

JET SKI

JF650 (X-2) AND JS650SX

NOTE: Metric fasteners are used throughout vehicle.

General

Engine Make.....	Own
Engine Type.....	Two-Stroke; Water-Cooled
Number of Cylinders.....	2
Bore.....	76 mm (3.0 in.)
Stroke.....	70 mm (2.75 in.)
Displacement.....	635 cc (38.7 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.....	1150-1350 rpm
Spark Plug:	
NGK.....	B7ES
Champion.....	N4G
Electrode Gap.....	0.7-0.8 mm (0.027-0.031 in.)

Ignition:

Type.....	CDI
Timing.....	17° BTDC @ 6000 rpm

Carburetor:

Make.....	Keihin
Model.....	CDK34 Diaphragm
Bore Size.....	28 mm (1.1 in.)

Sizes—Clearances

Cylinder Bore.....	76.050-76.065 mm (2.9941-2.9947 in.)
Service Limit.....	76.10 (2.996 in.)

Piston Diameter Measured

18 mm (0.7 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:

JF650.....	0.074-0.104 mm (0.0029-0.0041 in.)
JS650SX.....	0.074-0.084 mm (0.0029-0.0033 in.)

Piston Ring End Gap.....	0.2-0.4 mm (0.008-0.016 in.)
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Service Limit.....	0.7 mm (0.027 in.)
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Maximum Cylinder Head Warp.....	0.05 mm (0.002 in.)
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Connecting Rod Radial Clearance.....	0.045-0.055 mm (0.0018-0.0022 in.)
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Service Limit.....	0.11 mm (0.004 in.)
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Connecting Rod Side Clearance.....	0.45-0.55 mm (0.018-0.022 in.)
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Sizes—Clearances (Cont.)

Service Limit.....	0.8 mm (0.031 in.)
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Maximum Connecting Rod Bend or Twist Measured Over a 100 mm (3.9 in.) Length.....	0.2 mm (0.008 in.)
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Maximum Crankshaft Runout at Main Bearing Journal.....	0.10 mm (0.004 in.)
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Capacities

Fuel Tank:

JF650.....	16 L (4.2 gal.)
JS650SX.....	17.5 L (4.6 gal.)

Engine Oil Tank:

JF650.....	2.7 L (0.71 gal.)
JS650SX.....	2.8 L (0.74 gal.)

Tightening Torques

Carburetor Mounting Nuts.....	7.8 N·m (69 in.-lbs.)
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Cylinder Head Nuts:

JF650.....	25 N·m (18 ft.-lbs.)
JS650SX.....	23 N·m (17 ft.-lbs.)

Cylinder Block Nuts.....	34 N·m (25 ft.-lbs.)
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Crankcase Cap Screws:

6 mm.....	7.8 N·m (69 in.-lbs.)
8 mm.....	25 N·m (18 ft.-lbs.)

Engine-to-Engine Mounting Plate

Cap Screws:	
JF650.....	23 N·m (17 ft.-lbs.)
JS650SX.....	36 N·m (26 ft.-lbs.)

Engine Mounting Cap Screws.....	36 N·m (26 ft.-lbs.)
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Engine Drive Flange:

JF650.....	98 N·m (72 ft.-lbs.)
JS650SX.....	27 N·m (20 ft.-lbs.)

Drive Shaft Drive Flange:

JF650.....	98 N·m (72 ft.-lbs.)
JS650SX.....	27 N·m (20 ft.-lbs.)

Drive Shaft Bearing Housing.....	22 N·m (16 ft.-lbs.)
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Jet Pump Mounting Cap Screws.....	25 N·m (18 ft.-lbs.)
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Tightening Torques (Cont.)

Jet Pump Impeller.....	98 N·m (72 ft.-lbs.)
Flywheel Cap Screw:	
JF650.....	69 N·m (51 ft.-lbs.)
JS650SX.....	98 N·m (72 ft.-lbs.)
Spark Plug.....	27 N·m (20 ft.-lbs.)
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.)

Tightening Torques (Cont.)

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 40:1. 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.

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

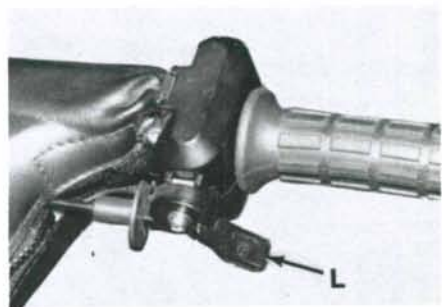


Fig. JS3-1—View identifies location of choke lever (L) on JF650 models.



Fig. JS3-2—View identifies location of choke knob (K) and fuel selector valve (V) on JS650SX models.

FUEL SYSTEM

All Models

CARBURETOR. A Keihin type CDK34 diaphragm carburetor is used on all models. Carburetor choke plate is actuated by choke lever (L—Fig. JS3-1) on JF650 models and by choke knob (K—Fig. JS3-2) on JS650SX models via a cable and linkage.

Initial setting of low speed mixture needle (L—Fig. JS3-3) is one turn out from a lightly seated position on all models. Initial setting of high speed mixture needle (H) is 5/8 turn out from a lightly seated position on all 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 (L) until smooth acceleration from the idle position is noted. After adjusting low speed mixture needle, adjust idle speed screw (I—Fig. JS3-4) until engine idle speed is approximately 1150-1350 rpm with throttle lever completely released. To adjust high speed fuel:air mixture, the engine spark plugs 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 plugs 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 (H—Fig. JS3-3) should be rotated out-

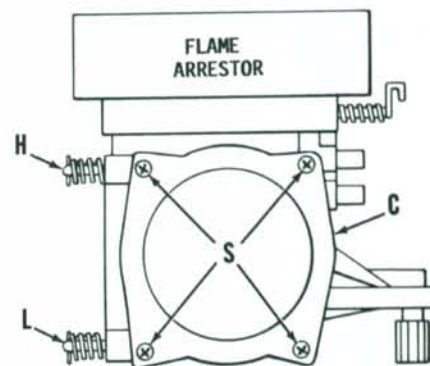


Fig. JS3-3—View identifies location of low speed mixture needle (L) and high speed mixture needle (H). Remove four corner screws (S) and withdraw cover (C) to service regulating diaphragm or check inlet needle valve lever (L—Fig. JS3-5) setting.

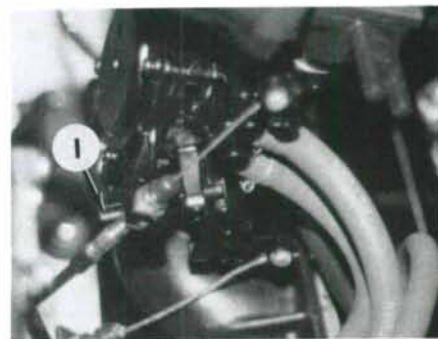


Fig. JS3-4—View identifies location of idle speed screw (I).

ward (counterclockwise) $\frac{1}{4}$ 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 (H) should be rotated inward (clockwise) $\frac{1}{4}$ turn to lean mixture. Clean, regap and reinstall spark plugs and continue test procedure until spark plug insulator tip is a normal color.

Carburetor regulating diaphragm can be serviced after removing four cover screws (S) and withdrawing cover (C). Inspect diaphragm for damage and renew if needed. Install diaphragm with a new gasket between diaphragm and cover.

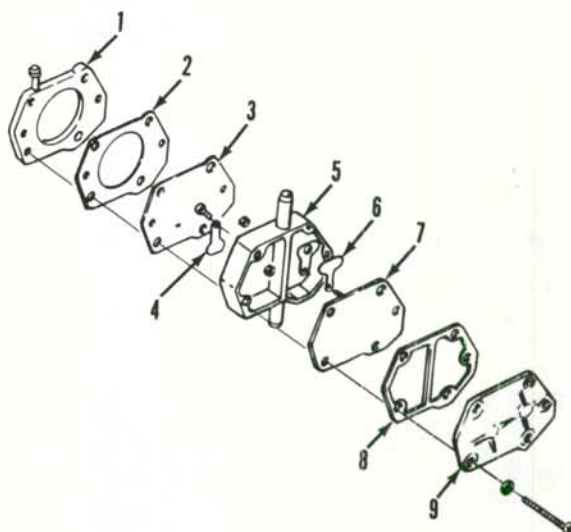
Inlet needle valve lever (L—Fig. JS3-5) should be 1-2 mm (0.04-0.08 in.) below surface of carburetor housing when needle valve is seated as shown in Fig. JS3-5. If lever must be adjusted, push down on lever immediately above spring to collapse the spring, then bend the end which contacts needle valve.

