



YAMAHA

**THE NEW "DE CARBON"
MONOCROSS
SUSPENSION SYSTEM
AND
THE NEW AIR
FRONT FORK**

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Service Manual

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. This service manual has been written to acquaint the machine with common disassembly, inspection, reassembly, maintenance, and troubleshooting procedures associated with this machine.

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 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 procedures that must be followed to avoid damage to the machine.

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

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**YAMAHA NEW MONOCROSS AND NEW AIR FRONT FORK
SERVICE MANUAL
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New “De Carbon” Monocross Suspension

Features

The New Monocross suspension (MXS) “De Carbon System” has the following features:

1. Greater wheel travel and better machine stability.
2. Single tube construction with aluminum fins for improved heat dissipation.
3. Sealed-in, high pressure nitrogen gas and free floating piston keeps oil free from aeration.
4. Tapered coil spring for better riding comfort.
5. Temperature compensation device which maintains a constant damping force.
6. Three adjustment devices (damping, pre-load and gas pressure) to suit rider and track characteristics.

Optimum performance can be maintained, under any operating conditions, by this New Monocross Suspension.



Construction

The New MXS is secured to the inside of the frame at the rear of the head pipe and to the top end of the swing arm. It contains oil, nitrogen gas and a taper coil spring.

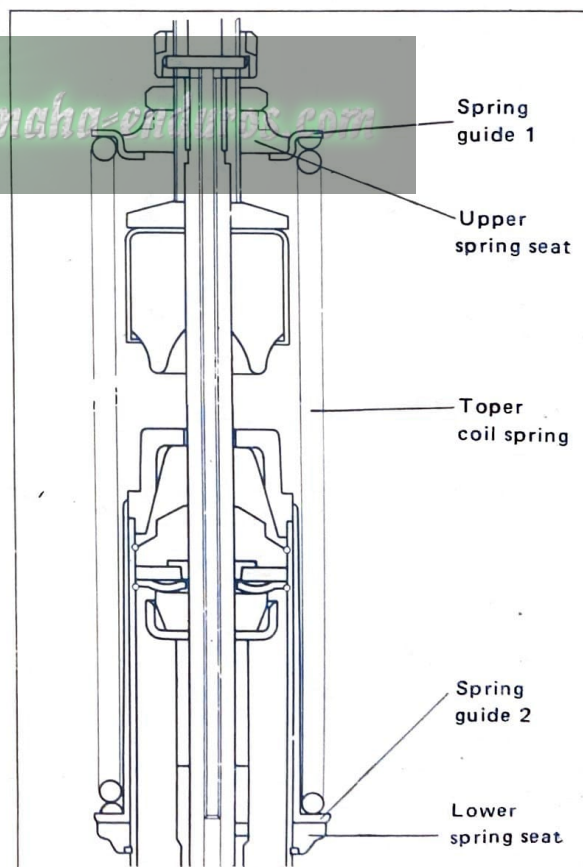
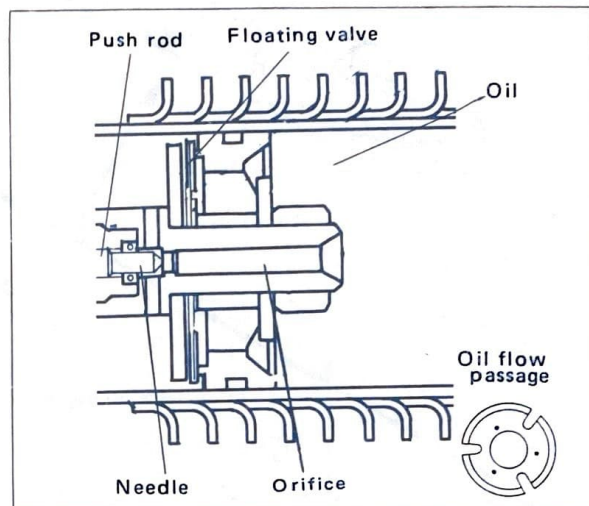
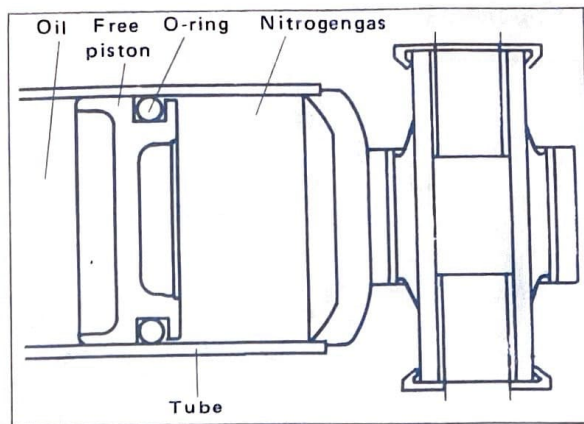
1. The New MXS body (rear shock absorber) has single cylinder construction. It contains a gas chamber on the bottom and an oil chamber on the top. These two chambers are separated by a free-piston and an O-ring.

The gas chamber is filled with a high pressure nitrogen gas which constantly applies pressure against the oil. A free piston moves according to changes in the volume of the oil caused by the piston rod movement.

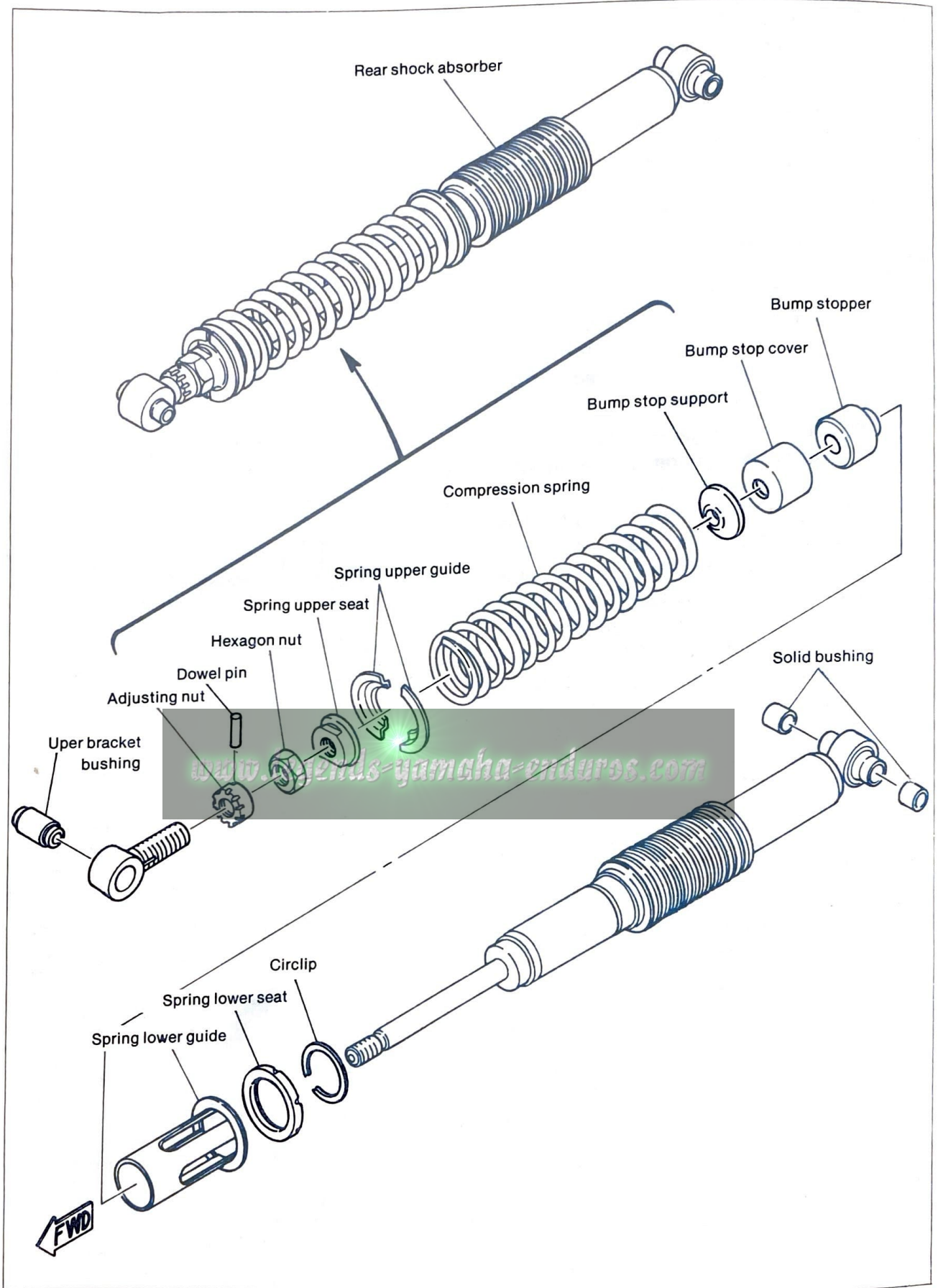
2. Damping force is generated by a combination of the piston orifice (needle valve) and floating valve.

The regulation of the damping force is accomplished by the needle valve positioned inside the piston rod. At the same time, a decrease in damping force due to a rising oil temperature is compensated by the thermal expansion of push rod. The floating valve consists of the center support having a permanent flow passage and the plate valve. The damping force is kept free from the effect of friction and inertia moment by this valve system.

