**John Deere Agriculture**

6405 and 6605 Tractors - Operation and Test

# DIAGNOSIS AND TESTS SERVICE MANUAL

6405, 6605

tm4867, May 2003



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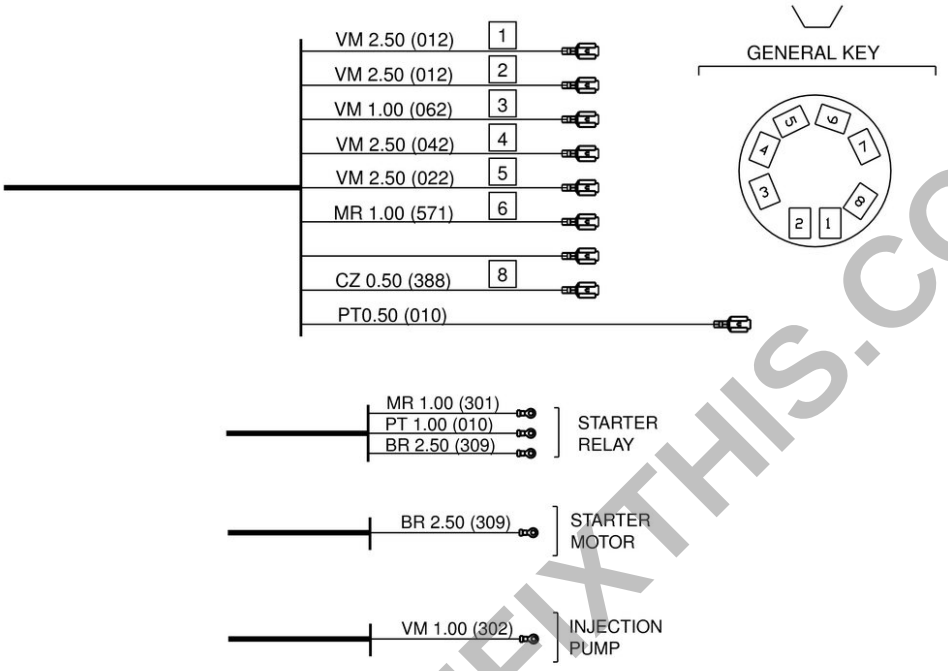
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CQ201090
506 X 409

# Source Circuit and Starting

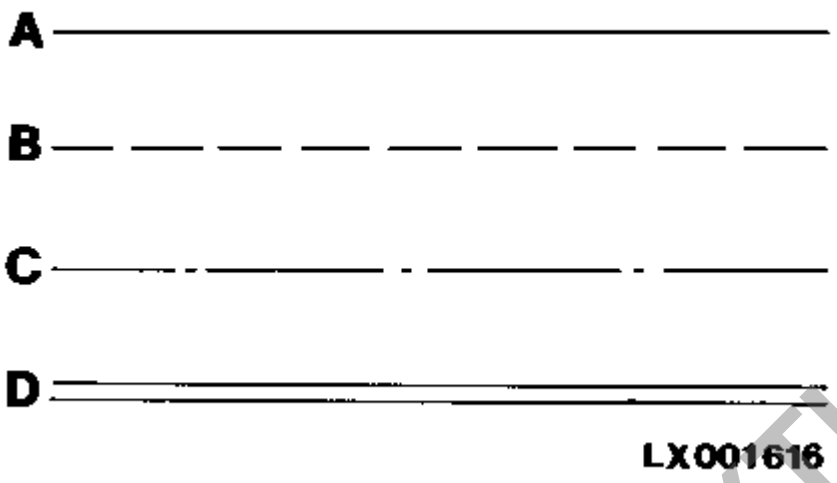
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# Group 15 - Hydraulic Circuits

## Hydraulic Symbols



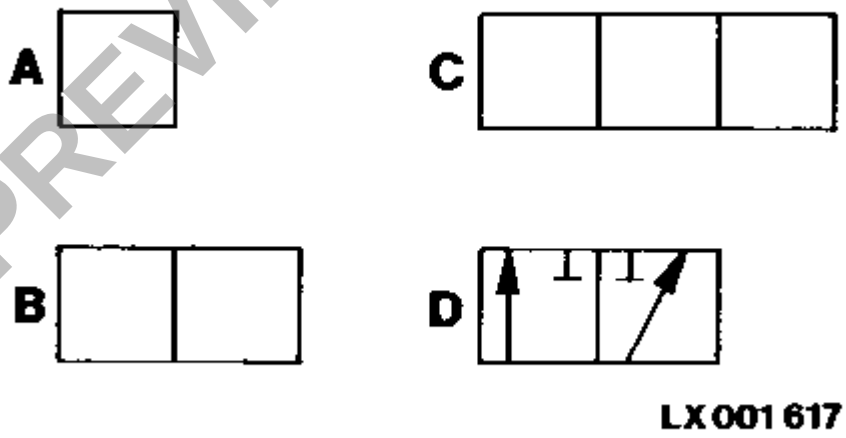

### Lines

A - Hydraulic line

B - Pilot oil line

C - Indicates that it is dealing with a set of components

D - Mechanical connection (for example: shafts)



