

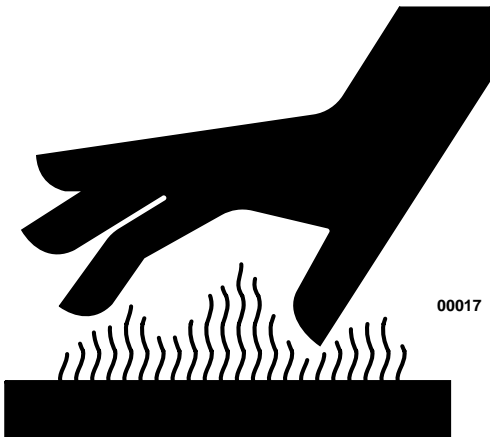
Tests & Adjustments - General Machine

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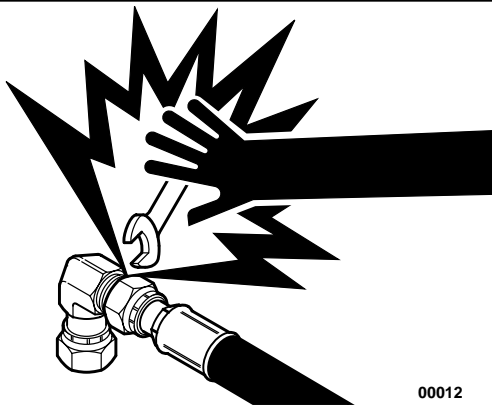
General Safety

NOTICE

You must read and understand the warnings and basic safety rules, found in Group-1 of this manual, before performing any operation, test or adjustment procedures.



At operating temperature, the engine, exhaust system components, cooling system components and hydraulic system components are HOT. Any contact can cause severe burns.



Pressure can be maintained in system circuits long after the engine and pumps have been shut down. Release trapped pressure in hydraulic, fuel, and cooling system lines before performing any maintenance or repair procedures.

Hydraulic Tank Turbo Boost Regulator

Tools Required:

- 1/2", 9/16", 5/8" & 11/16" wrenches
- 0 - 30 psi (200 kPa) gauge
- Air supply

Specification:

5 - 7 psig (34,5 - 48,2 kPa)

Procedure:



Figure 1: Turbo Boost Release Valve

1. Release turbo boost pressure at the turbo boost release valve. See Figure 1.

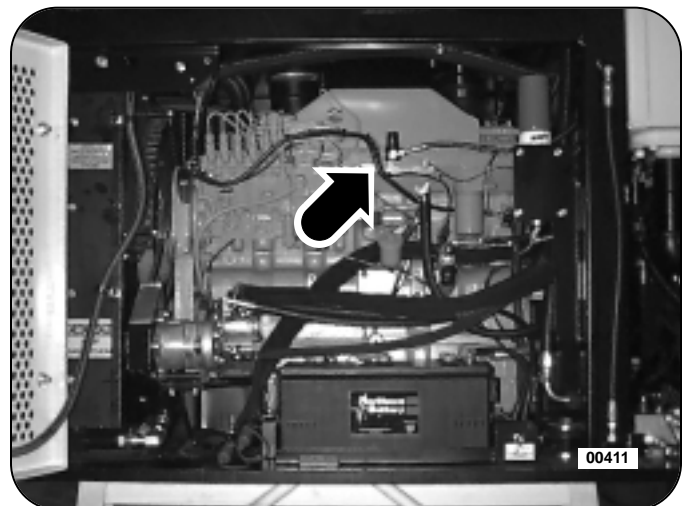


Figure 3: Hydraulic Tank Turbo Boost Regulator (Typical)

2. Locate the turbo boost release valve and turbo boost regulator. See figure 2.

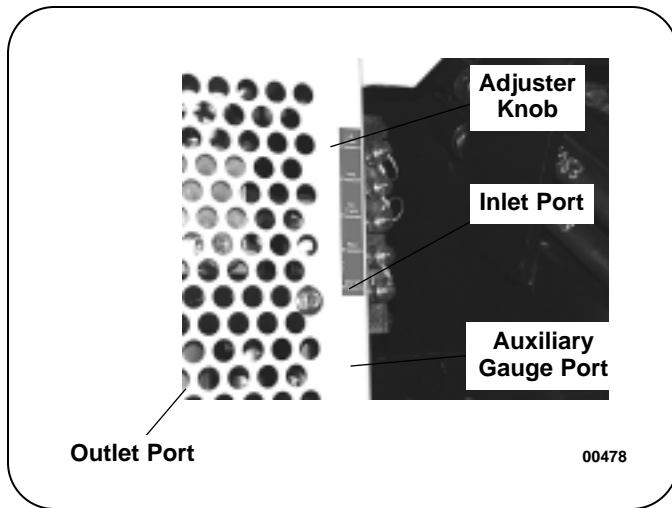


Figure 3: Turbo Boost Regulator

3. Disconnect and remove the turbo boost regulator from the engine intake manifold.
4. Install pressure gauge on the outlet port of the turbo boost regulator. See Figure 3.
5. Attach an air supply with a shut-off valve to the inlet port of the turbo boost regulator.
6. Record original reading.
7. Pull adjuster knob out from lock position and set the turbo boost regulator to specification.

To increase pressure setting, turn the adjuster knob in clockwise. To decrease the pressure setting, turn the adjuster knob out counter-clockwise.

NOTE: Always start with a pressure reading lower than specification and bring adjustment up to specification, otherwise pressure creep will occur.

8. Push the adjuster knob in to lock and then re-install the turbo boost regulator.
9. Close the turbo boost release valve then close and secure the perforated swing-out engine guard.

Hydraulic Tank Safety Relief Cap

Tools Required:

Coolant cap tester

Specification:

14 psig (96,5 kPa)

Procedure:



Figure 4: Turbo Boost Release Valve

1. Release turbo boost pressure at the turbo boost release valve. See Figure 4.

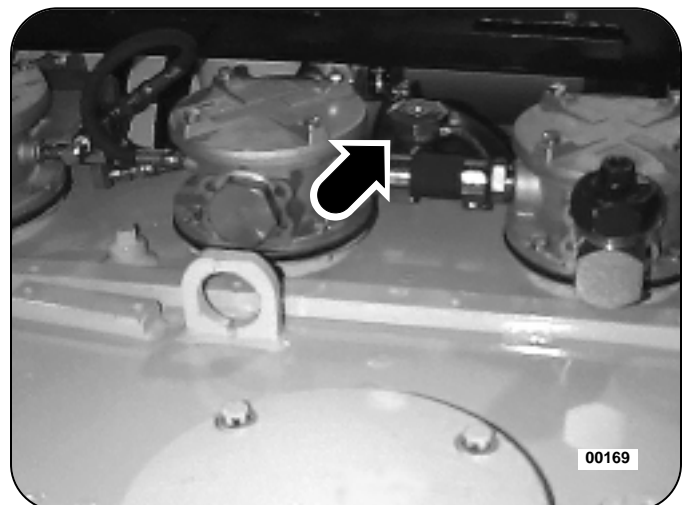


Figure 5: Hydraulic Tank Safety Relief Cap

2. Remove the hydraulic tank safety relief cap. See Figure 5. Test cap on a coolant cap tester. Replace cap if it does not meet specification.

Oil Cooler Performance

Tools Required:

Temperature Probe or gun

Specification:

- $T < 12^{\circ}\text{F}$ (7°C) - Scaled (internal) or dirty oil cooler (external)
- T 12 - 16°F (7°C - 9°C) - Normal cooler temperature differential
- $T > 20^{\circ}\text{F}$ (11°C) - Failed thermal bypass valve or internally plugged oil cooler

Test Standards:

- Hydraulics must be a minimum of 165°F to ensure thermo bypass valve is closed.
- Engine at full throttle.
- Oil flow across cooler.

Procedure:

1. Ensure machine meets test standards.
2. Open the louvered swing-out radiator guard.
3. Start engine and run at full throttle.
4. Cycle the boom up and down.
5. Measure the temperature at the top and bottom oil cooler. Record measurements.
6. Subtract the top temperature from the bottom temperature to obtain the temperature differential (T).

Oil Cooler Thermal Bypass Valve

NOTE: This test can be used if an accurate closing temperature of the thermal bypass valve is needed or if the thermal bypass valve is to be tested before installation. Otherwise, use the oil cooler performance test.

Tools Required:

- 1-3/4" wrench
- Steel Pot
- Heat source
- 0 - 200°F (0 - 93°C) Temperature probe
- Length of mechanics wire

Specification:

120 - 140°F (49 - 60°C) Closing

Test Standards:

Valve must be below 100°F (37°C) prior to starting test.

Procedure:

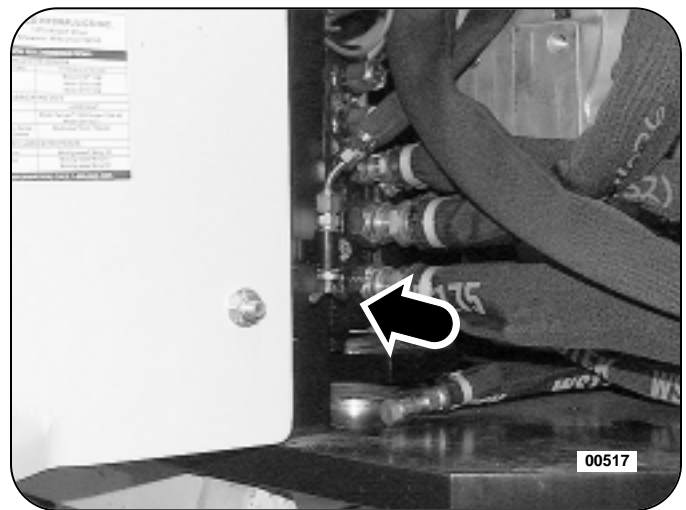


Figure 6: Turbo Boost Release Valve

1. Release turbo boost pressure at the turbo boost release valve. See Figure 6.
2. Open the perforated swing-out engine guard to access the thermal bypass valve at the top of the oil cooler. See figure 7.

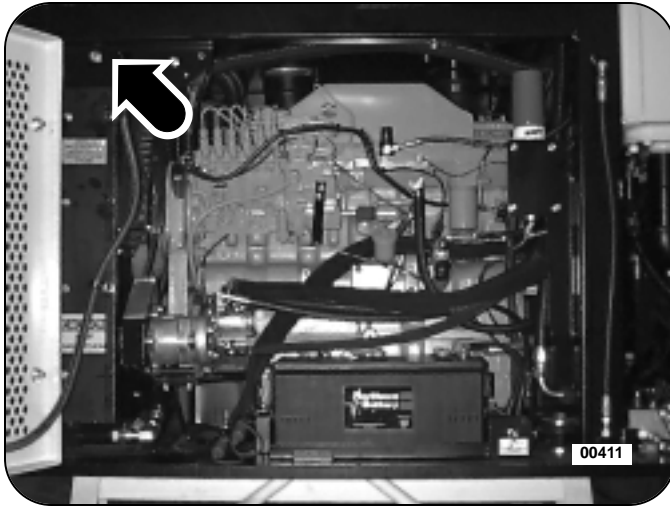


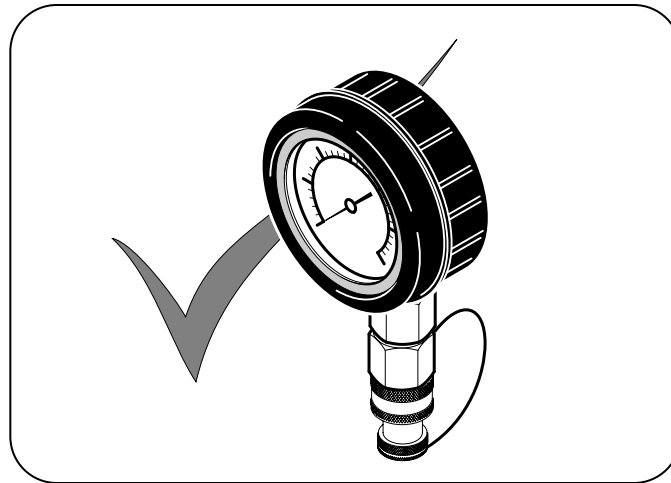
Figure 7: Oil Cooler Thermal Bypass Relief Location

3. Remove the thermal bypass valve from the oil cooler.
4. Set up steel pot and heat source. Fill the steel pot with oil.
5. Ensure the thermal bypass valve is below 100°F (37°C) then insert a length of mechanics wire between the valve's copper heat sink and spring cage.

6. Emmerge the thermal bypass valve in the oil by hanging it from the side of the steel pot with the mechanic's wire.

NOTE: Ensure the thermal bypass valve is not touching the bottom of the steel pot otherwise an incorrect test will result.

7. Insert the temperature probe in the oil. Do not let it contact the bottom of the pot otherwise incorrect temperature reading will occur.
8. Heat the oil until the thermal bypass valve slides off the wire. Read and record temperature that this occurred at. The thermal bypass valve cannot be adjusted so replace the valve if the test specification is not met.
9. Re-install the thermal bypass valve in the oil cooler.
10. Close and secure the perforated swing-out engine guard.



Tests & Adjustments - Implement Hydraulics

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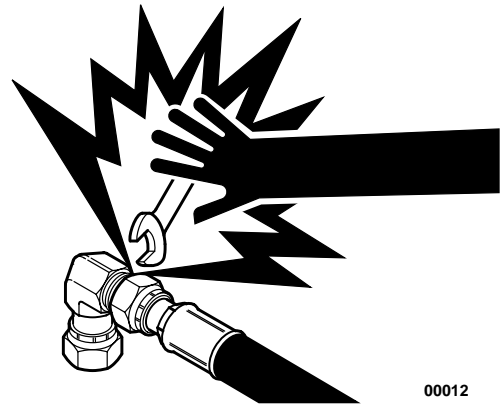
General Safety

NOTICE

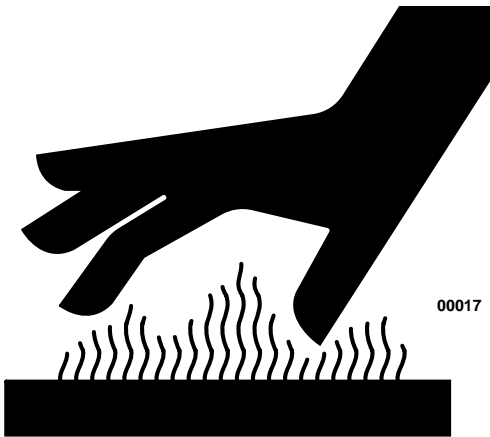
You must read and understand the warnings and basic safety rules, found in Group-1 of this manual, before performing any operation, test or adjustment procedures.



Diesel exhaust fumes contain elements that are hazardous to your health. Always run engine in a well ventilated area. If in an enclosed space, vent exhaust to the outside.



Pressure can be maintained in system circuits long after the engine and pumps have been shut down. Release trapped pressure in hydraulic, fuel, and cooling system lines before performing any maintenance or repair procedures.



At operating temperature, the engine, exhaust system components, cooling system components and hydraulic system components are HOT. Any contact can cause severe burns.

System Pilot Pressure

Tools Required:

- Tachometer
- 0 - 600 psi (0 - 5 Mpa) pressure gauge

NOTE: Each machine is shipped from the factory with at least one 600 psi and one 10,000 psi gauge with quick-couple adapters. The gauges can be found in the Up-Time Kit under the operator's seat.

Specification:

300 psig (2,07 Mpa)

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at high idle (approx. 1200 RPM).

Procedure:

1. Ensure the hydraulics are at correct operating temperature.
2. Start the engine and run at low idle.
3. Connect the 600 psi pressure gauge, with the TIMBCO quick-couple adapter attached, to the gauge port tap provided on the centralized pressure check manifold. See Figure 1.

