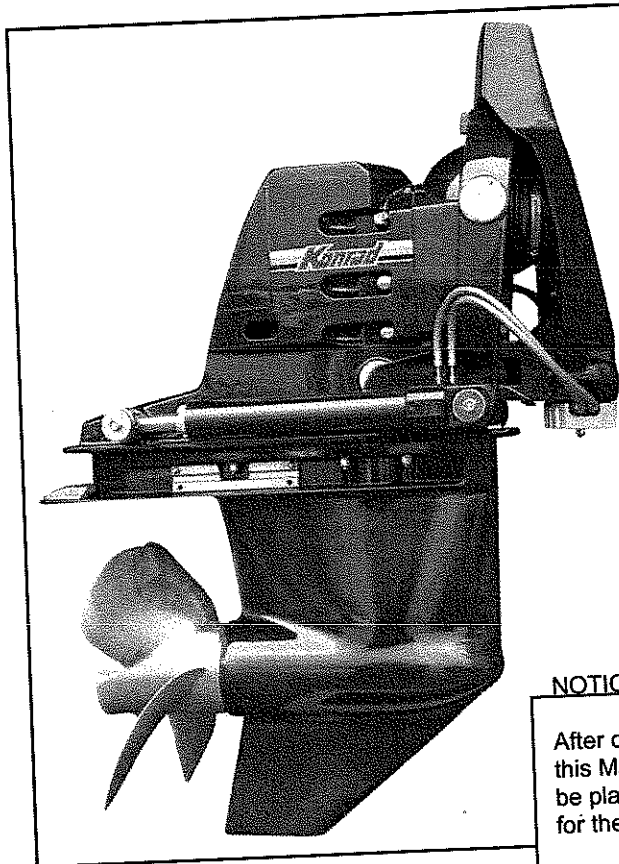


Kontad

HIGH OUTPUT PROPULSION SYSTEMS



NOTICE TO INSTALLER

After completing installation
this Maintenance Manual should
be placed with the Stern Drive
for the Owner's future use.

models

520 & 540

MAINTENANCE MANUAL

Konrad

MODEL 520 & 540

STERN DRIVE MAINTENANCE MANUAL

Version 2

PART # 10-544

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TABLE OF CONTENTS

1. Stern Drive

General Information	1
Safety Notices	1
Operation	2
Break-In Procedure	3
Torque Specifications for Fasteners	4
Removal	4
Installation	5

2. General Maintenance

Maintenance Schedule	6
Specified Lubricant (Gear Oil)	7
General	7
Naval	7
Filling	7
Removing Lubricant	8
Checking Lubricant	9
Hydraulic Fluids	10
Trim/Lift Pump	10
Specified Fluids	10
Filling	10
Bleeding	10
Steering System	11
Specified Fluids	11
Filling	11
Bleeding	12
Propeller and Hardware	13
Description and Parts Breakdown	13
Inspection	14
Removal	14
Installation	14

3. Complex Maintenance

Trim/Lift Electrical Drawing (12 Volt)	15
Trim/Lift Electrical Drawing (24 Volt)	16
Trim/Lift Electrical Drawing <u>for Navy RIBs</u> (24 Volt)	17
Setting Trim/Lift Switches	18
Universal Joints	20
Description and Parts Breakdown	20
Maintenance	21
Inspection	21
Removal	22
Installation	22
Bellows	24
Description and Parts Breakdown	24
Maintenance	24
Inspection	24
Removal & Installation	24
Trim System	25
Description and Parts Breakdown	25
Maintenance	26
Inspection	26
Trim Cylinder Removal	27
Trim Cylinder Installation	27
Steering Cylinder	28
Description and Parts Breakdown	29
Maintenance	29
Inspection	29
Anodes	30
Description and Parts Breakdown	30
Maintenance	31
Continuity Cables	32
Description and Parts Breakdown	32
Maintenance	33
Inspection	33
Propeller Shaft Bearing Carrier (Model 520)	34
Parts Breakdown	34
Removal	35

Rebuilding	35
Installation	35
Propeller Shaft Seal Carrier (Model 540)	36
Parts Breakdown	36
Removal	37
Rebuilding	37
Installation	37
Drive Shafts	38
Parts Breakdown	38
Maintenance	38
30-226 Parts List	39
30-264 Parts List	40
30-272 Parts List	41
Tools	42
Installation	43

1. STERN DRIVE

General Information

The Konrad 520 and 540 stern drives are steerable propulsion systems designed to accommodate engines that generate up to 738 lb ft of torque. Both stern drives have sixteen degrees (16°) trim range to optimize vessel performance while underway. However, when necessary, there is an additional thirty degrees (30°) of lift range. The additional lift may only be used when the stern drive is being serviced or trailered. The Konrad 520 and 540 stern drives are designed for applications where the vessel transom angle is twelve to fourteen degrees (12° to 14°). Applications that do not meet this criterion may require extra equipment or modifications. In some applications, it may not be possible to use Konrad equipment.

The Konrad 520 and 540 stern drives are designed to accommodate propellers with three (3) or four (4) blades, made of aluminum or stainless steel. Propellers are chosen depending on the application and performance criterion. The maximum diameter propeller size for the Konrad 520 stern drive is twenty inches (20"). The maximum diameter propeller for the Konrad 540 stern drive is sixteen inches (16").

Safety Notices

Read and understand all of the safety precautions and warnings before performing any installation or repair. This list contains the general safety precautions and warnings that **MUST** be followed to provide personal safety. This list is only a suggested safety guideline. Working conditions vary greatly, consequently safety measures will vary upon your individual circumstances. **Always use caution.** Make sure the work area surrounding the product is safe. Be aware of hazardous conditions that can exist.

ALWAYS wear protective eyeglasses and protective footwear when working.

DO NOT wear loose-fitting or torn clothing. Remove all jewelry when working.

DO NOT work on anything that is supported **ONLY** by lifting jacks or a hoist. **ALWAYS** use blocks or proper stands to support the product before performing any service work.

TO AVOID PERSONAL INJURY, use a hoist or get assistance when lifting drive components. Make sure all lifting devices such as chains, hooks, or slings are in good condition and are of the correct capacity.

ALWAYS use tools that are in good condition. Make sure you understand how to use them before doing any service work.

ALWAYS use the same fastener part number (or equivalent) when replacing fasteners. **DO NOT** use a fastener of lesser quality if replacements are necessary.

ADDITIONAL SAFETY PRECAUTIONS ARE INCLUDED IN THE PROCEDURES WHENEVER THEY APPLY.

Operation

The engine produces power (clockwise or counterclockwise rotation) that is transmitted through a reversing transmission. A coaxial planetary style reversing transmission is normally used in recreational applications. A twin shaft vertically offset standard reversing transmission (with coaxial additions available) is normally used in commercial applications. From this point the transmission is connected via close couple or drive shaft. The power is then transmitted through a series of shafts and gears and then to the propeller.

NOTE: In the case of a close couple application, a "Vulkan Torflex 1000" is recommended. In the case of a drive shaft application, "Spicer 1410 U-Joints" are recommended.

WARNING: If a u-joint style drive shaft is used, the drive shaft angle may not exceed one-half degree ($1/2^\circ$). If the angle exceeds one-half degree ($1/2^\circ$), any warranty that is offered with your application is void.

Break-In Procedure

NOTE: Make sure the stern drive and the gimbal carrier are properly filled with gear oil prior to operation.

Any new Konrad stern drive unit, whether a lower, upper or complete, requires a ten (10) hour break-in running period. Please use the following guidelines during the first ten (10) hours to assure optimum performance from your new Konrad stern drive.

1. **Avoid full throttle starts.**
2. **Avoid straining or heavy loading of the stern drive.**
3. **To achieve even wear patterns on your new drive gear sets, operate at intermittent throttle levels throughout the entire break-in period.**
4. **DO NOT exceed seventy-five percent (75%) of full throttle during the first five (5) hours.**
5. **During the next five (5) hours of the break-in period, operate periodically at full throttle.**
6. **The stern drive should be shifted into forward gear a minimum of ten (10) times during the first ten (10) hours with moderate (but not excessive) RPM's after each shift.**
7. **Change the gear oil when the break-in period is complete. See pages 7 and 8 for oil change procedure.**

NOTE: When the initial oil change is done, small metal particles may be found in the break-in oil. Do not be alarmed. This is typical during the break-in of the drive and will decrease as you continue to run the drive system.

Torque Specifications for Fasteners

Listed below are the torque specifications for those fasteners that have a specified torque value. Securely tighten all other fasteners. Internal drive component torque specifications are stated in the Konrad Technical Manual (10-591).

Description	Torque Value
Drive Shaft Flange to Transmission Output Flange Shaft Nuts/Bolts	70 lb ft (95 Nm)
Gimbal Housing Stud to Inner Transom Plate Nuts (8)	25-30 lb ft (34-41 Nm)
Drive Shaft Housing to Gear Housing Nuts and Bolts (8)	35 lb ft (48 Nm)
Power Trim Cylinder to Anchor Pin, Nuts (4)	Tighten until approximately 2 threads show. Do not over tighten
Propeller Nut 520/540 (1)	80 lb ft (109 Nm)/55 lb ft (75 Nm)
Top Cover (and Emergency Tiller Arm Bracket if applicable) (6)	20 lb ft (27 Nm)
Navy RIB Adapter Plate (5)	35 lb ft (48 Nm)
Stern Drive Unit to Bell Housing Attaching Nuts (6)	55 lb ft (75 Nm)
Gimbal Carrier Bolts (3)	70 lb ft (95 Nm)

Removal

1. Rig the Konrad drive for lifting. Secure the stern drive to the lifting device with a nylon strap or other fastener.
NOTE: An overhead lifting device is the preferred method of lifting the stern drive. The Konrad 520 weight is 188 lbs (85 kg) and the Konrad 540 weight is 153 lbs (69 kg).
NOTE: A lifting cart or forklift may be used as an alternate lifting device.
2. Disconnect hydraulic lines from the trim cylinders.
3. Remove the trim cylinders. (Refer to page 27).
4. Remove the six (6) nuts (10-334) and six (6) washers (10-415) attaching the stern drive to the transom assembly.
5. Remove the continuity cable (10-487) from the upper starboard side transom stud.

6. Slide the stern drive horizontally away from the transom, separating it from the transom assembly.
NOTE: It is recommended that a new gasket (10-305) be used when drive reinstallation occurs.

Installation

1. Rig the Konrad drive for lifting. Secure the stern drive to the lifting device with a nylon strap or other fastener.
NOTE: An overhead lifting device is the preferred method of lifting the stern drive. The Konrad 520 weight is 188 lbs (85 kg) and the Konrad 540 weight is 153 lbs (69 kg).
NOTE: A lifting cart or forklift may be used as an alternate lifting device.
2. Grease (using marine grade grease) both sides of the gasket (10-305) and slide it over the six (6) studs on the bell housing.
3. Grease the bellows (10-230).
4. Grease the splined shaft (10-365).
5. Grease both o-rings (10-306) and (10-493).
6. Grease and insert engagement pin (10-494) into the end of the splined shaft. 3/4 of the engagement pin should remain visible beyond the end of the splined shaft.
7. Slide the stern drive onto transom assembly. The splined shaft and u-joint assembly must be held up and guided into the gimbal carrier assembly.
NOTE: It may be necessary to rotate the splined shaft (this can be achieved by sliding the propeller onto the propeller shaft and rotating it back and forth) or yoke assembly so the splines line up for the drive to be fully seated against the transom assembly.
NOTE: If this step cannot be achieved, an alternate method is to remove the gimbal carrier, (from the inside of the vessel) slide the drive onto the transom assembly, then reinstall the gimbal carrier.
8. Fasten the stern drive to the transom assembly using the six (6) nuts (10-334) and six (6) washers (10-415). Torque nuts to 55 lb ft (75 Nm).
NOTE: Be sure to put the continuity cable (10-487) on the upper starboard stud before putting the washer and nut on.