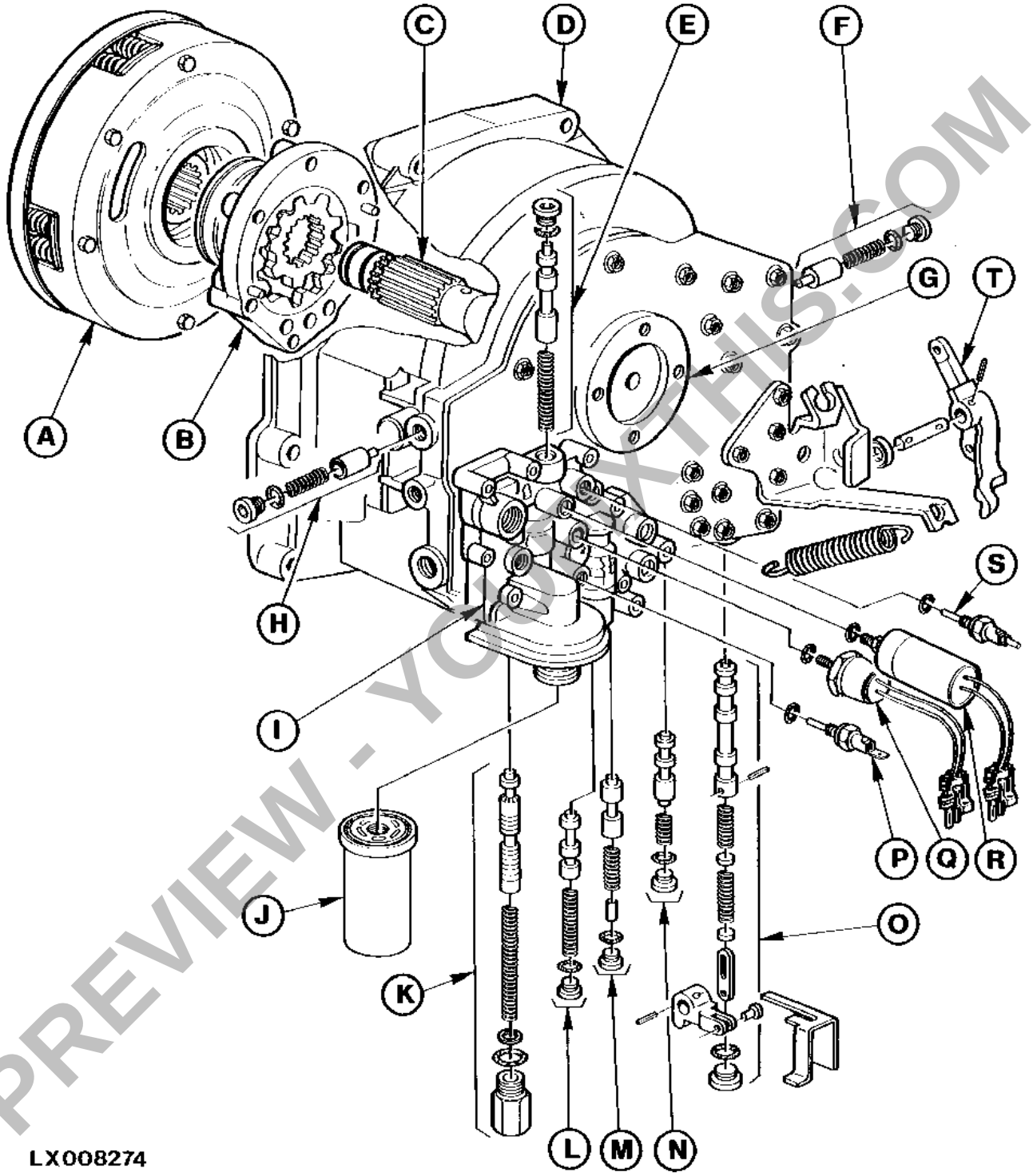

### Valves

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# Group 20 - PermaClutch II

## Clutch components




**LEGEND:**

| | |
|---|---|
| A | PTO |
| B | lubrication pump |
| C | Transmission shaft |
| D | Gear carcass |
| E | Shunt valve of the filter |
| F | Discharge valve of the lubricating oil |

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# List of Error Codes of the Hydraulic lift