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

Renew reeds if petals are broken, cracked, warped or bent. Do not attempt to bend or straighten reeds. Reed

Fig. JS3-8—Exploded view of fuel pump assembly.

1. Base
2. Gasket
3. Diaphragm
4. Check valve
5. Body
6. Check valve
7. Diaphragm
8. Gasket
9. Cover



seating surface on reed blocks should be smooth and flat. Maximum allowable reed petal stand open is 0.2 mm (0.008 in.). Install reed valve assemblies into crankcase intakes with small hole in reed valve holder on bottom.

FUEL PUMP. A diaphragm type fuel pump assembly (F—Fig. JS3-7) is used on all models. Refer to Fig. JS3-8 for an exploded view of fuel pump assembly. Alternating pressure and vacuum pulsations in the crankcase actuates the diaphragms and check valves in the pump. Fuel pump assembly uses reed valve type check valves.

With reference to Fig. JS3-8, disassemble fuel pump assembly. Inspect body (5), diaphragms (3 and 7) and check valves (4 and 6) for damage and renew if needed. Renew gaskets (2 and 8) during reassembly. Reassemble components, then securely and evenly tighten cover (9) retaining screws.

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. JS3-10). On JS650SX models, an inline sediment bowl (I) is used to prevent entrance of water into fuel tank. Occasionally or if water is noted, unscrew ring nut (N) 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). On all models, after every 25 hours of operation or more frequent if needed, fuel tank strainers (S—Fig. JS3-11)

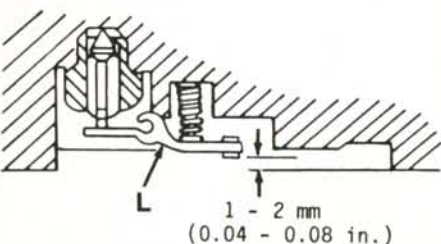


Fig. JS3-5—Inlet needle valve lever (L) should be 1-2 mm (0.04-0.08 in.) below surface of carburetor housing when needle valve is seated.

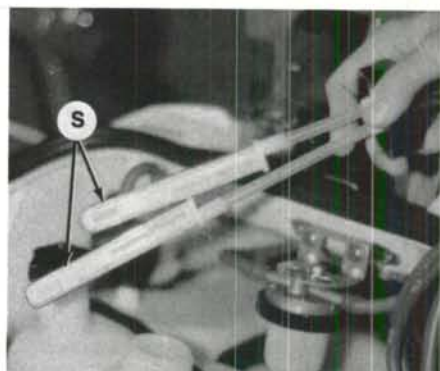


Fig. JS3-11—View identifies fuel tank strainers (S). Reserve "RES" is longest pickup line.

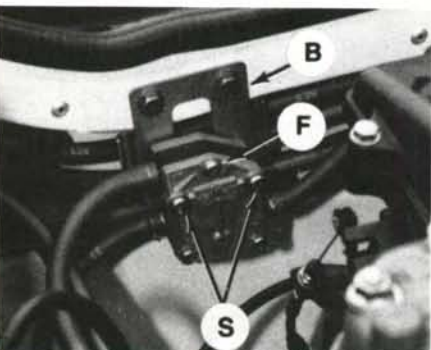


Fig. JS3-7—View identifies fuel pump assembly (F) used on all models. Remove two screws (S) to withdraw fuel pump assembly from mounting bracket (B).

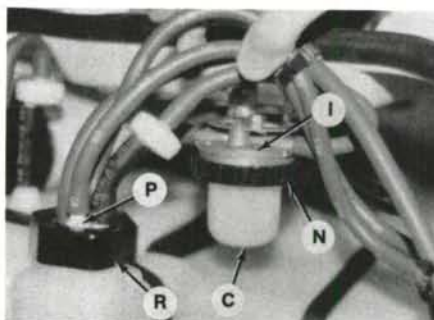


Fig. JS3-10—Ring nut (R) secures pickup assembly (P) in fuel tank. On JS650SX models, a sediment bowl assembly (I) is used. Unscrew ring nut (N) to withdraw cup (C) with sealing ring.

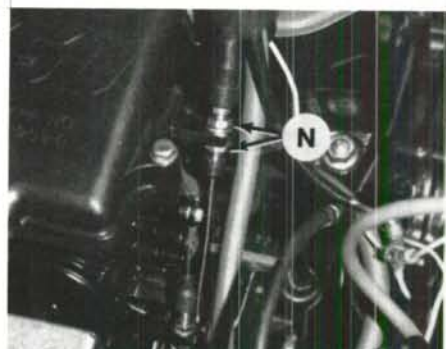


Fig. JS3-13—Rotate locknuts (N) up or down cable housing end as needed to adjust throttle lever free play. Model JF650 is shown. Throttle cable on Model JS650SX is routed from the bottom.

should be cleaned. Unscrew ring nut (R—Fig. JS3-10) and withdraw pickup assembly (P). Clean strainers (S—Fig. JS3-11) with a suitable cleaning solution and a soft-bristled brush if needed. Renew sealing ring and securely tighten nut (R—Fig. JS3-10) 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. JS3-13) 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. JS3-15). Every 25 hours or more frequent if needed, remove two cap screws (S) and withdraw cover and flame arrestor. Inspect flame arrestor for contamination and use clean compressed air to blow clean. Renew flame arrestor if damage is noted. Install flame arrestor while making sure gasket is located beneath flame arrestor. Apply Loctite Lock N'Seal or a suitable equivalent on threads of the two 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.

Remove bypass hose (H—Fig. JS3-30) from fitting (F) on cylinder head and exhaust pipe. Refer to Fig. JS3-31. Connect a short piece of a suitable sized hose to fitting on cylinder head and exhaust pipe, then connect hose ends to a tee

adapter. Use a suitable sized hose and an adapter and connect a supplemental water supply to tee adapter.

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.

Place a container under oil pump (P—Fig. JS3-17). 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 40:1 must be supplied to engine during test.

Disconnect transparent outlet hose (T—Fig. JS3-17) 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 and properly adjust water flow. Accelerate engine to 6000 rpm and maintain for one minute. After one minute, note amount of oil in measur-

ing 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 5.9-7.2 mL (0.20-0.24 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 simultaneous 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 17 degrees or 2.0 mm (0.08 in.) before top dead center (BTDC) at 6000 rpm on all models. Ignition timing can be checked dynamically using a suitable power timing light. Remove plug (G—Fig. JS3-19) from flywheel cover (C).

Remove bypass hose (H—Fig. JS3-30) from fitting (F) on cylinder head and exhaust pipe. Refer to Fig. JS3-31. Connect a short piece of a suitable sized hose to fitting on cylinder head and exhaust pipe, then connect hose ends to tee adapter. Use a suitable sized hose and an adapter and connect a supplemental water supply to tee adapter.

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.

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. Point timing light so strobe light flashes into plug opening (O—Fig. JS3-19). Note if timing mark on flywheel aligns with

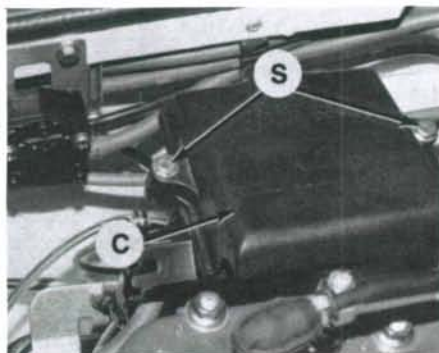


Fig JS3-15—Remove two cap screws (S) to withdraw cover (C) and flame arrestor.

