

SECTION S

TRANSMISSIONS

TYPE SAO MANUAL

DESCRIPTION

The Westerbeke Paragon manually operated reverse gear units consist of a multiple disc clutch and a planetary reverse gear train. The units are self contained and are independent of the engine lubrication system.

OPERATION

On the forward drive, the reverse gear case and multiple disc clutch are locked together as a solid coupling. The multiple disc clutch is locked or clamped by the pressure produced when the shift lever is moved to the forward position. Thus the propeller shaft turns in the same direction as the engine.

The reverse drive is obtained by clamping the reverse band around the reverse gear case which contains the planetary reverse gear train. The reverse band is clamped when the shift lever is moved and held in the reverse position. The reverse motion is then obtained by driving through the gears thus turning the propeller shaft opposite to the engine rotation.

With the shift lever in the neutral position the multiple disc clutch and the reverse band are unclamped and the planet gears run idle and the propeller shaft remains stationary.

It is desirable to start the engine with the transmission in neutral, thus avoiding moving the boat in either direction.

It is recommended that the shifting be done at speeds below 1000 RPM and preferably in the 800 RPM range or lower to prolong the life of the engine, transmission and of the boat.

TROUBLE SHOOTING

The trouble shooting charts below and on the next page should be studied and the suggestions carried out prior to any disassembly to determine as well as possible what the trouble may be. Also, the exploded views and the accompanying discussions should be carefully read and understood so that any or all of the service work as indicated from the trouble shooting charts may be carried out properly.

DISASSEMBLY

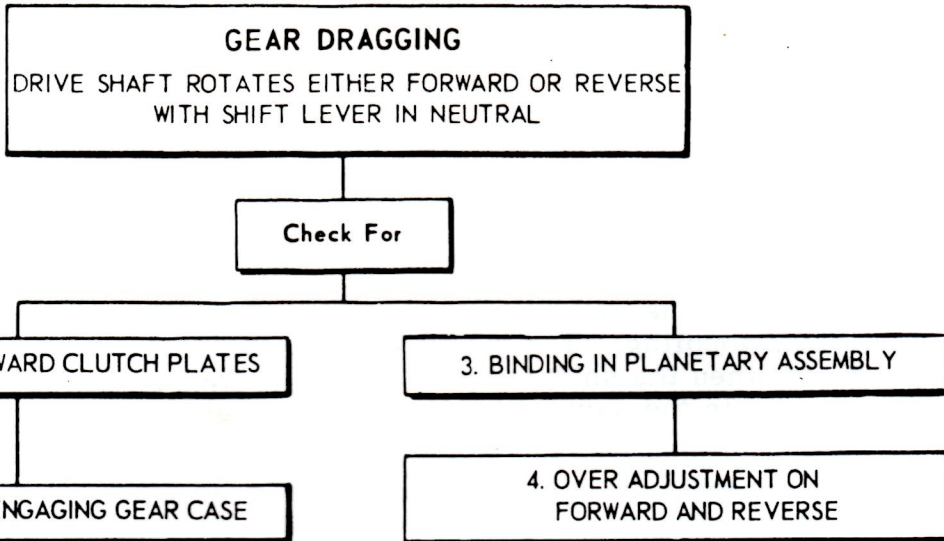
As in any servicing operation, cleanliness is a must and all rules for good workmanship apply. Some of these rules are as follows:

1. Use only clean fluid in any cleaning or washing of parts.
2. Use only clean oil for lubrication when pressing parts together.
3. Never use a hammer to drive ball bearings in place.
4. Never press a ball bearing so that the force is carried through the balls.
5. Use only properly sized wrenches in removing or securing nuts and cap-screws.
6. Replace gaskets and "O" rings with new material.
7. Work on a clean bench and protect gear teeth and oil seal surfaces from nicks and scratches.

NOTE: Remove the reverse and reduction gear as a complete unit before removing the oil to avoid fouling the bilges.

TROUBLE SHOOTING CHARTS

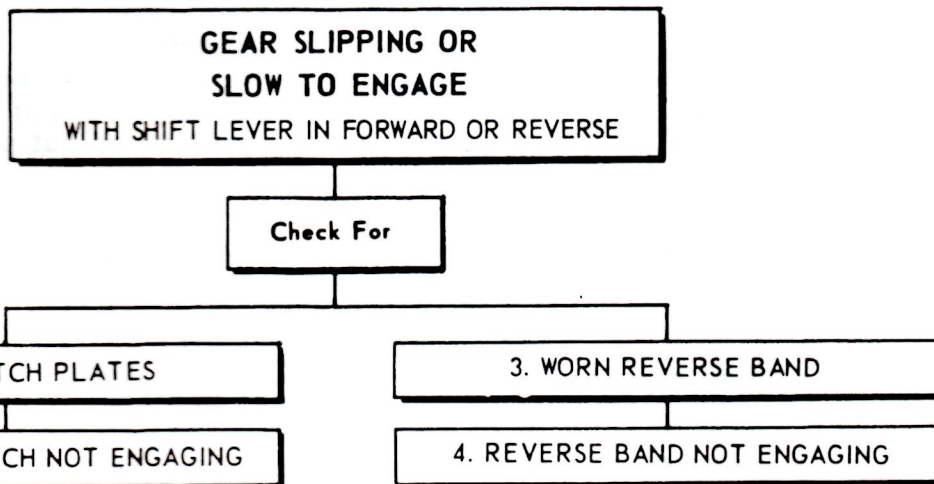
Chart 1



REMEDY

1. Forward clutch plate warped and sticking. Remove and replace clutch plates.
2. Improper reverse band adjustment. Adjust reverse band as outlined under adjustment.
3. Check the following items:
 - a. Bearings and gears worn excessively in gear case. Replace necessary parts.
 - b. Engine gear bearings worn excessively, causing misalignment of engine shaft. Replace necessary parts. Check misalignment of engine gear.
4. Over-adjustment of either forward and reverse or both will result in loss of neutral. Check and readjust as outlined under adjustment.

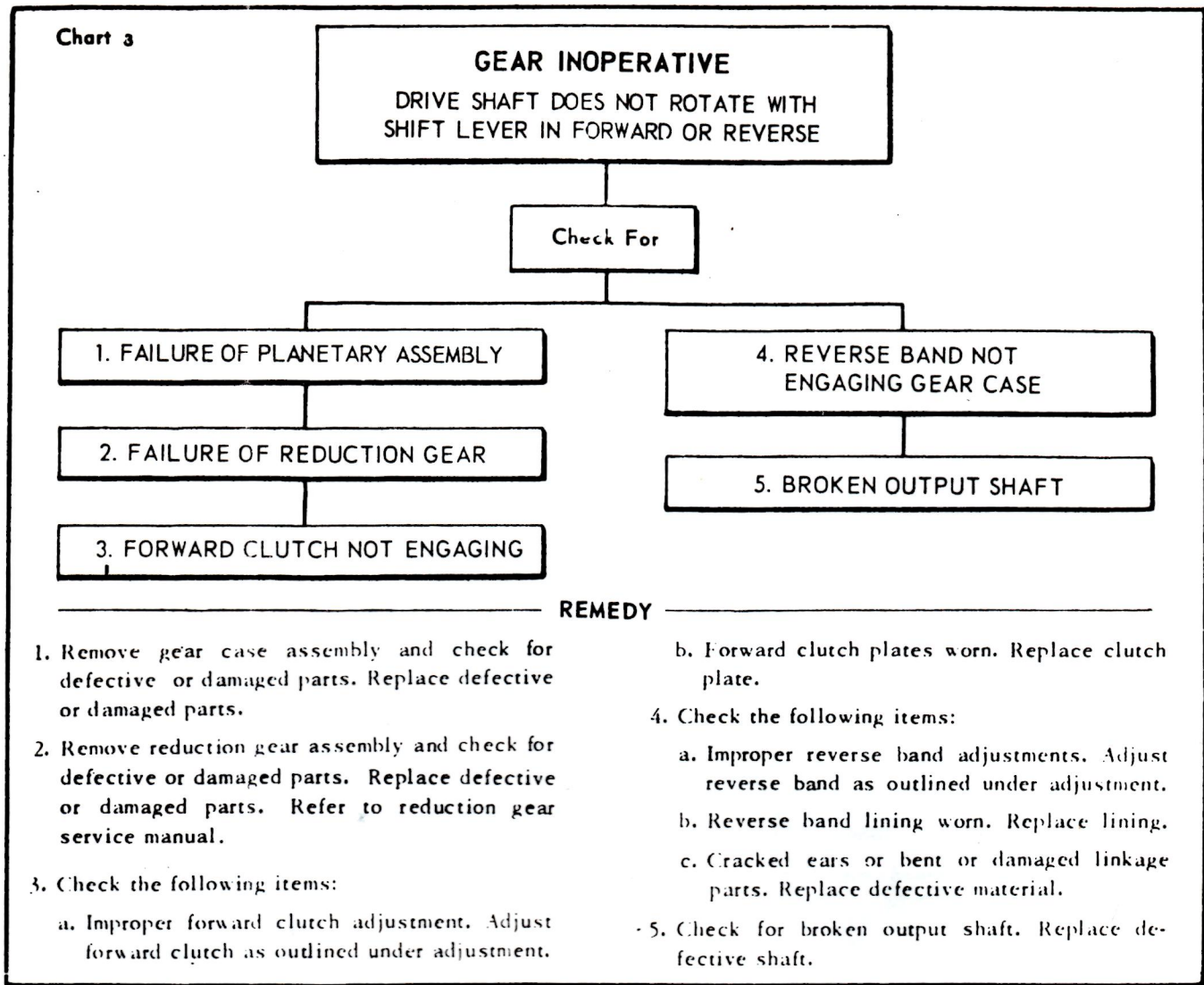
Chart 2



REMEDY

1. Remove forward clutch plates and check for wear. Replace if worn excessively.
2. Improper forward clutch adjustment. Adjust as outlined under adjustment.
3. Remove reverse band and check for wear. Replace lining if worn below rivets.
4. Improper reverse band adjustment. Adjust as outlined under adjustment.

