

Propulsion Train - stern tube, plumber block, universal couplings					REF:	Roger-07	
	1		2 hr		Some	Weather	Any

Aim:

To inspect, adjust and lubricate the propulsion train from but not including the reduction gearbox to and including the stern tube.

Periodicity:

Annual

Reason:

Apart from the universal coupling just after the reduction gearbox, the propulsion train is hidden from view under the cabin floor. There are grease nipples, the stern tube and mechanical items which require regular attention.

Overview:



Fig 07-01
Prop shaft looking forward towards the reduction gearbox and forward universal joint



Fig 07-02
Prop shaft looking back towards the aft universal joint and stern tube



Fig 07-03
Plumber block



Fig 07-04
Stern tube

The propulsion train runs from the reduction gearbox output shaft with a universal joint onto a propeller shaft, see **Fig 07-01**. The shaft attaches to another universal joint, see **Fig 07-02**. The shaft on the other side of this joint is supported by a plumber block, see **Fig 07-03**. This shaft finally runs through the stern tube stuffing gland, see **Fig 07-04**, to the propeller. The stern tube is packed with grease and stuffing to lubricate the shaft and prevent water from entering. The electronic device attached to the shaft next to the plumber block is an experimental motion detector and does not form part of this job sheet. Unfortunately, it was not possible to take one photograph of the whole propulsion train.

Difficulty level:

This is not a difficult task and should be within the capabilities of anyone familiar with basic mechanical systems and terminology.

People and duration:

Apart from the metric spanners and vernier caliper, all the tools required are available on the boat and can be found on the tool board, in the red toolbox under the oil tank or on top of the main fuel tank. Apart from a few pieces of dirty paper, there are no hazardous materials which need disposal. The job should not take more than two hours for one person.

Equipment needed:

Grease gun

Small tub of Morris K99 water resistant grease (kept normally on the bulk fuel tank)

Blue paper

3/16" Allen key

9/16" ring spanner

19mm ring spanner or socket with a tommy bar (**not on the boat but in the RWT workshop**).

Torch

Vernier caliper or steel rule (**not on the boat**)

Special notes/risk assessment:

Authority: Permission to carry out the work must be obtained from the **Conservation Manager**.

Access: Entry into the engine room is awkward and the towpath may be wet. There is a possible crush injury between the hull and bank; therefore, take care not to let any body part drop between the two.

Entry and exit: Once the hatch is open, ensure that the rung ladder is secure. Holding onto the roof rail above the opening, enter the space forward, taking care on the ladder. Leave the engine room backwards, using the ladder and rail as for entry.

Engine room and cabin: The engine room floor is uneven and slippery. Space is very limited and there are many trip hazards and sharp edges. Access to the cabin is needed and the door should be opened for extra light and access. It will be necessary to go back and forth through the cabin and engine room door and care needs to be taken not to tread on any pipework.

Environment: Apart from contaminated paper used for cleaning which should be disposed of responsibly, there are no large volumes of oils or greases. **Do not contaminate the bilge or canal with oil or grease.**

Tools: Apart from the metric spanners and vernier, all tools for the task are on the boat. If any are found to be missing or defective, work must not proceed until a replacement is found; **faults need to be reported.**

PPE: Overalls or other suitable clothing is required because access to and crawling in the bilge is necessary. Disposable latex or similar gloves should be worn.

Preparation: **Read the whole of this document before proceeding; if in doubt, ask the Conservation Manager.**

Safety: The task involves working on machinery which rotates when in use. Rotating machines are dangerous and it will be necessary to isolate the engine, see **Appendix 1**.

Method: access to transmission train



Fig 07-05
Undisturbed
Cabin floor



Fig 07-06
Coal box pulled
forward



Fig 07-07
First floor panel
removed

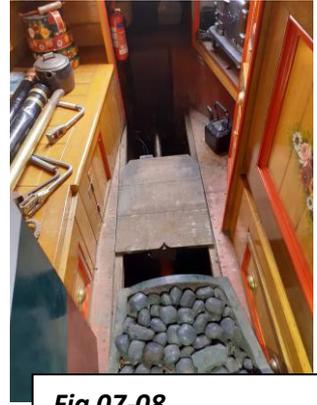


Fig 07-08
Second floor panel
pulled forward ready
to be lifted

The photos above, taken from the engine room door, show the easiest way to gain access to the propeller shaft, aft universal joint, plumber block and stern tube.

- Pull the coal box to the front of the cabin.
- Remove the first section of flooring and store safely out of the way.
- Pull the second flooring panel forward so it clears the lockers and lift out. Store safely out of the way.

Put the forward/reverse gearbox in neutral and by gripping and turning the propeller shaft, make sure that neutral has been found.

