

P/N 77139
#B - 10/02

HR65 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.
- 500 HR / YEARLY SERVICE SCHEDULE has 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.

HR65 DAILY SERVICE SCHEDULE

Input 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.

Lateral Drive Shafts

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

Refer to Service Bulletin 32 for recommended greases.

Side Drives

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.

HR65 WEEKLY / 50 HR SERVICE SCHEDULE

Input 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.

Clean oil circuit strainer & filter. Check for debris.

Remove and clean air filter.

Lateral Drive Shafts

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

Refer to Service Bulletin 32 for recommended greases.

Side Drives

Check for oil leaks from rotor drive seals.

Remove air filters and clean:

Check chain adjustment / tension skid.

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.

HR65 YEARLY / 500 HR SERVICE SCHEDULE

Model HR65 / _____ Serial No. _____ Hours worked _____ Service Date: _____

Universal Drive Shaft

- Universal crosses - check for movement / wear (replace if worn).
- Grease - Preferably while warm / after use. [Check all caps receive grease].
- Sliding members - clean, check for wear (replace if worn), re-grease.
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 decals.

Clutch

- Identify Clutch Spring Setting - **Record for re-setting.**
(Typical setting for 250hp PTO is coilbound then back 1 turn.)
- 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 frame tube.
- Remove breather and clean.
- Oil Strainer (on inlet to pump). Check for debris & clean.
- Oil Filter (on return line to gearbox). Check for debris & clean.
- Check dipstick is latest - oil level increased approximately 25mm at 6/2002.
(Dipstick level mark should be at 115mm from underside of plug cut off at 138 from underside of plug - old upper level mark.)
- Remove magnetic plug on RHS of gearcase - check for debris / clean.

Remove g'box selector lock / cover assy & rear cover and examine inside g'box. Check:

- Gears - markings indicate correct mesh and no pitting is evident.

Pick Off Gears
Crownwheel & Pinion
Final Drive gears

- Shafts - for excessive bearing endfloat, indicating wear or damage.

Input Shaft
Pinion Shaft
Final Drive Shaft

Remove cover to spare gears and inspect. Clean and apply grease to gears if required.

Note:

Air from the gearbox breather passes through the spare gear cavity and moisture will often condense on spare gears causing them to rust if unprotected.

Ensure also gears sit off bottom of cavity (use a suitable washer or other packing) as they otherwise will seal the gearbox preventing air escaping via the breather - this can cause overheating, high pressures inside the gearbox and some oils to foam excessively.

(Gears can be removed and stored elsewhere if preferred.)

Check frame cooling tube for debris / sludge - clean if required.

Re-fit covers and refill with new oil. Refer to Service Bulletin 40 for recommended oils.

Lateral Universal Drive Shafts (Comments LHS / RHS)

Universal crosses - check for movement / wear (replace if worn).

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

Shear Bolt Clutch - Remove / check shear bolt condition.

If 12mm shear bolt is performing adequately replace / renew as required.

Note: On later units, M12 shear bolt replaced with M14, Grade 10.9 grooved at shear face to dia 12). Drill out coupling flanges to suit to fit if required. Increase to shear bolt capacity is approx. 40%.

Splined section - clean, check for wear (replace if worn), apply anti-sieze and wrap with suitable tape to keep clean for ease of dismantling in future.

Yokes - check securing bolts are tight.

Universal drive shaft guarding in place.

Side Drives (Comments LHS / RHS)

Check for oil leaks from rotor drive seals.

Check breathers for leaks / remove and clean.

Note: Breather extensions of approx. 225 mm fitted to later units - trial results ?

Drain oil and remove covers. Check for debris.

Sprockets - markings indicate correct mesh and no pitting is evident.

Top Shaft - Check for excessive play in bearings.

Chain

Tensioner Skid - Check for wear.

Check wear on side drive protection skid.

Reassemble covers and refill side drives with new oil.

Refer to Service Bulletin 40 for recommended oils.

Center Bearing Assembly

Check for oil leaks from rotor drive seals.

Check center plate fixing bolts. If bolts show any evidence of damage / shearing.

Replace standard M16 Bolts with Special Bolts T48068. (16mm reduced thread G 10.9)

General

Overall check of fasteners, hitch pins, adjusting pins.

Safety guarding and decals in place and functional.

