

#1016313

Marine Transmission Owner's Manual



TWIN DISC INCORPORATED

ADMINISTRATIVE OFFICES - RACINE, WISCONSIN

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Marine Transmission Owner's Manual

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Identification Plate

Transcribe the following information from your unit's nameplate to the illustration below for ease of reference.

- Model Number
- BOM Number
- Ratio
- Serial Number
- Customer Number (if applicable)
- Oil Capacity
- Minimum Oil Pressure when Cruising

Keep this information at hand and refer to the model number, serial number and BOM number when requesting any parts or service.

The illustration shows a rectangular identification plate with rounded corners and four mounting holes. It contains the following fields and text:

- MODEL NO.:** []
- BOM NO.:** []
- RATIO:** []
- SERIAL NO.:** []
- CUSTOMER NO.:** []
- OIL CAPACITY:** [] GAL.
- MARINE TRANSMISSION**
- MIN. OIL PRESSURE AT RATED RPM:** [] P.S.I.
- LUBRICATION:**
 - EVERY 10 SERVICE HOURS OR DAILY: CHECK OIL LEVEL WITH ENGINE RUNNING AND MARINE TRANSMISSION IN NEUTRAL.
 - EVERY 100 HOURS (WHERE A GREASE FITTING IS PROVIDED): LUBRICATE OUTPUT SHAFT SEALS WITH WATER PUMP GREASE TO PREVENT BILGE WATER ENTERING HOUSING.
 - EVERY 1000 SERVICE HOURS OR 6 MONTHS, WHICHEVER COMES FIRST: DRAIN AND REFILL HOUSING WITH CLEAN OIL. REMOVE AND REPLACE FILTER ELEMENT WHERE APPLICABLE. CLEAN SUCTION SCREEN.
- IMPORTANT:** WARRANTY IS VOID UNLESS TRANSMISSION IS LUBRICATED AND MAINTAINED AS SPECIFIED IN THE SERVICE MANUAL AVAILABLE ON REQUEST. REFER TO "MARINE TRANSMISSION LUBRICANT" PLATE SHIPPED WITH UNIT. (BILL OF MATERIAL NO. MUST BE GIVEN WHEN ORDERING PARTS.)
- TWIN DISC** (INCORPORATED) MARINE, VT. 53403 U.S.A.
- MADE IN U.S.A.**
- 204098C** (vertical text on the right side)

Lubrication Plate

Fill in the blanks below with the information from your unit's lubrication data plate. Keep this information at hand and refer to it when servicing your transmission.

MARINE TRANSMISSION LUBRICANT		
See the Lubrication Plate on your Marine Transmission for Oil Specs		
STARTUP	STEADY OPERATION	VISCOSITY
MIN.		
MIN.		
MIN.		
MIN.		

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Oil temperature listed is temperature of oil **to** the heat exchanger.

NOTE: Some MG6000 series transmissions built before 2002 do not utilize a lubrication data plate. See Section 2.4 for oil recommendations.

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Section 1

Introduction

1.1 General Information

This publication provides general operating information for Twin Disc Marine Transmissions. Specific product details and performance characteristics can be obtained by contacting your nearest Twin Disc Authorized Distributor or Service Dealer.

This manual is current at the time of printing. When required, changes are made to reflect advancing technology and improvements in state of the art.

1.2 Safety and General Precautions

A. General

All personnel servicing this equipment should employ safe operating practices. Twin Disc, Incorporated will not be responsible for personal injury resulting from careless use of hand tools, lifting equipment, power tools, or unaccepted maintenance/working practices.

B. Important Safety Notice

Because of the possible danger to person(s) or property from accidents that may result from the use of machinery, proper installation, maintenance and operation procedures must be followed. Twin Disc, Incorporated will not be responsible for personal injury resulting from careless maintenance/working practices.

SECTION 1

Inspect as necessary to assure safe operations under prevailing conditions. Proper guards and other safety devices that may be specified in safety codes should be provided. These devices are neither provided by nor are they the responsibility of Twin Disc, Incorporated.

⚠ WARNING

Selecting **NEUTRAL** disengages transmission clutches but does not prevent propeller shaft rotation. If you require positive neutral (propeller shaft locked), a shaft brake or other shaft-locking device must be used.

⚠ WARNING

To prevent accidental starting of the engine when performing routine transmission maintenance, disconnect battery cables and remove ignition key from the switch.

1.3 Preventative Maintenance

Frequent reference to the information provided in this manual regarding daily operation and limitations of this equipment will assist in obtaining trouble-free operation. Schedules are provided for recommended maintenance of the equipment in Section 4 of this manual, as well as a chart in the Appendix, Section 6.

1.4 Ordering Parts and Obtaining Service

⚠ WARNING

All replacement parts or products (including hoses and fittings) must be of Twin Disc origin or equal, and otherwise identical with components of the original equipment. Use of any other parts or products will void the warranty and may result in malfunction or accident, causing injury to personnel and/or serious damage to the equipment.

A. Ordering

Renewal parts, service parts kits, optional equipment and product service assistance may be obtained from any authorized Twin Disc distributor or service dealer. Contact Twin Disc for the distributor or service dealer near you.

Twin Disc, having stipulated the bill of material number on the unit's nameplate, absolves itself of any responsibility resulting from any external, internal, or installation changes made in the field without the express written approval of Twin Disc. All returned parts, new or old, emanating from any of the above stated changes will not be accepted for credit. Furthermore, any equipment that has been subjected to such changes will not be covered by a Twin Disc warranty.

B. Source of Service Information

For the latest service information on Twin Disc products, contact any Twin Disc distributor or service dealer. Product service manuals are available, which provide more specific and detailed overhaul and installation instructions. Provide your model number, serial number and bill of material number to obtain information on your unit.

C. Warranty Information

The Commercial Twin Disc marine transmission warranty can be found in the Appendix, Section 6.3 of this manual. The Pleasure Craft Twin Disc marine transmission warranty can be found in the Appendix, Section 6.4 of this manual. This warranty may be supplemented by additional published warranty terms dependent upon the product involved. Supplementary warranty terms are available upon request. For details on administering the warranty, contact any Twin Disc distributor, service dealer or the Warranty Administration Department, Twin Disc, Incorporated, Racine, Wisconsin, U.S.A.

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Section 2

Description and Specifications

2.1 Description

1. While most Twin Disc marine transmissions are forward/reverse reduction units, some units provide speed-increasing capability. All may be used with standard (right-hand) rotation engines and certain models may be modified to accommodate nonstandard (left-hand) rotation engines. Contact your Twin Disc distributor if you anticipate using nonstandard engines.

NOTE: Engine direction of rotation is determined by facing the front of the engine (opposite engine flywheel). From this viewpoint, clockwise crankshaft rotation is defined as right-hand rotation.

2. All current Twin Disc marine transmissions can be operated through either primary or secondary clutch at full-rated horsepower for forward (ahead) propulsion using standard engines. Contact your Twin Disc distributor for the rated horsepower if you anticipate using nonstandard engines.

NOTE: The primary clutch has the shortest power path through the transmission. The secondary shaft is driven in opposite rotation by the primary shaft.

3. Transmission clutches are hydraulically applied using regulated oil pressure. All bearings, clutches and gears are lubricated and cooled with oil.

SECTION 2

2.2 Construction Features

A. Oil Pump Drive

For most transmissions, the secondary clutch shaft drives the oil pump. One exception is the MG540, having two pumps—one driven by the primary shaft and one driven by the secondary shaft.

B. Lubrication Features

The transmission case serves as the reservoir (sump) for all oil used in the transmission. Bearings and clutches on the primary and secondary shafts are lubricated and cooled through passageways in the shafts. Output shaft bearings are gravity and/or splash lubricated. Some transmissions use pressurized oil spray to lubricate gears and bearings.

C. Suction Screen

All units have a suction strainer located between the sump and oil pump in the hydraulic circuit. Its purpose is to prevent debris from entering the inlet side of the pump. The suction strainer must be cleaned as a part of every oil change. Consult the illustrations found in Section 6.2 for the suction strainer location on your unit.

D. Filter Assembly

Many units have an oil filter installed in the system. Some units incorporate a spin-on filter. Other units use a cartridge type filter plumbed into the hydraulic circuit between the pump outlet and the transmission inlet port. Replace oil filter as part of every oil change. Consult the illustrations found in Section 6.2 for the filter location on your unit.

2.3 Specifications

All Twin Disc marine transmissions are equipped with an identification plate. (See sample identification plate at the front of this manual.) In addition to information identifying the unit (i.e. model number, BOM number, ratio, serial number and customer number),

the identification plate provides information on oil capacity, minimum cruise oil pressure and oil check/oil change intervals for your particular transmission. All operators of this equipment are responsible to read and apply the information provided on the transmission identification plate.

2.4 Oil Recommendations

A. Oil Viscosity

See your unit's lubrication data plate for type of oil and viscosity recommendations. Transcribe the information from your transmission's lubrication data plate to the sample plate found at the front of this manual for ease of reference.

MG6000 SERIES ONLY: Some MG6000 series units that were manufactured prior to 2003 do not utilize a lubrication data plate. The recommended oil for these units is SAE 40W. Use only SAE-API service class CD engine oil that is certified by the vendor to pass **TO-2** or **C-3** test specifications.

⚠ CAUTION

Multi-viscosity oils (i.e. 15W-40 etc.), automatic transmission fluid (ATF) and synthetic oils are not approved for use in Twin Disc marine transmissions without written approval from Twin Disc.

SECTION 2

B. Oil Pressure and Temperature

▲ CAUTION

All units have provisions to install oil pressure and oil temperature gauges. Oil pressure gauges are recommended for all installations. By monitoring “main” oil pressure and temperature, you detect problems before major damage to the unit occurs.

Your unit’s identification plate specifies “minimum oil pressure when cruising.” This specification is the “main” oil pressure measured with the oil temperature in the normal operating range and engine speed at approximately 2/3 throttle setting. It is suggested that an alarm system be installed to notify the operator in the event that the oil pressure falls below the “minimum pressure when cruising” specification.

If you detect abnormal oil pressure:

1. Verify that the pressure reading is accurate. (Gauges can fail or malfunction.)
2. If gauge is malfunctioning, determine that actual operating pressure is within allowable range before resulting operation.
3. If pressure reading is accurate and pressure is outside of the allowable range, shut down the engine and correct the problem. See troubleshooting procedures in Section 5 of this manual.

NOTE: If problem cannot be corrected and engine must be shut down, see instructions for windmilling/backdriving and towing in Section 3.6 of this manual.

If unit must be kept in operation to prevent injury to personnel or damage to equipment, operate at lowest power possible until unit can be safely shut down.

C. Heat Exchanger

The heat exchanger is required to maintain the oil temperature in the hydraulic system within the recommended operating range. Proper oil temperature is maintained by passing coolant through the heat exchanger.

Some models, such as the MG5300 series and MG6000 series transmissions, may have an integral heat exchanger. On models with a remote mounted heat exchanger, the heat exchanger should be installed in a location convenient to coolant and marine transmission oil. **See your unit's lubrication plate for operating oil temperature ranges and the recommended viscosity for each.**

NOTES

Section 3

Operation

3.1 Selector Valve

A. General Description

A selector valve controls application of forward or reverse clutches in Twin Disc marine transmissions. In most transmissions a lever-actuated mechanical valve with detented positions for FORWARD, NEUTRAL and REVERSE is used. An electric, solenoid-operated valve is available as an option for certain transmissions and is standard equipment on other transmissions. The mechanical and solenoid operated valves both perform two functions: selecting FORWARD, NEUTRAL and REVERSE, and controlling main (clutch apply) pressure.

Omega® units, the MG530M and MG514M, use a mechanical selector valve actuated by a sprocket wheel to select FORWARD, NEUTRAL and REVERSE, and to control pressure applied to the selected clutch.

Most transmissions incorporate a rate-of-rise system that causes clutches to engage at a lower pressure, then progressively increases pressure to lock up the clutch. This results in smooth clutch engagement and minimizes shift shock.

⚠ WARNING

Control Systems that fail to place a mechanical selector valve in detented positions will damage or cause failure of the clutch packs.

Manually holding the shift selector out of the detented position will also damage or cause failure of the clutch packs.

⚠ WARNING

Control systems for units equipped with electric solenoid valves must NOT permit actuation of both forward and reverse solenoids at the same time.

B. Safety

Whenever maintenance is performed on the marine transmission or control valve, always assure that the transmission control are free and are adjusted properly. Be certain that the transmission range selected at the operator's station places the control valve in the fully detented position for the selection made.

3.2 Prestart-up Checks

Prior to starting the engine, check the transmission as follows.

1. Check that there is oil in the transmission.
NOTE: This check will determine that there is oil in the transmission but will not determine if oil level is correct. Oil level check must be performed with engine operating at low idle with transmission in neutral and oil temperature in operating range.
2. Check transmission for leaks, cracks and obvious damage.
3. Check mountings for tightness or damage such as cracks. Tighten loose mountings and replace damaged parts.
4. Inspect heat exchanger oil and coolant lines and hoses for leaky connections, kinks, cracks and other damage. Replace damaged lines and/or hoses.
5. Check pressure and temperature gauges where applicable.
6. Inspect driveline and input and output shaft oil seals for signs of leakage. Replace parts as required.
7. Inspect unit identification plate and lubrication plate for looseness and corrosion. Tighten mounting screws that are loose and replace corroded plates.

NOTE: Should you need to replace a plate, assure that all pertinent information is transcribed to the new plate. Failure to do so could result in the loss of important information necessary to obtain parts and service.

3.3 Start-up

1. Assure that transmission control is in NEUTRAL.
2. As soon as engine starts, check transmission oil pressure (oil pressure gauges are recommended for all installations). Pressure should register within 15 seconds. If no pressure is indicated, stop engine and determine cause.
3. Check oil level as follows.
 - A. Fill transmission to “low” mark on dipstick. Run engine at idle until oil temperature reaches **operating range**.
 - B. Continue running at idle and check oil level with oil level gauge (dipstick). Level should be at “**full**” mark on gauge. Add or remove oil as necessary to bring level to “**full**” mark on gauge.
 - C. Allow oil to cool (perhaps overnight). Check the oil level while cold at low idle engine speed while in neutral. **Make note of this adjusted cold oil “full” level for future reference. DO NOT OVERFILL.**

SECTION 3

3.4 Normal Operation

1. For maximum service life, make all shifts from NEUTRAL into either FORWARD or REVERSE with engine running at low idle.
2. When a shift range is selected, assure that the control lever is in the fully detented position for the range selected.
3. Monitor transmission oil pressure and temperature. See oil pressure information on identification plate and oil temperature information on lubrication plate.

