P/N 77137
#A - 5/01

HR35 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.

HR35 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.

HR35 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 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.

HR35 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

Remove air filter and clean. ☐
Check:

- Input Shaft - 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 seal. ☐
Drain oil and remove cover. Check for debris. ☐
Gears - markings indicate correct mesh and no pitting is evident. ☐
Idler Gear Brgs do not have excessive play (max. 0.1mm .004" at rim.) ☐
Check wear on side drive protection skid. ☐
Remove air filters and clean. ☐
Reassemble covers and refill side drive 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: _____

HR35 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. ☐
Remove air filter and clean. ☐
Check:

- Input shaft - for excessive bearing endfloat, indicating wear or damage. ☐

Refill with new oil. Refer to Service Bulletin 40 for recommended oils. ☐

Side Drive

Check for oil leaks from rotor drive seal. ☐
Drain oil and remove cover. Check for debris. ☐
Gears - markings indicate correct mesh and no pitting is evident. ☐
Idler Gear Brgs do not have excessive play (max. 0.1mm .004" at rim.) ☐
Check wear on side drive protection skid. ☐
Remove air filter 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

General Fastener Torque - G 8.8 Zinc Plated

Size	M8	M10	M12	M14	M16	M20
Nm	25	48	80	130	200	380
ftlb	20	35	60	95	150	280

Area	Details	Notes
Drive Shaft	Check universals for wear / play. All caps must receive grease when lubricated - if one does not - investigate, clean or replace cross. Lock pins dirty / jammed or damaged by shaft spline. Sliding sections – clean, check for play / damage and regrease.	Refer to Service Bulletin 32 for recommended greases.
Clutch	Sintered bronze plates: Minimum thickness of sintered bronze on backing plate 0.2mm (.008").	0.2mm of sintered bronze each side of 1.0mm plate.

GEARBOX

Refer to Service Bulletin 40 for recommended oils.

Input & Pinion Shafts

Bearing Adjustment Procedure.
Excludes jackshaft bearings.

1. Remove gaskets / shims behind bearing retaining caps on front of gearbox. (Alternatively assemble without gaskets.)
2. Replace bearing retaining caps and hand tighten fixing bolts to 40Nm (30 ftlb). (Significant preload should be created in each shaft (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 guage. Use 2 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.

Bearing Preload – Input shaft, Layshaft and Pinion Shaft.
Aim for a preload (crush) of 0.01 - .035mm (.0005 - .0015")

Alternative Preload procedure / measurement. Use steps 1- 6s previous but adjust gaskets fitted to produce a rolling drag from bearings of:

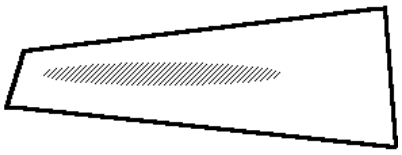
- 14 – 16 kgcm (1.4 – 1.5 kg @ 10cm torque radius, or 5.6 – 5.4 kg @ 2.5cm torque radius.

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.
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.

Crownwheel & Pinion

Shim between jackshaft housing and gearcase to give: Backlash 0.3 - 0.5mm (.012" - .020")

Mesh - Initial contact should show 60% of tooth face in contact biased towards thin end of tooth.



Jackshaft Assembly		
	Note: Take care that seal behind crownwheel is not damaged or displaced during re-assembly. C'wheel nut 307136020 torque = 260Nm (190 ftlb)	
Jackshaft Bearing Preload	To set / adjust: 1. Remove side drive cover and drain oil. 2. Lock the jackshaft by wedging a brass or mild steel rod between gear teeth on side drive. 3. Remove split pin and tighten top side drive gear nut (307 136 140) to 350 Nm (260 ftlb) using a torque wrench. 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 (307 136 140) approximately one half turn then hit jackshaft (as in step 5) to ensure bearing is backed off also. 8. Re-tighten nut (307 136 140) to 200 Nm (150 ftlb). 9. Rotate jackshaft at least one turn to seat bearing rollers then check and re-tighten nut (307 136 140) to 200 Nm (150 ftlb). 10. Locate next split pin fixing position and tighten nut to align – max. torque on nut 240Nm (180 ftlb). 11. Repeat steps 7, 8 and 9 if there is any concern as to the accuracy of the setting. 12. Secure nut (307 136 140) with split pin (208 016 170), re-assemble side drive cover and re-fill with recommended lubricant – see Service Bulletin 40. **Note:** This procedure creates a significant preload in the jackshaft bearings. 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.	

Side Drive		
	▪ Idler shaft 653 809 Replace bearing & shim pack as a set - gives bearing preload of .05mm (.002"). ▪ Idler shaft nut 650 018 Tightening torque = 800Nm (600 ftlb).	
Rotor		
	Rotor Drive Axle Nut 208056880 Tightening torque = 300Nm (220 ftlb) Rotor fixing bolts M14 x 1.5 Tightening torque = 170Nm (130 ftlb) Blade Bolts Tightening torque = 150Nm (110 ftlb) Non Drive Axle Nut 208109150 Tightening torque = 300Nm (220 ftlb) 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.	