

P/N 77143
#C - 12/2006

AH2000 & AH3000

Rotavator Service Notes

Servicing Recommendations

- These servicing recommendations are minimum requirements.
- Experience indicates that some operating conditions require additional and/or more frequent inspections.
- DAILY and WEEKLY SERVICE SCHEDULES are detailed as to the checks required but typically documented records of such checks would not be expected.
- 250 HR / YEARLY and 500 HR / BI-YEARLY SERVICE SCHEDULES have been detailed in a checklist format. These should be photocopied, completed and retained as a record of the machines maintenance history.
- For recommended grease and oil lubricants refer to Service Bulletins 32 and 40.
- Comments and requests for changes are appreciated.
- These forms (MS Word format) can be emailed or posted for your modification if required.
- Please contact Howard Australia if required:
 - Phone (02) 9674 2133
 - Fax (02) 9674 6263
 - Email Engineering@howard-australia.com
 - Post Private Bag 5, Post Office, SEVEN HILLS NSW 1730.

AH2000, AH3000 - DAILY SERVICE SCHEDULE

Universal Drive Shaft

Universal crosses - check for movement/wear.

Grease - While warm / after use. [Check all caps receive grease]

Refer to Service Bulletin 32 for recommended greases.

Clutch

Check for worn plates.

Primary Gearbox

Check oil level.

Side Drive

Check for oil leaks from rotor drive seals.

Check oil levels.

Rotor

Check for / replace broken, bent or excessively worn blades.

General

Overall check of fasteners, hitch pins, adjusting pins.

AH2000, AH3000 - WEEKLY / 50 HR SERVICE SCHEDULE

Universal Drive Shaft

Universal crosses - check for movement/wear.

Grease - While warm / after use. [Check all caps receive grease]

Sliding members - clean, check for wear, regrease.

Refer to Service Bulletin 32 for recommended greases.

Universal drive shaft guarding and safety decal.

Clutch

Check / reset clutch.

Check for worn plates.

Primary Gearbox

Check oil level.

Remove, clean and wash oil filter. Check for debris.

Remove and clean air filter.

Side Drive

Check for oil leaks from rotor drive seals.

Remove air filters and clean:

Check oil level.

Check wear on side drive protection skid.

Rotor

Check for / replace broken, bent or excessively worn blades.

General

Overall check of fasteners, hitch pins, adjusting pins.

Safety guarding and decals are in place and functional.

AH2000, AH3000 - 250 HR / YEARLY SERVICE SCHEDULE (& 1st 50 HRS)

Estimated actual hours worked _____ Service Date: _____

Universal Drive Shaft

- Universal crosses - check for movement / wear (replace if worn).
- Grease - While warm / after use. [Check that all caps receive grease]
- Sliding members - clean, check for wear (replace if worn), regrease.
- Refer to Service Bulletin 32 for recommended greases.
- PTO yoke - check lock pins for wear and function, lubricate with oil.
- (Lock pin damage can be caused by dirt or shaft members not sliding freely.)
- Universal drive shaft guarding and safety decal.

Clutch

- Remove clutch assembly, dismantle and check for worn plates.
- Check input shaft for twists or cracks.
- Check input shaft seal for leaks.
- Reassemble clutch to machine. Re-set clutch adjustment just prior to work – especially in tropics.

Primary Gearbox

- Clean oil circuit strainer & filter. Check for debris.
- Remove air filter and clean.
- Remove gearbox cover / selector plus rear cover and examine inside gearbox. Check:
 - Gears - markings indicate correct mesh and no pitting is evident.
 - Shafts - for excessive bearing endfloat, indicating wear or damage.
 - Oil condition - drain and refill if degraded (burnt / contaminated) or suspect.

Side Drive

- Check for oil leaks from rotor drive seals.
- Drain oil and remove cover. Check for debris.
- Sprockets / Chain / Adj Skid - Check for wear.
- Check / adjust jackshaft bearing preload - refer service details or Service Bulletin 61
- Check wear on side drive protection skid.
- Remove air filters and clean.
- Reassemble cover and refill side drives with new oil.
- Refer to Service Bulletin 32 for recommended greases.

