CATERPILLAR

RENR3817-02
September 2001

Testing and Adjusting

320C Excavator Hydraulic System

ANB1-Up (Machine)
BCB1-Up (Machine)
BDB1-Up (Machine)
AMC1-Up (Machine)
BBC1-Up (Machine)
BDC1-Up (Machine)
CCD1-Up (Machine)
ALF1-Up (Machine)
BEF1-Up (Machine)
AKH1-Up (Machine)
BER1-Up (Machine)
BPR1-Up (Machine)
BRX1-Up (Machine)

Important Safety Information

Most accidents that involve product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death couid occur to you or to other persons.

The hazards are identified by the "Safety Alert Symbol" and followed by a "Signal Word" such as "DANGER", "WARNING" or "CAUTION". The Safety Alert "WARNING" label is shown below.

WARNING

The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning explains the hazard and can be either written or pictorially presented.

Operations that may cause product damage are identified by "NOTICE" labels on the product and in this publication.

Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are, therefore, not all inclusive. If a tool, procedure, work method or operating technique that is not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and for others. You should also ensure that the product will not be damaged or be made unsafe by the operation, lubrication, maintenance or repair procedures that you choose.

The information, specifications, and illustrations in this publication are on the basis of information that was available at the time that the publication was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service that is given to the product. Obtain the complete and most current information before you start any job. Caterpillar dealers have the most current information available. For a list of the most current publication form numbers available, see the Service Manual Contents Microfiche, REG1139F.

WARNING

When replacement parts are required for this product Caterpillar recommends using Caterpillar replacement parts or parts with equivalent specifications including, but not limited to, physical dimensions, type, strength and material.

Failure to heed this warning can lead to premature failures, product damage, personal injury or death.

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Testing and Adjusting Section

Testing and Adjusting

General Testing and Adjusting information

SMCS Code: 5050

WARNING

Hydraulic oil pressure can remain in the hydraulic systems after the engine and pump have been stopped. Serious injury can be caused if this pressure is not released before any service is done on the hydraulic systems. To prevent possible injury, refer to the section, Testing and Adjusting, "Hydraulic System Pressure - Release" before any fitting, hose or component is loosened, tightened, removed or adjusted.

When possible, the work tool must always be lowered to the ground before service is started. When it is necessary for the boom to be in the raised position while tests or adjustments are done, be sure that the boom, stick and work tool have correct support.

The swing lock (if equipped) must be engaged before service is started.

Always move the machine to a location away from the travel of other machines. Be sure that other personnel are not near the machine when the engine is running and tests or adjustments are being made.

The correct oil temperature, flow, and pressure are necessary for correct operation. Pump output (oil flow) is a function of engine speed (rpm) and valve adjustment. Oil pressure is caused by resistance to the flow of oil.

Visual checks and measurements are the first steps during troubleshooting. Refer to Testing And Adjusting, "Visual Inspection". Next, perform the operational checks. Refer to Testing And Adjusting, "Operational Checks". Finally, perform the required tests and adjustments on the machine.

Visual Inspection

SMCS Code: 5050-040

A visual inspection of the system is the first step in order to troubleshoot a problem. Shut off the engine and lower all implements to the ground before performing the visual inspection.

1. Check the oil level in the hydraulic tank. Slowly loosen the fill/vent plug and release the pressure before the fill/vent plug is removed.

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

2. Remove the hydraulic filter elements. Inspect the hydraulic filters for material that would give an indication of damage to a component.

3. Inspect all lines and connections for damage or leaks.

4. Inspect control linkages for bent components, broken components or damaged components.

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Hydraulic System Pressure - Release

SMCS Code: 4250-553-PX; 5050-553-PX

The release of hydraulic pressure in a hydraulic circuit is required before service is performed to that hydraulic circuit. Release the pressure in the following hydraulic circuits before any hydraulic lines are disconnected or removed from that hydraulic circuit.

- Boom hydraulic circuit
- Stick hydraulic circuit

- Bucket hydraulic circuit
- Swing hydraulic circuit
- Travel hydraulic circuit
- Attachment hydraulic circuits (if equipped)
- Pilot hydraulic circuit
- Return hydraulic circuit

Note: Refer to the Disassembly and Assembly Manual for additional information concerning service of the components of specific hydraulic circuits.

Release Of Hydraulic Pressure From A Single Hydraulic Circuit

WARNING

Personal injury can result from hydraulic oil pressure and hot oil.

Hydraulic oil pressure can remain in the hydraulic system after the engine has been stopped. Serious injury can be caused if this pressure is not released before any service is done on the hydraulic system.

Make sure all of the attachments have been lowered to the ground, and the oil is cool before removing any components or lines. Remove the oil filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Perform the following Steps in order to release the hydraulic pressure from a single hydraulic circuit of the main hydraulic system.

1. Position the machine on level ground.

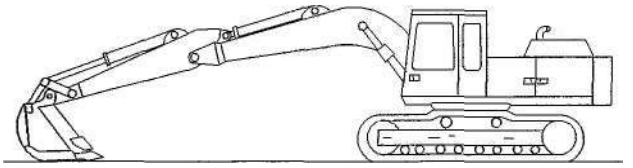

Illustration 1

2. Fully retract the stick cylinder rod. Adjust the position of the bucket so that the bucket is parallel to the ground. Lower the boom until the bucket is flat on the ground. Refer to Illustration 1.
3. Shut off the engine.
4. Turn the engine start switch to the ON position without starting the engine.
5. Place the hydraulic activation control lever in the UNLOCKED position.
6. Move only the joysticks or the pedals of the hydraulic circuit that requires service to the FULL STROKE positions. This will release the high pressure only in that single hydraulic circuit. This will also release any pressure that might be present in the pilot hydraulic circuit.

Note: if the desired hydraulic circuit that requires service requires the activation of a switch for operation, activate the necessary switches for the operation of the hydraulic circuit.

7. Place the hydraulic activation control lever in the LOCKED position.
8. Turn the engine start switch to the OFF position.
9. Slowly loosen the filler plug on the hydraulic tank and release the pressure from the hydraulic tank. Leave the filler plug loose for a minimum of 45 seconds. This will release the pressure that may be present in the return hydraulic circuit.
10. Tighten the filler plug on the hydraulic tank to the specified torque.
11. The pressure in the single hydraulic circuit that requires service is now released and lines and components can be disconnected or removed from that hydraulic circuit.

Release Of Hydraulic Pressure From Multiple Hydraulic Circuits

WARNING

Personal injury can result from hydraulic oil pressure and hot oil.

Hydraulic oil pressure can remain in the hydraulic system after the engine has been stopped. Serious injury can be caused if this pressure is not released before any service is done on the hydraulic system.

Make sure all of the attachments have been lowered to the ground, and the oil is cool before removing any components or lines. Remove the oil filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

Perform the following Steps in order to release the hydraulic pressure from multiple hydraulic circuits of the main hydraulic system.

1. Position the machine on level ground.

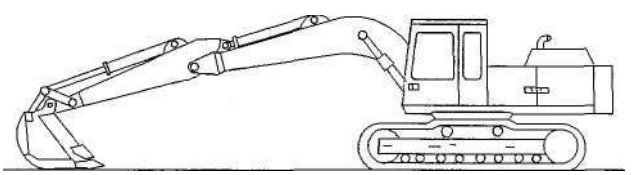

Illustration 2

2. Fully retract the stick cylinder rod. Adjust the position of the bucket so that the bucket is parallel to the ground. Lower the boom until the bucket is flat on the ground. Refer to Illustration 2.

3. Shut off the engine.

4. Turn the engine start switch to the ON position without starting the engine.

5. Place the hydraulic activation control lever in the UNLOCKED position.

6. Move only the joysticks or the pedals of the hydraulic circuit that requires service to the FULL STROKE positions. This will release the high pressure only in that hydraulic circuit. This will also release any pressure that might be present in the pilot hydraulic circuit.

Note: If the hydraulic circuit that requires service requires the activation of a switch for operation, activate the necessary switches for the operation of the hydraulic circuit.

7. Place the hydraulic activation control lever in the LOCKED position.

8. Start the engine.

9. Place the hydraulic activation control lever in the UNLOCKED position. **Do not move any joysticks or pedals from the NEUTRAL position during this step. Do not activate any switches during this Step.**

10. Return the hydraulic activation control lever to the LOCKED position.

11. Shut off the engine.

12. Repeat Steps 4 through 11 for each additional hydraulic circuit that requires service.

13. After releasing the hydraulic pressure in each of the desired hydraulic circuits, place the hydraulic activation control lever in the LOCKED position.

14. Turn the engine start switch to the OFF position.

15. Slowly loosen the filler plug on the hydraulic tank and release the pressure. Leave the filler plug loose for a minimum of 45 seconds. This will release the pressure that may be present in the return hydraulic circuit.

16. Tighten the filler plug on the hydraulic tank to the specified torque.

17. The pressure in the multiple hydraulic circuits that require service is now released and lines and components can be disconnected or removed from those hydraulic circuits.

Main Hydraulic Pump Air Pressure - Purge

SMCS Code: 5070-542-AI

When the main pumps have been serviced or the hydraulic oil has been replaced, remove the air from the hydraulic system. Remove the air from the hydraulic system in the following manner:

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

WARNING

Personal injury can result from hydraulic oil pressure and hot oil.

Hydraulic oil pressure can remain in the hydraulic system after the engine has been stopped. Serious injury can be caused if this pressure is not released before any service is done on the hydraulic system.

Make sure all of the work tools have been lowered to the ground, and the oil is cool before removing any components or lines. Remove the oil filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand.

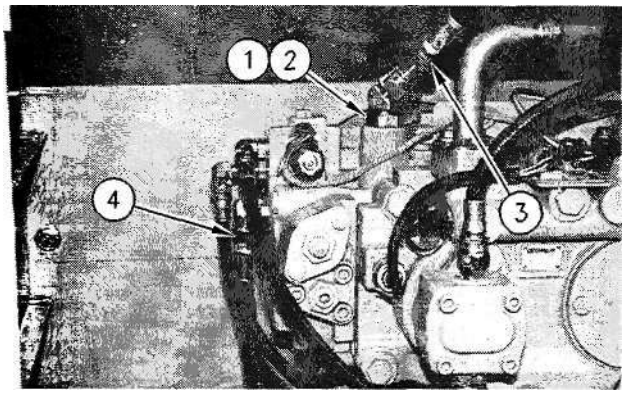

Illustration 3

Pump compartment

(1) Connector
(2) O-Ring seal
(3) Case drain hose
(4) Negative flow control hose

1. While the engine is stopped, disconnect hose (3) from connector (1).

2. Remove connector (1) and O-Ring seal (2) from the pump housing.

3. Fill the main pumps with oil.

4. Inspect O-Ring seal (2). If the seal is damaged, replace the seal.

5. Install O-Ring seal (2) and connector (1) at the pump housing.

6. Connect hose (3) to connector (1). Tighten hose (3) to the specified torque.

NOTICE

To avoid system damage, make sure that the hydraulic pump is properly filled with hydraulic oil before start-up.