Sign / Date: _____

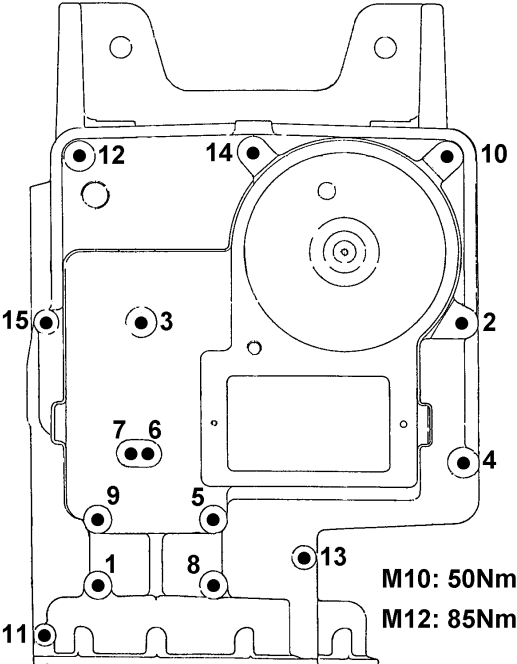
Service Details

HR65 Special Nuts - Tightening Torques & Tools

Location	Nut P/N	Details	Tightening Torque	Locking	Tools
Clutch Fixing	307622145	M22 Castle	375 - 520 Nm 280 - 390 ftlb	Split Pin	32 AF Socket Max OD = 45mm
Input Shaft / Front brg	255070111	C Nut M50	N/A Adjusts Brgs	Tab Washer	C Nut spanner to suit 70 dia.
Pinion Nut	110300	C Nut M40	200 Nm 150 ftlb	Araldite & Deformed Collar	110271 SKF TMSF 8
Crownwheel Nut	110297	Hex Nut	450 Nm 339 ftlb	Araldite & Locking Washer	70 AF Open End Spanner (2.3/4")
Top Side Drive Nut	254565101	C Nut M45	250Nm 185 ftlb	Tab Washer	C Nut spanner to suit 65 dia.
Rotor Drive Axle Nut	650 018	Hex Nut	300 Nm 220 ftlb	Belville Washer + Threadloc	65 AF Socket (2.9/16" AF)
Center Brg Nut	208109150	C Nut M55	300 Nm 220 ftlb	Threadloc recommended.	C Nut spanner to suit 75 dia.

Area	Details	Notes
Drive Shaft	<p>Check universals for wear / play. All caps must receive grease when lubricated - if one does not - investigate, clean or replace cross.</p> <p>Later crosses plugged with a grease nipple on each cap - ensures that each cap can be greased.</p> <p>Lock pins dirty / jammed or damaged by shaft spline.</p> <p>Sliding sections – clean, check for play / damage and regrease.</p> <p>Early unit clutch yokes can foul input shaft & clutch fixing nut. Check by attaching to clutch without front sintered bronze disc - clutch yoke must be able to fully seat.</p>	<p>Refer to Service Bulletin 32 for recommended greases.</p> <p>Refer to Service Bulletin 32 for recommended greases.</p> <p>That is the sintered bronze disc must be able to wear away to nothing.</p>
Clutch	<p>Sintered bronze plates: Minimum thickness 1.4mm.</p> <p>Tighten castle nut to 375-520 Nm (280-390ftlb)</p> <p>Fit Split Pin</p> <p>Note: Check clutch hub does not contact nut securing front input shaft bearings. The clutch hub should seat on the tapered section of the input shaft.</p>	<p>0.2mm of sintered bronze each side of 1.0mm plate.</p>
<p>GEARBOX</p> <p>Refer to Service Bulletin 40 for recommended oils.</p>		
Cleaning Oil Cooling Tube	<p>Drain frame member of oil and check for sludge / dirt with rod.</p> <p>Hot water pressure clean out if necessary.</p>	
Input Shaft	<p>Tighten nut to 270Nm (300ftlb) to seat bearings then back off approx 1/8 turn. Tap shaft to back off bearing, measure endfloat, then adjust to 0.025 -0.05 (0.001 - 2") preload.</p> <p>Lock tab washer to secure.</p>	<p>Thread pitch = 1.5mm (0.060") per turn.</p>
Crownwheel, Pinion & Shafts	<p>Adjustment of bearings on both shafts, gear backlash and checking of gear mesh must be completed together then both crownwheel and pinion are secured to shafts with Araldite. The following five steps indicated [1] - [5] must be performed in sequence.</p>	

Area	Details	Notes
<p>[1] Pinion & Shaft Assy</p>	<p>Grind notch into end of pinion shaft to suit collared locknut 110 300.</p> <p>Ensure mesh with crownwheel and backlash is correct before machining bearing spacer 109 286 to provide correct preload. Tighten nut 110 300 to provide slight preload in bearings to check gear mesh and backlash.</p> <p>When gear mesh and backlash is confirmed correct; adjust bearing preload to give 0.025 -0.05mm (0.001 - 2") preload. (Shaft should turn smoothly with no play)</p> <p>NOTE</p> <ul style="list-style-type: none"> • Use old spacer and shims temporarily to determine required spacer thickness for later machining or fit new spacer 109 286, measure play / gap in outer bearing races and machine spacer to suit. • Spacer 109 286 must be installed with larger end towards pinion to ensure adequate seating of the bearing inner races and to clear roller cage. • Do not lock nut at this stage ! 	<p>Ensure nut is tightened to around 200Nm and bearings are rotated at least 2 turns when checking bearing adjustment.</p> <p>Note ensure spacer is machined with ends parallel.</p>
<p>[2] Crownwheel Shaft Brgs</p>	<p>Fit crownwheel shaft bearings with bearing mount.</p> <p>Check Pump Hsg does not foul bearing - see next.</p> <p>Affix pump housing to lower half of gearcase and check / adjust crownwheel shaft bearing shims to give slight preload. Aim for 0.05 (0.002") preload. Accept 0.025 -0.075 (0.001 - 3") preload.</p>	<p>Use Loctite 641.</p> <p>Measure endfloat with dial gauge, then add shims required to produce the required preload. Allow .025mm (.001") extra shims to compensate for gearcase joint compound applied when fitting pump housing later.</p>
<p>[3] Pump Housing</p>	<p>Check roller bearing cage does not foul pump housing. Machine pump housing recess deeper if req'd to clear bearing cage. (Dia 110 x 5 deep)</p>	<p>Will only be a problem if there are few shims and bearing has a particularly wide cage.</p>
<p>[4] Crownwheel</p>	<p>Adjust crownwheel spacer to provide correct backlash and gear mesh. Backlash: 0.15- 0.3mm (.006 - .012").</p> <p>Crownwheel location is by single piece spacer surface ground to size. Do not final assemble with thin shims as these crush and fail due to the load being repeatedly applied and removed during rotation.</p>	<p>Check crownwheel & pinion mesh with bearing blue.</p>

