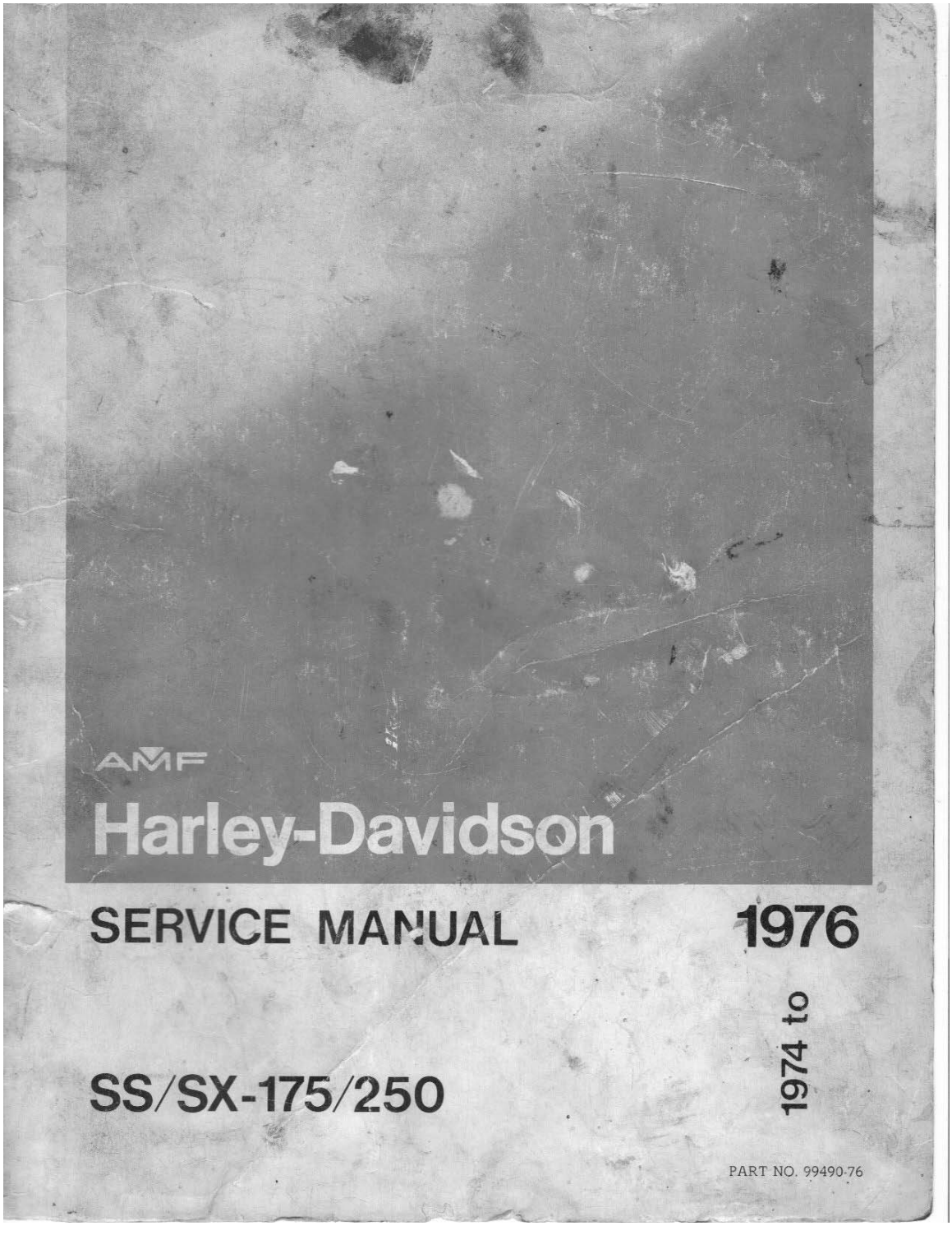


AMF

Harley-Davidson

SERVICE MANUAL

1974 to 1976

SS/SX-175/250

PART NO. 99490-76

FOREWORD

This service manual has been prepared with two purposes in mind. First, it will acquaint the reader with the construction of Harley-Davidson products and assist him in performing basic maintenance and repair. Second, it will introduce the latest field-tested and factory-approved major repair methods to the professional Harley-Davidson mechanic. We sincerely believe that this manual will make your association with Harley-Davidson products more pleasant and profitable.

HOW TO USE YOUR SERVICE MANUAL

Your service manual is arranged for quick, easy reference. It is divided into numbered sections such as: "Chassis," "Engine" and "Transmission." Sections are then divided into sub-sections. The engine section, for example, is made up of sub-sections such as "Cylinder," "Crankcase," etc.

Use this manual as follows:

1. Check the Table of Contents located in front of each section to find subject desired.
2. Page number is listed across from subject.
3. Each section is printed with section number for quick general location of subject. Page number consists of section number and page number.
4. Information is presented in a definite order as follows:

   Minor adjustments
   Minor maintenance or repair
   Complete disassembly
   Cleaning
   Major maintenance or repair
   Assembly

In figure legends, a number following a name of a part indicates the quantity necessary for one complete assembly.

All information for servicing a part should be read before repair work is started to avoid needless disassembly.

SERVICE BULLETINS

In addition to the information given in this service manual, service bulletins are issued to Harley-Davidson Dealers from time to time, which cover interim engineering changes and supplementary information. Service bulletins should be consulted for complete information on the models covered by this manual.

USE GENUINE REPLACEMENT PARTS

To insure a satisfactory and lasting repair job, follow the manual instructions carefully and use only genuine Harley-Davidson replacement parts. Behind the emblem bearing the words "Genuine Harley-Davidson" is more than half a century of designing, research, manufacturing, testing and inspecting experience.

This is your insurance that the parts you are using will fit right, operate properly and last longer. When you use genuine Harley-Davidson parts you use the best.

CAUTION

Gasoline is extremely flammable and highly explosive under certain conditions. Always stop engine and do not smoke or allow open flame or sparks when refueling or servicing the fuel system or when using gasoline as a cleaning solvent where specified in this manual.

1974-76

SS/SX-175/250

SERVICE MANUAL

The SS and SX models are similar in most respects and the information in this manual applies to both unless otherwise specified. The specific year and model designations are as follows:

1974	1975	1976 & Later
SX-175	SX-175/250 SS-250	SS/SX-175 SS/SX-250

PART NO. 99490-76 Printed in U.S.A.

TABLE OF CONTENTS

Revised 12-75

TABLE OF CONTENTS (CONT)

PRODUCT 1

TABLE OF CONTENTS

GENERAL

Note: Model SX specifications also apply to SS models unless otherwise specified.

SPECIFICATIONS

DIMENSIONS

	SX-175/250	SS-250
Wheel Base	54.2 in. (1375 mm)	56.0 in. (1420 mm)
Overall Length	82.1 in. (2085 mm)	86.0 in. (2180 mm)
Overall Width	34.6 in. (880 mm)	31.5 in. (800 mm)
Overall Height	45.3 in. (1150 mm)	44.5 in. (1130 mm)
Saddle Height	31.5 in. (800 mm)	31.5 in. (800 mm)
Road Clearance	6.9 in. (175 mm)	6.7 in. (170 mm)

WEIGHT
Total Weight . . . . . 252 Lbs (114 kg)

CAPACITIES
Main Fuel Tank . . . . . 2.22 gal. (8.4 l)
Reserve Fuel Tank . . . . . 1.2 qt (1.1 l)
Transmission . . . . . 2.54 pt max, 1.9 pt min (0.9 l to 1.2 l)
Oil Tank . . . . . 3.2 pt (1.5 l)

ENGINE
Model Designation SS-175, SX-175, SS-250, SX-250
Type of Engine . . Two Cycle, Air Cooled, Loop Scavenged
Number of Cylinders . . . . . One
Placement of Cylinder . . . . . Inclined Forward 15°
Cylinder . . . . . Cast Aluminum, Chrome Plated Bore
Piston . . . . . Aluminum Alloy, Flat Top
Connecting Rod . . . . . Steel Forging, I-Beam Section

	SX-175		SS-175	SX-250		SS-250
	1975 & Earlier	1976 & Later	1976 & Later	1975 & Earlier	1976 & Later	All Models
Horsepower (approx.) at Rear Wheel, with Muffler	15.4 B.H.P. @ 7500 R.P.M.	16.0 B.H.P. @ 6800 R.P.M.	15.5 B.H.P. @ 6750 R.P.M.	21.4 B.H.P. @ 7750 R.P.M.	19.2 B.H.P. @ 7000 R.P.M.	19.0 B.H.P. @ 7000 R.P.M.
Taxable Horsepower (NACC Rating)	2.30			3.22		
Bore	2.40 in. (61 mm)			2.84 in. (72 mm)		
Stroke	2.35 in. (59.6 mm)			2.35 in. (59.6 mm)		
Piston Displacement	10.63 cu. in. (174.15 cc)			14.80 cu. in. (242.6 cc)		
Compression Ratio (Uncorrected)	10.7:1			10.3:1		

IGNITION SYSTEM
Spark Plug
Type . . . . . SS/SX-175 Harley-Davidson No. 7-8
SS/SX-250 Harley-Davidson No.7
Size . . . . . 14 mm
Gap . . . . . .025 in.
Tightening Torque . . . . . .15 ft. lbs.
Ignition Timing . . . . . 21° (.100 in.) B.T.C.
Ignition Timing Pickup Gap . . . . . .012 to .016 in.

TRANSMISSION
Type . . . . . Constant Mesh
Speeds . . . . . 5 Forward
Drive Pinion Gear Teeth 20
Clutch Ring Gear Teeth 56
Transmission Internal Ratios
1st 2.53
2nd 1.79
3rd 1.30
4th 1.0
5th 0.80

	1975 & Earlier			1976 & Later			
	SX-175	SX-250	SS-250	SX-175	SS-175	SX-250	SS-250
Sprocket Teeth							
Transmission	14	16	16	13	14	15	15
Rear Wheel	50	49	50	49	50	50	49
Overall Gear Ratios							
1st	25.3	21.7	22.1	26.8	25.4	23.7	23.2
2nd	17.9	15.4	15.7	18.6	17.6	16.5	16.1
3rd	13.0	11.1	11.4	13.6	12.8	12.0	11.7
4th	10.0	8.6	8.8	10.6	10.0	9.3	9.1
5th	8.0	6.8	7.0	8.5	8.0	7.5	7.4

Tire Data

Model	Front	Rear
1975 & Earlier		
SX-175	3.00 x 19 in. 22 psi	3.50 x 18 in. 25 psi
SX-250		
SS-250	3.25 x 19 in. 22 psi	4.00 x 18 in. 25 psi
1976 & Later		
SX-175	3.00 x 19 in. 20 psi	4.00 x 18 in. 24 psi
SS-175	3.25 x 19 in. 20 psi	
SX-250	3.00 x 21 in. 22 psi	4.00 x 18 in. 26 psi
SS-250	3.25 x 19 in. 22 psi	

VEHICLE IDENTIFICATION NUMBER (V.I.N.)

The Vehicle Identification Number (V.I.N.) is stamped on the engine crankcase and on the frame steering head. It consists of a model code, a serial number, a manufacturer's identification and model year as shown in the table. Always give this number when ordering parts or making an inquiry.

Letters	Model No.	Serial No.	Mfg.	Year
SX-175	5D	10,000 and up (5 digits)	H Harley-Davidson	6 (1976)
SS-175	4F			
SX-250	6D			
SS-250	9E			

TORQUE SPECIFICATIONS

Table 1.1. Fastener Tightening Specifications

Component	Torque		Thread Size & Pitch in MM
	ft-lbs (lb-ft)	kgm (m. kg.)	
CYLINDER			
Cylinder Nut	17-18	2.4-2.5	8 x 1.25
Cylinder Head Nut	17-18	2.4-2.5	8 x 1.25
CRANKCASE			
Crankcase Screw	5-6	0.7-0.8	6 x 1
Right Crankcase Cover Screw	5-6	0.7-0.8	6 x 1
Left Crankcase Cover Screw	5-6	0.7-0.8	6 x 1
Oil Pump Cover Screw	3.5-4	0.5-0.6	5 x 0.8
Clutch Cover Screw	3.5-4	0.5-0.6	5 x 0.8
Tachometer Drive Unit Screw	9-10	1.3-1.5	6 x 1
LUBRICATION			
Oil Pump Mounting Screw	6-6.5	0.8-0.9	5 x 0.8
Carburetor Manifold Fitting Screw	-	-	6 x 1
Oil Drain Plug	35-37	4.8-5.2	10 x 1.5
CLUTCH & PRIMARY DRIVE			
Clutch Hub Nut	71-74	9.8-10.2	16 x 1.25
Releasing Plate Screw	5-6	0.7-0.8	5 x 0.8
Drive Pinion Nut	78-81	10.8-11.2	18 x 1.25
STARTER			
Clutch Releasing Plate Screw	9-10	1.3-1.5	6 x 1
Starter Lever Nut	11-12	1.5-1.7	8 x 1
TRANSMISSION			
Shifter Cam Plate Screw	9-10	1.3-1.5	6 x 1
Gear Shifter Lever	9-11	1.3-1.5	6 x 1
Neutral Switch	6.5-8	0.8-1.1	8 x 1
ELECTRICAL & INSTRUMENTS			
Rotor Nut	58-59	8-8.2	12 x 1.25
Spark Plug	25-28	3.5-3.9	14 x 1.25
Ignition Module Screws	6.5-7	0.9-1	5 x 0.8
Ignition Coil Nut	7-9	1-1.2	6 x 1
Headlamp Nut	42-45	5.8-6.2	12 x 1.5
Battery Support Nut	20-23	2.8-3.2	8 x 1.25
Taillamp Nut	3.5-4	0.5-0.6	6 x 1
Horn Nut	17-19	2.4-2.6	8 x 1.25
Instrument Bracket Screw	18-20	2.5-2.8	8 x 1.25
WHEEL			
Fork Bracket Screw	7-8	0.9-1.1	6 x 1
Brake Anchor Nut	35-38	4.8-5.2	10 x 1.5
Brake Lever Screw	9-11	1.3-1.5	6 x 1
Front Wheel Axle Nut	56-59	7.8-8.2	15 x 1.25
Brake Shoe Bracket Nut	9-11	1.3-1.5	6 x 1
Brake Side Plate Bracket Nut	42-45	5.8-6.2	10 x 1
Rear Wheel Axle Nut	56-59	7.8-8.2	16 x 1.5
Brake Shoe Operating Lever Nut	6.5-8	0.9-1	6 x 1
Sprocket Nut	14-15	1.9-2.1	6 x 1

Table 1.1. Fastener Tightening Specifications (Cont)

Component	Torque		Thread Size & Pitch in MM
	ft-lbs (lb-ft)	kgm (m. kg.)	
FRAME			
Engine Mounting Bolts	22-24	3-3.2	8 x 1.25
Footpeg Screw	79-81	10.8-11.2	12 x 1.5
Engine Guard Screw	7-9	1-1.2	-
Clutch & Brake Lever Pin Nut	7-9	1-1.2	6 x 1
Chainguard & Guide Nut	9-11	1.3-1.5	6 x 1
Front Fender Support Screw	6.5-8	0.9-1.1	6 x 1
Front Fender Nut	9-10	1.2-1.4	6 x 1
Rear Fender Nut	3.5-4	0.5-0.6	6 x 1
Side Panel Nut	7-8	1-1.2	6 x 1
Seat Hinge Nut	6.5-8	0.9-1.1	6 x 1
Seat Latch Nut	7-9	1-1.2	6 x 1
FRONT FORK			
Fork Side Retaining Screw	24-26	3.3-3.6	10 x 1.5
Handlebar Clamp Screw (Marzocchi)	12-13	1.7-1.8	8 x 1.25
Handlebar Clamp Screw (Ceriani)	10-11	1.4-1.6	6 x 1
Handlebar Clamp Screw (Betor)	12-13	1.7-1.8	
Steering Head Nut (Marzocchi)	42-45	5.8-6.2	24 x 1
Steering Head Nut (Ceriani)	35-38	4.8-5.2	22 x 1
Steering Head Nut (Betor)			
Oil Drain Screw	6.5-8	0.9-1.1	6 x 1
Pinch Bolt Nut	14-15	1.9-2.1	8 x 1.25
REAR SUSPENSION			
Rear Fork Bolt Nut	78-80	10.8-11	20 x 1.25
Rear Fork Bolt Nut	49-52	6.8-7.2	14 x 1.5
Grease Fitting	6.5-8	0.9-1.1	10 x 1
Shock Absorber Nut	31-33	4.3-4.5	10 x 1.25

Torque conversion (approximate):
7.2 x kgm = ft-lbs
.14 x ft-lbs = kgm

METRIC CONVERSION TABLE

MILLIMETERS to INCHES (MM x 25.40 = inches)								INCHES to MILLIMETERS (inches x 0.03937 = MM)							
MM	IN	MM	IN	MM	IN	MM	IN	IN	MM	IN	MM	IN	MM	IN	MM
.1	.0039	25	.9842	58	2.283	91	3.582	.001	.025	.6	15.240	1 15/16	49.21	3 5/16	84.14
.2	.0078	26	1.024	59	2.323	92	3.622	.002	.051	5/8	15.875	2	50.80	3 3/8	85.72
.3	.0118	27	1.063	60	2.362	93	3.661	.003	.076	11/16	17.462	2 1/16	52.39	3.4	86.36
.4	.0157	28	1.102	61	2.401	94	3.701	.004	.102	.7	17.780	2.1	53.34	3 7/16	87.31
.5	.0197	29	1.142	62	2.441	95	3.740	.005	.127	3/4	19.050	2 1/8	53.97	3 1/2	88.90
.6	.0236	30	1.181	63	2.480	96	3.779	.006	.152	.8	20.320	2 3/16	55.56	3 9/16	90.49
.7	.0275	31	1.220	64	2.519	97	3.819	.007	.178	13/16	20.638	2.2	55.88	3.6	91.44
.8	.0315	32	1.260	65	2.559	98	3.858	.008	.203	7/8	22.225	2 1/4	57.15	3 5/8	92.07
.9	.0354	33	1.299	66	2.598	99	3.897	.009	.229	.9	22.860	2.3	58.42	3 11/16	93.66
1	.0394	34	1.338	67	2.638	100	3.937	.010	.254	15/16	23.812	2 5/16	58.74	3.7	93.98
2	.0787	35	1.378	68	2.677	101	3.976	1/64	.397	1	25.40	2 3/8	60.32	3 3/4	95.25
3	.1181	36	1.417	69	2.716	102	4.016	.020	.508	1 1/16	26.99	2.4	60.96	3.8	96.52
4	.1575	37	1.456	70	2.756	103	4.055	.030	.762	1.1	27.94	2 7/16	61.91	3 13/16	96.84
5	.1968	38	1.496	71	2.795	104	4.094	1/32	.794	1 1/8	28.57	2 1/2	63.50	3 7/8	98.42
6	.2362	39	1.535	72	2.834	105	4.134	.040	1.016	1 3/16	30.16	2 9/16	65.09	3.9	99.06
7	.2756	40	1.575	73	2.874	106	4.173	.050	1.270	1.2	30.48	2.6	66.04	3 15/16	100.01
8	.3149	41	1.614	74	2.913	107	4.212	.060	1.524	1 1/4	31.75	2 5/8	66.67	4	101.6
9	.3543	42	1.653	75	2.953	108	4.252	1/16	1.588	1.3	33.02	2 11/16	68.26	4 1/16	102.19
10	.3937	43	1.693	76	2.992	109	4.291	.070	1.778	1 5/16	33.34	2.7	68.58	4.1	104.14
11	.4331	44	1.732	77	3.031	110	4.331	.080	2.032	1 3/8	34.92	2 3/4	69.85	4 1/8	104.77
12	.4724	45	1.772	78	3.071	111	4.370	.090	2.286	1.4	35.56	2.8	71.12	4 3/16	106.36
13	.5118	46	1.811	79	3.110	112	4.409	.1	2.540	1 7/16	36.51	2 13/16	71.44	4.2	106.68
14	.5512	47	1.850	80	3.149	113	4.449	1/8	3.175	1 1/2	38.10	2 7/8	73.02	4 1/4	107.95
15	.5905	48	1.890	81	3.189	114	4.488	3/16	4.762	1 9/16	39.69	2.9	73.66	4.3	109.22
16	.6299	49	1.929	82	3.228	115	4.527	.2	5.080	1.6	40.64	2 15/16	74.61	4 5/16	109.54
17	.6693	50	1.968	83	3.268	116	4.567	1/4	6.350	1 5/8	41.27	3	76.20	4 3/8	111.12
18	.7086	51	2.008	84	3.307	117	4.606	.3	7.620	1 11/16	42.86	3 1/16	77.79	4.4	111.76
19	.7480	52	2.047	85	3.346	118	4.645	5/16	7.938	1.7	43.18	3.1	78.74	4 7/16	112.71
20	.7874	53	2.086	86	3.386	119	4.685	3/8	9.525	1 3/4	44.45	3 1/8	79.37	4 1/2	114.30
21	.8268	54	2.126	87	3.425	120	4.724	.4	10.160	1.8	45.72	3 3/16	80.96	4 9/16	115.89
22	.8661	55	2.165	88	3.464	121	4.764	7/16	11.112	1 13/16	46.04	3.2	81.28	4.6	116.84
23	.9055	56	2.205	89	3.504	122	4.803	1/2	12.700	1 7/8	47.62	3 1/4	82.55	4 5/8	117.47
24	.9449	57	2.244	90	3.543	123	4.842	9/16	14.288	1.9	48.26	3.3	83.82	4 11/16	119.06

NEW MOTORCYCLE INITIAL SERVICE

PREDELIVERY

Service operations to be performed before delivery to customer are specified in the Setting Up Instructions and Important Instructions included with new vehicle.

After the motorcycle has been driven its first 500 miles, it should be serviced as follows:

CHECK AT FIRST 500 MILES

1. Check the adjustment of the rear chain and readjust, if necessary. Lubricate.
2. Change oil in transmission.
3. Check fork bearing adjustment.
4. Service the air cleaner.
5. Check brake, clutch and gear shifter adjustments.
6. Lubricate all points indicated for 2000 mile servicing as described in "REGULAR SERVICE INTERVALS" chart.
7. Check lubricating oil pump and throttle adjustment.
8. Check all nuts, bolts and screws and tighten where necessary.
9. Inspect spark plug. Clean and adjust gap if necessary.
10. Check ignition timing.
11. Check and tighten spokes if necessary.
12. Check tire pressure and inspect tread.
13. Aim headlight.
14. Road test.

REGULAR SERVICE INTERVALS, Table 1.2

Table 1.2 outlines recommended maintenance and lubrication intervals after performance of service on a new motorcycle and the initial break-in period. Refer to Figure 1.1 when using the table.

NOTE

The service procedures apply to road vehicles. For "off road" or competition use, more frequent service will be required.

LUBRICANTS

Engine Oil:
Type - 50/1 HDMCO "Two-Cycle Lubricant".
Capacity - 3-1/3 pints.

The engine oil tank is an integral part of frame and is located underneath the fuel tank.

Transmission Oil:
Type - HDMCO grades 75 oil above 40°F and 58-W oil below 40°F.
Capacity - 2-1/2 pints.

The transmission oil is contained in the crankcase and is filled through plug located above gear section of crankcase on right side of motorcycle.

GASOLINE

Use "Premium" grade leaded gasoline. Do not use "No Lead" grades.

Table 1.2. Regular Service Intervals

Interval	Fig 1.1 & Index No.	Grease	Oil	Check & Service
EVERY 500 MILES	1		Chain	Chain - Adjust Tension
EVERY 1000 MILES	2	Speedometer Drive		
	3		Transmission, add if needed	
	4			Spark Plug, Clean & Gap
	5			Air Filter, Clean
	6, 7			Brakes, Adjust
	8, 9			Tires, Check Pressure & Inspect Tread
	10			Battery, Check Electrolyte Level
EVERY 2000 MILES	11		Throttle Cable	
	12		Oil Pump Cable	
	13		Front Brake Shaft	
	14		Rear Brake Pedal Pivot	
	15		Rear Brake Operating Shaft	
	16		Rear Brake Cable Wire	
	17		Brake Control Joints	
	18		Clutch Hand Lever	
	19		Clutch Cable Wire	
	20		Front Brake Hand Lever	
	21		Front Brake Cable Wire	
	22		Rear Fork Pivot Bushing	
	32			Wheel Spokes, Tightness
EVERY 5000 MILES OR 1 YEAR (whichever comes first)	23			Ignition Timing, Check
	24			Magnetic Pickup Coil Gap, Check
	25			Muffler Pipe and Exhaust, Clean
	26		Transmission, Change	
	27	Wheel Bearings		
	28	Throttle Grip		
	29	Speedometer Cable		
	30	Tachometer Cable		
	31			Steering Head Bearing, Adjustment
	33			Spark Plug, Replace
	35			Muffler Expansion, Decarbonize
EVERY 10000 MILES	34			Steering Head Bearings, Check for Wear
	35			Engine Combustion Chambers, Decarbonize

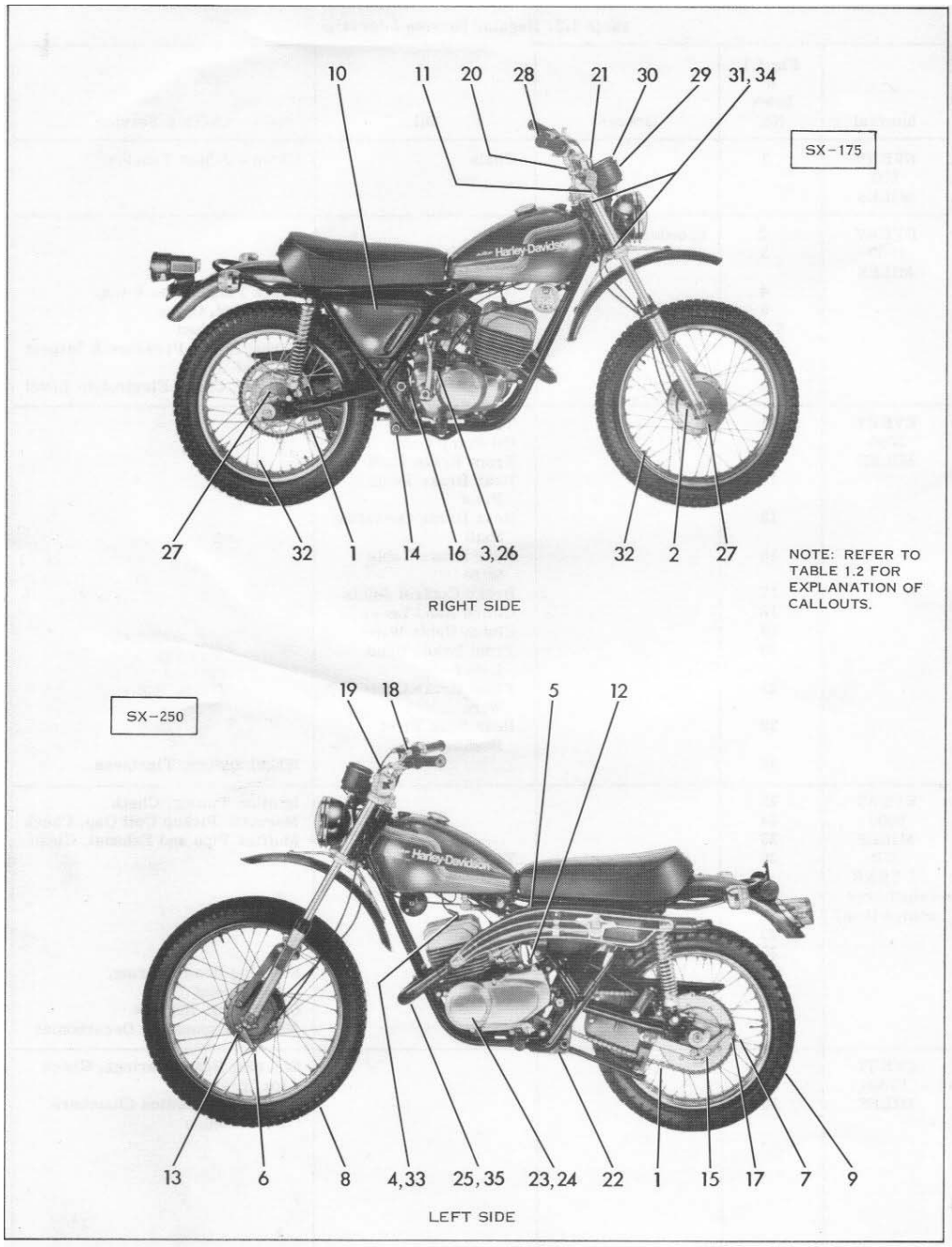


Figure 1.1. Lubrication and Service Chart, 1975 & Earlier

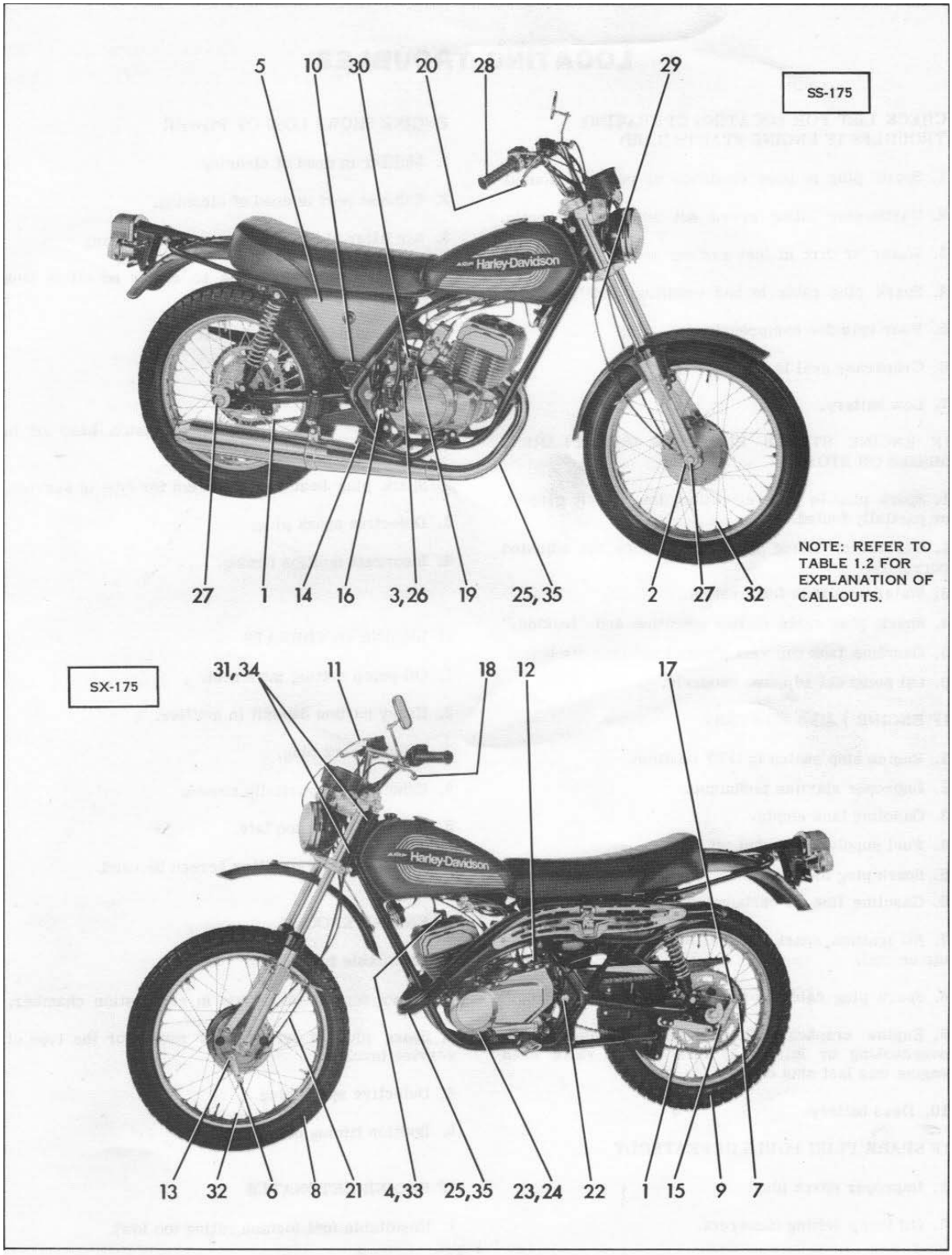


Figure 1.1A. Lubrication and Service Chart, 1976 & Later

LOCATING TROUBLES

CHECK LIST FOR LOCATING OPERATING TROUBLES IF ENGINE STARTS HARD

1. Spark plug in poor condition or partially fouled.
2. Carburetor idling speed not adjusted correctly.
3. Water or dirt in fuel system and/or carburetor.
4. Spark plug cable in bad condition and "leaking."
5. Poor cylinder compression.
6. Crankcase seal leak.
7. Low battery.

IF ENGINE STARTS BUT RUNS IRREGULARLY, MISSES OR STOPS

1. Spark plug in poor condition, improperly gapped, or partially fouled.
2. Carburetor idling speed or mixture not adjusted correctly.
3. Water or dirt in fuel system.
4. Spark plug cable in bad condition and "leaking."
5. Gasoline tank cap vent plugged and tank air bound.
6. Oil pump not adjusted properly.

IF ENGINE FAILS TO START

1. Engine stop switch in OFF position.
2. Improper starting technique.
3. Gasoline tank empty.
4. Fuel supply valve shut off.
5. Spark plug fouled.
6. Gasoline line or carburetor filler screen clogged.
7. No ignition spark. Either defective ignition module or coil.
8. Spark plug cable in poor condition and "leaking."
9. Engine crankcase flooded with gasoline due to overchoking or failure to turn off fuel valve when engine was last shut off.
10. Dead battery.

IF SPARK PLUG FOULS REPEATEDLY

1. Improper spark plug.
2. Oil pump setting incorrect.
3. Low battery.

ENGINE SHOWS LOSS OF POWER

1. Muffler in need of cleaning.
2. Exhaust port in need of cleaning.
3. Air filter blocked and in need of cleaning.
4. Engine overheating due to either no oil in tank or oil pump not working.
5. Poor cylinder compression.

IF ENGINE PRE-IGNITES

1. Excessive carbon deposit on piston head or in combustion chamber.
2. Spark plug heat range too hot for type of service.
3. Defective spark plug.
4. Incorrect ignition timing.

IF ENGINE OVERHEATS

1. Oil pump setting incorrect.
2. Heavy carbon deposit in muffler.
3. Wrong spark plug.
4. Exhaust port partially closed.
5. Ignition timing too late.
6. Oil tank empty or filter screen blocked.

IF ENGINE KNOCKS

1. Unsuitable fuel.
2. Heavy deposit of carbon in combustion chamber.
3. Spark plug of wrong heat range for the type of service involved.
4. Defective spark plug.
5. Ignition timing not correct.

IF ENGINE DETONATES

1. Unsuitable fuel (octane rating too low).
2. Defective spark plug.

3. Heavy deposit of carbon on piston head and combustion chamber.

4. Spark plug of the wrong heat range for type of service involved.

EXCESSIVE VIBRATION

1. Engine mounting bolts loose or exhaust system loose.

2. Gas tank, fenders or other major parts not tightly mounted.

3. Drive chain either dry, tight, or worn.

4. Cracked or broken frame.

5. Wheel spokes loose.

6. Tire out of balance or damaged.

IF CARBURETOR FLOODS

1. Gasoline shut-off valve not closed when the engine is shut-off.

2. Float valve sticking, worn, damaged or dirty.

IF TRANSMISSION SHIFTS HARD

1. Rounded or "dubbed" shifter clutch dogs.

2. Clutch dragging slightly or improperly adjusted (not releasing).

3. Transmission - oil too heavy (winter operation).

IF CLUTCH SLIPS

1. Clutch improperly adjusted.

2. Worn or damaged clutch drive plates.

IF CLUTCH DRAGS OR DOES NOT RELEASE

1. Clutch improperly adjusted.

2. Damaged or warped clutch drive or driven plates.

3. Transmission oil too heavy.

IF BRAKES DO NOT HOLD NORMALLY

1. Brakes not adjusted properly.

2. Brake controls binding.

3. Brake linings wet.

4. Brake linings badly worn.

5. Brake linings impregnated with grease or oil.

6. Brake drum badly worn or scored.

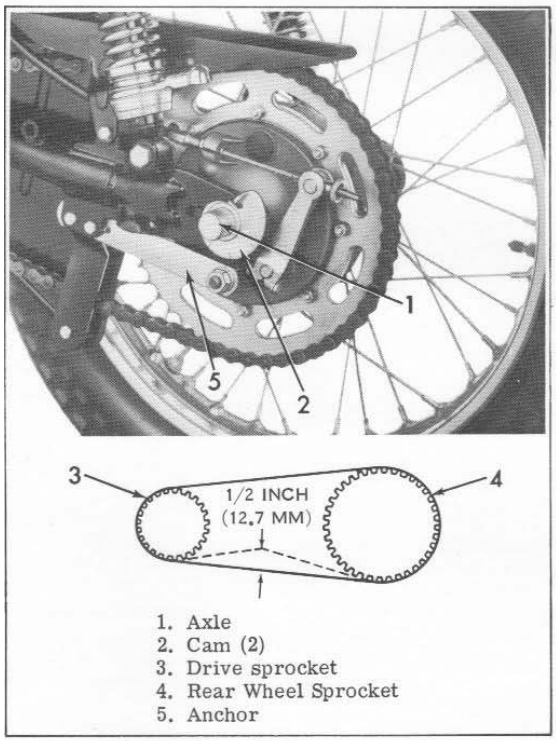
CHASSIS 2

TABLE OF CONTENTS

CHAIN ADJUSTING

The drive chain should be checked as specified in Table 1.2, "REGULAR SERVICE INTERVALS," for correct adjustment. As chain stretches and wears in service, it will run tighter at one point on sprocket than another; therefore, always rotate rear wheel and check adjustment at tightest point of chain.

To adjust rear chain, loosen axle nut and anchor stud nut. Rotate cams (2), Figure 2.1, on each side an equal distance to obtain proper tension. Refer to notches stamped on each cam. Both should be rotated to same relative notch. Also, check to see that each cam is in contact with rear fork stop tab. Otherwise, wheel axle could move, changing chain tension and wheel alignment during motorcycle operation.



1. Axle
2. Cam (2)
3. Drive sprocket
4. Rear Wheel Sprocket
5. Anchor

Figure 2.1. Drive Chain Adjustment

Chain adjustment must be made with rear wheel on ground and two persons on saddle to allow for full travel of rear fork. Both axles must be adjusted exactly the same in order to maintain proper wheel and chain alignment. The tire must run centrally in rear fork and chain must line up with rear wheel sprocket. Readjust as necessary or uneven wear of chain or tire will result. Retighten axle nut securely to 56-59 ft-lbs (7.8-8.2 kgm).

SERVICING CHAIN

At regular intervals, examine rear chain for adequate lubrication and worn chain links. Keep chain clean.

Occasionally, chain should be removed from motorcycle, inspected for worn condition and receive additional lubrication. Free chain from motorcycle by removing spring-locked connecting link shown in Figure 2.2. Lay cleaned chain out flat and contract chain by taking up all slack in its links. Measure chain length. Then, stretch chain out to its full length and again measure chain length. If difference between two measurements exceeds 1 inch, chain should be replaced. In addition, if chain has any stiff links, is visibly worn or damaged, it should be replaced. If a new chain is not available and it is necessary to repair old chain, remove damaged links by pressing out riveted link pins with chain repair tools and installing a repair link.

New chain should be 110 pitches long.

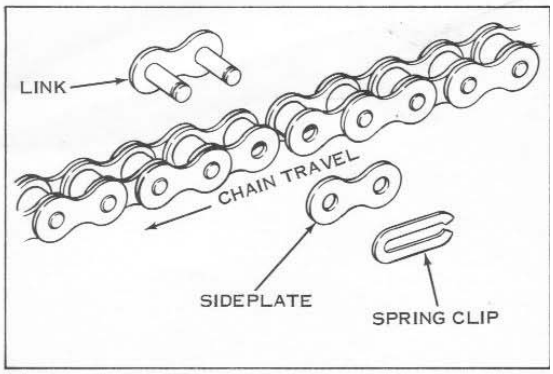


Figure 2.2. Chain Connecting Link

Before installing chain on motorcycle again, clean in either of two ways:

1. Wash chain in boiling water containing a cleansing agent, rinse with cold water, then dip in warm, high adhesive oil.

2. Soak and wash thoroughly in a pan of kerosene (or cleaning solvent). Remove chain and either hang up until dried completely or blow dry with compressed air. Lubricate chain with Harley-Davidson "CHAIN SAVER," "CHAIN SPRAY" or "CHAIN GREASE." Apply warm and move chain to work lubricant into bearings. Wipe all surplus lubricant from chain surface.

Install chain on motorcycle. Inspect connecting link and spring clip closely for bad condition. Replace if at all questionable. Be sure spring clip is securely locked on pin ends, open end of clip on outside, trailing direction of chain travel, as positioned on motorcycle.

CHAIN LUBRICATING

This motorcycle is not equipped with chain oiler. Therefore, condition of chain should be watched carefully. Under normal operating conditions, brush the dirt off and lubricate the rear chain at specified intervals. Under dirty or wet conditions, chain lubrication will be required more frequently. Lubricate chain with Harley-Davidson "CHAIN SAVER," "CHAIN SPRAY," or "CHAIN GREASE."

WHEELS

GENERAL

Maximum tire mileage and good handling qualities are related directly to care given wheels and tires. A front tire kept in continuous service will wear irregularly which may affect handling, especially if over-inflated. Therefore, it is extremely important that correct tire pressure be maintained at all times.

At either regular specified intervals or any time handling irregularities are experienced, refer to Table 2.1, "WHEEL SERVICE CHART," for recommended service.

Table 2.1 Wheel Service Chart

CHECK FOR	REMEDY
1. Loose axle nuts.	Tighten axle nuts (56 ft-lbs, 7.8 kgm, maximum torque).
2. Excessive side-play or radial (up and down) play in wheel hubs.	Replace wheel hub bearings as described in this section.
3. Loose spokes.	Tighten or replace spokes as described in "SPOKING FRONT AND REAR WHEEL."
4. Alignment of rear wheel in frame and with front wheel.	Check wheel alignment as described in this section, or, inspect and straighten frame or repair rear fork as described in "FRAME & REAR SUSPENSION."
5. Rims and tires out-of-true sideways (should not be more than 3/64 in, 1.2 mm).	True wheels, replace rims or replace spokes as described in, "SPOKING FRONT AND REAR WHEEL."
6. Rims and tires out-of-round or eccentric with hub (should not be more than 3/32 in, 2.4 mm).	See Item 5, above.
7. Irregular or peaked front tire wear.	Replace tire as described in this section.
8. Correct tire inflation.	Inflate tires to specified value.
9. Correct tire and wheel balance.	Static balance may be satisfactory if dynamic balancing facilities are not available; however, dynamic balancing is also recommended.
10. Steering head bearings.	Correct adjustment and replace worn bearings. See "FRONT FORK & STEERING HEAD."
11. Shock absorbers.	Check damping action and mounting stud rubbers. See "FRAME & REAR SUSPENSION." Adjust both shocks to same position.
12. Rear fork bushings.	Check for proper adjustment. See "FRAME & REAR SUSPENSION."

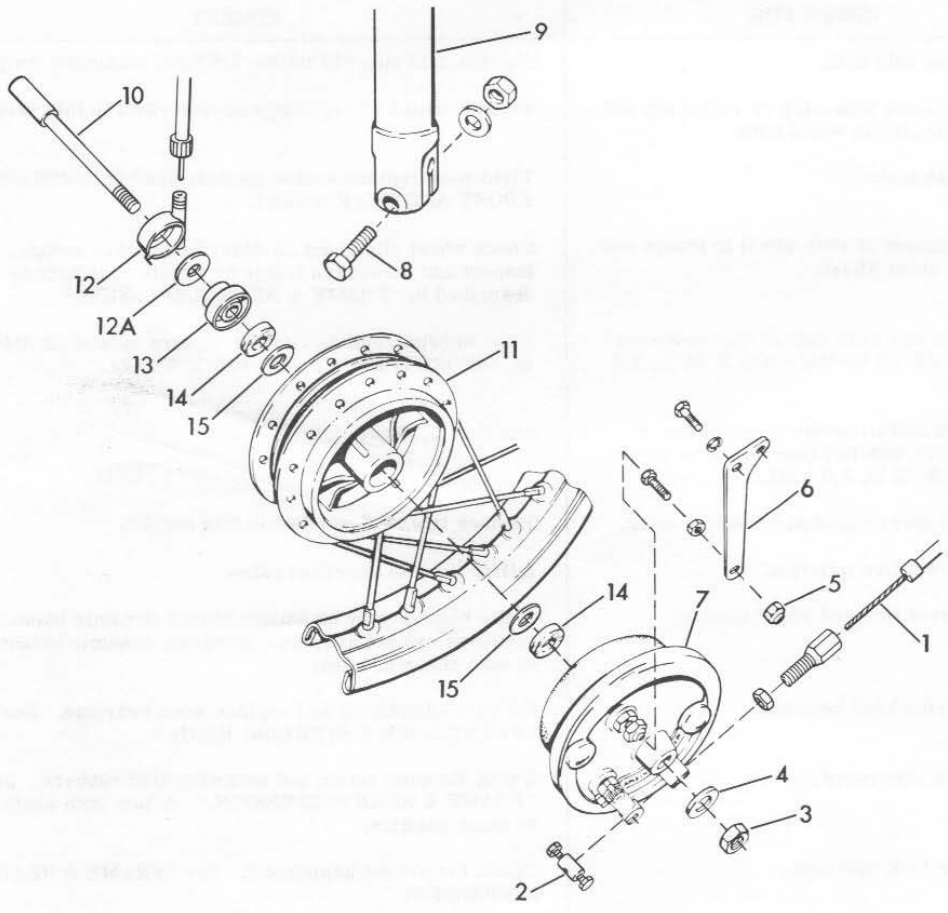
REMOVING AND INSTALLING FRONT WHEEL

Raise front end of motorcycle high enough to permit removing wheel. Support motorcycle with suitable blocking underneath frame. Disconnect brake control cable (1), Figure 2.3, by removing cable clamp (2). Remove axle nut (3) and axle nut flat washer (4). Remove nut (5) securing brake anchor (6) to brake assembly (7). Loosen axle pinch bolt (8) in fork side (9). Note that Marzocchi forks have a pinch bolt in right side only, Ceriani and Betor forks have a pinch bolt in both right and left sides. Using a soft hammer, loosen axle (10) and pull out from hub and fork assembly. This will free front wheel (11), speedometer drive (12), washer (12A) and brake assembly (7) so they can be pulled from between fork sides.

To reinstall front wheel and brake assembly, reverse disassembly procedure. When positioning speedometer drive (12), make sure ear engages hole in wheel hub when installed. Adjust brake as described in paragraph, "ADJUSTING FRONT WHEEL BRAKE," in this section. Spin wheel to make sure it turns freely.

NOTE

Tighten axle nut before pinch bolts 56-59 ft-lbs (7.8-8.2 kgm).

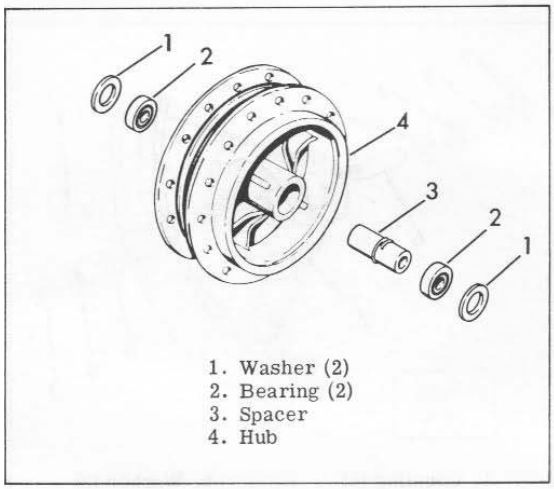


1. Brake Control Cable
2. Cable Clamp
3. Axle Nut
4. Washer
5. Nut
6. Brake Anchor
7. Brake Assembly
8. Bolt, Pinch
9. Fork Side
10. Axle
11. Front Wheel
12. Speedometer Drive
12A. Washer
13. Spacer
14. Felt Washers
15. Seal (2)

Figure 2.3. Removing and Installing Front Wheel

DISASSEMBLING AND ASSEMBLING FRONT WHEEL HUB

Remove front wheel and brake assembly from motorcycle as described in "REMOVING AND INSTALLING FRONT WHEEL." Separate and remove brake assembly from hub. Using a screwdriver, pry out washer (1), Figure 2.4, and remove ball bearing (2). Pull out bearing spacer from inside hub. From opposite side, remove other washer (1) and bearing (2).



1. Washer (2)
2. Bearing (2)
3. Spacer
4. Hub

Figure 2.4. Disassembling Front Wheel Hub

NOTE

Inspect bearings. Bearings should not be removed unless they are to be replaced. When removing bearings, use Harley-Davidson puller, 95760-69, which is available as a service part.

Reassemble front wheel hub in reverse order of disassembly.

REMOVING AND INSTALLING REAR WHEEL (QUICK DETACH)

NOTE

This procedure covers "quick detach" rear wheel only. The brake-sprocket assy and drive chain all remain assembled in place. For removing rear wheel plus these components, see procedure following this one.

Raise rear end of motorcycle high enough to allow removal of wheel. Support motorcycle by using suitable blocking underneath frame.

Remove rear axle nut (1), Figure 2.5, washer (2) and adjusting cam (3). Using a soft hammer, tap rear axle (4) loose and pull axle out of hub from opposite side. Remove spacer (5) from between right rear fork side and wheel. Separate rear wheel from brake assembly by prying apart as shown in Figure 2.6. Remove wheel.

