YAMAHA

XS650H
XS650SH

Supplementary Service Manual

H/SH

LIT-11616-02-30

4N9-28197-10

INDEX

This manual has been combined with previous service manuals to provide complete service information for: XS650H/SH.

Please read and give special consideration to the “NOTICE” on the preceding page for your safety.

XS650H/SH SUPPLEMENT	**H/SH**
XS650 MODELS 1978-80	**G**

FOREWORD

This Supplementary Service Manual has been prepared to introduce new service and new data for the XS650H/XS650SH. For complete information on service procedure, it is necessary to use this Supplementary Service Manual together with following manuals:

XS650E Service Manual (LIT-11616-00-76)
XS650SE Supplementary Service Manual (LIT-11616-01-08)
XS650SF/2F Supplementary Service Manual (LIT-11616-01-65)
XS650G/SG Supplementary Service Manual (LIT-1 1616-01-75)

SERVICE DEPT.
INTERNATIONAL DIVISION
YAMAHA MOTOR CO., LTD.

NOTE:
This Supplementary Service Manual contains information regarding periodic maintenance to the emission control system for the XS650H/XS650SH. Please read this material carefully.

NOTICE

This manual was written by the Yamaha Motor Company primarily for use by Yamaha dealers and their qualified mechanics. It is not possible to put an entire mechanic's education into one manual, so it is assumed that persons using this book to perform maintenance and repairs on Yamaha motorcycles have a basic understanding of the mechanical concepts and procedures inherent to motorcycle repair technology. Without such knowledge, attempted repairs or service to this model may render it unfit for use and/or unsafe.

This model has been designed and manufactured to perform within certain specifications in regard to performance and emissions. Proper service with the correct tools is necessary to ensure that the motorcycle will operate as designed. If there is any question about a service procedure it is imperative that you contact a Yamaha dealer before continuing. Before attempting any service, check with your Yamaha dealer for any service information changes that apply to this model: This policy is intended to provide the customer with the most satisfaction from his motorcycle and to conform with federal environmental quality objectives.

Yamaha Motor Company, Ltd. is continually striving to further improve all models manufactured by Yamaha. Modifications and significant changes in specifications or procedures will be forwarded to all Authorized Yamaha dealers and will, where applicable, appear in future editions of this manual.

Particularly important information is distinguished in this manual by the following notations:

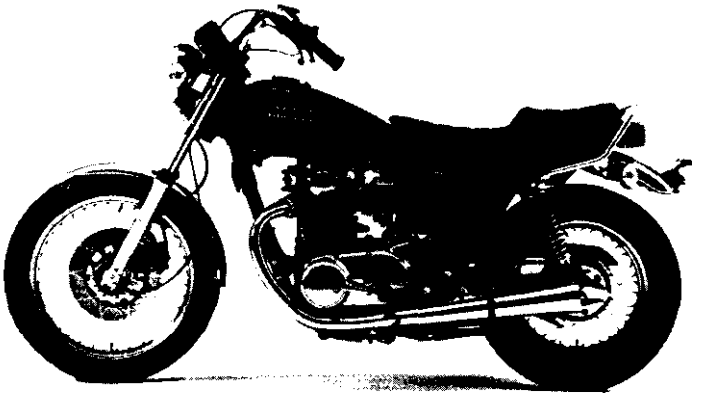
NOTE : **A NOTE provides key information to make procedures easier or clearer.**

CAUTION: **A CAUTION indicates special procedure that must be followed to avoid damage to the motorcycle.**

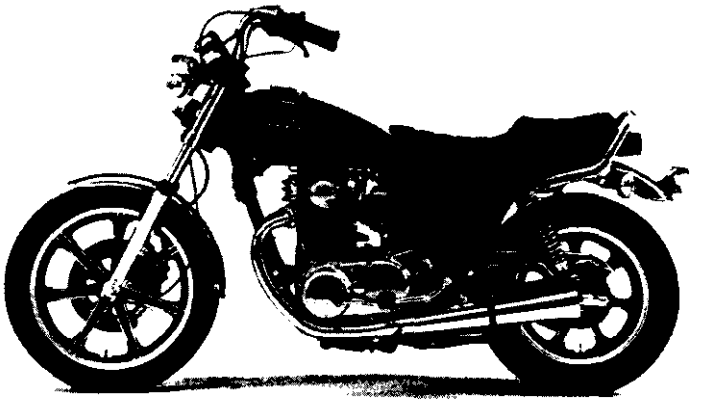
WARNING: **A WARNING indicates special procedures that must be followed to avoid injury to a motorcycle operator or person inspecting or repairing the motorcycle.**

Starting Serial Number

XS650H **4N9-000101**



XS650SH **4M4-000101**



MAINTENANCE AND LUBRICATION CHART

PERIODIC MAINTENANCE EMISSION CONTROL SYSTEM

NO.	ITEM	REMARKS	INITIAL BREAK-IN		THEREAFTER EVERY	
			1,000 km or 1 month (600 mi)	5,000 km or 7 months (3,000 mi)	4,000 km or 6 months (2,500 mi)	8,000 km or 12 months (5,000 mi)
1*	Cam Chain	Check and adjust chain tension.	○	○		○
2*	Valve Clearance	Check and adjust valve clearance when engine is cold.	○	○		○
3	Spark Plugs	Check condition. Adjust gap. Clean. Replace after initial 13,000 km (18 mos) and thereafter every 12,000 km (18 mos)		○	○	
4*	Crankcase Ventilation System	Check ventilation hose for cracks or damage. Replace if necessary.		○		○
5*	Fuel Hose	Check fuel hose and vacuum pipe for cracks or damage. Replace if necessary.		○		○
6*	Exhaust System	Check for leakage. Retighten as necessary. Replace gasket(s) if necessary.		○	○	
7*	Carburetor Synchronization	Adjust synchronization of carburetors.		○	○	
8*	Idle Speed	Check and adjust engine idle speed. Adjust cable free play if necessary.		○	○	

* It is recommended that these items be inspected and service by a Yamaha Dealer or other qualified mechanic.

GENERAL MAINTENANCE/LUBRICATION

NO.	ITEM	REMARKS	TYPE	INITIAL BREAK-IN		THEREAFTER EVERY		
				1,000 km or 1 month (600 mi)	5,000 km or 7 months (3,000 mi)	4,000 km or 6 months (2,500 mi)	8,000 km or 12 months (5,000 mi)	16,000 km or 24 month (10,000 mi
1	Engine Oil	Warm-up engine before draining	Yamalube 4-cycle oil or SAE 20W/40 "SE" motor oil	○	○	○		
2	Oil Filter	Clean element in solvent	–		○		○	
3*	Air Filter	Dry type filter. Clean with compressed air.	–		○		○	
4*	Brake System	Adjust free play. Replace pads (front brake only) or shoes (rear brake only) if necessary.	–	○	○	○		
5*	Clutch	Adjust free play.	–	○	○	○		
6	Drive Chain	Check chain condition. Adjust and lubricate chain thoroughly.	Yamaha chain and cable lube or 10W/30 motor oil	EVERY 500 km (300 mi)				
7	Control and Meter Cable	Apply cable lube thoroughly.	Yamaha chain and cable lube or 10W/30 motor oil	○	○	○		
8	Rear Arm Pivot Shaft	Apply until new grease shows.	Lithium soap base grease			○		
9	Brake Pedal and Change Pedal Shaft	Lubricate Apply chain lube lightly	Yamaha chain and cable lube or 10W/30 motor oil		○	○		
10	Brake/Clutch Lever Pivot Shafts	Apply chain lube lightly	Yamaha chain and cable lube or 10W/30 motor oil		○	○		

NO.	ITEM	REMARKS	TYPE	INITIAL BREAK-IN		THEREAFTER EVERY		
				1,000 km or 1 month (600 mi)	5,000 km or 7 months (3,000 mi)	4,000 km or 6 months (2,500 mi)	8,000 km or 12 months (5,000 mi)	16,000 km or 24 months (10,000 mi)
11	Center and Side Stand Pivots and Kick Crank Boss	Lubricate Apply chain lube lightly.	Yamaha chain and cable lube or SAE 10W/30 motor oil		○	○		
12*	Front Fork Oil	Drain completely. Refill to specification.	Yamaha fork oil 10wt or equivalent					○
13*	Steering Bearings	Check bearings assembly for looseness. Moderately repack every 16,000 km (10,000 mi).	Medium weight wheel bearing grease.		○	○		Repack
14*	Wheel Bearings	Check bearings for smooth rotation.	–		○	○		
15	Battery	Check specific gravity. Check breather pipe for proper operation.	–		○	○		
16*	A.C. Generator	Replace generator brushes. Replace at initial 9,000 km (5,500 mi) and thereafter every 8,000 km (5,000 mi).	–				○	

* It is recommended that these items be inspected and serviced by a Yamaha dealer or other qualified mechanic.

*ENGINE

A. IGNITION TIMING

The ignition system is modified for easier maintenance. Thus, the following "ignition timing check" should be changed,

Ignition timing check

1. Ignition timing is checked with a timing light by observing the position of the rotor pointer and the marks stamped on the timing plate.