TROUBLE SHOOTING CHART



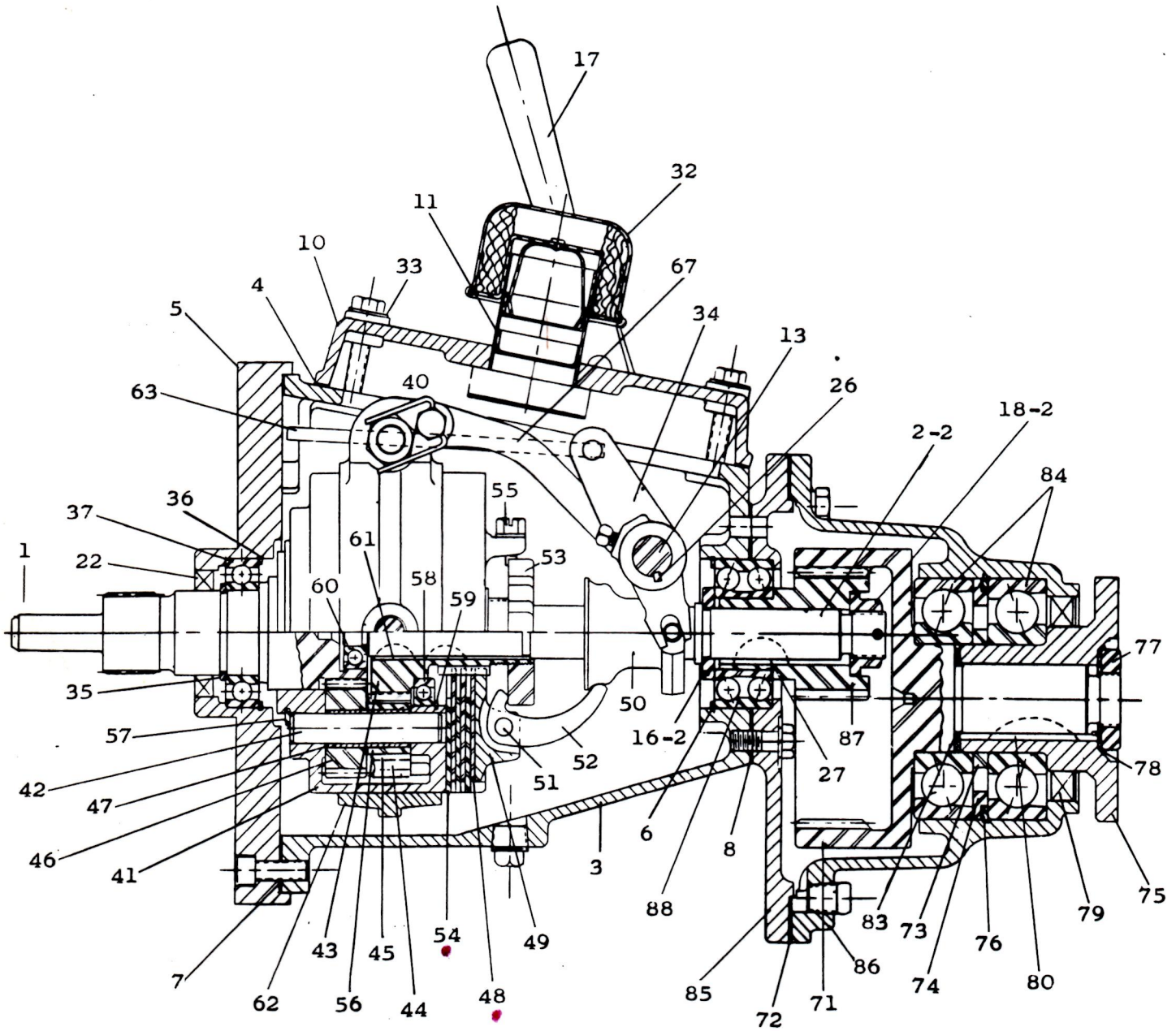
NOTE: Disassembly need be carried out only as far as is necessary to correct those difficulties which interfere with proper marine gear operation.

REMOVAL OF REDUCTION GEAR ASSEMBLY FROM REVERSE GEAR HOUSING IF INSTALLED

NOTE: Remove the reverse gear with reduction gear attached as a complete unit before draining oil, to avoid fouling the bilges.

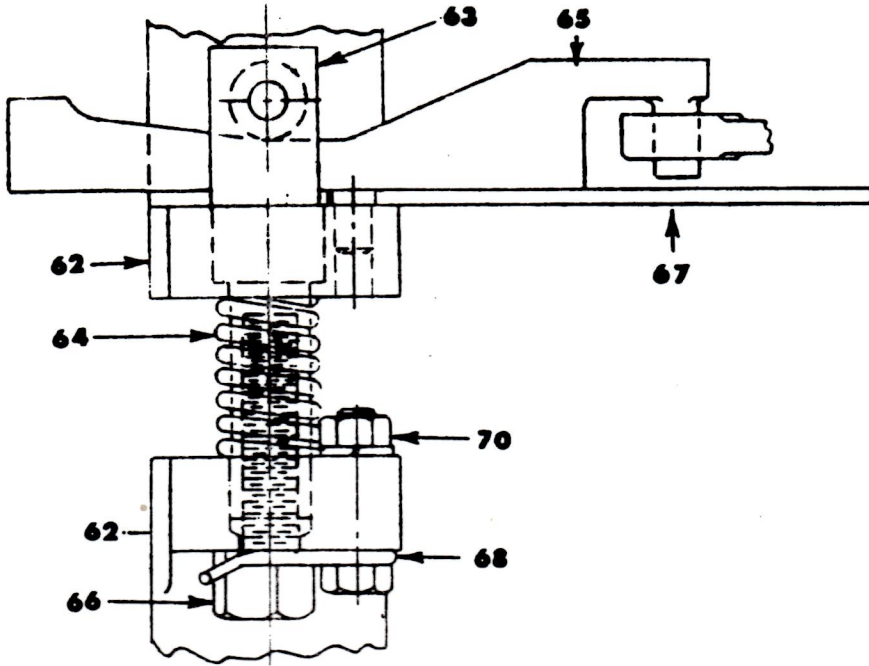
1. Remove starter motor
2. Disconnect propeller half coupling and slide back approximately 4 inches.
3. Remove capscrews securing reverse gear to bellhousing.
4. Strike gear half coupling flange with soft mallet to break reverse gear from bellhousing. Slide entire reverse and reduction gear straight back approximately 3 inches until reverse gear clears bellhousing and lift units clear of engine.

(Refer to "Reduction Gear" section of manual for disassembly and assembly of reduction unit.)



48 + 54 + all gaskets + seals for tranny only
+ gasket to reduction unit.

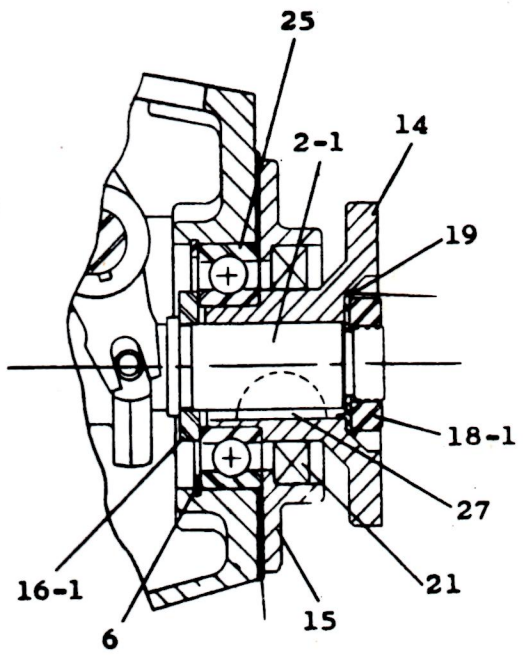
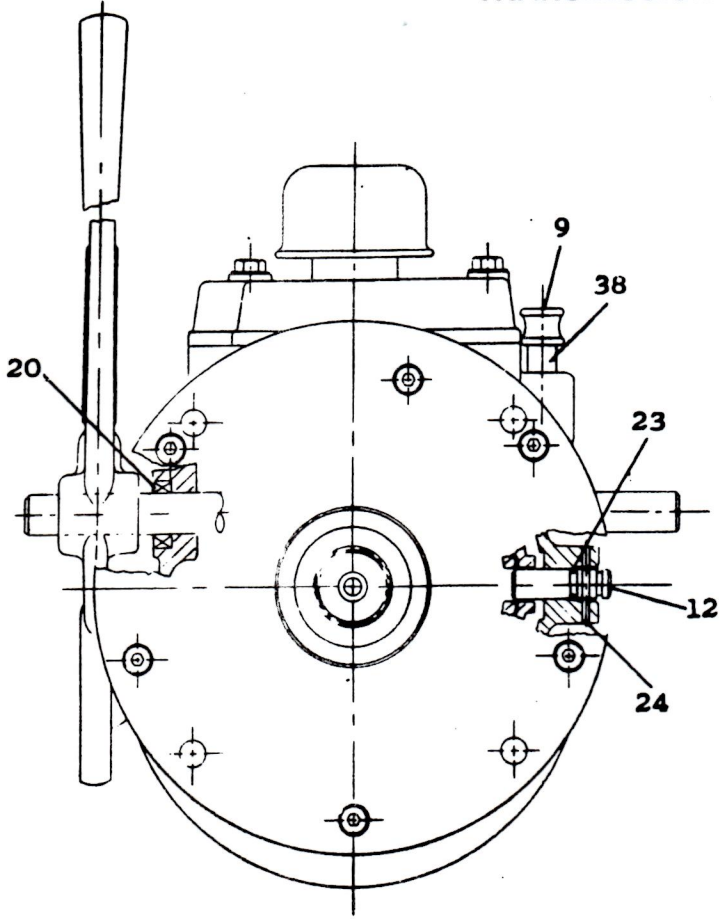
**SAO MANUAL
TRANSMISSION**



SAO MANUAL TRANSMISSION



DIRECT DRIVE FOR WALTER'S "V" DRIVE



DIRECT DRIVE SAOD

REMOVAL OF REVERSE GEAR HOUSING ASSEMBLY FROM ENGINE

1. Remove capscrews and lockwashers that secure reverse gear housing (3) to front end plate (5).
2. Slide entire reverse gear housing (3) straight back approximately 3 inches until housing is clear of front plate engine gear (1) and lift reverse gear housing assembly clear of front plate (5).
3. Remove pilot roller bearing (60) from front plate engine gear (1) if it remains on gear.
4. If necessary to replace front end plate (5), oil seal (22), or bearing (37) proceed as follows:
 - a. Remove capscrews and lockwashers securing front end plate (5) to engine flywheel housing.
 - b. Slide front end plate (5) straight back approximately two inches until front plate engine gear (1) is clear of flywheel housing, and lift clear of engine.
 - c. Remove retaining ring (36), bearing (37), retaining ring (35) and oil seal (22).
 - d. Replace new oil seal and bearing if required.

REMOVAL OF GEAR CASE ASSEMBLY FROM REVERSE GEAR HOUSING

REDUCTION MODEL

1. Remove four capscrews, cover seals (33), cover (10), and gasket (4) from reverse gear housing (3).
2. Through cover opening in reverse gear housing (3), remove nut (70), lockwasher and screw, securing adjustment nut lockspring (68) to ear of brake band assembly (62). Remove lock spring.
3. Remove adjustment nut (66) from reverse cam (65). Remove reverse cam (65) from eye in yoke (34) and slide out reverse cam (65) from reverse cam slide assembly (63).
4. Remove cross shaft (13) from reverse gear housing (3) as follows:
 - a. Loosen the two capscrews securing the yoke (34) to the cross shaft (13).
 - b. With small end of housing toward mechanic, slide cross shaft (13) from left to right being careful cross shaft doesn't come in contact with operating sleeve bearing (50), or Woodruff key (26) in cross shaft under yoke arm (34) isn't forced against cross shaft oil seal (20) in right side of housing. Remove the two Woodruff keys from cross shaft.
 - c. Slide cross shaft out of housing and remove brace (67) and lift yoke (34) from operating sleeve (50).
5. On dipstick side of housing remove roll pin (24) securing brake band locking pin (12) that secures brake band to housing. Remove locking pin and inspect "O" ring (23) and replace if damaged.
6. Slide brake band (62) from gear case assembly (41) and remove band from front of housing.
7. Remove cotter pin and nut (18-2) from reverse gear tailshaft (2-2).
8. Support reverse gear housing (3) with front end down so that gear case (41) may drop free approximately two inches.
9. Press on reverse gear tailshaft (2-2) until tailshaft is free of reduction drive gear (87).
10. Lift reverse gear housing (3) straight up until housing clears tailshaft (2-2).

11. Remove capscrews and lockwashers that secure reduction adapter plate (85) to reverse gear housing (3).
 - a. Remove reduction adapter plate with attached bearing (88) and reduction drive gear (87).
 - b. Press bearing with drive gear from adapter plate.
 - c. Press bearing from drive gear.

DIRECT DRIVE UNIT (perform procedures 1 through 6 above)

12. Bend tang of lockwasher (19) away from locknut (18-1) and remove nut from reverse gear tailshaft (2-1), by holding gear half coupling (14) with spanner wrench. Remove lockwasher.
13. Support reverse gear housing (3) face down so that gear case may drop free approximately 2 inches.
14. Press on reverse gear tailshaft (2-1) until tailshaft is free of gear half coupling (14). Lift reverse gear housing (3) straight up from gear case assembly (41) until housing clears tailshaft (2-1).
15. Remove capscrews and lockwashers that secure direct drive plate (15) to reverse gear housing (3).
 - a. Remove direct drive plate (15) with attached bearing (25) and gear half coupling (14) from reverse gear housing (3).
 - b. Press gear half coupling from bearing.
 - c. Press bearing from drive plate.
 - d. If necessary to replace, remove oil seal (21) from direct drive plate.