NOTE: Sustained operation of the marine transmission with oil temperature outside of normal operating range is not recommended.

4. Shifting Limits

The following chart contains the recommended engine rpm for all shifts (NEUTRAL into FORWARD or REVERSE, and FORWARD or REVERSE through NEUTRAL into the opposite direction) for all Twin Disc marine transmission models:

Model	Maximum Engine Speed for Shifting
MG 340, MG 360, MG 5005A, MG 5012SC MG 5015A, MG 5020SC, MG 5055A:	All shifts 900 rpm maximum.
MG 540, MG5600 Series:	All shifts 750 rpm maximum.
MG 6000 Series: (except MG 6650, MG 6690, and MG 6848):	50% of engine rated operating speed.
All other models:	All shifts 1000 rpm maximum.

NOTE: The recommended engine rpms pertain to normal operation only. In an emergency, the owner/operator is expected to employ whatever procedures are necessary to prevent loss of life and reduce damage to property.

3.5 Operation in “Dirty” or Debris Filled Waters

Operation in waters that contain debris such as logs, ropes, or cables must be done cautiously. The engines should be throttled back to near idle to prevent damage to the propellers, drivelines, and transmissions.

⚠ WARNING

Getting a rope (or similar object) caught in the propeller, or “propeller Strikes” can cause serious damage to the Marine Transmission. If the vessel gets a rope (or similar object) caught in the propeller, or the propeller strikes an object, the engine should be shut down and a visual inspection of the Marine Transmission should be conducted. *If in doubt, the transmission should not be operated.* Follow the towing or back-driving procedures outlined in the manual to reach port. Continued operation of the transmission after getting a rope (or similar object) caught in the propeller, or a severe propeller strike may cause further damage to the transmission and place the safety of vessel and crew in jeopardy.

3.6 Operation with Optional Trolling Valve

A. General

Trolling valves are available as optional equipment for most Twin Disc marine transmissions. The trolling valve allows reducing and controlling propeller speed below that normally attained by operating the engine at low idle. Examples of operations requiring such slow speeds are trolling or movement through “no wake” restricted areas.

Most trolling valve can be used with the selector valve in either the forward or reverse positions. Actuating the trolling valve reduces clutch apply pressure, which reduces propeller speed.

SECTION 3

B. Operating Limits

The following chart lists the maximum engine speeds for marine transmissions to operate in the trolling mode. Continuous trolling is permitted if engine speed does not exceed prescribed limits.

NOTE: Additional cooling is not required when in the trolling mode but trolling valve performance can be affected by operating oil temperature. In some cases a thermostatic bypass valve is recommended to maintain operating oil temperature at desired level.

Marine Transmission	Maximum Engine Speed with Transmission in the Trolling Mode
MG 5005A MG 5012SC MG 5015A MG 5020SC MG 5055A	1200 RPM Engine Speed
MG502 Series	Up to 42% of full load RPM, but not below 500 RPM or above 1100 RPM engine speed.
MG5010 Series MG509 MG5011 Series MG5090A MG506 Series MG5091 MG507 Series MG5111 Series MG5075 Series MG5112V MG5081 MG5113	1100 RPM or 40% of full load RPM, whichever is smaller.
MG5050 Series MG514C MG5061 Series MG5141 SC MG5062V MG516 MG5082 MG5170DC MG5085 MG518 MG(X)5114 Series MG520 MG(X)5135 MG5200 series MG(X)5145	1100 RPM or 60% of full load RPM, whichever is smaller.
MG5301 MG540 MG5600 Series MG 6650 MG 6690 MG 6848	1000 RPM or 50% of full load RPM, whichever is smaller.
Other MG6000 Series	800 RPM.

C. Normal Operation (Trolling Mode)

The following is the normal procedure for engaging and operating a marine transmission when trolling mode is to be used.

1. Shift transmission selector to NEUTRAL.
2. Reduce engine rpm to low idle.
3. Move trolling valve control lever out of detented “no troll” position to “maximum troll” (slowest vessel speed) position.
4. Move transmission selector lever to desired direction of travel.
5. Adjust trolling valve lever setting (and if necessary, engine rpm) up to specified limit to attain desired vessel speed.

⚠ WARNING

Do not exceed specified maximum engine speed while operating in the troll mode. To do so will result in excessive clutch heat buildup and possible clutch failure.

⚠ WARNING

The trolling valve must be in the detented “no troll” position when docking the vessel or when operating in congested areas. Failure to do so could result in sluggish response to power changes or shift reversals with loss of necessary control of vessel speed or direction of travel.

NOTE: Do not attempt to use a marine transmission equipped with a trolling valve as a “power dividing” device. The capability to run the engine at a constant rpm to power accessories (pump, generators, compressors, etc.) while maintaining independent control of output shaft speed can be adequately accomplished by Omega® type drives only (e.g., MG530M, MG514M). Attempts to use a trolling valve equipped transmission for such a purpose at engine speeds above the limits specified will result in clutch failures.

SECTION 3

6. To return to “no troll” operation
 - a. Move trolling valve control lever to detented “no troll” position.
 - b. Resume “normal” no troll operations.

NOTE: Moving the trolling valve control lever to the “no troll” position while engine speed is at the high limit for trolling operations will cause an abrupt change in propeller (and vessel) speed. Reducing engine speed to idle before selecting “no troll” will result in a smoother transition to “no troll” operation.

⚠ WARNING

Assure that the trolling valve cable control system is adjusted properly. The trolling valve control lever on the transmission must be in the detented no troll position when the control at the operator’s station is moved into the “no troll” position. Failure to do so could result in inadequate response to power and/or direction changes, endangering personnel and equipment.

3.7 Windmilling/Backdriving and Towing

“Backdriving” occurs when an engine is shut down and the propeller shaft is being “driven” by the flow of water across the propeller. This is sometimes referred to as “windmilling.” The propeller shaft is rotating components in the marine transmission. Locking the propeller shaft in place will prevent backdriving.

Situations where backdriving may occur:

- Vessel being towed for any reason.
- Multiple-transmission vessel with one or more engines shut down while under way.
- Sailboat under way with auxiliary engine shut down.
- Vessel tied up or docked in heavy current.

Most current Twin Disc production marine transmissions (with the exceptions that follow) can be backdriven in the situations listed. Vessel speed under all towing or backdriving conditions must not exceed the normal propulsion speed of the vessel.

⚠ WARNING

Do not exceed normal vessel speed during backdriving. Oil sump temperature must not exceed 100°C. Damage will occur to internal components. If oil temperature increases to 100°C, reduce temperature either by reducing backdriving speed, or supplying additional cooling with water flow or by idling the engine.

The following backdriving (towing) options are applicable to all transmissions except MG5170 series, MG5200 series, MG5300 series, MG5600 series, and all MG6000 series (without the optional trailing pump). For these transmissions, instructions in only B and C below are applicable.

You need to employ only one of the following methods:

- A. Start the engine and operate the marine transmission in neutral at normal fluid pressures for five minutes, doing this once every eight hours. Maintain the backdriven marine transmissions oil level at the full mark on the dipstick.
- B. Lock the propeller shaft to prevent rotation.
- C. Add a trailing pump to the lube circuit. See the hydraulic system prints for more details on auxiliary pump specifications for the applicable transmission or contact your Twin Disc distributor.
- D. In the case of an inoperable engine, or pump failure, where pressure lubrication of the transmission is not possible; plug the dipstick tube and completely fill the transmission with oil. Prior to backdriving or towing, drain the oil down to “full” oil level. Repeat this process every eight hours.

SECTION 3

3.8 Emergency Operation

A. Mechanical Stop on Failed Torsional Coupling

Many torsional couplings used with Twin Disc transmissions have mechanical stops to allow power to be transmitted to the transmission in the event of a coupling failure. Continued operation at high power levels could result in costly damage to the transmission internal components. In the event of a torsional coupling failure, return to a safe harbor immediately to initiate repair or replacement of the failed coupling.

⚠ WARNING

Limit operation to 50% of maximum engine speed, or a maximum of 1000 rpm to avoid additional costly internal damage to transmission components.

B. Come-Home Screws

1. *Description*

Certain marine transmissions are equipped with come-home screws that permit mechanical lock-up of a clutch in the event hydraulic pressure is lost.

Come-home screws are intended to be used on malfunctioning single-transmission vessels. On vessels with multiple transmissions, if one transmission malfunctions, propel the vessel with the remaining good transmission as described in the instructions for windmilling/backdriving (Section 3.6).

⚠ WARNING

In the event of hydraulic pump failure, using the come-home screws to mechanically lock up a clutch will cause the transmission to operate without pressure lubrication, which may cause further damage to the transmission. Avoid using come-home screws unless there is no other means available to bring the vessel into port.

Situations that may require the use of come-home screws are:

- Loss of hydraulic pump drive or failure of hydraulic pump.
- Loss of oil.
- Cracked clutch-apply piston.
- Broken, worn, or blown seal rings on clutch shaft(s) or clutch-apply piston.

2. Table: Transmissions with Come-Home Screws

The following table shows the marine transmissions that currently incorporate come-home screws in their design, the number of screws and the tool needed to engage them.

Model	Number of Come-Home Screws	Tool Needed
MG509*	2	Common screw driver
MG514C*	4	3/16" internal-hex wrench
MG514CHP*	4	3/16" internal-hex wrench
MG514M*	4	3/16" internal-hex wrench
MG516*	4	3/16" internal-hex wrench
MG5161*	4	3/16" internal-hex wrench
MG5202*	4	3/16" internal-hex wrench, or 5 mm internal-hex wrench
MG521	3	1/2" 12-point socket
MG527	3	1/2" 12-point socket
MG530	4	5/16" internal-hex wrench
MG530M	4	5/16" internal-hex wrench
MG540	4	5/16" internal-hex wrench

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*** Not all units in these model designations contain come-home screws.**

SECTION 3

3. *Using Come-Home Screws*

- a) Shut down engine.

⚠ WARNING

Remove ignition key or take whatever action necessary to prevent accidental engagement of engine starter. Failure to do so could result in injury to personnel or damage to equipment.

- b) Lock transmission output shaft to prevent shaft rotation.

⚠ WARNING

When using come-home screws, the following factors must be considered:

NEVER engage both clutches at one time. To do so will lock up the transmission and will prevent engine start or operation.

Identify and always engage the clutch used for forward (ahead) propulsion. Failure to correctly identify the clutch to be engaged will cause loss of time and may place the vessel and crew in jeopardy.

- c) Locate come-home screw access plugs in manifold at rear of transmission. See Section 6.2 for locations. Remove the two access plugs for the clutch to be engaged.

Most single-transmission vessels equipped with standard (right-hand) rotation engines engage the clutch on the transmission primary shaft for forward (ahead) propulsion. (Propeller shaft turns in anti-engine direction for forward).

Most units equipped with come-home screws have four screws in each clutch housing that are accessed through two come-home screw access plug holes in

the manifold for each clutch. Two screws can be tightened at a time. Then the clutch housing must be turned to provide access to the remaining two screws.

Some MG509 transmissions are equipped with two come-home screws in each clutch housing with two come-home screw access plug holes in the manifold at each clutch location.

- d) Use a flashlight to look into come-home screw access plug holes. For most transmissions with come-home screws, slowly bar engine over to align come-home screws in clutch housing with access plug holes in manifold. Models MG514C and MG530 require barring over the output propeller shaft rather than the engine.

NOTE: Procedure used to “bar” engine over to align come-home screws with access plug holes in the manifold will vary depending upon engine involved, auxiliary equipment installed, etc. Whatever the situation, it is necessary to rotate the transmission clutch housings and to stop rotation when alignment is achieved. “Bumping” the starter may be possible and may achieve necessary alignment. Where possible, using a bar or other device attached to the front of the engine crankshaft (after releasing engine compression) is the most effective method for achieving desired alignment.

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- e) Use tool specified for your transmission and alternately tighten (turn clockwise) the accessible come-home screws until screws are tightened as far as they will go.

⚠ WARNING

Assure the accessible come-home screws are tightened evenly. Failure to do so may cause the clutch apply piston to “cock” and bind in the clutch cylinder preventing compression of the clutch plates and lock up of the clutch.

- f) Unlock transmission output shaft.

NOTE: Steps g) through j) below apply to all except the MG509 transmission listed in the preceding “Applicability” section. For the MG509 transmissions, proceed directly to step k) below.

- g) Use procedure in step d) above and bar engine over to align remaining two come-home screws in the clutch housing with the come-home access plug holes in the manifold.
- h) Lock transmission output shaft to prevent shaft rotation.

⚠ WARNING

Failure to lock the output shaft may result in shaft rotation due to current or wave action against the propeller. With two come-home screws mechanically locking the clutch, such shaft rotation will cause the clutch housing and the engine crankshaft to turn and could result in injury to personnel and/or damage to equipment.

- i) Use screwdriver or internal-hex wrench and tighten remaining two come-home screws as far as they can go.

- j) Unlock transmission output shaft
- k) Reinstall plugs in come-home screw access holes in manifold.
- l) In the case of a pump failure where pressure lubrication of the transmission is not possible, an auxiliary lube oil pump should be run if available. Otherwise, plug the dipstick tube and completely fill the transmission with oil. Prior to starting engine, drain the oil down to “full” oil level. Repeat this process every eight hours.

⚠ WARNING

Do not start engine after mechanically locking a transmission clutch before assuring that the transmission will be adequately lubricated. Operation of the transmission without sufficient lubrication will cause bearing and/or gear failure, placing the safety of vessel and crew in jeopardy.

- m) Start engine and operate at no more than 1/3 throttle.

