

JET SKI

KAWASAKI MOTORS CORP., U.S.A.
9950 Jeronimo Road
Irvine, CA 92718-2016

JS300 AND JS300SX

NOTE: Metric fasteners are used throughout vehicle.

General

Engine Make	Own
Engine Type	Two-Stroke; Water-Cooled
Number of Cylinders	1
Bore	76 mm (2.99 in.)
Stroke	64.9 mm (2.55 in.)
Displacement	294 cc (17.94 cu. in.)
Compression Ratio	7.2:1
Engine Lubrication	Oil Injection
Engine Oil Recommendation	Kawasaki Jet Ski or Two-Stroke; BIA Certified TC-W

Tune-Up

Engine Idle Speed	1700-1900 rpm
Spark Plug:	
NGK	B7ES
Champion	N4G
Electrode Gap	0.7-0.8 mm (0.027-0.031 in.)
Ignition:	
Type	CDI
Timing	18° BTDC @ 6000 rpm
Carburetor:	
Make	Mikuni
Model	BN34 Diaphragm
Bore Size	28 mm (1.1 in.)

Sizes—Clearances

Cylinder Bore	76.050-76.065 mm (2.9940-2.9947 in.)
Service Limit	76.10 mm (2.996 in.)
Piston Diameter Measured 18 mm (0.71 in.) from Skirt Bottom and 90° to Pin Bore	75.961-75.976 mm (2.990-2.991 in.)
Service Limit	75.81 mm (2.985 in.)
Piston-to-Cylinder Wall Clearance	0.074-0.084 mm (0.0030-0.0033 in.)
Piston Ring End Gap	0.2-0.4 mm (0.008-0.016 in.)
Service Limit	0.7 mm (0.027 in.)
Maximum Cylinder Head Warp	0.025 mm (0.001 in.)
Connecting Rod Radial Clearance	0.037-0.049 mm (0.0015-0.0019 in.)

Sizes—Clearances (Cont.)

Service Limit	0.10 mm (0.004 in.)
Connecting Rod Side Clearance	0.45-0.55 mm (0.018-0.022 in.)
Service Limit	0.8 mm (0.03 in.)
Maximum Connecting Rod Bend or Twist Measured Over a 100 mm (3.9 in.) Length	0.2 mm (0.008 in.)
Maximum Crankshaft Runout at Main Bearing Journal	0.08 mm (0.003 in.)

Capacities

Fuel Tank:	
Model JS300	13 L (3.5 gal.)
Model JS300SX	19 L (5 gal.)
Engine Oil Tank:	
Model JS300	1.7 L (0.45 gal.)
Model JS300SX	2.2 L (0.58 gal.)
Starter Gear Housing	0.2 L (0.42 pt.)

Tightening Torques

Carburetor Mounting Nuts	19 N·m (14 ft.-lbs.)
Cylinder Head Nuts	25 N·m (18 ft.-lbs.)
Cylinder Base Nuts	34 N·m (25 ft.-lbs.)
Engine Mounting Cap Screws	37 N·m (27 ft.-lbs.)
Engine Drive Flange	98 N·m (72 ft.-lbs.)
Drive Shaft Drive Flange	98 N·m (72 ft.-lbs.)
Intermediate Housing Mounting Cap Screws	16 N·m (12 ft.-lbs.)
Intermediate Housing Front Cover Cap Screws	16 N·m (12 ft.-lbs.)
Jet Pump Mounting Cap Screws	22 N·m (16 ft.-lbs.)
Flywheel Screw	39 N·m (29 ft.-lbs.)
Spark Plug	27 N·m (20 ft.-lbs.)

Tightening Torques (Cont.)

Standard Fasteners:

5 mm.....	3.4-4.9 N·m (30-43 in.-lbs.)
6 mm.....	5.9-7.8 N·m (52-69 in.-lbs.)
8 mm.....	14-19 N·m (10-14 ft.-lbs.)
10 mm.....	25-39 N·m (18-29 ft.-lbs.)

12 mm.....	44-61 N·m (32-45 ft.-lbs.)
14 mm.....	73-98 N·m (54-72 ft.-lbs.)
16 mm.....	115-155 N·m (85-114 ft.-lbs.)
18 mm.....	165-225 N·m (121-165 ft.-lbs.)
20 mm.....	225-325 N·m (165-239 ft.-lbs.)

LUBRICATION

All Models

The engine is lubricated by oil mixed with the fuel. All models are equipped with oil injection. The manufacturer recommends using Kawasaki Jet Ski Oil or a BIA certified two-stroke TC-W engine oil. During break-in (first five hours or three tankfuls) of a new or rebuilt engine, mix fuel with oil in fuel tank at a ratio of 50:1. Switch to straight fuel in fuel tank at the completion of the break-in period. Manufacturer recommends regular or no-lead automotive gasoline having a minimum octane rating of 87. Gasoline and oil should be thoroughly mixed in fuel tank when used during break-in period.

Grease intermediate housing through grease fitting (F—Fig. JS1-1) with Shell MP or Alvania EP1 grease every 25 hours or more frequent if needed. Inject Shell MP or Alvania EP1 grease into grease fitting (G—Fig. JS1-2) at rear of jet pump housing every 25 hours or more frequent if needed to grease rear bushing.

Starter gear housing (H—Fig. JS1-3) should contain 0.2 L (0.42 pt.) of a good quality SAE 10W-40, 10W-50, 20W-40 or 20W-50 automotive oil with an API classification of SE or SF. Starter gear housing oil should be renewed every 100 hours or more frequent if needed.

Remove plug at base of housing and fill cap (C) to drain oil. Install drain plug and pour 0.2 L (0.42 pt.) of recommended oil into fill cap (C) opening to fill starter gear housing.

Lubricate all cables, linkage and pivots with WD-40 or Bel-Ray 6 in 1 every 25 hours or more frequent if needed.

FUEL SYSTEM

All Models

CARBURETOR. Refer to Fig. JS1-5 for an exploded view of Mikuni type BN34 diaphragm carburetor used on all models. (On JS300 models, choke plate (21—Fig. JS1-5) is actuated by choke knob (K—Fig. JS1-6) on control panel via a cable and linkage. On JS300SX models, choke plate (21—Fig. JS1-5) is actuated by choke knob (K—Fig. JS1-7) on left side of riding platform via a cable and linkage.

Initial setting of low speed mixture needle (22—Fig. JS1-5) is 5/8 turn out from a lightly seated position on JS300 models and 1-9/16 turns out from a lightly seated position on JS300SX models. Initial setting of high speed mixture needle (29) is 1 turn out from a lightly seated position on JS300 models and 1-1/4 turns out from a lightly seated position on JS300SX models. Final carburetor adjustments must be made with

engine at normal operating temperature and running. Clockwise rotation of either needle leans the mixture. Adjust low speed mixture needle (22) until smooth acceleration from the idle position is noted. After adjusting low speed mixture needle, adjust idle speed screw (37—Fig. JS1-8) until engine idle speed is approximately 1700-1900 rpm with throttle lever completely released. To adjust high speed fuel:air mixture, the engine spark plug must be removed and insulator tip color noted.

NOTE: Make sure that fuel tank contains straight fuel.

Make sure cooling system will receive an adequate supply of water, then operate and sustain engine at wide-open throttle for a suitable test period. Stop the engine with throttle in wide-open position. Remove spark plug and note insulator tip color. Normal insulator tip color is brown to light tan. If insulator tip appears to be light tan to white in color, then mixture is too lean and high speed mixture needle (29—Fig. JS1-5) should be rotated outward (counterclockwise) 1/4 turn to richen mixture. If insulator tip appears to be dark brown to black in color, then mixture is too rich and high speed mixture needle (29) should be rotated inward (clockwise) 1/4 turn to lean mixture. Clean, regap and reinstall spark



Fig. JS1-1—Intermediate housing is greased through grease fitting (F).

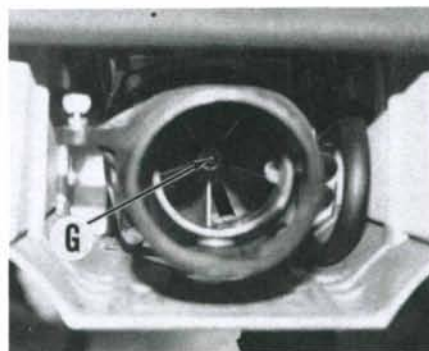


Fig. JS1-2—Jet pump drive shaft rear bushing is greased through grease fitting (G) at rear of jet pump housing.