2. GENERAL MAINTENANCE

Maintenance Schedule

USE SERVICE HOURS OR TIME INTERVAL, WHICHEVER OCCURS FIRST!!

Location and Service	Weekly	Every 50 Hours or 60 Days	Every 100 Hours or 120 Days	Every 400 Hours	At Least Once a Year
Stern Drive Unit Oil (Check Level)	EVERY DAY				
Stern Drive Unit Oil (Change Break-in Oil)	Change the break-in oil after the first 10 hours				
Stern Drive Unit Oil (Change)	EVERY 200 HOURS = Standard Oil EVERY 400 HOURS = Synthetic Oil				
Transom Assembly and Stern Drive Unit – (Inspect for corrosion or impact damage, including propeller)	X	X			X
Hoses – (Inspect for cracks, swelling, or other signs of deterioration. Check connections for adequate tightness)			X		X
Continuity Circuit – (Check components for continuity, loose connections, and broken or fraying wires)		X	X		X
Universal Joints (Greaseless)	REPLACE EVERY 200 HOURS				
Propeller Shaft and Nut (Lubricate and tighten)		X	X		X
Transom Gimbal Housing Assembly Swivel Shaft and Gimbal Bushing (Inspect for wear)		X	X		X
Bellows and Bellows Clamps (Inspect for wear and verify correct installation)			X		X

Specified Lubricants (Gear Oil)

NOTE: Synthetic gear lube (75-90W marine certified synthetic gear lube) **MUST** be used in cold waters under sixty degrees Fahrenheit, sixteen degrees Celcius (60°F, 16°C).

General

1. 80w90 Gear Lube Oil
2. "Royal Purple" (Max-Gear) 75W90 Synthetic Oil
 - 1 Quart (10-631)
 - 5 Gallon (10-633)
 - 55 Gallon (10-630)

Naval

1. Military PRF 2106, NSN 9150-01-035-5393

Filling

Lubricant Capacity:

Complete Stern Drive, 520 model - **approximately** seven (7) quarts (6.6 liters).
Complete Stern Drive, 540 model - **approximately** six (6) quarts (5.7 liters).

Pour Method:

1. Remove the top cover (10-209) of the stern drive by removing the six (6) socket head cap screws (10-110). If applicable, remove emergency tiller arm bracket (10-719) by removing the (4) four socket head cap screws (11-026) and four (4) nylon washers (11-033) and the two (2) socket head cap screws (10-110).
2. Pour in gear oil until drive is full.
3. Wait fifteen (15) minutes. Rotate the propeller five or six (5-6) times in both directions during those fifteen (15) minutes.
4. Repeat steps 2 and 3.
5. Replace the top cover (and the emergency tiller arm bracket if applicable) and torque to 20 lb ft (27 Nm).

NOTE: Make sure top cover o-ring (10-303) is greased and properly seated.

Pump Method (Pump Required)

1. Remove the upper breather screw (10-010) located on the top of the upper housing, port side and the lower drain plug (10-155) located on the lower housing under the tip of the nose cone.
2. Using a pump, pump gear oil into the drive from the bottom until it comes out of the top breather plug. Let the gear oil settle for ten to fifteen (10 to 15) minutes. Pump additional oil until it comes out of the top breather plug.
3. Replace lower drain plug and upper breather screw.
NOTE: Both drain plug and breather screw seal/gasket (10-285) must be in place when reinstalled.

Removing Lubricant

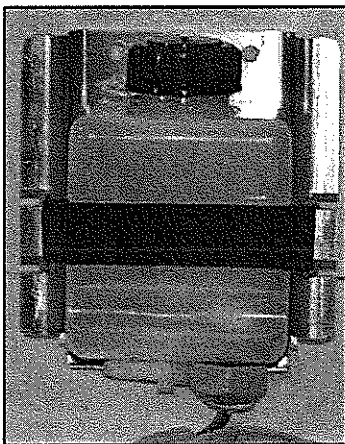
1. Trim drive unit to full "Out" or "Up" position.
2. Remove upper drive unit top vent plug (10-010) and bottom fill/drain plug (10-155). Allow lubricant to drain completely.
NOTE: Discharge of oil or oily waste into or upon the water is a direct violation of today's laws. Dispose of or recycle these substances properly.
3. Trim drive unit to full "In" or "Down" position (with anti-ventilation plate level) to complete draining process (540 model only).
4. Refer to previous pages for filling procedure and required lubricant.

Checking Lubricant Level

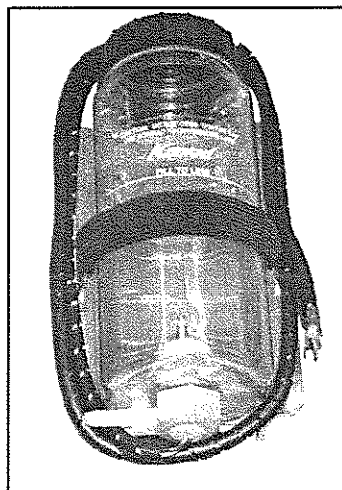
NOTE: The stern drive oil level is checked at the remote oil reservoir. There are three (3) different styles of reservoirs, only one (1) reservoir is used per drive. The one (1) pint (.47 liter) reservoir (rectangular bottle) assembly has a part number of 30-179. If you only need a replacement bottle, that part number is 10-931. The one (1) quart (.95 liter) reservoir (cylindrical bottle) assembly has a part number of 30-295. If you only need a replacement bottle, that part number is 10-416. The 42 ounce (1.24 liters) HP oil reservoir assembly has a part number of 11-944.

CAUTION: If the lubricant in the reservoir is milky brown or the lubricant is not level with the "fill line", there may be a leak in the drive unit. Before further use, the area where the leak occurs should be identified and corrected. Then refill the unit with new lubricant.

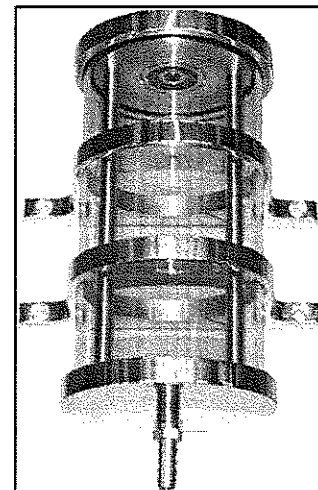
IMPORTANT: Always check oil level when the drive is cool and engine is shut down. Oil level in the reservoir will rise and fall during drive operation. If the lubricant reservoir is empty, **DO NOT** attempt to fill drive unit through reservoir, as air may be trapped in the drive unit and the stern drive could be damaged from lack of lubrication. After cause for low lubricant has been found and corrected, refill drive unit with lubricant, as outlined under "Filling" on pages 7 and 8.



30-179
Rectangular Reservoir Assembly
1 pint (0.47 liters)



30-295
Cylindrical Reservoir Assembly
1 quart (0.95 liters)



11-944
HP Oil Reservoir Assembly
42 ounces (1.24 liters)

Hydraulic Fluids

Trim / Lift Pump Specified Fluids

General

1. Automatic Transmission Fluid Type Dextron III
2. Light Hydraulic Fluid

Naval

1. Military H-17672, NSN 9150-00-985-7237
2. Military H-5606, NSN 9150-00-223-4134

Fluid Capacity

Trim Pump Reservoir - approximately one (1) quart (.95 liter).

Filling

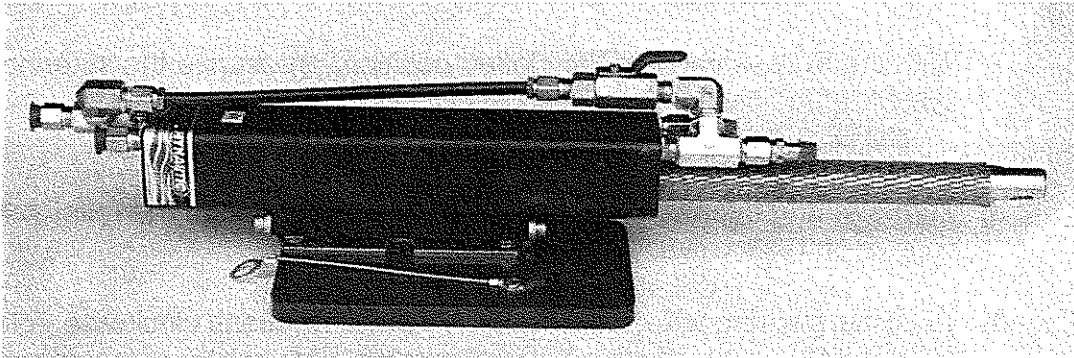
1. Remove cap (10-689) from the trim/lift pump reservoir.
2. Fill reservoir with specified fluid to indication line (maximum level).

IMPORTANT: Check fluid level with stern drive unit in the full down position.

Bleeding

1. Fill the trim/lift pump reservoir to appropriate level (if not already done).
2. Remove the down line from trim pump and place it in a container to catch any purged fluid. Hold one (1) finger over the down line port of the trim/lift pump to prevent the intake of air. Trim the drive all the way up using the toggle switches on the trim/lift control plate.
 - NOTE:** Only the toggle switch that's LED is illuminated can be used to trim or lift the drive.
 - NOTE:** Fluid may need to be added if the reservoir bottle level goes below the minimum.
3. With the drive in the up position, attach the down line to the trim/lift pump.
4. Cycle the drive all the way to the down position and then all the way to the up position. Repeat this step three or four (3-4) times to purge any remaining air out of the system.

Steering System



Specified Fluids

General

1. Automatic Transmission Fluid Type Dextron III
2. Power Steering Fluid

Naval

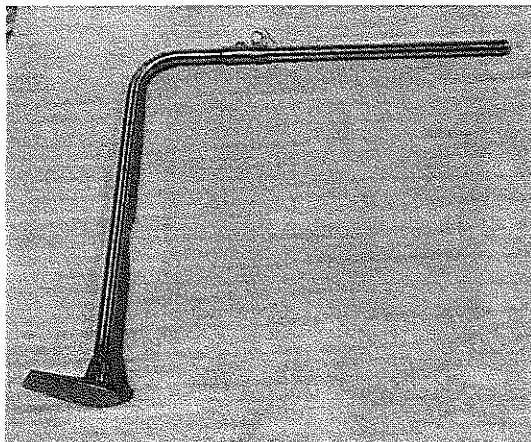
1. Military H-17672, NSN 9150-00-985-7237

Filling

1. Remove cap from reservale (depressurize first), helm pump reservoir, or power steering pump reservoir.
2. Fill with specified fluid to appropriate level.

