

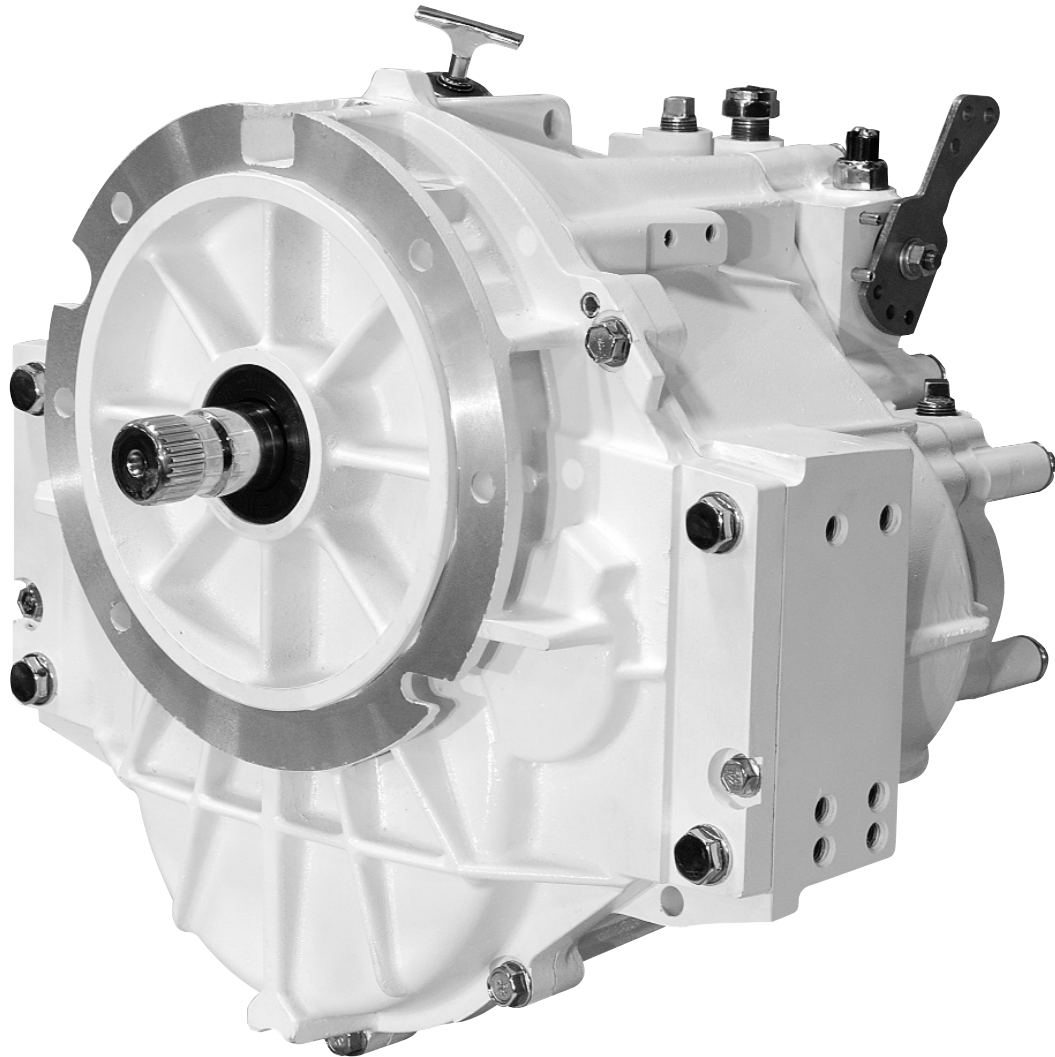


# ***Velvet Drive***

TRANSMISSIONS

A REGAL-BELOIT COMPANY

***"Velvet Smooth . . . Velvet Quiet"***



## **LIBERTY SERIES™**

# **MARINE TRANSMISSIONS**

## **Owners Manual**

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## Owner's Responsibilities

It is the responsibility of the owner or operator to perform necessary safety checks to ensure that all lubrication, cooling maintenance and recommended practices are followed for safe, enjoyable operation.