7. Start the engine.

8. Place the engine at low idle position. Raise the boom and hold the boom in this position.

9. Slowly loosen hose (4) until oil begins to flow around the hose connection.

10. Tighten hose (4) to the specified torque.

11. Stop the engine and slowly lower the boom until the bucket is on the ground. This pressurizes the hydraulic tank.

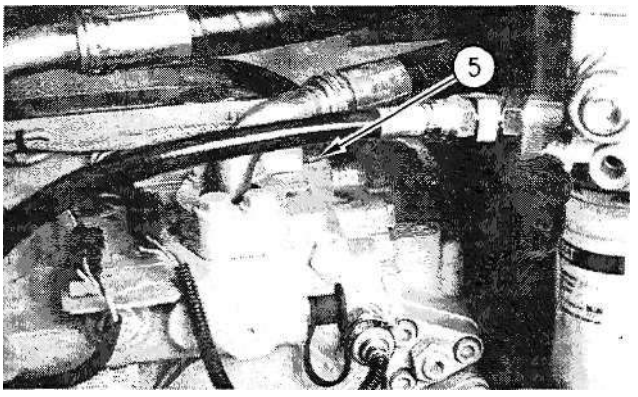

Illustration 4

(5) Vent plug

12. Slowly loosen vent plug (5) until oil begins to flow from the opening.

13. Tighten the vent plug to the specified torque.

Performance Tests

Operational Checks

SMCS Code: 5050-535

The operational checks can be used to find leakage in the system and components that are not functioning correctly. The speed of rod movement or the torque on a motor can be used to check the condition of the cylinders, motors and the pumps.

Perform the following operational checks in order to troubleshoot problems concerning the hydraulic circuits and components on the machine.

- Testing and Adjusting, "Engine Performance - Test"
- Testing and Adjusting, "Travel On Level Ground - Test"
- Testing and Adjusting, "Travel On Level Ground - Test (Optional Test)"
- Testing and Adjusting, "Machine Drift On A Slope - Check"
- Testing and Adjusting, "Swing Speed And Overswing On Level Ground - Check"
- Testing and Adjusting, "Swing Speed And Swing Drift On A Slope - Check"
- Testing and Adjusting, "Cylinder Drift - Check (Empty Bucket)"
- Testing and Adjusting, "Cylinder Drift - Check (Loaded Bucket)"
- Testing and Adjusting, "Cylinder Speed - Check"

The specifications that are listed in tables for the operational checks are calculated average values. The values will vary due to the configuration of the machine and engine speed. Table 1 and Table 2 contain the machine configurations that were used in order to obtain these specifications.

Reference: Refer to Testing and Adjusting, "Engine Performance - Test" for the specifications for engine speed.

Table 1

320C Machine Configuration		
Boom	**Stick**	**Bucket**
5.67 m (18 feet 6 inches)	2.92 m (9 feet 6 inches)	**0.8 m^3 (1.04 yd^3)**

Table 2

320C L Machine Configuration		
Boom	**Stick**	**Bucket**
5.67 m (18 feet 6 inches)	2.92 m (9 feet 6 inches)	**0.9 m^3 (1.17 yd^3)**

Engine Performance - Test (Engine Speed)

SMCS Code: 1000-081

Table 3

Required Tools		
Part Number	**Description**	**Qty**
9U-7400	Multitach Tool Group	1

1. Position the machine on level ground.
2. Stop the engine.
3. Install 9U-7400 Multitach Tool Group on the engine.
4. Start the engine.
5. Increase the hydraulic oil temperature to 55° ± 5°C (131° ± 9°F).
6. Read the engine speed display (rpm) on the multitach. Refer to Table 4 for the specifications for engine speed at the desired engine operation.

Table 4

Item	Specifications		
	New	Rebuild	Service Limit
No load high idle[2]	1860 ±50 rpm[1]		1660 to 1910 rpm[1]
	1970 ±50 rpmP)		1770 to 2020 rpm[3]
No load low idle	900 ± 50 rpm		900 ± 100 rpm
Maximum speed with load[4]	1720 rpm[5]	1670 rpm[5]	1620 rpm[5]
No load speed[6]	1300 ± 80 rpm		1300 ± 100 rpm

(1) AEC switch in the OFF position
(2) Three seconds after the engine speed dial was placed at position "10"
(3) Engine rpm within three seconds after the engine speed dial was placed at position "10"
(4) Pressure is relieved from both pumps (stall condition).
(5) Minimum rpm
(6) AEC switch in the ON position

Note: A New specification is the performance that can be expected for a new machine. A Rebuild specification is the performance that can be expected after rebuilding the components of a system. Performance beyond the Service Limit is an indication of these problems: improper maintenance or adjustment, component wear, and failure.

Travel on Level Ground - Test (Optional Test)

SMCS Code: 4351-081

Note: When the procedure for the Travel Test On Level Ground cannot be performed, this test may be used as a substitute.

Note: The engine speed and/or the machine configuration that is used during this test can affect the results of this test. Refer to Testing and Adjusting, "Engine Performance - Test" for the engine speed that was used for this test. Refer to Testing and Adjusting, "Operational Checks" for the machine configurations that were used for this test.

Note: The relief valve pressure settings must be set to the relief valve pressure specification before performing this operational check. Refer to Testing and Adjusting "Specifications".

Table 5

Required Tools		
Part Number	Description	Qty
	Stopwatch	1

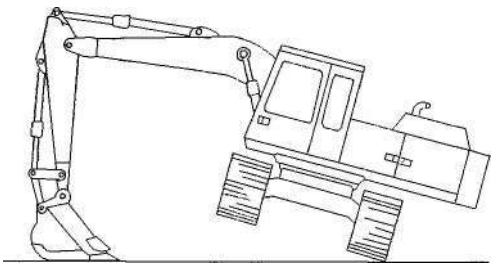

Illustration 5

1. Start the engine.
2. Position the machine on level ground.
3. Increase the hydraulic oil temperature to 55° ± 5°C (131° ± 9°F).
4. Raise a track off the ground. Refer to Illustration 5.
5. Put a mark on a shoe of the raised track.
6. Place the machine controls at the following settings: Engine speed dial "10" and AEC switch OFF.
7. Place the travel speed control switch in HIGH position.
8. Move the travel lever of the raised track to full travel position.
9. Measure the time that is required for the raised track to make three complete revolutions. Measure the time that is required in each direction.
10. Place the travel speed control switch in the LOW position and repeat Steps 8 through 9.

Table 6

320C Time For Three Revolutions (time in seconds)				
Travel Speed		**New**	**Rebuild**	**Service Limit**
HIGH	Forward	17.0 or less	18.0 or less	19.0 or less
	Reverse			
LOW	Forward	27.5 or less	28.5 or less	30.5 or less
	Reverse			

Table 7

320C L Time For Three Revolutions (time in seconds)				
Travel Speed		**New**	**Rebuild**	**Service Limit**
HIGH	Forward	18.5 or less	19.6 or less	20.7 or less
	Reverse			
LOW	Forward	30.0 or less	31.0 or less	33.2 or less
	Reverse			

Travel on Level Ground - Test

SMCS Code: 4351-081

Note: The engine speed and/or the machine configuration that is used during this test can affect the results of this test. Refer to Testing and Adjusting, "Engine Performance - Test" for the engine speed that was used for this test. Refer to Testing and Adjusting, "Operational Checks" for the machine configurations that were used for this test.

Note: The relief valve pressure settings must be set to the relief valve pressure specification before performing this operational check. Refer to Testing and Adjusting, "Specifications".

Table 8

Required Tools		
Part Number	**Description**	**Qty**
5P-3277	Measuring Tape	1
	Stopwatch	1

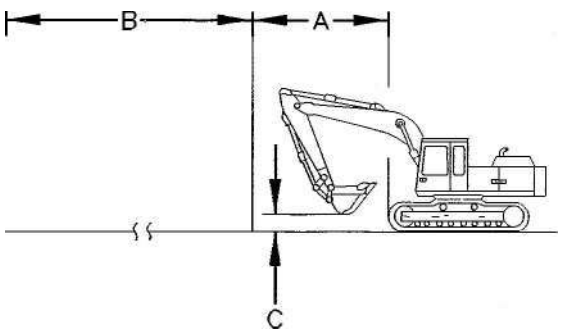

Illustration 6

(A) Preliminary run 5 m (16.4 ft)

(B) Travel distance 20 m (65.6 **ft)**

(C) Bucket height 0.5 to 1 m **(1**.6 to 3.3 ft)

1. Travel distance must be at least 25 m (82 ft) long. Travel test ground must be hard and as level as possible.

2. Draw a 25 m (82 ft) straight line on travel test ground as a reference line.

3. Start the engine.

4. Place the machine controls at the following settings: Engine speed dial "10" and AEC switch OFF.

5. Increase the hydraulic oil temperature to 55° ± 5°C (131° ± 9°F).

6. The bucket should be empty.

7. Position the machine so that one track is parallel with the reference line. Position the machine for the travel test. Refer to Illustration 6.

8. Place the travel speed control switch in HIGH position.

9. Move the machine by operating both travel levers at the same time.

10. The first 5 m (16.4 ft) are for a preliminary run. Measure the travel time that is required to travel the remaining 20 m (65.6 ft). Measure the time that is required in each direction.

11. Measure the travel deviation from the reference line.

12. Place the travel speed control switch on the LOW position and repeat Steps 9 through 1**1**.

Table 9

Travel Time (time in seconds)				
Travel Speed		**New**	**Rebuild**	**Service Limit**
HIGH	Forward	14.0 or less	15.0 or less	16.0 or less
	Reverse			
LOW	Forward	22.0 or less	23.5 or less	25.0 or less
	Reverse			

Note: The following table represents the travel deviation (distance) from the reference line.

Table 10

Travel Deviation mm (inch)				
Travel Speed		**New**	**Rebuild**	**Service Limit**
HIGH	Forward	800 (31.5) or less	1200 (47.2) or less	1500 (59.1) or less
	Reverse			
LOW	Forward	800 (31.5) or less	1200 (47.2) or less	1500 (59.1) or less
	Reverse			

Machine Drift on a Slope - Check

SMCS Code: 4095-535

Measuring the amount of drift of the machine on a slope will determine if there is a need to check the travel brake.

