CHAPTER 1. GENERAL INFORMATION

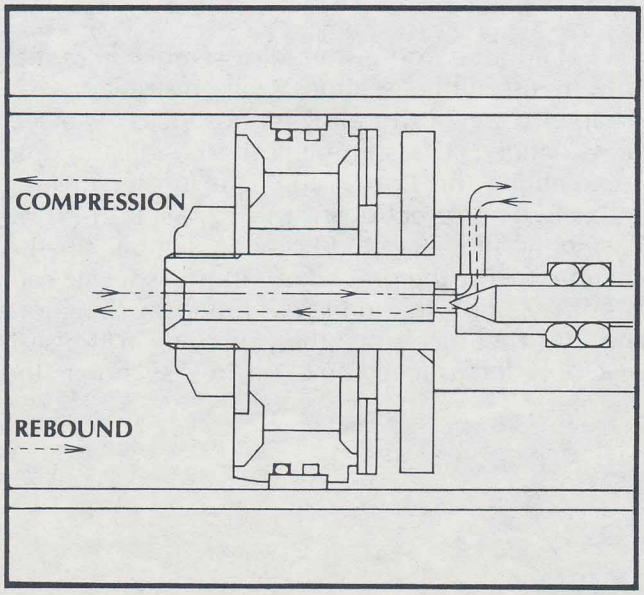
THEORY OF OPERATION

Shock absorbers function in a motorcycle by converting the kinetic energy of the suspension into heat and dispersing that heat into the atmosphere. When a shock contracts or rebounds, the piston and rod move through the oil in the cylinder. This movement forces oil through the valving in the rod and piston. The friction generated by this movement through the oil converts the kinetic energy into heat, and this heat is dissipated into the atmosphere.

A monoshock damps the energy from the suspension in the same manner. When a motorcycle goes over a small bump, the monocross suspension contracts. The rod and piston move through the oil and into the cylinder. Oil on one side of the piston flows to the other side by passing through the orifice in the center of the rod. Part of the energy from the contracting motion is damped by the movement of oil through the orifice. This energy is converted into heat and dissipated into the atmosphere. The remaining energy in the suspension is absorbed and stored by the gas-and-compression spring.

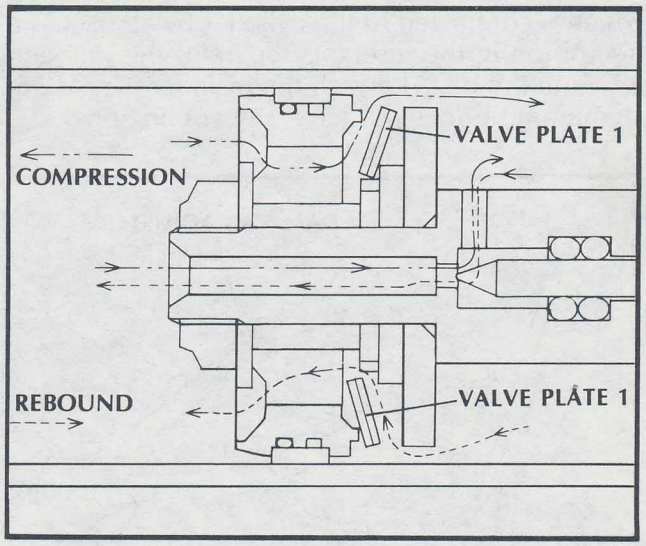
When the monoshock stops contracting, the gas-and-compression spring releases the energy it has absorbed and the shock rebounds. The rod and piston move out of the cylinder, oil flows back through the orifice, and more kinetic energy is converted into heat and dispersed.

Lee Waldie Craig Scott Chris Koira



The damping proces is slightly different when you jump a motorcycle or go over large whoops. When a motorcycle comes down off a jump, a great deal of energy is transmitted to the suspension. The monoshock contracts with a great deal of force, and the piston moves rapidly through the oil. Some oil passes through the orifice in the rod and damps part of the energy. More energy, however, is present in the suspension than can be damped by the movement of oil through the orifice in the rod. The pressure in the cylinder increases, and this increased pressure opens valve plate 1.