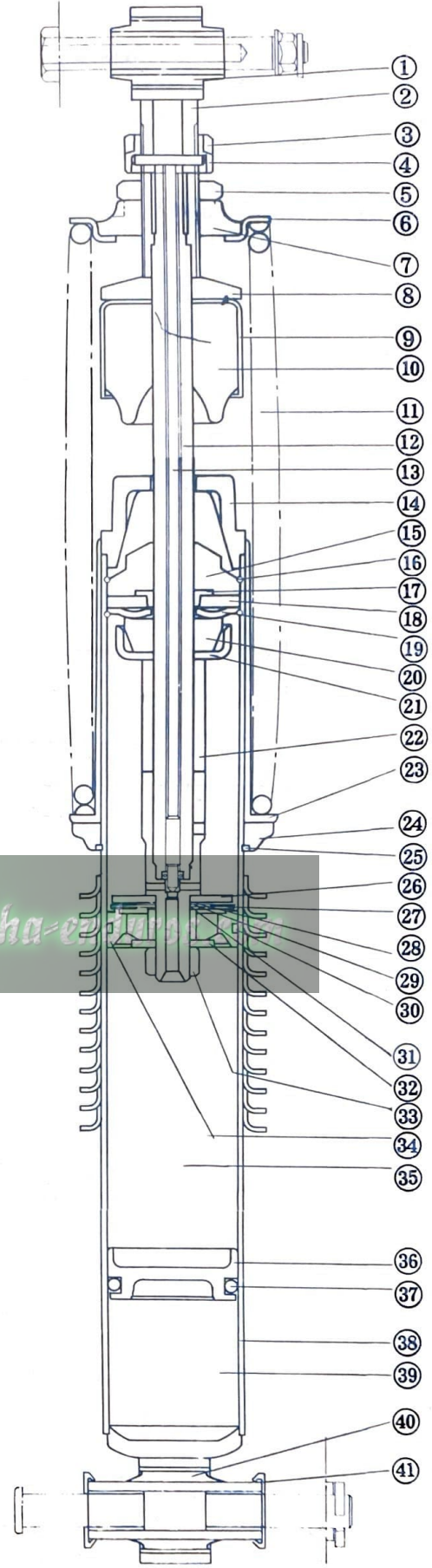
3. The suspension spring has different wire diameters in its center and ends, so the spring constant varies according to the suspension stroke. The spring is softer at the early stage of stroke and harder toward the end of stroke.



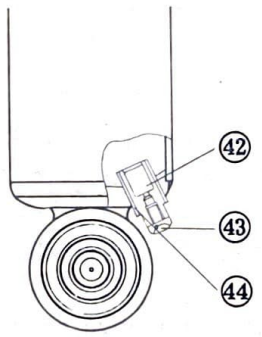
Components



1. Upper bushing
2. Upper bracket
3. Adjusting nut
4. Dowel pin
5. Lock nut
6. Upper spring guide
7. Upper spring seat
8. Bump stop support
9. Bump stop cover
10. Bump stop
11. Compression spring
12. Piston rod
13. Push rod
14. Case cap
15. Rod guide
16. Circlip
17. Rod seal
18. Static seal
19. Retainer seal
20. Rebound stop
21. Rebound stop support
22. Collar
23. Lower spring guide
24. Lower spring seat
25. Circlip
26. Seat washer
27. Plate valve
28. Support plate
29. Center plate
30. Piston ring
31. Valve set shim
32. Piston baffle
33. Hexagon nut
34. Piston
35. Oil
36. Free piston
37. O-ring
38. Cylinder case
39. Nitrogen gas
40. Lower bushing
41. Solid bushing
42. Valve rubber
43. Blind screw
44. Plug



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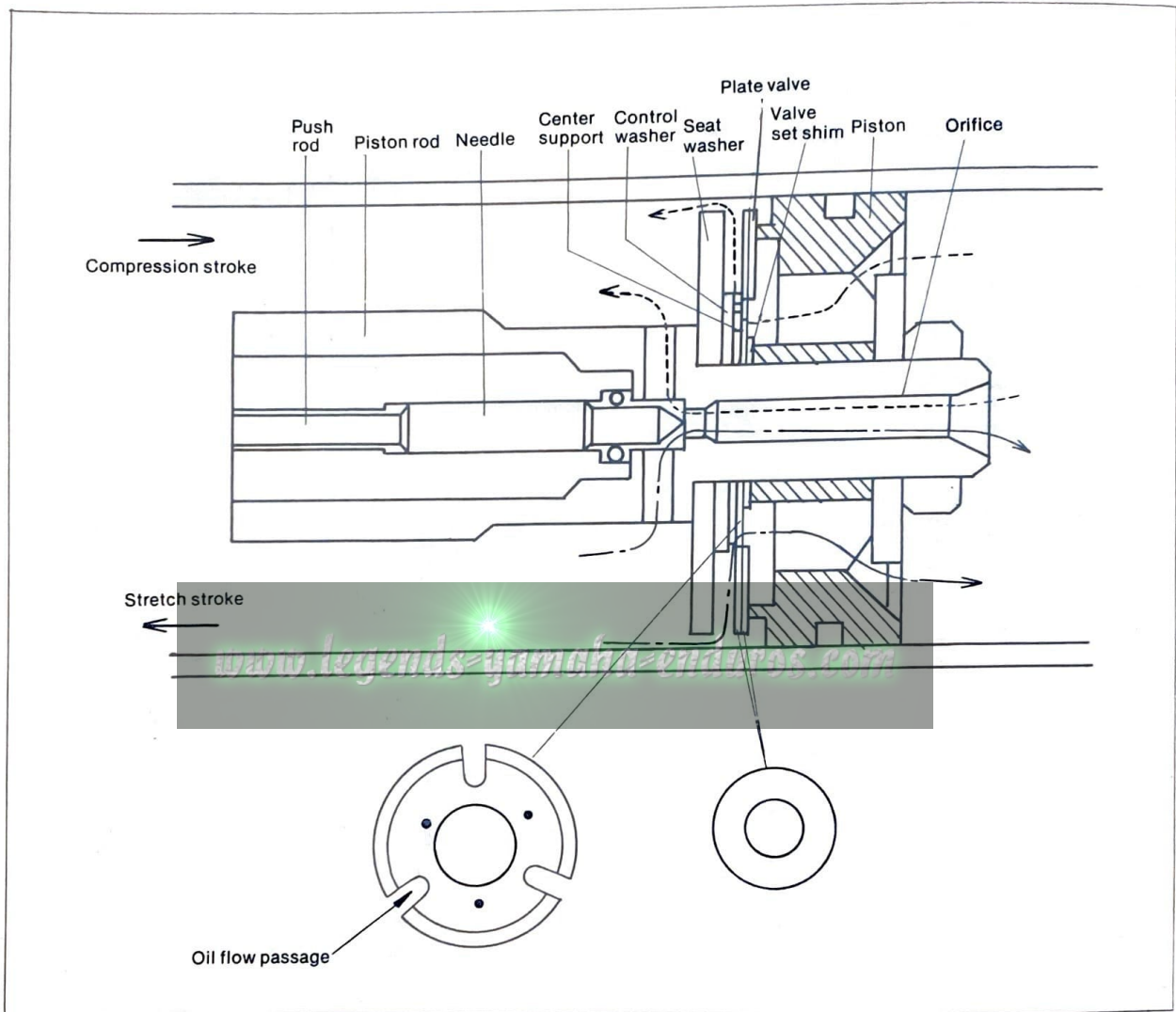


Operation

Small shock

When the piston rod contracts with a small shock, the oil behind the piston is forced through the center support permanent passage and the needle valve in the center of piston rod, and moves forward passing the piston. After absorbing the shock, the piston is stretched by the coil spring, thus causing the oil in front of the piston to move rearward through the permanent passage and needle valve.

Damping force is generated by resistance of the oil moving back and forth, and it is regulated depending on the piston speed.



Severe Shock

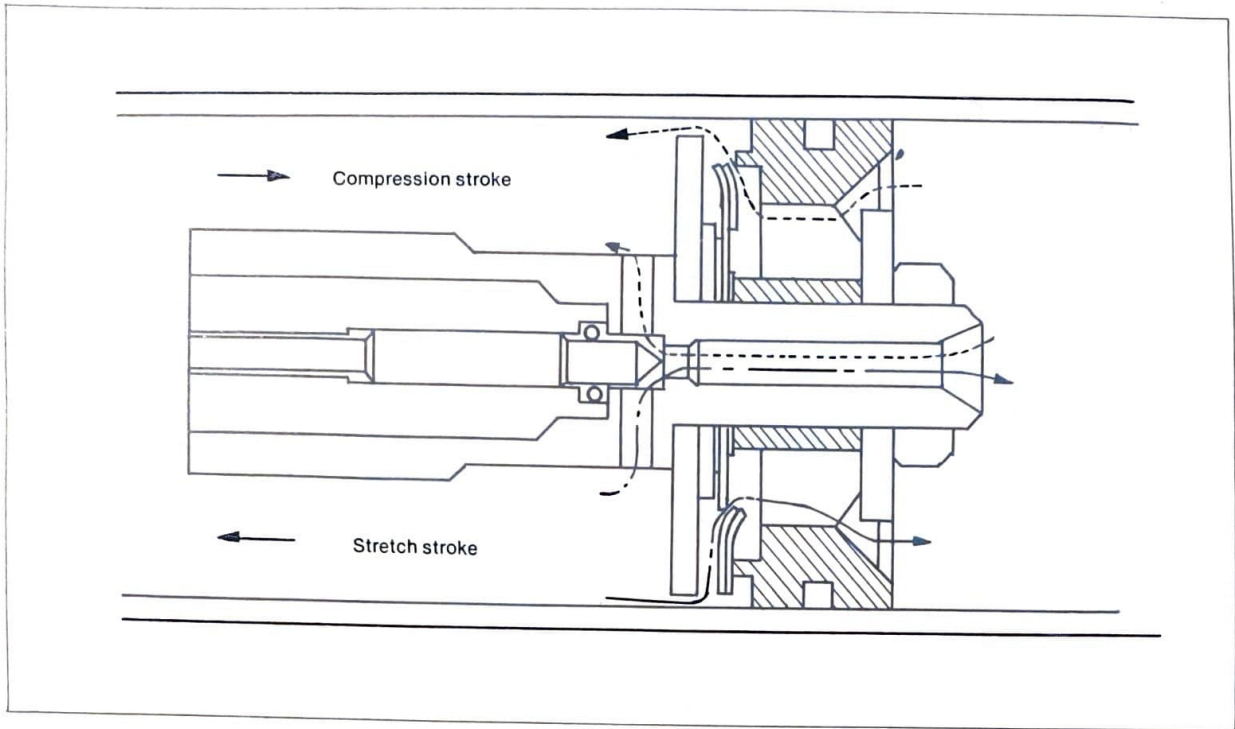
When the piston rod moves down very quickly, the oil pressure greatly increases because very little oil passes the permanent passage and needle valve, and thus the free piston is moved down, compressing the gas chamber.

