Service Techniques

General

The words 'front', 'rear', 'right-hand' and 'left-hand' used in this manual refer to the different parts of the machine as viewed from the Operator's seat, when facing the steering wheel.

Clean the exterior of all components before starting any type of repair. Dirt and abrasive dust can reduce the efficient working life of a component and lead to costly replacement.

Time spent on the preparation and cleanliness of working surfaces will pay dividends in making the job easier and safer and will result in overhauled components being more reliable and efficient in operation.

Use cleaning fluids which are known to be safe. Certain types of fluid can cause damage to O-rings and cause skin irritation. Solvents should be checked that they are suitable for the cleaning of components and also there is no risk to the personal safety of the user.

When replacing component parts, use the correct tool for the job.

Cleaning

⚠ Caution:

- Care should be exercised to avoid skin rashes, **fi**re hazards, and inhalation of vapours when using solvent type cleaners.

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and agitated until all old lubricant and foreign material is dissolved and the parts are thoroughly cleaned.

Bearings

Remove bearings from cleaning fluid and strike flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture-free compressed air. Be careful to direct air stream across bearing to avoid spinning. Do not spin bearings when drying . Bearings may be rotated slowly by hand to facilitate the drying process.

Housings

⚠ Caution:

- Care should be exercised to avoid inhalation of vapours and skin rashes when using alkali cleaners.

Thoroughly clean interior and exterior of housings, bearing caps, etc. Cast parts may be cleaned in hot solution tanks with mild alkali solutions, provided these parts do not have ground or polished surfaces.

Parts should remain in the solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water.

Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with a steam cleaner. All parts cleaned must be thoroughly dried immediately by using moisture-free compressed air or soft lint—free absorbent wiping rags, free of abrasive materials such as metal filings, contaminated oil or lapping compound.

Inspection

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

Bearings

Carefully inspect all rollers, cages and cups for wear, chipping, or nicks to determine fitness of bearings for further use. Do not replace a bearing cone or cup individually without replacing the mating cup or cone at the same time. After inspection, lubricate the bearings with suitable clean oil and wrap in clean lint—free cloth or paper to protect them until installed.

Oil Seals, Gaskets, Etc.

Replace O-rings, seals or gaskets whenever they are disturbed. Never mix new and old seals or O-rings, regardless of condition. Always lubricate new seals and O-rings with suitable clean oil before installation.

Replacement of spring-load oil seals, O-rings, metal sealing rings, gaskets and snap rings is more economical when the unit is disassembled than premature overhaul to replace these parts at a future time.

Further loss of lubricant through a worn oil seal may result in failure of other more expensive parts of the assembly. Sealing members should be handled carefully, particularly when being installed. Cutting, scratching or curling under the lips of seals seriously reduces their efficiency.

When assembling new metal type sealing rings, these should be lubricated with a light grease to stabilise rings in their grooves for ease of assembly of mating members.

Gears and Shafts

Examine teeth on all gears carefully for wear, pitting, chipping, nicks, cracks or scores. If gear teeth show spots where case hardening is worn through or cracked, replaced with new gear. Small nicks may be removed with a suitable hone. Inspect shafts and quills to make certain they are not sprung, bent or spline-twisted, and that shafts are not bent.

Housings, Covers, Etc.

Inspect housings, covers and bearing cups to ensure that they are thoroughly clean and that mating surfaces, bearing bores, etc. are free from nicks or burrs. Check all parts carefully for evidence of cracks or conditions that would cause subsequent oil leaks or failures.

GENERAL SAFETY

BHA0002IA

General Safety Considerations

Throughout this workshop manual you will see various WARNINGS, CAUTIONS and NOTES. Always read and obey the instructions in these wherever they appear.

⚠ Warning:

- Warning is used to indicate that failure to follow this instruction may result in personal injury.

⚠ Caution:

- Caution is used to indicate that failure to follow this instruction may result in damage to machine or the equipment being used.

Note:

- Note is used to provide the technician with additional essential information required to carry out a complete and satisfactory repair.

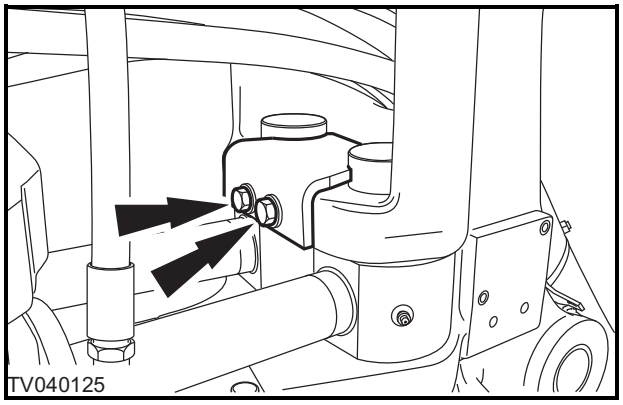
Before carrying out any maintenance on this machine, always carry out the following:

1. Park the machine on flat, level ground.
2. Lower the loader and backhoe attachments until they are resting on the ground.
3. Stop the engine and remove the starter switch key.
4. Engage the parking brake.
5. Lock the loader attachment controls (if equipped).
6. Block the wheels to prevent any machine movement. If a procedure requires the loader attachment to be raised (e.g. working on the engine), install the loader attachment control strut.
7. Removing the isolator key from the switch is recommended, especially when carrying out work on the electrical system.