General

- Overall check of fasteners, hitch pins, adjusting pins.
- Safety guarding and decals in place and functional.

Sign / Date: _____

AH2000, AH3000 - 500 HR / BI-YEARLY SERVICE SCHEDULE

Estimated actual hours worked _____ Service Date: _____

Universal Drive Shaft

- Universal crosses - check for movement / wear (replace if worn).
- Grease - While warm / after use. [Check all caps receive grease]
- Sliding members - clean, check for wear (replace if worn), regrease.
- Refer to Service Bulletin 32 for recommended greases.
- PTO yoke - check lock pins for wear and function, lubricate with oil.
- Universal drive shaft guarding and safety decal.

Clutch

- Remove clutch assembly, dismantle and check for worn plates.
- Check input shaft for twists or cracks.
- Check input shaft seal for leaks.
- Reassemble clutch to machine and re-set.

Primary Gearbox

- Drain oil from gearbox and front frame tube
- Remove air filter and clean.
- Clean oil circuit strainer & filter. Check for debris.
- Remove gearbox cover / selector plus rear cover and examine inside gearbox. Check:
 - Gears - markings indicate correct mesh and no pitting is evident.
 - Shafts - for excessive bearing endfloat, indicating wear or damage.
- Check front frame tube for sludge - hot water pressure clean if required.
- Re-fit covers and refill with new oil. Refer to Service Bulletin 40 for recommended oils.

Side Drive

- Check for oil leaks from rotor drive seals.
- Drain oil and remove covers. Check for debris.
- Sprockets / Chain / Adj. Skid - Check for wear.
- AH2000 ONLY:**
- Check / adjust jackshaft bearing preload - refer service details or Service Bulletin 61
- Check wear on side drive protection skid.
- Remove air filters and clean:
- Reassemble cover and refill side drive with new oil.
- Refer to Service Bulletin 40 for recommended oils.

General

- Overall check of fasteners, hitch pins, adjusting pins.
- Safety guarding and decals in place and functional.

Sign / Date: _____

Service Details

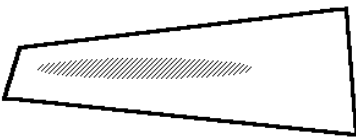
STANDARD BOLT TIGHTENING TORQUES

(Bolts Zinc Plated – torque figures to give 65% of proof load.)

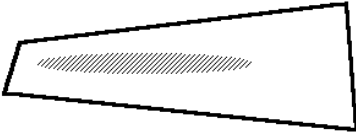
Standard Bolts	M10	M12(i)	M14	M16	M20	1" UNC (ii)	-
Torque (Nm)	30	55	85	135	260	530	
Torque (ftlb)	20	40	65	100	190	390	

- (i) M12 Bolts with nyloc nuts securing rubber shield and trailing boards should be tightened only until there is sufficient clamping force on rubber. DO NOT OVER-TIGHTEN (to the indicated torque) – especially with an impact gun.
- (ii) Wheel Arm Pivot Bolt fitted with 1" UNC nyloc nut – tighten nut to remove axial play from pivot bolt only. DO NOT TIGHTEN to the indicated torque.

Area	Details	Notes
Drive Shaft	<p>Check universals for wear / play.</p> <p>All caps must receive grease when lubricated - if one does not - investigate, clean or replace cross.</p> <p>Lock pins dirty / jammed or damaged by shaft spline.</p> <p>Sliding sections – clean, check for play / damage and regrease.</p>	Refer to Service Bulletin 32 for recommended greases.
Clutch	<p>Sintered Bronze discs (650 347) - minimum thickness of sintered bronze on backing plate = 0.2mm (0.008")</p> <p>Wear discs (650 346) min thickness = 1.25mm (.05")</p> <p>AH2000 Fixing nut (307624145) torque = 350Nm (260 ftlb)</p> <p>AH3000 Clutch Hub fixed with 3 Grub screws to 1.3/4" x 6 input shaft. Secure grub screws with thread locking compound.</p>	0.2mm of sintered bronze each side of 1.0mm plate.