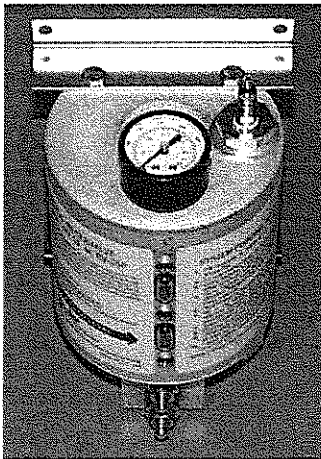
Emergency Tiller Arm (Navy applications)

Part Number 10-845

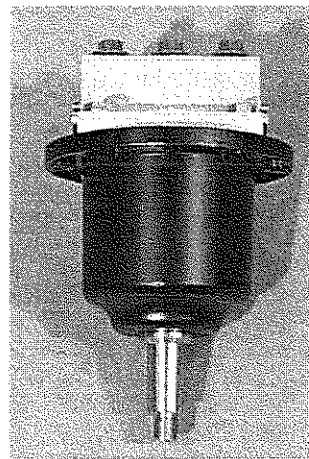


Bleeding Procedure (NAVY RIBs only)

1. Fill the steering reservale (30-151) to appropriate level (if not already done).
2. With the bypass valve in the closed position, pressurize the steering system at the reservale to 40 psi (276 kPa).
NOTE: Check steering system for leaks.
3. Turn steering bypass valve to the open position. Open the relief valve screws on reservale.
4. Oscillate steering wheel slowly forty (40) full rotations clockwise, followed by forty (40) full rotations counterclockwise. Repeat this procedure for twenty (20) and ten (10) full rotations.
5. Close bypass valve. Close relief valve screws on reservale. Oscillate the stern drive (using the steering wheel) four to five (4-5) times to the extreme port and starboard directions.
NOTE: Attempt to move the stern drive manually from left to right (from the outboard side of the transom). If the movement feels "springy" or "mushy" there is still air in the system, repeat steps 3 and 4.
6. Fill/top-off the reservale to the appropriate fluid level. Set operating pressure to 25-30 psi (172-207 kPa).
NOTE: Reservale gage has a Konrad Marine part number of 11-472.
NOTE: Steering wheel helm pump has a Konrad Marine part number of 30-192.



30-151 Reservale



30-192 Helm Pump

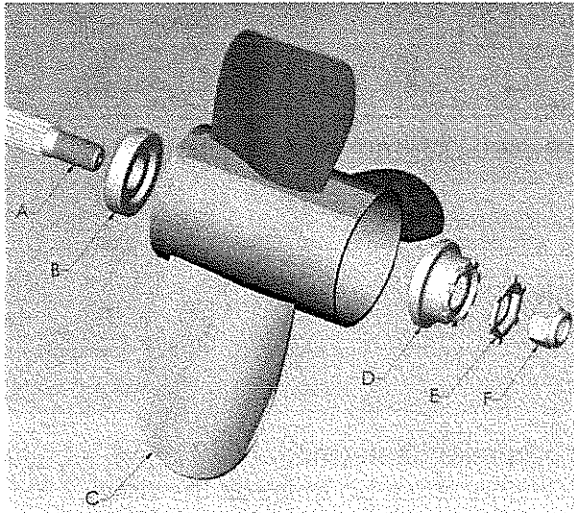
Propeller and Hardware

Description and Parts Breakdown



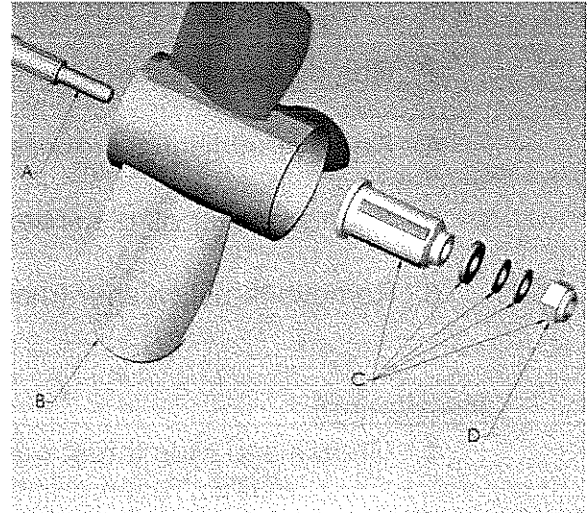
WARNING: Remote Control must be in NEUTRAL, the engine turned off and ignition key removed from switch before removing and/or installing propeller.

Model 520



	Description	Qty	Part #
A	Prop shaft (L) OR Prop shaft (R)	1	10-360 10-363
B	Forward thrust hub	1	10-292
C	Propeller	1	variable
D	Splined washer	1	10-293
E	Tab washer	1	10-295
F	Propeller nut	1	10-296

Model 540



	Description	Qty	Part #
A	Prop shaft (L) OR Prop shaft (R)	1	10-677 10-596
B	Propeller	1	variable
C	Prop Hardware Kit	1	10-680
D	Propeller Nut	1/0	10-667

When a stainless steel propeller is used, care must be taken to maintain good continuity between the prop and the prop shaft to prevent corrosion. Periodic removal of the propeller, a thorough cleaning of its hub, the prop shaft and all mounting components, and lubrication of the shaft with **marine grade grease** (or equivalent) will help maintain good continuity and prevent corrosion. A continuity washer can be installed between the propeller and the splined washer on all models to help maintain continuity.

Inspection

1. Check propeller shaft nut for correct torque – 55 lb ft (75 Nm) 540 model, 80 lb ft (109 Nm) 520 model.
2. Check propeller blades for any indication of damage.
3. Check tab washer - verify at least two (2) tabs are bent over (model 520 only).

Removal

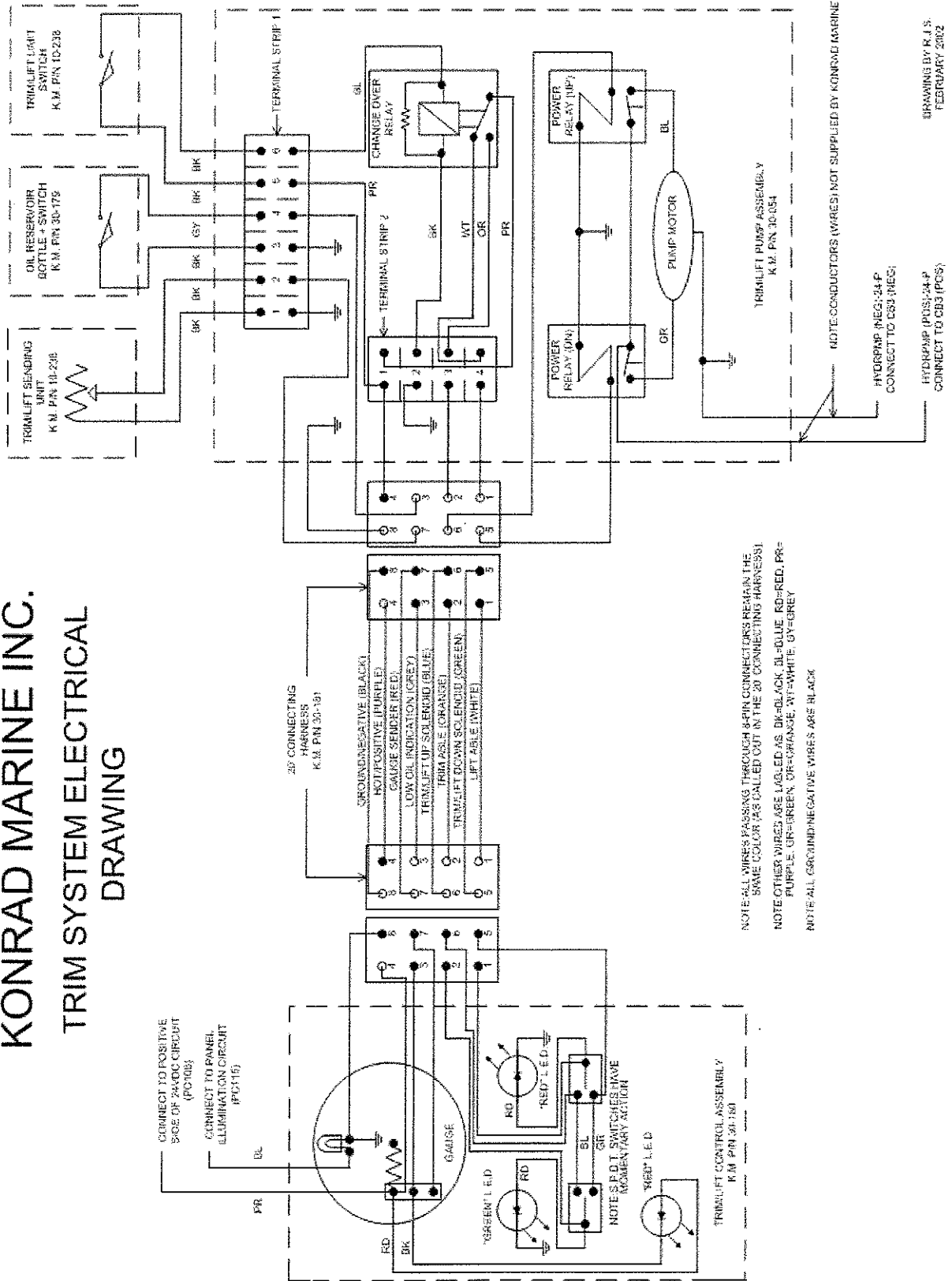
1. Unbend retaining washer tabs using Konrad Tool TO-063 (model 520 only).
2. Place a block of wood between the propeller and cavitation plate.
3. Remove propeller nut.
4. Remove additional propeller hardware (see diagram on previous page).
5. Slide propeller off of splined shaft.
6. Remove thrust washer (model 520 only).

Installation

1. Grease and slide thrust washer onto propeller shaft (model 520 only).
NOTE: Tapered end of thrust washer must be towards the drive.
2. Grease splined area and the threads of the propeller shaft.
3. Place the propeller on the propeller shaft followed by the appropriate hardware (see diagram on previous page).
4. Torque the propeller nut to 55 lb ft (75 Nm) 540 model, 80 lb ft (109 Nm) 520 model. When approaching 80 lb ft (109 Nm), 520 model only, make sure that the tabs on the tabbed retaining washer (at least 2 out of 6) line up with the grooves in the splined washer/hub.
NOTE: A block of wood can be placed between the propeller and the lower drive housing to prevent the propeller from spinning, while torquing the propeller nut.
5. Bend over the tabs using appropriate tools (model 520 only).

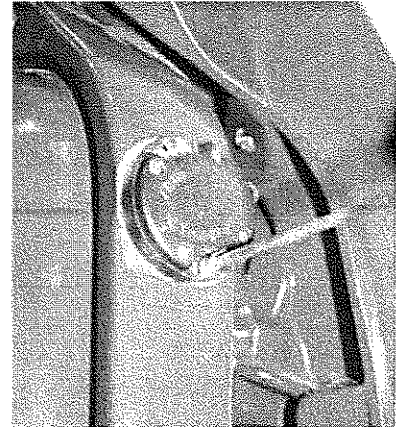
Trim/Lift Electrical Drawing for Navy RIBs (24 Volt)

KONRAD MARINE INC. TRIM SYSTEM ELECTRICAL DRAWING

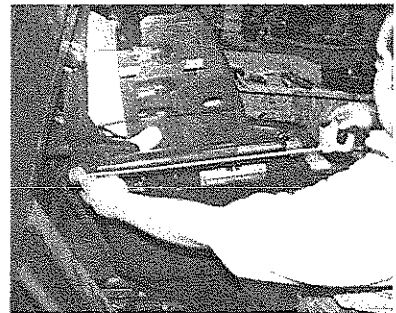


Setting Trim/Lift Limit and Sender Switch

1. Trim the drive all the way to the down position, approximately negative seven degrees (-7°).
2. Loosen the starboard side switch on the transom assembly and rotate the switch until gauge reads DN (farthest down position).
Note: If this position cannot be achieved by rotating the switch, it will be necessary to take the switch completely off the transom assembly and rotate the gray star-hex shaped knob until desired position is achieved. Remount the switch and fine tune.



3. Set the drive at approximately positive eight degrees ($+8^{\circ}$). This can be accomplished by trimming the drive up until the trim cylinders measure twenty-two inches (22") (56 cm) between the center of the front anchor pin and the center of the rear anchor pin.



Note: Alternate method of setting the drive at positive eight degrees ($+8^{\circ}$).

