OPERATOR'S MANUAL

865
TIER 3
AWD
GRADER

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87729375 NA

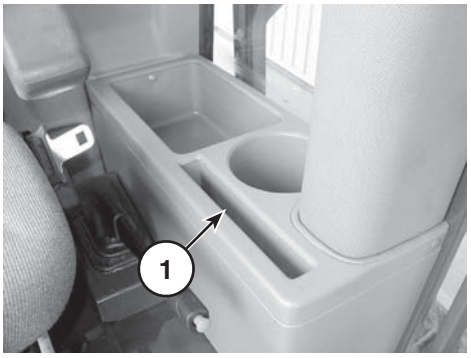
OPERATOR MANUAL STORAGE COMPARTMENT

READ THIS MANUAL COMPLETELY and make sure you understand the controls. All equipment has a limit.

Make sure you understand the speed, brakes, steering, stability and other characteristics of this machine before you start to operate.

DO NOT remove this manual or the safety manual from the machine. See your dealer for additional manuals.

Also see the manual information on the inside of the rear cover of this manual.



1. OPERATORS MANUAL STORAGE COMPARTMENT

⚠ MACHINE OPERATION ⚠

- Check all controls in a clear area and make sure the machine is operating correctly.
- Do not allow other persons to ride on the machine. Other persons can fall or can cause an accident. This is a one person machine with one operator's seat.
- Dust, fog, smoke, etc., can decrease your vision and cause an accident. Stop the machine or decrease the speed until you can see everything around you in the work area. Make sure the machine lamps are ON.
- Contact with high voltage power lines, underground cables, etc., can cause serious injury or death from electrocution.
- Before you drive or operate in an area with high voltage lines, cables, or a power station, tell the power or utility company what you are going to do. You **MUST HAVE THE POWER DISCONNECTED OR KEEP A SAFE WORKING DISTANCE** from the lines, cables, or power station. Keep all parts of the machine at least 5 m (15 feet) away from the power source. You must also know any federal, state/provincial, or local safety codes or regulations that apply to the job site.
- If a part of the machine touches high voltage power:
- Warn other workers **NOT TO TOUCH THE MACHINE** and to stay away from the machine.
- If you can break contact, reverse the operation that caused contact with the high voltage power, and move the machine away from the danger area. If you cannot break contact, stay in the machine until the utility company de-energizes the line and tells you that the power is off.
- If you have extreme conditions, such as a fire, etc., and you are forced to leave the machine, do not step off the machine. Jump as far from the machine as possible with your feet together and do not touch the ground with your hands.
- Then, hop away with your feet together until you are a safe distance from the machine and the electrical current. Do not take large steps. Because of the voltage differential across the ground, one foot can be in a higher voltage area than the other foot. This difference can kill you.
- Do not operate the machine if you do not feel well. This can be dangerous for you and for the people around you.
- You must make a judgment if weather, road, or earth conditions will permit safe operation on a hill, ramp, or rough ground.
- Stay away from hazardous areas such as ditches, overhangs, etc. Walk around the work area before you start and look for hazards.
- Be alert and always know the location of all workers in your area. Keep all other persons completely away from your machine. Injury or death can result if you do not follow these instructions.
- Operate the machine within the specified capacities and limits. See Specifications section of this manual.
- Operate the machine controls from the operators seat only.
- Digging through underground cables, pipes, lines, etc., can cause injury or death. Learn the location of all underground hazards before you operate your machine in any area.
- When working in areas where traffic is heavy always have a person direct the traffic and direct other persons for you. Have guard rails, warning signs, etc., as required for your job.
- Stop operating the machine if a malfunction occurs. Watch the indicator and warning lamps in the machine. Listen and smell for things that are not normal on your machine.
- Drive around large objects such as large rocks or trees.

Starting

Do not run engine in closed areas without proper ventilation systems for the exhaust gases.

Never expose your head, body, feet, hands and fingers close to rotating fans or belts.

Engine

Turn radiator cap slowly to relieve system pressure, prior to removing the cap. If any coolant is needed, add only to a cold or slow running engine.

