Raider 40 *Parts/Assembly* Manual

Part No. RPAM 40ES-001

C-130
Air Dropped

Submarine
Launched

Raider Part No. R40ES-001-B

Supplement to Raider Service Manual
No. R40 ES-001-15-3

Raider No R40ES-001-17-B

January 2017

Raider Parts and Assembly Manual R40ES-001-15-2 shows all part numbers and illustrates how the Raider subassembly is put together. This manual is a supplement to the Raider Service Manual R40ES-001-15-3. The Service Manual is detailed and describes in detail all steps required to repair the Raider 40.

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This Raider 40 manual has all parts and assembly data contained herein. It has been presented to help the user identify parts, identify part numbers, how that part has been assembled and tools required to repair the part or secure a new part if required.

The Raider is a military only engine and will not be sold to commercial market. It is submersible and can operate on multiple fuels. Performance on heavy fuels requires an additive to be placed into bladder with the JP-5/JP-8.

This manual, Parts/Assembly Manual 40 ES-001-15-2, provides drawings and part numbers for the Raider 40 outboard motor. This is a supplement to the Service Manual No. R40ES-001-15-3 that describes in detail how to repair the Raider 40.

Background - the Raider 40 comes from a family of motors that have an extensive history of reliability and performance and are identical in parts except for the branding and pricing. These motors are Mercury; Nissan; and Tohatsu supporting Raider with common parts available at local dealers supports a low life cycle cost for the Government – with worldwide support.

The Mercury, Nissan and Tohatsu outboards are Commercial Off The Shelf (COTS) engines with a long history of performance and reliability. Raider takes the basic COTS and modifies the outboards specifically for the military. We have eliminated as many electrical components as possible and use only the highest reliable mechanical parts.

Key components of the Raider features a fuel induction system (FIS) which allows burning of multiple fuels. To go from gasoline to heavy fuel a single valve is turned counter clockwise to move to heavy fuels. The second key component is the electric start feature with the battery located under the cowling. A new designed dewatering system is incorporated to allow starting within one minute after total submersion.. New heads were developed with special valves that allows water to be quickly eliminated between the heads and the pistons. This, combined with a high performance spark plug, made of stainless steel base with a robust spark – four times stronger than Iridium spark plug. This spark plug was developed to allow submersion without the need to replace spark plugs after submersion. A grab rail has been installed to assist in carrying the motor plus provide protection of the Raider outboard if dropped. A new slide plate has been installed in the Raider engine allowing for easier placement on the rubber inflatable boat, especially in higher sea states.

Parts and Assembly Manual

Section 1. GENERAL PRECAUTIONS

WARNING

Gasoline is extremely flammable and can explode if mishandled.
1. Before performing any service work on the fuel system, read and understand Section 1 - Service Safety.
2. Before servicing the fuel system, disable the ignition system by removing all spark plug leads to prevent accidental starting of engine.
3. Fuel leakage can contribute to a fire or explosion. After service work is complete and engine is fully assembled, always run the engine momentarily to pressurize the fuel system. Then check for leaks.
4. Never attempt to run the engine with any fuel system component removed or disconnected.
5. Check fuel hoses and other nonmetallic components for indications of damage or deterioration. Always replace components with authorized factory replacement parts suitable for fuel systems.
6. Clean up fuel spills immediately and store rags in approved containers. Keep drained fuel in approved containers for proper disposal.
7. When using compressed air to clean or dry parts, make sure the air supply is regulated not to exceed 25 psi [172 kPa / 1.76 kg/cm$_2$].

1.1 Checklist prior to Mission:

1. Fuel/Oil System 50:1 Mix in bladder
    a. Fuels must be premixed.
    b. Insure additive is placed in bladder if JP-5 or JP-8 is used (EPA)
2. Electrical System
    a. Clean spark plugs, replace if necessary, check gap
    b. Check condition of battery
    c. Check stop switch operation
3. Control wires and linkage
    a. Dewatering linkage works smoothly
    b. Check state of linkages
    c. Check choke control
4. Recoil starter
    a. Check wear or damage on starter rope
    b. Check state of ratchet gear
5. Clutch, propeller
    a. Check wear or damage on propeller
    b. Check condition of split pin
6. Other check points
    a. Condition of trim tab (anode)
    b. Corrosion or damage

1.2 RAIDER BREAK-in PROCEDURES

CAUTION

Failure to follow the Break-In Procedure in Owner's Manual and special fuel mixture requirements for break-in may lead to serious engine damage and shortened engine life.
To prevent serious engine damage and ensure long engine life, new engines, used engines with new powerhead, used engines with newly rebuilt powerhead, and engines coming out of storage must be run for a period of 10 hours in accordance with the break-in procedure.

First 10 Minutes

• Operate the engine at minimum idle speed
• Verify a steady stream of water from the cooling water check port and idle port on the engine, indicating the water pump is functioning properly.

Next 50 Minutes (0.16 to 1 Hour)

DO NOT operate the engine above 1/2 throttle.

DO NOT maintain a constant throttle setting. Vary engine speed from 1/4 to 1/2 throttle every 15 minutes.

NOTE

For boats which come onto plane easily, use full throttle to quickly accelerate onto plane; then immediately reduce throttle to 1/2 and maintain this speed.

Next Hour (1 to 2 Hours)

• Use full throttle to quickly accelerate boat onto plane; then immediately reduce throttle to 3/4 and maintain this speed.
• At intervals, run engine at 3/4 throttle for 1 - 10 minutes; then return to 1/2 throttle for a cooling period.
• Vary engine speed every 15 minutes.
• Check for water discharge from cooling water check port

Next Eight Hours (2 to 10 Hours)

• Run engine at 3/4 throttle.
• For short periods of time, run engine at full throttle and then reduce speed back to 3/4 throttle. As this part of the break-in period progresses, open to full throttle for longer and longer periods of time, but never longer than 5 minutes.
• Vary engine speed every 15 minutes.

DO NOT exceed the Full Throttle RPM Range of the engine. See Engine Specifications.

After Break-in
• Re-torque cylinder head bolts to specification after engine has been run and cylinder head has cooled to the touch.

Section 2. RAIDER ENGINE OVERVIEW

The Raider Outboard 40 horsepower engine has been designed specifically for the military. It operates on gasoline, Avgas, JP-5, JP-8, kerosene and diesel #2. It is a simple two-stroke; two-cylinder outboard.

Special Features:

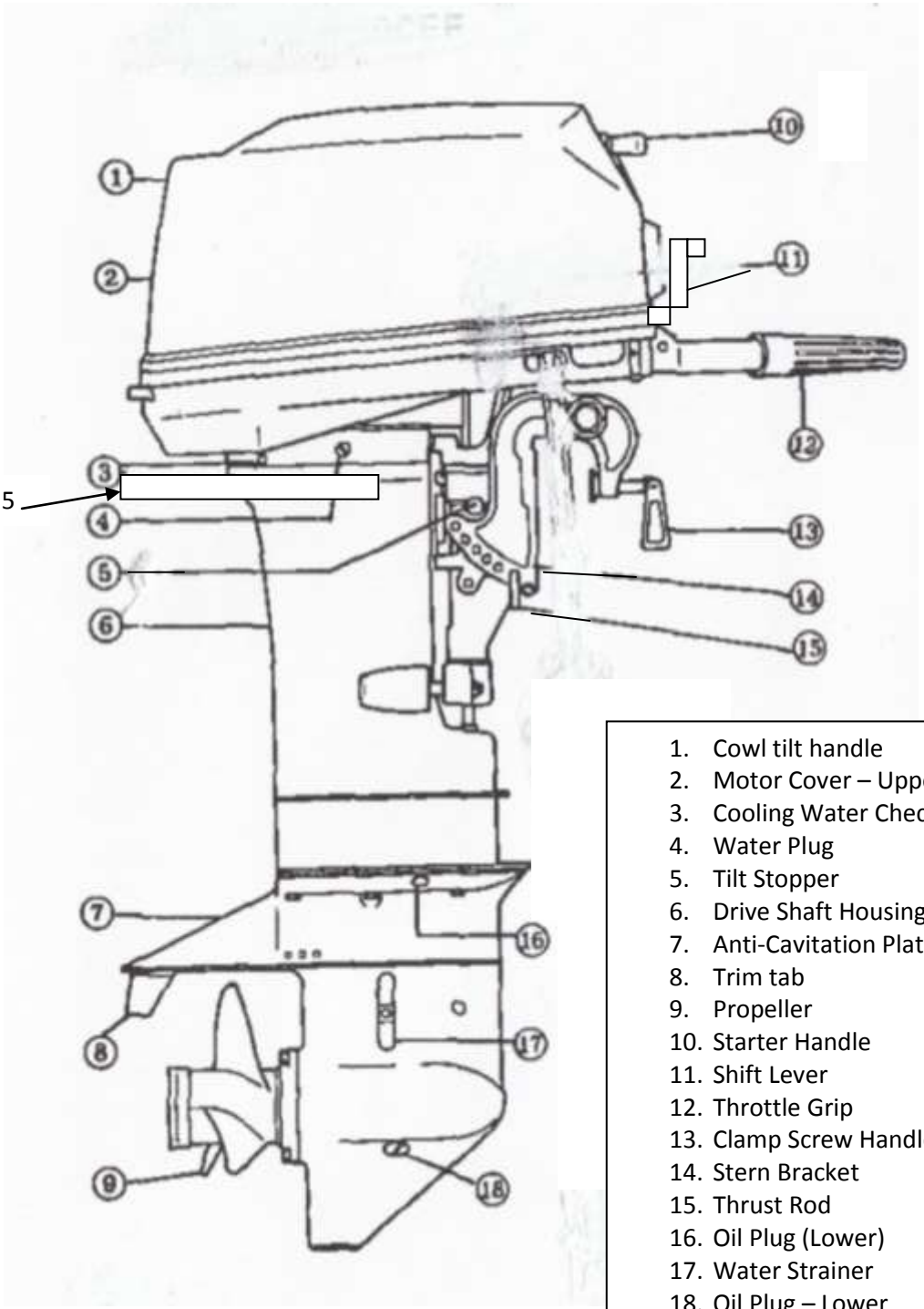
1. Submersible
2. Multi-fuel capability
3. Special transom mount adapter
4. Wrap around grab bar for easier carrying (engine protection)
5. Fuel additives to assist meeting EPA standards when operating JP-5 and JP-8 fuels

Section 3 will describe the Raider 40 outboard in detail. This information includes part numbers, how to assemble/disassemble each part.

Section 4 will present engine details including Tune-Up procedures, troubleshooting and special tools required for overhaul and maintenance.

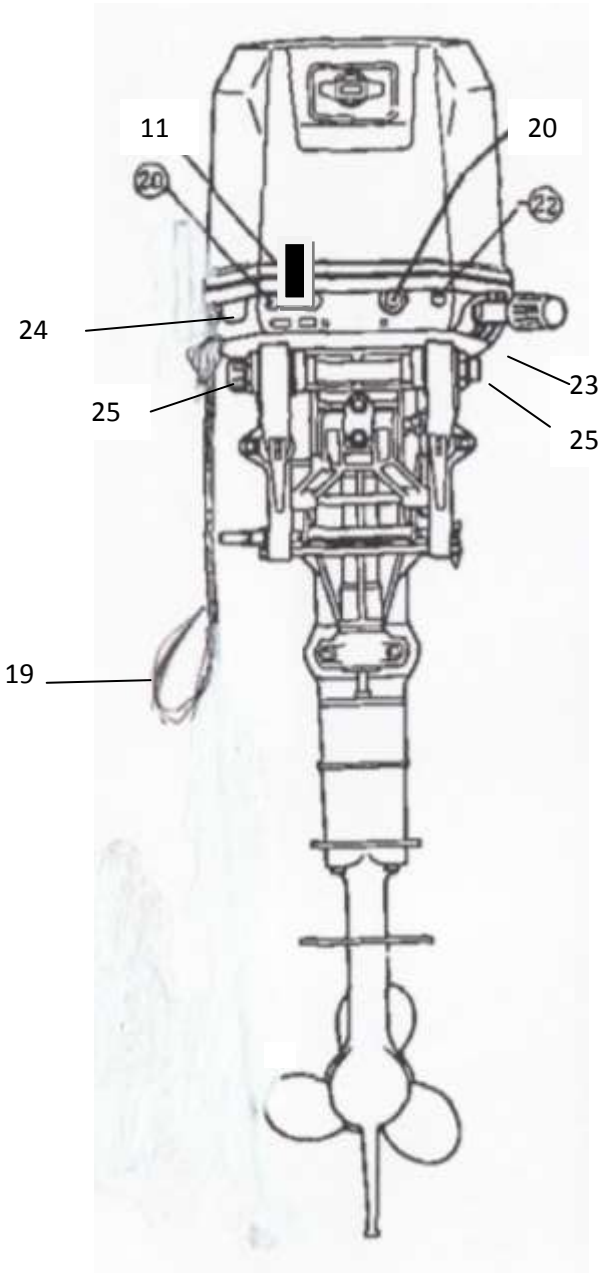
Section 5 provides a list of “recommended spare parts” that supports the Raider 40 outboard and is included in each ”spare parts kit”.

Section 3. ENGINE INFORMATION



1. Cowl tilt handle
2. Motor Cover – Upper
3. Cooling Water Check Port
4. Water Plug
5. Tilt Stopper
6. Drive Shaft Housing
7. Anti-Cavitation Plate
8. Trim tab
9. Propeller
10. Starter Handle
11. Shift Lever
12. Throttle Grip
13. Clamp Screw Handle
14. Stern Bracket
15. Thrust Rod
16. Oil Plug (Lower)
17. Water Strainer
18. Oil Plug – Lower
19. Retainer to transom
20. Stop switch
21. Choke knob
22. Electric Starter button
23. Fuel connection
24. Dewatering lever
25. Wrap around grab rail

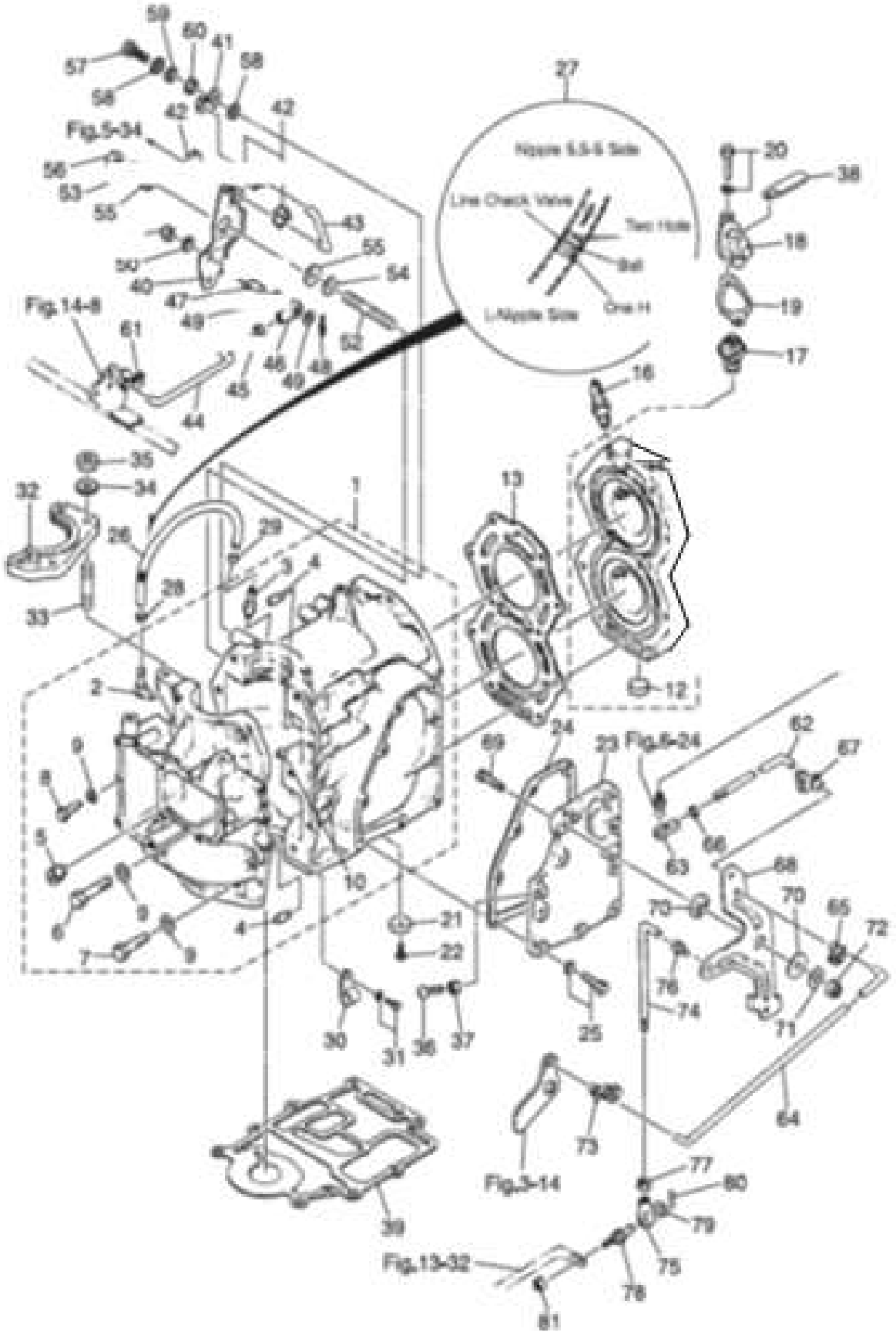
Front View Raider 40



Raider 40 Overview

- Cylinders - 2
- Displacement - 30.08 cu. in [493 cm3]
- Standard Bore - 2.76 in [70 mm]
- Stroke - 2.520 in [64 mm]
- Piston Clearance - 0.0020 - 0.0039 in [0.05 - 0.10 mm]
- Piston Ring End Gap - 0.008 - 0.016 in [0.20 - 0.40 mm]
- Compression: 106.6 PSI; 735.0 kPa; 7.5 kg/cm(3)
- Compression variation among cylinders should not exceed 15 psi [103 kPa / 1.05 kg/cm2]
- Length: 38.18 inches (919 mm)
- Width: 13 inches (330 mm)
- Height: 49 inches (1245 mm)
- Weight: 147 lbs. (63.5 kg)
- Maximum RPM range: 5200- 5800
- Piston Displacement: 493 cc
- Cooling system - Water cooling (Rotary rubber impeller)
- Tilt stage: 6
- Gear Reduction ratio: 13 : 25
- Battery 265 Cranking Amps - sealed Lithium Iron

3.1 CYLINDER/CRANKCASE



Ref.No.		Part No.	Description	Q'ty	Remarks
				M40C	
1-1		361B01100-2	CYL BLOCK & CRANKCASE ASSY	1	
1-2		393-01137-0	* NIPPLE	1	
1-3		393-01131-0	* NIPPLE 5.5-5	1	
1-4		345-00117-0	* DOWEL PIN	2	Bearing
1-5		345-01150-1	* CHECK VALVE ASSY	1	
1-6		916129-0850	* BOLT	1	
1-7		916124-0840	* BOLT	8	
1-8		9161F4-0835	* BOLT	1	
1-9		940121-0800	* WASHER	10	
1-10		345-01111-0	* DOWEL PIN 6-12	2	
1-11		R61B01001-1	CYLINDER HEAD	1	
1-12		R50-01093	* CYLINDER HEAD PLATE	1	
1-13		345-01005-1	CYLINDER HEAD GASKET	1	
1-14		9161F9-0845	BOLT	10	
1-15		345-01015-0	WASHER 8.5-19.5-3.2	10	
1-16		9701-1-1015	SPARK PLUG (BR7HS10)	2	NGK
1-17		345-01030-0	THERMOSTAT	1	Mark 52A PRV
1-18		RH6B01031-0	DEWATERING VALVES	2	
1-19		R46-01032-0	DEWATERING FLANGE	1	
1-20		R101F4-5630	DEWATERING ROD	1	
1-21		338-60218-2	ANODE	1	
1-22		910103-0616	BOLT	1	
1-23		345B02301-2	EXHAUST COVER (OUTER)	1	
1-24		345-02305-1	EXHAUST COVER GASKET	1	
1-25		9101F4-5620	BOLT	9	
1-26		98AL-40-230	HOSE	1	98AL-401000
1-27		393-01160-0	CHECK VALVE	1	
1-28		3T5-01133-0	CLIPφ8	1	
1-29		338-01133-0	CLIPφ7	1	
1-30		336-06973-0	CLAMP 6-9.5L	1	
1-31		910103-6612	BOLT	1	
1-		345B05101-	BRACKET	1	