<p>AH2000 GEARBOX Refer to Service Bulletin 40 for recommended oils.</p>		
<p>Input shaft & Pinion shaft</p>	<p>Bearing Adjustment Procedure. Excludes jackshaft bearings.</p> <ol style="list-style-type: none"> 1. Remove gaskets / shims behind bearing retaining caps on front of gearbox. 2. Replace bearing retaining caps and hand tighten fixing bolts to 40Nm (30 ftlb). (Significant preload should be created in each shaft / is tight to turn). 3. Tap bearing cap with soft hammer to ensure bearings seat. 4. Rotate each shaft 2 or more turns to seat rollers. 5. Repeat steps 2,3 & 4 until bolts do not tighten further. 6. Estimate cap / case gap – that is the required overall gasket thickness. 7. Remove cap and fit the estimated gasket thickness plus approximately 0.05mm (ie sufficient gaskets to create some endfloat.) 8. Tighten cap fixing bolts to seat cap against gaskets. 9. Hit rear of shaft to push bearing cup back against the cap. 10. Rotate shaft to ensure free. 11. Measure shaft endfloat with a dial gage. Use levers suitably located to push / pull shaft. 12. Remove gasket(s) to provide the following preload (ie gasket(s) to the thickness of the measured endfloat plus the required preload. <p>Bearing Preload – Input shaft, Layshaft and Pinion Shaft. Aim for a preload (crush) of 0.04 - 0.06 mm (.0015 - .0025")</p> <p>Alternative Preload procedure / measurement. Use steps 1- 6 previous but adjust gaskets fitted to produce a rolling drag from bearings of:</p> <ul style="list-style-type: none"> ▪ 14 – 16 kgcm (1.4 – 1.5 kg @ 10cm torque radius, or 5.6 – 5.4 kg @ 2.5cm torque radius. Measure rolling drag with a nylon cord wrapped around the shaft plus a spring balance or vice grip pliers plus suitable weight at a measured radius. <p>Note ensure after any adjustment of gaskets the shaft is hit to ensure the bearing cup is pushed against the cap and the shaft is turned at least 2 turns to locate rollers in their final / correct track.</p>	
<p>Crownwheel & Pinion</p>	<p>Shim between jackshaft housing and gearcase to give: Backlash 0.4 - 0.6mm (.016 - .024")</p> <p>Mesh - Initial contact should show 60% of tooth face in contact biased towards thin end of tooth.</p>	
<p>Oil Circulation Pump</p>	<p>Oil Circulation Pump Loctite (601) keyed drive bush to pump shaft.</p>	

AH2000, AH3000 Service Notes C 12/2006

<p>AH3000 – Comer DZ733 GEARBOX Refer to Service Bulletin 40 for recommended oils.</p>		
<p>Bearing Preload Setting</p>	<p>Note: Ensure all bearing are fully seated – hit bearing cups and cones fully home against housing or shaft shoulders.</p> <p>Method 1. Measured Bearing Crush Adjustment Aim for a preload (crush) of 0.04 - 0.06 mm (.0015 - .0025")</p> <p>Method 2. Shaft Drag Measure. (Measure with string and spring balance.)</p> <p>Input shaft & 1st Intermediate shaft: 1 - 5kgcm. (0.4 – 2.0 kg @ 2.5cm torque radius.)</p> <p>2nd Intermediate shaft: 2 - 7kgcm. (0.7 – 2.5 kg @ 2.75cm torque radius.)</p> <p>Crown-wheel bearing set: 10 - 16kgcm. (0.8 – 1.3 kg @ 12cm torque radius = OD of crown-wheel)</p>	
<p>Crownwheel & Pinion Mesh</p>	<p>Backlash 0.4 - 0.6mm (.016 - .024") Mesh - Initial contact should show 60% of tooth face in contact biased towards thin end of tooth.</p>	
<p>Oil Circulation Pump</p>	<p>Oil Circulation Pump Loctite (601) drive bush to pump shaft.</p>	

