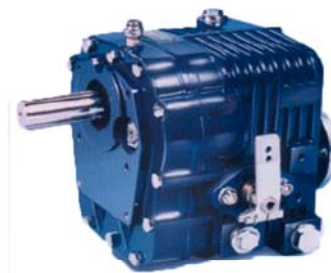


**manual for:**

**PRM120**



**this manual is offered to you by:**



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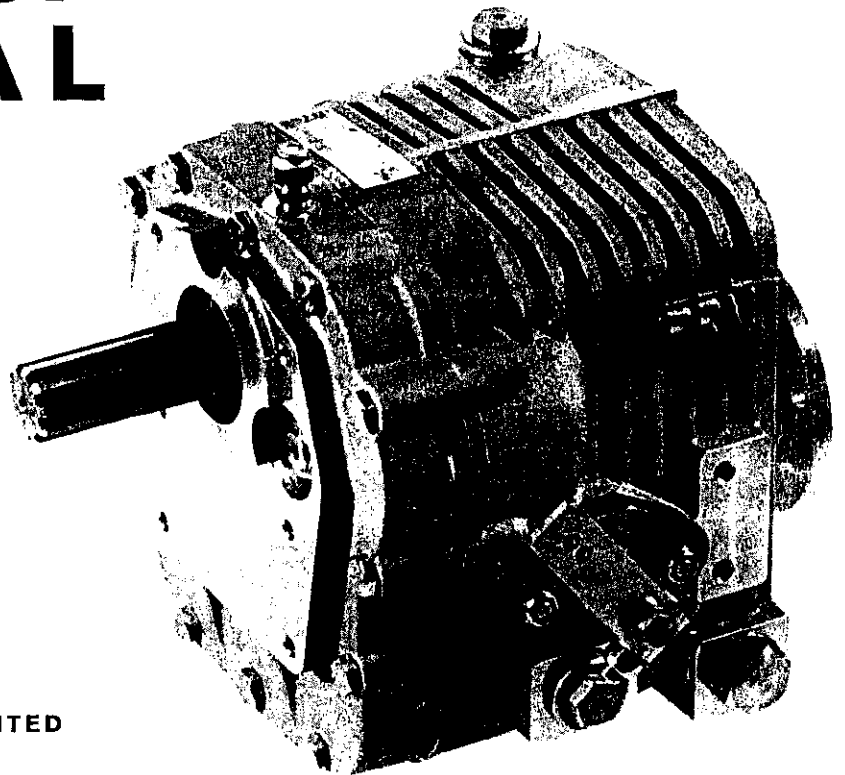
# NEWAGE

PRM

# PRM120

MARINE GEARBOX

# WORKSHOP MANUAL



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- ISSUE: 1 5/97

The following international symbols are used in this service manual.



**WARNING: THIS SYMBOL WARNS OF POSSIBLE PERSONAL INJURY**



**CAUTION: THIS SYMBOL WARNS OF POSSIBLE DAMAGE TO TRANSMISSION**

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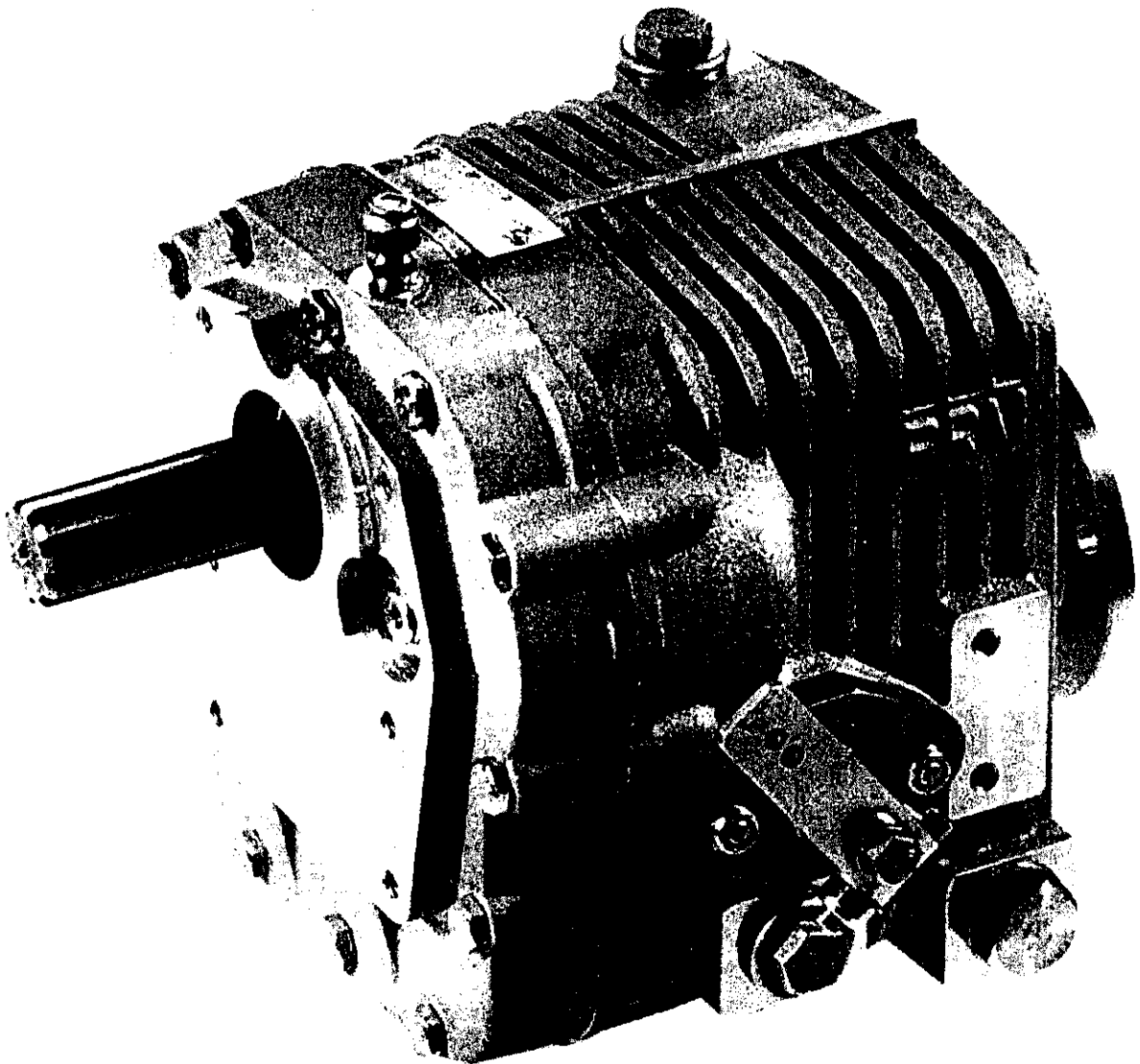


Fig. 1

## **FOREWORD**

Provided it is correctly installed, aligned and maintained, the PRM120 gearbox should have a long and trouble-free life. This workshop manual contains important instructions to ensure that this is so, and it is of the utmost importance that these are carefully followed. Newage Transmissions Ltd. can accept no responsibility under warranty or otherwise for any loss or damage resulting from failure to observe these instructions.