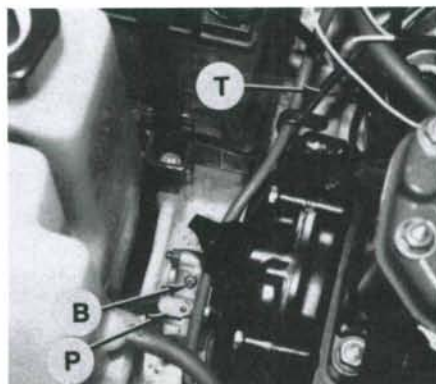


Fig. JS3-17—View identifies oil injection pump assembly (P), air bleed screw (B) and transparent outlet hose (T).

notch (N) in flywheel cover. 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, first disconnect battery cables from battery and remove battery from vehicle. Remove fuel tank hoses, as needed, and oil tank hose and plug openings to allow removal of respective tank. Remove fuel tank and oil tank. Remove oil injection pump assembly (P). Remove flywheel cover (C). Remove flywheel retaining cap 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 cap screw to 69 N·m (51 ft.-lbs.) on JF650 models and 98 N·m (72 ft.-lbs.) on JS650SX models.

Apply a suitable thread locking solution on threads of flywheel cover retaining screws, then install flywheel cover (C) with "O" ring seal and tighten screws to 7.8 N·m (69 in.-lbs.). Reinstall oil injection pump assembly (P), fuel tank and oil tank and reconnect hoses. Reinstall battery and connect battery cables. Bleed air from oil supply line or oil injection pump as outlined under BLEEDING PUMP in OIL INJECTION section.

Recheck ignition timing. Continue previously outlined adjustment procedure until correct ignition timing is obtained.

If accuracy of timing mark on flywheel is questioned, then detach spark plug leads from spark plugs and ground terminal ends. Disconnect battery cables from battery and remove battery from vehicle. Remove fuel tank hoses, as needed, and oil tank hose and plug openings to allow removal of respective tank. Remove fuel tank and oil tank. Remove oil injection pump assembly (P). Remove flywheel cover (C). Remove number one cylinder (forward cylinder) spark plug. Position a suitable dial indicator so indicator needle projects through number one cylinder spark plug hole. Rotate flywheel until piston in cylinder is posi-

tioned at TDC. Zero dial indicator face with needle, then rotate flywheel clockwise until 2.0 mm (0.08 in.) is read on dial indicator.

Apply a suitable thread locking solution on threads of flywheel cover retaining screws, then install flywheel cover (C) with "O" ring seal and tighten screws to 7.8 N·m (69 in.-lbs.). Reinstall oil injection pump assembly (P), fuel tank and oil tank and reconnect hoses. Reinstall battery and connect battery cables.

Note if original mark on flywheel aligns with notch (N) in flywheel cover. If not, scribe a new mark on flywheel in alignment with notch. Remove dial indicator and reinstall spark plug. Reconnect spark plug leads.

Bleed air from oil supply line or oil injection pump as outlined under BLEEDING PUMP in OIL INJECTION section. Recheck ignition timing as previously outlined. New scribe mark should align with notch (N) in flywheel cover if ignition timing is correct.

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 plugs, wiring or wiring connection failure. Trouble-shoot ignition circuit using a suitable ohmmeter as follows:

Disconnect battery cables from battery terminals. On JS650SX models, remove electric box cover mounting cap screws and withdraw cover to expose wire connectors. On JF650 models, disconnect black/red wire and black wire at connectors leading to exciter coil mounted on magneto base plate. On JS650SX models, disconnect black/yellow wire and black/red wire at connectors leading to exciter coil mounted on magneto base plate. Check condition of exciter coil by attaching a tester lead

to terminal end of each wire leading to exciter coil. Exciter coil can be considered satisfactory if resistance reading is within the limits of 250-380 ohms. Exciter coil is renewable as an assembly with battery charge coil and magneto base plate.

To renew magneto base plate assembly, first remove battery from vehicle. Remove fuel tank hoses, as needed, and oil tank hose and plug openings to allow removal of respective tank. Remove fuel tank and oil tank. Remove oil injection pump assembly (P—Fig. JS3-19). Remove flywheel cover (C). Remove flywheel retaining cap screw, then use a suitable puller and withdraw flywheel. Renew magneto base plate assembly. Align mark (M—Fig. JS3-20) on magneto base plate with mark (K) on crankcase, then securely tighten retaining screws. Install flywheel and tighten retaining cap screw to 69 N·m (51 ft.-lbs.) on JF650 models and 98 N·m (72 ft.-lbs.) on JS650SX models.

Apply a suitable thread locking solution on threads of flywheel cover (C—Fig. JS3-19) retaining screws, then install

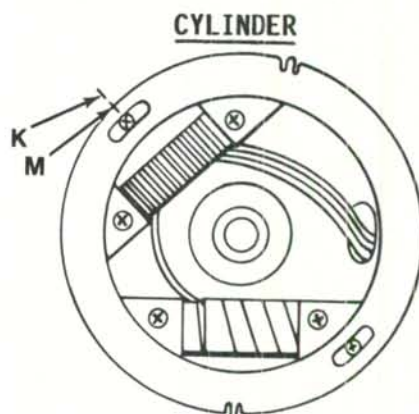
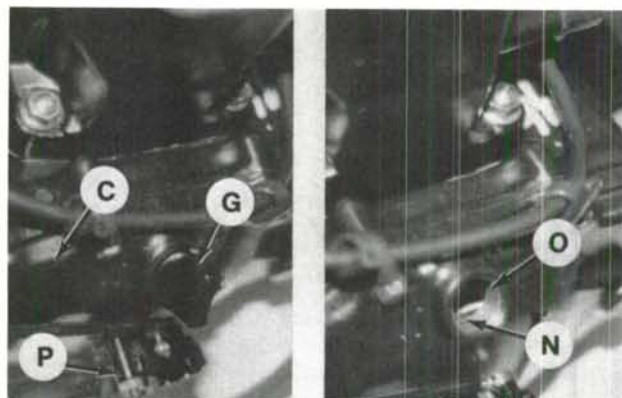


Fig. JS3-20—When renewing magneto base plate, align mark (M) on magneto base plate with mark (K) on crankcase.

Fig. JS3-19—View identifies flywheel cover (C), plug (G) and oil injection pump assembly (P). With plug (G) removed, notch (N) in flywheel cover opening (O) is exposed. Refer to text.



flywheel cover with "O" ring seal and tighten screws to 7.8 N·m (69 in.-lbs.). Reinstall oil injection pump assembly (P), fuel tank and oil tank and reconnect hoses. Reinstall battery and connect battery cables. Bleed air from oil supply line and oil injection pump as outlined under BLEEDING PUMP in OIL INJECTION section. Recheck and adjust ignition

timing as previously outlined under IGNITION TIMING.

To check CDI module/ignition coil assembly on JF650 models, refer to Fig. JS3-21. To check CDI module/ignition coil assembly on JS650SX models, refer to Fig. JS3-22. Ignition coil secondary winding resistance should be 2100-3100 ohms.

+Tester Lead -Tester Lead	Black /Red	Black /White	Black /Yellow
Black /Red		B	C
Black /White	A		A
Black /Yellow	B	D	

Fig. JS3-21—Use adjacent chart and values listed below to test CDI module/ignition coil unit on JF650 models.

- A. Infinite
- B. 1,000-5,000 ohms
- C. 500,000-Infinite ohms
- D. 5,000-17,000 ohms

+Tester Lead -Tester Lead	Brown	Black /Yellow	Black	Blue
Brown		E	A	E
Black /Yellow	C		A	B
Black	D	D		D
Blue	C	B	A	

Fig. JS3-22—Use adjacent chart and values listed below to test CDI module/ignition coil unit on JS650SX models.

- A. Infinite
 - B. Zero ohms
 - C. 3,000-6,000 ohms
 - D. Initial: 15,000-25,000 ohms; Charging capacitor: 50,000-100,000 ohms*
 - E. 500,000-Infinite ohms*
- *If test must be reperfomed to obtain value, a 30 second gap must be existent between tests.