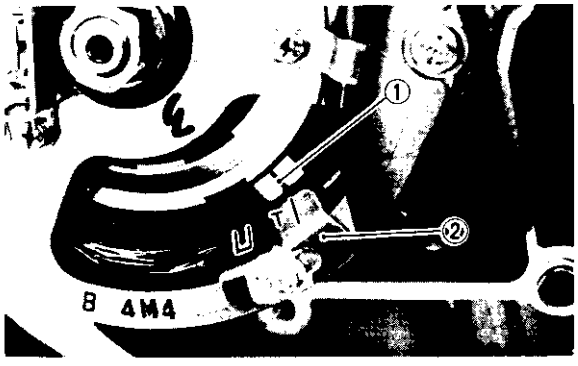
The timing plate is marked as follows.
"Π" Firing range for No. 1 (L.H.) cylinder
"T" Top Dead Center for No. 1 (L.H.) cylinder

2. Connect the timing light to the left cylinder spark plug lead wire.
3. Start the engine and keep the engine speed as specified. Use a tachometer to check the engine speed.

Specified engine speed:
1,200 r/min

4. The rotor pointer should be within the limits of "Π" on the timing plate. If it exceeds the limits or does not steady, check the timing plate for tightness and/or ignition system for damage.

NOTE:
Ignition timing is not adjustable.



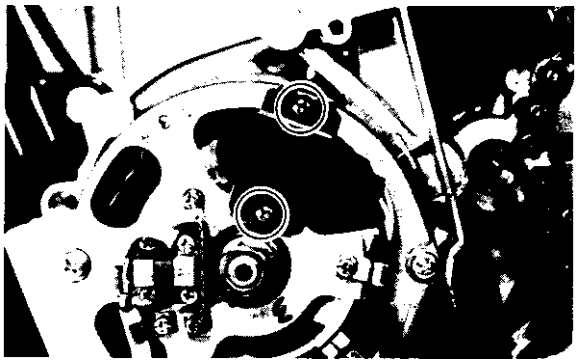
1. Rotor pointer 2. Timing plate

B. PICK-UP COIL ASSEMBLY

The method of mounting the pick-up coil assembly is changed for easier service work. Thus, the followings "Pick-up coil assembly removal" and "Pick-up coil assembly reinstallation" should be changed.

Pick-up coil assembly removal

Remove the pick-up coil securing screws and remove the pick-up coil assembly.



Pick-up coil assembly reinstallation

Install the pick-up coil assembly on to the stator assembly.

C. FUEL LEVEL

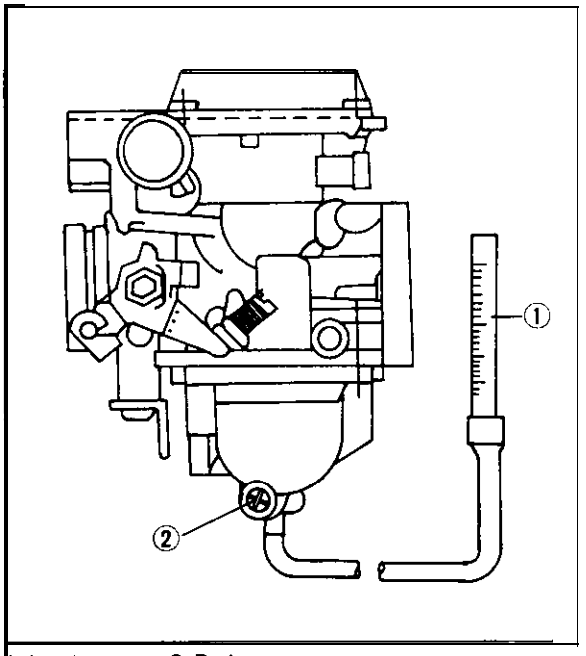
The carburetor is furnished with a drain screw to provide easy access to service work. Thus, the following "Fuel level measurement" should be added.

Fuel level measurement

NOTE:
Before checking the fuel level, note the following:

1. Place the motorcycle on a level surface.
2. Adjust the motorcycle position by placing a suitable stand or a garage jack under the engine so that the carburetor is positioned vertically.

1. Connect the level gauge (special tool) or a vinyl pipe of 6 mm (0.24 in) in inside diameter to the float bowl nozzle left or right side carburetor.
2. Set the gauge as shown and loosen the drain screw.

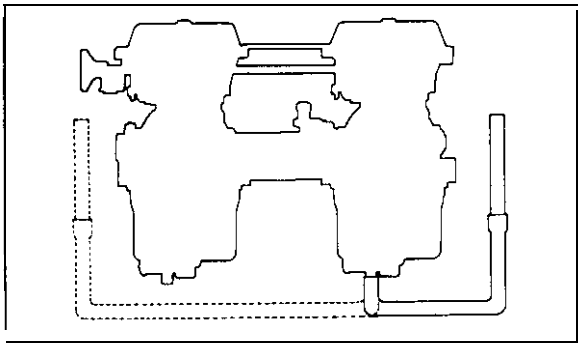


1. Level gauge 2. Drain screw

3. Start the engine and stop it after a few minutes of run. This procedure is necessary to obtain the correct fuel level.

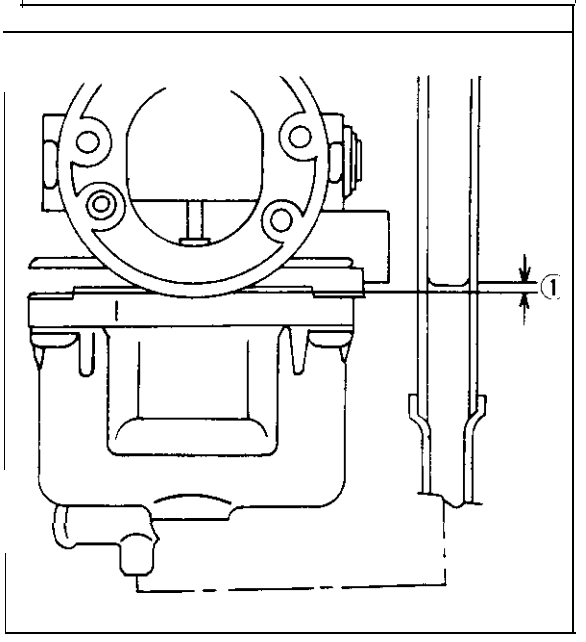
NOTE:
Make sure the fuel petcock is "ON" or "RES" oosition.

4. Note the fuel level and bring the gauge to the other end of the carburetor line and repeat step 3 above. Note the fuel level again and compare it with the previous gauge reading. They should be equal. If not, place a suitable size of wooden piece or the. alike under the center stand and adjust.



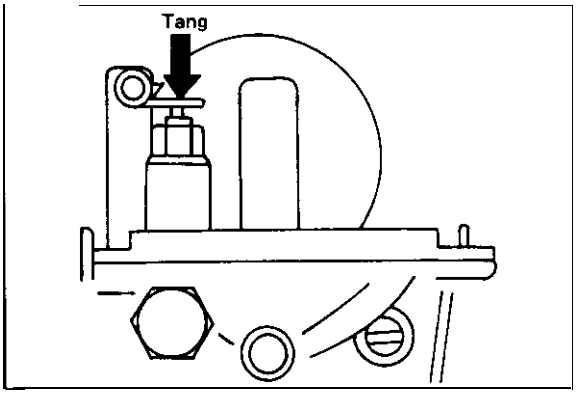
5. Check the fuel level one by one. The level should be in the specified range.

Fuel level:
1 ± 1 mm (0.04 ± 0.04 in) above from the carburetor mixing chamber body edge.



1. Fuel level

6. If the fuel level is incorrect, remove the carburetor assembly from the motorcycle and check the fuel valve(s) and float assembly(s) for damage.
7. If no damage is found, correct the fuel level by slightly bending the float arm tang. Recheck the fuel level.



D. ENGINE OIL LEVEL MEASUREMENT

1. Place the motorcycle on the center stand. Warm up the engine for several minutes.

NOTE:
Be sure the motorcycle is positioned straight up when checking the oil level; a slight tilt toward the side can produce false readings.

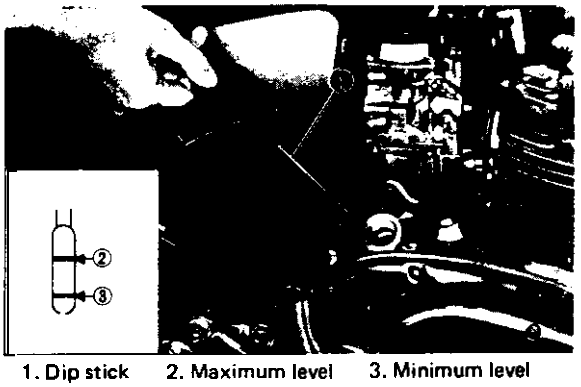
2 With the engine stopped, check the oil level through the level window located at the lower part of the right side crankcase cover, or screw the dip stick completely out and then the stick in the hole.

NOTE:

Wait a few minutes until the oil level settles before checking. When checking engine oil level with the dip stick, let the unscrewed dip stick rest on the case threads.



1. Level window 2. Maximum level 3. Minimum level



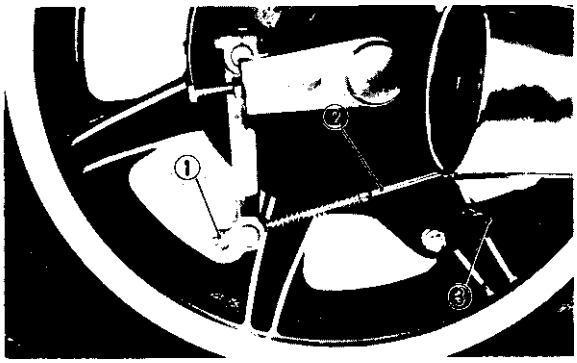
1. Dip stick 2. Maximum level 3. Minimum level

3. The oil level should be between maximum and minimum levels. If the level is lower, add sufficient oil to raise it to the proper level.

