Service Manual

Johnson®

2004

2 Stroke
9.9, 15, 25, 30

BOMBARDIER

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RECREATIONAL PRODUCTS

Bombardier Motor Corporation of America
Technical Publications
250 Sea Horse Drive
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QuikStart™
S.L.O.W.™
Speed Adjusting Failsafe Electronics (S.A.F.E.™)
System Check®
Triple-Guard® Grease
Twist-Grip™
2+4® Fuel Conditioner
Ultra-HPF™ Gearcase Lubricant

Printed in the United States.

SAFETY INFORMATION

Before working on any part of the outboard, read the SAFETY section at the end of this manual.

This manual is written for qualified, factory-trained technicians who are already familiar with the use of Bombardier Special Tools. This manual is not a substitute for work experience. It is an organized guide for reference, repair, and maintenance of the outboard(s).

This manual uses the following signal words identifying important safety messages.

⚠ DANGER ⚠

Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.

⚠ WARNING ⚠

Indicates a potentially hazardous situation which, if not avoided, CAN result in severe injury or death.

⚠ CAUTION ⚠

Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate personal injury or property damage. It also may be used to alert against unsafe practices.

IMPORTANT: Identifies information that will help prevent damage to machinery and appears next to information that controls correct assembly and operation of the product.

These safety alert signal words mean:

ATTENTION!
BECOME ALERT!
YOUR SAFETY IS INVOLVED!

Always follow common shop safety practices. If you have not had training related to common shop safety practices, you should do so to protect yourself, as well as the people around you.

It is understood that this manual may be translated into other languages. In the event of any discrepancy, the English version shall prevail.

To reduce the risk of personal injury, a safety review is provided at the beginning of each section.

DO NOT do any repairs until you have read the instructions and checked the pictures relating to the repairs.

Be careful, and never rush or guess a service procedure. Human error is caused by many factors: carelessness, fatigue, overload, preoccupation, unfamiliarity with the product, and drugs and alcohol use, to name a few. Damage to a boat and outboard can be fixed in a short period of time, but injury or death has a lasting effect.

When replacement parts are required, use *Evinrude/Johnson Genuine Parts* or parts with equivalent characteristics, including type, strength and material. Using substandard parts could result in injury or product malfunction.

Torque wrench tightening specifications must be strictly followed. Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to turning must be felt when reusing a locking fastener. If replacement is specified or required because the locking fastener has become weak, use only authorized *Evinrude/Johnson Genuine Parts.*

If you use procedures or service tools that are not recommended in this manual, YOU ALONE must decide if your actions might injure people or damage the outboard.

TABLE OF CONTENTS

INTRODUCTION

TABLE OF CONTENTS

ARRANGEMENT OF THIS MANUAL

This manual is divided into 13 major sections:

INTRODUCTION
1. SPECIAL TOOLS & SERVICE SPECS
2. INSTALLATION AND PREDELIVERY
3. MAINTENANCE
4. ELECTRICAL
5. IGNITION
6. FUEL SYSTEM
7. POWERHEAD
8. MIDSECTION
9. GEARCASE
10. MANUAL STARTER
11. SAFETY

WIRING DIAGRAMS

MODELS COVERED IN THIS MANUAL

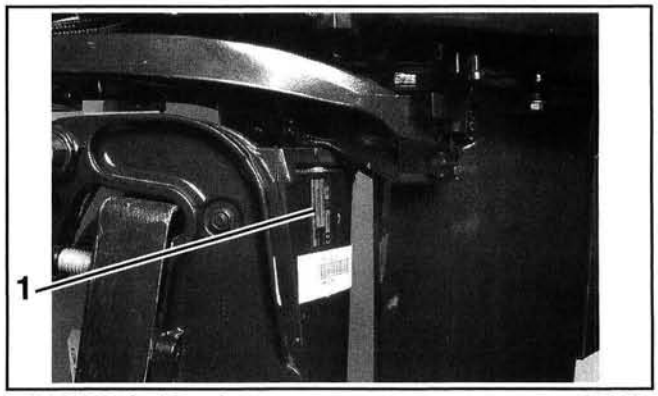
This manual covers service information on *Johnson* 9.9 through 30 HP 2-Stroke models. Use this manual together with the proper Parts Catalog for part numbers and for exploded views of the outboard, which are a valuable aid to disassembly and reassembly.

This manual presents the U.S. values and dimensions first and the metric values and dimensions second, inside parentheses ( ).

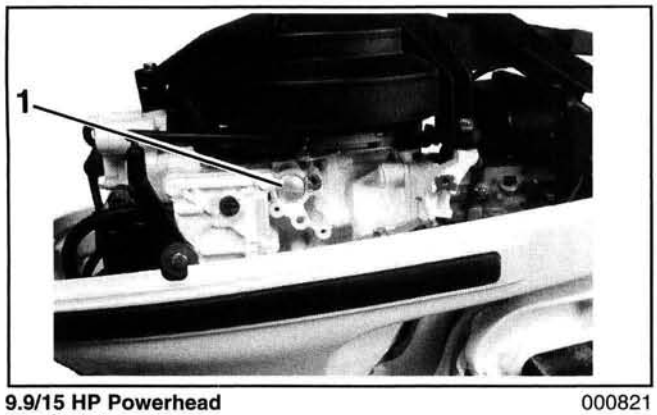
IDENTIFYING MODEL AND SERIAL NUMBERS

Outboard model and serial numbers are located on the swivel bracket and on the powerhead.

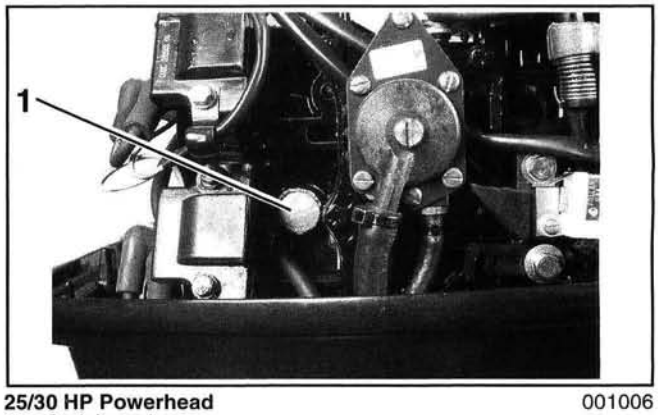
9.9/15 HP Swivel Bracket 000820
1. Model and serial number



25/30 HP Swivel Bracket 001005
1. Model and serial number

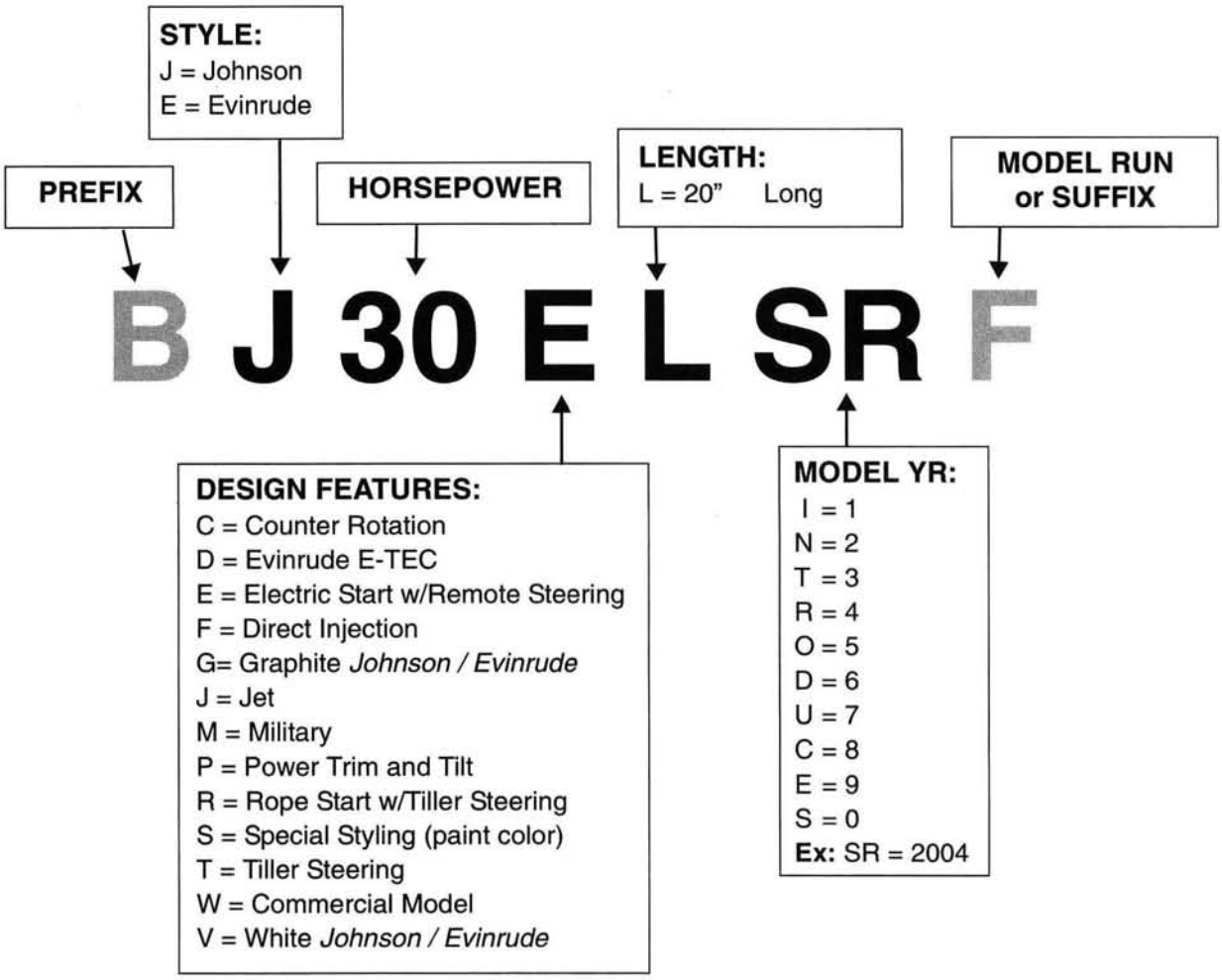


9.9/15 HP Powerhead 000821
1. Serial number



25/30 HP Powerhead 001006
1. Serial number

MODEL DESIGNATION



MODEL LIST

Model Number	Start	Shaft	Steer
J10RSRD	Rope	15"	Tiller
J10RLSRD	Rope	20"	Tiller
BJ10RHSRC	Rope	15"	Tiller
BJ10RHLSRC	Rope	20"	Tiller
J15RSRS	Rope	15"	Tiller
J15RLSRS	Rope	20"	Tiller
J25RSRR	Rope	15"	Tiller
J25RLSRR	Rope	20"	Tiller

Model Number	Start	Shaft	Steer
J25TESRA	Electric	15"	Tiller
J25TELSRA	Electric	20"	Tiller
J25ELSRM	Electric	20"	Remote
J30RSRE	Rope	15"	Tiller
J30RLSRE	Rope	20"	Tiller
J30ELSRE	Electric	20"	Remote
J30MLSRC	Rope	20"	Tiller

TYPICAL PAGE – A

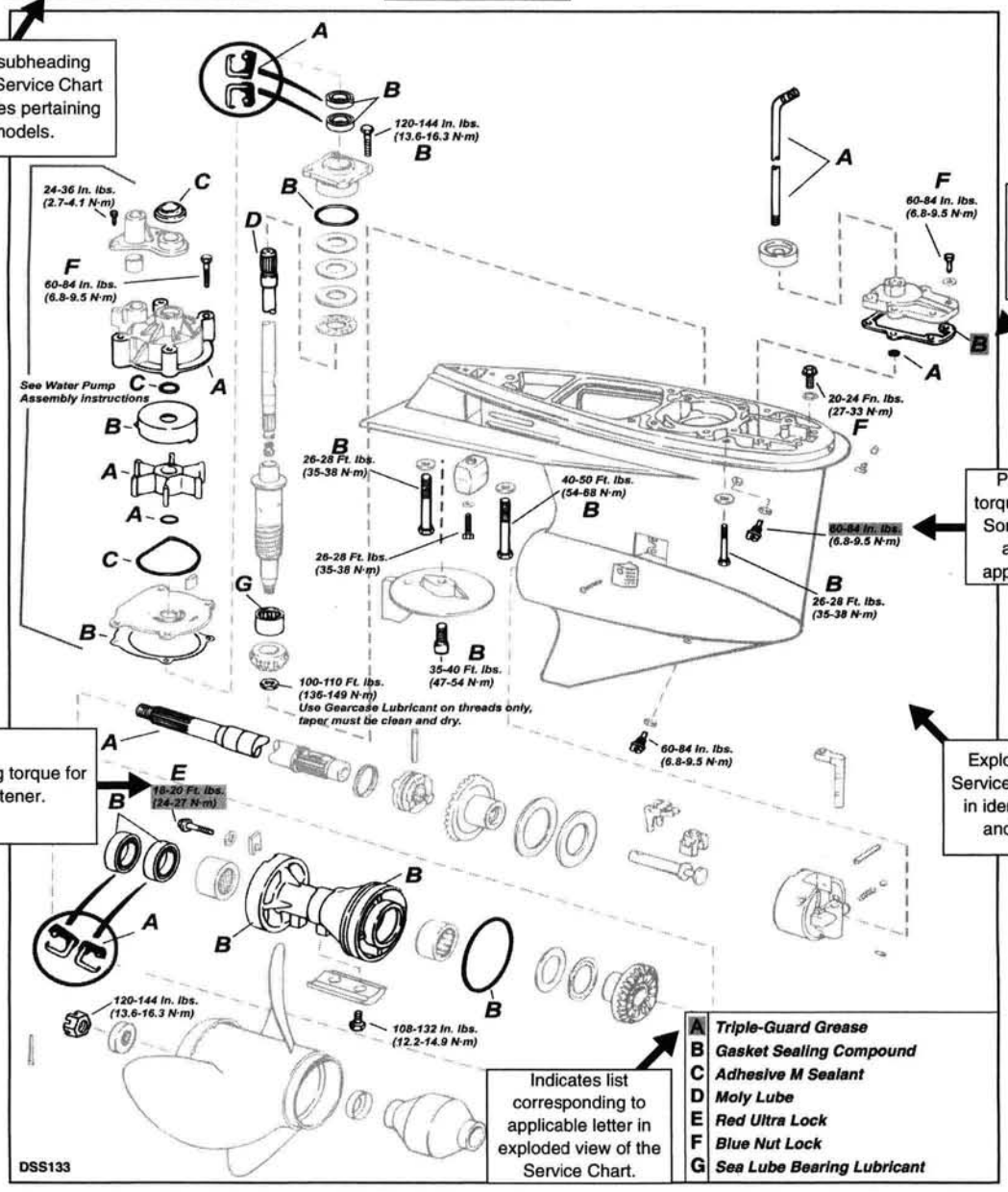
GEARCASE
SERVICE CHART

SERVICE CHART

60° V4 20 IN. MODELS

Subsection title indicates beginning of the subsection.

Italic subheading above Service Chart indicates pertaining models.



Bold letter indicates liquid product to be applied to a surface

Pay attention to torque specifications. Some units appear as in. lbs. Use appropriate torque.

Tightening torque for a fastener.

Exploded view of Service Chart assists in identifying parts and positions

A	***Triple-Guard Grease***
B	***Gasket Sealing Compound***
C	***Adhesive M Sealant***
D	***Moly Lube***
E	***Red Ultra Lock***
F	***Blue Nut Lock***
G	***Sea Lube Bearing Lubricant***

Indicates list corresponding to applicable letter in exploded view of the Service Chart.

328 Page Number

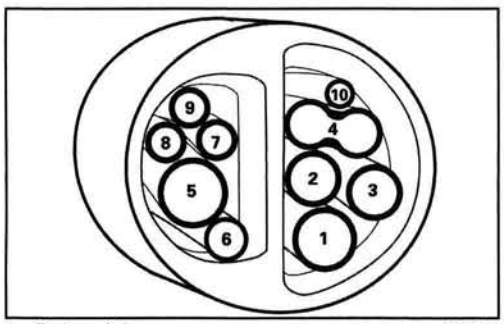
TYPICAL PAGE – B

Section Title → **INSTALLATION AND PREDELIVERY**
Subsection Title → OUTBOARD RIGGING PROCEDURE

Cable, Hose, and Wire Routing

Route all hoses, control cables, and wiring through a protective sleeve or conduit into the boat and through the grommet.

Refer to the following diagram to ensure proper positioning of rigging components in grommet.



1. *Fuel supply hose*
2. *Oil return hose*
3. *Oil supply hose*
4. *Battery cables*
5. *Main wire harness (MWS)*
6. *Throttle cable*
7. *Shift cable*
8. *Oil tank sending unit harness*
9. *Water pressure hose*
10. *Accessory charge wire*

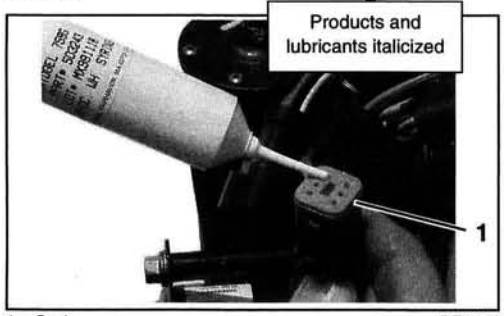
000084

Model specific illustrations designated with image captions

Connect outboard main wire harness to boat main wire harness.

Before installing electrical connectors, check that the seal is in place. Clean off any dirt from connectors. Apply a light coat of *Electrical Grease™* to the seal. Push connectors together until latched.

Products and lubricants italicized

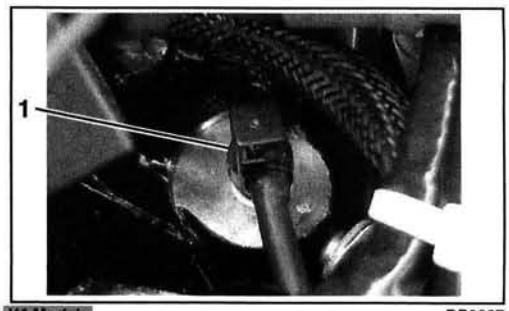


1. *Seal*

DP0824

If a water pressure gauge is to be used, install the water pressure hose fitting in the cylinder block. Use *Pipe Sealant with Teflon* (P/N 910048) on the threads of the hose fitting. Refer to installation instructions supplied with gauge.

Route the water pressure hose through cover grommet with oil tank sending unit harness. Route hose along battery cables toward the back of the powerhead. Use tie straps to fasten in place.



V4 Models

1. *Water pressure fitting location: top, starboard side of cylinder/crankcase assembly, below throttle position sensor.*

DP0827

V6 Models

1. *Water pressure fitting location: rear of cylinder/crankcase assembly*

DP0828

If temperature gauge is to be used, route sending unit wire through grommet with hose for water pressure gauge. Follow the path of battery cables. Provide adequate length to reach cylinder head. Refer to installation instructions supplied with gauge.

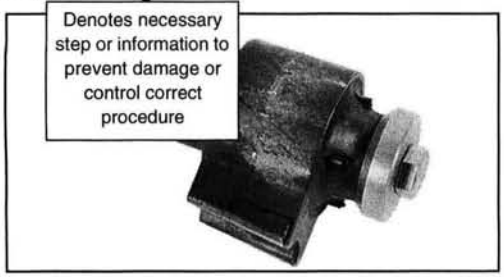
2

TYPICAL PAGE – C

POWERHEAD
INSTALLATION

IMPORTANT: The motor mount, washer, and screw are serviced as an assembly. Do not disassemble.

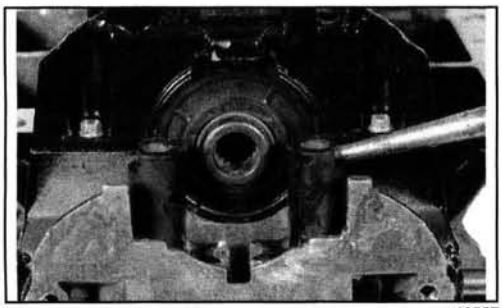
Denotes necessary step or information to prevent damage or control correct procedure



39820

Installation

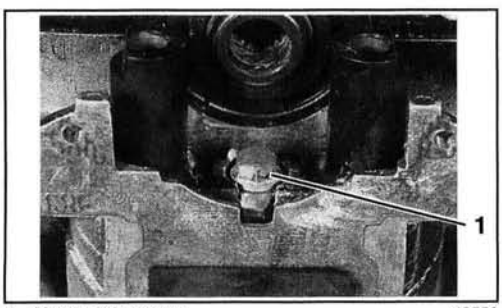
Place mount assemblies in position, with flats facing away from each other.



49557

Apply *Extreme Pressure Grease* to all sides of retainer and install between mounts.

Apply *Nut Lock* to retainer screw, install the screw, and torque to 15 to 20 ft. lbs. (20 to 27 N·m).



1. Mount retainer screw 49556

INSTALLATION

Title in italics indicates a procedure concerning a particular model

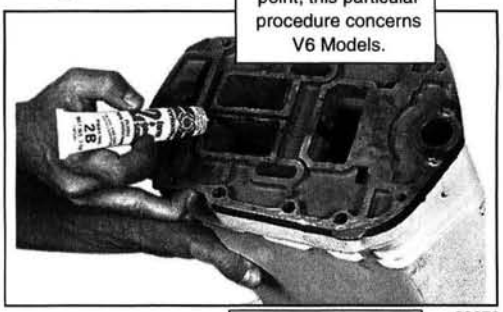
V4 MODELS

Install base gasket d ***rmatex No. 2* or *Gasket Seali***

V6 MODELS

Title indicates the procedure specific to V4 Models is finished. From this point, this particular procedure concerns V6 Models.

Apply *Permatex No.* inner exhaust housing flange a new base gasket with *Gask* *d.*

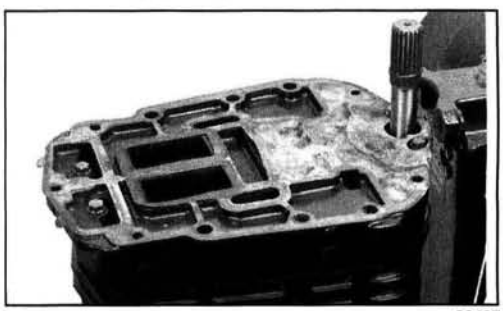


23079

Title indicates from this point, All Models are concerned

ALL MODELS

Install a **new** base ga ensure proper sealing, matin be clean and free of oil, grease, and foreign matter.



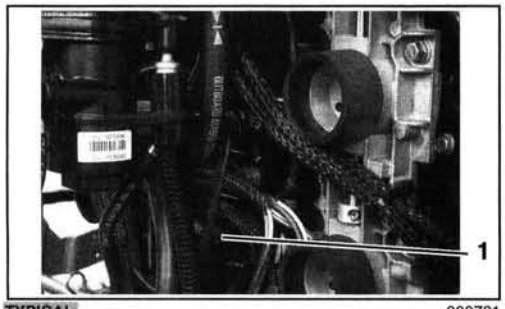
23497

Coat the driveshaft splines with *Moly Lube*. Do not apply lubricant to end of driveshaft.

TYPICAL PAGE – D

Two pulse hoses connect the pump to pulse fittings on the front of the cylinder/crankcase.

- **V4 Models** – cylinders 1 and 3
- **V6 Models** – cylinders 1 and 4



TYPICAL 000721
1. Lower pulse hose

Typical illustration for lower pulse hose of V4 or V6 Models

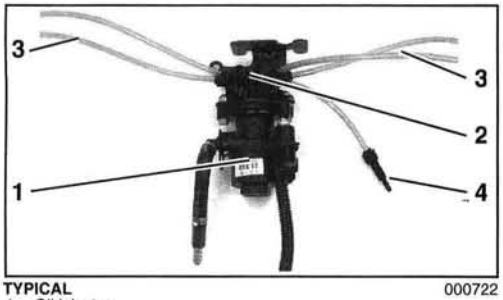
tor-Manifold

ctor-manifold distributes the oil sup- e oil lift pump. A pressure-sensing switch monitors oil injection pressure.

Oil Injector-Manifold Components

- 40 V oil injector
- Oil distribution manifold
- Oil pressure switch
- Pressure regulator (oil return hose)
- Oil distribution hoses
- Oil to fuel check valve

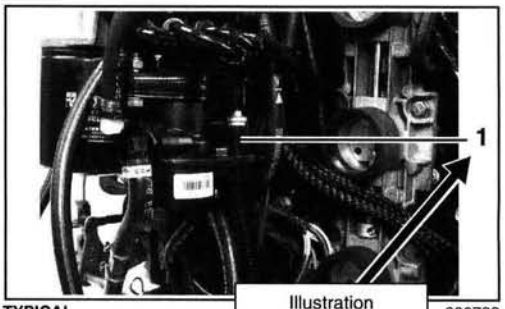
Cross references direct readers to related topics



TYPICAL 000722
1. *Oil injector*
2. *Oil distribution manifold*
3. *Oil distribution hoses*
4. *Oil to fuel check valve*

Oil Pressure Switch

The oil pressure switch is located in the oil injector-manifold and reacts to changes in oil manifold pressure. The *EMM* supplies and monitors electrical current to the switch.



TYPICAL 000723
1. Oil pressure switch

Illustration components numbered to correspond to image

The switch opens or clo llowing oil manifold pressures:

53 psi (365 kPa) (nominal) to close
43 psi (296 kPa) (nominal) to reopen

Refer to **Oil Pressure Switch Test** on p. 224.

Service Code 38

A faulty electrical circuit or an inoperative pressure switch activates service code 38 (no oil sensor feedback or lack of oil pressure) and the *EMM*:

Activates the *System Check* "NO OIL" light
Stores a service code
Initiates *S.L.O.W.*

Service Code 39

If no oil pressure is detected during startup, the *EMM* initiates an oil injector "recovery mode" to pressurize the system. If inadequate oil pressure is still detected after the recovery mode is completed, the *EMM*:

Activates the *System Check* "NO OIL" light
Stores a service code
Initiates *S.L.O.W.*

8

Section tabs allow for quicker reference when thumbing through manual

ABBREVIATIONS USED IN THIS MANUAL

Units of Measurement

A	Amperes
amp-hr	Ampere hour
fl. oz.	fluid ounce
ft. lbs.	foot pounds
HP	horsepower
in.	inch
in. Hg	inches of mercury
in. lbs.	inch pounds
kPa	kilopascals
ml	milliliter
mm	millimeter
N·m	Newton meter
P/N	part number
psi	pounds per square inch
RPM	revolutions per minute
°C	degrees Celsius
°F	degrees Fahrenheit
ms	milliseconds
µs	microseconds
Ω	Ohms
V	Volts
VAC	Volts Alternating Current
VDC	Volts Direct Current

List of Abbreviations

ABYC	American Boat & Yacht Council
ATDC	after top dead center
ATS	air temperature sensor
BPS	barometric pressure sensor
BTDC	before top dead center
CCA	cold cranking amps
CPS	crankshaft position sensor
DI	direct injection
ECU	electronic control unit
EMM	engine management module
ICOMIA	International Council of Marine Industry Associations
MCA	marine cranking amps
MWS	modular wiring system
NTC	negative temperature coefficient
OMS	oil metering system
PDP	power distribution panel
PTC	positive temperature coefficient
ROM	read only memory
SAC	start assist circuit
SAE	Society of Automotive Engineers
SYNC	synchronization
TDC	top dead center
TPS	throttle position sensor
WOT	wide open throttle
WTS	water temperature sensor

ENGINE EMISSIONS INFORMATION

Maintenance, replacement, or repair of the emission control devices and systems may be performed by any marine SI (spark ignition) engine repair establishment or individual.

Manufacturer's Responsibility

Beginning with 1999 model year outboards, manufacturers of marine outboards must determine the exhaust emission levels for each outboard horsepower family and certify these outboards with the United States of America Environmental Protection Agency (EPA). An emissions control information label, showing emission levels and outboard specifications, must be placed on each outboard at the time of manufacture.

Dealer's Responsibility

When performing service on all 1999 and more recent *Evinrude/Johnson* outboards that carry an emissions control information label, adjustments must be kept within published factory specifications.

Replacement or repair of any emission related component must be executed in a manner that maintains emission levels within the prescribed certification standards.

Dealers are not to modify the outboard in any manner that would alter the horsepower or allow emission levels to exceed their predetermined factory specifications.

Exceptions include manufacturer's prescribed changes, such as altitude adjustments, for example.

Owner's Responsibility

The owner/operator is required to have outboard maintenance performed to maintain emission levels within prescribed certification standards.

The owner/operator is not to, and should not allow anyone to, modify the outboard in any manner that would alter the horsepower or allow emissions levels to exceed their predetermined factory specifications.

Tampering with the fuel system to change horsepower or modify emission levels beyond factory settings or specifications will void the product warranty.

EPA Emission Regulations

All new 1999 and more recent *Evinrude/Johnson* outboards manufactured by Bombardier are certified to the EPA as conforming to the requirements of the regulations for the control of air pollution from new watercraft marine spark ignition outboards. This certification is contingent on certain adjustments being set to factory standards. For this reason, the factory procedure for servicing the product must be strictly followed and, whenever practical, returned to the original intent of the design. The responsibilities listed above are general and in no way a complete listing of the rules and regulations pertaining to the EPA requirements on exhaust emissions for marine products. For more detailed information on this subject, you may contact the following locations:

VIA U.S. POSTAL SERVICE:
Office of Mobile Sources
Engine Programs and Compliance Division
Engine Compliance Programs Group (6403J)
401 M St. NW
Washington, DC 20460

VIA EXPRESS or COURIER MAIL:
Office of Mobile Sources
Engine Programs and Compliance Division
Engine Compliance Programs Group (6403J)
501 3 rd St. NW
Washington, DC 20001

EPA INTERNET WEB SITE:
www.epa.gov

PRODUCT REFERENCE AND ILLUSTRATIONS

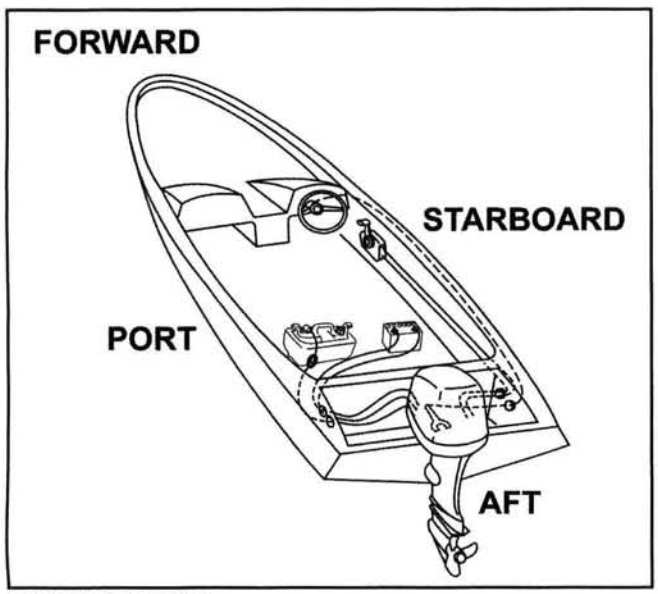
Bombardier Motor Corporation of America reserves the right to make changes at any time, without notice, in specifications and models and also to discontinue models. The right is also reserved to change any specifications or parts, at any time, without incurring any obligation to equip same on models manufactured prior to date of such change. Specifications used are based on the latest product information available at the time of publication.

The continuing accuracy of this manual cannot be guaranteed.

All photographs and illustrations used in this manual may not depict actual models or equipment, but are intended as representative views for reference only.

Certain features or systems discussed in this manual might not be found on all models in all marketing areas.

All service technicians must be familiar with nautical orientation. This manual often identifies parts and procedures using these terms.



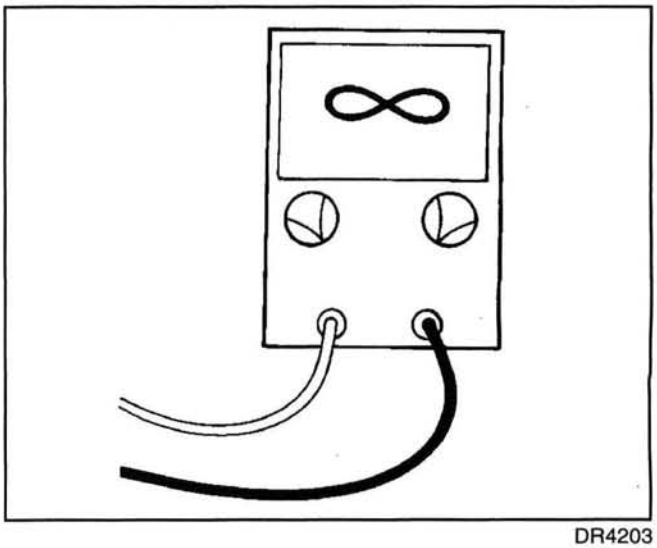
Nautical Orientation

SYMBOLS

Throughout this service manual, symbols are used to interpret electrical troubleshooting results or to assign values in drawings.

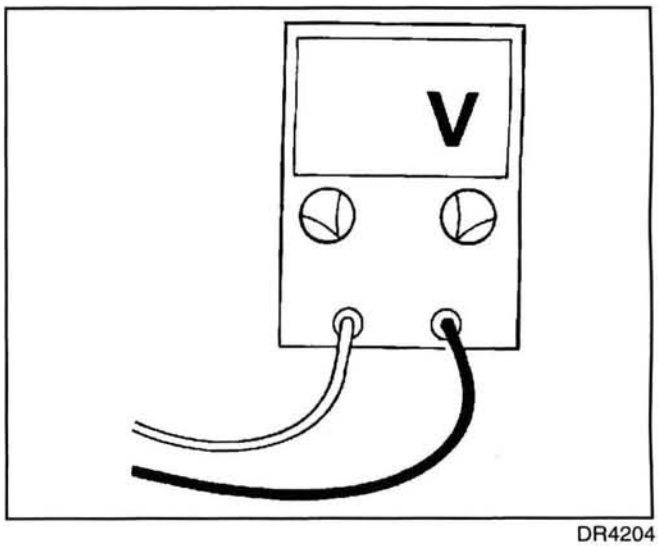
Electrical

When "∞" shows on the meter face, no continuity, or very high resistance, is indicated. The symbol is referred to as infinity.



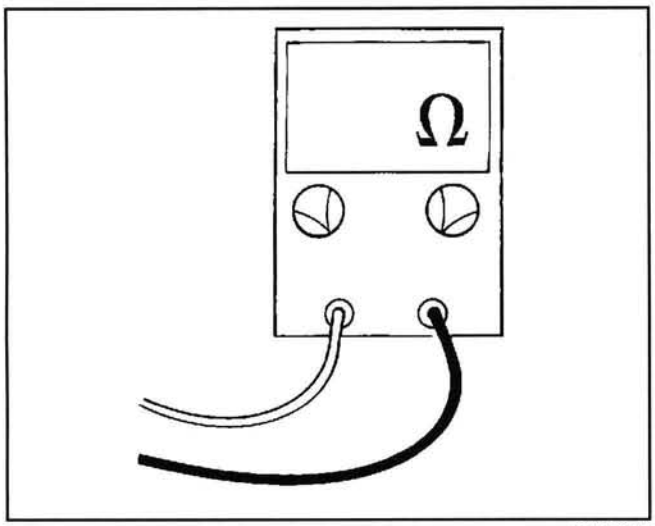
DR4203

When "V" follows a value on the meter face, the procedure is measuring voltage.



DR4204

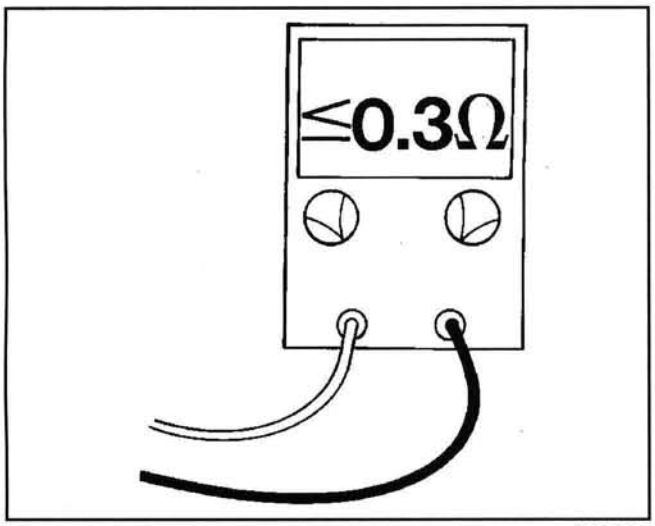
When "Ω" follows a value on the meter face, the procedure is measuring resistance. Ω is the symbol for ohm, the unit of measurement for resistance.



DR4205

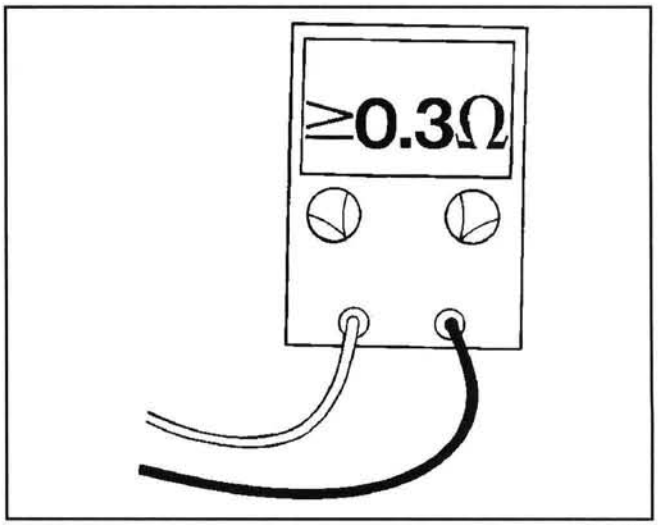
Values

When "≤" precedes a value on the meter face, it indicates your reading must be less than, or equal to, the value shown.



DR4206

When "≥" precedes a value on the meter face, it indicates your reading must be greater than, or equal to, the value shown.



DR4207

NOTES

Technician's Notes

Related Documents

Bulletins	
Instruction Sheets	
Other	

SPECIAL TOOLS AND SERVICE SPECIFICATIONS

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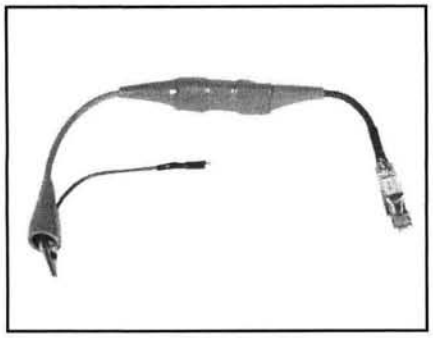
1

SPECIAL TOOLS

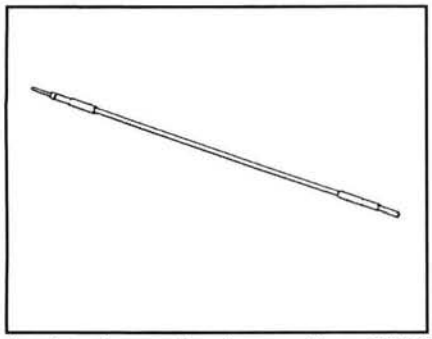
Electrical / Ignition



Adapter, power pack load resistor 49797
P/N 507983

1. *Amphenol insert tool* 000798
   P/N 322697
2. *Amphenol pin removal tool*
   P/N 322698
3. *Amphenol socket removal tool*
   P/N 322699

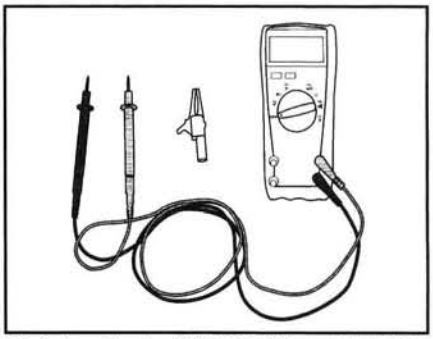
Coil locating ring P/N 334944 32211



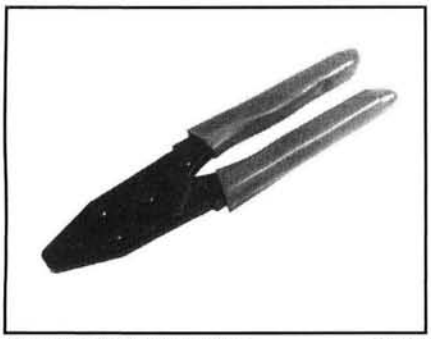
Amphenol connectors, jumper wire 73158

1. *No. 16 wire, 8 in. (200 mm)*
2. *Pin, P/N 511469*
3. *Socket, P/N 581656*
4. *Shrink tube, 510628*

Analog multimeter P/N 501873 49793

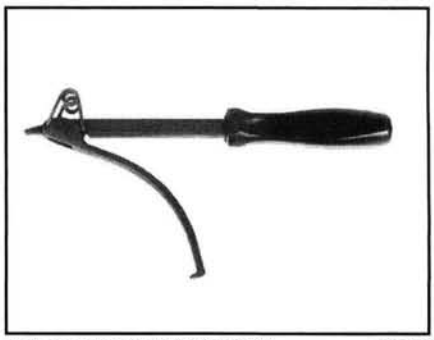


Digital multimeter P/N 500003 DRC7265

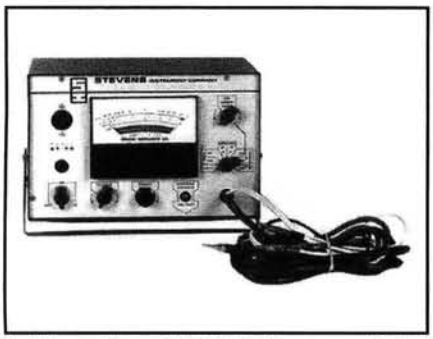


Amphenol crimping pliers 30387
P/N 322696

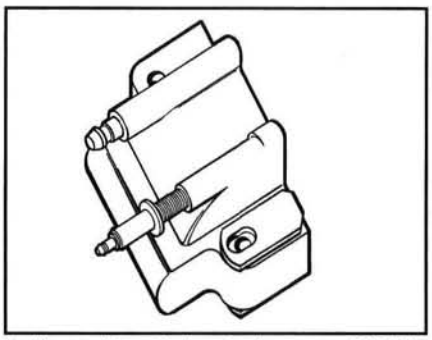
CD Peak reading voltmeter 49799
P/N 507972



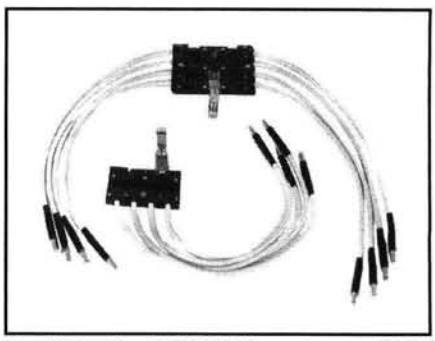
Flywheel holder P/N 771311 42938



Ignition analyzer P/N 501890 49791



Ignition coil terminal extender P/N 502054 CO3010

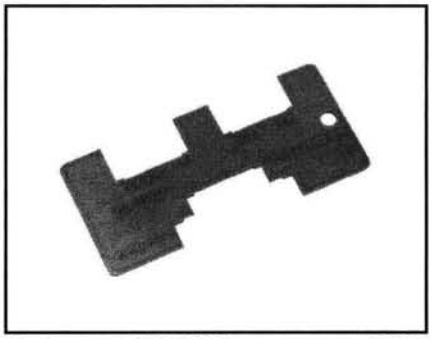


Spark checker P/N 508118 49798

Tachometer/timing light P/N 507980 49789

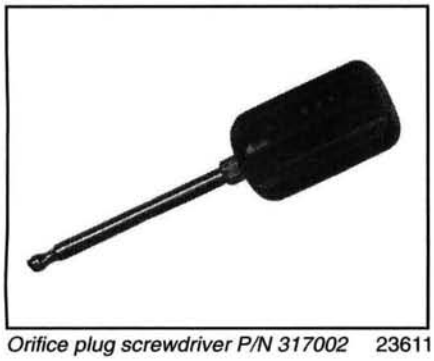
Fuel

Ball hex screwdriver P/N 327622 23664

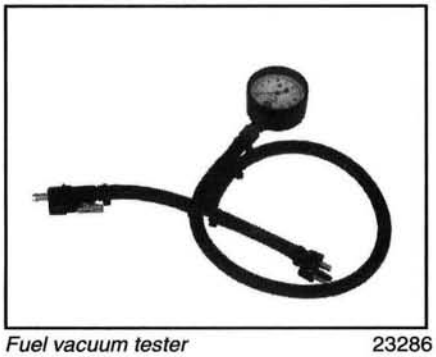


Float gauge P/N 324891 23678

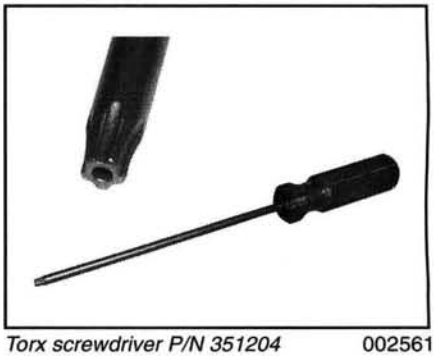
Nipple cleaning tool P/N 326623 23655



Orifice plug screwdriver P/N 317002 23611

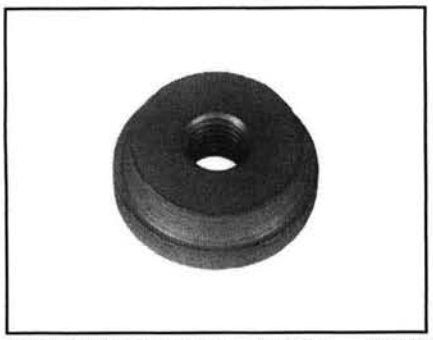


Fuel vacuum tester P/N 390954 23286



Torx screwdriver P/N 351204 002561

Gearcase



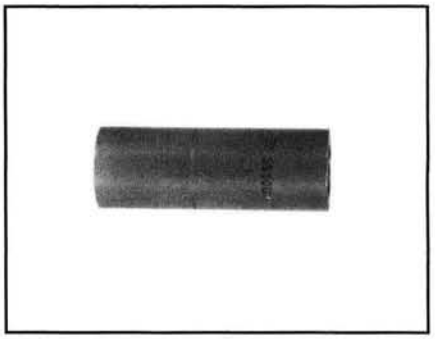
Forward gear bearing cup installer 23218
P/N 319929 (9.9-15 HP)

Driveshaft bearing installer, upper 32639
P/N 319931 (9.9-15 HP)

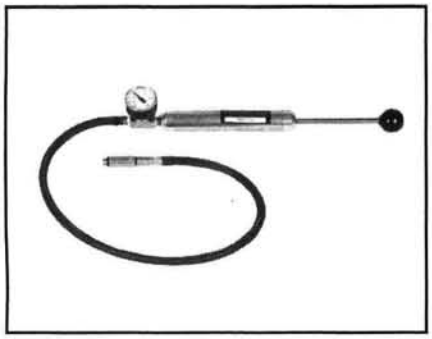
Pinion bearing spacer P/N 339753 32638
(9.9-15 HP)

Gearcase filler P/N 501882 49790

Driveshaft bearing installer 21887A
P/N 322923 (25-30 HP)

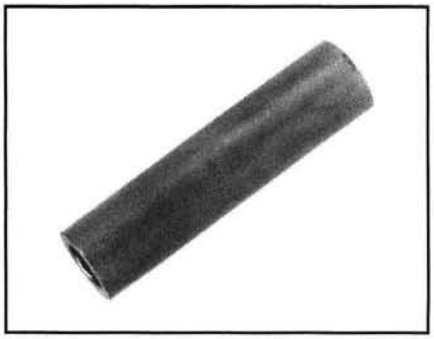


Pinion bearing spacer (lower) 32794
P/N 330067 (25-30 HP)

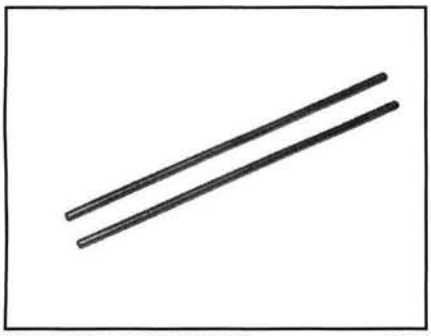


TYPICAL 49794
Gearcase pressure tester
P/N 507977 (Stevens P/N S-34)
Gearcase vacuum tester
P/N 507982 (Stevens P/N V-34)

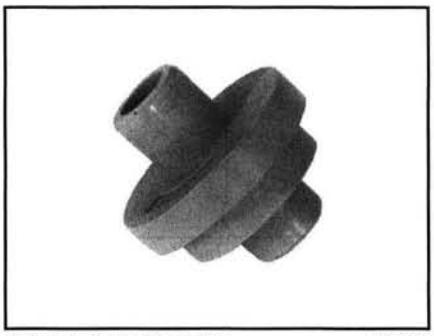
Driveshaft seal installer 32883
P/N 326554 (9.9-15 HP)



Pinion bearing spacer (upper) 32793
P/N 330068 (25-30 HP)



Guide pin set P/N 383175 2050



Driveshaft seal installer 23380
P/N 326552 (25-30 HP)

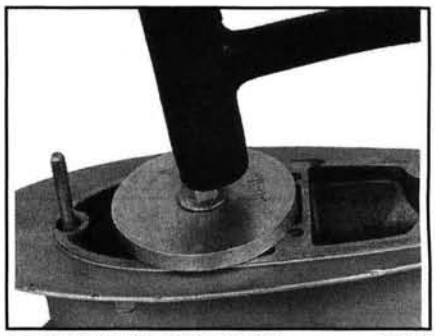
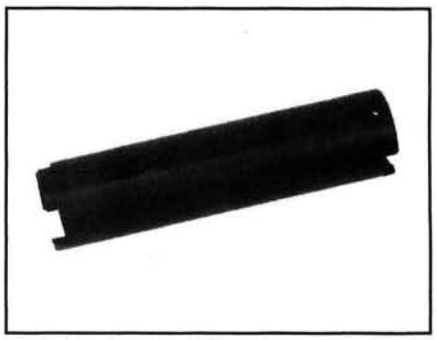


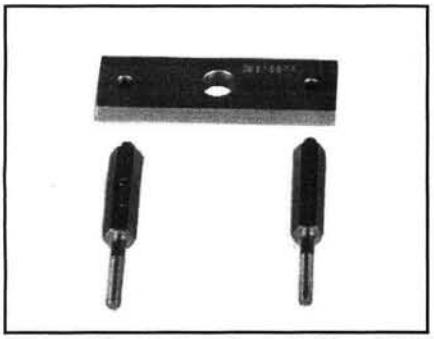
Plate P/N 318122 (25-30 HP) 21813

Prop shaft front bearing installer P/N 321428 (25-30 HP) 32999

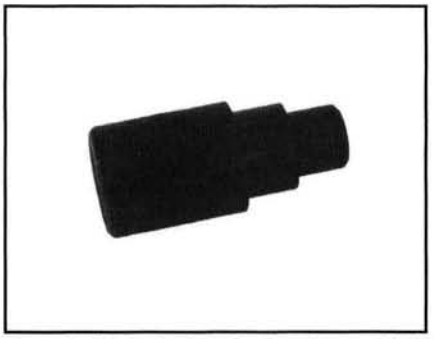
Prop shaft bearing housing bearing installer P/N 339751 (9.9-15 HP) 32881



Shift detent sleeve P/N 328081 (25-30 HP) 23544



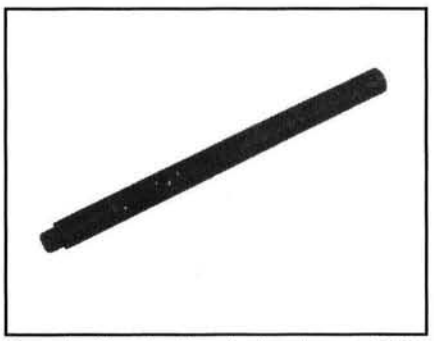
Prop shaft bearing housing puller kit P/N 386631 (9.9-15 HP) 32627



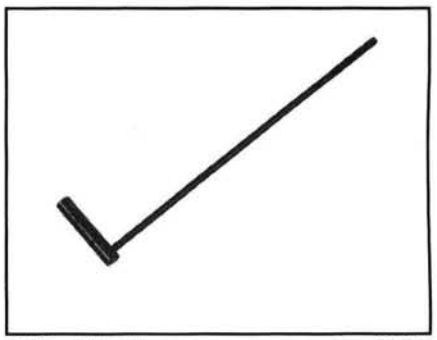
Prop shaft bearing housing bearing installer P/N 335820 (25-30 HP) 22420

Shift rod bushing installer P/N 304515 (25-30 HP) 23563

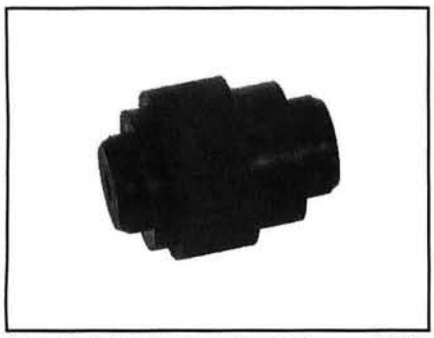
Prop shaft bearing housing seal installer P/N 342663 (9.9-15 HP) 40993 22429



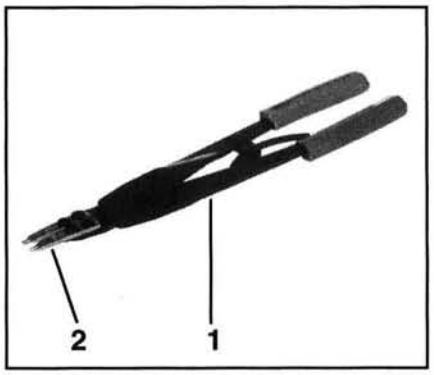
Prop shaft bearing housing bearing remover P/N 319880 (9.9-15 HP) 23699



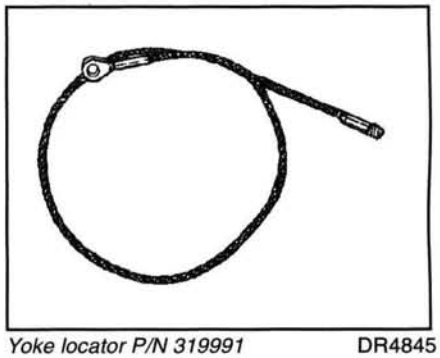
Shift rod bushing remover P/N 327693 23542



Prop shaft bearing housing seal installer P/N 335821 (25-30 HP) 22429

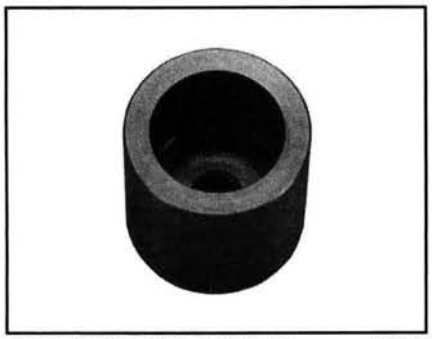


1. *Retaining ring pliers P/N 331045* 2036
2. *Replacement tip set P/N 395967*



Yoke locator P/N 319991 DR4845

Powerhead



Crankshaft bearing and sleeve installer P/N 339749 (25-30 HP) 32887

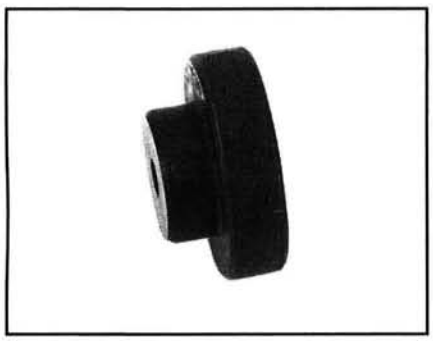
Crankshaft upper seal installer P/N 321539 (25-30 HP) 16718

Rod screw torque socket P/N 331638 000797

Crankshaft lower seal installer P/N 433391(9.9-15 HP) 23660

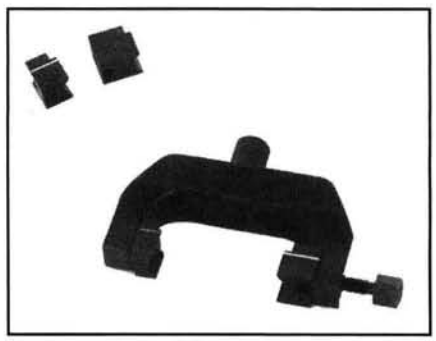
Crankshaft upper seal remover P/N 387780 (25-30 HP) 23624

Ring compressor CO3768
9.9-15 HP standard: P/N 339754
25-30 HP standard: P/N 326591
9.9-15 HP oversize: P/N 339755
25-30 HP oversize: P/N 330223

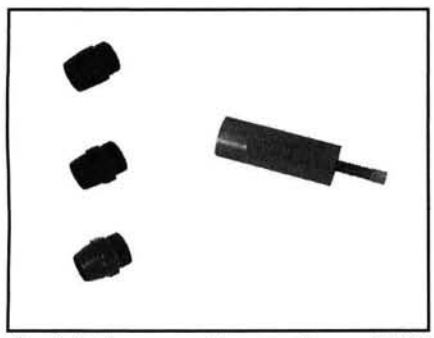


Crankshaft lower seal installer P/N 333520 (25-30 HP) 22428

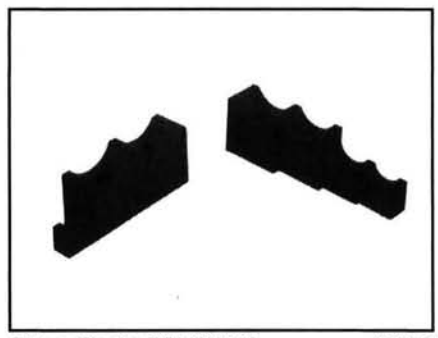
Cylinder bore gauge P/N 771310 45303



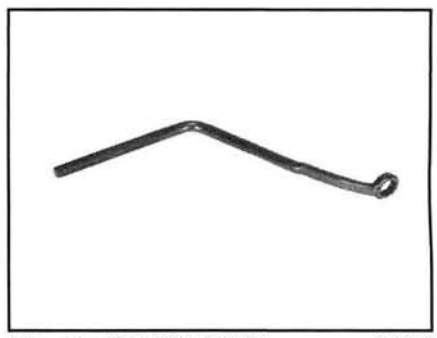
Rod cap alignment fixture P/N 396749 (25 HP and larger) 21596



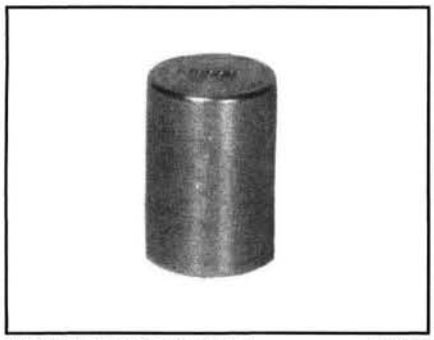
Crankshaft upper seal remover/ installer kit P/N 391060 (9.9-15 HP) 23102



Piston Cradle P/N 326573 23106

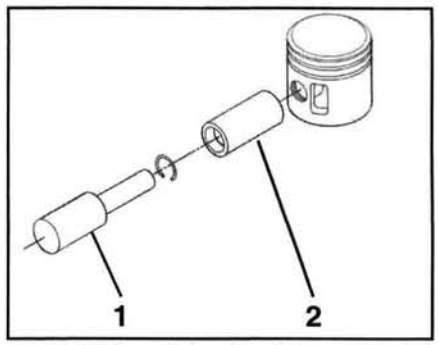


Wrench, offset P/N 322700 (25-30 HP) 32961



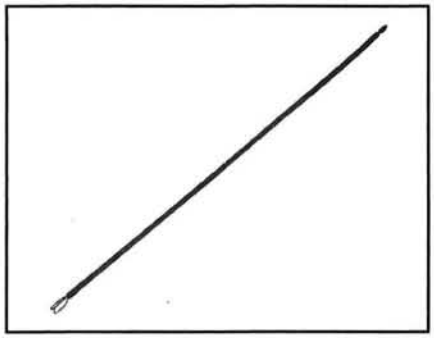
Wrist pin bearing installer 41029
P/N 336660

Wrist pin pressing pin 23668
9.9-15 HP: P/N 392511
25-30 HP: P/N 326356



1. *Wrist pin retaining ring driver* DR1641
   9.9-15 HP: P/N 392511
   (driver and cone)
   25-30 HP: P/N 318599
2. *Wrist pin cone*
   25-30 HP: P/N 318600

Starter



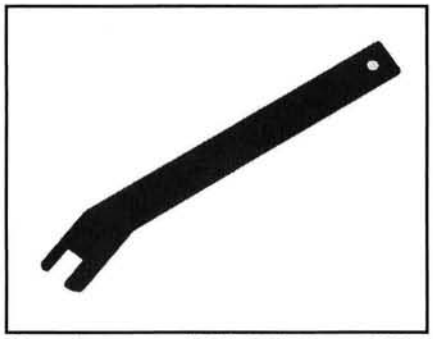
Starter rope threading tool 23682
P/N 378774

Starter spring winder/installer CO3583
P/N 392093

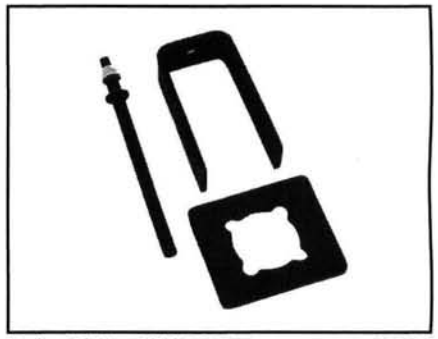
Starter spring winder/installer 50068
P/N 342682

Universal

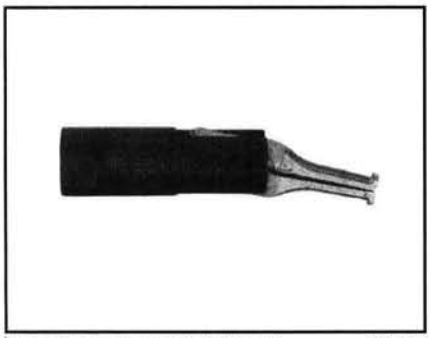
Drive handle P/N 311880 31932



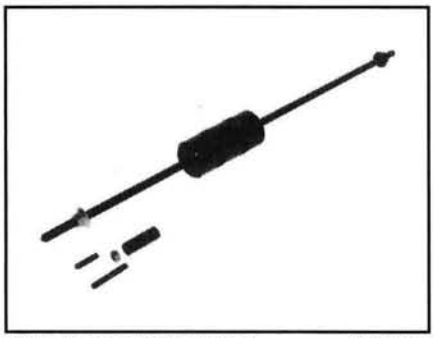
Hose clamp wrench P/N 325043 23674



Puller Bridge P/N 432127 23146

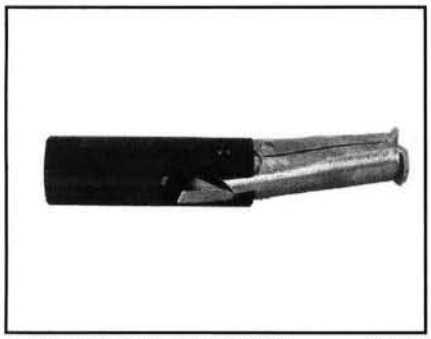


Small puller jaws P/N 432131 23150
(replacement jaws P/N 437952)

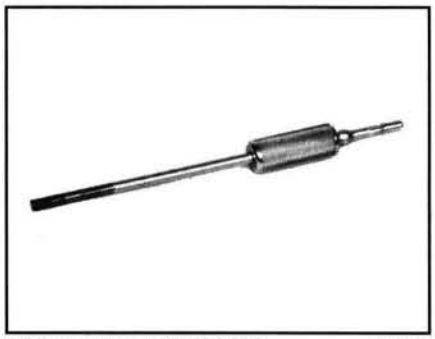


Slide hammer P/N 391008 CO1577

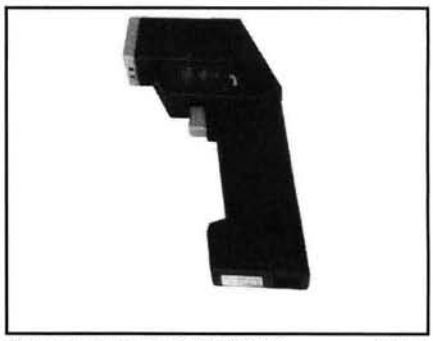
Lifting ring P/N 321537 23701
(use with P/N 378103 puller set)



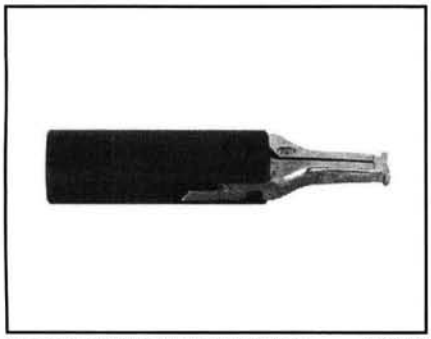
Large puller jaws P/N 432129 23148
(replacement jaws P/N 437954)



Slide hammer P/N 432128 15345



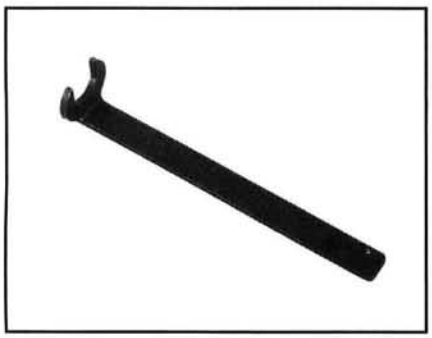
Temperature gun P/N 772018 45240



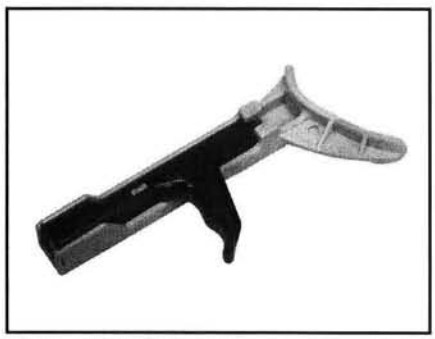
Bearing puller jaws P/N 432130 23149
(replacement jaws P/N 437953)

Syringe P/N 346936 50243

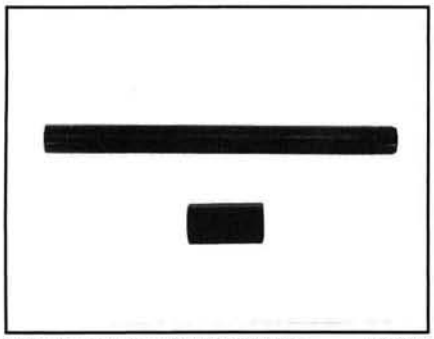
Tilt tube nut wrench P/N 342680 46879



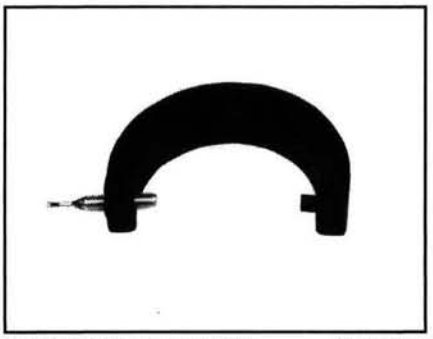
Puller wrench P/N 334359 23147
(use with puller jaws)



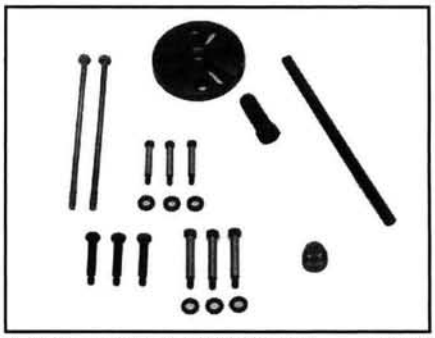
Tie strap installation tool 18105
P/N 323716



Tilt tube service kit P/N 434523 33249



Twist-Grip™ remover P/N 390767 COA6017



Universal Puller Set P/N 378103 32885

Torque wrench extension P/N 912031 23656

Universal pinion bearing remover and installer kit P/N 391257 33974

SHOP AIDS

2 + 4™ Fuel conditioner P/N 775613

Black Neoprene Dip P/N 909570

Engine Tuner P/N 775625

"6 in 1" Multi-Purpose Lubricant P/N 775782

Cleaning Solvent P/N 771087

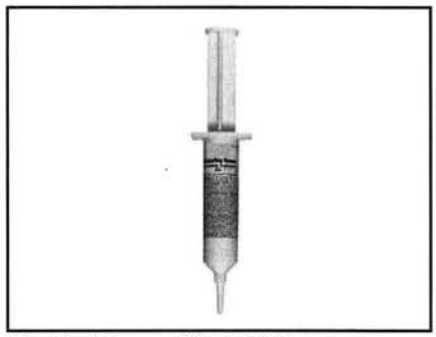
Fuel System Cleaner P/N 775632

Adhesive Type M P/N 776964

D.P.L. Spray P/N 776896

Gel-Seal and Gasket Remover P/N 771050

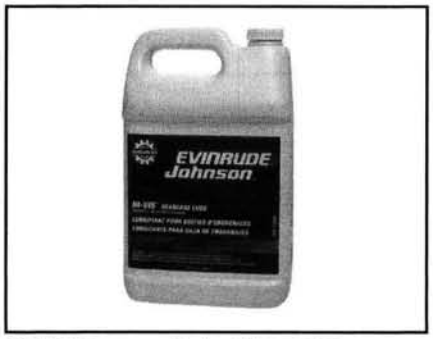
Anti-Corrosion Spray P/N 775624



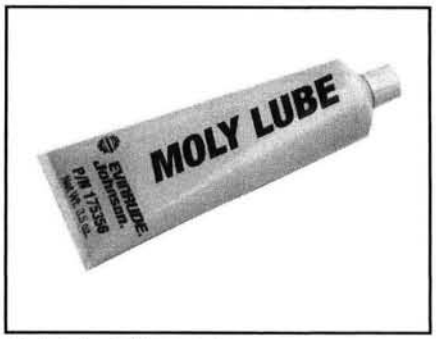
Electrical Grease P/N 503243

Gasket Sealing Compound P/N 317201

GE† RTV Silicone Sealant P/N 263753



HI-VIS Gearcase Lube P/N 772085



Moly Lube P/N 175356

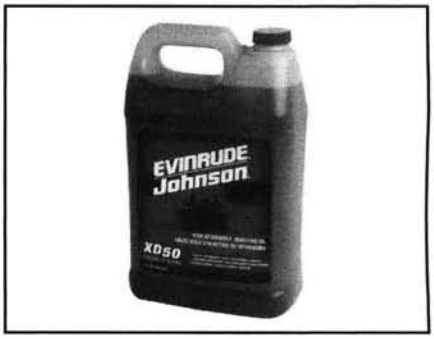
Gear Mark Compound P/N 772666

Locquic Primer P/N 772032

Oil - XD100 P/N 777118

Gel·Seal II P/N 327361

Lubriplate† 777 P/N 317619



Oil - XD50 P/N 777225

GM† Sealer Type B P/N 3853169

Marine EP Wheel Bearing Grease P/N 508303

Oil - XD30 P/N 777219

Permatex† No. 2 P/N 910032

Sea-Lube† Needle Bearing Grease P/N 378642

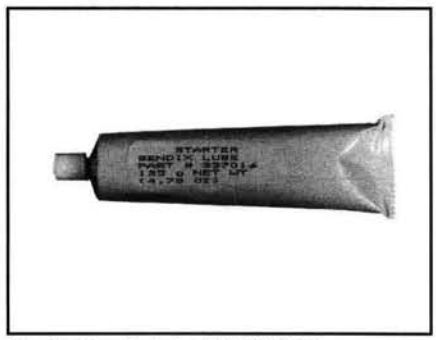
Storage Fogging Oil P/N 775626

Pipe Sealant with Teflon P/N 910048

Silicone spray P/N 775630

Triple-Guard™ Grease P/N 508298

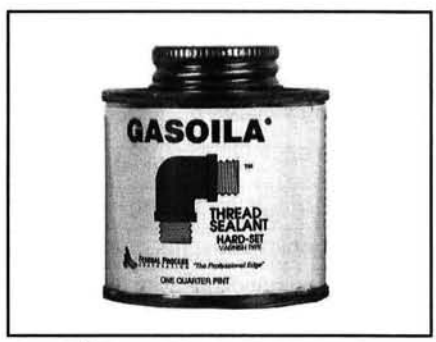
Power Trim/Tilt and Power Steering Fluid P/N 775612



Starter Bendix Lube P/N 337016

Ultra-HPF Gear Lube P/N 775601

1. *Screw Lock P/N 500417 (Loctite† Purple 222 equivalent*
2. *Nut Lock P/N 500421 (Loctite Blue 242 Equivalent)*
3. *Ultra Lock P/N 500423 (Loctite Red 271 Equivalent)*



Gasoila† Thread Sealant P/N 200763

TECHNICAL DATA

	HP	9.9, 15	25, 30
ENGINE	Full Throttle Operating Range RPM	**9.9 HP:** 5000-6000 **15 HP:** 5500-6500	**25 HP:** 4500-5500 **30 HP:** 5200-5800
	Power	9.9 HP (7.5 kw) @ 5500 RPM 15 HP (11.2 kw) @ 6000 RPM	25 HP (18.7 kw) @ 5000 30 HP (22.4 kw) @ 5500
	Idle RPM in Gear	700 ± 50	675 ± 25
	Weight	**R Models:** 74 lbs. (34 kg) **RL Models:** 77 lbs. (35 kg)	**R, TE Models:** 117 lbs. (53 kg) **RL, EL Models:** 122 lbs. (55 kg) **TEL Models:** 124 lbs. (56 kg)
	Lubrication	*Evinrude/Johnson* XD30 formula outboard oil Refer to **Engine Lubricant** on p. 51.	
	Engine Type	In-line 2 cylinder	In-line 2 cylinder
	Displacement	15.6 cu. in. (255 cm^3)	32 cu. in. (521 cm^3)
	Bore	2.375 in. (60.33 mm)	3.000 in. (76.20 mm)
	Stroke	1.760 in. (44.70 mm)	2.250 in. (57.15 mm)
	Standard Bore	2.3745 to 2.3750 in. (60.31 to 60.33 mm)	2.9995 to 3.0005 in. (76.19 to 76.21 mm)
		To bore oversize, add piston oversize dimension to standard bore	
	Top Crankshaft Journal	0.8757 to 0.8762 in. (22.24 to 22.26 mm)	1.2510 to 1.2515 in. (31.78 to 31.79 mm)
	Center Crankshaft Journals	0.8120 to 0.8125 in. (20.63 to 20.64 mm)	1.1833 to 1.1838 in. (30.06 to 30.07 mm)
	Bottom Crankshaft Journal	0.7870 to 0.7874 in. (19.98 to 19.99 mm)	0.9842 to 0.9846 in. (25.00 to 25.01 mm)
	Rod Crankpin	0.8120 to 0.8125 in. (20.63 to 20.64 mm)	1.1823 to 1.1828 in. (30.03 to 30.04 mm)
	Piston Ring End Gap, Both	0.005 to 0.015 in. (0.13 to 0.38 mm)	0.007 to 0.017 in. (0.18 to 0.43 mm)
	Lower Piston Ring Groove Side Clearance	0.004 in (0.10 mm) maximum	
	Test Propeller	340177	434505
	Minimum Test RPM	**9.9 HP:** 4900 **15 HP:** 5700	**25 HP:** 4800 **30 HP:** 5400
FUEL	Fuel/Oil Ratio	50:1	
	Carburetion	One single-throat carburetor, float feed	
	Calibration	Adjustable low speed; Fixed high speed	Adjustable low speed; Fixed intermediate and high speed
	Low-Speed Setting	Refer to **FUEL SYSTEM** section.	
	Starting Enrichment	Manual choke	**R, RL, TE, TEL Models:** Manual primer **EL Models:** Electric primer solenoid
	Carburetor Float Level Setting	Float gauge, P/N 324891	
	Carburetor Float Drop Setting	1 to 1 3/8 in. (25 to 35 mm)	1 1/8 to 1 5/8 in. (28 to 41 mm)
	Preferred Fuel	Regular unleaded, plus grade unleaded, premium unleaded gasolines	
	Acceptable Fuel	Any of the above gasolines with 10% Ethanol or 5% Methanol with 5% co-solvents	
	Minimum Octane	87 AKI (R+M)/2 or 90 RON	
	Additives	*2+4 Fuel Conditioner, Fuel System Cleaner, Carbon Guard* Use only Bombardier recommended fuel additives. The use of other additives may result in engine damage.	
		See **FUEL REQUIREMENTS** on p. 48 for additional information.	

	HP	9.9, 15	25, 30
ELECTRICAL	Battery, Minimum Requirements	12-Volt, 360 CCA (465 MCA) with 90 Minutes Reserve Capacity or 50 Ampere-Hour	12-Volt, 500 CCA (620 MCA) with 90 Minutes Reserve Capacity or 50 Ampere-Hour
	Alternator	5 A, Non-regulated (accessory)	4 A, Non-regulated (Standard 25/30TE, EL)
	Tachometer Setting	5 Pulse / 10 pole (with alternator)	5 Pulse / 10 Pole (with alternator)
	A/C lighting	Accessory	Standard on Rope start models
	Engine Fuse (20 Amp)	P/N 514021	
	Warning Signal	–	Water Temperature (180°F)
COOLING	Type	Auto Pressure-Temperature Controlled	
	Thermostat	143°F (62°C)	
IGNITION	Type	Magneto Powered Capacitor Discharge	
	RPM Limit	None	6100
	Spark Plugs	QL82C @ 0.030 in. (0.8 mm)	QL77JC4 @ 0.030 in. (0.8 mm)
	Ignition Coil	P/N 583740	P/N 582508
GEARCASE	Gear Ratio	12:29 (.414)	13:28 (.46)
	Lubricant	*Ultra-HPF* Gearcase Lubricant	
	Capacity	9 fl. oz. (260 ml)	11 fl. oz. (330 ml)

STANDARD TORQUE SPECIFICATIONS

Standard Torque Chart

Size	In. Lbs.	Ft. Lbs.	N·m
No. 6	7–10	0.58–0.83	0.8–1.1
No. 8	15–22	1.25–1.83	1.7–2.5
No. 10	24–36	2–3	2.7–4.0
No. 12	36–48	3–4	4.0–5.4
1/4 in.	60–84	5–7	6.7-9.4
5/16 in.	120–144	10–12	13.5–16.2
3/8 in.	216–240	18–20	24.4–27.1
7/16 in.	336–384	28–32	37.9–43.4

IMPORTANT: These values apply only when a specific torque for a specific fastener is not listed in the appropriate section. When tightening two or more screws on the same part, DO NOT tighten screws completely, one at a time.

⚠ WARNING ⚠

Torque wrench tightening specifications must be strictly adhered to. Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to turning must be felt when reusing a locking fastener.

If replacement is specified or required because the locking fastener has become weak, use only authorized *Evinrude/ Johnson Genuine Parts.*

INSTALLATION AND PREDELIVERY

TABLE OF CONTENTS

SAFETY INFORMATION

Before working on any part of the outboard, read the SAFETY section at the end of this manual.

DANGER

Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off. Remove propeller before servicing and when running the outboard on a flushing device.

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

WARNING

Wear safety glasses to avoid personal injury, and set compressed air to less than 25 psi (172 kPa).

The motor cover and flywheel cover are machinery guards. Use caution when conducting tests on running outboards. DO NOT wear jewelry or loose clothing. Keep hair, hands, and clothing away from rotating parts.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

To prevent accidental starting while servicing, disconnect the battery cables at the battery. Twist and remove all spark plug leads.

The electrical system presents a serious shock hazard. DO NOT handle primary or secondary ignition components while outboard is running or flywheel is turning.

Gasoline is extremely flammable and highly explosive under certain conditions. Use caution when working on any part of the fuel system.

Protect against hazardous fuel spray. Before starting any fuel system service, carefully relieve fuel system pressure.

Do not smoke, or allow open flames or sparks, or use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

Keep all electrical connections clean, tight, and insulated to prevent shorting or arcing and causing an explosion.

Always work in a well ventilated area.

Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to tightening must be felt when reusing a locking fastener. If replacement is indicated, use only authorized replacement or equivalent.

PREINSTALLATION CONSIDERATIONS

Maximum Capacity

WARNING

Do not overpower the boat by installing an outboard that exceeds the horsepower indicated on the boat's capacity plate. Overpowering could result in loss of control.

The following steps should be taken before installing the outboard.

- Refer to the boat manufacturer's certification label rating.
- Refer to ABYC Standards to determine the maximum horsepower capacity for boats without certification labeling.

1029A

Mounting Surface

Transom Surface Inspection

Inspect transom surface prior to drilling mounting holes in a boat's transom.

- The width of the top edge of the transom should provide adequate clearance.
- The transom must be flat and cannot have any protrusions.
- The transom should meet ABYC Standards.
- The boat's transom angle should be approximately 14 degrees.
- Identify issues related to transom strength, transom height, splash-well clearance, and cable or hose routing.
- Identify specific steering system requirements. Refer to the specifications for all steering systems and the manufacturer's steering system installation instructions.

WARNING

DO NOT install an outboard on a curved or irregular surface. Doing so can wear, bind, and damage components, causing loss of control.

Mounting Hardware

WARNING

Use all mounting hardware supplied with the outboard to help ensure a secure installation. Substituting inferior hardware can result in loss of control.

Use only *Evinrude/Johnson Genuine Parts* or parts of equivalent type, strength, and material.

TRANSOM MEASURING AND DRILLING

Inspect Transom Area

Transom Clearances

Make sure the transom and splash well area provide adequate outboard clearances. Confirm that the proposed mounting hole locations will provide adequate clearance for mounting bolts and washers. Check the inside area of the transom for obstructions prior to drilling mounting holes.

Water Flow

Inspect the hull area directly in front of the hull's centerline. Boat-mounted equipment should not create turbulence in the water flow directly in front of the outboard's gearcase. Turbulence or disruptions in the water flow directly in front of the gearcase will affect engine cooling and propeller performance.

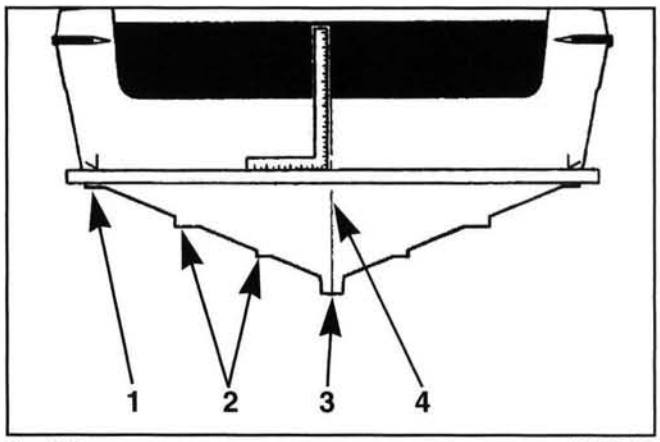
Measure Transom

Hull Centerline

Locate the centerline of the boat transom as it relates to the hull (bottom) of the boat.

Use a straightedge to draw a line connecting the port and starboard chines. The chines should be used as reference points for determining the centerline of the hull.

Use a framing square to accurately place a line on the transom. The centerline of the hull should be in line with the keel of the hull and perpendicular to the midpoint of the line connecting the port and starboard chines.

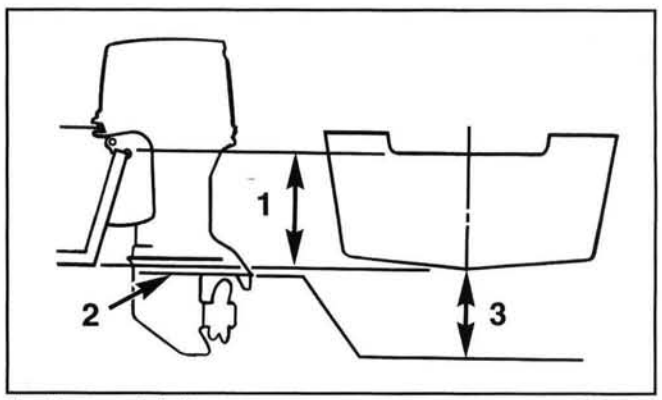


1. *Chine*
2. *Strake*
3. *Keel*
4. *Hull centerline*

DR5568

Transom Height and Shaft Length

The transom height dimension listed in **TECHNICAL DATA** on p. 30 is the height of the boat transom required by the outboard. This dimension is measured at the transom centerline, perpendicular to the bottom of the boat.

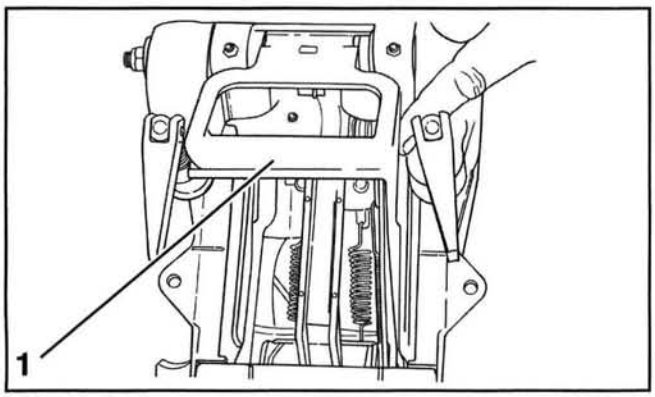


1. *Transom height*
2. *Anti-ventilation plate*
3. *Final position - 0 to 2 in. (0 to 51 mm)*

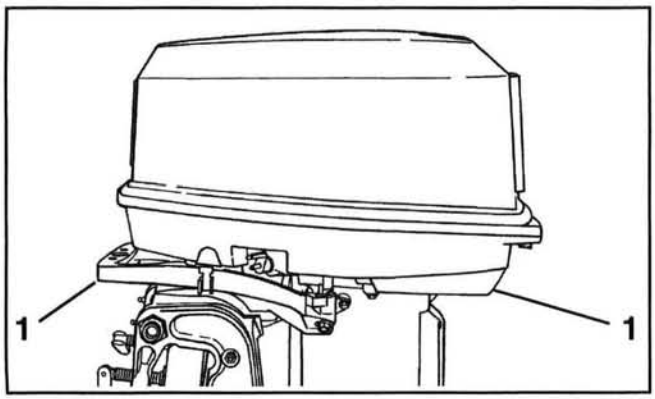
DR3486

Use this procedure to determine whether or not the boat's transom height is correct for the outboard's shaft length:

Lift the outboard using the lift grips (NOT the tilt grip or steering handle) and place it in the center of the boat's transom.



9.9/15 Model DR31712
1. Lift grip



TYPICAL DR16886
1. Lift grips

If equipped, tighten clamp screws by hand, NOT with tools, and adjust the outboard angle so the antiventilation plate is parallel with the boat bottom. Refer to the Operator's Guide.

The resulting position of the antiventilation plate must be no higher than the boat's bottom and no lower than 2 in. (5.1 cm) below it.

If the resulting position of the antiventilation plate is above or below the 0 to 2 in. (0 to 5.1 cm) range, the engine shaft length must be changed **or** the boat's transom must be modified.

If you install and operate the outboard:

- Lower than recommended — Serious powerhead damage could result from water entry into the lower engine cover or overloading from an under-revving propeller at wide open throttle.
- Higher than recommended — Serious powerhead damage could result from inadequate cooling or an over-revving propeller. Propeller ventilation (slippage) often occurs, resulting in poor boat performance.

IMPORTANT: On a specialty hull, non-planing hull, or on a boat with a curved transom, these guidelines might not apply. Contact the boat manufacturer for additional installation information.

Transom Drilling

Center the outboard on the boat's transom (or mounting bracket) and tighten the clamp screws by hand.

Use the stern brackets as a template for location and size of holes to drill in the transom.

The stern bracket assembly has mounting holes on each side of the outboard. Drill one hole for each side. Drill holes perpendicular to transom surface. Use the upper holes unless your situation requires using the lower holes (25/30 models).

STEERING SYSTEM

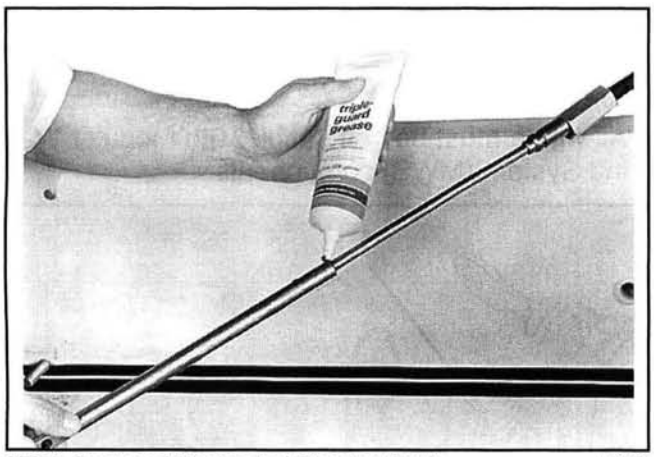
Before Mounting Outboard to Transom

Certain rigging components that attach directly to the outboard should be assembled before the outboard is mounted to the boat's transom. Steering system components and gearcase speedometer pickup hoses are the most common components. Determine what equipment will be installed prior to mounting the outboard to the transom or bracket.

Mechanical Steering

All *Evinrude/Johnson* outboards equipped with tilt tubes are designed to be compatible with mechanical steering systems that meet ABYC Standard P-17. Single-cable mechanical steering systems can be used on single or dual-outboard installations if an ABYC-approved steering link is used.

Extend the output end of the steering cable and lubricate the inner core prior to installation.



ABYC-Approved Mechanical Steering Cable 5873

OUTBOARD MOUNTING

⚠ WARNING ⚠

The outboard must be correctly installed. Failure to correctly install the outboard could result in serious injury, death, or property damage.

IMPORTANT: Follow all directions carefully. The outboard's warranty will not cover product damage or failure resulting from incorrect outboard installation.

⚠ WARNING ⚠

Even if equipped with clamp screws, the outboard must be bolted to the boat to prevent it from "working off the transom" during operation.

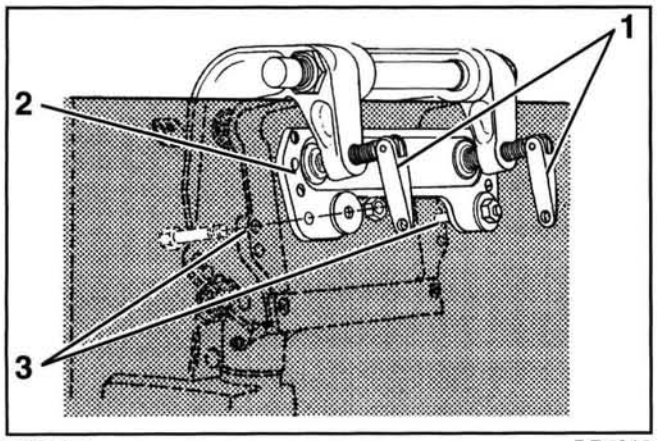
Center the outboard on the boat's transom (or mounting bracket) and tighten the clamp screws by hand. An accessory transom plate is recommended to protect the boat's transom (or mounting bracket).

Fastening the Outboard to the Transom

⚠ WARNING ⚠

If either side of the transom deforms or cracks when the bolts are tightened to their recommended torque, the transom construction may not be adequate or may be deteriorated. Structural failure of the transom could result in loss of boat control and injury to the occupants.

IMPORTANT: Use a marine sealant rated for above or below waterline use. RTV silicone is not approved for below waterline use. Polyurethane sealants are not easily removed and may damage outboard or boat mounting surfaces when removed.



TYPICAL DR5818
1. *Clamp screws*
2. *Transom plate*
3. *Stern bracket holes*

Apply marine sealant generously behind the heads and to the shanks of the mounting bolts before inserting them, and to the surfaces of washers that contact the transom.

Secure the outboard to the boat's transom using the mounting hardware provided.

IMPORTANT: After 30 minutes of operation, retighten clamp screws by hand. DO NOT use tools to tighten clamp screws. Check clamp screws regularly.

⚠ WARNING ⚠

When replacing bolts, screws, or other fasteners, use *Evinrude/Johnson* Genuine Parts or parts of equivalent strength and material.

REMOTE CONTROLS

Remote Control Selection

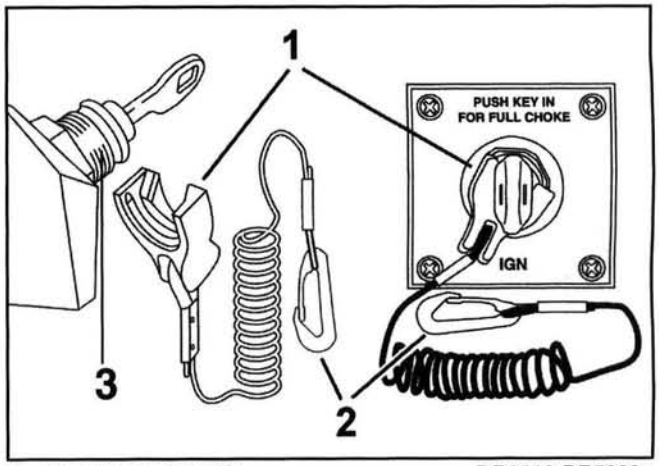
⚠ WARNING ⚠

The remote control used must have the start-in-gear prevention feature. This feature can prevent injuries resulting from unexpected boat movement when the outboard starts.

Remote control styles and applications are described in the *Evinrude/Johnson Genuine Parts and Accessories Catalog.* Plan the installation of all remote controls carefully. Read the outboard's Operator's Guide and the remote control's installation instructions prior to installation.

The remote control used must have the following features:

- Start-in-gear prevention.
- Emergency stop / key switch.
- Shift stroke must conform to outboard's specifications (1.125 to 1.330 in. (28.6 to 33.8 mm) measured between NEUTRAL and FORWARD).
- All wiring must be compatible with Modular Wiring System (MWS) components.



1. *Emergency stop clip* DR6819-DR5992a
2. *Safety lanyard*
3. *Key switch with emergency stop feature*

Additional remote control information:

- Side-mount controls require a neutral lock feature.
- Single-outboard binnacle remote controls are offered with or without an integrated key switch.

⚠ WARNING ⚠

Always install and recommend use of an emergency stop/key switch. Doing so will reduce the risk of personal injury or death should the operator fall away from the controls or out of the boat.

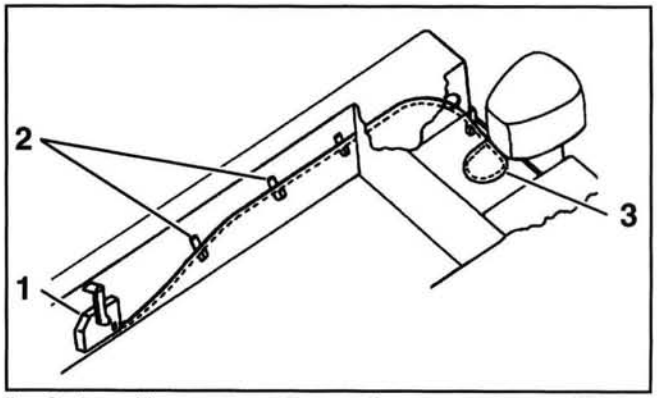
Installing Remote Controls

Install the appropriate remote control following all instructions provided with the remote control.

Make sure the following items are checked:

- Installation of the correct length control cables and wiring harnesses.
- Proper type and quality of cables and wiring harnesses.
- Correct routing of cables and harnesses.
- Adequate length and appropriate slack in front of the outboard for remote control cables.
- Proper routing of cables to prevent kinking.
- Positioning and securing of cables and harnesses along their lengths to prevent movement or damage.

Typical transom-mounted outboard installations require a 12 in. (30 cm) cable loop at the front of the outboard.



1. *Surface side-mount remote control* DR4277
2. *Cable support*
3. *12 in. (30 cm) cable loop at front of outboard*

IMPORTANT: Cables of the proper length, style, and quality that are correctly installed and adjusted will eliminate most control-related operational problems.

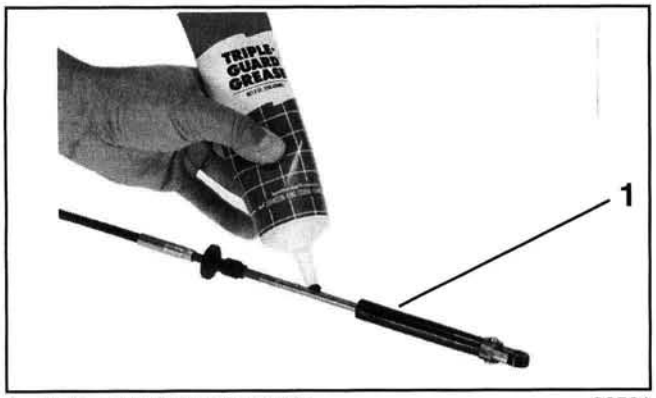
OUTBOARD RIGGING PROCEDURE

WARNING

To prevent accidental starting of engine, confirm the battery cables are disconnected at battery and spark plug leads are disconnected from spark plugs.

Control Cable Installation

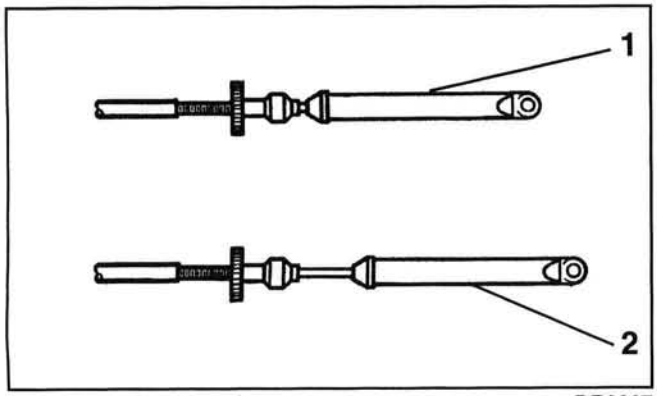
Extend the casing guide of the throttle cable and lubricate cable with *Triple-Guard* grease.



1. Fully extended casing guide 30501

IMPORTANT: Control cable function must be identified before continuing with installation.

Put the control handle into NEUTRAL position. The throttle cable casing guide will retract completely and the shift cable casing guide will go to the midpoint of its travel.



Control Cable Casing Guides DR2067
1. Retracted
2. Extended to midpoint

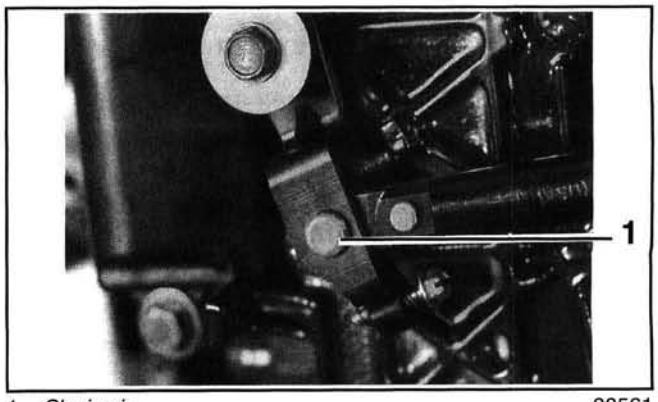
Throttle Cable Installation

Position the remote control handle in NEUTRAL. Be sure the throttle cable is retracted (IDLE).

9.9/15 Models

Remove rubber grommet from front of lower engine cover. Remove cable retainer. Apply a liberal amount of *Triple-Guard* grease to both anchor pockets.

Attach cable casing guide to throttle lever using clevis pin and cotter pin supplied with remote control adapter kit. Secure cable by spreading cotter pin ends.



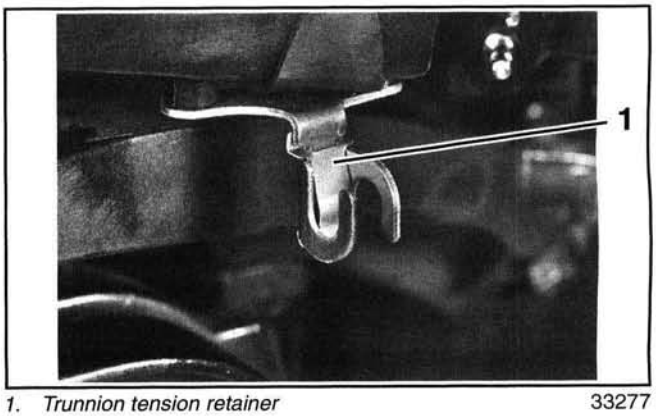
1. Clevis pin 38561

Hold throttle lever tight against idle stop screw. Pull firmly on throttle cable to remove backlash and install trunnion nut in anchor pocket.

Install cable retainer and torque screw to 60 to 84 in. lbs. (7 to 9 N·m).

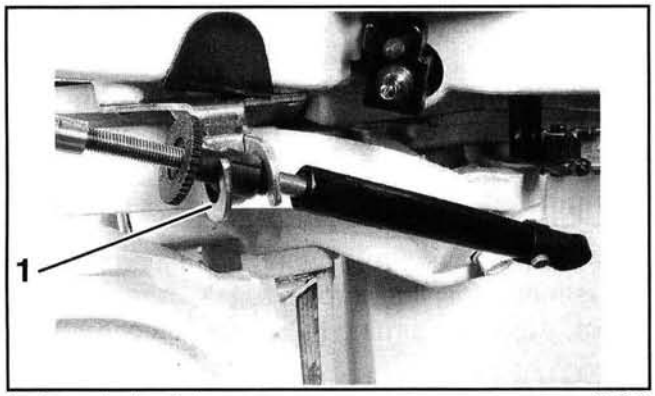
25/30 Models

Install the trunnion tension retainer onto the throttle cable trunnion bracket.



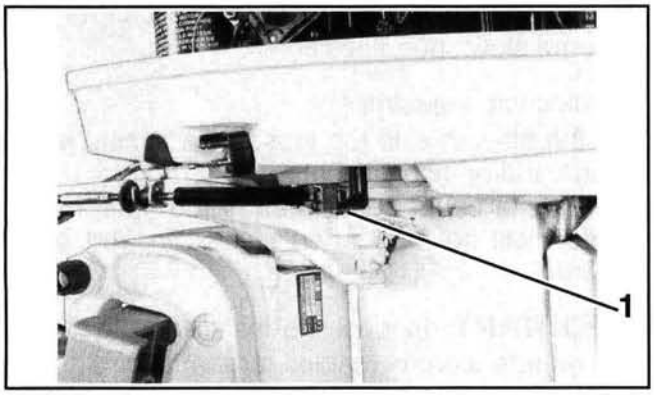
1. Trunnion tension retainer 33277

Place throttle cable into trunnion bracket.



1. Trunnion bracket 32276

Attach spring clip to the throttle lever and pin assembly. Attach casing guide to throttle arm and secure with spring clip.



1. Spring clip 001018

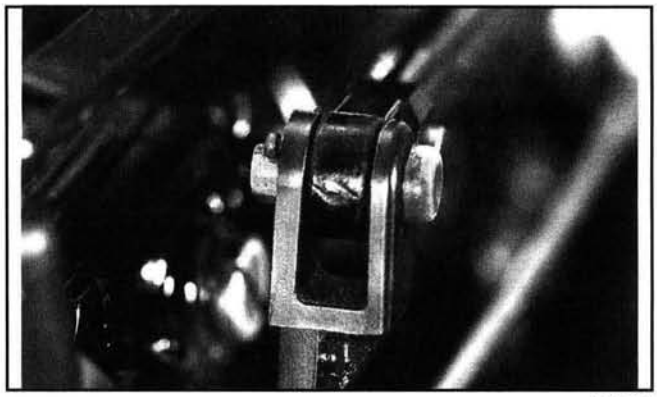
Shift Cable Installation

Position the remote control handle in NEUTRAL. Be sure the throttle cable is retracted to IDLE position and shift cable is at mid-point of travel.

Position shift linkage of outboard in NEUTRAL. Make sure gearcase is in NEUTRAL.

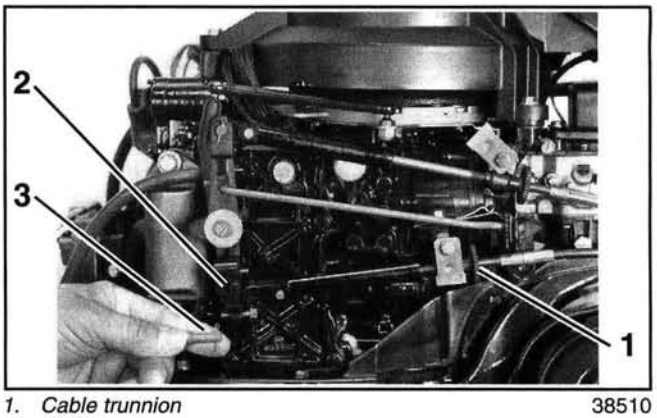
9.9/15 MODELS

Connect shift cable to shift lever using clevis pin and cotter pin supplied with remote control adapter kit.



38562

Adjust and locate cable trunnion in trunnion anchor bracket.



1. Cable trunnion 38510
2. Shift lever
3. Clevis pin

Install trunnion cover and torque the screw to 60 to 84 in. lbs. (7 to 9 N·m).

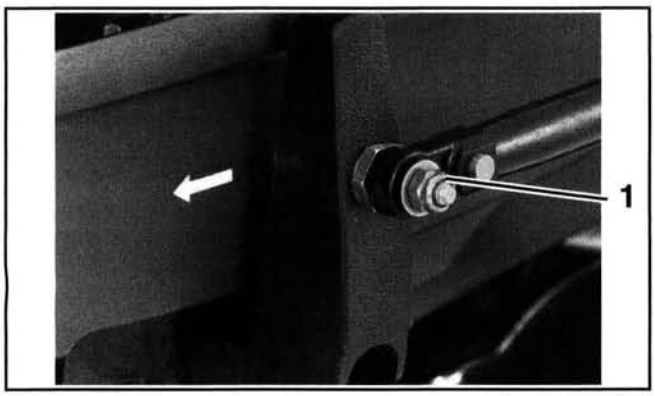
33259

Slip rubber grommet onto control cables and press grommet into groove in lower engine cover.

25/30 MODELS

Place shift cable through anchor bracket.

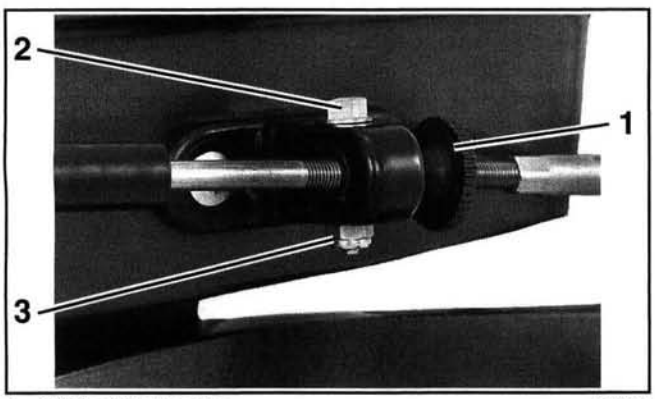
Install shift cable casing guide on shoulder bolt of shift lever. Install flat washer and locking nut supplied with outboard or accessory kit. Do not substitute locknut. Tighten locknut securely.



1. Locknut 22139

Adjust the length of the shift cable by turning the shift cable trunnion until the trunnion fits into the anchor bracket.

Secure shift cable in anchor bracket by installing screw and locknut. Tighten screw securely.



1. Shift cable trunnion 22137
2. Screw
3. Locknut

Control Cable Adjustment

⚠ WARNING ⚠

The trunnions on both remote control cables must be adjusted properly or operator may lose control of direction and engine speed.

The remote control cable trunnion provides adjustment for the throttle cable and the shift cable. Adjust by turning the trunnion nut.

Adjust the shift trunnion. The shift lever and gearcase must be in NEUTRAL when the remote control handle is in NEUTRAL.

Adjust the throttle trunnion. The throttle lever must be at extreme slow speed position and against the IDLE stop screw when the remote control is in extreme slow speed position.

Check cable adjustment:

- If throttle cable is too loose, idle speed will be high and/or inconsistent.
- If throttle cable adjustment is too tight, control effort will be high when shifting in and out of gear.

IMPORTANT: Inspect the installation to ensure the remote control cables are attached to the proper engine levers. Advance the fast idle lever to the START position. If correctly attached, the throttle cable and throttle lever on outboard will move.

Cable, Hose, and Wire Routing

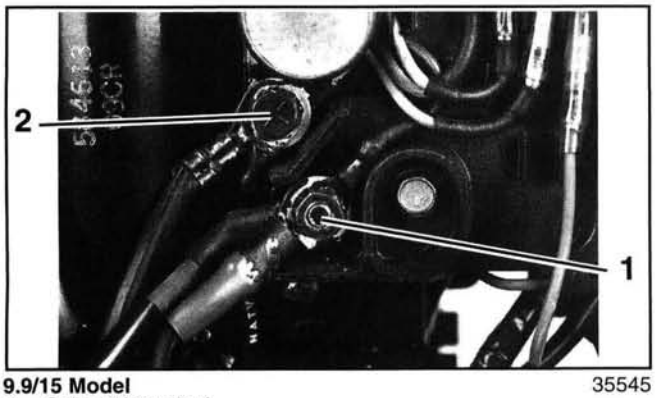
IMPORTANT: Provide sufficient slack at outboard end to permit unrestricted steering and tilting of outboard. Do not allow cables to bind.

Battery Cables

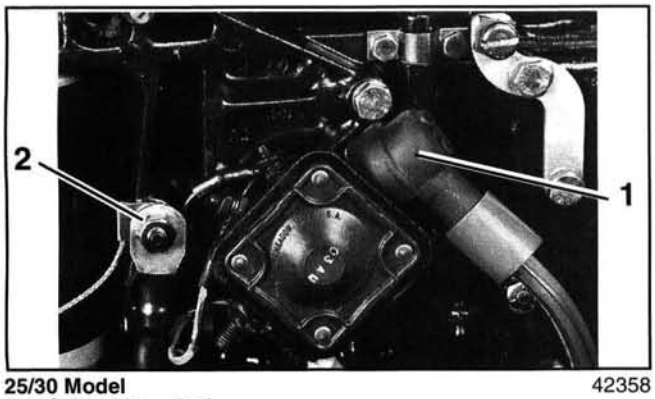
⚠ WARNING ⚠

Disconnect battery cable from battery before servicing electrical systems. Failure to do so could result in injury from ignitions sources (sparks) or from contact with moving parts if accidental cranking or starting occurs.

Route battery positive (+) cable to the starter solenoid. Secure the cable to terminal. Cover terminal with rubber boot (25/30 Model) and position grommet in lower engine cover.



9.9/15 Model 35545
1. *Solenoid terminal*
2. *Ground terminal*



25/30 Model 42358
1. *Solenoid terminal*
2. *Ground terminal*

Secure the battery negative (–) cable to the powerhead ground terminal. Apply *Black Neoprene Dip* to connection.

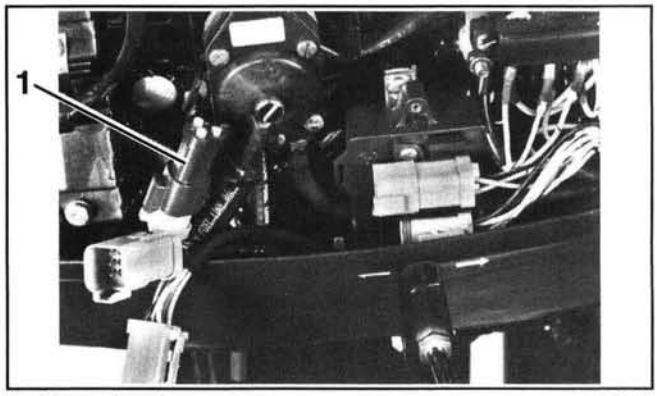
Remote Electrical Harness

9.9/15 Models

Refer to accessory instruction sheet.

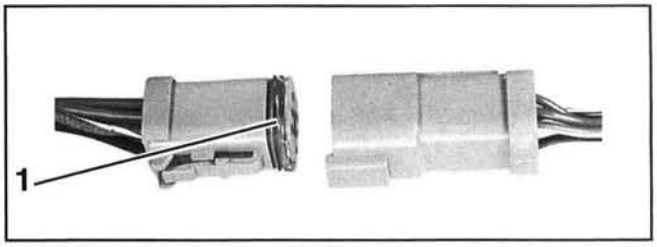
25/30 Models

Route electrical cable along starboard side to rear connector bracket. Install protective plug on power trim/tilt connector.



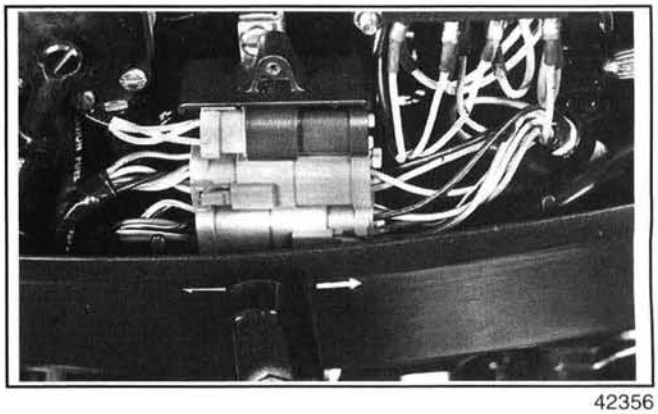
1. *Protective plug* 42355

Before installing connections, check that seal is in place. Clean connectors and apply a light coat of *Electrical Grease* to the seal. Push connector together until latched.



1. *Seal* 42079A

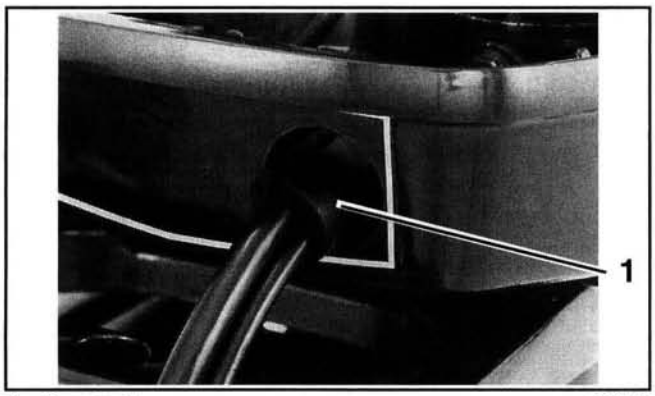
Secure connectors in bracket by latching connector in slot of bracket.



42356

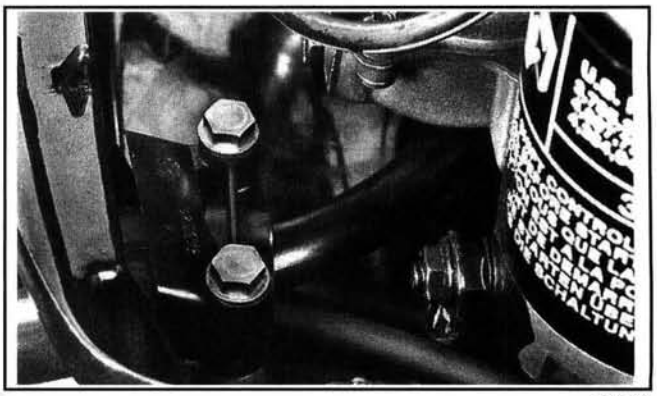
Install electrical bracket cover and secure with screw.

Install battery cables and electrical cable into grommet.



1. Grommet 22142

Install clamp and secure with screws.



42360

BATTERY AND CABLES

Select a battery that meets or exceeds the minimum requirements.

Minimum 12 Volt Battery Requirements

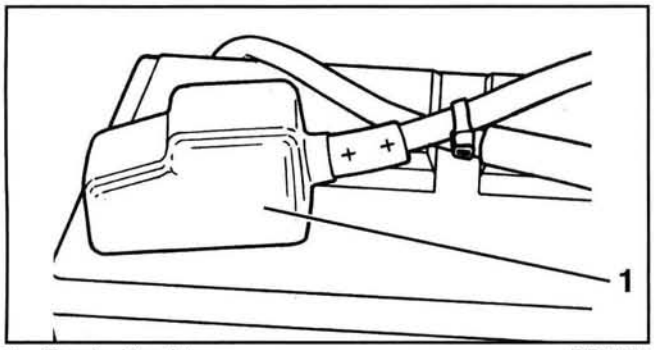
Model	Battery Rating
9.9/15 or 25/30	360 CCA (465 MCA), 50 amp-hr minimum

Installing Battery

Proper installation will prevent battery movement while underway.

Location and Preparation

- Secure all batteries in protected locations.
- Position battery as close to the outboard as possible.
- Battery location must provide access for periodic maintenance.
- Use battery mounting trays or battery boxes on all battery installations.
- Connections and terminals must be insulated.
- Battery connections must be clean and free from corrosion.
- Read and understand the safety information supplied with the battery before installation.



1. Terminal insulator DR5104

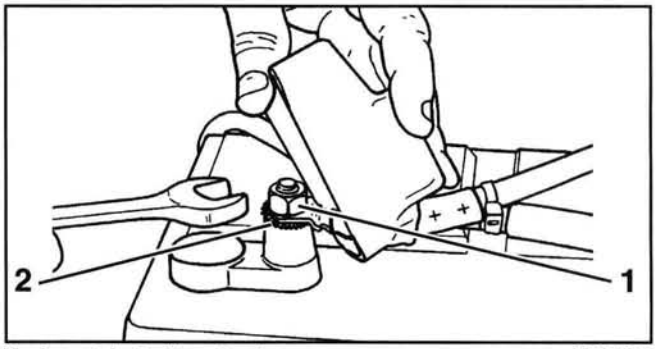
WARNING

Keep the battery connections clean, tight, and insulated to prevent their shorting or arcing and causing an explosion. If the battery mounting system does not cover the connections, install protective covers. Check often to see that connections stay clean and tight.

Installation

IMPORTANT: Connect the battery positive (+) cable to the battery positive (+) post FIRST. Connect the battery negative (–) cable to the battery negative (–) post LAST.

Install a starwasher on the threaded battery post. Stack cables from the outboard, then cables from accessories. Finish this connection with a hex nut.



Marine-style Battery Post DR5103
1. Starwasher
2. Hex nut

IMPORTANT: Do not use wing nuts to fasten ANY battery cables. Wing nuts can loosen and cause electrical system damage not covered under warranty.

Tighten all connections securely. Apply *Triple-Guard* grease to prevent corrosion.

Battery Cable Requirements

Evinrude/Johnson electric start outboards are shipped with stranded copper battery cables for typical installations in which the starting battery is positioned close to the transom.

Specialized outboard installations with extended length battery cables require an increased wire size. Refer to the following table:

Cable Size	Cable Length
6 Gauge	1 to 10 ft. (0.3 to 3 m)
4 Gauge	11 to 15 ft. (3.4 to 4.6 m)
3 Gauge	16 to 20 ft. (4.9 to 6.1 m)

IMPORTANT: Inadequate battery cables can affect the performance of an outboard's high amperage start circuit and the cranking speed of the outboard. DO NOT use aluminum wire cables. Use ONLY AWG stranded copper wire cables.

FUEL REQUIREMENTS

⚠ WARNING ⚠

Gasoline is extremely flammable and highly explosive under certain conditions. Follow the instructions in this section explicitly. Improper handling of fuel could result in property damage, serious injury or death.

Always turn off the outboard before fueling.

Never permit anyone other than an adult to refill the fuel tank.

Do not fill the fuel tank all the way to the top or fuel may overflow when it expands due to heating by the sun.

Remove portable fuel tanks from the boat before fueling.

Always wipe off any fuel spillage.

Do not smoke, or allow open flames, or sparks or use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

Always work in a well ventilated area.

Evinrude/Johnson outboards are certified to operate on unleaded automotive gasoline with an octane rating equal to or higher than that specified in **Minimum Octane**. When using gasoline that contains MTBE or alcohol, follow these guidelines:

Using unleaded gasoline that contains methyl tertiary butyl ether (MTBE) is acceptable **ONLY** if the MTBE content does not exceed 15% by volume.

Using alcohol-extended fuels is acceptable **ONLY** if the alcohol content does not exceed:

- 10% ethanol by volume
- 5% methanol with 5% cosolvents by volume

Minimum Octane

- 87 (R+M)/2 AKI
  or
- 90 RON

Evinrude/Johnson outboards have been designed to operate using the above fuels; however, be aware of the following:

- The boat's fuel system may have different requirements regarding the use of alcohol fuels. Refer to the boat's owner guide.
- Alcohol attracts and holds moisture that can cause corrosion of metallic parts in the fuel system.
- Alcohol blended fuel can cause engine performance problems.
- All parts of the fuel system should be inspected frequently and replaced if signs of deterioration or fuel leakage are found. Inspect at least annually.

IMPORTANT: Always use fresh gasoline. Gasoline will oxidize and weather; the result is loss of octane, volatile compounds and the production of gum and varnish deposits which can damage the outboard.

Additives

IMPORTANT: The only fuel additives approved by Bombardier for use in *Johnson* outboards are *2+4®* fuel conditioner and *Evinrude/Johnson* Fuel System Cleaner. **Use of other fuel additives can result in poor performance or engine damage.**

Evinrude/Johnson 2+4 **Fuel Conditioner** will help prevent gum and varnish deposits from forming in fuel system components and will remove moisture from the fuel system. It can be used continuously and should be used during any period when the outboard is not being operated on a regular basis. Its use will reduce spark plug fouling, fuel system icing, and fuel system component deterioration.

Evinrude/Johnson **Fuel System Cleaner** will help keep fuel injectors in optimal operating condition.

FUEL SYSTEM REQUIREMENTS

Overview

Fuel systems must meet minimum specifications. These requirements must be met to insure the proper delivery of fuel to the outboard.

The guidelines established by the ABYC and U.S. Coast Guard should always be followed.

- Permanent fuel tanks must be properly vented outside of the hull.
- Remote fuel tank gas fills must be grounded.
- Permanent fuel tank pickups should have the correct anti-siphon valve installed to prevent fuel flow if a leak occurs in the fuel distribution system. Refer to ABYC Standard H-24.

Fuel Hose

All fuel hoses must be designated as fuel hose and approved for marine use.

- Use only fuel lines (or copper tubing) that meet the outboard minimum I.D. requirement.
- "USCG Type A1" fuel hose must be used between permanent fuel tanks and motor well fittings on inaccessible routings.
- Use "USCG Type B1" for fuel hose routings in motor well areas.
- Use corrosion-resistant metal clamps on permanently installed fuel hoses routed below decks.
- Multi-outboard applications require separate fuel tank pickups. Install separate fuel hoses from the fuel tank to the outboards in multi-outboard applications.

Fuel System Primer

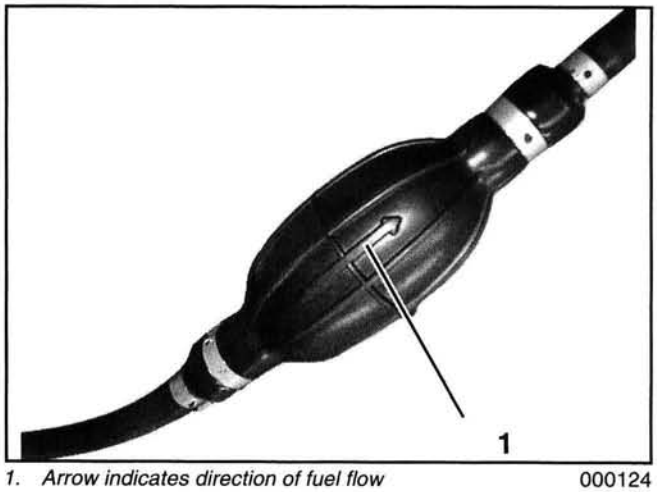
Outboards require a priming system capable of refilling the fuel system after periods of non-use.

Primer Bulbs

Primer bulbs that meet the outboard's minimum inside diameter fuel line requirements are used on most outboards.

Install the primer bulb in the fuel supply hose as follows:

- The primer bulb should be installed in an accessible location.
- The arrow on the primer bulb must point in the direction of fuel flow.
- The fuel primer bulb must be positioned in the fuel supply hose so the primer bulb can be held with the arrow pointing "up" during priming.



1. Arrow indicates direction of fuel flow 000124

Marine Primer Pump

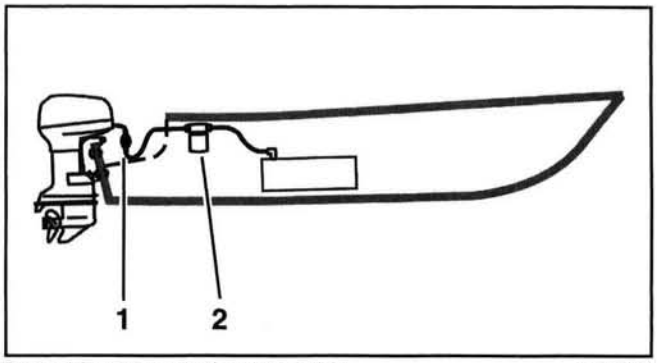
The alternative to a primer bulb is a U.S. Coast Guard approved marine primer pump. Electric primer pumps offer the convenience of outboard priming from a dash-mounted momentary switch.

Fuel Filters

Boat-mounted fuel filters and water-separating fuel filter assemblies must meet the required fuel flow and filter specification. The filter must be mounted to a rigid surface above the "full" level of the fuel tank and accessible for servicing.

The *Evinrude/Johnson* Fuel Filter Assembly, P/N 174176, meets all requirements for a water-separating fuel filter.

0070



Typical Fuel Supply Configuration 001151
1. *Primer bulb*
2. *Fuel filter (optional)*

Outboard Fuel System Requirements Chart

Component	25 HP – 130 HP Models	135 HP – 250 HP Models
Fuel tank pickup tube	5/16 in. (7.9 mm) min. I.D.	3/8 in. (9.5 mm) min. I.D.
Fuel fittings	1/4 in. (6.4 mm) min. I.D.	9/32 in. (7.1 mm) min. I.D.
Fuel supply hoses	5/16 in. (7.9 mm) min. I.D.	3/8 in. (9.5 mm) min. I.D.
	ALL MODELS	
Fuel tank pickup screen	100 mesh, 304 grade stainless steel wire, 0.0045 in. wire diameter, 1 in. (25 mm) long	
Antisiphon valve	2.5 in. (63.5 mm) Hg maximum pressure drop at 20 gph (76 l/hr) flow	
Remote fuel filter	0.4 in. Hg maximum pressure drop at 20 gph (76 l/hr) flow, 150 $in.^2$ (1290 cm^2) of filter area	
Maximum fuel pump lift height	Fuel pump should not be located more than 30 in. (76.2 cm) above bottom of fuel tank	

OIL REQUIREMENTS

Engine Lubricant

Evinrude/Johnson XD30 outboard oil is recommended for use in these outboards.

Evinrude/Johnson brand oils are formulated to give best engine performance while controlling piston and combustion chamber deposits, providing superior lubrication, and ensuring maximum spark plug life.

If *XD30* oil is not available, you must use an oil that meets NMMA TC-W3RL certification.

IMPORTANT: Failure to follow this recommendation could void the outboard warranty if a lubrication-related failure occurs.

These models require **50:1 (2% oil)** fuel/oil ratio during normal operation and a **25:1 (4% oil)** fuel/oil ratio during break-in. Refer to **Break-In (10 Hours)** on p. 52.

	Fuel		
Ratio	**6 U.S. Gallons**	**3 U.S. Gallons**	**1 Liter**
50:1	16 fl. oz. oil	8 fl. oz. oil	20 ml oil
25:1	32 fl. oz. oil	16 fl. oz. oil	40 ml oil

INITIAL RUNNING CHECKS

WARNING

DO NOT run outboard without a water supply to the outboard's cooling system. Cooling system and/or powerhead damage could occur.

DANGER

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

DANGER

Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off.

Break-In (10 Hours)

IMPORTANT: Follow this procedure to protect the outboard during its initial hours of operation. Careful break-in allows internal engine components to seat properly, resulting in maximum engine life and performance. Failure to carefully follow the break-in procedures can result in outboard damage.

Run the outboard on 25:1 fuel/oil ratio during break-in.

Perform the 10-hour break-in procedure with the boat and outboard in the water, using an appropriate propeller.

IMPORTANT: DO NOT perform break-in using a flushing device. DO NOT start up or run the outboard out of the water. DO NOT leave a running outboard unattended.

During the break-in, check water pump operation often. Look for a steady stream of water from the water pump indicator. If the stream of water stops, shut off the outboard to prevent damage. Find and correct the cause before continuing.

Change engine RPM often. Avoid holding a throttle setting longer than 15 minutes.

First 10 minutes of operation — Operate the outboard in gear at fast idle ONLY.

Next 50 minutes — Operate outboard in gear below 3500 RPM.

IMPORTANT: DO NOT hold a constant throttle setting. Change outboard speed every 15 minutes.

With easy planing boats, use full throttle to quickly accelerate boat onto plane. Immediately reduce throttle to one-half as soon as boat is on plane. BE SURE boat remains on plane at this throttle setting.

Second Hour — Use FULL throttle to accelerate boat onto plane, then reduce throttle setting to three-quarters. BE SURE boat remains on plane at this throttle setting.

At intervals, apply full throttle for periods of one to two minutes, returning to three-quarter throttle for a cooling period.

Change outboard speed every 15 minutes.

Next Eight Hours — Avoid continuous full throttle operation for extended periods. Change outboard speed every 15 minutes.

IMPORTANT: DO NOT exceed recommended maximum outboard RPM.

Fuel System

Perform running checks of the fuel system by following these steps:

- Squeeze fuel primer bulb until hard or activate electric primer. Observe all fuel hoses and connections. Repair any leaks.
- Start outboard. Visually inspect all oil hoses and connections and fuel hoses and connections. Repair any leaks or misrouted hoses immediately.

Emergency Stop / Key Switch

Check emergency stop function. With outboard running at IDLE, pull safety lanyard from emergency stop switch. Outboard must stop immediately.

Remote Control Operation

Confirm that control can be easily moved into all gear and throttle settings. Do not shift remote control when outboard is not running.

Start-In-Gear Prevention

⚠ WARNING ⚠

Make certain that the starter will not operate when the outboard is in gear. The start-in-gear prevention feature is required by the United States Coast Guard to help prevent personal injuries.

IMPORTANT: Tiller and remote models must have functional start-in-gear prevention.

Start outboard and shift outboard into FORWARD.

Turn outboard OFF while lever is in FORWARD.

Attempt restarting the outboard. Outboard should not start.

Pull shift lever back to NEUTRAL and restart outboard.

Shift remote control lever to REVERSE.

Turn outboard OFF while lever control is in REVERSE.

Attempt restarting the outboard. Outboard should not start.

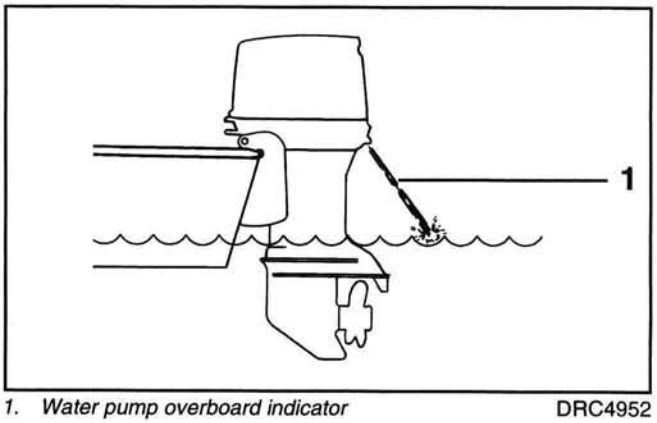
Tachometer Pulse Setting

The *Johnson* models included in this manual require a "5 Pulse" or "10 Pole" tachometer setting.

- Confirm accuracy of tachometer reading.
- Adjust dial on back of tachometer to required setting (outboard OFF).

Water Pump Overboard Indicator

A steady stream of water should flow from the overboard indicator.



1. Water pump overboard indicator DRC4952

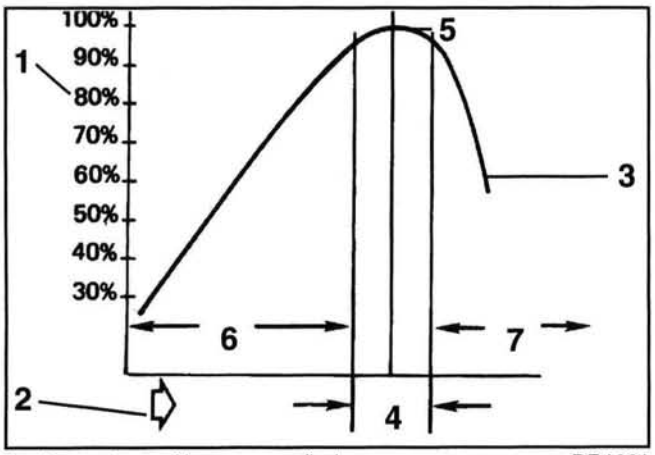
Operating Temperature

An outboard run at idle speed should achieve a temperature based on the engine's thermostatic control. In general, the powerhead temperature should reach at least 100°F (38°C) after five minutes of idling. Confirm that the powerhead reaches idle temperature. Refer to **ENGINE TEMPERATURE CHECK** on p. 173.

PROPELLER SELECTION

Refer to **PROPELLER** on p. 258 before installing propeller.

The correct propeller, under normal load conditions, will allow the engine to run near the midpoint of the RPM operating range at full throttle. Refer to **TECHNICAL DATA** on p. 30.



1. *Percentage of horsepower (kw)* DR1261
2. *Engine RPM*
3. *Horsepower curve*
4. *Full throttle operating range*
5. *Midpoint of full throttle operating range, horsepower rating in kilowatts (kw))*
6. *Engine is overloaded at full throttle*
7. *Engine is overspeeding at full throttle*

CAUTION

Selection of the wrong propeller could reduce engine service life, affect boat performance, or cause serious damage to the powerhead.

Procedure

The propeller selection process is very important to the engine's service life and to boat performance. Proceed carefully and thoroughly while considering the following points:

- During the engine break-in period, run the outboard at wide-open throttle for only brief periods of time to check full-throttle RPM.
- Use an accurate tachometer to determine the engine's full-throttle RPM while testing various propellers.
- Select a propeller that suits the customer's application and allows the engine to run near the midpoint of the full-throttle operating range when the boat has a normal load in it. Refer to **TECHNICAL DATA** on p. 30.
- To compensate for changes in boat loading, the engine's full-throttle RPM must be verified periodically.
- Occasionally, one propeller will not cover a wide range of boat applications — water skiing to high speed performance boating. In such cases, it might be necessary to have a propeller for each situation.

IMPORTANT: If the propeller blades have too much pitch, the engine is operating below its normal range at full throttle, power is being lost, and powerhead damage could occur. If the propeller blades have too little pitch, the engine is operating above its normal range at full throttle and damage from overspeeding could occur.

WARNING

When servicing the propeller, always shift the outboard to NEUTRAL, turn the key switch OFF, and twist and remove all spark plug leads so the engine cannot be started accidentally.

TRIM TAB ADJUSTMENT

25/30 MODELS

WARNING

Improper trim tab adjustment can cause difficult steering and loss of control.

A propeller will generate steering torque when the propeller shaft is not running parallel to the water's surface. The trim tab is adjustable to compensate for this steering torque.

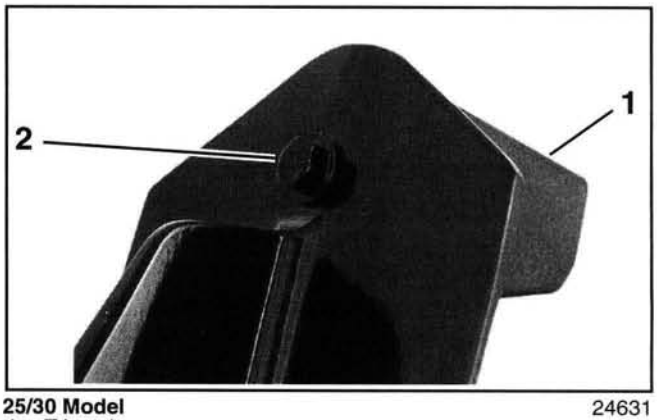
IMPORTANT: A single trim tab adjustment will relieve steering effort under only one set of speed, outboard angle and load conditions. No single adjustment can relieve steering effort under all conditions.

WARNING

To prevent accidental starting while servicing, twist and remove all spark plug leads.

If the boat pulls to the left or right when its load is evenly distributed, adjust the trim tab as follows:

- With the remote control in NEUTRAL and the engine OFF, loosen the trim tab screw. If the boat pulled to the right, move rear of the trim tab slightly to the right. If the boat pulled to the left, move rear of the trim tab slightly to the left.
- Tighten the trim tab screw to a torque of 60 to 84 in. lbs. (7 to 9 N·m).



25/30 Model 24631
1. *Trim tab*
2. *Trim tab screw*

Test the boat and, if needed, repeat the procedure until steering effort is as equal as possible.

NOTES

Technician's Notes

Related Documents

Bulletins	
Instruction Sheets	
Other	

MAINTENANCE

TABLE OF CONTENTS

INSPECTION AND MAINTENANCE SCHEDULE

Routine inspection and maintenance is necessary for all mechanized products. Periodic maintenance contributes to the product's life span. The following chart provides guidelines for outboard inspection and maintenance to be performed by an authorized Dealer.

The recommended lubricants have been formulated to protect bearings, gears and engine components. They must be used to avoid damage caused by improper lubrication.

IMPORTANT: Outboards used for rental operations, commercial applications, or other high hour use applications require more frequent inspections and maintenance. Inspection and maintenance should be adjusted according to operating conditions and use; and environmental conditions.

Engine Maintenance and Inspection Schedule						
		Frequency				
Description	**Engine Care Product**	**Each Use**	**10-Hour Inspection**	**Every 50 Hours or 6 months**	**Every 100 Hours or Annually**	**Every 200 Hours or Biannually**
Clamp screws, lubricate [1]	D	Every 60 days / Every 30 in Saltwater				
Tilt/run lever shaft / tilt shaft, lubricate [1]	D	Every 60 days / Every 30 in Saltwater				
Swivel bracket / tilt support bracket, lubricate [1]	D	Every 60 days / Every 30 in Saltwater				
Shift lever shaft and detent / shallow water drive bracket, inspect and lubricate [1]	D	Every 60 days / Every 30 in Saltwater				
Engine cover latch, lubricate [1]	D	Every 60 days / Every 30 in Saltwater				
Throttle and shift linkage, lubricate [1]	D	Every 60 days / Every 30 in Saltwater				
Choke, carburetor linkage / starter lockout, inspect and lubricate [1]	D	Every 60 days / Every 30 in Saltwater				
Fish line trap, inspect		Every 60 days / Every 30 in Saltwater				
Anticorrosion anodes, check operation		✓	✓			
Water intake screens, check condition		✓	✓			
Overboard water pump indicator, check operation		✓	✓			
Steering friction, check operation		✓	✓			
Steering system, check operation		✓	✓			
Throttle and shift operation, check function		✓	✓			
Emergency stop circuit and lanyard, check function		✓	✓			
Flush cooling system		✓				
Emergency start cord, onboard and inspect		✓				
Operator's Guide, onboard		✓				
Clamp screws, tighten		✓				
Engine upper and lower motor covers, clean and wax				✓		
Operator's Guide, review					✓	
Fuel filter inspection, eliminate contamination			✓			
Fuel system components, inspect and repair leaks [2]			✓	✓		
Fastener inspection, tighten loosened components			✓	✓		
Engine to transom mounting hardware, re-torque			✓		✓	

Engine Maintenance and Inspection Schedule						
		Frequency				
Description	**Engine Care Product**	**Each Use**	**10-Hour Inspection**	**Every 50 Hours or 6 months**	**Every 100 Hours or Annually**	**Every 200 Hours or Biannually**
Cam follower, inspect and lubricate			✓		✓	
Thermostat, inspect and check operation			✓		✓	
Spark advance linkage, lubricate			✓		✓	
Electric starter, lubricate			✓		✓	
Electrical and ignition wires and connections, inspect			✓		✓	
Gearcase lubricant replace	B		✓		✓	
Powerhead synchronization and linkage, inspect (2)	D		✓		✓	
Gearcase lubricant, inspect fill level and condition of lube	B			✓		
Starter pinion shaft, inspect and lubricate (3)	F			✓		
Propeller shaft splines, inspect and lubricate	D				✓	
Spark plugs, replace (2)					✓	
Decarbonize	G				✓	
Driveshaft splines, inspect and lubricate	E					✓
Water pump, inspect and replace						✓

(1) Also recommended at 10-Hour Inspection

(2) Emission-related component

(3) Do not use light duty penetrating lubricants

A *Evinrude/Johnson* Anti-Corrosion Spray or *Evinrude/Johnson* "6 in 1" Multi-Purpose Lubricant

B *Ultra-HPF* Gearcase Lubricant

C Power Trim/Tilt and Power Steering Fluid

D *Triple Guard* Grease

E *Evinrude/Johnson Molylube* P/N 175356

F Starter Bendix Lube Only P/N 337016

G *Evinrude/Johnson* Engine Tuner

SAFETY INFORMATION

Before working on any part of the outboard, read the SAFETY section at the end of this manual.

DANGER

Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off. Remove propeller before servicing and when running the outboard on a flushing device.

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

WARNING

Wear safety glasses to avoid personal injury, and set compressed air to less than 25 psi (172 kPa).

The motor cover and flywheel cover are machinery guards. Use caution when conducting tests on running outboards. DO NOT wear jewelry or loose clothing. Keep hair, hands, and clothing away from rotating parts.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

To prevent accidental starting while servicing, disconnect the battery cables at the battery. Twist and remove all spark plug leads.

The electrical system presents a serious shock hazard. DO NOT handle primary or secondary ignition components while outboard is running or flywheel is turning.

Gasoline is extremely flammable and highly explosive under certain conditions. Use caution when working on any part of the fuel system.

Protect against hazardous fuel spray. Before starting any fuel system service, carefully relieve fuel system pressure.

Do not smoke, or allow open flames or sparks, or use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

Keep all electrical connections clean, tight, and insulated to prevent shorting or arcing and causing an explosion.

Always work in a well ventilated area.

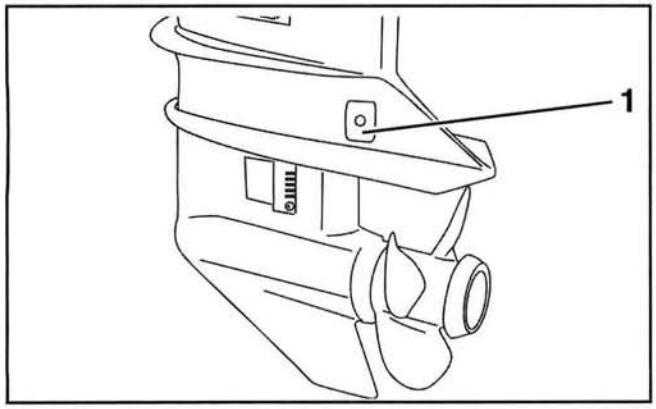
Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to tightening must be felt when reusing a locking fastener. If replacement is indicated, use only authorized replacement or equivalent.

ANTI-CORROSION PROTECTION

Sacrificial Anodes

Galvanic corrosion occurs in fresh or salt water. Salt, brackish, and polluted water can accelerate corrosion. "Sacrificial" anodes are intended to protect the underwater metal components of the outboard from galvanic corrosion.

Outboards are equipped with sacrificial anodes.



TYPICAL 000288R
1. Anode

Visually inspect anodes and metal components below water level. Erosion of anodes is normal and indicates the anodes are functioning properly.

IMPORTANT: Anodes that are not eroding may indicate that the anodes are not properly grounded. Anodes and the mounting screws must be clean and tight for effective corrosion protection.

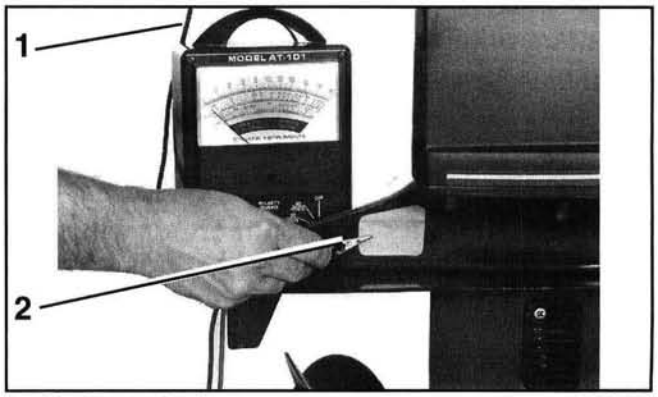
For best anode performance:

- Replace all anodes that have eroded or disintegrated to two-thirds of their original size.
- Do not paint or apply protective coatings to anodes or anode fasteners.
- Avoid using metal-based antifouling paint on the boat or outboard.

Testing Procedure – Continuity

Calibrate multimeter on "HIGH" ohm scale.

Connect meter leads between engine ground and anode surface.



1. Black meter lead 270757
2. Red meter lead

The multimeter should indicate little or no resistance. If resistance is high, check the following:

- Remove the anode and clean the area where the anode is installed.
- Clean the mounting screws.
- Install the anode and test again.

Metallic Component Protection

Protect metal components on outboards from corrosion. Use the following products to minimize corrosion.

- *Anti-Corrosion Spray* provides a heavy, waxy coating to protect components.
- *"6 in 1" Multi-Purpose Lubricant* provides a thin film of anti-corrosion protection.

Exterior Finishes

Maintain the outboard's exterior finish to prevent corrosion and reduce oxidation.