DISASSEMBLY OF GEAR CASE

1. Remove thrust washer (16-2) and retainer ring (6) from end of reverse gear tailshaft on reduction units, and Woodruff key (27), seal washer (6) and thrust washer (16-1) from end of tailshaft on direct drive units.
2. Remove lockscrew (55) and lockwasher from screw collar (53) and remove screw collar from gear case by unscrewing. Lift operating sleeve assembly (50) from tailshaft when removing screw collar.
3. Lift pressure plate (49) and clutch plates (48) and (54) from end of gear case.
4. Properly support gear case on clutch plate carrier and press tailshaft (2-1) or (2-2) from propeller gear (43) and clutch plate carrier. Lift clutch plate carrier from gear case.
5. Remove case ball bearing retaining ring (59) from groove in gear case.
6. Remove capscrews (14) and lockwashers (13) and case bushing (23) from gear case.
7. Before removal of the short or long pinions is attempted, first inspect the gear teeth for indication of wear. Also, rotate each pinion to check for rough spots during rotation. If further inspection or replacement is necessary, proceed with the disassembly. However, do not disassemble unless required.
8. Drive pinion shaft (20) of one of the short pinions (22) from threaded end of gear case approximately 1/2 inch. Push pinion shaft on through with a dummy shaft.
9. Push dummy shaft until centered in short pinion (46) and short pinion spacer (56). Remove pinion shaft (42) from front end of gear case.
10. Remove remaining short pinions (46) from gear case.
11. Press propeller gear (43) from the case ball bearing (58).
12. Remove long pinions (44) using dummy shaft as in removing short pinions.

NOTE: Bushings are pressed into the long and short pinions.

INSPECTION

All parts should be thoroughly cleaned before inspection. Parts showing excessive wear should be replaced.

1. Ball and roller bearings should be examined for indication of corrosion and pitting on balls or rollers and races.
2. Long and short pinion bushings should be examined for wear.
3. Pinion shafts should be examined for wear or "brinelling".
4. Long and short pinion spacers should be examined for wear.
5. Long and short pinion bore diameters should be examined for wear.
6. All gear teeth should be examined for "pitch line pitting", uneven wear pattern or excessive wear.
7. All shafts should be examined for wear on splines and shoulders.
8. Clutch plates should be examined for flatness, roughness, indicating of excessive heating and wear or peening of driving lugs.
9. Clutch plate carrier should be examined for wear and peening of lugs and splines.
10. Examine all oil seals for rough or charred lips.
11. Reverse band links, pins, etc. should be examined for wear or bending.
12. Reverse band lining should be examined for wear.

NOTE: Lining should be replaced before rivets come in contact with gear case.

13. Gear case should be examined for wear from reverse band linking, short or long pinions wearing into inside faces or wear in clutch plate slots on threaded end.
14. Screw collar and finger assembly should be examined for wear.
15. Pressure plate should be examined for wear.
16. All old gaskets should be replaced.
17. Operating sleeve assembly should be examined for wear.
18. Engine gear should be examined for wear on oil seal surfaces, case roller bearing race, pilot bearing race and gear teeth for "pitch line pitting", uneven wear or excessive wear.

NOTE: When uneven gear teeth wear has been noticed, check engine gear for eccentricity. Maximum eccentricity at pilot bearing race is .005 inches.

19. Where special vibration dampers are used as flexible couplings, check springs and splines for wear.

ASSEMBLY OF GEAR CASE

1. If pinion gears (45) and (46) bushings (21), and pinion shafts (42) were removed from gear case (41), assembled as follows:
 - a. Insert dummy shaft into long pinion (44).

NOTE: Use same dummy shaft as used in disassembly.

- b. Insert four bushings (21) equally spaced around dummy shaft to center shaft in gear; then assemble remaining bushings.

NOTE: Smear dummy shaft with cup grease to prevent bushings from dropping out. Install bushing spacer (56) in gear next to first row of bushings.

- c. Lay gear case (41) on side and insert long pinion (44) in case to align with hole in outer row.

- d. Insert pinion shaft (42) plain end first, into unthreaded end of gear case and push through pinion as far as rear wall of gear case, forcing out the dummy shaft.
 - e. Remove dummy shaft, and start pinion shaft into rear wall of case. Do not drive pinion shaft all the way into gear case until all shafts are inserted.
 - f. Assemble remaining long pinions in gear case.
 - g. Using dummy shaft, insert short bushings (47) into short pinion (46) in same manner covered in paragraphs a and b above. With short pinion, use pinion spacer (56).
 - h. Insert short pinion (46) into gear case, pinion toward front of case, to line up with hole in inner row and insert pinion shaft (20) as described in d above.
 - i. Assemble remaining short pinions in gear case.
2. Assemble case bushing (23) to gear case with edges of race in line with flats on pinion shafts. Replace lockwashers (13) and capscrews (14).
 3. Insert propeller gear (24) through rear of gear case in mesh with long pinions.
 4. Press case ball bearing (58) into gear case and onto propeller gear by supporting entire assembly on propeller gear inside front end of gear case. Make certain that case ball bearing is seated properly on propeller gear and into gear case. Install case ball bearing retaining ring (59) in groove in gear case next to case ball bearing.
 5. Press clutch plate carrier (27) onto reverse gear tailshaft (2-1) or (2-2).
 6. Align splines on reverse gear tailshaft and press tailshaft through propeller gear until propeller gear is seated against the clutch plate carrier already on tailshaft. Support the entire assembly on propeller gear inside front end of gear case during pressing operation.
 7. Place Woodruff key (61) on end of tailshaft inside propeller gear.
 8. Install clutch plates in clutch plate cavity in rear of gear case starting first with bronze clutch plate (54) and alternating steel plate (34) and bronze clutch plate.
 9. Install pressure plate (49) on top of last bronze clutch plate in clutch plate cavity.

NOTE: Make certain that all plates ride freely and that no binding is apparent during assembly.

10. Assemble finger assembly (52) to screw collar (53) using finger pins (51) and securing with cotter pins.
11. Thread screw collar (53) onto gear case assembly (41) approximately half of the thread length.
12. Place operating sleeve assembly (50) onto tailshaft. Position ball ends of finger assembly over sleeve assembly.
13. Continue screwing screw collar onto gear case (41) until finger assembly will snap over center and lock into position against the shoulder of the pressure plate (49).
14. Push operating sleeve assembly (50) forward until finger assemblies are free.
15. Place lockwasher over end of lockscrew (55) and thread lockscrew into one hole near edge of screw collar (53). Rotate screw collar until dog on end of lockscrew lines up with closest hole in pressure plate.
16. On reduction tailshafts, install retaining ring on reverse gear tailshaft making certain that retaining ring is seated properly in groove in reverse gear tailshaft.

CAUTION: The forward clutch is not properly adjusted at the end of this assembly. Proper adjustment is made after installation in boat is complete. Follow instructions as outlined under section on adjustments.

ASSEMBLY OF REVERSE GEAR CASE IN REVERSE GEAR HOUSING

REDUCTION MODEL

1. Place new gaskets (8), (7), and (4) on front, rear, and top of reverse gear housing (3).
2. If removed for replacement, install new oil seals (20) in cross shaft holes in housing.
3. Support gear case assembly (41) on propeller gear (43) inside front end of gear case so that reverse gear housing (3) will not rest on face when lowered over gear case assembly.
4. Lower reverse gear housing (3) over gear case assembly with reverse gear tailshaft (2-2) protruding through bore in rear of housing.
5. Place thrust washer (16-2) with counter-bored side down over reverse gear tailshaft (2-2). (Make certain that thrust washer seats properly on shoulder of retaining ring (6) on tailshaft (2-2).)
6. Press reduction drive gear (87) into ball bearing (88).
7. Place new gasket (8) on reverse gear housing (3) and press reduction drive gear (87) and ball bearing (88) on reverse gear tailshaft (2-2) until ball bearing is seated against thrust washer (16-2). Thread on reverse gear tailshaft nut (18-2).
8. Press reduction gear adapter plate (85) over ball bearing and secure with necessary bolts.
9. Install reduction gear crescent (74).
10. Tighten all capscrews. Tighten reverse gear tailshaft nut (18-2) until cotter pin can be installed through castellation in nut and hole in reverse gear tailshaft.
11. Install cotter pin and bedn ends over nut.
12. Place new gasket (72) on reduction adapter plate (85).
13. Install brake band assembly (62) onto gear case assembly (41) in reverse gear housing.
14. With reduction adapter plate (85) facing mechanic, insert yoke (34) through cover opening in housing placing forked arms of yoke over pins of operating sleeve assembly (50). Ensure part number of yoke is facing mechanic.
15. Align and hold hole in brace (67) on inside right hole in yoke and push cross shaft through yoke and brace to left side of housing.
16. Pull cross shaft out from right side of housing approximately one inch and insert Woodruff key in cross shaft to the right of each yoke hole to position yoke to cross shaft.
17. Secure yoke to cross shaft by tightening the two cap screws in yoke.
18. Slide reverse cam (65) through reverse cam slide assembly (63) and in hole in arm of yoke (34).
19. Position pin in brake band (62) in hole in brace (67).
20. Replace and tighten adjustment nut (66) to reverse cam slide assembly (63).
21. Secure lock spring (68) over adjustment nut (66) with screw, lockwasher and nut (70).

DIRECT DRIVE UNIT

22. After paragraph 4 above place thrust washer (16-1) over reverse gear tailshaft. Place seal washer (6) over reverse gear tailshaft against thrust

- washer and install Woodruff key (27) in keyway in tailshaft.
23. If removed for replacement, press new oil seal (21) into direct drive plate (15). Press ball bearing (25) into direct drive plate.
 24. Place direct drive plate, oil seal and ball bearing assembly on suitable support and press gear half coupling (14) into oil seal (21) and ball bearing (25) until gear half coupling is seated against ball bearing. Care must be taken not to damage oil seal during assembly.
 25. Align direct drive plate and gear half coupling up with key in reverse gear tailshaft and press together until ball bearing is seated against thrust washer (16-1).
 26. Place lockwasher (19) over reverse gear tailshaft with tang in keyway in gear half coupling and thread locknut (18-1) on reverse gear tailshaft.
 27. Install lockwashers and capscrews in holes in direct drive plate and bolt to reverse gear housing.
 28. Tighten all capscrews. Tighten locknut (18-1) and bend up one tang on lockwasher (19) over locknut.
 29. Continue with paragraphs 13 through 20.

ASSEMBLE TRANSMISSION TO ENGINE

1. If front end plate (5) was removed from reverse gear housing (3) or engine flywheel housing proceed as follows:
 - a. Replace oil seal (22) or bearing (37) if necessary.
 - b. Slide engine gear (1) into flywheel housing damper spline.
 - c. Align mounting holes in front end plate (5) with holes in flywheel housing and secure with lockwashers and capscrews.
 - d. After installing on engine, check engine gear for runout. Maximum eccentricity is .005 inches at pilot roller bearing.
2. Insert two studs three inches long in two opposite bolt holes in front end plate (5).
3. Check to be certain that pilot roller bearing (60) is properly installed in propeller gear inside gear case.
4. Start reverse gear housing (3) over the two studs and slide housing over engine gear (1) right up against flywheel housing. It may be necessary to rotate gear case slightly to properly mesh teeth on engine gear and short pinions in gear case.
5. Install lockwashers and capscrews in holes around flange of housing.
6. Remove the two studs and install remaining lockwashers and capscrews. Tighten all capscrews.

ASSEMBLY OF REDUCTION GEAR ASSEMBLY TO REVERSE GEAR HOUSING ASSEMBLY

NOTE: Refer to reduction gear assembly and disassembly procedures.

1. Install two studs 3 1/2 inches long in two opposite holes in reduction adapter plate.
2. Position reduction gear assembly over studs with oil drain plug at bottom and slide onto reduction drive gear. It may be necessary to rotate reduction ring gear slightly to properly mesh gear teeth.
3. Install lockwashers and capscrews around flange of reduction gear housing and tighten uniformly.