Do not refuel machine with the engine running, particularly if it is too hot, so as to prevent fire.

Never attempt to check or adjust belt tensions with the engine running.

Avoid running the engine with air intakes open without the protective guards.

If for any technical reasons, this is not possible, fit proper protections over these openings prior to servicing or operation.

Electrical System

If you have to jump start, remember cable ends must be connected as follows: (+) to (+) and (-) to (-). Avoid short-circuits. Follow carefully the instructions in this Manual. Prior to any servicing of the electrical system, ensure that the battery master switch is disconnected.

The fumes released by the battery are highly flammable. While recharging, leave batteries uncovered for better ventilation. Never check battery charge by short-circuiting the battery terminals. Do not smoke near batteries to prevent explosions.

Prior to carrying out any servicing, check for fuel or battery electrolyte leaks. Eliminate these leaks prior to proceeding with the work.

Do not charge batteries in closed areas. Check for proper ventilation to prevent possible inadvertent explosion caused by fumes buildup from the charging operation.

Hydraulic System

Fluid gushing from a hole can be invisible to the eye but have sufficient force to penetrate the skin causing serious injuries. Under these circumstances, if you have to locate leaks, use a piece of cardboard or wood.

Never use your bare hands: if the fluid penetrates your skin, see a doctor immediately. Lack of quick medical attention may lead to serious complications and skin disease.

Relieve internal system pressure prior to removing any caps, plugs, etc. (See applicable instructions).

When checking system pressures, use appropriate measuring instruments.

Implements

Keep your head, body, feet and hands away from the raised implements. Use supports provided as a safety measure, prior to proceeding to servicing and repair operations. Use proper safety elements.

If you must operate an attachment using the hydraulic machine control system, remember that this operation must be carried out only from the operator's seat position. The operator is responsible for any non-authorized persons allowed into the cab.

Ensure no other persons are within the machine's radius of operation.

Give warnings using the horn or using your own voice. Lift the attachment slowly.

Do not use the machine for transporting loose objects, unless suitable means are provided for this purpose.

When leaving the operator's cab, lower the attachment to the ground.

Prior to carrying out any servicing or repair operation with raised attachments, these must be supported on stable supports.

It is recommended that you carry a FIRST AID kit in the machine.

HAND SIGNALS

It is recommended that you and the flagman on the job use hand signals for communications. Before you start, make sure that you both understand the signals that will be used.

START ENGINE

STOP ENGINE

COME TO ME

Move hands forward and rearward (palms in)

ALL STOP AND HOLD

Move hands forward and rearward (palms out).

L. WARNING FLASHER

This indicator flashes when the button located on the right console is pressed in.

M. RIGHT TURN SIGNAL

N. HIGH BEAM

O. LEFT TURN SIGNAL

P. SECONDARY STEERING LIGHT (OPTIONAL)

Whenever the emergency steering pump is activated the light indicator turns on.

Machines equipped with this system must be checked every day, before starting the operation.

The test is performed with the ignition switch in "IGN" position, turning the steering wheel slightly. The booster pump, driven by an electric motor, acts on the steering system and the "P" indicator on the panel turns on.

To complete the test, the engine must be started and the emergency steering system will automatically be cancelled.

CAUTION: *The emergency steering system test must be brief, since the drive motor consumes too much electric current and may discharge the batteries.*

4. DIFFERENTIAL LOCK SWITCH OPTIONAL

This switch is used to lock or unlock the differential when it is necessary. Use the differential lock switch only in straight line operation. To steer or articulate the machine the operator must turn off the differential lock switch.

IMPORTANT: *Do not turn off the differential lock system when the grader is operating.*

5. GEAR AND ERROR CODE DISPLAY

This display shows the actual neutral, forward or reverse transmission gear selected.

When an error occurs the display will flash an error code indicating that a problem has been detected in the system.

When the ignition key is first turned on, the display will show three sets of double letters (TD DC ER) at the top and three 8's. The first 8 will have a diagonal line through it. This is a system light check.