As a result, the outer peripheral edge of the plate valve is bent and allows the oil to move through, increasing oil flow.

After the shock is absorbed, the piston rod is moved up quickly by the gas chamber pressure and

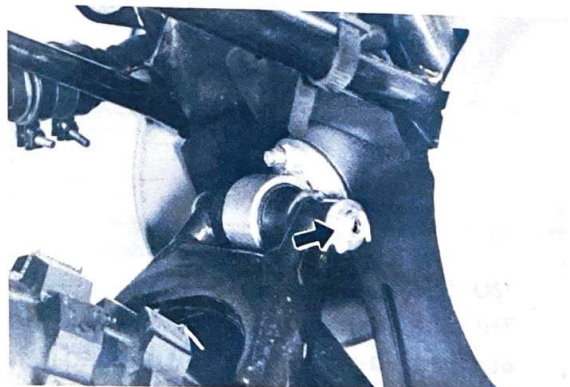
coil spring. Since the oil flow passing the permanent passage and needle valve is very small, the oil pressure increases.

As a result, the inner peripheral edge of the palte valve is bent and allows the oil to move through, thus the oil flow is increased.

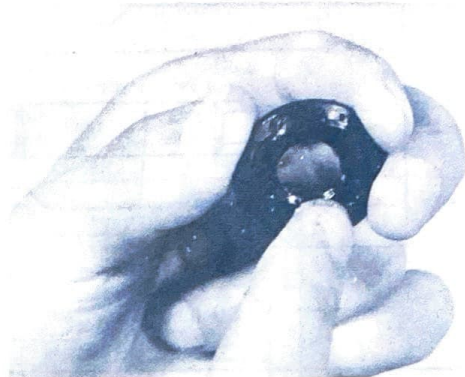
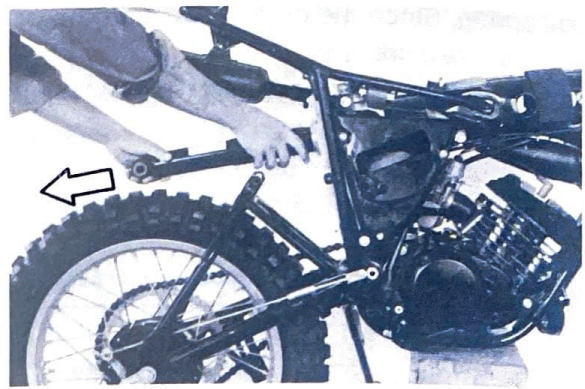


Removal and Assembly

1. Raise the rear wheel off the ground by placing a wooden block under the engine. Be careful so that the machine does not fall down.
2. Remove the seat, fuel tank and frame cover. Remove cotter pin, and remove nut from the upper bracket, then remove the bolt from the frame.
3. Remove the cotter pin and washer from the lower bracket, and pull out the shaft.



4. Pull out the absorber while taking care not to scratch cylinder fins.
5. For reassembly, reverse the procedure for disassembly.
 - a. Apply a thin coating of grease to the inner surface of the washer.
 - b. Always use a new cotter pin for replacement.
 - c. Install the suspension, with the caution label facing upward.
 - d. Tighten the upper bracket to specification.



Tightening torque:
4 m·kg (29 ft·lb)

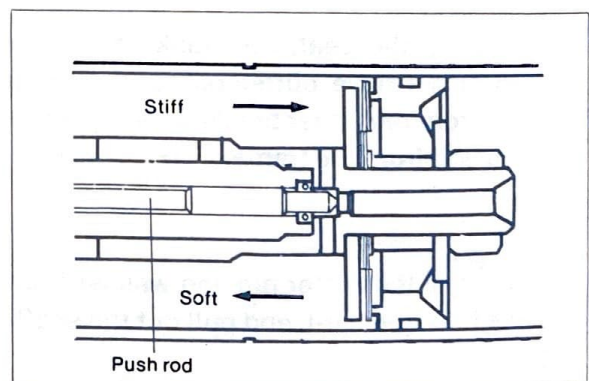
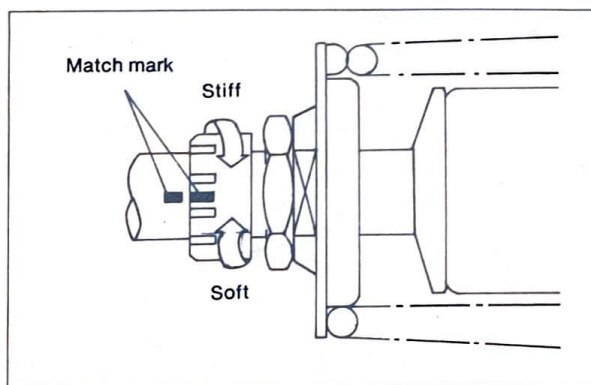
Adjustment

The new MXS can be adjusted by adjusting the spring preload, damping force and gas pressure and also by changing the spring entirely.

1. Damping force (oil flow rate)

Damping force can be adjusted by moving the adjusting nut. When the nut is **SCREWED IN**, the push rod is forced in, and the orifice is narrowed by the needle at the end of the rod, thus reducing the flow rate of oil to **INCREASE** the damping force.

When the nut is **LOOSENED**, the push rod is forced back by the gas pressure (through the oil), and the orifice is opened, thus **DECREASING** the damping force.



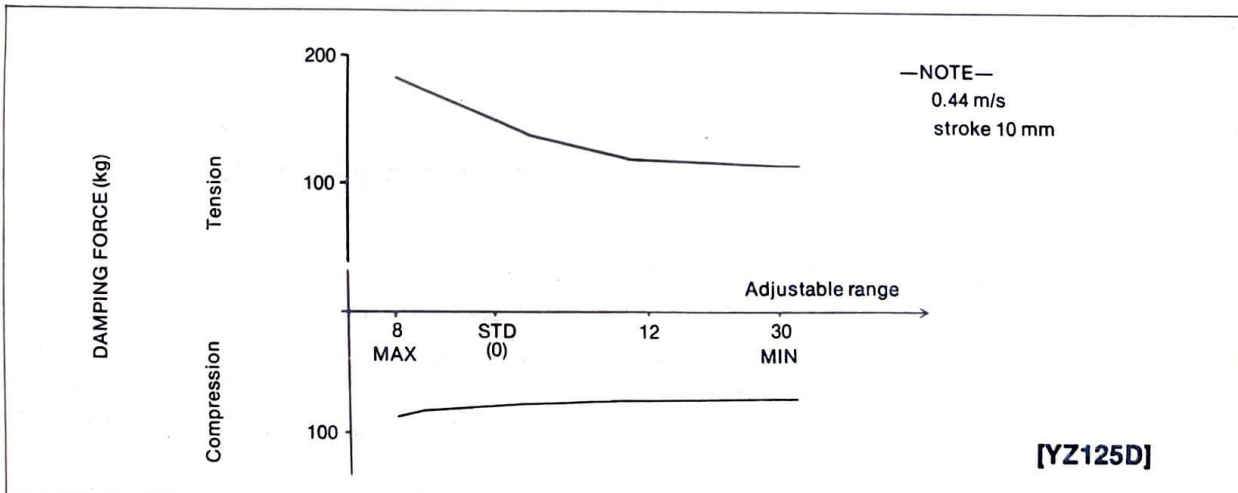
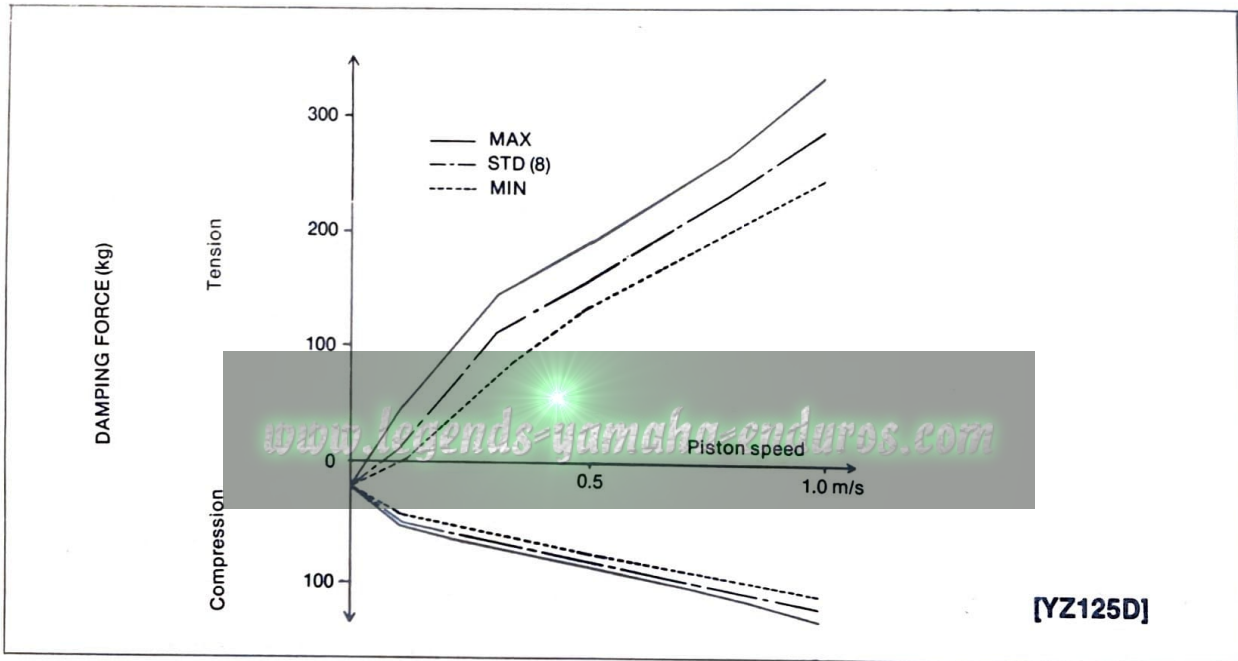
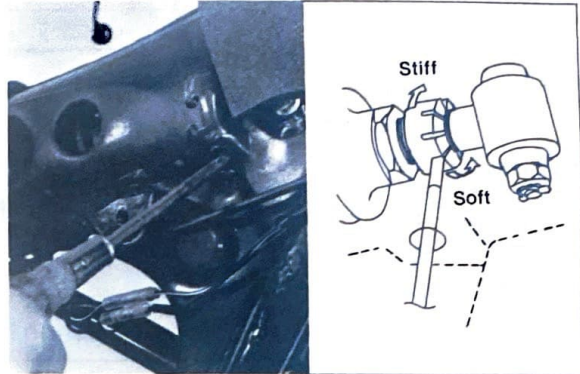
NOTE:

Turn the adjuster until it clicks. When it becomes stiff (or soft), turning of the nut should be stopped. The nut should not be used for any other purpose than specified above. The standard nut position is match mark (paint).