Install wheel by reversing above procedure.

1. Nut (2)
2. Washer (2)
3. Cam (2)
4. Axle
5. Spacer
6. Chain
7. Cover
8. Screws (6)
9. Link
10. Nut
11. Cable
12. Nut
13. Brake Plate Assy
14. Pin
15. Arm
16. Washer
17. Nut
18. Screw (2)
19. Washer (2)
20. Nut (2)

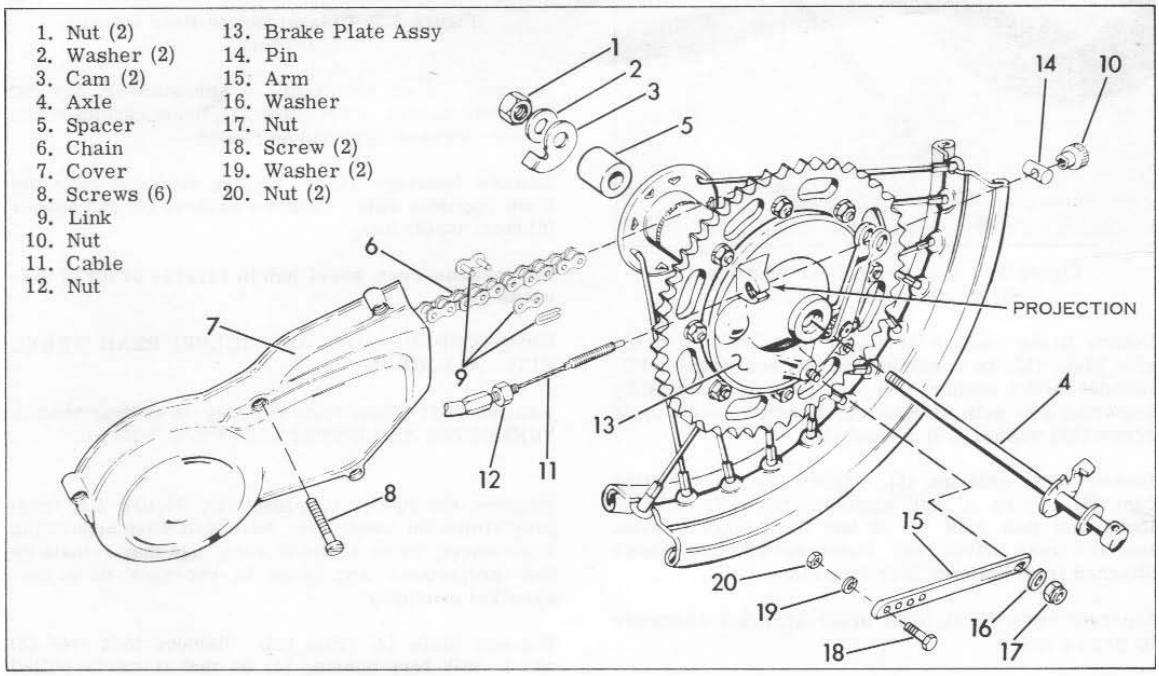


Figure 2.5. Removing and Installing Rear Wheel

REMOVING AND INSTALLING REAR WHEEL AND BRAKE-SPROCKET ASSEMBLY

NOTE

This procedure covers rear wheel and brake-sprocket assembly together. For rear wheel only, see preceding procedure.

Raise rear end of motorcycle high enough to allow removal of rear wheel. Support motorcycle by using suitable blocking underneath frame.

Remove drive chain (6), Figure 2.5, as follows. Locate and remove connecting link (9). Pull chain free of rear sprocket, leaving chain on engine sprocket.

Remove brake adjusting knurled nut (10). Unthread nut (12) from threads in projection on brake side plate (13). Pull threaded part of brake cable (11) out of hole in pin (14). Slip brake cable (11) through slot in projection, freeing it from side plate.

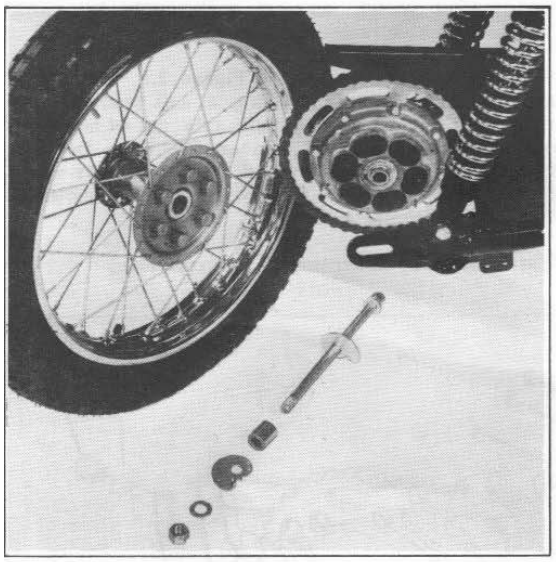


Figure 2.6. Separating Rear Wheel and Brake-Sprocket Assembly

Detach brake anchor arm (15) from stud on brake side plate (13) by removing nut (16) and washer (17). Remove brake anchor arm (15) from motorcycle by removing two sets of attaching hardware made up of screw (18) washer (19) and nut (20).

Remove rear axle nut (1), washer (2) and adjusting cam (3). Using a soft hammer, tap rear axle (4) loose and pull axle out of hub from opposite side. Remove rear wheel with brake-sprocket assembly attached from between rear fork sides.

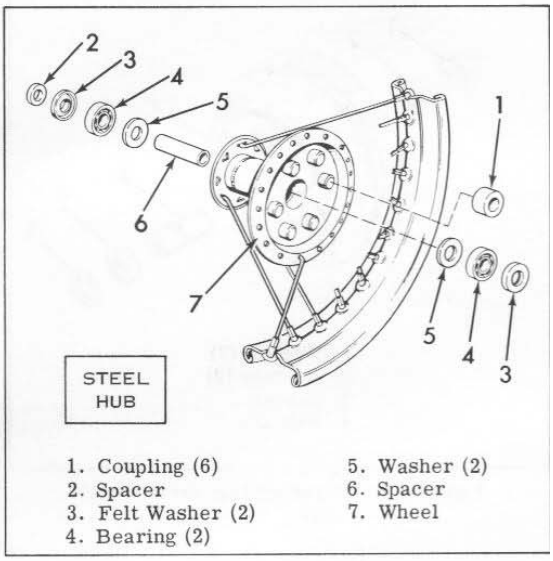
Separate rear wheel from brake-sprocket assembly by prying apart.

Reinstall wheel by reversing above procedure.

DISASSEMBLING AND ASSEMBLING REAR WHEEL HUB - STEEL

Remove rear wheel from motorcycle as described in "REMOVING AND INSTALLING REAR WHEEL."

Remove six rubber couplings (1), Figure 2.7, from projections on wheel (7). Note that when separating rear wheel, some of these couplings may remain on hub projections and some in recesses in brake-sprocket assembly.



1. Coupling (6)
2. Spacer
3. Felt Washer (2)
4. Bearing (2)
5. Washer (2)
6. Spacer
7. Wheel

Figure 2.7. Disassembling Rear Wheel Hub-Steel

Remove spacer (2). Using a screwdriver, pry out both felt washer assemblies (3), being careful not to damage them so they can be reused.

Remove bearings (4) by tapping each out carefully from opposite side. Remove washers (5) and spacer (6) from inside hub.

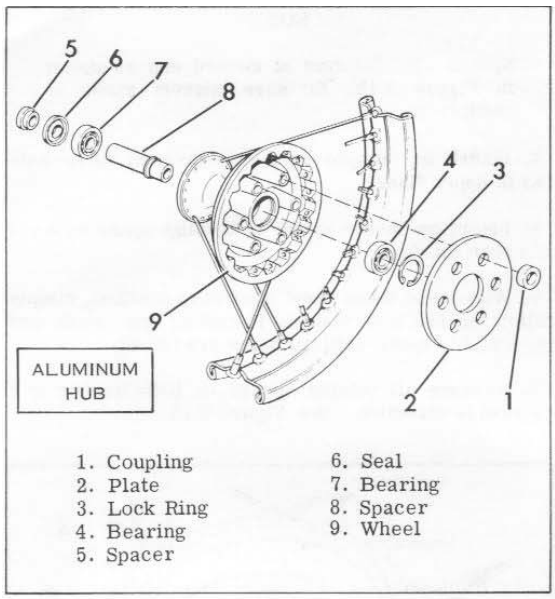
Reassemble rear wheel hub in reverse order of disassembly.

DISASSEMBLING AND ASSEMBLING REAR WHEEL HUB - ALUMINUM

Remove rear wheel from motorcycle as described in "REMOVING AND INSTALLING REAR WHEEL."

Remove six rubber couplings (1), Figure 2.8, from projections on wheel (9). Note that when separating rear wheel, some of these couplings may remain on hub projections and some in recesses in brake-sprocket assembly.

Remove plate (2) from hub. Remove lock ring (3) which will free bearing (4) so that it can be pulled out next. Slide spacer (8) out of hub.



1. Coupling
2. Plate
3. Lock Ring
4. Bearing
5. Spacer
6. Seal
7. Bearing
8. Spacer
9. Wheel

Figure 2.8. Disassembling Rear Wheel Hub - Aluminum

Remove spacer (5). Pry out seal (6), taking care not to damage it so it can be reused.

Remove bearing (7) by tapping out from opposite side.

Reassemble rear wheel hub in reverse order of disassembly.

DISASSEMBLING & ASSEMBLING REAR WHEEL BRAKE-SPROCKET ASSEMBLY - STEEL HUB

Remove rear wheel and brake-sprocket assembly from motorcycle as described in "REMOVING AND INSTALLING REAR WHEEL AND BRAKE-SPROCKET ASSEMBLY." Separate rear wheel from brake-sprocket assembly by prying apart. Then, disassemble brake-sprocket assembly as follows.

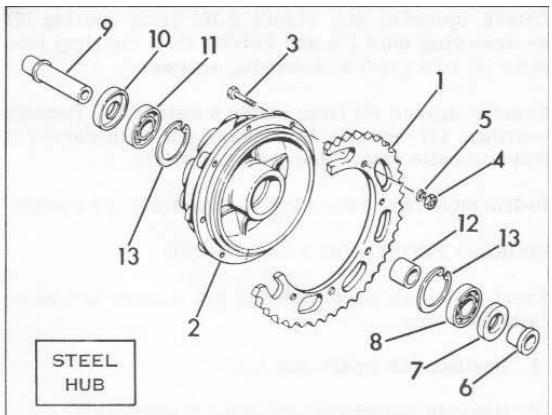
Detach sprocket (1), Figure 2.9, from housing (2) by removing nuts (4), washers (5), and screws (3).

Pull out collar (6) and sleeve (9). Using a screwdriver, pry out both felt washer assemblies (7) and (10), being careful not to damage so they can be reused.

Remove bearings (8) and (11) by tapping each out carefully from opposite side. Remove spacer (12).

This completes disassembly, except for lock rings (13). Remove these rings only if needed using special pliers.

Reassemble by reversing disassembly procedure.

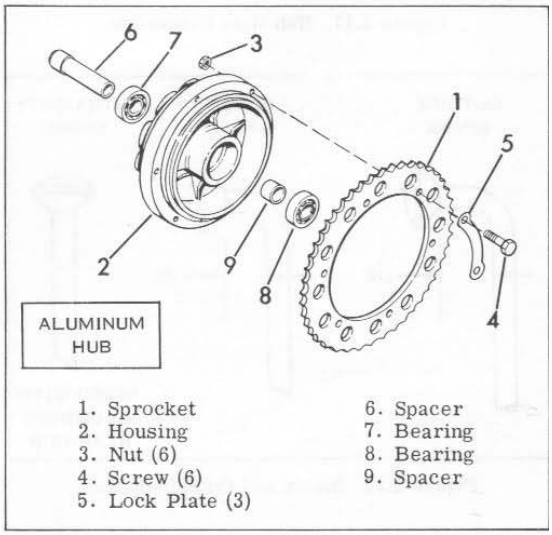


1. Sprocket
2. Housing
3. Screw (8)
4. Nut (8)
5. Washer (8)
6. Collar
7. Felt Washer Assy
8. Bearing
9. Sleeve
10. Felt Washer Assy
11. Bearing
12. Spacer
13. Ring

Figure 2.9. Removing and Installing Rear Wheel Sprocket Assembly - Steel Hub

DISASSEMBLING & ASSEMBLING REAR WHEEL BRAKE-SPROCKET ASSEMBLY - ALUMINUM HUB

Remove rear wheel and brake-sprocket assembly from motorcycle as described in "REMOVING AND INSTALLING REAR WHEEL AND BRAKE-SPROCKET ASSEMBLY." Separate rear wheel from brake-sprocket assembly by prying apart. Then, disassemble brake-sprocket assembly as follows.



1. Sprocket
2. Housing
3. Nut (6)
4. Screw (6)
5. Lock Plate (3)
6. Spacer
7. Bearing
8. Bearing
9. Spacer

Figure 2.10. Removing and Installing Rear Wheel Sprocket Assembly - Aluminum Hub

Detach sprocket (1), Figure 2.10, from housing (2) by removing nuts (3) and screws (4). Uncrimp lock plate (5) tabs prior to removing screws.

Remove spacer (6) from inside housing (2). Remove bearings (7) and (8) by tapping out each carefully from opposite side. Remove spacer (9).

Reassemble by reversing disassembly procedure.

SPOKING FRONT AND REAR WHEEL

Front and rear wheel spoking procedures are basically the same.

1. Position hub brake side up.

2. Draw an imaginary centerline through axle center hole and over any spoke hole (X) on upper flange. See Figure 2.11. Note that centerline also lines up exactly between spoke holes (Y and Z) on lower flange of hub.

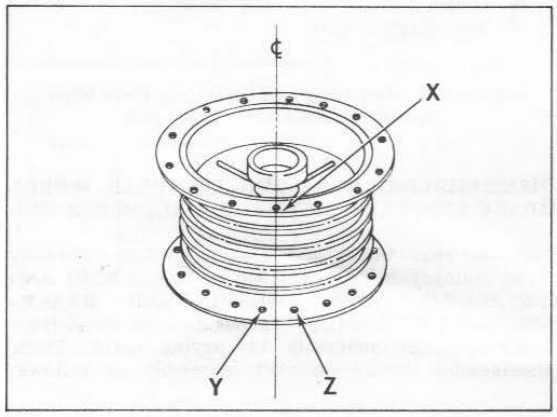


Figure 2.11. Hub With Centerline

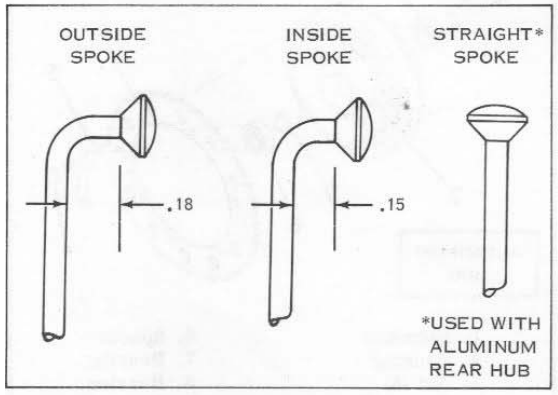


Figure 2.12. Inside and Outside Spokes

3. Insert an outside spoke down through spoke hole (Y) in lower flange of hub.

NOTE

Spokes are different at curved end as shown in Figure 2.12. Be sure correct spoke is used.

4. Insert an outside spoke up through spoke hole (X) in upper flange.

5. Insert an inside spoke up through spoke hole (Z) in lower flange.

6. With these three "key" spokes in position, simply follow around both flanges installing one inside and one outside spoke until all holes are filled.

7. Arrange all outside spokes on both flanges in a clockwise direction. See Figure 2.13.

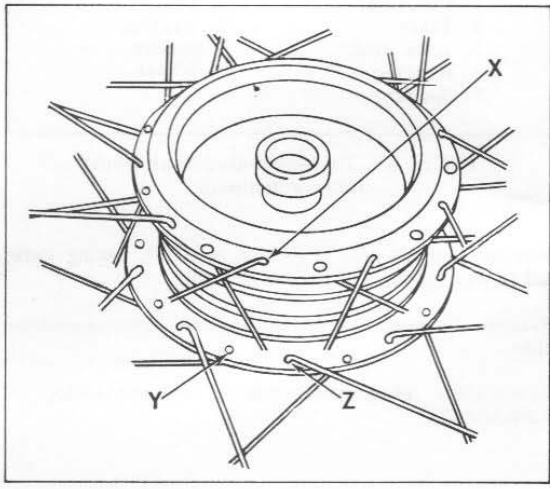


Figure 2.13. Spoke Arrangement

8. Arrange all inside spokes on both flanges in a counterclockwise direction. See Figure 2.13.

9. Place wheel rim over hub assembly and line up imaginary centerline two spoke holes to right of valve stem hole. See Figure 2.14.

10. Insert spoke (X) in wheel rim spoke hole (A), three holes to left of valve stem hole and start nipple. See Figure 2.14.

NOTE

Do not tighten spoke nipples during lacing procedure.

11. Insert spoke (Y) in wheel rim spoke hole (B), four holes to left of valve stem hole and start nipple. See Figure 2.14.

12. Insert spoke (Z) in wheel rim spoke hole (C), seven holes to right counterclockwise from valve stem hole and start nipple. See Figure 2.14.

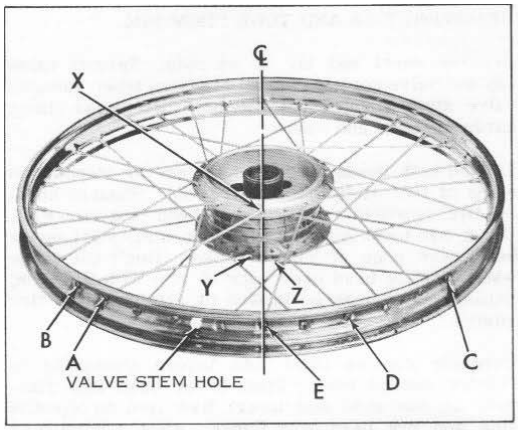


Figure 2.14. Inserting Spokes in Wheel Rim

13. Taking first inside spoke on upper flange of hub to left of (X), insert in fourth hole (D) to right of valve stem in rim.

14. Insert all inside upper flange spokes in rim skipping three holes in a counterclockwise direction from previous spoke installed. Start nipples on spoke threads.

15. Taking first outside spoke on upper flange of hub to right of (X), insert in second hole (E) to right of valve stem in rim.

16. Insert all outside upper flange spokes in rim, skipping three holes in a clockwise direction from previous spoke installed. Start nipples on spoke threads.

17. Starting from first inside lower flange hole to right of spoke (Z), skip three spoke holes in rim and install all inside spokes in a counterclockwise direction.

18. Starting from first outside lower flange hole to left of spoke (Y), skip three spoke holes in rim and install all outside spokes in a clockwise direction.

TRUING WHEEL

1. Use wheel axle as truing arbor. Insert axle in wheel hub as described in "DISASSEMBLING AND ASSEMBLING WHEEL HUB," and place wheel in truing stand as shown in Figure 2.16.

2. Tighten all spoke nipples until there is approximately 3/16 inch (4.8 mm) of thread exposed below nipple on each spoke.

3. Starting at valve hole, tighten all nipples one full turn each, using a spoke nipple wrench.

4. Continue around wheel rim tightening all outside nipples until all outside spokes have only 1/16 to 1/8 inch (1.59 - 3.2 mm) thread exposed below nipple. Tighten all inside nipples until spokes have no threads exposed below nipple.

5. Check rim for concentricity, centering sideways. Centering rim sideways must be done as one operation. The rim must be properly centered sideways in relation to hub for correct alignment and "tracking" of wheels.

6. Figure 2.15 shows method of using a straightedge to determine correct sideways centering of wheel rim. If rim is too close to straightedge, loosen all nipples on brake side slightly and tighten all nipples on opposite side slightly. If rim is too far from straightedge, reverse above operation. Lay straightedge across brake side spoke flange to hub and measure distance from straightedge to rim. When rim is correctly centered, this measurement should be as shown for front and rear wheels.

7. Adjust truing stand gauge Figure 2.16 so that when wheel is turned, highest point on rim just touches gauge. At same time gauge can be adjusted to check rim side movement or runout by moving gauge in or out until rim bead just touches gauge at its point of farthest runout.

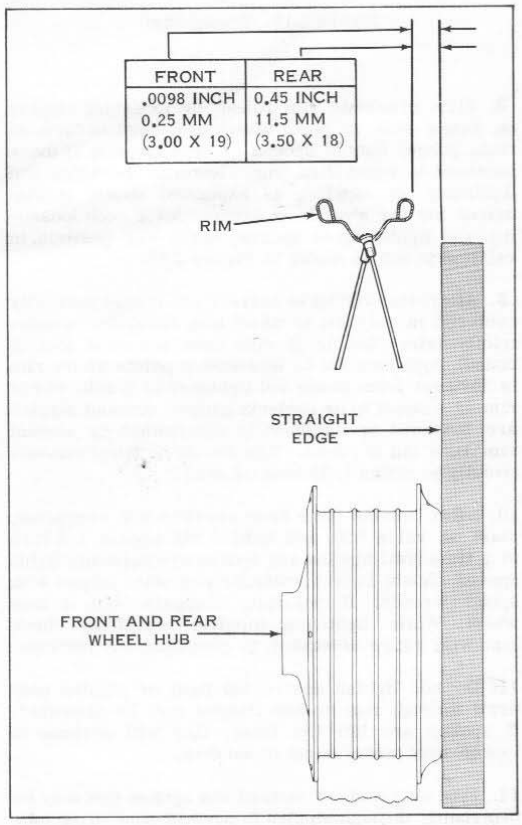


Figure 2.15. Aligning Wheel With Straightedge

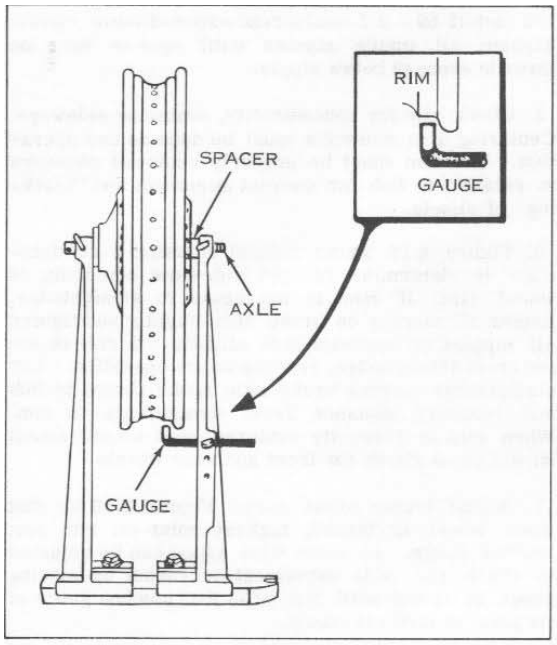


Figure 2.16. Truing Rim

8. First eliminate rim runout by loosening nipples on gauge side at point where rim bead is farthest from gauge; tighten spokes on opposite side of those loosened to bring rim true. Reverse loosening and tightening of nipples, as explained above, if rim moves too far away from gauge. After each loosening and tightening of spokes, check rim position in relation to hub as shown in Figure 2.15.

9. After rim runout is correct and rim is correctly centered in relation to wheel hub, check for concentricity (rim "hop"). If rim runs eccentric (out of round), nipples must be loosened at points where rim is farthest from gauge and tightened at points where rim is closest to or contacts gauge. Amount nipples are loosened or tightened is determined by amount rim runs out of round. Rim should be trued concentrically to within 1/32 inch (.8 mm).

10. After wheels have been checked and corrected, start at valve hole and tighten all nipples 1/4 turn at a time until nipples and spokes are normally tight. Spokes should have a metallic ring when tapped with spoke wrench. If possible, compare with a new wheel. While tightening nipples, repeatedly check rim with gauge according to preceding instructions.

11. Do not tighten spokes too tight or nipples may draw through rim or hub flanges may be distorted. If spokes are left too loose, they will continue to loosen when wheel is put in service.

12. File or grind off ends of any spokes that may be protruding through nipples to prevent puncturing tube when tire is mounted.

REMOVING TIRE AND TUBE FROM RIM

Remove wheel and lay on its side. Remove valve cap and valve core to free all air from tube. Remove valve stem knurled nut. Remove tire bead clamp hardware - nut and washers.

Loosen both beads from rim flanges by stepping on sides of tire or by using a tire tool. Stand or kneel on tire opposite valve to push bead into rim-well. Using tire tools (not sharp instruments), start upper bead over edge of rim at valve. Don't use force when starting bead over edge of rim with tire iron, because bead may be broken or stretched and tire ruined.

Carefully remove inner tube before attempting to remove second bead. Push lower bead into rim-well on one side and insert tire iron on opposite side and pry bead over flange. After a portion of second bead is started over rim edge, tire can be further removed from rim without aid of tire iron.

It is not always necessary to completely remove tire from rim. Removing one side only allows inner tube to be removed and installed and also allows inside of casing to be inspected.

INSTALLING TIRE AND TUBE ON RIM

Carefully remove all dust and dirt, particularly hard particles, from inside tire which might chafe inner tube. Wipe tube and inside of tire thoroughly with clean, dry cloth. If rim is dirty or rusty, clean it with a stiff wire brush. Be sure to examine a used tire carefully for fabric injuries which, if neglected, will damage tube.

Postion rubber rim strip in rim-well with valve hole correctly registered. Install tube in tire and swab thoroughly all around base of tube between tube and side walls of tire with mounting compound. Bead seat of tire should not be coated.

Inflate tube just enough to round it out. With wheel lying flat, place tire on rim and align valve with hole in rim. Push bottom bead into rim-well near valve, and hold in well while forcing remaining portion of bead over rim flange with a rubber mallet. Spread tire and insert valve through hole in rim. Install knurled nut loosely on valve stem to hold stem in position.

Force upper bead over rim flange and into well at point opposite valve. Stand or kneel on tire at this point to hold bead in well and force remaining portion of tire over rim flange. While forcing bead over rim flange, keep as much bead as possible in rim-well. Be careful not to damage beads or pinch tube.

Make sure tire bead clamp is properly positioned. Refer to paragraph "TIRE BEAD CLAMPS," below.

Inflate tire to recommended pressure. Tighten valve stem nut. Then, completely deflate tire to smooth

out any wrinkles in tube and allow tube to find its place free from strain or stress. Again, inflate to recommended pressure and check valve for leak.

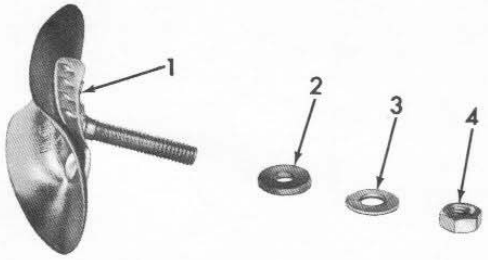
TIRE BEAD CLAMPS

Tire bead clamps are used on both front and rear wheels to securely retain tire on rim in case of sudden deflation of inner tube during motorcycle operation.

When installing inner tube and tire on rim, make sure tire bead is between tire bead clamp and wheel rim. Also, make sure inner tube is not pinched between tire bead and tire bead clamp. Leather washer (2), Figure 2.17, washer (3) and nut (4) are assembled to stud on tire bead clamp on outside of rim. Nut (4) should be tightened securely.

Care should be taken to keep tires inflated properly. See tire data for correct tire inflation pressure. Do not over-inflate tires.

The front tire of a solo motorcycle normally wears unevenly. It is recommended that tires be inspected for condition at periods of about 2000 miles.



1. Tire Bead Clamp
2. Leather Washer
3. Washer
4. Nut

Figure 2.17. Tire Bead Clamp

HANDLEBAR

REMOVING AND INSTALLING HANDLEBAR

Referring to Figure 2.18, handlebar (13) is attached to upper fork bracket of motorcycle by hardware (2). The particular arrangement of hardware varies with fork used.

There are two attaching hardware arrangements. One uses handlebar clamps along with hex head screws, nuts, and washers utilizing through holes in upper fork bracket. Ceriani forks use this arrangement. The other arrangement uses handlebar clamps along with allen head screws attached to holes threaded into upper fork bracket, requiring no nuts. Marzocchi and Betor forks use this arrangement.

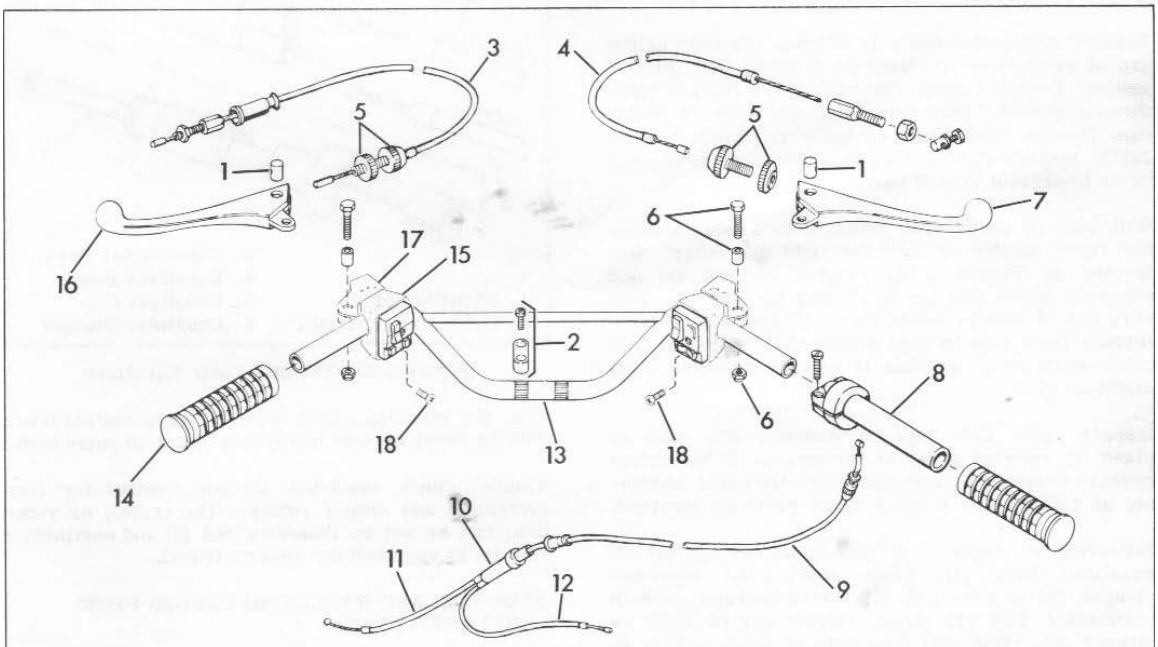
In either case, removing screws will detach handlebar from fork bracket.

Next remove throttle control and both lever-switch housings. Loosening screws (1), Figure 2.19, will allow throttle control to be slipped off handlebar. Removal of screws (18), Figure 2.18, will allow lever housings to be separated from switch housings and thereby removed from handlebar.

The handlebar will then be freed completely from motorcycle. Assemble it back on motorcycle in reverse order of disassembly.

REMOVING AND REPLACING THROTTLE CABLE ASSEMBLY

The throttle cable controls both carburetor and oil pump through an equalizer. To replace cable, therefore, cable must be detached from both these devices plus at throttle control on handlebar.



1. Cable Wire Retainer
2. Handlebar Mounting Hardware
3. Clutch Cable
4. Front Brake Cable
5. Cable and Adjusting Hardware
6. Control Lever Mounting Hardware - Screw, Spacer, Nut
7. Front Brake Control Lever
8. Throttle Control
9. Throttle Cable
10. Equalizer
11. Cable to Carburetor
12. Cable to Oil Pump
13. Handlebar
14. Handle Grip
15. Switch Housing
16. Clutch Control Lever
17. Lever Housing
18. Screws - Lever Housing

Figure 2.18. Handlebar and Associated Components

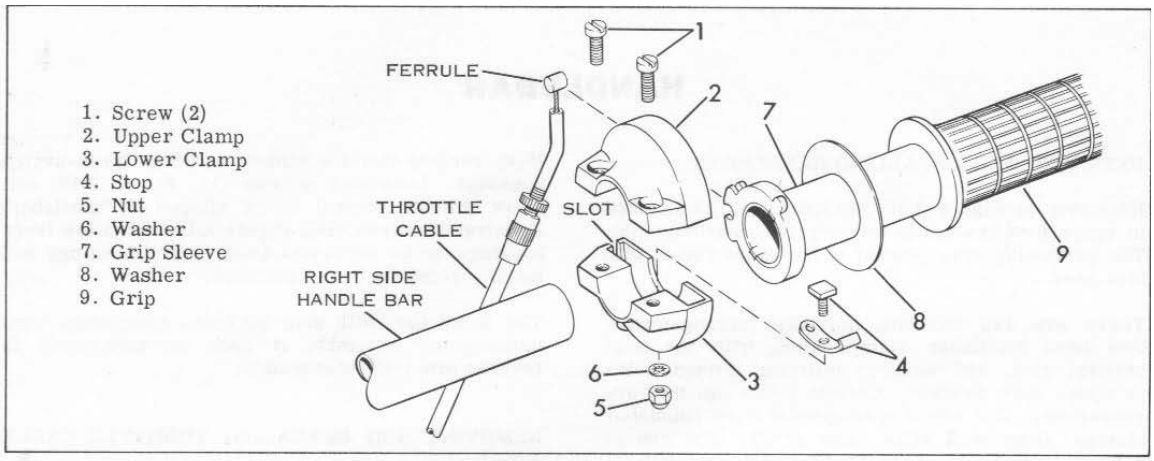


Figure 2.19. Throttle Control

Remove oil pump cable as follows. Remove left side cover and oil pump cover on left side of motorcycle. Detach oil pump cable wire ferrule from pump control lever and pull cable out and free of engine.

Remove carburetor cable as follows. Remove piston cap of carburetor and remove it along with throttle piston. Detach carburetor cable wire ferrule from throttle piston. Pull cable out and free of piston cap, freeing cable from carburetor. Note: temporarily replace carburetor parts until time to replace cable to prevent loss of parts.

With both of above ends freed, detach cable assembly from throttle control on right handlebar. Referring to Figure 2.19, remove screws (1) and separate upper and lower clamps (2) and (3). Pull wire out of slot in lower clamp (3) and unhook cable ferrule from slot in grip sleeve (7). This will free cable completely so that it can be removed from motorcycle.

Inspect cable for wear or damage. Put back in place in reverse order of taking off. If inspection reveals damage, disassemble throttle cable assembly as follows and replace those parts as required.

Referring to Figure 2.20 pull equalizer cap (5) off equalizer body (4). Slide apart until equalizer plunger (6) is revealed. Slip wire ferrules of both carburetor and oil pump cables out of slots in plunger (6). This will free both of these cables so they can be pulled out of two holes in equalizer body (4).

Replace any cables that are damaged.

Reassemble throttle cable assembly on motorcycle paying particular attention to following. Adjust carburetor cable adjusting screw so throttle piston fully closes with clockwise handgrip movement, leaving 1/8 inch free play. Adjust oil pump control cable adjusting screw with throttle piston in fully open position (handgrip counterclockwise). In this position, the maximum flow mark on pump control lever will be lined up with reference mark on pump body.

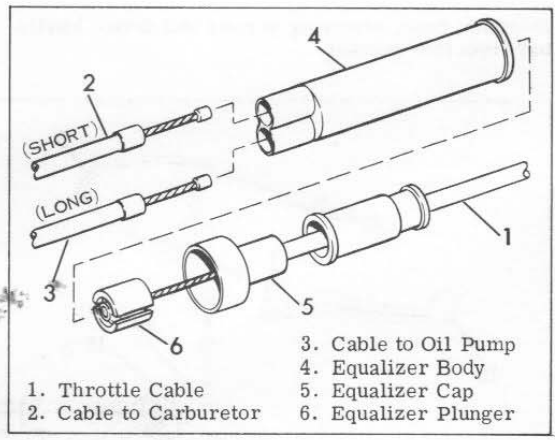


Figure 2.20. Throttle Cable Equalizer

Finally, check handlebar throttle control for free movement and proper return. The travel, or rotation, can be set by loosening nut (5) and positioning stop (4) as required for correct travel.

REMOVING AND REPLACING CABLES FROM HANDLEBAR LEVERS

The front brake cable (4), Figure 2.18, and clutch cable (3) are removed from their respective handlebar levers (7) and (16) both in same manner as follows.

Unscrew cable adjusting nuts (5) from lever housings. Slip cable wires out of housings and through slots in each housing. Push cable wire retainers (1) up and out of levers, thus releasing cable wire ferrules and freeing cables.

Replace in reverse order of removal.

CHANGING FORK OIL

To drain fork oil, support front end of motorcycle so that front fork is fully extended. Remove upper fork cap (3), Figure 2.21. Remove lower drain plug screw (1) from each fork side and allow all oil to drain from fork.

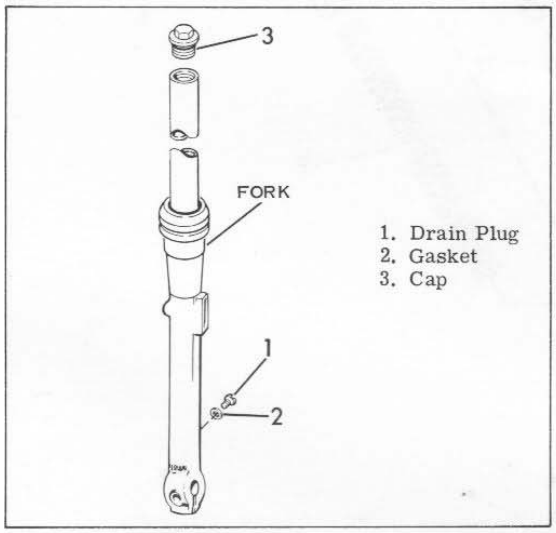


Figure 2.21. Front Fork Lubrication

To refill fork, replace drain plug (1) and pour correct amount of fork oil into fork as specified in Table 2.2. Note that there is a difference in quantity if fork is just drained and is wet or if it has been completely disassembled or flushed with a solvent and is dry. This difference between a wet and a dry fork is due to oil cling.

NOTE

The specified type fork oil should be used exclusively as heavier oil will stiffen fork action or lighter oil will make action too free.

Table 2.2. Fork Oil Quantities

Fork Mfg	Quantity (Liq. Oz.) Each Side		HDMCO Type
	Wet	Dry	
Marzocchi	6	6-1/2	Type C
Ceriani	5-3/4	6-1/4	Type A
Betor	5-1/4	5-3/4	Type C

REMOVING AND INSTALLING FORK SIDE

Remove front wheel as described in "REMOVING AND INSTALLING FRONT WHEEL." Loosen two pinch bolts (1), Figure 2.22, that secure fork side - either (4) or (5) - to motorcycle. The upper bolt attaches fork side to upper fork bracket (2); the lower bolt, to lower fork stem and bracket (3). Remove fork side from brackets by pulling down until fork side is free of both brackets.

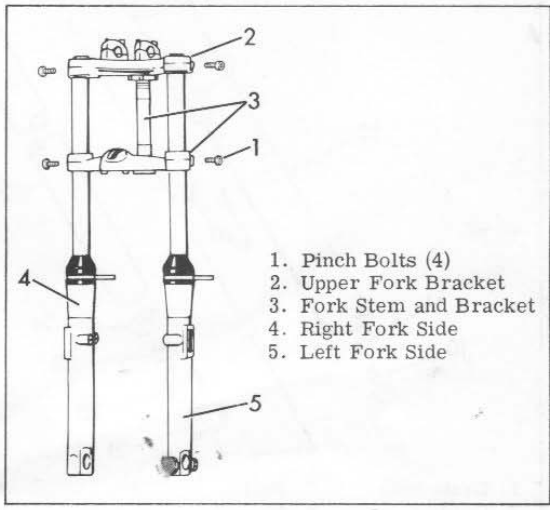


Figure 2.22. Removing Fork Side From Brackets

Install fork side on motorcycle in reverse order of removing.

DISASSEMBLING MARZOCCHI FORK SIDE

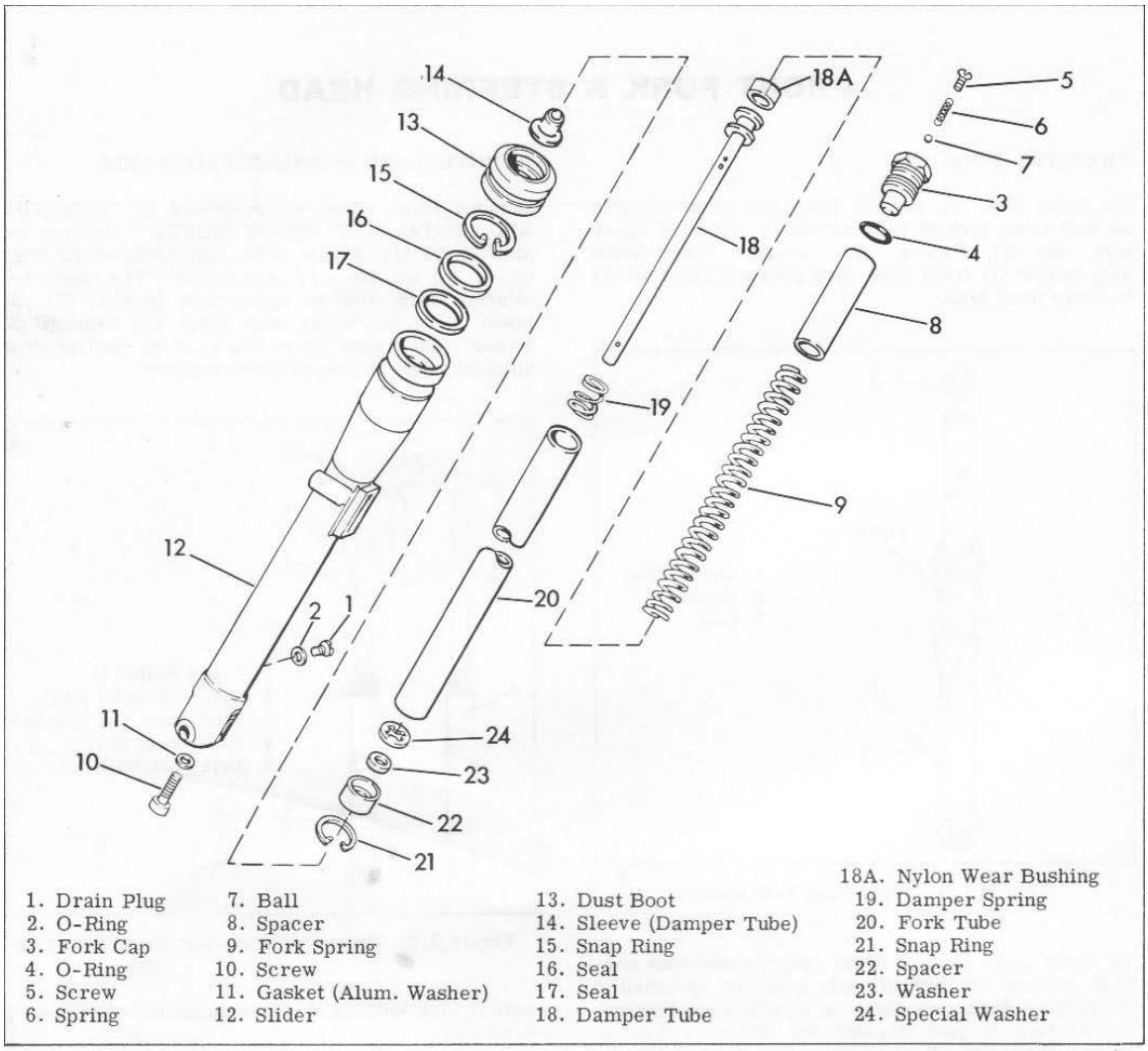
Remove fork cap (3), Figure 2.23, and drain fork oil from tube by tipping it upside-down. Then, disassemble as follows. Note that both fork sides are similar and are taken apart the same way.

With fork plug (3) removed, withdraw spacer (8) and fork spring (9) from fork tube (20). Remove screw (10) along with gasket (11). This will free fork tube (20) and allow it to be withdrawn from slider (12).

Withdraw damper tube (18) from inside fork tube (20) and slide damper spring (19) off tube. Slip nylon wear bushing (18A) out of recess in damper tube (18).

Remove spacer (22), washer (23), and special washer (24) from fork tube (20) by removing snap ring (21).

Carefully remove sleeve (14) from within slider (12), taking care not to damage seals (16) and (17).



1. Drain Plug
2. O-Ring
3. Fork Cap
4. O-Ring
5. Screw
6. Spring
7. Ball
8. Spacer
9. Fork Spring
10. Screw
11. Gasket (Alum. Washer)
12. Slider
13. Dust Boot
14. Sleeve (Damper Tube)
15. Snap Ring
16. Seal
17. Seal
18. Damper Tube
18A. Nylon Wear Bushing
19. Damper Spring
20. Fork Tube
21. Snap Ring
22. Spacer
23. Washer
24. Special Washer

Figure 2.23. Marzocchi Fork - Exploded View

Pull dust boot (13) off slider (12). Remove seals (16) and (17) only if inspection reveals they are to be replaced. Remove snap ring (15) and then pry out seals (16) and (17), discarding seals.

Remove spring (6) and ball (7) from fork plug (3) by removing screw (5) from plug. Slip O-ring (4) out of groove in threaded portion of plug (3).

This completes normal disassembly of Marzocchi fork.

DISASSEMBLING CERIANI FORK SIDE

Remove fork cap (3), Figure 2.24, and drain fork oil from tube by tipping it upside-down. Then, disassemble as follows. Note that both fork sides are similar and are taken apart the same way.

Slip O-ring (4) out of groove in fork cap (3). Pull fork spring (5) out of fork tube (8).

From bottom end of slider (17), remove screw (6) and washer (7). This will free fork tube (8) so it can be pulled out of slider (17).

Removal of screw (6) will also free damper tube (9) so it can be pulled out of fork tube (8). Remove damper tube bushing (10) from damper tube (9) by removing snap ring (11) which retains it in position on tube.

Remove damper spring (12) from inside fork tube (8). Note that large diameter end of spring (12) is positioned downward or into tube (8) first.

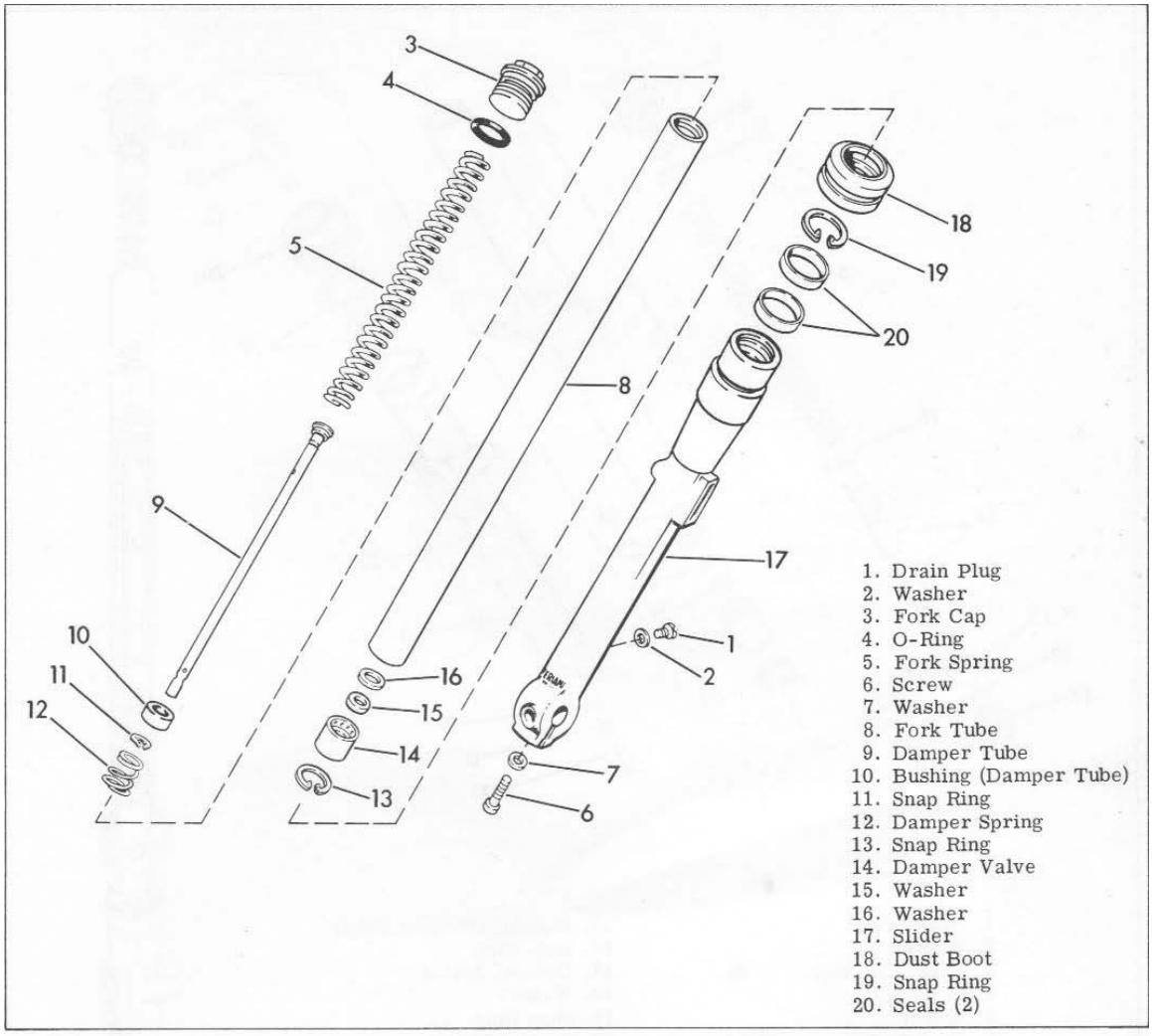


Figure 2.24. Ceriani Fork - Exploded View

Remove snap ring (13), then pull out damper valve (14) and washers (15 and 16) from lower end of fork tube (8). If valve (14) is tight, remove by tapping it out from behind by inserting a long tube down fork tube (8). Note that this long tube should have a large enough diameter that it does not damage washers (15 and 16) as valve (14) is tapped out.