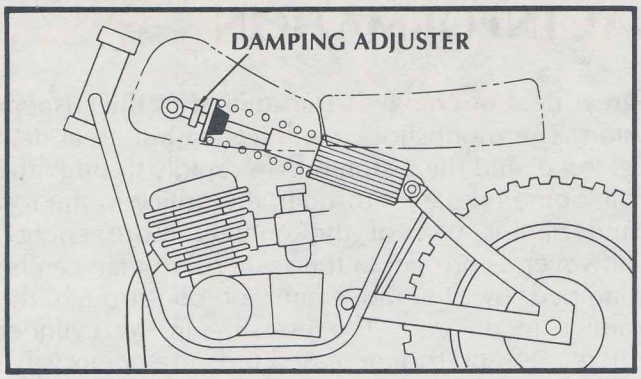
As described above, the gas-and-compression spring stores the remaining energy. When the suspension stops contracting, the spring releases the energy and the monoshock rebounds. Oil flows back through the orifice in the rod and through valve plate 1.



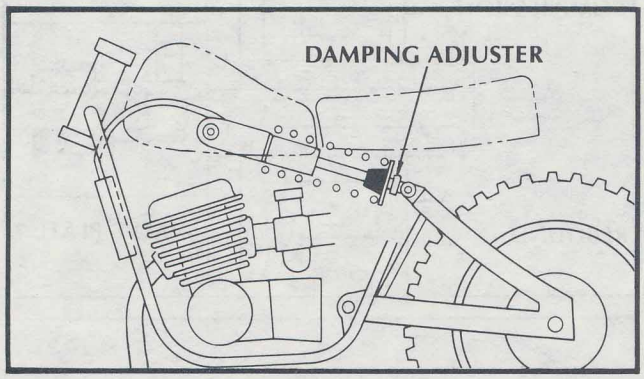
CONSTRUCTION AND IDENTIFICATION

Yamaha monoshocks are identified by the external construction and by the rod-piston assembly. Two types of external constructions are found on Yamaha monoshocks: the X construction and the R construction.

The X construction (2X3 and 2X4 monoshocks) is used on YZ125F, YZ250F, and YZ400F models. These monoshocks are mounted to the motorcycle with the damper subassembly facing the rear of the motorcycle. The cylinder mounting bracket is mounted to the swingarm while the upper mounting bracket is bolted to the frame. The cylinder is made of aluminum and has cooling fins to help dissipate the heat. The nitrogen gas and oil in the cylinder are completely separated by the free piston.



The R construction (3R3, 3R4, and 3R6 monoshocks) is found on the IT175G, YZ125G, YZ250G, and YZ465G. These monoshocks are mounted with the damper subassembly positioned toward the front of the motorcycle. The cylinder mounting bracket mounts to the frame while the upper mounting bracket mounts at the swingarm. The R construction uses a separate gas reservoir which is connected to the cylinder by a hose. The free piston in the reservoir separates the nitrogen gas from the oil. Although the cylinder is made of aluminum, it does not have any cooling fins.



In addition to the external constructions, Yamaha also uses three rod-piston assemblies in its monoshocks: 2X3, 2X4, and 3R4 rod-pistons. As a result, there are five (5) types of Yamaha monoshocks: 2X3, 2X4, 3R3, 3R4, and 3R6. The monoshock type is printed on the i.d. tag found on each shock. The tag is on the cylinder on X monoshocks and on the gas reservoir on R monoshocks.

Before beginning any work on a monoshock, you must identify the external construction and the rod-piston assembly so you can locate the correct instructions for that particular shock. The major difference between external constructions is obvious: R shocks have a separate gas reservoir while X shocks do not.

The noticeable differences between rod-piston assemblies are slight, but these differences greatly affect the damping characteristics of the shock. You must identify the rod-piston assembly before beginning any work so you can locate the correct instructions for that particular rod-piston assembly.

Use the chart on the next page to identify the external construction and the rod-piston assembly of the shock you are working on. Locate the appropriate instructions and proceed accordingly.

Do not confuse the monoshock type with the rod-piston assembly. Although these designators are similar, they refer to two distinct units. A rod-piston assembly designator (2X3 rod-piston) refers to a specific rod-piston construction. The monoshock type (3R6 shock), however, refers to the combination of external construction and rod-piston assembly used in that type of shock.

For example: a 3R6 monoshock (from an IT175G) has an R construction and a 2X3 rod-piston. If you are working on a 3R6 monoshock, follow the instructions in Chapter 5. When you come to the rod-piston assembly section, follow the instructions for the 2X3 rod-piston assembly found in Chapter 5.

Except for the rod-piston disassembly and rod-piston assembly sections, all instructions in Chapter 5 pertain to all R monoshocks. The sections entitled "Disassembling the Rod-Piston" and "Assembling the Rod Piston" are further divided into two subsections: the 2X3 Rod-Piston Assembly and 3R4 Rod-Piston Assembly. In this section, follow the procedures for the specific rod-piston assembly found in your monoshock. Ignore the instructions for the second rod-piston assembly and proceed on to the next section in the chapter.