Adjustment range

	YZ 125D	YZ 250D/YZ 400D
Stiff	8 notches	12 notches
Soft	10 notches	8 notches

Adjustment can be made without removing the shock absorber. Turn the adjuster with a slotted-head screwdriver through the hole provided on either side of the frame.



2. Gas pressure

The gas pressure can be adjusted using the special tools. By increasing the gas pressure, the initial load is increased. (The suspension becomes hard to compress but stretches easily.)

By decreasing the gas pressure, the initial load is decreased. (The suspension can contract easily but is hard to stretch.)

NOTE:

The gas pressure should be in the following range:

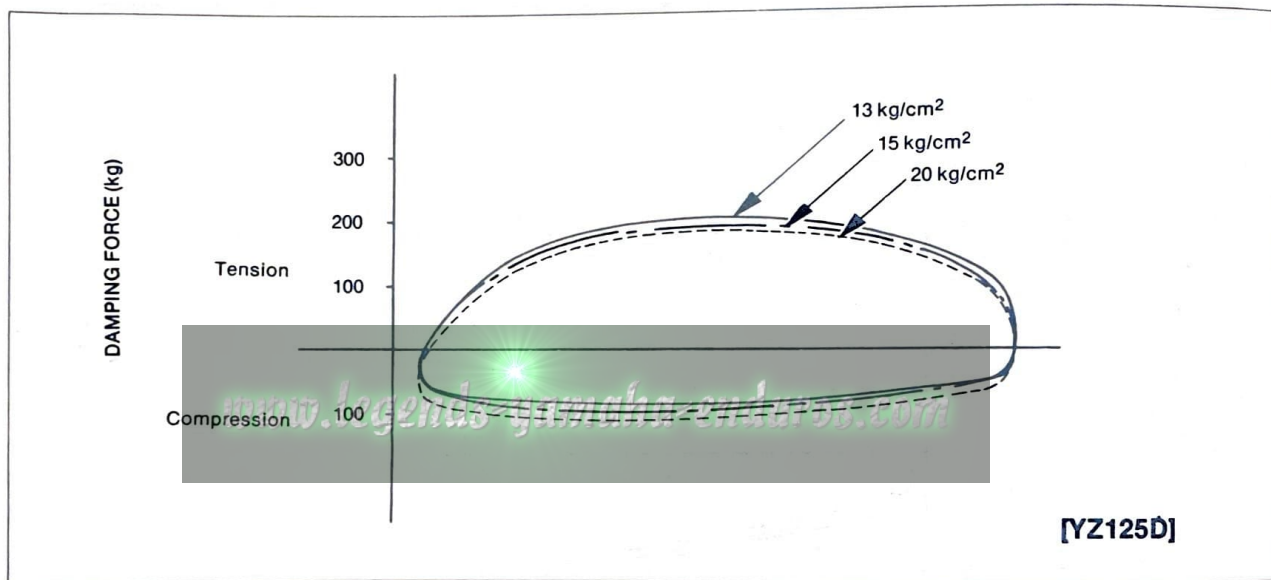
MAX.: 20 kg/cm² (284 psi) MIN.: 13 kg/cm² (185 psi) STANDARD: 15 kg/cm² (213 psi)

CAUTION: Do not use any other gas than nitrogen gas. The gas pressure should always be in specified range.

The gas adjustment valve is located at the bottom of the cylinder. To make an adjustment, remove only the panhead screw.

NOTE:

Oil the injection needle before inserting it is the Gas adjustment valve.



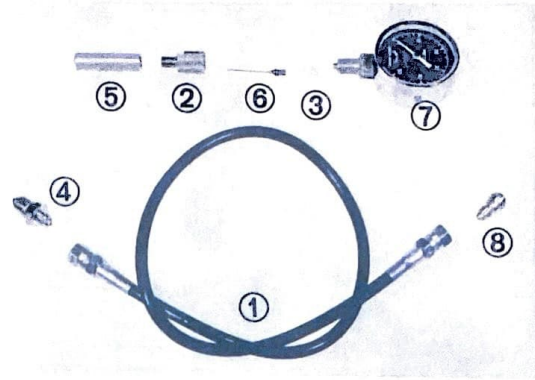
Measuring conditions:

Stroke: 75 mm Speed: 168 rpm

3. Special tools

To check the nitrogen gas pressure or refill with nitrogen gas, the following tools are required.

Gauge set	90890 — 01160		
1. Hose	90890 — 01158	5. Joint cover	90890 — 01164
2. Joint gague	90890 — 01161	6. Needle	90890 — 01167
3. Joint holder	90890 — 01162	7. Check gauge	90890 — 03063
4. Joint hose end	90890 — 01163	8. Joint	90890 — 01165



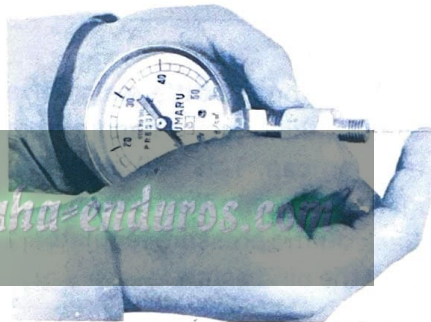
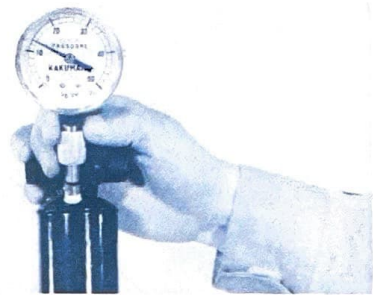
A. Checking nitrogen gas pressure

To check the nitrogen gas pressure in the gas chamber, use the check gauge. To measure the gas pressure, remove the bind screw from the housing cap, and insert the oiled needle into the membrane housing.

B. Refilling nitrogen gas

To refill with nitrogen gas, proceed as follows:

1. Remove the bind screw from housing cap.
2. Thread the injector needle onto the nitrogen pressure hose and oil the injector needle lightly.
3. Close the regulator off completely by turning the knob in a counterclockwise direction. Open the nitrogen bottle main valve.
4. Insert the injector into the rubber valve in the housing cap.



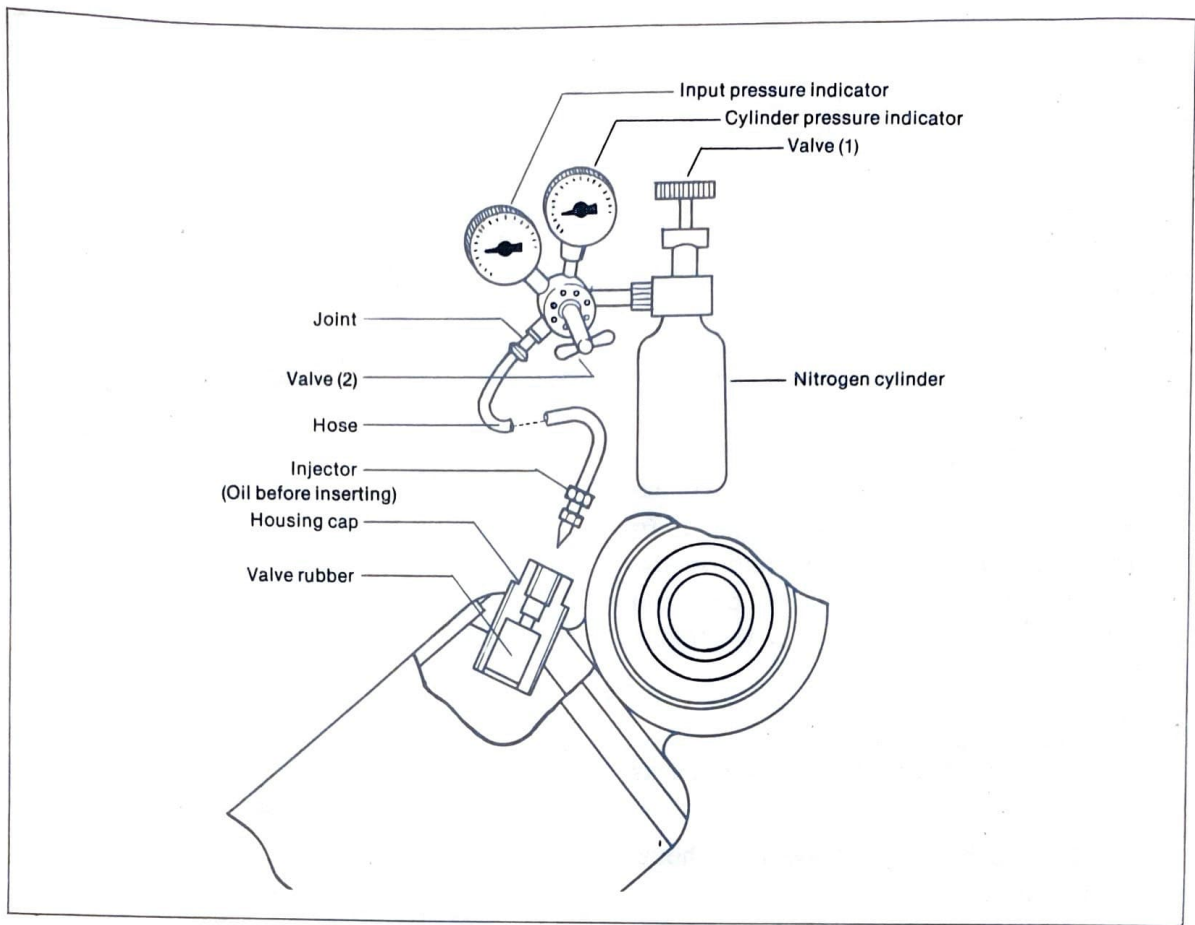
NOTE: _____
Support the injector needle with your hand during pressurization.