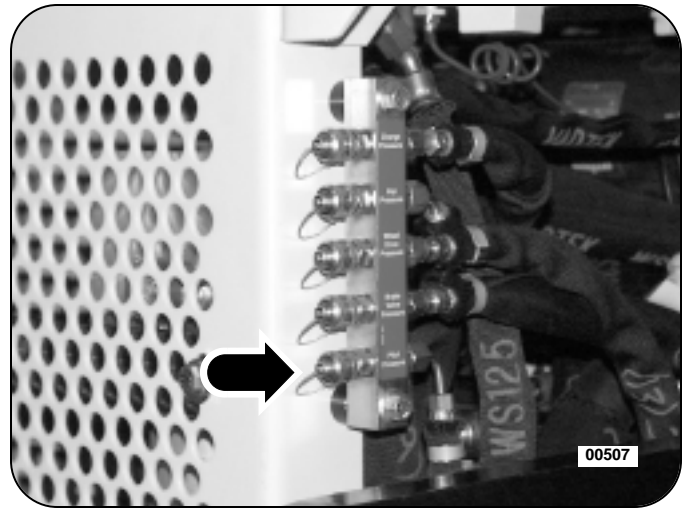


Figure 1: Pilot Pressure Gauge Port Tap

NOTE: Only install a 600 psi pressure gauge after the engine is running. If the gauge is installed before the engine is started it will be damaged.

6. Increase engine throttle to high idle (approx. 1200 RPM).
7. Read the pressure gauge, the system pilot pressure should be set at 300 psig (2,07 Mpa).

Pilot pressure is not adjustable. If the system pilot pressure does not match specification, the pressure reducing valve located inside the main control valve must be replaced.

Implement Pump Stand-By Pressure

Tools Required:

- Tachometer
- 11/16" & 13/16" wrench
- 13mm wrench
- 4mm allen wrench
- 0 - 600 psi (0-5 Mpa) pressure gauge
- PN# 15869, TIMBCO quick-couple adapter
- PN# 18838, TIMBCO #6 ORS plug
- PN# 18839, TIMBCO #6 ORS cap

NOTE: Each machine is shipped from the factory with at least one 600 PSI and one 10,000 PSI gauge with quick-couple adapters. The gauges can be found in the Up-Time Kit under the operator's seat. See Figure 4.

Specification:

400 psig (2,76 Mpa)

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at high idle (approx. 1200 RPM).

Procedure:

1. Ensure the hydraulics are at correct operating temperature.
2. Open the swing-out pump guard to access the implement pump. See Figure 2.
3. Use the 11/16" and 13/16" wrenches to disconnect the implement pump's load sense line. See Figure 3.



Figure 2: Swing-Out Pump Access Guard

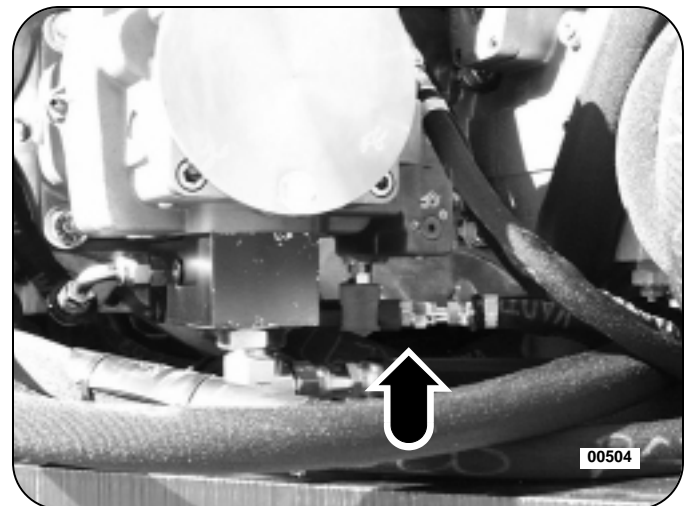


Figure 3: Disconnect Load Sense Line (Typical)

NOTE: The load sense must be disconnected before testing or adjusting the implement pump stand-by pressure. This prevents false readings from the control valve interacting with the pump.

3. Cap the fitting, but leave the hose end open.
4. Start the engine and run at low idle.
5. Connect the 600 psi pressure gauge, with the TIMBCO quick-couple adapter attached, to the gauge port tap provided on the centralized pressure check manifold. See Figure 4.

NOTE: Only install a 600 psi pressure gauge after the engine is running. If the gauge is installed before the engine is started it will be damaged.

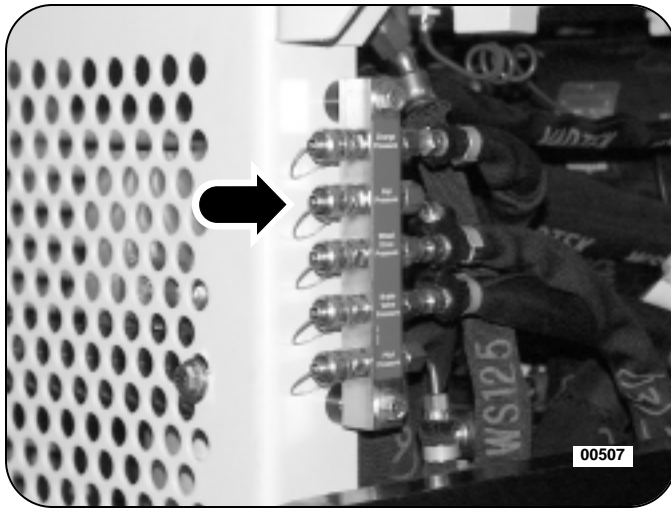


Figure 4: Implement Pump Pressure Gauge Port Tap

6. Increase engine throttle to a high idle (approx. 1200 RPM).
7. Read the pressure gauge, the implement pump stand-by pressure should be set at 400 psig (2,76 Mpa).

If implement pump stand-by pressure setting is correct, go to step #12. If adjustment is required, continue with step #8.

8. Use the 13mm wrench to loosen the jam nut on the stand-by pressure adjustment setscrew. See Figure 5.

NOTE: The compensator is located on the cab side of the pump.

9. Use the 4mm allen wrench to turn the adjustment setscrew.

Turning the adjustment setscrew **CLOCKWISE** increases the pressure setting. Turning the setscrew **COUNTER-CLOCKWISE** decreases the pressure setting.

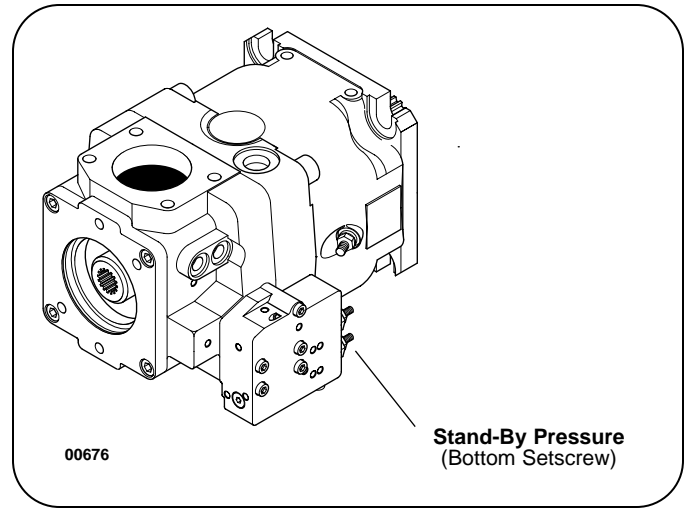


Figure 5: Implement Pump Stand-By Pressure Adjustment

10. Read the pressure gauge and adjust pressure setting as required.
11. After the correct pressure setting is made, tighten the jam nut to lock the setscrew.
12. Remove the pressure gauge and shut down the engine.
13. Re-connect the load sense line removed in step #2.

NOTE: It is not necessary to bleed the load sense line because the pump is vented internally.

14. Close and secure the swing-out pump guard.

Implement Pump POR Pressure

Tools Required:

- Tachometer
 - 13mm wrench
 - 4mm allen wrench
 - 0 - 10,000 psi (0 - 80 Mpa) pressure gauge
 - PN# 15869, TIMBCO quick-couple adapter
- The operator or another mechanic may be required to operate a control while a pressure reading is being taken.

NOTE: Each machine is shipped from the factory with at least one 600 psi and one 10,000 psi gauge with quick-couple adapters. The gauges can be found in the Up-Time Kit under the operator's seat.

Specification:

3000 +/- 50 psig (20,69 +/- 0,35 Mpa)

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at high idle (approx. 1200 RPM).

Procedure:

1. Ensure the hydraulics are at correct operating temperature.
2. Open the swing-out pump guard to access the implement pump. See Figure 6.
3. Connect the 600 psi pressure gauge, with the TIMBCO quick-couple adapter attached, to the gauge port tap provided on the centralized pressure check manifold. See Figure 7.
4. Start engine and increase engine throttle to high idle (approx. 1200 RPM).
5. Instruct the operator or another mechanic to bottom out a loader function while you read the pressure gauge, implement pump POR pressure should be set at 3,000 psig (20,69 Mpa).



Figure 6: Swing-Out Pump Access Guard

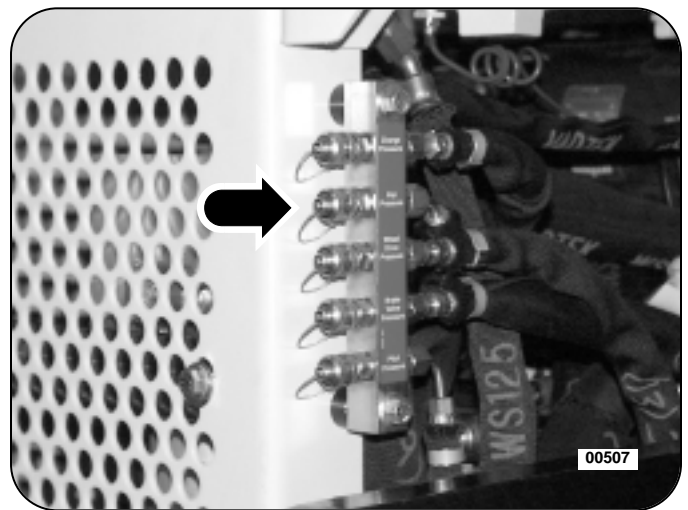


Figure 7: Implement Pump Pressure Gauge Port Tap

6. If implement pump POR pressure setting is correct, go to step #10. If adjustment is required, continue with step #7.
7. Use the 13mm wrench to loosen the jam nut on the POR pressure adjustment setscrew. See Figure 8.

NOTE: The compensator is located on the cab side of the loader pump.

8. Use the 4mm allen wrench to turn the adjustment setscrew.

Turning the adjustment setscrew **CLOCKWISE** increases the pressure setting. Turning the setscrew **COUNTER-CLOCKWISE** decreases the pressure setting.

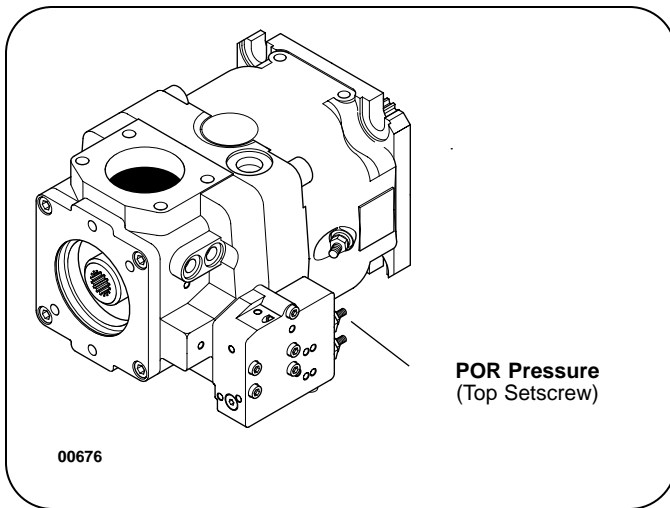


Figure 8: Implement Pump Stand-By Pressure Adjustment

9. Instruct the operator or another mechanic to bottom out a loader function while you read the pressure gauge and adjust pressure setting as required.
10. After the correct pressure setting is made, tighten the jam nut to lock the setscrew.
11. Shut down the engine.
12. Remove the pressure gauge then close and secure the swing-out pump guard.

Implement Pump Case Drain Pressure

Tools Required:

- 9/16", 11/16", 3/4" & 1-1/4" wrenches
 - 0 - 60 psi (0 - 1000 kPa) pressure gauge
 - Gauge test hose
 - #12 ORBM - #4 JICM adapter
- The operator or another mechanic may be required to operate a control while a pressure reading is being taken.

Specification:

Maximum 35 psig (241 kPa) allowed.

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at full throttle (approx. 1800 RPM).
- Implement pump pressure at specification.

Procedure:

1. Produce a gauge test hose that will allow you to connect a 60 psi gauge to the adapter #4 JICM adapter that will be installed into the loader implement pump case drain port.
2. Ensure the hydraulics are at correct operating temperature.
3. Open the swing-out pump guard to access the implement pump. See Figure 9.
4. Locate and remove the implement pump case drain plug that is 180° from the case drain line. Install the #12 ORBM - #4JICM adapter into the port.
5. Install the gauge test hose and pressure gauge to the case drain port adapter.



Figure 9: Swing-Out Pump Access Guard

NOTICE

Be sure the pump case is full of oil before starting the machine otherwise catastrophic damage to the pump will occur.

6. Start engine and run at full throttle.
7. Instruct the operator or another mechanic to bottom out a loader function and hold it for a full minute while you observe the pressure gauge.

The implement pump case drain pressure should not exceed specification. If the specification is exceeded, look for conditions that would increase backpressure in the case drain circuit such as a plugged case drain filter element, failing component, etc.
8. After completing the test, cycle all implement functions for a least 2-minutes to cool the hydraulics down.
9. Shutdown the engine and re-install the loader implement pump case port plug.
10. Close and secure the swing-out pump guard.

Implement Pump Case Drain Flow

Tools Required:

- 1-1/4" & 1-3/8" wrenches
 - PN# 15437, TIMBCO #12 ORS cap
 - Calibrated container - 10 gallons (38 litres)
 - Stop watch
- The operator or another mechanic may be required to operate a control while a pressure reading is being taken.

Specification:

- New or rebuilt - Maximum 4.6 gpm (17,5 litres) allowed.
- Used - Maximum 5.8 gpm (22 litres) allowed.

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at full throttle (approx 1800 RPM).
- Implement pump pressure at specification.

Procedure:

1. Ensure the hydraulics are at correct operating temperature.
2. Open the swing-out pump guard to access the loader implement pump. See Figure 10.
4. Use the 1-1/4" and 1-3/8" wrenches to remove the implement pump case drain line at the return oil manifold. Cap the fitting to prevent contaminants from entering the hydraulic system.
5. Place the open end of the case drain hose into the calibrated container.

