School of Electrical and Mechanical Engineering
BORDON HAMPSHIRE

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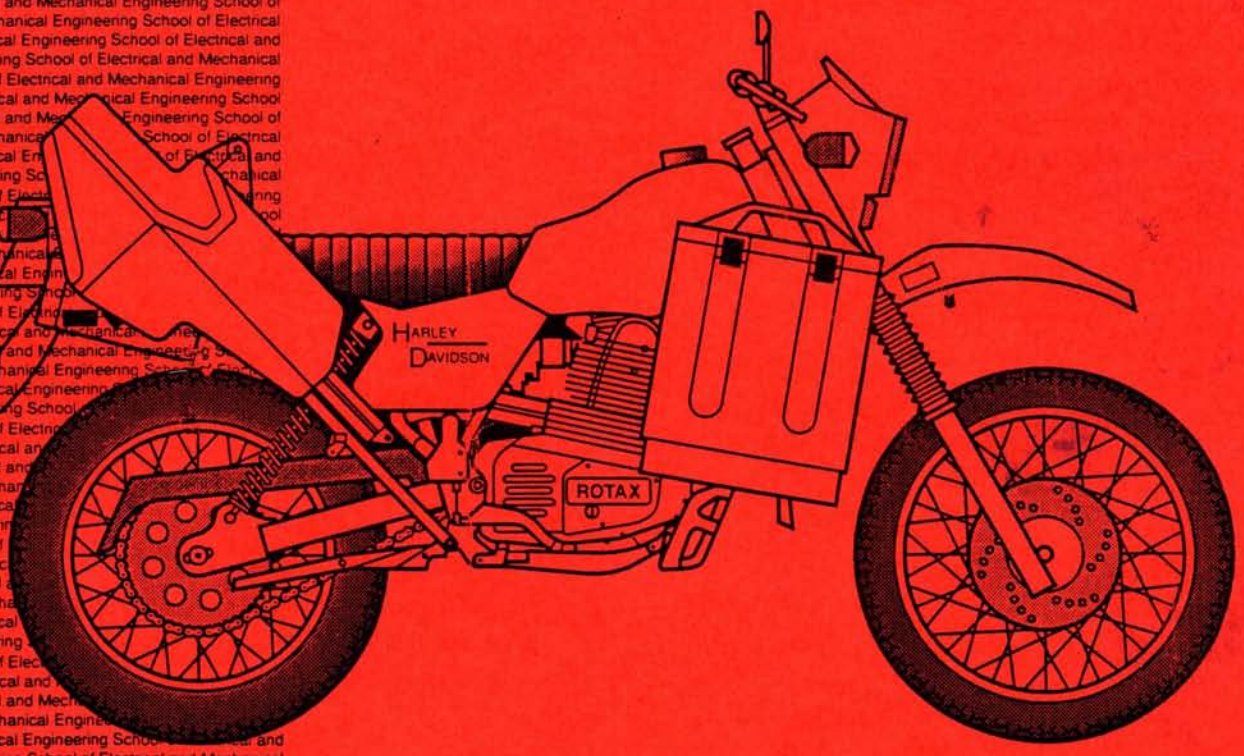
This is not a TQM authorised document
- the information may have been superseded.

HARLEY-DAVIDSON MT 350E GP MOTOR CYCLE



AW 2207

SEME REF NO: PR 36
Version 2

GENERAL SPECIFICATION

GENERAL

Weight Dry.....162 kg (358 lb)
Weight GVWR (gross vehicle weight) 366kg (808 lb)
Overall Length.....2240 mm (88.2)
Overall Width .....835 mm (32.9 in)
Overall Height .....1346mm(53 in)
Ground Clearance..... .....1346.mm(53 in.)
Weight Distribution.....37.5% Front 62.5% Rear

ENGINE

Manufacturer.....Harley -Davidson
Type.....Internal Combustion, Four-stroke, Gasoline
Weight, Dry (as installed).....46 kg (101.41)
Number of cylinders.....1
Fuel Type.....87 Octane, Unleaded
Oil Type..... .....H -D Multi-Grade.
API grade SF or SG, 15W-40 or 15W-50 or OMD80
Displacement.....349cc (21.297 cu in)
Bore.....79.5 mm(3.130 in)
Stoke .....70.4 mm (2.772 in)
Compression ratio.....9:1
Idle Speed.....1200rpm
Cylinder Cooling.....Air
Spark Plug Type .....12 mm NGK D8E-A
Champion 12 A6YC
Spark Plug Electrode Gap.....0.7 mm (0.027 in)
CO.....1.15g/km
HC.....1.70g/km
Nox.....0.23g/km
Decibels.....61 dba
BHP.....29.5
Kilo watts..... .....21.9

TRANSMISSION

Manufacturer.....Harley- Davidson/Bombardier
Type .....constant mesh
Gear Ratios:
First.....1:2.9
Second.....1:2.0
Third.....1:1.1
Fourth.....1:1.1
Fifth.....1:0.9(overdrive)

ALTERNATOR

Voltage.....12
Amperage..... .....15.8
Drive.....Direct From End of Crankshaft.
Control .....Solid State Regulator
Alternator Output....3 phase A.C. Flywheel Generator
12V 190W

BATTERY

Voltage..... 12
Capacity .....14 Amp - Hours
Ground Connection polarity.....Negative

PERFORMANCE

Acceleration
0-100km/hr (62 mph) ....9.5 Secs
Max. Speed ....127 km/hr (79 mph)

Braking Distance
50-0 km/hr (31-0 mph).....13.1m(43 ft
Turning Radius ....4.25m (14 ft)
Minimum Constant Speed .....5-8 km/hr (3-5 mph)
Fuel Consumption (on road)...18.5 km/ltre (53 mph)
Fuel Consumption (off road) 12.7 km/ltre (30 mpg)
Range (approx).....240 km (150 miles)
Gradability ....26.5 deg
Slide Slope 40%
Vertical Step (maximum).....0.38m (15 in)
Fording Depth.....30.5 cm(12 in)

FUEL AND OIL CAPACITIES

Fuel Tank (Total) .....13.0 litres(2.85 gallons)
Oil Tank Capacity .....
(Tank and Engine) .....3.2 litres (0.85 gallons)

BULB CHART

Headlamp .....H4 Quartz Halogen
Turn Signals.....Osram 7506 P21W37R
Tail / Brake / License .....Osram 7528P21/5W

TIRES

Manufacturer .....Metzeler or Equivalent
Model .....Euduro 3 Sahara
Type ....Inner Tube
Size, Front .....90/90 -21:54
Maximum Load, Front .....211 kg (465 lb)
Size, Rear.....4.00-18
Inflation Pressures:
Front on road ....152 kPa (22 psi)
Front off road .....124 kPa (18 psi)
Rear on road .....165 kPa (24 psi)
Rear off road .....124 kPa (18 psi)

NOTE
Increase inflation pressures by 21 kPa (3 psi.) when Vehicle is loaded to full gross weight

BRAKE FLUID

Fluid Type .. Dot 3

DIMENSIONS

See Figure 1 - 5

ORDERING SPARES PARTS

The vehicle components and parts are identified by part number and description, found in the Illustrated Parts Book #84771047

HARLEY DAVIDSON UK LTD
The Bell Tower
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School of Electrical and Mechanical Engineering
BORDON HAMPSHIRE

HARLEY DAVIDSON MT 350E GP MOTOR CYCLE

Amended by:

Vehicle Technology Branch – Engines

Approved by:

J W. Pratt

for Director of Training

9 Jan 98

Date

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FOREWORD

This publication is designed to summarise the build-up of the Harley-Davidson motorcycle as taught in this School. The information it contains can act as a form of reference and is a valuable aid to revision.

Each chapter follows roughly the sequence in which the topics are dealt with during the training programme, which builds up the information in a logical order.

The publication is a teaching aid only – it sets out the principles of operation. It is not designed to take the place of any Army Equipment Support Publications (AESPs) or Maintenance Schedule. There is **NO** automatic updating process.

INTRODUCTION

The role of the Harley-Davidson motorcycle is to provide a means of transport for liaison, reconnaissance and courier duties.

The motorcycle is based on a standard commercial pattern vehicle with service options. The high compression 350 cc single cylinder, 4 stroke cycle, air cooled engine has a dry sump lubrication system and is capable of using 91 Octane/Military fuels. The engine and gearbox is of unit construction having a 5 speed foot operated gearbox.

The suspension consists of hydraulic telescopic front forks and swinging arm with hydraulic damping rear suspension.

The lighting system comprises: instrument panel lights, headlamp with main/dip beams and pilot light, stop light and flashing indicators. An isolation switch is provided for tactical purposes, lights, indicators, warning lights and horns. Headlamps dip to left or right hand as necessary to conform to existing Traffic Regulations.

A facility is provided to enable a radio to be fitted. The motorcycle is painted with infra-red reflective paint.

ASSOCIATED PUBLICATIONS

Army Equipment Support Publication

Workshop Manual	2340–H200–302
Maintenance Schedule	2340–H200–601
Operating Information	2340–H200–201

Illustrated Spare Parts List

Motor Cycle	2340–H200–721

CHAPTER 1
General Information

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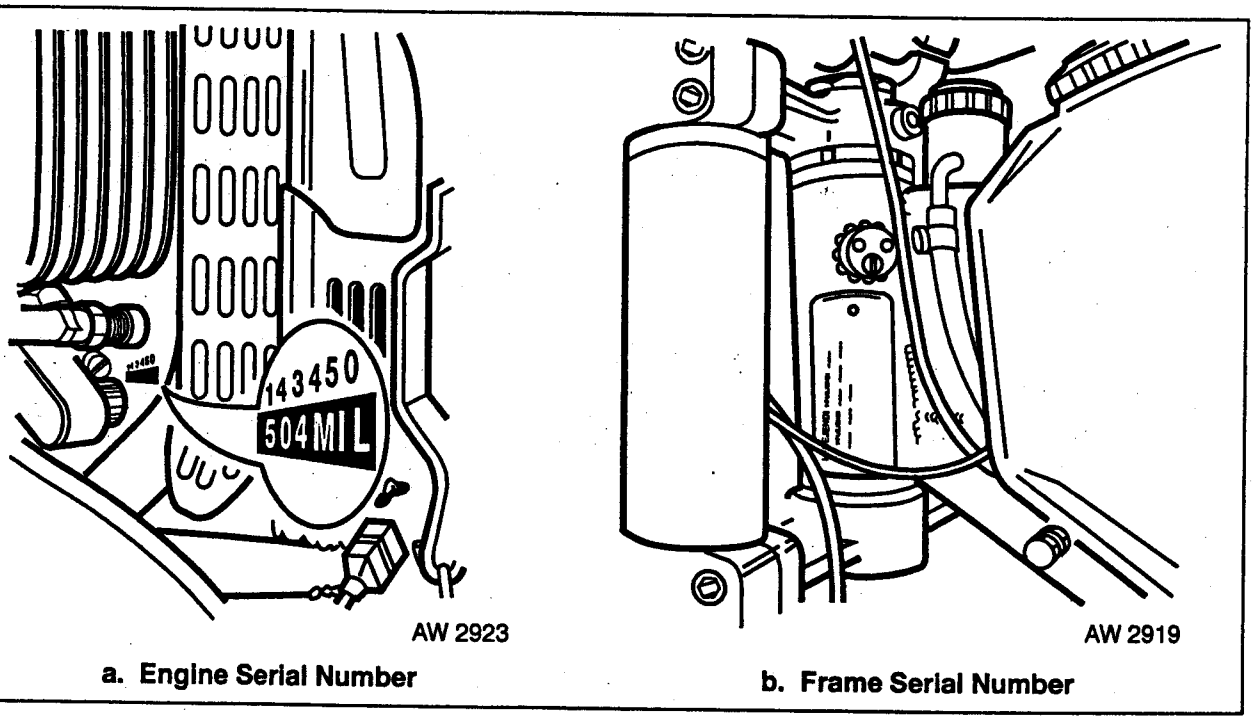
1.1 IDENTIFICATION

Every motorcycle has its own identification number stamped on the engine and frame.

a. **Engine Identification Number.** Located on the right near side of the crankcase.

b. **Frame Identification Number.** Located on the right side of the steering head.



a. Engine Serial Number

b. Frame Serial Number

Fig 1.1 Machine Identification

1.2 MEASUREMENTS AND DIMENSIONS

Max width	835 mm (handlebars)	
Seat height	889 mm	
Ground Clearance	254 mm	
Dry Weight	162 kgs	
Petrol Tank Capacity	13·0 litres (inc 2·2 litres reserve)/3 gallons	
Fuel Consumption	19 km/l — 80-53 mpg depending on conditions	
Fuel Grade	91 Octane	
Range	240 km — 150 miles	
Oil Tank Capacity	3·2 ltres — 5½ pints	
Recommended Oil Grade	15W/50 or OMD 80	
Max Speed	127 kph — 79 mph	
Tyre Pressures - Cold	Front:1·2 — 1·8 Bar/22 psi	+ 3 psi when full gross
	Rear: 1·3 — 1·9 Bar/24 psi	weight
	To suit terrain	

TABLE 1 - FUELS, LUBRICANTS, ETC.

Ser	Assembly/System	Product		Capacity	
		Above – 15°C	Below – 15°C	Litres	Pints
(1)	(2)	(3)	(4)	(5)	(6)
1	Oil Tank	OMD 80	OMD 80	3·2	5·5
2	Front Forks (each leg)	OM 33	OM 33	0·475	0·80
3	Drive Chain	Spray	Grease	–	–
4	Swinging Arm	XG 279	XG 279	–	–
5	Oil Can Lubrication	OMD 80	OMD 80	–	–
6	General greasing	XG 279	XG 279	–	–
7	Fuel Tank	Civgas	Civgas	–	–
8	Battery	Demin water/PX7		–	–
9	Brake Fluid	DOT 4	DOT 4	–	–

1.3 IGNITION SWITCH

Fig 1.2 refers.

The ignition switch has four positions as follows:

a. **Off Position.** Ignition and lighting completely inoperative.

b. **Ignition Position.** Motor cycle may be operated normally. Electric starter, indicator lamps, brake lights, headlight flasher, horn and console warning lights are all fully functional.

c. **Lights Position.** As ignition position but headlights operative (for low light conditions and rider visibility).

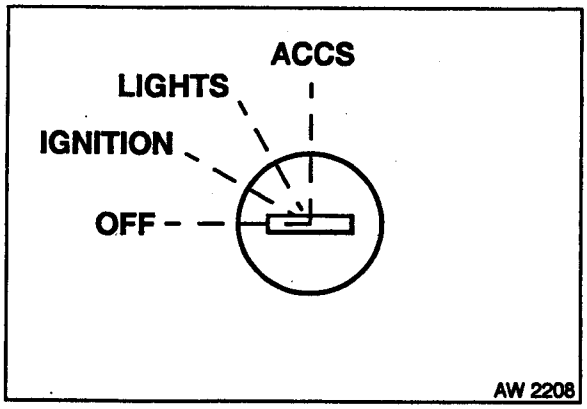


Fig 1.2 Ignition Switch

1.4 BLACKOUT SWITCH

Fig 1.3 refers.

This switch cuts out all lighting and horn irrespective of ignition switch position.

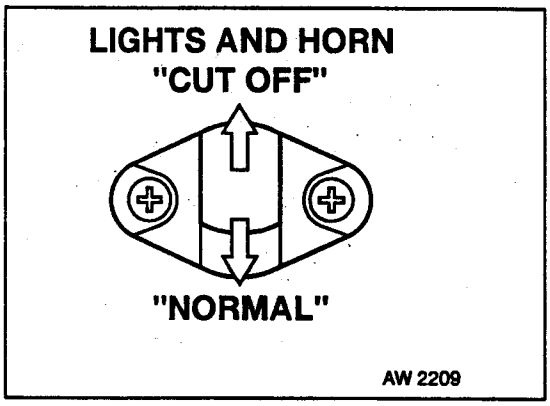


Fig 1.3 Blackout Switch

1.5 'KILL' SWITCH

Vehicle features a 'Kill' switch – this must be in the run position for engine to operate.

NOTE: Starter motor will operate in both 'OFF' and 'RUN' modes.

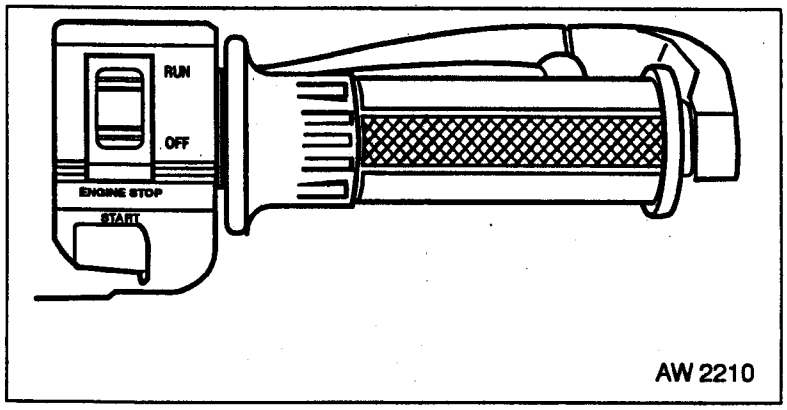


Fig 1.4 'Kill' Switch

CHAPTER 2
Engine and Gearbox Units

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2.1 GENERAL DESCRIPTION

The engine/gearbox unit is a unit construction, four stroke single cylinder unit with a belt driven overhead camshaft operating rocker arms on two exhaust and two inlet valves. The gearbox itself is a constant mesh five speed type driven from a wet multi-plate clutch.

2.2 SPECIFICATIONS

a. General

Type	4 stroke single cylinder, single overhead camshaft.
Displacement	349 cc
Bore and Stroke	79·5 mm x 70·4 mm
Compression Ratio	9·3:1
Power	29·5 BHP @ 800 RPM
Torque	27·9 Nm @ 6500 RPM
Lubrication	Forced circulation by double Trochoidal pump and detachable filter
Cooling	Air type by fins on cylinder and head
Clutch	8 disc multiplate in oil bath
Valve Timing System	Overhead camshaft type driven by toothed rubber belt
Inlet	Opens 3° BTDC — Closes 46° ABDC
Exhaust	Opens 46° BBDC — Closes 3° ATDC

Transmission	Constant Mesh
Primary Gear Ratio	1:2·375 ($^{32}/_{76}$) Straight cut ground gears
Driving Ratio	1:2·765 ($^{17}/_{47}$) (17 tooth Eng sprocket, 47 tooth rear wheel)
Water Crossing	305 mm/12 inches

b. **Gearbox**

Gear	Gearbox Ratio	Overall Engine - Wheel Ratio
1st	1:2·909 ($^{11}/_{32}$)	1:19·103
2nd	1:2·000 ($^{12}/_{24}$)	1:13·134
3rd	1:1·400 ($^{15}/_{21}$)	1: 9·194
4th	1:1·117 ($^{17}/_{19}$)	1: 7·335
5th	1:0·913 ($^{23}/_{21}$)	1: 6·000

c. **Torque Settings**

Item	Torque Nm
Spark Plug	18
Cylinder head nut M10	35
Cylinder head nut M8	20
Flywheel nut (M18 x 1·5)	100
Gearbox Sprocket nut (M20 x 1·5)	100
Kick-starter stop Hex screw (M12)	75
Clutch Shaft (M18 x 1·5)	120
Counter Shaft (M14 x 1·5)	75
Timing Pulley 15t (M16 x 1·5)	100
Timing Pulley 30t (M8 hex screw)	20
Sump Plugs (engine and frame)	20
Timing Belt Tensioner	35

2.3 REMOVAL/REPLACEMENT

To remove the engine/gearbox unit from the motorcycle, proceed as follows referring to the applicable sections for more detailed information if difficulty is encountered.

a. Place the motorcycle on the mainstand and drain the oil from the frame.

b. Remove or disconnect the following from the machine:

Battery
Seat, petrol tank
Clutch cable
Throttle and choke cables, carburettor – only if carburettor is to be removed, otherwise disconnect carburettor at head joint.
Engine sprocket guard, drive chain
Exhaust system
Oil pipes, engine breather hose

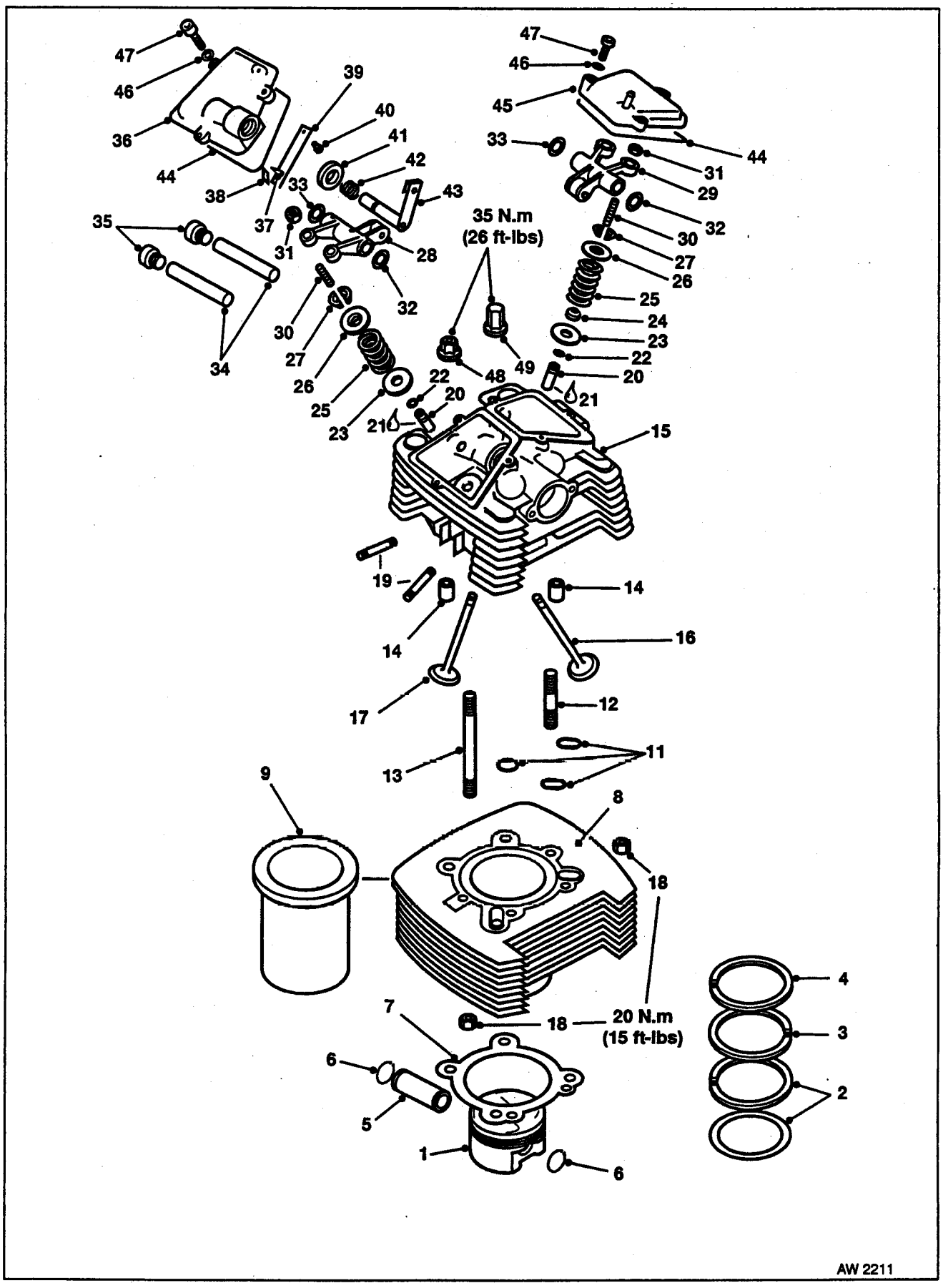


Fig 2.1 MT350 Top End

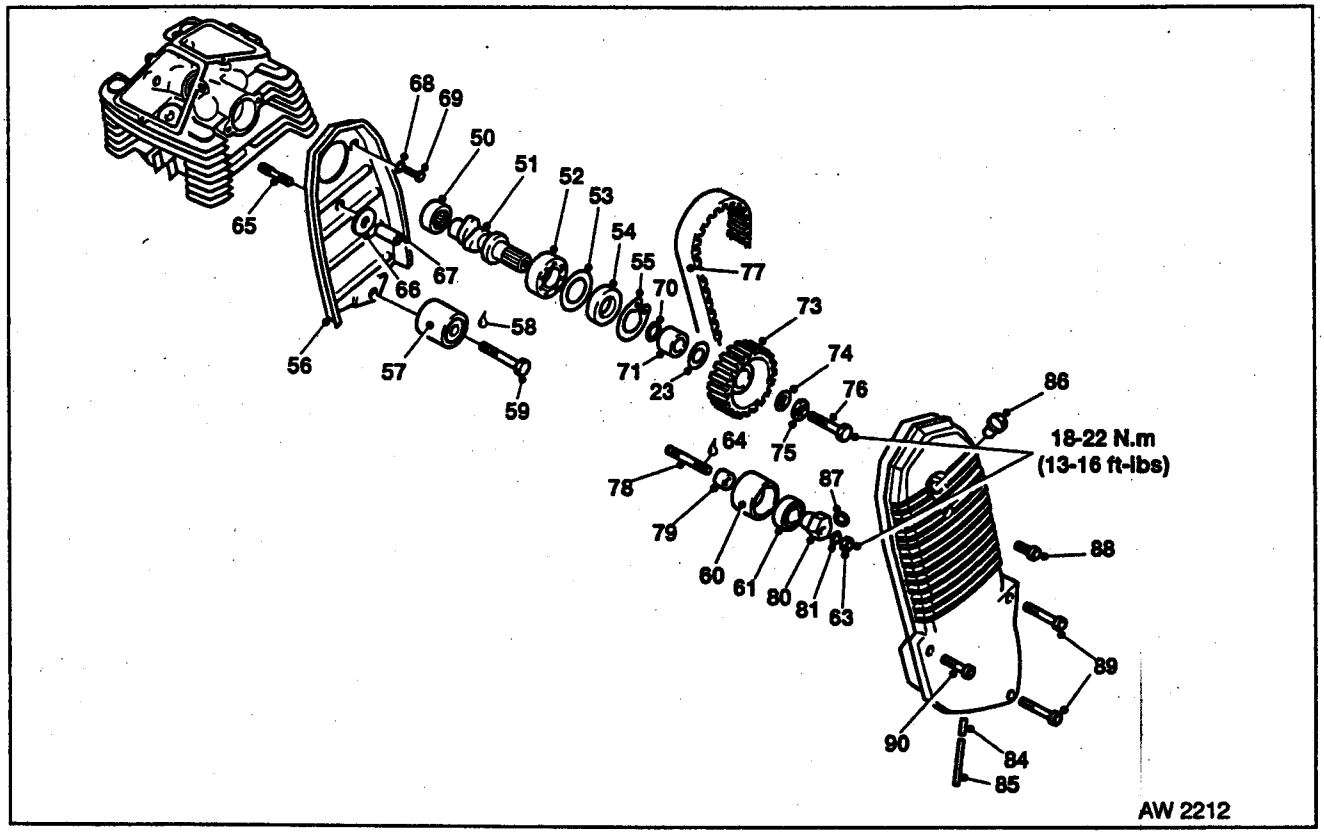


Fig 2.2 MT 350 Top End

KEY TO FIGS 2.1 AND 2.2

1. Piston with rings, 79·5 mm
2. Oil strainer ring 79·5 mm
3. Rectangular ring, 79·5 mm
4. Chrome plated rectang. ring, 79·5 mm
5. Piston pin
6. Circlip
7. Cylinder base gasket
8. Cylinder with sleeve
9. Cylinder sleeve
10. No Cyl Head gasket – only seals
11. O-rings (cylinder head)
12. Stud M8 x 78·5
13. Stud M8 x 119
14. Dowel 13·9 x 15
15. Cylinder head
16. Exhaust valve
17. Intake valve
18. Hexagonal nut 8 mm
19. Stud M8 x 37
20. Valve guide
21. Grease (Molykote G-n)*
22. Circlip
23. Shim 12" x 29·5 x 1
24. Intake valve seal
25. Valve spring
26. Spring retainer
27. Valve cotters
28. Exhaust rocker arm
29. Intake rocker arm
30. Adjustment screw
31. Hexagonal nut 7 mm
32. Thrust washer 14·3 x 20 x 0·5
33. Spring washer 14.3 x 30 x 0·5
34. Rocker arm shaft
35. Plug screw M16 x 1·5
36. Exhaust valve cover
37. Groove pin 4 x 20
38. Decompressor plate
39. Decompressor flat spring
40. Taptite screw M6 x 12
41. Seal 14 x 24 x 7
42. Spring
43. Decompressor shaft assembly
44. O-ring 107 x 2·5
45. Intake valve cover
46. Lockwasher 6
47. Allen screw M6 x 20
48. Hexagonal Nut 10 mm
49. Cap nut 10 mm
50. Needle bearing
51. 220° camshaft
52. Ball bearing 6204
53. Shim 38 x 46·8 x 1·0
54. Seal 30 x 47 x 7
55. Locking ring 47 x 1·75
56. Timing belt housing
57. Guide pulley 28 x 27 x 30
58. Loctite 221 (violet, medium strength) *
59. Hex screw M8 x 50
65. Stud M6 x 40
66. Flat washer 6·4 x 30 x 3
67. Distance nut 6 mm
68. Lockwasher 6
69. Allen screw M6 x 20
70. O-ring 18 1·5
71. Distance sleeve 20 x 30 x 13
72. Flat washer 20·2 x 35 x 3
73. Timing pulley 30th
74. Flat washer 8·4 x 32 x 3
75. Spring washer 8
76. Hexagonal screw M8 x 30
77. Timing belt
78. Stud M8 x 63
79. Distance sleeve 8·4 x 22 x 11
80. Tensioner eccentric
81. Lockwasher 8
82. O-ring 933 mm
83. Timing belt cover
84. Vent tube
85. Vent line 270 mm (10·5") *
86. Lens
87. O-ring 9·3 x 2·4
88. Allen screw M6 x 20
89. Allen screw M6 x 20
90. Allen screw M6 x 35

* As required

CLEANING

WARNING

Solvent with a low flashpoint such as gasoline, naphtha, benzol, etc should not be used as they are flammable and explosive.

Remove old sealant from mating surface of crankcase with acetone, wood alcohol or equivalent.

CAUTION

Never use a sharp object to scrape away old sealant as score marks incurred are detrimental to cylinder head or cylinder sealing.

Ensure that all oil passages are perfectly clean.

Front engine crash bars, sump guard, front engine plate
Both footrest arms
Footrest cross tube and springs
Spark plug cap
Engine wiring harness/starter motor cable (**NOTE**: Cable fits under bracket).
Vent tubes

c. Support the engine on a suitable stand.

d. The swinging arm spindle can now be partially withdrawn utilising the special drift (service tool kit) to gauge how far to push the spindle out. Withdraw the drift up to the line.

e. At this stage the top engine mount should be removed enabling the motorcycle to be lifted clear of the engine resting on its support.

f. Replacement is the reversal of the removal procedure. For more complete information pertaining to particular component refitting refer to the applicable chapters. Adjust clutch and refill with oil.

2.4 OPERATIONS WITH ENGINE IN FRAME

a. Most engine maintenance operations can be performed without the need to remove the engine from the frame. These include:

Tappet adjustment and cam/rocker arm removal.
Cam drive belt adjustment/removal.
Ignition timing verification, generator removal.
Engine oil filter change.
Oil sump removal.
Clutch removal/adjustment.
Clutch cover removal allowing access to:

Starter Motor drive gear
Oil pump drive gear
Kick-start ratchet assembly
Balancer shaft drive gear

b. The engine/gearbox unit will need to be removed from the motorcycle to allow stripdown, for access to the following engine internals:

Cylinder head assembly and valves
Piston rings
Crankshaft
Gearbox shafts/gears/bearings
Balancer shaft

2.5 CYLINDER HEAD AND CYLINDER REMOVAL (STEP BY STEP PROCEDURE)

NOTE: Clean engine before disassembly. Always work with recommended tools – read and understand manual procedure.

a. Using the crankshaft locking bolt (P/N 241965) lock the crankshaft at TDC (Fig 2.3 refers).

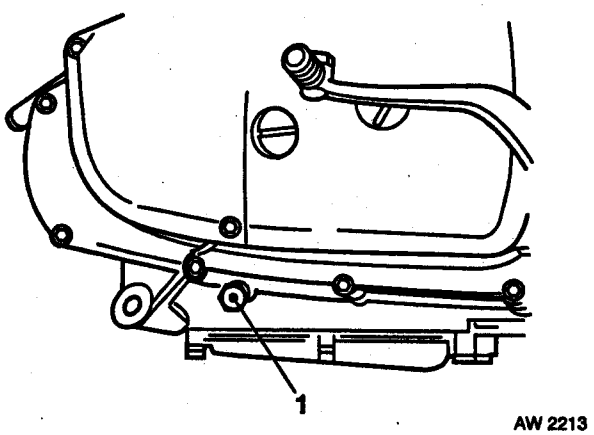
b. Remove the timing belt outer cover. Release the cam belt tensioner and remove cam belt.

NOTE: If belt is to be reused – before removing mark direction of rotation. Fig 2.4 refers.

Hold camshaft with suitable tool and remove central bolt, withdraw camwheel from camshaft, remove belt guide pulley, tensioner pulley, 3 inner panel securing screws, remove inner belt cover.

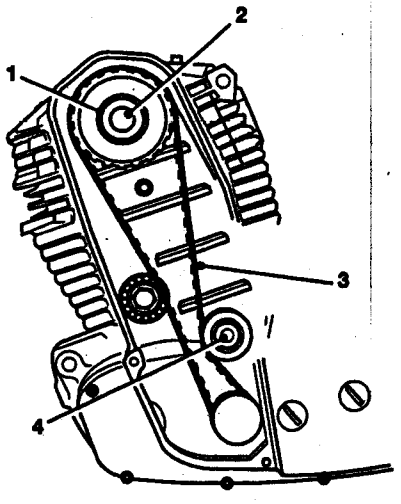
c. Undo the 2 – 8M lower head securing studs (Fig 2.5 refers) then diagonally release the 4 – 10M cylinder head securing nuts (Fig 2.6 refers), noting the position of the one capped nut (magneto side – intake end of head). Failure to use the capped nut in this position will result in oil leakage – the cylinder head will now be free to lift off, if stuck 2 pry levers can be used but make sure NO damage to the cylinder mating faces occurs (Fig 2.7 refers).

d. Once the cylinder head is removed the cylinder can be lifted from the crankcase by sliding up the studs (Fig 2.8 refers). The cylinder base gasket can now be removed.



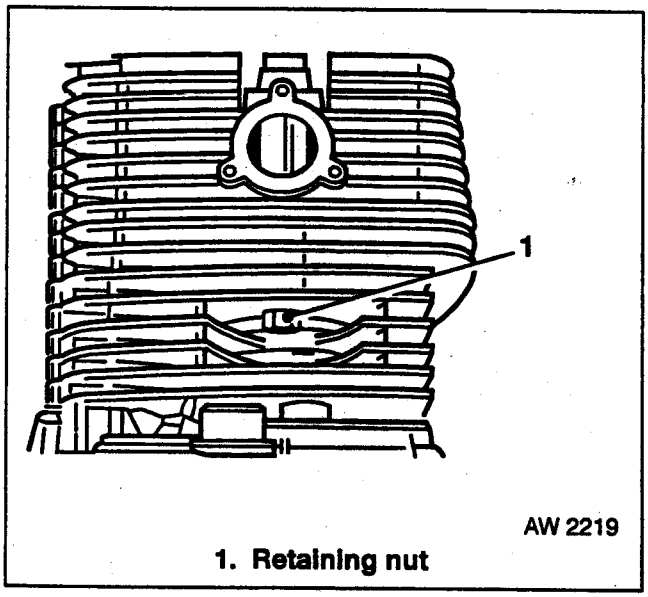
1. Crankshaft Locking Bolt

Fig 2.3 Crankshaft Locking



1. Washer
2. Camshaft pulley retainer bolt
3. Timing belt
4. Timing belt tensioner

Fig 2.4 Timing Belt



1. Retaining nut

Fig 2.5 Cylinder Head Retaining Nut

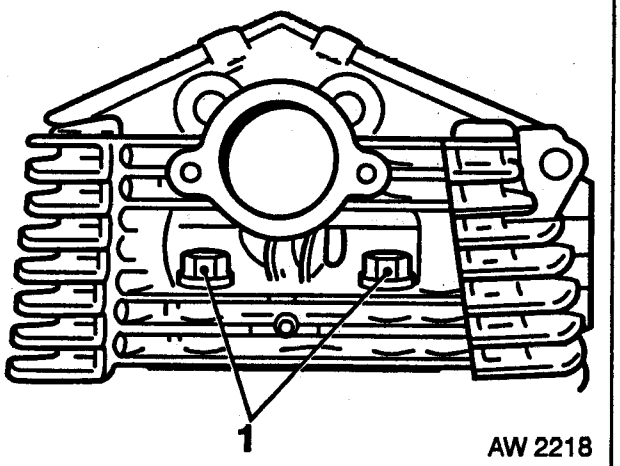
e. **Cylinder Head – Strip Down.** Remove valve access covers, undo the 2 Hex socket plugs, then using a 10mm bolt to locate into rocker shafts – pull the shafts from the cylinder head (Fig 2.9 refers).

NOTE: The 2 shim washers will fall as shaft is removed.

f. Lift rocker arms from cylinder head. Remove Camshaft distance sleeve and securing circlip (Fig 2.10 refers), then using camshaft removal tool remove camshaft, pulling camshaft bearing and seal as one assembly (Fig 2.11 refers). The remaining camshaft bearing (needle roller type) can be driven from the cylinder head using a suitable sized socket and nylon hammer (Fig 2.12 refers).

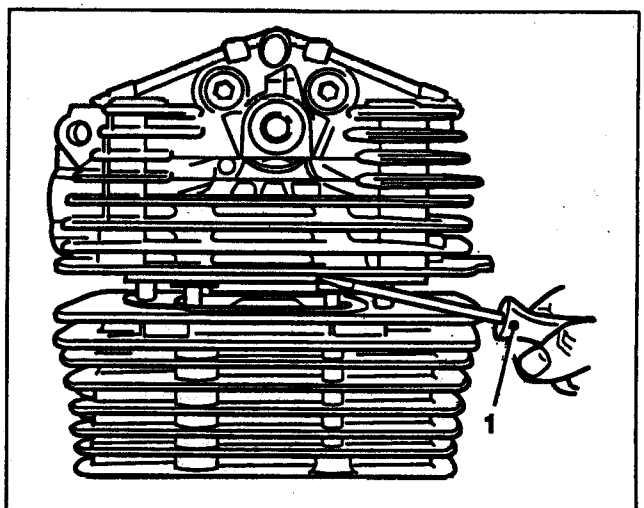
CAUTION

Prior to camshaft removal the rocker arms must be removed. Otherwise the rocker rollers and camshaft may be damaged.



1. Retaining nuts

Fig 2.6 Cambelt Side Cylinder Head Retaining



1. Pry lever

Fig 2.7 Cylinder Head Removal

g. Using suitable valve spring compressor, remove retaining cotters, remove springs and valves. Access can now be gained to replace valve stem oil seals if necessary. Fig 2.13 refers.

NOTE: At cylinder head nut removal, note the position of the closed cap nut (Fig 2.20 refers). **(DO NOT** damage head faces).

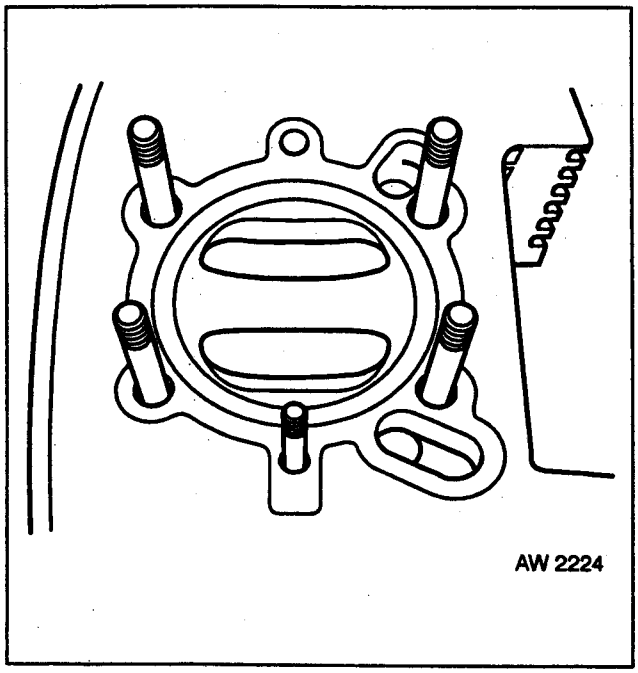
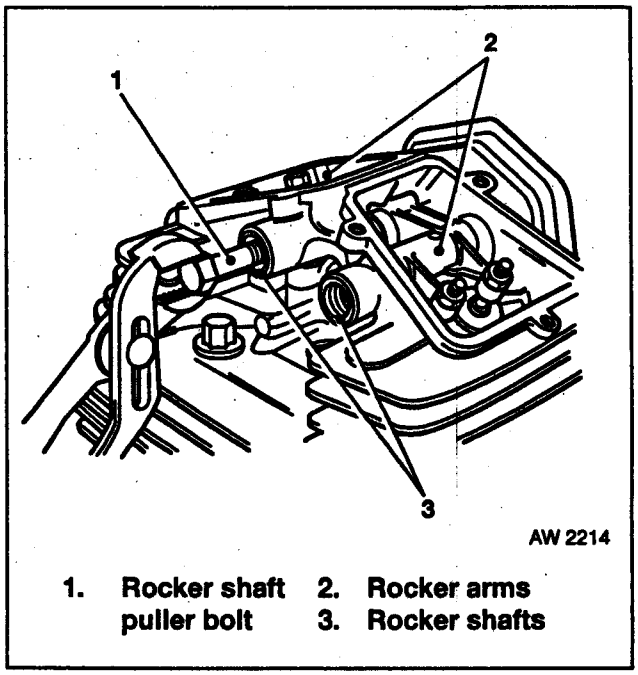


Fig 2.8 Cylinder Removal

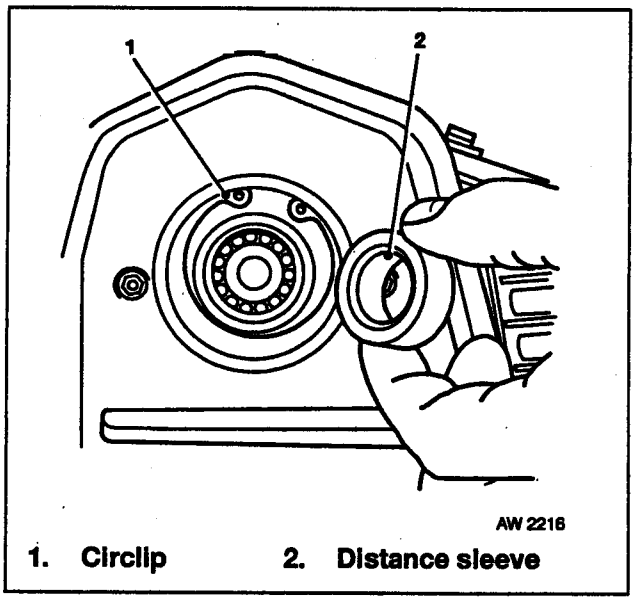


1. Rocker shaft puller bolt
2. Rocker arms
3. Rocker shafts

Fig 2.9 Rocker Shaft Removal

CAUTION

Do not try to remove the needle bearing from the inside to the outside of the cylinder head, otherwise the bearing stoppers will be damaged.