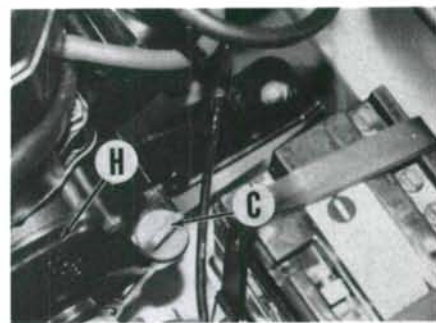


Fig. JS1-3—Refer to text for starter gear housing (H) recommended lubricant and lubricant quantity. Add lubricant through fill cap (C) opening.

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plug and continue test procedure until spark plug insulator tip is normal color.

The fuel pump and regulating diaphragm (12) can be removed after removing the six through-bolts. Note

that alignment tabs on components (3 through 12) are provided to assist in proper alignment during reassembly.

Do not remove choke plate, throttle plate or shafts unless necessary. The choke and throttle plate retaining screws are either staked or retained with a thread locking solution to prevent loosening. If screws are removed, properly stake or apply a suitable thread locking solution on threads prior to assembly. Inlet needle valve lever (17) must be flush with floor of housing

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recess when needle valve is seated. Refer to Fig. JS1-9. If lever must be adjusted, push down on lever immediately above spring to collapse the spring, then bend the end which contacts needle valve.

REED VALVES. A vee type reed valve assembly is located between the intake manifold and crankcase. Remove intake manifold for access to reed valve assembly.

Renew reeds if petals are broken, cracked, warped or bent. Do not at-

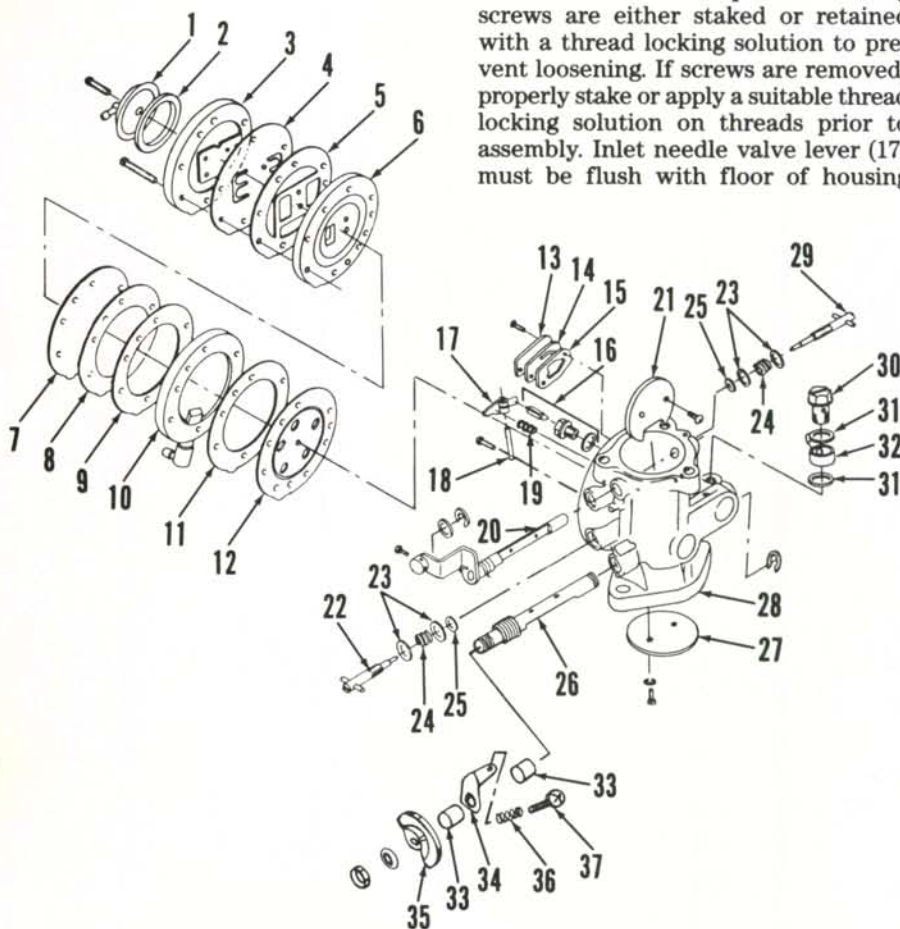


Fig. JS1-5—Exploded view of Mikuni type BN34 diaphragm carburetor used on all models.

- | | | | |
|--------------------------|--------------------------|------------------------------|-------------------------------|
| 1. Fuel inlet cover | 11. Gasket | 20. Choke shaft | 29. High speed mixture needle |
| 2. Gasket | 12. Regulating diaphragm | 21. Choke plate | 30. Banjo bolt |
| 3. Inlet body | 13. Plate | 22. Low speed mixture needle | 31. Gaskets |
| 4. Check valve diaphragm | 14. Diaphragm | 23. Washers | 32. Return line fitting |
| 5. Gasket | 15. Gasket | 24. Springs | 33. Spacers |
| 6. Pump body | 16. Inlet valve assy. | 25. "O" rings | 34. Bracket |
| 7. Diaphragm | 17. Valve lever | 26. Throttle shaft | 35. Cable lever |
| 8. Gasket | 18. Pivot shaft | 27. Throttle plate | 36. Spring |
| 9. Gasket | 19. Spring | 28. Body | 37. Idle screw |
| 10. Diaphragm cover | | | |

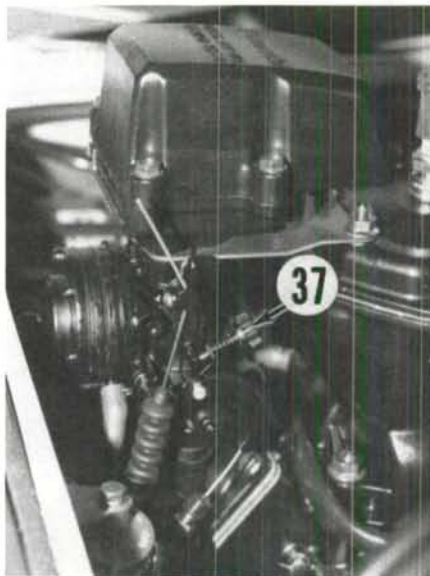


Fig. JS1-8—View identifies location of idle speed screw (37).

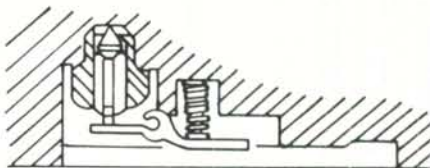


Fig. JS1-9—Inlet needle valve lever should be flush with floor of housing recess as shown.

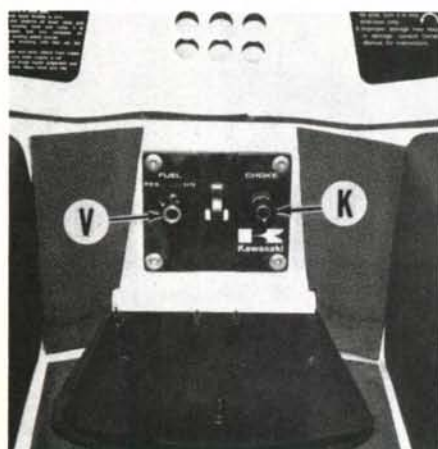


Fig. JS1-6—View identifies location of choke knob (K) and fuel selector valve (V) on JS300 models.



Fig. JS1-7—On JS300SX models, choke knob (K) is located on left side of riding platform and is rotated to control choke plate position.

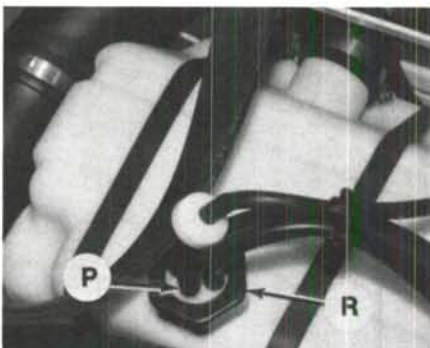


Fig. JS1-10—Ring nut (R) secures pickup assembly (P) in fuel tank.

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tempt to bend or straighten reeds. Reed seating surface on reed blocks should be smooth and flat. Maximum allowable reed petal stand open is 0.2 mm (0.008 in.).