Method: stern tube

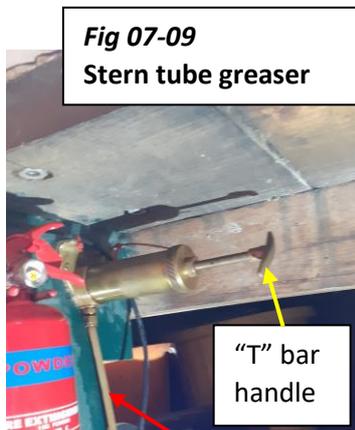


Fig 07-09
Stern tube greaser

The stern tube is greased by turning the “T” bar clockwise on the end of the greasing cylinder, which is located under the cabin step, see **Fig 07-09**. It should be turned **by hand** until resistance is felt – probably no more than one full turn. Refill the cylinder as described in **Appendix 2**.

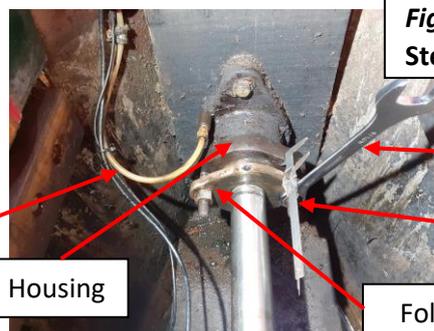
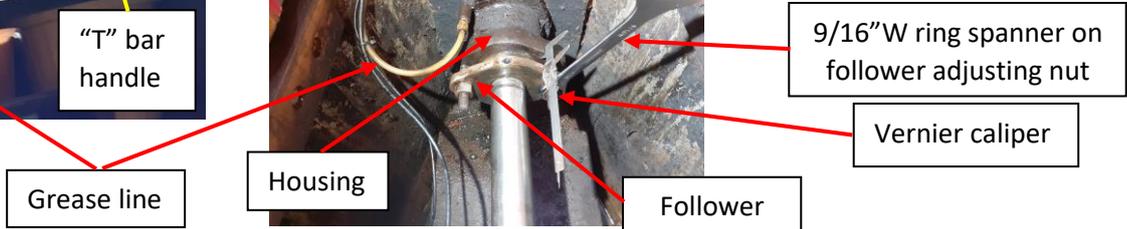


Fig 07-10
Stern tube follower assembly



The stern tube follower adjusts the stuffing gland and using the 9/16”W ring spanner, nip up the nuts equally until resistance is felt – **do not be tempted to overtighten otherwise the shaft might seize in the stuffing gland**. Using a vernier caliper or steel rule, check that the gap between the follower and the housing is equal on both sides, see **Fig 07-10**. Turn the propeller shaft by hand to confirm that the gland is not too tight. Do not attempt to adjust the coach bolts through the stern tube housing into the stern post.

Method: plummer block and aft universal joint

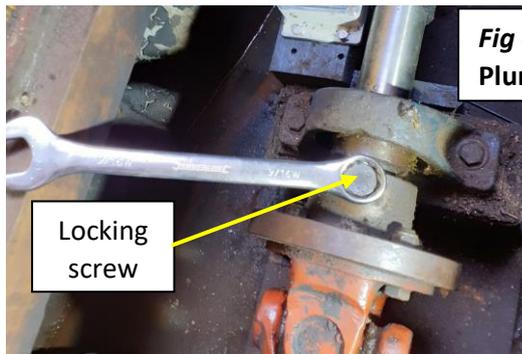


Fig 07-11
Plummer block

The forward/astern gearbox must be in neutral for all the following operations. In neutral, the shaft can be rotated by hand.

The shaft through the plummer block is pinched to the aft universal coupling by a large locking screw with a 9/16" W head. This can work loose and should be tightened with the ring spanner.