Proper care and maintenance will help ensure trouble-free operation and long service life from your Velvet Drive marine transmission.

# Section I

# General Information

Every Liberty Series™ Velvet Drive marine transmission is self-contained with its own sump and hydraulic pump separate from the engine; however, connection to an external oil (transmission fluid) cooler is required.

The Velvet Drive Liberty Series™ transmission is available with gear ratios (refer to table 1-1) suitable for inboard pleasure and work boats.

There are two Liberty Series™ transmission designs:

1. Model Liberty A is a down angle design.
2. Model Liberty V is a V-drive design with a hollow output shaft. The propeller shaft passes through the transmission in this design allowing better flange to coupler assembly. Both designs require a left hand engine (turning counter clockwise at the flywheel) and will turn a right or left propeller with equal efficiency.

The identification tab (see figure 1), located on top of the transmission's mounting boss (see figure 2), shows the model number, serial number and gear ratio for the unit:

– **Model number** appears below the words Velvet Drive.

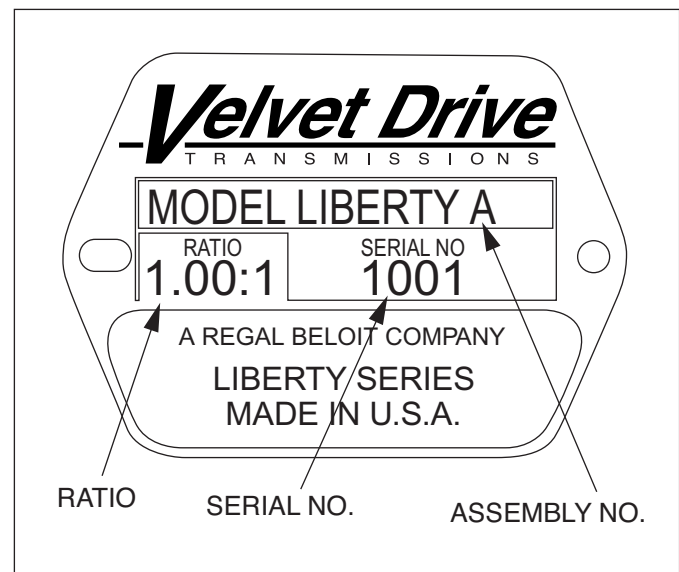
– **Serial number** appears just below the model number, to the right.

– **Ratio** appears just below the model number, to the left.

Transfer the information on the identification tag to the Maintenance Record Chart found on page 10 of this manual so that you will have it available without having to look at the transmission.

The model number and serial number are required on all correspondence regarding warranty or service.

