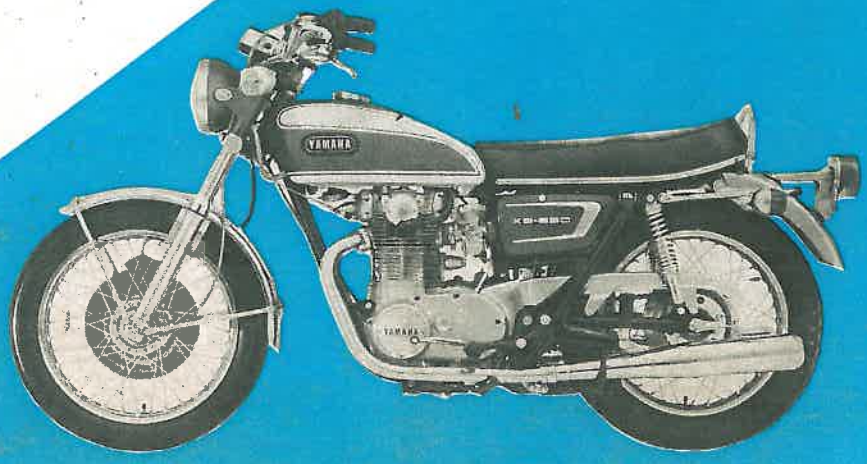
YAMAHA

SUPPLEMENTARY INFORMATION

650 XS2



YAMAHA MOTOR CO., LTD.

1175

NOTICE

This manual has been written by Yamaha Motor Company for use by Authorized Yamaha Dealers and their qualified mechanics. In light of this purpose it has been assumed that certain basic mechanical precepts and procedures inherent to our product are already known and understood by the reader.
Without such basic knowledge, repairs or service to this model may render the machine unsafe, and for this reason we must advise that all repairs and/or service be performed by an Authorized Yamaha dealer who is in possession of the requisite basic product knowledge.
Other information is produced by the U.S. distributor, Yamaha International Corporation, and is necessary to provide total technical coverage regarding the product.

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The Research, Engineering, and Service Departments of Yamaha are continually striving to further improve all models manufactured by the company. Modifications are therefore inevitable and changes in specifications or procedures will be forwarded to all Authorized Yamaha Dealers and will, where applicable, appear in future editions of this manual.

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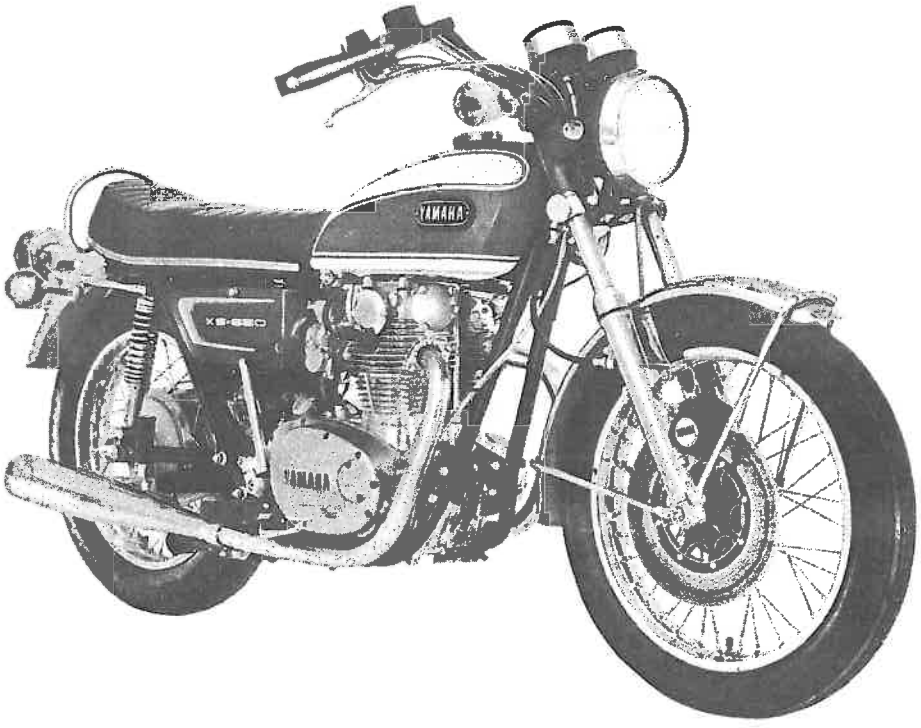
YAMAHA (650XS2) SUPPLEMENTARY INFORMATION
First Edition
ENGINEERING & SERVICE DEPARTMENT
YAMAHA MOTOR COMPANY
HAMAMATSU, JAPAN

YAMAHA

XS2–TX650

SUPPLEMENTARY INFORMATION

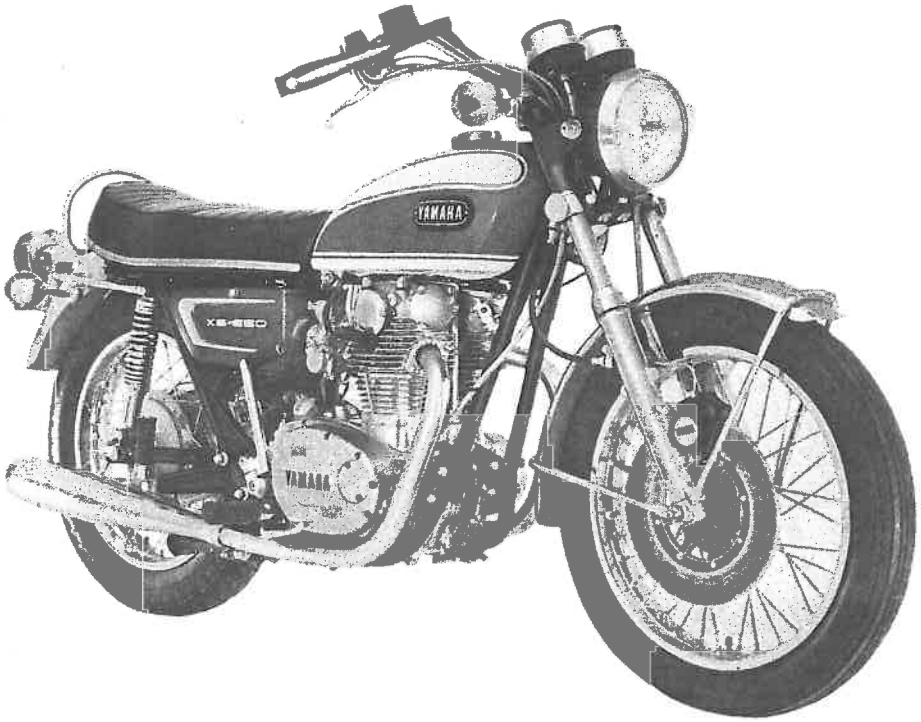


FOREWORD

This new XS2 is an improved version of the XS1 and equipped with additional components - an electric starter and a disc brake for the front wheel.

This XS2 Supplementary Information describes the construction of the electric starter and the disc brake, and the procedures for inspection and maintenance.

It is advisable to use this booklet, together with the XS1 Service Manual.



YAMAHA MOTOR CO., LTD.

ENGINEERING & SERVICE DEPARTMENT

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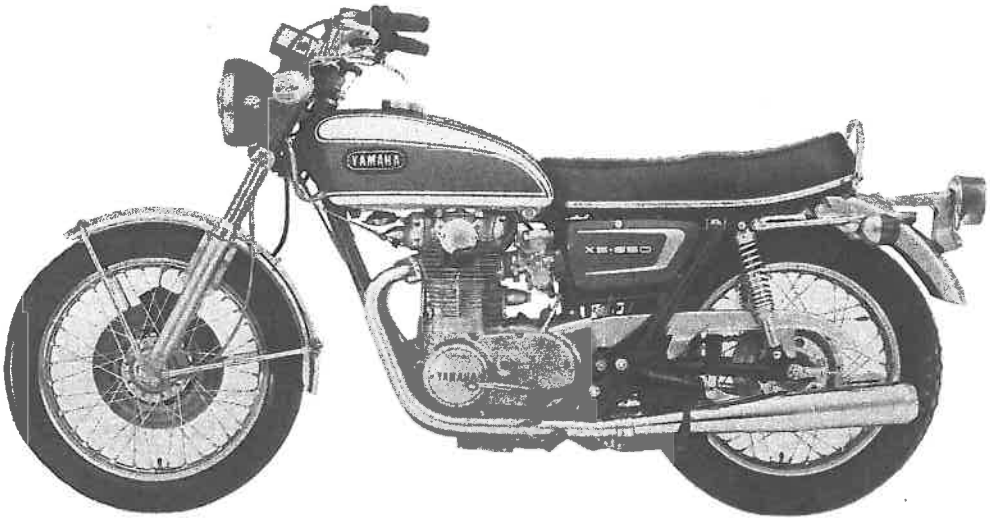
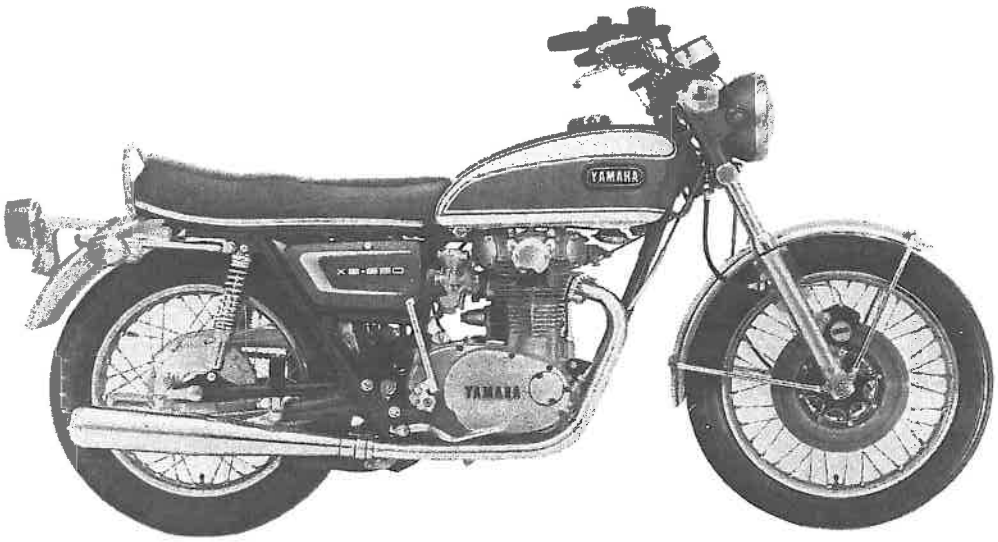
CHAPTER GENERAL





Dimensions.	
Overall Length	85.6 in. (2175 mm)
Overall Width	35.6 in. (905 mm)
Overall Height	45.9 in. (1165 mm)
Wheelbase	55.5 in. (1410 mm)
Min. Ground Clearance	5.9 in. (150 mm)
Weight (net)	427 lbs. (194 Kg)
Performance:	
Max. Speed	115 + mph
Fuel Consumption (on paved level road)	82.5 mpg at 37 mph (35 km/l at 60 km/h)
Climbing Ability	26 degrees
Minimum Turning Radius	98.4 in (2500 mm)
Braking Distance	46 ft. at 31 mph (14 m at 50 km/h)
Engine:	
Type	Twin cylinder Air-cooled 4 stroke W/S.O.H.C.
Lubrication System	Pressure lubricated, wet sump.
Bore and Stroke	2.953x2.913 in. (75x74 mm)
Displacement	39.85 cu. in. (653 cc)
Compression Ratio	8.7 : 1
Maximum Power	53 BHP/7000 rpm
Maximum Torque	40.1 ft-lbs/6000 rpm (5.5 kg-m/6000 rpm)
Oil Sump Capacity	2.6 qts. (2.5 l)
Valve Clearance	Cold IN: 0.15 mm (0.006 in.) EX: 0.30 mm (0.012 in.)
Idle Speed	1000 ~ 1200 rpm
Carburetor:	
Type	BS38x2
Needle Jet	4JN19-4th Stage
Pilot Fuel Jet	42.5
Air Filter	Dry paper filter
Clutch:	
Type	Wet, multi-disc. (6 friction + 5 metal plates.)
Primary Drive: Type:	Spur gear (straight cut)
Reduction Ratio (gear and total)	72/27 (2.667)
Transmission: Type:	Constant mesh, five speed, wide-ratio
Oil	SAE 20W/40
1st	32/13 = 2.461 (5.904)
2nd	27/17 = 1.588 (4.235)
3rd	26/20 = 1.300 (3.466)
4th	23/21 = 1.095 (2.920)
5th	22/23 = 0.956 (2.550)

Internal engine ration (Pri. x Trans.)
Multiply by drive chain ration for overall gearing

Secondary Reduction System:	
Type	Single Row chain
Secondary Reduction Ratio:	34/17 = 2.0

Chassis:		
Fuel Tank Capacity		3.7 U.S. gals. (14.0 ℓ) (3.7 gals. – TX650)
Caster		63°
Trail		3.9 in (101 mm)
Front Tire		
Size		3.50 - 19 - 4PR
Fork Oil Quantity (each)		135cc(4.6 oz.)
Rear Tire		
Size		4.00 - 18 - 4PR
Front Brake Type		Hydraulic Disc Brake
Rear Brake Type		Internal expansion, single leading shoe
Generator		
Type		Alternator
Model		LD115
Manufacturer		HITACHI
Ignition System		
Spark Plug	Manufacturer	N.G.K.
	Heat Range	B-8ES
Battery		
Model		(12N12-4A-1) x 1
Manufacturer		G. S.
Capacity		12V. 12 AH.
Dimension		5.36 x 2.36 x 5.16 ins. (134 mm. x 59 mm. x 129 mm.)
Lighting System		
Headlight		12V, 50W/40W
Tailight		12V/8W
Stoplight		12V/23W
Neutral Light		12V/3W
Flasher Indicator Light		12V/3W
Flasher Light		12V/27W
High Beam Indicator		12V/2W
Speedometer Light		12V/3W
Tachometer Light		12V/3W

NOTE: TX650 SPECIFICATIONS IDENTICAL TO XS2 UNLESS OTHERWISE NOTED.