*CHASSIS

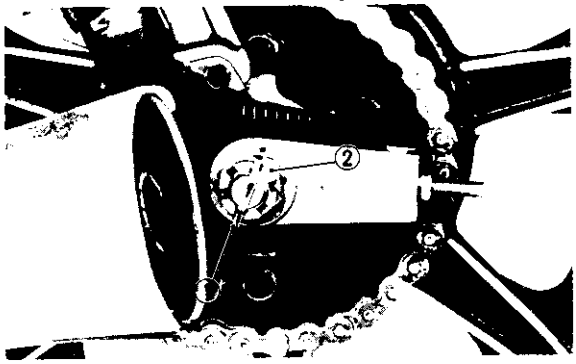
A. REAR WHEEL REMOVAL

1. Place the motorcycle on the center stand.
2. Remove the tension bar and the brake rod from the brake shoe plate. The tension bar can be removed by removing the cotter pin and nut from the tension bar bolt. The brake rod can be removed by removing the adjuster.



1. Adjuster 2. Brake rod 3. Tension bar

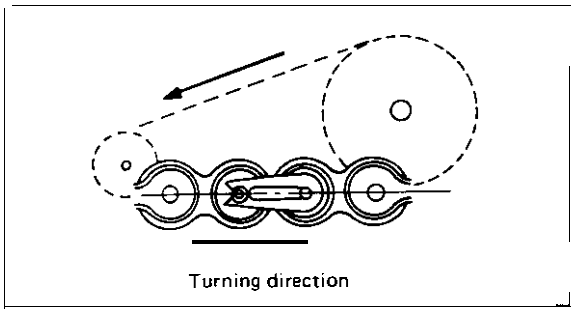
3. Disconnect the drive chain.
4. Loosen the chain tension adjusting nuts and bolts on both sides.
5. Remove the axle nut cotter pin and axle nut. Discard the old pin.



1. Cotter pin 2. Axle nut

6. Remove the axle shaft and the wheel.
7. For reassembly, follow the procedure below with care:

a. Make sure the drive chain master link is correctly installed with rounded end in direction of chain travel.



Turning direction

b. Make sure the axle nut is properly torqued and a new cotter pin is installed.

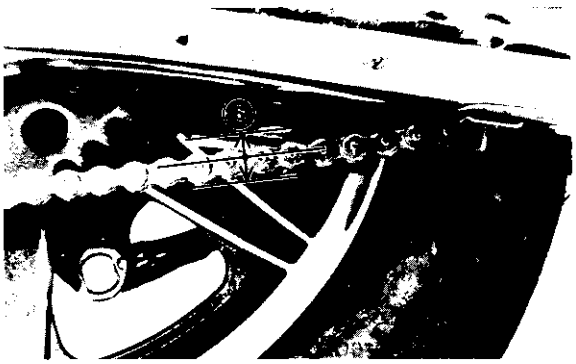
Axle nut torque:
15.0 m-kg (108.5 ft-lb)

c. Adjust the drive chain.

B. DRIVE CHAIN TENSION CHECK

NOTE:

Before checking and/or adjusting, rotate rear wheel through several revolutions and check tension several times to find the tightest point. Check and/or adjust chain tension with rear wheel in this "tight chain" position.



a. 20 ~ 30 mm (0.8 ~ 1.2 in)

Inspect the drive chain with the center stand put up. Check the tension at the position shown in the illustration. The normal vertical deflection is approximately 20 ~ 30 mm (0.8 ~ 1.2 in). If the deflection exceeds 20 ~ 30 mm (0.8 ~ 1.2 in) adjust the chain tension.

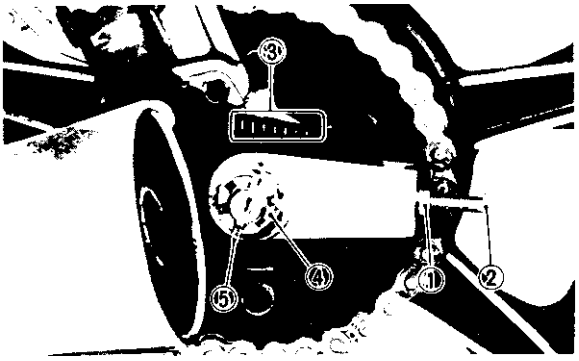
C. DRIVE CHAIN TENSION ADJUSTMENT

1. Loosen the rear brake adjuster.
2. Remove the cotter pin of the rear wheel axle nut with pliers.

NOTE:

The rear wheel axle nut is located on the right side.

3. **Loosen the rear wheel axle nut.**
4. **Loosen the lock nuts on each side. To tighten chain turn chain puller adjusters clockwise. To loosen chain turn adjusters counterclockwise and push wheel forward. Turn each adjuster exactly the same amount to maintain correct axle alignment. (There are marks on each side of the rear arm and on each chain puller; use them to check for proper alignment.)**

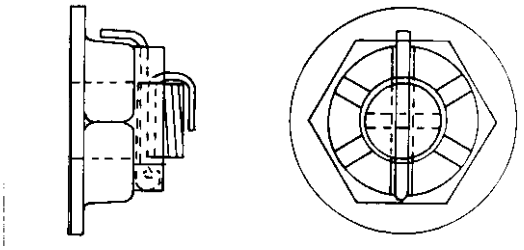


1. Lock nut
2. Adjuster
3. Marks for align
4. Rear wheel axle nut
5. Cotter pin

5. **After adjusting, be sure to tighten the lock nuts and the rear wheel axle nut.**
6. **Insert the cotter pin into the rear wheel axle nut and bend the end of the cotter pin (if the nut notch and the cotter pin hole do not match, tighten the nut slightly to match).**

-CAUTION:

Excessive chain tension will overload the engine and other vital parts; keep the tension within the specified limits. Also, replace the rear axle cotter pin with a new one.



7. **In the final step, adjust the play in the brake pedal.**

D. REAR BRAKE ADJUSTMENT

1. **Pedal height**

a. **Loosen the adjuster lock nut (for pedal height).**

b **By turning the adjuster bolt clockwise or counterclockwise, adjust the brake pedal position so that its top end is approx. 12 ~ 18 mm (0.47 ~ 0.71 in) below the footrest top end.**

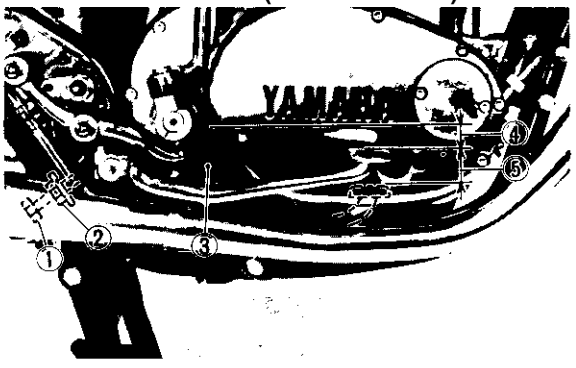
c **Secure the adjuster lock nut.**

-WARNING:

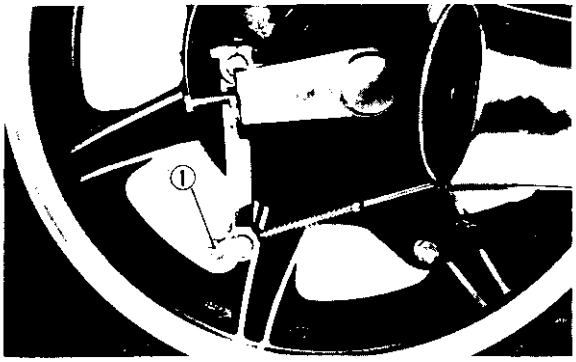
After adjusting the pedal height, the brake pedal free play should be adjusted.

2. **Free play**

Turn the adjuster on the brake rod clockwise or counterclockwise to provide the brake pedal end with a free play of 20 ~ 30 mm (0.79 ~ 1.18 in).



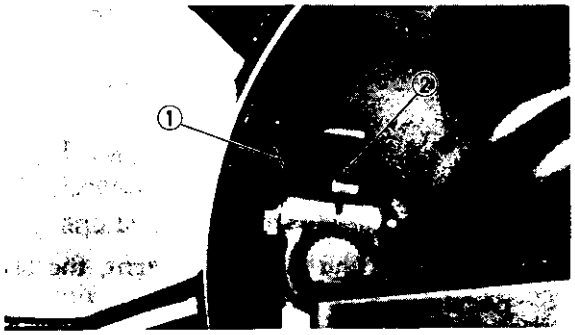
1. Adjuster bolt (for pedal height)
2. Lock nut
3. Footrest
4. Pedal height 12 ~ 18 mm (0.47 ~ 0.71 in)
5. Free play 20 ~ 30 mm (0.79 ~ 1.18 in)



1. Adjuster

E. REAR BRAKE LINING INSPECTION

The specified thickness of the brake lining is 4 mm (0.16 in). The lining should be replaced when it wears to less than 2 mm (0.079 in). To check, see the wear indicator position while depressing the brake pedal.