AH2000 Jackshaft Assembly	
	<p>Note: Take care that seal behind crownwheel is not damaged or displaced during re-assembly.</p> <p>Crown-wheel nut (307 140 140) torque = 260 Nm (190 ftlb)</p>
Jackshaft Bearing Preload	<p>To set / adjust:</p> <ol style="list-style-type: none"> 1. Remove side drive cover and drain oil. 2. Lock the jackshaft by wedging a brass or mild steel rod between sprocket teeth and chain. 3. Tighten top side drive gear nut (307 140 140) to 400 Nm (300 ftlb) using a <u>torque wrench</u>. 4. Rotate jackshaft at least one turn to seat bearing rollers. 5. Hit the end of the jackshaft with a copper hammer (if using a normal hammer, avoid damaging the shaft by hitting through a brass or hardwood block). 6. Repeat steps 2, 3 & 4 until nut will not tighten further. [This ensures that all bearings and related components are fully seated.] 7. Back off nut (307 140 140) approximately one <u>half turn</u> then hit jackshaft (as in step 5) to ensure bearing is backed off also. 8. Re-tighten nut (307 140 140) to 270 Nm (200 ftlb). 9. Rotate jackshaft at least one turn to seat bearing rollers then check and re-tighten nut (307 140 140) to 270 Nm (200 ftlb). 10. Locate next split pin fixing position and tighten nut to align – maximum torque on nut <u>325 Nm</u> (240 ftlb). 11. Repeat steps 7, 8 and 9 if there is any concern as to the accuracy of the setting. 12. Secure nut (307 140 140) with split pin (208 016 120), re-assemble side drive cover and re-fill with recommended lubricant – see Service Bulletin 40. <p>Notes:</p> <ol style="list-style-type: none"> i. This procedure creates a significant preload in the jackshaft bearings and is the same as specified for the HR41 Rotavator which was necessary to maintain gear alignment. As the AH2000 series has a chain side drive which is more tolerant of any misalignment, the final tightening torque setting (steps 8, 9 above) can be reduced to 220 Nm (165 ftlb) if necessary to suit available split pin fitting. ii. The resulting preload, although making it difficult to turn the jackshaft from the top sprocket by hand, is well within the capacity of bearings and does not cause the bearings to overheat. iii. Initial bedding-in wear and the temperature differential between the jackshaft and the housing will reduce applied preload during work.

AH3000 – Comer DZ733 Lateral Shaft Assembly	
Lateral Shaft Outer Bearing.	<p>NOTE: No preload of the lateral shaft outer bearing is required.</p> <p>Top side drive sprocket nut clamps; bearing inner race, spacer and sprocket to shoulder on the lateral shaft.</p> <p>Tighten to 300 Nm (220 ftlb) and lock with grub-screw. Secure grub-screw with thread-lock compound.</p>

Side Drive See Jackshaft Assembly.	
Rotor	
	<p>Rotor Drive Axle Nut 208056880 Tightening torque = 300Nm (220 ftlb). Secure with thread-lock compound also.</p> <p>Rotor fixing bolts M16 x 1.5 Tightening torque = 200 Nm (150 ftlb)</p> <p>Blade Bolts Tightening torque = 260 Nm (180 ftlb)</p> <p>Non Drive Axle Nut 2635 Tightening torque = 300Nm (220 ftlb)</p> <p>Bends in Rotor Max. allowed = 6mm TIR. Smooth shallow bends - can be straightened by heating (use oxy-acetylene torch) tube at centre of bend on the outside of the curve then cool with water soaked sack. Repeat as required.</p>