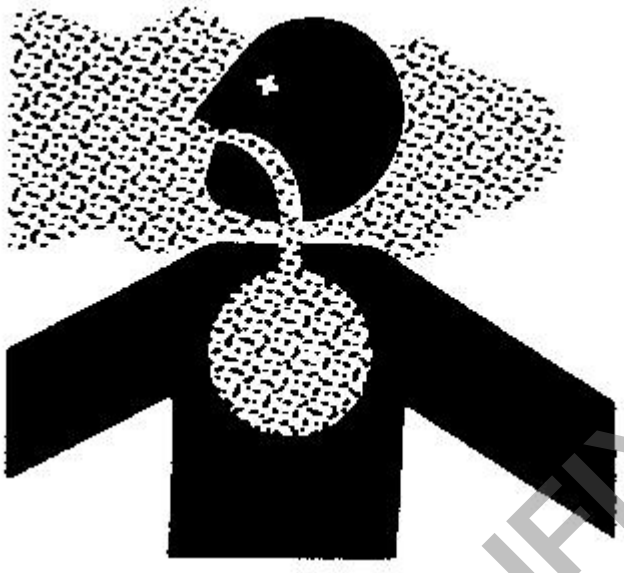
| Code | Circuit has a problem | Corrective action recommended |
|---|---|---|
| 000 | There are no stored codes | Is not required |
| 027 | The calibration is not valid | A sensor (or sensors) has/have not been calibrated correctly. An additional code related to the defective circuit is stored. It can only be erased after recalibration. |
| 028 | Calibration memory error | For a new HCU that has never been calibrated, or when the previous calibration was not stored. Any HCU that arrives not calibrated is typically an error of the HCU. Re-calibrate and if the code persists, change the HCU. |
| 029 | Calibration mode (function 20) selected for less than 30 seconds | It is not necessarily an error if function 20 is selected less than 30 seconds and generates this code. Check if there is some interruption in the voltage system (fuse F4 and F8). |
| 030 | No error | Erase this code. |
| 041 | Open circuit of the lift valve (pressure) | The lift valve (pressure) continues operating but presents a voltage interruption of 0.3 to 0.6 seconds. |
| 042 | Open circuit of the lift valve (return) | The lift valve (return) stops operating but presents a voltage interruption of more than 0.6 seconds. The system should be reestablished by turning off and turning on the tractor. If the circuit continues open, the supply of the valve will be cut off once again. |
| 043 | Circuit of the lift valve in short circuit (pressure) | The lift valve continues operating but presents a voltage interruption of 0.3 to 0.6 seconds. |
| 044 | Circuit of the lift valve in short circuit (return) | The coupling valve stops operating but presents a voltage interruption of more than 0.6 seconds. The system should be reestablished by turning off and turning on the tractor. If the circuit continues open, the supply of the valve will be cut off once again. |
| 045 | Error in the voltage supply sensor circuit. Incorrect tension. | Check the function 13 (voltage sensor) 046. |
| 046 | Error in the voltage supply sensor circuit to the load sensors of the lift arms. | Check function 14 (voltage supply to the load sensors of the lift arms). |
| 049 | Error in the circuit of the raise/lower switch | Check function 3 (circuit of the raise/lower switch) This code can be generated when the depth lever is moved in the opposite direction of a control executed on the raise/lower switch. Erase the error code. |
| 050 (6000) | Outside the dead range of the step motor. | Check the step motor. |
| 050 (7500) | Internal relay error of the HCU. | Replace HCU. |
| 051 (6000) | Error in the load sensor circuit of the left lift arm. | Check the sensor signal voltage (function 4). If it is out of range, adjust according to the Technical Manual. |
| 052 (6000) | Error in the load sensor circuit of the right lift arm. | Check the sensor signal voltage (function 5). If it is out of range, adjust according to the Technical Manual. |
| 052 (7500) | Error in the load sensor circuit. | Check the sensor signal voltage (function 5). If it is out of range, adjust according to the Technical Manual. |
| 053 | Error in the load/depth sensitivity control circuit | Check the potentiometer signal voltage (function 6). |
| 054 | Error in the potentiometer circuit of the lift control lever. | Check the potentiometer signal voltage (function 7). |

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develop, which, if ignited, can cause serious burns to anyone close by. Avoid applying heat with either arc or oxyacetylene near the pressurized fluid lines or any other line containing inflammable fluid. The lines can be accidentally cut by excessive heat given off by the welding torch.

## Work in a well ventilated area



The ingestion of exhaust fumes can cause damage or death. If it is necessary to carry out work on the engine with it running, remove the exhaust gasses from the area with a extension pipe connected to the exhaust pipe.

If you do not have an extension pipe, open the doors and let the outside air circulate inside the work area.

## Wear Appropriate Clothing

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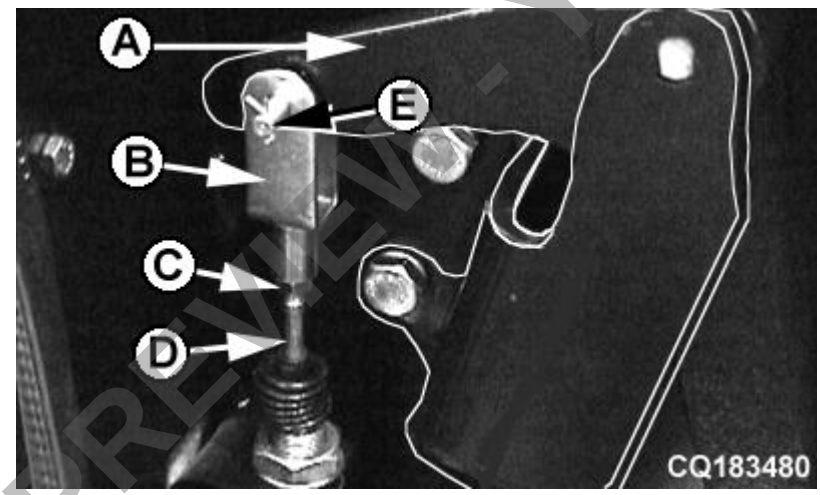
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# Specifications