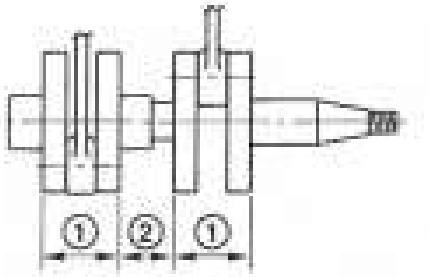
32		0			
1-33		915324-0825	STUD	2	
1-34		940121-0800	WASHER	2	
1-35		930121-0800	NUT	2	
1-36		921503-0520	SCREW	1	
1-37		930103-0500	NUT	1	
1-38		309-06972-0	CLAMP 6.5-47.5P	1	
1-39		345-01303-1	ENGINE BASEMENT GASKET	1	
1-40		361-05211-0	STARTER LOCK ARM	1	
1-41		345-05213-0	THROTTLE LIMITER ARM	1	
1-42		345-05223-1	ROD SNAP 3.5-2	3	
1-43		345-05221-1	THROTTLE LIMITER ROD	1	
1-44		345-05222-1	STARTER LOCK ROD	1	
1-45		930103-0500	NUT	2	
1-46		346-05234-0	ROD JOINTφ5	1	
1-47		353-83728-1	PIN	1	
1-48		951603-0800	SNAP PIN d=8	1	
1-49		3AA-83719-0	WASHER 8.5-18-1.6	2	
1-50		941303-0600	SPRING WASHER	1	
1-51		930103-0600	NUT	1	
1-52		915324-0825	STUD	1	
1-53		940103-0800	WASHER	1	
1-54		345-01015-0	WASHER 8.5-19.5-3.2	1	
1-55		345-63713-0	BUSHING 8-14-4	2	
1-56		930403-0800	NYLON NUT 8-P1.25	1	
1-57		9101F4-0620	BOLT	1	
1-58		940103-0600	WASHER	2	
1-59		941403-1000	WAVE WASHER d=10	1	
1-60		346-63721-0	BUSHING 6.2-16-5	1	
1-61		345-05224-0	ROD SNAP 5-2.5	1	
1-62		348-63715-1	ROD 5-75L	1	
1-63		3B7-05243-0	BALL JOINT CONNECTOR	1	
1-64		348-63716-1	THROTTLE ROD	1	
1-65		345-05223-1	ROD SNAP 3.5-2	1	
1-66		930103-0500	NUT	1	

1-67		3B7-63733-0	ROD SNAP 5-2.5	1	
1-68		348-63711-1	ADVANCER ARM	1	
1-69		910121-0840	BOLT	1	
1-70		345-63713-0	BUSHING 8-14-4	2	
1-71		334-66233-0	WASHER 8.1-16-1.5	1	
1-72		930403-0800	NYLON NUT 8-P1.25	1	
1-73		345-05223-1	ROD SNAP 3.5-2	1	
1-74		348-63715-1	ROD 5-75L	1	for MF/EF
1-75		346-05234-0	ROD JOINTφ5	1	for MF/EF
1-76		3B7-63733-0	ROD SNAP 5-2.5	1	for MF/EF
1-77		930103-0500	NUT	1	for MF/EF
1-78		361-83728-0	PIN	1	for MF/EF
1-79		3AA-83719-0	WASHER 8.5-18-1.6	1	for MF/EF
1-80		951603-0800	SNAP PIN d=8	1	for MF/EF
1-81		930103-0600	NUT	1	for MF/EF

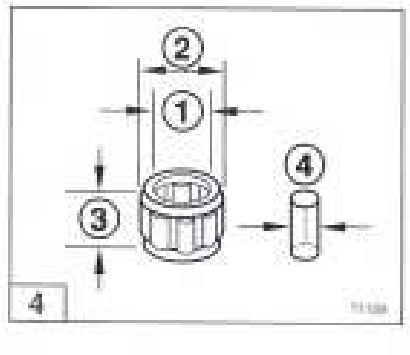
Crankshaft

Crankshaft is not an item that is addressed in the field. Raider Outboard should be sent back to depot or manufacturer for inspection. Critical concern would be starting the engine with the electric start prior to dispelling water between piston and heads. It is critical that the dewatering valves are opened after submersion and pull start is firmly and slowly pulled at a minimum of eight times prior to using electric starter. Starting engine after submersion without proper dewatering when using Electric start could damage crankshaft.

Service Information



Dimension 1 - 2.071 + 0 in [52.6 + 0 mm]
-0.002 - 0.05
Dimension 2 - 1.591 ± 0.002 in [40.4 ± 0.05 mm]



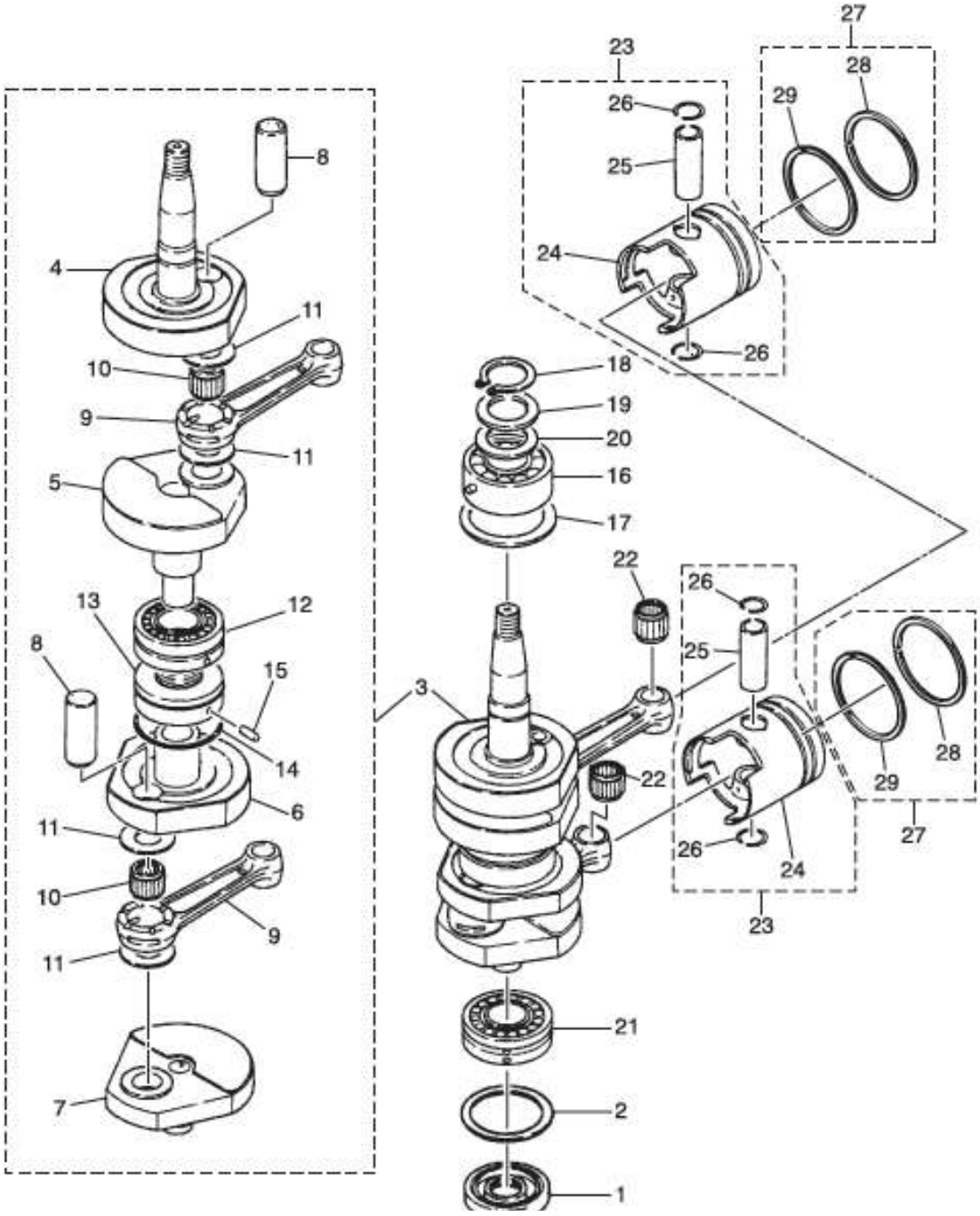
4 Connecting Rod Bearing (small end)

1. .0669 in (17 mm)
2. .827 in (21 mm)
3. 1.03 in (27 mm)
4. 0.079 in (2 mm)

Connecting Rod Bearing (big end)

1. 0.984 in (25 mm)
2. 1.260 in (32 mm)
3. 0.787 in (20 mm)
4. 0.138 in (3.5 mm)

3.2 Piston/Crankshaft



Remarks: Crank shaft assembly is difficult to assemble. The component parts should be purchased as an assembly if possible.

Ref.No.		Part No.	Description	Q'ty	Remarks
2-1		345-00122-0	OIL SEAL 25-55-10	1	
2-2		345-00125-0	RETAINER 50-60-1.6	1	
2-3		361-00069-1	CRANKSHAFT SUB-ASSY	1	
2-4		361-00031-0	* CRANKSHAFT A	1	
2-5		348-00032-0	* CRANKSHAFT B	1	
2-6		348-00033-0	* CRANKSHAFT C	1	
2-7		348-00034-0	* CRANKSHAFT D	1	
2-8		348-00061-1	* CRANK PIN	2	
2-9		345-00040-1	* CONNECTING ROD	2	
2-10		345-00043-0	* ROLLER BEARING 25-32-20	2	
2-11		345-00045-0	* BIG END BEARING WASHER	4	
2-12		345-00114-0	* MAIN BEARING 355520	1	Center
2-13		345-00051-0	* LABYRINTH PACKING	1	
2-14		345-00053-0	* O-RING 2-49.5	1	
2-15		951407-0306	* SPRING PIN 3-6	1	
2-16		345-00113-0	MAIN BEARING 5206	1	Upper
2-17		345-00115-0	RETAINER 56-66-1.6	1	
2-18		945107-3000	C-RING d=30	1	
2-19		345-00116-0	SPACER 30.2-40-2.3	1	
2-20		345-00141-0	SHIM 31-42	A	
2-21		345-00114-0	MAIN BEARING 355520	1	Lower
2-22		345-00042-0	ROLLER BEARING 17-21-27	2	
2-23	1	3C1-87130-0	PISTON REPAIR KIT	2	STD
2-24	1	361-00001-1	* PISTON	1	STD
2-25		345-00021-1	* PISTON PIN	1	
2-26		334-00024-1	* PISTON PIN CLIP	2	
2-27	1	3C1-87123-0	PISTON RING SET	2	STD
2-28	1	361-00011-0	* PISTON RING	1	STD 1st

2-29	1	345-00011-0	* PISTON RING	1	STD 2nd

3.3 Intake Manifold/Fuel Pump

Reed Valve and Stopper

Ref.No.		Part No.	Description	Q' t y	Remarks
3-1		915321-0655	STUD	2	
3-2		345B02010-0	INTAKE MANIFOLD	1	
3-3		345-02104-0	INTAKE MANIFOLD GASKET	1	
3-4		345-02105-0	INTAKE MANIFOLD GASKET	1	
3-5		345-02100-1	REED VALVE ASSY	1	
3-6		921521-7412	SCREW	8	
3-7		345-02106-0	PLATE	1	
3-8		910121-7620	BOLT	1	
3-9		345-02103-0	REED VALVE SEAT GASKET	2	
3-10		9101F4-5630	BOLT	7	
3-11		915321-0620	STUD	2	
3-12		930103-0600	NUT	4	
3-13		941303-0600	SPRING WASHER	4	
3-14		348-63718-0	THROTTLE CAM	Ref.No.	
3-15		921503-0616	SCREW	1	
3-16		346-63721-0	BUSHING 6.2-16-5	1	
3-17		3C8-66308-0	WASHER 6-16-1.5	1	
3-18		941403-1000	WAVE WASHER d=10	1	
3-19		345-02011-3	CARBURETOR GASKET	1	
3-20		345-67191-1	PRIME ROD	1	
3-21		345-67192-0	PRIME ROD	1	
3-22		345-67194-0	PRIME ROD CONNECTER	1	
3-23		921503-0408	SCREW	1	
3-24		356-04000-1	FUEL PUMP ASSY	1	
3-25		334-04004-0	* PUMP COVER	1	
3-26		9225F2-6528	* SCREW	3	
3-27		334-04005-0	* PUMP DIAPHRAGM	1	
3-28		334-04007-0	* DIAPHRAGM GASKET	1	
3-29		356-04030-0	* DIAPHRAGM GASKET SET	1	

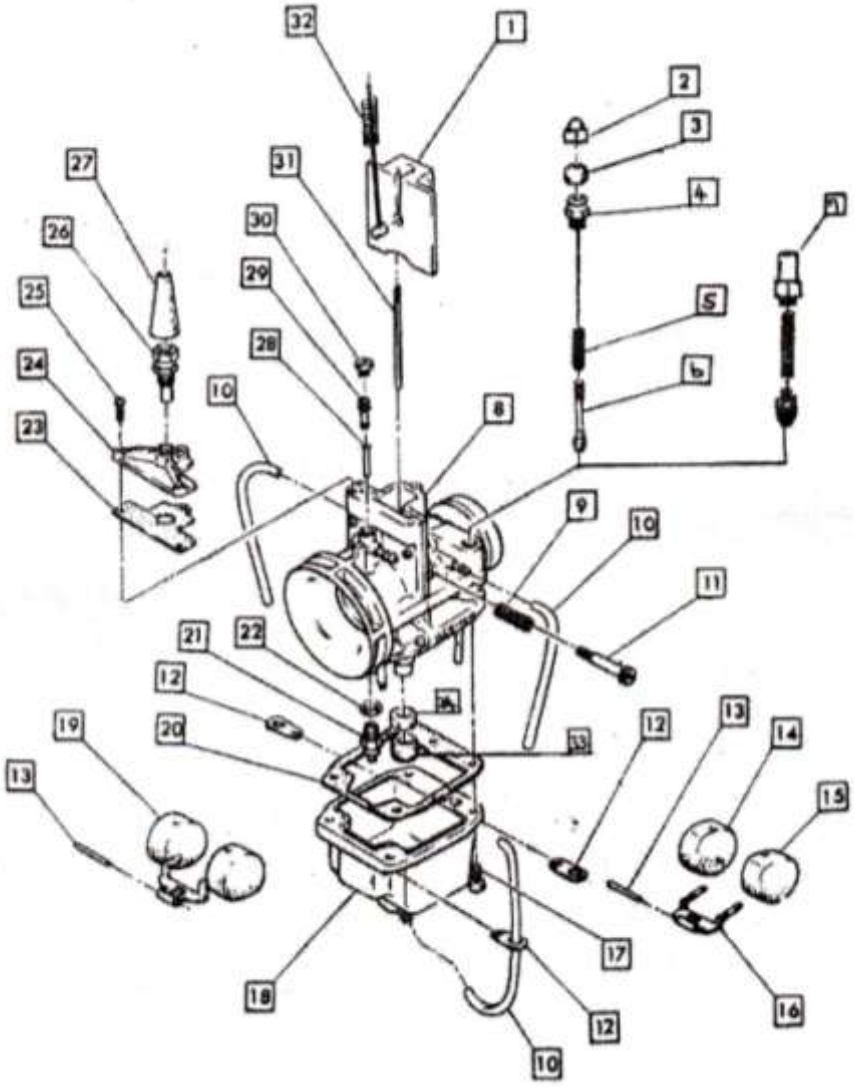
3-30		356-04044-0	* CHECK VALVE	2	
3-31		921722-0306	* SCREW	2	
3-32		930222-0300	* NUT	2	
3-33		346-04901-2	GASKET	1	Fuel Pump
3-34		921503-6640	SCREW	2	
3-35		98AB-50-160	HOSE	1	F/Connector-Fuel Filter 98AB-501000
3-36		98AB-50-270	HOSE	1	Fuel Filter-Fuel Pump 98AB-501000
3-37		98AB-50-210	HOSE	1	Fuel Pump-Carburetor 98AB-501000
3-38		338-02215-0	CLIPφ10	6	
3-39		346-02230-0	FUEL FILTER ASSY	1	
3-40		346-02237-0	* CUP	1	
3-41		346-02235-0	* GASKET	1	
3-42		346-02234-0	* FILTER	1	
3-43		930103-0800	NUT	1	
3-44		940103-0800	WASHER	2	
3-45		348-02231-0	PLATE	1	
3-46		345-02411-0	INTAKE PROTECTION COVER	1	
3-47		345-02415-0	INTAKE SILENCER COVER	1	
3-48		9101F4-0616	BOLT	2	
3-49		345-02416-0	INTAKE SILENCER PLATE	1	
3-50		921503-5508	SCREW	2	
3-51		345-02417-1	INTAKE SILENCER LOCK PLATE	1	
3-52		345-67195-1	BUSHING	1	

Note: Lift height of each reed valve and stopper must be within specification.
Used reeds must never be turned over and reused. Reed could break when returned to service causing serious powerhead damage.

Number of Valves - 40
Strips - 4
Valves/Strip - 3 Valves/Strip
A = Valve – 0.236-0.244 in
Height – (6.0-6.2 mm)
B = Gap - 0.0079 in
Valve End/Valve Seat – (0.2 mm)

3.4 Multi-fuel (Throttle Body) Atomizer

The Fuel Induction System (FIS) was given a name replacing "carburetor" as it looks like a carburetor, however, has minimal moving parts. The key to the FIS is the slide as it is shaped larger at bottom; smaller at top; as both flat and round surfaces with serrations in two directions. As the fuel reaches the slide, with harmonic frequency the fuel flows to the top of the slide and gets broken down into very small droplets that burn more effectively than carburetors.

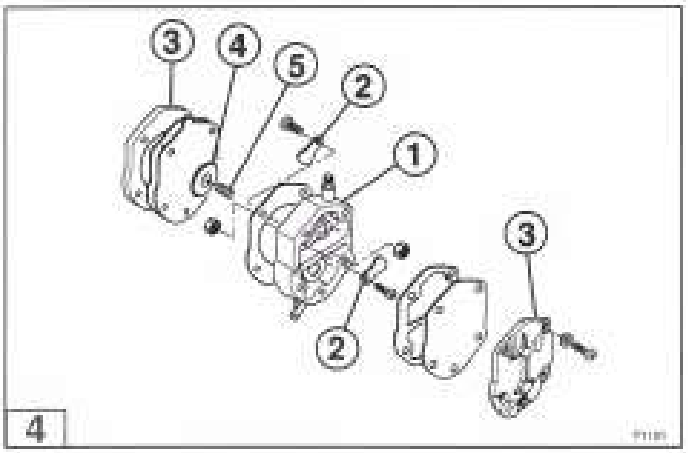


Ref.No.	Part No.	Description	Quantity	Remarks
4-1	RL4-32-200	**MULTI-FUEL ATOMIZER**	1	
4-2	RL4-3221-0	SLIDE	1	
4-3	RL4-0322	PUSH PULL KNOB	1	
4-4	RL4-0323	CHOKE RETAINER BOOT	1	
4-5	RL4-0324	CHOKE ASSY COMPONENT 2709	1	
4-6	RL4-0325	CHOKE ASSY COMPONENT 2709	1	
4-7	RL4-0326	CABLE CHOKE ASSY 2719	1	
4-8	RL4-0327	MFA BODY	1	
4-9	RL4-0328	IDLE KIT COMPONENT	1	
4-10	RL4-0329	VENT LINE 2430	1	
4-11	RL4-0330	IDLE KIT COMPONENT 2759	1	
4-12	RL4-0331	VENT CLIP	1	
4-13	RL4-0332	FLOAT DUIDE PIN 2280	1	
4-14	RL4-0333	INDEPENDENT FLOAT -LEFT 2202-1	1	
4-15	RL4-0334	INDEPENDENT FLOAT -RIGHT 2202-R	1	
4-16	RL4-0335	FLOAT LEVER 2200-1	1	
4-17	RL4-0336	FLOAT BOWL SCREW 2320	1	
4-18	RL4-0337	FLOAT BOWL -POWER JET 2300 PJ	1	
4-19	RL4-0338	DUAL FLOAT ASSY 2200-D	1	
4-20	RL4-0339	FLOAT BOWL GASKET	1	
4-21	RL4-0340	NEEDLE & SEAT GRAVITY 2500-030	1	
4-22	RL4-0341	NEEDLE & SEAT GASKET 2501	1	
4-23	RL4-0342	TOP COVER GASKET 2010-G	1	
4-24	RL4-0343	TOP COVER	1	
4-25	RLS-0344	TOP COVER SCREWS 9PKG. 3) 2010-0	1	
4-26	RLS-0345	BRASS CABLE ADJUSTORS	1	
4=27	RL4-0346	CABLE WEATHER SEAL 2150	1	
4=28	RL4-0347	POWER JET NOZZLE (LONG) 2810-L	1	
4=29	RL4-0348	POWER JET 2800	1	
4=30	RL4-0349	PJ CAP SCREW & GASKET 2709	1	
4=31	RL4-0350	METERING ROD 2600	1	
4=32	RL4-0351	SLIDE SPRING 2022	1	
4=33	RLS-0352	FUEL SCREEN	1	
4=34	RL4-0353	FUEL SCREEN ENCAPSULATOR 2335	1	

3.5 Fuel Pump/Oil System

Fuel Pump

CAUTION: Before servicing the fuel pump, disconnect the fuel hose from the engine to prevent excessive fuel spillage.