**Figure 1: Identification Tag**



# General Information (cont'd)

Figure 2: Liberty Series™ Marine Transmission

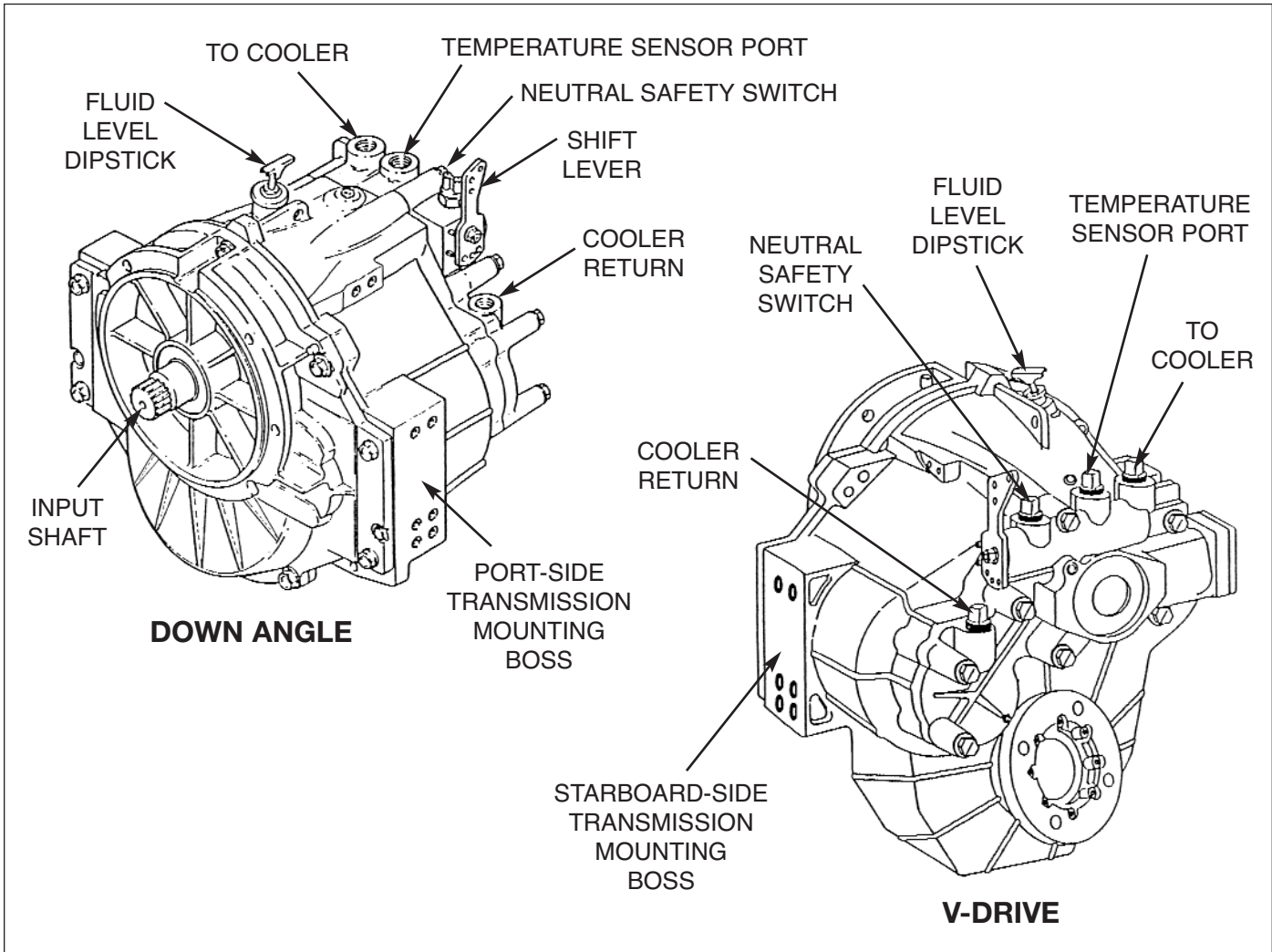


Table 1-1: General Specifications

	Assembly Number	Ratios	Fluid Capacity* (Qts./Liters)	Dry Weight (Lbs/Kgs)
<b>Down Angle</b>	3001-000-001	1.00:1	2.0/1.9	114/52
	3001-000-002	1.25:1	2.0/1.9	114/52
	3001-000-003	1.50:1	2.0/1.9	114/52
	3001-000-004	2.00:1	2.0/1.9	114/52
	3001-000-005	2.45:1	2.0/1.9	114/52
	3001-000-006	2.80:1	2.0/1.9	114/52
<b>V-Drive</b>	3002-000-002	1.25:1	3.0/28	135/62
	3002-000-003	1.50:1	3.0/28	135/62
	3002-000-004	2.00:1	3.0/28	135/62
	3002-000-005	2.50:1	3.0/28	135/62

\* Approximate, depending on the angle of transmission installation, for transmission only. Capacity given does not include fluid required to fill oil cooler and oil cooler hoses.

## Section II

# Launch Maintenance

The following maintenance shall be performed immediately after launching your boat. This will give you optimum performance and service life from your Velvet Drive Liberty Series™ transmission.

### Coupling Alignment Check

**CAUTION** Vibration, gear noise, loss of RPM and premature oil seal and bearing failures may be caused by misalignment of shaft flanges.