Area	Details	Notes
	<p>NOTE Trial different single piece spacer / shims. Alternatively use old spacer shims temporarily only to determine required spacer thickness</p> <p>Do not lock nut at this stage !</p>	
<p>[5] Secure Pinion, Crownwheel and Nuts with Epoxy Resin</p>	<p>Confirm / final check backlash and gear mesh before locking gears to shafts.</p> <p>Remove and dismantle the pinion shaft assy. (Back off crownwheel nut if required) Reassemble with Epoxy Adhesive on all mating faces of pinion, shaft and nut. Tighten nut to 400Nm (300ftlb). Deform pinion nut collar into groove.</p> <p>Remove and dismantle the crownwheel shaft assy. (Reassemble with Epoxy Adhesive on all mating faces of crownwheel, shaft and nut. Tighten nut to 450Nm (340 ftlb). Deform crownwheel nut collar into groove.</p>	<p>Epoxy Adhesive:</p> <ul style="list-style-type: none"> • Araldite Super Strength or • Loctite E-120HP. <p>Clean area with Brakeclean or similar degreasing solvent before applying. Once clamped with nut assembly can continue but requires 24 hr min cure before working.</p> <p>Note It may be necessary to refit pinion shaft assembly to gearbox before finally locating crownwheel.</p>
<p>Final or Output Shaft</p>	<p>Adjust bearing shims to give slight preload. Aim for 0.05 (0.002") preload. Accept 0.025 -0.075 (0.001 - 3") preload.</p>	
<p>Gearbox Reassembly</p>	<p>Clean and reassemble case with jointing compound. Loctite (antisieze) long socket head set screws into gearcase.</p>	<p>Loctite 515 or 518</p> <p>Loctite 511 (Hyd pipe sealant)</p>
<p>Gearcase Bolt Tightening Sequence</p>	 <p>M10: 50Nm M12: 85Nm</p>	<p>Gearcase bolt tightening sequence.</p>

Area	Details	Notes
LATERAL DRIVE SHAFTS		
Shear Coupling	Standard 2 x 3/8" Bolts 2 x M10 bolts increase shear capacity by 10% 2 x 7/16" bolts increase shear capacity by 36%	Bolts must have full (unthreaded) shank at shear face. Tighten bolts only sufficiently to prevent play between coupling faces. DO NOT OVERTIGHTEN such that clamping force on faces can provide friction drive - this negates the function of the shear bolt.
Re- assembly of Lateral Shafts.	Apply antisieze to all shaft splines to ensure ease of dismantling when required. Keep crosses both sides of machine in line - this simplifies greasing as grease nipples will all align with access holes simultaneously. Rotate / adjust rotors each side of center bearing before fitting lateral shafts to retain blade scroll through center of machine. When assembled wrap splined sliding section with duct tape or similar to keep spline clean and to ensure ease of dismantling when required.	
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SIDE DRIVES		
Top Shaft	Taper roller bearing pair. Machine inner spacer to provide correct bearing adjustment of .05 - .075mm (2-3" thou) preload. DO NOT USE THIN SHIMS.	
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ROTORS & CENTRE BEARING ASSEMBLY		
Oil Level Plugs	Note: Both level plugs (1 at front on LHS, 1 at rear on RHS access the same oil cavity)	
Refitting Rotors	<ol style="list-style-type: none"> 1. Ensure centre bearing assy and mounting is secured. 2. Fix side drive backplate c/w rotor drive axle to frame and lightly tighten. 3. Measure Rotor length. 4. Measure distance from Side Drive axle to center bearing axle - ie where rotor fits between. 5. Shim backplate out from frame with suitable flat washers or space rotor with P/N 109 3117 as required. <p>Axial difference should be less than 1mm to prevent lateral loads being imposed on rotor support bearings.</p> <p>Note: Rotate / adjust rotors each side of center bearing before final fixing to retain blade scroll through center of machine.</p>	
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