Pull dust boot (18) off slider (17). Remove seals (20) only if inspection reveals they are to be replaced. Remove snap ring (19) and then pry out seals (20), discarding seals.

This completes normal disassembly of Ceriani fork.

DISASSEMBLING BETOR FORK SIDE

Remove fork cap (3), Figure 2.25, and drain fork oil from tube by tipping it upside-down. Then, disassemble as follows. Note that both fork sides are similar and are taken apart the same way.

Slip O-ring (4) out of groove in fork cap (3). Note that fork cap (3) is a non-serviceable assembly which is not disassembled. Remove spacer (5) and pull fork spring (6) out of fork tube (10). Note also that the close wound end of spring (6) is positioned downward or into tube (10) first.

From bottom end of slider (25), remove screw (7) and washers (8 and 9). This will free fork tube (10) so it can be pulled out of slider (25).

Removal of screw (7) will also free damper tube (14) so it can be pulled out of fork tube (10). However, before this can be done, damper tube sleeve (11) must be pulled off end of tube (14).

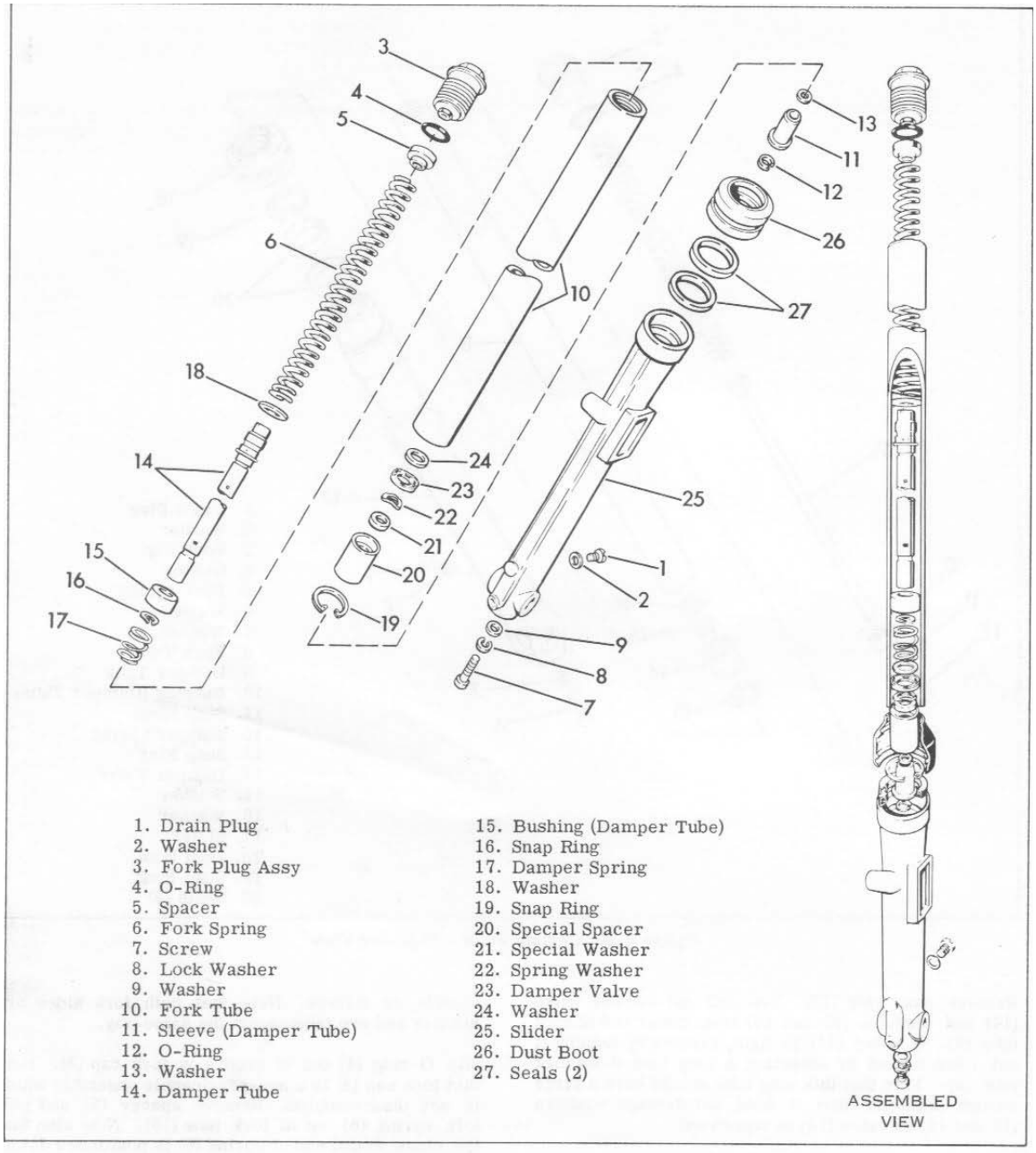


Figure 2.25. Betor Fork - Exploded View

After removing sleeve (11), remove O-ring (12) from groove in one end of sleeve and remove washer (13) from inside hole in other end of sleeve.

With damper tube (14) freed, slip washer (18) off upper end and spring (17) off lower or inward end of tube. Next, slide off bushing (15) after first removing snap ring (16) which retains it in place.

From lower end of fork tube (10), remove snap ring (19). This will free parts (20) through (24) which can then be removed from inside end of tube.

Pull dust boot (26) off slider (25). Remove seals (27) only if inspection reveals they are to be replaced.

This completes normal disassembly of Betor fork.

CLEANING AND INSPECTING FORK SIDE

Clean all parts thoroughly, then examine for wear or damage. If inspection shows any parts bent, broken or damaged, those parts should be removed and replaced. If fork tube shows any play when slipped into slider, slider or slider and tube may have to be replaced since slider does not have renewable bushings.

Thoroughly clean out all holes and openings in damper valves.

Inspect seals mounted in slider for wear. If seals were removed, new ones must be installed. Inspect wear bushing mounted on damper tube and replace if necessary.

Check dust boot where it slides on fork tube. The fork tube should show a bright, shining surface, free of scoring or abrasions; the boot should present a good, continuous seal and not show excessive wear. Inspect wiping lip of dust boot to see that it fits snugly over tube, replacing if it does not.

Check all sealing washers. They should provide a good seal when used with their respective screws to prevent oil leakage.

Replace any broken springs.

Make sure O-rings are in good condition, without irregularities, and that they provide tight sealing when in place.

Check any snap rings that were removed to see that they still have enough tension to seat properly in their respective grooves when put back in place. Replace any that are too loose.

ASSEMBLING FORK SIDE

Assemble fork side in reverse order of disassembly while observing following special considerations.

Assemble springs (19), Figure 2.23, and (12), Figure 2.24, into their respective fork tubes with large diameter end of springs positioned downward or in first. Spring (17), Figure 2.25, has a uniform diameter and can be assembled with either end downward.

Assemble spring (6), Figure 2.25, into fork tube with close wound end positioned downward or in first. Springs (9), Figure 2.23, and (5), Figure 2.24, are uniformly wound and can be positioned with either end downward.

Add correct amount of fork oil to assembled fork through top end of fork tube just prior to capping with fork cap. The amount and type needed are given in Table 2.2.

Special consideration should be given to making sure screw projecting through bottom of slider into bottom end of damper tube is tight. These screws are (10), (6), and (7) in figures 2.23, 2.24, and 2.25, respectively.

During initial assembly, turn these screws in until they are all the way in but not tight. Note that damper tube, into which screw is turned, will tend to turn along with screw, making it impossible to tighten at this time.

After final assembly, with fork tube and fork cap in place (and thus applying pressure to hold damper tube in one place), re-tighten these screws. Applying sharp raps with a mallet to allen wrench handle used to tighten these screws will generally aid in securing necessary tightness.

After assembly is completed, test slide action of fork. It should be smooth and free of jerky or irregular movement. Check, also, to make sure there are no oil leaks.

DISASSEMBLING AND ASSEMBLING THE STEERING HEAD

Before steering head can be disassembled, the following components must be removed.

Remove front wheel as outlined in paragraph titled "REMOVING AND INSTALLING FRONT WHEEL." Remove both fork sides as outlined in paragraph titled "REMOVING FORK SIDE." Remove front fender by removing four sets of hardware attaching it to fork stem and bracket (9), Figure 2.26. Remove headlamp assembly from bracket (9) by removing attaching nut. Remove instrument mounting bracket from upper fork bracket (4) by removing two sets of attaching hardware. Remove handlebar as outlined in paragraph titled "REMOVING AND REPLACING HANDLEBAR."

The steering head, itself, can now be disassembled.

Referring to Figure 2.26, remove nut (1), along with washer (2), from threaded end of fork stem and bracket (9). Loosen screw (3) and slide off upper fork bracket (4). Thread nut (5) off stem. Remove washer (6), shield (7) and washer (8) from stem. Using a rawhide mallet, carefully tap stem (9) out of head, taking care not to damage bearings (10). When stem is freed, slip off washer (12). Using a bearing puller, pull bearings (10) only if inspection reveals they must be replaced.

Clean and inspect all parts for wear or damage. Check bearings (10) for excessive looseness or roughness and replace if necessary.

Reassembly is essentially the reverse of disassembly procedure described above. Adjust nut (5) on fork stem (9) to remove all appreciable play in steering head assembly. Turning action should be smooth and free.

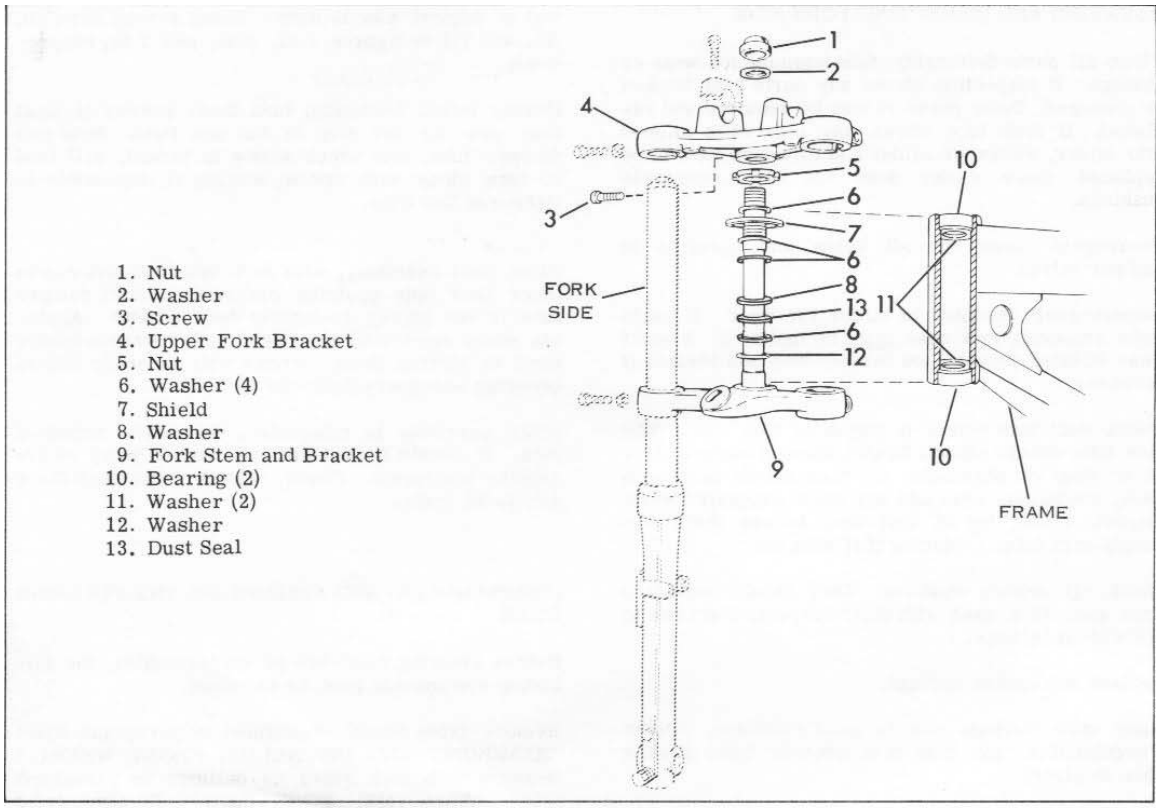


Figure 2.26. Steering Head - Exploded View

After reassembling completely, check turning through complete turning arc. There should be neither binding nor end play. If found tight, it may be necessary to reposition (back off) upper fork bracket (4) and make it looser on fork stem (9). Be sure not to back it off too much, however, as there should be no appreciable shake or sideways movement of front fork. Retighten bolts loosened in readjusting.

SERVICING FRAME

Rough check dimension of frame for correct alignment according to Figure 2.27. The dimensions given should provide enough information to determine whether a frame is out of alignment enough to require either realigning or replacing.

IMPORTANT

Frames bent or damaged severely will require replacement. It is usually cheaper to replace these than to fix them.

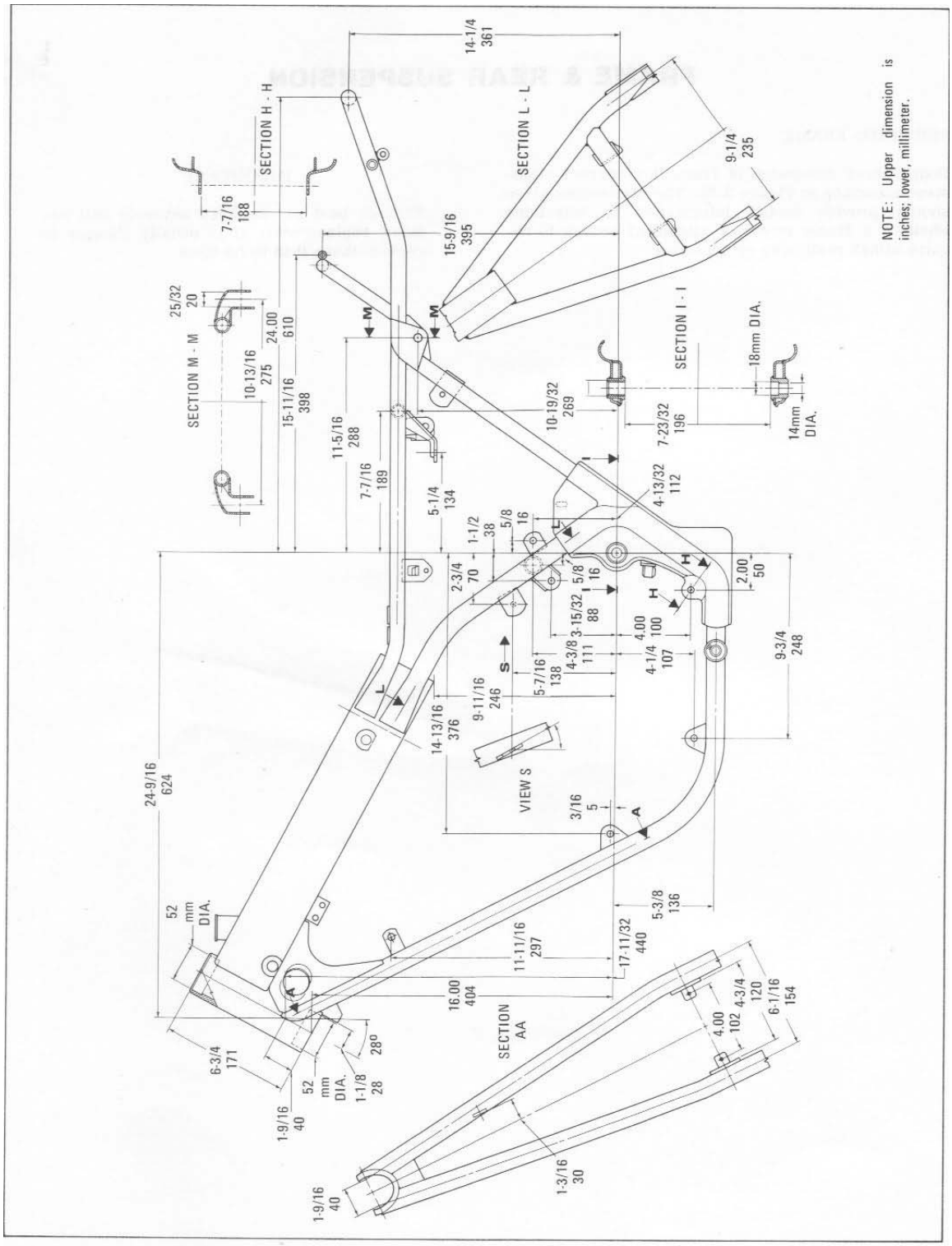


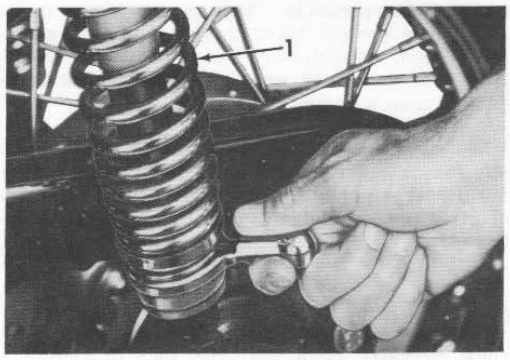
Figure 2.27. Basic Frame Dimensions

REAR SUSPENSION - GENERAL

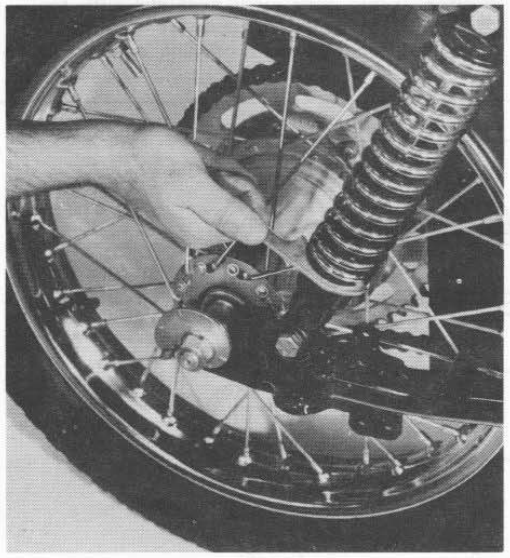
The rear suspension consists of two spring shock absorber assemblies and a rear fork assembly. The shock absorbers are attached to frame and to rear fork by means of rubber bushings inserted into fixed eyes. They are of the hydraulic type with outer helical springs and can be adjusted to match load and operating conditions as shown in Figure 2.28.

NOTE

Two different shock absorbers are used. One is five position, adjustable with attached lever. The other is three position, adjustable using special adjusting tool, HD No. 94820-75.



FIVE POSITION



THREE POSITION

Figure 2.28. Adjusting Shock Absorbers

The rear fork supports lower ends of shock absorbers and mounts rear wheel. It attaches to frame through rear fork pivot pin which provides upward and downward floating motion. The fork also provides cam stops used in conjunction with cams mounted on rear axle to adjust drive chain tension.

DISASSEMBLING AND ASSEMBLING REAR SUSPENSION

The rear shock absorber assemblies cannot be disassembled for repair and, therefore, should be replaced instead if damaged or worn out. Replace as follows.

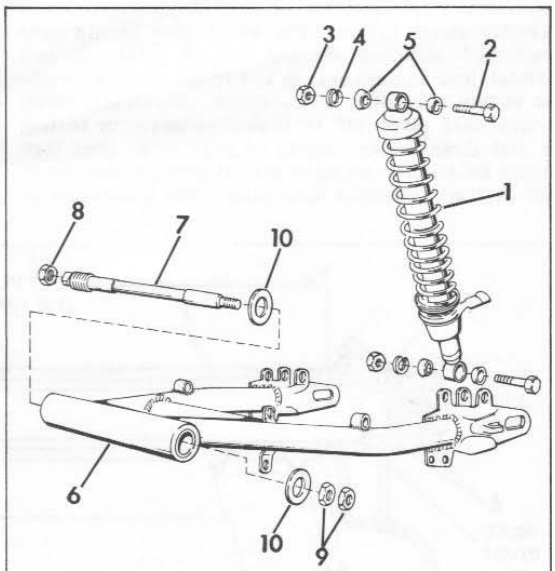
Raise rear end of motorcycle and place blocking underneath frame. If blocking is unavailable, working on one side only at a time will allow shock not being worked on to hold rear fork and frame in place.

Referring to Figure 2-28A, remove two sets of hardware (top and bottom) - bolt (2), nut (3), washer (4), and bushings (5) - from each shock absorber. This will free the shock absorber and it can be removed.

Rubber bushings should be replaced if excessively loose, worn or damaged.

To assemble, simply reverse disassembly procedure.

In order to remove rear fork, the rear wheel, chain guard, and shock absorbers must be removed. Re-



1. Rear Shock Absorber
2. Bolt (2)
3. Nut (2)
4. Lock Washer (2)
5. Bushing (4)
6. Rear Fork
7. Pivot Pin
8. Nut
9. Nut (2)
10. Thrust Washer

Figure 2.28A. Rear Shock Absorber and Fork

move rear wheel as described in paragraph titled "REMOVING AND INSTALLING REAR WHEEL." Remove chain guard by removing attaching hardware. Remove shock absorbers as explained in paragraphs directly above.

Referring again to Figure 2.28A, remove both nuts (9) from left end of pivot pin (7). Remove nut (8) from right end of pin (7). Remove pivot pin (7) by unscrewing threaded portion of pin (right end) from threads in right frame member. Remove and retain both thrust washers (10) for reuse.

To assemble, simply reverse disassembly procedure, except that adjustments will be required as outlined in paragraph following titled "ADJUSTING REAR FORK PIVOT PIN."

ADJUSTING REAR FORK PIVOT PIN

Refer to Figure 2.29 while performing following procedure.

Place rear fork (1) in position to mount between right frame member (2) and left frame member (3). Position thrust washer (4) on each side between rear fork and frame member as shown in figure. Insert pivot pin (5) into hole from right side of motorcycle. Screw in until approximately .47 inch (12 mm) remains exposed.

Visually check frame. The above step should have positioned shoulder on left end of pivot pin (not visible) just against seat in left frame member without unduly spreading frame apart. Physically check to see that pivot pin is seated properly by testing up and down swing motion of rear fork. The fork should be neither so tight that it binds nor so loose that it has excessive side play. The looseness or tightness will be most evident at thrust washer (4) locations. Correct either condition as outlined below.

Checks:

If swing motion appears correct, install one of two nuts (6) on pivot pin shaft (left side), tighten, and check motion once again.

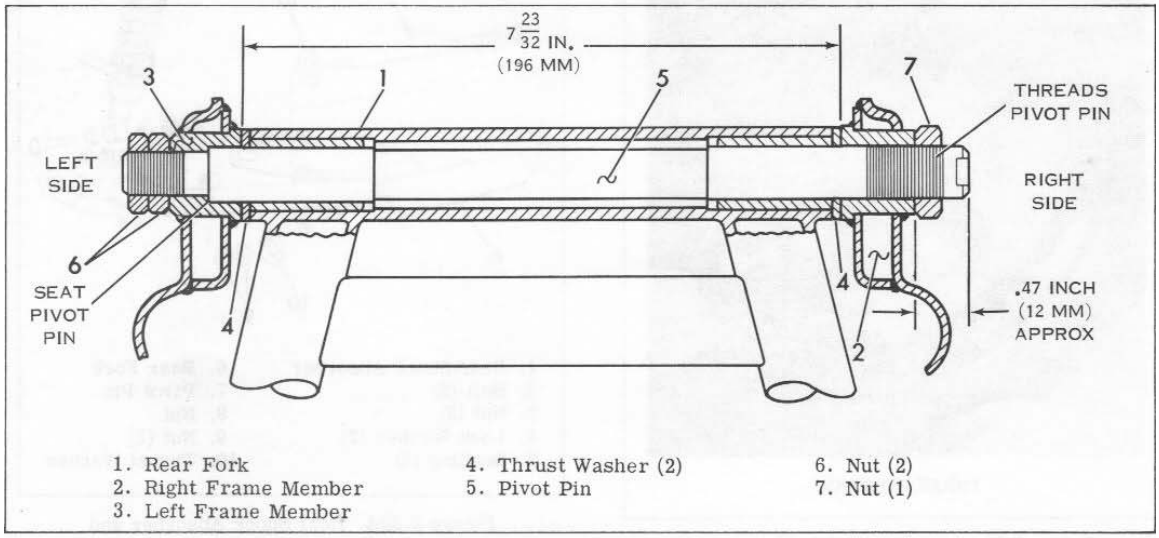
If fork now becomes tight, pivot pin (5) was not screwed in enough originally to seat properly. Loosen nut (6), screw pivot pin in two turns more, re-tighten nut (6), and check again. Repeat until just loose.

If excessive side play occurs when nut (6) is tightened, it is an indication pivot pin (5) was screwed in originally past position where it should have seated properly. This means frame members were spread apart farther than they should have been, causing the loose condition. Loosen nut, back out pivot pin a turn, and check again. Repeat until it is just tight.

When above adjusting is completed, place other nut (6) on pivot pin (5) shaft and tighten against nut already in place. Place nut (7) on right end of pivot pin and tighten against right frame member (2).

NOTE

If bronze bushings within fork are worn, a new oversize pivot pin .008 inch (0.2 mm) larger should replace the old pin. This oversize pin is available as a replacement part and is listed in parts catalog. Prior to installing, ream fork pivot bushings with tool 94810-65, Expansion Reamer (18 mm) to recondition bushings and provide proper fit.



1. Rear Fork
2. Right Frame Member
3. Left Frame Member
4. Thrust Washer (2)
5. Pivot Pin
6. Nut (2)
7. Nut (1)

Figure 2.29. Rear Fork Pivot Pin Adjusting

SERVICING BRAKES

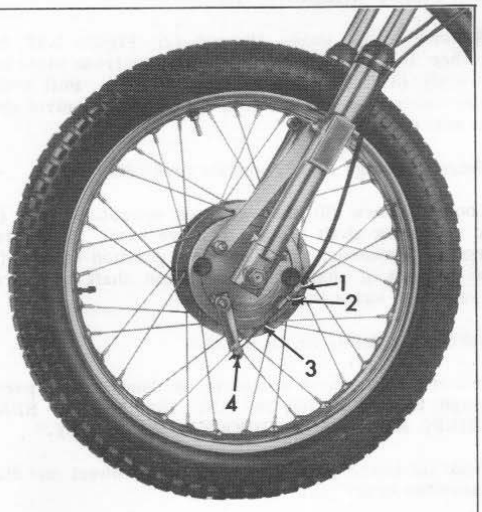
The front wheel brake is operated by a hand lever on right side handlebar, and the rear wheel brake is operated by a foot pedal on right side of motorcycle. Both hand lever and foot lever controls are connected to their respective brake shoe operating shafts independently through cable and mechanical linkage. Compressing front wheel brake hand lever and depressing rear wheel brake foot lever actuate operating shaft cam, moving brake shoes against brake drum. To keep brakes in proper operating condition, it is essential to check adjustment of brakes at regular service intervals, or sooner, depending on wear of brake linings and drums. See adjustment procedure for brakes and brake shoes. If brakes do not operate satisfactorily after adjustment, disassemble and service brakes and connecting linkage.

NOTE

Inspection ports, covered by removable plugs, are located on front and rear brake sideplates for checking brake lining wear.

ADJUSTING FRONT BRAKE

Refer to Figure 2.30 while performing following adjustment.



1. Adjusting Screw
2. Locknut
3. Brake Cable Wire
4. Clamping Block Setscrews

Figure 2.30. Front Brake Adjustment

Readjust front wheel brake when required. When properly adjusted, hand lever on handlebar will move freely about 1/8 its full movement before brake starts to take effect. If adjusted tighter, brake may drag. Minor adjustment can be made by loosening locknut and turning knurled nut located at handlever on handlebar. Retighten locknut. If adjustment cannot be obtained at handlever, loosen locknut (2), Figure 2.30, on control adjusting screw (1); turn adjusting screw down to increase free movement of handlever, or up to decrease free movement of handlever. When brake is adjusted properly, tighten locknut (2) securely. Major adjustment of cable and lever can be made by loosening clamping block setscrews (4) and changing position on cable wire (3).

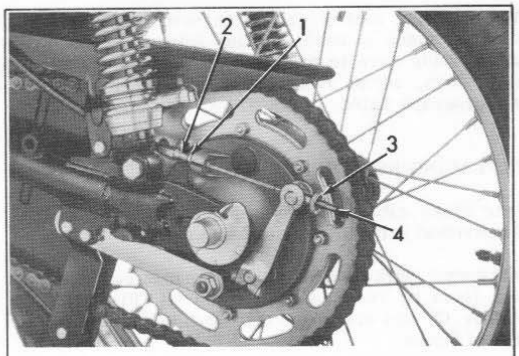
ADJUSTING REAR BRAKE

Refer to Figure 2.31 while performing following adjustment.

The rear wheel brake adjustment is made by means of a knurled nut (3), Figure 2.31, which may be adjusted to compensate for brake lining wear. Set brake cable adjusting nut so brake does not start to take effect until foot pedal is pushed downward about 1/2 inch (12.7 mm). Turn nut on to tighten brake and back off to loosen brake. After brake is adjusted, turn wheel to see that it rotates freely to be sure brake is not too tight and dragging. Major adjustment can be made with brake cable adjusting nut and screw (1) and (2).

NOTE

When drive chain is adjusted, rear brake may be too tight. Readjust brake cable if necessary in this case.



1. Brake Cable Adjusting Screw Locknut
2. Brake Cable Adjusting Screw
3. Adjusting Nut
4. Brake Cable Wire End Stud

Figure 2.31. Rear Brake Adjustment

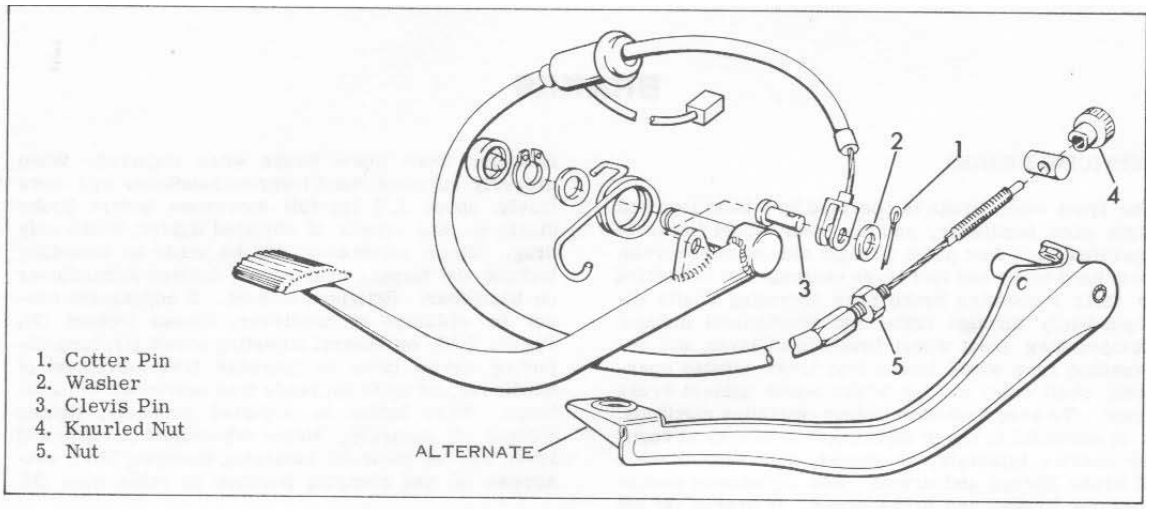


Figure 2.32. Rear Brake

REPLACING FRONT BRAKE CABLE

To remove front brake cable, cable wire must be detached both at handlebar lever and at front wheel hub. Detach at front wheel hub by loosening clamping block setscrew (4), Figure 2.30, allowing wire to be pulled free. Detach at handlebar lever as explained in paragraph titled, "REMOVING AND REPLACING CABLES FROM HANDLEBAR LEVERS."

At this point, cable assembly can be replaced complete, or, cable wire inside cable assembly can be replaced by itself. If cable assembly complete is to be replaced, simply remove old one and replace with new one. To replace cable wire, remove cable assembly and pull wire out of cable housing. Note that cable wire is pulled out from handlebar lever end of cable assembly.

Apply a light coat of grease on new cable wire and slide in place in cable housing from top end. Reattach cable wire to handlebar lever and front wheel hub. Then, adjust front brake as described above in paragraph titled, "ADJUSTING FRONT BRAKE."

REPLACING REAR BRAKE CABLE

Rear brake cable must be replaced as an assembly if individual parts are worn or damaged.

Disconnect wire to taillight. Disconnect cable end at foot lever by removing cotter pin (1), Figure 2.32, washer (2) and clevis pin (3). Pull this end of cable free of frame.

Disconnect rear cable end as follows. Remove rear brake knurled adjusting nut (4) from end of cable. Loosen nut (5) which locks threaded cable end in threaded hole in projection on brake housing.

Finally, unscrew cable end from hole, freeing cable completely.

Install new rear brake cable in reverse order of above.

DISASSEMBLING FRONT BRAKE

Remove front wheel and brake assembly from motorcycle as described in "REMOVING AND INSTALLING FRONT WHEEL."

Remove brake shoes (1) and (2), Figure 2.33, together by folding them up and away from plate assembly (3) as shown in Figure 2.33A. Pull brake shoe ends free of operating shaft (4) and pivot stud in side plate (3).

Unhook springs (5) to separate brake shoes.

Loosen screw (6) that secures operating arm (7) to operating shaft (4) and remove arm. Before removing, however, mark relative position of arm (7) on splines of shaft (4) so arm and shaft can be reassembled same way again.

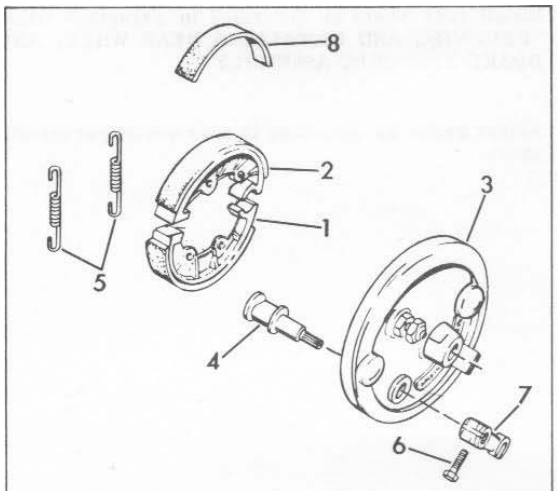
DISASSEMBLING REAR BRAKE

Remove rear wheel complete as described in paragraph titled "REMOVING AND INSTALLING REAR WHEEL AND BRAKE-SPROCKET ASSEMBLY."

Separate brake plate assembly from wheel and disassemble brake plate as follows.

Remove brake shoes (1) and (2), Figure 2.34, together by folding them up and away from plate assembly (3) as shown in Figure 2.33A. Pull brake shoe ends free of operating shaft (4) and pivot stud in side plate.

Unhook springs (5) to separate brake shoes.



1. Brake Shoe
2. Brake Shoe
3. Plate Assembly
4. Operating Shaft
5. Spring
6. Screw
7. Operating Arm
8. Brake Lining (2)

Figure 2.33. Disassembling Front Brake

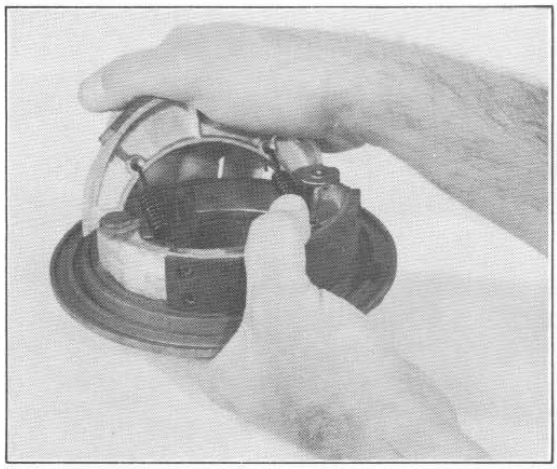
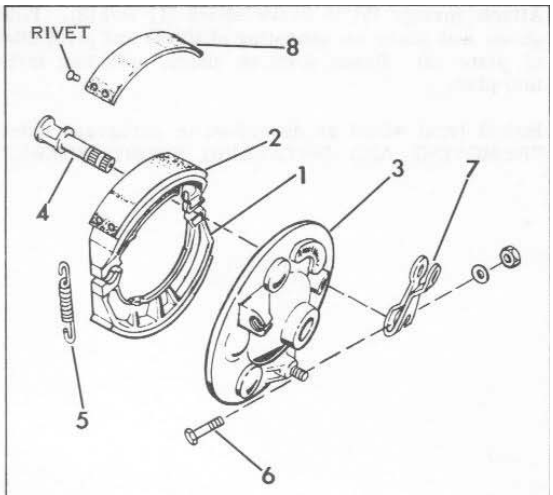


Figure 2.33A. Disassembling and Installing Brake Shoes

Loosen screw (6) that secures operating arm (7) to operating shaft (4) and remove arm. Before removing, however, mark relative position of arm (7) on splines of shaft (4) so arm and shaft can be reassembled same way again.

CLEANING AND INSPECTING

Clean loose particles and dirt from brake shoes and hub braking surface. Clean and inspect brake shoe linings (8), Figures 2.33 and 2.34, for wear, glazing



1. Brake Shoe
2. Brake Shoe
3. Plate Assembly
4. Operating Shaft
5. Spring
6. Screw
7. Operating Arm
8. Brake Lining (2)

Figure 2.34. Disassembling Rear Brake

or imbedded particles. Check for loose rivets on rear brake shoes.

NOTE

Linings are bonded to front shoes, bonded and riveted to rear shoes. Rear shoes with linings that are worn down to rivet heads or less than 2.5 mm thick must be replaced.

In cases where linings need replacing, complete shoe assemblies consisting of items (1) and (2), Figures 2.33 & 2.34, (shoes with new linings attached) can be replaced. Note, also, that linings are sold separately, but must be bonded by local Brake Bonding Co.

Linings that are only glazed slightly and in apparent good condition otherwise can be reused after roughening linings with a medium grade of sandpaper.

ASSEMBLING BRAKES

The following procedure applies to both front and rear brakes and reference is made to figures 2.33 and 2.34.

Insert operating shaft (4) through hole in plate (3) and reinstall operating arm (7) on shaft end. Realign marks made on these parts during disassembly so they are reassembled in same way at this time. Attach and tighten arm mounting hardware.

Lightly grease portion of operating shaft (4) that contacts shoes (1) and (2) and shaft hole area.

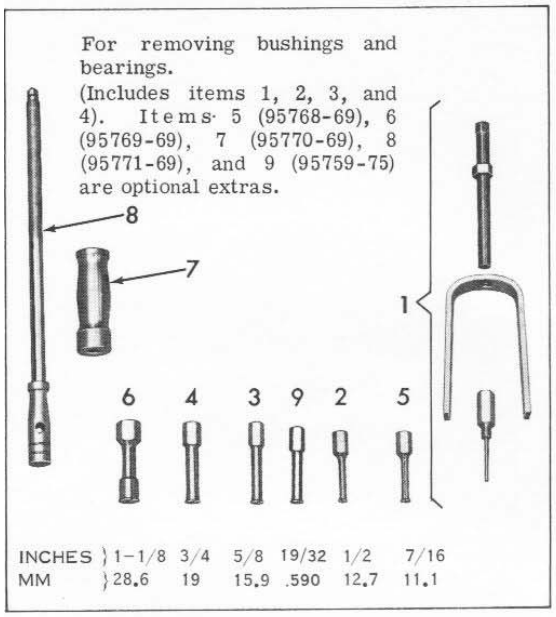
Attach springs (5) to brake shoes (1) and (2). Fold shoes and place on operating shaft (4) and pivot stud of plate (3). Press down on shoes, unfolding them into place.

Install front wheel as described in paragraph titled "REMOVING AND INSTALLING FRONT WHEEL."

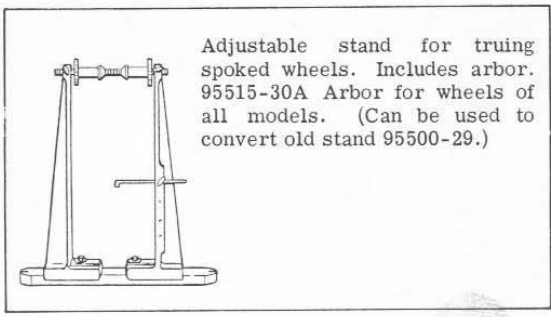
Install rear wheel as described in paragraph titled "REMOVING AND INSTALLING REAR WHEEL AND BRAKE-SPROCKET ASSEMBLY."

Adjust brake as described in appropriate paragraph, above.

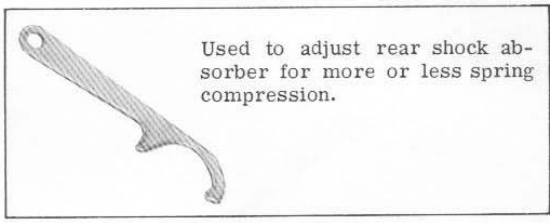
TOOLS



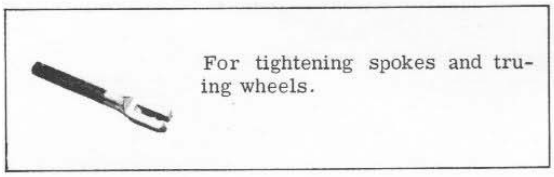
95760-69. Bushing and Bearing Puller Set.



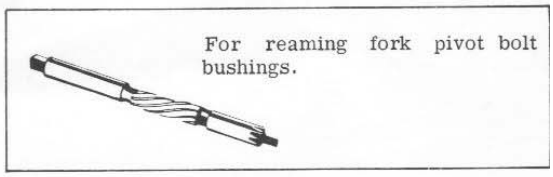
95500-29A. Wheel Truing Stand.



94820-75. Rear Shock Spanner Wrench.



94682-61. Spoke Nipple Wrench.



94810-65. Expansion Reamer (18 mm).

ENGINE 3

TABLE OF CONTENTS

GENERAL

SPECIFICATIONS

PISTON

Ring Size . . . . . 1st Comp. - Width 0.059" (1.5 mm)
2nd Comp. - Width 0.059" (1.5 mm)

Pin Type . . . . . Floating

Pin Retainer . . . . . Lock Rings in Piston

	SX-175	SX-250/SS-250
Piston Fit in Cylinder	0.0006 to 0.0018"* (0.015 to 0.045 mm)	0.0013 to 0.0021"* (0.003 to 0.054 mm)

*Measured on major diameter as follows: SX-175—0.87" (22 mm), SX-250—1.0" (25 mm) from bottom of skirt.

Top Compression Ring:

	SX-175	SX-250/SS-250
End Gap	0.008 to 0.014" (0.20 to 0.35 mm)	0.01 to 0.016" (0.25 to 0.40 mm)
Side Clearance	0.0043 to 0.0060" (0.11 to 0.152 mm)	

Bottom Compression Ring:

	SX-175	SX-250/SS-250
End Gap	0.008 to 0.014" (0.20 to 0.35 mm)	0.01 to 0.016" (0.25 to 0.40 mm)
Side Clearance	0.0031 to 0.0048" (0.08 to 0.12 mm)	

Pin Fit in Piston# . . . . . White - 0.00004 to 0.0002" (0.001 to 0.0065 mm)
Black - 0.00002 to 0.0002" (0.0005 to 0.006 mm)

#Piston and pin are both color coded either black or white and must match.

Pin Fit in Connecting Rod . . 0.0001 to 0.0002" loose (0.002 to 0.006 mm loose)

CONNECTING ROD

End Play Between Flywheels . . . . 0.012 to 0.016" (0.30 to 0.40 mm)

Fit on Crankpin . . . . . 0.0004 to 0.0008" (0.01 to 0.02 mm)

DESCRIPTION

The 175 cc and 250 cc engines are similar in design and construction. Both are single cylinder, two-cycle, air cooled engines.

The cylinder assembly includes the head and piston. The cylinder and head are stud mounted on the engine crankcase. The gasoline charge is admitted to the cylinder and the exhaust gas is ejected from the cylinder through ports in the cylinder wall.

During the upstroke of the piston, a negative pressure is created in the crankcase and the skirt of the piston uncovers the intake port, drawing a gasoline and air mixture from the carburetor into the crankcase. At the same time, compression of the previous charge takes place above the piston.

After ignition, on the downward power stroke of the piston, the exhaust gas is ejected from the cylinder. At the same time, gases in the crankcase are compressed and forced up through the cylinder transfer ports into the cylinder chamber as the descending piston uncovers the ports.

The reciprocating, linear motion of the piston in the cylinder is converted into circular motion by the crankshaft. The crankshaft consists of an off-center crank pin interposed between two counterweighted flywheels which rotate on two end shafts supported by anti-friction ball bearings. One flywheel shaft drives the alternator. The flywheel shaft opposite drives the primary gear which drives the transmission through the clutch. The lower end of the connecting rod is fitted with caged roller bearings and is connected to a single crank pin. Rod upper bearings are also caged roller bearings.

The flywheel makes one revolution of 360° for intake, compression, power and exhaust, firing every time the piston reaches the top of its stroke. The flywheel revolves clockwise viewing engine from the primary (right) side.

ENGINE REMOVING & INSTALLING

GENERAL

When an engine needs repair, it is not always possible to determine beforehand whether repair can be made with only cylinder head, cylinder and piston removed from engine or whether engine must be removed completely from motorcycle for crankcase repair.

Usually, only cylinder head and cylinder repairs are needed (rings, pistons, etc.). It is recommended procedure, therefore, to service these units first, allowing crankcase to remain attached to frame. Follow the procedure under "STRIPPING MOTORCYCLE FOR ENGINE REPAIR," steps 1 through 8, for removal of cylinder head, cylinder and piston only.

After disassembling cylinder head, cylinder and piston only, it may be found that crankcase repair is necessary. This would require removal of engine crankcase from chassis by performing additional steps as outlined under "STRIPPING MOTORCYCLE ENGINE FOR REPAIR," steps 9 through 16, complete.

In cases where it has been determined definitely beforehand that crankcase repair is necessary, the completely assembled engine should be removed from chassis before disassembly.

STRIPPING MOTORCYCLE ENGINE FOR REPAIR

Refer to Figure 3.1. Before starting, clean engine thoroughly with Harley-Davidson "GUNK" cleaner to remove all road dirt. Remove "GUNK" and dirt with water spray and blow engine dry with compressed air.

1. Remove exhaust pipe from motorcycle by loosening shock mount hardware (2 places) and removing springs attaching pipe to the cylinder casting.

2. Remove air cleaner.

3. Detach cable from spark plug.

4. Turn off fuel supply at tank valve, then remove fuel line from carburetor by unscrewing banjo fitting retaining screw.

5. Remove gas tank from motorcycle to provide access to engine area. This is done by removing rubber strap from rear of tank and slipping tank from front mount.

6. Loosen carburetor holding clamp at cylinder manifold and remove carburetor. To keep out dirt, plug intake port with a clean cloth. Let carburetor hang free on its control cable out of way.

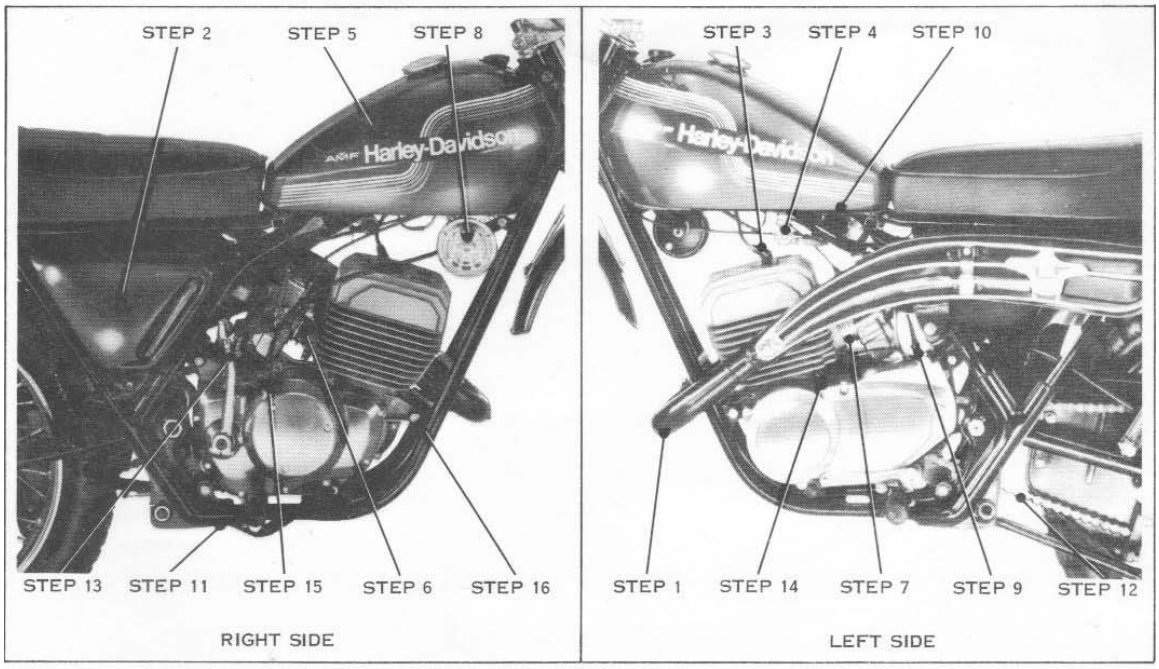


Figure 3.1. Engine Removing and Installing

7. Remove oil line from oil pump to cylinder manifold at manifold by removing banjo fitting.

8. For clearance purposes, remove horn from bracket on frame.

At this point, the head, cylinder and piston can be removed and worked on without further disassembly of engine. If the complete engine is to be removed instead, however, continue as follows:

9. Disconnect oil pump control cable from oil pump on left side of motorcycle as follows. Remove foot shift lever. Detach left crankcase cover (20), Figure 3.13, by removing attaching screws (21). Next, remove oil pump cover (22) which will expose cable connection to oil pump and allow it to be removed.