## Perma II Clutch

| Item | Measurement | Specification |
|---|---|---|
| Clutch pressure 6405 | Engine pressure at 1000 rpm | 1200 kPa (12 bar/170 psi) |
| 6605 | Engine pressure at 1000 rpm | 1400 kPa (14 bar/200 psi) |
| Work pressure 6405 | Engine pressure at 1000 rpm | 1200 kPa (12 bar/170 psi) |
| 6605 | Engine pressure at 1000 rpm | 1400 kPa (14 bar/200 psi) |
| Clutch control valve | Vertical | 15° |
| | Force | 18 to 20 Nm approx. (13 to 15 lb-ft) |
| Coolant oil pressure | Engine pressure at 1000 rpm | 150 kPa (1.5 bar/22 psi) |
| Lubrication pressure | Engine pressure at 1000 rpm | 75 kPa (0.75 bar/11 psi) |
| | Pressure with the engine at a setting of 2300 rpm | 200 to 400 kPa (2 to 4 bar/29 to 58 psi) |
| Clutch pedal | Measurement “to” (stroke of the pedal) measured from the fastening hole of the Clutch hub | 51±1 mm |
| | Tightening torque on the lock nut of the regulating bolt | 15 Nm (11 lb-ft) |
| Output flow in the oil cooler | Output flow when the engine setting is at 2300 rpm | 60 L/min |

# Clutch Pedal Regulation

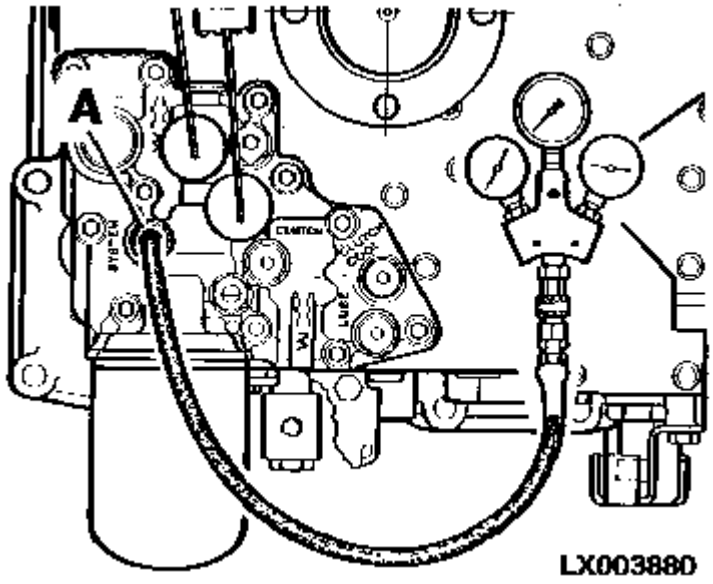



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**( 1 ) Check the pressure of the system (work pressure)**

## Action:




Connect and check the SYSTEM connection (A).
Engine rotation to 1000 rpm.
Specified pressure; 1200 kPa (12 bar/174 psi) - 6405
1400 kPa (14 bar/203 psi) - 6605.

## Result:

**YES:**Go to **( 2)**

**NO:**Pressure too low. Go to **(1b)**

**NO:**Pressure too high: Go to **(1c)**

**NO:**System without pressure: Go to **(1d)**

**( 2 ) When the pressure is too low, check the following possibilities:**

## Action:

Adjust the pressure regulating valve. See 1.2.
Change the transmission filter.
Does the transmission pump operate correctly?
The primary filter is plugged.

## Result:

**YES:**Repeat **( 1)**

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# Procedure of Calibration

The calibration is a procedure by which the characteristics of the tractor's components in the lift control unit (HCU) are specified. This is necessary if some component of the lift has been replaced, adjusted, or if the lift is working poorly.

**CAUTION:**

***When running these tests on the hydraulic lift, remember that there is danger of accidents happening with the lift arms. That is why it is important to stay out of the area of moving parts.***

## Preparation of the Lift

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# Chart of the Test Results

**Hydraulic System with a gear pump**

Owner: Model: Date:

Hours of work: Serial Number:

Problems:

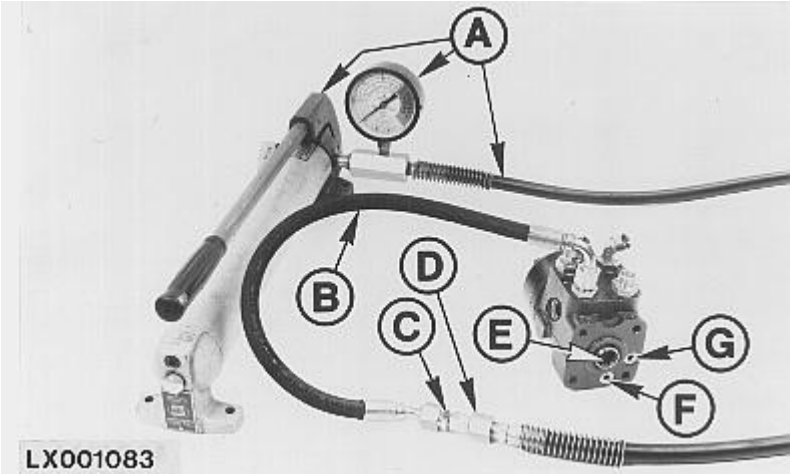
| Test | Denomination | Theoretical Value | Real Value |
|---|---|---|---|
| 1 | Min. system pressure test | 13 to 15 bar<br>188.5 to 218 psi | |
| | Max. system pressure test | 190 to 205 bar<br>2756 to 2973 psi | |
| 2 | Steering pressure (primary circuit) minimum (neutral) | 11 to 13 bar<br>159.5 to 188.5 psi | |
| | Maximum (steering at the limit) | 175 to 188 bar<br>2540 to 2730 psi | |
| 3 | Load control pressure (load sense) min. | 0 to 0.5 bar<br>0 to 7.3 psi | |
| | Maximum | 190 to 205 bar<br>2756 to 2973 psi | |
| 4 | Lubrication pressure. | 1.5 bar/21.8 psi at 2000 rpm<br>0.7 bar/10.2 psi at 1000 rpm. | |
| 5 | Output flow measure at 2450 rpm with hydraulic pump of 23 $cm^3$ and RCV 101 | 54 l/min | |