The propeller shaft and transmission output flange alignment must be checked after launching your boat. It should also be checked any time your boat strikes a heavy object or has been pulled from the water.

**CAUTION** Before removing your boat from the water, unbolt and separate the transmission and propeller shaft flanges.

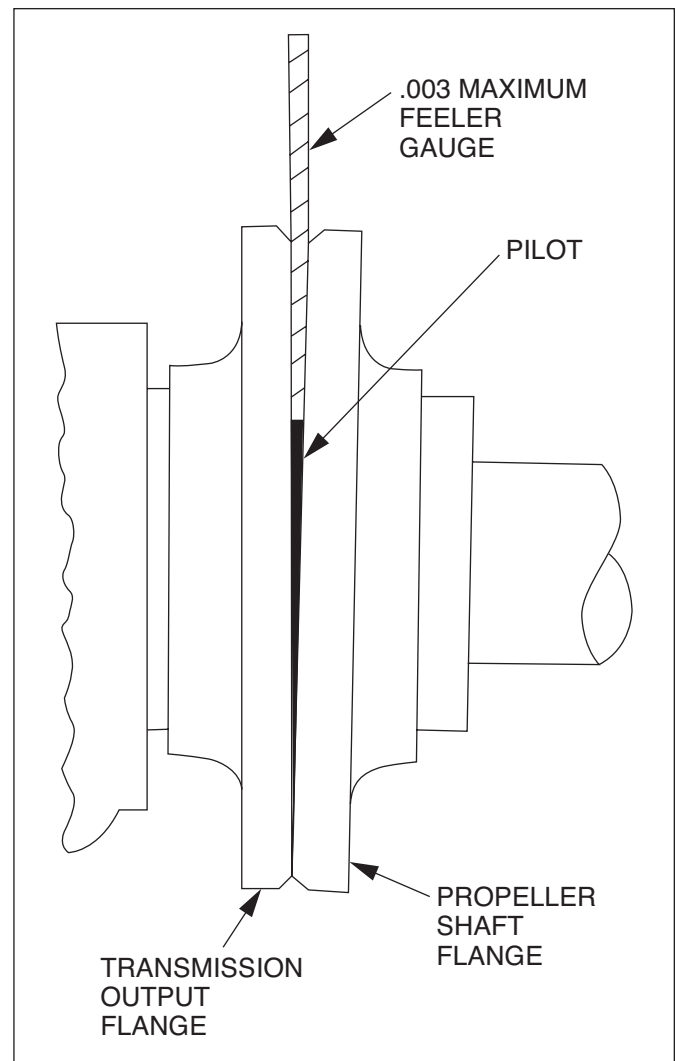
Check the alignment of the transmission output flange and the propeller shaft flange with the boat in the water and fully loaded. The fuel and water tanks should be full. Proceed as follows:

1. Disconnect the battery
2. Unbolt the coupling flanges (see figure 3)
3. With the flange pilot engaged, check the clearance around the coupling flange using a 0.003 inch feeler gage.
4. Rotate the transmission flange through one complete revolution, stopping each 90 degrees to check the clearance with the feeler gage. Repeat this procedure with the propeller shaft flange.
5. The alignment is satisfactory when the flanges are within 0.003 inch (0.076 mm) of parallel.
6. If the alignment is unsatisfactory, adjustment is required. This adjustment is accomplished at the boat motor and transmission mounts **ONLY**. This procedure should be accomplished by a skilled marine mechanic.