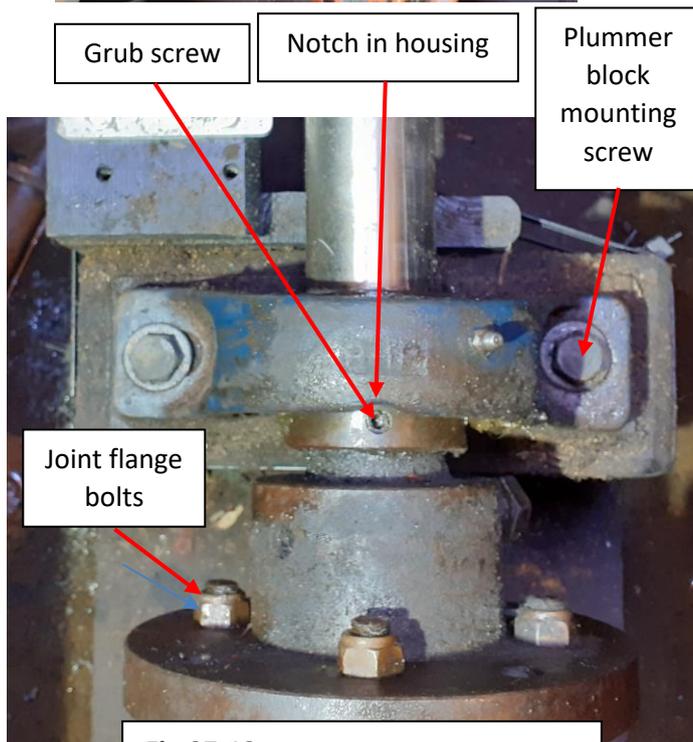


Fig 07-12
Plummer block grub screws

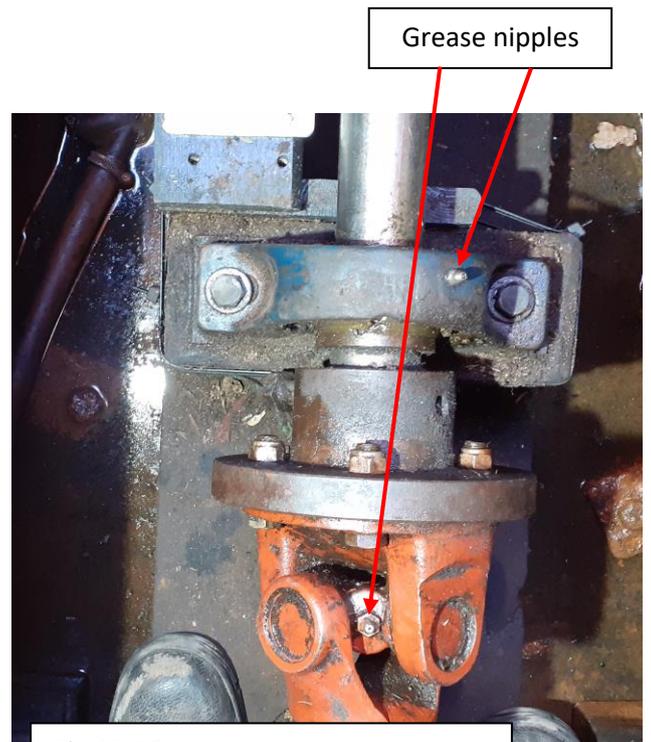


Fig 07-13
Plummer block and aft universal joint grease nipples

Plummer block grub screws:

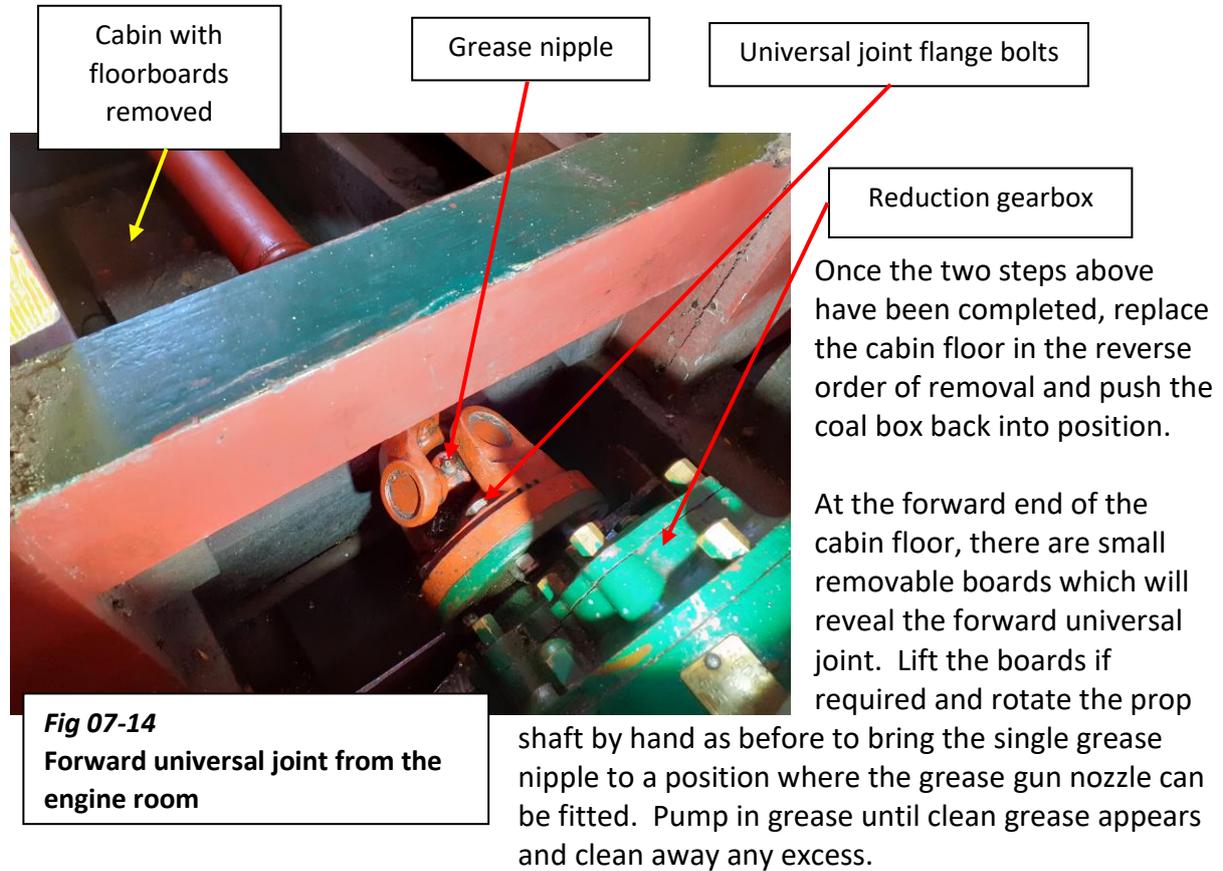
The plummer block inner race is secured to the prop shaft with two socket head grub screws set at 90deg to each other and they can work loose. To check, turn the prop shaft by hand to line up one grub screw with the notch in the plummer block housing and clean out the socket so that the 3/16" Allen key can be used, see **Fig 07-12**. Tighten the first screw and turn the shaft again to line up the second screw and repeat. Using the grease gun, pump grease into the bearing housing until clean grease appears. Wipe away any excess grease. Check the tightness of the flange bolts and the plummer block mounting bolts with the 19mm ring spanner.