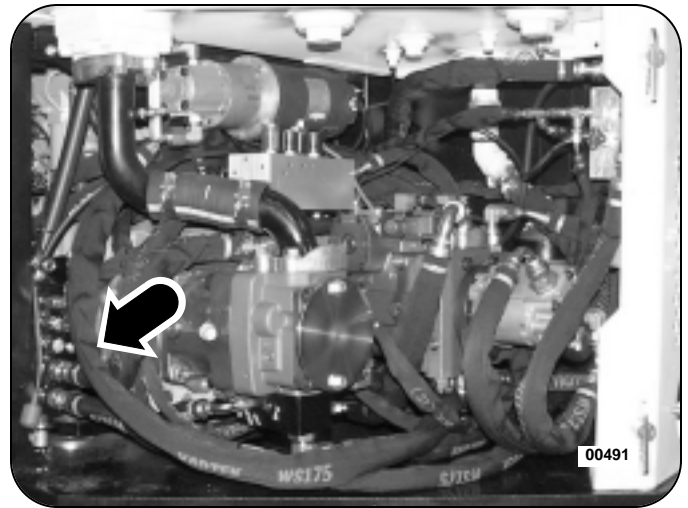
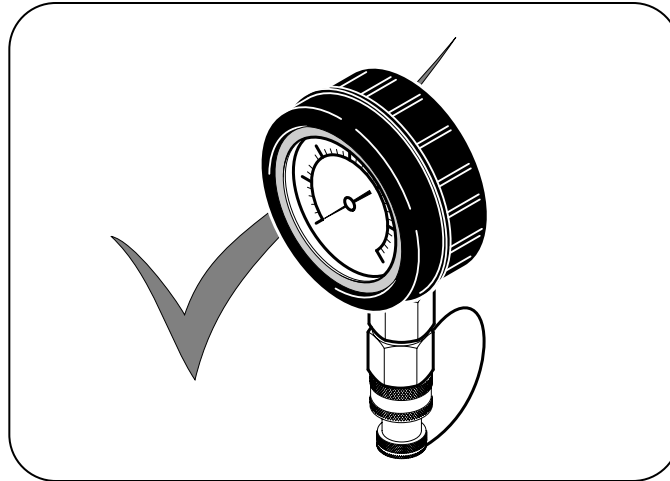


Figure 10: Return Oil Manifold

NOTICE

Be sure the pump case is full of oil before starting the machine otherwise catastrophic damage to the pump will occur.

6. Start engine and run at full throttle. Immediately have the operator or another mechanic bottom out a loader function and hold it for a full minute.
7. After one minute, deactivate the loader function and shutdown the engine.
8. Remove implement pump case drain hose from the container and re-connect it to the return oil manifold.
9. Cycle all implement functions for a least 2-minutes to cool the hydraulics down.
10. Measure the oil in the container. If the amount exceeds specification, the implement pump is worn or failing and may have to be replaced.
11. Close and secure the swing-out pump guard.



Tests & Adjustments - Wheel Drive Hydraulics

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MAX Displacement Lock Signal Pressure (Hydraulic motor shift signal pressure in optional single wheel drive motor configurations)	8.3.22

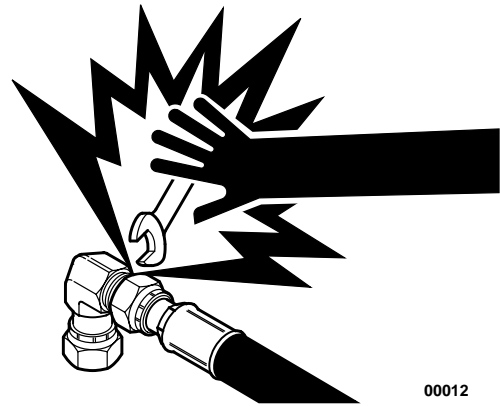
General Safety

NOTICE

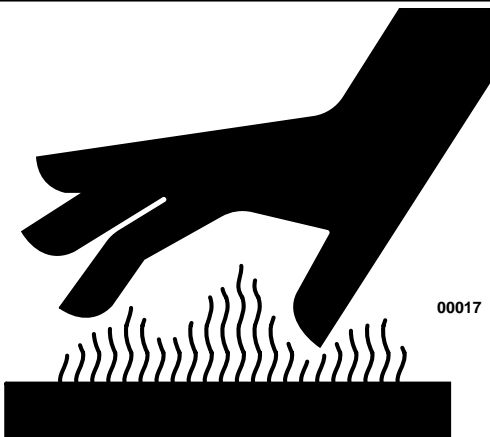
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Diesel exhaust fumes contain elements that are hazardous to your health. Always run engine in a well ventilated area. If in an enclosed space, vent exhaust to the outside.



Pressure can be maintained in system circuits long after the engine and pumps have been shut down. Release trapped pressure in hydraulic, fuel, and cooling system lines before performing any maintenance or repair procedures.



At operating temperature, the engine, exhaust system components, cooling system components and hydraulic system components are HOT. Any contact can cause severe burns.

Wheel Drive Charge Pressure

Tools Required:

- Tachometer
- 9/16" wrench
- 5/32" allen wrench
- 0 - 600 psi (0 - 5 Mpa) pressure gauge
- PN# 15869, TIMBCO quick-couple adapter

NOTE: Each machine is shipped from the factory with at least one 600 psi and one 10,000 psi gauge with quick-couple adapters. The gauges can be found in the Up-Time Kit under the operator's seat.

Specification:

400 psig (2,76 Mpa)

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at high idle (approx. 1200 RPM).

Procedure:

1. Ensure the hydraulics are at correct operating temperature.
2. Start the engine and run at low idle.
3. Connect the 600 psi pressure gauge, with the TIMBCO quick-couple adapter attached, to the gauge port tap provided on the centralized pressure check manifold. See Figure 1.

NOTE: Only install a 600 psi pressure gauge after the engine is running. If the gauge is installed before the engine is started it will be damaged.

6. Increase engine throttle to high idle (approx. 1200 RPM).

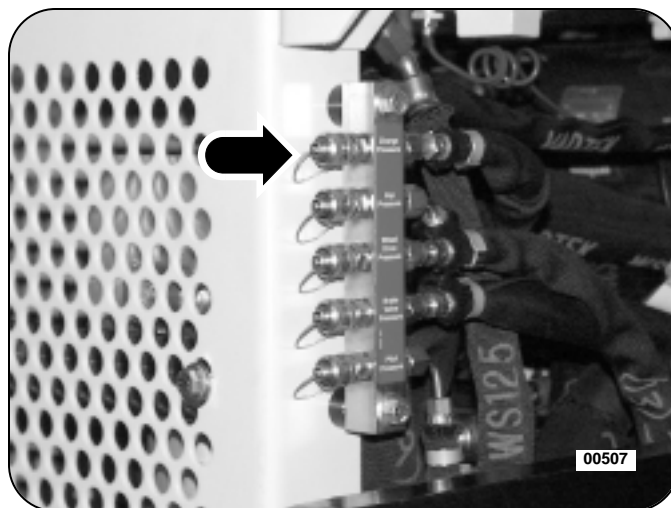


Figure 1: Wheel Drive Charge Pressure Gauge Port Tap

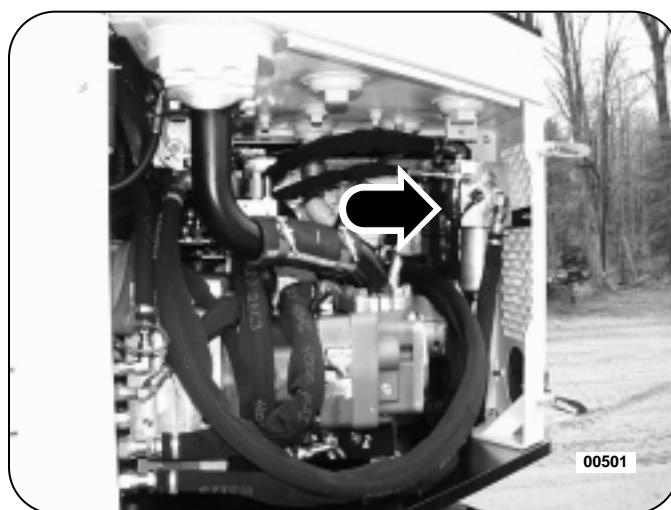


Figure 2: Wheel Drive Charge Pressure Manifold Assembly

7. Read the pressure gauge, the wheel drive charge pressure should be set at 400 psig (2,76 Mpa).

If wheel drive charge pressure setting is correct, go to step #10. If adjustment is required, continue with step #8.

8. Open the swing-out pump access guard and locate the wheel drive charge pressure manifold assembly. See Figure 2.

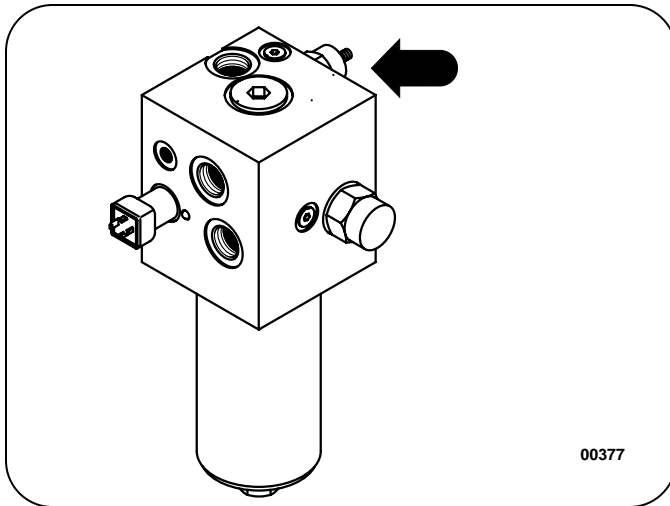


Figure 3: Wheel Drive Charge Pressure Adjustment

9. Use the 9/16" wrench and 5/32" allen wrench to loosen the jam nut on the charge pressure relief adjustment setscrew. See Figure 3.

Turning the adjustment setscrew **CLOCKWISE** increases the pressure setting. Turning the setscrew **COUNTER-CLOCKWISE** decreases the pressure setting.

10. Read the pressure gauge, re-adjust pressure setting as required. After the correct pressure setting is made, tighten the jam nut to lock adjustment setting.
11. Shut down the engine. Remove the pressure gauge and secure the swing-out pump guard.

Wheel Drive Pump Directional Relief Pressure

Tools Required:

- Tachometer
 - 3/4" wrench
 - 13mm & 17mm wrenches
 - 4mm & 5mm allen wrenches
 - 0 - 10,000 psi (0 - 75 Mpa) pressure gauge
 - PN# 15869, TIMBCO quick-couple adapter
- The operator or another mechanic may be required to operate a control while a pressure reading is being taken.

NOTE: Each machine is shipped from the factory with at least one 600 psi and one 10,000 psi gauge with quick-couple adapters. The gauges can be found in the Up-Time Kit under the operator's seat.

Specification:

6400 psig (44,14 Mpa)

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at high idle (approx. 1200 RPM).

Procedure:

NOTICE

Operating the wheel drives over relief produces extreme heat that can damage hydraulic system components. Expedite all pressure readings and adjustments.

1. Ensure the hydraulics are at correct operating temperature.

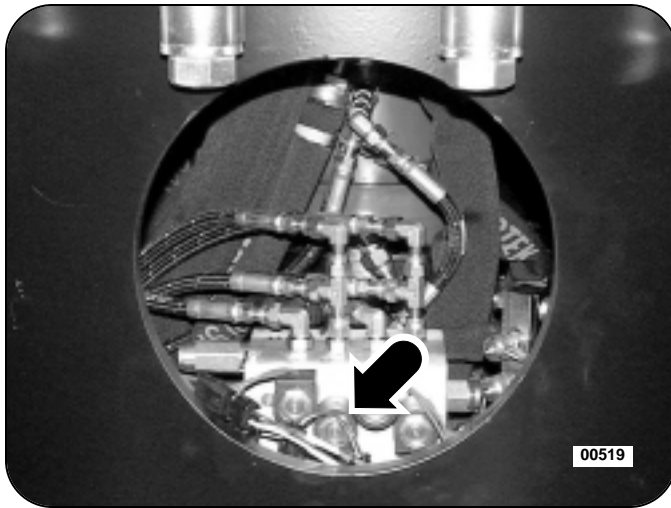


Figure 4: Lower Solenoid Manifold



Figure 6: Swing-Out Pump Access Guard

2. Locate and disconnect the parking brake solenoid coil harness (yellow wire) at the lower solenoid manifold located in the right side of the upper turntable riser. See Figure 4. This will prevent the parking brake from releasing.

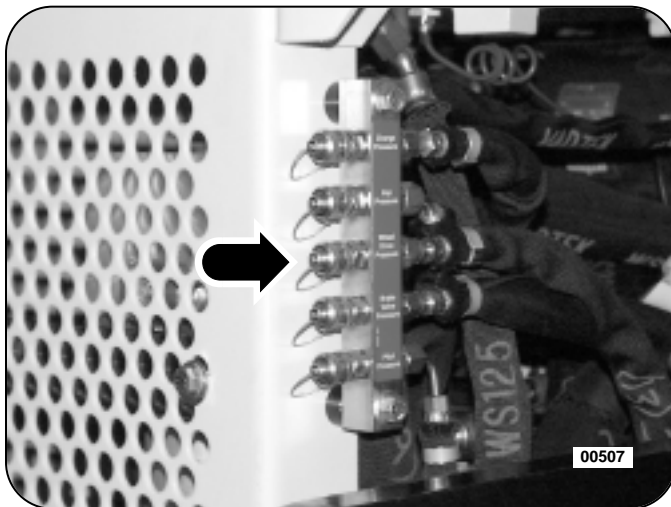


Figure 5: Wheel Drive Pump Pressure Gauge Port Tap

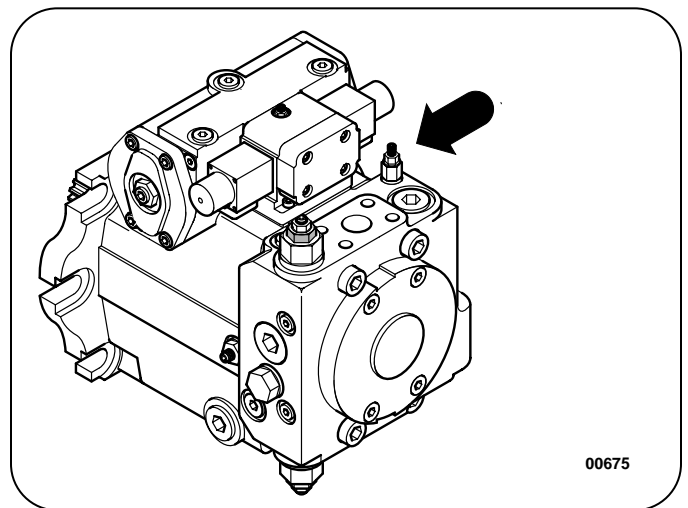


Figure 7: Wheel Drive PCO Relief

3. Connect the 10,00 psi pressure gauge, with the TIMBCO quick-couple adapter attached, to the gauge port tap provided on the centralized pressure check manifold. See Figure 5.
4. Open the swing-out pump guard to access the wheel drive pump. See Figure 6.
5. Before the directional reliefs can be set the wheel drive PCO relief must be cancelled. Locate the PCO relief on the wheel drive pump. See Figure 7.

6. Use the 13mm wrench and 4mm allen wrench to loosen the jam nut on the PCO relief adjustment setscrew.

7. Carefully turn the adjustment screw in **CLOCKWISE** until it bottoms out. This cancels the PCO relief and allows the gauge to read the directional relief settings.

NOTE: Do not turn the adjustment setscrew in too far or it will damage the relief valve.

8. Instruct the operator or another mechanic to start the engine and run at high idle (approx. 1200 RPM).
9. On your signal, have the operator or another mechanic apply the travel brake and activate the FORWARD travel function while you take a pressure reading. Then activate the REVERSE travel function and take a reading. Wheel drive directional relief pressure should be set at 6,400 psig (44,14 Mpa) in both directions.

If wheel drive directional relief pressure settings are correct, go to step #15. If an adjustment is required, continue with step #10.

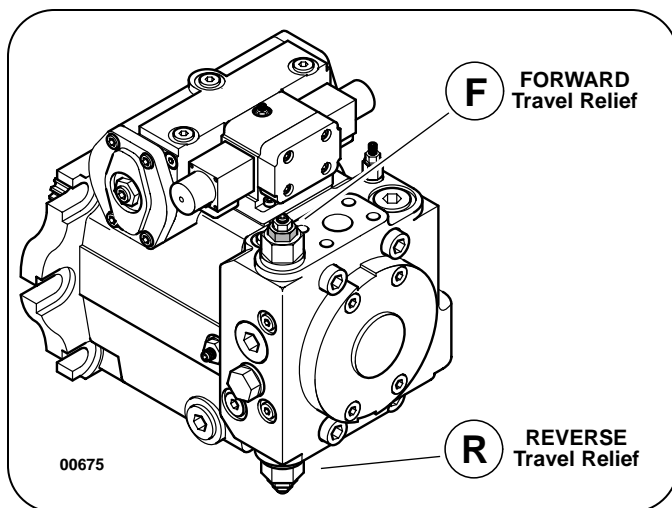


Figure 8: Wheel Drive POR Relief

10. Locate the directional relief for the direction of travel that requires adjustment. See Figure 8.

11. Use the 17mm wrench and 5mm allen wrench to loosen the jam nut on the directional relief adjustment setscrew.
13. On your signal, have the operator or another mechanic apply the travel brake and activate the required direction of travel while you set the directional relief to 6400 psig (44,14 Mpa).