1. Circlip
2. Distance sleeve

Fig 2.10 Camshaft Distance Sleeve and Circlip Removal

CAUTION

To prevent loss of tension, do not compress the valve springs more than necessary to remove the cotters.

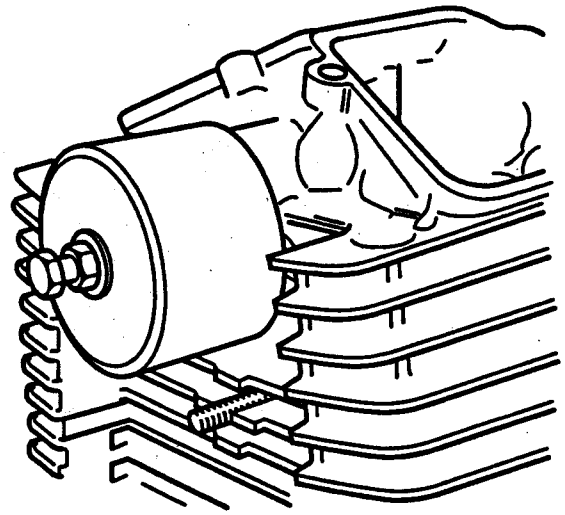
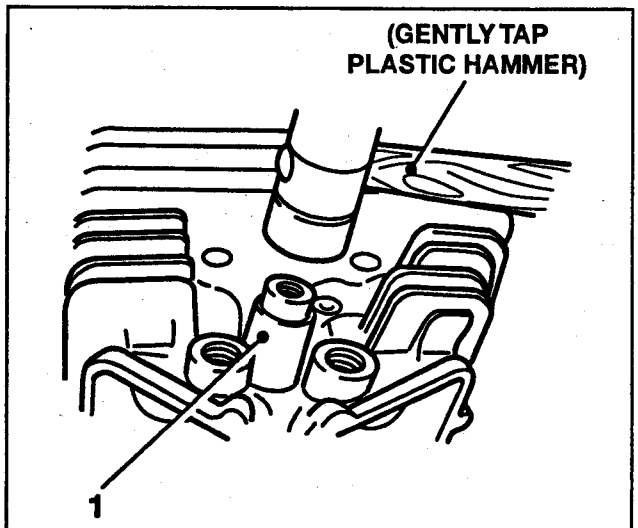


Fig 2.11 Camshaft Extraction



1. Socket

Fig 2.12 Camshaft Bearing Removal

1. Valve compression tool
2. Valve cotters
3. Valve spring compressor

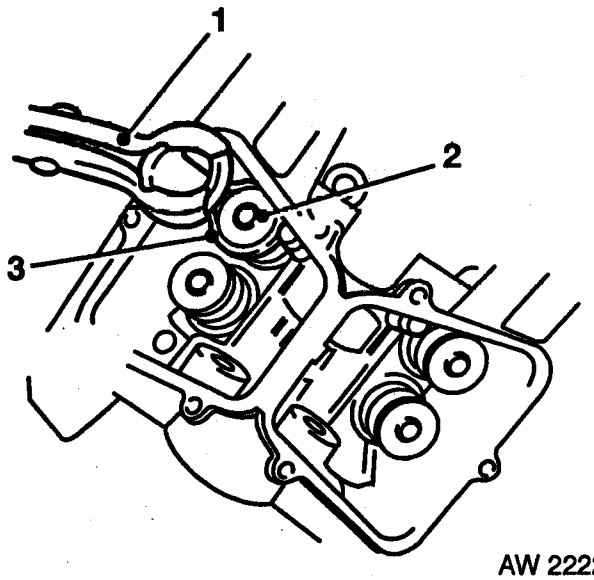


Fig 2.13 Valve Removal

CAUTION

During the piston pin removal, ensure the piston is held firmly, to prevent any damage to the connecting rod and/or piston.

2.6 PISTON REMOVAL

a. Remove the piston pin circlips, using a pointed tool.

NOTE: Before piston pin circlip removal, install a clean rag over the crankcase.

b. Remove the piston pin using an appropriate pin pusher, then remove the piston – Fig 2.14 refers.

CAUTION

During the piston pin removal, ensure the piston is held firmly, to prevent any damage to the connecting rod and/or piston.

c. Using a piston ring expander, the piston rings can be removed.

NOTE: To install, reverse the removal procedure and pay attention to the following:

d. At assembly the piston must be installed with the largest grooves facing the intake side, and the rings spaced at 120° angles between ring gaps. Fig 2.15 refers.

e. Once the circlips are installed, turn each circlip so that the circlip break is not directly in line with the piston notch. Fig 2.16 refers.

f. At cylinder installation replace base gasket, lightly oil cylinder walls, and install piston into cylinder using piston ring compressor. Fig 2.17 refers.

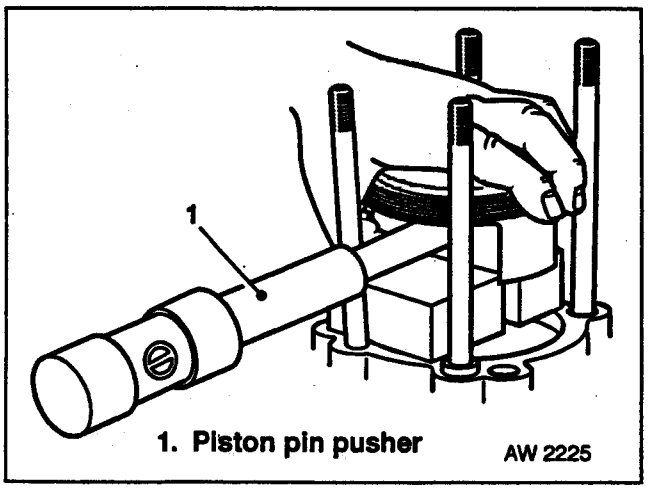


Fig 2.14 Piston Pin Removal

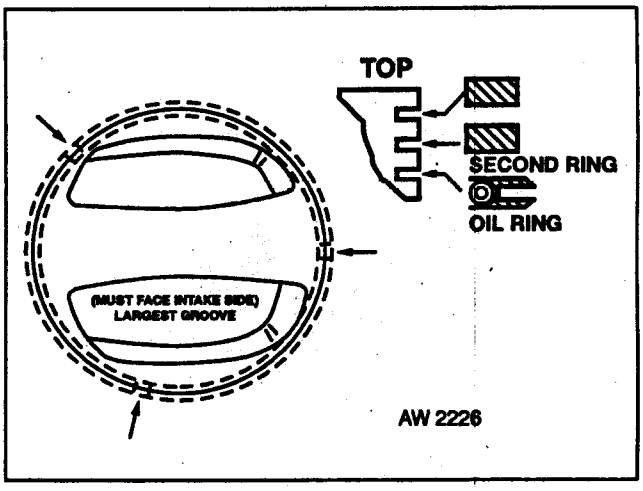


Fig 2.15 Piston Ring Assembly

2.7 CYLINDER HEAD ASSEMBLY AND REFITTING

NOTE: Before engine reassembly, always ensure components are clean and free from defect, within tolerance as against specification, and assembled with new gaskets and seals. Oil all moving parts and grease seals and apply 'Loctite' as appropriate.

a. Reassemble valve seals, valves, valve springs, caps and cotters in reverse order of stripping.

b. Refit camshaft needle roller bearing, Fig 2.18 refers, using an appropriate sized socket, to fit the bearing to a cylinder head warmed to 60–80°C, until the bearing seats against the bearing stoppers. Do **NOT** press on the bottom of the bearing case, only on the shoulder.

c. Insert camshaft and install roller bearing with appropriate sized drift (or socket), slide 'O' ring on to camshaft, fit shim, press in new seal and secure with lock ring. Install distance sleeve, Fig 2.19 refers, with chamfered edge towards bearing.

d. Refit rocker arms, shafts and shims (**NOTE:** the spring shim and threaded portion of rocker shaft **MUST** face magneto side of engine). Secure with hex plugs.

e. Ensure clean surfaces (no cylinder head gasket fitted) and dowels (2) in position – lightly grease and correctly position 'O' rings (3) – refit the cylinder head.

f. Torque the cylinder head in a diagonal sequence:

The two (2) M8 Nuts – 20 Nm (15 ft/lbs)

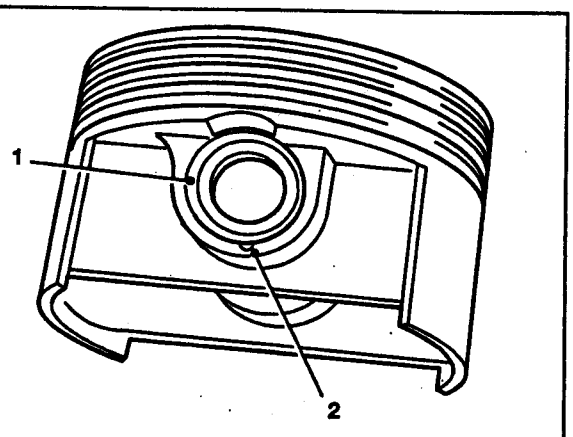
The four (4) M10 Nuts – 35 Nm (26 ft/lbs).

NOTE: Capped nut must be fitted to intake – magneto side stud. Fig 2.20 refers.

g. Refit inner timing belt cover – refit camshaft timing pulley.

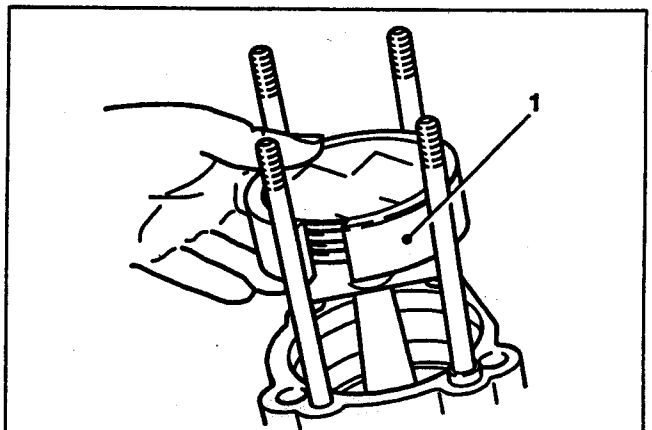
NOTE: Do **NOT** knock pulley on to camshaft as bearing damage can occur – pull on with M8 bolt. Use LOCTITE 221 and torque to 35 Nm (26 ft/lbs).

Ensure inner and outer reference marks in camshaft and pulley align. Refit guide pulley and torque to 24 Nm (18 ft/lbs). Refit belt tensioner and gently tighten nut. Refit crankshaft pulley (with TDC mark at 12 o'clock) and torque to 100 Nm (74 ft/lbs).



1. Circlip break 2. Piston notch

Fig 2.16 Piston Pin Circlip



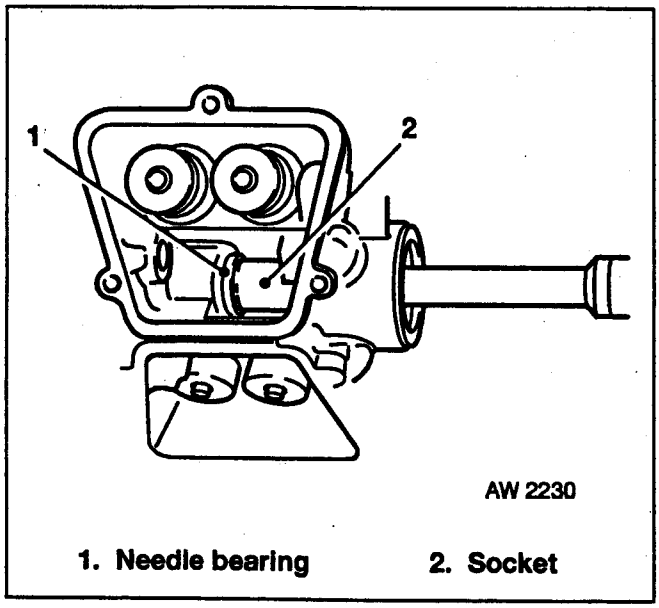
1. Piston ring compressor

Fig 2.17 Use of Piston Ring Compressor

h. **Timing Pulley Alignment** – If belt only is being replaced ensure crankshaft is locked to TDC (Fig 2.21 refers).

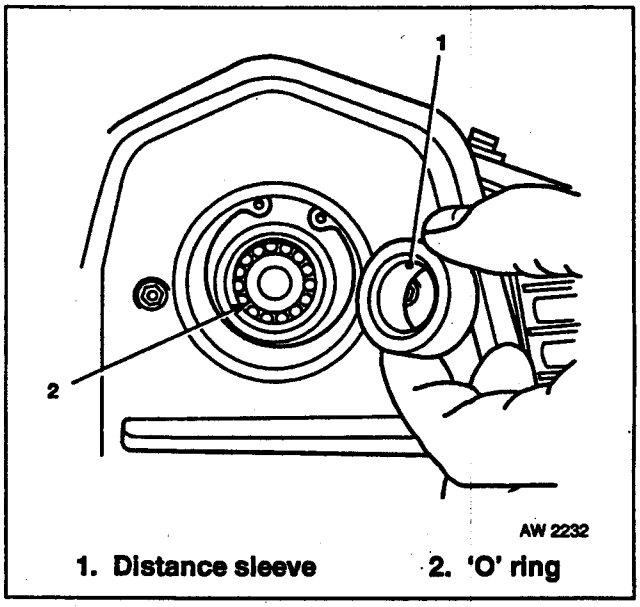
Using a straight edge (ie piece of string) line up crankshaft and camshaft pulleys, Fig 2.22 refers. Refit belt (**NOTE:** If re-using belt ensure correct direction of travel), turning belt tensioner in a counter clockwise direction – tension belt until 6mm of deflection with 20 Nm pressure is applied at guide pulley, Fig 2.23 refers. Tighten tensioner lock nut – remove crankshaft locking screw – rotate engine through 2 revolutions, lock crankshaft and check camshaft and crankshaft alignment. If incorrect repeat above operation.

j. With engine in set position, adjust all (4) valve clearances to ·05mm (·002") cold. Fig 2.24 refers. Replace valve access plates (crankcase breather to rear position) ensuring cover seals are in good order. Replace timing belt outer cover.



1. Needle bearing 2. Socket

Fig 2.18 Camshaft Needle Bearing Installation

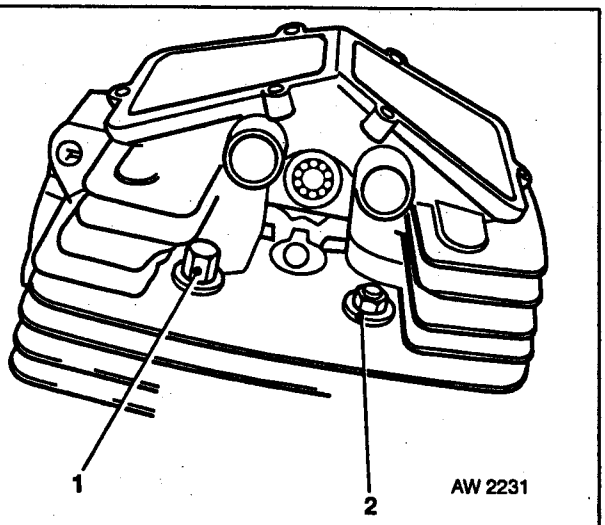


1. Distance sleeve 2. 'O' ring

Fig 2.19 Camshaft Distance Sleeve Installation

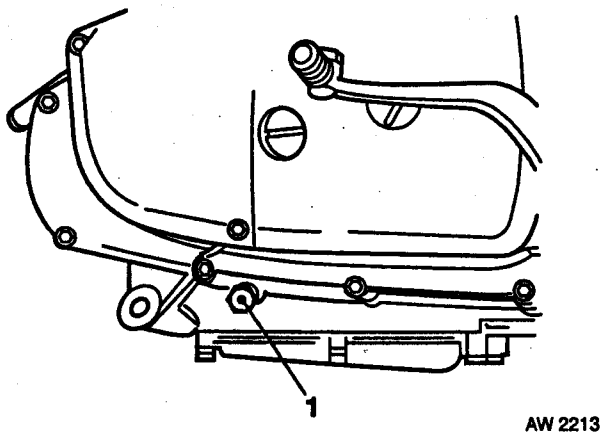
CAUTION

Engine damage will occur if valve clearance is incorrect.



1. Capped nut 2. Regular nut

Fig 2.20 Cylinder Head Unit



1. Crankshaft locking bolt

Fig 2.21 Crankshaft Locking

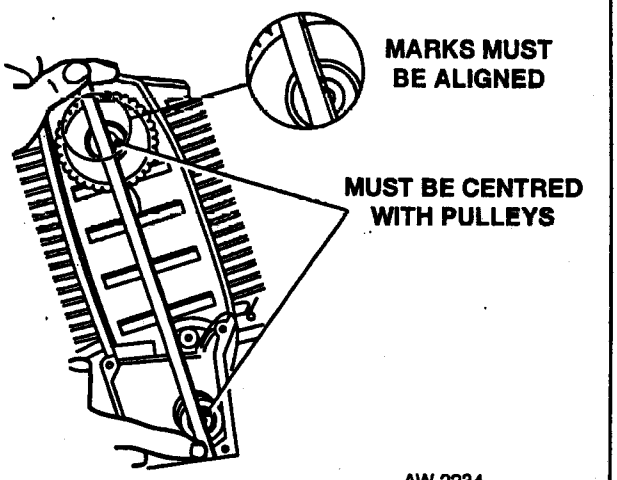
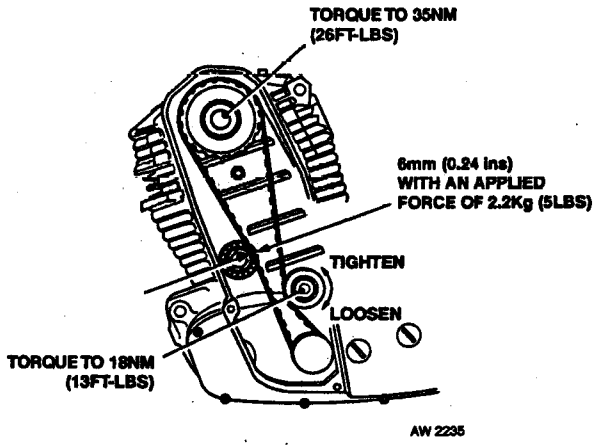


Fig 2.22 Timing Pulley Alignment



Use Loctite 221 Violet

Fig 2.23 Timing Belt Tensioning

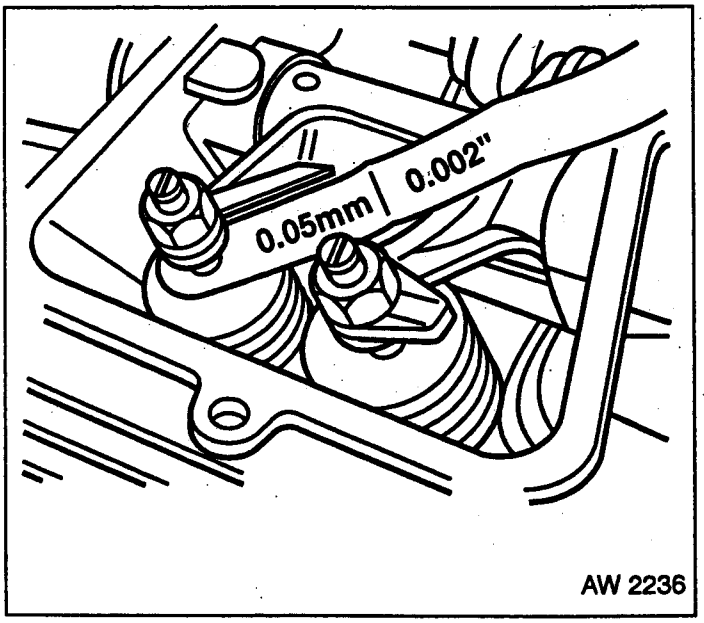


Fig 2.24 Valve Clearance

2.8 CLUTCH ASSEMBLY BUILD-UP

The clutch is built up of the following: clutch drum, friction plates, pressure plates, inner pressure plate, clutch springs, spring pressure plate and clutch hub.

a. The crankshaft gear is in mesh with the clutch drum outer gear. The clutch drum is mounted on bearings which are on a sleeve on the clutch drum, this will give a small amount of end float, which allows the drum to rotate independently of the sleeve. The small gear on the back of the clutch drum is in mesh with the kick-start idler gear which is in turn in mesh with the kick-start gear. There are slots cut in the drum to drive the friction plates.

b. The clutch hub is splined to the clutch shaft and held in place by splined lock washer and nut. The outside of the hub is splined to take the pressure plates. There are holes in the hub through which the posts on the inner pressure plate protrude.

c. There are two types of plates. There are friction plates, these have cork on both faces and lugs on the annulus, they are also free to rotate on the hub. The other set of plates are pressure plates made of mild steel and splined to the hub. The two types of plates are alternately mounted on the hub.

d. The inner pressure plate is internally splined and geared to the clutch hub. The posts on the inner pressure plate protrude through the clutch hub with springs positioned over them, the posts are internally threaded. Screws secure the plate to the top of the posts holding the springs under tension. In this position the springs force the retaining plate away from the hub, which draws the inner pressure plate to the hub, and so clamps all the plates together.

2.9 CLUTCH ASSEMBLY POWER FLOW

Crankshaft gear

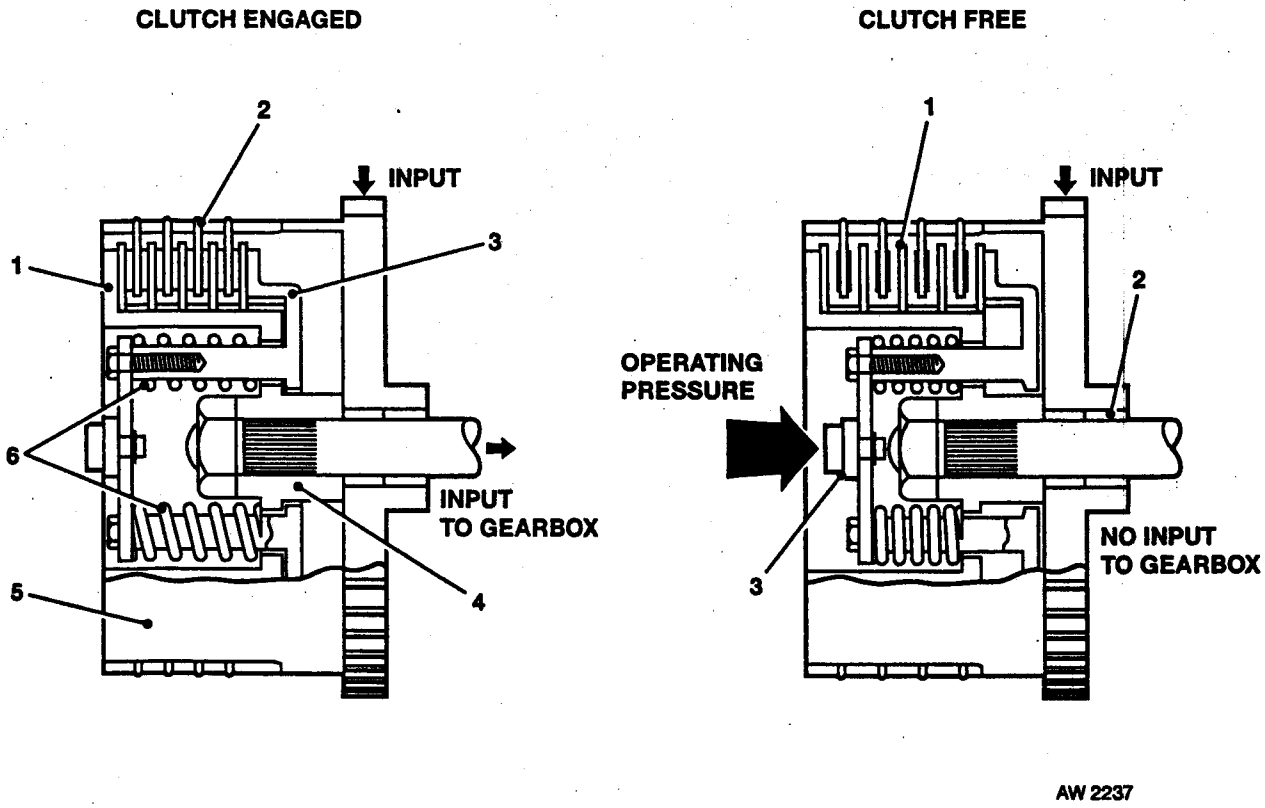
Clutch drum

Friction plates (via lugs)

Driven plates

Clutch hub

Clutch shaft



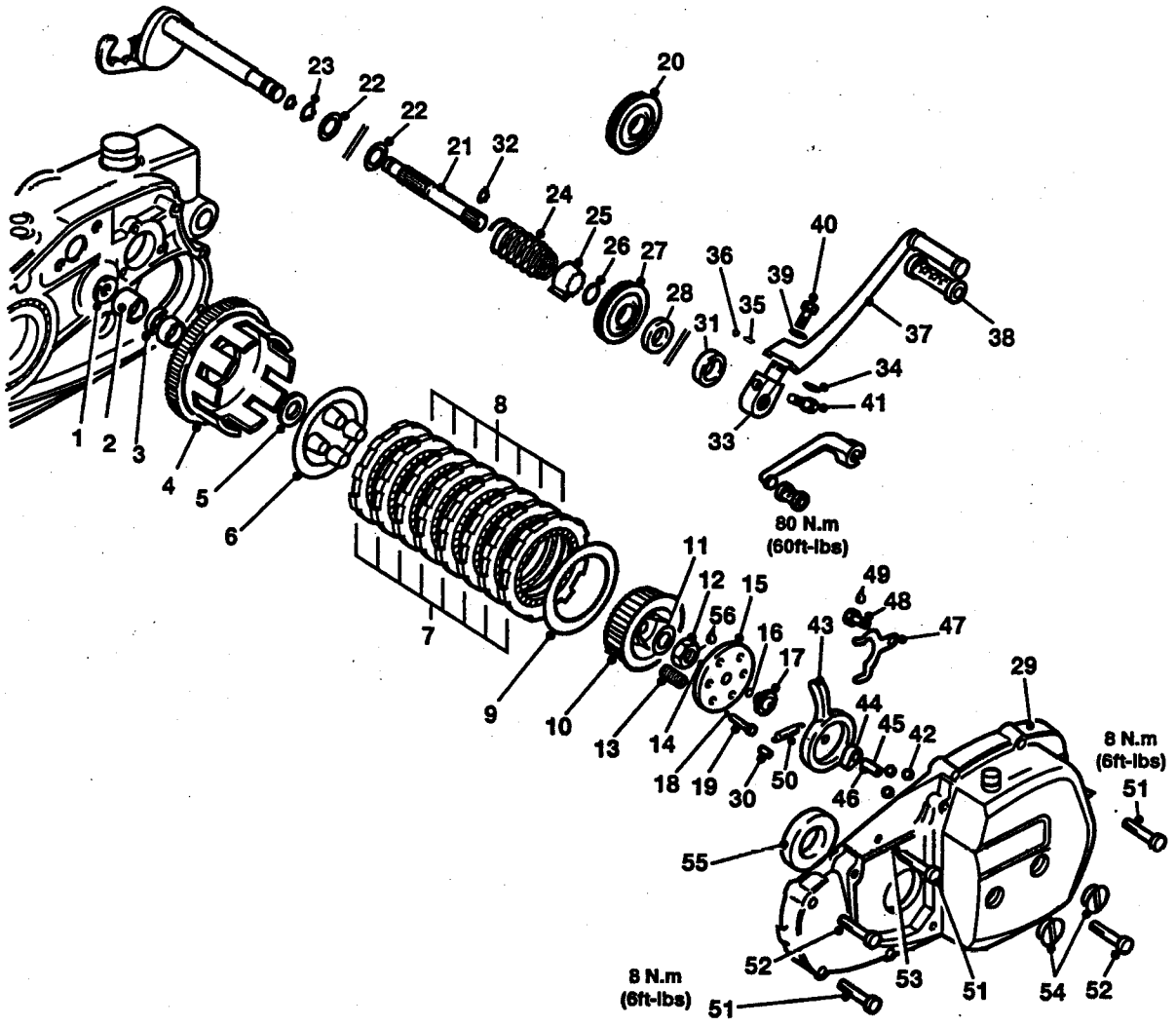
1. Hub flange
2. Friction plates keyed to drum
3. Inner pressure plate
4. Hub centre
5. Drum
6. Pressure springs

Friction Plates compressed between hub and pressure plate by springs. Drum and hub locked together and revolve as one unit.

1. Pressure plates keyed to hub
2. Bearings
3. Release bearing

Pressure Plate moved inward by Operation of Clutch H/Bar control. Friction plates released from compression and separate axially. No drive between drum and hub.

Fig 2.25 Clutch Assembled View



1. Inner thrust washer
2. Inner race
3. Needle bearing
4. Clutch drum
5. Outer thrust washer
6. Inner pressure plate
7. Friction plate
8. Driven plate
9. Outer pressure plate *
10. Clutch hub
11. Locking washer
12. Hexagonal nut 18 x 1·5
13. Clutch spring
14. Snap ring 10 x 1
15. Spring retaining plate
16. Ball 5/32"
17. Spring retaining hub
18. Lockwasher 5
19. Hexagonal head screw 5 x 25

* 7 x 1·25mm

* 1 x 1·5mm

20. Tooth idler gear
21. Kick-start shaft
22. Thrust washer
23. Snap ring
24. Kick-start return spring
25. Ratchet gear
26. Thrust washer 22·2 x 25·5 x1
27. Tooth drive gear
28. Thrust washer 22·5 x 30 x 0·5
29. Clutch cover assembly
30. Drive pin 3 x 8
31. Seal 22 x 32 x 7
32. Circlip
33. Kick start hub
34. 'O' ring
35. Spring
36. Ball 7/32"
37. Lever
38. Rubber sleeve
39. Washer 6·2 x 20 x 2
40. Hexagonal screw M6 x 12
41. Allen screw M8 x 30
42. Ball 7/32"
43. Clutch release cam
44. Locking plate
45. Clutch adjustment screw M8 x 19·5
46. Set screw M4 x 6
47. Cam retaining spring
48. Slotted head screw M5 x 12
49. Loctite 242 (blue, medium strength)
50. Cam return spring
51. Allen screw M6 x 35
52. Allen screw M6 x 40
53. Gasket ring
54. Adjustment plug M18 x 1·5
55. Seal 35 x 47 x 7
56. Loctite 271 (red-high strength)

Fig 2.26 Clutch/Kick-Start/Clutch Cover

NOTE: All bracketed numbers in the text which follows refer to Fig 2.26 – Clutch/Kick-Start/Clutch Cover.

2.10 ACCESS/CLUTCH COVER REMOVAL

a. Prior to clutch cover removal the engine oil will need to be drained. Alternatively it is possible to gain access to the clutch without draining the oil by lying the machine on its side. If this method is used, remove the battery to avoid acid spillage.

b. The clutch cover can be removed with the engine in the frame, but it is necessary to remove the L/H footrest arm for clearance, starter gear cover plate and gear for access to two clutch cover screws.

NOTE: Shim washer on either side of starter gear.

c. For access to the clutch cover assembly it is necessary to remove the timing belt cover, the timing belt and the crankshaft timing belt pulley – see 'Top End' section for removal information.

d. For removal of the cover, and hence access to the clutch itself, the kickstart and gear levers will need to be removed and the circlip (32).

e. Proceed to remove the clutch cover by unscrewing the twelve M6 allen screws (51 and 52) in a diagonal sequence. If the clutch cable is still connected, operating the clutch lever at the handlebar will separate the mating surfaces of the cover and crankcase. Alternatively gently tapping with a soft faced mallet and/or carefully prising the mating surfaces apart with two screwdrivers simultaneously at the two points (where the cases have protrusions cast in for this purpose) will achieve the same result.

2.11 CLUTCH DISASSEMBLY

a. With the clutch exposed the springs (13) and retaining plate (15) are released on unscrewing the six hexagon headed M5 screws (19) with their lockwashers.

b. To remove the clutch shaft nut (12), lock the crankshaft at top dead centre, unbend the locking washer and lock the clutch using the tool (P/N 276 825) from the service tool kit.

c. The clutch is now free to be disassembled.

2.12 CLUTCH INSPECTION/REFURBISHMENT

a. **Clutch Drum.** If the clutch drum splines of the clutch drum (4) are found to be severely worn, replacement may not be necessary. File the damaged spline surfaces equally (Fig 2.27 refers).

CAUTION

The shouldered wall should not be filed thinner than 1·5 mm (0·060"). If replacement is needed always replace both crankshaft drive gear and clutch drum together.

b. **Springs**

(1) The free length of each spring (13) should not be less than 32 mm.

(2) If replacement is necessary, replace the springs as a set – do not replace individual springs.

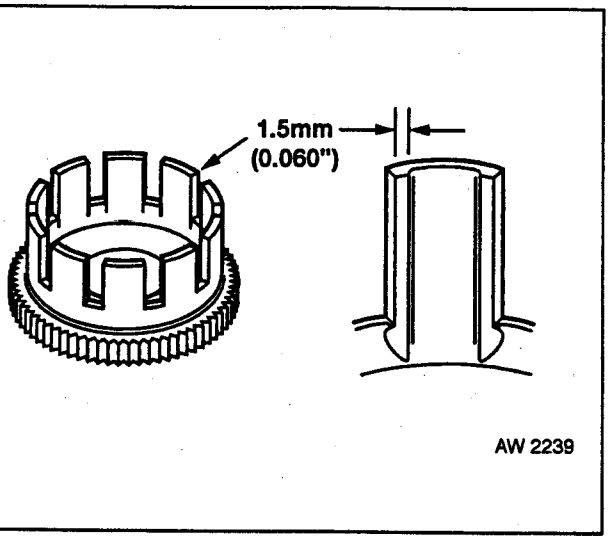


Fig 2.27 Clutch Drum Refurbishment

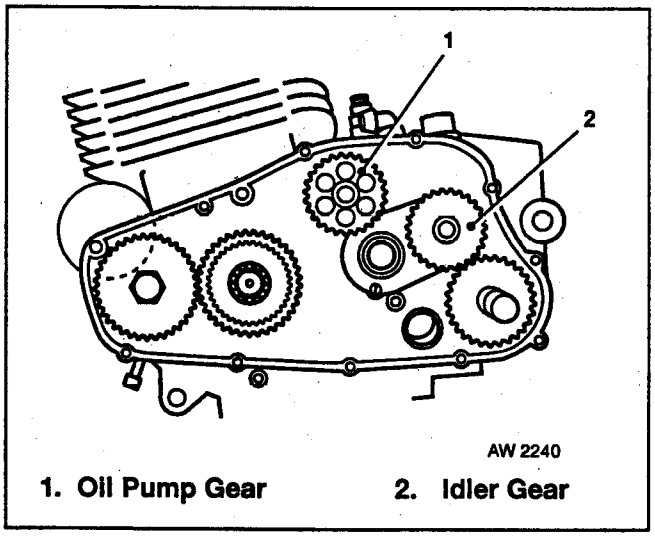


Fig 2.28 Idler and Drive Gear Installation

c. **Plates**

(1) The driven plates (8) (steel) should have a thickness of 1·25 mm ± 0·06 mm and have a maximum distortion from absolute flatness of 0·25 mm. Normally the distortion will be between 0 and 0·15 mm. Any distortion greater than 0·15 mm will contribute to clutch judder, but is not a serious problem.

NOTE: Outer driven plate is 1·5mm.

(2) The drive plate thickness should not be less than 2·2 mm.

(3) Examine all plates for score marks and blackening – particularly the drive plates. This is evidence of overheating due to clutch abuse. Replace the plates as a set if in doubt.

2.13 CLUTCH ASSEMBLY

a. Prior to assembling the clutch hub, position the idler and drive gears as illustrated in Fig 2.28. Note that the flanged side of the idler must face towards the crankcase.

b. Position the thrust washer (5).

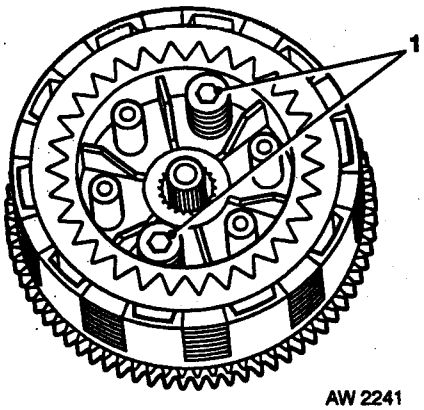
c. With the clutch plates mounted on the clutch hub, fit the clutch inner pressure plate in alignment with the hub splines. Carefully insert the clutch, hub/plate assembly into the clutch drum and onto the clutch shaft.

It may be helpful here to install two clutch springs with washers to hold the clutch together (Fig 2.29 refers).

d. Fit the main clutch shaft nut (12) with an application of Loctite Number 271 red (high strength) and torque to 120 Nm (89 ft/lbs). Use the clutch hub locking tool to do this and ensure that the locking washer (11) is in good order (replace if bent more than twice).

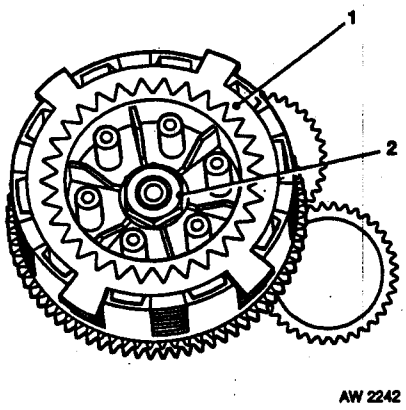
e. Bend the locking washer (11) but do not pry on the inner pressure plate spring post to do so – use a pair of 'waterpump' pliers.

f. Refit the springs (13), retaining plate (15) and tighten the screws (19) in a diagonal sequence. Torque to 5·5 Nm (4 ft/lbs).



1. Clutch spring with washer

Fig 2.29 Clutch Assembly



1. Clutch hub locking tool 2. Locking washer

Fig 2.30 Clutch Fitting

2.14 CLUTCH RELEASE MECHANISM

a. The clutch release mechanism is installed on the inside of the clutch cover assembly and is assembled as illustrated in Fig 2.31.

b. At assembly, clean the three holes with compressed air. Drop a small amount of oil into the three holes and install the three 6mm bearing balls (Fig 2.32 refers).

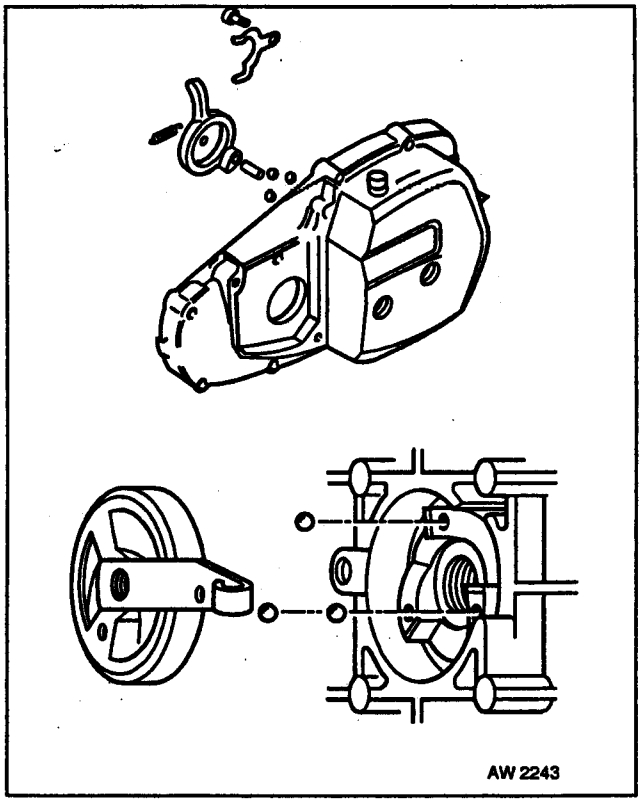
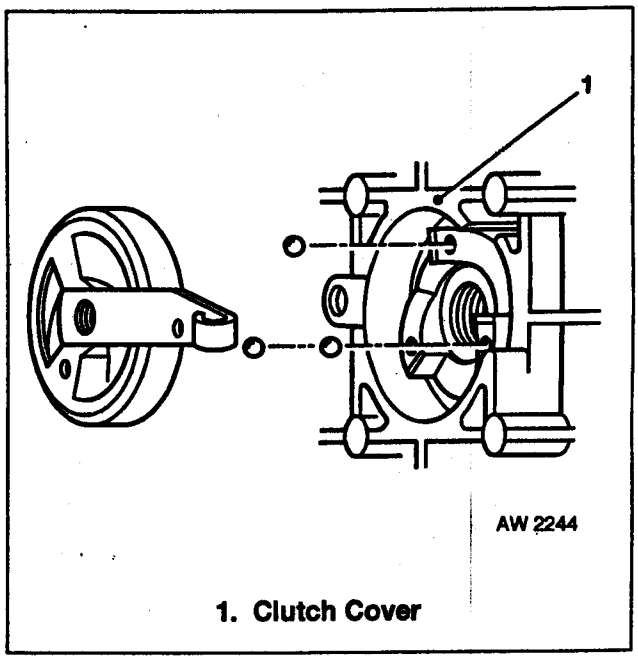


Fig 2.31 Clutch Release Mechanism



1. Clutch Cover

Fig 2.32 Clutch Release Mechanism Installation

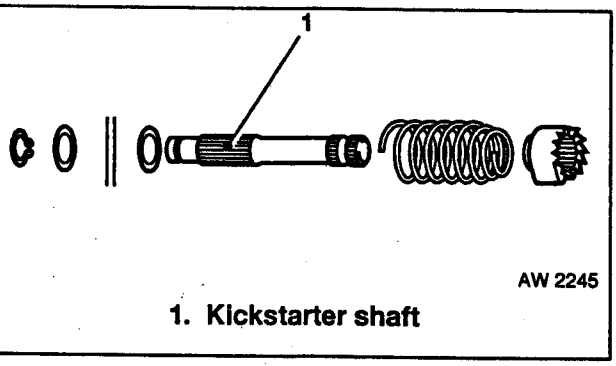
c. On refitting the screw (48) apply Loctite Number 242 blue (medium strength) on the threads and torque to 5·5 Nm (4 ft/lb).