To avoid prejudicing your rights under warranty, do not undertake any repair or other work on the gearbox during the warranty period without first contacting Newage Transmissions Ltd. or an authorised dealer for advice. In the event of failure, you should do this via the engine distributor who supplied the gearbox, or his local dealer; if this is not possible, you should notify the local Newage distributor/dealer or Newage Transmissions Ltd. direct, quoting the serial number.

## **CLAIMS UNDER WARRANTY**

Claims for replacement of parts under warranty must always be submitted with the gearbox serial number to the distributor who supplied the gearbox; if this is not possible, application may be made to the nearest distributor, who must, however, be advised of the supplier's name and address.

## **SERVICE PARTS**

The comprehensive illustrated parts list gives full information and ordering procedure.

## **PRE-DELIVERY TEST**

Before it leaves the factory, every gearbox is subjected to a final test and inspection which includes the following:-

1. Flush clean.
2. Pressurise the case, and check for leaks.
3. Check drag torque in ahead, neutral and astern.
4. Run gearbox in neutral, ahead and astern.
5. Check force to engage and disengage ahead and astern gear.
6. Check noise levels.
7. Check output nut torque.
8. Check coupling concentricity.

## IDENTIFICATION PLATE

Every PRM gearbox is fitted with an identification plate on the top half of the gearcase before it leaves the factory; an example of such a plate is shown below.

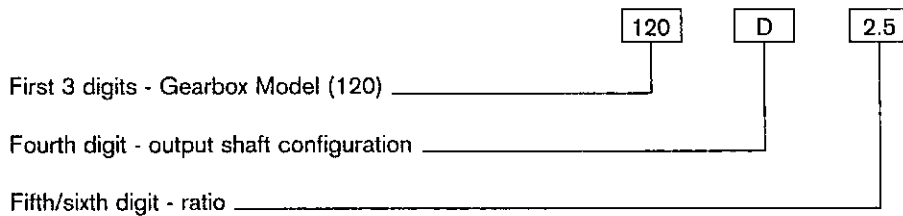
NEWAGE	PRM	COVENTRY
123456		R1234
120D2.5		
MADE IN ENGLAND		

NEWAGE	PRM	COVENTRY
MADE IN ENGLAND		

Please complete the above box with serial number and specification of your own gearbox.

It will be noted that there are two lines of numbers.

The top line is the gearbox serial number, and should always be quoted when ordering spare parts; the lower line is the gearbox specification, in the example given this translates as follows:-



**NOTE:** Throughout this manual, engine, gearbox and propeller rotation are always described as seen looking forward from the propeller to the engine.

## 1. GENERAL DATA

### 1.1 Specifications

Gear ratios - ahead

2.04:1, 2.50:1, 2.94:1

Gear ratio - astern

2.50:1 - common

### POWER RATING

AHEAD RATIO	PLEASURE	
	BHP	kW
2.04:1	1.67	1.25
2.50:1	1.34	1.00
2.94:1	1.11	0.83
Max. Input Power	67	50

**Note:** These powers are expressed in BHP and kW per 100 rev/min engine speed, and are measured at the engine flywheel. Ratings have been established to ensure the long trouble-free life of the gearbox which should not, therefore be used at powers in excess of those shown.

#### Input speed:

Maximum operating speed 5000 rev/min.

#### Input rotation:

For engines of left-hand (anti-clockwise) rotation as viewed looking on the flywheel from behind the engine.

#### Output rotation:

Right-hand (clockwise) in ahead direction.

#### Approximate dry weight:

16kg (35lb) excluding adaptor flange.

#### Oil capacity:

0.8 litres (1.4 pints).

#### Working oil temperature:

The normal operating temperature should be in the range 50°C to 120°C.

#### Engine Mounting adaptors:

Available in SAE5 and Velvet Drive (Borg Warner).

#### Input drive couplings:

Flexible centre damper plate SAE 6.5" or SAE 7.5".

#### Gearcase:

Made from heavy duty aluminium alloy for use in a marine environment, webbed internally for strength and rigidity, external fins to aid cooling.



**Input shaft:**

28.5mm diameter with 10 tooth spline to DIN5464.

**Propeller thrust:**

Ahead and astern thrust is carried by output shaft bearings of ample capacity for the approved rating.

**Output flange:**

102mm diameter, with 4 holes 10.5mm diameter on 82.5 pitch circle diameter.

**Installation angle:**

The maximum fore and aft installation angle at rest is 15°.

**2. INTRODUCTION**

Newage Transmissions Ltd. PRM120 marine transmission is a simple, lightweight, mechanically operated gearbox for use in pleasure craft. Ahead and astern is selected by engaging a cone clutch which requires no adjustment. The PRM120 can only be installed onto engines that rotate left hand (anti-clockwise) as viewed when standing behind the gearbox output coupling facing towards the engine flywheel.

**3. CONSTRUCTION**

**3.1 Gearcase**

The gearcase is made from heavy duty aluminium alloy rigidly designed and externally ribbed for efficient heat dissipation. The case assembly comprises two halves vertically split to facilitate servicing.

**3.2 Gear train**

The gear train is manufactured from high grade steel with all gears being hardened for long life. All shafts are supported on taper roller bearings which are amply proportioned to absorb all the thrust from the propeller.

**4. OPERATION**

**4.1**

With the control lever in the mid, or neutral position no power is transmitted to the propeller as the cone clutch is not engaged with either ahead or astern gears. Moving the lever forward i.e. towards the engine selects ahead, and rearwards i.e. towards the propeller selects astern. In ahead the output shaft rotates in the opposite direction to the input shaft (which rotates as engine). It is therefore necessary to fit a right hand propeller.

**4.2 Lubrication**

All lubrication is supplied by internal splash with oil cooling being by radiation through the gearbox case.