10. Remove oil line from oil tank and either drain oil tank or plug tank fitting.

11. Drain oil from crankcase by removing magnetic drain plug (1) from lower rear of left crankcase. This is required if the right side cover (7), Figure 3.13, is to be removed and the crankcase opened.

12. Take off drive chain by locating and then removing connecting link in chain.

13. Unscrew tachometer drive cable from crankcase on right side of motorcycle.

14. Disconnect electrical wiring by detaching alternator cable from connector, ignition module, and rectifier.

15. Disconnect clutch cable (4), Figure 4.1, as follows. Detach clutch cover (2) by removing attach screws (1). Run clutch cable adjuster all the way into cover. Free cable end from clutch mechanism, loosen adjusting screw, and pull cable out of housing.

16. Loosen four sets of mounting hardware fastening engine to frame. Free engine from mounting brackets on frame by lifting it and removing it sideway out right side of motorcycle.

REINSTALLING ENGINE

To reinstall the engine on the motorcycle, perform the above steps in the reverse order given. Physically remount the engine, then reattach and reconnect all of the various components that were removed during the "stripping" procedure. If the engine was removed completely assembled, skip those steps in the procedure that do not apply.

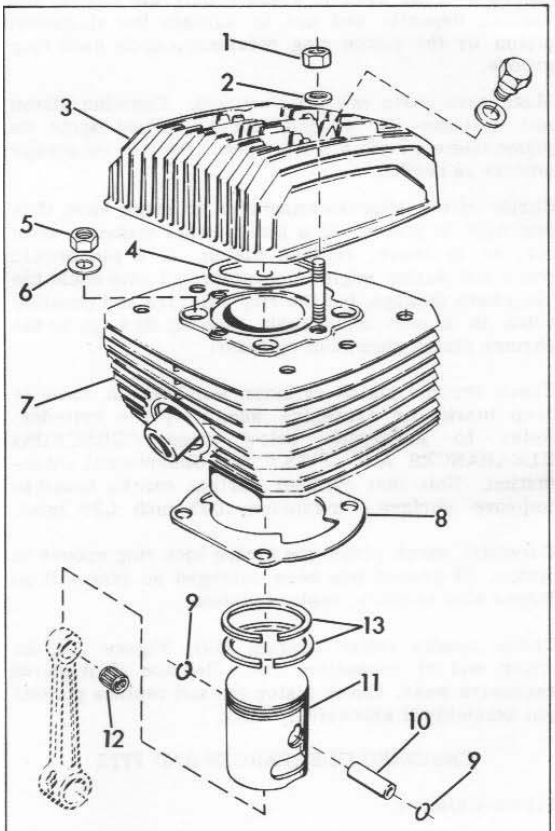
CYLINDER & PISTON

GENERAL

To remove cylinder assembly, motorcycle must be partially stripped down as described in "STRIPPING MOTORCYCLE ENGINE FOR REPAIR," steps 1 through 8.

DISASSEMBLING CYLINDER HEAD, CYLINDER, AND PISTON

Refer to Figure 3.2 while performing following steps.



1. Nut (4)
2. Washer (4)
3. Head, Cylinder
4. Gasket, Head
5. Nut (4)
6. Washer (4)
7. Cylinder
8. Gasket
9. Ring
10. Pin, Piston
11. Piston
12. Bearing
13. Ring, Piston (2)

Figure 3.2. Exploded View of Cylinder and Piston

Clean crankcase around cylinder base to keep dirt from falling into crankcase opening when cylinder is lifted off.

Detach cylinder head (3) from cylinder (7) by removing four nuts (1) and washers (2). Remove head gasket (4).

Disassemble cylinder (7) from crankcase by removing four nuts (5) and washer (6) from studs which secure cylinder to crankcase. Stuff a clean rag around connecting rod before removing cylinder so dirt particles cannot fall into crankcase. Carefully slide cylinder from studs and off piston. Remove and discard cylinder base gasket (8).

At this point, piston (11) can be checked and rings (13) replaced if needed. Remove ring by first turning slightly in its seat in piston to clean groove, then spring open until it clears groove and slip off as shown in Figure 3.3.

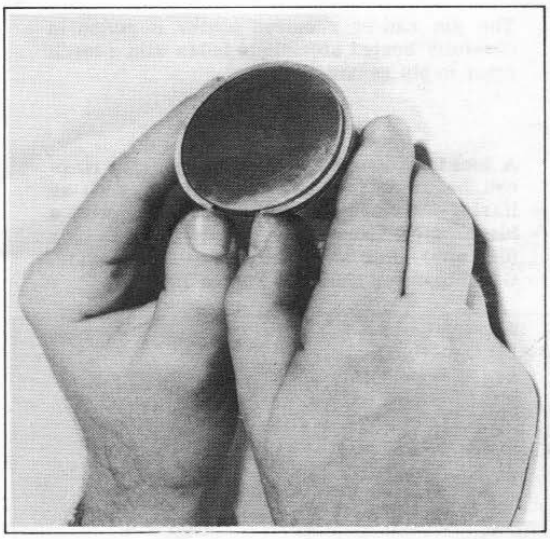


Figure 3.3. Removing Rings From Piston

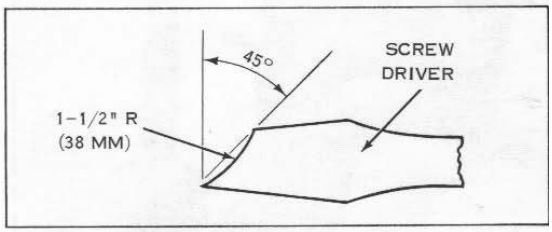


Figure 3.4. Piston Pin Retaining Ring Removing Tool

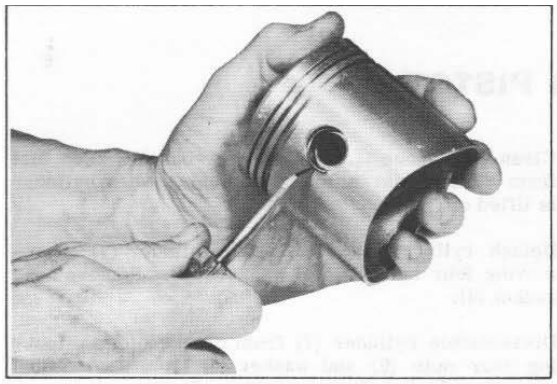


Figure 3.5. Removing Pin Retaining Ring

Disassemble piston (11), Figure 3.2, from connecting rod as follows. Remove either one of two pin lock rings (9) with lock ring removing tool as shown in Figure 3.5. Discard lock ring that was removed. Using a rawhide mallet and a stepped drift pin, tap pin (10) out of piston as shown in Figure 3.6.

NOTE

The pin can be removed easier if piston is carefully heated around pin holes with a torch prior to pin removal.

NOTE

A tool for removing piston pin retaining rings can be made from a screw driver, such as Harley-Davidson Part No. 95002-45, with a blade measuring approximately 1/32 inch (0.8 mm) thick and 9/32 inch (0.7 mm) wide. Grind blade as shown in Figure 3.4.

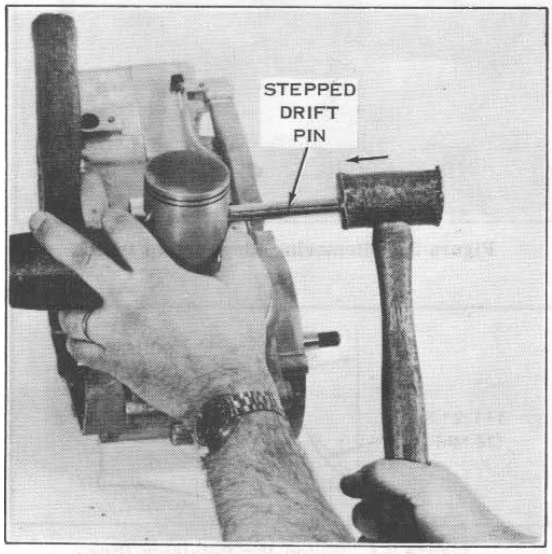


Figure 3.6. Removing Pin From Piston

CLEANING AND INSPECTING

Place piston, cylinder and cylinder head in "GUNK" or other carbon and gum dissolving agent until deposits are soft. Afterward, thoroughly scrub piston and cylinder with a soft bristle brush in cleaning solvent to remove deposits. Pay special attention to cylinder exhaust port. Where carbon deposit is thick or hard, scrape carbon before cleaning. Use a wooden scraper. Use extreme care to avoid scraping into aluminum of pistons.

After parts are thoroughly washed, blow dry with compressed air. Force air through cylinder ports. Clean piston ring grooves with a tool for cleaning ring grooves; if not available, sharpen end of a broken ring to a chisel edge and use it for this purpose. Take care to remove only the carbon and varnish deposits and not to damage the aluminum piston or the piston ring retaining pin in each ring groove.

Make sure parts are not damaged. Examine piston and cylinder for cracks, burrs, burned spots on piston dome, grooves and gouges. Replace or scrape smooth as needed.

Check piston ring locating pins to make sure they are tight in piston. If a pin is either missing, worn out, or is loose, replace piston. If a pin should come out during engine operation, not only could the pin cause damage, but the ring will turn and possibly catch in a port and break, causing damage to the chrome plated aluminum cylinder.

Check chrome plated cylinder surface. In case of deep marks or excessive wear, replace cylinder. Refer to paragraph below titled, "CHECKING CLEARANCES AND FITS," for dimensional information. Note that cylinder surface can be honed to improve surface — maximum .005 inch (.25 mm).

Carefully check piston pin spring lock ring groove in piston. If groove has been damaged so ring will no longer stay in place, replace piston.

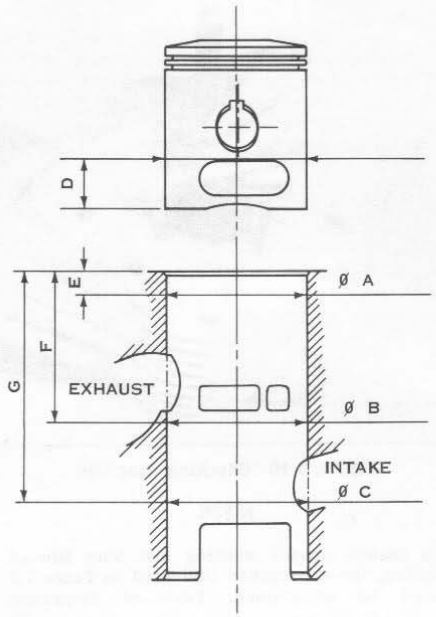
Check needle roller bearing (12), Figure 3.2, in upper end of connecting rod. Replace if it shows excessive wear. Check piston pin and replace piston/pin assembly if excessively worn.

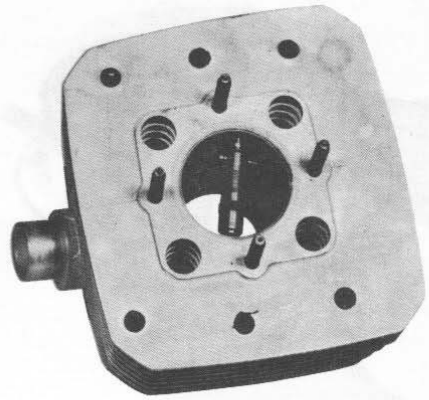
CHECKING CLEARANCES AND FITS

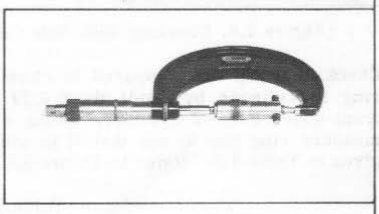
Piston-Cylinder

The cylinder and piston are matched dimensionally and are coded by color. The piston has a color mark on crown; the cylinder, on top fin. Therefore, dimensional checking should be unnecessary. Should cylinders and pistons get mixed up, however, then diameters can be measured and cylinders matched to pistons according to methods and fitting information given in Figures 3.7 and 3.8.

Figure 3.7 shows an inside micrometer being used to measure cylinder bore. The measurement should be made from top about 1/4 inch (6.35mm) above exhaust port from front to rear of cylinder.







Dimension	SX-175		SX-250	
	Inch	Milli-meter	Inch	Milli-meter
D	0.866	22	0.984	25
E	0.394	10	0.394	10
F	2.560	65	2.677	68
G	3.937	100	4.370	111

NOTE

Dimensions A, B and C are measured at points E, F and G. Maximum out-of-round allowed is .0003 inches (0.007 mm); maximum taper, .0005 inches (0.012 mm).

Figure 3.7. Checking Cylinder Dimensions

Figure 3.8 shows piston being measured with an outside micrometer, 0.87 inch (22 mm)/175 and 0.98 inch (25 mm)/250 up from bottom of piston skirt, measured from front to rear, 90° from center line of piston pin location.

By subtracting piston measurement from cylinder bore measurement, amount of piston-cylinder clearance is obtained.

Tables 3.1 and 3.2 show the color codes of various cylinder-piston combinations that are available.

Piston Rings

Clearance checking of piston ring is done by placing ring in proper seat and inserting feeler gauge as shown in Figure 3.9. If lateral clearance exceeds maximum value shown in Table 3.3, determine what the excessive clearance is due to. Check ring thickness and ring seat for wear. Replace parts as needed.

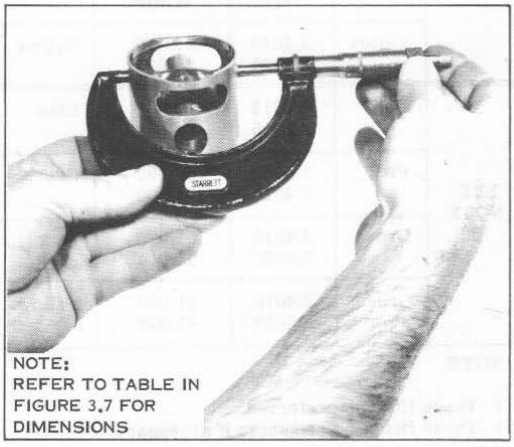


Figure 3.8. Checking Piston Dimension

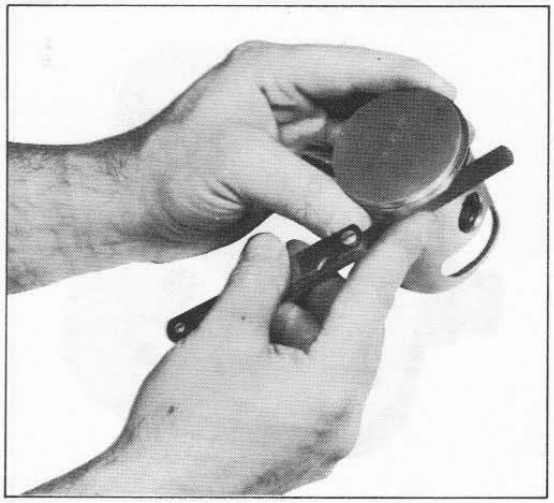


Figure 3.9. Checking Ring Side Clearance

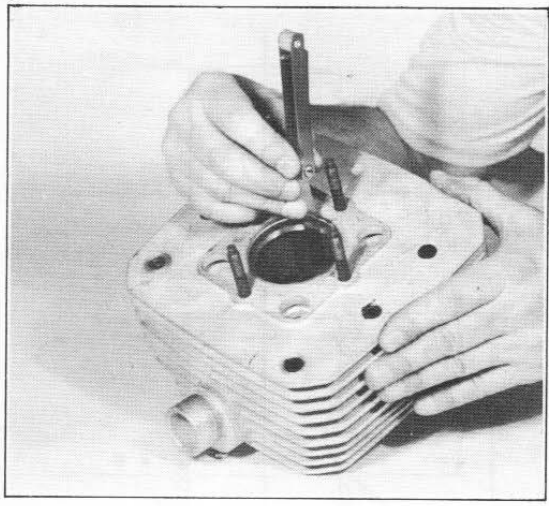


Figure 3.10. Checking Ring Gap

Check ring gap (as compared to a new ring). Place ring in cylinder by itself about 0.39 inch (10 mm) from upper edge of cylinder. Using a feeler gauge, measure ring gap to see that it is within the values given in Table 3.3. Refer to Figure 3.10.

NOTE

To insure proper running and long life of engine, the clearances indicated in Table 3.3 must be maintained. Lack of clearance

Table 3.1. SX-175 Cylinder-Piston Color Code

	Cylinder			Piston			Resulting Assembly Clearance		
		Dimension			Dimension				
	Color	Inch	Millimeter	Color	Inch	Millimeter	Min./ Max.	Inch	Millimeter
SEE NOTE 1	Blue	2.4008 2.4012	60.980 60.990	Blue	2.4002 2.4000	60.965 60.960	Min. Max.	0.0006 0.0012	0.015 0.030
	Pink	2.4012 2.4016	60.990 61.000	Pink	2.4004 2.4002	60.970 60.965	Min. Max.	0.0008 0.0014	0.020 0.035
	Green	2.4016 2.4020	61.000 61.010	Green	2.4006 2.4004	60.975 60.970	Min. Max.	0.0010 0.0016	0.025 0.040
	Yellow	2.4020 2.4024	61.010 61.020	Yellow	2.4008 2.4002	60.980 60.975	Min. Max.	0.0012 0.0018	0.030 0.045
SEE NOTE 2	Pink	2.4012 2.4016	60.990 61.000	Blue	2.4002 2.4000	60.965 60.960	Min. Max.	0.0010 0.0016	0.025 0.040
	Pink	2.4012 2.4016	60.990 61.000	Green	2.4006 2.4004	60.975 60.970	Min. Max.	0.0006 0.0012	0.015 0.030
	Green	2.4016 2.4020	61.000 61.010	Pink	2.4004 2.4002	60.970 60.965	Min. Max.	0.0012 0.0018	0.030 0.045
	Green	2.4016 2.4020	61.000 61.010	Yellow	2.4008 2.4002	60.980 60.975	Min. Max.	0.0008 0.0014	0.020 0.035

NOTE

1 These fits are preferred.
2 These fits are acceptable if necessary due to parts supply.

Allowable assembly clearance:
Min. - 0.0006 inch (0.015 mm)
Max. - 0.0018 inch (0.045 mm)
Maximum wear limit:
0.0098 inch (0.250 mm)

creates friction which causes rapid wear of rings and cylinder bore. Also, excessive clearance, in itself, increases side wear by allowing blow-by. If it proves unnecessary to replace piston rings, assemble them in their original positions.

Piston and Piston Pins

These parts are supplied in matched sets that are color coded. There is a paint dot in inside end of pin and on bottom of pin boss in piston. Checking of fit can be done to a new set by inserting proper piston pin into piston pin boss after having lubricated pin with oil. The fit is correct if piston pin can be inserted with only a slight pressure of the thumb.

As stated above, this applies to a new set. For an old set – one that has been run in an engine – this will not be possible. For assembly in this case, the piston will have to be heated around the pin holes prior to installing pin and the pin then tapped into place.

Connecting Rod Lower End

Check clearance of pin in connecting rod lower end to see that it does not exceed the wear limit indicated in Table 3.3. Also, if working surfaces are marked, replace rod and pin and roller bearing assembly. The new parts should be fitted at ambient temperature, observing assembling clearances indicated in Table 3.3.

Table 3.2. SX-250 Cylinder-Piston Color Code

	Cylinder			Piston			Resulting Assembly Clearance		
		Dimension			Dimension				
	Color	Inch	Millimeter	Color	Inch	Millimeter	Min./ Max.	Inch	Millimeter
SEE NOTE 1	Blue	2.8339 2.8342	71.980 71.987	Blue	2.8323 2.8326	71.940 71.947	Min. Max.	0.0013 0.0019	0.033 0.047
	Pink	2.8342 2.8344	71.987 71.994	Pink	2.8326 2.8329	71.947 71.954	Min. Max.	0.0013 0.0019	0.033 0.047
	Green	2.8344 2.8346	71.994 72.001	Green	2.8329 3.8331	71.954 71.961	Min. Max.	0.0013 0.0019	0.033 0.047
	Yellow	2.8346 2.8349	72.001 72.008	Yellow	3.8331 2.8334	71.961 71.968	Min. Max.	0.0013 0.0019	0.033 0.047
	Black	2.8349 2.8352	72.008 72.015	Black	2.8334 2.8337	71.968 71.975	Min. Max.	0.0013 0.0019	0.033 0.047
	White	2.8352 2.8355	72.015 72.022	White	2.8337 2.8340	71.975 71.982	Min. Max.	0.0013 0.0019	0.033 0.047
SEE NOTE 2	Pink	2.8342 2.8344	71.987 71.994	Blue	2.8323 2.8326	71.940 71.947	Min. Max.	0.0016 0.0021	0.040 0.054
	Green	2.8344 2.8346	71.994 72.001	Pink	2.8326 2.8329	71.947 71.954	Min. Max.	0.0016 0.0021	0.040 0.054
	Yellow	2.8346 2.8349	72.001 72.008	Green	2.8329 2.8331	71.954 71.961	Min. Max.	0.0016 0.0021	0.040 0.054
	Black	2.8349 2.8352	72.008 72.015	Yellow	2.8331 2.8334	71.961 71.968	Min. Max.	0.0016 0.0021	0.040 0.054
	White	2.8352 2.8355	72.015 72.022	Black	2.8334 2.8337	71.968 71.975	Min. Max.	0.0016 0.0021	0.040 0.054

NOTE

1 These fits are preferred.
2 These fits are acceptable if necessary due to parts supply.

Allowable assembly clearance:
Min. - 0.0013 inch (0.033 mm)
Max. - 0.0021 inch (0.054 mm)
Maximum wear limits:
0.0098 inch (0.250 mm)

Connecting Rod Upper End

Check by moving rod sideways as shown in Figure 3.11. If reading is not within 0.0158 inch (0.4 mm), the entire assembly (connecting rod, crankpin and roller bearing) should be replaced.

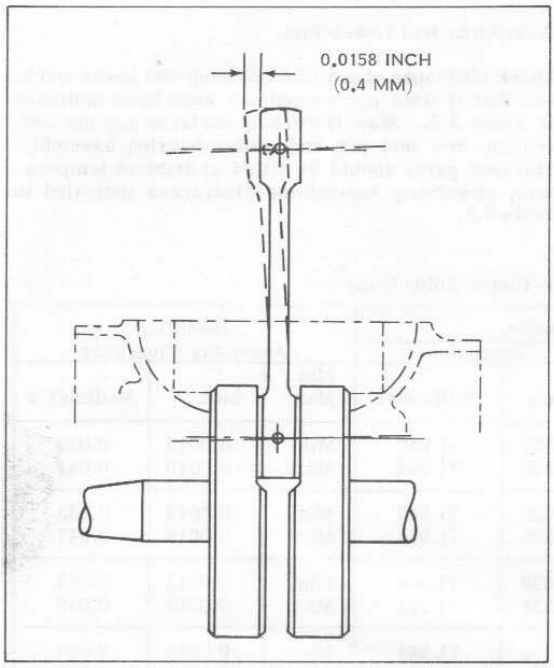


Figure 3.11. Connecting Rod Side Play

NOTE

It is not advisable nor economical to replace just one part. Because of this, the complete group is supplied together as spares. Note, too, that this operation requires disassembling of crankcase.

ASSEMBLING CYLINDER AND PISTON

Make sure all parts are clean and lightly lubricated with oil.

Assemble piston with arrow on piston crown facing exhaust port. Press piston pin into piston and secure in place with a new pin lock ring.

Check alignment of connecting rod, piston and cylinder. This can be done by temporarily assembling piston (with no rings) into cylinder which is then fixed to crankcase. Move piston while checking to see that clearance between piston and cylinder wall is equal all around in its entire up and down travel range. Equal clearance means, also, that connecting rod is not pressing laterally on piston and piston travel is parallel to bore. Disassemble temporary arrangement when finished.

Install rings on piston. Slip rings over piston into their respective grooves. Be careful not to overexpand, twist rings or damage the finely finished piston surface when slipping them in place.

Check to see that rings move freely. Ring ends should be positioned to the locating pins. Lubricate rings and piston skirt with oil.

Place a new gasket on crankcase flange.

Table 3.3. Piston Component Clearances

Component	Clearance		Wear Limits	
	SX-175	SX-250	SX-175	SX-250
Lateral Clearance of Piston Rings: 1st 2nd	0.0043 to 0.0060 inch (0.110 to 0.152 mm) 0.0032 to 0.0047 inch (0.080 to 0.120 mm)		0.0079 inch (0.20 mm) 0.0067 inch (0.17 mm)	
Ring Gap: 1st and 2nd	0.008 to 0.014 inch (0.20 to 0.35 mm)	0.01 to 0.016 inch (0.25 to 0.40 mm)	0.022 inch (0.55 mm)	0.026 inch (0.65 mm)
Piston Pin to Piston: White Black	0.00004 to 0.0003 inch (0.001 to 0.0065 mm) 0.00002 to 0.0002 inch (0.0005 to 0.006 mm)		0.0008 inch (0.02 mm)	
Connecting Rod Lower End:	0.0001 to 0.0002 inch (0.002 to 0.006 mm)		0.0006 inch (0.015 mm)	

Hold connecting rod upright with tool, Part No. 97356-74P. Position ends of each ring over locating pin. Compress rings in piston grooves and slip cylinder over piston and onto crankcase as shown in Figure 3.12. Note that bottom of cylinder has been chamferred to aid in assembly.

Push cylinder all the way down to crankcase, taking care rings remained compressed as they pass ports. Secure cylinder to crankcase. Recheck alignment of connecting rod, piston and cylinder. Torque attaching nuts with a torque wrench - 17-18 ft-lbs (2.5 kgm). Do this in a diagonal pattern in 5 ft-lb (.8 kgm) steps at each location.

Place new head gasket on cylinder. Assemble cylinder head to cylinder. When tightening nuts, make sure gasket is seated properly. Again, torque attaching nuts with a torque wrench, same as above.

NOTE

Uneven tightening will result in cylinder and head distortion, causing piston failure.

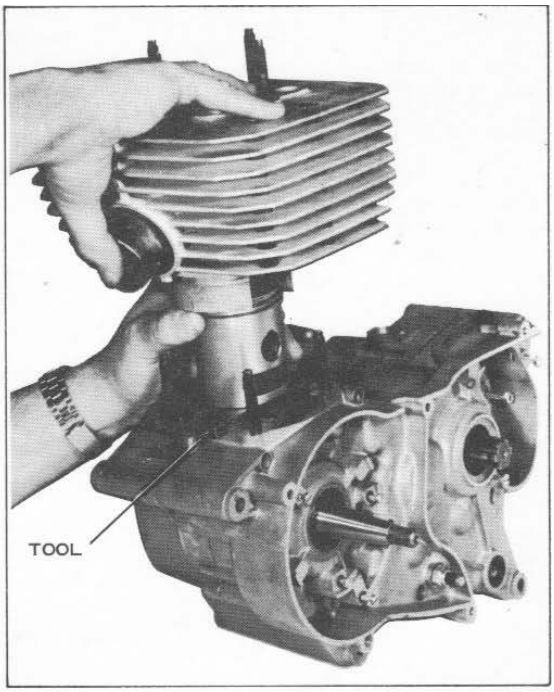
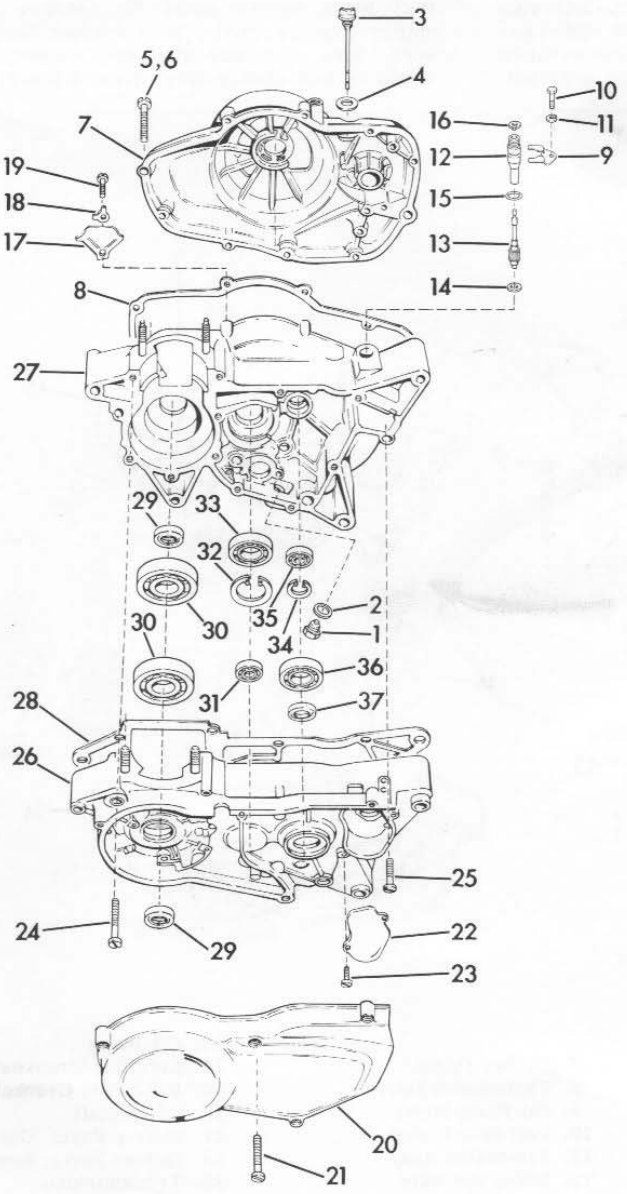


Figure 3.12. Reinstalling Cylinder

CRANKCASE

DISASSEMBLING

The engine must be removed from motorcycle in order to work on crankcase. First, remove engine from motorcycle as outlined in paragraph, "STRIPPING MOTORCYCLE ENGINE FOR REPAIR," steps 1 through 16. Then, disassemble cylinder and associated parts from the engine, including piston from



1. Plug, Drain (Magnetic)
2. Gasket
3. Dipstick, Oil
4. Gasket
5. Screw (8)
6. Screw (2)
7. Cover, Right Side
8. Gasket
9. Plate, Retaining
10. Screw
11. Lock Washer
12. Bushing, Tach. Drive and Pump
13. Pinion, Tach. Drive
14. Washer
15. O-Ring
16. Seal
17. Plate, Oiler
18. Washer
19. Screw
20. Cover, Left Side
21. Screw
22. Cover, Oil Pump
23. Screws (2)
24. Screw (11)
25. Screw (2)
26. Crankcase, Left Side
27. Crankcase, Right Side
28. Gasket
29. Seal
30. Bearing, Crankshaft (2)
31. Bearing, Mainshaft
32. Lock Ring
33. Bearing, Mainshaft
34. Lock Ring
35. Bearing, Countershaft
36. Bearing, Countershaft
37. Seal

Figure 3.13. Exploded View of Crankcase Parts

connecting rod as outlined in paragraph, "CYLINDER AND PISTON."

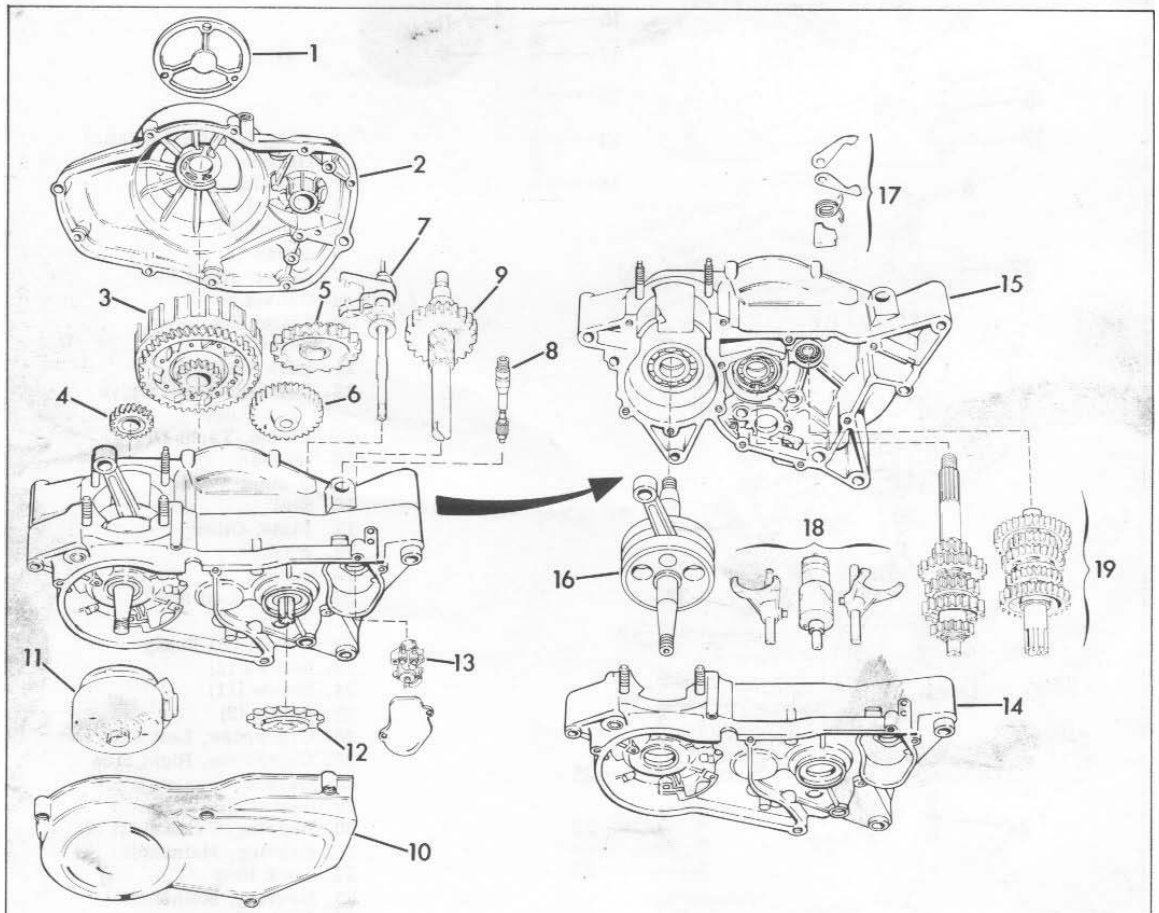
NOTE

Certain steps in the following disassembly may be given in general terms only. For specific details such as actual nuts, bolts, and other parts to be removed, etc., refer to each major component under its own heading elsewhere in this manual.

Refer to Figure 3.14 while performing the following steps. Remove clutch cover (1). Detach clutch cable, then remove right side cover (2). Remove throw out bearing, clutch hub nut, and primary gear nut. Using a puller tool such as shown in Figure 4.4, pull off the complete clutch assembly (3) from right end of crankshaft. Next, pull primary drive gear (4) off right end of crankshaft using a gear puller. Note that clutch assembly and primary drive gear form a matched pair.

Remove starter ratchet gear (5) which will be laying in place loose. Slip idler gear (6) and two thrust washers off right end of countershaft after removing lock ring which secures it in place.

Pull loose shifter parts (7) — shifter shaft with shifter pawl attached — from through hole in crankcase. Note that this step will require prior removal of foot shifter lever from left side of engine.



1. Clutch Cover
2. Right Side Cover
3. Clutch Assy
4. Primary Drive Gear
5. Starter Ratchet Gear Assy
6. Idler Gear
7. Shifter Parts
8. Tachometer Drive
9. Oil Pump Drive
10. Left Side Cover
11. Alternator Assy
12. Drive Sprocket
13. Oil Pump
14. Left Side Crankcase
15. Right Side Crankcase
16. Crankshaft
17. Shifter Parts, Outer
18. Shifter Parts, Inner
19. Transmission

Figure 3.14. Partial Engine Disassembly

If desired, pull tachometer drive (8) from hole in top of crankcase side and oil pump drive (9) from through hole in crankcase.

The above steps complete the partial disassembly of the right side of engine. The left side is done next.

Remove left side cover (10), exposing alternator components (11) and drive sprocket (12). Remove hardware securing sprocket to left end of countershaft and slip sprocket from shaft. Using the proper tools, remove alternator rotor from left end of crankshaft and stator from left side of crankcase.

Remove oil pump (13) from compartment in left crankcase side (14).

From left side of engine assembly, remove thirteen screws (24) and (25), Figure 3.13, that attach two crankcase sides (14) and (15), Figure 3.14, to each other. Note that there are eleven long screws (24) and two short (25).

Attach tool, Part No. 97358-74P, to left side crankcase (26), Figure 3.13, as shown in Figure 3.15. Note that the three hole arrangement of the tool is used in conjunction with three left side cover screws (21), Figure 3.13.

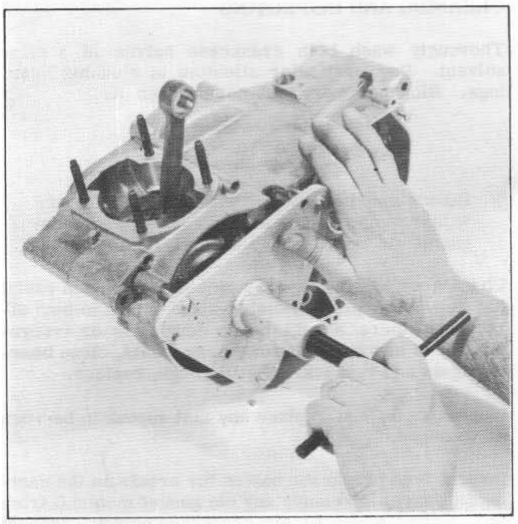


Figure 3.15. Splitting Crankcase

Split crankcase as follows. Using tool, Part No. 97358-74P, press left crankshaft end out of bearing (30) in left side crankcase (26) while at the same time lightly tapping halves apart with a rawhide mallet. Work halves apart evenly, taking care not to damage gasket (28), Figure 3.13, if it must be reused. Always replace gasket if one is available. Note, too, that tapping lightly on left end of countershaft will help to separate halves evenly.

Taking crankcase apart as outlined above will result in crankshaft (16), Figure 3.14, transmission components (19), and certain of shifter parts (18) to remain in right side crankcase (27), Figure 3.13.

Remove crankshaft as follows. Attach the same tool, Part No. 97358-74P, to right side crankcase (27), Figure 3.13, as shown in Figure 3.16. Note that the four hole arrangement of tool is used this time in conjunction with four right side cover screws (5) and (6). Using tool, press right crankshaft end out of bearing (30) in right side crankcase (27).

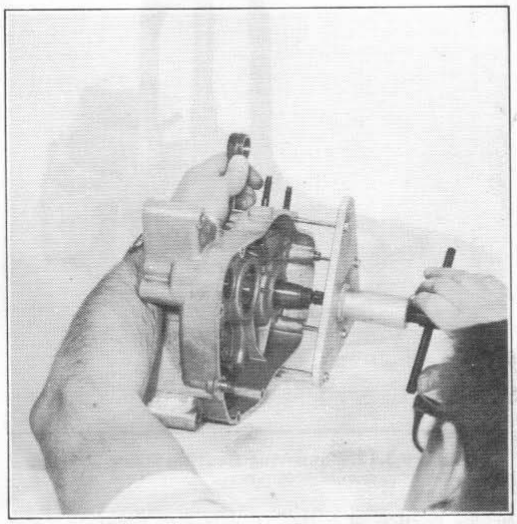


Figure 3.16. Removing Crankshaft

Remove shifter parts (17) and (18), Figure 3-14. These parts are held in place by retaining ring (9), screw (20) and plate (18) as shown in Figure 4.12.

With shifter parts (17) and (18), Figure 3.14, removed, transmission components (19) can be removed. Alternately tap on both transmission shafts with a rawhide mallet until shafts simultaneously slide out of their respective bearings — bearing (33), Figure 3.13, for mainshaft and bearing (35) for countershaft.

This leaves only the various seals and bearings to be removed from each crankcase half. Before removing, however, inspect each thoroughly. Then, remove only those that need be replaced, leaving the others in place.

The seals are removed by prying them out carefully, avoiding damage to the seat. The bearings are removed by either pressing them out with a press or pulling them out with an appropriate bridge or slide hammer type puller. Figure 3.17 shows bearing (31), Figure 3.13, which is in a blind hole, being removed by using a bridge type puller and 19/32 in. collet, HD Part No. 95759-75. Note in the figure that the

Figure 3.17. Removing Bearing Using Puller

bridge portion of puller is rested on separate metal plates and not on sealing edges of crankcase half.

Bearings (33) and (35), Figure 3.13, are retained by lock rings (32) and (34), respectively, and these rings must be removed before bearings can be removed.

This completes the disassembly of crankcase.

SPLITTING CRANKCASE WITHOUT SPECIAL TOOLS

In the event tool, Part No. 97358-74P, is unavailable, the crankcase can be split using ordinary hand tools if extra care is taken so parts are not damaged. Refer to Figure 3.18.

Hold crankcase above bench as shown. Using a rawhide mallet, alternately tap crankshaft and countershaft out of bearings in left crankcase side thus splitting crankcase. Observe in figure how crankcase is held up so right crankcase side will drop down as case is split. Make sure two sides come apart evenly all around as shafts are tapped. Also, support lower right crankcase as case finally splits apart so it does not fall and become damaged.

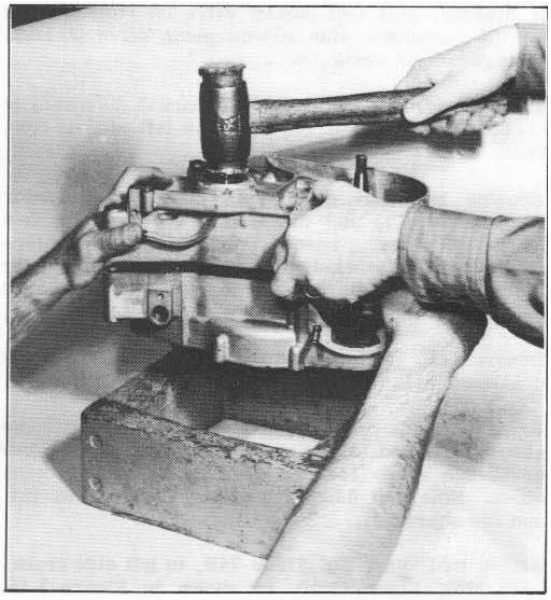


Figure 3.18. Splitting Crankcase Using Ordinary Tools

CLEANING AND INSPECTING

Thorougly wash both crankcase halves in a clean solvent. Pay particular attention to cleaning bearings. Blow parts dry with compressed air.

CAUTION

Do not spin bearings excessively while drying with compressed air or damage to races could result or bearing may actually disintegrate.

Check each ball bearing for excessive side and radial (up and down) play. Rotate each bearing in both directions; there should be no roughness or irregularities of any kind. If roughness exists, clean bearing again and recheck. If still rough, replace.

Inspect seals and replace any that appear to be worn or damaged.

Inspect both crankcase halves for cracks in the castings. Carefully remove any old gasket material from flat, mating edges of the crankcase halves. Inspect edges for irregularities that might cause the two halves not to mate properly when assembled together again. Minor repairs can be made sometimes by dressing edges lightly with a long flat file as shown in Figure 3.19.

NOTE

In addition to cleaning and inspecting the crankcase at this time, clean and inspect the following, also: crankshaft, transmission, shifter parts, etc.

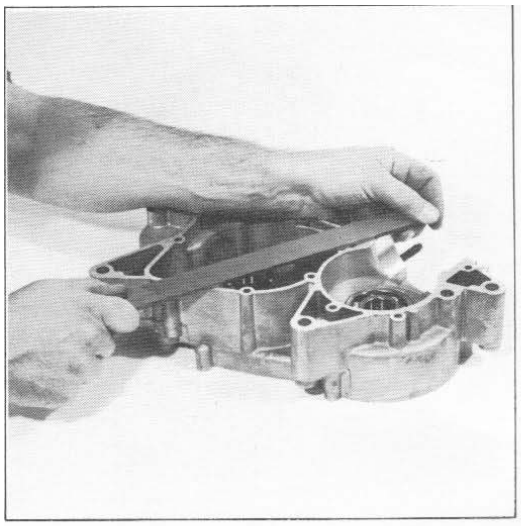


Figure 3.19. Cleaning Crankcase Edge With File

ASSEMBLING

The crankcase is reassembled in essentially the reverse order it was taken apart. Components such as the shifter parts, the transmission, the crankshaft, etc. are all put back in place as described under each of these individual headings in other parts of this manual.

Make sure all parts are clean and lightly lubricated with oil. Take special care to lubricate each bearing so that they are not dry at initial start-up.

Use a new gasket (28), Figure 3.13.

Make sure halves come together evenly as crankcase is closed and that the seal between the two is perfectly tight all around. Check to see that all rotating parts rotate freely.

Check crankshaft clearances as specified in "CRANKSHAFT" section.

Tighten the thirteen screws attaching two crankcase halves together and torque each to 5-6 ft-lbs (0.8 kgm).

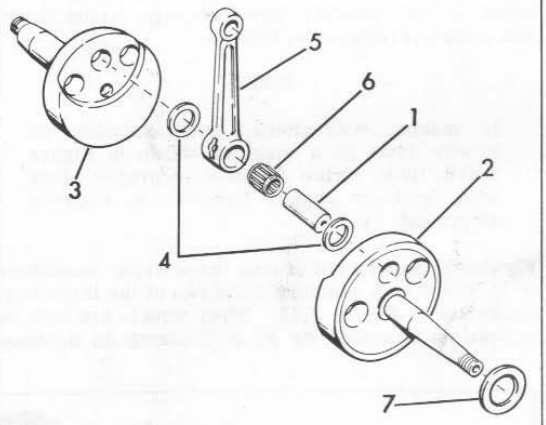
CRANKSHAFT

DISASSEMBLING

The crankcase must be split apart in order to work on the crankshaft. This procedure — along with the procedure necessary to remove the crankshaft from the crankcase halves — is covered in "DISASSEMBLING" under "CRANKCASE."

After the crankshaft has been removed from the crankcase, it can be disassembled as follows.

Using a hydraulic press (10 ton capacity minimum) and a flat press plate, press crankpin (1), Figure 3.20, from either the right or left crankshaft flywheel (3) or (2) as shown in Figure 3.21. Remove connecting rod (5), bearing assembly (6), and bronze washers (4) from crankpin. Press crankpin out of remaing flywheel. Retain both bronze thrust washers (4) for reassembly.



1. Crankpin
2. Left Flywheel (Alter. Side)
3. Right Flywheel (Gear Side)
4. Washer, Thrust (2)
5. Rod, Connecting
6. Bearing
7. Washer, Thrust

Figure 3.20. Exploded View of Crankshaft

CLEANING AND INSPECTING

Thoroughly clean all crankshaft parts and inspect for wear or damage. Pay particular attention to bearing surfaces and threads. If worn or damaged, the part should be replaced. If wear is evident on the crankpin and/or the connecting rod lower end bearing surface, a new connecting rod, crankpin and bearing assembly should be installed.

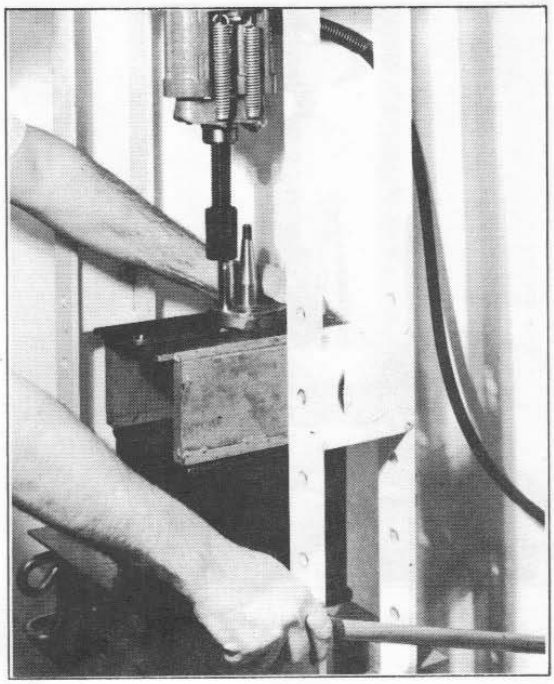


Figure 3.21. Removing Crankpin With Hydraulic Press

NOTE

Whenever crankpin, connecting rod or crankpin roller bearing show excessive wear and require replacement, the practice is to replace all these parts with a complete new set of parts.

At this time, check main bearings (30), Figure 3.13, in left and right crankcase halves (26) and (27). If either have excessive play or are rough, replace by pressing out. If either is replaced, a new seal (29) should be installed at the same time.

ASSEMBLING CRANKSHAFT

Place outside surface of either crankshaft flywheel (2) or (3), Figure 3.20, on flat press plate. Press crankpin (1) into hole in flywheel until pin is flush with outside flywheel surface. Release press, but keep parts in place.