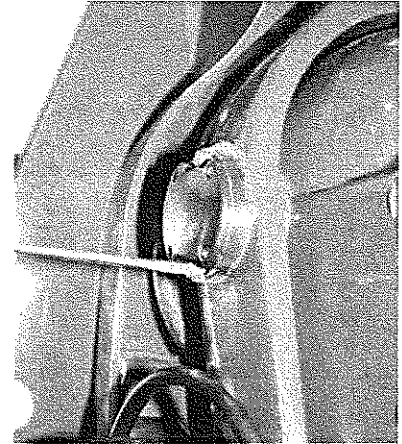
Insert a one inch (1") (2.5 cm) shim at the front of the top cover.

Place one end of a level on the one inch (1") (2.5 cm) shim and the other end on the back of the top cover.



Trim the drive up or down until the level indicates levelness.

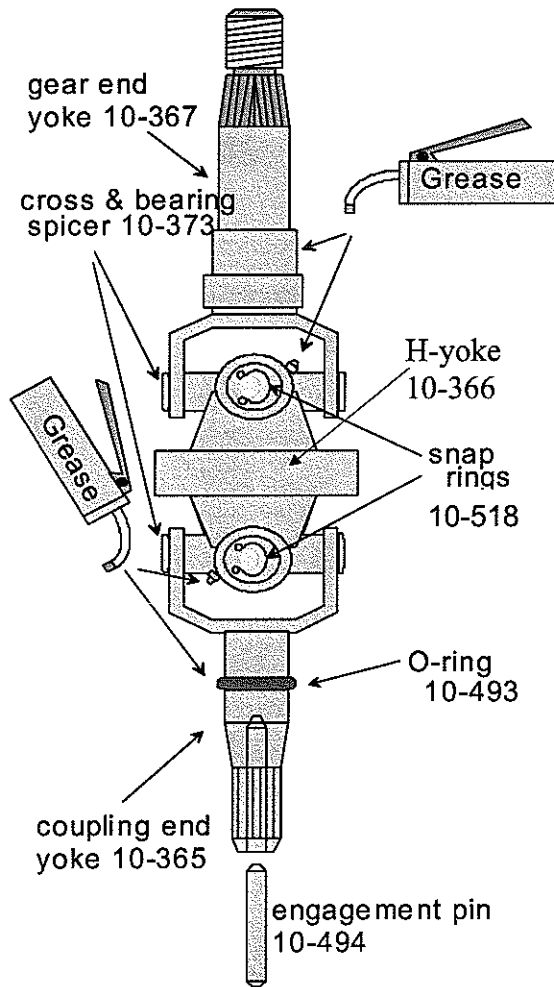
4. Loosen the port side switch on the transom assembly and rotate until the red and green LED's are on the verge of switching.
Note: If this position cannot be achieved by rotating the switch, it will be necessary to take the switch off the transom and rotate the gray star-hex shaped knob until desired position is achieved. Remount the switch and fine tune.



NOTE: Complete trim/lift switch assembly has a part number of 10-238.
(Includes both port and starboard sending units)

Universal Joints

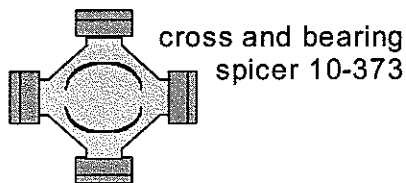
Description and Parts Breakdown



Complete U-Joint Assembly 30-033

Description	Qty	Part #
Gear end yoke	1	10-367
Cross and bearing	2	10-373
Snap rings	8	10-518
O-ring	1	10-493
Coupling end yoke	1	10-365
Engagement pin	1	10-494
H-yoke	1	10-366

Individual Components



Maintenance

Inspection

Inspection Before Disassembly

1. U-joint cross and bearings should be greased and inspected every two hundred (200) hours for wear and possible replacement, depending on usage. Severe applications may require shorter intervals.
2. Check cross and bearing for roughness and excessive side-to-side play.
3. Check splines on coupling end yoke for wear.
4. If troubleshooting a u-joint knocking condition, inspect for evidence of interference with bearing caps hitting center socket.

Cleaning and Inspection

1. Clean all parts **except the bearing** in fresh solvent. Blow dry with compressed air.

IMPORTANT: DO NOT clean bearing with solvent, as this will wash away the lubricant that retains needle bearings.

2. Inspect crosses for the following:
 - Bearing surfaces - for pitting, scratches and grooves
 - Ends - for galling
 - Seal - for cracks or other signs of deterioration
3. Inspect coupling and gear end of u-joint - for spline wear.
4. Clean all corrosion from the coupling.
5. Replace coupling yoke if splines are partially corroded away.

NOTE: If wear or corrosion is found in the u-joint assembly, contact Konrad for new parts and/or service.

Removal

Universal Joint Shaft Assembly

U-joint cross and bearings should be replaced at four hundred (400) hours (or before if necessary). The u-joint assembly requires two (2) cross and bearing kits, (10-373).

CAUTION: New snap rings should be installed whenever new cross and bearing kits are installed. The 520 stern drive utilizes a **special snap ring** (10-518), different than many of those found on other stern drives or with after market cross and bearing sets. It is required that only these snap rings be used.

CAUTION: Be sure not to damage grease zerk.

1. Remove external snap rings.
2. Remove bearing cup.
3. Remove second bearing.
4. Remove yoke.

Installation

Universal Joint Shaft Reassembly

Lube Specifications

Use only non-lithium soap base or equivalent E.P. grease with an operating temperature of three hundred twenty-five degrees Fahrenheit (+325° F) (163° C) to minus ten degrees Fahrenheit (-10° F) (-23° C), meeting N.L.G.I. grade one (1) or two (2) specifications or DIN51. **The use of any other lubricant will decrease the life of the bearings.**

IMPORTANT: Crosses MUST BE installed so that grease fittings are toward the socket (center yoke).

1. Press bearing caps into yoke and onto cross. If a press is unavailable, use a large c-clamp.
2. Install external snap rings.
3. Repeat same procedure for other bearing caps.
4. Lubricate cross and bearings with a liberal amount of above specified lube.

Universal Joint Shaft Lubrication

U-joint cross and bearings and yoke splines should be lubricated every two hundred (200) hours of operation or every three (3) months. Severe applications require shorter intervals. To insure proper lubrication of all eight (8) bearing assemblies, it is essential to add the lubricant until it appears at all journal cross bearing seals. This assures removal of dirt particles and other contaminants that may find their way into the bearing. It also indicates that the bearings are fully lubricated with fresh grease. Be sure to check external snap rings and make sure they are still tightly in position.

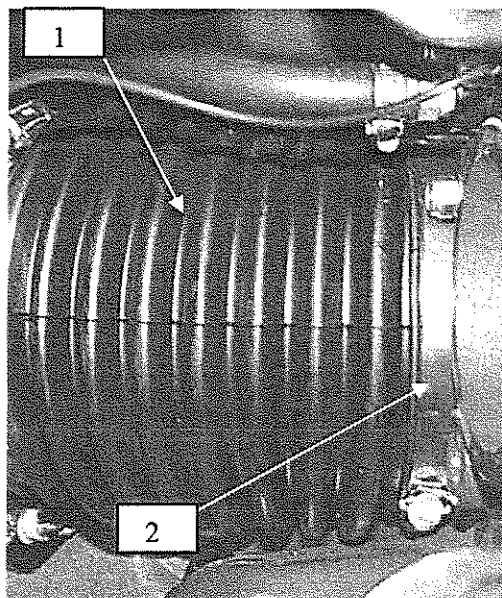
NOTE: When u-joint assembly is completely removed from the upper housing of the stern drive for u-joint maintenance, it is recommended that a new front seal (10-307) and a new locking nut (10-268) be used when reinstallation occurs. The locking nut is to be torqued to 200 lb ft (271 Nm) when reassembled.

Bellows

Description and Parts Breakdown

Individual Components

Description	Qty	Part #
Bellows	1	10-230
Hose clamp	2	10-336



Maintenance

Inspection

1. Look for any cracks, holes, tears or a broken seal.
2. Look for large amount of corrosion on the surface of material or excessive wear.

Removal & Installation

NOTE: Sterndrive must be removed for removal and installation of bellows. Refer to a previous section in this manual for removal instructions.

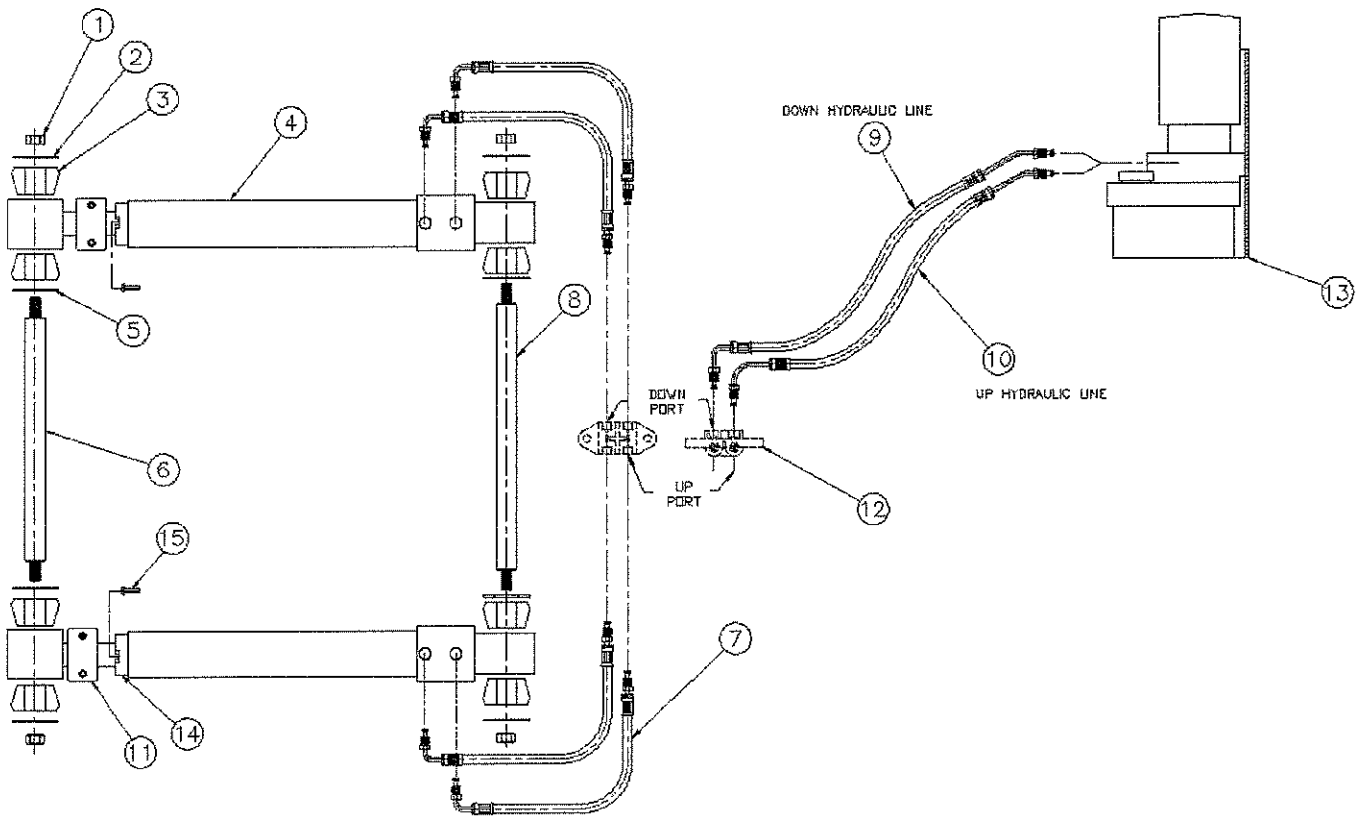
1. Remove U-joint bellows from gimbal housing by loosening the two (2) hose clamps (10-336).
2. Position ground clips on bellows.
3. Position u-joint bellows with "TOP" mark facing upwards and install u-joint bellows on gimbal housing flange and position clamp. Torque to 30-40 lb in (3.4 - 4.5 Nm).