Turning the adjustment setscrew **CLOCKWISE** increases the pressure setting. Turning the setscrew **COUNTER-CLOCKWISE** decreases the pressure setting.

14. After the correct pressure setting is made, hold the adjustment setscrew stationary and tighten the jamnut to hold the pressure setting.
15. After testing or making adjustments to the wheel drive reliefs, re-adjust the wheel drive PCO pressure setting to specification.
16. Shut down the engine and remove the pressure gauge.
17. Re-connect the parking brake solenoid coil harness. Close and secure the swing-out pump guard.
18. If possible, start the engine and operate the wheel drives to help cool the circuit down.
19. Shut down the engine.

Wheel Drive Pump PCO Pressure

Tools Required:

- Tachometer
 - 3/4" wrench
 - 13mm wrench
 - 4mm allen wrench
 - 0 - 10,000 psi (0 - 75 Mpa) pressure gauge
 - PN# 15869, TIMBCO quick-couple adapter
- The operator or another mechanic may be required to operate a control while a pressure reading is being taken.

NOTE: Each machine is shipped from the factory with at least one 600 psi and one 10,000 psi gauge with quick-couple adapters. The gauges can be found in the Up-Time Kit under the operator's seat.

Specification:

6000 psig (41,38 Mpa)

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at high idle (approx. 1200 RPM).
- Wheel drive pump charge pressure and charge spike relief set to specification.

Procedure:

NOTICE

Operating the wheel drives over relief produces extreme heat that can damage hydraulic system components. Expedite all pressure readings and adjustments.

1. Ensure the hydraulics are at correct operating temperature.

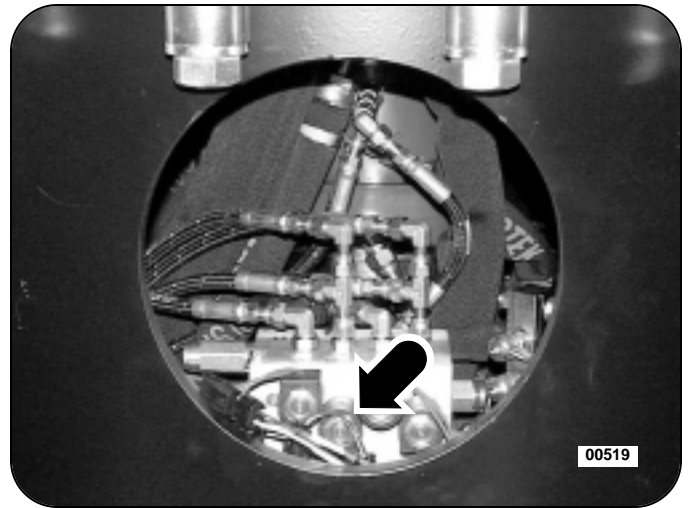


Figure 9: Lower Solenoid Manifold

2. Locate and disconnect the parking brake solenoid coil harness (yellow wire) at the lower solenoid manifold located in the right side of the upper turntable riser. See Figure 9. This will prevent the parking brake from releasing.

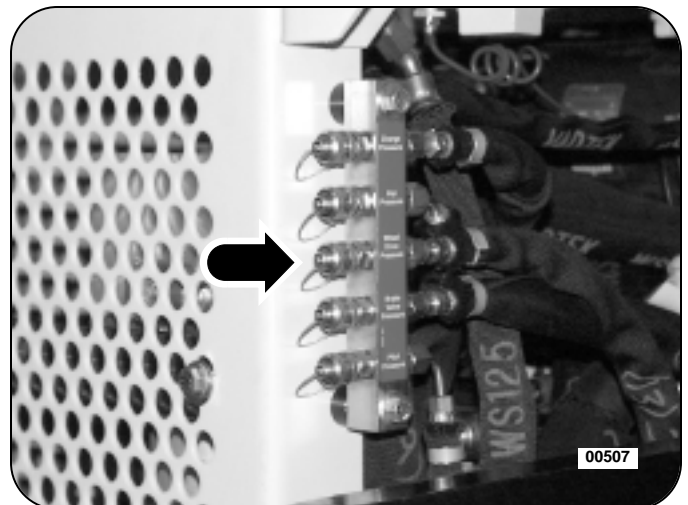


Figure 10: Wheel Drive Pump Pressure Gauge Port Tap

3. Connect the 10,000 psi pressure gauge, with the TIMBCO quick-couple adapter attached, to the gauge port tap provided on the centralized pressure check manifold. See Figure 10.



Figure 11: Swing-Out Pump Access Guard

4. Open the swing-out pump guard to access the wheel drive pump. See Figure 11.
5. Instruct the operator or another mechanic to start the engine and run at high idle (approx. 1200 RPM).
6. On your signal, have the operator or another mechanic apply the travel brake and activate the FORWARD travel function while you take a pressure reading. Wheel drive pump PCO pressure should be set at 6000 psig (41,38 Mpa).

If wheel drive pump PCO pressure is correct, go to step #12. If an adjustment is required, continue with step #7.

7. Locate the PCO relief on the wheel drive pump. See Figure 12.
8. Use the 13mm wrench and 4mm allen wrench to loosen the jam nut on the PCO relief adjustment setscrew.
9. On your signal, have the operator or another

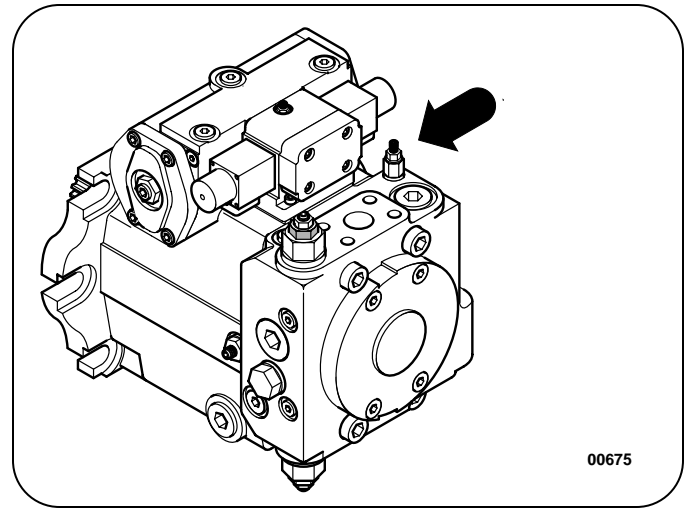


Figure 12: Wheel Drive PCO Relief

mechanic apply the travel brake and activate the FORWARD travel function while you set the PCO relief to 6000 psig (41,38 Mpa).

Turning the adjustment setscrew **CLOCKWISE** increases the pressure setting. Turning the setscrew **COUNTER-CLOCKWISE** decreases the pressure setting.

10. After the correct pressure setting is made, hold the adjustment setscrew stationary and tighten the jamnut to hold the pressure setting.
11. Shut down the engine and remove the pressure gauge.
12. Re-connect the parking brake solenoid coil harness. Close and secure the swing-out pump guard.
13. If possible, start the engine and operate the wheel drives to help cool the circuit down.
14. Shut down the engine.

Wheel Drive Pump Null

Tools Required:

- 13mm & 24mm wrenches
- 1/4" allen wrench
- 8mm allen wrench
- (2) #6 ORBM - #4 JICM adapters
- 24" (61cm) jumper hose w/#4 JICF ends
- 0 - 600 psi (0 - 5 Mpa) pressure gauges
- 0 - 10,000 psi (0 - 75 Mpa) pressure gauges
- (2) PN# 15869, TIMBCO quick-couple adapter

NOTE: Each machine is shipped from the factory with at least one 600 psi and one 10,000 psi gauge with quick-couple adapters. The gauges can be found in the Up-Time Kit under the operator's seat.

Specification:

Obtain the lowest possible pressure between ports "X1" and "X2" with the jumper hose installed.

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at low idle (approx. 1000 RPM).

Procedure:

1. Ensure the hydraulics are at correct operating temperature.
2. Locate and disconnect the parking brake solenoid coil harness (yellow wire) at the lower solenoid manifold located in the right side of the upper turntable riser. See Figure 13. This will prevent the parking brake from releasing.

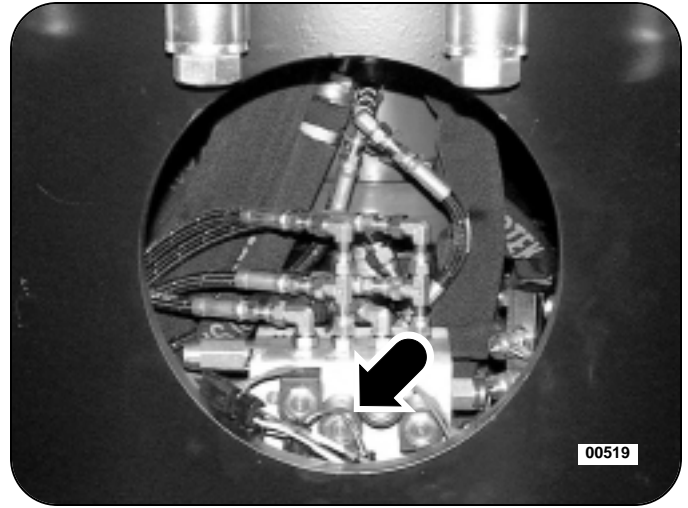
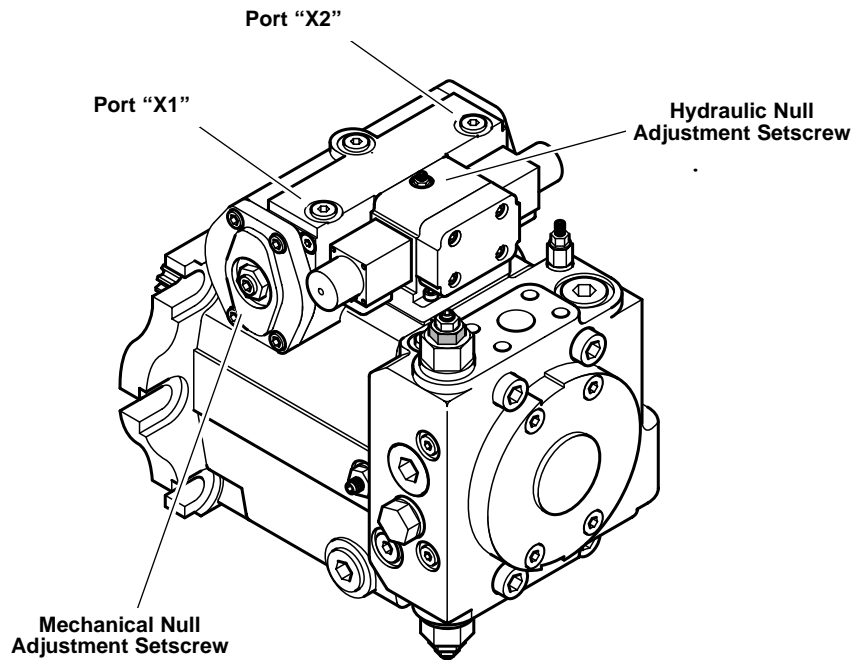


Figure 13: Lower Solenoid Manifold



Figure 14: Swing-Out Pump Access Guard

3. Open the swing-out pump guard to access the wheel drive pump. See Figure 14.
4. Using the 3/16" allen wrench, remove the plugs from ports "X1" and "X2". See Figure 15. Install the #6 ORBM - #4 JICM adapters into the ports.
5. Connect the 24" (61cm) jumper hose between ports "X1" and "X2".
6. Start the engine and run at low idle (approx. 1000 RPM). The engine will remain running throughout the procedure.



00675

Figure 15: Hydrostatic Pump Null Adjustments

7. Connect the 10,000 psi pressure gauge, with the TIMBCO quick-couple adapter attached, to the gauge port tap on the wheel drive pump. See Figure 16.
8. The mechanical null adjustment is made with a large setscrew in the control piston cover. See Figure 15. Use the 24mm wrench and 8mm allen wrench, to loosen the jamnut and turn the adjustment setscrew in and out until the gauge reads the lowest possible pressure.

NOTE: The lowest pressure reading indicates when the control piston is in the centered null position.

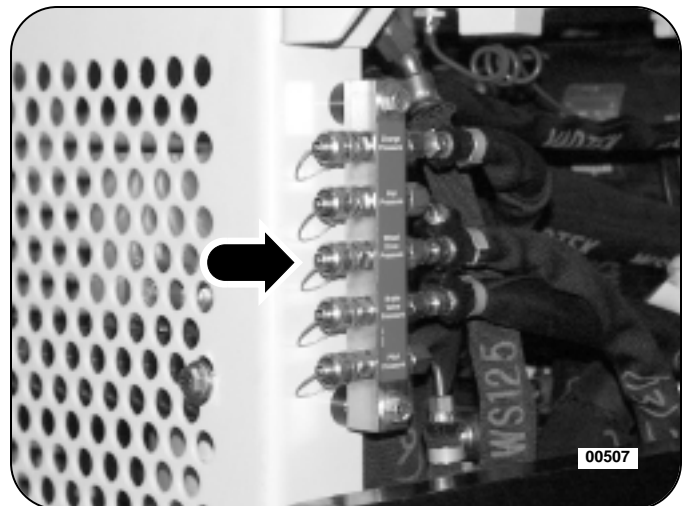


Figure 16: Wheel Drive Pump Pressure Gauge Port Tap

9. Remove the 10,000 psi gauge and install the 600 psi gauge in its place. Repeat step #8 to make the final adjustment.
10. Remove the 600 psi gauge and install the 10,000 psi gauge in its place.

NOTICE

The hydraulic null adjustment is made with an eccentric pin and should not be turned more than 90° from center (as indicated by a notch on the adjustment screw), otherwise damage to the eccentric pin could result.

11. The hydraulic null adjustment is made with a small setscrew on top of the stroke control. See Figure 15. Use the 13 mm wrench and 4 mm allen wrench, to loosen the jamnut and turn the adjustment setscrew in and out until the gauge reads the lowest possible pressure.

NOTE: The lowest pressure reading indicates when the control spool is in the centered null position.

12. Remove the 10,000 psi gauge and install the 600 psi gauge in its place. Repeat step #11 to make the final adjustment.
13. Shut-down engine and remove jumper hose, fittings, and gauge.
14. Re-connect the parking brake solenoid coil harness. Close and secure the swing-out pump guard.
15. Procedure complete.

Wheel Drive Pump Case Drain Pressure

Tools Required:

- 9/16", 5/8", 11/16", 3/4" & 13/16" wrenches
- 0 - 60 psi (0 - 1 Mpa) pressure gauge
- Gauge test hose
- #12 ORBM - #4 JICM adapter
- The operator or another mechanic may be required to operate a control while a pressure reading is being taken.

Specification:

Maximum 30 psig (0,21 Mpa) allowed.

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at full throttle (approx. 1800 RPM).
- Wheel drive pump and charge pressures at specification.

Procedure:

1. Produce a gauge test hose that will allow you to connect a 60 psi gauge to the #4 JICM adapter that will be installed into the wheel drive pump case drain port.
2. Ensure the hydraulics are at correct operating temperature.