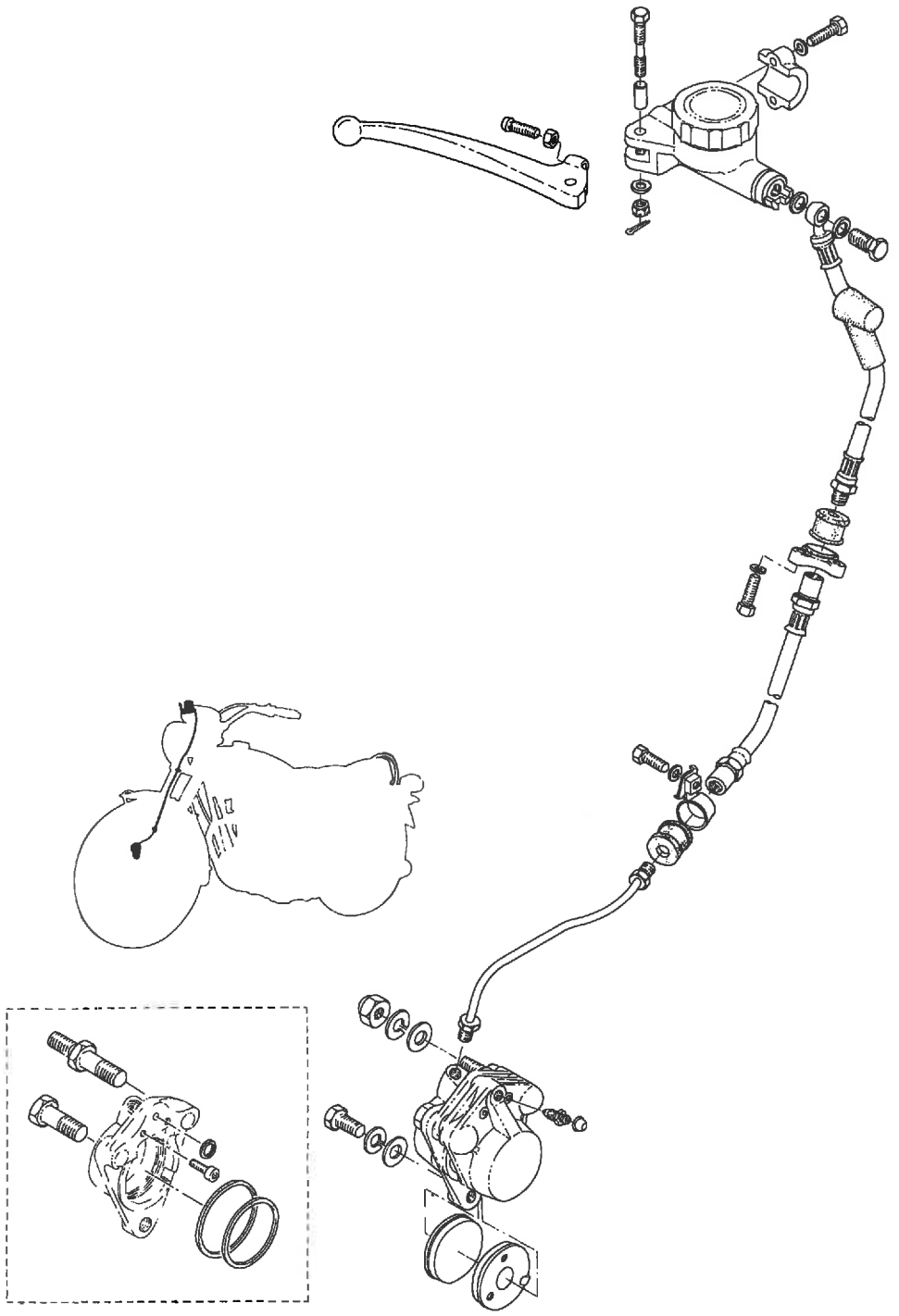
SEE ALSO XS1/XS1B SPECIFICATIONS.

DISC BRAKE

I . Construction

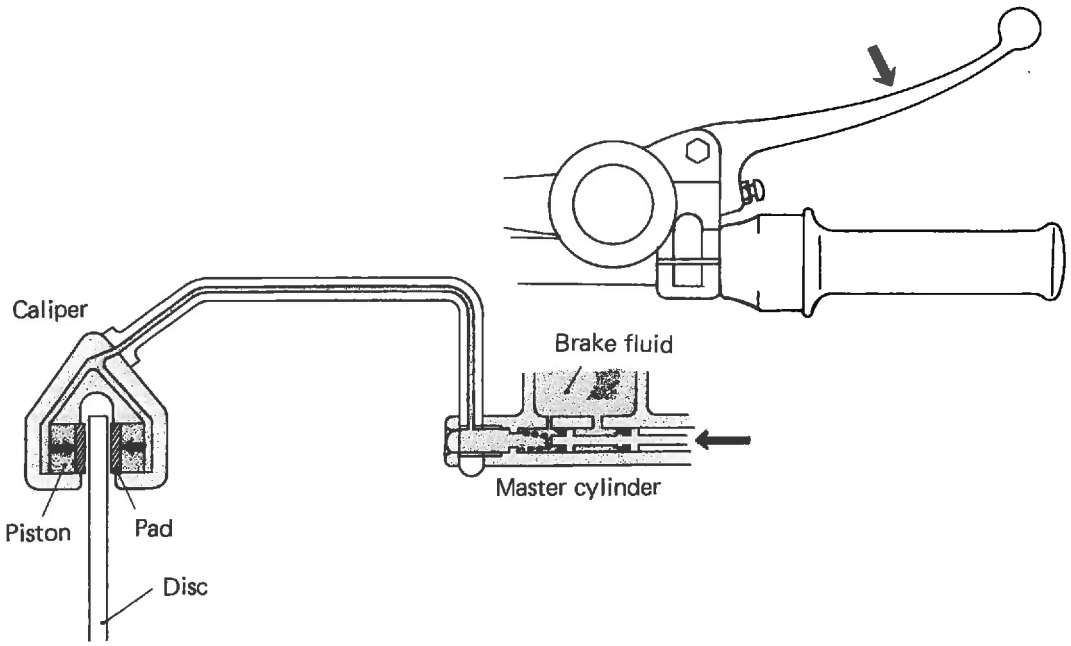
Construction

A fixed-caliper type disc brake, in which the two flat shoes grip the rotating disc, is in use. The right part of the handlebar has a brake lever and a master cylinder. The calipers are installed on the front fork, while the brake disc is mounted on the front hub. The master cylinder is connected to the calipers by a brake hose and pipe.



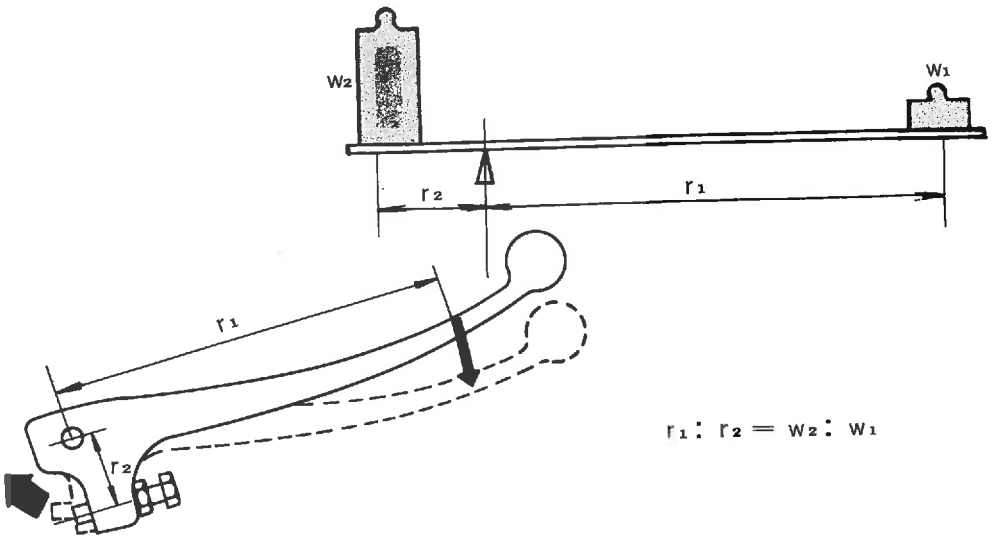
Operation

When the front brake lever is squeezed, it forces the master cylinder piston to move. As the piston cup moves past the compensating port, it traps the brake fluid in the cylinder. Pressure rises rapidly, and the fluid is forced through the brake hose to the caliper cylinders. The brake fluid forced into the caliper cylinders pushes against the pistons in the cylinders, and the pads (or "pucks") located on each side of the disc are forced against the disc. The friction between the pads and revolving disc then provides the braking action. As the brake lever is released, both brake lever and pistons are forced back to their respective original positions by the force of return springs.



Brake Lever

When the brake lever is squeezed, it produces a push, at the master cylinder piston about four times greater than the force applied to the brake lever.

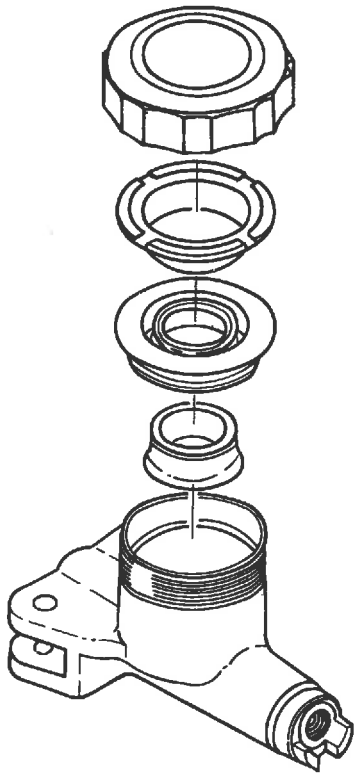


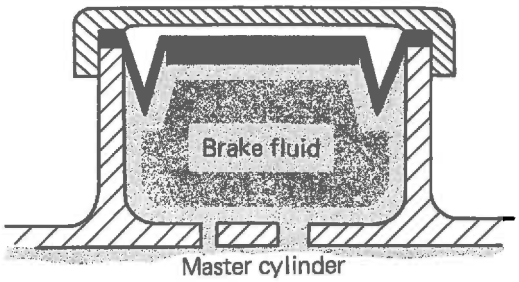
Master Cylinder

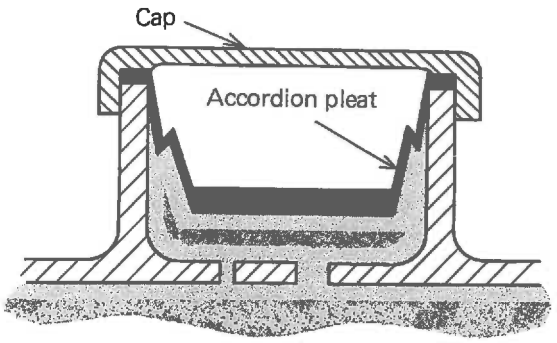
The master cylinder piston is linked to the brake lever. When the brake lever is squeezed, the piston forces the brake fluid through the hose and pipe to the calipers.

Reservoir Tank

As wear on the brake pads increases, the amount of brake fluid must be increased to maintain proper hydraulic pressure. The reservoir tank supplies this brake fluid. (tank capacity is approximately 30cc). To prevent air from entering the brake line when the brake fluid level lowers, especially on a rough road or in an inclined position, a compensating diaphragm is provided for the reservoir tank.

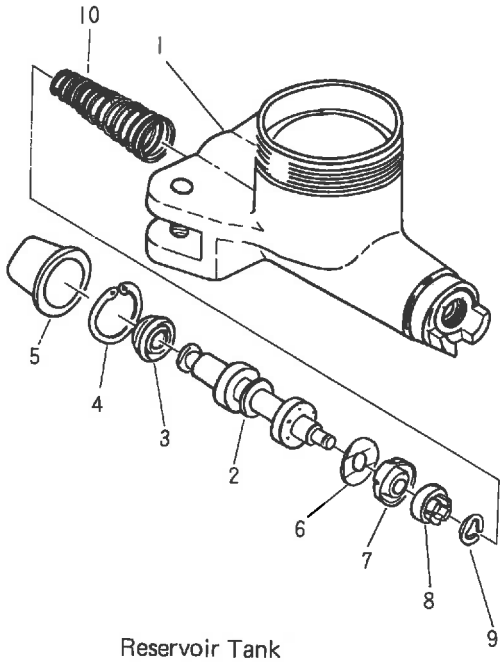






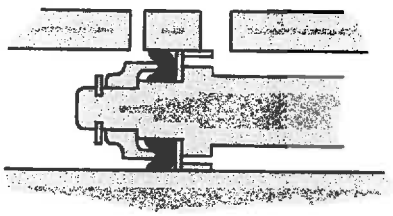
Piston

The master cylinder piston has two cups; one maintains good sealing between the cup and the cylinder wall of the master cylinder, and the other prevents the brake fluid from leaking out from the cylinder to the brake lever side. The return spring forces the brake lever to its home position, when the lever is released.

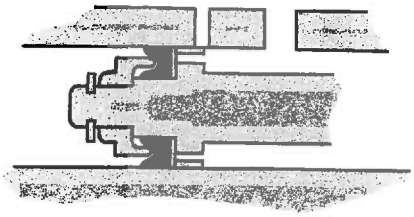


1. Body Master cylinder
2. Piston
3. Cup
4. Circlip
5. Dust boot
6. Spacer
7. Cup
8. Retainer
9. Clip
10. Spring

Reservoir Tank



When the brake lever in squeezed



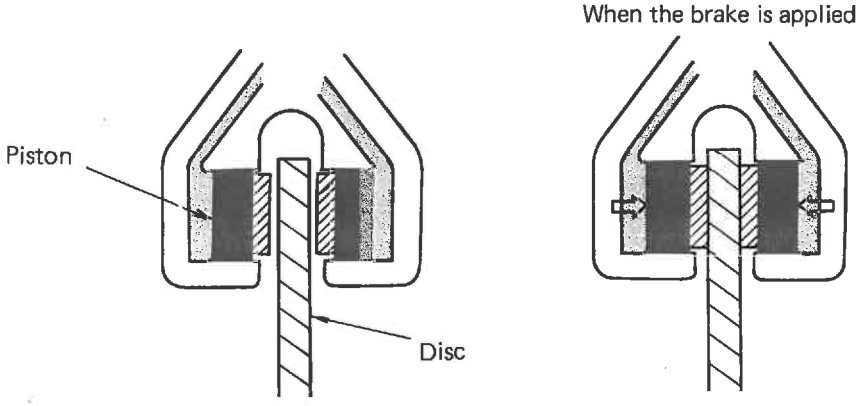
Brake hose and pipe

The brake hose and pipe carry hydraulic pressure to the calipers.
The brake hose is flexible and capable of withstanding a hydraulic pressure of 350 kg/cm² in conferming to SAEJ—1401.
The brake pipe is made of doubled steel tubing. For better corrosion resistance it is plated with zinc.