1. Wear limit 2. Wear indicator

*ELECTRICAL

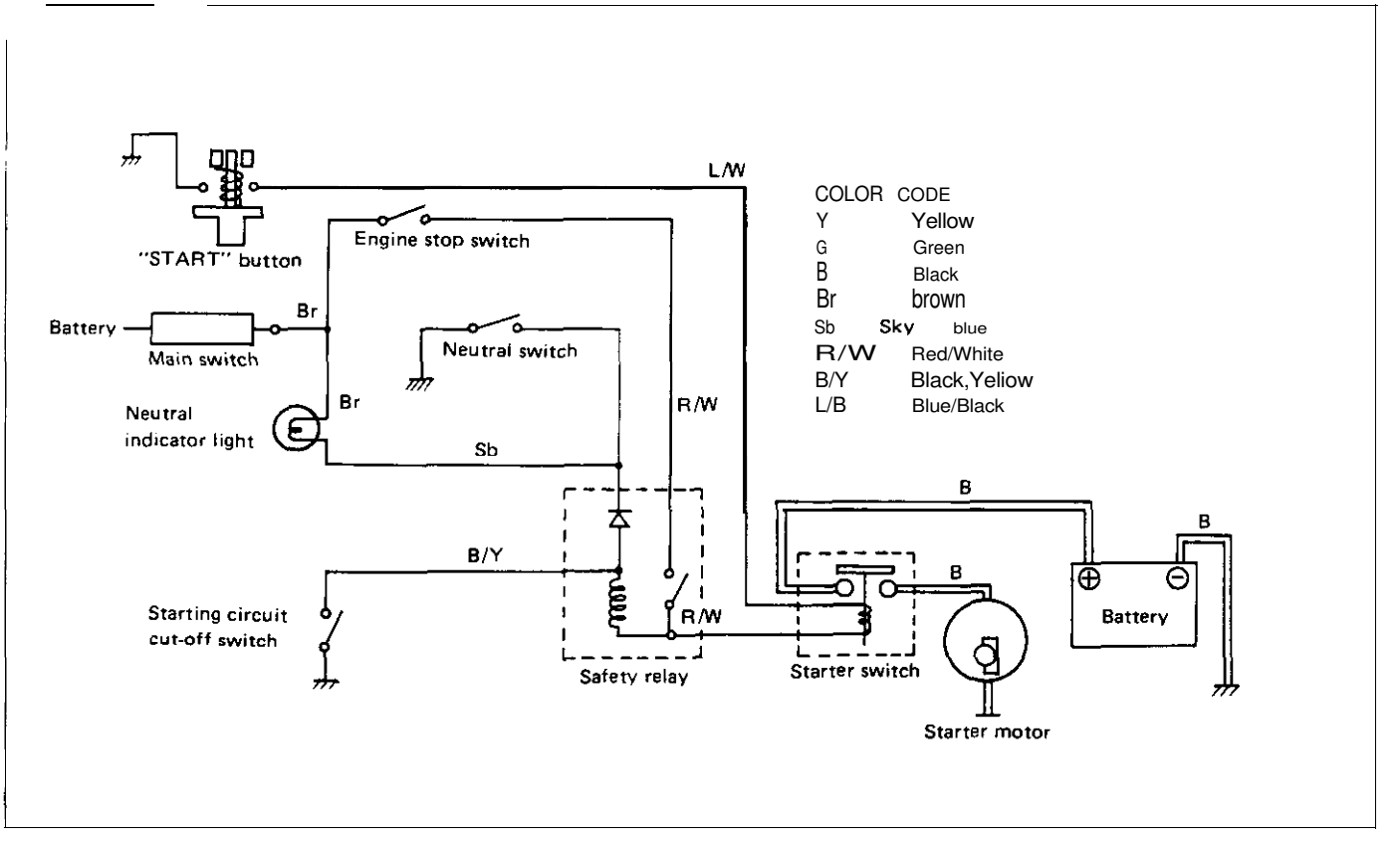
STARTING CIRCUIT CUT-OFF SYSTEM

The starting circuit cut-off system is employed. Hence, the following description.

Description

This model is equipped with a starting circuit cut-off switch. The starter motor is so designed that it can be started only when the transmission is in Neutral or the clutch is disengaged.

Accordingly, the starter motor will not start when the transmission is shifted into any position other than neutral, unless the clutch lever is pulled in



Function of the Diode in the Relay

When the transmission is in a position other than Neutral:

Turning on the clutch lever switch (Clutch is disengaged by pulling the clutch lever) makes the safety relay to turn on.

In this case, the diode interrupts the flow of current from the main switch to the neutral indicator light and to the relay, and thus the light will not come on.

Operation

a) When the transmission is in Neutral:

Neutral switch	**ON**
Clutch lever switch	**OFF or ON**

○ When the main switch is turned on while the transmission is in neutral the starting circuit cut-off relay circuit is closed and the relay is actuated.

○ When the “START” button is pressed, the circuit from the main switch to the relay → starter switch assembly → “START” (button) is closed, and the starter switch assembly is turned on, thus causing the starter motor to start.

b) When the clutch lever is released while the transmission is in position other than neutral:

Neutral	switch	OFF
Clutch	lever switch	OFF

○ Since the starting circuit cut-off is kept open, the relay is not actuated, and it is impossible to turn on the starter switch assembly by pushing the “START” button.

As a result, the starter motor does not run.

c) When the clutch lever is disengaged by pulling in the clutch lever while the transmission is in a position other than neutral:

Neutral	switch	OFF
Clutch	lever switch	ON

Since the clutch lever switch is on while the neutral switch is off, the following circuit → main switch → starting circuit cut off relay → clutch lever switch is closed and the relay is actuated.

The subsequent operation is the same as a).

*SPECIFICATION

A. General

'XS650SH only **XS650H only

1. MODEL		
1) Model (I.B.M. No.)	XS650SH (4M4/XS650H (4N9)	
21 Basic color	*CARDINAL RED or NEW YAMAHA BLACK **BLACK GOLD	
2. DIMENSION		
1) Overall length	2.120 mm (83.5 in)	
2) Overall width	925 mm (36.4 in)	
3) Overall height	1,220 mm (48.0 in)	
4) Seat height	790 mm (31.1 in)	
5) Wheelbase	1,435 mm (56.5 in)	
6) Minimum ground clearance	135 mm (5.3 in)	
3. WEIGHT		
1) Net weight (Dry)	"208 kg (459lb)	"205 kg (452 lb)
4. PERFORMANCE		
1) Climbing ability	26°	
2) Minimum turning radius	2,500 mm 198.4 in)	

B. Engine

1. DESCRIPTION	
1) Engine type	Air cooled, 4.stroke. SOHC twin. parallel forward incline
2) Engine model	*4M4 **4N9
3) Displacement	653 cc (39.85 cu.in)
4) Bore x stroke	75 x 74 mm (2.953 x 2.913 in)
5) Compression ratio	8.7 : 1
6) Starting system	Kick and electric starter
7) Ignition System	Battery ignition (Full transistor ignition)
8) Lubrication system	wet sump
2. CYLINDER HEAD	
1) Combustion chamber volume (with N-7Y)	42.5 cc (2.59 cu.in)
2) Combustion chamber type	Dome + Squish
3) Head gasket thickness	1.2 mm IO.047 in)
3. CYLINDER	
1) Material	Aluminum alloy with cast iron sleeve
2) Bore size	$75.00^{+0.02}_{0}$ mm ($2.9528^{+0.008}_{0}$ in)
3) Taper limit	0.05 mm (0. 002 in)
4) Out of round limit	0.01 mm (0.0004 in)

4. PISTON

1) Piston skirt clearance: 0.050 ~ 0.055 mm 10.0020 ~ 0.0022 in)

2) Piston oversize

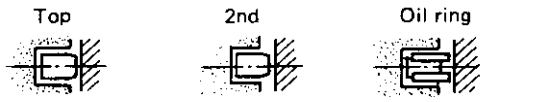
75.25 mm (2.963 in)	75.50 mm (2.972 in)	75.75 mm (2.982 in)	76.00 mm (2.992 in)

3) Piston pin outside diameter x length: $20.0\ ^{0}_{-0.005}$ mm x $61.0\ ^{0}_{-0.3}$ mm

($0.79\ ^{0}_{-0.0002}$ in x $2.40\ ^{0}_{-0.0116}$ in)

5. PISTON RING

1) Piston ring design



1.2mm (0.047 in) 1.5mm (0.059 in) 2.8 mm (0.110 in)

2) Ring end gap (Installed, top): 0.2 ~ 0.4 mm (0.008 ~ 0.016 in)

(Installed, 2nd): 0.2 ~ 0.4 mm (0.008 ~ 0.016 in)

(Installed, oil): 0.3 ~ 0.9 mm (0.012 ~ 0.035 in)

3) Ring groove side clearance (Top): 0.04 ~ 0.08 mm (0.0016 ~ 0.0031 in)

(2nd): 0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in)

6. BIG END BEARING

1) Type: Needle bearing

2) Bearing size: $\phi 26 \times \phi 34 \times 19.8$

3) Needle size: $\phi 4 \times \phi 15.8 \times 13$

7. CAMSHAFT

1) Cam drive type: Chain (Center side)

2) Number and type of bearing: 4 bearings, Ball bearings (6005)

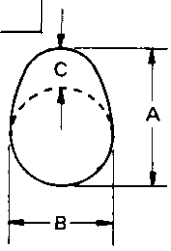
3) Bearing type: $\phi 25$-$\phi 47$-8

4) Cam dimensions

	Cam height "A"	Limit	Base circle "B"	Limit	Lift "C"
IN	39.99 ± 0.05 mm (1.574 ± 0.002 in)	39.84 mm (1.569 in)	32.24 ± 0.05 mm (1.269 ± 0.002 in)	32.09 mm (1.263 in)	7.99 mm (0.315 in)
EX	40.03 ± 0.05 mm (1.576 ± 0.002 in)	39.88 mm (1.570 in)	32.30 ± 0.05 mm (1.272 ± 0.002 in)	32.15 mm (1.266 in)	8.03 mm (0.316 in)