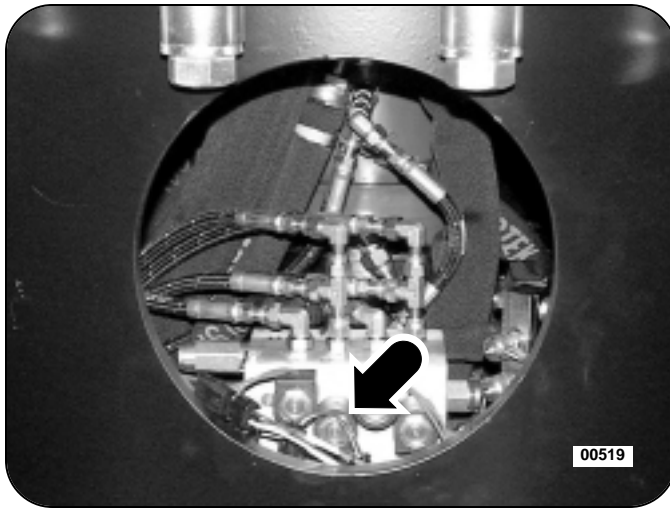


Figure 17: Lower Solenoid Manifold



Figure 18: Swing-Out Pump Access Guard

3. Locate and disconnect the parking brake solenoid coil harness (yellow wire) at the lower solenoid manifold located in the right side of the upper turntable riser. See Figure 17. This will prevent the parking brake from releasing.
4. Open the swing-out pump guard to access the wheel drive pump. See Figure 18.
5. Locate and remove the wheel drive pump case drain plug in port "R". Install the #12 ORBM - #4JICM adapter into the port.
6. Install the gauge test hose and pressure gauge to the case drain port adapter.

NOTICE

Be sure the pump case is full of oil before starting the machine otherwise catastrophic damage to the pump will occur.

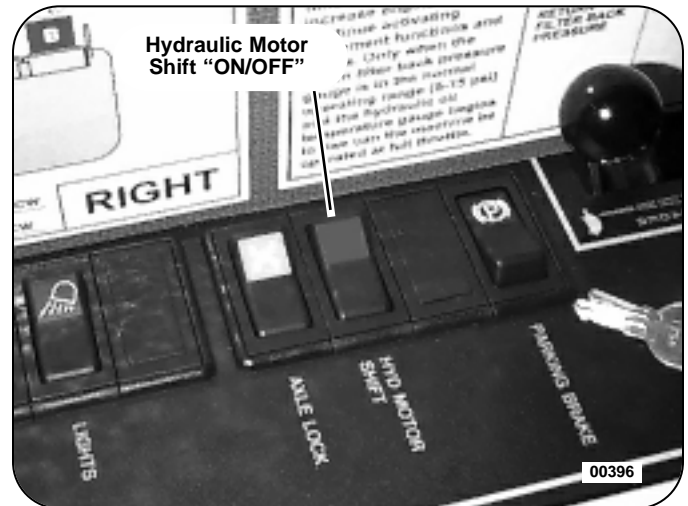


Figure 19: Hydraulic Motor Shift Control

7. Start engine and set the hydraulic motor shift control to the "OFF" position. See Figure 19.
8. Advance engine to full throttle..
9. On your signal, have the operator or another mechanic apply the travel brake and activate full FORWARD travel while you take a pressure reading. Then activate full REVERSE travel and take a reading.

The wheel drive pump case drain pressure should not exceed specification. If the specification is exceeded, look for conditions that would increase backpressure in the case drain circuit such as a plugged case drain filter element, failing component, etc.

10. Shutdown the engine and re-install the wheel drive pump case port plug.
11. Re-connect the parking brake solenoid coil harness. Close and secure the swing-out pump guard.
12. Procedure complete.

Wheel Drive Motor Displacement

Tools Required:

- 9/16" wrench
- 19mm wrench
- 6mm allen wrench
- Vernier caliper
- Depth micrometer (optional)

NOTICE

The wheel drive motor MIN and MAX displacement adjustments are sealed at the factory and no attempt to adjust them should be made without prior authorization from TIMBCO. Unauthorized adjustment of the MIN and MAX displacements will void the machine and component warranty.

Specification:

NOTICE

In the standard configurations the front and rear wheel drive motors are different internally. From the factory, the motors are marked with either 031/002 or 031 indicating the motor type. There is also a serial number plate attached to the underside of each motor for identification. The 031/002 motor should be in the front position, but this may not be so on early production machines. Be sure to identify the motors before beginning adjustment procedures. Incorrect adjustment will overheat and possibly damage the machine.

Displacement setscrew "X" Dimension:

Standard Dual Motors:

- 031/002 motor MIN - 19.90mm (0 cc)
(w/STD 80mm screw)
- 031 motor MIN - 9.05mm (83-85 cc)
(w/ STD 100mm screw)
- MAX (both) - 19.90mm (160 cc)
(w/ STD 80mm screw)

Optional Single Motor:

- MIN - 9.05mm (83-85 cc)
(w/STD 100mm screw)
- MAX - 19.90mm (160 cc)
(w/STD 80mm screw)

"X" Dimension Definition:

This is the length of the adjusting screw protruding from the jam nut when the jam nut has been torqued down. It is measured from the top of the jam nut (flat area) to the top of the protruding adjusting screw. This measurement is used in both the MIN and MAX displacement adjustments.

NOTE: The measurement of this screw is critical, failure to measure the "X" dimension properly, or adhering to the specifications provided, will cause catastrophic damage to the wheel drive motor.

Procedure:

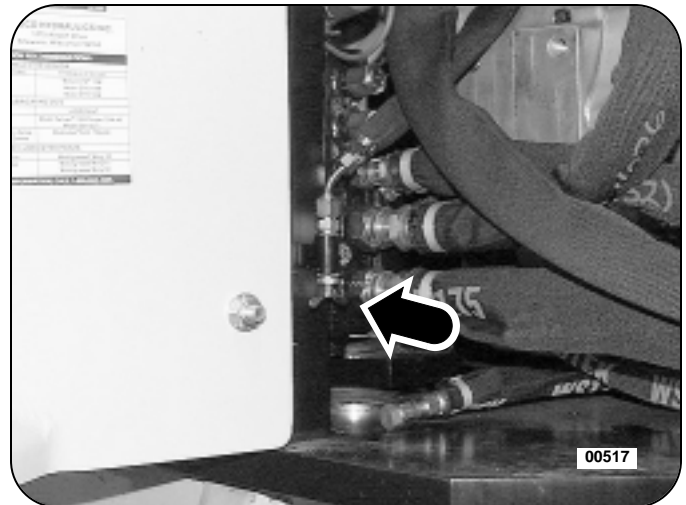


Figure 20: Turbo Boost Release Valve

1. Release turbo boost pressure at the turbo boost release valve. See Figure 20.
2. Remove the guards over the wheel drive motors and transfer case.

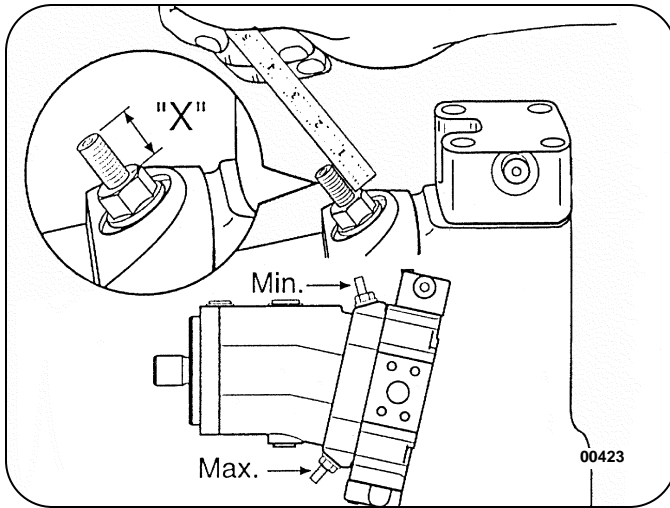


Figure 21: Wheel Drive Motor Displacement Adjustments

3. Locate the MIN displacement adjustment setscrew and carefully measure the "X" dimension with the vernier caliper (or depth micrometer). Record dimension. See Figure 21.

NOTE: Motor shown in figure is upside-down. Timbco installs the motor with the MAX adjustment screw facing up.

4. Crack the jam nut loose on the MIN displacement setscrew. Remove the setscrew with the jam nut still threaded on.
5. Measure the length of the setscrew and compare with the standard screw length listed in the specifications.
6. Re-install the setscrew and adjust the "X" dimension to specification.

Standard 80mm setscrew - Set dimension "X" to specification.

Longer than standard setscrew - For each 10mm the screw is longer than standard, add 10mm to dimension "X".

Shorter than standard setscrew - For each 10mm shorter than standard, subtract 10mm from dimension "X".

7. Locate the MAX displacement adjustment setscrew and carefully measure the "X" dimension with the vernier caliper (or depth micrometer). Record dimension. See Figure 21.
8. Crack the jam nut loose on the MAX displacement setscrew. Remove the setscrew with the jam nut still threaded on.
9. Measure the length of the setscrew and compare with the standard screw length listed in the specifications.
10. Re-install the setscrew and adjust the "X" dimension to specification.

Standard 80mm setscrew - Set dimension "X" to specification.

Longer than standard setscrew - For each 10mm the screw is longer than standard, add 10mm to dimension "X".

Shorter than standard setscrew - For each 10mm shorter than standard, subtract 10mm from dimension "X".

11. If required, repeat steps #3 thru #10 for the remaining motor.
12. Re-install guards.

Wheel Drive Motor Begin Of Stroke

Tools Required:

- 9/16", 5/8", 11/16" & 3/4" wrenches
 - 10mm & 13mm wrenches
 - 3mm & 4mm allen wrenches
 - Tachometer
 - (2) #06ORBM - #04JICM adapter
 - (2) gauge test hose w/#4 JICF end
 - 0 - 6000 psi (0 - 50 Mpa) pressure gauge
 - 0 - 10,000 psi (0 - 75 Mpa) pressure gauge
 - PN# 15869, TIMBCO quick-couple adapter
 - PN# 16031, #04 ORS plug
- The operator or another mechanic may be required to operate a control while a pressure reading is being taken.

Specification:

NOTICE

In the standard configurations the front and rear wheel drive motors are different internally. From the factory, the motors are marked with either 031/002 or 031 indicating the motor type. There is also a serial number plate attached to the underside of each motor for identification. The 031/002 motor should be in the front position, but this may not be so on early production machines. Be sure to identify the motors before beginning adjustment procedures. Incorrect adjustment will overheat and possibly damage the machine.

Wheel drive pump PCO relief pressure:

- 6000 psig (41,38 Mpa)

Begin of stroke pressure:

Standard Dual Motors:

- 031/002 Motor - 4000 psig (27,6 Mpa)
- 031 Motor - 4400 psig (30,3 Mpa)

Optional Single Motor:

4200 psig (28,9 Mpa)

Shift pressure:

Standard Dual Motors:

- 031/002 Motor - 2000 psig (13,8 Mpa)
- 031 Motor - 2200 psig (15,2 Mpa)

Optional Single Motor:

2100 psig (14,5 Mpa)

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at high idle (approx. 1200 RPM).
- Wheel drive pump and charge pressures at specification.

NOTICE

Operating the wheel drives over relief produces extreme heat that can damage hydraulic system components. Expedite all pressure readings and adjustments.

Procedure:

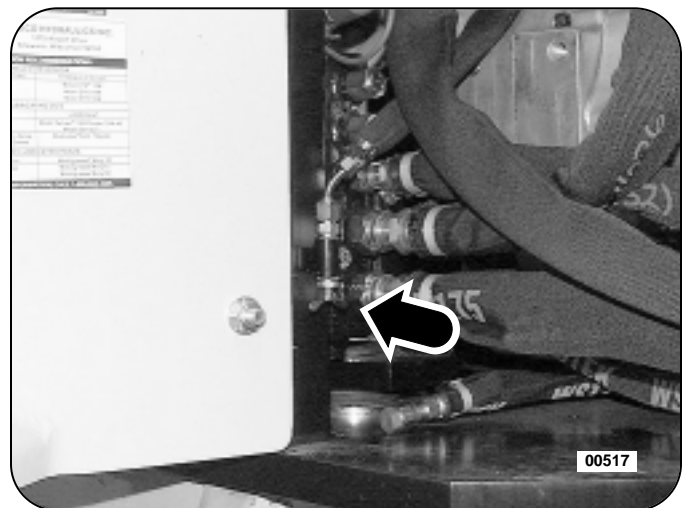


Figure 22: Turbo Boost Release Valve

1. Ensure the hydraulics are at correct operating temperature.
2. Release turbo boost pressure at the turbo boost release valve. See Figure 22.

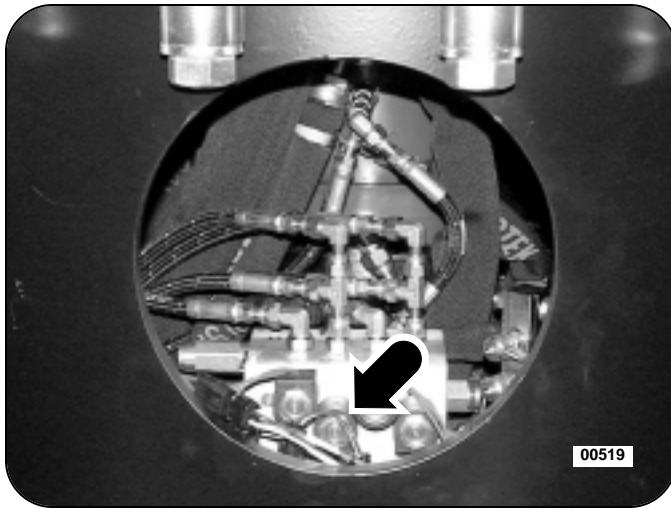


Figure 23: Lower Solenoid Manifold

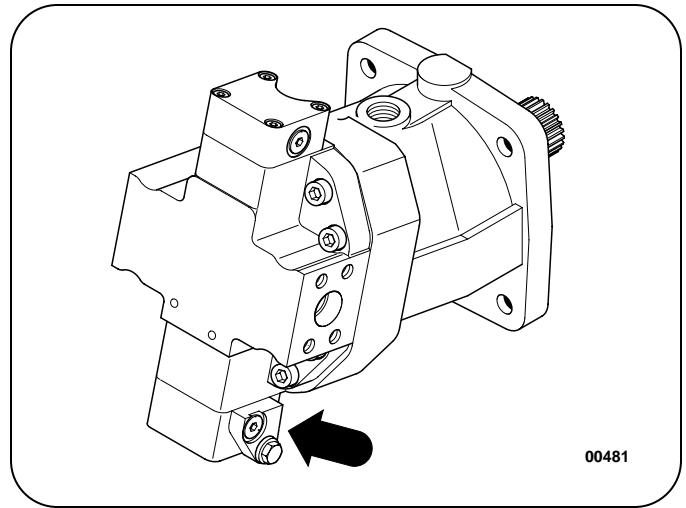


Figure 24: Wheel Drive Motor Port "M1"

3. Locate and disconnect the parking brake solenoid coil harness (yellow wire) at the lower solenoid manifold located in the right side of the upper turntable riser. See Figure 23. This will prevent the parking brake from releasing.

4. Remove the guards over the wheel drive motors and transfer case.

5. Locate port "M1" on each wheel drive motor. See Figure 24.

6. Remove the plug in port "M1" of each motor and install a #06ORBM - #04JICM adapter into the port. Install a gauge test hose to each adapter.

7. Standard dual motor configuration:

Disconnect the motor max displacement lock signal line where it connects to the tee joining the two wheel drive motors. See Figure 25. Plug the line and leave the fitting open to atmosphere.

Optional single motor configuration:

Disconnect the motor shift line. See Figure 26. Plug the line and leave the fitting open to atmosphere.

NOTE: Failure to leave the motor fitting open to atmosphere will result in an incorrect begin of stoke pressure readings.