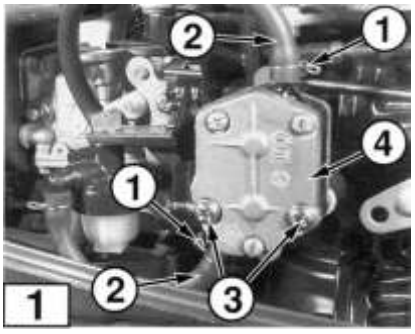
Inspection

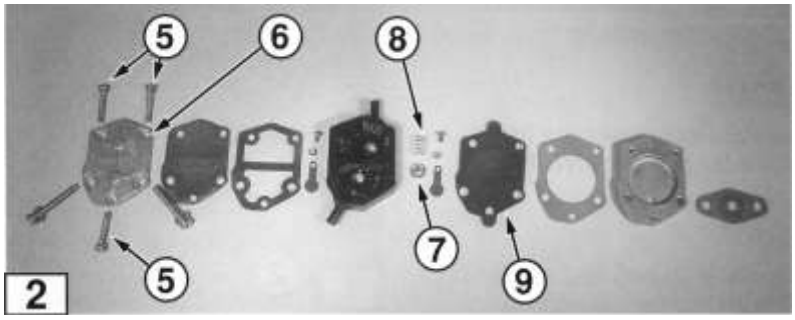
1. Inspect pump body **(1)** for cracks.
2. Inspect check valves **(2)** for deformation.
3. Inspect pump covers **(3)** for cracks and surface deformation.
4. inspect guide plate **(4)** and spring **(5)**, if equipped, for deformation and tension.
5. Inspect gasket between crankcase and fuel pump for dryness (crankcase-mounted pumps).

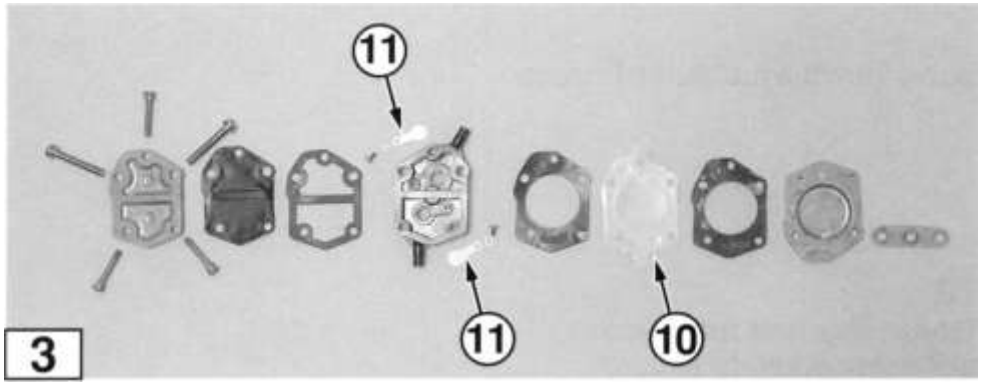
Disassembly

NOTE: *Match mark parts before disassembly and reference the illustrations in the Inspection procedure to ensure proper orientation of internal components.*

1. Expand and move clips **(1)** on fuel hose(s) **(2)**.
2. Disconnect fuel hoses from fuel pump.
3. Loosen pump mounting screws **(3)** and remove fuel pump **(4)** and gasket from crankcase.
4. Remove fuel pump cover screws **(5)** and cover **(6)**. Gently separate the pump components.







*Past production model contained an internal guide plate **(7)** and spring **(8)** assemblies under tension. The rubber diaphragm **(9)** that required the guide plate and spring has been replaced by a resin film (white opaque) diaphragm **(10)** which no longer requires the guide plate and spring.*

4. Remove and discard all serviceable gaskets and diaphragms.
5. Remove ail check valves **(11)** from pump body.

Cleaning

1. Clean ail pump components with kerosene.
2. lf necessary, clean pump mounting surface on Multi-fuel (Throttle Body) Atomizer with isopropyl alcohol.
3. Dry all components with low pressure compressed air.

Assembly

1. Install all check valves in pump body.
2. Fully assemble fuel pump. Ail serviceable gaskets and diaphragms must be replaced.
3. install fuel pump. Use Loctite 242 on mounting screw threads.
4. Connect fuel hoses to fuel pump.

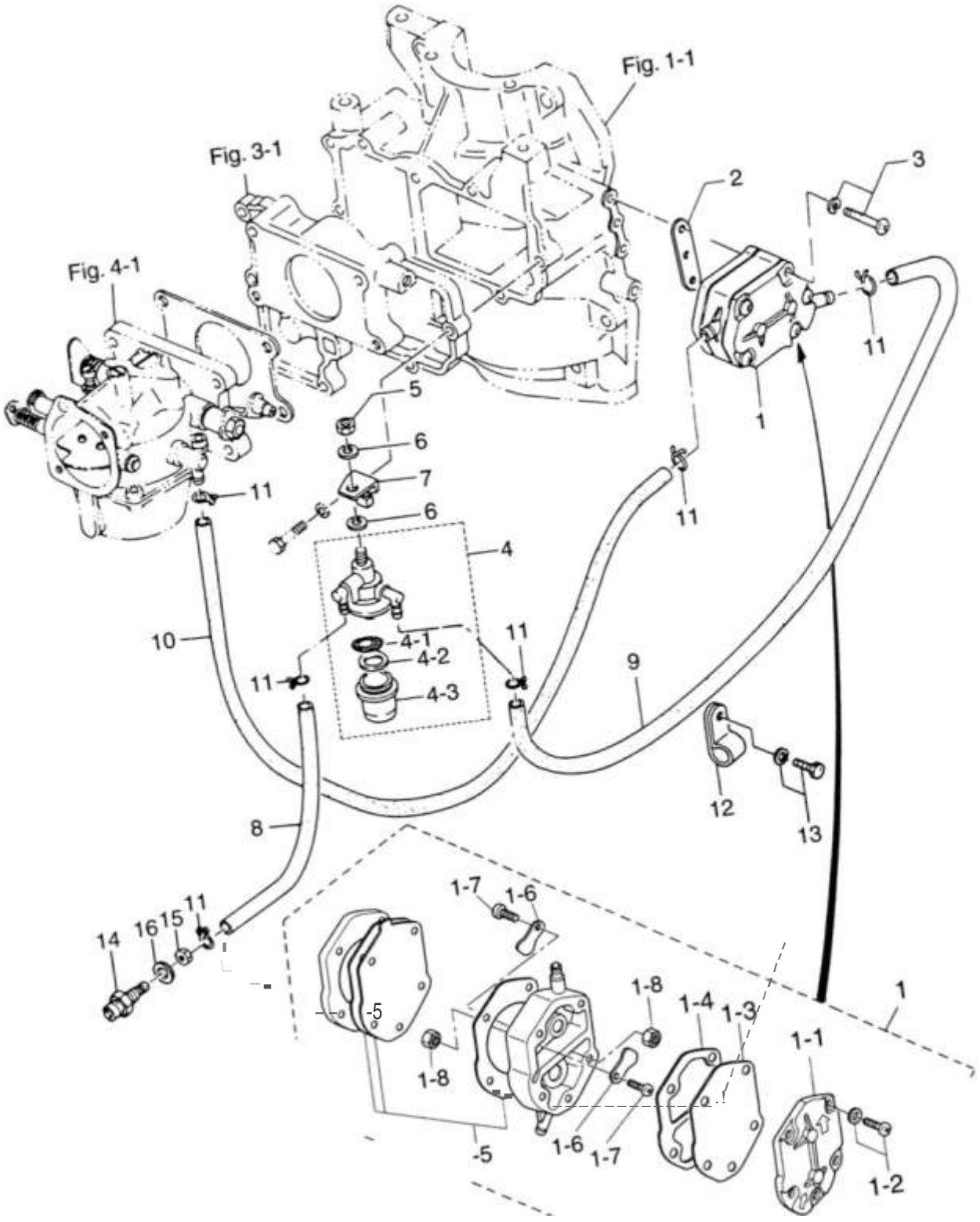


Fig. 1-1
Fig. 3-1
Fig. 4-1
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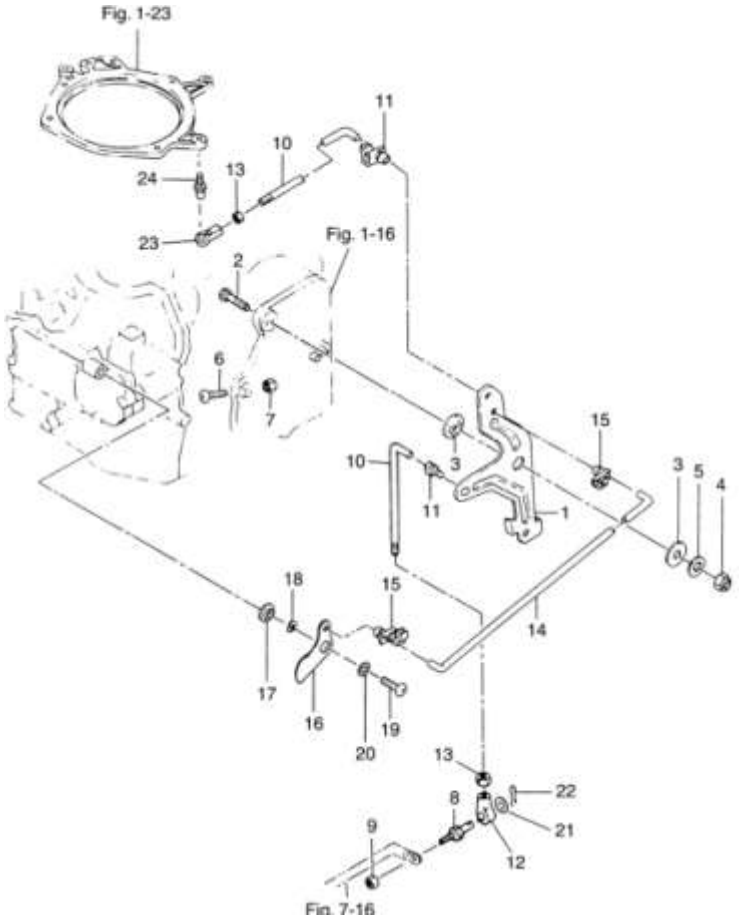
Ref. No.	Part No.	Description	Q'ty	Remarks
5-1	356-04000-1	Fuel Pump	1	
5-1-1	334-04004-0	* Pump Cover	1	
5-1-2	92251 2-6528	* Screw	3	
5-1-3	334-04005-0	* Diaphragm	1	
5-1-4	334-04007-0	* Gasket "B", Diaphragm	1	
5-1-5	356-04030-0	* Diaphragm Set	1	
5-1-6	356-04044-0	* Check Valve	2	
5-1-7	921 722-0306	* Screw	2	
5-1-8	930222-0300	* Nut	2	
5-2	346-04901 -0	Gasket. Fuel Pump	1	
5-3	921503-6640	Screw	2	
5-4	346-02230-0	Fuel Filter	1	
5-4-1	346-02234-0	* Filter	1	
5-4-2	346-02235-0	* Gasket	1	
5-4-3	346-02237-0	* Cup	1	
5-5	9301 13-0800	Nut	1	
5-6	9401 13-0800	Washer	2	
5-7	348-02231 -0	Plate. Fuel Filter	1	
5-8	98AB-5-01 60	Fuel Pipe	1	
5-9	98AB-5-0270	Fuel Pipe	1	
5-10	98AB-5-0210	Fuel Pipe	1	
5-11	338-0221 5-0	Clip #10	6	
5-12	336-06973-0	Clamp, 6-9.5L	1	
5-13	910113-5612	Bolt	1	
5-14	382-70260-1	Fuel Connector (Engine, Male)	1	
5-15	332-70261-0	Nut, 10-Pl .25	1	
5-16	336-701 12-0	Gasket 10.2-16-0.5	1	

3.6 Throttle Mechanism



Ref. No.	Part No.	Description	Q'ty	Remarks
6-1	348-63711-1	Advancer Arm	1	
6-2	9101 21-0840	Bolt	1	
6-3	345-63713-0	Bushing:. 8-14-4	2	
6-4	930406-0800	Nylon Nut. 8P-1.25	1	
6-5	3P0-66233-0	Washer. 8.1-16-1.5	1	or 334-66233-0
6-6	921 506-0520	Screw	1	
6-7	930106-0500	Nut	1	
6-8	361 -83728-0	Cable Pin	1	
6-9	930106-0600	Nut	1	
6-10	348-63715-0	Link Rod. 5-75L	2	
6-11	3B7-63733-0	Rod Snap. 5-3	2	
6-12	346-05234-0	#5 Rod Joint	1	
6-13	930106-0500	Nut	2	
6-14	348-63716-0	Throttle Link Rod	1	
6-15	345-05223-1	Rod Snap. 3.5-2	2	
6-16	348-63718-0	Throttle Cam	1	
6-1 7	346-63721 -0	Bushing:, 6.2-16-5	1	
6-18	941403-1000	Wave Washer, d=10	1	
6-19	921503-061 6	Screw	1	
6-20	3R0-66308-0	Washer, 6-16-1.5	1	
6-21	353-83719-0	Washer, 8.5-18-1.6	1	
6-22	951603-0800	R-Pin, d=8	1	
6-23	3B7-05243-0	Cap "C". Ball Joint	1	
6-24	346-05228-0	* Ball Joint "B"	1	

3.7 Tiller Handle

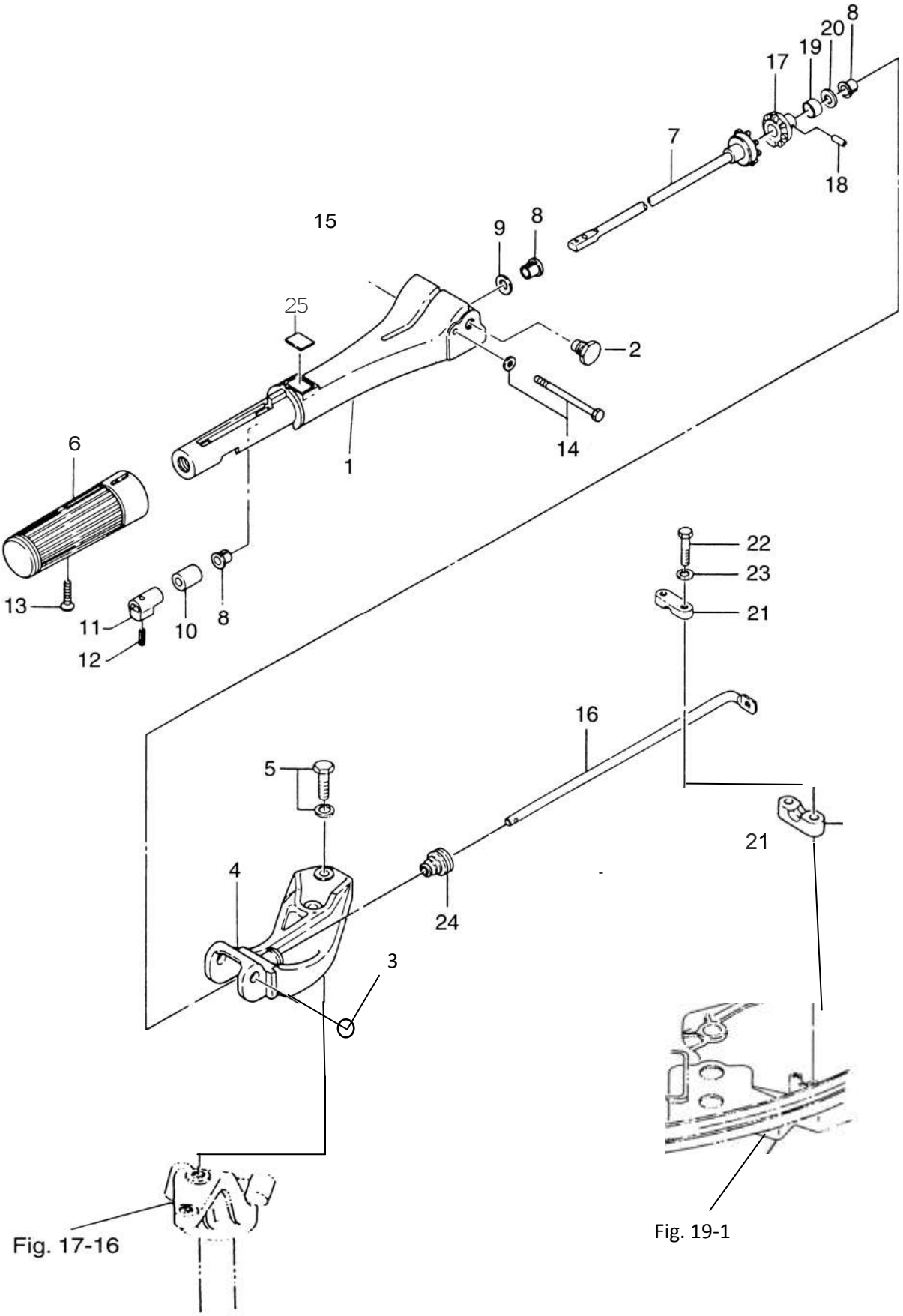
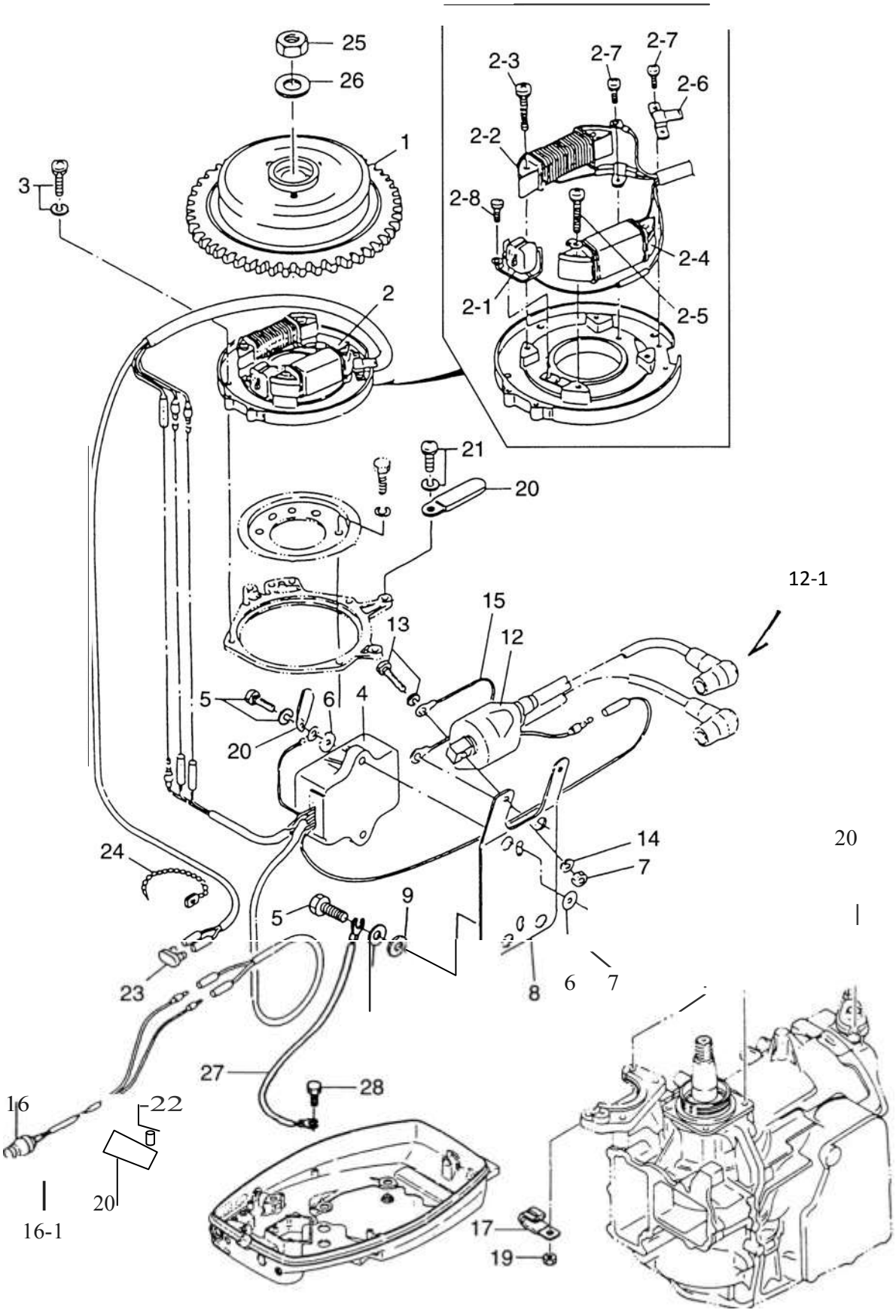