5) Valve timing

	OPEN	CLOSE	DURATION	OVERLAP
IN	BTDC 35°	ABDC 69°	284°	72°
EX	BBDC 67°	ATDC 37°	284°	



6) Camshaft deflection limit: 0.03 mm (0.0012 in)

7) Cam chain

Type: TSUBAKIMOTO BF05M

Number of links: 106L

Sprocket ratio: 36/18 (2.000)

8. ROCKER ARM AND ROCKET SHAFT

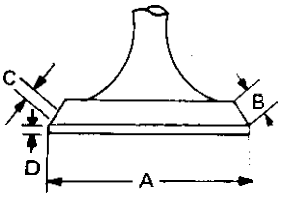
1) Rocker arm inner diameter: $15.0\ ^{+0.018}_{0}$ mm ($0.591\ ^{+0.0007}_{0}$ in)

2) Rocker arm shaft diameter: $15.0\ ^{-0.009}_{-0.015}$ mm ($0.591\ ^{-0.00035}_{-0.00059}$ in)

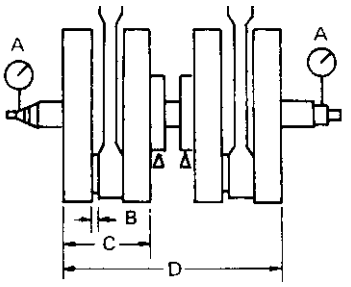
3) Clearance: 0.009 ~ 0.033 mm (0.00035 ~ 0.00130 in)

4) Lift ratio: X : Y = 40 : 48.41 mm (1.575 : 1.906 in)

9. VALVE, VALVE SEAT AND VALVE GUIDE	
1) Valve per cylinder	2 pcs.
2) Valve clearance (In cold engine)	IN: 0.06 mm (0.0024 in) EX: 0.15 mm (0.0059 in)
3) Dimensions	
Valve head diameter "A"	IN: 41 mm (1.614 in) EX: 35 mm (1.378 in)
Valve face width "6"	IN: 2.1 mm (0.083 in) EX: 2.1 mm (0.083 in)
Valve seat width "C"	IN: 1.3 mm (0.051 in) EX: 1.3 mm (0.051 in)
Valve margin thickness "D"	IN: 1.3 mm (0.051 in) EX: 1.3 mm (0.051 in)
Valve stem diameter	IN: $8.0^{0}_{-0.015}$ mm ($0.315^{0}_{-0.0010}$ in) EX: $8.0^{-0.025}_{-0.040}$ mm ($0.315^{-0.0010}_{-0.0016}$ in)
Valve guide diameter	IN: $8.0^{+0.019}_{+0.010}$ mm ($0.315^{+0.0007}_{+0.0004}$ in) EX: $8.0^{+0.019}_{+0.010}$ mm ($0.315^{+0.0007}_{+0.0004}$ in)
Valve stem to guide clearance	IN: 0.010 ~ 0.034 mm (0.00079 ~ 0.00173 in) EX: 0.035 ~ 0.059 mm 10.00138 ~ 0.00232 in)
4) Valve face runout limit	IN & EX: 0.03 mm 10.0012 in) or less
0. VALVE SPRING	
1) Free length	INNER (IN/EX): 42 mm (1.654 in) OUTER(IN/EX): 42.55 mm (1.675 in)
2) Spring rate	INNER (IN/EX): k_1 = 1.43 kg/mm 180.1 lb/in) k_2 = 1.81 kg/mm 1101.4 lb/in) OUTER(IN/EX): k_1 = 3.2 kg/mm (179.2 lb/in) k_2 = 4.18 kg/mm (234.1 lb/in)
3) Installed length (Valve closed)	INNER (IN/EX): 35 mm 11.378 in) OUTER(IN/EX): 37 mm 11.457 in)
41 Installed pressure (Valve closed)	INNER (IN/EX): 10 ± 0.7 kg (22.0 ± 1.5 lb) OUTER(IN/EX): 17.7 ± 1.25 kg (39.0 ± 2.8 lb)
5) Compressed length (Valve open)	INNER (IN/EX): 25.5 mm (1.004 in) OUTER(IN/EX): 27.5 mm (1.083 in)
6) Compressed pressure (Valve open)	INNER (IN/EX): 27.2 ± 1.9 kg (60.0 ± 4.2 lb) OUTER(IN/EX): 57.4 f4.0 kg (126.5 ± 8.8 lb)
7) Wire diameter	INNER (IN/EX): 2.9 mm (0.114 in) OUTER(IN/EX): 4.2 mm (0.165 in)
8) Winding O.D.	INNER (IN/EX): 19.4 mm (0.764 in) OUTER(IN/EX): 32.6 mm (1.283 in)
91 Number of windings	INNER (IN/EX): 6.0 turns OUTER(IN/EX): 4.25 turns



I. CRANKSHAFT



1) Crankshaft deflection limit	(A)	0.05 mm (0.002 in)
2) Con-rod large end clearance	(B)	0.15 ~ 0.4 mm (0.0059 ~ 0.0157 in)
3) Width of crankshaft	(C)	$66\ ^{-0.05}_{-0.10}$ mm ($2.598\ ^{-0.002}_{-0.004}$ in)
	(D)	$186\ ^{0}_{-0.3}$ mm ($7.323\ ^{0}_{-0.012}$ in)
41 Crank pin I.D.		$26\ ^{-0.077}_{-0.095}$ mm ($1.024\ ^{-0.003}_{-0.004}$ in)
5, Crank pin O.D. x length		$26\ ^{0}_{-0.006} \times 65\ ^{+0.1}_{-0.2}$ mm
		($1.024\ ^{0}_{-0.0002} \times 2.559\ ^{+0.004}_{-0.008}$ in)

2. CONNECTING ROD

1) Big end I.D.	$34\ ^{+0.016}_{0}$ mm ($1.339\ ^{+0.0006}_{0}$ in)
2) Small end I.D.	$20\ ^{+0.028}_{+0.015}$ mm ($0.787\ ^{+0.0011}_{+0.0006}$ in)

3. CRANK BEARING

1) Type Right end	$\phi 30$-$\phi 78$-19 (Ball bearing)
Others	$\phi 32$-$\phi 68$-17 (Rollar bearing)
2) Oil seal type	SD-25-40-9

4. CLUTCH

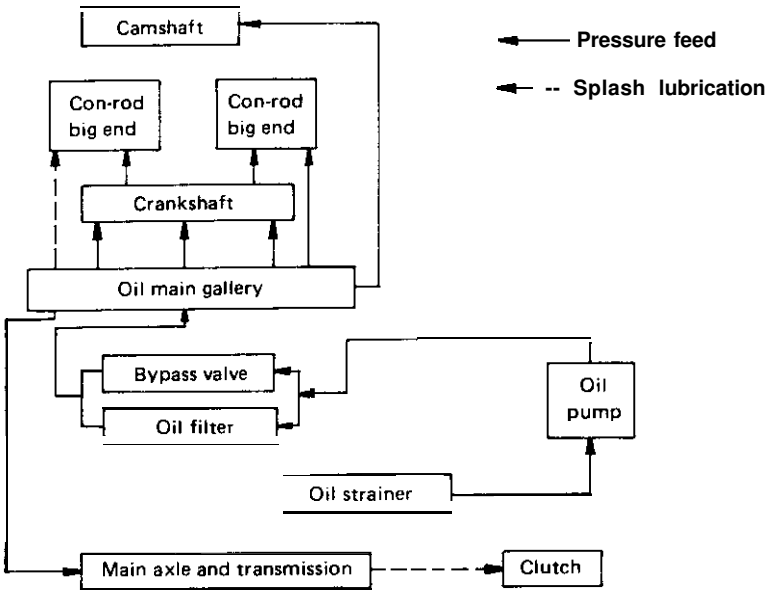
1) Clutch type	Wet. multiple type
2) Clutch operating mechanism	Inner push type, screw push system
3) Primary reduction ratio and method	72/27 (2.666), spar gear
4) Primary reduction gear back lash (4 teeth)	$21.45\ ^{0}_{-0.025}$ mm ($0.8445\ ^{0}_{-0.00010}$ in)
5) Friction plate	
Thickness/Quantity	3 mm (0.118 in)/7 pcs.
Wear limit	2.7 mm (0.106 in)
6) Clutch plate	
Thickness/Quantity	1.4 mm (0.055 in)/6 pcs.
Warp limit	0.05 mm (0.002 in)
7) Clutch spring	
Free length/Quantity	34.6 mm (1.362 in)/6 PCS.
8) Clutch housing radial play	0.027 ~ 0.081 mm (0.0011 ~ 0.0032 in)
9) Push rod bending limit	0.2 mm (0.008 in)