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# Testing and Adjusting the Safety Valve




**LEGEND:**

| | |
|---|---|
| A | Manual pump D01019AA with pressure gauge and hydraulic hose |
| B | Hydraulic hose of the valve set |
| C | Connection L35560 |
| D | Coupling JT03248 |
| E | Interior spool |
| F | Safety valve (turn to the right) |
| G | Safety valve (turn to the left) |

Join the coupling JT03248 (D) to the connection L38860 (C) to a hydraulic hose of the manual pump D01019AA.

Connect the hydraulic hose (B) to the "R" connection or to the “L” connection of the steering valve set and to the L38860 adapter.

With the manual pump, increase the pressure between 23500 to 25500 kPa (235 to 255 bar/3400 to 3700 psi). The regulating of the valve is correct if it reaches this pressure and the pressure gauge needle drops suddenly.

***IMPORTANT:***

***After doing the test of the safety valve, oil stays trapped between the connections. Turn the interior spool (E) to the left and to the right so that the oil can escape.***

If necessary, adjust the safety valves as follows:

1. Remove the screw-in plugs and apply LOCTITE 242 (L41475) to the regulating bolts situated in the top part.
2. Screw the regulating bolts in or out until a pressure is reached between 23500 and 25500 kPa (235 to 255 bar/3400 to 3700 psi).

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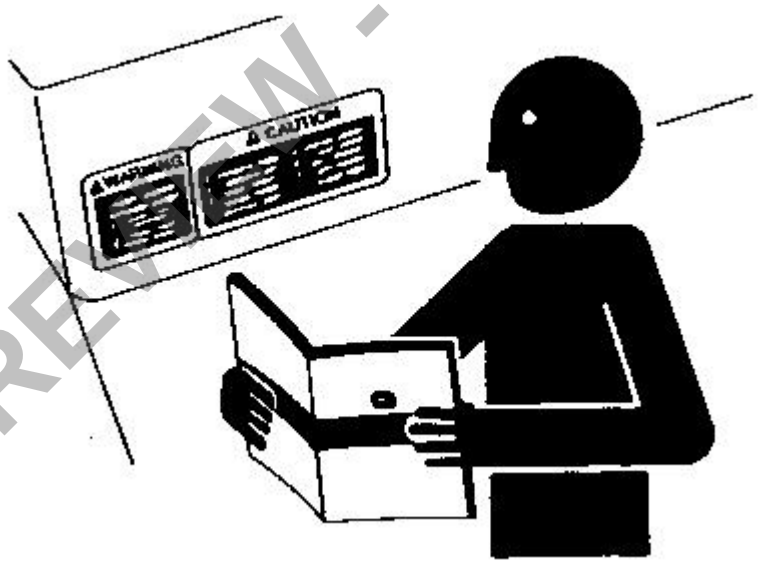
# Group 05 - Norms of Safety

## Acknowledge the safety Information



This is the Safety prevention symbol. When you see this on your machine or in this publication, always be aware of the risk of injury or accidents related to operating the equipment.

## Observe the Safety Messages




Read the safety information in this publication and on your tractor carefully. Maintain the corresponding decals in good condition. Replace worn or missing decals. Get to know the operation of your Tractor and its Controls.

Always keep your tractor in good working condition. Any unauthorized modification to the

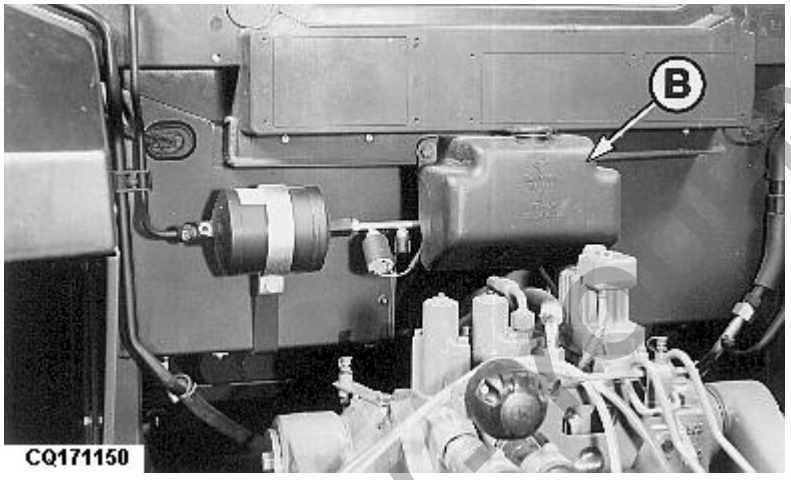
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# Group 65 - Cab

## Air-conditioning Electrical Controls




### Windshield Wiper and Wash System

The windshield wiper switch (A) has two positions:

1. slow speed
2. High speed

The wiper system is turned on by a switch (A) (push it in the direction of the tractor ceiling).