NOTE: When ordering the bellows (10-230), two (2) hose clamps (10-336) are included.

IMPORTANT: Be sure that the bead on the inner mating surface of bellows is positioned in the groove on the gimbal-housing flange.

Trim System

Description and Parts Breakdown



Complete Trim Assembly 30-002

Trim System

Individual Components

	Description	Qty	Part #
1	Hex Nut, Nylock	4	10-314
2	Washer, Anchor Pin	4	10-444
3	Bushing, Anchor Pin	8	10-443
4	Cylinder, Trim, Assembly	2	30-024
5	Washer, Anchor Pin	4	10-442
6	Pin, Anchor (Rear)	1	10-459
7	Hose, Braided Oil	4	11-078
8	Pin, Anchor (Front)	1	10-458
9	Hose, Oil (Gray) 32" (81 cm) OR Hose, Oil (Gray) 48" (122 cm)	1 1	10-489 11-180
10	Hose, Oil (Black) 32" (81 cm) OR Hose, Oil (Black) 48" (122 cm)	1 1	10-490 11-170
11	Shaft, Collar (if applicable)	2	10-434
12	Connector	1	10-331
13	Pump, Trim (12 Volt) OR Pump, Trim (24 Volt)	1 1	10-430 10-690
14	Trim Cylinder Anode (If applicable)	2	11-277
15	Screw (If applicable)	4	11-278

Maintenance

Inspection

1. Check for external leaks.
2. Check hydraulic line fittings for corrosion or fatigue.
3. Inspect bushings for excessive wear.
4. Check for correct tightness of nuts (10-314). Two (2) threads should be visible beyond the nut.

Trim Cylinder Removal

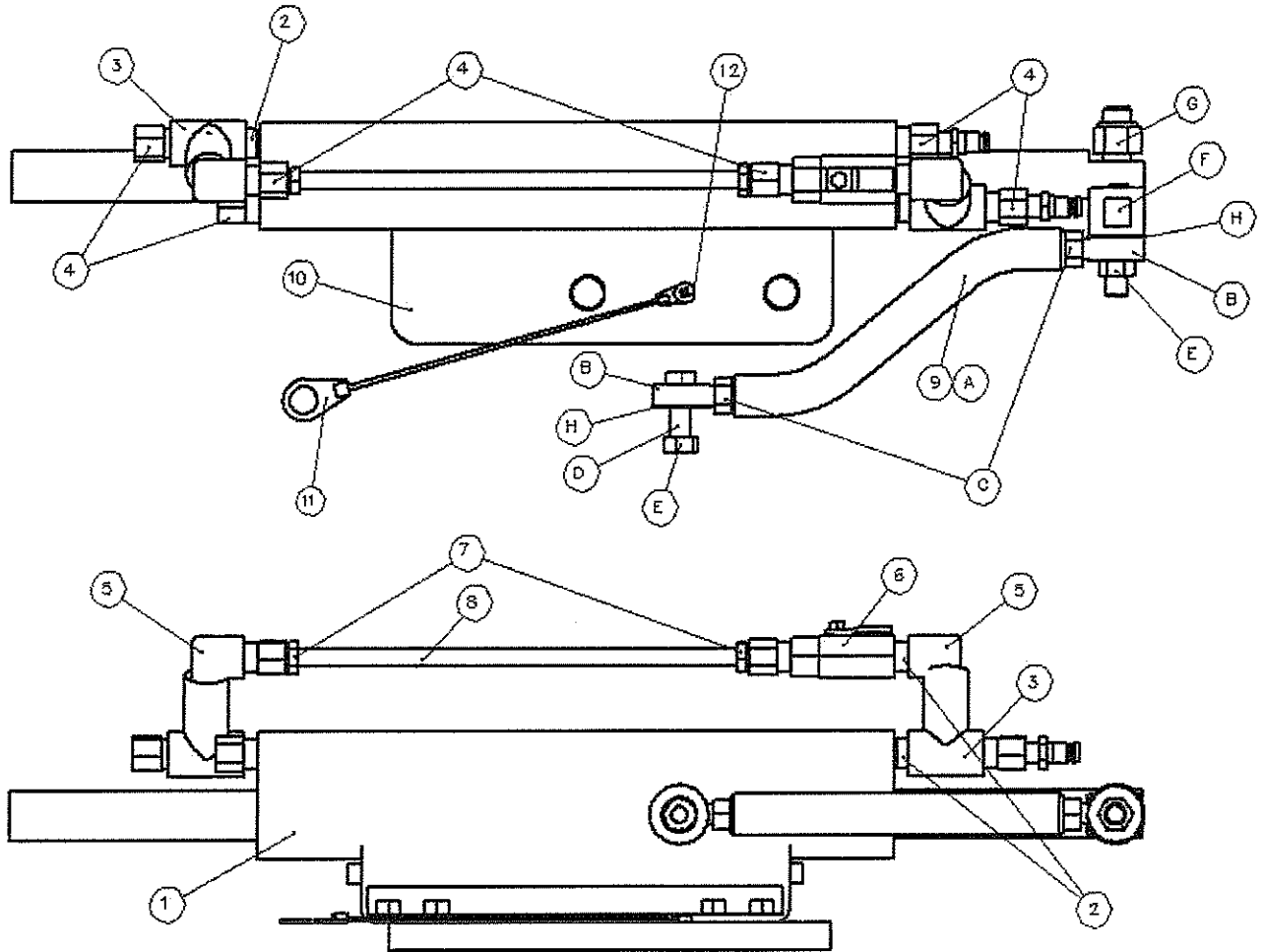
1. Remove hydraulic oil hoses from trim cylinders.
2. Remove the nut, the outer retaining washer, and the outer rubber bushing from the trim cylinder anchor pin.
NOTE: Repeat step #2 for front and rear anchor pin, port and starboard sides.
3. Slide trim cylinders off of anchor pins.

Trim Cylinder Installation

1. Slide the trim cylinders onto the anchor pins.
NOTE: If trim cylinders are at an inappropriate length to fit onto the anchor pins, the red caps must be removed and length must be adjusted. Another method is to lift the stern drive manually to the appropriate level to match the length of the trim cylinder.
NOTE: The end of the trim cylinder with the line inputs must be face up and toward the transom.
2. Place the outer rubber bushing, followed by the outer retaining washer and the nut, back on the trim cylinder anchor pin. Repeat process for both sides of both pins. Tighten the nuts so two (2) threads of the anchor pin are showing beyond the end of the nut.
NOTE: Start all four (4) nuts before tightening any nut completely.
3. Remove the red caps from the trim cylinders if they have not been removed previously (new trim cylinders only).
4. Hook up the four (4) trim lines (from the transom assembly to the trim cylinders) according to their tags, which are labeled "up" and "down", (new installations only). The threaded line input on the trim cylinders, which is closest to the transom, is the "up" line. The remaining threaded line input, is the "down" line.

Steering Cylinder

Steering Cylinder Assembly 30-267



***NOTE: ALL LETTERED BALLOONS ARE CONSIDERED
PART OF THE 30-266 DRAG ARM ASSEMBLY**

Description and Parts Breakdown

Individual Components

Item	Description	Qty	Part #
G	Nylock Nut	1	10-334
12	Self Tapping Screw	1	10-479
11	Continuity Cable	1	10-487
C	Jam Nut	2	10-758
D	Hinge Bolt	1	10-915
E	Nylock Nut	2	10-927
5	90° Elbow	2	11-027
10	Inner Steering Transom Plate	1	11-044
3	Tee	2	11-051
2	Nipple	3	11-052
6	Bypass Valve	1	11-053
8	Hose	1	11-054
4	Adapter	6	11-055
7	Sleeve	2	11-056
B	Rod End	2	11-077
A	Drag Arm	1	11-265
F	Steering Post	1	11-271
H	Nylon Washer	2	11-286
1	Cylinder Assembly	1	30-062
9	Drag Arm Assembly	1	30-266

Maintenance

Inspection

1. Check for any external fluid leaks.
2. Inspect all parts for excessive fatigue or wear.

Bleeding System After Installation (Navy RIBs only)

Refer to page 12 for instruction on bleeding the steering system.

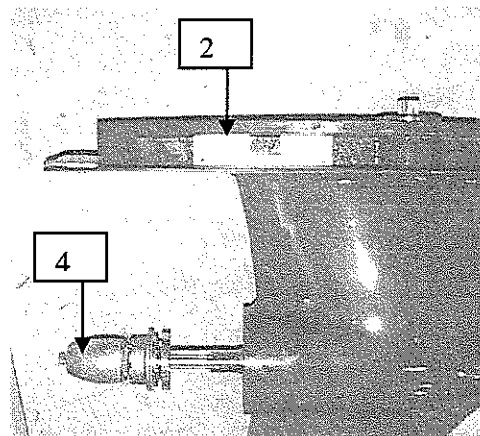
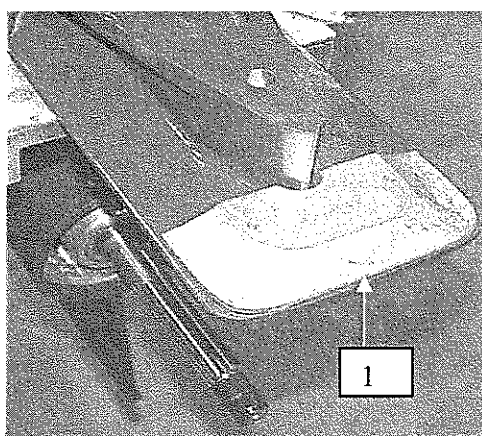
Anodes

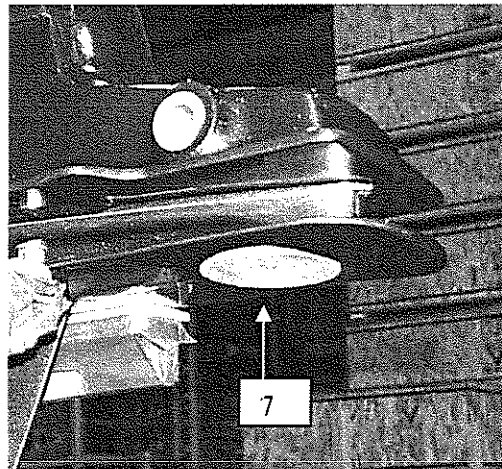
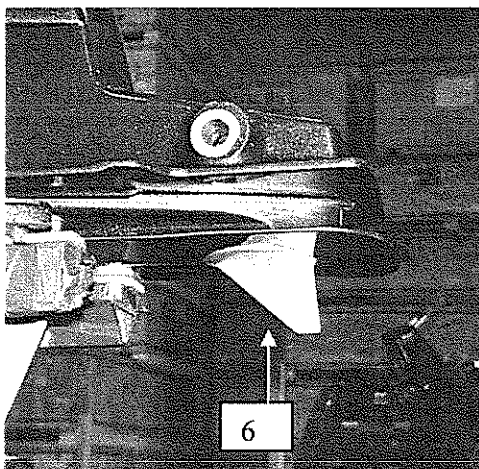
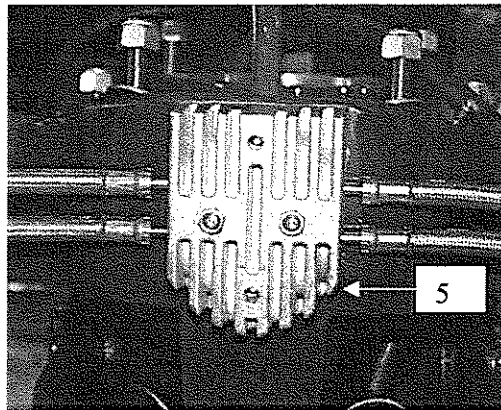
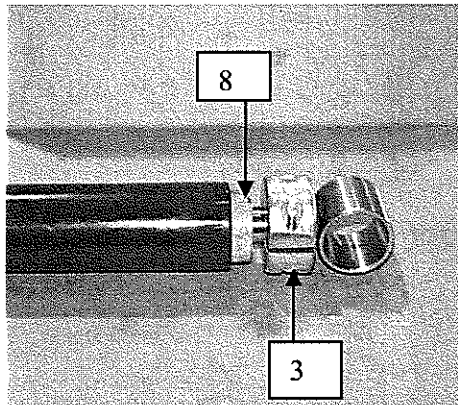
Description and Parts Breakdown