⚠ WARNING

Transmission cannot be shifted to neutral or reverse with a mechanically locked up clutch. Engine must be shut down and vessel placed under tow before entering any congested area or dock area. Failure to do so will endanger safety of vessel and crew as well as others in the area.

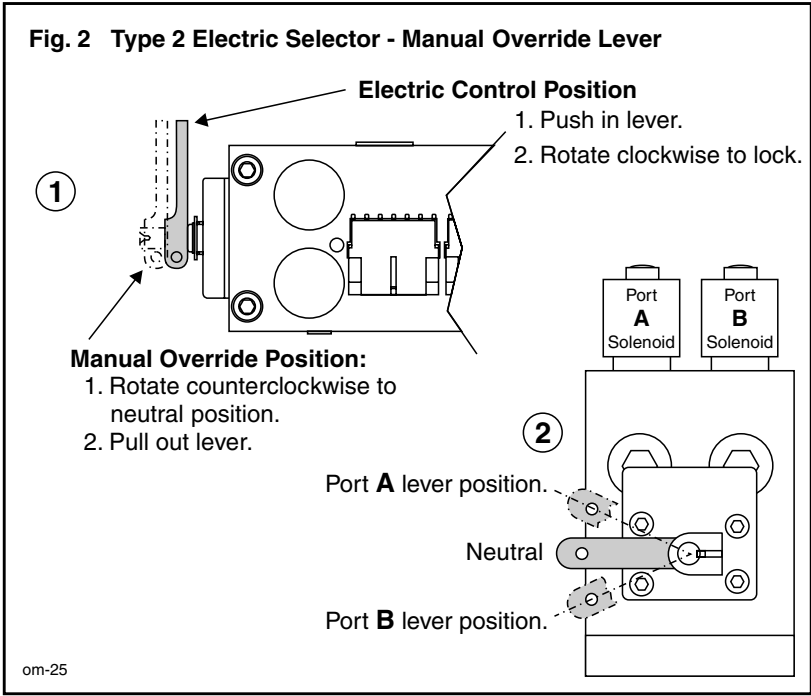
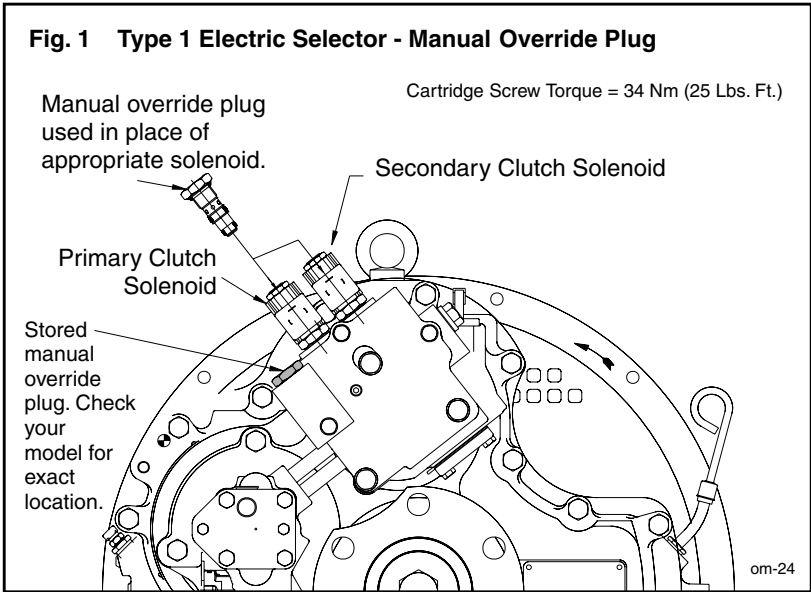
SECTION 3

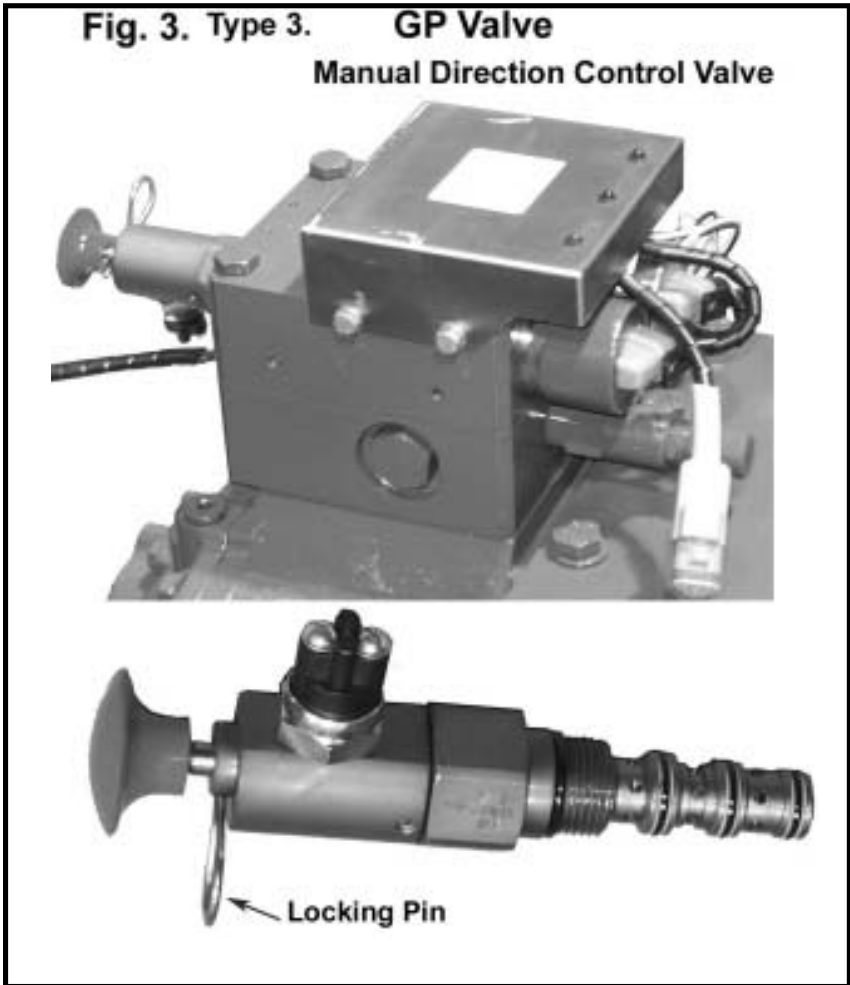
C. Electric Selector Manual Override

1. *Determine Your Electric Selector Type*

If an electrical power interruption occurs, the electric selector can be overridden as follows:

- a) Stop the engine.
- b) Based on Figures 1, 2, and 3, determine the type of electric selector valve used on the transmission.
- c) Go to the following instructions:
 - Type 1 (manual override plug) under Section 3.7.C.2
 - Type 2 (manual override lever) under Section 3.7.C.3.
 - Type 3 (manual direction control valve) under Section 3.7.C.4.





2. Type 1 Selector - Installation of Override Plug

Consult Fig. 1 for items referenced in the following steps.

⚠ WARNING

Once the override plug is installed, the transmission cannot be shifted to neutral, or into the opposite gear.

Shut down the engine and place the vessel under tow before entering any congested area or dock area. Failure to do so will endanger the safety of the crew and vessel as well as other people and vessels in the area.

- a) Locate and remove the stored manual override plug from the selector valve body for use in step c).

NOTE: The location of the stored override plug varies on different models.

- b) Determine which clutch should be engaged (primary or secondary clutch) and remove the appropriate solenoid.
- c) Install the override plug in place of the removed solenoid.

⚠ CAUTION

The selected clutch is engaged whenever the engine is running. If the vessel is going in the wrong direction, stop the engine and remove the override plug. Reinstall the removed solenoid, then repeat the above procedure with the opposite solenoid.

- d) Store the removed solenoid where the override plug was stored until repairs are performed.

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3. *Type 2 Selector - Manual Override Lever*

Type 2 electric selector valves (Fig. 2) have a lever that can be put into the manual override position. If electrical power is interrupted, the manual override feature can be used to engage the clutches.

⚠ WARNING

The control cable must always place the selector lever on the valve into the detented positions. Operation in an improper lever position can cause clutch failure.

- a) Rotate the lever to the neutral position (counterclockwise) and pull outward (view 1 in Fig. 2).
- b) Rotate the selector lever to select forward or reverse (view 2, Fig. 2).

NOTE: Some vessels may have a cable at the operating station that lets the operator manually control clutch selection when in the manual override position.

- c) Once electrical power is restored to the selector valve, switch the lever back to electric control.
 - Put lever in neutral.
 - Push the lever into the valve body. It will be more difficult to push the lever in if the engine is running.
 - Lock it in place by rotating clockwise.

4. Type 3 Selector - Manual Direction Control Valve

Remove the locking pin from the Manual Direction Control Valve, and push the valve in to engage Clutch A, or pull it out to engage Clutch B. Note that the center position is Neutral.

⚠ CAUTION

Engagement of a clutch using the Manual Direction Control Valve should only be done with the engine at idle speed.

NOTES

Section 4

Maintenance

4.1 General Maintenance

NOTE: A chart is provided in the front of the manual to record the dates/hours that maintenance procedures are performed.

A. Oil Level Check

Check oil level daily or every 10 hours of engine operation. Check with engine running at low idle and with marine transmission in neutral. Transmission oil temperature should be in normal operating range prior to checking oil level. See Section 3.3, Start-Up.

B. Lubrication

If your unit is equipped with a lubrication fitting, grease the oil seals at the output end of the transmission output shaft with water pump grease through the lubrication fitting. See illustrations in Section 6.2 for location of the lubrication fitting. Apply grease every 100 hours or when boat is docked. No other lubrication is required.

NOTE: Preferred grease is one with lithium soap, NLGI consistency #2 for component temperatures above 20° C (68° F).

C. Filter and Oil Change Interval

With a new transmission, change the oil and filter element within first 50 hours of operation. Change oil and filter element after each 1000 hours of operation, or six months, whichever comes first. The oil may need to be changed more frequently if conditions warrant.

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For a rebuilt transmission, check the suction screen and filter element after eight hours of operation. Look for lint or other material that may collect from rags or towels used in the parts cleaning process. Look for chips or shavings particularly if the transmission has had a problem that caused debris in the system. (For units with spin-on filters, this will require cutting the filter element apart to access the element core.) If the filter is clean, install a new filter element and then change the oil and filter element after 1000 hours of service. If the filter is dirty, change the element and operate for another eight hours. Check the filter again. Continue this cycle until the filter is clean and then change the oil and filter after 1000 hours of service or more often if conditions warrant.

NOTE: Situations involving debris in the hydraulic system will require that heat exchangers and all connecting lines and hoses be thoroughly cleaned. If the heat exchanger cannot be disassembled, or if it cannot be assured that all debris is removed, the heat exchanger should be replaced.

Draining

Drain the transmission by removing the oil drain plug from the rear/bottom of the transmission. See illustrations in Section 6.2 or service literature for your transmission for location of transmission and filter drain plugs.

NOTE: Dispose of used oil and oil filters in accordance with federal, state or local laws. Exercise precautions to prevent environmental contamination during any transmission servicing procedure.

Filling

1. Remove the breather or the oil fill closure from the top of transmission case.
2. Pour new oil through breather or closure opening. Fill with recommended clean oil, taking necessary precautions to prevent entry of dirt or debris. (See lubrication plate on transmission and information transcribed to the front of this manual for additional oil information.)

D. Oil Capacity

See lubrication plate. Capacity given will be internal quantity required to fill transmission to proper level, but may **NOT** include quantity to fill external hoses and heat exchanger. Check oil level per Section 3.3 *Start-Up*.

E. Heat Exchanger Check

Heat exchangers furnished by Twin Disc to be used for salt water applications have zinc rods installed at the inlet and outlet heads. These rods must be checked every 30 to 90 days depending on coolant conditions, pH factor, salinity, etc. If over one half of the rod is disintegrated, it should be replaced to provide effective protection.

Excessive corrosion of the zinc rod indicates electrolytic action. A careful inspection should be made to determine if this action is caused by a short circuit or external grounded electric current. These conditions must be eliminated to avoid frequent replacement of the zinc rods. If these conditions do not exist, it is evident that the corrosion is due to local electrolysis. If rods are corroded with foreign material, they should be cleaned with a wire brush.

F. Suction Strainer

Remove and clean the suction strainer at every oil change or sooner if necessary. See illustrations in Section 6.2 for location.

G. Flexible Input Coupling

Do not obstruct the flywheel housing vents preventing the free flow of air for cooling the coupling. Life of the coupling may be reduced if the ambient temperature of the air around the coupling is outside the operating range. Operating air temperatures above -6°C (22°F) and below 82°C (180°F) should be maintained.

If possible, visually inspect the coupling after the first 100 hours of operation and every 2000 hours thereafter, or every six months,

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whichever comes first. Torsional vibration, misalignment, degradation by contaminants (oil), heat, ultraviolet radiation, and excessive system torque can cause cracks or other signs of distress to appear on the surface of the rubber. The above-described items affect the life of the coupling element.

If coupling access is restricted, inspection may be possible only at engine overhaul or whenever the transmission is separated from the engine. On such units, frequently check the flywheel housing vents. Coupling deterioration, from a variety of causes may be indicated by an accumulation of residue at the vents. Should this be evident, inspect to determine the cause.

H. Bearing Inspection and Replacement

At the engine overhaul interval, or more frequently, inspect all transmission bearings and replace as necessary.

I. Overhaul Interval

Overhaul the transmission at the same time the engine is overhauled.

4.2 Storage Maintenance Procedures

It is sometimes necessary to store Twin Disc transmissions or boats equipped with Twin Disc components. In order to prevent corrosion damage, the following procedures are recommended:

A. Short Term Storage (Less than One Year)

Transmission installed in a boat on an engine that can be run. (Boat in the water.)

1. To the extent possible, store boat in a location that minimizes exposure to the elements.
2. Prior to storage, drain oil and refill to full level on the dipstick with recommended new oil. Install new filter, if applicable. After changing oil and filter, run engine

long enough to bring oil to operating temperature and operate transmission in all ranges. Shut down.