Check and refill the water tank (B) for the windshield wipers.

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hazard lights and turn signals to function.

**Operation:** Each time this K11 relay receives current from the K6 relay, it becomes functional. As it leaves, it emits an intermittent signal to the K9 and K10 relays.

**→NOTE:**

**When it is functioning normally, the K11 emits a typical and intermittent sound.**

**Remaining inactive** : The K11 output will be zero volts.

**Using Switched Access:** The output will be a direct current of 12 V.

## K8 Relay

(See the location of the Central Fuse Box on 240-25)

**Function:** turning on the two front / rear work lights

**Operation:** with the light switch in 3rd position, the K8 relay remains energized turning on the work lights.

This circuit is protected by fuse F9 of 20 A .

## K9 Relay

(See the location of the Central Fuse Box on 240-25)

**Function:** Turning on the left hazard light with an intermittent signal.

**Operation:** The K9 relay receives an intermittent signal from the K11 relay, that reverses the flow of current in the same rhythm of the K11, turning on and off the left hazard light.

**Using Static Mode:** The left hazard light does not turn on.

**Using Switched Access:** The left hazard light is continually lit.

## K10 Relay

(See the location of the Central Fuse Box on 240-25)

**Function:** Turning on the right hazard light with an intermittent signal.

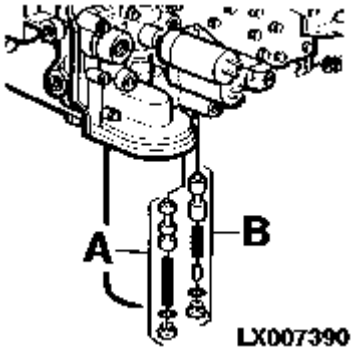
**Operation:** The K10 relay receives an intermittent signal from the K11 relay, that reverses

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**( 2 ) Check the following:**

## Action:




Check the spring and the body of the cooling valve (B).

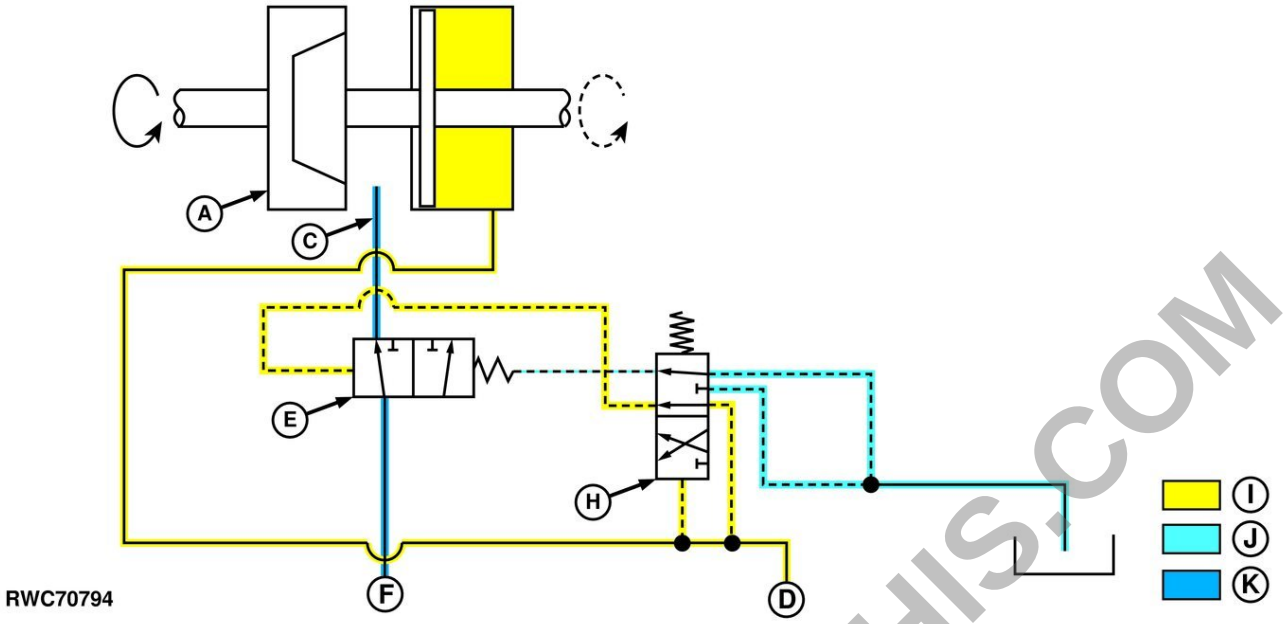
## Result:

**YES:**Repeat the test **(5a)**

# Check the oil cooling system

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**LEGEND:**

| | |
|---|---|
| A | Clutch of the engine |
| B | Control valve |
| C | Coolant oil channel |
| D | From the control valve |
| E | Clutch cooling valve |
| F | From the lubrication of the transmission |
| G | Gear shift |
| H | Cooling pilot valve of the clutch |
| I | Pilot oil |
| J | Oil without pressure |
| K | Cooling and lubricating oil |

At a clutch pressure of 150 to 900 kPa (1.5 to 9 bar/22 to 130 psi) on the 6405 tractor, or 150 to 1100 kPa (1.5 to 11 bar/22to160 psi) on the 6605 tractor, the control oil flows through the control valve of the coolant oil (H) until the oil coolant valve (E) (closed) and opens this valve.