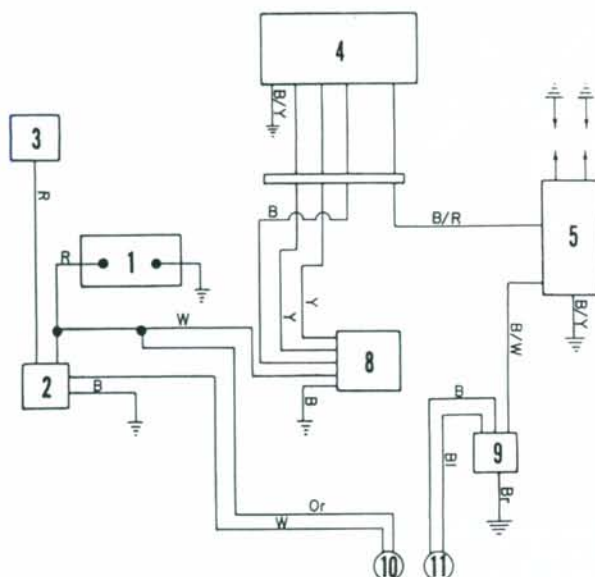


Fig. JS3-23—Wiring diagram typical of all JF650 models.

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

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 on all models. The charge coil should produce 38 ac volts when engine is operated at approximately 3000 rpm. Rectifier/ regulator assembly should prevent regulated voltage from exceeding 15 dc volts.

The battery electrolyte level should be checked periodically and filled to maximum 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. Disconnect battery cables from battery terminals. On JS650SX models, remove electric box cover mounting cap screws and withdraw cover to expose wire connectors. On all models, disconnect two yellow wires at connectors leading to charge coil mounted on magneto base plate. Refer to Fig. JS3-23 for Model JF650 and Fig. JS3-24 for Model JS650SX. Check condition of charge coil by attaching one tester lead to terminal end of one yellow wire and attaching other tester lead to terminal end of remaining yellow wire. Resistance reading should be 1.5-2.3 ohms. Check resistance between each charge coil wire and black wire. Tester should show 0.7-1.3 ohms resistance at each wire. Charge coil is renewable as an assembly with ignition exciter coil and magneto base plate.

To renew magneto base plate assembly, first remove battery from vehicle. Remove fuel tank hoses, as needed, and oil tank hose and plug openings to allow removal of respective tank. Remove fuel tank and oil tank. Remove oil injection pump assembly (P—Fig. JS3-19). Remove flywheel cover (C). Remove flywheel retaining cap screw, then use a suitable puller and withdraw flywheel. Renew magneto base plate assembly. Align mark (M—Fig. JS3-20) on magneto base plate with mark (K) on crankcase, then securely tighten retaining screws. Install flywheel and tighten retaining cap screw to 69 N·m (51 ft.-lbs.) on JF650 models and 98 N·m (72 ft.-lbs.) on JS650SX models.

Apply a suitable thread locking solution on threads of flywheel cover (C—Fig. JS3-19) retaining screws, then install flywheel cover with "O" ring seal and tighten screws to 7.8 N·m (69 in.-lbs.) Reinstall oil injection pump assembly (P), fuel tank and oil tank and reconnect hoses. Reinstall battery and connect battery cables. Bleed air from oil supply line and oil injection pump as outlined under BLEEDING PUMP in OIL INJECTION section. Recheck and adjust ignition timing as outlined under IGNITION TIMING in IGNITION section.

To check rectifier/regulator assembly, refer to chart shown in Fig. JS3-26. 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.

Remove bypass hose (H—Fig. JS3-30) from fitting (F) on cylinder head and exhaust pipe. Refer to Fig. JS3-31. Connect a short piece of a suitable sized hose to fitting on cylinder head and exhaust pipe, then connect hose ends to a tee adapter. Use a suitable sized hose and an adapter and connect a supplemental water supply to tee adapter.

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.

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 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 (T—Fig. JS3-28) 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. JS3-29) 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 the 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, remove bypass hose (H—Fig. JS3-30) from fitting

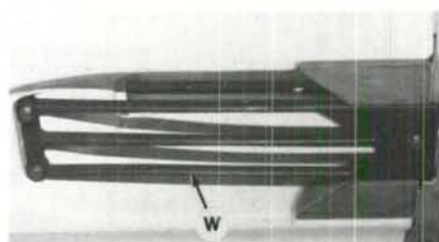


Fig. JS3-29—Jet pump water intake grill (W) must be kept clean of all foreign debris.

Fig. JS3-24—Wiring diagram typical of all JS650SX models.

1. Battery
2. Starter solenoid
3. Starter motor
4. Magneto assy.
5. CDI module/ignition coil assy.
8. Rectifier/regulator
10. Start switch
11. Stop switch
- B. Black
- R. Red
- W. White
- Y. Yellow
- Bl. Blue
- Or. Orange
- B/R. Black/red
- B/Y. Black/yellow

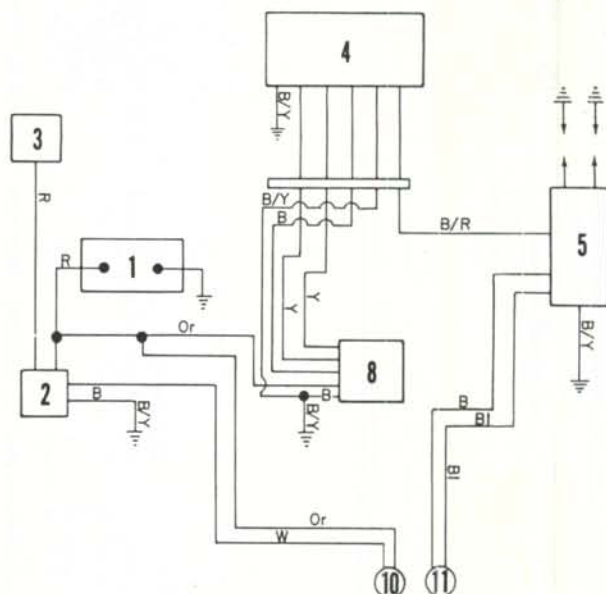


Fig. JS3-26—Use adjacent chart and values listed below to test condition of rectifier/regulator assembly.

- A. Infinite resistance
- B. 1,000-5,000 ohms
- C. 2,000-10,000 ohms

+Tester Lead -Tester Lead	White (JF650) Orange (JS650SX)	Black	Yellow	Yellow
White (JF650) Orange (JS650SX)		A	A	A
Black	A		A	A
Yellow	B	C		A
Yellow	B	C	A	

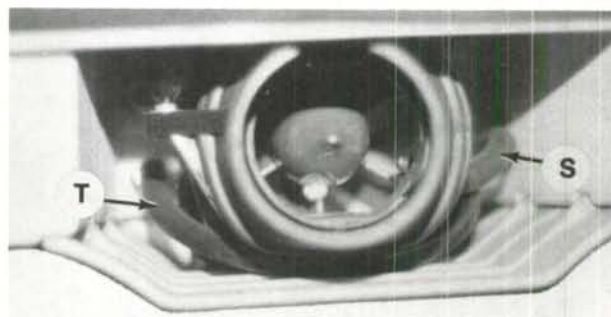


Fig. JS3-28—View identifies jet pump cooling system supply hose (T) and bilge siphon hose (S).

Jet Ski (JF650 & JS650SX)

(F) on cylinder head and exhaust pipe. Refer to Fig. JS3-31. Connect a short piece of a suitable sized hose to fitting on cylinder head and exhaust pipe, then connect hose ends to a tee adapter. Use a suitable sized hose and an adapter and connect a supplemental water supply to tee adapter.

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.

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.

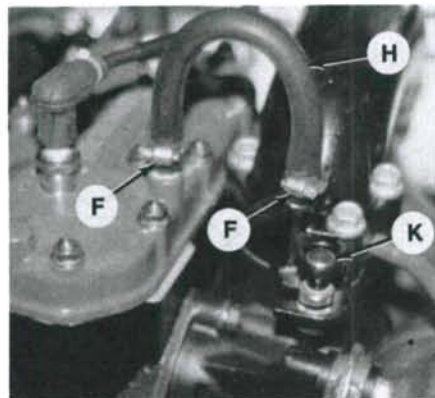


Fig. JS3-30—View identifies bypass hose (H) and fitting (F) on cylinder head and exhaust pipe. Knob (K) controls operation of water drain valve via a cable.