YOUR NOTES

SA1 AND SA0 MANUAL CLUTCH ADJUSTMENTS

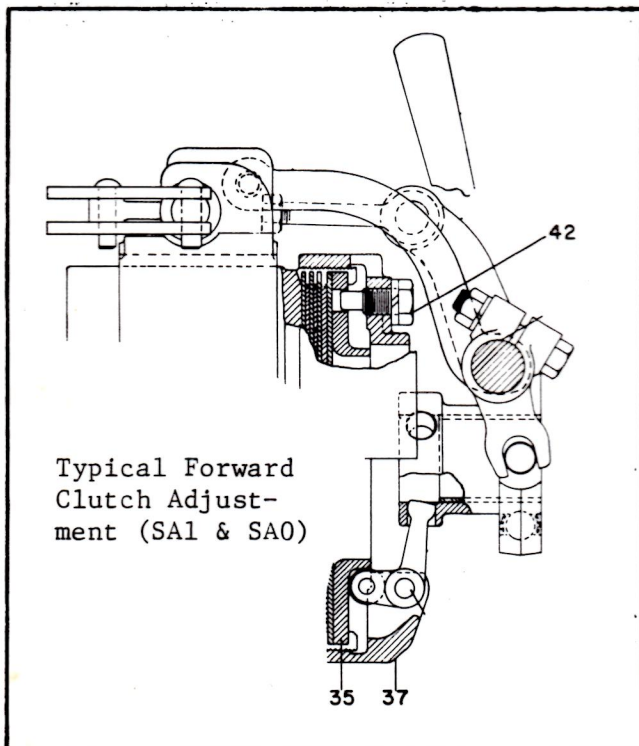
With the transmission secured to the engine, replace all water lines, etc. However, do not connect the shifting linkage until all the adjustments have been made and are satisfactorily tested.

Before securing the propeller half coupling to the gear half coupling, check to make certain that the couplings do not run out more than .002 inches with respect to each other. Study section "Alignment to Engine" on Pages 14 and 15 of Technical Manual.

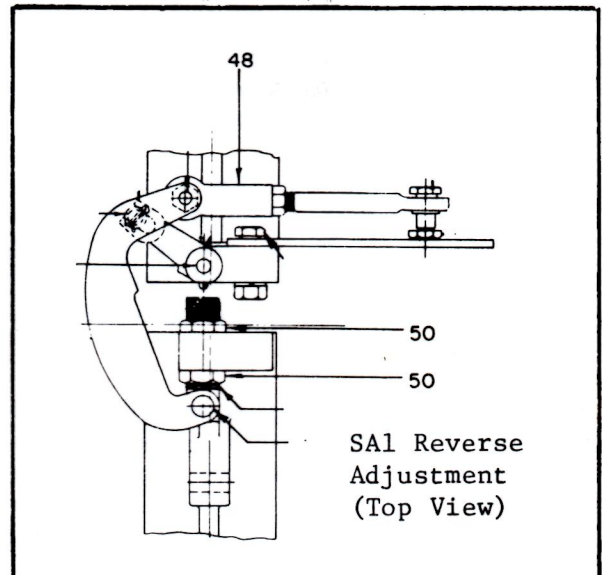
The transmission should be filled with new oil as specified under lubrication.

The transmission can be partially adjusted before the engine has been run. However, a complete running test is necessary to satisfactorily determine whether the adjustments have been properly made.

The preliminary adjustments for the forward drive are made as follows: remove reverse cover plate, rotate pressure finger assembly and screw collar (37) until lock screw (42) is up and facing you. Then, working carefully to avoid dropping either screw or tools into clutch housing --

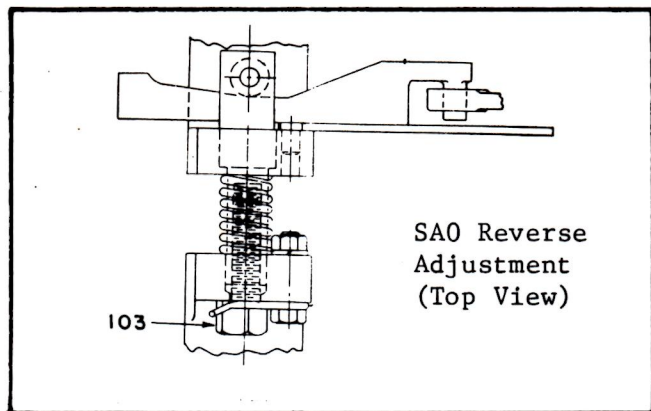


1. Back out the lock screw (42) until the dog on the end of the lock screw is clear of the hole in the pressure plate (35).
2. Rotate the screw Collar (37) to the right until the lock screw (42) is opposite the next hole in the pressure plate (35).
3. Tighten the lock screw making certain that the dog on the end properly enters the hole in the pressure plate.
4. Continue this until a decided effort is required to shift into forward (approximately 26 foot pounds).



The preliminary adjustments for the reverse drive are made as follows:

1. Loosen the locknut (50) on the inside of the upright ear at the top of the reverse band.
2. Tighten the adjusting nut (50) on the outside of the ear until both nuts are again tight against the ear of the reverse band.
3. Repeat until a decided snap is required to shift into reverse.
4. Do not tamper with adjustment of link (48).
5. For Four-99s and early Four-107s there was a cam operated reverse adjustment. Simply turn screw head (103) clockwise one flat at a time until satisfactory reverse engagement is obtained (see Figure 3).



Replace the cover on the reverse gearhousing. The transmission is ready for a preliminary test which may be done at dockside,

Check all of the mooring lines before continuing the test,

With the engine running at idle speed, shift the transmission into forward and reverse noting how well the transmission responds.

If the transmission does not engage in one or both of the forward or reverse positions further dockside adjustments are necessary. Continue the adjustments as outlined above until the transmission will engage in both forward and reverse drives.

A complete running test is necessary to determine that the transmission is properly adjusted. The transmission should not slip or "break" away under full power conditions in the forward drive and should hold in reverse under all normal reversing conditions.

If further adjustments are necessary, continue the adjustments as outlined above until satisfactory operation is reached. It should be noted however that the adjustments should be carried out only until satisfactory operation is reached since it is possible to over-adjust the transmission. If the transmission is over-adjusted it will be more difficult to shift into forward and reverse and the parts will be heavily stressed and subject to early fatigue failure. Therefore, once the preliminary adjustments have been made, only a very small amount of adjustment will be necessary for either forward or reverse. Usually, an adjustment of a half a step on the forward, or at the most, a full step is required for full adjustment. Only a very small adjustment is required for the reverse drive.

On the forward drive, a full step of adjustment is as outlined above or is made by loosening the lock screw (42) and rotating the screw collar (37) to the right until the next hole in the pressure plate (35) can be lined up under the lock screw. A half a step is made by taking the lock screw out of the hole that it is in and placing it in the hole adjoining it in the screw collar. Then rotate the screw collar to the right until the next hole in the pressure plate is lined up under the dog of the lock screw. Make certain that the lock screw enters the hole properly or it will bind up the forward clutch.

When the transmission is properly adjusted, replace the cover and secure all external bolts and fasteners. Before replacing the shifting linkage, check to make certain that it operates freely and does not bind or drag. Replace the linkage on the transmission shift lever and secure properly.

WHEN CLUTCH SLIPPING IS NOTICED, STOP AND ADJUST AT ONCE.
 PROPER ADJUSTMENT WILL MAINTAIN YOUR CLUTCH FOR YEARS,
 BUT A SLIPPING CLUTCH MAY DESTROY ITSELF, CAUSING COSTLY
 REPAIRS.

SA1 AND SA0 REDUCTION UNITS

DESCRIPTION

The Westerbeke/Paragon reduction gears consist of an internal ring gear and a drive gear that offers a variety of reduction ratios.

ADJUSTMENTS

There are no adjustments necessary to maintain the reduction gears in proper running condition.

DISASSEMBLY OF REDUCTION UNIT

NOTE: Disassembly need be carried out only as far as necessary to correct those difficulties which interfere with proper marine gear operation.

Remove reverse and reduction gear as a complete unit before removing the oil to avoid fouling the bilges.

1. Remove oil drain plug from bottom of reduction gear housing (86) and drain oil from unit. Make certain that all lubricating oil is removed from reverse gear unit.
2. Remove capscrews and lockwashers from flange of reduction gear housing and slide entire reduction unit straight back approximately 3 inches until reduction unit clears reduction drive pinion.
3. Bend tang of lockwasher (78) away from locknut (77). Remove locknut using suitable wrench and lift lockwasher from shaft.
4. Remove gear half coupling (75) with gear type puller or by supporting entire assembly under flange of gear half coupling and press against shaft to force coupling from assembly.
5. Support reduction gear housing so that flanged shaft assembly can drop free approximately 2 inches and press flanged shaft assembly from reduction gear housing.
6. Remove retaining ring (76) from groove next to ball bearing (84) inside reduction gear housing and press ball bearing from housing.
7. If necessary to replace, remove oil seal (79).
8. Remove Woodruff key (80) from flanged shaft and remove seal washer (74) and spacer (73).
9. Press ball bearing (84) from flanged shaft using two holes in flange.
10. Remove capscrews and lockwashers from rim of flanged shaft and remove ring gear (71) from flanged shaft.

INSPECTION

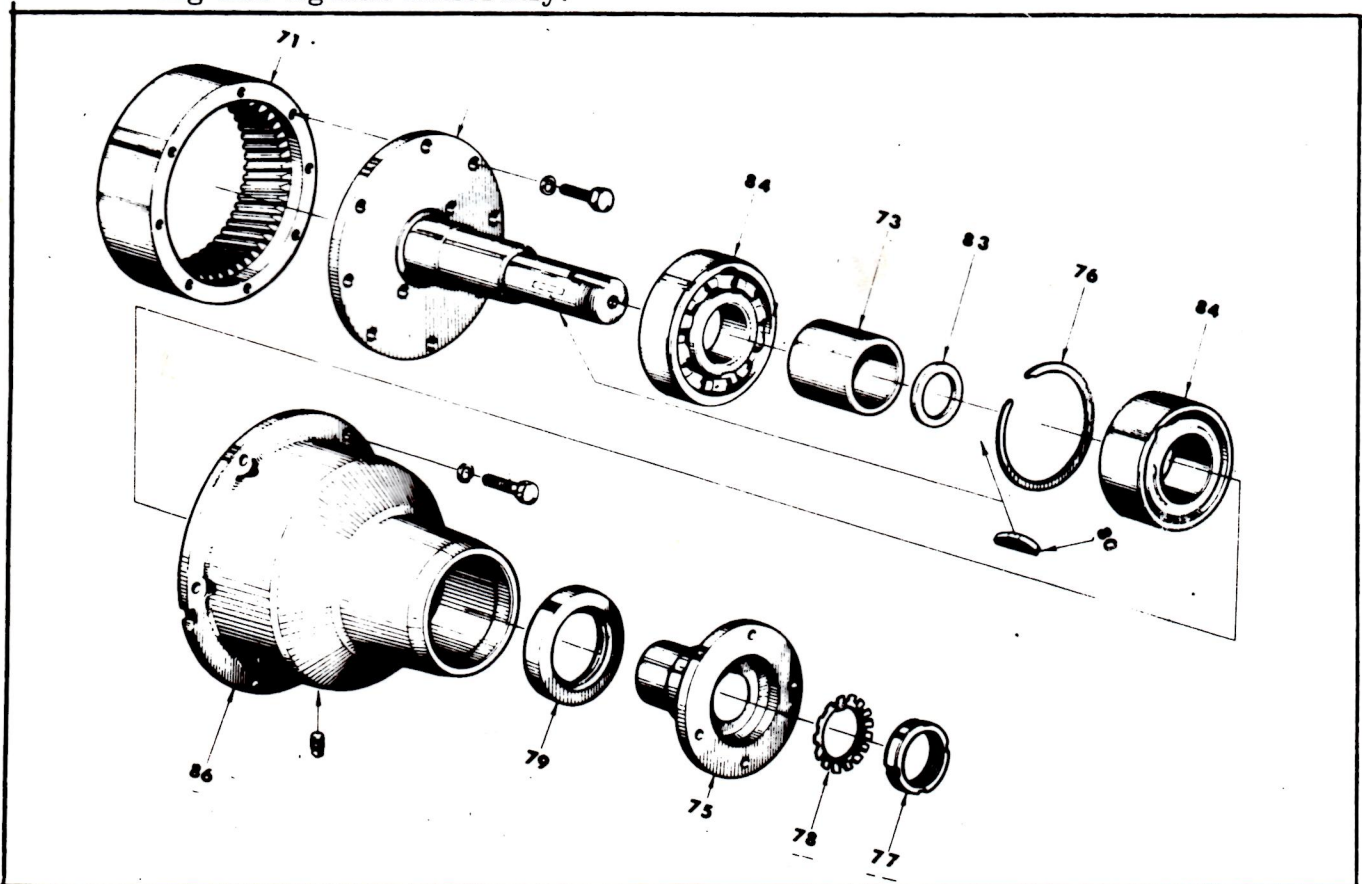
All parts should be thoroughly cleaned before inspection. Parts showing excessive wear should be replaced.