Read and obey the following before carrying out a repair:

- Do not carry out any maintenance operations until you have read and understood the instructions and warnings given in the manual.
- Always wear suitable clothing when working on the machine.
- Always wear suitable eye protection when using a tool which might project metal particles. Use a hammer with a soft face, such as copper for installing pins.
- Unauthorized modifications of the machine can cause serious injury. Do not carry out any unauthorized modification on the machine. Any modification carried out must be in conformity with the machines technical specifications and must conform to current safety regulations.
- Do not carry out any welding operation without prior authorization.
- Some of the machines components are subject to type approvals. It is mandatory when replacing these components to ensure they are in conformity with regulations. Always use genuine parts.
- Hydraulic fluid, diesel fuel or grease under pressure which penetrates the skin can cause serious injury. Take the necessary safety precautions (protective clothing and face and hand protection) to prevent such risks. In addition, before handling these products, read the manufacturers specific instructions for their use. If hydraulic fluid, diesel fuel or grease penetrates the skin, seek medical attention immediately.
- When carrying out an authorized welding operation on the machine, disconnect the alternator plug and connect the welding set earth lead to the component on which the welding is to be carried out. Never connect the earth lead to a hydraulic system component.
- When checking tyre pressures or during an inflation operation, never stay facing the tyre but always facing the tread surface. Always use an inflation cage when the wheel is removed from the machine. keep all other persons away from the area. Never weld near a tyre. It is essential to remove the tyre before any welding operation.
- Take the necessary safety precautions to protect your face when using compressed air.
- The machines structure is in conformity with the 'FOPS' and 'ROPS' protection standards. Any modification (drilling, welding etc.) may cause that conformity to be invalidated.
- Always follow the specified repair and maintenance procedures outlined in this manual.
- Never carry out any repairs to the machine while someone is sitting in the operator seat, unless they are assisting in the procedure being carried out.
- Do not perform any repair on the machine while the engine is running, unless stated. Stop the engine and make sure all pressure is released from hydraulic circuits before removing any caps, covers, valves etc.
- Always use lifting equipment of appropriate capacity to lift or move heavy components.
- When performing a repair, disconnect the battery(s) and label the controls to warn the machine is being worked on. Block the machine and any implements which may be in the raised position.
- Only operate the machine or attachments when in the Operator's seat, do not attempt to operate the controls from outside of the cab.
- Do not wear rings, wristwatches, jewellery, unbuttoned or flapping clothing such as ties, torn clothes, scarves, open jackets or shirts with open zips which could become caught on moving parts. Use approved safety clothing such as anti-slipping footwear, gloves, safety goggles, hard hat etc.
- Lift and handle all heavy components using suitable lifting equipment of adequate capacity. Make sure that parts are supported by appropriate

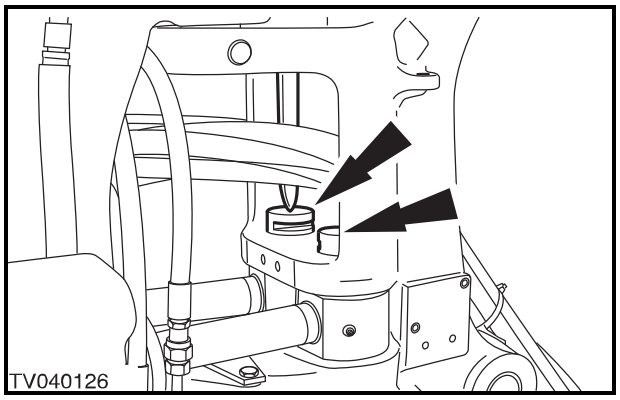
9. Remove the retaining bolts and remove the slew pins locking plate.



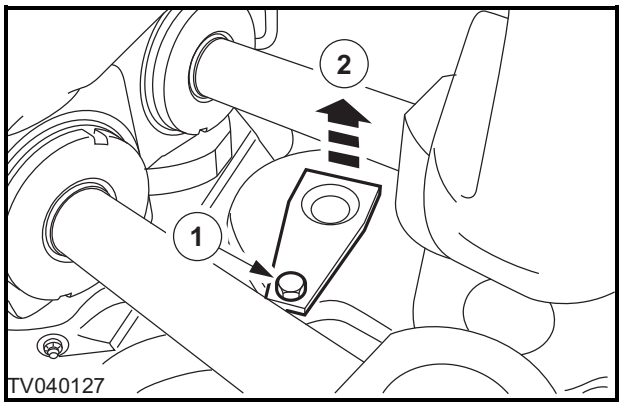
10. Using a suitable drift, remove the slew pins.

⚠ Warning:
- This component is very heavy. Ensure the lifting equipment is adequate. Failure to follow this instruction may result in personal injury.

11. Using suitable lifting equipment, support the boom swing tower.



12. Remove the boom swing tower lower pivot pin retaining bolt (1) and remove the pivot pin (2).



Assembly

Note:
- Install new O-ring seals, seals and rings.

Note:
- Lubricate the new O-ring seals, seals and rings with clean oil.

1. Install the O-ring (4), the bearing (5), the seal (6), the ring (7), the O-ring (8), the ring back-up (9) and the O-ring (10) to the retaining bush (3).