IDENTIFICATION CHART

		EXTERNAL CONSTRUCTION		ROD-PISTON ASSEMBLY (PISTON, VALVE AND RELATIVE PARTS)		
TYPE OF MONOSHOCK	RELATIVE MODEL	X CONSTRUCTION	R CONSTRUCTION	2X3 ROD-PISTON	2X4 ROD-PISTON	3R4 ROD-PISTON
2X3	YZ125F	0		0		
2X4	YZ250F YZ400F	0			0	
3R3	YZ125G		0			0*
3R4	YZ250G YZ465G		0			0
3R6	IT175G		0	0		

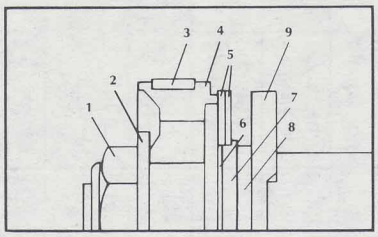
*The construction and configuration are identical to the 3R4 Rod-Piston, but the dimensions of the valve parts are slightly different.

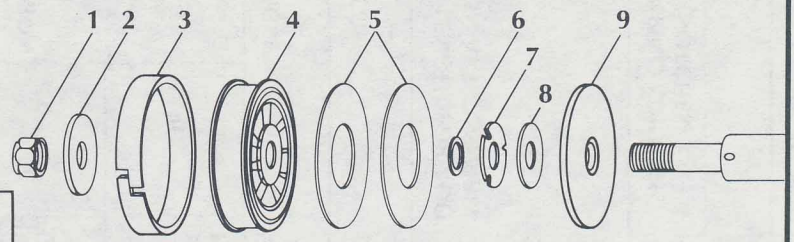
ROD-PISTON COMPONENTS

REF. NO.	PART	2X3 ROD-PISTON	2X4 ROD-PISTON	3R3 ROD-PISTON*	3R4 ROD-PISTON
1	U-Nut	0	0	0	0
2	Piston Baffle	12/29/25mm (0.5/1.1/0.1 in.)		12/25.5/1.4mm (0.5/1/0.05 in.)	
3	Piston Ring	Non-directional		Directional	
4	Piston	Without Seal Ring Groove		With Seal Ring Groove	
5	Valve Plate 1	25/42.5/0.46mm (1/1.7/0.02 in.)		25/41/0.46mm (1/1.6/0.02 in.)	25/42.5/0.46mm (1/1.7/0.02 in.)
6	Valve Set Shim	12/19/0.36mm (0.5/1.3/0.01 in.)			
7	Center Plate	12/25/0.92mm (0.5/1/0.04 in.)	12/–/1.3mm (0.5/–/0.05 in.)	12/25/0.77mm (0.5/1/0.03 in.)	12/25/0.82mm (0.5/1/0.03 in.)
8	Control Washer	12/25/0.55mm (0.5/1/0.02 in.)	12/25.8/1.0mm (0.5/1/0.04 in.)	12/26.0/1.4mm (0.5/1/0.06 in.)	12/26.5/1.4mm (0.5/1/0.06 in.)
9	Seat Washer	12/42.5/2.5mm (0.5/1.7/0.1 in.)		12/41/3.2mm (0.5/1.6/0.1 in.)	
10	Expansion Clip			0	0
11	Ring Seal			0	0

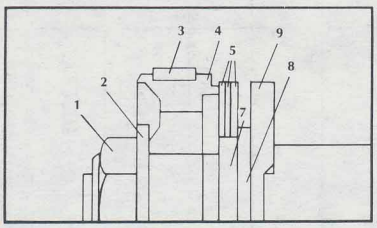
(inner diameter/outer diameter/thickness)
*The construction and configuration are identical to the 3R4 Rod-Piston, but the dimensions of the valve parts are slightly different.