3. Use only recommended oils to maintain proper levels. Do not use preservative-type oils.
4. Every three months, check oil level and availability of coolant. Start engine and run at approximately 1000 rpm to bring oil temperature up to normal operating range. Run engine at least five minutes, shifting into each range and shut down.
5. Drain and refill with recommended oil and change filters, if applicable, prior to returning unit to regular service.
6. Check the condition of the zinc rods in the heat exchanger according to Section 4.1.E.

B. Long Term Storage (More than One Year)

Transmission installed in a boat where the engine cannot be run. (Boat out of water.)

1. Use standard recommended oil for the following procedures:

Once each year, remove dipstick and plug dipstick tube. Completely fill the transmission with oil. Rotate the output shaft at least five revolutions. Partially drain oil, reinstall dipstick, and then drain oil down to full mark on the dipstick.
2. Seal breather, dipstick tube and all other openings with waterproof tape.
3. Grease exposed members that are subject to corrosion.
4. Every three months rotate output shaft four or five revolutions.

SECTION 4

5. Tag transmission to show date it was placed in storage and current status relating to storage procedure.
6. To remove from storage and place in regular service:
 - a. Remove waterproof tape from breather, dipstick tube and all openings.
 - b. Drain oil and remove oil filter.
 - c. Install new oil filter and fill transmission with new recommended oil to full mark on dipstick.
 - d. Replace zinc rods in heat exchanger.

C. Heat Exchanger Storage

When storing a heat exchanger, oil and water ports must be kept sealed. Heat exchangers stored during cold weather must have the water chamber drained to prevent freezing. Take precautions to prevent damage from freezing and corrosion.

Section 5

Troubleshooting

5.1 Troubleshooting Tables

The following charts are intended as a guide for determining the cause of problems that could be encountered and the corrective actions for those difficulties.

The transmission is one part of a complete propulsion system. Problems before the transmission (in the engine) or after the transmission (in the output shaft or propeller) can cause problems to develop in the transmission. It is important that the entire propulsion system be considered when transmission problems are encountered.

Note that there are three separate charts on the following pages.

- o Troubleshooting charts for Standard MG Marine Transmissions
- o LED Troubleshooting chart for MGX Series of Marine Transmissions
- o Troubleshooting charts for MGX Series of Marine Transmissions

Note: Troubleshooting assistance, as well as maintenance, repair and parts service is available from your Twin Disc distributor or service dealer.

SECTION 5

Standard MG Chart 1

Symptom	Cause	Remedy
1. Low main oil Pressure	1-1 Partially clogged oil strainer.	1-1 Remove and clean oil strainer.
	1-2 Stuck pressure regulation piston in selector valve.	1-2 Disassemble the selector valve and clean the piston.
	1-3 Worn or broken piston rings on clutch shaft(s).	1-3 Remove the collector and inspect piston rings. Replace damaged piston rings.
	1-4 Damaged or worn oil pump assembly.	1-4 Replace damaged or worn oil pump assembly. (Pump is not serviceable.)
	1-5 Incorrect linkage adjustment to control valve assembly.	1-5 Adjust linkage so that control valve stem is indexed properly by detent.
	1-6 Clogged or plugged orifice in orifice plate.	1-6 Remove orifice plate cover. Clean parts.
	1-7 Shimming required between inner and outer springs and rate-of-rise piston.	1-7 Shim as required.
	1-8 Engine idle speed too low.	1-8 Raise engine speed.

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Standard MG Chart 2

Symptom	Cause	Remedy
<p>2. No main oil pressure, or erratic low pressure at control valve tap.</p>	<p>2-1 Oil pump suction strainer plugged.</p> <p>2-2 Oil level low.</p> <p>2-3 Air leak on suction side of pump.</p> <p>2-4 Pump drive broken.</p> <p>2-5 Regulating valve stuck in open position.</p> <p>2-6 Oil pump defective.</p> <p>2-7 Leaking heat exchanger has caused oil to be lost overboard.</p>	<p>2-1 Remove and clean strainer.</p> <p>2-2 Check oil level and correct.</p> <p>2-3 Correct cause of air leak.</p> <p>2-4 Disassemble and repair as required.</p> <p>2-5 Remove, disassemble, clean and repair the regulating valve.</p> <p>2-6 Replace oil pump.</p> <p>2-7 Replace heat exchanger.</p>
<p>3. High main oil pressure.</p>	<p>3-1 Regulating valve stuck.</p> <p>3-2 Wrong oil type.</p>	<p>3-1 Remove and clean regulating valve.</p> <p>3-2 Use recommended oil.</p>

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SECTION 5

Standard MG Chart 3

Symptom	Cause	Remedy
<p>4. High temperature.</p>	<p>4-1 Improper oil level (high or low).</p>	<p>4-1 Check and fill or drain with proper oil to the correct level.</p>
	<p>4-2 Faulty heat exchanger (if used).</p>	<p>4-2 Inspect, repair or replace heat exchanger.</p>
	<p>4-3 Blockage in heat exchanger line preventing free flow of oil or water through heat exchanger.</p>	<p>4-3 Replace defective line.</p>
	<p>4-4 Clutches slipping.</p>	<p>4-4 Check clutch apply oil pressure. If pressure is normal, remove, disassemble and repair slipping clutch.</p> <p>If oil pressure is abnormal, determine cause and repair as listed under previous troubleshooting sections.</p>
	<p>4-5 Bearing failure.</p>	<p>4-5 Overhaul marine transmission.</p>
	<p>4-6 Air leak on suction side of pump.</p>	<p>4-6 Inspect and correct cause of suction leak.</p>

Tbl-003

Standard MG Chart 4

Symptom	Cause	Remedy
5. Excessive noise.	5-1 Bearing failure.	5-1 Overhaul marine transmission.
	5-2 Worn or damaged input coupling.	5-2 Remove marine transmission. Replace worn or damaged coupling.
	5-3 Gear rattle from torsional vibrations.	5-3 Raise low idle setting.
	5-4 Worn or damaged gears.	5-4 Overhaul marine transmission.
	5-5 Improper alignment.	5-5 Check alignment of engine and transmission and transmission output flange to propeller shaft. Correct as necessary.
	5-6 Damaged propeller.	5-6 Repair propeller.
	5-7 Misfiring engine.	5-7 Repair engine.

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SECTION 5

Standard MG Chart 5

Symptom	Cause	Remedy
6. No neutral. (Neutral selected, but boat continues to move.)	6-1 Clutch plates warped.	6-1 Overhaul unit and replace clutch plates.
	6-2 Control valve incorrectly indexed.	6-2 Check and adjust control linkage.
	6-3 Worn seal rings.	6-3 Check clutch apply pressure. Replace seal rings as necessary.
	6-4 Broken or faulty clutch linkage.	6-4 Repair control linkage.
7. Harsh engagement.	7-1 Regulating piston or rate-of-rise piston stuck.	7-1 Disassemble control valve. Clean parts. Replace parts if necessary.
	7-2 Orifice plate ball in control valve not seating properly.	7-2 Remove orifice plate cover. Clean parts. Replace parts if necessary.
	7-3 Engine speed too high.	7-3 Reduce engine speed.

Tbi-003

Standard MG Chart 6

Symptom	Cause	Remedy
8. Low lube oil pressure.	8-1 Pump GPM output too low. 8-2 Pump suction strainer plugged. 8-3 Air leak on suction side of pump. 8-4 Lube regulator valve stuck. 8-5 Broken piston rings.	8-1 Replace pump. 8-2 Remove, clean, inspect and install the suction screen. 8-3 Inspect and correct cause of suction leak. 8-4 Remove and clean or replace parts as necessary. 8-5 Replace damaged piston rings.
9. Oil escaping from breather.	9-1 Oil level too high. 9-2 Wrong type of oil.	9-1 Adjust oil level. 9-2 Drain and refill with recommended oil.

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SECTION 5

MGX Series LED Chart

Light Status	Profile Generator (Non trolling)	E-troll Module
Green light on (Illuminated only when Clutch A or B is selected. Not illuminated in Neutral.)	Supply Voltage > 9.0 Volts	Supply Voltage > 9.0 Volts
Red light on	Valve coil commanded on	Valve coil commanded on
One red light flashing	Open circuit in an energized valve coil circuit	Open circuit in an energized valve coil circuit, or Valve coil leads shorted together, or Low coil current
Both red lights flashing simultaneously	Not applicable	After entering troll from neutral with both voltage and current troll signals present, or power is applied to Solenoid A and B switch inputs at the same time.
Both red lights flashing alternately	Not applicable	Either or both speed signals missing.

MGX Series Chart 1

Symptom	Cause	Remedy
1. Low main oil pressure	1-1 Partially clogged oil strainer	1-1 Remove and clean oil strainer.
	1-2 Contamination on Pilot Relief Valve seat.	1-2 Disassemble the Pilot Relief Valve and clean. Service the transmission oil filter.
	1-3 Contamination in Main Valve Cartridge	1-3 Clean or replace the Main Valve Cartridge, and service the transmission oil filter.
	1-4 Broken piston rings on clutch shaft(s).	1-4 Remove the collector and inspect piston rings.
	1-5 Damaged or worn oil pump assembly.	1-5 Replace damaged or worn oil pump assembly (pump is not serviceable).
	1-6 Engine idle speed too low.	1-6 Raise engine speed.
2. No oil pressure, or erratic low pressure at control valve.	2-1 Oil pump suction strainer plugged.	2-1 Remove and clean strainer.
	2-2 Oil level low.	2-2 Check oil level and correct.
	2-3 Air leak on suction side of pump.	2-3 Correct cause of air leak.
	2-4 Pump drive on reverse clutch shaft broken.	2-4 Disassemble and repair as required.
	2-5 Pilot Relief Valve or Main Regulating Valve stuck in open position	2-6 Remove, disassemble, clean and repair the Pilot Relief Valve. Remove, clean, or replace the Main Regulating valve. This valve cannot be disassembled.
	2-6 Oil pump defective	2-7 Replace oil pump.
	2-7 Leaking heat exchanger has caused oil to be lost over board.	2-7 Replace heat exchanger

SECTION 5

MGX Series Chart 2

Symptom	Cause	Remedy
3. High main oil pressure.	3-1 Pilot Relief Valve out of adjustment..	3-1 Adjust the Pilot Relief Valve. Replace if necessary.
	3-2 Main Regulating Valve orifice missing.	3-2 Replace Main Regulating Valve Cartridge.
4. High temperature.	4-1 Improper oil level.	4-1 Check and fill (or drain) with proper oil to the correct level.
	4-2 Faulty heat exchanger	4-2 Inspect, repair, or replace heat exchanger.
	4-3 Clutches slipping	4-3 Check clutch apply oil pressure. If pressure is normal, remove, disassemble, and repair slipping clutch. If pressure is low, replace Proportional Valve, and service transmission oil filter.
	4-4 Bearing failure.	4-4 Overhaul marine transmission.
	4-5 Air leak on suction side of pump.	4-5 Inspect and correct cause of suction leak.
	4-6 Control valve malfunction	4-6 Inspect, repair, or replace control valve.
5. Excessive Noise	5-1 Bearing failure.	5-1 Overhaul marine transmission.
	5-2 Worn or damaged input coupling.	5-2 Remove marine transmission. Replace a worn or damaged coupling.
	5-3 Excessive torsional vibration.	5-3 Select proper torsional coupling.
	5-4 Worn or damaged gears.	5-4 Overhaul marine transmission.
	5-5 Improper alignment.	5-5 Check alignment of engine and transmission output flange to propeller shaft. Correct as necessary.
	5-6 Damaged propeller.	5-6 Repair propeller.
	5-7 Misfiring engine.	5-7 Repair engine.

MGX Series Chart 3

Symptom	Cause	Remedy
6. No neutral.	6-1 Clutch plates warped.	6-1 Remove clutch plates. Overhaul unit.
	6-2 Disengaged clutch has apply pressure.	6-2 Replace Proportional Valve. Service transmission oil filter.
7. Harsh engagement or no engagement.	7-1 Faulty Proportional Valve.	7-1 Replace Proportional Valve.
	7-2 Faulty Temperature Sensor (if equipped).	7-2 Replace Temperature Sensor.
	7-3 Profile Generator defective or out of adjustment.	7-3 Replace Profile Generator. Adjust if proper equipment is available.
8. Low lube oil pressure.	8-1 Pump flow output too low.	8-1 Replace pump.
	8-1 Pump suction strainer plugged.	8-2 Remove, clean, inspect, and install the suction screen.
	8-3 Air leak on suction side of pump.	8-3 Inspect and correct cause of suction leaks.
	8-4 Lube relief valve malfunction.	8-4 Remove and clean or replace parts as necessary.
	8-5 Broken piston rings.	8-5 Replace damaged piston rings.
9. Oil spilling out of breather.	9-1 Oil level too high.	9-1 Adjust oil level.
	9-2 Wrong type of oil.	9-2 Draw and refill with recommended oil.
10. Low Clutch Apply Pressure	10-1 Low Main Pressure	10-1 See Paragraph 1.
	10-2 Defective Proportional Valve.	10-2 Replace Proportional Valve
	10-3 Low voltage to Profile Generator	10-3 Verify that green (voltage supply) light, and red (clutch energized) lights are bright

NOTES

Section 6

Appendix

6.1 Accessories and Optional Equipment

A number of options and accessories are available for use with Twin Disc marine transmissions. Contact your Twin Disc distributor for specific information on items to fit your unit and procedures for installation.

The following items are available for all units:

1. **Oil Temperature Gauges**—Used to monitor transmission sump oil temperature. Scales calibrated in Centigrade and Fahrenheit ranges.
2. **Oil Pressure Gauges**—Used to monitor main (clutch apply) oil pressure. Scale calibrated in kilopascal and pound-force-per-square-inch ranges. The use of oil pressure gauges is recommended for all installations.
3. **Output Shaft Companion Flanges**—Used to connect transmission output flange with vessel propeller shaft.
4. **Hub to Fit Flexible Input Couplings**—Provides the connection between the engine-driven input coupling and the transmission input shaft.
5. **Trolling Valves**—Used to reduce propeller speed below what can be obtained by operating the engine at low idle. (e.g. trolling operations, operating in no-wake areas, etc.)
6. **Heat Exchangers**—Used to control and maintain hydraulic system oil temperature at the proper level. Thermostatic bypass valves are available for use where needed. Contact

SECTION 6

your Twin Disc distributor for specific cooling information and recommendations to fit your transmission installation.