Calipers

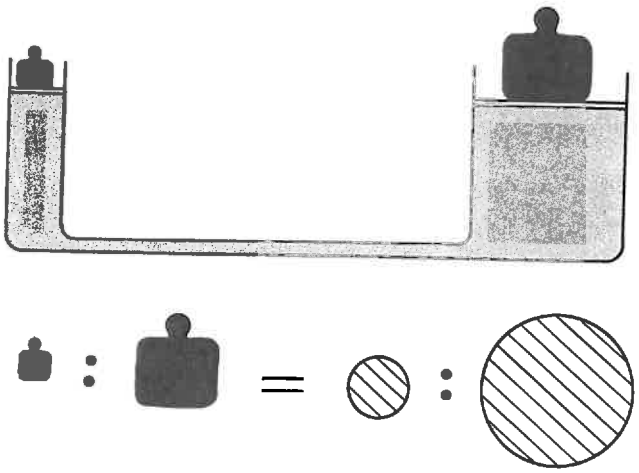
The hydraulic pressure carried to the calipers forces the caliper pistons out; by which action the pads are pushed out to grip the revolving disc.

When the brake is applied



Piston

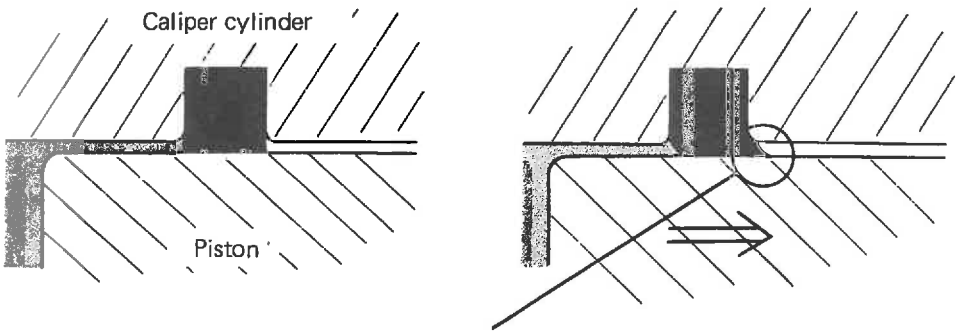
The caliper pistons are forced against the pads by hydraulic pressure which is about nine times greater than the pressure produced in the master cylinder. This is because the caliper cylinder piston surface area in much larger than the master cylinder piston surface area.



The pressure load ratis is proportional to the area ratis.

Seals

Each caliper cylinder has a piston seal (to maintain good sealing between the piston and the caliper cylinder wall) and a dust seal (to prevent dirt and water from entering the cylinder).
The piston seal is designed to move the piston back to its home position by making use of its tortional moment after the brake lever is released. The tortional moment is produced by the frictional force and elasticity of the piston seal. The piston seal also serves as an automatic adjuster of the clearance between the disc and the pad. (The clearance between the disc and the pad is normally 0.1 to 0.3 mm.)



The friction between piston real and piston and elasticity of the seal cause the piston to return to its home position.

Pads

The pads are forced against the revolving disc by the caliper cylinder pistons to grip the disc. They are composed of resin mold asbest.

Bleed Screw

Air in the hydraulic line impairs hydraulic action. To expel air out of the caliper cylinder, a bleed screw is provided on the caliper ass'y.

Disc

The stainless steel disk the held to the front wheel hub, and it is gripped by the pads located on each side of the disc.

Brake Fluid

The brake fluid is compressed in the master cylinder, and the hydraulic pressure thus produced is carried to the caliper cylinder pistons. In this sense, the brake fluid plays a very important role.
The brake fluid must meet the following requirements:

1. Proper viscosity and liquidity can be maintained at working temperatures.
2. Good stability is maintained. (That is, the fluid will not separate, change in viscosity, and/or precipitate.)
3. Boiling point is high. (No vapor lock will result.)
4. It will not deteriorate rubber.
5. Water resisting property is excellent.

Note that the disk brake fluid must be of genuine quality, because the fluid temperature tends to rise as compared with the drum brake.
Suggested brake fluid specifications: SAE J1703B.

2 . Disassembly

The tire and bearings can be disassembled without removing the brake disc. Do not attempt to remove the brake disc unnecessarily.
Tools and Parts required for Disassembly:

General service tools
Hexagon wrench, 5mm
Grip pliers
Air compressor
Rags
Torque wrench

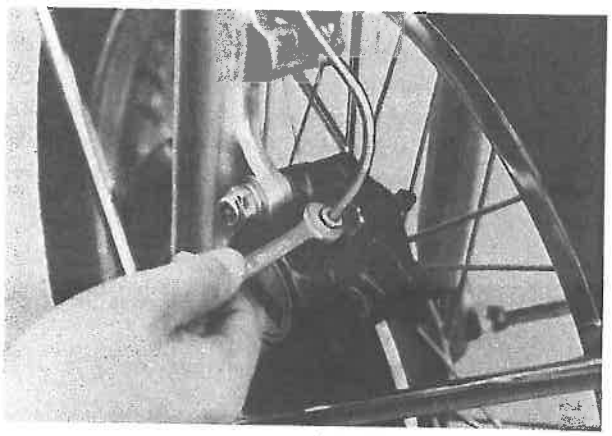
Caliper

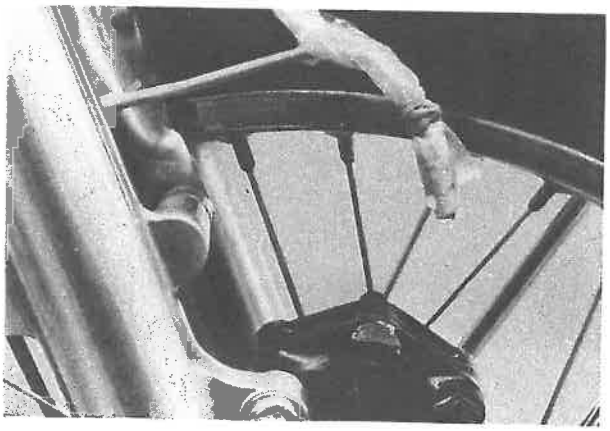
Removing the Caliper

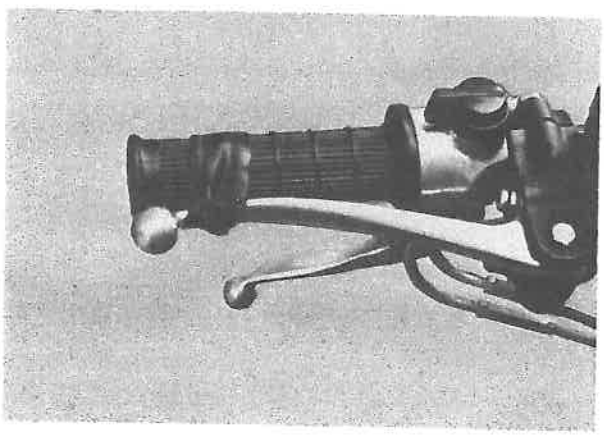
1. Remove the brake pipe from the caliper ass'y.
   Put the removed brake pipe in a clean vinyl bag so that it can be kept free from dust and dirt.

Note

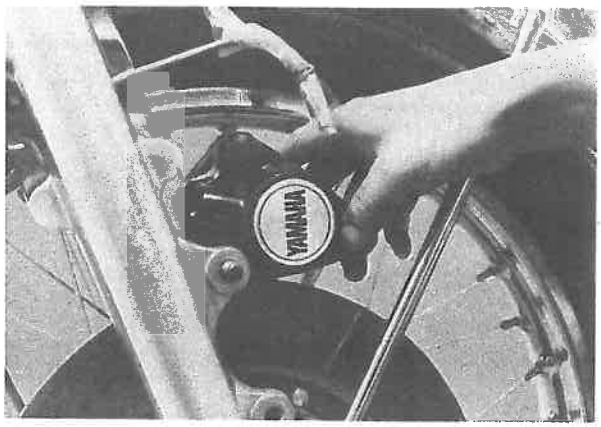
It is advisable to keep the brake lever squeezed, because this brake lever position prevents the fluid from leaking out of the reservoir. Place a heavy rubber band around the lever and handlebar grip.





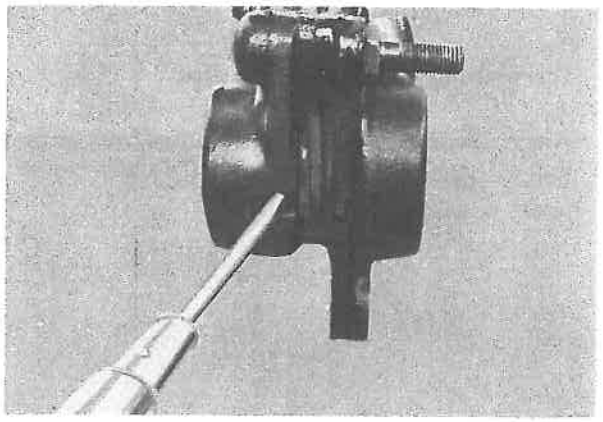


2. Remove the caliper mounting bolts and nuts.
3. Rotate the caliper ass'y upward, and remove it.



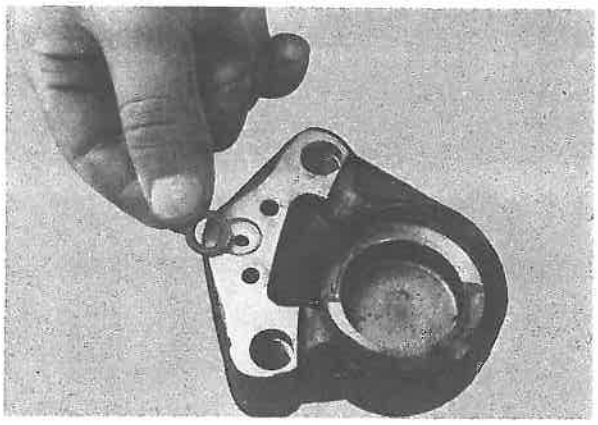
Removing the Pads

4. Remove the pads from their seats.

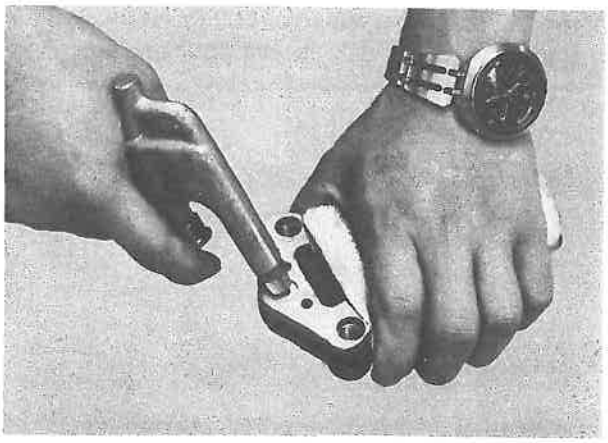


Removing the caliper Pistons and Seals:

5. Remove the two bridge bolts and two hexagon bolts.
6. Remove the caliper seal.



7. Force the piston from the caliper cylinder by feeding compressed air into the cylinder through the fluid inlet. Never attempt to push the pistons. with a screw driver.

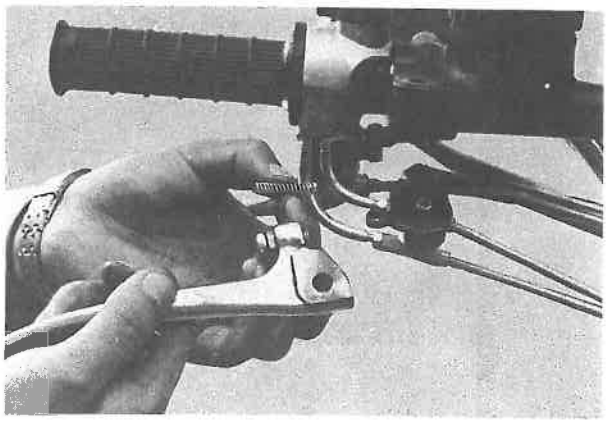


8. Remove the piston seal and dust seal from the caliper body.
   The foregoing applies to both pistons.

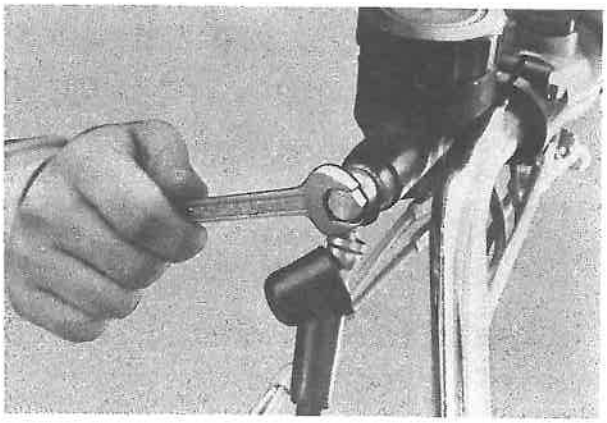
Note:
The removed parts should be kept free from gasoline, kerosene, engine oil, etc. If any oil attaches to a seal, it will swell up or deteriorate.

Master Cylinder

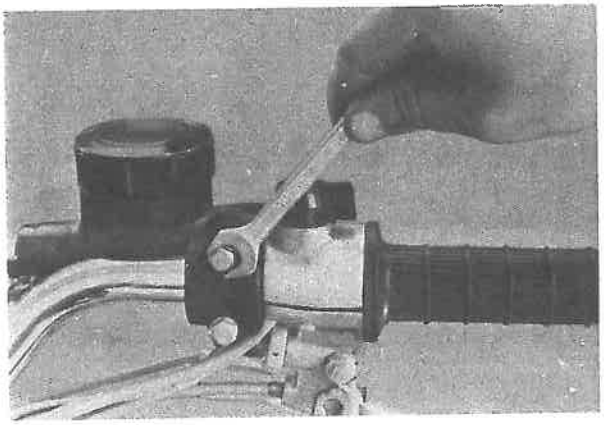
1. Remove the stop switch and brake lever.
   (Take care not to misplace the brake lever return spring.)