- Use automotive wax to protect the outboard's exterior finish from oxidation.
- Clean regularly using clean water and mild detergent soap.
- Touch-up damage to painted surfaces promptly.
- Protect moving components with appropriate lubricants.

COOLING SYSTEM

Check the condition of cooling system components regularly. The outboard cooling system consists of:

- water intake screens;
- overboard water pressure indicator;
- water pump;
- all internal water passages;
- thermostats; and
- all external water hoses and fittings.

Flushing

Flush the outboard with fresh water following each use in brackish, salt, or polluted water to minimize the accumulation of scale and silt deposits in cooling system passages.

The outboard can be flushed on the trailer or at dockside; running or not running.

IMPORTANT: The outboard must be located in a well ventilated area with appropriate ground drainage during the flushing procedures.

Keep water inlet pressure between 20 to 40 psi (140 to 275 kPa).

Flushing — Outboard Running

⚠ WARNING ⚠

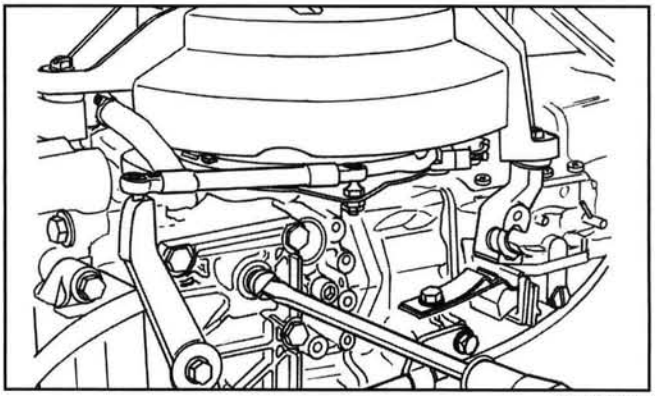
Prevent injury from contact with rotating propeller; remove the propeller before flushing.

Refer to **PROPELLER** on p. 258.

Place outboard in VERTICAL (DOWN) position in a well ventilated area.

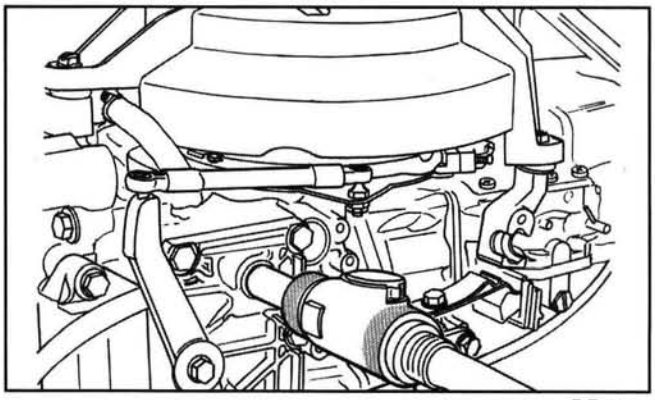
9.9/15 MODELS

Remove the plug from the flushing port on exhaust manifold.



DR31699

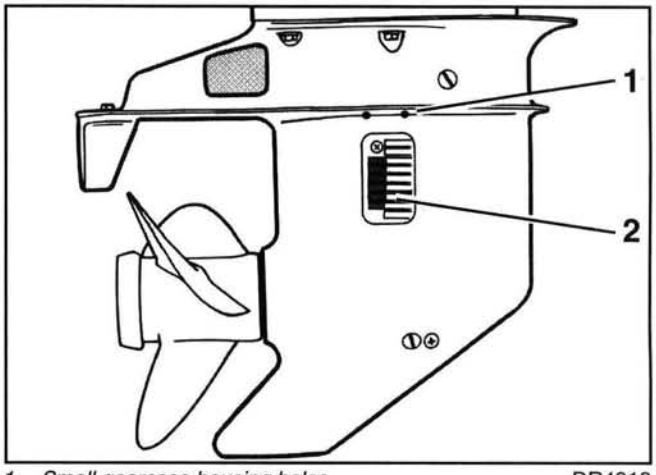
Install flushing adapter and garden hose.



DR5077

25/30 MODELS

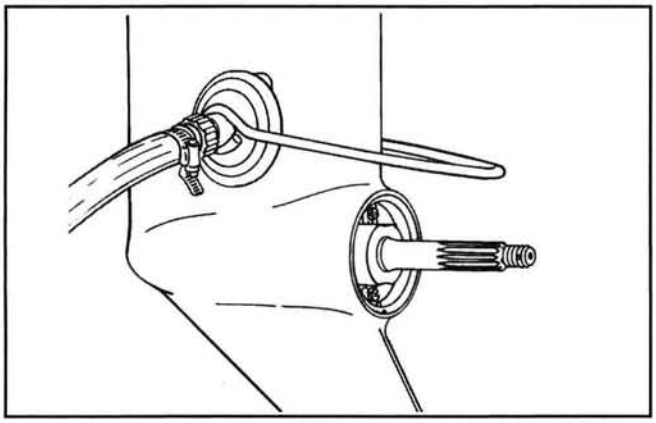
Cover the two small holes on each side of the gearcase with heavy tape to make sure adequate water travels to the powerhead.



1. *Small gearcase housing holes*
2. *Water intakes*

DR4918

Install flushing adapter and garden hose.



DRC44684

ALL MODELS

Remove propeller and shift the outboard to NEUTRAL.

Turn water supply on. START outboard. Run outboard at IDLE only for at least five minutes.

Shut OFF the outboard. Turn off water supply. Remove garden hose and flushing device. Reinstall plug (9.9/15 HP models). Uncover taped holes (25/30 HP models).

Leave the outboard in VERTICAL (DOWN) position long enough for the powerhead to drain completely.

Reinstall propeller.

Flushing — Outboard Not Running

9.9/15 MODELS

Outboard can be in VERTICAL (DOWN) or TILTED (UP) position.

Remove the plug from the flushing port. Install flushing device and garden hose.

Turn water supply ON.

Flush outboard for at least five minutes.

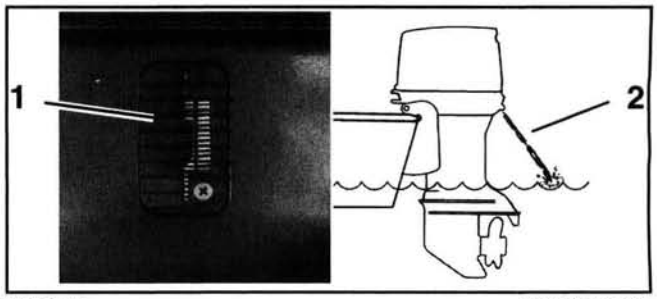
Turn off water supply. Remove garden hose and flushing device.

Reinstall plug. Position outboard in VERTICAL position (DOWN) long enough to allow the powerhead to drain completely.

Water Intake Screens

Inspect condition of water intake screens. Clean or replace as needed.

Confirm function of overboard water pressure indicator. Clean or replace plug and nozzle as needed.



TYPICAL 32894DRC49
1. *Water intake screen* 52
2. *Overboard water pressure*

Additional Maintenance

- Confirm function of *System Check* engine monitor (remote electric models).
- Check operation or visually inspect thermostat and pressure relief valve. Clean or replace as needed.
- Replace water pump.

LUBRICATION

Steering System

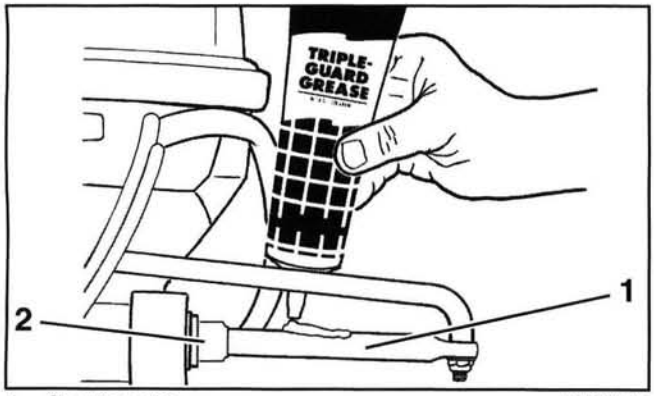
⚠ WARNING ⚠

Failure to grease as recommended could result in steering system corrosion. Corrosion can affect steering effort, making operator control difficult.

Remote Models

Grease the stainless steel output end of the steering cable with *Triple-Guard* grease.

Use an appropriate cleaning solvent to remove corrosion and dirt from output end of cable prior to coating it with grease. Make sure wiper nut is installed and not damaged.



1. *Steering cable*
2. *Wiper nut*

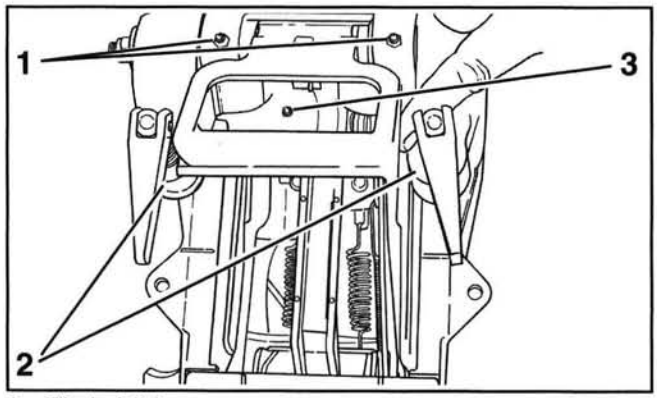
DR29546

Midsection

Lubricate the tilt tube/tilt shaft grease fittings, clamp screws, tilt lever shaft grease fittings, and swivel bracket with *Triple-Guard* grease. Apply grease to the swivel bracket fitting until the grease begins to flow from the upper or lower swivel bracket areas.

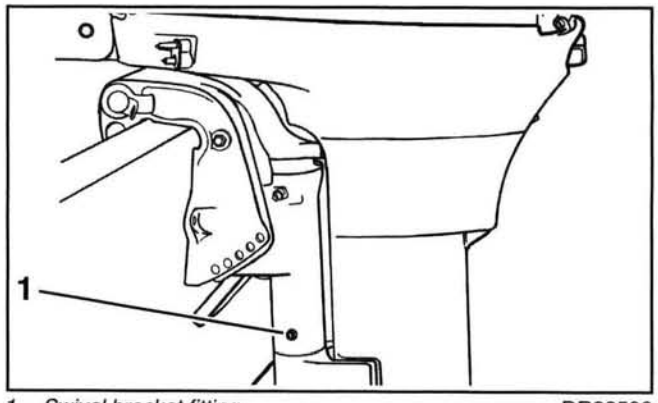
Coat the pivot points of the tilt lock brackets and the reverse lock mechanism with *Triple-Guard* grease.

9.9/15 MODELS



1. *Tilt shaft fittings*
2. *Clamp screws*
3. *Tilt lever shaft fitting*

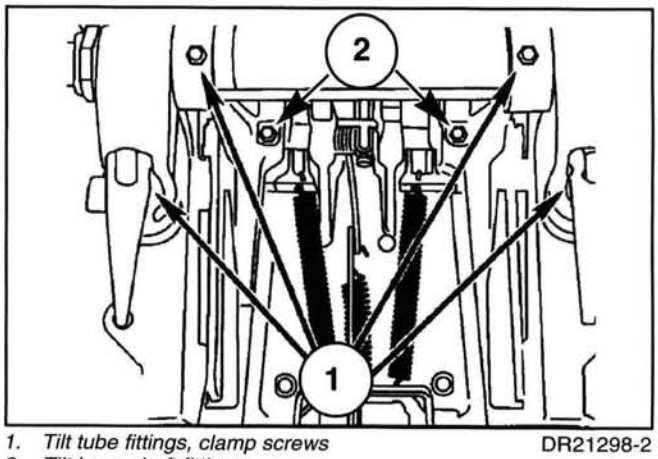
DR31712



1. *Swivel bracket fitting*

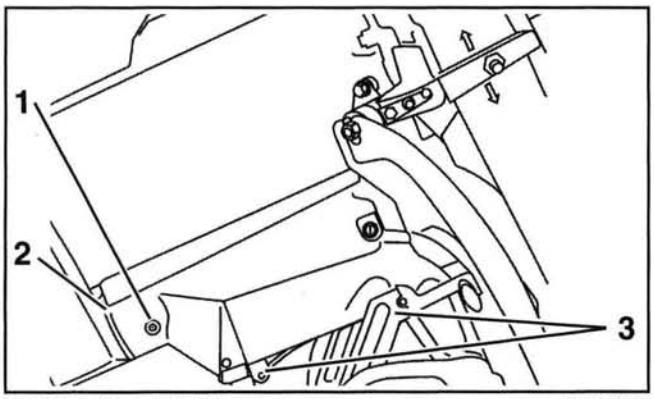
DR32598

25/30 MODELS



1. *Tilt tube fittings, clamp screws*
2. *Tilt lever shaft fittings*

DR21298-2



1. *Swivel bracket fitting*
2. *Lower swivel bracket area*
3. *Pivot points*

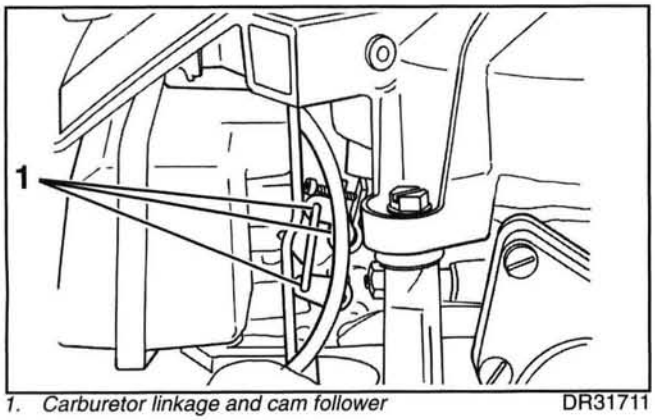
DR21886

Throttle and Shift Linkage

Lubricate the throttle linkage, shift linkage, starter lockout mechanism, and carburetor linkage with *Triple-Guard* grease. Refer to the following diagrams.

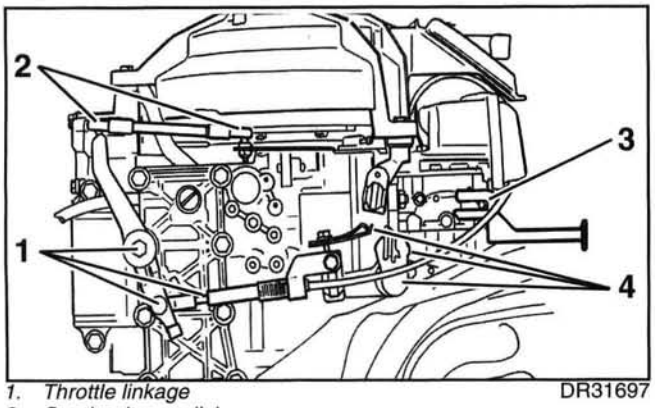
IMPORTANT: Check proper throttle and shift function.

9.9/15 MODELS



1. *Carburetor linkage and cam follower*

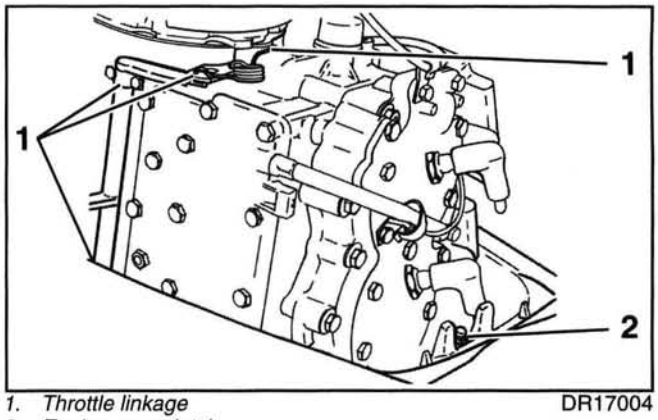
DR31711



1. *Throttle linkage*
2. *Spark advance linkage*
3. *Choke linkage*
4. *Shift linkage*

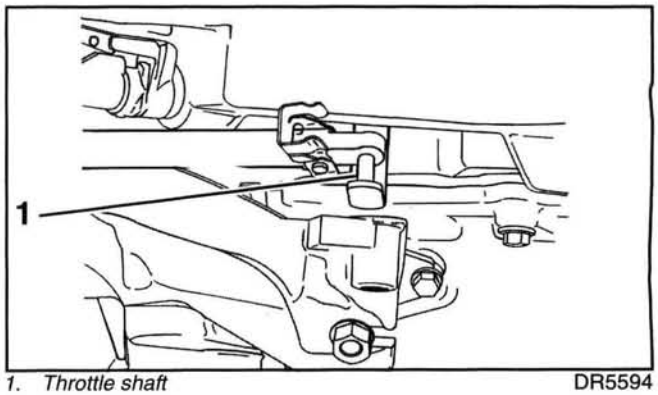
DR31697

25/30 MODELS



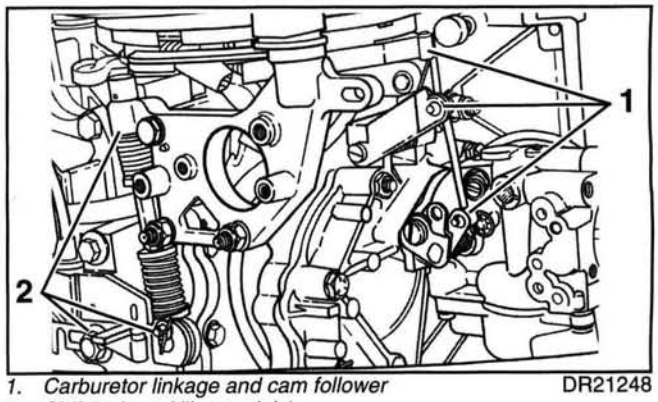
1. *Throttle linkage*
2. *Engine cover latch*

DR17004



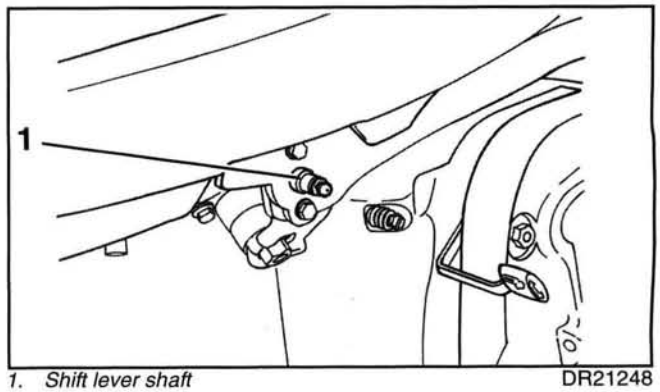
1. *Throttle shaft*

DR5594



1. *Carburetor linkage and cam follower*
2. *Shift lockout (tiller models)*

DR21248

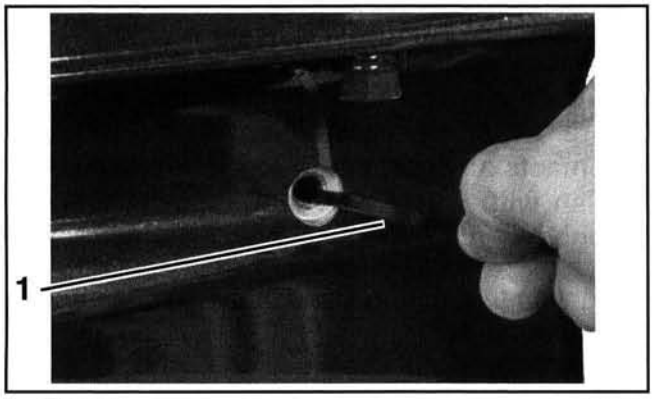


1. *Shift lever shaft*

DR21248

Gearcase Lubricant

IMPORTANT: Always check the fill level of the gearcase lubricant prior to removing drain/fill plug. A tie strap can be used to check lubricant level.

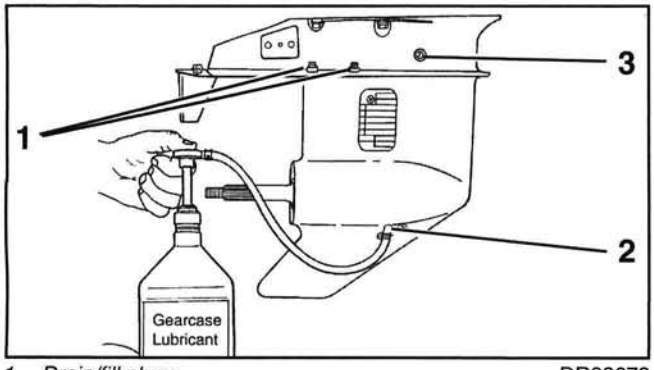


1. Tie strap 000072

Examine drained lubricant for excessive metal fragments and for any indication of water in oil (cloudy or milky appearance). Lubricant that is black in color with a burnt odor indicates worn, overheated oil. Pressure and vacuum check gearcases with apparent leaks. Repair all leaks.

Refer to **INSPECTION AND MAINTENANCE SCHEDULE** on p. 58 for service frequency and recommended lubricants.

Refer to **LUBRICANT** on p. 259 for complete gearcase lubricant filling procedures.



1. Drain/fill plugs
2. Drain/fill hole
3. Lubricant level hole
DR33673

REFILL the gearcase with *Ultra-HPF* Gearcase Lubricant.

If *Ultra-HPF* Gearcase Lubricant is not available, *Hi-Vis* gearcase lubricant can be used as an alternative; however, long term durability may be affected with continued use.

IMPORTANT: The recommended gear lubricants include special additives for marine applications. Do not use any automotive gear lubricants, 2-stroke or 4-stroke engine oil, or any other oil or grease for gearcase applications.

Propeller Shaft

Debris from the water can become lodged around propeller shaft. Frequent inspection can minimize potential gearcase damage.

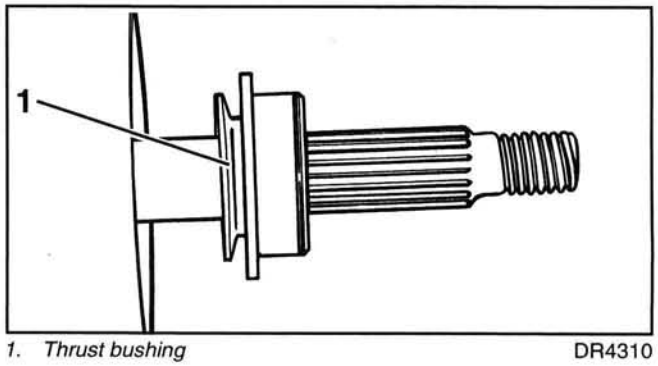
⚠ WARNING ⚠

When servicing the propeller, always shift the outboard to NEUTRAL position, and twist and remove all spark plug leads so the engine cannot be started accidentally. Disconnect battery cables at battery on electric start models to prevent accidental starter engagement. Remove the battery negative (–) cable first and the battery positive (+) cable last.

Remove propeller. Refer to **PROPELLER** on p. 258.

Inspect bushing and blade surfaces. Replace damaged or worn propellers.

Clean propeller shaft. Inspect propeller shaft seals. Replace damaged or worn seals.



1. Thrust bushing DR4310

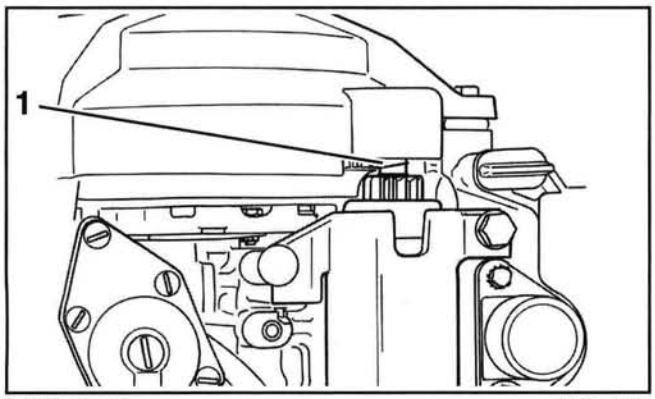
Apply *Triple-Guard* grease to entire length of propeller shaft prior to installing propeller.

Reinstall propeller hardware and propeller.

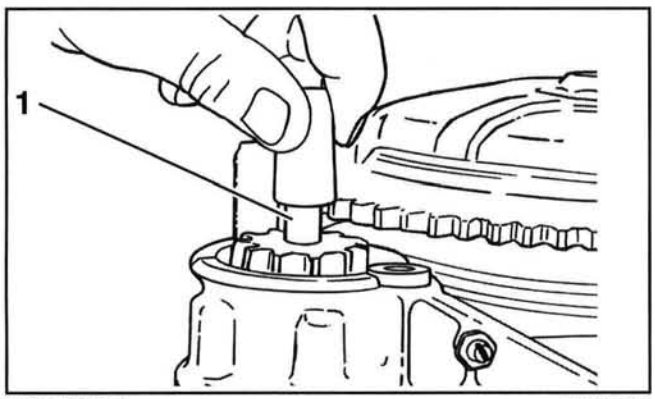
Electric Starter

Lubricate the starter pinion area of the starter shaft with *Starter Lube.*

IMPORTANT: Do not use liquid or aerosol spray lubricants.



9.9/15 Model DR31713
1. Starter shaft



25/30 Model DR36589
1. Starter shaft

Refer to **ELECTRIC STARTER SERVICING** on p. 100.

BATTERY AND BATTERY CONNECTIONS

Check battery connections frequently. Clean and service battery connections at regular intervals.

WARNING

Battery electrolyte is acidic—handle with care. Wear eye protection. If electrolyte contacts any part of the body, immediately flush with water and seek medical attention.

- Confirm that battery meets the minimum engine requirements.
- Connections must be clean and tight.
- Observe all wiring connections prior to disassembly.

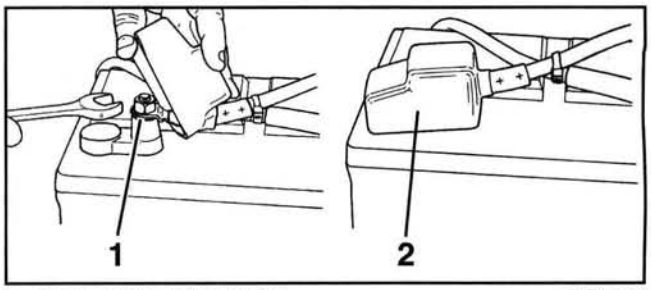
Disconnect battery negative (–) cable **first** and the battery positive (+) cable last.

Clean all terminals, battery posts, and connectors with a solution of baking soda and water. Use a wire brush or battery terminal tool to remove corrosion buildup. Rinse and clean all surfaces.

Reinstall battery and tighten all connections securely. Refer to **Installing Battery** on p. 49.

IMPORTANT: DO NOT secure battery cables with wing nuts.

Coat all connections with *Triple-Guard* grease and insulate to prevent shorts or spark arcing.



1. Large surface star washer DR5103
2. Cover DR5104

WARNING

Keep battery connections clean, tight, and insulated to prevent their shorting or arcing and causing an explosion. If the battery mounting system does not cover the connections, install covers.

FUEL SYSTEM

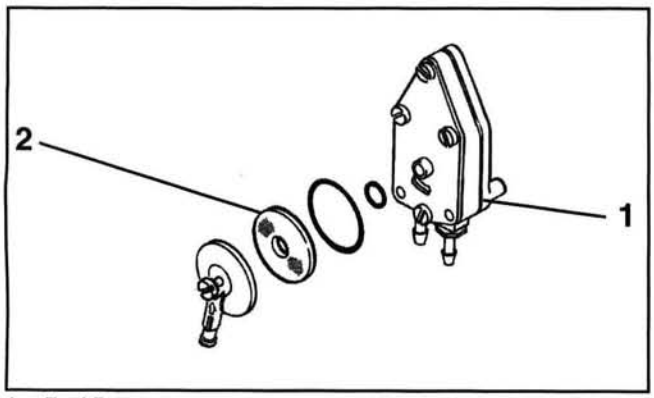
Visual inspection of fuel system components reduces the possibility of undetected fuel system leaks. Inspect fuel system components regularly.

⚠ WARNING ⚠

Failure to check for fuel leakage could allow a leak to go undetected, resulting in fire or explosion.

Fuel Filter

Johnson outboards are equipped with a serviceable fuel filter element. Clean or replace the element as needed. Refer to **FUEL PUMP** on p. 149.



1. *Fuel Pump*
2. *Filter element*

DR3000

Air Silencer

The air silencer on *Johnson* outboards minimizes audible noise related to air flow into the engine. Additionally, it collects any fluid residue that migrates from the leaf plate or the throttle body area. Periodically clean the air silencer to remove any accumulations.

Hoses and Connections

Check condition of all hoses and connections related to the fuel system.

- Visually inspect all components.
- Observe all clamps, hoses, and connections while outboard is running.
- Replace all damaged components.
- Repair all leaks.

SPARK PLUGS

Spark plugs should be removed and examined periodically. Replace worn, fouled or damaged spark plugs.

- Remove spark plugs and inspect condition.
- Set spark plug gap on new, replacement spark plugs.
- Apply *Electrical Grease* to the ribbed portion of the spark plug ceramic and to the opening of the spark plug cover to prevent corrosion.

See table below for recommended spark plug data and gap setting.

Models	Recommended Spark Plug
9.9/15	*Champion* QL82C @ 0.030 in. (0.8 mm)
25/30	*Champion* QL77JC4 @ 0.030 in. (0.8 mm)

SYNCHRONIZATION AND LINKAGE ADJUSTMENTS – 9.9/15

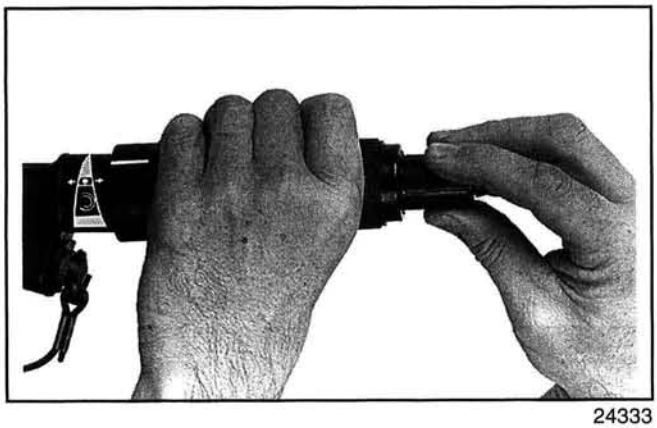
IMPORTANT: Synchronization and linkage procedures MUST be followed in sequence and be performed exactly as described to ensure consistent engine idling and smooth operation throughout the RPM range.

IMPORTANT: If equipped, remove both remote control cables from the outboard before performing these adjustments.

Preliminary Adjustments

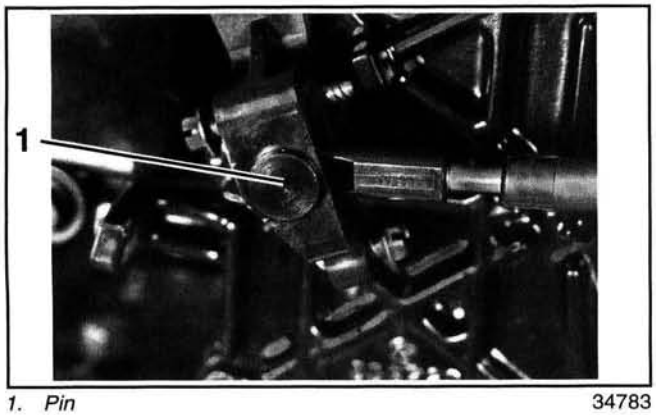
TILLER MODELS

Turn the idle adjustment knob counterclockwise to the full SLOW position.



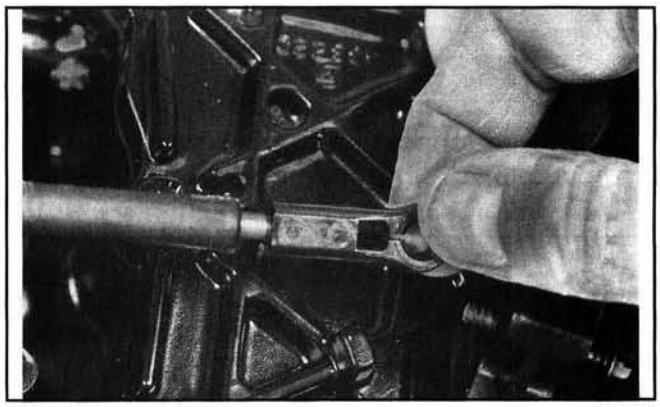
24333

Remove the pin retaining the cable connector to the throttle lever.



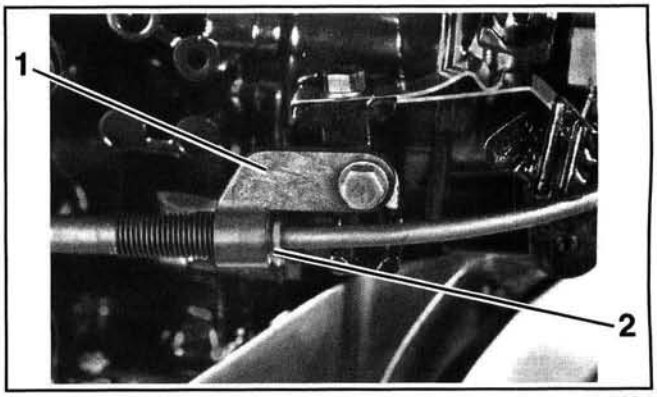
1. Pin 34783

Turn the connector clockwise until it seats. Turn counterclockwise no more than one-half turn to align it with the throttle lever. Install the retaining pin.



34782

The throttle cable bracket must be flush with the inside edge of the threaded cable. To adjust, remove the screw and turn bracket. Install screw.

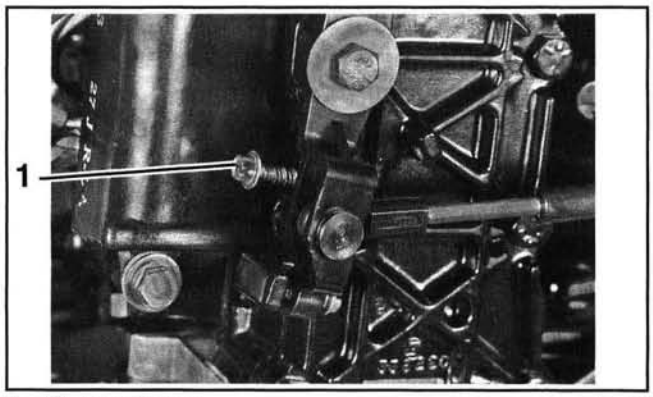


1. Throttle cable bracket 34784
2. Screw

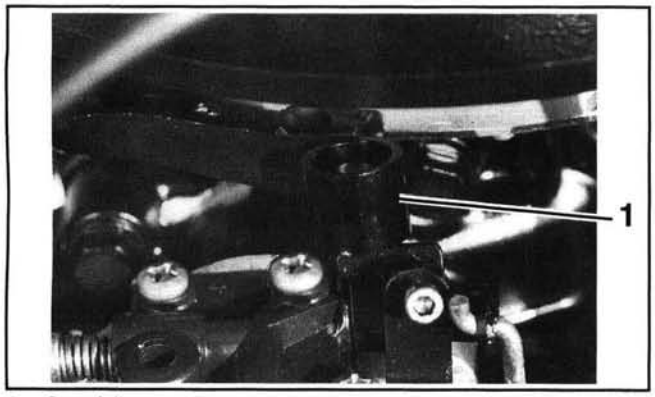
Close the throttle completely so the idle speed screw is against the stop. The center of the cam follower roller should be halfway between pick-up mark and the end of the throttle cam.

TILLER AND REMOTE MODELS

To adjust, advance the throttle to wide-open position and adjust idle speed screw. Turn the screw in to move the cam closer to the roller and out to move cam away from the roller. Close the throttle completely and check the cam to roller alignment. Repeat procedure if necessary.



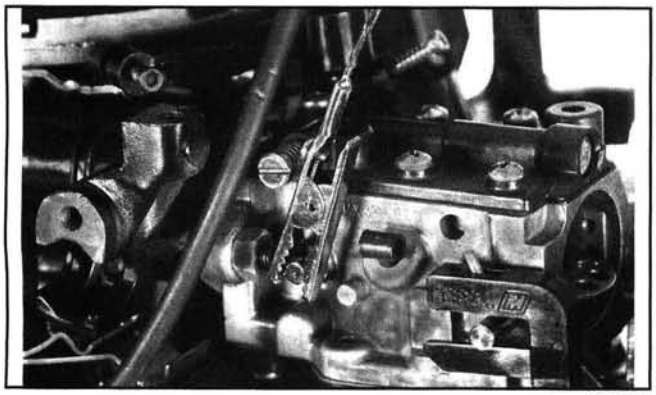
1. Idle speed screw 34786



1. Cam follower roller 34785

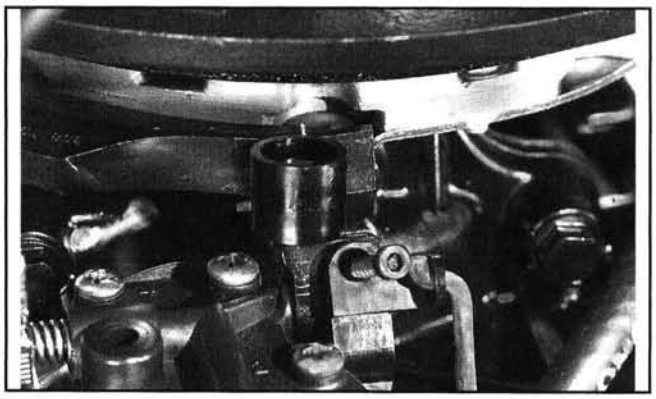
Cam Follower Pickup Point

Connect a throttle shaft amplifier to the carburetor throttle shaft as shown.



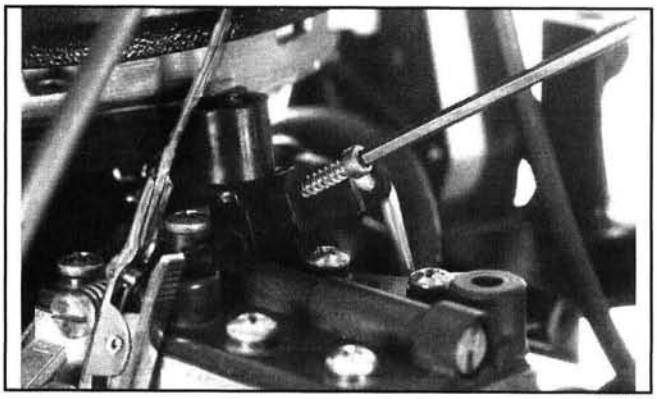
35000

Advance the throttle until the tip of the amplifier begins to move. At this point, the center of the roller should align with the indicator mark on cam.



35001

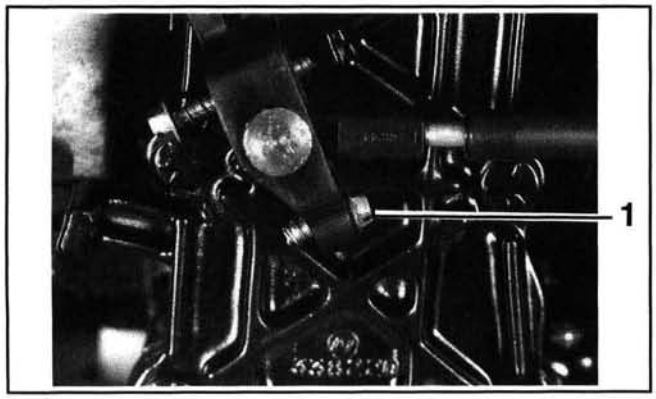
To adjust, use Ball Hex Screwdriver, P/N 327622. Back out cam follower adjusting screw until the cam and cam follower do not touch. Turn the screw until amplifier begins to move and confirm the mark on cam aligns with the center of the cam follower. Repeat procedure if necessary. If air silencer is on, remove plug to adjust screw. Reinstall plug after procedure.



35002

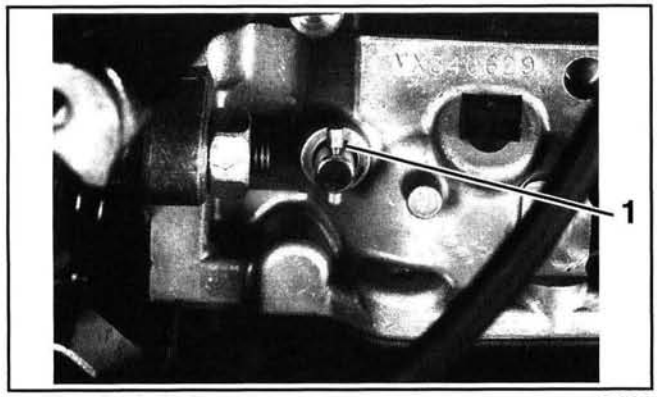
Wide Open Throttle Adjustment

Adjust wide open throttle (WOT) stop screw until the tip protrudes 0.25 in. (8 mm) through the throttle lever.

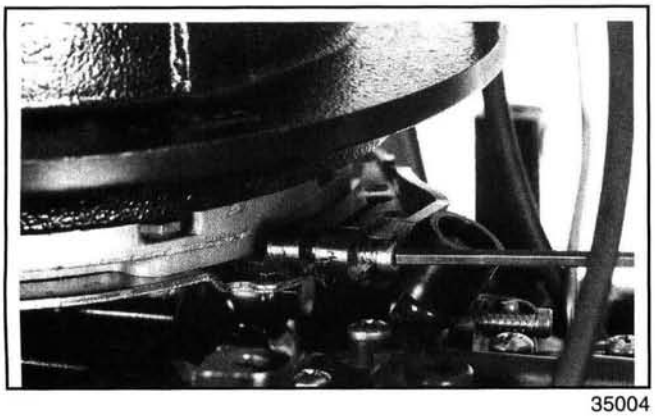


1. Stop screw, WOT 34778

Open throttle to WOT position and make sure the throttle shaft pin is vertical. If adjustment is required, turn the cam screw in to open the throttle valve and out to close the throttle valve.



1. Throttle shaft pin 35003



35004

Maximum Spark Advance

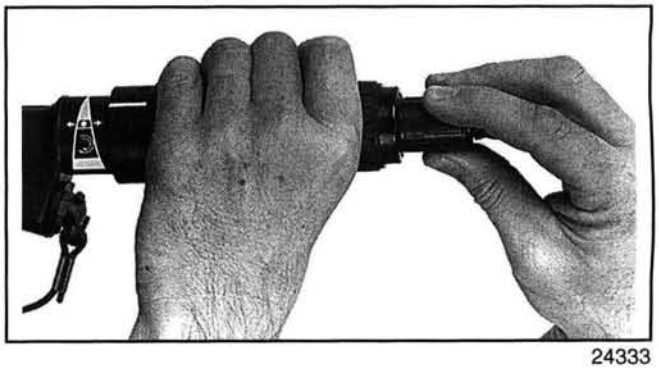
No maximum spark advance adjustment is necessary. Correct ignition primary lead position is all that is required to maintain proper ignition timing. Orange/blue lead must connect to top ignition coil.

Idle Speed

The boat must be in the water, under normal operating conditions, with correct propeller installed. The boat's movement must be unrestrained. The boat must not be tied to a dock or trailer.

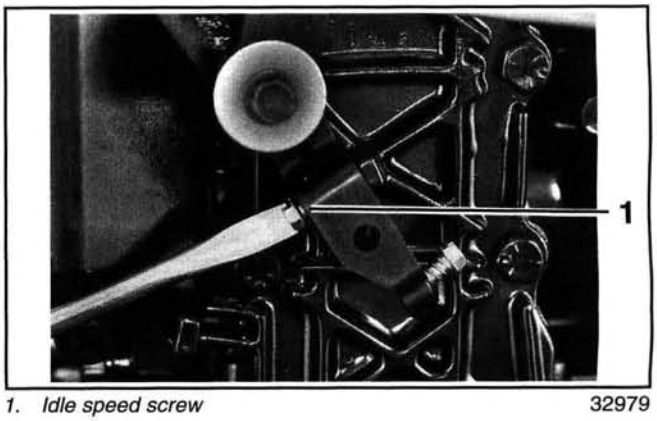
Before proceeding with this procedure, be sure the low speed needle is properly adjusted. Refer to **CARBURETOR MIXTURE ADJUSTMENT** on p. 161.

Turn the idle speed knob fully counterclockwise to the full SLOW position (tiller models).



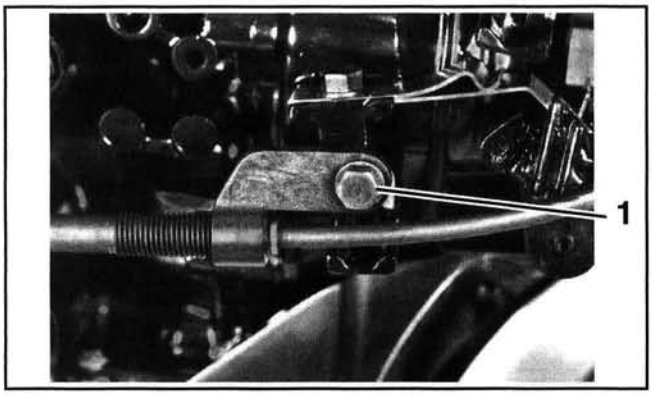
24333

Start the outboard and allow it to reach normal operating temperature. When speed is reduced, engine must idle at 700 ± 25 RPM in FORWARD gear. Stop the outboard and adjust the idle speed screw to change idle speed.



1. Idle speed screw 32979

Remove the throttle cable bracket screw. Adjust the throttle cable bracket to provide a slight preload against the idle speed screw when *Twist-Grip* throttle is held at the full throttle position (tiller models).



1. Throttle cable bracket screw 34784

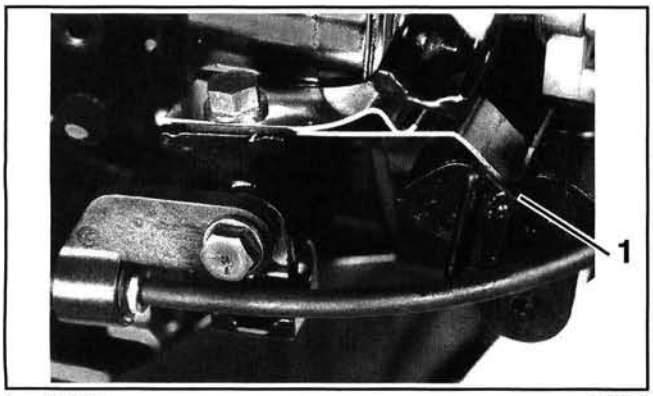
Run outboard in gear at, or near, full throttle for one minute. Quickly reduce engine speed to 700 RPM and shift into NEUTRAL. Engine should continue to run smoothly.

If outboard stalls or backfires, the idle fuel mixture may be too lean. Refer to **CARBURETOR MIXTURE ADJUSTMENT** on p. 161.

Shift Lever Detent

Rotate propeller shaft and move the shift lever to NEUTRAL position.

The lower detent spring should be fully engaged in notch of the shift lever detent.



1. Notch 34780

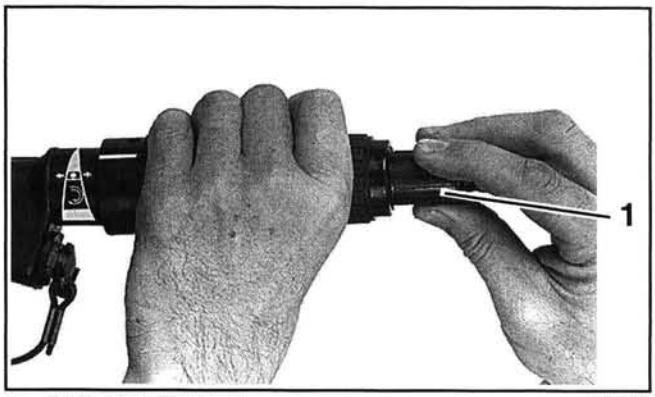
SYNCHRONIZATION AND LINKAGE ADJUSTMENTS – 25/30

IMPORTANT: Synchronization and linkage procedures MUST be followed in sequence and be performed exactly as described to ensure consistent engine idling and smooth operation throughout the RPM range.

IMPORTANT: If equipped, remove both remote control cables from the outboard before performing these adjustments.

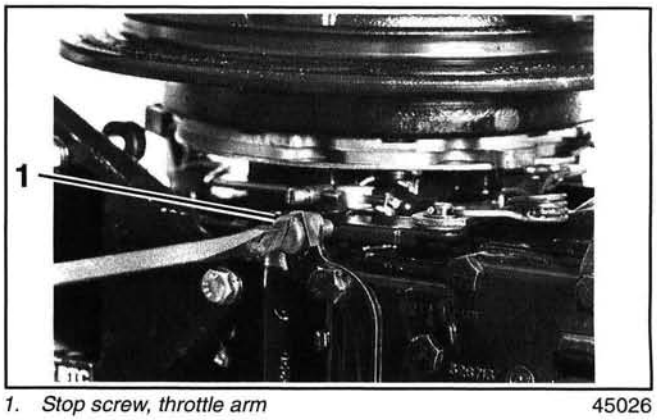
Cam Follower Pickup Point

Turn the idle adjustment knob counterclockwise to the full SLOW position (tiller models).



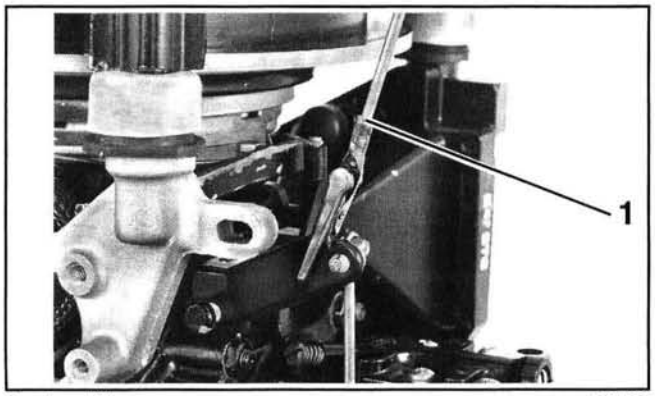
1. Knob, idle adjustment 24333

Loosen locknut and back out throttle arm stop screw until throttle arm touches screw's mounting bracket.



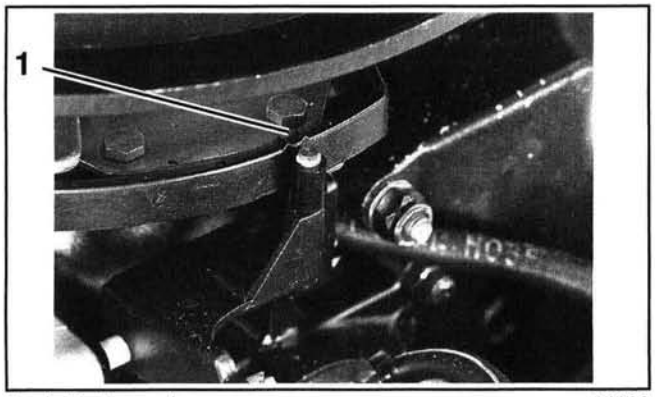
1. Stop screw, throttle arm 45026

Connect a throttle shaft amplifier to the carburetor throttle shaft as shown.



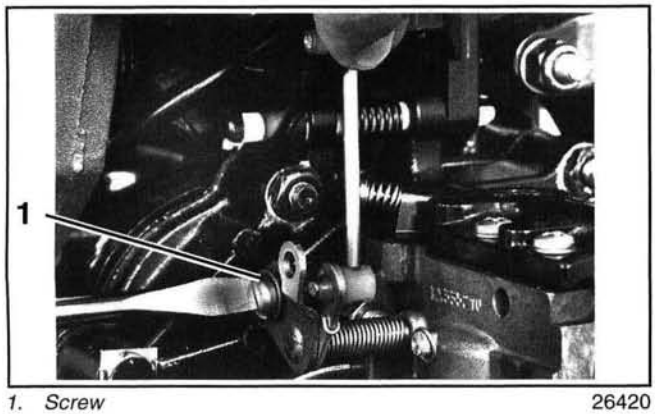
1. Amplifier 26423

Advance the throttle until the tip of the amplifier begins to move. At this point, the cam follower roller should contact the cam between the indicator marks.



1. Indicator marks 21106

To adjust, loosen the screw retaining the adjustment lever to the throttle shaft. Slide the adjustment lever up or down to make the adjustment.



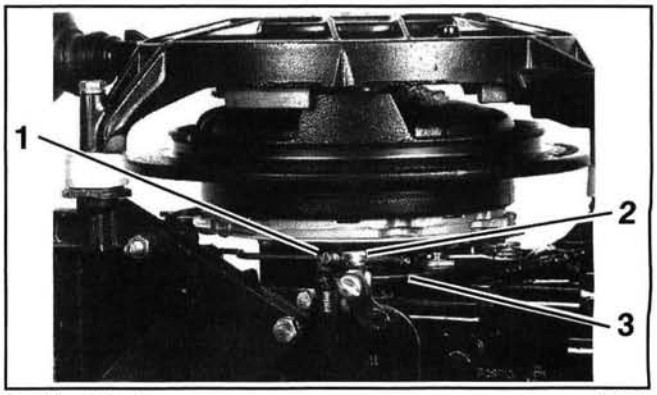
1. Screw 26420

Throttle Control Rod

IMPORTANT: Offset on pivot block must face toward the control rod collar.

While rotating the propeller shaft, move the shift lever to FORWARD.

Loosen the control rod collar screw. Advance the throttle lever until it contacts the stop on the cylinder block. Move the throttle control rod forward until the carburetor throttle plate is horizontal.



1. Pivot block 45103
2. Collar screw
3. Throttle lever

Move the control rod collar backward until it touches the pivot block. Tighten the collar screw securely.

IMPORTANT: Check your adjustment. The carburetor throttle plate must be exactly horizontal when the throttle lever is fully advanced.

Maximum Spark Advance

IMPORTANT: Run the engine with the proper test wheel. Do not run the engine with a propeller or a flushing adapter for this adjustment.

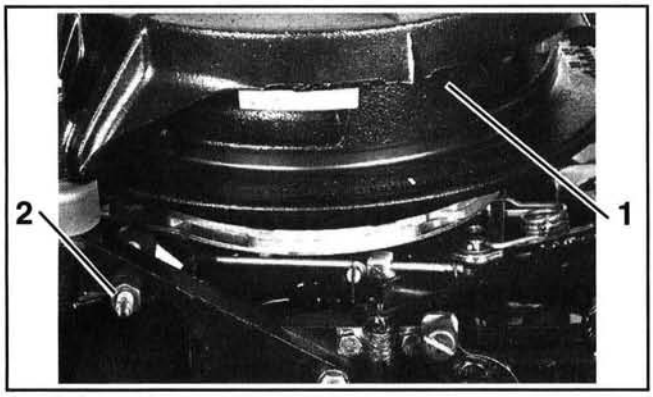
Connect a timing light to the top cylinder. Start the engine and allow it to reach normal operating temperature.

Run the engine at full throttle in FORWARD to check maximum spark advance.

Maximum Spark Advance	
25/30	30° BTDC

ROPE START MODELS

Timing mark must align with appropriate timing mark on CD flywheel grid.



1. *Timing mark* 45102
2. *Screw, timing adjustment*

ELECTRIC START MODELS

Timing mark must align with appropriate timing mark on ELEC CD flywheel grid.

1. *Timing mark* 001152
2. *Screw, timing adjustment*

To adjust, stop the outboard to prevent contact with rotating parts. Loosen the timing adjustment screw nut. Turn the adjustment screw in or out, as necessary, to correct the timing. One turn clockwise retards the timing about 1°; one turn counterclockwise advances timing about 1°.

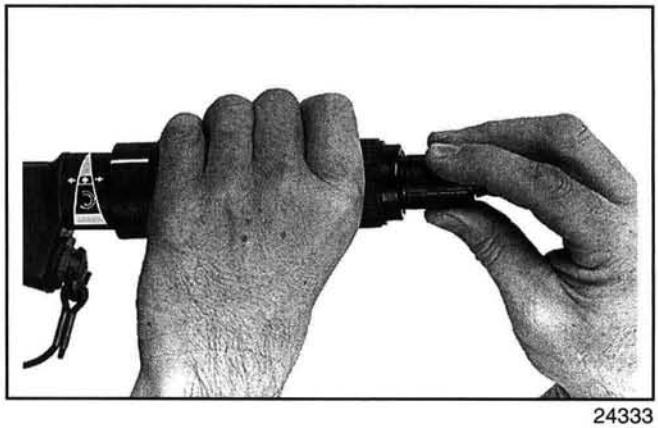
Tighten the nut and recheck the timing adjustment.

Idle Speed

The boat must be in the water, under normal operating conditions, with correct propeller installed. The boat's movement must be unrestrained. The boat must not be tied to a dock or trailer.

Before proceeding with this procedure, be sure the low speed needle is properly adjusted. Refer to **CARBURETOR MIXTURE ADJUSTMENT** on p. 161.

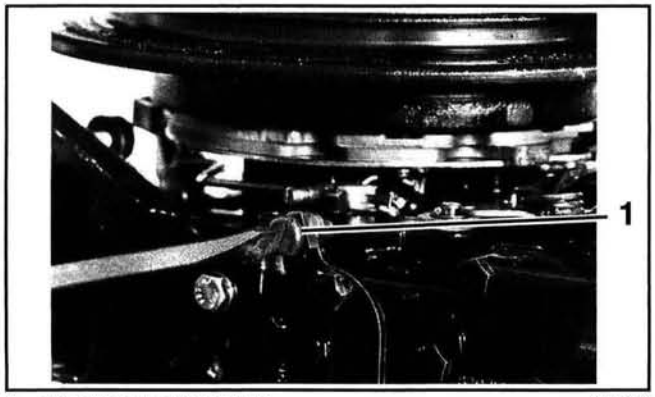
Turn the idle speed knob fully counterclockwise to the full SLOW position (tiller models).



24333

Start the engine and allow it to reach normal operating temperature. When speed is reduced, engine must idle at 675 ± 25 RPM in FORWARD gear.

Stop the engine and adjust the throttle arm stop screw to change idle speed. Tighten locking nut when the desired idle speed is obtained.



1. Throttle arm stop screw 45026

Run engine in gear at, or near, full throttle for one minute. Quickly reduce engine speed to 700 RPM and shift into NEUTRAL. Engine should continue to run smoothly.

If outboard stalls or backfires, the idle fuel mixture may be too lean. Refer to **CARBURETOR MIXTURE ADJUSTMENT** on p. 161.

Throttle Cable Installation

Using the hardware supplied, attach the throttle cable to the throttle arm. Tighten locknut securely.

Refer to **Control Cable Installation** on p. 42 for correct cable installation procedure.

IMPORTANT: Failure to follow this procedure exactly might cause accelerated wear of shift system components and high shifting effort.

Install the throttle cable trunnion cover and tighten cover screw to 60 to 84 in. lbs. (7 to 9 N·m).

CLAMP SCREWS AND MOUNTING BOLTS

Check clamp screws and mounting bolts frequently. Grease or replace components as needed. High use applications require more frequent checks.

10-HOUR INSPECTION

IMPORTANT: All *Johnson* outboard owners are encouraged to return their new engines to an authorized dealer for a mechanical check.

This check should be performed after approximately 10 operating hours. The cost of this check should be figured at local dealer labor *rates and* paid for by the engine owner.

The 10 hour inspection should check:

- Battery connections and condition
- *System Check* and warning horn functionality
- Anticorrosion anodes functionality
- Water intake screens
- Overboard water pressure indicator functionality
- Steering system functionality (lubricate as needed)
- Throttle and shift operation
- Emergency stop circuit and lanyard functionality
- Fuel system components, fix and repair any leaks
- Fuel filter, eliminate any contamination
- Fasteners, tighten loose components
- Air silencer, clean and inspect
- Thermostat operation
- Engine to transom mounting hardware
- Electrical and ignition wires and connections
- Powerhead synchronization and linkage adjustments

STORAGE

WARNING

To prevent injury from contact with rotating propeller, remove the propeller before flushing.

IMPORTANT: DO NOT start outboard without a water supply to the outboard's cooling system. Cooling system and/or powerhead damage could occur.

Fuel System Treatment

Stabilize the boat's fuel supply with *Evinrude/Johnson 2+4 Fuel Conditioner* following the instructions on the container.

Prepare a "storage mixture" of fuel in a separate outboard six gallon fuel tank. The storage mixture should consist of:

- 5 gallons (18.9 liter) of fuel;
- 2 quarts (1.9 liter) of *Evinrude/Johnson Storage Fogging Oil*;
- 2.5 ounces (74 ml) of *Evinrude/Johnson 2+4 Fuel Conditioner*; and
- 1 pint (473 ml) of *Evinrude/Johnson* outboard lubricant.

Temporarily connect fuel tank with storage mixture to the outboard.

Shift the remote control to NEUTRAL and remove the propeller.

START outboard and RUN at IDLE speed for five minutes to ensure that the entire fuel system is filled with the storage mixture.

STOP outboard. Turn key switch to OFF position on remote electric start models. Proceed with **Internal Engine Treatment**.

Internal Engine Treatment

Use *Evinrude/Johnson Storage Fogging Oil* to prevent corrosion of internal engine components during periods of storage.

Remove all spark plugs and spray a liberal amount *Evinrude/Johnson Storage Fogging Oil* into the spark plug holes.

Turn the flywheel in a clockwise direction to distribute the fogging oil throughout the cylinders. Install and torque the spark plugs.

If outboard is equipped with a portable fuel tank, disconnect fuel hose from outboard and tank.

IMPORTANT: DO NOT restart outboard until it goes back into service.

If the outboard is removed from boat, examine all loosened and removed hardware. Replace damaged or missing parts with genuine *Evinrude/Johnson* parts or equivalent.

Additional Recommendations

- Replace gearcase lubricant.
- Remove and inspect propeller.
- Clean and grease propeller shaft.
- Lubricate all grease fittings and linkages.
- Clean or replace fuel filter element.
- Inspect outboard, steering system, and controls. Replace all damaged and worn components. Refer to manufacturer's maintenance and lubrication recommendations).
- Touch up painted surfaces as needed. Coat outer painted surfaces with automotive wax.
- Remove battery(s) from boat. Store in a cool, dry location. Periodically charge battery(s) while stored. (Refer to manufacturer's maintenance recommendations when servicing batteries.)
- Store outboard in upright (vertical) position.
- Check for fuel leakage.

WARNING

Failure to check for fuel leakage could allow a leak to go undetected, resulting in fire or explosion.

PRE-SEASON SERVICE

If outboard was removed from boat for storage, make certain it has been reinstalled with factory specified hardware. Refer to **INSTALLATION AND PREDELIVERY** section for proper set-up procedures.

Gearcase Lubricant

- Check the lubricant level.
- Inspect gearcase for leaks. If leak is apparent, pressure and vacuum test gearcase.
- Repair gearcase as needed.

Battery(s)

- Replace batteries that cannot be properly charged.

Operational Checks

- Steering
- Throttle and shift
- *System Check* gauge
- All other accessories and instrumentation

Fuel System

- Inspect entire fuel system for leaks prior to starting outboard. Repair all leaks.
- Start outboard and reinspect.

⚠ WARNING ⚠

Failure to check for fuel leakage could allow a leak to go undetected, resulting in fire or explosion.

SUBMERGED ENGINES

Once an outboard has been submerged in fresh or salt water, it must be serviced within three (3) hours of recovery. Immediate service can minimize the corrosive affect that air has on the polished surfaces of the crankshaft, connecting rods, and internal powerhead bearings.

IMPORTANT: If outboard cannot be started or serviced immediately, it should be resubmerged in fresh water to avoid exposure to the atmosphere.

Engine Dropped Overboard (Not Running)

Disconnect battery cables at the battery (electric models).

Remove outboard cover(s) and rinse powerhead with clean water.

Remove spark plug leads and spark plugs.

Place outboard in horizontal position (cylinder heads down). Slowly rotate flywheel in a clockwise rotation to work all water out of powerhead.

IMPORTANT: If outboard shows evidence that sand or silt may have entered it, DO NOT attempt to start the outboard. It must be disassembled and cleaned.

Disassemble all electrical connectors. Clean connectors and terminals, and treat with water displacing electrical spray. Apply *Electrical Grease* to terminals prior to reassembly. Coat all exposed solenoid terminals and engine grounds with *Black Neoprene Dip.*

Clean and inspect all electrical components. Replace damaged or corroded components prior to returning the outboard to service. Electric starters should be disassembled, cleaned, flushed with clean water, and treated with water displacing electrical spray prior to reassembly.

Remove carburetor for draining, disassembly and cleaning.

Disconnect fuel supply hose from outboard. Drain and clean all fuel hoses, filters, and fuel tanks.

Inject a small amount of outboard lubricant into spark plug holes and install new spark plugs.

Reinstall all removed or disconnected parts.

Run the outboard below 1500 RPM for one-half hour on a 25:1 fuel/oil mixture.

Engine Dropped Overboard (Running)

Follow the same procedures as **Engine Dropped Overboard (Not Running)**. However, if there is any binding when the flywheel is rotated, it may indicate a bent connecting rod and no attempt should be made to start the outboard. Powerhead must be disassembled and serviced immediately.

Engine Dropped Overboard (In Salt Water)

Follow the same procedures used for **Engine Dropped Overboard (Not Running)** and **Engine Dropped Overboard (Running)**. Disassemble and clean outboards that have been submerged in salt water for prolonged periods of time. Electrical components must be cleaned or replaced as necessary.

Prolonged Submersion (Fresh or Salt Water)

Outboards that have been dropped overboard and not recovered immediately, must be serviced within three hours of recovery. Follow the same procedures used for **Engine Dropped Overboard (Not Running)** and **Engine Dropped Overboard (Running)**.

NOTES

Technician's Notes

Related Documents

Bulletins	
Instruction Sheets	
Other	

ELECTRICAL

TABLE OF CONTENTS

SAFETY INFORMATION

Before working on any part of the outboard, read the SAFETY section at the end of this manual.

DANGER

Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off. Remove propeller before servicing and when running the outboard on a flushing device.

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

WARNING

Wear safety glasses to avoid personal injury, and set compressed air to less than 25 psi (172 kPa).

The motor cover and flywheel cover are machinery guards. Use caution when conducting tests on running outboards. DO NOT wear jewelry or loose clothing. Keep hair, hands, and clothing away from rotating parts.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

To prevent accidental starting while servicing, disconnect the battery cables at the battery. Twist and remove all spark plug leads.

The electrical system presents a serious shock hazard. DO NOT handle primary or secondary ignition components while outboard is running or flywheel is turning.

Gasoline is extremely flammable and highly explosive under certain conditions. Use caution when working on any part of the fuel system.

Protect against hazardous fuel spray. Before starting any fuel system service, carefully relieve fuel system pressure.

Do not smoke, or allow open flames or sparks, or use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

Keep all electrical connections clean, tight, and insulated to prevent shorting or arcing and causing an explosion.

Always work in a well ventilated area.

Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to tightening must be felt when reusing a locking fastener. If replacement is indicated, use only authorized replacement or equivalent.

GENERAL

Some information in this section specified for the **9.9/15 Models** may only apply if any of the following kits have been installed:

- Electric Start Kit, P/N 586398
- Remote Electric Start Kit, P/N 176905
- Battery Charging Kit, P/N 176942

CHARGING SYSTEM COMPONENTS

The charging system consists of a battery, flywheel, alternator stator, and rectifier.

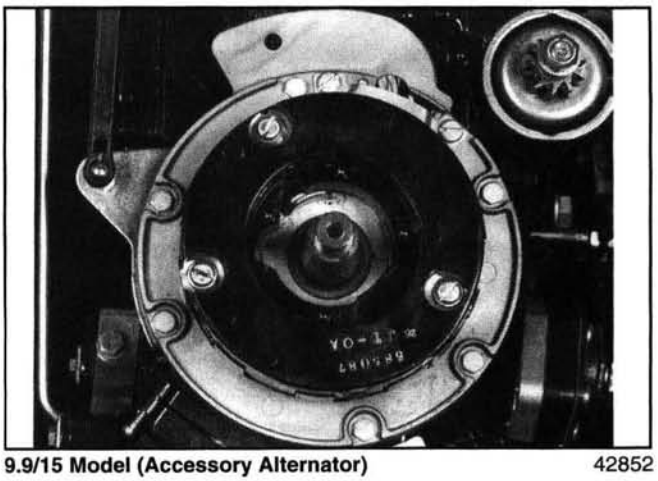
Flywheel

The engine's flywheel contains permanently charged magnets. The magnets supply energy to power the stator windings. The magnets must be at their original design strength for full alternator output.

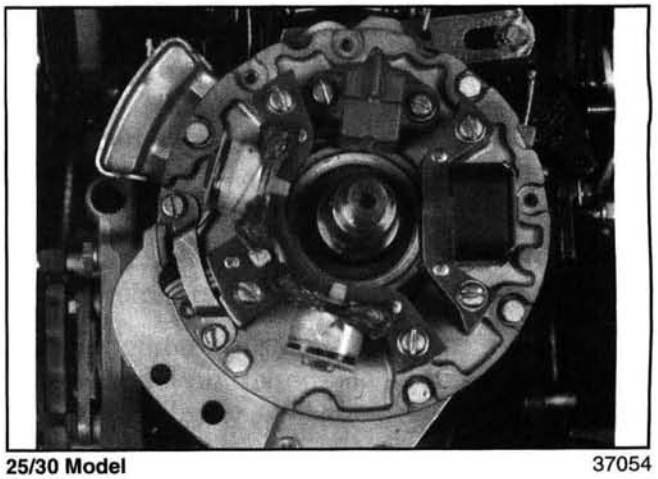
32278

Stator

The alternator stator has windings wrapped around metal laminations. The flywheel's magnetic lines of force cutting through the stator windings produce alternating current.



9.9/15 Model (Accessory Alternator) 42852



25/30 Model 37054

Rectifier

The rectifier consists of a series of diodes which change the stator's alternating current to the direct current used to charge the battery.

42854

CHARGING SYSTEM TESTS

Charging System Check Chart

Where to Look	Cause	Procedure	Reference
Battery	Battery defective or worn out	Check condition and charge	Accessories Service Manual
	Low electrolyte level	Add water and recharge	
	Terminal connections loose or corroded	Clean and tighten	
	Excessive electrical load	Evaluate accessory loads	
Wiring	Connections loose or corroded	Clean and tighten	Running alternator output test; Stator resistance test
	Stator leads shorted or grounded	Perform ohmmeter tests	Stator resistance test
	Circuit wiring grounded	Perform ohmmeter tests	
Alternator/stator	Damaged stator windings	Perform ohmmeter tests	Stator resistance test
	Weak flywheel magnets	Perform running output tests	Running alternator output test
	Damaged stator leads	Perform ohmmeter tests	Stator resistance test
Rectifier	Inoperative rectifier	Perform rectifier tests	Rectifier resistance tests

Running Alternator Output Test

Disconnect battery cables at the battery.

Remove the rectifier red lead.

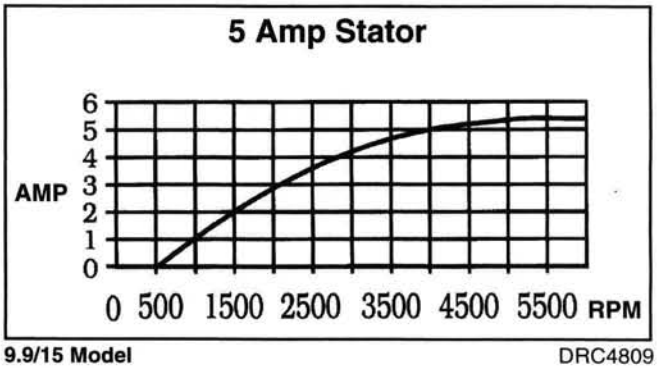
Wire a 0 to 40 A ammeter in series with the rectifier red lead and the wiring harness red lead.

⚠ CAUTION ⚠

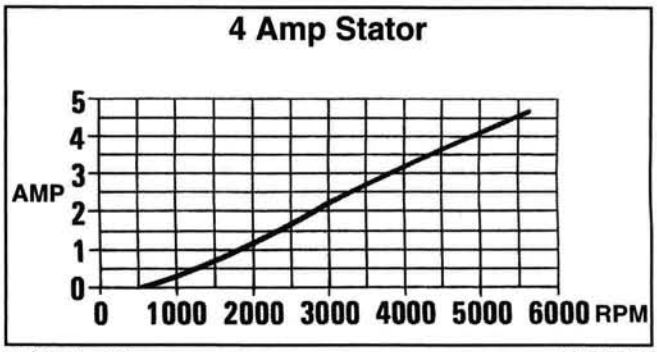
Guard against any red wire, its terminals, or the ammeter coming in contact with engine ground while the engine is running. Contact could cause arcing.

The outboard's battery should not be fully charged when beginning this test. Connect the battery cables and run the outboard in a test tank. Refer to the output curve to determine the correct output-to-RPM ratio.

- If there is no output or the output is not correct, refer to **Stator Resistance Tests** on p. 86 and **Rectifier Resistance Tests** on p. 87.



9.9/15 Model DRC4809



25/30 Model DRC1153

Stator Resistance Tests

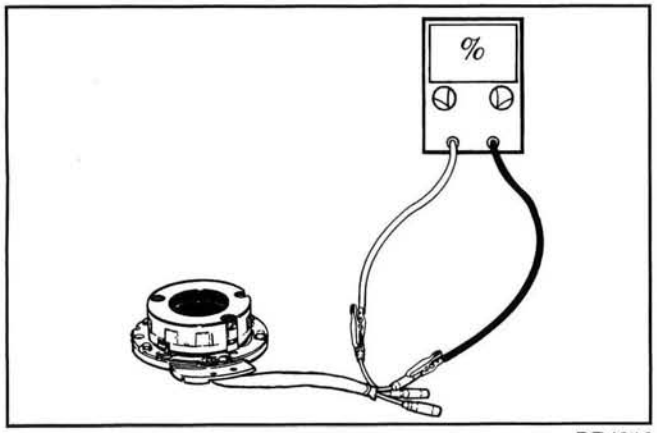
9.9/15 MODELS

Disconnect battery cables at the battery.

Disconnect all stator leads.

Calibrate ohmmeter on appropriate scale. Connect meter leads between the two stator yellow/gray leads.

- Ohmmeter must show a low reading.
- If ohmmeter shows a high reading, repair lead between the two yellow/gray connectors, or replace stator.



DR4816

Connect meter leads between the yellow and yellow/gray stator leads.

- Ohmmeter must show 0.80 to 0.90 ohms.

Connect meter leads between the yellow and yellow/blue stator leads.

- Ohmmeter must show 0.80 to 0.90 ohms.

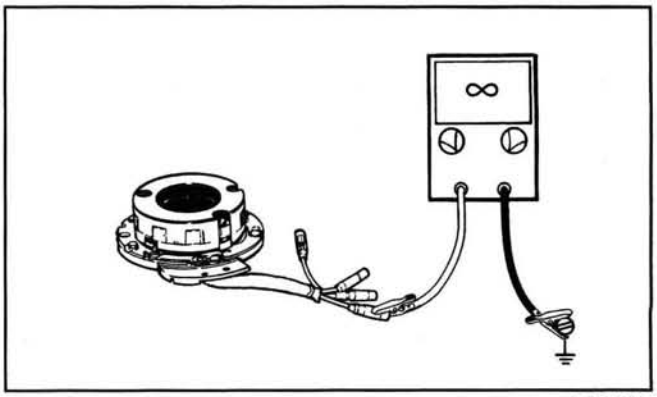
Connect meter leads between yellow/blue and one yellow/gray lead.

- Ohmmeter must show 1.5 to 1.7 ohms.

To check stator for a grounded condition, connect one meter lead to a clean engine ground and the other lead alternately to the yellow/blue, yellow, and yellow/gray stator leads.

- Ohmmeter should show a high reading.
- If ohmmeter shows a low reading, stator is grounded.

If a stator lead is grounded, repair it or replace the stator assembly.



DR4818

25/30 MODELS

Disconnect battery cables at the battery.

Disconnect all stator leads from terminal board.

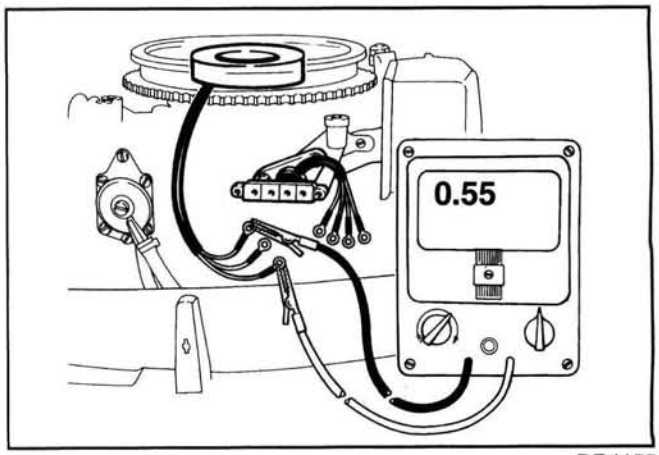
Calibrate ohmmeter on appropriate scale. Connect meter black lead to the stator yellow/blue lead.

Connect meter red lead to the stator yellow lead.

- Ohmmeter should show 0.55 ± 0.05 ohms.

Move the meter red lead to the stator yellow/gray lead.

- Ohmmeter should show 0.55 ± 0.05 ohms.

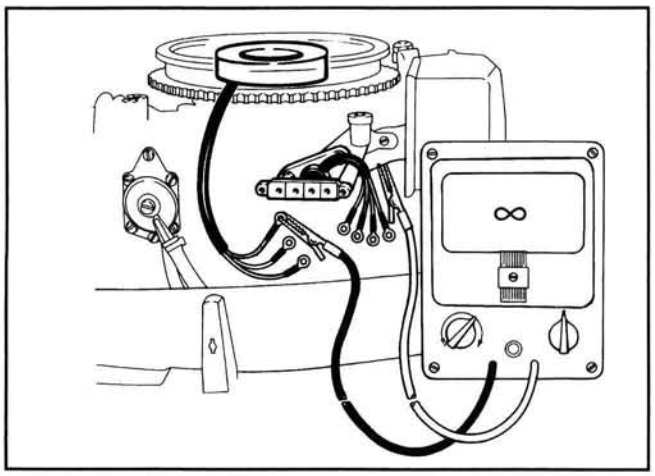


DR4155

To check stator for a grounded condition, connect one meter lead to a clean engine ground and the other lead alternately to the yellow/blue, yellow and yellow/gray stator leads:

- Ohmmeter should show a high reading.
- If ohmmeter shows a low reading, stator is grounded.

If a stator lead is grounded, repair it or replace the stator assembly.



DR4156

Rectifier Resistance Tests

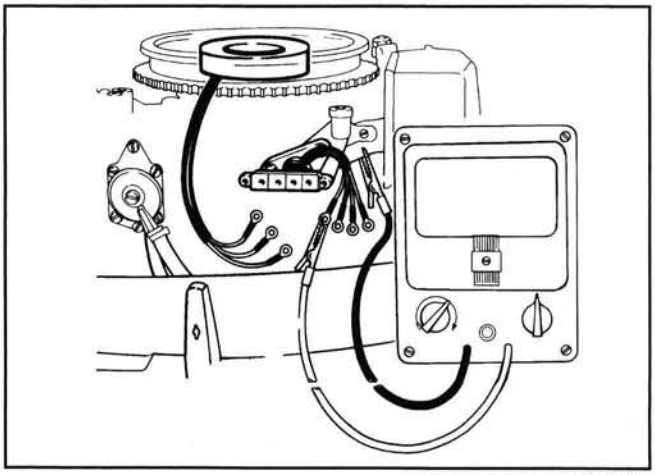
Disconnect battery cables at the battery.

STEP 1

Disconnect all rectifier leads from terminal board.

Calibrate ohmmeter on appropriate scale. Connect one lead to a clean engine ground. Connect the other lead to the rectifier yellow/gray lead. Note the reading. Reverse the ohmmeter connections or press the "reverse polarity" button and note the reading. Perform the same procedure on the yellow and yellow/blue rectifier leads. Note the readings.

- A high reading in one direction and a low reading in the other direction indicates the diode is OK.
- Two high readings or two low readings indicate the diode is damaged.



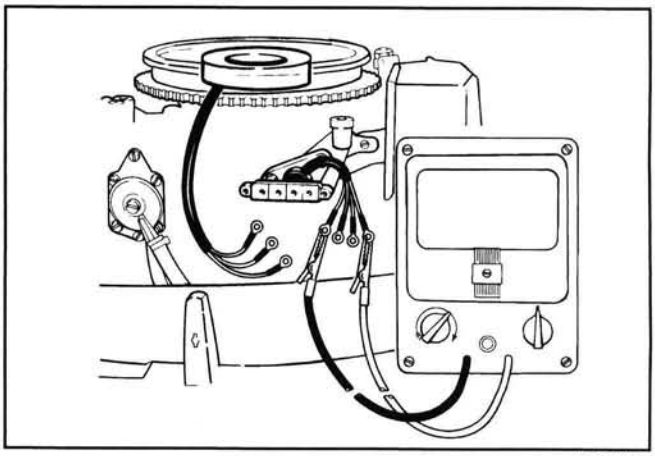
DR4157

STEP 2

Move ohmmeter lead from engine ground to rectifier red lead. Connect the other meter lead to the yellow/gray rectifier leads. Note the reading. Reverse the ohmmeter connections or press the "reverse polarity" button and note the reading. Perform the same procedure on the yellow and yellow/blue rectifier leads. Note the readings.

- A high reading in one direction and a low reading in the other direction indicates the diode is OK.
- Two high readings or two low readings indicate the diode is damaged.

Replace the rectifier if test results vary.



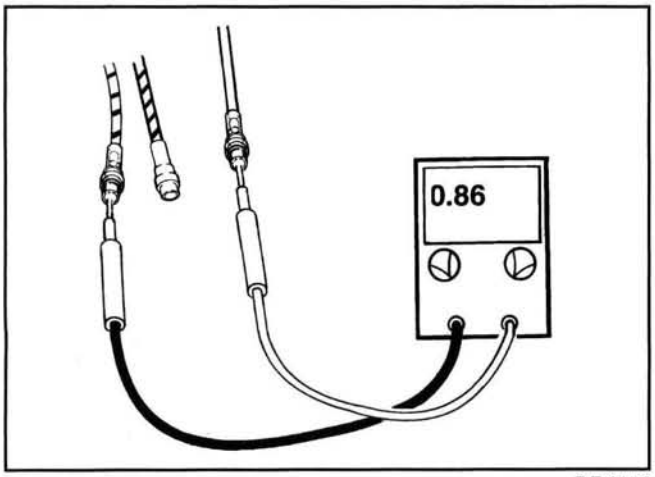
DR4158

AC Lighting Coil Resistance Tests

25/30 MODELS

Calibrate an ohmmeter on appropriate scale. Connect meter leads between yellow/gray and yellow stator leads.

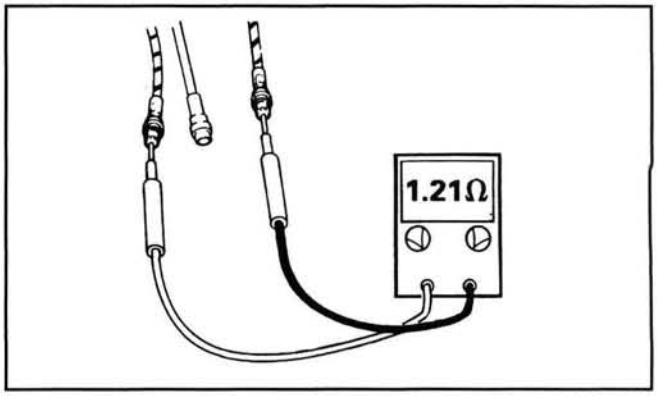
- Meter must show 0.86 ± 0.05 ohms.



DR4159

Connect meter leads between yellow/gray and yellow/blue stator leads.

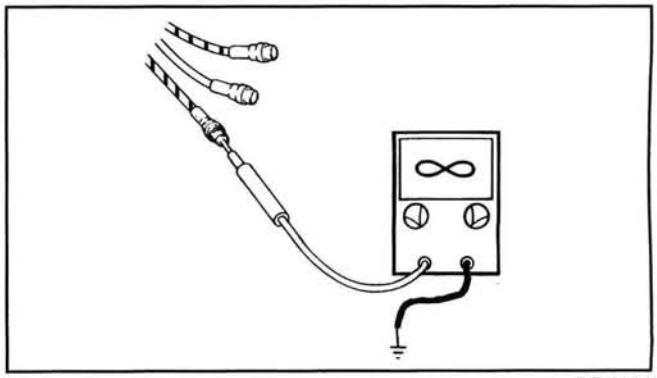
- Meter must show 1.21 ± 0.02 ohms.



DR4160

Calibrate ohmmeter on high ohms scale. Connect one lead to a clean engine ground. Probe each of the connector pins with the other ohmmeter jumper wire.

- The ohmmeter should show a high reading.
- If ohmmeter reading is low, repair the grounded coil lead or replace the stator assembly. Refer to **IGNITION PLATE SERVICING** on p. 130.



DR4161

TACHOMETER CIRCUIT TEST

IMPORTANT: The tachometer circuit is driven by the stator output. Before proceeding, check condition of the stator and do the **Stator Resistance Tests** on p. 86.

Inspect all engine and boat wiring and make sure connectors are in good condition.

Do the following tests if the tachometer does not operate.

STEP 1
Set peak-reading voltmeter to "POS" and "50." Check voltage at the battery.
- Use this reading as the reference for battery voltage.

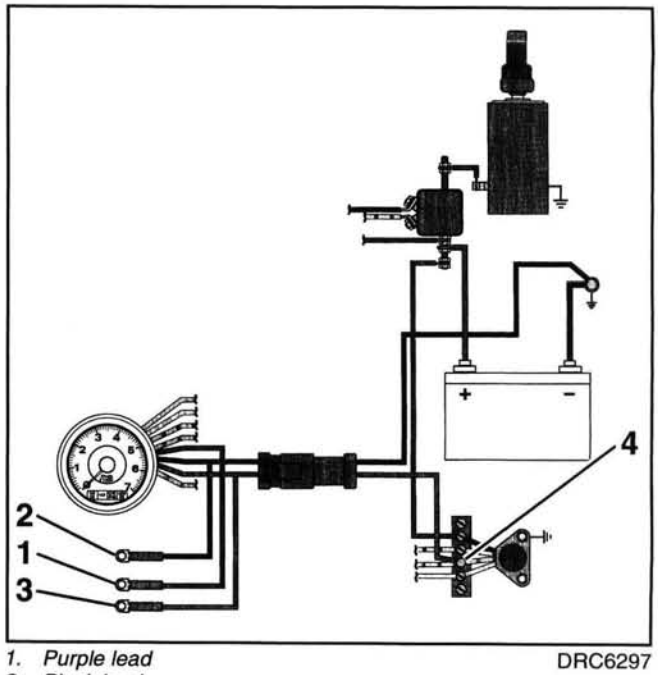
STEP 2
Check for battery voltage between the tachometer purple lead and black lead at the dash with the engine NOT running and the key switch ON.
- If the voltmeter shows battery voltage, go to **STEP 3.**
- If the voltmeter shows less than battery voltage, check the purple, purple/red, and black circuits engine fuse, key switch, and the battery connections.

STEP 3
With the engine NOT running and the key switch ON, check for battery voltage between the instrument harness gray lead and black lead at the dash.
- If voltmeter shows 0 V, go to **STEP 4.**
- If voltmeter shows any voltage replace rectifier.

STEP 4
With the engine running at 1000 RPM, check for voltage between the instrument harness gray lead and black lead at the dash.
- If voltmeter shows 0 V, go to **STEP 5.**
- If voltmeter shows more than 8 V, replace the tachometer.

STEP 5
With the engine running at 1000 RPM, check for voltage at the engine terminal board gray connection.
- If voltmeter shows 0 V, replace or repair the rectifier.

If the voltmeter shows 8 V or higher, check the instrument harness and engine harness gray circuit for an open.



1. *Purple lead*
2. *Black lead*
3. *Gray lead*
4. *Terminal board gray connection*

DRC6297

ELECTRIC STARTER TESTS

Start Switch Test

Disconnect the two starter switch leads.

Connect ohmmeter between switch leads. Activate switch. Meter must indicate resistance as follows:

- Low resistance reading when switch is pressed.
- High resistance reading when switch is released.

Replace the start switch if test results are not correct.

Start Circuit Voltage Test

⚠ WARNING ⚠

Avoid accidental starting while testing; disconnect the starter cable from the starter terminal.

IMPORTANT: Outboard must be in NEUTRAL throughout test procedure and battery must be fully charged.

9.9/15 MODELS

STEP 1

Connect voltmeter red lead to battery positive (+) terminal. Connect voltmeter black lead to battery negative (–) terminal. Check the battery voltage.

- If the voltmeter shows 12 V, go to **STEP 2**.
- If the voltmeter shows 0 V, test the battery.

STEP 2

Move the voltmeter black lead to the rectifier terminal ground. Check the voltage between battery positive (+) terminal and rectifier terminal ground.

- If the voltmeter shows 12 V, go to **STEP 3**.
- If the voltmeter shows 0 V, test the negative (–) battery cable.

STEP 3

Move the voltmeter red lead to the start switch connection. Check the voltage between the start switch connection and rectifier terminal.

- If the voltmeter shows 12 V, go to **STEP 4**.
- If the voltmeter shows 0 V, test the positive (+) battery cable.

STEP 4

Move the voltmeter black lead to powerhead ground. Check the voltage between the start switch connection and powerhead ground.

- If the voltmeter shows 12 V, go to **STEP 5**.
- If the voltmeter shows 0 V, clean and tighten the rectifier terminal screw.

STEP 5

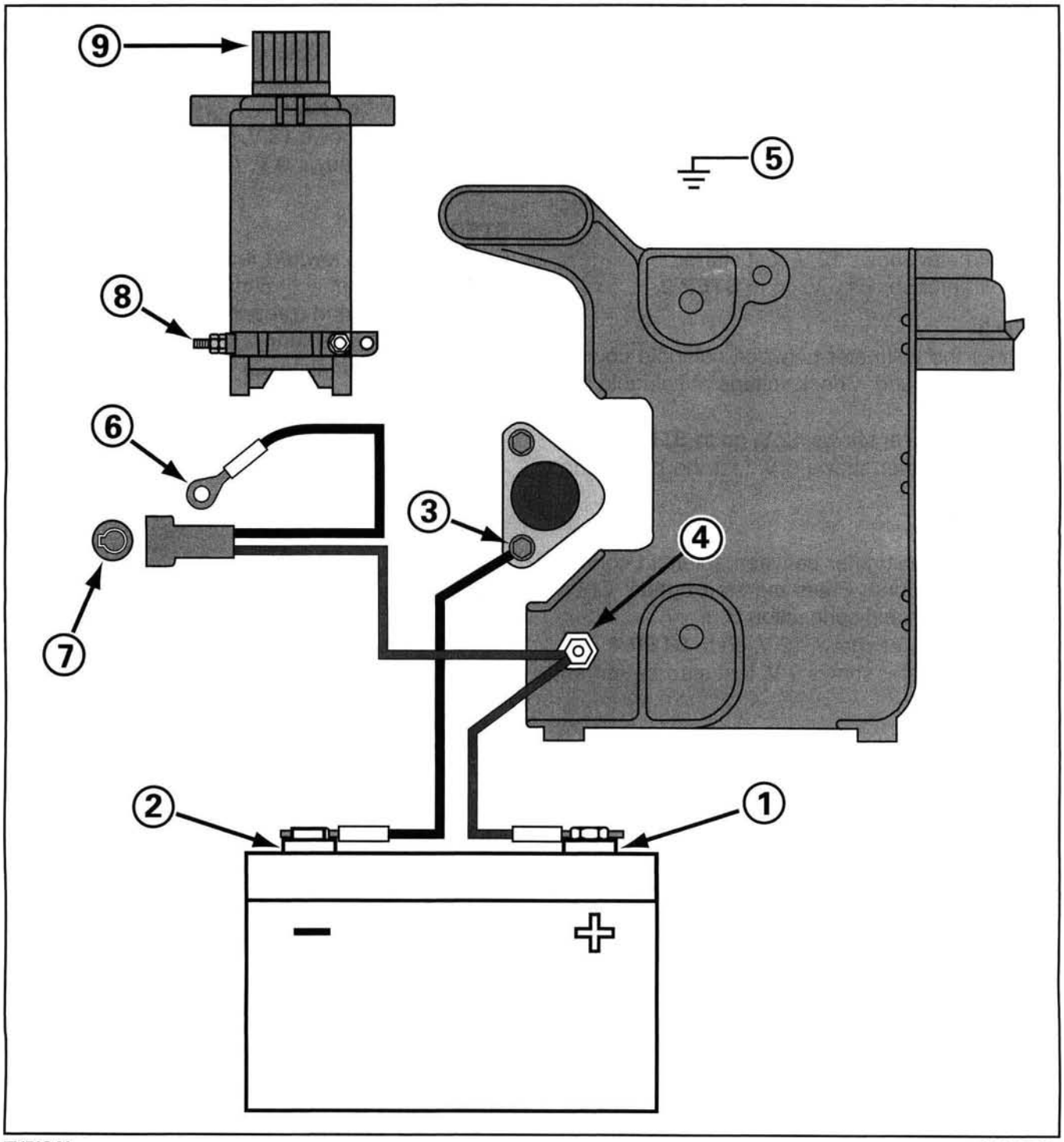
Move the voltmeter red lead to the start switch output lead. Push the start button. Check the voltage between the start switch output lead and powerhead ground.

- If the voltmeter shows 12 V, go to **STEP 6**.
- If the voltmeter shows 0 V, check the start switch, start switch wires and start switch connection.

STEP 6

Remove voltmeter red and black leads. Connect the start switch output lead to the starter terminal. Push the start button. Check for correct operation of the starter.

- If the starter runs, check the condition of the pinion.
- If the starter does not run, service the starter. Refer to **ELECTRIC STARTER SERVICING** on p. 100.



TYPICAL

DRC6305

1. *Battery positive (+)*
2. *Battery negative (-)*
3. *Rectifier terminal ground*
4. *Start switch connection*
5. *Powerhead ground*
6. *Start switch output lead*
7. *Start button*
8. *Starter terminal*
9. *Pinion*

TILLER ELECTRIC MODELS – 25

IMPORTANT: Engine must be in NEUTRAL throughout test procedure and battery must be fully charged.

STEP 1
Connect the voltmeter between cable at starter terminal and ground. Press start button. Check voltage to cable at starter terminal.

- If voltmeter shows 12 V, test starter.
- If voltmeter shows 0 V, go to **STEP 2**.

STEP 2
Connect the voltmeter between solenoid connection A and ground. Check voltage at solenoid connection A.

- If the voltmeter shows 12 V, go to **STEP 3**.
- If the voltmeter shows 0 V, test the battery and cables.

STEP 3
Connect the voltmeter between solenoid connection B and ground. Press the start button. Check voltage at solenoid connection B.

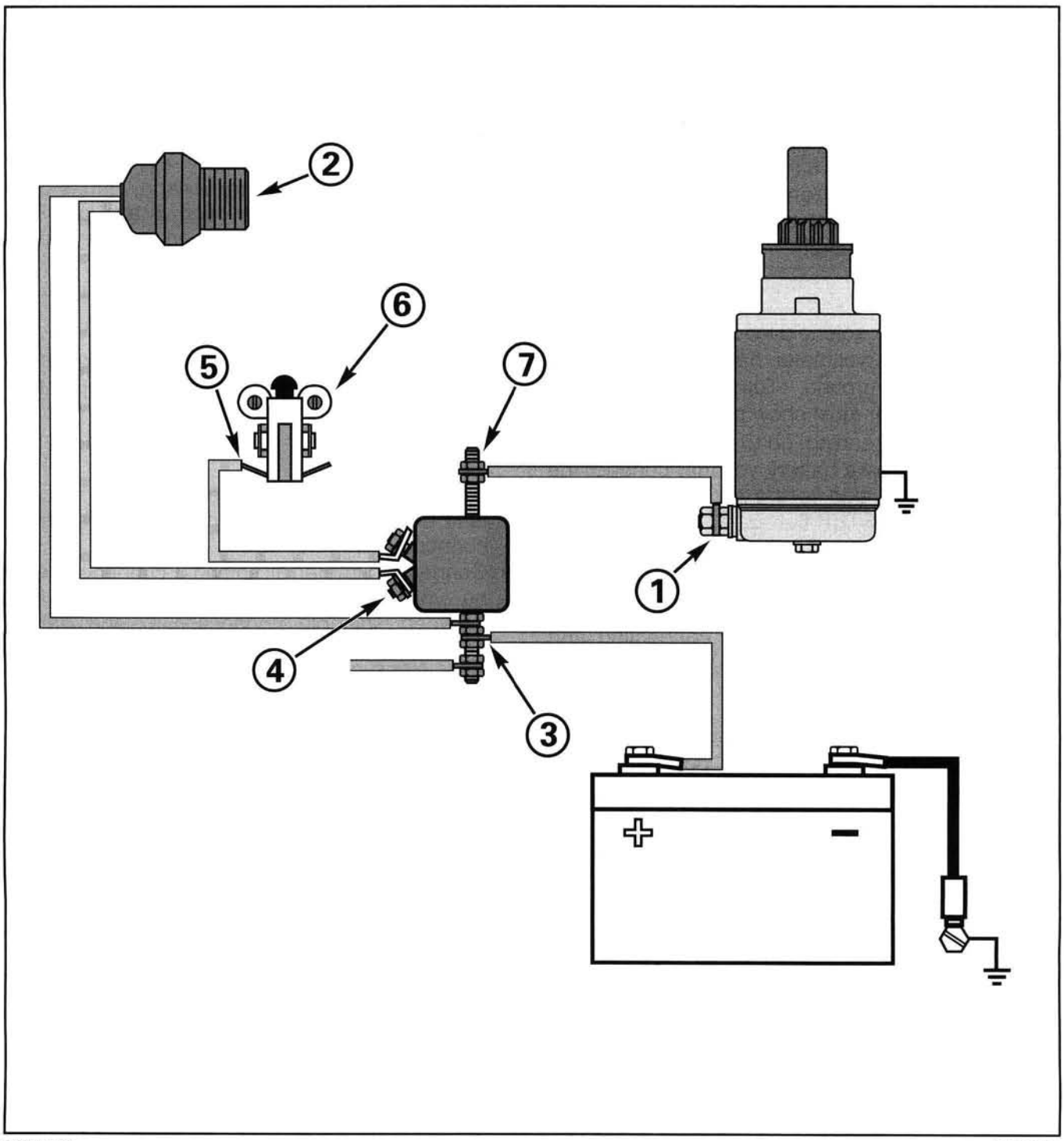
- If the voltmeter shows 12 V, go to **STEP 4**.
- If the voltmeter shows 0 V, test start button and wiring.

STEP 4
Disconnect the yellow/red lead from neutral start switch. Connect voltmeter between yellow/red lead and ground. Press start button. Check voltage at yellow/red lead.

- If voltmeter shows 12 V, go to **STEP 5**.
- If voltmeter shows 0 V, replace solenoid or yellow/red lead.

STEP 5
Connect the yellow/red lead back to the neutral start switch. Connect voltmeter between solenoid connection C and ground. Press start button. Check voltage at solenoid connection C.

- If the voltmeter shows 0 V, replace solenoid.
- If voltmeter shows 12 V, replace starter cable.



TYPICAL DR6187

1. *Starter terminal*
2. *Start button*
3. *Solenoid connection A*
4. *Solenoid connection B*
5. *Yellow/red lead*
6. *Neutral start switch*
7. *Solenoid connection C*

REMOTE MODELS – 25/30

IMPORTANT: Battery must be fully charged.

⚠ WARNING ⚠

While performing STEPS 1 through 6, remove the cable from the starter to the solenoid to prevent starter engagement while making checks.

STEP 1
Remove the black solenoid lead from ground connection. Connect voltmeter between black solenoid lead and ground. Turn key to START position. Voltmeter must show battery voltage.

- If no voltmeter reading, go to **STEP 2**.
- If voltmeter shows battery voltage, connect the black solenoid lead to the ground connection point and go to **STEP 6**.

STEP 2

IMPORTANT: While performing STEPS 2 through 6 turn key OFF before connecting and disconnecting voltmeter. Turn key to START after connecting voltmeter.

Connect voltmeter between solenoid connection A and ground. Turn key to START position. Check voltage between solenoid connection A and ground.

- If voltmeter shows battery voltage, lead is open between black solenoid lead and solenoid connection A.
- If no voltmeter reading, go to **STEP 3**.

STEP 3
Connect voltmeter between solenoid connection B and ground. Turn key to START position. Check voltage between solenoid connection B and ground.

- If voltmeter reads battery voltage, solenoid is faulty.
- If no voltmeter reading, go to **STEP 4**.

IMPORTANT: Remote control must be in NEUTRAL for neutral safety switch to be closed.

STEP 4
Connect voltmeter between key switch connector pin S and ground. Turn key to START position. Check voltage between pin S and ground.

- If voltmeter shows battery voltage, lead is open between solenoid connection B and pin S or neutral start switch is open or improperly adjusted.
- If no voltmeter reading go to **STEP 5**.

STEP 5
Connect voltmeter between key switch connector pin B and ground. Turn key to OFF position. Check voltage between pin B and ground.

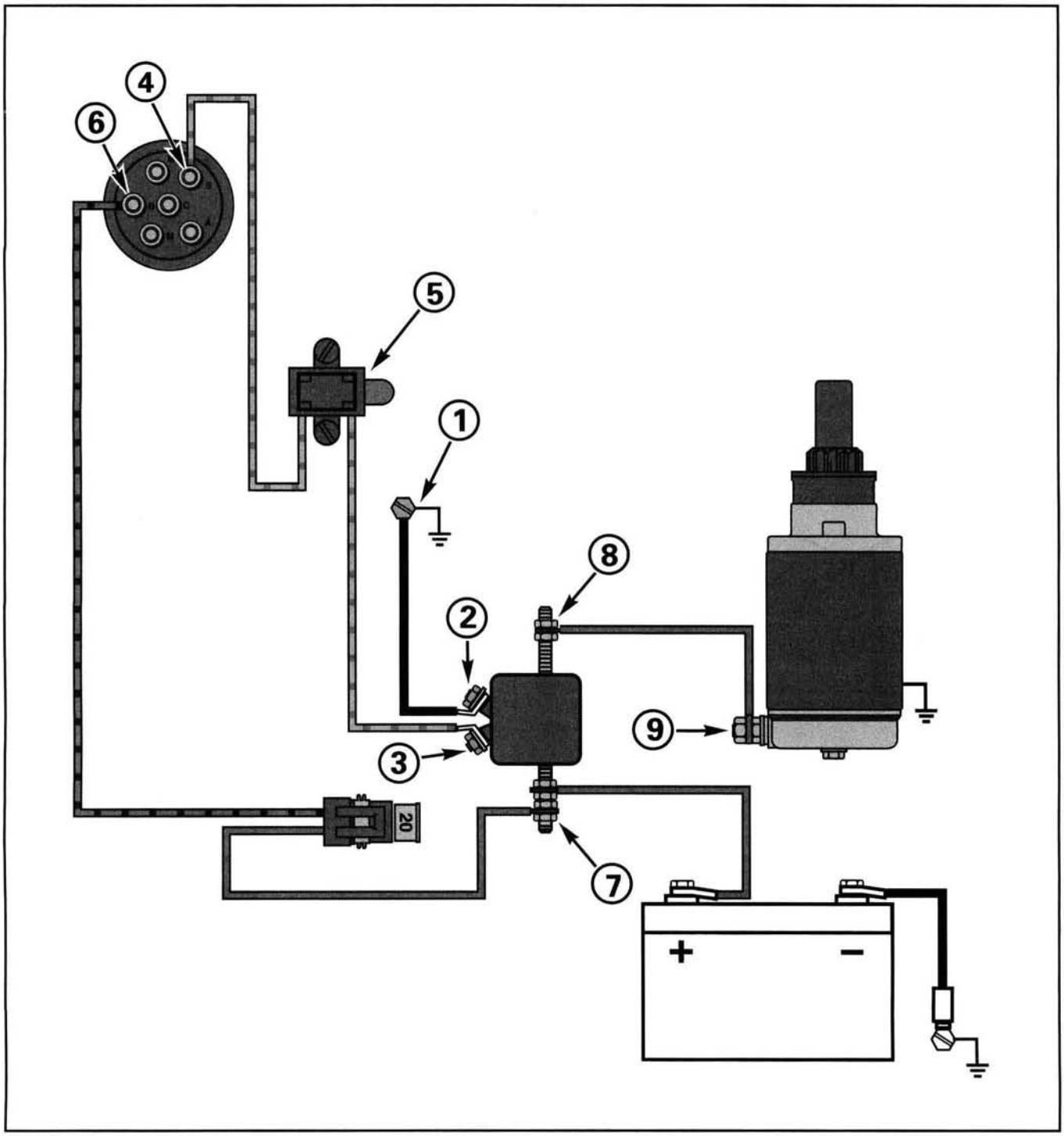
- If voltmeter shows battery voltage, check key switch.
- If no voltmeter reading at pin B, check for open lead or open fuse between pin B and solenoid connection C.
- Connect voltmeter at solenoid connection C. If no voltmeter reading, check for open lead between solenoid connection C and battery positive (+) terminal. If voltmeter shows voltage, go to **STEP 7**.

STEP 6
Connect voltmeter between solenoid connection D and ground. Turn key to START position. Check voltage between solenoid connection D and ground.

- If no voltmeter reading, solenoid is faulty.
- If solenoid clicks and voltmeter shows battery voltage, go to **STEP 7**.

STEP 7
Connect the cable from starter to solenoid connection D. Connect voltmeter between starter terminal and ground. Turn key to START position.

- If voltmeter shows battery voltage and starter does not turn, check starter motor.
- If no voltmeter reading, check for broken cable or poor connection.



TYPICAL DRC6183

1. *Black solenoid lead*
2. *Solenoid connection A*
3. *Solenoid connection B*
4. *Key switch connector pin S*
5. *Neutral start switch*
6. *Key switch connector pin B*
7. *Solenoid connection C*
8. *Solenoid connection D*
9. *Starter terminal*

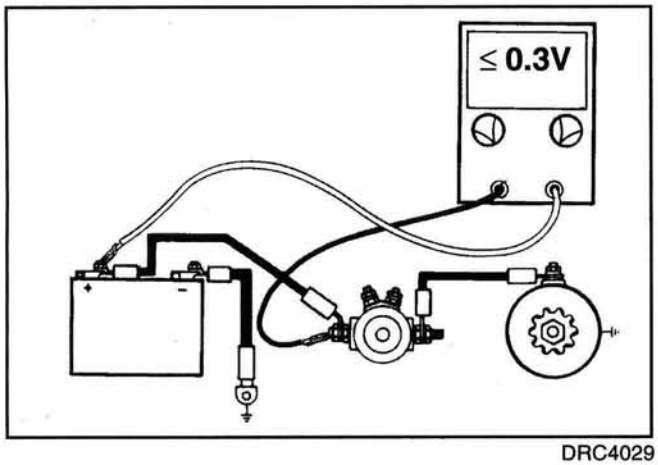
Voltage Drop Tests

WARNING

Avoid accidental starting while testing; twist and remove all spark plug leads.

STEP 1
Connect voltmeter positive (+) lead to battery positive (+) post. Connect voltmeter negative (–) lead to starter solenoid positive (+) terminal. Turn key switch to START to crank engine.

- Voltage reading must not be more than 0.3 volt.



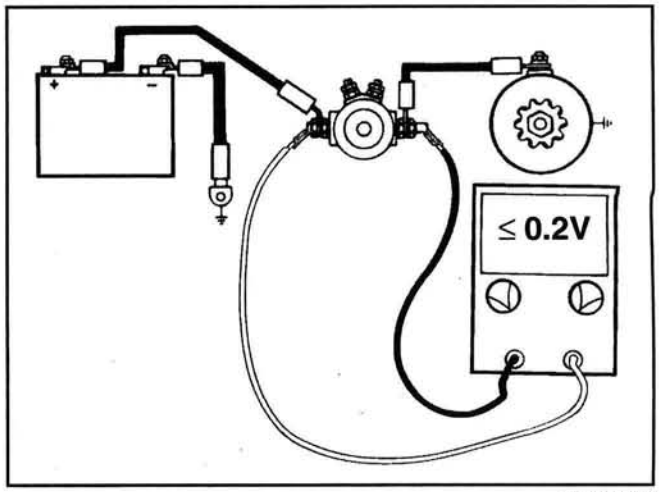
DRC4029

IMPORTANT: In **STEP 2**, connect the voltmeter leads only while the engine is cranking, or damage to the voltmeter can occur.

STEP 2
Connect voltmeter negative (–) lead to the starter side of the starter solenoid terminal. While cranking engine, connect voltmeter positive (+) lead to starter solenoid opposite terminal.

- Voltage reading must not be more than 0.2 V.

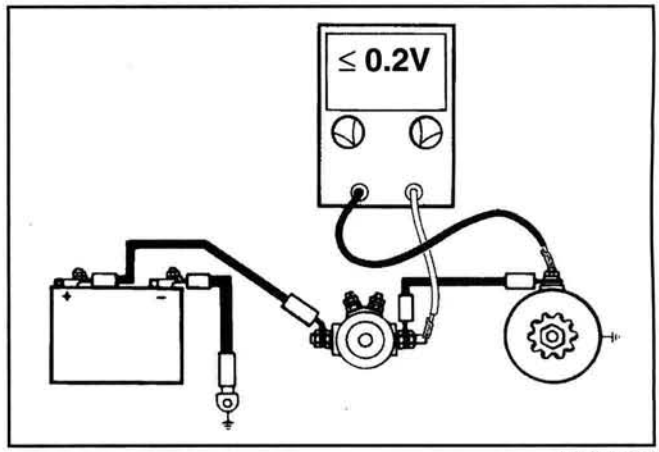
Remove voltmeter positive (+) lead from starter solenoid and stop cranking engine.



DRC4030

STEP 3
Connect voltmeter positive (+) lead to starter solenoid, starter lead terminal. Connect voltmeter negative (–) lead to starter motor terminal. Turn key switch to START.

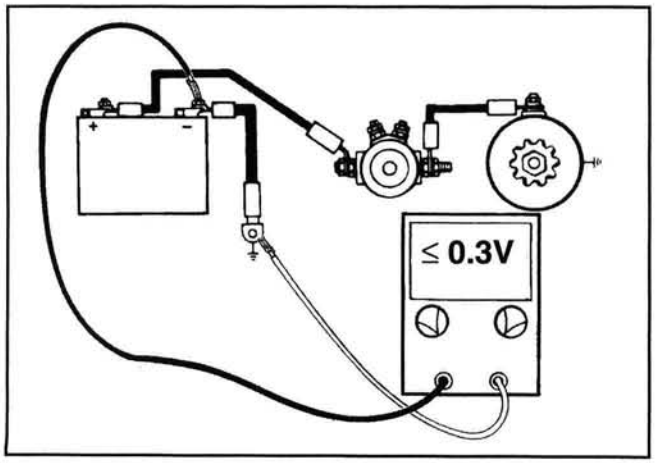
- Voltage reading must not be more than 0.2 V.



DRC4031

STEP 4
Connect voltmeter positive (+) lead to battery negative (–) lead common powerhead ground screw. Connect voltmeter negative (–) lead to battery negative (–) post. Turn key switch to START.

- Voltage reading must not be more than 0.3 volt.



DRC4032

STEP 5
Clean and tighten, or replace, any connection, cable, or other component that does not meet the specified values.

Starter Solenoid Test

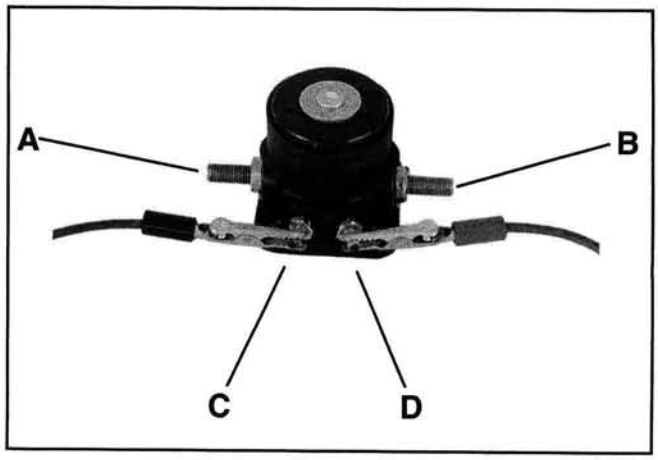
IMPORTANT: All engine wiring must be disconnected from the solenoid before proceeding.

STEP 1
Connect one ohmmeter lead to terminal (A) and the other lead to terminal (B).

- Ohmmeter must show a high reading.
- If ohmmeter shows a low reading, replace the solenoid.

STEP 2
With the ohmmeter still connected, attach a positive (+) battery jumper to terminal (C) and a negative (–) battery jumper to terminal (D). The solenoid should close with an audible click.

- Ohmmeter must show a low reading.
- If ohmmeter shows a high reading, replace the solenoid.



24082

After installing the solenoid, coat all wires and terminals with *Black Neoprene Dip*.

No Load Current Draw Test

IMPORTANT: Put the starter in a vise or suitable fixture and make sure it is tight before proceeding with this check.

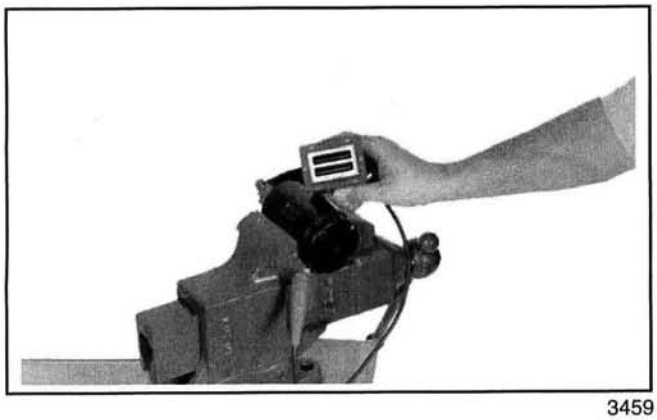
Use a battery rated at 350 CCA or higher that is in good condition and fully charged.

Connect a 0 to 50 amp ammeter in series with a heavy jumper between the battery positive (+) terminal and the starter positive (+) terminal.

Fluke model 334 or 336, *Snap-On* model MT110 or EETA501, and various other ammeters should be available through your local tool suppliers.

Attach or hold a vibration tachometer, such as a *Frahm Reed* tachometer, to the starter.

Complete the circuit with a heavy jumper between the battery negative (–) terminal and the starter frame.



3459

Monitor the starter RPM and current draw and refer to the chart below for the correct specifications.

No Load Current Draw Specifications

Model	Voltage	Amps (Maximum)	RPM
9.9/15	12 to 12.4	7	7000 to 9200
25/30	12 to 12.4	30	6500 to 7500

IMPORTANT: When performing this test, the driven gear and pinion assembly must be removed.

WATER TEMPERATURE SWITCH TEST

A heat sensitive temperature switch is installed in the cylinder head. The switch is connected in series with the warning system. If the switch senses a temperature in excess of a predetermined limit, the contacts close and *S.L.O.W.* is initiated. On models with a *System Check* gauge, the "WATER TEMP" light goes on and the warning horn sounds for ten seconds.

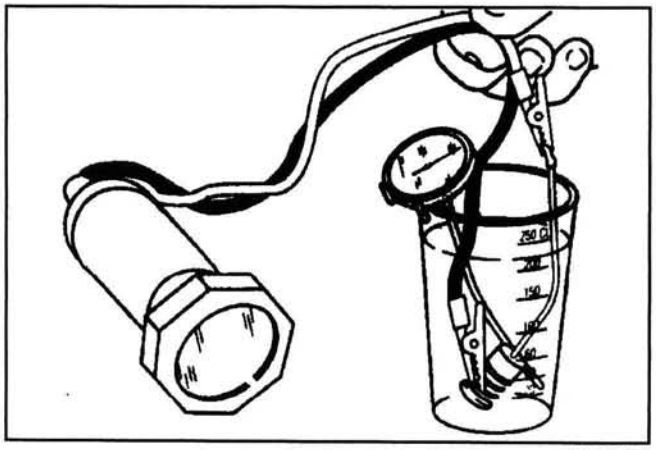
⚠ WARNING ⚠

To avoid possible fire or explosion, use a suitable container for the oil, DO NOT use open flame as a heat source, and use an oil that has a flashpoint above 300°F (150°C), such as a 4-cycle motor oil.

Separate the connector and remove the temperature switch from the cylinder head.

Using a continuity light or ohmmeter, make positive connections to the switch — one lead to the switch lead and one lead to the metal portion of the switch.

Place the switch and an accurate industrial thermometer in warm automotive crankcase oil. Slowly increase the oil temperature using an external heat source.



DR5984

The temperature switch must function as follows:

Wire Color	Switch Closed	Switch Open
Tan/Red	180°F (82°C)	155°F (68°C)

Replace the switch if test results vary.

ELECTRIC STARTER SERVICING

Removal

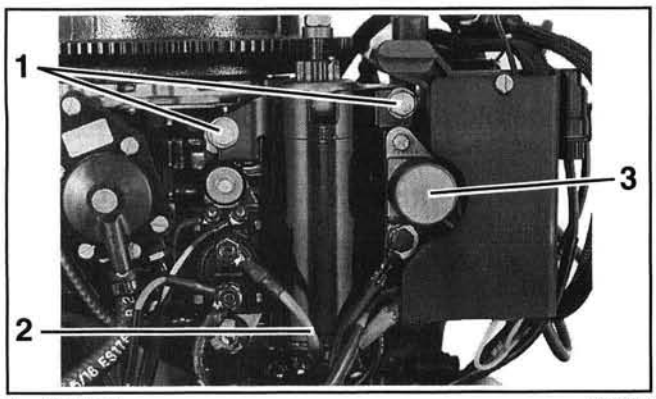
9.9/15 MODELS

IMPORTANT: Disconnect the battery cables at the battery.

Remove the two retaining screws.

Disconnect the starter lead at the terminal on the bottom of the starter.

Remove rectifier from the starter bracket.



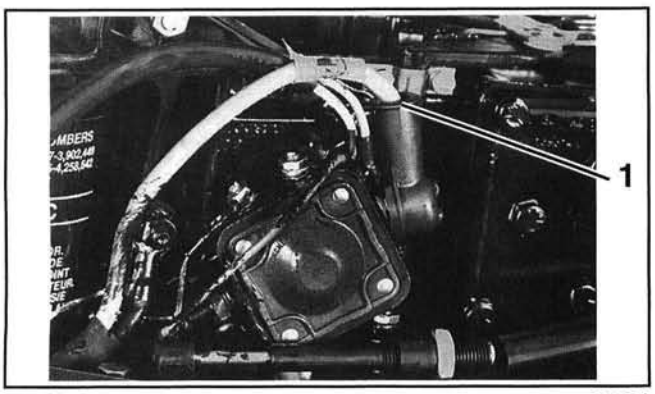
1. *Screws* 32987
2. *Starter lead at terminal*
3. *Rectifier*

25/30 MODELS

IMPORTANT: Disconnect the battery cables at the battery.

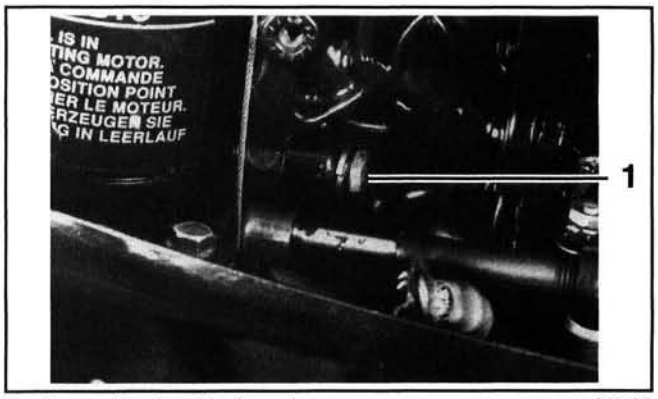
Disconnect all the leads from the starter solenoid.

Remove the vertical throttle shaft clamp screws and clamp.



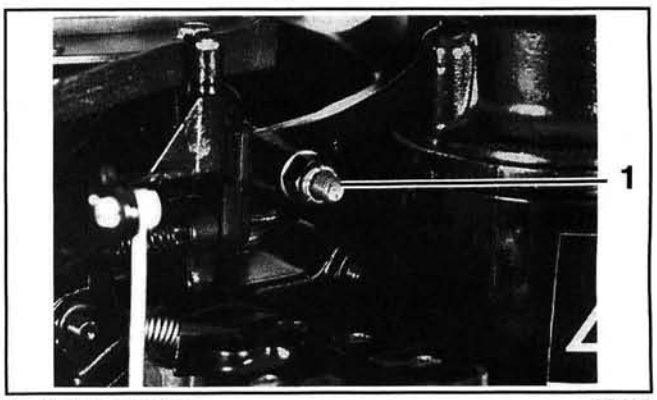
1. *Clamp* 30721

Remove the screws and washers retaining the starter bracket to the side of the powerhead. Note that the ground lead attaches to the lower screw and has a lock washer.



1. *Ground lead and lock washer* 30719

Remove the nut and washer retaining the starter bracket to the front of the powerhead. Lift the starter bracket from the powerhead.



1. *Nut and washer* 30720

Remove the red lead from the starter motor.

Disassembly

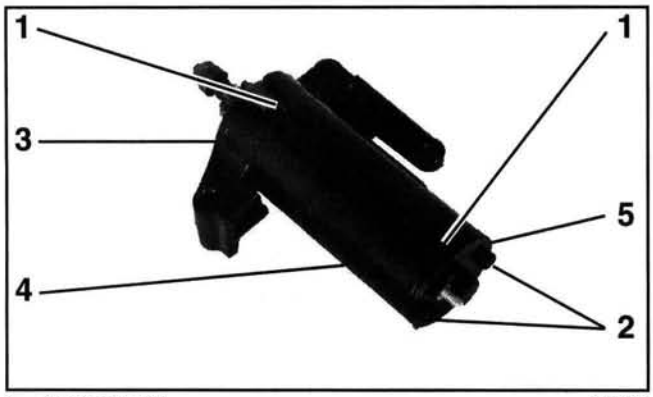
9.9/15 MODELS

IMPORTANT: Before disassembly, scribe marks on starter frame for reference during reassembly.

Remove the two bolts.

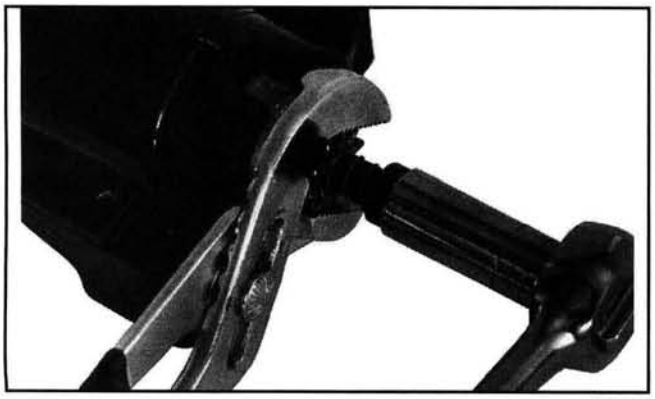
Remove the drive end cap and the armature from the frame and magnet assembly.

Remove the brush end cap from the frame and magnet assembly.

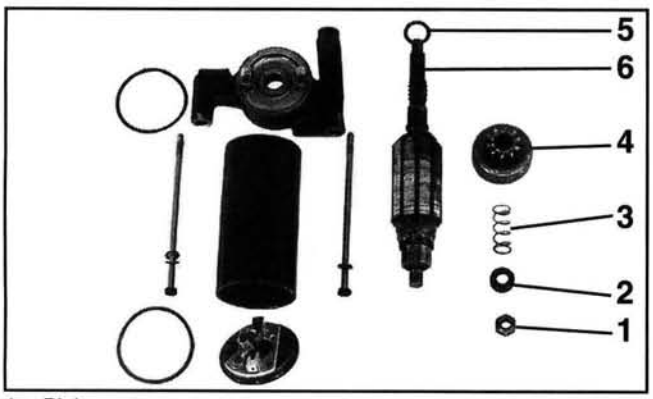


1. *Scribe marks* 32986
2. *Bolts*
3. *Drive end cap*
4. *Frame*
5. *Brush end cap*

Remove the pinion nut, spacer, spring, pinion, and washer from the armature.



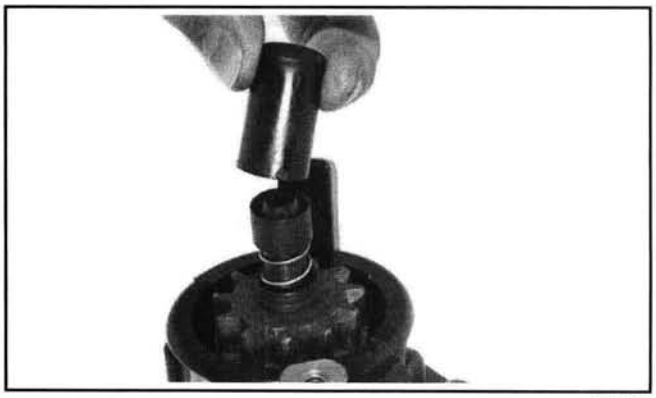
32985



1. *Pinion nut* 32983
2. *Spacer*
3. *Spring*
4. *Pinion*
5. *Washer*
6. *Armature*

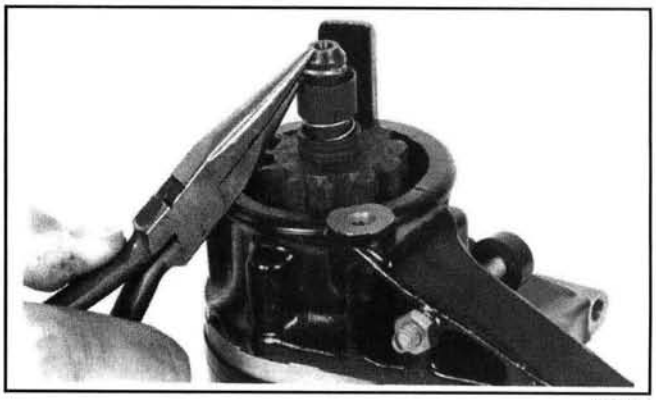
25/30 MODELS

Gently pry bottom of protective cap from groove on spacer and remove cap.



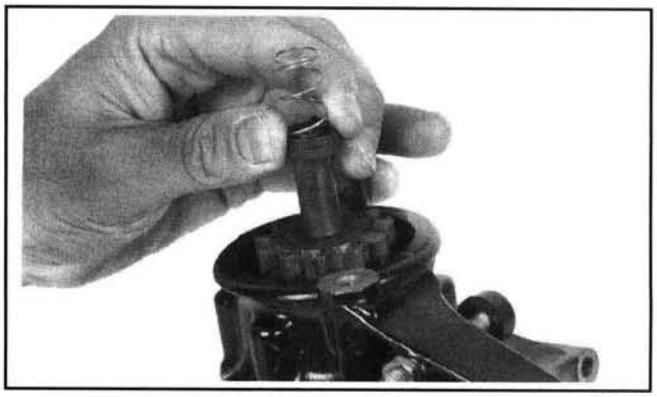
38523

Pull cup down on armature shaft to expose retaining ring. Remove ring using Retaining Ring Pliers. Remove cup.



38524

Remove spring and spacer.

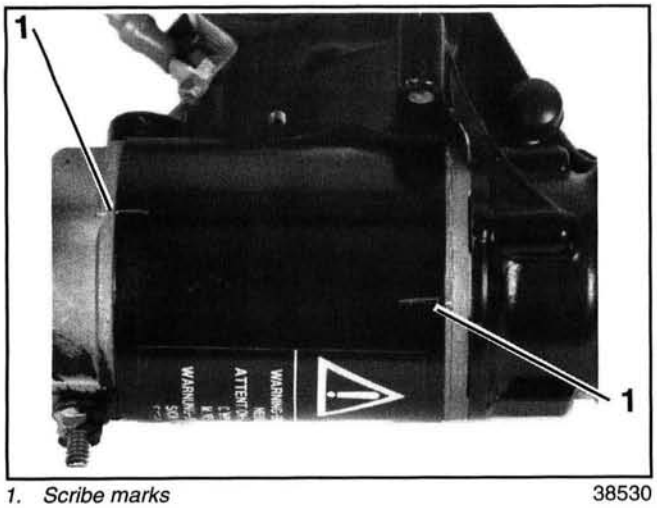


38526

Remove pinion and base.

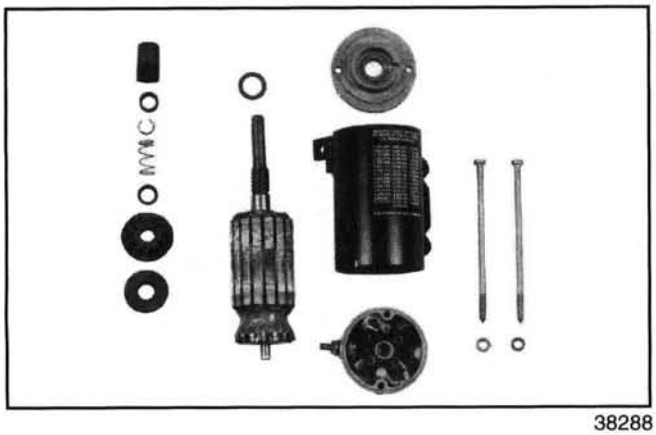
38527

IMPORTANT: Before disassembly, scribe marks on frame and end caps for reference during reassembly.



1. Scribe marks 38530

Remove the two thru-bolts and separate components.

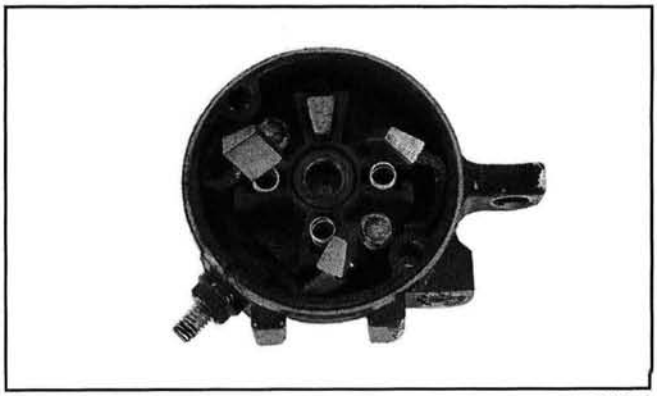


38288

Cleaning and Inspection

ALL MODELS

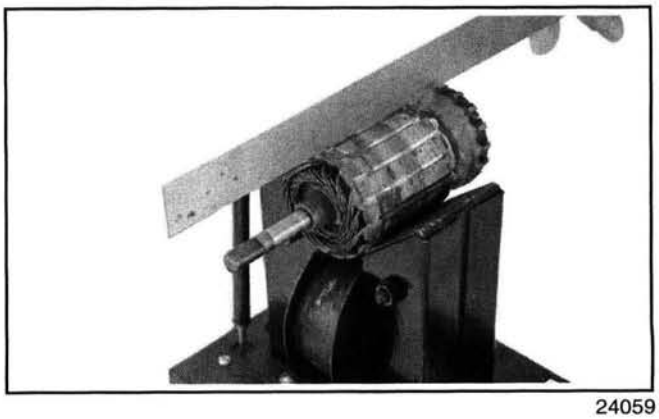
Inspect the brushes for wear and damage. Replace brushes if damaged or worn. Replace weak brush springs.



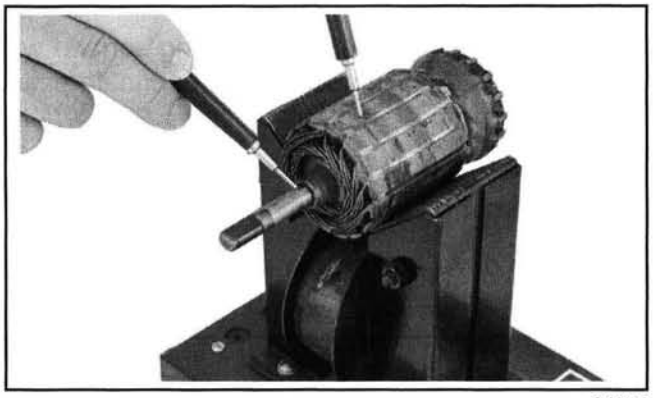
24056

Clean commutator with 300-grade emery cloth. If commutator surface is unevenly worn or pitted, turn on a lathe. Remove any trace of oil or metal dust from commutator.

Check the armature on a growler for shorted turns using a test light or meter. Inspect armature insulation for indications of overheating or damaged windings. Clean off any carbon deposits or foreign matter which could contribute to failure of windings.

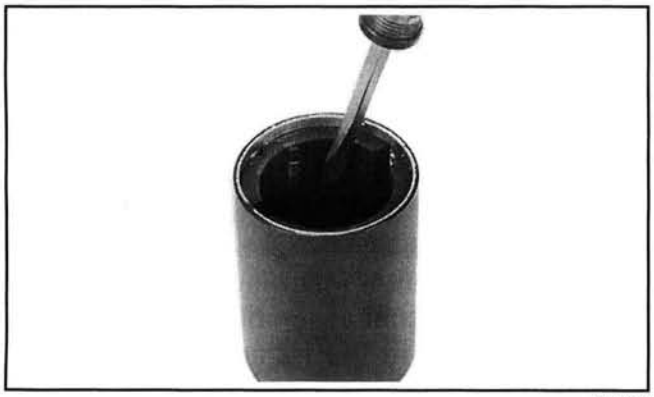


24059



24058

Check permanent magnets and make sure they strongly attract any steel or iron object held inside frame. Weak magnets could cause excessive RPM on **No Load Current Draw Test** on p. 98.



24057

Do not clean drive assembly while the starter and drive are installed. The cleaning agent could drain into the starter, washing dirt from the drive into the bearings and commutator. After disassembling, clean each part with a grease solvent and inspect.

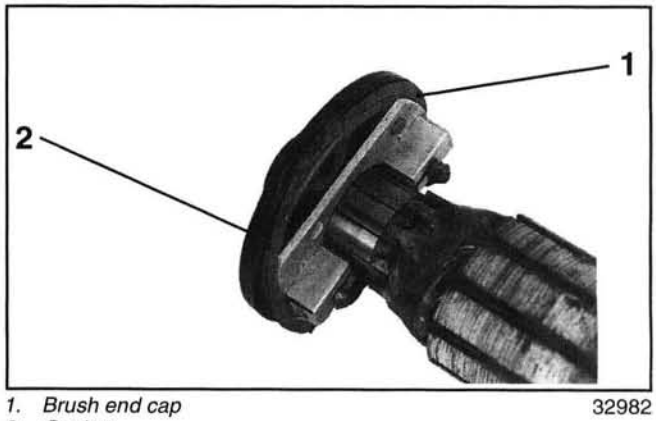
If the pinion does not properly engage the flywheel, the pinion and screw shaft assembly may be worn, distorted, or dirty. Locate the cause of binding and correct it before completing the assembly.

Assembly

9.9/15 Models

Lubricate the armature shaft bearing surface with *Moly Lube*. Lubricate the armature shaft on and above the pinion helix with *Starter Pinion Lube*, P/N 337016.

Assemble the brush end cap with brushes and springs to the armature shaft. Place a new gasket on the brush end cap.



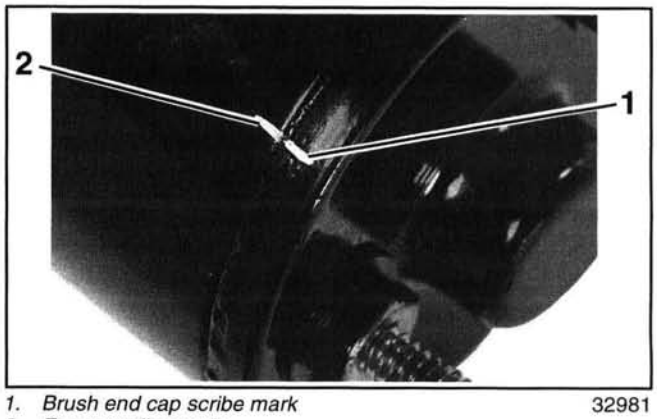
1. *Brush end cap*
2. *Gasket*

32982

WARNING

Use caution when inserting armature into frame and magnet assembly as the permanent magnets in the frame exert extreme pulling force on the armature which could result in pinched fingers.

Align the brush end cap mark with the mark on the frame and magnet assembly. Assemble the brush end cap to the frame and magnet assembly.



1. *Brush end cap scribe mark*
2. *Frame scribe mark*

32981

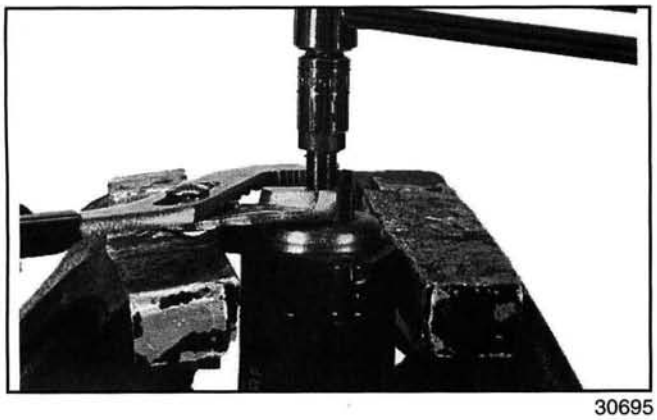
Place the washer on the armature shaft. Place a new gasket on the drive end cap.

Align the drive end cap mark with the mark on the frame and magnet assembly. Assemble the drive end cap to the frame and magnet assembly.

32980

Put a drop of oil on the two thru-bolts and install the thru-bolts. Tighten the thru-bolts and torque 30 to 40 in. lbs. (3.4 to 4.6 N·m). Apply *Black Neoprene Dip* to the seams between the end caps and frame and magnet assembly.

Assemble the pinion, spring, spacer, and nut to the armature shaft. Tighten the nut and torque 150 to 170 in. lbs. (17 to 19 N·m).



30695

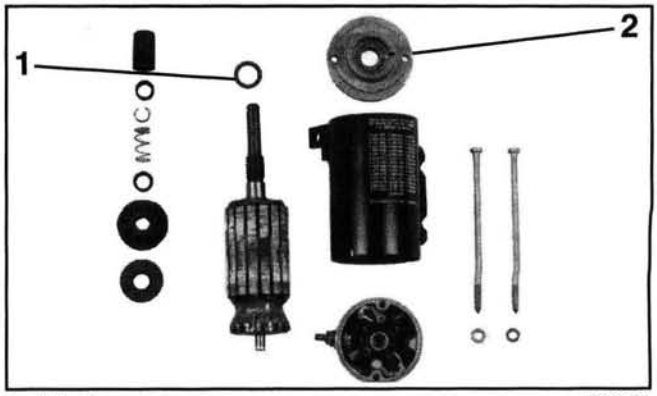
Refer to **No Load Current Draw Test** on p. 98 to check starter operation.

25/30 MODELS

Lubricate the armature shaft bearing surface with one drop of SAE Number 10 oil. Lubricate pinion helix on armature shaft with *Starter Pinion Lube*, P/N 337016.

Install washer on drive end of armature shaft.

Assemble drive end cap to drive end of armature shaft.



1. *Washer*
2. *Drive end cap*

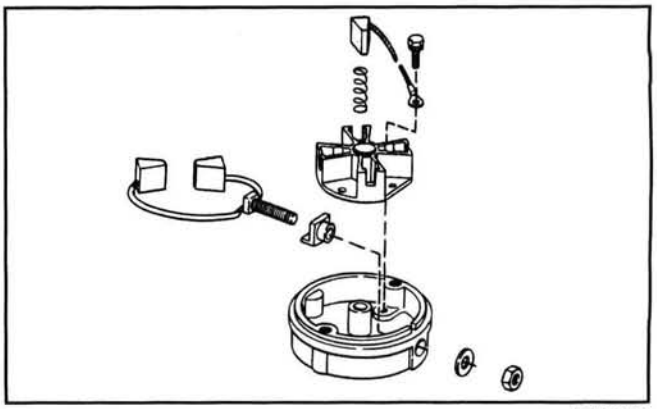
38288

WARNING

Use caution when inserting armature into frame and magnet assembly as the permanent magnets in the frame exert extreme pulling force on the armature which could result in pinched fingers.

Assemble armature to frame and magnet assembly, aligning marks on drive end cap and frame.

Install insulated brush and terminal set in commutator end cap with long lead in slot. Position the insulators and nut as shown in figure.



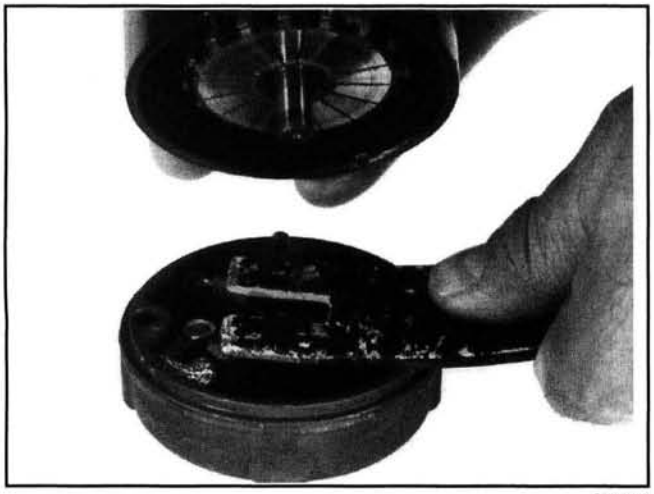
DR5446

IMPORTANT: Reversing these brushes will cause starter motor to run backwards.

Install brush holder, brush springs, and ground brushes. Screws secure ground brush leads and holder. Insert insulated brushes in holder.

30716

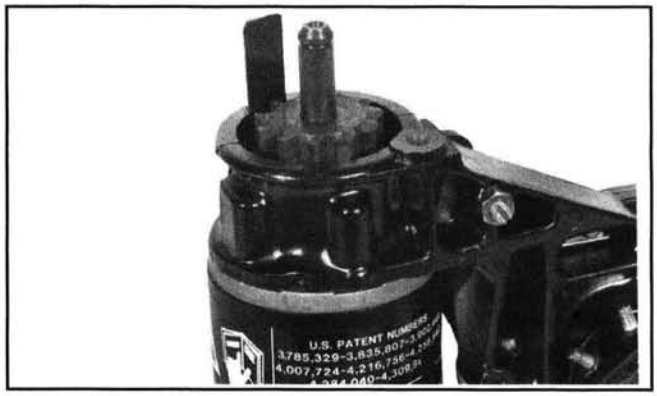
Assemble end cap to frame and field, aligning notch and rib. A suitable tool for holding brushes in place can be made from a putty knife.



37154

Put a drop of oil on thru-bolts before assembling starter motor. Install thru-bolts. Torque thru-bolts 95 to 100 in. lbs. (11 to 12 N·m). Seal with *Black Neoprene Dip.*

Install pinion base and pinion on armature shaft.



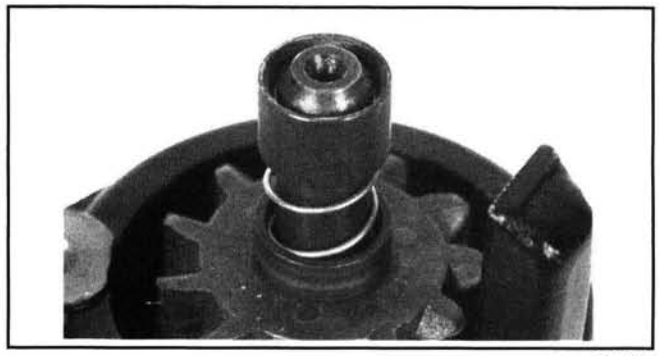
38531

Install spacer and spring on armature shaft.

38532

Install cup on armature shaft. Press cup down on spring and install retaining ring in groove on armature shaft.

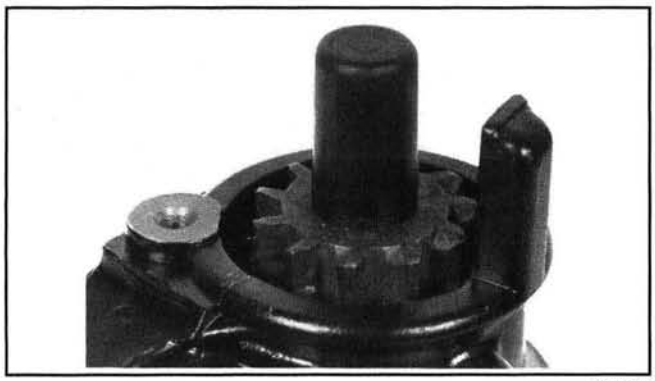
Pull cup up over retaining ring and make sure ring seats in shaft groove and cup groove to allow full bendix travel.



38533

If cup will not pull up over ring, use a screwdriver or similar tool to compress ring and pry cup up over ring.

Install protective cap over armature shaft and spacer.



38534

Refer to **No Load Current Draw Test** on p. 98 to check starter operation.

Installation

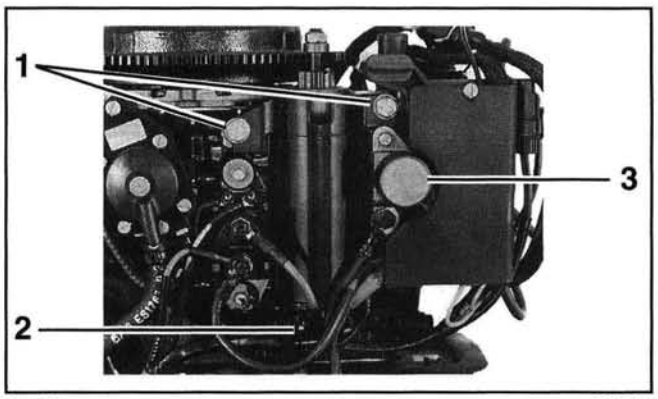
9.9/15 Models

Install the starter on the bypass cover. The electric starter motor must be held firmly against the bracket while bolting it to the bypass cover. Tighten screws and torque 10 to 12 ft. lbs. (14 to 16 N·m).