1. Ball bearings should be examined for indications of corrosion and pitting on balls and races.
2. All gear teeth should be examined for "pitch line pitting", uneven wear pattern or excessive wear.
3. Examine oil seal for rough or charred lips.
4. Retaining rings should be checked for burrs or deformities.
5. All gaskets should be replaced.

ASSEMBLY OF REDUCTION UNIT

1. Replace oil drain plug into reduction gear housing (86).
2. Press ball bearing (84) into reduction gear housing (86) and install retaining ring (76) into groove next to ball bearing.

3. If removed for replacement, press new oil seal (79) into reduction gear housing.
4. Place flanged shaft over ring gear (71) and line up holes in flange with those in ring gear.
5. Place lockwasher over capscrew and insert capscrew into hole in flanged shaft and secure flanged shaft to ring gear.
6. Press ball bearing (84) onto flanged shaft. Place spacer (73) over shaft next to ball bearing and place seal washer (74) over shaft next to spacer.
7. Install Woodruff key (80) into keyway in flanged shaft.
8. Place reduction gear housing over small end of flanged shaft and start ball bearing (84) on flanged shaft into bore in housing by tapping housing with a soft mallet.
9. Turn unit over with small end of housing down and press on center of flanged shaft until spacer (73) is seated against ball bearing (84) in reduction housing.
10. Support unit on inside of flanged shaft with large end of unit down and press gear half coupling (75) onto shaft end and into ball bearing until coupling is seated against ball bearing. Care must be taken to line up keyway in coupling and key in shaft before pressing together.
11. Place lockwasher (78) over end of flanged shaft with tang on inside of lockwasher in slot on flanged shaft. Place locknut (77) onto shaft and secure using suitable wrench.
12. Bend one tang of lockwasher into slot on locknut.
13. Install two studs 3 1/2 inches long into two opposite holes in reduction adapter plate.
14. Position reduction gear assembly over studs with oil drain plug at bottom of housing and slide onto reduction drive gear. It may be necessary to rotate reduction gear slightly to properly mesh gear teeth.
15. Install lockwashers and capscrews around flange of reduction gear housing and tighten uniformly.



II. INTRODUCTION

Transmissions have been designed for smooth operation and dependability in marine use. The transmission is self-contained, having an oil pressure system and oil supply completely separated from engine lubricating oil systems.

Transmission oil under pressure is used to engage a forward or reverse drive. The for-

ward drive is through a multiple disc clutch arrangement, while the reverse drive utilizes a reverse clamp band and planetary gear train. The transmission oil is circulated and cooled through a separate external oil cooler core, which is in turn cooled by the engine water. Paragon transmissions are furnished with either direct drive or reduction gears. Gear reduction ratios and corresponding model identification numbers are listed in Section I, under "SPECIFICATIONS".

III. INSTALLATION

A. The installation instructions below are for use when the original transmission has been removed for servicing and must be re-installed, or when the transmission unit is to be adapted as non-original equipment to a marine engine.

B. It is important that the engine and transmission rotations are matched. The direction of rotation of an engine is defined in this manual as the direction of rotation of the engine crankshaft as viewed from the output end of the transmission. A clockwise rotation of the engine is a right hand rotation and a counterclockwise rotation of the engine is a left hand rotation.

A letter "R" or "L" appearing on the transmission serial number plate illustrated in Section I, "SPECIFICATIONS", indicates whether the transmission is for use with a right or left hand rotating engine.

C. The hydraulic transmission is attached to the engine in the following manner:

1. Insert two 3-1/2" studs in opposite transmission mounting holes in the engine adapter plate.
2. Place the transmission against the studs so that the studs go through two of the matching holes in the transmission housing flange.
3. Slide the transmission along the studs toward the engine so that the spline on the shaft at the front of the transmission enters the matching splined hole in the engine vibration dampener.

4. Install and tighten four bolts with lockwashers through the transmission housing flange into the engine adapter plate. Remove the 3-1/2" studs. Install and tighten the two remaining bolts with lockwashers through the transmission housing flange.

D. The transmission and propeller shaft coupling must be carefully aligned before the propeller shaft is connected to the transmission, in order to avoid vibration and consequent damage to the transmission, engine, and boat hull during operation. To align the coupling, move the propeller shaft, with attached coupling flange, toward the transmission so that the faces of the propeller shaft coupling flange and transmission shaft coupling flange are in contact. The coupling flange faces should be in contact throughout their entire circumference. The total runout or gap between the faces should not exceed .002" at any point. If the runout exceeds .002", reposition the engine and attached transmission by loosening the engine support bolts and adding or removing shims to raise or lower either end of the engine. If necessary, move the engine sideways to adjust the runout or to align the coupling flange faces laterally. Tighten the engine support bolts and recheck the alignment of the coupling before bolting the coupling flanges together. Connect the coupling flanges with bolts, lockwashers, and nuts.

E. Connect the oil cooler lines to the transmission.

F. Connect the shift control cable from the cockpit control station to the transmission control valve lever, shown in Figure on page 5. Place the transmission control valve lever in the neutral position and

adjust the shaft control cable length until the cockpit control station hand lever is in the neutral position. Move the cockpit control hand lever to forward and reverse positions several times while observing the transmission control valve lever motion. The transmission control valve lever should move fully into forward or reverse position when the hand lever is moved into forward

or reverse position, and should return exactly to the neutral position when the hand lever is in the neutral position.

- G. Remove the oil dipstick, shown in Figure on page 5, and fill the transmission with Type A transmission fluid to the mark on the dipstick. Replace the dipstick in the transmission housing.

IV. OPERATION

Principle of Operation

The transmission forward and reverse drives are operated by transmission oil under pressure. An internal gear type oil pump delivers the transmission oil, under pressure, to the external oil cooler. The transmission oil is returned, still under pressure, to the oil distribution tube and relief valve. The relief valve maintains the oil pressure by remaining closed until the oil pressure reaches 60 PSI. When the control lever is shifted to the forward position, oil under pressure is delivered to the multiple disc clutch piston, which moves to clamp the clutch discs and planetary reverse gear case together. The discs and case then revolve as a solid coupling in the direction of engine rotation. The reverse drive is engaged by shifting the control lever to the reverse position, so that oil under pressure is delivered to the reverse piston. The reverse piston moves to clamp the reverse band around the planetary gear case, preventing the planetary gear case from moving but allowing the planetary gears to revolve to drive the output or propeller shaft in a direction opposite to the rotation of the engine. With the control lever in the neutral position, pressurized oil is prevented from entering the clutch piston or reverse band piston and the propeller shaft remains stationary.

Starting Procedure

1. Always start the engine with the transmission in NEUTRAL to avoid moving the boat suddenly forward or back.
2. When the engine is first started, allow it to idle for a few moments. Stop the engine and check the transmission oil level. Add oil if necessary to bring the oil level up to the mark on the transmission dipstick.

NOTE

ON SUBSEQUENT START-UPS, THE TRANSMISSION OIL LEVEL MAY BE CHECKED BEFORE RUNNING THE ENGINE, WHEN ENGINE OIL IS CHECKED.

3. Start the engine again, with the transmission in NEUTRAL, and allow the engine to warm up to operating temperature.
4. Shift the transmission into FORWARD or REVERSE as desired. If the engine should stall when the transmission is shifted to FORWARD or REVERSE, place the transmission in NEUTRAL before restarting the engine.

It is recommended that shifting be done at speeds below 1000 RPM, and preferably in the 800 RPM, or idle engine range, to prolong the life of the engine, transmission, and boat. EMERGENCY shifts may be at higher engine speeds, but this is not a recommended practice.

V. MAINTENANCE

A. Lubrication

The Models P200, P300 and P400 transmissions are self-contained units, independent of the engine lubricating systems. The units are lubricated by pressure and by splash from its own oil. The type of oil recommended is "Transmission Fluid, Type A", commonly used for automatic transmissions in automobiles.

The quantity of oil depends upon the angle of installation, as well as the reduction model. The level must be maintained at the mark on the dipstick and should be checked periodically to ensure satisfactory operation.

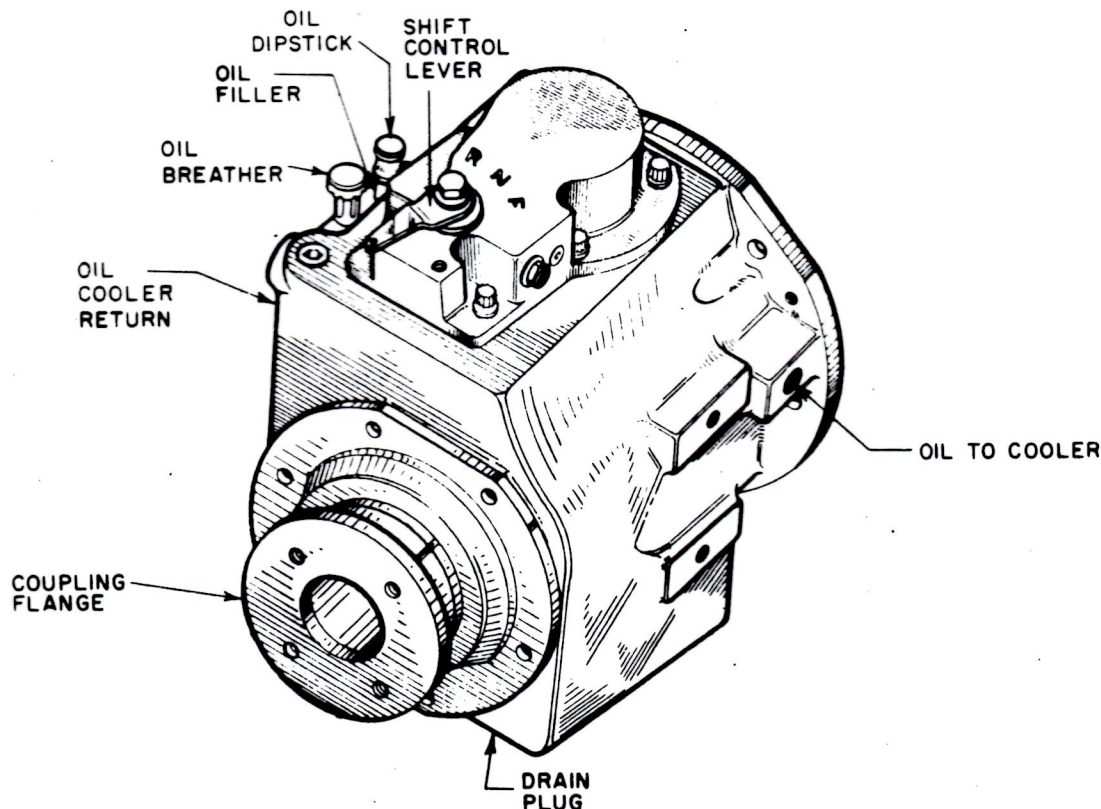
When filling for the first time or refilling after an oil change, check the level after running for a few minutes to make certain that the oil cooler and the various passages

are full. If necessary, refill to the mark on the dipstick to ensure proper operation of the transmission. The transmission oil level should be checked each time the engine oil level is checked, before running the engine.