WATER DRAIN VALVE

All Models

A reed valve type water drain valve is mounted on the lower crankcase half. Water drain valve is provided to allow crankcase to be easily drained when contaminated with water. Knob (K—Fig. JS3-30) is used to operate a control valve in water drain valve assembly via a cable. The positioning of the control valve will allow operation or restrict operation of reed valve in water drain valve assembly. To drain crankcase of any water, remove spark plug leads and properly ground. Pull knob (K) up to allow operation of reed valve. Crank engine over with electric starter to expel water from crankcase. To restrict operation of reed valve, push knob (K) down to seated position.

ENGINE

All Models

REMOVE AND REINSTALL. Disconnect battery cables from battery and remove battery from vehicle. Remove oil tank and on Model JF650, remove fuel tank. Plug all hose and fitting openings. Remove throttle cable and choke cable from carburetor. Remove hoses from carburetor, label if needed and plug openings. Remove exhaust pipe from exhaust manifold. Separate wires at connectors leading to exciter coil and battery charge coil mounted on magneto base plate.

Detach spark plug leads, disconnect starter motor lead and all other electrical wiring that will interfere with engine removal and label for reassembly. Remove fuel pump pulse line from crankcase fitting. Remove cooling system supply hose (P—Fig. JS3-32) from fitting on bottom of exhaust manifold. Remove four cap screws (C—Fig. JS3-33) 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.

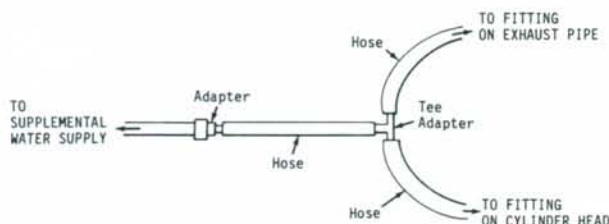


Fig. JS3-31—Remove bypass hose (H—Fig. JS3-30), then connect components as shown to fitting (F—Fig. JS3-30) on cylinder head and exhaust pipe to connect a supplemental water supply.

PERSONAL WATER VEHICLE

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. Align cast protrusion (P—Fig. JS3-34) on flywheel cover with arrow (A) molded into vehicle hull. Check for clearance between engine mounting plate and shims on top of vehicle hull mounts by attempting to rock engine with light hand pressure. If rocking is noted, indicating clearance, then adjust thickness of shims until engine will not rock on mounts. Apply Loctite Lock N'Seal or a suitable equivalent on threads of four engine retaining cap screws (C—Fig. JS3-33) and tighten cap screws to 36 N·m (26 ft.-lbs.).

Complete reassembly in reverse order of disassembly. Bleed air from oil supply line or oil injection pump as outlined under BLEEDING PUMP in OIL INJECTION section.

DISASSEMBLY. Remove engine mounting plate. Remove flame arrestor assembly, carburetor and spark plugs. Remove water drain valve cable from mounting bracket. Remove cylinder

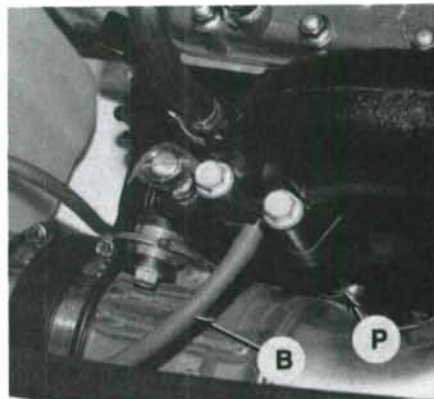


Fig. JS3-32—View identifying cooling system supply hose (P) routed from jet pump and bypass hose (B) routed to fitting in side of hull.

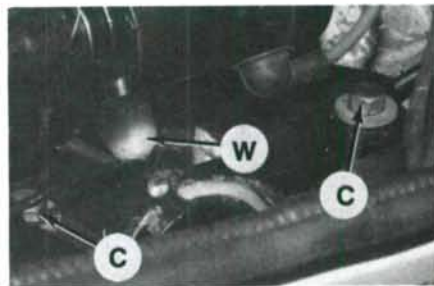


Fig. JS3-33—Engine is retained to vehicle hull by front and rear cap screws (C) on each side of engine. A lockwasher and flat washer is used on each cap screw. View identifies location of water drain valve (W) on port side of engine.

head nuts, then tap cylinder head with a soft-faced mallet to separate components and lift cylinder head off cylinder block. Remove cylinder block nuts, then tap cylinder block with a soft-faced mallet to break loose from top crankcase half. Carefully withdraw cylinder block. Rotate crankshaft to position piston for number one cylinder (front) at top of stroke. Remove piston pin retaining clips. Use a suitable piston pin puller if needed and extract piston pin. Lift piston off connecting rod. Remove needle bearing from small end of connecting rod. Keep piston components together and place to the side. Label components "number one cylinder" for reference during reassembly. Repeat procedure to remove piston for number two cylinder and label accordingly.

Remove oil injection pump assembly. Remove flywheel cover. Hold flywheel with a suitable tool and rotate engine drive flange off crankshaft using Kawasaki tool 57001-1230. Remove electric starter motor and reduction gear assembly. Remove cap screw retaining flywheel, then use a suitable puller and withdraw flywheel. Note mark (M—Fig. JS3-20) on magneto base plate that aligns with mark (K) on crankcase. If magneto base plate position has been altered during ignition timing adjustment, then a new mark should be scribed in magneto base plate to align with mark (K) on crankcase to ensure correct position during reassembly. Remove magneto base plate with ignition components. Remove water drain valve assembly. Mount crankcase assembly in an engine holder or suitably support top of upper crankcase half so lower crankcase half faces upward. Remove seven 6 mm cap screws and washers securing crankcase halves together. Use a soft-faced mallet and tap crankcase halves to separate or pry halves apart using care not to damage

mating surfaces. Lift bottom crankcase half off top crankcase half. Crankshaft assembly can now be withdrawn from top crankcase half.

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

ASSEMBLY. 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. Apply a high temperature grease on lip of seals. Properly assemble components on crankshaft. Install crankshaft assembly into top crankcase half. Make sure pin (5—Fig. JS3-37) in top crankcase half properly seats in hole in center oil seal assembly. 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 surfaces of bottom crankcase half. Position bottom crankcase half on top crankcase half. Apply a suitable thread locking solution on threads of crankcase halves securing cap screws, then install the seven 6 mm cap screws and washers and the eight 8 mm cap screws and washers. Use tightening sequence shown in Fig. JS3-35 and tighten 6 mm cap screws to 7.8 N·m (69 in.-lbs.) and 8 mm cap screws to 25 N·m (18 ft.-lbs.).

Install water drain valve assembly. Install magneto base plate with ignition components and properly align mark (M—Fig. JS3-20) on magneto base plate with mark (K) on crankcase, then securely tighten retaining screws. Install flywheel and tighten retaining cap screw to 69 N·m (51 ft.-lbs.) on JF650 models and 98 N·m (72 ft.-lbs.) on JS650SX models. Install engine drive flange and tighten to 98 N·m (72 ft.-lbs.) on JF650 models and 27 N·m (20 ft.-lbs.) on JS650SX models using Kawasaki 57001-276. Apply a suitable thread locking solution on threads of flywheel cover retaining screws, then install

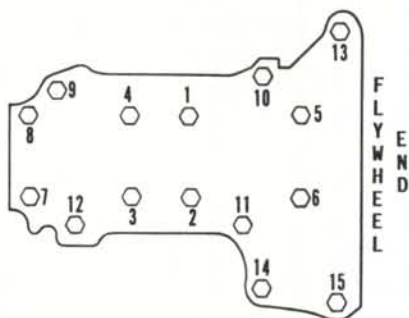


Fig. JS3-35—Tighten crankcase cap screws in sequence shown. Refer to text for tightening torque specifications.

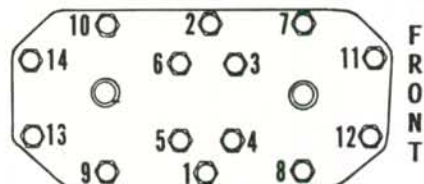


Fig. JS3-36—Tighten cylinder head nuts in sequence shown. Refer to text for tightening torque specifications.