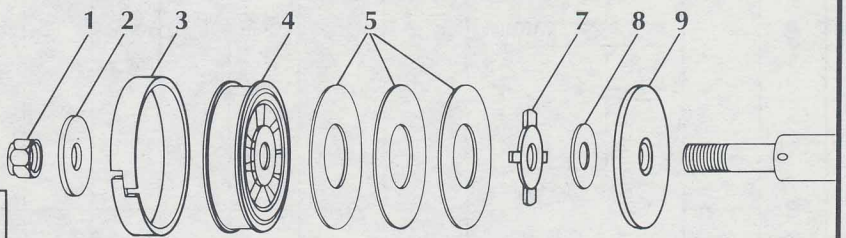
2X3 ROD-PISTON



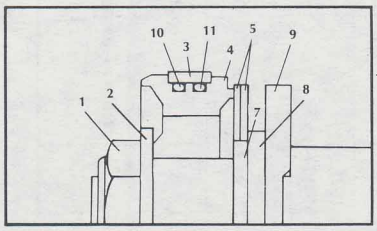


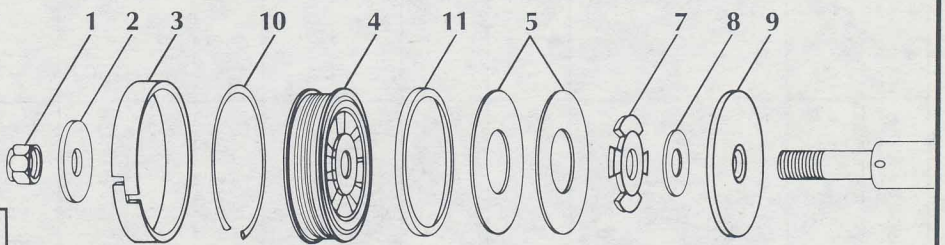
2X4 ROD-PISTON





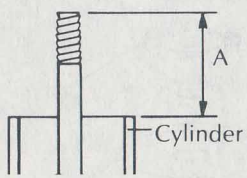
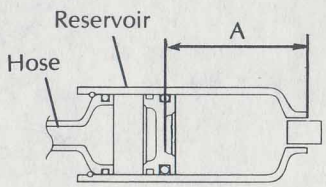
3R4 ROD-PISTON





SERVICE DATA

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

TYPE OF M.X.S.			2X3 TYPE (without the reservoir)	2X4 TYPE (without the reservoir)		3R3 TYPE (with the reservoir)	3R4 TYPE (with the reservoir)		3R6 TYPE (with the reservoir)
MODEL			YZ125F	YZ250F	YZ400F	YZ125G	YZ250G	YZ465G	IT175G
EYE TO EYE			633 (632 ~ 635) mm (25.0 in.)	640 (639 ~ 642) mm (25.2 in.)		540 (539 ~ 542) mm (21.0 in.)			518 (517 ~ 520) mm (20.4 in.)
SET LENGTH			295 mm (11.6 in.)	308 mm (12.1 in.)	306 mm (12 in.)	356 mm (14 in.)			335 mm (13.2 in.)
COMPRESSION SPRING	S.T.D.	Spring Rate (kg/mm)	2.17 ~ 3.75	2.55 ~ 5.03		1.8 ~ 3.1	2.1 ~ 5.1		2.2 ~ 4.6
		Color Code (Part No.)	Pink (90501-98540)	Blue (90501-99479)		Red (3R3-22210-00)	None (3R4-22210-00)		Yellow 3R6-22210-00)
	SOFT	Spring Rate (kg/mm)	1.91 ~ 4.02	2.09 ~ 4.91		1.7 ~ 2.8	2.0 ~ 4.6		2.0 ~ 4.2
		Color Code (Part No.)	White, Yellow (90501-98478)	Yellow (90501-99481)		Red, Green (3R3-22210-10)	Green (3R4-22210-10)		Yellow, Green (3R6-22210-10)
	HARD	Spring Rate (kg/mm)	2.72 ~ 4.03	2.96 ~ 5.05		1.9 ~ 3.6	2.2 ~ 5.7		2.41 ~ 5.2
		Color Code (Part No.)	White, Red (90501-98477)	Red (90501-99480)		Red, Blue (3R3-22210-20)	Blue (3R4-22210-20)		Yellow, Blue (3R6-22210-20)
GAS PRESSURE			15 ± 0.5 kg/cm² (213 psi)	17 ± 0.5 kg/cm² (242 psi)		15 ± 0.5 kg/cm² (213 psi)			
OIL CAPACITY			344 cm³ (cc) (0.364 quart)	345 cm³ (cc) (0.365 quart)					
SPECIFIED LENGTH FOR ROD OR FREE PISTON AT REASSEMBLY			 A= 50 ± 2mm (2.0 ± 0.08 in.)			 A= 130 ~ 138 mm (5.1 ~ 5.4 in.)			
S.T.D. DAMPING ADJUSTER POSITION (NOTCHES)			14	12		9	11		15
OIL			Yamaha suspension oil C or equivalent			Yamaha suspension oil F or equivalent			Yamaha suspension oil D or equivalent