Install both thrust washers (4), (one on each side) roller bearing assembly (6) and connecting rod (5) on crankpin (1). Position other crankshaft flywheel in place over crankpin (1). Lower press until it just touches, holding flywheel in position.

Position and align both flywheels as accurately as possible using a straightedge such as a metal ruler as shown in Figure 3.21A. Using press, just start loose crankshaft flywheel onto crankpin (1).

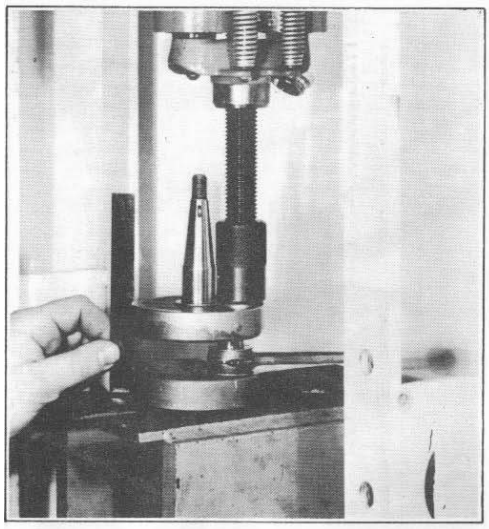


Figure 3.21A. Aligning Flywheels

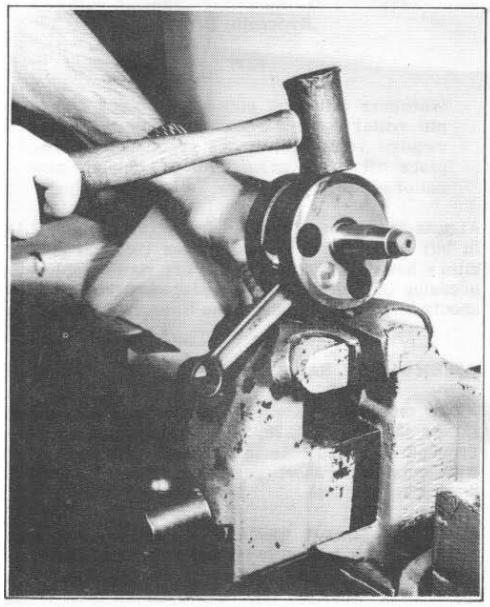


Figure 3.21B. Correcting Alignment

Recheck alignment with straightedge. If alignment has changed, tap loose crankshaft flywheel to get it back in alignment. Proceed to press together until crankpin (1) is almost flush with outer surface of loose crankshaft flywheel.

Check connecting rod (5) side play as flywheels are pressed together. Check with a feeler gauge to see that clearance is 0.012 inch (0.3 mm) to 0.016 inch (0.4 mm). If too much, continue to press flywheels together. If not enough (pressed too tightly together) it may be necessary to press crankpin (1) back out one of the flywheels a slight amount.

TRUING CRANKSHAFT ASSEMBLY

Using Flywheel Truing Device, Part No. 96650-30, check shaft run-out as shown in Figure 3.22.

Adjust indicators to take reading on shafts as near to flywheels as possible. Turn flywheels slowly and observe movement of indicator pointers. Movement toward flywheels indicates high point of shafts. Shafts must run true within 0.001 inch (0.03 mm). This is one-half graduation on truing device. If flywheels are not true within this limit, find highest point of each shaft and chalkmark flywheel rims at those points. Remove flywheel from truing device and make corrections as follows.

NOTE

In making corrections, rest assembly on bronze jaws of a vise as shown in Figure 3.21B, then strike flywheel at proper place with lead or copper hammer to improve alignment.

Flywheels may be out of true three ways: conditions A, B, and C or a combination of two of the three ways as shown in Figure 3.23. When wheels are both out of true as indicated in A, a C-clamp is tightened

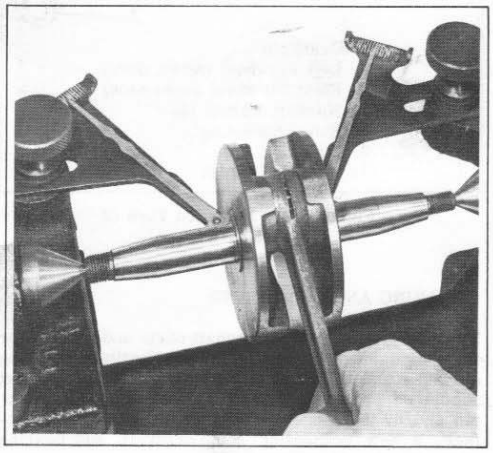


Figure 3.22. Checking Crankshaft Runout

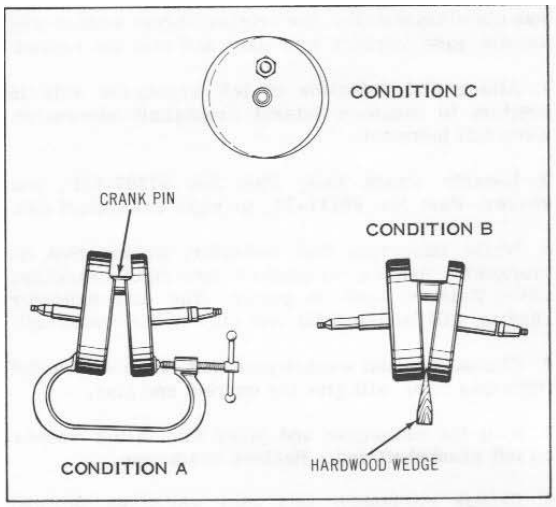


Figure 3.23. Correcting Crankshaft Alignment

on rims of wheel opposite crank pin to squeeze flywheels together.

When wheels are both out of true as indicated in B, a hardwood wedge is driven between wheels opposite the crank pin to spread flywheels apart.

When wheels are out of true as indicated in C, strike the rim of the wheel a firm blow at about 90 degrees from crankpin on high side.

When wheels are out of true in a combination of conditions shown, correct A or B first, then correct condition C.

Remember, flywheel assembly must be removed from truing device when striking with hammer or damage to truing stand centers will result.

INSTALLING CRANKSHAFT ASSEMBLY IN CRANKCASE

After reassembling and truing crankshaft assembly, it is reinstalled in crankcase as follows.

NOTE

Since this procedure re-closes crankcase, all other parts and assemblies (i.e., shifter parts and transmission) within crankcase must be assembled in place properly also. This includes having correct crankshaft end play as explained in paragraph titled "ADJUSTING CRANKSHAFT END PLAY," below.

Assemble crankshaft assembly in right crankcase side (27), Figure 3.13, using tool, Part No. 97297-61PA, and spacer, Part No. 96111-74, as shown in Figure 3.24. Position a new gasket (28) on right crankcase surface. Slip left crankcase side into position on crankshaft and countershaft. Place tool, Part No. 96110-68P, and spacer, Part No. 96111-74, on crankshaft end as shown in Figure 3.25. Then, while tapping rear of crankcase into place with a rawhide mallet, pull crankshaft into place in left crankcase side (26). This operation should be per-

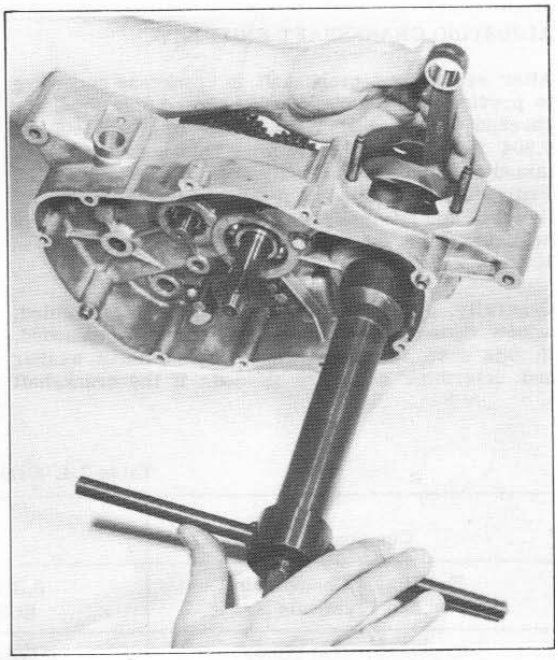


Figure 3.24. Reinstalling Crankshaft Assembly In Right Crankcase Side

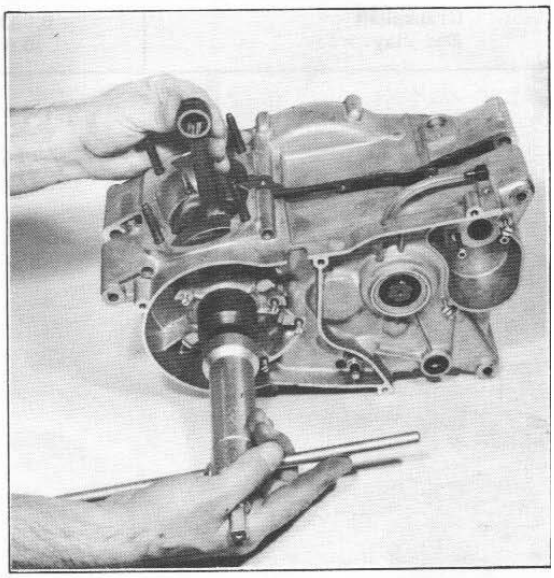


Figure 3.25. Closing Crankcase

formed so that both crankcase sides come together evenly. Secure crankcase sides to each other from the left side using some screws (24) and (25), Figure 3.13. Remove tool from left side of crankcase. Check crankshaft end play as outlined in paragraph "ADJUSTING CRANKSHAFT END PLAY," below.

ADJUSTING CRANKSHAFT END PLAY

After reinstalling crankshaft in crankcase according to previous procedure, crankshaft end play should be checked to see that it is within limits of 0.002 to 0.004 inch (0.05 to 0.1 mm). This end play is obtained by using the correctly sized thrust washer (7), Figure 3.20, on the left flywheel shaft between left flywheel and left main bearing. Thrust washer (7) is available in a number of different thicknesses in 10ths of a mm increments.

Generally, if the crankshaft itself was disassembled, a new thrust washer of a new size may be needed. In this case, therefore, reassemble without washer and determine new size needed. If the crankshaft was not disassembled, the original thrust washer will usually give correct end play and may be reused.

1. Attach dial indicator to left crankcase side in position to measure lateral crankshaft movement. Zero dial indicator.

2. Loosely attach tool, Part No. 97297-61P, and spacer, Part No. 96111-74, to right crankshaft end.

3. While observing dial indicator, tighten tool on crankshaft, pulling crankshaft into right crankcase side. Release load on puller. The dial indicator reading will be the total end play of the crankshaft.

4. Choose a thrust washer size that, when subtracted from this total, will give the correct end play.

5. Split the crankcase and place this thrust washer on left crankshaft end. Reclose crankcase.

6. Repeat crankshaft end play check as outlined above. If end play is still incorrect, repeat the procedure until correct end play is obtained.

Table 3.4. Crankshaft Clearances

Components	Assembly Clearance	Wear Limits
End Play - Connecting Rod and Flywheels	0.012 to 0.016 inch (0.30 to 0.40 mm)	0.028 inch (0.7 mm)
Connecting Rod Upper End Clearance	0.0004 to 0.0008 inch (0.010 to 0.020 mm)	0.016 inch (0.4 mm)
Maximum Crankshaft Eccentricity	0.0012 inch (0.03 mm)	
Crankshaft End Play	0.0020 to 0.004 inch (0.05 to 0.10 mm)	0.006 inch (0.15 mm)

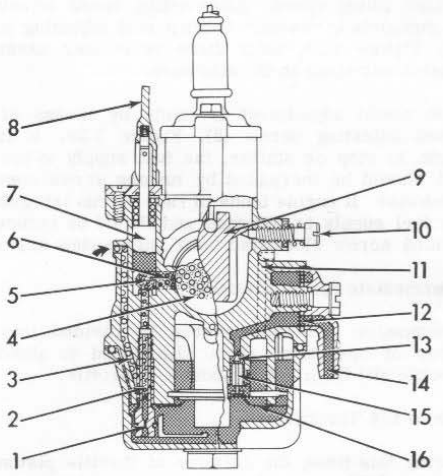
CARBURETOR

GENERAL

The SX-175 uses a Dellorto VHB27AD carburetor; the SX-250, a PHB32AD. These two carburetors are similar in construction and operation and, consequently, are covered here as one.

Starting

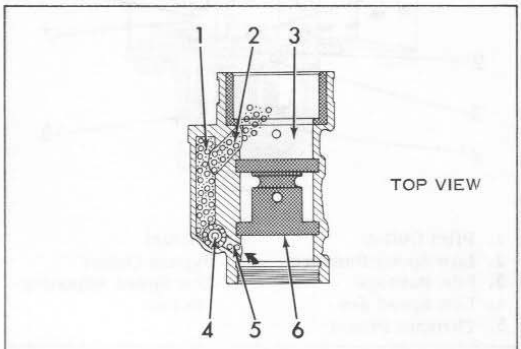
Figure 3.26 shows a cutaway view of a carburetor. In place of a choke, a starter system is used. The fuel mix for starting is metered through a jet independent of other operating jets. Fuel metered through starting jet (1) mixes with air from starting air passage (3) and is broken up into tiny particles (vapor) in emulsion tube (2).



1. Starting Jet
2. Emulsion Tube
3. Starting Air Passage
4. Venturi
5. Plunger Area
6. Fuel Discharge Port
7. Starting Valve Plunger
8. Starting Valve Lever
9. Throttle Piston
10. Throttle Piston Stop Screw
11. Air Passage
12. Filter Screen
13. Float Valve Seat
14. Fuel Inlet
15. Float Valve
16. Float

Figure 3.26. Cutaway View of Carburetor

As shown in Figure 3.27, this mixture then flows into plunger area (4) where it mixes further with air coming in through air intake port (5). This mixture is then directed into engine through venturi (3) in the correct air-fuel ratio via fuel discharge port (2).



1. Bypass
2. Fuel Discharge Port
3. Venturi
4. Plunger Area
5. Air Intake Port
6. Throttle Piston

Figure 3.27. Carburetor-Starting Operation

The starter is opened and closed by means of starting valve lever (8), Figure 3.26.

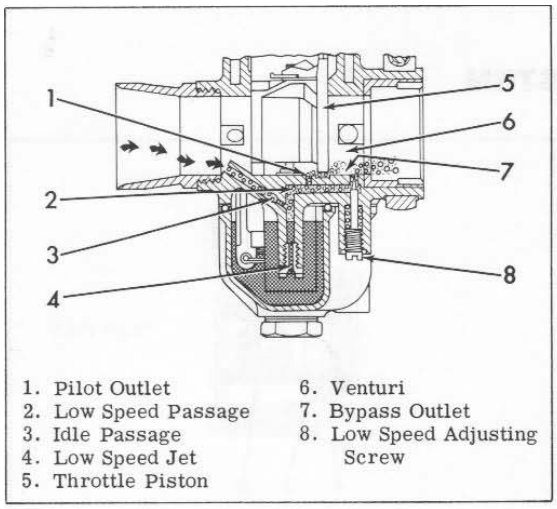
Low Speed Operation

Because the throttle piston is almost closed at low or idling speeds, the velocity of fuel flow through the main nozzle is slow. This results in the pressure not being strong enough to draw fuel from the high speed jet of the main fuel system. This condition then causes the engine to draw upon the low speed system for fuel under these conditions.

The fuel supply to the engine under these conditions is through pilot (1) and bypass outlets (7) as shown in Figure 3.28. When the opening provided by throttle piston (5) is small (at low or idle speeds), fuel is metered by low speed jet (4) and is mixed with air coming in through low speed passage (2). This mix is then directed through idle passage (3) to both pilot (1) and bypass outlet (7).

The fuel mix through bypass outlet (7) provides the major portion of fuel required by engine at very low or idle speeds. As the engine fuel requirements increase (throttle piston (5) is raised), the combination of the two outlets provides the additional fuel. The pilot acts to eliminate any shortage that might otherwise be evident prior to the main nozzle taking over at higher speeds.

Note that low speed operation of the carburetor is adjustable as will be explained under separate paragraph below.

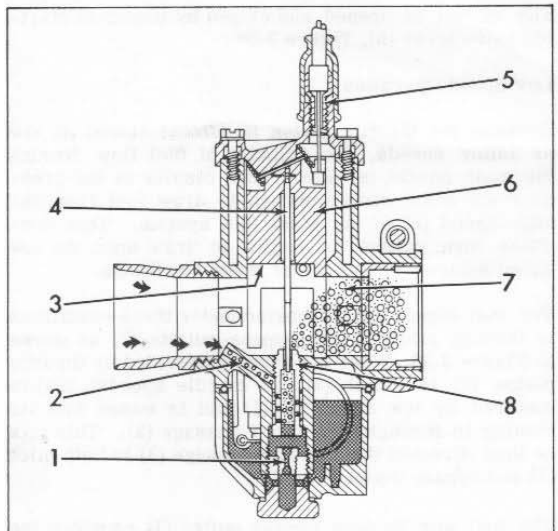


1. Pilot Outlet
2. Low Speed Passage
3. Idle Passage
4. Low Speed Jet
5. Throttle Piston
6. Venturi
7. Bypass Outlet
8. Low Speed Adjusting Screw

Figure 3.28. Carburetor - Low Speed Operation

High Speed Operation

The engine operates at medium to high speeds by drawing fuel from main nozzle (8) as shown in Figure 3.29.



1. High Speed Jet
2. Acceleration Passage
3. Throttle Piston Cutaway
4. Metering Pin
5. Control Coil Adjusting Screw
6. Throttle Piston
7. Venturi
8. Main Nozzle

Figure 3.29. Carburetor - Mid and High Speed Operation

Air is drawn into acceleration passage (2), mixes with fuel in main nozzle tube and is sucked through main nozzle as vapor into the main passage of venturi (7). In venturi (7), it mixes further with more air which is drawn in through the main air intake. The mixture is then drawn into engine in amounts controlled by the position of throttle piston (6).

ADJUSTING

Before attempting to correct faulty engine performance through carburetor adjustment, eliminate other possible causes for poor engine performance such as bad spark plug, improper spark timing, dirty air filter or leaky carburetor and manifold connection.

Low Speed Adjusting

Low speed adjustments should always be made while engine is hot.

Idling speed adjustment is made by means of throttle piston stop screw (10), Figure 3.26, which regulates closing of throttle piston (9). Turn screw clockwise to increase idling speed; counterclockwise to decrease idling speed. After idling speed adjustment is completed, readjust control coil adjusting screw (5), Figure 3.29, until there is neither excessive tension nor slack in throttle wire.

Low speed adjustment is made by means of low speed adjusting screw (8), Figure 3.28. If engine tends to stop or stutter, the fuel supply is too lean and should be increased by turning screw counterclockwise. If engine tends to race or run irregularly, the fuel supply is too rich and should be reduced by turning screw clockwise until engine runs smoothly.

Intermediate Speed Adjusting

Intermediate adjustments can be divided into two areas of operation: from idle speed to about 1/4 throttle and from 1/4 to about 3/4 throttle.

Idle to 1/4 Throttle

During this time, the cutaway of throttle piston (9), Figure 3.26, controls pressure on main nozzle, thereby regulating amount of fuel-air mix that is drawn into engine.

If engine runs regularly as throttle is gradually opened, cutaway is suitable. If engine falters or backfires, cutaway is too high, causing a lean mixture. Use next smaller size. If engine gives off black smoke from exhaust or fires irregularly, cutaway is too low, causing too rich a mixture. Use next larger size.

One Quarter to 3/4 Throttle

During this time, fuel-air mixture is through main nozzle (8), Figure 3.29, and is controlled primarily by position metering pin (4) is set in throttle piston (6). The pin is held in place by a clip and can be in any of three positions which determine how far it pulls out of main nozzle as throttle piston is raised.

Again, the same symptoms that applied to checking cutaway, above, apply here. If mixture seems too lean, pin must be moved upward one or two grooves to allow a greater flow of fuel-air mix out of main nozzle. If mixture seems too rich, the opposite must be done. The pin should be lowered one or two grooves.

High Speed Adjusting

In high speed operation, with throttle from about 3/4 to fully open, the amount of fuel-air mix is governed by size of high speed jet (1), Figure 3.29, opening which supplies main nozzle (8). The opening is non-adjustable and must be physically changed if needed. For a leaner mixture, a smaller opening is required; for a richer mixture, a larger opening.

REMOVING AND PARTIAL DISASSEMBLING OF CARBURETOR

Remove carburetor from motorcycle as outlined below.

CAUTION

When removing carburetor, an explosive mixture of gasoline liquid and vapor will be present. Because of this, take precautions to avoid a fire.

Drain gas line from tank to carburetor as follows. Shut off fuel supply valve. Disconnect gas line at valve. Bend free end of gas line down into a suitable container and drain gasoline. This will drain most of gasoline, except for what remains in bowl which can be emptied after carburetor is removed from engine.

Remove air filter assembly.

Refer to Figure 3.30. Unscrew two screws (1) that retain piston cap. This will allow piston cap (2) to be removed along with throttle piston (3) and associated parts as an assembly.

At this time, two adjustments can be made without disassembling carburetor further. Metering pin (4) can be repositioned from one groove to another, and throttle piston (3) can be exchanged for one with a different cutaway.

To change grooves of metering pin (4), remove clip (5), reposition pin, and replace clip. To change throttle piston (3), detach control wire (6) and metering pin (4), exchange pistons, then put control wire and metering pin back in place.

To remove carburetor (7) from engine, loosen intake pipe clamp (8) and pull carburetor from engine with a twisting motion.

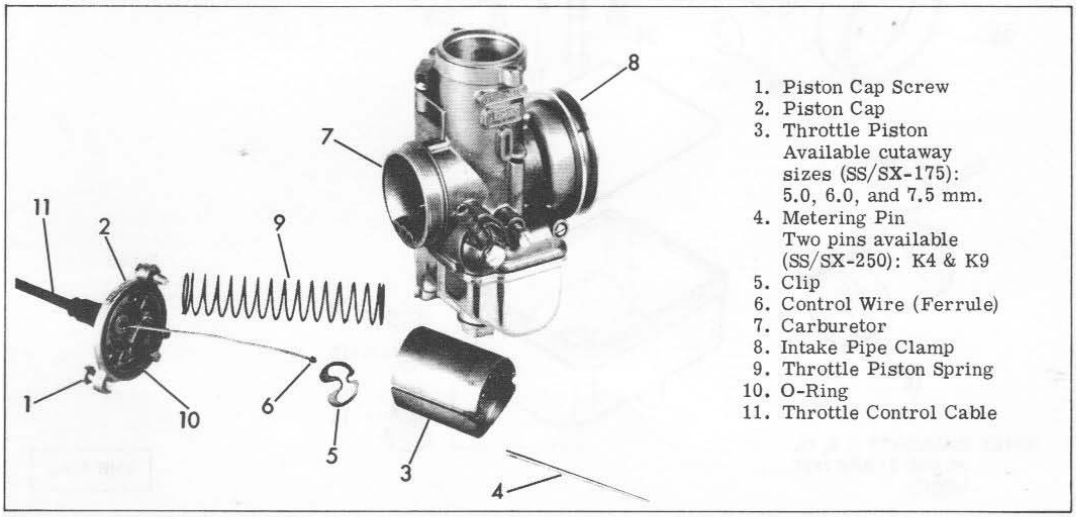
Protect engine intake port with a clean cloth after removing carburetor.

COMPLETE DISASSEMBLING OF CARBURETOR

Refer to Figure 3.31. Remove and partially disassemble carburetor as outlined in procedure directly above.

Unscrew both throttle piston stop screws (1) and low speed needle valve (2) from carburetor body (3). A spring (4) - and, if used, a washer (5) and O-ring (6) - will come out with each screw.

Detach inlet fitting (7) by removing screw (8) and washer (9). Pry inlet screen (10) out of recess, taking care not to damage it so it can be reused.



1. Piston Cap Screw
2. Piston Cap
3. Throttle Piston
   Available cutaway sizes (SS/SX-175): 5.0, 6.0, and 7.5 mm.
4. Metering Pin
   Two pins available (SS/SX-250): K4 & K9
5. Clip
6. Control Wire (Ferrule)
7. Carburetor
8. Intake Pipe Clamp
9. Throttle Piston Spring
10. O-Ring
11. Throttle Control Cable

Figure 3.30. Partial Disassembly of Carburetor

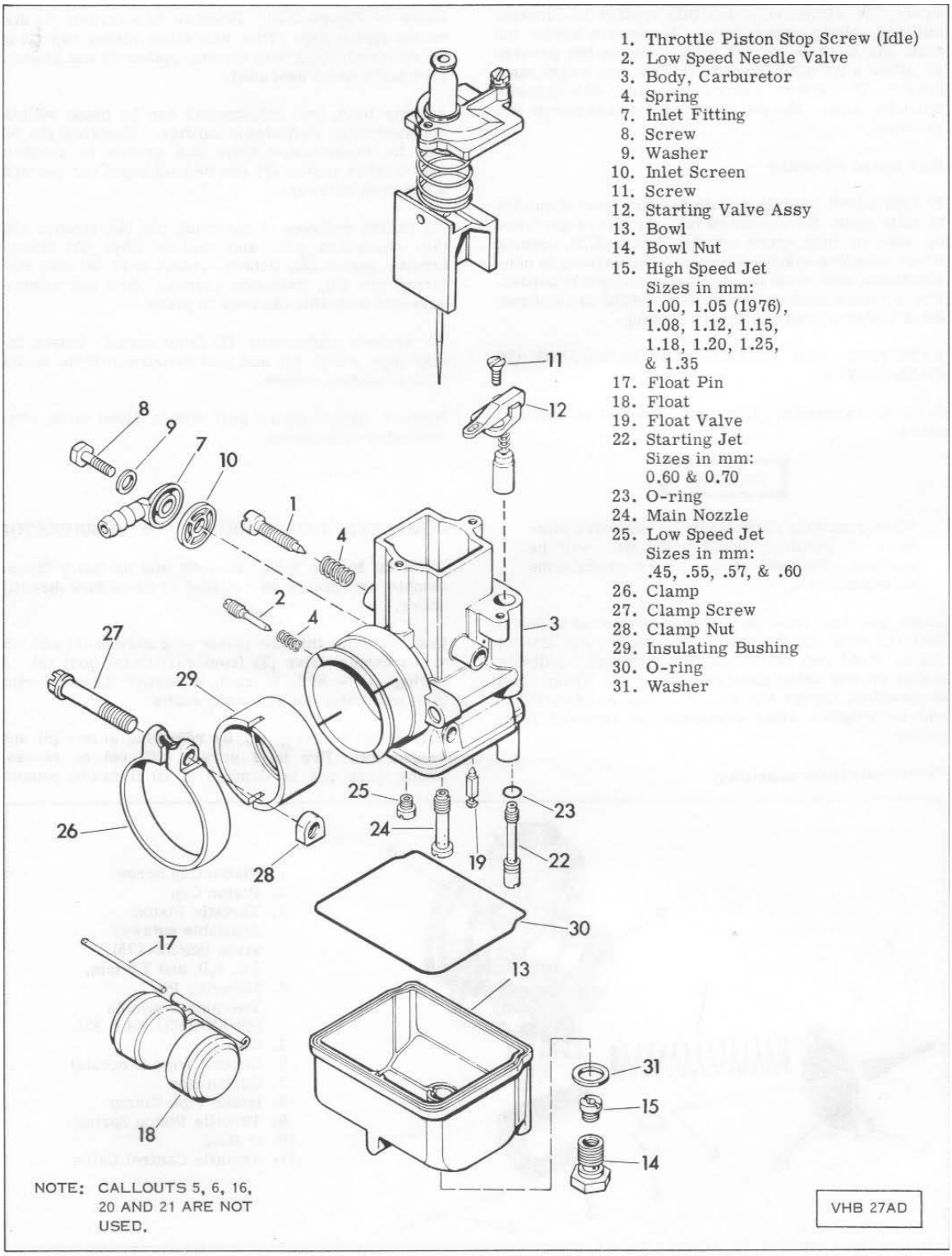
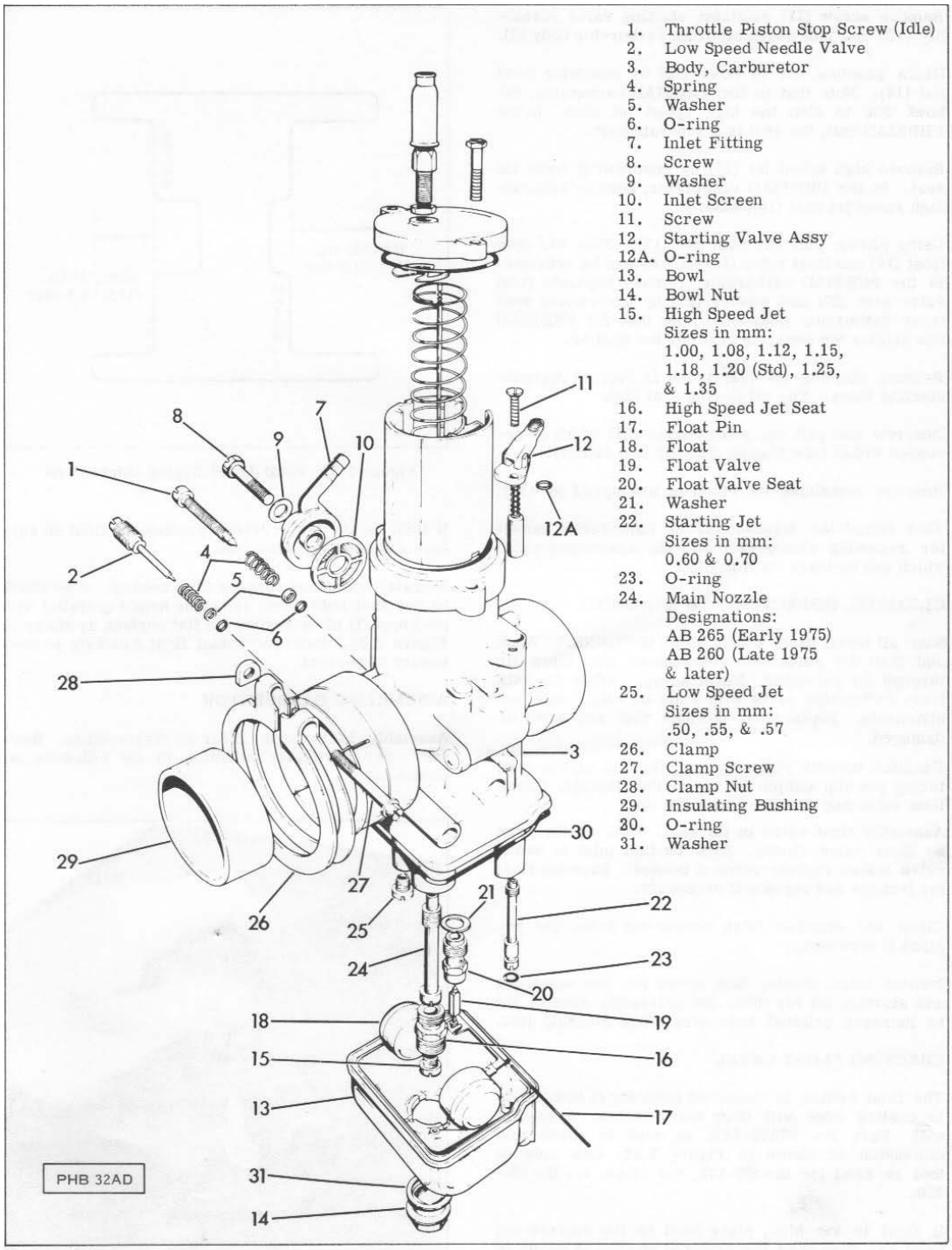


Figure 3.31A. Exploded View of SS/SX-175 Carburetor



1. Throttle Piston Stop Screw (Idle)
2. Low Speed Needle Valve
3. Body, Carburetor
4. Spring
5. Washer
6. O-ring
7. Inlet Fitting
8. Screw
9. Washer
10. Inlet Screen
11. Screw
12. Starting Valve Assy
12A. O-ring
13. Bowl
14. Bowl Nut
15. High Speed Jet
    Sizes in mm:
    1.00, 1.08, 1.12, 1.15, 1.18, 1.20 (Std), 1.25, & 1.35
16. High Speed Jet Seat
17. Float Pin
18. Float
19. Float Valve
20. Float Valve Seat
21. Washer
22. Starting Jet
    Sizes in mm:
    0.60 & 0.70
23. O-ring
24. Main Nozzle
    Designations:
    AB 265 (Early 1975)
    AB 260 (Late 1975 & later)
25. Low Speed Jet
    Sizes in mm:
    .50, .55, & .57
26. Clamp
27. Clamp Screw
28. Clamp Nut
29. Insulating Bushing
30. O-ring
31. Washer

Figure 3.31. Exploded View of SS/SX-250 Carburetor

Remove screw (11) retaining starting valve assembly (12) and pull assembly from carburetor body (3).

Drain gasoline out of bowl (13) by removing bowl nut (14). Note that in the VHB27AD carburetor, the bowl nut is also the high speed jet seat. In the PHB32AD unit, the seat is a separate part.

Remove high speed jet (15) by unscrewing from its seat. In the PHB32AD carburetor, remove separate high speed jet seat (16), also.

Using pliers, pull out float pin (17). This will free float (18) and float valve (19) so they can be removed. In the PHB32AD carburetor, remove separate float valve seat (20) and washer (21) by unscrewing seat from carburetor body (3). Note that the VHB27AD has neither the separate seat nor the washer.

Remove starting jet (22) which is located opposite starting valve. Slip off O-ring seal (23).

Unscrew and pull out main nozzle (24) which is recessed within tube leading directly into venturi.

Unscrew remaining jet which is low speed jet (25).

This completes disassembly of carburetor, except for removing clamp (26) and its associated parts which can be taken off if needed.

CLEANING, INSPECTING AND REPAIRING

Soak all metal parts except float in "GUNK." Wash and then dry parts with compressed air. Blow air through all passages. Never scrape carbon deposits from carburetor parts with knife or other steel instruments. Replace all O-rings that are worn or damaged.

Examine throttle piston spring, throttle piston, metering pin clip and pin for any visible damage. Check float valve and seat for excessive wear.

Assemble float valve in its seat. Hold upside down so float valve closes. Suck on fuel inlet to see if valve leaks; replace valve if needed. Examine float for leakage and replace if necessary.

Clean and examine inlet screen for holes and replace if necessary.

Inspect main nozzle, high speed jet, low speed jet and starting jet for dirt. Be extremely careful not to increase original hole size when cleaning jets.

CHECKING FLOAT LEVEL

The float setting is measured from top of both floats to casting edge with float valve seated. A special tool, Part No. 97362-74P, is used to check this dimension as shown in Figure 3.32. One side of tool is used for the SX-175; the other, for the SX-250.

If float is too high, place float on flat surface and bend ear downward the required amount as shown in Figure 3.33.

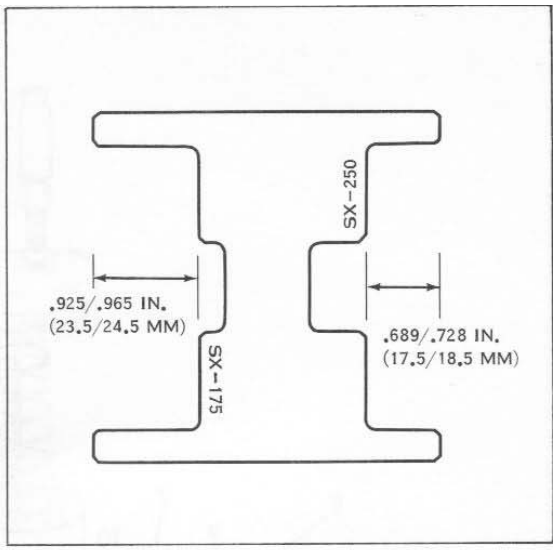


Figure 3.32. Float Level Gaging Dimensions

If float is too low, reverse position of float on surface and bend ear downward.

Reinstall float and recheck float setting. Also check to see that both floats are same height (parallel with pin support) when resting on flat surface as shown in Figure 3.33. Bend individual float brackets as necessary to correct.

ASSEMBLING CARBURETOR

Assembly is reverse order of disassembly. However, pay particular attention to the following instructions.

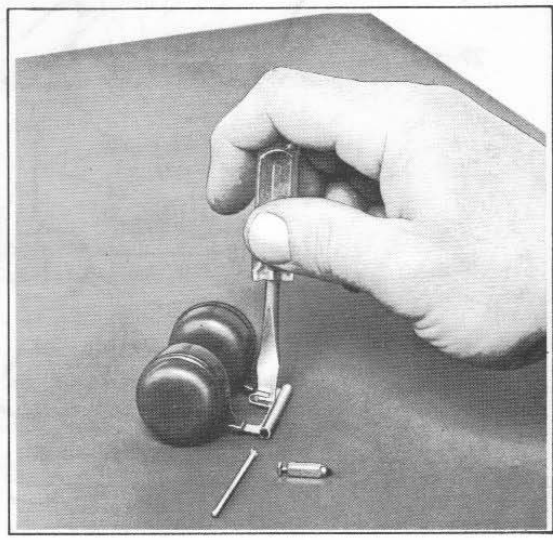


Figure 3.33. Adjusting Float

Assemble throttle parts to control wire as follows.

Referring to Figure 3.30, install metering pin (4) in throttle piston (3) and insert clip (5) in desired groove of metering pin (normally, middle groove is used).

Insert throttle control cable (11) through boot and adjusting screw and install piston spring (9) between cap and piston, inserting wire and ferrule (6) in piston slot.

Insert throttle piston in carburetor body and assemble cap.

REMOUNTING

Install carburetor on intake manifold. Connect fuel line and air filter. Adjust carburetor as described in "ADJUSTING CARBURETOR."

GAS TANK

GENERAL

The gas tank is of welded steel construction with capacity of approximately 2.22 U.S. gallons. Of this, 1.2 qts. is retained in the tank for reserve supply.

NOTE

Use a good quality, "Premium" grade of leaded gasoline. If "Premium" is unavailable, "Regular" grade can be used temporarily. Do not use "No-Lead" grades.

When motorcycle is to be stored for any length of time, tank should be drained and tank interior bathed with an oil-fuel mixture of equal proportions. The fuel will evaporate leaving a protective oil film on tank walls. Moisture formation and subsequent damage may also be avoided by using only "good grade" anti-knock ethyl fuels with moisture absorbing additives.

DISASSEMBLING

Turn off fuel supply valve (7), Figure 3.34. Detach inlet fitting from carburetor with fuel hose (2) from tank (1) attached. Catch the small quantity of gasoline that will drain from hose to prevent a fire hazard from developing.

Remove strap (3) from either anchor tab on under side of tank in rear. Pull rear end of tank up and away. This will free holding slots in front end of tank so tank can be removed.

Lay tank aside if removal was all that was desired. Or, drain gasoline from tank if tank requires servicing.

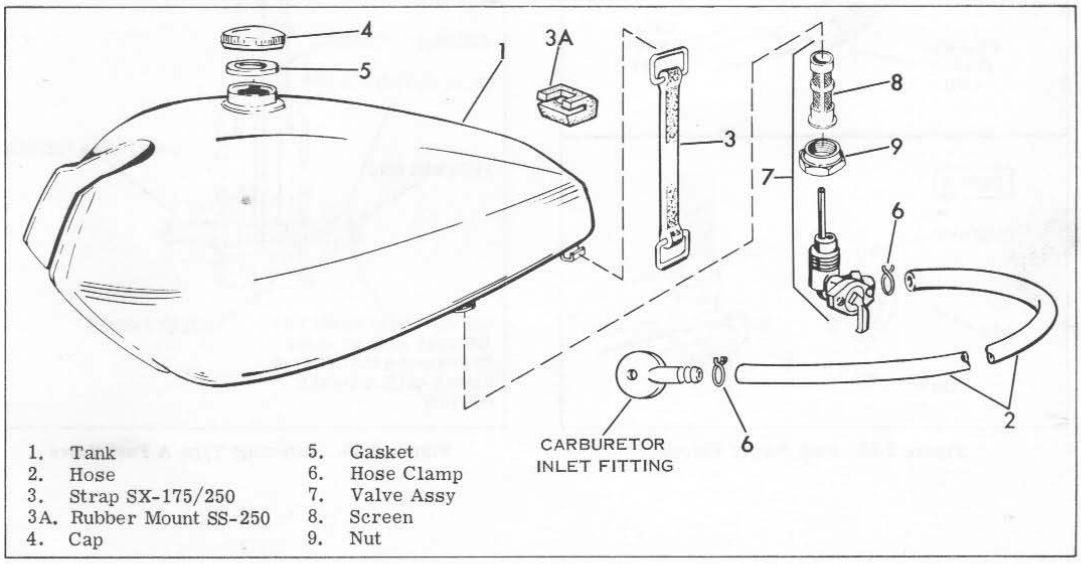
Unscrew nut (9) and pull fuel supply valve and screen out of tank. Remove screen (8) from valve and clean. If valve needs service, refer to procedure under separate heading, "FUEL SUPPLY VALVE," in this manual.

REPAIRING LEAKING TANKS

Tank leaks may be arc welded or gas welded. However, only firms or persons qualified to make such repairs should be entrusted with the operation. If neither is available, it is best to replace a leaking tank rather than attempting a repair.

WARNING

If all traces of fuel are not purged, an open flame repair may result in a tank explosion. Extreme caution in all tank repair is recommended.



1. Tank
2. Hose
3. Strap SX-175/250
3A. Rubber Mount SS-250
4. Cap
5. Gasket
6. Hose Clamp
7. Valve Assy
8. Screen
9. Nut

Figure 3.34. Exploded View of Gas Tank

CLEANING AND INSPECTING

Check gasket (5) in cap (4) and replace if there is evidence of a gas leak. Inspect screen (8) to see that it is not obstructed or clogged. Replace if needed.

ASSEMBLING

Reassemble parts and remount tank on motorcycle in reverse order of removal.

FUEL SUPPLY VALVE

GENERAL

The fuel supply valve is located on the left side under the gas tank. Two types of valves are used.

Early type A, Figure 3.35, have two handles; one is marked "RESERVE" and the other is unmarked. Gasoline to carburetor is shut off when both handles are in horizontal position. Turning the unmarked handle to vertical position turns on main gasoline supply; turning "RESERVE" handle to vertical position turns on reserve supply. Valves should always be closed when motorcycle is not in use.

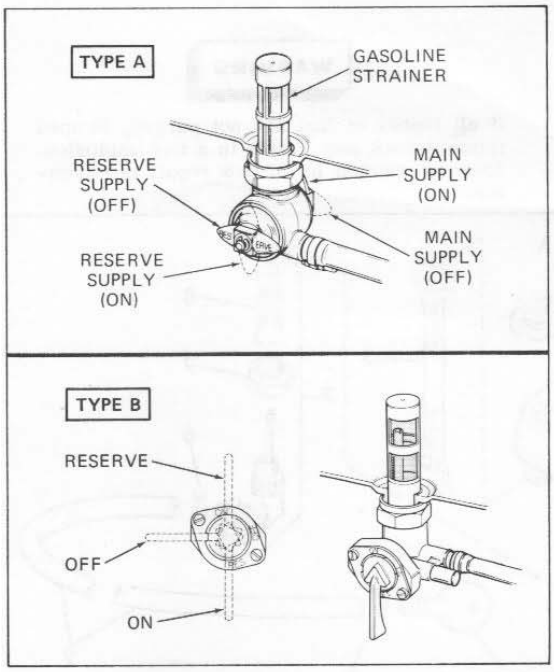


Figure 3.35. Fuel Supply Valves

Later type B have a single handle to control "ON," "OFF" and "RESERVE" positions of valve.

CLEANING AND INSPECTING

The fuel strainer is located on top of supply valve inside fuel tank. If supply of fuel is restricted as indicated by irregular carburetion, remove supply valve by unscrewing from tank and thoroughly clean strainer.

Be sure to drain tank before removing supply valve.

NOTE

If handle is too loose on type A fuel tank valves, it will not allow full flow of gasoline to engine. This can result in engine slow-down because of insufficient fuel supply at high speed.

There should not be more than 0.010 inch (.25 mm) clearance between lock ring and handle when valve is in closed position. If there is excessive clearance, add enough 0.006 inch (0.15 mm) thick shims, Part No. 6160 P, to provide only slight clearance when valve is closed. This will give maximum diaphragm opening when valve is turned on. See Figure 3.36. After any shimming, check to see that valve does not leak fuel from outlet with both handles closed.

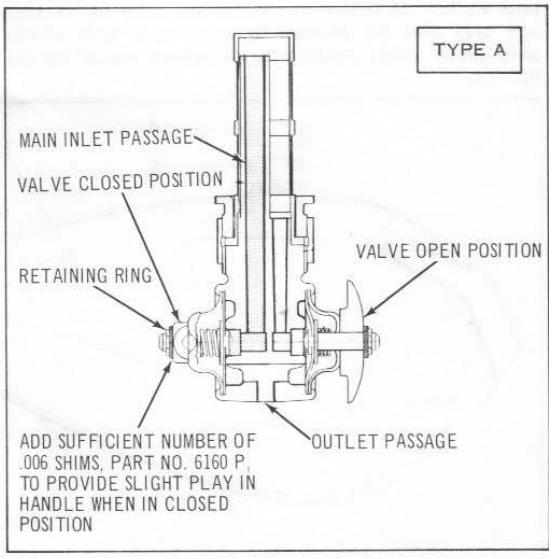


Figure 3.36. Shimming Type A Fuel Valve

LUBRICATION SYSTEM

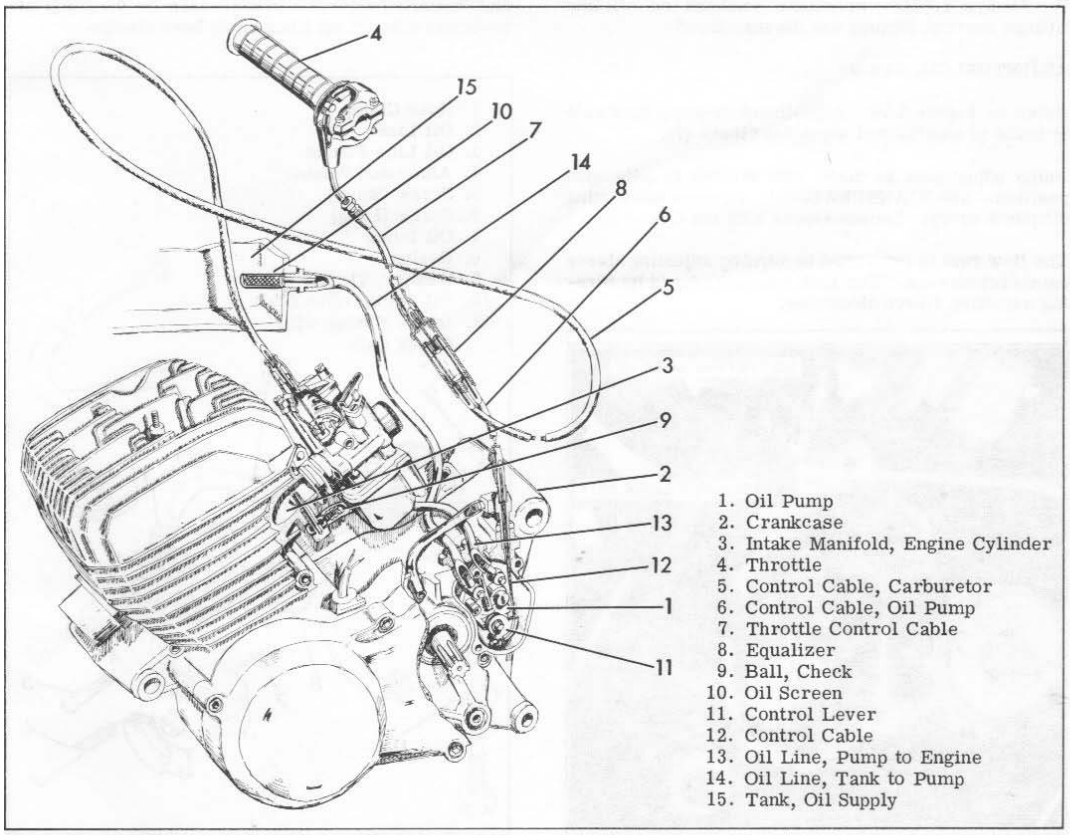
GENERAL

The oil pump (1) is a precision reciprocating type pump located inside crankcase (2) on left side as shown in Figure 3.37. The amount of oil delivered to cylinder intake manifold (3) depends on engine R.P.M. and throttle (4) position thus providing the correct ratio of gas to oil under all operating conditions. The engine drives the pump piston through a worm gear. The control lever is mounted on a cam shaft which varies the length of piston stroke according to throttle opening. Both carburetor control cable (5) and oil pump control cable (6) are connected to handlebar throttle control cable (7) through equalizer (8). A check ball (9), located in the oil line fitting on the intake manifold, prevents oil from flowing away from engine and prevents air from entering oil line (13) when engine is not running. An oil filter (14) is located inside of the oil line connection at oil tank. The filter should be inspected periodically and cleaned if necessary. The oil pump should not be disassembled for repairs. If it is not working properly, it should be replaced.

Pumps are calibrated differently for the 175 cc and the 250 cc models because of the different oil requirements of each. The pump for the 175 cc engine has a "175" stamped on control lever (11); for the 250 cc engine, a "250."

NOTE

The pump has been calibrated to provide proper lubrication (50/1 ratio) when Harley-Davidson "Two Cycle Lubricant" is used. Use of any other kind could cause engine damage.