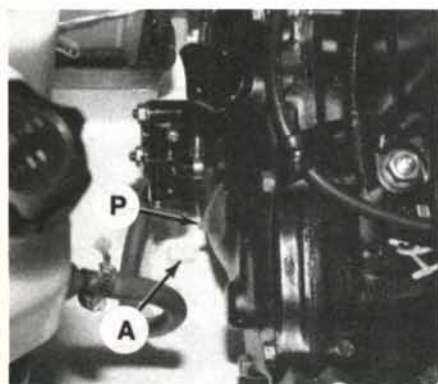
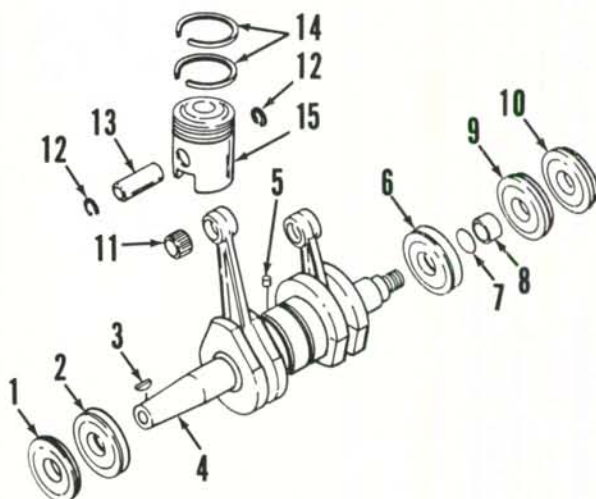


Fig. JS3-34—Protrusion (P) on flywheel cover must align with arrow (A) molded into vehicle hull.

Fig. JS3-37—Exploded view of typical crankshaft assembly used on all models. Pin (5) is located in top crankcase half.

1. Seal
2. Bearing
3. Key
4. Crankshaft & connecting rod assy.
5. Pin
6. Bearing
7. "O" ring
8. Collar
9. Seal
10. Seal
11. Needle bearing
12. Retaining clip
13. Piston pin
14. Piston rings
15. Piston



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flywheel cover with "O" ring seal and tighten screws to 7.8 N·m (69 in.-lbs.).

Rotate crankshaft to position connecting rod for number two cylinder (rear) at top of stroke. Install needle bearing in small end of connecting rod and liberally lubricate with engine oil. Position piston assembly on connecting rod with arrow on piston crown facing cylinder exhaust port side and lubricate piston pin bores with engine oil. Use a suitable tool if needed and install piston pin. Install new piston pin retaining clips with openings facing top or bottom of piston. Repeat procedure to install number one cylinder piston assembly. Install cylinder block base gasket. Position a suitable tool on engine drive flange to prevent crankshaft rotation. Use suitable ring compressors and compress piston rings. Liberally lubricate cylinder bores with engine oil. Slide cylinder block onto top of crankcase half and remove piston ring compressors as piston assemblies slide into cylinders. Use a crisscross pattern and tighten cylinder block retaining nuts to 34 N·m (25 ft.-lbs.). Install cylinder head gasket with "UP" mark facing upward and "EX" mark facing exhaust port side of cylinder block. Install cylinder head and tighten retaining nuts to 25 N·m (18 ft.-lbs.) on JF650 models and to 23 N·m (17 ft.-lbs.) on JS650SX models following tightening sequence shown in Fig. JS3-36.

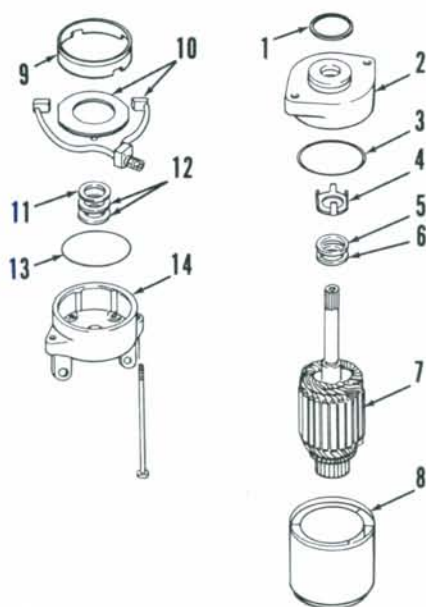


Fig. JS3-39—Exploded view of typical electric starter assembly.

- | | |
|------------------|----------------------------|
| 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 | |

Complete remainder of assembly by reversing disassembly procedure.

PISTONS, PINS, RINGS AND CYLINDERS. Recommended piston skirt-to-cylinder clearance is 0.074-0.104 mm (0.0029-0.0041 in.) on JF650 models and 0.074-0.084 mm (0.0029-0.0033 in.) on JS650SX models. 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 walls for scoring. If minor scoring is noted, cylinders should be honed to smooth out cylinder walls.

Recommended piston ring end gap is 0.2-0.4 mm (0.008-0.016 in.) with a service limit of 0.7 mm (0.027 in.). Install piston rings on piston so locating pin notch in piston ring ends faces 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; openings of retaining clips must face top or bottom of piston. Coat bearings, pistons, rings and cylinder bores with engine oil during assembly.

CONNECTING RODS, CRANKSHAFT AND BEARINGS. The crankshaft assembly should only be disassembled if the necessary tools and experience are available to service this type of crankshaft. Connecting rods, crankpins and crank halves are only available as a complete crankshaft assembly.

Maximum crankshaft runout measured on outer surface of outside main bearings with crankshaft center main bearings supported on vee blocks is 0.10 mm (0.004 in.). Connecting rod radial clearance should be 0.045-0.055 mm (0.0018-0.0022 in.) with a service limit of 0.11 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 (0.031 in.). Maximum allowable connecting rod bend or twist measured over a 100 mm (3.9 in.) length is 0.2 mm (0.008 in.).

ELECTRIC STARTER

All Models

All models are equipped with electric starter shown in Fig. JS3-39. 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.

PERSONAL WATER VEHICLE

Starter brushes have a standard length of 12.5 mm (0.49 in.) and should be renewed if worn to 6.5 mm (0.26 in.). Commutator has a standard diameter of 28 mm (1.10 in.) and should be renewed 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. JS3-28) opening. The passing force of water creates a vacuum effect, thus drawing (siphoning) any water out of vehicle bilge. Make sure all hoses and bilge strainer (S—Fig. JS3-40) 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 hole in plastic fitting (F) 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

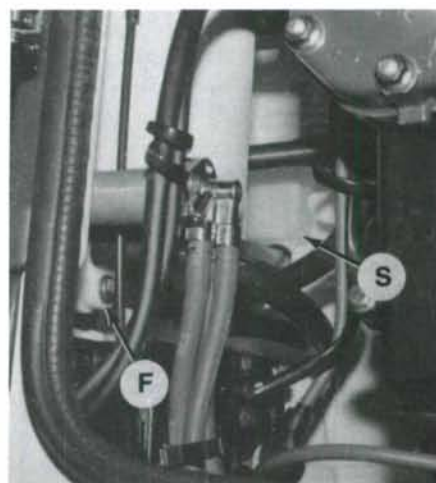


Fig. JS3-40—View identifies location of bilge strainer (S). Plastic fitting (F) of antisiphon loop is located as shown on JS650SX models. On JF650 models, plastic fitting is located near top of main bulkhead.

will result in a decrease in bilge siphoning efficiency.

DRIVE SHAFT AND BEARING CARRIER

All Models

R&R AND OVERHAUL. Disconnect battery cables from battery and remove battery from vehicle. Remove oil tank and on Model JF650, remove fuel tank. Plug all hose and fitting openings. Remove throttle cable and choke cable from carburetor. Remove hoses from carburetor, label if needed and plug openings. Remove exhaust pipe from exhaust manifold. Separate wires at connectors leading to exciter coil and battery charge coil mounted on magneto base plate.

Detach spark plug leads, disconnect starter motor lead and all other electrical wiring that will interfere with engine removal and label for reassembly. Remove fuel pump pulse line from crankcase fitting. Remove cooling system supply hose (P—Fig. JS3-32) from fitting on bottom of exhaust manifold. Remove four cap screws (C—Fig. JS3-33) 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.