FUEL PUMP. The fuel pump is an integral part of the carburetor. The fuel pump assembly can be overhauled without overhauling the complete carburetor.

With reference to Fig. JS1-5, disassemble the fuel pump assembly. Inspect all components for excessive wear or any other damage and renew if needed. Clean components as needed with a suitable cleaning solution. Blow dry with clean compressed air. If compressed air is not available, use only lint-free cloths to wipe dry. Make sure all passages are clear of any obstructions.

With reference to Fig. JS1-5, reassemble the fuel pump assembly with new gaskets. Securely tighten the six through-bolts.

FUEL TANK AND FUEL FILTER. A fuel strainer is attached on the bottom of the "ON" fuel tank pickup line and on the bottom of the "RES" fuel tank pickup line. The pickup lines are contained within fuel tank pickup assembly (P—Fig. JS1-10). On JS300 models, an inline sediment bowl (I—Fig. JS1-11) is located between fuel selector valve (V—Fig. JS1-6) and carburetor fuel pump intake. After every 25 hours of

operation or more frequent if needed, unscrew ring nut (N—Fig. JS1-11) and withdraw cup (C) with sealing ring from base. Clean cup with a suitable cleaning solution. Renew sealing ring and securely tighten nut (N) during installation of cup (C). After every 25 hours of operation or more frequent if needed, fuel tank strainers (S—Fig. JS1-12) should be cleaned. Unscrew ring nut (R—Fig. JS1-10) and withdraw pickup assembly (P). Clean strainers (S—Fig. JS1-12) with a suitable cleaning solution and a soft-bristled brush if needed. Renew sealing ring and securely tighten nut (R—Fig. JS1-10) during installation of pickup assembly (P).

THROTTLE LEVER FREE PLAY. Throttle lever should have a small amount of free play prior to activating carburetor throttle shaft when throttle lever is in released position. To adjust, rotate locknuts (N—Fig. JS1-13) up or down cable housing end as needed until a small amount of free play is noted. Tighten locknuts (N) to retain adjustment.

FLAME ARRESTOR. A flame arrestor is located beneath cover (C—Fig. JS1-14). Every 25 hours or more frequent if needed, remove two cap screws (S) on each side of cover and withdraw cover and flame arrestor. Inspect flame arrestor for contamination and use clean compressed air to blow clean.

PERSONAL WATER VEHICLE

Renew flame arrestor if damage is noted. Install flame arrestor with curved side facing down. Apply Loctite Lock N' Seal or a suitable equivalent on threads of the four cap screws (S) retaining cover (C) and securely tighten.

OIL INJECTION

All Models

BLEEDING PUMP. To bleed trapped air from oil supply line or pump, first make sure vehicle is level and oil tank is full.

Use a short piece of a suitable sized hose and an adapter and connect a supplemental water supply to fitting on exhaust manifold after removing cooling system supply hose (H—Fig. JS1-18) routed from jet pump.

NOTE: When using a supplemental water supply, do not turn on water until engine is ready to be started as exhaust flooding could occur. Operate engine only at low rpm or during a test, do not exceed recommended high rpm and only operate for a short period of time.

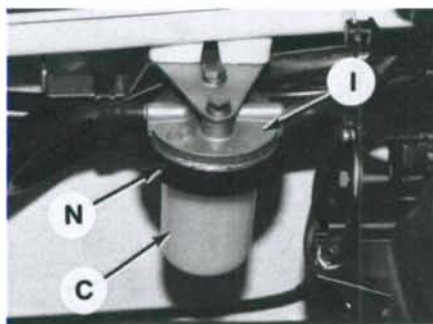


Fig. JS1-11—On JS300 models, a sediment bowl assembly (I) is used. Unscrew ring nut (N) to withdraw cup (C) with sealing ring.



Fig. JS1-13—Rotate locknuts (N) up or down cable housing end as needed to adjust throttle lever free play.

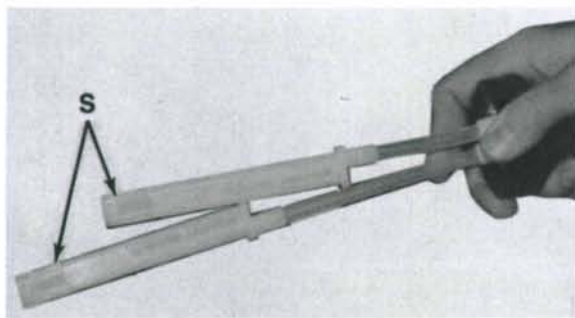


Fig. JS1-12—View identifies fuel tank strainers (S). Reserve "RES" is longest pickup line.

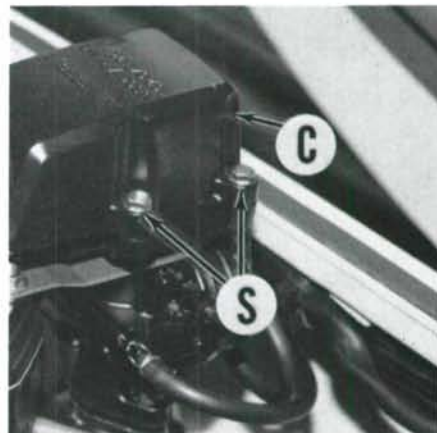


Fig. JS1-14—Remove two cap screws (S) on each side of cover (C) to withdraw cover (C) and flame arrestor.

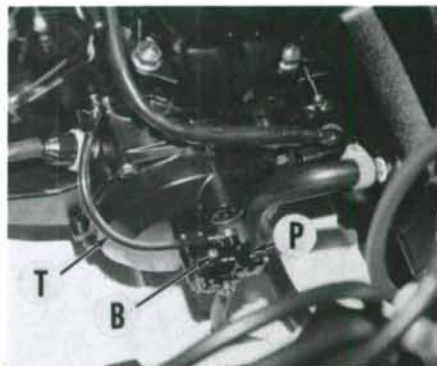


Fig. JS1-16—View identifies oil injection pump assembly (P), air bleed screw (B) and transparent outlet hose (T).

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Place a container under oil pump (P—Fig. JS1-16). Open oil pump air bleed screw (B) two or three turns to allow oil to seep out around screw threads. After no air bubbles are noticed, close air bleed screw (B).

Start engine, then turn on supplemental water supply. Adjust water pressure to where a small amount of water is being discharged out bypass outlet on side of hull. Note transparent outlet hose (T). Allow engine to idle until no air bubbles are noted in transparent outlet hose (T).

Turn off supplemental water supply and stop engine.

NOTE: Make sure engine is not operated without a supply of water longer than 10-15 seconds or damage to engine and/or exhaust components could result.

OIL PUMP OUTPUT. Connect a supplemental water supply as previously outlined under BLEEDING PUMP.

NOTE: A fuel:oil mixture of 50:1 must be supplied to engine during test.

Disconnect transparent outlet hose (T—Fig. JS1-16) from engine inlet fitting. Route end of transparent outlet hose (T) into a suitable measuring container. Connect a tachometer to engine. Start engine, then turn on supplemental water supply. Adjust water pressure to where a small amount of water is being discharged out bypass outlet on side of hull. Accelerate engine to 6000 rpm and maintain for one minute. After one minute, note amount of oil in measuring container. Allow engine to return to idle position, then turn off supplemental water supply and stop engine.

NOTE: If oil pump output test must be reformed, allow engine to idle for a short period with supplemental water supply circulating through cooling system. Do not sustain engine at a high rpm for an extended

period when not operated under a load and do not exceed the recommended testing rpm of 6000.

Oil pump can be considered satisfactory if measured oil is within the range of 3.3-4.1 mL (0.11-0.14 oz.). If oil pump output is not within the recommended range, then oil pump must be renewed.

IGNITION

All Models

All models are equipped with a capacitor discharge ignition system. The ignition timing is electronically advanced as the magneto base plate is fixed. Ignition timing should not require adjustment, after first being correctly set, unless magneto base plate is moved or an ignition component is renewed.

IGNITION TIMING. Ignition timing should be 18 degrees or 1.99 mm (0.08 in.) BTDC at 6000 rpm. Ignition timing can be checked using a suitable power timing light. Remove oil injection pump assembly (P—Fig. JS1-16) and flywheel cover (F—Fig. JS1-18).

NOTE: A fuel:oil mixture of 50:1 must be supplied to engine during test.

Note flywheel timing mark (M—Fig. JS1-19) and crankcase timing mark (T).