2.15 KICK-START MECHANISM DISASSEMBLY

a. The kick-start assembly is as Fig 2.33.

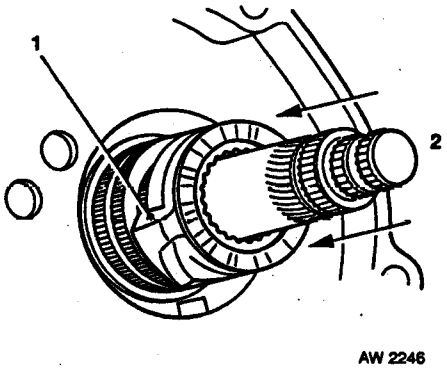
b. To disassemble, remove the thrust washer, gear and thrust washer (28, 27, 26 respectively).

c. The ratchet gear (25) can only be removed when the stop screw, screwed into the crankcase casting from the underside has been removed. Caution should be exercised here as the kick-start return spring (24) is under tension and is liable to quickly rotate the ratchet gear and force it off the shaft.



1. Kickstarter shaft

Fig 2.33 Kick-Start Assembly



1. Ratchet gear shoulder
2. Stop screw installed

Fig 2.34 Kick-Start Installation

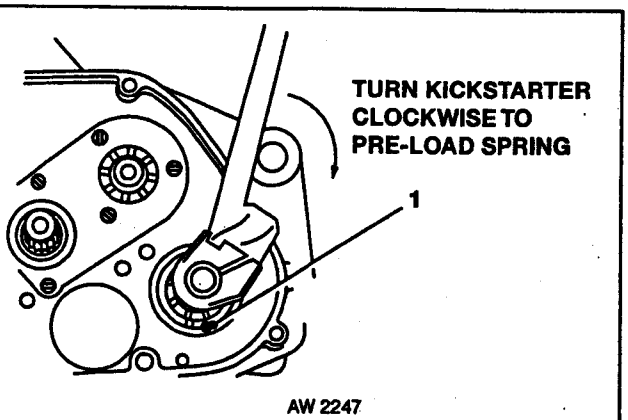
2.16 KICK-START MECHANISM ASSEMBLY

a. Ensure that the spring ends are well positioned in the crankcase and ratchet gear holes.

b. Partially engage the ratchet gear onto the shaft splines (Fig 2.34 refers).

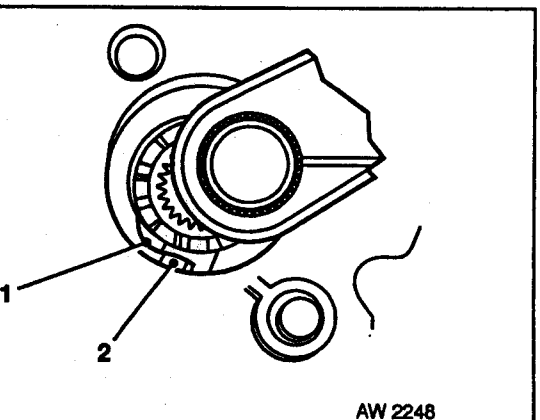
c. Install the kick-start lever and pre-load the return spring approximately 1 turn clockwise (Fig 2.35 refers).

d. Completely slide the ratchet gear onto the splines while retaining the tension with the kick starter lever.



1. Stop screw

Fig 2.35 Kick-Start Spring Pre-Loading



1. Ratchet gear shoulder 2. Stop screw

Fig 2.36 Kick-Start Ratchet Gear Position

e. Slowly release the kick-starter lever and the ratchet gear will lean against the stop screw (Fig 2.36 refers).

NOTE 1: After assembly, do not assemble the kick-starter stop screw unless needed, otherwise the kick starter spring will lose its pre-load and the clutch cover will have to be removed to reposition.

2: The complete kick-start assembly, including the shaft (21) can only be removed after splitting the crankcases. This will then allow access to the retaining circlip (23).

2.17 CLUTCH COVER REPLACEMENT

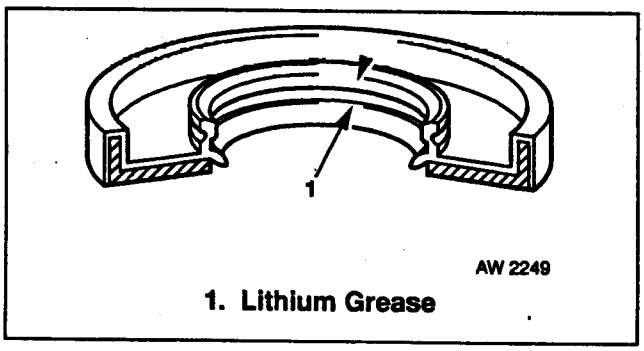
NOTE: Before replacing the clutch cover, check on the condition of the seals (31 and 55). It is easier to replace them at this stage. Apply a thin coat of lithium grease on the seal lips (Fig 2.37).

a. Ensure the mating surfaces of the crankcase and clutch cover are clean. Apply a light coat of Loctite 515 sealant to mating surfaces and lightly tap cover into place.

CAUTION

As the cover is being installed, ensure that the kick starter seal lip is not flipped over by the kick-starter shaft splines.

b. Replace the cover screws (51, 52) and torque to 8 Nm (6 ft/lbs) in a diagonal sequence, with a thin coat of grease or a small drop of oil on the threads.



1. Lithium Grease

Fig 2.37 Seal Greasing

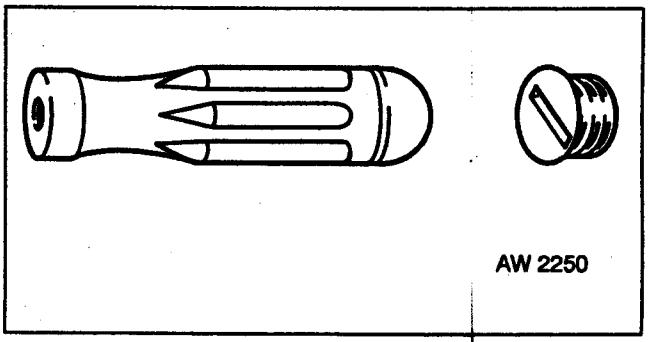


Fig 2.38 Clutch Access Plug Installation

2.18 CLUTCH ADJUSTMENT

a. Using screwdriver handle from tool kit, remove clutch adjustment access plug, item 54, Fig 2.26 refers.

b. Pull clutch lever shroud back far enough to expose cable adjuster. Loosen locknut and rotate adjuster until it goes as far as possible into clutch lever body. This is necessary to remove all tension from the cable and to obtain maximum free play in the lever.

c. Place clutch adjusting wrench from tool kit onto lock nut, accessible through screw plug hole. Hold adjusting screw with flat tip screwdriver and loosen lock nut.

d. Turn adjusting screw clockwise until it bottoms, then back off counter clockwise ¼ turn. While holding screw in this position, tighten the lock nut. Fig 2.39 refers.

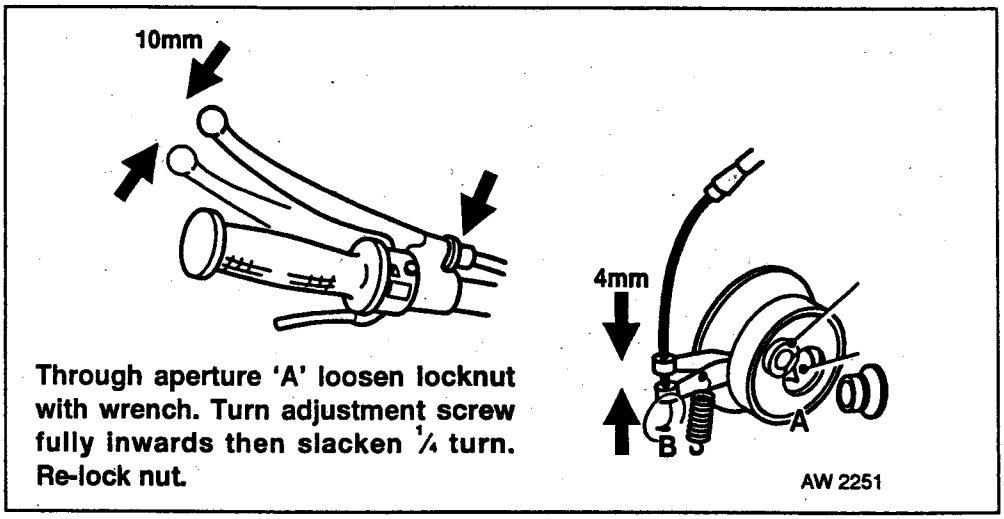


Fig 2.39 Clutch Adjustment Points

e. Rotate adjuster out from clutch lever body until the lever is comfortable for the operator. Minimum free play 10mm at clutch handlebar lever end. Tighten lock and replace access plug.

2.19 GEARBOX ASSEMBLY – CONSTRUCTION AND OPERATION

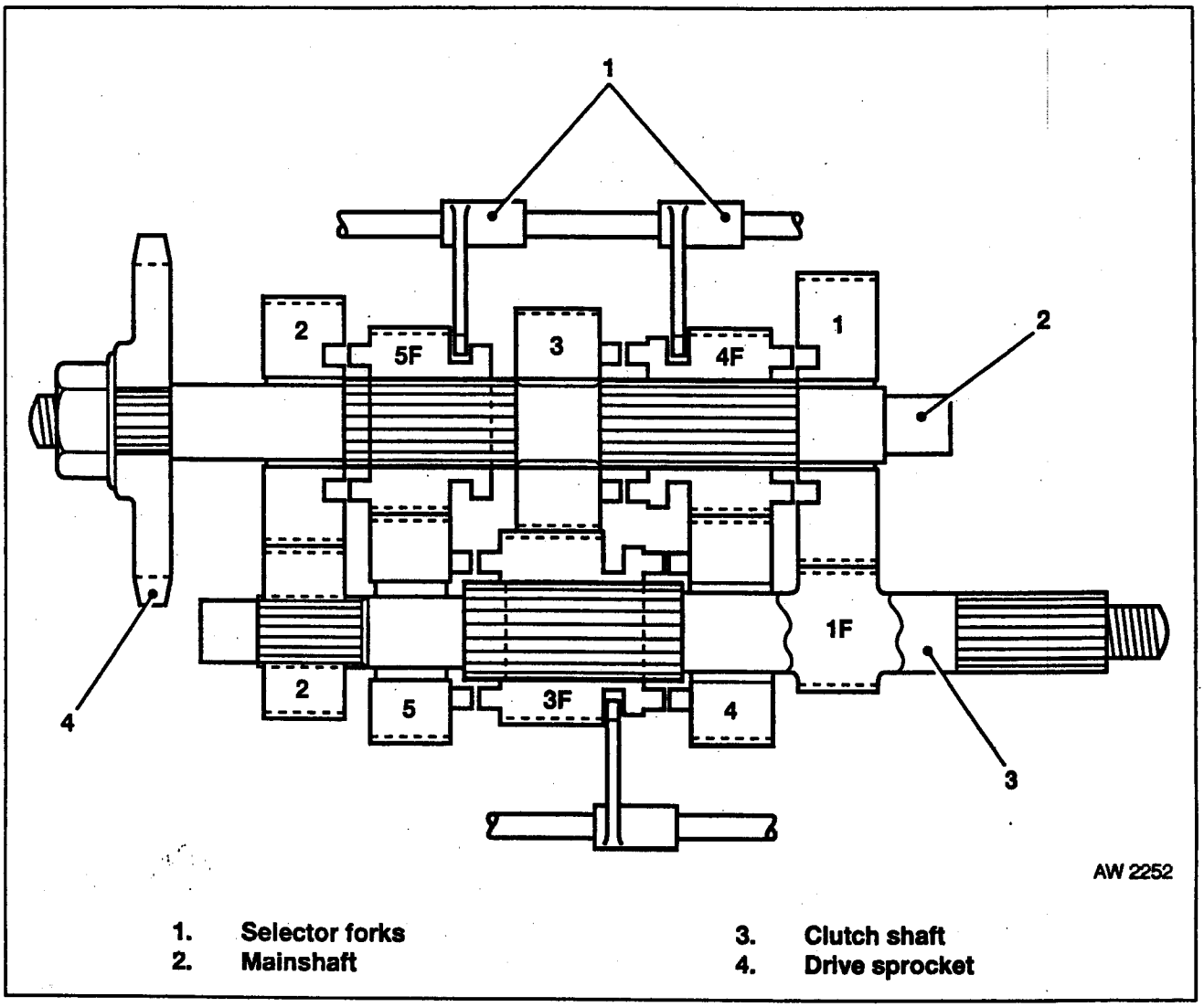
a. It is a five speed constant mesh gearbox mounted integral with the engine casing to the rear of the crankcase. The gears are all spur gears and gear engagement is by dog teeth. There are two shafts, the main shaft and the clutch shaft. The clutch shaft has 1st gear built into it, 4th and 5th gear sit on bearings on the clutch shaft, and 2nd and 3rd are splined to it. Third gear also has a recess to accept the selector fork. By sliding 3rd gear left or right, it will engage 4th or 5th. The gears are mounted 1st, 4th, 3rd and 2nd from the left. The clutch shaft is mounted on two ball bearings located in both crankcase halves. The left side of the clutch shaft protrudes through the crankcase and the clutch hub is splined to it and secured by a nut.

b. The main shaft also has 5 gears mounted to it in the same relationship as the clutch shaft. 1st, 2nd and 3rd are mounted on bearings, and 4th and 5th are splined to the shaft. 4th and 5th gears have recesses to accept the selector forks. By sliding 5th gear to the left, 2nd gear will be engaged and 4th moves left for 3rd and right for 1st. The main shaft is also mounted on two ball bearings pressed into the crankcase halves. The L/H end of the shaft protrudes through the crankcase as a plain shaft and the kick-start idler gear with an internal bush fits on it. The R/H side of the shaft projects through the crankcase and the chain sprocket is splined onto it and held rigidly by a nut (Fig 2.40 refers).

c. Gear selection is achieved by moving the selector forks and gears in and out of mesh. The movement of the selector fork is controlled by the selector drum. The drum is mounted to the L/H and R/H crankcase halves and is allowed to rotate. The selector fork pegs follow grooves in the drum, the pattern of the grooves allows two selectors to remain stationary and the other to move the chosen gear in and out of mesh.

d. The R/H side of the drum also has a grooved plate of which the depressions refer to an engaged gear or neutral and into which a sprung pawl locates, this acts as a locking device. The drum is rotated by a toothed arm which coincides with pegs integral on the drum. The arm is returned to the central position after gear engagement. The eccentric pin adjusts the position of the arm in relation to the drum. The arm is controlled by the gear selector shaft and the foot pedal.

e. An insulated washer is integral with the selector drum and fits between the drum and the R/H crankcase. A metal pin protrudes through the washer and coincides with an electrical switch when the gearbox is in neutral, this provides an earth path for the neutral light.



1. Selector forks
2. Mainshaft
3. Clutch shaft
4. Drive sprocket

Fig 2.40 Gear Train

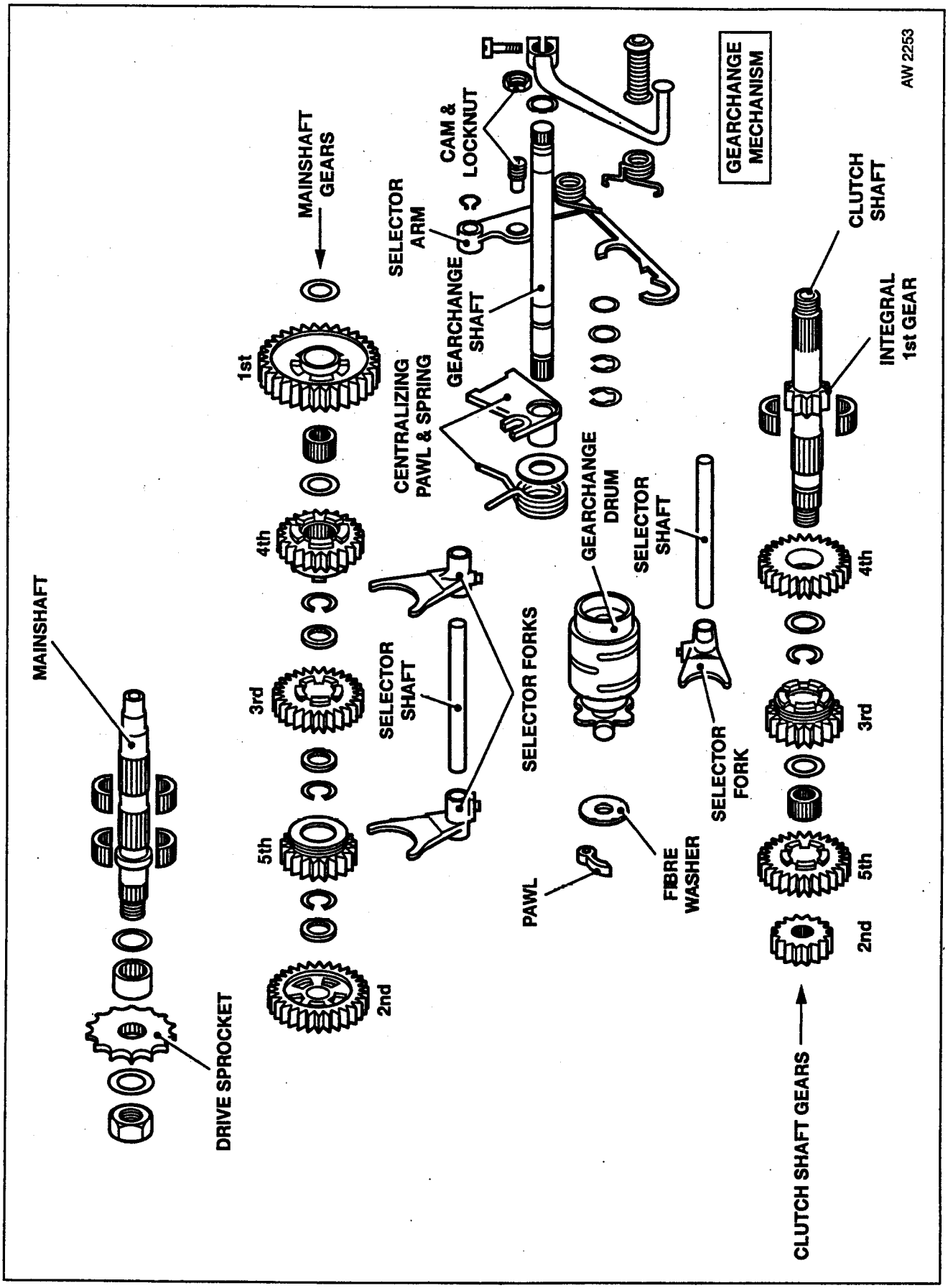


Fig 2.41 Gearbox Assembly Exploded View

2.20 FAULT DIAGNOSIS – ENGINE GEARBOX UNIT

SYMPTOM	FAULT	REMEDY
1. Engine will not (or is hard) to start and/or runs poorly	a. Operator insufficiently experienced in technique of starting. 'RUN' switch in incorrect position.	Practice correct technique! Switch to correct position.
	b. Poor, intermittent, wrongly timed or non-existent sparks at plug due to:	
	Ignition switched off	Switch on
	Spark plug dirty, incorrectly set or wrong type	Clean, reset or replace as necessary
	Fault with ignition system	See Chapter 6.
	c. Fuel/air mixture not reaching engine due to:	
	Out of fuel	Refuel
	Fuel tap turned off	Turn on
	Blocked fuel line	Unblock
	Air filter element clogged	Replace
	Fault with carburettor and/or setting thereof.	See Chapter 4.
	d. Engine compression low due to:	
	Improperly tightened spark plug	Tighten
	Improperly tightened cylinder head	Tighten
	Valve sticking	Stripdown and free off. Replace as necessary.
	Piston ring stuck in groove	Stripdown, repair/replace
	Worn cylinder and piston rings	Repair or replace
	Tight valve clearance	Readjust
	e. Excessive carbon deposits in engine, causing pre-ignition	Stripdown, remove deposits, scrutinise for wear.
	f. No oil in engine	Add oil, investigate for evidence of damage.
	g. Valve timing wrong	Check timing bolt setting. Reset as necessary.
2. Clutch slips, drags or noisy in operation.	Problem due to:	
	a. Incorrect adjustment	Adjust according to specification.
	b. Worn or buckled plates	Replace.

SYMPTOM	FAULT	REMEDY
Gearbox problem: 3. Jumping out of gear/poor gear engagement	a. Worn dogs on gears b. Improper engagement due to: Bent or worn shifting forks Bent shift fork shaft Shift drum channels worn Shift drum index spring brakes, worn	Stripdown, replace Replace Replace Replace Replace
4. Abnormal noises from engine	a. Component failure or wear. More specifically:	Investigate, replace.
5. Excessive clicking from cylinder head vicinity.	a. Incorrect tappet clearance. b. Foreign body in combustion chamber.	Check, adjust Investigate if possible by looking through spark plug hole.
6. Ticking noise, excessive oil consumption, low power.	a. Broken piston ring	Stripdown, replace.

CHAPTER 3
Lubrication System

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

3.1 GENERAL DESCRIPTION

Fig 3.1 refers.

a. The lubricating system on the MT350 is a 'dry sump type'. This means that there is no oil reservoir in the lower portion of the crankcase. The frame backbone acts as an oil reservoir.

b. Oil is fed to the engine oil pump assembly from the reservoir after first being filtered by the primary oil filter. (Fig 3.1 refers (12)).

c. The oil is finally returned to the reservoir via an oil pipe line (3) after circulating the engine. Refer to Fig 3.2 for the circulation diagram.

d. This chapter explains the procedure for oil changes and oil filter servicing/replacement. Paras e. to n. continue to explain the system in more detail.

e. The oil feed pump is installed inside the R/H half of the crankcase, and is used to circulate the oil through the lubrication system. The oil pump is of the 'bi-rotor' type, commprising two combined assemblies, one for feeding, the second for scavenging/returning the oil to the reservoir.

NOTE: The scavenger pump has three times the capacity of the feed pump.

f. The inner rotors are attached to the oil pump drive shaft, which is mounted off-centre in the pump housing. The inner rotors drive the outer rotors. As the units turn, the space between the inner and outer rotors are first filled with oil. After one-half a revolution, the lobes of the inner rotors move into the spaces of the outer rotors, forcing the oil out of spaces through the pump outlets and to the various sections of the engine.

g. The oil, coming from the oil reservoir (backbone) enters the engine by the INLET (90° coupling) on the L/H half of the crankcase, and flows to the R/H half through an inner drilling, this drilling takes the oil to the feed section of the oil pump.

h. From the feed pump, the oil flows through the check valve (which opens under pressure) to the outer side of the filter element. Flowing through the element to the inner side, the oil flows through a drilling in the R/H half of the crankcase, taking it to a three-way distribution point (key 4).

j. Under pressure, a porportion of the oil flows to the cylinder head, via the oil passage incorporated around the rear R/H side cylinder head stud (capped nut) to lubricate camshaft, valve train and all cylinder head components.

The camshaft rotates in an oil bath fed by a small hole underneath, as the oil bath level increases oil runs through the cylinder head and cylinder passages to the L/H half of the crankcase to lubricate the clutch, balancer gear, L/H crankshaft bearing and gear, oil pump drive, idler gears and all other clutch components.

k. A second feed from (4) takes a supply of oil to the R/H half of the crankcase to lubricate the crankshaft main bearing. Rotating masses (eg crankshaft - incorporating an oil slinger, and balancer shaft) spray oil on to the cylinder wall for lubrication, and also crank pin (big end). The piston oil control ring scrapes excess oil down the cylinder wall into the crankcase some of which will enter four (4) small holes on the piston to lubricate the gudgeon pin/small end assembly.

l. The remaining feed from point 4 directs oil through a drilling in the R/H half of the crankcase to splash feed the transmission gears.

All oil fed to the engine/transmission will drop by gravity through the strainer into the sump, where it will be drawn up by the scavenge pump for return to the oil reservoir.

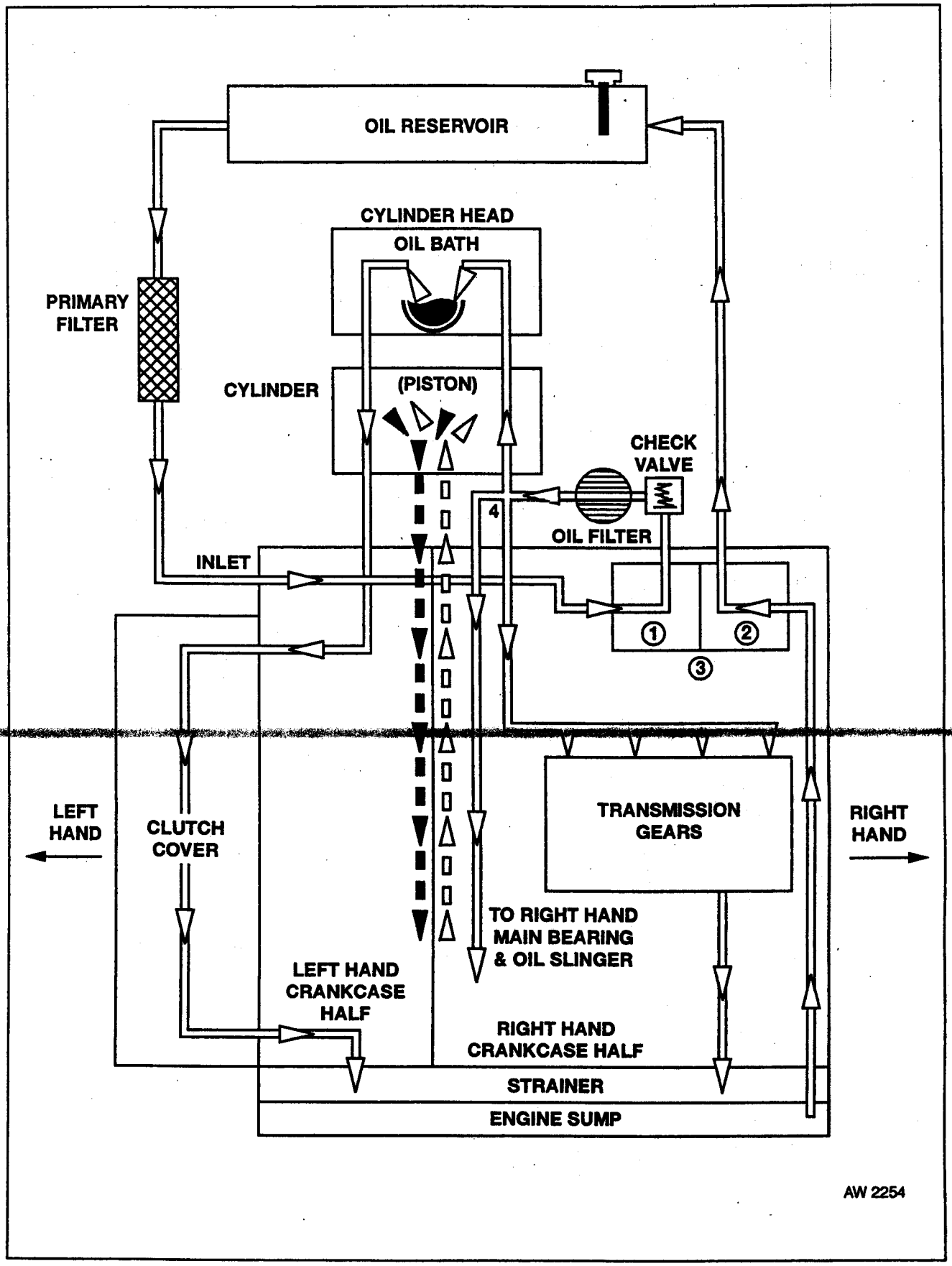
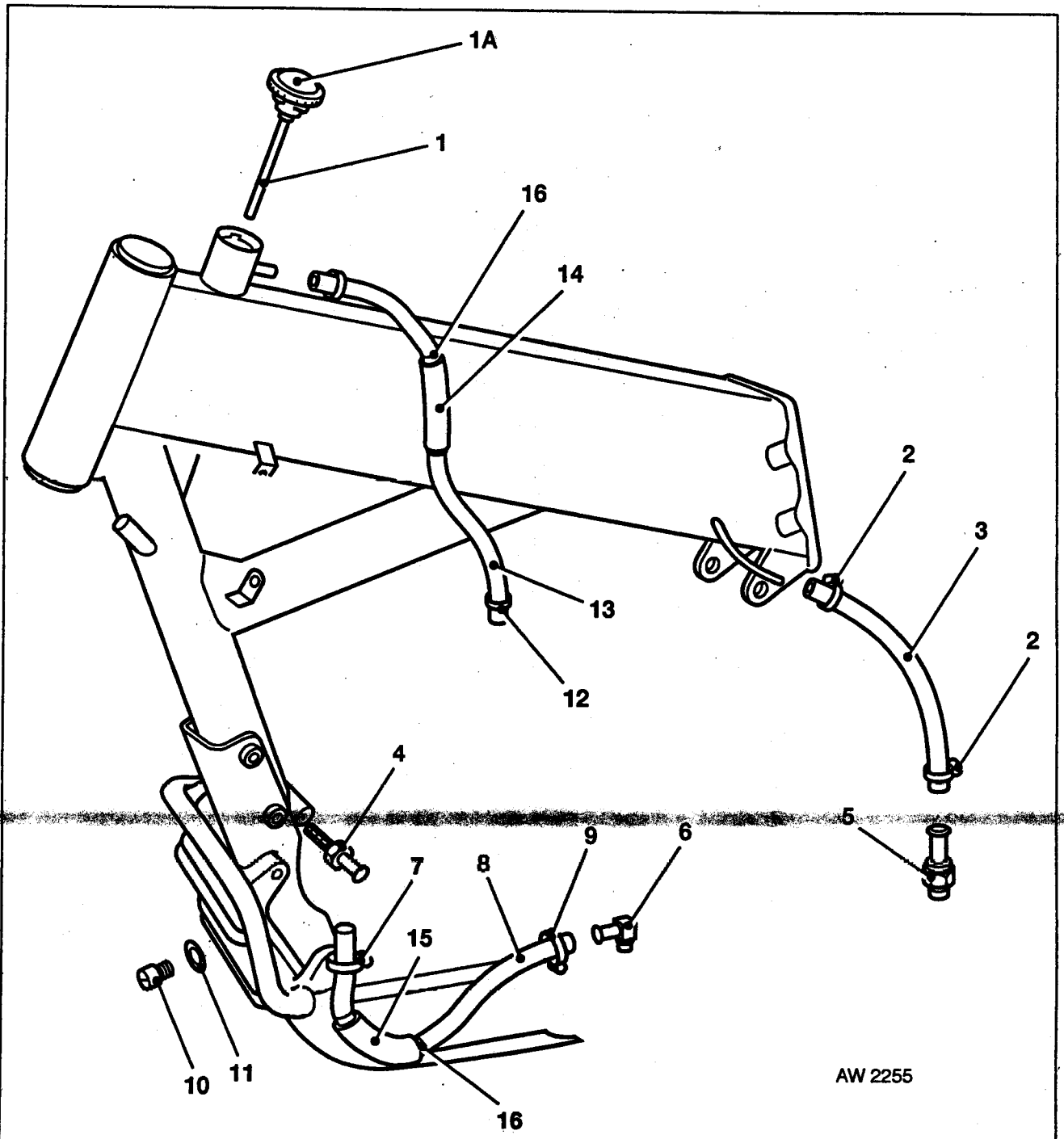


Fig 3.1 Schematic Engine Lubrication



1.	Dipstick assembly	9.	Hose clamp
1A.	Dipstick cap	10.	Drain plug
2.	Hose clamp	11.	Drain plug seal
3.	Oil return hose	12.	Hose clamp
4.	Oil strainer	13.	Breather hose
5.	Return hose fitting	14.	Protection sleeve
6.	Inlet coupling (90° fitting)	15.	Protection Sleeve
7.	Hose clamp	16.	Tye Wrap
8.	Supply hose		

Fig 3.2 Oil Piping Set

3.2 ENGINE OIL CHECK AND TOP UP

a. The dipstick is integral with the oil filler cap and is used to check the engine oil level contained within the main frame tubing.

CAUTION

Ensure engine oil is at minimum level on dip stick before starting.

b. To ensure with any certainty the accuracy of the dipstick readings it is necessary to check the oil level only by the following procedure, c. to k. It must be borne in mind that some oil may drain into the sump when standing and is pumped back into the oil tank within the first minutes of starting, so raising the level.

c. Start the engine and fully warm up until it will sustain an even tickover without choke.

d. Allow machine to tickover for at least 45 seconds to allow the engine oil level to become steady.

e. Stop the engine, ensure the machine is upright.

f. Depress and rotate oil cap anti-clockwise to release.

g. Remove and wipe dipstick.

h. Insert dipstick, remove and check that the level is between the lower and upper marks (Fig 3.3 refers).

j. Add oil if necessary, **but do not overfill.**

k. Replace cap.

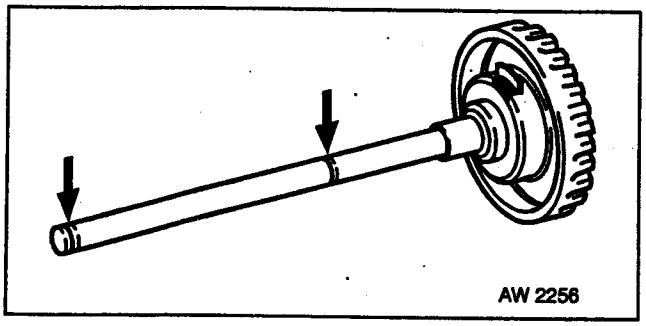
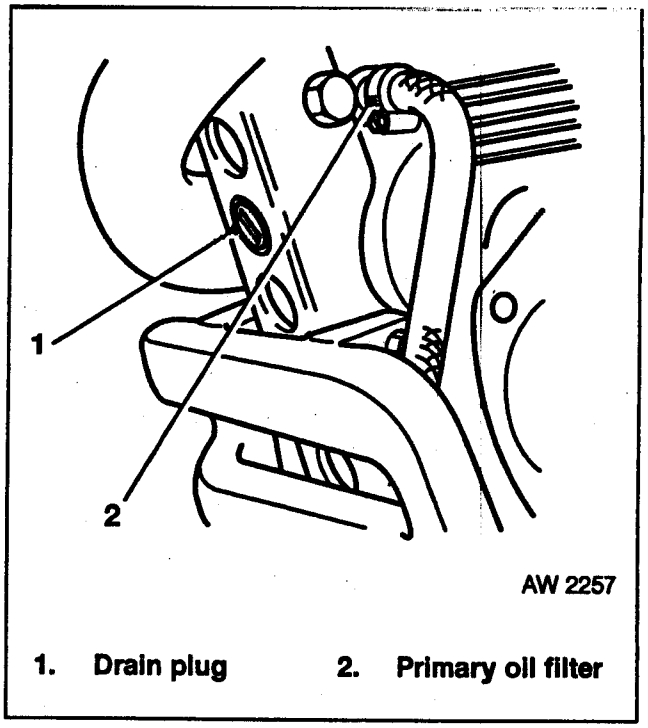


Fig 3.3 Engine Oil Dipstick



1. Drain plug **2. Primary oil filter**

Fig 3.4 Front Frame Drain Plug and Primary Oil Filter

3.3 ENGINE OIL CHANGE AND FILTER SERVICING REPLACEMENT

a. The main reservoir for the engine oil is contained within the tubing of the front frame section. At any one time most of the oil is in the frame whilst a small portion remains in the engine and oil pipes.

b. The engine oil and oil filter should be changed and the primary oil filter serviced at the specified service interval.

c. **Draining the engine oil**

(1) If possible ensure the engine is warm to facilitate and speed the oil draining process.

(2) Drain the frame reservoir by removing the plug situated on the front frame downtube (Fig 3.4(1) refers). Replace sealing washer.

NOTE: The oil tends to shoot out forward.

d. Drain the engine of oil by removing the engine oil plug (Fig 3.5 refers). **NOTE:** Do **NOT** overtighten.

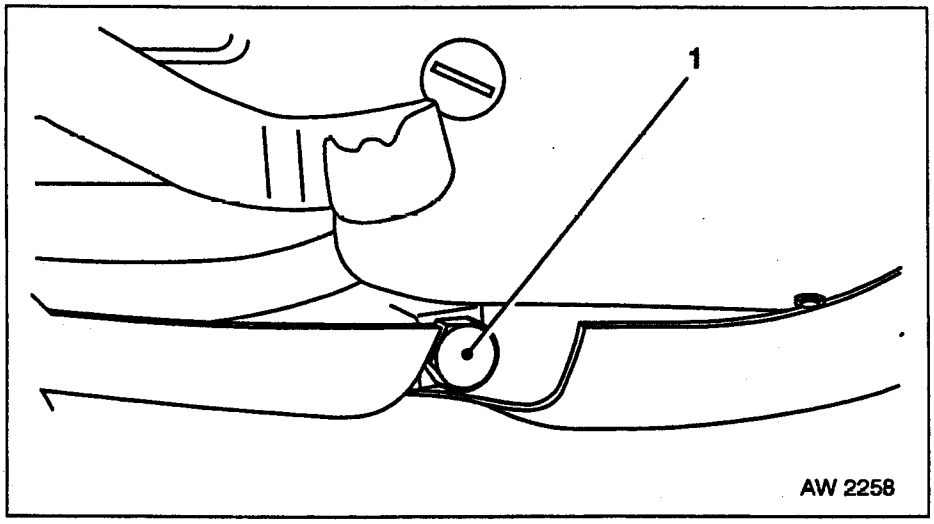


Fig 3.5 Crankcase Drain Plug

3.4 PRIMARY OIL FILTER, CLEANING SERVICING

a. The primary oil filter is situated at the front of the frame (Fig 3.4(2) refers) on the left hand side behind the crash bar. To service the primary oil filter it needs to be removed.

b. Thoroughly wash gauze with paraffin/petrol (Fig 3.6 refers). If possible back-flush gauze filter by rinsing petrol/paraffin down attached pipe so as to flush the filter from the inside.

Re-seal with PTFE tape.

c. Reassemble on machine, reversing the disassembly process.

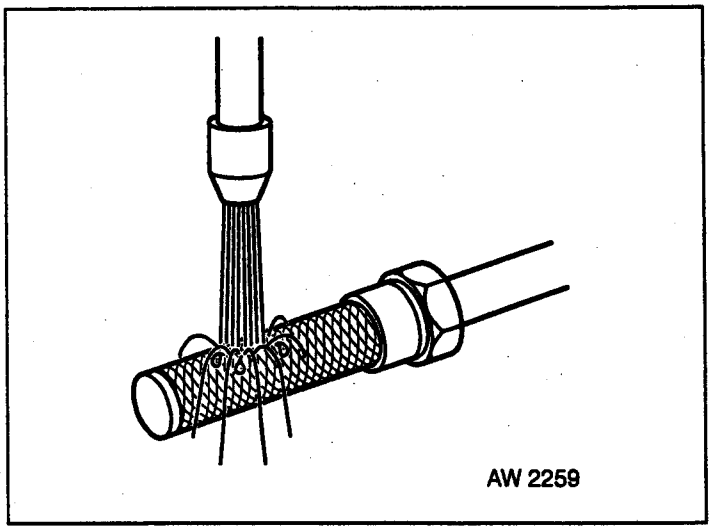


Fig 3.6 Primary Oil Filter Gauze Cleaning

3.5 MAIN ENGINE OIL FILTER, RENEWING

a. The main engine oil filter (Fig 3.7 refers) is situated behind the sprocket cover on the right hand side of the machine. To gain access it is necessary to remove the rear brake pedal and sprocket cover. Proceed as follows:

b. Remove sprocket cover retained by three allen screws. The engine oil filter is housed behind the cover (Fig 3.7(1) refers). Remove the three retaining screws (Fig 3.7(2) refers) and cover.

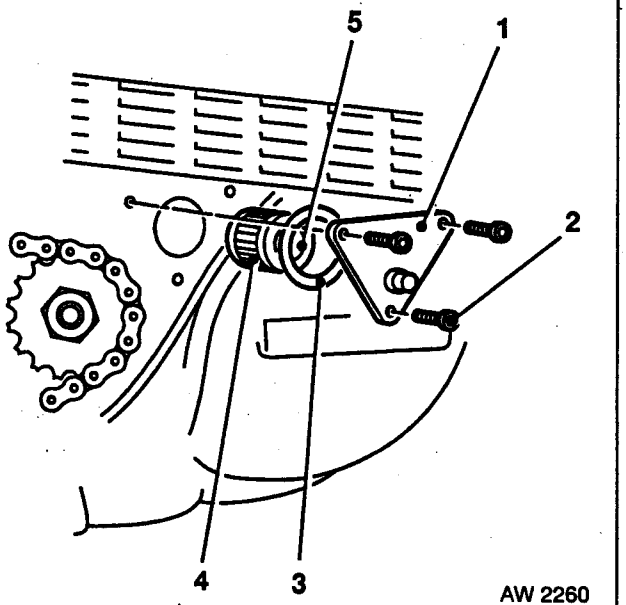
c. The engine oil filter may now be withdrawn.

CAUTION

This oil filter type is equipped with a safetey valve to prevent lack of oil in the engine caused by a blocked oil filter. To check, depress the safety valve with a finger (Fig 3.7(5) refers). It should function freely.

d. Install the new filter and replace the cover, ensure the 'O' ring is in good condition.

e. Replace the removed components.