**4.3 Approved oils**

TEMP	TYPE OF OIL
Below Zero	10W30 or 20W engine oil to AP1 designation CD
0°C to 30°C	10W30 or 15W40 engine oil to AP1 designation CD
Above 30°	10W30 or 40W engine oil to AP1 designation CD
<b>Note: Gearboxes are dispatched from the factory without oil.</b>	

It is essential that only good quality engine oil, supplied by a recognised and well known manufacturer, is used in the PRM120. Do not mix different brands, types or grade of oil.

## 5. INSTALLATION

### 5.1 General

Drive is transmitted from the engine to the gearbox via a flexible centre drive plate (damper plate) which bolts to the engine flywheel, the gearbox input shaft is driven from the centre spline.

These drive plates have a degree of torsional flexibility, the purpose being to reduce engine torsional or cyclic vibrations and prevent them being passed to the transmission.

The strongest engine vibrations are usually those caused by firing in the cylinders; diesel engines which have high compression ratios, usually generate stronger vibration pulses than petrol (gasoline) engines; and it is often the case that of two engines of roughly equivalent size, the one having the greater number of cylinders will tend to run more smoothly than the one with fewer cylinders, although this is by no means always the case.

In all marine installations, correct alignment of the engine, gearbox and propeller shaft is extremely important - misalignment can cause noise, vibration and premature failure - and it is strongly recommended that all the procedures detailed in this manual are carefully followed.



**CAUTION:** It is particularly important to ensure the torsional compatibility of the complete propulsion system from engine through to propeller since disregarding this may result in gear noise at low speed operation and in extreme cases damage or failure of components. Newage Transmissions Ltd. will provide all possible information and assistance to help find solutions to potential torsional problems, but it is the ultimate responsibility of the person assembling the drive and driven equipment to ensure that they are torsionally compatible.

### 5.2 Checking the engine flywheel housing

Attach a dial test indicator, calibrated in units of 0.025mm (0.001in.) or smaller, to the flywheel so that the measuring stylus of the indicator is perpendicular to the bore of the flywheel housing (bore A on Fig.3). Rotate the flywheel and check the deviation on the indicator over one complete revolution: this should not exceed 0.152mm (0.006in.) total indicator reading.

With the dial test indicator still attached to the flywheel, re-position the stylus so that it is perpendicular to the face of the flywheel housing (face B on Fig. 3). Rotate the flywheel and check the deviation over one complete revolution; again, this should not exceed 0.152mm (0.006in.) total indicator reading.

### 5.3 Checking the engine flywheel

Attach a dial test indicator, calibrated to 0.025mm (0.001in.) or less, to the engine flywheel housing so that the measuring stylus of the indicator is perpendicular to the bore of the register in the flywheel (bore C on Fig. 3). Rotate the flywheel through one complete revolution and note the deviation, this should not exceed 0.125mm (0.005in.) total indicator reading.

With the dial test indicator still attached to the flywheel housing, reposition the stylus so that it is perpendicular to the face of the flywheel register (D on Fig. 3). Rotate the flywheel through one complete revolution and note the deviation, this should not exceed 0.125mm (0.005in.) total indicator reading.

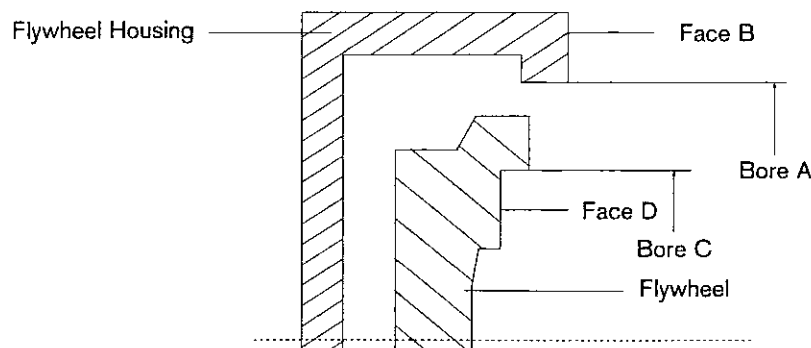
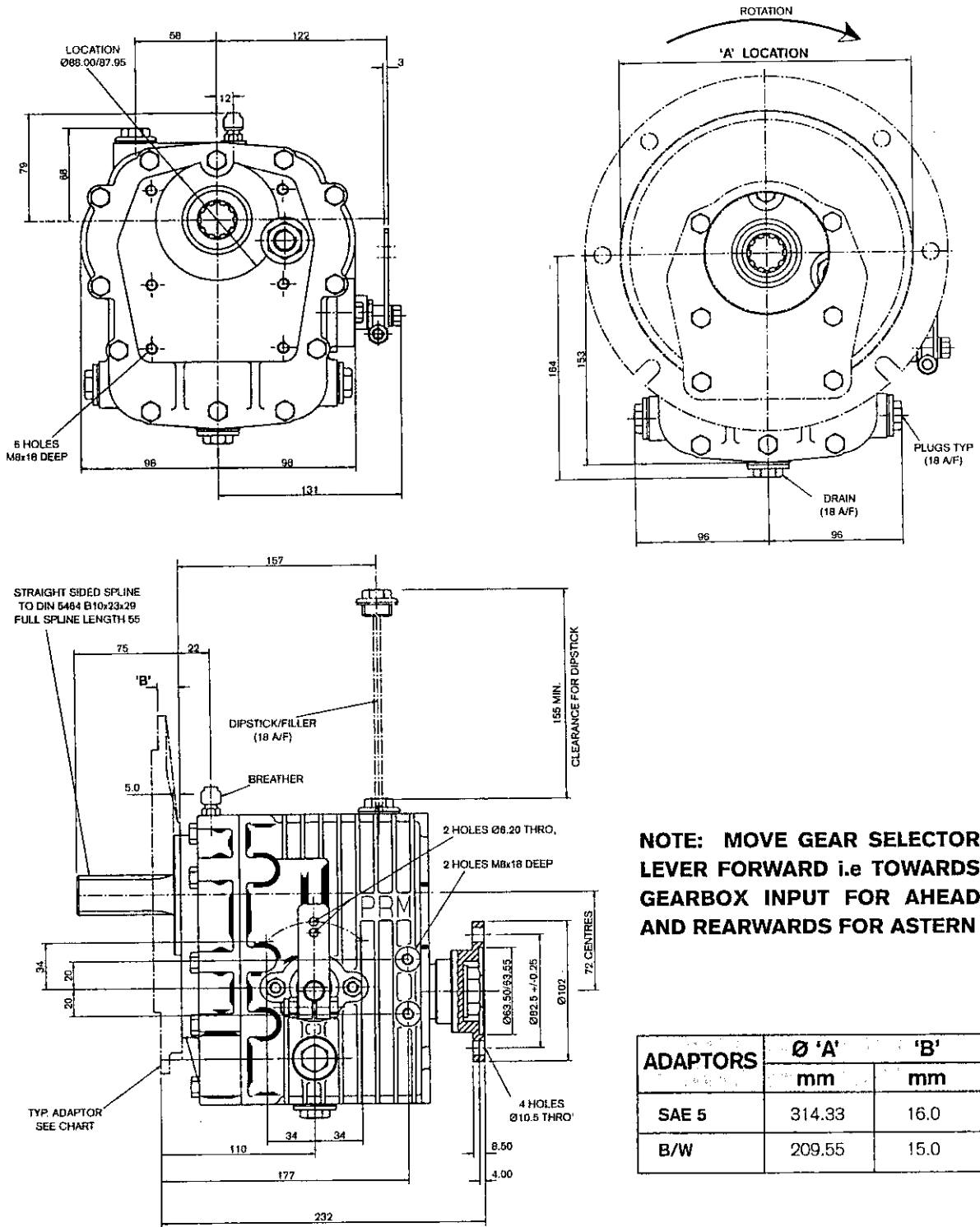