The oil in the transmission should be changed every 100 hours, or each season under normal conditions. However, the number of hours that can be run between oil changes varies with the operating conditions. Drain plugs are located at the bottom of the reverse gear housing and the reduction gear housing.

B. Adjustments

No adjustment is necessary for the FORWARD drive multiple disc clutches, and the reverse band is self adjusting to compensate for lining wear, so that no external reverse band adjustment is necessary.



PROBLEM	POSSIBLE CAUSES AND METHODS OF CORRECTION
<p>GEAR INOPERATIVE</p> <p>Drive Shaft does not operate with selector valve in forward or reverse.</p>	<ol style="list-style-type: none"> 1. Low Oil Pressure. <ol style="list-style-type: none"> a. Low oil supply. Add oil, refer to lubrication. b. Faulty oil gauge. Replace gauge. Oil gauge slow to register, air or obstruction in oil gauge line. Clean and bleed oil gauge line. c. Plugged oil lines or passages. Clean lines or passages. d. Oil pressure relief valve scored and sticking. Remove relief valve. Clean valve and valve bore in control valve housing with crocus cloth to free valve, or replace. e. Defective pistons and oil distributor seal rings. Replace seal rings. f. Defective oil pump. Check for wear, and replace if necessary. 2. High Oil Temperature <ol style="list-style-type: none"> a. Low oil supply. Add oil, refer to lubrication. b. Low water level in cooling system. Add water, and check for leaks. c. Plugged raw water inlet screen. Clean screen. d. Collapsed or disintegrated water inlet hose. Replace hose. e. Air leak in cooling water suction line. Replace suction line. f. Raw water pump impeller worn or damaged. Replace impeller. g. Clogged or dirty oil cooler element. Remove and clean 3. Reverse Band not engaging Planetary Gear Cage. <ol style="list-style-type: none"> a. Reverse band lining worn out. Replace lining. b. Defective reverse piston "O" ring. Replace "O" ring. 4. Failure of Planetary Assembly. <p>Remove gear case assembly, and check for defective or damaged parts. Replace defective or damaged parts.</p> 5. Failure of Reduction Gear. <p>Remove reduction gear assembly and check for defective or damaged parts. Replace defective or damaged parts.</p>

PROBLEM	POSSIBLE CAUSES AND METHODS OF CORRECTION	
<p>GEAR DRAGGING</p> <p>Drive Shaft rotates either forward or reverse with Selector Valve in neutral position.</p>	<ol style="list-style-type: none"> 1. Defective forward Clutch Plates. 2. Defective forward Clutch Piston Release Spring. 3. Binding in Planetary Assembly. 	<p>Forward clutch plates warped and sticking. Remove clutch plates and replace.</p> <p>Forward clutch piston release spring broken or weak. Replace spring.</p> <ol style="list-style-type: none"> a. Bearings and gears worn excessively in gear case. Replace necessary parts. b. Input shaft bearings worn excessively, causing misalignment of input shaft. Replace necessary parts.
<p>GEAR SLIPPING OR SLOW TO ENGAGE</p> <p>With Selector Valve in forward or reverse position.</p>	<ol style="list-style-type: none"> 1. Low Oil Pressure. 2. Worn forward Clutch Plates. 3. Reverse Band not engaging Gear Case. 	<p>See "Gear Inoperative", (1).</p> <p>Remove forward clutch plates and check for wear excessively, replace clutch plates.</p> <p>See "Gear Inoperative", (3).</p>
<p>INTERNAL AND EXTERNAL LEAKS</p>	<ol style="list-style-type: none"> 1. Water in Lubricating Oil. 2. Excessive Oil in Engine Crankcase or Flywheel Housing. 3. Oil on Exterior of Marine Gear. 4. Loss of Oil from Transmission. 	<ol style="list-style-type: none"> a. Hole in oil cooler element permitting water to seep into oil compartment. Replace oil cooler element. b. Oil cooler gaskets. Check gaskets and replace. <p>Defective front end plate oil seal. Replace oil seal.</p> <ol style="list-style-type: none"> a. Oil seeping from breather. Check for too high oil level. b. Defective rear end oil seal. Replace oil seal. <ol style="list-style-type: none"> a. Check for defective gaskets and seal.

WARNER HYDRAULIC

DESCRIPTION

Westerbeke Four-107 Engines are also furnished with Warner hydraulic direct drive and reduction gear assemblies.

The direct drive transmission consists of a planetary gear set, a forward clutch, a reverse clutch, an oil pump, and a pressure regulator and rotary control valve. All of these are contained in a cast iron housing along with necessary shafts and connectors, to provide forward, reverse and neutral operation. A direct drive ratio is used for all forward operation. In reverse, the speed of the output shaft is equal to input shaft speed, but in the opposite direction. Helical gearing is used to provide quieter operation than can be obtained with spur gearing.

Oil pressure is provided by the crescent type pump, the drive gear of which is keyed to the drive shaft and operates at transmission input speed to provide screened oil to the pressure regulator.

From the regulator valve the oil is directed through the proper circuits to the bushings and anti-friction bearings requiring lubrication. A flow of lubricant is present at the required parts whenever the front pump is turning and it should be noted that supply is positive in forward, neutral and reverse conditions.

The unit has seals to prevent escape of oil.

Both the input and output shafts are coaxial, with the input shaft splined for the installation of a drive damper, and the output shaft provided with a flange for connecting to the propeller shaft.

CONTROL LEVER POSITION

The position of the control lever on transmission when in forward should

be shifted to the point where it covers the letter "F" on the case casting, and is located in its proper position by the poppet ball. The Warranty is cancelled if the shift lever poppet spring and/or ball is permanently removed, or if the control lever is changed in any manner, or repositioned, or if linkage between remote control and transmission shift lever does not have sufficient travel in both directions. This does not apply to transmissions equipped with Warner Gear electrical shift control.

LUBRICATION

The properties of the oil used in the transmission are extremely important to the proper function of the hydraulic system. Therefore, it is extremely important that the recommended oil, automatic transmission fluid (ATF), Type "A" be used.

PROCEDURE FOR FILLING TRANSMISSION WITH OIL

When filling the transmission, oil should be added until it reaches the full mark on the dipstick. The quantity of oil depends upon the angle of the installation. The unit should be turned over at engine idle speed for a short time in order to fill all circuits, including the cooler and cooler piping.

PROCEDURE FOR CHECKING OIL LEVEL

The oil level should be checked immediately after shutting off engine and sufficient oil added to again bring the transmission oil level to the full mark on the dipstick assembly. The dipstick assembly need not be threaded into the case to determine the oil level. It need only be inserted into the case until the cap or plug rests on the surface surrounding the oil filler hole.

The transmission should be checked periodically to assure proper oil level, and oil should be added if necessary.

CHANGING OIL

It is recommended that the transmission oil be changed once each season. After draining oil from the unit, the removable oil screen should be thoroughly cleaned before refilling the transmission with the recommended oil (ATF) Type "A".

REDUCTION GEAR BOX

The reduction gear box operates in conjunction with the direct drive unit. The reduction gear box consists of a planetary gear set which reduces the input revolutions to a fixed ratio.

It is recommended that all installations using a reduction gear have a suitable locking device or brake to prevent rotation of the propeller shaft when the boat is not under direct propulsion. If the marine gear is not in operation and the forward motion of the boat causes the propeller shaft to rotate, lubricating oil will not be circulated through the gear because the oil pump is not in operation. Overheating and damage to the marine gear may result unless rotation of the propeller shaft is prevented.

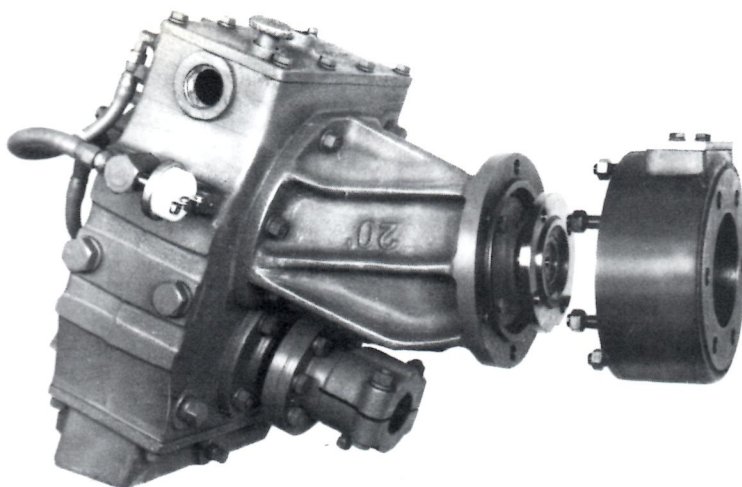
Except in an emergency, shift from forward to reverse drive through neutral at engine speeds below 1000 rpm to prevent damage to the engine, or marine gear.

WALTER DIRECTLY MOUNTED V-DRIVES

OWNER'S MANUAL

Models RV-10D thru RV-50D

- **More Space For Living Quarters and Cargo—** Placing engines in the stern saves space for living quarters and cargo space. Engine compartment becomes very compact and can be bulkheaded; reduces engine noise and fuel odors while increasing safety.
- **Better Performance—** Weight of engines in stern of boat allows boat to plane more easily. Floorboards and center of gravity can be lowered, resulting in a more stable boat design.
- **Reliable—Practically Maintenance Free—** V-Drives make it possible to use inboard engines on small cruisers. Eliminates costly maintenance and problems associated with I/O's which are constantly immersed in corrosive saltwater.



Advantages of WALTER V-DRIVES

- 1 WIDE RANGE OF STANDARD RATIOS!** Up to 3:1 reduction available on most models. No need for reduction gear on transmission.
- 2 CHOICE OF V-ANGLES!** All independently mounted V-Drives can be supplied with a choice of 3 standard V-angles.
- 3 IDLER GEAR CHANGES ROTATION OF PROP SHAFT!** This option makes it possible to obtain twin screw rotation with same-hand engines. Walter V-Drives use a third gear to reverse rotation rather than potentially troublesome chains & sprockets.
- 4 HIGH QUALITY GEARS!** Only fully hardened, precision helical gears made of the finest alloy steel are employed in WALTER V-Drives. The gear teeth are cut, heat-treated, and precision ground or honed to an aircraft quality finish and accuracy for smooth and quiet operation. No other method of manufacturing can consistently produce a finer gear.
- 5 HIGH PROP THRUST CAPACITY!** Special anti-friction bearings and rugged tapered roller bearings are used.
- 6 REVOLUTIONARY DESIGN!** Specially coupled cardan-type needle bearing universal joints operate at equal angles for constant velocity. Fully encased; lubricated & cooled by lube system.
- 7 EXCEPTIONAL FLEXIBILITY!** Independently mounted models use self-aligning bearing, slidable splined connecting shaft and flex joint assembly to provide 2 points of flexibility, eliminate strain between engine and V-Drive.
- 8 HIGH CAPACITY WATERCOOLING!** A waterjacket or tubular oil cooler and filter cools each V-Drive. V-Drives equipped with reversible oil-circulating pumps force feed lubrication to gears and bearings and have an oil pressure drop switch and warning light. Oil pumps are self-adjusting for either right or left hand rotation.
- 9 ADJUSTABLE MOUNTING BRACKETS!** Easy installation and realignment. Brackets are 2 or 3 way adjustable on all models.
- 10 CLAMP-FIT PROPELLER SHAFT COUPLINGS!** Standard on all V-Drives, these flanges grip the entire circumference of the prop shaft and compensate for small variations in shaft sizes. Bores are broached and keyed.