1. Engine oil filter cover
2. Retaining screws (8 Nm torque)
3. 'O' Ring
4. Filter
5. Safety Valve

Fig 3.7 Engine Oil Filter

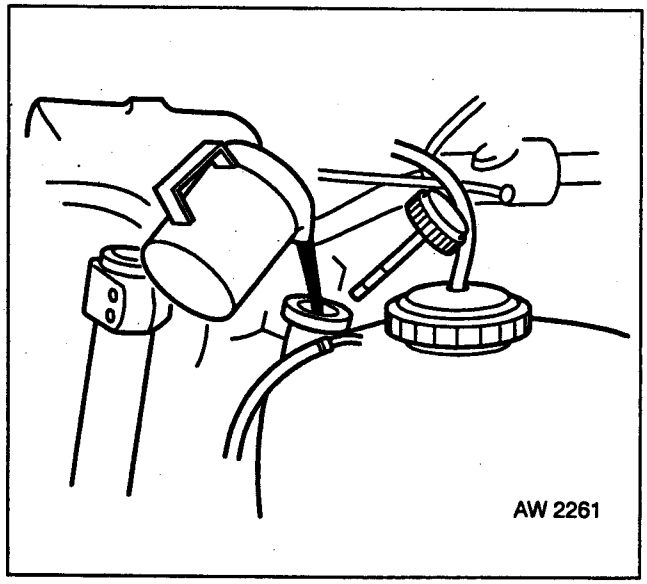


Fig 3.8 Oil Replacement

3.6 REFILLING WITH OIL

a. Check that all oil pipes are connected and drain plugs installed. Refer to specs for tightening torques.

b. Refill the motorcycle with oil (Fig 3.8 refers) so that the level lies between the two marks on the dipstick.

c. Run the engine and check that the oil is circulating and being returned to the reservoir by looking through the filler neck. If no oil appears within 20 seconds, stop engine and investigate. Probable fault is an air lock in the oil pipes; release this air lock by releasing the feed oil pipe from the 90° fitting behind the engine cylinder (19 mm wrench) about 2 turns until oil appears, then retighten.

d. After running the engine, top up the oil as described in the previous section. In total the quantity of oil replaced should be between 2·8 – 3·1 litres, depending upon whether or not both filters have been serviced.

NOTE: Recheck oil with engine at normal running temperature.

3.7 FAULT DIAGNOSIS - LUBRICATION SYSTEM

SYMPTOM	FAULT	REMEDY
1. Oil on external surfaces of machine	a. Overfilled with oil.	Check according to oil filling procedure
	b. Oil pipe coupling loose.	Check, retighten
	c. Split oil pipe	Replace
2. Oil not returning to reservoir	a. No oil in machine	Check, add oil according to procedure (See Para 3.2).
	b. Crushed, broken or disconnected oil return pipe - giving symptom No 1 perhaps.	Investigate, replace/connect as required.
	c. No supply to oil pump due to:	
	(1) Crushed, broken or disconnected oil feed pipes - giving symptoms No 1 perhaps.	Investigate, replace/connect as required.
	(2) Completely blocked primary oil filter	Check, clean/replace as necessary.
	d. Oil pump ineffective, due to:	
	(1) Oil pump drive gear broken	Investigate, replace.
	(2) Oil pump worn out	Investigate, compare to specification. Replace as necessary.
3. Oil level drops dramatically when standing with engine off.	Non-return valve stuck, broken	Check, replace.

CHAPTER 4
Intake System

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LIST OF ILLUSTRATIONS

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4.1 GENERAL INFORMATION

a. The intake system comprises a petrol tank from which petrol is fed by gravity via a tap and short piece of pipe to the float chamber of the carburettor.

b. The carburettor draws air via a short convoluted rubber/plastic boot from a moulded plastic airbox containing a rectangular paper element type filter.

4.2 FUEL TANK

Fig 4.1 refers.

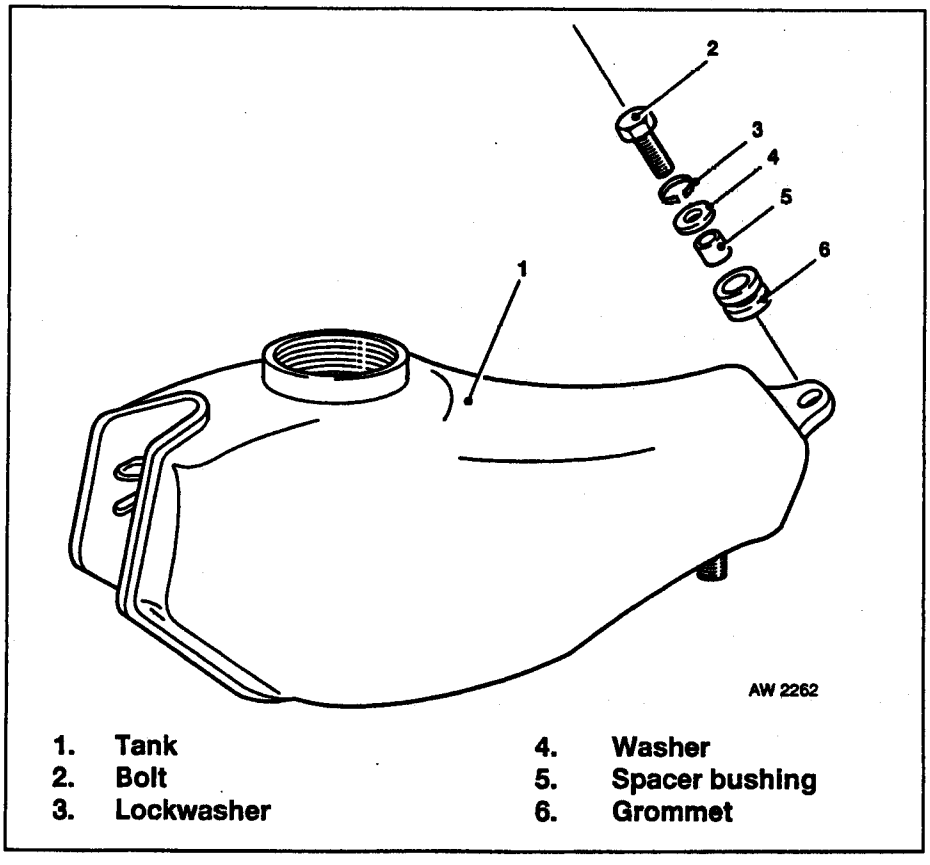
a. **Fuel Tank Removal.** Place vehicle on centrestand and proceed as follows:

(1) Remove seat. Seat is secured by a screw on the rear fender.

(2) Switch fuel valve to OFF position. Disconnect fuel hose from valve outlet by loosening clamp. Remove fuel tank retaining bolt and washers.

(3) If vehicle is equipped with plastic tank, remove screws and 'U' bracket located next to the steering lock stops on the frame.

(4) Grasping rear of tank, gently pull up and back to remove. At the same time, be sure control cables are clear.



1. Tank
2. Bolt
3. Lockwasher
4. Washer
5. Spacer bushing
6. Grommet

Fig 4.1 Fuel Tank

b. **Fuel Tank Inspection.**

(1) Before inspection, clean the external surfaces with a solution of soapy water or mild solvent.

(2) Inspect for sediment in the tank. If necessary, flush with clean fuel.

(3) Inspect the mounting rubbers for damage or deterioration.

(4) Inspect the fuel hose for cracks or deterioration.

(5) Inspect the fuel cap and gasket.

(6) Replace parts as necessary.

c. **Fuel Tank Installation.** When installing the fuel tank be sure the cables are routed correctly in relation to the mounting rubbers on the frame.

4.3 AIR CLEANER

a. **Removal.**

(1) Remove L/H side panel.

(2) Unscrew the airbox lid retaining screws (5) and washers (8) remove lid (6) and seal (5). Fig 4.2 refers.

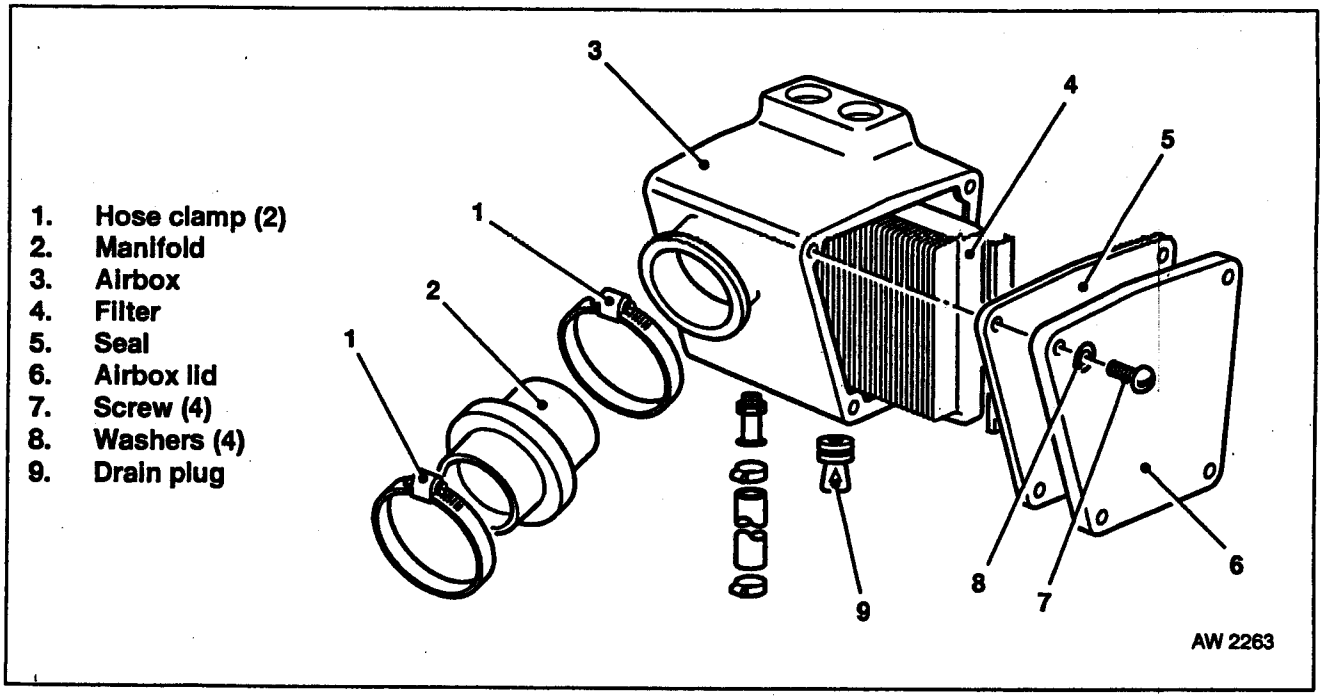


Fig 4.2 Airbox

(3) Remove the filter and clean the inside of the airbox. Fig 4.3 refers.

(4) Be sure the rubber drain bladder at the bottom of the airbox is clean.

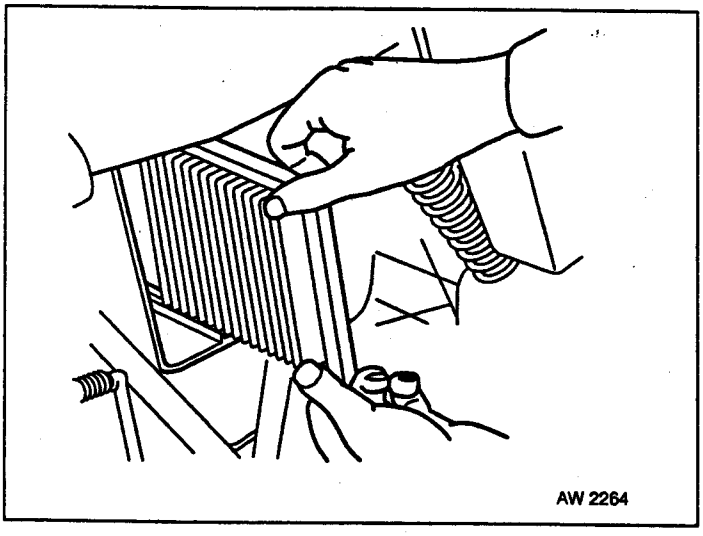


Fig 4.3 Air Filter

b. **Air Cleaner Installation**

(1) Lightly grease edges of new filter to ease installation in airbox.

(2) Carefully slide in replacement filter. Be sure edge is seated correctly in channel. Be sure rear vertical edge is fully engaged.

(3) Place lid in position and install retaining screws.

(4) Install sidepanel.

c. **Intake System Disassembly**

(1) Remove the battery and battery plate.

(2) Remove the fasteners inside the airbox which fasten the airbox to the rear fender.

(3) Remove the circuit breaker plate assembly. Remove the crankcase breather line from the bottom of the airbox. Loosen the airbox manifold hose clamp.

(4) Rotate airbox onto its left side. Remove the airbox from the right side, through the frame tubes.

d. **Cleaning and Inspection**

(1) Inspect the airbox manifold and the carburettor intake manifold for tears, holes and signs of deterioration.

(2) Be sure the rubber drain bladder at the bottom of the airbox is clear of debris.

(3) The airbox lid is lined with a rubber seal. The seal should be in good condition where it seals airbox, to prevent dirt and debris from entering the airbox.

e. **Intake System Assembly**

(1) Assembly is the reverse of the disassembly procedure. Be sure that all hose clamps on the intake manifold and airbox manifold are tight. Replace hose clamps throughout if necessary.

4.4 FUEL VALVE

a. **Fuel Valve Removal/Installation.** (Fig 4.4 refers).

(1) The fuel valve may be removed from the tank by unscrewing the valve fitting.

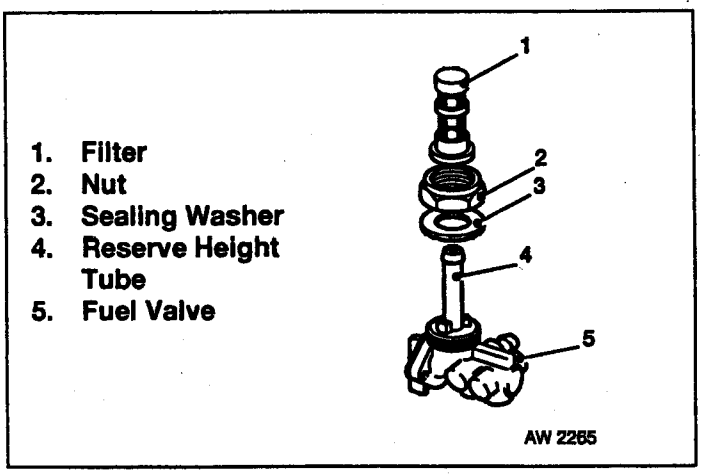


Fig 4.4 Fuel Valve

(2) The fuel valve has a plastic, pillar-type fuel filter which should be cleaned by rinsing in fuel. Check for tears or rips in the filter. If damaged, replace.

(3) When installing the fuel valve, check to be sure the gasket is in good condition.

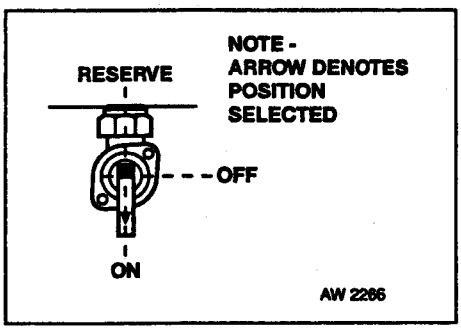


Fig 4.5 Fuel Tap

4.5 CARBURETTOR

a. **General.** Fig 4.6 refers. The carburettor is a constant velocity, gravity fed type with a float operated inlet valve, a variable venturi, a throttle stop screw for idle speed adjustment and a fuel enrichment system for starting.

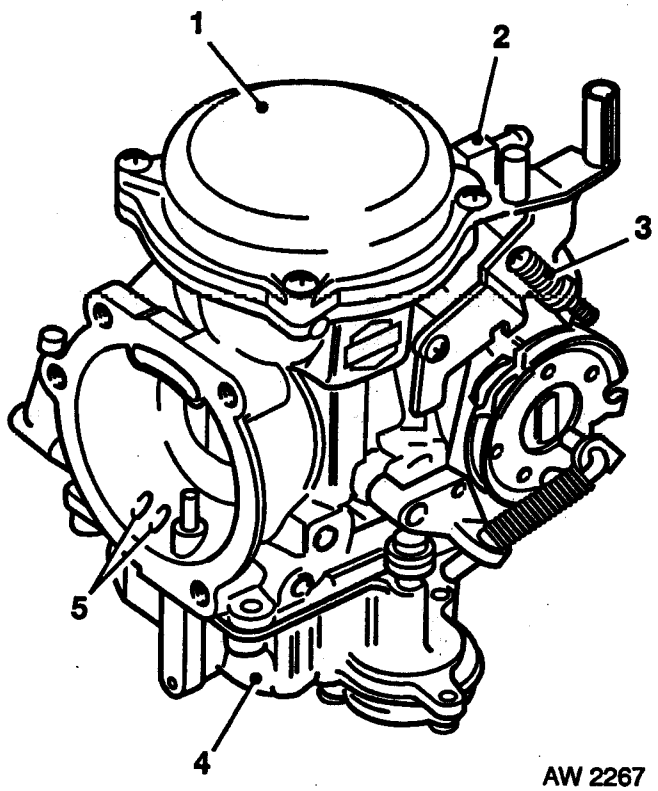
Idle and transfer ports provide a balanced fuel mixture during the transition period from stop to mid-range. A vacuum piston controls venturi opening.

The carburettor is specifically designed to control exhaust emissions. All jets are fixed. The idle mixture has been preset at the factory.

The idle (air/fuel) mixture screw is recessed in the carburettor casting. The opening is sealed with a plug because it is intended that the idle mixture be non-adjustable.

NOTE: Adjusting mixture setting by procedures other than specified in this section may be in violation of EPA regulations.

This system partially compensates for changes in the mixture that are normally caused by changes in altitude. Because atmospheric pressures drop as altitude increases. The pressure difference in the upper and lower chambers is reduced, which provides less fuel to the engine.



1. Vacuum piston chamber
2. Vacuum fitting
3. Screw, idle speed
4. Float chamber
5. Air jets

Fig 4.6 Carburettor

b. **Fuel Supply System – Theory of Operation.** Fuel from the fuel tank passes through the inlet valve into the float chamber. The fuel entering the chamber causes the float to rise until it shuts off the fuel valve, stopping flow at a level pre-determined by float level setting.

The float chamber is vented to atmosphere through an air passage opening in the air cleaner mounting flange.

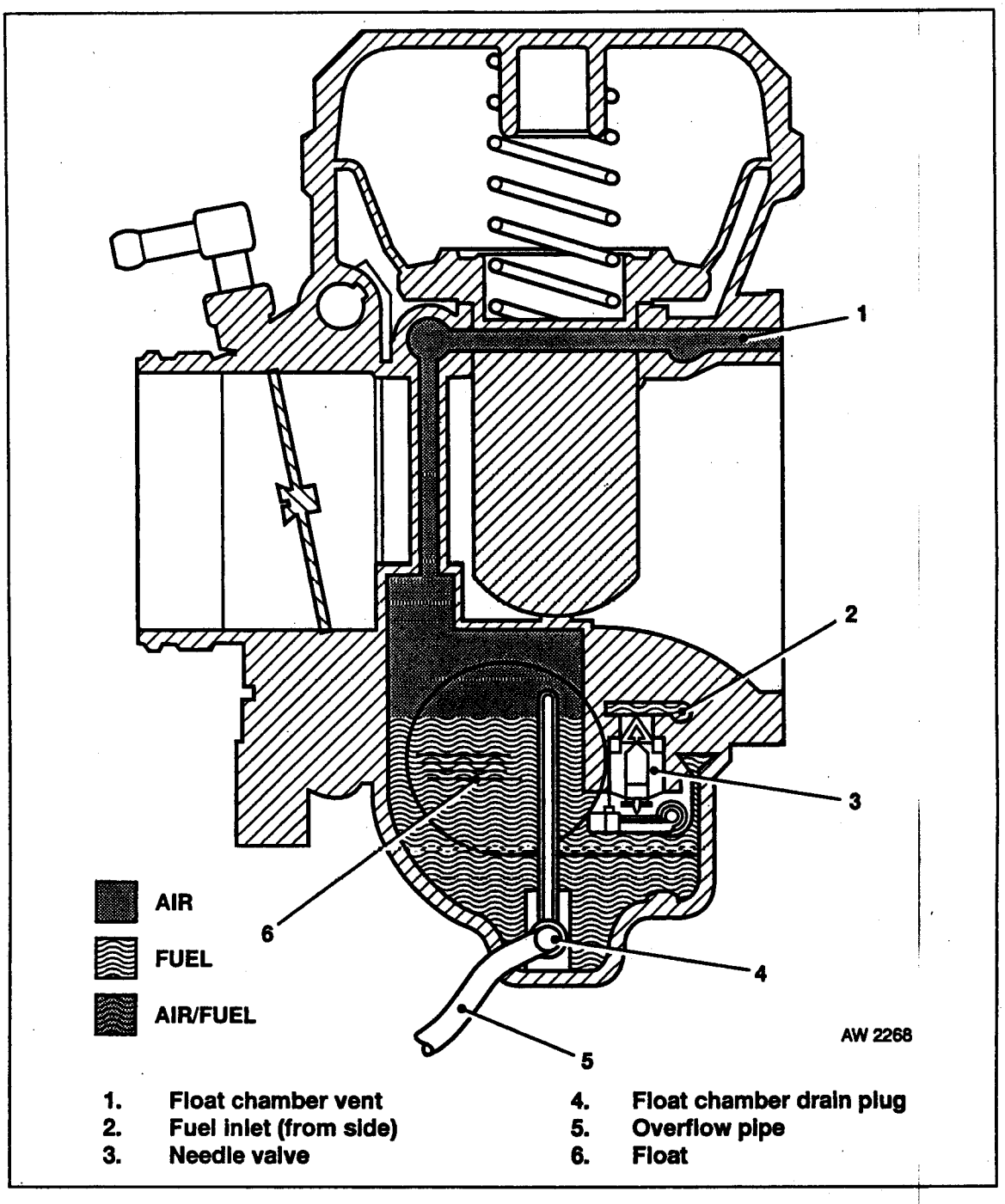


Fig 4.7 Diagrammatic View of Carburettor

c. **Operation**

(1) **Enrichener.** The handlebar mounted enrichener lever controls the opening and closing of the enrichener valve at the carburettor. The enrichener knob has two positions at full open, and half-way closed.

(2) **Cool Engine.** BE SURE THROTTLE IS CLOSED. Pull enrichener lever fully back. Turn the ignition switch on and press starter switch to operate the electric starter.

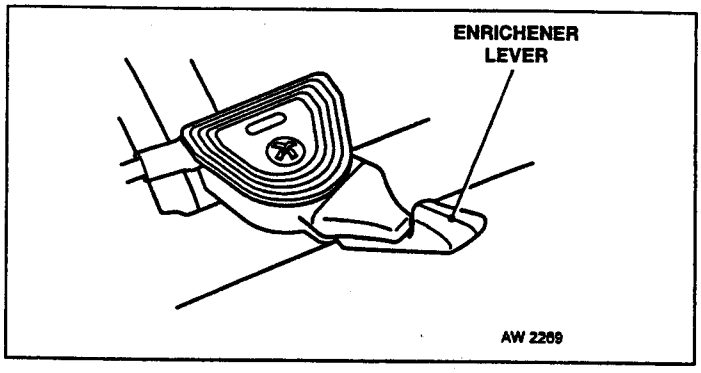


Fig 4.8 Enrichener Lever Fully Back

(3) **Outside Temperature Less than 50°.** The vehicle should be allowed to warm up for only 15-30 seconds before being driven. Initial warm-up periods longer than 30 seconds are not recommended.

(a) If the outside temperature is less than 50°F, ride for 5 minutes or 3 miles with enrichener lever fully back.

(b) After 5 minutes or 3 miles push the enrichener lever in to the half-way position. Ride another 2 minutes or 2 miles.

(c) After 2 minutes or 2 miles push enrichener lever full back.

(4) **Outside Temperature Greater than 50°F.** The vehicle should be allowed to warm up for only15-30 seconds before being driven. Initial warm up periods longer than 30 seconds are not recommended.

(a) If the outside temperature is greater than 50°F, ride for 3 minutes or 2 miles with enrichener lever fully back.

(b) Push the enrichener lever in to the half-way position. Ride another 2 minutes or 2 miles.

(c) After 2 minutes or 2 miles push enrichener lever fully in.

(5) **Warm or Hot Engine.** Open throttle ⅛ – ¼. Turn on ignition switch and operate electric starter. DO NOT USE ENRICHENER.

d. **Starter System.** The starting circuit consists of a cable actuated starter valve and converging fuel and air passages in the carburettor body.

Fuel metered through the enrichener jet is directed upward through a passage to the valve chamber. The starter valve opens the fuel passage to the carburettor venturi (vacuum side) when the enrichener knob is pulled outward. The engine draws air through a moulded plastic airbox containing a rectangular paper element air filter, air intake system, and the carburettor venturi. Air from an opening in the carburettor inlet is directed to the valve chamber, where it mixes with incoming fuel.

Low pressure (vacuum), created by the downward stroke of the engine pistons, causes the higher pressure in the float chamber to force the fuel/air mixture through the fuel/air outlet passage in the carburettor venturi.

CAUTION

You must pay close attention to a CV carburettor equipped vehicle's warm up time. Both excessive use and insufficient use of the enrichener may cause poor performance, erratic idle, poor fuel economy and spark plug fouling.

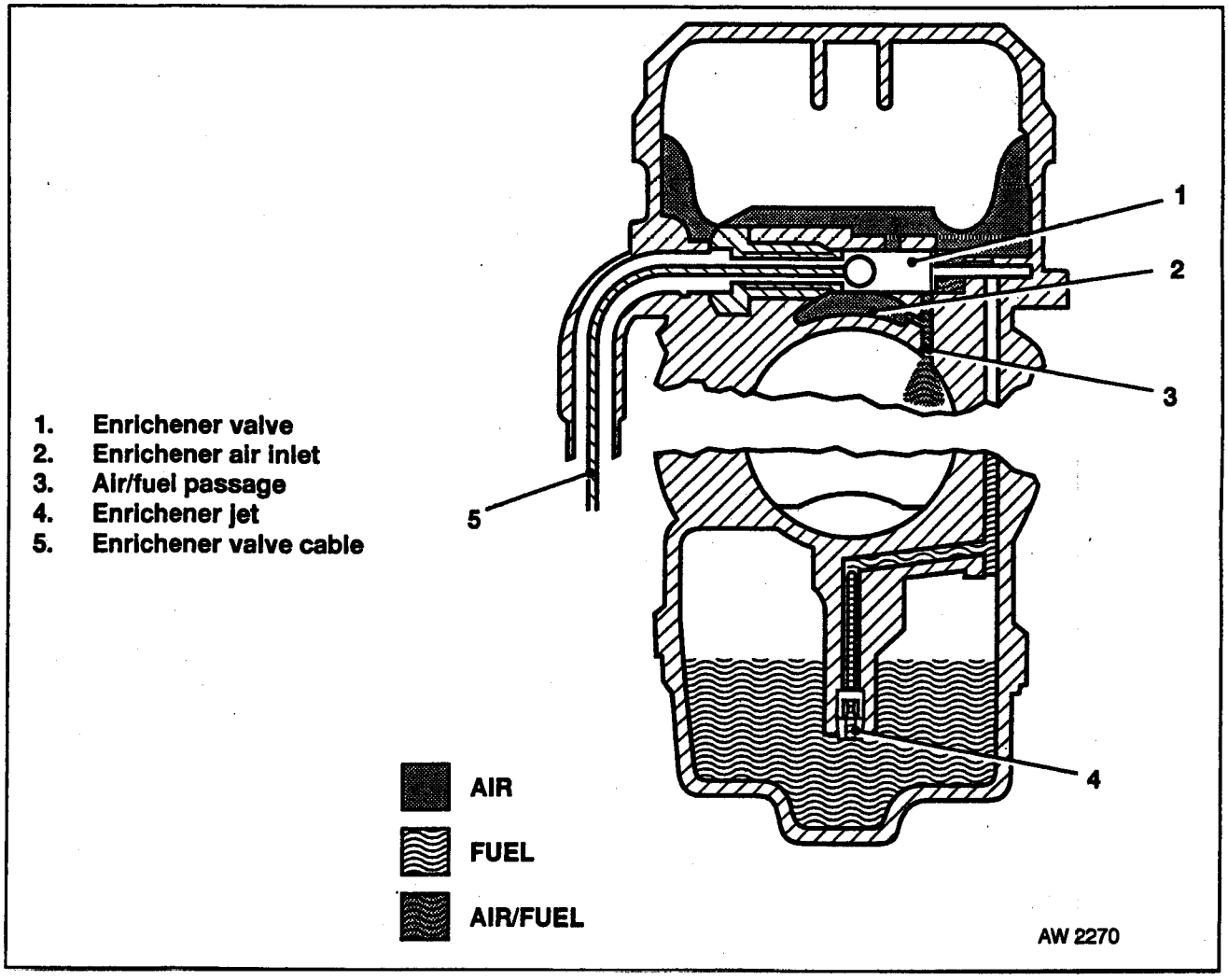
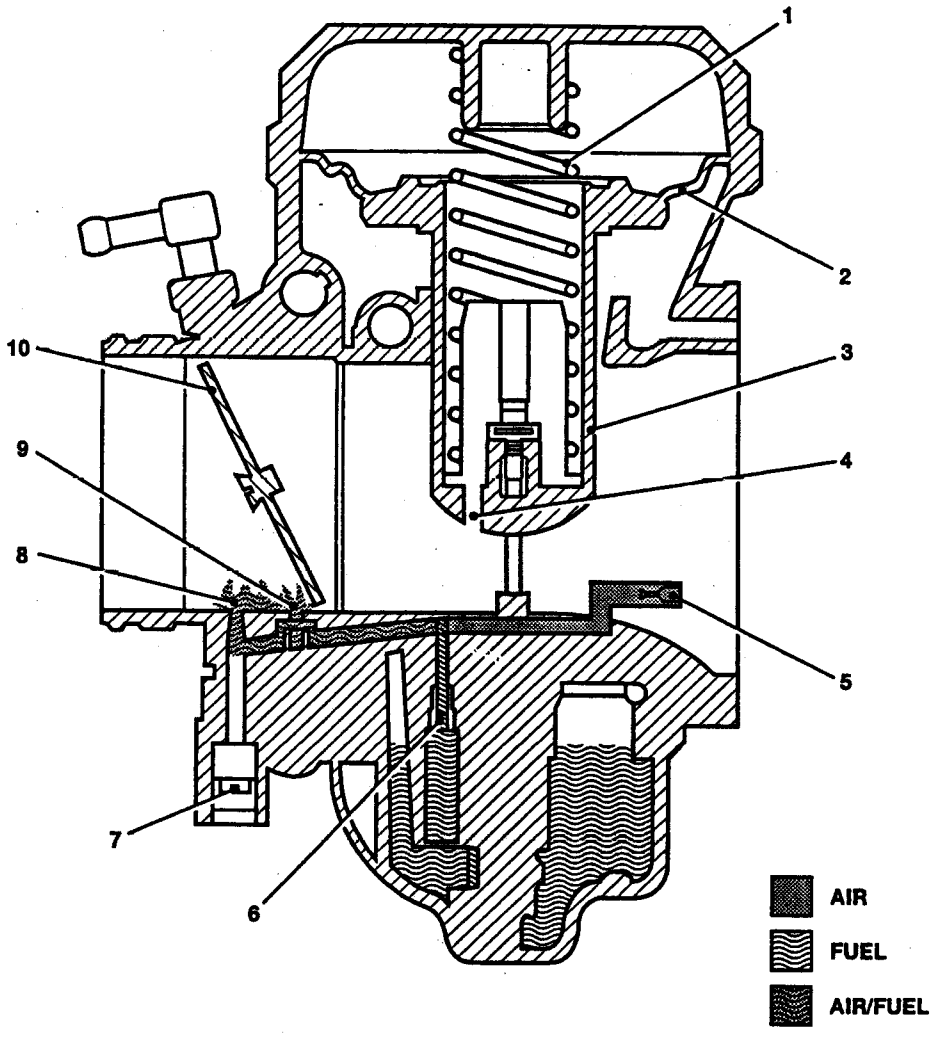


Fig 4.9 Starter System

e. **Idle and Low Speed Circuit.** At idle with the throttle plate closed and the air stream cut off, idle speed is maintained by fuel metered through the slow jet. Air from the slow air jet mixes with the fuel and is delivered to the idle port at the vacuum side of the throttle plate. At low speed as the throttle plate is cracked open the transfer ports are exposed to the vacuum side of the throttle plate and additional fuel is directed to the barrel of the carburettor. With the throttle plate cracked open a quantity of fuel also enters the air stream from the needle jet. The idle and transfer ports supply additional fuel to the carburettor barrel to assist during the transition period from idle to mid range.

The venturi opening is reduced by the low position of the vacuum piston. This enables initial air stream velocities to be higher than normally attainable with fixed venturi carburettors. The higher air stream velocities provide greater quantities of fuel necessary for good acceleration.



1. Spring
2. Diaphragm
3. Vacuum piston
4. Vacuum port
5. Slow air jet
6. Slow jet
7. Idle mixture screw
8. Idle port
9. Transfer ports
10. Throttle plate

Fig 4.10 Idle and Low Speed Circuit

f. **Mid Range Slide Position and Fuel Discharge.** As the throttle plate is opened air flow increases through the carburettor and the pressure drop in the venturi near the needle jet increases.

The low pressure in the venturi travels through the vacuum port in the vacuum piston to the chamber above the diaphgram. The chamber beneath the diaphragm is vented to atmospheric pressure by a passage from the chamber to the carburettor inlet. The higher pressure at the underside of the diaphragm overcomes spring pressure and moves the vacuum piston upward in proportion to the pressure difference between chambers.

The tapered needle moves upward with the vacuum piston, opening the needle jet. The higher pressure in the float chamber forces fuel into the needle jet passage. Air at atmospheric pressure from the main jet is forced through the main bleed tube openings and mixes with the fuel. The fuel air mixture is then delivered through the needle jet into the air stream.

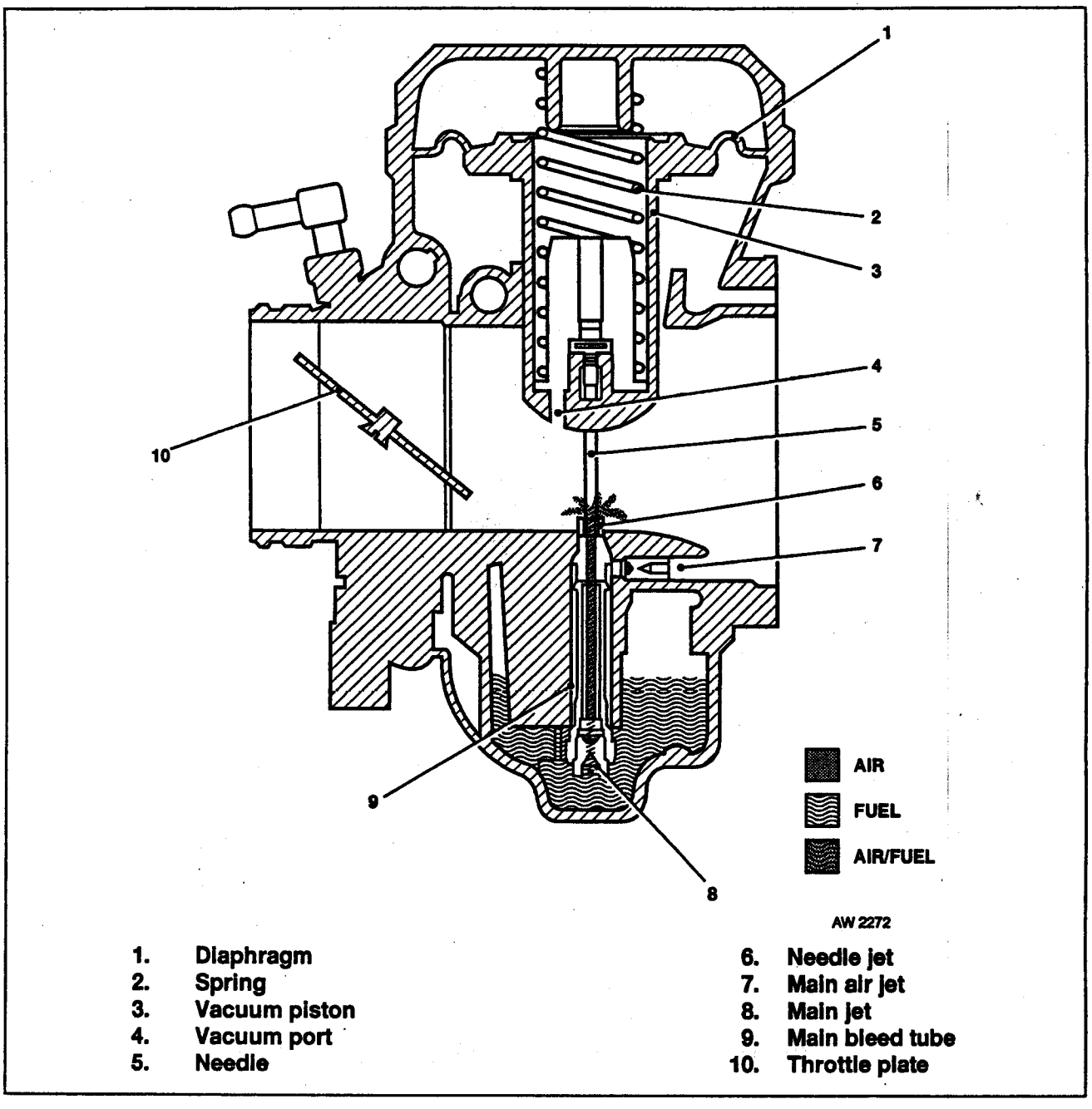
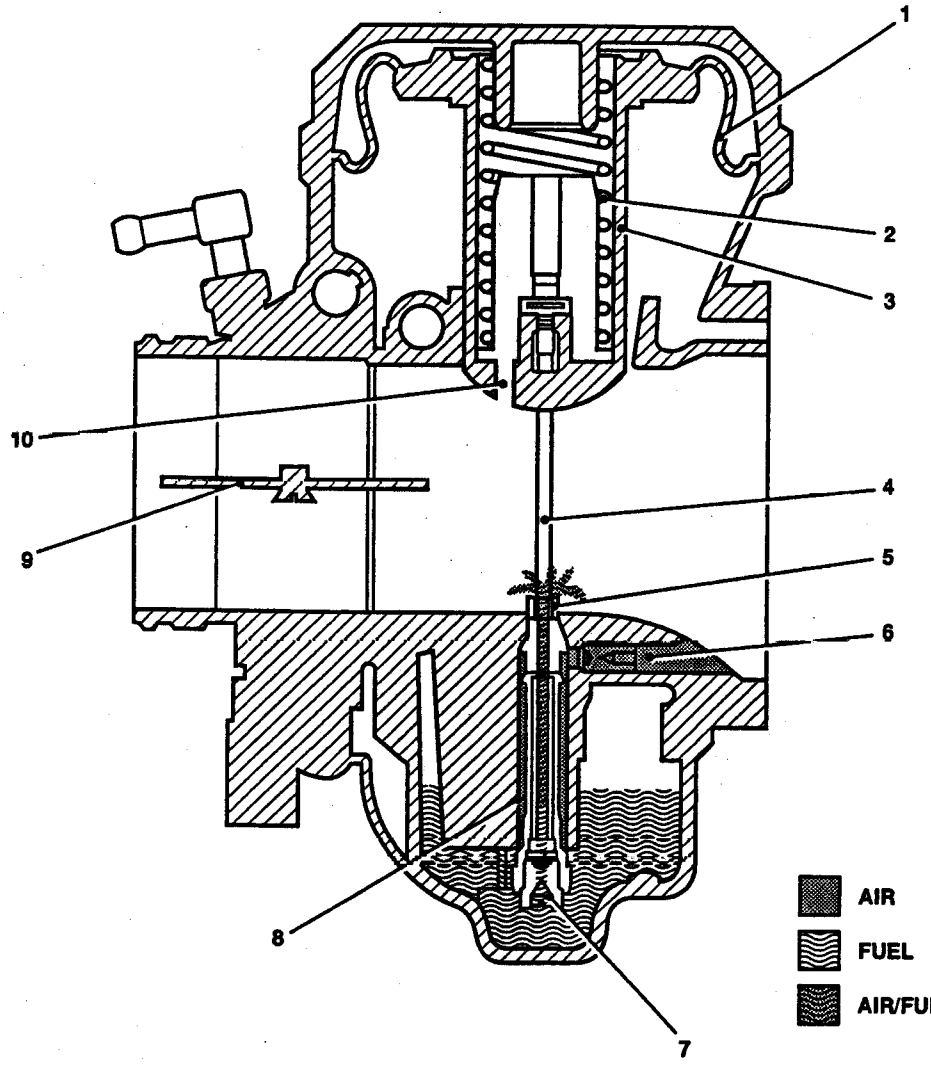


Fig 4.11 Mid Range Slide Position and Fuel Discharge

g. **High Speed Circuit Slide Position and Fuel Discharge.** As the throttle plate is opened, the pressure difference between the chambers above and below the diaphragm increases and the vacuum piston moves further upward.

The venturi opening increases and the needle is lifted further out of the needle jet. The quantity of fuel and the volume of air are simultaneously increased and metered to the proportions of engine demand by the variable venturi and needle lift. With the vacuum piston fully upward, the venturi opening is fully enlarged and the needle jet opening exposure to the air stream is at its maximum. Air and fuel supplies are now available in quantities sufficient to meet all engine demands.



1. Diaphragm
2. Spring
3. Vacuum piston
4. Needle
5. Needle jet
6. Main air jet
7. Main jet
8. Main bleed tube
9. Throttle plate
10. Vacuum port

Fig 4.12 High Speed Circuit Slide Position and Fuel Discharge

h. **Accelerator Pump System.** The accelerator pump system uses sudden throttle openings (rapid accelerations) to quickly inject fuel into carburettor venturi to provide extra fuel for smooth acceleration. This fuel also assists engine operation during cold engine warm-up when the enrichener is turned off prematurely.

Rapid throttle action during the first third of throttle travel pushes the pump rod down, flexing a diaphragm. This flexing action forces fuel past a check valve into the venturi. The check valve prevents backflow during this stroke. A spring then returns diaphragm to its original position and a new supply of fuel flows in under the diaphragm from the float chamber for the next acceleration.