8. Connect the 10,000 psi pressure gauge, with the TIMBCO quick-couple adapter attached, to the gauge port tap provided on the centralized pressure check manifold. See Figure 27.

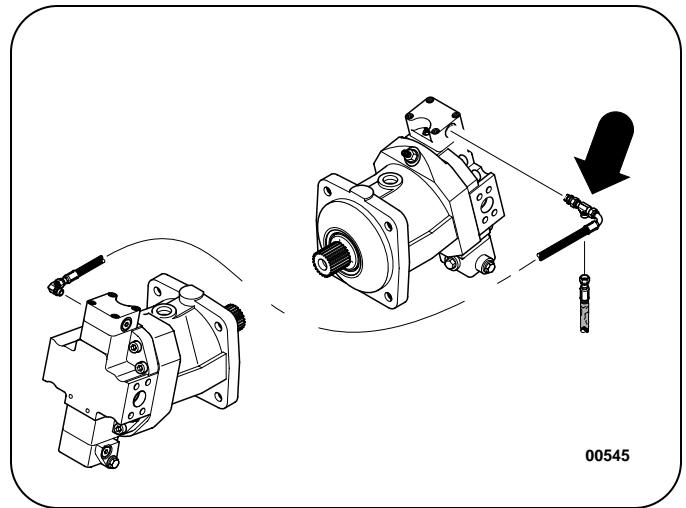


Figure 25: Motor Max Displacement Lock Signal Line (Standard dual motors)

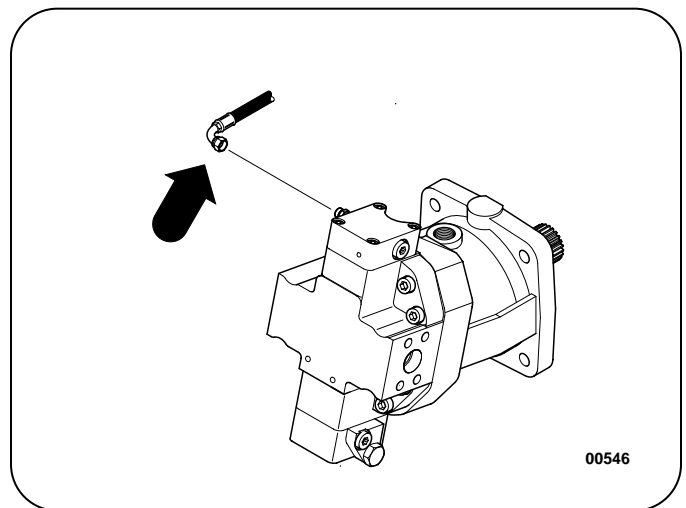


Figure 26: Motor Shift Signal Line (Optional single motor)

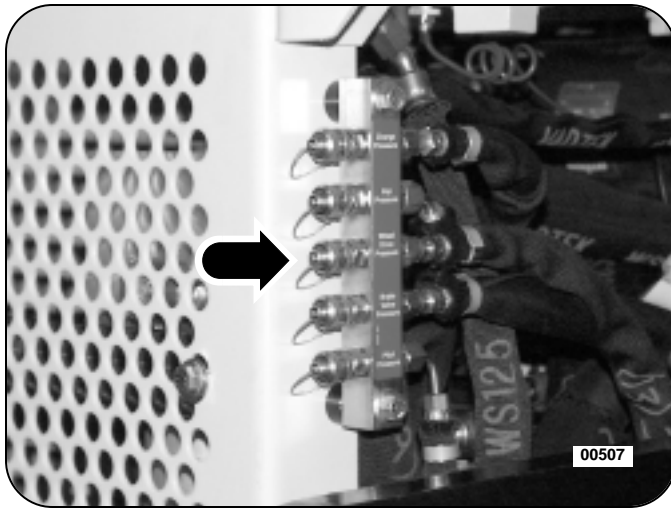


Figure 27: Wheel Drive Pump Pressure Gauge Port Tap

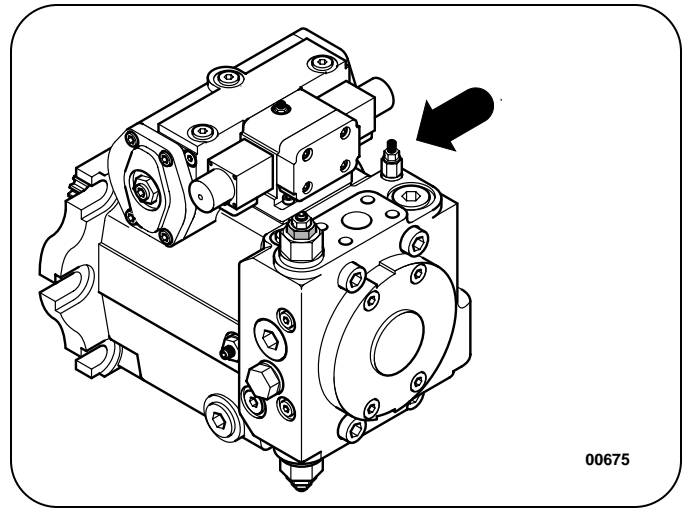


Figure 29: Wheel Drive PCO Relief



Figure 28: Swing-Out Pump Access Guard

9. Open the swing-out pump guard to access the wheel drive pump. See Figure 28.
10. Instruct the operator or another mechanic to start the engine and run at high idle (approx. 1200 RPM).
11. On your signal, have the operator or another mechanic apply the travel brake and activate the FORWARD travel function while you set the wheel drive pump PCO relief to 3500 psig (24,1 Mpa). See Figure 29.

Turning the adjustment setscrew **CLOCKWISE** increases the pressure setting. Turning the setscrew **COUNTER-CLOCKWISE** decreases the pressure setting.

12. Connect the 6000 psi pressure gauge to the gauge test hose from the motor being adjusted.

NOTE: Begin with the rear 031 wheel drive motor when performing the begin stroke adjustment on the standard dual motor configuration.

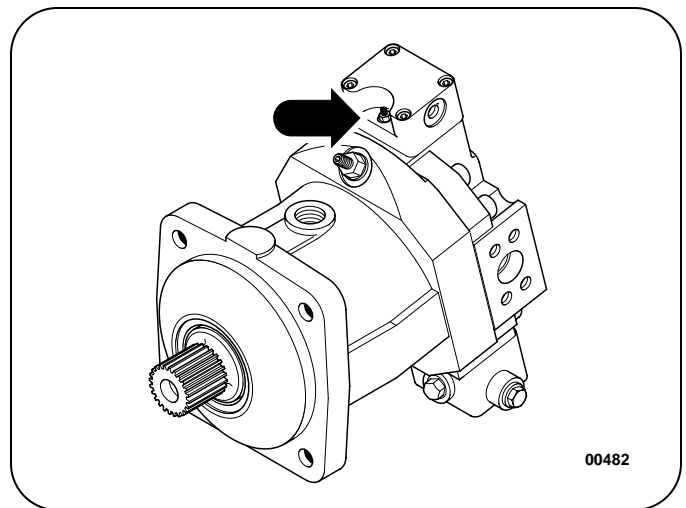


Figure 30: Wheel Drive Motor Begin Of Stroke Adjustment

13. Locate the begin stroke adjustment setscrew on the motor. See Figure 30. Use the 10mm wrench and 3mm allen wrench to loosen the jamnut and back the setscrew out **COUNTERCLOCK-WISE** a few turns. This will allow easier setting of the motor.

NOTE: The begin of stroke adjustment is made using the motor shift pressure at port "M1". The motor shift pressure should be 1/2 the desired begin of stroke pressure.

14. On your signal, have the operator or another mechanic apply the travel brake and activate full FORWARD travel function while you turn the begin of stoke setscrew in CLOCKWISE until the shift pressure reaches specification.
15. Instruct the operator or another mechanic to deactivate the FORWARD travel function as soon as the adjustment is made to avoid excessive heat build-up in the wheel drive circuit.
16. After the correct pressure setting is made, hold the adjustment setscrew stationary and tighten the jamnut to hold the pressure setting.
17. If required, repeat step #12 thru #16 for the front 031/002 wheel drive motor.
18. After begin of stroke pressure have been adjusted, reset the wheel drive pump PCO relief pressure to specification.
19. Shut down the engine.
20. Release turbo boost pressure at the turbo boost release valve.
21. Remove the #06ORBM - #04JICM adapters and gauge test hoses from the wheel drive motors. Re-install the plugs to port "M1".
25. Re-install the guards over the wheel drive motors and transfer case.
26. Re-connect the parking brake solenoid coil harness. Close and secure the swing-out pump guard.

Wheel Drive Motor Case Drain Pressure

Tools Required:

- 9/16" & 1-1/4" wrenches
- 0 - 60 psi (0 - 1 Mpa) pressure gauge
- Gauge test hose
- #12 ORBM - #4 JICM adapter
- The operator or another mechanic may be required to operate a control while a pressure reading is being taken.

Specification:

Maximum 45 psig (0,31 Mpa) allowed.

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at full throttle (approx. 1800 RPM).
- Wheel drive pump and charge pressures at specification.

Procedure:

1. Produce a gauge test hose that will allow you to connect a 60 psi gauge to the #4 JICM adapter that will be installed into the wheel drive motor case drain port.
2. Ensure the hydraulics are at correct operating temperature.
3. Locate and disconnect the parking brake solenoid coil harness (yellow wire) at the lower solenoid manifold located in the right side of the upper turntable riser. See Figure 31. This will prevent the parking brake from releasing.
4. Remove the guards over the wheel drive motors and transfer case.
5. Locate and remove a wheel drive motor case drain plug in a port 180° from the motor's case drain line. Install the #12 ORBM - #4JICM adapter into the port.

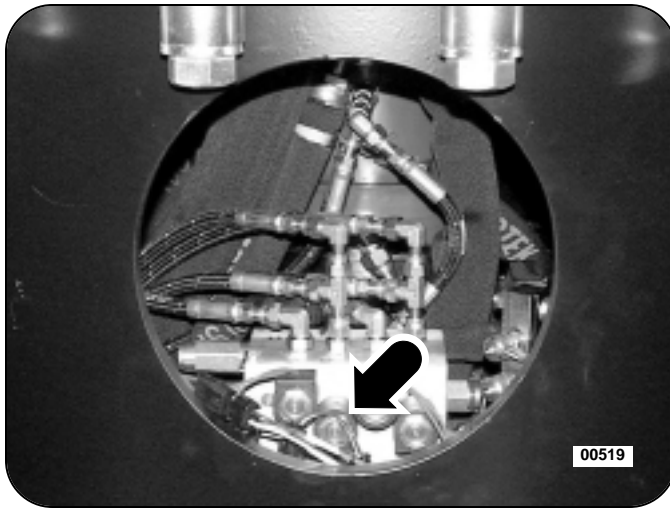


Figure 31: Lower Solenoid Manifold

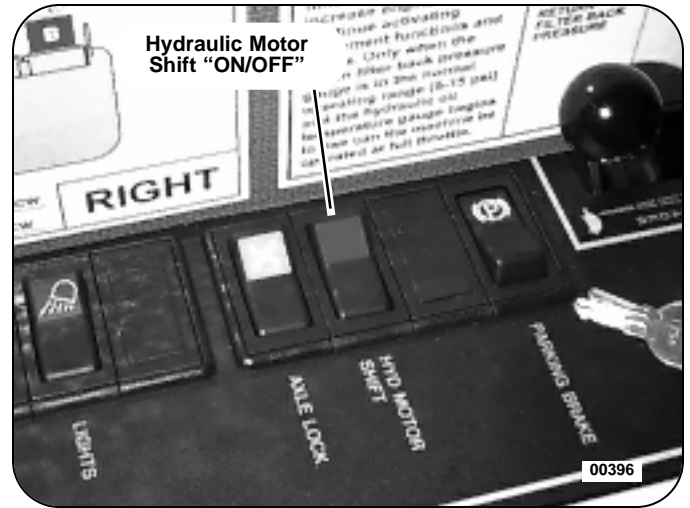


Figure 33: Hydraulic Motor Shift "ON/OFF"

6. Install the gauge test hose and pressure gauge to the case drain port adapter.

NOTICE

Be sure the pump case is full of oil before starting the machine otherwise catastrophic damage to the pump will occur.



Figure 31: Swing-Out Pump Access Guard

7. Open the swing-out pump guard to access the wheel drive pump. See Figure 32.
8. Start engine and run at idle.
9. Set the hydraulic motor shift control to the "OFF" position. See Figure 33.
10. Advance engine to full throttle.

11. On your signal, have the operator or another mechanic apply the travel brake and activate full FORWARD travel while you take a pressure reading. Then activate full REVERSE travel and take a reading.
12. Shutdown the engine and re-connect the parking brake solenoid coil signal wire.
13. Start the engine and move the machine several feet forward.
14. Shutdown the engine and disconnect the parking brake solenoid coil signal wire.
15. Repeat step #8 thru #11 with the machine in the new position.

The wheel drive motor case drain pressure should not exceed specification. If the specification is exceeded, look for conditions that would increase backpressure in the case drain circuit such as a plugged case drain filter element, failing component, etc.

16. Shutdown the engine and re-install the wheel drive motor case port plug.
17. Re-connect the parking brake solenoid coil harness.
18. Close and secure the swing-out pump guard and replace the guards over the wheel drive motor.

Wheel Drive Motor Case Drain Flow

Tools Required:

- 3/4", 7/8" & 15/16" wrenches
 - PN# 16032, TIMBCO #08 ORS plug
 - #08 test hose w/#08 ORSF fitting
 - Calibrated container - 10 gallons (38 litres)
 - Stop watch
- The operator or another mechanic may be required to operate a control while a pressure reading is being taken.

Specification:

Maximum 8.0 gpm (30,1 litres) allowed.

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at full throttle (approx. 1800 RPM).
- Wheel drive pump and charge pressures at specification.

Procedure:

1. Ensure the hydraulics are at correct operating temperature.
2. Locate and disconnect the parking brake solenoid coil harness (yellow wire) at the lower solenoid manifold located in the right side of the upper turntable riser. See Figure 31. This will prevent the parking brake from releasing.
3. Remove the guards over the wheel drive motors and transfer case.
4. Use the 3/4", 7/8" and 15/16" wrenches to remove the wheel drive motor case drain line at the motor. Plug the case drain hose to prevent contaminants from entering the hydraulic system.

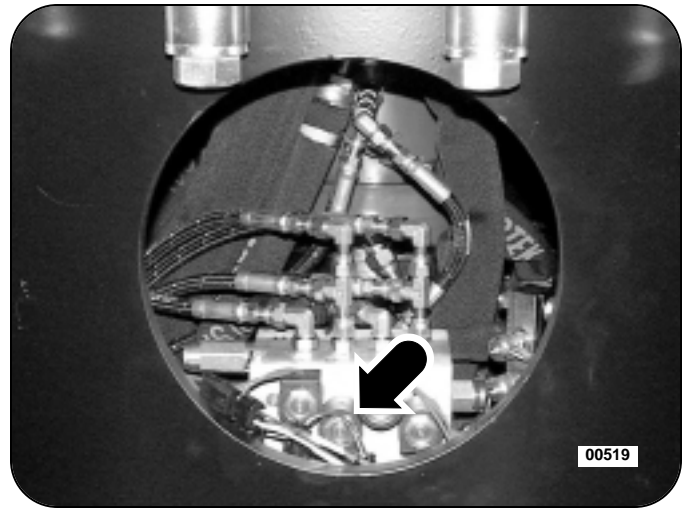


Figure 34: Lower Solenoid Manifold

5. Install the #08 test hose to the motor case drain fitting and place the open end of the hose into the calibrated container.

NOTICE

Be sure the pump case is full of oil before starting the machine otherwise catastrophic damage to the pump will occur.