**CAUTION** Do not lift or pry against transmission output flange to move engine.

7. When alignment is satisfactory, install the coupling flange bolts and nuts. Torque to 25-43 lb-ft (34-58 Nm).

Figure 3: Coupling Flange Alignment



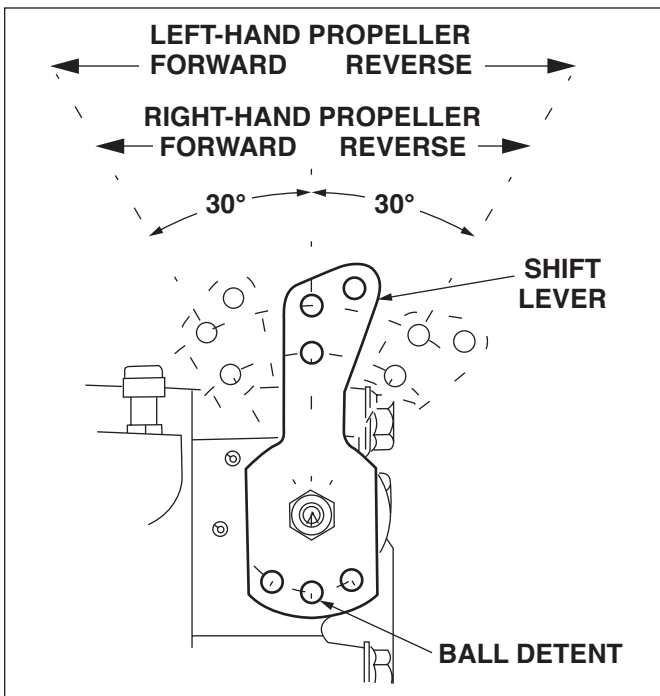
# Launch Maintenance (cont'd)

## Shift Linkage Check

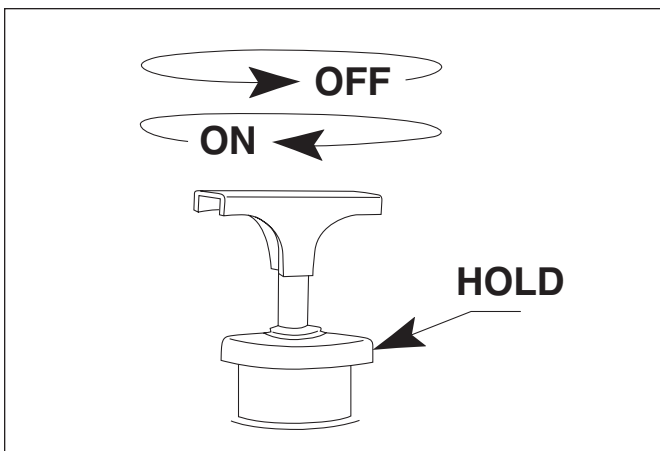
**CAUTION** Incorrectly adjusted shift linkage may result in transmission damage.

The transmission shift lever forward and reverse positions depend on whether the transmission drives a right hand or left hand propeller (see figure 4). The shift linkage must position the shift lever on the transmission exactly in forward, neutral and reverse positions. The shift lever at the helm must agree with that on the transmission. Adjust the shift linkage if required.

**Figure 4: Transmission Shift Lever Positions**



**Figure 5: Dipstick Removal**



## Transmission Bolt Check

Check that all exterior transmission bolts and nuts, including those in the coupling flange, are tight. Tighten loose bolts to specifications.

## Cooler and Electrical Connections

Visually check the transmission ports, oil (fluid) cooler, connecting lines and fittings for fluid leaks, loose connections, or broken or loose fasteners. Replace worn or damaged hydraulic hoses.

Visually inspect all electrical connections to the transmission for loose terminals or worn wires. Replace all worn or broken wires to U.S. Coast Guard specifications. Tighten all loose connections.

## Changing Transmission Fluid

A seasonal change of the transmission fluid is recommended for all pleasure boats. Work boats require transmission fluid change every 1000 hours. In addition, the transmission fluid must be changed any time it becomes overheated, contaminated, changes color, or becomes rancid smelling.

**WARNING** Do not use gasoline or any other volatile or highly combustible liquid as a cleaning solvent when changing the transmission fluid.

1. Place a suitable container under the oil drain plug.
2. Remove the dipstick (see figure 2).
3. Remove the oil drain plug. Drain all fluid from the transmission into the container.
4. Reinstall drain plug and torque to 20-25 lb-ft (27-34 Nm).
5. Fill the transmission with the proper type (refer to **Type of Transmission Fluid**, following) and quantity of transmission fluid. Table 1 lists fluid capacity, depending on angle of installation, for the transmission only. Additional fluid may be required to allow for oil cooler and cooler line capacity.
6. Replace dipstick and check fluid level (refer to **Checking Fluid Level**, following).