Use a short piece of a suitable sized hose and an adapter and connect a supplemental water supply to fitting on exhaust manifold after removing cooling system supply hose (H—Fig. JS1-18) routed from jet pump.

NOTE: When using a supplemental water supply, do not turn on water until engine is ready to be started as exhaust flooding could occur. Operate engine only at low rpm or during a test, do not exceed recommended high rpm and only operate for a short period of time.

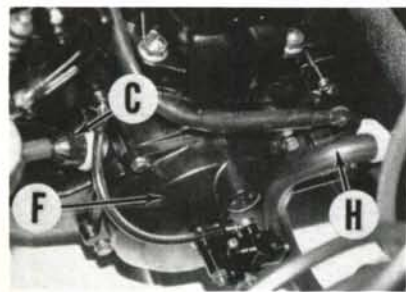


Fig. JS1-18—A supplemental water supply can be connected to fitting on exhaust manifold after removing cooling system supply hose (H) routed from jet pump. Engine flywheel is located behind flywheel cover (F). Unscrew cap (C) and withdraw wiring harness leading to electric box to expose terminal ends of wires leading to ignition exciter coil and charging system charge coil.

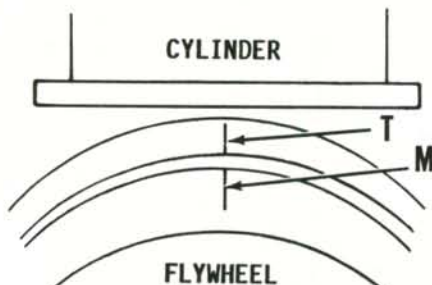


Fig. JS1-19—Mark (M) on flywheel represents 18 degrees BTDC. When engine is operated at 6000 rpm, flywheel mark (M) should align with crankcase mark (T).

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Connect a tachometer to engine. Start engine, then turn on supplemental water supply. Adjust water pressure to where a small amount of water is being discharged out bypass outlet on side of hull. Accelerate engine to 6000 rpm. Use power timing light and check alignment of flywheel timing mark (M—Fig. JS1-19) with crankcase timing mark (T). Allow engine to return to idle position, then turn off supplemental water supply and stop engine.

NOTE: Make sure engine is not operated without a supply of water longer than 10-15 seconds or damage to engine and/or exhaust components could result.

NOTE: If Ignition timing test must be reformed, allow engine to idle for a short period with supplemental water supply circulating through cooling system. Do not sustain engine at a high rpm for an extended period when not operated under a load and do not exceed the recommended testing rpm of 6000.

If ignition timing is incorrect, remove flywheel retaining screw, then use a suitable puller and withdraw flywheel. Loosen magneto base plate screws and rotate base plate as needed. Tighten magneto base plate screws, then reinstall flywheel and tighten retaining screw to 39 N·m (29 ft.-lbs.).

Recheck ignition timing. Continue procedure until correct ignition timing is obtained. Apply a water-resistant grease on flywheel cover (F—Fig. JS1-18) "O" ring. Apply a suitable thread locking solution on threads of flywheel cover retaining screws, then install flywheel cover (F) and securely tighten screws.

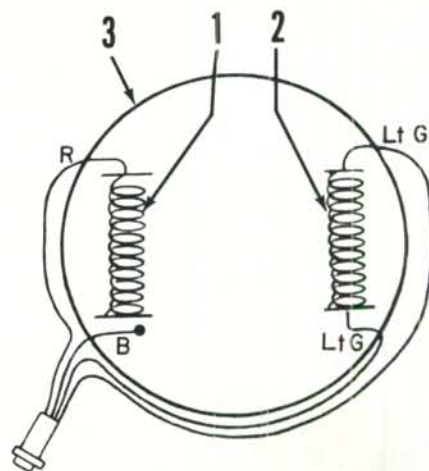


Fig. JS1-20—View identifying magneto components and color of leads.

- | | |
|-----------------------|-------------------|
| 1. Exciter coil | B. Black |
| 2. Charge coil | R. Red |
| 3. Magneto base plate | Lt G. Light green |

TROUBLE-SHOOTING. If ignition malfunction occurs, use only approved procedures to prevent damage to the components. The fuel system should be checked first to make certain that faulty running is not caused by contaminated fuel. Make sure malfunction is not due to spark plug, wiring or wiring connection failure. Trouble-shoot ignition circuit using a suitable ohmmeter as follows:

Unscrew cap (C—Fig. JS1-18) and withdraw wiring harness leading to electric box to expose terminal ends of wires leading to exciter coil. Refer to Fig. JS1-20. Check condition of exciter coil (1) by attaching one tester lead to terminal end of red wire (R) and attaching other tester lead to terminal end of black wire (B) leading to magneto assembly. Exciter coil can be considered satisfactory if resistance reading is within the limits of 168-252 ohms. Exciter coil is serviceable after removing flywheel cover and flywheel. Make sure a suitable puller is used to withdraw flywheel. Tighten flywheel retaining screw to 39 N·m (29 ft.-lbs.). Recheck ignition timing as previously outlined

under IGNITION TIMING. Apply a water-resistant grease on flywheel cover "O" ring. Apply a suitable thread locking solution on threads of flywheel cover retaining screws, then install flywheel cover (F—Fig. JS1-18) and securely tighten screws.

Ignition coil secondary winding resistance should be 5000-7500 ohms. If no components are found faulty, then renew CDI module/ignition coil assembly with a known good assembly and recheck engine operation.

CHARGING SYSTEM

All Models

All models are equipped with a charge coil, rectifier/regulator and battery. Standard battery has a 19 ampere hour, 12 volt rating. The charge coil should produce 12-15 ac volts when engine is operated throughout rpm range. Rectifier/regulator assembly should prevent regulated voltage from exceeding 15 dc volts.

The battery electrolyte level should be checked periodically and filled to max-

imum level with distilled water if required. The battery should be removed from the vehicle and the battery caps removed when charging. The manufacturer recommends charging the battery at a rate of 1.9 amperes for a period of 10 hours. Do not exceed recommended charging rate.

NOTE: Make sure battery charging area is well ventilated.

The charge coil can be statically tested using a suitable ohmmeter. Unscrew cap (C—Fig. JS1-18) and withdraw wiring harness leading to electric box to expose terminal ends of wires leading to charge coil. Refer to Fig. JS1-20. Check condition of charge coil (2) by attaching one tester lead to terminal end of one light green wire (Lt G) and attaching other tester lead to terminal end of remaining light green wire (Lt G). Resistance reading should be 2.4-3.6 ohms. Check resistance between each charge coil wire and black wire. Tester should show 1.2-1.8 ohms resistance at each wire. To check rectifier/regulator assembly, refer to chart shown in Fig. JS1-21. To check rectifier/regulator during operation, first make sure battery is fully charged, charge coil test good and all wiring is in good condition and all connectors fit tightly or are securely fastened. Attach test leads of a suitable voltmeter directly on battery terminals.

Use a short piece of a suitable sized hose and an adapter and connect a supplemental water supply to fitting on exhaust manifold after removing cooling system supply hose (H—Fig. JS1-18) routed from jet pump.

NOTE: Do not turn on water until engine is ready to be started as exhaust flooding could occur.

Start engine, then turn on supplemental water supply. Adjust water pressure to where a small amount of water is being discharged out bypass outlet on side of hull. Accelerate engine while observing voltmeter. The voltmeter should

Tester Lead -Tester Lead	Orange	Ground	Light Green	Light Green
Orange		A	A	A
Ground	A		A	A
Light Green	B	B		A
Light Green	B	B	A	

Fig. JS1-21—Use adjacent chart and values listed below to test condition of rectifier/regulator assembly.

- A. Infinite resistance
- B. Continuity

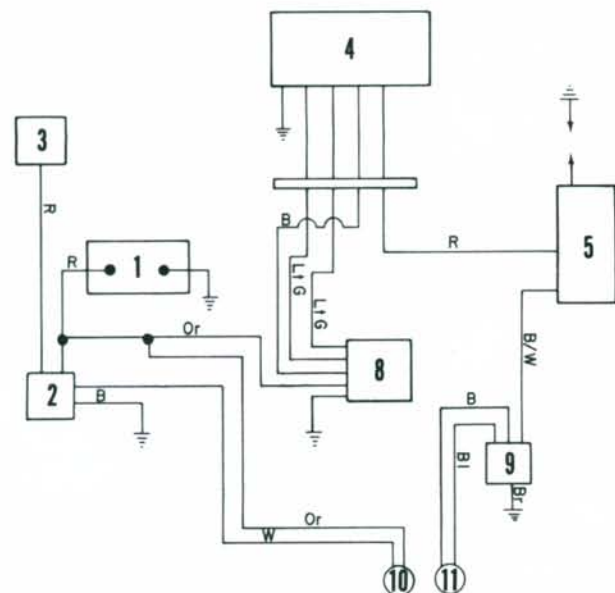


Fig. JS1-22—Wiring diagram typical of all JS300 and JS300SX models. On JS300SX models, a controller is connected in black/white (B/W) wire between CDI module/ignition coil (5) and stop switch relay (9). Components (2, 5, 8 and 9) are contained within electric box.