Figure 35: Swing-Out Pump Access Guard

6. Open the swing-out pump guard to access the wheel drive pump. See Figure 35.
7. Start engine and run at idle.

8. Set the hydraulic motor shift control to the "OFF" position. See Figure 36.
9. Advance engine to full throttle..
11. On your signal, have the operator or another mechanic apply the travel brake and activate full FORWARD travel.
12. After one minute, deactivate the travel function and shutdown the engine.
13. Remove the wheel drive motor case drain hose from the container.
14. Measure the oil in the container. If the amount exceeds specification, the wheel drive motor is worn or failing and may have to be replaced.
14. Repeat steps #11 thru #14 for REVERSE travel.
15. Shutdown the engine and re-connect the wheel drive motor case drain hose to the motor.
16. Re-connect the parking brake solenoid coil harness. Close and secure the swing-out pump guard.

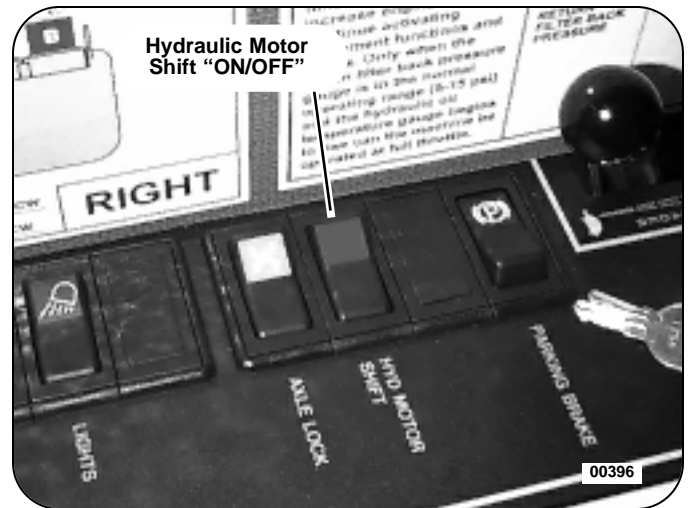


Figure 36: Hydraulic Motor Shift Control

MAX Displacement Lock Signal Pressure

Tools Required:

- 9/16" & 11/16" wrenches
 - TIMBCO PN# 15176, #4 ORS run tee
 - Gauge test hose
 - 0 - 600 psi (0 - 5 Mpa) pressure gauges
 - Tachometer
- The operator or another mechanic may be required to operate a control while a pressure reading is being taken.

NOTE: Each machine is shipped from the factory with at least one 600 psi and one 10,000 psi gauge with quick-couple adapters. The gauges can be found in the Up-Time Kit under the operator's seat.

Specification:

- OFF - 0 psig (0 Mpa)
- ON - 200 - 300 psig (1,4 - 2,1 Mpa)
(Non-adjustable)

Test Standards:

- Hydraulics at operating temperature of 140°F (60°C) or greater.
- Engine operating at high idle (approx. 1200 RPM).

Procedure:

1. Ensure the hydraulics are at correct operating temperature.
2. Remove the guards over the wheel drive motors and transfer case.
3. Locate the #04 MAX displacement lock signal hose where it connects the top control covers of both motors.
4. disconnect the hose at the front motor and install the #4 ORS run tee between the motor and hose.
5. Install the gauge test hose and 600 psi gauge to the tee.

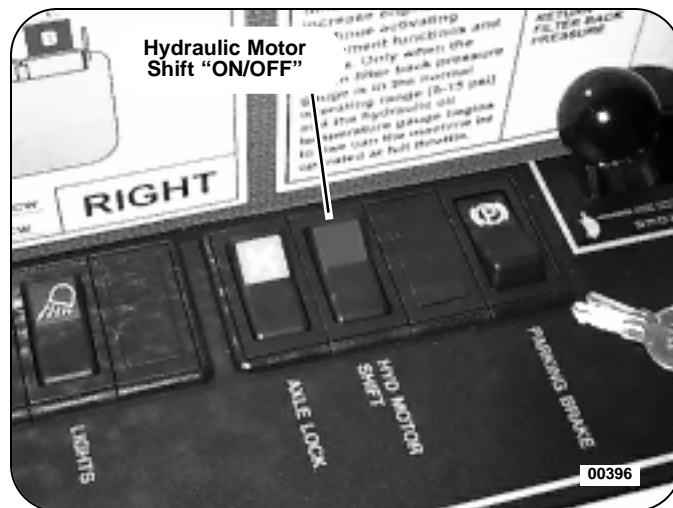


Figure 37: Hydraulic Motor Shift Control

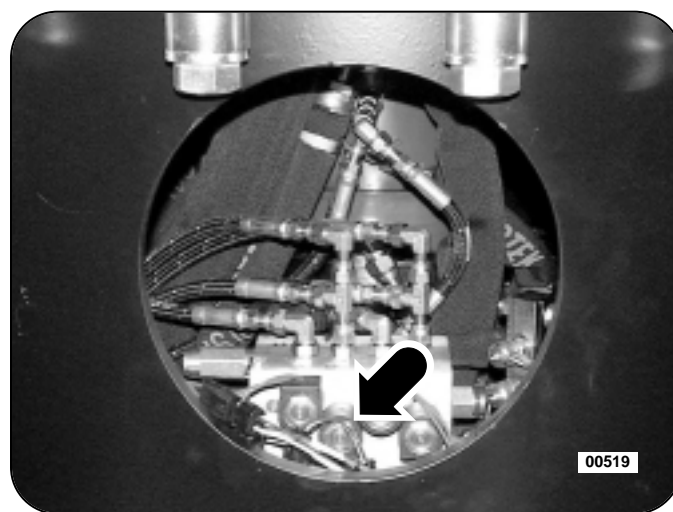
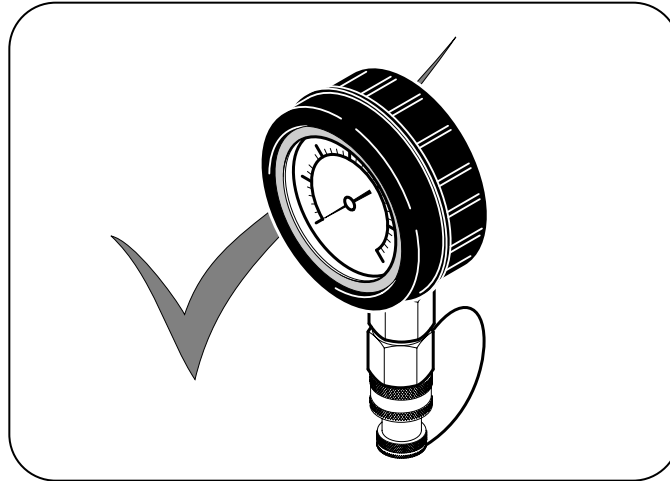


Figure 38: Hydraulic Motor Shift Solenoid

6. Start the engine and adjust the throttle to high idle (approx. 1200 RPM).
7. Instruct the operator or another mechanic to select hydraulic motor shift "ON" (switch lighted) while you take a pressure reading. See Figure 37. Record the pressure reading.
8. Instruct the operator or another mechanic to select hydraulic motor shift "OFF" while you take a pressure reading. Record the pressure reading.
9. If the MAX displacement lock signal pressure doesn't meet specifications, check for leakage past the seals of the motor shift solenoid valve (green wire) located in the lower solenoid manifold on the right side of the upper turntable riser. See Figure 38.



Tests & Adjustments - Electrical

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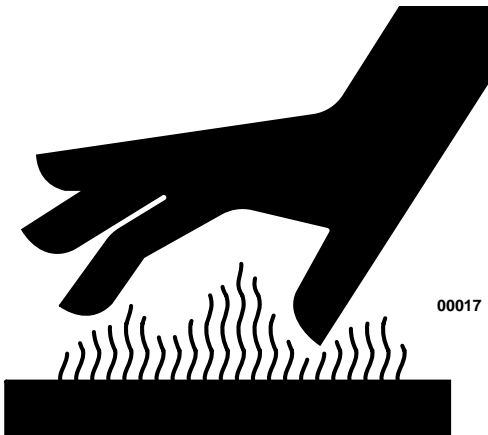
General Safety

NOTICE

You must read and understand the warnings and basic safety rules, found in Group-1 of this manual, before performing any operation, test or adjustment procedures.



Diesel exhaust fumes contain elements that are hazardous to your health. Always run engine in a well ventilated area. If in an enclosed space, vent exhaust to the outside.



At operating temperature, the engine, exhaust system components, cooling system components and hydraulic system components are HOT. Any contact can cause severe burns.

Battery Tests

Battery Voltage Test

Tools Required

- Voltmeter
- Temperature Probe

Specification

11.8 - 12.6 Volts DC

Test Standards

Battery at 70 - 90°F (21 - 32°C)
for accurate reading

Procedure

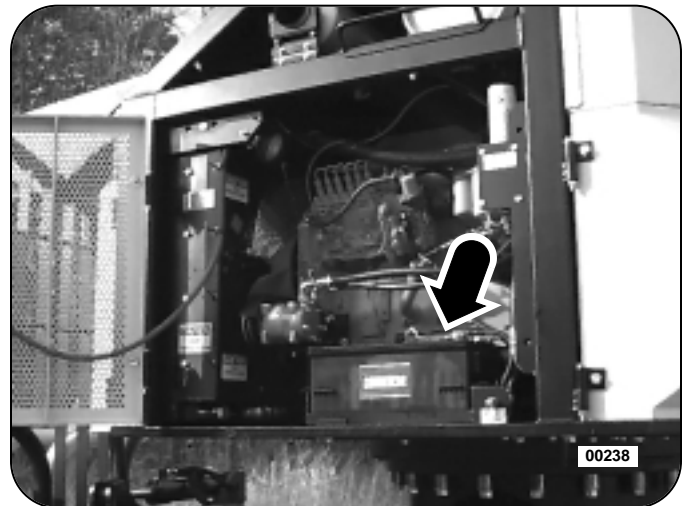


Figure 1: Battery Location

1. Open the perforated swing-out engine guard to gain access to the battery. See Figure 1.
2. Ensure top of battery is clean and accessible.
3. Turn the ignition switch and exterior light switch on for 15 seconds to remove the surface charge from the battery.
4. Connect the voltmeter to the positive and negative terminal of the battery. Read and record voltage.
5. Close and secure perforated swing-out engine guard.

Battery Specific Gravity Test

Tools Required

- Voltmeter
- Temperature Probe

Specification

1.225 - 1.280 Sp. Gr. Corrected to 80°F (27°C)
Maximum Variation between cells 0.050 Sp. Gr. Points

Test Standards

Correction for temperature other than standard temperature should be used.

- **Greater than 80°F (27°C)** - ADD .004 for every 10°F (5.5°C) above 80°F (27°C) to the hydrometer reading.

- **Less than 80°F(27°C)** - Subtract .004 for every 10°F (5.5°C) below 80°F (27°C) to the hydrometer reading.

Procedure

1. Open the perforated swing-out engine guard to gain access to the battery. See Figure 1.
2. Ensure top of battery is extremely clean.

3. Remove the cell covers on the battery. Ensure that no debris falls into the battery cells as this can cause the battery to short out.
4. Insert the hydrometer and fill it as per the manufactures guidelines. Read and record the temperature and Specific Gravity reading.
5. Repeat step #4 for the rest of the cells.
6. Correct all readings for temperature as specified above in test standards. Also ensure that there is no more than .050 between cells.
7. Compare readings to specifications:

Specific Gravity Less than 1.260 Sp. Gr. - charge the battery and retest.

Specific Gravity Greater than 1.260 Sp. Gr. - Specific gravity OK, continue with load test.

Cell Variation Less than 0.050 - battery OK, continue with load test.

Cell Variation Greater than 0.050 - battery failed, replace battery.

8. Replace all battery cell covers.
9. Close and secure the perforated swing-out engine guard.

Battery Load Test

Tools Required

- Battery Load Tester
- Temperature Probe

Specification

9.6 Volts DC @ 70°F (21°C)

Test Standards

Battery temperature must be above 70°F (21°C) otherwise inaccurate results will occur.

Procedure

1. Ensure battery meets test standards.
2. Perform specific gravity test prior to performing load test.
3. Open the perforated swing-out engine guard to gain access to the battery. See Figure 2.
4. Disconnect the battery and ensure all corrosion is cleaned from the battery and the terminals.
5. Connect the battery tester load and voltage leads to the proper terminals on the battery.
6. Record the CCA (Cold Cranking Amp) and/or the Amp/hour rating of the battery from the battery.

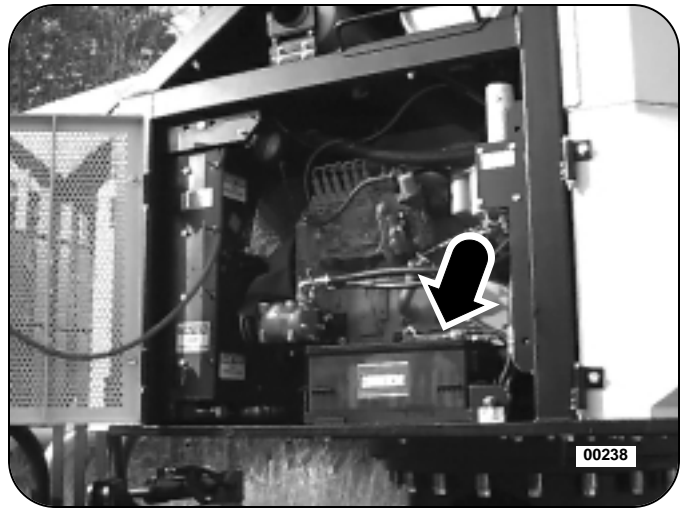


Figure 2: Battery Location

7. Apply a load to the battery by setting the battery tester to the equivalent of 50% of the CCA (3 times the amp/hour rating of the battery being tested) for 15 seconds.
8. Remove the load and record the lowest voltage reading found during the test.

If the voltage is above specification, the battery is good. If the voltage is below specification, the battery has failed and should be replaced.

9. Re-connect the batteries.
10. Close and secure the perforated swing-out engine guard.

Ignition Switch Tests

Ignition Switch Voltage Test

Tools Required

- 7/16" & 11/32" wrenches
- Voltmeter

Specification

Terminal	Key Off	Key On	Start
Battery	12.0 V	12.0 V	12.0 V
Ignition	0.0 V	11.8 V	< 12.0 V
Ignition	0.0 V	11.8 V	< 12.0 V
Accessory	0.0 V	11.8 V	< 12.0 V
Start	0.0 V	0.0 V	11.8 V

Test Standards

None

Procedure

1. Remove the side cover from the dash panel.
2. Ground voltmeter to a good chassis ground.
3. Remove start terminal wires to prevent machine from starting.
4. With the key in the appropriate position, see chart, connect the voltmeter to each terminal of the ignition switch.
5. Record each voltmeter reading and compare to specifications above.
6. Re-install the start terminal wires and dash panel.

Ignition Switch Continuity Test

Tools Required

- 7/16" & 11/32" wrenches
- Ohm meter

Specification

Terminal	Key Off	Key On	Start
Battery - Ignition		0.7 ± 20 %	5.0 ± 20%
Battery - Accessory		0.5 ± 20%	13.0 ± 20%
Battery - Start			0.2 ± 20%

Test Standards

None

Procedure

1. Remove the side cover from the dash panel.
2. Remove the wires from the ignition switch terminals.
3. With the key in the appropriate position, see chart, connect the ohm meter across the terminals as listed.
4. Record each ohm meter reading, and compare to specifications above.
5. Re-install the start terminal wires and dash panel.

Diode Test

Tools Required

- Diode tester or Voltmeter
- Battery
- Jumper wire

Specification

Continuity in one direction only

Test Standards

None

Method “A” Procedure

1. Remove the diode from the circuit
2. Place the diode tester across the diode contacts and record the results.
3. Reverse the tester leads on the diode contacts and record the results.
4. Compare readings to specification above.

If there is continuity in one direction only the diode is good. If there is continuity in both directions, or no continuity in either direction, the diode has failed and should be replaced.