Withdraw drive shaft with drive flange from jet pump impeller and drive shaft bearing carrier (R—Fig. JS3-41). To remove drive shaft drive flange, hold drive shaft with Kawasaki tool W56019-003 and adapter 57001-1231 or a suitable equivalent tool, then rotate drive flange off drive shaft using Kawasaki tool 57001-1230 or a suitable equivalent. Remove four bearing carrier assembly mounting cap screws (S), then withdraw bearing carrier assembly (R).

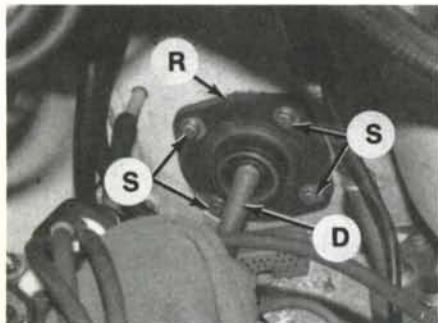


Fig. JS3-41—After withdrawing drive shaft (D) as outlined in text, remove cap screws (S) to withdraw bearing carrier assembly (R).

On JF650 models, pry out two seals (3—Fig. JS3-42) in each end of bearing carrier (1) and press ball bearing (4) out of carrier if needed. On JS650SX models, remove snap ring (6—Fig. JS3-43) in front of large seals (3), then press two large seals (3), ball bearing (4) and two small seals (5) out front of carrier (1).

Inspect all components for excessive wear or any other damage and renew if needed. Drive shaft runout should not exceed 0.5 mm (0.020 in.) on JF650 models and 0.6 mm (0.024 in.) on JS650SX models with drive shaft supported on vee blocks on each end and midway between shaft ends. Measure drive shaft runout midway between center vee block and end vee block on each side of drive shaft.

Install seals in bearing carrier with open sides facing away from center ball bearing. Fill inner seals with a suitable high temperature grease. Install a nonpermanent thread locking solution on threads of bearing carrier mounting cap screws (S—Fig. JS3-41), then install bearing carrier (R) and tighten cap screws (S) to 22 N·m (16 ft.-lbs.). Hold drive shaft with Kawasaki tool W56019-003 and adapter 57001-1231 or a suitable equivalent tool, then use Kawasaki tool 57001-1230 or a suitable equivalent and tighten drive flange to 98 N·m (72 ft.-lbs.) on JF650 models and to 27 N·m (20 ft.-lbs.) on JS650SX models. Grease drive shaft splines, then install drive shaft through bearing carrier and engage drive shaft splines with splines in jet pump impeller.

Use a suitable lifting device to hoist engine assembly into vehicle. Make sure coupler is located between engine drive

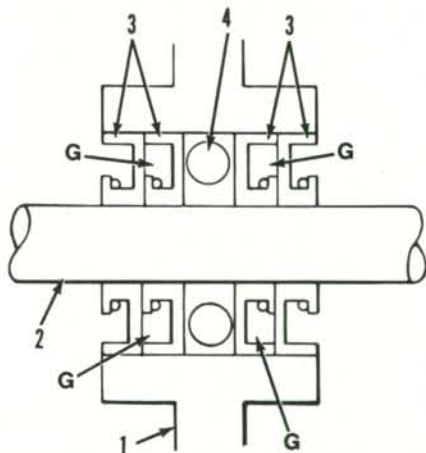


Fig. JS3-42—Cross-sectional view of bearing carrier assembly used on JF650 models. Fill area (G) between inner and outer seals with a suitable high temperature grease.

- | | |
|--------------------|-----------------|
| 1. Bearing carrier | 3. Seals |
| 2. Drive shaft | 4. Ball bearing |

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flange and drive shaft drive flange. Install shims into original locations under engine mounts. Align cast protrusion (P—Fig. JS3-34) on flywheel cover with arrow (A) molded into vehicle hull. Check for clearance between engine mounting plate and shims on top of vehicle hull mounts by attempting to rock engine with light hand pressure. If rocking is noted, indicating clearance, then adjust thickness of shims until engine will not rock on mounts. Apply Loctite Lock N'Seal or a suitable equivalent on threads of four engine retaining cap screws (C—Fig. JS3-33) and tighten cap screws to 36 N·m (26 ft.-lbs.).

Complete reassembly in reverse order of disassembly. Bleed air from oil supply line or oil injection pump as outlined under BLEEDING PUMP in OIL INJECTION section.

JET PUMP

All Models

R&R AND OVERHAUL. Disconnect battery cables from battery. Remove jet pump water intake grill (W—Fig. JS3-45)

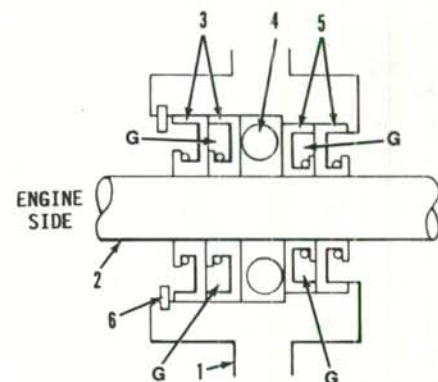


Fig. JS3-43—Cross-sectional view of bearing carrier assembly used on JS650SX models. Fill area (G) between inner and outer seals with a suitable high temperature grease.

- | | |
|--------------------|-----------------|
| 1. Bearing carrier | 4. Ball bearing |
| 2. Drive shaft | 5. Seals |
| 3. Seals | 6. Snap ring |

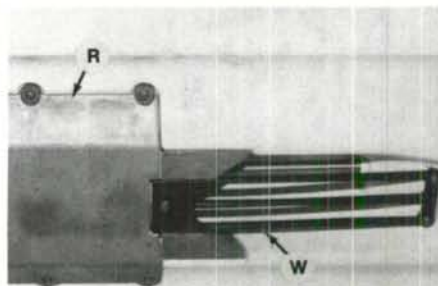


Fig. JS3-45—View identifying jet pump water intake grill (W) and cover (R).

Jet Ski (JF650 & JS650SX)

and cover (R). Detach steering linkage joint (J—Fig. JS3-46) from ball joint on steering nozzle. On JF650 models, detach trim linkage joint from ball joint on trim nozzle. Remove bilge siphon hose (S) and cooling system supply hose (T) from fittings on 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 intake nozzle and vehicle hull. Slide jet pump assembly off rear of drive shaft. Place jet pump assembly on a clean work bench.

On JS650SX models, remove steering nozzle (N). On JF650 models, remove steering nozzle and trim nozzle as an assembly. Remove four cap screws, two on top and two on bottom, to remove outlet nozzle (O). Remove two cap screws to remove cap (12—Fig. JS3-47) with "O" ring (11). Insert rear of impeller shaft (10) into a suitable soft-jawed vise and tighten vise jaws to prevent impeller rotation. Insert Kawasaki impeller tool 57001-1228 into drive shaft splines in impeller (2) and rotate impeller tool counterclockwise (R.H. threads) to remove impeller (2) from impeller shaft (10). Lift pump housing (6) off impeller shaft (10). Extract collar (3), then use a suitable slide hammer and finger assembly to withdraw seals (4). Use a suitable punch and hammer and drive bearing (5) out front of pump housing. Remove spacer (7), then drive bearing (8) out rear of pump housing.

Inspect impeller (2) and impeller case of pump housing (6) for excessive wear or any other damage. Diameter of impeller case in pump housing should not exceed 141.1 mm (5.55 in.). Renew jet pump housing if impeller case is worn beyond limit or any other damage is

noted. Minimum impeller diameter is 138.5 mm (5.453 in.). Manufacturer recommends renewing pump housing (6) if any deep scratches are noted in impeller case. Inspect all other components for any type of damage. Renew components as needed.