- 1. Battery
- 2. Starter solenoid
- 3. Starter motor
- 4. Magneto assy.
- 5. CDI module/ignition coil
- 8. Rectifier/regulator
- 9. Stop switch relay
- 10. Stop switch
- 11. Stop switch
- B. Black
- R. Red
- W. White
- Bl. Blue
- Br. Brown
- Or. Orange
- B/W. Black/white
- Lt. G. Light green

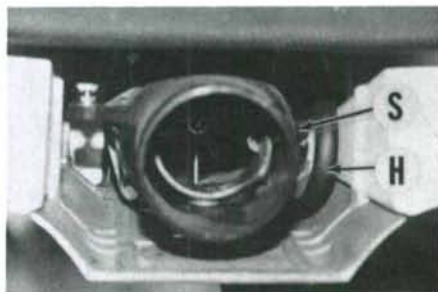


Fig. JS1-23—View identifies jet pump cooling system supply hose (H) and bilge siphon hose (S). Bilge siphon hose fitting is located on top jet pump steering nozzle on Model JS300SX.

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show approximately 15 dc volts. Allow engine to return to idle position then turn off supplemental water supply and stop engine.

NOTE: Make sure engine is not operated without a supply of water longer than 10-15 seconds or damage to engine and/or exhaust components could result.

COOLING SYSTEM

All Models

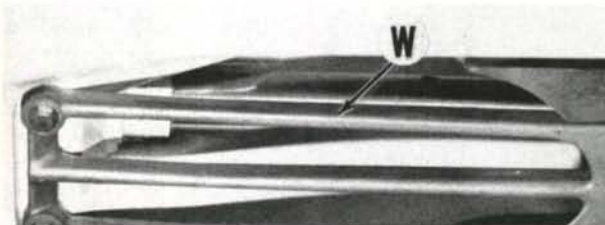
All models are water-cooled. Forced water is supplied to the engine through jet pump outlet fitting and directed through hose (H—Fig. JS1-23) to fitting on exhaust manifold. As jet pump impeller rpm increases, so does water circulation through cooling system.

Make sure jet pump water intake grill (W—Fig. JS1-24) is kept clean. Inspect all hoses periodically for cracks, kinks or any other damage and renew if needed. The cooling system should be flushed out after each operating period when vehicle is used in contaminated or salt water. The cooling system should be flushed out prior to extended periods of storage and prior to usage after extended periods of storage.

To flush the cooling system, use a short piece of suitable sized hose and an adapter and connect a supplemental water supply to fitting on exhaust manifold after removing cooling system supply hose (H—Fig. JS1-18) routed from jet pump. Use only clean, fresh water.

NOTE: Do not turn on water until engine is ready to be started as exhaust flooding could occur. Operate engine only at low rpm.

Start engine then turn on supplemental water supply. Adjust water pressure to where a small amount of water is being discharged out bypass outlet on side of hull. Allow water to circulate through system for several minutes. Turn off supplemental water supply. If vehicle is to be stored for an extended period, raise rear of vehicle and quickly accelerate engine between idle and one-quarter throttle a couple of times. This is to force out all water within exhaust system, thus preventing damage from developing contaminants or freezing.



ENGINE

All Models

REMOVE AND REINSTALL. Disconnect battery cables from battery and remove battery from vehicle. Remove throttle cable and choke cable from carburetor. Remove hoses from carburetor, label if needed and plug openings. Remove flame arrestor and carburetor fasteners, then withdraw components. Cover intake manifold passage to prevent entrance of foreign debris. Remove oil supply hose from oil injection pump and plug openings. Disconnect all electrical wiring that will interfere with engine removal and label for reassembly. Remove cooling system hoses from exhaust pipe and elbow. Remove exhaust pipe and elbows. Remove drive coupler shield (S—Fig. JS1-34). Remove four cap screws (C—Fig. JS1-26) and washers retaining engine to vehicle hull. Note shims located under engine mounts and identify each shim for installation in original location. Remove any other components that will interfere with engine removal. Use a suitable lifting device to hoist engine assembly from vehicle. Place engine assembly on a clean work bench.

Use a suitable lifting device to hoist engine assembly into vehicle. Make sure

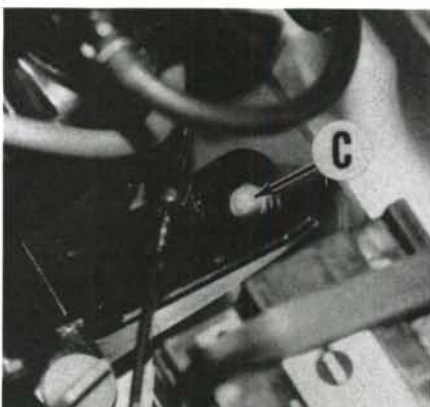


Fig. JS1-26—Cap screw (C) and washer on each side of front and rear engine crankcase mounts retains engine assembly to engine bases.

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coupler is located between engine drive flange and drive shaft drive flange. Install shims into original locations under engine mounts. Lay a straightedge (S—Fig. JS1-27) across top of engine drive flange and drive shaft drive flange. Engine drive flange should be 0-0.3 mm (0-0.012 in.) higher than drive shaft drive flange. Measure distance (A—Fig. JS1-28) and distance (B). Distance (B) should not exceed distance (A) by more than 0.6 mm (0.024 in.). Measure clearance between engine drive flange and coupler and drive shaft drive flange and coupler. Total of the two clearance measurements should not exceed 0.5 mm (0.020 in.). If recommended settings are not measured, then adjust thickness of shims located under engine mounts until recommended settings are obtained. Apply Loctite Lock N' Seal or a suitable equivalent on threads of four cap screws (C—Fig. JS1-26) and tighten cap screws to 37 N·m (27 ft.-lbs.). Remeasure as previously outlined to verify engine drive flange to drive shaft drive flange settings are as recommended. Adjust shim thickness if needed.

Complete reassembly in reverse order of disassembly.

DISASSEMBLY. Remove cylinder head nuts, then pry cylinder head off cylinder. Remove cylinder base nuts, then withdraw cylinder. Remove oil injection pump and flywheel cover. Hold flywheel with a suitable tool and rotate engine drive flange off crankshaft using Kawasaki tool 57001-1025. Remove electric starter motor. Drain oil from starter gear housing. Remove starter gear housing, crankshaft collar and "O"

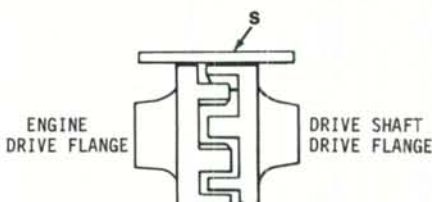


Fig. JS1-27—Engine drive flange should be 0-0.3 mm (0-0.012 in.) higher than drive shaft drive flange. Lay straightedge (S) across components and use a feeler gage to measure.

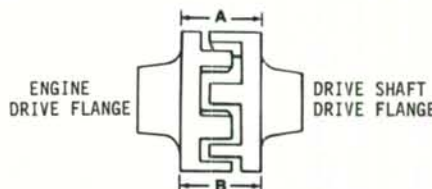


Fig. JS1-28—Distance (B) should not exceed distance (A) by more than 0.6 mm (0.024 in.).

ring. Use a suitable puller and withdraw starter clutch and idle gear. Remove screw retaining flywheel, then use a suitable puller and withdraw flywheel. Remove magneto base plate with ignition components. Remove eight cap screws securing crankcase halves together. Three crankcase screws outside starter gear housing are stainless steel. Identify cap screws for installation in original locations. Use Kawasaki tool 57001-1098, 156 or a suitable puller assembly and separate starter gear housing crankcase half from crankshaft assembly and flywheel side crankcase half. Press crankshaft assembly from flywheel side crankcase.