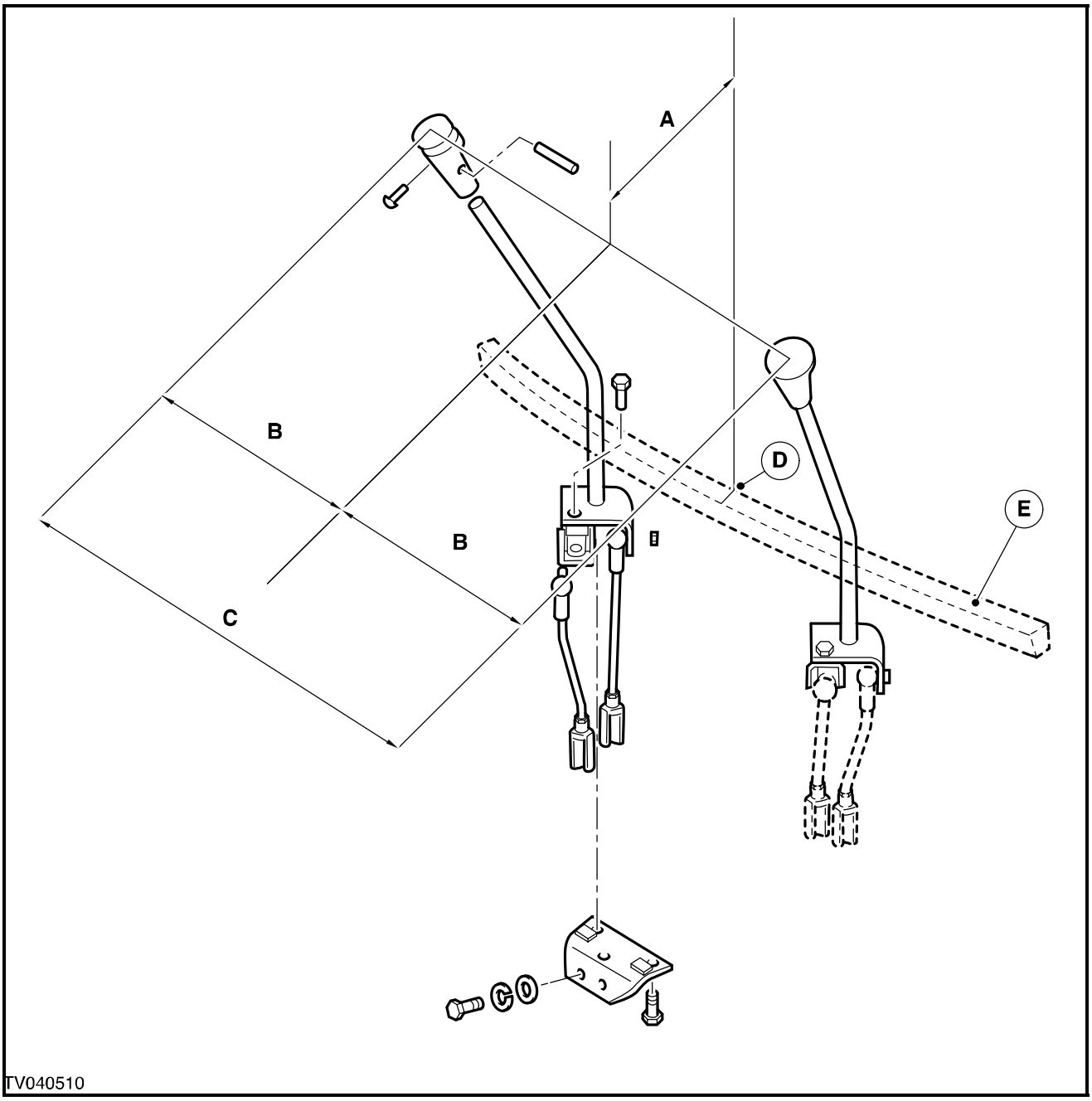
Note:
- To aid installation of the bush, lubricate the bore of the bush with clean oil.

2. Install the retaining bush (3) onto the piston rod (17).
3. Install the ring (12), the seal (13), the ring (14), the O-ring (15) to the piston (11).

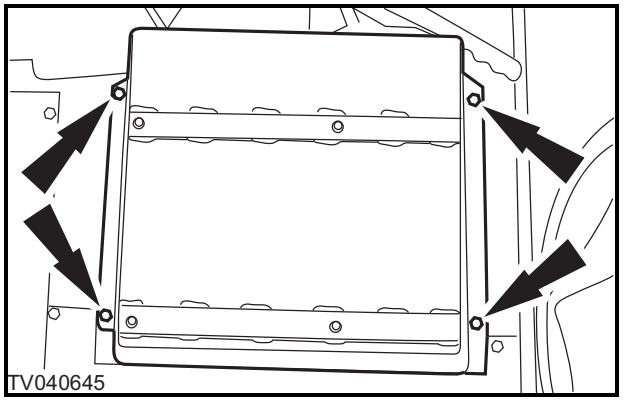
Note:
- To aid installation of the piston, lubricate the bore of the piston with clean oil.

4. Install the piston assembly onto the piston rod (17).
5. Install the piston lock nut (16) and tighten to 800Nm (590 lb.ft).
6. Using a suitable piston ring compression tool to hold the new rings in place, start the tube onto the piston tube assembly. Push the tube onto the piston rod assembly until the compression tool is pushed off the piston rod assembly.
7. Install the retaining bush (3).

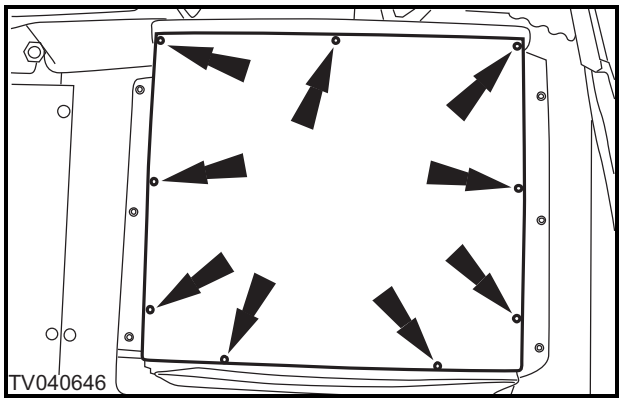
X Pattern Version



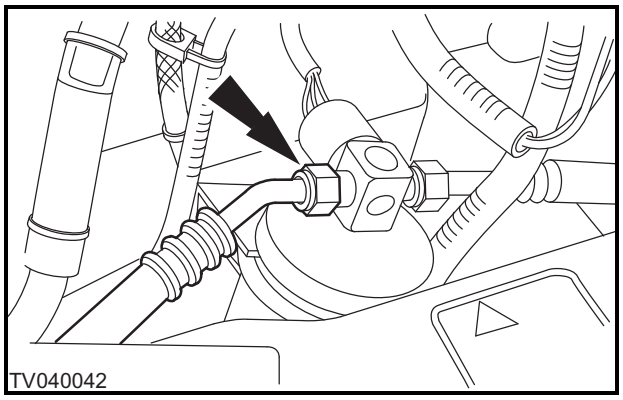
8. Remove the cab heater cover.