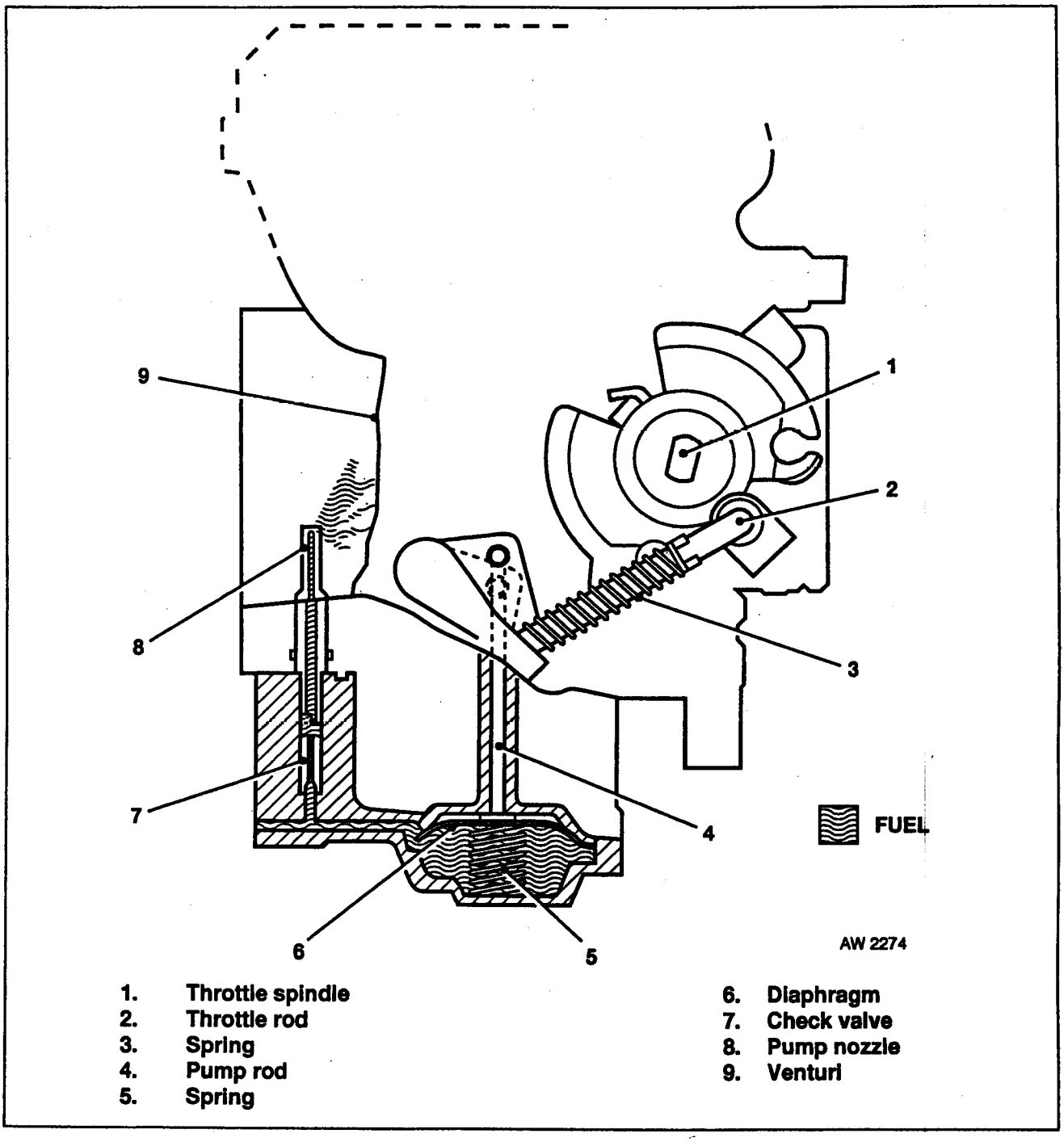


Fig 4.13 Accelerator Pump System

j. **Adjustments**

(1) **Slow Idle.** With the engine at normal operating temperature and the enrichener all the way in (enrichener valve closed) adjust the throttle stop screw so the engine idles at 900–1050 RPM.

NOTE: Use an inductive-type tachometer to check engine RPM.

(2) **Float Level.**

(a) Remove the carburettor as described.

(b) Remove screws and washers. Remove float bowl.

NOTE: Prior to float adjustment check that float halves are properly aligned and at equal height. Lightly bend to realign if necessary.

(3) Fig 4.14 refers. Use a vernier or dial caliper depth rod to measure from the carburettor flange face to the perimeter of the float. Be careful not to push on float while measuring.

(4) If measurement is not within 0·0285–0·0287 mm (0·725–0·730 in) carefully bend tab to position float to proper level.

(5) Position the float bowl on carburettor body. Install screws and washers.

(6) Install carburettor as described.

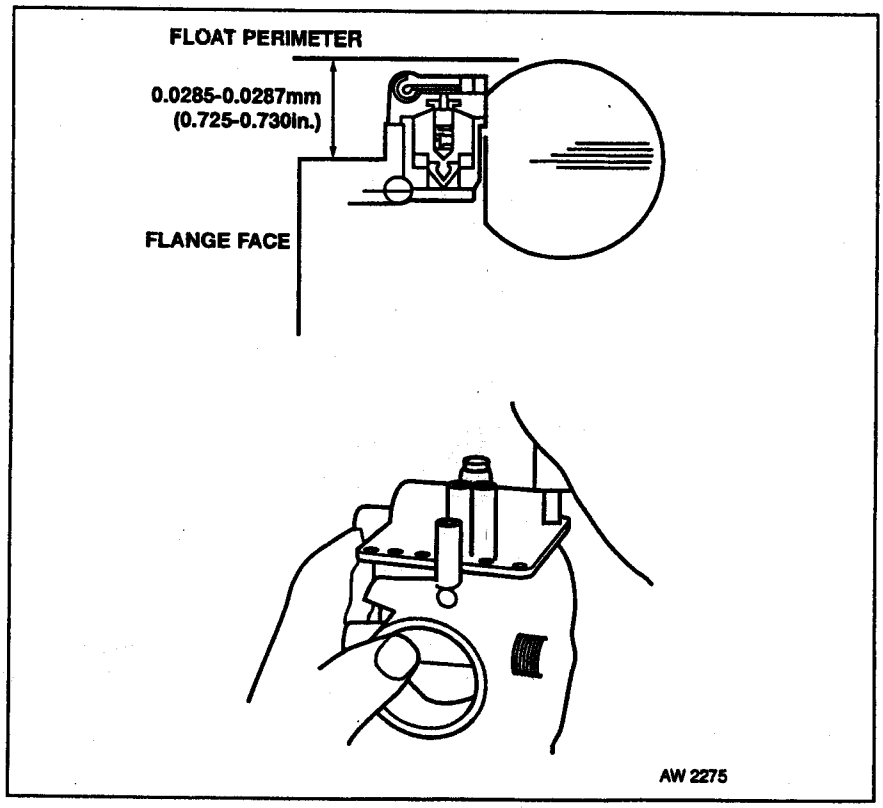


Fig 4.14 Float Adjustment

TABLE 1 VACUUM PISTON ASSEMBLY TROUBLESHOOTING

PISTON DOES NOT RAISE PROPERLY	
Check for:	**Remedy:**
1. Enrichener valve open, not seated or leaking.	1. Adjust, clean or replace.
2. Piston atmosphere vent blocked.	2. Clear vent.
3. Diaphragm cap loose, damaged or leaking.	3. Tighten or replace cap.
4. Spring binding.	4. Correct or replace spring.
5. Diaphragm pinched at lip groove.	5. Reposition diaphragm lip.
6. Torn diaphragm.	6. Replace piston diaphragm assembly.
7. Piston binding.	7. Clean piston slides and body or replace piston.
8. Piston vacuum passage plugged.	8. Clean and clear passage.
PISTON DOES NOT RAISE PROPERLY	
Check for:	**Remedy:**
1. Spring damaged.	1. Replace spring.
2. Piston binding.	2. Clean piston slides and body or replace piston.
3. Piston diaphragm ring dirty or damaged.	3. Clean or replace piston.

k. Operation Check – Vacuum Piston

(1) Opening Malfunction

WARNING

While observing piston slide movement be sure to maintain a safe distance from the carburettor and wear suitable eye protection. An unexpected engine backfire could cause serious burns or eye injury.

(a) With air cleaner cover off and engine running, partially open and close throttle control several times to observe whether vacuum piston has upward movement. If piston does not rise, see Table 1.

(b) With engine not running, lift vacuum piston with finger. Feel whether piston lifts fully and smoothly or whether it binds.

(2) Closing Malfunction

(a) With engine not running, lift vacuum piston to full open position, then release. Observe whether piston slides downward smoothly and fully to stop.

(b) Observe position of piston slide at its lowest downward point. Lower edge of slide should rest at horizontal groove at lower end of slide track. See Table 1 if any problems are observed.

(3) Carburettor Removal

WARNING

Petrol is extremely flammable and highly explosive under certain conditions. Do not smoke or allow open flame or sparks anywhere in the area when refuelling or servicing the fuel system.

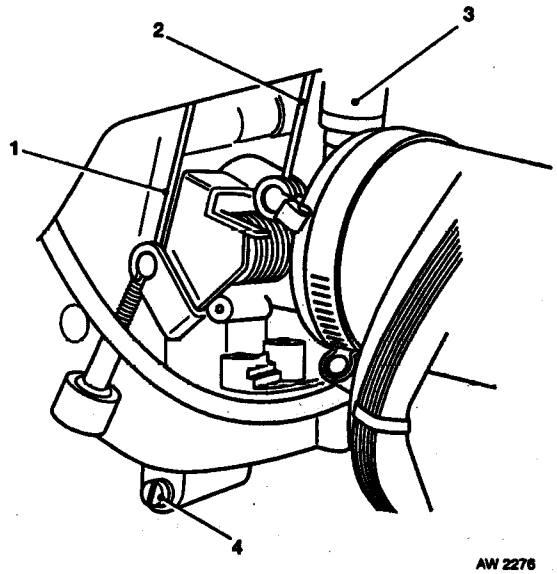
(a) Turn the fuel supply valve off.

(b) Remove the airbox.

(c) Disconnect the fuel line, throttle cables, enrichener valve and vacuum hose from the carburettor.

(d) Remove the fuel tank.

(e) Loosen hose clamps. Compress airbox boot to make room to remove carburettor. Pull carburettor free of manifold.



1. Throttle cable
2. Idle cable
3. Vacuum line
4. Float bowl drain screw

Fig 4.15 Carburettor Hoses and Cable Connections

(4) Carburettor Installation

(a) Place the manifold and gasket in position on the cylinder head. Fig 4.16 refers.

(b) Install the countersunk screws.

(c) Place boot and hose clamp in position on carburettor inlet. Tighten hose clamp securely.

(d) Connect throttle cables. Connect enrichener valve and vacuum hose to carburettor.

(e) Install fuel tank. Connect fuel line to carburettor. Install air cleaner.

(f) Route the float bowl overflow line behind front cylinder push rods, then down between front cylinder and crankcase.

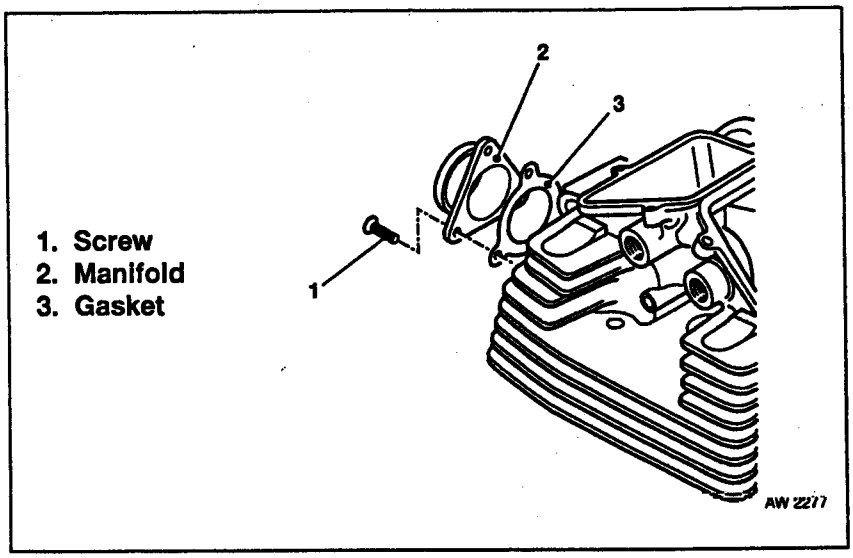


Fig 4.16 Intake Manifold and Gasket

(5) **Disassembly.** Fig 4.17 refers.

(a) **Vacuum Piston Chamber**

i. Remove carburettor.

ii. Remove screws (25, 26) and bracket (24).

iii. Remove screws and washers(2). Remove cover (1) and spring (3).

iv. Lift out vacuum piston (4) with needle (6) and spring seat (5). Remove loose parts from vacuum piston.

(b) **Carburettor Body**

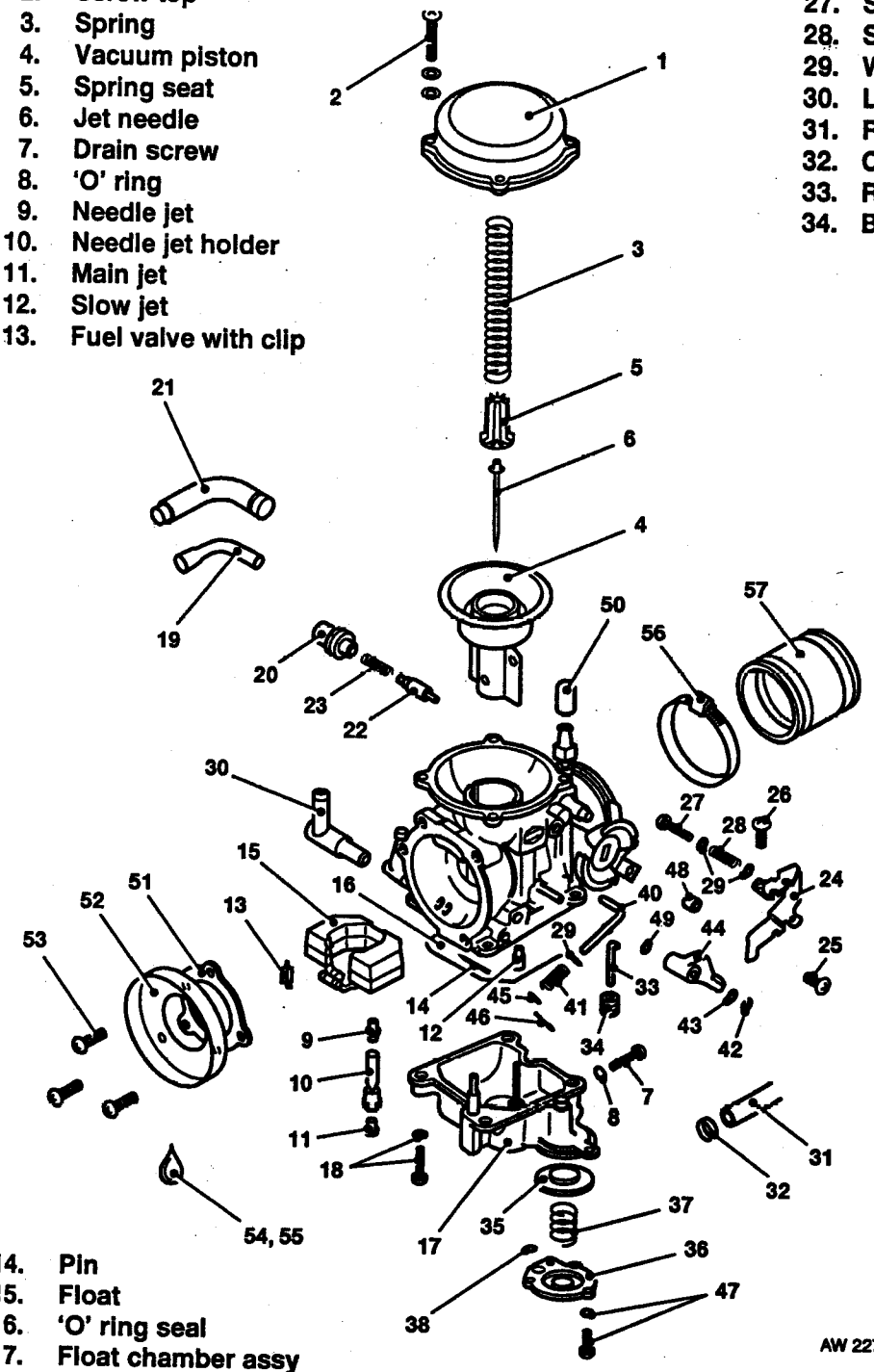
i. Remove screws and washers (18). Remove float bowl assembly (17).

ii. Remove pin (14), float (15) and valve (13).

iii. Unscrew main jet (11) and needle jet holder (10). Needle jet (9) is now free to be removed from bottom end of passage.

iv. Insert thin bladed screwdriver into slow jet passage and turn out slow jet (12).

1-55 Carburettor Assembly
1-50 Carburettor
1. Top
2. Screw top
3. Spring
4. Vacuum piston
5. Spring seat
6. Jet needle
7. Drain screw
8. 'O' ring
9. Needle jet
10. Needle jet holder
11. Main jet
12. Slow jet
13. Fuel valve with clip



14. Pin
15. Float
16. 'O' ring seal
17. Float chamber assy
18. Screw
19. Cable guide
20. Starter cap
21. Cable sealing cap
22. Enrichener valve
23. Spring
24. Bracket, throttle wire
25. Screw, throttle cable bracket
26. Screw, throttle cable bracket
27. Screw, idle speed adjust
28. Spring
29. Washer
30. L-Joint
31. Rubber tube
32. Clip, tube
33. Rod
34. Boot
35. Diaphragm assy
36. Pump housing
37. Spring
38. 'O' ring
39. Carburettor body
40. Rod
41. Spring
42. E-clip
43. Washer
44. Lever
45. Washer
46. Cotter Pin
47. Screw, washer (3)
48. Collar
49. Washer
50. Cap - (OBS)
51. Gasket
52. Adaptor
53. Screws
54. Primer
55. Loctite
56. Hose clamp
57. Manifold Boot

Fig 4.17 Exploded Carburettor View

(c) **Accelerating Pump.** Remove screws and lockwashers (47), accelerating pump housing (36), spring (37) and diaphragm (35). Remove 'O'-ring (38) from housing (36).

l. **Cleaning Inspection and Repair.** Fig 4.17 refers.

(1) **Vacuum Piston Components.** The entire carburettor should be cleaned with carburettor cleaner and dried before disassembly. Carburettor body and jets should be cleaned in clean fuel.

(a) Hold vacuum piston up to strong light. Examine diaphragm at top of vacuum piston (4) for evidence of pinching, holes or tears. Replace if damaged.

(b) Examine vacuum passage through bottom of piston (4). Clean passage if restricted.

(c) Examine spring (3) for stretching, crimping or any distortion or damage. Replace if damaged.

(d) Examine slide on sides of piston (4) to be sure surface is smooth and clean. Clean or buff out any rough surfaces.

(e) Examine needle for evidence of binding or damage. Examine tip of float needle for grooves. Needle should be straight and surface of taper smooth and even. Examine float for holes.

(2) **Carburettor Body Components**

(a) Check float bowl 'O' ring (16) for any distortion or damage. Replace if seating surfaces are damaged.

(b) Examine inlet valve (13) and inlet valve seat. Clean with carburettor cleaner. Replace if seating surfaces are damaged.

(c) Clean low speed jet (12) with carburettor cleaner. Check to be sure all orifices are open.

(d) Check enrichener valve (22). Be sure needle guide is clean, straight and undamaged. Check composition seating surface for wear or damage. Replace if damaged.

(e) Check enrichener valve chamber. Clean with carburettor cleaner. Check that all passages are open and free of obstruction.

(f) Clean needle jet (9). Replace if damaged.

(g) Clean all internal fuel/air passages and jets. Check that all passages and jets are open and free of obstruction.

(h) Check needle jet holder (10). Clean bleed tube orifices. Replace holder if damaged.

(j) Check float (15) for cracks or other leaks. Replace if damaged.

(k) Clean main jet with carburettor cleaner and inspect for damage. Replace if damaged.

m. **Assembly.** Fig 4.17 refers.

(1) **Vacuum Piston Chamber**

(a) Place needle (6) through centre hole in vacuum piston (4). Place spring seat (5) over top of needle.

(b) Insert vacuum piston into carburettor body. The slides on the piston are off-centre and the piston will fit into the slide track grooves one way only. If piston does not fit, rotate 180°.

(c) Check to be sure diaphragm is seated evenly into groove at top of carburettor body.

Place spring (3) over spring seat (5) and carefully lower top (1). Keep spring straight while lowering top.

(d) After top is seated, hold top while lifting up on vacuum piston. Piston should rise to top smoothly. If piston movement is restricted, spring is cocked. Lift up on top and lower carefully, keeping spring coils straight.

(e) Once top is installed correctly, install screws and washers (2). Place bracket (24) in position with idle screw resting on top of throttle cam stop. Install body screw and washer (26) first, then top screw (25) to prevent bending bracket or throttle cam.

(2) **Carburettor Body**

(a) Screw slow jet (12) into slow jet passage with narrow bladed screwdriver.

(b) Turn carburettor upside down. Place needle Jet (9) in main jet passage with needle passing through centre hole. Be sure end of jet with larger opening and chamfered surface enters passage first.

(c) Insert needle jet holder (10) into main jet passage with needle inserted into centre of holder. Thread holder into passage and tighten. Thread main jet (11) into tapped hole in holder (10) and tighten.

(d) Place float assembly (15) into position with fuel valve (13) inserted into valve seat and pivot arm aligned with holes in mounting posts at bottom of carburettor body. Insert pin (14) through float pivot arm and float mounting posts.

(e) Place float bowl (17) over float and onto carburettor body flange. Bowl will only fit on one position. Install screws and washers (18) and tighten.

(3) **Accelerator Pump.** Install diaphragm (35), spring (37), 'O' ring (38) and housing (36). Secure with screws and lockwashers (47).

TABLE 2 TROUBLESHOOTING

OVERFLOW	
Check for:	**Remedy:**
1. Damaged or non-venting fuel tank cap.	1. Replace cap.
2. Loose float bowl screws.	2. Tighten screws.
3. Damaged float bowl 'O' ring.	3. Replace 'O' ring.
4. Damaged or leaking float assembly.	4. Replace float assembly.
5. Particle contamination in inlet fitting cavity.	5. Clean and clear cavity and fuel supply tract.
6. Worn or dirty inlet valve or seat.	6. Clean or replace valve and clean seat.
7. Improper fuel level in float bowl.	7. Adjust float tab for correct fuel level.
8. Misaligned float halves.	8. Align and adjust float level.
POOR IDLING	
Check for:	**Remedy:**
1. Idle speed improperly adjusted.	1. Adjust operating idle speed.
2. Inlet system air leak.	2. Correct as required.
3. Loose low speed jet.	3. Tighten jet.
4. Plugged low speed jet.	4. Unplug blocked jet.
5. Contaminated or plugged low speed system.	5. Clean contaminants and clear passages.
6. Enrichener valve not seated or leaking.	6. Adjust, clean or replace.
7. Leaking accelerator pump.	7. Repair.
POOR FUEL ECONOMY	
Check for:	**Remedy:**
1. Excess use of enrichment system.	1. Limit system use.
2. Enrichener valve not seated or leaking.	2. Adjust, clean or replace.
3. Dirty air cleaner element.	3. Clean or replace as required.
4. Damaged or non-venting fuel tank cap.	4. Replace cap.
5. High speed riding style.	5. Modify riding habits.
6. Idle speed improperly adjusted.	6. Adjust operating idle speed.
7. Loose jets.	7. Tighten jets.
8. Fuel level too high.	8. Adjust float level.
9. Plugged or restricted bowl vent.	9. Clean and clear passages.
10. Worn or damaged needle or needle jet.	10. Replace needle or needle jet.
11. Vacuum piston assembly malfunction.	11. See Vacuum Piston troubleshooting (Table 1).
12. Plugged air jets or passages.	12. Clean and clear passages.
13. Excessive accelerator pump output.	13. Replace accelerator pump nozzle.

TABLE 2 TROUBLESHOOTING (contd)

POOR ACCELERATION	
Check for:	**Remedy:**
1. Throttle cables misaligned.	1. Adjust throttle cables.
2. Inlet system air leak.	2. Correct as required.
3. Damaged or non-venting fuel tank cap.	3. Replace cap.
4. Restricted fuel supply passages.	4. Correct and clear restriction.
5. Plugged bowl vent or overflow.	5. Clean and clear passages.
6. Enrichener valve not seated or leaking.	6. Adjust, clean or replace.
7. Worn or damaged needle or needle jet.	7. Replace assembly.
8. Vacuum piston malfunction.	8. See Vacuum Piston Troubleshooting (Table 1)
9. Plugged jets or passages.	9. Clean and clear as required.
10. Fuel level (float chamber) too low.	10. Adjust float level.
11. Accelerator pump leaking or no output.	11. Repair as necessary.
HARD STARTING	
Check for:	**Remedy:**
1. Enrichener system plugged, not properly functioning or improperly operated.	1. Clean, adjust, replace or read Owner's Manual
2. Inlet system air leak.	2. Correct as required.
3. Restricted fuel supply.	3. Correct fuel supply or passages.
4. Fuel overflow.	4. See Overflow troubleshooting (Table 2).
5. Plugged slow jet or passages.	5. Clean and clear jet or passages.
POOR PERFORMANCE ON ROAD	
Check for:	**Remedy:**
1. Idle speed improperly adjusted.	1. Adjust operating idle speed.
2. Inlet system air leak.	2. Correct as required.
3. Damaged or non-venting fuel tank cap.	3. Replace cap.
4. Dirty or damaged air cleaner element.	4. Clean or replace.
5. Enrichener valve not seated or leaking.	5. Adjust, clean or replace.
6. Restricted fuel supply tract.	6. Correct and clear restriction.
7. Plugged bowl vent or overflow.	7. Clean and clear passages.
8. Loose or plugged fuel and air jets or passages.	8. Clean, clear and correct as required.
9. Worn or damaged needle or needle jet.	9. Replace assembly.
10. Vacuum piston assembly malfunction.	10. See Vacuum Piston Troubleshooting (Table 1)
11. Accelerator pump inoperative.	11. Repair as required.

TABLE 2 TROUBLESHOOTING (contd)

POOR HIGH SPEED PERFORMANCE	
Check for:	**Remedy:**
1. Inlet system air leak.	1. Clean or replace.
2. Enrichener valve not seated or leaking.	2. Adjust, clean or replace.
3. Damaged or non-venting fuel tank cap.	3. Replace cap.
4. Restricted fuel supply tract.	4. Correct and clean restriction.
5. Dirty or damaged air cleaner element.	5. Clean or replace.
6. Plugged bowl, vent or overflow.	6. Clean and clear passages.
7. Worn or damaged needle or needle jet.	7. Replace assembly.
8. Vacuum piston assembly malfunction.	8. See Vacuum Piston Troubleshooting (Table 1)
9. Loose or plugged main jets or passages.	9. Tighten, clean, clear as required.
10. Improper fuel level.	10. Adjust float level.
11. Accelerator pump inoperative.	11. Repair as required.

CHAPTER 5
Exhaust System

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

5.1 DESCRIPTION

The exhaust system comprises two header pipe assemblies, a midsection (including trouser guards) and a silencer section, complete with three joint clamps.

WARNING

To prevent burns it is necessary to allow sufficient time for the exhaust system to cool prior to work on or near the exhaust system. If any adjustment has to be performed with the engine running, do not touch the components related to the exhaust system.

5.2 SPECIFICATIONS

a. **Header Pipes/Midsection:**	Type:	Curved Tubular Steel
	Finish:	Black Chrome
b. **Silencer:**	Type:	Welded Sections of Pressed Steel
	Finish:	Black Heat Resistant Paint
c. **Tightening Torques:**	See Chap 5 page 2.	

Fig 5.1 Key Ref	Items	Tightening Torque (Nm)	Tightening Torque (lbs/ft)
3	Silencer Retaining Bolt	51	38
6	Clamp Bolt	20	15
10	Exhaust/Engine Nut	24	18
14	Clamp Bolt	12	9
16	Trouser Guard Screw	10	7·5

5.3 REMOVAL

a. Place motorcycle on mainstand.

b. Remove pannier frames as necessary.

c. Remove L/H side panel, and rear L/H foot rest strut.

d. Undo and remove L/H Shock Absorber retaining bolts and withdraw shock absorber.

e. Slacken exhaust clamp on midsection/silencer joint.

f. Remove silencer retaining bolt (Fig 5.1 (3) refers) located on inside of rear mudguard (Fig 5.2 refers).

g. Withdraw silencer.

h. Unscrew exhaust on cylinder head and remove along with spacers.

j. Slide clamping ring (Fig 5.1 (9) refers) along header pipes and off cylinder head studs.

k. Slacken clamps (Fig 5.1 (14) refers) on header pipe/midsection joints.

l. Remove trouser guard (Fig 5.1 (15) refers).

m. Withdraw exhaust system from machine.

5.4 CLEANING AND INSPECTION

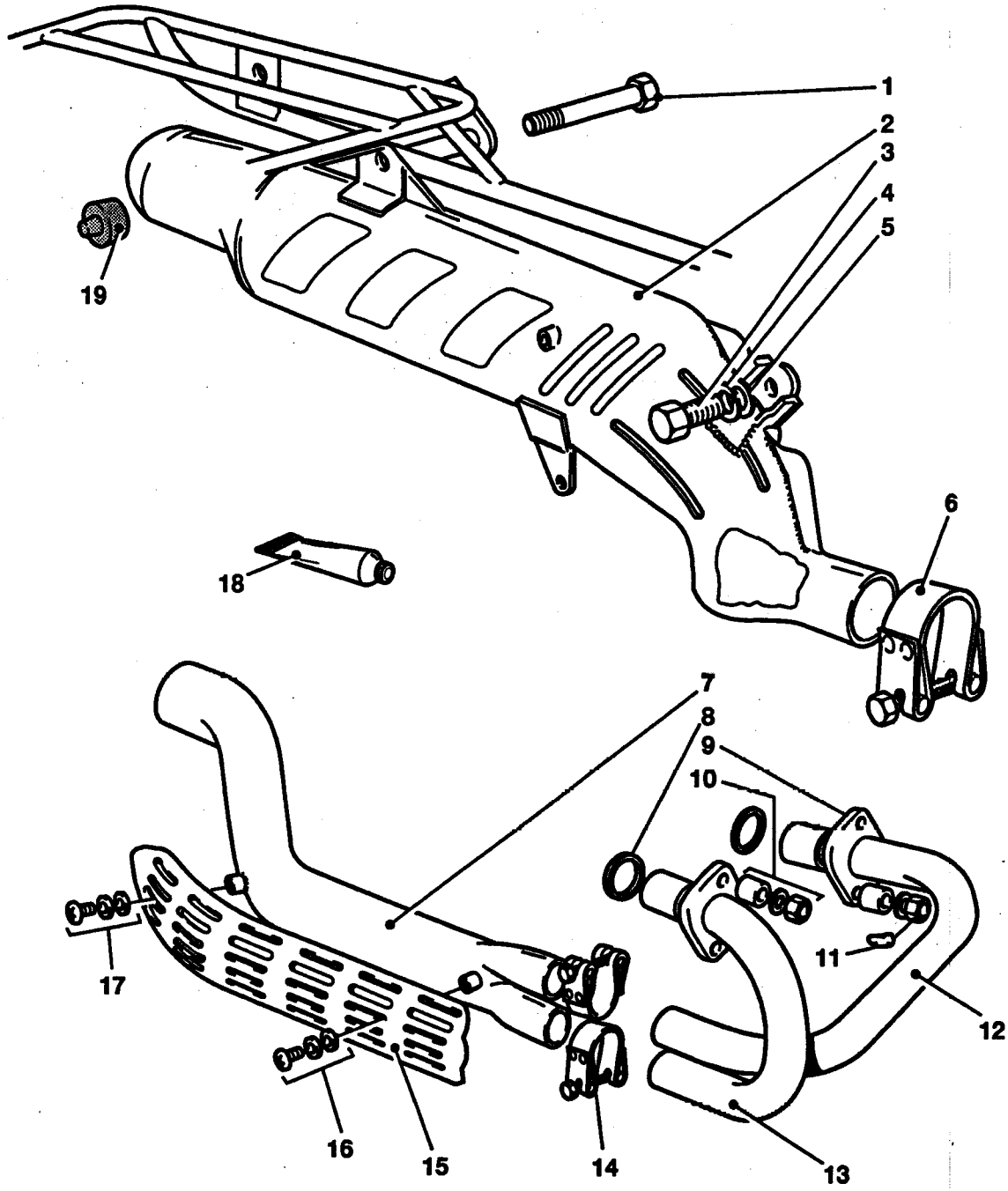
a. Clean the exhaust system with a solution of soapy water to remove dirt, mud, grease, etc.

b. Inspect the exhaust pipes and silencer for any fractured brackets or crushed surfaces. Check that internals of exhaust silencer do not rattle. Replace or repair as necessary.

5.5 REPLACEMENT

a. Exhaust replacement is achieved by reversing the removal procedure.

b. Be sure to renew the header pipe sealing rings.



1. Hex bolt
2. Exhaust silencer
3. Hex set screw
4. Spring washer
5. Plain washer
6. Clamp, exhaust midsection/silencer
7. Exhaust midsection
8. Seal, exhaust/head
9. Clamping ring/exhaust/engine
10. Spacer, exhaust downpipe clamp
    Plain nut
    Spring washer
11. Copper grease
12. Exhaust header pipe, L/H
13. Exhaust header pipe, R/H
14. Clamp, exhaust header/ midsection
15. Exhaust trouser guard
16. Button head screw
    Spring washer
    Plain washer
17. Button head screw
    Spring washer
    Plain washer
18. Exhaust jointing compound
19. Exhaust heat protection rubber

Fig 5.1 Exhaust System

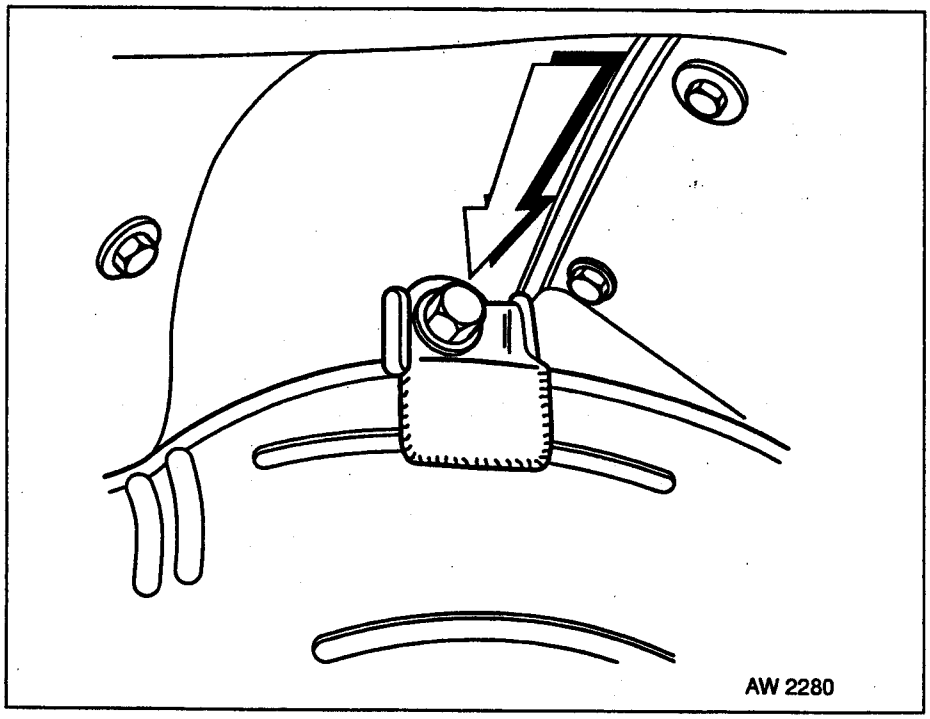


Fig 5.2 Silencer Retaining Bolt

c. Use a good quality high temperature jointing compound (Fig 5.1 (18) refers) on all joints.

d. Both cylinder head exhaust flange nuts (Fig 5.1 (10) refers) must be tightened progressively to effect square clamping.

An application of copper grease (Fig 5.1 (11) refers) will prevent subsequent seizure of the nuts.

5.6 FAULT DIAGNOSIS

SYMPTOM	FAULT	REMEDY
1. Rusty exhaust	a. Failure to clean regularly b. Aged system	Re-paint with good quality proprietary black exhaust paint after removing all loose scale/rust according to instructions. Alternatively replace.
2. Excessive noise	a. Leaking from: (1) Holes in system (2) Joints	Replace or repair exhaust Remake joints using good quality jointing compound and seals (at cylinder head junction). See para 5.5.
3. Exhaust pipes glow red	a. Overheating. Fault not due to exhaust system but: (1) Incorrect carburation, OR (2) Incorrect ignition timing	 Check against specifications. See Chap 4 Verify correct timing. See Chap 6.

CHAPTER 6
Ignition System

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

6.1 GENERAL DESCRIPTION

a. The motorcycle ignition system is a NIPPONDENSO, capacitor discharge (CDI) magneto generator system comprising the following:

(1) The stator plate

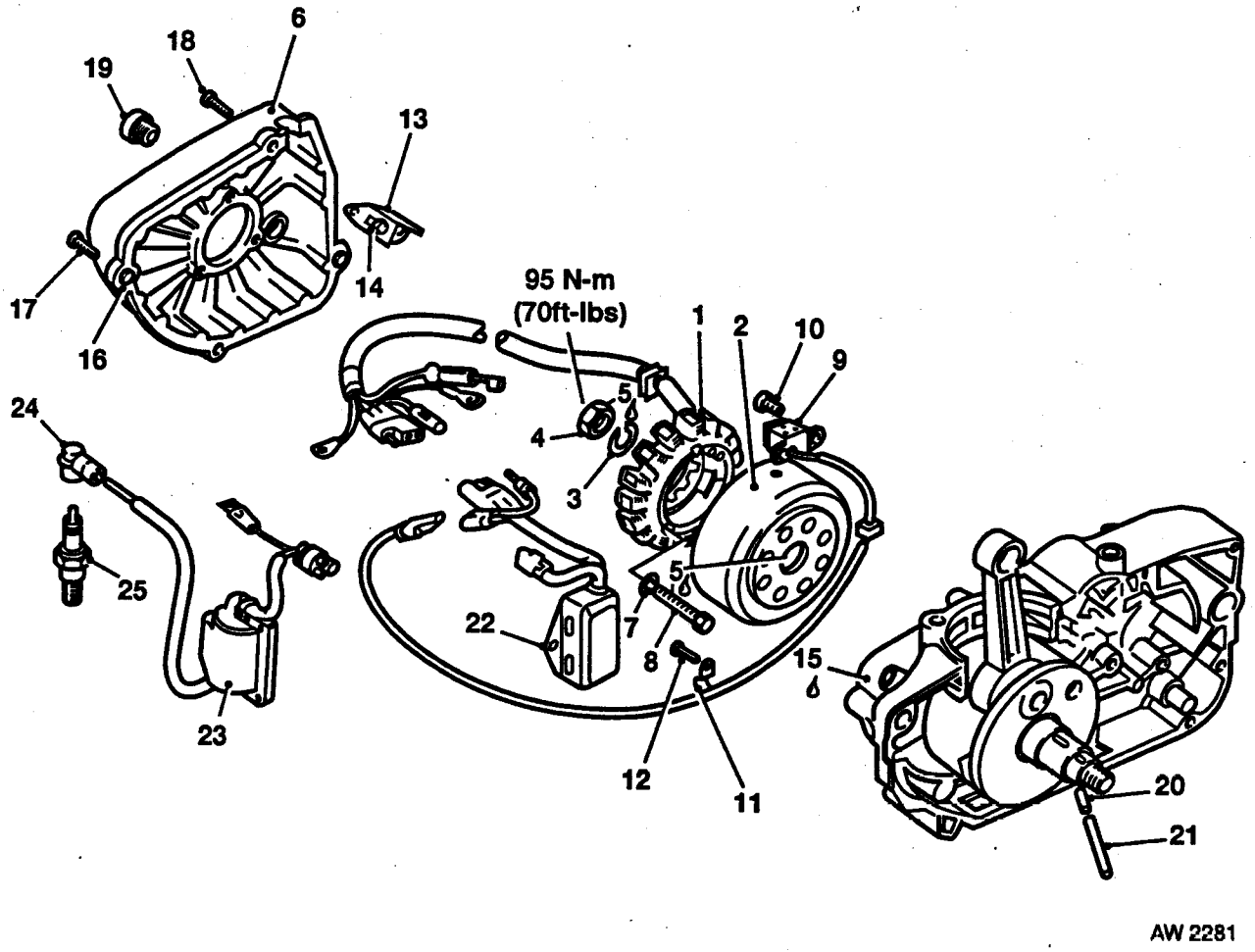
(2) The flywheel

(3) The CDI control unit (amplifier box)

(4) The trigger coil assembly

(5) The ignition coil assembly

b. In essence the ignition system operates by charging a capacitor in the amplifier box by means of the two ignition charging coils (high and low speed). The capacitor is then discharged at the correct time (triggered by the two trigger coils – high and low speed) the energy released transformed to a high voltage spark at the spark plug by means of the ignition coil.



1-2.	Stator assembly & flywheel	14.	Taptite screw M4 x 6 (2)
3.	Lockwasher 18	15.	Silicone seal *
4.	Hexagonal nut M18 x 1·5	16.	Dowel 9·8 x 10 (2)
5.	Loctite 242 (blue, medium strength) *	17.	Allen screw M6 x 30 (1)
6.	Ignition cover	18.	Allen screw M6 x 25 (2)
7.	Lockwasher 6 (3)	19.	Plug
8.	Hexagonal screw M6 x 40 (3)	20.	Vent tube
9.	Trigger coil	21.	Vent tube 270 mm (10·5")
10.	Taptite screw M6 x 16 (2)	22.	Amplifier box
11.	Clamp	23.	Ignition coil
12.	Taptite screw N4 x 6	24.	Spark plug protector
13.	Cable holder	25.	Spark plug Champion A6HC

* as required

Fig 6.1 Ignition System

c. A lighting coil is electrically separate and powers the motorcycle's main electrical devices – see Chapter 7 Electrical and Lighting.