Install the starter lead to the starter. Tighten the nut securely. Apply *Black Neoprene Dip* to connection.

IMPORTANT: When tightening the terminal nut, make sure the starter lead and terminal does not turn into a position where the lead and terminal could contact the starter or lower engine cover.

Attach rectifier and two black wires to starter bracket.

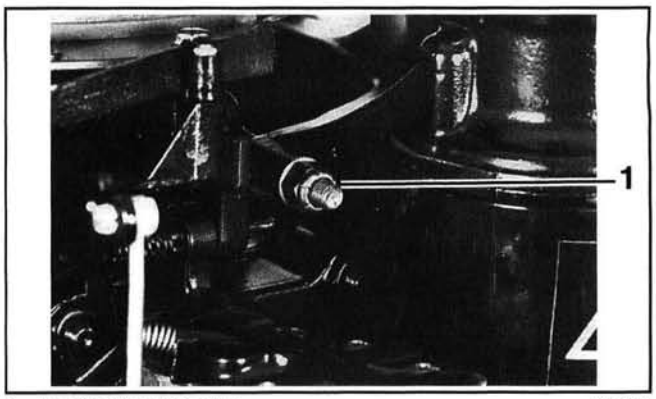


1. *Screws* 32987
2. *Starter lead at terminal*
3. *Rectifier*

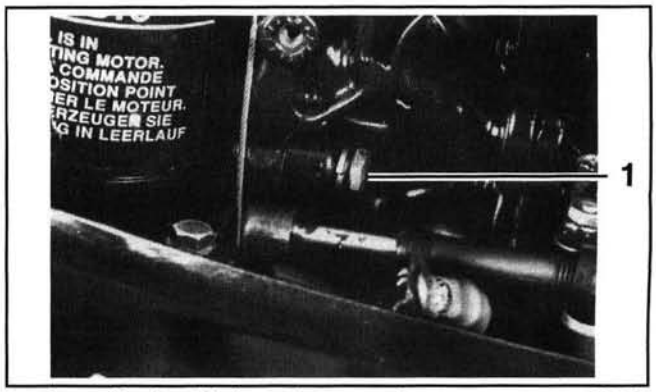
Reconnect the battery cables at the battery.

25/30 Models

Position the starter bracket on the powerhead. Secure the starter bracket using the two screws with washers and the locknut with washer. Be sure to install the ground lead and lock washers on the lower screw. Tighten the screws and locknut 60 to 84 in. lbs. (7 to 9 N·m).

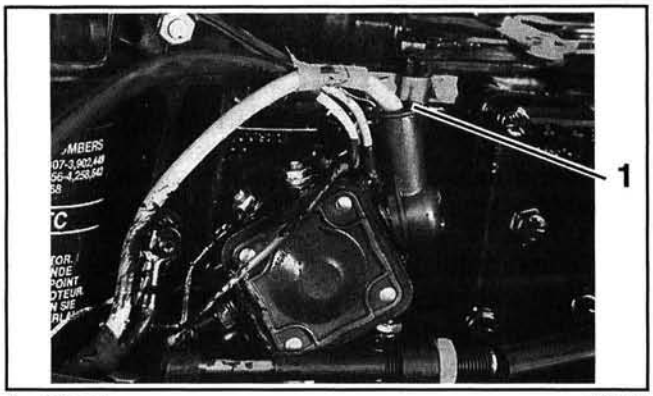


1. *Lock nut and washer* 30720



1. *Ground lead and lock washer connection* 30719

Attach the vertical throttle shaft to the powerhead with the clamp and two screws.



1. Clamp 30721

Secure all the solenoid leads to the solenoid. Apply *Black Neoprene Dip* to all connections except the battery (+) cable and terminal.

Reconnect the battery cables at the battery.

ACCESSORY COMPONENTS

9.9/15 MODELS

General

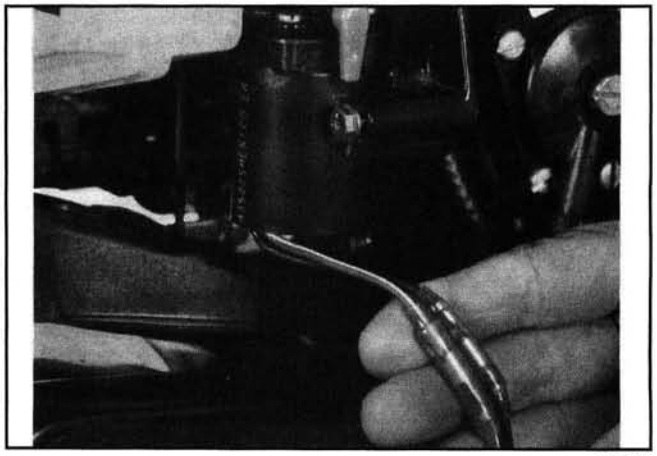
Use these procedures if it is necessary to remove any of the following accessory components:

- Primer
- Solenoid
- Rectifier
- Electrical bracket

IMPORTANT: Disconnect battery cables at the battery.

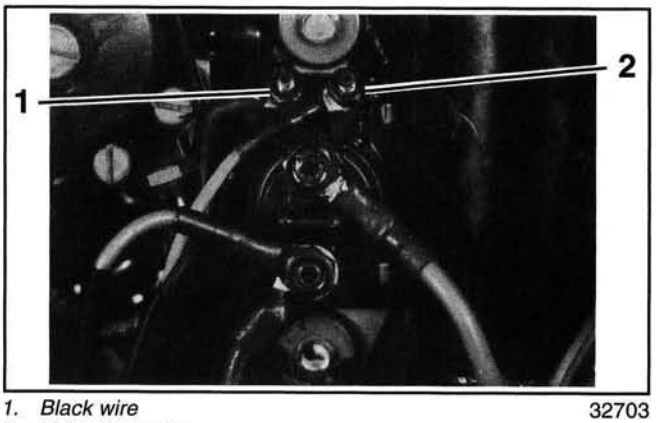
Removal

Disconnect the black and purple/white wires and remove the primer.



32704

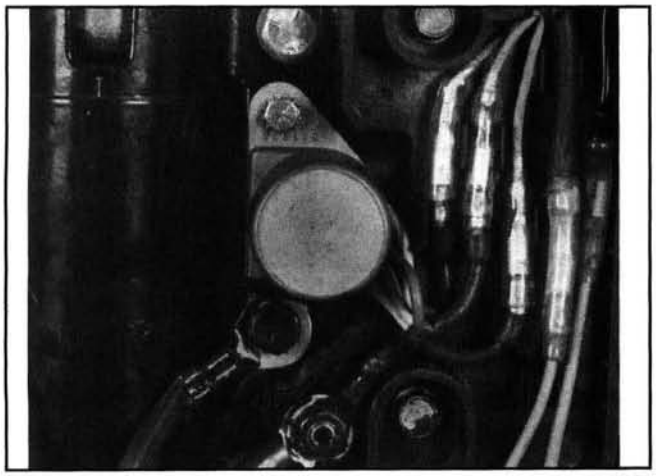
Remove the black and yellow/red wires from the top posts. Remove the red cables and remove the solenoid with bracket.



1. Black wire 32703
2. Yellow/red wire

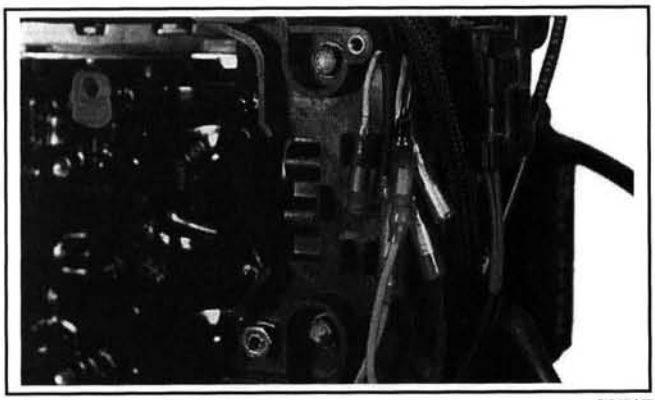
Disconnect the yellow/blue, yellow/gray, and yellow wires. Remove the red wire and two screws

retaining the rectifier and black cables. Remove the rectifier.



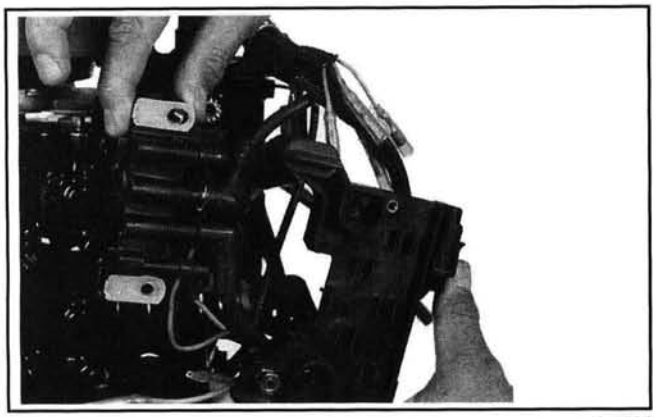
32722

Remove the fuse and disconnect the gray and tan wires.



32717

Remove the two screws retaining the electrical bracket. Remove the bracket.



32721

Installation

Installation is essentially the reverse of removal. Pay close attention to any **additional** task that may be required for installation.

Install bracket (with coil) on powerhead. Torque screws 48 to 96 in. lbs. (5.4 to 10.8 N·m).

Install the fuse and connect the gray and tan wires.

Install the rectifier with the red wire and black cables and torque screws 48 to 96 in. lbs. (5.4 to 10.8 N·m). Connect the yellow/blue, yellow/gray, and yellow wires.

Install bracket with solenoid and tighten screws securely. Attach the red cables (starter cable to top large post). Attach black and yellow/red wires to top posts.

Install primer and connect black and purple/white wires.

CONNECTOR SERVICING

Amphenol Terminal Removal

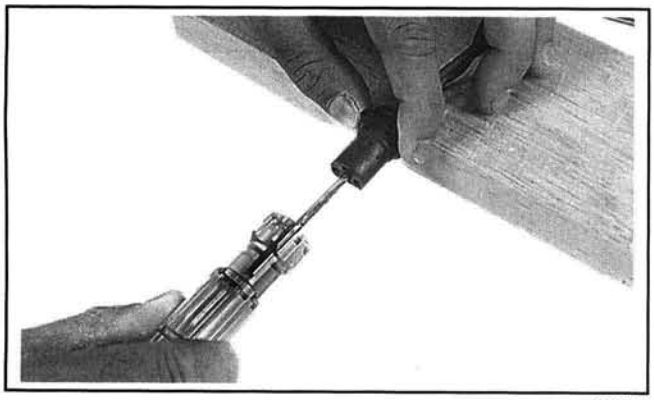
IMPORTANT: The *Amphenol®* pin and socket terminals are not the same size as *Deutsch®* pin and socket terminals. DO NOT interchange them.

To remove a terminal from the plug or receptacle, lubricate both ends of the cavity with isopropyl alcohol.

Pick the proper tool for the service being performed. Refer to **SPECIAL TOOLS** on page 19 in **SPECIAL TOOLS AND SERVICE SPECIFICATIONS** section.

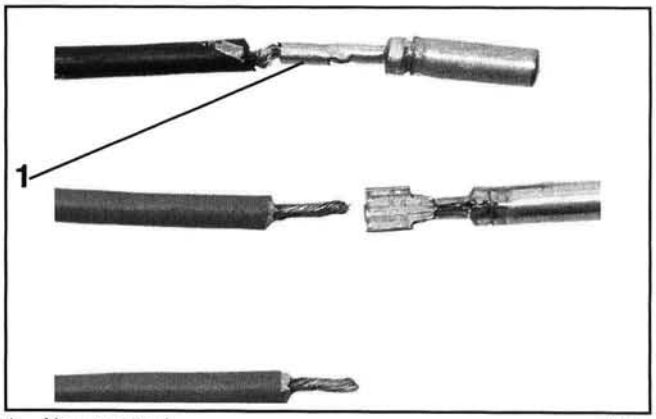
- Pin Remover, P/N 322698
- Socket Removal Tool, P/N 322699
- Crimping Pliers, P/N 322696
- Pin Insert Tool, P/N 322697

Place the plug or receptacle against the edge of a flat surface with clearance behind connector for terminal to be pushed out. Push terminal from connector with appropriate tool.

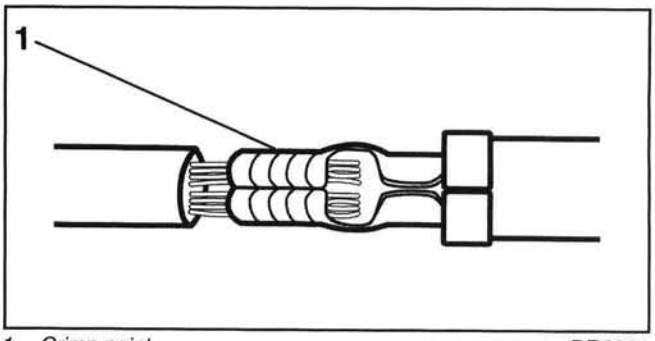


30386

Pin and socket terminals may be replaced if damaged. Strip 1/4 in. (6 mm) insulation from wire and crimp new terminal onto wire with crimping pliers.



1. New terminal 42201

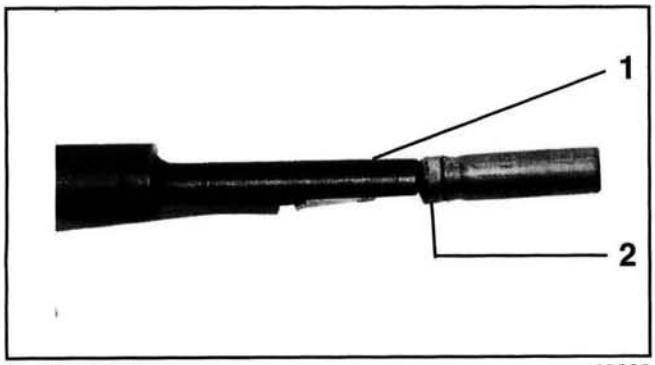


1. Crimp point DR6201

Amphenol Terminal Installation

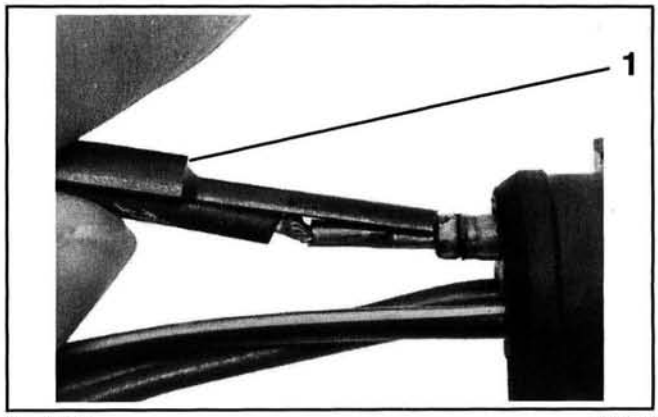
Connect the plug and receptacle before installing terminal. Apply isopropyl alcohol to connectors, align arrows, and push together.

Apply isopropyl alcohol to the terminal cavity. Place connectors against solid surface. Hold tip of tool securely against shoulder of terminal while inserting terminal. Push terminal into connector until step of insert tool touches connector body.



1. *Tip of tool*
2. *Shoulder of terminal*

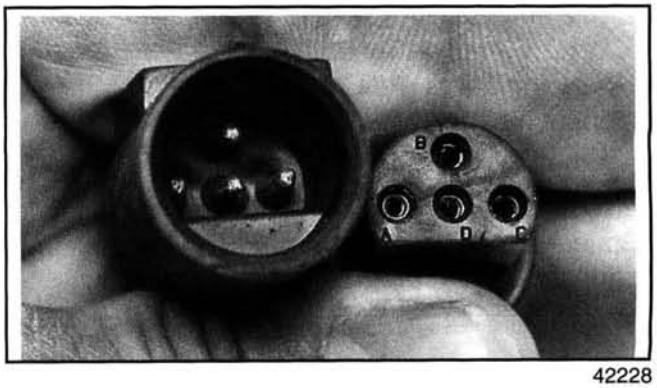
42226



1. *Step*

42227

Check your work. Separate the connectors and check to see that terminals are inserted the proper distance.



42228

IGNITION

TABLE OF CONTENTS

5

SAFETY INFORMATION

Before working on any part of the outboard, read the SAFETY section at the end of this manual.

DANGER

Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off. Remove propeller before servicing and when running the outboard on a flushing device.

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

WARNING

Wear safety glasses to avoid personal injury, and set compressed air to less than 25 psi (172 kPa).

The motor cover and flywheel cover are machinery guards. Use caution when conducting tests on running outboards. DO NOT wear jewelry or loose clothing. Keep hair, hands, and clothing away from rotating parts.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

To prevent accidental starting while servicing, disconnect the battery cables at the battery. Twist and remove all spark plug leads.

The electrical system presents a serious shock hazard. DO NOT handle primary or secondary ignition components while outboard is running or flywheel is turning.

Gasoline is extremely flammable and highly explosive under certain conditions. Use caution when working on any part of the fuel system.

Protect against hazardous fuel spray. Before starting any fuel system service, carefully relieve fuel system pressure.

Do not smoke, or allow open flames or sparks, or use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

Keep all electrical connections clean, tight, and insulated to prevent shorting or arcing and causing an explosion.

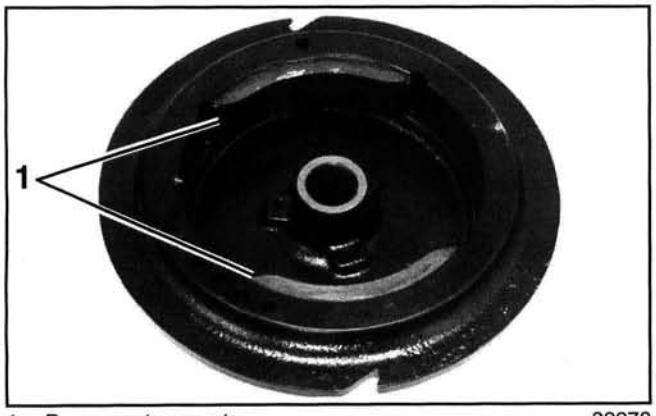
Always work in a well ventilated area.

Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to tightening must be felt when reusing a locking fastener. If replacement is indicated, use only authorized replacement or equivalent.

COMPONENTS

Flywheel

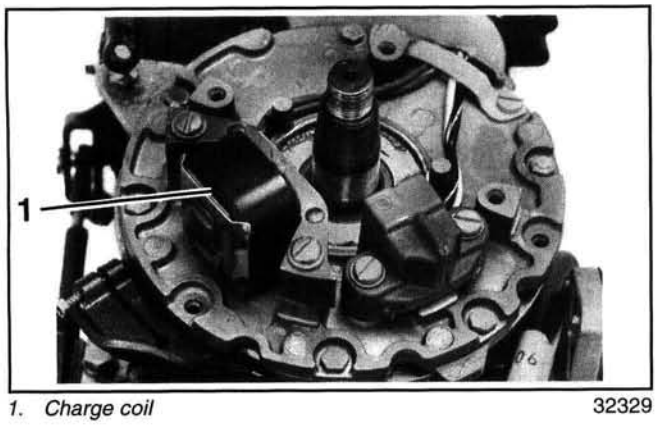
The flywheel contains permanent magnets which energize the charge coil, sensor coil, and alternator stator. Once the flywheel exceeds a minimum cranking RPM, the flywheel's magnetic lines of force pass through the ignition plate components to produce voltage in those circuits.



1. Permanent magnets 32278

Charge Coil

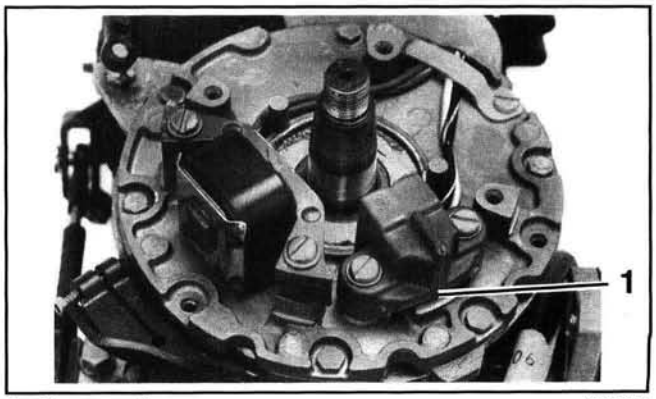
The charge coil contains many windings of wire wrapped around a metal lamination. Once the flywheel exceeds a minimum cranking RPM, the flywheel's magnetic lines of force pass through the coil windings to produce voltage. The voltage is supplied to the power pack to operate the ignition system.



1. Charge coil 32329

Sensor Coil

The sensor coil contains many windings of wire wrapped around a metal lamination. Once the flywheel exceeds a minimum cranking RPM, the flywheel's magnetic lines of force cutting through the sensor coil windings produce approximately 3 V.

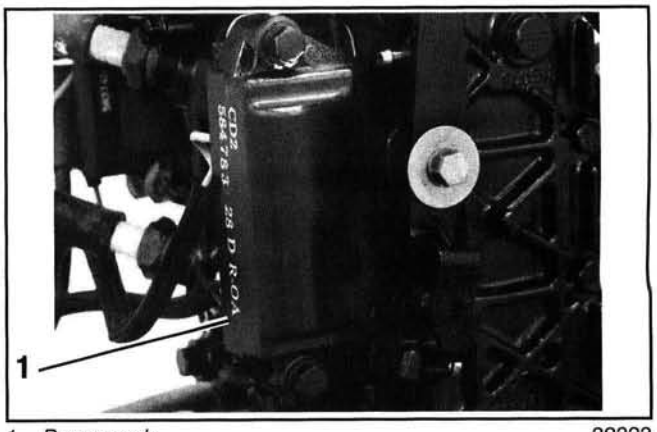


1. Sensor coil 32329

This voltage is supplied to the power pack to control small electronic switches (SCRs) which, in turn, direct power pack output to the correct ignition coil primary.

Power Pack

The power pack has several basic functions. It stores and distributes the voltage received from the charge coil. The power pack uses electronic switches, activated by sensor coil output, to select the correct ignition coil primary winding.



1. Power pack 32323

25/30 MODELS

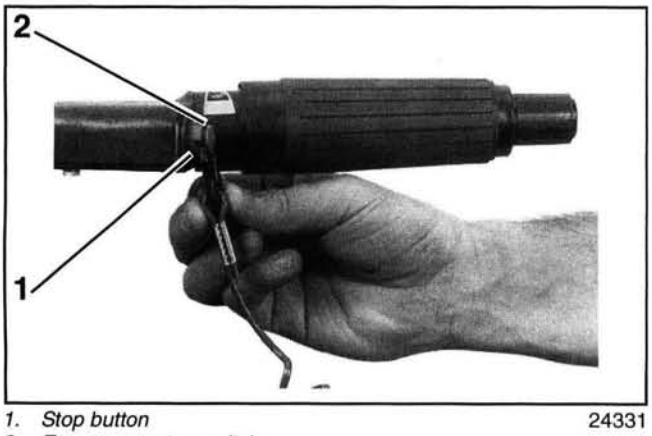
The power pack used on these models has:

- RPM limiting circuit to protect the engine from damage due to overreving. Maximum RPM is limited to 6100.
- *S.L.O.W.™* warning system which limits engine speed to approximately 2000 RPM if engine temperature exceeds 180°F (82°C). Once the *S.L.O.W.* warning system has activated, the engine must cool to 155°F (68°C) and the outboard must be slowed to an idle before normal operation can be resumed.

Stop Button

The stop button, and emergency stop switch are connected to the power pack through the engine wiring harness. When activated, these switches direct the power pack output to ground, stopping the ignition system.

The steering handle contains a combination stop switch/emergency stop device (tiller models).



1. *Stop button*
2. *Emergency stop switch*

24331

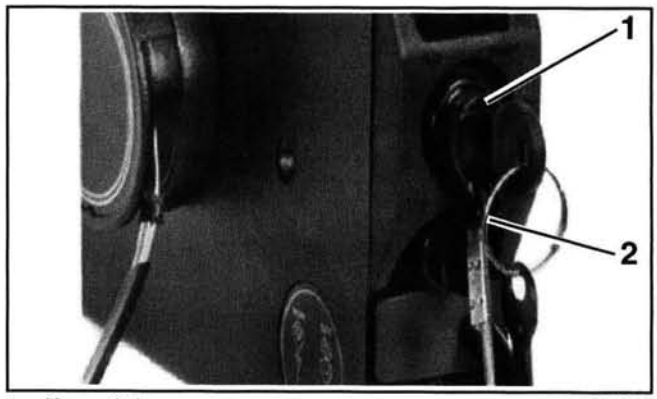
When the clip and lanyard assembly is **removed**, the emergency stop device is in the STOP position.

When the clip and lanyard assembly is **installed**, the emergency stop device is in the RUN position.

To stop the engine when the clip and lanyard assembly is in place, press the stop button **inward** until the engine stops.

Key Switch

A combination key switch and emergency stop switch is connected to the power pack through the engine wiring harness (remote electric models). When activated, this switch directs power pack output to ground, stopping the ignition system.



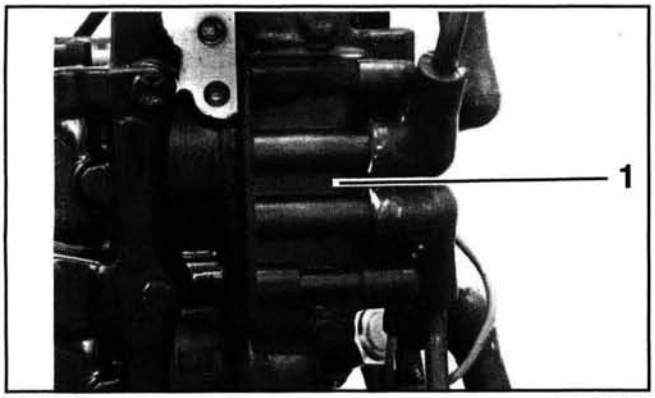
1. *Key switch*
2. *Emergency stop switch clip*

31545

IMPORTANT: This emergency stop switch clip turns the key from ON to OFF as it is removed. It does not electrically disarm the ignition system. The key switch, ignition system, and starting circuit are all fully functional after the emergency stop switch clip has been removed.

Ignition Coil

The ignition coil consists of two windings of wire wrapped around a compacted ferrite core. The coil has primary and secondary terminal connections and a ground plate.



9.9/15 Model 32322
1. Dual ignition coil

25/30 Model 17127
1. Single ignition coils

Through mutual induction, the ignition coil transforms the ignition module output to as much as 40,000 V to fire the spark plugs. There is one ignition coil per cylinder.

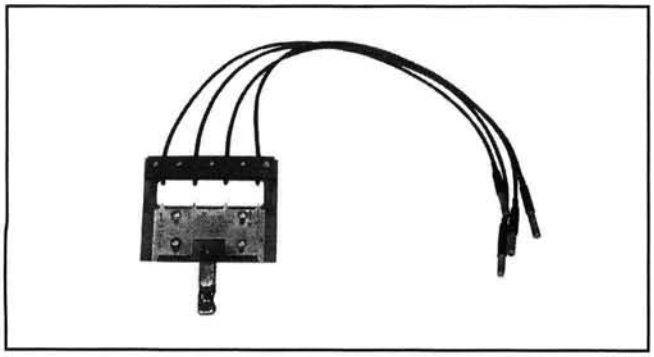
TEST EQUIPMENT

IMPORTANT: The following equipment is available from various manufacturers to support ignition and electrical system troubleshooting.

Spark Testers

Various models available:

- *Stevens* Number S21, S13C, or S48
- *Merc-O-Tronic* Number 55-4S or 55-6S

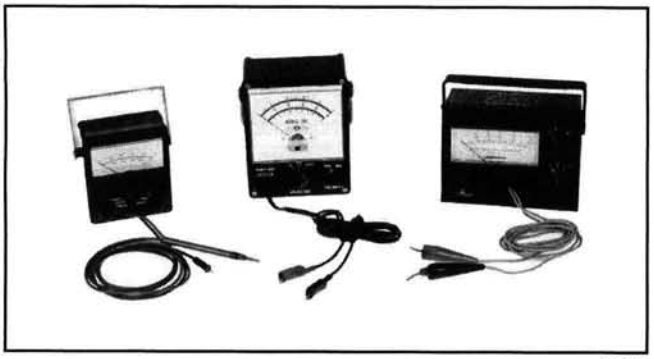


1942

Peak-reading Voltmeters

Used to measure power pack output to ignition coils. Various models available:

- *Merc-O-Tronic* Number 781
- *Stevens* Number CD-77
- *Electro-Specialties* Number PRV-1



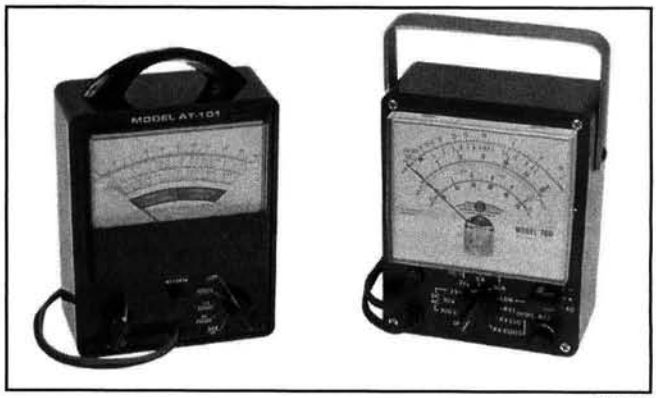
2804

Ohmmeter

Used for various resistance measurements and must be capable of reading low and high ranges.

Various models available:

- *Merc-O-Tronic* Number 700 VOA
- *Stevens* Number AT-101



16489

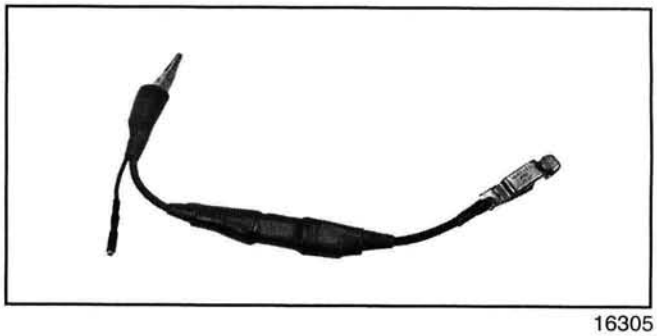
IMPORTANT: Component temperature can affect resistance values at a rate of 10 ohms per 1°F. All resistance values listed in this manual are correct at 70°F (21°C).

Ignition Module Load Adapter

Simulates ignition coil resistance for power pack output tests.

Model available:

- *Stevens* Number PL-88, P/N 507983



16305

Ignition Coil Terminal Extenders

Terminals extenders are used for power pack running output tests. They provide access for peak-reading voltmeter connection. Model available:

- *Stevens* Number TS-77

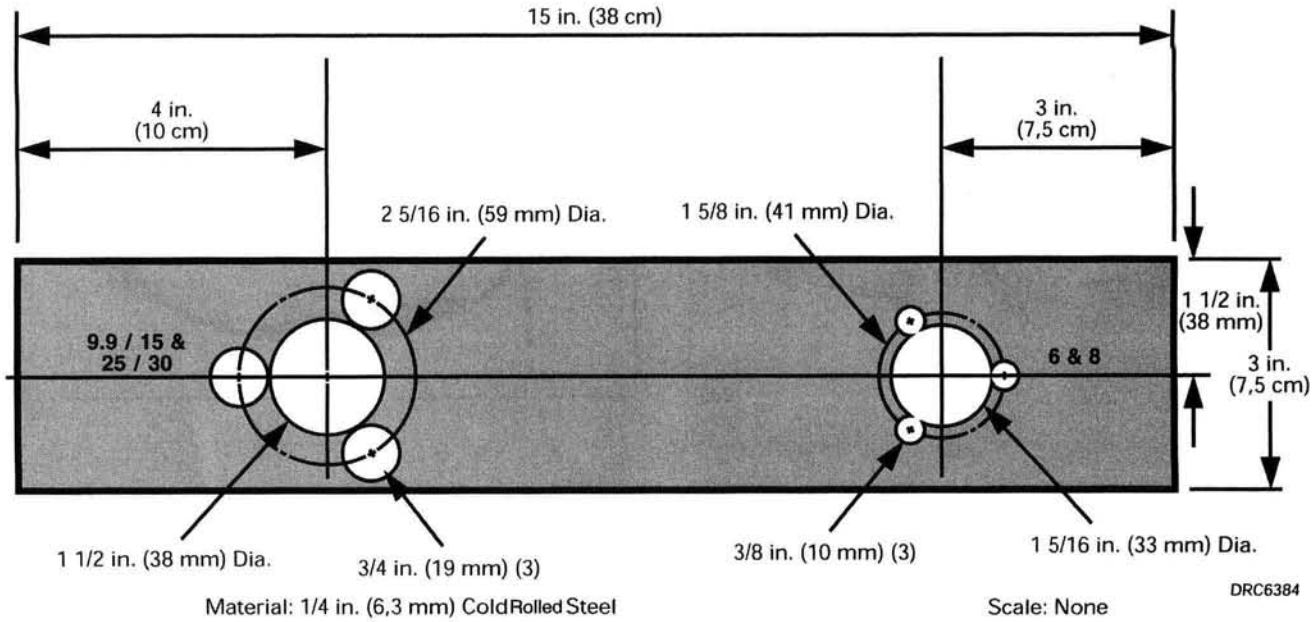
1. Ignition coil terminal extender 23600

Amphenol Connector Adapter

A jumper wire used for performing ignition output tests can be made locally using the following:

- Number 16 wire – 8 in. (200 mm) length
- Pin, P/N 511469
- Socket, P/N 581656
- Shrink tube, P/N 510628

Flywheel Holding Tool



TROUBLESHOOTING

Complete these tasks to obtain fast, accurate test results when troubleshooting the capacitor discharge ignition system.

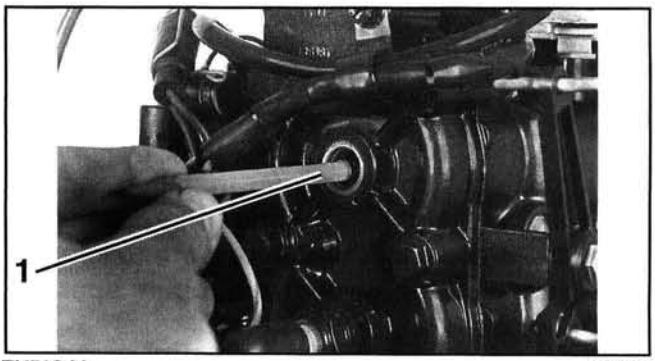
- **Visual Inspection** – Check wiring for broken, pinched, or loose leads. Connectors must be securely fastened and free from moisture or water accumulation.
- **Test Equipment Condition** – Make sure testers are in working order. Many hours can be wasted by replacing working components needlessly.
- **Follow Procedure** – Troubleshooting can seem difficult if you vary your technique for each problem. Many times items in the system are overlooked because you "thought" you tested them. By following the same procedure each time you troubleshoot, all items in the ignition system will be tested.
- **Test the Complete System** – There may be occasions when more than one component is defective. If this condition is undetected, repeated ignition system failure may occur, or damage to replacement parts could result. Test everything.

Flywheel Indexing

This test is used to identify erratic ignition operation. Internal power pack problems could cause a pack to fire erratically or continuously. To troubleshoot this situation, determine if each cylinder is firing at the correct time and no more than once per revolution.

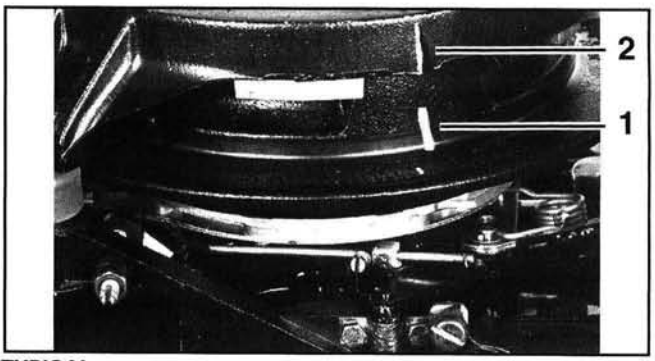
Disconnect the spark plug leads and remove both spark plugs.

Place the eraser end of a pencil in the number 1 spark plug hole. Slowly turn the flywheel by hand, clockwise, until the greatest length of the pencil is outside the spark plug hole. This indicates the number 1 piston is near top dead center.



TYPICAL 27360
1. Pencil

Make a reference mark on the flywheel rim, directly across from the timing pointer or starter pivot screw. Label this mark number 1.



TYPICAL 45102
1. Mark
2. Timing pointer

Repeat procedure for number 2 cylinder. Label this mark number 2.

Install the spark plugs and spark plug leads. Start the engine in a test tank and run the engine at the RPM where the problem exists.

Carefully hook an induction timing light to each cylinder, alternately. The timing light should indicate that cylinder's number only, and the number should only appear near the timing pointer or starter pivot screw.

If another cylinder's number appears, or the correct number appears more than once per revolution, check ignition coil primary lead routing or replace power pack.

IGNITION SYSTEM TESTS

CAUTION

All cranking output tests must be performed with spark plugs installed and torqued in the cylinder head. If necessary to remove the spark plugs, be sure to keep the spark tester away from open spark plug holes.

The following series of steps will systematically isolate a problem area in the ignition system. To reduce your troubleshooting time and to avoid incomplete results, perform these steps in the order written.

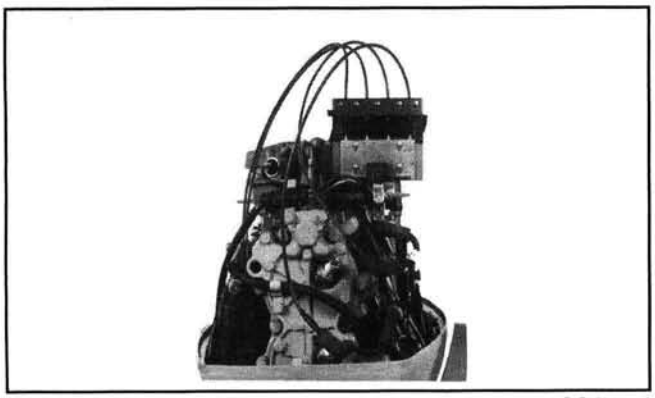
Total Ignition Output Test

CAUTION

To avoid possible shock hazard, do not handle ignition coils or spark tester during cranking tests.

Twist and remove the leads from both spark plugs.

Adjust the gap on the spark tester to 1/2 in. (12 mm). Connect tester leads to the spark plug leads. Secure tester clip to a clean engine ground.



COA4308

IMPORTANT: To prevent high voltage arc, route tester leads at least 2 in. (51 mm) from any metal surface.

If equipped, install the clip onto the emergency stop switch. Crank the engine. Spark should jump each tester gap alternately.

- If tester shows good output on both cylinders, go to **Power Pack Running Output** on p. 125.
- If tester shows good output on one cylinder, go to **Power Pack Cranking Output** on p. 124.
- If tester shows no output, go to **Stop Circuit Tests**.

IMPORTANT: It is possible for the ignition system to have a problem but still produce good output. If the engine pops or backfires during starting, the ignition may be out of time. Check the following:

- Coil primary wire routing
- Spark plug lead routing
- Flywheel condition and location
- Synchronization and linkage adjustments

Stop Circuit Tests

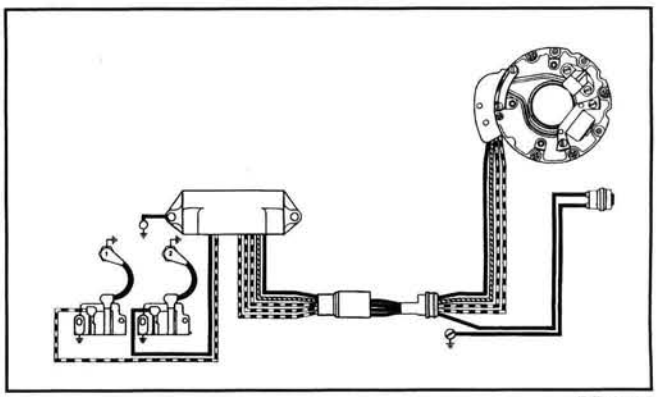
CAUTION

To avoid possible shock hazard, do not handle ignition coils or spark tester during cranking tests.

Elimination Test

Disconnect 5-pin *Amphenol* connector between ignition plate and power pack.

Insert jumper wires between the "A," "B," "C," and "D" terminals of the 5-pin connector.



DR4185

Crank engine and observe results at spark tester.

- If there is no spark at one gap, go to **Power Pack Cranking Output** on p. 124.
- If there is no spark at both gaps, go to **Charge Coil Test** on p. 122.
- If the spark jumps alternately at each gap, the problem is in the stop circuit. Begin troubleshooting with **Ohmmeter Test** and follow all steps to locate the fault.

Ohmmeter Test

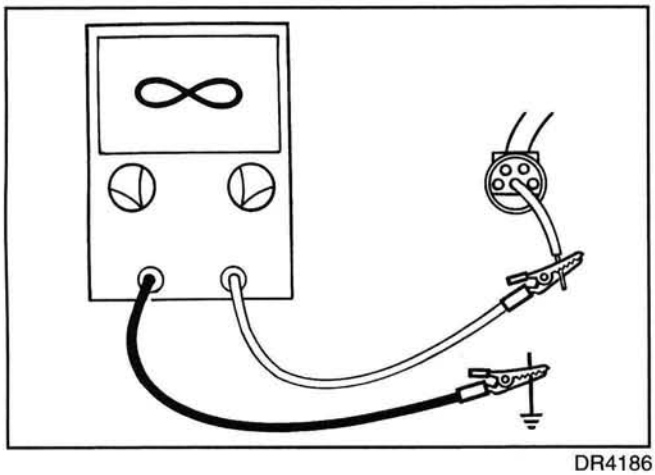
Step 1

IMPORTANT: All ohmmeter tests must be performed with the engine NOT running.

Install the clip and lanyard.

Calibrate an ohmmeter on appropriate scale. Connect meter leads between ignition plate end of connector, terminal "E," and a clean engine ground.

- The meter must show a high reading.



DR4186

Momentarily press inward on the stop button.

- The meter must show a low reading.

Remove the emergency stop switch clip and lanyard.

- The meter must show a low reading.
- If any of the test results are incorrect, replace the stop button assembly.

Complete all circuits disconnected during this test.

STEP 2

Install the emergency stop switch clip and lanyard.

Disconnect the 5-pin *Amphenol* connector between the power pack and ignition plate.

Calibrate ohmmeter on appropriate scale. Connect meter leads between ignition plate end of connector, terminal "E," and a clean engine ground.

- Key OFF, meter must show a low reading.
- Key ON, meter must show a high reading.

If key ON reading is a low one, disconnect harness black/yellow lead from key switch "M" terminal.

- If meter now shows a high reading, replace key switch.
- If meter shows a low reading, go to **STEP 3**.

STEP 3

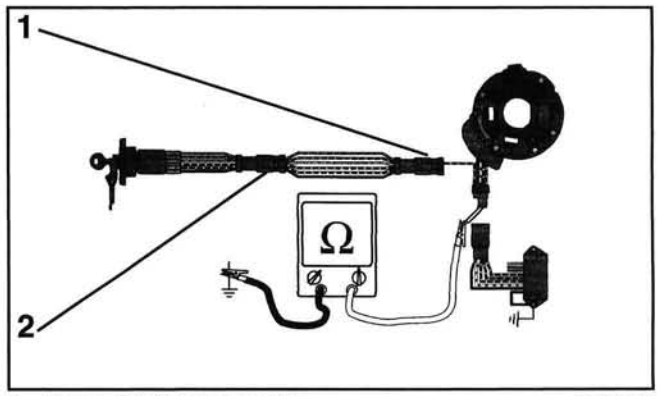
Disconnect the key switch 6-pin connector

- If meter now shows a high reading, repair or replace key switch harness.
- If meter shows a low reading, go to **STEP 4**.

STEP 4

Disconnect the engine harness to instrument harness 6-pin connector that contains the black/yellow lead.

- If meter now shows a high reading, repair or replace instrument harness.
- If meter shows a low reading, repair or replace engine harness.
- If the engine fails to shut off, test for open black/yellow lead, black/white lead, damaged key switch, or damaged power pack.



1. *Key switch 6-pin connector*
2. *Instrument harness 6-pin connector*

DR6224

Complete all circuits disconnected during this test.

5

Charge Coil Test

STEP 1

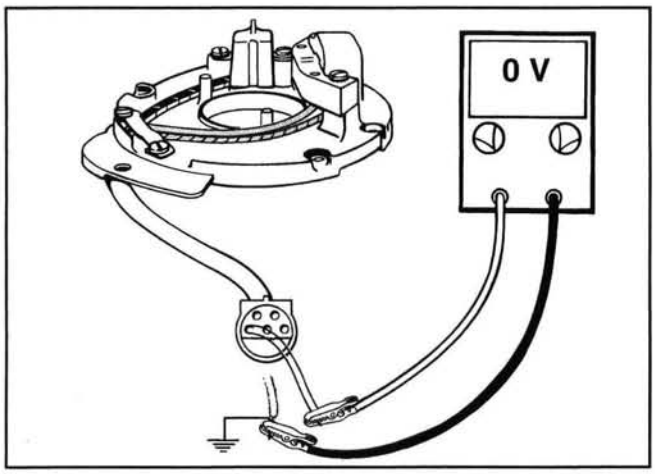
Disconnect 5-pin *Amphenol* connector between ignition plate and power pack.

Set peak-reading voltmeter to:

- **9.9/15 –** "NEG" and "500."
- **25/30 –** "POS" and "500."

Alternately, connect voltmeter between ignition plate connector terminals "A," "D," and a clean engine ground. Crank engine and observe meter at each connection.

- Any reading on either test indicates charge coil or leads are grounded.
- Locate and repair ground, or replace charge coil.
- If no reading is indicated go to **STEP 2**.



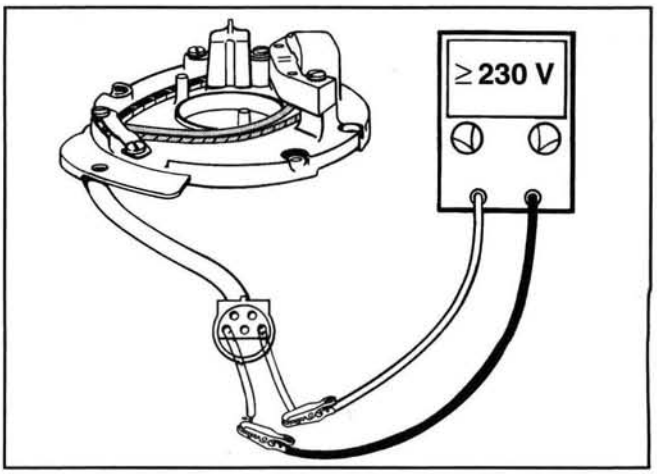
DR4619

STEP 2

Set peak-reading voltmeter to:

- **9.9/15 –** "NEG" and "500."
- **25/30 –** "POS" and "500."

Attach voltmeter black lead to ignition plate connector, terminal "A." Attach meter red lead to terminal "D."



DR4620

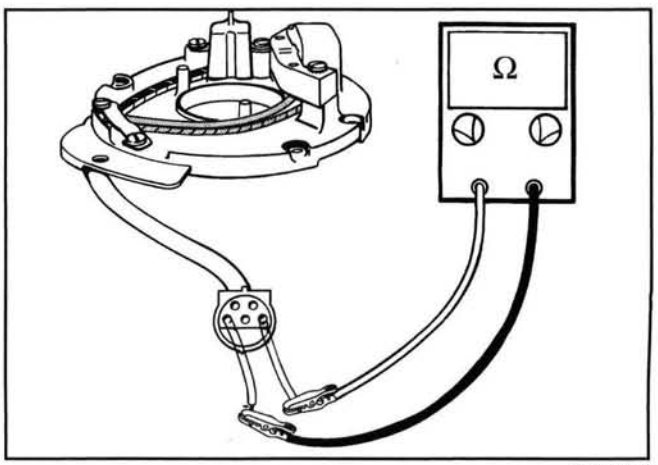
Crank engine and observe meter.

- If meter shows 230 V or higher, go to **Sensor Coil Test** on p. 123.
- If meter shows less than 230 V, check condition of wiring and connectors.
- If wiring and connector condition is good, go to **STEP 3**.

STEP 3

IMPORTANT: All ohmmeter tests must be performed with the engine NOT running.

Insert jumper wires in ignition plate connector, terminals "A" and "D."



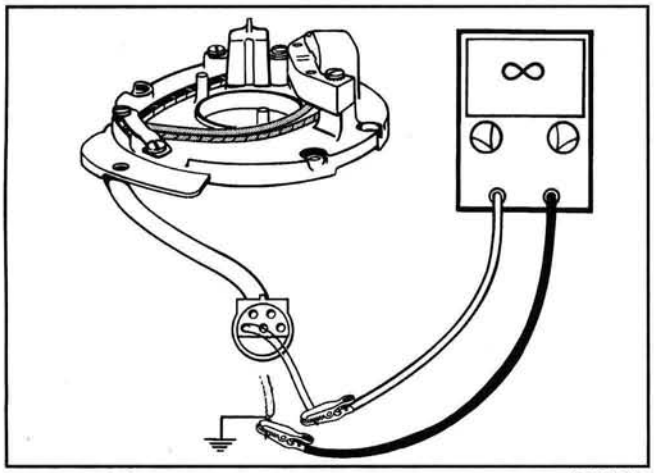
DR4620

Calibrate ohmmeter on appropriate scale. Connect between jumpers. Meter must show:

- **9.9/15 R, 25/30** – 900 ± 100 ohms.
- **9.9/15 (accessory stator, electric)** – 760 ± 80 ohms.

To test for a grounded condition, connect ohmmeter, alternately, between each jumper and a clean engine ground.

- Any needle movement indicates charge coil or leads are grounded.
- Locate and repair ground, or replace charge coil.



DR4619

Complete all circuits disconnected during this test.

Sensor Coil Test

STEP 1

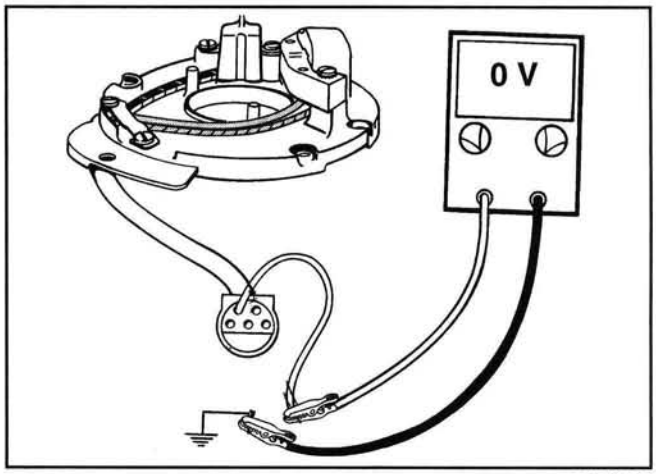
Disconnect 5-pin *Amphenol* connector between ignition plate and power pack.

Set peak-reading voltmeter to:

- **9.9/15** – "NEG" and "50," or "SEN" and "50" on *Stevens* CD-77 meter.
- **25/30** – "POS" and "50," or "SEN" and "50" on *Stevens* CD-77 meter.

Alternately, connect voltmeter between ignition plate connector terminals "B," "C," and a clean engine ground. Crank engine and observe meter at each connection.

- Any reading indicates sensor coil or leads are grounded.
- Locate and repair ground, or replace sensor coil.
- If no reading is indicated, go to **STEP 2**.



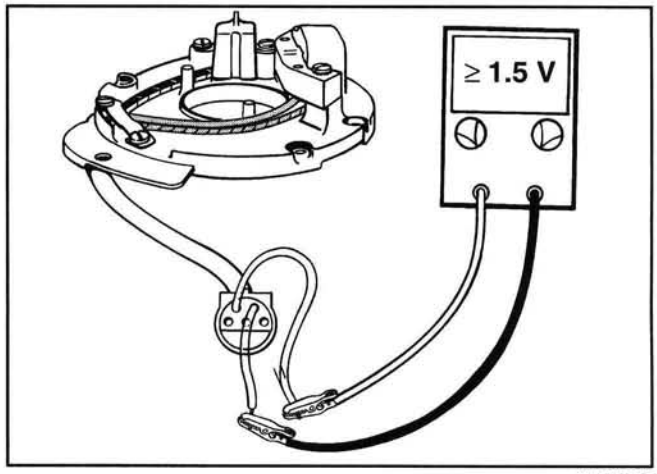
DR4621

STEP 2

Set peak-reading voltmeter to:

- **9.9/15** – "NEG" and "50," or "SEN" and "50" on *Stevens* CD-77 meter.
- **25/30** – "POS" and "50," or "SEN" and "50" on *Stevens* CD-77 meter.

Attach voltmeter black lead to ignition plate connector, terminal "C." Attach meter red lead to terminal "B."



DR4622

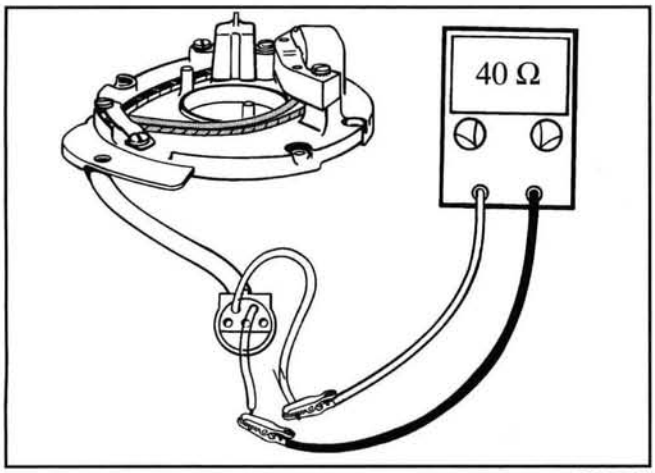
Crank engine and observe meter.

- If meter shows 1.5 V or higher, go to **Power Pack Cranking Output** on p. 124.
- If meter shows less than 1.5 V, check condition of wiring and connectors.
- If wiring and connector condition is good, go to **STEP 3**.

STEP 3

IMPORTANT: All ohmmeter tests must be performed with the engine NOT running.

Insert jumper wires in ignition plate connector, terminals "B" and "C."



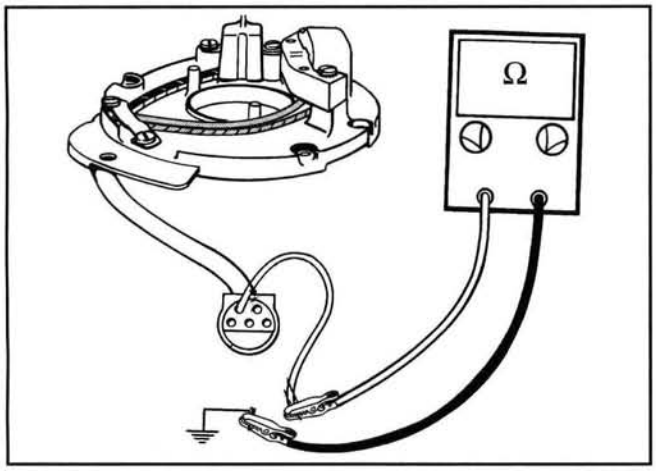
DR4622

Calibrate ohmmeter on appropriate scale. Connect between jumpers.

- Meter must show 40 ± 10 ohms.

To test for a grounded condition, connect ohmmeter, alternately, between each jumper and a clean engine ground.

- Any needle movement indicates sensor coil or leads are grounded.
- Locate and repair ground, or replace sensor coil.



DR4621

Complete all circuits disconnected during this test.

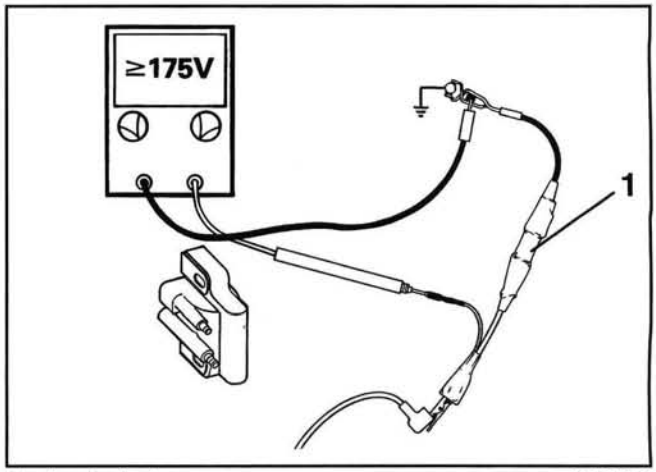
Power Pack Cranking Output

Twist and remove primary leads from ignition coils.

Connect number 1 ignition coil primary lead to *Stevens* Number PL-88 Pack Load Adapter, P/N 507983, red lead. Connect adapter black lead to a clean engine ground.

If *Stevens* Number PL-88 is not available, an adapter can be made using a 10-ohm, 10-watt resistor, *Radio Shack* Number 271-132, or equivalent.

Connect peak-reading voltmeter red lead to adapter red lead and meter black lead to a clean engine ground.



1. Load adapter DR4052

Adjust voltmeter to settings listed in following chart. Crank engine and observe meter. Meter must show at least:

Model	Voltmeter	Output
9.9/15	NEG/500	175 V
25/30	POS/500	175 V

After testing number 1 ignition coil primary lead, test the number 2 ignition coil primary lead.

- If both primary leads have good output, test ignition coils. Refer to **Ignition Coil Tests** on p. 125.
- If one primary lead has no output, replace power pack.
- If both primary leads have no output, go to **Charge Coil Test** on p. 122. If charge coil tests good, replace the power pack.

Power Pack Running Output

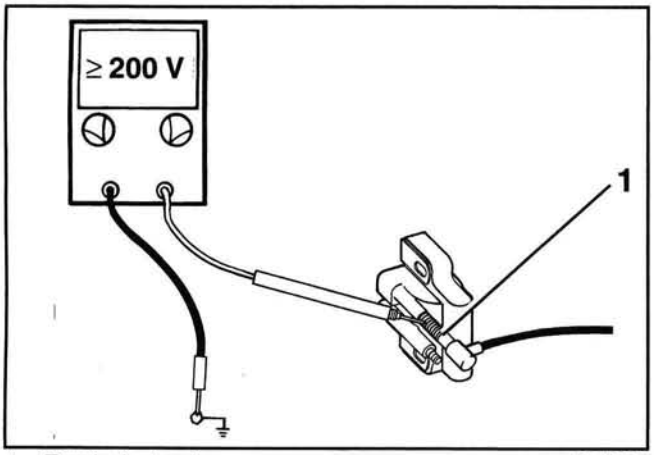
Twist and remove primary leads from ignition coils.

Use a clockwise twist to install *Stevens* Number TS-77 terminal extenders, or equivalent, to ignition coil primary posts.

Install primary leads on terminal extenders. Observe proper wire routing. Orange/blue primary lead must be connected to number 1 ignition coil.

IMPORTANT: Route all tester leads so they do not interfere with moving engine parts.

Connect peak-reading voltmeter red lead to number 1 terminal extender. Connect meter black lead to a clean engine ground.



1. Terminal extender DR4053

Adjust voltmeter to setting listed in following chart. Start engine and run it under load at RPM where ignition problem exists. Meter must show at least:

Model	Voltmeter	Output
9.9/ 15	NEG/500	200 V
25/30	POS/500	200 V

After testing number 1 ignition coil, test the number 2 ignition coil.

- If either cylinder shows less than specified output, test charge coil. Refer to **Charge Coil Test** on p. 122.
- If charge coil tests good, replace the power pack.

Ignition Coil Tests

DANGER

To avoid personal injury from electrical shock, perform all coil tests on a wooden (or insulated) bench top.

Ignition Coil Specifications

Magneto C.D. Coil Specifications	
Primary Resistance	0.1 ± 0.05 Ω
Secondary Resistance	275 ± 50 Ω

Resistance Test

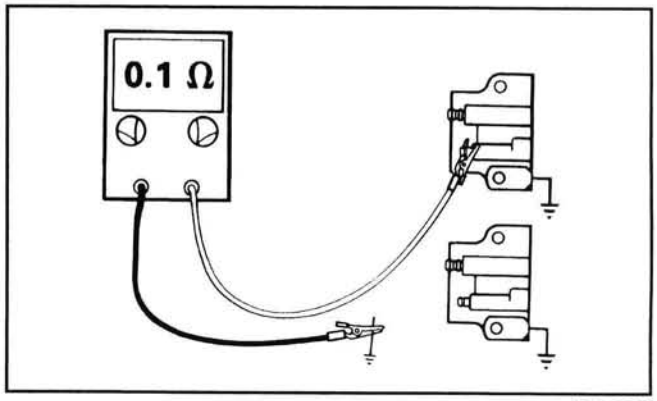
Resistance tests may be performed while the ignition coil is still mounted on the powerhead.

STEP 1

Twist and remove the spark plug leads and primary coil leads from the ignition coil.

Calibrate ohmmeter on appropriate scale. Connect meter black lead to a clean engine ground. If the coil is not mounted on the engine, connect meter black lead to ground tab on the coil. Connect meter red lead to coil primary terminal.

- Meter must show 0.1 ± 0.05 ohm



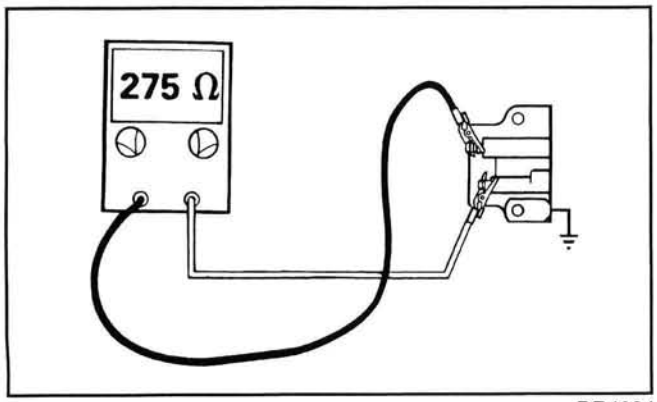
DR4093

5

STEP 2

Calibrate ohmmeter on appropriate scale. Connect meter red lead to coil primary terminal. Connect meter black lead to coil spark plug terminal.

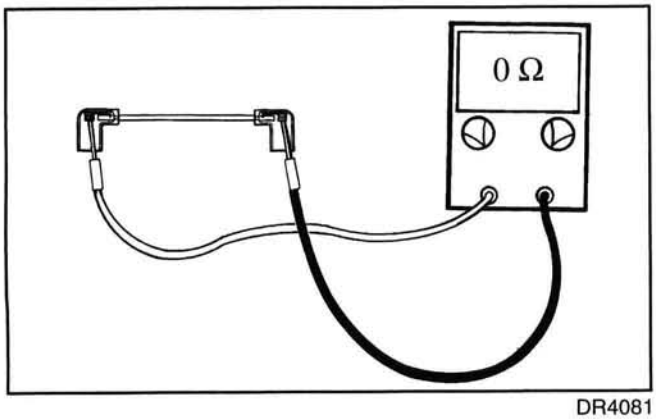
- Meter must show 275 ± 50 ohms



DR4094

STEP 3

Test spark plug leads for continuity. Calibrate ohmmeter on low ohms scale. Attach one ohmmeter lead to each spring terminal. While wiggling both spark plug covers and entire length of the spark plug lead, the resistance should remain near zero. Replace spark plug lead if your test results vary.



DR4081

Ignition Coil Analyzer Tests

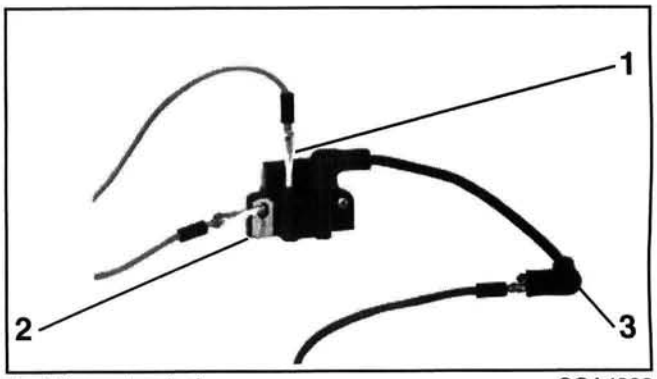
IMPORTANT: When conducting these tests to the coil, do not exceed its maximum specified amperage.

Magneto C.D. Coil Specifications		
Operating Amps (Max)	*Merc-O-Tronic* 1.5 amps	*Stevens* 1.1 amps
Analyzer Polarity	Normal	

Power Test

The ignition coil is tested with normal polarity connections.

Connect tester red lead to the primary terminal of the coil and the tester black lead to the ground tab. Connect the high tension lead of the tester to the coil spark plug lead.



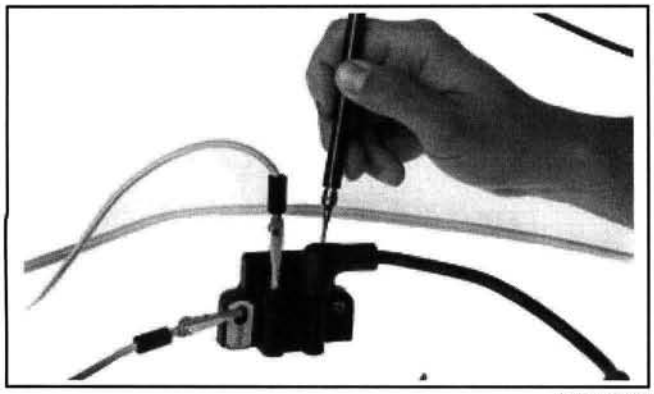
1. *Primary terminal*
2. *Ground tab*
3. *Coil spark plug lead*

COA4328

A steady spark, in the tester at or before maximum specified amperage, indicates a good coil. Refer to **Ignition Coil Specifications** on p. 125.

Surface Leakage Test
The ignition coil and spark plug lead should be tested for leakage or insulation failures using the ignition analyzer. Leakage is caused by moisture, cracks, or holes in the coil housing or spark plug leads.

With the analyzer's black and red leads still connected from the Power Test, remove the analyzer's high tension lead from the coil. Turn on the analyzer and probe the entire surfaces of the coil, spark plug lead, and spark plug cover.



COA4327

Flashover will be apparent wherever insulation has broken down. Replace any coil or spark plug lead which shows leakage.

S.L.O.W. WARNING SYSTEM TESTS

25/30 MODELS
This ignition system incorporates the *S.L.O.W.*™ (Speed Limit Overheat Warning) system, which limits engine speed to approximately 2000 RPM if engine temperature exceeds 180°F (82°C). Once the *S.L.O.W.* warning system has activated, the engine must cool to 155°F (68°C) and the outboard must be slowed to an idle before normal operation can be resumed.

The *S.L.O.W.* warning system depends on input from the temperature switch tan/red lead.

Function Test
Disconnect temperature switch tan/red lead.

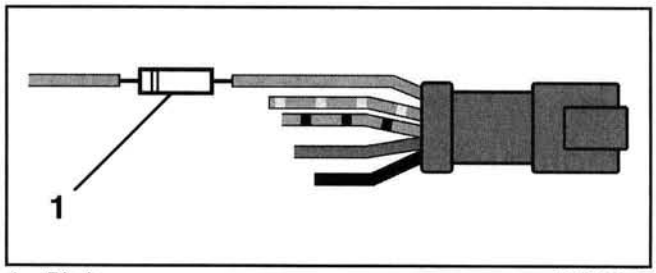
Install correct test propeller. Start outboard in test tank and run at 3500 RPM.

Touch engine harness tan/red lead to a clean engine ground.
- If engine speed slows to approximately 2000 RPM (normal operation), test the temperature switch.
- If engine does not slow to approximately 2000 RPM, check wiring or replace power pack.

IMPORTANT: On remote electric start models, if the engine goes into *S.L.O.W.* repeatedly or if the engine goes into *S.L.O.W.* without an operator warning signal, check the engine harness blocking diode. Refer to **Blocking Diode Test**.

Blocking Diode Test

25/30 REMOTE ELECTRIC MODELS
The diode is located in the engine harness tan wire circuit.



1. Diode DRC6251

Disconnect engine harness 6-pin *Deutsch* connector containing the tan wire, and the temperature switch tan lead.

Calibrate ohmmeter on appropriate scale. Using jumper wires, connect meter between engine harness tan lead and engine harness 6-pin connector terminal 6. Note reading.

Reverse meter connections or press polarity button. Note reading.
- A very high reading in one direction and a low reading in the other direction indicates diode is good.

Replace engine harness blocking diode if your test results are not correct.

Complete all circuits disconnected during this test.

SPARK PLUGS

Remove and inspect the spark plugs for the following conditions:

- Worn electrodes
- Cracked insulator
- Dirty spark plugs

Replace all defective spark plugs.

Before installing the spark plug lead cover on the spark plug, apply a light coating of *Electrical Grease* to the ribbed portion of the spark plug ceramic and to the opening of the spark plug cover. See table below for recommended spark plug data and gap setting.

Spark Plug, *Champion*

Models	Recommended
9.9/15	QL82C @ 0.030 in. (0.8 mm)
25, 30	QL77JC4 @ 0.030 in. (0.8 mm)

IMPORTANT: Use of non-suppression spark plugs will cause ignition problems.

FLYWHEEL SERVICING

IMPORTANT: In order to produce the voltage necessary to run an ignition system, the flywheel magnets must be of a particular strength. Weak flywheel magnets can cause low ignition voltage which would affect engine performance. Weak flywheel magnets can also cause low readings on ignition test equipment such as the peak-reading voltmeter, which might cause unnecessary replacement of ignition components.

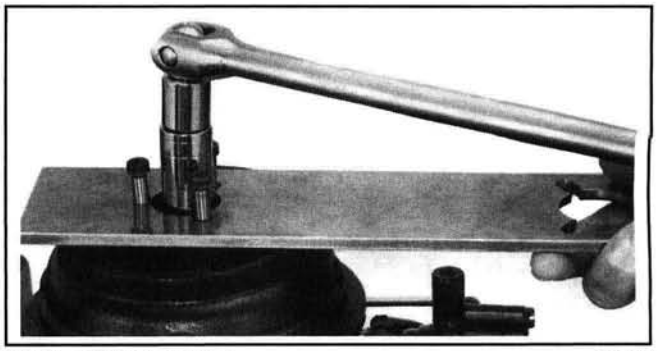
An accurate test of alternator output can help determine flywheel condition. Refer to **Running Alternator Output Test** on p. 85.

Removal

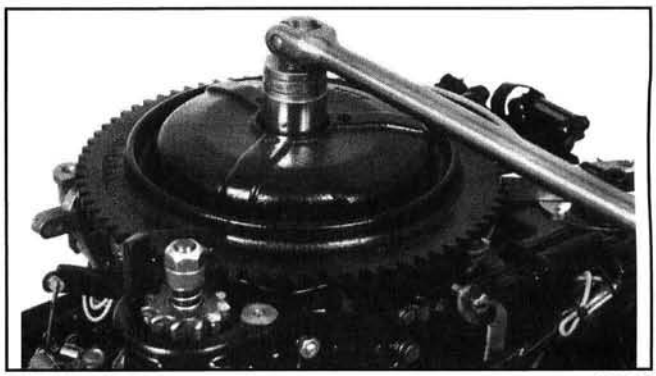
⚠ WARNING ⚠

To prevent accidental starting while servicing, twist and remove all spark plug leads.

Remove the flywheel nut. Use a Flywheel Holding Tool and three screws, P/N 307641, from Universal Puller Set, P/N 378103, or Flywheel Holder, P/N 771311.

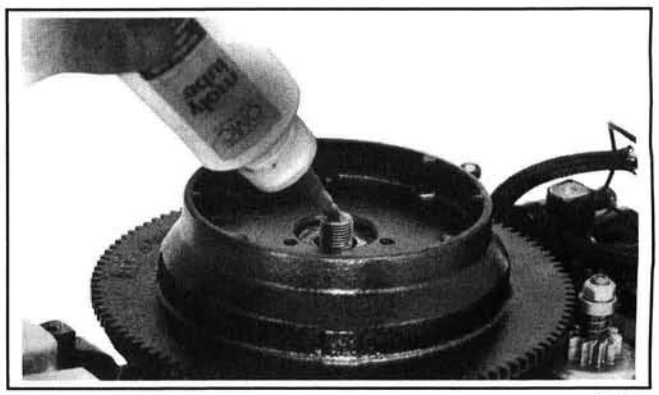


Flywheel Holding Tool 32927



Flywheel Holder 32640

Apply *Moly Lube* to threads of pressing screw and center hole of crankshaft.



32845

Assemble the following components from Universal Puller Set, P/N 378103:

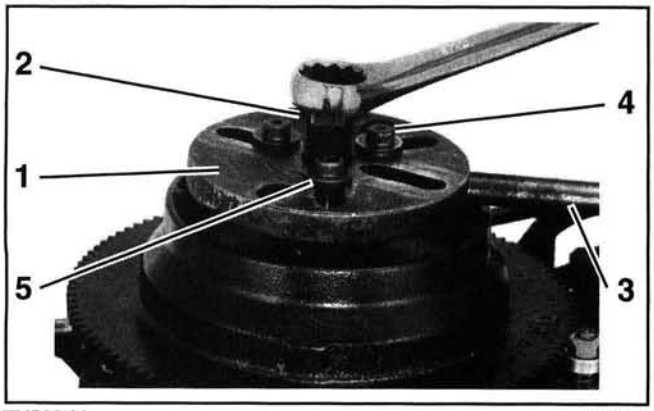
- Body, P/N 307636
- Pressing Screw, P/N 307637
- Handle, P/N 307638

9.9/15 MODELS

- Three screws, P/N 307641
- Three washers, P/N 307639

25/30 MODELS

- Three screws, P/N 307642
- Three washers, P/N 307640



TYPICAL 32846

1. *Body*
2. *Pressing screw*
3. *Handle*
4. *Screws (3)*
5. *Washers (3)*

ALL MODELS

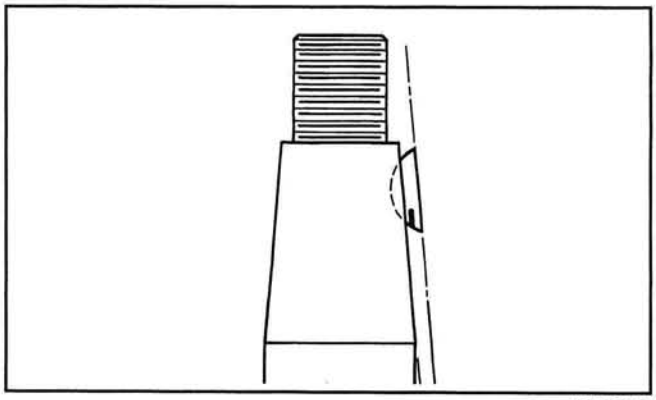
Install the puller on flywheel with body flat side up. Seat the shoulder screws completely. Hold puller by its handle, and tighten pressing screw until flywheel releases.

Remove the flywheel.

Installation

9.9/15 MODELS

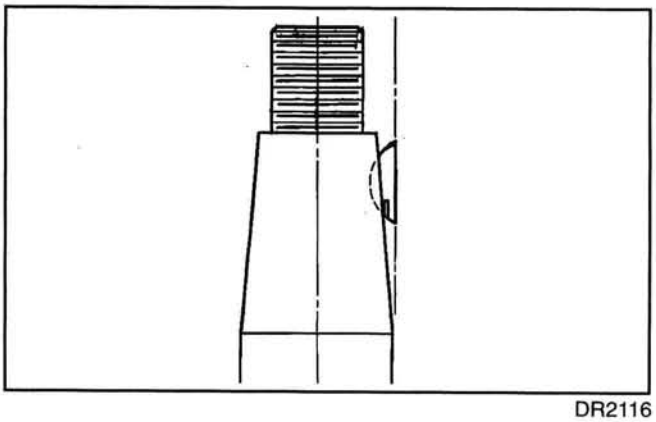
Install the flywheel key with its outer edge parallel to taper of crankshaft.



DR2115

25/30 MODELS

Install the flywheel key with its outer edge parallel to centerline of crankshaft and single upset mark facing down.



DR2116

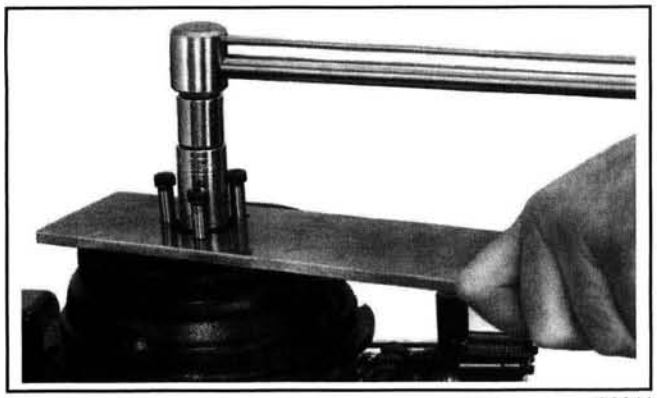
ALL MODELS

Clean the crankshaft and flywheel tapers with *Cleaning Solvent* and let dry. These surfaces must be clean and dry to allow proper locking of the tapers.

Align the flywheel keyway and install flywheel. Coat the threads of the flywheel nut with *Gasket Sealing Compound.* Install the nut and torque to the correct value. See chart below.

Flywheel Nut Torque Chart

Model	Ft. lb.	N·m
9.9/15	45 to 50	60 to 70
25/30	100 to 105	135 to 140



32911

IGNITION PLATE SERVICING

Removal

⚠ WARNING ⚠

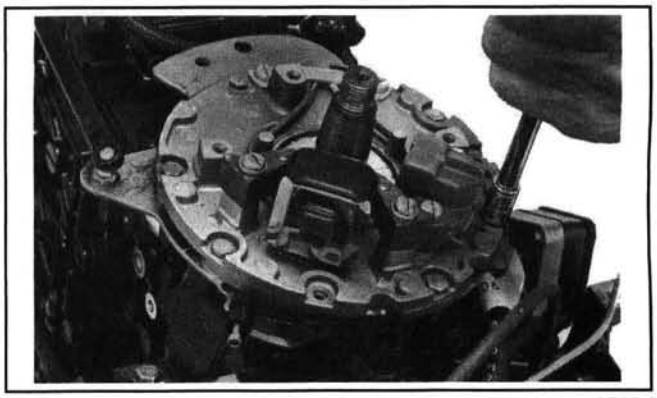
To prevent accidental starting while servicing, twist and remove all spark plug leads.

If equipped, remove the manual starter. Refer to Manual Starter **REMOVAL** on p. 294 section.

Remove the flywheel. Refer to **FLYWHEEL SERVICING** on p. 128.

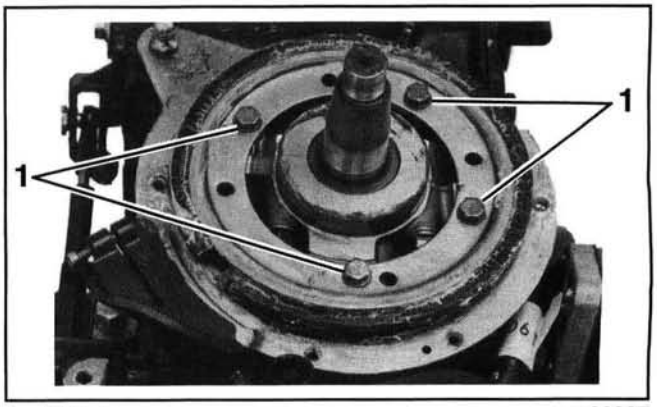
9.9/15 MODELS

Loosen the six screws attaching the ignition plate to the retainer plate. Lift the ignition plate from the powerhead.



32324

Remove the four support plate screws. Lift the retainer and support plate from the powerhead.

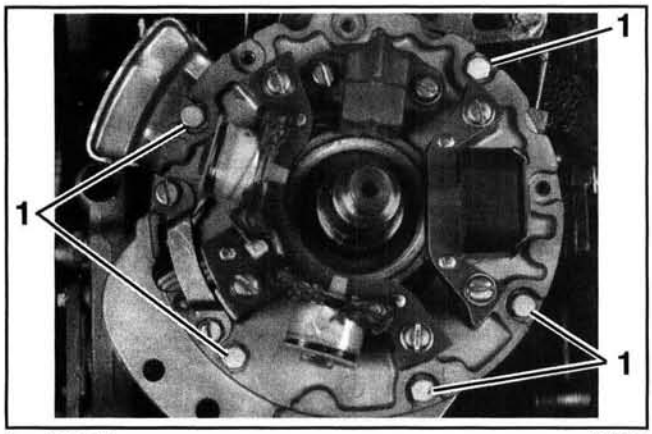


1. Screws

32327

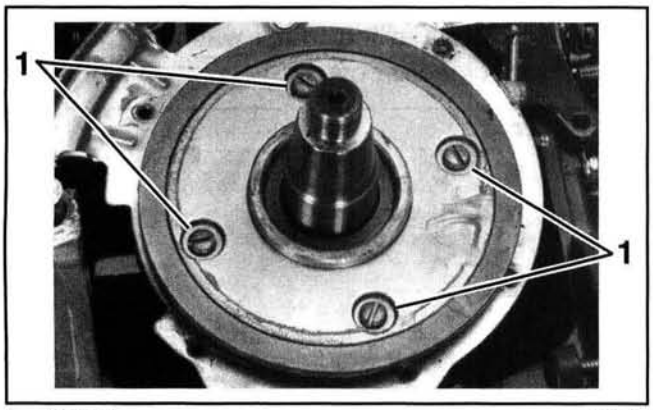
25/30 MODELS

Loosen the five screws attaching the ignition plate to the retainer plate. Lift the ignition plate from the powerhead.



1. Screws 37054

Remove the four pilot ring screws. Lift the retainer, ring, thrust washer, and pilot ring (with washers) from the powerhead.

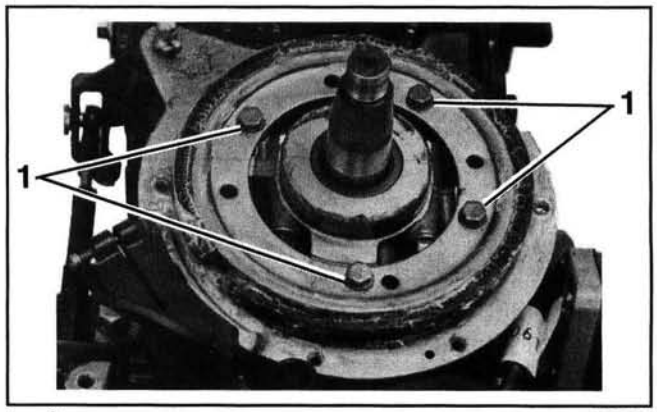


1. Screws 47303

Installation

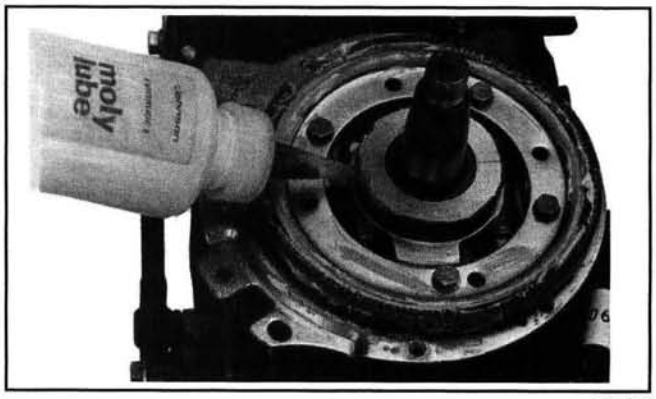
9.9/15 MODELS

Place the retainer plate, then the support plate on the powerhead. Align support plate with four screw holes in powerhead. Apply *Nut Lock* to threads of the four support plate screws. Install the screws and torque to 48 to 60 in. lbs. (5 to 7 N·m).



1. Screws 32327

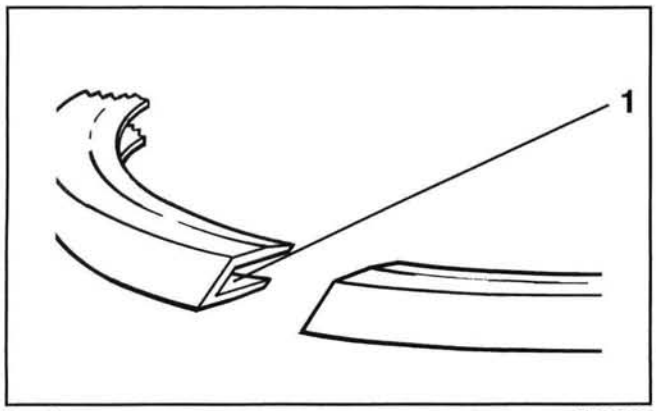
Apply *Moly Lube* to the crankcase boss.



32326

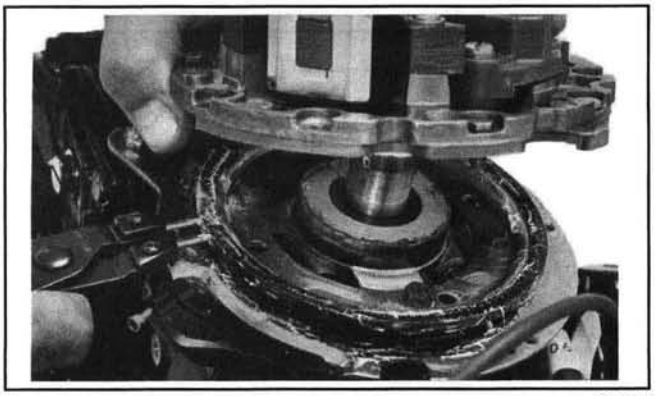
5

Lubricate the ignition plate bearing groove with *Moly Lube*.



1. Groove DR2618

Apply *Nut Lock* to the threads of the ignition plate screws. Insert needle-nose pliers into slots in the ignition plate bearing and compress bearing while guiding the ignition plate into position.



32380

Align the ignition plate with the retainer plate. Torque the screws to 25 to 35 in. lbs. (2.8 to 4.0 N·m).

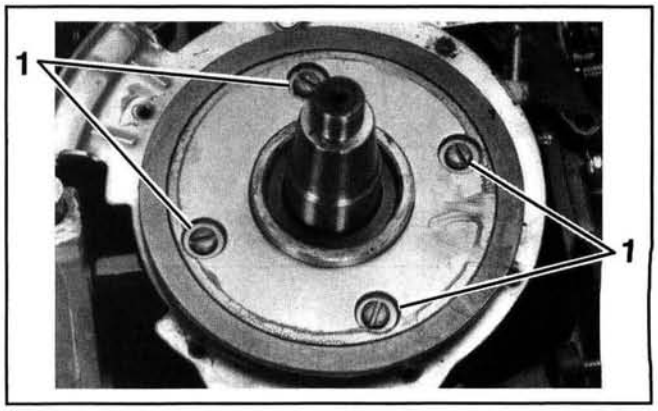
Connect and adjust spark advance link. Refer to **SYNCHRONIZATION AND LINKAGE ADJUSTMENTS – 9.9/15** on p. 70.

Check for sufficient slack on ignition component leads during full advance movement of the ignition plate.

25/30 MODELS

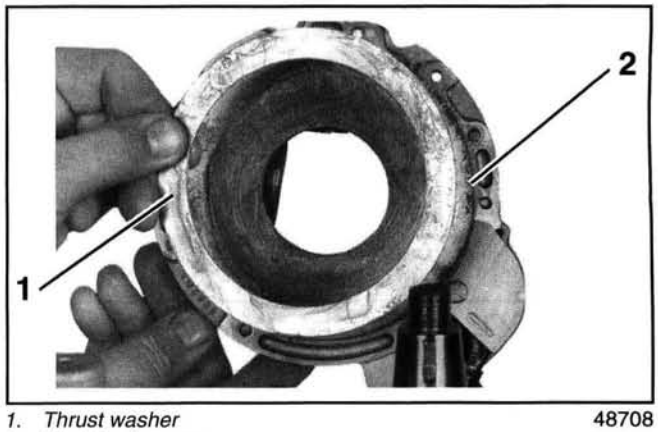
Place the retainer plate, washers, and pilot ring on the powerhead. Be sure washers are placed between the pilot ring and powerhead.

Align pilot ring with four screw holes in powerhead. Apply *Nut Lock* to threads of the four pilot ring screws. Install the screws and torque to 48 to 60 in. lbs. (5 to 7 N·m).



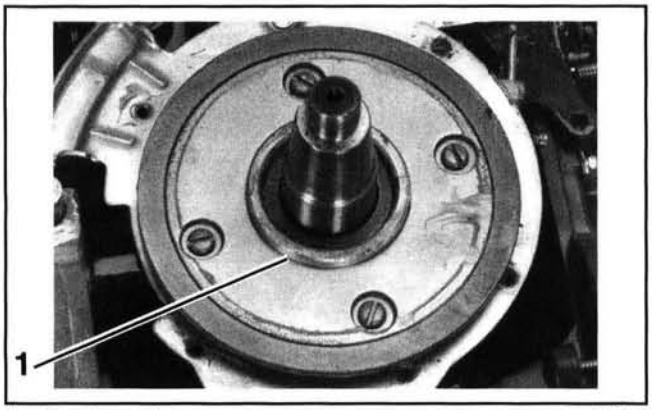
1. Screws 47303

Apply *Moly Lube* to the thrust washer, and place into the machined groove of the ignition plate.



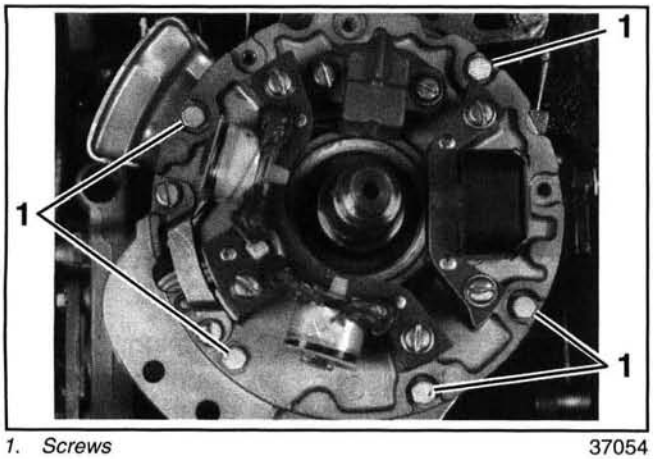
1. Thrust washer 48708
2. Machined groove

Apply *Moly Lube* to the crankcase boss and pilot ring.



1. Crankcase boss 47303

Apply *Nut Lock* to the threads of the five ignition plate screws. Align the ignition plate with the retainer plate. Torque the screws to 25 to 30 in. lbs. (2.8 to 4.0 N·m).



1. Screws 37054

Connect and adjust spark advance link. Refer to **SYNCHRONIZATION AND LINKAGE ADJUSTMENTS – 25/30** on p. 73.

Check for sufficient slack on ignition component leads during full advance movement of the ignition plate.

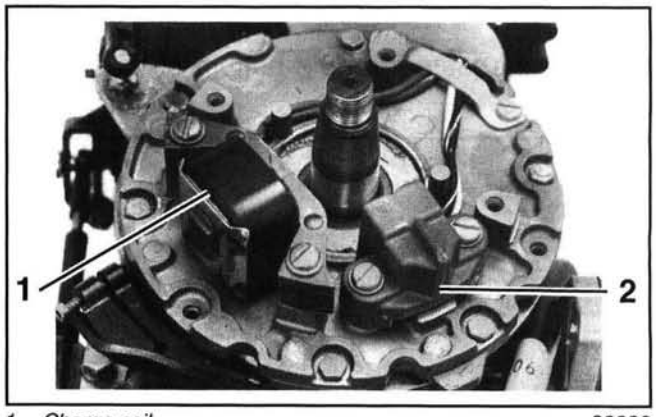
CHARGE COIL AND SENSOR COIL

Removal

⚠ WARNING ⚠

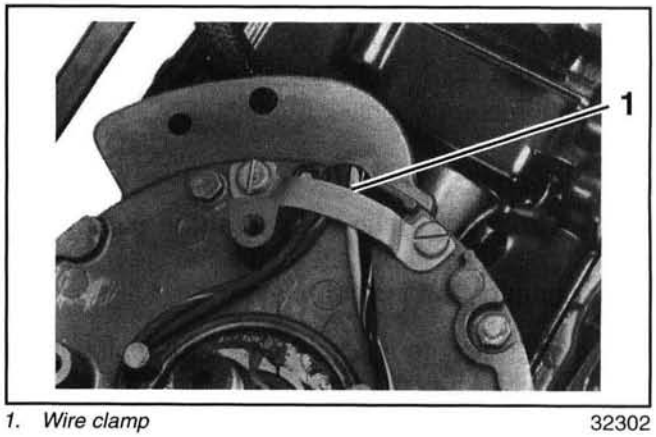
To prevent accidental starting while servicing, twist and remove all spark plug leads.

Remove the screws retaining the ignition component that is being replaced.



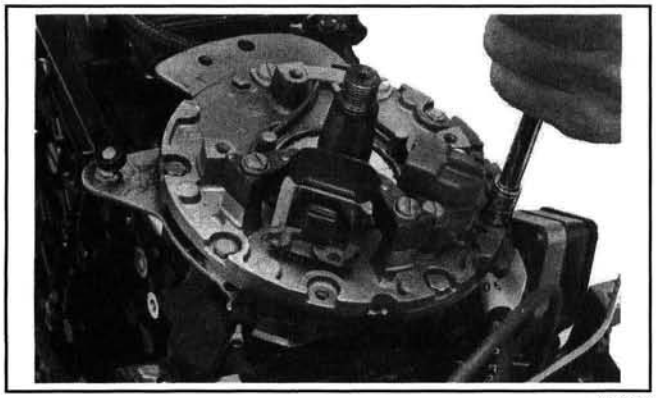
1. Charge coil
2. Sensor coil 32329

Remove the wire clamp from the ignition plate.



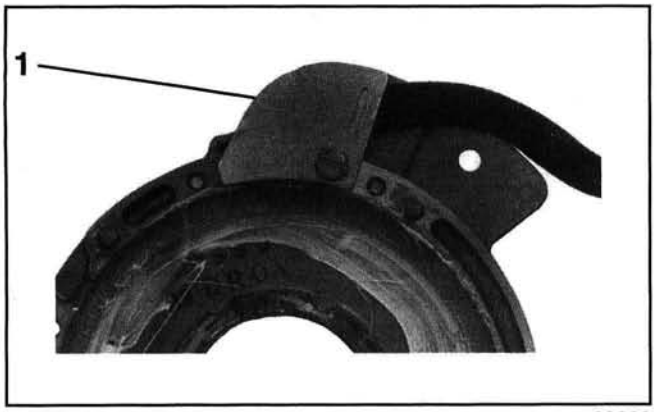
1. Wire clamp 32302

Loosen the ignition plate screws. Lift the ignition plate from the powerhead.



32324

Remove the plate from the bottom of the ignition plate.



1. Plate 32288

Remove the leads from the spiral wrap and from the ignition component.

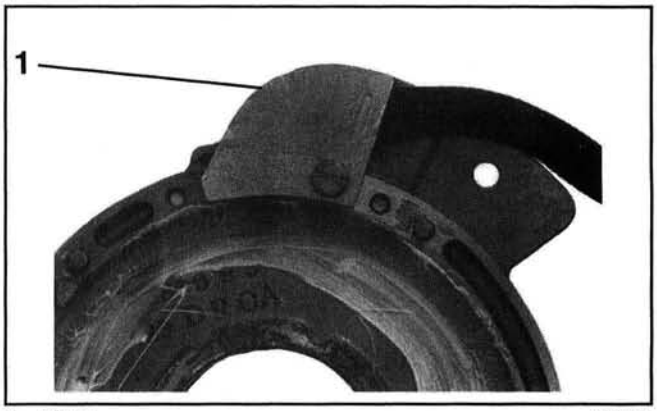
Installation

Apply *Ultra Lock* to the threads of the component retaining screws. Loosely install the new ignition component on the ignition plate.

Connect and route the leads from the spiral wrap and from the ignition component.

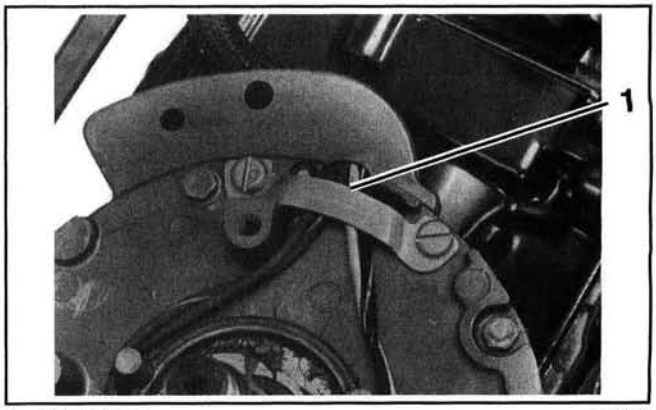
IMPORTANT: All component leads must be routed through the clamp and plate in a single layer, not twisted or crossed over another lead.

Install plate on bottom of the ignition plate.



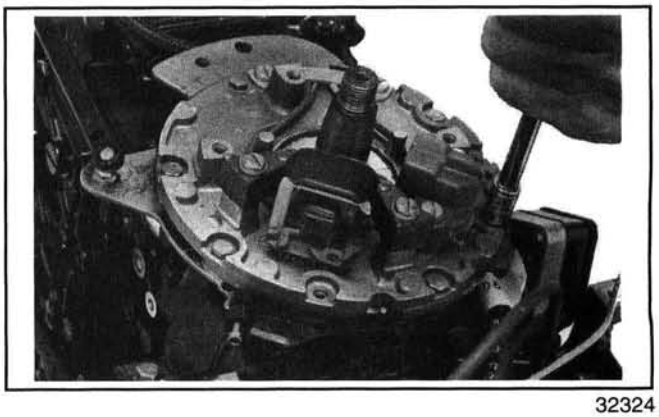
1. Plate 32288

Install the wire clamp on ignition plate.



1. Wire clamp 32302

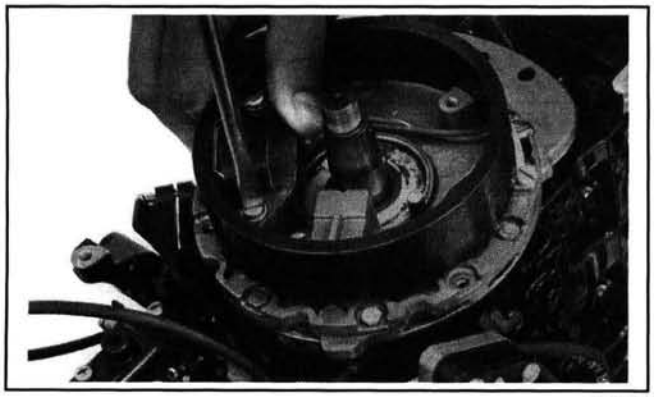
Apply *Nut Lock* to the threads of the ignition plate screws. Install the ignition plate on the retainer plate. Torque screws to 25 to 35 in. lbs. (2.8 to 4.0 N·m).



32324

Check for sufficient slack on ignition component leads. Route component leads through wire clamps.

Position Coil Locating Ring, P/N 334994, over machined bosses on the ignition plate. Push the locating ring in toward the component to be installed. Hold the ring in place and pull the component out toward the ring. Tighten screws to 15 to 22 in. lbs. (1.6 to 2.4 N·m). Do this step for each component installed.



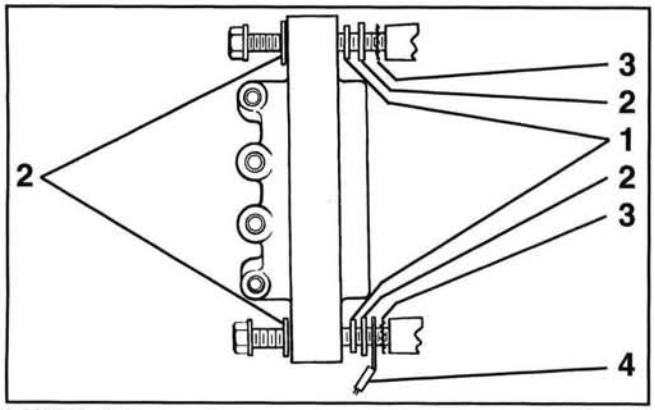
32287

IGNITION COIL

Removal

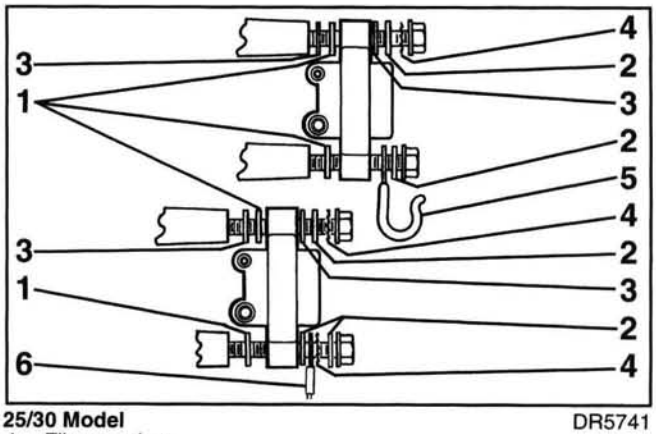
Twist and remove cover. Remove the spark plug and primary leads from the ignition coils.

IMPORTANT: Make a note of the fastener and washer locations before removing any screws.



9.9/15 Model DR5055

1. *Fiber washer*
2. *Ignition coil ground strap*
3. *Starwasher*
4. *Stop switch ground lead*



25/30 Model DR5741

1. *Fiber washer*
2. *Flat washer*
3. *Ignition coil ground strap*
4. *Starwasher*
5. *J-clamp*
6. *Stop switch ground lead*

Remove the screws, coil, and washers.

Installation

Assemble the correct sequence of washers and locate the ignition coil on the powerhead. Install screws and torque to 48 to 96 in. lbs. (5.4 to 10.8 N·m).

Apply a light coating of *Electrical Grease* to the ribbed portion of the spark plug ceramics and to the openings of each of the spark plug lead covers. Install the spark plug leads.

Apply a light coating of *Electrical Grease* to the opening of each primary lead cover and install the covers. Observe proper wire routing and ignition timing. Orange/blue primary lead must be connected to the number 1 ignition coil.

NOTES

Technician's Notes

Related Documents

Bulletins	
Instruction Sheets	
Other	

FUEL SYSTEM

TABLE OF CONTENTS

SAFETY INFORMATION

Before working on any part of the outboard, read the SAFETY section at the end of this manual.

DANGER

Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off. Remove propeller before servicing and when running the outboard on a flushing device.

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

WARNING

Wear safety glasses to avoid personal injury, and set compressed air to less than 25 psi (172 kPa).

The motor cover and flywheel cover are machinery guards. Use caution when conducting tests on running outboards. DO NOT wear jewelry or loose clothing. Keep hair, hands, and clothing away from rotating parts.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

To prevent accidental starting while servicing, disconnect the battery cables at the battery. Twist and remove all spark plug leads.

The electrical system presents a serious shock hazard. DO NOT handle primary or secondary ignition components while outboard is running or flywheel is turning.

Gasoline is extremely flammable and highly explosive under certain conditions. Use caution when working on any part of the fuel system.

Protect against hazardous fuel spray. Before starting any fuel system service, carefully relieve fuel system pressure.

Do not smoke, or allow open flames or sparks, or use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

Keep all electrical connections clean, tight, and insulated to prevent shorting or arcing and causing an explosion.

Always work in a well ventilated area.

Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to tightening must be felt when reusing a locking fastener. If replacement is indicated, use only authorized replacement or equivalent.

COMPONENTS

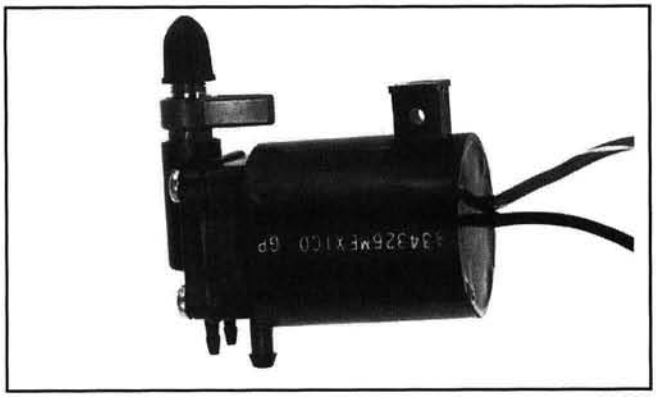
The carbureted fuel system consists of the following components:

- Primer solenoid
- Primer pump (25 TE and 25/30 R Models)
- Fuel pump
- Carburetor
- Intake manifold assembly

Primer Solenoid

REMOTE ELECTRIC MODELS

Fuel mixture enrichment for cold starting and running is provided by a solenoid operated fuel primer valve. When activated at the key switch, the valve diverts fuel from the fuel pump directly to the carburetor and/or the intake manifold.

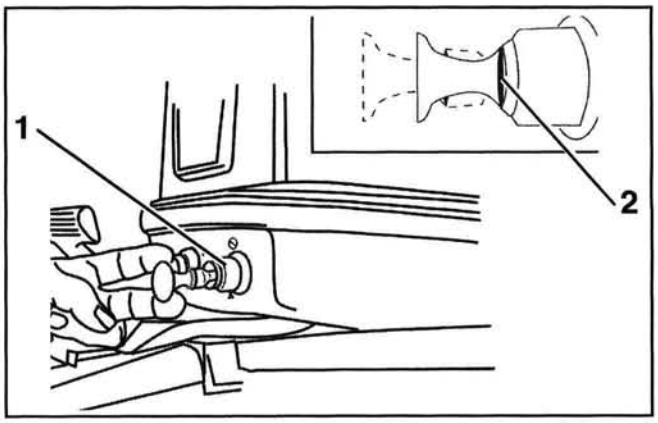


30393

Primer Pump

25 TE AND 25/30 R MODELS

Fuel mixture enrichment for cold starting and warm-up is provided by a manually operated primer pump. Pull the primer knob through its full stroke twice and return to the warm-up position to operate the primer.

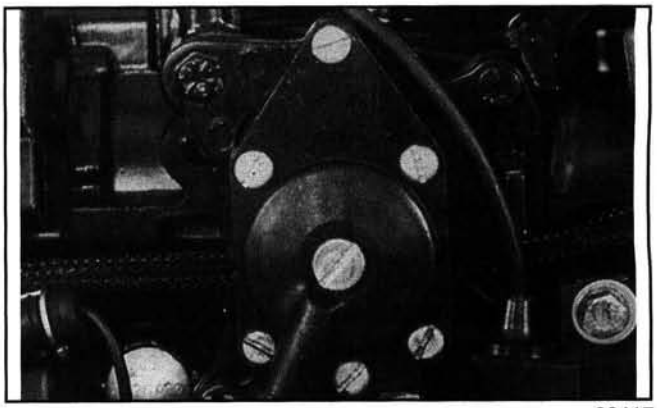


1. *Manual primer*
2. *Warm-up position (colored groove)*

DR3753A

Fuel Pump

The fuel pump is a diaphragm-displacement type and is operated by changes in crankcase pressure. A pulse hose connects the pump to the cylinder/crankcase. Alternately, vacuum and pressure in the crankcase are transmitted to the pump diaphragm.

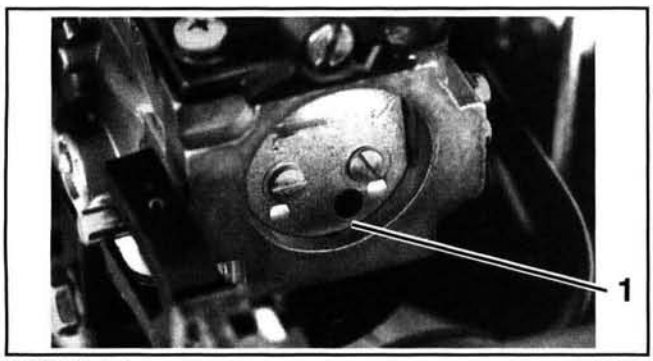


26417

Carburetor

The carburetor meters and distributes the fuel to the engine. It controls engine speed and power output by varying the intake charge density. To react correctly to a wide range of operating conditions, the carburetor has multiple fuel mixing circuits.

Fuel mixture enrichment for cold starting is controlled by either a choke (9.9/15 Models), a manual primer (25 TE and 25/30 R Models), or a fuel primer solenoid (Remote Electric Models).

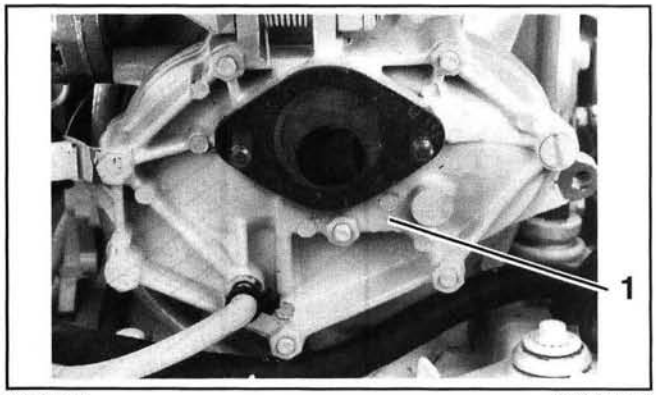


9.9/15 Model 32958
1. Choke

IMPORTANT: The 9.9/15 models use a tamper resistant carburetor. Changing original factory fuel mixture calibrations beyond the limits allowed by the tamper resistant device is a violation of federal law. Any carburetor adjustments beyond preset limits become the responsibilty of the servicing technician and/or the owner. Refer to **Emissions Compliance** on p. 150.

Intake Manifold

The intake manifold provides the mounting surfaces to adapt the carburetor to the cylinder/crankcase assembly. It contains the leaf valves which control the intake charge to each cylinder.



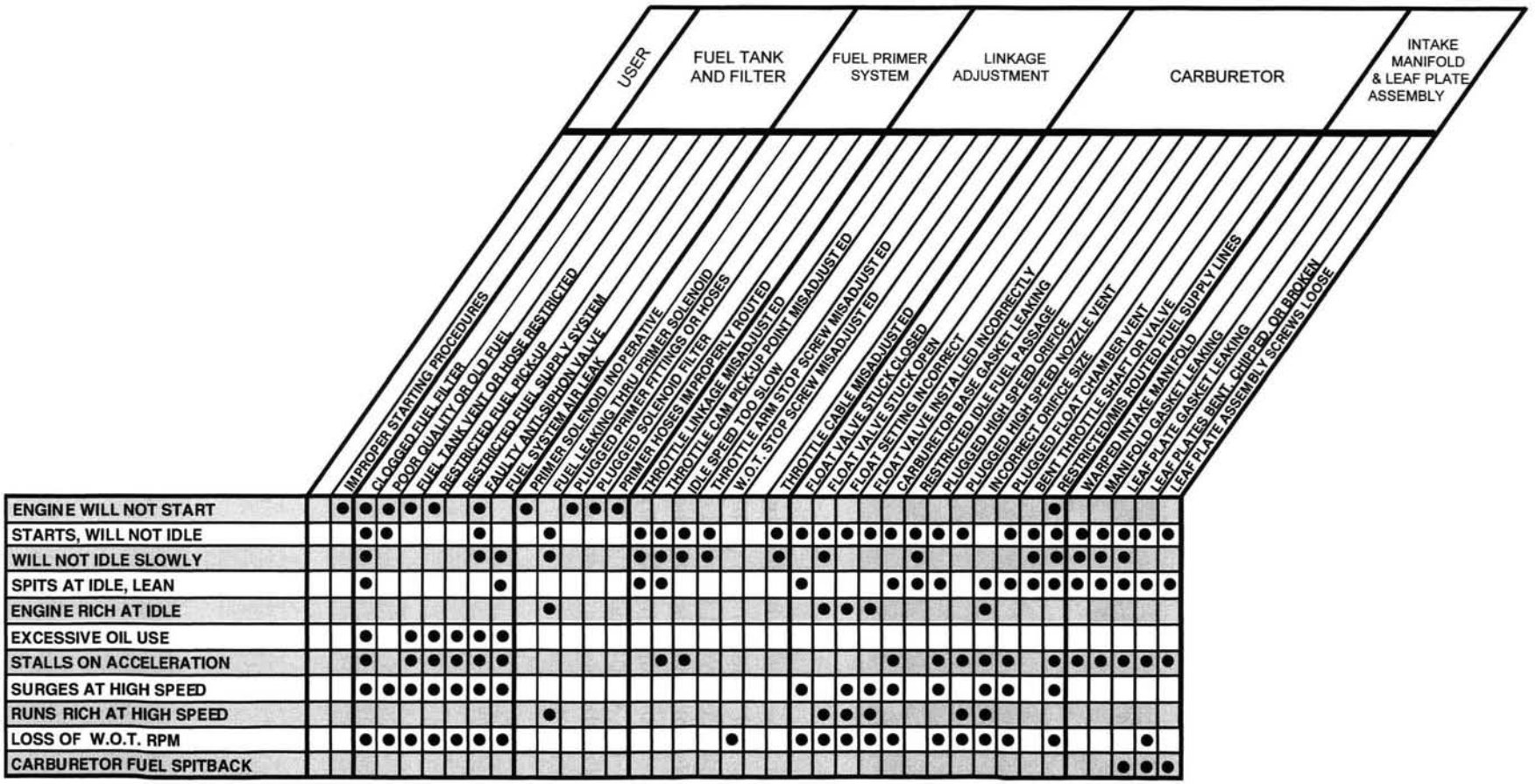
TYPICAL COA1524
1. Intake manifold

WARNING

After servicing the fuel system, check for leaks. Failure to check for fuel leakage could allow a leak to go undetected, resulting in fire or explosion.

6

FUEL SYSTEM TROUBLE CHECK CHART



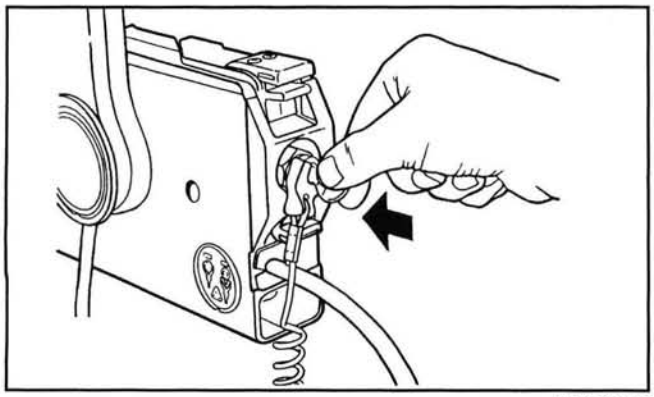
32CFTCENR

FUEL SYSTEM TESTS

Primer Solenoid Tests

Functional Test

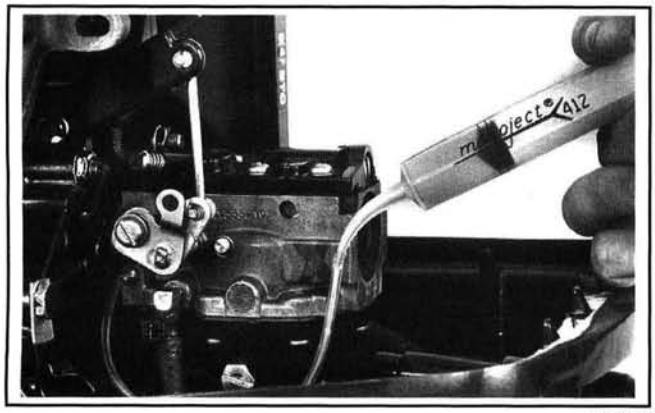
STEP 1
Start engine and allow it to reach normal operating temperature. Set engine speed at 2000 RPM. While engine is running, push in key. Engine should run richly and drop 1000 RPM. Stop engine.



DRC6140

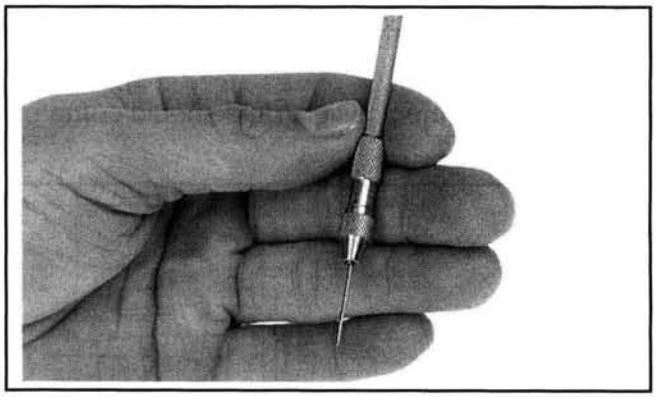
Results:
- Outboard slows approximately 1000 RPM, primer circuit is functional.
- No affect on speed, make sure primer solenoid activates and valve of primer solenoid is opening. Proceed to next step.

STEP 2
Remove primer hose from intake or carburetor fitting. Connect a 1/8 in. I.D. clear vinyl hose between the fitting and a syringe, P/N 346936, filled with isopropyl alcohol. Press lightly on the syringe.



26416

Results:
- Fluid moves through passage, it is clear.
- Fluid does not move through passage(s), or excessive restriction exists, clean carburetor or manifold fittings with Nipple Cleaning Tool, P/N 326623, and retest.

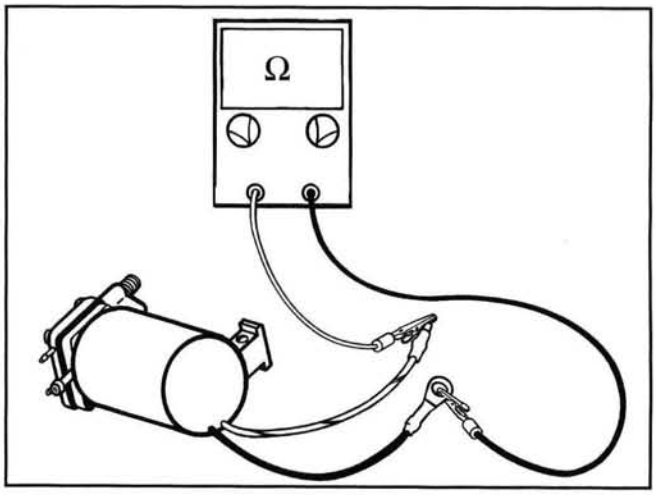


Cleaning Tool 6784

Solenoid Winding Test

Test the solenoid windings with an ohmmeter calibrated on the low ohms scale. Connect meter leads to solenoid leads. Meter should indicate:

Solenoid Resistance
5.5 ± 1.5 ohms



DR4034

6

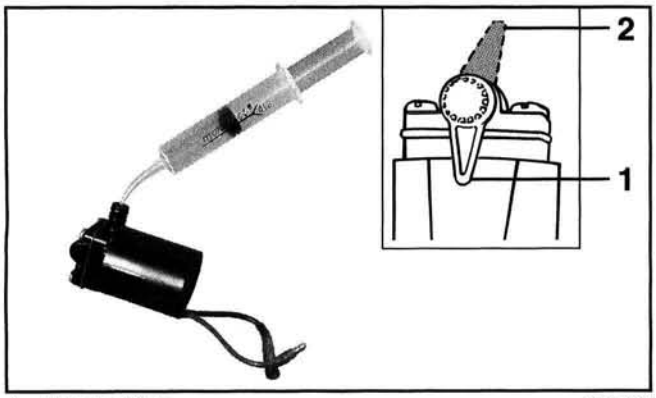
Solenoid Valve and Seat Test

Remove solenoid to perform this test. Refer to **Removal** on p. 146.

Lightly pressurize inlet fitting with alcohol and syringe.

With lever in run position, no fluid should enter inlet fitting.

With lever in prime position, fluid should come out both inlet fittings.



1. *Run position* 000897
2. *Prime position*

Primer Pump Tests

Running Test

STEP 1

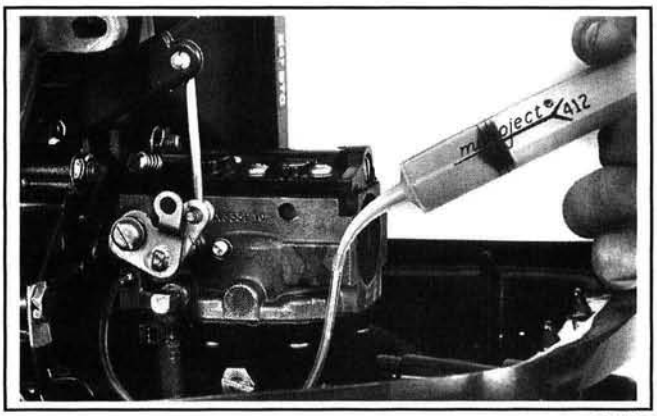
Start engine and allow it to reach normal operating temperature. Set engine speed at 2000 RPM. While engine is running, operate the primer knob and observe engine speed. Turn engine OFF.

Results:

- Outboard slows approximately 1000 RPM, primer circuit is functional.
- No affect on speed, check primer operation. Proceed to next step.

STEP 2

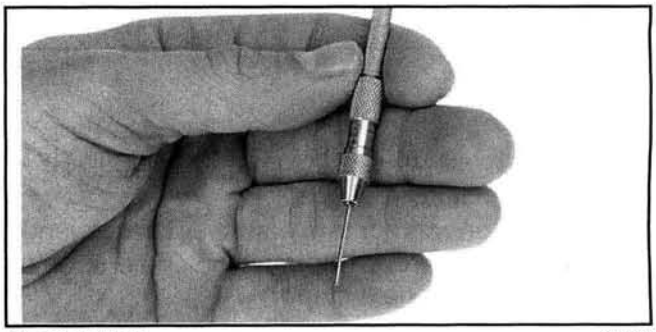
Remove primer hose(s) from intake or carburetor fitting(s). Connect a 1/8 in. I.D. clear vinyl hose between the fitting and a Syringe, P/N 346936, filled with isopropyl alcohol. Press lightly on the syringe.



26416

Results:

- Fluid moves through passage, it is clear.
- Fluid does not move through passage(s), or excessive restriction exists, clean intake or carburetor fitting(s) with Nipple Cleaning Tool, P/N 326623, and retest.



Cleaning Tool 6784

Fuel Flow Test

Perform these steps if the primer pump is difficult to operate or suspected of not working.

⚠ WARNING ⚠

Wear safety glasses when working on fuel systems to protect eyes from hazardous fuel spray.

STEP 1

Remove primer hose from carburetor or intake manifold fitting and install hose end into a suitable container to catch the fuel.

Squeeze fuel tank primer bulb to fill carburetor bowls with fuel and operate primer pump knob twice.

Results:

- Pumps fuel from hose(s), the primer pump is good.
- Fails to pump fuel from hose(s), make sure the hose is not kinked or restricted.
- If the primer pump still does not pump fuel go to **STEP 2**.

STEP 2

Remove hose at small nipple on top side of primer pump. Inspect hose for kinks or obstructions to flow.

Operate primer pump knob. Fuel must squirt from small nipple.

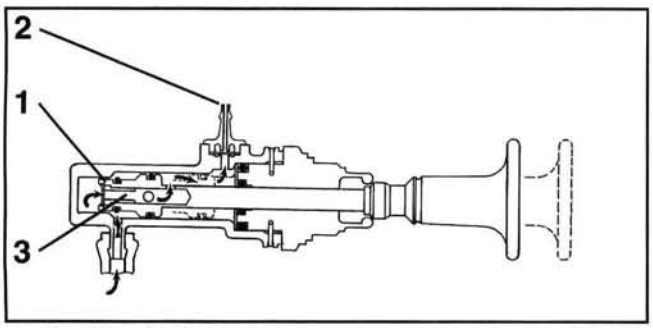
Results:

- Fails to pump fuel, inspect inlet hose between primer pump and carburetor for kinks and obstructions.
- If inlet hose is open and not kinked, remove and service primer pump. Refer to **PRIMER PUMP** on p. 147.
- If primer pump is externally leaking, replace the O-rings. Refer to **PRIMER PUMP** on p. 147.

IMPORTANT: The three smaller O-rings are made with a special material; use only the proper O-rings.

A built-in fuel inlet check valve on the primer pump housing (under the small nipple) should allow fuel to come out in one direction and close in the other direction.

The fuel inlet check valve allows fuel into the end of the plunger and out through the hole in the side of the plunger. Replace if damaged or does not function.



DR2578

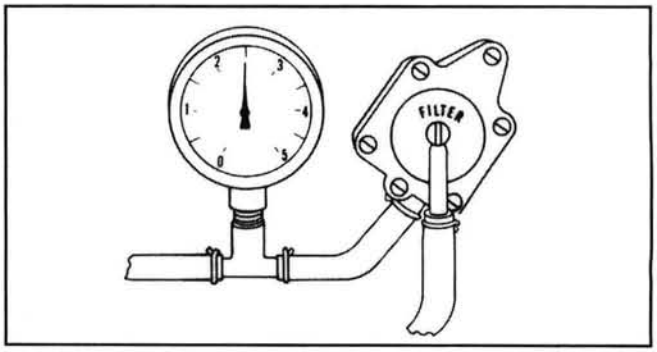
1. *Fuel inlet check valve*
2. *Small nipple*
3. *Plunger*

Fuel Pump Pressure Test

Perform this test with the outboard in a test tank or on the boat.

Before testing, loosen fuel tank gas cap momentarily to release any pressure that may have built up. Fuel tank must not be more than 30 in. (76 cm) below fuel pump.

Remove carburetor to fuel pump hose. Connect a fuel pressure gauge between the carburetor and fuel pump.



63328

Start outboard and monitor gauge. Pump pressure must be as specified below:

RPM	Pressure	
600	1 psi	7 kPa
2500-3000	1.5 psi	10 kPa
4500	2.5 psi	17 kPa

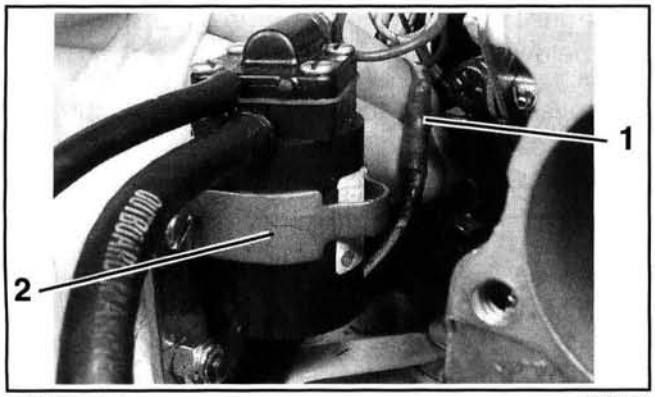
Results:

If pump does not develop minimum pressure, replace the pump.

PRIMER SOLENOID

Removal

Disconnect the primer solenoid purple/white lead connector.

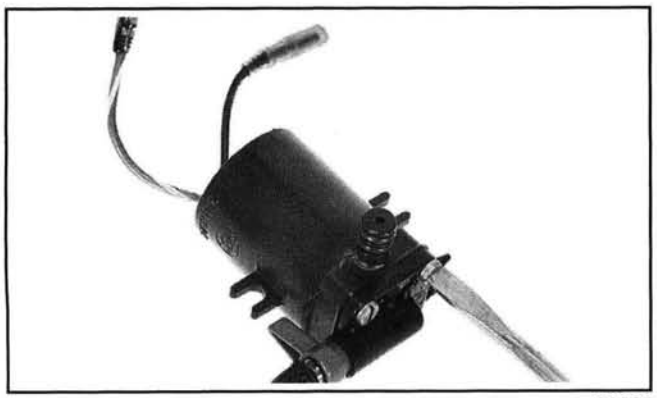


25/30 Model 001015
1. *Connector*
2. *Bracket*

Carefully remove the two hoses. Remove the two bracket screws and the ground lead positioned on the rear bracket screw. Remove primer solenoid.

Disassembly

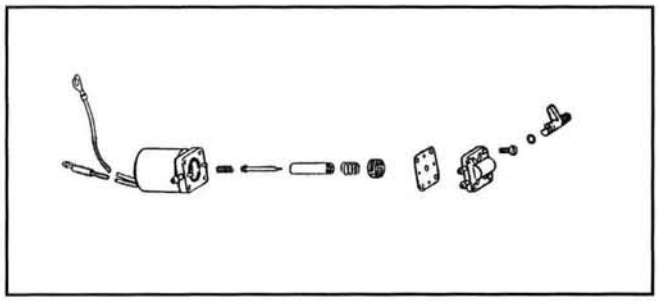
To inspect or replace internal components, remove the four solenoid cover screws.



30239

Assembly

When assembling solenoid, back out screws in their holes to engage original threads and tighten securely.



DR1417

Installation

Install solenoid and bracket with screws. Position ground lead under rear bracket screw.

Attach purple/white leads, black leads, and all hoses. Secure large hose with tie strap.

Connect fuel tank hose to outboard and squeeze primer bulb until definite pressure is felt in the bulb. Check for fuel leaks. Repair as needed.

⚠ WARNING ⚠

After servicing the fuel system, check for leaks. Failure to check for fuel leakage could allow a leak to go undetected, resulting in fire or explosion.

PRIMER PUMP

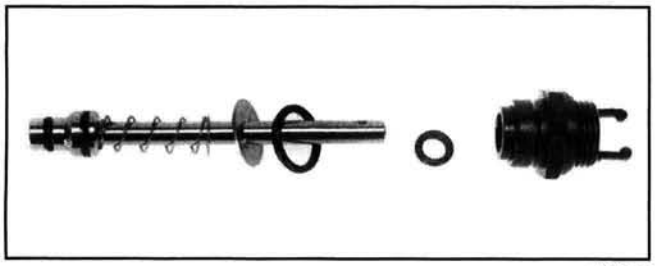
25 TE AND 25/30 R MODELS

Disassembly

Remove primer pump housing retaining ring from primer pump.

29284

Remove primer plunger from housing. Discard O-rings.

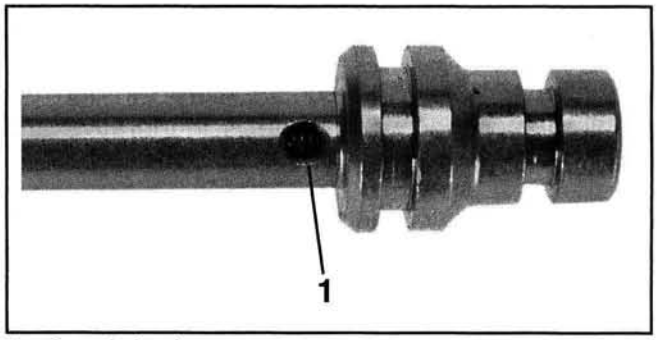


29283

Cleaning and Inspection

Inspect brass plunger shaft for any burrs or scratches. Remove small scratches by polishing the plunger with crocus cloth. If the plunger has deep scratches, replace the plunger.

Inspect plunger where cross hole intersects inside hole. Any burrs around cross hole will accelerate wear of O-rings. Remove any protruding burrs and polish with crocus cloth.

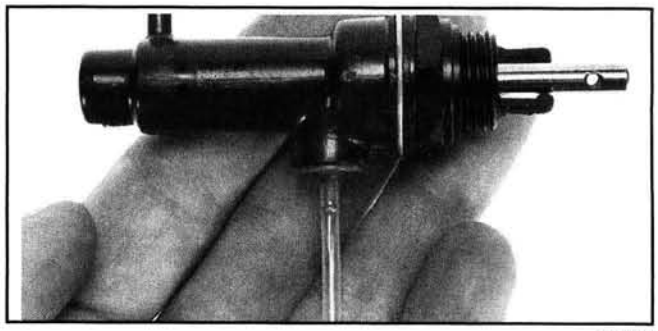


1. Cross hole, plunger 29282

To test for proper check valve function, use a squeeze bottle containing alcohol (such as isopropyl rubbing alcohol).

29274

Connect a clear plastic hose between **small** nipple and bottle to observe flow of alcohol. Squeeze the bottle lightly to force alcohol through the hose.

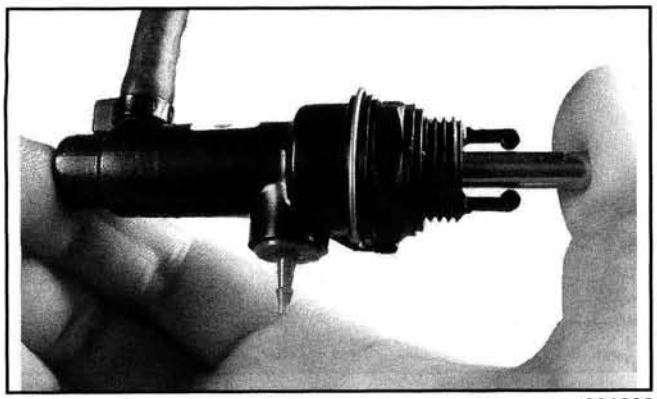


29275

Visually check for flow of alcohol into the housing. It is permissible for a few drops to be present. This indicates the check valve is blocking the flow and functioning correctly.

If a steady stream of alcohol flows through the small nipple, the check valve is inoperative and the primer pump housing must be replaced.

Install a hose over the **large** nipple of the primer pump housing and connect other end of hose to the alcohol squeeze bottle. Place your thumb over end of the plunger housing.Squeeze the alcohol bottle to fill the plunger housing. Alcohol should flow freely out of the small nipple, indicating no obstructions.

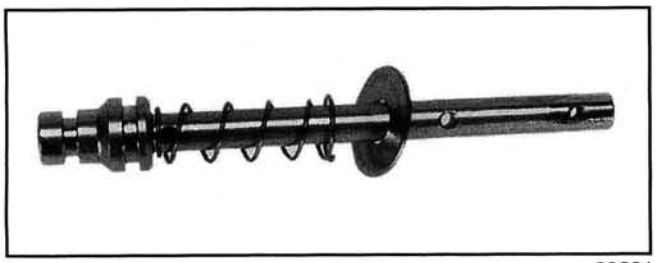


001008

If no flow is indicated, replace primer pump housing.

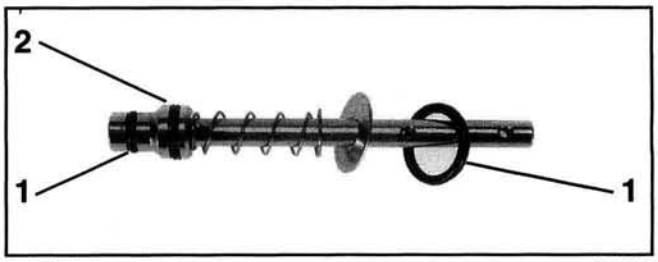
Assembly

Position the spring and washer on the plunger shaft.



29281

Install two new O-rings and quad ring onto plunger shaft.



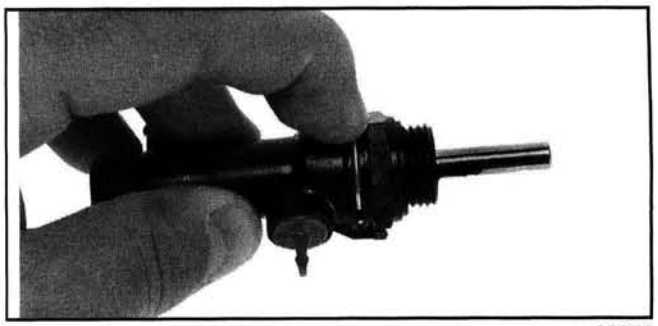
1. O-ring
2. Quad ring

29280

Install a new O-ring onto the end cap and position the end cap on the plunger shaft.

29279

Insert plunger shaft and end cap into primer pump housing. Reinstall retainer clip.

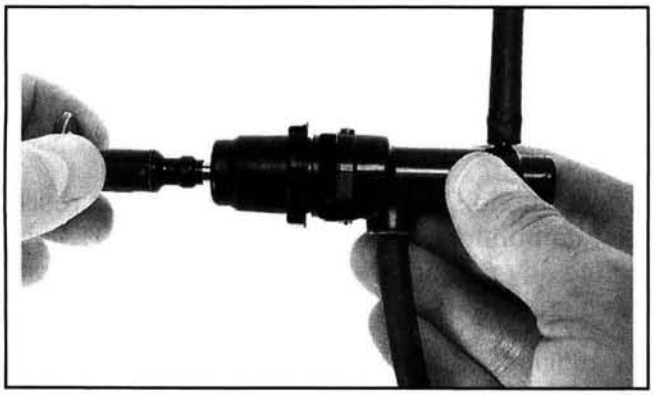


29278

To bench test the primer pump after assembly, connect a 5 in. piece of hose to the large nipple and place the other end of hose in a container of alcohol.

Place a hose on the small nipple and place other end of hose to drain into a container.

Hold primer pump in horizontal position as it would be installed on the engine. Move plunger back and forth ten times.



29277

Primer should pump approximately 10 cc of alcohol in ten strokes. If pump fails to pump alcohol, disassemble and check for missing, cut, or split O-rings or damaged check valves.

IMPORTANT: After installing, check for leaks by connecting fuel tank hose to outboard and squeezing primer bulb until definite pressure is felt in the bulb.

⚠ WARNING ⚠

After servicing the fuel system, check for leaks. Failure to check for fuel leakage could allow a leak to go undetected, resulting in fire or explosion.

FUEL PUMP

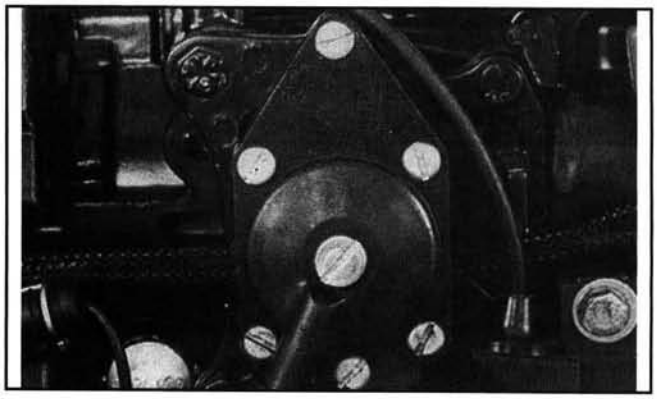
General

Before replacing a suspect fuel pump, remove and clean the fuel filter and install a new filter element. Also, remove the fuel hose from the fuel tank and blow through all passages and hoses with low-pressure compressed air to be sure they are open. This might be the cause of inadequate fuel delivery. If this procedure does not correct the trouble, perform **Fuel Pump Pressure Test** on p. 145.

IMPORTANT: To prevent excessive fuel spillage, disconnect hose connector at outboard before disassembly.

Disassembly

Loosen cover screw and remove cover. Do not lose small O-ring from around center post or large O-ring from outer edge of cover.



26417

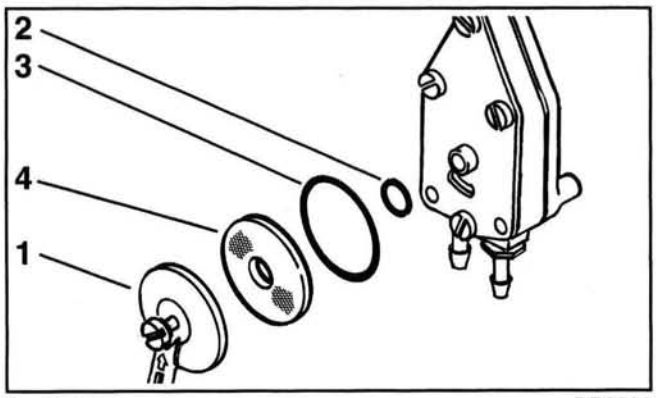
Cleaning

Wash filter element with clean solvent and a brush. Do not dry parts with a cloth as lint might stick to the parts and clog the passages. Dissolve any gummy deposits with *Cleaning Solvent*.

Assembly

Install filter with lip facing fuel pump body.

- Confirm the large O-ring is seated in its groove in the cover and the small O-ring is in place around center post.
- Install cover. Position inlet nipple between screw heads.
- Tighten the cover screw.



DR3000

1. *Cover*
2. *Small O-ring*
3. *Large O-ring*
4. *Filter element*

When installing fuel pump, apply *Nut Lock* to threads of screws. Install screws and torque 24 to 36 in. lbs. (2.8 to 4.0 N·m).

⚠ WARNING ⚠

After servicing the fuel system, check for leaks. Failure to check for fuel leakage could allow a leak to go undetected, resulting in fire or explosion.

IMPORTANT: Check for leaks after assembling pump. Connect the fuel hose to outboard and squeeze the primer bulb until definite resistance is felt.

CARBURETOR

Emissions Compliance

Johnson 9.9/15 models for model year 2004 are manufactured in accordance with United States of America Environmental Protection Agency (EPA) standards for emissions.

These models are equipped with tamper resistant carburetors. When servicing, DO NOT substitute any part of the carburetor with non-tamper resistant parts.

In addition, carburetor fuel mixture adjustments MUST NOT be altered from original factory calibrations beyond the limits allowed by the tamper resistant device.

Changes to the original design or adjustment limits of the outboard that effect emissions are a violation of federal law, and become the responsibility of the servicing technician and/or the owner.

When servicing the carburetors, it is very important that the procedures in this section are followed EXACTLY to ensure compliance with emissions standards.

Removal

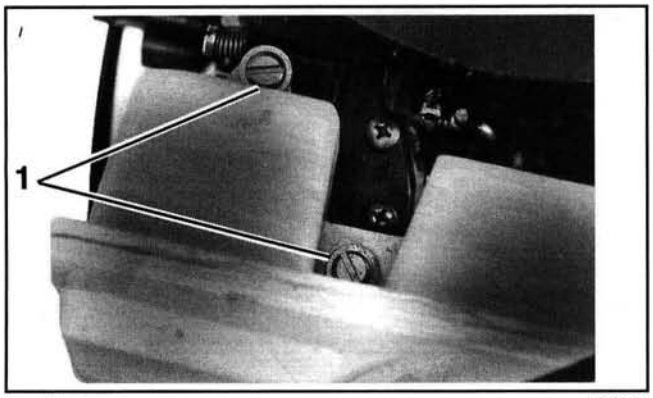
⚠ WARNING ⚠

Do not attempt to run engine with any fuel system component disconnected or removed. Fuel leakage could contribute to a fire or explosion.

9.9/15 MODELS

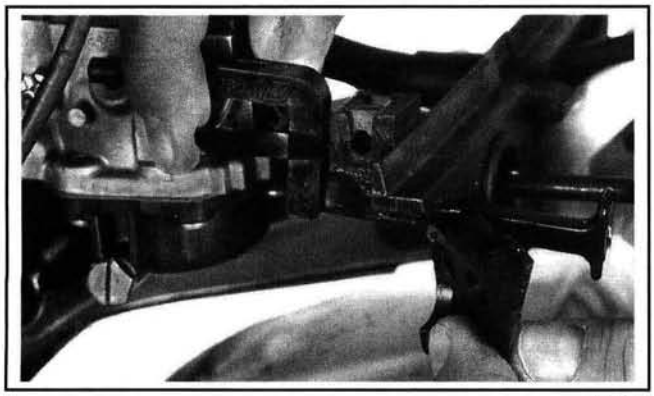
Remove the manual starter. Refer to Manual Starter **REMOVAL** on p. 294.

Loosen two retaining screws and remove air silencer.



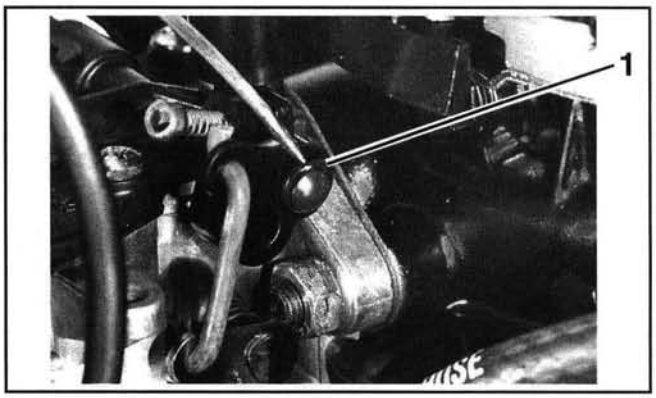
1. Screws 32957

Remove the choke lever.



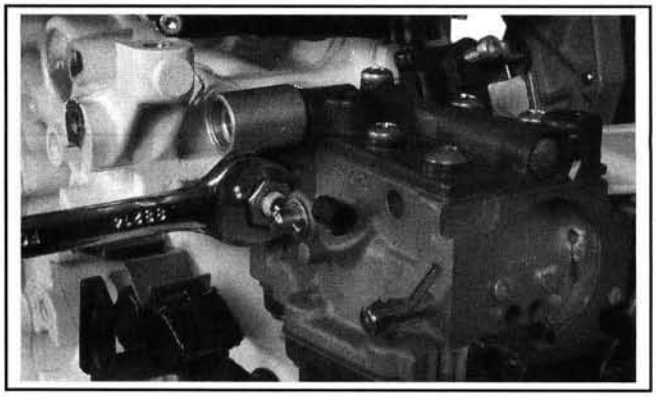
35005

Remove the cam follower O-ring.



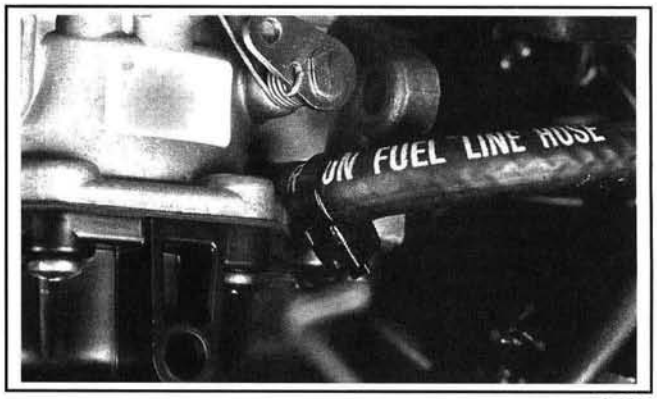
1. O-ring 35010

Loosen two mounting nuts and remove carburetor.