Fig. 17-16

Fig. 19-1

Ref. No.	Part No.	Description	Q'ty	Remarks
6-1	348-63711-1	Advancer Arm	1	
6-2	9101 21-0840	Bolt	1	
6-3	345-63713-0	Bushing:. 8-14-4	2	
6-4	930406-0800	Nylon Nut. 8P-1.25	1	
6-5	3P0-66233-0	Washer. 8.1-16-1.5	1	or 334-66233-0
6-6	921 506-0520	Screw	1	
6-7	930106-0500	Nut	1	
6-8	361 -83728-0	Cable Pin	1	
6-9	930106-0600	Nut	1	
6-10	348-63715-0	Link Rod. 5-75L	2	
6-11	3B7-63733-0	Rod Snap. 5-3	2	
6-12	346-05234-0	#5 Rod Joint	1	
6-13	930106-0500	Nut	2	
6-14	348-63716-0	Throttle Link Rod	1	
6-15	345-05223-1	Rod Snap. 3.5-2	2	
6-16	348-63718-0	Throttle Cam	1	
6-1 7	346-63721 -0	Bushing:, 6.2-16-5	1	
6-18	941403-1000	Wave Washer, d=10	1	
6-19	921503-061 6	Screw	1	
6-20	3R0-66308-0	Washer, 6-16-1.5	1	
6-21	353-83719-0	Washer, 8.5-18-1.6	1	
6-22	951603-0800	R-Pin, d=8	1	
6-23	3B7-05243-0	Cap "C". Ball Joint	1	
6-24	346-05228-0	* Ball Joint "B"	1	

3.8 Magneto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Ref. No.	Part No.	Description	Q'ty	Remarks
8-1	361-06091-0	Flywheel Cup	1	FP5506 #91569
8-2	3A0-06002-0	Coil Plate Ass'y	1	
8-2-1	3G2-06022-0	* Pulser Coil	1	
8-2-2	3A0-06023-0	* Alternator	1	
8-2-3	921521-6528	* Screw	2	
8-2-4	3G2-06021-0	* Exciter Coil	1	
8-2-5	921521-6522	* Screw	2	
8-2-6	350-06025-0	* Holder. Magneto Cord	1	
8-2-7	921521-6406	*Screw	3	
8-2-8	921521-6408	*Screw	2	
8-3	9215216510	*Screw	4	
8-4	361-06060-1	G.D. Unit	1	CU2503
8-5	910103-6625	Bolt	5	
8-6	3R0-66308-0	Washer, 6-16-1.5	4	
8-7	930113-0600	Nut	4	
8-8	3A0-06322-1	Plate, Electric	1	
8-9	3B7-06305-0	Rubber Mount. 9-16-43	3	
8-10	3F3-06920-0	Rubber Mount, 9-12-2	3	
8-11	3A0-76079-0	Collar. 6.2-9-7.4	3	
8-12	361-06040-1	Ignition Coil (with Resistance Cao)	1	
8-12-1	3C7-06921-0	* Plug Cap (with Resistance)	2	
8-13	910113-5620	Bolt	2	
8-14	941303-0600	Spring Washer	2	
8-15	3B7-76142-0	Ground Cable	1	L=120
8-16	398-06830-0	Lanyard Stop Switch	1	
8-16-1	353-06821-0	* Lock, Lanyard Stop Switch	1	
8-17	345-06917-1	Clamp. 9-20U	1	
8-18	9101 14-0820	Bolt	1	
8-19	9301 13-0800	Nut	1	

8-20	309-06972-0	Clamp, 6.5-47.5P	4	
8-21	922503-6510	Screw	1	
8-22	9101 13-0612	Bolt	1	
8-23	353-76037-0	Plug:. Cable Terminal	1	
8-24	336-76091-0	Band, Lead Wire	1	
8-25	931121-1600	Nut. Magneto (16P-1.5)	1	#032986XD-Clockwise
	334-00132-0	Nut. Magneto (16P-1.5L)	(1)	#028121XD-Counterclockwise
8-26	345-00133-0	Washer. 16-28-3.2	1	
8-27	3C7-76142-0	Ground Cable	1	L=170 for MF Type
		Bolt	1	

3.9 Electrical System

The Raider 40 Electrical system is very straight forward. For the user the secondary starting process is the built in self starter which consists of a protected starter button supported by a small lightweight battery.

3.8.1 Battery.

The Raider battery should be removed when not used. To maintain use it must be charged every six months. Prior to mission check to insure the battery voltage is not lower than 12.8 V. This battery is completely sealed and requires no topping of any fluid. Never attempt to open the battery. Short cranking of the Raider 40 is recommended. DO NOT attempt to continuously crank the battery more than 5 times.

Battery Installation requires removing cowling; place battery on platform in engine front. The battery has a hole underneath that will match the extended pin. Place in position and install a Velcro strap. Connect the battery cable to the cable inside the motor pan. To remove do the process in reverse.

Storage. Battery should be stored with 70 percent charge level. Store in dry cool location away from rain, furnaces of other heat sources.

The electric start function is considered a secondary starting method.

NEVER use battery to dewater engine as this will cause critical internal damage to the engine when the piston tries to quickly push water out of dewatering valves. This will potentially destroy the internal parts of the engine.

Electrical System Overview

Ignition type - Flywheel magneto capacitor discharge

Spark Plug (with resistor) - **S**BE1/10 (Pulstar)

Spark Plug wires **–** 2 x 23 015 002 051 (Nology)

Spark Plug Gap **-** 0.040 in [0.9 - 1.0 mm]

Battery - Sealed type 12 Volt W/Hr (Wh) – 24 (Ah- 2) Cold Cranking Amps - 140

Engine Fuse **- none**

Rectifier - **04KE03**

Starter Solenoid **- 2J6**

Starter Motor – **Part No. 346760100m**

Starter Switch – #FS-ST05 Moroso 74120

Alternator - 12V 80W

Charging Performance (at 5500 RPM) – 5 Amps

Number of Tachometer-to-Alternator Coil Impulses - 4

Alternator Coil Resistance -
Y-W : 0.65 - 0.98 Ohms
Y-B : 0.31 - 0.47 Ohms
W-B : 0.37 - 0.55 Ohms

Ignition Coil Resistance - (±25%)

Primary Coil - 0.2 - 0.3 Ohms

Secondary Coil - 4.1 - 6.1 KOhms

Electrical Starter

Position	Color of lead wires
A	Yellow
B	White
C	Red
D	Blue/Brown
E	Green/Black

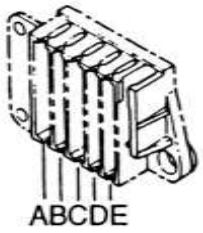


Fig. 11-4

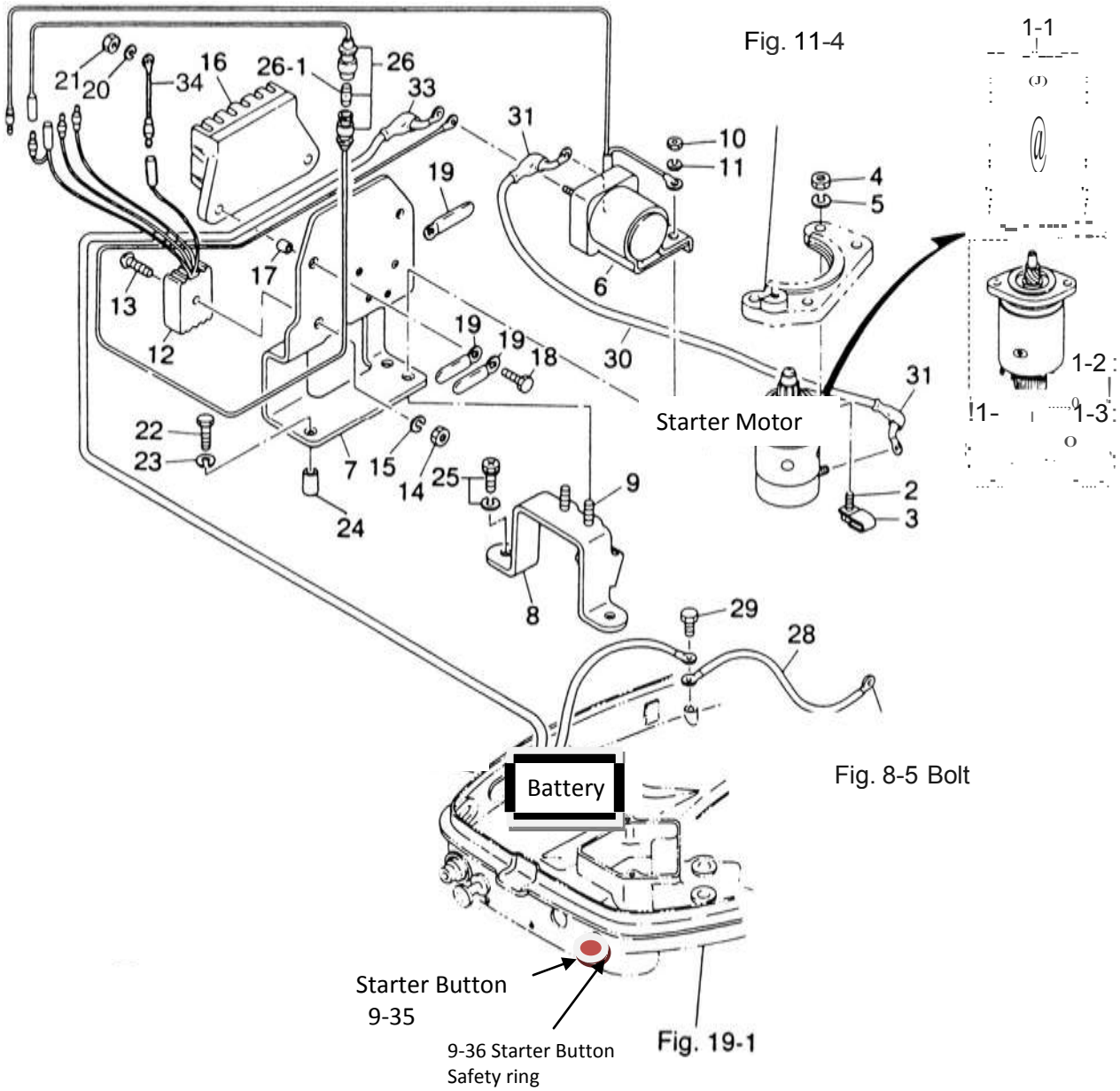


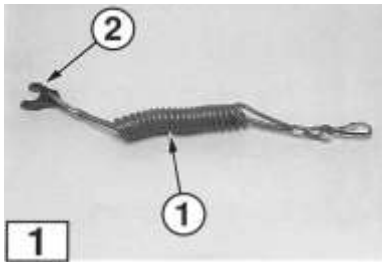
Fig. 8-5 Bolt

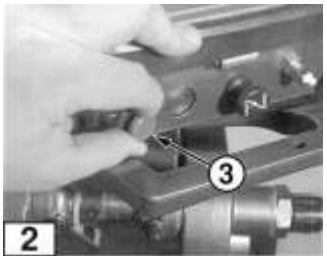
Fig. 19-1

Ref. No.	Part No.	Description	Q'ty	Remarks
9-1	346-76010-0	Starter Motor	1	
9-1-1	346-76015-0	* Pinion	1	
9-1-2	346-76012-0	* Carbon Brush (+)	2	
9-1-3	346-76013-0	* Carbon Brush (-)	1	
9-1-4	346-76014-0	* Brush Holder	1	
9-2	916103-0830	Bolt	2	
9-3	345-06971-0	Clamp, 9-12U	2	
9-4	930113-0800	Nut	2	
9-5	941303-0800	Spring Washer	2	
9-6	346-76040-0	Starter Solenoid	1	
9-7	361-76055-0	Bracket. Choke Solenoid	1	
9-8	345-76081-0	Bracket. Neutral Switch	1	
9-9	910103-0618	Bolt	2	
9-10	930113-0600	Nut	2	
9-11	941303-0600	Spring: Washer	2	
9-12	3G2-76060-0	Rectifier	1	
9-13	921503-0525	Screw	1	
9-14	930103-0500	Nut	1	
9-15	941303-0500	Spring: Washer	1	
9-16	353-06281-0	Holder. Cable Terminal	1	
9-17	353-06283-0	Collar.6.4-10-4.7	2	
9-18	910113-0620	Bolt	2	
9-19	309-06972-0	Clamp.65-475P	3	
9-20	941303-0600	Spring: Washer	2	
9-21	930113-0600	Nut	2	
9-22	910103-0645	Bolt	1	
9-23	941303-0600	Spring: Washer	1	or 910103-6645
9-24	128-02605-1	Spacer.6-8-28.5	1	
9-25	910903-6616	Bolt	2	
9-26	352-76062-0	Fuse Wire - eliminated	1	L=355

EMERGENCY STOP SWITCH AND LANYARD

The emergency stop switch and lanyard should be inspected and tested after servicing outboard. The operator should perform Emergency Stop function test with the boat in the water prior to leaving the launch area.





1. Lanyard P/N 361-06305-1
2. Emergency Kit Stop P/N 361-06305-2

WARNING

Do not attempt to repair worn or faulty stop switch and lanyard. Replace only with genuine parts. Do not substitute.

Inspection

1. Inspect lanyard **(1)** for cuts or fraying, lock clip **(2)** for cracks.
2. Inspect stop switch assembly

(3) For signs of wear and make sure the switch has adequate spring tension to hold the lanyard lock clip in place

Stop Switch Test

1. Attach the lanyard lock clip to the stop switch.
2. Start the engine.
3. With engine running, pull the lanyard to disengage the lock clip.

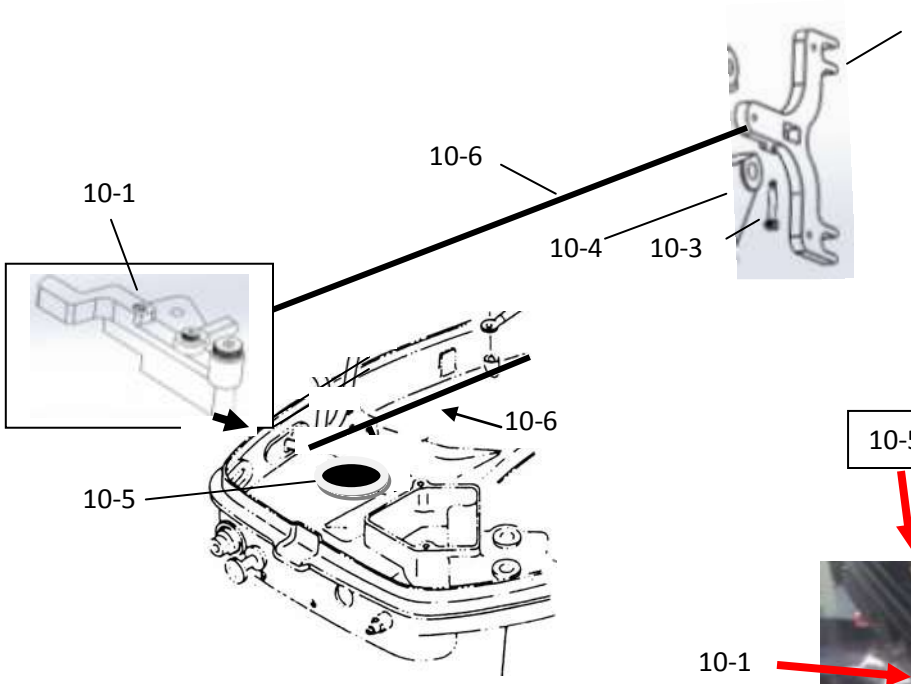
Engine should stop running.

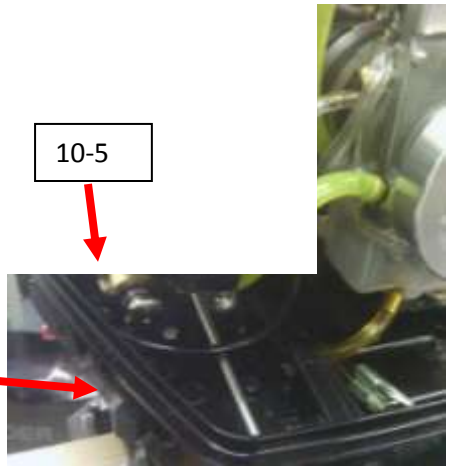
NOTE

The stop switch also operates as a push-button switch with the lanyard left attached.

4. Repeat the test but do not remove the lanyard. Press down firmly and hold the stop switch until engine stops running. If engine continues to run in either test, the stop switch or wiring are faulty and must be replaced before engine is operated.

3.10 Dewatering System





Dewater and Start Procedure: (Pull Start)

1. Connect fuel line.
2. Tilt engine into boat
3. Push dewatering valve toward rear of engine – hold back 10-7
4. Pump primer bulb clearing old fuel
5. Release dewatering against fuel valve
6. Pull slowly 8 times on rope. Even strokes.
7. Tilt engine back to standard position
8. Pump primer two times
9. Pump primer bulb until tight
10. Slide dewatering valve to front of engine (close) 10-1
11. Pull rope until engine starts

Dewater and Start Procedure: (Electric Start)
Perform 1 – thru – 10
Press start button

Caution: Do not hit start button until water is cleared between pistons and head. If this is done internal damage to the engine can occur.

Ref. No.	Part No.	Description	Q'ty	Remarks
10-1	DW50540	Dewatering lever	1	
10-2	DW50541	Head dewatering lever	1	
10-3	DW50542	Shoulder Bolt	1	
10-4	DW50543	Lock washer	1	
10-5	DW50544	Carburetor dewatering valve depressor	1	
10-6	DW50545	Dewatering rod	1	
10-7	DW50546	Carburetor dewater valve	1	
10-8	DW50547	Dewatering valves	2	

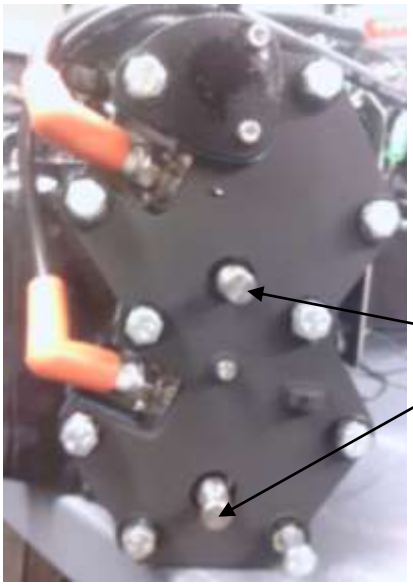
3.10-1 Dewatering System operation

The dewatering system is utilized after total motor submersion. After the Raider is installed on the transom and secured the dewatering lever, located on the left side of the motor, is pushed toward the back of the outboard motor.

The operator must depress the lever to full back position, then press fuel bulb for four presses. This evacuates all potential water that would be in the carburetor.

This action also opens up two dewatering valve located in the head of each cylinder. The operator will slowly pull the starter rope a minimum of eight SLOW pulls. This eliminates all water trapped between pistons and the head. Following instructions located on the motor cowling the Raider should start within five minutes using the pull start.

It is critical after submersion the motor is turned over by hand for a minimum of eight slow pulls; insure the rope is engaged prior to pulling as to not put pressure on the pull starter. NEVER use the electric start immediately after submersion as the water trapped will cause internal damage to the outboard.



Picture of rear of Raider motor showing head.