Note: The engine speed and/or the machine configuration that is used during this test can affect the results of this test. Refer to Testing and Adjusting, "Engine Performance - Test" for the engine speed that was used for this test. Refer to Testing and Adjusting, "Operational Checks" for the machine configurations that were used for this test.

Note: The relief valve pressure settings must be set to the relief valve pressure specification before performing this operational check. Refer to Testing and Adjusting, "Specifications".

Table 11

Required Tools		
Part Number	**Description**	**Qty**
	Stopwatch	1
	Scale150 mm (6 inch)	1

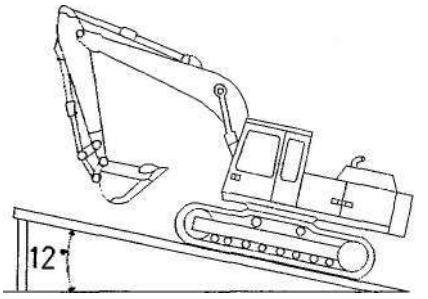

Illustration 7

1. Place the machine on a slope of 12 degrees. The surface of the slope must be hard and smooth.
2. Position the implements, as shown. Refer to Illustration 7.
3. The bucket should be empty.

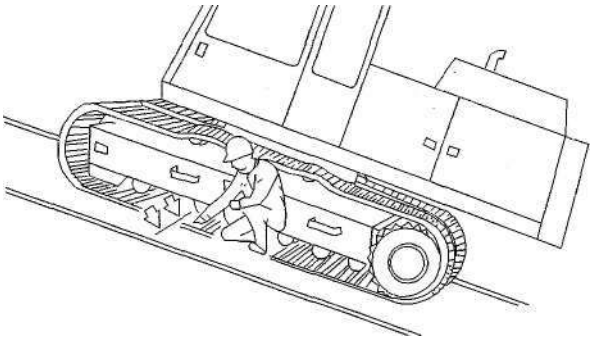

Illustration 8

4. To indicate the machine's relative position to the slope, put a mark on both the track and the track roller frame. Refer to Illustration 8.
5. Stop the engine.
6. Measure the machine movement on the slope after three minutes.

Table 12

Drift mm (inch)		
New	**Rebuild**	**Service Limit**
0	**0**	**0**

Swing Speed and Overswing on Level Ground - Check

SMCS Code: 5058-535-ZW

Measuring the swing speed and the overswing of the machine will determine if there is a need to check the swing motor or the anti-reaction valve. The fine swing control switch (if equipped) must be in the OFF position.

Note: The engine speed and/or the machine configuration that is used during this test can affect the results of this test. Refer to Testing and Adjusting, "Engine Performance - Test" for the engine speed that was used for this test. Refer to Testing and Adjusting, "Operational Checks" for the machine configurations that were used for this test.

Note: The relief valve pressure settings must be set to the relief valve pressure specification before performing this operational check. Refer to Testing and Adjusting, "Specifications".

Table 13

Required Tools		
Part Number	**Description**	**Qty**
5P-3277	Measuring Tape	1
	Stopwatch	1

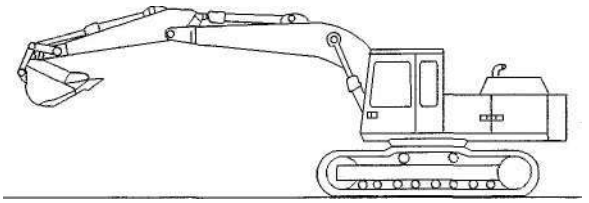

Illustration 9

1. Position the machine on level ground. Refer to Illustration 9.

2. Stop the engine.

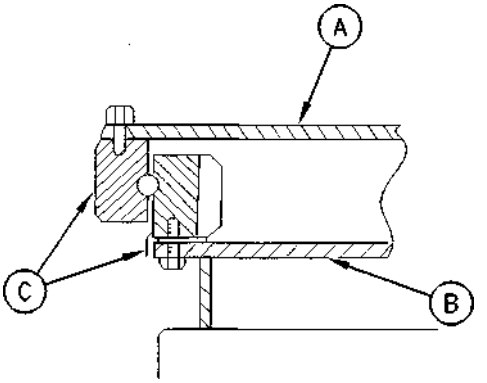

Illustration 10

(A) Upper frame
(B) Undercarriage frame
(C) Marking

3. To indicate the relationship of the two positions, put a mark (C) on the inner race and the outer race of the swing bearing. The mark will be used as a target to stop the swing operation. Refer to Illustration 10.

4. The bucket should be empty.

5. Move the swing joystick in either direction until the machine completes a 180 degree swing operation away from the target.

6. Move the swing joystick in either direction until the machine completes a 180 degree swing operation toward the target. Return the swing joystick to the NEUTRAL position at the target.

7. Measure the amount of overswing by measuring the distance between the marks on the swing bearing. Refer to Illustration 10.

Note: Use a point that is visible from the operator seat as a reference point for the target.

Table 14

Overswing			
Item	**New**	**Rebuild**	**Service Limit**
Right Swing	1100 mm (43.3 inch) or less	1200 mm (47.2 inch) or less	1400 mm (55.1 inch) or less
Left Swing			

8. Move the swing joystick in each direction and measure the time that is required to complete a 180 degree swing operation.

Table 15

Swing Time			
Item	**New**	**Rebuild**	**Service Limit**
Right Swing	4.2 seconds or less	4.6 seconds or less	5.2 seconds or less
Left Swing			

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Swing Speed and Swing Drift on a Slope - Check

SMCS Code: 5058-535-ZW

Measuring the swing speed on a slope will determine if there is a need to check the swing motor and the anti-reaction valve. Measuring the swing drift on a slope will determine if there is a need to check the swing parking brake.

Note: The engine speed and/or the machine configuration that is used during this test can affect the results of this test. Refer to Testing and Adjusting, "Engine Performance - Test" for the engine speed that was used for this test. Refer to Testing and Adjusting, "Operational Checks" for the machine configurations that were used for this test.

Note: The relief valve pressure settings must be set to the relief valve pressure specification before **performing** this operational check. Refer to Testing and Adjusting, "Specifications".

Table 16

Required Tools		
Part Number	**Description**	**Qty**
5P-3277	**Measuring** Tape	1
	Stopwatch	1

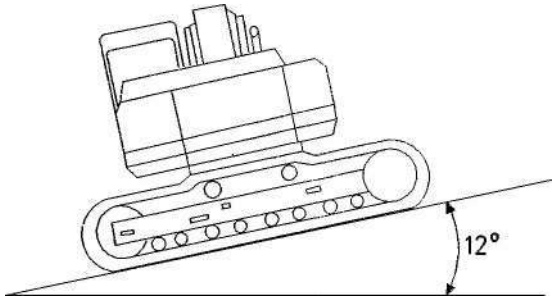


Illustration 11 g00298078

1. Complete the following steps in order to measure the swing speed on a slope.

   a. The bucket should be empty.

   b. Position the machine on a slope of 12 degrees. Refer to Illustration 11.

   c. Position the implements at maximum reach and close the bucket. Position the bucket above the ground so that the bucket will not come in contact with any obstacles.

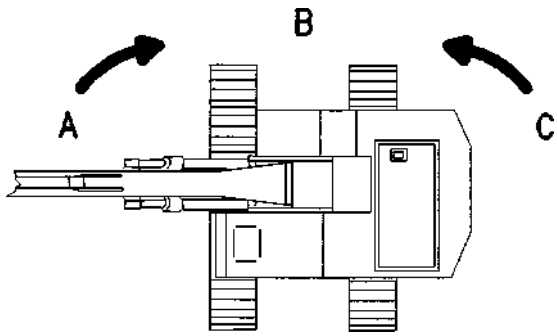


Illustration 12 g00298079

   d. Position the upper structure at position (A). The upper structure should be at a 90 degree angle to the lower structure. Refer to Illustration 12.

   e. Measure the time that is required to swing the upper structure from position (A) to position (B).

   f. Position the upper structure at position (C). The upper structure should be at a 90 degree angle to the lower structure.

g. Measure the time that is required to swing the upper structure from position (C) to position (B).

Table 17

Swing Time (seconds)			
Item	**New**	**Rebuild**	**Service Limit**
Right Swing	5.2 or less	5.7 or less	6.5 or less
Left Swing			

2. Complete the following steps in order to measure the swing drift on a slope.

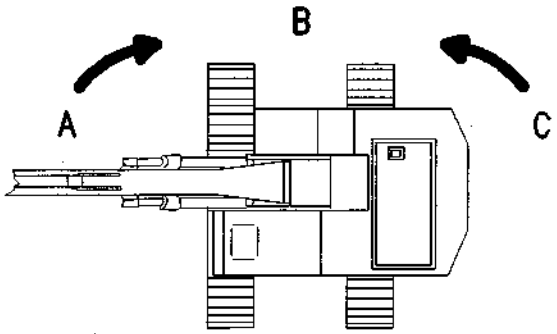


Illustration 13

a. Position the upper structure at position (A). The upper structure should be at a 90 degree angle to the lower structure. Refer to Illustration 13.

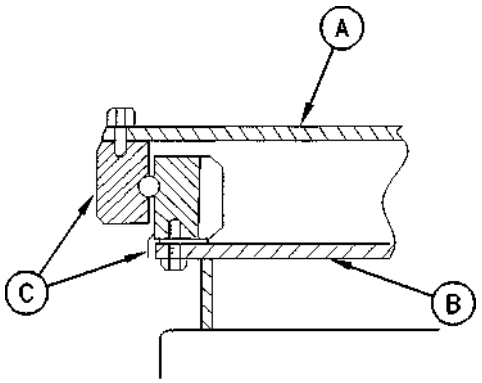


Illustration 14

(A) Upper frame
(B) Undercarriage frame
(C) Marking

b. To indicate the relationship of the two positions, put a mark (C) on the inner race and the outer race of the swing bearing. Refer to Illustration 14.

c. Stop the engine.

d. Leave the machine in this position for three minutes. Measure the swing drift on the circumference of the swing bearing.

e. Start the engine.

f. Position the upper structure at position (C). The upper structure should be at a 90 degree angle to the lower structure. Refer to Illustration 13.

g. Repeat Steps 2.b through 2.d.

Table 18

Swing Drift mm (inch)			
Item	**New**	**Rebuild**	**Service Limit**
Right Swing	0	**0**	**0**
Left Swing			

Cylinder Drift - Check (Loaded Bucket)

SMCS Code: 7562-535-D9

Note: The engine speed and/or the machine configuration that is used during this test can affect the results of this test. Refer to Testing and Adjusting, "Engine Performance - Test" for the engine speed that was used for this test. Refer to Testing and Adjusting, "Operational Checks" for the machine configurations that were used for this test.