002558

Cut tie strap securing fuel hose to carburetor.



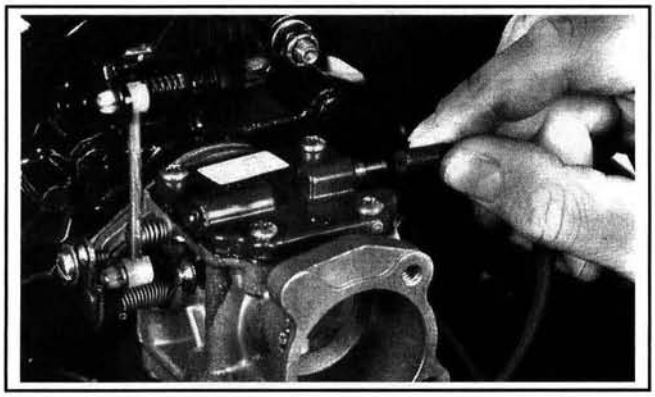
35009

6

25/30 MODELS

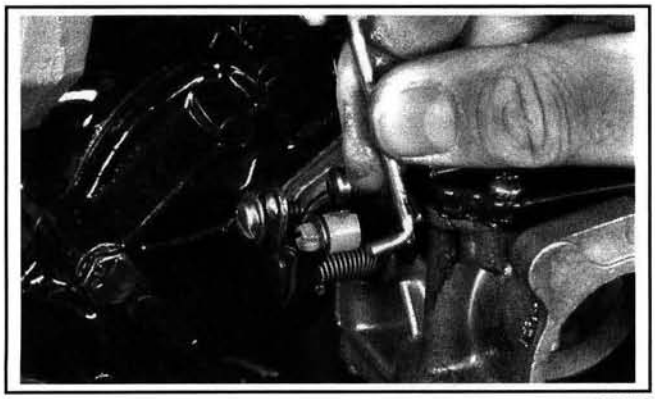
Remove electric starter bracket (if equipped) and set it aside.

Remove primer hose from nipple.



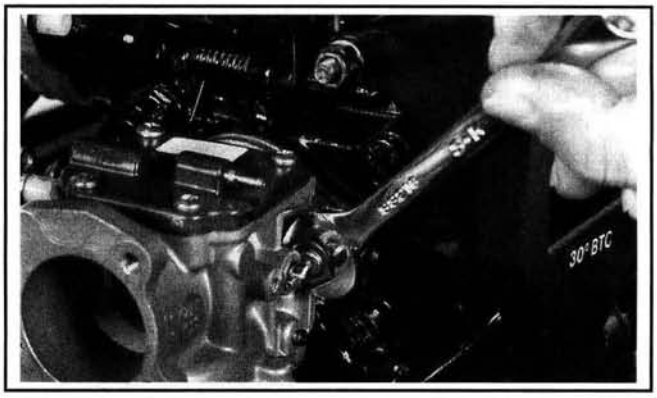
38512

Push throttle link out of cam follower.



38513

Remove carburetor mounting nuts.



38515

Remove carburetor from manifold.

Remove and discard tie strap. Disconnect hose from fuel nipples.

38518

Disassembly

9.9/15 MODELS

IMPORTANT: Changing original factory fuel mixture calibrations beyond the limits allowed by the tamper resistant device is a violation of federal law. Changes to the original design or adjustment limits become the responsibilty of the servicing technician and/or the owner. The following procedures must be followed EXACTLY to ensure compliance with emissions standards.

IMPORTANT: This carburetor uses a tamper resistant low speed needle and body cover assembly (except 10HR models). The needle valve is NOT removable from the cover and is adjustable within a limited range. If the needle is turned for any reason, it should be returned to its original location.

HR Models Only

Remove the low-speed needle and spring from the carburetor body cover.

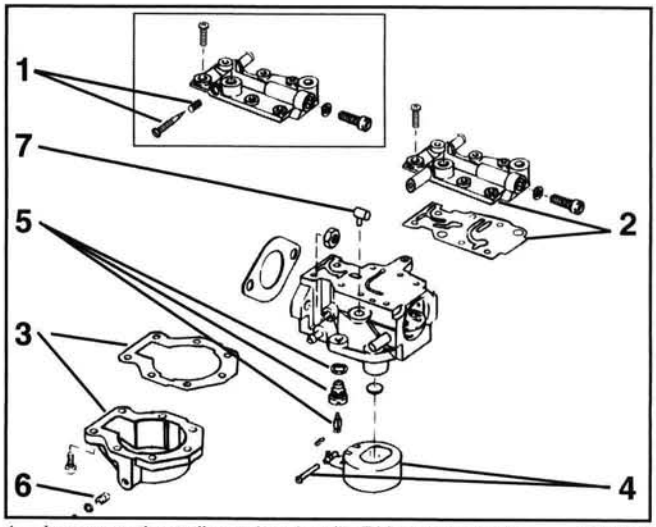
All Models

Remove the six cover screws. Lift the cover and gasket off the carburetor body.

Remove the seven float chamber screws and the float chamber and gasket.

Remove the hinge pin, float, and inlet valve assembly.

Remove the high-speed orifice. If necessary, remove the air vent.



002535

1. *Low speed needle and spring (10RH models only)*
2. *Carburetor body cover and gasket*
3. *Float chamber and gasket*
4. *Hinge pin and float*
5. *Inlet valve assembly*
6. *High-speed orifice*
7. *Air vent*

Refer to **Cleaning and Inspection** on p. 154.

25/30 MODELS

Remove manual primer fuel nipple, gasket and high-speed orifice from float chamber using Orifice Driver, P/N 317002.

Remove intermediate air bleed orifice.

Remove the screws, float chamber and gasket.

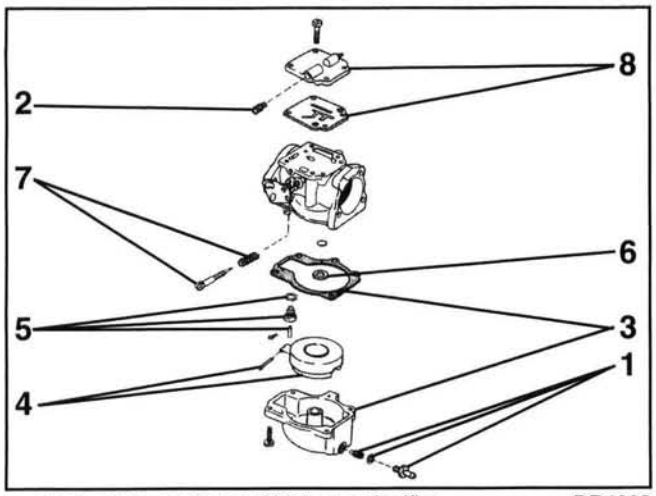
Remove hinge pin and float

Remove inlet valve assembly.

Remove nozzle well gasket.

Remove slow-speed needle and spring.

Remove four screws and carburetor body cover with gasket.



DR4808

1. *Fuel nipple, gasket and high-speed orifice*
2. *Intermediate air bleed orifice*
3. *Float chamber and gasket*
4. *Hinge pin and float*
5. *Inlet valve assembly*
6. *Nozzle well gasket*
7. *Slow-speed needle and spring*
8. *Carburetor body cover and gasket*

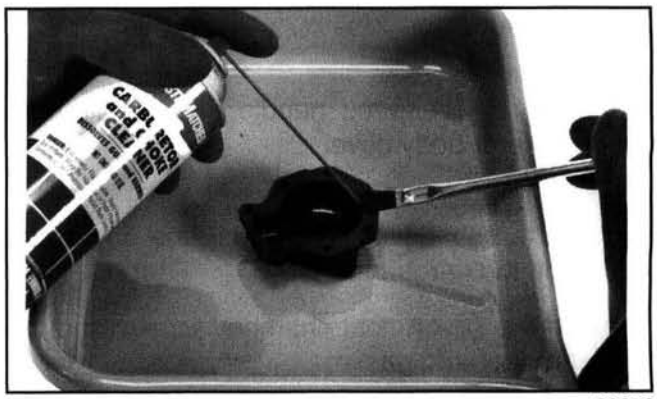
Refer to Carburetor Assembly, **Cleaning and Inspection**.

Cleaning and Inspection

IMPORTANT: Do not clean carburetor or its components by submerging in strong carburetor cleaner or hot soaking tank. Strong cleaners might damage components or remove sealing compounds.

Before inspection, all carburetor components must be thoroughly clean.

- Carburetor must be completely disassembled.
- Clean parts with *Carburetor and Choke Cleaner.*
- Use a clean bristle brush to remove gum or varnish deposits.
- Blow dry with shop air of not more than 25 psi (172 kPa). When drying passages, direct the flow of shop air opposite to the direction of fuel flow.

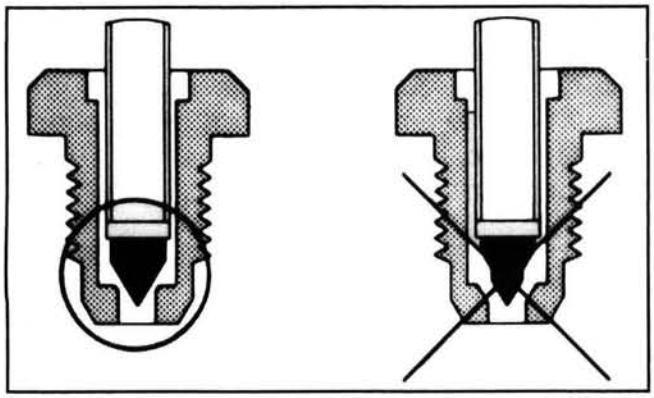


33953

Float Valve Assembly

Inspect the inlet needle and float valve seat.

- Check the inlet needle tip for grooves, nicks, scratches, or distortion.
- Check the float valve seat for nicks, scratches, or distortion.
- Check the float for signs of oil or gasoline saturation.

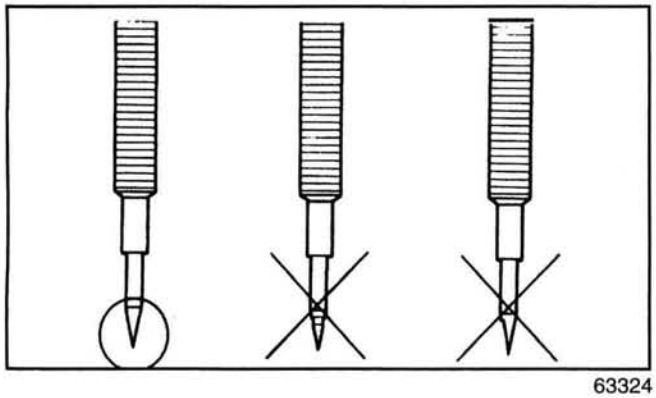


DR3584

IMPORTANT: The inlet needle and float valve seat must be replaced as a set.

Needle Valves

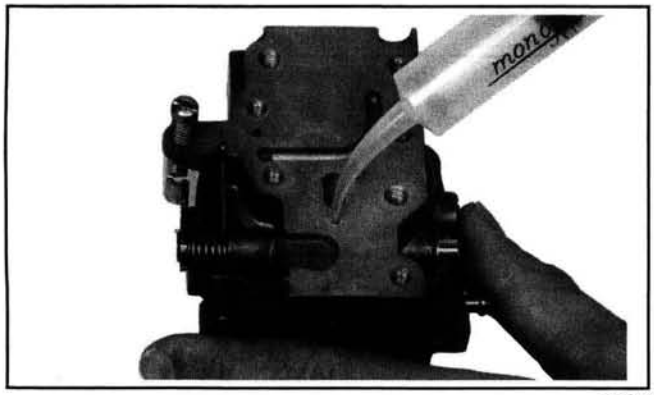
Inspect the tapered end of the needle valve for nicks, scratches, grooves, or signs of distortion.



63324

Carburetor Body

Check all drillings and passages with a syringe filled with isopropyl alcohol.



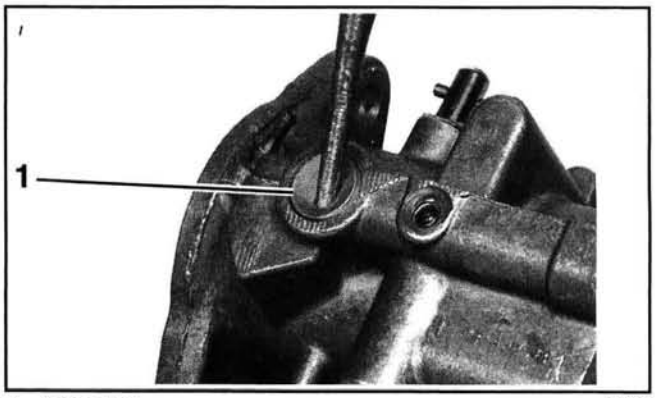
7628

Visually inspect all gasket surfaces for nicks or irregularities.

Check for excessive throttle shaft play. Check for throttle valve misalignment.

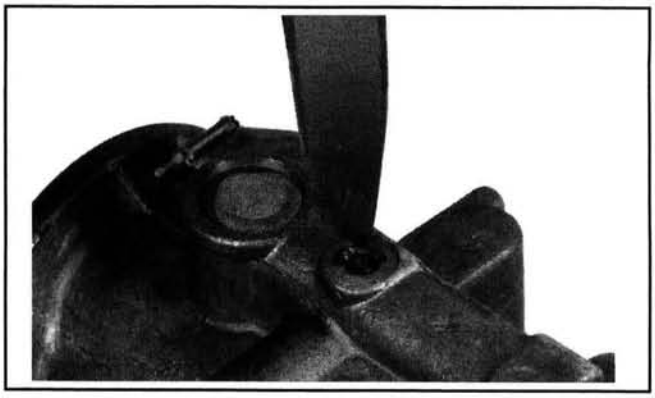
If necessary, remove the calibration pocket core plug to inspect the pocket for damage or restrictions.

- Drive a small punch not more than 1/8 in. (3 mm) through plug and pry out.
- Install a new core plug with the convex side up. Seat the plug using a flat end punch and plastic mallet. Apply *Gasoila* sealer to the rim of the core plug after it is seated.



1. Core plug 9490

If necessary, remove the lead shot to inspect passage for restrictions or leaks. Gently pry up on lead shot with a sharp edged tool.



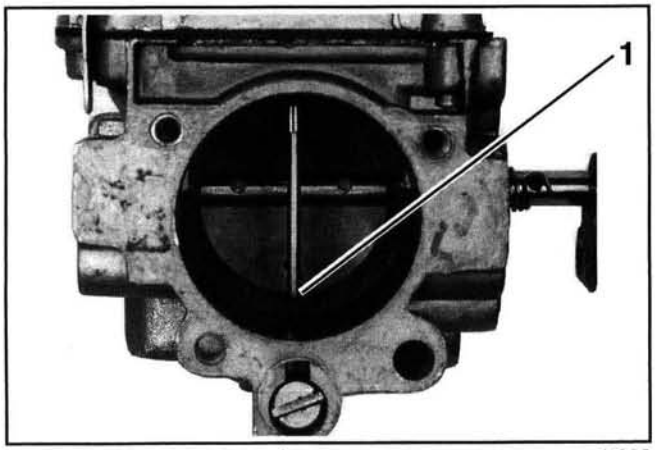
16768

Install a new lead shot. Flatten shot with flat end punch and plastic mallet. Check for leakage.

16767

Check for leaks between emulsion pickup tube and carburetor body.

- Invert carburetor body and fill idle circuit with isopropyl alcohol.
- Check for leaks at point shown below.
- If a leak occurs, blow dry and apply a drop of *Ultra Lock* at point shown.



1. Ultra Lock *application point* 7626

Assembly

When installing new parts from a carburetor rebuild kit, inspect gaskets and compare to original gaskets to ensure all holes are correctly punched. Also, inspect new gaskets for any loose fibers or particles of gasket material.

IMPORTANT: Before proceeding, be sure that all parts are perfectly clean. Be sure that all replacement parts match original ones in size and shape. Replace all gaskets, O-rings, and sealing washers each time you assemble a carburetor.

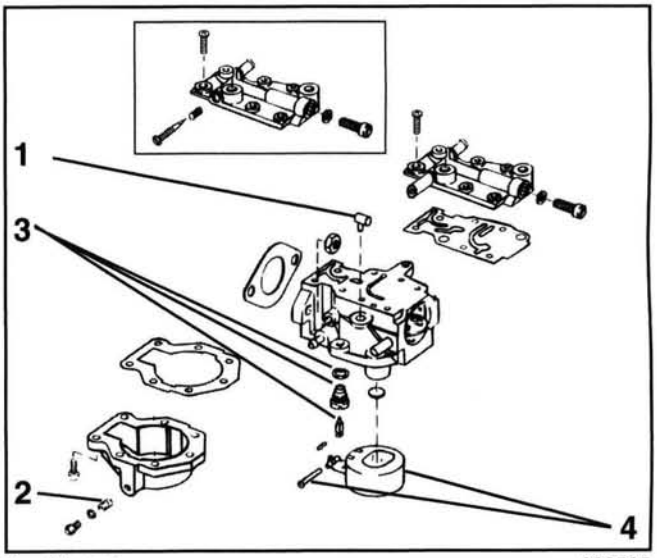
9.9/15 Models

If removed, press the air vent in the carburetor body.

Install the high-speed orifice.

Install the inlet valve assembly

Install the hinge pin and float.

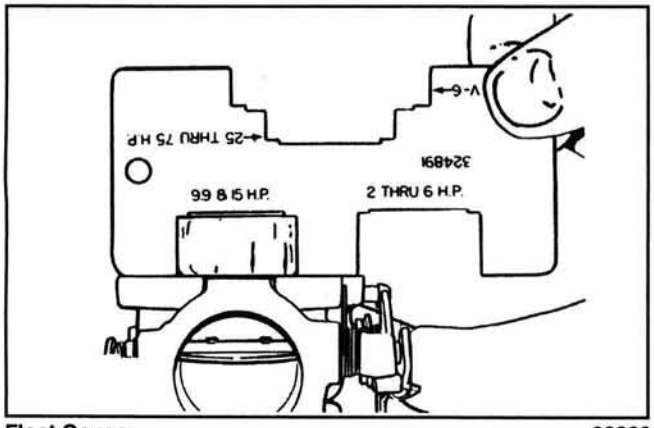


1. *Air vent* 002535
2. *High-speed orifice*
3. *Inlet valve assembly*
4. *Hinge pin and float*

Check for correct positioning of the float level. The float level controls the height of fuel in the float chamber and is essential to carburetor calibration and function.

Turn carburetor body upside down and hold so gasket surface is horizontal. The weight of the float will close the float valve needle. Rest Float Gauge, P/N 324891, on gasket surface and slide gauge up, next to float. Top of float should be between notches on gauge.

Use notch that is indicated "9.9 & 15 HP." Be certain gauge is not holding down the float.



Float Gauge 93328

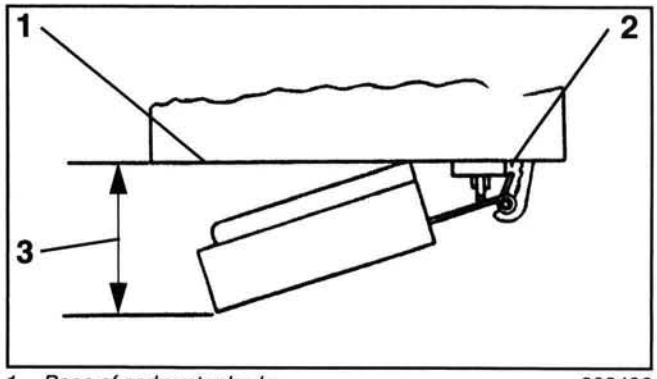
If float level is not between the notches of gauge, lightly bend metal float arm to adjust level. Be careful not to force float needle valve into seat.

Check for correct float drop setting. This setting affects the full opening of the inlet needle and is critical to correct operation of the carburetor.

With carburetor body in normal running position, the float must drop open from base of carburetor body to setting shown.

Float Drop Setting – 9.9/15
1 in. to 1 3/8 in. (25 to 35 mm)

Bend the float lever tab to adjust float drop.



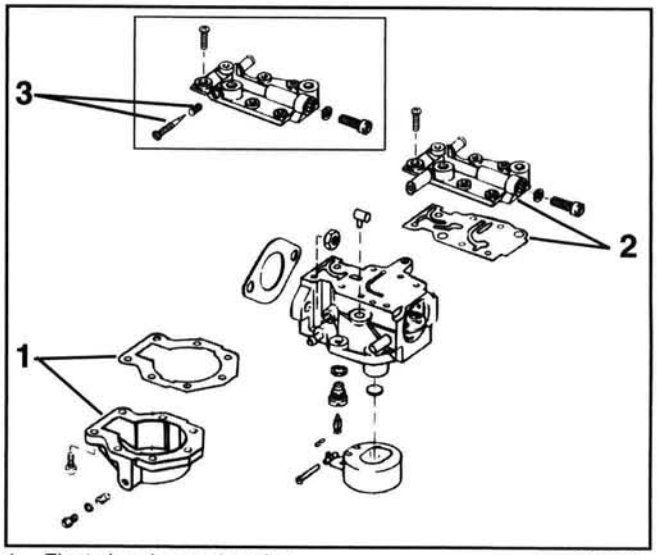
1. *Base of carburetor body* 803406
2. *Float lever tab*
3. *Float drop dimension*

Install the float chamber and a new gasket. Tighten the screws to a torque of 8 to 10 in. lbs. (0.8 to 1.2 N·m), following sequence embossed on float chamber.

Install the carburetor body cover and gasket. Tighten the screws to a torque of 8 to 10 in. lbs. (0.8 to 1.2 N·m), following sequence embossed on cover.

HR Models Only

Install the low-speed needle and spring. Turn needle carefully until it lightly contacts the seat; then back it off three turns.



1. *Float chamber and gasket* 002535
2. *Carburetor body cover and gasket*
3. *Low-speed needle and spring (10RH models only)*

6

25/30 MODELS

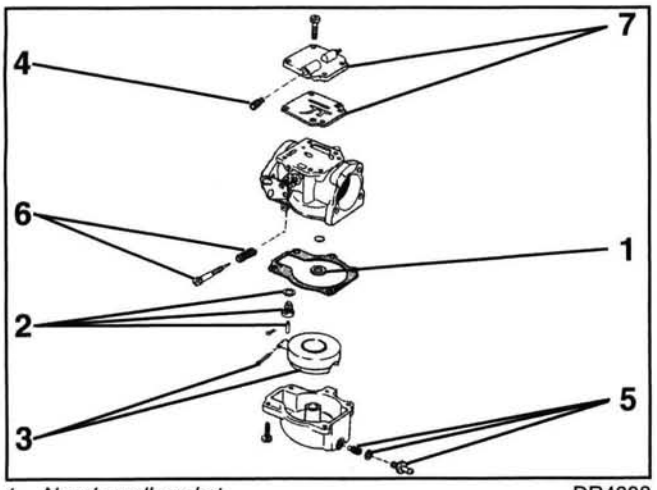
Install the inlet valve assembly and new nozzle well gasket.

Install the hinge pin and float.

Install the intermediate air bleed orifice, the high-speed orifice, gasket and manual primer fuel nipple.

Install slow-speed needle and spring. Turn carefully until it lightly contacts seat. Back needle out 2 1/2 turns for initial setting.

Install the carburetor body cover and gasket. Tighten the screws in an "X" pattern to a torque of 15 to 22 in. lbs. (1.6 to 2.4 N·m).



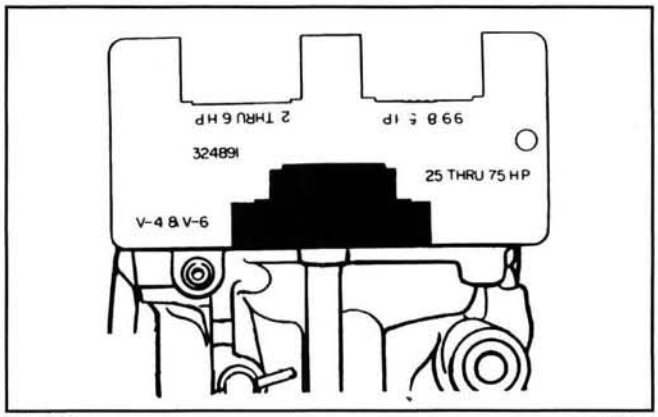
DR4808

1. *Nozzle well gasket*
2. *Inlet valve assembly*
3. *Hinge pin and float*
4. *Intermediate air bleed orifice*
5. *High-speed orifice, gasket and fuel nipple*
6. *Slow-speed needle and spring*
7. *Carburetor body cover and gasket*

Check for correct positioning of the float level. The float level controls the height of fuel in the float chamber and is critical with regard to carburetor calibration and function.

Turn carburetor body upside down and hold so gasket surface is horizontal. The weight of the float will close the float valve needle. Rest Float Gauge, P/N 324891, on gasket surface, and slide gauge up next to float. Top of float should be between notches float gauge.

Use notch that is indicated "25 thru 75 HP." Be certain gauge is not holding down the float.



Float Gauge 93329

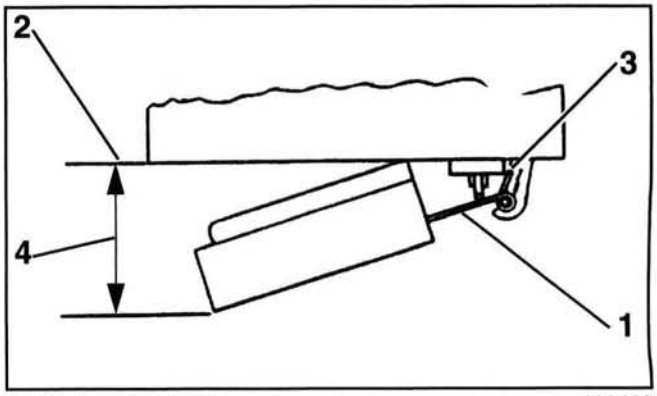
If float level is not between the notches of gauge, lightly bend metal float arm to adjust level. Be careful not to force float needle valve into seat.

Check for correct float drop setting. This setting affects the full opening of the inlet needle and is critical to correct operation of the carburetor.

With carburetor body in normal running position, the float must drop open from base of carburetor to setting shown.

Float Drop Setting – 25/30
1 1/8 in. to 1 5/8 in. (28 to 41 mm)

Bend float lever tab to adjust float drop.

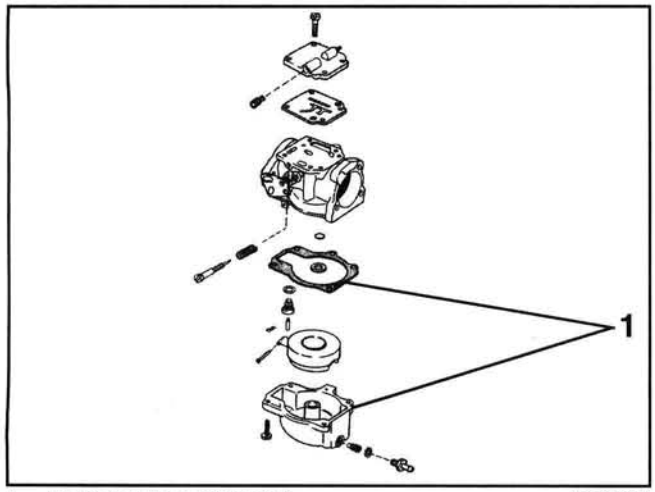


Float Drop Dimension 803406

1. *Metal float arm*
2. *Base of carburetor body*
3. *Float lever tab*
4. *Bend dimension*

Install the float chamber and a new gasket.

Apply *Locquic Primer* and *Screw Lock* to the threads of four float chamber screws. Install the screws and torque in an "X" pattern to 25 to 35 in. lbs. (2.8 to 4.0 N·m).



1. Float chamber and gasket DR4808

Installation

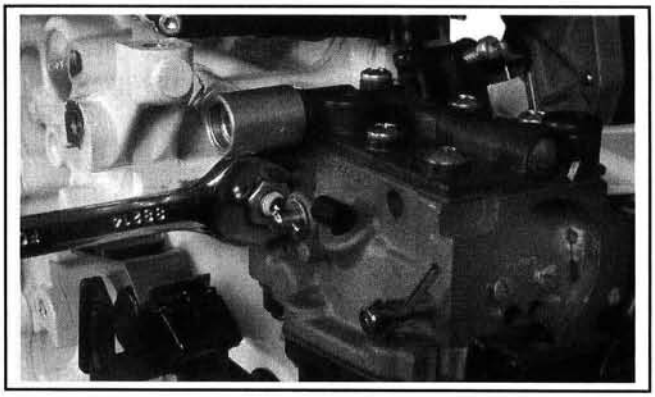
9.9/15 MODELS

Attach the fuel supply hose, and secure with a tie strap.

35009

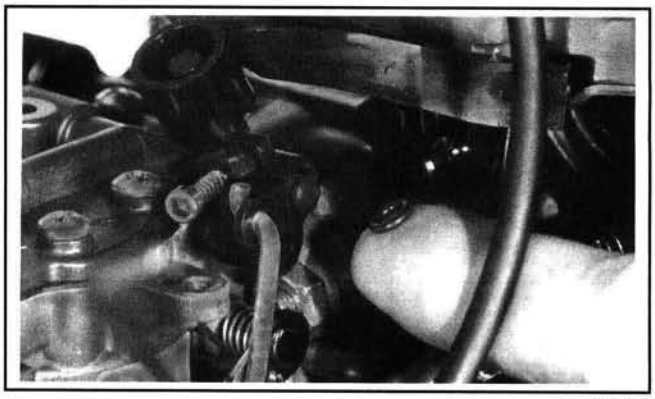
Position a new gasket on the intake manifold.

Install the carburetor. Tighten two retaining nuts securely.



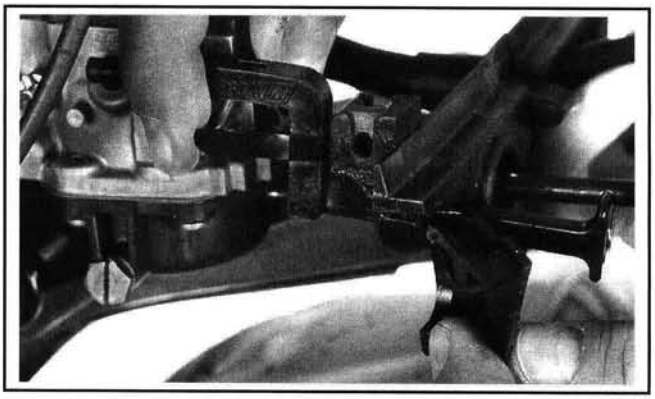
002558

Install cam follower on post. Position O-ring on the post to secure cam follower.



35007

Install the choke lever.



35005

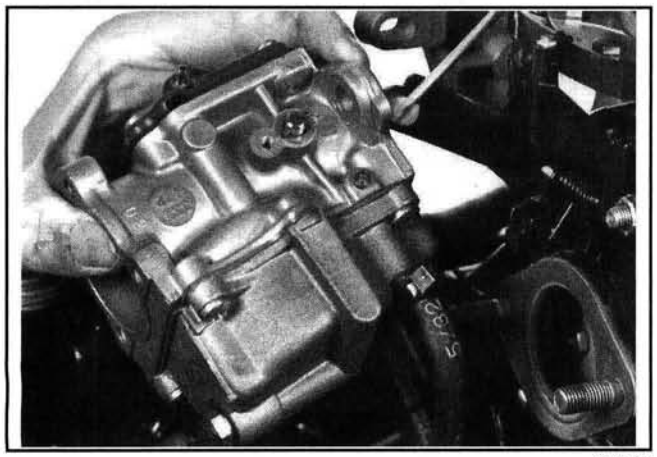
Install the air silencer cover and tighten screws securely.

Install the manual starter. Refer to Manual Starter **INSTALLATION** on p. 303 section.

If the low speed needle adjustment has been disturbed, refer to **CARBURETOR MIXTURE ADJUSTMENT** on p. 161.

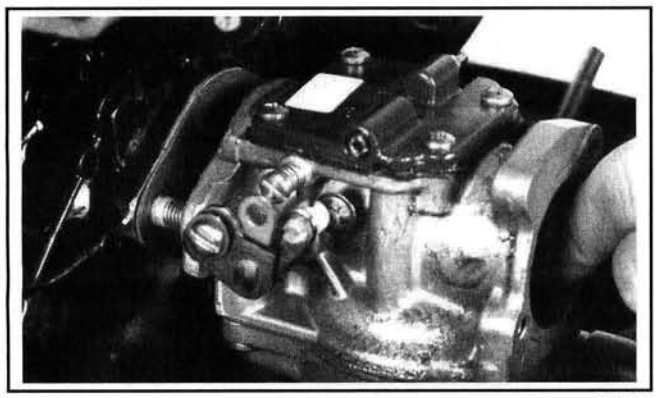
25/30 MODELS

Install the fuel inlet hose and manual primer hose to the carburetor. Secure the hoses using new tie straps. Install with Tie Strap Installation Tool, P/N 323716.



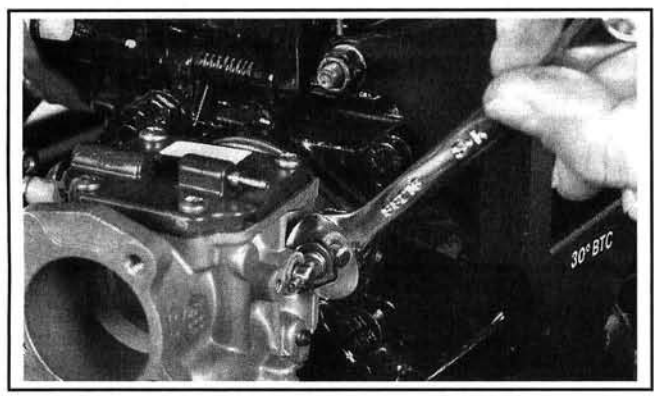
38517

Position a new carburetor base gasket on the intake manifold studs. Do not use sealer on the gasket.



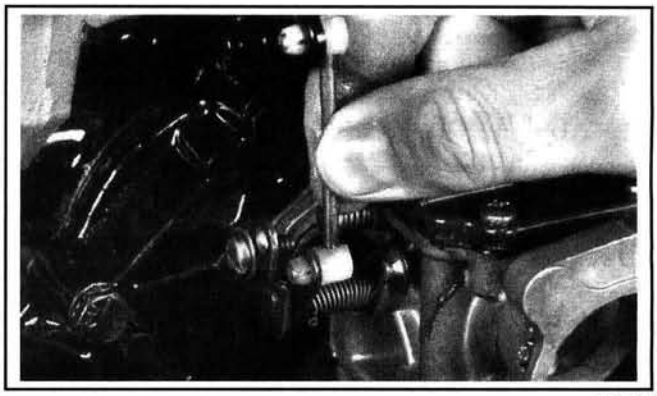
38516

Secure the carburetor to the intake manifold.



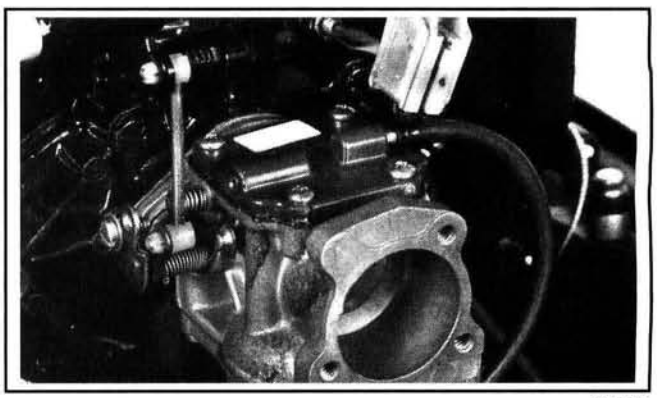
38515

Connect the throttle link to the cam follower.



38514

Secure the primer hose to the carburetor using a new tie strap.



38511

If the low speed needle adjustment has been disturbed, refer to **CARBURETOR MIXTURE ADJUSTMENT**.

CARBURETOR MIXTURE ADJUSTMENT

9.9/15 MODELS

IMPORTANT: Changing original factory fuel mixture calibrations beyond the limits allowed by the tamper resistant device is a violation of federal law. Any needle valve adjustments beyond preset limits become the responsibility of the servicing technician and/or the owner. Refer to **Emissions Compliance** on p. 150.

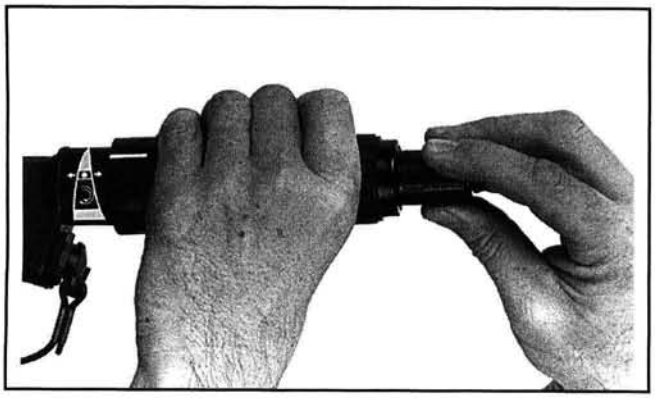
If the carburetor body cover assembly must be replaced; or, if the original calibration settings are lost, the following procedure can be used to make adjustments based on engine performance.

Adjustment of the tamper resistant needle valve requires a special Torx Screwdriver, P/N 351204.

Start the engine and run it in FORWARD at one-half throttle. Allow the engine to reach normal operating temperature.

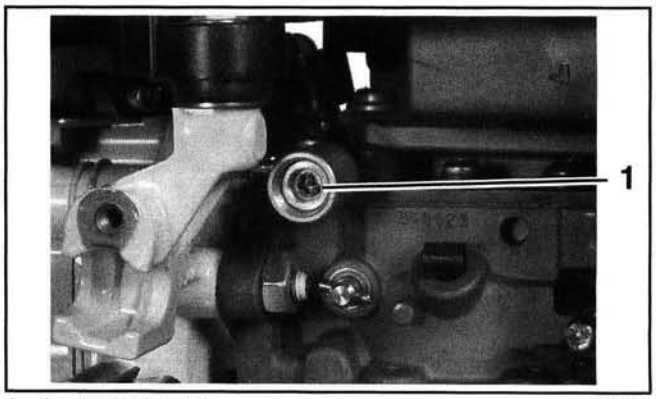
Tiller Models

Face the steering handle. Turn the idle speed adjustment knob counterclockwise to lowest SLOW speed position.



24333

Run the engine at slow speed (700 to 800 RPM) and adjust the low-speed needle until the highest consistent RPM is attained. Allow 15 seconds after each adjustment for the engine to respond.



1. Low-speed needle 35008

Reduce engine speed and turn the idle speed adjustment to allow the engine to run at a minimum of 650 RPM in FORWARD.

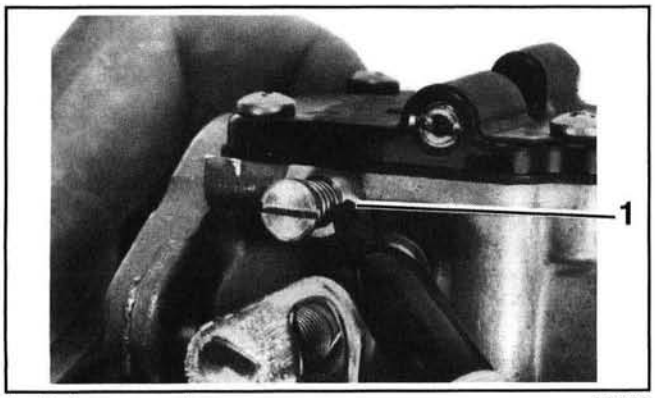
Run the engine in gear near full throttle for one minute. Quickly reduce speed to SLOW (700 to 800 RPM) and shift into NEUTRAL. The engine should continue to run smoothly.

If the engine stalls or pops, the mixture is too lean. Turn the needle counterclockwise 1/16 turn. Allow 15 seconds after each adjustment for the engine to respond. Do the previous step again to make sure the mixture adjustment is correct.

If the engine does not respond to adjustments, check it for other problems. Make sure gasoline is of good quality and mixed with the proper amount of oil.

25/30 MODELS

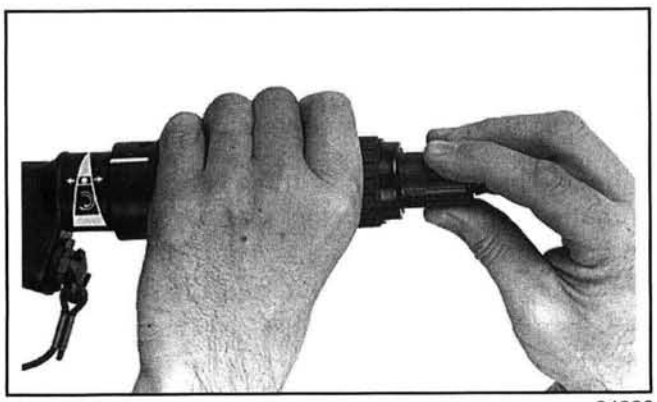
Make a reference mark on the carburetor body before you disturb the needle adjustment.



1. Reference mark 31856

Tiller Models

Face the steering handle. Turn idle speed adjustment knob counterclockwise to lowest SLOW speed position.



24333

Start the engine and run it in gear, at slow speed (700 to 800 RPM), for three minutes. Allow it to reach normal operating temperature.

If the adjustment is too lean, the engine will sneeze and backfire. Do the following procedure:

- Note the reference mark and turn the needle 1/8 revolution counterclockwise. Wait 15 seconds after each adjustment and repeat this procedure until you reach the highest consistent RPM.

If the adjustment is too rich, the engine will be rough and unsteady. Do the following procedure:

- Note the reference mark and turn the needle 1/8 revolution clockwise. Wait 15 seconds after each adjustment and repeat this procedure until you reach the highest consistent RPM.

Test the adjustment. Run outboard near full throttle for three minutes. Return the outboard to idle, in gear. The outboard should maintain a smooth idle RPM.

If the test results vary, repeat the adjustment.

If the outboard does not respond properly to these adjustments, check the following:

- Engine temperature
- Linkage adjustments
- External recirculation system
- Sufficient exhaust back pressure

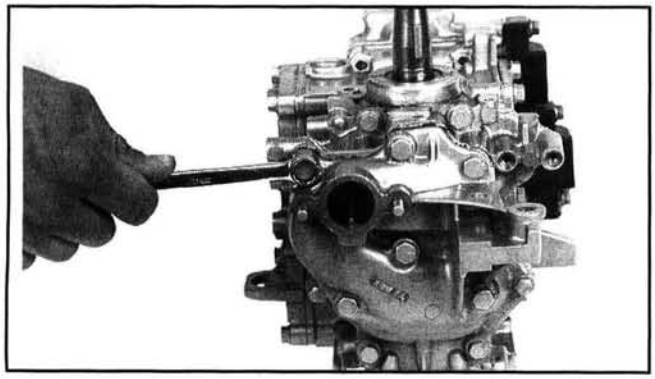
INTAKE MANIFOLD

Removal

9.9/15 MODELS

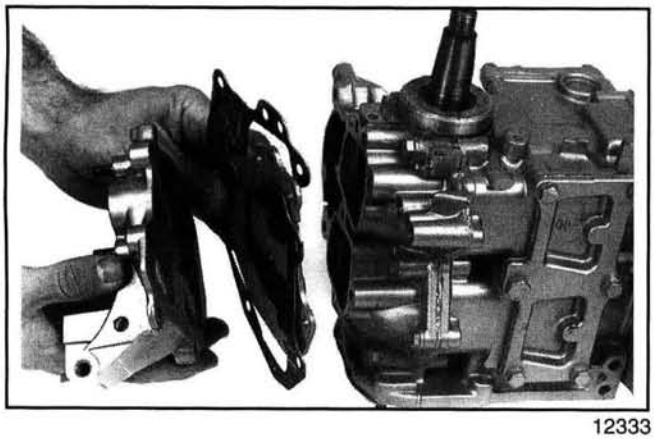
Remove the powerhead. Refer to Powerhead **REMOVAL – 9.9/15** on p. 180.

Loosen and remove six intake manifold screws.



12334

Remove intake manifold, leaf plate, and two gaskets. Discard gaskets.

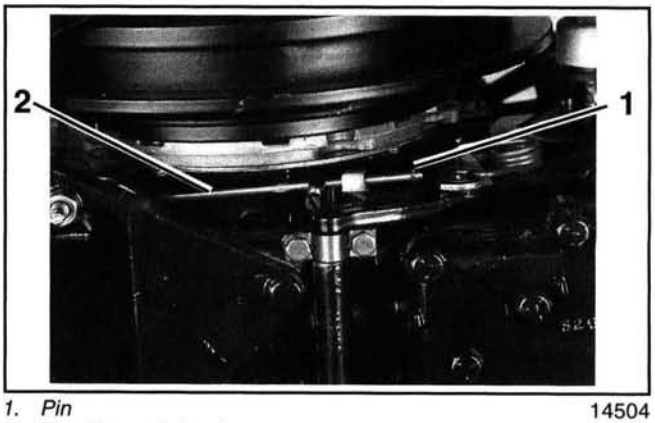


12333

25/30 MODELS

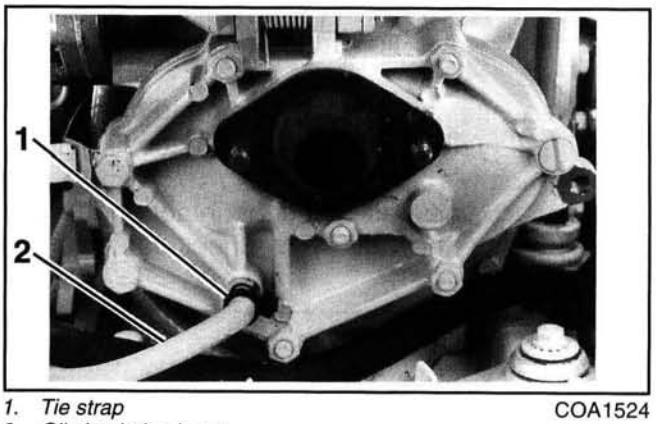
Follow steps listed in **CARBURETOR, Removal** on page 150.

Remove pin from end of throttle control rod.



1. Pin 14504
2. Throttle control rod

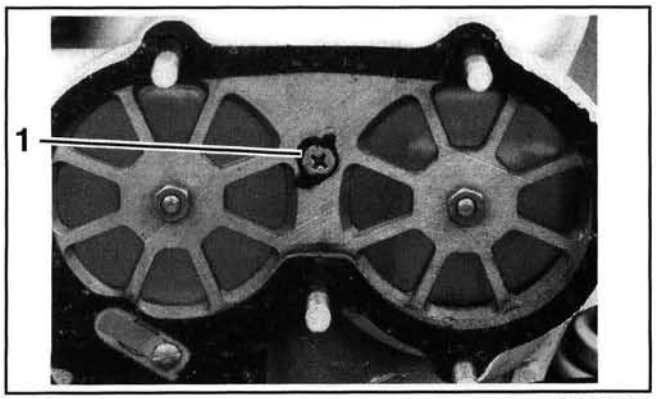
Remove tie strap and disconnect oil recirculation hose.



1. Tie strap COA1524
2. Oil circulation hose

Remove screws attaching intake manifold to powerhead. Remove intake manifold and gasket.

Remove flat head Phillips screw and carefully remove leaf plate assembly and gasket.



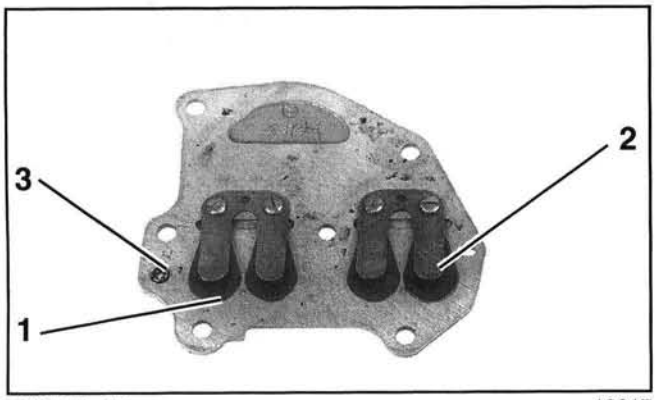
1. Screw COA1526

Inspection

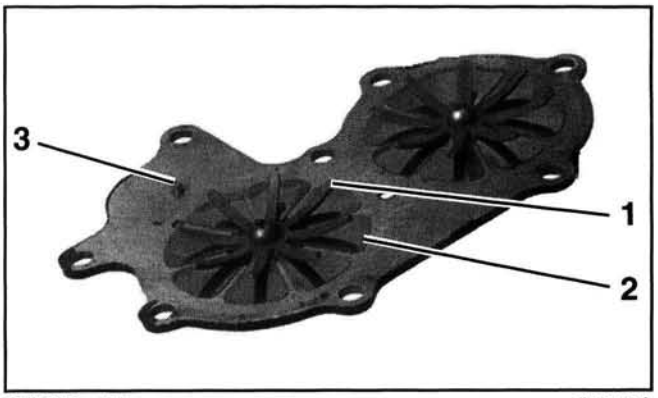
IMPORTANT: Do not lift or bend leaf valves by hand. This may damage them so they may not seal properly or may break after the engine is returned to service.

Inspect the leaf plate assemblies for damage:

- The leaf valves and plate must not be distorted.
- The leaf valve tips must not be cracked or chipped.
- The leaf stops must not be distorted or loose.
- Test leaf plate screw tightness. If loose, tighten using *Screw Lock*.
- The check valve disk must be intact and free to move inside the valve. The check valve screen must be clean.

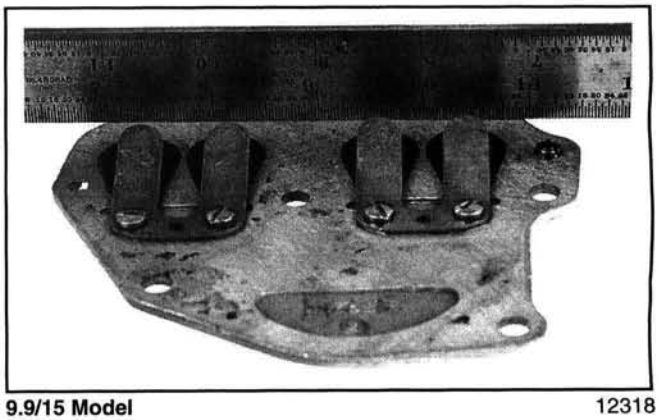


9.9/15 Model 12317
1. Leaf valve tips
2. Leaf stops
3. Check valve disk

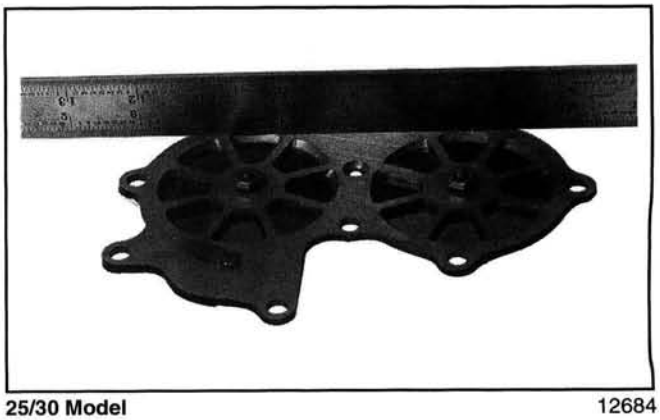


25/30 Model 12686A
1. Leaf valve tip
2. Leaf stop
3. Check valve disk

- Use a machinist's straightedge to check the flatness of the leaf plate. The gasket surfaces must be flat, ± 0.003 in. (0.08 mm).



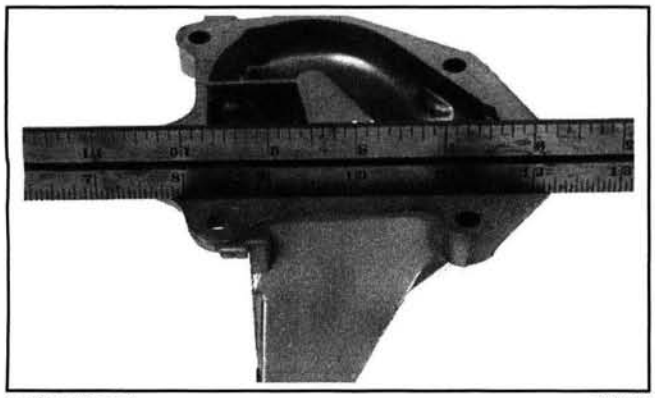
9.9/15 Model 12318



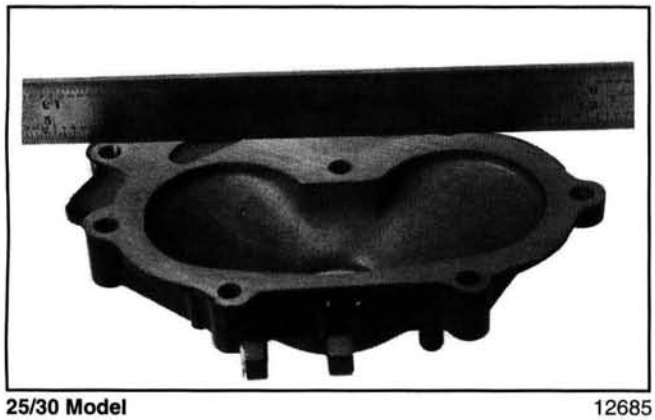
25/30 Model 12684

Inspect the intake manifold:

- All gasket surfaces must be smooth and free of nicks.
- Use a machinist's straightedge to check for flatness in all directions. The gasket surface must be flat, ± 0.003 in. (0.08 mm).



9.9/15 Model 12319



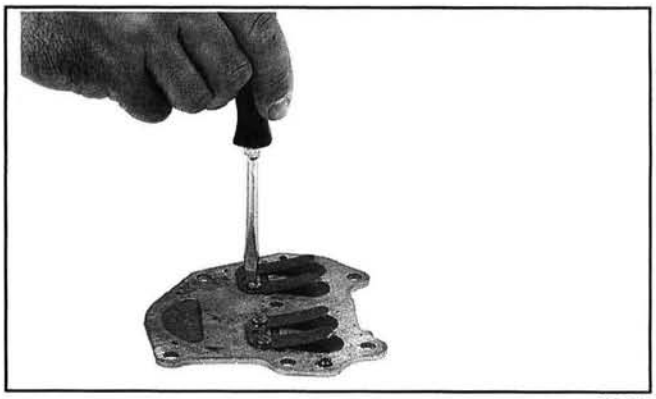
25/30 Model 12685

Disassembly

9.9/15 Models

IMPORTANT: Do not disassemble leaf plate assemblies unless leaf plate seats, leaf valves, or leaf stops are damaged or corroded.

Remove two screws per leaf valve and remove the leaf valves as required.



12320

When disassembling leaf plate assemblies, do not lift or bend leaf valves. Remove the leaf stop screws and remove the stops, shims, and leaf valves.

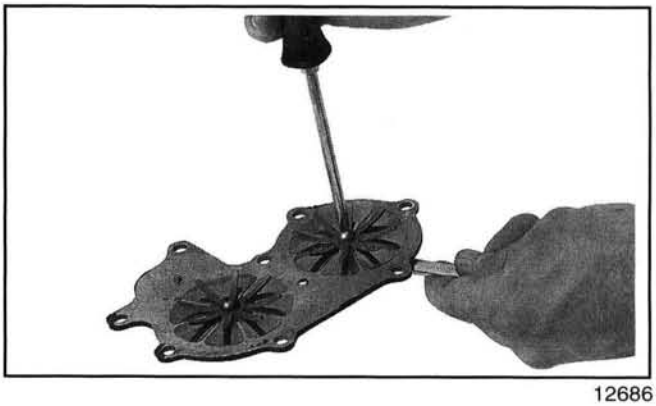
When disassembled, keep the stops, shims, and leaf valves separated by assembly.

IMPORTANT: The 9.9 and 15 leaf valves are not interchangeable. The thickness of the valves is not the same.

25/30 Models

IMPORTANT: Do not disassemble leaf plate assemblies unless leaf plate seats, leaf valves, or leaf stops are damaged or corroded.

Remove one screw and nut per leaf valve and remove the leaf plate assemblies as required.



12686

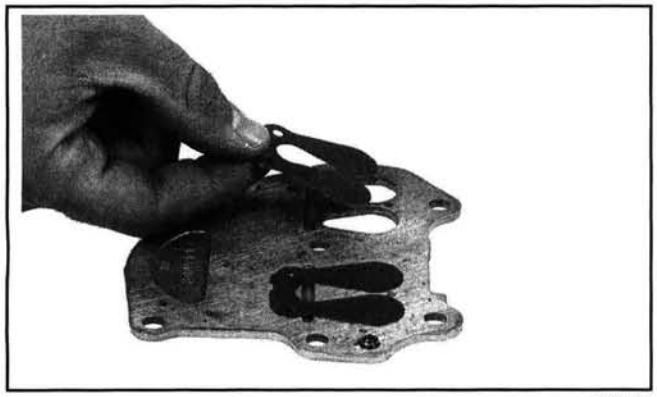
When disassembled keep the stop leaf and valves separated by assembly.

Assembly

9.9/15 MODELS

IMPORTANT: All intake manifold components must be perfectly clean before assembly. Do not use a strong carburetor cleaner or hot soaking tank.

Place leaf valves on leaf plate. If new valves do not seat on the leaf plate, turn the leaf valves over.



12321

IMPORTANT: Used leaf valves must not be turned over for reuse. Leaf valve may break when returned to service, causing serious powerhead damage.

If any leaf valves are standing open, apply light pressure using a pencil eraser. If leaf valve closes with light pressure, valve is acceptable. If not, inspect leaf plate for high spots or burrs.

IMPORTANT: Do not lap leaf plate. If plate is too smooth, the leaf valves may stick closed after off-season storage.

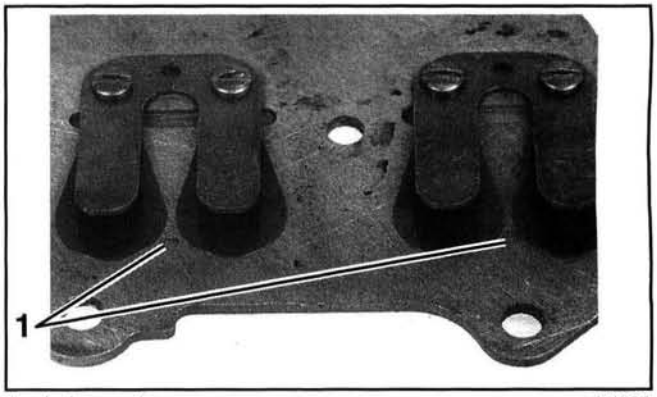
Apply *Locquic Primer* to mounting screws and allow to air dry.

Apply *Screw Lock* to mounting screws. Wipe off excess adhesive.

12322

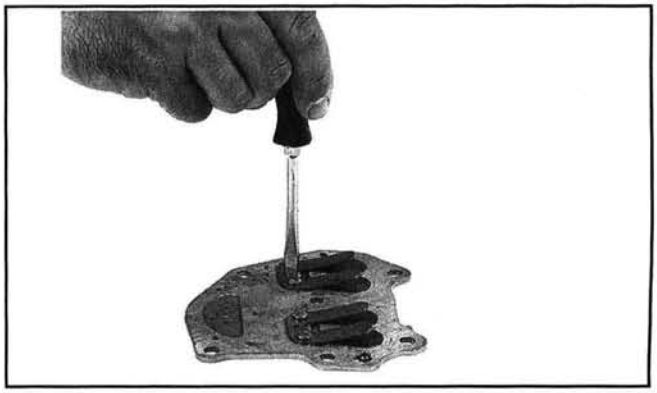
Assemble leaf valve shim (if required) and leaf stop. Install screws finger tight.

Center the leaf valves on the plate using index marks.



1. Index marks 12331

Tighten screws securely.

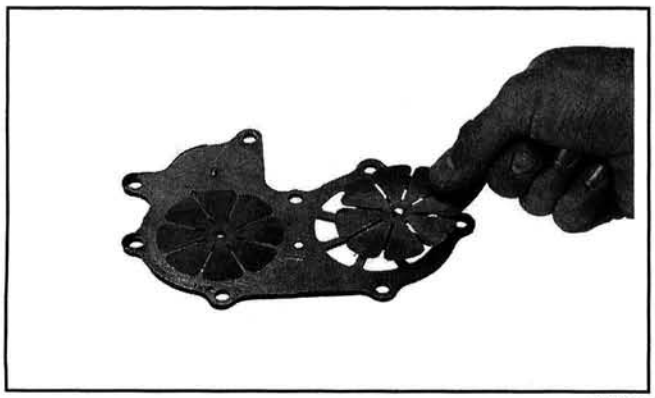


12320

25/30 MODELS

IMPORTANT: All intake manifold components must be perfectly clean before assembly. Do not use a strong carburetor cleaner or hot soaking tank.

Place leaf valves on leaf plate. If new valves do not seat on the leaf plate, turn the leaf valves over.



12687

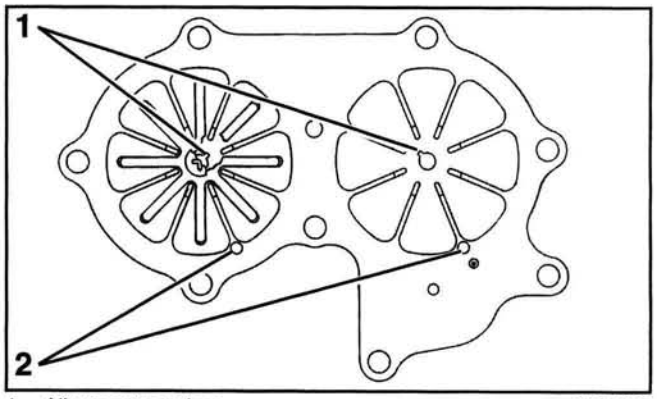
IMPORTANT: Used leaf valves must not be turned over for reuse. Leaf valve may break when returned to service, causing serious powerhead damage.

If any leaf valves are standing open, apply light pressure using a pencil eraser. If leaf valve closes with light pressure, valve is acceptable. If not, inspect leaf plate for high spots or burrs.

IMPORTANT: Do not lap leaf plate. If plate is too smooth, the leaf valves may stick closed after off-season storage.

Viewed from the back (leaf stop) side, the alignment notches must face as shown. The port notch will face one o'clock and the starboard notch will face 11 o'clock. Failure to follow this procedure will cause premature leaf valve failure.

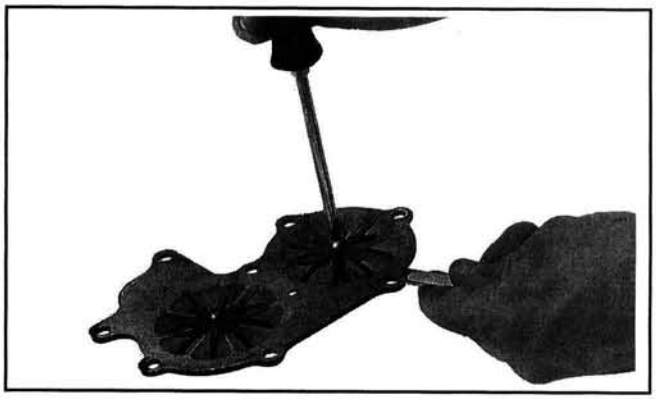
Center the leaf valves on the plate using the index marks.



1. *Alignment notches*
2. *Index marks*

DR1465

Center the leaf stops, and tighten the leaf valve screws to a torque of 25 to 35 in. lbs. (3 to 4 N·m).



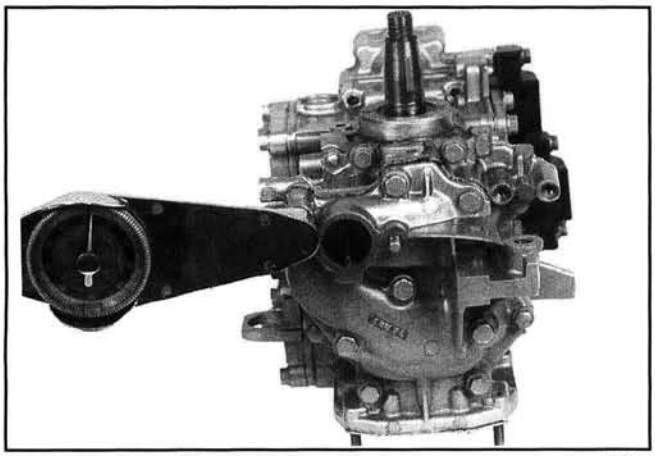
12686

Installation

9.9/15 Models

Position leaf plate assembly and new gaskets on powerhead. Install gaskets dry. Use no sealer.

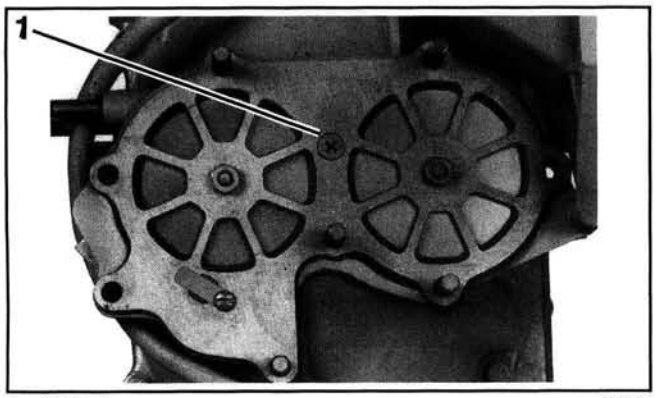
Install intake manifold using six retaining screws. Torque screws 60 to 80 in. lbs. (7 to 9 N·m).



12335

25/30 Models

Position the leaf plate with a new gasket on crankcase. Apply *Gel-Seal II* to the threads of the flat head Phillips head screw and install loosely. Align the leaf plate and gasket with crankcase and tighten screw securely.

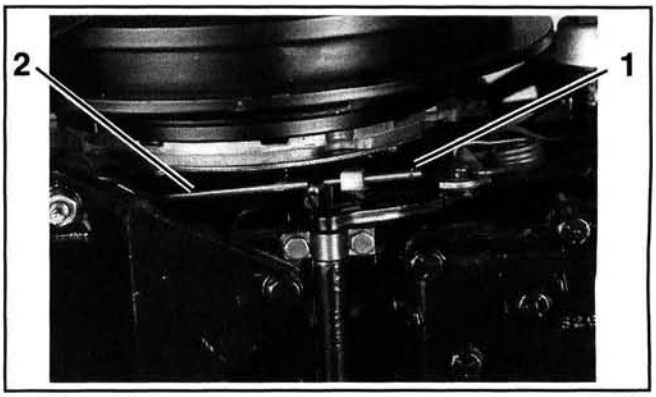


1. Screw 1427

IMPORTANT: Install all intake manifold gaskets dry. Do not use sealer.

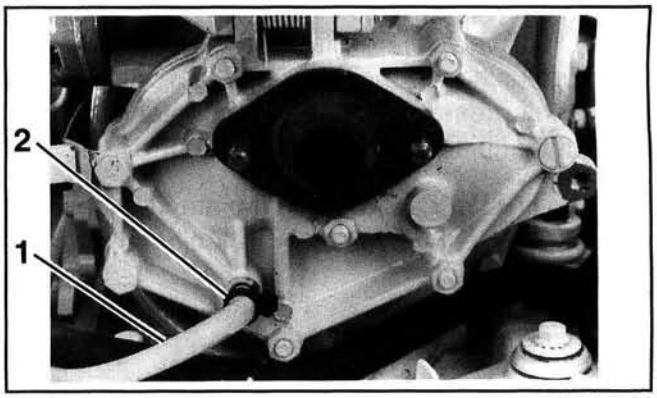
Install the intake manifold using a new gasket between manifold and leaf plate. Install throttle rod in pivot pin on throttle lever.

Align the gasket with the manifold and install manifold screws. Tighten screws evenly and securely. Install wire retainer in throttle rod.



1. Wire retainer 14504
2. Throttle rod

Install the oil recirculation hose on the intake manifold and secure with tie strap.



1. Oil circulation hose COA1524
2. Tie strap

POWERHEAD

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7

TORQUE CHART

Description	9.9/15	25/30	Lubricant
Connecting Rod Cap Screws	60 to 70 in. lbs. (7 to 7.5 N·m)	30 to 32 ft. lbs. (40 to 43 N·m) *	Apply *Evinrude/Johnson* Outboard Lubricant to threads
Lower Crankcase Head Screws	60 to 84 in. lbs. (7 to 9 N·m)	60 to 84 in. lbs. (7 to 9 N·m)	Apply *Gasket Sealing Compound* to threads.
Cylinder Head Screws	216 to 240 in. lbs. (25 to 27 N·m)	216 to 240 in. lbs. (25 to 27 N·m)	Install screws dry. Do not use sealants on threads.
Powerhead Retaining Screws	60 to 84 in. lbs. (7 to 9 N·m)	192 to 216 in. lbs. (22 to 24 N·m)	Apply *Gasket Sealing Compound* to threads (**9.9/15 ONLY**).
Main Bearing Screws	144 to 168 in. lbs. (16 to 19 N·m)	168 to 192 in. lbs. (19 to 22 N·m)	Apply *Gel Seal II* to threads
Inner Exhaust Tube Screws	60 to 84 in. lbs. (7 to 9 N·m)	96 to 120 in. lbs. (11 to 14 N·m)	
Cylinder Head Cover Screws	60 to 84 in. lbs. (7 to 9 N·m)	60 to 84 in. lbs. (7 to 9 N·m)	Apply *Gasket Sealing Compound* to threads (**9.9/15 ONLY**).
Exhaust Cover Screws	90 to 130 in. lbs. (11 to 14 N·m)	48 to 84 in. lbs. (5 to 9 N·m)	
Bypass Cover Screws	60 to 84 in. lbs. (7 to 9 N·m)	60 to 84 in. lbs. (7 to 9 N·m)	
Intake Manifold Screws and Nuts	60 to 84 in. lbs. (7 to 9 N·m)	60 to 84 in. lbs. (7 to 9 N·m)	

* Use Rod Cap Alignment Fixture, P/N 396749.

IMPORTANT: For fasteners not listed, refer to **STANDARD TORQUE SPECIFICATIONS** on p. 32.

SAFETY INFORMATION

Before working on any part of the outboard, read the SAFETY section at the end of this manual.

DANGER

Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off. Remove propeller before servicing and when running the outboard on a flushing device.

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

WARNING

Wear safety glasses to avoid personal injury, and set compressed air to less than 25 psi (172 kPa).

The motor cover and flywheel cover are machinery guards. Use caution when conducting tests on running outboards. DO NOT wear jewelry or loose clothing. Keep hair, hands, and clothing away from rotating parts.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

To prevent accidental starting while servicing, disconnect the battery cables at the battery. Twist and remove all spark plug leads.

The electrical system presents a serious shock hazard. DO NOT handle primary or secondary ignition components while outboard is running or flywheel is turning.

Gasoline is extremely flammable and highly explosive under certain conditions. Use caution when working on any part of the fuel system.

Protect against hazardous fuel spray. Before starting any fuel system service, carefully relieve fuel system pressure.

Do not smoke, or allow open flames or sparks, or use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

Keep all electrical connections clean, tight, and insulated to prevent shorting or arcing and causing an explosion.

Always work in a well ventilated area.

Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to tightening must be felt when reusing a locking fastener. If replacement is indicated, use only authorized replacement or equivalent.

GENERAL

Cylinder Compression Testing

Start and run outboard until it achieves operating temperature, then shut OFF.

Remove all spark plugs and disconnect the 5-pin power pack connector.

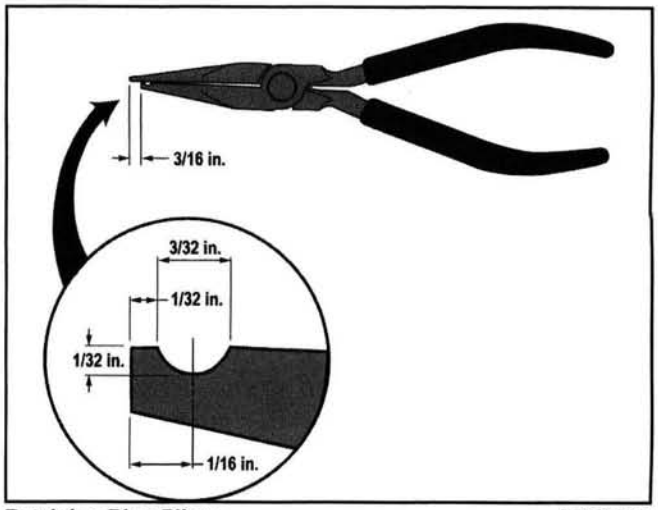
Advance throttle linkage to WOT.

Install compression tester's hose attachment into spark plug hole (14 mm threads).

While cranking outboard with starter, note maximum pressure reading on gauge. Repeat procedure for each cylinder.

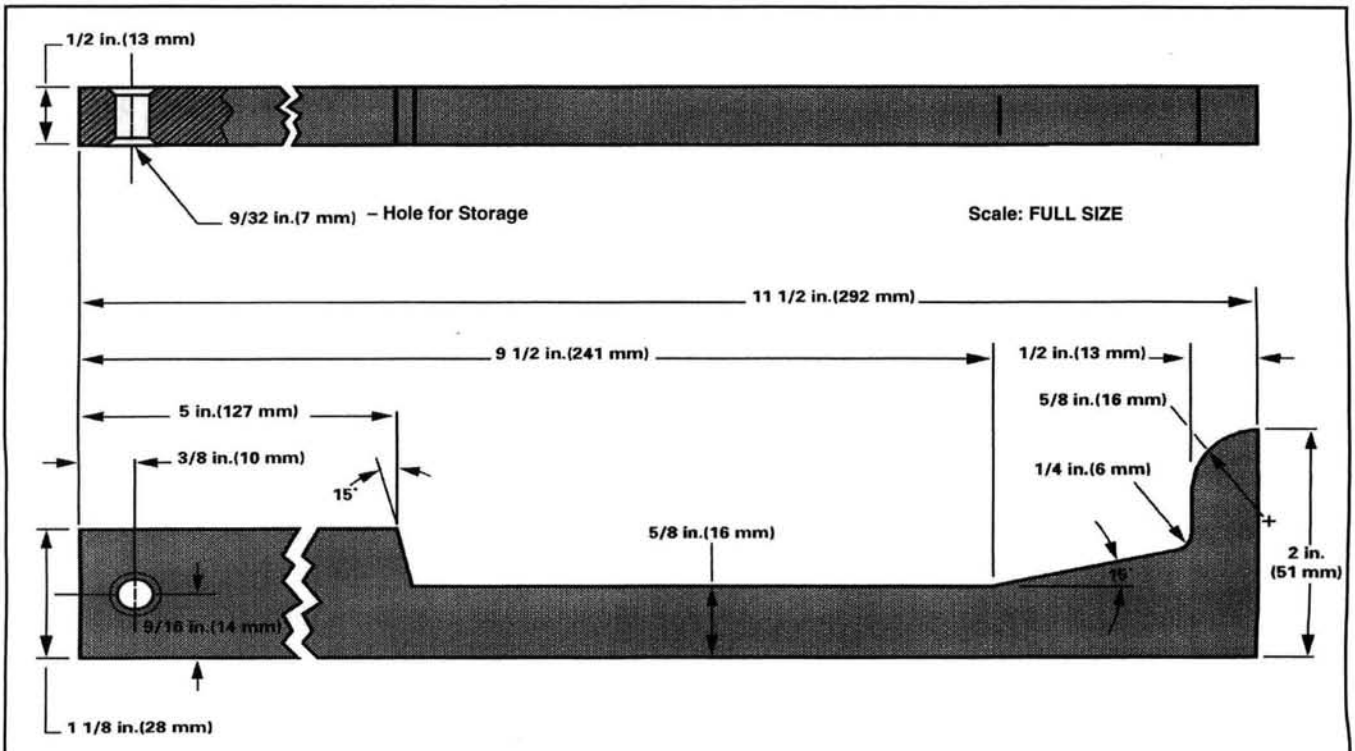
Return throttle to idle position and reconnect power pack connector. Replace spark plugs.

Retaining Ring Pliers



Retaining Ring Pliers DRC2523

Taper Pin Tool



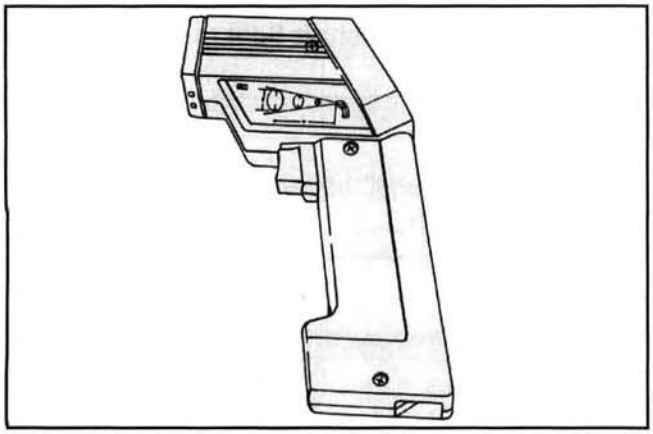
Cold Roll Steel
Heat treatment: Carburize 0.015 to 0.020 in. (0.3 to 0.5 mm) deep.
Quench and harden to 58 to 62 R "C" case.

WARNING

Striking a steel punch with a steel hammer may produce chips which can cause serious damage to eyes. Safety glasses must be worn to prevent injury.

ENGINE TEMPERATURE CHECK

Temperature Gun, P/N 772018, or a digital pyrometer should be used to accurately determine the engine's operating temperatures.



Temperature Gun DR6825

To achieve accurate and consistent readings, engine temperature must be gauged at the top of cylinder head.

IMPORTANT: For the following engine operating temperatures and RPM figures to be correct, the inlet water temperature must be 70° ± 10°F (21° ± 3°C).

STEP 1
Install correct test propeller and place outboard in a test tank.

⚠ WARNING ⚠

To prevent accidental starting of engine while changing propellers, twist and remove all spark plug leads.

Start outboard and run at 3000 RPM for at least five minutes.

Reduce engine speed to 900 RPM. At 900 RPM, the digital pyrometer or Temperature Gun should indicate 140° ± 15°F (60° ± 7°C) when checking at top of the cylinder head.

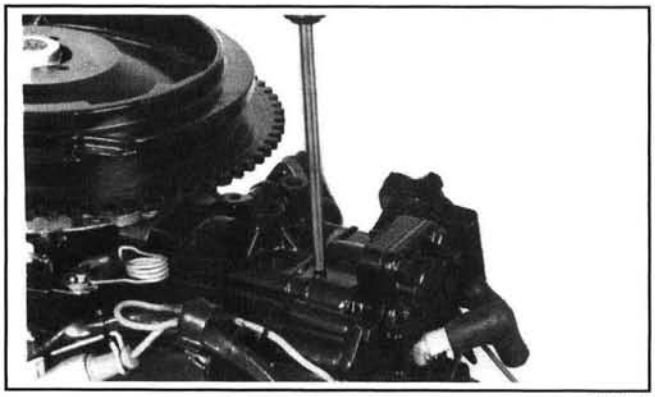
Model	IDLE Temperature
ALL	140° ± 15°F (62° ± 8°C)

If engine temperature is not within this range, troubleshoot cooling system to determine problem.

STEP 2
Increase engine speed to 5000 RPM. At 5000 RPM, the digital pyrometer must not indicate more than 160°F (71°C).

Model	WOT Temperature
ALL	Maximum 160°F (71°C)

If engine temperature exceeds 160°F (71°C), troubleshoot cooling system to determine problem.



17212

IMPORTANT: If you get low or inaccurate readings during these tests, coat the probe location with a liberal amount of *Wakefield Heat Sink Compound*, P/N 322170.

UPPER CRANKCASE SEAL

General

The presence of oil under the flywheel could indicate a leaking upper crankcase seal. The upper crankcase seal can be replaced without disassembly of crankcase. Refer to **FLYWHEEL SERVICING** on p. 128 for flywheel removal.

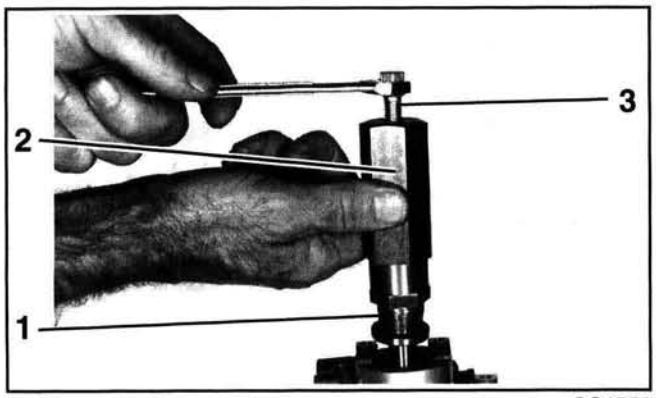
Removal

9.9/15 Models

Use Remover/Installer Kit, P/N 391060.

To remove seal, install tip "C," P/N 326270, into remover/installer body, P/N 326271. Thread remover/installer body with tip into seal to engage metal case.

While holding remover/installer body, turn pressing screw, P/N 342227, and remove seal.



1. *Tip* CO1556
2. *Remover/installer body*
3. *Pressing screw*

25/30 Models

Use Seal Remover, P/N 387780.

Thread remover/installer body into seal to engage metal case.

While holding remover/installer body, turn pressing screw and remove seal.

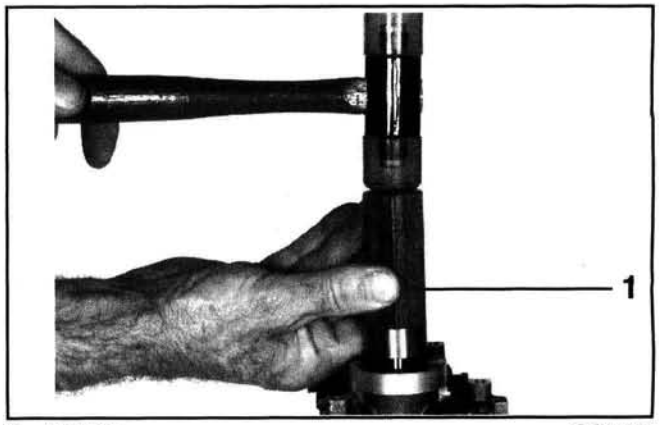
Installation

All Models

To install a new seal, apply *Gasket Sealing Compound* to the outside diameter of the metal casing. Position seal on crankshaft with lip facing crankcase assembly.

Upper Crankshaft Seal Installer	
9.9/15	P/N 326271
25/30	P/N 321539

Use a mallet to install the seal flush with the top of the crankcase flange.



1. *Installer* CO1557

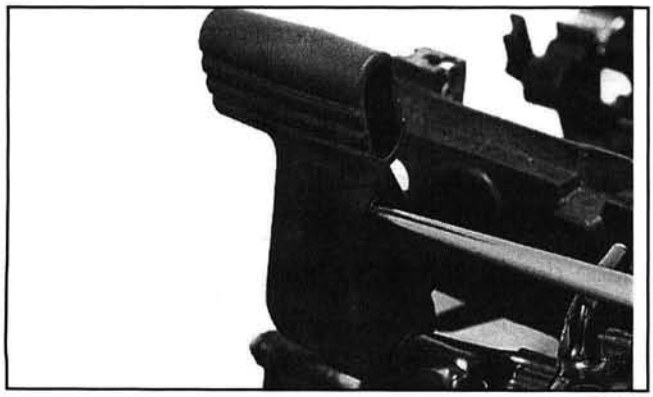
SHIFT LINKAGE

Removal

9.9/15 MODELS

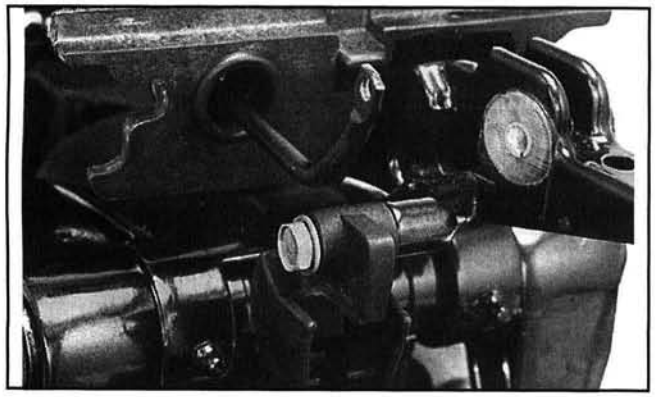
Remove the lower engine covers as described in **REMOVAL – 9.9/15** on p. 180.

Remove the clip and drive pin from shift handle.



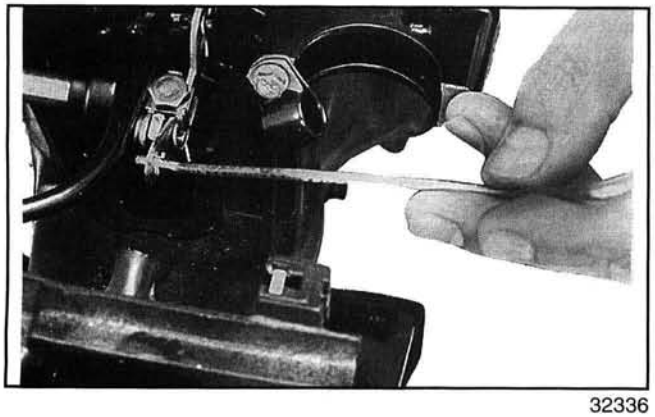
32338

Remove the screw retaining the shift handle.



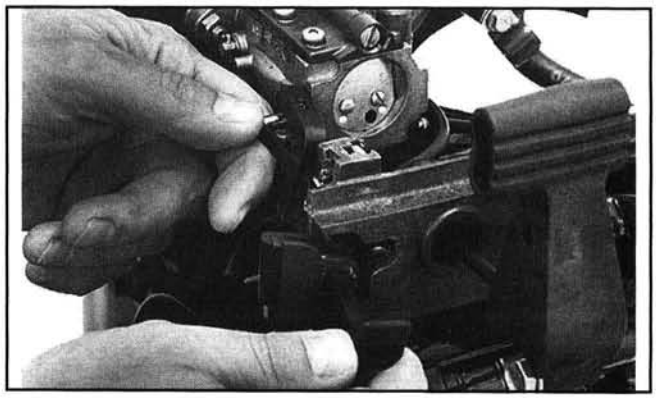
32337

Remove the lockout rod.



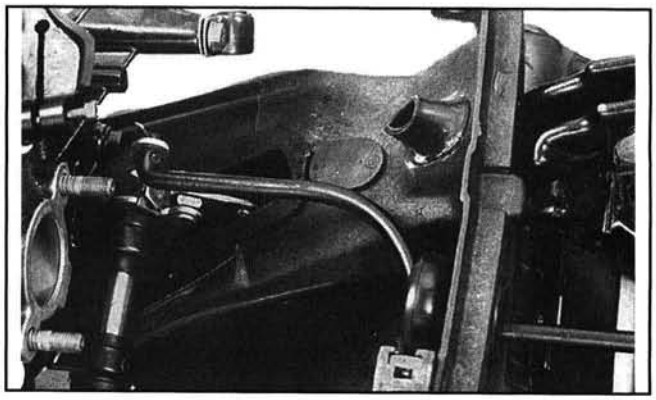
32336

Remove the choke lever and grommet.



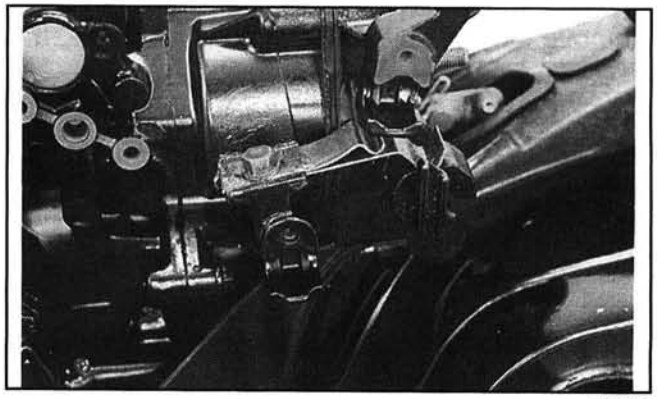
32333

Remove the pin, shift rod, and grommet.



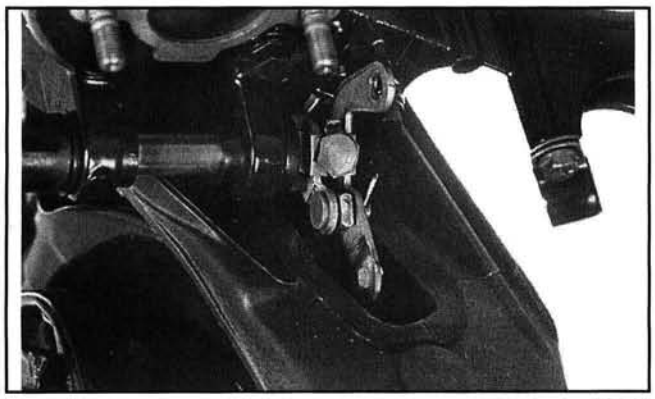
32344

Remove the screw and detent springs.



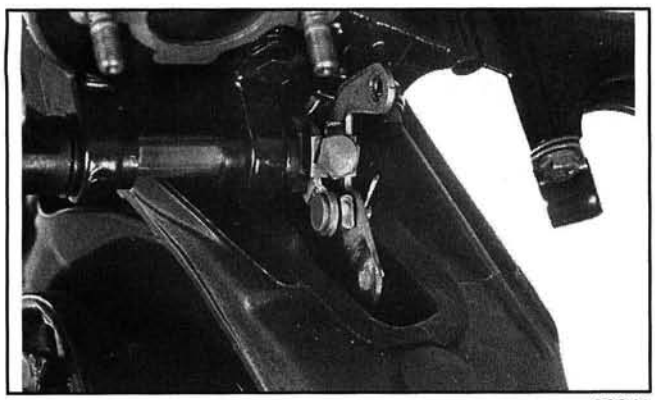
32320

Bend lock tab back and remove screw. Remove lock tab from shift arm.



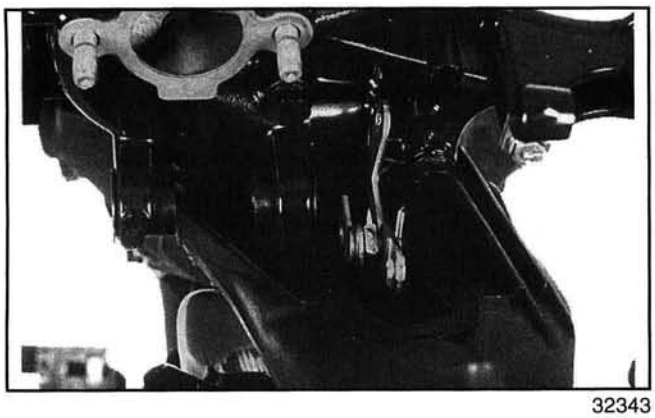
32341

Remove shift arm and spacer.



32340

Remove the cotter pin, and pin and shift lever. Remove the two shift arm bushings.



32343

25/30 MODELS

Refer to **MIDSECTION** section.

Installation

9.9/15 MODELS

Installation is essentially the reverse of removal. Pay close attention to any additional task that may be required for installation.

Install the two shift arm bushings. Install the pin and shift lever, and secure with cotter pin.

Install the shift arm and spacer.

Position lock tab on shift arm and install screw securely. Bend tab onto screw.

Place detent springs in position and secure with screw.

Install shift rod and retain with pin. Install grommet.

Attach choke lever to each linkage and install grommet.

Install the lockout rod.

Install shift handle and secure with screw.

Install the drive pin and clip in shift handle.

Install lower engine covers.

25/30 MODELS

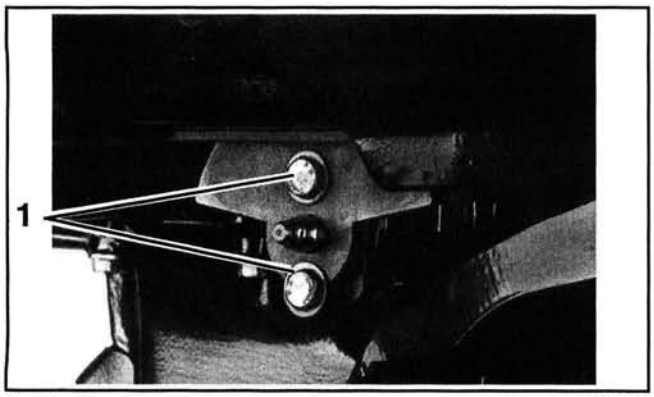
Refer to **MIDSECTION** section.

Adjustment

25/30 MODELS

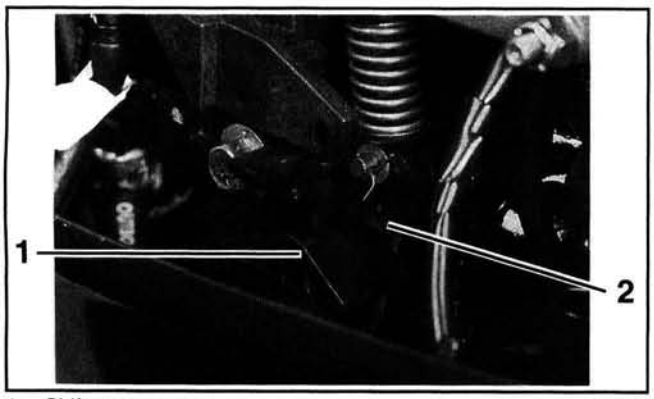
Rotate the propeller shaft and move the shift lever to NEUTRAL.

Loosen both shift lever screws.



1. Screws 47177

Move the shift actuator cam back and forth until the neutral shift lockout lever centers in the notch of shift actuator cam.



1. Shift actuator cam
2. Lockout lever 47175

Tighten the shift lever screws and torque 60 to 84 in. lbs. (7 to 9 N·m).

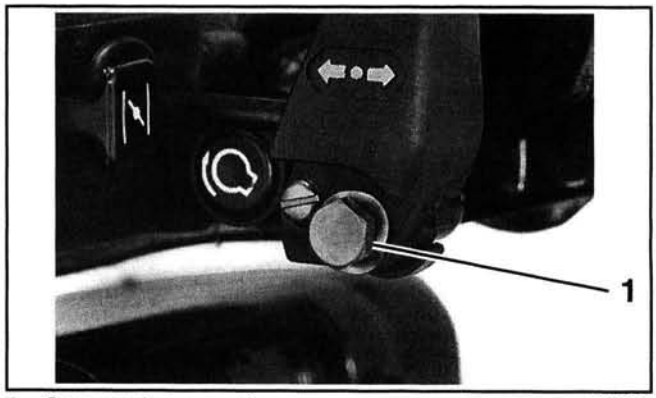
Refer to **NEUTRAL START PROTECTION** on p. 178 to adjust the neutral start switch.

Start Switch

9.9/15 MODELS

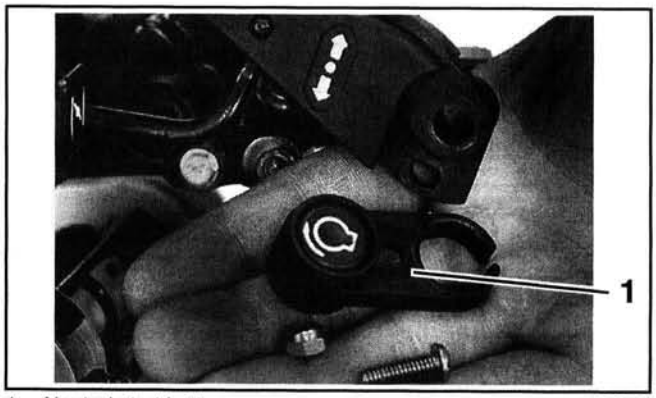
Removal

Remove screw and wave washer retaining the shift handle.



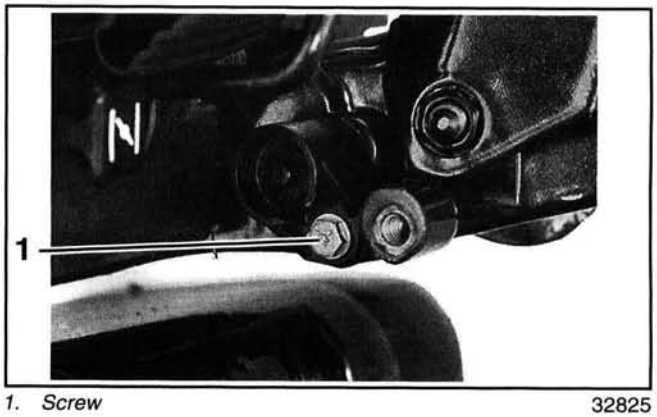
1. Screw and wave washer 32826

Remove adjustment screw and nut from start button and remove.



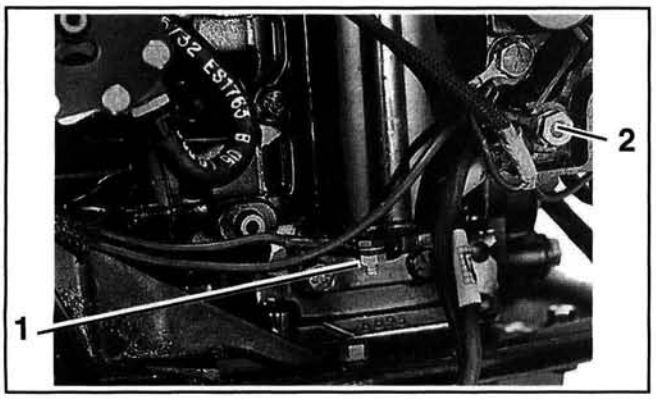
1. Neutral start button 32823

Remove screw retaining neutral start switch.



1. Screw 32825

Disconnect the red wires and from the starter motor and electrical box connection.



1. *Starter wire* 32824
2. *Start switch wire*

Pull wires out of grommet.

Installation

Installation is essentially the reverse of removal. Pay close attention to any **additional** task that may be required for installation.

Install switch wires through grommet. Connect the red wires to the starter motor and electrical box. Apply *Black Neoprene Dip* to the connections.

Install switch to shift bracket and tighten screw securely.

Install start button on shift handle and secure with screw and nut.

Install shift handle on bracket and secure with wave washer and screw.

IMPORTANT: Test neutral start switch in FORWARD and REVERSE. Adjust as required.

NEUTRAL START PROTECTION

Manual Starter

Manual start outboards are equipped with starter lockout mechanisms. Check operation of starter and lockout. Manual starter must NOT operate when shift handle is in FORWARD or REVERSE position. Refer to **MANUAL STARTER** section.

Electric Starter

IMPORTANT: Starter must operate ONLY when the outboard's shift handle is in the NEUTRAL position.

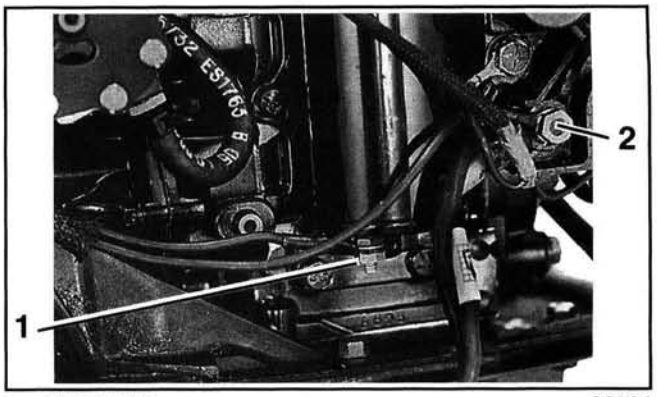
Disconnect the battery cables at the battery.

Test / Adjustment Procedure

9.9/15 TE Models

Shift outboard into NEUTRAL. Disconnect the starter motor red wire at the motor.

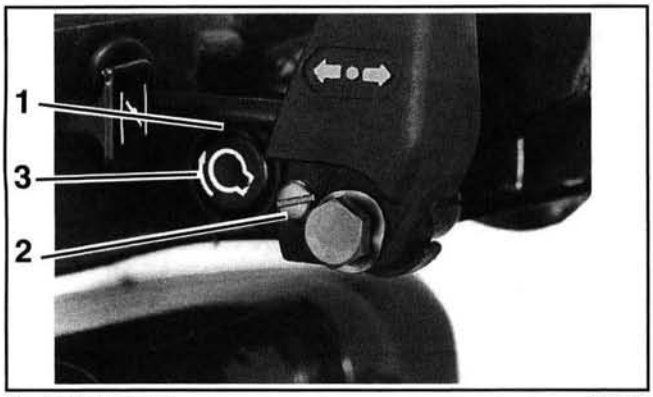
Attach a continuity light or ohmmeter between the starter wire and the start switch wire at the electrical box, and press start button. The continuity *light* or ohmmeter should show continuity.



1. *Starter wire* 32824
2. *Neutral start switch wire*

Shift outboard into FORWARD and REVERSE and press start button. No continuity should be indicated in either position.

To adjust, loosen the start button screw. With the outboard in NEUTRAL, center the button in the switch recess. Tighten the start button screw.



1. *Switch recess*
2. *Start button screw*
3. *Button*

32826

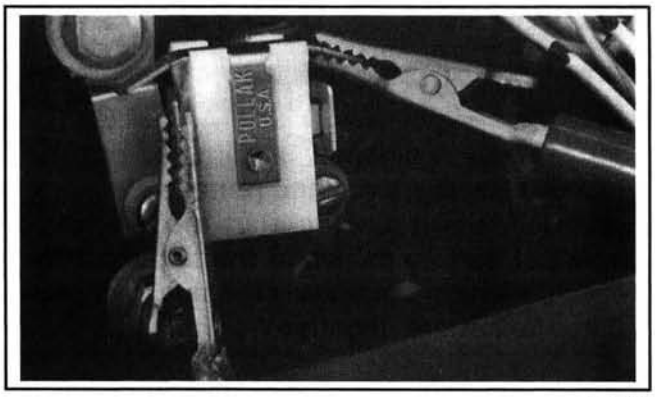
Connect the starter motor red wire to the starter motor. Tighten the nut securely. Apply *Black Neoprene Dip* to the connection. Reconnect the battery cables.

Check operation of start switch. Shift outboard into FORWARD and REVERSE and press start button. Starter should operate ONLY with shift lever in NEUTRAL position.

25/30 TE MODELS

Attach a continuity light or an ohmmeter between the neutral start switch yellow/red lead terminal and ground. With the outboard in NEUTRAL, the light or ohmmeter should show continuity.

While rotating the propeller shaft, shift the outboard into FORWARD, then REVERSE. The light or ohmmeter should NOT show continuity in either position.



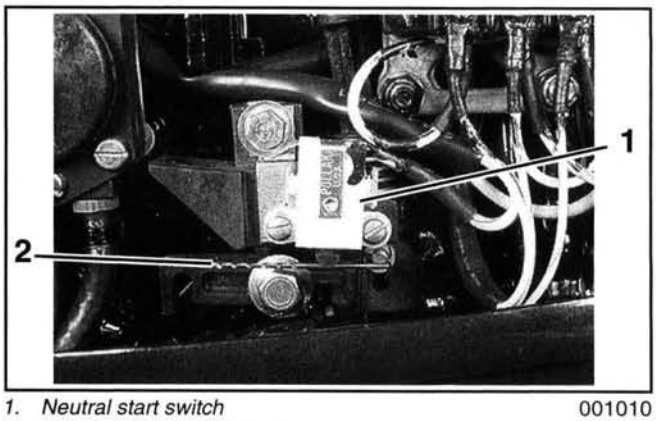
21571

To adjust, rotate the propeller shaft and shift outboard into NEUTRAL. Remove the yellow/red lead from the neutral start switch.

Loosen the neutral start switch screws and adjust the distance between the bottom of the neutral start switch and the top of the plunger to 1/16 in. (1.6 mm).

Insert a 1/16 in. (1.6 mm) drill bit between the bottom of the switch and the top of the plunger to gauge the clearance.

Move the switch until the switch and plunger contact the drill bit. Tighten the switch screws securely.



1. *Neutral start switch*
2. *Drill bit, 1/16 in. (1.6 mm)*

001010

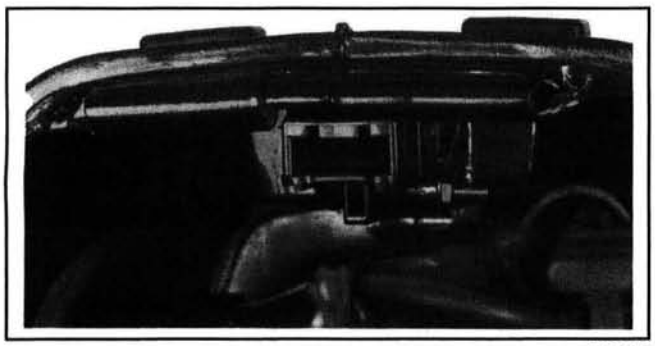
7

REMOVAL – 9.9/15

WARNING

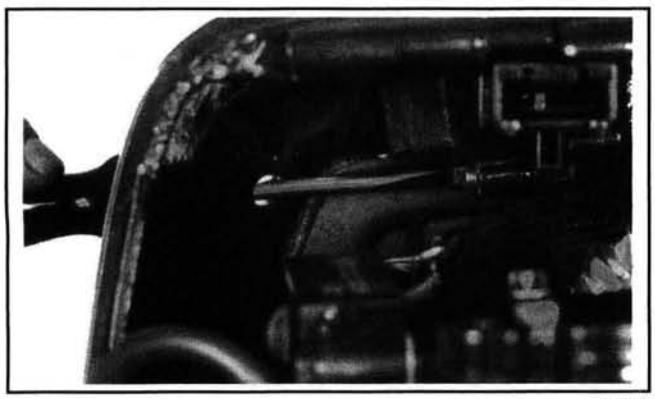
To prevent accidental starting of engine while servicing, twist and remove all spark plug leads. On electric start models, disconnect battery cables at the battery. Disconnect battery positive (+) cable first and then the battery negative (–) cable.

Remove the two screws and nuts from the top rear of lower engine cover.



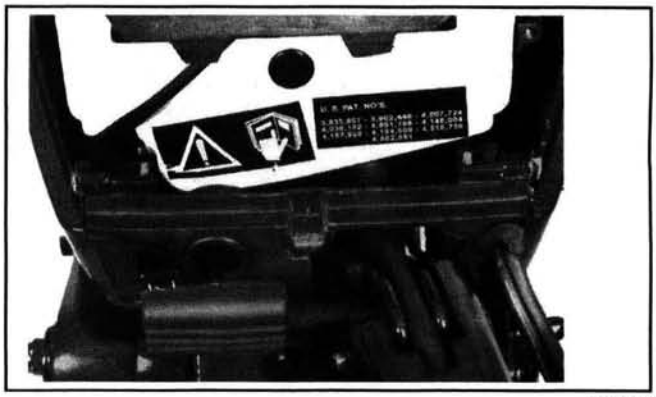
32816

Remove the water indicator hose and remove the screw from the lower rear of the lower engine cover.



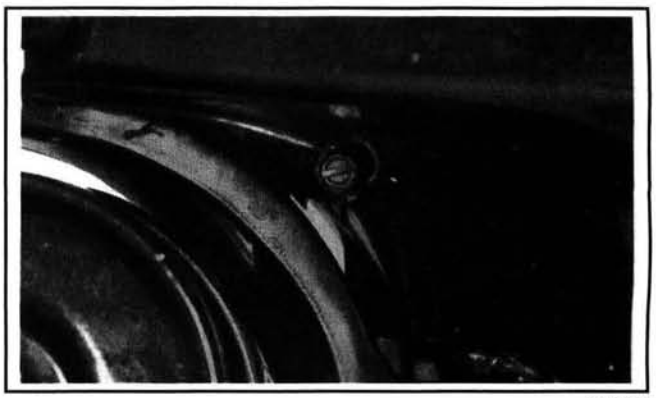
32819

Remove the two screws from the top front of the lower engine cover.



32817

Remove the screw and nut from the lower front of the lower engine cover.



32818

Remove the lower covers.

Remove electrical components. Refer to **ELECTRICAL** section.

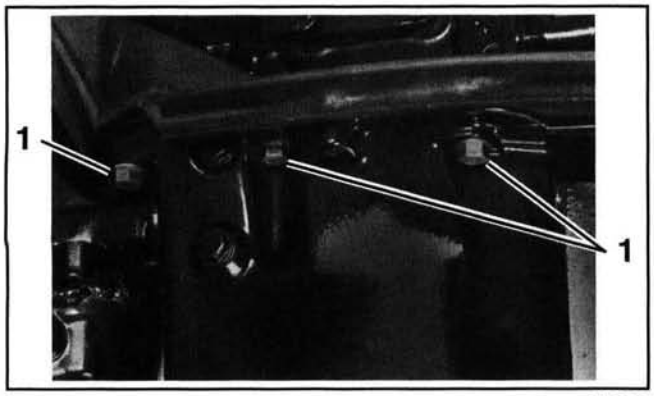
Remove the fuel components. Refer to **FUEL SYSTEM** section.

Remove the ignition components. Refer to **IGNITION** section.

Remove the shift lever and linkage. Refer to **SHIFT LINKAGE** on p. 175.

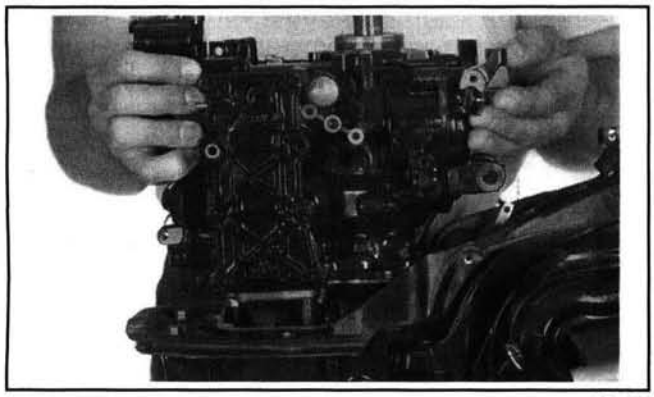
If equipped with a steering handle, remove the handle and components. Refer to **MIDSECTION** section.

Remove the six retaining screws, powerhead to the exhaust housing.



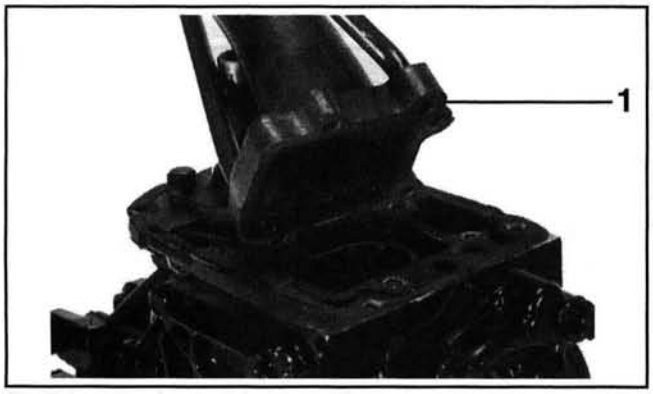
32309

The powerhead can now be removed. Lift the powerhead from the exhaust housing.



32308

Remove the exhaust and water tube assembly from the powerhead. Remove and discard the gasket.



1. *Exhaust and water tube assembly* 32402

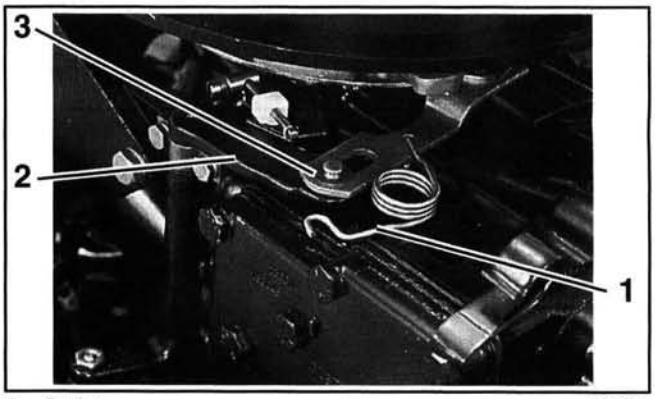
REMOVAL – 25/30

WARNING

To prevent accidental starting of engine while servicing, twist and remove all spark plug leads. On electric start models, disconnect battery cables at the battery. Disconnect battery positive (+) cable first and then the battery negative (–) cable.

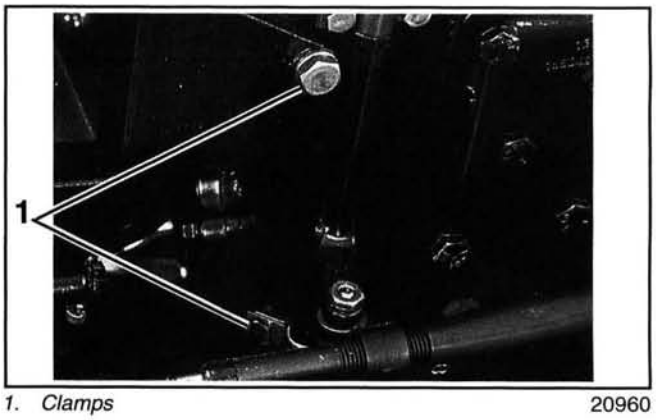
Remove the manual starter. Refer to Manual Starter **REMOVAL** on p. 294 section.

Disengage the spring from pin of the throttle control lever. Remove the washer.



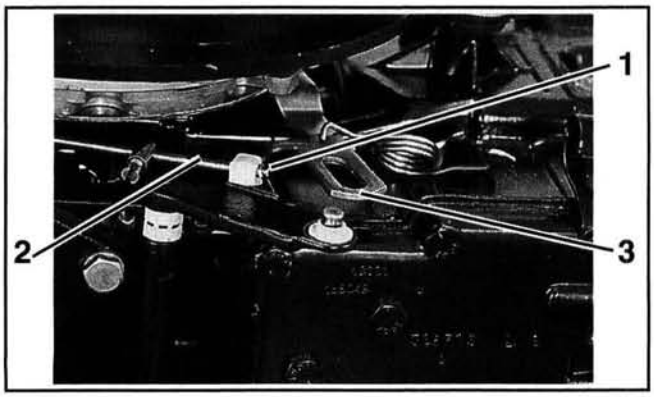
1. *Spring* 20961
2. *Throttle control lever*
3. *Washer*

Remove four screws from the pivot bearing clamps. Remove the clamps from the throttle control lever.



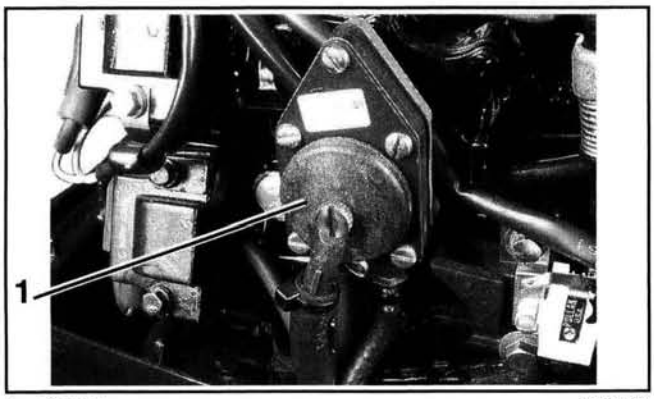
1. *Clamps* 20960

Remove the pin from end of the throttle control rod. Lift the armature plate link from the throttle control lever. Move the throttle control lever aside.



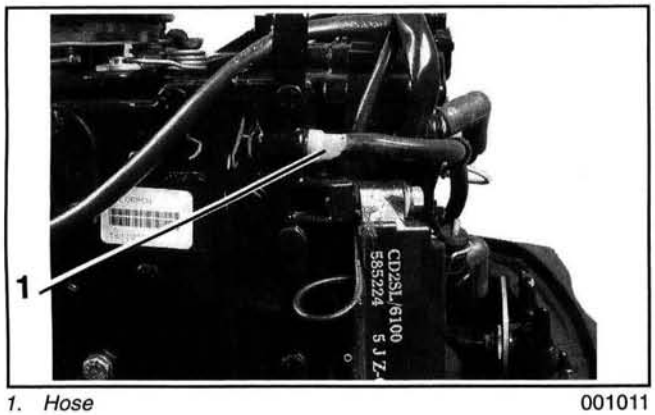
1. *Pin* 20959
2. *Throttle control rod*
3. *Armature plate link*

Remove fuel pump cover. Retain O-ring inside.



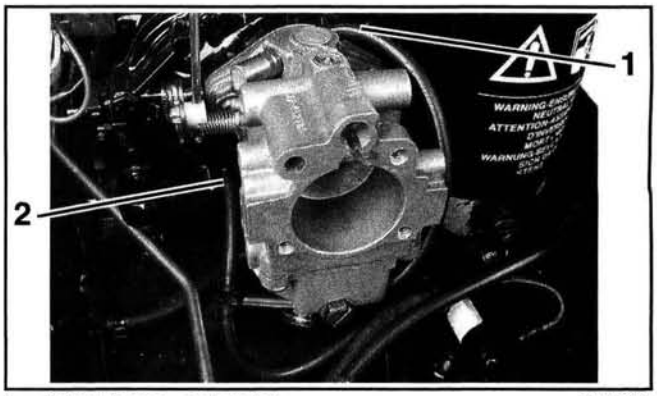
1. *Cover* 001007

Remove the overboard water indicator hose from fitting on exhaust cover. Remove the hose from J-clamp.



1. *Hose* 001011

Remove the primer hose from the carburetor and the primer hose from the intake manifold.



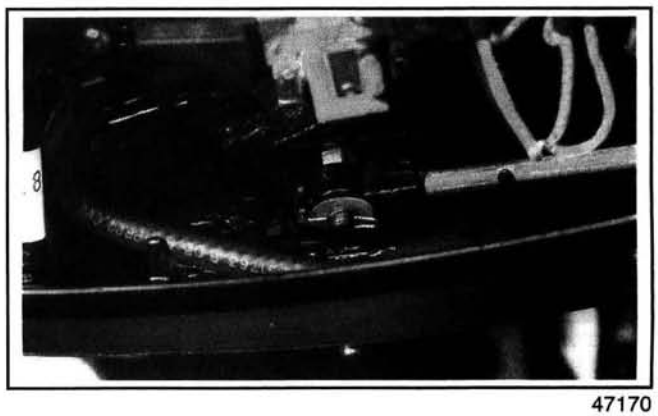
1. *Primer hoses, carburetor* 001009
2. *Primer hose, intake manifold*

R AND TE MODELS

Separate the 5-pin *Amphenol* connector. Remove the stop switch wire from terminal "E." Remove stop switch ground wire from ignition coil.

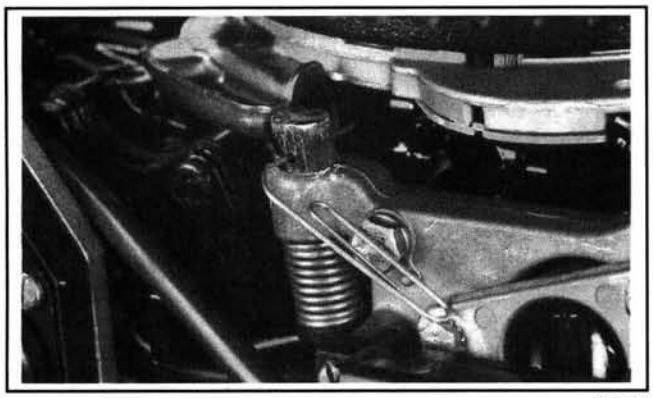
33274

Remove the shift lever.



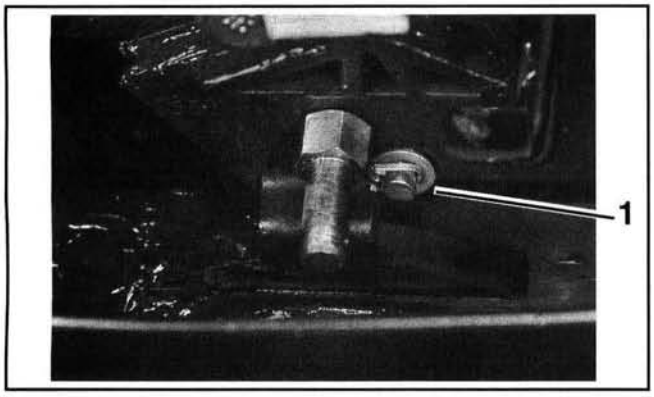
47170

Insert a paper clip into plunger.



47172

Remove the pin and washer from the actuator cam link. Disengage the link from the shift actuator cam.

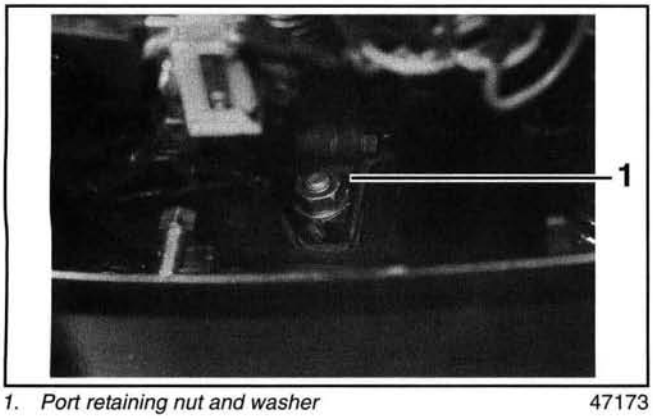


1. *Pin and washer* 47171

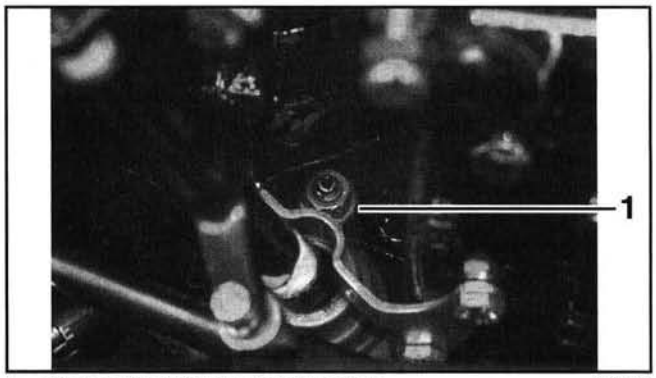
ALL MODELS

Remove the ground lead from the powerhead.

Using Special 1/2 in. Box Wrench, P/N 322700, remove port and starboard powerhead retaining nuts with washers.

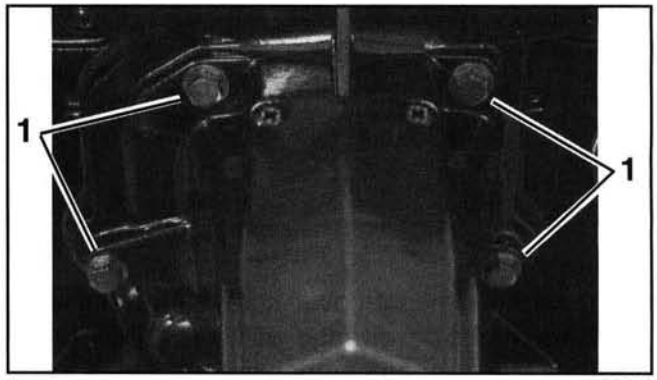


1. *Port retaining nut and washer* 47173



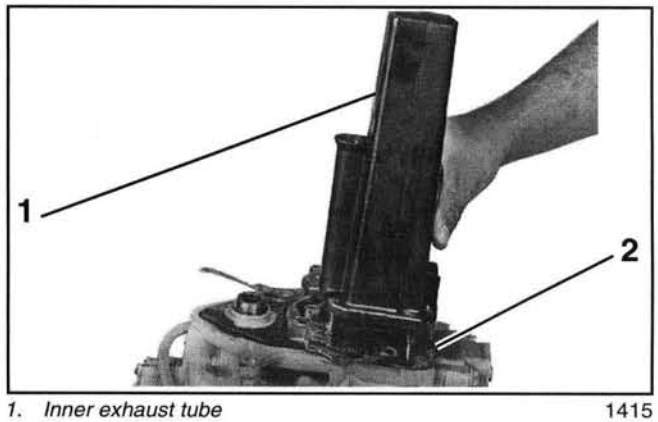
1. *Starboard retaining nut and washer* 47174

Remove the four screws retaining the powerhead to the exhaust housing.



1. *Screws* 20984

Move the powerhead sideways to break the gasket loose and remove from midsection. Remove the inner exhaust tube from the powerhead.



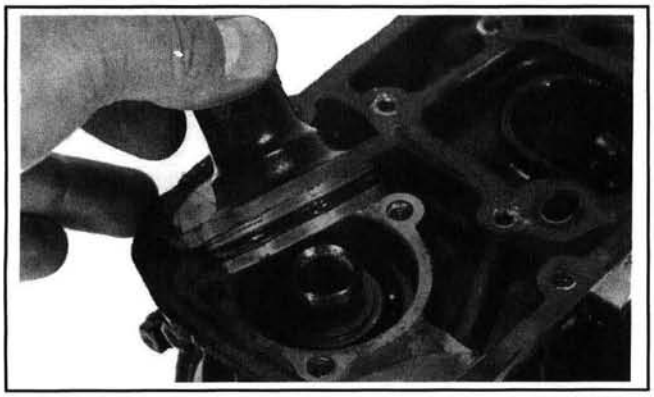
1. *Inner exhaust tube* 1415
2. *Gasket*

Place the powerhead in a suitable holding fixture and remove all carburetor, ignition, and electrical components from the powerhead. To simplify reassembly and wiring installation, lay out the various screws and clamps in order of their proper location.

DISASSEMBLY – 9.9/15

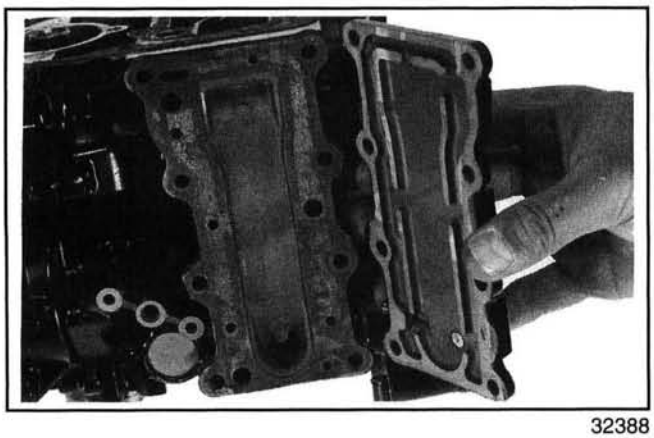
IMPORTANT: To simplify reassembly, lay out the various screws and clamps in the order of their proper location.

Remove the three screws retaining the crankcase head to the powerhead. Using a mallet and a punch, drive the seals from the crankcase head. Discard the O-ring and seals.



32303

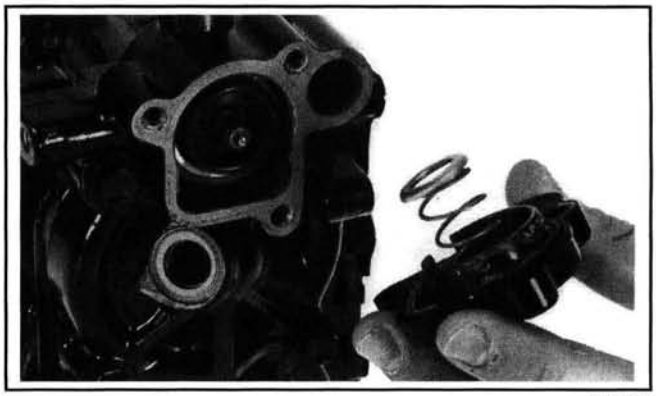
Remove the exhaust cover screws. If necessary, tap the exhaust cover edge with a rawhide mallet. Remove the inner and outer exhaust covers; carefully separate the pieces.



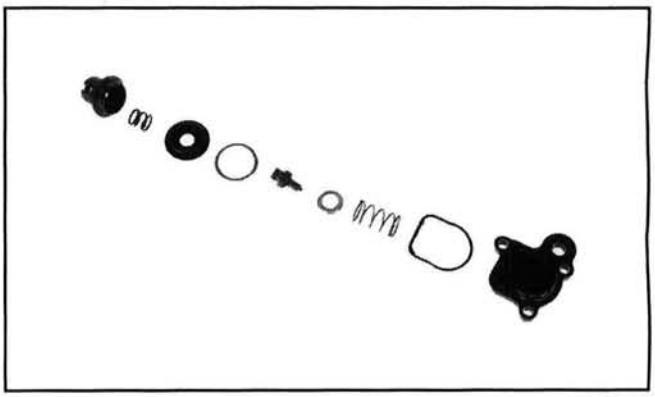
32388

IMPORTANT: Check the inner exhaust cover for pitting and flatness. If pitting exists or the cover is warped, discard it and replace with a new cover during reassembly.

Remove the thermostat assembly and temperature switch (if equipped).



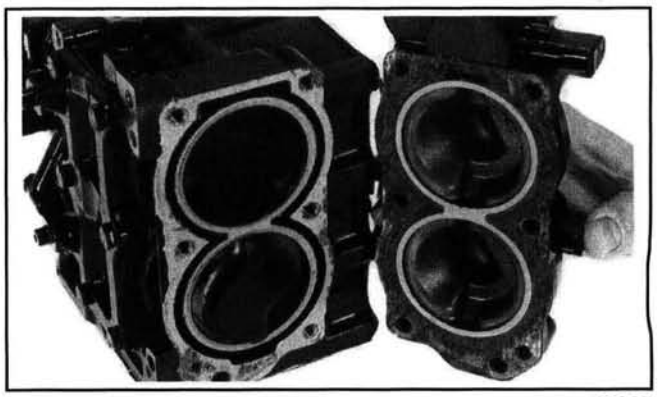
32387



32386

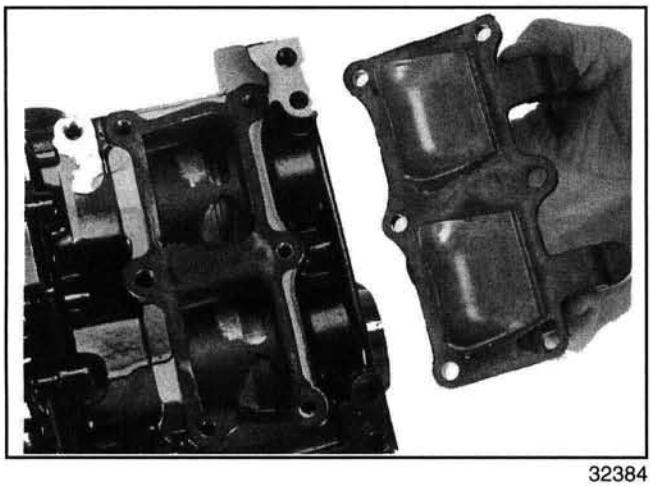
Remove the cylinder head screws.

Remove cylinder head. With number punches, mark the top piston dome number 1 and the bottom piston dome number 2.



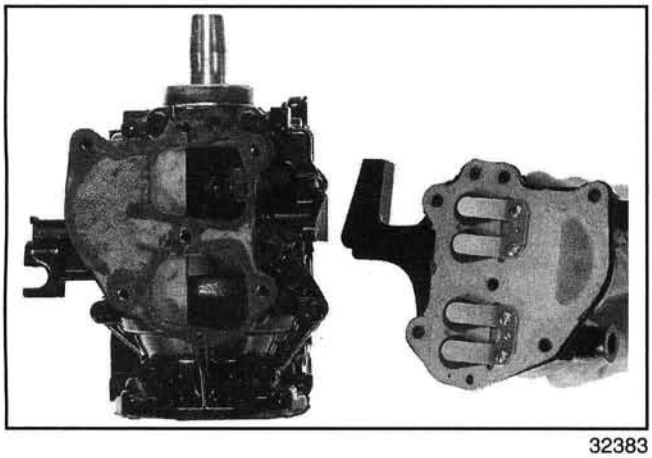
32385

Remove the intake bypass cover from the cylinder block. Clean the gasket surfaces.



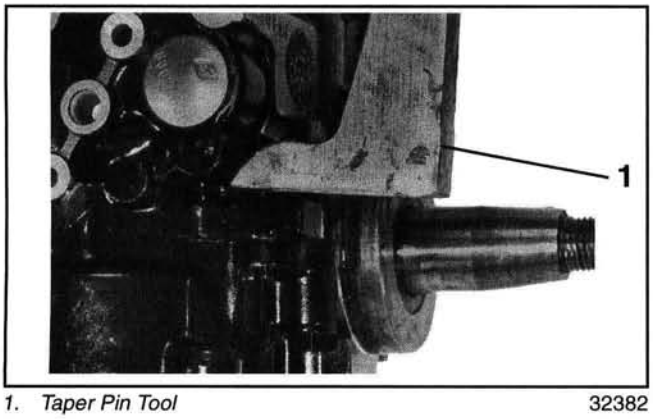
32384

Remove the six intake manifold screws, intake manifold, leaf plate assembly, and gaskets.



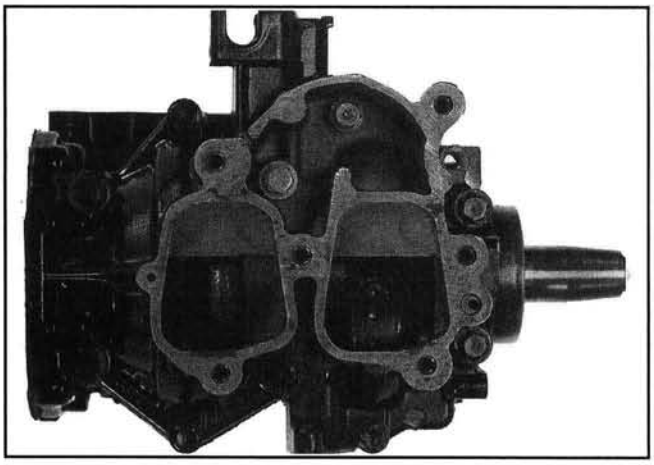
32383

Using the **Taper Pin Tool**, or equivalent, push crankcase taper pin toward intake manifold surface. Do not use any tool smaller than taper pin bore to remove the pin.



1. Taper Pin Tool 32382

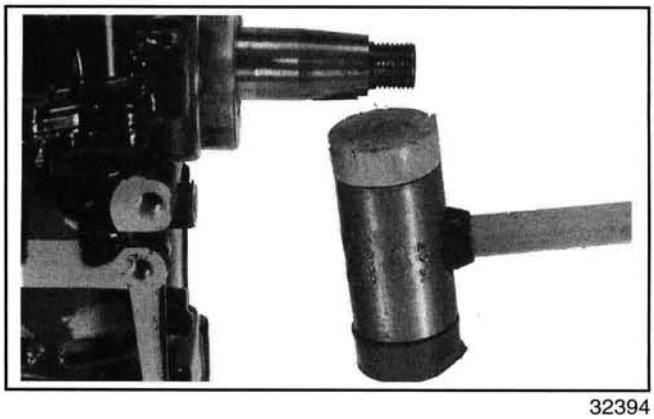
Remove the four crankcase flange screws and six main bearing screws.



32395

Turn the powerhead so the intake manifold surface faces up.

Using a rawhide mallet, lightly tap upward on the crankshaft until the halves just begin to separate. Lift up and remove the crankcase.

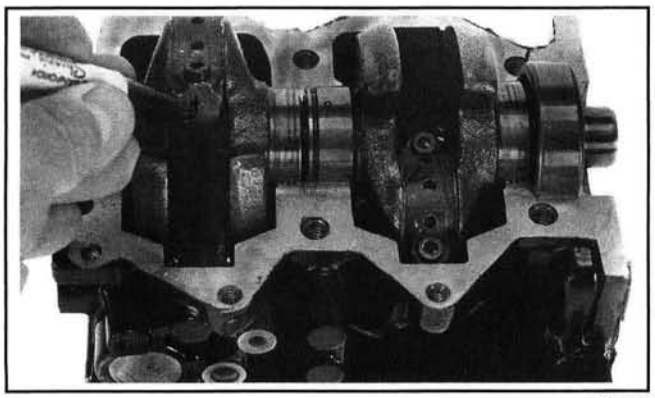


32394

IMPORTANT: Pistons, connecting rods, needle bearings, and liners are wearing parts and seat with the operation of the engine. Because of this, it is essential to maintain their original positions at reassembly.

7

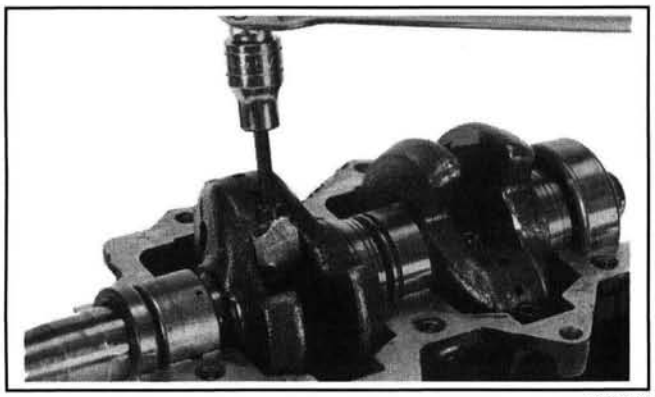
Use an indelible ink marker to mark each component when it is removed to ensure correct mating. Keep the needles of each cylinder together.



32403

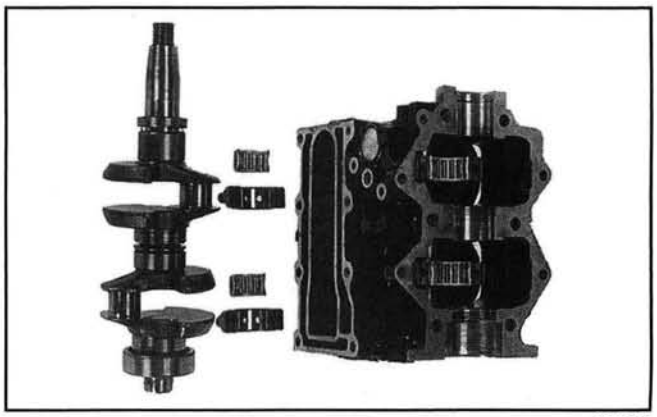
IMPORTANT: Loosely install the cylinder head to prevent the pistons from falling out when the crankshaft is removed.

Use a 5/32 in. Allen wrench to remove connecting rod screws. Remove the rod caps and bearing retainers.



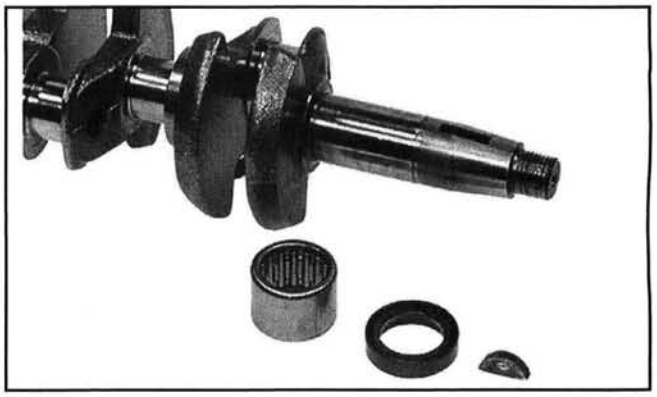
32393

Lift the crankshaft out of the cylinder block. Replace the connecting rod caps on the rods. Orient them exactly as they were before you removed them. Install the screws finger tight.



32391

Use diagonal-cutting pliers to remove the flywheel key from the crankshaft. Remove the upper seal and main bearing from the crankshaft.



COB1126

Remove the retaining ring from groove of the center main bearing. Separate the bearing and remove the 23 loose needle bearings.

COB1127

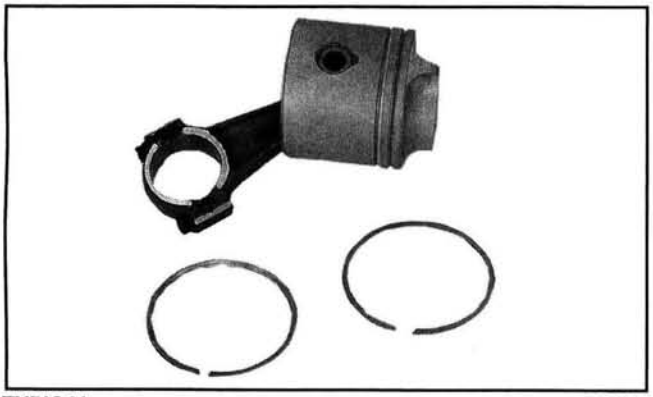
IMPORTANT: Remove the lower main bearing only if it needs to be replaced.

Use external retaining ring pliers to remove the lower bearing retaining ring and a bearing separator to support the bearing. Place the separator flats against the bearing and press the crankshaft from the bearing.

Rotate the powerhead so the cylinder head faces up. Remove the cylinder head and gently push up on the connecting rods to remove number 1 and number 2 piston assemblies.

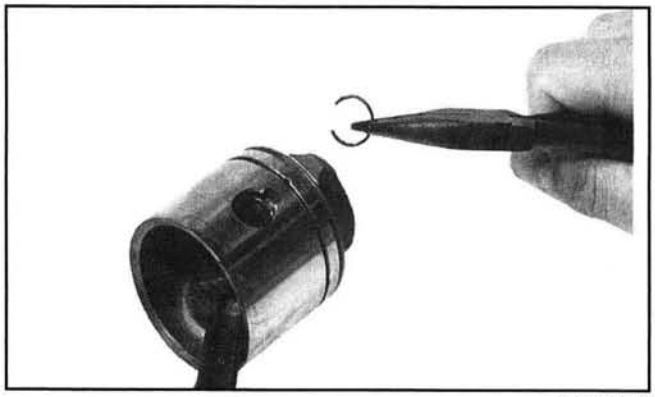
IMPORTANT: Protect the condition of the piston by packing paper towels between the connecting rod and piston. Do not allow the connecting rod to contact the inside of the piston skirt during handling.

Remove the piston rings using an appropriate ring expander. DO NOT try to save the rings. Install a complete set of **new** rings at reassembly.



TYPICAL 22153

Use **Retaining Ring Pliers** or equivalent to remove wrist pin retaining rings. Discard the rings.



COB1129

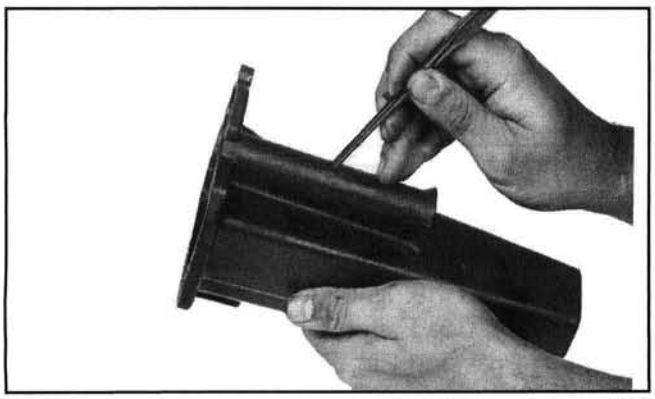
The fit between the wrist pin to bosses of the piston is loose on both sides. Push the wrist pin through to free the piston from the connecting rod. If necessary, use Piston Cradle, P/N 326573, and Wrist Pin Pressing Pin, P/N 392511. With the piston skirt flush with the cradle, press out the wrist pin using an arbor press. Be careful not to lose any of the 22 needle bearings or the two wrist pin washers. If any of the bearings are worn or lost, replace all the bearings on reassembly.

COB1130

DISASSEMBLY – 25/30

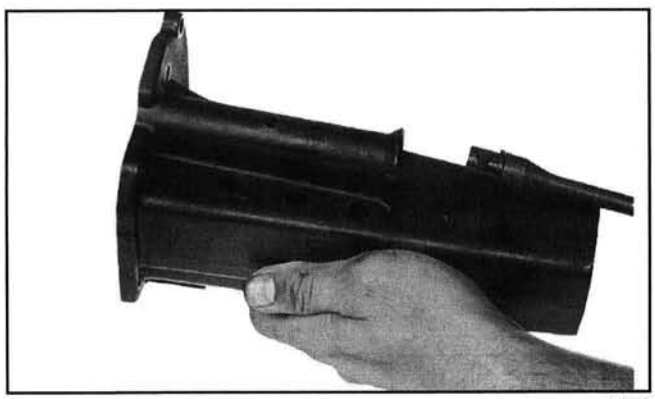
IMPORTANT: To simplify reassembly and wiring installation, lay out the various screws and clamps in the order of their proper location.

To remove the water tube grommet, depress tab of the grommet. Push the grommet out of the inner exhaust housing.



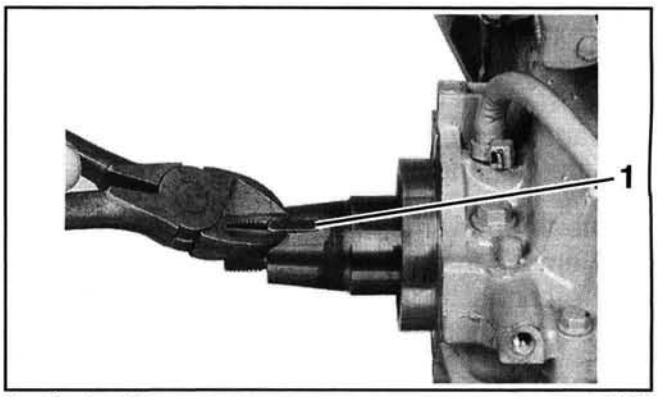
1409

Install a new grommet. Apply *Gasket Sealing Compound* to outside diameter of the grommet. Align tab of the grommet with hole in the housing and install grommet.