Dewatering Valves
P/N DW 50546

"O" Rings on Valves
P/N DW50546-A

3.11 Recoil Starter

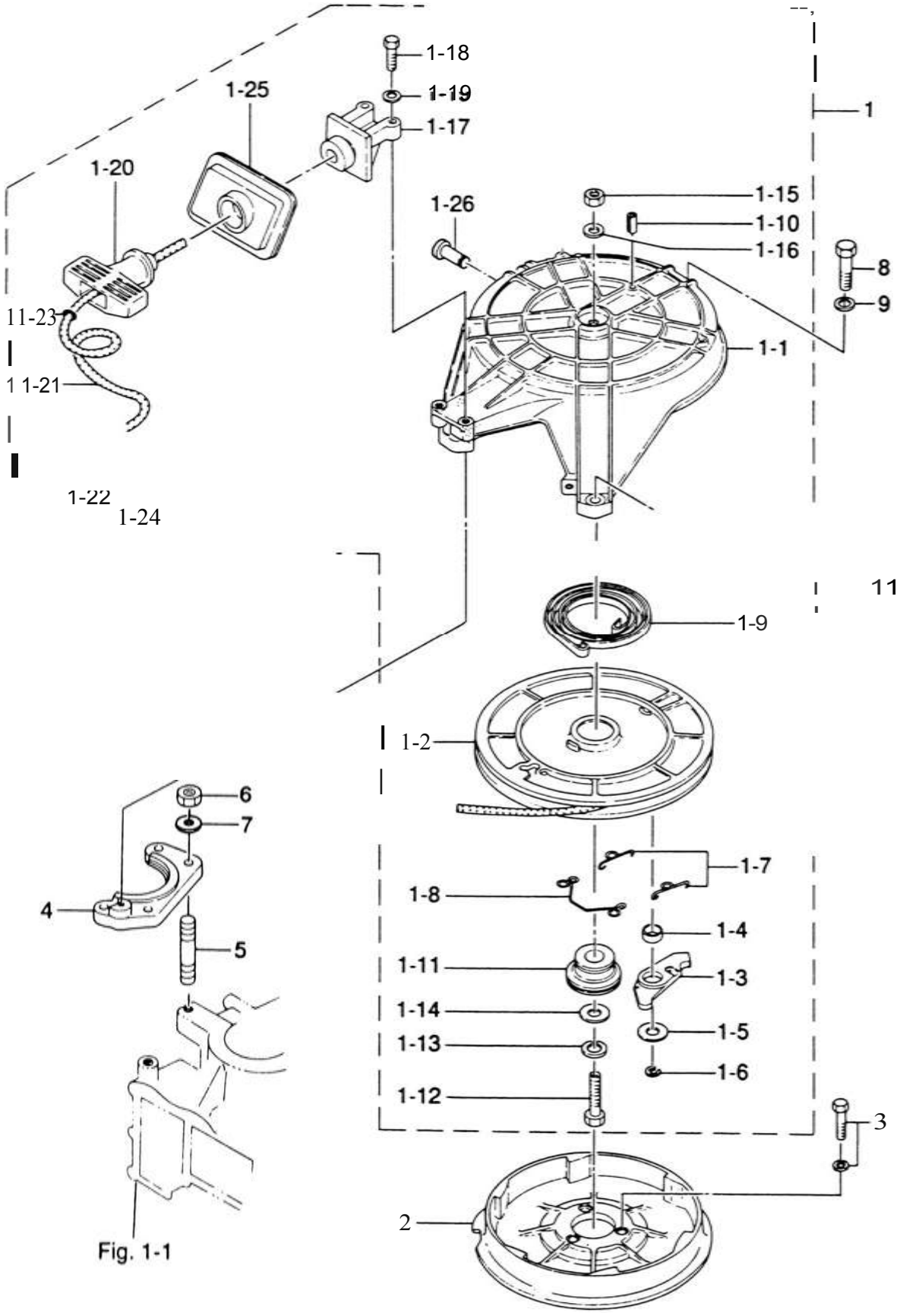


Fig. 1-1

Ref. No.	Part No.	Description	Q'ty	Remarks
1 1-1	345-05000-1	Recoil Starter	1	
1 1-1-1	345-05105-1	* Starter Case	1	
1 1-1-2	345-05105-1	* Reel	1	
1 1-1-3	345-05003-1	* Ratchet	1	
1 1-1-4	345-051 35-1	* Bushing, Ratchet	1	
1 1-1-5	345-05122-0	* Washer. 6.5-23-1.5	1	
1 1-1-6	945303-0500	* E-Ring, d=5	1	
1 1-1-7	345-05123-0	* Ratchet Guide "A"	2	
1 1-1-8	345-051 24-0	* Ratchet Guide "B"	1	
1 1-1-9	345-05004-0	* Starter Spring	1	
1 1-1-10	951403-031 6	* Spine: Pin, 3-16	1	
1 1-1-1 1	345-05132-0	* Starter Shaft	1	
11-1-12	9101 14-0830	* Bolt	1	
11-1-13	941322-0800	* Spring Washer	1	
11-1-14	940121-0800	* Washer	2	
11-1-15	930103-0800	* Nut	1	or 910113-0800
11-1-16	941322-0800	* Spring Washer	1	
11-1-17	336-050 14-0	* Guide. Starter Rope	1	
1 1-1-18	9101 14-0625	* Bolt	2	
1 1-1-19	941303-0600	* Spring: Washer	2	
1 1-1-20	338-0501 9-0	* Starter Handle	1	
1 1-1-21	345-05013-1	* Starter Rope	1	5-2000
11-1-22	338-05131-0	* Rope Anchor	1	
11-1-23	350-05136-0	* 0-Ring:. 2.5-4.5	1	
11-1-24	345-05134-0	* Plate. Rope Anchor	1	
11-1-25	344-051 16-0	* Seal Plate. Starter	1	
11-1-26	345-05225-0	* Shaft. Starter Lock Lever	1	
11-2	345-05901-1	Starter Pulley	1	

Ref. No.	Part No.	Description	Q'ty	Remarks
11-5	915314-0825	Stud Bolt	2	
11-6	930121-0800	Nut	2	
11-7	940121-0800	Washer	2	
11-8	910114-0830	Bolt	1	
11-9	941303-0800	Spring: Washer	1	
11-10	910114-0625	Bolt	2	
11-11	941303-0600	Spring: Washer	2	

Recoil Starter Removal

1. Remove the neutral start mechanism components and remove the recoil starter from the engine.
2. Rewind the reel and loosen the recoil starter spring. Note: use a screw driver to put the starter rope in the reel notch. With the rope hooked in the notch, rotate the reel slowly to loosen the rope. Repeat this process until the starter spring does not pull the reel.
3. Remove the handle (7) from the starter rope (8).

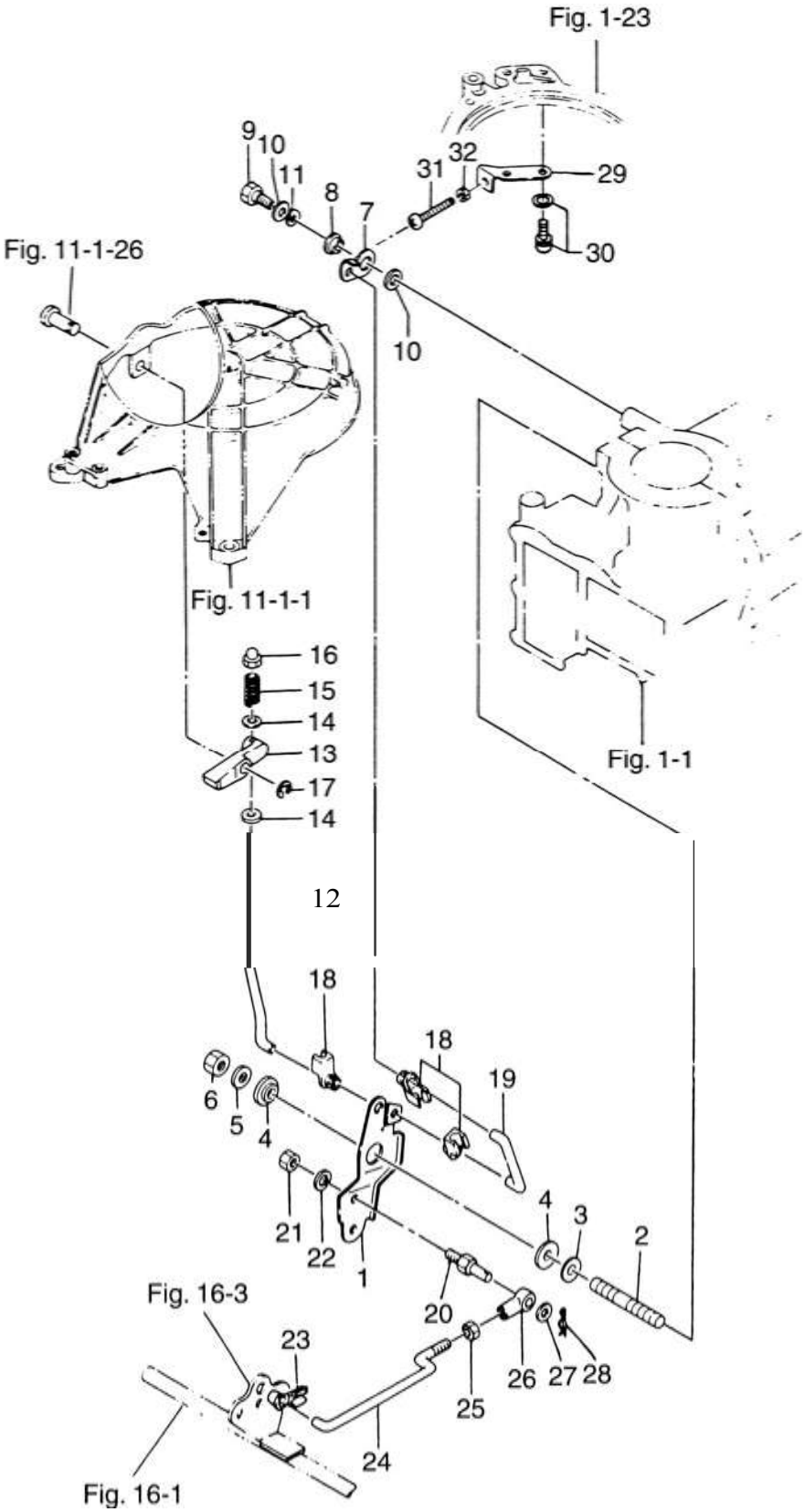
WARNING: The Raider 40 has a neutral start mechanism (start-in-gear protection) attached to the recoil starter. This feature disables the engine from starting while in gear (forward/reverse). If the electric start is used it will not start the engine unless it is in neutral.

Cleaning and Inspection:
All worn, damaged, or missing parts must be replaced.
1. Clean metal parts with solvent and dry with low pressure compressed air. Clean plastic parts with dry cloth.
2. Inspect following components as follows:
Starter rewind spring for cracked or broken end loops.
• Ratchet and reel stopper springs for deformation or poor tension.
• Sliding plates, stopper components, and busing for cracks or signs of wear.
• Reel assembly for wear.
• Starter housing for sharp or rough edges which could fray starter rope.
Starter rope for frays and rope handle for damage.

Assembly

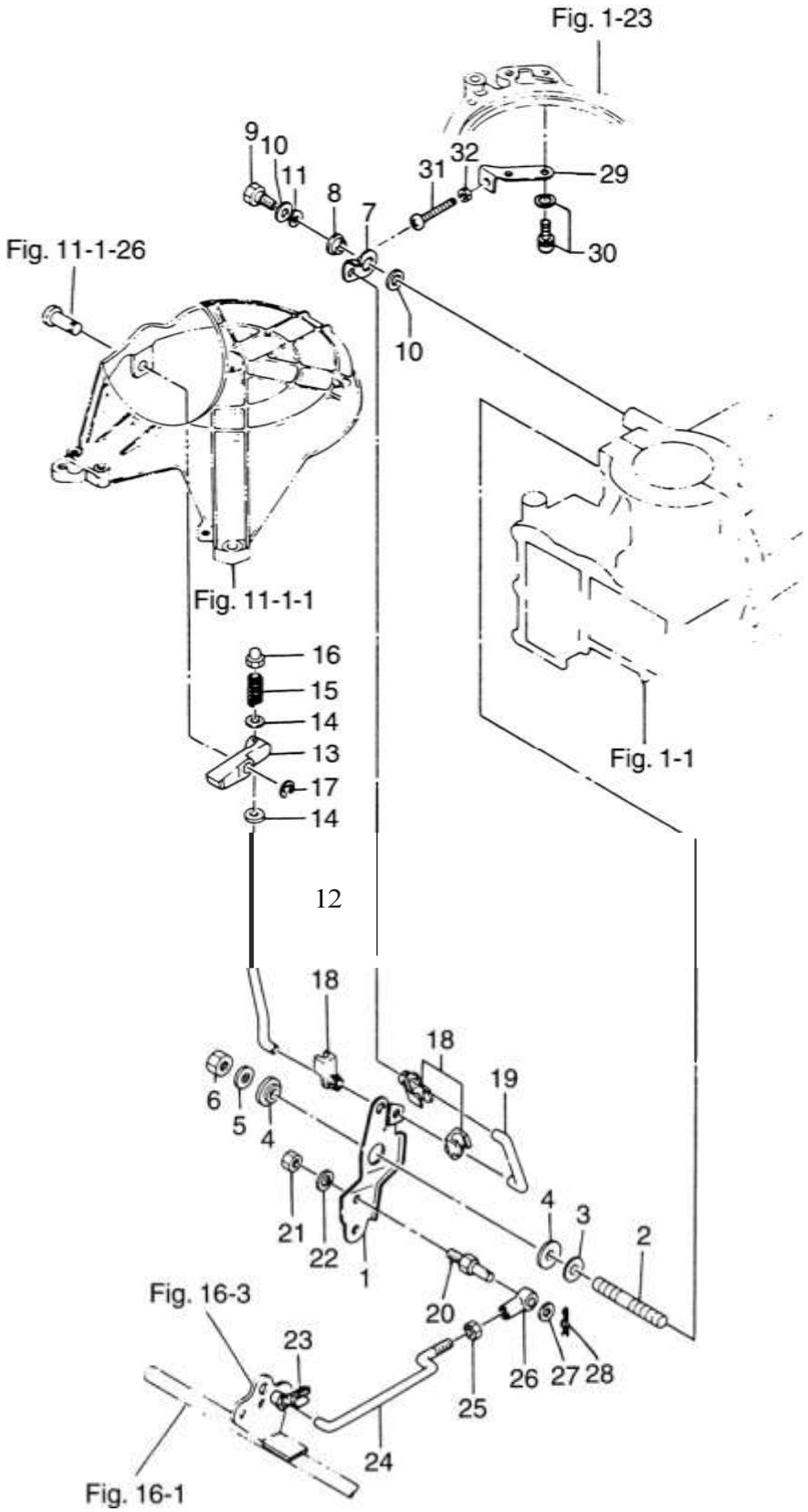
For assembling, use the procedure reverse to the disassembly: following notes.
• When setting the starter spring **(2)** on the starter spring case **(1)** direct the outer edge hook of the coil spring to the right and set it in the notch of the starter spring case outer circumference.
• When winding the starter spring **(2)** , rotate the reel **(3)** to the direction of turn (left turn) at pulling out the rope. Then, set the spring so that the reel rotates 1/4 of a turn to one and 1/4 of a turn when rope is fully pulled out. • Apply anti-freeze grease to both ends of the starter spring **(2)** and sliding area between the starter shaft bolt **(14)** and friction plate. • Tighten the starter shaft bolt to the specified toque.

3.12 Starter Lock (Pull Starter)



Ref. No.	Part No.	Description	Q'ty 40 R		Remarks
12-1	361-05211-0	Lock Arm. Starter	1		
12-2	915314-0825	Stud Bolt	1		
12-3	345-01015-0	Washer, 8.5-19.5-3.2	1		
12-4	345-63713-0	Bushing, 8-14-4	2		
12-5	9401 13-0800	Washer	1		
12-6	930406-0800	Nylon Nut. 8P-1.25	1		
12-7	345-05213-0	Stop Arm. Throttle	1		
12-8	346-63721-0	Bushing:. 6.2-16-5	1		
12-9	910114-0620	Bolt	1		
12-10	940113-0600	Washer	2		
12-11	941403-1000	Wave Washer	1		
12-12	345-05217-1	Rod. Starter Lock	1		
12-13	345-05226-0	Lever. Starter Lock	1		
12-14	940103-0400	Washer	2		
12-15	345-05216-0	Spring, Starter Lock	1		
12-16	346-05209-0	Cap. Starter Lock Lever	1		
12-17	945303-0600	E-Ring D-6	1		
12-18	345-05223-1	Rod Snap. 3.5-2	3		
12-19	345-05221-1	Rod. Throttle Stop Arm	1		
12-20	353-83728-0	Pin. Rod Joint	1		
12-21	930106-0600	Nut	1		
12-22	941303-0600	Spring Washer	1		
12-23	345-05224-0	Rod Snap, 5-2.5	1		
12-24	345-05222-1	Link, Starter Lock Arm	1		
12-25	930106-0500	Nut	1		
12-26	346-05234-0	5 Rod Joint	1		
12-27	353-83719-0	Washer, 8.5-18-1.6	1		
12-28	951603-0800	R-Pin. d-8	1		
12-29	348-05233-0	Plate. Throttle Adjust	1		
12-30	921521-6510	Screw	2		

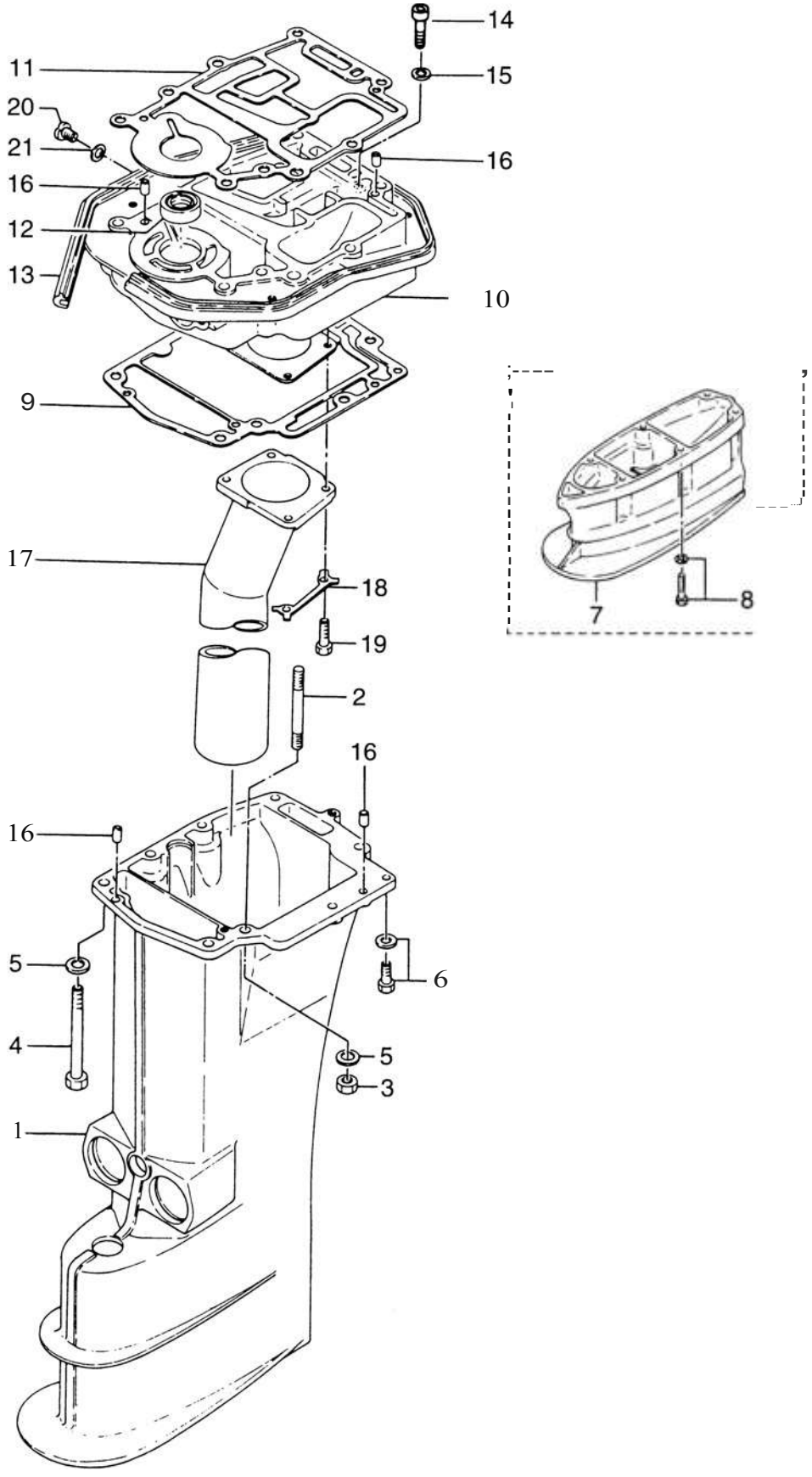
Fig. 12 STARTER LOCK



Ref. No.	Part No.	Description	Q'ty	Remarks
12-1	361-05211-0	Lock Arm. Starter	1	
12-2	915314-0825	Stud Bolt	1	
12-3	345-01015-0	Washer, 8.5-19.5-3.2	1	
12-4	345-63713-0	Bushing, 8-14-4	2	
12-5	9401 13-0800	Washer	1	
12-6	930406-0800	Nylon Nut. 8P-1.25	1	
12-7	345-05213-0	Stop Arm. Throttle	1	
12-8	346-63721-0	Bushing:. 6.2-1 6-5	1	
12-9	910114-0620	Bolt	1	
12-10	9401 13-0600	Washer	2	
12-11	941403-1000	Wave Washer	1	
12-12	345-0521 7-1	Rod. Starter Lock	1	
12-13	345-05226-0	Lever. Starter Lock	1	
12-14	940103-0400	Washer	2	
12-15	345-05216-0	Spring, Starter Lock	1	
12-16	346-05209-0	Cap. Starter Lock Lever	1	
12-17	945303-0600	E-Ring D-6	1	
12-18	345-05223-1	Rod Snap. 3.5-2	3	
12-19	345-05221-1	Rod. Throttle Stop Arm	1	
12-20	353-83728-0	Pin. Rod Joint	1	
12-21	930106-0600	Nut	1	
12-22	941303-0600	Spring Wash er	1	
12-23	345-05224-0	Rod Snap, 5-2.5	1	
12-24	345-05222-1	Link, Starter Lock Arm	1	
12-25	930106-0500	Nut	1	
12-26	346-05234-0	5 Rod Joint	1	
12-27	353-83719-0	Washer, 8.5-18-1.6	1	
12-28	951603-0800	R-Pin. d-8	1	
12-29	348-05233-0	Plate. Throttle Adjust	1	