Engine components are now ready for overhaul as outlined in the appropriate following paragraphs. Refer to the following section for assembly procedure.

ASSEMBLY. Refer to specific service sections when assembling the crankshaft, connecting rod and piston. Make sure all joint and gasket surfaces are clean, free from nicks and burrs and hardened cement or carbon.

Whenever the engine is disassembled, it is recommended that all gasket surfaces and mating surfaces without gaskets be carefully checked for nicks, burrs and warped surfaces which might interfere with a tight seal. Cylinder head and mating surfaces of crankcase halves should be checked on a surface plate and lapped, if necessary, to provide a smooth surface. Do not remove any more metal than is necessary.

When assembling engine, first lubricate all friction surfaces and bearings with engine oil. Press oil seal into flywheel side crankcase half with

manufacturer's marks toward flywheel. Press oil seal into starter gear housing crankcase half with manufacturer's marks toward inside of crankcase. Apply a high temperature grease on lip of each oil seal. Press crankshaft main bearings into crankcase halves. Position Kawasaki tool 57001-1174 or a suitable equivalent over connecting rod and adjust tool to fit tightly between crankshaft halves.

NOTE: The tool is used to protect crankshaft alignment during installation of crankshaft assembly into crankcase halves.

Press crankshaft assembly into flywheel side crankcase half. Wipe mating surfaces of crankcase halves clean and make sure surfaces are dry. Apply a coating of Kawasaki Bond or a suitable form-in-place gasket compound on crankcase mating surface of flywheel side crankcase half. Press starter gear housing crankcase half onto flywheel side crankcase half. Remove special tool from connecting rod. Install eight crankcase securing cap screws into original locations. Apply Loctite Lock N' Seal or a suitable equivalent on threads of three stainless steel screws prior to installation. Tighten all screws in small increments using a crisscross pattern until securely tightened.

NOTE: Make sure crankshaft assembly rotates freely. If not, split crankcase halves and repair as needed.

Reassemble flywheel side and starter gear side of crankcase in reverse order of disassembly while noting the following: Align mark on magneto base plate with projection on crankcase and securely tighten two retaining screws. Tighten flywheel screw to 39 N·m (29 ft.-lbs.). The manufacturer recommends applying a molybdenum disulfide grease

on starter gear holder where starter gear bushing rides and on starter gear bushing. One-way clutch assembly should rotate freely when rotated in counterclockwise direction and lock when rotated in clockwise direction. Install a new "O" ring into starter gear housing cover and flywheel cover. Install starter gear housing cover and apply Loctite Lock N' Seal or a suitable equivalent on threads of retaining screws and securely tighten. Install engine drive flange and tighten to 98 N·m (72 ft.-lbs.) using Kawasaki tool 57001-1025. Refill starter gear housing as outlined in LUBRICATION section. Install flywheel cover and apply Loctite Lock N' Seal or a suitable equivalent on threads of retaining screws and securely tighten.

Tighten cylinder base nuts to 34 N·m (25 ft.-lbs.). Apply a thin coating of a RTV silicone sealer on both sides of cylinder head gasket. Install cylinder head gasket with arrow facing up and pointing toward exhaust side of cylinder. Install cylinder head so tab on cylinder head aligns with tab on cylinder head gasket. Use a crisscross pattern and tighten cylinder head nuts to 25 N·m (18 ft.-lbs.).

PISTON, PIN, RINGS AND CYLINDER. Recommended piston skirt-to-cylinder clearance is 0.074-0.084 mm (0.0030-0.0033 in.). Bore cylinder to 0.50 mm (0.020 in.) or 1.0 mm (0.040 in.) oversize if measured piston skirt-to-cylinder clearance is beyond limit. Piston and piston rings are available in 0.50 mm (0.020 in.) and 1.0 mm (0.040 in.) oversizes. Inspect cylinder wall for scoring. If minor scoring is noted, cylinder should be honed to smooth out cylinder wall.

Recommended piston ring end gap for top and second ring is 0.2-0.4 mm (0.008-0.016 in.) with a service limit of 0.7 mm (0.027 in.). The top and second piston ring is semi-keystone shaped. Install piston rings on piston with manufacturer's mark facing top of piston. Make sure piston rings properly align with locating pins in ring grooves.

When reassembling, install piston on connecting rod so arrow on top of piston faces toward exhaust side of cylinder after assembly. Install new piston pin retaining clips (1—Fig. JS1-30); openings of retaining clips must face top or bottom of piston. Coat bearing, piston, rings and cylinder bore with engine oil during assembly.

CONNECTING ROD, CRANKSHAFT AND BEARINGS. The crankshaft assembly should only be disassembled if the necessary tools and experience are available to service this type of

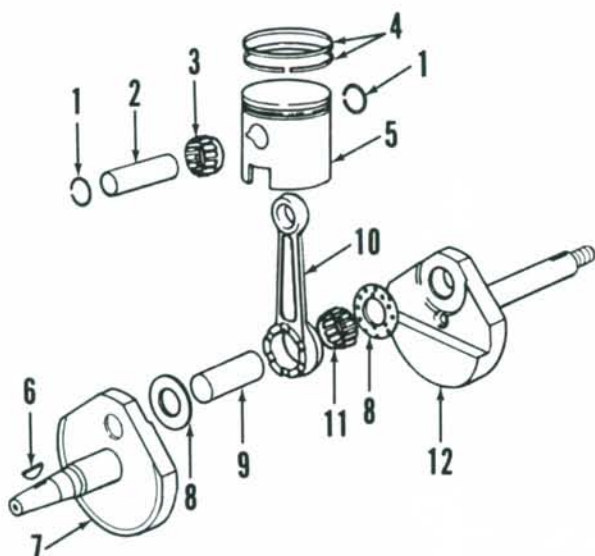


Fig. JS1-30—Exploded view of crankshaft assembly.

1. Clips
2. Piston pin
3. Needle bearing
4. Piston rings
5. Piston
6. Key
7. Crank half
8. Thrust washers
9. Crankpin
10. Connecting rod
11. Needle bearing
12. Crank half

crankshaft. Crankshaft components are available individually.

Maximum crankshaft runout measured at main bearing journals with crankshaft ends supported in lathe centers is 0.08 mm (0.003 in.). Connecting rod radial clearance should be 0.037-0.049 mm (0.0015-0.0019 in.) with a service limit of 0.10 mm (0.004 in.). Connecting rod side clearance should be 0.45-0.55 mm (0.018-0.022 in.) with a service limit of 0.8 mm (0.03 in.). Maximum allowable connecting rod bend or twist measured over a 100 mm (3.9 in.) length is 0.2 mm (0.008 in.).

Lubricate bearings, piston, rings and cylinder with engine oil prior to installation. Tighten crankcase and cylinder head screws as outlined in ASSEMBLY section.

ELECTRIC STARTER

All Models

All models are equipped with electric starter shown in Fig. JS1-32. Disassembly is evident after inspection of unit and reference to exploded view. When servicing starter motor, scribe reference marks across motor frame to aid in reassembly.

Starter brushes have a standard length of 12 mm (0.47 in.) and should be renewed if worn to 8.5 mm (0.33 in.). Commutator has a standard diameter of 28 mm (1.10 in.) and should be renewed

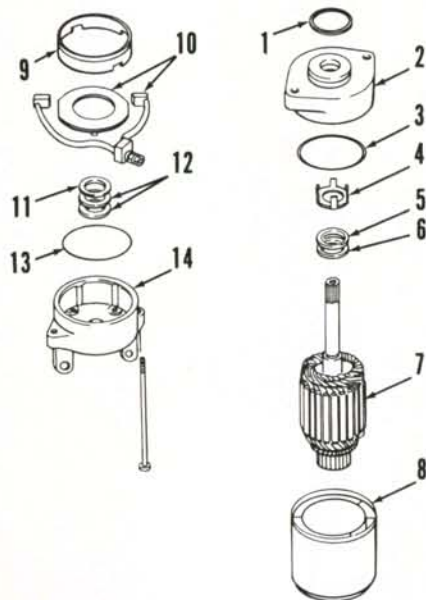


Fig. JS1-32—Exploded view of typical electric starter assembly.

- | | |
|------------------|----------------------------|
| 1. "O" ring | 9. Brush plate holder |
| 2. Frame head | 10. Brush assy. |
| 3. Seal ring | 11. Thick thrust washer |
| 4. Tab washer | 12. Thinner thrust washers |
| 5. Insulator | 13. Seal ring |
| 6. Thrust washer | 14. End housing |
| 7. Armature | |
| 8. Frame | |

if worn to a diameter of 27 mm (1.06 in.). During reassembly, apply Loctite Superflex or a suitable RTV silicone sealer around frame opening for terminal end of positive brush assembly and on sealing surfaces of frame, frame head and end housing where components mate.