Drive rear bearing (8) into pump housing (6) until seated using a suitable bearing driver and hammer. Install spacer (7), then drive front bearing (5) into pump housing until properly seated. Apply Shell MP or Alvania EP1 grease onto seals (4), then install seals into pump housing with open side facing toward impeller. Make sure seals properly seat. Fill seals with previously recommended grease. Push collar (3) into grease seals. Renew "O" rings (9) on impeller shaft (10). Apply Shell MP or Alvania EP1 grease onto impeller shaft, then slide pump housing (6) with assembled components onto impeller shaft (10). With rear of impeller shaft (10) mounted in a suitable soft-jawed vise, install impeller onto impeller shaft and tighten (rotate clockwise) impeller to 98 N·m (72 ft.-lbs.) using Kawasaki impeller tool 57001-1228 and a suitable torque wrench. Renew impeller grease seal (1) if needed. Fill grease seal with Shell MP or Alvania EP1 grease. Install cap (12) with "O" ring (11). Apply Loctite N'Seal or a suitable equivalent onto threads of cap (12) retaining screws, then install screws and securely tighten. Apply Loctite N'Seal or a suitable equivalent onto threads of outlet nozzle (O—Fig. JS3-46) retaining screws, then install outlet nozzle and securely tighten retaining screws. On JS650SX models, install steering nozzle (N). On JF650 models, install steering nozzle and trim nozzle as an assembly.

Apply Shell MP or Alvania EP1 grease on drive shaft splines. Apply Loctite Superflex or a suitable RTV silicone sealer onto jet pump intake area where intake mates with vehicle hull. Slide jet pump assembly onto drive shaft. Apply Loctite Stud N'Bearing Mount or a suitable equivalent on threads of each jet pump housing mounting cap screw, then install and tighten to 25 N·m (18 ft.-lbs.). Reconnect bilge siphon hose (S) and cooling system supply hose (T) on-

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to fittings on jet pump. Reattach steering linkage joint (J) onto ball joint on steering nozzle (N). On JF650 models, reattach trim linkage joint onto ball joint on trim nozzle. Install jet pump cover (R—Fig. JS3-45) and water intake grill (W) and tighten retaining screws to 10 N·m (88 in.-lbs.).

STEERING

Model JS650SX

ADJUSTMENT. With steering handlebar in straight ahead position, jet pump steering nozzle (N—Fig. JS3-46) should be centered or at a 90 degree angle to stern of vehicle. If not, raise handle pole and loosen locknut (L—Fig. JS3-49) below steering linkage joint (G). Remove joint (G) from ball joint on handlebar pivot plate. Rotate joint (G) 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 (G) on ball joint and tighten locknut (L).

NOTE: If steering linkage joint (G) must be rotated out to where minimal threads on steering cable engage joint (G), then rotate joint (G) onto threaded end of steering cable to obtain safe thread engagement and complete adjustment on joint (J—Fig. JS3-46) at jet pump.

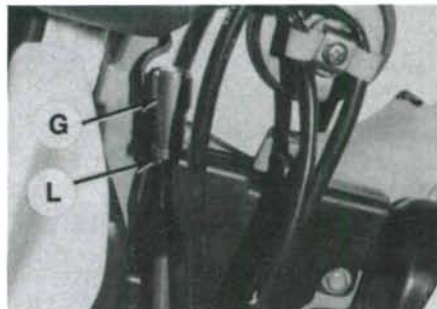


Fig. JS3-49—On JS650SX models, loosen locknut (L) and remove joint (G) from ball joint on handlebar pivot plate and rotate joint (G) up or down on threaded end of steering cable as needed to center jet pump steering nozzle when steering handlebar is in a straight ahead position.

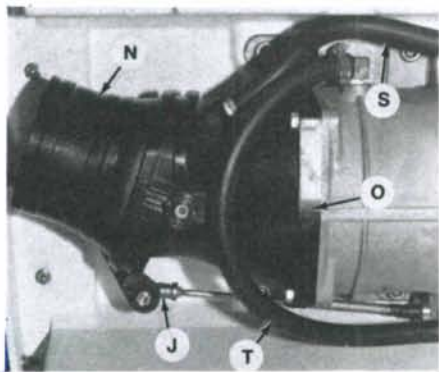
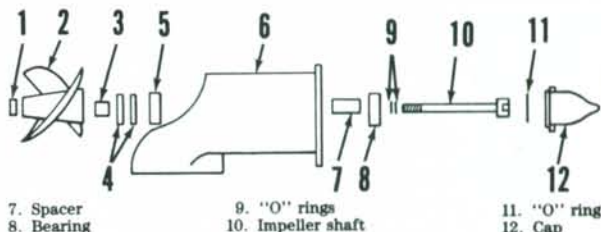


Fig. JS3-46—View of rear jet pump components used on all models. On Model JF650, an adjustable trim nozzle is located between outlet nozzle (O) and steering nozzle (N).

J. Steering linkage joint
N. Steering nozzle
O. Outlet nozzle
S. Bilge siphon hose
T. Cooling system supply hose

Fig. JS3-47—Exploded view showing correct arrangement of jet pump components on all models.

1. Seal
2. Impeller
3. Collar
4. Seals
5. Bearing
6. Pump housing



7. Spacer
8. Bearing

9. "O" rings
10. Impeller shaft

11. "O" ring
12. Cap

Model JF650

ADJUSTMENT. With steering handlebar in straight ahead position, jet pump steering nozzle (N—Fig. JS3-46) should be centered or at a 90 degree angle to stern of vehicle. If not, remove engine cover and loosen locknut (L—Fig. JS3-50) below steering linkage joint (R). Remove joint (R) from ball joint on steering arm. Rotate joint (R) up or down threaded end of steering cable as needed to properly center jet pump steering

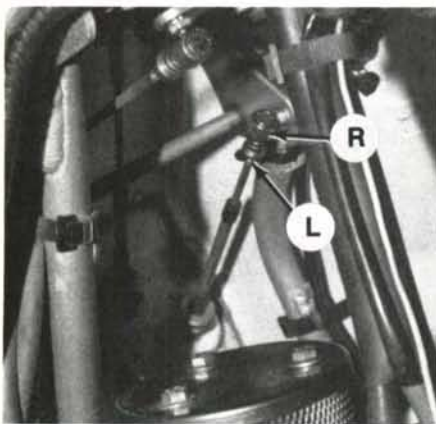


Fig. JS3-50—On JF650 models, loosen locknut (L) and remove joint (R) from ball joint on steering arm and rotate joint (R) up or down on threaded end of steering cable as needed to center jet pump steering nozzle when steering handlebar is in a straight ahead position.

nozzle. After correct adjustment is obtained, reinstall steering linkage joint (R) on ball joint and tighten locknut (L).

NOTE: If steering linkage joint (R) must be rotated out to where minimal threads on steering cable engage joint (R), then rotate joint (R) onto threaded end of steering cable to obtain safe thread engagement and complete adjustment on joint (J—Fig. JS3-46) at jet pump.

TRIM

Model JF650

ADJUSTMENT. With trim knob (K—Fig. JS3-51) rotated complete clockwise (down), jet pump steering nozzle (N—Fig. JS3-46) should almost touch jet pump cover (R—Fig. JS3-45). If not,



Fig. JS3-51—View identifies trim knob (K) on JF650 models.

remove engine cover and adjust steering handlebar to highest position. Loosen locknut (N—Fig. JS3-52) below trim linkage joint (M). Remove joint (M) from ball joint on lever. Rotate joint (M) up or down threaded end of trim cable as needed so steering nozzle almost touches jet pump cover. After correct adjustment is obtained, reinstall trim linkage joint (M) onto ball joint and tighten locknut (N).

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

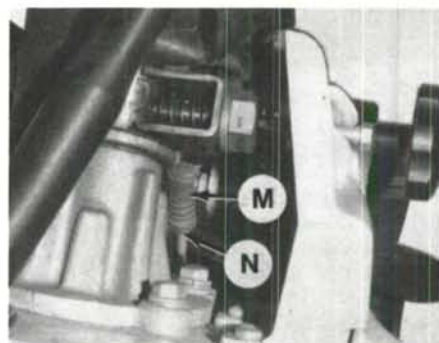


Fig. JS3-52—On JF650 models, loosen locknut (N) and remove joint (M) from ball joint on lever and rotate joint (M) up or down on threaded end of trim cable as needed to correctly position steering nozzle (N—Fig. JS3-46) as outlined in text.

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