If the key is left in this position without starting the engine, the display will next flash ER100 few times. This designates the revision version of the transmission's computer software.

There is also an error code ER100 but this error code only appears during recalibration.

The revision code may change. The next code will be ER101, ER102, etc.

6. STEERING WHEEL TILT LEVER

Loosen the lever and adjust the steering wheel position to obtain more comfortable operating position. Tighten lever again to assure the steering wheel does not move.

7. HOURMETER

The hourmeter indicates operating hours with the engine off and key switch in the RUN position.

8. "INCHING" PEDAL

The "inching control pedal" is helpful under the following conditions:

- When starting or stopping
- For grader finishing work requiring "creeper gear" or very slow speeds
- For very slow ground speed work to increase engine speed for hydraulic performance (this should rarely be necessary because of the wide range performance of the hydraulic system).

CAUTION: *Do not abruptly depress and release inching pedal to start a heavy load or free a stuck machine.*

OPERATORS SEAT

GROUP 4

Standard Seat

1. LUMBAR ADJUSTMENT KNOB

Turn the knob clockwise to increase the lumbar support, turn the knob counterclockwise to decrease the lumbar support.

2. ARMREST HEIGHT CONTROL ADJUSTMENT

Turn the knob to raise or lower the armrest to the desired position.

NOTE: *Each armrest will pivot to the up position.*

3. RECLINER ADJUSTMENT HANDLE

Lift up on the handle, move the backrest to the desired position, release the handle to lock the backrest in position.

4. SLIDE ADJUSTMENT LEVER

Pull this lever up and adjust the seat forward or rearward as required. Release the lever to lock the seat in position.

5. WEIGHT ADJUSTMENT KNOB

To adjust the seat for your weight you must pull the release lever out of the knob, Use the release lever to turn the knob clockwise to increase the weight resistance. Turn the knob counterclockwise to decrease the weight resistance.

6. HEIGHT ADJUSTMENT, STANDARD SEAT

Lift the seat all the way up, drop the seat to the lowest position. Lift the seat to the desired position. The seat will lock into accepted positions.

FIRST SERVICE INTERVALS

The following items are to be done during the Run-In Period and are in addition to the items in the Lubrications/Maintenance Charts in this manual.

AFTER FIRST 100 HOURS OF OPERATION

Change the rear axle differential and planetary oil when the axles are new or repaired ..... See Rear Axle in this manual

Change the transmission oil and filter when the transmission is new or repaired .....See Transmission Specifications in this manual

Replace the front wheel final drives oil (AWD) ..... See "Front Drive Axle" in this manual

Check all hose clamps, tighten as required.

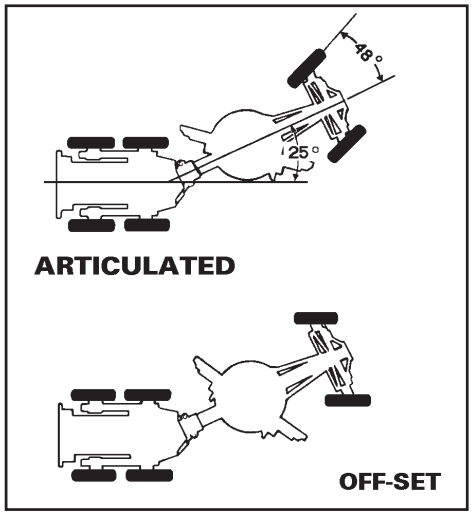
SEAT BELT

Always securely fasten your seat belt before operating the machine. From time to time, carefully inspect the seat belts for worn areas and replace belts when needed.