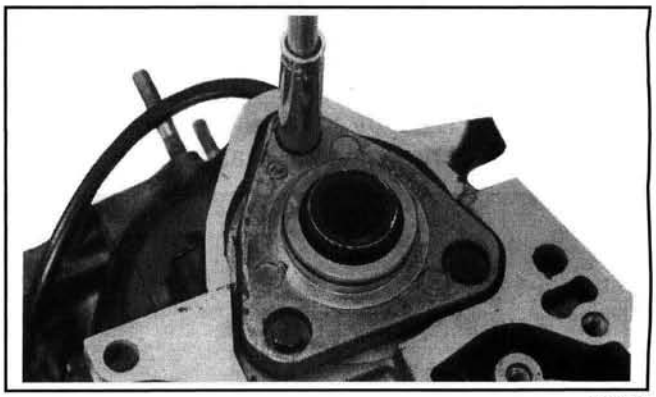
1406

Using diagonal or end cutters, gently pry out and remove the flywheel key.



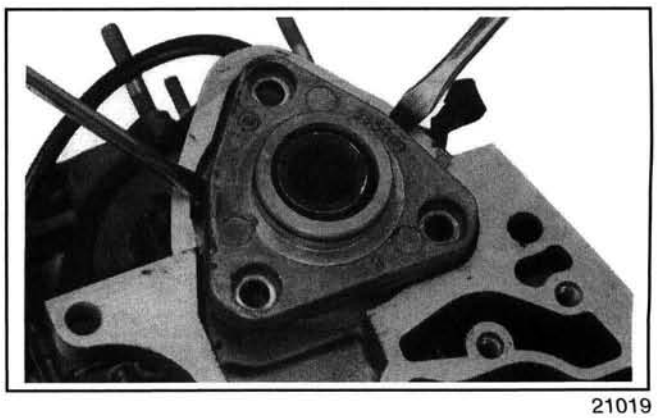
1. Flywheel key 1411

Remove the three lower crankcase head screws.



21020

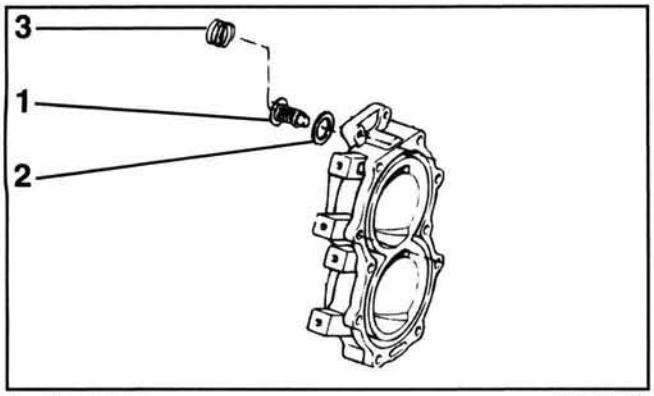
Raise crankcase head evenly to remove.



21019

Discard both crankcase head O-rings and the three screws. Use a punch and a mallet to drive the seal from the lower crankcase head. Remove all traces of sealer from the crankcase head.

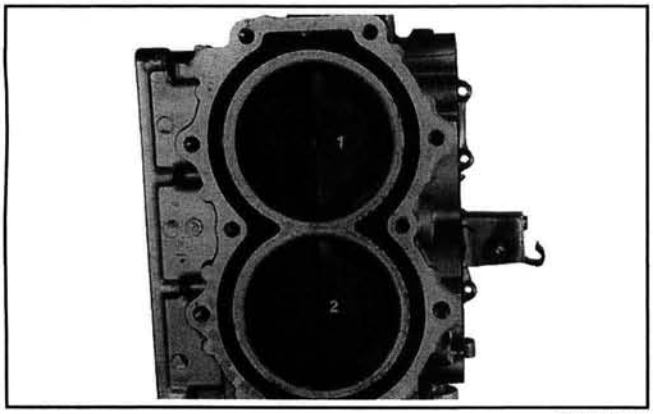
Remove cylinder head water cover screws. Tap around the edge of cover with a soft mallet to loosen. Remove the cover, thermostat, seal, and spring.



1. *Thermostat*
2. *Seal*
3. *Spring*

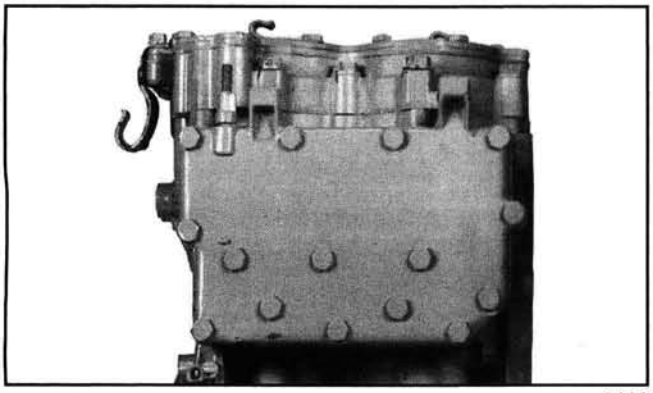
COA1452

Remove the cylinder head. Mark the top piston dome number 1 and the bottom piston dome number 2.



COA1458

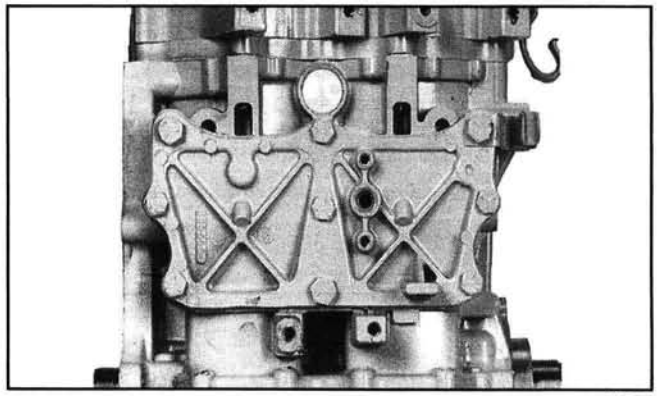
Remove the exhaust covers screws. Carefully separate the inner and outer exhaust covers. Clean all gasket surfaces.



1418

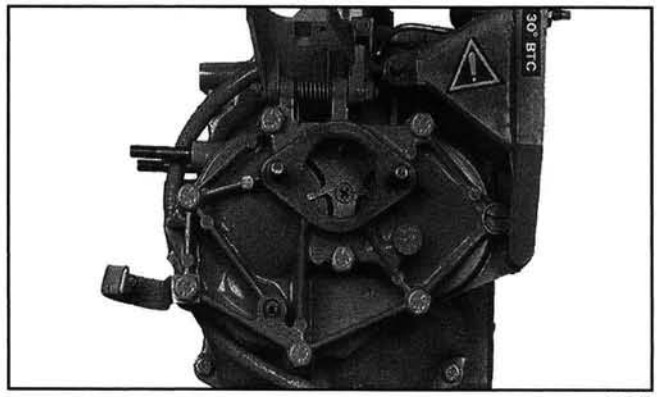
IMPORTANT: Check the inner exhaust cover for pitting and flatness. If pitting exists or the cover is warped, discard it and replace with a new cover during reassembly.

Remove the intake bypass cover and clean the gasket surfaces.



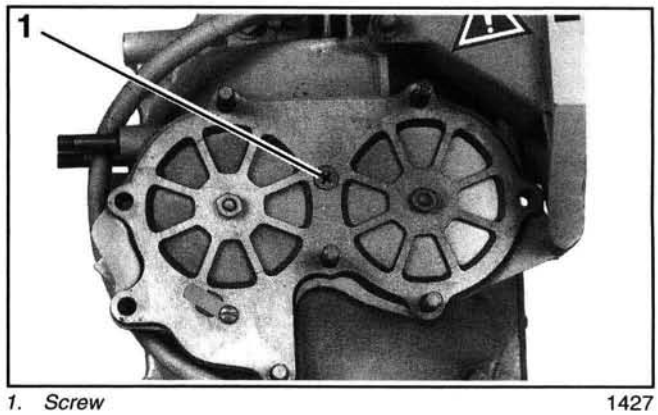
1421

Remove the seven hex head screws and one flat head screw, and remove the intake manifold.



1423

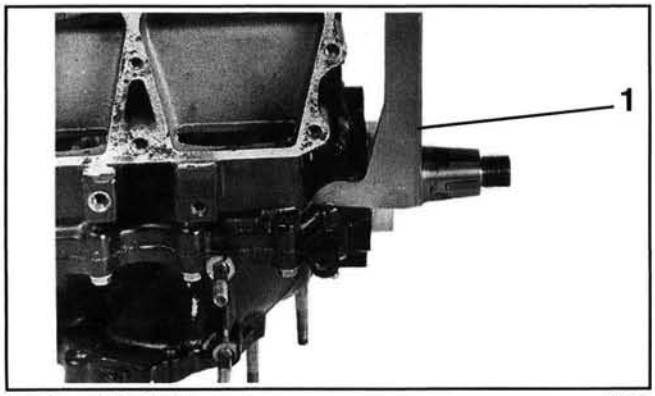
Remove one phillips head screw and remove the leaf plate.



1. *Screw*

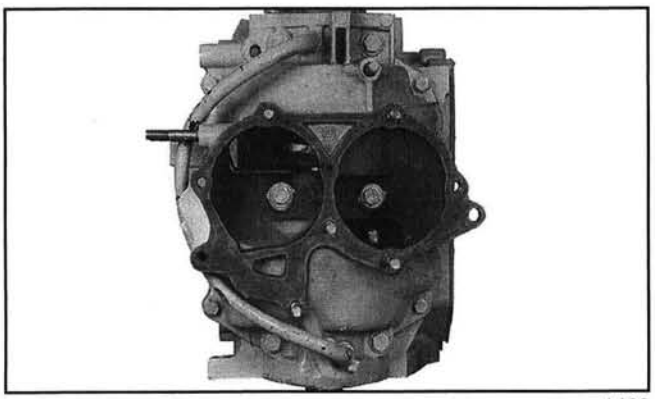
1427

Using the **Taper Pin Tool**, or equivalent, push the taper pin toward the intake manifold surface. Do not use any tool smaller than the taper pin bore to remove the pin.



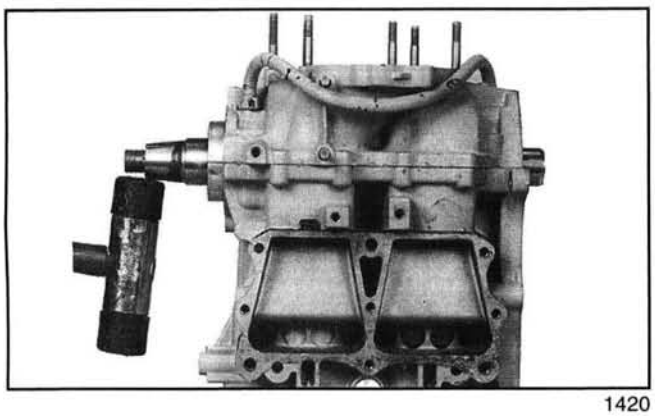
1. Taper Pin Tool 9886

Remove the six main bearing screws and eight flange screws.



1428

Position powerhead with intake facing up. Lightly tap upward on the crankshaft until the crankcase halves begin to separate.



1420

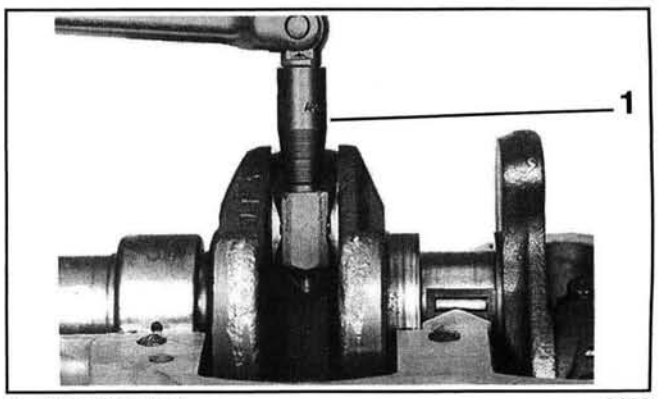
Lift the crankcase from the cylinder block.

IMPORTANT: Pistons, connecting rods, rod bearings, and bearing retainers are wearing parts and seat with the operation of the engine. Because of this, it is essential to maintain their original positions at reassembly. Using an indelible ink marker, mark each connecting rod, cap, and bearing component as they are removed to ensure proper reassembly. Keep the needles of each cylinder together.

1588

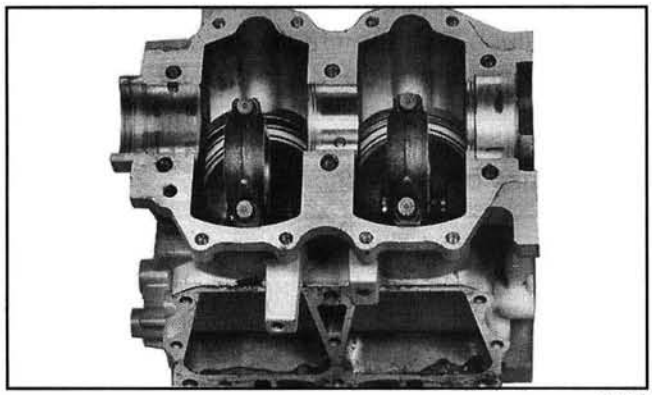
IMPORTANT: Loosely install cylinder head to prevent pistons from falling out.

Remove the rod cap screws using Torquing Socket, P/N 331638. Remove the cap's needle bearings and cages.



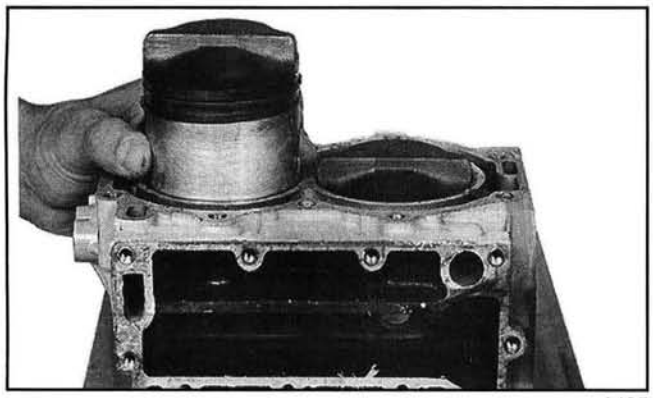
1. Torque Socket 1416

Lift the crankshaft out of the cylinder block. Replace the rod caps on the rods. Orient them exactly as they were before you removed them. Install the screws finger tight.



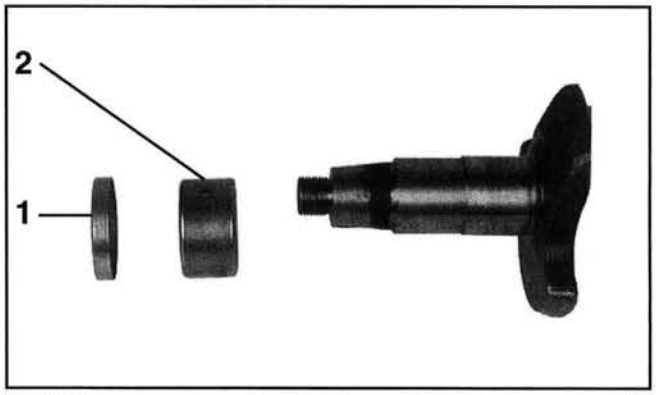
1422

Rotate the powerhead so the cylinder head faces up. Remove the cylinder head and gently push up on the connecting rods to remove number 1 and number 2 piston assemblies. Protect the condition of the piston by packing paper towels between the connecting rod and piston. Do not allow the connecting rod to contact the inside of the piston skirt during handling.



1425

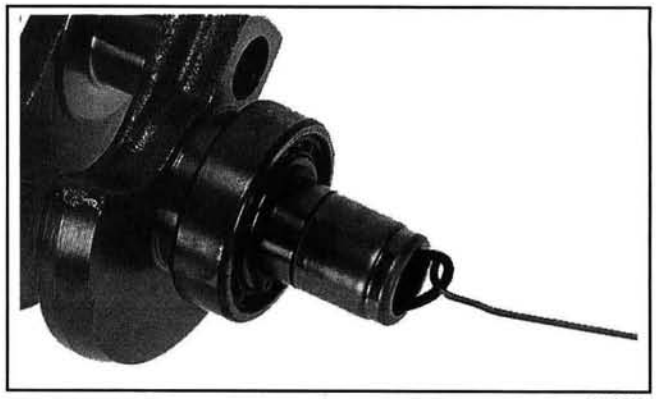
Remove the upper crankshaft seal and bearing. Discard the seal and clean and inspect the bearing.



1524

1. *Seal*
2. *Bearing*

Remove O-ring from crankshaft sleeve and inspect. Replace if necessary.



33262

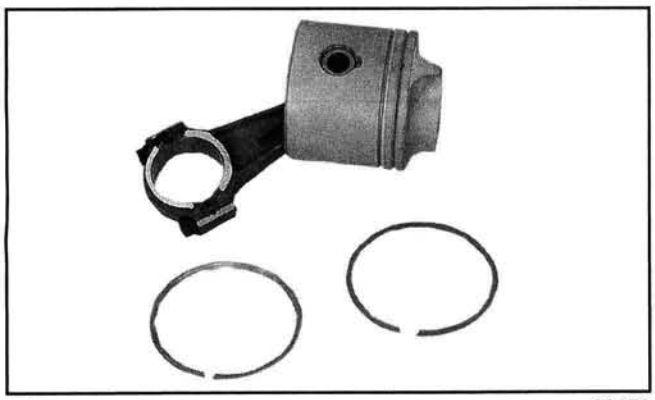
Inspect crankshaft sleeve and replace if necessary. To remove, use Slide Hammer, P/N 432128, and Large Puller Jaws, P/N 432129.

33261

IMPORTANT: Remove the lower main bearing only if it needs to be replaced.

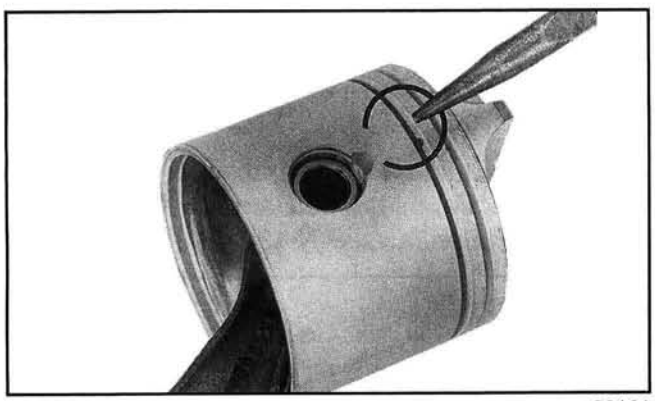
Using external retaining ring pliers, remove the lower bearing retaining ring. Using an appropriate bearing separator place separator flats against the bearing. Support the bearing and separator and press crankshaft from bearing.

Remove the rings from the pistons using piston ring expanders. DO NOT try to save the rings. Install a complete set of **new** rings at reassembly.



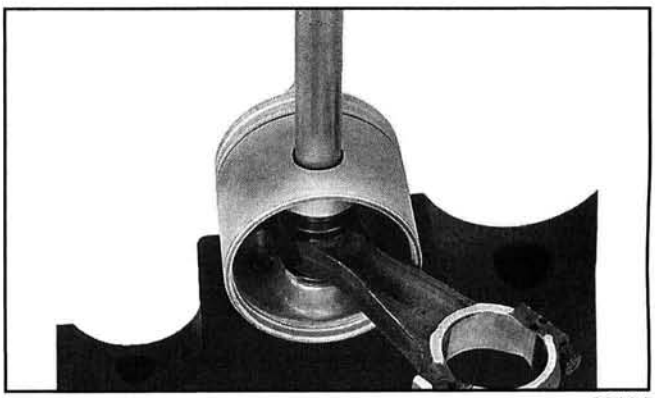
22153

Using **Retaining Ring Pliers** or equivalent, remove the wrist pin retaining rings. Discard the rings.

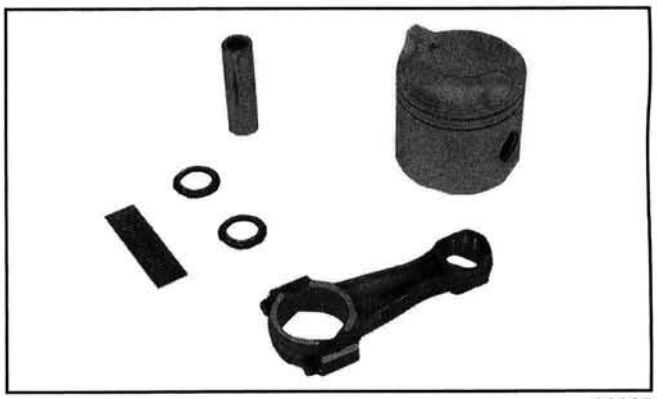


22161

The fit between the wrist pin to bosses of the piston is loose on both sides. Push the wrist pin through to free the piston from the connecting rod. If necessary, use Piston Cradle, P/N 326573, and Wrist Pin Pressing Pin, P/N 326356. With the piston skirt flush with the cradle, press out the wrist pin using an arbor press. Be careful not to lose any of the 28 needle bearings or the two wrist pin washers. If any of the needle bearings are worn or lost, replace bearing assembly.



22164



22165

CLEANING

IMPORTANT: Before inspecting or assembling powerhead, all internal components must be perfectly clean and free of contaminants.

Remove any carbon accumulation from exhaust port areas.

Remove any carbon accumulation from cylinder head combustion chambers.

If cylinder walls are glazed from extended use, use a medium grit hone to resurface walls. Use slow RPM to achieve a strong "crosshatch" pattern for best oil retention and ring sealing.

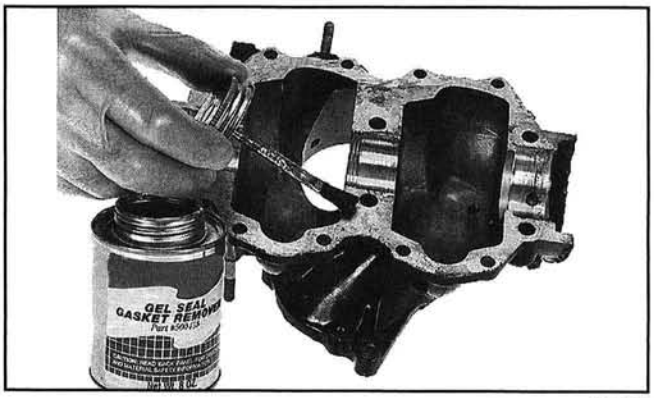
⚠ CAUTION ⚠

To avoid piston or cylinder block damage, restore the chamfer to all port edges using a ball hone or other suitable tool.

⚠ WARNING ⚠

To avoid personal injury, wear eye protection and rubber gloves when using *Gel Seal and Gasket Remover.*

Use *Gel Seal and Gasket Remover* to remove all traces of gaskets, adhesives, and *Gel-Seal II* from the cylinder block and crankcase.



34865

Carefully remove any carbon accumulation from the tops and ring grooves of the piston. A ring groove cleaning tool can be made by breaking an old ring and grinding an angle on its end. Do not damage ring grooves while cleaning.

Thoroughly wash entire cylinder block and crankcase with warm, soapy water to remove all traces of contaminants.

⚠ WARNING ⚠

To avoid personal injury, wear eye protection and set compressed air pressure at less than 25 psi (172 kPa).

Air dry cylinder block and crankcase. Blow out all holes and passages with compressed air.

Cover the cylinder walls with a liberal amount of *Johnson/Evinrude Outboard Lubricant* to protect them from corrosion.

INSPECTION

All Models

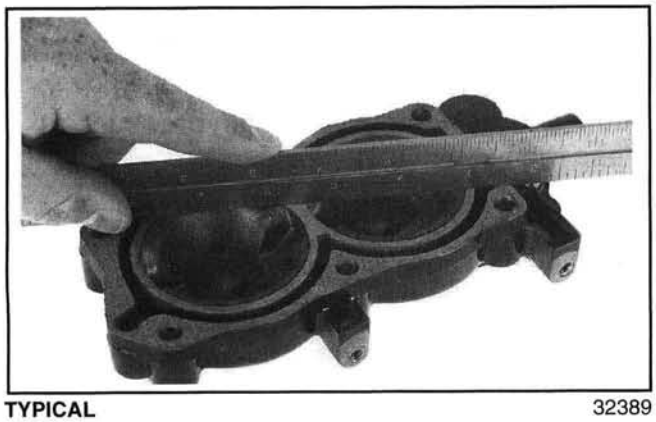
Before any inspection process can begin, all internal components must be clean and free of excess oil. Refer to **CLEANING** on p. 193.

Make a visual inspection of all internal components. Check for unusual wear patterns, scuffing or deterioration of aluminum parts, heat-related discoloration of bearings or bearing surfaces, and broken components.

Use a micrometer to measure the diameter of each crankpin and main bearing journal. Measure the lower main bearing journal if the bearing was removed. Refer to **TECHNICAL DATA** on p. 30 for dimensions.

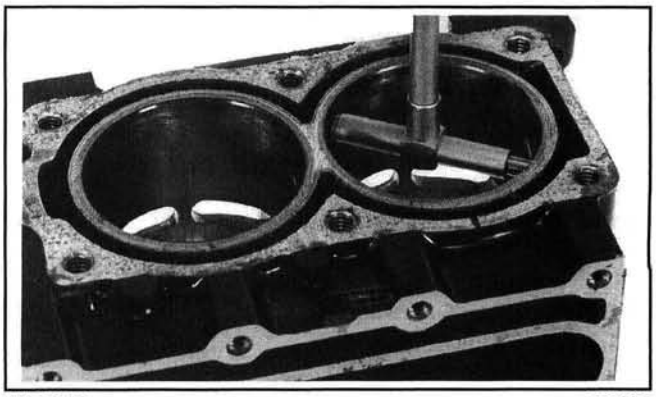
Check for cylinder head warpage using a piece of bar stock or machinist's straightedge and a feeler gauge set.

- Cylinder head warpage must not exceed 0.004 in. (0.10 mm) per inch of measurement. Replace head if warpage exceeds this dimension.



TYPICAL 32389

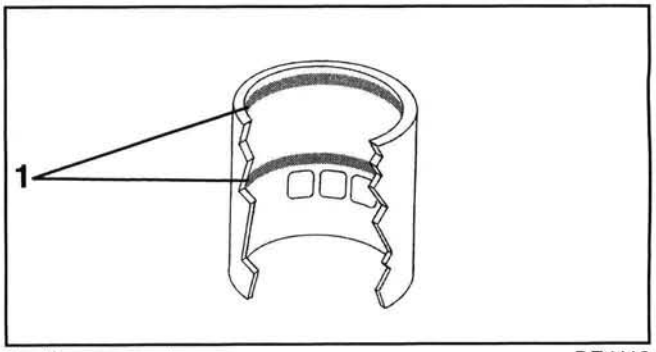
Use Cylinder Bore Gauge, P/N 771310, to inspect each cylinder bore for an out-of-round, oversize, or tapered condition. Make sure the gauge or micrometer is perfectly square in the bore when measuring.



TYPICAL 32409

Measure each cylinder in at least two areas as shown. Each area should be measured twice. The difference between the two measurements in each area is the cylinder out-of-round dimension.

- The cylinder must not be out-of-round by more than 0.003 in. (0.08 mm).



1. Measurement areas DR1119

The dimensional difference between the two areas is the cylinder taper.

- Cylinder taper must not exceed 0.002 in. (0.05 mm).

9.9/15 Models

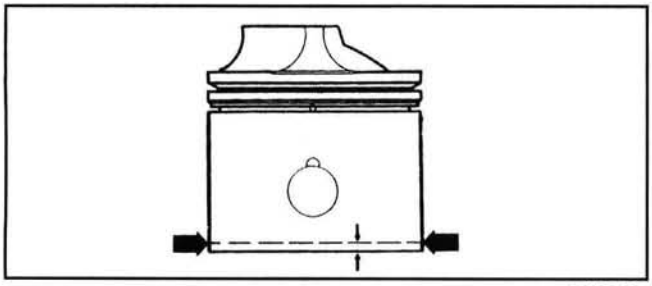
The difference between your measurements and standard bore dimension is cylinder oversize. Refer to **TECHNICAL DATA** on p. 30 for dimensions.

- The cylinder must not be oversize by more than 0.002 in. (0.05 mm).

IMPORTANT: If any cylinder is outside these tolerances, it must be bored oversize. One oversize piston is available for this engine 0.020 in. (0.508 mm). To determine oversize bore, add 0.020 in. (0.508 mm) to the standard bore. Refer to **TECHNICAL DATA** on p. 30. It is permissible to have one or more oversize pistons in an engine.

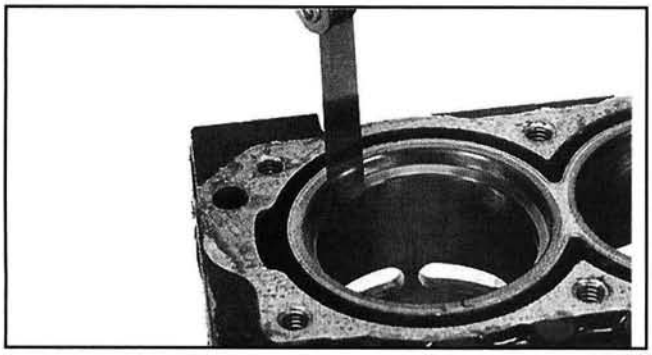
Measure the piston in two locations, 90° apart from each other, 1/8 in. (3 mm) above the bottom of the piston skirt.

- The difference between the two measurements is the out-of-roundness and must be no more than 0.002 in. (0.05 mm).



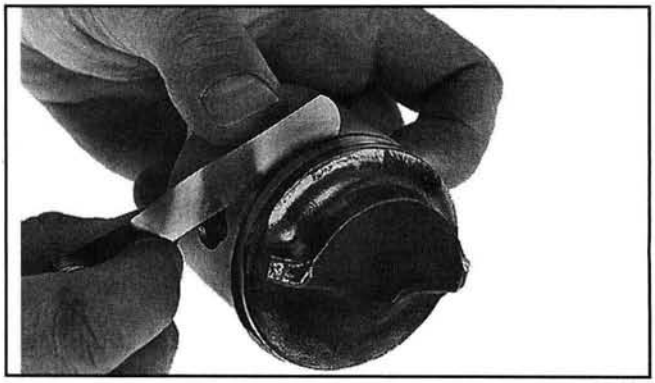
CO3082

Place each ring, separately, in its respective bore. Use a piston to square the ring in the cylinder. Use a feeler gauge to measure the ring end gap. The ring gap must be within 0.005 to 0.015 in. (0.13 to 0.38 mm).



32408

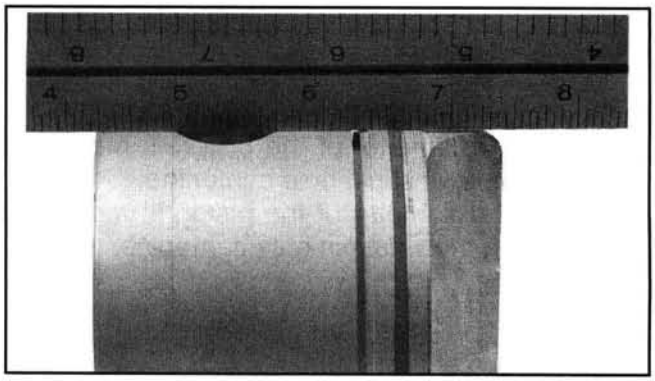
Use a feeler gauge to check groove side clearance on the lower square rings. Install each square ring on its piston. With the ring seated in its groove, make several checks around the piston. The side clearance must not exceed 0.004 in. (0.10 mm).



32407

Use a machinist's straightedge to check clearance on the upper tapered rings. Install each ring on its piston. When checked with the straightedge, there should be enough ring clearance to allow the straightedge to touch the piston on both sides of the ring groove. Make several checks around the piston.

- If straightedge does not touch piston, remove the ring and clean ring groove.



12907

7

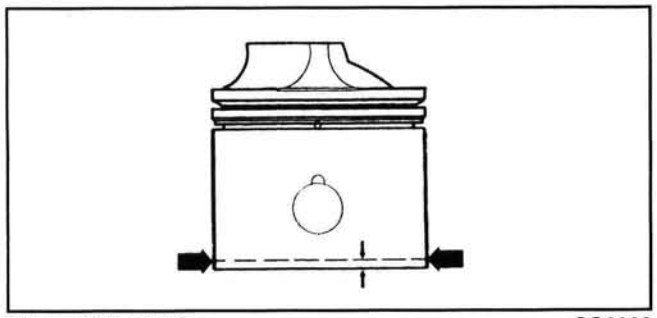
25/30 Models

The difference between your measurements and standard bore dimension is cylinder oversize. Refer to **TECHNICAL DATA** on p. 30 for dimensions.

- The cylinder must not be oversize by more than 0.003 in. (0.08 mm).

IMPORTANT: If any cylinder is outside these tolerances, it must be bored oversize. One oversize piston is available for this engine 0.030 in. (0.762 mm). To determine oversize bore, add 0.030 in. (0.762 mm) to the standard bore. Refer to **TECHNICAL DATA** on p. 30. It is permissible to have one or more oversize pistons in an engine.

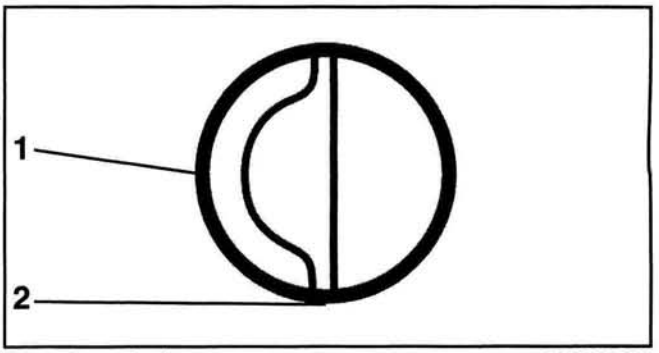
Measure the piston diameter in at least two places to check piston condition. Make your measurements 1/8 to 1/4 in. (3.2 to 6.4 mm) above the bottom edge of the piston skirt.



Piston (side view) CO3082

Measure the diameter of the pistons as follows:

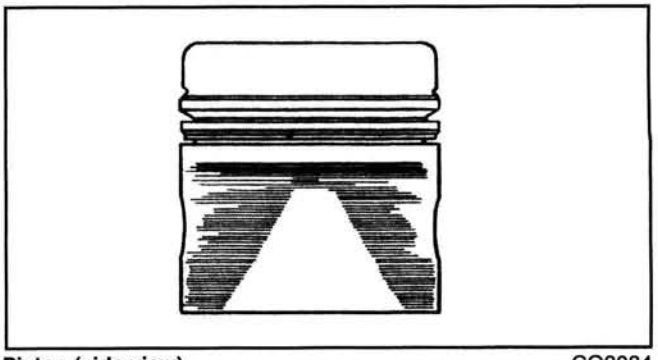
- The **major** diameter of the piston is measured 90° from the wrist pin hole centerline.
- The **minor** diameter of the piston is measured in line with the wrist pin hole centerline.
- The minor diameter must be smaller than the major diameter by the cam dimension. See **Piston Dimension Chart**.



Piston (top view) PCE0073A
1. Major diameter
2. Minor diameter

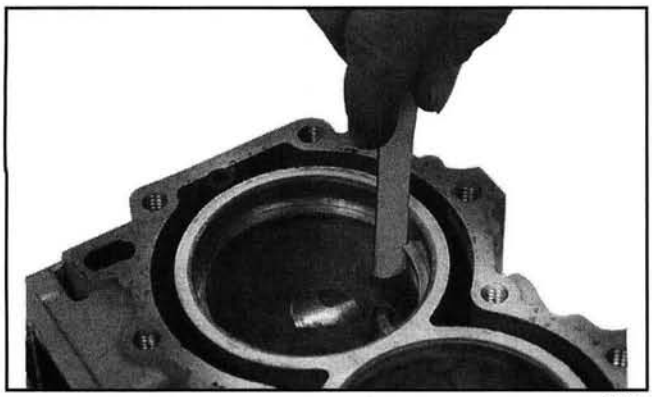
Piston Dimension Chart		
Major Piston Diameter	**Standard:** 2.9956 in. (76.11 mm)	**Oversize (.030):** 3.0256 in. (76.88 mm)
Cam Dimension	0.006 ± 0.001 in. (0.15 ± 0.03 mm)	

If the machining on the sides of the piston is worn smooth in a pattern similar to the illustration, replace the piston.



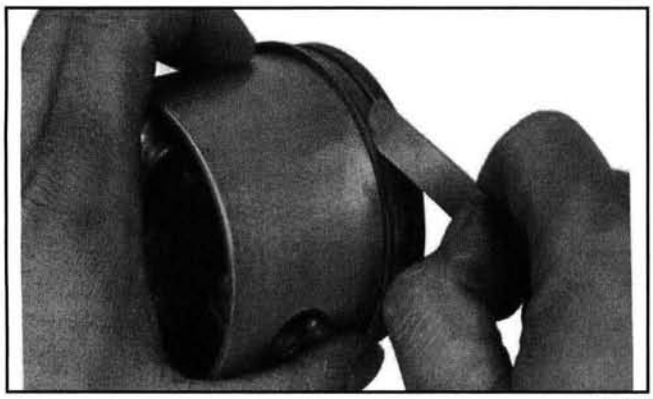
Piston (side view) CO3084

Place each ring, in turn, in its respective bore. Use a piston to square the ring in the cylinder. Use a feeler gauge to measure the ring end gap. The ring gap must be within 0.007 to 0.017 in. (0.17 to 0.43 mm).



1507

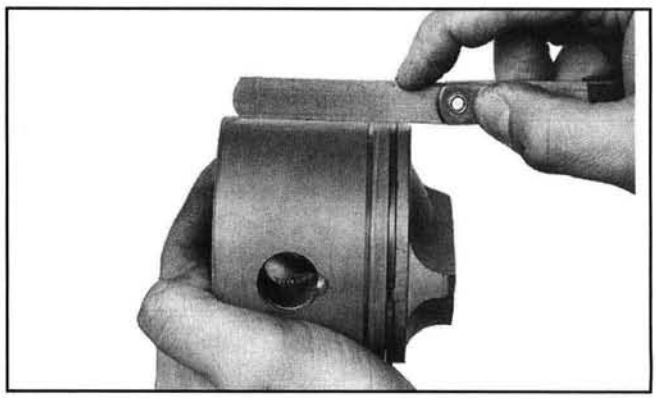
Use a feeler gauge to check groove side clearance on the lower square rings. Install each square ring on its piston. With the ring fully seated in its groove, make several checks around the piston. The side clearance must not exceed 0.004 in. (0.10 mm).



1529

Use a machinist's straightedge to check clearance on the upper *Pressure-Back™* rings. Install each *Pressure-Back* ring on its piston. Ring to piston clearance should allow the straightedge to touch the piston on both sides of the ring groove. See image. Make several checks around the piston.

If the straightedge does not touch the piston, remove the ring and clean the ring groove.



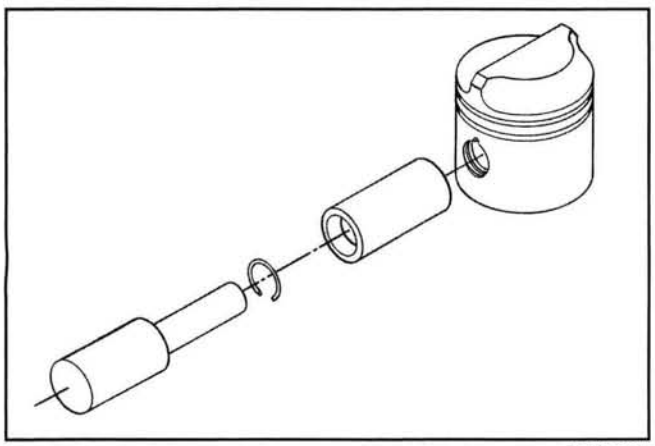
3125

7

ASSEMBLY – 9.9/15

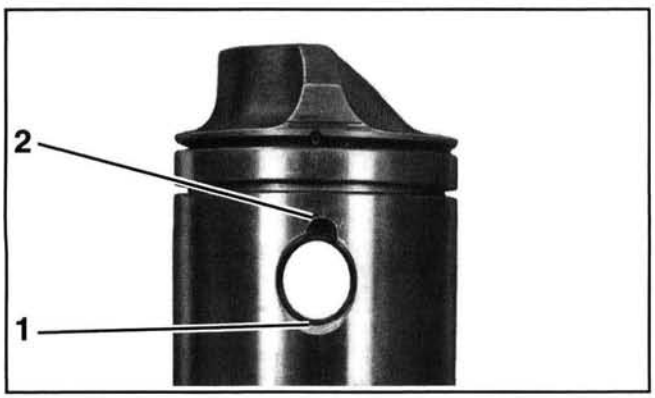
IMPORTANT: Proceed slowly. Make no forced assemblies unless a pressing operation is called for. All internal components must be perfectly clean and lightly coated with *Johnson/Evinrude Outboard Lubricant.*

Using Wrist Pin Pressing Pin, P/N 392511, seat a **new** retaining ring in groove of the piston.



DR2661

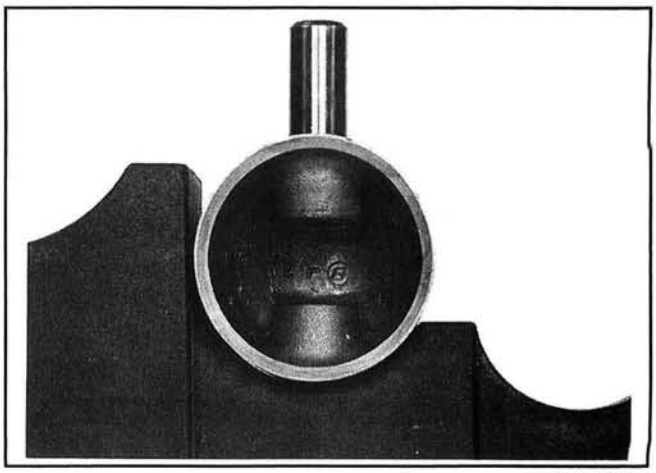
IMPORTANT: Gap of the ring must be positioned opposite notch in the piston.



1. *Gap of retaining ring*
2. *Notch in piston*

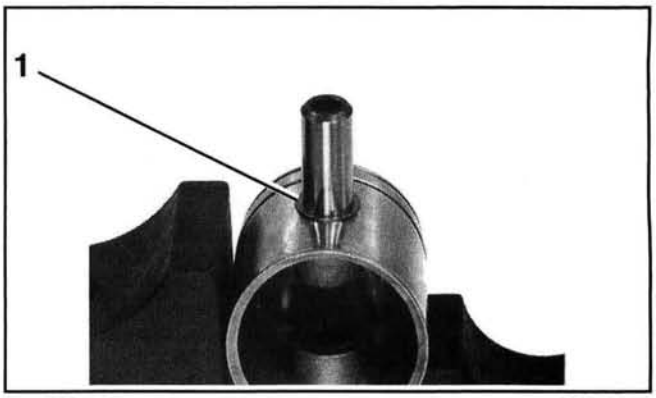
COB1132

Using the piston cradle and wrist pin driver, oil and start the wrist pin into the piston wrist pin boss opposite where the retaining ring is installed. Do not allow the wrist pin to enter the piston cavity.



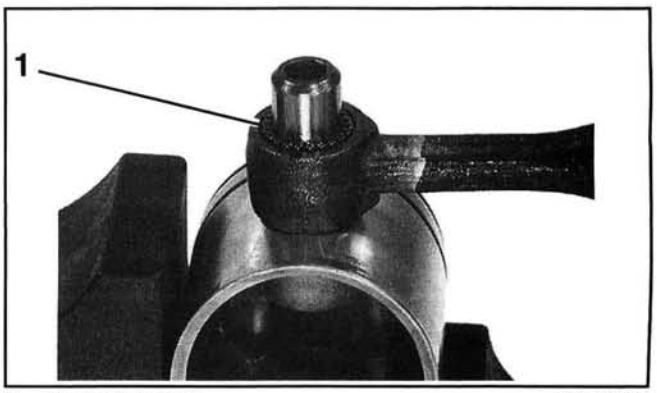
COB1133

Slide one of the wrist pin washers down the wrist pin. Position the top end of the connecting rod over the wrist pin. Apply *Needle Bearing Assembly Grease* to the 22 needle bearings and install the bearings into the connecting rod.



1. *Wrist pin washer*

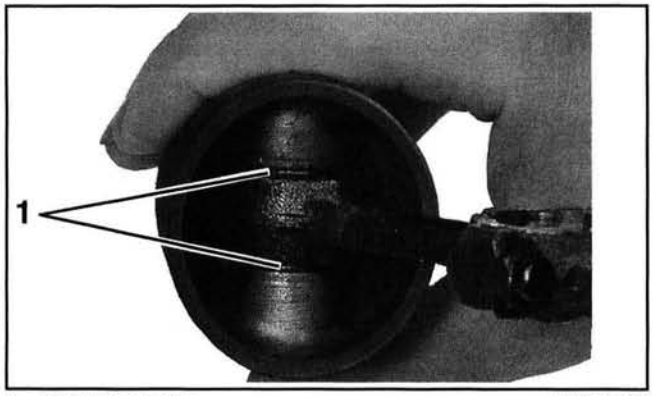
COB1134



1. *Needle bearings*

COB1135

Slide the connecting rod with the needle bearings and washer up and off the wrist pin, being careful not to disturb the bearings. Place the connecting rod and the two wrist pin washers in position in the piston cavity, aligned with the wrist pin boss.



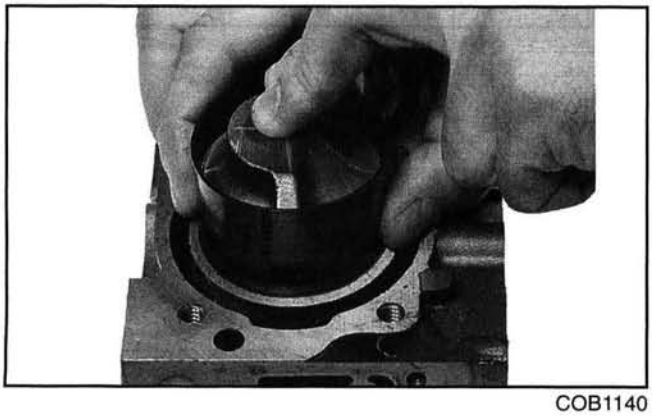
1. Wrist pin washer COB1137

Finish installing the wrist pin through the connecting rod and the piston until the wrist pin contacts the installed retaining ring. Check to be sure none of the needle bearings have been disturbed and pushed out of the connecting rod. Install a second **new** retaining ring.

Install piston rings on each piston. Tapered ring must be installed in top groove. Spread each ring with a ring expander just enough to slip it over the head of the piston and down into place.

Coat the piston and cylinder bore with oil.

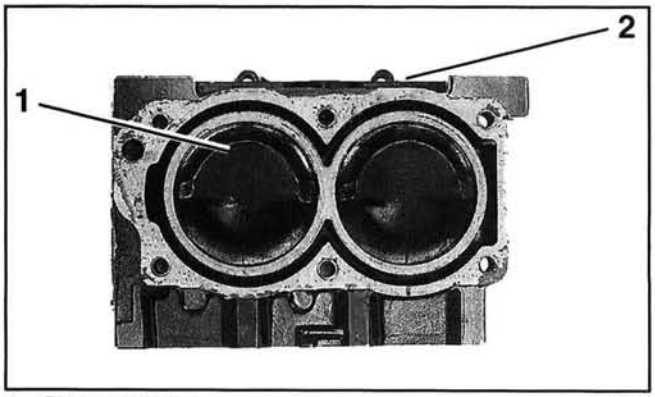
Place the piston in Ring Compressor, P/N 339754, (P/N 339755 for oversize pistons). Make certain that the rings are correctly positioned in their grooves with respect to the dowel pins. Damaged pistons and broken rings may result from imperfect alignment of the ring gap and the dowel pins.



COB1140

IMPORTANT: The piston rings must be correctly located on their dowel pins to prevent permanent powerhead damage.

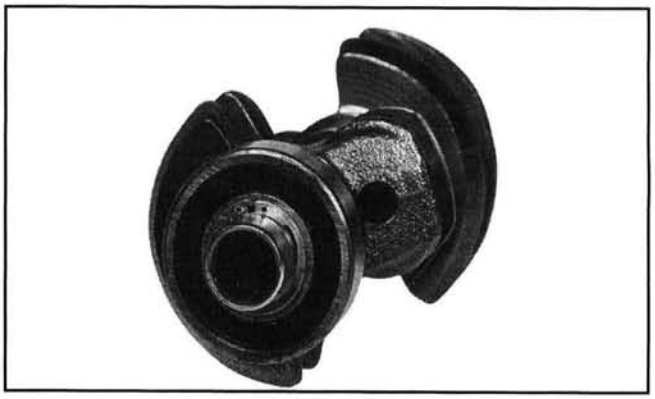
Start the piston into bore of the cylinder with deflector of the piston (sharp edge) toward intake port side of the cylinder block.



1. Piston, deflector
2. Intake port side 32406

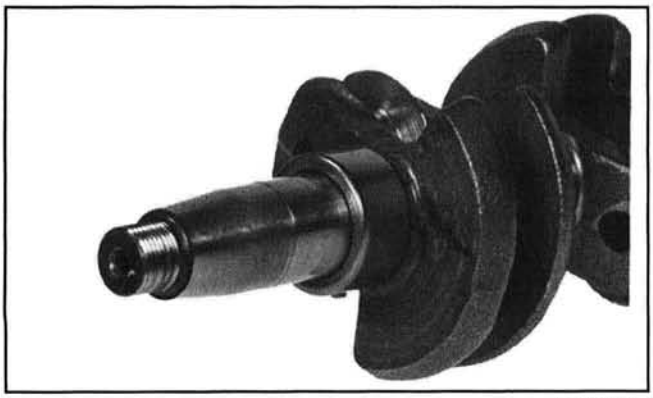
IMPORTANT: Loosely install the cylinder head to prevent the pistons from falling out.

If removed, oil and press a new lower main bearing onto the crankshaft. When pressing on the bearing, support the crankshaft between the two lower counterweights and press against the lettered side of the bearing. Install the retaining ring in groove of the crankshaft with sharp edge of the ring facing away from bearing.



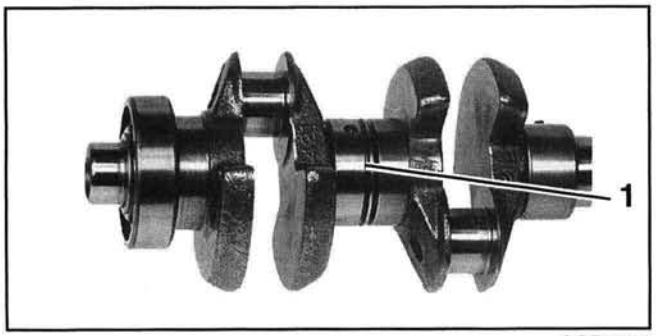
COB1141

Oil the upper main bearing surface of the crankshaft. Slide the upper main bearing onto the crankshaft with lettered side facing the flywheel end of the crankshaft.



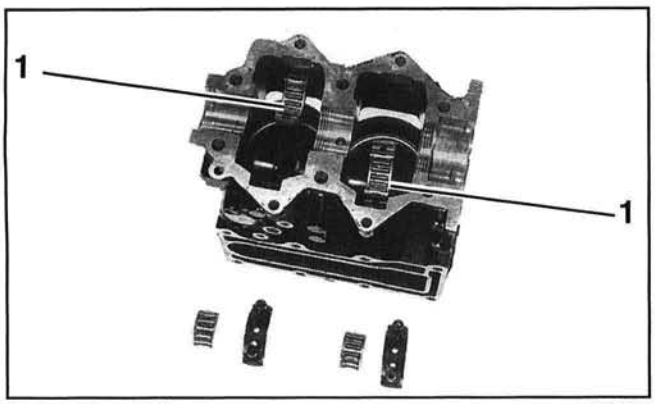
COB1142

Install the center main bearing. Apply *Needle Bearing Assembly Grease* to the 23 needle bearings. Place the bearings around the center main journal of the crankshaft. Place the sleeves around the bearings with retaining ring end of the sleeves facing flywheel end of the crankshaft. Secure sleeves together with the retaining ring.



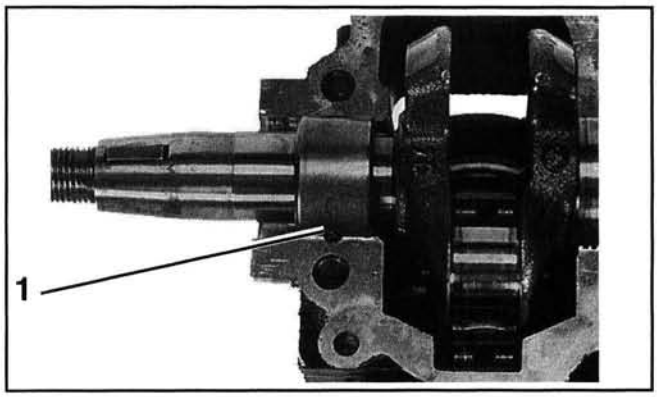
COB1144

Remove the rod caps from connecting rods. Place one retainer half and bearings on each rod.



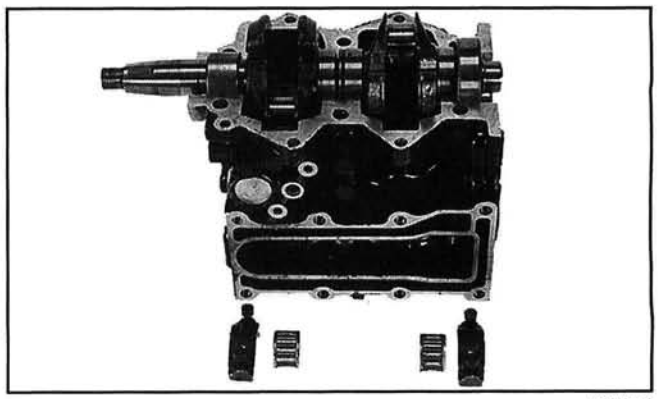
1. Retainer half 32405

Place crankshaft in position on cylinder block. Align center main bearing dowel pin hole with dowel pin in cylinder block. Roll the upper main bearing pin into groove of the cylinder block.



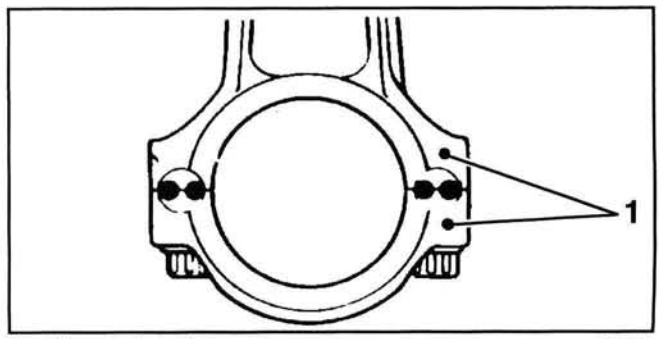
1. Upper main bearing pin 32404

Position the rods on the crankpins at this time. Place other retainer halves and bearings on crankpins.



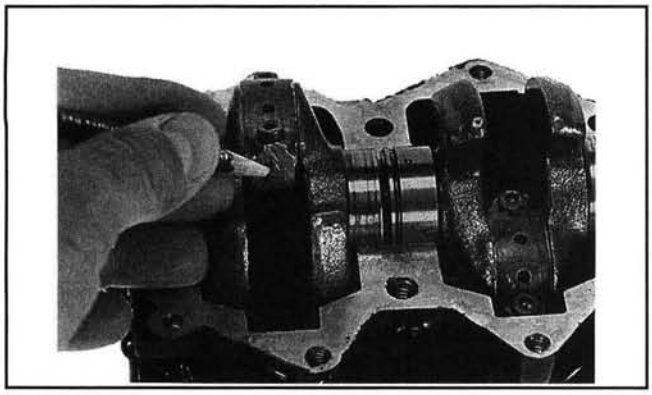
32454

Oil threads of rod cap screws and install each rod cap on the proper connecting rod. Make sure alignment mark on rod cap aligns with mark on rod.



1. Alignment mark 53628

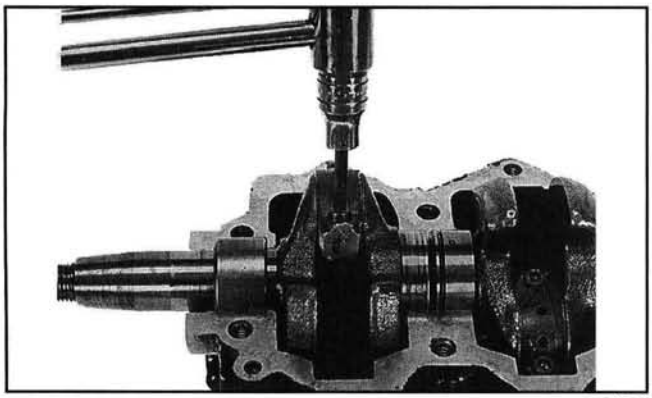
Use your fingernail or pencil lead to determine if the caps are aligned properly by scraping it across the joint between the cap and the rod. If your rod caps are not correctly aligned, lightly tap them into position with an aluminum rod and a mallet.



32453

IMPORTANT: Replace connecting rod assembly if proper cap and rod alignment cannot be achieved.

Tighten the screws in stages to a final torque of 60 to 70 in. lbs. (7.0 to 7.5 N·m).

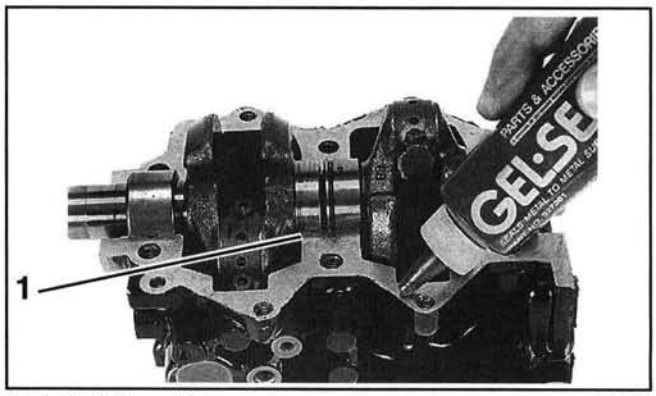


32452

Thoroughly clean and degrease the crankcase mating flange of the cylinder block with *Cleaning Solvent* and let air dry.

Apply *Locquic Primer* to the mating flange of the crankcase and let air dry.

Apply a thin coat of *Gel-Seal II* to the cylinder block flange. Coating must be even and consistent and not excessive. Keep application 1/4 in. (6.4 mm) from the labyrinth seals and bearings.

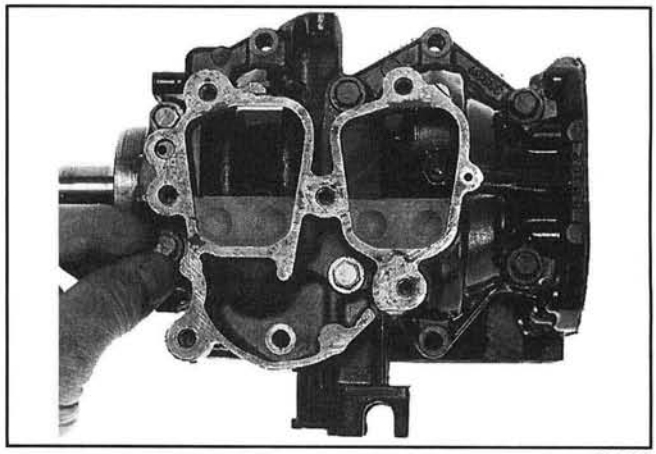


1. Labyrinth seal (grooves) 32451

IMPORTANT: *Gel-Seal II* has a shelf life of at least one year when stored at room temperature. Test the *Gel-Seal II* or replace it if the age of the tube can not be determined. Using old *Gel-Seal II* could cause crankcase air leaks.

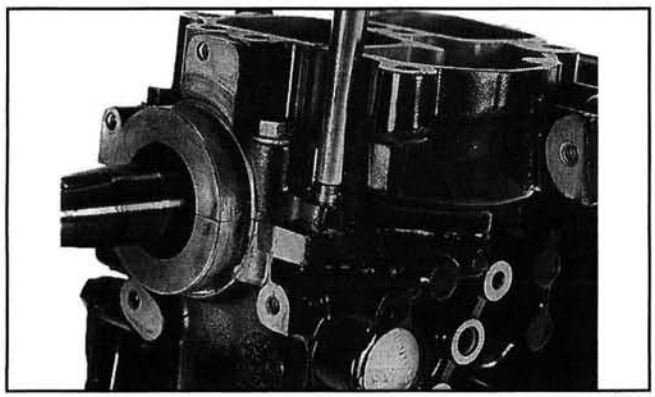
Lower the crankcase into place.

Lightly coat threads of the six main bearing screws with *Gel-Seal II*. Install the screws finger tight.



32450

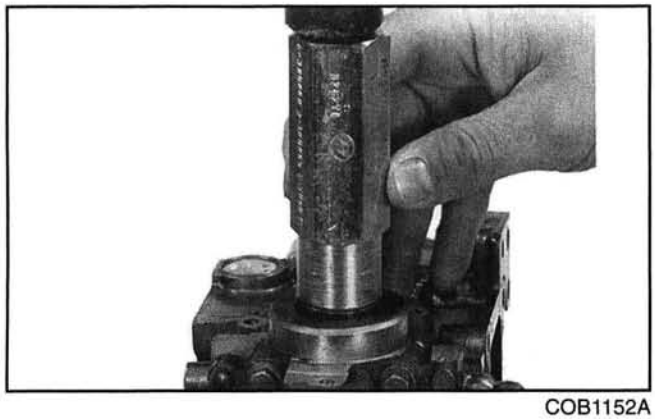
When the crankcase is seated, install and firmly seat the crankcase taper pin.



32378

Using a soft face mallet, lightly tap bottom of the crankshaft to seat the lower main bearing.

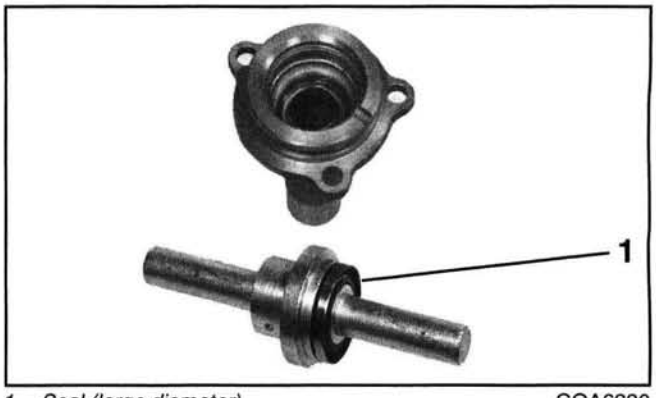
Apply *Gasket Sealing Compound* to metal case of a new upper main bearing seal. Install seal using Seal Installer, P/N 326271, with lip of seal facing crankcase assembly.



COB1152A

Apply *Gasket Sealing Compound* to metal cases of two new crankcase head seals. Place the small diameter seal on Crankcase Head Seal Installer, P/N 433391, with lip of the seal facing large diameter of the tool. Install the seal until tool contacts the head. Use the opposite side of the tool to install the large diameter seal. Lip of this seal must face away from large diameter of the tool. When installed, both seal lips will face toward each other. Apply approximately 3 cc of *Moly Lube* between the seals.

1. Seal (small diameter) COA6229



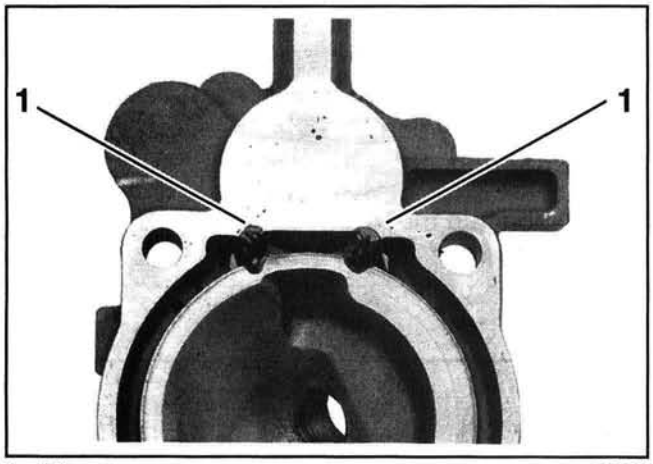
1. Seal (large diameter) COA6230

Oil and place a new O-ring on the crankcase head. Install the crankcase head. Apply *Gasket Sealing Compound* to threads of crankcase head screws. Install the screws finger tight.

Tighten the six main bearing screws in stages to a final torque of 144 to 168 in. lbs. (16 to 19 N·m). Begin with the center screws and work outward in a spiral pattern. Tighten the smaller crankcase screws to a torque of 60 to 84 in. lbs. (7 to 9 N·m).

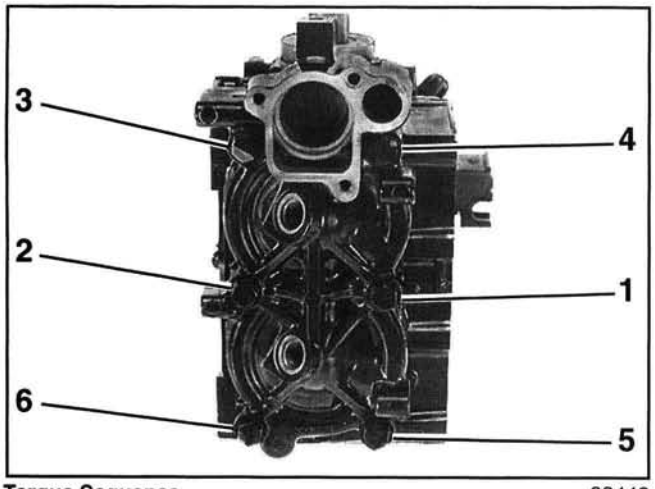
Tighten the crankcase head screws to 60 to 84 in. lbs. (7 to 9 N·m).

Apply *Permatex No. 2* to the two ribs in the cylinder head next to thermostat water passage.



1. Ribs 38609

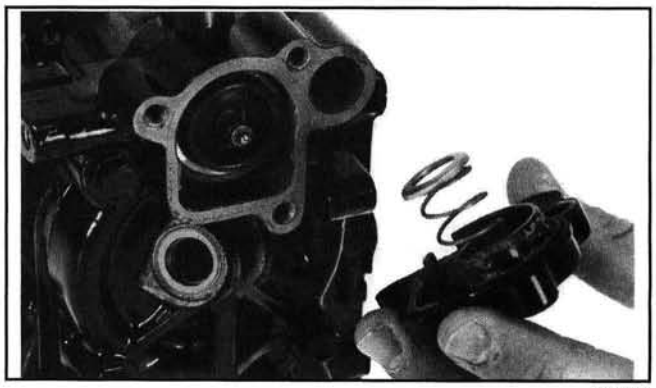
Lightly coat both sides of a new cylinder head gasket with *Gasket Sealing Compound.* Install the gasket and cylinder head. Tighten the cylinder head screws in stages to the final torque of 216 to 240 in. lbs. (24 to 27 N·m), following the sequence shown. Install the cylinder head screws dry. Do not use sealant on threads.



Torque Sequence 32448

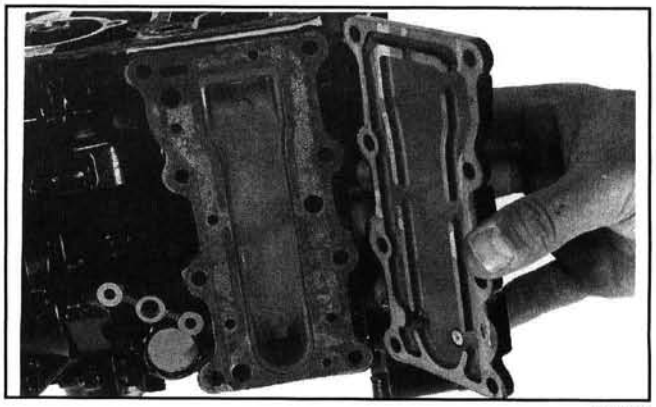
Install the thermostat assembly (and temperature switch, if equipped) in the cylinder head.

Install thermostat cover and O-ring. Torque screws 60 to 84 in. lbs. (7 to 9 N·m).



32387

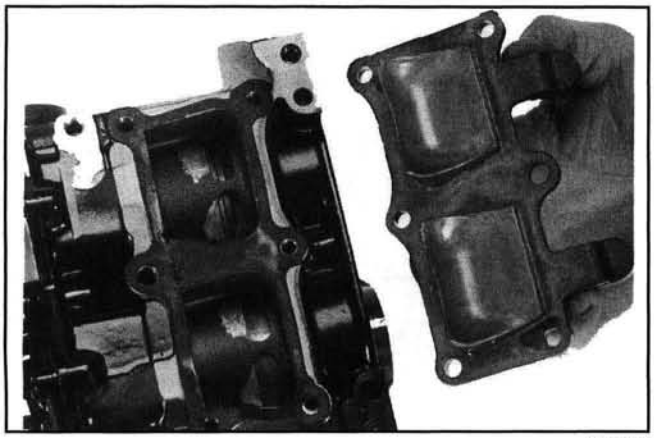
Apply *Gasket Sealing Compound* to both sides of two new exhaust cover gaskets. Install the inner and outer exhaust covers. Tighten the screws to a torque of 95 to 130 in. lbs. (11 to 14 N·m), starting with the center screws.



32388

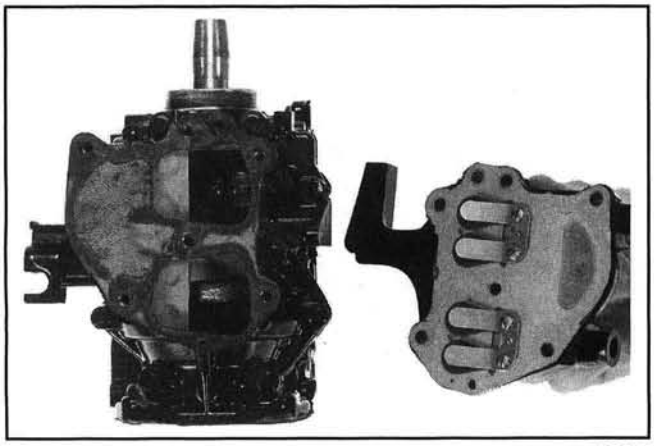
7

Apply *Gasket Sealing Compound* to both sides of a new bypass cover gasket. Install bypass cover and tighten the screws to a torque of 60 to 84 in. lbs. (7 to 9 N·m), starting with the center screws.



32384

Install the intake manifold and leaf valve assembly using new gaskets. Do not use sealer on these gaskets. Tighten the screws to a torque of 60 to 84 in. lbs. (7 to 9 N·m).



32383

Install the fuel, ignition, and electrical components to the powerhead.

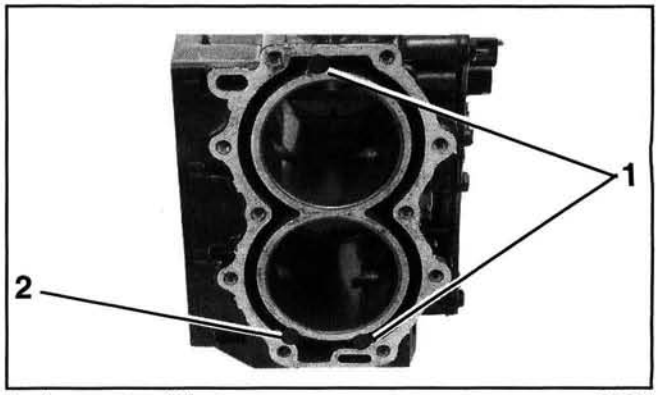
⚠ WARNING ⚠

To prevent possible fire and explosion under the engine cover, make sure ignition and electrical wires are routed and clamped in original position; away from rotating parts which could cut or abrade wire insulation.

ASSEMBLY – 25/30

IMPORTANT: Proceed slowly. Make no forced assemblies unless a pressing operation is called for. All internal components must be perfectly clean and lightly coated with *Johnson* or *Evinrude Outboard Lubricant.*

Lightly lubricate the three water deflectors with *Triple-Guard* grease. Install the two long and one short water deflectors until they are flush, or nearly flush, with the gasket surface.

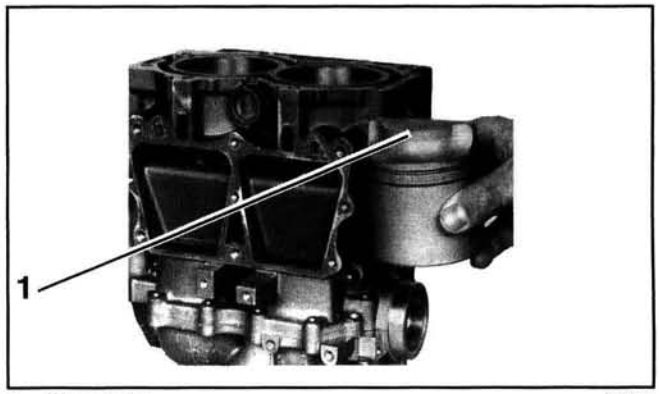


1. *Long water deflectors*
2. *Short water deflector*

21227

IMPORTANT: DO NOT shorten the water deflectors. The water deflectors might be slightly above the gasket surface in a normal installation.

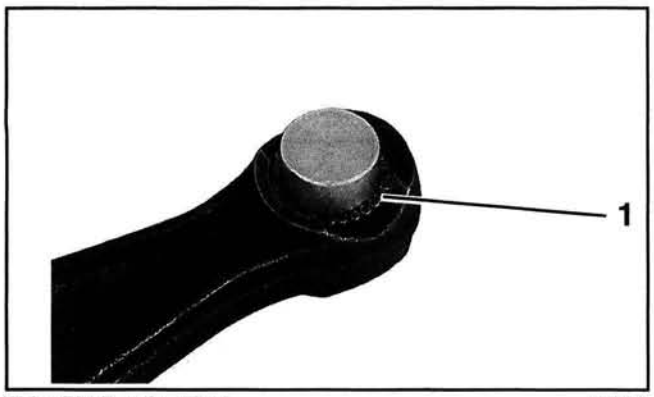
Determine which part of the piston faces up by holding the piston next to the cylinder block. When installed, the sharp edge of the piston deflector will face the intake ports.



1. *Sharp edge*

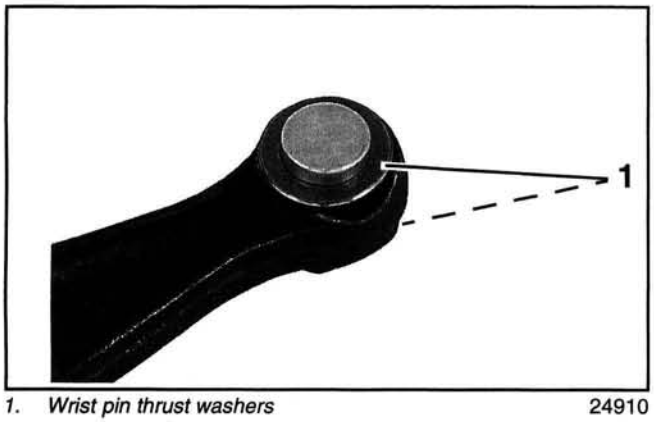
3521

Apply *Needle Bearing Assembly Grease* to the 28 wrist pin bearings. Install the bearings in the wrist pin bore. Align the bearings in the bore using Wrist Pin Bearing Tool, P/N 336660.

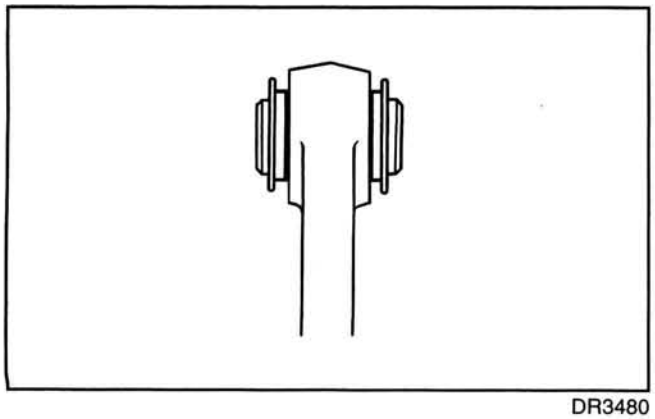


Wrist Pin Bearing Tool 24911
1. *Bearings*

Place the two wrist pin thrust washers on the tool with flat side of the washers facing out.



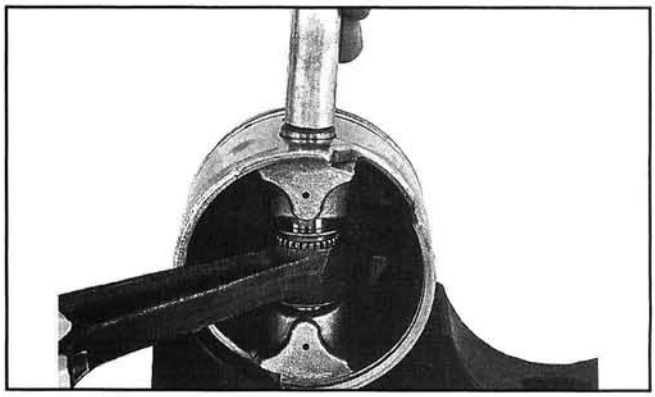
1. *Wrist pin thrust washers* 24910



DR3480

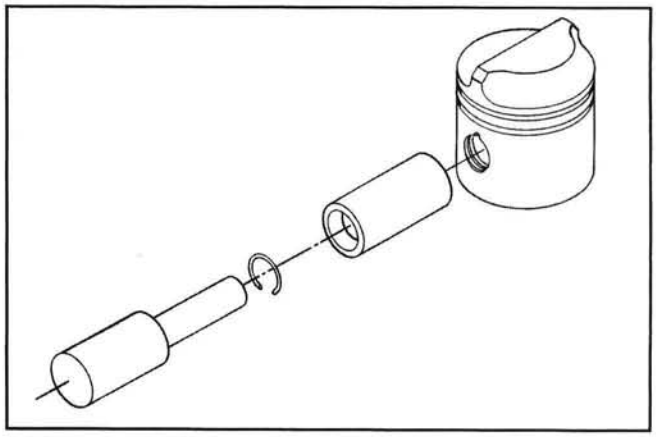
IMPORTANT: The connecting rod has no specific orientation. Support the piston in Piston Cradle, P/N 326573. Oil the wrist pin bore and wrist pin.

Install the wrist pin through the piston and connecting rod, pushing the tool out through the piston.

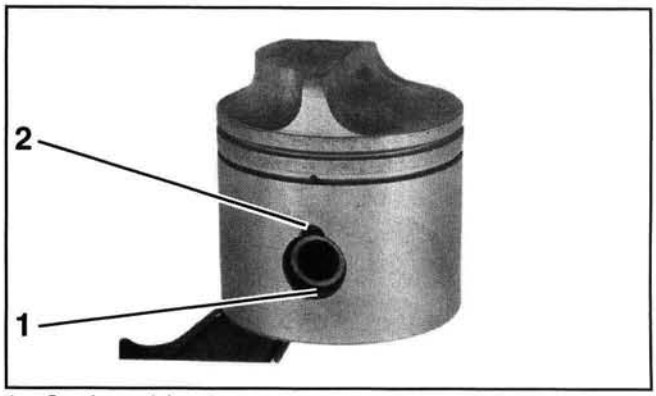


24442

Using Cone, P/N 318600, and Driver, P/N 318599, install **new** wrist pin retaining rings in both wrist pin retainer grooves of piston. When installed, gap of the ring should be positioned opposite notch in the piston.



DR2661



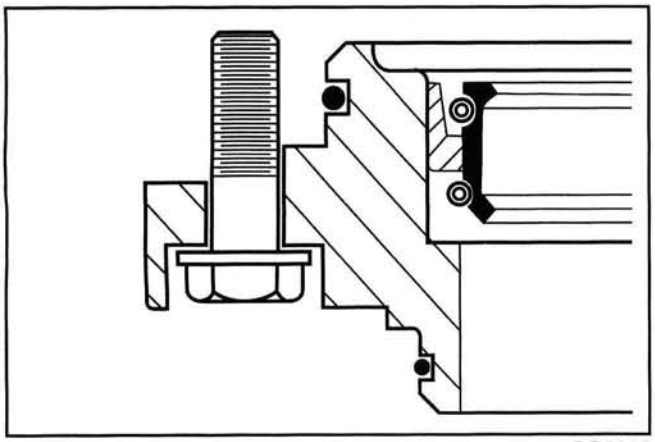
1. *Gap in retaining ring* 24909
2. *Notch in piston*

Repeat these steps for each piston.

7

Install piston rings on each piston. Tapered ring must be installed in top groove. Spread each ring with a ring expander just enough to slip it over the head of the piston and down into place.

Clean the seal bore of the crankcase head and install a new seal using Seal Installer, P/N 333520. Apply *Gasket Sealing Compound* to the metal casing of the seal and press the seal into the crankcase head until the tool is seated. The sharp edge of the seal's metal case must face the tool during installation. Lightly coat the seal lips with *Triple-Guard* grease.



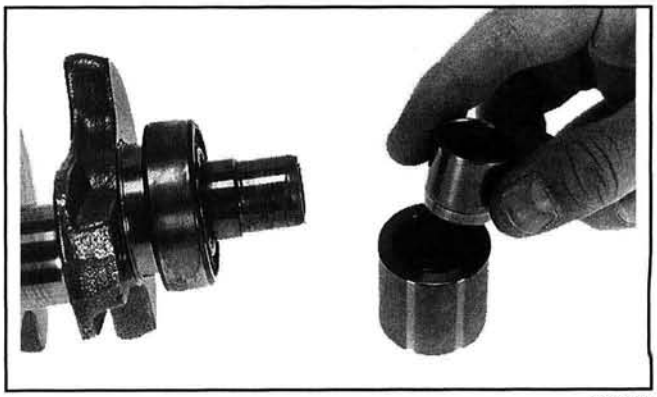
DR3015

Install a new lower main bearing. Oil the end of the crankshaft. Use Crankshaft Bearing/Sleeve Installer, P/N 339749, to install bearing. Support the crankshaft between the two lower counterweights and press against the lettered side of the bearing. Install bearing until it seats in the crankshaft.

33273

Install a new crankshaft sleeve. Oil the end of the crankshaft. Place the sleeve in Crankshaft Bearing/Sleeve Installer, P/N 339749, and drive the sleeve onto the crankshaft until the installer contacts the lower main bearing.

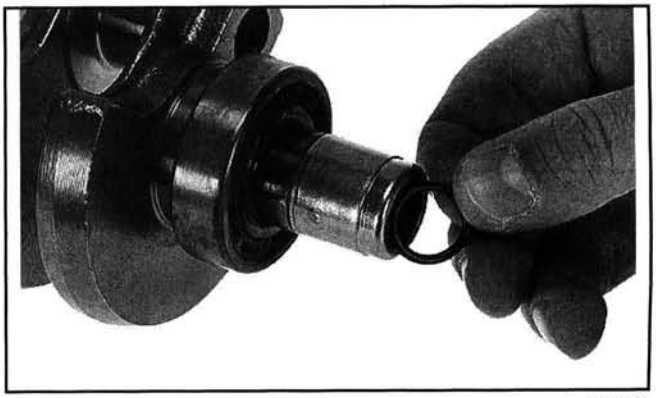
- If the installer sticks on the sleeve after installation, thread Slide Hammer, P/N 391008, onto installer and pull off.



33272

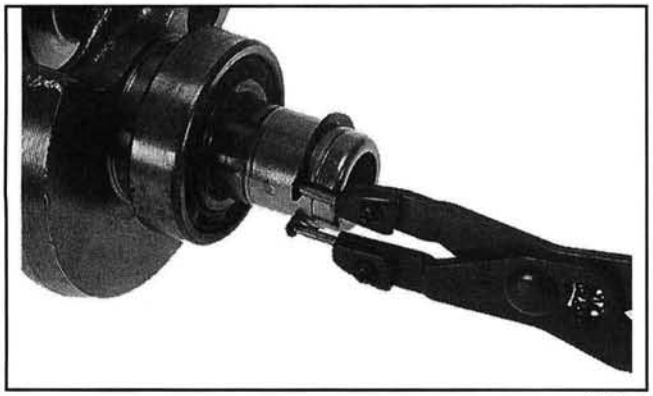
IMPORTANT: Inspect sleeve surface after installing. Sleeve must not be used if surface is damaged.

Lubricate a new driveshaft O-ring and lightly lubricate crankshaft splines with *Moly Lube.* Install O-ring in sleeve.



33271

Using retaining ring pliers, install lower main bearing retaining ring with sharp edge of ring facing out.



33270

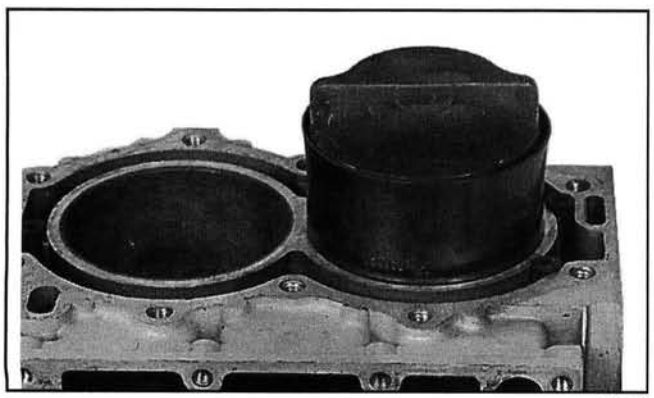
Oil the upper main bearing and replace it with the lettering facing the flywheel end of the crankshaft.

Oil the two roller assemblies and place them around the center journal of the crankshaft.

Install the center main bearing sleeve with its ring end facing the lower end of the crankshaft. Secure sleeves together with retaining ring.

Coat pistons, rings, cylinders, and Ring Compressor, P/N 326591 (P/N 330223 for oversize), with outboard lubricant.

Center connecting rod in piston and locate piston rings on their dowel pins. Slide one piston assembly into the respective cylinder bore while guiding the connecting rod through the block.

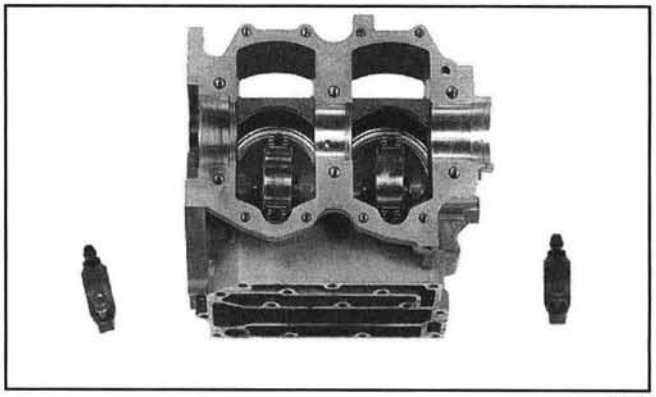


1548

IMPORTANT: The piston rings must be correctly located on their dowel pins to prevent permanent powerhead damage.

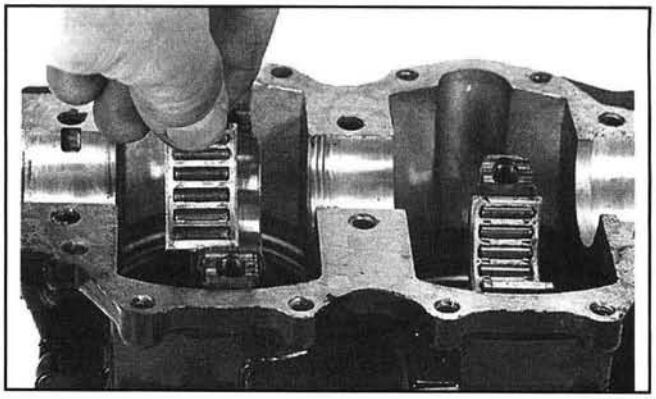
IMPORTANT: Loosely install cylinder head to prevent pistons from falling out.

Remove the connecting rod caps from the connecting rods.



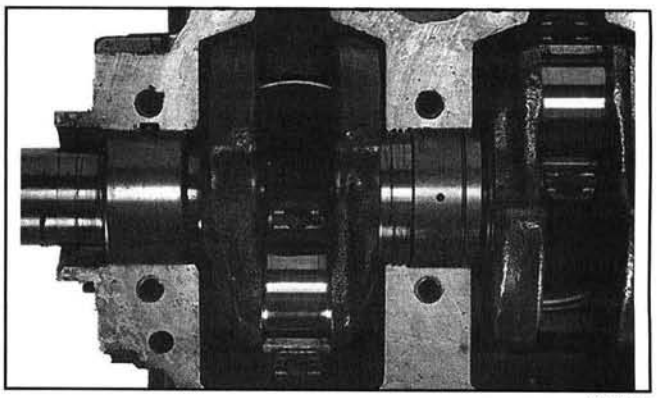
1543

Place one-half of crankpin bearing on each rod.



35028

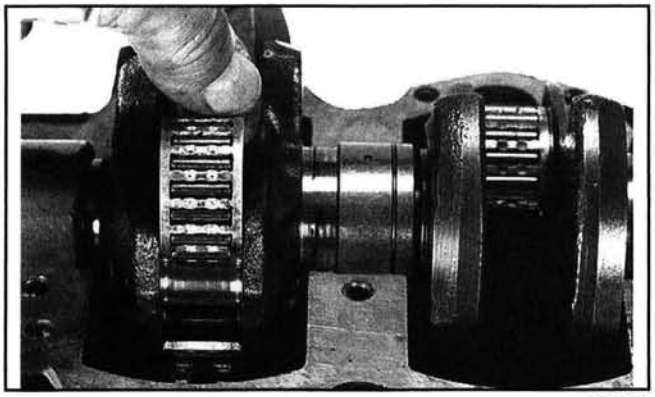
Place the crankshaft in position. Align top and center main bearings with pins in the cylinder block.



35029

7

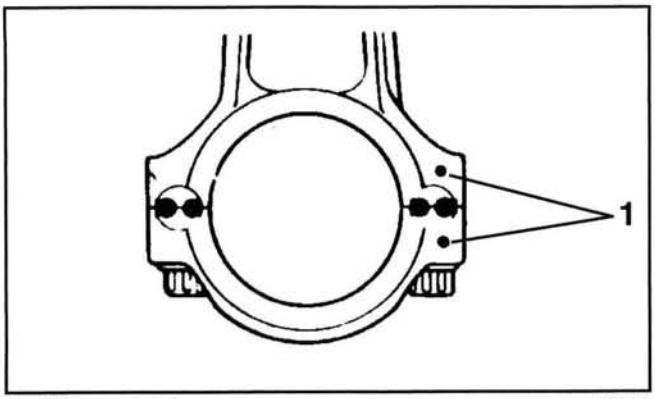
Install remaining bearing half on each crankpin.



35030

Oil threads of rod cap screws and install both rod caps finger tight.

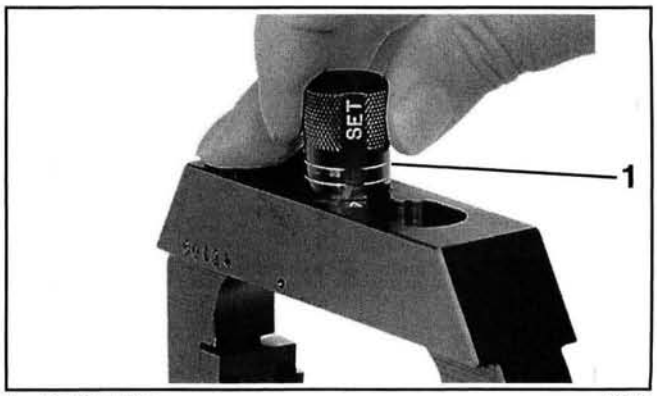
Make sure alignment dot on rod cap matches dot on rod.



1. Alignment dot 53628

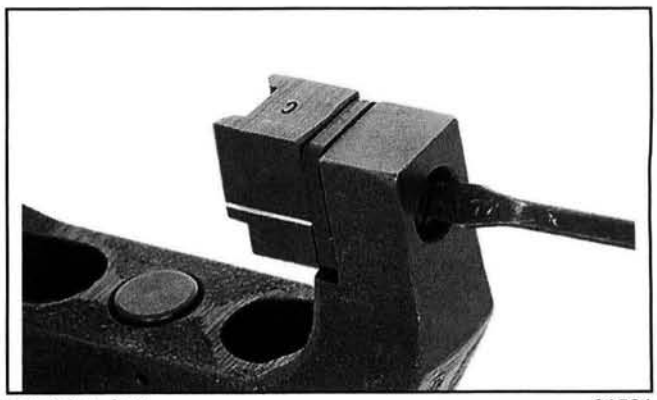
IMPORTANT: Torquing the screws without Alignment Fixture, P/N 396749, or using an incorrect procedure could cause permanent damage to the connecting rod and crankshaft. To maintain accurate torque values, keep torque wrench extension length to a minimum.

Install Rod Cap Alignment Fixture, P/N 396749, **before** tightening rod cap screws. Align the flat marked "set" on the rod engagement stop with the arrow on the frame. Move the adjustment knob to top setting (no lines showing). Rotate adjustment knob 180° to lock position.

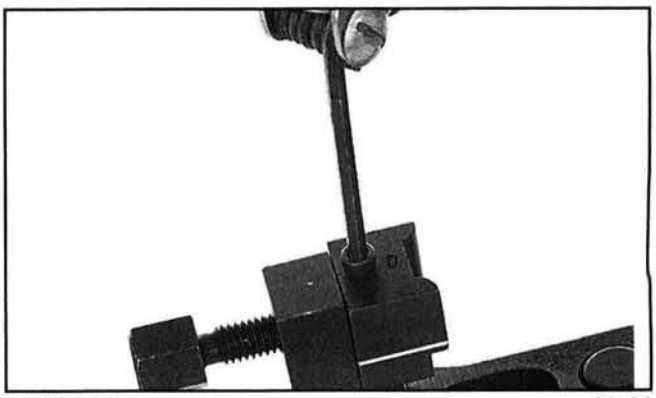


1. Knob setting 2287

Secure restraining jaw "C" and forcing jaw "D" to frame.



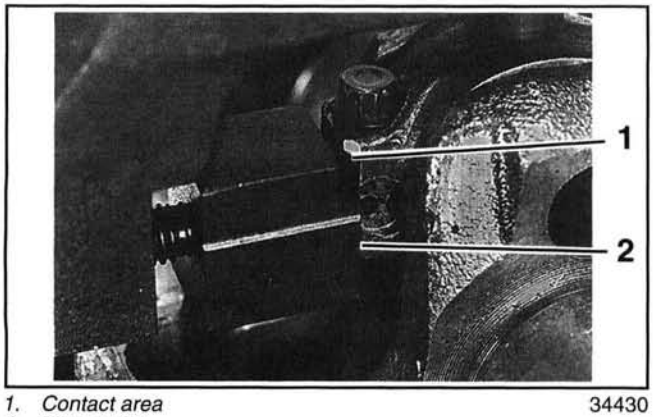
Retaining Jaw 21591



Forcing Jaw 21594

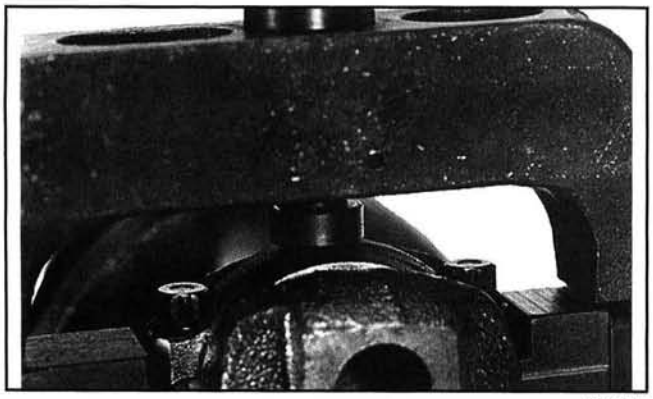
Apply a light coat of outboard lubricant to the corners of the connecting rod and rod cap. Place frame on connecting rod using the following procedure:

- Position frame onto the connecting rod so the contact area of the jaw is centered on the side of the rod.
- Tighten forcing screw until jaws contact connecting rod.
- Slide frame down until adjustment stop contacts the rod cap. The groove lines on the jaws must be centered on the rod/crankpin diameter.



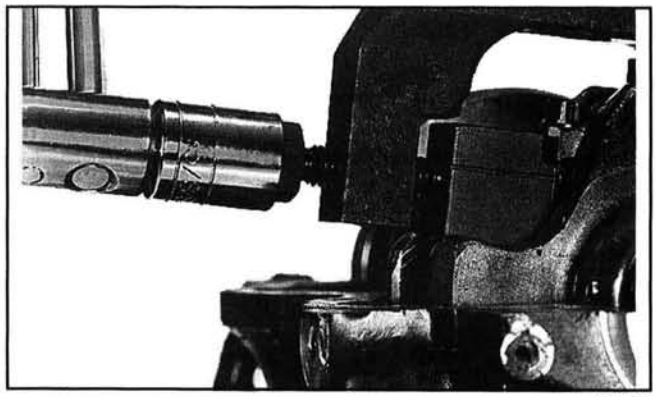
1. *Contact area*
2. *Side of rod*

34430



34431

- Tighten the forcing screw to a torque of 14 to 16 in. lbs. (1.6 to 1.8 N·m).



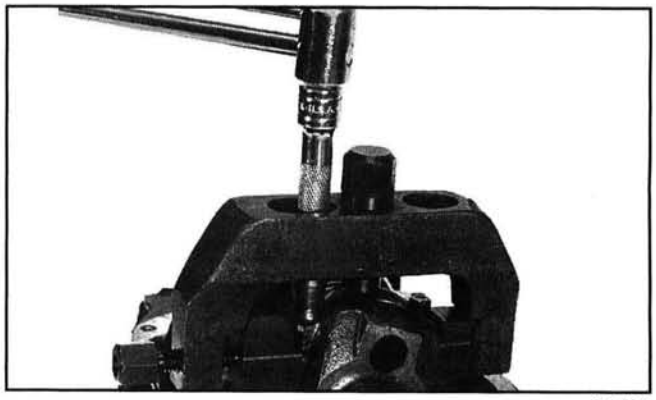
34432

IMPORTANT: Make sure that frame is squarely in position and that rod and cap are aligned. Test at least three corners of the rod and cap joint with a pick. Joint must be smooth with no step.

Loosen both rod cap screws 1/4 turn.

Use Torquing Socket, P/N 331638, to tighten rod cap screws in three stages:

- Apply an initial torque of 40 to 60 in. lbs. (5 to 7 N·m) to both rod cap screws.
- Torque screws to 14 to 16 ft. lbs. (19 to 21.7 N·m).
- Apply a final torque of 30 to 32 ft. lbs. (41 to 43 N·m).



34433

Loosen forcing screw and remove the frame.

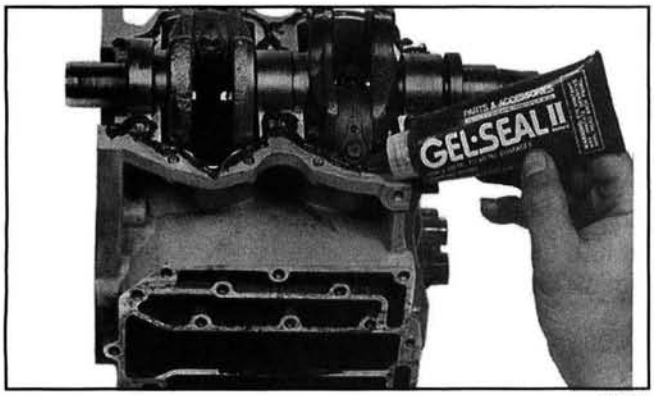
Retest the rod and cap joint with pick.

7

Thoroughly clean and degrease the mating flanges of the crankcase and cylinder block with *Cleaning Solvent* and let air dry.

Apply *Locquic Primer* to the mating flanges of the cylinder block and crankcase and let air dry.

Apply a thin, even coat of *Gel-Seal II* sealant to the cylinder block flange. The application must not come within 1/4 in. (6.4 mm) of the labyrinth seals or bearings.



1551

IMPORTANT: *Gel-Seal II* has a shelf life of at least one year when stored at room temperature. Test the *Gel-Seal II* or replace it if the age of the tube can not be determined. Using old *Gel-Seal II* could cause crankcase air leaks.

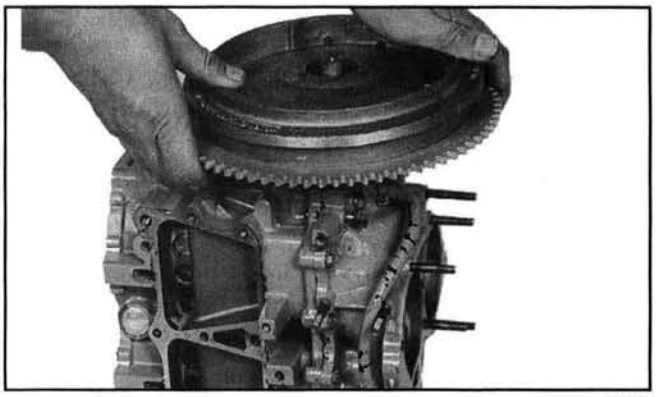
Lower the crankcase into place.

Lightly coat threads of the six main bearing screws with *Gel-Seal II.* Install the screws finger tight.

When the crankcase is seated, install and firmly seat the crankcase taper pin.

Install crankcase flange screws finger tight.

Using a soft face mallet, lightly tap bottom of the crankshaft to seat the lower main bearing. Check for binding between the crankshaft and the bearings on the connecting rods by rotating the crankshaft with the flywheel.



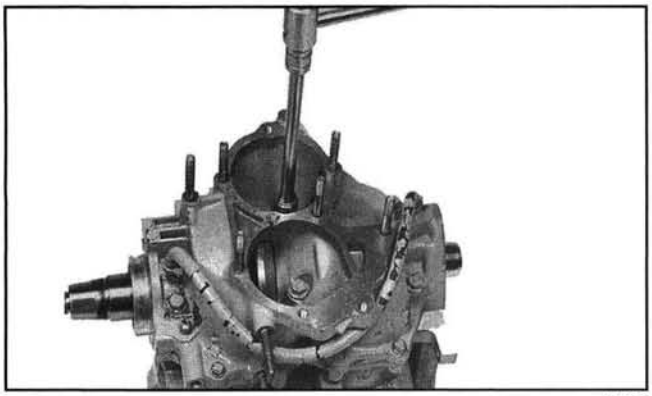
1562

Lightly coat the machined mating surface of the crankcase head with *Gasket Sealing Compound.* Lubricate a new crankcase head O-ring with *Triple-Guard* grease and install it. Install the lower crankcase head. Lightly coat the threads of three new crankcase head screws with *Gasket Sealing Compound* and install them finger tight.

17659

Starting with the center screws, tighten the six main bearing screws and torque 168 to 192 in. lbs. (19 to 22 N·m). Starting with the center

screws, tighten the remaining eight screws and torque 60 to 84 in. lbs. (7 to 9 N·m).

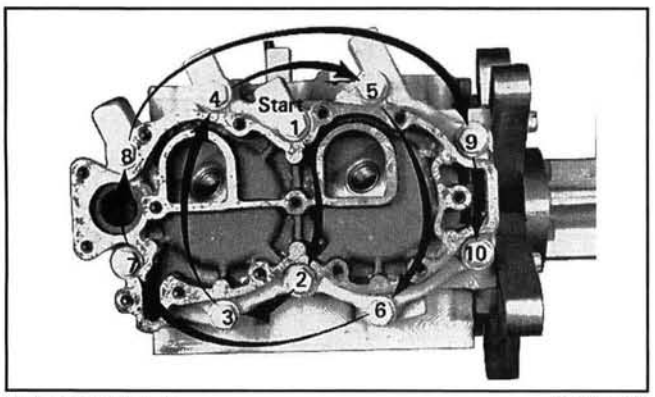


1538

Tighten the three lower crankcase head screws and torque 60 to 84 in. lbs. (7 to 9 N·m).

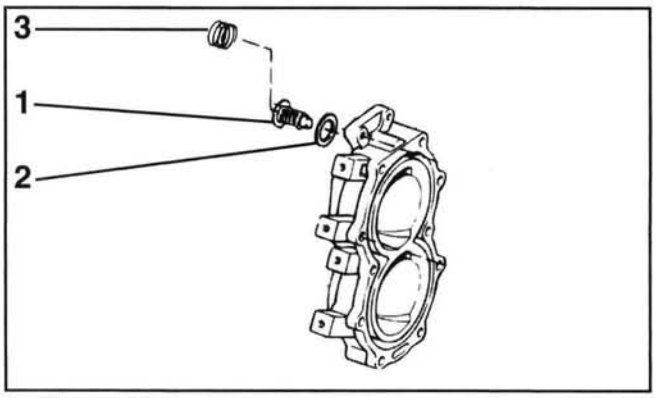
Apply *Gasket Sealing Compound* to outside metal casing of a new upper main bearing seal. Using Seal Installer, P/N 321539, install the seal with its lip facing down.

Lightly coat both sides of a new cylinder head gasket with *Gasket Sealing Compound.* Install the gasket and cylinder head. Tighten the screws in the sequence shown and torque 216 to 240 in. lbs. (24 to 27 N·m).



Torque Sequence COA1476

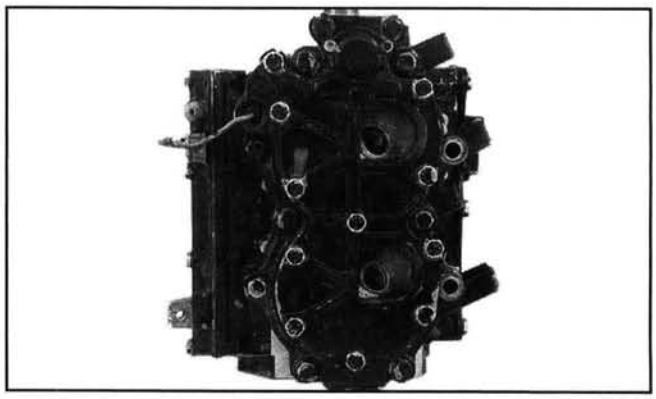
Place the thermostat and the seal in the cavity provided in the cylinder head. Set the spring on top of the thermostat.



1. *Thermostat*
2. *Seal*
3. *Spring*

COA1452

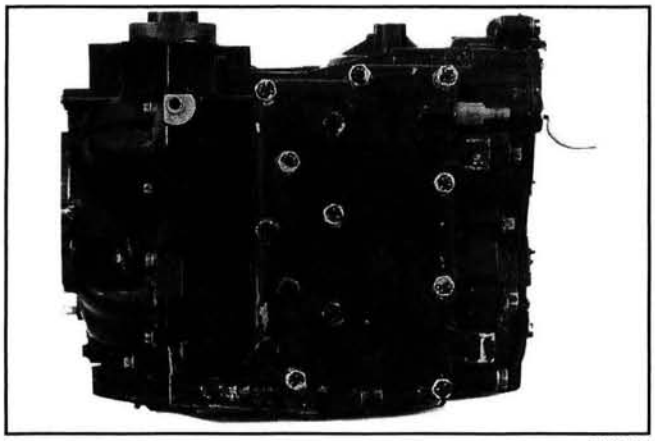
Apply *Gasket Sealing Compound* to both sides of a new cylinder head water cover gasket; install the gasket and cover. Starting with the center screws and working outward, tighten the screws and torque 60 to 84 in. lbs. (7 to 9 N·m). Install the cylinder head screws dry. Do not use sealant on threads.



24941

Install the inner and outer exhaust covers. Coat both sides of two new gaskets with *Gasket Sealing Compound.* Install the screws. Starting with the center screws and working outward, tighten

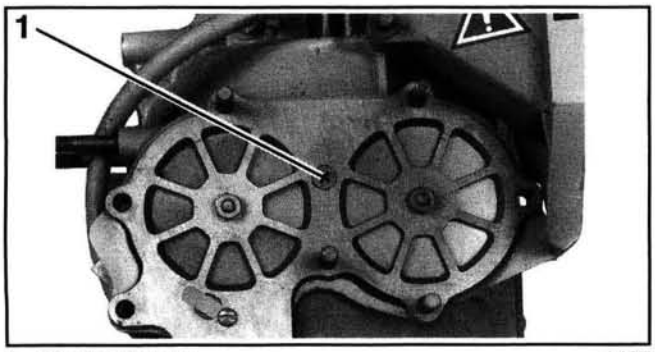
the screws and torque 48 to 84 in. lbs. (5 to 9 N·m).



24940

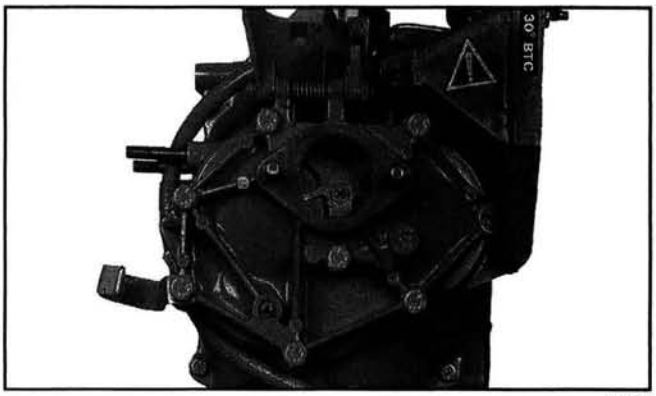
Apply a bead of *Adhesive M* to both sides of a *new* bypass cover gasket. Install the gasket and bypass cover. Tighten the screws and torque 60 to 84 in. lbs. (7 to 9 N·m).

Slide a new leaf plate gasket over the crankcase studs, then install the leaf plate. Do not use sealer on the gasket. Apply *Gel-Seal II* to the threads of the flat head screw, then install and tighten the screw.



1. Flat head screw 1427

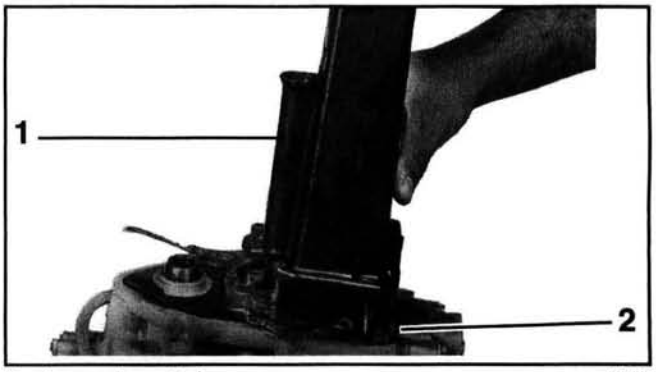
Install a new intake manifold gasket over the crankcase studs, then install the manifold. Do not use sealer on the gasket. Install the screws and torque 60 to 84 in. lbs. (7 to 9 N·m).



1423

Install a new powerhead gasket. Install dry; use no sealer.

Install the inner exhaust housing. Tighten screws and torque 96 to 120 in. lbs. (11 to 14 N·m).



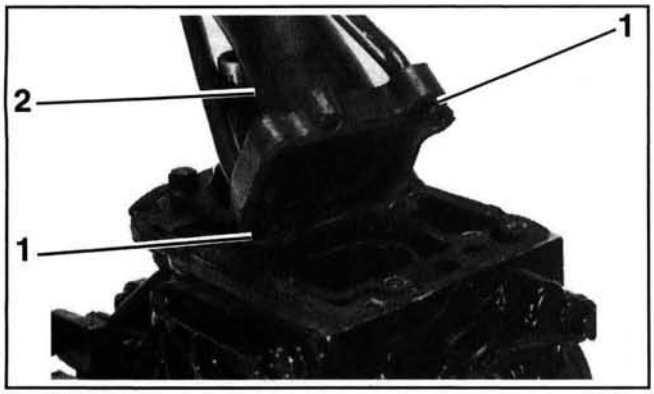
1. Inner exhaust tube
2. Gasket
1415

INSTALLATION – 9.9/15

IMPORTANT: Remove the gearcase to aid in guiding the water tube into the water pump grommet. Refer to Gearcase **REMOVAL AND INSTALLATION** on p. 260.

Install new powerhead to exhaust housing gasket. Install dry; use no sealer.

Install both grommets and water tubes in inner exhaust tube. Center water tube in grommets. Do not allow water tubes to touch inner exhaust tube. Position inner exhaust tube on powerhead. Tighten the screws and torque 60 to 84 in. lbs. (7 to 9 N·m).



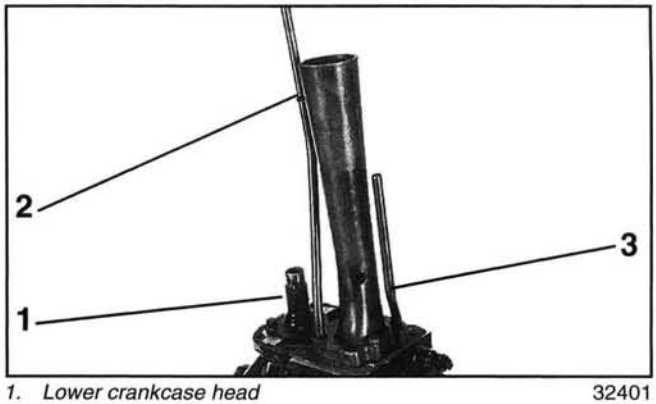
1. *Grommets*
2. *Inner exhaust tube*

32402

Apply a liberal amount of *Permatex No. 2* sealer to the machined diameter of lower crankcase head.

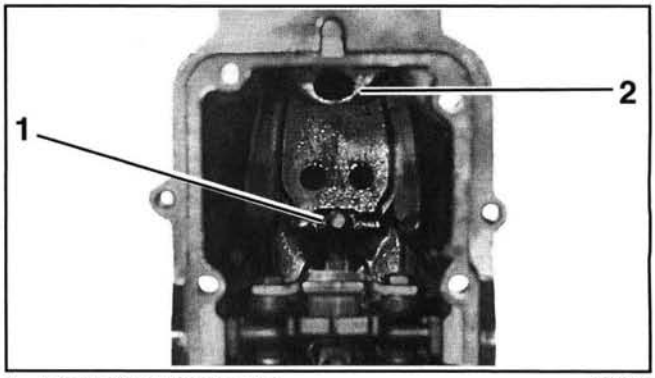
Position the long water tube and the short water tube as shown prior to installing the powerhead on the exhaust housing.

Guide the long water tube into the water tube opening in the exhaust housing and the short water tube into the opening in the rear of the exhaust housing as the powerhead is lowered into the exhaust housing.



1. *Lower crankcase head*
2. *Long water tube*
3. *Short water tube*

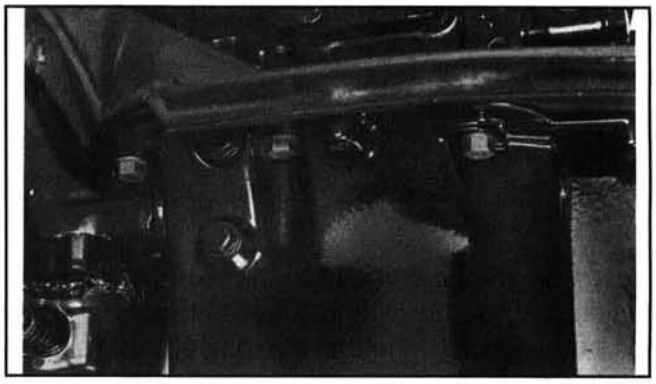
32401



1. *Long water tube opening*
2. *Short water tube opening*

32398

Apply *Gasket Sealing Compound* to the six powerhead retaining screws and install the screws. Tighten the six powerhead retaining screws and torque 60 to 84 in. lbs. (7 to 9 N·m).



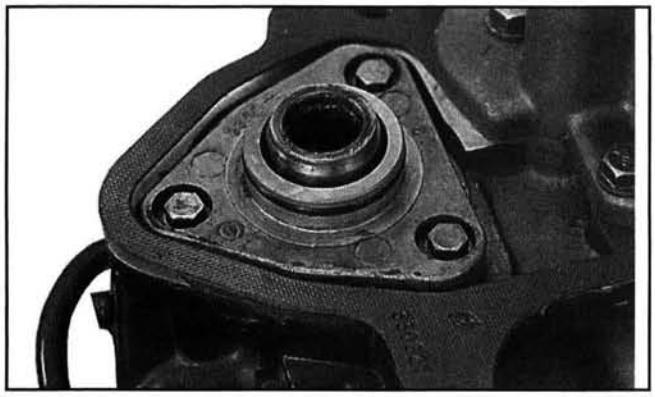
32309

IMPORTANT: Adjust the start button assembly. See **Start Switch** on p. 177. To avoid permanent powerhead damage, instruct operator to repeat the outboard **Break-In (10 Hours)** on p. 52.

7

INSTALLATION – 25/30

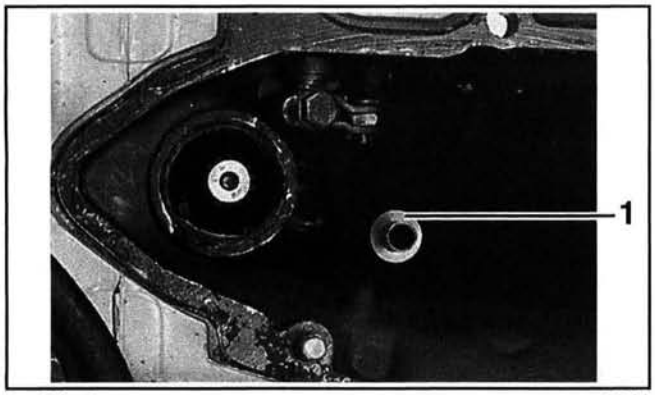
Lightly coat a new O-ring and outside bore of the crankcase head with *Triple-Guard* grease. Install the O-ring in groove of the crankcase head.



21018

Coat crankshaft splines with *Moly Lube*. Do not allow lubricant to pack at end of splines. Lubricant here may prevent seating of driveshaft in crankshaft. Be sure O-ring is in crankshaft sleeve.

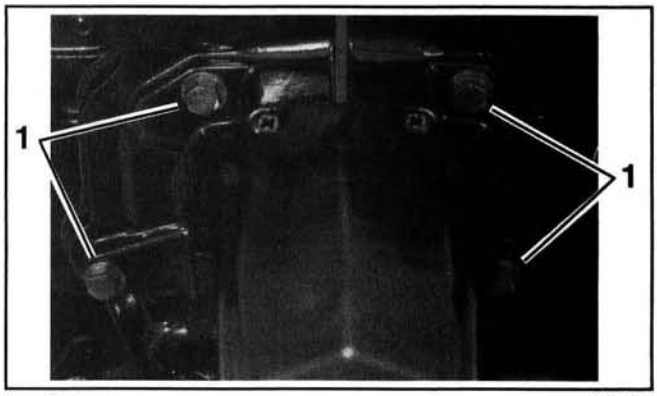
Make sure the water tube washer is positioned on the water tube. Lightly apply *Triple-Guard* grease to upper outside diameter of the water tube.



1. *Washer* 1941

Assemble the powerhead to the exhaust housing, making sure the water tube enters the inner exhaust housing. Rotate the powerhead slightly back and forth to align the crankshaft and the driveshaft splines.

Install four powerhead retaining screws and torque 192 to 216 in. lbs. (22 to 24 N·m).



1. *Screws* 20984

Apply *Nut Lock* to the threads of the port and starboard exhaust housing studs. Place the washer on the studs. Install and tighten the two powerhead retaining nuts.

Install the ground lead to the powerhead. Apply *Black Neoprene Dip* to ground screw connections.

21549

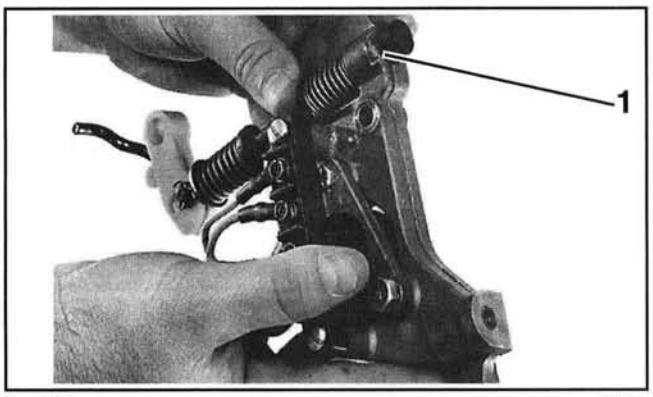
Install the fuel, ignition, and electrical components to the powerhead.

⚠ WARNING ⚠

To prevent possible fire and explosion under the engine cover, make sure ignition and electrical wires are routed and clamped in original position; away from rotating parts which could cut or abrade wire insulation.

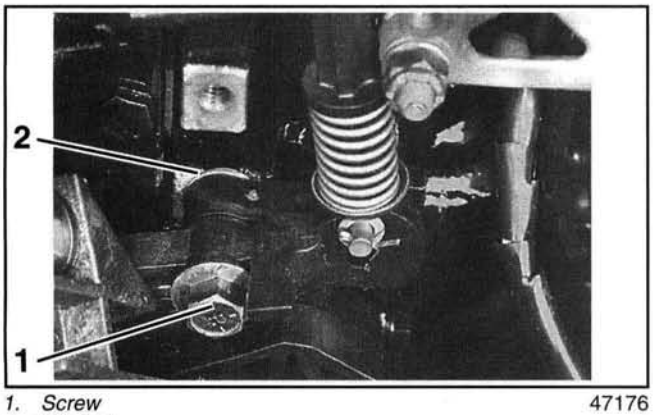
R AND TE MODELS

Install the neutral start plunger and spring through the component bracket. Using a pin, secure plunger as shown.



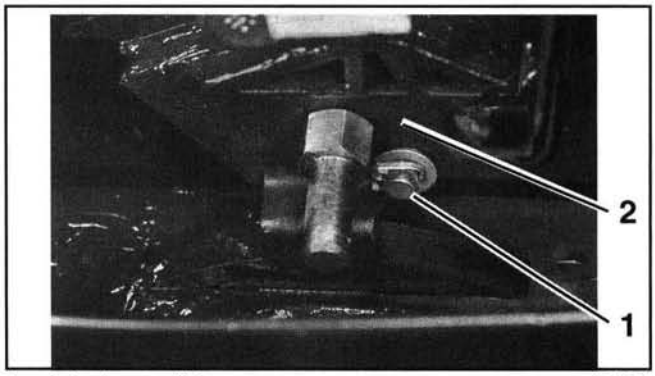
1. Pin 2541

After checking ignition plate routing, install the component bracket, neutral start plunger, lockout lever, pivot screw, and flat washer, as shown. Tighten pivot screw to 60 to 84 in. lbs. (7 to 9 N·m). Remove the pin securing the plunger.



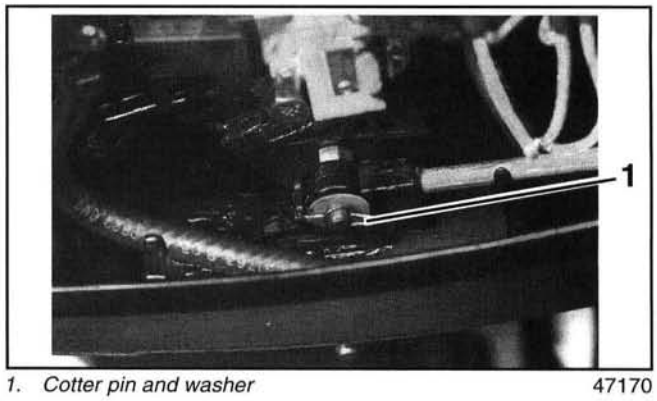
1. Screw 47176
2. Washer

Rotate the propeller shaft and shift the engine into REVERSE. Place the actuator cam link into the shift actuator cam. Secure the link with the washer and pin.



1. Actuator cam link 47171
2. Shift actuator cam

Seat shift lever socket on the lever. Snap socket onto the stud. Secure the socket with washer and retainer pin.

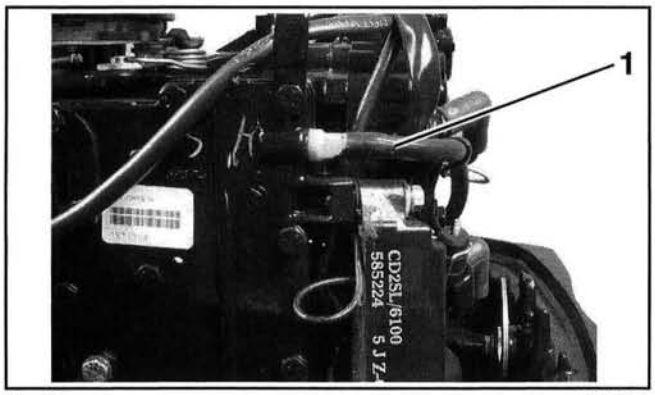


1. Cotter pin and washer 47170

7

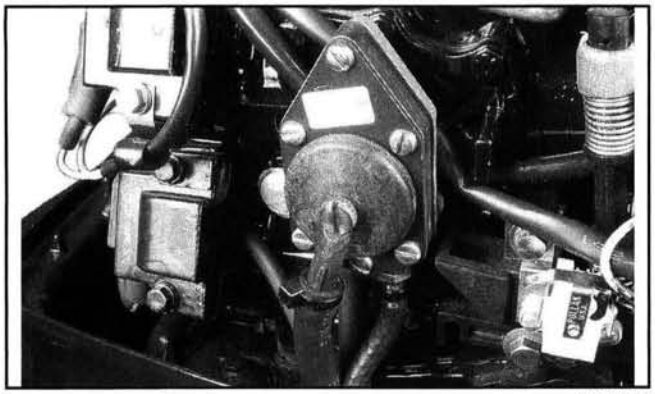
ALL MODELS

Connect the overboard water indicator hose to the fitting on the exhaust cover. Secure the hose in the J-clamp.



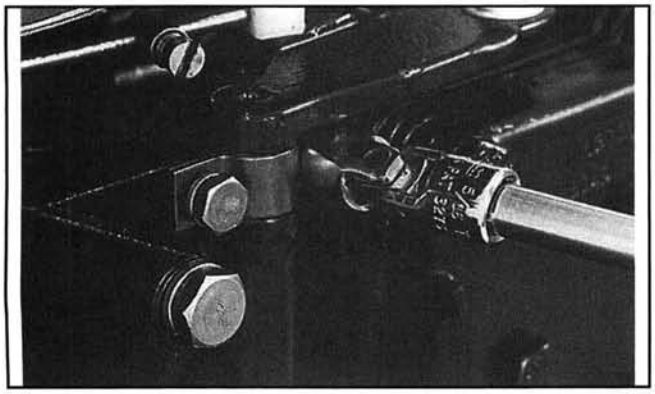
1. Hose 001011

Connect the fuel hose to the fuel pump with a new tie strap.



001007

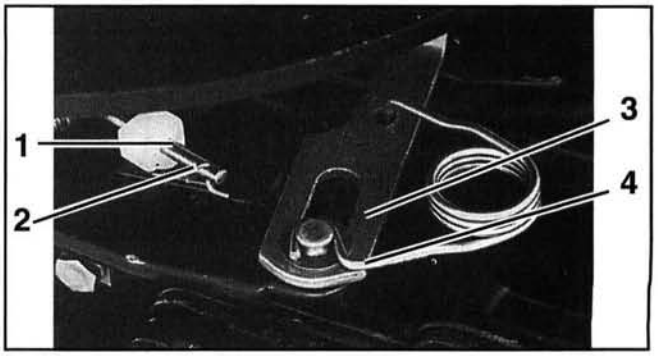
Install the throttle control lever.



21580

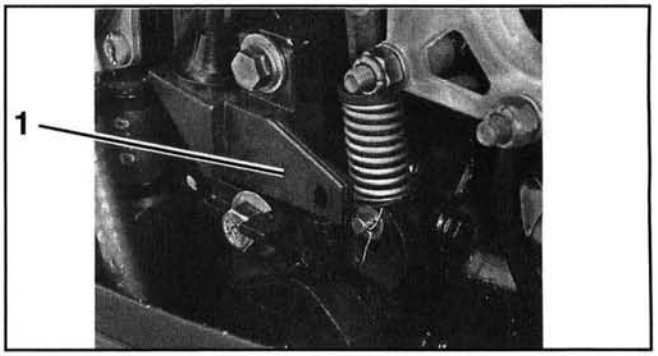
Slide the throttle control rod through the nylon block on the throttle control lever. Insert the pin in the end of the rod. The offset on the nylon block must face forward.

Place the nylon bushing on the stud of the throttle control lever. Engage the armature plate link on the stud. Place the washer over the stud and engage the spring.



1. Throttle control rod 21579
2. Pin
3. Armature plate link
4. Spring

Install the manual starter lockout cable bracket (R Models only).



1. Bracket 21014

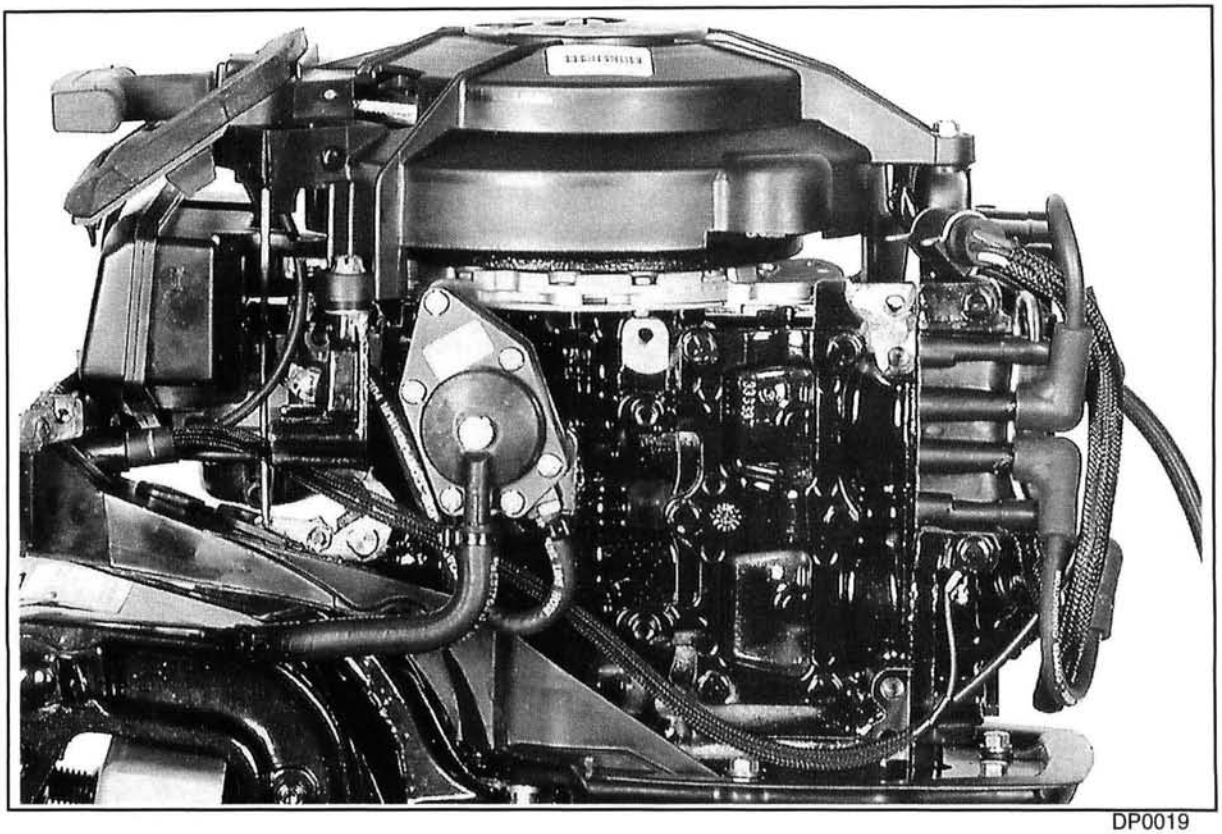
Install the manual starter. Refer to Manual Starter **INSTALLATION** on p. 303.

Adjust the neutral start switch (TE Models only). Refer to **NEUTRAL START PROTECTION** on p. 178.

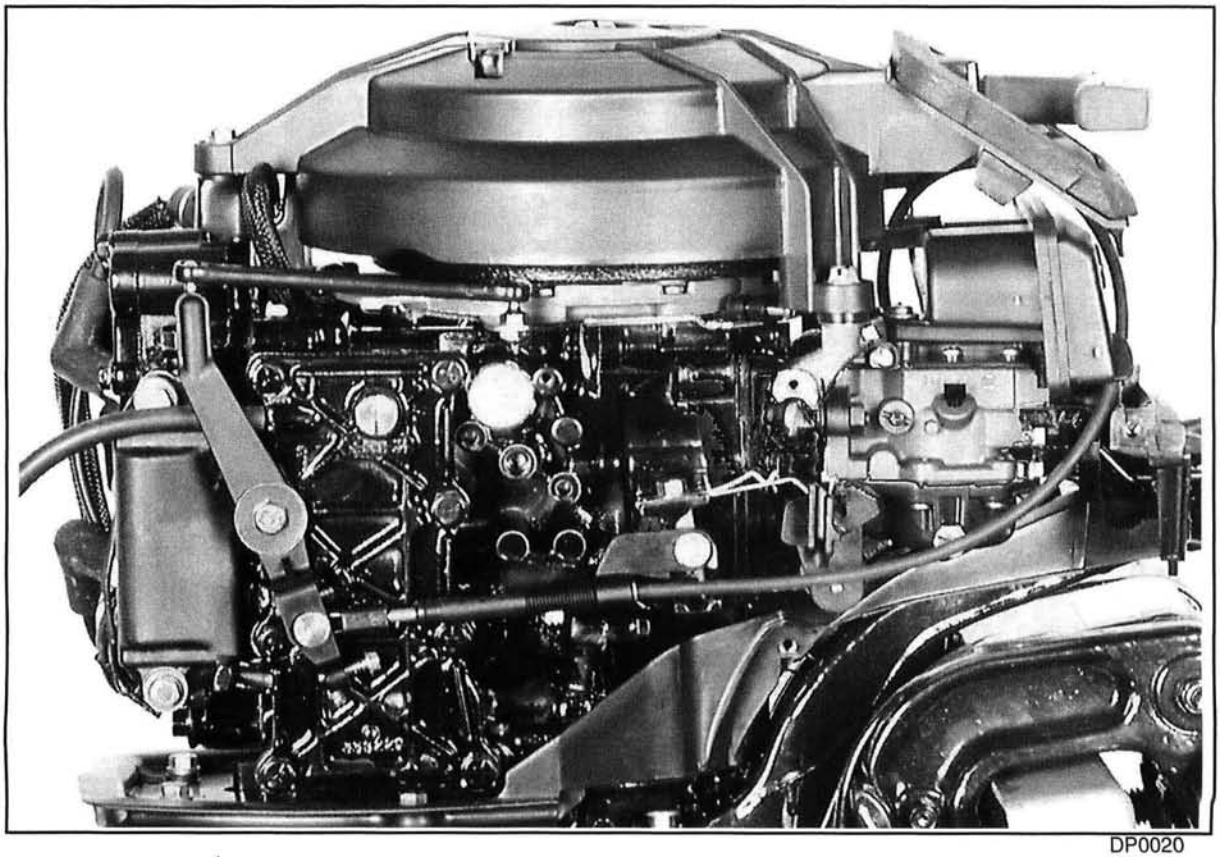
Adjust the shift lever. Refer to Shift Linkage **Adjustment** on p. 177.

IMPORTANT: To avoid permanent powerhead damage, instruct operator to repeat the outboard **Break-In (10 Hours)** on p. 52.