2. Remove the brake hose.

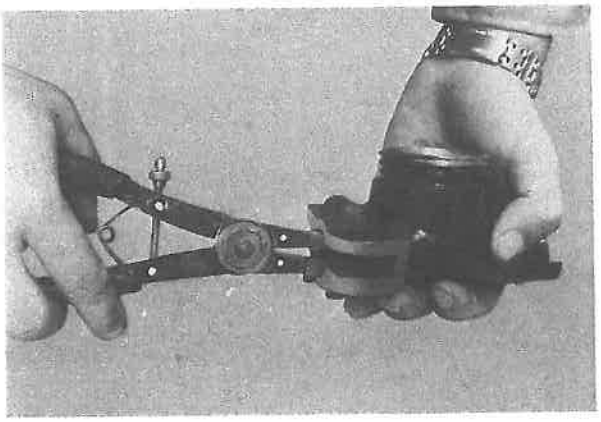


3. Remove the two master cylinder mounting bolts, and remove the master cylinder from the handle-bar.
4. Remove the reservoir tank cap, and remove the diaphragm.
5. Drain the brake fluid from the reservoir tank.

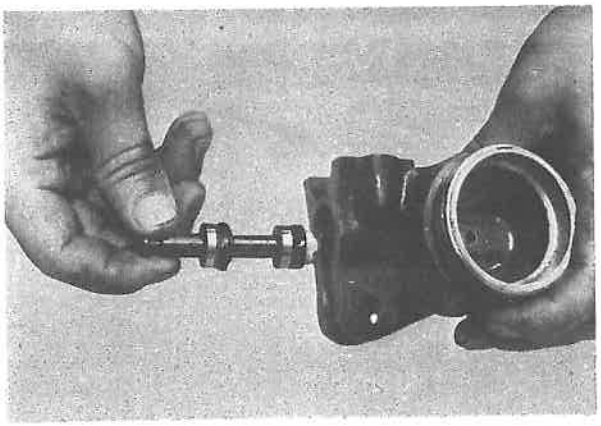


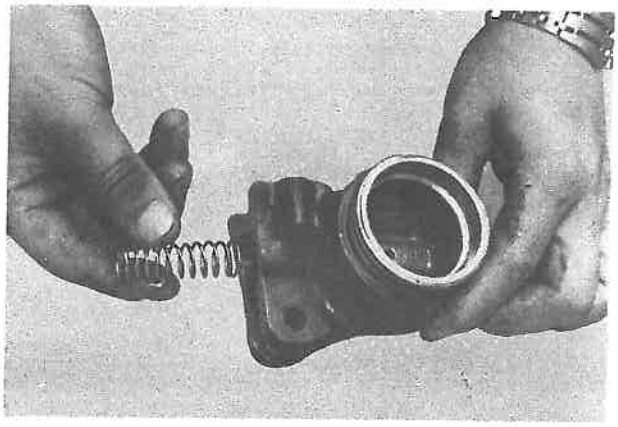
6. Remove the master cylinder boot.

7. Remove the snap ring with clip pliers.

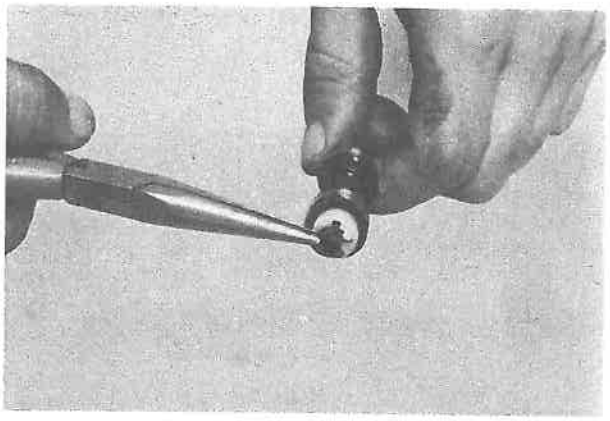


8. Remove the piston. (Note that a spring remains in the master cylinder.)

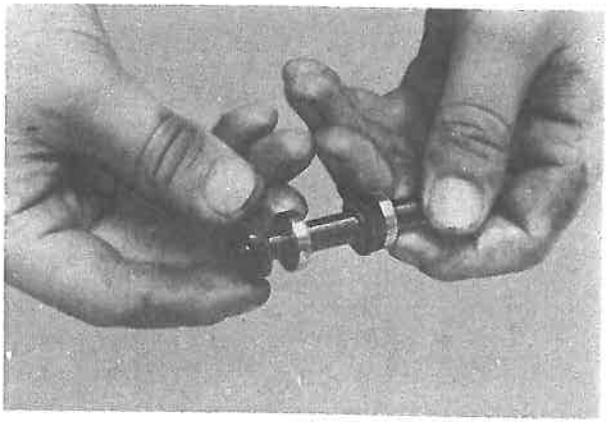




9. Remove the E clip, and remove the cylinder cup retainer.



10. Remove the cylinder cup.



3 . Inspection

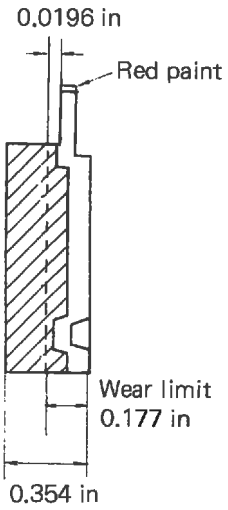
Measuring Instruments required for Inspection

Dial gauge
Dial gauge adapter
Micrometer 0-25 mm
Vernier calipers 150mm

Pistons

Pistons

If any piston is found scratched or worn, replace it.



Pads

If any pad is found excessively worn, replace it.
Min allow pad thickness: 0.5 mm

Piston Seal and Dust Seal

If any seal is found damaged, replace it.
It is advisable to replace the seals every two years of use, whether they appear damaged or not.

Bridge Bolt

Replace the bridge bolts each time they are removed for disassembly, whether damaged or not.

Master Cylinder

Master Cylinder Body

1) If the master cylinder has any streak or grooved wear on its wall, replace it.
2) If the outlet end has any scratch or dent, replace it.
3) Check the compensating port for clogging.
4) Check for any foreign matter inside the cylinder and the reservoir tank.

Piston

1) If the piston has any streak or grooved wear, replace it.
2) If the piston has any rust, replace it.

Cylinder Cups

1) If any cylinder cup has a streak or grooved wear on its contacting surface, replace it.
2) If any cylinder cup is found to be swollen, replace it together with the other seal and rubber parts. Thoroughly wash all areas which are exposed to brake fluid in free it, new, brake fluid.
3) Whether it shows wear or not, replace the cylinder cup every two years of use.

Reservoir Diaphragm and Master Cylinder Boot.

1) Check the flange and accordion pleats for damage, cracks and aging.
2) Check for swelling. (If swollen, take the same steps as in the case of the cylinder cup.)
3) Replace both every two years fo use, whether they are in good condition or net.

Conical Spring

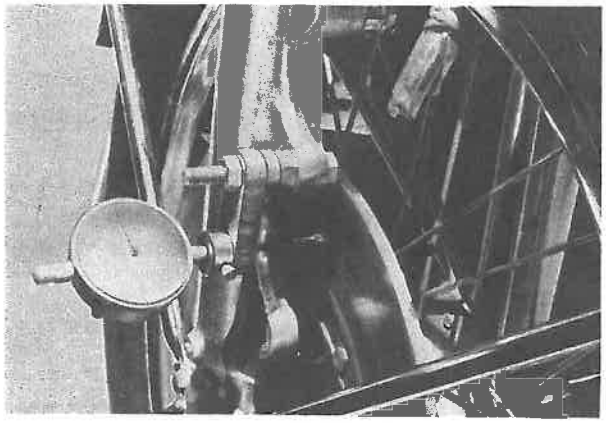
1) Check the spring for breakage and wear.

Brake Hose and Brake Pipe

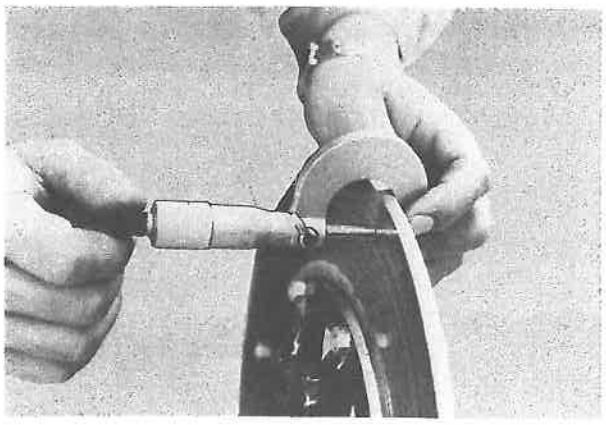
1) Check them for leakage and damage.
2) Replace the brake hose every four years of use, whether it appears to be in good condition or not.

Disc

1) Check the disc ass'y for run-out.
   If the disc shows a deflection of 0.15 mm or more, check the disk itself and the bearings.



2) If the disc has excessive wear or damage, replace it.
   Min allow disc thickness: 6.5mm



4. Assembly and Adjustment

Cleaning

All the removed parts should be washed in the following manner before they are installed.

1) A new brake fluid should be used as a cleaning detergent.
   (The use of any mineral oil should avoided, because it causes rubber parts to swell. The same can be said of alcohol. Any rubber dipped in alcohol will swell.)
2) If an oil of any other kind (such as mineral oil) is mixed in the system by mistake, the piston cups and seals should be replaced with new ones. All other parts should be washed with fresh, clean, new brake fluid. In addition, the lines, ports, passages, etc., should be thoroughly flushed with clean, new brake fluid.

Calipers

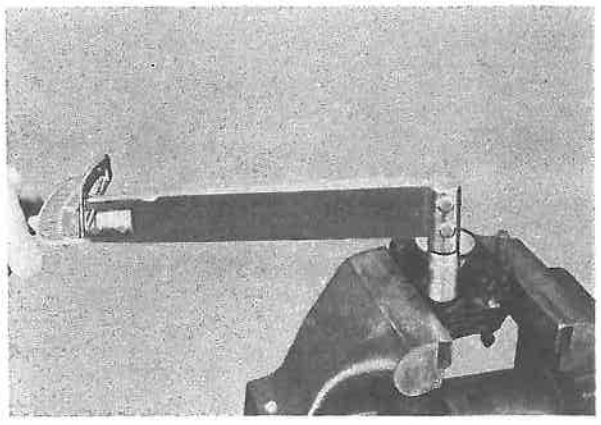
Piston Installation

1) Install the piston seal and dust seal in their seats in the caliper cylinder.
2) Coat the caliper cylinder walls and piston with new brake fluid.
3) Insert the piston into the caliper cylinder with your hand.
   In inserting the piston, special care should be taken so that the piston goes into the cylinder smoothly.

Assembling the outer and inner calipers.

4) Install the caliper seal in their seat.

5) Put together the outer and inner calipers.
   (Make sure that no dust or dirt is attached to the mating surfaces.)
6) The two bridge bolts must be replaced with new ones. Tighten the two hexagon bolts. (The bridge bolts should be tightened later.)
   Tightening torque: 60~100 kg-cm



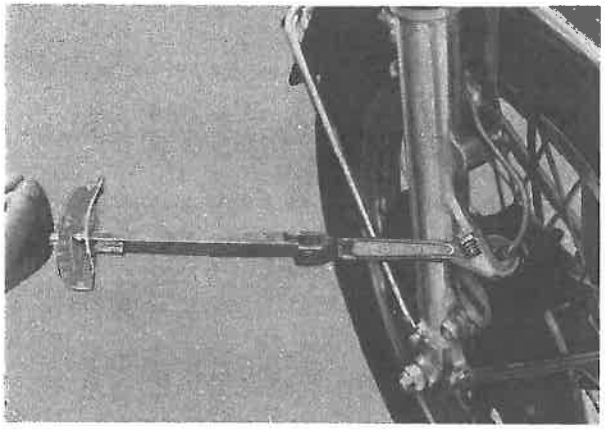
7) They are very important parts viewed from operational safety, and therefore, the removed bridge bolts should always be replaced. Be sure they are tightened with correct torque.
   Tightening torque: 750 - 950 kg-cm

Pad Installation

8) Install the pads in their seats.
9) When replacing the pads alone, it is necessary to push back the piston so that new pads can easily be installed. (When the piston is pushed back, and the compensating port is open, the brake fluid level in the reservoir tank will rise steeply. Loosen the bleed screw in necessary, and bleed off the excess brake fluid.

Installing the Calipers

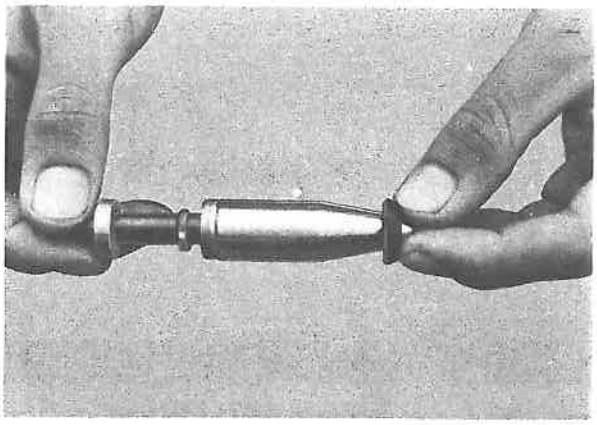
10) To install the calipers on the front fork, reverse the procedures for removal.
    Tightening torque: 400-500 kg-cm
11) Install the brake pipe.
    Tightening torque: 130-180 kg-cm

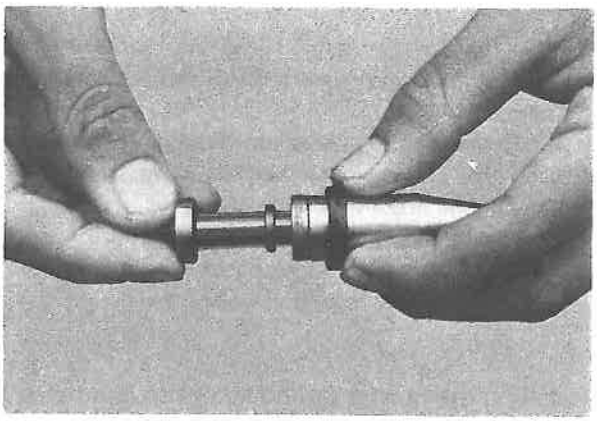


Master Cylinder

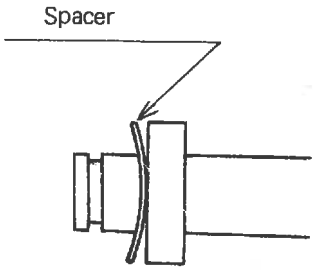
Installing the Cylinder Cup

1) Dip the cup in a new brake fluid, and install it. Take care not to scratch the cup and the piston. (Use the jigs.)