WARNING: *Securely fasten your seat belt. Your machine is equipped with a ROPS cab or canopy for your protection. The seat belt can help insure your safety if it is used correctly and maintained. Never wear a seat belt loosely or with slack in the belt system. Never wear the seat belt in a twisted condition.*

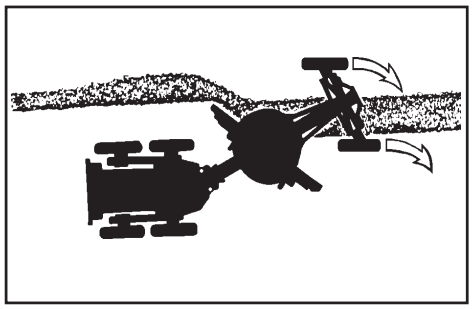
OPERATING TIPS

Articulated motor graders can be operated with the frame ARTICULATED OR OFF SET (CRAB).



NON ARTICULATED frame is normally used for grading large areas and for road maintenance and conservation.

With the frame ARTICULATED, the turning radius is reduced, making machine control easier in restricted areas. In addition, a more precise control of material spreading is permitted.



The OFFSET position permits the operator to maintain the machine on firm ground when working in ditches, and reduce the number of passes necessary to spread material. This permits a better weight concentration, behind the blade in severe operation conditions.

Although the grader permits the circle turn 360°, most of the grading operations are done with the blade between 15° and 45° in relation to the work direction.

Increasing the angle of the blade reduces the side movement of the material cut by the blade. However this permits deeper cuts and more “severe” grading.

The change of the attack angle, blade pitch is also very important for productivity.

The blade with the involute “ROLL-AWAY” profile maintains the capacity to roll material, with the top of the blade inclined to the rear.

Changing blade angle while cutting, generates side forces on the machine. These forces should be compensated by leaning the front wheels and/or articulating the frame in the direction of the blade cutting forces.

1. LEANED FRONT WHEELS
2. ARTICULATED CHASSIS

Always use an inflation cage, safety cables or chains when removing tire lock rings or inflating tires. Always deflate tires before removing lock rings or objects from tread, according to local or national requirements.

Never begin to inflate a tapered bead tire unless bead seat band is securely in place over the lock ring.

Improper inflation is a large contributor to tire failures. Under inflation will cause damage to the cord body of the tire. The repeated excessive flexing of the sidewall area may eventually cause a series of breaks and separation in the cord fabric.

Over inflation must also be avoided. For maximum flotation in very soft footing, inflation may be decreased.

If 24 hour operation does not permit checking inflation pressure on completely cooled tires, a correction factor can be determined by experiment.

Check as many times as possible when “cold” and again after two hours of operation. The average difference must be added to the recommended pressure when checking the tires during constant operation.

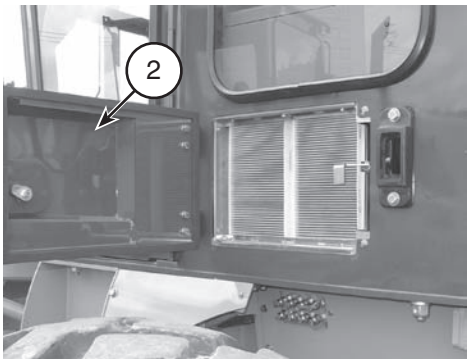
Continuous operation of equipment builds up heat and accompanying higher pressure in the tire. These normal increases are allowed for in the design of the tires.

WARNING: *Travel pressures are recommended to optimize the performance of the machine during long transfer trips on open roads with no load. Before putting the machine back to work, it is imperative to reinflate the tires to working pressure to avoid damaging the tire sidewalls.*

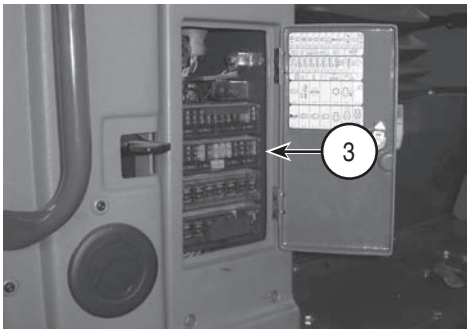
NOTE: *Never exceed the maximum pressure stamped onto tire sidewalls.*