5. TRANSMISSION

1) Type	Constant mesh, 5-speed forward

2) Gear ratio: 1st		32113 (2.461)
2nd		27/17 (1.588)
3rd		26/20 (1.300)
4th		23/21 (1.095)
5th		22/23 (0.956)
3) Bearing: Main axle	(Left)	Needle bearing (φ20-φ30-20)
	(Right)	Ball bearing (φ25-φ52-20.6)
Drive axle	(Left)	Ball bearing (φ30-φ62-23.8)
	(Right)	Needle bearing (φ20-φ30-16)
41 Oil seal type Drive axle (Left)		SDD-40-62-9
5) Secondary reduction ratio and method		34117 (2.000)/Chain
16. SHIFTING MECHANISM		
1) Type		Cam drum, return type
2) Oil seal type (Change lever)		SDO-14-24-6
17. KICK STARTER		
1) Type		Bendix type
2) Oil seal type (Kick axle)		SD-25-35-7
3) Kick clip friction tension		1.2 ~ 1.7 kg (2.6 ~ 3.7 lb)
18. INTAKE		
1) Air cleaner: Type/Quantity		Dry. foam rubber/2 pcs.
2) Cleaner cleaning interval		Every 6,000 km (5,000 mile)
19. CARBURETOR		
1) Type and manufacturer/Quantity		BS34 MIKUNI/2 pcs.
2) I.D. mark		3G I-00
3) Main jet	(M.J.)	#132.5
4) Air jet	(A.J.)	#85
5) Jet needle	(J.N.)	5HX12
61 Needle jet	(N.J.)	Y-O
7) Throttle valve	(Th.V.)	#135
8) Pilot jet	(P.J.)	#42.5
9' Pilot screw (Turns out)	(P.S.)	Preset
101 starter jet	(G.S.)	#30
11) Fuel level	(F.L.)	27.3 ± 0.5 mm (1.075 ± 0.020 in)
12) Idling engine speed		1.200 r/min
20. LUBRICATION		
1) Engine sump oil quantity		Oil exchange: 2.0 lit (2.1 US qt) Overhaul: 2.5 lit (2.6 US qt)
2) Oil type and grade		Yamalube 4-cycle oil or SAE 20W/40 type "SE" motor oil
31 Oil pump type		Trochoid pump
4) Trochoid pump specifications		
Top clearance		0.10 ~ 0.18 mm (0.0039 ~ 0.0071 in)
Tip clearance		0.03 ~ 0.09 mm (0.0012 ~ 0.0035 in)
Side clearance		0.03 ~ 0.08 mm (0.0012 ~ 0.0031 in)
Oil pump volume		1.3 lit/min (1.37 qt/min) at 1,000 r/min
5) Bypass valve setting pressure		1.0 kg/cm^2 (14 psi)

6) Lubrication chart



C. Chassis

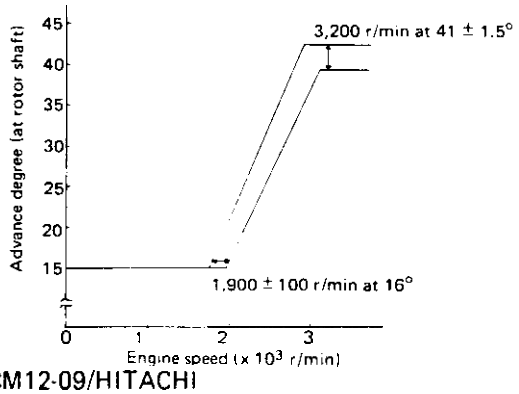
1. FRAME	
1) Frame design	Double cradle, high tensile frame
2. STEERfNG SYSTEM	
1) caster	27°
2) Trail	115 mm (4.53 in)
3) Number and size of balls in steering head	
upper race	19 pcs. 1/4 in
Lower race	19 pcs. 1/4 in
4) Steering lock to lock	42" each (L and R)
3. FRONT SUSPENSION	
1) Type	Telescopic fork
2) Damper type	Oil damper, coil spring
3) Front fork spring	
Free length	482 mm (18.98 in)
Wire diameter x winding diameter	4 x 24.5 mm IO.157 x 0.965 in)
Spring constant	k_1 = 0.48 kg/mm 126.88 lb/in)/ 0 ~ 100 mm (0 ~ 3.94 in)
	k_2 = 0.65 kg/mm 136.40 lb/in)/ 100 ~ 150 mm (3.94 ~ 5.91 in)
41 Front fork travel	150 mm (5.906 in)
51 Inner tube O.D.	35 mm (1.378 in)
6) Front fork oil quantity and type	169 cc (5.72oz) each leg
	Yamaha fork oil 1Owt or equivalent
7) Distance from the top of inner tube oil level without spring	Approx. 454 mm (17.9 in)
4. REAR SUSPENSION	
1) Type	Swing arm
2) Damper type	Oil damper, coil spring
3) Shock absorber travel	80 mm (3.15 in)

4) Shock absorber spring	
Free length	226 mm (8.90 in)
Wire diameter x winding diameter	7.5 x 60.5 mm (0.295 x 2.382 in)
Spring constant	k_1 = 1.714 kg/mm (96.0 lb/in)/ 0 ~ 45 mm (0 ~ 1.77 in)
	k_2 = 2.244 kg/mm 1125.7 lb/in)/ 45 ~ 80 mm (1.77 ~ 3.15 in)
5) Swing arm free play (Limit)	1 mm (0.04 in)
6) Pivot shaft — Outside diameter	16 mm IO.63 in)
5. FUEL TANK	
1) Capacity	~ 11.5 lit (3.04 US gal)
2) Reserve capacity	2.3 lit IO.61 US gal)
3) Fuel grade	Regular gasoline
6. WHEEL	
1) Type (Front and rear)	'Cast wheel ** Spoke wheel
2) Tire size (Front)	3.50S19-4PR 'Tubeless tire "Tube-type tire
(Rear)	130/90-16 67S *Tubeless tire **Tube-type tire
3) Tire pressure:	
Up to90 kg (198 lb) load""	Front: 1.6 kg/cm^2 122 psi)
	Rear: 2.0 kg/cm^2 (28 psi)
90 kg (198 lb) load ~ 206 kg (453 lb) load"' (Maximum load)	Front: 2.0 kg/cm2 (28 psi)
	Rear: 2.3 kg/cm' (32 psi)
High speed riding	Front: 2.0 kg/cm^2 (28 psi)
	Rear: 2.3 kg/cm^2 (32 psi)
4) Rim run out limit (Front and rear)	
Vertical	2 mm (0.08 in)
Lateral	2 mm (0.08 in)
5) Rim Size (Front)	*MT1.85 x 19 "1.85 x 19
(Rear)	"MT3.00 x 16 "2.75 x 16
6) Bearing type	
Front wheel (Left)	6630322 "66303
(Right)	'863032 **B6303RS
Rear wheel (Left)	B6305Z
(Right)	663042
7) Oil seal type	
Front wheel (Left)	SDD-45-56-6
(Right)	'SD-28-47-7 **SD-22-42-7
Rear wheel (Left)	SD-35-62-9
(Right)	SO-27-52-5
8) Secondary drive chain type	
Type	50HDS
Number of links	103L + Joint
Chain pitch	15.875 mm (5/8 in)
Chain free play	20 ~ 30 mm (0.8 ~ 1.2 in)

* : XS650SH
** : XS650H
*** : Total weight of accessories. etc.. excepting motorcycle.

7. BRAKE	
1) Front brake	
Type	**Hydraulic disc** type
Disc size (Outside dia. x thickness)	**298 x 7.0 mm 11 1.73 x 0.28 in)**
Disc wear limit	**6.5 mm (0.26** in)
Disc pad thickness	**11.0 mm (0.43** in)
Pad wear limit	**6.0 mm (0.24** in)
Master cylinder inside dia.	**14.0 mm (0.55** in)
Caliper cylinder inside dia.	**38.1 mm (1.50** in)
Brake fluid type/Quantity	**DOT #3 Brake fluid** / 38.1 **cc II.29** oz)
2) Rear brake	
Type	**Drum brake (Leading trailing)**
Actuating method	**Link rod**
Brake drum I.D.	**180 mm (7.09** in)
Brake shoe dia. x width	**180 X 30 mm 17.09 x 1.18 in)**
Lining thickness/wear limit	**4** mm/**2 mm IO.16** in/0.08 **in)**
Shoe spring free length	**68 mm (2.68** in)

D. Electrical

1. IGNITION SYSTEM	
1) Ignition timing (B.T.D.C.)	15°/1,200 r/min 
2) Ignition coil	
Model/Manufacturer	CM12-09/HITACHI
Spark gap	**6 mm (0.24 in) or more at 500** r/min
Primary winding resistance	2.5Ω ± **10% at 20" C (68°F)**
Secondary winding resistance	11kΩ ± **20% at** 20°C(68°F)
3) Spark plug	
Type	**N-7Y (CHAMPION) or BP7ES (N.G.K.)**
Spark plug gap	**0.7 ~ 0.8 mm (0.027 ~ 0.031 in)**
2. CHARGING SYSTEM	
1) A.C. generator	
Charging output	**14V 16Ai5.000** r/min
Rotor coil resistance (Field coil)	5.25Ω ± **10% at 20" C (68°F)**
Stator coil resistance	0.46Ω ± **10% at** 20°C(68°F)
Brush length	**14.5 mm (0.571 in)**
Brush wear limit	**7.0 mm (0.276** in)