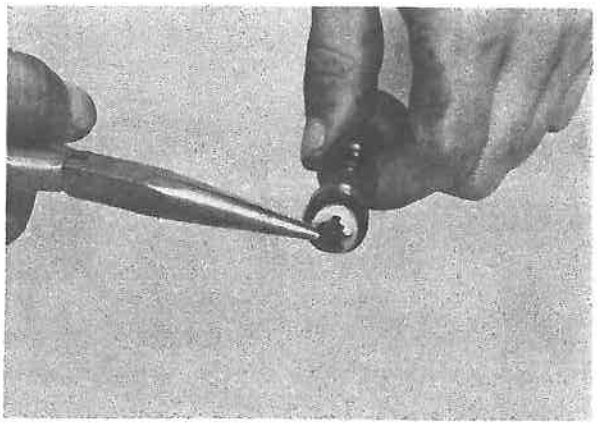




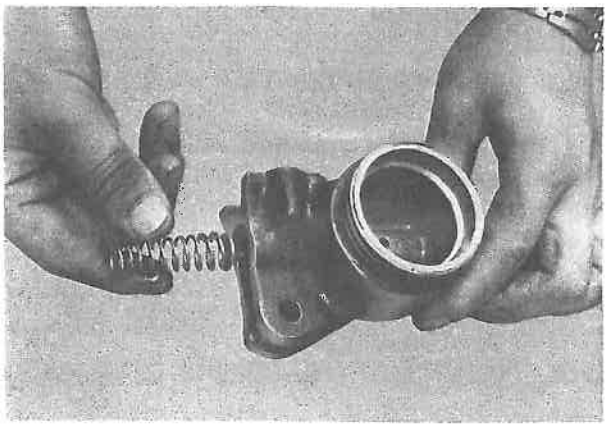
2) Install the spacer. Be sure that the spacer is positional correctly.



3) Install the cup, retainer and E clip.



4) Insert the spring into the master cylinder body.



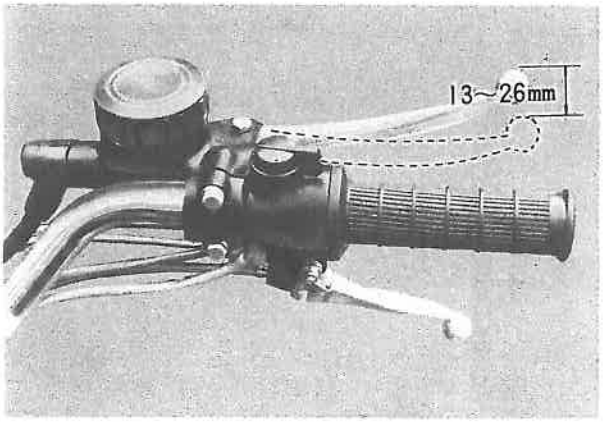
Installing the Piston

5) Check the piston surfaces and cup surfaces for scratches, and then, insert the piston into the cylinder.
   Avoid forcing the piston into the cylinder; otherwise, the cylinder wall will be scratched, thus allowing the brake fluid to leak past.
6) Install the snap ring.
7) Install the boot in the master cylinder groove and the piston groove, respectively.

Installing the master cylinder on the handlebar.

8) Install the master cylinder on the handlebar.
9) Adjust the clearance between the piston and the push rod.

Note:
Fully tighten the adjusting screw lock nut so that it will not become loose.



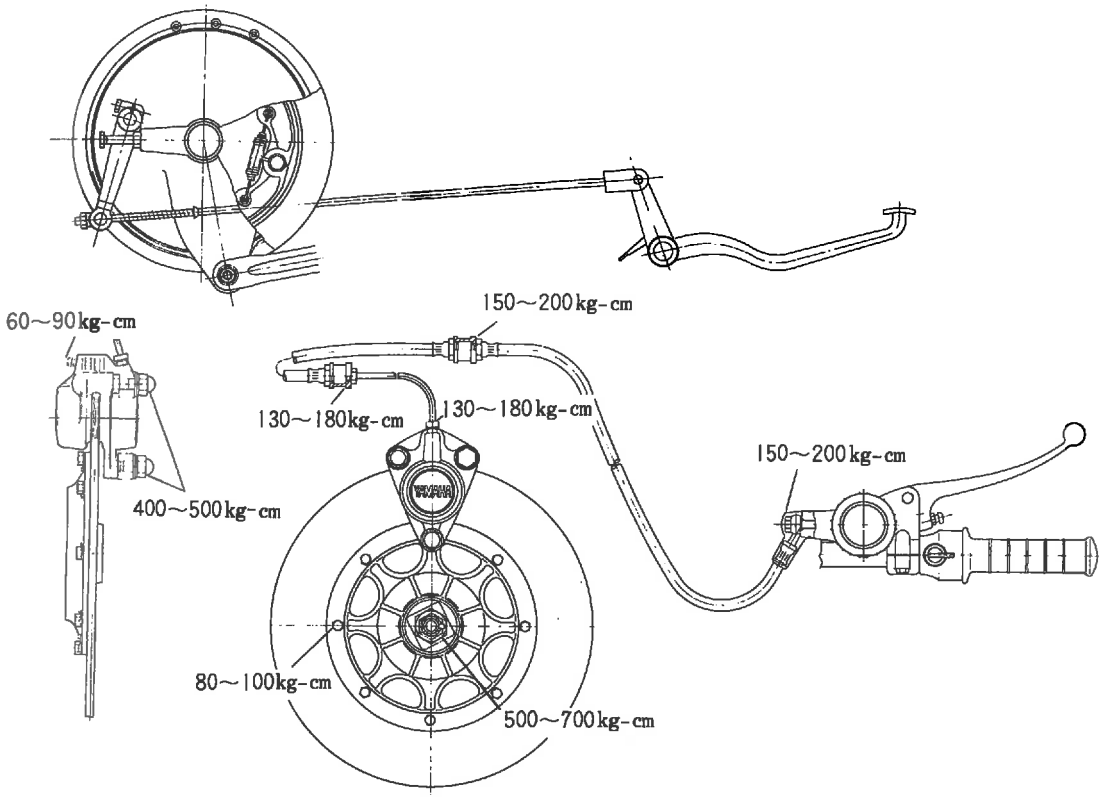
10) Fasten the brake hose to the master cylinder with the union bolt.

Note:
If the gasket is fourd scratched, it should be replaced.

11) Feed approximately 30cc brake fluid into the reservoir tank prior to bleeding.

Brake Hose and Brake Pipe

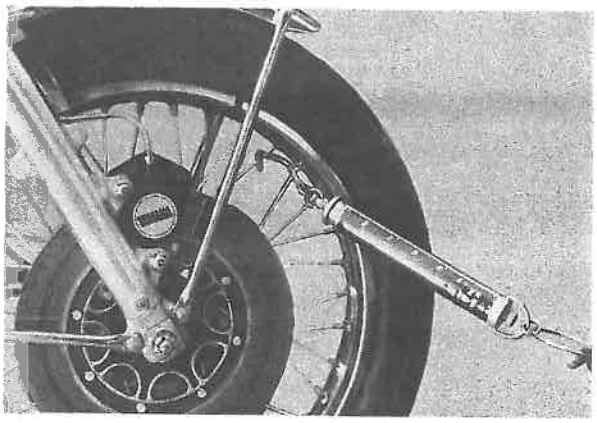
The brake hose and brake pipe fittings should be fastened with the following torque.



Disc

1) The disc mounting bolts should be tightened gradually and in pattern with correct torque. The lock tabs should be properly positioned and bent tightly over the bolt heads.
   Tightening torque: 80~100kg—cm
2) The deflection of the disc ass'y should be within the specified value. (0.15mm)
3) The disc trailing torque should be within the specified amount after it is assembled.
   Torque: 2~4 kg when assembled as shown in the figure on the right.
   If the value exceeds this limit, check the disc run out.

* On the disc brake, a slight drag can be neglected. A slight drag will not result in serious trouble, and will not develop into a worse condition.

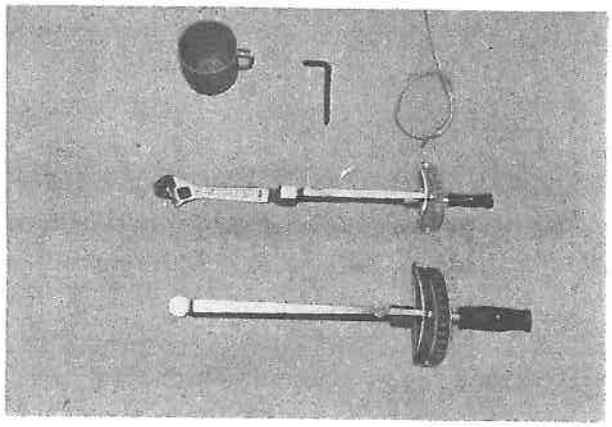


Air Bleeding

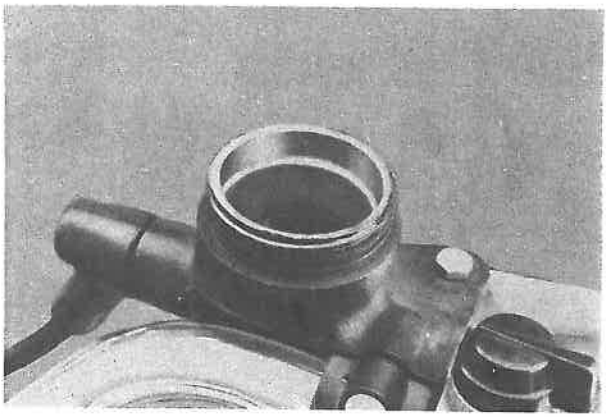
When any parts relating to the brake fluid are reinstalled, be sure that each metal fastner is fully tightened and then bleed the air.

Tools and Parts

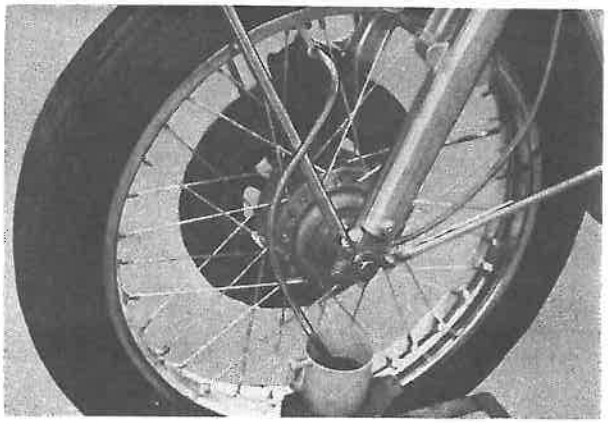
Wrench
Torque wrench
Vinyl tube Inside dia 4mm
Brake fluid (SAE grade #J1703B)
Brake fluid receiving vessel
Rags



1) Fell with brake fluid so that the reservoir level reaches the specified line.
2) Install the diaphragm to prevent the brake fluid from escaping.



3) Connect the vinyl tube to the caliper bleed screw tightely so that no brake fluid will leak out.



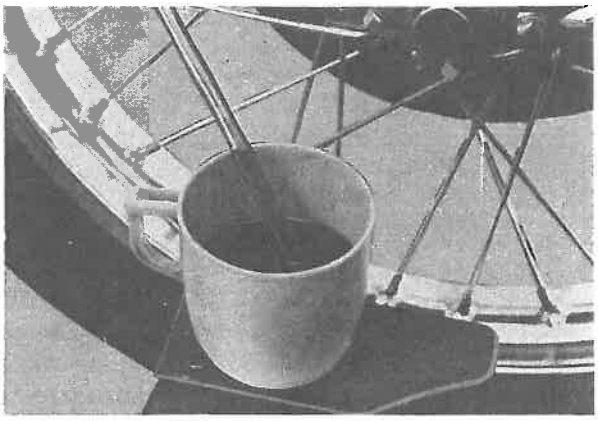
4) Place the brake fluid receiving vessel at the end of the vinyl tube.

5) Apply the brake lever slowly a few times. With the brake lever squeezed, loosen the bleed screw.
6. As fluid and air escape, the lever will close. Tighten the bleed screw before the lever bottoms on the handle bar grip.

Note:
When bleeding the air, do not operate the brake lever quickly. Otherwise, the air will turn into fine bubbles, thereby making the air bleeding difficult.

7) Repeat the procedures in 5) - 6) above until air bubbles will completely disappear in the vinyl. tube.