ACCESS DOORS

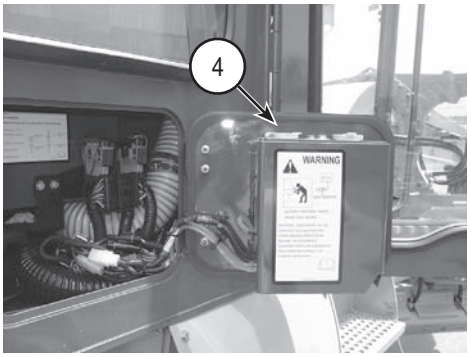
1. ENGINE ACCESS HOOD



2. CAB FILTER ACCESS DOOR



3. FUSE BOX



4. WINDSHIELD WASHER RESERVOIR AND COME-HOME CONECTORS

Engine Service Specifications

Oil Level check interval ..... Every 10 hours of operation or each day, whichever occurs first

Oil Change interval ..... Every 500 hours of operation

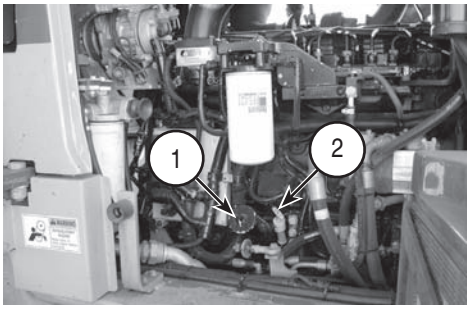
Oil filter change interval ..... Every 500 hours of operation if used CG-4 engine oil or once a year whichever occurs first

Oil type ..... See Fluids and Lubricants

Oil Capacity - with filter change ..... 18.5 liters (4.7 U.S. Gallons)

Engine Oil Level

To check the engine oil level put the machine on a level surface and stop the engine. Remove engine oil dipstick and wipe clean with a cloth. Replace dipstick in tube and push the engine oil dipstick completely DOWN and then remove. If the oil level is below the ADD mark, add oil to raise the oil level to the FULL mark.

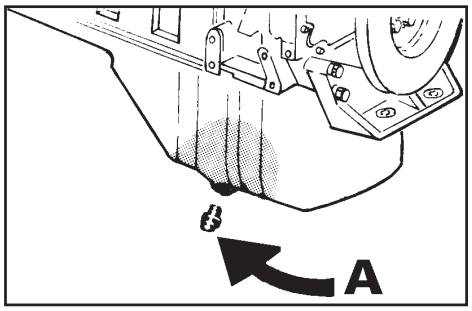


1. ENGINE OIL FILLER
2. ENGINE OIL LEVEL DIPSTICK

Engine Oil Change and Filter Replacement

Make sure engine is at operating temperature. Shut-off the engine. Remove the drain plug (A) located on the lower right side of the engine crankcase and allow all the oil to drain.

Make sure the seal is in good condition and install the drain plug.

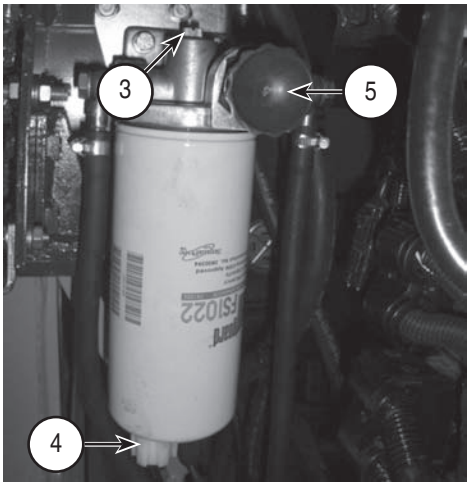


Remove the oil filter. Carefully clean the gasket seat on the filter.