5. Adjust the gas pressure to a desired value. Hold this pressure for one minute.



Maximum static pressure:
20 kg/cm² (284 psi)

CAUTION: Do not over-pressurize the gas chamber. Gradually increase the regulator setting until the required pressure is reached.



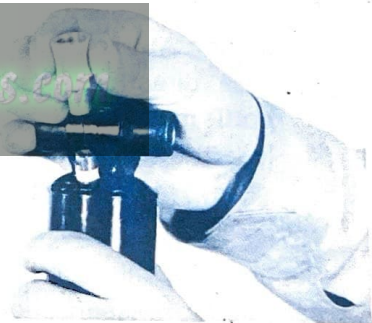
6. Close the nitrogen bottle main valve and remove the injector needle from the housing cap. This will allow the nitrogen pressure in the hose to flow out. Back off the pressure regulator.

7. Reinstall the bind screw.

C. Bleeding nitrogen gas

To bleed the nitrogen gas, oil the injector (needle) and thrust it into the housing cap. The gas can easily be bled.

NOTE: _____
 After nitrogen gas refilling or bleeding, screw in the joint cover over the check gauge.

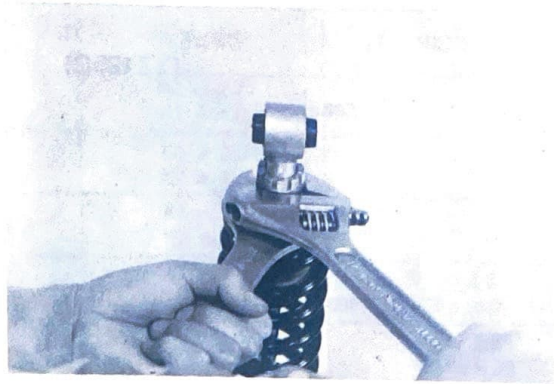


NOTE: _____

1. When using the check gauge to verify the nitrogen pressure, approximately 5 psi will be lost. Do not use the regulator pressure gauge to check the pressure in the unit.
2. Take care not to damage nitrogen gas needle during insertion. Replace safety

sheave when needle is not in use.

3. As the Suspension is used, it will heat up, thus increasing the nitrogen gas pressure. It is recommended that gas pressure be adjusted and check at room temperature so consistent results can be achieved.



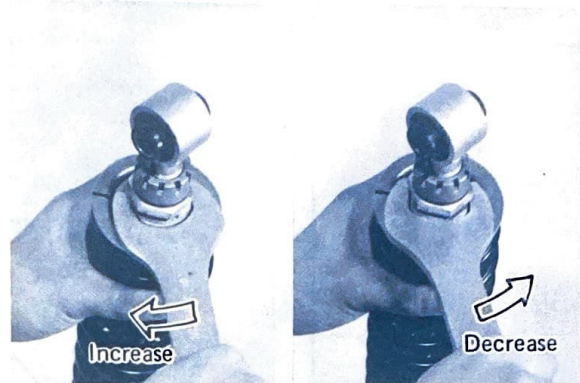
3. Initial load

By moving the spring upper seat, the initial load can be adjusted.

Remove the absorber from the machine, and loosen the upper spring seat locknut.

To increase the initial load, tighten the adjuster.

To decrease, loosen the adjuster.



NOTE:

Initial fitting length is set for 294 mm (11.6 in). — YZ125D
for 303 mm (11.9 in). — YZ250D
for 298 mm (11.7 in). — YZ400D

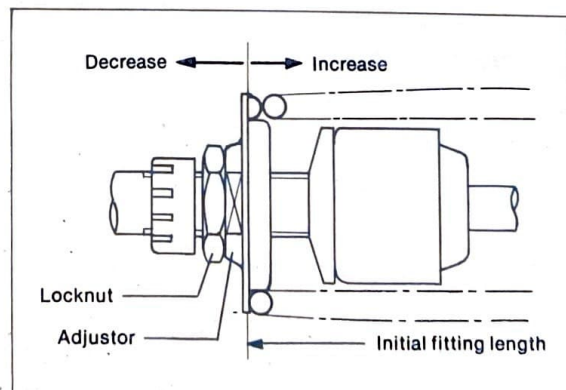
Minimum adjustable extent: YZ125D: 281 mm (11.1 in)
YZ250D: 292 mm (11.5 in)
YZ400D: 292 mm (11.5 in)

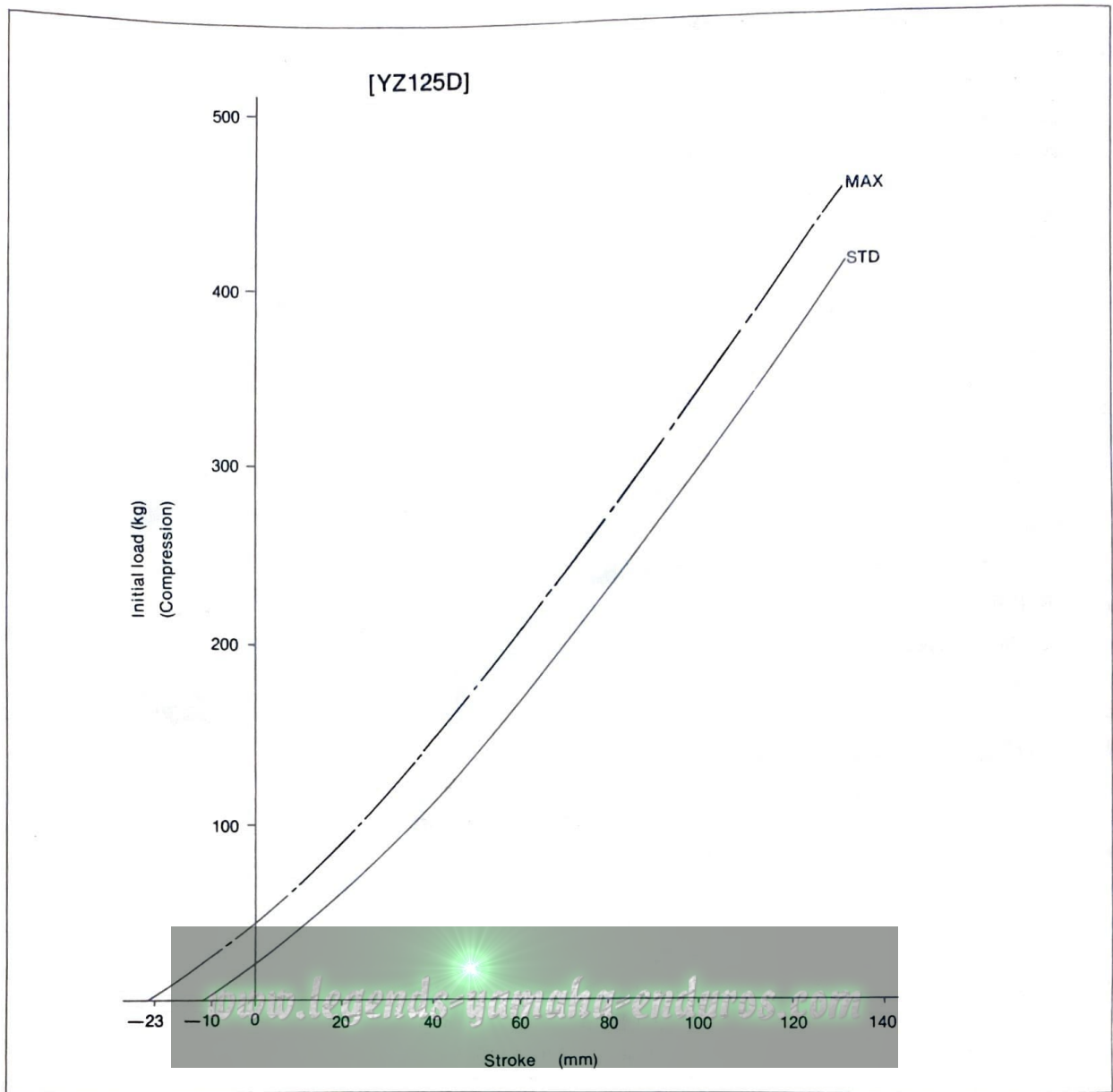
Maximum adjustable extent: YZ125D: 296 mm (11.7 in)
YZ250D: 307 mm (12.1 in)
YZ400D: 307 mm (12.1 in)

CAUTION: Never attempt to turn it beyond the range.

To tighten or loosen the adjuster, use the special wrench. (P/N 1W1-28135-00)

Locknut tightening torque: 6.0 m·kg (43.2 ft·lb)





4. Spring replacement

The coil spring is a newly designed taper coil, and spring constant changes from 1.9 to 4.0 kg/mm in a curved line. (In case of YZ125D)

Remove the absorber from the machine, loosen the damping force adjuster to a minimum, and loosen the adjuster locknut. Next, remove the upper spring guide and coil spring.

NOTE: _____

If it is hard to remove, contract the spring.