Note:
Bleed screw tightening torque: 60-90 kg-cm



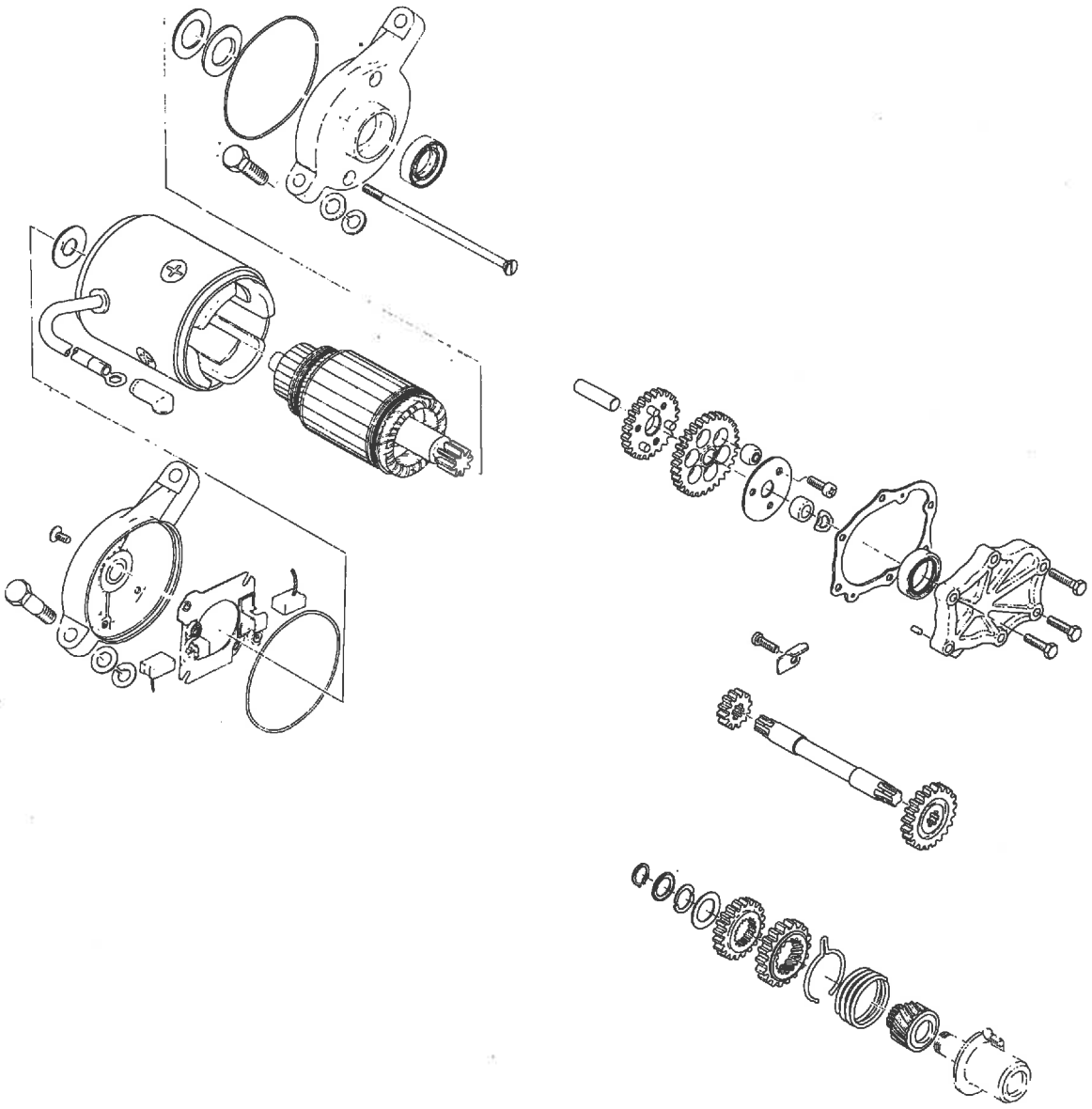
8) Refill with brake fluid so that the level will again reach the specified line.

9) The reservoir tank is of complete airtight design. When the pads become worn, the brake fluid level will lower, but the diaphragm will automatically adjust the brake fluid level by shifting its position. Therefore, when the reservoir tank is filled with the brake fluid, the diaphragm must be reset to its original position.

5. Specifications

1. Brake lever ratio	3.77
2. Caliper area ratio of master cylinder	9.15
3. Total lever ratio	34.5
4. Braking torque	3.45 F
(F denotes gripping force)	
5. At a reduced speed of 0.8 G	
a. Required braking torque	54.0 kg-m
b. Required gripping force	15.7 kg
c. Generated oil pressure	30.8 kg/cm^2
d. Pressure on lining surface	32.0 kg/cm^2
6. Dragging resistance of pad	13.5 kg-cm
7. Lining	
Material	Resin mold
Dimension	47.0ϕ x 5.3^t
Effective thickness	4.3^t
Wear coefficient	0.40
8. Brake hose	
Dimension	10.5ϕ x 3.1ϕ
Allowable compression	350 kg/cm^2 or more
9. Brake pipe	
Dimension	4.70ϕ x 0.7^t
Allowable compression	350 kg/cm^2
10. Disc	
Outside diameter	298ϕ
Effective friction radius	124.7
Thickness	7
Material	13-14 Cr stainless
Heat treatment	High frequency hardening
Master cylinder	
Inner diameter (bore)	15.875ϕ
Stroke	16 mm
Reservoir capacity	31.5 cc
Material	LP cast AC2B
Type	Rockied type tightly sealed reservoir
Caliper	
Inner diameter	48.1
Material	FCD40
Type	Two opposing piston type
Others	Automatic clearance adjusting device for wear

ELECTRIC STARTER



Construction

The starter motor is located under the crankcase. An idler gear is attached to the shaft. Torque from the motor, during operation, is transmitted from the idler gear, through the three reduction gears to the splined engagement gear (gear 4). The engagement gear works in the same manner as a splined kick gear; moving out to engage the gear mounted on the outer half of the right-hand crankshaft half. In this fashion, torque from the starter motor is transmitted to the crankshaft. As the engine starts, gear 4 is automatically disengaged.

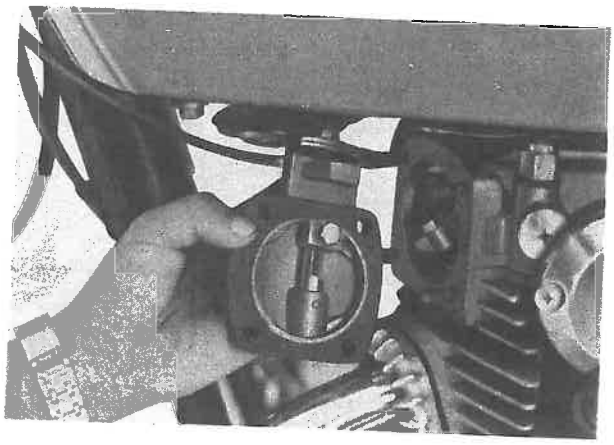
The starter motor itself is a series-wound, 12 volt D.C. motor which draws 150 amps or less initially. (When the decompression lever is squeezed, at 20°C)

Due to the compression and displacement of the XS2, a decompression device is employed to ease the starting load on the starter motor. This eases the starting procedure and prolongs motor life.

A safety relay is incorporated within the starting circuit to automatically open the circuit when the engine fires. This provides for immediate disengagement of the starter motor gear train and, in addition, prevents the starter motor from over-revving through a no-load condition as gear 4 disengages.

Operation

1) When the decompression lever is squeezed, the cable opens the left cylinder exhaust valve slightly, reducing overall engine compression.

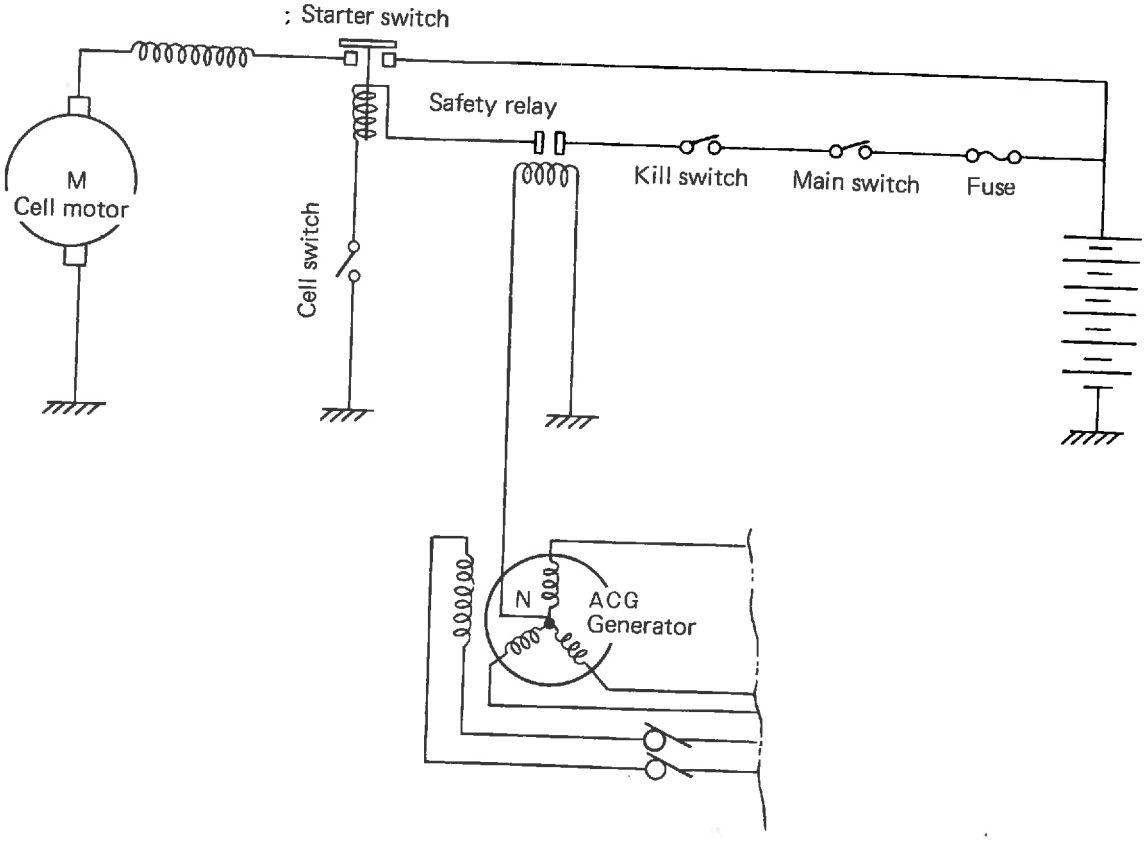


2) Next, the cell switch, which is built into the decompression lever assy, closes. This creates current flow in the starter motor solenoid's windings and the solenoid closes.

3) When the solenoid (starting motor switch) closes, a direct circuit from the battery to ground through the motor circuit is created. Resistance is extremely low in this circuit and, consequently, a heavy current flow passes through the motor to ground, causing the motor to turn.

4) As the engine starts, the ACG begins to generate voltage. As voltage rises to 4V (±0.5V) the safety relay opens. This opens the circuit to the cell switch which in turn opens the circuit to the solenoid. With no current flow in the solenoid windings, the solenoid arm return spring opens the heavy duty circuit between the battery and starter motor. The starter motor stops turning and the splined engagement gear (gear 4) returns to the "rest" position.

5) Finally, the decompression lever is released and the engine runs fully on both cylinders.



Specifications

NOTE: The following specifications should be referred to while disassembly and troubleshooting (explained in following chapters) is taking place.

COMPONENT	ITEM	MAINTENANCE STANDARDS	REMARKS
Motor			
FIELDS	Resistance	0.05 ohms (20°C)	
BRUSH	W x T x L	16 x 7 x 11 mm	
	Limit length	4.5 mm	
ARMATURE	Resistance	0.055 ohms (20°C)	No Grounded core
COMMUTATOR	Diameter	33 ϕ std	
	Wear limit	32 ϕ	
	Mica undercut	0.5~0.8 mm	
	Undercut limit	0.2 mm	
	Max. allow runout	±0.15 mm	Out of roundness
BRUSH SPRING		800 gr pressure std.	(+10%,-25%)
STARTER SWITCH	Yoke gap	——	(solenoid)
	core gap	1.5~1.88 mm	
	point gap	0.88~1.11 mm	
	magnet windings	3.5 ohms (20°c)	
	Cut in Voltage	6.5V	
	Cut out Voltage	4.0V	
	Coil circuit	4A Draw. (20°C)	
SAFETY SWITCH	Yoke gap	0.2 mm	
	Core gap	0.5~0.6 mm	
	Point gap	0 mm	
	Cut Out Voltage	2.5 V or less	
MISCELLANEOUS ELECTRICAL			
STARTER MOTOR DRAW:		35 A 12 V (20°C)	No load
FEATURE STANDARDS:			
LOAD:		8.3V 100A 3800 r.p.m	
CONSTRAINT:		4V 300A or less	
NOMINAL ENGINE R.P.M :		300 r.p.m at 75A or less	
	(When the decompression lever is squeezed, at 20°C)		

Disassembly

Starter motor

1. Drain the engine oil.

2. Remove the four motor mounting bolts. (8 mm)

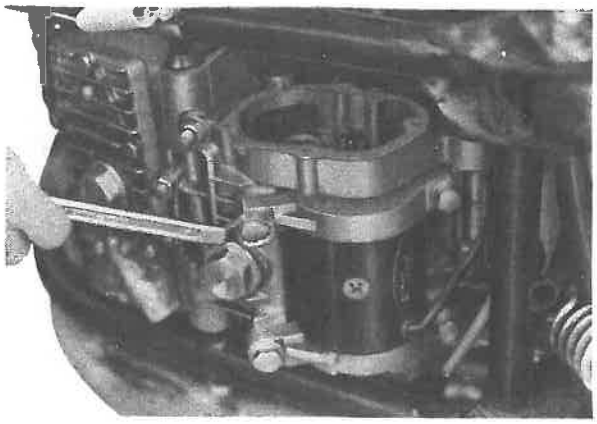
Note:

To ease removal, the machine should be placed on a lift or tilted towards the left.

3. Remove the motor. Pull straight back from its mounting location.

NOTE ON REASSEMBLY:

Make sure the gear shaft properly engages the reduction gear. Torque the 8 mm securing bolts evenly, in gradual stages, to a setting of 2.0 kg/m. Refill the sump with 2500 cc of SAE "SD" (MS) Motor oil.



Servicing and troubleshooting

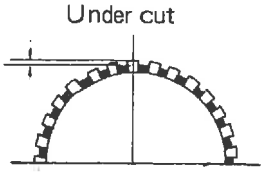
Armature

1. If the commutator surface is dirty, clean with #600 grit sandpaper as shown in the drawing at the right.

After sanding, wash thoroughly with electrical contact cleaner and dry with high-pressure air stream.

2. The mica insulation between commutator segments should be 0.5~0.8mm below the segment level.

If not, scrape to proper limits with appropriately shaped tool. (A hacksaw blade can be ground to fit).