MADE IN THE U.S.A.

PARTS LIST

Advise serial number, model and ratio of V-Drive when ordering parts.

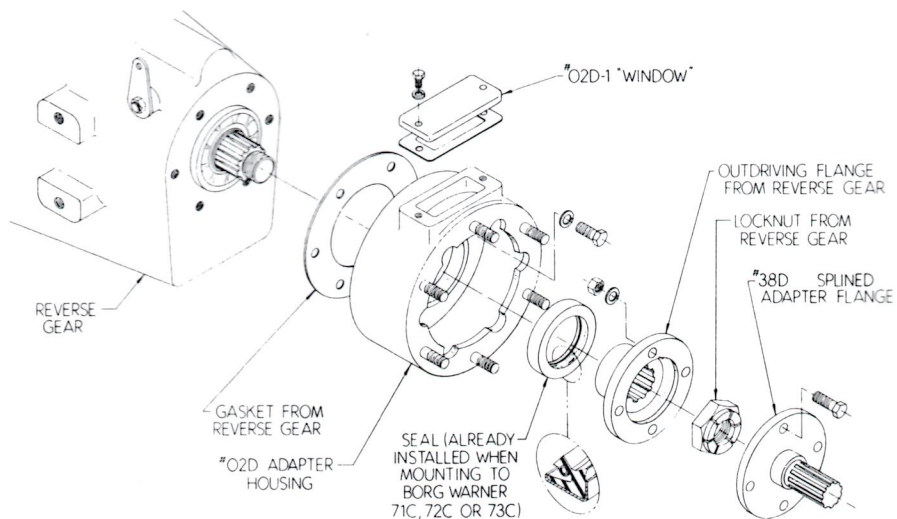
(A dash indicates a part is not used in that model.)

Part No.	DESCRIPTION	RV-10D	RV-26D	RV-36D	RV-40D	RV-48D	RV-50D	Part No.	DESCRIPTION	RV-10D	RV-26D	RV-36D	RV-40D	RV-48D	RV-50D
1	Housing, Main	1	1	1	1	1	1	15A	Bearing, Gear Shaft, flange end	1	1	1	1	1	1
2	Adapter Plate	1	—	—	1	1	1	16	Mounting Bkt	2	2	2	2	2	2
02D	Adapter Housing	1	1	1	1	1	1	18	Stud, Nut & L'Wash	24	24	24	28	28	31
02D-1	Cover, Adapter	1	1	1	1	1	1	19A	Screw & L'Wash	—	6	8	8	8	8
3	Cover, no pump	1	1	—	—	—	—	19B	Stud, Nut & L'Wash	4	4	8	8	8	8
3SP	Cover, pump	—	1	1	1	1	1	21	Oil Level Gage	1	1	1	1	1	1
4	Cover, Seal	1	1	1	1	1	1	22	Magnetic Plug	1	2	2	2	2	2
5	Cover, Blank	1	1	1	1	1	1	23B	Screw & L'Wash	—	4	4	4	4	4
6	Cover, Watercooled	1	—	—	—	—	—	23D	Angle Housing	1	1	1	1	1	1
6B	Cover, Plain Bottom	—	1	1	1	1	1	24D	Angle Housing Cover	—	1	1	1	1	1
6D	Cover, top	—	1	1	1	1	1	24A-D	Seal, Angle Housing	1	1	1	1	1	1
6E	Oil Cooling Coil	—	1	1	1	1	1	25	Prop Flange, complete	1	1	1	1	1	1
6F	Coil Terminal and O-Rings	—	2	2	2	2	2	25B	Bolts & L'Wash	3	8	8	6	8	8
8	Seal, Gear Shaft	1	1	1	1	1	1	26D	Bearing, Angle Housing	—	1	1	1	1	1
9A	Pinion Shaft only	1	—	—	—	—	—	28	Idler Gear	—	1	1	1	1	1
9AJ	Pinion Shaft and Yoke, 1 piece	—	1	1	1	1	1	29	Idler Shaft	—	1	1	1	1	1
9AJ-N	Locknut	—	1	1	1	1	1	29A	Idler Bushing	—	1	1	1	1	1
9AJ-W	Lockwasher	—	1	1	1	1	1	29B	Idler Spacer & Shim	—	1	1	1	1	1
9B	Pinion Gear	1	1	1	1	1	1	30	Idler Bearing	—	2	2	2	2	2
9C	Pinion Shaft Sleeve	—	1	—	1	1	1	34	Universal Joint Double, complete	1	—	—	—	—	—
9F	Spacer Ring	—	1	1	—	—	—	34A	Joint Repair Kit	1	1	1	1	1	1
10	Driven Gear	1	1	1	1	1	1	34J	Univ. Joint, less Yoke	—	1	1	1	1	1
11A	Gear Shaft	1	1	1	1	1	1	38B*	Bolt, Nut & L'Wash	4	4	4	4	6	6
11A-N	Locknut	1	1	1	1	1	1	38D	Splined Adap. Flange	1	1	1	1	1	1
11A-W	Lockwasher	1	1	1	1	1	1	42A	Oil pump and Spring	—	1	1	1	1	1
11C	Gear Shaft Sleeve	—	—	1	—	—	—	42B	Pump End Cap	—	1	1	1	1	1
11T	Spacer	—	—	1	—	—	—	42T	Pump Drive Ring & Pin	—	1	1	1	1	1
11D	Spacer Ring	—	1	1	1	1	1	43S	Oil Strainer	—	1	1	1	1	1
12	Breather Cap	1	1	1	1	1	1	44	Hose & Hose Connections	—	1	1	1	1	1
12A	Breather Elbow	1	1	1	1	1	1	45	Spray Nozzle	—	1	1	1	1	1
13	Gaskets, complete set	1	1	1	1	1	1	45C	Nozzle Holder	—	1	1	1	1	1
14	Bearing, Pinion Shaft, yoke end	1	1	1	1	1	1	49	Pressure Drop Switch	—	1	1	1	1	1
14A	Bearing, Pinion Shaft, closed end	1	1	1	1	1	1	49A	Warning Light & Plate	—	1	1	1	1	1
15	Bearing, Gear Shaft, closed end	1	1	1	1	1	1	50	Seal, Adapter Housing	1	1	1	1	1	1

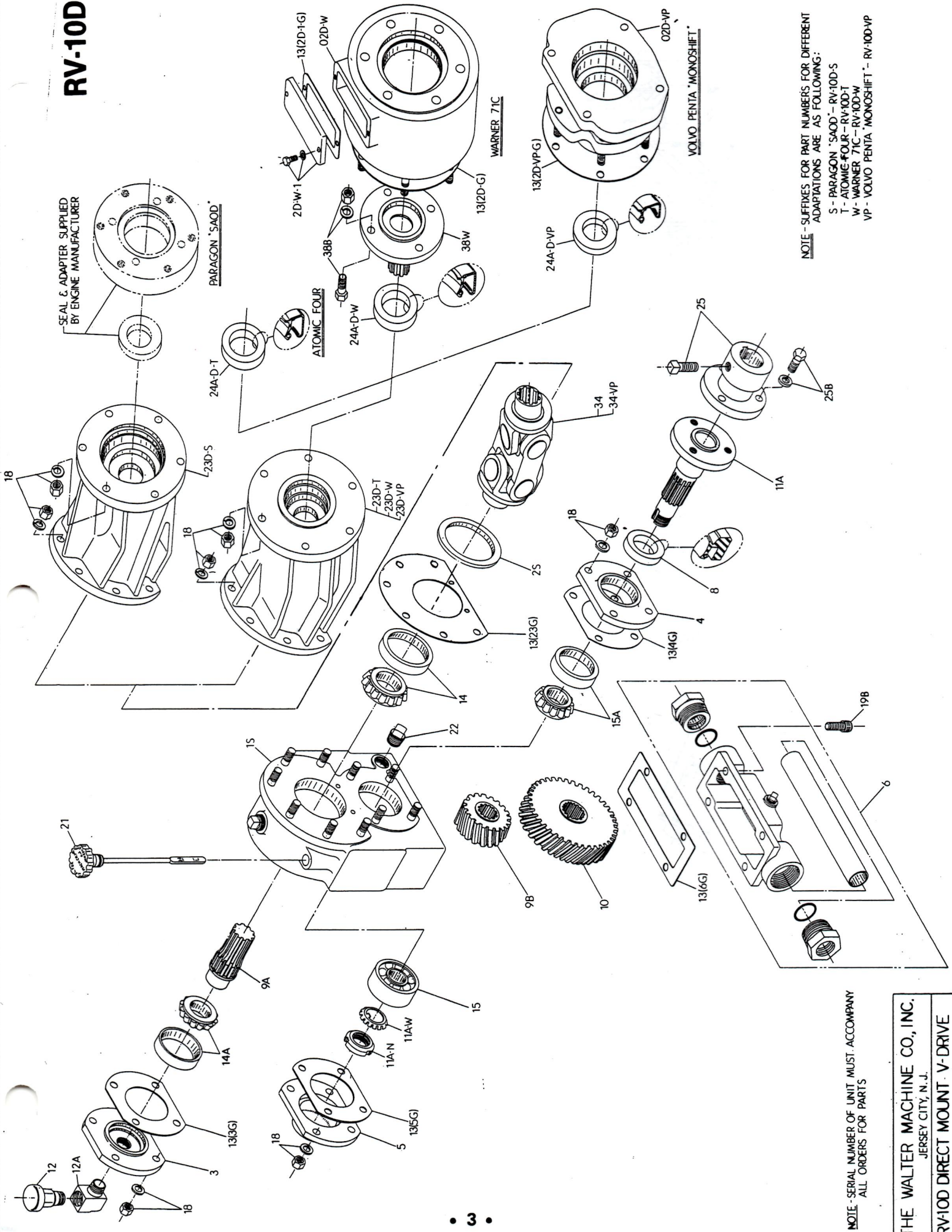
*Supplied by engine manufacturer

ASSEMBLY TO REVERSE GEAR

• Unbolt the output flange and back cover from the reverse gear/marine transmission. (On the RV-48D and RV-50D mounted to the Warner 73 only, the spacer ring and bearing cup must also be removed from the reverse gear back cover and installed in the #02D-73 Adapter Housing). Bolt the #02D Adapter Housing to the reverse gear (the reverse gear back cover is no longer required). Reinstall the reverse gear output flange and fasten with the locknut per the reverse gear manufacturer's specifications. Remove the #02D-1 "Window" from the Adapter Housing for wrench clearance and bolt the #38D Splined Adapter Flange to the reverse gear output flange. Reinstall #02D-1 "Window". (On some RV-10D models the #38D is not required; the female spline of the #34 Universal Joint fits over the male spline on the reverse gear output shaft). Place the #02D-G Gasket over the studs on the #02D Adapter Housing and then slide the V-Drive on the #38D Splined Adapter Flange. Secure the #23D Angle Housing against the #02D Adapter Housing with the nuts provided.