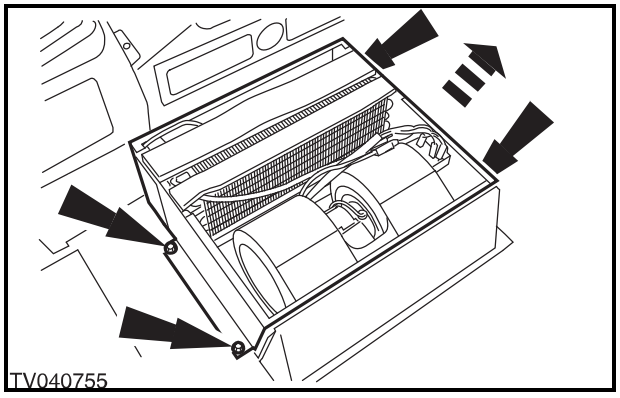
9. Remove the cab heater top cover.



10. Disconnect the air conditioning filter/drier.



11. Remove the cab heater box retaining bolts.
12. Position the cab heater box to one side.



13. Remove the air conditioning evaporator pipe clamp (1) and detach the pipes.

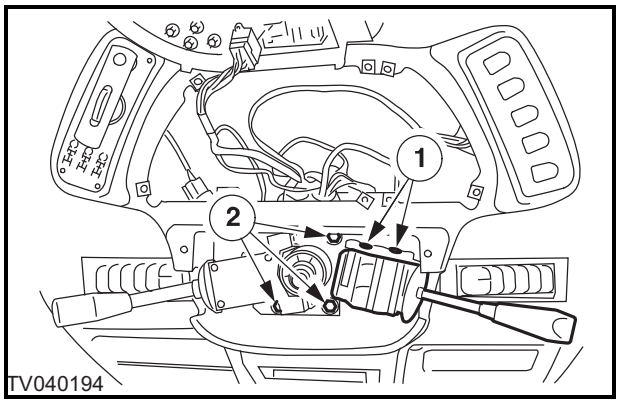
Torque Values

Description	Nm	Lb.ft
Epicyclic Reduction Hub	80	59
Wheel Hub	230	170
Axle Drain/Fill Plugs	60	44
Wheel Studs	70	52
King Pin	190	140
Crown Wheel	95	70
Grease Nipple	8	6
Differential Adjustment Nut Locking Tabs	13	10
Differential Housing	169	125
Differential Half Collers	266	196
Breather	10	7
Blanking Plug	25	18
Steering Cylinder	120	89
Swivel Joint	300	221
Tie-Rod Locking Nut	250	184
Tie-Rod End	220	162
Steering Angle Adjustment Locking Nut	150	111

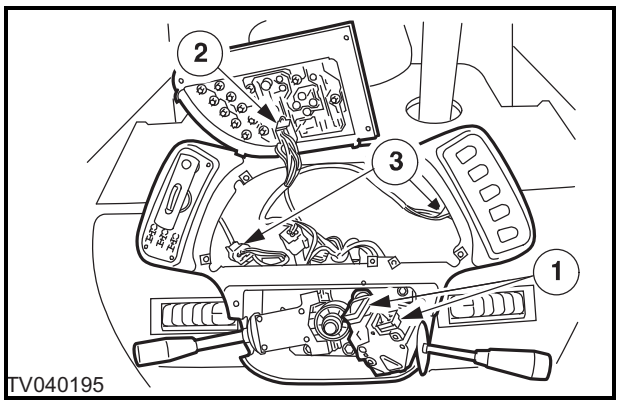
General Specifications

Description	Value
Crown Wheel Gear Ratio	2.133/1
Epicyclic Reduction Gear Ratio	6.00/1
Total Ratio	12.80/1
Dry Weight	303 Kg
Input Rotation	Clockwise (C.W.)
Steering Angle	55° 0–2mm
Toe-in	0–5mm
Crown Wheel / Pinion Backlash	0.18 – 0.23mm
Pinion Shaft Bearing Pre-Load “P”	“P” = 9.2 – 13.7 daN
Total Pinion/Differential Bearing Pre-load	(4.3 + P) — (6.45 + P) daN
Axle Housing Oil Capacity	6.5 Litres
Epicyclic Reduction Hub Oil Capacity	1.0 Litre
Oil Type (Use recommended oil enriched in Additives)	API GL5 (for possible alternatives see – GENERAL INFORMATION – FLUIDS AND LUBRICANTS at the start of this manual).
Grease Type	TECNOLUBE SEAL PLOYMER 400/L (DIN = KHER1R ISO-I-XMR-XM2) AGIP MU/EP2 (King pin only)
Sealant	Silastic 732

10. Remove the front instrument panel retaining bolts (2).



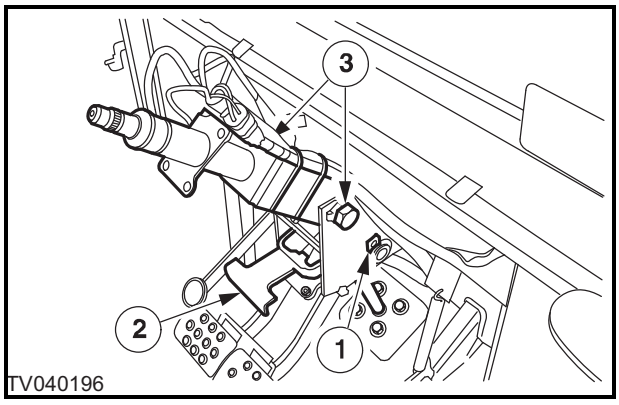
11. Remove the turn signal stalk (1)
12. Remove the front instrument cluster (2).
13. Disconnect the differential electrical connector and wiper electrical connectors and remove the front instrument panel (3).