Note: The relief valve pressure settings must be set to the relief valve pressure specification before performing this operational check. Refer to Testing and Adjusting, "Specifications".

Table 19

Required Tools		
Part Number	**Description**	**Qty**
5P-3277	Measuring Tape	1
	Stopwatch	1

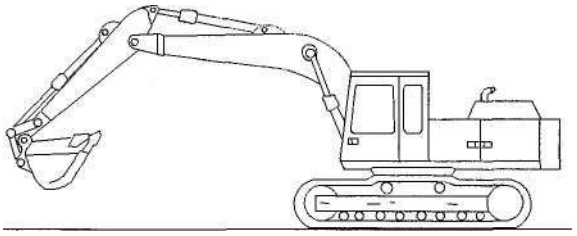


Illustration 15

1. Position the machine on level ground. Refer to Illustration 15.
2. Load the bucket.

   Weight of bucket load

   320C.....1050 kg (2310 lb)
   320C L.....1200 kg (2650 lb)

3. Raise the boom until the top stick pin is the same height as the boom foot pin.
4. Fully extend the bucket cylinder.
5. Fully retract the stick cylinder.
6. Extend the stick cylinder rod 70 mm (2.8 inch) from the fully retracted position.
7. Measure each cylinder's length from cylinder pin to cylinder pin.
8. Stop the engine.
9. Leave the machine in this position for three minutes. Measure each cylinder's length from cylinder pin to cylinder pin for drift.

Table 20

Cylinder Drift (Loaded Bucket)		
New Boom Cylinder	**New Stick Cylinder**	**New Bucket Cylinder**
6.0 mm (0.24 inch) or less	12.0 mm (0.47 inch) or less	18.0 mm (0.71 inch) or less

i01572461

Cylinder Drift - Check (Empty Bucket)

SMCS Code: 7562-535-D9

Note: The engine speed and/or the machine configuration that is used during this test can affect the results of this test. Refer to Testing and Adjusting, "Engine Performance - Test" for the engine speed that was used for this test. Refer to Testing and Adjusting, "Operational Checks" for the machine configurations that were used for this test.

Note: The relief valve pressure settings must be set to the relief valve pressure specification before performing this operational check. Refer to Testing and Adjusting, "Specifications".

Table 21

Required Tools		
Part Number	**Description**	**Qty**
5P-3277	Measuring Tape	1
	Stopwatch	1

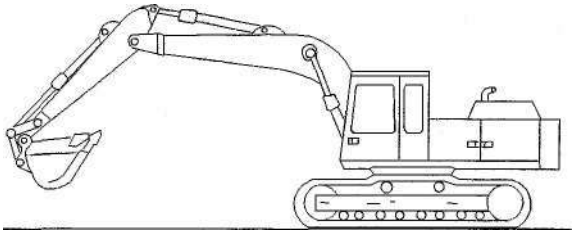


Illustration 16

1. Position the machine on level ground. Refer to Illustration 16.
2. Empty the bucket.

3. Raise the boom until the top stick pin is the same height as the boom foot pin.

4. Fully extend the bucket cylinder.

5. Fully retract the stick cylinder.

6. Extend the stick cylinder rod 70 mm (2.8 inch) from the fully retracted position.

7. Measure each cylinder's length from cylinder pin to cylinder pin.

8. Stop the engine.

9. Leave the machine in this position for five minutes. Measure each cylinder's length from cylinder pin to cylinder pin for drift.

Table 22

Cylinder Drift (Empty Bucket)			
Item	**New**	**Rebuild**	**Service Limit**
Boom Cylinder	6.0 mm (0.24 inch) or less	12.0 mm (0.47 inch) or less	24.0 mm (0.94 inch) or less
Stick Cylinder	10.0 mm (0.39 inch) or less	15.0 mm (0.59 inch) or less	25.0 mm (0.98 inch) or less
Bucket Cylinder	10.0 mm (0.39 inch) or less	15.0 mm (0.59 inch) or less	25.0 mm (0.98 inch) or less

Cylinder Speed - Check

SMCS Code: 5456-535-VF; 5458-535-VF

Note: The engine speed and/or the machine configuration that is used during this test can affect the results of this test. Refer to Testing and Adjusting, "Engine Performance - Test" for the engine speed that was used for this test. Refer to Testing and Adjusting, "Operational Checks" for the machine configurations that were used for this test.

Note: The relief valve pressure settings must be set to the relief valve pressure specification before performing this operational check. Refer to Testing and Adjusting, "Specifications".

1. Perform the following steps in order to test the operating speed of the boom cylinders.

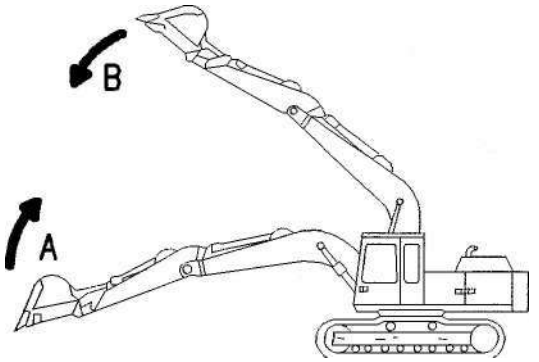


Illustration 17

(A) Extension test

(B) Retraction test

a. Place the machine on level ground.

b. The bucket should be empty.

c. Fully retract the bucket cylinder and the stick cylinder.

d. Position the bucket on the ground. With a stopwatch, measure the time that is required to fully extend the boom cylinders.

e. Position the boom cylinders at full extension. With a stopwatch, measure the time that is required for the bucket to come in contact with the ground.

f. Refer to the specifications in Table 23 for the operating speed of the boom cylinders.

2. Perform the following steps in order to test the operating speed of the stick cylinder.

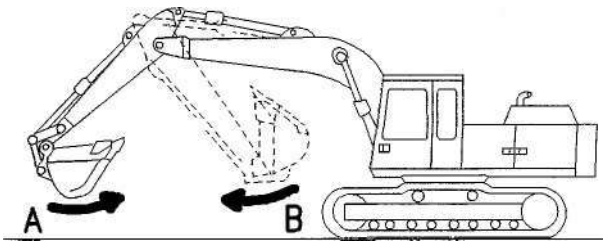


Illustration 18

(A) Extension test

(B) Retraction test

a. Place the machine on level ground.

b. The bucket should be empty.

c. Position the upper surface of the boom parallel to the ground.

d. Fully extend the bucket cylinder.

e. Retract the stick cylinder. With a stopwatch, measure the time that is required to fully extend the stick cylinder.

f. Extend the stick cylinder. With a stopwatch, measure the time that is required to fully retract the stick cylinder.

g. Refer to the specifications in Table 23 for the operating speed of the stick cylinder.

3. Perform the following steps in order to test the operating speed of the bucket cylinder.

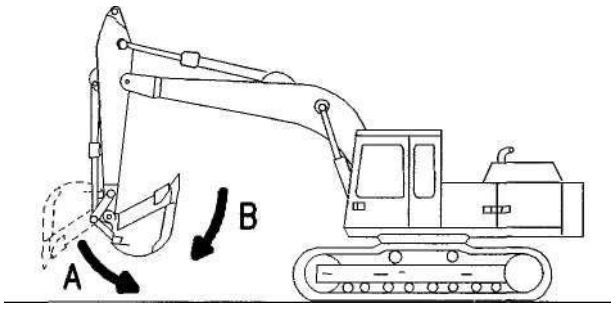


Illustration 19

(A) Extension test
(B) Retraction test

a. Place the machine on level ground.

b. The bucket should be empty.

c. Position the upper surface of the boom parallel to the ground.

d. Position the stick so that the stick is perpendicular to the ground.

e. Fully retract the bucket cylinder.

f. With a stopwatch, measure the time that is required to fully extend the bucket cylinder.

g. Position the bucket cylinder at full extension. With a stopwatch, measure the time that is required to fully retract the bucket cylinder.

h. Refer to the specifications in Table 23 for the operating speed of the bucket cylinder.

Table 23

Cylinder Operating Speed (seconds)				
Item		**New**	**Rebuild**	**Service Limit**
Boom	Extension	2.8 ± 0.5	3.2(1)	3.6(1)
	Retraction	1.9 ±0.5	2.2(1)	2.4(1)
Stick	Extension	3.2 ± 0.5	3.7(1)	4.2(1)
	Retraction	2.4 ± 0.5	2.6(1)	3.0(1)
Bucket	Extension	3.3 ± 0.5	3.8(1)	4.3(1)
	Retraction	1.8 ±0.5	2.1(1)	2.3(1)

(1) Maximum

Hydraulic Pressure Adjustments

Required Tools

SMCS Code: 0701; 0738; 0770; 0774; 0775; 0784; 7320

S/N: ANB1-Up

S/N: BCB1-Up

S/N: BDB1-Up

S/N: AMC1-Up

S/N: BBC1-Up

S/N: BDC1-Up

S/N: ALF1-Up

S/N: BEF1-Up

S/N: AKH1-Up

S/N: BER1-Up

S/N: BPR1-Up

S/N: BRX1-Up

Table 24

Required Tools		
Part Number	**Description**	**Qty**
	Container for measuring	1
	Remote drain hose with inside diameter of 20 mm (0.78 inch)	1
	Scale 150 mm (6 inch)	1
	Stopwatch	1
FT-2542	Track block assembly	1
4C-6481	Coupler Assembly	8
4C-6482	Nipple Assembly	8
4C-8767	Coupling	8
4C-9910	Portable Hydraulic Tester (Flow Meter)	2
8C-9026	Adapter	4
4I-6140	Coupling	1
4I-6141	Coupling	2
3J-1907	O-Ring Seal	4
5K-9090	O-Ring Seal	16

(continued)

(Table 24, contd)

Required Tools		
Part Number	**Description**	**Qty**
6K-6307	O-Ring Seal	18
7M-8485	O-Ring Seal	8
1P-3703	Rectangular Seal	2
5P-0201	Hose	4
5P-1010	Sleeve	8
5P-3277	Measuring Tape	1
8T-0470	Thermometer Group	1
8T-0855	Pressure Gauge	2
8T-0856	Pressure Gauge	2
8T-0861	Pressure Gauge	3
8T-4184	Bolt	8
8T-4223	Hard Washer	8
8T-5082	Union	1
8T-8902	Elbow	4
1U-8292	Adapter	2
1U-8303	Fitting	2
9U-7335	Blocking Cover	2
9U-7400	Multitach Tool Group	1
6V-0400	Half Flange	4
177-7860	Hose	5
6V-3965	Nipple Assembly	2
6V-3989	Unvalved Nipple	5
6V-4143	Coupler Assembly	10
6V-8397	O-Ring Seal	8
6V-8398	O-Ring Seal	4
6V-8716	Seal Connector	2
6V-9508	Face Seal Plug	2
6V-9509	Face Seal Plug	1
6V-9829	Cap	2
6V-9830	Cap	1
6V-9832	Cap	4
6V-9840	Swivel Tee	2
6V-9854	Swivel Elbow	2