Individual Components

			Zinc	Magnesium
	Description	Quantity	Part #	Part #
1	Plate, Inhibitor	1 (if applicable)	10-432	11-038
2	Plate, Inhibitor	2 (if applicable)	10-433	11-076
3	Shaft, Collar	2 (if applicable)	10-434	
4	Plate, Inhibitor	1 (if applicable)	10-435	
5	Anode, Gimbal Housing	1	10-456	11-039
6	Trim Tab	1 (if applicable)	10-139	
7	Anode	1 (if applicable)	11-254	
8	Trim Cylinder Anode	2 (if applicable)	11-277	

Placement on Stern Drive





Maintenance of Anodes

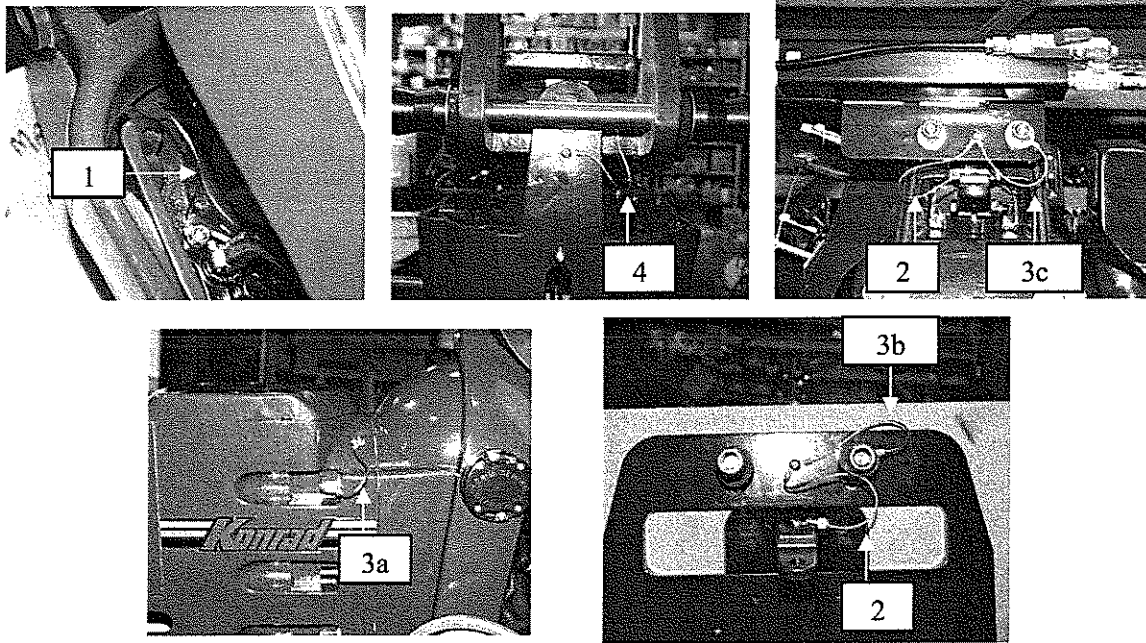
The stern drive unit is equipped with several sacrificial zinc (salt water) or magnesium (fresh water) alloy anodes to help protect underwater metal parts from galvanic corrosion. Because of their self-sacrificing nature, all anodes **MUST BE REPLACED** if eroded 50% or more.

In replacing anodes, the following should be kept in mind to maximize anode effectiveness:

Anodes offer no protection when the boat is out of the water. Whenever the boat is put in storage, the external surface of the drive unit should be thoroughly flushed with fresh water to remove any polluted or salt water. When the boat is moored in the water, the drive unit must be kept in the full down position to make sure that the anodes remain in the water. If they are not, they will offer no protection against corrosion. The anodes should not be painted. Paint will prevent them from protecting the drive unit against corrosion. Whenever an anode is replaced, make sure the anode mounting screws are fastened tightly and making good electrical contact with the drive unit.

Continuity Cables

Placement on Stern Drive



Description and Parts Breakdown

Continuity Cables

	Part #	Description	Location
1	10-345	Cable, Continuity, #10 to ¼, 7.25 Lg	Inside Bell Housing
2	10-483	Cable, Continuity, #10 to #10, 6.75" Lg	Tiller Arm
3	10-487	Cable, Continuity, #10 to ½", 6" Lg	Upper Housing (a) Inter Transom Plate (b) Steering Bracket (c)
4	11-171	Cable, Continuity, #10 to #10, 5.25" Lg	Outside Gimbal Housing

Fastening Hardware

Part #	Description	Part used for/with
10-333	Nut ¼-28 UNF Nylock	10-345
10-334	Nut ½-20 UNF Nylock	10-487
10-343	Washer, Lock ¼" SS	10-345
10-415	Washer .875 OD X .600 ID	10-487
10-479	Screw, Self Tapping #10-24 X .375	10-345, 11-171, 10-483, 10-487
10-482	Screw, RSLM Brass	10-483

Continuity Replacement Kit 30-016

Part #	Quantity	Description
10-333	1	Nut ¼-28 UNF Nylock
10-343	1	Washer, Lock ¼" SS
10-415	2	Washer 0.875 OD X 0.592 ID X 0.1
10-482	1	Screw, RSLM Brass
10-487	2	Cable, Continuity, #10 to ½", 6" Lg
10-334	2	Nut ½-20 UNF Nylock
10-345	1	Cable, Continuity, #10 to ¼, 7.25" Lg
10-479	7	Screw, Self Tapping #10-24 X 0.375
10-483	1	Cable, Continuity, #10 to #10, 6.75" Lg
11-171	1	Cable, Continuity, #10 to #10, 5.25" Lg

Maintenance

Inspection

1. Check cable for corrosion.
2. Inspect for fatigue wear.
3. Inspect for breaks.

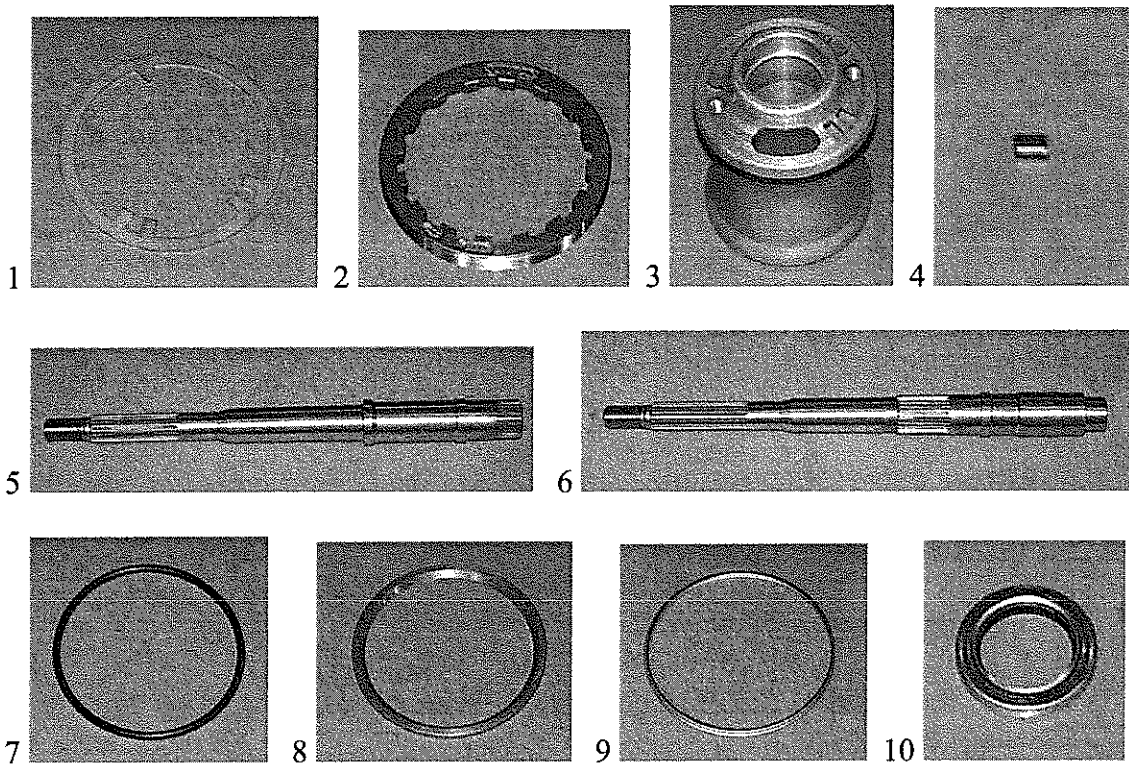
NOTE: If continuity cables become ineffective, damage could be done to the stern drive system.

Propeller Shaft Bearing Carrier

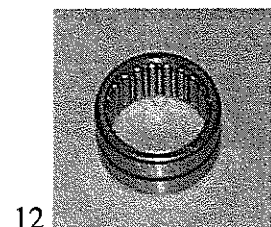
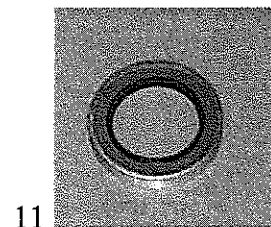
Seal Replacement

Model 520

Parts Breakdown



	Description	Qty	Part #
1	Tab Washer	1	10-203
2	Cover Nut	1	10-242
3	Bearing Carrier	1	10-364
4	Key	1	10-017
5	Propeller Shaft (Left Hand)	1/0	10-360
6	Propeller Shaft (Right Hand)	1/0	10-363
7	O-Ring	1	10-290
8	Thrust Washer	1	10-499
9	Crush Ring	1	10-289
10	Seal	1	10-639
11	Seal	1	10-291
12	Bearing	1	10-394



Removal

1. Bend down tab on tab washer (10-203).
2. Remove cover nut (10-242) from lower housing using tool TO-029.
3. Remove tab washer (10-203).
4. Remove bearing carrier (10-364) using slide hammer TO-028.
NOTE: If bearing carrier cannot be removed using slide hammer, either heat up lower housing or use a puller on the prop shaft.
NOTE: Recover key (10-017).
5. Remove propeller shaft (10-360 Left Hand) or (10-363 Right Hand), o-ring (10-290), thrust washer (10-499) and crush ring (10-289).

Rebuilding

1. Remove both seals (10-639) and (10-291) using a seal driver or punch.
1. Remove bearing (10-394) using a bearing driver or punch.
2. Clean carrier unit (10-364) thoroughly.
3. Press new bearing (10-394) into carrier unit using tool TO-019.
4. Apply *Loctight* to outside of first seal (10-291) and press into carrier unit using tool TO-030. Apply *Loctight* to outside of second seal (10-639) and press into carrier unit using opposite side of tool TO-030.