# Launch Maintenance (cont'd)

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## Type of Transmission Fluid

**Dexron III or any transmission fluid which meets Detroit Diesel Allison C4 or Caterpillar TO-4 specification is recommended.**

**Do not mix different brands or types of transmission fluid.**


**If transmission fluid temperature exceeds 190°F, the fluid must be changed.**

**Any additions to the boat that will change the installed angle of the transmission at rest may require an oil level adjustment.**


## Checking Fluid Level

The transmission should be at operating temperature to get an accurate fluid level reading. The fluid will expand when heated and significantly affect the level in the transmission.

 **WARNING** Hot transmission fluid can cause burns.

 **WARNING** Do not enter the engine compartment with the engine running.

## Warm Fluid Level Check

 **CAUTION** Transmission fluid will drain back into the transmission from the cooler and connecting lines after engine shutdown. Fluid level must be checked immediately after engine shutdown otherwise the dipstick reading will not be accurate and transmission could be operating with insufficient fluid.

With the engine at operating temperature, place control lever in neutral and shut down the engine. Remove the dipstick by holding the base and turning the T-handle counter clockwise (see figure 5). Wipe the dipstick clean and insert the dipstick fully into the transmission, withdraw, and check the fluid level. Add or remove fluid as necessary to bring the fluid level to the full mark on the dipstick. Replace dipstick and tighten by holding the base and turning the T-handle securely clockwise.

## Cold Fluid Level Check

For ease of checking the fluid level prior to start-up, a cold fluid level mark can be made on the dipstick. First make the warm fluid level check as described above and adjust the fluid level to the dipstick full mark. Shut down the engine and allow the transmission to cool overnight. Before operating the engine, with the transmission cold, check the fluid level as described above and put a cold full mark on the dipstick.

## Additional Maintenance and Service Information

A service manual for the Liberty Series™ marine transmission can be obtained by contacting your Velvet Drive distributor.

# Operation

## Section III

### System-Related Torsional Vibrations

System-related noises or vibrations can occur at low engine speeds. They can cause gear rattle and result in damage to the boat engine as well as the transmission. Velvet Drive is not responsible for total system-related torsionals of this type.


### Start Up

Make sure the transmission is in neutral before starting the engine. At the helm, move the shift lever back and forth and stop at the detent in the central position of shift lever travel. With the shift lever in this position, no power is transmitted through the transmission output shaft to the propeller shaft. The neutral safety switch will not allow the engine to be started unless the transmission is in neutral.

Start the engine and set the throttle at idle speed to warm up the transmission and the engine for a few minutes. Be aware of any unusual noises or vibrations and investigate to determine the cause.

### Shifting the Transmission

Shifts to and from any position can be made at any time with the engine operating below 1000 RPM.

 **CAUTION** Shifting the transmission at engine speeds above 1000 RPM can severely damage the boat, transmission and engine.

### Forward

From neutral, move the shift lever to the forward position. When the transmission is engaged in forward, you will feel the detent. The propeller should move the boat in a forward direction.

### Reverse

From neutral, move the shift lever to the reverse position. When the transmission is engaged in reverse, you will feel the detent. The propeller should move the boat in a backwards direction.

### Freewheeling

It has been determined by tests and practical experience that Velvet Drive marine transmissions can be freewheeled during sailing or trolling with one engine without risking damage. Be certain to maintain the proper fluid level in the transmission for freewheeling as well as power operation.

## Section IV

# Winter Storage

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The following steps are necessary to properly prepare the transmission for winter storage:

1. Disconnect the battery.
2. Separate the transmission and propeller shaft flanges before removing the boat from the water. Unbolt the flanges and move the propeller shaft to the rear until the flange pilot clears.
3. Drain the water from the transmission's oil cooling system. It is not necessary to drain the transmission fluid unless the transmission is due for a fluid change.
4. Wipe the transmission free of dirt, grime and grease.
5. Check the transmission for evidence of external damage or leaks. Take corrective action before placing the transmission back in service.