The following options/accessories are available for use where needed. Contact your Twin Disc distributor for specific cooling information on items compatible with your transmission installation.

1. **Front Mount Power Take-Offs**—Used to drive a variety of items (pumps, compressors, generators, etc.) Equipped with spring loaded clutches housing one or two driving plates. Available in a variety of SAE housing sizes and plate diameters.
2. **Top Mounted Clutch Controlled Power Take-Offs**—Lever actuated or hydraulically applied clutch models are available.
3. **Live Power Take-Offs**—Provides live power to accessories at all times engine is operating.
4. **Electric Solenoid Valves**—Used to select FORWARD, NEUTRAL or REVERSE. Available in 12 and 24 volt DC power configurations. Must be mated with a control system for selection of desired range.
5. **Flexible Input Coupling**—Used to reduce gear rattle caused by input vibrations.
6. **Trailing Pump**—Used to supply oil pressure for lubrication during “windmilling” or backdriving situations.

6.2 Marine Transmission Illustrations

The following illustrations are representative samples of Twin Disc Marine Transmissions. The illustrations are grouped into similar model designs and show the general locations of the:

- Oil Filler
- Oil Filter (if applicable)
- Suction Strainer
- Oil Level Gauge
- Lube (grease) Fitting (if available)
- Oil Drain Plug
- Come-Home Screws (if applicable)

To find the illustration that matches your model, look up the model number on the following chart, then go to the referenced figure number.

Speed Sensor Location

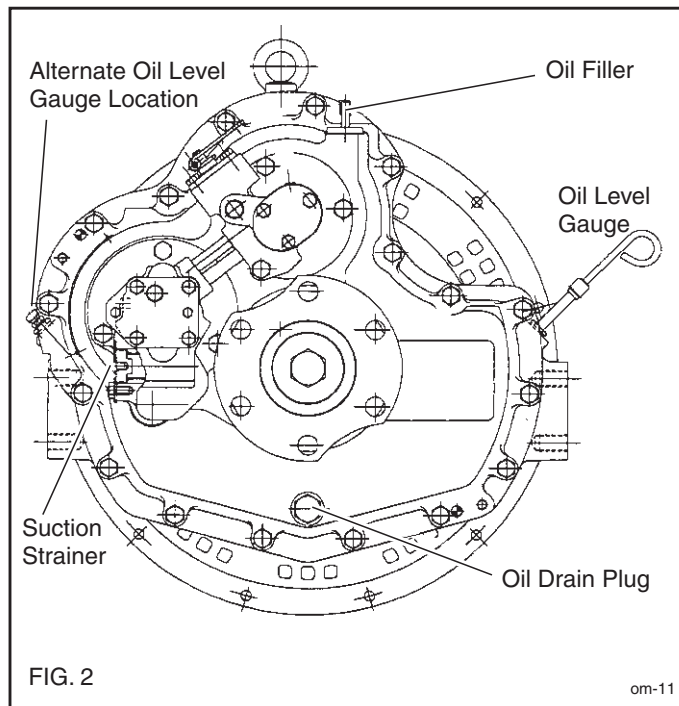
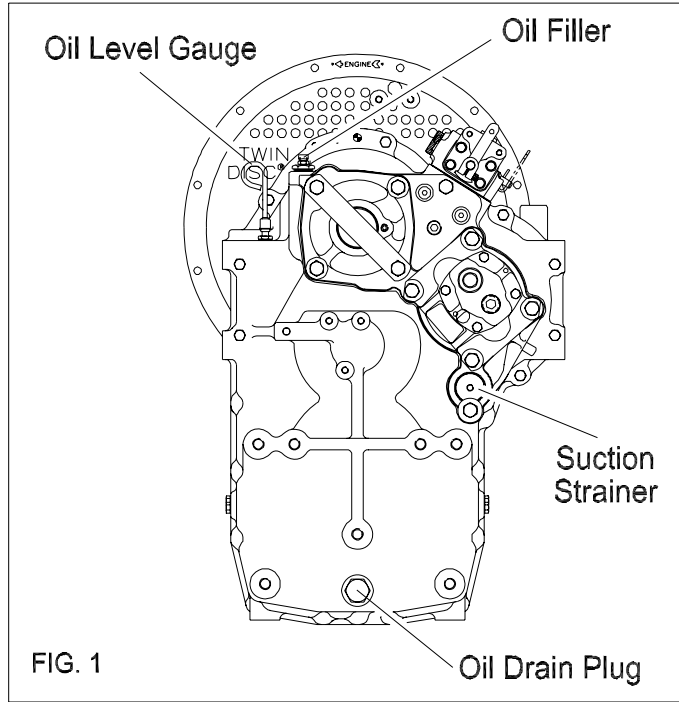
Marine Transmission models that require engine and output speed signals will have speed sensors included that are not shown on the following figures. The output speed sensor is generally located on the rear of the unit and to the right of the output flange as viewed from the rear. Integral V units generally have the output speed sensor located on the top of the housing. The engine speed sensor is generally located on the top of the transmission housing, or clockwise from the top as viewed from the rear of the transmission. Consult the Service Manual for the exact location.

SECTION 6

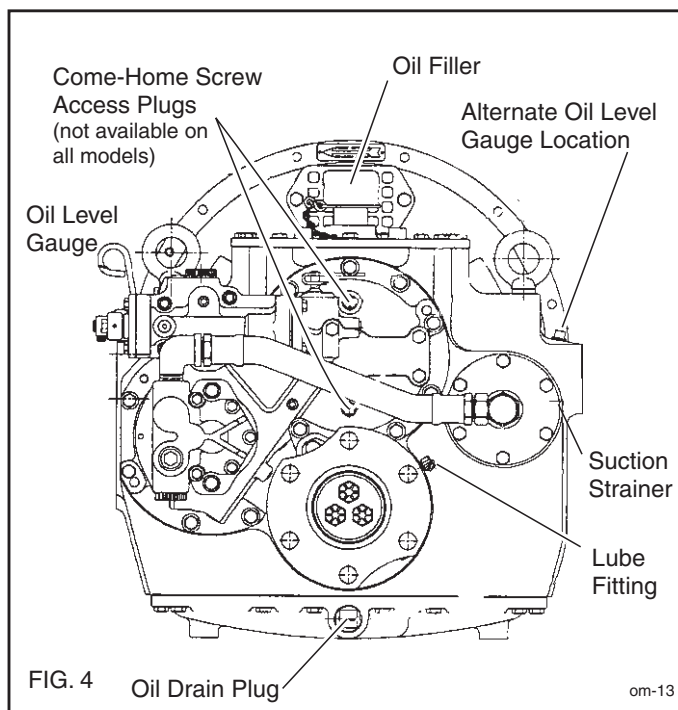
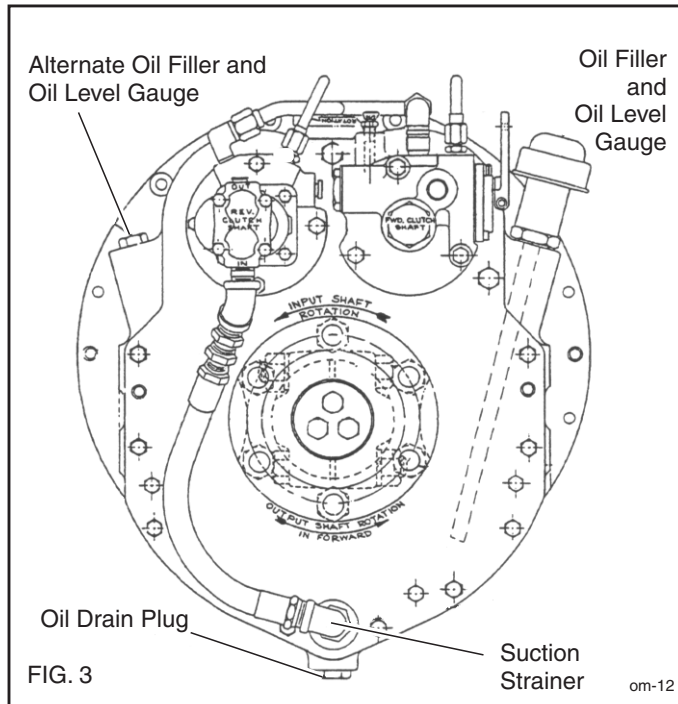
NOTE: The illustrations identified by figure number are accurate for the general location of features; however, they may not be an exact depiction of all designs. If more specific information is needed on your marine transmission's features, please refer to your service manual.

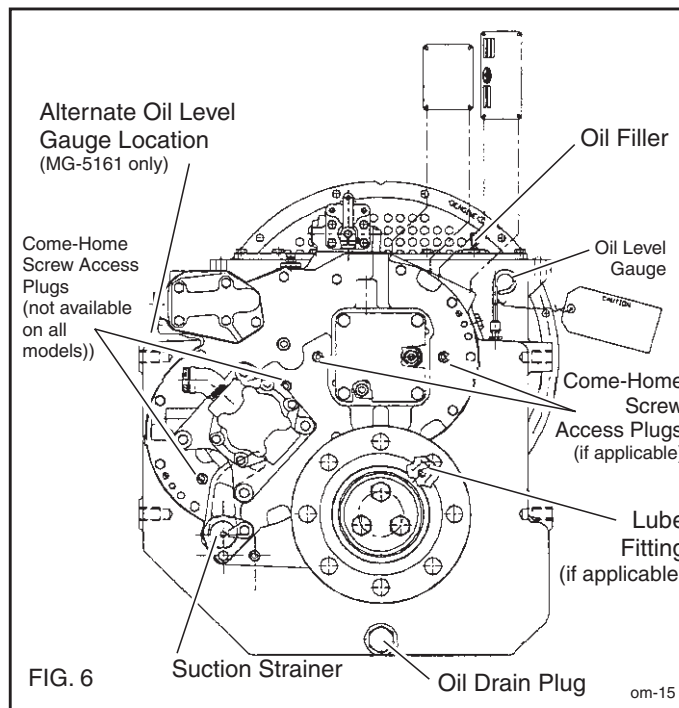
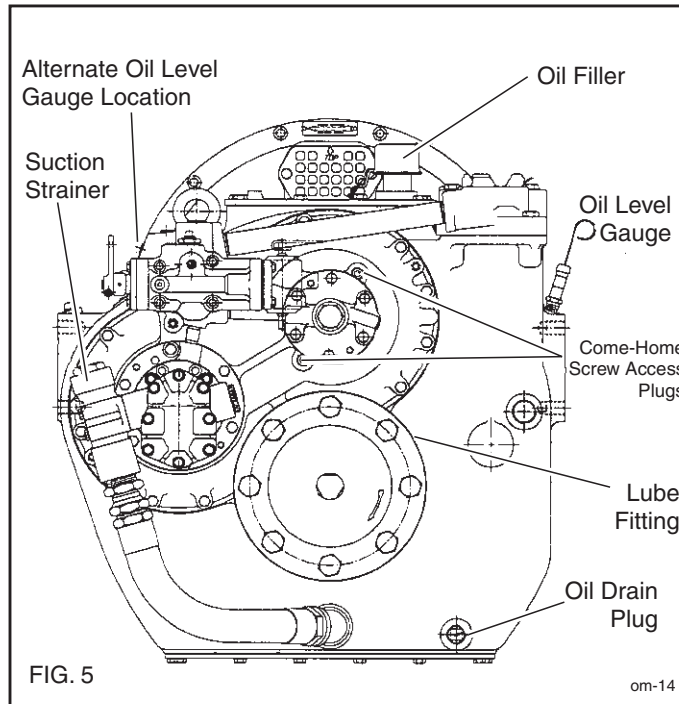
Illustration Reference Chart			
Model	Figure	Model	Figure
MG502-1	26	MG5111	11
MG506, MG506A	2	MG5111A	23
MG506-DC	3	MG5112V	1
MG507, MG507A	2	MG5113	11
MG509	4	MG(X)5114SC, MG5114DC	11
MG514C	5	MG(X)5114A	23
MG514CHP, MG514M	5	MG(X)5114IV, MG(X)5114RV	1
MG(X)5135, MG(X)5145, MG516	6	MG5141	6
MG518	7	MG5161	6
MG520	7	MG5170DC	22
MG521, MG527	8	MG5202SC, MG5202DC	6
MG530, MG530M	9	MG5203, MG5204 MG5222DC, MG5225DC, MG5205DC	6
MG540	10	MG5301DC	12
MG5010, MG5010A	25	MG5600, MG5600DR	13
MG5010V	24	MG6449A, MG6449RV	18
MG5011, MG5011A	25	MG6557A, MG6557RV	14
MG5011IV	24	MG6557SC, MG6557DC	14
MG5050, MG5050A	27	MG6600DC	15
MG5061, MG5061A	27	MG6619A, MG6619RV	16
MG5061V	27	MG6619SC	17
MG5062V	28	MG6650	19
MG5075, MG5075A	2	MG6984SC, MG6984A	20
MG5081, MG5081A MG5082, MG5082A	2	MG6984RV	21
MG5085, MG5085A	27	MG61242SC, MG61242A	20
MG5090A	23	MG61242RV	21
MG5091	11		