Installation

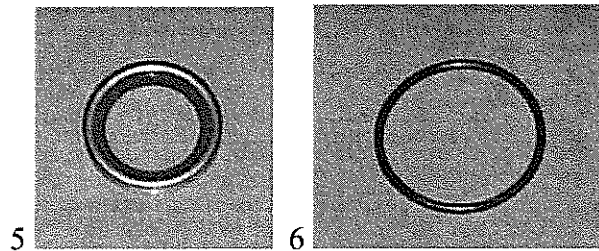
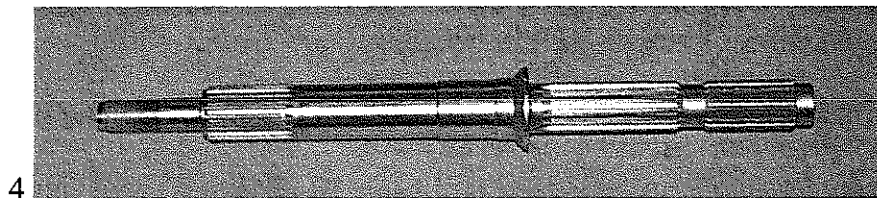
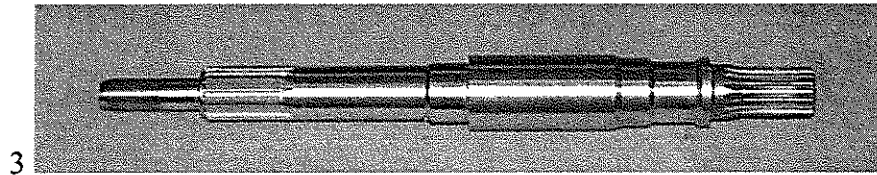
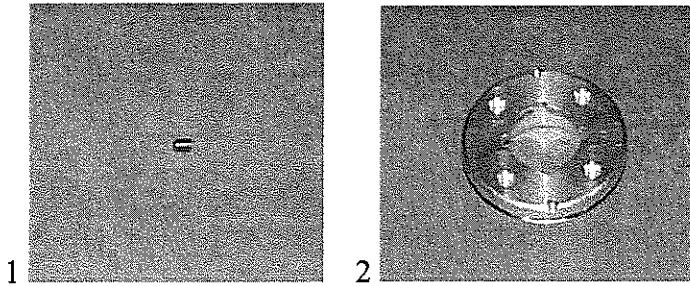
1. Install a new crush ring (10-289). The old one may not be reused.
2. Install thrust washer (10-499), o-ring (10-290), propeller shaft (10-360 Left Hand) or (10-363 Right Hand) and key (10-017) into housing.
3. Bend tabs up thirty degrees (30°) on tab washer (10-203) and insert into housing.
4. Lubricate with 90w oil and install cover nut (10-242) into housing. Tighten until 25-30 lb ft (34-41 Nm) of rolling torque is achieved on the propeller shaft.
5. Bend tab over on tab washer (10-203).

Propeller Shaft Seal Carrier

Seal Replacement

Model 540

Parts Breakdown



	Description	Qty	Part #
1	Set Screw	2	11-204
2	Seal Carrier	1	10-678
3	Propeller Shaft (Left Hand)	1/0	10-606
4	Propeller Shaft (Right Hand)	1/0	10-661
5	Seal	2	10-679
6	O-Ring	1	10-449

Removal

1. Loosen both set screws (11-204).
2. Remove seal carrier (10-678) from propeller shaft bearing carrier (10-606 left hand) or (10-661 right hand) using tool TO-051.

Rebuilding

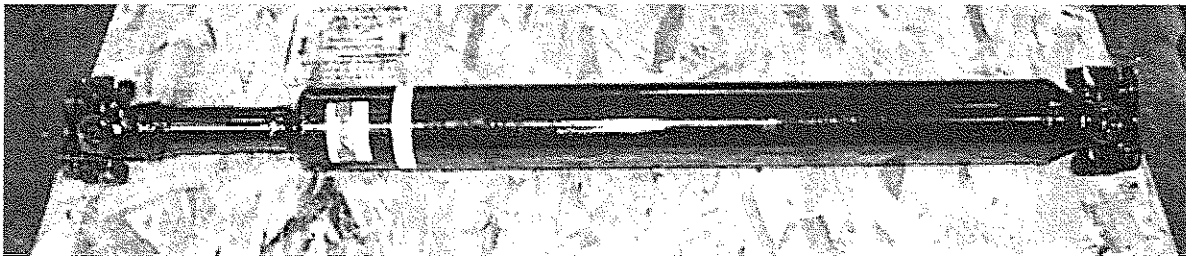
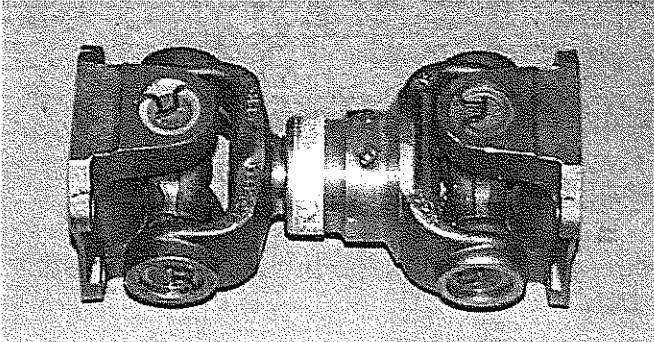
1. Remove both seals (10-679) using a seal driver or punch.
2. Clean seal carrier (10-678) thoroughly.
3. Apply *Loctite* to outside of both seals (10-679) and press them into seal carrier (10-678) using tool TO-043.

Installation

1. Grease o-ring (10-449).
2. Lubricate with 90w oil and install seal carrier (10-678) into propeller shaft bearing carrier (10-606 left hand) or (10-661 right hand) using tool TO-051.
3. Tighten both set screws (11-204).

Drive Shafts

U-joint style



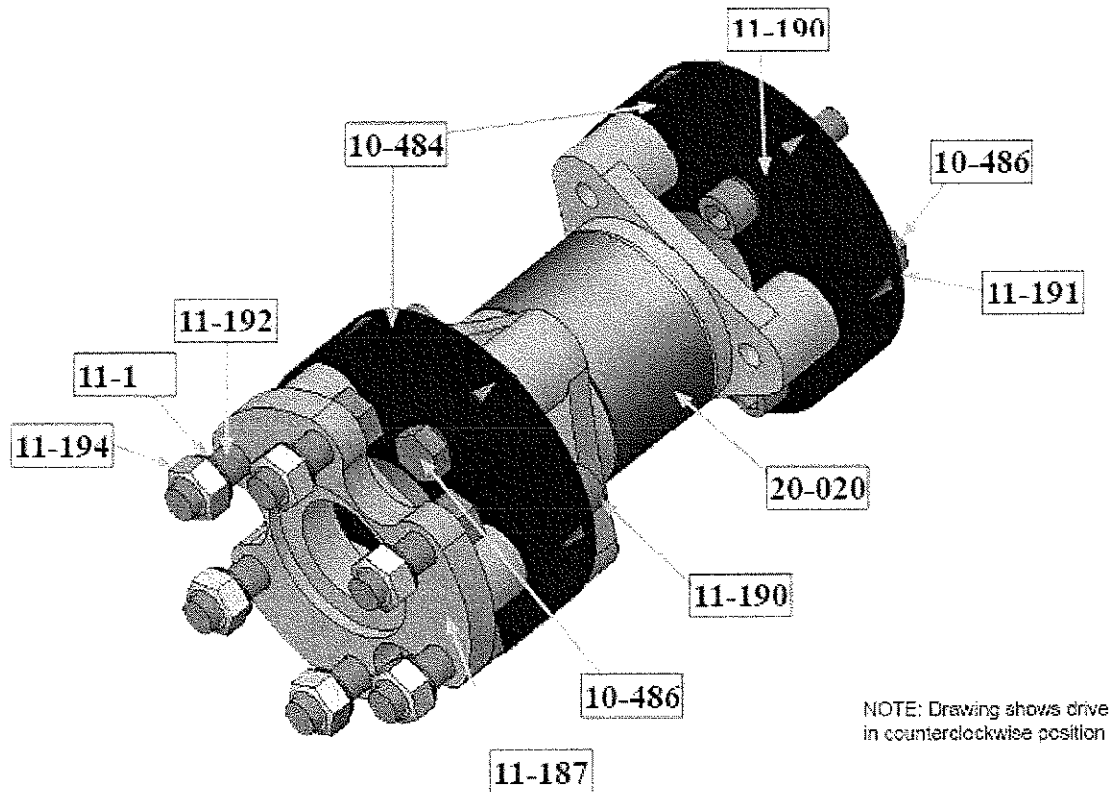
Description and Parts Breakdown

<u>Part #</u>	<u>Length</u>	<u>Range</u>	<u>Used in/Application</u>
30-043	9.25"	8.73"-9.73"	
30-063	59.11"	57.38"-60.85"	U.S. Navy 7m RIB ('96/'97 only)
30-173	62.86"	61.60"-64.97"	U.S. Navy 7m RIB (excluding '96/'97)
30-174	60.63"	59.00"-62.47"	U.S. Navy 24' RIB
30-175	10.00"	9.50"-10.25"	
30-214	62.27"	60.50"-63.97"	R.O. Korean 7m RIB
30-215	46.27"	45.00"-48.47"	U.S. Navy 32' Kingston Patrol Boat

Maintenance

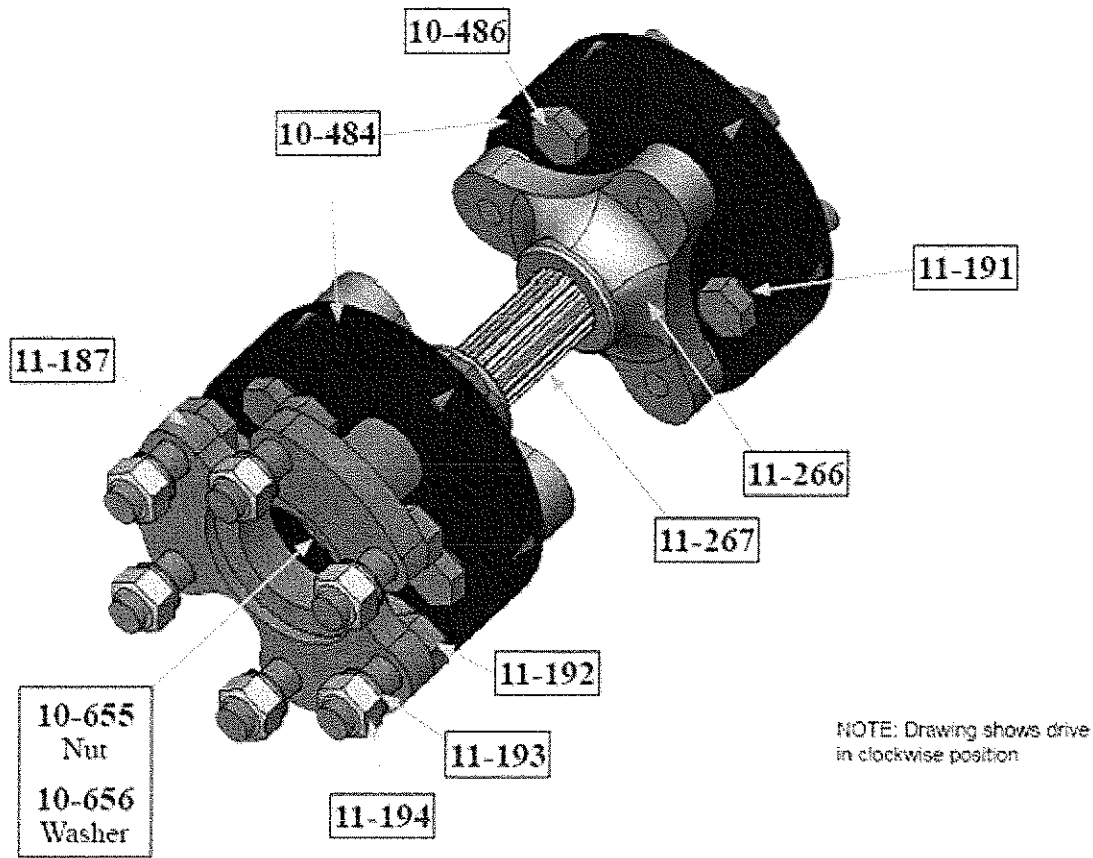
1. Grease joints weekly or every fifty (50) hours of operation.
2. Replace joints after one thousand to fifteen hundred (1000-1500) hours of operation.
3. Check fasteners for proper torque.