14. Remove the tilt retaining clip and tilt pin (1)
15. Remove the steering column tilt bracket (2).

Note:
- Cut the cable ties.

16. Remove the steering column (3).



Installation

Note:
- The splines on the steering column may be fitted into the orbital control valve in any position. Make sure the splines are seated correctly.

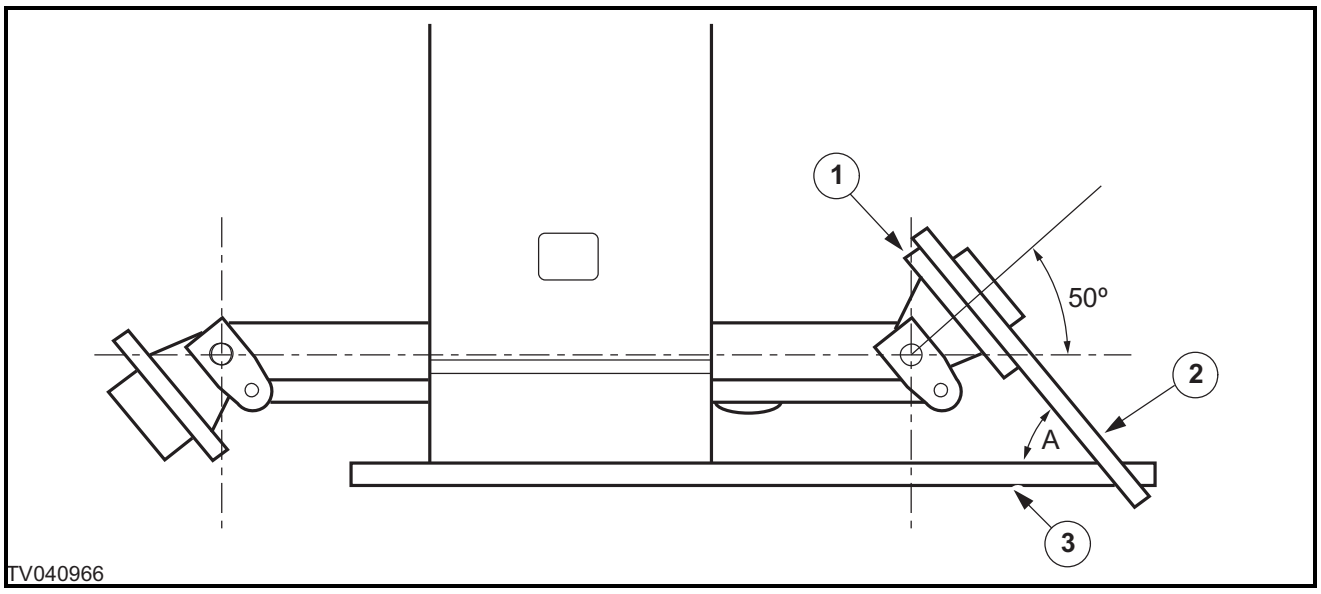
Note:
- Install new cable ties.

1. To install, reverse the removal procedure.

GENERAL PROCEDURE —
STEERING ANGLE ADJUSTMENT

BHL1105GB

General Procedure



1. Remove the front wheels. For additional information, refer to Section M12-01 FRONT WHEEL, PAGE M12–01–3 .

   Note:
   - Support the machine under the front chassis.

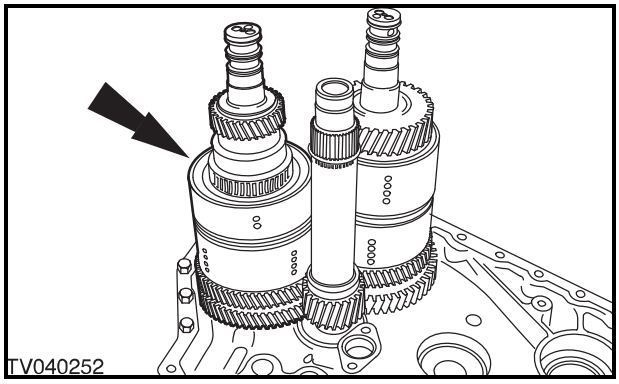
2. Turn the steering wheel until the front wheel hubs are on full left-hand lock.
3. Place a straight edge (3) against the axle input flange or against the machine hardnose. Make sure the straight edge is parallel with the axle centre-line.
4. Place a second straight edge (2) against the wheel hub flange (1).

   ⚠ Caution:
   - Make sure the steering angle does not exceed 52 degrees. Failure to follow this instruction may result in excessive wear to the drive shaft universal joints.

5. Measure the angle (A) at which both straight edges intersect. Subtract angle A from 90 degrees to give the steering lock.
   Angle A = 40
   Steering angle 90 – 40 = 50 degrees.
6. Adjust the left-hand stop for maximum left steering lock and right-hand stop for maximum right steering lock.
7. Loosen the lock nut (1) and adjust the steering stop adjuster bolt (2) until the bolt head touches the steering stop. Tighten the lock nut (1) to 150Nm.