1. Oil Pump
2. Crankcase
3. Intake Manifold, Engine Cylinder
4. Throttle
5. Control Cable, Carburetor
6. Control Cable, Oil Pump
7. Throttle Control Cable
8. Equalizer
9. Ball, Check
10. Oil Screen
11. Control Lever
12. Control Cable
13. Oil Line, Pump to Engine
14. Oil Line, Tank to Pump
15. Tank, Oil Supply

Figure 3.37 Lubrication System

PRECAUTIONS to be observed in operation of oil pump:

1. Use only clean Harley-Davidson "Two-Cycle Lubricant" in tank. Dirt or an oil other than that designated above could damage pump and lead to engine failure.

2. Do not turn pump in reverse direction. Correct rotation is set at manufacture. Reversing shaft rotation can damage worm gear.

3. Do not run engine without oil in tank as this will cause pump to heat up and seize which could cause engine damage.

4. Do not run pump with delivery line plugged or pinched.

5. Do not overighten mounting screws. This may cause distortion of pump body casting resulting in binding of internal parts. Screws should be tightened 6-1/2 ft. lbs. (0.9 kgm).

6. Always replace O-ring between pump and crankcase cover anytime pump is removed from engine.

7. Always replace aluminum washers on oil line fittings anytime fittings are disassembled.

ADJUSTING OIL PUMP

Refer to Figure 3.38. Adjustment or pump flow rate is made at control coil adjusting sleeve (1).

Pump adjustment is made with throttle in fully open position. See "CARBURETOR." Remove lubricating oil pump cover. Loosen sleeve lock nut (2).

The flow rate is increased by turning adjusting sleeve counterclockwise. The flow rate is reduced by turning adjusting sleeve clockwise.

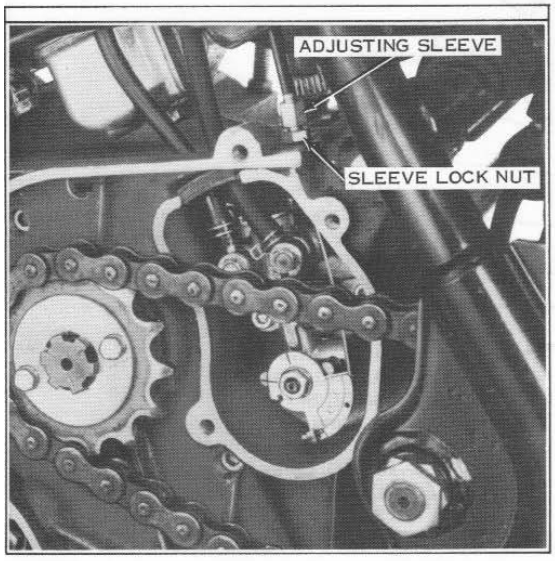


Figure 3.38. Adjusting Lubricating Pump

The pump is properly adjusted when the "MAXIMUM FLOW" mark, located on pump control lever, is in line with the "REFERENCE MARK" on pump body with throttle in fully open position. Oil consumption at this setting should be 3% to 3.5% of gasoline consumption.

REMOVING AND INSTALLING OIL PUMP

Refer to Figure 3.39. If oil pump must be replaced, proceed as follows. Disconnect oil pump control cable. Remove hose clamps (1). Pull oil lines (2) off oil line fittings (3) at pump and plug oil lines with protective plastic caps. Do not remove oil line fittings. If these fittings are removed for any reason, replace aluminum washers (4) with new ones to insure proper seal. Remove mounting screws (5) and (6) and pump (7). Remove and discard O-ring (8). Whenever a pump is removed from an engine, use a new O-ring in reassembly. Assemble new pump and O-ring to engine. Make sure mating faces on pump and crankcase cover are clean. Tighten mounting screws (5) and (6) and torque. Overtightening mounting screws may cause distortion of pump body casting and binding of internal parts. Remove and discard protective plastic caps on oil pump fittings and connect oil lines using hose clamps.

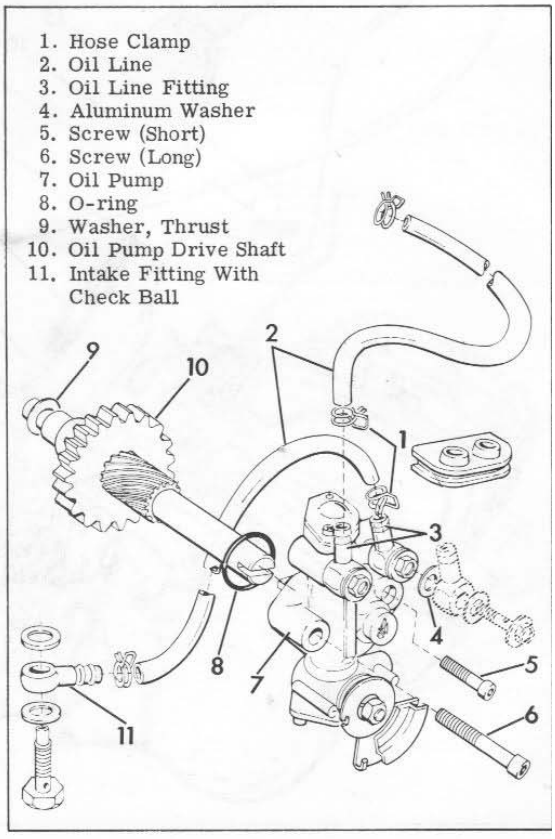


Figure 3.39. Oil Pump and Drive

BLEEDING OIL PUMP

Disconnect oil outlet line from manifold fitting (11). Do not remove fitting from manifold. Drain all gas from gas tank and carburetor and replace it with a small quantity (about a pint) of a 50/1 gas-oil mixture. Fill oil tank with Harley-Davidson "Two-Cycle Lubricant." Start engine and run at idle. Hold oil pump control lever at its maximum flow position until oil flows out of outlet line and is free of air bubbles. Reconnect oil line. Connect control cable to control lever and adjust pump as described under ADJUSTING OIL PUMP. Stop engine. Fill gas tank with straight gas.

OIL TANK

The engine lubricating oil tank (15), Figure 3.37, is an integral part of frame. It is located directly under fuel tank. The tank cap, in addition to closing tank, has a hinged gauge rod attached for checking oil level. The rod extends down the full length of tank and has four marks on it to indicate how full the tank is as shown in Figure 3.40. Always check oil level with cap fully seated in its closed position. The marks indicated are: 3.3 (full), 2.3, 1.3 and .3 pints.

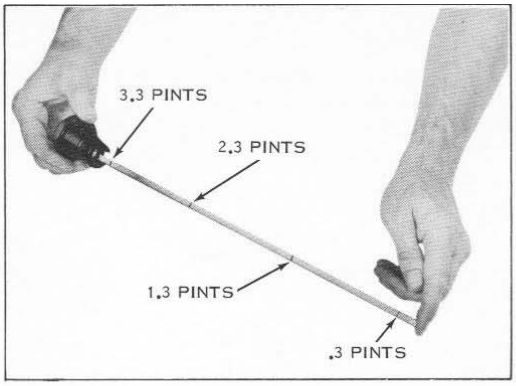


Figure 3.40. Oil Tank Gauge Rod

CLEANING AND INSPECTING

The following maintenance should be done periodically.

Clean oil filter screen located inside oil tank line connection. Clean tank cap vent hole. Check oil lines to see that they are not cracked, kinked or bent which would hinder normal oil flow.

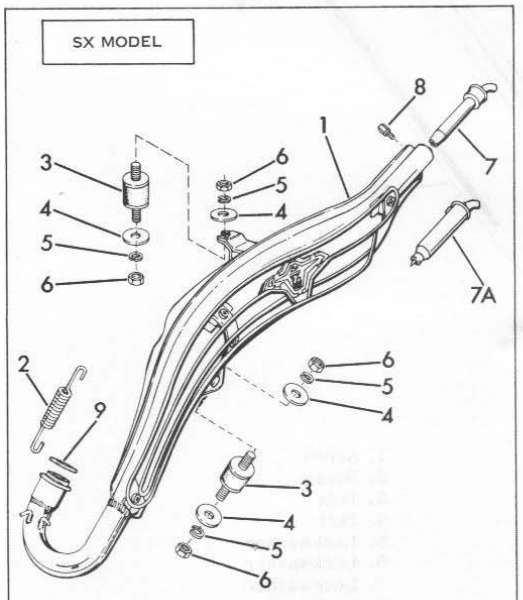
EXHAUST SYSTEM

GENERAL

The carbon deposits must be removed from exhaust system regularly in order to maintain overall performance. There are two ways to do this: decarbonizing exhaust system parts by scrubbing with a wire brush in carbon solvent and/or burning out carbon using an oxyacetylene torch. Both of these methods are covered here.

DISASSEMBLING

Unhook springs (2), Figure 3.41, that anchor muffler (1) to cylinder. Detach hardware that fastens muffler to two rubber supports (3) on frame. Slip end of muffler off engine cylinder exhaust pipe, freeing it completely. Remove core retainer screw (8) so that core (7) is free to come out of muffler shell. With a pliers, turn core 1/4 turn and pull from muffler shell.



1. Muffler
2. Spring
3. Support (2)
4. Washer (4)
5. Lock Washer (4)
6. Nut (4)
7. Core (Early)
7A. Core (Later)
8. Retainer Screw
9. Gasket

Figure 3.41. Exploded View of Muffler, SX Model

CLEANING AND INSPECTING

Using a wire brush and carbon solvent.

With exhaust pipe removed from cylinder exhaust port, move piston to bottom dead center and carefully scrape all carbon from exhaust port using a wooden scraper. Wipe all loose carbon particles from exhaust port. Soak muffler in a carbon solvent and clean with a wire brush.

NOTE

After an extended period of service, heavy deposits of carbon will tend to collect in combustion chamber, causing engine to knock or lose power. This requires disassembly of cylinder for removing carbon from cylinder head, piston and piston ring grooves. See "CYLINDER" section in this manual for procedure to remove cylinder.

Burn out method of cleaning.

This method requires use of an oxyacetylene gas welding torch.

CAUTION

A great deal of heat and smoke will develop using this method. Therefore, the working area should be well ventilated and necessary precautions taken to protect against fire and personal injury from burning.

Secure muffler in a vise. Using a large tip in oxyacetylene torch and a medium hot flame, begin heating spiral formed spark arrestor located inside end of muffler. When spark arrestor begins to glow, turn off acetylene and increase oxygen flow to burn out carbon deposits. A low velocity compressed air jet can be directed into muffler opening alongside oxygen jet to help burning process along. Continue until carbon is all burned out as evidenced by shell ceasing to glow red.

ASSEMBLING

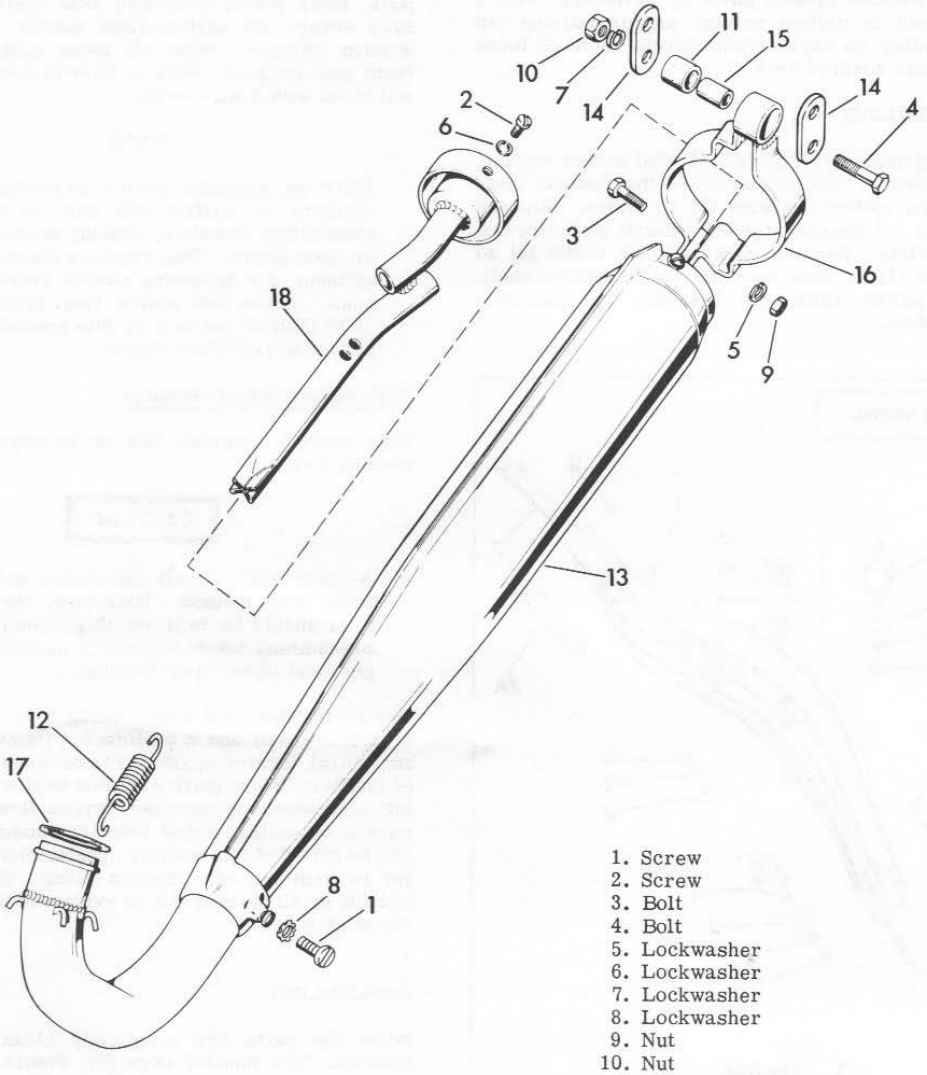
When the parts are completely clean, reassemble muffler. The muffler core (7), Figure 3.41, should be pushed in, twisted 1/4 turn, then aligned in the muffler shell with retainer screw (8) holes lined up. Reinstall retainer screw (8).

NOTE

The muffler is designed to maintain correct back pressure. Any alterations will affect engine performance.

Reinstall muffler on motorcycle in reverse order of disassembly. Check gasket (9) in cylinder seat and replace at this time, if damaged.

SS MODEL



1. Screw
2. Screw
3. Bolt
4. Bolt
5. Lockwasher
6. Lockwasher
7. Lockwasher
8. Lockwasher
9. Nut
10. Nut
11. Rubber Bushing
12. Spring
13. Exhaust Pipe and Muffler Assembly
14. Mounting Plate
15. Steel Bushing
16. Clamp
17. Gasket
18. Spark Arrestor

Figure 3.41A. Exploded View of Muffler, SS Model

AIR CLEANER

GENERAL

Refer to Figure 3.42. The air cleaner element is contained in removable metal case (1) located under seat. It is a reversed flow type with air flow from inside to outside. The assembly is held in place either by two wing nuts (2) or a spring. Built into case is a shield which acts as a silencer to eliminate intake noise. The air cleaner element (3) is a dry, corrugated type.

CLEANING AND REPLACING

Lift up seat and remove case assembly (1), disconnecting rubber connection (4) to carburetor. Remove cover (5) from case by unscrewing wing nut (6). Pull out filter element (3).

Remove loose dirt from inside element by tapping lightly or blow off with air hose. Do not immerse in solvent. Hold element up to light and inspect for damage as indicated by light being visible through holes in paper.

Check gasket (8) attached to cover and replace if needed. When element becomes clogged by dirt or oil to cause restriction, it must be replaced.

IMPORTANT

The air cleaner must be kept clean since a dirt-clogged filter will cause an excessively rich mixture, resulting in loss of engine power, overheating and excessive fuel consumption.

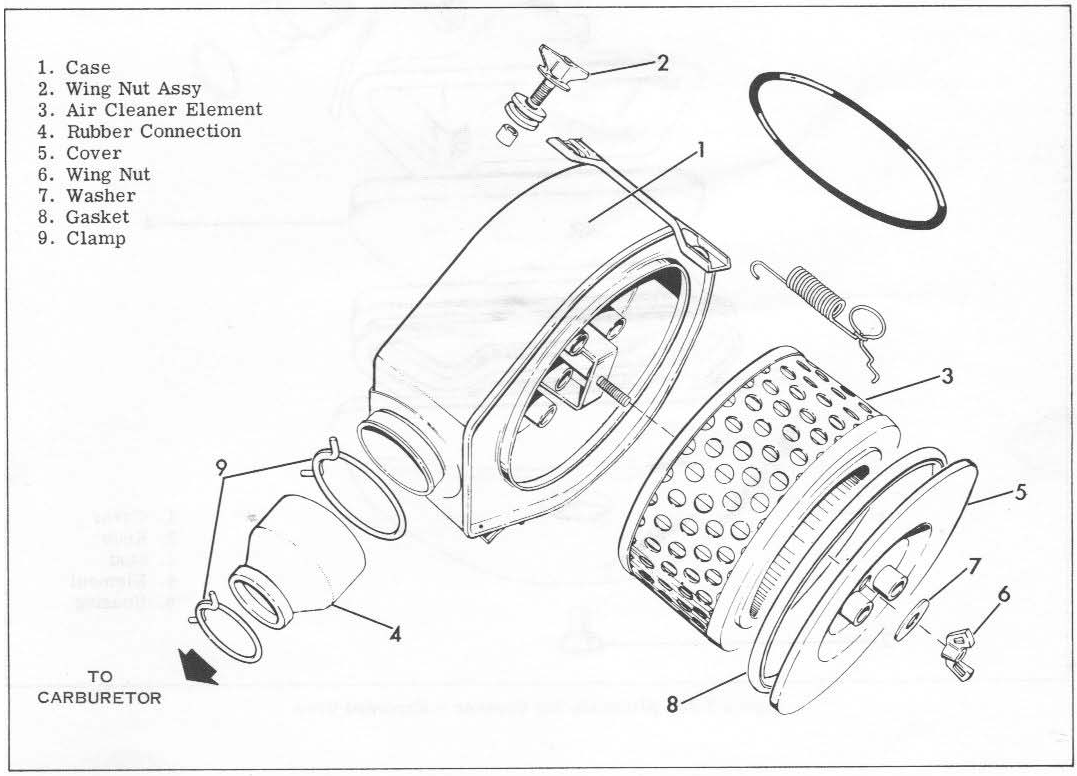


Figure 3.42. Air Cleaner - Exploded View

ALTERNATE AIR CLEANER ARRANGEMENT

This air cleaner is located behind cover (1) as shown in Figure 3.43. To service air cleaner, unscrew knob (2) which retains the cover on stud (3) and remove cover. Withdraw air filter parts, including plastic foam element (4), from housing (5). Wash element in a non-flammable petroleum solvent or detergent and water. Allow to dry thoroughly. Saturate filter element with same weight oil as recommended for engine crankcase. Apply oil to element liberally working in with hands and fingers until element is uniform in color indicating uniform saturation. After excess oil has drained off, replace element on screen and reinstall on engine. Parts must fit air-tight for maximum cleaner efficiency. Do not over-tighten cover knob. End of stud should not extend into slot in knob.

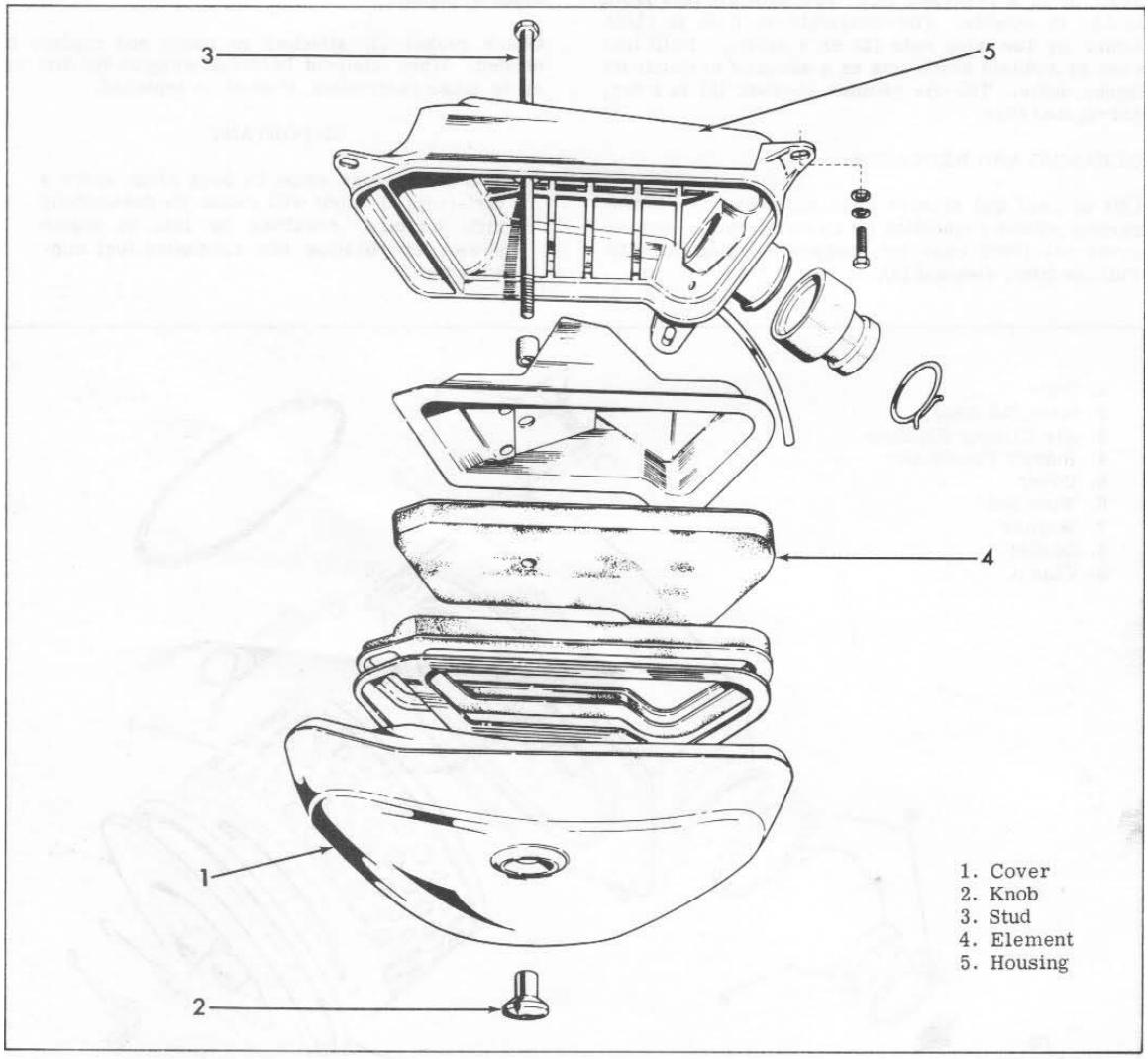
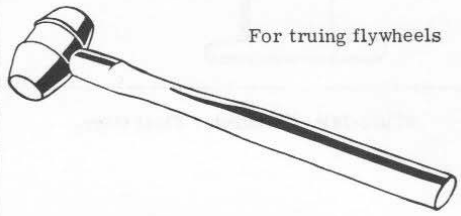


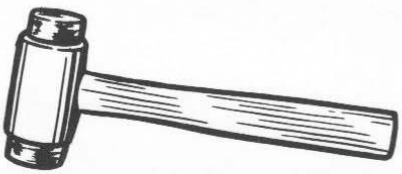
Figure 3.43. Alternate Air Cleaner - Exploded View

TOOLS



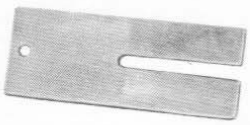
For truing flywheels

95007-16. Copper Hammer.



NOTE: Rawhide Ends (Pair) 95004-16

95003-16. Rawhide Mallet.

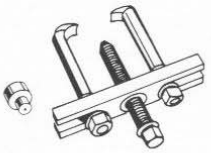


97356-74P. Connecting Rod Holding Tool.

Used to pull clutch hub from clutch.

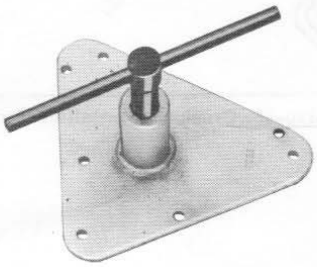
NOTE: Use with: (2 Ea.) 2480561P Studs, 7841P Nuts, Flat Washers.

95960-52A. Clutch Hub Puller.

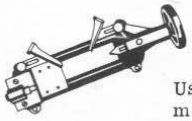


95652-43A Cap

97292-61P. Two Jaw Puller.

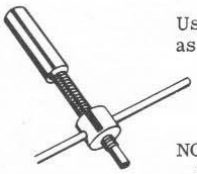


97358-74P. Crankcase Splitting Tool.



Used to true crankshaft alignment. Measures and indicates alignment to .001".

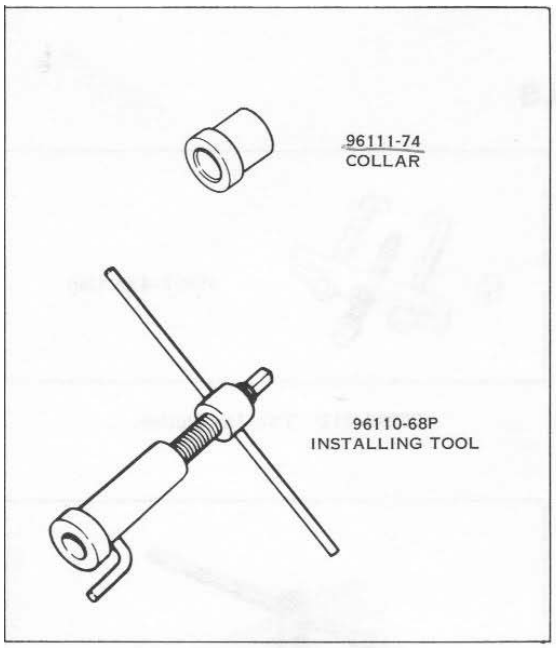
96650-30. Crankshaft Truing Stand.



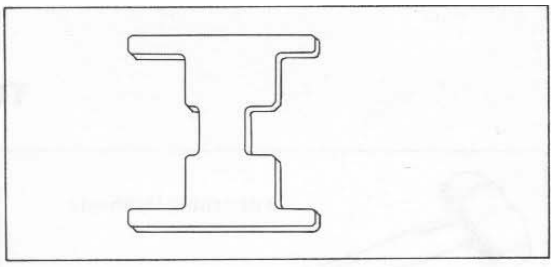
Used for installing crankshaft assembly.

NOTE: Used with spacer 96111-74.

97297-61PA. Crankshaft Installing Tool.



96110-68. Crankshaft Installing Tool.



97362-74P. Carburetor Float Gage.

TRANSMISSION 4

TABLE OF CONTENTS

SPECIFICATIONS

CLUTCH
Type . . . . . Multiple Plate in Oil Bath

	SX-175 (Early)	SX-250 (Early)	All Models (Late)
Capacity . .	123 ft-lbs (17 kgm)	168 ft-lbs (23.26 kgm)	158 ft-lbs (22 kgm)

Spring Pressure Setup . .	243 lbs (110 kg)	221 lbs (100 kg)

DRIVE
Primary Drive . . . . . Helical Gears
Lubrication . . . . . Oil in Crankcase
Final Drive . . . . . Single Chain - 5/8" x 6.5'

DESCRIPTION

The complete power transmission system consists of a clutch, starter, shifter, and transmission components.

Clutch

The clutch is operated by a hand lever on left handlebar. The purpose of the clutch is to disengage and engage engine from rear wheel for starting, stopping and shifting gears.

The clutch is a multiple disc, wet clutch with driven steel plates and lined aluminum drive (friction) plates set alternately in clutch shell. One set of plates are keyed to clutch shell and alternate plates to clutch hub. It is through this arrangement that the engine drives the transmission.

When the clutch is fully engaged, a diaphragm spring forces the plates together and causes them to turn as a unit. The power transmitted through the clutch is then transferred to the rear wheel through the transmission.

Starter

The starter provides a means of starting engine by manual cranking. The starter foot pedal, which is a primary type kick starter, is located on right side of crankcase.

When pedal is moved in a downward stroke, mating ratchet teeth on starter ratchet and gear assembly mesh, transmitting rotary motion to idler gear. The idler gear meshes with small gear on clutch, transmitting force to engine through primary gear.

Shifter

The gear shifter foot pedal is located on left side of crankcase. It actuates shifter arm which rotates gear shifter cam assembly.

The rotation of cam assembly moves various shifter forks to position gears to desired gear ratios. These positions provide five forward gear ratios (or gears) plus a neutral position.

Transmission Components

The transmission is contained in the crankcase. It is a constant mesh type that permits changing ratio of engine speed to rear driving wheel speed in order to meet varying conditions of operations.

The transmission components are: mainshaft, countershaft, and all associated components needed to provide five forward gear ratios (or gears) as shown in Table 4.1.

Table 4.1. Transmission Gear Ratios

Model	GEARS				
	1st	2nd	3rd	4th	5th
SX-175 & (Early) SX-250	$\frac{38}{15}$ = 2.5	$\frac{34}{19}$ = 1.8	$\frac{30}{23}$ = 1.3	$\frac{27}{27}$ = 1.0	$\frac{24}{30}$ = 0.8
(Late) SX-250 & SS-250	$\frac{33}{13}$ = 2.5	$\frac{30}{17}$ = 1.8	$\frac{27}{21}$ = 1.3	$\frac{24}{24}$ = 1.0	$\frac{21}{26}$ = 0.8

CLUTCH

Table 4.2. General Clutch Description

Components	SX-175	SX-250
Type	Wet Multiple Disks	
Control	Lever On Left Side Of Handlebar	
Releasing Disc	Ball & Cam Plate	
Engaging & Disengaging System	Diaphragm Spring	
Load Of Spring In Seat With Clutch Engaged	243 lbs (110 kg.)	221 lbs (100 kg.)
Diaphragm Spring Disengaging Free Play	.08 inch (2 mm)	
Drive Plates	Aluminum With Linings	

CLUTCH

There are two types of clutches in use: an earlier clutch shown in Figure 4.2 and a later clutch shown in Figure 4.3. The paragraphs immediately following cover the first. The second is covered separately in paragraph titled "DISASSEMBLING AND ASSEMBLING LATER CLUTCH," below.

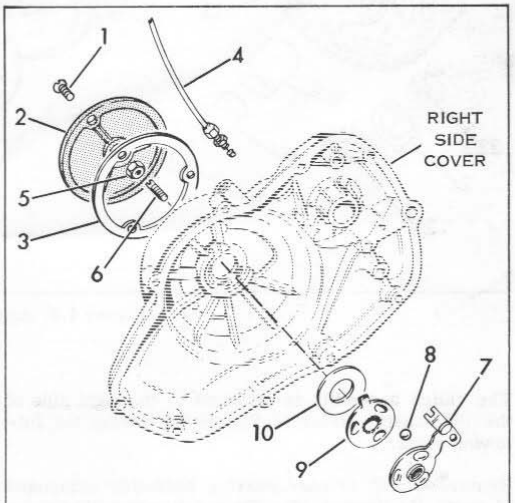
DISASSEMBLING

The clutch can be serviced without removing engine from motorcycle. Simple adjustments can be made to clutch from the outside. The clutch release mechanism can be adjusted by removing clutch cover (2), Figure 4.1. The complete clutch will be exposed and can be serviced by removal of crankcase right side cover (7), Figure 3.13. Complete disassembly is as follows.

Drain crankcase oil by removing drain plug (1), Figure 3.13.

Remove right side cover by removing screws attaching it to crankcase, then tap cover around edges so that it comes off evenly. Take care not to damage mating surfaces of cover and case during this procedure or oil leaks could result at reassembly.

Disassemble parts attached to right side cover as follows. Loosening nut (5) and unscrewing clutch adjust screw (6) will free clutch release plate (7) and the three balls (8). Release plate (9) will remain attached to right side cover and should not be removed unless it is to be replaced.



1. Screw (2)
2. Cover, Clutch
3. Gasket
4. Cable, Clutch
5. Nut
6. Screw, Clutch Adj.
7. Outer Plate, Clutch Release
8. Ball (3)
9. Inner Plate, Clutch Release
10. Washer

Figure 4.1. Clutch Components

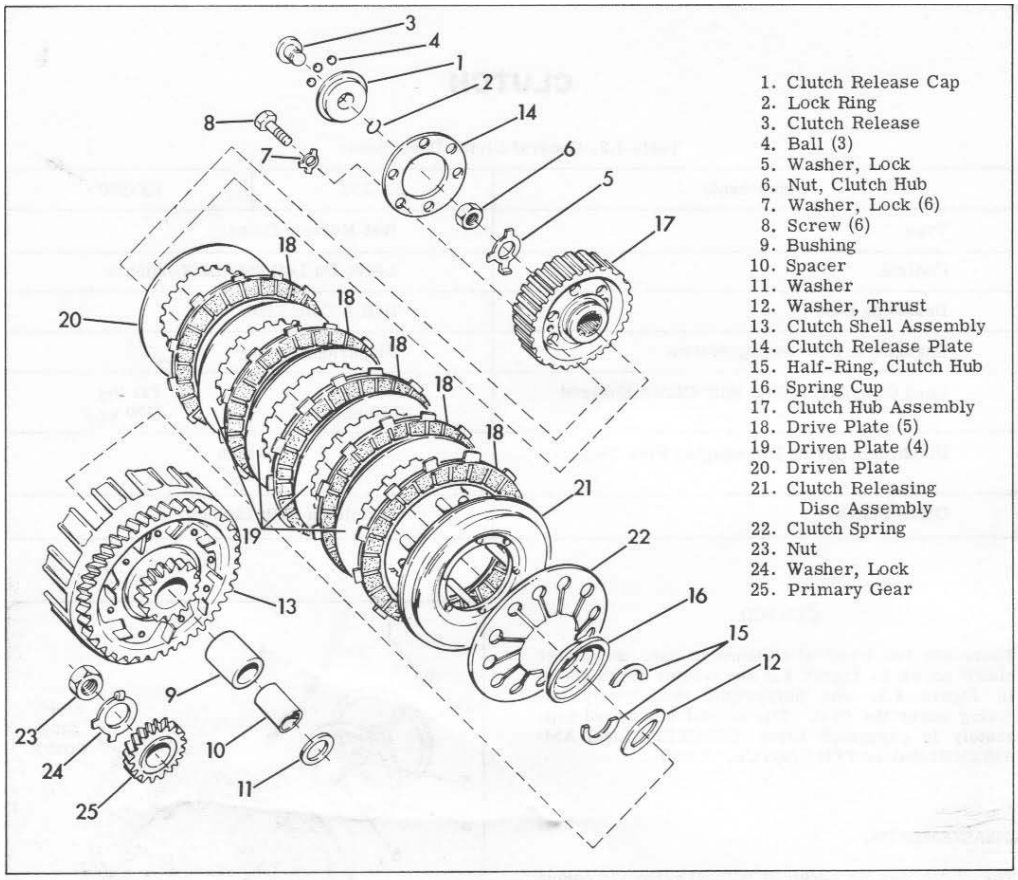


Figure 4.2. Exploded View of Clutch

The clutch assembly is attached to the right side of the mainshaft. Refer to Figure 4.2 during the following steps.

Remove clutch release bearing assembly composed of parts (1) through (4). Do not disassemble unless servicing is required.

Uncrimp tabs of locking washer (5). Jam a rag in gears as shown in Figure 4.4 so gears cannot turn and remove nut (6) from mainshaft. Note that if an impact wrench is used, rag may not be necessary.

Remove two screws (8) so that a puller tool can be used in their place to pull clutch plate assembly from clutch shell assembly (13). The two screws should be directly opposite each other (180° apart) to accommodate tool. Install tool, Part No. 95960-52A, as shown in Figure 4.5 and pull clutch plate assembly off mainshaft.

NOTE

The clutch plate assembly referenced below is made up of parts (15) through (22), Figure 4.2.

After assembly is pulled, remove remaining screws (8) and detach clutch release plate (14).

Disassembly of clutch hub assembly requires Harley-Davidson tool, Part No. 97353-74P, and a press. This assembly comes apart by removing both half-rings (15) from ring slot in clutch hub assembly (17) as shown in Figure 4.6. As shown in figure, press down on clutch spring (22) until half-rings (15) are loose and can be removed. With half-rings (15) removed from hub (17), the parts making up the clutch plate assembly can be separated simply by unstacking all the parts.

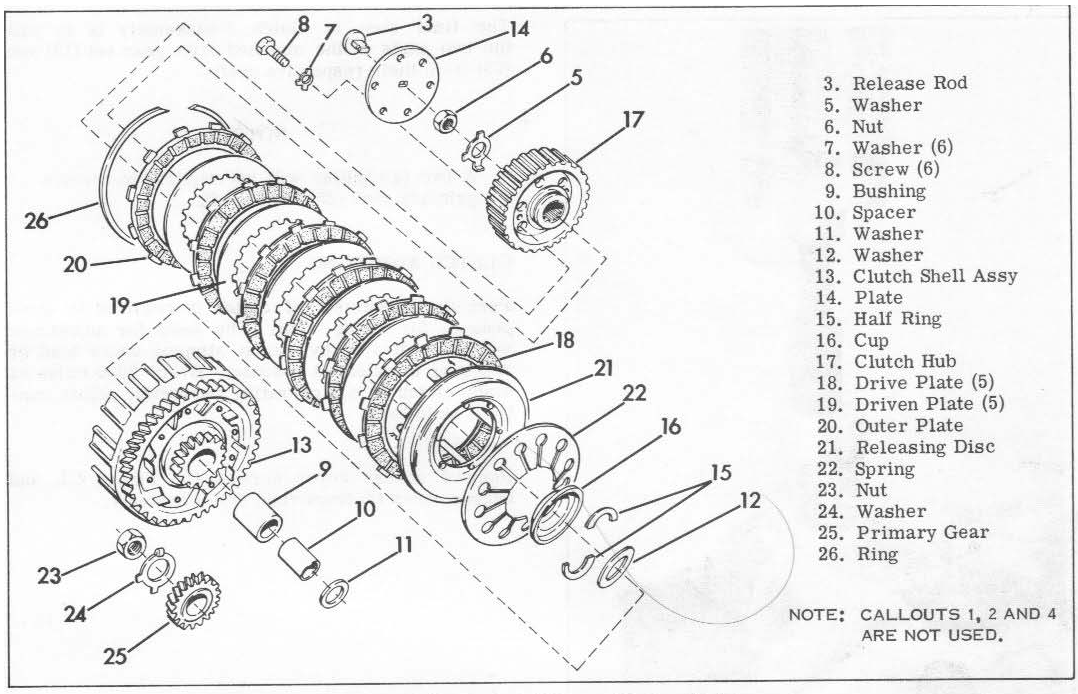


Figure 4.3. Exploded View of Later Clutch

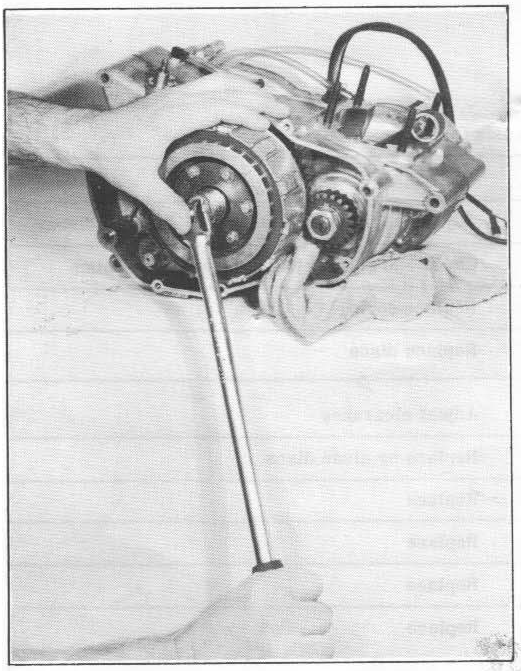


Figure 4.4. Removing Clutch Hub Nut

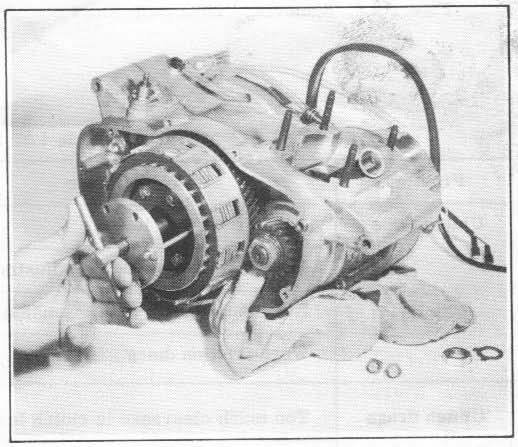


Figure 4.5. Removing Clutch Using Puller Tool

Remove the matched drive gear set which is composed of clutch shell assembly (13) and primary gear (25) as follows.

Uncrimp lock washer (24). Jam a rag in gears, again, as was done above, so gears won't turn. Remove nut (23) from crankshaft.

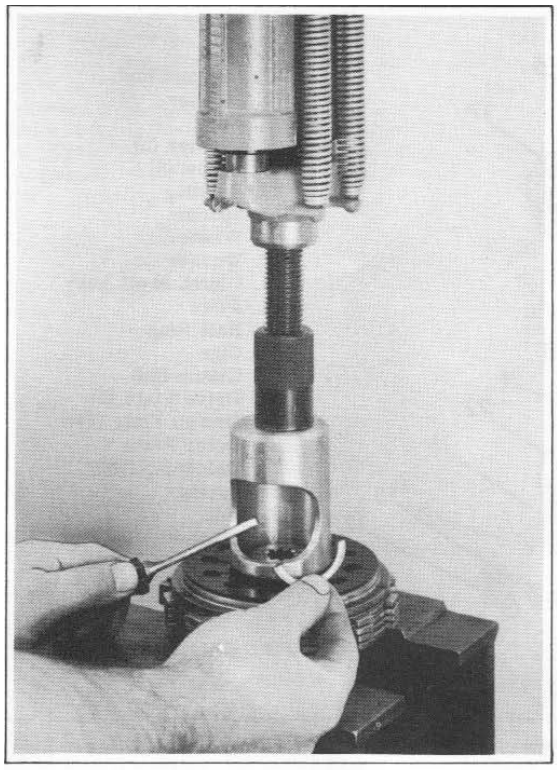


Figure 4.6. Removing Clutch Half-Rings

The final step in clutch disassembly is to pull the two parts of the matched drive gear set (13) and (25) from their respective shafts.

NOTE

A two jaw puller will be required to remove primary gear (25) from shaft.

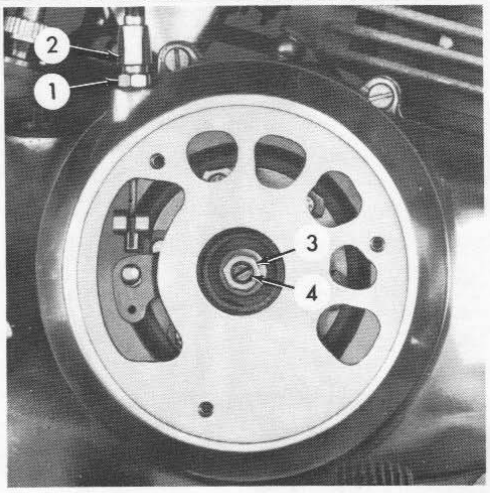
CLUTCH ADJUSTING

Periodic adjustment of clutch is required to compensate for lining wear. The need for adjustment will be indicated by clutch slipping under load or dragging in released position. Every 2000 miles or when clutch is not operating correctly, adjust controls as follows.

Remove access cover screws (1), Figure 4.1, and access cover (2) from right side crankcase.

Table 4.3. Diagnosis Chart

Problem	Probable Cause	Possible Remedy
Clutch Slips	Sticking release lever	Adjust clearance of release lever on handlebar
	Incorrect clutch release adjustment	Check and adjust clutch release mechanism
	Not enough clutch spring tension	Replace spring
	Worn friction discs	Replace discs
Clutch drags	Too much clearance in clutch lever	Adjust clearance
	Sticking discs	Replace or clean discs
	Warped discs	Replace
	Warped releasing disc	Replace
	Warped mainshaft	Replace
	Transmission oil too heavy or wrong type	Replace



1. Clutch Control Cable Adjuster Locknut
2. Control Cable Adjuster
3. Release Adjusting Screw Locknut
4. Release Adjusting Screw

Figure 4.7. Clutch Adjustments

See that clutch cable adjuster on left handlebar is adjusted outward several turns.

Loosen locknut (1), Figure 4.7, on control coil adjusting screw (2) and turn adjuster inward all the way.

Loosen locknut (3) on release screw (4) and turn screw inward until it starts to release clutch (screw turns harder). Then turn screw two turns farther inward. This centers release balls in lowest position on cam.

Turn cable adjuster (2) back out to position where all slack in cable is eliminated (no play at hand lever) and tighten locknut (1).

Adjust clutch releasing screw (4) by backing off until clutch is engaged (screw turns easier). Turn screw inward until point where free play is eliminated (screw turns harder), then back screw out 1/8 turn to establish slight release bearing free play. Check for correct free play at handlebar and retighten locknut (3).

Minor cable adjustment can be made by loosening locknut and turning knurled nut located at clutch handlever on handlebar as shown in Figure 4.8.

If clutch slips under load or drags in disengaged position after free play has been adjusted as outlined above, it must be taken apart for inspection of discs which may be worn and require replacement.

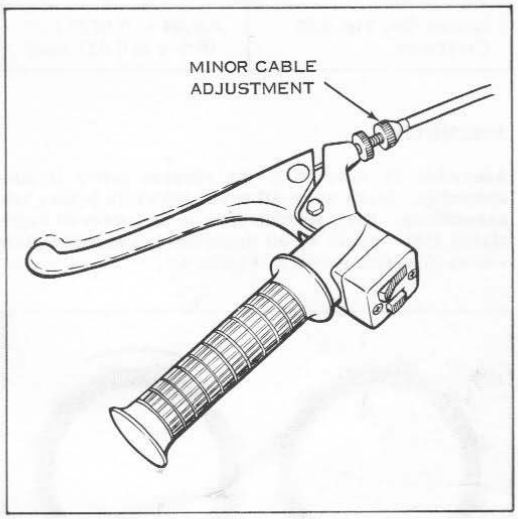


Figure 4.8. Clutch Adjustment at Handlebar Control

CLEANING AND INSPECTING

Referring to Figure 4.2, check drive plates (18). Plates that are badly worn, grooved or scored should be replaced. Wash plates out in solvent to remove dirt and blow dry with compressed air; then soak in clean oil.

Examine driven plates (19) for excessive wear and damage. Plates that are badly worn, grooved, warped, burned or scored should be replaced. File off any burrs on teeth of plates.

Inspect clutch shell assembly (13) for worn teeth. When replacing shell assembly, primary gear (25) must be replaced also because they are a matched set.

Check bushing (9), spacer (10) and washer (11); if worn or blued, replace them.

Check clearances and end play of clutch shell assembly (13) and associated parts. They should correspond to values shown in table 4.4.

Table 4.4. Shell-Gear Assembly Clearances

Component	Assembly Clearance
Clutch Shell Assembly (13, Fig. 4.2) End Play	0.004 to 0.008 inch (0.1 to 0.2 mm)
Bushing (9, Fig. 4.2) Clearance	0.0004 to 0.0012 inch (0.01 to 0.03 mm)
Spacer (10, Fig. 4.2) Clearance	0.0004 to 0.0020 inch (0.009 to 0.025 mm)

ASSEMBLING

Assembly is essentially the reverse order of disassembly. Make sure all parts are clean before reassembling. Give special care to assembly of drive plates (18). Angle of oil drain notches should follow rotary direction shown in Figure 4.9.

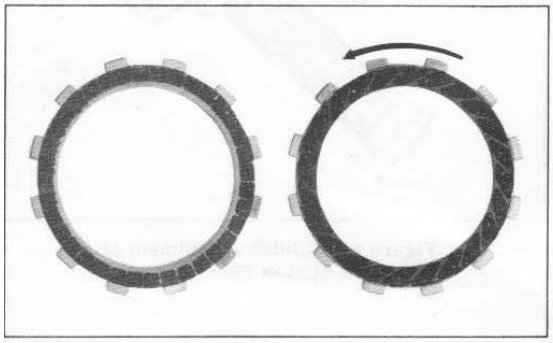


Figure 4.9. Clutch Plate Oil Drain Notches

NOTE

Some drive plates (18) have drain notches radiating directly outward with no angle. These require no special positioning.

Tool, Part No. 97353-74P, and the press are again used to install half-rings (15) in hub (17).

DISASSEMBLING AND ASSEMBLING LATER CLUTCH

The later clutch has a large retaining ring which holds the lined plates in place. It is serviced basically in the same way as the one described above. The differences, which are mostly in disassembling and assembling, are covered here. Remove and disassemble the clutch as follows.

Drain crankcase oil by removing drain plug (1), Figure 3.13. Then, remove right side crankcase cover. Tap cover around edges with rawhide hammer so that it comes off evenly. Take care not to damage mating surfaces of cover and case during this procedure or oil leaks could result at reassembly.