Fig. 2 Checking the flywheel and flywheel housing

## BASIC INSTALLATION DETAILS - PRM120



### INSTALLATION ANGLE

The maximum fore and aft installation angle permissible at rest is 15°.

### IMPORTANT NOTE

All information given in this manual is correct at the time of going to press. However, in the interests of technical progress, design specifications are subject to change without notice. Accordingly, data given herein should be regarded as a general guide only and does not form part of any contract. Any specific performance requirements must be made known to us in writing with customer orders for goods. Illustrations are approximate only and do not form part of any contract with us; certified installation drawings are available on request. All goods are supplied in accordance with our standard terms and conditions of sale.

Fig. 3

## 5.4 Mounting the gearbox to the engine

1. Mount the drive plate to the flywheel, using an alignment mandrel if available, and bolt to the flywheel. Where components to SAE standard are used, the outside diameter of the drive plate should be a close fit in the register on the flywheel.

If a mandrel is not available, tighten the bolts just sufficiently to prevent free movement, assemble the gearbox to the drive plate and rotate the engine two or three revolutions by hand to align the plate.

Tighten up two or three opposite bolts. Remove the gearbox and fully tighten all the drive plate bolts.

2. Offer the gearbox and adaptor up to the drive plate and flywheel housing. Insert the gearbox input shaft into the centre of the drive plate (it may be necessary to rock the shaft slightly to ensure the splines align). Press the assembly fully into position, align the holes in the adaptor with those on the flywheel housing and tighten fully. See fastening torque chart 10.2, page 16.

## 5.5 Alignment to propeller shaft



**CAUTION:** Alignment between the propeller shaft and the mating flange on the gearbox output shaft is extremely important since excessive vibration and stress may lead to premature failure if correct alignment is not achieved.

It is generally considered preferable to couple the propeller shaft direct to the gearbox output flange using a rigid coupling particularly in the majority of boats whose hulls have sufficient rigidity as not to allow flexing in heavy sea conditions, which could cause the engine and transmission to shift in relation to the propeller shaft.

The two main conditions when a flexible coupling should be used are:

- a) in boats whose hulls are not sufficiently rigid to prevent the flexing referred to above,
- b) in cases where the engine is mounted on flexible mounts.

In both instances, the flexible coupling helps to isolate engine vibration or other movement from the propeller shaft thus enabling correct alignment with the propeller shaft and stern tube to be maintained.

Whether a solid or flexible coupling is used, it is extremely important that the following points are carefully checked:

- i) the coupling should be a tight press fit on the shaft and the keyway accurately made to the correct size, and
- ii) the two halves of the coupling should be carefully aligned. This should be done by bringing the two flanges close enough together so that a feeler gauge can be used to check the vertical and horizontal alignment.

Since the propeller shaft line is normally fixed in the boat, alignment is usually obtained by adjusting engine mount shims on the mounts themselves.

Note: Whenever possible, the engine and gearbox should be installed whilst the hull is afloat, otherwise there is a danger of the hull distorting because of insufficient support over its surface. If the engine and transmission are fitted before the hull is in water, the installation should be very carefully re-checked for alignment after launching.

In designing PRM120, SAE standards were adhered to as far as possible. However, other manufacturers of similar sized transmissions have a different, but common, output coupling spigot, which is not to SAE. This spigot size has become the industry standard and most proprietary flexible output couplings are made to suit.

## 5.6 Installation angle

The transmissions should normally be installed so that the maximum fore and aft angle relative to the water line does not exceed 15° with the boat at rest. Please consult Newage Transmissions Ltd. if installation angles greater than this are required.

## 5.7 Remote control operating systems

The PRM120 can be used with remote control operating systems which must be of the single lever type of remote control, i.e. Morse MT3 or SL3 which controls both the engine throttle and gear selection.

The following points should be noted:

- i) The gearbox operating lever is provided with a positive neutral position, which greatly assists the setting up of the remote control unit.



**CAUTION ii)** care should be taken to ensure that the cable moves the gearbox lever to the full extent of its travel both forward and backward. This is most important for correct gear selection.

The control equipment should in all cases be connected in accordance with the manufacturer's recommendations.

## 6. OPERATION

### 6.1 First time usage



**CAUTION:** Before starting the engine fill the gearbox to the correct level with a suitable oil (refer to recommended list, section 4.3, Page 7).

Ensure the gearbox is in neutral. Start and run the engine for a short time so that the oil circulates through the gearbox. Stop the engine and allow the oil to settle for 2 minutes, re-check the level and top up if required to the maximum mark on the dipstick.

### 6.2 Drive selection

The PRM120 has been designed to operate with proprietary single lever control systems which decreases the engine speed to idle before opposite gear selection can be made. It is most important that when changing direction a short pause is taken in neutral at engine idle before selecting gear.

### 6.3 Trailing (free wheeling) the propeller

The output shaft can be rotated continually with the engine shut down which makes the PRM120 particularly suited for use in auxiliary sailboats, sailing yachts etc.



**CAUTION:** Under these conditions the gear lever **MUST BE IN THE NEUTRAL POSITION**

## 7. ROUTINE MAINTENANCE

### 7.1. Initial maintenance (after 25 hours running)

Drain all oil from the gearbox, the drain plug is located in the centre of the underside of the transmission, an 18mm across flats spanner is required. Refit drain plug.