This way lubricating oil gets to the coolant oil channel (C) from the clutch (A). The heat generated by the friction between the clutch discs is absorbed by the lubricating oil.

## Operation of the Clutch Cooling System (Clutch almost all the way in)

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**( 1 ) Test**

## Action:

Possible causes of leaks in the circuit of the reverse brake:

-Check the control valve box.

-The chart (step 12) lists the points where leaks could show up.

## Result:

**YES:**Jot down for repair after, go to **(2)**

# Differential lock leak test

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# Gearshift Lever Changed from Neutral to the Second Gear or Reverse

**Modulating valve Part I**

1. When moving the gearshift lever, the gearshift valve is mechanically dislocated:
   - The discharge channel of the gearshift valve is opened to discharge the end of the gearshift valve heads B1-B2 (I) and B3-C4 (J).
   - The pressure channel of the gearshift valve is opened, spraying oil under pressure to the end of the gearshift valve head (B2-B3 (K).
2. The gearshift valve (B2-B3 (K) has pressure on the end of the head coming from the gearshift control valve in order to:
   - Open the reservoir channel to discharge the element B3 (G) through the valve B3-C4 (J).
   - Open the pressure valve to spray the oil under pressure from System 2 (A) to gearshift valve B1-B2 (I).
3. The force of the spring moves the gearshift valve B1-B2 (I) in order to:
   - Open the reservoir channel to discharge the element B1 (E).
   - Open the pressure channel to direct the pressure from the System 2 (A) of the gear modulation valve (B), through the valves B2-B3 (K) and B1-B2 (I) to connect the element B2 (F).
4. The force of the spring positions the gearshift valve B3-C4 (J):
   - Discharges the element B3 (G) through the gearshift valve B2-B3 (K).
   - Discharges the element C4 (H) on the gearshift valve. **Modulating valve Part II**
5. When moving the speed control lever, the gearshift valve is mechanically dislocated:
   - The discharge channel of the control valve (D) is opened to discharge the end of the discharge valve spring (M).

     **→NOTE: The orifice of the discharge valve (M) creates a restriction on the output flow of System 1 (C), creating a drop in pressure on the end of the discharge valve spring (M).**

6. The pressure of the accumulator pushes the discharge valve (M) against the force of the spring, which in turn:
   - Closes the pressure channel to keep the output flow of System 1 (C) from going back to the reservoir before the control valve.
   - Opens the reservoir channel of the discharge valve (M) in order to completely discharge the accumulator (L) and alleviate the pressure from the gear modulation valve spring (B).
7. With the gearshift valve retained in the second gear, the gearshift valve (D) stays retained, with the channel of the discharge valve (M) closed.
8. With the accumulator (L) completely discharged, the spring on the discharge valve moves the discharge valve (M):
   - To close the discharge channel, preparing for the recharge from the accumulator (L).
   - To open the pressure channel and direct the pressure from System 1 (C) to the gearshift valve (D) and the end of the discharge valve spring (M).

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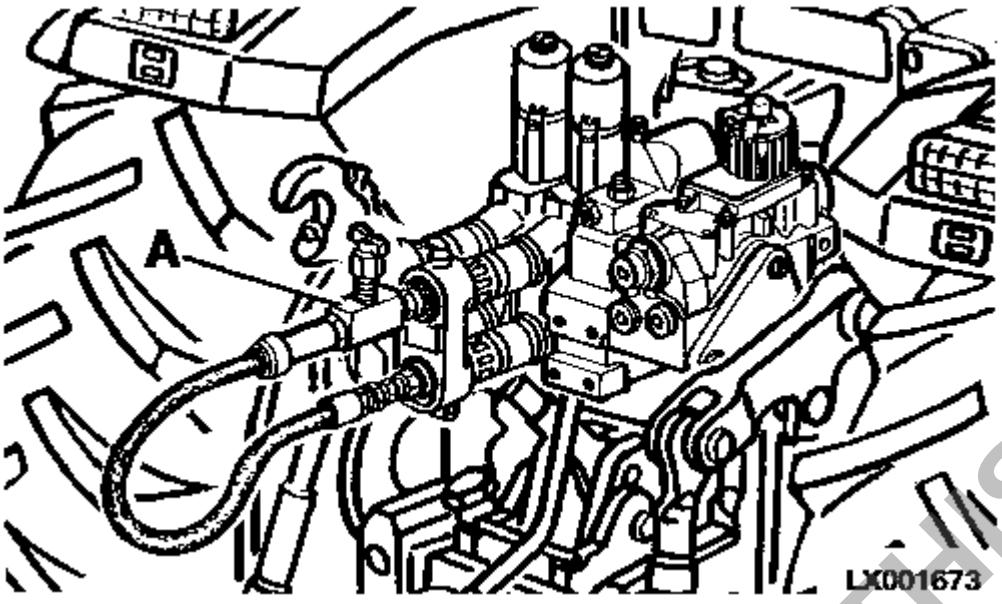

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If the braking is insufficient, unequal (if the tractor swerves to one side) or if excessive noises come from the brake, then the rear brakes should be repaired .