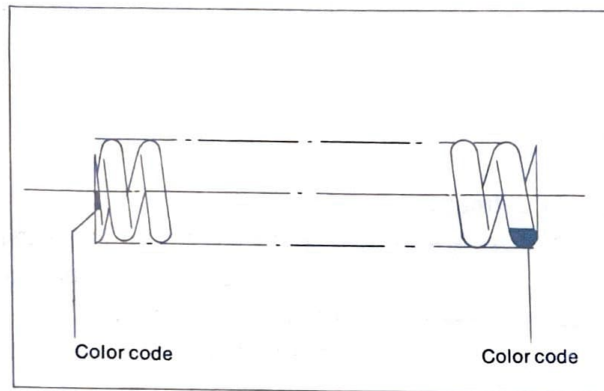
Replace the spring with one that best suits rider ability and track conditions. Install the spring by reversing the procedure for removal. Test-ride the machine and make the necessary adjustments.

Hard spring: increases initial load so that the suspension is hard to contract and can stretch quickly.

Soft spring: Decreases initial load so that the suspension can contract easily and stretch slowly.

Type	Taper coil spring Part No.	Code color	YZ125D	YZ250D/YZ400D
Hard	90501 - 98477	White/Red	K1 = 2.7 K2 = 4.0	—
Standard	90501 - 98466	White/Blue	K1 = 2.31 K2 = 4.01	—
Soft	90501 - 98478	White/Yellow	K1 = 1.9 K2 = 4.0	—
Hard	90501 - 99480	Red	—	k1 = 2.9 K2 = 5.0
Standard	90501 - 99479	Blue	—	K1 = 2.55 K2 = 5.03
Soft	90501 - 99481	Yellow	—	K1 = 2.1 K2 = 5.0

NOTE: _____
Color code is painted at the end of each coil.



Handling notes

1. The new MXS has single cylinder construction. If bent, the piston movement will be obstructed. Take special care not to bend the cylinder.
2. This shock absorber contains highly compressed nitrogen gas. Read and understand the following information before handling the absorber.

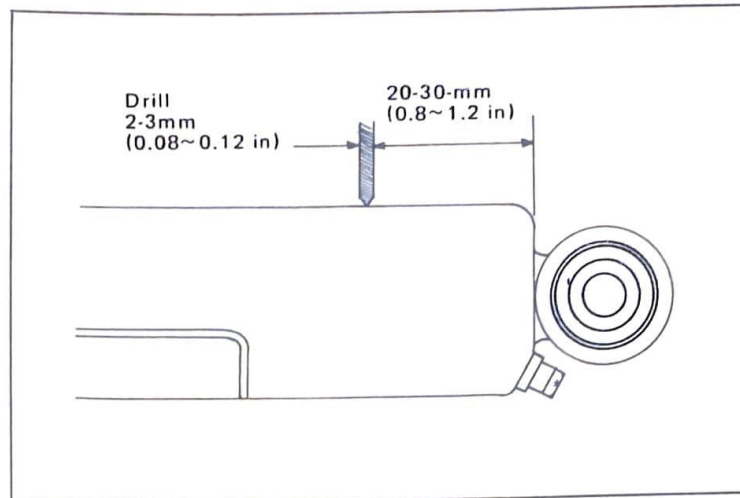
CAUTION:

1. Do not tamper with or attempt to open the cylinder assembly. Injury may result.
2. Do not subject shock absorber to an open flame or other high heat. This may cause the unit to explode due to excessive gas pressure.
3. Do not deform or damaged the cylinder in any way. Cylinder damage will result in poor damping performance.

3. Notes on disposal

Gas pressure must be released before disposing of shock absorber. To do so, drill a 2-3 mm (0.08-0.12 in) hole through the cylinder wall at a point 20-30 mm (0.8-1.2 in) above the bottom of the cylinder.

CAUTION: Always wear proper eye protection when drilling hole to dispose of shock absorber!



General Tuning

Adjustments and effects

1. Damping force (orifice) adjustment
 - a. Tightening the adjuster _____ causes damping force to increase, and as a result, the shock absorber becomes stiff.
 - b. Loosening the adjuster _____ causes damping force to decrease, and as a result, the shock absorber becomes soft.
2. Gas pressure
 - a. Increasing the gas pressure _____ achieves the same effect as when initial load is increased. That is the absorber becomes stiff and stretches quickly.
 - b. Decreasing the gas pressure _____ achieves the same effect as when initial load is decreased. That is the absorber becomes soft and stretches slowly.
3. Spring set length
 - a. shortening the length _____ increases the initial load, and thus the absorber becomes stiff and stretches quickly.
 - b. Lengthening the length _____ decreases the initial load, and thus the absorber becomes soft and stretches slowly.
4. Spring replacement
 - a. Hard Type _____ spring constant is higher, and thus the spring is stiff and stretches quickly.
 - b. Soft type _____ spring constant is lower, and thus the spring is soft and stretches slowly.

Symptoms and adjustments

The general procedure for absorber adjustment is described below. Adjustment should be made after you have full understanding of effects of the adjustments.

Symptom	SEQUENCE			
	1	2	3	4
Bottoming	Shorten the set length (Increase initial load)	Increase damping force	Increase gas pressure	Replace spring (Hard type)
Soft	Increase damping force	Shorten set length (Increase initial load)	Increase gas pressure	Replace spring (Hard type)
Hard	Decrease damping force	Extend the set length (Decrease initial load)	Decrease gas pressure	Replace spring (Soft type)

Tuning notes:

1. It is advisable to use the standard setting. If it does not suit your preference, then make an adjustment according to the table above and the following instructions.
2. Start adjustments using sequence 1. After each test ride. Proceed to the next sequence, if necessary.
 - a. Set length should be adjusted 3 mm each time and within the
296 to 284 mm. range (YZ125D)
307 to 295 mm. range (YZ250D/400D)
 - b. Damping force should be adjusted by changing 2 notches each time and within 6 notches from standard.
 - c. Gas pressure should be adjusted within the 13 kg/cm to 20 kg/cm range.

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New Air Front Fork

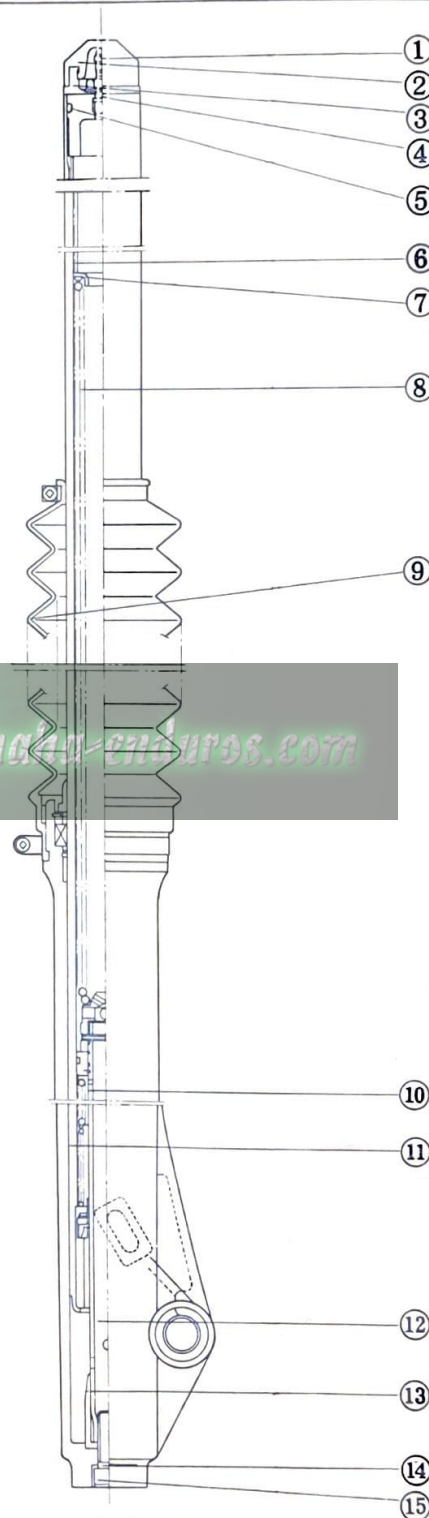
Features

newly-developed front forks are used on this model. A valve is used on the cap bolt at the end of the inner tube allowing the tube pressure can be adjusted according to track conditions and rider's preference.

The front forks will produce excellent suspension characteristics when the proper combination of air pressure and spring coil has been obtained.

Component

1. Valve complete
2. Cap
3. Fork cap
4. O-ring
5. O-ring
6. Spacer
7. Spring guide
8. Spring
9. Boot
10. Cylinder complete
11. Inner tube complete
12. Oil
13. Taper spindle
14. Gasket
15. Bolt



Handling notes

Always use air or nitrogen gas in the front forks.

WARNING: Never attempt to use oxygen or any other explosive gas. Never subject the front forks to fire or place them in heated a place.

1. Tolerance for gas pressure adjustment is 0.1 kg/cm² or less. Be sure to check the air pressure and adjust to specification before each ride.

CAUTION: The gas pressure should not exceed 2.5 kg/cm². Excess gas pressure will cause damage to the forks.

Fork oil replacement

1. Raise the front wheel off the floor with a suitable stand.
2. Remove the rubber cap on the cap bolt. Remove valve cap.
3. Press on the valve to remove all air pressure.

CAUTION: When the air has to extract it little by little. If not, oil will spurt out together with the air.

4. Remove the cap bolt assembly.
5. Remove drain screw from bottom of fork leg and drain oil.
6. When most of oil has drained, slowly raise and lower outer tubes to pump out the remaining oil.
7. Replace drain screws.

NOTE:

Check gasket, replace if damaged.