OM-22A

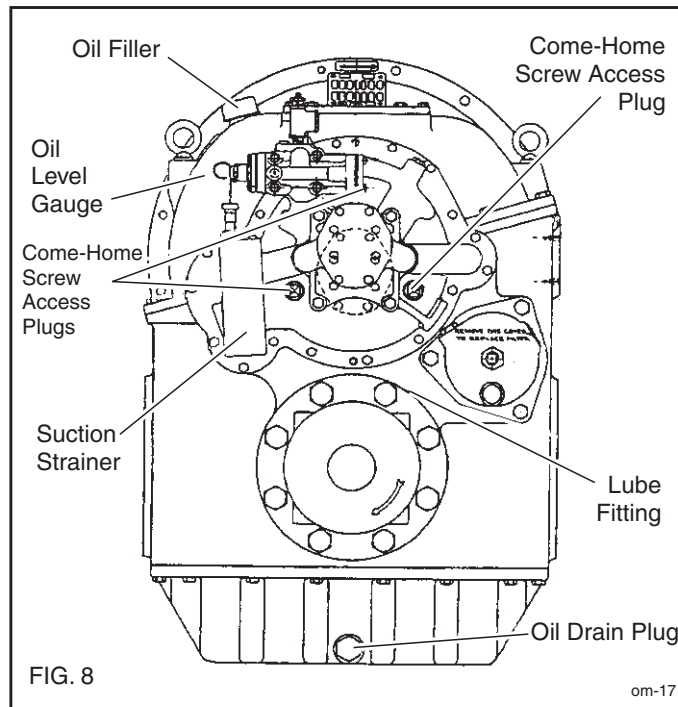
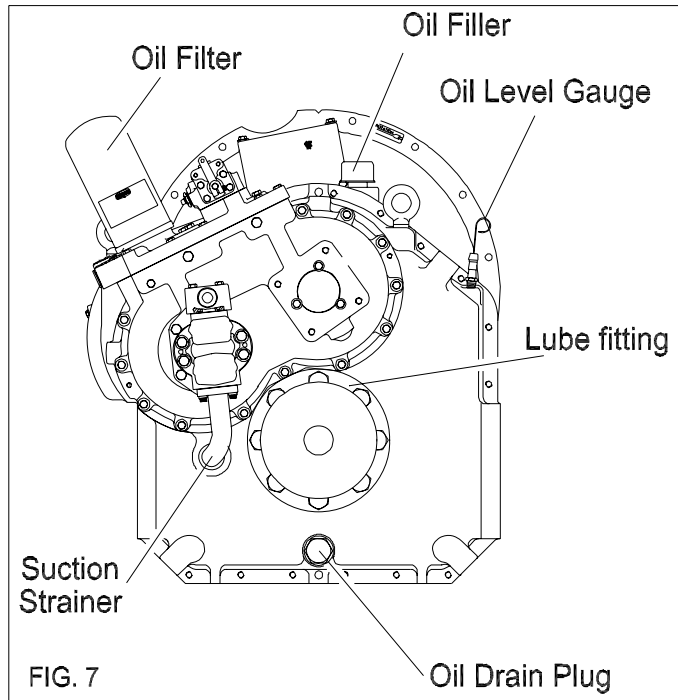


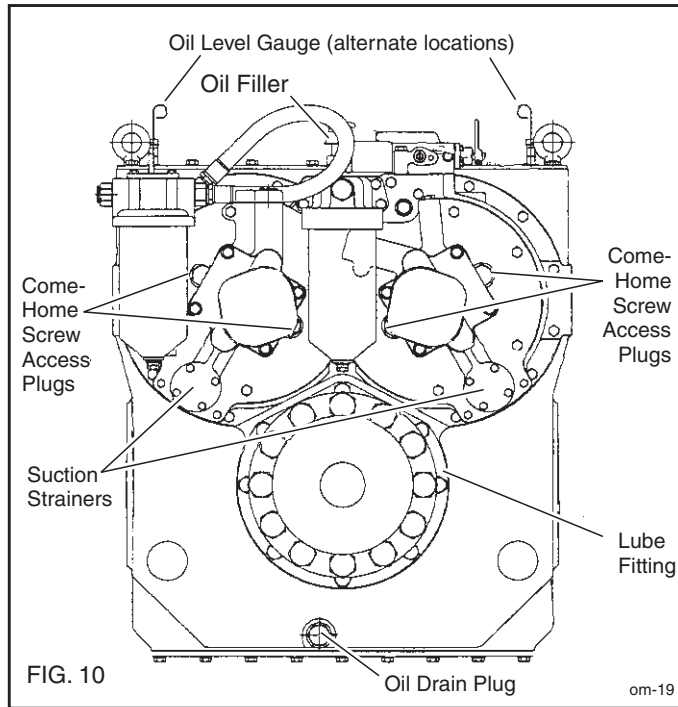
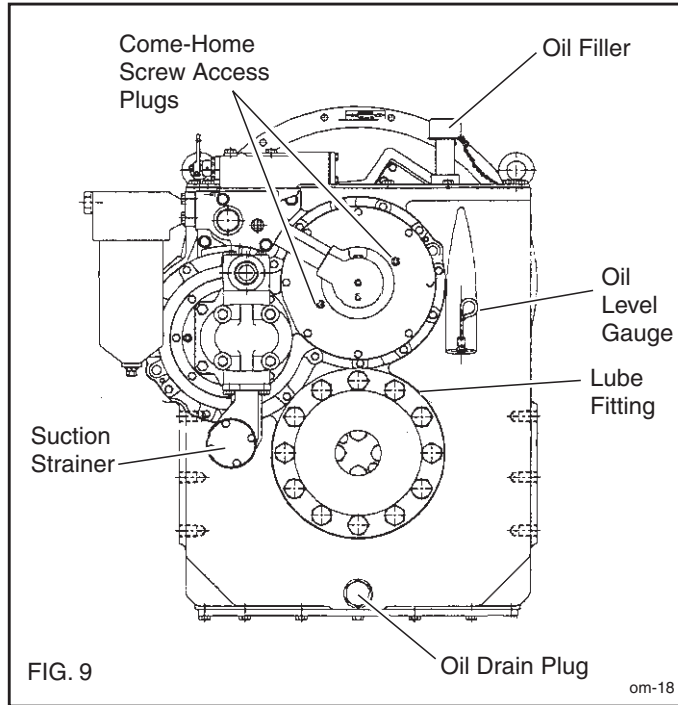
SECTION 6



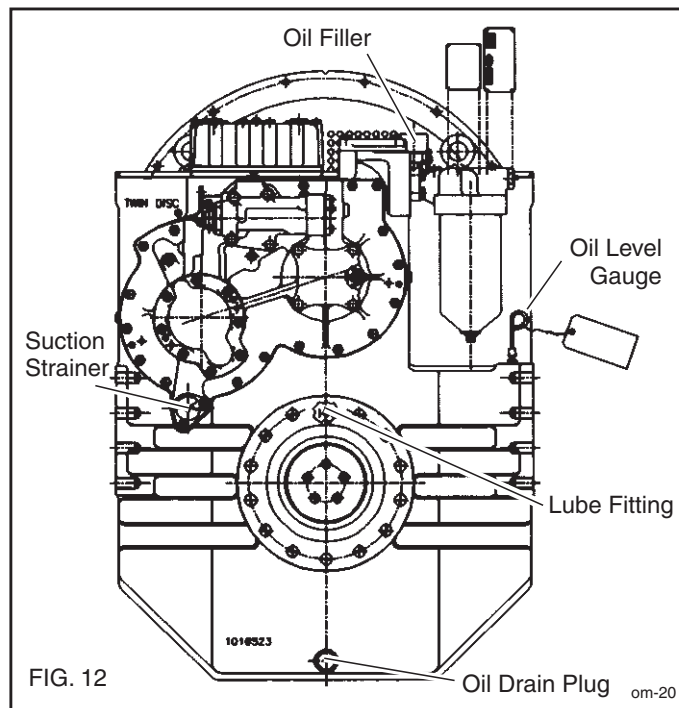
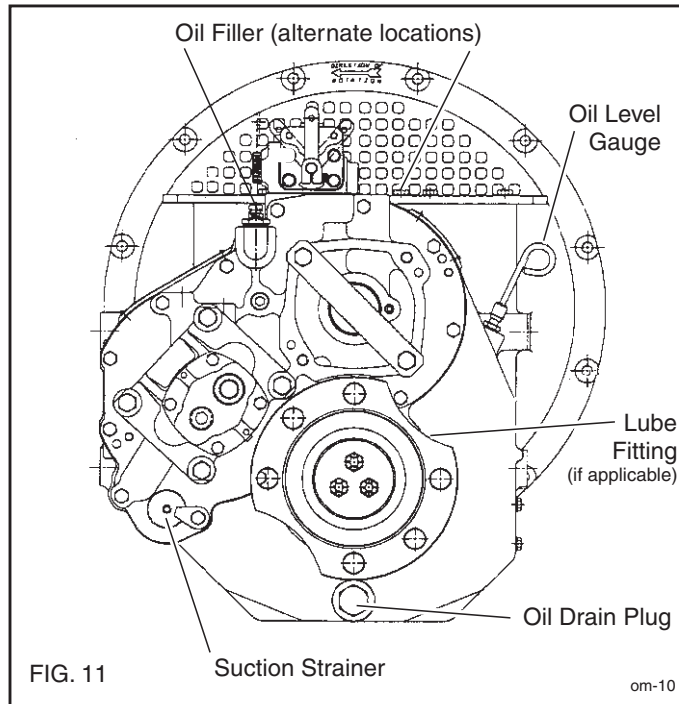


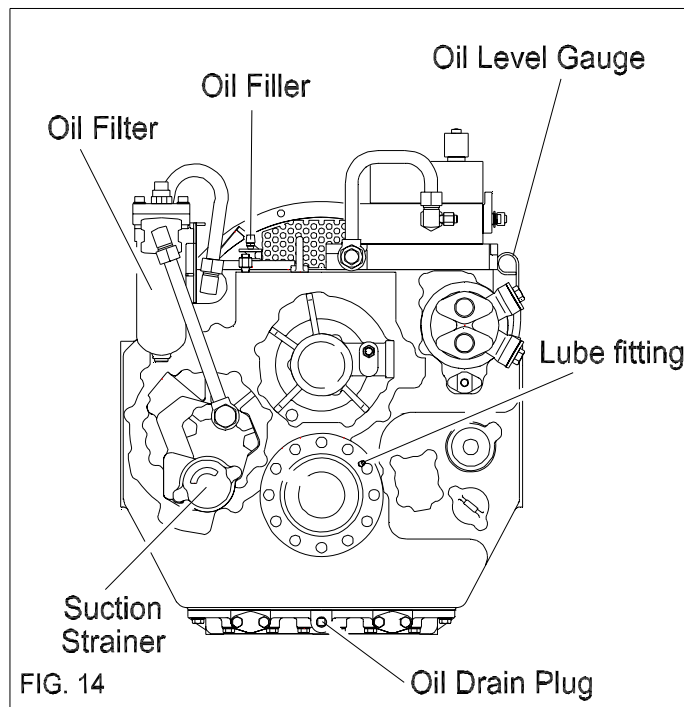
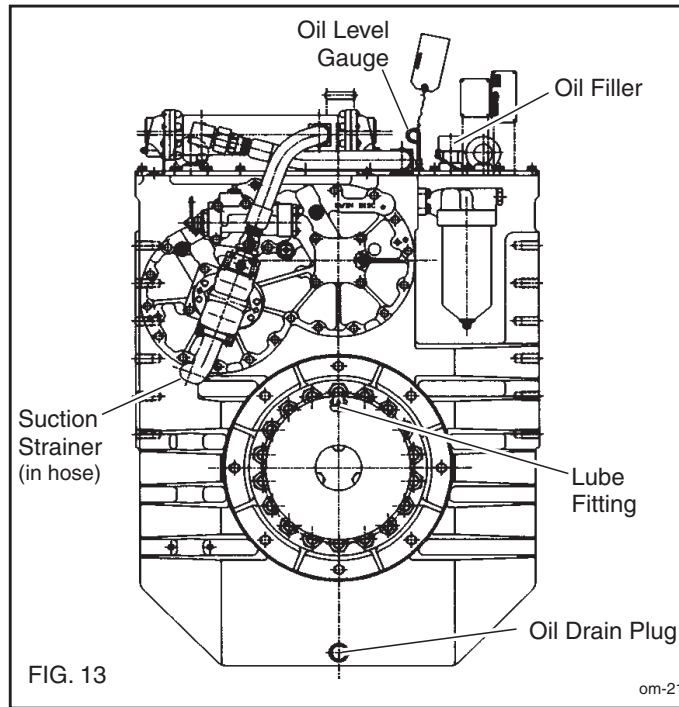
SECTION 6



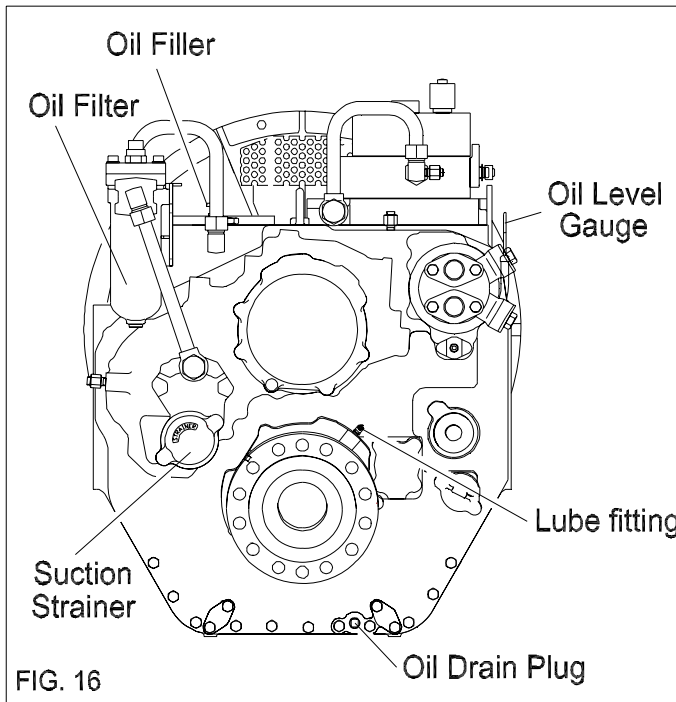
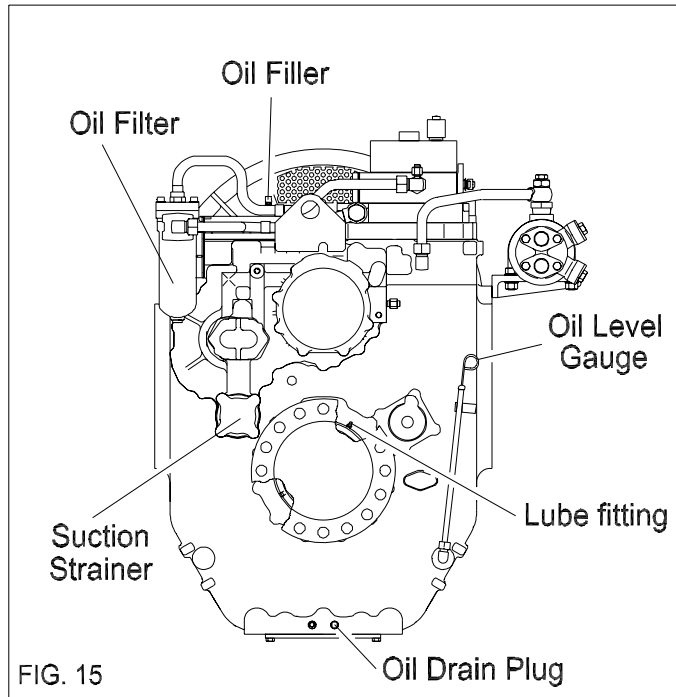