Port/Starboard View, Manual Start

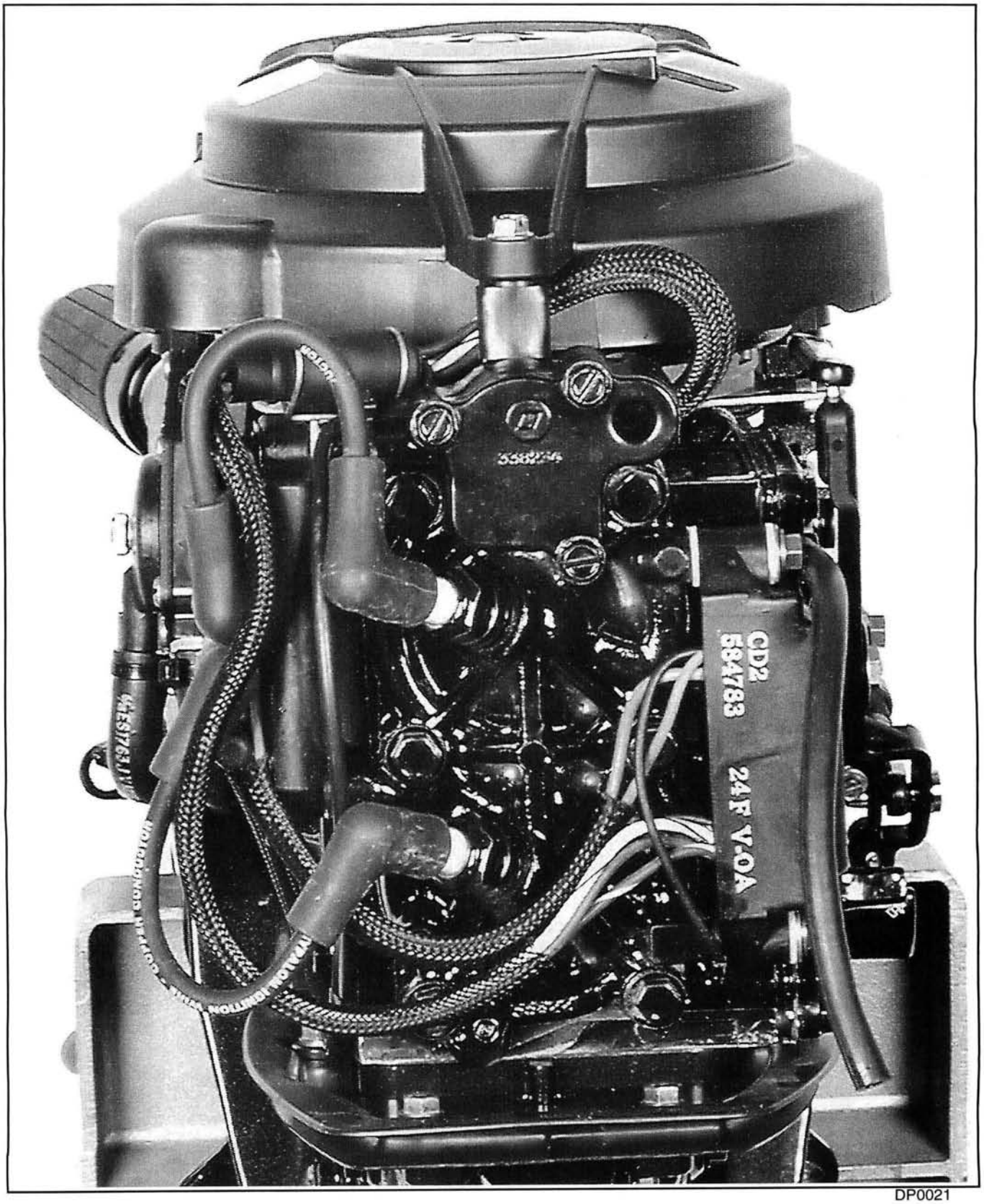


DP0019



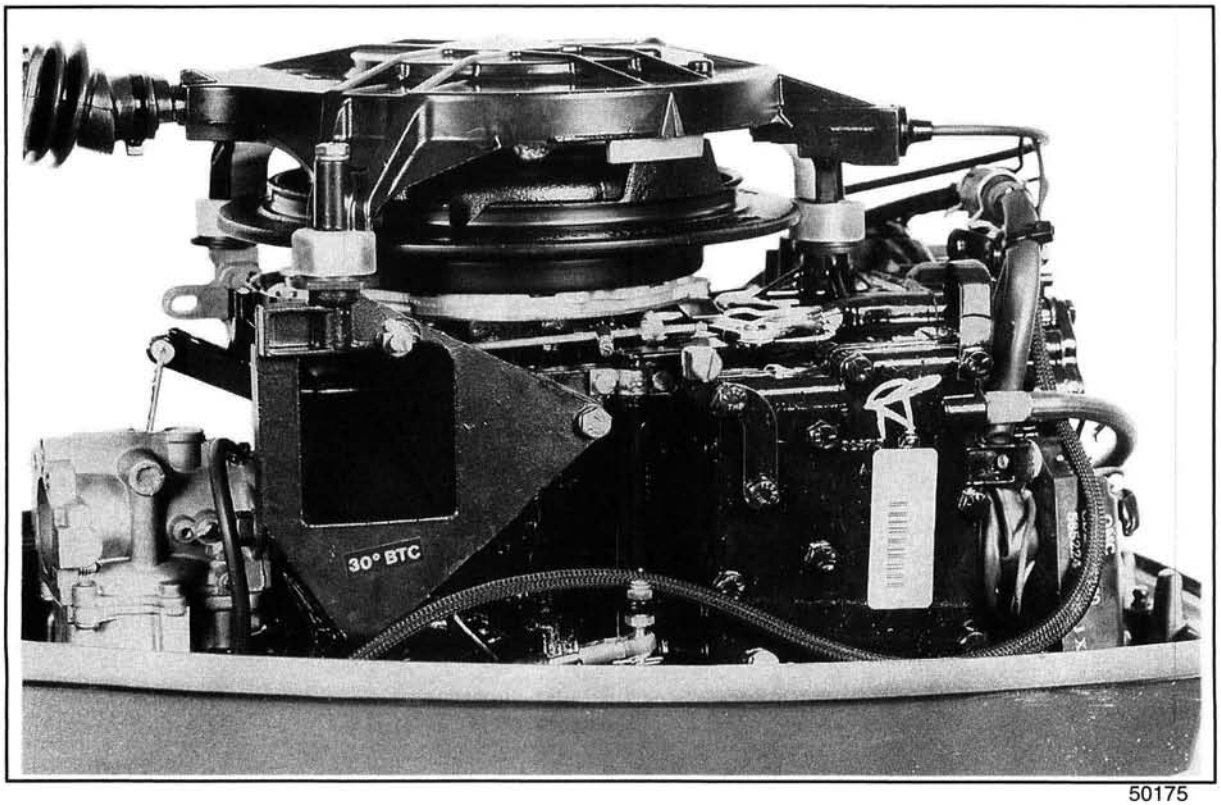
DP0020

Rear View, Manual Start

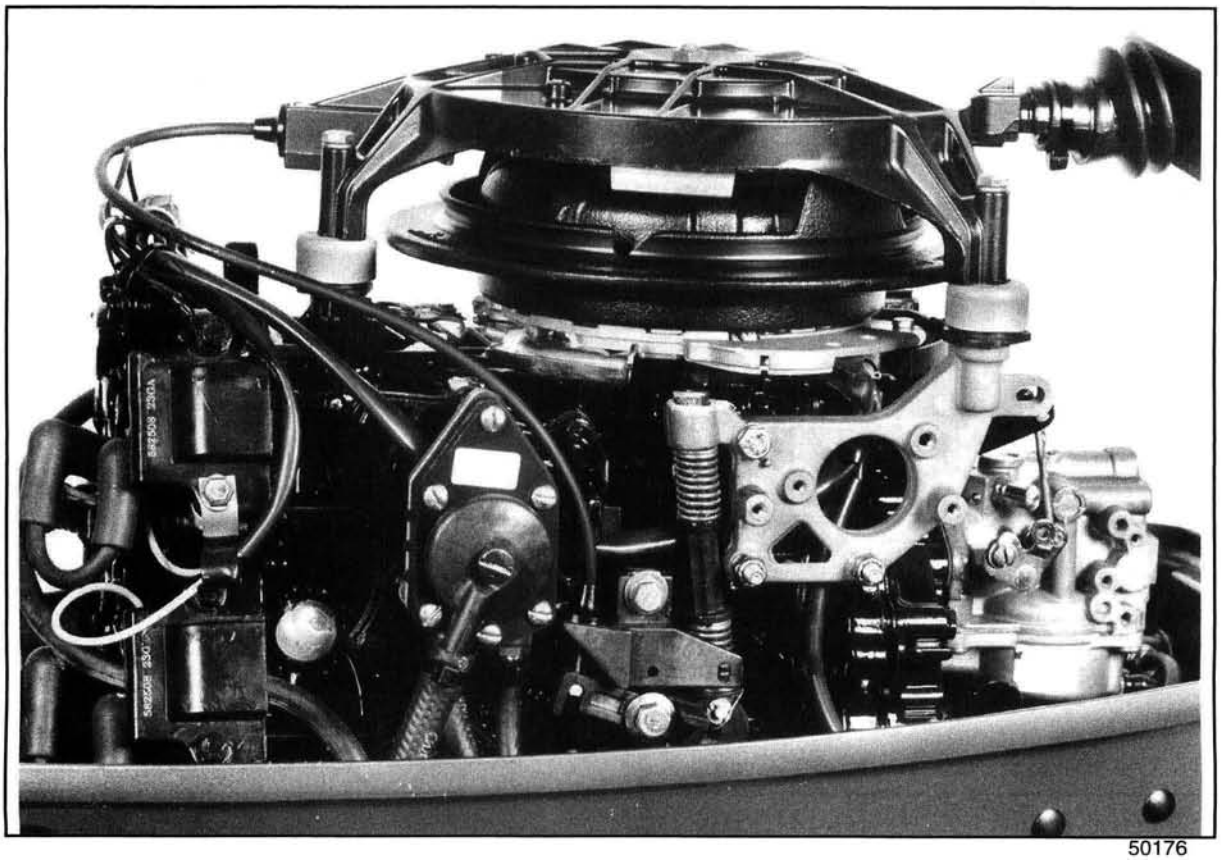


DP0021

Port/Starboard View, Manual Start



50175

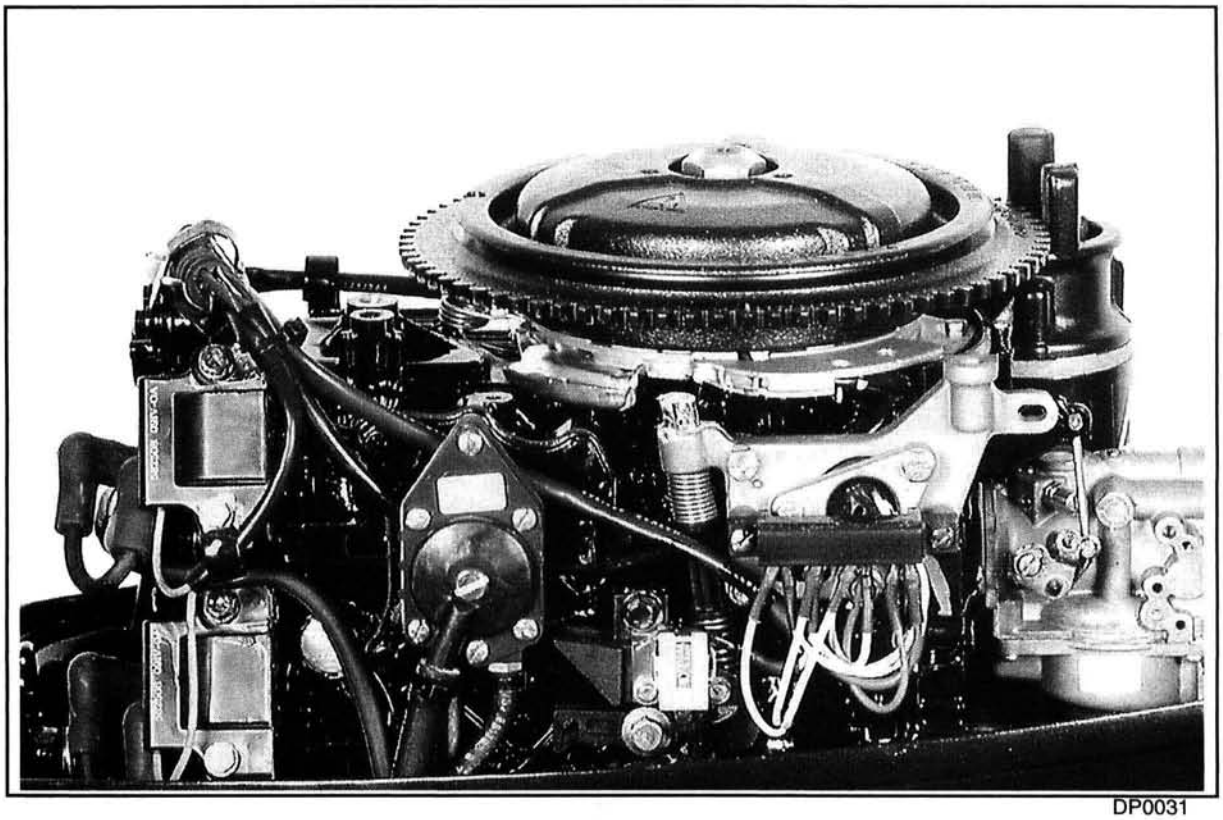


50176

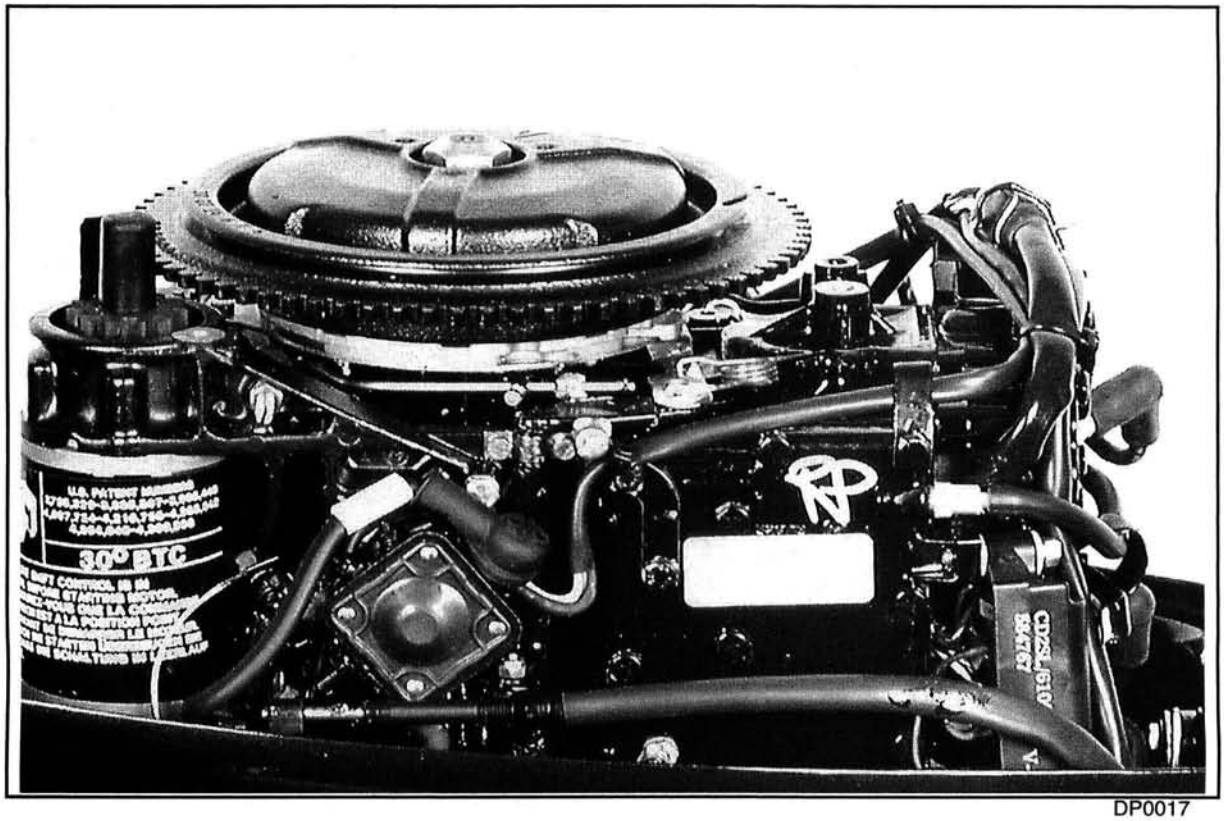
Rear View, Manual Start

50177

Port/Starboard View, Tiller Electric Start

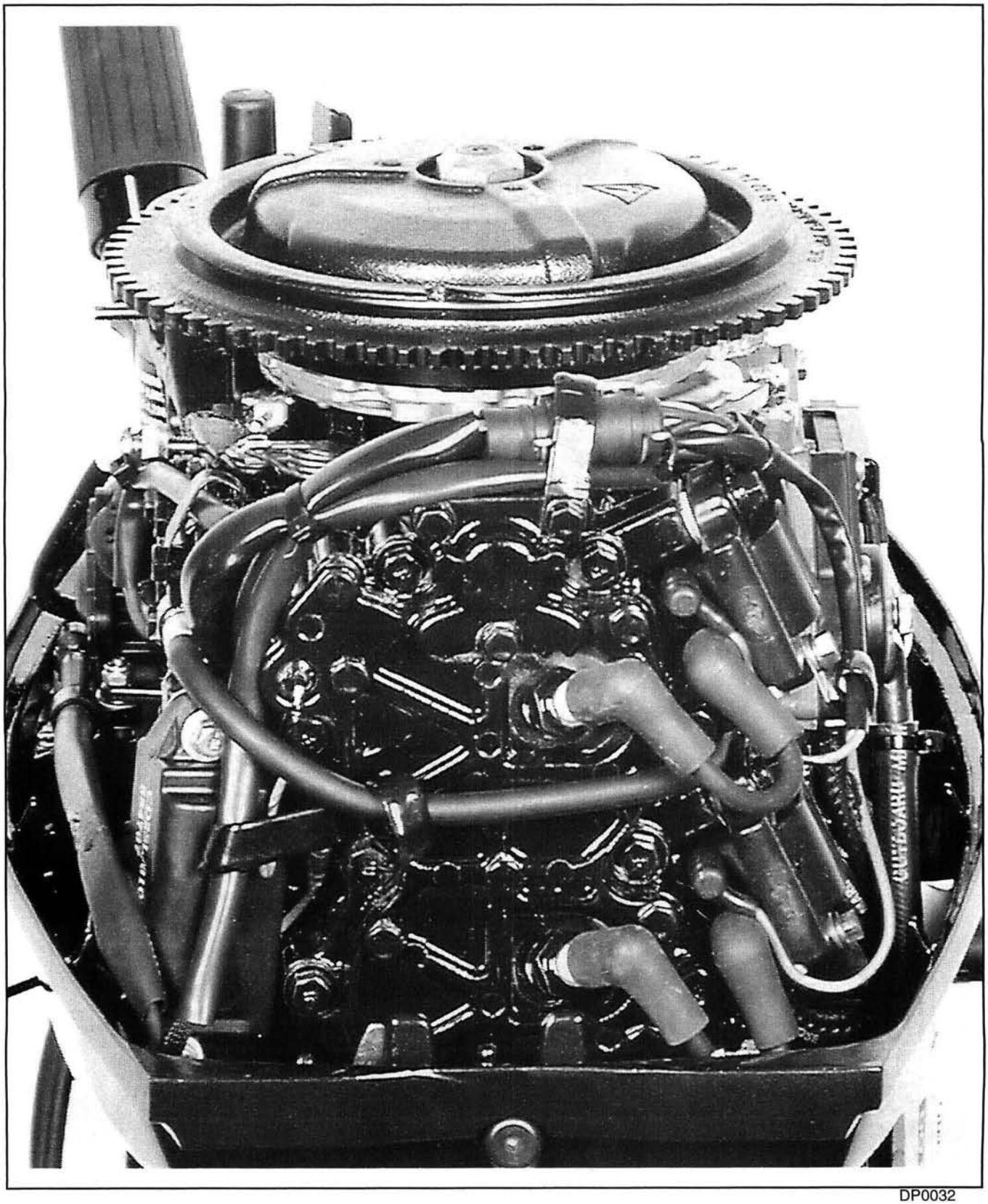


DP0031



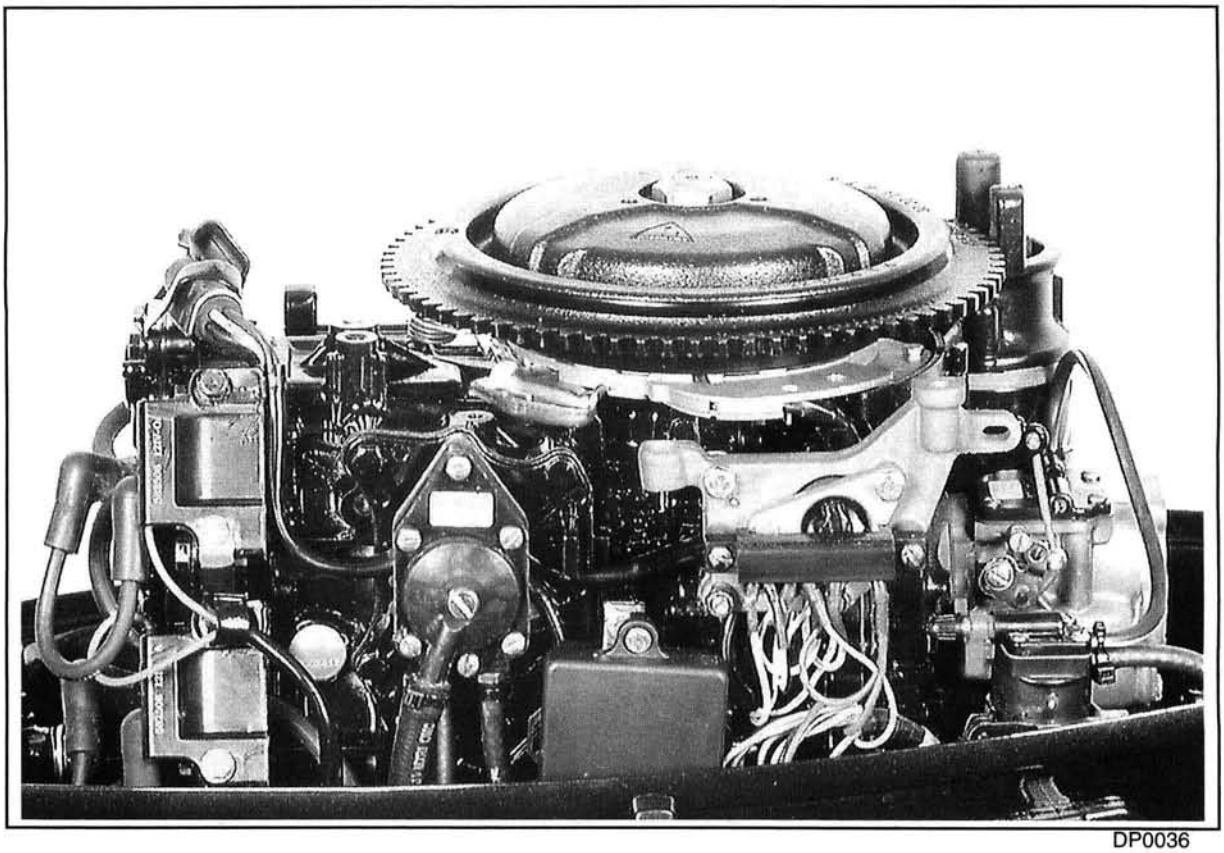
DP0017

Rear View, Tiller Electric Start

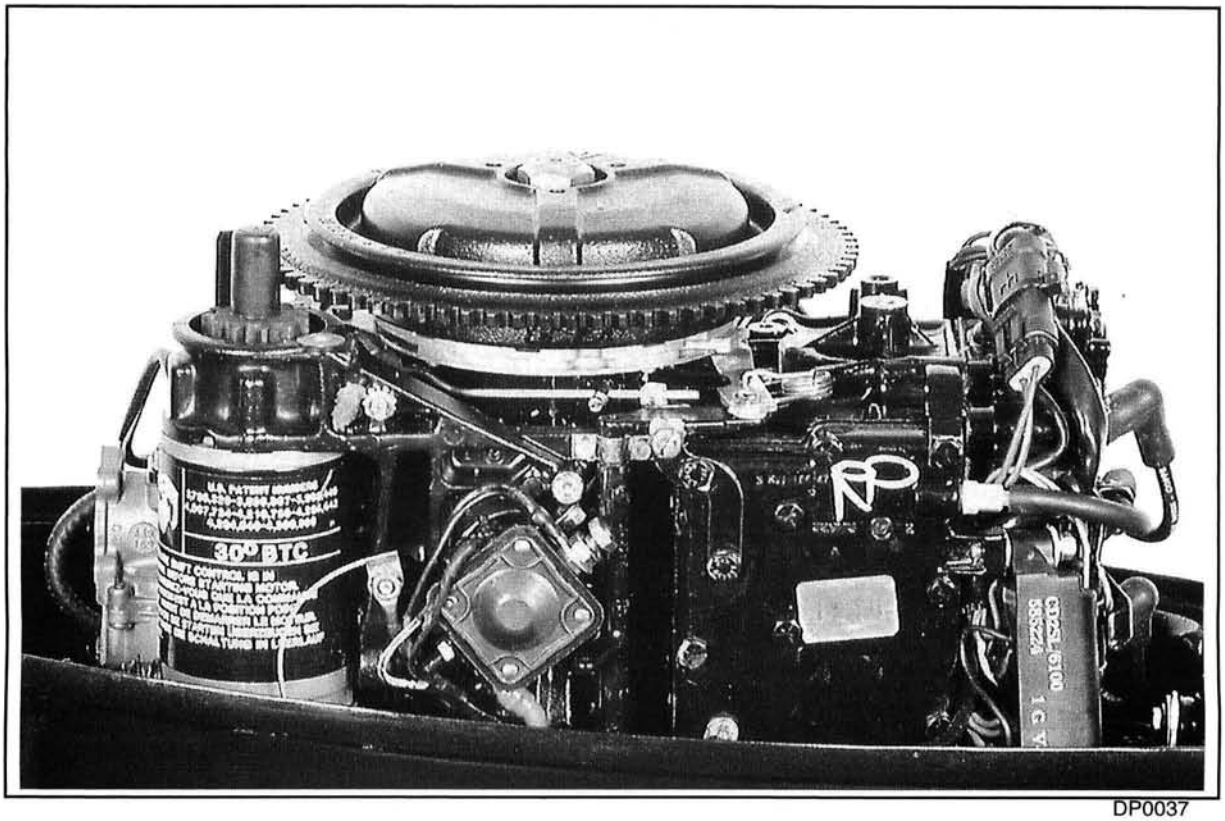


DP0032

Port/Starboard View, Remote Electric

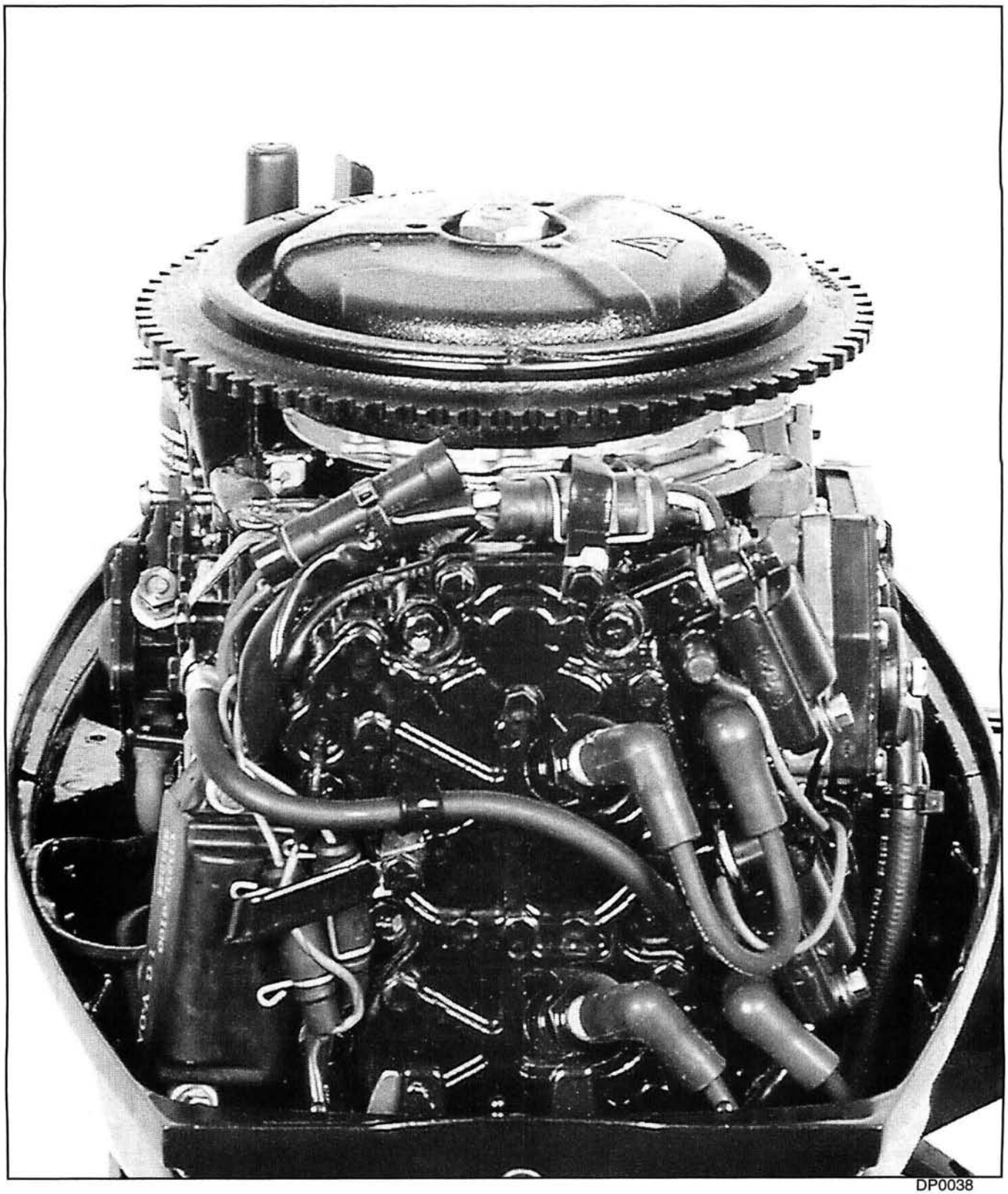


DP0036



DP0037

Rear View, Remote Electric



DP0038

MIDSECTION

TABLE OF CONTENTS

8

TORQUE CHART

Description	9.9/15	25/30	Lubricant
Upper Mount to Exhaust Housing	60 to 84 in. lbs. (7 to 9 N·m)		*Nut Lock*
Upper Side Mount to Exhaust Housing		144 to 168 in. lbs. (16 to 19 N·m)	*Nut Lock*
Upper Mount to Steering Bracket	18 to 20 ft. lbs. (24 to 27 N·m)		*Nut Lock*
Lower Mount to Exhaust Housing		144 to 168 in. lbs. (16 to 19 N·m)	*Nut Lock*
Lower Mount Bracket Screws	60 to 84 in. lbs. (7 to 9 N·m)	144 to 168 in. lbs. (16 to 19 N·m)	*Nut Lock*
Steering Bracket to Pivot Shaft Screws	18 to 20 ft. lbs. (24 to 27 N·m)	120 to 144 in. lbs. (14-16 N·m)	*Screw Lock*
Lower Side Mount Nuts		144 to 168 in. lbs. (16 to 19 N·m)	*Gasket Sealing Compound*
Upper Side Mount Nuts		144 to 168 in. lbs. (16 to 19 N·m)	*Gasket Sealing Compound*
Tilt Bolt Nut	60 to 84 in. lbs (7 to 9 N·m)		
Tilt Tube Nut *	50 to 54 ft. lbs. (68 to 73 N·m)	50 to 54 ft. lbs. (68 to 73 N·m)	
Idle Relief Muffler Screws	48 to 60 in. lbs. (5 to 7 N·m)		*Nut Lock*

* Back off nut 1/4 turn after torquing.

IMPORTANT: For fasteners not listed, refer to **STANDARD TORQUE SPECIFICATIONS** on p. 32.

SAFETY INFORMATION

Before working on any part of the outboard, read the SAFETY section at the end of this manual.

DANGER

Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off. Remove propeller before servicing and when running the outboard on a flushing device.

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

WARNING

Wear safety glasses to avoid personal injury, and set compressed air to less than 25 psi (172 kPa).

The motor cover and flywheel cover are machinery guards. Use caution when conducting tests on running outboards. DO NOT wear jewelry or loose clothing. Keep hair, hands, and clothing away from rotating parts.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

To prevent accidental starting while servicing, disconnect the battery cables at the battery. Twist and remove all spark plug leads.

The electrical system presents a serious shock hazard. DO NOT handle primary or secondary ignition components while outboard is running or flywheel is turning.

Gasoline is extremely flammable and highly explosive under certain conditions. Use caution when working on any part of the fuel system.

Protect against hazardous fuel spray. Before starting any fuel system service, carefully relieve fuel system pressure.

Do not smoke, or allow open flames or sparks, or use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

Keep all electrical connections clean, tight, and insulated to prevent shorting or arcing and causing an explosion.

Always work in a well ventilated area.

Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to tightening must be felt when reusing a locking fastener. If replacement is indicated, use only authorized replacement or equivalent.

STEERING HANDLE – TILLER MODELS

Removal

WARNING

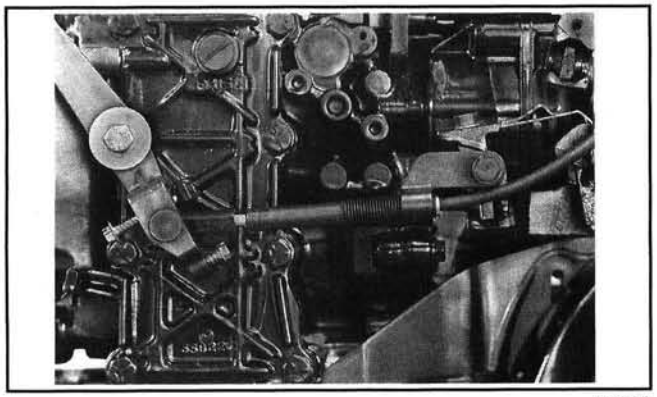
To prevent accidental starting while servicing, twist and remove all spark plug leads.

9.9/15 MODELS

Remove the lower motor covers, manual starter, and air silencer.

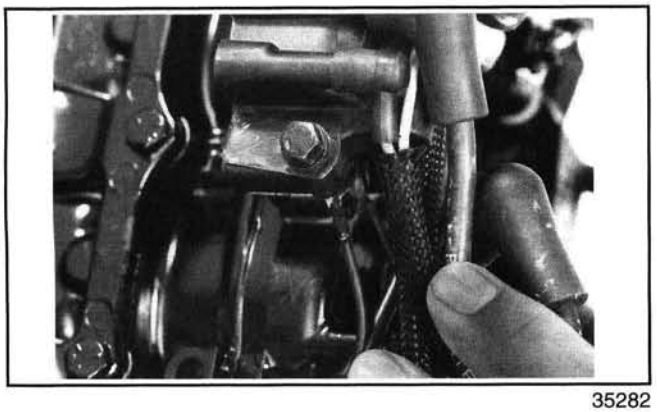
Remove the throttle cable pin from the throttle lever.

Remove the shoulder screw and washer retaining the throttle cable anchor to the powerhead. Remove the cable end connector and throttle cable anchor from the cable.



35281

Remove the stop button ground lead from the ignition coil.

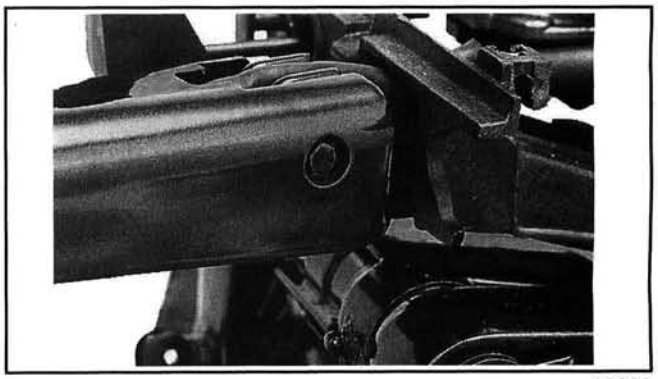


35282

Cut tie strap and separate the 5-pin *Amphenol* connector. Remove the stop button black wire from the plug using Socket Removal Tool, P/N 322699.

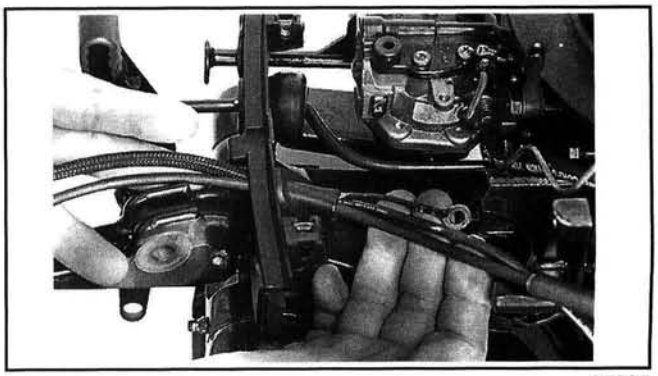
35283

Remove the steering handle screw, nut and sleeve. Lift the handle from the steering bracket.



32282

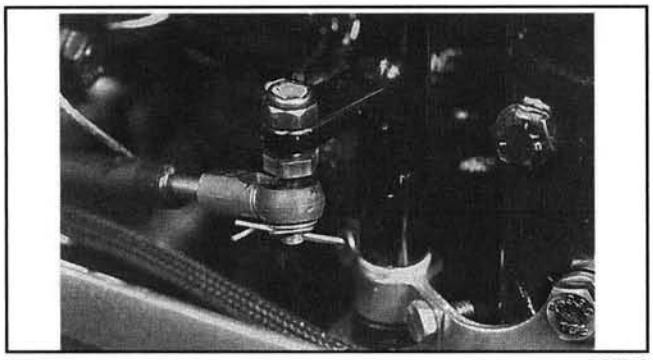
Pull the throttle cable and stop button leads through the grommet in the lower motor cover. Use isopropyl alcohol on the sleeve to ease removal.



35285

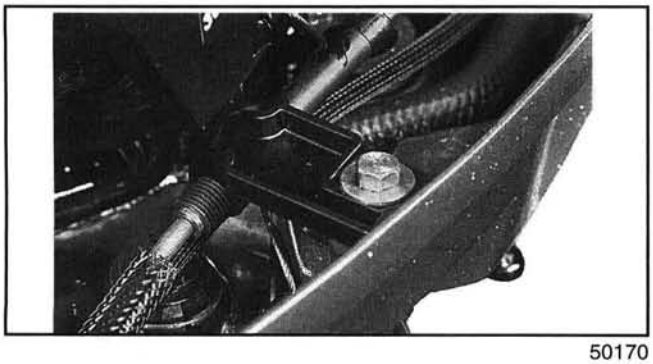
25/30 MODELS

Remove the spring retainer and washer from the throttle arm ball joint. Remove throttle cable connector.



50172

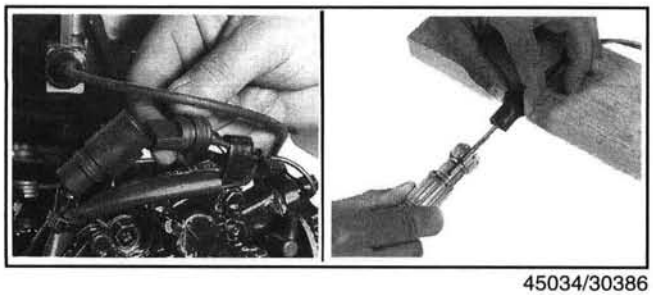
Remove the shoulder screw and spacer from the throttle cable anchor bracket.



50170

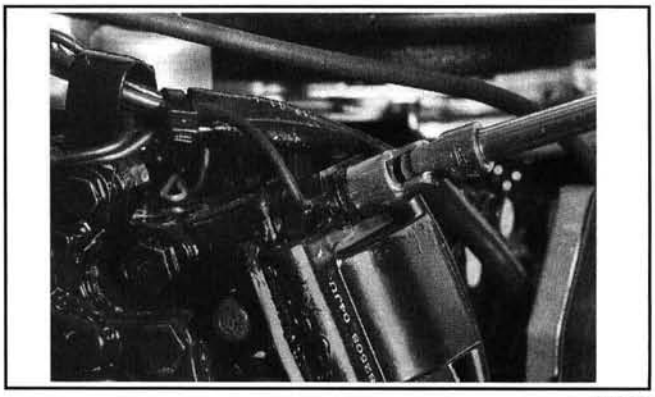
Remove bracket and connector from throttle cable.

Separate the 5-pin *Amphenol* connector. Remove the stop button lead from the plug using Socket Removal Tool, P/N 322699.



45034/30386

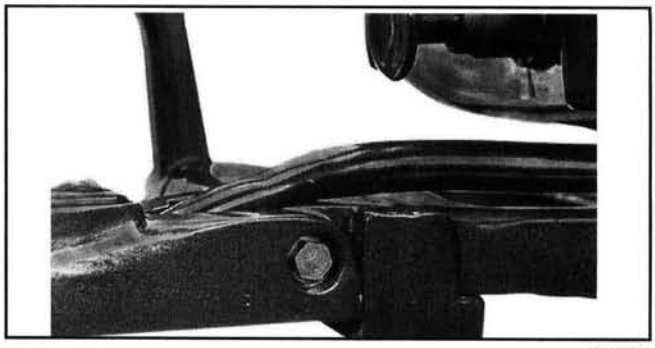
Remove the stop button ground lead from bottom ignition coil mounting screw.



45035

Remove protective sleeve from stop button leads and throttle cable.

Remove the steering handle screw. Pull the throttle cable and stop button leads through the grommet in the lower engine cover.

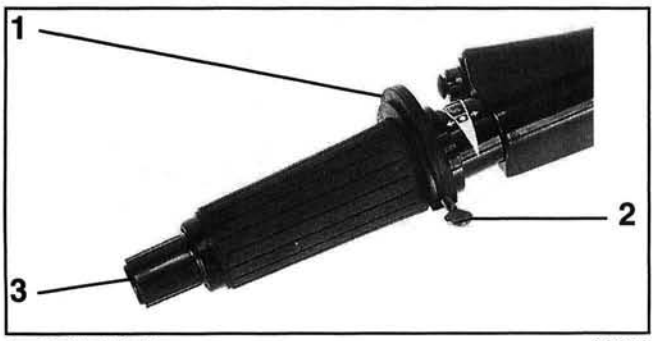


24194

8

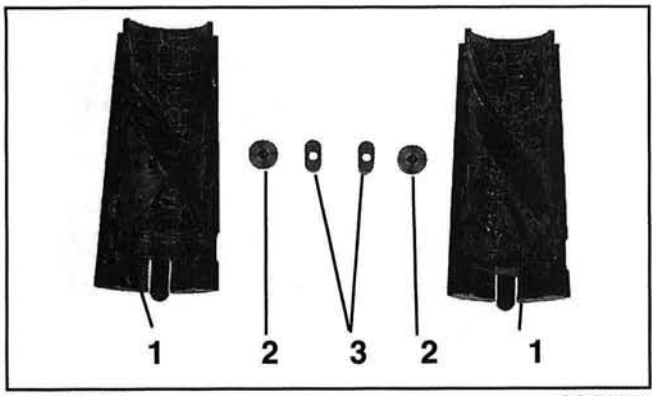
Disassembly

Using *Twist-Grip* Remover, P/N 390767, depress the grip detents. Tighten screw and remove the grip by pulling grip and turning the idle adjustment knob clockwise.



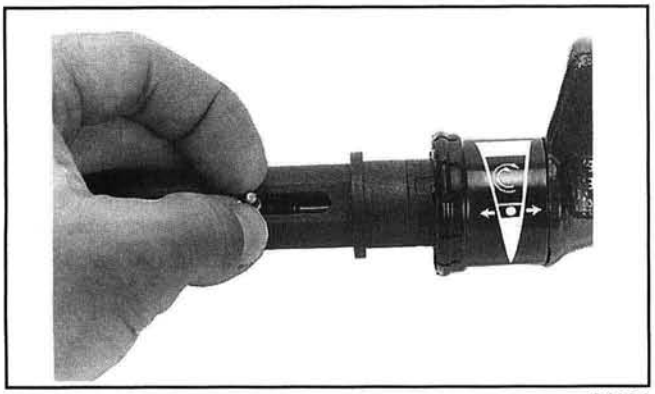
1. Twist-Grip *Remover* 32290
2. *Screw*
3. *Idle adjustment knob*

Remove the helix halves, rollers, and guides.



1. *Helix halves* COA2674
2. *Rollers*
3. *Guides*

Pull the throttle pin out of the cable.

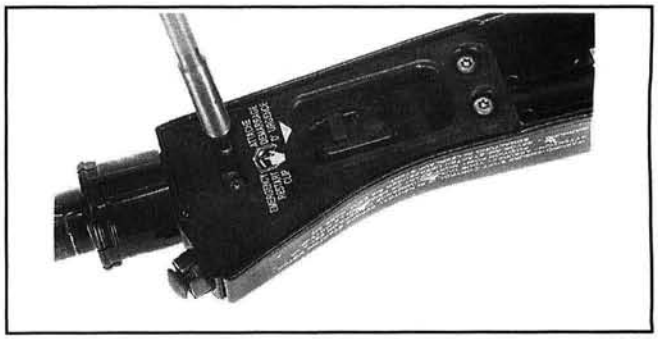


24294

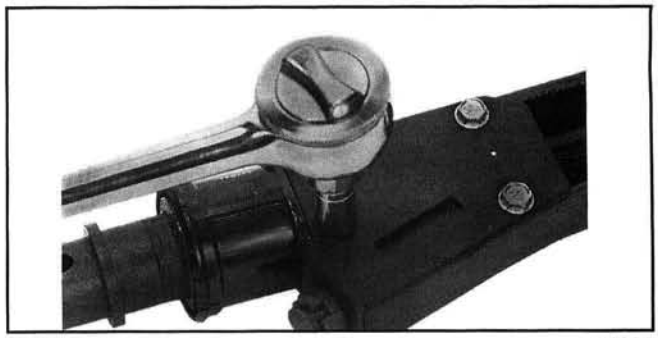
Remove throttle end cap from inner handle.

24298

Remove stop switch cover screws and cover/stop switch assembly.

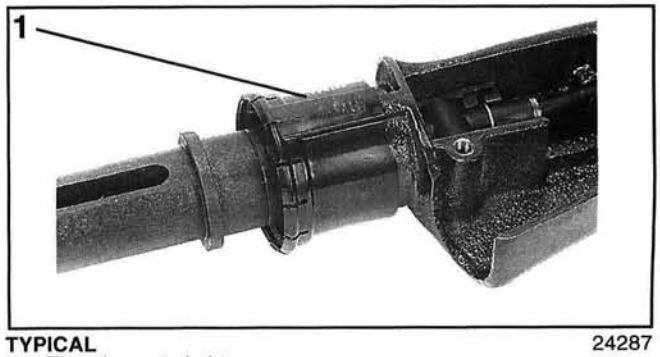


9.9/15 Model 32292



25/30 Model 24288

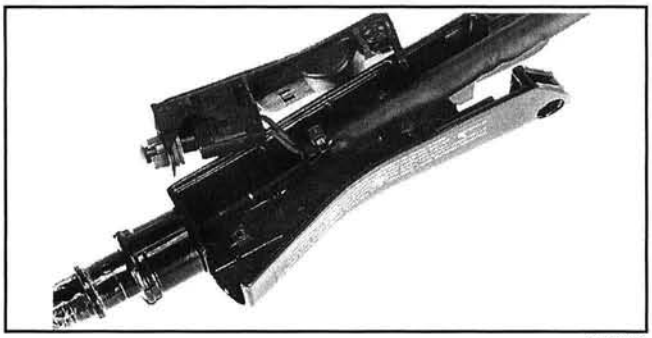
Remove the throttle control plate.



TYPICAL 24287
1. *Throttle control plate*

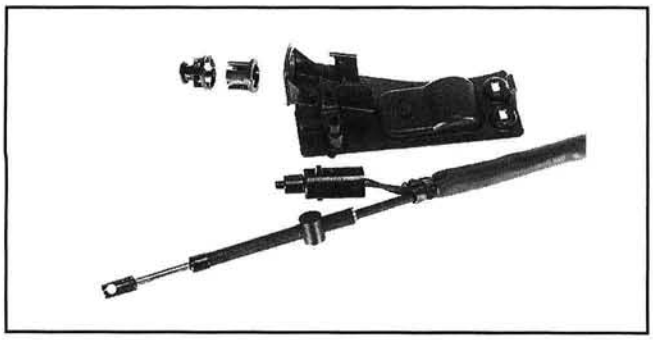
9.9/15 MODELS

Remove throttle cable from the steering handle.



32293

Remove stop switch assembly with throttle cable from cover.

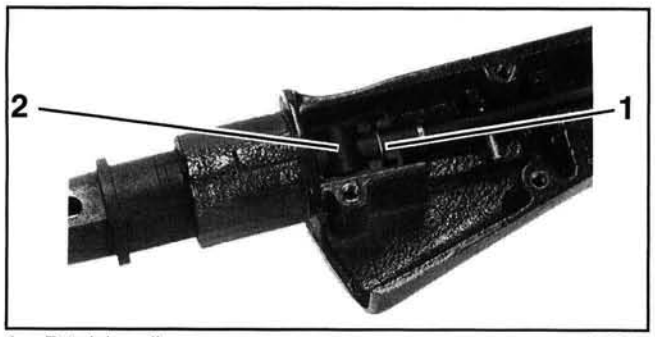


32294

Remove throttle cable seal from the inner handle.

25/30 MODELS

Remove the throttle cable retaining clip. Pry the cable trunnion out of the steering handle and remove cable.

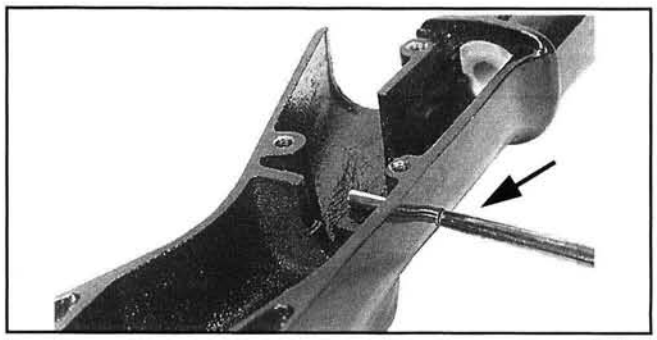


1. *Retaining clip*
2. *Cable trunnion*

24286

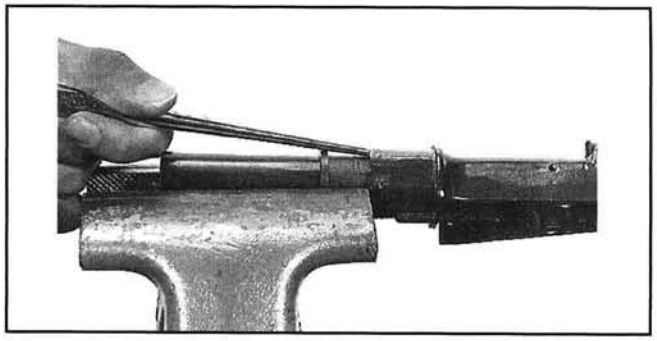
IMPORTANT: DO NOT remove the inner handle except to replace it.

Using a punch and mallet, drive the steel pin that retains the inner handle from the steering handle.



24285

Remove the plastic inner handle from the metal outer handle by driving the outer handle off with a mallet and a punch. Inner handle is bonded to the outer handle. After removing, chip away remnants of inner handle.



24284

Remove throttle cable seal from the inner handle.

Inspection

Inspect the throttle cable for kinks and wear. Replace if necessary.

Inspect the steering handle components for wear, cracks, or damage. Replace parts if necessary.

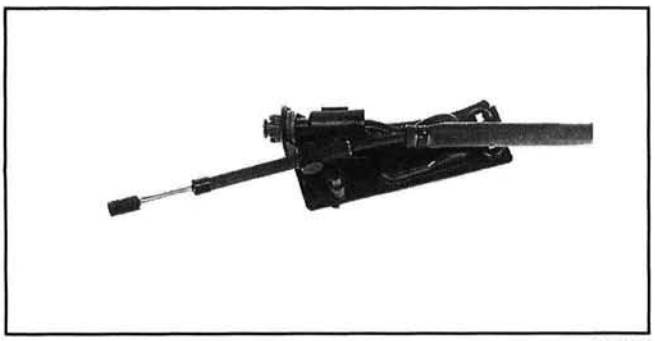
Refer to **Stop Circuit Tests** on p. 120 to test stop switch.

Assembly

Install the throttle cable seal in inner handle.

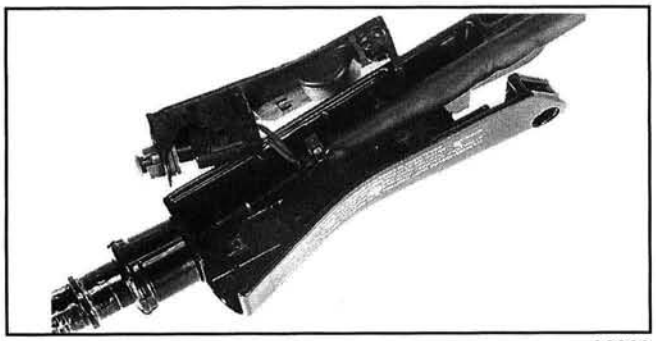
9.9/15 Models

Snap the stop switch assembly with the throttle cable into the cover. Be sure the protective sleeve covers the stop switch wires and throttle cable.



32295

Place the throttle cable into the inner handle and align the cover with the handle. Install the throttle control plate on outer handle.

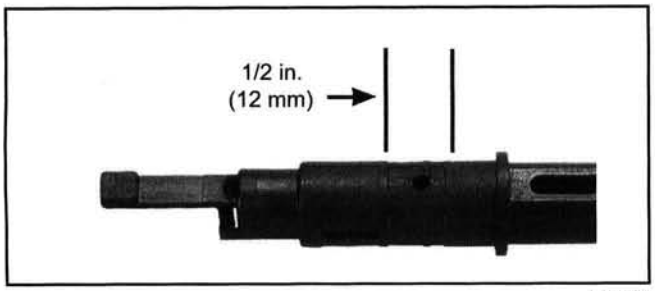


32293

25/30 Models

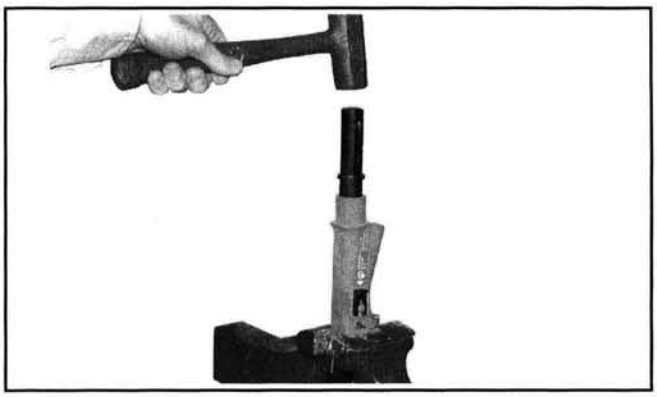
Install the throttle cable seal in inner handle.

If removed, apply *Loctite Depend 300* adhesive to inner handle at areas shown.

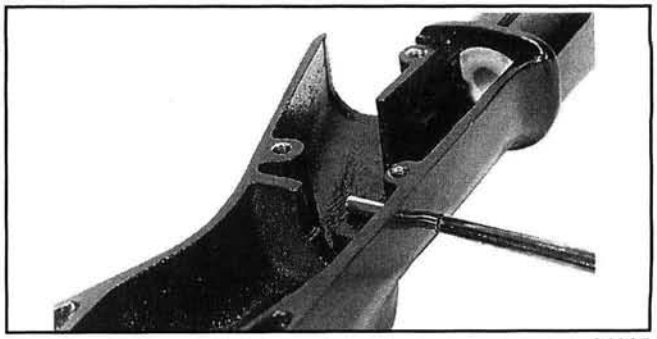


20849

Install the metal outer handle over the plastic inner handle and drive the outer handle into place.

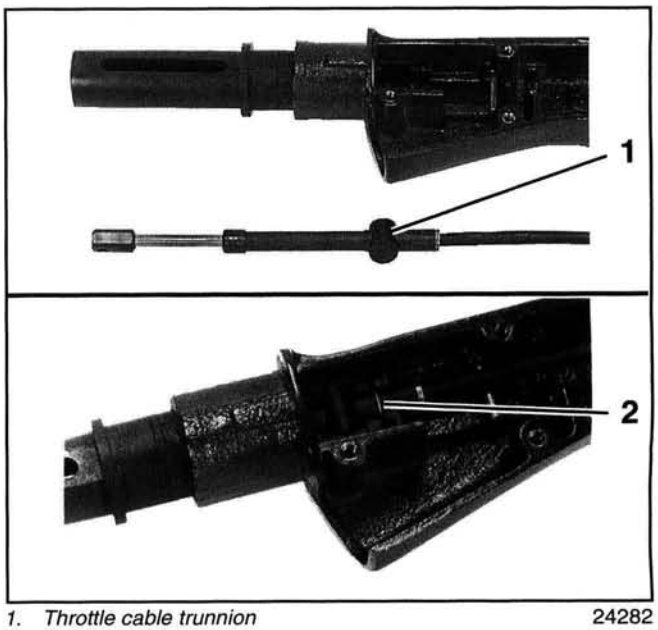


Secure tab of the inner handle into recess of the outer handle with the steel pin.



24285

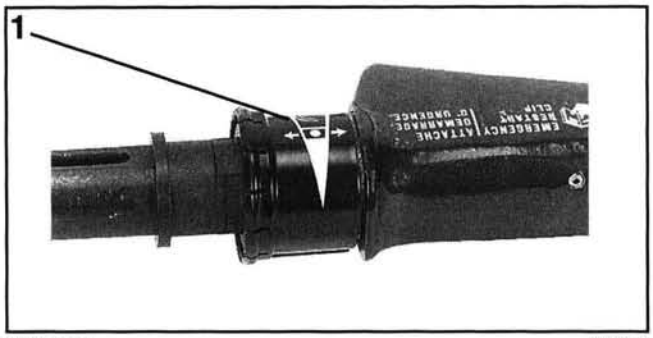
Install the handle end of the throttle cable. Snap the throttle cable trunnion into the recess in the handle. Install the retainer clip.



1. *Throttle cable trunnion* 24282
2. *Retainer clip* 24286

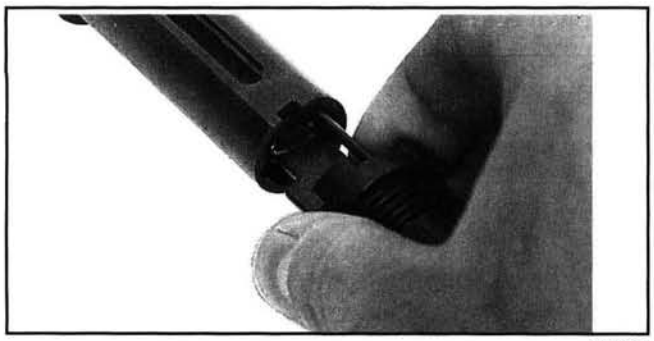
ALL MODELS

Install the throttle control plate on outer handle.



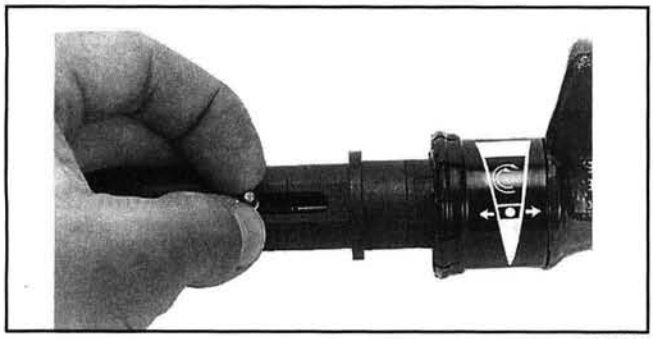
TYPICAL 24295
1. Throttle control plate

Place the throttle end cap into inner handle. The tab on the cap goes into the recess of the inner handle.



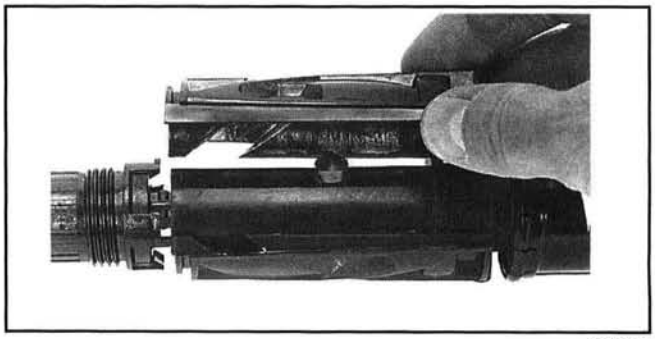
24298

Push the throttle cable pin through the end of the throttle cable.



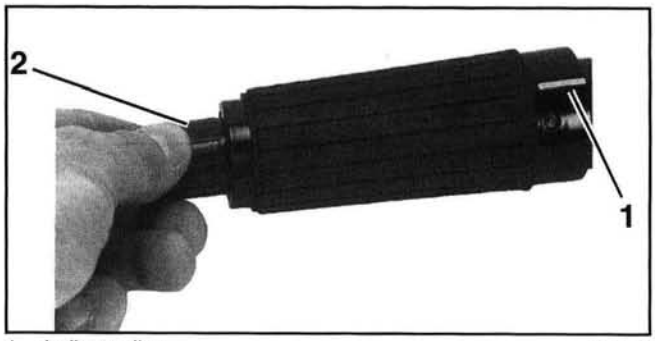
24294

Lubricate end of the pin, guides, rollers, helix grooves, and inner handle guide slot with *Moly Lube.* Place the guides over the roller pin and into the slots of the inner handle. Place the rollers on the ends of the roller pin. Assemble helix halves on the handle and slide the grip over the helix.



24293

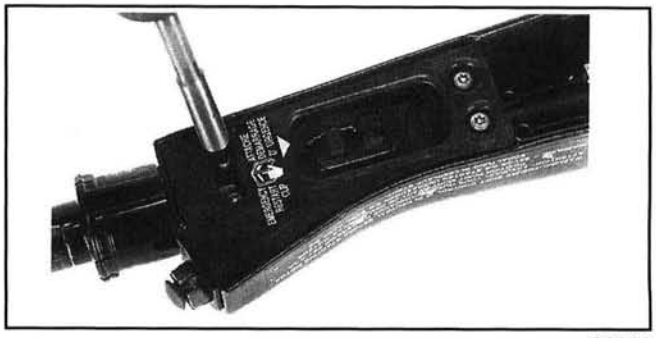
Be sure the twist-grip's speed indicator line is positioned with the speed range symbol on the handle. Snap the grip into place. Turn the idle speed adjustment knob counterclockwise to the minimum slow speed position.



1. Indicator line 24292
2. Idle speed adjustment knob

9.9/15 MODELS

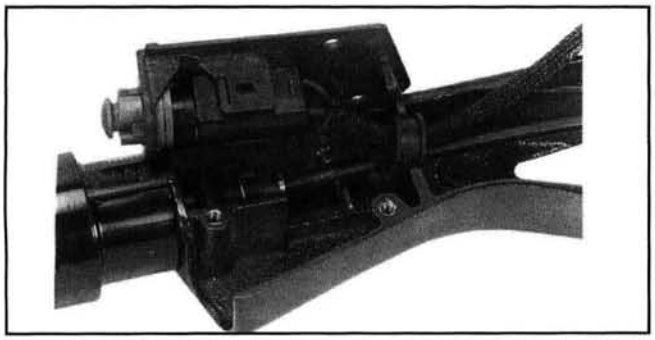
Install stop switch cover onto handle.



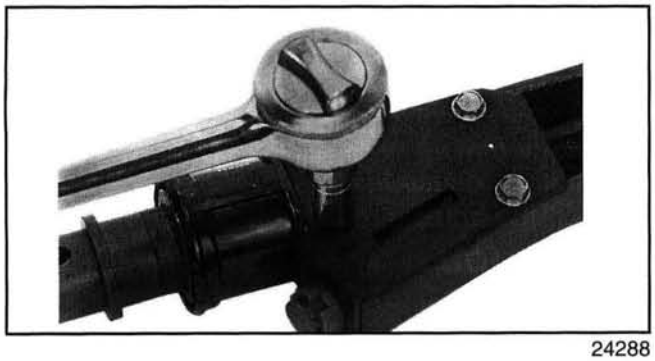
32292

25/30 MODELS

Slide the protective sleeve over the stop switch leads and throttle cable. Slide grommet over the protective sleeve until 1/2 in. (12 mm) of the sleeve is exposed. Place grommet in position and install stop switch bracket.



24291



24288

Installation

Insert the throttle cable and stop switch wires through the lower motor cover grommet. Use isopropyl alcohol to ease assembly.

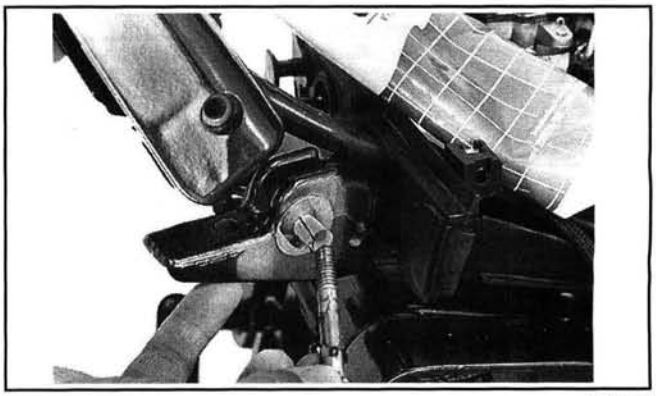
IMPORTANT: Make sure the protective sleeves are on the throttle cable and stop switch wires.

Apply *Triple-Guard* grease to the steering handle sleeve, and place the sleeve into the steering bracket.

9.9/15 MODELS

Apply *Triple-Guard* grease to the steering handle sleeve. Place the sleeve into the steering bracket. Attach the steering handle to the steering bracket.

Tighten the screw and nut so the steering handle can pivot and maintain any position.



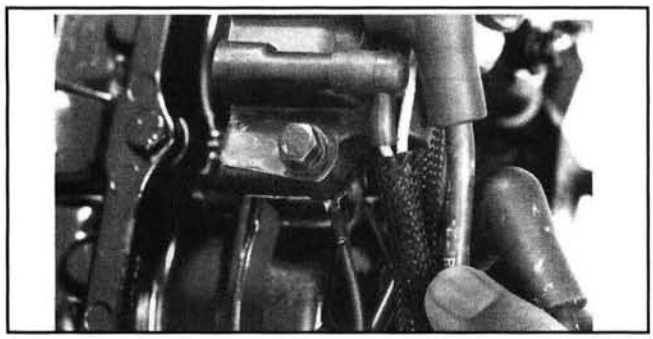
35286

Tighten the nut so the steering handle can be pivoted and maintain any position.

⚠ WARNING ⚠

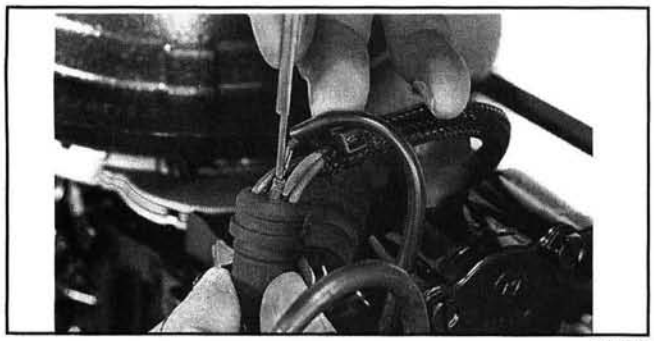
Replace the steering handle locknut if it has lost its locking action.

Secure the stop button ground lead behind the ignition coil on the lower screw, with starwasher next to block.



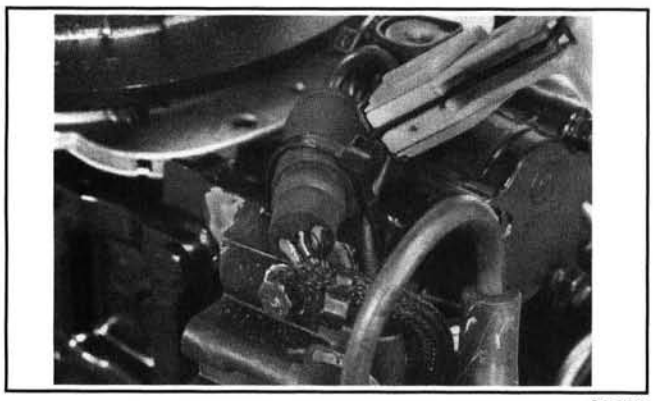
35282

Use Pin Insert Tool, P/N 322697, to install the stop button black wire into the 5-pin *Amphenol* plug.



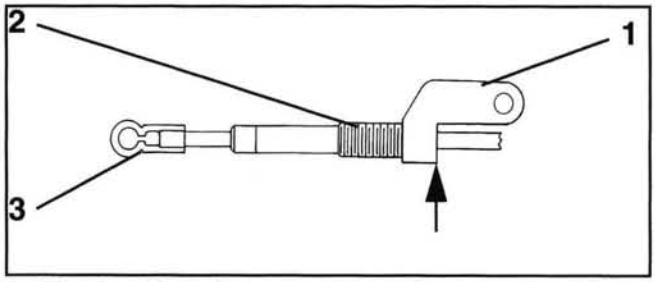
35279

Connect the *Amphenol* connector. Secure the connector to the ignition coil post with a tie strap.



35289

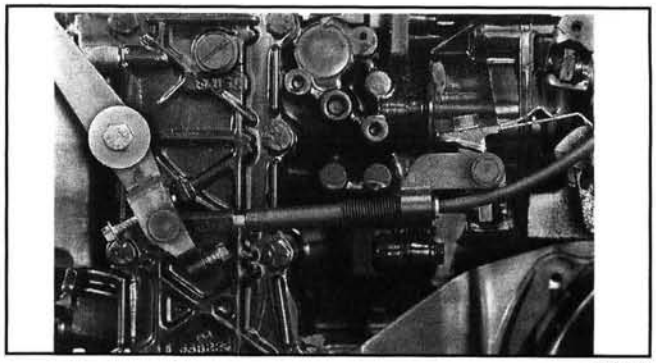
Thread the throttle cable anchor onto the cable housing until anchor is flush with end of threads. Thread the cable end connector on the cable until seated.



1. *Throttle cable anchor*
2. *Threads*
3. *Cable end*

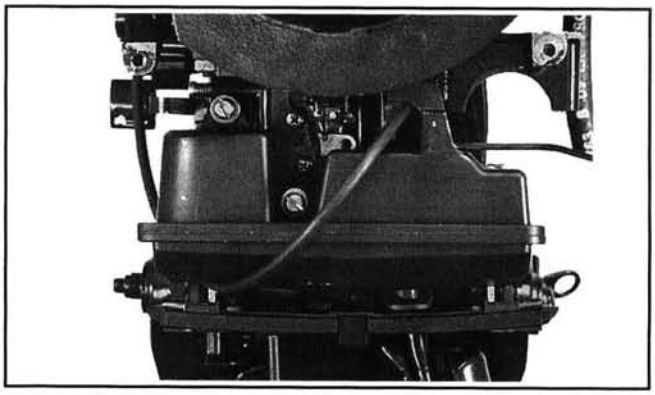
DR4947

Position the throttle cable connector into throttle lever and insert pin. Position throttle cable anchor on powerhead and secure with shoulder screw and washer.



35281

Hook cable retainer around throttle cable and install air silencer.



35300

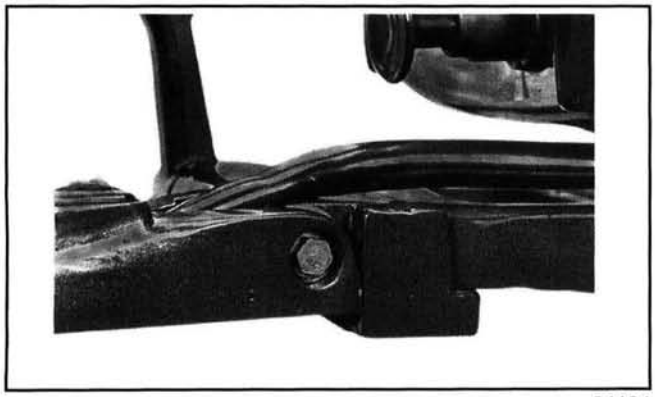
Install manual starter and lower motor covers.

To adjust the throttle cable, refer to **SYNCHRONIZATION AND LINKAGE ADJUSTMENTS – 9.9/15** on p. 70.

25/30 MODELS

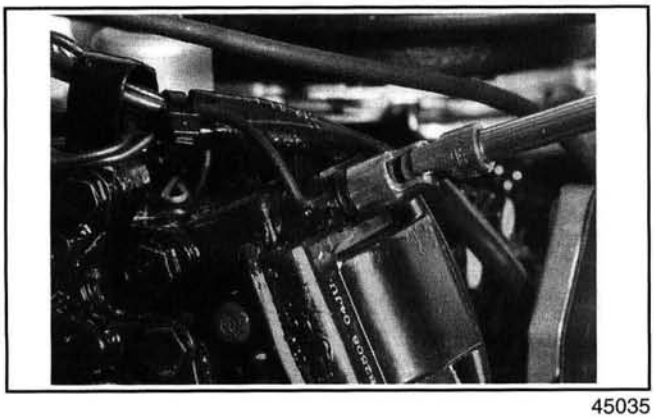
Apply *Triple-Guard* grease to the steering handle sleeve. Place the sleeve into the steering bracket. Attach the steering handle to the steering bracket.

Tighten the screw and nut so the steering handle can pivot and maintain any position.



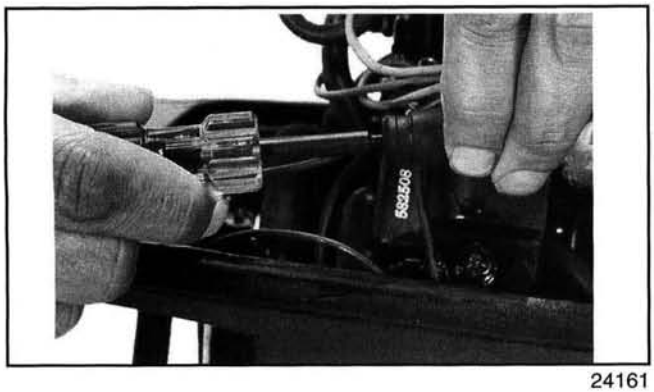
24194

Secure stop button ground lead to bottom ignition coil mounting screw. Tighten screw to a torque of 48 to 96 in. lbs. (5.4 to 10.8 N·m).



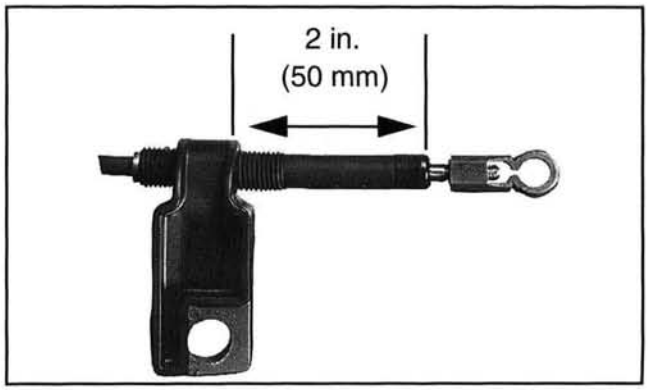
45035

Use Pin Insert Tool, P/N 322697, to install stop button lead into plug. Connect the 5-pin *Amphenol* connector. Secure connector with wire retainer.



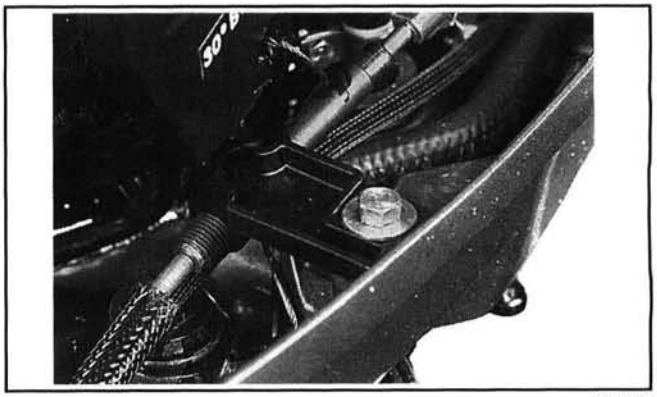
24161

Thread the anchor onto the cable housing 2 in. (50 mm), plus or minus one turn, from the end of the cable sleeve. Secure anchor in place with shoulder screw and spacer. Next, thread the connector onto the cable end.



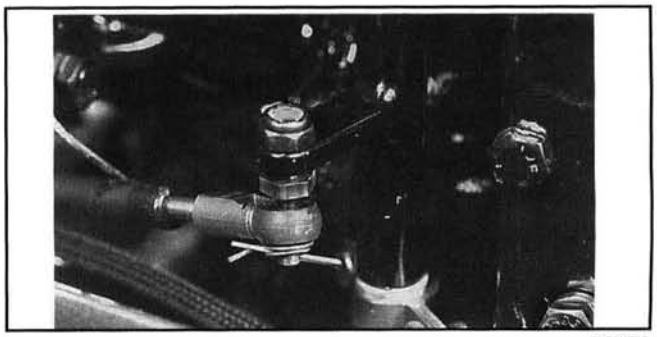
50174

Position the connector on the throttle arm ball joint. Secure the connector using the washer and spring retainer.



50170

Secure the bracket to the lower engine cover using shoulder screw and spacer.



50172

To adjust the throttle cable, refer to **SYNCHRONIZATION AND LINKAGE ADJUSTMENTS – 25/30** on p. 73.

EXHAUST HOUSING

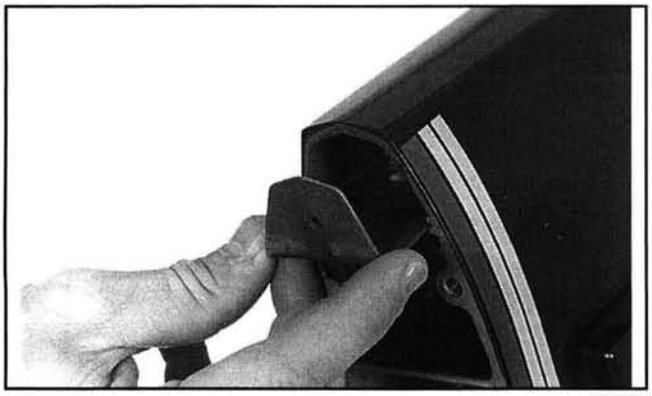
Disassembly

9.9/15 MODELS

Remove the following:

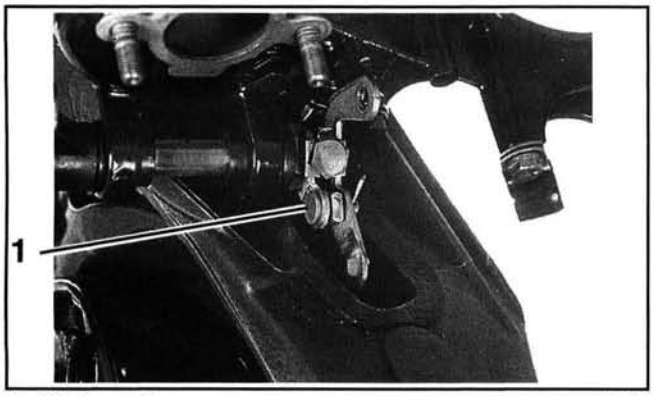
- Powerhead; refer to Powerhead **REMOVAL – 9.9/15** on p. 180.
- Gearcase; refer to Gearcase **REMOVAL AND INSTALLATION** on p. 260.

.Remove the exhaust housing baffle.



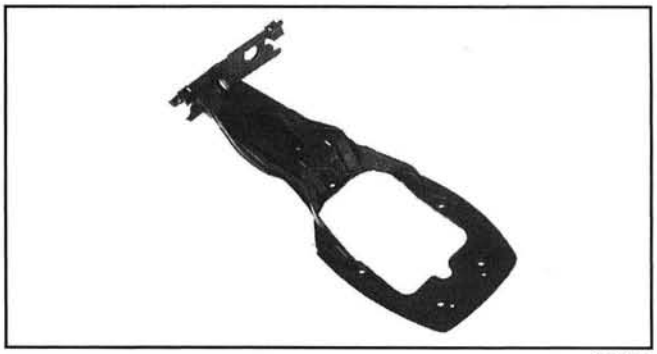
32419

Remove the cotter pin. Remove the shift arm pin to disengage the shift rod from the shift arm, and remove the rod.



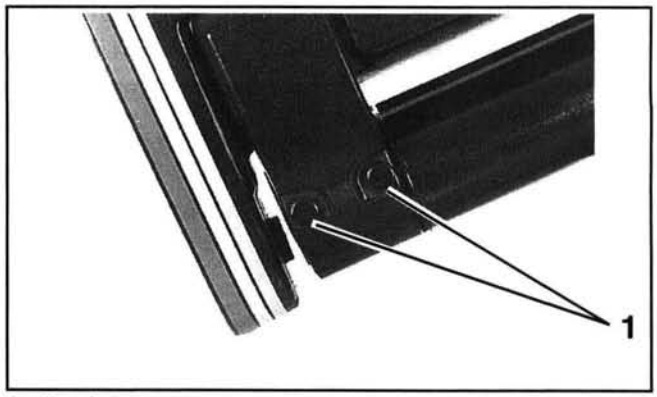
1. Shift arm pin 32341

Remove the five screws and lift the lower engine cover support off the exhaust housing.



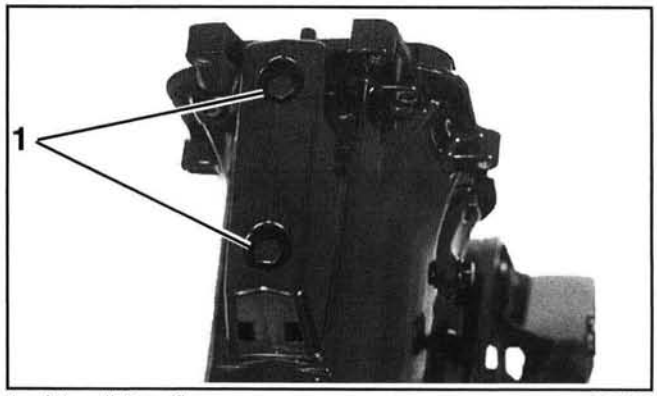
32305

Remove the two lower mount bracket screws. Remove the port and starboard lower mount brackets with two lateral mounts.



1. Bracket screws 32469

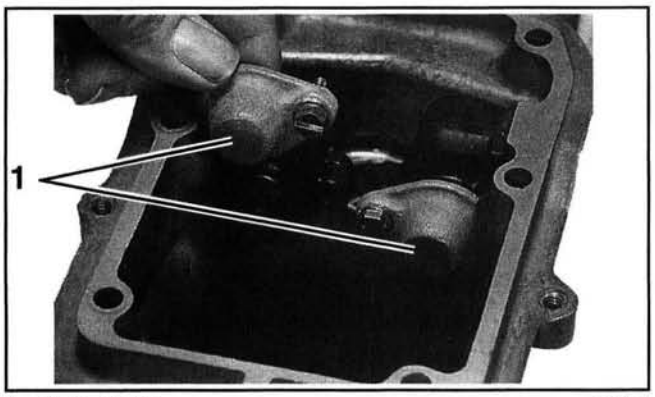
Remove the two idle relief muffler screws. Remove the muffler and discard gasket.



1. Idle relief muffler screws 32468

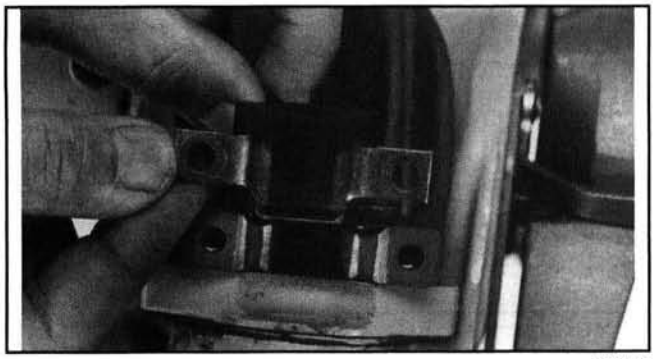
8

Remove the two upper mount to steering bracket screw caps and discard O-rings. Remove the two upper mount screws. Separate the exhaust housing from the swivel bracket assembly.



1. Screw caps 33356

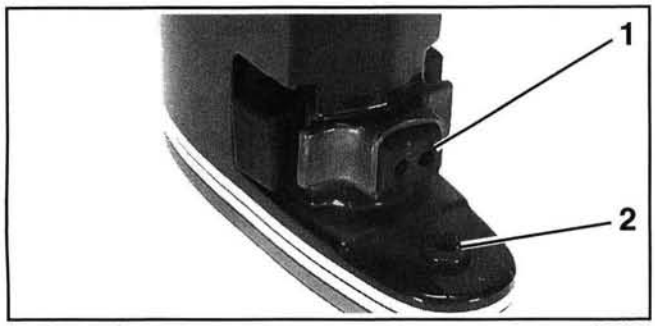
Remove the upper thrust mount and plate from the swivel bracket assembly.



33355

Remove the four screws (two port and two starboard) retaining the two upper mounts to the exhaust housing. Remove the two upper mounts.

Remove the lower thrust mount and shift rod grommet.



1. Lower thrust mount 32470
2. Shift rod grommet

Refer to **Cleaning and Inspection** on p. 241.

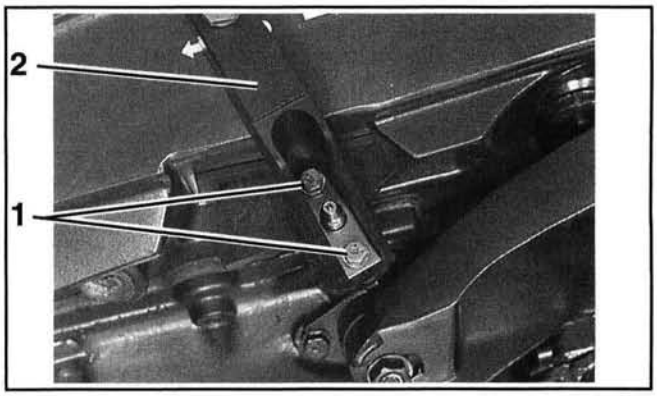
25/30 MODELS

Remove the following:

- Powerhead; refer to Powerhead **REMOVAL – 25/30** on p. 181.
- Gearcase; refer to Gearcase **REMOVAL AND INSTALLATION** on p. 260.

REMOTE MODELS

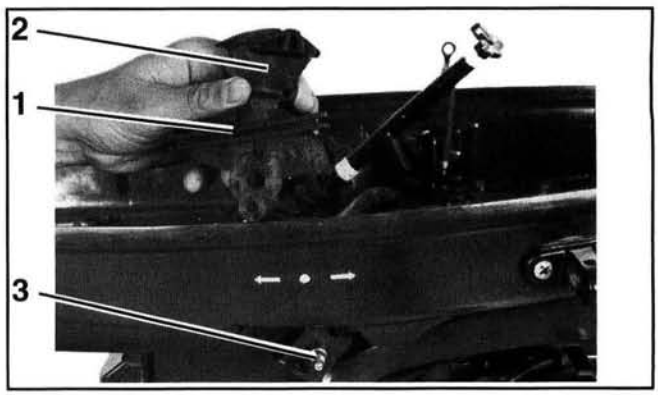
Remove the two shift lever retaining screws and nuts, the plate spacer, shift lever, and spacer lever from the adjustment lever and shaft.



1. Screws 17357
2. Shift lever

TILLER MODELS

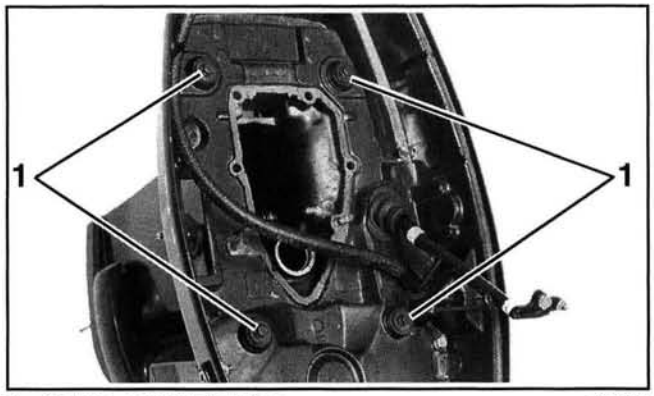
Remove the two actuator cam retaining screws, washers, and nuts. Raise the grommet toward top of the actuator cam. To remove the actuator cam from the adjustment lever and shaft, pull the base of cam over the grease fitting. Remove the actuator cam from the lower engine cover.



1. Grommet 17261
2. Actuator cam
3. Grease fitting

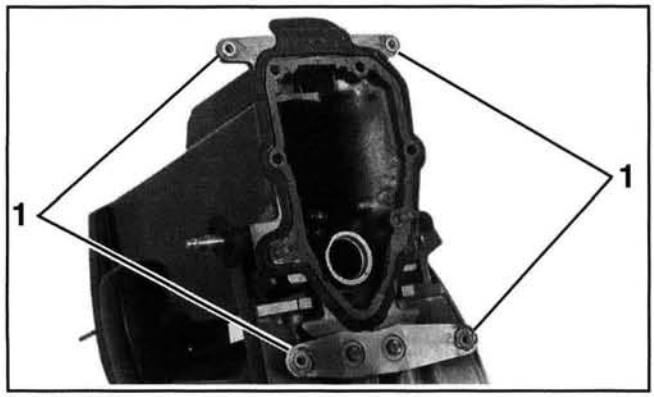
ALL MODELS

Remove the four screws holding the lower engine cover to the exhaust housing.



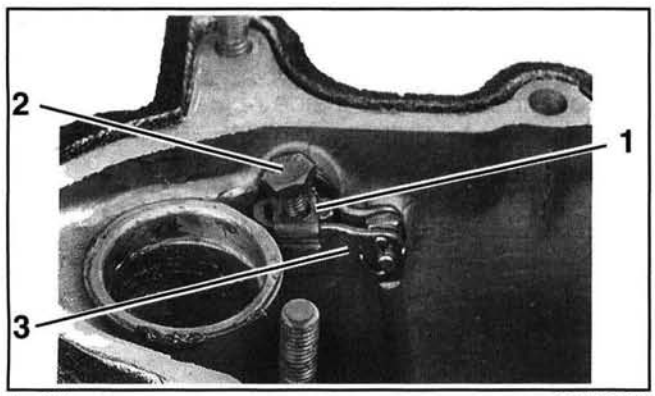
1. Screws, cover to housing 17262

Lift the cover off the exhaust housing. If the washers on the exhaust housing are loose, remove them at this time.



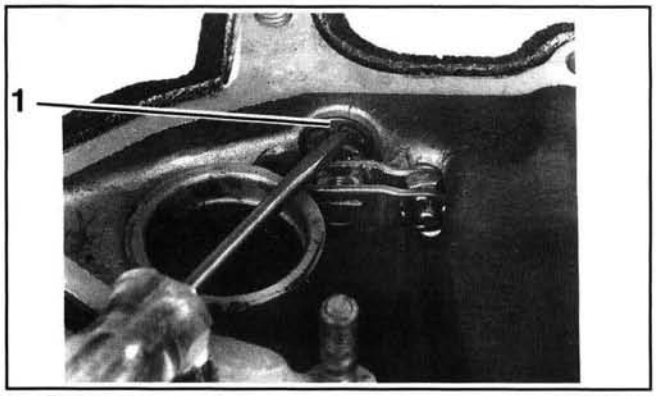
1. Washers 17263

Bend locking tab on the clip and remove the screw and the clip retaining the shift rod lever.



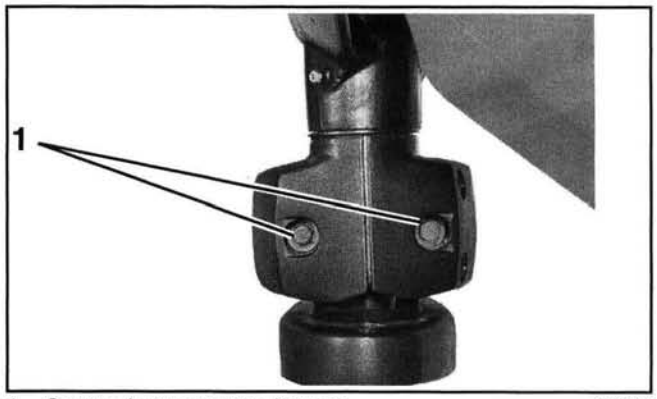
1. Clip COA2522
2. Screw
3. Shift rod lever

Remove the adjustment lever and shaft retainer with a small screwdriver. Hold the shift rod lever and the upper shift rod while removing the adjustment lever and shaft.



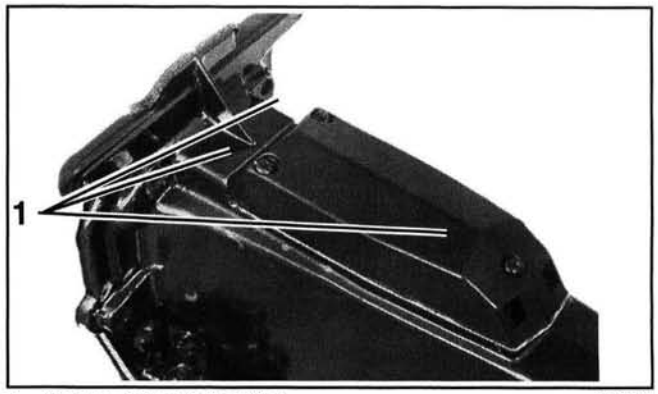
1. Retainer COA2524

Remove two lower mount to exhaust housing screws from front of the lower mount housings.



1. Screws, lower mount to housing 17264

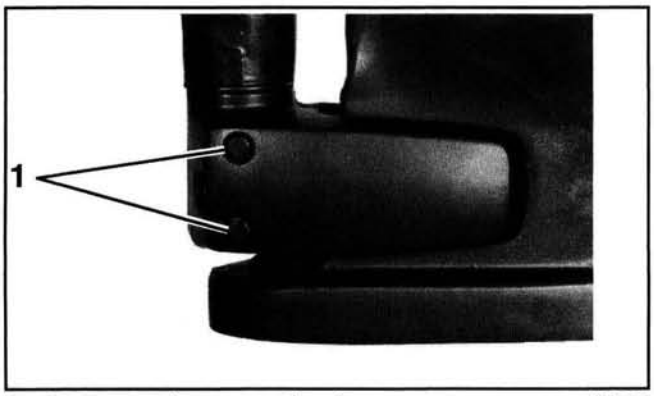
Remove the three screws retaining the idle relief muffler. Remove the muffler. Discard the muffler gasket and seals from the screws.



1. Screws, idle relief muffler 17394

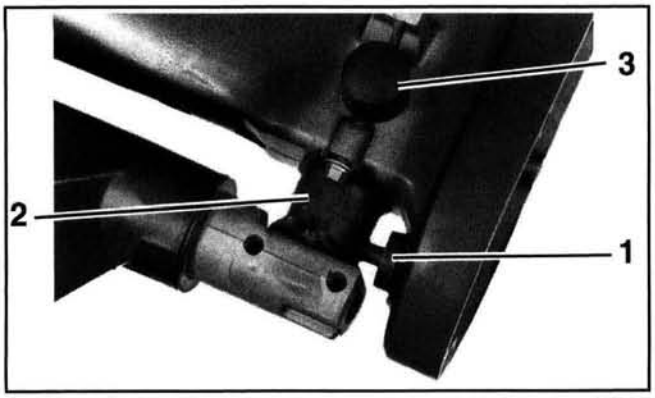
8

Remove the two remaining lower mount housing screws from the port lower mount housing. Separate and remove the port and starboard lower mount housings.



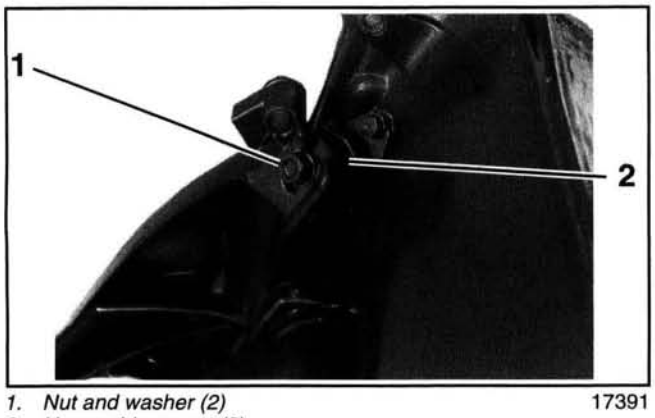
1. *Screws, port lower mount housing* 17265

Slide the mount housing bumper from between the lower front mount and the exhaust housing.



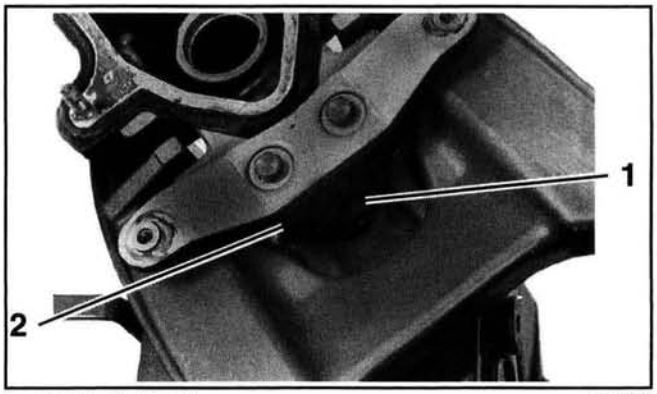
1. *Mount housing bumper* 17393
2. *Lower front mount*
3. *Lower side mount (2)*

Remove the nuts and washers from the two upper side mounts.



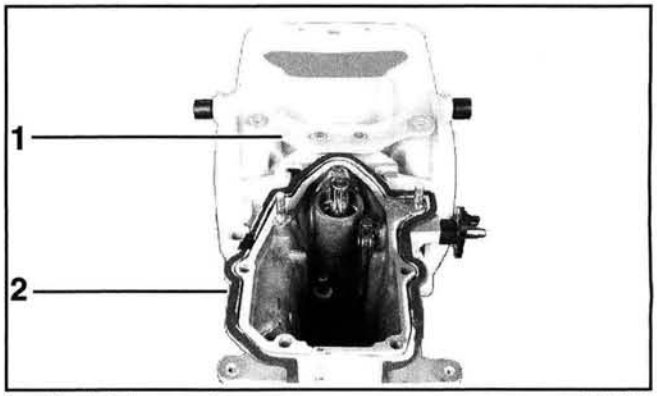
1. *Nut and washer (2)* 17391
2. *Upper side mount (2)*

Remove the nut and the washer from the upper front mount. Separate the exhaust housing from the swivel bracket assembly.



1. *Nut and washer* 17392
2. *Upper front mount*

Remove the two screws retaining the lower motor cover bracket to the exhaust housing and remove the bracket. Remove and discard the exhaust housing to lower engine cover seal.



1. *Bracket, lower motor cover* 001019
2. *Seal, lower cover to exhaust housing*

Remove the upper side mounts and the lower front mount from the exhaust housing.

Remove the nuts from inside of the exhaust housing that retain both lower side mounts to the exhaust housing.

Refer to **Cleaning and Inspection** on p. 241.

Cleaning and Inspection

General

Clean all parts with parts cleaning solvent and dry with compressed air. All nut and screw threads coated with *Screw Lock* or *Nut Lock* must be thoroughly cleaned before reassembly. When using a thread locking product, be sure to prime the threads with *Locquic Primer.*

Examine the rubber motor mounts and replace if deteriorated or damaged.

Inspect water tube for obstructions or kinks which may restrict water flow.

Inspect shift components for wear. Replace if deteriorated or damaged.

Clamp Screw

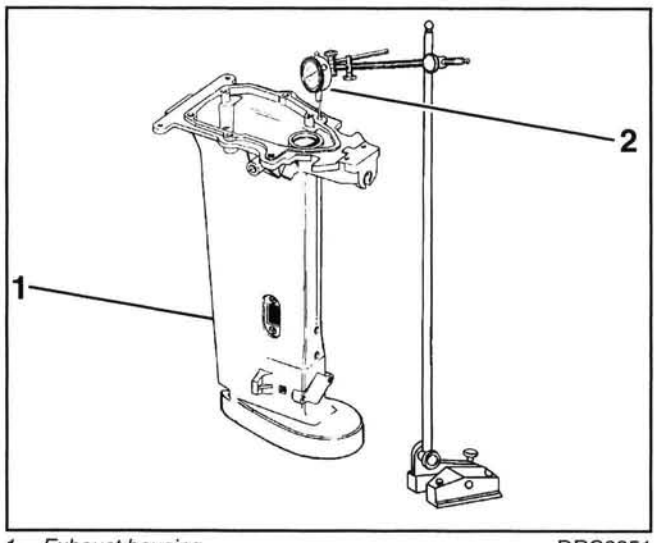
Inspect clamp screw assembly(s). Replace swivel plate and retainer if bent or loose. To install a new swivel plate, remove screw and old plate. Apply *Locquic Primer* to the threads of the screw and allow it to dry four to five minutes. Then apply *Ultra Lock* to threads. Install a new swivel plate with screw and tighten securely.

Exhaust Housing

Before checking the exhaust housing for distortion, thoroughly clean the top and bottom mating surfaces and remove all sealer and corrosion.

Check the exhaust housing for distortion. Place the housing on a surface plate. Using a dial indicator, check flatness by measuring the run-out on the top edge of housing. The maximum allowable run-out is 0.009 in. (0.228 mm). If you do not have access to a dial indicator and surface plate, seek the services of a machine shop. DO NOT attempt to straighten a distorted housing; replace it.

IMPORTANT: A distorted exhaust housing will cause the upper driveshaft splines to wear excessively and will damage the crankshaft splines.



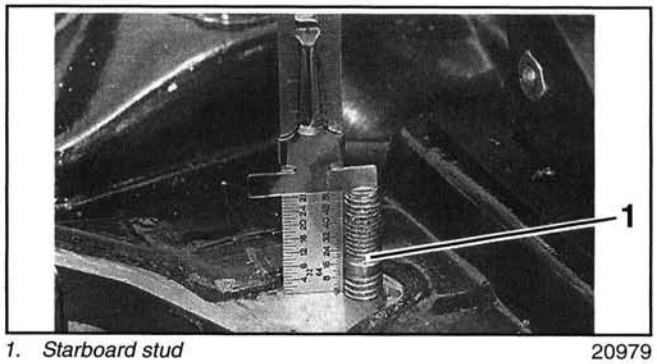
1. *Exhaust housing*
2. *Dial indicator*

DRC2351

25/30 MODELS

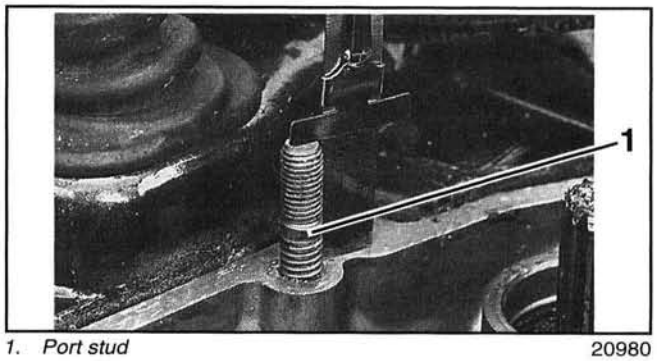
Powerhead retaining studs, installation heights:

- Starboard Stud – 7/8 in. (21 mm)
- Port Stud – 1 1/32 in. (26 mm)



1. *Starboard stud*

20979



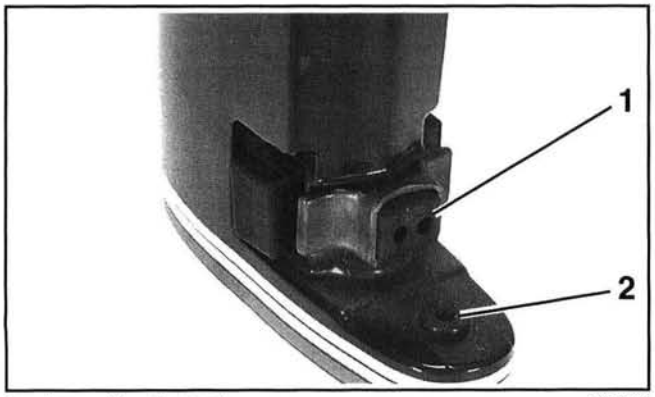
1. *Port stud*

20980

Assembly

9.9/15 MODELS

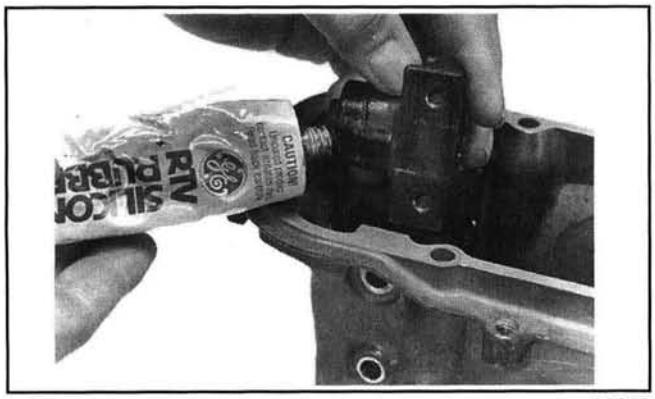
Install the lower thrust mount and shift rod grommet.



1. *Lower thrust mount*
2. *Shift rod grommet*

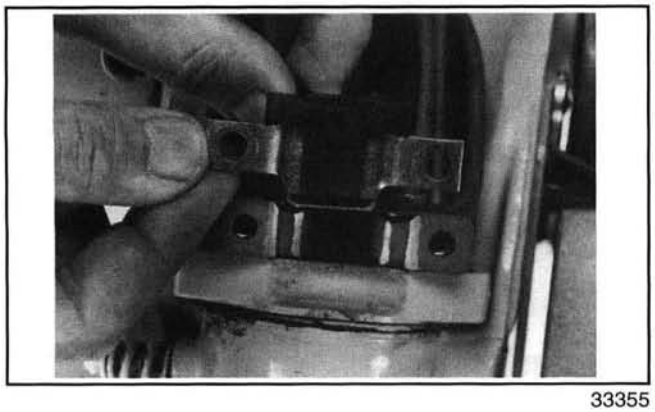
32470

Apply *GE RTV* adhesive and install the two upper mounts. Apply *Nut Lock* to the four upper mount retaining screws and torque to 60 to 84 in. lbs. (7 to 9 N·m).



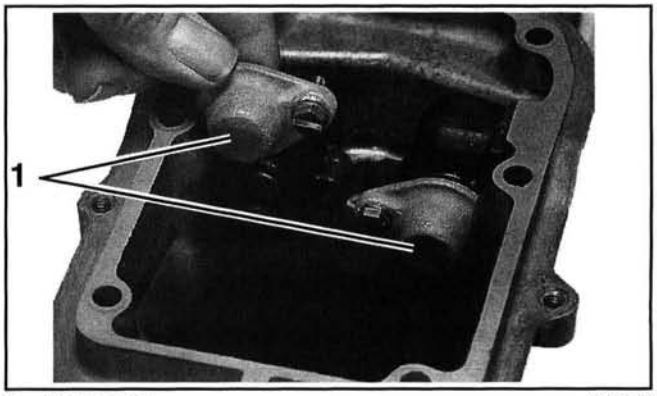
33363

Place the upper thrust mount and plate in position on the swivel bracket assembly.



33355

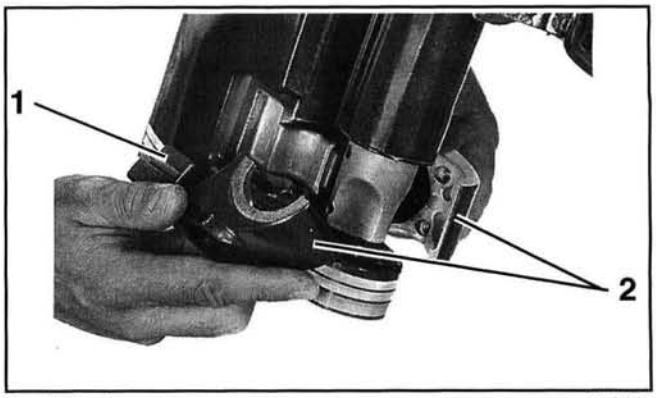
Clean all sealant from the threads on the two upper mount to steering bracket screws. Apply *Nut Lock* to threads of screws. Position the swivel bracket assembly on the exhaust housing. Install the two upper mount screws and tighten to a torque of 18 to 20 ft. lbs. (24 to 27 N·m). Install caps with new O-rings and torque screws to 60 to 84 in. lbs. (7 to 9 N·m).



1. *Screw caps*

33356

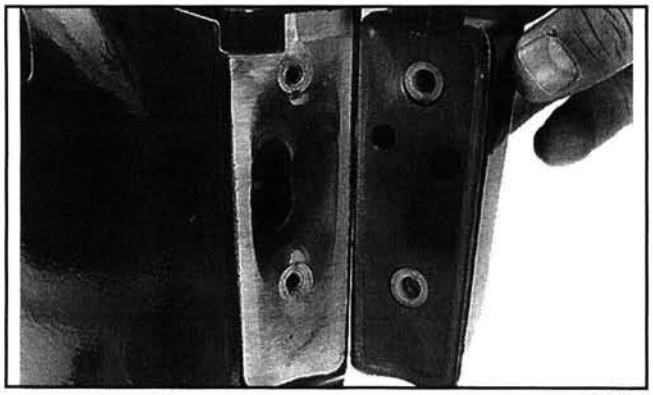
Place the lateral mounts in the lower mount brackets. Apply *Nut Lock* to threads of lower mount bracket screws. Install the lower mount brackets. Tighten screws to a torque of 60 to 84 in. lbs. (7 to 9 N·m).



1. *Lateral mount*
2. *Lower mount brackets*

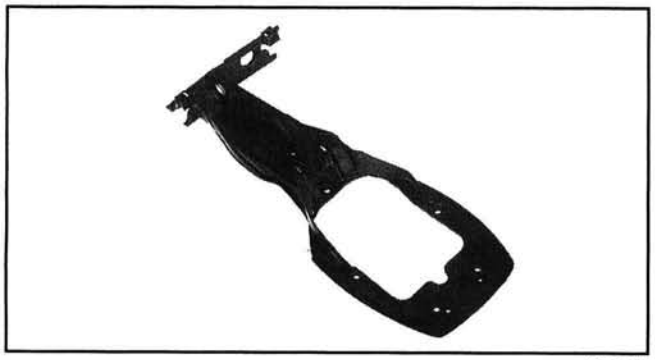
32465

Position a new idle relief muffler gasket. Install the muffler to the exhaust housing. Apply *Nut Lock* to the muffler's retaining screw threads. Tighten the screws to a torque of 48 to 60 in. lbs. (5 to 7 N·m).



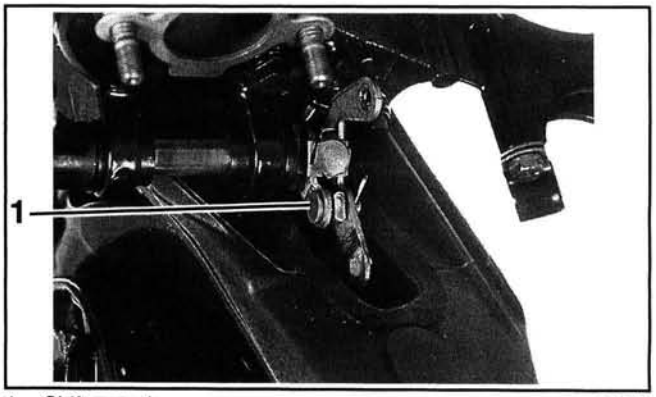
32464

Position the lower engine cover support on the exhaust housing and torque the five screws to 60 to 84 in. lbs. (7 to 9 N·m).



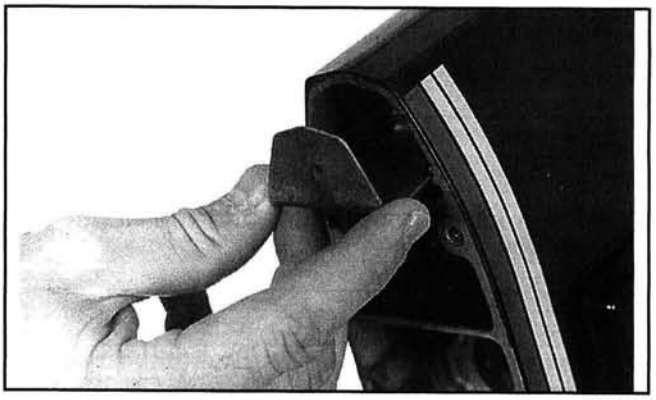
32305

Lubricate the upper shift rod with *Triple-Guard* grease. Install the shift rod into the shift arm a with pin and a **new** cotter pin.



1. Shift arm pin 32341

Place exhaust housing baffle in position.



32419

Install the following:

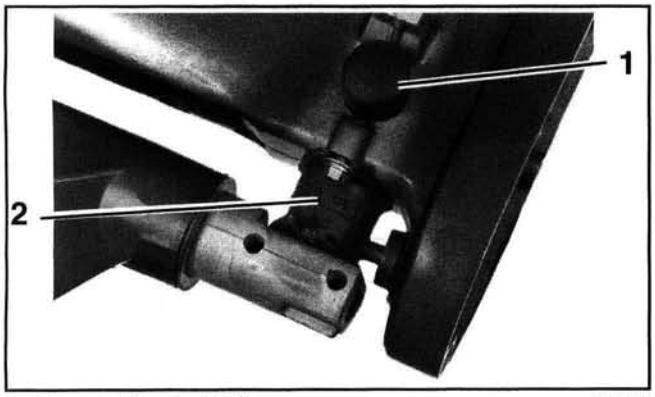
- Gearcase; refer to Gearcase **REMOVAL AND INSTALLATION** on p. 260.
- Powerhead; refer to Powerhead **INSTALLATION – 9.9/15** on p. 213.

8

25/30 MODELS

IMPORTANT: If not otherwise specified, apply *Gasket Sealing Compound* to threads of all screws.

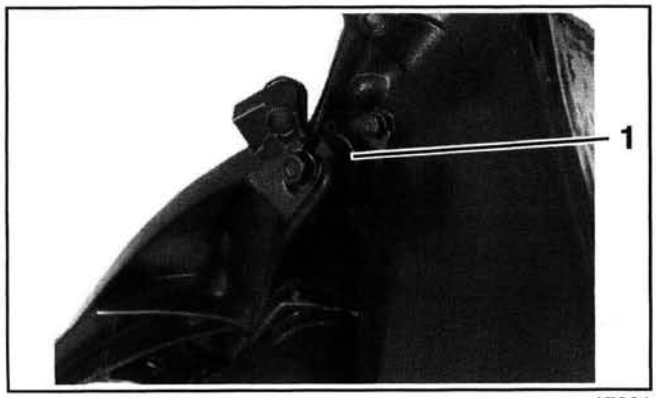
Apply *Gasket Sealing Compound* to the threads of lower side mounts. Install the two lower side mounts. Torque nuts to 144 to 168 in. lbs. (16 to 19 N·m).



1. *Lower side mount (2)*
2. *Lower front mount*

17393

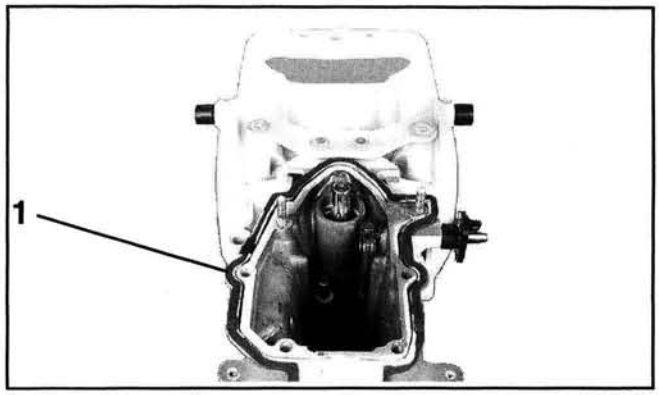
Install the lower front mount and the upper side mounts to the exhaust housing.



1. *Upper side mount*

17391

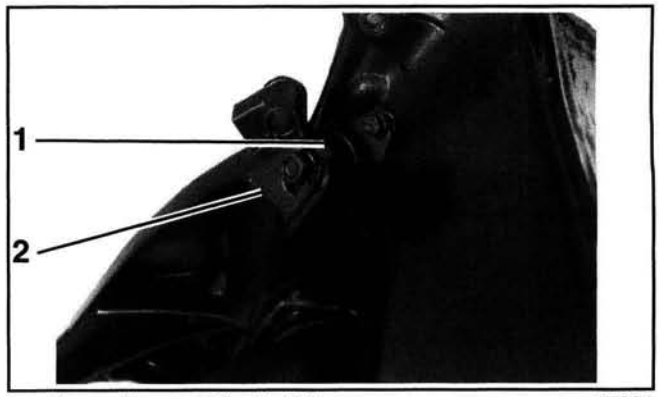
Install the lower motor cover bracket on the exhaust housing. Apply *Adhesive M* to the seal surface of the exhaust housing. Position a new exhaust housing to lower engine cover seal.



1. *Seal, lower engine cover*

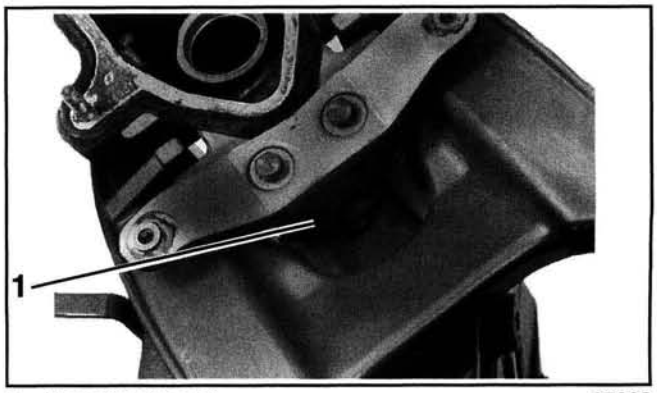
001019

Apply *Gasket Sealing Compound* to threads of the upper side mounts. Place front of the exhaust housing over the upper front mount. Push lower part of the exhaust housing toward the swivel bracket. Align the two upper side mounts in the slots of the steering bracket. Install the washers and nuts on the upper front mount and the two upper side mounts. Tighten the nuts to a torque of 144 to 168 in. lbs. (16 to 19 N·m).



1. *Upper side mount (port side)*
2. *Steering bracket*

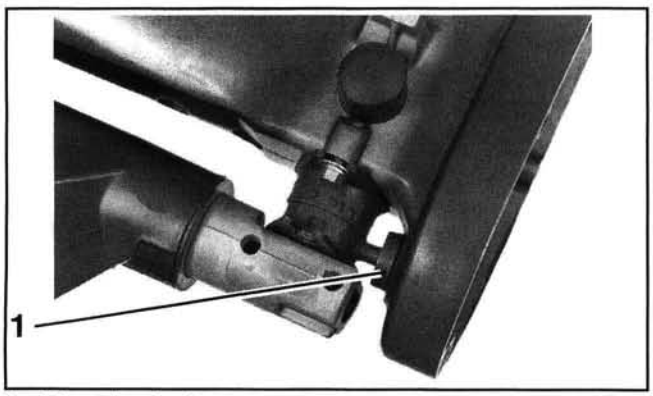
17391



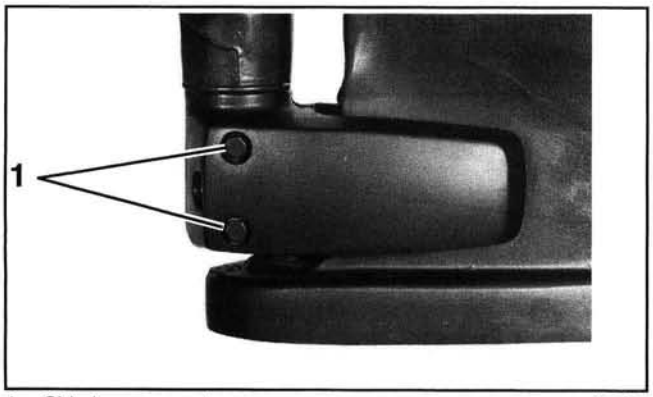
1. *Upper front mount*

17392

Slide the mount housing bumper into place between the lower front mount and the exhaust housing. Position the port and starboard lower mount housings. Clean the threads of the four lower mount housing screws and apply *Screw Lock* to threads of the screws. Install the two side lower mount screws, then install the two front screws. Tighten all four screws to a torque of 144 to 168 in. lbs. (16 to 19 N·m).

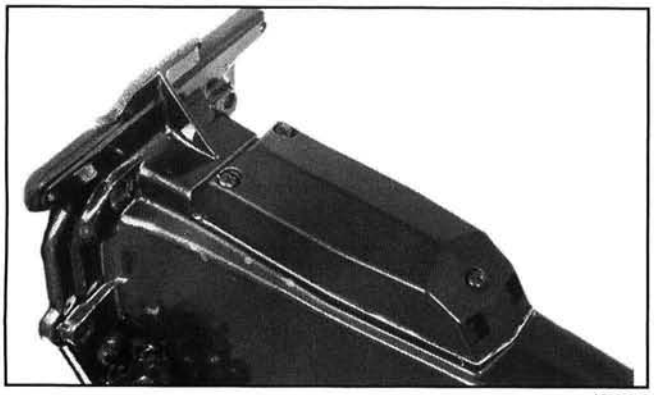


1. Mount housing bumper 17393



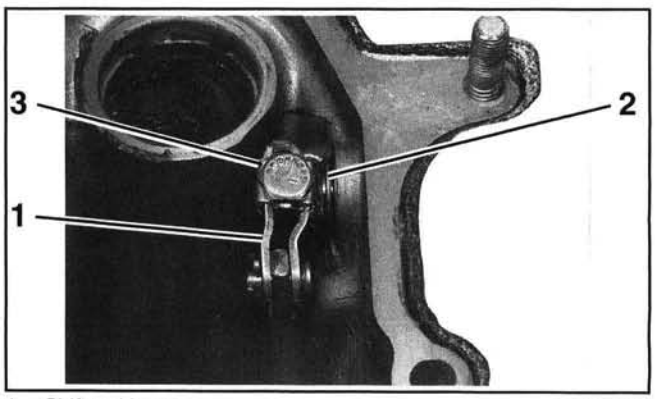
1. Side lower mount screws 17265

Apply *Gasket Sealing Compound* to a new idle relief muffler gasket. Place new seals on the screws. Position the gasket and install the muffler.



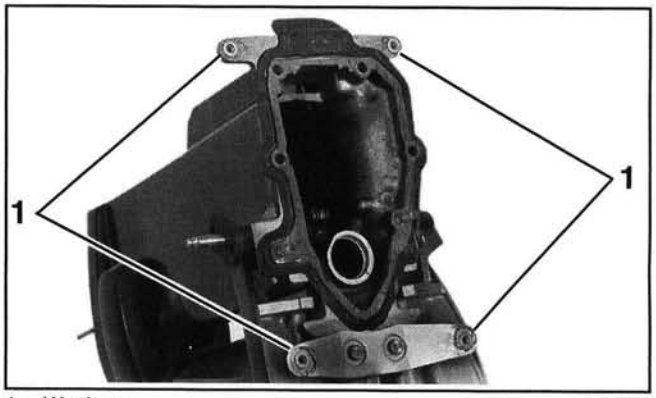
17394

Slide the adjusting lever and shaft through the exhaust housing with flat side up. As the adjusting lever and shaft comes through the exhaust housing, install the shift rod lever. Snap the shift shaft retainer into place. Place a new shift rod lever clip over the shift rod lever. Install and tighten the screw to a torque of 60 to 84 in. lbs. (7 to 9 N·m). Bend the locking tab of the clip against the head of the screw.



1. Shift rod lever COA2523
2. Retainer
3. Clip

If removed, apply *Adhesive M* to the four washers and place the washers as shown in figure. Place the lower engine cover on the exhaust housing. Install and tighten the screws to a torque of 72 to 96 in. lbs. (8 to 11 N·m).

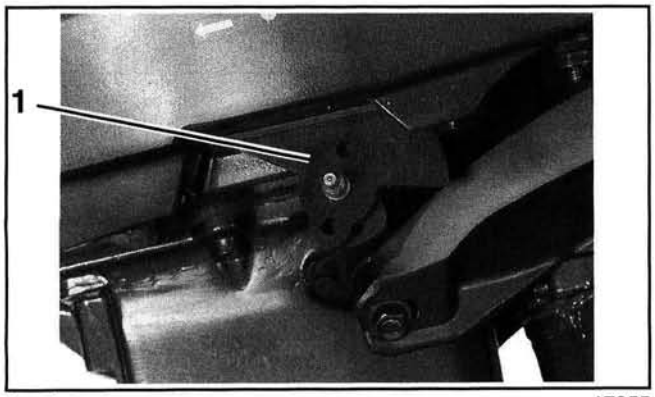


1. Washers 17263

8

TILLER MODELS

Slide the actuator cam through the lower engine cover. Place the bottom of the cam over the grease fitting of the adjustment lever and shaft. Secure the actuator cam to the adjustment lever and shaft with two screws, washers, and nuts. Torque screws to 60-80 in. lbs. (7-9 N·m).

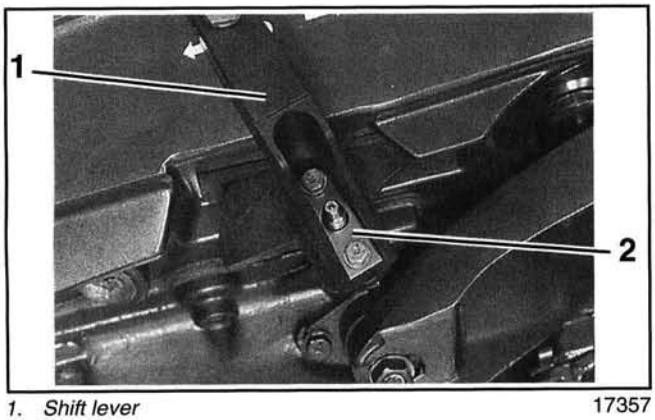


1. Actuator cam 17355

Position the actuator cam grommet in place in the lower engine cover.

REMOTE MODELS

Secure the spacer lever and shift lever to the adjustment lever and shaft with two screws, plate spacer, and nuts. Torque screws to 60 to 80 in. lbs. (7 to 9 N·m).



1. Shift lever 17357
2. Spacer

ALL MODELS

Install the following:

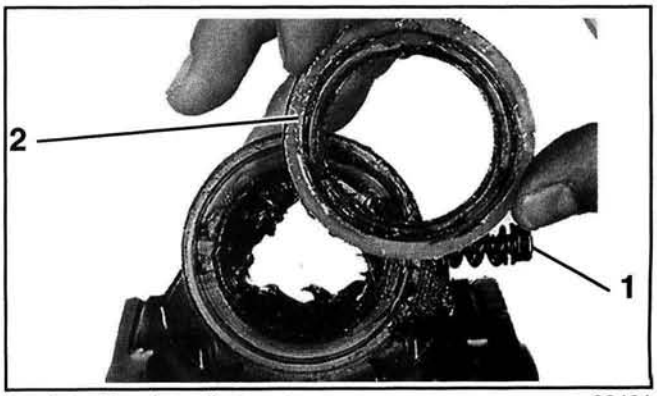
- Gearcase; refer to Gearcase **REMOVAL AND INSTALLATION** on p. 260.
- Powerhead; refer to Powerhead **INSTALLATION – 25/30** on p. 214.

SWIVEL BRACKET

Disassembly

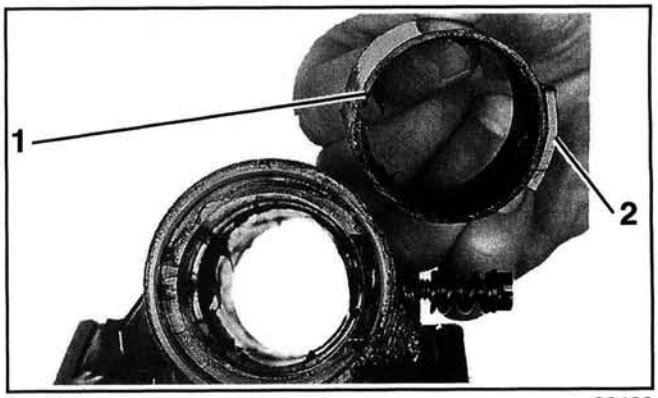
9.9/15 MODELS

Loosen the swivel bracket adjustment screw. Lift the steering bracket and pilot shaft from the swivel bracket. Remove the upper thrust washer/seal.



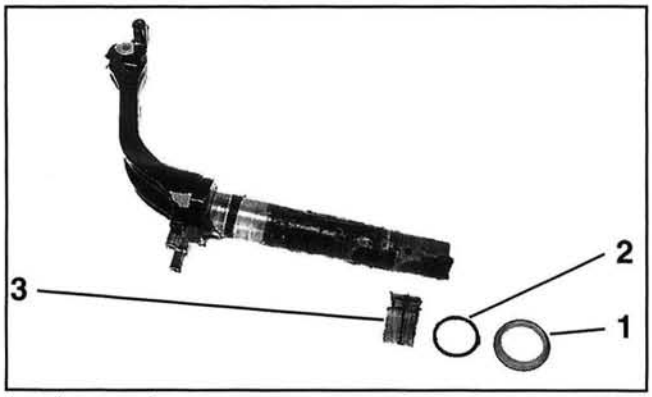
1. Swivel bracket adjustment screw 32481
2. Upper thrust washer

Remove liner and friction block from top of the swivel bracket.



1. Liner 32480
2. Friction block

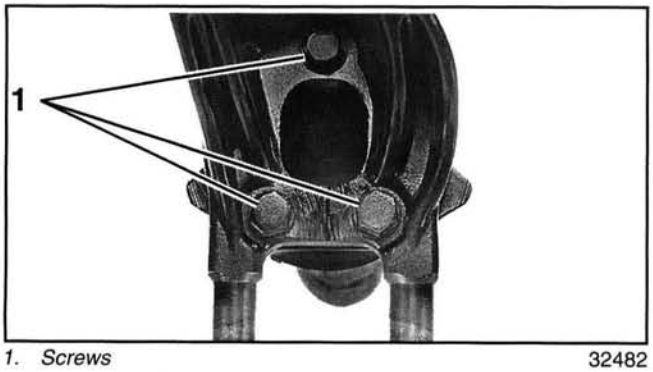
Remove the thrust washer, O-ring, and bushing from bottom of swivel bracket.



1. *Thrust washer*
2. *O-ring*
3. *Bushing*

32483

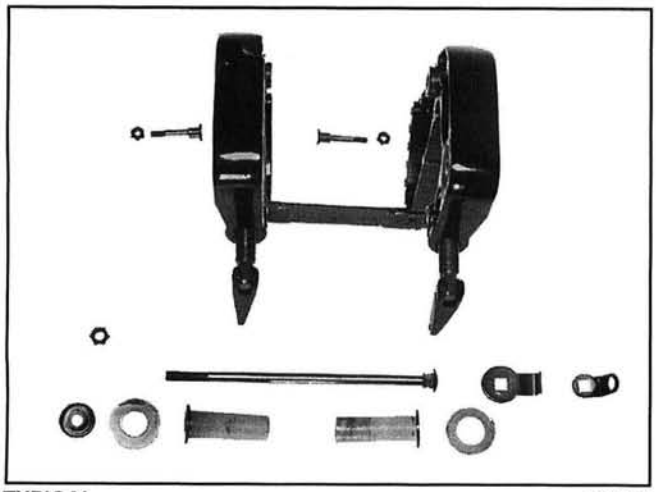
If necessary, disassemble the steering bracket from the pilot shaft by removing the three screws.



1. *Screws*

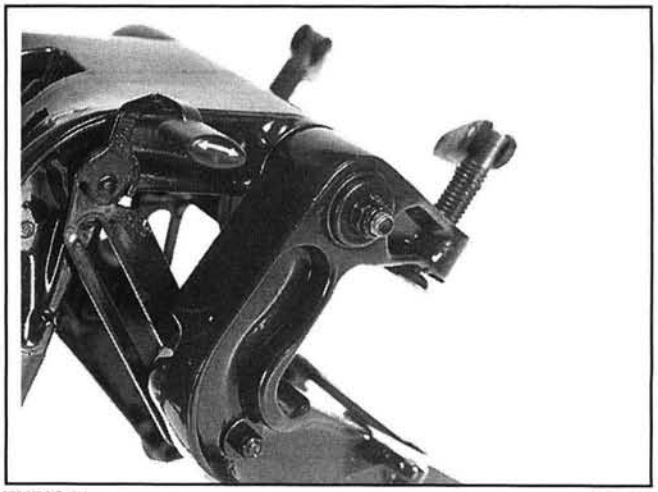
32482

If necessary, service the components of the stern brackets.



TYPICAL

32471



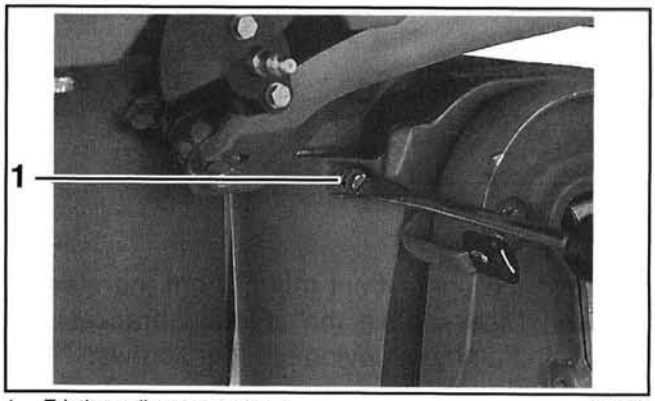
TYPICAL

32478

If the tilt bolt is removed, tighten the bolt to a torque of 60 to 84 in. lbs. (7 to 9 N·m) when assembled.

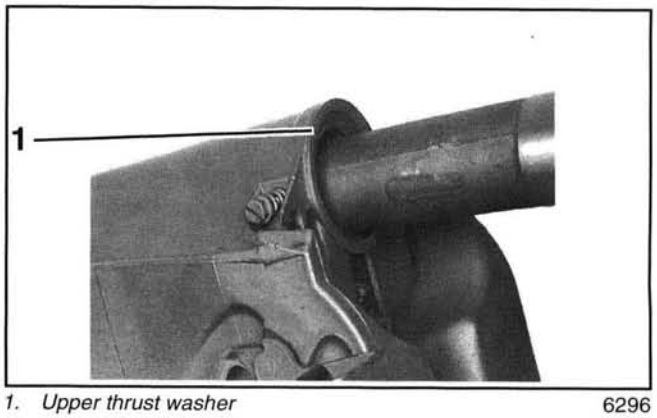
25/30 MODELS

Loosen the swivel bracket friction adjustment screw. Lift the steering bracket and pilot shaft from the swivel bracket. Remove upper thrust washer.



1. *Friction adjustment screw*

22100

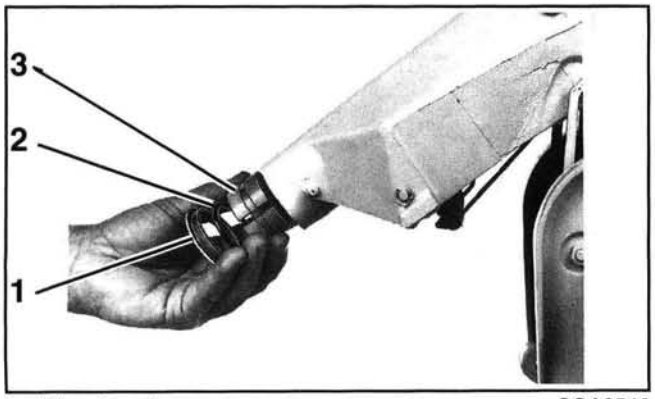


1. *Upper thrust washer*

6296

8

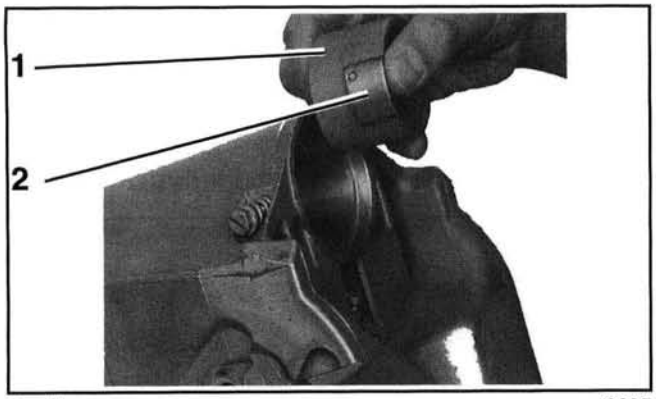
Remove the lower thrust washer, O-ring, and lower bushing from the swivel bracket.



1. *Thrust washer*
2. *O-ring*
3. *Lower bushing*

COA2546

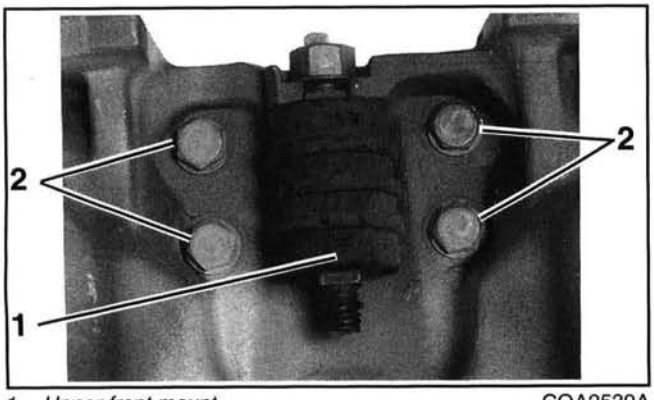
Remove the liner and friction block from the swivel bracket.



1. *Liner*
2. *Friction block*

6295

Remove the upper front mount from the steering bracket. Disassemble the steering bracket from the pilot shaft by removing the four screws.



1. *Upper front mount*
2. *Screws*

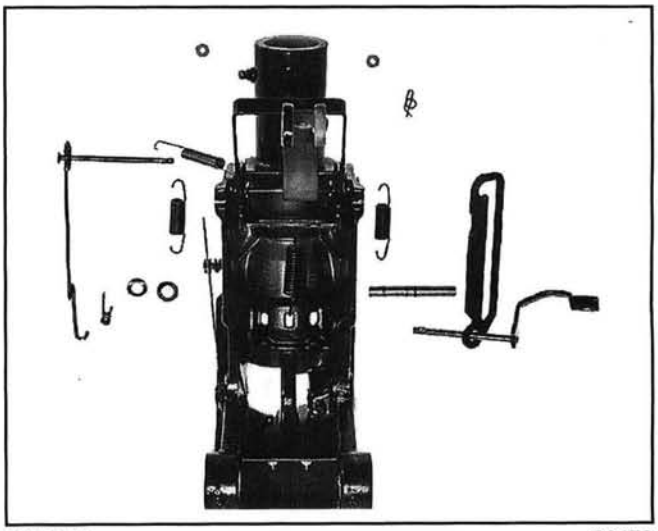
COA2539A

Assembly

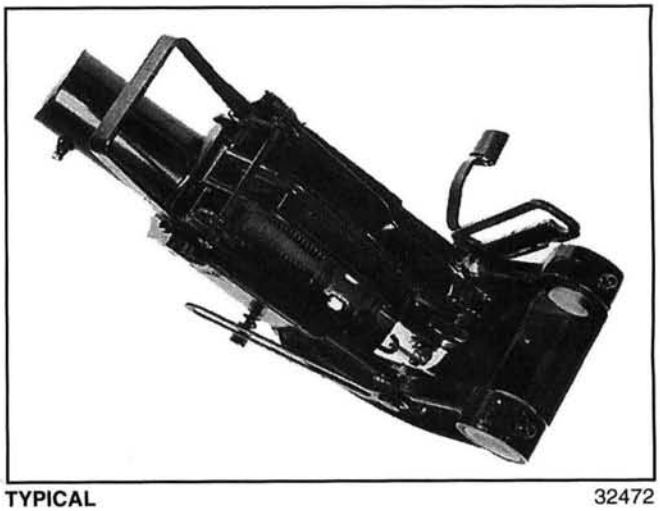
IMPORTANT: Lubricate pilot shaft and bushings with *Triple-Guard* grease.

9.9/15 MODELS

If any of the swivel bracket components were removed, refer to the two reference pictures for correct reassembly.

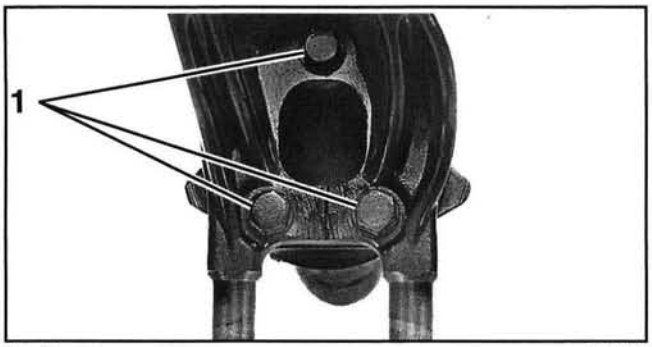


TYPICAL 32473



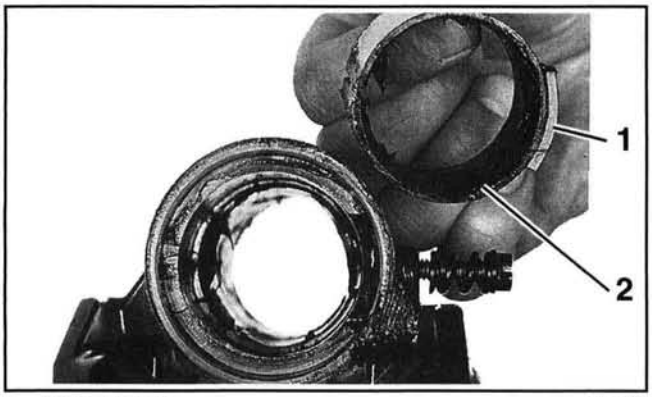
TYPICAL 32472

If removed, install the steering bracket to the pilot shaft with the three screws. Apply *Screw Lock* to the threads. Torque screws to 18 to 20 ft. lbs. (24 to 27 N·m).

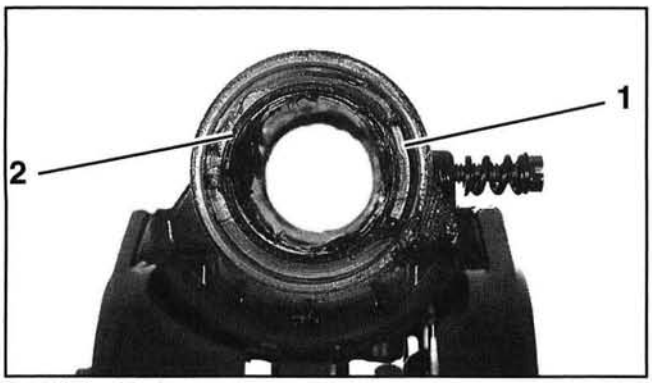


1. Screws 32482

Assemble the friction block and liner. Lubricate and place the liner and friction block in the swivel bracket.

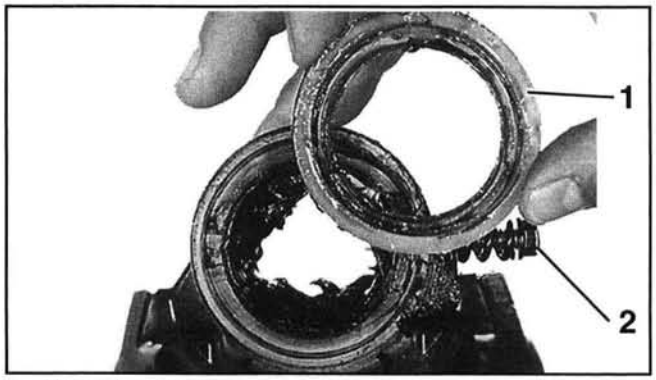


1. Friction block 32480
2. Liner



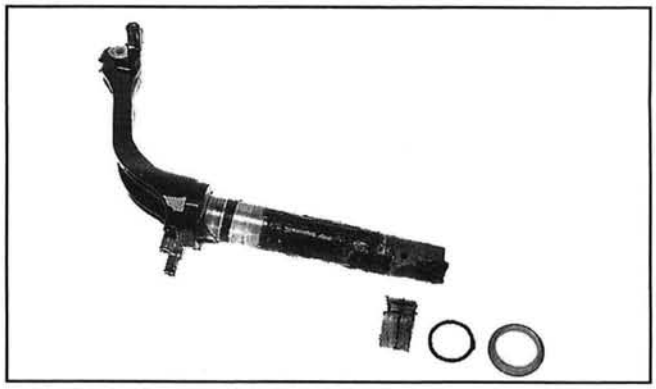
1. Friction block 32479
2. Liner

Install the upper thrust washer on the swivel bracket.



1. Upper thrust washer 32481
1. Friction adjustment screw

Apply *Triple-Guard* grease to the lower bushing. Install the lower bushing, O-ring, and lower thrust washer.



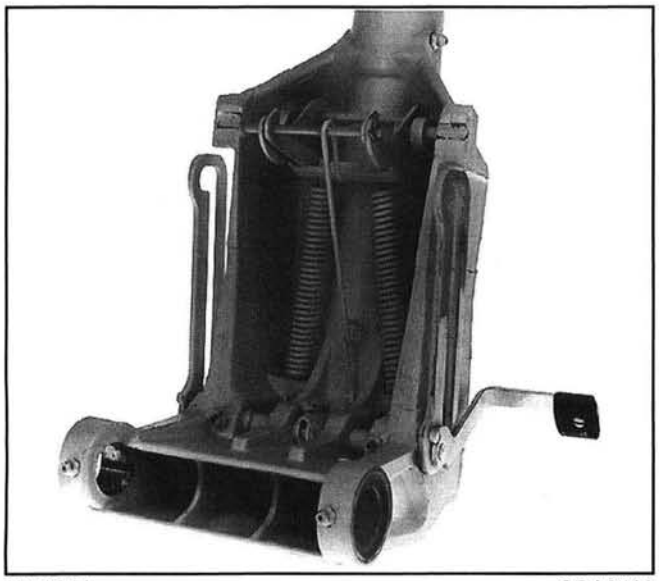
32483

Apply *Triple-Guard* grease to the pivot tube. Install the pivot tube and steering bracket into the swivel bracket. Thread the friction adjustment screw with spring into the swivel bracket to retain the steering bracket.

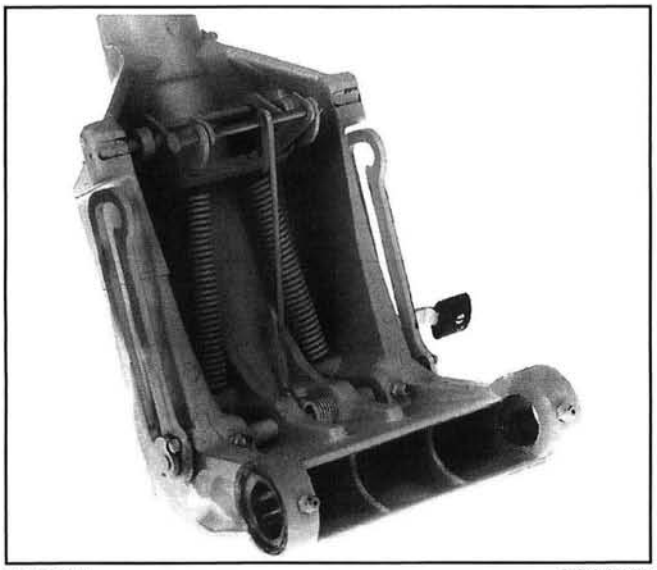
8

25/30 MODELS

If any of the swivel bracket components were removed, refer to the two reference pictures for correct reassembly.

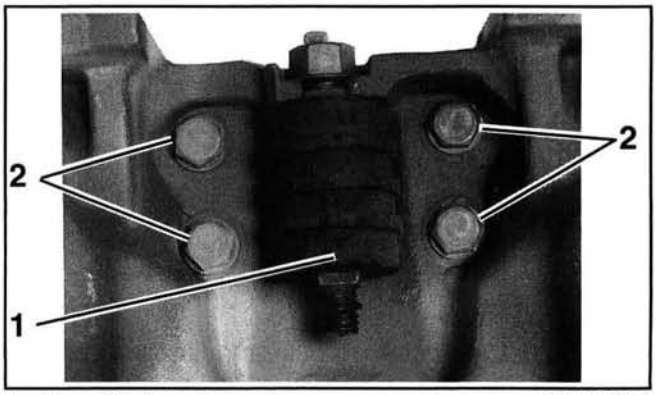


TYPICAL COA2544



TYPICAL COA2543

Clean the threads of the four steering bracket to pivot shaft screws thoroughly. Apply *Screw Lock* to the threads. Apply *Ultra Lock* to top mating flange of the pilot shaft. Assemble the pilot shaft to the steering bracket. Torque screws to 120 to 144 in. lbs. (14 to 16 N·m).

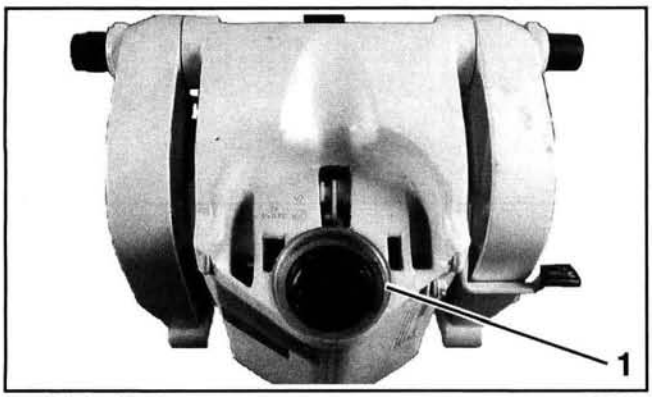


1. *Upper front mount* COA2539A
2. *Screws*

Install the upper front mount to the steering bracket with nut and washer. Tighten the nut to a torque of 144 to 168 in. lbs. (16 to 19 N·m).

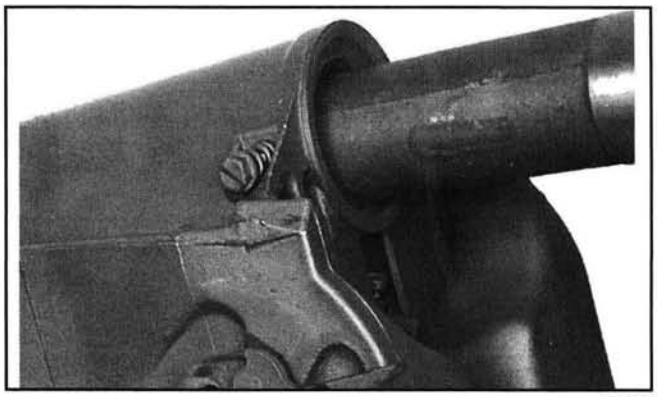
Assemble the friction block and liner. Lubricate and place the liner and friction block in the swivel bracket.

6295



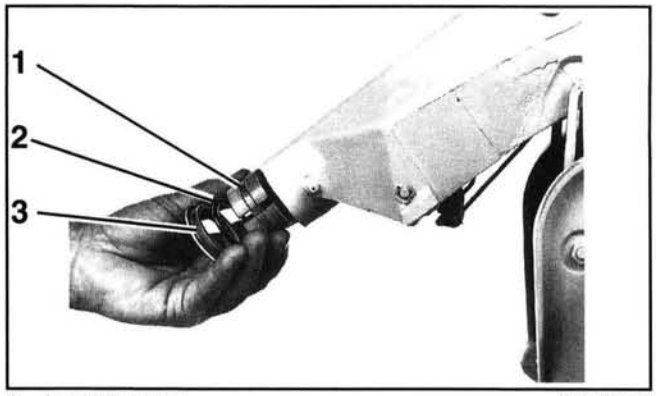
1. Friction block 001017

Install the upper thrust washer. Slide the pilot shaft into the swivel bracket.



6296

Lubricate and slide the lower bushing, O-ring, and lower thrust washer on the pilot shaft and seat in the swivel bracket.



1. Lower bushing COA2546
2. O-ring
3. Thrust washer

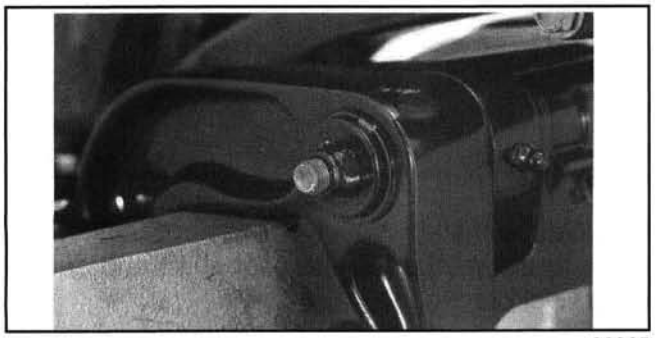
8

ADJUSTMENTS

Tilt Friction Adjustment

9.9/15 MODELS

Use 9/16 in. wrench to tighten the tilt shaft nut only enough to control the return of the gearcase from TILT to RUN position.



32925

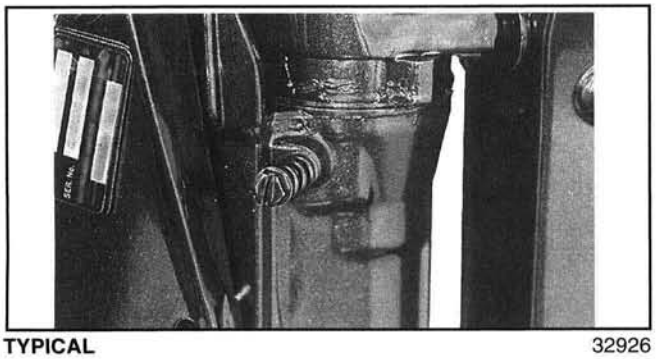
Steering Friction Adjustment

ALL MODELS

Adjust steering friction with outboard mounted to boat by loosening or tightening screw with screwdriver. Steering friction should be adjusted so that a slight drag is felt when turning. Minimum friction is required when remote steering is used.

⚠ WARNING ⚠

Do not overtighten. The steering friction screw is not intended to allow "hands off" steering.