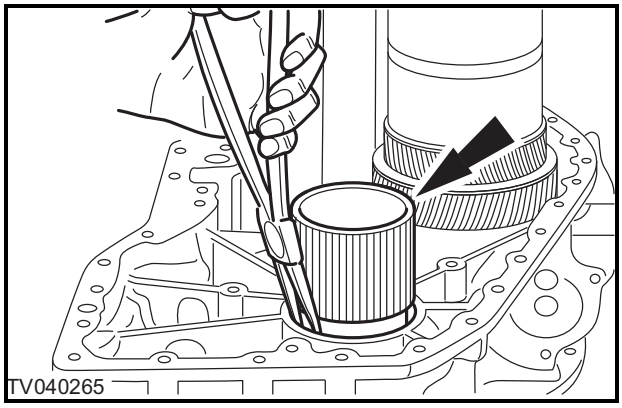
⚠ Caution:
- Take care not to damage the sealing rings.

5. Install the forward low/high shaft.


TV040252

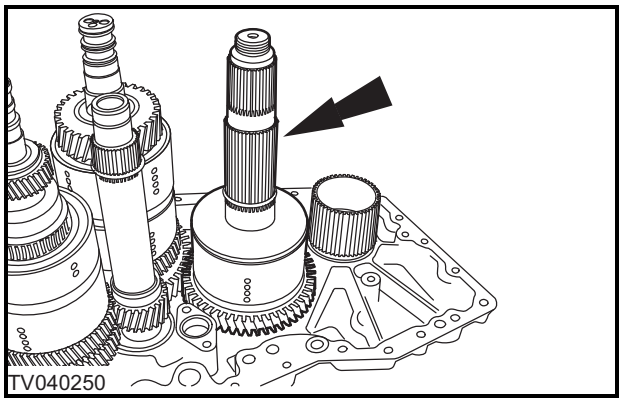
6. Using suitable circlip pliers, expand the circlip and install the disconnect shaft into the housing.

Note:
- Make sure the circlip is correctly located into the groove.

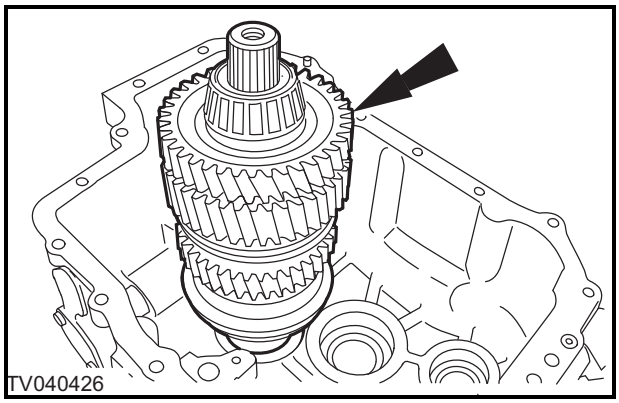

TV040265

⚠ Caution:
- Take care not to damage the sealing rings.

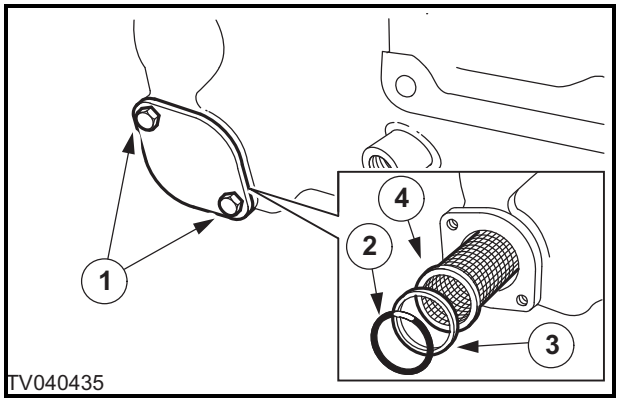
7. Install the 2nd shaft assembly.