30-226 Parts List



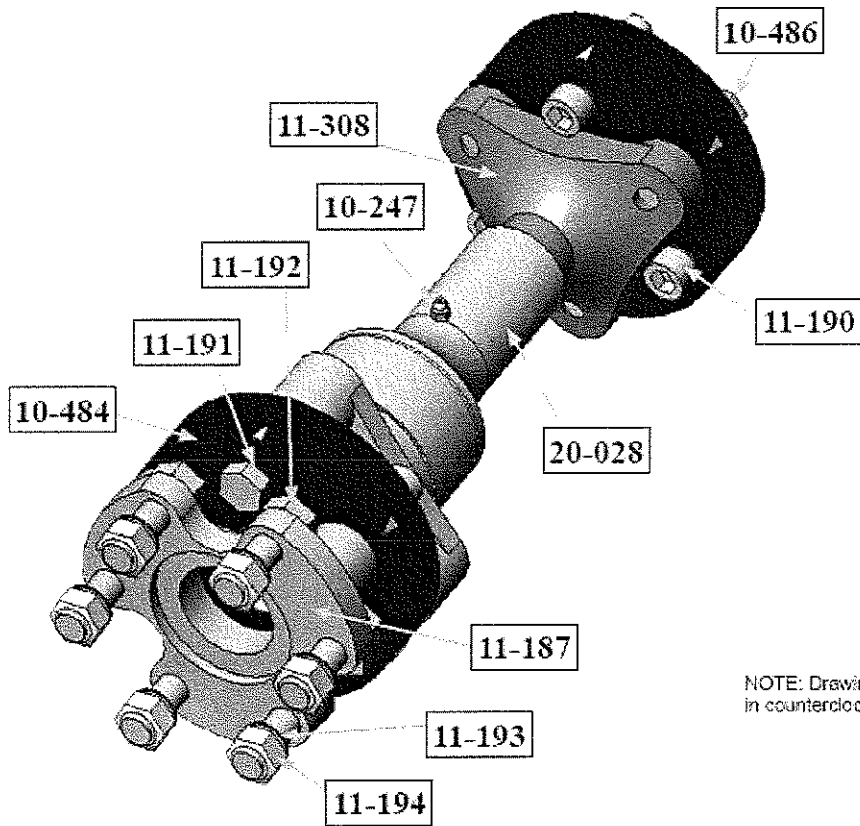
PART NO.	DESCRIPTION	QTY.
10-484.....	Rubber Coupling.....	2
10-486.....	M-14 H. H. C. S.	6
11-187.....	Adapter Flange.....	1
11-190.....	M-14 S. H. C. S.....	6
11-191.....	M-14 Belleville Washer.....	12
11-192.....	M-16 H. H. C. S.....	6
11-193.....	M-16 Belleville Washer.....	6
11-194.....	M-16 Nut.....	6
20-020.....	Center Drive Shaft.....	1

30-264 Parts List



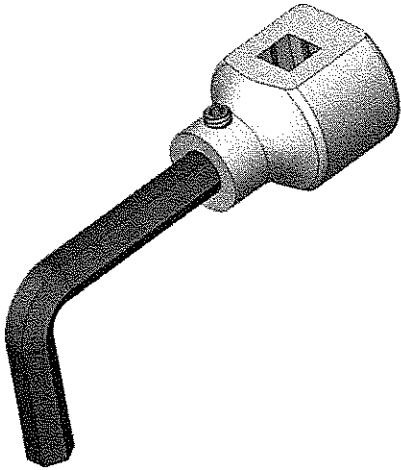
PART NO.	DESCRIPTION	QTY.
10-484.....	Rubber Coupling.....	2
10-486.....	M-14 H. H. C. S.....	12
10-655.....	Nut.....	2
10-656.....	Washer.....	2
11-187.....	Adapter Flange.....	1
11-191.....	M-14 Belleville Washer.....	12
11-192.....	M-16 H. H. C. S.....	6
11-193.....	M-16 Belleville Washer.....	6
11-194.....	M-16 Nut.....	6
11-266.....	Trilobe, Brass.....	2
11-267.....	Solid Drive Shaft.....	1

30-272 Parts List

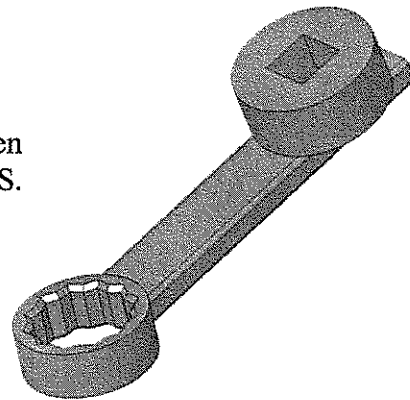


PART NO.	DESCRIPTION	QTY.
10-247.....	Grease Fitting	1
10-484.....	Rubber Coupling.....	2
10-486.....	M-14 H. H. C. S.....	6
11-187.....	Adapter Flange	1
11-190.....	M-14 S. H. C. S.	6
11-191.....	M-14 Belleville Washer.....	12
11-192.....	M-16 H. H. C. S.....	6
11-193.....	M-16 Belleville Washer.....	6
11-194.....	M-16 Nut	6
11-308.....	Splined Trilobe	1
20-028.....	Tube.....	1

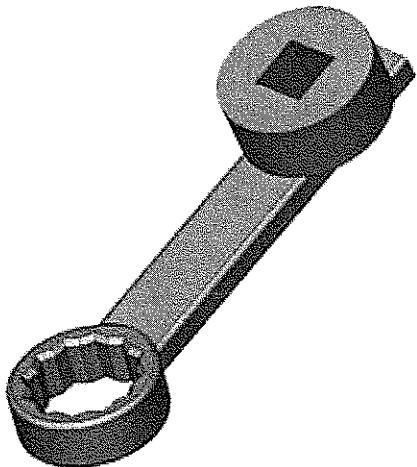
Tools available for Rubber Coupling Drive Shaft Installation



TO-066
Used to tighten
M-14 S.H.C.S.



TO-067
Used to tighten
M-14 H.H.C.S.



TO-068
Used to tighten
M-16 H.H.C.S.

Note: These tools can be purchased from Konrad Marine.

Installation Procedure

NOTE: Verify correct shaft length before proceeding.

NOTE: Apply Loctite to all fasteners in this step before fastening occurs.

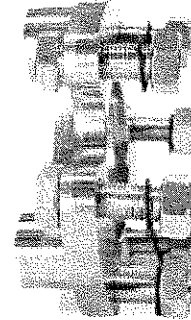
NOTE: Rotation determined by viewing transmission flange from stern of vessel.

“CCWR” = Counterclockwise rotation, “CWR” = Clockwise rotation.

Step 1

Install the adapter flange (11-187) onto the back of the transmission using:

- Six (6) M-16 H.H.C.S (11-192)
- Six (6) M-16 Belleville Washers (11-193)
- Six (6) M-16 Nuts (11-194)



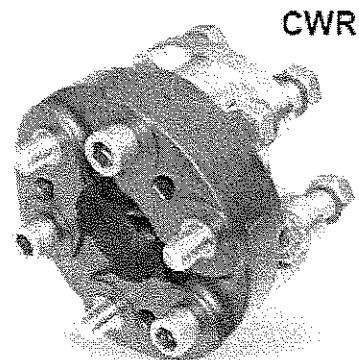
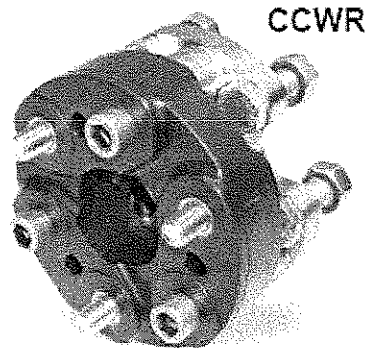
Step 2

Prior to assembly, place three (3) H.H.C.S. (10-486) and three (3) Belleville washers (11-191) into the rubber coupling (10-484) element. These fasteners will attach to the center drive shaft component (20-020, 11-267 & 11-266, 20-028 & 11-308). Install the rubber coupling (10-484) to the adapter flange (11-187) using:

- Three (3) M-14 S.H.C.S. (11-190)
- Three (3) Belleville Washers (11-191)

Counterclockwise rotation: The H.H.C.S. (10-486) should be inserted through the rubber coupling in the direction of the arrows. For the S.H.C.S. (11-190) attaching the rubber coupling to the adapter flange (11-187) point arrows on the rubber coupling toward the adapter flange (11-187).

Clockwise rotation: The H.H.C.S. (10-486) should be inserted through the rubber coupling against the direction of the arrows. For the S.H.C.S. (11-190) attaching the rubber coupling to the adapter flange (11-187), point arrows on the rubber coupling away from the adapter flange (11-187).



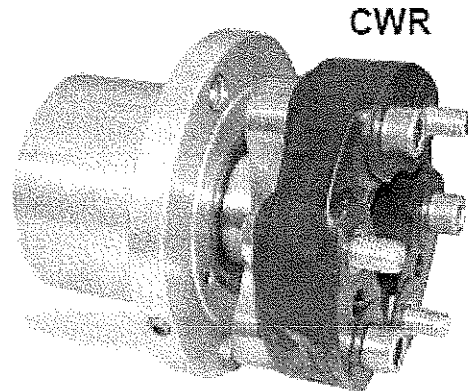
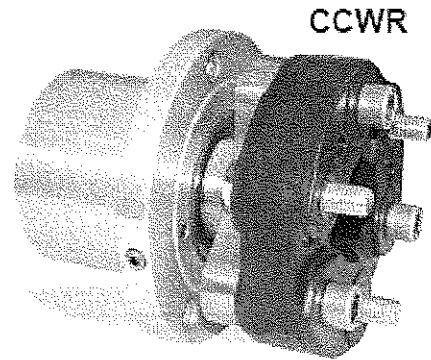
Step 3

Prior to assembly, place three (3) H.H.C.S. (10-486) and three (3) Belleville washers (11-191) into the rubber coupling (10-484) element. These fasteners will attach to the center drive shaft component (20-020, 11-267 & 11-266, 20-028 & 11-308). Attach the second rubber coupling (10-484) to the gimbal carrier flange (10-466) using:

- Three (3) M-14 S.H.C.S. (11-190)
- Three (3) Belleville Washers (11-191)

Counterclockwise rotation: The H.H.C.S. (10-486) should be inserted through the rubber coupling in the direction of the arrows. For the S.H.C.S. (11-190) attaching the rubber coupling to the gimbal carrier flange (10-466), point arrows on the rubber coupling toward the gimbal carrier flange (10-466).

Clockwise rotation: The H.H.C.S. (10-486) should be inserted through the rubber coupling against the direction of the arrows. For the S.H.C.S. (11-190) attaching the rubber coupling to the gimbal carrier flange (10-466), point arrows on the rubber coupling away from the gimbal carrier flange (10-466).



Step 4

Insert the center drive shaft component (20-020, 11-267 & 11-266, 20-028 & 11-308) in between the two (2) rubber couplings (10-484) using:

- Six (6) H.H.C.S. (10-486)
- Six (6) Belleville Washers (11-191)

Tighten all fasteners to 70 lb. ft. (95 Nm).