NOTE: *The filter's sealing gasket normally stays attached to the filter gasket seat.*

Fuel System Air Bleed

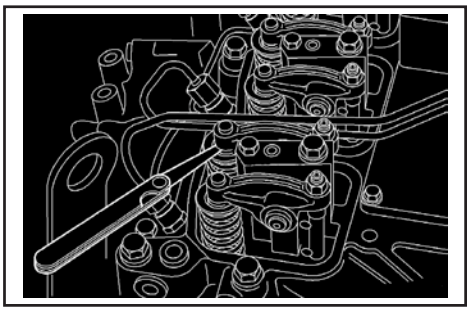
1. Clean the area around the water separator filter head to avoid contamination.
2. Completely loose the aluminum bleeder screw (3) located on the filter head, with a screw driver.
3. Be sure that the water drain bolt (4) on the lower part of the filter is completely tight.
4. Manually loose 3 to 4 turns the filter pumping knob (5).
5. Prime the knob until the Diesel fuel comes out through the bleeder screw (3) hole without the presence of bobbles.
6. Manually tight the knob (5) and the bleeding bolt (3).



3. BLEEDER SCREW
4. DRAIN BOLT
5. PUMPING KNOB

Valve Clearance Adjustment

EACH 1000 HOURS



Always adjust the valve clearance with engine cold, that is, with engine coolant temperature below 140ºF (60°C). First determine the top dead center (TDC) on engine nº 1 cylinder. To perform so, rotate the crankshaft slowly, using the adapter and gear of the manual rotating tool. Install the synchronizing pin and adjust the following valves: 1A, 1E, 2A, 3E, 4A, 5E. Remove the synchronizing pin, rotate the crankshaft 360° and install again the synchronizing pin. Perform the adjustment of the following valves: 2E, 3A, 4E, 5A, 6A, 6E. Clearance of valves must meet the specifications of table below:

Valves	min.	max.	rated
Intake	0,152 mm	0,381 mm	0,254 mm
Exhaust	0,381 mm	0,762 mm	0,508 mm

NOTES: *Clearance will be correct if a slight effort is felt when the feeler gauge is introduced between the valve stem and the rocker arm. Tighten the lock nut to 24Nm (212 lb.in) torque.*

SWING/CIRCLE TURN GEAR BOX

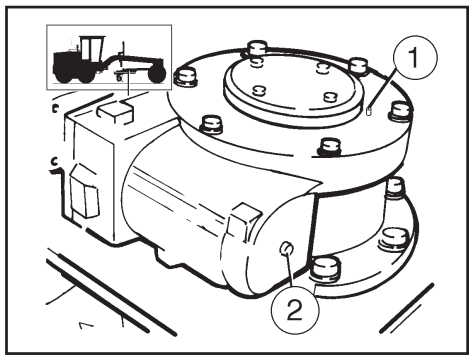
Service Specifications

Circle Turn Gear Housing Refill Capacity ..... 2.8 liters (0.75 U.S. Gallons)
Type of oil ..... See Fluids and Lubricants
Oil check interval ..... each 250 hours
Oil change interval ..... 1000 hours

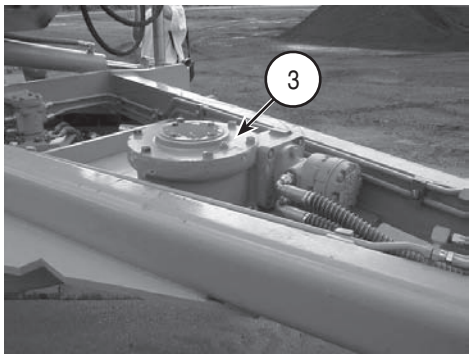
Checking Circle Turn Gear Box Oil

EACH 250 HOURS

Remove oil level plug. If the oil does not drain from the hole, remove the filler plug and add oil until it comes out of the level plug hole. Then install level plug and filler plug.