Refill with oil as stated in 4.3. Page 7.

### 7.2 Daily checks

Check the gearbox oil level.  
Visually inspect for oil leaks and general condition of the gearbox.

### 7.3 Six monthly check

Check the remote control operating linkage is accurately adjusted to give maximum travel (stop to stop) in both directions.

### 7.4 Annual check

All above checks.  
Propeller shaft alignment inspection.  
Change gearbox oil and re-fill.

## 8. FAULT FINDING

The following fault finding chart is designed to help diagnose some of the problems which might be encountered. It assumes that the installation and operating instructions in this manual have been followed and we advise that these are checked before proceeding to fault finding.

To avoid prejudicing warranty rights, no repair or other work should be done on the gearbox during the warranty without first contacting Newage Transmissions Ltd. or an authorised distributor or dealer for advice.

**FAULT FINDING CHART**

SYMPTOM	CAUSE	REASON	REMEDY
No drive ahead or astern		Broken drive plate Broken input shaft Broken output shaft	Replace drive plate Replace input shaft Replace output shaft
Propeller speed does not increase with engine speed, ahead and astern		Remote control cable or linkage not allowing F-N-R lever to move correct distance	Remove cable and operate lever by hand to check movement. Adjust cable if necessary
Propeller speed does not increase with engine speed in one direction only		Damaged clutch cones Incorrect lever setting	Remove and examine clutch cone and replace if necessary Reset lever to end stops
Excessive noise from gearbox at low speeds	Engine idle speed set too low Torsional vibration	Faulty adjustment Torsional incompatibility of elements in driveline	Increase idling speed If cured by increasing engine idling speed, refer to engine supplier
Excessive noise throughout operating range	Defective input coupling Propeller shaft misalignment	Input coupling worn or damaged Hull flexing or faulty installation	Remove, examine and replace if necessary Check the alignment of the propeller shaft coupling; if necessary rectify by adjusting the shims under the engine mounts or the engine mounts themselves
Excessive vibration throughout operating range	Propeller out of balance Engine/gearbox misalignment Defective bearing	Propeller damaged or badly machined Faulty installation Bearing worn or damaged	Remove the propeller and check that the pitch, weight, diameter and balance of all the blades are equal and rectify if necessary. Remove the transmission and check that the flywheel face is flat and that the flexible input coupling is aligned correctly Isolate defective bearing, remove and replace
Excessive oil temperature	Power too high Oil level too high/low	Incorrect engine rating Incorrect oil type	Re-assess engine power Fill with correct oil Fill to correct oil level on dipstick
Oil level needs constant topping up	Oil leaks	Defective oil seal, sealant or 'O' ring	Clean the outside of the gearcase, particularly around the ends of shafts including the output shaft. Run the engine and inspect the gearbox for leaks. Replace seals as required
Escape of high pressure from gearbox when dipstick is removed	Defective breather causing leaks past oils seals		Contact distributor or factory for advice
Difficulty in moving single lever control	Faulty installation	Incorrect selector shimming Remote control operating cable kinked or frayed	Re check shimming see 9.7.6 for procedure Check the installation and eliminate all tight bends in the cable



**WARNING:** Before carrying out any service work always ensure that the engine is switched off and disconnect the operating cable from the gearbox.



**CAUTION:** The above operations should be carried out by suitably qualified personnel and strictly in accordance with the procedures detailed in the workshop manual.

## 9. SERVICING AND REPAIRS - GENERAL



**WARNING:** Before removal of the gearbox for repair or overhaul carefully study the following procedures. Use proper hand tools, slings or hoists for the job - **WORK SAFELY**  
Keep all work areas, tools and gearbox clean. Wipe up any spilled oil or fluids to prevent accidents. Wear correct safety equipment i.e. safety glasses and safety shoes to guard against personal injury.

Remember **WORK SAFELY - USE COMMON SENSE.**

Drawings showing all internal components are contained in the parts lists. See page 17.

### 9.1 Seals

Remove oil seals carefully to prevent damage if they are to be re-used, however it is best to replace these items.

### 9.2 Bearings

If removing bearings for re-use keep them in matched sets i.e. cone and cup together.

### 9.3 Cleaning



**WARNING:** If using cleaning solvents these can be toxic, flammable, a skin irritant or give off harmful fumes. Avoid prolonged contact, vapour inhalation, or smoking. Failure to take care can result in injury or death.

Rinse all metal parts in solvent to remove dirt, grease and oil.

Be careful to remove solvent from items before re-fitting.

### 9.4 Inspection

#### 9.4.1 Gearcase

Inspect for cracks. Check sealing surfaces for any scratches, damage etc. which will lead to oil leaks.

#### 9.4.2 Gears

Inspect for any chipped broken or cracked gear teeth, also for any excessive wear, i.e. gear pitting.

#### 9.4.3 Bearings

Inspect for any damage, pitting or over-heating.

#### 9.4.4 Threaded parts

Inspect for stripped or damaged threads.

### 9.5 Assembly



**CAUTION:** All threaded fasteners must be tightened to the torques listed in table 10.2, page 16 to prevent premature failure.

**CAUTION:** A new output shaft and drive flange nut must be fitted if these are removed. Prior to assembly oil all internal parts with clean gearbox oil.

### 9.6 Disassembly of gearbox

Drain oil and remove adaptor plate. Hold drive flange (1) securely whilst removing locknut (9), carefully remove the "staked" portion of locking device so as to avoid damaging thread of output shaft (10).

#### 9.6.1 Selector assembly

Remove the drive flange (1). Release two nuts (34) securing selector housing (21). Withdraw selector assembly ensuring selector shoe (27) and spring (22) do not fall into the gearbox.

#### 9.6.2 Gearcase assembly

Remove locknut (35) securing idler shaft (38) into gearcase. Remove eleven bolts (28) and using a soft mallet lightly tap on the end of the input shaft (12) to split the two casings apart from dowels (16A). Remove the front cover (30). Withdraw the idler shaft (38) the output shaft assembly (10) and the input shaft (12).

#### 9.6.3 Input shaft

Using a bearing puller remove the two bearings (15) ensuring the cups remain with their respective cones. See 9.4.3.

#### 9.6.4 Output shaft

Carefully remove "staked" portion of locking device so as to avoid damaging the thread and remove locknut (9) from output shaft (10). Using a bearing puller remove the one bearing cone (15) on the output end of the output shaft.