2) Regulator	
Type	I.C. type
Model/Manufacturer	S8515/TOSHIBA
Regulating voltage	14.5 ±0.3V
3) Battery	
Model/Manufacturer/Quantity	YB14L-A2/YUASA/1 PC.
Capacity	12V. 14AH
Charging rate	1.4A 10 hours
Specific gravity	1.28 at 20°C (68°F)
3. STARTER	
1) Starter motor	
Type	Bendix type
Manufacturer/Model	HITACHI/S108-35
output	0.5kw
Armature coil resistance	0.0067Ω± 10% at 20°C (68°F)
Field coil resistance	0.0049 ± 10% at 20°C (68°F)
Brush size/Quantitv	16 mm (0.63 in)/2 pcs.
Wear limit	4 mm 10.16 in)
Spring pressure	BOO g (28.2 oz)
Commutator O.D./Wear limit	33 mm (1.30 in)/30 mm ll.18 in)
Mica undercut	0.7 mm 10.028 in)
21 Starter switch	
Manufacturer	HITACHI
Model	A10470
Amperage rating	100A
Cut-in voltage	6.5V
Winding resistance	3.5Ω
3) Starter clip friction tension	2.2 ~ 2.5 kg (4.9 ~ 5.5 lb)
4. LIGHTING SYSTEM	
1) Headlight type	Sealed beam
2) Bulb brightness and wattage/Quantity	
Headlight	12v. 50/40W x 1 PC.
Tail/Brake light	12V. 3132 CP (8W/27W) x 2 pcs.
Flasher light	12V, 32 CP (27W) x 4 pcs.
License light	12V, 3.8W x 2 PCS.
Pilot lights: Turn	12V, 3.4W x 1 pc.
High beam	12V, 3.4W x 1 pc.
Headlight failure	12V, 3.4W x 1 pc.
Neutral	12v. 3.4w x 1 pc.
Meter lights	12v. 3.4w x 2 PCS.
3) Reserve lighting unit	
Model/Manufacturer	337-I 1720/KOITO
4) Horn	
Model/Manufacturer	'CF.12 **SF-12/NIKKO
Maximum amperage	2.5 ± 0.5A

* : XS650SH only

** : XS650H only

5) Flasher relay		
Type		Condenser type
Model/Manufacturer		061300-04810/NIPPON DENS0
Flasher frequency		85 ± 10 cycle/min.
Capacity		32 CP (27W) x 2 + 3.4w
6) Flasher cancelling unit		
Model		EVH-AC518
Voltage		DC9V ~ 16V
7) Fuse		
Rating/Quantity:	Main	20A x 1 pc.
	Headlight	10A x 1 pc.
	Signal	
	Ignition	10A x 1

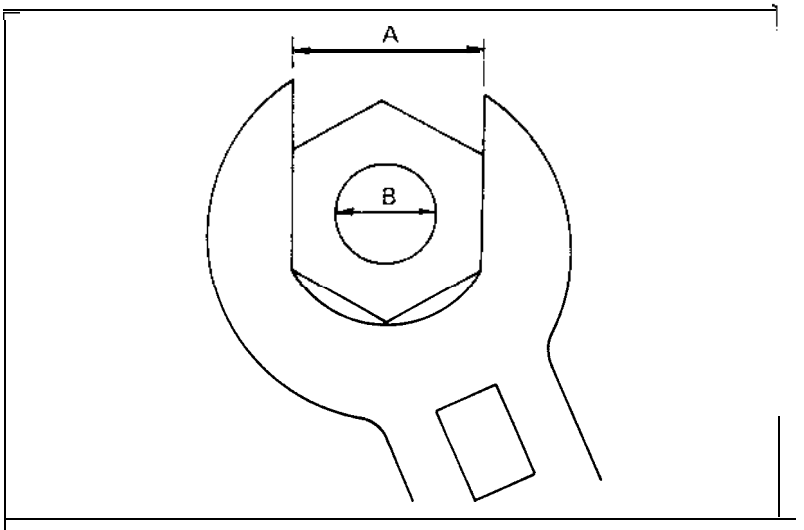
Torque Specifications

Part to be tightened	Thread dia. and part name	Tightening torque
Engine:		
Cylinder head and cylinder head cover	10 mm nut 8 mm bolt	3.7 m-kg (27.0 ft-lb) 2.1 m-kg (15.0 ft-lb)
Cylinder head	6 mm bolt	0.9 m-kg (6.5 ft-lb)
Cylinder head cover side	6 mm crown nut 8 mm crown nut	0.9 m-kg (6.5 ft-lb) 1.3 m-kg (9.5 ft-lb)
Spark plug	14 mm	2.0 m-kg (14.5 ft-lb)
Generator	12mm nut	3.8 m-kg (27.5 ft-lb)
Stator coil	6 mm pan head screw	0.9 m-kg (6.5 ft-lb)
Governer	6 mm bolt	0.8 m-kg (6.0 ft-lb)
Valve clearance adjustment nut	8 mm nut	2.7 m-kg (19.5 ft-lb)
Cam chain tensioner	18 mm cap	2.1 m-kg (15.0 ft-lb)
Pump cover	6 mm pan head screw	1.0 m-kg (7.2 ft-lb)
Strainer cover	6 mm bolt	1.0 m-kg (7.2 ft-lb)
Drain plug	30 mm bolt	4.2 m-kg (30.5 ft-lb)
Oil filter	6 mm bolt	0.9 m-kg (6.5 ft-lb)
Delivery pipe	10 mm union bolt	2.1 m-kg (15.0 ft-lb)
Exhaust pipe	8 mm nut	1.3 m-kg (9.5 ft-lb)
Crankcase	8 mm bolt/nut	2.1 m-kg (15.0 ft-lb)
Kick crank boss	8 mm bolt	2.0 m-kg (14.5 ft-lb)
Primary drive gear	14 mm nut	9.0 m-kg (65.0 ft-lb)
Clutch boss	18 mm nut	8.0 m-kg (58.0 ft-lb)
Drive sprocket	22 mm nut	6.5 m-kg (47.0 ft-lb)
Change pedal	6 mm bolt	1.0 m-kg (7.2 ft-lb)
Chassis:		
Front wheel axle	14 mm nut	10.7 m-kg (77.5 ft-lb)
Front fork and axle holder	8 mm nut	1.4 m-kg (10.0 ft-lb)
Handle crown and inner tube	8 mm nut	1.1 m-kg (8.0 ft-lb)
Handle crown and steering shaft	8 mm nut	1.1 m-kg (8.0 ft-lb)
Handle crown and steering shaft	14 mm bolt	5.4 m-kg (39.0 ft-lb)
Handle crown and handlebar holder	8 mm bolt	1.8 m-kg (13.0 ft-lb)
Under bracket and inner tube	8 mm nut	2.0 m-kg (14.5 ft-lb)
Engine mounting Upper	8 mm nut	1.8 m-kg (13.0 ft-lb)
Engine mounting Upper	10 mm nut	3.0 m-kg (21.5 ft-lb)
Engine mounting Front	10 mm nut	4.6 m-kg (33.5 ft-lb)
Engine mounting Rear	10 mm nut	4.1 m-kg (29.5 ft-lb)
Engine mounting Rear-Lower	10 mm nut	4.6 m-kg (33.5 ft-lb)
Engine mounting Lower	10 mm nut	9.0 m-kg (65.0 ft-lb)
Front flasher and headlight	8 mm nut	1.0 m-kg (7.2 ft-lb)
Master cylinder and brake hose	10 mm union bolt	2.6 m-kg (19.0 ft-lb)

Part to be tightened	Thread dia. and part name	Tightening torque
Brake disc and hub	8 mm bolt	2.0 m-kg (14.5 ft-lb)
Caliper and support bracket	8 mm bolt	1.8 m-kg (13.0 ft-lb)
Caliper and pad	5 mm bolt	0.3 m-kg (2.2 ft-lb)
Caliper and bleed screw	8 mm bolt	0.6 m-kg (4.5 ft-lb)
Front caliper and front fork	10 mm bolt	3.5 m-kg (25.5 ft-lb)
Master cylinder and cylinder bracket	6 mm bolt	0.6 m-kg (4.5 ft-lb)
Pivot shaft	14 mm nut	6.5 m-kg (47.0 ft-lb)
Rear wheel axle	16 mm nut	15.0 m-kg (108.5 ft-lb)
Tension bar and brake caliper (plate)	8 mm nut	1.8 m-kg (13.0 ft-lb)
Tension bar and rear arm	8 mm nut	3.2 m-kg (23.0 ft-lb)
Rear shock absorber Upper	10 mm bolt	3.0 m-kg (21.5 ft-lb)
Rear shock absorber Lower	10 mm bolt	3.9 m-kg (28.0 ft-lb)
Rear arm and rear arm end	8 mm bolt	1.0 m-kg (7.2 ft-lb)
Front fender	8 mm bolt	1.0 m-kg (7.2 ft-lb)
Neutral switch	12mm	1.3 m-kg (9.5 ft-lb)

General Torque Specifications

This chart specifies torque for standard fasteners with standard I.S.O. pitch threads. Torque specifications for special components or assemblies are included in the applicable sections of this book. To avoid warpage, tighten multi-fastener assemblies in a criss-cross fashion, in progressive stages, until full torque is reached. Unless otherwise specified, torque specifications call for clean, dry threads. Components should be at room temperature.