12-30	921521-6510	Screw	2	
12-31	921503-0530	Screw	1	
12-32	930106-0500	Nut	1	

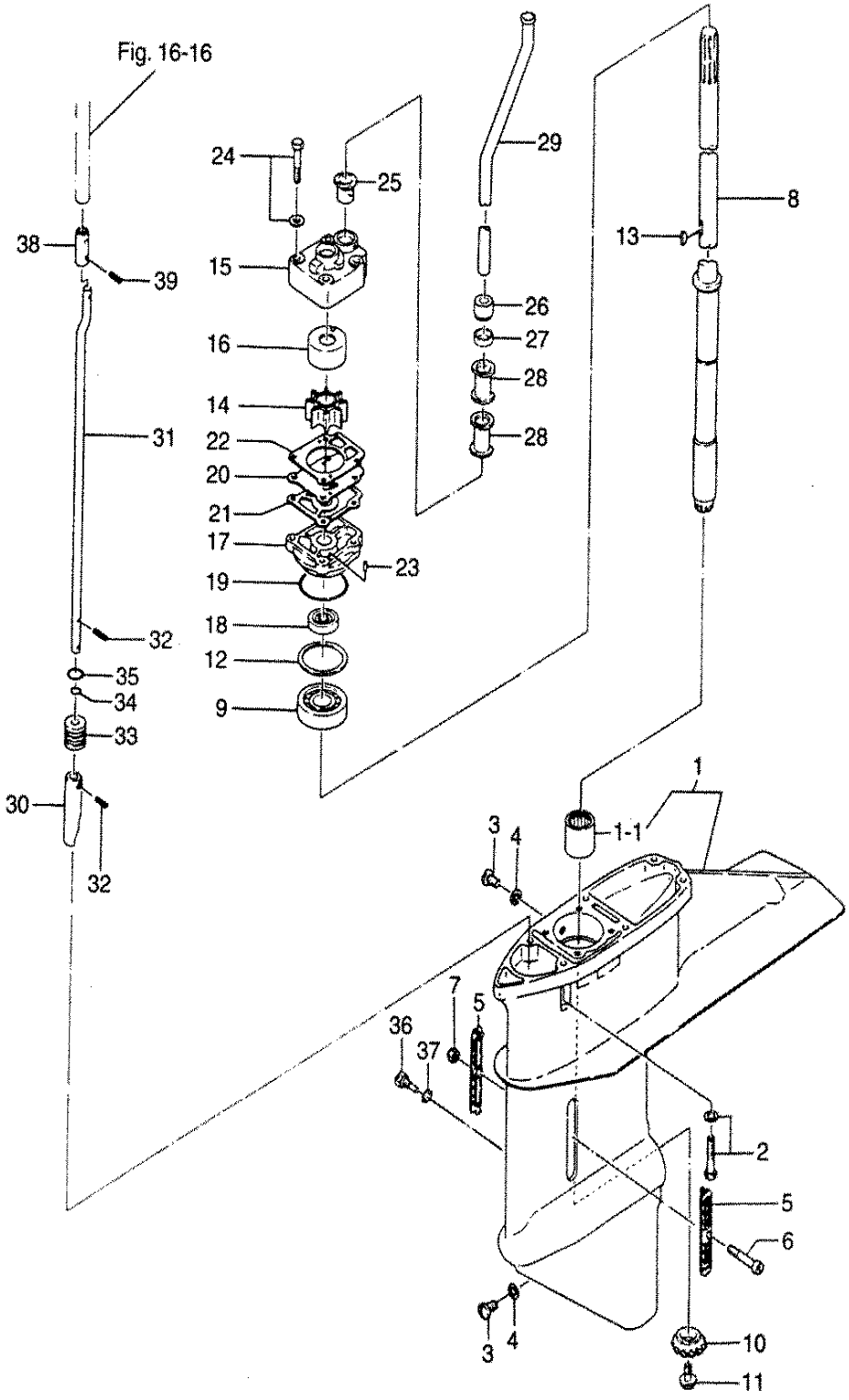
3.13 Drive Shaft Housing



Ref. No.	Part No.	Description	Q'ty	Remarks
13-1	345S61030-1	Drive Shaft Housing "L"	1	
13-2	345-61 1 11-1	Stud Bolt. Drive Shaft Housing:	1	
13-3	9301 13-0800	Nut, Drive Shaft Housing	1	
13-4	9161 13-0885	Bolt	8	
13-5	3P0-66233-0	Washer, 8.1-16-15	8	
13-6	9101 13-5620	Bolt	1	
13-7	345S611 10-0	Extension Housing: "UL"	1	
13-8	9101 13-5840	Bolt	6	
13-9	345-61012-0	Gasket. Drive Shaft Housing	1	
13-10	345S01301-0	Engine Base	1	
13-11	345-01303-0	Gasket. Engine Basement	1	
13-12	345-01215-0	Oil Seal. 17-30-8	1	
13-13	345-671 16-0		2	
13-14	910203-0640	Bolt, Engine Base	2	
13-15	941303-0600	Spring: Washer	2	
13-16	345-01 1 11-0	Knock. 6-12	4	
13-17	345-02314-1	Exhaust Pipe. "s"	1	
	361-02311-0	Exhaust Pipe. "L" & "UL"	1	
13-18	345-02313-0	Lock Plate. Exhaust Pipe	2	
13-19	9101 13-0625	Bolt	4	
13-20	910613-0808	Bolt	1	
13-21	332-60006-0	Gasket. 8.1-15-1	1	

3.14 Gear Case (Drive Shaft)

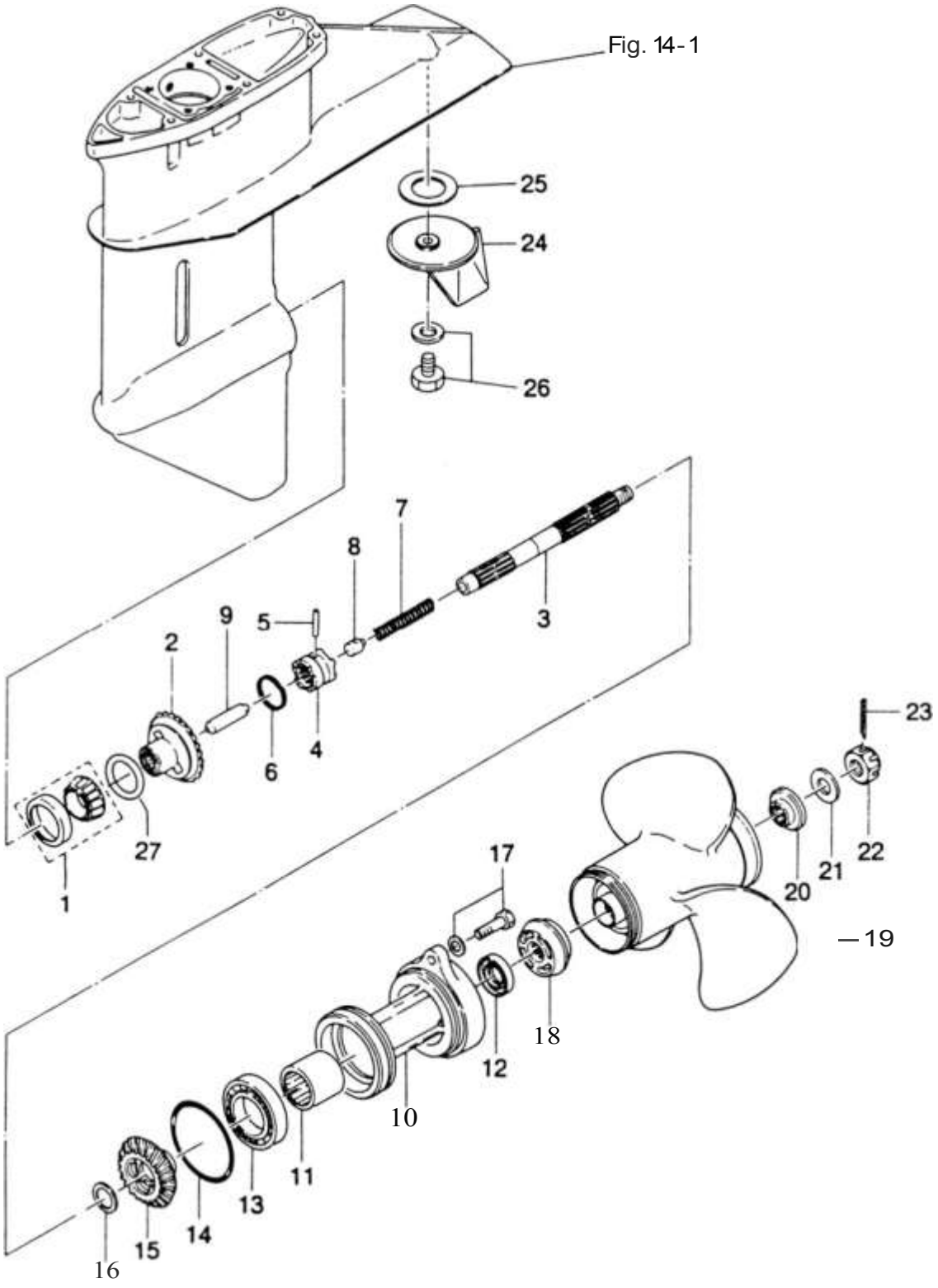
Ratio: 13 : 25
Lubricant - Genuine manufacturer gear oil or API GL5, SAE #80 - #90
Capacity - Approximately 14.2 U.S. fl oz [420 ml]
Clutch System - Dog clutch type (Forward-Neutral-Reverse



Ref. No.	Part No.	Description	Q'ty	Remarks
14-1	361 S60000-0	Gear Case	1	
	345-602 11-0	* Needle Bearing, 22-30-30	1	
14-2	910113-5840	Bolt	6	
14-3	332-60005-2	Oil Plug	2	
14-4	332-60006-0	Gasket, 8.1-15-1	2	
14-5	345-60206-0	Water Strainer	2	
14-6	921503-0440	Screw	1	
14-7	930406-0400	Nylon Nut. 4P-0.7	1	
14-8	345-64302-0	Drive Shaft "L"	1	
14-9	345-602 13-0	Bearing. 32304	1	
14-10	345-64020-1	Bevel Gear "B"	1	
14-11	345-64025-0	Bolt. Bevel Gear "B"	1	
14-12	345-64081-0	Shim, 41-51.5-0.1	AR	
	345-64082-0	Shim. 41-51.5-0.15	AR	
	345-64083-0	Shim. 41-51.5-0.3	AR	
	345-64084-0	Shim. 41-51.5-0.5	AR	
14-13	332-65022-0	Key. Pump Impeller	1	
14-14	345-65021-0	Impeller, Water Pump	1	
14-15	348-6501 6-1	Pump Case Upper	1	
14-16	348-650 1 1-0	Liner. Pump Case	1	
14-17	348-65017-1	Pump Case Lower	1	
14-18	332-601 11-0	Oil Seal. 17-33-9.5	1	
14-19	345-65015-0	0-Ring, 3.2-47	1	
14-20	348-65025-0	Guide Plate. Water Pump	1	
14-21	348-65029-1	Gasket. Pump Guide Plate	1	
14-22	348-65018-0	Gasket. Pump Case Upper	1	
14-23	334-6501 2-0	Knock. 4-10	2	
14-24	91011 3-5652	Bolt	4	
14-25	3B7-65014-0	Seal Rubber Lower, Water Pipe	1	

Ref. No.	Part No.	Description	Q'ty	Remarks
14-26	345-65206-0	Seal Rubber Upper, Water Pipe	1	
14-27	345-65205-0	Set Ring, Seal Rubber	1	
14-28	345-65204-0	Lock Rubber, Water Pipe	1	
14-29	345-65110- 1	Water Pipe "L"	1	
14-30	348-66011 -0	Clutch Cam	1	
14-31	348-66013-0	Cam Rod "L"	1	
14-32	951403-031 6	Spring Pin, 3-16	2	
14-33	345-66031- 1	Bushing, Cam Rod	1	
14-34	345-66021 -0	0-Ring, 1.9-6.8	2	
14-35	332-66032-0	0-Ring:. 2.4-15.4	1	
14-36	301-66024-1	Stopper, Cam Rod Bushing	1	
14-37	301-66025-0	Gasket. 6.2-11-1	1	
14-38	345-66241-0	Joint Shift Rod	1	
14-39	951403-0312	Spring: Pin, 3-12	2	

Section 15. GEAR CASE (PROPELLER SHAFT)



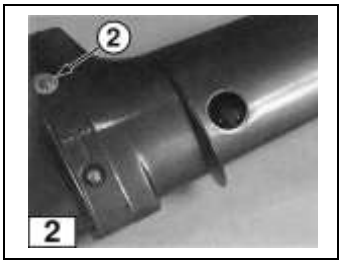
Gear Case/Propeller

Ref. No.	Part No.	Description	Q'ty	Remarks
15-1	345-60215-0	Bearing 32007	1	
15-2	348010-1	Bevel Gear "A"	1	
15-3	348-64211-0	Propeller Shaft	1	
15-4	348-64215-0	Clutch	1	
15-5	345-64217-0	Clutch pin	1	
15-6	345-64219-0	Snap, Clutch pin	1	
15-7	345-64221-0	Spring, Clutch	1	
15-8	345-64222-0	Spring Holder, Clutch	1	
15-9	345-64223-0	Push rod, Clutch	1	
15-10	345S60101-1	Housing, Propeller Shaft	1	
15-11	345-60211-0	Needle Bearing 22-30-30	1	
15-12	334-60223-0	Oil Seal 22-36-10	1	
15-13	9601-0-6007	Ball Bearing 6007	1	
15-14	345-60103-0	"O" ring 353-69.44	1	
15-15	348-64030-0	Bevel Gear "C"	1	
15-16	345-64032-0	Washer 22.1-28-3	1	
15-17	9101 13-5830	Bolt	2	
15-18	3C8-64231-0	Thrust Holder, Propeller	1	
15-19	348W64108-0	Propeller	1	Raider Standard
15-20	348-64232-0	Stopper, Propeller	1	
15-21	345-64124-0	Washer, 17-32-3	1	
15-22	345-64121-0	Nut, Propeller	1	
15-23	951503-0325	Split Pin 3-25	1	
15-24	348-60217-0	Trim Tab	1	
15-25	353-60219-0	Gasket Trim Tab	1	
15-26	9101 13-5618	Bolt	1	
15-27	353-64036-0	Shim 36-44-03	AR	
	353-64037-0	Shim 36-44-0.15	AR	
	353-64038-0	Shim 36-44-01	AR	

Raider Outboards are equipped with seal sacrificial anodes to help protect metal parts from the effects of galvanic corrosion (electrolysis). Disintegration of the anodes indicates they are performing their function. Anodes must be replaced when reduced to 2/3 its original size. Engine corrosion will increase if eroded anodes are not replaced.

The powerhead anode provides protection to the powerhead. It is located in the cylinder head. The anode should be replaced whenever work requires removal of the cylinder head or when a complete overhaul of the engine is performed.

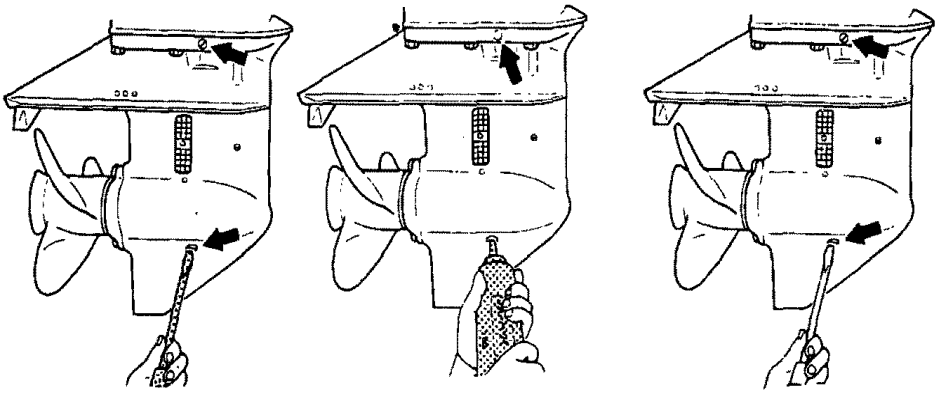
The following procedure is used to test for proper installation of the anode. Make sure the surface of the anode is clean prior to testing.



1. Calibrate an ohmmeter on the high ohms scale.
   onnect one meter lead to a ground on the powerhead and the other lead to the anode. The ohmmeter should show a low reading. If not, remove the anode; clean the surface where it was mounted. Install anode and retest.

Maintenance Procedure:

1. Drain gear oil completely By removing both upper And lower plugs.
2. Inject oil into lower oil plug hole until it Flows from upper Oil plug.
3. Replace upper plug, then lower plug after withdrawing oil injector.

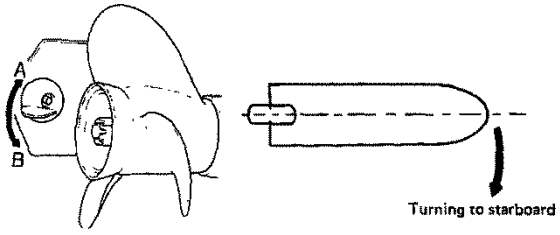


Adjusting Trim Tab

If the Rubber Inflatable boat fails to run straight, adjust the trim tab which you will find underneath the anti-cavitation plate.

If the boat has a tendency to pull to the right, move the trim tab in direction A as shown in the drawing. If it pulls to the left, move the trim tab towards B.

Note: A trim tab is a sacrificial anode that protects against corrosion. Do not paint it as this makes it ineffective.