Remove the following: thrust washer (7), gear (3), needle bearing (2) (carefully checking for wear), thrust washer (4), cone clutch (5). Using puller remove the bearing cone (15) on the input end of the shaft, thrust washer (7), output reverse gear (6), needle bearing (2) (again carefully checking for wear), and thrust washer (4).

#### 9.6.5 Idler shaft

Remove locknut (9) again carefully removing the "staked" portion to avoid damaging the thread, and supporting gear (37) on soft material i.e. wood or similar to prevent damage to gear, tap the shaft (38) through the gear and remove bearing cone (39).

#### 9.6.6 Selector

By hand remove selector shoe (27) and the selector spring (22). Pass the selector control body (20) through the housing (21) and remove 'O' ring (41) and oil seal (42) if replacing them.

#### 9.6.7 Front cover

If it is required to replace the front cover (30) then it will be necessary to remove the oil seal (11) and breather (13). If the bearings (15) are to be re-used the cups can be removed with the aid of two levers.

#### 9.6.8 Gearcase

If it is required to replace the gearcase (14) then the following parts must be removed, again if the bearings are to be re-used then cup and cone must be kept together. Remove output seal (16) bearing cup (15) two studs (40) dipstick (31) drain plug (24) and two further plugs (29) three sealing washers (23) and two dowel pins (16A).

### 9.7 Re-assembly of gearbox

(Note: coat all bearings with clean gearbox oil prior to fitting).

#### 9.7.1 Input shaft

Press the two bearing cones (15) onto the input shaft (12) taking care to position correctly as illustrated.

#### 9.7.2 Output shaft

All of the following components are fitted over the output spline end of the shaft (10).

Large bore thrust washer (4) needle bearing (2) output gear (3) with cone towards the scroll, small bore thrust washer (7) and bearing cone (15) (Press on).

Fit the following components from the opposite end of the shaft (10).

The cone clutch (5) large bore thrust washer (4) needle bearing (2) output reverse gear (6) ensuring cones match, small bore thrust washer (7) press on bearing cone (15) fit locknut (9).



**CAUTION:** Remember to tighten locknuts (9) to recommended torque and **STAKE INTO KEYWAY.** (SEE TORQUE CHART 10.2, PAGE 16)

#### 9.7.3 Idler shaft

Slide on bearing cone (39) so that it abuts fully against the idler shaft (38) shoulder, as shown on the drawing.

Fit the internal spring ring (36) into the groove in the idler gear (37) and press the two bearing cups (back to back) (39) into the idler gear (37). Assemble the idler gear over the one bearing cone, slide the second bearing cone (39) onto the idler shaft (38) taking care to support it under the shoulder NOT the threaded end as this could be damaged. Fit locknut (9) and tighten to recommended torque (see torque chart 10.2 page 16). Fit 'O' ring (43) to idler shaft groove.

#### 9.7.4 Selector housing assembly

\* Before proceeding with this assembly see shimming procedure 9.7.6 page 16.

Press in oil seal (42) flush to the face of selector housing (21). Using tool number PR29418 insert into seal to expand it whilst assembling selector control body (20) into the selector housing (21). This will displace the tool and allow the control body to slide through the seal. Fit the 'O' ring (41) to selector housing, insert spring (22) and selector shoe (27) into selector housing.



### 9.7.5 Shimming (taper bearings)

Both the input shaft and output shaft bearings must be shimmed zero to 0.05mm preload. This is achieved as follows:

1. Measure shafts over bearing cups. Dimension A
2. Measure case bore depths to joint face Dimension C
3. Measure cover bore depths to joint face Dimension B
4. Add cover and case bore depths to give "bore face lengths". Dimension Y
5. Subtract bore face lengths from shaft lengths to achieve shim requirement. Dimension Y-A
6. Fit shims as required to within zero to 0.05mm preload.

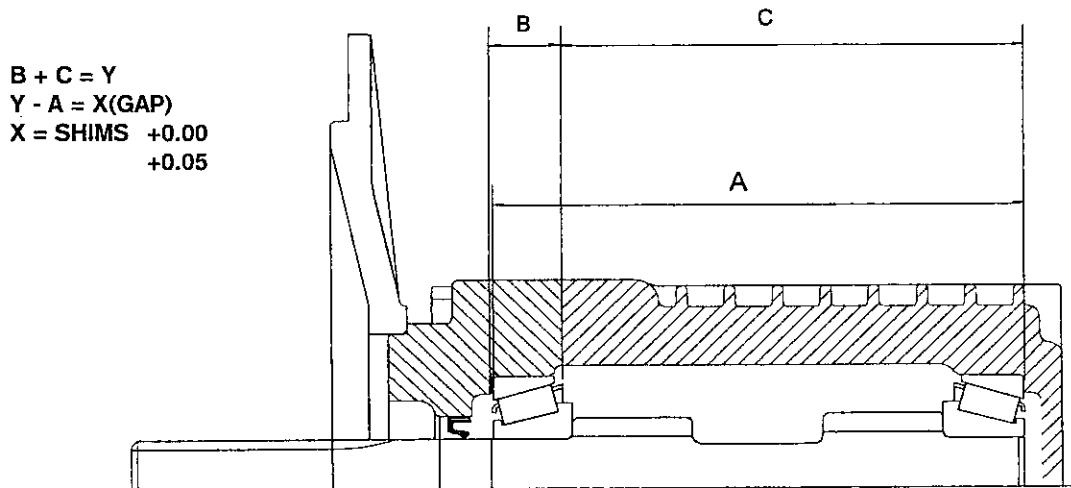


Fig. 4

Place the shims (8) into the appropriate bores of the front cover (30) so that they are located under the bearing cups (15).

Fit the remaining bearing cups (15) into the gearcase (14) bores. Locate both input and idler shaft assemblies into bearings. Fit the two dowels (16A) and apply silicon sealant to the joint face.

Assemble the front cover (30) ensuring dowels are correctly located and fit 11 bolts (28) tightening to the recommended torque.

Fit locknut (35) to the idle shaft, tighten to the recommended torque and then fit the two studs (40) to the gearcase using a hydraulic sealant. (see torque chart 10.2 page 16)

Move the cone clutch (5) to the neutral position, and locate the assembled selector mechanism over the two studs (40). Locate the selector shoe (27) into the groove of the cone clutch, ensuring the identification pip of the selector shoe is uppermost.

Fit the two nuts (34) to the studs (40), tighten to the recommended torque. Secure gear selector lever (19) to the selector control body (20) using bolt (32) washer (33) and nut (34). Fit oil seal (16) to gearcase bore and oil seal (11) to the front cover (30) (see tool sheet). Assemble the output coupling (1) to the output shaft.