TV040250

28. Remove the output shaft assembly.

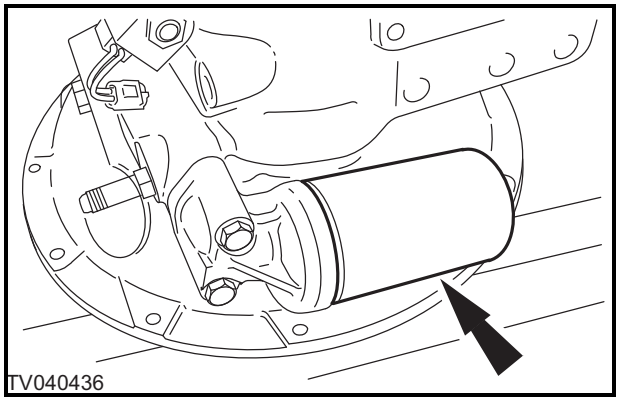

TV040426

29. Remove the transmission oil strainer cover (1), O-ring (2), spacer (3) and transmission oil strainer (4).



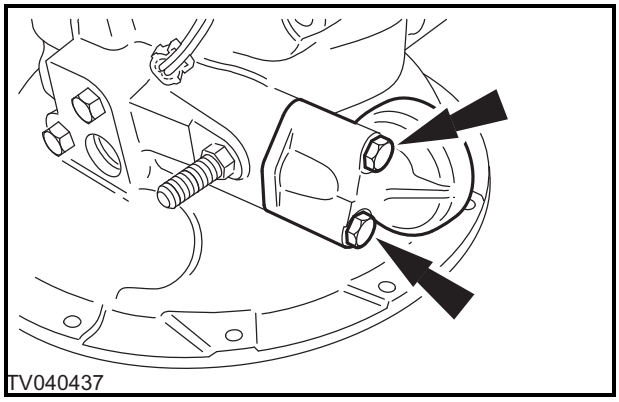
TV040435

30. Remove and discard the oil filter.


TV040436

31. Remove the oil filter housing.

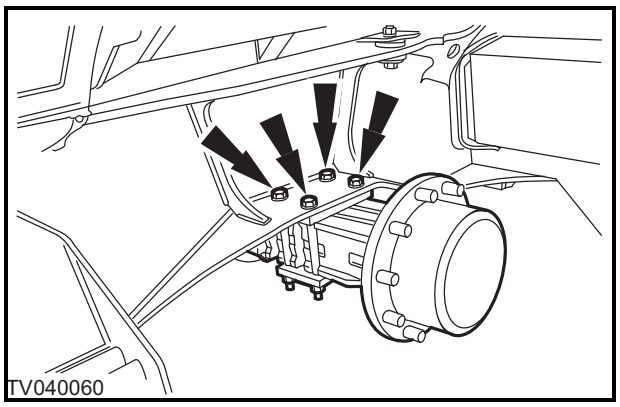
Note:
- Remove and discard the gasket.


TV040437

⚠ Warning:
- This component is very heavy. Ensure the lifting equipment is adequate. Failure to follow this instruction may result in personal injury.

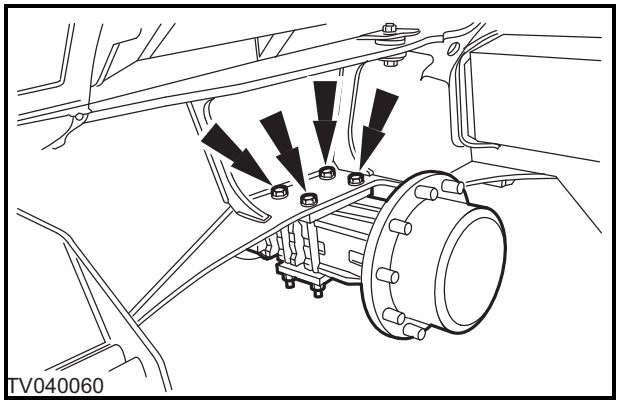
⚠ Warning:
- Secure the rear axle to the transmission jack. Failure to follow this instruction may result in personal injury.

12. Using a suitable transmission jack, support the rear axle.
13. Remove the rear axle retaining bolts and remove the rear axle (left-hand side shown, right-hand side similar

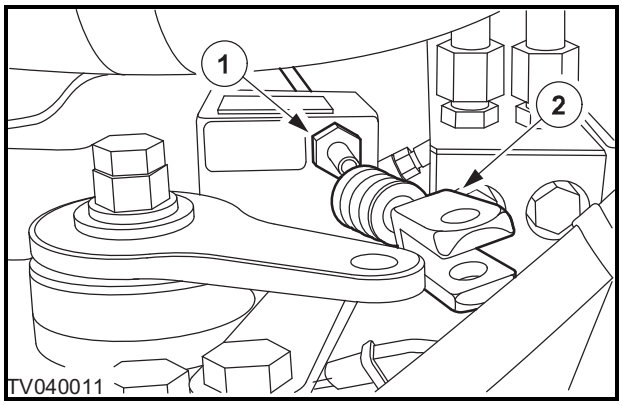


Installation

1. To install, reverse the removal procedure.
2. Tighten to 475Nm (35 lb.ft).



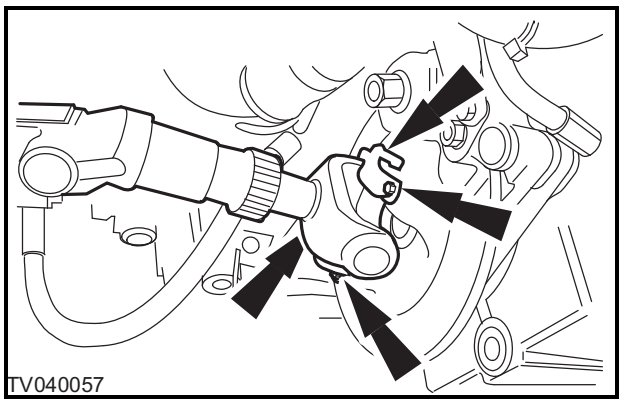
9. Detach the parking brake cable from the parking brake caliper (2).



Note:
- Secure the propshaft to prevent disengagement of the sliding joint.

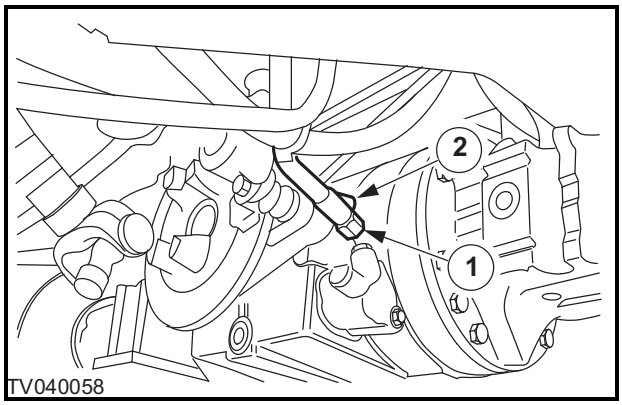
10. Detach the rear propshaft from the rear axle.

Note:
- Discard the retaining bolts.