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SECTION 6



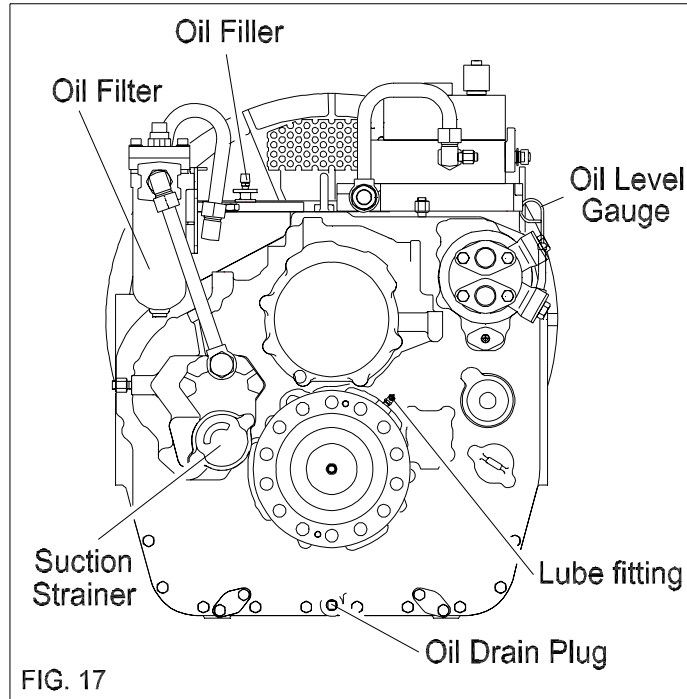


FIG. 17

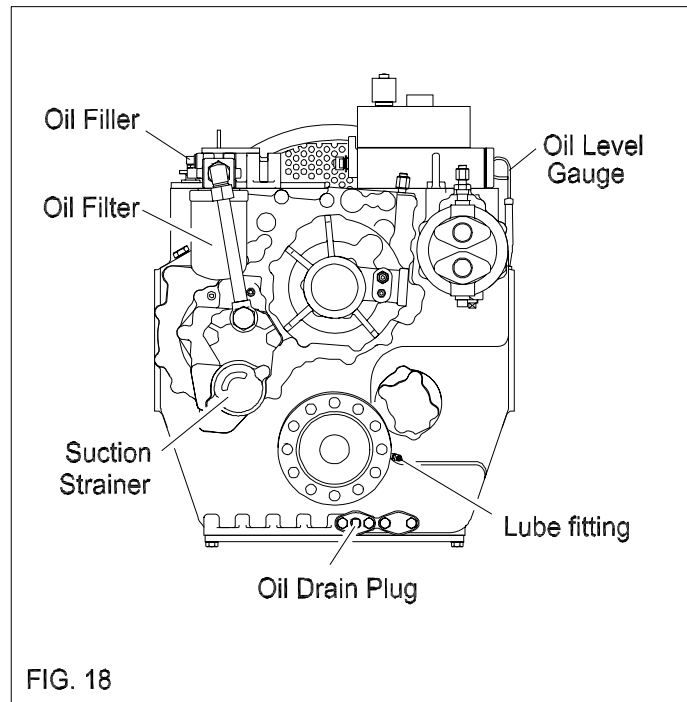
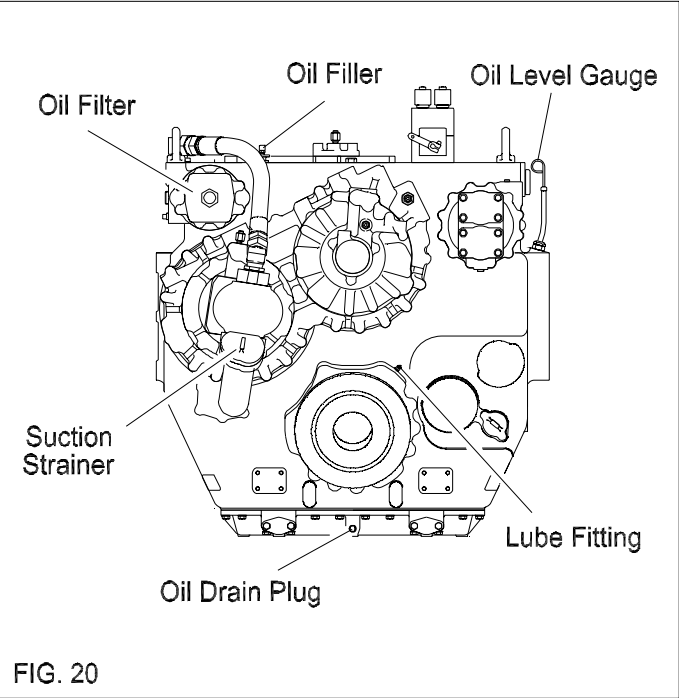
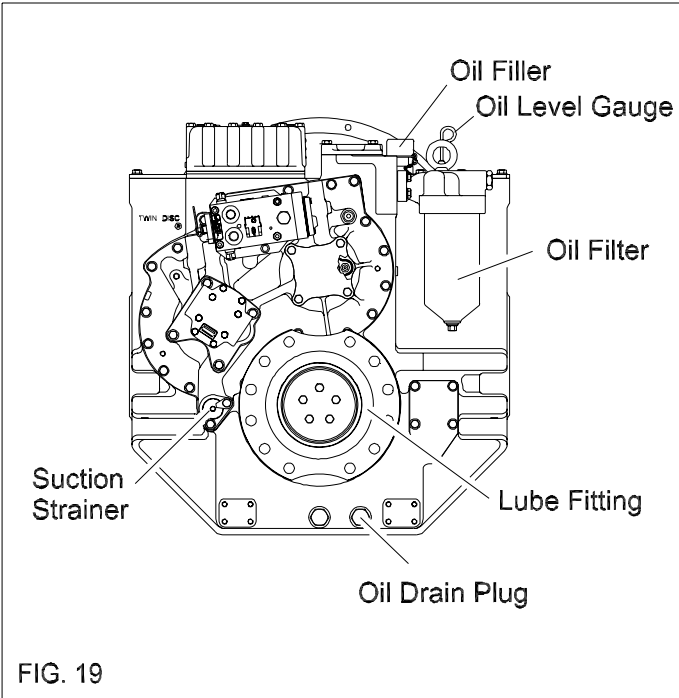


FIG. 18

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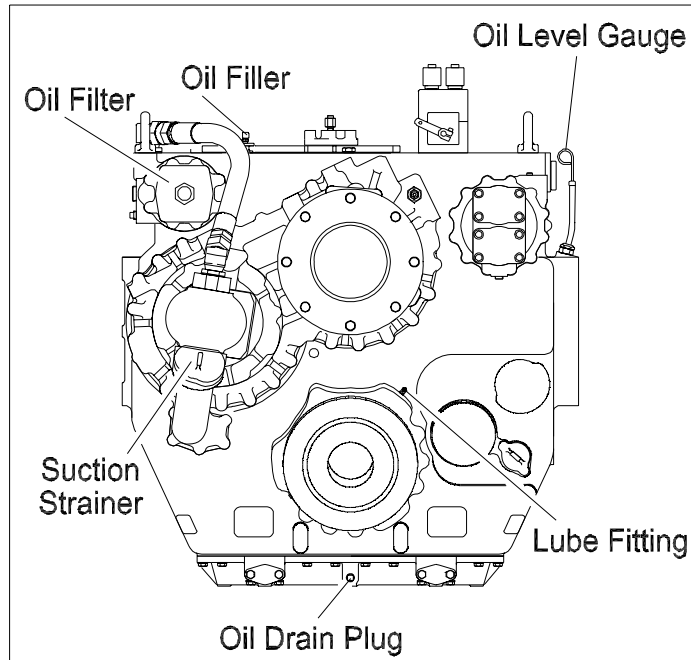


FIG. 21

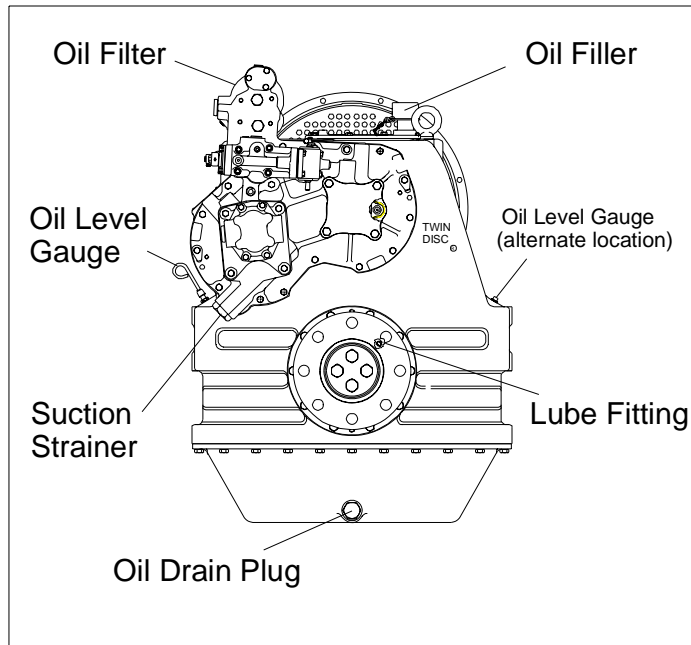
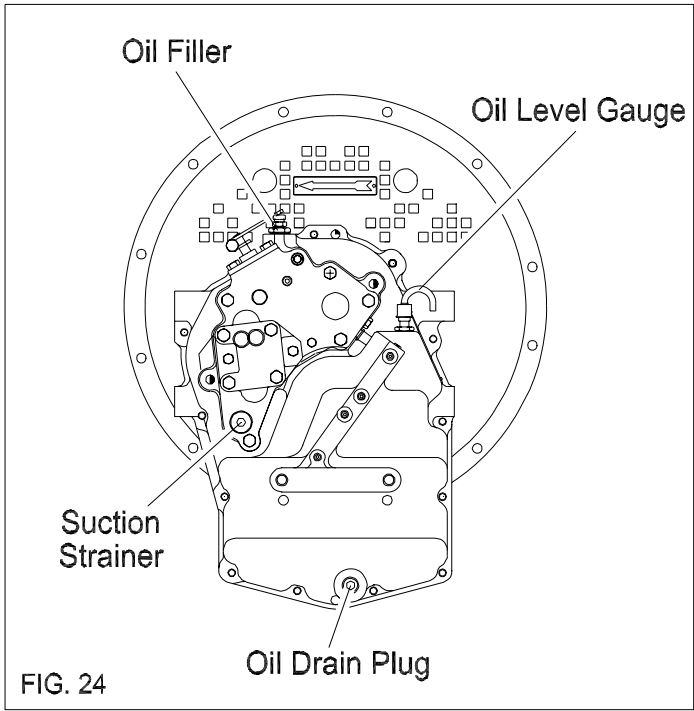
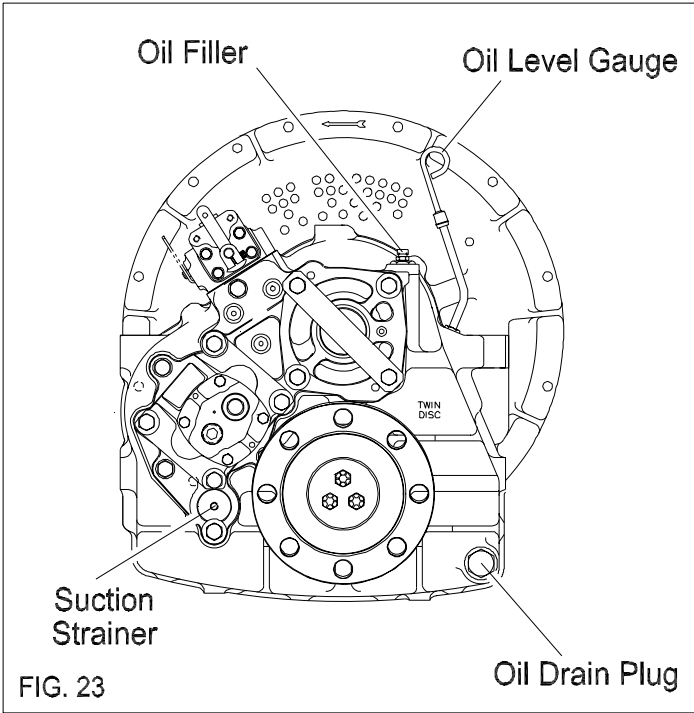
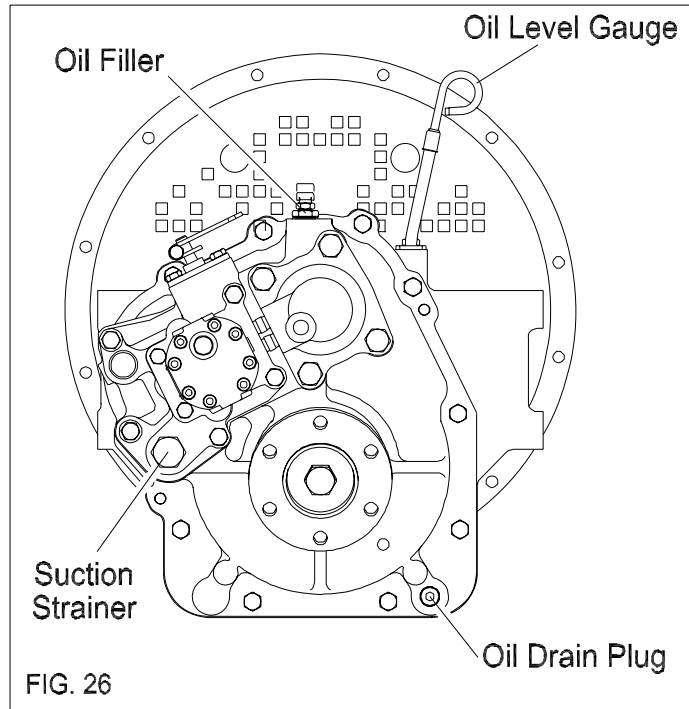
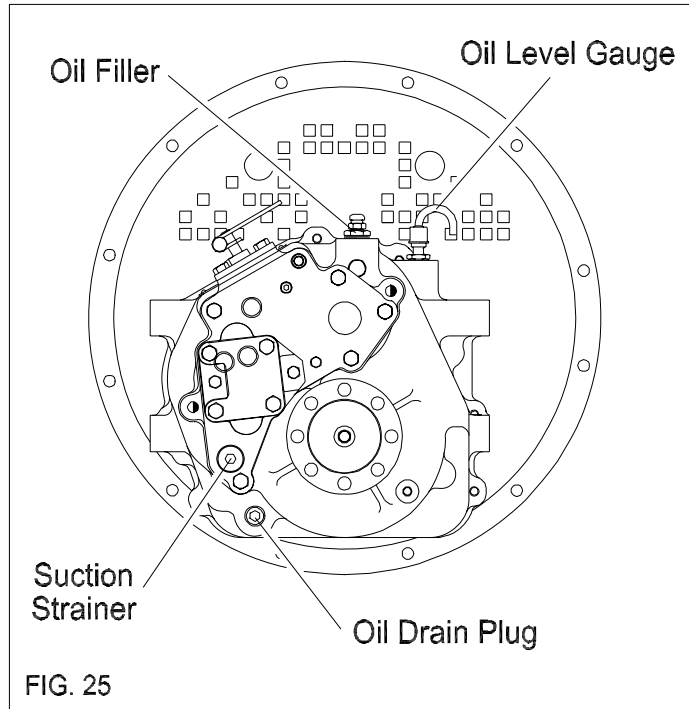