1. FILLER PLUG
2. LEVEL PLUG

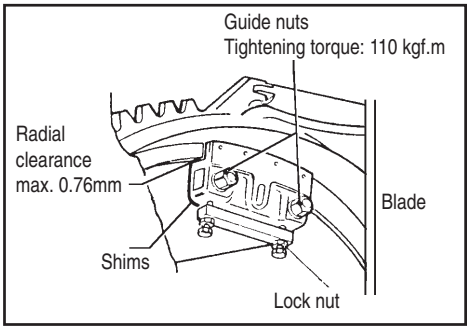


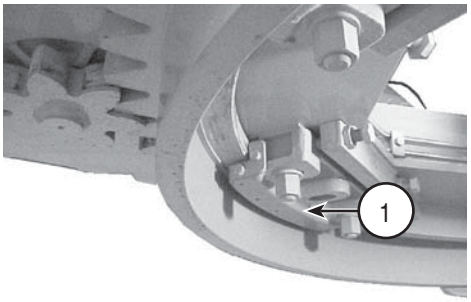
3. CIRCLE TURN GEAR BOX

NOTE: *See Circle Guides Check and Adjustments.*

CIRCLE GUIDES CHECK AND ADJUST

The circle and circle guides must be kept clean to prevent caking. If the circle guides are excessively loose, the gear teeth will wear, causing the circle turn to function erratically.





1. CIRCLE GUIDES

Wear Plate Adjustment

Proceed as follows:

The first adjustment is to eliminate play between the upper wear plates and the upper circle guides (vertical clearance).

To make this adjustment, shims between wear plates and the upper circle surface must be removed.

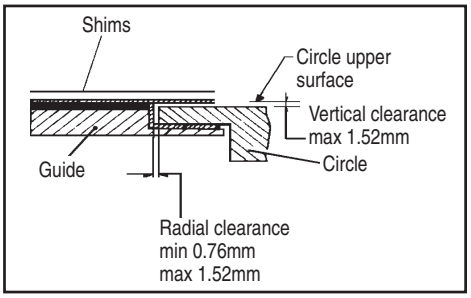
NOTE: *Do not throwaway the shims that were removed. They can be used again in other new adjustment.*

Make sure that the maximum clearance does not exceed 1.52 mm. This adjustment must be completed on each of the four (4) guides, one at a time, beginning with one closest to the circle turn motor pinion gear.

After vertical adjustment rotate the circle 360° to be sure that the circle turns freely.

Next, adjust the clearance between the wear plates and the inner circle guides (radial clearance), proceeding as follows:

CIRCLE TURN CLEARANCES

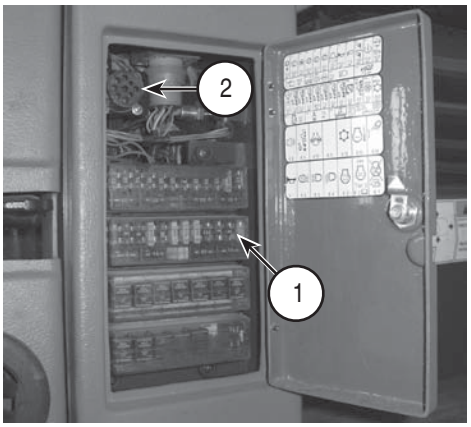


With the vertical clearance already adjusted, loosen the circle guide nuts and the jam nuts of radial clearance adjusting screws.

Position the circle turn motor pinion in such a way that the tooth engagement is as shown below. Make sure that the center of the circle turn motor pinion, center line of the engaged tooth and the front guide center locknut are aligned.

FUSE BOX

Fuse Box and Front Wheel Drive Diagnosis Conector



1. FUSE BOX
2. FRONT WHEEL DRIVE CONECTOR

The fuse box is located inside the right console. To access the fuses for replacement or service of fuse box, open the front cover of the console.

Fuse and Relay List

Fuse Box 1

F1	15 amp	To flasher relay, turn signal beacon, cab dome lights
F2	15 amp	To current plug
F3	15 amp	To work light after (opt) and before (std) moldboard
F4	7.5 amp	To head lights (low beam)
F5	15 amp	To horn
F6	3 amp	To E.D.M. (Electronic Data Panel) and buzzer
F7	10 amp	To Funk transmission system
F8	10 amp	To Funk transmission system
F9	10 amp	To Funk transmission system
F10	7.5 amp	To cab fans (opt)
F11	10 amp	To front wiper and washer pump
F12	15 amp	To hydraulic solenoid valves saddle lock pin and float control (opt)
F13	7.5 amp	To rear flood lights
F14	7.5 amp	To high beam
F15	10 amp	To brake light, back-up alarm (opt) and differential lock (opt)
F16	10 amp	To rear wiper and washer pump