Relief Valve (Pilot) - Test and Adjust

SMCS Code: 5072-025; 5072-081

1. Place the machine on level ground.

2. Stop the engine.

3. Release the pressure in the hydraulic system. Refer to Testing and Adjusting, "Hydraulic System Pressure - Release".

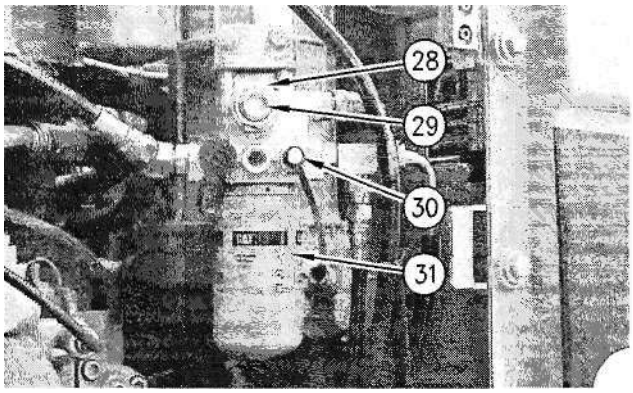


Illustration 20

Pilot oil manifold compartment

(28) Locknut
(29) Setscrew
(30) Pressure tap
(31) Pilot filter

4. Connect a 6000 kPa (870 psi) pressure gauge to pressure tap (30).

5. Start the engine.

6. Place the machine controls at the following settings: engine speed dial "10" and AEC switch OFF Refer to Testing and Adjusting, "Engine Performance - Test" for engine rpm settings.

7. Increase the hydraulic oil temperature to 55° ± 5°C (131° ± 9°F).

8. Check the pilot relief valve setting at pressure tap (30).

9. The pilot relief valve setting should be 4100 ± 200 kPa (595 ± 29 psi). If the pilot relief valve setting is not within the specification, adjust the pilot relief valve.

10. In order to adjust the pilot relief valve, loosen locknut (28).

11. Turn setscrew (29) until the pressure gauge reading at pressure tap (30) is 4100 ± 200 kPa • (595 ± 29 psi).

Note: Turning setscrew (29) clockwise increases the pressure. Turning setscrew (29) counterclockwise decreases the pressure.

Note: Always make final pressure adjustments on pressure rise.

12. Tighten locknut (28) to a torque of 49 4.9 N-m (36 ± 4 lb ft).

Note: Normal operation of the engine and pumps are necessary for the pressure adjustment. If the results of the pressure adjustments are not correct, then the engine and the pump characteristic curve needs to be checked.

Relief Valve (Main) - Test and Adjust

SMCS Code: 5069-025; 5069-081

1. Position the machine on level ground and stop the engine.

2. Release the pressure in the hydraulic system. Refer to Testing And Adjusting, "Hydraulic System Pressure - Release". >

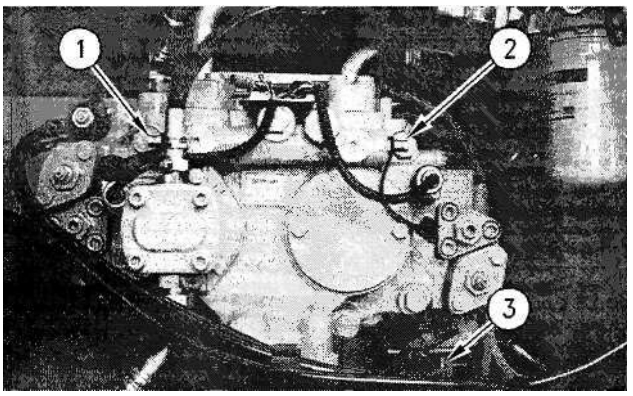


Illustration 21

Pump compartment

(1) Pressure tap (right pump delivery pressure)
(2) Pressure tap (left pump delivery pressure)
(3) Pressure tap (power shift pressure)

3. Attach a 60000 kPa (8700 psi) pressure gauge to pressure tap (1).

4. Start the engine.

5. Place the machine controls at the following settings: engine speed dial "10" and AEC switch OFF. Refer to Testing and Adjusting, "Engine Performance - Test" for engine rpm settings.

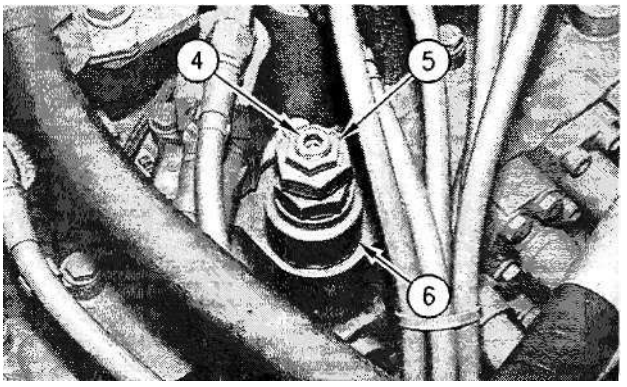
6. Increase the hydraulic oil temperature to 55° ± 5°C (131° ± 9°F).

7. Open the bucket until the bucket cylinder rod is at the full retraction.

8. Check the main relief valve pressure setting at pressure tap (1).

9. Return the joystick for the bucket to the NEUTRAL position.

10. The main relief valve pressure setting should be 34300 ± 490 kPa (4950 ± 72 psi). If the main relief valve pressure setting is not within the specification, adjust the main relief valve pressure setting.



(4) Adjustment screw
(5) Locknut
(6) Main relief valve

11. In order to adjust the main relief valve, loosen locknut (5) and turn adjustment screw (4) until the pressure gauge reading at pressure tap (1) is 34300 ± 490 kPa (4950 ± 72 psi).

Note: Turning adjustment screw (4) clockwise increases the pressure. Turning adjustment screw (4) counterclockwise decreases the pressure.

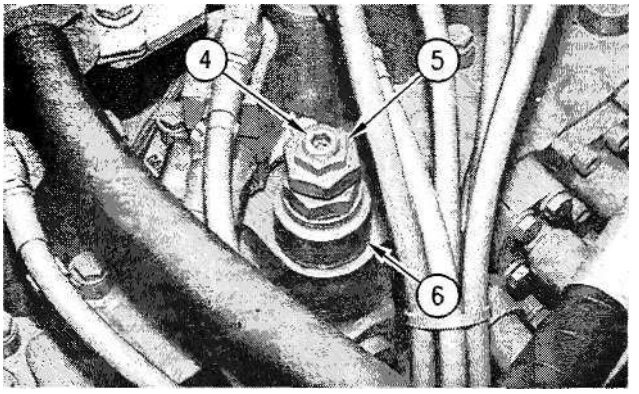
Note: Always make final pressure adjustments on pressure rise.

12. Tighten locknut (5) to a torque of 50 ± 10 N.m (37 ± 7 lb ft).

Temporary Setting of the Main Relief Valve

Note: A temporary setting of the main relief valve is required before any line relief valve can be adjusted.

1. The main relief valve pressure setting should be 34300 ± 490 kPa (4950 ± 72 psi). If the main relief valve is not within the specification, adjust the main relief valve pressure setting to the correct pressure specification before performing Step 2. Refer to Testing and Adjusting, "Relief Valve (Main) - Test and Adjust".



Top of main control valve

(4) Adjustment screw
(5) Locknut
(6) Main relief valve

2. Loosen locknut (5) and turn adjustment screw (4) clockwise for one half turn. Tighten locknut (5) to the specified torque.

Note: Always make final pressure adjustments on pressure rise.

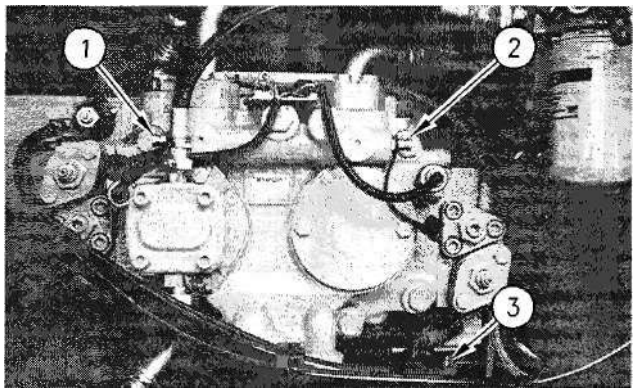
Relief Valve (Crossover) - Test and Adjust

SMCS Code: 5069-036

Note: A temporary setting of the main relief valve is required before travel crossover relief valves can be tested. Refer to Testing And Adjusting, "Relief Valve (Main) - Test and Adjust".

1. Position the machine on level ground.

2. Stop the engine.



Pump compartment

(1) Pressure tap (right pump delivery pressure)
(2) Pressure tap (left pump delivery pressure)
(3) Pressure tap (power shift pressure)

3. Connect a 6000 kPa (870 psi) pressure gauge to pressure tap (3).

4. Connect a 60000 kPa (8700 psi) pressure gauge to pressure tap (1). Use this pressure gauge to monitor the crossover relief valve pressure setting of the right travel motor.

5. Connect a 60000 kPa (8700 psi) pressure gauge to pressure tap (2). Use this pressure gauge to monitor the crossover relief valve pressure setting of the left travel motor.

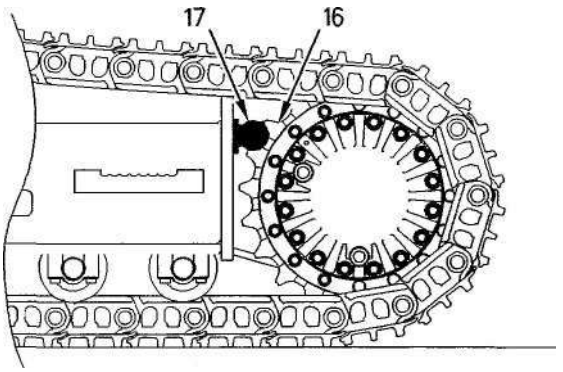


Illustration 25

Sprocket (left track)

(16) Sprocket
(17) FT-2547 Track block assembly

6. Place track block assembly (17) in sprocket (16) in order to block forward left travel. Refer to Illustration 25.

7. Start the engine.

8. Place the machine controls at the following settings: engine speed dial "10" and AEC switch OFF. Refer to Testing And Adjusting, "Engine Performance - Test" for engine rpm settings.