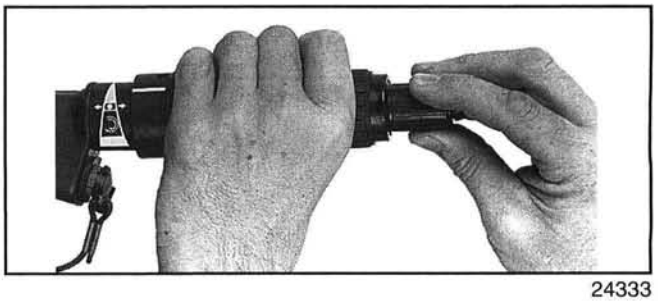


TYPICAL 32926

Idle Speed Adjustment

TILLER MODELS

The idle speed adjusting knob is located on the steering handle. Turning the knob clockwise increases idle speed, turning it counterclockwise decreases idle speed. Make certain that throttle is in SLOW position and the outboard is at normal operating temperature before making the idle speed adjustment. Outboard should idle at recommended RPM in gear. Refer to **SYNCHRONIZATION AND LINKAGE ADJUSTMENTS – 9.9/15** on p. 70 or **SYNCHRONIZATION AND LINKAGE ADJUSTMENTS – 25/30** on p. 73.



24333

Throttle Friction Adjustment

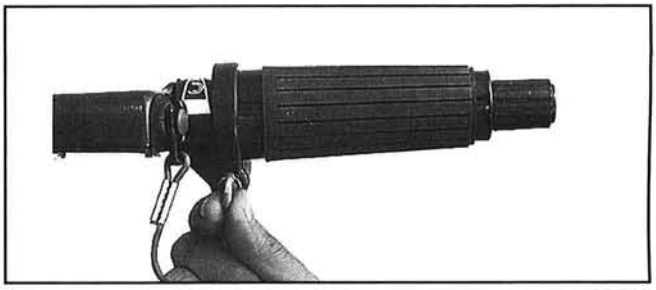
TILLER MODELS (OPTIONAL)

Some models are equipped with a throttle friction adjustment knob located on the steering handle. Tighten the knob to reduce the effort required to hold a throttle setting.

Turn the knob clockwise to **increase** friction or counterclockwise to **decrease** friction.

⚠ WARNING ⚠

Tighten knob only enough to hold throttle at a constant engine speed. Overtightening will prevent quick throttle change in case of emergency.



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GEARCASE

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SERVICE CHART

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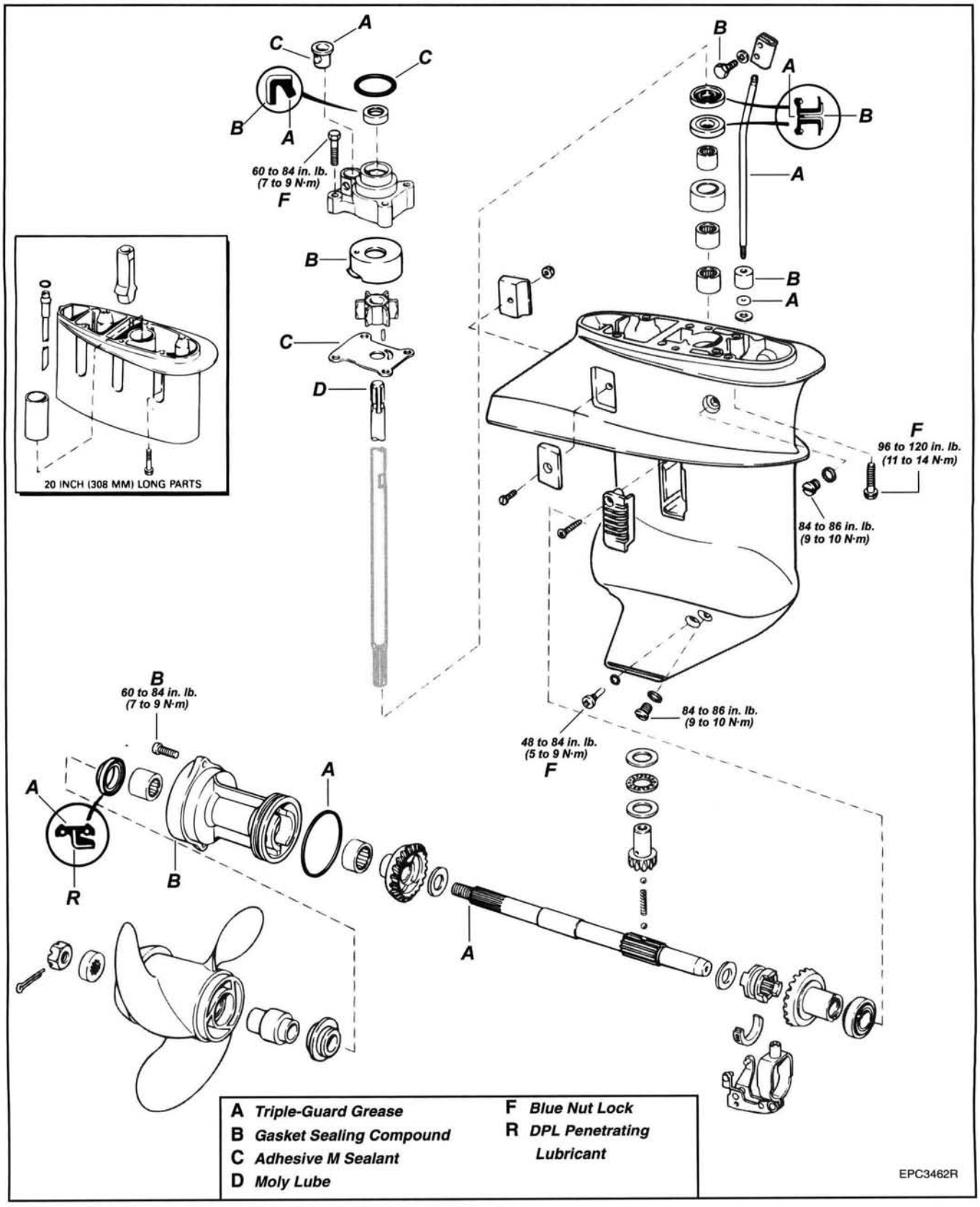
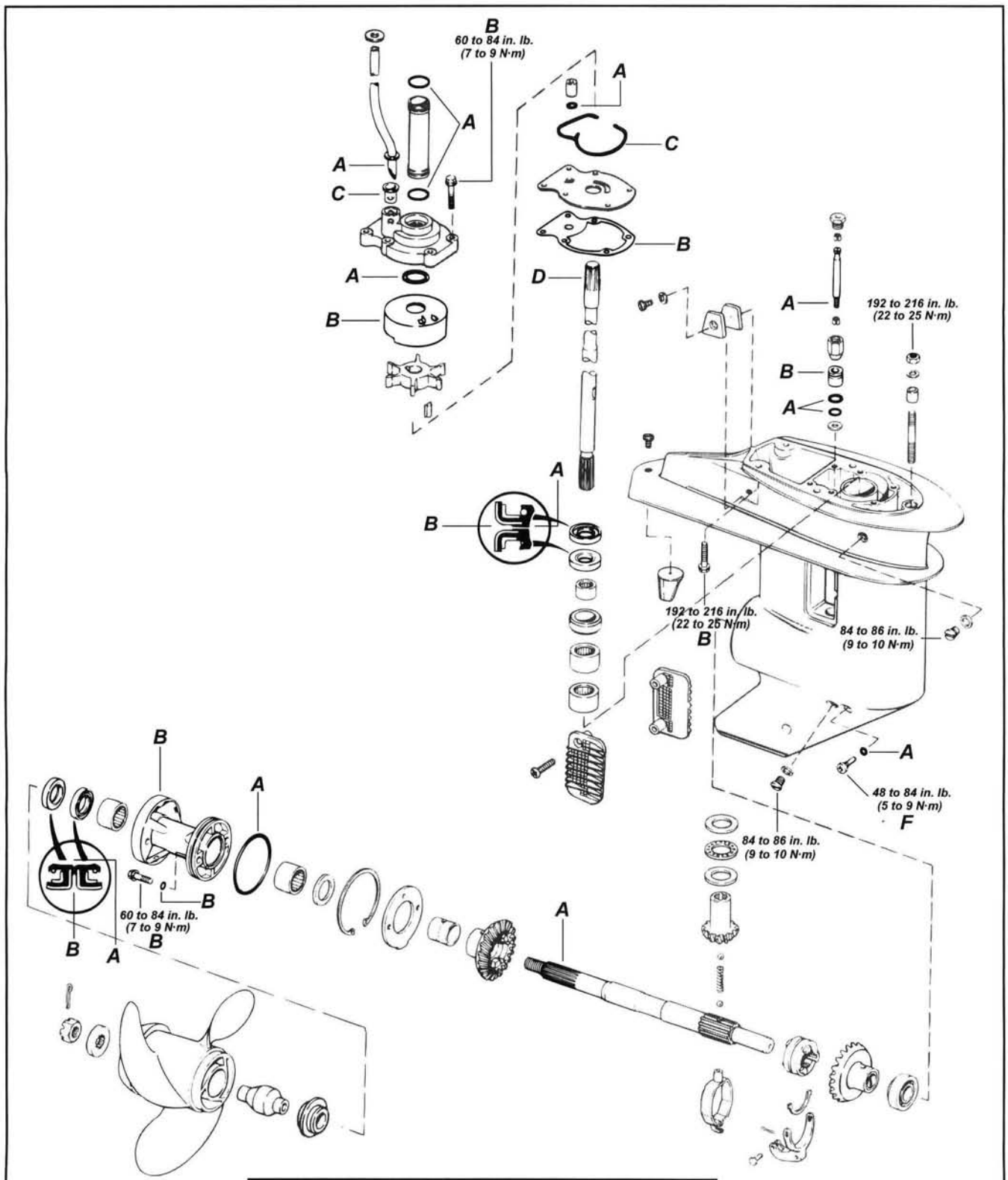


25/30 MODELS



SAFETY INFORMATION

Before working on any part of the outboard, read the SAFETY section at the end of this manual.

DANGER

Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off. Remove propeller before servicing and when running the outboard on a flusher.

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

WARNING

Wear safety glasses to avoid personal injury, and set compressed air to less than 25 psi (172 kPa).

The motor cover and flywheel cover are machinery guards. Use caution when conducting tests on running outboards. DO NOT wear jewelry or loose clothing. Keep hair, hands, and clothing away from rotating parts.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

To prevent accidental starting while servicing, disconnect the battery cables at the battery. Twist and remove all spark plug leads.

The electrical system presents a serious shock hazard. DO NOT handle primary or secondary ignition components while outboard is running or flywheel is turning.

Gasoline is extremely flammable and highly explosive under certain conditions. Use caution when working on any part of the fuel system.

Protect against hazardous fuel spray. Before starting any fuel system service, carefully relieve fuel system pressure.

Do not smoke, or allow open flames or sparks, or use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

Keep all electrical connections clean, tight, and insulated to prevent shorting or arcing and causing an explosion.

Always work in a well ventilated area.

Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to tightening must be felt when reusing a locking fastener. If replacement is indicated, use only authorized replacement or equivalent.

PROPELLER

Inspection

- Damaged blades and signs of propeller cavitation (burned paint, etc.)
- Spun or overheated inner hub
- Worn or twisted splines and inadequate lubricant
- Damaged or missing converging ring (if applicable)
- Damage to outer hub area
- Worn, missing, or incorrect thrust washer and spacer
- Correct size
- Check for bent or damaged propeller shaft and twisted splines

Installation

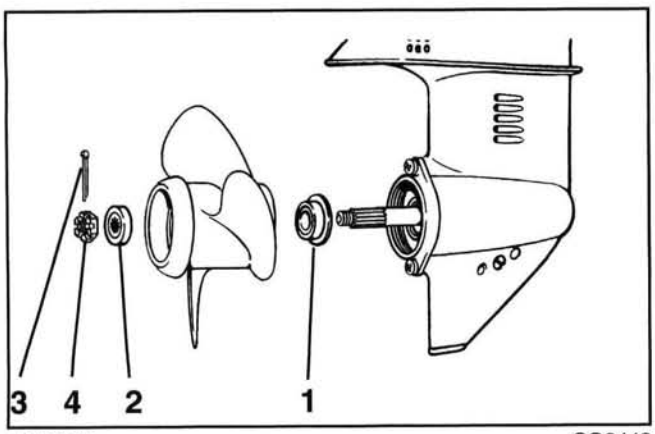
Place outboard's shift lever in NEUTRAL.

Apply *Triple-Guard* grease to inner taper of propeller thrust bushing and the propeller shaft.

Install thrust bushing onto propeller shaft with shoulder of thrust bushing facing aft matching tapers.

Install propeller on propeller shaft by aligning splines and pushing until seated on the thrust bushing.

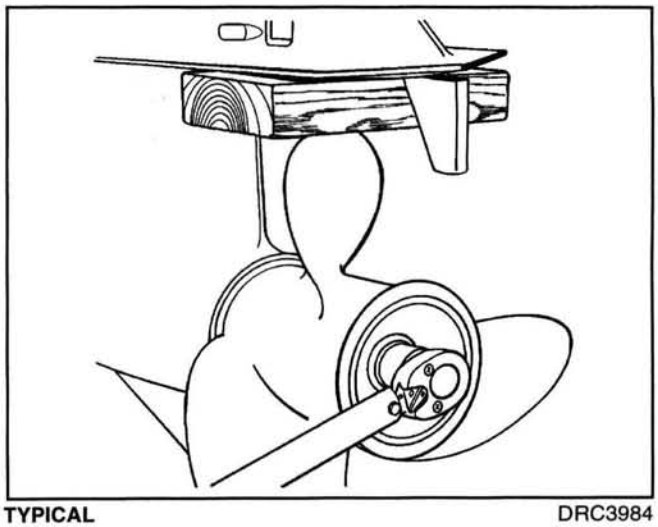
Install the spacer, engaging the propeller shaft splines.



TYPICAL CO2443

1. *Thrust bushing*
2. *Thrust washer*
3. *Cotter pin*
4. *Propeller nut*

Wedge a block of wood between propeller blade and the anti-ventilation plate.



TYPICAL DRC3984

Install the propeller nut and torque to 120 in. lbs. (14 N·m). If cotter pin holes in the propeller nut and propeller shaft are not aligned, continue to tighten the nut until they are in line. Do not loosen.

Insert a **new** cotter pin through the propeller nut and shaft. Bend its ends over the nut to secure the assembly. Remove block of wood.

IMPORTANT: After fastening propeller nut, make sure outboard is in NEUTRAL and carefully spin propeller. Propeller must turn freely and should not spin off center. If propeller appears to spin off center, check for possible bent propeller shaft.

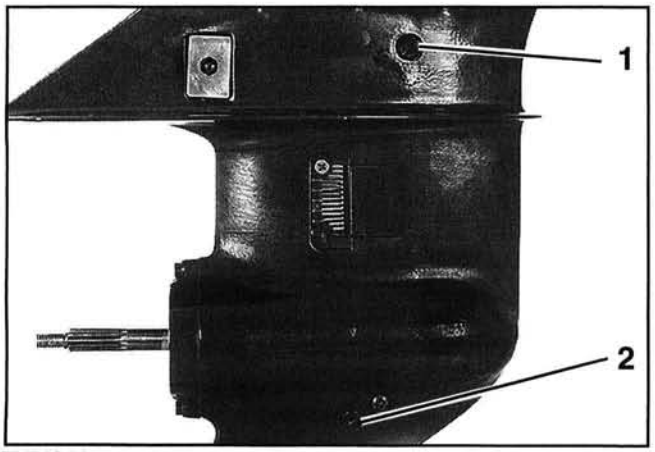
LUBRICANT

Draining

WARNING

Gearcase lubricant may be under pressure and/or hot. If plug is removed from a recently operated outboard, take precautions to avoid injury.

Remove the lubricant level plug, then the lubricant drain/fill plug, and drain the lube from the gearcase into a container. Inspect the lubricant for metal chips.



TYPICAL 32396
1. *Lubricant level plug*
2. *Lubricant drain/fill plug*

The presence of metal **fuzz** can indicate normal wear of the gears, bearings, or shafts within the gearcase. Metal **chips** can indicate extensive internal damage.

Inspection

Inspect the lubricant for water contamination. Water can make the lubricant milky in appearance. However, normal aeration can also cause the same appearance.

To check for water contamination, drain lubricant into a suitable glass container. Allow the drained oil to settle for a minimum of one hour to determine if there is an abnormal amount of water in the oil. Some gearcase lubricants are designed to mix with a small amount of water from normal water vapor condensation within the gearcase.

Refer to **LEAK TEST PROCEDURE** on p. 260.

Overheated lubricant will have a black color and burned odor.

Internal gearcase inspection is recommended when lubricant is contaminated or shows signs of failure.

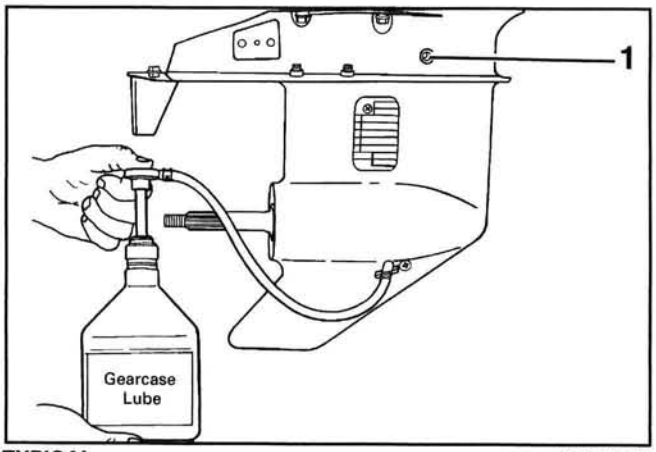
Filling

Secure the gearcase in a vertical position.

Remove the lubricant level plug and the lubricant drain/fill plug.

Slowly fill the gearcase with *Ultra-HPF* gearcase lube through the drain/fill hole until it appears at the oil level hole. Filling the gearcase too quickly can cause air pockets and the gearcase may not fill completely.

Clean plug seal area and install the lubricant level plug and **new** seal, then the lubricant drain/fill plug and **new** seal. Tighten them to a torque of 60 to 84 in. lbs. (7 to 9.5 N·m).



TYPICAL DR33673
1. *Oil level hole*

LEAK TEST PROCEDURE

Drain lubricant before testing.

STEP 1
Install lubricant drain/fill plug and seal, thread pressure test gauge fitting and seal in lubricant level fill hole.

Pressurize 3 to 6 psi (21 to 42 kPa).

If pressure gauge indicates leakage, submerge the gearcase in water to determine source of leak.

If the gearcase pressure gauge does not indicate leakage, increase pressure to 16 to 18 psi (110 to 124 kPa). Check for leakage.

Make necessary repairs and repeat test.

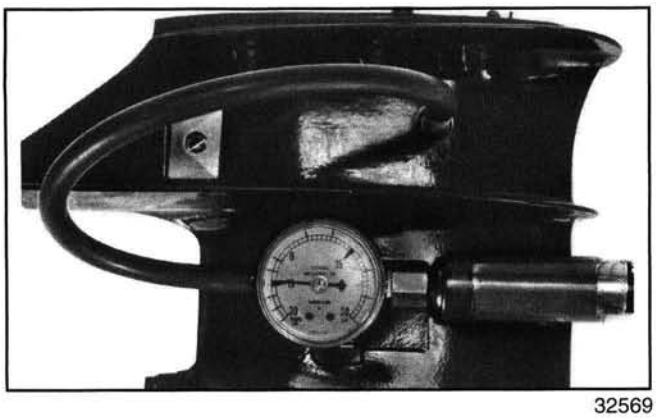
STEP 2
Complete successful **STEP 1** before proceeding.

Install vacuum test gauge. Apply 3 to 5 in. of vacuum (76 to 127 mm) Hg. with pump.

Check for leakage.

If leakage occurs, apply oil around suspected seal. If leak then stops or oil is drawn in, that seal is defective.

Repeat test. Gearcase must hold minimum of 15 in. Hg. (kPa).



32569

REMOVAL AND INSTALLATION

Removal

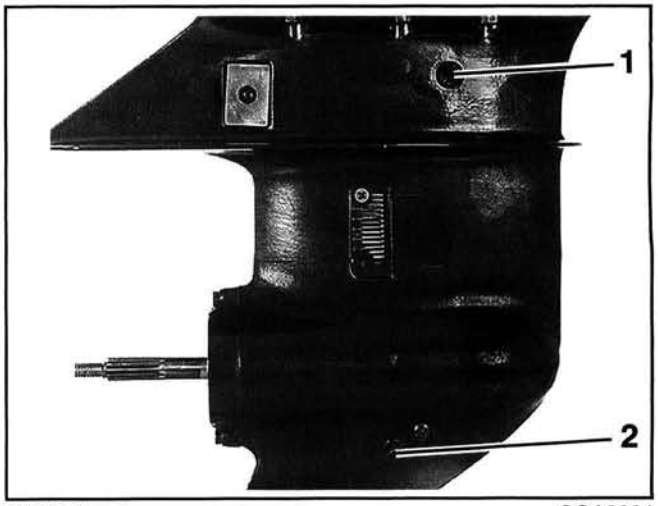
⚠ WARNING ⚠

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

Remove the propeller from the gearcase. Inspect the condition of the propeller hub.

25/30 MODELS
Remove the trim tab.

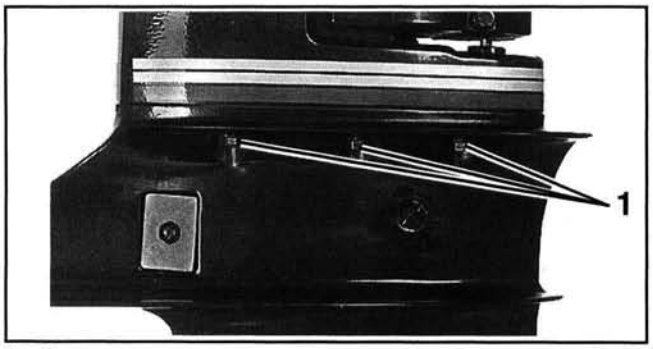
ALL MODELS
Drain the gearcase by first removing the oil level plug, then the oil fill/drain plug.



TYPICAL COA3264
1. *Oil level plug* 32396
2. *Oil fill/drain plug*

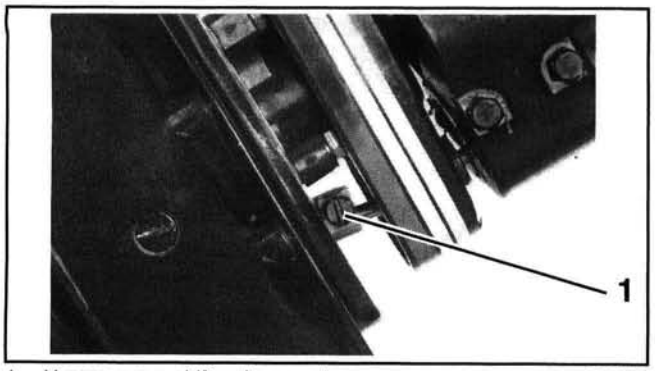
9.9/15 MODELS

Remove six screws attaching gearcase to exhaust housing.



1. Screws 32397

Separate gearcase and exhaust housing to expose the shift rod connector. Remove the upper connector screw.

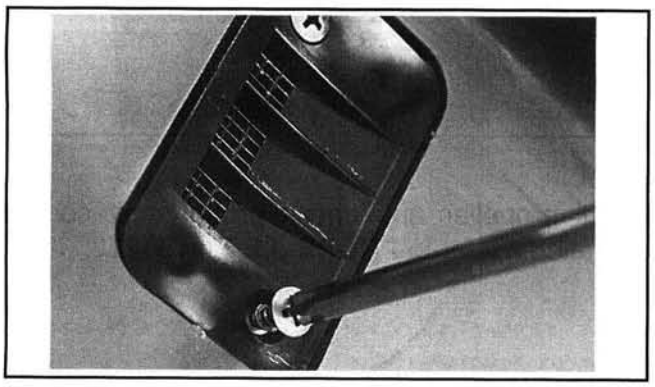


1. Upper screw, shift rod connector 32566

Remove gearcase from the exhaust housing and place in a suitable holding fixture.

25/30 MODELS

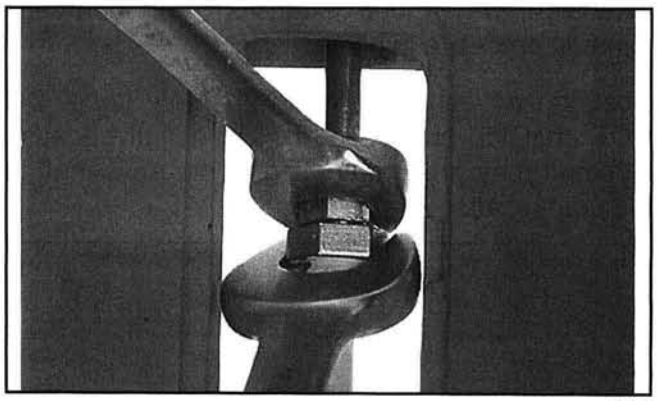
Remove both water intake screens.



21078

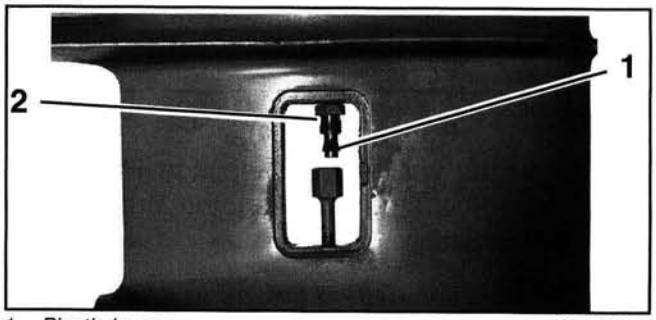
IMPORTANT: Remove any paint from the upper shift rod before disassembling the shift rod connectors.

Disengage the shift rods using two open-end wrenches.



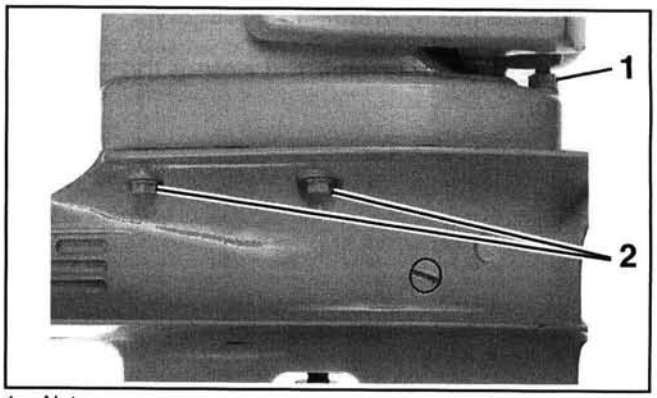
1937

Remove and discard the upper plastic keeper. Remove the upper connector.



1. Plastic keeper
2. Upper connector COB3045

Remove the nut and the four gearcase to exhaust housing screws.



1. Nut
2. Screws 1946

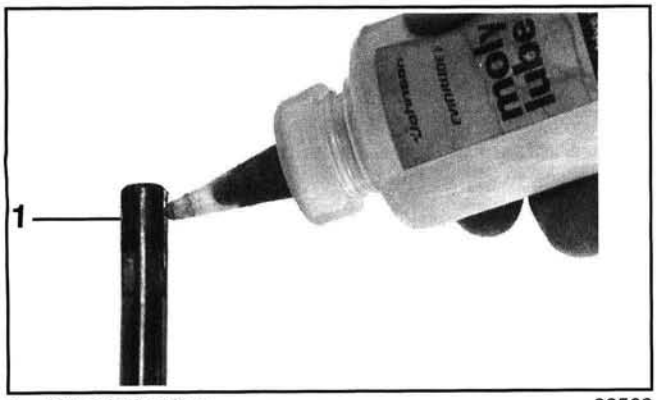
Remove gearcase from the exhaust housing and place in a suitable holding fixture.

Installation

9.9/15 MODELS

IMPORTANT: On models with a gearcase extension kit, make sure the driveshaft tube extension, water tube extension, and gearcase exhaust seals are in place.

Coat the driveshaft splines with *Moly Lube*. DO NOT coat top surface of the driveshaft because lubricant may prevent seating of the driveshaft in the crankshaft.



1. Driveshaft splines 32568

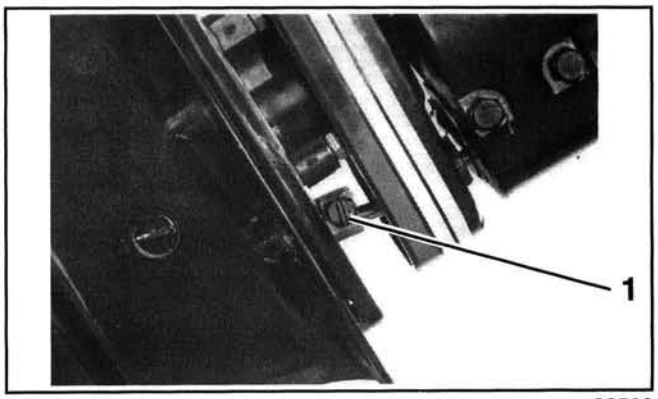
Pull up on the shift rod and engage REVERSE gear. Move the shift lever on the outboard to REVERSE position.

Lightly apply *Triple-Guard* grease to lower outside diameter of the water tube.

Install the gearcase onto the exhaust housing. Guide the water tube into the water tube grommet and see that the driveshaft engages the crankshaft. Rotate the flywheel, if necessary.

Make sure the upper shift rod enters the shift rod connector.

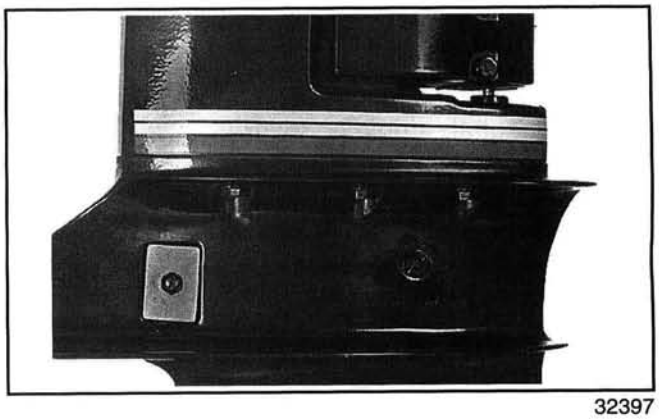
Align the groove in the lower shift rod with the screw hole in the connector. Apply *Gasket Sealing Compound* to shift rod connector screw. Install and tighten the screw with washer to a torque of 60 to 84 in. lbs. (7 to 9 N·m).



1. Screws 32566

Apply *Nut Lock* to the threads of the gearcase (and extension) retaining screws. Install and tighten the screws to a torque of 96 to 120 in. lbs. (11 to 14 N·m).

IMPORTANT: When installing a gearcase to a gearcase extension, do not tighten the retaining screws until the gearcase and the extension have been placed in proper position with the exhaust housing and powerhead assembly.

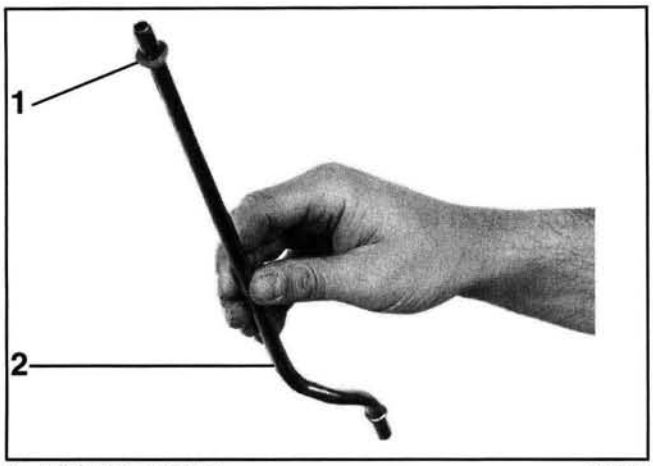


32397

Install propeller and check proper shift control operation. Refer to **PROPELLER** on p. 258.

25/30 MODELS

Check outside diameter of the water tube for dents and burrs. Remove dents and burrs. Check to be sure the water tube washer is positioned on the water tube.

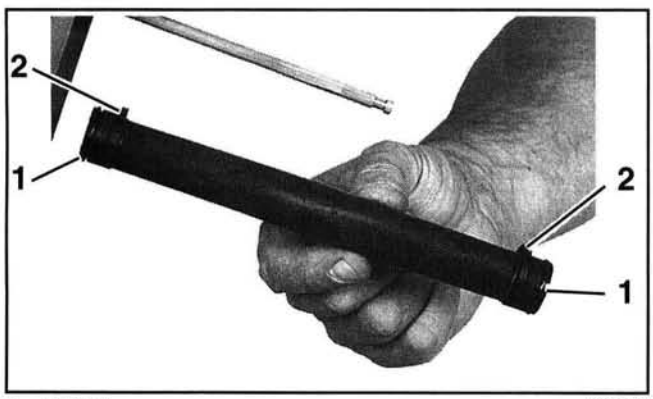


1. *Water tube washer*
2. *Water tube*

12562

Lightly apply *Triple-Guard* grease to upper and lower outside diameter of the water tube. Install the straight end of water tube through the guide and into inner exhaust tube.

Apply *Triple-Guard* grease to two new driveshaft spacer O-rings. Install O-rings on the driveshaft spacer. Position spacer in exhaust housing with tabs facing rear of the housing.



1. *O-rings*
2. *Tabs*

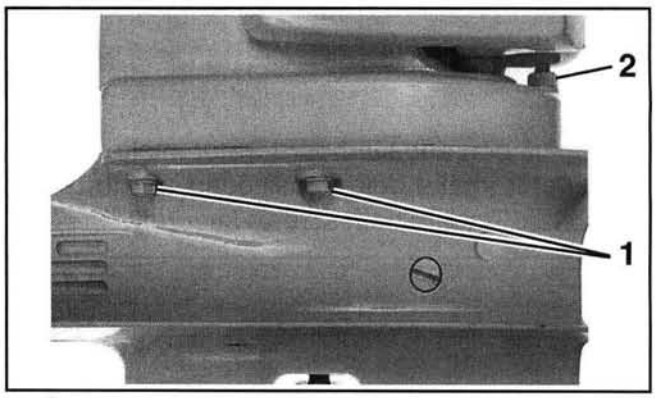
32895

Coat the driveshaft splines with *Moly Lube.* Do not coat top surface of the driveshaft as the lubricant here may prevent seating of the driveshaft in the crankshaft. Coat upper shift rod with *Triple-Guard* grease.

Temporarily install the upper shift rod connector on the gearcase lower shift rod.

Install the gearcase onto the exhaust housing. Guide the water tube into the water tube grommet and see that the driveshaft engages the crankshaft. Rotate the flywheel, if necessary.

Apply *Gasket Sealing Compound* to the threads of the gearcase (and extension) retaining screws and threads of the gearcase stud. Place lock washer on stud. Install and tighten the screws and one nut to a torque of 192 to 216 in. lbs. (22 to 25 N·m).

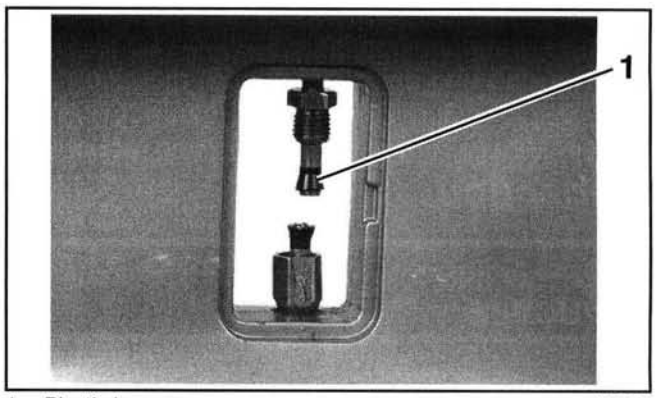


1. *Screws*
2. *Nut*

1946

IMPORTANT: When installing a gearcase on models with a gearcase extension, do not tighten the retaining screws until the gearcase and the extension are properly aligned with the exhaust housing.

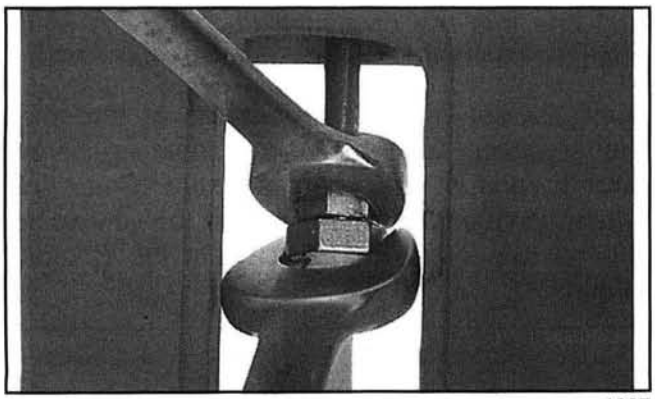
Slide the upper connector half onto the upper shift rod and install the plastic keeper.



1. *Plastic keeper*

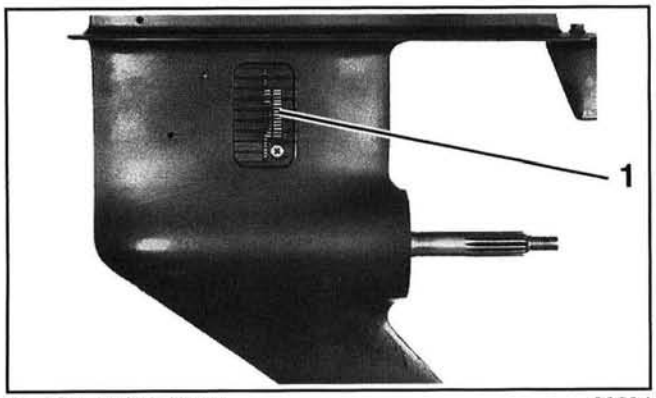
12526

Move the shift lever until the upper shift rod engages the lower shift rod connector. While holding the lower shift rod connector, tighten the upper shift rod connector securely.



1937

Install the port and starboard water intake screens with water intake holes positioned at the rear of gearcase. Tighten both screws securely.



1. Water intake holes 32894

Install the propeller. Refer to **PROPELLER** on p. 258.

Confirm proper shift control operation.

R AND TE MODELS

Adjust the shift lever (actuator cam) and the neutral start switch. Refer to Shift Linkage **Adjustment** on p. 177, and **NEUTRAL START PROTECTION** on p. 178.

EL MODELS

Rotate the propeller shaft and move the shift lever to shift gearcase into NEUTRAL position.

Loosen both shift lever screws.

Adjust the shift lever to align with the centerline of the crankshaft.

Tighten the shift lever screws to a torque to 60 to 84 in. lbs. (7 to 9 N·m).

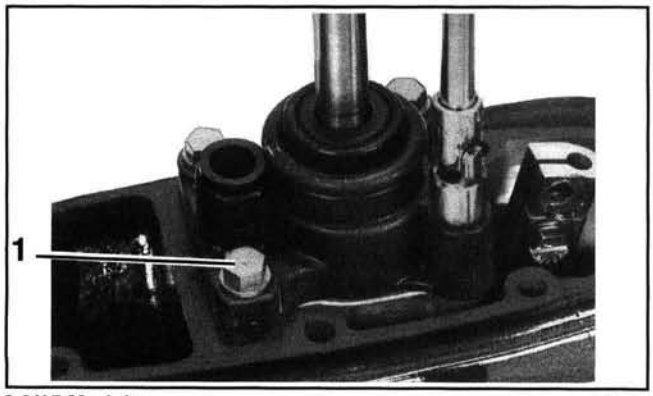
22139

WATER PUMP

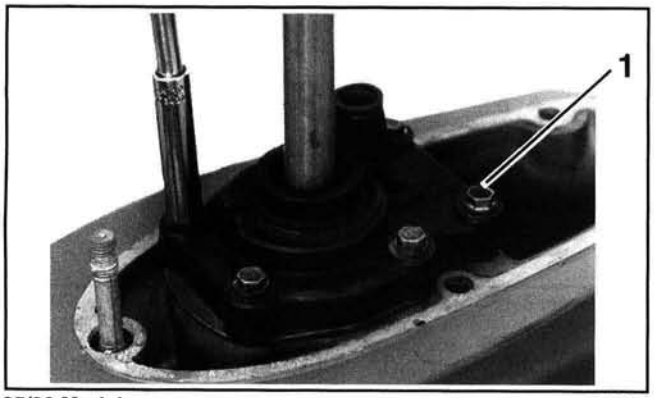
Disassembly

Remove gearcase from exhaust housing as described in **REMOVAL AND INSTALLATION** on p. 260.

Remove the impeller housing screws.



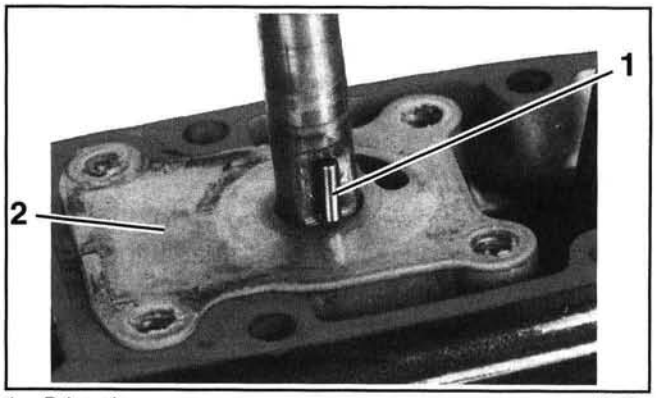
9.9/15 Model 16306
1. Screws, four (4)



25/30 Model 21066
1. Screws, six (6)

9.9/15 Models

Remove the impeller housing and impeller by sliding them up and off the driveshaft. Then remove the impeller drive pin and impeller plate.



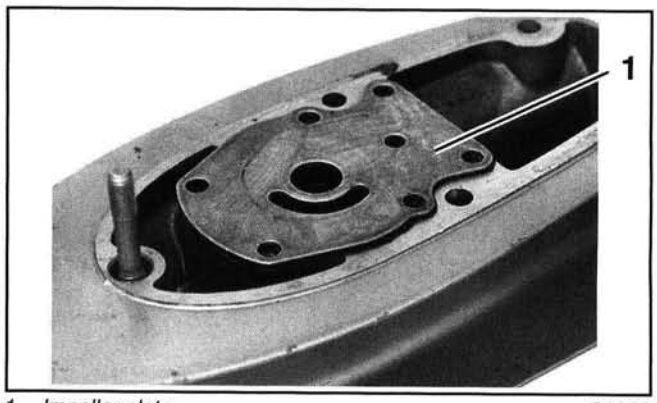
1. Drive pin 16307
2. Impeller plate

Remove and discard the water tube grommet, O-ring, and seal in the impeller housing.

25/30 Models

Pull up on the driveshaft and remove the driveshaft with the water pump assembly from the gearcase. Remove the water pump assembly from the driveshaft.

Remove the impeller plate and gasket. Discard the gasket.



1. Impeller plate 21063

Remove the water pump grommet, all O-rings, and the shift rod bushing from the impeller housing.

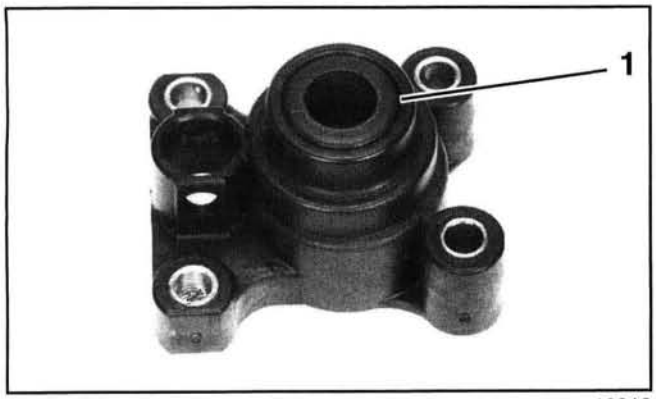
Inspection

Check impeller for overheating, hub separation and visible signs of wear or damage. Check impeller cup and plate for scoring, distortion, and impeller material transfer. Inspect housing for cracks or melting.

Assembly

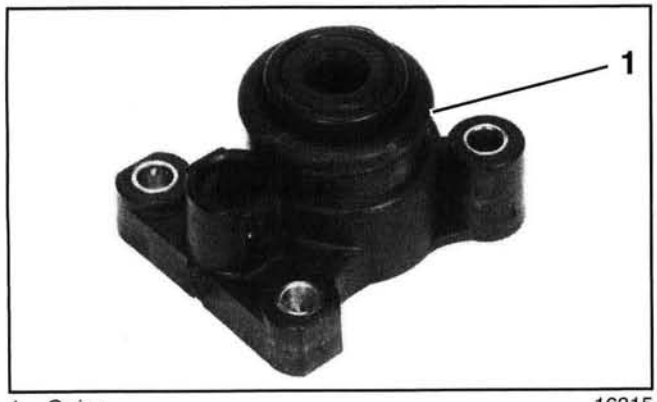
9.9/15 MODELS

Apply *Gasket Sealing Compound* to the metal casing of a new driveshaft seal. Install the seal in the impeller housing with lip of seal facing into the housing.



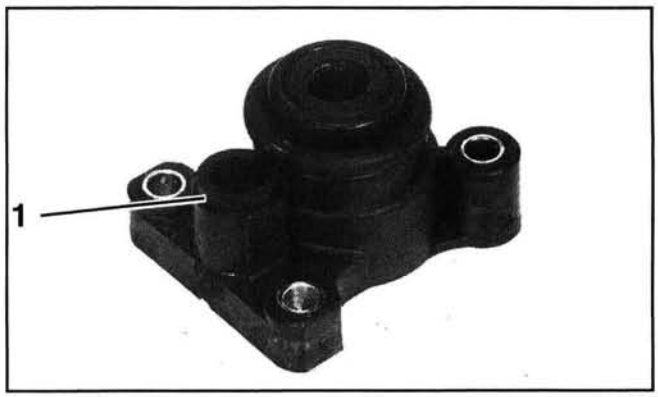
1. Seal 16312

Apply *Adhesive M* to the impeller housing O-ring and install it on the housing.



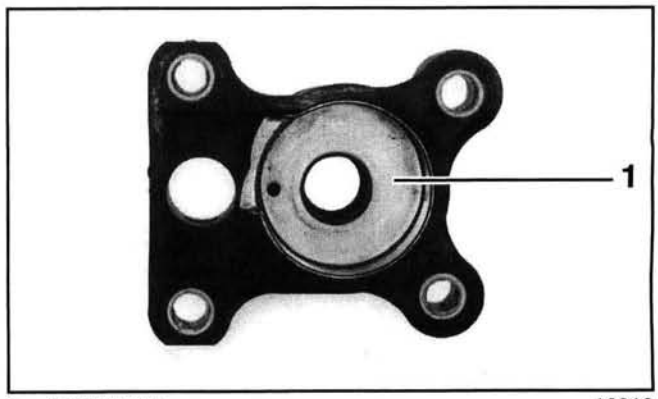
1. O-ring 16315

Apply *Adhesive M* to outside surface of the water tube grommet. Install the grommet in the impeller housing with bosses of grommet seated in housing. Coat the inside surface of grommet with *Triple-Guard* grease.



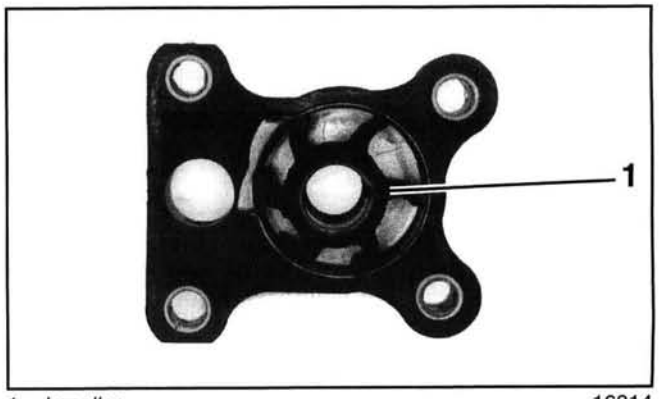
1. Grommet 16308

Lightly coat the exterior of the impeller cup with *Gasket Sealing Compound*. Position the impeller cup in the impeller housing as shown.



1. Impeller cup 16313

Lightly coat the inside of the impeller cup with oil. With a counterclockwise rotation, install the impeller into the impeller cup.



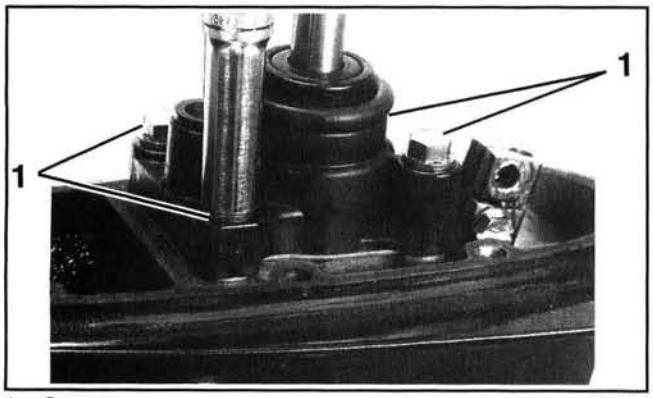
1. Impeller 16314

Apply a thin bead of *Adhesive M* to the machined surface, on the top of the gearcase that contacts the impeller plate. Slide the plate down over the driveshaft and position it.

Apply *Needle Bearing Assembly Grease* to the impeller drive pin and position it on the flat of the driveshaft.

Apply a thin bead of *Adhesive M* to the impeller housing mounting surface.

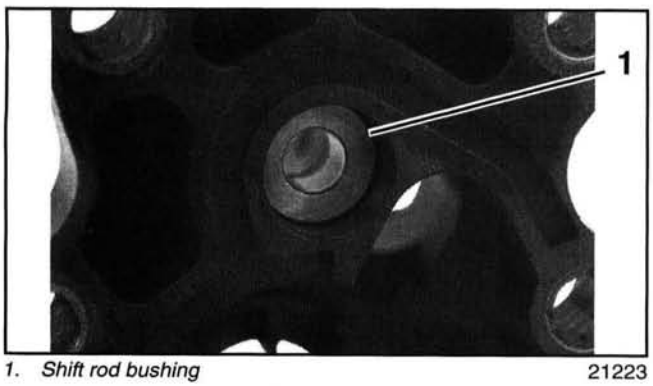
Slide the impeller housing into position while rotating the driveshaft to engage the impeller with the drive pin. Apply *Nut Lock* to the threads of the four impeller housing screws. Tighten the screws to a torque of 60 to 80 in. lbs. (7 to 9 N·m)



1. Screws 16310

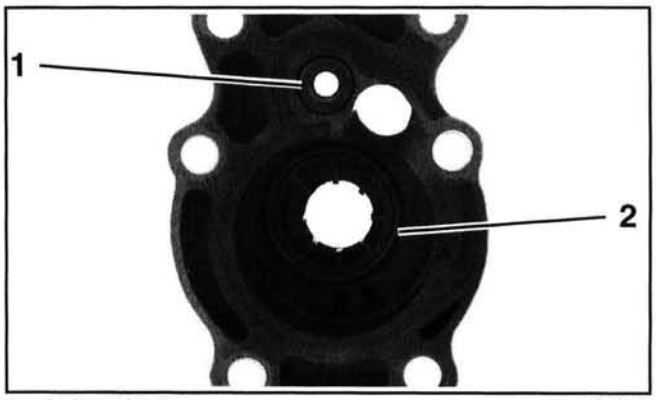
25/30 MODELS

Oil and install the shift rod bushing into the impeller housing.



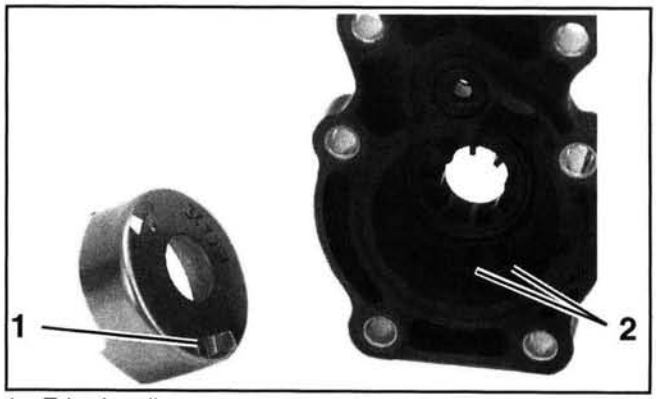
1. Shift rod bushing 21223

Apply *Triple-Guard* grease to the two impeller housing O-rings. Install the small, thick shift rod O-ring. Position the large O-ring in the groove of the impeller housing.



1. Shift rod O-ring 21219
2. Large O-ring

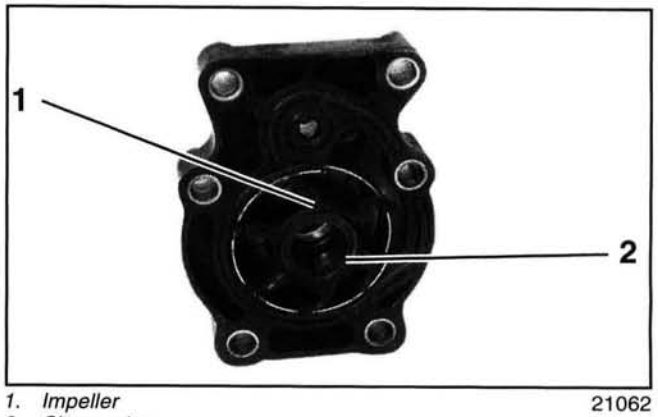
Lightly coat the exterior of the impeller cup with *Gasket Sealing Compound*. Align tabs of impeller cup with location holes of impeller housing and install the impeller cup into the impeller housing.



1. Tabs, impeller cup 21218
2. Location holes

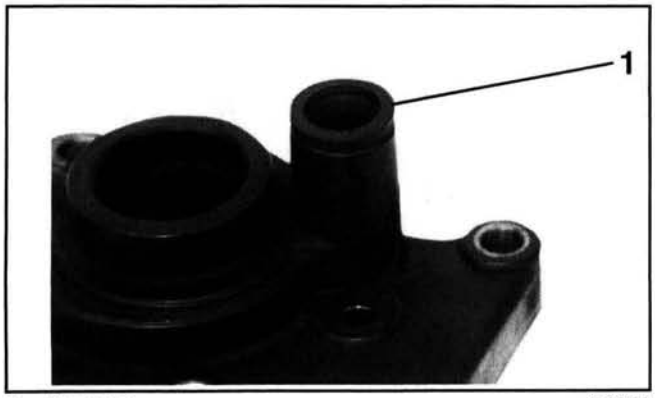
Lightly coat the inside of the impeller cup with oil. With a counterclockwise rotation, install the impeller into the impeller cup.

IMPORTANT: The sharp edge of cam slot in the impeller is the leading edge during rotation.



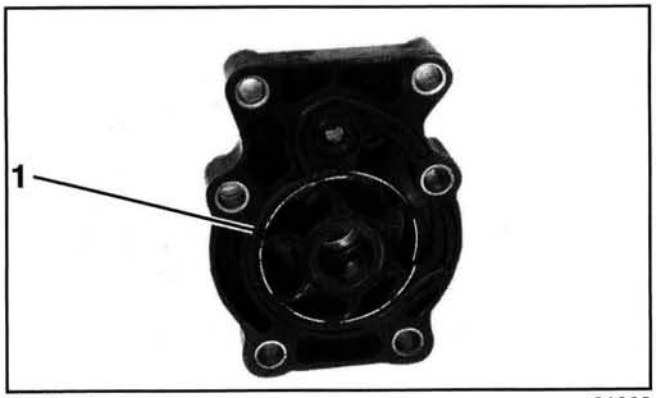
1. Impeller 21062
2. Sharp edge

Apply *Adhesive M* to outside of water tube grommet. Install grommet and locate grommet bosses into holes of impeller housing.



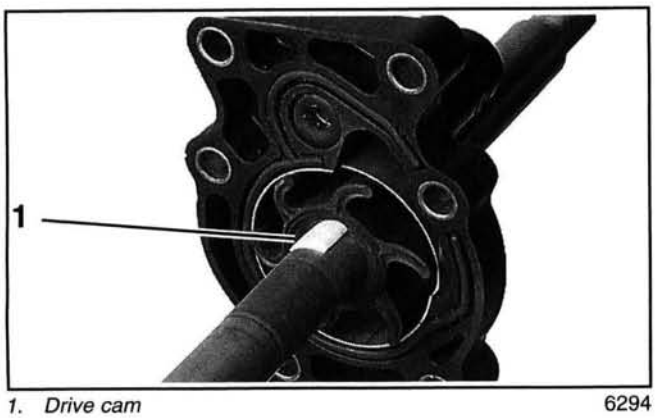
1. Grommet 21059

Apply *Adhesive M* to the seal groove of the impeller housing. Install a **new** seal into the groove.



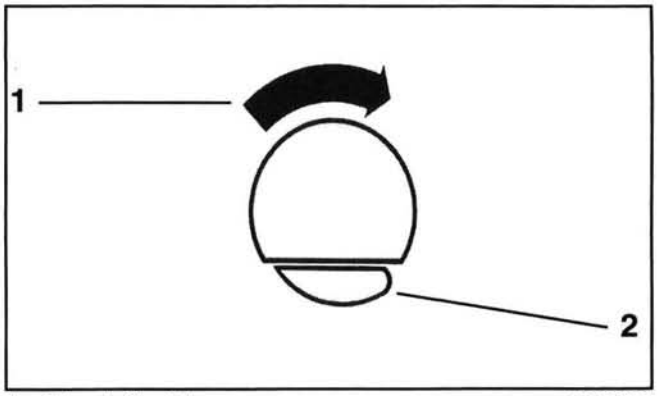
1. Seal 21062

Lightly oil pinion splines of the driveshaft. Slide the driveshaft through the impeller housing and impeller until drive cam flat of the driveshaft is below the impeller. Align drive cam flat with groove of the impeller. Install the impeller drive cam.



1. Drive cam 6294

Sharp edge of the cam is leading edge during driveshaft rotation. Slide the impeller housing down the driveshaft. Engage the impeller with the cam.



1. Driveshaft rotation CO2995
2. Drive cam

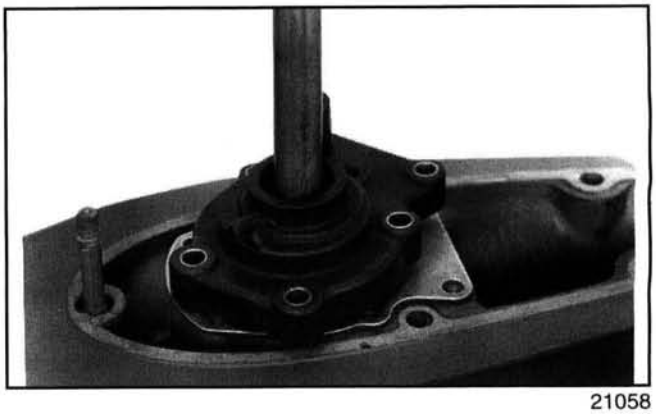
IMPORTANT: Confirm the impeller is oriented properly and engages the impeller cam properly. Serious powerhead damage will result if impeller cam is displaced.

Lightly coat both sides of a new impeller plate gasket with *Gasket Sealing Compound.* Place gasket on the gearcase.

Place the impeller plate over the gasket.

Slide the driveshaft down into the gearcase and engage the pinion.

Turn the driveshaft until holes of the impeller housing are aligned with holes of the gearcase. Place the washers on the six impeller housing screws. Apply *Gasket Sealing Compound* to the threads of the screws. Install and tighten the screws to a torque of 60 to 84 in. lbs. (7 to 9 N·m).

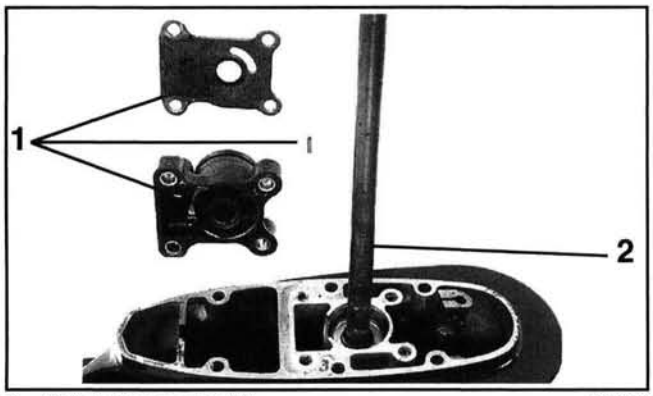


21058

DISASSEMBLY – 9.9/15

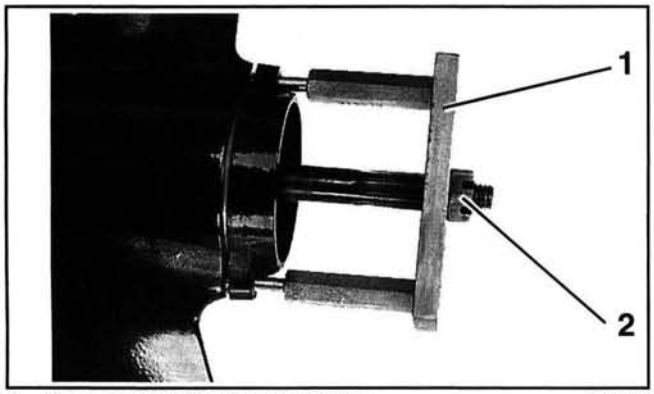
Remove gearcase. Refer to **REMOVAL AND INSTALLATION** on p. 260.

Remove water pump and driveshaft from gearcase. Refer to **WATER PUMP** on p. 265.



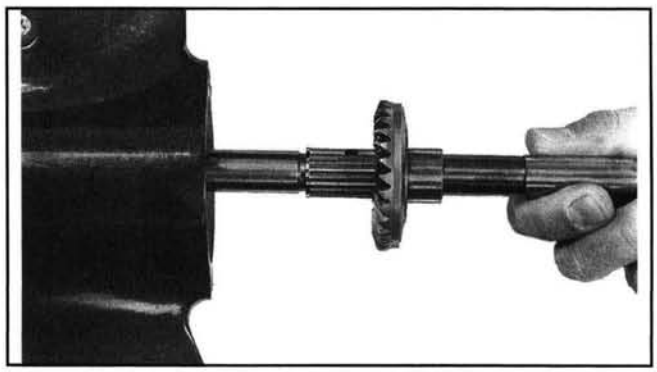
1. *Water pump assembly* 32539
2. *Driveshaft*

Remove the propeller shaft bearing housing retaining screws. Using Gearcase Bearing Housing Puller, P/N 386631, and a propeller nut, remove the propeller shaft bearing housing.



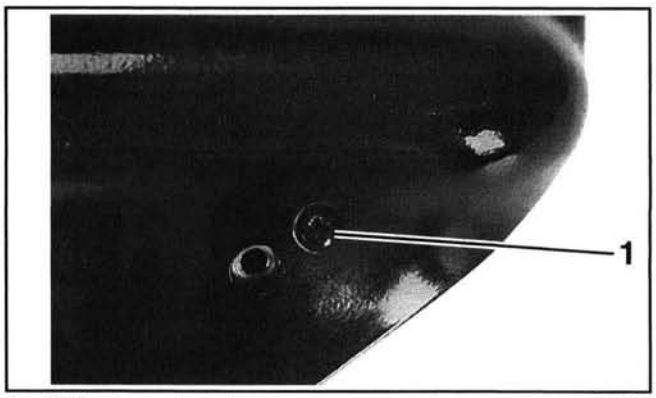
1. *Gearcase Bearing Housing Puller* 32534
2. *Propeller nut*

Remove the propeller shaft, with thrust washers, and reverse gear components. If forward thrust washer is not on propeller shaft, check for it in the relieved area of the forward gear. Use a magnetic tool to locate and remove the two shifter detent balls and one detent spring from the gearcase.



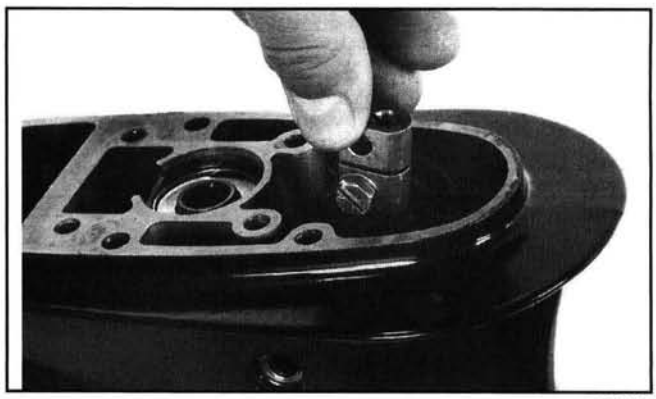
44107

Remove shift lever pivot pin from gearcase. Discard the O-ring.



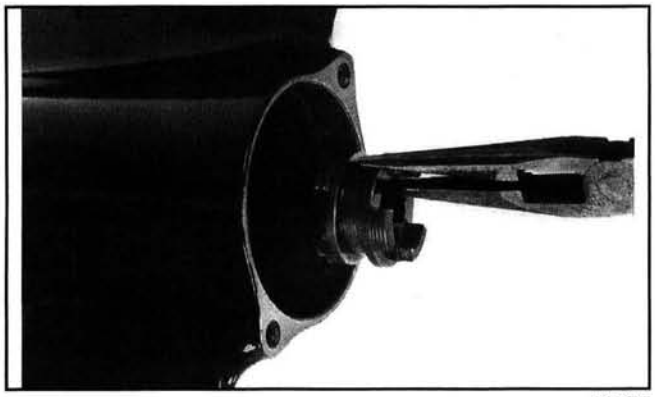
1. *Shifter lever pivot pin* 32536

Unscrew the shift rod and remove it from the gearcase.



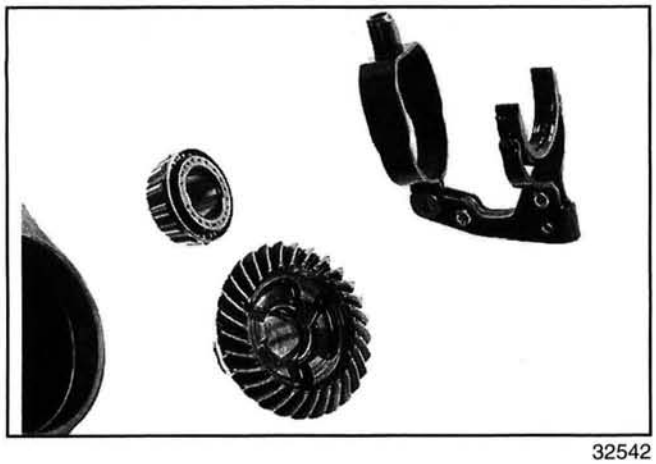
32575

Use long-nose pliers to remove the clutch dog from the gearcase.



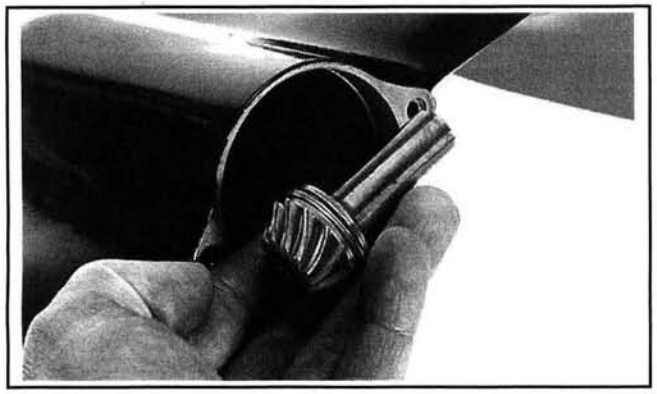
32577

Use long-nose pliers to remove the forward gear and shifter lever assembly. Use no force. Tilting the shifter lever slightly will allow you to remove it from the gearcase. Remove the forward gear roller bearing.



32542

Remove the pinion gear, two thrust washers, and thrust bearing.



32558

DISASSEMBLY – 25/30

⚠ WARNING ⚠

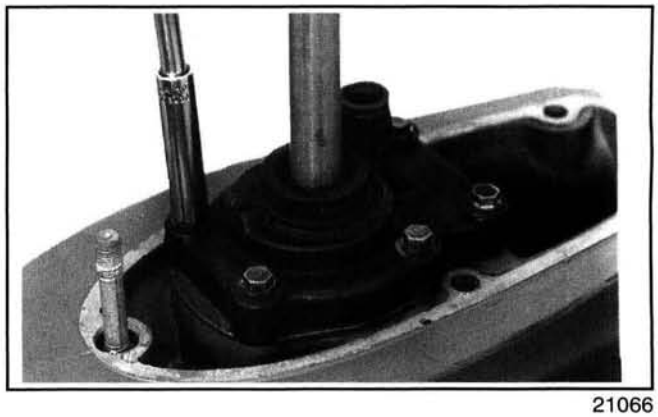
Wear safety glasses to avoid personal injury, and set compressed air pressure to less than 25 psi (172 kPa).

IMPORTANT: Clean and inspect all components during disassembly. Replace all damaged components, seals, O-rings, and gaskets upon assembly.

Remove gearcase. Refer to **REMOVAL AND INSTALLATION** on p. 260.

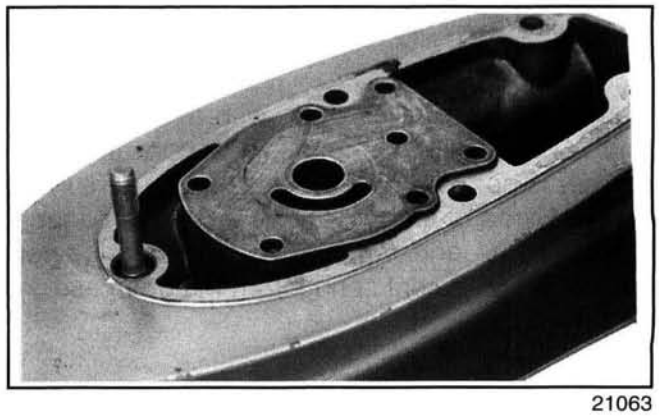
Drain the gearcase by first removing the oil level plug, then the oil fill/drain plug.

Remove water pump and driveshaft from gearcase. Refer to **WATER PUMP** on p. 265.



21066

Remove the impeller plate and gasket. Discard the gasket.

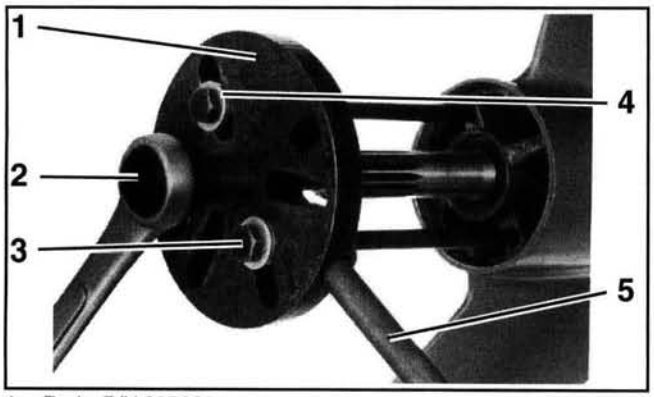


21063

Remove the two propeller shaft bearing housing screws.

COB3047

Assemble the following components from Universal Puller Set, P/N 378103. Remove the propeller shaft bearing housing from the gearcase.



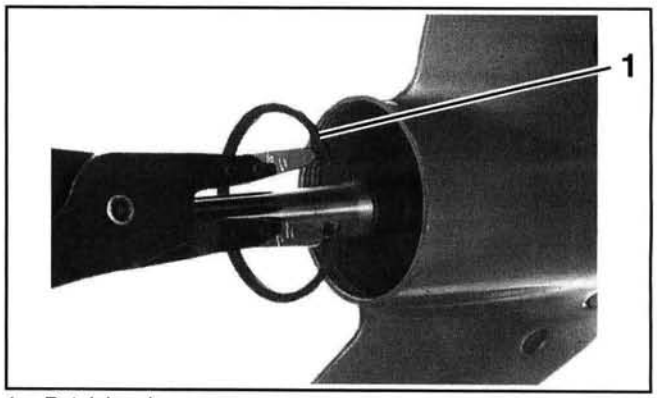
1. *Body, P/N 307636*
2. *Pressing screws (2), P/N 307637*
3. *2 Screws, 1/4-20 x 6 in. (obtain locally)*
4. *Flat washers (2), P/N 307639*
5. *Handle, P/N 307638*

21609

⚠ WARNING ⚠

Wear safety glasses and proceed with care to avoid unsnapping the ring from the pliers.

Remove the retaining ring using Retaining Ring Pliers, P/N 331045. The retaining ring is under extreme pressure during removal and installation. After the retaining ring is removed far enough from the gearcase to clear the housing, release the pliers while retaining ring is still around the propeller shaft.

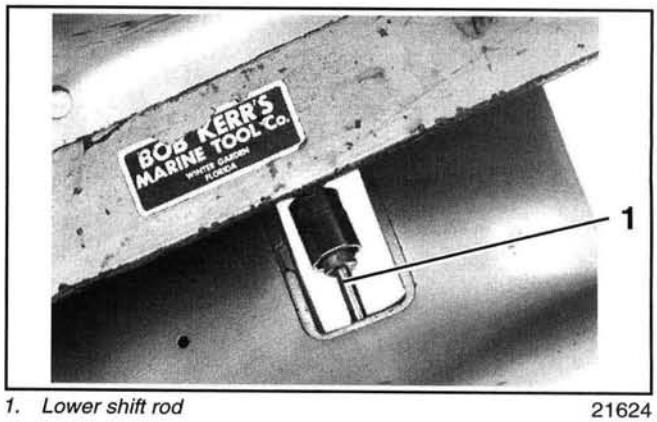


1. *Retaining ring*

21608

Remove the retainer plate from gearcase.

Unthread the lower shift rod from the shifter yoke and remove the shift rod from the gearcase. Remove and discard lower plastic keeper.

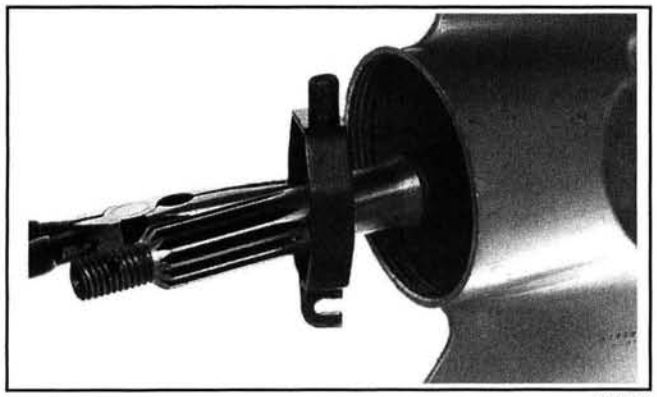


1. *Lower shift rod*

21624

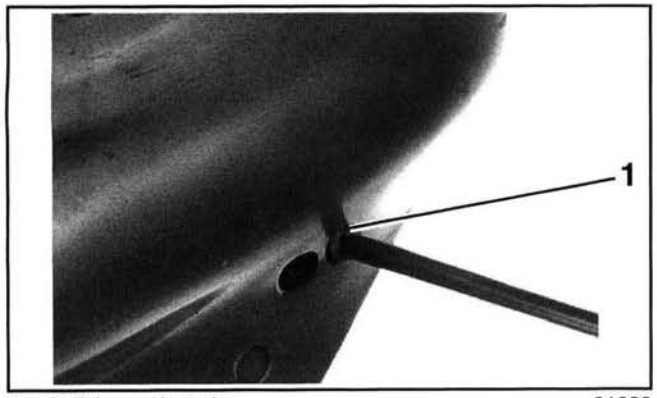
9

Use long-nose pliers to remove the shift yoke.



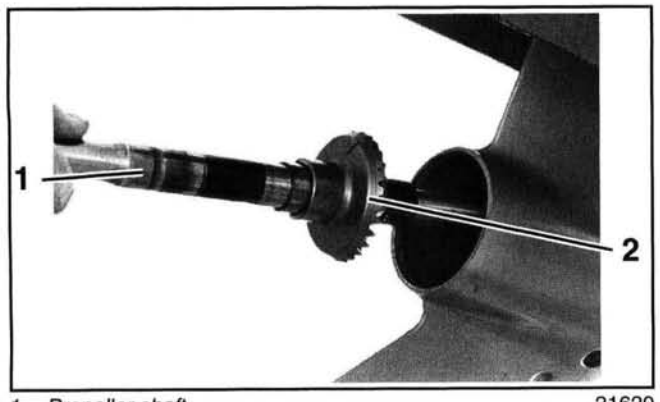
21621

Remove the shifter lever pivot pin. Discard the pivot pin O-ring.



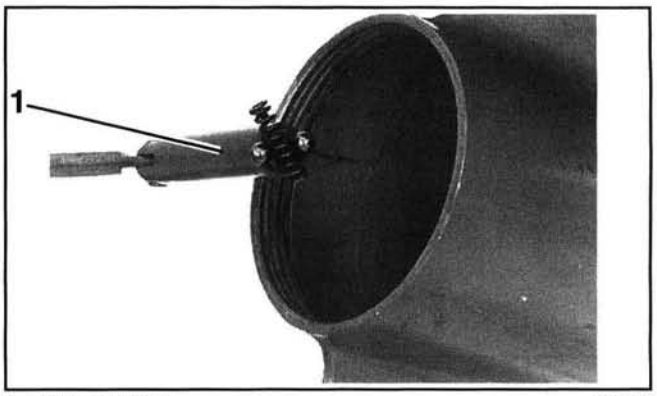
1. Shift lever pivot pin 21623

Remove the propeller shaft and reverse gear components from the gearcase.



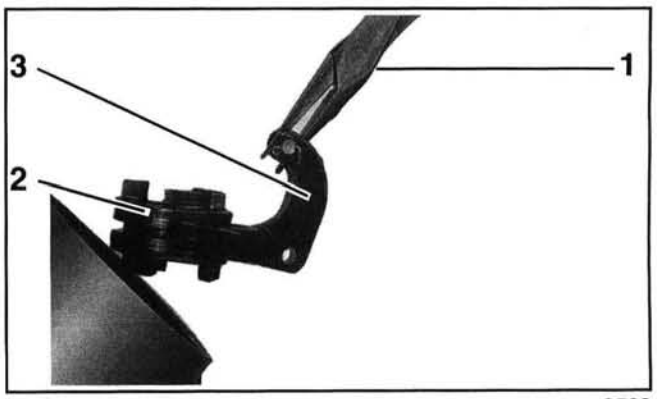
1. Propeller shaft
2. Reverse gear 21620

Using a magnetic tool, locate and remove the two shifter detent balls and one detent spring from the gearcase.



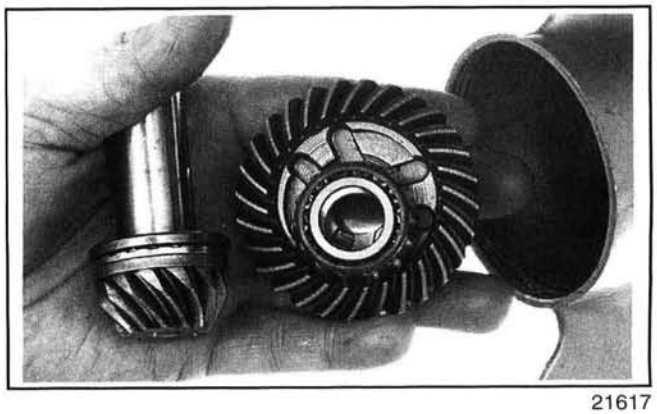
1. Magnetic tool 21619

Use long-nose pliers to remove the clutch dog and shifter lever assembly. Use no force. Tilting the shifter lever slightly will allow you to remove it from the gearcase.



1. Long nose pliers 9593
2. Clutch dog
3. Shifter lever assembly

Remove the forward bearing, forward gear, pinion, pinion thrust bearing, and two pinion thrust washers.



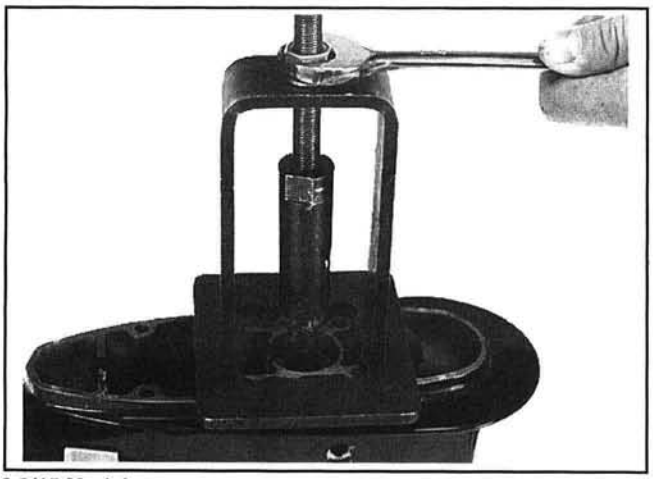
21617

BEARING AND SEAL REMOVAL

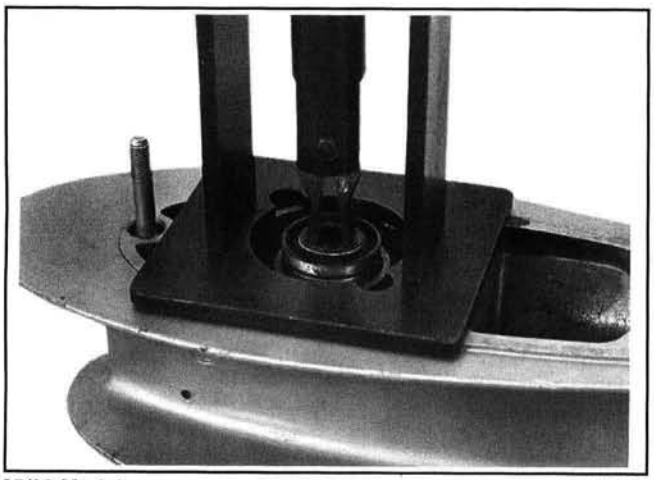
IMPORTANT: Inspect bearings for damage while in place. If bearing is damaged, remove and discard. If the bearing is removed for any reason, it must be replaced.

Driveshaft Seals

Use Puller Bridge, P/N 432127, and Small Puller Jaws, P/N 432131, to remove the two driveshaft seals. Discard the seals.



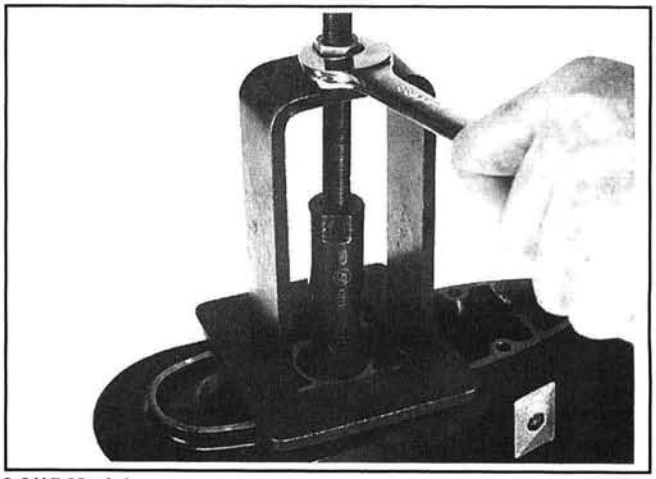
9.9/15 Model 32545



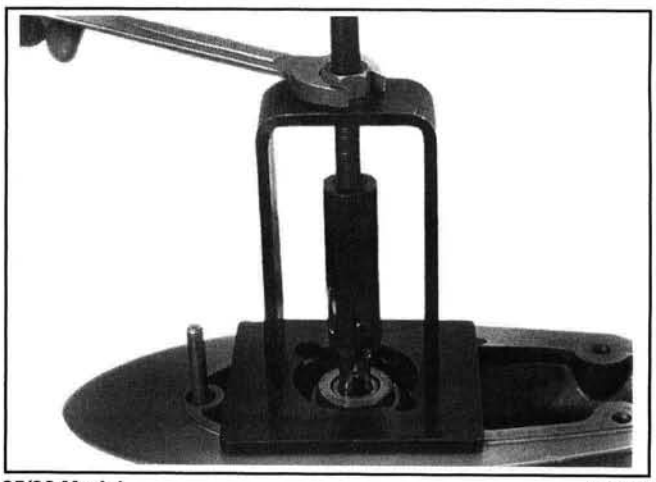
25/30 Model 21074

Driveshaft Bearing

Use Puller Bridge, P/N 432127, and Small Puller Jaws, P/N 432131 to remove the driveshaft bearing and sleeve from the gearcase. Discard the bearing.



9.9/15 Model 32531



25/30 Model 21072

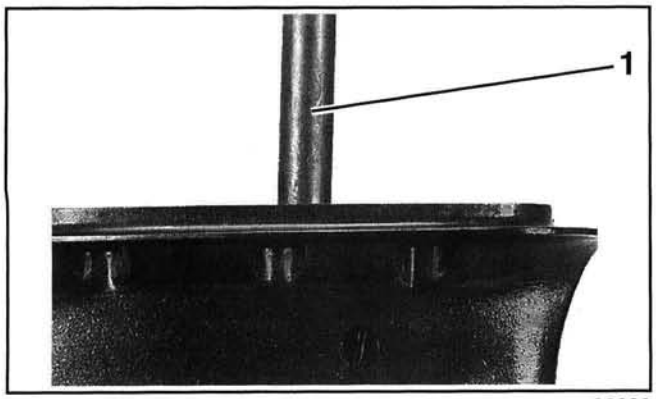
9

Pinion Bearings

Place bearing removal tool in the driveshaft cavity. Use a mallet to drive the two pinion bearings into the propeller shaft cavity of gearcase. Discard the bearings.

9.9/15 MODELS

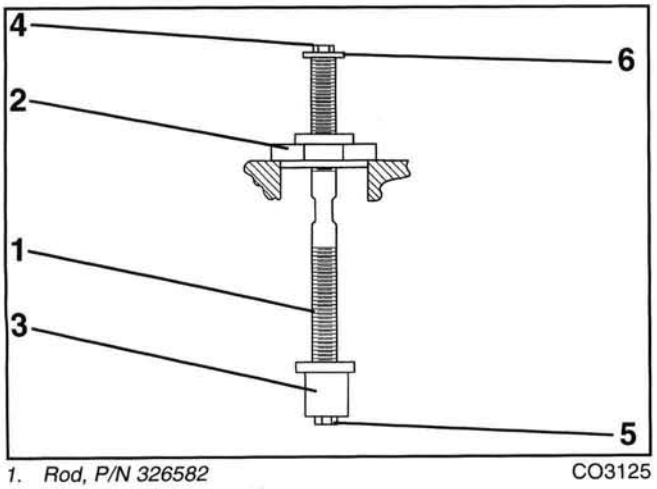
Use Bearing Remover, P/N 319880.



1. Bearing remover 33239

25/30 MODELS

Assemble the following components from Universal Pinion Bearing Remover and Installer, P/N 391257.

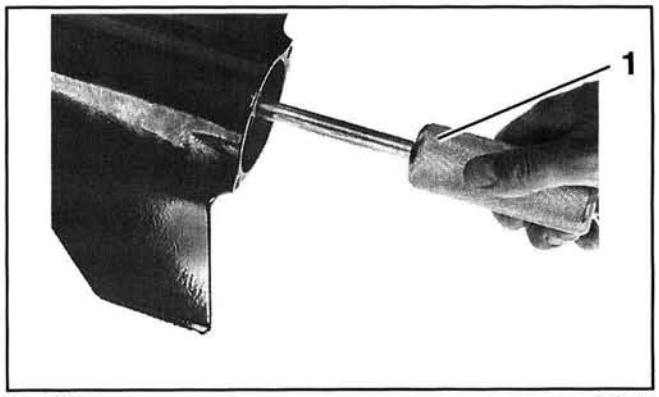


1. Rod, P/N 326582 CO3125
2. Pilot Plate, P/N 326583
3. Remover and Installer, P/N 326577
4. 1/4-20 x 1/2 in. hex head screw
5. 1/4-20 x 11/4 in. hex head screw
6. 1 in. O.D. flat washer

Place the tool in gearcase. using a mallet, drive the pinion bearings into the gearcase propeller shaft cavity. Discard the bearings.

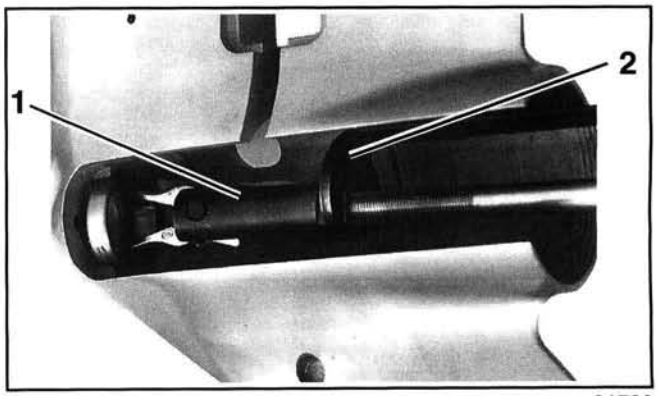
Forward Bearing

Using Slide Hammer, P/N 432128, and Bearing Puller, P/N 432130, remove the forward bearing cup from the gearcase.



1. Slide hammer 32548

Secure the puller jaws into grooves behind the cup. Use Wrench, P/N 334359, to hold the puller while tightening the jaws.



1. Bearing puller 21789
2. Wrench

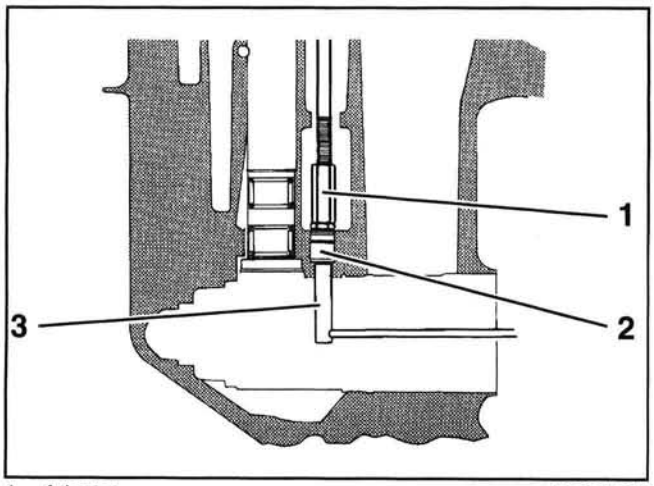
Shift Rod Bushing and O-ring

Position Shift Rod Bushing Remover, P/N 327693, under the shift rod bushing.

Thread the adapter of the Slide Hammer, P/N 391008, in the slide hammer. Place the adapter through the shift rod bushing and thread into the remover tool.

Remove the handle from the remover tool. Then remove the bushing from the gearcase.

Once the bushing has been removed from the gearcase, examine the bushing for damage. If damaged, replace the bushing on reassembly. Remove and discard the O-ring(s) and washer from the bushing.

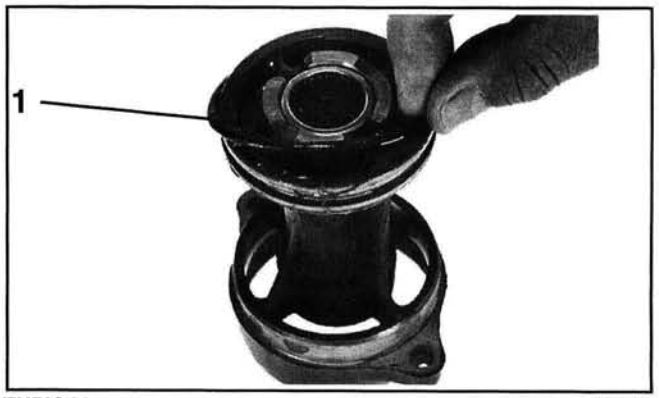


1. *Adapter*
2. *Shift rod bushing*
3. *Remover tool, P/N 327693*

DRC1505

Prop Shaft Bearing Housing Seals and O-ring

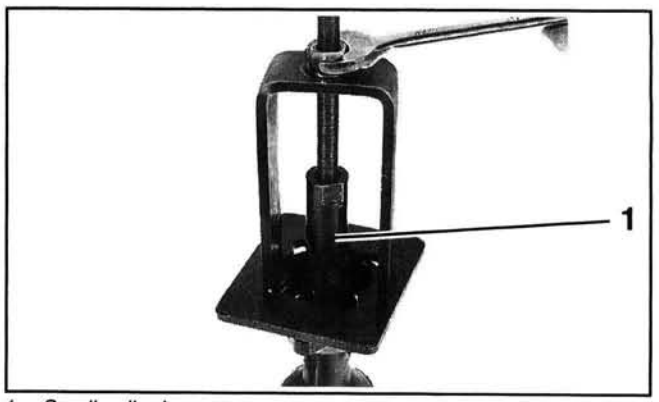
Remove and discard the propeller shaft bearing housing O-ring.



TYPICAL
1. *O-ring*

32547

Using Puller Bridge, P/N 432127, and Small Puller Jaws, P/N 432131, remove seal(s). Discard seal(s).



1. *Small puller jaws*

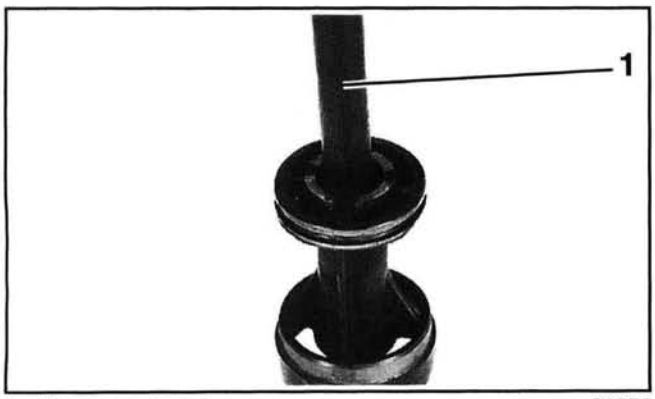
32555

9

Prop Shaft Bearing Housing Bearings

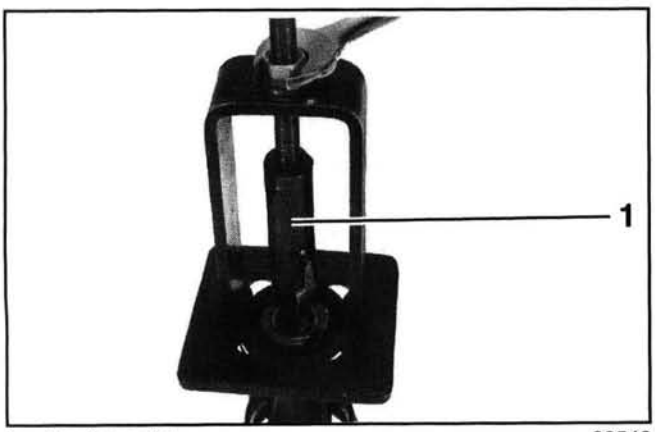
9.9/15 MODELS

Using Bearing Remover, P/N 319880, and a mallet, remove the smaller propeller shaft bearing located in the aft end of the bearing housing. Discard the bearing.



1. Bearing remover 32554

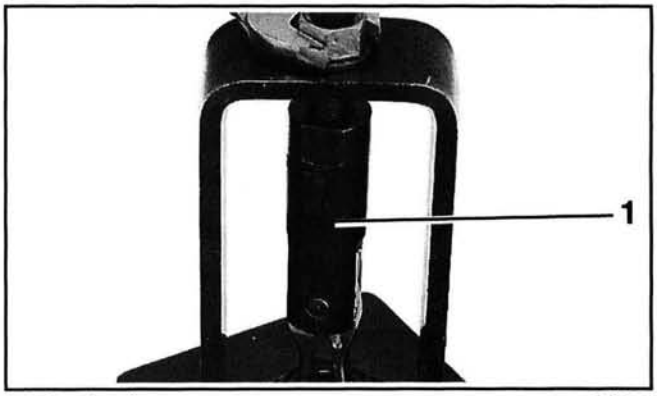
Using Puller Bridge, P/N 432127, and Bearing Puller, P/N 432130, remove the larger propeller shaft bearing located in the front of the bearing housing. Discard the bearing.



1. Bearing puller 32546

25/30 MODELS

Using Puller Bridge, P/N 432127, and Small Puller Jaws, P/N 432131, remove both propellers shaft bearings from the bearing housing. Discard both bearings.



1. Small puller 21795

CLEANING AND INSPECTION

⚠ WARNING ⚠

Replace damaged components. Shift system failure could cause loss of control over direction of engine thrust.

⚠ WARNING ⚠

To avoid personal injury, wear eye protection and regulate air pressure to not more than 25 psi (172 kPa).

Discard all seals, O-rings, gaskets, and clutch dog spring.

Clean all gearcase components in solvent and dry with compressed air. After cleaning, coat all internal components with *Ultra-HPF* gearcase lubricant to prevent rusting.

Perform the following inspections:

- **Gearcase housing** — all gasket surfaces must be free of gasket material. All threaded holes must be free of corrosion and sealer.
- **Gearcase anode** — if anode has been reduced to two-thirds of its original size, it must be replaced. Refer to Anode **Testing Procedure – Continuity** on p. 62.
- **Driveshaft** — check splines for chips, wear, and cracks. Bearing and gear surfaces must not show signs of metal transfer, corrosion, or discoloration. Severe spline wear might indicate an exhaust housing or gearcase has been distorted by impact damage.
- **Water intake screen** — must be clear. If screen can't be cleaned, it must be replaced.
- **All internal components** — must be visually inspected for signs of wear, distortion, chipping, metal transfer, pitting, galling, and discoloration due to improper lubrication.
- **Water pump** — check impeller for wear, crumbling, and hub bonding. Check impeller cup and plate for scoring and distortion.

SEAL AND BEARING INSTALLATION

IMPORTANT: Make no dry assemblies. Lubricate all bearings, shafts, and gears with *Ultra-HPF* gearcase lubricant.

Press the bearings into the housings until the tools are seated on the housing.

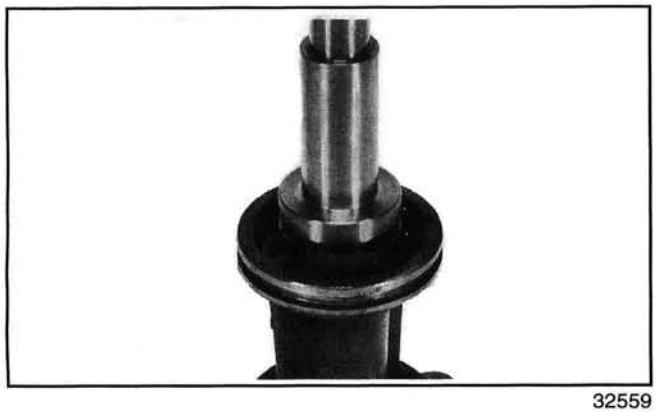
Prop Shaft Bearing Housing Bearings

9.9/15 MODELS

Install **new** aft bearing (small) from the forward end of the bearing housing. Use Bearing Installer, P/N 339751. Position installer against the lettered side of bearing.

32560

Install **new** front bearing (large) from the forward end of bearing housing. Use Bearing Installer, P/N 339751. Position installer against the lettered side of bearing.



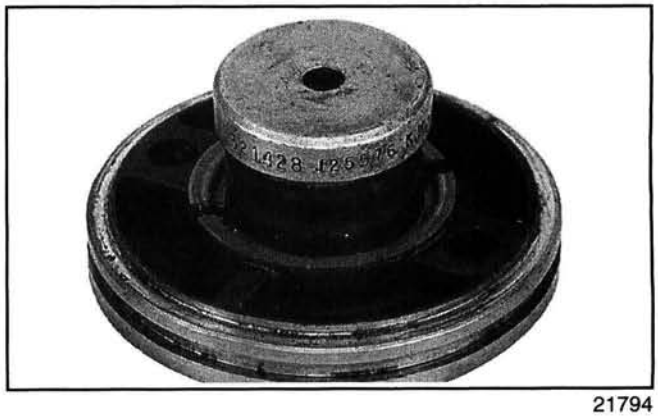
32559

25/30 MODELS

Install **new** bearing in aft end of bearing housing. Use Bearing Installer, P/N 335820. Position installer against the lettered side of bearing. Press the bearing into the housing until the tool is seated on the housing.

21793

Install **new** bearing in the forward end of the bearing housing. Use Bearing Installer, P/N 321428. Position installer against the lettered side of bearing.

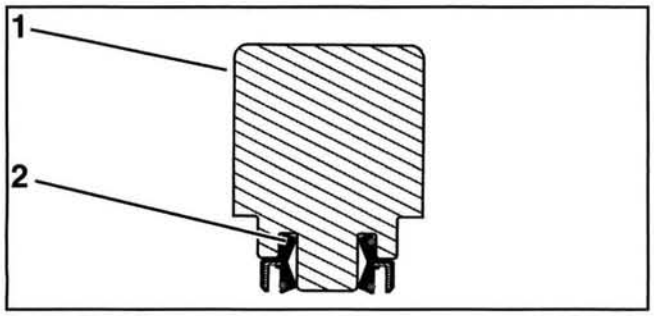


21794

Propeller Shaft Bearing Housing Seals and O-ring

9.9/15 MODELS

Use Seal Installer, P/N 342663, to install a new seal in the rear of the bearing housing. Apply *DPL Penetrating Lubricant* to the casing of the seal before installing. Install the seal with the exposed lip facing away from the bearing housing. Press the seal into the housing until the tool seats. Apply *Triple-Guard* grease to seal lips after installing.

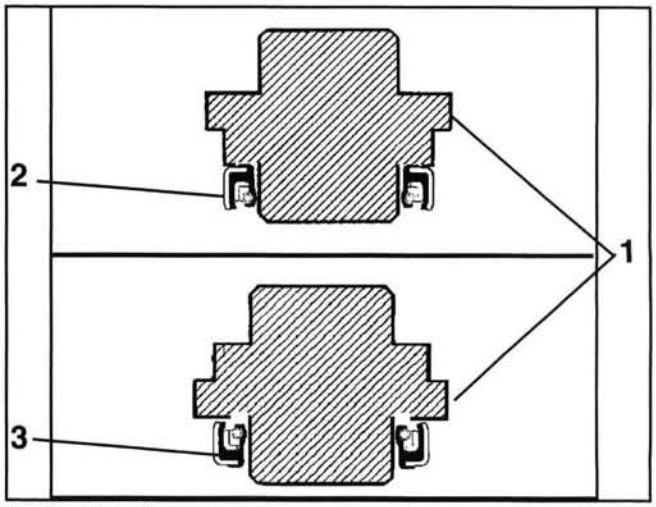


1. *Seal installer* DR6186
2. *Exposed lip of seal*

Apply *Triple-Guard* grease to **new** bearing housing O-ring. Place O-ring in groove.

25/30 MODELS

Install **new** seals back to back in aft end of the propeller shaft bearing housing using Seal Installer, P/N 335821. Apply *Gasket Sealing Compound* to the metal casing of the seals before installing. Install the inner seal with lip facing into the bearing housing and install the outer seal with lip facing away from the bearing housing. Apply *Triple-Guard* grease to seal lips after installing.



1. *Seal installer* DR2061
2. *Inner seal* DR2062
3. *Outer seal*

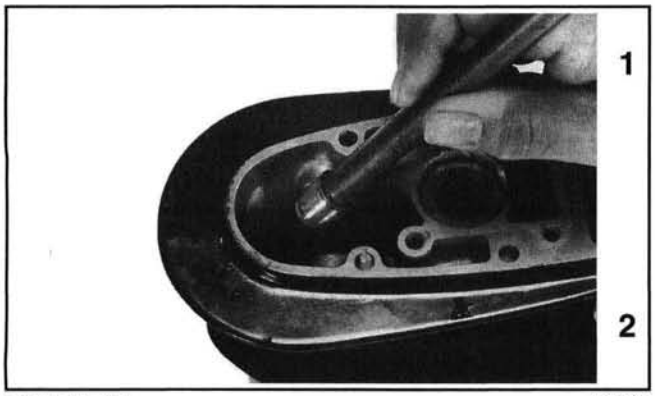
Apply *Triple-Guard* grease to a **new** bearing housing O-ring. Place the O-ring in the bearing housing groove.

Shift Rod Bushing and O-ring

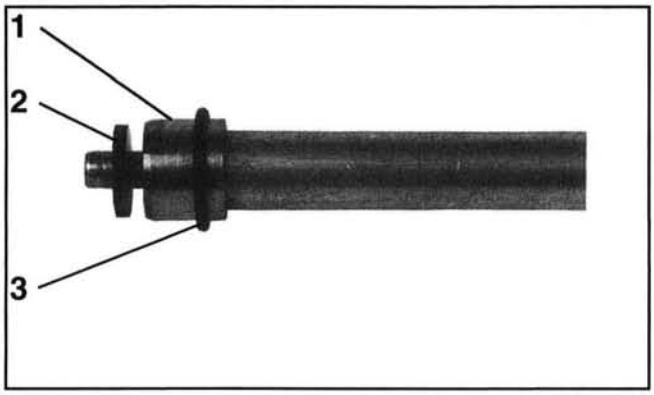
Coat the shift rod O-ring with *Triple-Guard* grease and install in shift rod bushing.

Place a **new** washer and bushing on Shift Rod Bushing Installer, P/N 304515. Apply *Gasket Sealing Compound* to the outside diameter of the shift rod bushing.

Install **new** bushing O-ring in outer groove of bushing (25/30HP models only.)



9.9/15 Model 32562

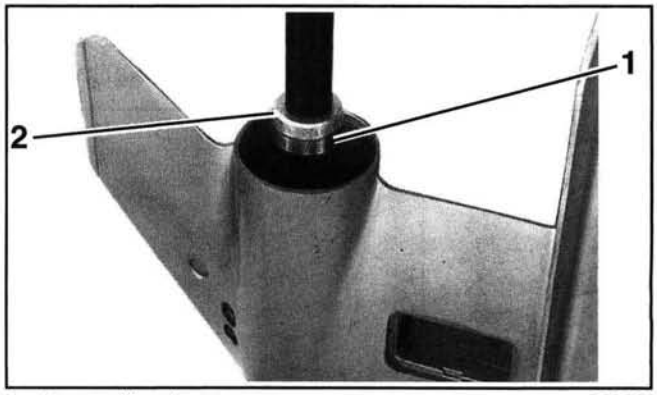


25/30 Model COA3319
1. *Bushing*
2. *Washer*
3. *O-ring, outer groove*

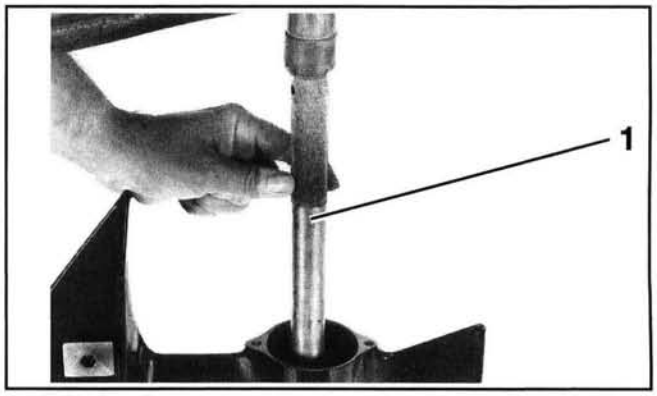
Use a mallet to drive the bushing into the gear-case housing.

Forward Bearing

Remove the gearcase from the holding fixture, and place the nose of it on a wooden block on the floor. Use Drive Handle, P/N 311880, Bearing Cup Installer, P/N 319929, and a mallet to drive the bearing cup into position in the gearcase housing. Oil the forward bearing cup and seat it firmly in the housing.



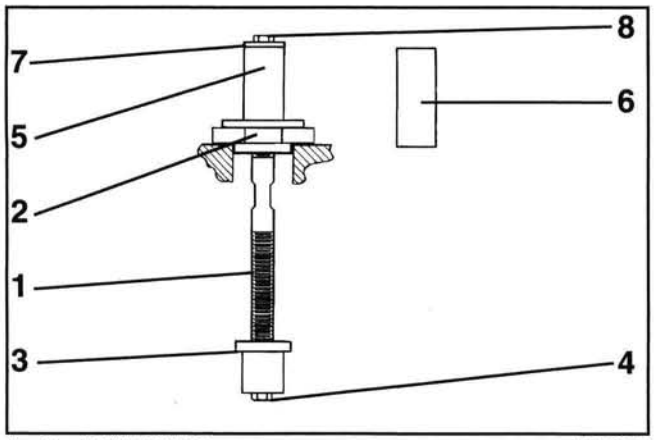
1. *Forward bearing cup* 21791
2. *Bearing cup installer*



1. *Drive handle* 32551

Pinion Bearings

Install the pinion bearings using the following components of the Universal Pinion Bearing Remover and Installer, P/N 391257. Use the remover/installer and spacers for the specific outboard model.



DR4692

1. *Rod, P/N 326582*
2. *Plate, P/N 326583*
3. *Remover/Installer*
   ***9.9/15 Model**: P/N 326578*
   ***25/30 Model**: P/N 326577*
4. *1/4-20 x 1 1/4 in. screw*
5. *Spacer, Short*
   ***9.9/15 Model**: P/N 326585*
   ***25/30 Model**: P/N 330067*
6. *Spacer, Long*
   ***9.9/15 Model**: P/N 339753*
   ***25/30 Model**: P/N 330068*
7. *1 in. flat washer*
8. *1/4-20 x 1/2 in. screw*

IMPORTANT: To ensure accurate bearing location, washer must be flat and screw must be tight.

9.9/15 Models

Install **lower** pinion bearing. Assemble tool using **short** spacer, P/N 326585, and remover/installer, P/N 326578. Position installer against the lettered side of bearing. Drive bearing into gearcase housing until washer contacts spacer.

Install **upper** pinion bearing. Assemble tool using **long** spacer, P/N 339753.

25/30 Models

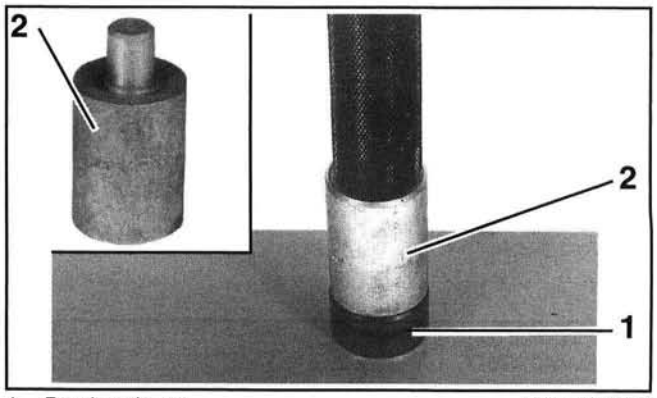
Install **lower** pinion bearing. Assemble tool using **short** spacer, P/N 330067, and remover/installer, P/N 326577. Position installer against the lettered side of bearing. Drive bearing into gearcase housing until washer contacts spacer.

Install **upper** pinion bearing. Assemble tool using **long** spacer, P/N 330068.

Driveshaft Bearing

9.9/15 Models

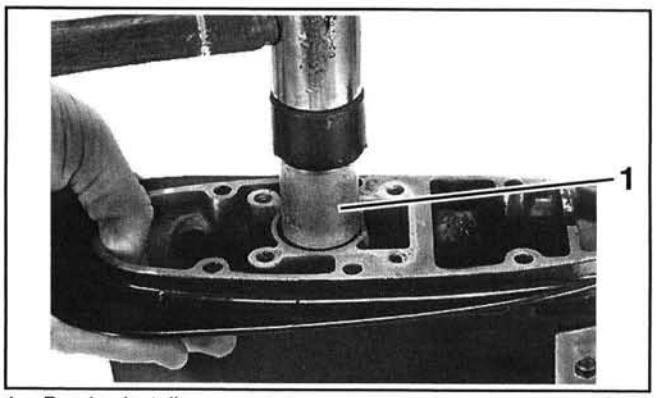
Oil and install a new driveshaft bearing in the bearing sleeve using Bearing Installer, P/N 319931, and an arbor press. Press against the lettered side of bearing until the tool is seated in the bearing sleeve.



1. *Bearing sleeve*
2. *Bearing installer*

32550/32639

Oil the bearing sleeve and install with the bearing into the gearcase housing using Bearing Installer, P/N 319931. Position lettered side of bearing towards gearcase and press the bearing sleeve assembly into the gearcase until seated at bottom of bore.



1. *Bearing installer*

32549

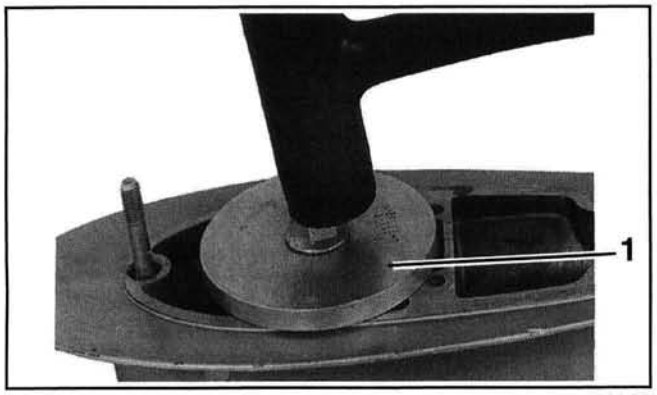
9

25/30 MODELS

Oil and install a new driveshaft bearing in the bearing sleeve using Bearing Installer, P/N 322923. Press against the lettered side of the bearing until the tool is seated in the bearing sleeve.

1. *Driveshaft bearing* 21887
2. *Bearing sleeve* 21887A
3. *Bearing installer*

Using the same tool attached to Plate, P/N 318122, press the bearing sleeve assembly into the gearcase until the plate contacts the gearcase. Position the lettered side of the bearing against the tool.



1. *Plate* 21813

Driveshaft Seals

Install **new** seals, back to back, in the driveshaft bore using the appropriate seal installer.

Apply *Gasket Sealing Compound* to the metal casing of the seals before installing.

Install the inner seal with flush lip facing into the gearcase, then the outer seal with extended lip facing out of the gearcase.

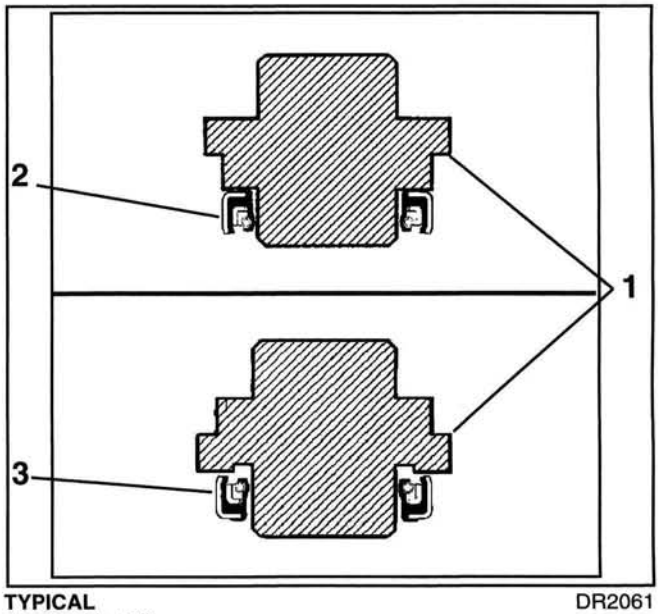
Apply *Triple-Guard* grease to the seal lips after installing.

9.9/15 MODELS

Use Seal Installer, P/N 326554. Install the inner seal with lip of the seal facing into the gearcase, then the outer seal with lip of the seal facing out of the gearcase.

25/30 MODELS

Use Seal Installer, P/N 326552. Install the inner seal with flush lip facing into the gearcase, then the outer seal with extended lip facing out of the gearcase.



TYPICAL DR2061
DR2062

1. *Seal Installer*
   ***9.9/15 Model**: P/N 326554*
   ***25/30 Model**: P/N 326552*
2. *Inner seal*
3. *Outer seal*

ASSEMBLY – 9.9/15

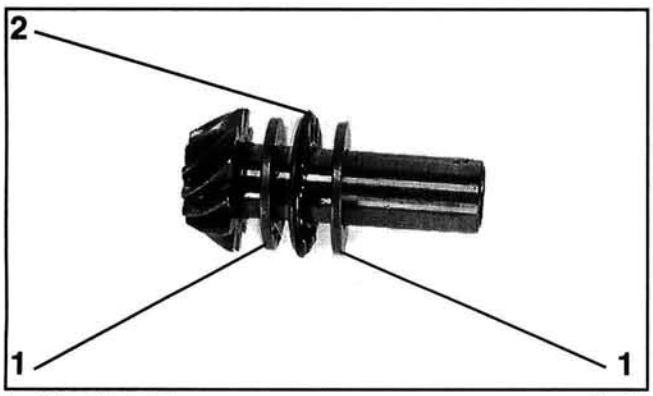
IMPORTANT: Make no dry assemblies. Lubricate all bearings, shafts, and gears with *Ultra-HPF* gearcase lubricant.

Oil and place the forward bearing cone and roller assembly in the forward bearing cup.

To install the forward gear and the shifter lever and yoke assembly, begin by threading Yoke Locator, P/N 319991, through the shift rod bushing and threading it into the shifter yoke. Remove the cradle from the yoke. Then, while pulling on the yoke locator, guide the assembly into the gearcase. The forward gear should come to rest against the forward bearing, and the shift lever should be located in the slot at the bottom of the gearcase.

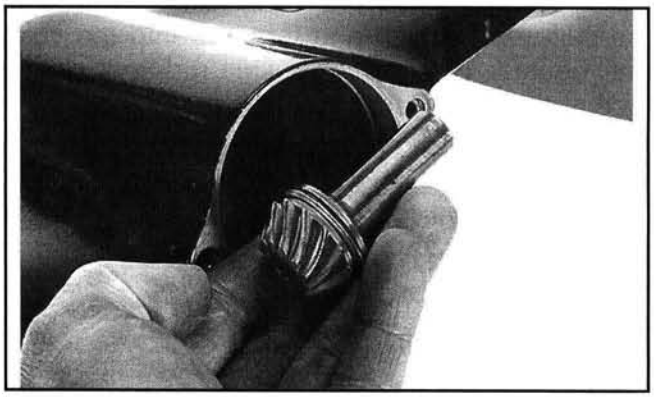
1. Yoke Locator 32557

Position one pinion thrust washer on the pinion. Oil and install the thrust bearing. Install the other thrust washer on the pinion.



1. Thrust washer
2. Thrust bearing 32544

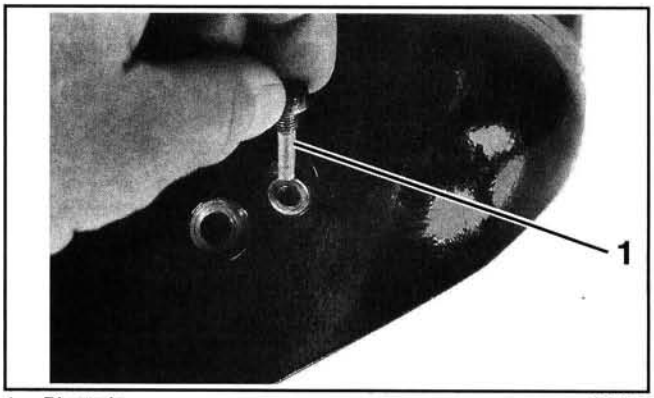
Install the pinion in the gearcase.



32558

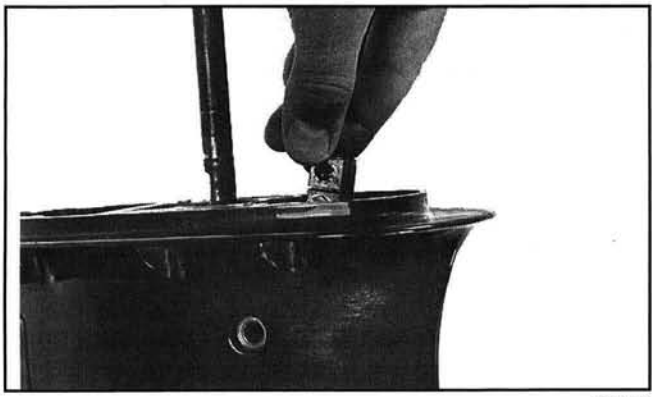
IMPORTANT: If the pinion binds upon assembly, angle the forward gear to allow engagement. If binding is still present, the forward bearing cup is not properly seated.

Oil a **new** O-ring and install on the pivot pin. Apply *Nut Lock* to the threads of the pivot pin. Use the yoke locator to locate the pivot pin hole in the yoke. Install and tighten the pivot pin to a torque of 48 to 84 in. lbs. (5 to 9 N·m).



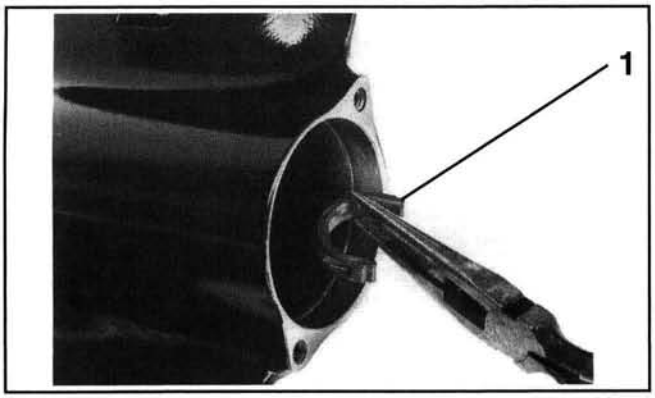
1. Pivot pin 32576

Coat the threaded area of the shift rod with *Triple-Guard* grease. Slide the shift rod down through the shift rod bushing and thread it into the yoke until seated. Then back out shift rod until slotted face of connector faces the driveshaft.



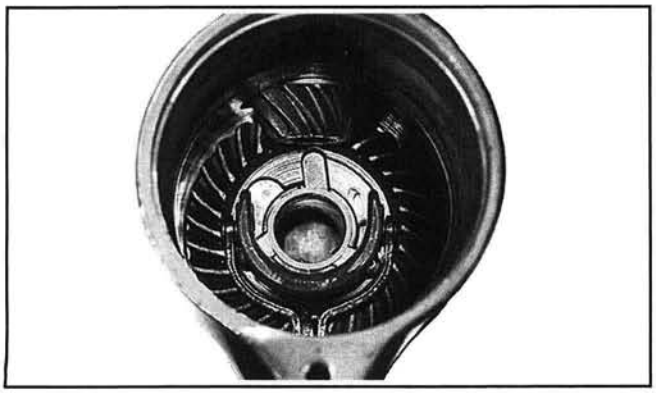
32538

Pull shift rod up and install cradle on yoke.



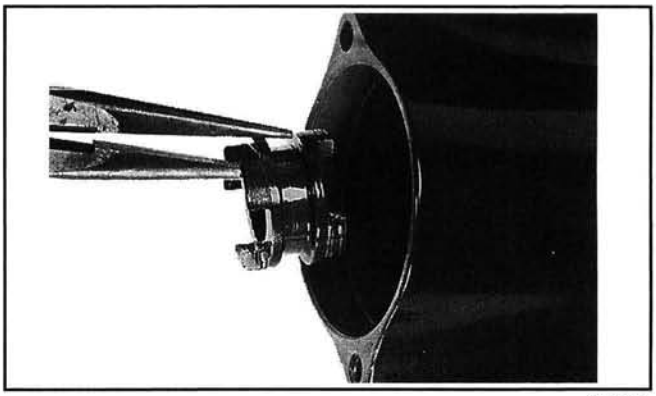
1. Cradle 32574

Apply *Needle Bearing Assembly Grease* to the forward thrust washer and install in relief area of forward gear.



44122

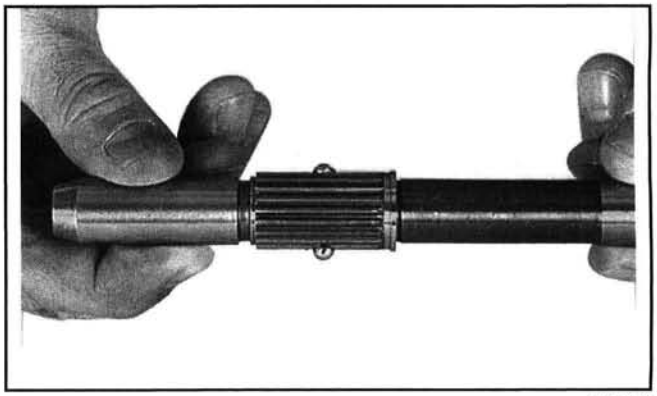
Using long-nose pliers, place the clutch dog in the cradle. Groove on the clutch dog **must** face the forward gear.



32541

Hold propeller shaft in place and move shift rod to NEUTRAL position.

Apply *Needle Bearing Assembly Grease* to the thrust washer, propeller shaft spring, and two detent balls. install thrust washer behind splines on propeller shaft. Install the spring and balls in the propeller shaft.



44123

Align the two detent balls with the two grooves in the internal splines of the clutch dog. Aid installation of loose detent ball with a flat blade screwdriver. Push the propeller shaft into the clutch dog, forward gear, and the forward bearing.

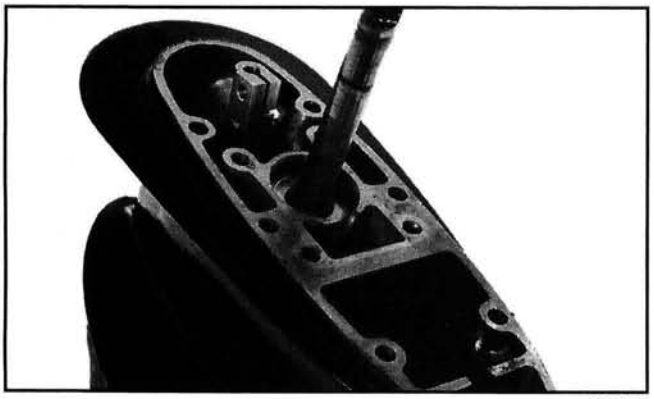
Slide the reverse gear onto the propeller shaft.

32573

Lightly apply *Gasket Sealing Compound* to the aft support flange of the propeller shaft bearing housing. Install the bearing housing into the gearcase.

Apply *Gasket Sealing Compound* to the threads of the bearing housing screws. Install the screws and tighten to a torque of 60 to 80 in. lbs. (7 to 9 N·m).

Install the driveshaft. Rotate the driveshaft to allow the splines in the pinion to engage the splines on the driveshaft.



32572

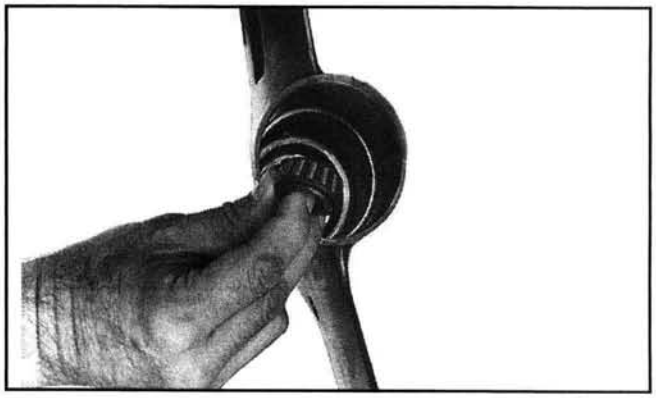
IMPORTANT: Pressure and vacuum test gearcase before filling with *Ultra-HPF* gearcase lubricant.

To complete gearcase servicing, refer to:
- **LEAK TEST PROCEDURE** on p. 260
- **WATER PUMP** on p. 265
- **REMOVAL AND INSTALLATION** on p. 260
- **PROPELLER** on p. 258

ASSEMBLY – 25/30

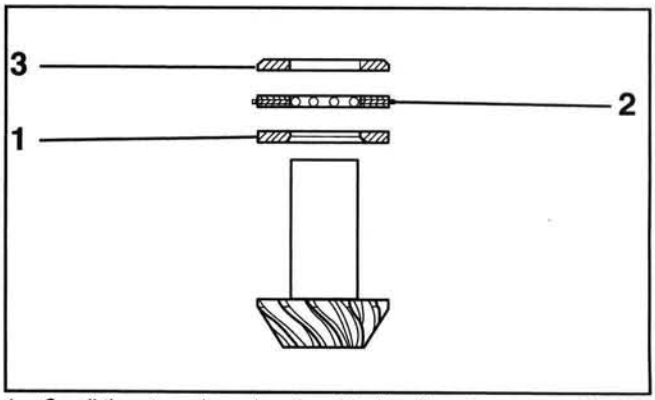
IMPORTANT: Make no dry assemblies. Lubricate all bearings, shafts, and gears with *Ultra-HPF* gearcase lubricant.

Oil and place the forward bearing cone and roller assembly in the forward bearing cup.



COA3216

Install the small thrust washer with the chamfered inside diameter facing the pinion gear. Oil and install the thrust bearing. Install the large thrust washer with chamfered outside edge facing up.

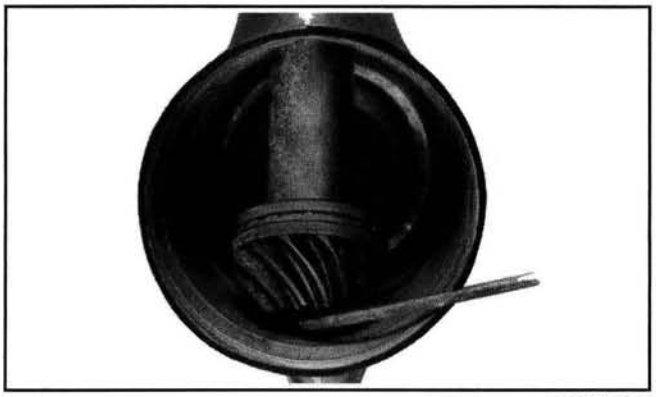


1. *Small thrust washer, chamfered inside diameter*
2. *Thrust bearing*
3. *Large thrust washer, chamfered outside edge*

803051

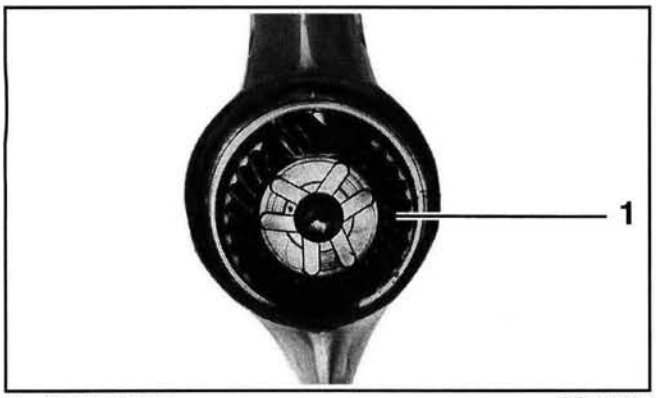
9

Using a right angled rod, install the pinion assembly in the gearcase.



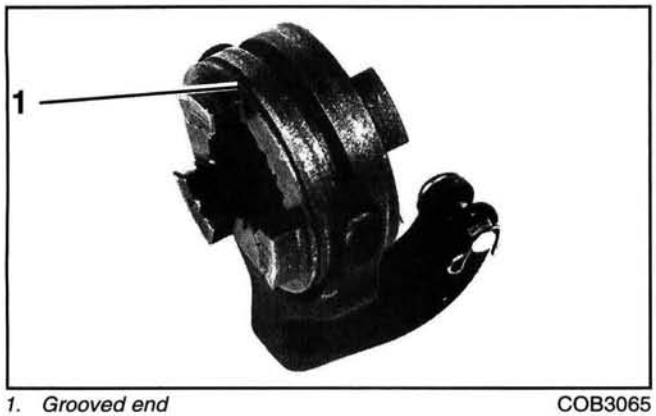
COA3290

Place the forward gear into the gearcase.



1. Forward gear COB3057

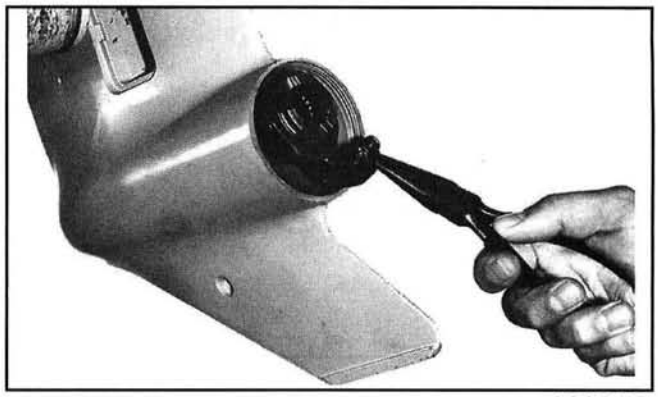
Install the shifter cradle on clutch dog. Grooved end of clutch dog must face forward gear end of the propeller shaft.



1. Grooved end COB3065

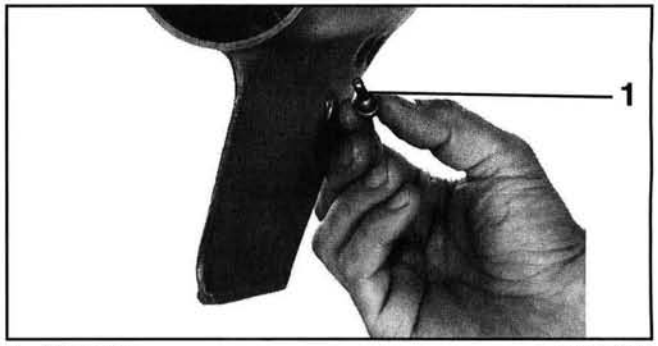
IMPORTANT: Apply *Needle Bearing Assembly Grease* to clutch dog and shifter cradle to hold in place while assembling.

Install the shifter cradle and clutch dog in the gearcase using long-nose pliers.



COB3061

Apply *Triple-Guard* grease to a new pivot pin O-ring. Install O-ring on the pivot pin. Apply *Nut Lock* to threads of the pin. Align hole of shifter lever with hole in gearcase. Install and tighten pivot pin to a torque of 48 to 84 in. lbs. (5 to 9 N·m).

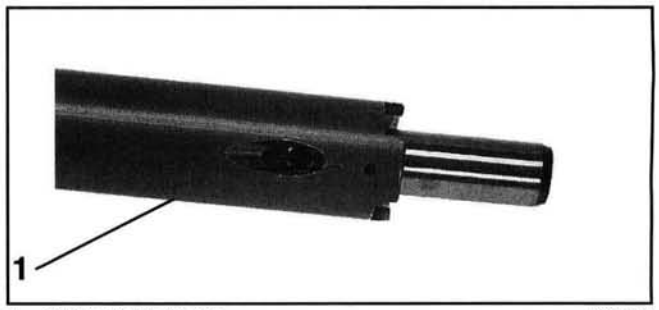


1. Pivot pin COA3236

⚠ WARNING ⚠

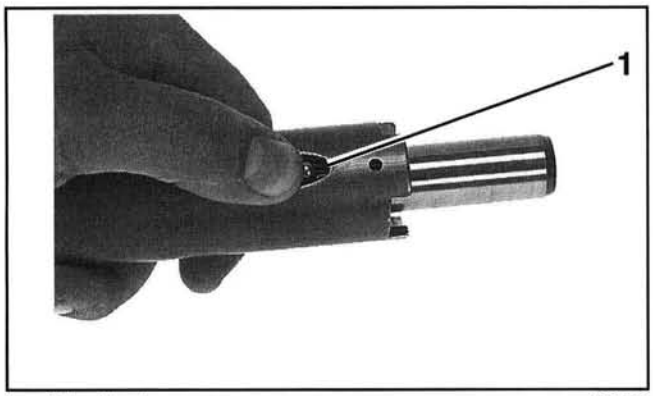
Wear safety glasses for eye protection. Detent balls can pop out with great force.

Slide the Shift Detent Sleeve, P/N 328081, over the propeller shaft. Align slot in the tool with hole in the propeller shaft.



1. Shift detent sleeve 26727

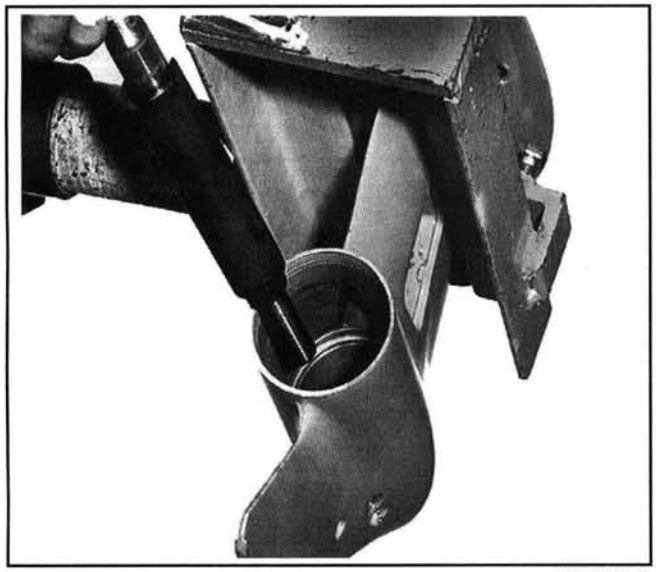
Insert one detent ball, then the spring, then the other detent ball. Push down on the ball and slide the tool back until you feel the ball slip into the detent.



1. Detent ball 26728

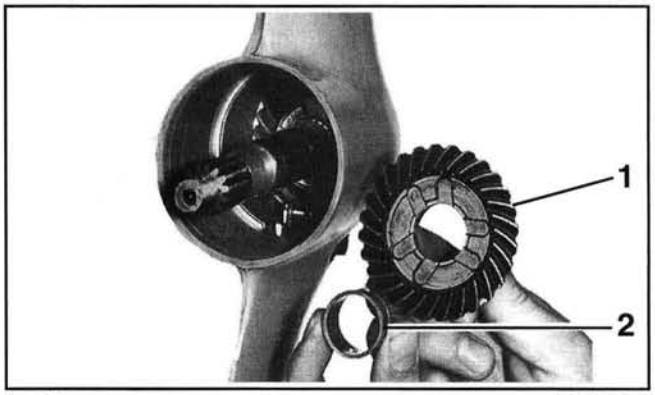
Install the propeller shaft and detent tool in gearcase. Make sure the following occurs:

- Propeller shaft must engage forward bearing.
- Tool ramps must engage clutch dog ramps.
- Hold tool firmly against clutch dog.
- Gently tap propeller shaft with a rawhide mallet to seat detent assembly.



COB3058

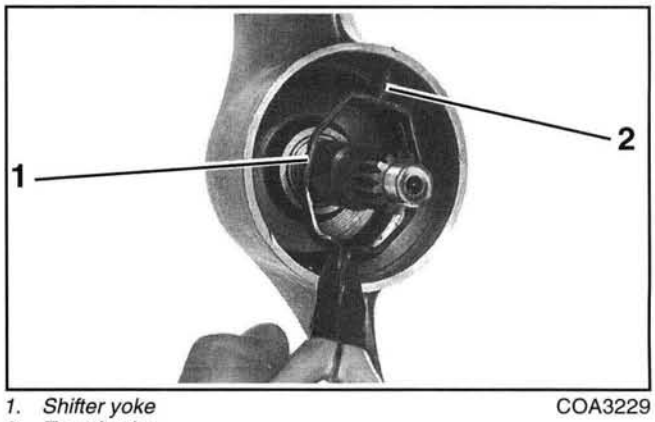
Remove detent tool. Slide the reverse gear down the propeller shaft and into the gearcase.



1. Reverse gear COB3051
2. Bushing

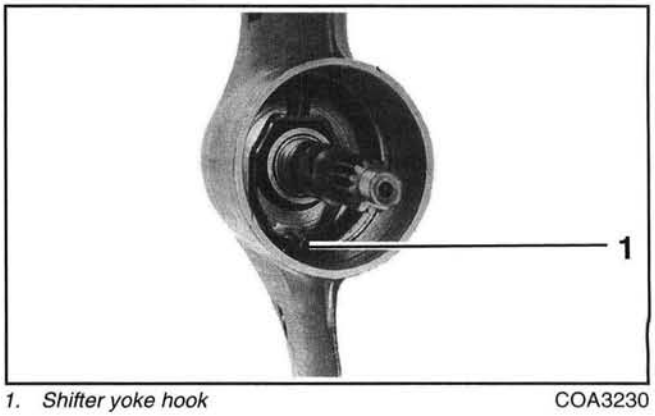
Coat the reverse gear bushing with oil. Slide the bushing down the propeller shaft, seating the bushing into the reverse gear.

Holding the shifter yoke a with long-nose pliers, install the yoke at a tilted position, locating top of yoke into upper gearcase cavity.



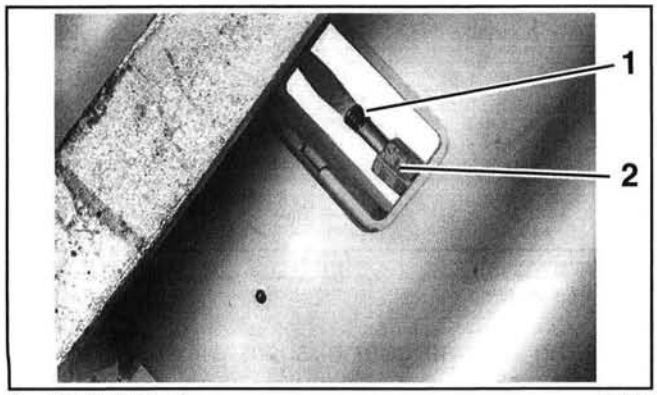
1. Shifter yoke COA3229
2. Top of yoke

Engage the shifter yoke hook onto the shifting lever clevis pin in bottom of the gearcase cavity.



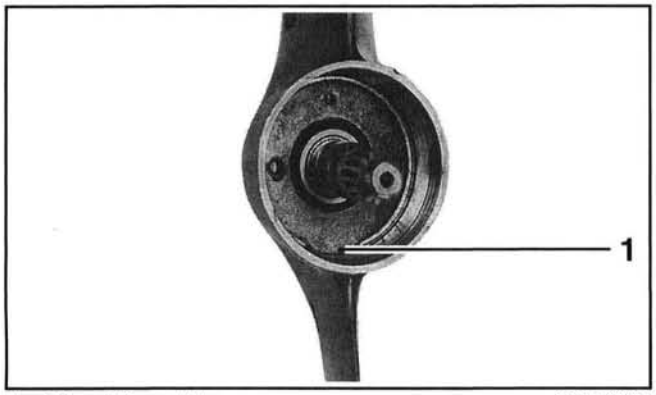
1. Shifter yoke hook COA3230

Install a new plastic keeper and the lower shift rod nut. Apply *Triple-Guard* grease to threads of lower shift rod and install into gearcase through the water intake opening and engage the shifter yoke. Thread the shift rod into the shifter yoke until the rod bottoms in the yoke.



1. *Plastic keeper* 9594
2. *Lower shift rod*

Slide the retainer plate down the propeller shaft and into the gearcase with tab facing down.



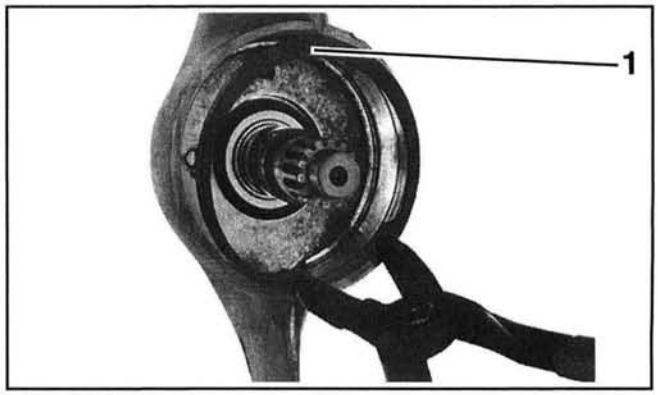
1. *Tab, retainer plate* COA3238

⚠ WARNING ⚠

Wear safety glasses and proceed with care to avoid unsnapping the ring from the pliers.

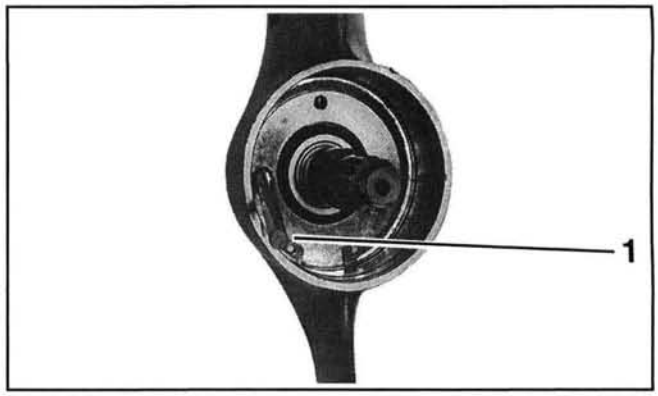
Using Retaining Ring Pliers, P/N 331045, install the retaining ring into groove in gearcase with sharp outside edge facing aft.

IMPORTANT: The retaining ring is under extreme pressure during installation. Make sure that the ring is seated in groove.



1. *Retaining ring* COA3239

Thread one Guide Pin, P/N 383175, into the retainer plate.