A (Nut)	B (Bolt)	Standard tightening torque	
		m-kg	ft-lb
IOmm	6mm	0.6	4.5
12mm	8mm	1.5	11
14 mm	10mm	3.0	22
17mm	12mm	5.5	40
19mm	14 mm	8.5	61
22 mm	16mm	13.0	94

CONVERSION TABLES

METRIC TO INCH SYSTEM

	KNOWN	MULTIPLIER	RESULT
TORQUE	m-kg	7.233	ft-lb
	m-kg	86.80	in-lb
	cm-kg	0.0723	ft-lb
	cm-kg	0.8680	in-lb
WT.	kg	2.205	lb
	g	0.03527	oz
FLOW/DISTANCE	km/lit	2.352	mpg
	km/hr	0.6214	mph
	km	0.6214	mi
	m	3.281	ft
	m	1.094	yd
	cm	0.3937	in
	mm	0.039377	in
VOL./ CAPACITY	cc (cm^3)	0.03382	oz (US liq)
	cc (cm^3)	0.06102	cu.in
	lit (liter)	2.1134	pt (US liq)
	lit (liter)	1.057	qt (US liq)
	lit (liter)	0.2642	gal (US liq)
MISC.	kg/mm	56.007	lb/in
	kg/cm^2	14.2234	psi (lb/in^2)
	Centigrade (°C)	9/5(°C) + 32	Fahrenheit (°F)

INCH TO METRIC SYSTEM

	KNOWN	MULTIPLIER	RESULT
TORQUE	ft-lb	0.13826	m-kg
	in-lb	0.01152	m-kg
	ft-lb	13.831	cm-kg
	in-lb	1.1521	cm-kg
WT.	lb	0.4535	kg
	oz	28.352	g
FLOW/DISTANCE	mpg	0.4252	km/lit
	mph	1.609	km/hr
	mi	1.609	km
	ft	0.3048	m
	yd	0.9141	m
	in	2.54	cm
	in	25.4	mm
VOL./ CAPACITY	oz (US liq)	29.57	cc (cm^3)
	cu.in	16.387	cc (cm^3)
	pt (US liq)	0.4732	lit (liter)
	qt (US liq)	0.9461	lit (liter)
	gal (US liq)	3.785	lit (liter)
MISC.	lb/in	0.017855	kg/mm
	psi (lb/in^2)	0.07031	kg/cm^2
	Fahrenheit (°F)	5/9(°F) – 32	Centigrade (°C)

DEFINITION OF TERMS:

m-kg	=	Meter-kilogram(s) (usually torque)
g	=	Gram(s)
kg		Kilogram(s) (1,000 grams)
lit	=	liter(s)
km/lit	=	Kilometer(s) per liter (fuel consumption1
cc	=	Cubic centimeter(s) (cm^3) (volume or capacityl
kg/mm	=	Kilogram(s) per millimeter (usually spring compression rate)
kg/cm^2	=	per square centimeter (pressure)

CONSUMER INFORMATION

Notice

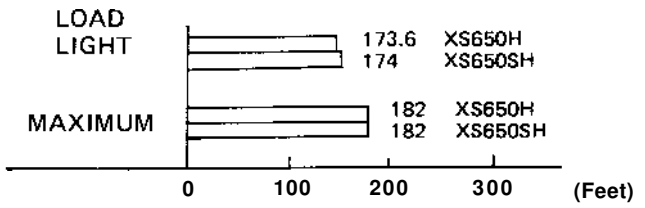
The information presented represents results obtainable by skilled drivers under controlled road and vehicle conditions, and the information may not be correct under other conditions.

STOPPING DISTANCE

This figure indicates braking performance that can be met or exceeded by the vehicles to which it applies, without locking the wheels, under different conditions of loading and with partial failures of the braking system.

FULL OPERATIONAL SERVICE BRAKE

("Partial failure" information is not applicable and is not included.)

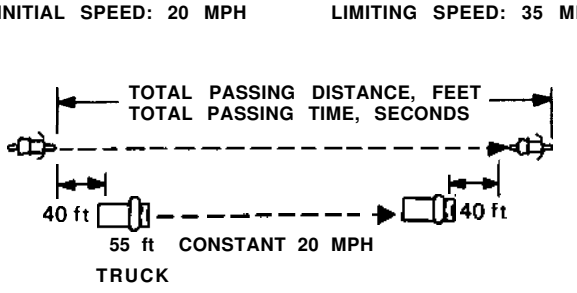


STOPPING DISTANCE IN FEET FROM 60 MPH

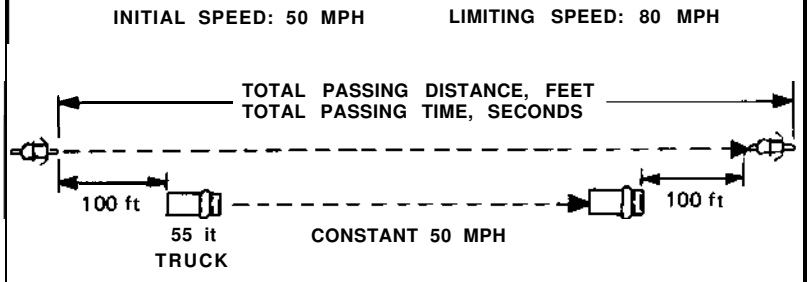
ACCELERATION AND PASSING ABILITY

This figure indicates passing times and distances that can be met or exceeded by the vehicles to which it applies, in the situations diagrammed below. The low-speed pass assumes an initial speed of 20 mph. and a limiting speed of 35 mph. This high-speed pass assumes an initial speed of 50 mph. and a limiting speed of 80 mph.

LOW-SPEED PASS



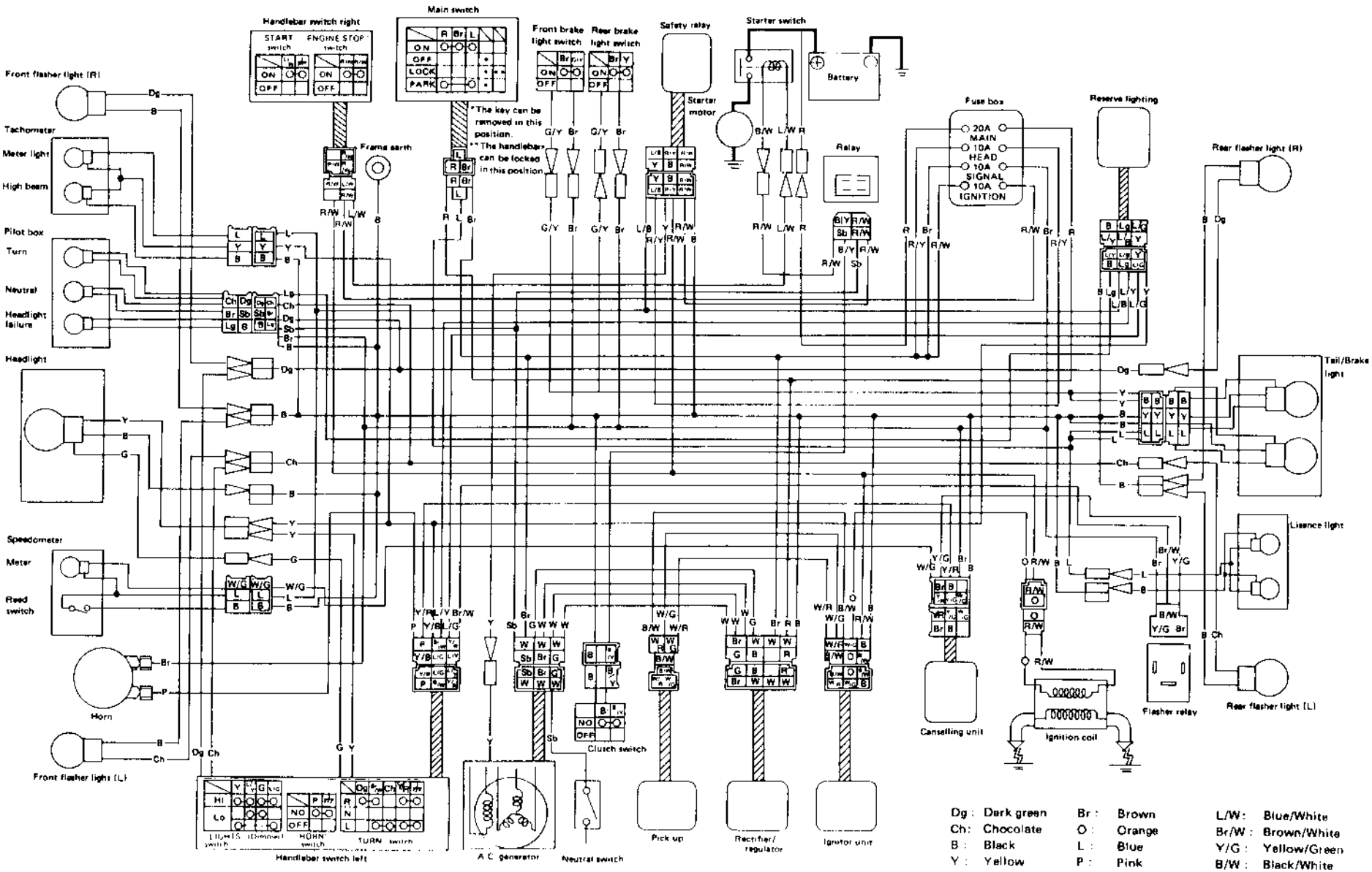
HIGH-SPEED PASS



SUMMARY

Low-speed pass	353.3 feet: 7.2 seconds	XS650H
	357.0 feet: 7.3 seconds	XS650SH
High-speed pass	944.0 feet: 9.27 seconds	XS650H
	945.5 feet: 9.3 seconds	XS650SH

XS650H/XS650SH WIRING DIAGRAM



Dg :	Dark green	Br :	Brown	L/W :	Blue/White
Ch :	Chocolate	O :	Orange	Br/W :	Brown/White
B :	Black	L :	Blue	Y/G :	Yellow/Green
Y :	Yellow	P :	Pink	B/W :	Black/White
Lg :	Light green	L/B :	Blue/Black	W/G :	White/Green
G :	Green	R/W :	Red/White	W/R :	White/Red
W :	White	R/Y :	Red/Yellow	G/Y :	Green/Yellow
Sb :	Sky blue	L/Y :	Blue/Yellow	Y/R :	Yellow/Red
R :	Red	L/G :	Blue/Green	Y/B :	Yellow/Black