3.16 Shifter

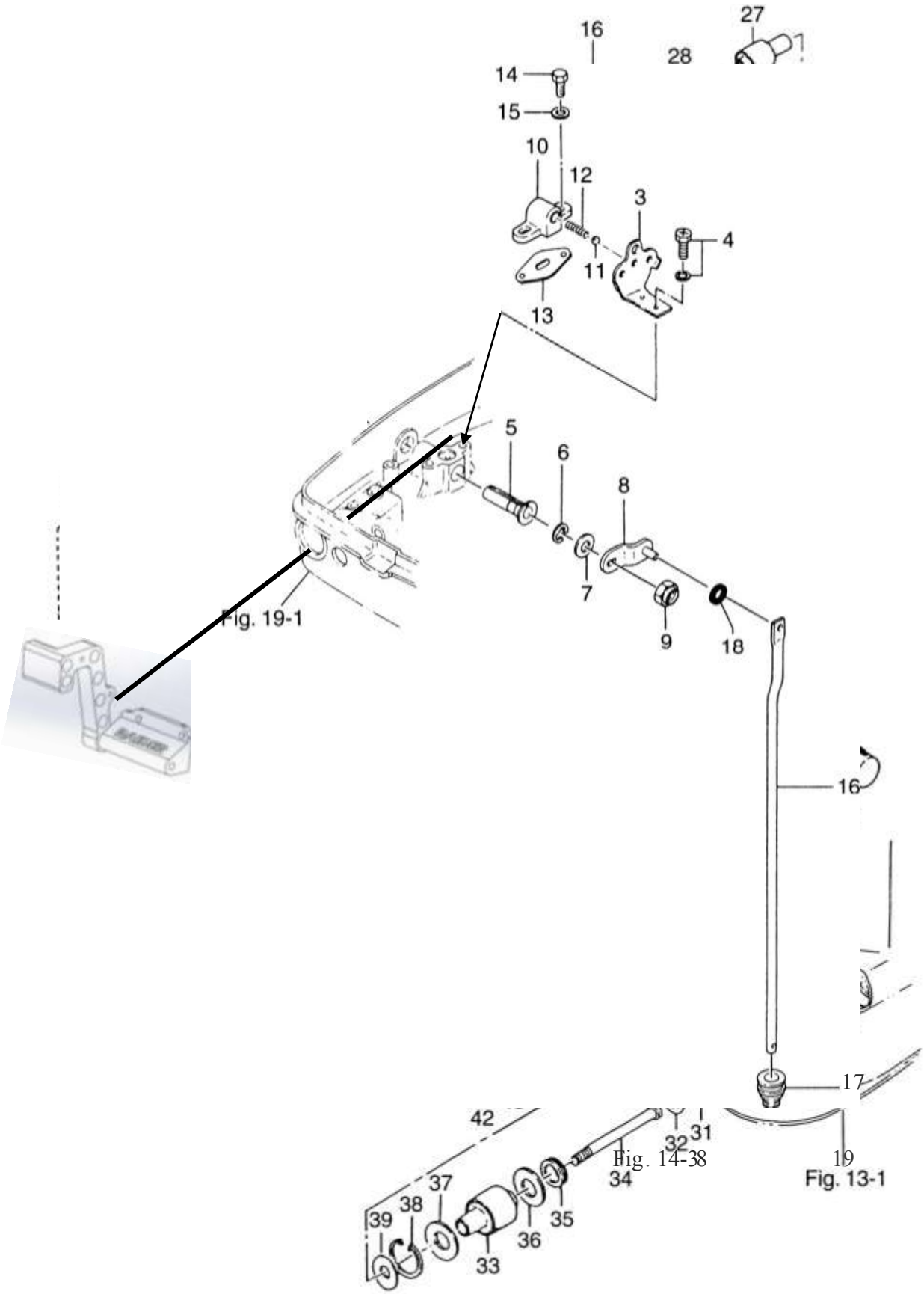

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Fig. 19-1
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Fig. 14-38
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Fig. 13-1
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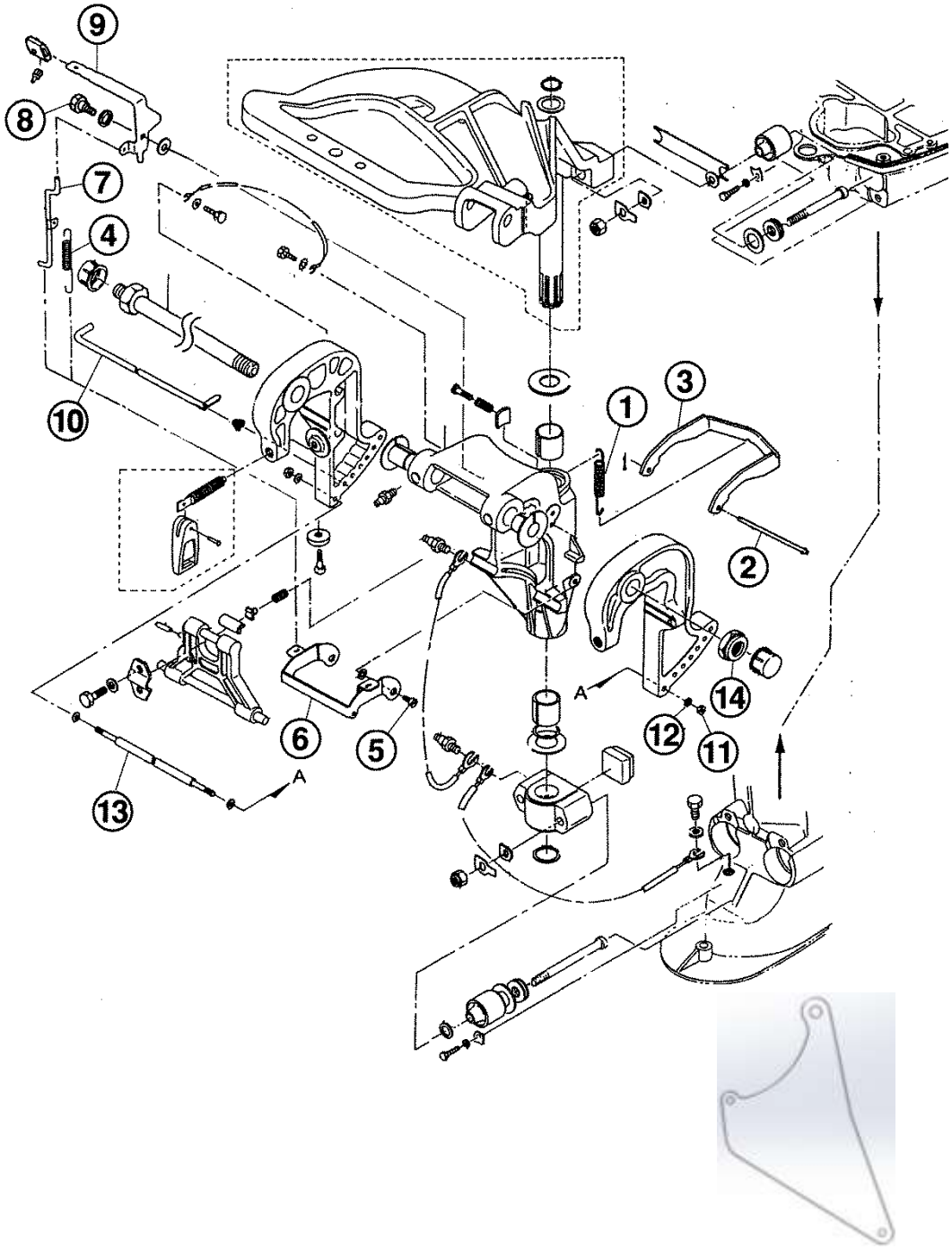
Ref. No.	Part No.	Description	Q'ty	Remarks
16-1	345S66110-2	Shift Lever	1	
16-2	345-66137-0	Oil Seal, 10-20-4	1	
16-3	345-66121-0	Stopper Plate, shift Lever	1	
16-4	910903-6512	Bolt	2	
16-5	345-67101-0	Bushing, 10-12.8-42.5	1	
16-6	945303-0800	E-Ring:, d=8	1	
16-7	332-61315-0	Washer. 10.5-18-1.5	1	
16-8	345-66225-0	Shift Rod Lever	1	
16.9	930403-1000	Nylon Nut, 1O5-1.5	1	
16-10	345-661 15-0	Holder, shift Lever Stopper	1	
16-11	965002-1605	Steel Ball, 5/16	1	
16-12	332-661 12-0	Spring, shift Lever Stopper	1	
16-13	345-661 19-0	Shim, shift Lever Stopper	AR	T=0.2
16-14	9101 14-0618	Bolt	2	
16-15	9401 13-0600	Washer	2	
16-16	348-66211 -0	Shift Rod	1	
16-17	345-66226-0	Grommet. Shift Rod	1	
16-18	332-66021 -0	O-Ring:, 2.4-5.8	1	
16-19	951403-0312	Spring: Pin. 3-12	2	

Shifter

Developed to be similar to existing military outboards to maintain familiarity for the soldier. The shifter is a mechanical front mounted, easy fit, rugged device. For movement it can be pushed into the Raider to minimize size. The shifter also has a safety device which only allows the motor to be started into neutral. The primary pull starter must be in neutral for the primary start.

For electric start caution must be taken. It is possible the motor could start in gear with the electric start. The electric start button has protection against accidental starting, however, caution should be taken to insure the shifter is in neutral.

3.17 Transom Bracket



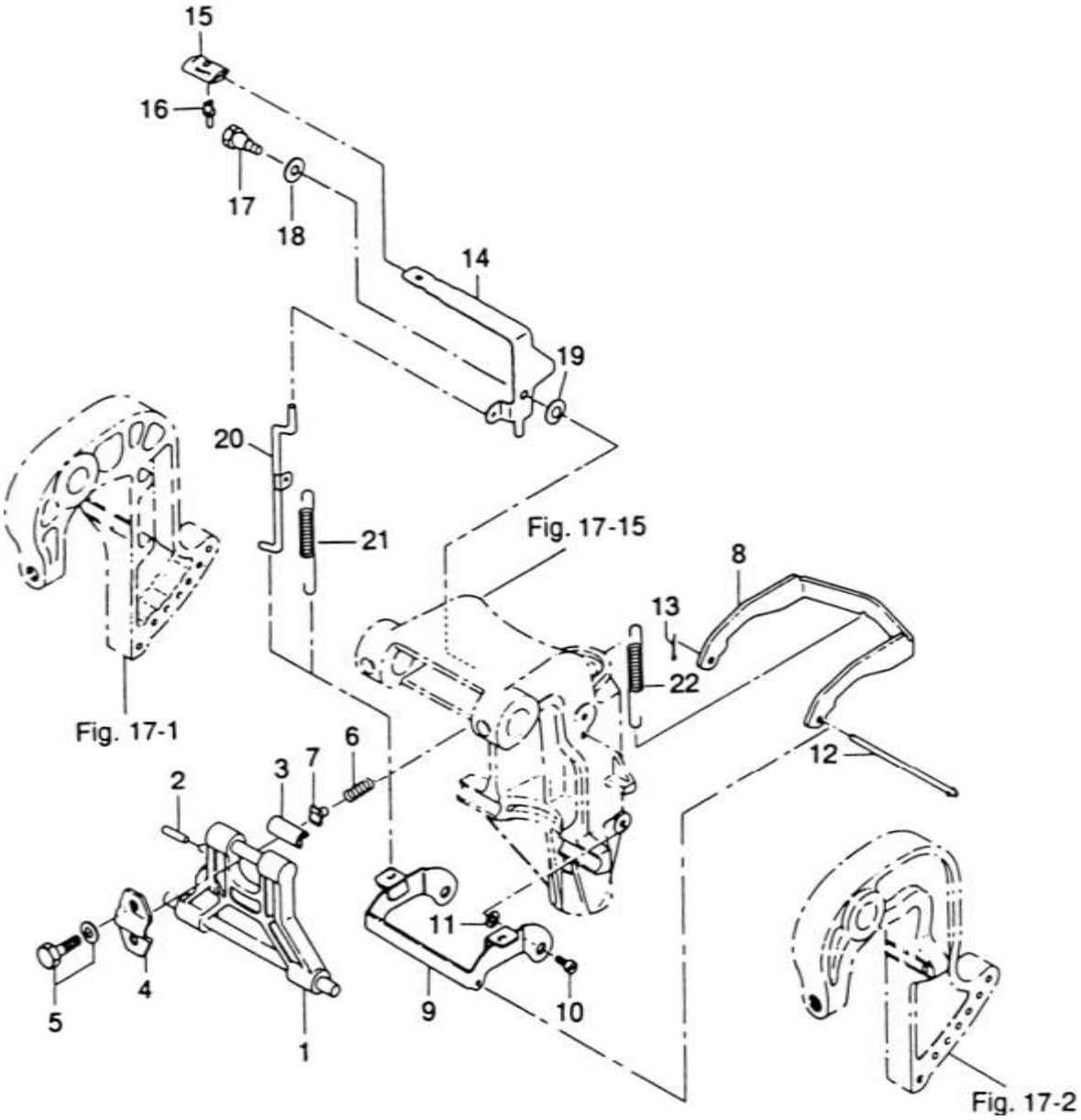
Ref. No.	Part No.	Description	Q'ty 40 R		Remarks
17-1	349S62112-0	Stern Bracket (Right)	1		Starboard
17-2	349S62113-0	Stern Bracket (Left)	1		Port
17-3	346-62191-0	Bracket Bolt	1		
17-4	346-62124-0	Nylon Nut. 7/8	1		
17-5	349-62126-0	Bushing, Bracket Bolt	2		
17-6	346-62127-0	Cap	2		
17-7	346-62117-1	Distance Piece	1		
17-8	940113-0600	Washer	2		
17-9	930113-0600	Nut	2		
17-10	940113-0600	Washer	2		
17-11	345-62121-1	Thrust Rod	1		
17-12	345-62122-2	Spring, Thrust Rod	1		
17-13	398S62100-0	Clamp Screw Ass'y	2		
17-13-1	398-62103-0	* Clamp Screw	2		
17-13-2	332S62102-1	* Handle, Clamp Screw	2		
17-13-3	3C8-62104-1	* Rivet. 3-22	2		
17-14	332-62101-0	Pad, Clamp Screw	2		
17-15	349S62310-2	Swivel Bracket	1		# 95605-
17-16	348S62010-0	Steering Shaft	1		
17-17	345-62417-0	Bushing, 26-32	2		
17-18	345-62441-0	Friction Plate. Bracket	1		
17-19	346-62421-1	Spring, Friction Plate	1		
17-20	910103-0830	Bolt	1		or 910113-0830
17-21	3A0-62423-2	Thrust Plate. 27-50-1	1		
17-22	346-62424-1	Thrust Plate, 26.5-46-1	1		
17-23	345-62415-0	0-Ring:. 3.5-25.7	1		
17-24	348S6141 1-2	Mount Bracket	1		
17-25	945103-2500	C-Ring, d=25	1		
17-26	344-67177-0	Grease Nipple	5		
17-27	345-61301-0	Rubber Mount (Upper)	2		

Ref. No.	Part No.	Description	Q'ty 40 R		Remarks
17-28	345-61313-0	Stud Bolt, Rubber Mount (Upper)	2		
17-29	345-61312-0	Retainer, Rubber Mount	2		
17-30	9101 13-5820	Bolt	2		
17-31	345-61331-0	Damper Clamp	2		
17-32	345-61332-0	Damper Collar	2		o 20- O 31.7-3mm
17-33	345-61302-0	Rubber Mount (Lower)	2		
17-34	345-61321-2	Bolt. Rubber Mount (Lower)	2		
1 7-35	345-61333-0	Damper Plate	4		
1 7-36	345-61334-0	Lock Plate Lower	2		O 21- O 40.3-4mm
17-37	348-61309 -0	Shim, 33-40.7-0.5	AR		
17-38	945003-4000	C-Ring, d=40	2		
17-39	940113- 1000	Washer	2		
17-40	930403- 1000	Nylon Nut, lOP-1.5	2		
17-41	345-61 322-2	Washer, Rubber Mount (Lower)	2		
17-42	930103- 1000	Nut	2		
17-43	346-61 323-0	Lock Plate, Rubber Mount	2		
17-44	916113-0885	Bolt	2		
17-45	940113-0800	Washer	4		
17-46	930113-0800	Nut	2		
17-47	3C8-62158-0	Ground Cable	1		L=130
17-48	910113-5612	Bolt	2		
17-49	3A3-62396-0	Ground Cable	2		L=110
17-50	910113-5610	Bolt	1		
17-51	338-60218-2	Anode	1		
17-52	910113-5620	Bolt	1		
17-53	348-62141-0	Spring "L", Tilt Assistant	1		for Transom "UL"
17-54	348-62142-0	Spring "R", Tilt Assistant	1		for Transom "UL"

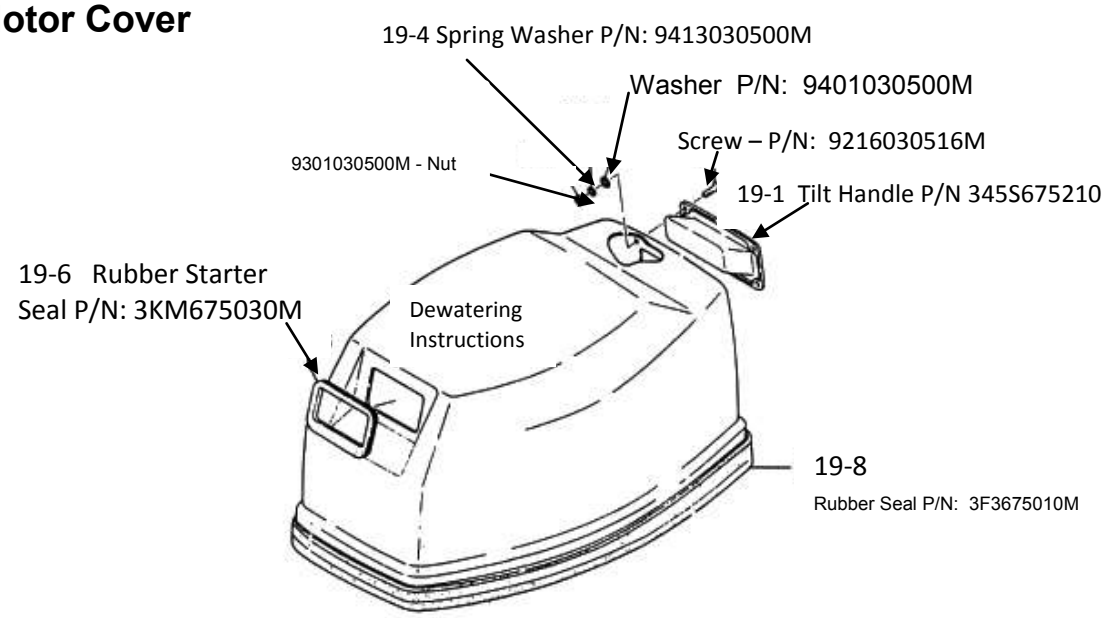
17-55	348-62143-0	Shaft. Tilt Assistant	1		
17-56	348-62107-0	Raider transom safety support	1		

Transom parts should be checked before missions for damage.

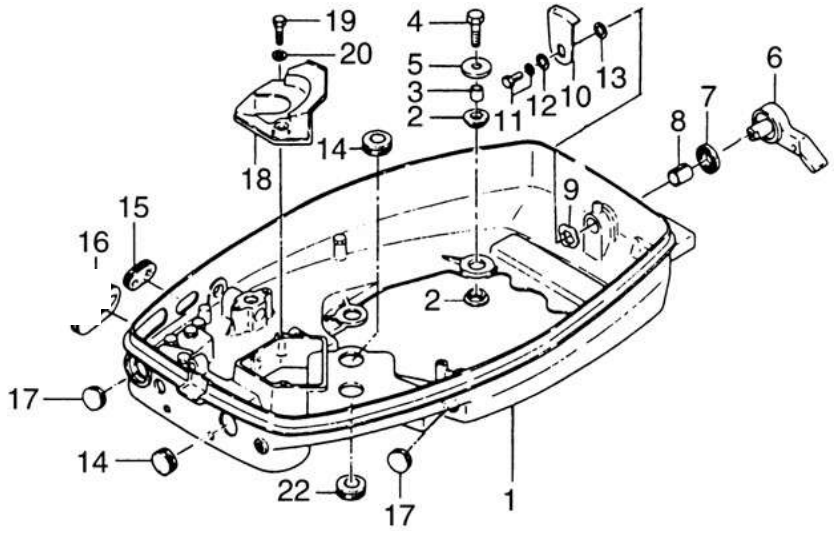
3.18 Reverse Lock (Transom Bracket)



3.19 Motor Cover



Upper Unit



Lower Unit

Ref. No.	Part No.	Description	Q'ty 40 C		Remarks
19-1	345S67100-2	Motor Cover Lower	1		# 93201 —
19-2	345-671 13-0	Rubber Mount. 12-18-2.5	8		
19-3	3C7-67114-0	Spacer, 8.4-12-17	4		
19-4	9101 13-0835	Bolt	4		
19-5	345-671 15-0	Washer, Rubber Mount	4		
19-6	338S67141-0	Hook Lever	1		
19-7	338-67147-0	Seal Ring:, Hook Lever	1		
19-8	350-67105-0	Bushing, 14-16.5-17.7	1		
19-9	941403-1400	Wave Washer, d=l4	1		
19-10	345-67142-1	Cover Hook	1		
19-11	910103-661 2	Bolt	1		
19-12	3R0-66308-0	Washer, 6-16-1.5	1		
19-13	3C8-67146-0	Washer, 14-22-1	1		
19-14	345-671 61-0	Grommet. 22-3	2		
19-15	353-671 62-0	Grommet. Battery Cable	1		
19-16	345-83732-0	Grommet. Cable	1		
19-17	345-671 17-0	Grommet. 17-2.7	2		
19-18	345-671 83-0	Baffle. Air Intake	1		
19-19	9101 14-0625	Bolt	2		
19-20	9401 13-0600	Washer	2		
19-21	361S67500-4	Motor Cover upper	1		# 96958-
19-21 -1	345S67521 -0	* Tilt Handle	1		
19-21-2	921 603-0516	* Screw	4		
19-21-3	930103-0500	* Nut	4		
19-21-4	941303-0500	* Spring Washer	4		
19-21-5	940103-0500	* Washer	4		
19-21-6	344-67503-0	* Seal Rubber. Starter	1		
19-21-7	361S87801- 1	* Decal Set	1 set		
19-21-8	3F3-67501 -0	* Seal Rubber. Motor Cover Upper	1		
19-22	369-61016-0	Grommet. 29-3	1		

3.20 Fuel Hose

FUEL HOSE AND PRIMER

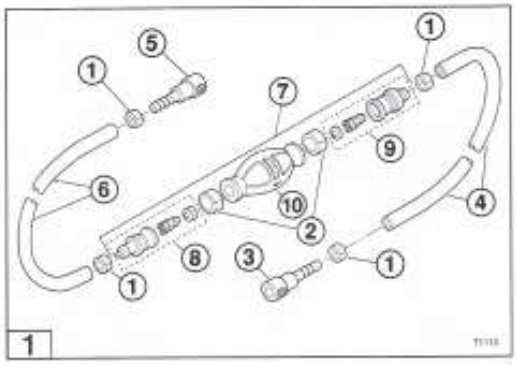
Separate fuel tanks are connected to the engines by a hose with a primer bulb. The primer bulb forces fuel into the Multi-fuel (Throttle Body) Atomizer float chamber for engine starting. Check valves on each side of the primer bulb maintain fuel flow, in one direction only, from the tank to the engine.