Method “B” Procedure

1. Remove the diode from the circuit.
2. Connect one contact of the diode with the jumper wire to the positive terminal of the battery.
3. Connect the other contact of the diode to the voltmeter.
4. Connect the last voltmeter lead to the ground terminal of the battery.
5. Read and record voltmeter recording.
6. Reverse the connections of the jumper wire and voltmeter lead on the diode.
7. Read and record voltmeter results.
8. Compare readings to specification above.

If there is continuity in one direction only the diode is good. If there is continuity in both directions, or no continuity in either direction, the diode has failed and should be replaced.

Pilot Pressure Manifold Solenoid Coil Test

Tools Required

- 3/8" wrench
- Ohm meter

Specification

Resistance Value:9.5 - 10.0
.@ 68°F (20°C)

Test Standards

- Coil isolated from rest of electrical circuit
- Coil at standard temperature

Procedure

1. Open the swing-out valve cover to access the pilot pressure manifold. See Figure 3.
2. Disconnect the wires from the coil to be tested to isolate it from electrical system.
3. Zero the ohm meter.
4. Place ohm meter probes on the contacts of the coil.

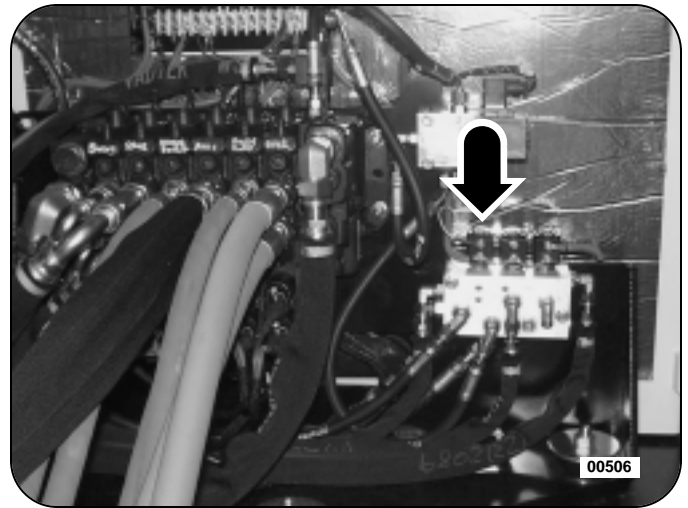


Figure 3: Pilot Pressure Manifold (Typical)

5. Record the ohm meter reading.

NOTE: Generally coils will fail in two ways and produce large variations from specification:

Shorted Coil - Resistance Value is 0 Ω .

Open Coil - Resistance Value is ∞ (infinite) Ω .

6. Re-install wires to the coil terminals.
7. Re-install pilot pressure manifold cover.

Upper & Lower Solenoid Manifold Coil Test

Tools Required

- 11/32" wrench
- Ohm meter

Specification

SV2 - SV5 Resistance Value:
.....9.5 - 10.0
.....@ 68°F (20°C)

SV1 Resistance Value:
.....10.5 - 11.0
.....@ 68°F (20°C)

Test Standards

- Coil isolated from rest of electrical circuit
- Coil at standard temperature

Procedure

1. Open the swing-out pump guard to access the upper solenoid manifold, see Figure 5, or the right side upper turntable riser cover to access the lower solenoid manifold, see Figure 6.
2. Disconnect the wire from the coil to be tested to isolate it from the electrical system.
3. Zero the ohm meter.
4. Ground the negative meter probe to the manifold, contact the positive probe to the coil terminal.
5. Record the ohm meter reading.

NOTE: Generally coils will fail in two ways and produce large variations from specification:

Shorted Coil - Resistance Value is 0 Ω.
Open Coil - Resistance Value is ∞ (infinite) Ω.

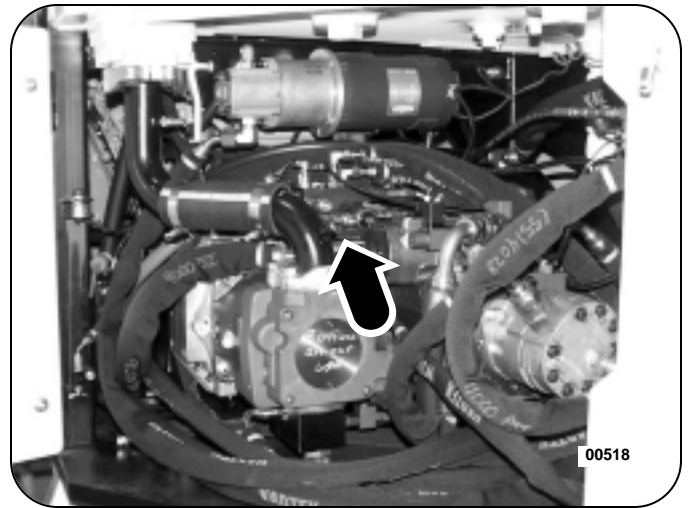


Figure 5: Upper Solenoid Manifold

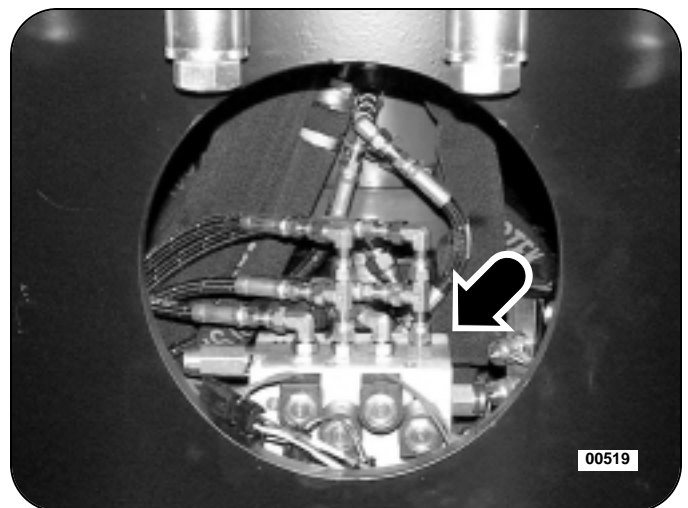


Figure 6: Lower Solenoid Manifold

6. Re-install wire to the coil terminal.
7. Close and secure the swing-out pump guard or turntable riser access cover.

Implement Control System Tests & Adjustments

Control Box Power Input Voltage Test

Tools Required

Voltmeter

Specification

9.5 - 16.0 Volts DC

Test Standards

N/A

Procedure

- 1) Turn Key switch to on position and close the cab door.
- 2) Attach ground of voltmeter to a good ground on the cab.



Figure 7: Control Boxes For The VOAC Control Valve

- 3) Connect the voltmeter positive probe to the #10 terminal in the "B" connector (green) of the control box being tested. See Figure 7.

NOTE: Reference connector terminal diagram on top of control box.

- 4) Read and record indicated voltage.

Control Handle Input Power Test

Tools Required

Voltmeter

Specification

5.0 Volts DC

Test Standards

N/A

Procedure

- 1) Turn key switch to on position and close the cab door.
- 2) Attach ground of volt meter to a good ground in the cab.
- 3) Connect the voltmeter positive probe to the #1 terminal in the "A" connector (white) of the control box being tested. See Figure 6.

NOTE: Reference connector terminal diagram on top of control box.

- 4) Read and record indicated voltage.

Control Handle Voltage Output Test

Tools Required

Voltmeter

Specification

0 - 5.0 Volts DC

No dead spots in the control curve.

Test Standards

N/A

Procedure

- 1) Turn the key switch to the on position and close the cab door.
- 2) Attach the ground wire of the voltmeter to a good ground in the cab.
- 3) Connect the voltmeter positive probe to each of the following terminals in the "A" connector (white) of the control box being tested. See Figure 6. Then activate the lever or switch in the appropriate direction smoothly to full deflection.

Left Handle = Left Box

Right Handle = Right Box

<u>Channel</u>	<u>Terminal #</u>	<u>Channel</u>	<u>Terminal #</u>
1A	6	1B	13
2A	5	2B	12
3A	4	3B	11
4A	3	4B	9

- 4) Read and record the maximum voltage indication for each channel and also note if any dead spots in the voltage control curve.

Control Box Module Output Current Test

Tools Required

Amp meter

Parallel harness adapter (Contact TIMBCO)

12 Volt DC power source

2 - jumper leads

Specification

Starting control current - minimum 550 mA

Fully actuated current - maximum 980 mA

Test Standards

Coil temperatures - 70° F (20° C)

Battery voltage - 12 Volts DC

Procedure

- 1) Ensure unit meets test standards.
- 2) Install the harness adapter inline adjacent to the coil or at the control box. The following is a reference chart for the control box channels and what terminals they activate on the box.

Left Handle = Left Box

Right Handle = Right Box

<u>Channel</u>	<u>Terminal #</u>	<u>Channel</u>	<u>Terminal #</u>
1A	6	1B	13
2A	5	2B	12
3A	4	3B	11
4A	3	4B	9

- 3) Attach the amp meter to the adapter harness.
- 4) Start the unit, and close the cab door.
- 5) Slowly activate the function for the direction being tested, note and record the amp meter reading when the function first starts to move. This is the starting control current.
- 6) Bottom the function lever or switch fully, read and record the amp meter reading. This is the fully actuated current.

NOTE: The valve control module may be adjusted not to allow full actuation of specific coils resulting in low current signal to the coils.

Loader Function Speed Adjustments

Tools Required

- T10 Torx screwdriver
- Small standard screwdriver (-)

Procedure

1. Locate the control boxes for the VOAC control valve in the cab. See Figure 8.

NOTE: The LEFT control box is used for the LEFT hand control functions and the RIGHT control box is used for the RIGHT hand control functions.

2. Use the T10 Torx screwdriver to remove the cover of the box for the hand control where the function being adjusted is located.
3. Start the engine and run at low idle.
4. Activate the function to be adjusted to locate its red indicator light that shows which row of adjustment screws will be used.
5. Reference the control box layout and MIN, MAX and RAMP definitions in Figure 9.
6. Increase engine throttle to 3/4 (75%) and make function speed adjustments as required.
7. After all adjustments have been made, shut down the engine and replace the control box cover.

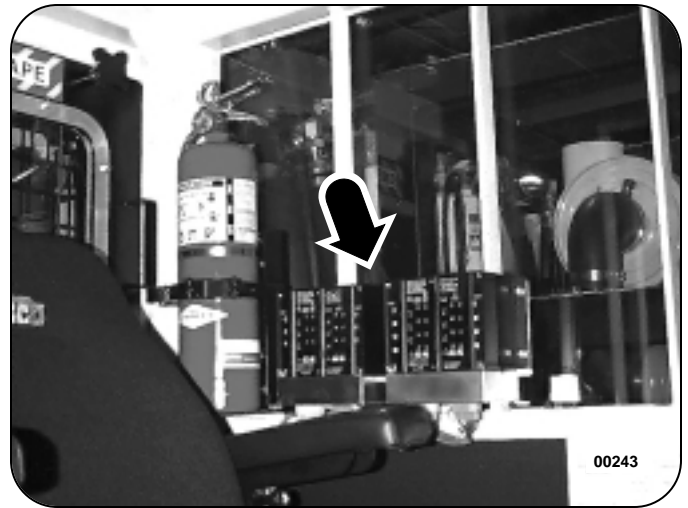
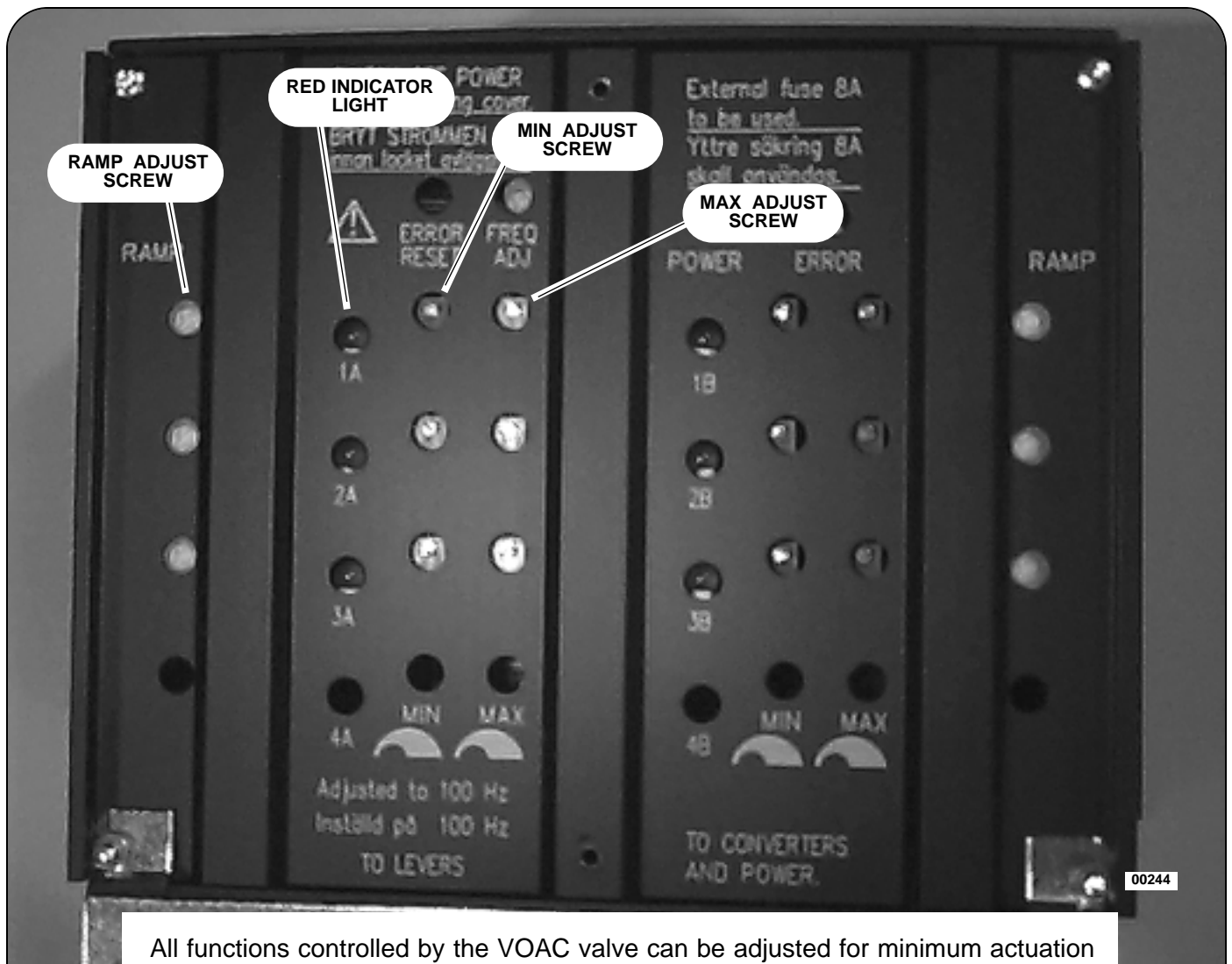


Figure 8: Control Boxes For The VOAC Control Valve



00244

All functions controlled by the VOAC valve can be adjusted for minimum actuation (MIN), maximum actuation speed (MAX) and ramp (RAMP).

MIN - The minimum distance the control must be moved before the function will respond. Also called the function's "dead band." Used to control function sensitivity at the beginning of actuation.

MAX - Controls maximum stroke of the function valve spool. Used to set the maximum speed of the function at full actuation.

RAMP - Allows gradual acceleration or deceleration of the function. Used to smooth out "jerky" controls and helps protect the system from the sudden stopping or starting of a function like swing or bucket rotate.

Turning the adjustment screw **CLOCKWISE** increases the setting. Turning the adjustment screw **COUNTER-CLOCKWISE** decreases the setting.

Figure 9: Control Box Layout And MIN, MAX & RAMP Definitions