RV-10D



SEAL & ADAPTER SUPPLIED BY ENGINE MANUFACTURER

PARAGON SAOD

WARNER 71C

VOLVO PENTA MONOSHIFT

NOTE - SUFFIXES FOR PART NUMBERS FOR DIFFERENT ADAPTATIONS ARE AS FOLLOWING:

- S - PARAGON SAOD - RV-10D-S
- T - ATOMIC FOUR - RV-10D-T
- W - WARNER 71C - RV-10D-W
- VP - VOLVO PENTA MONOSHIFT - RV-10D-VP

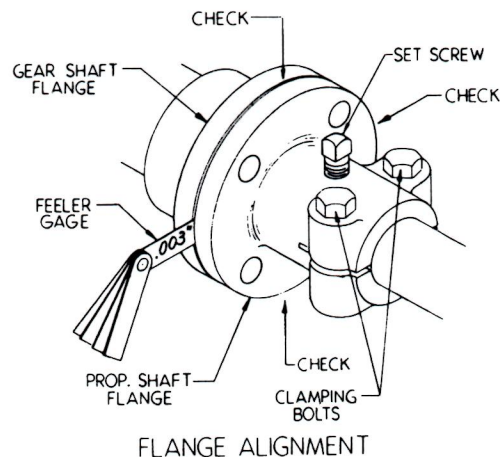
NOTE - SERIAL NUMBER OF UNIT MUST ACCOMPANY ALL ORDERS FOR PARTS

THE WALTER MACHINE CO., INC.
 JERSEY CITY, N. J.
 RV-10D DIRECT MOUNT - V-DRIVE

INSTALLATION

Flange Alignment

• Install the #25 propeller shaft flange on to the propeller shaft and tighten the two clamping bolts on the split hub (none on RV-10D). A self-locking set screw is provided for the propeller shaft flange. Spot drill the propeller shaft and then securely tighten the set screw. Many good installations are ruined by improper propeller shaft flange alignment. Accurate alignment will ensure a smooth operating drive train and eliminate many problems that arise due to misalignment. Final alignment should not be attempted until the boat has been allowed to "settle" in the water. After the engine has been installed, adjust the mounts per manufacturer's instructions until the pilot diameters of the gear shaft flange and the propeller shaft flange engage freely. Butt the flange faces together. Without rotating either flange, check with a feeler gage in at least four places as shown in the illustration. If the maximum feeler gage that can slip between the flange faces at any point is .003", the unit is properly aligned. If a thicker gage can be inserted at any point, the engine must be readjusted until proper alignment is obtained. Turn the propeller shaft flange 1/4 of a turn without moving the gear shaft flange. Try inserting the .003" feeler gage as described above. The gap will not change if the propeller shaft is straight. If it increases, the shaft or flange is bent and must be removed and straightened. Rotate the propeller shaft flange in two more 1/4 turn increments and repeat the procedure. The pilot diameters

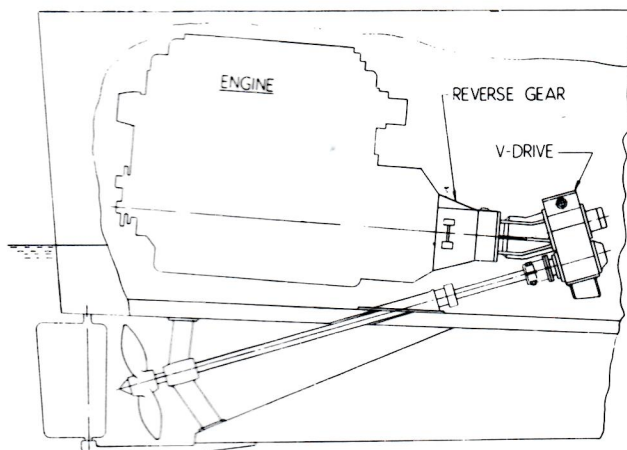


must be rechecked to ensure that they still engage freely. Secure the two flanges together with the heat treated bolts and special high collared lockwashers supplied. The RV-26D & RV-36D use stainless steel hex head cap screws, nuts, and high collared lockwashers. For the RV-50D only, see additional notes on the reduced engineering print on page 4.

Water and Switch Connections

• Hook up the water lines to the two pipe connections on the V-Drive (intake and exhaust lines are interchangeable). The V-Drive should be incorporated into the cold side of the cooling system. In some cases, scuppers through the hull are connected to and from the V-Drive to provide independent water-cooling and are actuated by the movement of the boat through the water. With closed cooling systems, the V-Drive should be incorporated into the cold side of the raw water system. Normal operating temperature should not exceed 180°F, although safe intermittent operating temperatures may be as high as 210°F. On the models equipped with an oil circulating pump, the #49 oil pressure drop switch and the 12 volt #49A warning light should be hooked up per the wiring diagram (see page 4). The switch may be grounded to any part of the V-Drive or engine (either terminal may be used for the ground). Any silt, sand or scale in the cooling chamber (None on RV-10D) on the top of the #01C main housing should be cleaned at the start of each season. Remove the #19A cap screws and lift off the #6D-C flat top cover to expose the chamber.

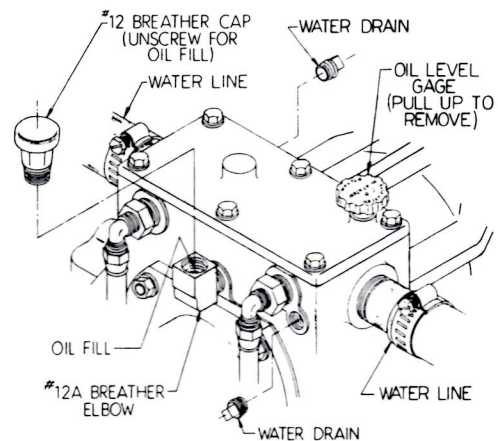
INSTALLATION DRAWING



Oil Fill

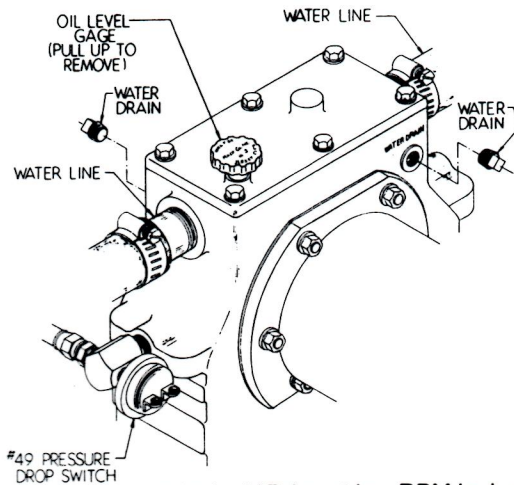
Pull out the #21 oil level gage. Unscrew the #12 breather cap and fill the V-Drive with SAE #30 heavy duty non-detergent motor oil through the #12A breather elbow. On the RV-10D only, the oil may be added by removing the plug in the #6D top cover. See table below for approximate oil capacities (the amount varies with the angle that the V-Drive is installed). The oil level should be checked with the oil level gage fully inserted in the unit. The proper level is between the "H" and "L" marks on the gage. Reinstall the breather cap. The oil level should be rechecked after the unit has been run and allowed to sit for about a minute. Add oil if necessary.

	RV-10D	RV-26D	RV-36D	RV-40D	RV-48D	RV-50D
Oil Capacity	1 pint	2 pints	3 pints	4 pints	4 pints	5 pints
(Approx.)	(NOTE: 1 quart = 2 pints, 1 gallon = 8 pints)					



OPERATION

- A pressure drop warning light is mounted on the instrument panel on V-Drives equipped with an oil circulating pump. The warning light will stay lit until the boat gets under way and the engine speed increases to sufficient RPM for the pump to maintain pressure. This normally occurs at approximately 1200 RPM, but the actual speed may vary by as much as 400 RPM. Extended cruising at low RPM, such as when trolling, is not harmful to the V Drive, even though the warning light may stay lit. Normal operation is between 6 to 12 PSI. The light will go on when the oil pressure drops below 2 PSI. Loss of oil and/or insufficient oil level are the major causes of pressure drop. The oil level should immediately be restored, and while running the boat, the unit should be checked for leaks. If the oil level is normal and the light stays lit when the boat reaches normal cruising speed, the wiring should be checked for loose and/or corroded connections. If the wiring is correct and the light remains lit, the #49 pressure drop switch, which is mounted on the side of the V-Drive (see illustration), should be checked for proper operation. The switch can easily be removed and an accurate oil pressure gage installed in its place. If the pressure is normal, the switch should be replaced. If the pressure is below normal, the oil lines should be checked for blockage. The pump should be inspected and replaced if necessary. The oil level should be checked several times during the season, especially on V-Drives without pumps (see "Oil Fill").

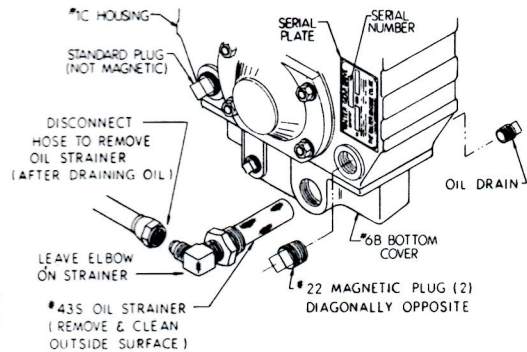


A clatter or rattle in the V-Drive at low RPM is due to drive line related vibrations, such as the over-riding of the propeller during the compression stroke of the engine. It is usually not harmful to the V-Drive if it occurs intermittently. It may be reduced by adjusting the idle speed and/or tuning up the engine for smoother operation. Walter Machine Co. is not responsible for total system related torsionals of this type.

MAINTENANCE

Oil Change

- Note: Disregard all references to oil lines and strainer if the V-Drive is without a pump (None on RV-10D). After the first 100 hours of operation and every season and/or 500 hours thereafter, the oil should be changed. Run the boat to warm up the V-Drive to operating temperature. Turn off the engine. Remove the plug in #6B bottom cover that is opposite the #43S oil strainer. Reinstall after draining. Disconnect the oil hose leading from the #43S strainer (leave the elbow on the strainer). Unscrew the strainer and clean the outside surface. Reinstall the strainer and reconnect the oil hose. Unscrew the two #22 magnetic plugs that are located on diagonally opposite corners of the #1C main housing (only one on RV-10D). The plugs can be checked to see if they are magnetic only after removal. Touch the inside face with a metallic object, such as a screwdriver. Clean them and reinstall. Usually, there are four plugs in the bottom part of the main housing. Only two of these are magnetic. The other two need not be removed (see illustration). Refill with SAE 30 motor oil to the proper level (see "Installation—Oil Fill").



Water Drain

- For protection from freezing during winter lay-up, remove the small pipe plugs (located diagonally opposite) on the front and back of the housing marked "Water Drain" (see illustration). On the RV-10D only, one of the water lines going into the #6 water-cooled bottom cover must be disconnected to drain the water.

Flange Realignment

- When the boat is launched after being in drydock, the line-up of the V-Drive to the propeller shaft flange should be rechecked and corrected if necessary. Some engines with rubber mounts may sag and must be raised with adjustments or shims for proper alignment (see "Flange Alignment" & "Engine Alignment").

Dealer Preparation

- The propeller shaft and engine alignment must be checked and corrected, if necessary, before the boat is delivered. Final alignment should not be attempted until the boat is allowed to "settle" in the water. The oil level must be checked and oil added if required. While the boat is being run, the water connections should be checked for leaks. The oil pressure drop switch and warning light (if the V-Drive is equipped with an oil circulating pump) should be checked for proper operation. Do not transport the boat with the propeller shaft coupling connected. Damage to the shaft, shaft log and V-Drive can result.

DANGER: Do not touch V-Drive or related components until all shafts and exposed parts are stopped and the ignition is off. All repair and maintenance must be done by a person who is fully qualified.

LIMITED ONE YEAR WARRANTY — All assembled V-Drives and parts are warranted against defective material or workmanship for a period of twelve months or 400 hours of operation, whichever occurs first, from date of delivery. The Walter Machine Co. Inc. obligation under this warranty is limited to replacement or repair of any defective material when returned prepaid to our factory in Jersey City, and shall be subject to our inspection and verification of claim. Each V-Drive has a serial number on a nameplate on the side of the main housing, which must be submitted when making warranty claim. This warranty will not apply to any failure which results from accident, neglect, fire, sinking, abuse, abnormal service, lack of maintenance or improper installation or service. This warranty will not apply to haul-out, launch, towing or storage charges, mechanic travel time, inconvenience, loss of time or income, removal and replacement and/or modification of any boat parts to facilitate repairs. The Walter Machine Co. Inc. will not accept responsibility for contingent liability through failure of any complete unit or part.

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