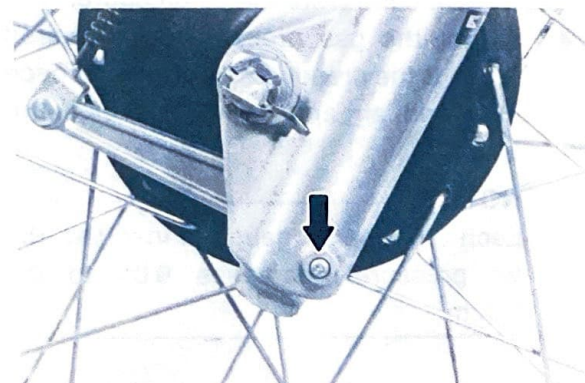
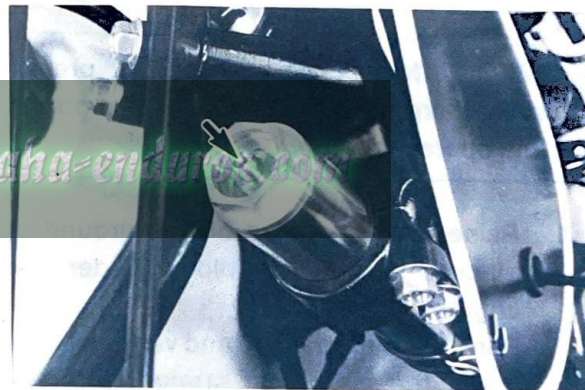
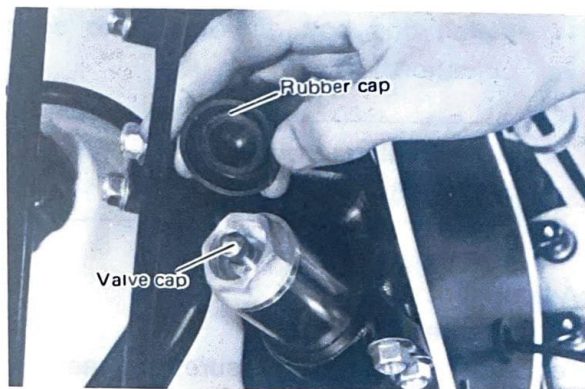
8. Measure correct amount of oil and pour into each leg.

Recommended oil: SAE #15

Oil quantity:

284 cc (9.65 oz) — YZ125D

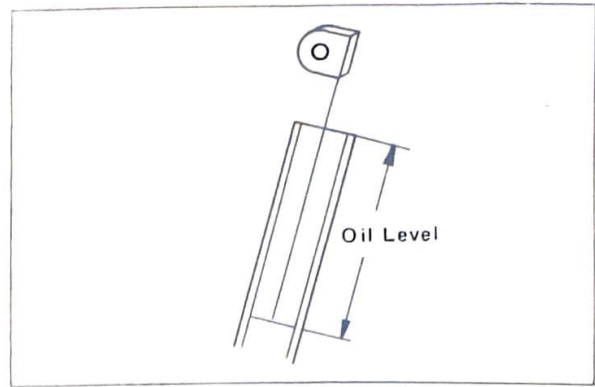
338 cc (11.4 oz) — YZ250D/YZ400D



9. After filling with oil, remove the spacer and main spring, and with the forks bottomed, measure the oil level from the inner tube top end.
The oil levels must be the same.

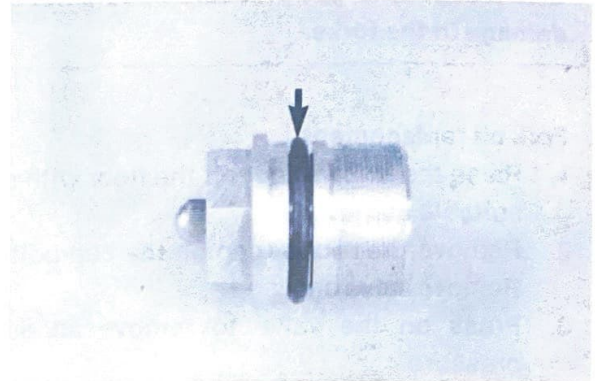
Oil level:

- 180 mm (7.1 in) — YZ125D
182.5 mm (7.2 in) — YZ250D/400D



- Replace main spring and spacer.
10. Inspect the O-ring on cap bolt and replace if damaged.
11. Install cap bolt and torque to specification.

Tightening torque:
2.5 m·kg (18 ft·lb)



Adjustment

Air pressure adjustment

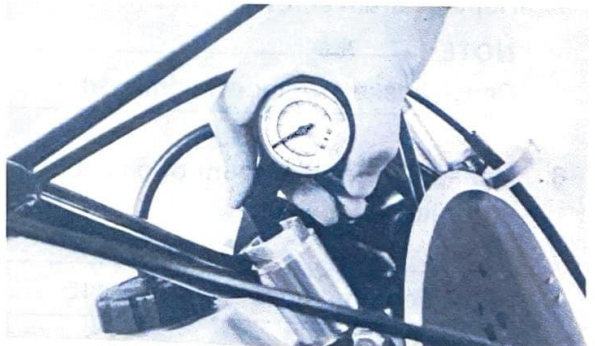
To adjust the gas pressure, proceed as follows:

IMPORTANT: Correct, exact air pressure charging is CRITICAL for proper fork operation.

1. Raise the front forks off the ground by placing a wooden block under the engine.
2. Remove the rubber cap and valve cap.
3. Insert the air gauge straight into the valve and measure the air pressure.
4. Adjust the gas pressure to a desired value. If the pressure is below the specified, add air and check the pressure again.

NOTE: _____

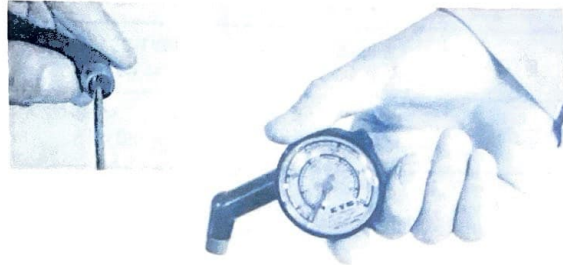
Each time the air gauge is inserted, the air pressure decreases 0.05 to 0.1 kg/cm²



Required air pressure:
 1.0 kg/cm² (14.2 psi)
 Air pressure adjustment range:
 0.8-1.2 kg/cm² (11.4-17 psi)

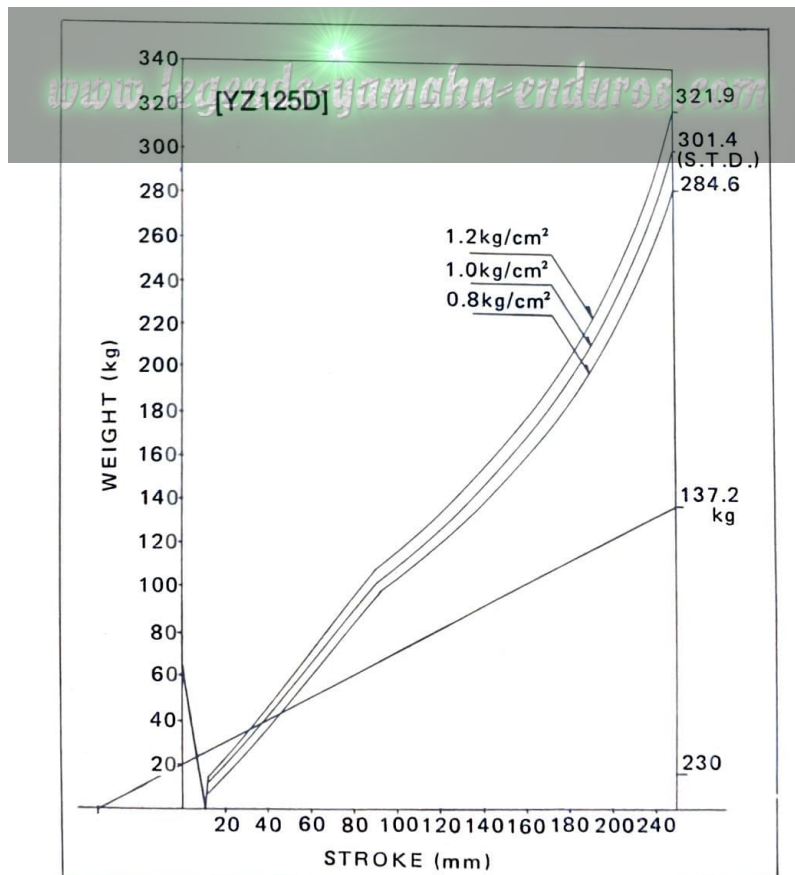
- The pressure difference between right and left fork should be 0.1 kg/cm² or less.

NOTE: _____
 The needle indicating 0 on the air gauge may sometimes deflect when the gauge is inserted into oil. In this case, loosen the screw and remove the gauge. Wait until the needle returns to 0 and tighten the screw.



- Tighten the valve cap firmly. Air leakage can be checked by applying soap water to the valve and cap. If air leakage is noticed, replace the cap bolt as an assembly. After checking, wipe off the water.

CAUTION: When filling with air, be sure that the air pressure does not exceed 2.5 kg/cm².