6.2 SPECIFICATIONS

a. Ignition

Make	Nippondenso
Type	Capacitor Discharge
Basic timing	28° full advanced at 6000 rpm 3° start ignition

b. Magneto Generator (for lighting supply)

Output Power	190W (AC13, 5V) above 3000 rpm
Voltage	12V

c. Spark Plug

Make	Champion	or equivalent
Model	A6HC	
Gap		0·7 mm

d. Coil Resistances:

High speed trigger coil	12–20 ohms
Low speed trigger coil	120–180 ohms
Low speed charging coil	230–350 ohms
High speed charging coil	4–6 ohms
Lighting coils white-orange	0·6 – 0·9 ohms
white-green	0·54 – 0·8 ohms
green-orange	0·8 – 1·6 ohms

e. Ignition Coil

Primary Winding	0·95 – 1·1 ohms
Secondary Winding	11–12 K ohms

6.3 TESTING PROCEDURE

a. The charging coils, triggering coils, lighting coils and the high tension coil may be tested for continuity using a standard ohmeter.

NOTE: Values are taken at 20°C (68°F) – bear in mind that resistance increases with temperature.

b. Disconnect the connectors of each part, and check the resistance or continuity between each terminal as follows.

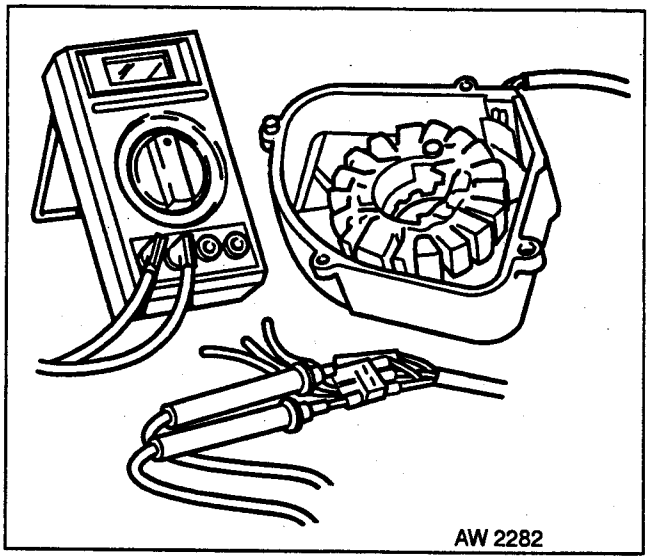


Fig 6.2 High Speed Trig Coil Continuity Test

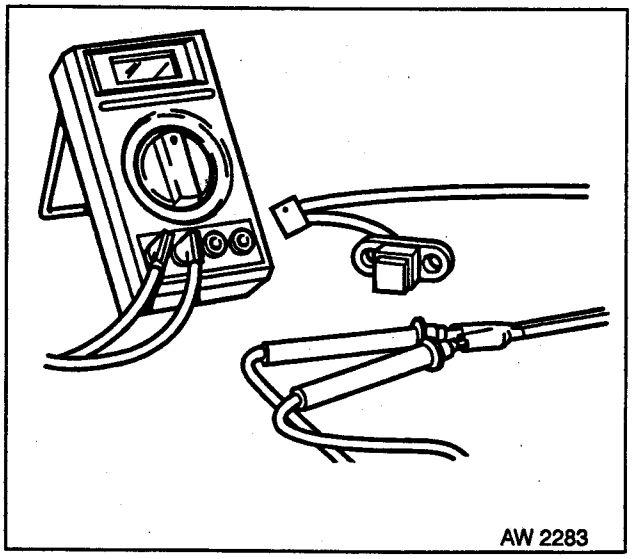


Fig 6.3 Low Speed Trig Coil Continuity Test

6.4 TRIGGER COIL TESTING

PART NAME		WIRE COLOUR	RESISTANCE	
Ignition Timing Sensor	High Speed trigger coil	Black – Pink	12 – 20 Ω	Fig 6.2
	Low Speed trigger coil	Black – Blue	120 – 180 Ω	Fig 6.3

6.5 FLYWHEEL GENERATOR TESTING

PART NAME		WIRE COLOUR	RESISTANCE	
Flywheel Generator	Low Speed charging coil	Black – Brown	230 – 250 Ω	Fig 6.2
	High Speed charging coil	Brown – Red	4 – 6 Ω	
	Lighting coils	White – Orange White – Green Green – Orange	0·6 – 0·9 Ω 0·54 – 0·8 Ω 0·8 – 1·6 Ω	Fig 6.5

6.6 IGNITION COIL TESTING

PART NAME		WIRE COLOUR	RESISTANCE	
Ignition Timing Sensor	Primary Winding	Core – Orange	0·95 – 1·1 Ω	Fig 6.6
	Secondary Winding	High Tension wire – Black	11 – 12 K Ω	Fig 6.7

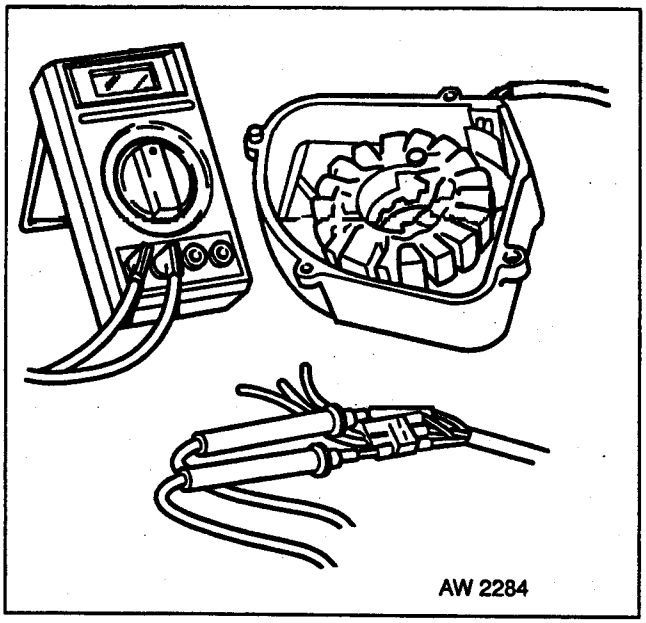


Fig 6.4 Charging Coil Continuity Testing

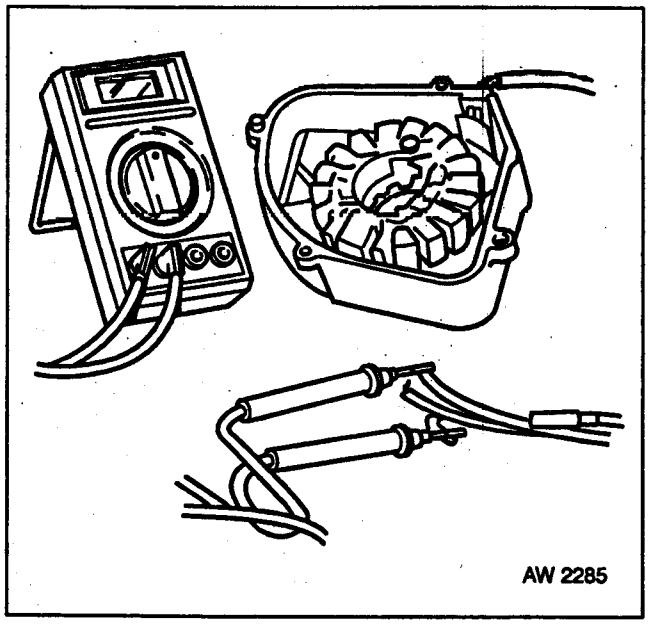


Fig 6.5 Lighting Coil Continuity Testing

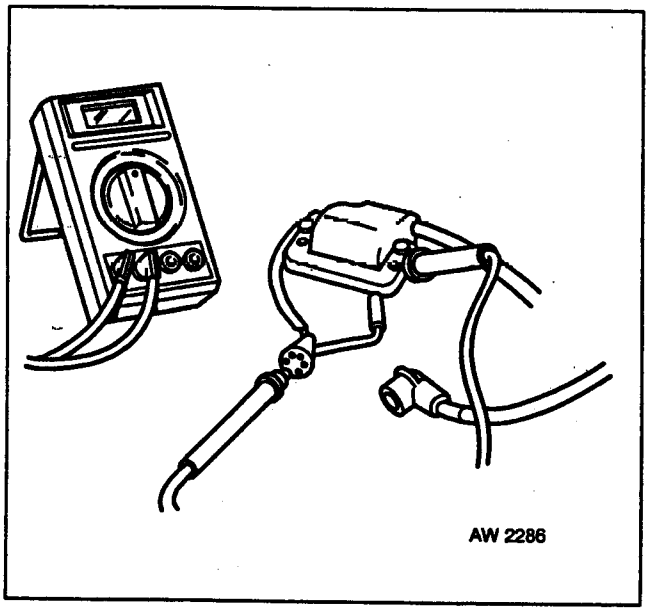


Fig 6.6 Ignition Coil Primary Winding Checking

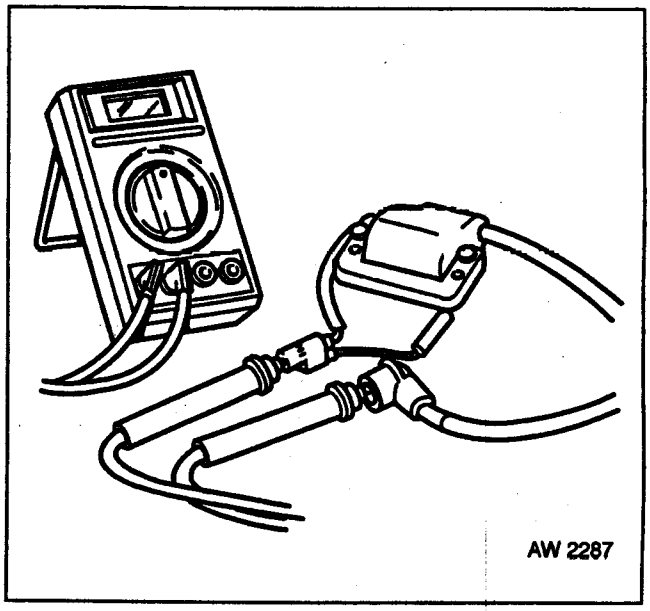


Fig 6.7 Ignition Coil Secondary Winding Checking

6.7 TIMING VERIFICATION (STROBOSCOPIC TIMING LAMP)

a. The ignition timing cannot be adjusted on the MT350, but it can be checked for electrical malfunction. To check the ignition timing, a tachometer (induction type only) must be connected to the high tension wire.

b. Only stroboscopic timing lights utilizing capacitor or inductive pick-up can be used to indicate correct spark setting without disturbing the electronic equilibrium of the ignition circuit.

Remove the timing inspection plug, and connect the timing light pick-up to the high tension lead.

c. Use a separate battery to supply timing lamp.

Start the engine and allow it to warm.

WARNING

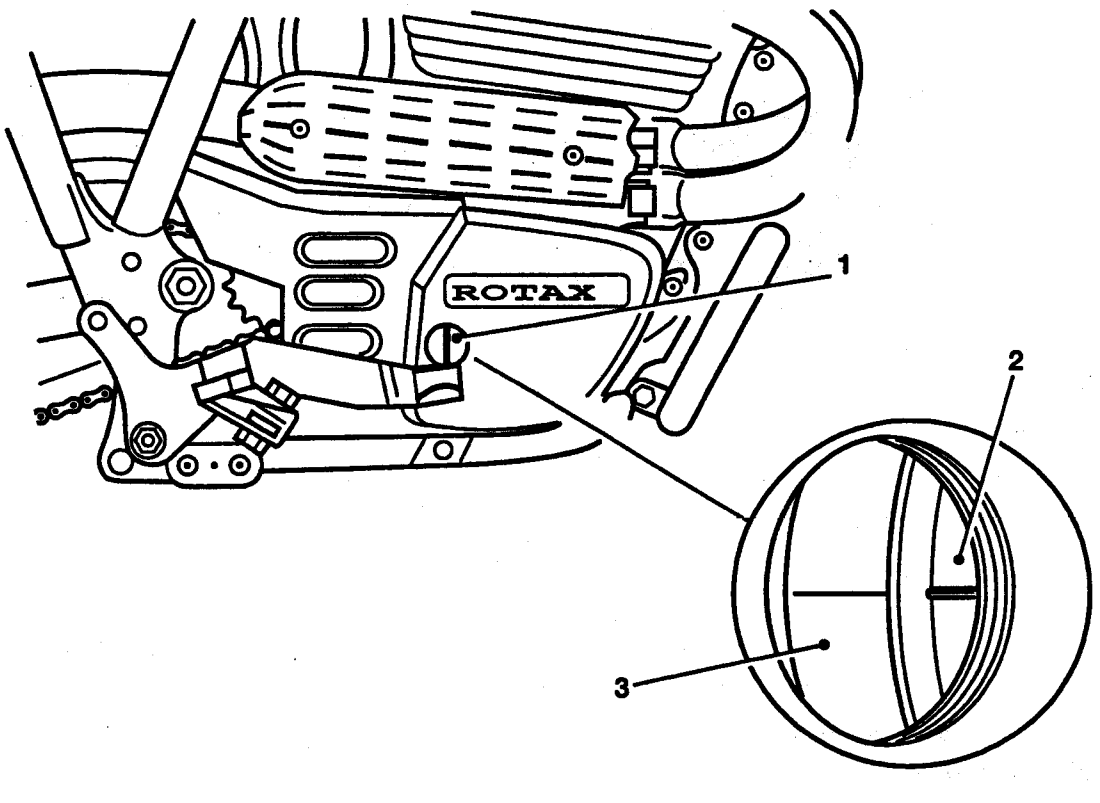
To prevent powerful electric shock, do not touch the high tension wire while the engine is running.

d. The flywheel has two timing marks, one for the minimum advance, the other for maximum advance. With a view facing the flywheel, the right hand one is the maximum advance timing mark and the left hand one is the minimum timing mark.

Point the timing light beam straight into the inspection hole and rev the engine for a brief instant to 1200 rpm (minimum advance timing mark). Fig 6.8 refers.

e. Check the timing marks alignment at 1200 rpm and 6000 rpm. If the timing is correct, the magneto cover mark and flywheel mark will align as shown.

If the timing is incorrect, it is an indication of an ignition problem and should be investigated further.

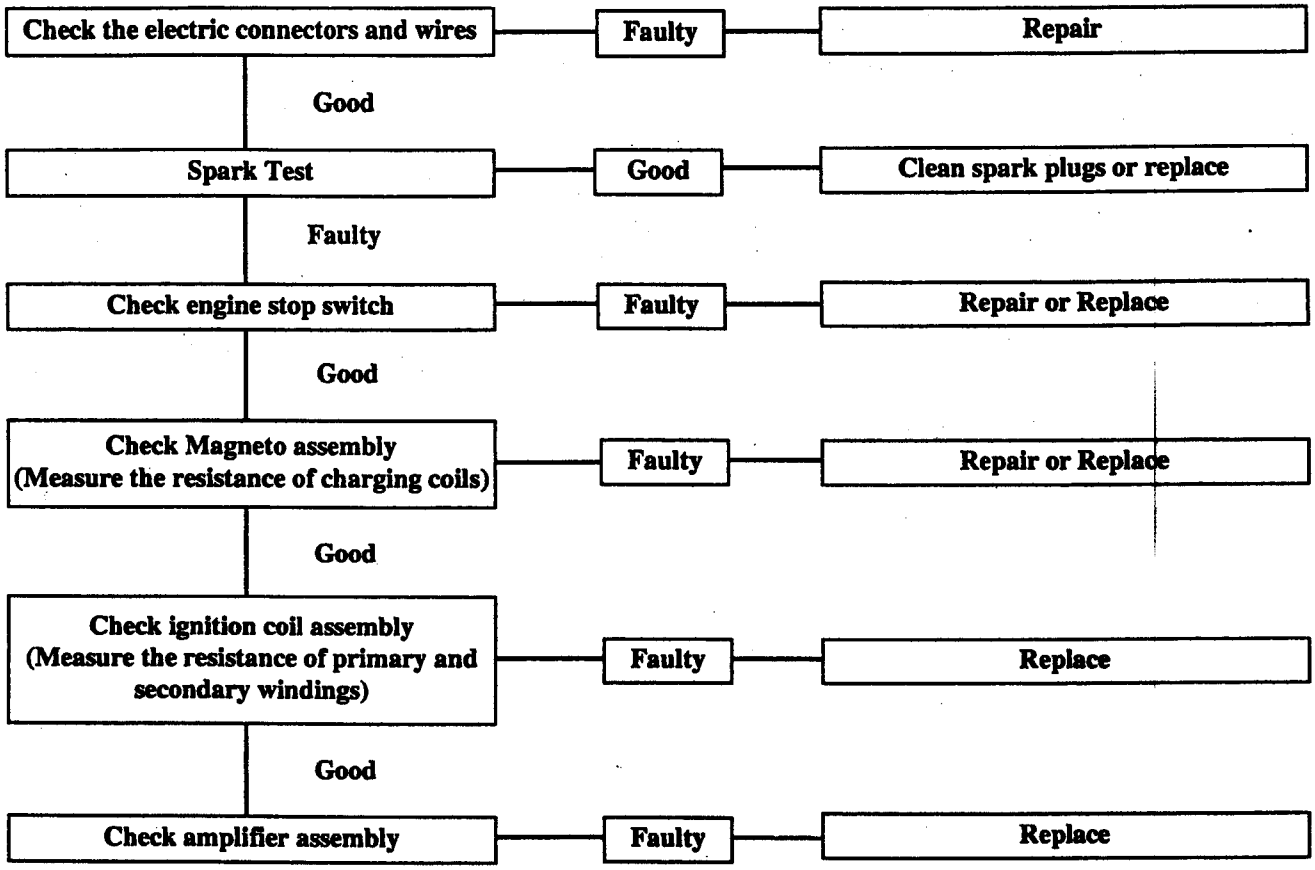


1. Timing access plug **2. Magneto cover mark** **3. Flywheel mark**

Fig 6.8 Timing Verification

6.8 FAULT DIAGNOSIS – IGNITION SYSTEM

If the engine trouble is considered to be caused by any defect in the CDI system, check the system with the following steps.



Cause / Symptom	Magneto Assembly			Ignition Coil Assembly	
	Low Speed Charging Coil	High Speed Charging Coil	Lighting Coil	Primary Winding	Secondary Winding
Engine does not start	Winding Open	Winding Open		Winding open or layer short	Winding open or layer short
Engine stalls at low speed	Winding layer short				
Irregularity at low speed	Winding layer short			Winding layer short	Winding layer short
Irregularity at high speed		Winding layer short			Winding layer short
Load is not charged			Winding open		

CHAPTER 7
Electrical and Lighting

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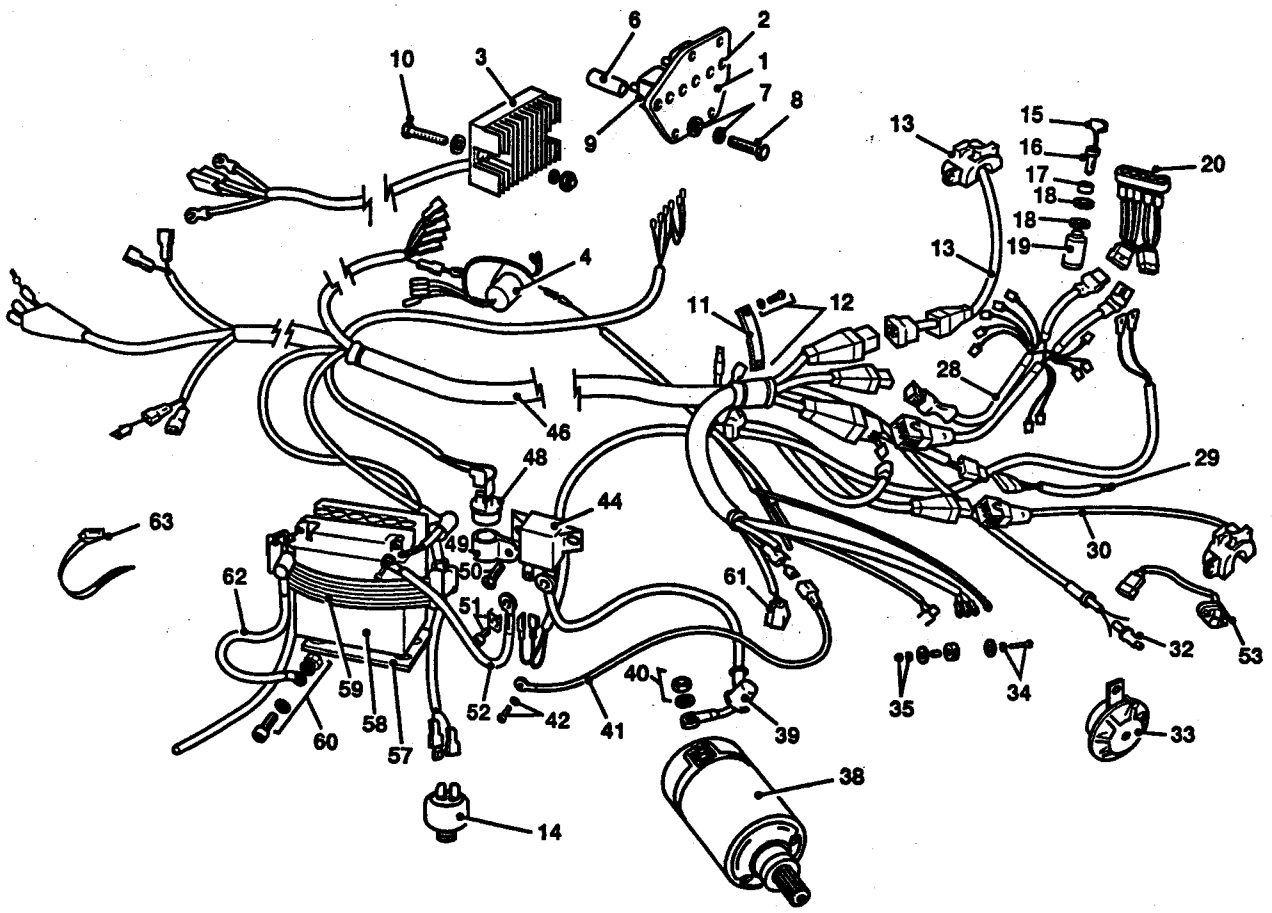
7.1 GENERAL DESCRIPTION

a. Figs 7.1 and 7.2 illustrate the electrical and lighting system, Fig 7.3 shows schematically the circuit diagram to be consulted when tracing problems. The ignition system is dealt with in Chapter 6.

b. In essence, alternating current from the generator on the engine is supplied to a rectifier/regulator (Fig 7.1 (1) refers) from where a direct current charges the battery. The battery (12 volt) (Fig 7.1 (21) refers) supplies all electrical equipment with the exception of the ignition system, which is totally independent.

c. There are three separate circuits, individually protected by a thermal circuit breaker (located under the seat, including a fourth auxiliary unit). These are automatic in action and will reset in approx 20 secs. All circuits are deprived of current when the blackout switch is operated.

d. A main wiring loom (Fig 7.1 (3) refers) fastened to the frame at points along its length with zip ties serves to connect the various electrical components together.



1.	Circuit breaker plate	33.	Horn
2.	Rivet and washer	34/35.	Fastener bolt with grommet
3.	Regulator	38.	Starter motor
4.	Low voltage ind switch	39.	Starter motor relay cable
6.	Circuit breaker spacer	40.	Nut & washer
7/8.	Washers and screw M6	41.	Neutral ind light cable
9.	Circuit breaker	42.	Washer and screw M3
10.	Screw, washer, nut M6	44.	Relay
11.	Harness strap	46.	Main harness
12.	Screw and washer M5	48.	Flasher unit
13.	L/H control switch	49.	Flasher mount
14.	Rear stop light switch	50.	Screw M6
15.	Ignition key	51.	Clip and screw M5
16.	Lock barrel	52.	Battery cable
17/18.	Lock nut and washer	53.	Blackout switch
19.	Ign switch housing	57.	Battery mat
20.	Warning light panel	58.	Battery
28.	Console harness	59.	Battery strap
29.	Headlight harness	60/62.	Earth cable and fixings M6
30.	R/H control switch (throttle)	63.	Cable tye
32.	Front brake switch		

Fig 7.1 Electrical Cabling and Components

7.2 SPECIFICATIONS

a. **Flywheel Magneto:**

Output: 12v/190w Make: Nippondenso

b. **Battery:**

Rating: 12v/11AH

c. **Bulb Ratings (W):**

Headlamp:	45/40	Indicator:	21	Console Warning:	2
Rear Light Tail: } Rear Light Stop: }	5/21	Speedometer Illumination:	1·2		

d. **Flasher Unit:**

Rating: 12v

e. **Regulator/Rectifier:** Solid State

f. **Stop Switch**

Front: Type: Pressure release makes contacts

Rear: Type: Application of pressure applies switch on master cylinder.

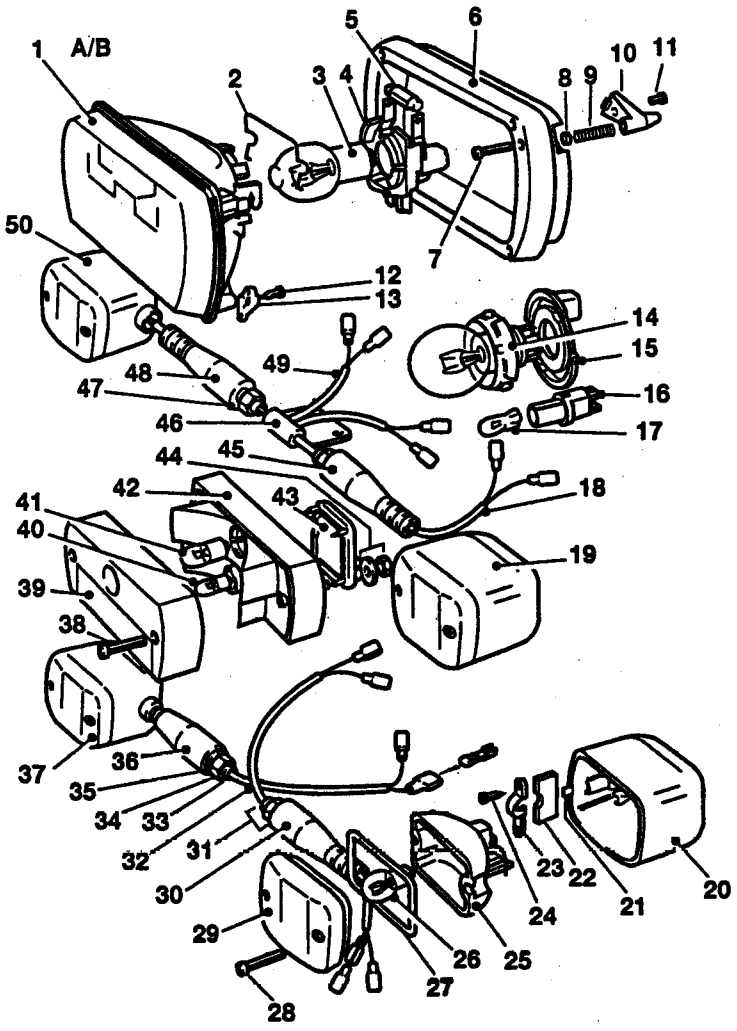
7.3 FAULT DIAGNOSIS - ELECTRICAL EQUIPMENT

a. Fault diagnosis on the electrical system requires a systematic approach. The majority of faults tend simply to be corroded, loose (bad) connections, improperly mounted components (thus subjecting them to excessive vibration) and/or wiring that has rubbed or chafed on, or become trapped between, other components. Therefore a thorough visual inspection of the electrical equipment should be of priority in any investigation.

b. In cases where visual inspection reveals nothing, a multi-meter used in conjunction with the wiring diagram (Fig 7.3) should be used to trace earth faults and line to line faults.

c. If a faulty component is suspected, substitution with a known good component is the best policy. The following information may be used as a guide.

SYMPTOM	REASON	REMEDY
1. Particular light (or lights) inoperative	a. Blackout switch operated!	Set blackout switch to normal position.
	b. Burnt out filament(s) due to:	
	(1) Worn out bulb(s)	Replace
	(2) Excessive electrical supply (electrical surging)	Replace bulb but check output of rectifier/regulator and alternator
	c. No supply reaching bulb(s) due to:	
	(1) Bad contacts	Clean
	(2) Fuse blown on circuit(s) feeding bulb(s)	Replace fuse but check reason for failure, eg earth or line to line fault.
	(3) Circuit feeding bulb(s) switched in at ignition switch (Faulty).	Check ignition switch with ohmeter, replace if necessary.
	(4) Circuit feeding bulb(s) not switched in at handlebar switches	Check switches with ohmeter against circuit diagram (Fig 7.3).
	(5) Battery disconnected and regulator/rectifier output non-existent	Check, reconnect battery if necessary. Look for loose connections from alternator to rectifier/ regulator. Failing success, check output of rectifier/regulator and alternator.
2. Lights dim, particularly when engine revs drop	a. Corroded or loose battery terminals	Check, reconnect battery if necessary.
	b. Battery output low due to:	
	(1) Low electrolyte level (2) Failing battery	Top up level. Replace
3. Lights completely inoperative	See Symptom No 1	
4. Horn note poor	a. Poor battery voltage	See Symptom 2.
	b. Horn out of adjustment	Adjust
5. Flashers inoperative	a. See Symptom No 1	
	b. Horn out of adjustment	Replace
6. Brake light inoperative	a. See Symptom No 1	
	b. Switch faulty	Check, replace as necessary.
	c. Switch(es) out of adjustment	Check, adjust if necessary



AW 2290

1A	Headlamp unit LHD	18,45,47	Indicator stem assy front	33-37	Indicator assy, L/H rear
1B	Headlamp unit RHD	18,19,45	Indicator assembly front	33-36	Indicator stem assy
1A-5	Headlamp assy LHD	50		34	Plain nut
1B,14-17	Headlamp assy RHD	18-37	Indicator set complete	35	Plain washer
1A-13	Headlamp assy LHD (complete)	45-50		36	Indicator stem
1B,6-17	Headlamp assy RHD (complete)	19,20-29	Indicator complete	37	Indicator, complete
2	Clip, LHD H'lamp bulb rtng	20	Indicator body (bare)	38	Screw, rear lens
3	Bulb, LHD H'lamp	20-32	Indicator assy, R/H rear	38-44	Light unit, rear
4	Bulb holder, LHD H'lamp	21	Screw insert, indicator	39	Lens, rear light unit
5	Bulb, LHD front pilot *	22	Clamp plate, indicator	40	Bulb, rear tail *
6	Headlamp surround	23	Clamp, indicator	41	Bulb, rear stop *
7	Screw H'lamp adjuster	24	Screw, indicator clamp	42	Reflector/body (bare) rear
7-11	Headlamp adjuster assembly	25	Reflector, indicator		light
8	Washer, H'lamp adjuster	26	Bulb, indicator	43	Terminal cap, rear light
9	Spring, H'lamp adjuster	27	Gasket, indicator lens	44	Plain large washer
10	H'lamp adjuster	28	Screw, indicator lens rtng	45	Indicator stem
11	Screw, H'lamp unit rtng	29	Lens, indicator		Plain nut
12	See key 11	30	Indicator stem	46	Bracket front indicator mtg
13	Headlamp unit retainer	30-32	Indicator stem assy	47	Plain nut
14	Bulb, RHD H'lamp	31	Plain nut	48	Indicator stem
15	Clip, RHD H'lamp bulb rtng		Plain Washer	49	Cable, R/H front indicator
16	Bulb holder, RHD front pilot	32	Cable, R/H rear indicator	50	Indicator complete
17	Bulb RHD front pilot	33	Cable, L/H rear indicator		
18	Cable, LH front indicator	33A	Terminal, indicator cable		

* Some vehicles may be fitted with a pilot light/and combined stop/tail bulb

Fig 7.2 Lighting Kit

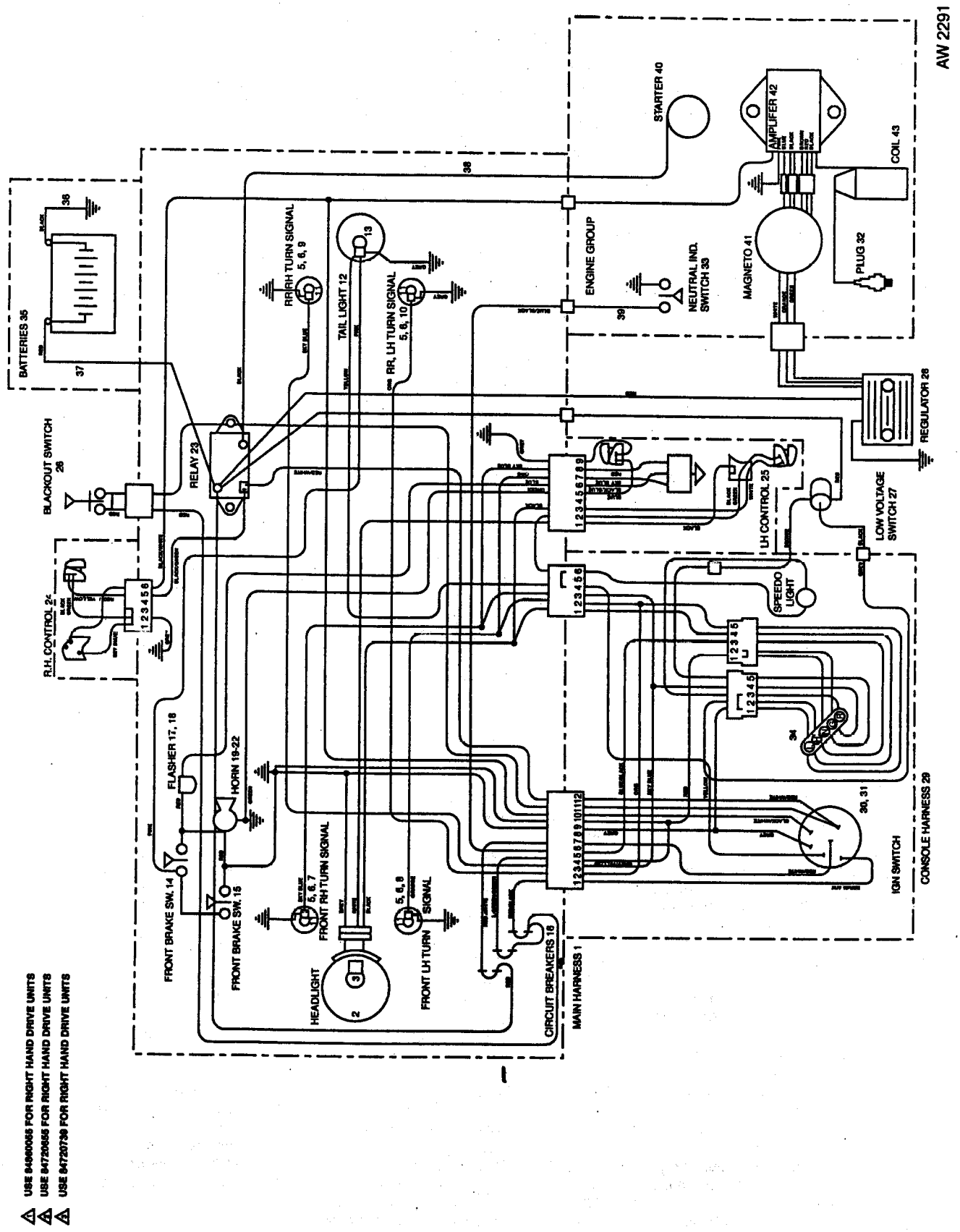


Fig 7.3 Electrical Circuit Diagram (See Key Page 58)

KEY TO FIG 7.3

1. Main harness	16. Circuit breaker	31. Ignition switch label
2. Headlight assy	17. Flasher	32. Spark plug
3. Headlight bulb	18. Flasher holder	33. Neutral start switch
4. Headlight harness	19. Horn	34. Indicator light assy
5. Turn indicator assy	20. Horn spacer	35. Battery
6. Turn indicator stem	21. Horn washer	36. Battery ground cable
7. Front stem assembly	22. Horn grommet	37. Battery cable
8. Front stem assembly	23. Relay	38. Relay to starter cable
9. Rear stem assembly	24. R/H control switch	39. Neutral start cable
10. Rear stem assembly	25. L/H control switch	40. Starter
11. Indicator bulb	26. Blackout switch	41. Magneto
12. Tail light assembly	27. Low V. ind switch	42. Amplifier box
13. Tail light bulb	28. Regulator	43. Coil
14. Front brake switch	29. Console wiring harness	
15. Rear brake switch	30. Ignition switch	

7.4 MAINTENANCE PROCEDURES – GENERAL

a. The electrical system of the machine should not require any major attention in normal use – malfunctioning is almost always a result of damaged connections or failed bulbs.

b. Regularly inspect the wiring for loose connections, chafing, rubbing and trapping on and between other components.

c. Keep the battery terminals greased and free of deposits.

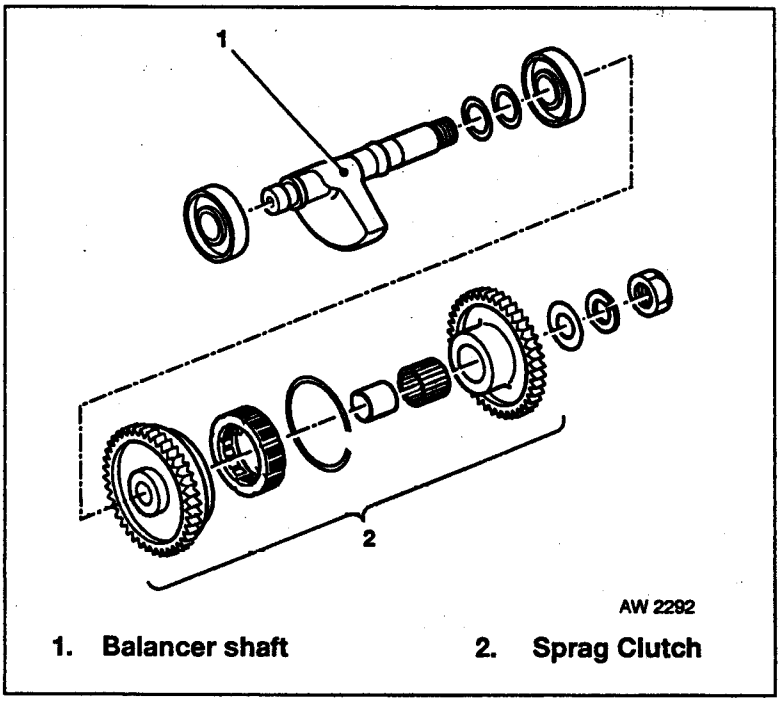
TABLE 3 LIGHTING DATA

LIGHT	QTY	RATING	TYPE	ACM PT NO
Headlight dip/main beam LH dip only	1	12V 40/45W	Dual fitment asymmetrical offset bayonet	A0084720242
Headlight dip/main beam RH dip only	1	12V 40/45W	Dual filament symmetric	A0084720655
Front daylight LH Pilot light	1	12V 5W	Glass	A0084720630
Front daylight RH Pilot light	1	12V 5W	Festoon	A0084720648
* Rear stop	1	12V 10W	Bayonet	A0084720259
* Rear tail	1	12V 4W	Bayonet	A0084720184
Direction indicator	4	12V 21W	Bayonet	A0084720259
Speedometer light	1	12V 1·2W	Glass – pea bulb	A0084720036
Console warning lights	5	12V	Replaced as warning panel	

* Alternative 12v-5W/21W Double filament Offset bayonet

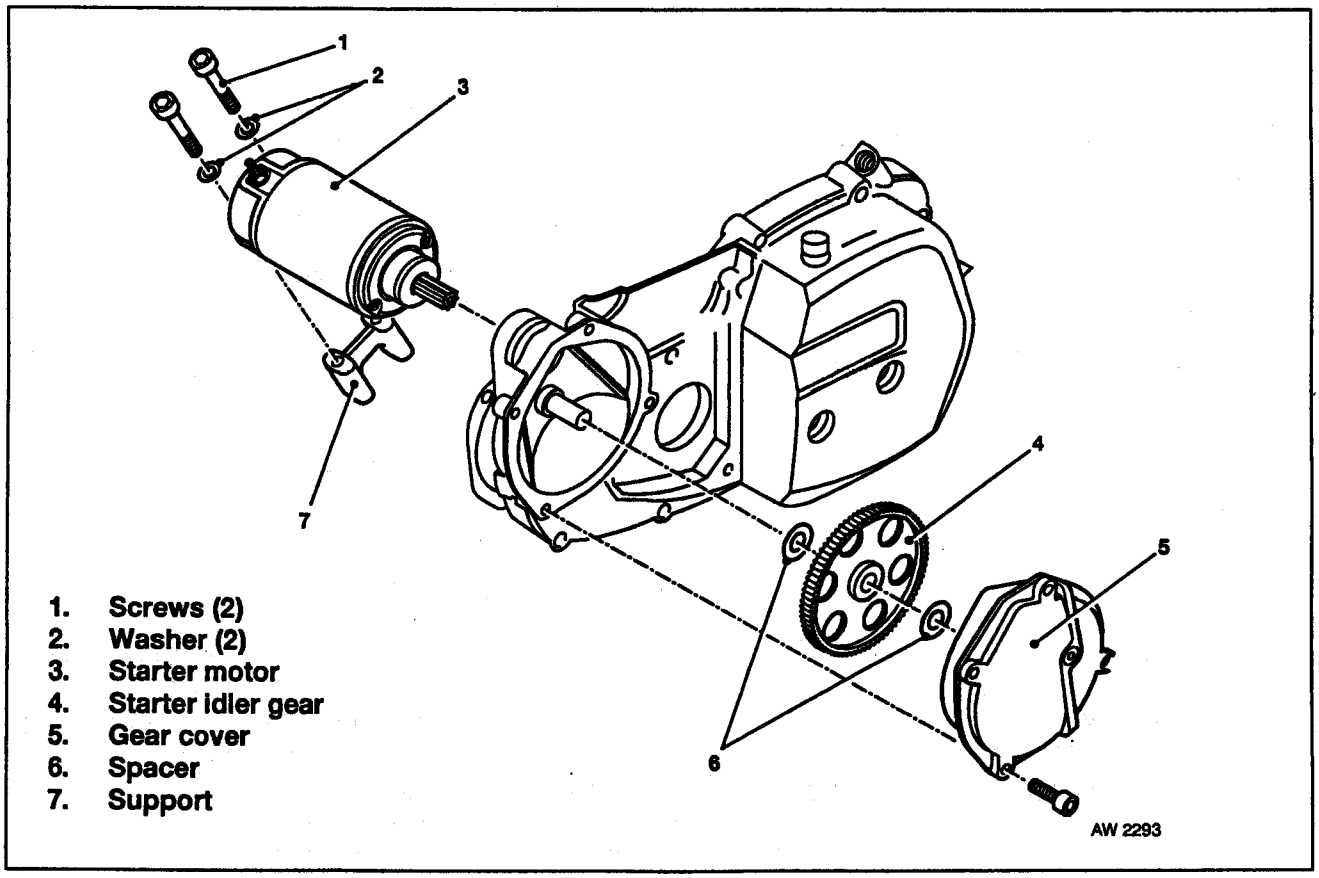
7.5 ELECTRIC STARTER MOTOR

a. **General.** Figures 7.4 and 7.5 refer. The starter motor is continuously engaged, driving an idler gear which drives a one-way (sprag) gear clutch mounted on the end of the balancer shaft.