9. Increase the hydraulic oil temperature to 55° ± 5°C (131° ± 9°F).

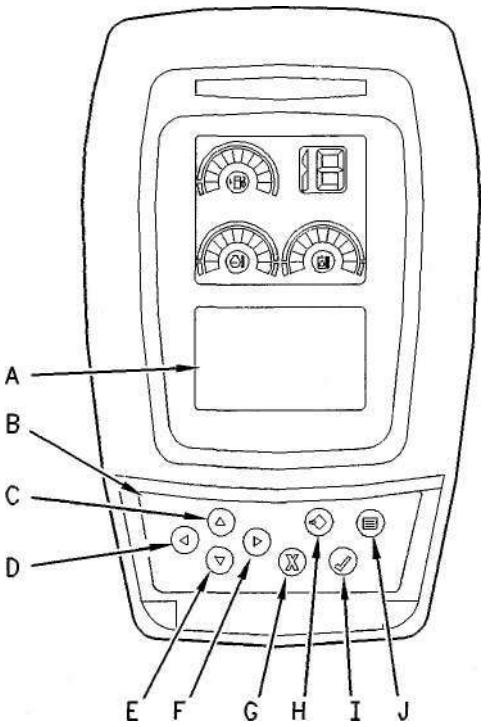


Illustration 26

Monitor

(A) Message display
(B) Keypad
(C) Up key
(D) Left key
(E) Down key
(F) Right key
(G) Cancel key
(H) Set key
(I) OK key
(J) Menu key

10. Start Service Mode and input a fixed power shift pressure of 2900 kPa (420 psi).

    a. Press menu key (J).

Note: If more than thirty seconds pass between pushing the keys on the keypad, the menu mode will be cancelled and the previous display will be restored to message display (A).

    b. Press down key (E) in order to highlight the menu item "SERVICE OPTIONS" on the message display. Press OK key (I).

c. Input the password "FFF2". Press left key (D) or right key (F) in order to change the position of the flashing character. Press up key (C) or press down key (E) in order to change the value of the flashing character. Press OK key (I) after the correct password is displayed.

d. Press down key (E) once in order to highlight the second line on the message display.

e. Press right key (F) repeatedly until "DEVICE TEST" appears on the message display.

f. Press down key (E) in order to move down one line on the message display.

g. Press right key (F) until the "PS PRV - FIXED" appears on the message display.

h. Press down key (E).

i. Press OK key (I). The display on line 4 of the message display will now change to a numeric value. These characters represent the power shift pressure (kPa).

j. Press left key (D) or right key (F) in order to increase or decrease the numeric value that is displayed on line 4 of the message display. Pressing left key (D) one time decreases the power shift pressure 10 kPa (1.5 psi). Pressing right key (F) one time increases the power shift pressure 10 kPa (1.5 psi).

Note: The value for power shift pressure on the monitor may not always match the pressure reading on the pressure gauge. Adjust the value on the monitor until the desired power shift pressure is attained on the pressure gauge that is connected to the pressure tap for power shift pressure. The actual power shift pressure must be 2900 kPa (420 psi) on the pressure gauge.

k. Press up key (C). "SUCCESS" should appear on the message display.

Note: To prevent a change in power shift pressure during the relief valve adjustment, do not turn the engine start switch to the OFF position.

Note: Refer to Service Manual, "Engine And Pump Electronic Control System' for additional information on Service Mode.

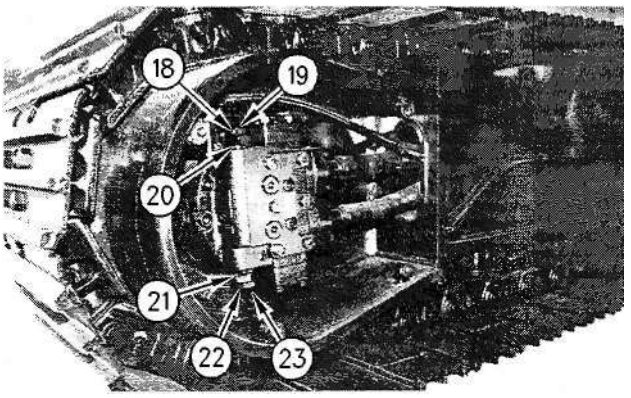


Illustration 27

Travel brake valve (left side)

(18) Locknut
(19) Adjustment screw
(20) Crossover relief valve (forward left travel)
(21) Crossover relief valve (reverse left travel)
(22) Locknut
(23) Adjustment screw

11. Slowly move the left travel control lever to full FORWARD position and check the pressure gauge reading at pressure tap (2). The pressure setting of crossover relief valve (20) should be 36800 ± 1470 kPa (5350 ±215 psi).

12. Return the left travel control lever to the NEUTRAL position.

13. In order to adjust crossover relief valve (20), loosen locknut (18) and turn adjustment screw (19) until the pressure gauge reading at pressure tap (2) is 36800 ± 1470 kPa (5350 ± 215 psi).

Note: Turning adjustment screw (19) clockwise increases the pressure. Turning adjustment screw (19) counterclockwise decreases the pressure.

Note: Always make final pressure adjustment on pressure rise.

14. Tighten locknut (18) to a torque of 130 ± 13 N-m (95 ± 10 lb ft).

Note: Always make final pressure adjustments on pressure rise.

15. Place track block assembly (17) in sprocket (16) in order to block reverse left travel.

16. Slowly move the left travel lever to full REVEF5SE position and check the pressure gauge reading at pressure tap (2). The pressure setting of crossover relief valve (21) should be 36800 ± 1470 kPa (5350 ±215 psi).

17.Re*um the left travel control lever to Hie NEUTRAL position.

18. In order to adjust crossover relief valve (21), loosen locknut (22) and turn adjustment screw (23) until the pressure gauge reading at pressure tap (2) is 36800 ± 1470 kPa (5350 ±215 psi).

Note: Turning adjustment screw (23) clockwise increases the pressure. Turning adjustment screw (23) counterclockwise decreases the pressure.

Note: Always make final pressure adjustment on pressure rise.

19. Tighten locknut (22) to a torque of 130 ± 13 N.m (95 ± 10 lb ft).

Note: Always make final pressure adjustments on pressure rise.

20. After relief valve adjustments, cancel Service Mode.

21. Return the main relief valve pressure to the specified setting after crossover relief valve pressure setting is attained.

In order to adjust the crossover relief valves on the right travel motor, place stopper (17) in the sprocket for right travel. Use the pressure gauge at pressure tap (1) in order to monitor the crossover relief valve pressure settings for the right travel motor. Adjust the crossover relief valves on the right travel motor in the same manner as the adjustment for the left travel motor.

Relief Valve (Line) - Test and Adjust

SMCS Code: 5117-025-L9; 5117-081-L9

Note: Adjustment procedures must be performed before a test and adjustment of any line relief valve pressure setting is attempted. A temporary setting of the main relief valve pressure is required before any line relief valve pressure setting is adjusted. Refer to the adjustment procedures in Testing And Adjusting, "Relief Valve (Main) - Test and Adjust".

Test

1. Position the machine on level ground.

2. Stop the engine.

3. Release the pressure in the hydraulic system. Refer to Testing and Adjusting, "Hydraulic System Pressure - Release".

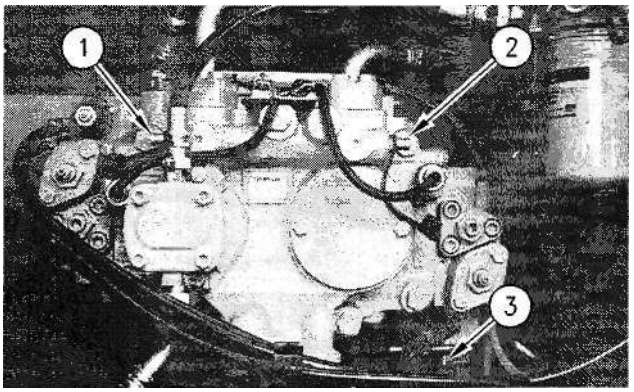


Illustration 28

Pump compartment

(1) Pressure tap (right pump delivery pressure)
(2) Pressure tap (left pump delivery pressure)
(3) Pressure tap (power shift pressure)

4. Connect a 60000 kPa (8700 psi) pressure gauge to pressure tap (1).

5. Connect a 60000 kPa (8700 psi) pressure gauge to pressure tap (2).

6. Connect a 6000 kPa (870 psi) pressure gauge to pressure tap (3). This is used to monitor power shift pressure.

7. Start the engine.

8. Place the machine controls at the following settings: engine speed dial 10 and AEC switch OFF. Refer to Testing and Adjusting, "Engine Performance - Test" for engine rpm settings.

9. Increase the hydraulic oil temperature to 55° ± 5°C (131° ± 9°F).

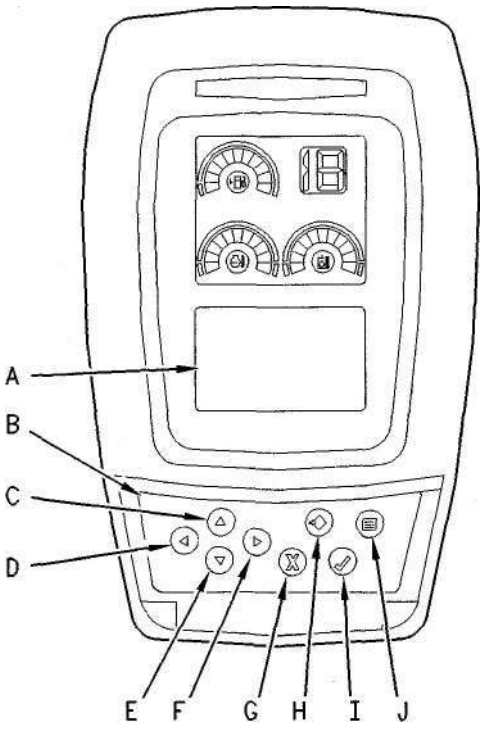


Illustration 29

Monitor

(A) Message display
(B) Keypad
(C) Up key
(D) Left key
(E) Down key
(F) Right key
(G) Cancel key
(H) Set key
(I) OK key
(J) Menu key

10. Start Service Mode and input a fixed power shift pressure of 2900 kPa (420 psi).

    a. Press menu key (J).