Adjustments by use of fork spring

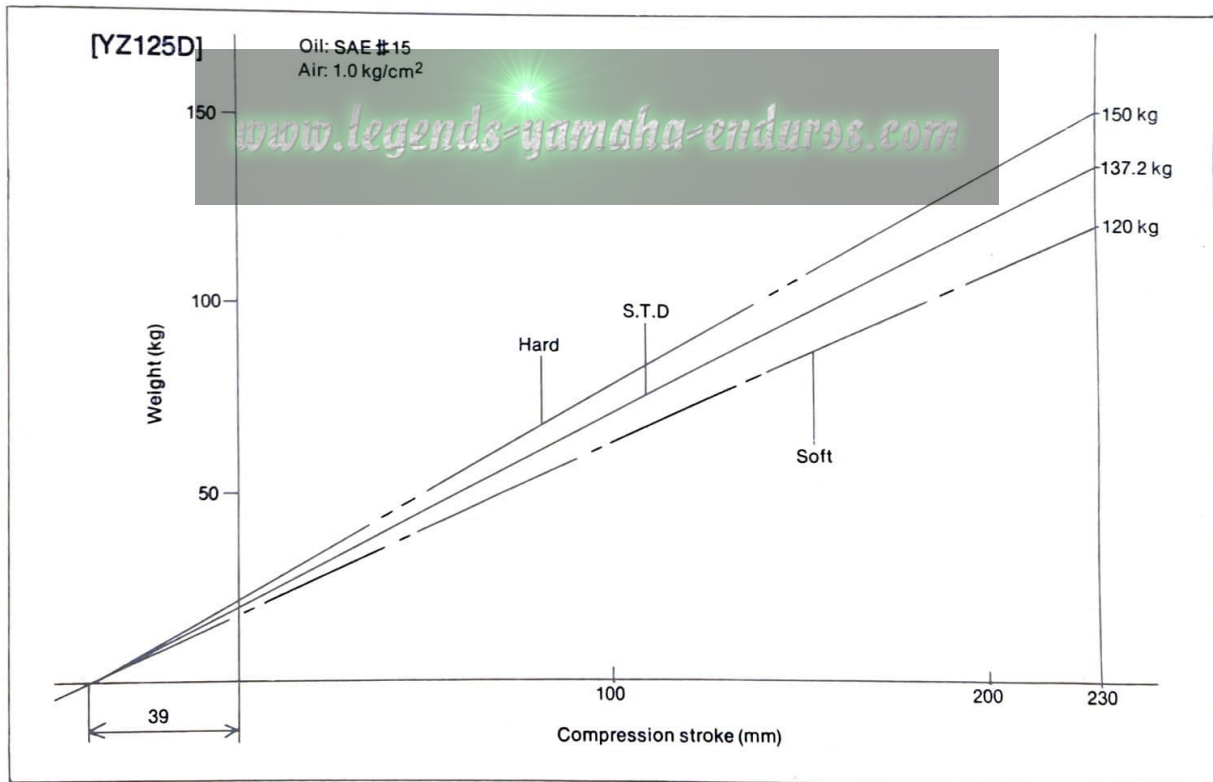
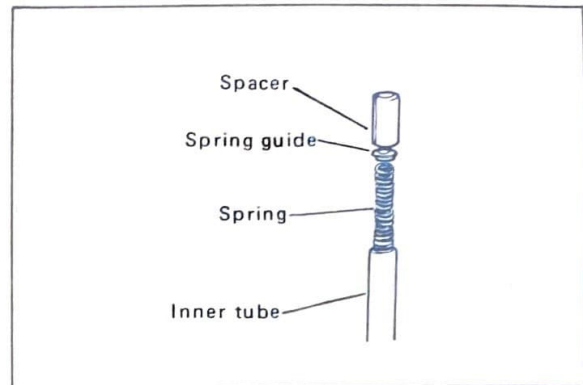
Adjust the spring and spacer.

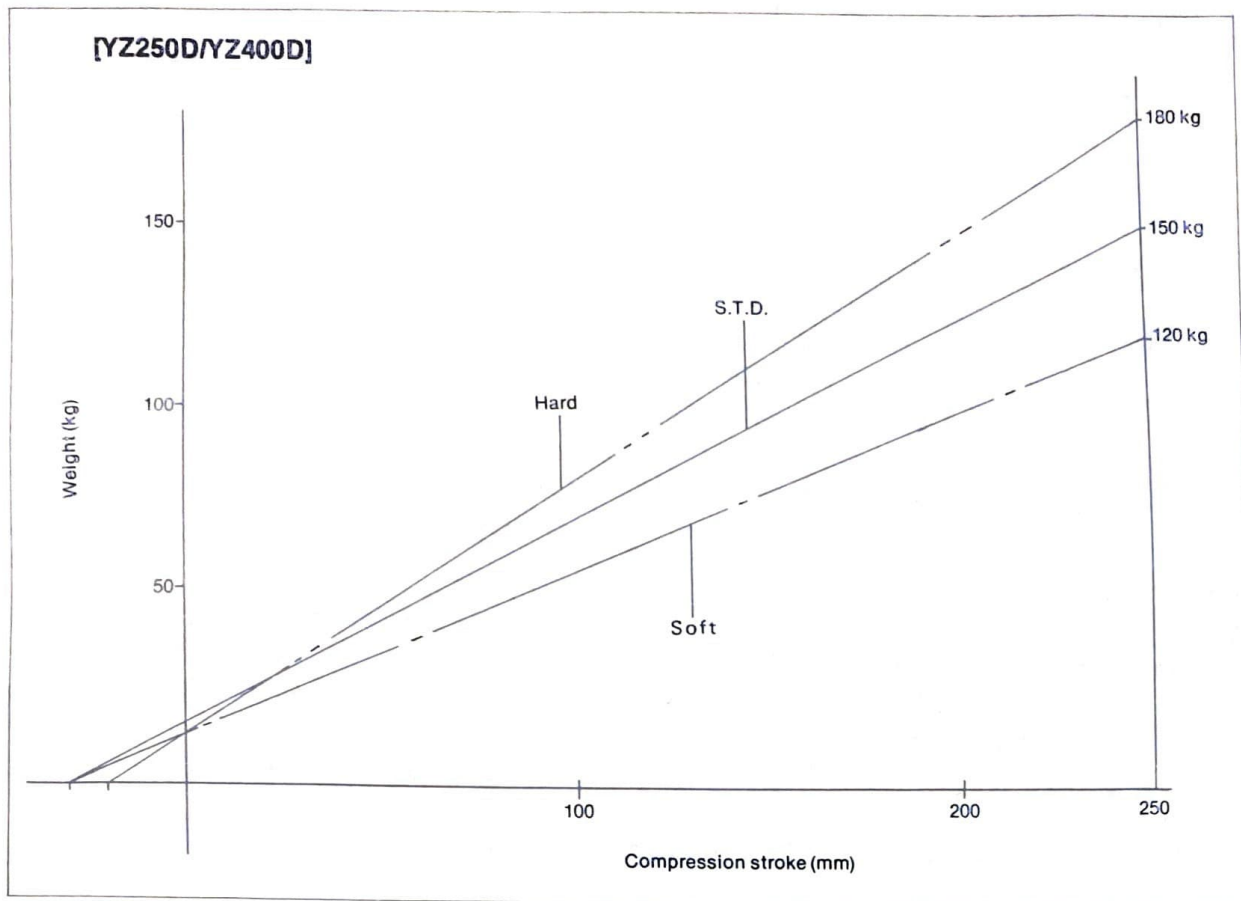
Type	YZ125D		YZ250D/YZ400D		Spring I.D. mark
	Spring	Spacer	Spring	Spacer	
Hard	1W1-23141-20 K = 0.279	1W1-23118-LO L = 30 mm	1W4-23141-20 K = 0.333	1W4-23118-LO L = 50 mm	
STD	1W1-23141-LO K = 0.255	1W1-23118-LO L = 30 mm	1W4-23141-LO K = 0.268	1W4-23118-LO L = 50 mm	
Soft	1W1-23141-10 K = 0.223	1W1-23118-10 L = 80 mm	1W4-23141-10 K = 0.214	Not required	

NOTE:

1. Only replace the spacer on the YZ125D, if the spring is the soft type.
2. Only remove the spacer on the YZ250D/400D, when the spring is the soft type.

Before installing the spring, check the oil level. If incorrect, adjust the level.





General tuning

Adjustments and effects

1. Air pressure adjustment
 - a. Increasing air pressure ——— cause initial load to increase, and cushion becomes hard.
 - b. Decreasing air pressure ——— cause initial load to decrease, and cushion becomes soft.
2. Spring replacement
 - a. Replacement with hard type ——— initial load is slightly affected, and cushion becomes hard.
 - b. Replacement with soft type ——— initial load is slightly affected, and cushion becomes soft.
3. Oil viscosity adjustment
 - a. From Nos. 15 to 20 ——— As viscosity increases, damping force increases, and the fork moves slowly.
 - b. From Nos. 15 to 10 ——— As viscosity decreases, damping force decreases, and the fork moves quickly.

Symptoms and adjustments

The general procedure for absorber adjustment is described below. Adjustment should be made after you have full understanding of effects of the adjustments.

Symptom	SEQUENCE		
	1	2	3
Bottoming	Increase air pressure	Replace spring (Hard type)	Increase oil quantity
Soft	Increase air pressure	Increase oil viscosity (#15 to #20)	Replace spring (Hard type)
Hard	Decrease air pressure	Decrease oil viscosity (#15 to #10)	Replace spring (Soft type)
Too much contract during riding	Increase air pressure	Replace spring (Hard type)	—

Tuning notes:

The standard setting is advisable. If it does not suit your preference, then adjust according to the above table and the following instructions.

1. Adjustments should be made starting with sequence 1. After each test ride, proceed to the next adjustment if necessary.
2. Air pressure adjustment should be made 0.1 kg/cm² each time and within the 0.8 to 1.2 kg/cm² range.
3. Oil quantity adjustment should be made 15 cc each time and up to 350 cc.

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Postscript:

For your reference, service data for IT175D, IT250D and IT400D are given below.

1. Damping force

	IT175D	IT250D/IT400D
Stiff	12	8
Soft	8	12

2. Gas pressure

STANDARD	18kg/cm ²
MAXIMUM	20 kg/cm ²
MINIMUM	13 kg/cm ²

3. Initial load

	IT175D	IT250D/IT400D
Initial fitting length	262 mm (10.3 in)	266.5 mm (10.5 in)
Minimum adjustable extent	256.5 mm (10.1 in)	256.5 mm (10.1 in)
Maximum adjustable extent	271.5 mm (10.7 in)	271.5 mm (10.7 in)

4. Spring replacement

	I.D. color	IT175D	IT250D/IT400D
Std. type coil spring (Large) 90501-99471. K = 5.20	Pink	Std.	Option (Soft)
90501-99472. K = 6.18	Green	Option (Hard)	Std.
Std. type coil spring (Small) 90501-90482. K = 9.10	Red	Hard K1 = 3.31, K2 = 5.20	Hard K1 = 3.68, K2 = 6.18
90501-85470. K = 7.41	Blue	Std. K1 = 3.06, K2 = 5.20	Std. K1 = 3.37, K2 = 6.18
90501-80483. K = 5.96	Yellow	Soft K1 = 2.78, K2 = 5.20	Soft K1 = 3.03, K2 = 6.18

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