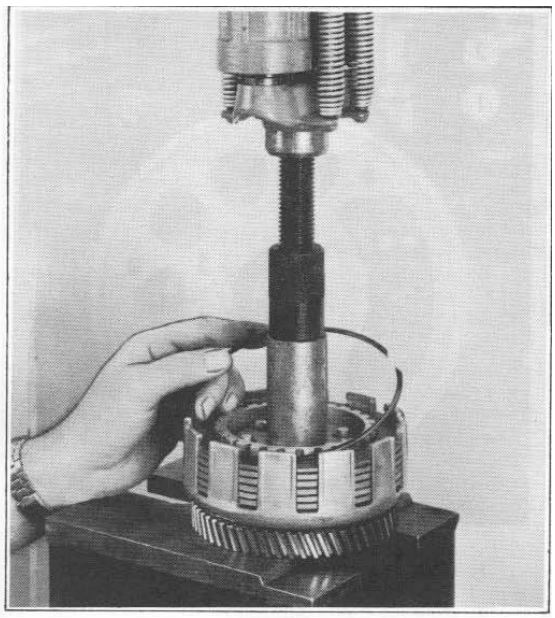


Figure 4.9A. Disassembling Later Clutch

NOTE

At this point, plates (18), (19) and (20) can be removed and replaced without assembled clutch being removed by using tool, Part No. 97354-74P, if this tool is available. Refer to paragraph title "REMOVING PLATES OF LATER CLUTCH USING SPECIAL TOOL," below. If tool, Part No. 97354-74P is unavailable, proceed as follows.

Detach plate (14), Figure 4.3, by removing six screws (8) along with lock tab washers (7).

Uncrimp tabs of locking washer (5). Jam a rag in gears as shown in Figure 4.4 so gears cannot turn and remove nut (6) from mainshaft. Note that if an impact wrench is used, rag may not be necessary.

Remove assembled clutch by sliding it off shaft. Note that, if assembly is tight on shaft, a puller tool can be used as shown in Figure 4.5.

Remove ring (26) from slot in clutch shell assembly (13) as follows. Temporarily remount plate (14) using two of screws (8). Place assembled clutch in press as shown in Figure 4.9A. Then, using a tubular spacer as shown, compress assembly until ring (26) can be removed. Remove ring (26). Back off press and remove assembly from press.

With ring (26) removed, plates (18) and (19) can be removed and replaced without further disassembly.

Again, detach plate (14) and simply slip plates (18) and (19) off splines of clutch hub (17) and out of clutch shell assembly (13).

As a final step in disassembling, separate clutch releasing disc (21) from clutch hub (17) by removing half rings (15) as follows. Place above assembled parts into hydraulic press with clutch spring (22) facing up. Using tool, Part No. 97353-74P, compress spring (22) and remove half rings (15) as shown in Figure 4.6.

This completes disassembly. Assemble in reverse order of above, taking care to assemble outer plate (20) correctly. Outer plate (20) has a lining on one side only. Mount plate so that this lining faces inward. When assembling complete clutch, make sure washer (12) is aligned with the mounting hole before compressing and reinstalling ring (26). Note, also, that primary gear (25) and clutch shell assembly (13) are a matched set and they both must be replaced together. Reinstall right side crankcase cover and replace crankcase oil.

REMOVING PLATES OF LATER CLUTCH USING SPECIAL TOOL

Drain crankcase oil and remove right side cover from engine. Attach tool, Part No. 97354-74P, to crankcase. Utilizing tool, compress plate (14) inward until ring (26) can be removed. Remove ring (26) from slot in clutch shell assembly (13). Remove the tool. With ring (26) removed, plates (18), (19), and (20) can be removed and replaced without further disassembly.

Replace plates (18), (19), and (20) as required and reassemble by remounting tool and compressing plate (14) again so that ring (26) can be put back in place in slot in clutch shell assembly (13). Reinstall right side crankcase cover and replace crankcase oil.

STARTER

GENERAL

The kick starter works directly on the small gear located on clutch shell assembly (13), Figure 4.2, through idler gear (3), Figure 4.13, on the countershaft. This permits engine to be started even when transmission is in gear, provided clutch is disengaged.

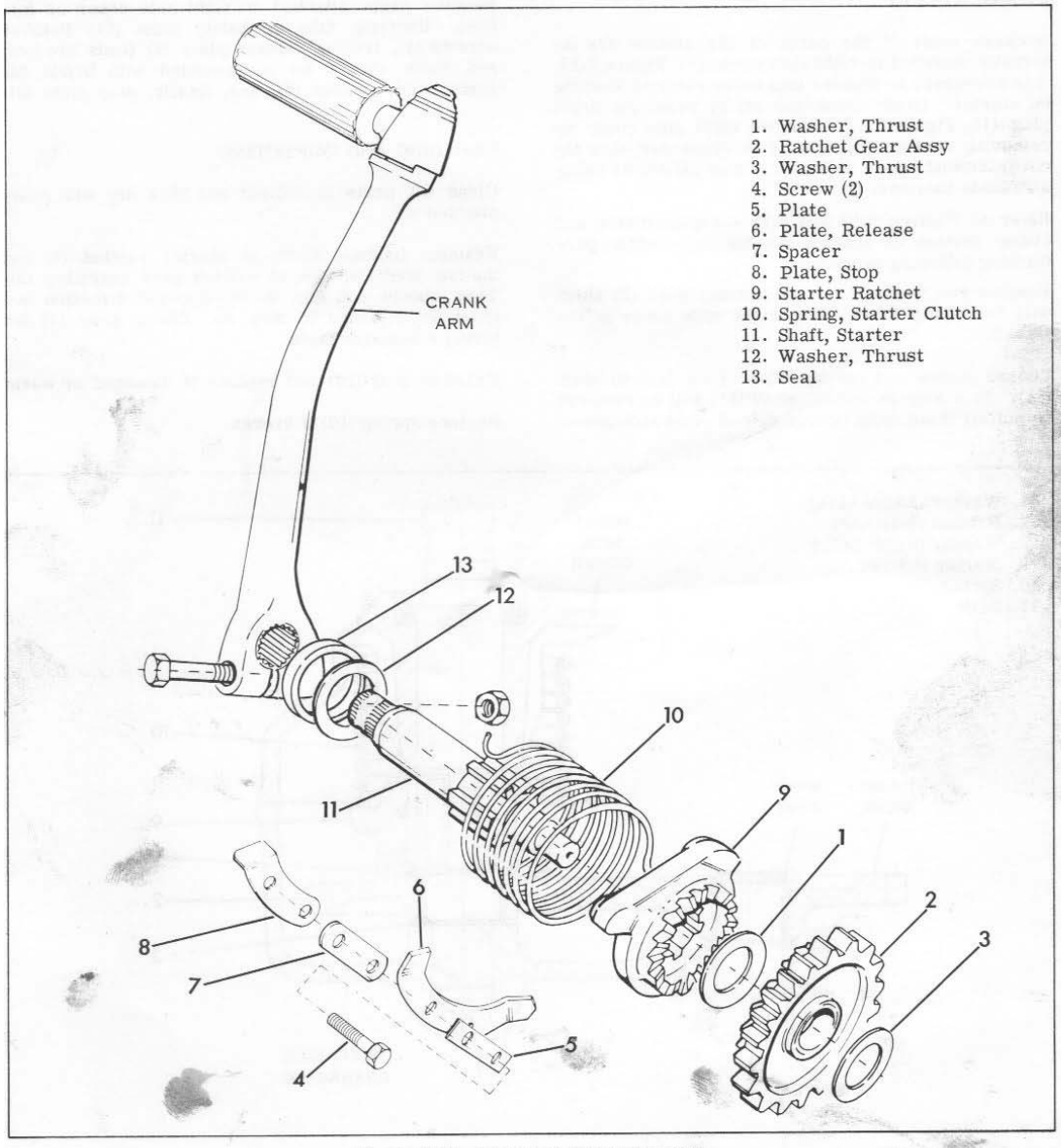


Figure 4.10. Exploded View of Starter

when starter pedal is either completely down or completely up, starter is disengaged by release plate (6), Figure 4.10. This is due to the cam action of starter ratchet (9) riding on the formed ends of plate (6), positively disengaging starter clutch.

The starter crank arm has a spring return and the inclined tooth arrangement of starter parts (9) and (2) allows the arm to return to its original upward position without kickback after engine starts.

DISASSEMBLING

Because most of the parts of the starter are internally mounted in right side cover (7), Figure 3.13, it is necessary to remove this cover prior to working on starter. Drain crankcase oil by removing drain plug (1), Figure 3.13. Remove right side cover by removing screws attaching it to crankcase, then tap cover around edges so that it comes off evenly using a rawhide hammer.

Refer to Figures 4.10 and 4.11 — exploded view and cross section of starter mechanism — while performing following procedure.

Remove two washers (1) and ratchet gear (2) which will be laying loose when right side cover is removed.

Loosen screw and nut securing crank arm to shaft (11). In a step to follow, shaft (11) will be removed by pulling it out from inward side of right side cover.

Holding starter ratchet (9) so that it does not spring out, disengage from release plate (6) by turning crank arm down in direction normally used in starting. Remove starter ratchet (9) along with spring (10) from shaft (11).

Remove crank arm from shaft (11) and pull shaft (11) out from inward side of right side cover.

Remove parts attached to right side cover as follows. Uncrimp tabs on safety plate (5). Remove screws (4), freeing release plate (6) (ends are bent and plate should be reassembled with bends the same way), spacer (7), and, finally, stop plate (8).

CLEANING AND INSPECTING

Clean all parts in solvent and blow dry with compressed air.

Examine inclined teeth on starter ratchet (9) and mating teeth on face of ratchet gear assembly (2). They should not slip in the opposed direction and must be replaced if they do. Check gear (2) for worn or damaged teeth.

Examine seal (13) and replace if damaged or worn.

Replace spring (10) if broken.

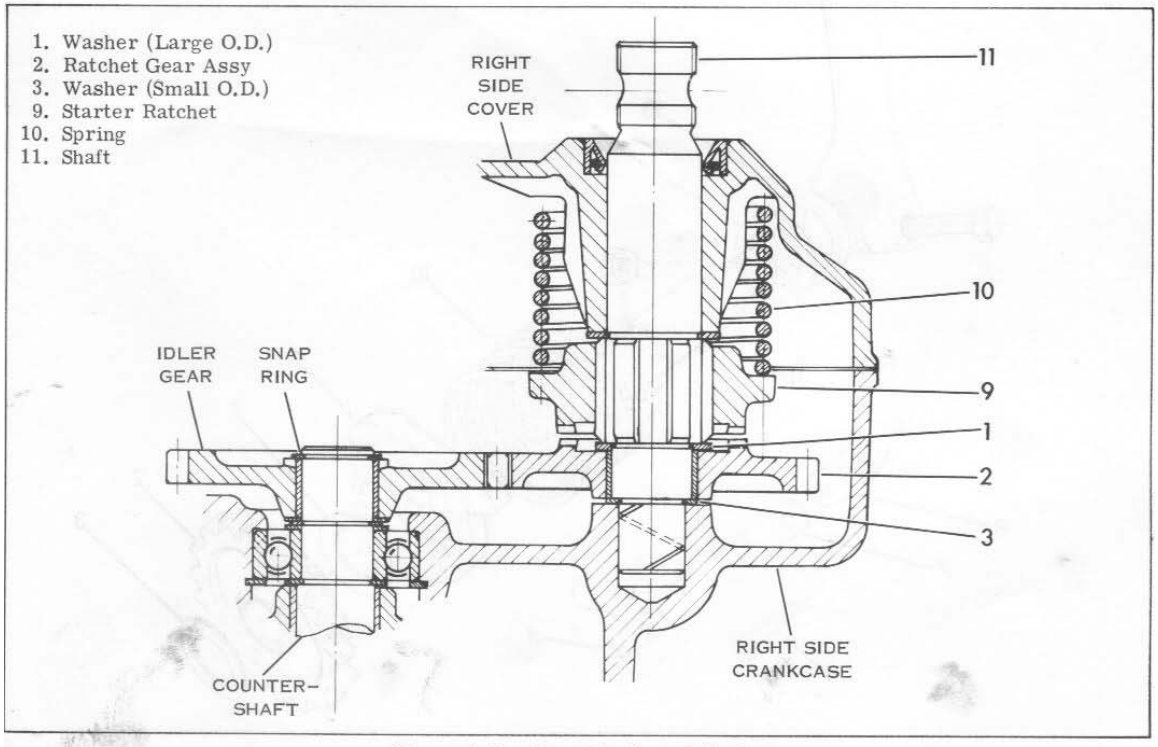


Figure 4.11. Cross Section of Starter

ASSEMBLING

Assemble in reverse order of disassembly, with following special steps being taken.

Use starter crank arm as follows to wind up and load spring (10) and to set starter ratchet (9) back in position under release plate (6).

Insert shaft (11) into place in right side cover and temporarily attach starter crank arm in upward position. Place spring (10) on shaft (11) with larger hooked end of spring facing in. Catch this hook on projection on right side cover.

Position starter ratchet (9) on shaft (11), match splines, and then slide ratchet partially on shaft. When placing ratchet (9) on shaft (11), make sure other bent end of spring (10) catches on projection on ratchet (9).

Next, push ratchet (9) further on shaft (11) while at the same time rotating shaft (11) with crank arm. Rotate until ratchet (9) again catches under plate (6) in same position it was in originally prior to disassembly.

Remove crank arm and reposition it upward as it should be for final assembly.

Reassemble remaining parts in reverse order of disassembly. Re-crimp tabs on safety plate (5) against screws (4) to hold screws in place.

When reassembling, make sure clearances correspond to those given in Table 4.5.

Table 4.5. Starter Clearances

Component	Assembly Clearance	
	Inches	Millimeters
Starter Shaft End Play	.006 to .008	.15 to .20
Ratchet Assy End Play	.006 to .012	.15 to .30
Clearance - Ratchet & Starter Shaft	.0012 to .027	.030 to .68
Clearance - Idle Gear on Countershaft	.0006 to .002	.015 to .04
End Play - Idle Gear on Countershaft	.008 to .02	.2 to .47

SHIFTER

DISASSEMBLING

In order to disassemble shifter parts, engine must be partially disassembled and crankcase split open. Refer to engine section under paragraphs, "ENGINE REMOVING AND INSTALLING" and "CRANKCASE," for these procedures.

Pull out shifter shaft (1), Figure 4.12, with parts attached from right crankcase. Remove retaining ring (4) from groove and slide remaining parts off shaft. Slide return spring (3) off other end of shaft.

Pull fork pin (23) out of hole in right side crankcase. This will free gear shifter forks (24) and (25).

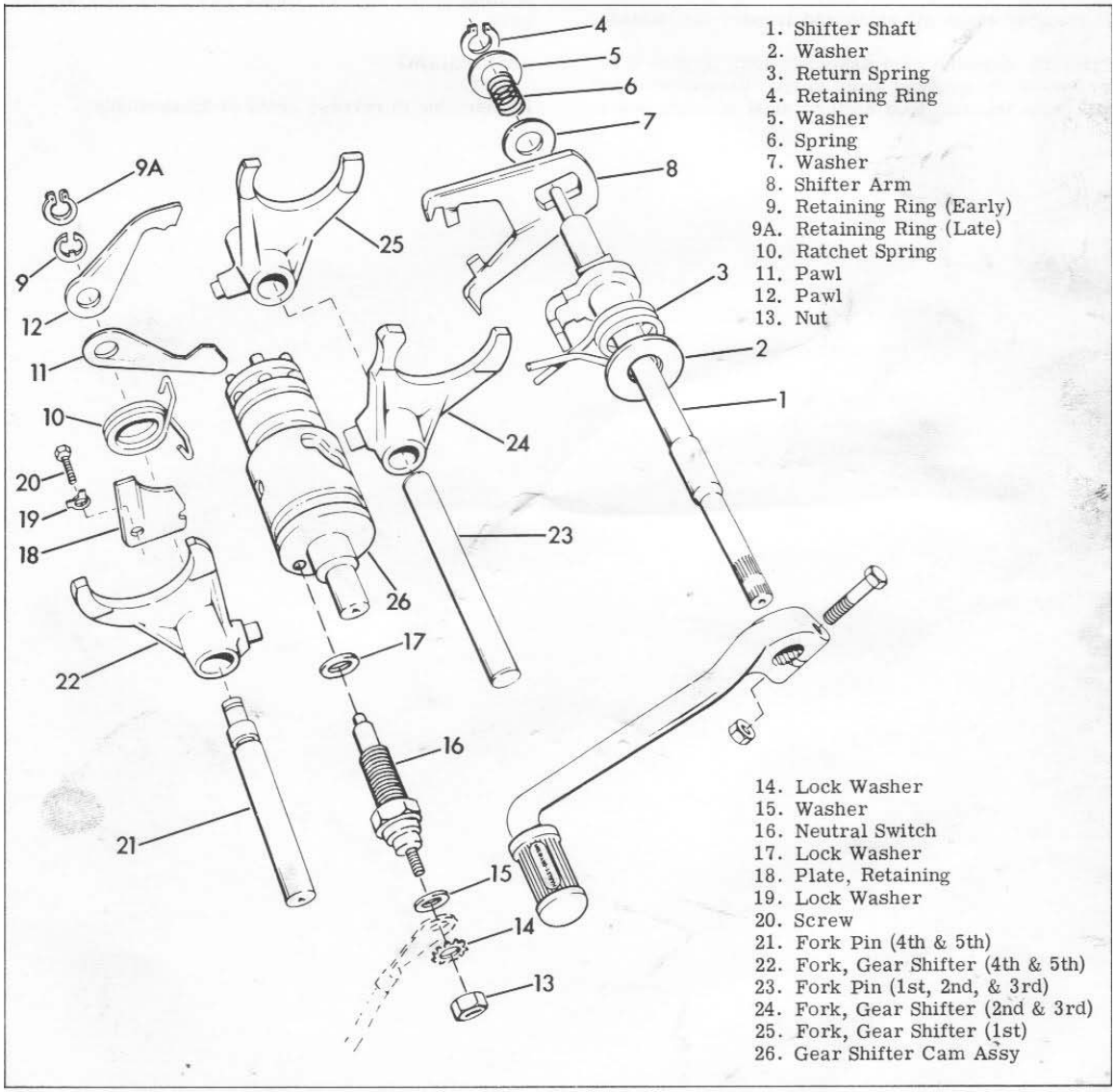


Figure 4.12. Shifter Parts

Remove retaining ring (9) from end of fork pin (21) which projects through right side crankcase. Pry pawls (11) and (12) apart and away from cam assembly (26), then slide them off fork pin along with spring (10).

Remove retaining plate (18) by removing screw (20). Removal of this plate will free cam assembly (26) and fork pin (21). From the inward side of the right side crankcase, pull both of these parts from their respective holes.

Slide fork (27) off fork pin (21) which completes the disassembly of shifter parts.

CLEANING AND INSPECTING

Thoroughly clean all parts and inspect for damage.

Carefully examine cam assembly (26), Figure 4.12, for worn or grooved cam slots. Excessive wear will make transmission hard to shift through gears. Also, check pins in end of cam (26) for proper length. They all should extend out a uniform 0.16 inch (4 mm) or gears will not engage properly. If for any reason the length cannot be maintained, replace the cam.

Check forks (22), (24), and (25) for bent condition or deep grooves worn into fork fingers caused by excessive thrust action of gears. Also check cam pins of each fork for wear. Replace any of these parts if required.

Replace any weak or broken springs (3), (6), or (10).

Check prongs on arm (8) and replace if bent or worn. Note that these prongs cause the actual shifting of gears. Any defects here will show up in poor gear shifting performance. Check pawls (11) and (12) for wear.

ASSEMBLING

Reassemble in reverse order of disassembly.

TRANSMISSION COMPONENTS

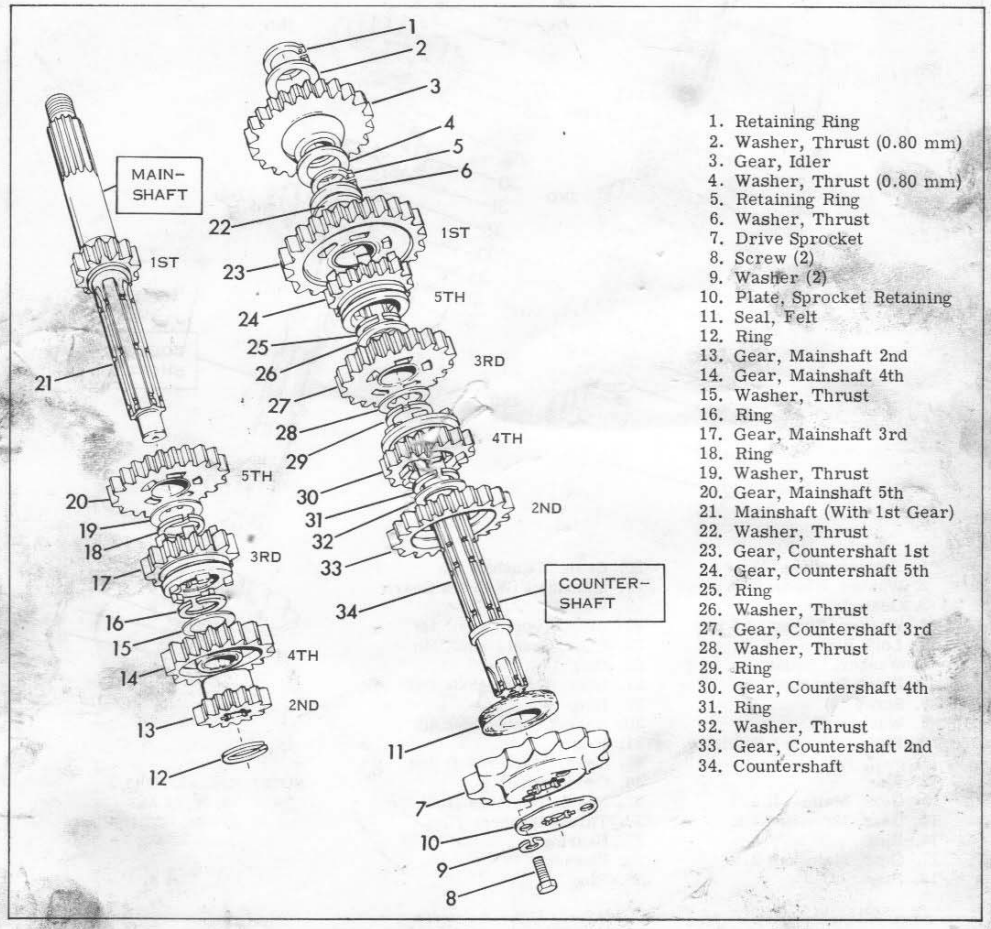
TRANSMISSION

There are two types of transmissions in use: a bushing type (SX-175 & early SX-250) as shown in Figure 4.13 and a roller bearing type (later SX-250 only) as shown in Figure 4.13A. The paragraphs immediately following cover the first. The second is covered separately in paragraph titled "DISASSEMBLING AND ASSEMBLING LATER TRANSMISSION," below.

DISASSEMBLING

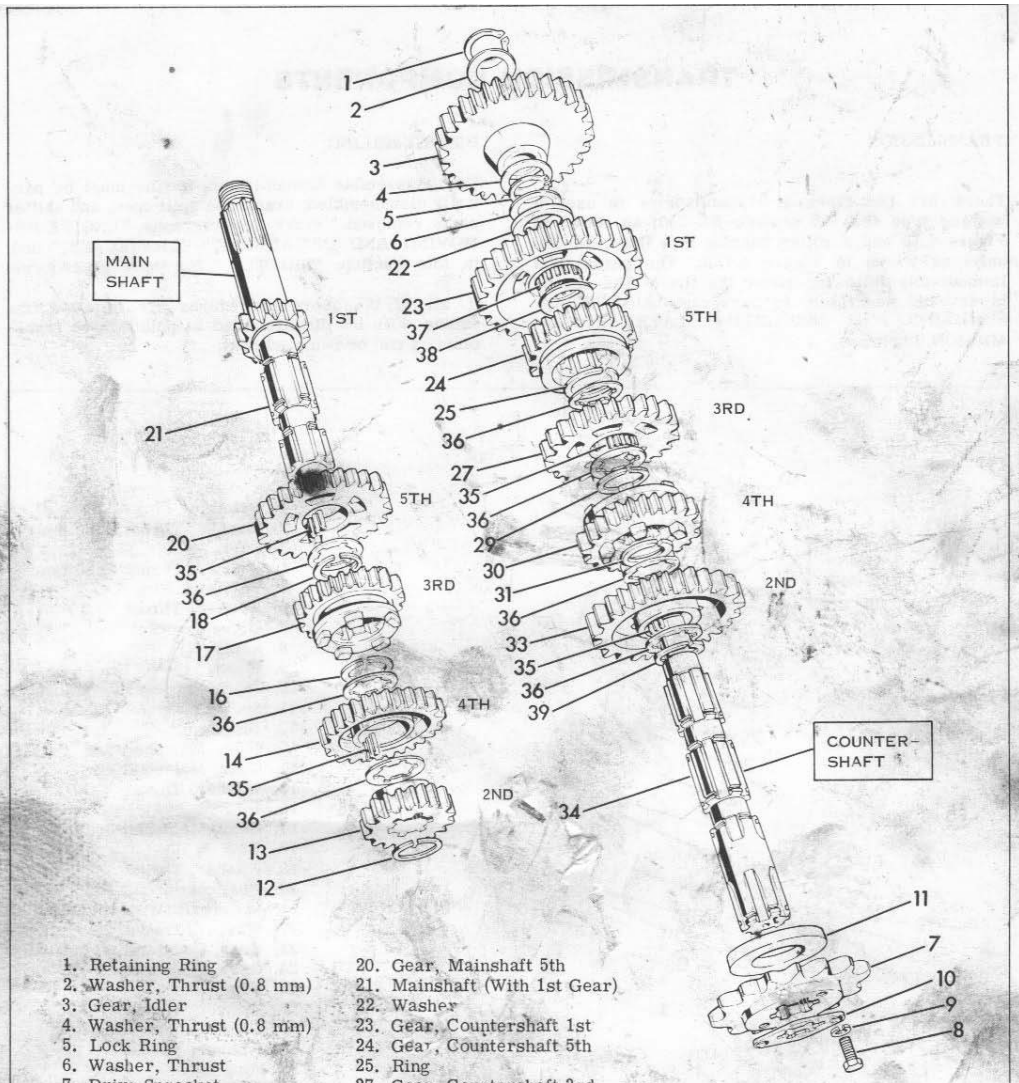
To disassemble transmission, engine must be partially disassembled, crankcase split open, and shifter parts removed. Refer to paragraphs, "ENGINE REMOVING AND INSTALLING," "CRANKCASE," and, in this section, "SHIFTER," for these procedures.

If all of the above procedures are followed, the engine will be disassembled to point where transmission can be removed next.



1. Retaining Ring
2. Washer, Thrust (0.80 mm)
3. Gear, Idler
4. Washer, Thrust (0.80 mm)
5. Retaining Ring
6. Washer, Thrust
7. Drive Sprocket
8. Screw (2)
9. Washer (2)
10. Plate, Sprocket Retaining
11. Seal, Felt
12. Ring
13. Gear, Mainshaft 2nd
14. Gear, Mainshaft 4th
15. Washer, Thrust
16. Ring
17. Gear, Mainshaft 3rd
18. Ring
19. Washer, Thrust
20. Gear, Mainshaft 5th
21. Mainshaft (With 1st Gear)
22. Washer, Thrust
23. Gear, Countershaft 1st
24. Gear, Countershaft 5th
25. Ring
26. Washer, Thrust
27. Gear, Countershaft 3rd
28. Washer, Thrust
29. Ring
30. Gear, Countershaft 4th
31. Ring
32. Washer, Thrust
33. Gear, Countershaft 2nd
34. Countershaft

Figure 4.13. Exploded View of Transmission (Bushing Type)



1. Retaining Ring
2. Washer, Thrust (0.8 mm)
3. Gear, Idler
4. Washer, Thrust (0.8 mm)
5. Lock Ring
6. Washer, Thrust
7. Drive Sprocket
8. Screw (2)
9. Washer (2)
10. Plate, Sprocket Retaining
11. Seal, Felt
12. Ring
13. Gear, Mainshaft 2nd
14. Gear, Mainshaft 4th
16. Ring
17. Gear, Mainshaft 3rd
18. Ring
20. Gear, Mainshaft 5th
21. Mainshaft (With 1st Gear)
22. Washer
23. Gear, Countershaft 1st
24. Gear, Countershaft 5th
25. Ring
27. Gear, Countershaft 3rd
29. Ring
30. Gear, Countershaft 4th
31. Ring
33. Gear, Countershaft 2nd
34. Countershaft
35. Needle Bearings (100)
36. Thrust Washers (7)
37. Bearing
38. Washer
39. Ring

NOTE: CALLOUTS 15, 19, 26, 28 AND 32 ARE NOT USED.

Figure 4.13A. Exploded View of Later Transmission (SX-250, Roller Bearing Type)

The transmission consists, basically, of mainshaft, countershaft, and associated sets of gears from 1st through 5th. Remove assembled main and countershafts together as follows. Reference will be made to both Figures 3.13 and 4.13 during following step. From outward side of right side crankcase (27), Figure 3.13, simultaneously tap out both mainshaft (21), Figure 4.13, and countershaft (34), Figure 4.13, from bearings (33) and (35), respectively, Figure 3.13. Tap each shaft end alternately so they both come out evenly at same time. Support assemblies by hand as they come out so they do not drop and become damaged.

Disassemble both shafts in same manner as follows. Alternately remove each gear snap ring, then gear, until all rings and gears are removed from each shaft. Note that unless rings must be reused — possibly because new rings are not available — they can be removed most easily by destroying. These rings are (12), (16), (18), (25), (29), and (31).

It is suggested that each piece be laid out in the exact order it is removed. Note, too, exactly how it was oriented when mounted. In this way, the parts can be put back together in exactly the same order and positioned in exactly the same way.

CLEANING AND INSPECTING

Thoroughly clean all mainshaft and countershaft parts in solvent. Blow parts dry with compressed air. Inspect each gear for worn or damaged teeth dogs and slots. Inspect shaft splines for excessive wear. Replace any of these parts as needed.

Check the grooves in gears (17), (24), and 31), Figure 4.13, and make sure they make contact with the shifter fingers. The grooves should be smooth and free of irregularities.

Inspect bearings in crankcase sides in which shafts rotate. Replace any that are found defective.

ASSEMBLING

Assembling transmission requires not only correctly putting parts back together again but checking to see they work as they should. Of particular importance is that gears mesh, shafts rotate freely and shifter functions to change gears through all five positions plus neutral.

Assembly is the reverse order of disassembly, except for using tool, Part No. 97361-74P, to aid in installing new gear snap rings as shown in Figure 4.14.

Tool, Part No. 97361-74P, is made up of a pronged inner part and an outer sleeve. Slip pronged inner part on shaft between splines. Place new gear snap ring on end. Place outer sleeve on ring and tap ring so it slides down shaft until it snaps in place in its groove in shaft.

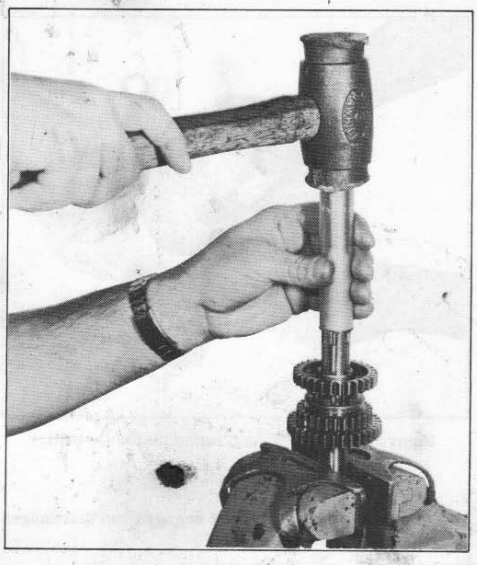


Figure 4.14. Assembling Gear Snap Ring on Shaft

Do this progressively, after placing each gear on shaft, in turn, from innermost to outermost ring until all gears, washers, and snap rings are in place as shown in Figure 4.13. Check clearances given in Table 4.6 during assembly. Note that variable thrust washers control spacing and end play.

Table 4.6. Transmission Component Clearances

Component	Assembly Clearance
Clearance - Gears in Neutral Position	.002 to .0024 inch (.037 to .060 mm)
End Play - Gears in Neutral Position	.004 to .016 inch (.1 to .4 mm)
End Play - Selector Shaft	.006 to .012 inch (.15 to .30 mm)

Reinstall assembled shafts into right side crankcase by holding shafts together in their correct relative position and alternately tapping each until they seat back in place against bearings.

Reinstall following shifter parts so gearing can be given preliminary check before closing crankcase. Referring to Figure 4.12, these parts are (18) through (26). With these parts in place, tool, Part No. 97359-74P, can be used as shown in Figure 4.15. With tool placed on cam assembly (26), Figure 4.12, as shown, rotate cam assembly through all gear po-

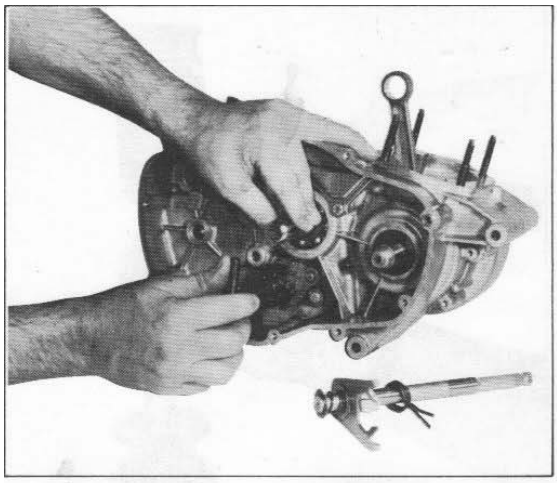


Figure 4.15. Checking Transmission Operation

sitions to see that each gear engages and disengages freely while turning main shaft.

When it is determined by this preliminary check that gearing is okay, remaining shifter parts can be assembled and crankcase then closed. Note that after crankcase has been closed, gearing should be checked again using same procedure.

One final check should be made after closing crankcase to see that there is some play in transmission parts when in gear. Grasp one of shifter pins with a pliers and see that cam assembly moves axially.

LUBRICATION

Whenever crankcase is split, the transmission lubrication must be replaced when crankcase is reclosed. With motorcycle standing straight up, remove oil level plug on top of crankcase on right side of motorcycle and add oil as necessary to restore oil level to upper mark on gage rod attached to plug.

Use Harley-Davidson grade 75 oil in warm weather or 58-W oil in cold weather. The capacity is 2-1/2 pts of oil to fill to upper mark on rod with gage rod not threaded in.

Re-insert and tighten oil level plug.

CAUTION

Do not allow oil level to fall below lower mark on gage rod, for lack of oil will damage transmission.

NOTE

After filling transmission and before start-up, lay motorcycle down on each side so oil flows to and lubricates all parts of the transmission.

DISASSEMBLING AND ASSEMBLING ROLLER BEARING TRANSMISSION (LATER SX-250)

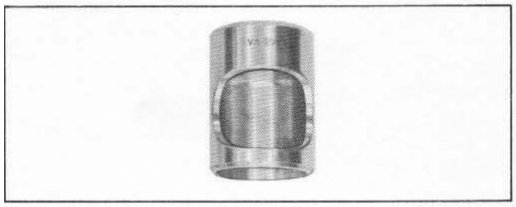
The later transmission is taken apart and put back together using basically the same procedure as described in above paragraphs. The differences are in handling the bearings that are a part of this assembly. As shown in Figure 4.13A, there are five locations where bearings are used. Bearing (37) is a cage bearing, bearings (35) are loose, consisting of twenty-five bearing rollers at each location retained by special washers (36) and snap rings.

Disassemble basically as outlined in preceding paragraphs, above, but take special care not to lose any of the loose bearing rollers. The total quantity of these rollers is one-hundred.

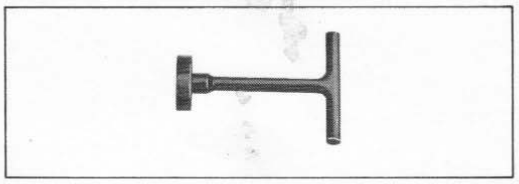
When removing snap rings, take care not to break them so they can be reused. These parts are (12) (16), (18), (25), (29), (31) and (39) in the figure.

When all parts are disassembled, clean thoroughly. Inspect for worn or damaged parts and replace as required.

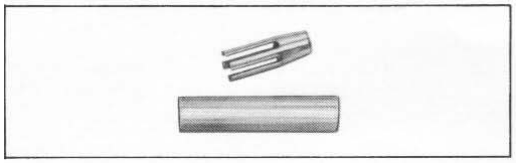
Reassemble parts following same procedure as outlined in paragraphs above. Assemble snap rings in place by again using tool, Part No. 97361-74P, as shown in Figure 4.14. Install bearing rollers in place using light grease to hold in position as parts are put back together. When positioning rollers, align them uniformly using a straightedge all around to insure evenness for ease of assembly. Test bearing action by spinning gears. Action should be smooth, without irregularities.



97353-74P. Clutch Disassembly Tool.



97359-74P. Shifter Cam Operator.



97361-74P. Transmission Assembling Tool.

ELECTRICAL 5

TABLE OF CONTENTS

GENERAL

SPECIFICATIONS

Ignition
- Type . . . . . Breakerless capacitor discharge
- Timing . . . . . 20.5°, 0.100 inch (2.5 mm) Piston position BTC

Alternator . . . . . 70 Watt, 12 Volt

Battery . . . . . 12 Volt, 7 ampere-hour

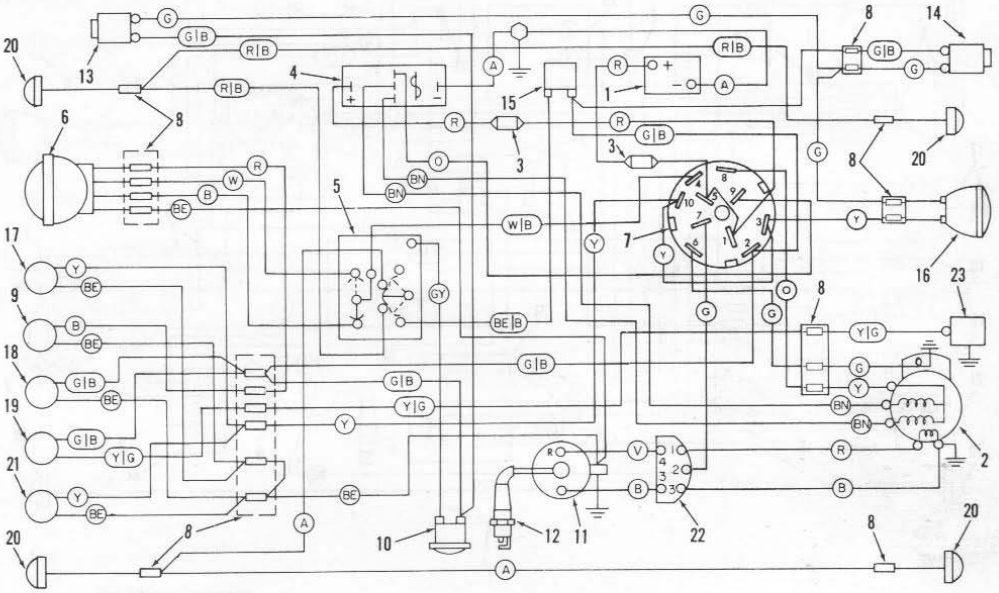
	SX-175	SX-250
Spark Plug	HDMCO 7-8	HDMCO 7
Gap	0.024 - 0.028 inch (0.6 - 0.7 mm)	
Tightening Torque	28 ft-lb (3.86 kgm)	

Pickup Coil to Rotor Pin Air
- Gap Setting . . . 0.012 - 0.016 inch (0.3 - 0.4 mm)

Horn . . . . . 12 Volt DC Vibrating type

Lights

Headlamp - Sealed	12V, 35/35 W
Tail Lamp	12V, 5 W
Stoplight	12V, 21 W
Turn Signal	12V, 21 W
High Beam Light	12V, 1.2 W
Speedometer Light	12V, 1.2 W
Tachometer Light	12V, 1.2 W
Ignition (ON) Light	12V, 1.2 W
Neutral Light	12V, 1.2 W



1. Battery
2. Alternator
3. Fuse (15 Amp.)
4. Rectifier
5. Handlebar Switch
6. Headlamp
7. Ignition-Light Key Switch
8. Connector
9. High Beam Indicator Lamp
10. Horn
11. Ignition Coil
12. Spark Plug
13. Stoplamp Front Switch
14. Stoplamp Rear Switch
15. Flasher
16. Tail Lamp
17. Speedometer Lamp
18. Ignition Indicator Lamp
19. Neutral Indicator Lamp
20. Direction Signal Lamp
21. Tachometer Lamp
22. Ignition Module
23. Neutral Indicator Switch

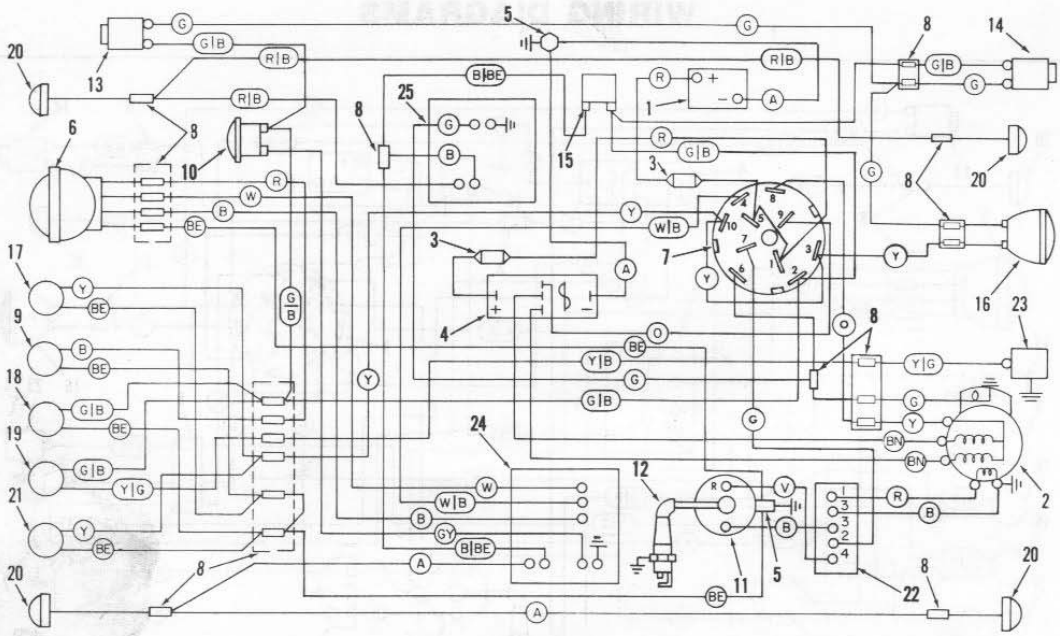
KEY SWITCH CONTACTS

SWITCH POSITION	CONNECTS TERMINALS
PARK	5 - 10
OFF	NONE
IGNITION	1 - 2/6 - 7
IGN. & LIGHTS	1 - 2 - 3/4 - 5/6 - 7/8 - 9

COLOR KEY

B	BLACK	V	VIOLET
BE	BLUE	A	AZURE (Light Blue)
G	GREEN	B | BE	BLACK AND BLUE
BN	BROWN	G | B	GREEN AND BLACK
W	WHITE	W | B	WHITE AND BLACK
GY	GRAY	R | B	RED AND BLACK
R	RED	O	ORANGE
Y	YELLOW	Y | G	YELLOW AND GREEN

Figure 5.1. Wiring Diagram (1974 and Early 1975, Type A Handlebar Switch/71505-73P Key Switch)



1. Battery
2. Alternator
3. Fuse (15 Amp.)
4. Rectifier
5. Frame Bolt
6. Headlamp
7. Key Switch
8. Connector
9. High Beam Indicator Lamp
10. Horn
11. Ignition Coil
12. Spark Plug
13. Stoplamp Front Switch
14. Stoplamp Rear Switch
15. Flasher
16. Tail Lamp
17. Speedometer Lamp
18. Ignition Indicator Lamp
19. Neutral Indicator Lamp
20. Direction Signal Lamp
21. Tachometer Lamp
22. Ignition Module
23. Neutral Indicator Switch
24. Left Handlebar Switch
25. Right Handlebar Switch

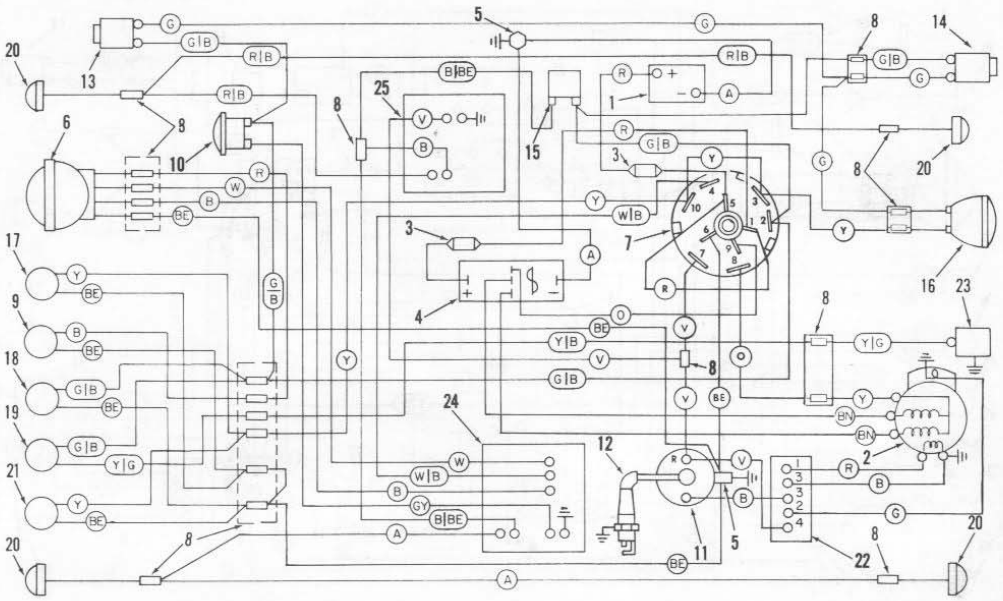
KEY SWITCH CONTACTS

SWITCH POSITION	CONNECTS TERMINALS
PARK	5 - 10
OFF	NONE
IGNITION	1 - 2/6 - 7
IGN. & LIGHTS	1 - 2 - 3/4 - 5/6 - 7/8 - 9

COLOR KEY

B	BLACK	V	VIOLET
BE	BLUE	A	AZURE (Light Blue)
G	GREEN	B|BE	BLACK AND BLUE
BN	BROWN	G|B	GREEN AND BLACK
W	WHITE	W|B	WHITE AND BLACK
GY	GRAY	R|B	RED AND BLACK
R	RED	O	ORANGE
Y	YELLOW	Y|G	YELLOW AND GREEN

Figure 5.2. Wiring Diagram (Late 1975, Type B Handlebar Switches/71505-73PA Key Switch)



1. Battery
2. Alternator
3. Fuse (15 Amp.)
4. Rectifier
5. Frame Bolt
6. Headlamp
7. Ignition-Light Key Switch
8. Connector
9. High Beam Indicator Lamp
10. Horn
11. Ignition Coil
12. Spark Plug
13. Stoplamp Front Switch
14. Stoplamp Rear Switch
15. Flasher
16. Tail Lamp
17. Speedometer Lamp
18. Ignition Indicator Lamp
19. Neutral Indicator Lamp
20. Direction Signal Lamp
21. Tachometer Lamp
22. Ignition Module
23. Neutral Indicator Switch
24. Left Handlebar Switch
25. Right Handlebar Switch

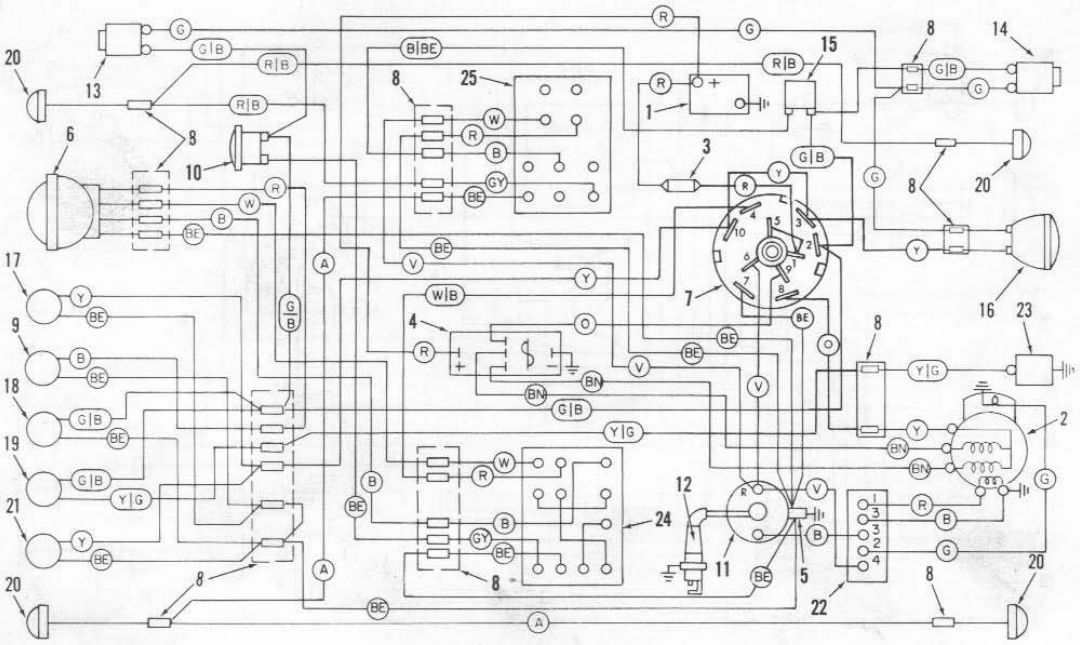
KEY SWITCH CONTACTS

SWITCH POSITION	CONNECTS TERMINALS
OFF	6 - 7
IGNITION	1 - 2
IGN. & LIGHTS	1 - 2 - 3/4 - 5/8 - 9
PARK	6 - 7/5 - 10

COLOR KEY

B	BLACK	V	VIOLET
BE	BLUE	A	AZURE (Light Blue)
G	GREEN	B|BE	BLACK AND BLUE
BN	BROWN	G|B	GREEN AND BLACK
W	WHITE	W|B	WHITE AND BLACK
GY	GRAY	R|B	RED AND BLACK
R	RED	O	ORANGE
Y	YELLOW	Y|G	YELLOW AND GREEN

Figure 5.3. Wiring Diagram (Late 1975, Type B Handlebar Switches/71505-75P Key Switch)



1. Battery
2. Alternator
3. Fuse (15 Amp.)
4. Rectifier
5. Frame Bolt
6. Headlamp
7. Ignition-Light Key Switch
8. Connector
9. High Beam Indicator Lamp
10. Horn
11. Ignition Coil
12. Spark Plug
13. Stoplamp Front Switch
14. Stoplamp Rear Switch
15. Flasher
16. Tail Lamp
17. Speedometer Lamp
18. Ignition Indicator Lamp
19. Neutral Indicator Lamp
20. Direction Signal Lamp
21. Tachometer Lamp
22. Ignition Module
23. Neutral Indicator Switch
24. Left Handlebar Switch
25. Right Handlebar Switch

71505-75P
KEY SWITCH CONTACTS

SWITCH POSITION	CONNECTS TERMINALS
OFF	6 - 7
IGNITION	1 - 2
IGN. & LIGHTS	1 - 2 - 3/4 - 5/8 - 9
PARK	6 - 7/5 - 10

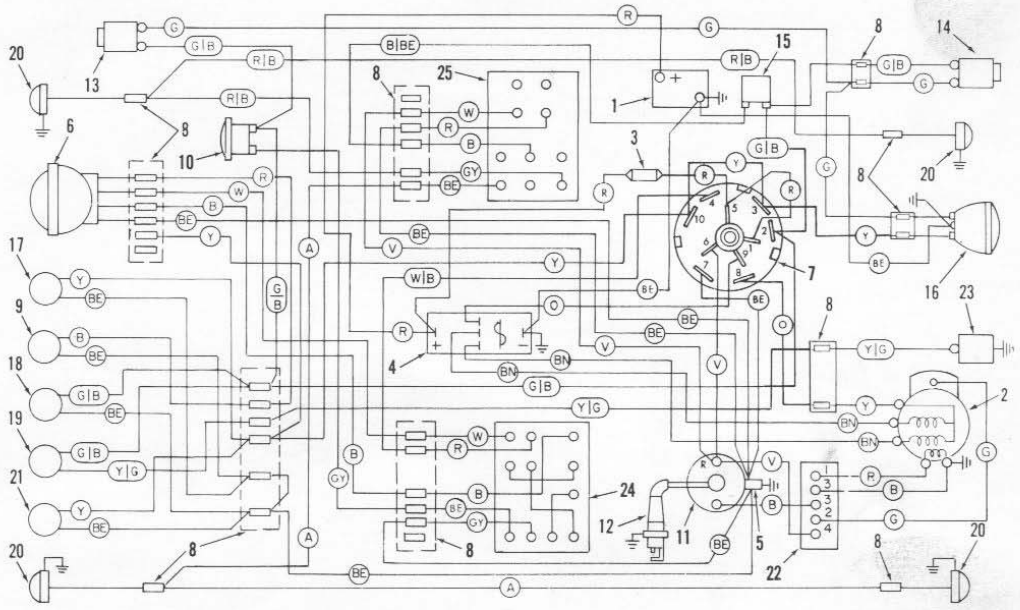
COLOR KEY

B	BLACK	V	VIOLET
BE	BLUE	A	AZURE (Light Blue)
G	GREEN	B|BE	BLACK AND BLUE
BN	BROWN	G|B	GREEN AND BLACK
W	WHITE	W|B	WHITE AND BLACK
GY	GRAY	R|B	RED AND BLACK
R	RED	O	ORANGE
Y	YELLOW	Y|G	YELLOW AND GREEN

71514-75P
KEY SWITCH CONTACTS

SWITCH POSITION	CONNECTS TERMINALS
OFF	6 - 7
IGNITION & LIGHTS	1 - 2 - 3/4 - 5/8 - 9
PARK	6 - 7/5 - 10

Figure 5.4. Wiring Diagram (Late 1975, Type C Handlebar Switches/71505-75P or 71514-75P Key Switch)



1. Battery
2. Alternator
3. Fuse (15 Amp.)
4. Rectifier
5. Frame Bolt
6. Headlamp
7. Ignition-Light Key Switch
8. Connector
9. High Beam Indicator Lamp
10. Horn
11. Ignition Coil
12. Spark Plug
13. Stoplamp Front Switch
14. Stoplamp Rear Switch
15. Flasher
16. Tail Lamp
17. Speedometer Lamp
18. Ignition Indicator Lamp
19. Neutral Indicator Lamp
20. Direction Signal Lamp
21. Tachometer Lamp
22. Ignition Module
23. Neutral Indicator Switch
24. Left Handlebar Switch
25. Right Handlebar Switch

COLOR KEY

B	BLACK	V	VIOLET
BE	BLUE	A	AZURE (Light Blue)
G	GREEN	B | BE	BLACK AND BLUE
BN	BROWN	G | B	GREEN AND BLACK
W	WHITE	W | B	WHITE AND BLACK
GY	GRAY	R | B	RED AND BLACK
R	RED	O	ORANGE
Y	YELLOW	Y | G	YELLOW AND GREEN

KEY SWITCH CONTACTS

SWITCH POSITION	CONNECTS TERMINALS
OFF	6 - 7
IGNITION & LIGHTS	1 - 2 - 3/4 - 5/8 - 9
PARK	6 - 7/5 - 10

Figure 5.4A. Wiring Diagram (1976 & Later)

ELECTRICAL SYSTEM

GENERAL

Figures 5.5 and 5.6 show the basic electrical system, excluding lights, functional switches, etc.