Fuse Box 2

F17	20 amp	To air conditioner system (opt)
F18	3 amp	To reverse fan solenoid valve (opt)
F19	3 amp	To reverse signal on the gear selector
F20	3 amp	To air conditioner system mode door (opt)
F21	5 amp	To front wheel drive system
F22	5 amp	To front wheel drive system
F23	3 amp	To front wheel drive system
F24	5 amp	To front wheel drive system
F25	3 amp	To front wheel drive system
F26	3 amp	To front wheel drive system
F27	3 amp	To front wheel drive system
F28	15 amp	To front lower wipers/washers/ and air suspension seat (opt)
F29	15 amp	To front blade board and cab head light (opt)
F30	10 amp	To radio and cigarette lighter
F31	7.5 amp	To alternator regulator and hability relay
F32	5 amp	To electrical engine shut-off

Relays

K1	Hability Relay
K2	Dual Power (Tier 3) Relay
K3	Auxiliary starting relay
K4	Low beam relay
K5	High beam relay
K6	Rear flood lights and rear work lights relay
K7	Horn relay
K8	Back-up alarm relay (opt)
K9	Front wheel drive system relay
K10	Differential lock relay (opt)
K11	Not used
K12	Magnetic clutch/compressor relay air conditioner system (opt)
K13	On-off fan drive relay (opt)
K14	Work light before moldboard relay (opt)

Fault Code	Lamp Color	Cummins Description
2367	Amber	Engine Brake Actuator Circuit #2 - Voltage Above Normal, or Shorted to High Source
2377	Amber	Fan Control Circuit - Voltage Above Normal, or Shorted to High Source
2384	Amber	VGT Actuator Driver Circuit - Voltage Below Normal, or Shorted to Low Source
2385	Amber	VGT Actuator Driver Circuit - Voltage Above Normal, or Shorted to High Source
2555	Amber	Intake Air Heater #1 Circuit - Voltage Above Normal, or Shorted to High Source
2556	Amber	Intake Air Heater #1 Circuit - Voltage Below Normal, or Shorted to Low Source
2557	Amber	Auxiliary PWM Driver #1 - Voltage Above Normal, or Shorted to High Source
2558	Amber	Auxiliary PWM Driver #1 - Voltage Below Normal, or Shorted to Low Source
2963	—	Engine Coolant Temperature High - Data Valid but Above Normal Operational Range - Least Severe Level
2964	—	Intake Manifold Temperature High - Data Valid but Above Normal Operational Range - Least Severe Level
2973	Amber	Intake Manifold Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect

Hydraulic System

Full hydraulic control, supplied by a “Load Sensing” type gear pump. Closed center circuits. Blade raise cylinders mounted over the saddle. Saddle lock system by a hydraulic cylinder controlled by a solenoid valve activated by a switch located on the side console. Relief and check valves for all controls.

Implement pump ..... 49 gpm (186 l/min) and 2600 psi (179 bar)

Steering & brake pump

Brake and steering section ..... 11.1 gpm (41.8 l/min) @ 2200 engine rpm
Rear axle diff. lock section (optional) ..... 2.3 gpm (8.8 l/min) @ 2200 engine rpm

All Wheel Drive Hydraulic System

Closed circuit hydraulic system, fed by a variable volume piston pump, and drive by variable volume radial piston hydraulic motors, flow divider valve and half volume valve. An electronic control system, integrated to the transmission controls the pump and motors volumes in order to synchronize the front and rear wheels speed.

Hydraulic pump ..... 54,8 cm^3/rev
Maximum flow ..... 143,5 l/min (37,9 gpm) @ 2200 rpm
Maximum pressure ..... 420 bar
Accumulator volume ..... 0,7 liter
Filter ..... 10 microns
Hydraulic Motors ..... 75,9 cm^3/rev
Wheel reducer ..... Carraro O&K
Reduction ratio 17,196:1