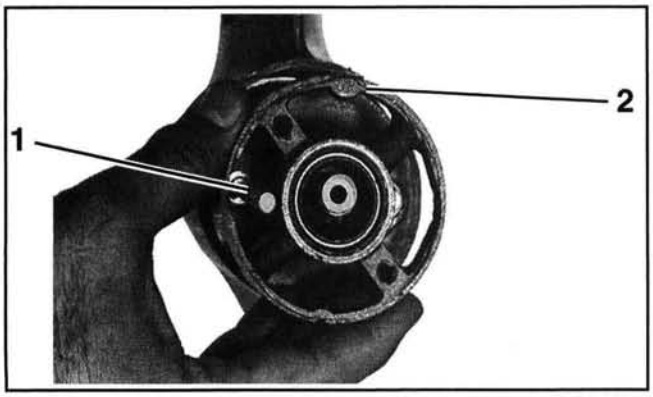


1. *Guide pin* COA3240

Stick the reverse gear thrust washer to the back side of the propeller shaft bearing housing with *Needle Bearing Assembly Grease.*

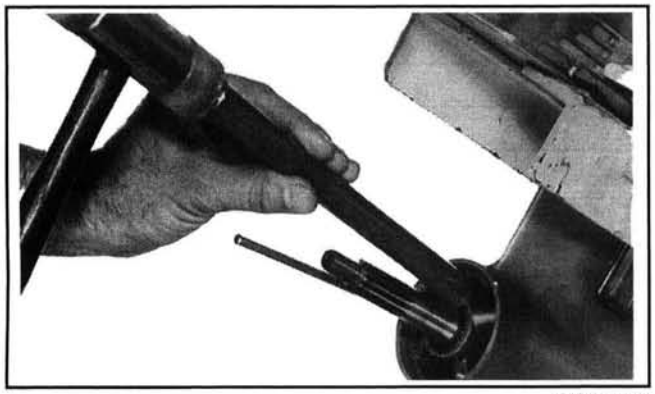
1. Reverse gear thrust washer COA3309

Lightly apply *Gasket Sealing Compound* to the aft support flange of the bearing housing. Align the propeller shaft bearing housing on the guide pin with the word "UP" toward the top.



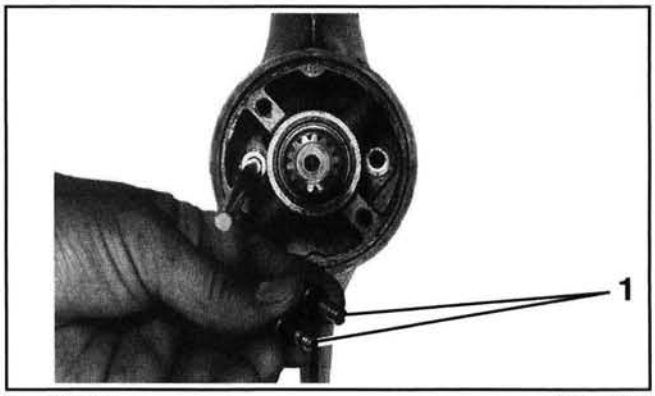
1. Guide pin COA3241
2. "UP"

Using a brass punch and a mallet, seat the bearing housing in the gearcase.



COA3242

Place new O-rings on the bearing housing retaining screws. Apply *Gasket Sealing Compound* to the O-rings and threads of the screws.



1. Screws COA3243

Install one screw in the bearing housing. Remove the guide pin and install the second screw. Tighten screws to 60 to 84 in. lbs. (7 to 9 N·m).

Coat the lower driveshaft splines with *Ultra-HPF* gearcase lubricant. Install the driveshaft into the gearcase with the water pump key end down. Be careful not to damage the seals with the splines. Turn the driveshaft to engage the pinion gear.

IMPORTANT: Pressure and vacuum test gearcase before filling with *Ultra-HPF* gearcase lubricant.

To complete gearcase servicing, refer to:

- **LEAK TEST PROCEDURE** on p. 260
- **WATER PUMP** on p. 265
- **REMOVAL AND INSTALLATION** on p. 260
- **TRIM TAB ADJUSTMENT** on p. 55
- **PROPELLER** on p. 258

NOTES

Technician's Notes

Related Documents

Bulletins	
Instruction Sheets	
Other	

MANUAL STARTER

TABLE OF CONTENTS

10

SAFETY INFORMATION

Before working on any part of the outboard, read the SAFETY section at the end of this manual.

DANGER

Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off. Remove propeller before servicing and when running the outboard on a flusher.

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

WARNING

Wear safety glasses to avoid personal injury, and set compressed air to less than 25 psi (172 kPa).

The motor cover and flywheel cover are machinery guards. Use caution when conducting tests on running outboards. DO NOT wear jewelry or loose clothing. Keep hair, hands, and clothing away from rotating parts.

During service, the outboard may drop unexpectedly. Avoid personal injury; always support the outboard's weight with a suitable hoist or the tilt support bracket during service.

To prevent accidental starting while servicing, disconnect the battery cables at the battery. Twist and remove all spark plug leads.

The electrical system presents a serious shock hazard. DO NOT handle primary or secondary ignition components while outboard is running or flywheel is turning.

Gasoline is extremely flammable and highly explosive under certain conditions. Use caution when working on any part of the fuel system.

Protect against hazardous fuel spray. Before starting any fuel system service, carefully relieve fuel system pressure.

Do not smoke, or allow open flames or sparks, or use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

Keep all electrical connections clean, tight, and insulated to prevent shorting or arcing and causing an explosion.

Always work in a well ventilated area.

Replace any locking fastener (locknut or patch screw) if its locking feature becomes weak. Definite resistance to tightening must be felt when reusing a locking fastener. If replacement is indicated, use only authorized replacement or equivalent.

GENERAL

Starter Rope Length

Model	Rope Length
9.9/15	59 in. (150 cm)
25/30	73.5 in. (186.6 cm)

Torque Chart

Model	Description	In. lbs.	Ft. lbs.	N·m
9.9/15	Starter Retaining Screw	60 - 84	5 - 7	7 - 9
25/30	Starter Retaining Screw	48 - 72	4 - 6	5.4 - 8
9.9–30	Starter Spindle Screw and Nut	120 - 144	10 - 12	14 - 16

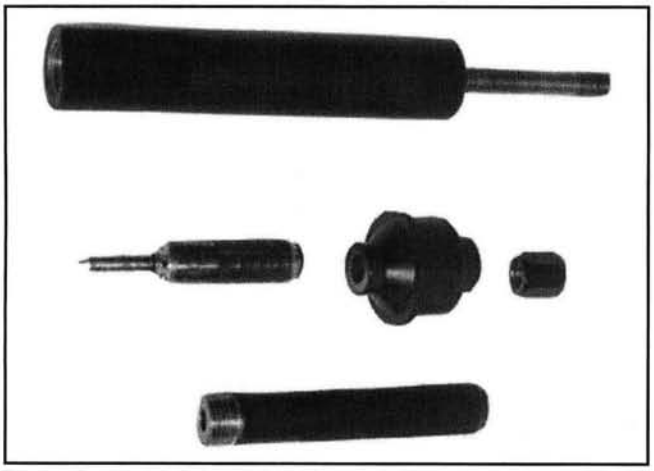
REMOVAL

9.9/15 MODELS

⚠ WARNING ⚠

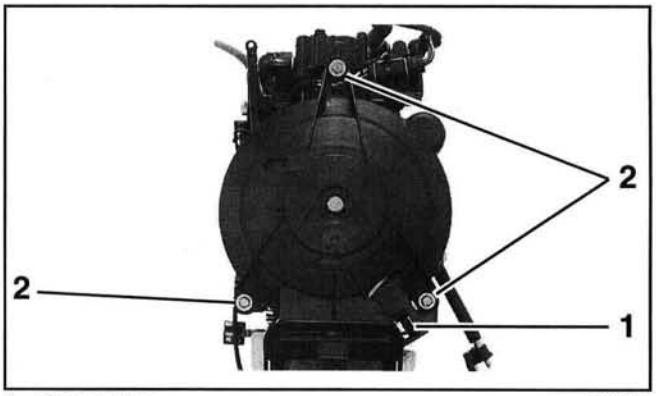
Avoid accidental starting of engine while servicing, twist and remove all spark plug leads.

IMPORTANT: Use of Starter Spring Installer Kit, P/N 342682, is required.



Starter Spring Installer Kit 50068

Loosen starter lockout cam screw several revolutions. Remove the three starter retaining screws.



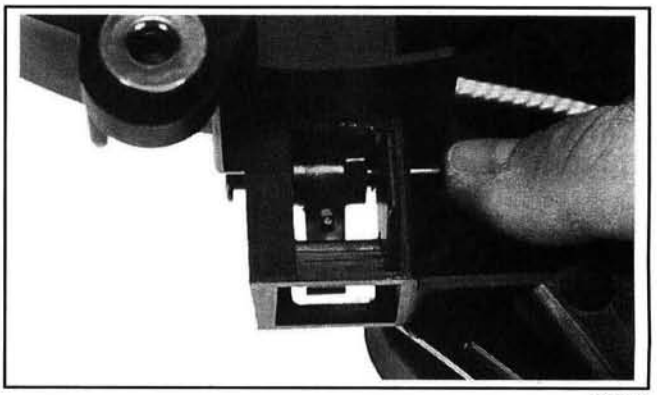
1. Cam screw
2. Starter screws

32312

Remove link from lockout cam. Lift starter from powerhead.

33746

To service lockout assembly, remove retaining pin.



33745

Remove the plunger, spring, tappet, and cam from the housing, and the screw from the cam.

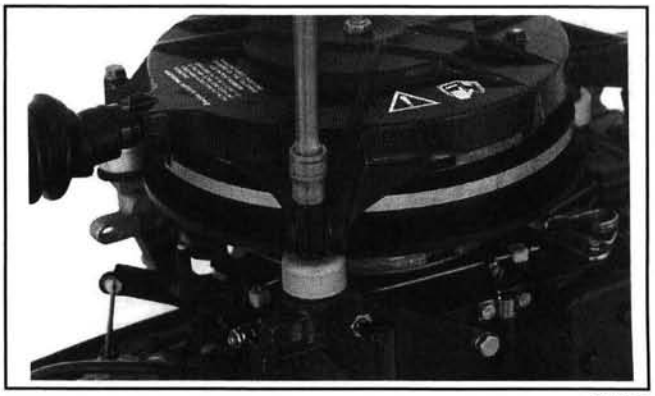
33744

25/30 MODELS

⚠ WARNING ⚠

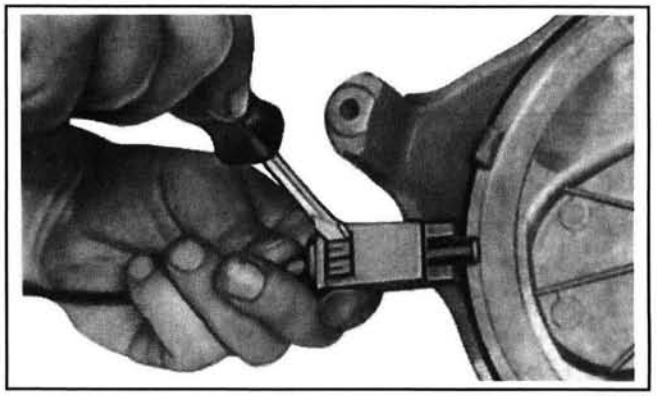
Avoid accidental starting of engine while servicing, twist and remove all spark plug leads.

Remove the three starter housing retaining screws. Lift starter housing from engine.



22095

Using a screwdriver, apply pressure to one side of the starter lockout locking tab. While applying pressure, pull on cable until tab is clear of starting housing.



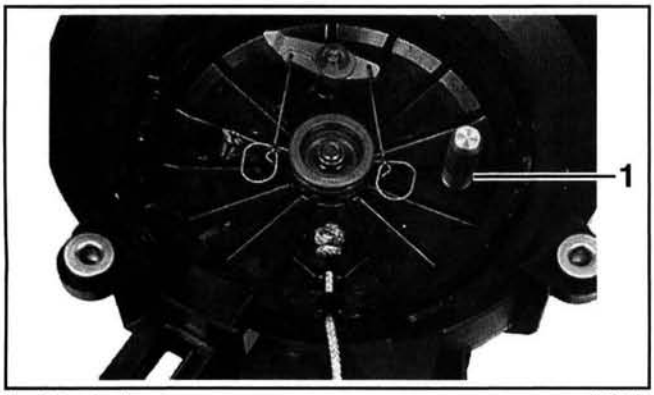
813149

ROPE REPLACEMENT – 9.9/15

WARNING

Wear safety glasses to avoid personal injury.

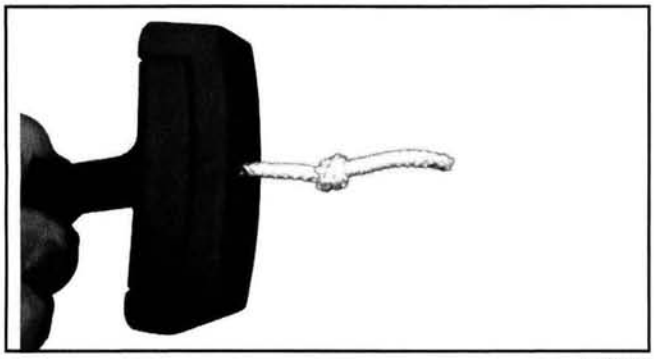
Pull rope out completely and retain pulley in position with stop tool from Starter Spring Installer Kit, P/N 342682.



1. Stop tool 46714

Remove rope from pulley channel, untie knot, and remove rope from starter assembly.

Remove cap from handle, untie knot and remove rope from handle.



001016

Cut new rope 59 in. (150 cm) long. Fuse 1/2 in. (12 mm) of both ends.

Route rope through housing into pulley. Tie knot in rope end and install in pulley channel.

Insert rope into handle, tie knot at end of rope, install handle cap.

Hold rope taut and pull stop tool out. Allow rope to slowly wind into starter.

DISASSEMBLY

9.9/15 MODELS

WARNING

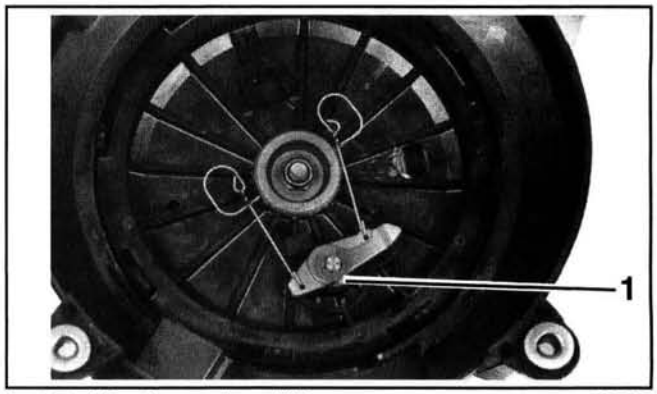
Wear safety glasses while disassembling and assembling manual starters to avoid personal injury caused by rewind spring tension.

Pull rope out completely and retain pulley in position with stop tool from Starter Spring Installer Kit, P/N 342682.

Remove rope from pulley channel, untie knot, and remove rope from starter assembly.

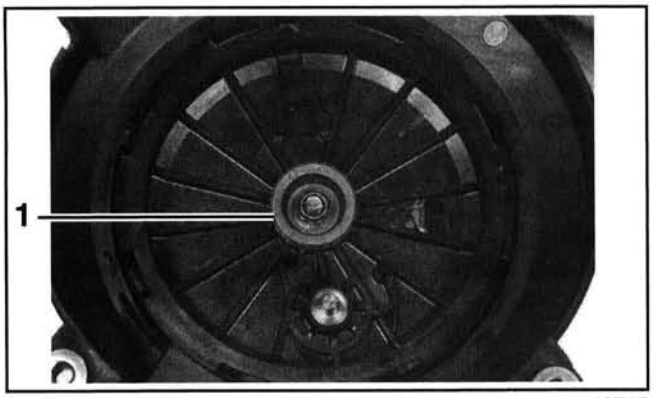
Remove stop tool and slowly unwind pulley until tension is released.

Remove retaining ring, pawl, and linkage.



1. Retaining ring, pawl, and linkage 46716

Remove the starter spindle screw and locknut. Hold the pulley down in housing and lift out spindle. Carefully lift out pulley, leaving spring in housing.



1. Screw and locknut 46717

⚠ WARNING ⚠

Do not remove spring with housing facing up. Do not lift spring out of housing by hand or with pliers. Spring is under tension and will cause injury if accidentally released. Keep fingers away from uncoiling spring.

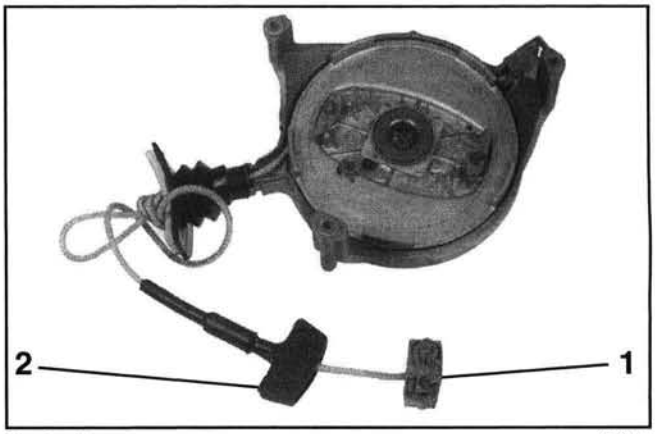
Turn starter housing over and jar on bench to remove spring.

25/30 MODELS

⚠ WARNING ⚠

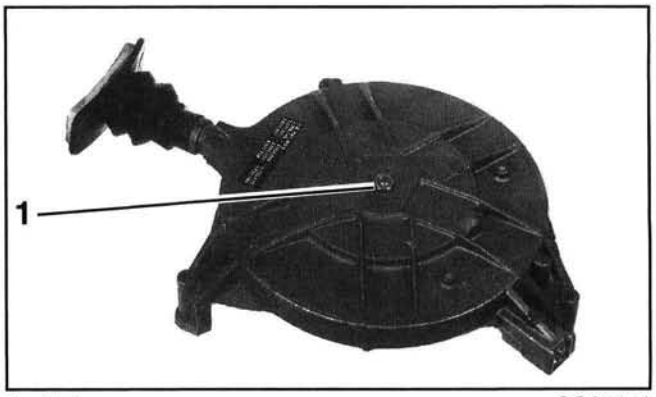
Wear safety glasses while disassembling and assembling manual starters to avoid personal injury caused by rewind spring tension.

Pull the starter rope out far enough to tie a slipknot in the rope. Pry the starter rope anchor out of the handle. Remove the handle, release the slipknot, and ease the pulley back until the rewind spring is fully unwound.



1. Anchor
2. Handle 0645

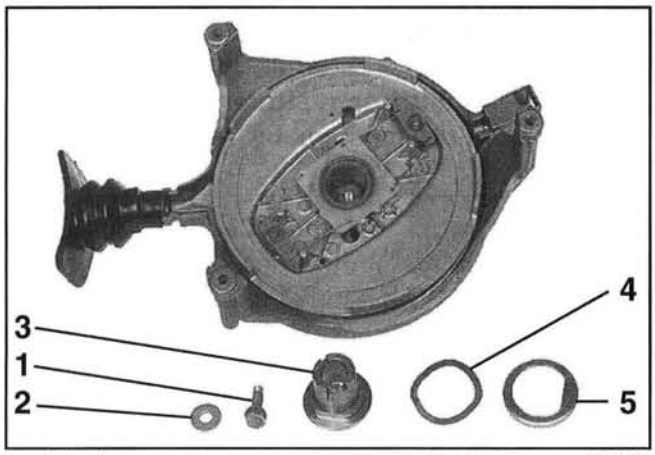
Remove the spindle screw nut.



1. Nut COA1341

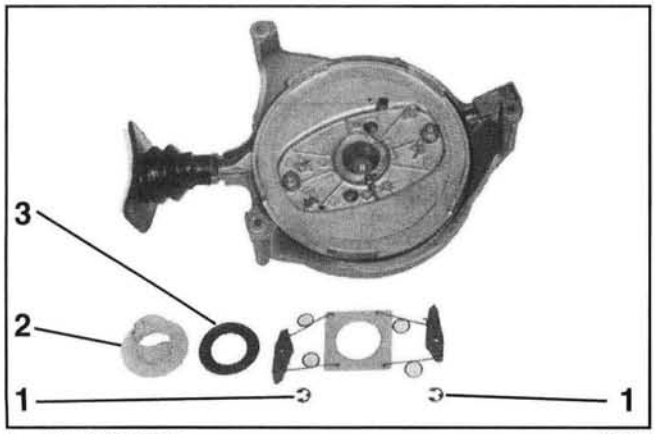
10

Remove the spindle screw, spindle washer, spindle, spring washer, and friction ring.



1. *Spindle screw* 0646A
2. *Spindle washer*
3. *Spindle*
4. *Spring washer*
5. *Friction ring*

Remove the two retaining rings and lift both pawls, links, and friction plate as an assembly. Remove the spindle bushing and shim.



1. *Retaining rings* 0649
2. *Spindle bushing*
3. *Shim*

Hold the pulley in the starter housing while turning the starter over, legs down. Hold fingers clear of the pulley and jar the starter housing against a bench to dislodge the rewind spring and pulley.

CLEANING AND INSPECTION

Wash metal components in solvent and dry with compressed air.

Inspect the rewind spring for broken end loops and weak tension.

Examine the pawl and links for wear.

Examine the pulley and the starter housing. Look for sharp edges and rough surfaces that could fray the starter rope. File and polish to remove.

25/30 MODELS

Inspect the friction plate and spindle.

Inspect starter rope. Replace rope if frayed. Cut new rope to 73.5 in. (186.6 cm) in length. Fuse ends of rope to a length of 1/2 in. (12 mm).

Inspect the starter spring shield for wear.

Examine starter lockout parts. Replace any worn or damaged parts.

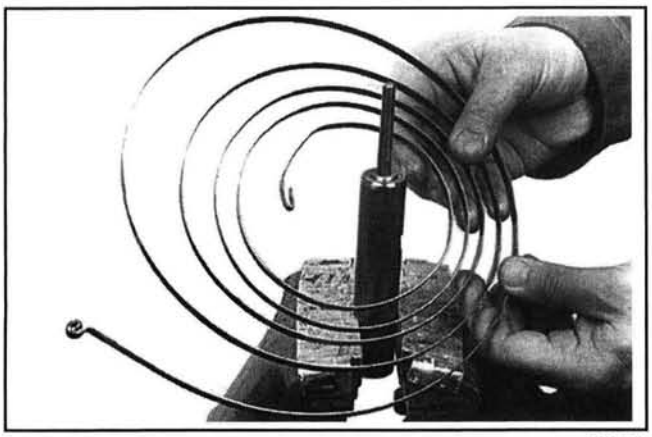
ASSEMBLY

9.9/15 MODELS

WARNING

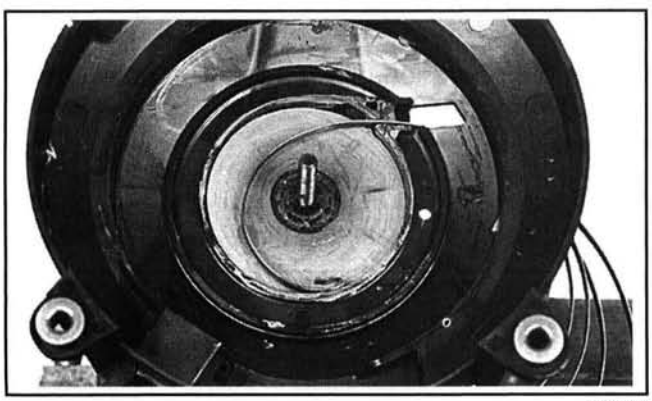
Wear safety glasses while disassembling and assembling manual starters to avoid personal injury caused by rewind spring tension.

Install mandrel from Starter Spring Installer Kit, P/N 342682, in vice and place spring around mandrel as shown.



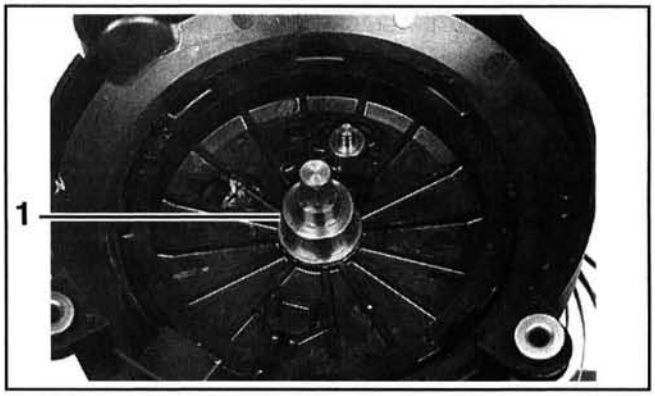
46684

Place housing, with shield, over mandrel and route hook end of spring through housing opening.



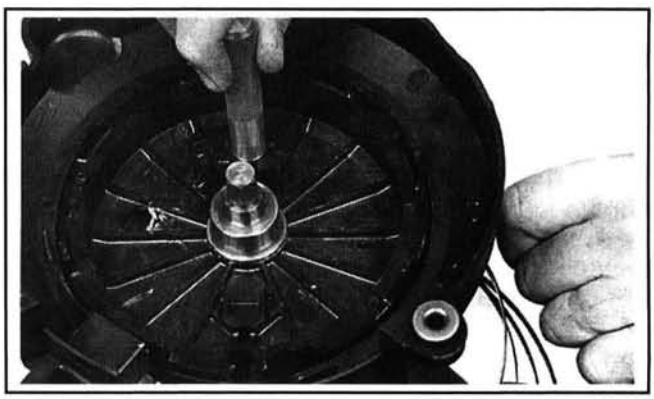
46718

Place pulley over mandrel and secure with pulley retainer (taper toward pulley) and left hand thread nut from Starter Spring Installer Kit, P/N 342682.



1. Pulley retainer 46719

Pull lightly on spring to eliminate slack and turn pulley counterclockwise with handle from Starter Spring Installer Kit, P/N 342682 until spring hook engages pulley hub slot.

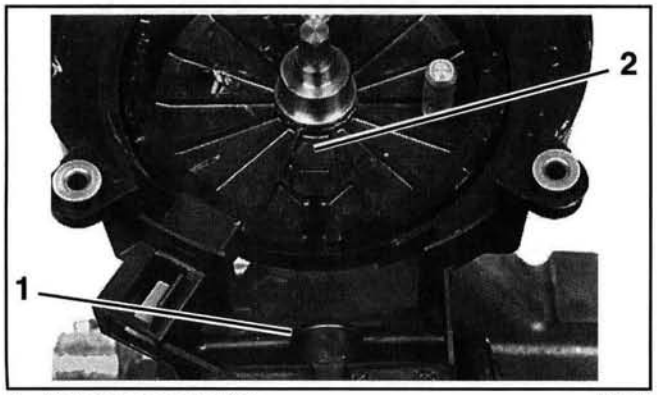


46720

10

Turn pulley counterclockwise to pull spring all the way into housing. Allow pulley to slowly unwind until tension is relieved.

Turn pulley counterclockwise approximately 3 1/2 turns until opening for rope in housing aligns with rope channel in pulley. Secure pulley in place by installing stop tool into pulley and housing holes.



1. *Housing rope opening*
2. *Rope channel on pulley*

46721

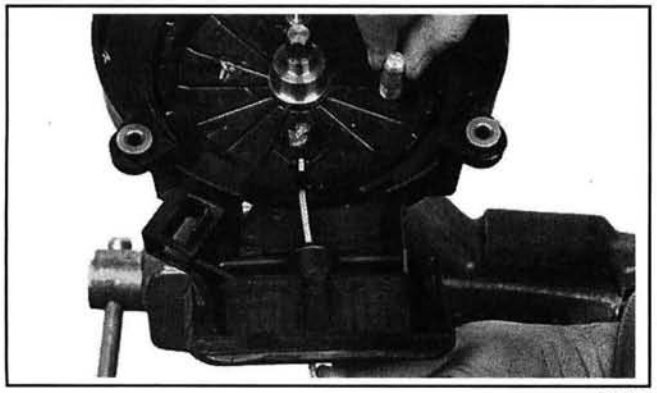
Inspect starter rope. Replace rope if frayed. Cut new rope to 59 in. (150 cm) in length and fuse ends of rope.

Insert rope into starter handle, tie knot and seat knot in handle. Install starter handle cap.

Route rope through housing into pulley. Tie knot in rope end and install in pulley channel.

Insert rope into handle, tie knot at end of rope, install handle cap.

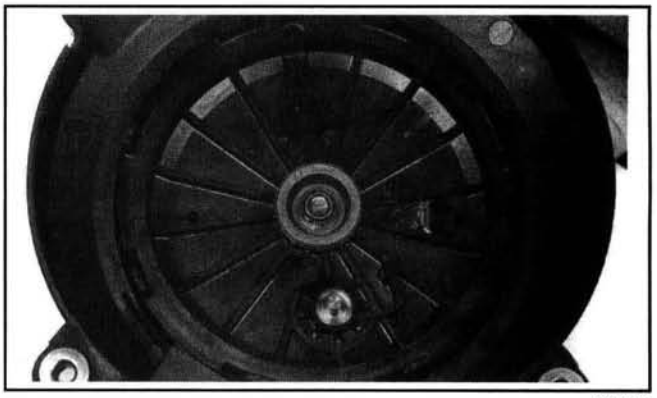
Hold rope taut and pull stop tool out. Allow rope to slowly wind into starter.



46722

Remove nut and pulley retainer from mandrel and remove starter assembly.

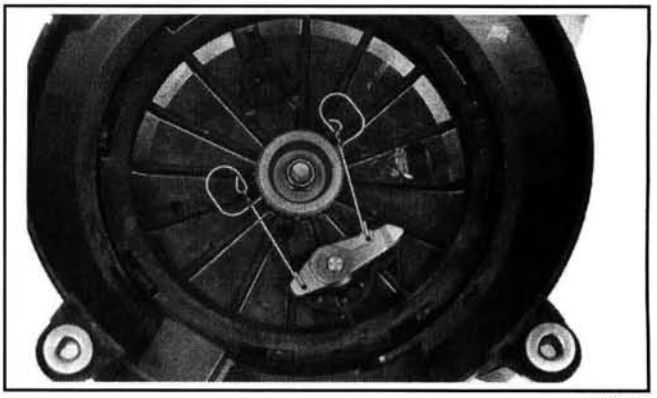
Install spindle, screw, and locknut. Tighten locknut 120 to 144 in. lbs. (14 to 16 N·m).



46717

Examine lockout parts. Replace any worn or damaged parts.

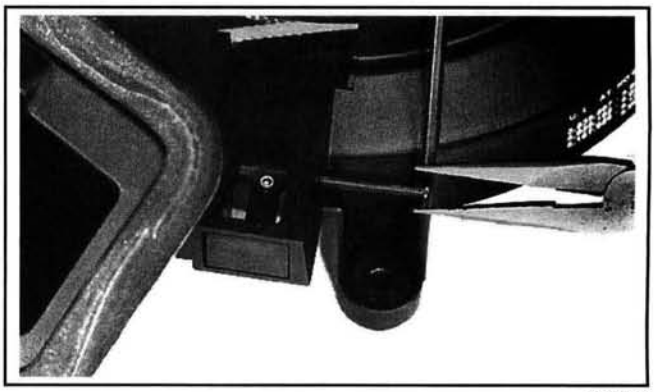
Install pawl, linkage, and retaining ring (sharp edge up).



46716

Check the operation of the pawl. The pawl should extend when the starter rope is pulled and retract when the starter rope rewinds.

Install screw into cam. Install plunger, spring, tappet, and cam with retaining pin.



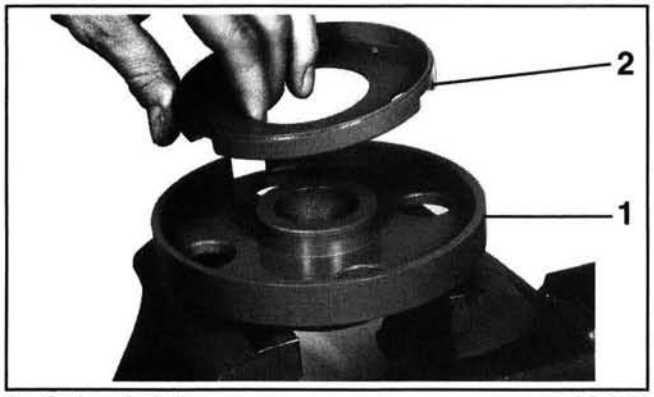
35054

25/30 MODELS

⚠ WARNING ⚠

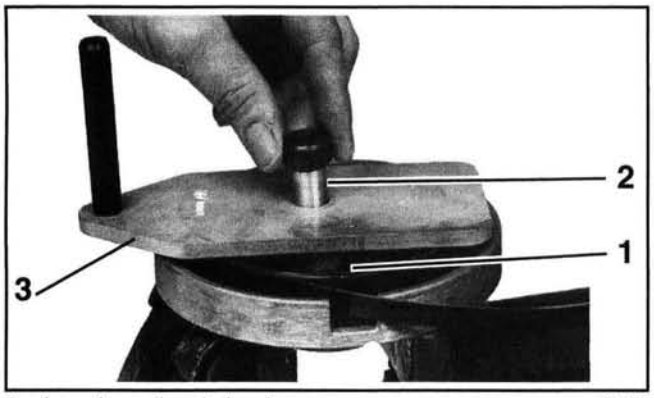
Wear safety glasses while disassembling and assembling manual starters because of rewind spring tension.

Using Starter Spring Winder and Installer, P/N 392093, clamp spring winder base in a vise. Insert adapter release plate into spring winder base.



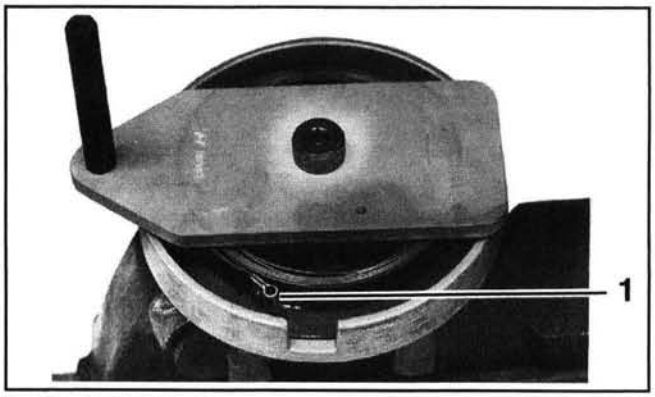
1. *Spring winder base* CO3587
2. *Adapter release plate*

Apply *Triple-Guard* grease or *Lubriplate 777* to the rewind spring. Place inner loop of rewind spring in the spring winder base. Insert the pin of the crank and pin assembly into the inner loop of the rewind spring. Secure the crank and pin assembly to the starter winder base with the crank retainer screw.



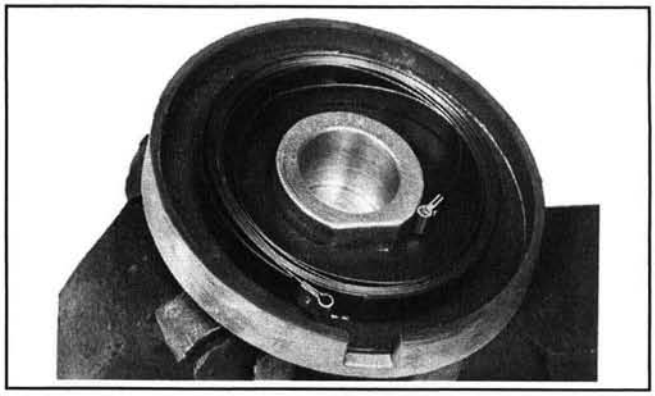
1. *Inner loop of rewind spring* 2677
2. *Pin*
3. *Crank and pin assembly*

Rotate the crank and pin assembly in the direction shown on the tool. Wind the spring into the starter winder base until end of rewind spring contacts the starter winder base.



1. *Rewind spring* 2681

Remove the crank retainer screw and the crank and pin assembly from the starter winder base.

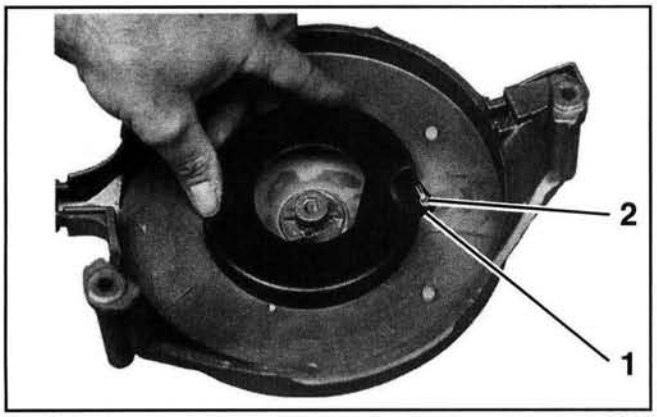


2680

Remove the adapter release plate with the rewind spring from the starter winder base.

10

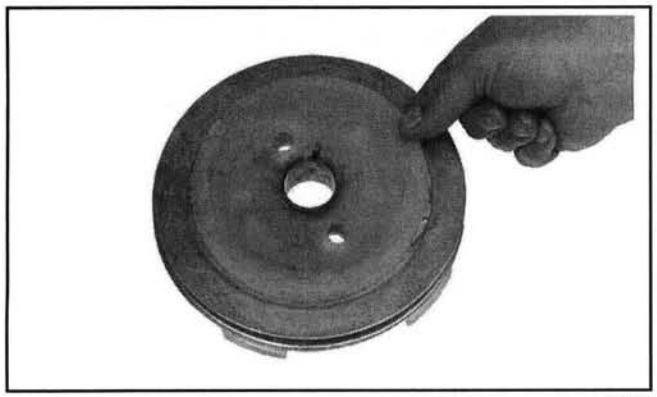
Install the rewind spring into the starter housing. Locate the outer loop of the rewind spring on the pin in the starter housing. Press down through the holes of the adapter release plate to transfer the rewind spring into the starter housing.



1. *Outer loop*
2. *Pin*

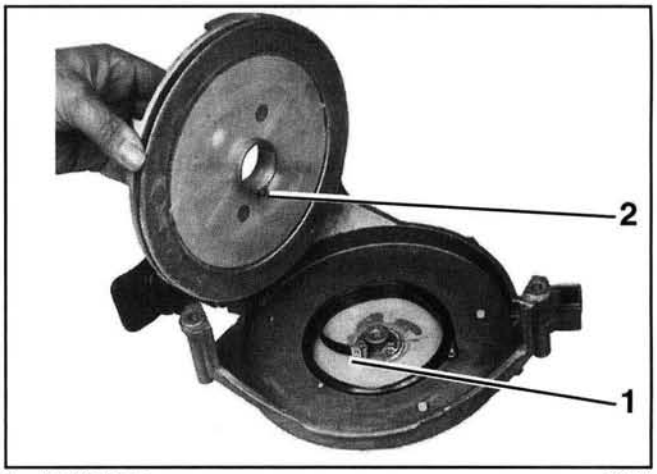
2684

Place the starter spring shield with holes onto the pulley.



0648

Bend the inside loop of the rewind spring in toward the center of the starter housing. Engage the pin of the pulley with the inner loop of the rewind spring and install the pulley in the starter housing.

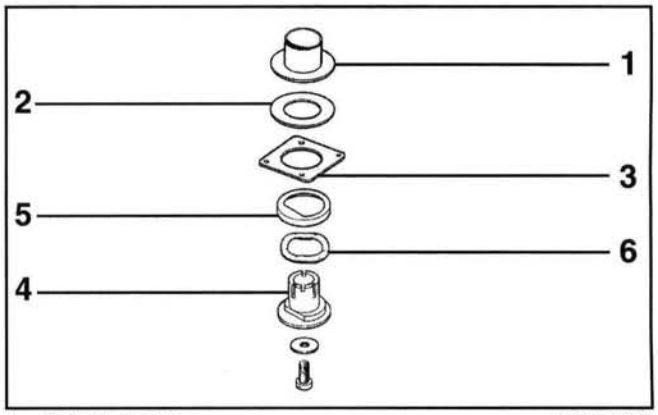


1. *Inside loop*
2. *Pin*

2679

Lightly apply *Triple-Guard* grease or *Lubriplate 777* to the spindle bushing and pawl pins on the pulley. Install the bushing and the shim into the starter pulley. Next install the friction plate, links, and pawls. Secure the pawls with the retaining clips.

Lightly apply *Triple-Guard* grease or *Lubriplate 777* to the spindle. Install the spindle, friction ring, and spring washer.



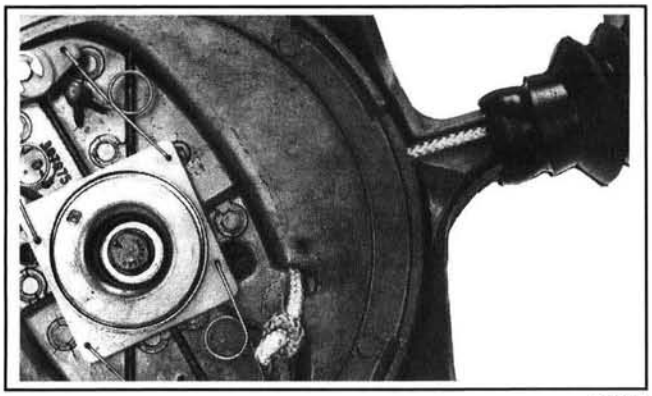
1. *Spindle bushing*
2. *Shim*
3. *Friction plate*
4. *Spindle*
5. *Friction ring*
6. *Spring washer*

DR1743A

IMPORTANT: The flat section of the friction ring and spindle must be aligned.

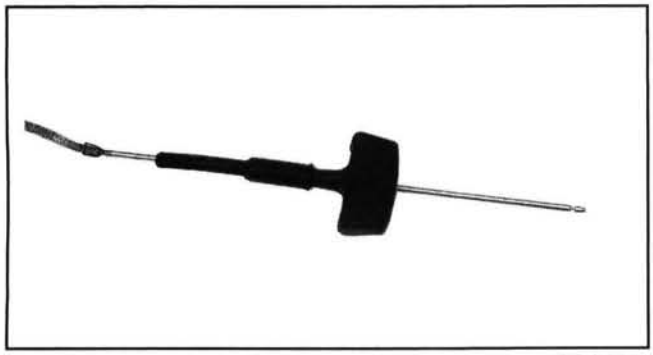
Clean threads of the spindle retaining screw and nut to remove adhesive. Install the spindle retaining screw and washer into the starter housing. Tighten screw and torque 120 to 145 in. lbs. (14 to 16 N·m). Spray threads of spindle retaining screw that protrude through the starter housing with *Loc-quic Primer.* Apply *Nut Lock* to the threads of the nut. Hold the spindle screw and torque the nut 120 to 145 in. lbs. (14 to 16 N·m).

Tie a knot in one end of the starter rope. With the starter housing upside down on a bench, wind the pulley counterclockwise until the rewind spring is tight. Back off the spring about 1/2 to 1 turn. Thread the starter rope through the hole in the pulley, behind roll pin in pulley, and out through the starter housing.



16707

Apply *Triple-Guard* grease or *Lubriplate 777* to the handle end of the starter rope. Using Starter Rope Threading Tool, P/N 378774, thread the starter rope through the handle. Press the starter rope into the channel of the rope anchor, with end of starter rope butting firmly against end of channel. Press the anchor into the handle. Tug on end of starter rope to seat the knot against the pulley. Allow starter rope to wind slowly onto the pulley.



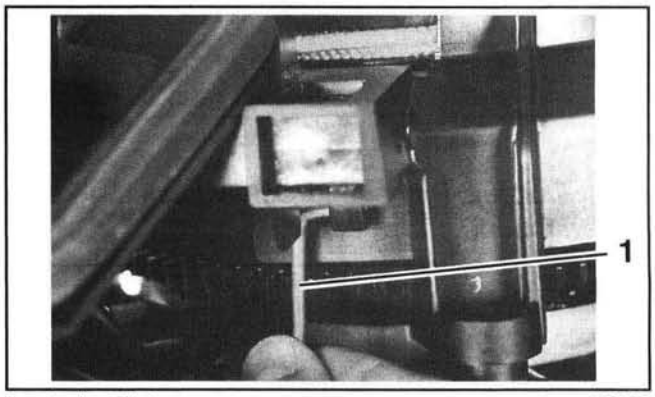
COA1347

Check the operation of the pawls when the starter rope is pulled out. The pawls should extend when the starter rope is pulled and retract when the starter rope recoils.

INSTALLATION

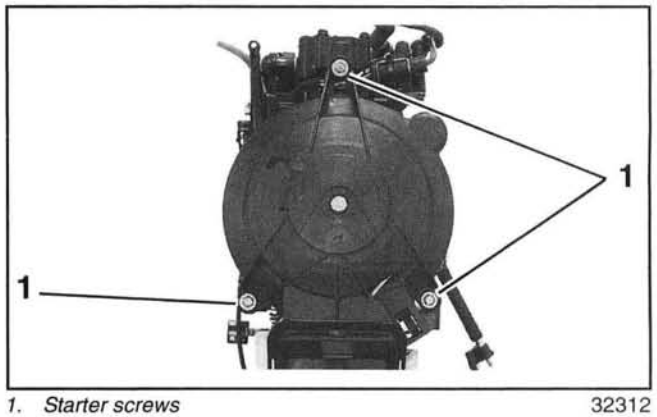
9.9/15 MODELS

Position starter on engine. Connect starter lockout link to cam. Turn cam screw IN carefully until screw head contacts cam. Do not overtighten.



1. Lockout link 33746

Install starter screws. Tighten screws 60 to 84 in. lbs. (7 to 9 N·m).

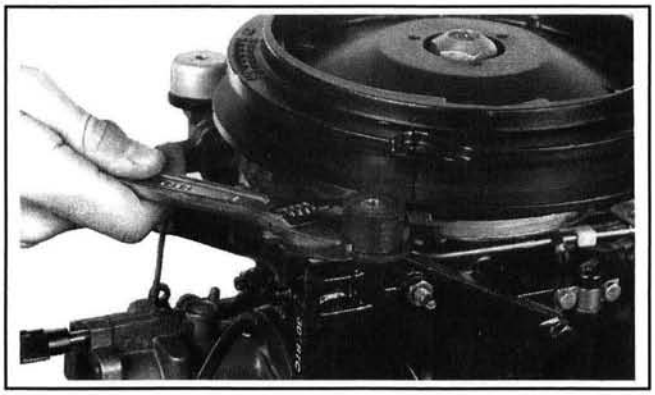


1. Starter screws 32312

Check operation of starter and starter lockout. Starter should crank outboard in NEUTRAL gear. **Starter MUST NOT crank outboard in FORWARD or REVERSE gear.**

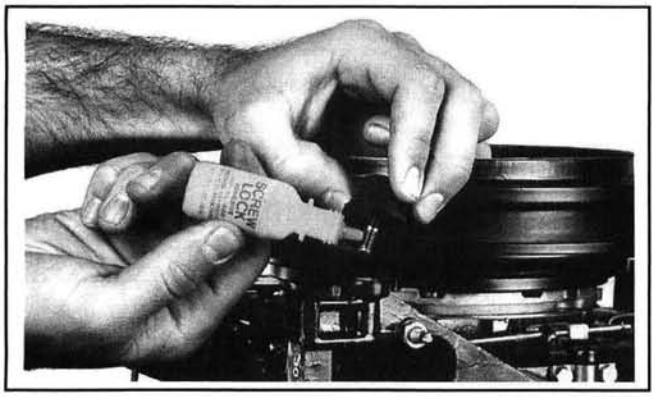
25/30 MODELS

Inspect the starter mount. If the mounts are damaged or worn, replace by removing the mount using a crescent wrench.



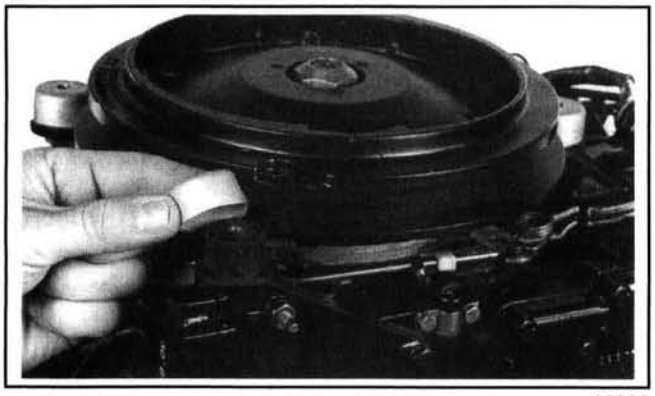
12302

Apply *Locquic Primer* and *Screw Lock* to threads of new mount.



12301

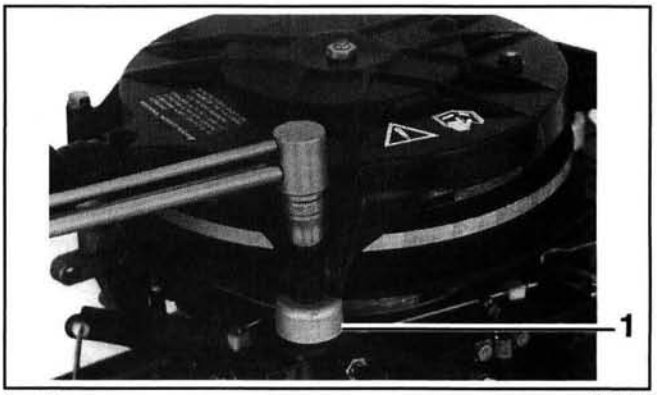
Tighten mount securely. Install caps on starter mounts.



12303

Install the starter lockout cable into the starter housing.

Position the starter assembly onto the outboard. Install the three starter housing retaining screws. The short screw is installed on the port side of the starter housing. Tighten screws and torque 48 to 72 in. lbs. (5.4 to 8 N·m).



1. Screw 22094

Check operation of starter and starter lockout. Starter should crank outboard in NEUTRAL gear. **Starter MUST NOT crank outboard in FORWARD or REVERSE gear.**

SAFETY

TABLE OF CONTENTS

MARINE PRODUCTS AND THE SAFETY OF PEOPLE WHO USE THEM

⚠ WARNING ⚠

This Safety section contains information relevant to the safety of boaters and people that service boats. Please read this section carefully and share it with all shop technicians. Always follow common shop safety practices. If you have not had training related to common shop safety practices, you should do so not only to protect yourself, but also to protect the people around you.

It is impossible for this manual to cover every potentially hazardous situation you may encounter. However, your understanding and adherence to the recommendations contained in this manual and use of good judgment when servicing outboards will help promote safety. Always be alert and careful: a good foundation for safety.

Enjoyable boating is the goal of people who design and build marine products. To reach this goal, manufacturers are careful to make sure:

- Product user is informed; and
- Products are safe and reliable.

It is up to you, the people who...

- Rig boats;
- Fix machinery; and
- Maintain equipment

...to keep the products safe **and** reliable.

This section talks about safe boating and how you can help make it safe. Some of these safety issues you will know, others you may not.

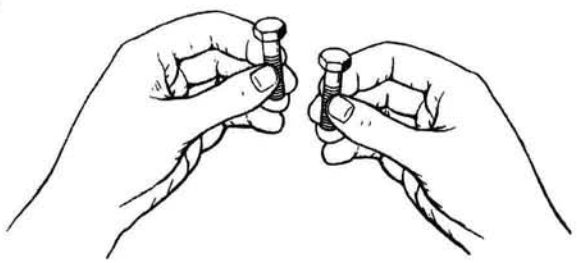
First!

A word about parts... Plain parts; special parts; all parts!

DO NOT SUBSTITUTE PARTS

"They look the same, but are they the same?"

- Same size?
- Same strength?
- Same material?
- Same type?

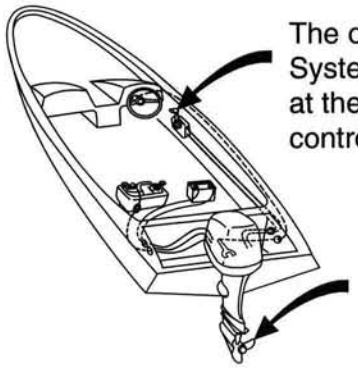


Don't substitute unless **you know** they are the **same** in **all** characteristics.

Second!

- Special locking bolts and nuts are often used to hold steering, shift, and throttle remote control cables to the outboard.
- When you take any outboard off a boat, keep track of special nuts and bolts. Do not mix with other parts. Store them on the outboard, then they are there when you need them.
- When the outboard is returned to the boat, use only the special nuts and bolts to hold remote steering, shift, and throttle cables to the outboard.

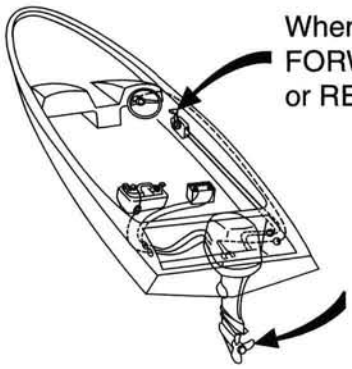
Outboard Shift Systems and Safety



The outboard Shift System starts here at the remote control lever...

...and ends here at the propeller.

What is most important?

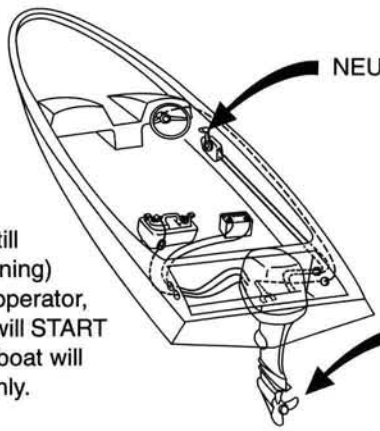


When control lever is in FORWARD, NEUTRAL or REVERSE...

...shift linkage must match control lever position.

What could happen?

IF...

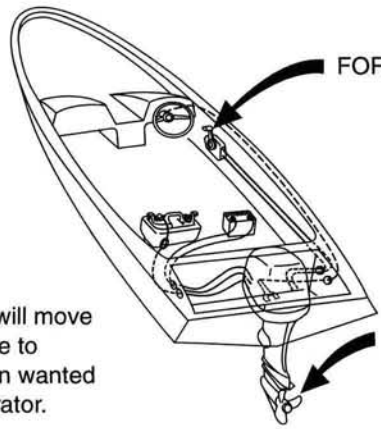


NEUTRAL

...propeller still powered (turning) unknown to operator, or outboard will START in gear, and boat will move suddenly.

FORWARD or REVERSE

IF...



FORWARD

...boat will move opposite to direction wanted by operator.

REVERSE

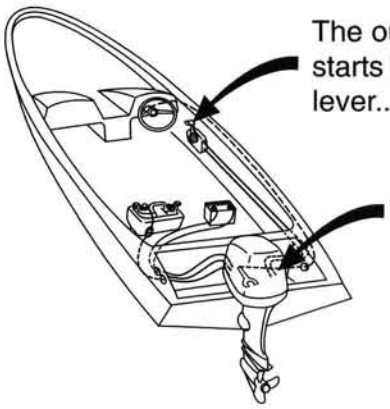
How can loss of shift control be minimized?

When rigging or after servicing

Read, **understand**, and **follow** manufacturer's **instructions**

- Follow warnings marked "⚠" closely.
- Assemble parts carefully.
- Make adjustments carefully.
- Test your work. Do not guess. Make sure propeller does just what the operator wants and nothing else.
- Do not shift gears on a stopped outboard. Adjustments can be lost and parts weakened.

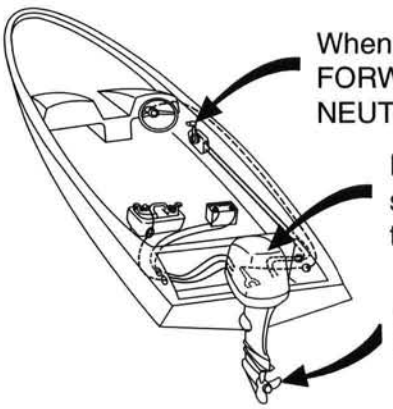
Outboard Speed Control System and Safety



The outboard speed control system starts here at the remote control lever... (single lever remote control)

...and ends here on the powerhead.

What is most important?



When control lever is moved from FORWARD (or REVERSE) to NEUTRAL...

Powerhead speed must slow down to allow operator to shift into NEUTRAL.

Operator must be able to STOP propeller.

What could happen?

If Operator cannot slow down the outboard or shift into NEUTRAL gear (stop propeller), Operator could panic and lose control of boat.

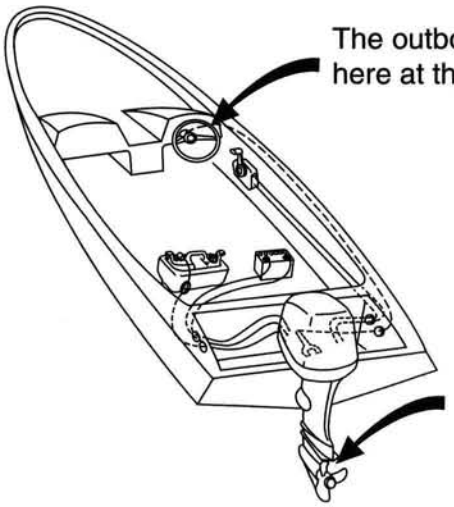
How can loss of speed control be minimized?

When rigging or after servicing

Read, **understand**, and **follow** manufacturer's **instructions**

- Follow warnings marked "⚠" closely.
- Assemble parts carefully.
- Make adjustments carefully.
- Test your work. Do not guess. Make sure speed control system does just what the operator wants and nothing else.
- Make sure full throttle can be obtained so Operator will not overload parts.

Outboard Steering Control System and Safety

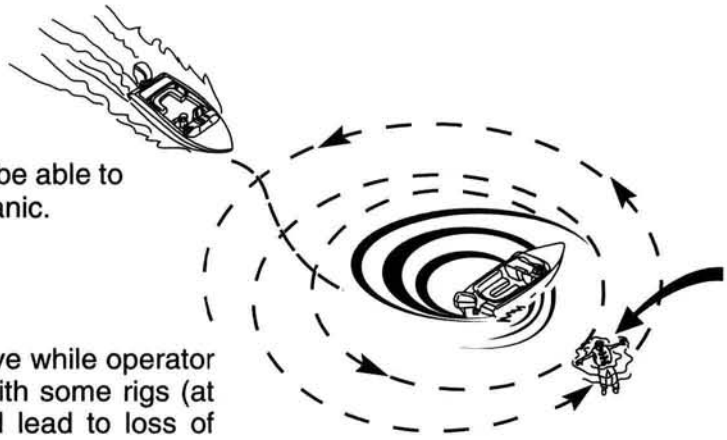


What is most important?

The steering system:
- Must not come apart;
- Must not jam; and
- Must not be sloppy or loose.

What could happen?

- If steering system comes apart, boat might turn suddenly and circle. Persons thrown into the water could be hit.



- If steering jams, operator may not be able to avoid obstacles. Operator could panic.

- If steering is loose, boat may weave while operator tries to steer a straight course. With some rigs (at high speed), loose steering could lead to loss of boat control.

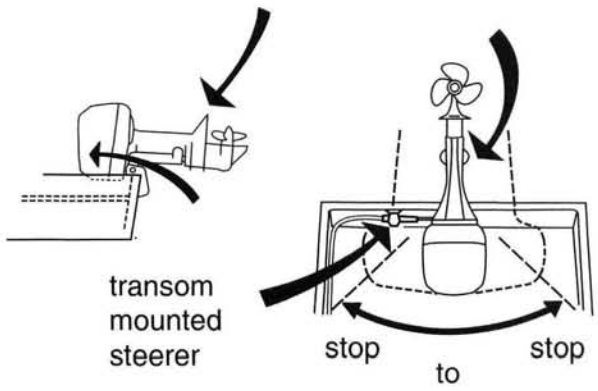
How can loss of steering control be minimized?

When rigging or after servicing

- Use a steering system recommended by the outboard manufacturer which meets Marine Industry Safety Standards (ABYC).
- **Read**, **understand**, and **follow** manufacturer's **instructions**
- Follow warnings marked "⚠" closely.
- Assemble parts carefully.
- Make adjustments carefully.
- Keep parts moving freely. Lubricate parts as shown in manual.
- Use the bolts, nuts and washers supplied with steering attachment kits—they are a special locking type that will not loosen, rust, or weaken.

Transom Mounted Steering Systems – Check to Uncover Possible Trouble!

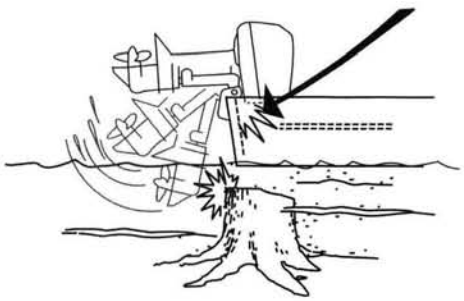
Tilt outboard into boat, then turn it.



During this procedure, steering parts:

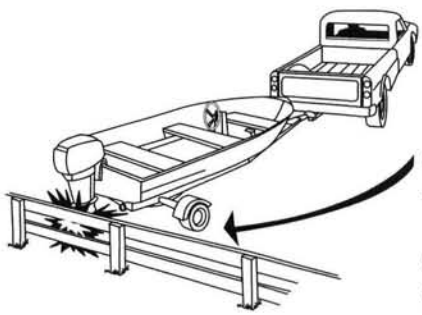
- Must not bind; and
- Must not touch other boat, outboard, or accessory parts in transom area.

Why? A hard blow to the outboard's gearcase can result in damage to steering parts.



Be aware that raising or lowering outboard on transom can change a set-up which was OK earlier. If moved up or down even one-half inch, run test again to make sure steering parts are free and clear.

Check for damaged parts. Blows to the outboard like this

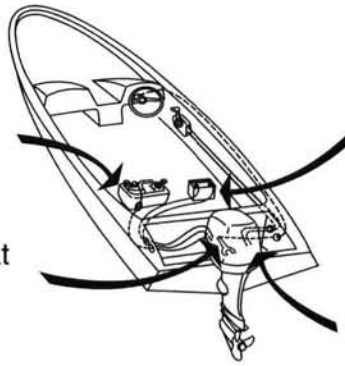


or this can put heavy loads on steering parts. Look for:

- Cracked parts, including steering parts, swivel brackets, and transom brackets;
- Bent parts; and
- Loose nuts and bolts.

Replace damaged parts. If weakened, parts could fail later on the water when least expected.

Outboard Fuel, Electrical System, and Safety



The fuel system starts here at the fuel tank...

...and ends here at the fuel injector.

The electrical system begins here at the battery...

...and ends here on the powerhead.

What is most important?

- Fuel leakage must be eliminated.
- Stray electric sparks must be avoided.

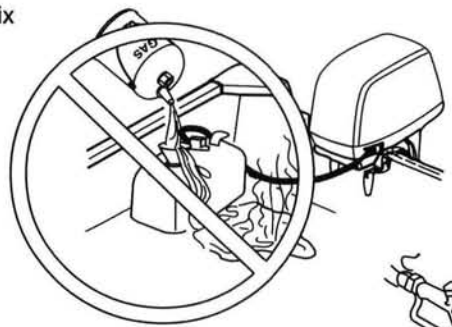
What could happen?

- **When not boating**, fuel leaking in car trunk or van, or place where portable tank is stored (basement or cottage), could be ignited by any open flame or spark (furnace pilot light, etc.).
- **When boating**, fuel leaking under the engine cover could be ignited by a damaged or deteriorated electrical part or loose wire connection making stray sparks.

How Can Fire and Explosion Be Minimized?

- **Read**, **understand**, and **follow** manufacturer's **instructions**
- Follow warnings marked "⚠" closely.
- **Do not** substitute fuel or electrical systems parts with other parts which may look the same. Some electrical parts, like starter motors, are of special design to prevent stray sparks outside their cases.
- Replace wires, sleeves, and boots which are cracked or torn or look in poor condition.

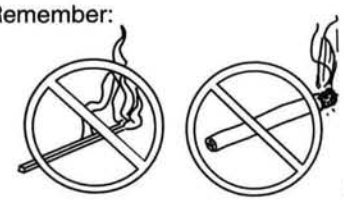
When mixing and refueling, always mix gas and oil outside...



Always fill the tank outside the boat

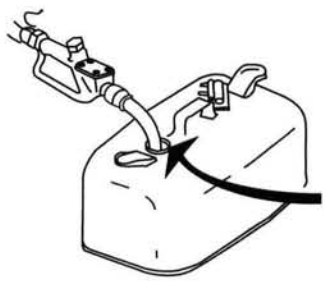
Fumes are hard to control. They collect and hide in the bottom of the boat.

Remember:



Do not use electrical devices such as cellular phones in the vicinity of a fuel leak or while fueling.

If you use a funnel, it has to be metal to ground the spout to the tank.



To avoid those static electric sparks, ground (touch) the spout against the tank.

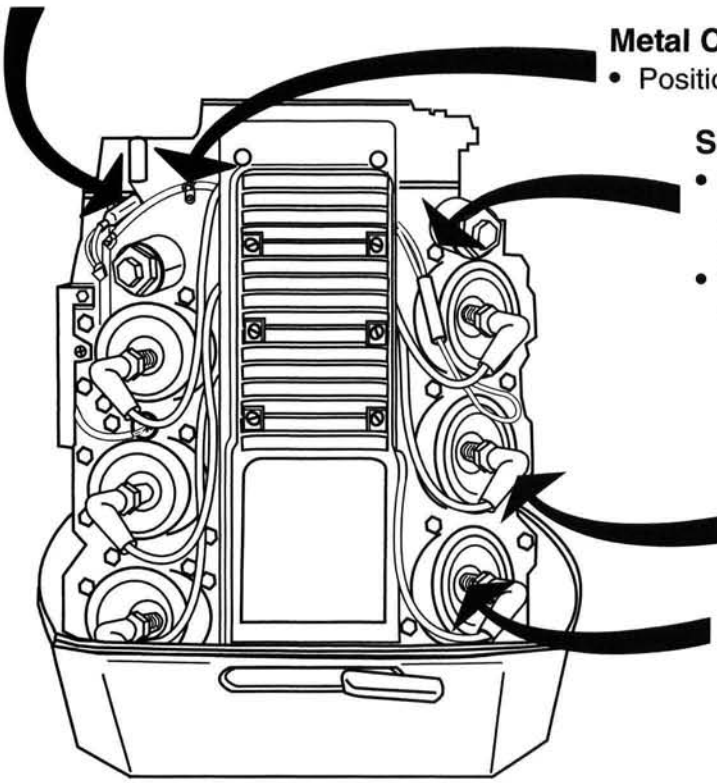
If electrical parts are replaced or even removed from the outboard, check the following:

Wire and high voltage lead routing

- As shown in service manual
- Away from moving parts which could cut wires or wire insulation
- Away from engine cover latches which can catch and cut insulation from high voltage spark plug leads

Sleeves, boots, shields

- In position (to avoid shock hazard)
- Not torn or cracked



Metal Clamps – Tie Straps

- Position as shown in manual

Screws, Nuts, Washers

- Tighten firmly–these keep clamps in position and ends of wires from sparking
- Where lock washers are called for, use them

Spark Plug Boots

- Not torn or cracked
- Fully pushed onto spark plug

Spark Plugs

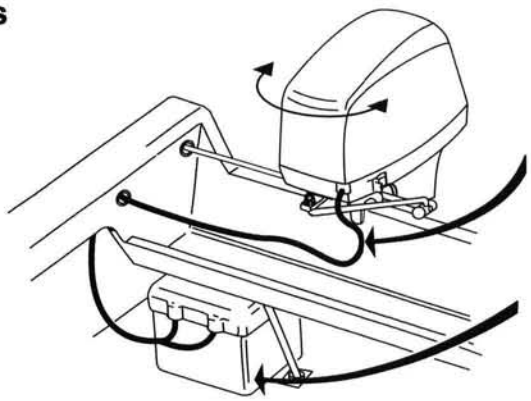
- Avoid rough handling that could crack ceramic part of plug. (Sparks may jump across outside of plug.)

In transom area:

All Connections

- Clean
- Tight

(Prevents sparks)



Electric Cable

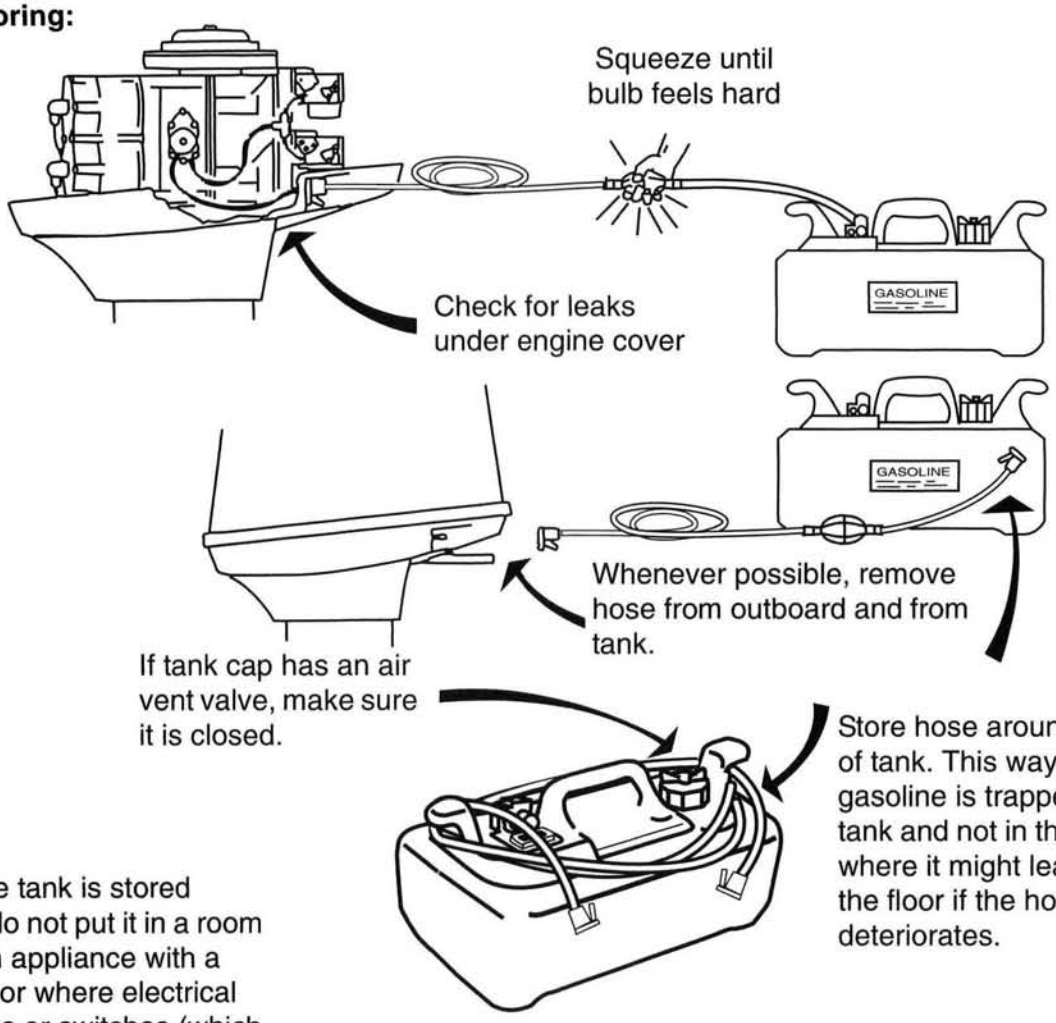
- Not rubbing on sharp objects
- Enough slack to allow full turning without pull loads on cable (prevents sparks)

Batteries

- Secure in approved battery box or battery tray
- Battery terminals insulated
- No strain on cables

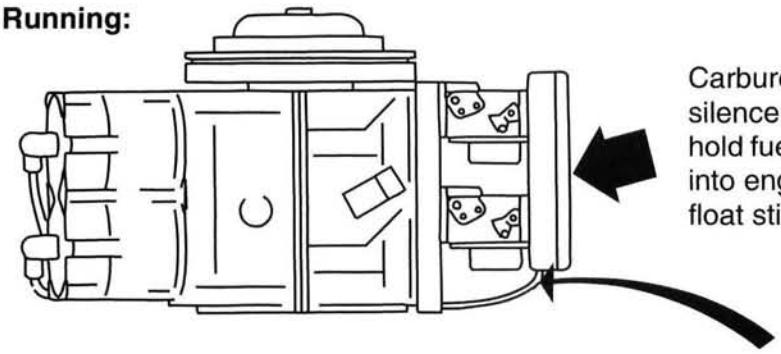
After repair on any part of the fuel system, pressure test engine portion of fuel system as shown:

When Storing:



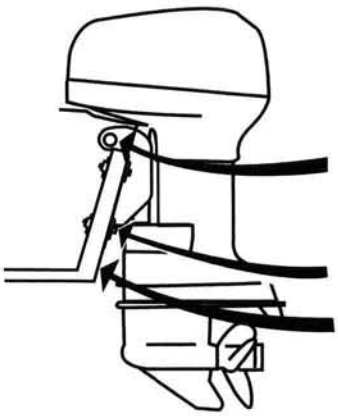
If gasoline tank is stored indoors, do not put it in a room having an appliance with a pilot light or where electrical appliances or switches (which may spark) will be used.

When Running:



- **Make sure silencer and its gaskets are on engine and drain hose is in place.**
- **Air silencer mounting screws are special lock screws. Use only the special screws.**

Outboard Mounting System and Safety



The mounting system includes:

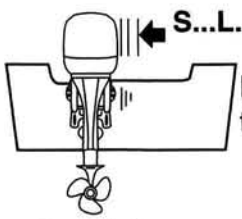
- outboard parts
- bolts, nuts, and washers
- boat's transom

What is most important?

- Outboard must **stay** in position on boat's transom.

What could happen?

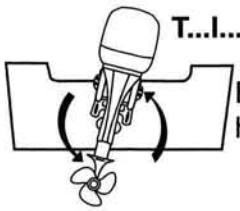
Outboard may



S...L...I...D...E on transom

Boat may turn and be hard to steer.

Outboard may

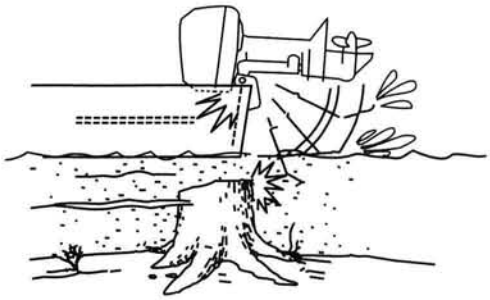


T...I...L...T on transom

Boat may turn and be hard to steer.

- If outboard hits something solid and does not stay on the transom, boat occupants may be injured from the outboard or its parts entering the boat.

Boat's transom could break away.

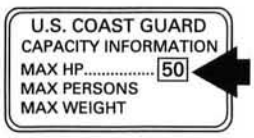


Outboard may be lost overboard. Boat may **SINK**.

How Can Loss of Mounting Be Minimized?

- **Read**, **understand**, and **follow** manufacturer's **instructions.**
- Follow warnings marked "⚠" closely.

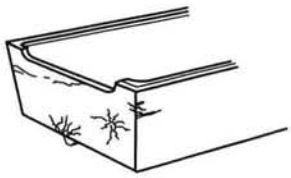
If weakened, parts could fail later on the water, when not expected



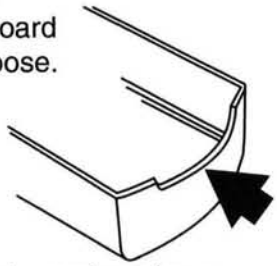
If boat plate shows...

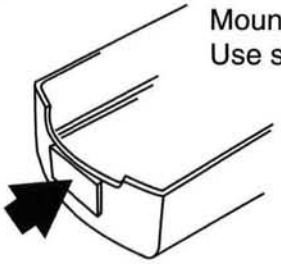
Use only or smaller

When rigging or fixing any boat, if transom looks weak, tell the owner.



If transom is curved, outboard may come loose.





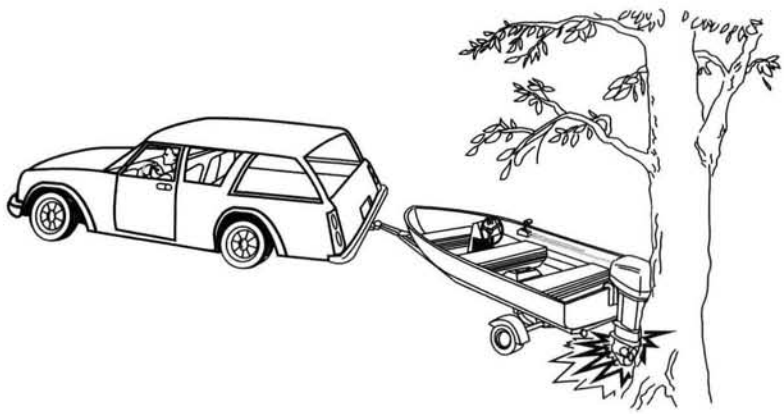
Mount on flat surface only. Use shims to make surface flat.

Use bolts, nuts, and washers supplied with outboard. They are usually special, and will not rust or weaken.

If owner tells you "I hit something really hard..."

Check for a high speed blow to the lower unit.

OR...



"I was backing up and I think the outboard may have hit a tree or something."

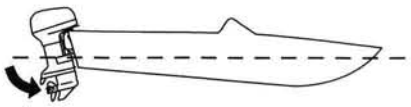
Check for a slow, heavy squash to the outboard.

- Look for damaged parts and loosened nuts and bolts in both the steering and mounting systems. Replace damaged parts.

Outboard Hydraulic Tilt/Trim Shock Absorption System and Safety

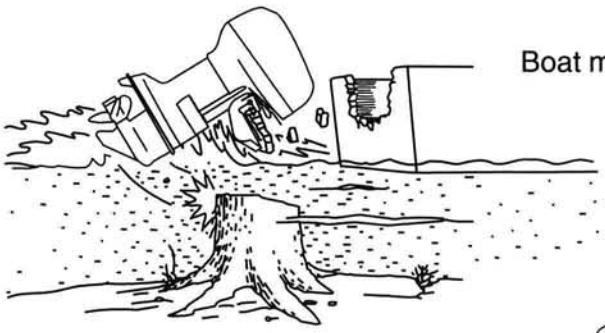
What is most important?

- Shock absorption system must always be ready to absorb some blows to the lower parts of the outboard.
- Outboard must not trim in too far suddenly.

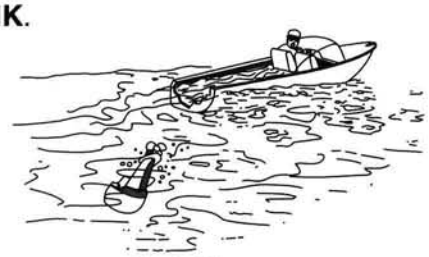


What can happen?

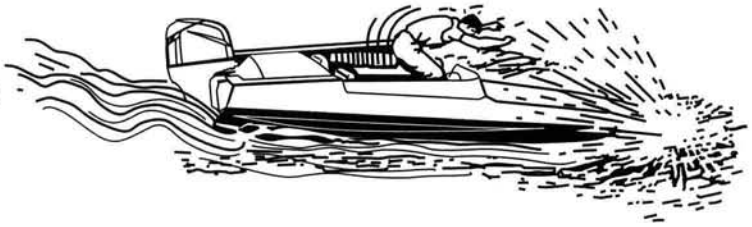
Without shock protection, a blow like this could cause serious damage to the outboard and injury to boat occupants from the outboard or its parts entering the boat. Transom could break away and outboard may be lost overboard.



Boat may **SINK**.

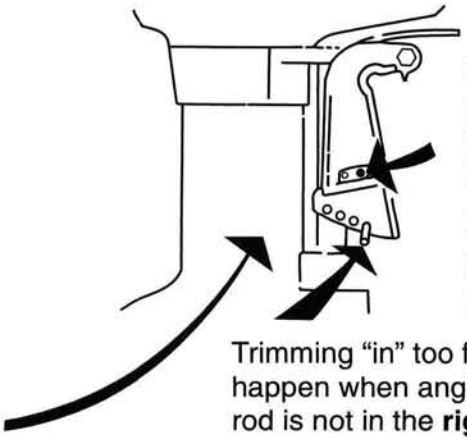


At high speeds, sudden trimming in too far may dive boat under water or spin it around.



How can possible conditions be minimized?

- **Read**, **understand**, and **follow** manufacturer's **instructions.**
- Follow warnings marked "⚠" closely.
- Test your work whenever possible.
- If oil leaks are seen in service areas, determine source. Keep reservoir filled.
- If outboard is hydraulic tilt/ trim model, always return rod to hole position determined by boat operator and make sure angle adjusting rod retain is in locked position.

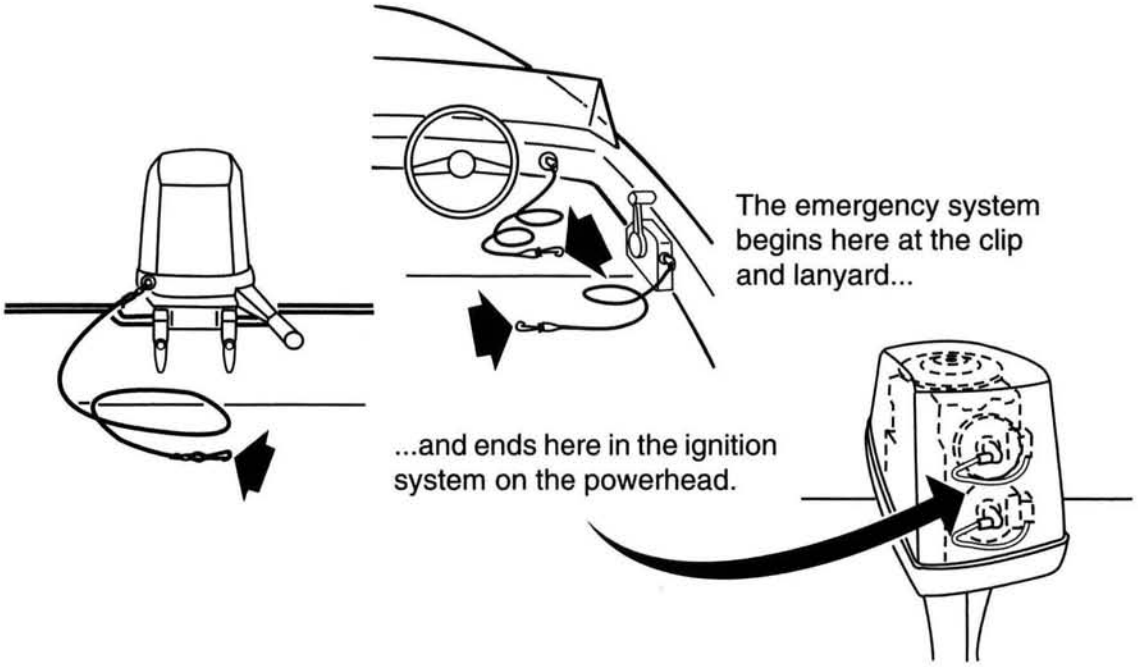


Make sure manual release valve is closed tight. Torque to 45 to 55 in. lbs. (5.1 to 6.2 N·m).

If left open, outboard has no shock protection.

Trimming "in" too far can happen when angle adjusting rod is not in the **right** hole or is not in **any hole** (lost).

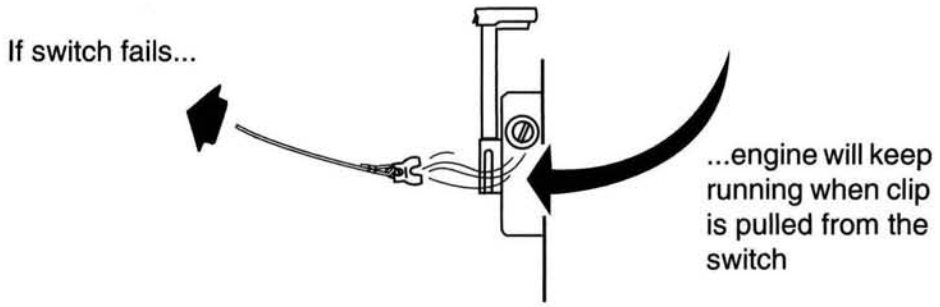
Outboard Emergency Stop System and Safety

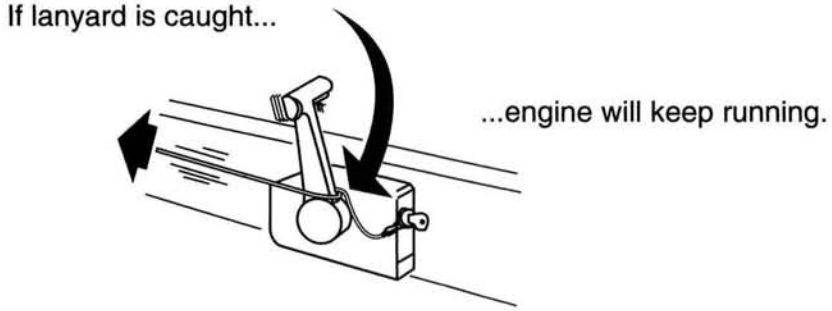


What is most important?

- The emergency stop system must **STOP** the engine when the clip is removed or the lanyard pulled from the emergency stop / key switch.

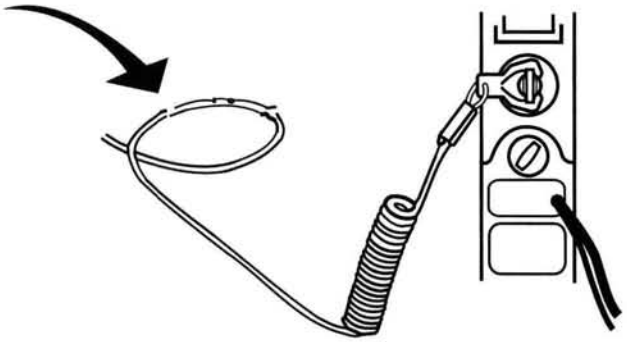
What could happen?



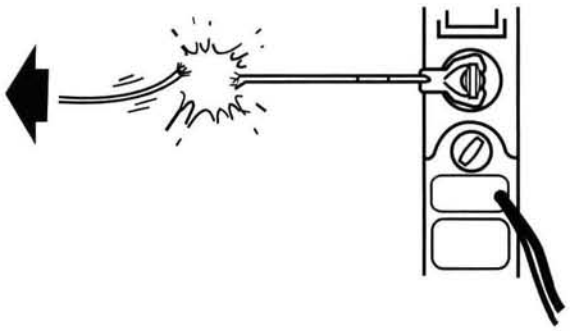


What could happen?

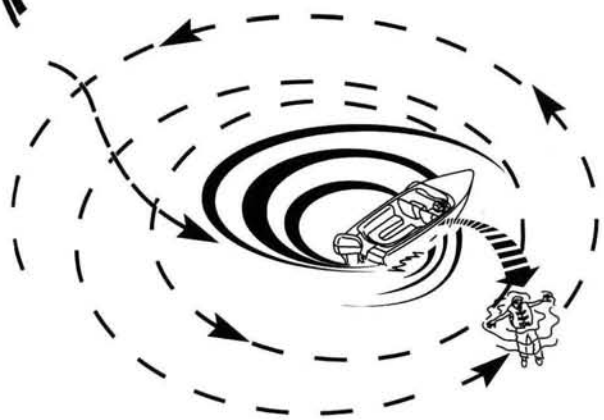
If lanyard is cut or frayed...



...lanyard or clip may break when pulled...



If engine does **NOT** stop when lanyard is pulled, an operator thrown from the boat could be hit as boat circles area. Or, boat may not turn but leave area as a runaway. Operator may drown and boat **WILL** run into something.



How can failure of the emergency stop system be minimized?

When rigging or after servicing

- **Read**, **understand**, and **follow** manufacturer's **instructions**
- Follow warnings marked "⚠" closely.
- Assemble parts carefully.
- Inspect lanyard for cuts or fraying; clip for wear. Replace with original parts. Do not substitute.
- Locate control box and other items in area to keep lanyard from being caught.
- **ALWAYS TEST EMERGENCY STOP SYSTEM. PULL LANYARD. ENGINE MUST STOP. IF IT DOES NOT, REPAIR BEFORE NEXT USE.**

Summing up

Now you know some things that can take the joy out of boating.

No doubt about it—proper safety takes time!

- Reading and understanding instructions
- Re-reading warnings marked "⚠"
- Putting parts together correctly
- Making correct adjustments
- Testing your work

And making sure

- Worn or damaged parts are replaced
- Replaced parts are like originals in every way
- Customer is told of things which need attention

But, do you really want the alternative?

MARINE PRODUCTS AND THE SAFETY OF PEOPLE WHO FIX THEM

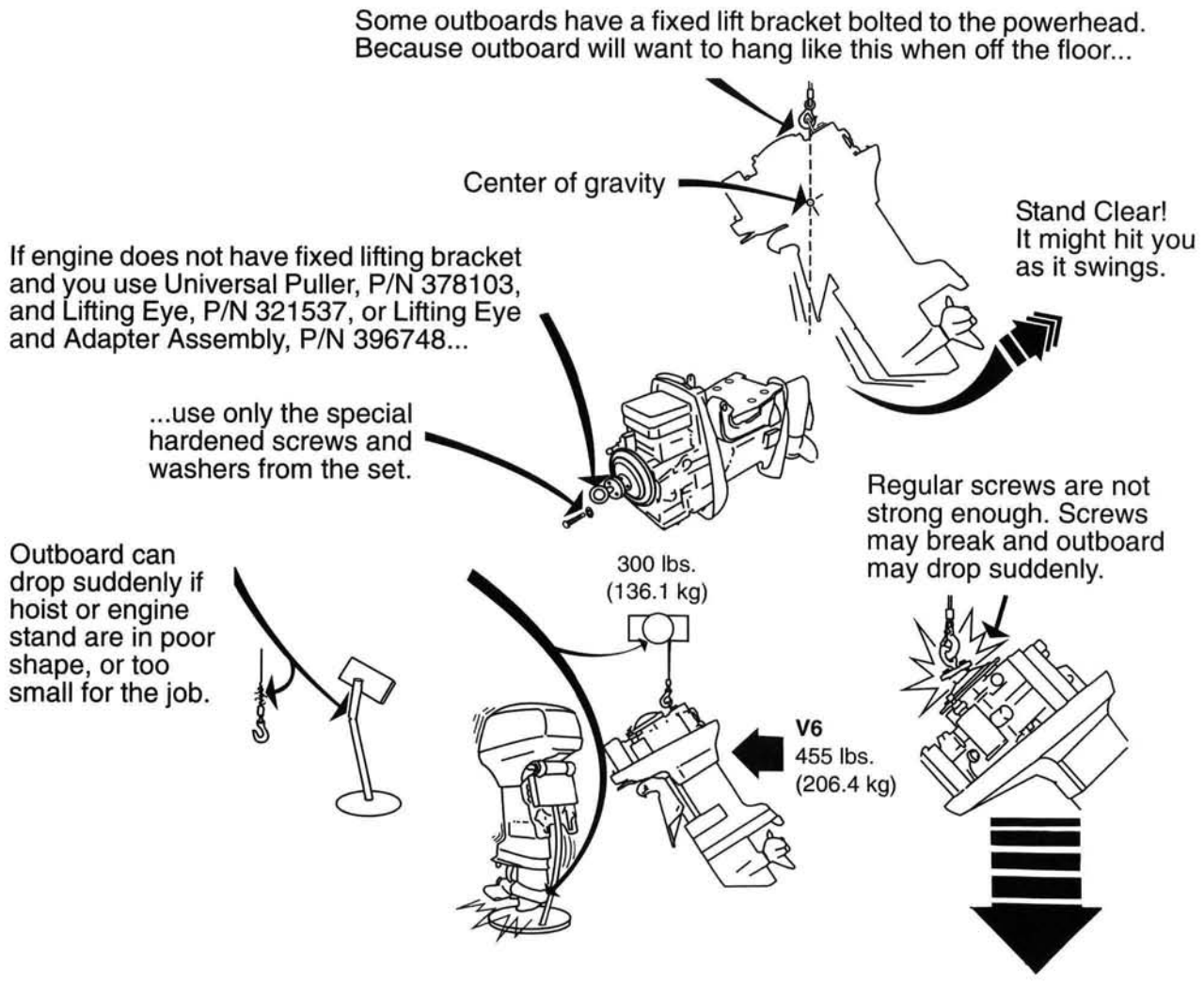
The first part of this Safety section talked about safe boating and how you, the technician, can help keep it safe for the boater. But what about you? Technicians can be hurt while:

- Rigging boats
- Troubleshooting problems
- Fixing components
- Testing their work

Some of these safety issues you will know, others you may not.

Handling Outboards

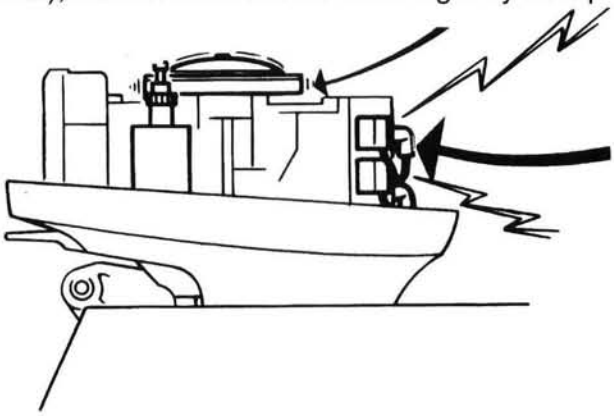
When lifting outboards



- Make sure shop aids have extra capacity, and keep them in good repair.

Running outboard with engine cover removed

Engine cover is a guard. When you remove cover/guard to work on the outboard, remember: loose clothing (open shirt sleeves, neckties), hair, jewelry (rings, watches, bracelets), hands and arms can be caught by the spinning flywheel.



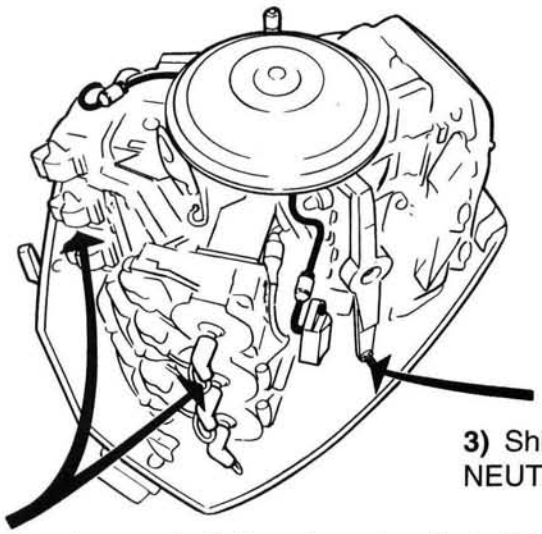
Handling high voltage parts like spark plugs and coils can shock you and may cause you to recoil into the rotating flywheel.

- Two people working together on a live outboard must look out for each other. Never, ever, use the key to start the outboard before signaling your partner. He may be leaning over the outboard with hands on the flywheel, handling a "hot" electrical part, or near the propeller.

Outboard starting at the wrong time

When you do things that turn the flywheel like:

- Off-season storage fogging (oiling) of outboard;
- Removing propeller with a powered tool;
- Electrical system checks;
- Servicing the flywheel; or
- Any other actions **ALWAYS...**



1) Turn key switch OFF

2) Twist and remove ALL spark plug leads

3) Shift to NEUTRAL

Check prop shaft. Is outboard really in NEUTRAL?

NO SPARK ➡ **NO START** ➡ **NO SURPRISES**

Running outboard too fast (Overspeeding)

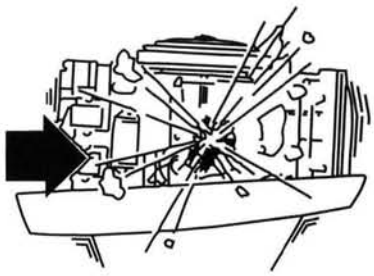
- "Too fast" means running faster than outboard normally runs on boat.

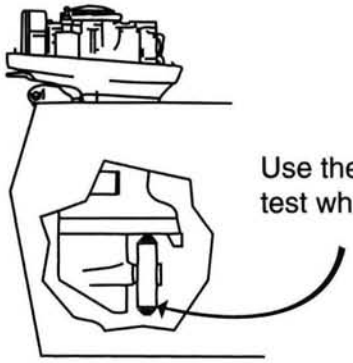
Running too fast can happen when:

1) Using a flushing device...
Turn on water before starting outboard. Keep engine speed below 2000 RPM. With no load, outboard will run too fast very easily. Wear eye protectors.

2) Running with the wrong test wheel...

This may happen if outboard runs too fast.





Use the right test wheel.

Running outboards: Exhaust fumes

DANGER

DO NOT run the engine indoors or without adequate ventilation or permit exhaust fumes to accumulate in confined areas. Engine exhaust contains carbon monoxide which, if inhaled, can cause serious brain damage or death.

- Whenever running the engine, assure there is proper ventilation to avoid the accumulation of carbon monoxide (CO), which is odorless, colorless, and tasteless, and can lead to unconsciousness, brain damage, or death if inhaled in sufficient concentrations. CO accumulation can occur while docked, anchored, or underway, and in many confined areas such as the boat cabin, cockpit, swim platform, and heads. It can be worsened or caused by weather, mooring and operating conditions, and other boats. Avoid exhaust fumes from the engine or other boats, provide proper ventilation, shut off the engine when not needed, and be aware of the risk of backdrafting and conditions that create CO accumulation. In high concentrations, CO can be fatal within minutes. Lower concentrations are just as lethal over long periods of time.

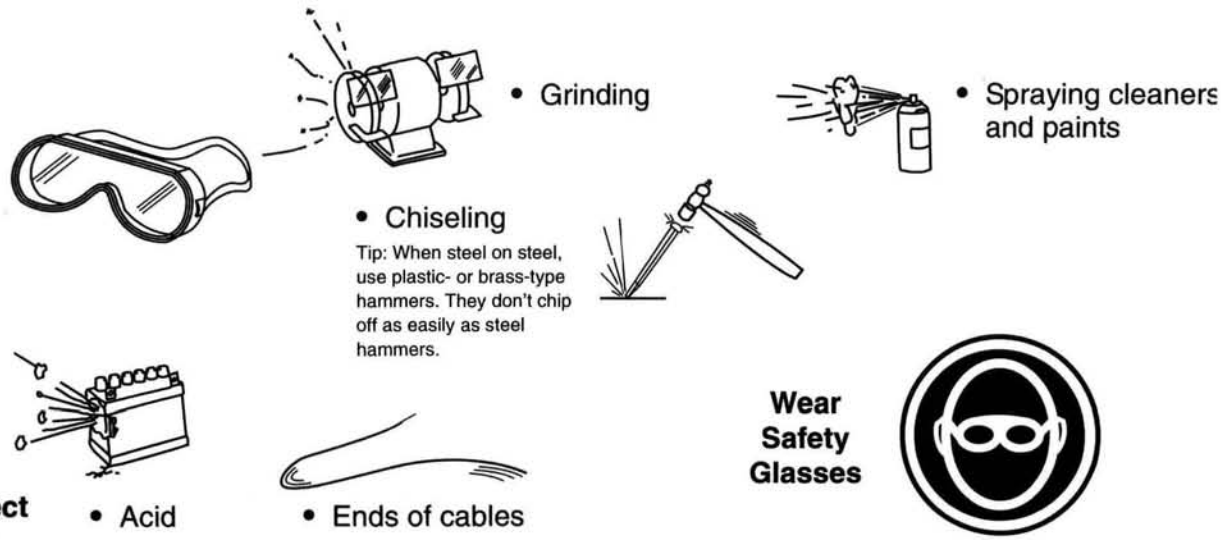
Running outboards: Propellers

DANGER

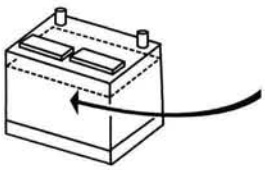
Contact with a rotating propeller is likely to result in serious injury or death. Assure the engine and prop area is clear of people and objects before starting engine or operating boat. Do not allow anyone near a propeller, even when the engine is off. Blades can be sharp and the propeller can continue to turn even after the engine is off. Always shut off the engine when near people in the water.

Eye protection

Eyes need protection when:



Handling Lead/Acid Batteries



Strong acid solution (sulfuric acid)

If solution gets into eyes, wash and contact a doctor immediately.

If spilled or splashed on any part of body...

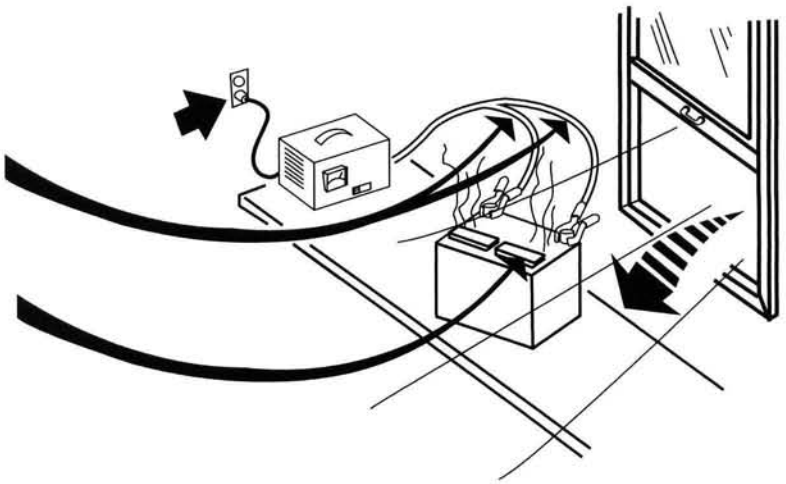
Wash with lots of water.

Charging lead acid batteries

1) Attach and remove these cables with charger UNPLUGGED from 110 V wall socket. (This prevents shocks if charger is defective.)

2) Observe correct polarity when connecting these larger leads.

3) Always charge in a well ventilated area. Charging causes acid solution to give off hydrogen gas through the vents in the caps. **Make sure vents are open.** If clogged, pressure inside may build. Battery may EXPLODE.



Battery gas is explosive!

While charging or discharging, remember:

- No smoking
- No flames
- No sparks

Never remove charger cables from battery posts. It is a sure way to make a lot of sparks in an area surrounded by battery gas.

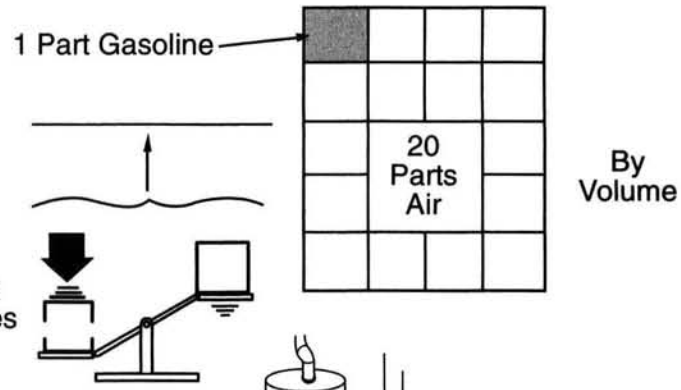
DO NOT check battery charge by placing metal objects across posts. You will make sparks and serious burns are possible.

After charging:

- Shut off charger
- Pull charger plug out of 110 V outlet
- Take charger cables off battery posts

Gasoline – Handle With Care!

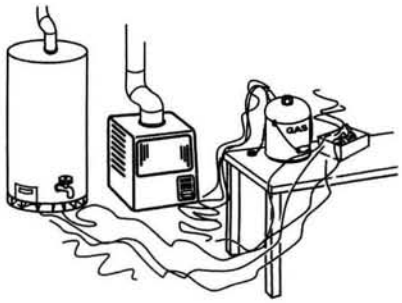
Gasoline vapor and air mixtures explode easily and violently when mixed as shown...



When you smell ANY odor of gasoline, explosion is possible.

Gasoline fumes are heavy and will sink to the lowest point in the boat or room and will STAY there, WAITING...

If the air around you is calm, the pilot light in the heater could **ignite** the heavy fumes before your nose ever **smells** the fumes.



What can you do?

Store gasoline in sturdy, approved, sealed gas can and keep outside.

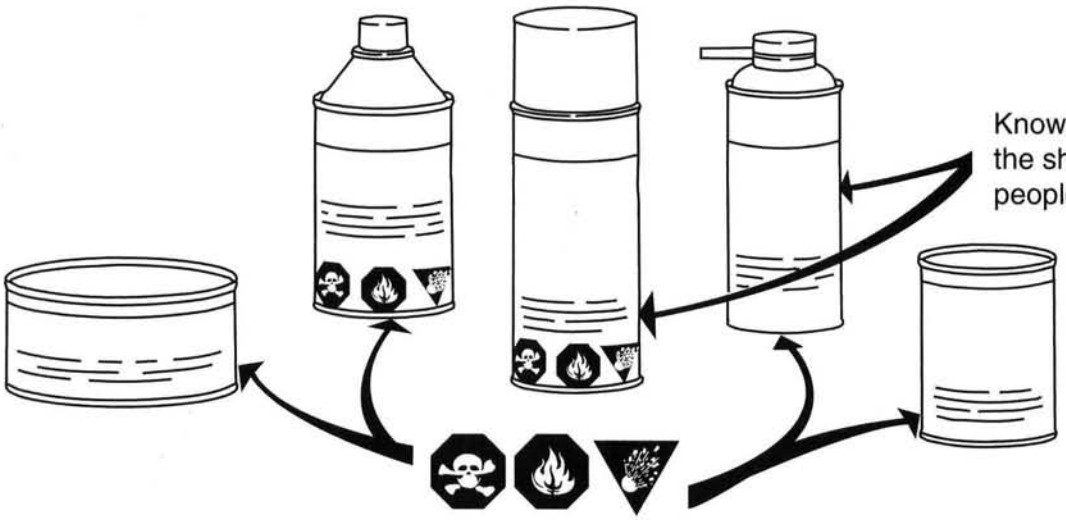
- Always store gasoline outside in a safe can (flame arrester and pressure relief valve in pour spout).
- Fill portable tanks outside of boat. Spillage will collect in bottom of boat.
- Use fuel as fuel ONLY, **not** for a cleaner or degreaser.
- If fumes are smelled in shop, basement, or garage, **immediately**:
  - Put out open flames, cigarettes, sparking devices;
  - Wipe up spill or leak;
  - Get towels and rags outside fast;
  - Open doors and windows; and
  - Check **lowest** area for fumes.

Be aware of items in and around repair area which can ignite fumes. Control them if fumes are smelled.

- Matches, cigarettes, blow torches, welders
- Electric motors (with unsealed cases)
- Electric generators (with unsealed cases)
- Light switches
- Appliance pilot lights or electric ignitors (furnace, dryer, water heaters)
- Loose wires on running outboards
- Other variables which may ignite fumes

How many of these are in your repair area?

Hazardous Products



READ

- "How and where to use"
- "How to give First Aid." Have recommended First Aid materials on hand should an emergency arise
- "How to dispose of can"

It's all on the **back of the can or bottle label.**

And remember: Little children are very curious and will try to taste everything so **keep containers away from children!**

Safety Awareness Test

The Technician's Safety Awareness Test....

1) Did you read this Safety section from page S–1 to page S–24?

2) Are you ready to take responsibility for the safe maintenance practices and procedures of your repair shop, co-workers, and technicians?

3) Do you understand all the safety precautions and instructions contained in this entire service manual?

4) Will you follow all safety warnings, precautions, instructions and recommendations outlined in this service manual?

5) Do you understand that the service manual as a whole and this Safety section, in particular, contain essential information to help prevent personal injury to yourself and your customers, as well as prevent damage to equipment?

6) Have you received training related to common shop safety practices to protect yourself and others around you?

7) When replacement parts are required, will you use *Evinrude®/Johnson® Genuine Parts* or parts with equivalent characteristics, including type, strength and material?

8) Are you ready to follow the recommendations in this service manual before you service any boat or outboard?

9) Do you understand that safety-related accidents can be caused by carelessness, fatigue, overload, preoccupation, unfamiliarity of operator with the product, drugs and alcohol, just to name a few?

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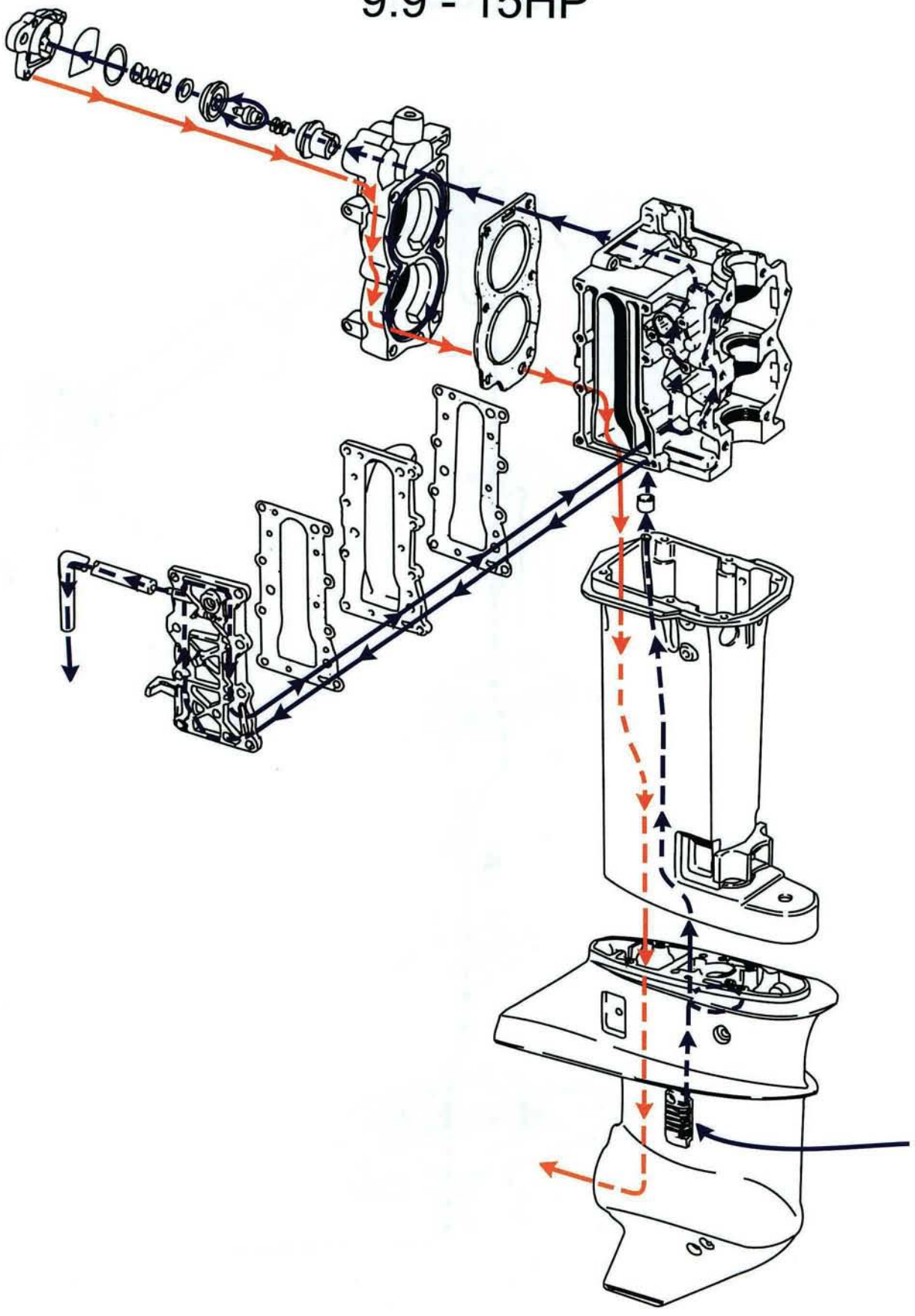
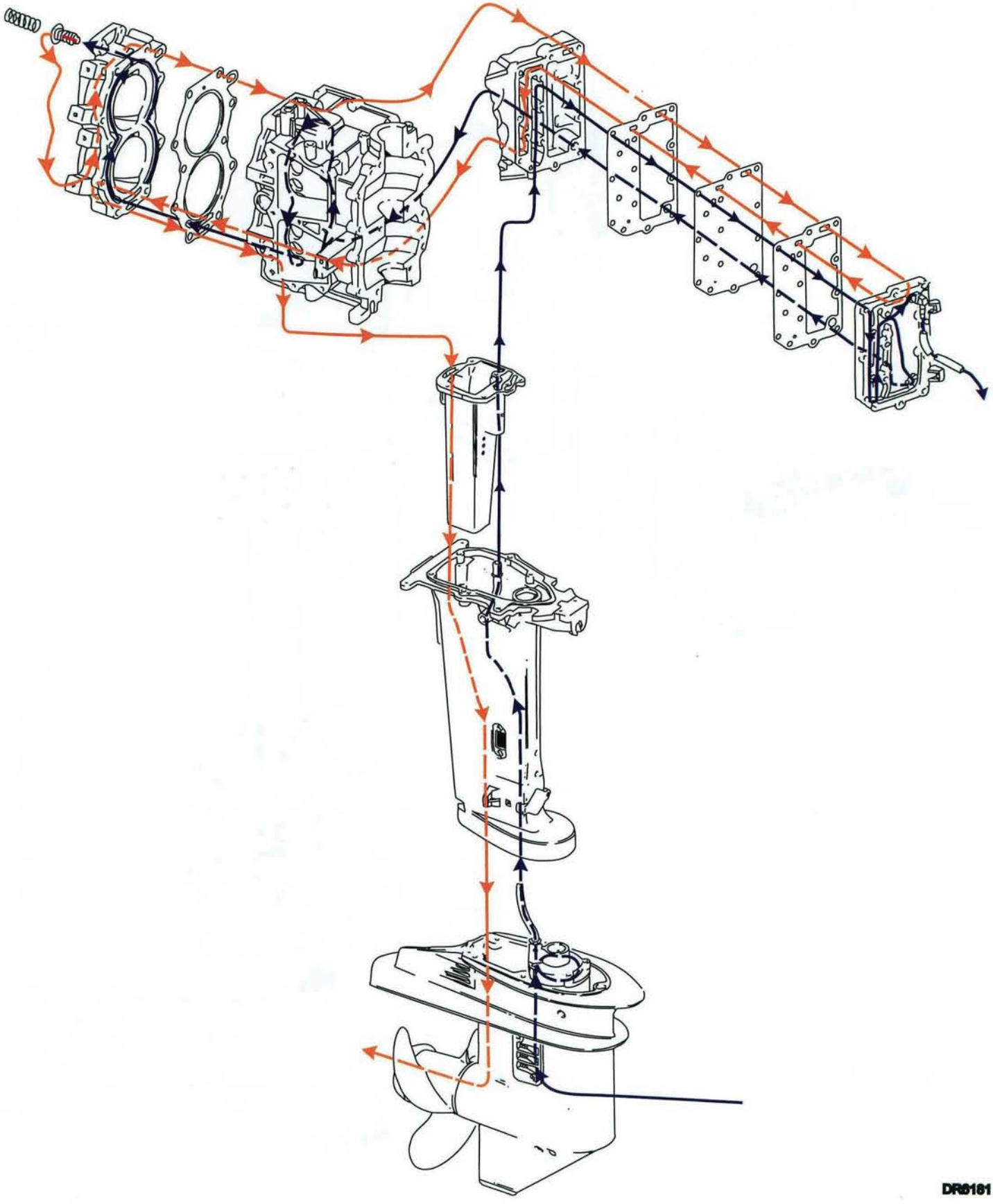
Water Flow Diagram
9.9 - 15HP



DR4698

Water Flow Diagram

25 - 30HP



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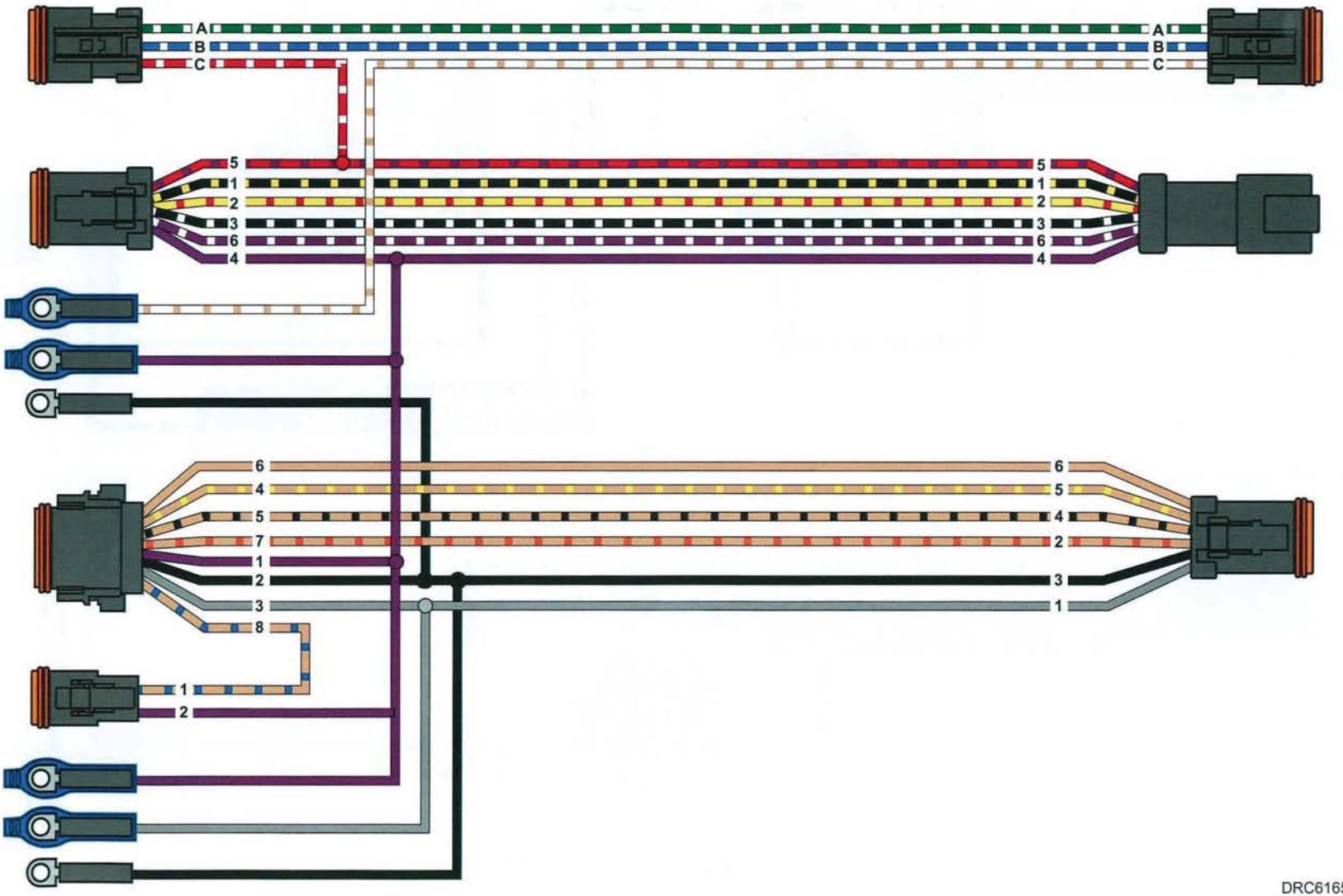
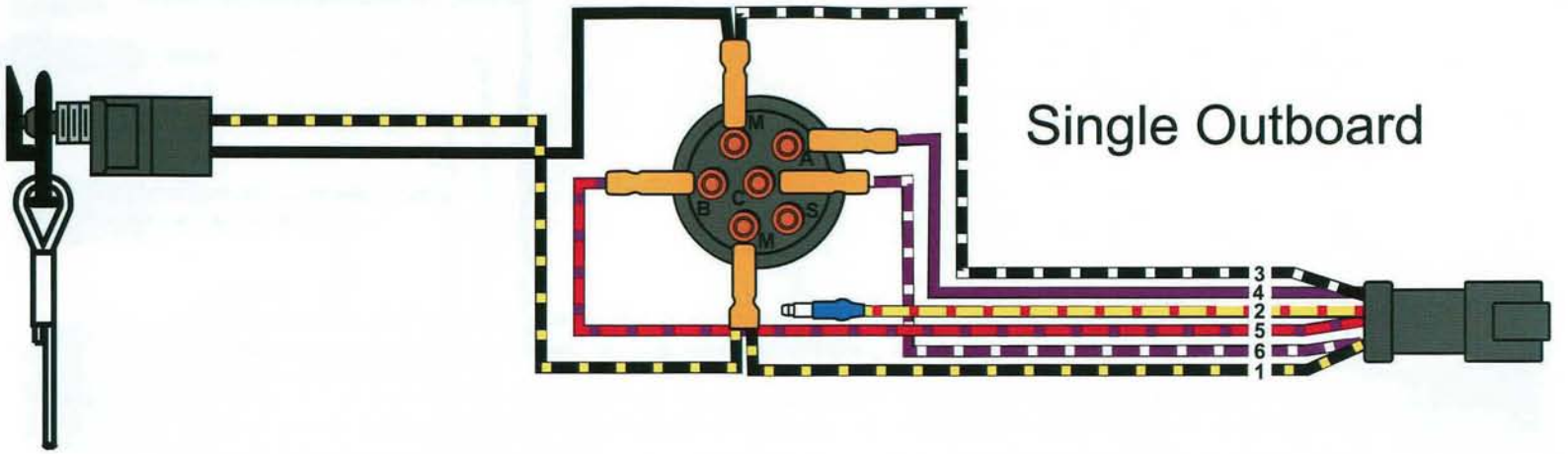
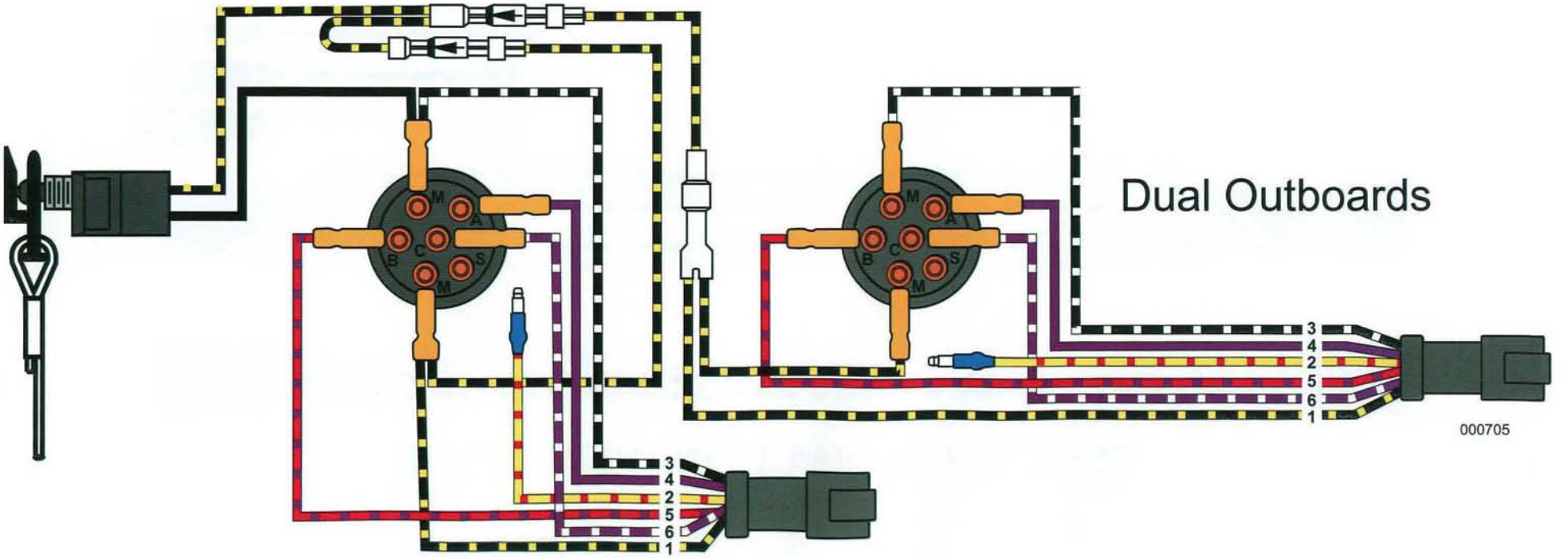
MWS Instrument Wiring Harness

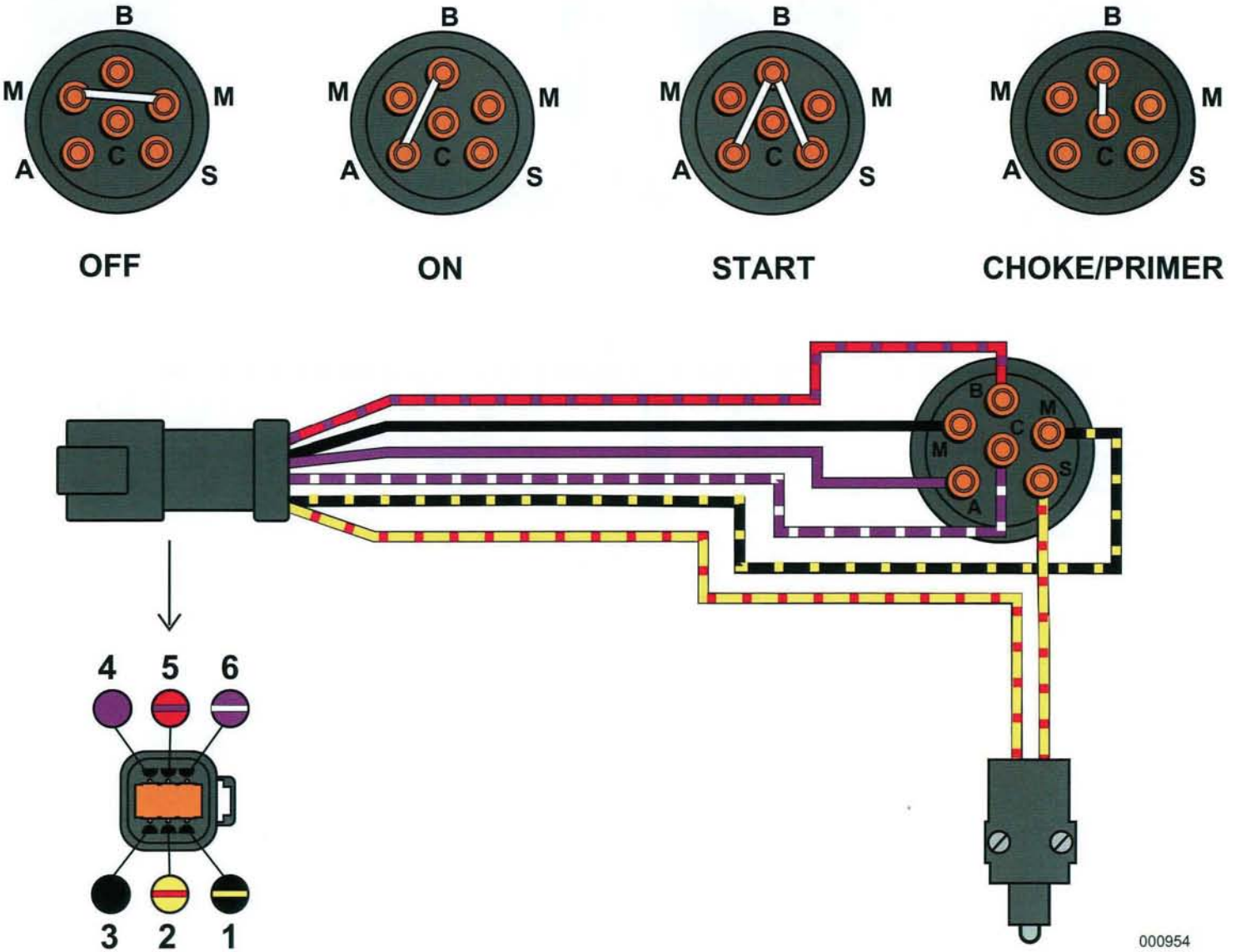


Lanyard Switch / Emergency Stop Circuits

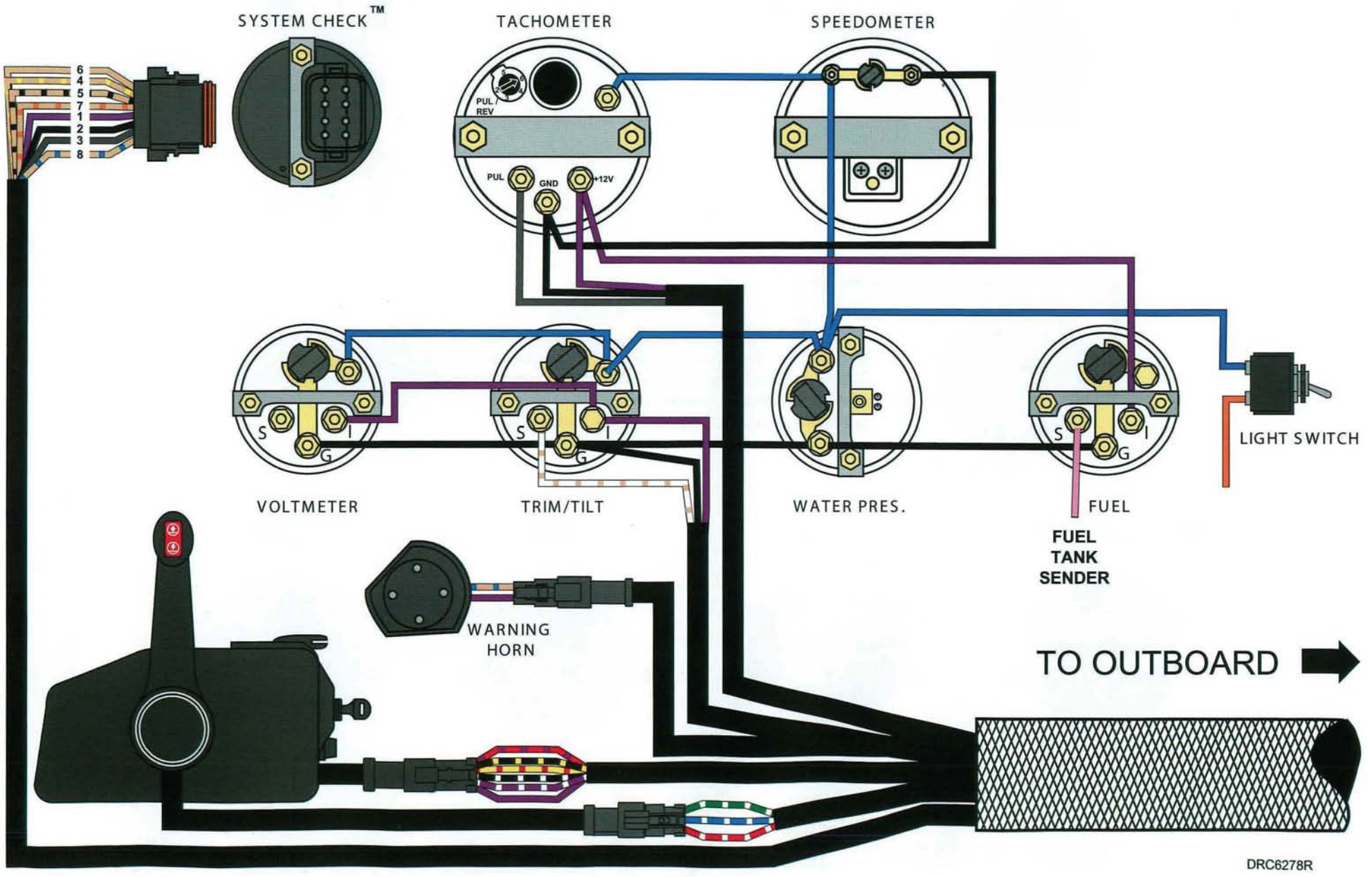


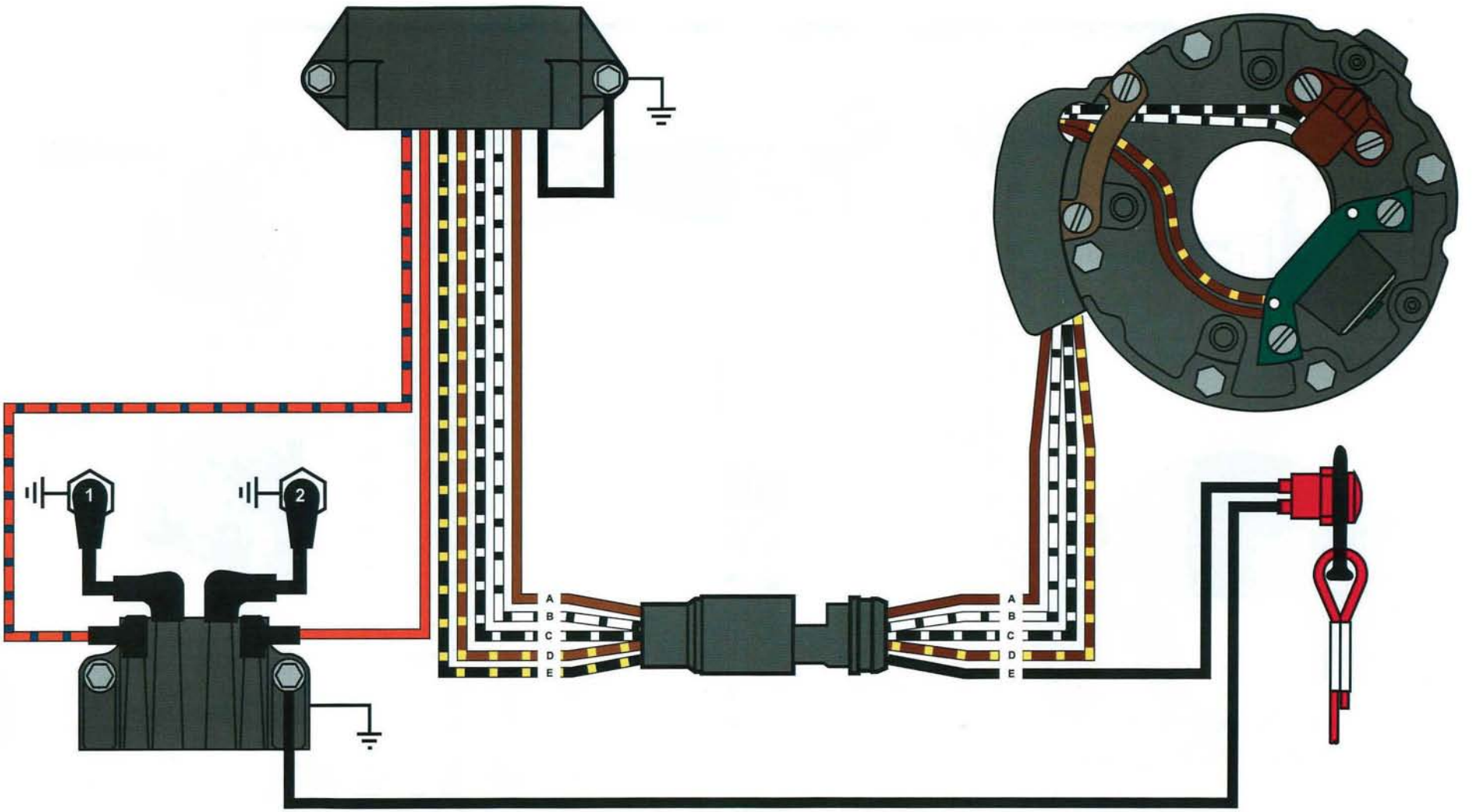


MWS Key Switch and Neutral Safety Switch



MWS DASHBOARD





9.9/15HP

DRC 6217

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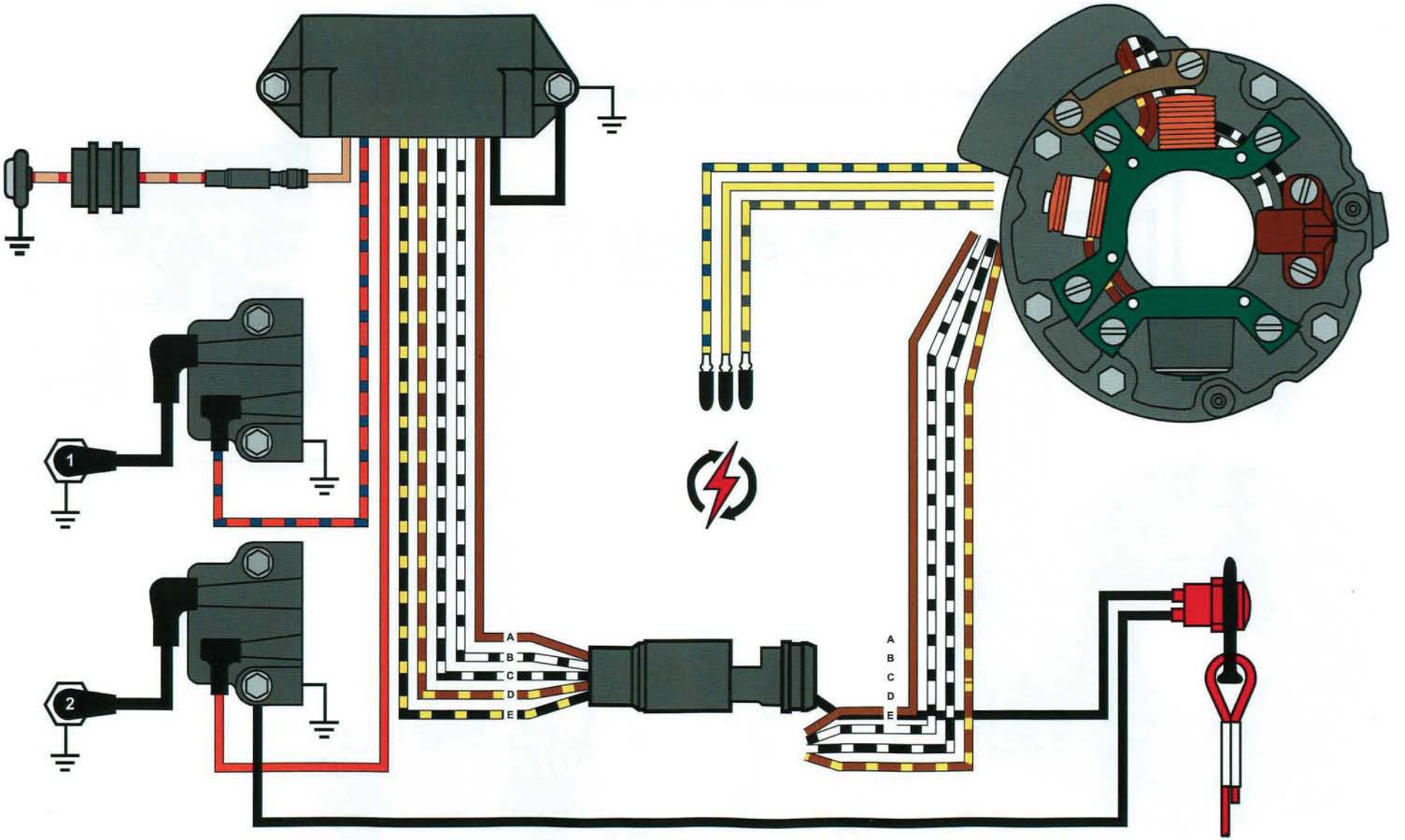
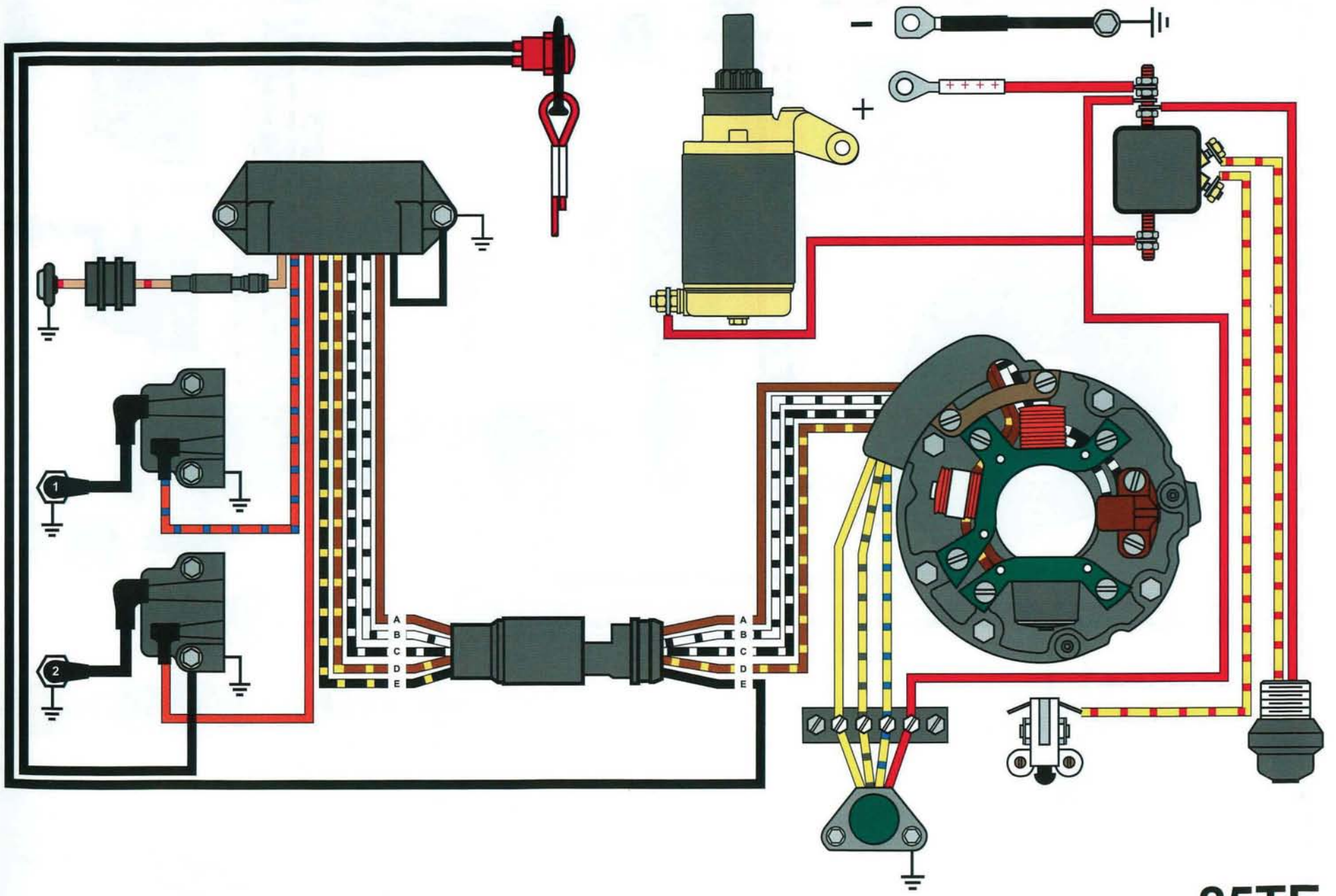
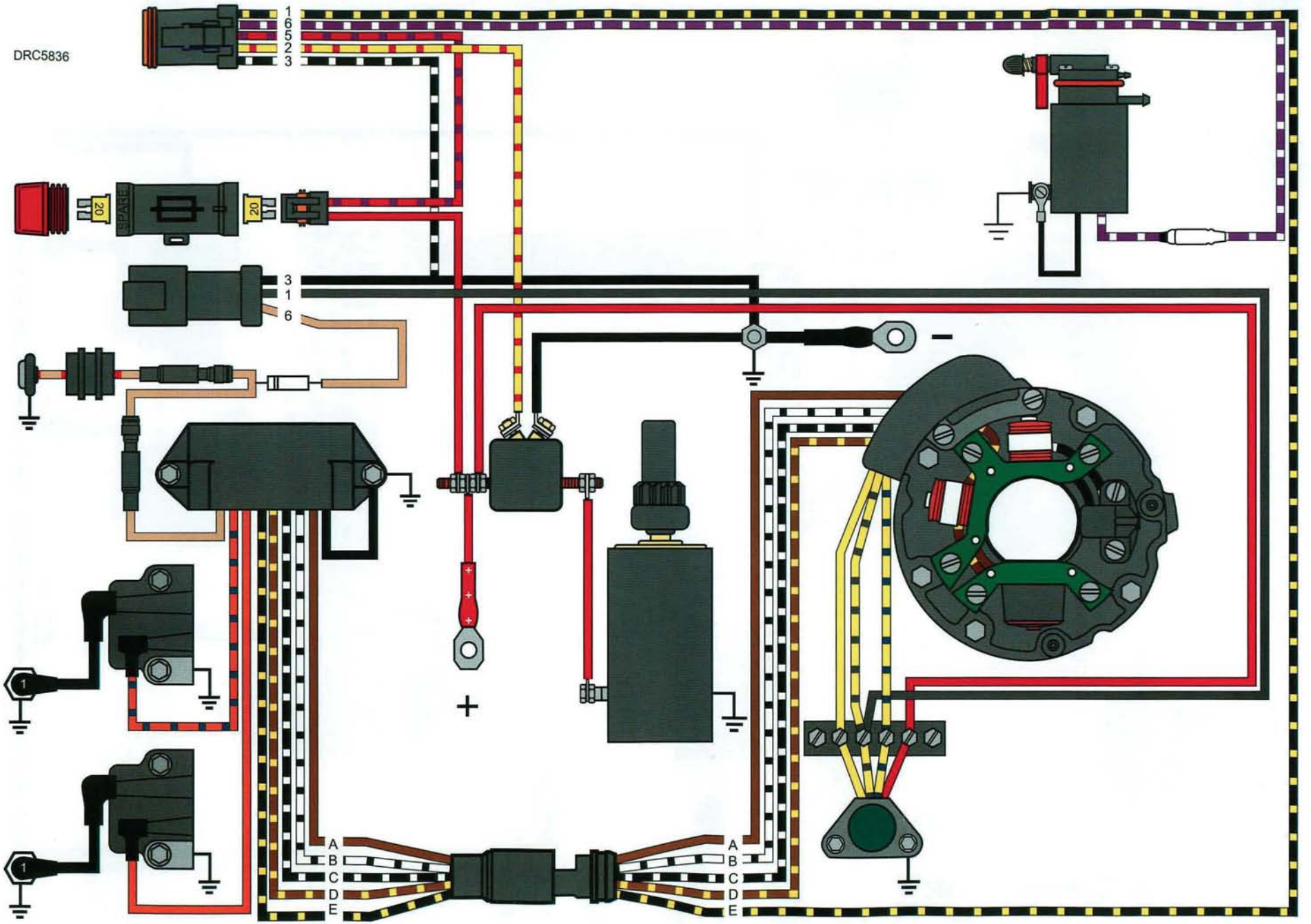


25/30 Rope with AC

DRC7523



25TE



25/30 EL

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