# Troubleshooting

# Section V

The trouble analysis chart lists operating problems which may be encountered, the causes and the recommended corrective action. Procedures involving power train alignment or transmission repair should be performed by a qualified marine mechanic.

## Trouble Analysis Chart

Problem	Probable Cause	Correction
No forward or reverse	• Low fluid level	• Fill to proper level
	• Fluid pump not operating	• Remove valve and pump assembly and replace pump
	• Low oil pressure due to leakage	• Find and repair leak. If leakage is internal, remove & repair transmission
	• Broken input or output shaft	• Remove and repair transmission
	• Transmission control valve incorrectly positioned	• Adjust shift linkage
	• Damaged shift linkage	• Repair shift linkage
	• Cavitation of propeller	• Use lower engine speed or change propeller
	• Broken propeller	• Repair or replace propeller
No forward	• Suction screen clogged	• Clean or replace screen
	• Transmission control valve incorrectly positioned	• Adjust shift linkage
	• Forward clutch failure	• Remove and repair transmission
	• Leakage in forward clutch circuit	• Remove and repair transmission
No reverse	• Reverse clutch not releasing	• Remove and repair transmission
	• Transmission control valve incorrectly positioned	• Adjust shift linkage
	• Reverse clutch failure	• Remove and repair transmission
	• Leakage in reverse clutch circuit	• Remove and repair transmission
No neutral	• Forward clutch not releasing	• Remove and repair transmission
	• Damaged shift linkage	• Repair shift linkage
Valve buzz or noise	• Forward or reverse clutch not releasing	• Remove and repair transmission
	• Air in hydraulic system	• Normal operation should bleed air from hydraulic system. If not, continue trouble analysis
	• Low fluid level	• Add fluid to full mark
	• Air being sucked into pump	• Remove and repair transmission
Transmission overheats	• Restricted fluid flow	• Remove transmission, disassemble and clean or repair as required
	• Cooler transmission fluid flow restricted	• Reverse flush cooler and transmission fluid lines. Replace components that cannot be cleaned out.
	• Cooler water flow restricted	• Reverse flush cooler and water lines. Replace components that cannot be cleaned out.
	• Suction screen clogged	• Clean or replace screen
Noisy in forward or reverse	• Fluid pump worn	• Replace fluid pump
	• Misalignment of flywheel housing or adapter with engine or transmission	• Align power train components
	• Misalignment of propeller shaft and transmission coupling flanges	• Align coupling flanges
	• Damaged gear or gears	• Remove and repair transmission



## Velvet Drive Liberty Series™ Marine Transmission Warranty

Seller warrants to engine manufacturers and to seller's distributors only that all Velvet Drive marine transmissions manufactured or furnished by seller shall be free from defects in material and workmanship under normal use and service for a period of twelve months for pleasure craft installations or six months for commercial craft installations from date placed into operation by the original owner/operator or twenty-four months from date of shipment to the engine manufacturer or to seller's distributor, whichever occurs first.

This warranty shall not apply to any product or part which has been subjected to misuse, negligence, damage in handling or shipment, modification or alteration, improper maintenance, or use beyond the product's rated capacity or in any other improper manner.

Seller's obligation under this warranty is expressly limited to the repair or replacement, at its option, of Velvet Drive marine transmissions which are returned f.o.b. seller's factory, Liberty, South Carolina, and which are determined by seller to be defective.

**THIS IS THE SOLE AND ONLY WARRANTY OF SELLER AND NO OTHER WARRANTY IS APPLICABLE, EITHER EXPRESS OR IMPLIED, IN FACT OR BY LAW, INCLUDING ANY WARRANTY AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE.**

The sole and only remedy in regard to any defective Velvet Drive marine transmission shall be the repair or replacement thereof as herein provided, and seller shall not be liable for any consequential, special, incidental, or punitive damages resulting from or caused by any such defects.

Velvet Drive Transmissions

Effective Date

January 1, 2005

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[WWW.VELVETDRIVE.COM](http://WWW.VELVETDRIVE.COM)



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