1. Balancer shaft
2. Sprag Clutch

Fig 7.4 Starter Sprag Gear Clutch



1. Screws (2)
2. Washer (2)
3. Starter motor
4. Starter idler gear
5. Gear cover
6. Spacer
7. Support

Fig 7.5 Electric Starter

b. **Removal, Disassembly, Inspection and Repair.**

(1) Fig 7.5 refers. Disconnect the electrical cable. Remove support screws (1), washers (2) and support (7). Remove starter motor (3).

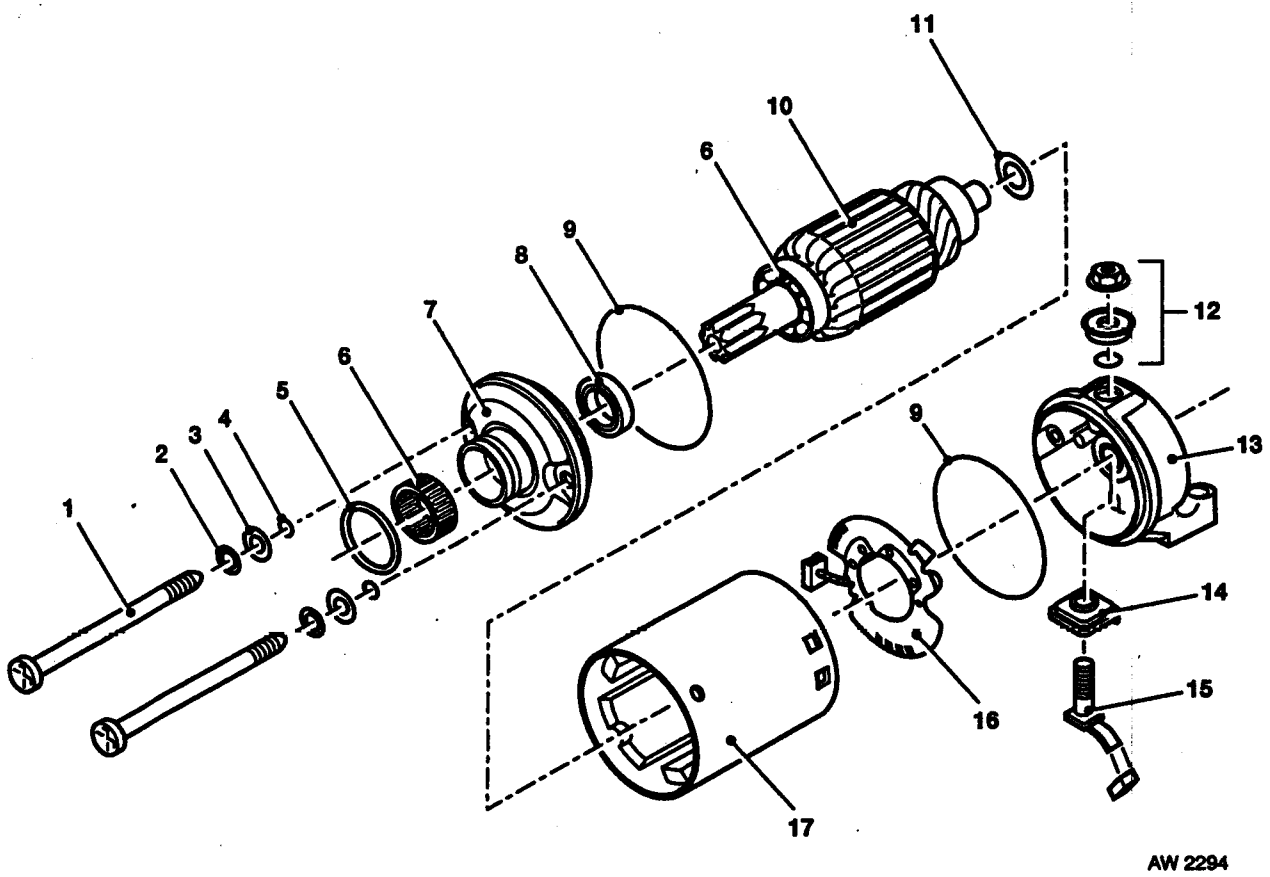
(2) Fig 7.6 refers. Disassemble by unscrewing the two through bolts (1).

(3) If the brushes are severely worn, a new brush assembly (16) should be installed.

(4) Clean the surface of the armature (10) segments, and the area between the segments, of loose dust which can cause arcing and poor motor performance.

(5) Check that the rotor runs smoothly in the bearings (6). Be sure all 'O' rings (9) are intact and lightly greased and that the arrangement of the isolating bush assembly (12) is correct. The oil seal (8) should be in good condition. When assembling, be sure the brush holder assembly is located correctly.

(6) Installation is the reverse of removal.



1. Through-bolt (2)
2. Lockwasher (2)
3. Washer (2)
4. 'O' ring (2)
5. 'O' ring
6. Armature bearings
7. Drive housing
8. Oil seal
9. 'O' Ring (2)
10. Armature
11. Spacer
12. Isolating bush assy
13. End cap
14. Isolating bush
15. Isolating bush stud assy
16. Brush holder
17. Field coil

Fig 7.6 Electric Starter

c. **Starter Motor Tests.** Place armature in lathe or truing stand and check runout of commutator. Commutators with more than 0·002 in runout should be replaced or machined on a lathe. Commutators should be replaced when diameter is less than 1·141 in.

CHAPTER 8
Mainframe and Fittings

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8.1 GENERAL DESCRIPTION

a. The mainframe comprises one section, and several smaller items that cradle the engine, support the footrests, battery, etc.

b. A crash bar rail is mounted forward of the engine and a mainstand assembly (and sidestand assembly for RHD machines) support the machine when stationary.

c. The front section of the frame has a welded steel box section spine serving as the engine oil reservoir tank and incorporates the steering head bearings.

8.2 SPECIFICATIONS

Frame	Welded Steel Tube Sections
Sump Guard and Engine Plate	Pressed Steel Plate

Painted to MOD Standards
All Fasteners Plated

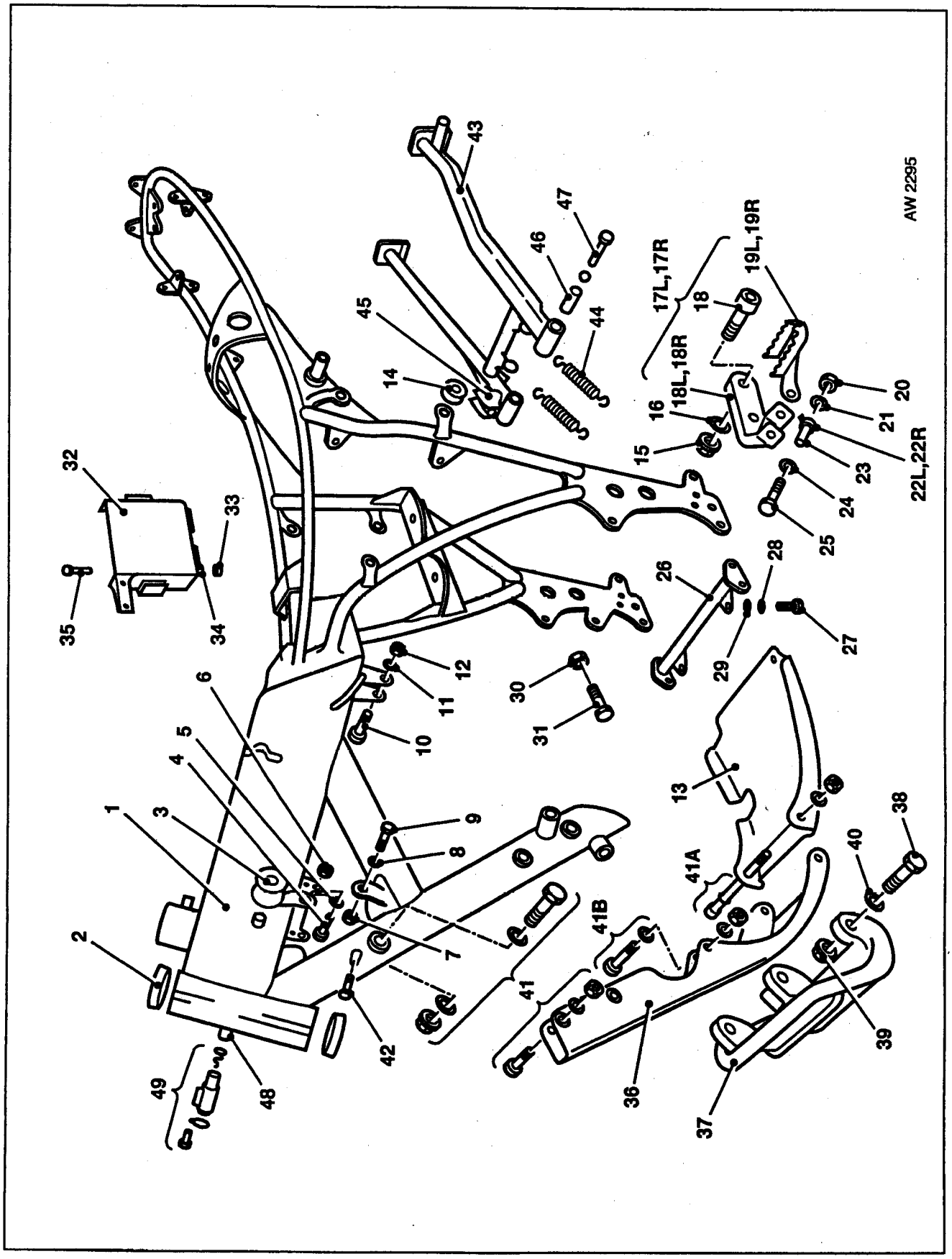

Fig 8.1 Mainframe and Fittings

KEY TO FIGURE 8.1

1. One piece frame, GRN
2. Head Stock Bearing Seal
3. Tank cushion, extended (4)
4. Soc head screw M6X30(2)
5. Plain washer M6 (4)
6. Nut, self locking M6 (2)
   Washer, serrated (2)
7. Nut, self locking M6(2)
8. Plain washer M6 (4)
9. Hex head screw M6X16 (2)
10. Bolt, soc cap head M10X70
11. Washer M10 (2)
12. Nut, self locking
13. Sump guard, grn
14. Grommet (6)
15. Nut, self locking M8 (4)
16. Plain washer M8 (4)
17R. R/H Footpeg assembly
17L. L/H Footpeg assembly
18R. Mounting, R/H Footrest, grn
18L. Mounting, L/H footrest, grn
18. Screw, soc cap head M8X30 (4)
19R. Footrest Peg, R/H, grn
19L. Footrest Peg, L/H, grn
20. Nut self locking M8 (2)
21. Plain washer (2)
22R. Spring, R/H
22L. Spring, L/H
23. Bushing, Footpeg (2)
24. Plain washer (2)
25. Hex head bolt M8X45 (2)
26. Crosstube, grn
27. Hex, head screw M8X16 (2)
28. Spring Washer M8(2)
29. Plain Washer M8 (2)
30. Plain Nut M6
31. Hex head screw M6X30
32. Battery tray, grn
33. Nut, self locking M6 (2)
34. Plain washer M6 (2)
35. Truss head bolt M6 x 20 (2)
36. Engine carrier, grn
37. Engine guard, grn
38. Hex head screw, M6X30 (4)
39. Nut, self locking M6 (4)
40. Plain washer M6 (4)
41. Soc head cap screw M10X85 (3)
41A. Soc head cap screw, M10X150
41B. Soc head cap screw, M10X100
    Plain Washer M10 (10)
    Nut, self-locking (5)
42. Steering lock bolt M8X30(2)
43. Centre stand
44. Centre stand, spring (2)
45. Chain slipper
46. Inner bushing (2)
47. Plain flat washer M8 (2)
48. Lock housing
49. Steering lock assembly
50. Cap
51. Rivet
52. C washer
53. Barrel
54. Spring

TABLE 4 FRAME TROUBLESHOOTING

SYMPTOM	FAULT	REMEDY
Centre stand does not retract smoothly, without assistance.	Centre stand pivot partially seized because of lack of grease. Weak or broken return springs.	Grease, dismantle and clean if necessary. Replace
Footrests do not fold smoothly and/or return without assistance.	Broken return spring. Pivot bolt too tight. Damaged/bent bracket.	Replace. Loosen, but be sure self-locking is in order. Replace.
Components do not fit together without excessive force.	Damaged/bent components.	Replace.
Machine exhibits peculiar handling tendencies.	Fault lies in other areas, check: a. Front forks b. Front & rear wheels c. Rear suspension Twisted frame	– – – – Visually examine, refer to factory or replace.
Steering lock difficult to operate.	Jammed spring. Rusty housing.	Remove lock, replace. Remove lock, clean and reassemble.
Steering lock operational only when steering in wrong position.	Fault lies with incorrect steering stem spindle and lower steering yoke.	Refer to Chapter 10.

CHAPTER 9
Rear Suspension and Fittings

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9.1 GENERAL DESCRIPTION

a. The rear suspension comprises a steel fork pivoted on the rear of the engine on needle roller bearings.

b. The bearings rotate on flanged journals which are themselves held between the frame sideplates and the rear engine mount.

c. The swinging arm spindle passes through the centre of the journals.

d. A shock absorber/spring unit is mounted on each arm of the fork, their upper ends pivoted to the main frame.

e. Shock absorbers are Girling Gas with an adjustable cam for increasing or decreasing spring pressure.

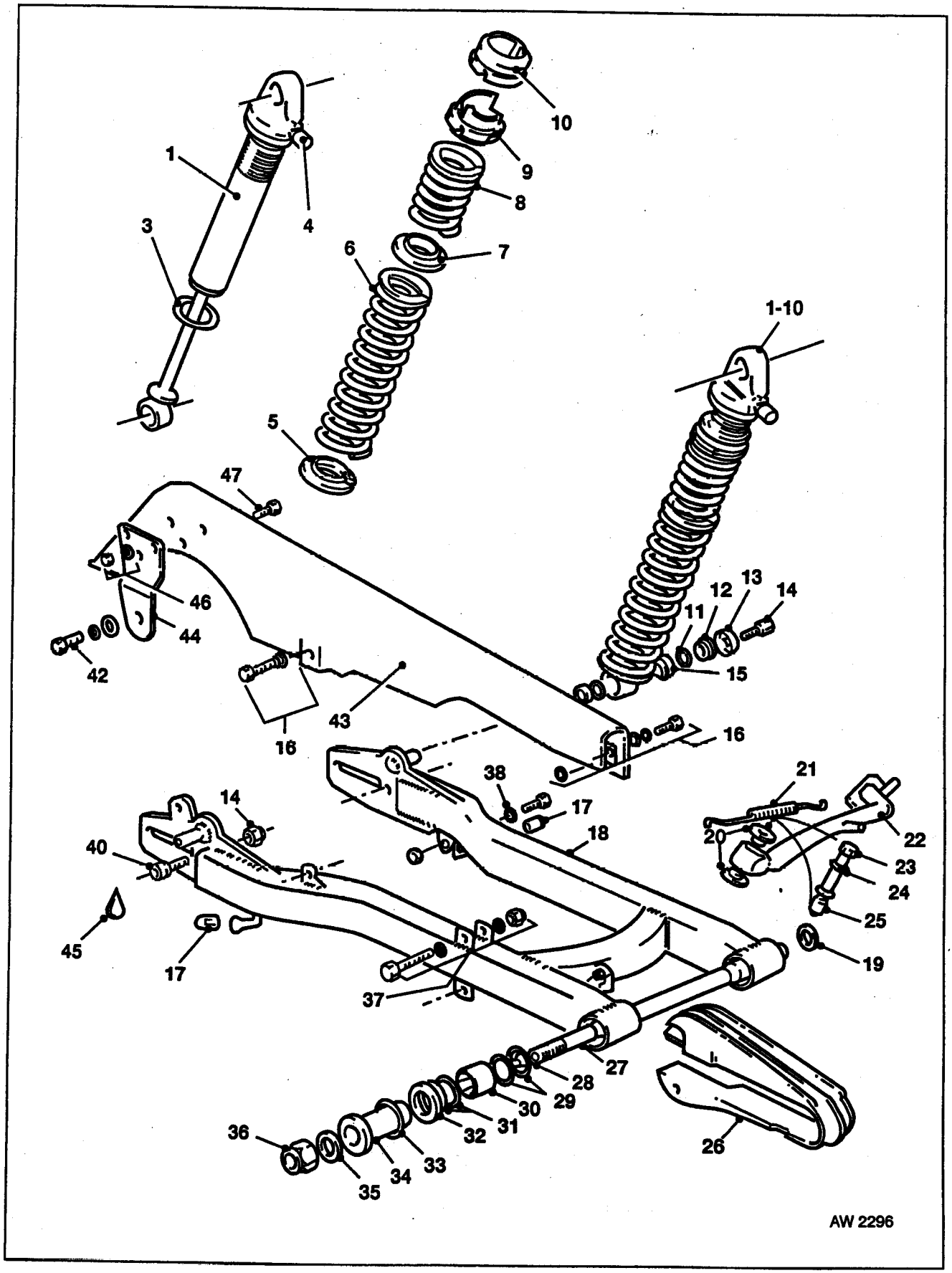


Fig 9.1 Rear Suspension and Fittings

KEY TO FIG 9.1

1. Bare shock
3. Circlip
5. Collet
6. Main spring
7. Spring spacer collar
8. Auxiliary spring
9. Adjuster
10. Adjuster stop
11. 'O' ring (8)
12. Spacer (8)
13. Washer retaining (4)
14. Screw, socket cap headed M6X12(4)
15. Bearing (4)
16. Hex head screw M6X16 (2)
    Spring Washer M6 (2)
    Plain washer M6 (2)
17. Stand buffer (2)
18. Swing arm, grn
19. Jam nut M14
20. Bush, sidestand (2)
21. Spring
22. Sidestand, grn
23. Bolt, hex head M8X50
24. Washer M8 (2)
25. Nut, self locking M8
26. Slipper, chain swing arm
27. Spindle, swing arm
28. Grease nipple
29. 'O' ring seal (4)
30. Bearing, swing arm (2)
31. 'O' ring seal (8)
32. Washer, thrust (2)
33. Shims, swing arm
34. Journal, swing arm
35. Washer, swing arm
36. Nut, swing arm
37. Hex head screw M6X35 (2)
    Plain washer (4)
    Nut, self locking M6
38. See item 48 (Parts List) - Fig 13.1
40. Socket head cap screw M8X6 (2)
42. Hex head screw M8X16
43. Chainguard, grn
44. Chainguard bracket, grn
45. Blue Loctite 242
46. Dome nut M5 (3)
    Plain washer M5 (3)
47. Csk screw M5X12 (3)

9.2 SPECIFICATIONS

a. Swinging Arm:

Construction	Welded Steel Tubular and Plate Sections

b. Pivot:

Bearings

Type	Needle Roller
Quantity	2 off
Size	28 mm o/d. 22 mm Bore, Width 20 mm

c. Journals

Type	Flange Ground Hardened
Quantity	2 off

d. Seals:

Type	'O' Ring
Quantity	8 off
Size	28 mm o/d, 22 mm Bore

e. **Thrust Washers**

Type	Nylotron
Quantity	2 off and steel shims to suit.

f. **Damper Unit**

Type	Oil Emulsion, Load Adjustable
Quantity	2 off

g. **Fittings:**

Chainguard, Chainslipper– Construction	Plastic Compound
LHD Sidestand Assembly – Construction	Welded Steel, Pivoting on hardened bushes. Retained with Tension Type Spring.

Tightening Torques:

Fig 9.1 Key Ref	Item	Tightening Torque (Nm)	Tightening Torque (lbs/ft)
14	Damper Retaining Bolt	14	10
23/25	Sidestand Pivot Bolt/Nut	27	20
27/36	Spindle/Nut Swinging Arm	68	50
38	Torque Arm Bolt	27	20

9.3 OPERATION

As in the front suspension unit, the spring does all the work and the spring oscillations are damped out by the hydraulic action. The Girling gas shocks have a single chamber sealed at both ends. The bottom seal being made by a piston attached to an operating rod. The top chamber is attached to the frame, and the operating rod to the swing arm. The sealed chamber has a level of oil and above that, nitrogen gas under pressure.

As the unit is operated nitrogen readily mixes with the oil. The action of the piston moving up the chamber compresses the oil/nitrogen mixture and the effect felt is similar to that of a spongy brake pedal. The more it is depressed, the harder it becomes.

9.4 SWING ARM DISASSEMBLY

a. Place the motorcycle on the centre stand.

b. Remove chainguard rear fasteners and pivot chainguard up.

c. Remove rear wheel sprocket and disc assembly.

d. Disconnect the chain at master link and remove.

e. Remove both shock absorbers, spacers and 'O' ring seals.

f. Remove the swing arm pivot nut and washer from the L/H side.

CAUTION

If the pivot is removed from the L/H side, be sure the grease nipple in the end of the pivot is removed before using the drift.

g. Carefully drive out the pivot using a suitable drift.

9.5 PIVOT INSPECTION, REPAIR

a. **Journal Bearings.**

(1) With the swing arm clear of the vehicle, the journals with their thrust washers can be removed from the pivot. Wipe with a clean rag.

(2) Fig 9.2 refers. The journal surfaces should be smooth and free from damage. Check for ridges caused by the needle rollers in the journal surface.

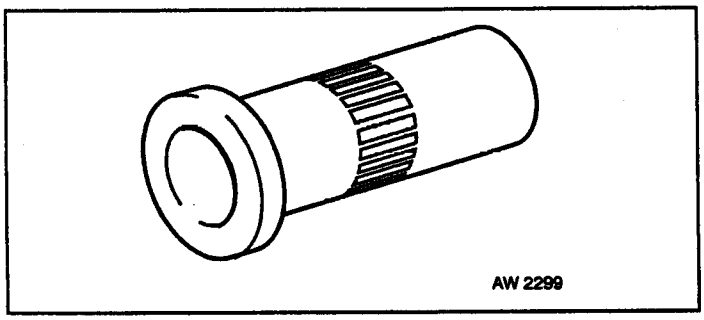


Fig 9.2 Journal Damage

b. **'O' Rings, Bearings.**

(1) Fig 9.3 refers. There are two 'O' ring seals on each side of the two bearings. Pry the seals out with a seal remover or large screwdriver and discard.

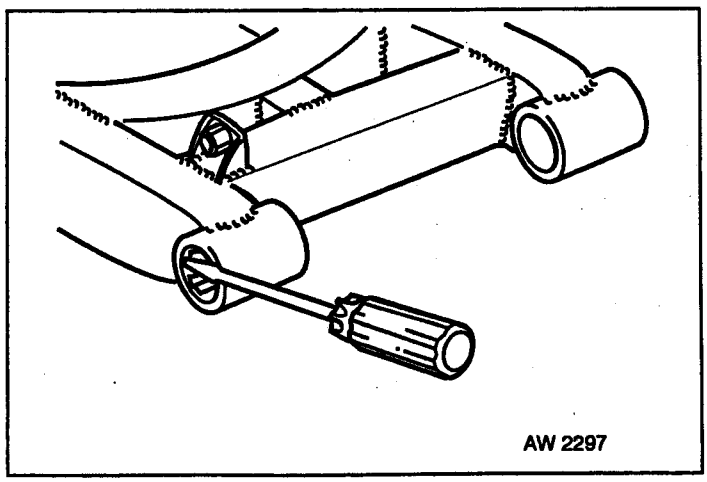


Fig 9.3 'O' ring Seal Removal

(2) Fig 9.4 refers. Use a suitable drift to remove swing arm bearings.

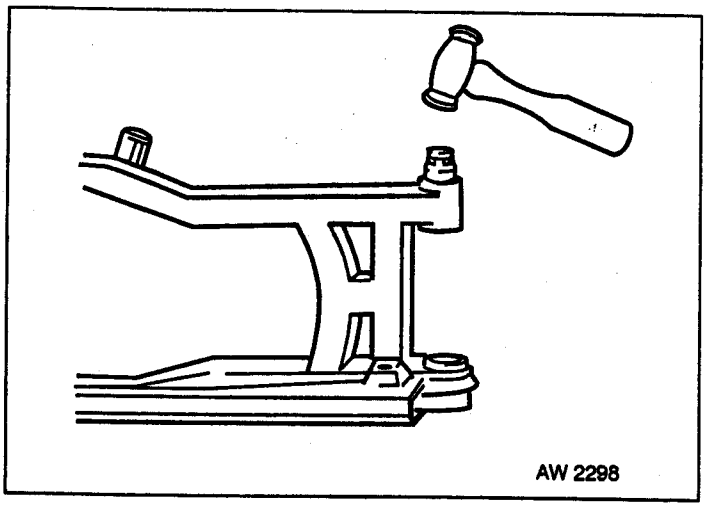


Fig 9.4 Swing Arm Bearing Removal

(3) Inspect the bearings for seized, damaged or pitted rollers. Place the bearings in their journals and rotate them. There should be no noticeable roughness.

(4) Replace 'O' ring seals.

(5) Replacement is the opposite of the removal procedure. Be sure the bearing is centred in the housing tube. Loctite the outside of the outer bearing race. Allow room on each side of each bearing for the 'O' ring seals.

9.6 SWING ARM ASSEMBLY

a. The swing arm and journals are a tight fit between the frame sideplates.

b. To ease assembly, loosen the bolts securing the footrest arm and crosstube.

c. Thoroughly grease the bearings and journals and slide into position.

d. Side to side free play of the swing arm is controlled by a nylotron thrust washer and shims, positioned on the journal, against the flange. The shims are 0·25 mm (0·010 in) thickness. The swing arm is individually shimmed when manufactured.

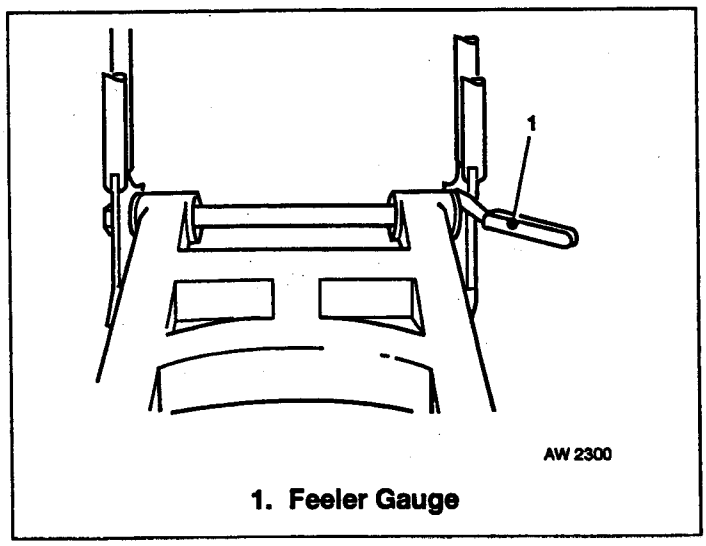
e. Fig 9.5 refers. When assembled there should be no more than 0·25 mm (0·010 in) and zero minimum end float. Shims can be inserted or removed between the journal flange and the nylotron washer to achieve this. Although zero end float is acceptable the swing arm should not be tight and should always be able to drop under its own weight, with the pivot bolts tightened.

9.7 SHOCK ABSORBER

The only shock absorber service required is to periodically inspect for general condition and performance.

Damaged units should be either replaced or returned to the factory for rebuilding.

The shock absorber consists of two springs separated by a double collar and fitted over a shock absorber unit. A collet and a spring pre-load adjuster hold the spring on the shock absorber.



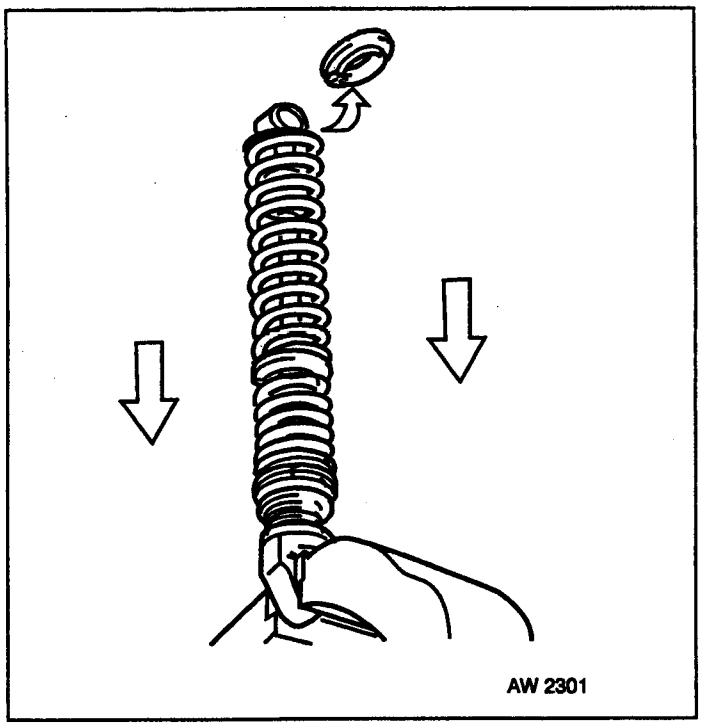
1. Feeler Gauge

9.5 Swing Arm Free Play

a. **Spring Replacement**

(1) Move adjuster to its shortest position.

(2) Fig 9.6 refers. Clamp the shock absorber in a shock absorber spring compressor and compress the springs. Remove the spring collar and spring.



9.6 Spring Removal

(3) Assembly is the reverse of the removal procedure. Note that the circlip on the shock absorber body acts as a stop for the spring preload adjuster and is normally positioned in the sixth groove of the ten from the shock absorber end.

b. **Shock Absorber Inspection**

(1) Inspect the shock absorber for any obvious damage, bent shock absorber rod or pitted rod surface.

(2) Oil leakage.

(3) Check the bearings in the shock absorber eyes. They should rotate freely with negligible free play. If the bearing is seized or worn, press out with a suitable sized socket and replace.

(4) When compressed without spring, the rod should extend under internal gas pressure. If it does not, then loss of gas pressure is indicated. The shock will still work but with reduced effectiveness.

TABLE 5 REAR SUSPENSION TROUBLESHOOTING

SYMPTOM	FAULT	REMEDY
Rear ride height too low.	Increased vehicle loading.	Alter spring preload setting with wrenches provided in tool kit.
	Shock absorber springs weakened with age.	Shift circlip position in groove to give greater spring compression.
Vehicle has peculiar handling characteristics	Fault with rear wheel or front of vehicle	Refer to Chapter 14 and other appropriate chapters.
	Shock absorbers damaged.	Remove and test.
	Excessive swing arm sideplay.	Check and remedy.
	Swing arm pivot components worn, or seized.	Strip, clean, replace parts if necessary. Grease.
	Swing arm twisted.	Replace.

CHAPTER 10
Front Forks and Steering

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10.1 GENERAL DESCRIPTION

The front forks are of the hydraulically damped type with rubber protective gaiters. The steering pivots on taper roller bearings are protected from dirt ingress by rubber seals.

10.2 SPECIFICATIONS

a. Front Forks

Type	Marzocchi Telescopic Fork, Oil Damped
Travel	230 mm
Stanchion Diameter	42 mm
Overall Length	879 mm ± 2·0 (spindle ctr to top nut)
Oil Quantity per leg (Overhaul)	500 cc
Oil Quantity per leg (Change)	475 cc
Oil Type	SAE 15W Hydraulic Oil/OM 33

b. Steering Bearings

Type	Taper Roller
Size	47 mm O/D 25 mm Bore

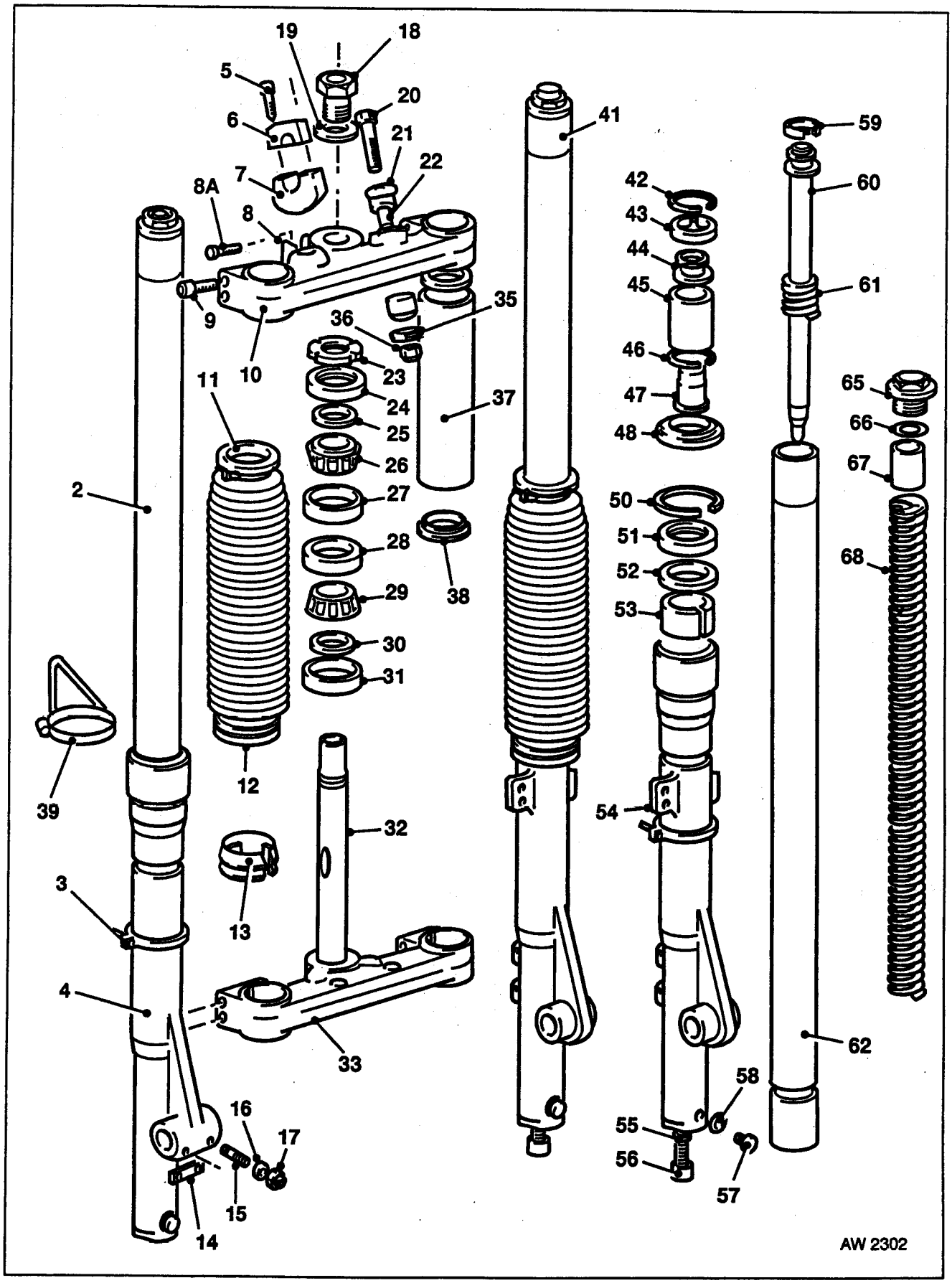

Fig 10.1 Front Forks and Steering

KEY FOR FIG 10.1

2.	R/H Fork leg assy, grn	35.	Washer, dished (2)
3.	Clamp(2)	36.	Nut, Self Locking (2)
4.	R/H slider, grn	37.	Headlight mount, grn
5.	Bolt, handlebar clamp (4)	38.	Rubber mount, anti-vibration (4)
6.	Clamp top, grn (2)	39.	Speedo cable guide
7.	Clamp base (2)	41.	L/H fork leg assy, grn
8.	Spacer steering stem clamp	42.	Circlip (2)
8A.	Screw, Pinch	43.	Washer, 3 pointed (2)
9.	Bolt, pinch-yoke	44.	Valve (2)
10.	Yoke, top	45.	Bush, VLV housing (2)
11.	Clamp, top gaiter (2)	46.	Circlip, bush retainer (2)
12.	Gaiter (2)	47.	Seat, dampner rod (2)
13.	Ring, bottom gaiter fixing (2)	48.	Dust cap (2)
14.	Spacer	50.	Circlip (2)
15.	Stud (2)	51.	Oil seal (2)
16.	Plain washer (2)	52.	See key 49.
17.	Nut, self locking (2)	53.	Upper bushing (2)
18.	Nut, steering stem	54.	L/H slider, grn
19.	Washer, steering stem	55.	Washer, sealing (2)
20.	Bolt, handlebar clamp (2)	56.	Screw, fork main retaining (2)
21.	Grommet (4)	57.	'O' ring, oil drain screw (2)
22.	Spacer, sleeve (2)	58.	Screw (2)
23.	Ring adjuster	59.	Nylon bushing
24.	Seal bearing (2)	60.	Dampner rod, w/bushing (2)
25.	Spacer, headstock bearing (2)	61.	Spring, topping (2)
26/27.	Bearing oomplete (2)	62.	Stanchion (2)
28/29.	Refer to key 26/27.	65.	Fork cap body (2)
30.	Refer to key 25.	66.	'O' ring, fork cap (2)
31.	Refer to key 24.	67.	Spacer, preload (2)
32.	Steering tube	68.	Fork spring (2)
33.	Bottom yoke assy		

TABLE 6 TORQUE VALUES

ITEM	ITEM	
	Nm	(ft/lbs)
Front axle nut	68	(50)
Upper yoke steering stem pinch bolt	20–27	(15–20)
Handlebar clamp nut/stud	13–16	(10–12)
Pinch bolt	24	18
Spindle clamp nut/stud	12	(8-8)
Steering stem nut	105	(78)
Main fork retaining screw	60	(45)
Oil drain screw	11	(8)

TABLE 7 FRONT FORKS AND STEERING TROUBLESHOOTING

SYMPTOM	CAUSE	REMEDY
Vehicle is unduly sensitive to road conditions.	Defective damping.	Check oil quantity. If no improvement, disassemble forks for investigation.
Fork action is stiff.	Crash damage resulting in fork legs twisted in yokes.	Loosen axle pinchbolt nuts, yoke pinch bolts, top steering stem nut, stem pinch bolt. Realign forks by pumping several times. Tighten all bolts.
	Incorrect front wheel installation (spacer absent on axle)	Check, strip and reassemble correctly.
	Bent forks.	Investigate, replace as nec.
	Ambient temperature very cold.	Replace front fork oil with less viscous grade.
Forks shake when front brake is applied.	Steering head bearings too loose.	Readjust accordingly.
	Front brake caliper loose.	Tighten mounting bolts.
Vehicle tends to wobble at low speeds.	Steering head bearings too loose or damaged.	
Vehicle tends to weave at high speeds.	Steering head bearings too tight, contaminated, worn or damaged.	Perform steering head bearing adjustment. If no improvement dismantle and inspect bearings.
	Front wheel unbalanced.	Balance front wheel.
Steering imprecise	Fault with front and/or rear wheel and/or swing arm, eg punctures, worn swing arm bearings, worn wheel bearings, buckled wheels.	Refer to appropriate sections.
	Incorrect weight distribution	Redistribute loaded weight.
	Frame twisted or incorrect spoke tension.	Replace/Refer to factory.

10.3 FRONT FORKS REMOVAL

The individual front forks may be removed by executing the following procedure:

a. Place motor cycle on centre stand and support on 3" (min) block.

b. Support motorcycle under frame area to lift front wheel from ground. Remove dust shield from front brake.

c. Remove front wheel by slackening clamp pinch bolts on right hand slider. Refer to Chapter 11.

d. Slacken axle and remove whilst supporting wheel (when axle is removed wheel spacer will fall (left side)) free of hub – retrieve and clean for reassembly).

e. Remove wheel from between fork sliders, disengaging speedometer drive as wheel is lowered.

CAUTION

DO NOT operate the front brake lever whilst wheel is removed, as caliper pistons will be forced out of their bores, necessitating disassembly of caliper to re-install pistons.

f. Slacken the yoke pinch bolts, Fig 10.1, item 9 refers, and carefully withdraw the leg.

CHAPTER 11
Front Wheel, Rear Wheel and Chain

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LIST OF ILLUSTRATIONS

11.1 FRONT WHEEL REMOVAL

NOTE: Vehicle must be supported under frame so that front tyre is off ground.

a. Fig 11.1 refers. Remove screw, lock washer, flat washer, and front brake dust shield (2).

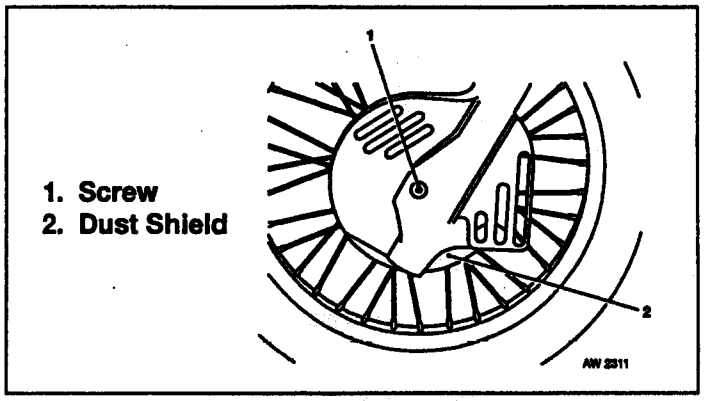
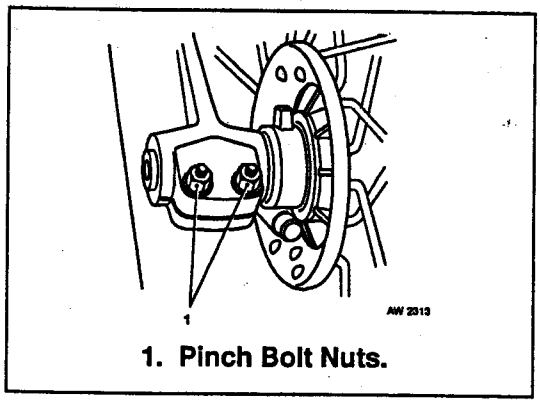


Fig 11.1 Front Brake Dust Shield

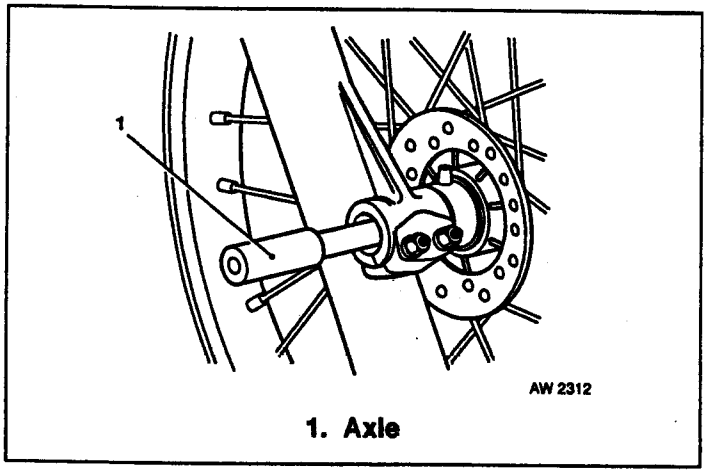
b. Fig 11.2 refers. Loosen pinch bolt nuts on right slider. Do not remove nuts.