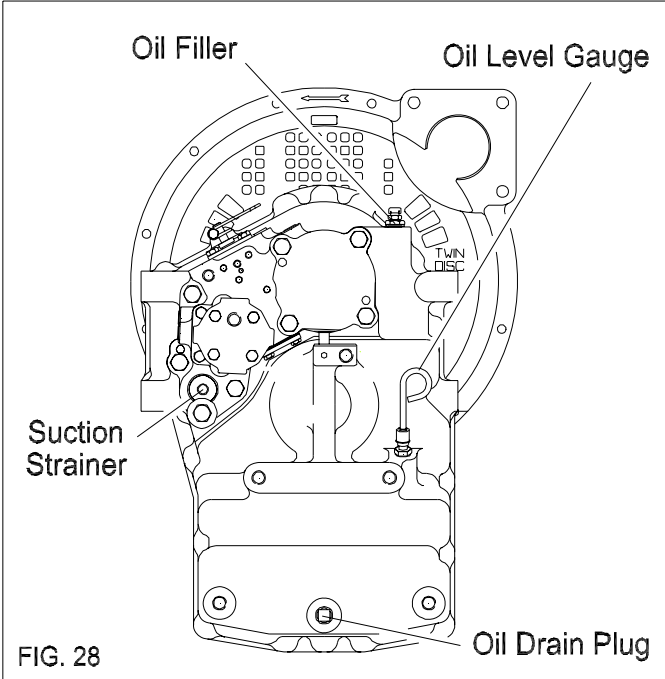
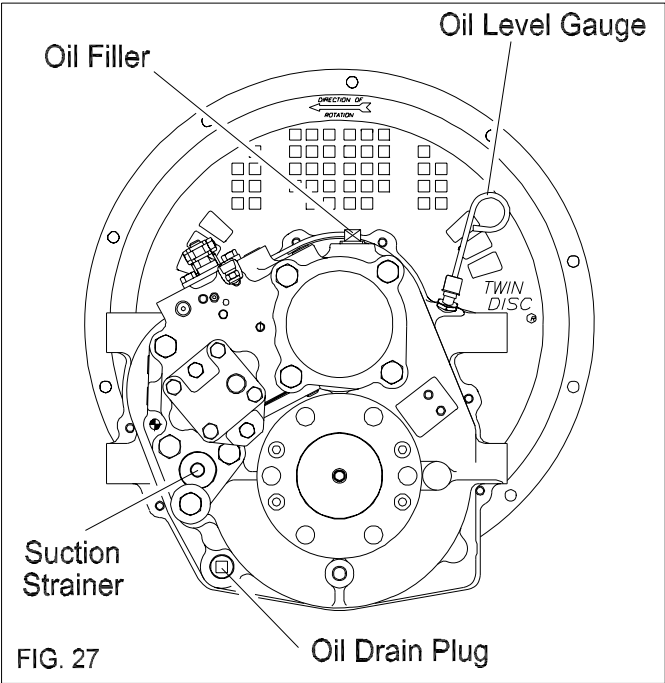
FIG. 22

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SECTION 6



6.3 TWIN DISC, INCORPORATED

EXCLUSIVE LIMITED WARRANTY
COMMERCIAL MARINE
TRANSMISSION,
SURFACE DRIVE
ELECTRONIC CONTROL SYSTEMS

A. Twin Disc, Incorporated warrants all assembled products and parts, (except component products or parts on which written warranties issued by the respective manufacturers thereof are furnished to the original customer, as to which Twin Disc, Incorporated makes no warranty and assumes no liability) against defective materials or workmanship *for a period of twenty-four (24) months from the date of shipment by Twin Disc, Incorporated to original customer, but not to exceed twelve (12) months of service, whichever occurs first.* **This is the only warranty made by Twin Disc, Incorporated and is in lieu of any and all other warranties, express or implied, including the warranties of merchantability or fitness for a particular purpose and no other warranties are implied or intended to be given by Twin Disc, Incorporated.**

The original customer does not rely upon any tests or inspections by Twin Disc, Incorporated or on Twin Disc, Incorporated's application engineering. Twin Disc, Incorporated is not responsible for any specific application, installation or performance standard. Any analysis program by Twin Disc, Incorporated based upon customer supplied information is done solely as an accommodation to the customer and is not to be interpreted or construed as an approval for specific application or installation or a guarantee of performance.

B. The exclusive remedy provided by Twin Disc, Incorporated whether arising out of warranty within the applicable warranty period as specified, or otherwise (including tort liability), shall at the sole option of Twin Disc, Incorporated be either the repair or replacement of any Twin Disc, Incorporated part or product found by Twin Disc, Incorporated to be defective and the labor to perform that work and to remove and reinstall (or equivalent credit). In this context, labor is defined as the flat rate labor hours established by Twin Disc, Incorporated in the published Twin Disc Flat Rate Schedule, required to remove, disassemble, inspect, repair, reassemble, reinstall and test the Twin Disc, Incorporated product only. Authorized reasonable travel and living expenses will be considered for payment on all Commercial Marine Products except on Electronic Control Systems. . Under no circumstances, including a failure of the exclusive remedy, shall Twin Disc, Incorporated be liable for economic loss, consequential, incidental or punitive damages.

The above warranty and remedy are subject to the following terms and conditions:

1. Complete parts or products upon request must be returned transportation prepaid and also the claims submitted to Twin Disc, Incorporated within sixty (60) days after completion of the in warranty repair.
2. The warranty is void if, in the opinion of Twin Disc, Incorporated, the failure of the part or product resulted from abuse, neglect, improper maintenance or accident.
3. The warranty is void if any modifications are made to any product or part without the prior written consent of Twin Disc, Incorporated.

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4. The warranty is void unless the product or part is properly transported, stored and cared for from the date of shipment to the date placed in service.
5. The warranty is void unless the product or part is properly installed and maintained within the rated capacity of the product or part with installations properly engineered and in accordance with the practices, methods and instructions approved or provided by Twin Disc, Incorporated.
6. The warranty is void unless all required replacement parts or products are of Twin Disc origin or equal, and otherwise identical with components of the original equipment. Replacement parts or products not of Twin Disc origin are not warranted by Twin Disc, Incorporated.

C. As consideration for this warranty, the original customer and subsequent purchaser agree to indemnify and hold Twin Disc, Incorporated harmless from and against all and any loss, liability, damages or expenses for injury to persons or property, including without limitation, the original customer's and subsequent purchaser's employees and property, due to their acts or omissions or the acts or omissions of their agents, and employees in the installation, transportation, maintenance, use and operation of said equipment.

D. Only a Twin Disc, Incorporated authorized factory representative shall have authority to assume any cost or expense in the service, repair or replacement of any part or product within the warranty period, except when such cost or expense is authorized in advance in writing by Twin Disc, Incorporated.

E. Twin Disc, Incorporated reserves the right to improve the product through changes in design or materials without being obligated to incorporate such changes in products of prior manufacture. The original customer and subsequent purchasers will not use any such changes as evidence of insufficiency or inadequacy of prior designs or materials.

F. If failure occurs within the warranty period, and constitutes a breach of warranty, repair or replacement parts will be furnished on a no charge basis and these parts will be covered by the remainder of the unexpired warranty which remains in effect on the complete unit.

April 19, 2007

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6.4 TWIN DISC, INCORPORATED
**EXCLUSIVE LIMITED WARRANTY
PLEASURE CRAFT MARINE TRANSMISSION,
SURFACE DRIVE
ELECTRONIC CONTROL SYSTEMS**

A. Twin Disc, Incorporated warrants all assembled products and parts, (except component products or parts on which written warranties issued by the respective manufacturers thereof are furnished to the original customer, as to which Twin Disc, Incorporated makes no warranty and assumes no liability) against defective materials or workmanship *for a period of thirty six (36) months from the date of original shipment by Twin Disc, Incorporated to the original customer, but not to exceed twenty four (24) months or one thousand (1,000) hours of service, whichever occurs first.* **This is the only warranty made by Twin Disc, Incorporated and is in lieu of any and all other warranties, express or implied, including the warranties of merchantability or fitness for a particular purpose and no other warranties are implied or intended to be given by Twin Disc, Incorporated. This warranty applies only to private, non commercial (non revenue earning) marine pleasure craft applications.**

The original customer does not rely upon any tests or inspections by Twin Disc, Incorporated or on Twin Disc, Incorporated's application engineering. Twin Disc, Incorporated is not responsible for any specific application, installation or performance standard. Any analysis program by Twin Disc, Incorporated based upon customer supplied information is done solely as an accommodation to the customer and is not to be interpreted or construed as an approval for specific application or installation or a guarantee of performance.

B. The exclusive remedy provided by Twin Disc, Incorporated whether arising out of warranty within the applicable warranty period as specified, or otherwise (including tort liability), shall at the sole option of Twin Disc, Incorporated be either the repair or replacement of any Twin Disc, Incorporated part or product found by Twin Disc, Incorporated to be defective. For all models except MG340 and MG360 this include the labor to perform that work and to remove and reinstall (or equivalent credit). In this context, labor is defined as the flat rate labor hours established by Twin Disc, Incorporated in the published Twin Disc Flat Rate Schedule, required to remove, disassemble, inspect, repair, reassemble, reinstall and test the Twin Disc, Incorporated product only. Authorized reasonable travel and living expenses will be considered for payment in all model except MG340, MG360 and Electronic Control Systems. Under no circumstances, including a failure of the exclusive remedy, shall Twin Disc, Incorporated be liable for economic loss, consequential, incidental or punitive damages..

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The above warranty and remedy are subject to the following terms and conditions:

1. Complete parts or products upon request must be returned transportation prepaid and also the claims submitted to Twin Disc, Incorporated within sixty (60) days after completion of the in warranty repair.
2. The warranty is void if, in the opinion of Twin Disc, Incorporated, the failure of the part or product resulted from abuse, neglect, improper maintenance or accident.
3. The warranty is void if any modifications are made to any product or part without the prior written consent of Twin Disc, Incorporated.
4. The warranty is void unless the product or part is properly transported, stored and cared for from the date of shipment to the date placed in service.
5. The warranty is void unless the product or part is properly installed and maintained within the rated capacity of the product or part with installations properly engineered and in accordance with the practices, methods and instructions approved or provided by Twin Disc, Incorporated.
6. The warranty is void unless all required replacement parts or products are of Twin Disc origin or equal, and otherwise identical with components of the original equipment. Replacement parts or products not of Twin Disc origin are not warranted by Twin Disc, Incorporated.

C. As consideration for this warranty, the original customer and subsequent purchaser agree to indemnify and hold Twin Disc, Incorporated harmless from and against all and any loss, liability, damages or expenses for injury to persons or property, including without limitation, the original customer's and subsequent purchaser's employees and property, due to their acts or omissions or the acts or omissions of their agents, and employees in the installation, transportation, maintenance, use and operation of said equipment.

D. Only a Twin Disc, Incorporated authorized factory representative shall have authority to assume any cost or expense in the service, repair or replacement of any part or product within the warranty period, except when such cost or expense is authorized in advance in writing by Twin Disc, Incorporated.

E. Twin Disc, Incorporated reserves the right to improve the product through changes in design or materials without being obligated to incorporate such changes in products of prior manufacture. The original customer and subsequent purchasers will not use any such changes as evidence of insufficiency or inadequacy of prior designs or materials.

F. If failure occurs within the warranty period, and constitutes a breach of warranty, repair or replacement parts will be furnished on a no charge basis and these parts will be covered by the remainder of the unexpired warranty which remains in effect on the complete unit.

April 19, 2007

TDWP10099 rev 2007