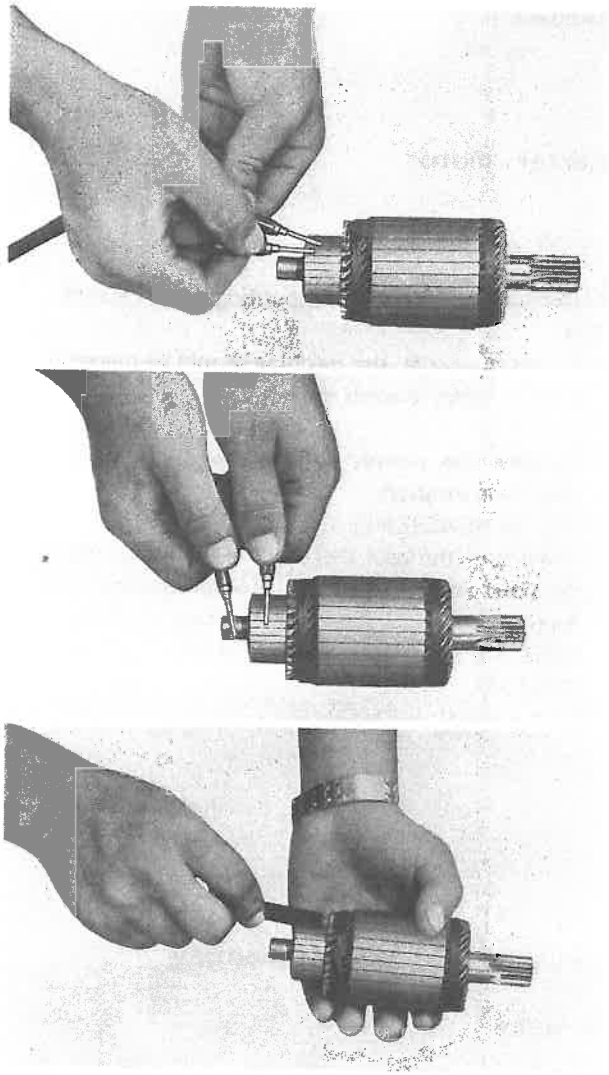


3. Each commutator segment should show zero ohms resistance to the others and at least three million ohms resistance to the core. If there is less than ohms resistance to the core, or one of the segments is open, replace the armature.

   In addition, the armature can be placed on a "growler" (testing device) and checked magnetically for internal shorts. Follow manufacturer's test recommendations.
4. If the armature shows signs of having been in contact with the yoke windings check the front and rear cover bearings.
   Replace as necessary.

5. If the commutator surface shows heavy scoring it can be turned down on a lathe or commutator turning machine. Check the specification chart for minimum allowable commutator diameter. Recut the mica after.

NOTE:
Should turning be required, check the condition of the cover bearings, armature electrical properties, starter amperage draw and rpm and, finally, carbon brushes.



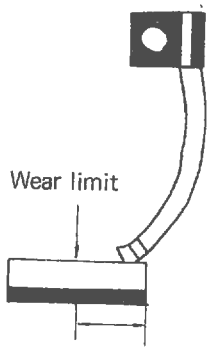
Carbon brushes

1. Check brush length and replace if at or near limits.

2. Check brush spring pressure. Replace if over/under specs.

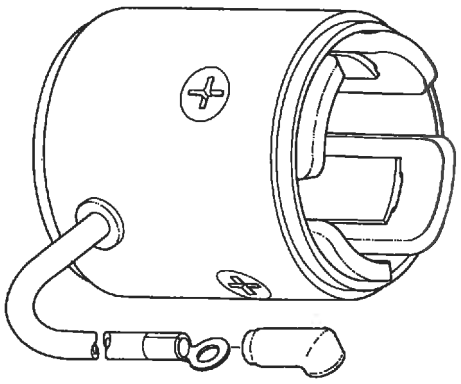
NOTE:
Spring pressure is measured with a nominal length brush installed. Lift until spring starts to lift off brush and note reading on scale. (Nominal: 800gr.)

3. Clean the brush holders thoroughly. Use clean solvent, a soft-bristled brush, and dry with high-pressure air stream.



Yoke

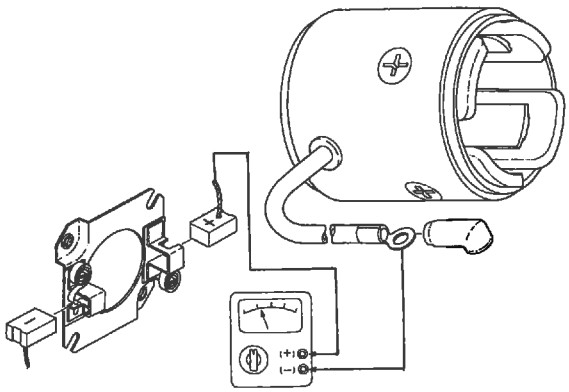
1. If the yoke area is dirty, clean with clean solvent and dry with high-pressure air.



2. Yoke coil resistance is 0.05 ohms.
   If coil resistance is more than 0.055 ohms or less than 0.045 ohms, replace it.

   If the yoke shows leakage to ground (resistance is less than 0.1 million øhms) replace it. (20° C)

NOTE:
   Immediately after cleaning, the yoke may show some insulation leakage. Wait for it to thoroughly dry before checking or reinstalling.



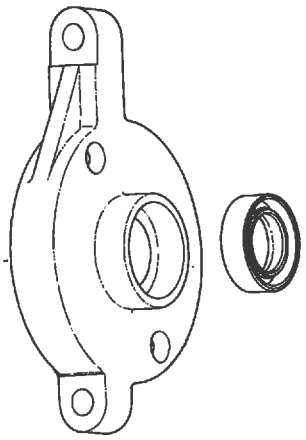
Covers

1. Check oil seals for hardening, cracking, worn lips. Replace as necessary.

NOTE:
   During reassembly, pre-lube the lips of all seals with "white" grease. (lithium soap base grease)

2. Clean the bearings thoroughly, lightly oil each and check for hard spots during rotation, cracked or broken balls and/or races, etc.
   Replace as necessary.

NOTE:
   During reassembly, all non-sealed bearings should be given a light coating of 20W or 30W "SD" (MS) Motor oil.

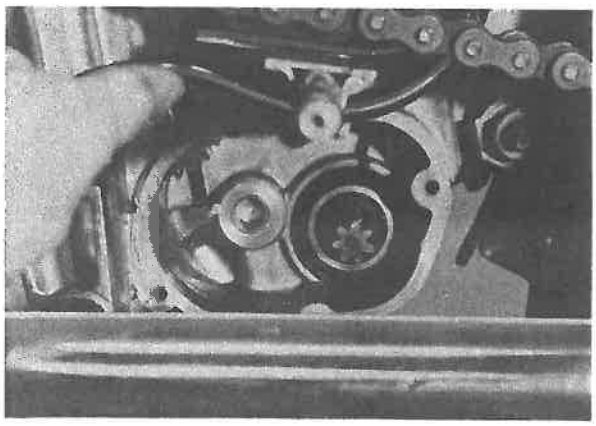


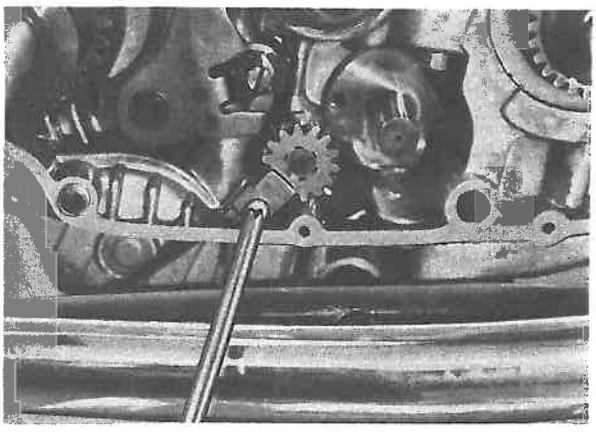
Starter reduction gears

NOTE:
   Additional disassembly details can be found in the Engine Section.

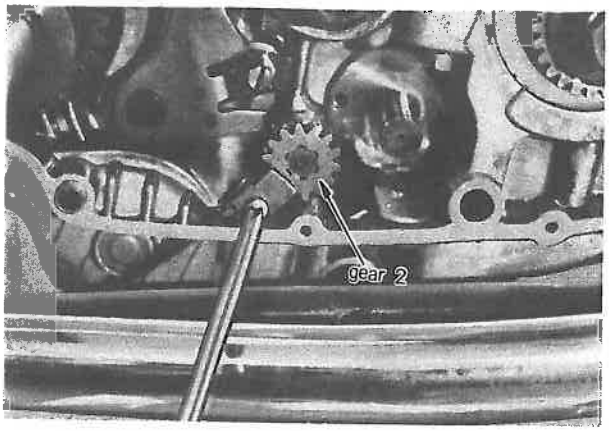
1. Drain the engine oil.
2. Remove the left crankcase cover.
3. Remove the gear train cover.
4. Remove the idler gear.

5. Remvoe the right crankcase cover.
6. Remvoe the clutch.
7. Remove the stopper plate mounting bolt and plate.

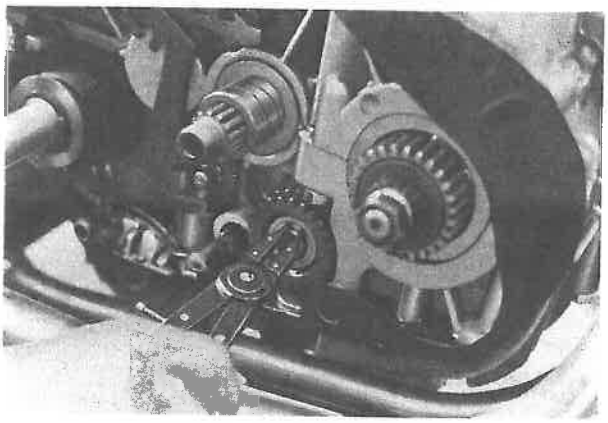




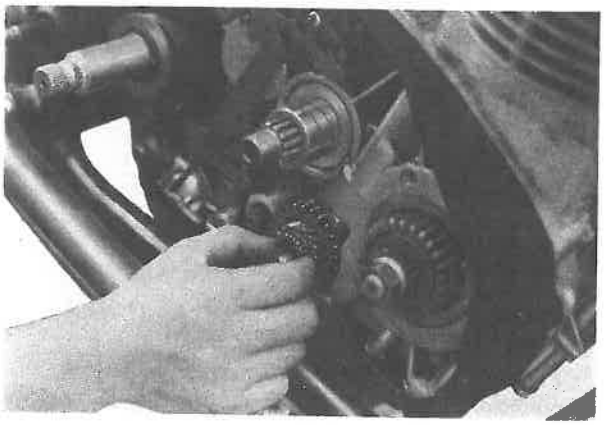
8. Remove the gear "2".



9. Remove the circlip.



10. Remove the gears "3" and "4". Remove the starter wheel.

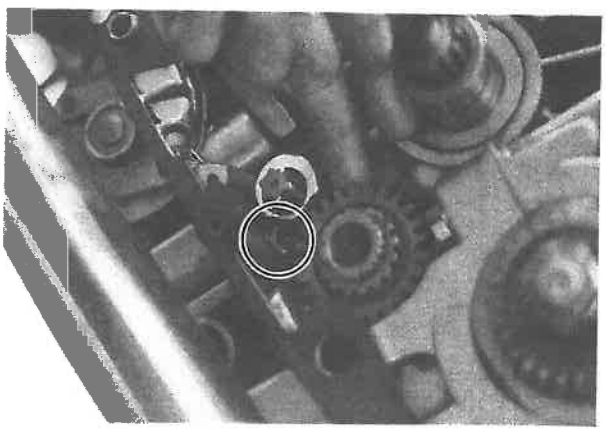


Servicing and troubleshooting

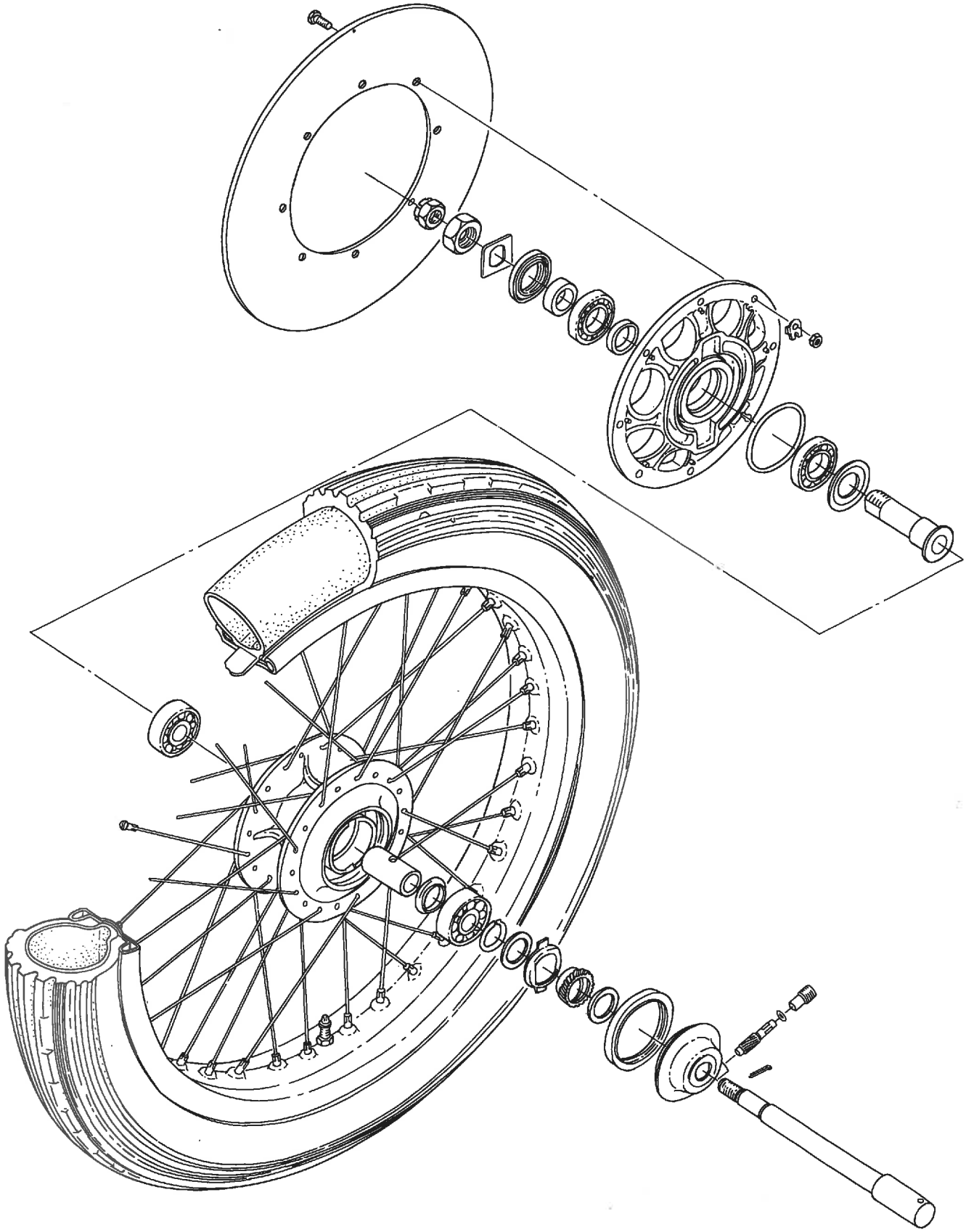
1. Gear "4" receives the most use. Check it thoroughly for signs of wear. Replace as necessary.
2. Check the return spring for fatigue. It should provide for positive return. Replace as necessary.
3. Check the remaining gears for shipped teeth, gauling, etc. Replace as necessary.