Apply silicone sealant to the flat face of the locknut (9) and hydraulic sealant to threads of the shaft. Fit locknut (9).



**CAUTION:** Remember to tighten locknut (9) to the recommended torque and stake the nut into slot. When using sealants and locking compounds all surfaces should first be cleaned by degreasing.

Fit magnetic drain plug (24) to underside of the gearcase and the two plugs (29) together with sealing washers (23). Fit dipstick (31) and sealing washer (23).

Assemble breather (13) tighten carefully as this thread is tapered, finally fit the gear selector lever (19) into the required position.

### 9.7.6 Selector mechanism shimming

Assemble the bolt (17) into the selector mechanism leaving a gap of approximately 2mm.

Ensure the selector mechanism is positively located in the neutral position.

By hand, hold in the mechanism whilst rotating the output coupling in a clockwise direction as viewed from the output coupling. This rotating action will force out the mechanism to the top dead centre. Re-affirm that the selector is still located in the positive neutral.

Carefully screw in the bolt (17) until contact is made with the end of the shoe, thus removing all end float (see caution below) using feeler gauges measure the gap under the head of the bolt.

Add to the measured dimension 0.6mm (+ 0.1mm - zero tolerance).

Remove the bolt (17). Place the measured shims under bolt head. Apply hydraulic sealant to the bolt threads re-fit and tighten to the recommended torque.



**CAUTION:** This condition can only be maintained with the clutch at the top dead centre. If this is not achieved the gear selection will be affected, creating difficulty in gear engagement or disengagement.

## 10. SPECIAL TOOLS

Oil seal to selector housing	PR29418
Oil seal to gearcase	PR29281
Oil seal to front cover	PR29283

### 10.1 Tool Kit

Socket size	13mm
	24mm
	30mm
Drain plug	1" AF
Dipstick	18mm

### 10.2 Tightening torques

RECOMMENDED TIGHTENING TORQUES			
Size	Grade	Type	Nm
M8	8.8	Nut	24
M8	8.8	Stud	13
M8	8.8	Screw	30
M16	8.8	Binx Nut	56
M20	8.8	Special nut	205
		Staked nut idler	1.7

## 11. REPLACEMENT PARTS ORDERING

When ordering replacement parts the following should be quoted:

- Gearbox model and serial number
- Description(s) and part number(s) of the component(s) required
- Quantity required
- Orders and enquiries for replacement parts must be made through Newage distributor/dealer network

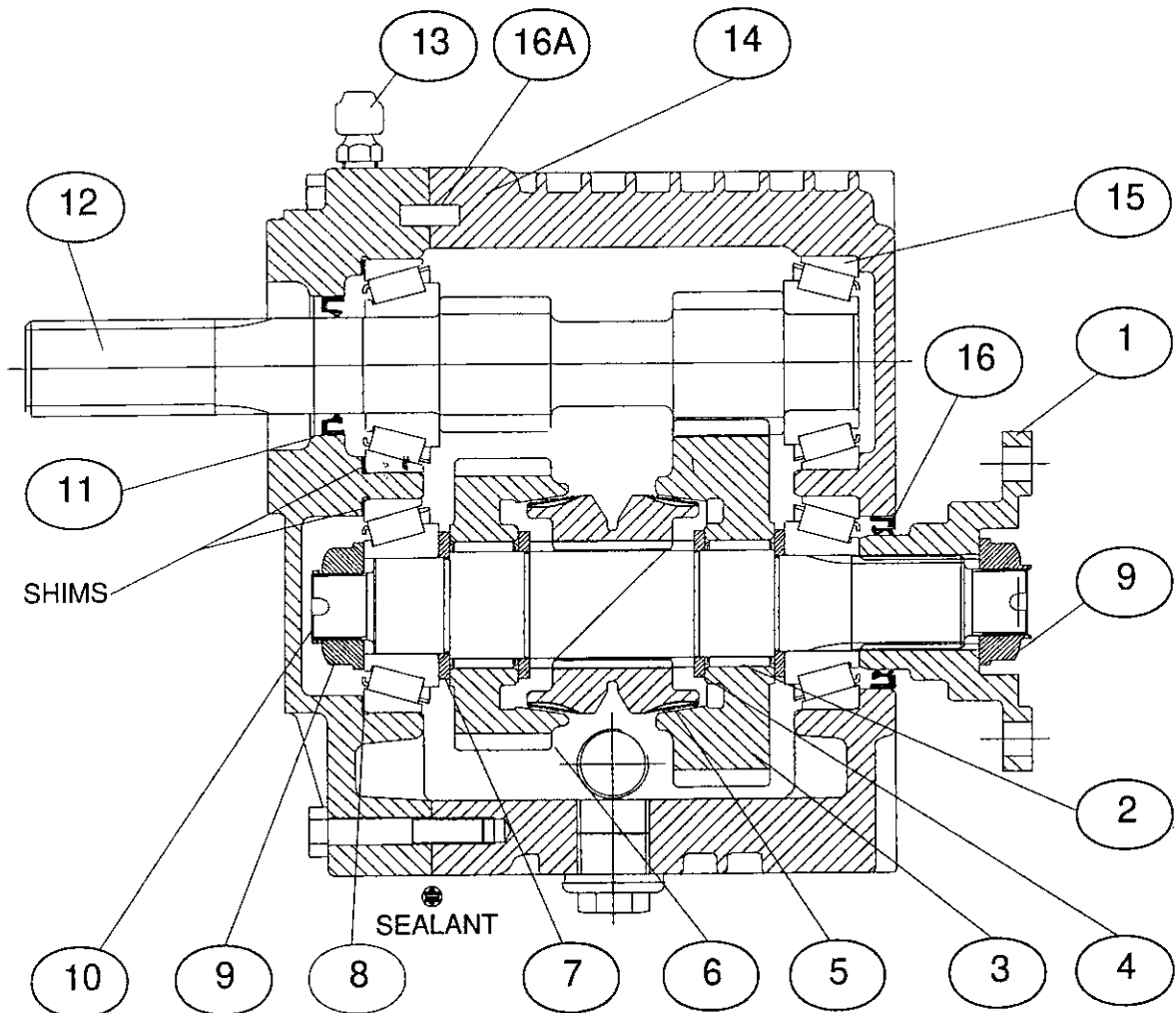
**NOTE:** Enquiries relating to a technical or service nature can be made direct to:

**NEWAGE TRANSMISSIONS LTD.  
BARLOW ROAD  
COVENTRY CV2 2LD  
ENGLAND**

**TEL: +44 (0)1203 617141  
FAX: +44 (0)1203 611845**

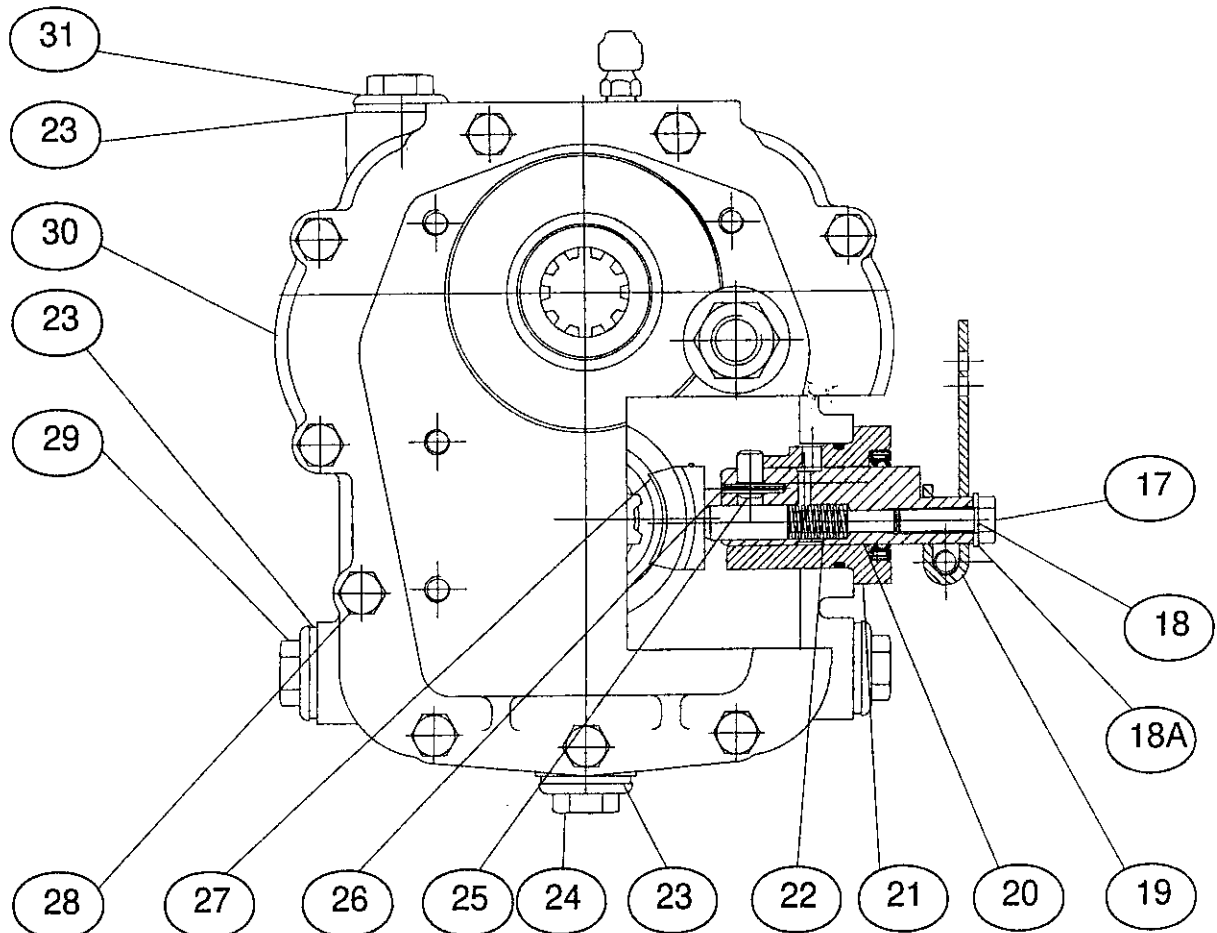
# **PARTS LIST**

ITEM NO.	DESCRIPTION	PART NO.	QTY
1	Drive flange	MT8099	1
2	Needle bearing	0563201	2
3	Output forward gear 2:1 ratio	MT8091	1
	Output forward gear 2.5:1 ratio	MT8092	1
	Output forward gear 3:1 ratio	MT8106	1
4	Thrust washer	MT8096	2
5	Cone clutch	MT8098	1
6	Output reverse gear 2.5:1 ratio	MT8094	1
7	Thrust washer	0672801	2
8	Shim 0.05, Shim 0.075mm	057064A/B	AR*
	Shim 0.25, Shim 0.80mm	057064C/D	AR*
	(Bearing shim kit containing 4 off each shim).	MT0430	
9	Special locknut	MT8095	3
10	Output shaft	MT8089	1
11	Oil seal	0400286	1
12	Input shaft 2:1	MT8086	1
	Input shaft 2.5:1	MT8087	1
	Input shaft 3:1	MT8105	1
13	Valve (breather)	008-0070	1
14	Gearcase	MT8085	1
15	Bearing	001-0270	4
16	Oil seal	0400407	1
16A	Dowel	0210815	2



ITEM NO.	DESCRIPTION	PART NO.	QTY
17	Bolt M8 x 26	MT8117	1
18	Washer M8	0191007ZP	1
18A	Shim 0.125, Shim 0.25, Shim 0.50mm (Selector shim kit containing 3 off each shim)	057017B/C/D	AR*
19	Gear selector lever	MT0429	1
20	Selector control body	MT8100	1
21	Selector housing	MT8102	1
22	Spring	MT8101	1
23	Bonded seal	0311042	1
24	Magnetic drain plug	0201714	4
25	Selector pin	CP1331	1
26	Spring dowel	MT8104	1
27	Selector shoe	010-0210	1
28	Bolt	MT8103	1
29	Drain plug 1/2" BSP	0040812ZP	11
30	Front cover	CP1189	2
31	Dipstick	MT8084	1
		0800551	1

NOTE: \*AR - As Required



ITEM NO.	DESCRIPTION	PART NO.	QTY
32	Bolt M8 x 35	0040810ZP	1
33	Plain washer M8	0191007ZP	1
34	Nut nyloc	0050806ZP	3
35	Nut M16	0051610	1
36	Internal spring ring	0320470	1
37	Idler gear	MT8090	1
38	Idler shaft	MT8088	1
39	Bearing	0540252	2
40	Stud M8 x 37	MT3094	2
41	'O' ring	04303524	1
42	Oil seal	0400255	1
43	'O' ring ( 'O' ring oil seal kit containing 1 off each 'O' ring/seals)	04301416 MT0428	1