Note: If more than thirty seconds pass between pushing the keys on the keypad, the menu mode AIII be cancelled and the previous display will be restored to message display (A).

    b. Press down key (E) in order to highlight the menu item "SERVICE OPTIONS" on the message display. Press OK key (I).

    c. Input the password "FFF2". Press left key (D) or right key (F) in order to change the position of the flashing character. Press up key (C) or press down key (E) in order to change the value of the flashing character. Press OK key (I) after the correct password is displayed.

    d. Press down key (E) once in order to highlight the second line on the message display.

    e. Press right key (F) repeatedly until "DEVICE TEST" appears on the message display.

    f. Press down key (E) in order to move down one line on the message display.

    g. Press right key (F) until the "PS PRV - FIXED" appears on the message display.

    h. Press down key (E).

    i. Press OK key (I). The display on line 4 of the message display will now change to a numeric value. These characters represent the power shift pressure (kPa).

    j. Press left key (D) or right key (F) in order to increase or decrease the numeric value that is displayed on line 4 of the message display. Pressing left key (D) one time decreases the power shift pressure 10 kPa (1.5 psi). Pressing right key (F) one time increases the power shift pressure 10 kPa (1.5 psi).

Note: The value for power shift pressure on the monitor may not always match the pressure reading on the pressure gauge. Adjust the value on the monitor until the desired power shift pressure is attained on the pressure gauge that is connected to the pressure tap for power shift pressure. The actual power shift pressure must be 2900 kPa (420 psi) on the pressure gauge.

    k. Press up key (C). "SUCCESS" should appear on the message display.

Note: To prevent a change in power shift pressure during the relief valve adjustment, do not turn the engine start switch to the OFF position.

Note: Refer to Service Manual, "Engine And Pump Electronic Control System" for additional information on Service Mode.

11. The pressure setting for both the head end and the rod end for each cylinder is 36800 ± 1470 kPa (5350 ± 215 psi).

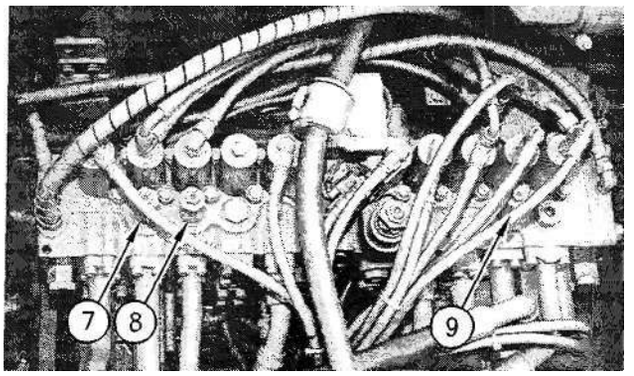


Illustration 30

Main control valves (front view)

(7) Line relief valve (boom cylinder rod end)
(8) Line relief valve (bucket cylinder head end)
(9) Line relief valve (stick cylinder head end)

The following line relief valves are located on top of the main control valves: boom cylinder rod end, bucket cylinder head end, and stick cylinder head end. The line relief valve for the bucket cylinder rod end is located under the main control valves and opposite the line relief valve for bucket cylinder head end (8).

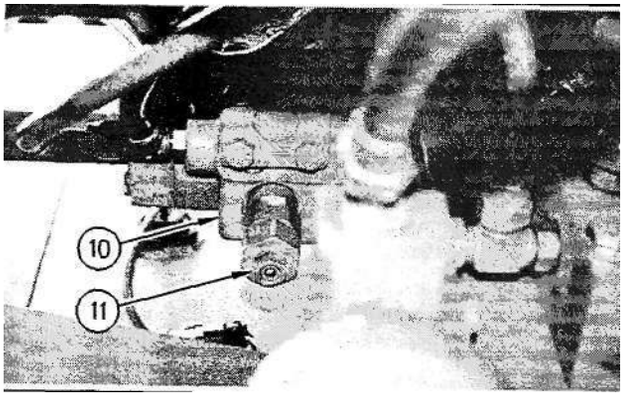


Illustration 31

Main control valve (bottom view)

(10) Boom drift reduction valve
(11) Line relief valve (boom cylinder head end)

The line relief valve (boom cylinder head end) (11) is located on boom drift reduction valve (10).

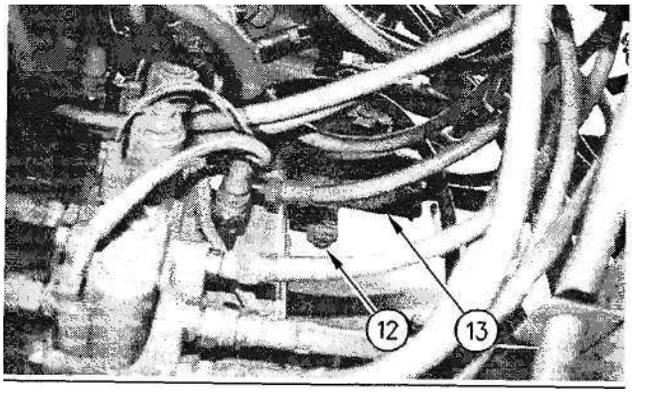


Illustration 32

Main control valve (bottom view)

(12) Line relief valve (stick cylinder rod end)
(13) Stick drift reduction valve

The line relief valve (stick cylinder head end) (12) is located on stick drift reduction valve (13).

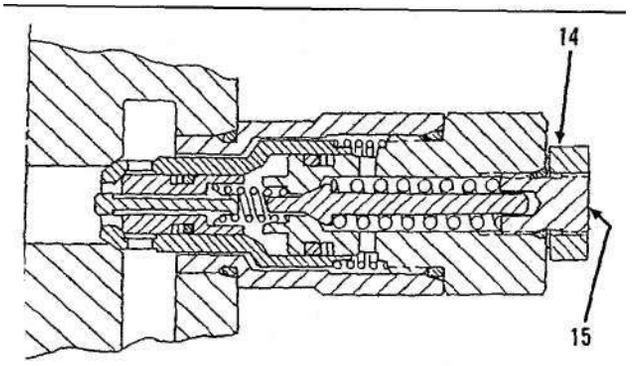


Illustration 33

Line relief valve (typical example)

(14) Locknut
(15) Adjustment screw

Note: After relief valve adjustments, cancel Service Mode.

Note: Return the main relief valve pressure to the specified setting after testing and adjusting any line relief valve. Refer to Testing And Adjusting, "Relief Valve (Main) - Test and Adjust" for the main relief valve pressure setting.

Adjustment (Stick Cylinder)

1. To adjust the line relief valve pressure setting of the stick cylinder rod end, move the joystick for the stick until the stick is at the full STICK OUT position (full retraction of stick cylinder). Hold the joystick for the stick in this position.

2. Check the pressure in the stick cylinder rod end on the pressure gauge at pressure tap (2).

3. Return the joystick for the stick to the NEUTRAL position.

4. Loosen locknut (14) on the stick line relief valve. Turn adjustment screw (15) until the pressure gauge reading at pressure tap (2) is 36800 ± 1470 kPa (5350 ±215 psi).

5. To adjust the line relief valve pressure setting of the stick cylinder head end, move the joystick for the stick until the stick is at the full STICK IN position (full extension of stick cylinder). Hold the joystick for the stick in this position.

6. Check the pressure in the stick cylinder head end on the pressure gauge at pressure tap (2).

7. Return the joystick for the stick to the NEUTRAL position.

8. Loosen locknut (14) on the stick line relief valve. Turn adjustment screw (15) until the pressure gauge reading at pressure tap (2) is 36800 ± 1470 kPa (5350 ± 215 psi).

9. After completion of line relief valve adjustment, tighten locknut (14).

Note: Turning adjustment screw (15) clockwise increases the pressure. Turning adjustment screw (15) counterclockwise decreases the pressure.

Note: Always make final pressure adjustment on pressure rise.

Adjustment (Bucket Cylinder)

1. To adjust the line relief valve pressure setting of the bucket cylinder head end, move the joystick for the bucket until the bucket is at the full BUCKET CLOSE position (full extension of bucket cylinder). Hold the joystick for the bucket in this position.

2. Check the pressure in the bucket cylinder head end on the pressure gauge at pressure tap (1).

3. Return the joystick for the bucket to the NEUTRAL position.

4. Loosen locknut (14) on the bucket line relief valve. Turn adjustment screw (15) until the pressure gauge reading at pressure tap (1) is 36800 ± 1470 kPa (5350 ±215 psi).

5. To adjust the line relief valve pressure setting of the bucket cylinder rod end, move the joystick for the bucket until the bucket is at the full BUCKET OPEN position (full retraction of bucket cylinder). Hold the joystick for the bucket in this position.

6. Check the pressure in the bucket cylinder rod end on the pressure gauge at pressure tap (1).

7. Return the joystick for the bucket to the NEUTRAL position.

8. Loosen locknut (14) on the bucket line relief valve. Turn adjustment screw (15) until the pressure gauge reading at pressure tap (1) is 36800 ± 1470 kPa (5350 ±215 psi).

9. After completion of line relief valve adjustment, tighten locknut (14).

Note: Turning adjustment screw (15) clockwise increases the pressure. Turning adjustment screw (15) counterclockwise decreases the pressure.

Note: Always make final pressure adjustment on pressure rise.

Adjustment (Boom Cylinders)

1. To adjust the line relief valve pressure setting of the boom cylinder head end, move the joystick for the boom until the boom is at the full BOOM RAISE position (full extension of boom cylinders). Hold the joystick for the boom in this position.

2. Check the pressure in the boom cylinder head end on the pressure gauge at pressure tap (1).

3. Return the joystick for the boom to the NEUTRAL position.

4. Loosen locknut (14) on the boom line relief valve. Turn adjustment screw (15) until the pressure gauge reading at pressure tap (1) is 36800 ± 1470 kPa (5350 ± 215 psi).

Note: In order to adjust the line relief valve pressure setting for the boom cylinder rod end, a temporary adjustment of the line relief valve for the bucket cylinder rod end must be performed.

5. Loosen locknut (14) on the line relief valve for the BUCKET OPEN function. Turn adjustment screw (15) by one half turn in a clockwise direction. Tighten locknut (14) on the line relief valve for the bucket cylinder.

6. Move the joystick for the bucket until the bucket is at the full BUCKET OPEN position (full retraction of the bucket cylinder). Hold the joystick for the bucket in this position. At the same time, move the joystick for the boom until the boom is at the full BOOM DOWN position (full retraction of boom cylinders). Hold the joystick for the boom in this position.