BILGE PUMP

All Models

When the vehicle is operated, the jet pump forces water past siphon hose (S—Fig. JS1-23) opening. The passing force of water creates a vacuum effect, thus drawing (siphoning) any water out of vehicle bilge. Make sure all hoses and strainer (R—Fig. JS1-34) are kept clean of all foreign debris. Disassemble and clean or renew components if needed. Make sure all hose connections are tight or vacuum loss will result in siphoning system malfunction. An antisiphon loop is positioned at top, rear of engine compartment to prevent water from being drawn into hull when engine is not being operated. Make sure small breather

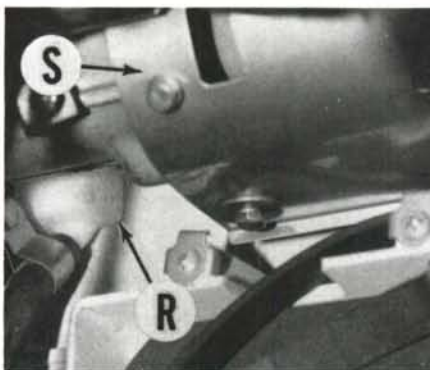


Fig. JS1-34—View identifies drive coupler shield (S) and location of bilge strainer (R).

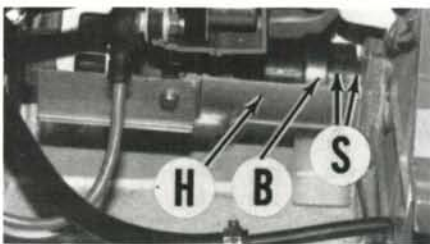


Fig. JS1-36—Cutaway view showing a typical intermediate housing setup. After removing intermediate housing assembly as outlined in text, remove drive shaft drive flange and front cover. Tap intermediate housing (H) off rear of drive shaft using a soft-faced mallet. Bearing (B) is located on drive shaft at front and rear of intermediate housing. Two seals (S) are located in rear of intermediate housing and two seals are located in front cover. An "O" ring is used around outside of front cover. A shim may be used between front cover and front drive shaft bearing.

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hole in plastic fitting of antisiphon loop is clear. If hole is plugged, water could be drawn into engine compartment when engine is stopped or idling. Clean hole only with compressed air. Using a tool to clean hole could enlarge hole size, thus causing a vacuum loss at bilge strainer during operation. The lower vacuum will result in a decrease in bilge siphoning efficiency.

INTERMEDIATE HOUSING AND DRIVE FLANGE

All Models

R&R AND OVERHAUL. Disconnect battery cables from battery and remove battery from vehicle. Remove throttle cable and choke cable from carburetor. Remove hoses from carburetor, label if needed and plug openings. Remove flame arrestor and carburetor fasteners, then withdraw components. Cover intake manifold passage to prevent entrance of foreign debris. Remove oil supply hose from oil injection pump and plug openings. Disconnect all electrical wiring that will interfere with engine removal and label for reassembly. Remove cooling system hoses from exhaust pipe and elbow. Remove exhaust pipe and elbows. Remove drive coupler shield (S—Fig. JS1-34). Remove four cap screws (C—Fig. JS1-26) and washers retaining engine to vehicle hull. Note shims located under engine mounts and identify each shim for installation in original location. Remove any other components that will interfere with engine removal. Use a suitable lifting device to hoist engine assembly from vehicle. Place engine assembly on a clean work bench.

Remove jet pump water intake grill (W—Fig. JS1-38) and cover (R). Detach steering linkage joint (J) at ball joint on steering nozzle (N). Remove bilge siphon hose and cooling system supply hose from fittings on jet pump housing. Remove four jet pump mounting cap screws (two at front and two at rear).

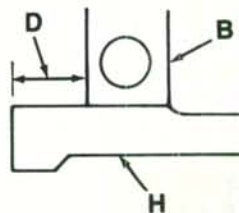


Fig. JS1-37—Refer to text after reassembling intermediate housing. Measure distance (D) between surface of intermediate housing (H) and surface of drive shaft front bearing (B) to determine if a shim is needed between front cover and bearing.

Be careful and use a suitable sharp tool and cut silicone sealer between jet pump mounting flanges and vehicle hull and jet pump water intake nozzle and vehicle hull. Slide jet pump assembly off rear of drive shaft. Note shims located under jet pump housing mounting flanges. Use a suitable tool and rotate impeller counterclockwise to remove from drive shaft.

Remove intermediate housing (H—Fig. JS1-36) four mounting cap screws. Withdraw intermediate housing with drive flange and drive shaft. Note shims located behind intermediate housing mounting flanges and label for installation in original locations.

Hold drive shaft with Kawasaki tool W56019-003 or a suitable equivalent, then use Kawasaki tool T57001-276 or a suitable equivalent to rotate drive flange off drive shaft. Remove three front cover retaining cap screws then withdraw front cover. Remove any shims located between front cover and drive shaft front bearing. Use a soft-faced mallet and tap intermediate housing off rear of drive shaft. Use correct fixtures and press drive shaft bearings and spacer off drive shaft if needed. Inspect all components for excessive wear or any other damage and renew if needed. Drive shaft runout should not exceed 0.1 mm (0.004 in.) when measured in intermediate housing area and 0.5 mm (0.020 in.) when measured midway between shaft ends. Renew all seals and "O" ring during reassembly. Apply Shell MP or Alvania EP1 grease on front cover and intermediate housing grease seals prior to installation. Install grease seals with open side facing away from drive shaft bearings. Fill gap between seals with previously recommended grease. Apply recommended grease onto drive shaft bearings. Slide intermediate housing onto rear of drive shaft and tap intermediate housing onto drive shaft bearings with a soft-faced mallet until seated. If original intermediate housing and original drive shaft bearings are

used, then original shim located between front cover and front drive shaft bearing can be used. If intermediate housing or drive shaft bearings have been renewed, then proceed as follows. Measure distance (D—Fig. JS1-37) from surface of intermediate housing (H) to surface of drive shaft front bearing (B). If distance measured is between 12.90 mm (0.5079 in.) and 13.05 mm (0.5138 in.), no shims need to be added between front cover and bearing. If distance measured is between 13.06 mm (0.5142 in.) and 13.20 mm (0.5197 in.), add Kawasaki shim 92025-502 between front cover and bearing. If distance measured is between 13.21 mm (0.5201 in.) and 13.32 mm (0.5244 in.), add Kawasaki shim 92025-503 between front cover and bearing. Install front cover and tighten cap screws to 16 N·m (12 ft.-lbs.). Install drive flange on drive shaft and tighten to 98 N·m (72 ft.-lbs.).

Install shims in their original locations between intermediate housing mounting flanges and vehicle hull. If vehicle hull has been renewed, then the drive shaft must be properly aligned to mate with jet pump. The drive shaft must be positioned so drive shaft center is 77 mm (3.03 in.) from top of jet pump mounting surface and equally centered from side-to-side. Adjust thickness of shims located under intermediate housing mounting flanges until correct drive shaft alignment is obtained. Tighten intermediate housing mounting cap screws to 16 N·m (12 ft.-lbs.) and recheck drive shaft alignment.

Remove grease fitting (G—Fig. JS1-38) at rear of jet pump housing. Install impeller on drive shaft and tighten using hand pressure. Do not overtighten impeller. Lightly grease lips of jet pump housing grease seals and rear surface of drive shaft with Shell MP or Alvania EP1 grease. Apply Loctite Superflex or a suitable RTV silicone sealer on mounting flanges of jet pump housing and on jet pump intake area where intake mates with vehicle hull. Slide jet pump

assembly onto drive shaft. Thickness of shims located under jet pump housing mounting flanges must be adjusted so clearance (C—Fig. JS1-39) between impeller and impeller housing is at least 0.1 mm (0.004 in.) measured throughout entire impeller circumference. Tighten jet pump housing mounting cap screws, then recheck impeller-to-impeller housing clearance. After recommended clearance is obtained, remove each jet pump housing mounting cap screw and apply Loctite Stud N'Bearing Mount or a suitable equivalent on threads of each screw, then install and tighten to 22 N·m (16 ft.-lbs.). Install grease fitting (G—Fig. JS1-38) and inject Shell MP or Alvania EP1 grease through grease fitting as needed. Reconnect bilge siphon hose and cooling system supply hose onto fittings on jet pump. Reattach steering linkage joint (J) onto ball joint on steering nozzle (N). Install jet pump cover (R) and water intake grill (W) and tighten retaining screws to 10 N·m (88 in.-lbs.).