NOTE ON REASSEMBLY:

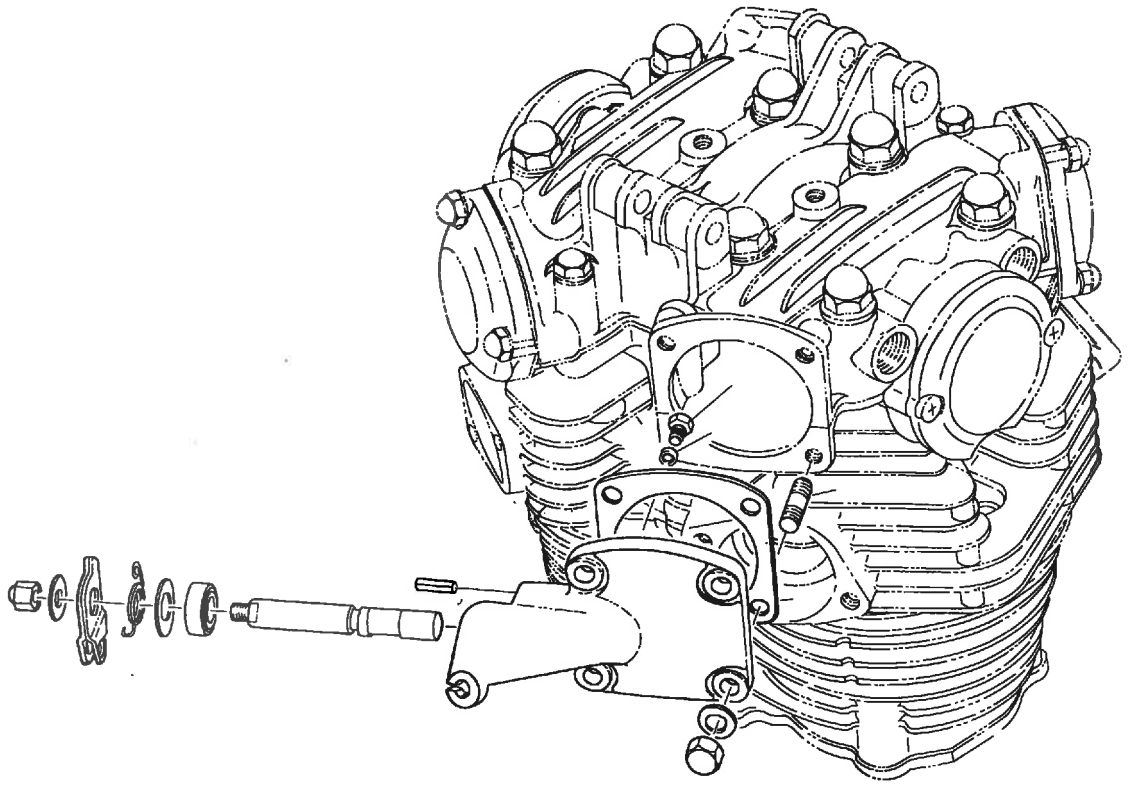
During reassembly, make sure the starter clip is firmly fitted in th crankcase groove.



FRONT WHEEL



CYLINDER HEAD



XS2 CIRCUIT DIAGRAM

Circuit connected by main switch

Color / Position	R	Br	Bl	R/Y
OFF	×	×	×	×
I	○	○	×	○
II	○	×	○	×

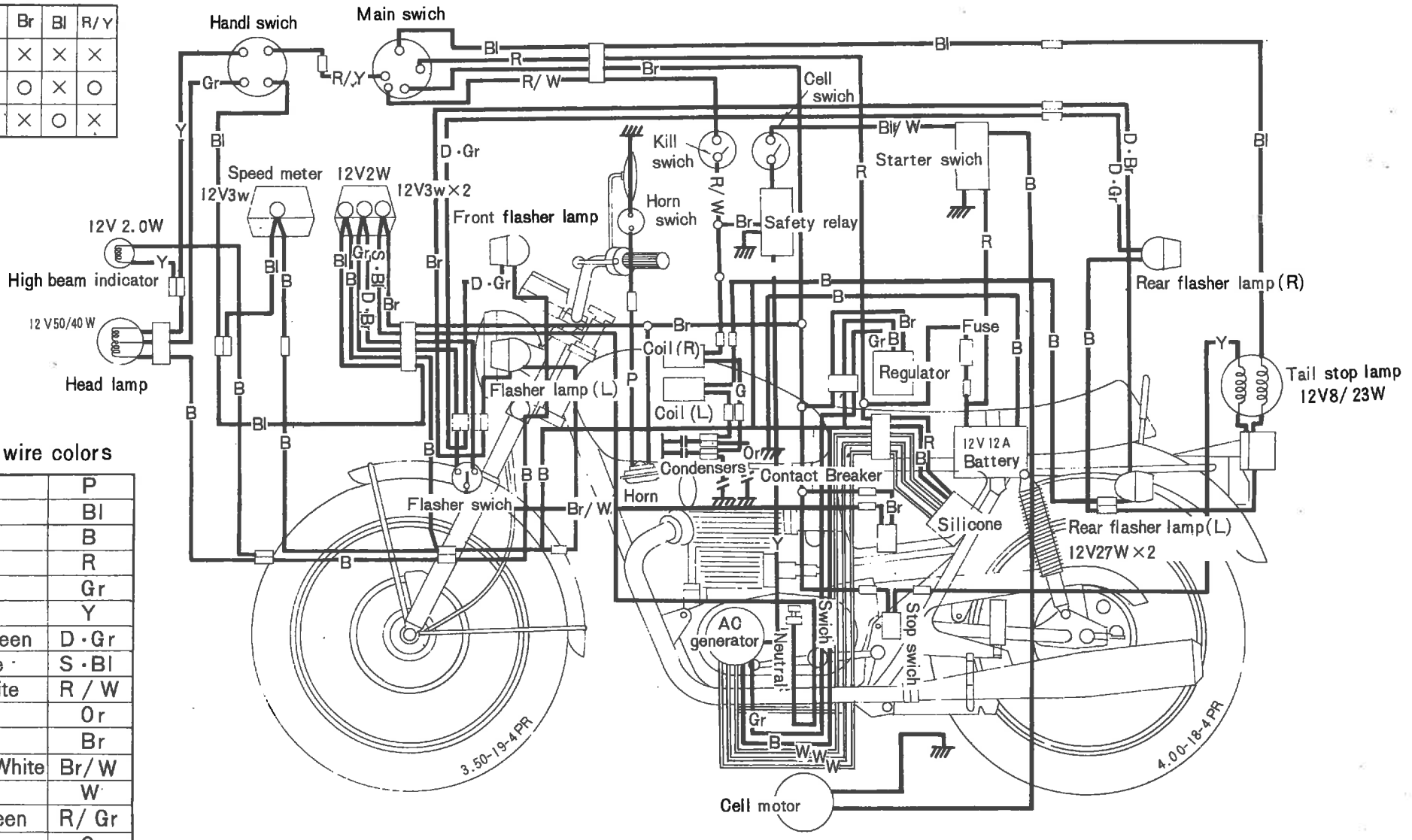


Chart of wire colors

Pink	P
Blue	Bl
Black	B
Red	R
Green	Gr
Yellow	Y
Dark Green	D·Gr
Sky Blue	S·Bl
Red/ White	R / W
Orange	Or
Brown	Br
Brown/ White	Br/W
White	W
Red/ Green	R/ Gr
Grey	G

Specifications for Disc Brake

1. Brake lever ratio	3.77
2. Caliper area ratio of master cylinder	9.15
3. Total lever ratio	34.5
4. Braking torque (F denotes gripping force)	3.45 F
5. At a reduced speed of 0.8 G	
a. Required braking torque	54.0 kg-m
b. Required gripping force	15.7 kg
c. Generated oil pressure	30.8 kg/cm2
d. Pressure on lining surface	32.0 kg/cm2
6. Dragging resistance of pad	13.5 kg-cm
7. Lining	
Material	Resin mold
Dimension	47.0ϕ x 5.3t
Effective thickness	4.3t
Wear coefficient	0.40
8. Brake hose	
Dimension	10.5ϕ x 3.1ϕ
Allowable compression	350 kg/cm2 or more
9. Brake pipe	
Dimension	4.70ϕ x 0.7t
Allowable compression	350 kg/cm2
10. Disc	
Outside diameter	298ϕ
Effective friction radius	124.7
Thickness	7
Material	13-14 Cr stainless
Heat treatment	High frequency hardening
Master cylinder	
Inner diameter (bore)	15.875 ϕ
Stroke	16 mm
Reservoir capacity	31.5 cc
Material	LP cast AC2B
Type	Rockied type tightly sealed reservoir
Caliper	
Inner diameter	48.1
Material	FCD40
Type	Two oppositing piston type
Others	Automatic clearance adjusting device for wear

MODEL TX650

This supplement is for the exclusive parts for the TX650.

Please refer to XS2 and previous Parts Lists for parts not listed in this supplement.

Fig. 3 FRONT FENDER · CALIPER · MASTER CYLINDER

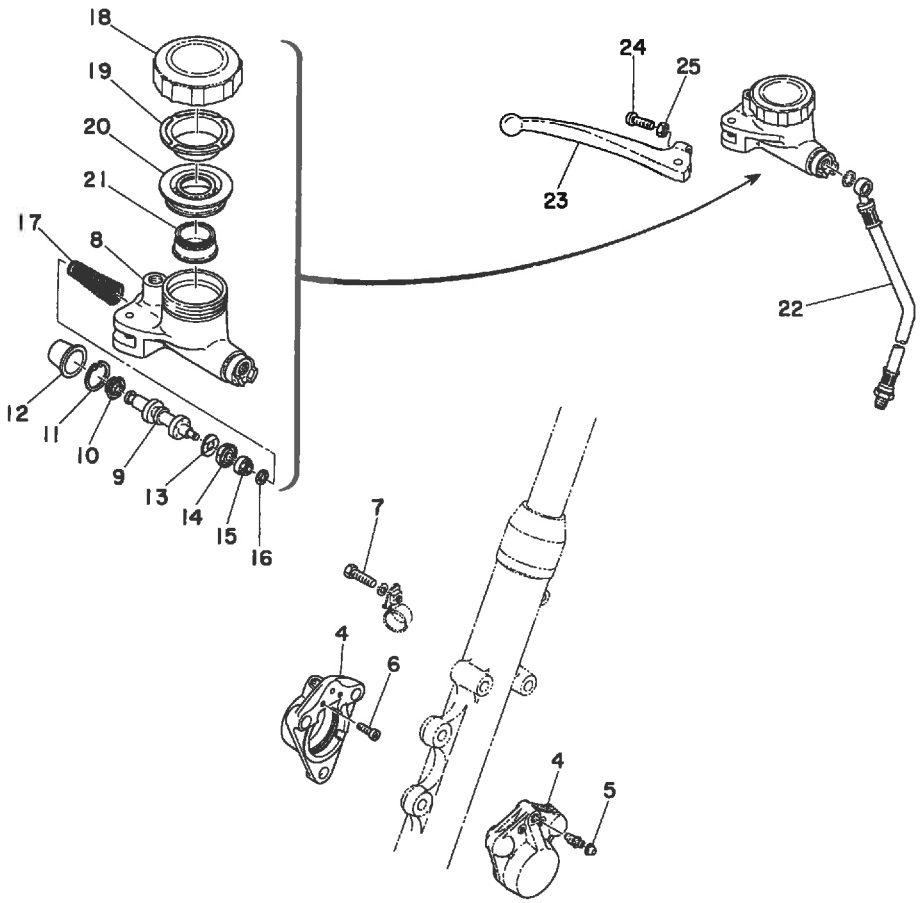


Fig. 4 FRONT FORK

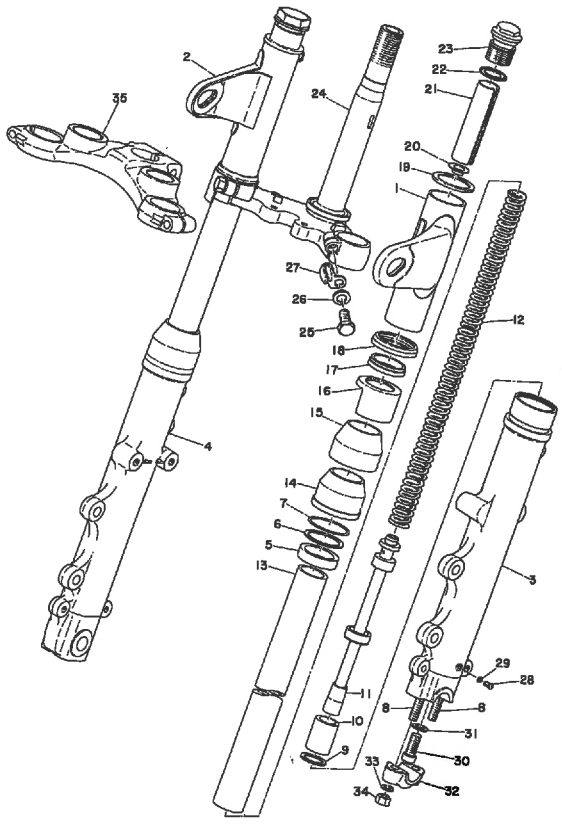


Fig. 5 FRONT WHEEL · DISC BRACKET