Universal joint grease nipple:

There is one grease nipple on the universal joint. Turn the prop shaft by hand until it is visible and use the grease gun to pump in grease until clean grease appears. As before, wipe away any excess grease.

Method: forward universal joint

The forward universal joint is visible from the engine room but it may be easier to grease it from the cabin.



It's difficult to fit a ring spanner onto the flange bolts. Rock the shaft back and forth by hand and make a visual check. If they appear to be loose, inform the **Conservation Manager**.

Replace the cabin floor boards if they have been removed and collect all the contaminated paper into a secure bag for safe disposal. Clean all the tools and return them to their rightful locations.

Appendix 1: Engine isolation



There is a remote chance that someone might start the engine when the transmission train is being serviced. **This is potentially very dangerous and the engine needs to be isolated.** The simplest way of doing this is for the person carrying out the task to keep the starting handle - see **Fig 07-15**, shown in the starting position - with them until all work is finished.

Appendix 2: Filling the stern gland greaser

Because this task is part of the annual service routine, the stern gland greaser should be refilled ready for use during the following season.

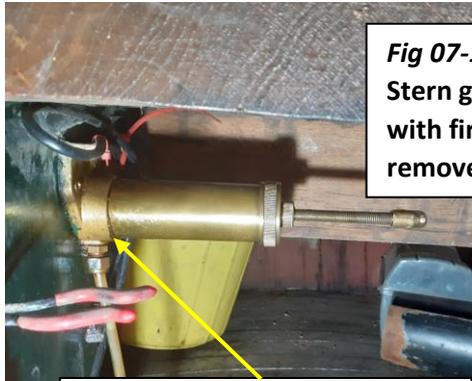


Fig 07-16
Stern gland greaser
with fire extinguisher
removed

Unscrew the cylinder **by hand**
and remove from this joint

Unscrew the greaser body from the base mount, see **Fig 07-16**. Grease will be flush with the end of the cylinder, see **Fig 07-17**.

Using the "T" handle unscrew the greaser piston until the grease is pulled away from the end of the cylinder.

Fig 07-17
Stern gland
greaser cylinder



Fig 07-18
Spooning grease
into the stern gland
greaser

Using a clean pallet knife or similar, spoon **Morris K99** water resistant grease into the cylinder, see

Fig 07-18 until the grease is flush with the cylinder end. Repeat until the piston is fully retracted and the grease up to the end of the cylinder. Screw the cylinder back onto its base.

Note that the cylinder to base threads are very fine and great care is needed; use hands only, never use a chain wrench or similar.

Screw in the "T" bar rod until resistance is felt and wipe off any excess grease.

Tips:

- It is good practice to use ring spanners or sockets wherever possible.
- Neutral can be awkward to find. Using the starting handle to turn the engine slowly with the cylinder decompression levers set to open, watch the first universal joint which will not rotate when the gearbox is in neutral.

Finally:

When work is completed and all the floor is replaced, replace the starting handle on the fuel tank within the fiddle.

Make sure the cabin and engine room are clean. Remove any rubbish and dispose of responsibly. Leave and secure the boat. Report completion of the task to the **Conservation Manager**.