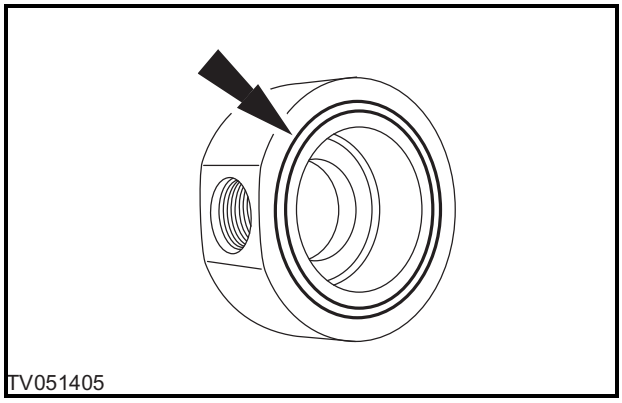
Note:
- Install blanking plugs to avoid contamination.

11. Disconnect the rear axle oil supply pipe (1).
12. Disconnect the rear axle left-hand brake supply pipe (2).



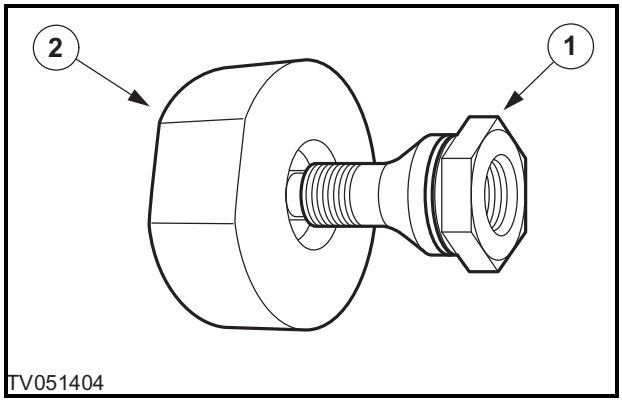
Note:
- Install a new O-ring seal.

3. Install the O-ring seal to the adaptor.

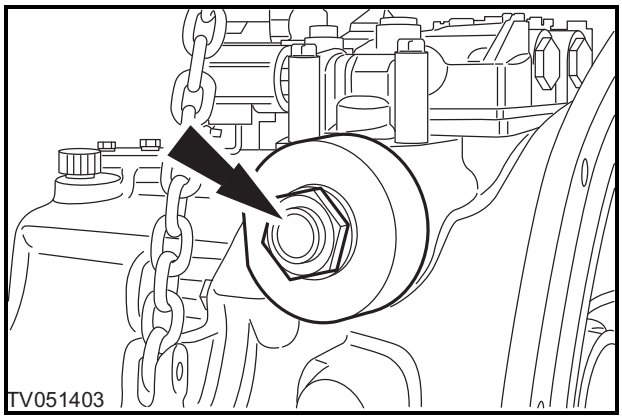


Note:
- Install a new O-ring seal.

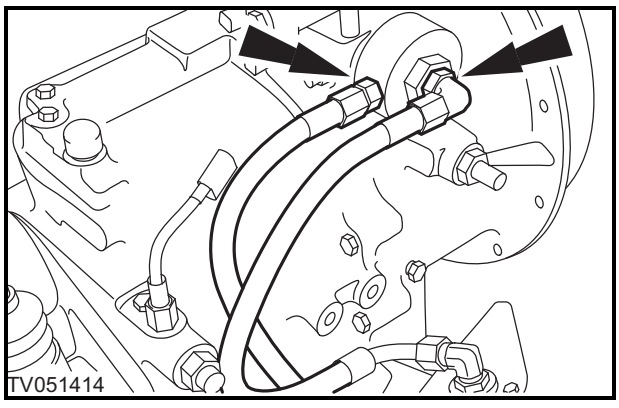
4. Install the connector (1) into the adaptor (2).



5. Install the adaptor to the transmission housing. Tighten to 50Nm (37 lb.ft).



6. Install the oil filter supply and return lines.



DIAGNOSING AND TESTING —
CARRARO POWERSHIFT TRANSMISSION PRESSURE TESTING BHN1307TB

⚠ Warning:
- Do not work on or around hydraulic systems without wearing safety glasses. Failure to follow this instruction, may result in personal injury.

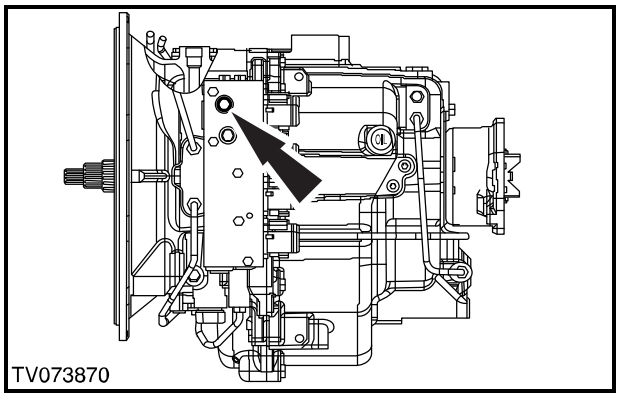
Note:
- All pressure tests to completed with the transmission at 80°C.

Note:
- All temperature and pressure test ports have 9/16" - 18 UNF-2B.

Measure pressures at 900 — 2200 RPM engine speed with the oil temperature at 80°C.
Pump acceptance criteria on bench test : 19 ltr per min total pump flow at 900 rpm measured before filter.

1	Torque Converter pressure test port
2	Forward clutch pressure test port
3	Reverse clutch pressure test port
4	Lubrication pressure test port
5	Gear pressure test port
6	Control valve pressure test port
7	Differential lock pressure test port

1. Gear pressure test port Transmission top view



2. Forward clutch pressure test port Transmission top view
   - Select forward first
   - Pressure should be 13.5 – 16.5 bar
   - Max pressure 0.3 bar in neutral