Use a suitable lifting device to hoist engine assembly into vehicle. Make sure coupler is located between engine drive flange and drive shaft drive flange. Install shims into original locations under engine mounts. Lay a straightedge (S—Fig. JS1-27) across top of engine drive flange and drive shaft drive flange. Engine drive flange should be 0-0.3 mm (0-0.012 in.) higher than drive shaft drive flange. Measure distance (A—Fig. JS1-28) and distance (B). Distance (B) should not exceed distance (A) by more than 0.6 mm (0.024 in.). Measure clearance between engine drive flange and coupler and drive shaft drive flange and coupler. Total of the two clearance measurements should not exceed 0.5 mm (0.020 in.). If recommended settings are not measured, then adjust thickness of shims located under engine mounts until recommended settings are obtained. Apply Loctite Lock N'Seal or a suitable equivalent on threads of four cap screws (C—Fig. JS1-26) and tighten cap screws to 37 N·m (27 ft.-lbs.). Remeasure as previously outlined to verify engine drive flange to drive shaft flange settings are as recommended. Adjust shim thickness if needed.

Complete reassembly in reverse order of disassembly.

JET PUMP

All Models

R&R AND OVERHAUL. Disconnect battery cables from battery. Remove jet pump water intake grill (W—Fig. JS1-38) and cover (R). Detach steering linkage joint (J) at ball joint on steering nozzle (N). Remove bilge siphon hose and cooling system supply hose from fittings on

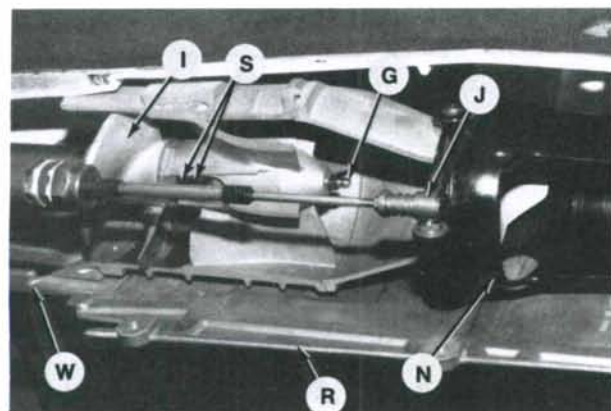


Fig. JS1-38—Cutaway view of jet pump assembly and related components.

- G. Grease fitting
- I. Impeller
- J. Steering linkage joint
- N. Steering nozzle
- R. Jet pump cover
- S. Seals
- W. Water intake grill

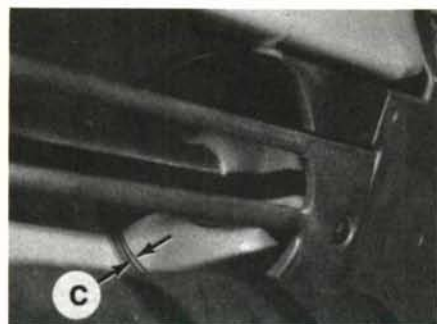


Fig. JS1-39—Clearance (C) between impeller and impeller housing should be at least 0.1 mm (0.004 in.) and should not exceed 0.87 mm (0.034 in.) measured throughout entire impeller circumference.

jet pump housing. Remove four jet pump mounting cap screws (two at front and two at rear). Be careful and use a suitable sharp tool and cut silicone sealer between jet pump mounting flanges and vehicle hull and jet pump water intake nozzle and vehicle hull. Slide jet pump assembly off rear of drive shaft. Note shims located under jet pump housing mounting flanges. Label shims for reassembly in original locations. Use a suitable tool and rotate impeller counterclockwise to remove from drive shaft.

Inspect impeller and impeller housing for excessive wear or any other damage. Diameter of impeller housing should not exceed 122.7 mm (4.83 in.). Renew jet pump housing if impeller housing is worn beyond limits or any other damage is noted. Minimum impeller diameter is 120 mm (4.72 in.). Inspect all other components for any type of damage. Remove snap ring and withdraw seals (S) using a suitable slide hammer. Diameter of drive shaft bushing in jet pump housing should not exceed 20.2 mm (0.79 in.). Renew bushing if worn beyond limit. Cool bushing and warm bushing area of jet pump to 93°C (200°F) to ease installation. Install Shell MP or Alvania EP1 grease on seals in jet pump housing prior to installation. Install thick seal next to bushing and install both seals with open side facing toward snap ring groove. Install snap

ring. Fill gap between seals with previously recommended grease. If output nozzle was removed, apply a thin coating of Loctite Superflex or a RTV silicone sealer on jet pump housing surface where output nozzle mates and install output nozzle. Apply Loctite Stud N'Bearing Mount on threads of output nozzle mounting cap screws and tighten in a crisscross pattern to 16 N·m (12 ft.-lbs.).

Remove grease fitting (G) at rear of jet pump housing. Install impeller on drive shaft and tighten using hand pressure. Do not overtighten impeller. Lightly grease lips of jet pump housing grease seals and rear surface of drive shaft with Shell MP or Alvania EP1 grease. Apply Loctite Superflex or a suitable RTV silicone sealer on mounting flanges of jet pump housing and on jet pump intake area where intake mates with vehicle hull. Slide jet pump assembly onto drive shaft. Install shims located under jet pump housing mounting flanges in original locations. Tighten jet pump housing mounting cap screws, then check impeller-to-impeller housing clearance. Clearance (C—Fig. JS1-39) should not exceed 0.87 mm (0.034 in.) measured between impeller and impeller housing throughout entire impeller circumference. Adjust thickness of shims located under jet pump housing mounting flanges if measured clearance is not equal around impeller circumference. If measured clearance is beyond recommended limit, then renew excessively worn or damaged component. After correct setting is obtained, remove each jet pump housing mounting cap screw and apply Loctite Stud N'Bearing Mount or a suitable equivalent on threads of each screw, then install and tighten to 22 N·m (16 ft.-lbs.). Install grease fitting (G—Fig. JS1-38) and inject Shell MP or Alvania EP1 grease through grease fitting as needed. Reconnect bilge siphon hose and cooling system supply hose onto fittings on jet pump. Reattach steering linkage joint (J) onto ball joint on steering nozzle (N). Install jet pump cover (R) and water intake grill (W) and tighten retaining screws to 10 N·m (88 in.-lbs.).

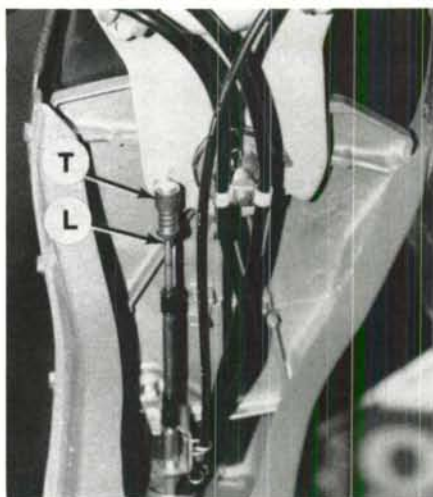


Fig. JS1-41—Loosen locknut (L) and remove joint (T) from ball joint on handlebar pivot plate and rotate joint (T) up or down on threaded end of steering cable as needed to center jet pump steering nozzle when steering handle bar is in a straight ahead position.

STEERING

All Models

ADJUSTMENT. With steering handlebar in straight ahead position, jet pump steering nozzle (N—Fig. JS1-38) should be centered or at a 90 degree angle to stern of vehicle. If not, raise handle pole and loosen locknut (L—Fig. JS1-41) below steering linkage joint (T). Remove joint (T) from ball joint on handlebar pivot plate. Rotate joint (T) up or down threaded end of steering cable as needed to properly center jet pump steering nozzle. After correct adjustment is obtained, reinstall steering linkage joint (T) onto ball joint and tighten locknut (L).

NOTE: If steering linkage joint (T) must be rotated out to where minimal threads on steering cable engage joint (T), then rotate joint (T) onto threaded end of steering cable to obtain safe thread engagement and complete adjustment on joint (J—Fig. JS1-38) at jet pump.

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