Disassembly

1. Remove and discard hose clamps **(1)** and primer bulb clamps **(2)** as required.
2. Remove tank connector **(3)** and hose **(4)**.
3. Remove engine connector **(5)** and hose **(6)**.
4. Remove primer bulb assembly **(7)**. Remove check valves **(8)** and **(9)** from primer bulb **(10)**.

NOTE

Note direction of fuel flow as indicated by the arrow on the primer bulb.



1. Clamp P/N
2. Clamps P/N
3. Fuel Connector – Bladder P/N 9999800MA2
4. Hose – P/N
5. Fuel Connector – Engine P/N 3B2702501M
6. Hose – P/N
7. Primer Bulb – P/N
8. Connector
9. Connector
10. Primer Bulb P/N
11. System P/N 3E070-2001M

Cleaning and Inspection

1. Clean components using soap and water.
2. Dry all components with low pressure compressed air. Make sure all parts and passages are completely dry.

in-Line Fuel Filter Replacement

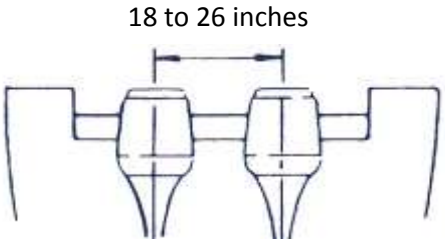
NOTE: *In-line fuel filters cannot be serviced. Replace in-line fuel filters once a year or with each tune-up. When replacing an in-line fuel filter, note direction of fuel flow as indicated by the arrow on the filter housing for proper installation.*

1. Loosen clips **(1)** on each side of the filter **(2)** and slide down the hose.
2. Separate the fuel filter from the hoses and discard.
3. Replace with new fuel filter.
4. Attach hoses and secure clips.

Fuel: Gasoline; Avgas; JP-5; JP-8; Diesel #2

Note: To comply with local EPA requirements when JP-5 or JP-8 fuels are used Raider Additive Must be added to reduce smoke and emissions.

3.21 Two Motor Configuration Dual Motor Control and Throttle (DMCT)



Raider can be used in a two engine configuration to power the conventional 15 passenger Rubber Inflatable Boat. The motors are placed on the transom where the DMCT connecting rod can be screwed into the bolt located on each side of the Raider. Simply place one on the first engine and move the second engine into position to accept the second screw.

After installation of the DMCT both engines can be controlled via a single tiller.

Then place the DMCT cable on both engines to provide throttle control of both engines by the throttle on the tiller arm.

3.22 Tool Kit

Tools:	Tool bag
	Pliers
	10 x 13 mm socket wrench
	21 mm socket wrench
	Socket wrench handle
	Slotted-head screwdriver
Spare Parts:	Starter rope
	Spark Plugs (2)
	Split Pin (Cotter Key)
Other:	Plastic emergency clip

Section 4. RAIDER ENGINE DETAILS

4.1 TUNE-UP PROCEDURE

WARNING

Deteriorated or damaged parts identified during engine tune-up must be replaced in order to maintain safe engine operation.

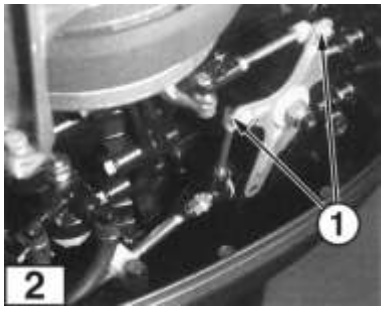
1. Inspect engine for leaks, missing, loose or damaged parts, or other visible defects.
2. Remove each spark plug and check for fouling, cracks in ceramic, and incorrect gap. Replace plugs if needed.
3. Check engine compression. Refer to Cylinder Compression –Test in Section 4.
4. Check ail wiring, connectors, and clamps for damage. Replace parts as needed.
5. Replace fuel filter and inspect Multi-fuel (Throttle Body) Atomizer. Check fuel hoses for deterioration. Replace as needed.
6. Check for proper clutch engagement and make shift linkage adjustments as need

4.2. Lubrication for Raider 40

Lubrication

Lubrication Chart

Lubrication Points and Lubricant	Lube Type		Frequency/Hrs.
	1	Figure 1. Shift Lever Mechanism	50
	2	Throttle Cable	50
	1	Figure 2. Throttle Linkage	50



4.2.1 General Equipment Required

Water Pressure Gauge - 0 - 15 psi [0 - 103 kPa / 0 - 1 kg / cm2]
Fuel Pressure Gauge - 0 - 15 psi [0 - 103 kPa / 0 - 1 kg / cm2]
Torque Wrench - 0 - 150 in-lb [0 - 17 N·m / 0- 1.7kg-m]
Torque Wrench - 0 - 750 ft-lb [0 - 1000 N·m / 0 - 100 kg-m]
Dial Gauge - minimum scale 0.0001 in [0.01 mm]
Micrometer Set or Dial Caliper - minimum scale 0.0001 in [0.01 mm]
Telescoping Gauge, Inside Micrometer Set, or Dial Caliper, minimum scale 0.0001 in [0.01 mm]
Variable Load High Rate Discharge Tester, *Electronic Specialties® Model 700 or equivalent*
Analog Multimeter, *Electronic Specialties® Model M-530 or equivalent*
Digital Multimeter, *Electronic Specialties® Model KD 3200 or equivalent*
Digital Pulse Tachometer, 10 - 6000 RPM, *Electronic Specialties® Model 321 or equivalent*
Ammeter, 0 - 100 A
Gearcase Pressure Tester, *Stevens® S-34 or equivalent*
Gearcase Vacuum Tester, *Stevens ® V-34 or equivalent*
Engine Compression Gauge, 0 - 300 psi [0 - 2000 kPa / 0 - 20 kg/cm2]
Spark Gap Tester, *Stevens® S-13C, S-48, or equivalent*
Flexible Fuel Tubing, 1/4 in I.D. x 5 in [6 mm I.D. x 127 mm]
Flexible Fuel Tubing, 3/8 in I.D. x 5 in [9.5 mm I.D. x 127 mm]
Industrial Thermometer, minimum 300°F [150°C]
Heat-Resistant Container, *Pyrex®*
Bearing Puller
Seal Pullers
Seal Installers
Heat Gun
Hydrometer

4.2.2 Consumables Required

Thread locker, *Loctite® 242*
Thread locker, *Loctite® 243*
Gasket Dressing, *Permatex® Hylomar® Aerosol High-Temp Gasket Dressing*
Gasket Sealant, *Permatex® High Tack Gasket Sealant*
Anaerobic Gasket Maker, *Loctite® 518*
Silicone Sealant, *Permatex® Hi-Temp RTV Silicone Gasket*
Super Bond Adhesive, *Permatex® Super Glue Gel*
Cleaning Pads, *Scotch-Brite® Abrasive Pads*
Low Temperature Lithium Grease
Genuine Grease or Equivalent Friction Surface Marine Grease
Power Trim/Tilt Fluid, *Nisseki® power torque fluid or GM approved automatic transmission fluid*
Isopropyl Alcohol
Cleaning Solvent
Gasket Remover
Gear Lubricant, *Genuine gear oil or API grade GL5, SAE #80 - #90*
Engine Lubricant, *Genuine engine oil or NMMA certified TC-W3 oil*
Automotive Crankcase Oil, flashpoint above 300°F [150°C]
Battery Spray Protector, *Permatex® Battery Protector & Sealer*
Electrical Shrink Tubing, various diameters

4.2.3 Operational Information.

Power - **Raider** 40 HP [29.4 kW] **Throttle Setting**

Full Throttle RPM Range - Raider 40 - 5200 – 5800 - Full Open: Match Mark –BTDC 25 deg.
Full Closed (in gear) – ATDC 4 deg.
Target RPM – 850 for full closed

Fuel Consumption at Full Throttle - 3.49 g/hr

Test Propeller - 348-64111-0

Idle RPM	In GEAR	NEUTRAL
Raider 40	850	1000

Adjustment Procedure:

1. Rotate the throttle grip to the FAST side until Throttle Stops
2. Adjust ignition timing link so that the timing full open match mark is aligned with the fitting line (Crankcase Mating Surfaces).
3. Adjust the stopper bolt so that the advancer arm touches the full open stopper bolt when throttle is fully opened.
4. Turn the throttle grip toward SLOW side.
5. Adjust the stopper bolt (for full close adjustment) so that it hits the stopper bolt at the position where the magneto coil plate timing mark (fully closed side) meets the ignition timing inspection line (crank case mating surface). **NOTE: After making adjustments, check that the advancer arm moves firmly and smoothly. Tighten adjusting nut after completing adjustments.**
6. At the neutral and reverse position, the starter lock arm and neutral stop arm controls the engine speed.
7.

8. Adjust the engine ignition timing and Multi-fuel (Throttle Body) Atomizer. See Synchronization and Linkage Adjustments, this section.
9. Remove propeller and inspect propeller shaft oil seal for leakage. Inspect propeller, thrust washer, and other propeller shaft hardware for damage. Replace as needed.
10. Drain and refill the Gearcase with specified gear oil. See Engine Specifications in this section.
11. Lubricate all engine components as specified in the Lubrication Chart, this section.
12. Verify that all bolts and screws are torque to specification by applying a torque wrench to each.
13. Run engine in test tank with proper test propeller and check for the following:

- Abnormal engine noise.
- Improper clutch operation.
- Little or no cooling water discharge from check port and idle port.
- Fuel leaks from mating surfaces of crankcase.
- Fuel leaks from mounting surface of intake manifold.
- Cooling water leaks from mating surfaces of cylinder head.
- Cooling water leaks from engine mounting surfaces.
- Cooling water leaks from exhaust cover mounting surfaces.
- Improper idle RPM and stability.
- Defective stop switch.

UNIT CONVERSIONS

Prefix	Symbol	Power
mega	M	x 1,000,000
kilo	k	x 1,000
centi	c	x 0.01
milli	m	x 0.001
micro	µ	x 0.000001

Units of Length

mile	x 1.6090 = km
ft	x 0.3050 = m
in	x 2.5400 = cm
in	x 25.4000 = mm
km	x 0.6210 = mile
m	x 3.2810 = ft
cm	x 0.3940 = in
mm	x 0.0394 = in

Units of Mass

lb	x 0.45360 = kg
oz	x 28.35000 = g
kg	x 2.20500 = lb
g	x 0.03527 = oz

Units of Torque

ft-lb	x 1.3558 = N-m
ft-	x 0.1383 = kg-m
in-lb	x 0.1130 = N-m
-lb	x 0.0115 = kg-m
-m	x 7.2330 = ft-lb
kg-m	x 86.8000 = in-lb
kg-m	x 9.8070 = N-m
N-m	x 0.7376 = ft-lb
N-m	x 8.8510 = in-lb
N-m	x 0.1020 = kg-m

Units of Power

HP	x 1.01400 = PS
HP	x 745.70000 = W
HP	x 550.00000 = ft-lbf/s
PS	x 0.98630 = HP
PS	x 735.50000 = W
PS	x 542.50000 = ft-lbf/s
W	x 0.00134 = HP
W	x 0.00136 = PS
W	x 0.73760 = ft-lbf/s
kW	x 1.34100 = HP
kW	x 1.36000 = PS
kW	x 737.56000 = ft-lbf/s
ft-lbf/s	x 0.00181 = HP
ft-lbf/s	x 0.00184 = PS
ft-lbf/s	x 1.35600 = W

Units of Volume

gal (U.S.)	x 3.78540 = L
qt (U.S.)	x 0.94635 = L
cu-in	x 0.01 639 = L
cu-in	x 16.38700 = mL
fl oz (U.S.)	x 0.02957 = L
fl oz (U.S.)	x 29.57000 = mL
cm_3	x 1.00000 = mL
cm_3	x 0.03382 = fl oz (U.S.)

Units of Force

Lbf	x 4.4480 = N
lbf	x 0.4536 = kgf
N	x 0.2248 = lbf
N	x 0.1020 = kgf
kgf	x 2.2050 = lbf
kgf	x 9.8070 = N

Units of Temperature

°F	=	(1.8 • °C) + 32
°C	=	0.556 • (°F - 32)

Units of Pressure

Psi	x 0.0689 = bar
psi	x 6.8950 = kPa
psi	x 0.0703 = kg/cm_2
bar	x 14.5030 = psi
bar	x 100.0000 = kPa
bar	x 29.5300 = in Hg (60°F)
kPa	x 0.1450 = psi
kPa	x 0.0100 = bar
kPa	x 0.0102 = kg/cm_2
kg/cm_2	x 14.2200 = psi
kg/cm_2	x 0.9807 = bar
kg/cm_2	x 98.0700 = kPa
in Hg (60°F)	x 0.0333 = bar
in Hg (60°F)	x 3.3770 = kPa
in Hg (60°F)	x 0.0344 = kg/cm_2

Standard Torque Values

Size	Torque			
	in-lb	ft-lb	N-m	kg-m
M4	10 - 17	0.8 - 1.4	1 - 2	0.1 - 0.2
M5	26 - 35	2.2 - 2.9	3 - 4	0.3 - 0.4
M6	44 - 52	3.6 - 4.3	5 - 6	0.5 - 0.6
M8	97 - 133	8 - 11	11 - 15	1.1 - 1.5
M10	204 - 274	17 - 22	23 - 31	2.3 - 3.1

These torque values apply only when a special torque specification is not listed in the **Special Torque Values** chart at the beginning of each section.

Section 4. ENGINE DETAILS

SYNCHRONIZATION AND LINKAGE ADJUSTMENTS

To ensure consistent engine idling and smooth operation throughout the full RPM range, it is important that each procedure be performed exactly as written and in the following sequence:

1. ignition Timing Adjustment
2. Multi-fuel (Throttle Body) Atomizer Synchronization

WARNING

Before beginning procedures, disable the ignition system to prevent accidental engine startup.

NOTE. *The seam at the mating surfaces of the crankcase halves is the alignment point for ail ignition timing degree measurements.*

TROUBLESHOOTING

The troubleshooting chart lists common engine symptoms related to problems with the fuel system. lt also indicates specific malfunctions in the fuel system which may be causing the problem so it can be isolated more effectively. Before beginning major troubleshooting operations on the fuel system, perform the following operations:

• Disconnect fuel tank hose from the engine. Connect a known good tank and hose and determine if the problem persists.
• Remove and clean the engine fuel filter assembly and replace the filter element.
• Replace filter element in the fuel tank pickup tube.

TROUBLESHOOTING - Powerhead

The troubleshooting chart list common engine symptoms related to problems with the powerhead. It also indicates specific component failures which may be causing the problem so it can be isolated more effectively for the Raider 40.

Symptom / Check	Hard to start or will not start	Low cylinder compression	Runs rough or erratically	Idles poorly	No acceleration or fails to get full RPM	RPM decreases	Engine overheats	Runs noisy or has vibration
Poor crankcase Seal	o							
Ignition timing or Throttle linkage Out of adjustment	o		o		o			
Water entering Crankcase	o			o		o		
Defective Thermostat					o		o	
Fouled, defect. Or incorrect Spark plug; Wrong gap Setting	o		o	o		o	o	
Worn or Defective Cylinder, Piston, rings Or warped Head	o	o			o			o
Blown cylinder Head or Engine base Gasket	o	o	o	o	o	o		o
Worn connecting Rod or crankshaft Bearings, internal Wear limits out Of specification	o		o					o
Defective ignition Components	o		o		o			
Carbon Accumulation in	o				o			

Engine does not start.	Engine starts but stops soon.	Poor idling	Poor accele-ration	Engine revolu-tions abnor-mally high	Engine revolu-tions abnor-mally low	Slow speed	Over-heating of engine	Possible cause
•	•							Empty fuel tank
•	•	•	•		•	•	•	Incorrect connection of fuel system
•	•	•	•		•	•	•	Air entering fuel line
•	•	•	•		•	•	•	Distorted fuel pipe
•	•	•	•		•	•	•	Closed fuel cock of fuel tank and air vent of fuel cap
•	•	•	•		•	•	•	Clogged fuel filter, fuel pump or carburator
		•	•		•	•	•	Improper engine oil
•		•	•			•	•	Improper gasoline
•	•	•	•		•	•		Excessive oil in mixture
							•	Shortage of oil in mixture
•			•					Excessive supply of fuel
•	•	•	•		•	•	•	Poor carburetor adjustment
•	•	•	•			•	•	Recirculation pipe broken
•	•	•	•		•	•	•	Incorrect spark plug used
•	•	•	•		•	•		Dirt or bridge on spark plug
•	•	•	•		•	•		No or weak spark
						•	•	(Insufficient cooling water flow) faulty pump, clogged pump
		•				•	•	Faulty thermostat
			•	•		•	•	Cavitation
			•	•	•	•	•	Unsuitable propeller used
		•	•	•	•	•	•	Damaged and bent propeller
			•	•		•	•	Improper thrust rod position
			•	•	•	•	•	Unbalanced load position
			•	•	•	•	•	Transom too high or low
•								Short-circuit of engine stop switch
•		•	•		•	•		Incorrect adjustment of throttle link mechanism
•		•	•		•	•		Incorrect adjustment of ignition timing
•								Loose battery terminal connection, corrosion

Section 5. RECOMMENDED SPARE PARTS KIT

The Raider 40 horsepower multi-fuel/submersible outboard engine has been reviewed and all the possible spare parts for sixteen units that can be supported by the users are identified in this section. Where the Raider is used dictates more of some parts than others – like propellers. This list will be updated as required.

Engine	
Spark Plugs	**32**
Thermostat	**3**
Thermostat gasket	**3**
Fuel Pump	**1**
Electric Starter	**3**
Push button starter switch	**3**
Kill switch assembly	**3**
Fuel Induction Unit	**1**
-Rebuild Kits FIU	**16**
-Throttle Cables	**4**
Recoil manual pull Starter	**1**
Water pump impellers	**16**
Props	**2**
Batteries Sealed	**4**
Maintainers for batteries (2)	**6**
Primer Cable	**2**
Rubber Impellers	**16**
Emergency tool kit	**1**
-Spark Plugs (2)	
-Pliers -	
-Screwdriver	
-Plug Socket	
-Pull Starter socket	
-Pull Rope	
-Spare emergency stop	
-Cotter Key	
-Emergency Kit plastic bag	
- "L" Socket tool	

JA-8 Additive	**Ground delivered**
Oil Additive	**Ground delivered**

If any discrepancies are found the manual can be updated by called (321) 403-3585 – Raider Outboards.

Updates will be automatically done on line. www.raideroutboards.com Manuals will be listed. Password is required for entry.

Raider Outboards
707 Main Street
Titusville, FL 32796

(321) 403-3585

Other Manuals Available

Owner/User Manual R40 ES-001-15-1
Service Manual R40 ES-001-15-3