7. Check the pressure in the boom cylinder rod end on the pressure gauge at pressure tap (1).

8. Return the joystick for the boom to the NEUTRAL position.

9. Loosen locknut (14) on the boom line relief valve. Turn adjustment screw (15) until the pressure gauge reading at pressure tap (1) is 36800 ± 1470 kPa (5350 ±215 psi).

10. Tighten locknut (14) on the boom line relief valve.

Note: Turning adjustment screw (15) clockwise increases the pressure. Turning adjustment screw (15) counterclockwise decreases the pressure.

Note: Always make final pressure adjustment on pressure rise.

11. After completion of line relief valve adjustment for the boom cylinders, return the line relief valve pressure setting of the bucket to the specified pressure setting.

Note: If an appropriate location is not available to fully extend the boom cylinders, exchange the functions of the boom line relief valves. Remove the line relief valve for the boom cylinder head end and the line relief valve for the boom cylinder rod end from the main control valve. Exchange the location in the main relief valve of the line relief valves. Adjust the pressure of the boom line relief valve that is now attached in the head end. After completion of line relief valve adjustment, return the respective line relief valves to the original locations.

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Relief Valve (Swing) - Test and Adjust

SMCS Code: 5454-036

1. Position the machine on level ground.

2. Stop the engine.

3. Release the pressure in the hydraulic system. Refer to Testing And Adjusting, "Hydraulic System Pressure - Release".

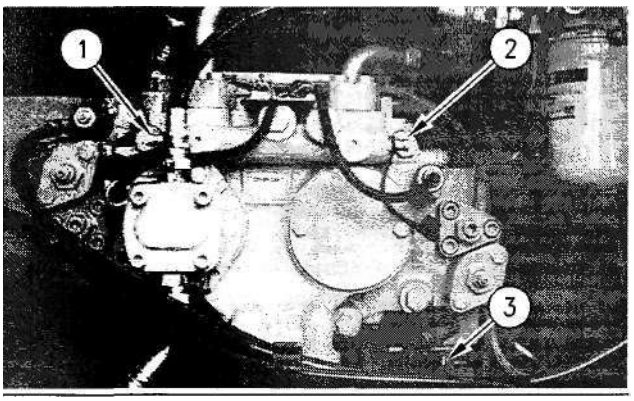

Illustration 34 900666193

Pump compartment

(1) Pressure tap (right pump delivery pressure)
(2) Pressure tap (left pump delivery pressure)
(3) Pressure tap (power shift pressure)

4. Connect a 60000 kPa (8700 psi) pressure gauge to pressure tap (2).

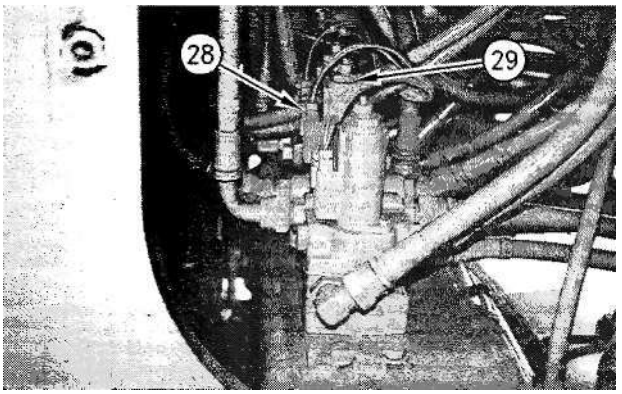

Illustration 35 900668854

Pilot oil manifold

(28) Connector
(29) Swing parking brake solenoid valve

5. Disconnect connector (28) from swing parking brake solenoid valve (29).

6. Start the engine.

7. Place the machine controls at the following settings: engine speed dial "10" and AEC switch OFF.

   Reference: Refer to Testing And Adjusting, "Engine Performance - Test" for engine rpm settings.

8. Move the swing joystick slowly and ensure that the swing parking brake is operating properly.

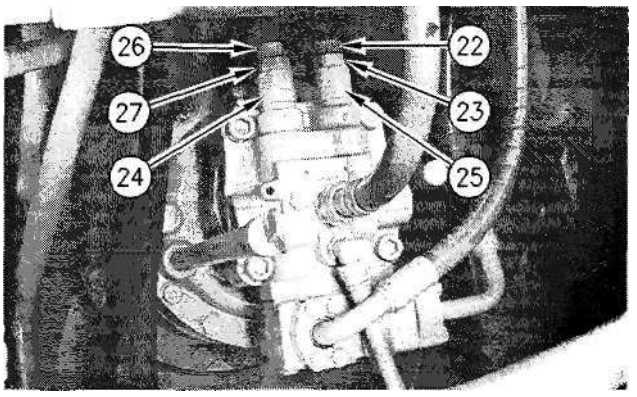

Illustration 36

Swing motor

(22) Adjustment plug
(23) Locknut
(24) Relief valve (left swing)
(25) Relief valve (right swing)
(26) Adjustment plug
(27) Locknut

9. Slowly move the swing joystick for a full SWING RIGHT operation and check the pressure for relief valve (25) at pressure tap (2).

10. Return the swing joystick to the NEUTRAL position.

11. The pressure setting of the swing relief valve is 26000 ± 980 kPa (3750 ± 140 psi). If the pressure reading at pressure tap (2) is not within the specification, adjust the swing relief valve.

12. In order to adjust the swing relief valve, loosen locknut (23). Turn adjustment plug (22) until the pressure gauge reading at pressure tap (2) is 26000 ± 980 kPa (3750 ± 140 psi).

Note: Turning adjustment plug (22) clockwise increases the pressure. Turning adjustment plug (22) counterclockwise decreases the pressure.

Note: Always make final pressure adjustments on pressure rise.

13. Tighten locknut (23) to a torque of 117 ± 10 N-m (85 ± 7 lb ft).

14. Slowly move the swing joystick for a full SWING LEFT operation and check the pressure for relief valve (24) at pressure tap (2).

15. Return the swing joystick to the NEUTRAL position.

16. The pressure setting of the swing relief valve is 26000 ± 980 kPa (3750 ± 140 psi). If the pressure reading at pressure tap (2) is not within the specification, adjust the swing relief valve.

17. In order to adjust the swing relief valve, loosen locknut (27). Turn adjustment plug (26) until the pressure gauge reading at pressure tap (2) is 26000 ± 980 kPa (3750 ± 140 psi).

Note: Turning adjustment plug (26) clockwise increases the pressure. Turning adjustment plug (26) counterclockwise decreases the pressure.

Note: Always make final pressure adjustments on pressure rise.

18. Tighten locknut (27) to a torque of 117 ± 10 N-m (85 ± 7 lb ft).

19. After completing the test and/or the adjustment procedures for the swing relief valves, stop the engine.

20. Release the pressure in the hydraulic system. Refer to Testing And Adjusting, "Hydraulic System Pressure - Release".

21. Connect connector (28) to the solenoid valve for swing parking brake (29).

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Solenoid Valve (Swing Parking Brake) - Test

SMCS Code: 5483-081-OD

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

1. Position the machine on level ground.

2. Stop the engine.

3. Release the pressure in the hydraulic system. Refer to Testing and Adjusting, "Hydraulic System Pressure - Release".

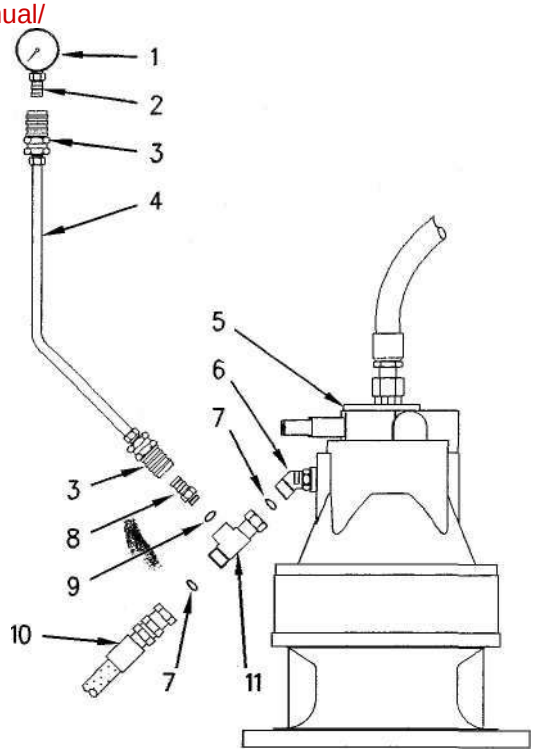

Illustration 37

(1) 8T-0856 Pressure Gauge
(2) 6V-3989 Fitting
(3) 6V-4143 Coupler
(4) 177-7860 Hose Assembly
(5) Swing motor
(6) Connector at rear of swing motor
(7)6V-8397 0-RingSeal
(8) 6V-3965 Fitting Assembly
(9) 3J -1907 O-Fting Seal
(10) Pilot hose
(11) 8T-8902 Tee

4. Disconnect pilot hose (10) from connector (6) at the rear of swing motor (5).

5. Install seal (7) and tee (11) to connector (6).

6. Install seal (7) and pilot hose (10) to tee (11).

7. Install seal (9) and fitting (8) to tee (11).

8. Assemble and install the test hose and gauge to fitting (8).

9. Start the engine.

10. Place the machine controls at the following settings : engine speed dial "10" and AEC switch OFF. Refer to Testing and Adjusting, "Engine Performance - Test" for engine rpm settings.

11. Increase the hydraulic oil temperature to 55° ± 5°C (131° ± 9°F).

12. Place the hydraulic activation control lever in the UNLOCKED position.

13. Check the pressure gauge reading at pressure gauge (1). When all of the joysticks are in the NEUTRAL position, the swing parking brake solenoid valve is not energized and the swing parking brake is engaged. The pressure gauge reading should be 0.0 kPa (0.0 psi).

14. Slowly move the swing joystick away from the NEUTRAL position and check the pressure on pressure gauge (1). The swing parking brake solenoid valve should now be energized and the swing parking brake should be released. The pressure gauge reading should be equal to the pilot system pressure.

Control Valve (Boom Lowering) - Test and Adjust

SMCS Code: 5147-025-BM; 5147-081-BM

Two preliminary temporary adjustment procedures must be performed:

1. A temporary setting of the main relief valve pressure is required.

2. A temporary line relief setting of the head end of the boom cylinder is required.

Four relief valves are involved in this procedure:

- main relief valve
- head end of the boom line relief valve
- boom lowering control valve of the right cylinder
- boom lowering control valve of the left cylinder

Note: A New specification is the performance that can be expected for a new machine. A Rebuild specification is the performance that can be expected after rebuilding the components of a system. Performance beyond Service Limit specifications is an indication of these problems: improper adjustment, wear, damage of relief valves, and damage of pumps.