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## Heating the Hydraulic Oil




1. Connect a hose with a throttle valve to the quick hitches on to a remote control valve.
2. Installing the thermometer.
3. Put the RCV control flow valve (if there is) in central position.
4. Put the 1700rpm motor and move the RCV control gearshift.
5. Observe the thermometer and place the lever of the control unit in neutral when it reaches the desired temperature (40°C).

**→NOTE:**

**To heat the oil more quickly, you can use a regulator**

[ JT07120 included in the set of pressure gauges JT07115 ]

**(A). The regulator must be almost closed.**

## Connections and Pressure Gauges

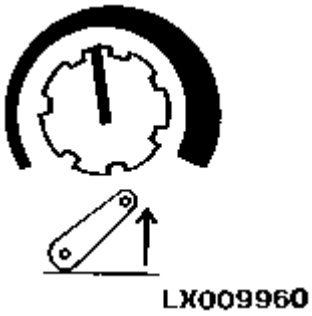
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**( 4 ) .**

## Action:

Turn the raise limit control completely to the left (min.) and then completely to the right (max).




**Hydraulic Lift:** The lift raises more than 1/4 of its stroke, but not completely

**Monitor:** “20:XXX”
6000:XXX=001-008.
7500:XXX=005-075.

**→NOTE:**

**The amount should preferably be larger than 1 and less than 8; if not, the system could generate an error code 050.**

## Result:

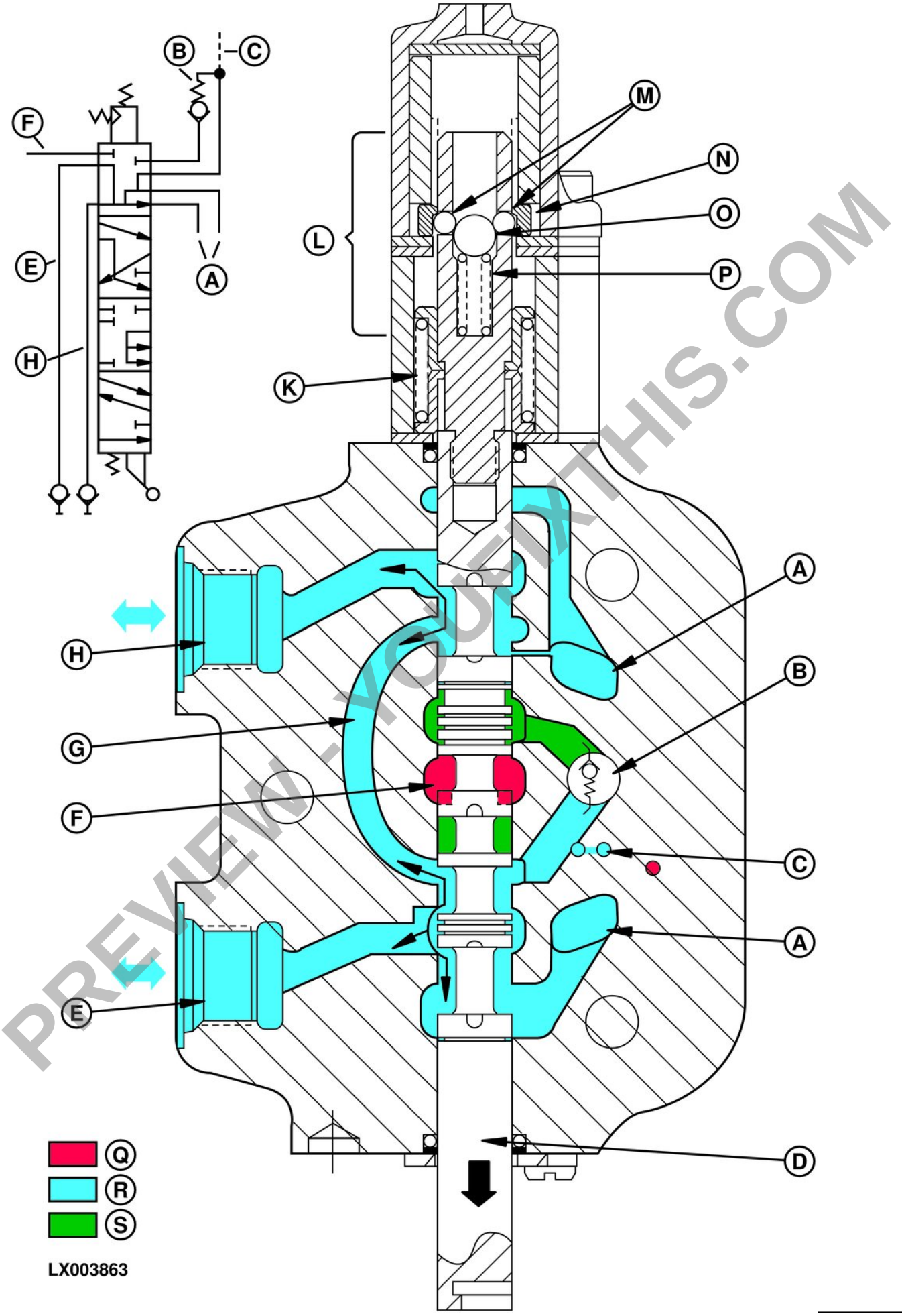
**YES:**Step **( 9)**

**NO:**Check the valve; check for leaks.

# Identifying the Lift Cylinders

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