The system features a breakerless capacitor discharge ignition (CDI) (7), Figures 5.5 and 5.6. It also includes an alternator (4), ignition switch (3), high tension coil (6), spark plug (5), and an ignition capacitor charging coil located inside the alternator. The alternator has permanent internal magnets, two external trigger projections located on its circumference, and a pickup coil mounted on the crankcase at the side of the alternator rotor. The pickup coil is adjustable for both air gap and ignition timing.

Rotation of the rotor permanent magnets past the CDI charging coil generates alternating current which is transmitted to the capacitor inside the ignition module. This charges the capacitor. When the two projections on the rotor pass the pick-up coil, a small alternating current pulse is generated which is transmitted to the silicon controlled rectifier (SCR) in the ignition module. This pulse turns on the SCR and stored electrical energy in the capacitor is allowed to pass through the primary windings in the high tension coil. This increases the voltage in the secondary windings and causes a high energy spark to occur at the electrode of the spark plug.

NOTE

The battery charging circuit and ignition circuit are two separate systems and they operate independently of each other.

TROUBLE SHOOTING

If no spark occurs at spark plug, perform the following steps in sequence to determine cause and correction.

1. Replace spark plug.

2. Check ignition switch as follows. Do either A or B below, depending upon circuit configuration - either Figure 5.5 or 5.6.

   A. If as in Figure 5.5, remove two green wires shown from back of ignition switch and connect wires together. If spark now occurs at plug when engine is turned over rapidly, the ignition switch is faulty and should be replaced.

   B. If as in Figure 5.6, disconnect ground wire from ground lug of coil (6) to switch (3) at switch - blue wire (BE) in this case. If spark now occurs at the plug when engine is turned over rapidly, ignition switch is faulty and should be replaced.

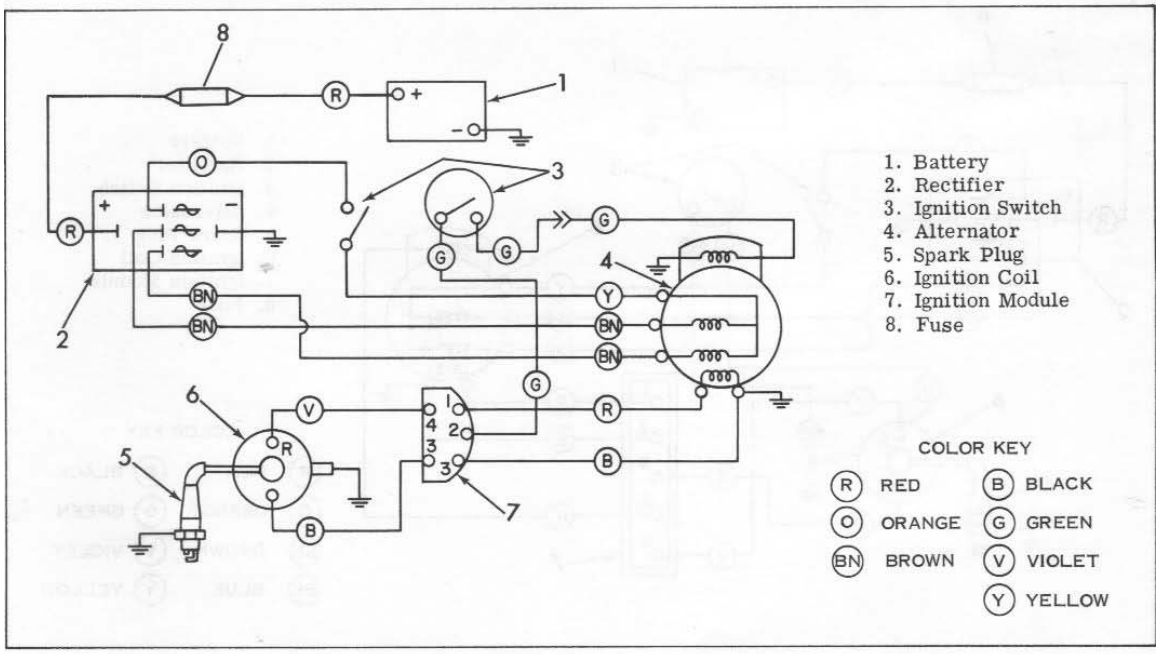


Figure 5.5. Basic Electrical System (Early)

3. Check capacitor charging coil as follows.

Disconnect red wire from terminal 1 of ignition module (7) and slip insulator away from spade terminal. Following recommendations of manufacturer of your volt/ohm meter, zero the needle on the RX 100 scale and check the resistance between the red wire terminal and a good ground on the engine. A value between 500 and 600 ohms should be obtained. If the reading is substantially lower, an internally shorted coil is indicated and coil should be replaced. This coil is located behind the alternator rotor. It is the smallest coil. Note that a reading of 0 ohms resistance would indicate that the red wire is shorted to ground. A reading of infinite resistance would indicate an open coil or broken wire.

4. Check the pickup coil as follows.

Remove the green wire from the pick-up coil. Switch ohm meter to the RX 1 scale and again zero the pointer. Check the resistance between the insulated terminal of the pick-up and its metal body. For earlier coils, the value should be between 120 to 150 ohms; for later coils, 85 to 90 ohms.

5. Check the ignition coil as follows.

Primary Side of Coil

Disconnect the violet and black wires on the threaded terminal and the high tension cable from the tower of the high tension coil. Switch ohm meter to the RX 1 scale and zero the pointer. Connect one test lead to the "R" threaded terminal and the other test lead to the other threaded coil terminal to test primary resistance. A value of about 0.5 ohms should be obtained. Note: Since a low ohms reading below .5 ohms is usually unreliable with other than a laboratory grade ohmmeter, and even a correct resistance reading will not show up possible insulation breakdown at the high voltages attained in operation, it is suggested that a doubtful ignition coil be substituted with one from another motorcycle known to function okay.

Secondary Side of Coil

Switch to the RX 100 scale and again zero pointer. Connect one test lead to the spur contact inside the coil tower and the other test lead to either threaded coil terminal to test secondary resistance. A value of about 2800 ohms should be obtained.

Any large difference from these figures would indicate a faulty coil and the coil should be replaced.

6. Check wiring as follows.

Check for pinched wires behind stator plate and insulation wear from contact with crankshaft at this location. Also check all wire terminal connectors for correct wire location according to wiring diagram.

NOTE

A plastic wire guide was added to later units to route wires away from crankshaft. It is suggested that this be added to earlier units also.

7. Check the ignition module as follows.

If after each of the above oulined procedures have been followed and there still is no spark at the plug, it is recommended that the ignition module be replaced. Due to its internal circuitry, no conclusive tests can be made other than substitution of this unit.

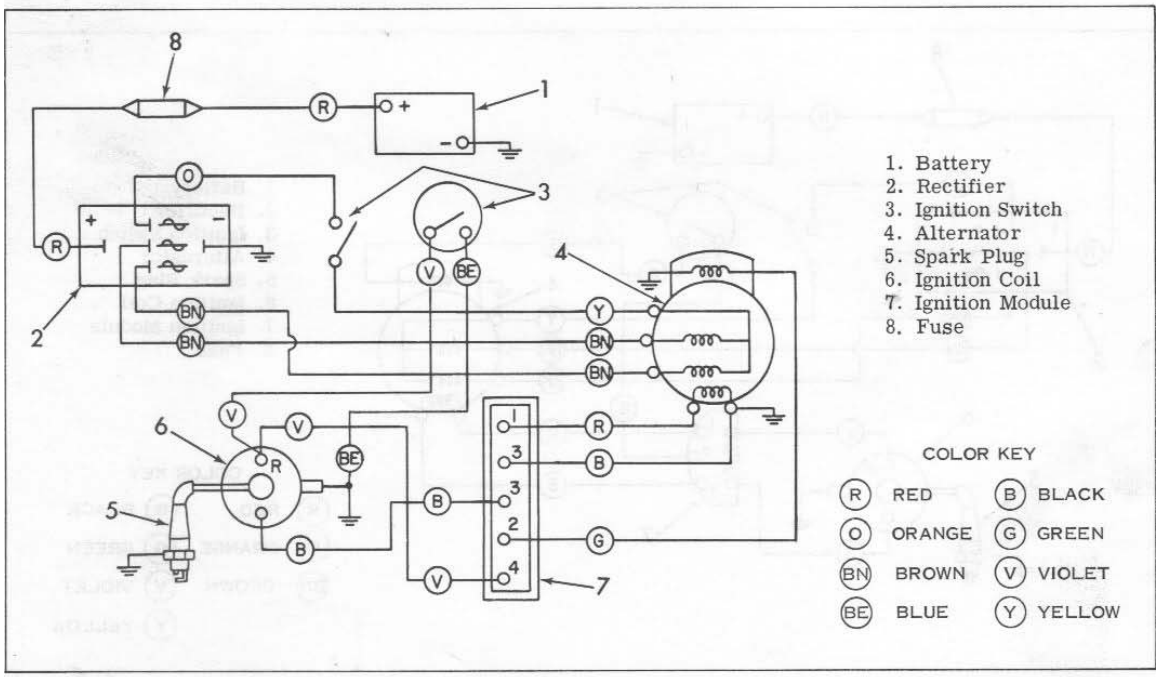


Figure 5.6. Basic Electrical System (Late)

ALTERNATOR

GENERAL

The alternator consists of two main components: the rotor (magnetic field) which is mounted on the engine shaft, and the stator (armature) which is bolted to the engine crankcase.

The alternator has two load windings that are out-of-phase. That is, each reaches its peak voltage at a different crankshaft angle. Because of this, a six diode rectifier is provided to convert this generated out-of-phase alternating current to direct current.

REMOVING AND INSTALLING ALTERNATOR

Remove nut (1), Figure 5.7, as follows. Place round pegs of tool, Part No. 97352-71MA, into holes in rotor (3) housing as shown in Figure 5.8 so that rotor can be held and prevented from turning. Using an impact wrench, remove the nut. If an impact wrench is used, holding tool may not be necessary. Remove washer (2) when nut is off.

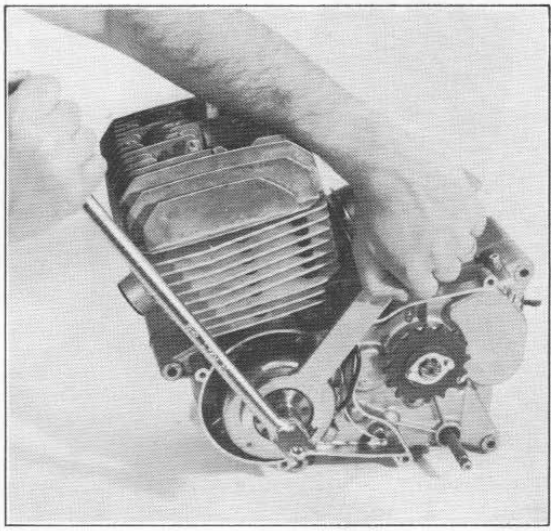


Figure 5.8. Removing Nut Using Tool to Hold Alternator

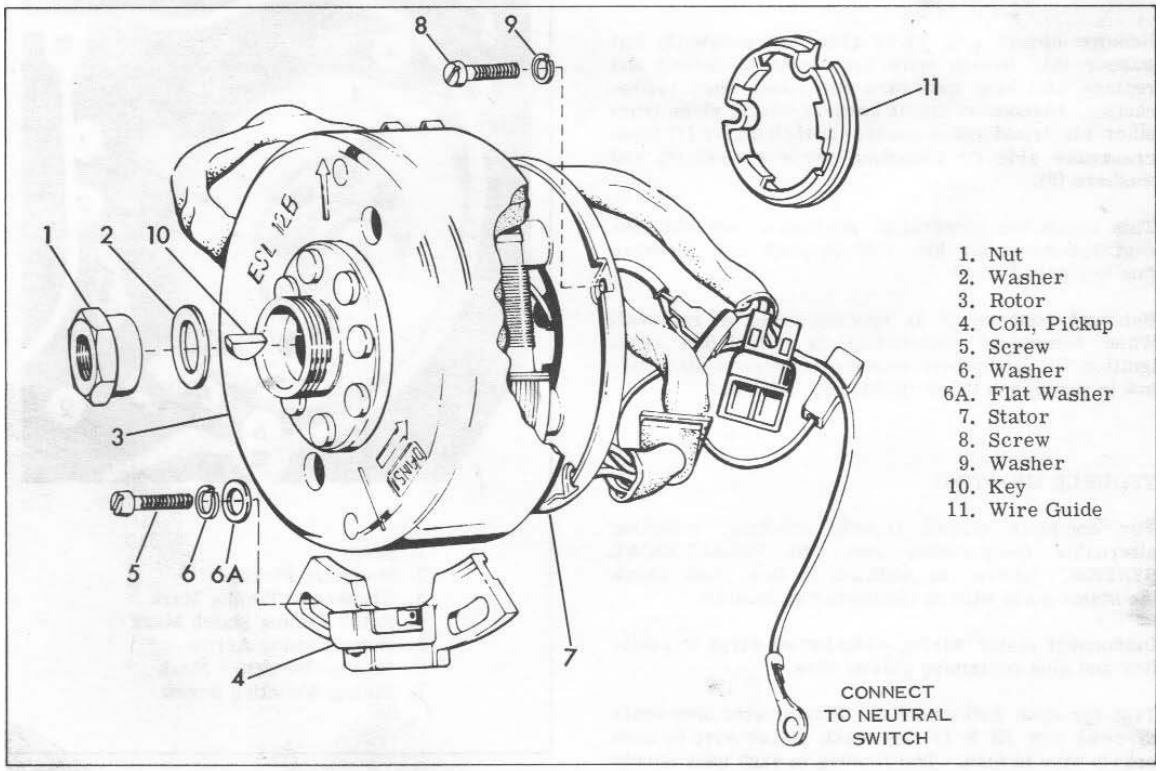


Figure 5.7. Alternator Components - Exploded View

Remove rotor (3) from crankshaft using tool, Part No. 97302-70M, as shown in Figure 5.9.

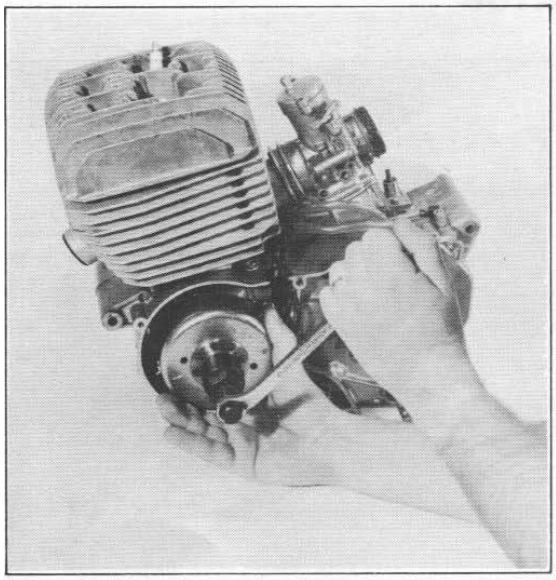


Figure 5.9. Pulling Alternator from Crankshaft End

Remove pickup coil (4) by removing screw (5) and washer (6). Detach wire from neutral switch and replace attaching hardware for reuse when reconnecting. Disconnect stator harness wiring plugs from other electrical components. Detach stator (7) from crankcase side by removing three screws (8) and washers (9).

This completes removal of alternator assembly except for removing key (10) in shaft end. Remove this key only if needed.

Remount components in reverse order of removal. When component remounting is completed, reset ignition timing by performing procedure outlined below in paragraph titled "IGNITION TIMING."

TROUBLE SHOOTING

For complete circuit trouble shooting, including alternator components, refer to "ELECTRICAL SYSTEM," above. In addition to this, also check the stator coils with an ohmmeter as follows.

Disconnect stator wiring - two brown wires to rectifier and plug containing yellow wire.

Test for open coil or short. Place meter ohm scale to read low (R X 1) and check yellow wire to each brown wire in turn. The reading in each case should be a very low value — 1 ohm or less.

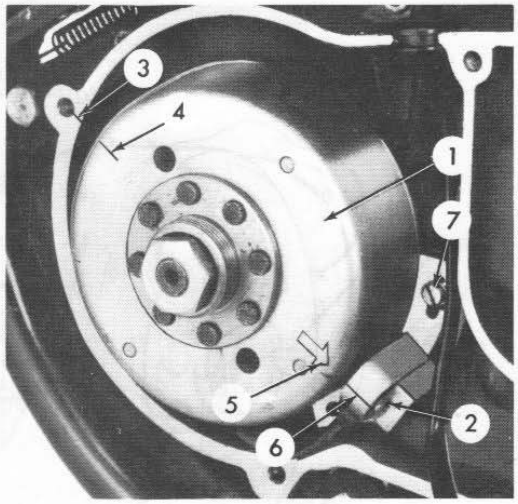
Test for ground. Place meter ohm scale to read high and check yellow wire to black wire. The reading should be infinity.

Finally, check battery charging circuit as follows. Alternator output at 3600 rpm should be 4.6 amperes minimum for DC battery charging. Disconnect red wire from rectifier module and insert an ammeter in series at this point to check this value. Note: while measuring, the headlamp must be turned on.

IGNITION TIMING

Ignition timing and pickup gap should be checked every 5000 miles. Ignition timing is determined by the position of a magnetic pickup coil which is adjustable.

The alternator rotor and crankcase are match marked for 20.5 degrees, 0.100 inch (2.5 mm), piston position before top center ignition timing. Also, there is a timing arrow on the rotor and a reference mark on the magnetic pickup. Timing is correct when all marks are in alignment. Obtain alignment by loosening pickup mounting screws and adjusting position of the pickup to align marks as shown in Figure 5.10.



1. Rotor
2. Magnetic Pickup
3. Crankcase Timing Mark
4. Rotor Timing Match Mark
5. Rotor Timing Arrow
6. Pickup Reference Mark
7. Pickup Mounting Screw

Figure 5.10. Ignition Pickup and Timing Marks

IMPORTANT

The air gap between the pickup core and the rotor pin should be .012 to .016 inch (.3 to .4 mm).

As an aid to setting the timing, a tool, Part No. 97360-74P, can be used as shown in Figure 5.11. This tool attaches to the crankcase and provides a mark identical to that of 3 in Figure 5.10, except raised higher to match mark 4 more easily.

NOTE

Factory timing mark on crankcase generally is within acceptable timing error limits. However, if performance is poor, engine kickback occurs, or, if more accurate timing is desired, the timing can be adjusted with a dial indicator as follows. Remove cylinder head. Mount indicator so actuating rod rests on piston crown. Find true top dead center and zero out indicator at this point. Then, back up rotor until indicator shows 0.1 inch (2.5 mm) BTC. Position pickup so pointer lines up with mark on pickup. Adjust air gap and recheck.

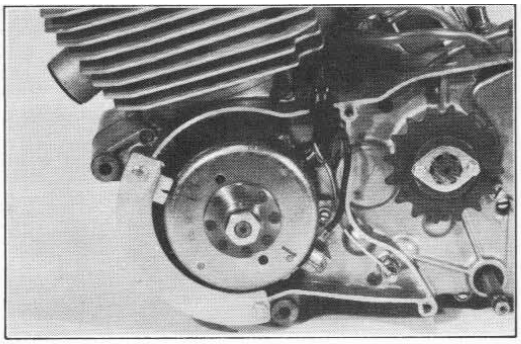


Figure 5.11. Aligning Timing Mark Using Special Tool

IGNITION MODULE

IGNITION MODULE

The ignition module is encapsulated to form a permanent assembly. There are two different units in use - an earlier and later one - as shown in Figures 5.5 and 5.6. Although they are slightly different in physical appearance, they both function electrically in exactly the same way.

Figure 5.12 is a schematic diagram of the module. Theory of operation is as follows. The module provides the high voltage pulse to the ignition coil at the right time for proper ignition. It does it electronically which eliminates periodic ignition point replacement (there are no points) and adjustment. Referring to the figure, the capacitor is charged by the charging coil in the alternator. When the projections on the rotor pass the trigger coil, voltage is generated which closes the SCR and discharges the capacitor through the ignition coil primary, causing a spark at the spark plug.

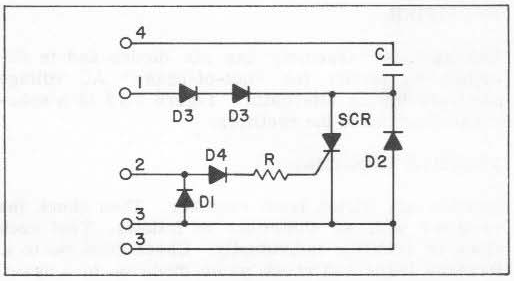


Figure 5.12. Ignition Module Internal Schematic

TROUBLE SHOOTING

For complete circuit trouble shooting, including ignition module, refer to "ELECTRICAL SYSTEM."

RECTIFIER

RECTIFIER

The rectifier assembly has six diodes and is designed to rectify the "out-of-phase" AC voltage produced by the alternator. Figure 5.13 is a schematic diagram of the rectifier.

TROUBLE SHOOTING

Remove all wiring from rectifier. Then check the rectifier with an ohmmeter as follows. Test each diode in rectifier individually. Check from ~ to +. Reverse leads and check same diode ~ to + again. The readings in one direction should be greater than the reading in the other direction by at least 100X.

Repeat the same procedure with those diodes ~ to -. Again, the reverse readings on each diode should be greater by 100X.

Finally, check each terminal on the rectifier to ground. Readings should be infinity in each case.

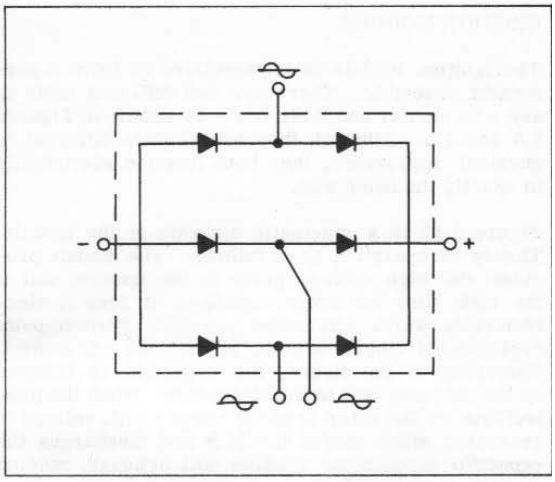


Figure 5.13. Schematic Diagram of Rectifier

IGNITION COIL

DESCRIPTION

The ignition coil is a pulse transformer that transforms or steps up the ignition module voltage to high voltage necessary to jump the electrode at the spark plug in the engine cylinder head. Internally, coil consists of primary and secondary windings with laminated iron core and sealed in waterproof, oil filled case. Case cannot be taken apart or coil repaired.

TROUBLE SHOOTING

For complete circuit trouble shooting, including ignition coil, refer to "ELECTRICAL SYSTEM," above.

If testing indicates a faulty or questionable ignition coil, try a new coil. If new coil corrects engine performance, proving that the fault is in coil, replace coil. If not, inspect plug cable for damaged insulation, particularly at points where cable enters coil. The insulation on cable may be cracked or otherwise damaged, allowing high tension current to short to metal parts. Trouble resulting from this condition is most noticeable when operating in wet weather or just after motorcycle has been washed.

REPLACING SPARK PLUG CABLE

When inspection indicates that plug cable is faulty, proceed as follows.

Remove old cable from coil terminal and install new cable. Always be certain that cable boot is securely tightened to coil tower to prevent moisture and dirt from contacting high tension lead. Replace connector if damaged or loose fitting.

BATTERY

GENERAL

The battery serves as a storage place for current used in starting the motorcycle, to operate accessories when the engine is not running, and to provide additional current, when necessary, over the amount being generated. For a battery to remain in good condition, the current draw must be balanced by a current input. All Harley-Davidson batteries have lead plates and sulphuric acid electrolyte units of capacities suitable for load requirements under intended use.

NOTE

A new battery is shipped dry and must be activated before placing in service. Fill with electrolyte and charge.

BATTERY CARE

Prompt and correct battery care determines the life span of the unit. Therefore, for a longer useful life, the battery solution level must be checked at weekly intervals. Add only pure distilled or approved water.

With a hydrometer or syringe, add water to each cell to raise solution up to proper level. Be careful not to overfill. Overfilling will result in some of the electrolyte being forced out through cap vent holes, diluting or weakening the solution strength. An overflow of battery solution will cause cables to corrode and motorcycle parts near the battery to be damaged.

Clean battery and terminals when necessary with a baking soda-water solution. Be careful to avoid getting any of the solution into the cap vent holes. When solution stops bubbling, flush off battery with clean water.

Coat terminals with grease or oil felt terminal post washers after wires have been attached to retard corroding.

TESTING BATTERY

Use the following instructions for testing battery condition. As a guide for determining when to start or stop charging, check charge state in all cells, tests A and B. As a guide for determining battery condition, use load test C.

HOW TO TEST

Discharged, or less than 1/2 charged batteries (1.190 gravity or 2.04 open circuit cell voltage) must be recharged in order to have charge sufficient for testing. Use hydrometer (A), cell tester (B), or load tester (C), as follows:

A. Use of Hydrometer: (Refer to chart below)

1. Be sure to correct reading for temperature extremes. For each 10° above 80°F. add 4 points, or deduct 4 points for each 10° below 80°F.

NOTE

Harley-Davidson Hydrometer, Part No 96802-63, has built-in thermometer and correction chart and is recommended for testing all batteries.

2. Read gravity of each cell and record.

3. If any 2 cells vary more than 50 points, replace battery.

4. If cells are even or vary only slightly, battery is generally not "suspect."

5. Batteries with satisfactory specific gravity (1.220 or better) but very low or no open circuit voltage are probably not serviceable.

B. Use of Cell Tester: (Refer to chart below)

1. Remove surface charge.

NOTE

The Sun Model CT-230 volmeter is recommended for battery cell test.

2. Put red prod on positive post and span cell cap with other prod to locate cell connector.

3. Read open circuit voltage of each cell and record.

4. If any 2 cells vary more than .05 volts (25% or 5 scale divisions), replace battery.

5. If cells are even or vary only slightly, the battery is generally not "suspect."

BATTERY CHARGE CONDITION

State of Charge	Specific Gravity (A)	Open Circuit Volts/Cell (B)
100%	1.250 - 1.270	2.10 - 2.12
75%	1.220 - 1.240	2.07 - 2.09
50%	1.190 - 1.210	2.04 - 2.06
25%	1.160 - 1.180	2.01 - 2.03

C. Use of Load Tester:

1. Never use on discharged batteries or batteries under 3/4 charged (1.240 sp. gr.).

NOTE

The Sun VAT-26 Tester (or equivalent) is recommended for load testing the battery.

2. Fully charge the battery before testing. Load battery to 3 x amp hour rating using the Sun VAT-26 Tester. (The Harley-Davidson 7 amp hr battery should be loaded to 21 amperes.) Voltage reading after 15 seconds should be 9.6 or more. Note: Voltmeter leads must be connected directly to battery posts.

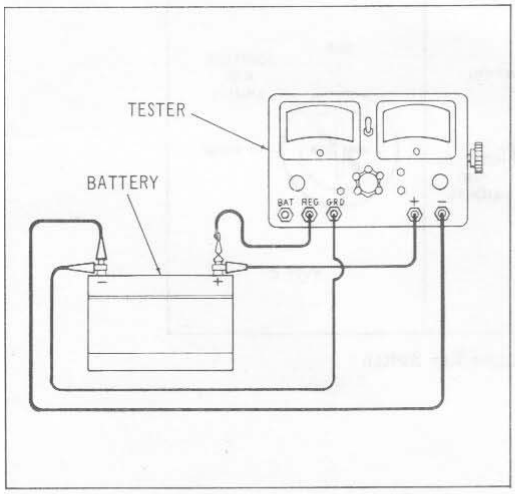


Figure 5.14. Testing Battery Capacity

CHARGING BATTERY

Never allow a battery to stand in a discharged condition. Start charging it at once at the recommended continuous charge rate.

To determine the amount or condition of a battery charge, check solution in each cell with a battery hydrometer or individual cell voltage with a voltmeter as outlined in paragraph titled "TESTING BATTERY," above. When hydrometer reading is 1.200 or less, battery is considered discharged and should be removed from motorcycle and charged at the following maximum continuous charge rate, using appropriate 12 volt charger: for a 12 volt 7 Ampere hour battery - 1.5 amperes.

A higher battery charge rate will heat and damage the battery. For this reason, do not allow the small motorcycle battery to be charged in the same line with large batteries. Hydrometer reading of a fully charged battery in good condition, with full strength electrolyte will be 1.270 or higher.

WARNING

Hydrogen gas, formed when charging, is explosive. Avoid open flame or electrical spark near battery.

Allowing a battery to remain in a discharged condition will shorten its life. It is important that a battery be kept well charged during below freezing weather.

RECLAIMING SULPHATED BATTERY

If a battery has been allowed to stand in a discharged condition for a period of time, the lead sulphate in the plates will crystallize and not take a charge at normal rates. Such batteries should be charged at half the specified continuous rate for twice the computed time. A longer charging time at a slower rate will many times break down the crystalline structure into active materials and restore the battery.

CHANGING ELECTROLYTE

In normal service with average care, it is never necessary to change electrolyte for the lifetime of the battery. However, if the battery solution is spilled, diluted as a result of careless water addition, or neutralized by the addition of an alkaline substance, the battery solution may be changed and in some cases near full capacity restored.

A weak acid solution may be detected by charging the battery until all cells gas freely and the gravity has not shown a rise for three successive readings taken at hourly intervals. "Gassing" is evidenced by a bubbling action in the electrolyte that may be detected by sight or sound. Do not change electrolyte in a battery with one or more cells that fail to gas. Such a condition indicates a structural failure.

Pour solution out of charged battery and fill with water. Charge battery again until maximum specific gravity is reached. Pour out this solution and add prepared battery electrolyte to specified level and charge again for a short length of time for full capacity.

Check specific gravity and add a little water if necessary to bring solution down to desired maximum limits.

The value of changing electrolyte in a fairly old battery is questionable. By tipping over such a battery to drain the solution, the sloughed-off waste materials accumulated by repeated charging and discharging actions might be dislodged from the sediment chambers in the bottom of the battery and deposited in the separators. This material is an electrical conductor and thus may "tree" or catch in the separators and cause a short circuit.

IGNITION - LIGHT KEY SWITCH

IGNITION-LIGHT KEY SWITCH

Ignition-light switch is located on the instrument panel and is operated with a removable key. From OFF (vertical) position, turn key to either the right or the left to initiate the various operating conditions as shown in Figure 5.15. Shown in the figure are the different types of switches in use, the switch key positions of each and the switch function in each position. Note that each switch has a "PARK" position which lights the tail lamp only for parking. Key is removed from switch in "OFF" position.

TROUBLE SHOOTING

For complete circuit trouble shooting, including the ignition switch, refer to "ELECTRICAL SYSTEM," "TROUBLESHOOTING."

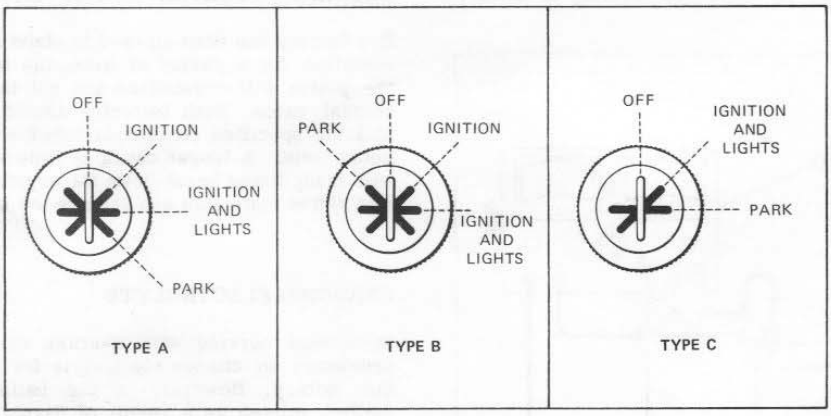


Figure 5.15. Ignition-Light Key Switch

HANDLEBAR SWITCHES

HANDLEBAR SWITCHES

The three types of handlebar switches used and their function are shown in Figure 5.16.

The type A switch on left handlebar only is on 1974 and early 1975 models. The types B and C switches are on late 1975 models.

The headlamp beam switch controls the headlamp high and low beams. High beam indicator light, located on tachometer dial (blue lens), remains on when high beam is on. A high beam flash button is incorporated in the type C switch.

Turn signal switch or button operates the desired right or left front and rear flashing lamps. The right and left buttons on type B switch operates the signals only while button is depressed.

The engine stop switch turns the ignition on or off and should be used to stop the engine in an emergency only. This switch only kills the ignition, with the lights continuing to function. To stop engine, push switch to position marked "OFF." Switch must be in position marked "RUN" to operate engine.

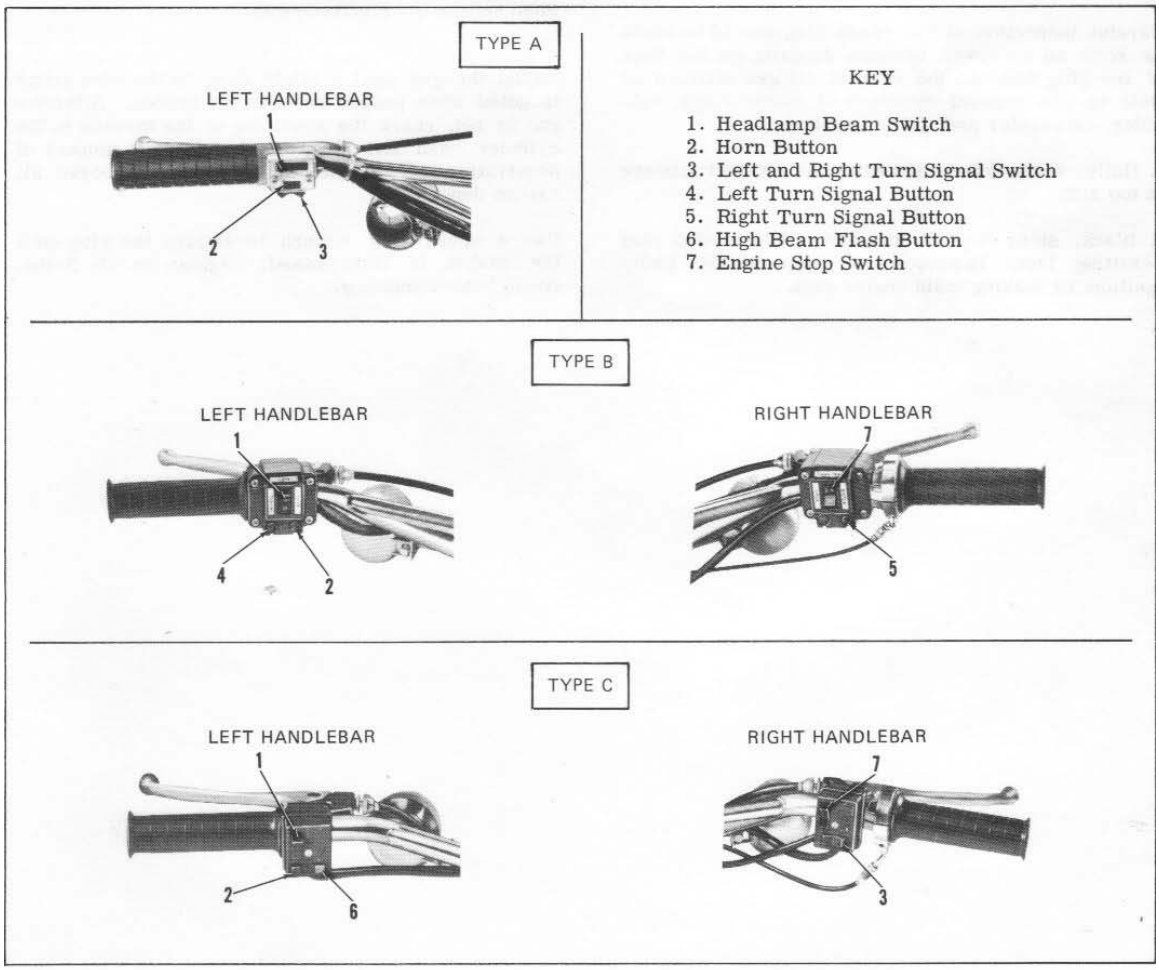


Figure 5.16. Handlebar Switches

SPARK PLUG

SPARK PLUG

The spark plug should be removed, the condition checked, and gap adjusted every 1000 miles.

NOTE

The cylinder head is provided with an extra spark plug port which is plugged on original equipment. This is for use with an optional spark plug or compression release equipment.

Disconnect the snap-on wire connection and remove any grease and dirt located around the plug base. Use special spark plug wrench or deep socket wrench for easy removal.

Careful inspection of the spark plug should be made as soon as removed because deposits on the base of the plug indicate the correct oil/gas mixture as well as the general condition of piston rings, cylinder, carburetor and ignition system.

A fluffy, sooty deposit indicates the air-fuel mixture is too rich.

A black, shiny deposit indicates an oil-fouled plug resulting from improper oil pump setting, faulty ignition, or leaking main engine seal.

A light brown, dry, glassy looking deposit indicates an overheated plug, causing misfiring at high speeds, too lean air-fuel mixture, a hot running engine or improper ignition timing.

A plug with rust brown to tan powdery deposit indicates a balanced ignition and combustion condition.

Plugs with a cracked insulator, or eroded electrode should be replaced with a new plug.

Before attempting to set spark plug gap to .024 to .028 inch (0.6 to 0.7 mm), clean the plug electrodes. Do not use a sand blast cleaner. Use a wire gauge when setting the electrode gap.

Adjust the gap until a slight drag on the wire gauge is noted when passed between electrodes. After the gap is set, check the condition of the threads in the cylinder head and plug. Apply a small amount of penetrating oil in the plug opening to loosen all carbon deposits.

Use a spark plug wrench to tighten the plug until the gasket is compressed. Tighten to 15 ft-lbs. Avoid over-tightening.

HEADLAMP

The headlamp is of the sealed-beam type. When replacement is required, use only the prescribed sealed-beam unit. To replace the unit, remove the outer molding screw located beneath the headlamp housing. Pull sealed beam unit and gasket out of rubber molding. Pull connector block from sealed-beam unit prongs.

Install new sealed-beam unit by reversing above operation. Unit should be positioned so that it registers correctly with gasket and housing. Make sure connector block contacts are clean to insure a good electrical contact. After final assembly, readjust headlamp as described in the following paragraph.

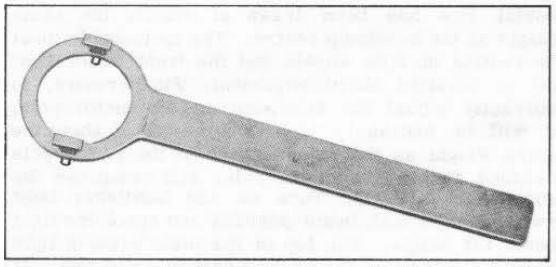
The headlamp beam must be adjusted for height and direction to get the greatest efficiency and meet the requirements of the law. Make the following adjustment in the dark or at night.

With the tires correctly inflated, stand the motorcycle on a level surface 25 feet away from and headed toward a wall or screen upon which a horizontal line has been drawn at exactly the same height as the headlamp center. The motorcycle must be resting on both wheels and the front wheel must be in straight ahead alignment. Furthermore, to correctly adjust the headlamp on the motorcycle, it will be necessary to have someone of about the same weight as the rider seated on the motorcycle because the weight of the rider will compress the suspension slightly. Turn on the handlebar light switch to the high beam position and check the light beam for height. The top of the main beam of light should register on the wall or screen, even with, but no higher than the horizontal line.

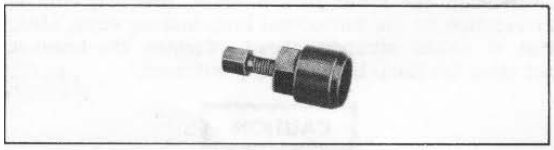
After loosening the headlamp mounting stud nut underneath the lower fork bracket, properly aim it in relation to the horizontal line, making sure, also, that it points straight ahead. Tighten the bracket nut after the lamp is properly positioned.

CAUTION

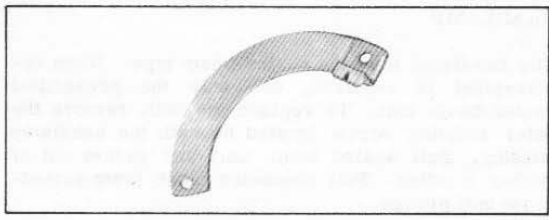
Lamp bulbs of lesser or greater wattage must not be installed as the alternator is designed to furnish adequate output only for the lamp bulb wattage specified.



97352-71MA. Rotor Holding Tool.



97302-70M. Rotor Puller Tool.



97360-74P. Ignition Timing Setting Tool.

MISCELLANEOUS 6

TABLE OF CONTENTS

INSTRUMENTS

SPEEDOMETER

GENERAL

Lubricate cable core every 5,000 miles with graphite grease.

REMOVING AND SERVICING

To lubricate the speedometer drive core or replace a damaged or broken core, proceed as follows:

With a pliers remove speedometer cable coupling nut from speedometer head and withdraw core from casing. To free a broken core from casing, disconnect lower case coupling nut from speedometer drive unit on front wheel. Withdraw core from lower case end.

Install core in upper end of casing, applying a light coat of graphite grease to the core as it is inserted into position. Engage squared lower end of core in speedometer drive shaft. Connect case coupling upper end to the speedometer head, engaging squared end of core in speedometer shaft. Be sure to tighten both case coupling nuts securely.

TACHOMETER

GENERAL

Lubricate cable core every 5,000 miles with graphite grease.

REMOVING AND SERVICING

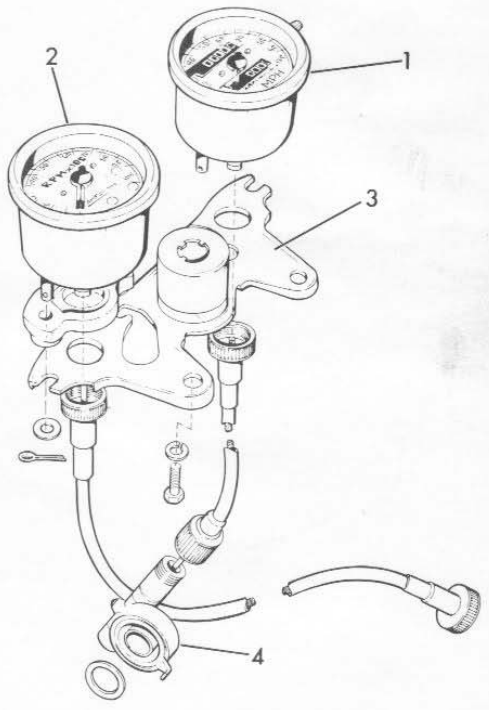
To lubricate the tachometer drive core or replace a damaged or broken core, proceed as follows:

With a pliers remove case coupling nut from tachometer and withdraw core from casing. To free a broken core from casing, disconnect lower case coupling nut from drive unit. Withdraw core from lower case end.

Install core in upper end of casing, applying a light coat of graphite grease to the core as it is inserted into position. Engage squared lower end of core in drive shaft. Connect case coupling upper end to the head engaging squared end of core in shaft. Be sure to tighten both case coupling nuts securely.

NOTE

Located on the upper end of the speedometer cable and tachometer cable is a metal thrust collar that fits into instrument housing. The lower cable end has no thrust collar. When installing a new cable, or reinstalling a removed cable, be sure thrust collar is toward top and fits into instrument. Before attaching cables, lightly grease ends. Damage will occur if thrust collar end of cable is inserted in speedometer or tachometer drive mechanism.



1. Speedometer
2. Tachometer
3. Mounting Bracket
4. Speedometer Drive

Figure 6.1. Speedometer and Tachometer

AMF
Harley-Davidson
Milwaukee, Wisconsin 53201