1. Pinch Bolt Nuts.

Fig 11.2 Pinch Bolt Nuts

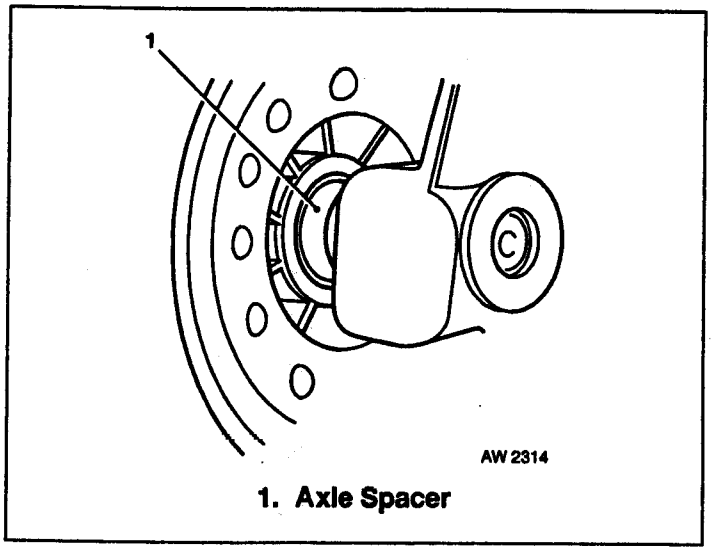
c. Fig 11.3 refers. Support wheel by hand and remove front axle.



1. Axle

Fig 11.3 Remove Front Axle

NOTE: Fig 11.4 refers. When axle is removed, axle spacer on left side of front hub will fall free of hub. retrieve and clean spacer for use during front wheel installation.



1. Axle Spacer

Fig 11.4 Axle Spacer

d. Remove wheel from between fork sliders, disengaging speedometer drive as wheel is lowered.

CAUTION

DO NOT operate the front brake lever when front wheel is removed. Caliper pistons will be forced out of their bores, requiring disassembly of caliper to install pistons.

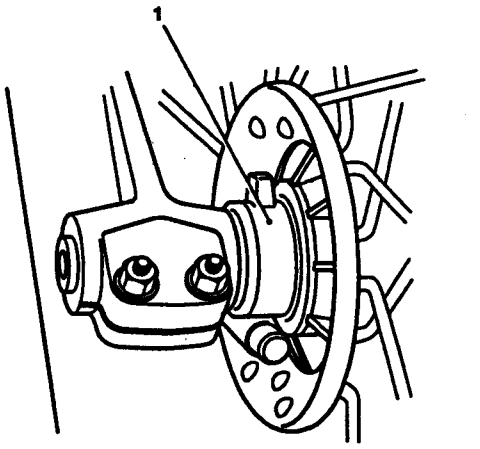
11.2 FRONT WHEEL INSTALLATION

a. **Special Tools** – None.

b. **Torque Values Nm (ft/lbs).**

(1) Axle nut	68 (50)
(2) Slider pinch bolt nuts	7 (5 ft/lbs)

c. Fig 11.5 refers. Position speedometer cable drive unit on wheel hub. Be sure both parts are completely engaged.



1. Speedometer Drive Unit

Fig 11.5 Speedometer Drive Unit

d. Keep speedometer cable drive engaged with wheel hub while positioning wheel between sliders. Be sure that brake disc is installed between brake caliper pads.

e. Support wheel between sliders and install axle until it just begins to exit from left side of wheel hub.

f. Fig 11.2 refers. Position axle spacer between left side of wheel hub and left slider, then drive axle through spacer and slider, tapping axle with a soft faced mallet.

g. Tighten axle nut to 68 Nm (50 ft/lb).

h. Remove frame support from vehicle and set vehicle on ground so normal weight is on front axle.

j. Fig 11.2 refers. Tighten right slider pinch bolt nuts to 7 Nm (5 ft/lbs).

k. Fig 11.1 refers. Install front brake dust shield, flat washer, lock washer and socket head screw.

11.3 SPECIFICATIONS

a. **Rim:**	Type:	High Tensile Aluminium Alloy
	Finish:	Matt Black Anodised
	Size:	Rear 18" Diameter x 2·15"
		Front 21" Diameter x 1·6"
b. **Tyre:**	Type:	Enduro
	Size:	Rear 400 x 18 – 64R
		Front 90/90 – 21:54
	Construction:	Tread – 3 plys nylon
		Sidewall – 2 plys nylon
	Pressure:	Rear 24 psi road, 18 psi off road
		Front 22 psi road, 18 psi off road
c. **Inner Tube:**	Type:	Rubber with car type Schrader valve
d. **Hub:**	Type:	Two part Aluminium Alloy Casting incorporating Rubber Cush Drive.
	Bearings:	4 off in main hub 3 off in sprocket hub
e. **Rear Wheel:**	Offset:	12·5 ± 1·0 mm (see text).
f. **Sprocket:**	Type:	Hardened Plated Steel
	Teeth:	47
g. **Chain:**	Type:	Self-lubricated 'O' ring

KEY TO FIG 11.6

2. Rear wheel adj L/H	20. Security nut	38. Bearing, hub centre
3. Rear wheel adj R/H	21. Security bolt assy	39. Rear hub, Cast
4. Cotter Key (2)	22. Wheel weight 0·50 oz	40. Bearing (2)
6. Spider housing	23. Rear tyre	41. Bearing hub left (2)
7. Spider housing assy	24. Rear inner tube	42. Rear hub spacer R/H
8. Rear wheel washer (2)	25. Rim strip	43 Spacer
9. Brake disc	26. Wheel weight 1·00 oz	44. Rear disc guard, grn
10. Rear axle	28. Black rim	45. Screw M6X16 (2)
11. Rear axle nut	29. Spoke rear drive	Flat washer M6 (2)
12. Rear hub sub-assy	30. Spoke, rear non-drive	46. See Plate 14-26
13. Rear spider	31. Rear nipple	47. See Plate 14-26
14. Sprocket	33. Rear hub spacer, bearing	48. Hex screw M8X30 (2)
15. Screw M6X20	34. Rear wheel spacer L/H	Lock nut M8 (2)
16. Lock washer M8 (5)	35. Rear hub spacer, bearing	Flat washer M8 (4)
17. Screw M8X40 (5)	36. Bearing	49. Drive Chain w/link
19. Rear wheel sub-assy	37. Bearing, hub right	50. Chain link

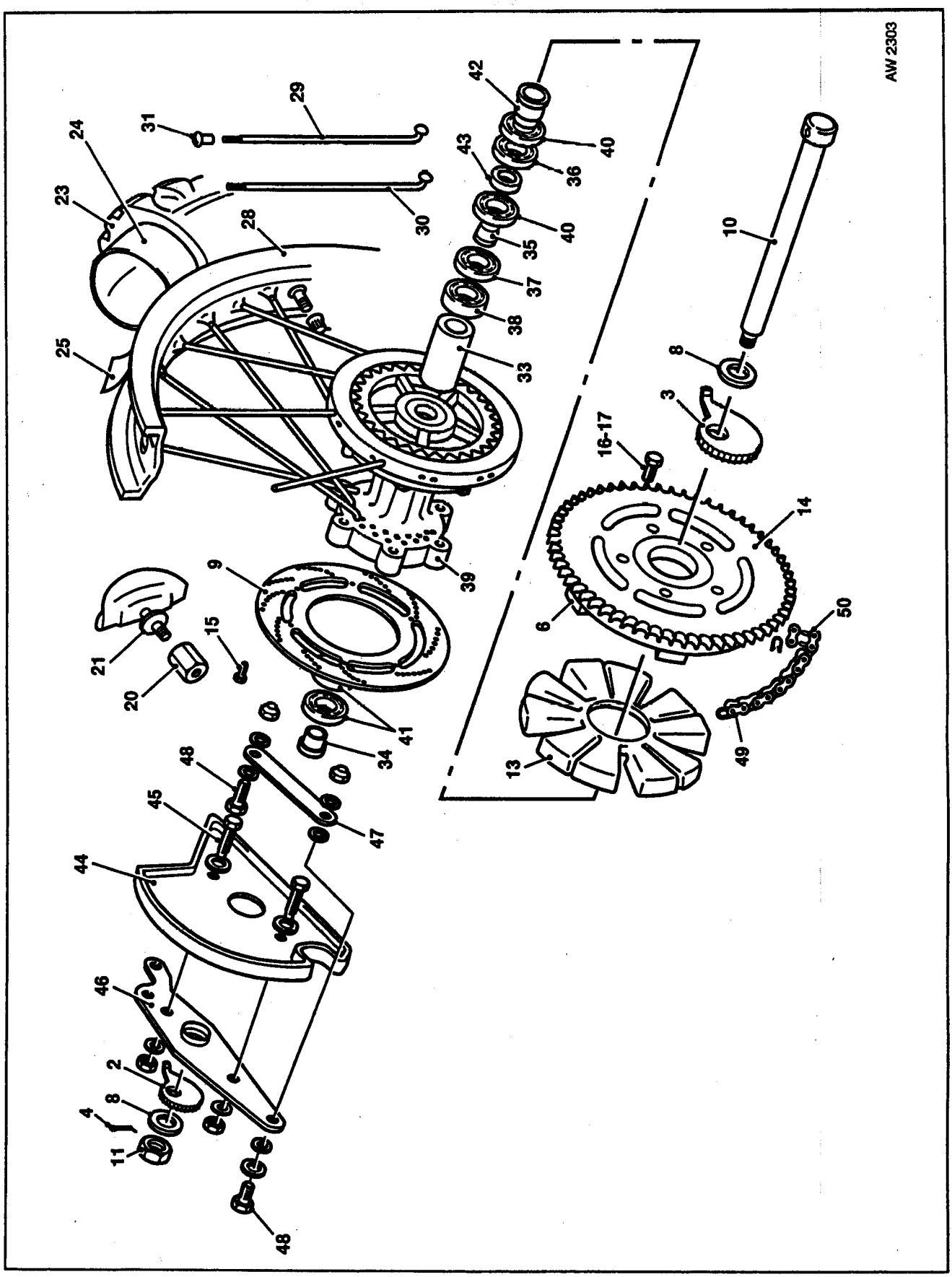


Fig 11.6 Rear Wheel, Brake, Chain

h. **Tightening Torques** (Fig 11.6 key ref)

	Items	Max Tightening Torque (Nm)	(ft/lbs)
21	Security Bolt nut	20·3	15
31	Nipple on spoke	As reqd	
48 & 47	Hex set screw	43·4	32
11	Nut, rear spindle	101	75
17	Rear sprocket bolts	24	18

11.4 WHEEL REMOVAL/REPLACEMENT

Fig 11.7 refers.

The rear wheel may be removed with the following procedure:

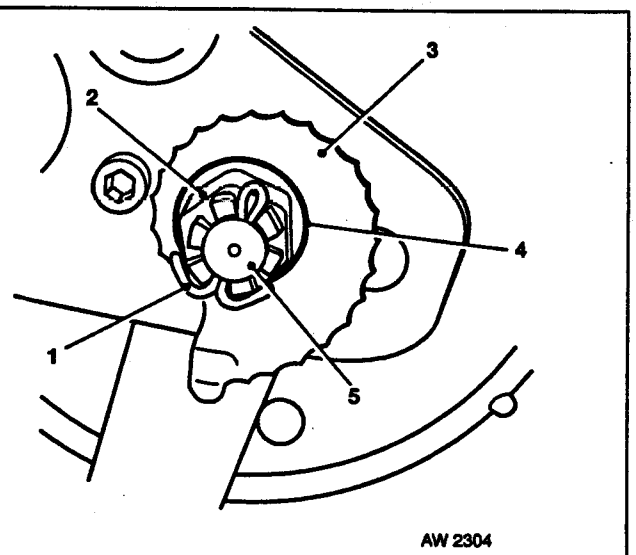
a. Mount machine on its centre stand and raise rear wheel from ground (4").

b. Disconnect chain drive from rear sprocket.

c. Remove split pin and nut,withdraw axle spindle with adjusting cams.

d. Lower wheel complete with brake disc and remove to right (once out wheel can be split from cushion drive).

e. Refit in reverse order, ensuring equal chain adjustment as in Fig 11.12. Fit new split pin, and ensure chain split link is correctly assembled (Fig 11.11). Check rear brake for operation.



1. Split pin
2. Nut
3. Snail cam
4. Washer
5. Spindle

Fig 11.7 Rear Wheel Removal

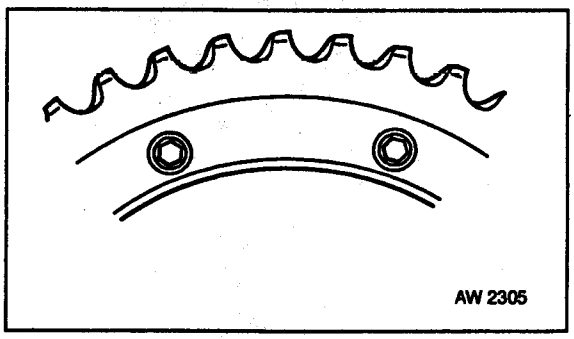


Fig 11.8 Worn Sprocket

11.5 REAR SPROCKET REMOVAL

a. Remove rear wheel as in para 11.4.

b. Remove sprocket from hub by undoing 5 hex bolts.

c. Reassemble in reverse order – replacing lock tabs if necessary.

NOTE: If replacing, check condition of front sprocket.

11.6 CHAIN - MAINTENANCE, INSPECTION

a. Sprocket wear rate is greatly increased if the chain is beyond its useful life. It is of the heavy duty 'O' ring sealed type and should be checked periodically. The only maintenance required is to spray periodically as required with a proprietary chain spray suitable for 'O' ring chains to keep the rollers lubricated. If the chain can be lifted away from the rear sprocket any more than illustrated in Fig 11.9 the chain should be replaced.

b. The length of 16 pitches of a new chain is 25·4 cm (10"). If the chain has stretched to more than 25·9 cm (10 7/32") for 16 pitches, it should be replaced. (Fig 11.10 refers).

c. At installation ensure the master link clip is fitted with its closed end facing the direction of chain travel (Fig 11.11 refers).

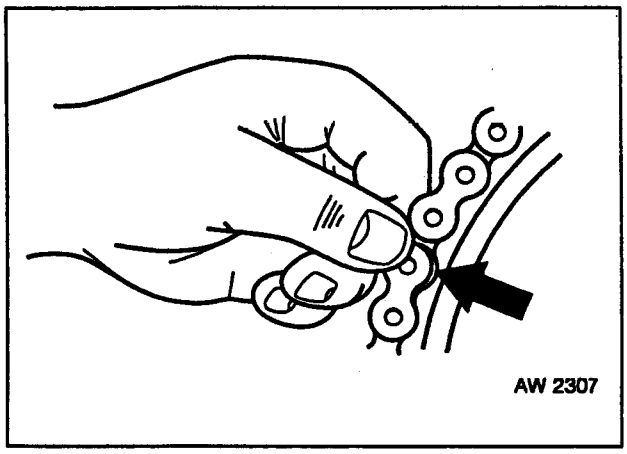


Fig 11.9 Chain Wear Illustration

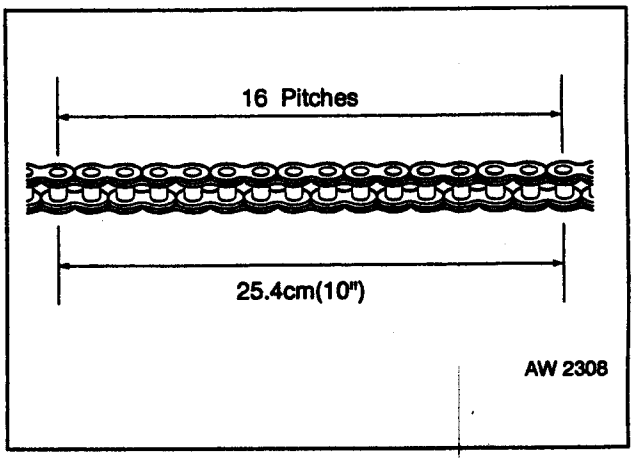


Fig 11.10 Chain Wear Measurement

11.7 CHAIN ADJUSTMENT

To adjust the chain follow the procedure:

a. Place motorcycle on centrestand.

b. Loosen wheel spindle.

c. Adjust rear wheel position by means of snail cams to give a free play in the chain of 40-50 mm (1·6-2") measured at the centre of its run (Fig 11.12 refers).

IMPORTANT NOTE: Ensure snail cam positions are equal for correct wheel alignment.

d. Tighten spindle and nut securely. Replace split pin.

e. Re-check chain.

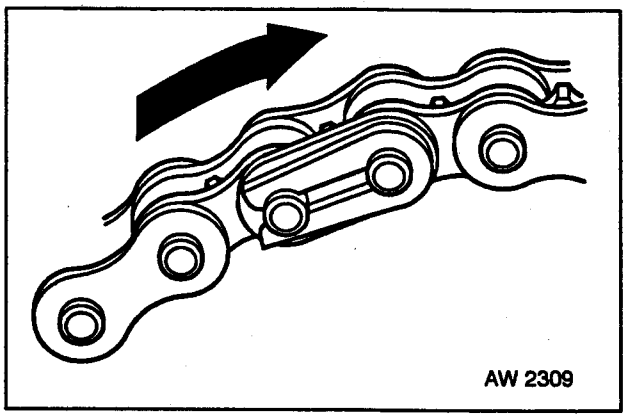


Fig 11.11 Master Link Clip Installation

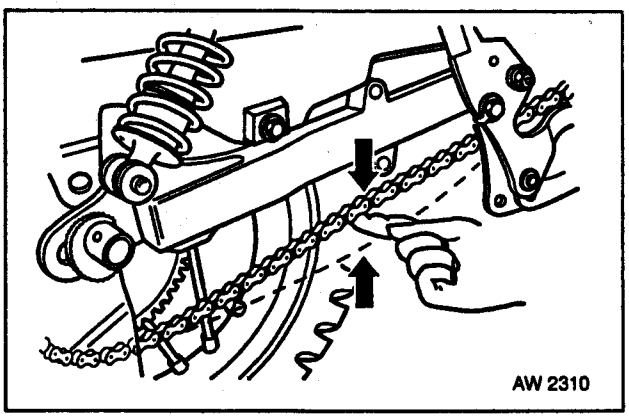


Fig 11.12 Chain Free Play (Gun Carrier removed for illustration)

CHAPTER 12
Brakes

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LIST OF ILLUSTRATIONS

12.1 GENERAL

The front and rear brakes are fully hydraulic disc brakes and require little maintenance. Every 5000 miles, check master cylinders for proper fluid levels and check brake pads and discs for wear. If brake pads' friction material is worn to $\frac{1}{16}$ in or less they should be replaced. Minimum brake disc thickness is stamped on the side of the disc. When filling master cylinders, use only DOT 3 Hydraulic Brake Fluid which is approved for use in hydraulic brake systems. When removing master cylinder/reservoir filler plug or cover, be sure that all dirt is removed from the area to prevent dirt getting into reservoir. Rear brake reservoir should be filled to the 'MAX' line. Front brake master cylinder should be filled to half way in reservoir sight glass with the reservoir in a level position.

The front brake master cylinder is an integral part of the brake hand lever assembly. The rear brake master cylinder is located on the right side of the motorcycle near the brake pedal.

WARNING

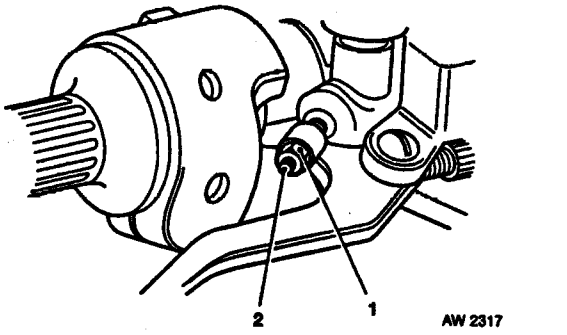
Because brake performance is a critical safety item, brake system servicing requires special tools, correct replacement parts and procedures. Whenever the brake system is serviced, it should be tested on dry, clean road at slow speeds before putting the motorcycle in regular service.

12.2 ADJUSTMENT

a. **Front Brake Lever.** The front brake lever can be adjusted to the rider.

(1) Fig 12.1 refers. Loosen jam nut (1).

(2) Turn adjusting screw (2) until lever is comfortable for rider.



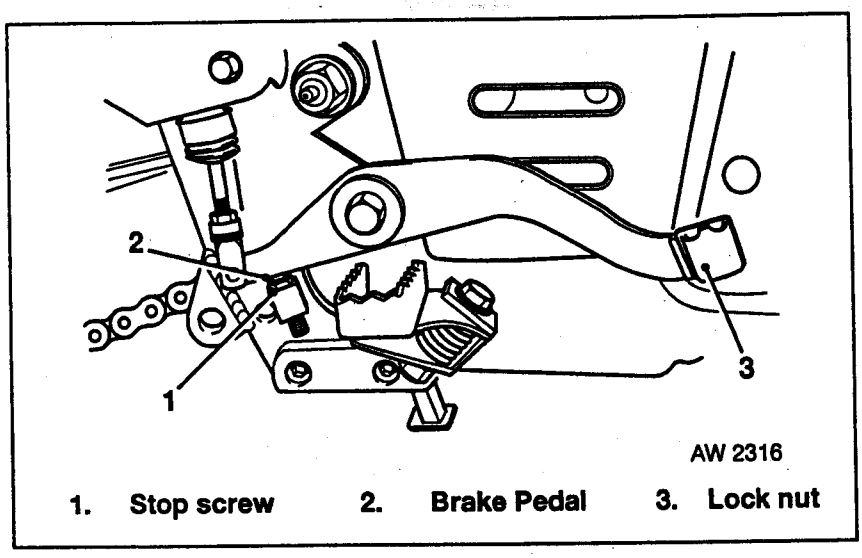
1. Jam nut 2. Adjusting screw

Fig 12.1 Front Brake Control Lever Free Play Adjustment

(3) Hold adjusting screw (2) stationary and tighten lock nut (1).

b. **Rear Brake Pedal**

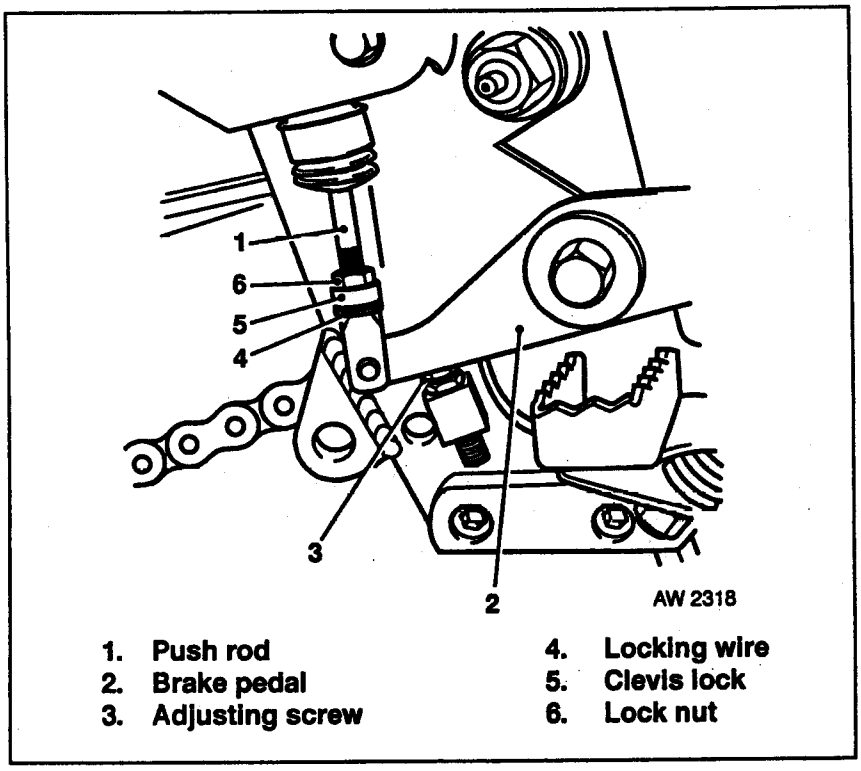
(1) Fig 12.2 refers. Loosen lock nut (3) and adjust stop screw (1) until brake pedal (2) is at desired height. Tighten locknut (3).



1. Stop screw 2. Brake Pedal 3. Lock nut

Fig 12.2 Rear Brake Pedal Height Adjustment

(2) Fig 12.3 refers. Depress brake pedal only as far as necessary for push rod (1) to contact master cylinder piston (a significant resistance can be felt). Hold pedal in this position while making adjustment in steps (3) to (7).



1. Push rod
2. Brake pedal
3. Adjusting screw
4. Locking wire
5. Clevis lock
6. Lock nut

Fig 12.3 Free Play Adjustment

(3) Measure clearance between brake pedal (2) and adjusting screw (3). Clearance should be 1·6 mm ($\frac{1}{16}$ in).

(4) If clearance is not 1·6 mm ($\frac{1}{16}$ in) use long nose pliers and remove and discard locking wire (4).

(5) Fig 12.3 refers. Remove lock wire, unsnap clevis lock (5) and swing out of way.

(6) Loosen lock nut (6).

(7) Lengthen or shorten push rod (1) by rotating it until clearance is 1·6 mm ($\frac{1}{16}$ in).

(8) Tighten lock nut (6).

(9) Snap clevis lock (5) over clevis.

(10) Install new lock wire (4).

12.3 BLEEDING THE HYDRAULIC BRAKE SYSTEM

NOTE: Hydraulic brake fluid bladder type pressure equipment can be used to fill brake master cylinder through the bleeder fitting if master cylinder cover is removed so that system cannot pressurise. The ball check in the bleeder fitting must also be removed. Do not use pressure bleeding equipment when the hydraulic system is sealed with master cylinder cover and gasket in place.

a. Fig 12.4 refers. Slip a length of appropriate size clear plastic tubing over wheel cylinder bleeder valve with other end in a clean container. Turn handlebars so that bleeder valve is nearly vertical.

b. Depress brake pedal or lever once to build up pressure. Open bleeder valve by rotating counterclockwise about one-half turn.

c. Keep master cylinder full of fluid at all times. Slowly depress brake pedal or lever once until fluid stops flowing from tubing. Close the bleeder valve. Allow pedal or lever to return slowly to release position.

d. Repeat operation until brake system is free of air bubbles. Add fluid to master cylinder to bring to original level. Do not re-use fluid. Tighten brake bleeder nipple to 32-40 in/lbs torque.

NOTE: If, after bleeding the brake(s) it still feels spongey, remove the brake caliper. Lift the caliper and bleeder higher than the brake reservoir, purge the brake light switch, and resume normal bleeding operation. Install the caliper when finished. See para on Removal/Installation of Brake Caliper.

NOTE: If rear brake continues to feel spongy:

1. See Fig 12.4. Clamp supply line.

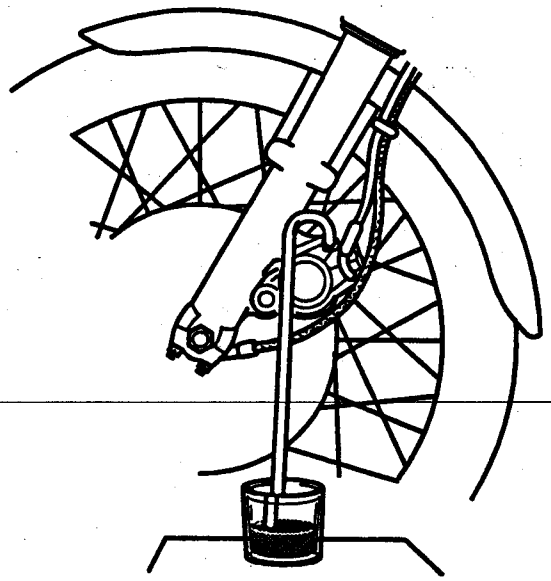
2. Remove brake switch, turn over and fill with brake fluid. Install brake switch.

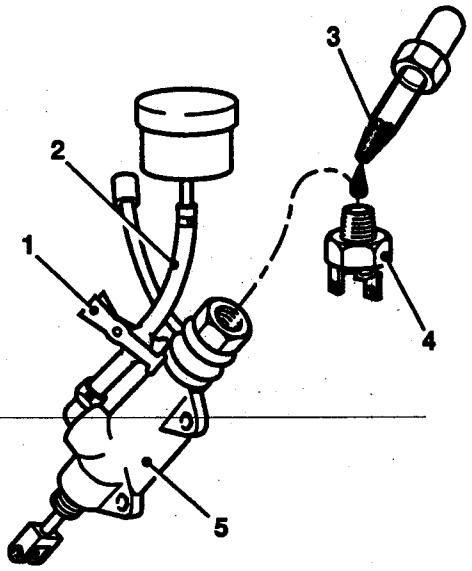
WARNING

Replace fluid reservoir covers before bleeding. DOT 3 brake fluid can cause eye irritation. In case of contact with eyes, flush with plenty of water and get medical attention. KEEP BRAKE FLUID OUT OF THE REACH OF CHILDREN.

CAUTION

Whenever a hydraulic brake line or fitting is opened the fitting should be flushed with brake fluid and the brake system must be bled. Do this to eliminate any air or contaminants from the brake system. Air in the fluid will cause the brake pedal to have a spongy feel. If a contaminant becomes lodged in the seat of a fitting, leakage of fluid could occur, and/or air could be drawn into the system.





AW 2319

1. Clamp
2. Brake supply line
3. Brake fluid
4. Stoplamp switch
5. Rear brake master cylinder

Fig 12.4 Bleeding Brakes (Typical)

12.4 FRONT BRAKE MASTER CYLINDER REMOVAL/DISASSEMBLY

Fig 12.5 refers.

The master cylinder is located on the right side of the handlebar. Remove and disassemble as follows.

a. Open the bleeder nipple on the front caliper and drain the brake fluid by pumping the handlever.

b. Disconnect the hydraulic brake line from the master cylinder by removing banjo bolt (21) and washer (20).

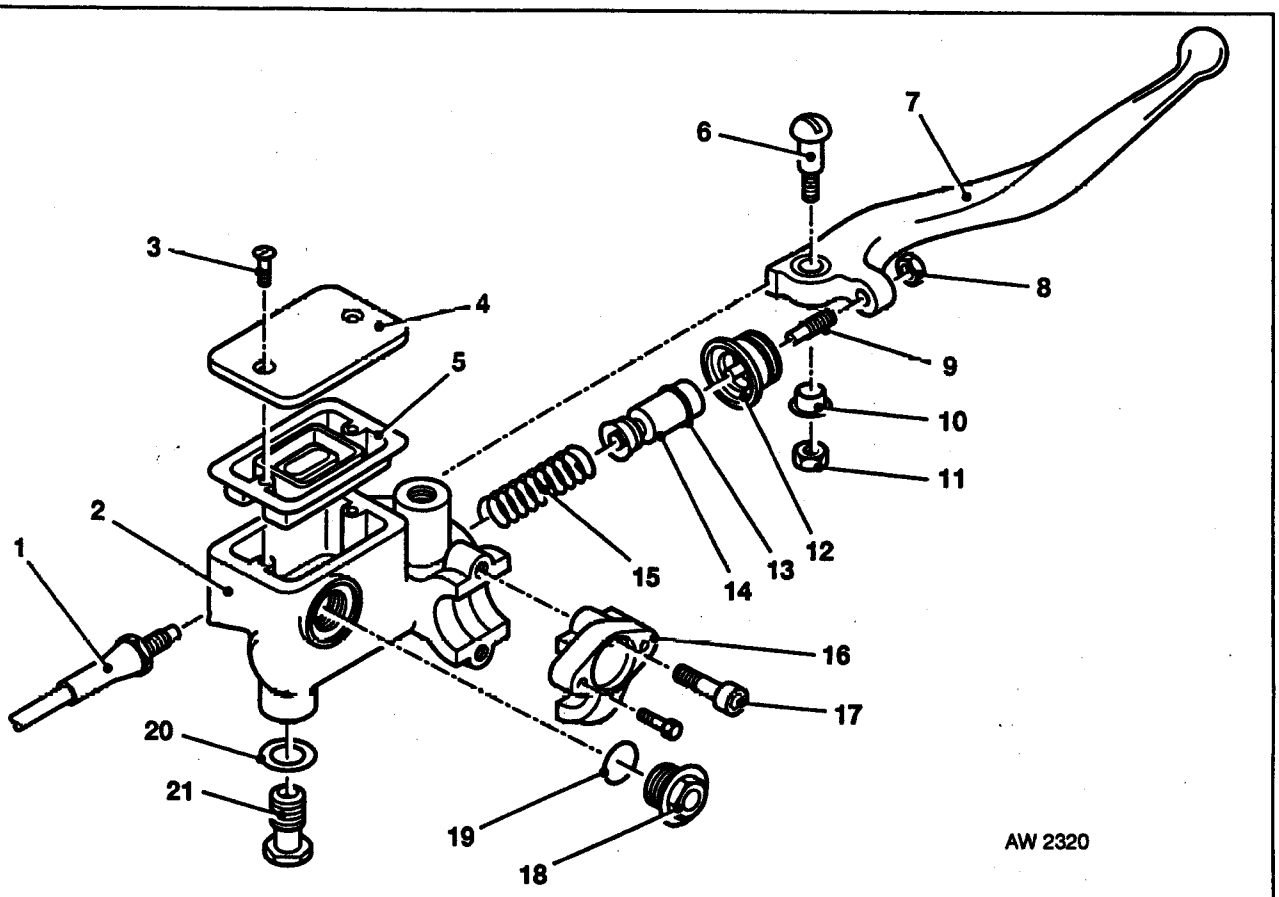
c. Remove the master cylinder screws (3), cover (4) and gasket (5). (Gasket includes plastic plate).

d. Remove nut (11). Unscrew pivot pin (6) and remove bushings (10). Remove brake lever (7), nut (8) and reaction pin (9).

e. Remove master cylinder from handlebar by removing screws (17) and clamp (16).

f. Pull out the dust boot (12), piston (14), 'O' ring (13) and spring (17).

g. If necessary, remove sight glass (18) and 'O' ring (19).



1.	Stoplamp switch	12.	Dust boot
2.	Banjo bolt	13.	'O' ring
3.	Screw (2)	14.	Piston
4.	Cover	15.	Spring
5.	Gasket	16.	Clamp
6.	Pivot pin	17.	Screw (12)
7.	Brake lever	18.	Sight glass
8.	Nut	19.	'O' ring
9.	Reaction pin	20.	Washer
10.	Bushing (2)	21.	Banjo bolt
11.	Nut		

Fig 12.5 Front Master Cylinder

12.5 CLEANING, INSPECTION AND REPAIR

Fig 12.5 refers.

a. Inspect piston (14), 'O' ring (13), dust boot (12) and pivot pin (6) for wear, softening or enlarging. Replace if necessary.

b. Examine the cylinder walls for scratches and grooves. If damaged, replace master cylinder/ reservoir (2).

c. The gasket (5) should be replaced if torn or punctured.

12.6 ASSEMBLY/INSTALLATION

a. Dip all internal parts in DOT 3 hydraulic brake fluid.

b. Fig 12.5 refers. Coat 'O' ring (19) with DOT 3 hydraulic brake fluid and install sight glass (18) and 'O' ring, if removed.

c. Install spring (15). Assemble piston (14) with 'O' ring (13) and dust boot (12).

d. Fig 12.6 refers. Lightly coat pivot pin (6) and bushings (10) with Loctite Anti-Seize. Assemble the brake lever (7) to the master cylinder/reservoir assembly (2) using pivot pin and bushings. Check front brake lever for proper operation. Wipe off excess Anti-Seize.

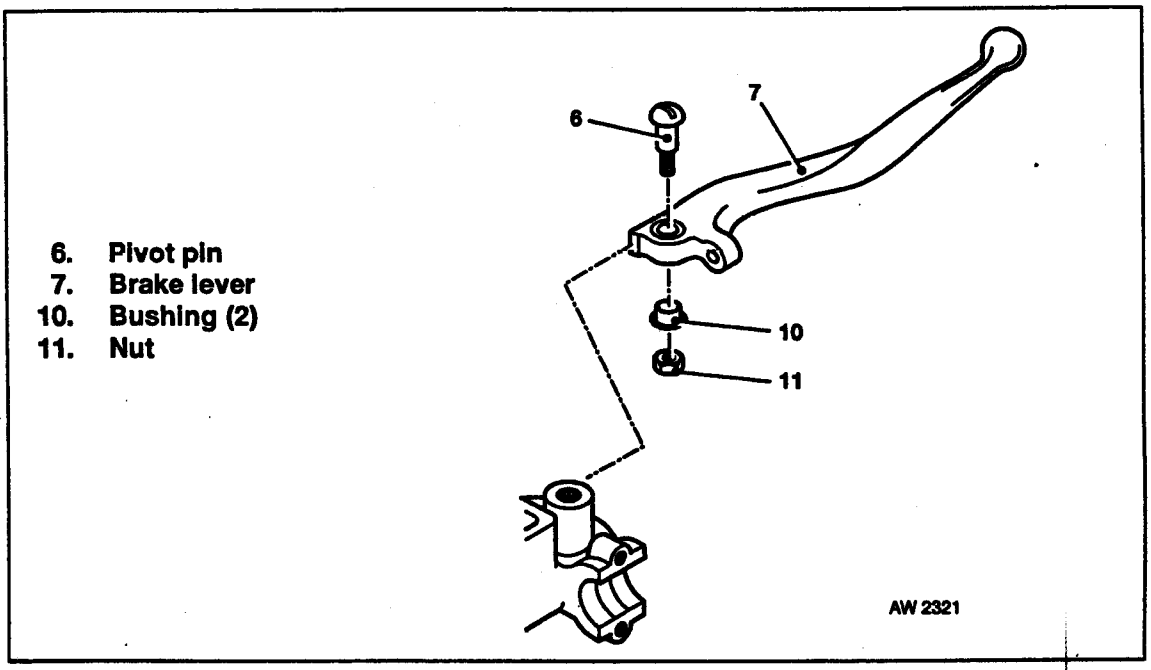


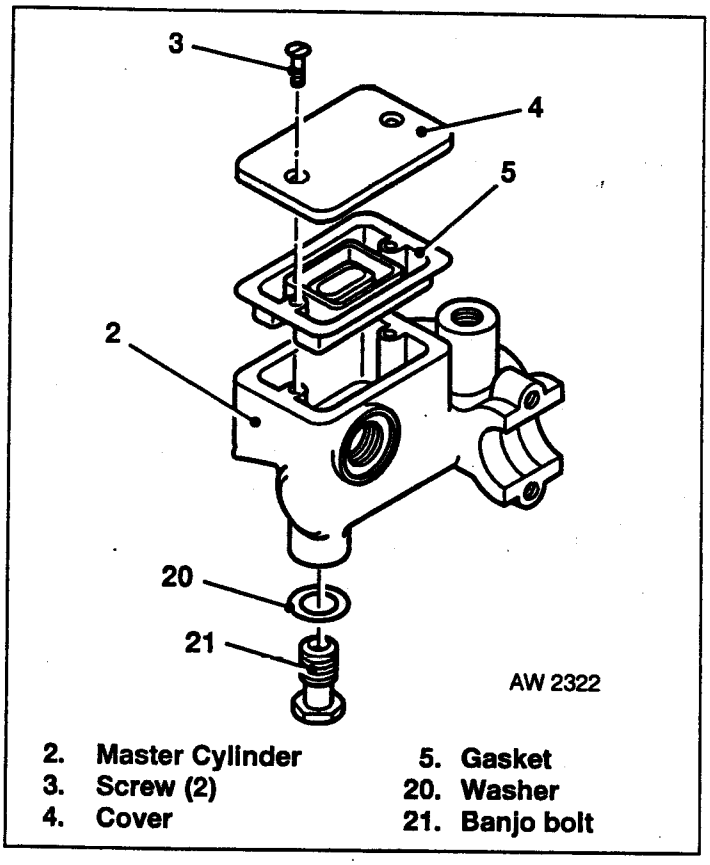
Fig 12.6 Front Brake Hand Lever and Reservoir

e. Fig 12.5 refers. Install master cylinder to handlebar by installing clamp (16) and screws (17). Tighten screws to 70-80 in/lbs torque.

CAUTION

Fig 12.7 refers. Be sure washer (20), banjo bolt (21), hydraulic brake line and master cylinder bore are free of DOT 3 hydraulic brake fluid, dirt and metal chips before assembly to avoid leakage.

f. Install banjo bolt (21), washer (20) and hydraulic brake line in master cylinder/reservoir.



2. Master Cylinder
3. Screw (2)
4. Cover
5. Gasket
20. Washer
21. Banjo bolt

Fig 12.7 Master Cylinder/Reservoir Assembly

g. Fill the master cylinder with DOT 3 Hydraulic Brake Fluid. Bleed the brake system using the procedure outlined in Bleeding the Hydraulic Brake System.

WARNING

Be sure the relief port in the cylinder is operating properly. After servicing the master cylinder, always check the operation of the internal components with the reservoir cover removed. Actuate the brake lever. A slight spurt of fluid will break through the fluid surface if all internal components are working properly. Improper operation of brake components can endanger the operator.

h. Install gasket (5), cover (4) and screws (3). Tighten screws (3) to 6-8 in/lbs torquie.

j. Test ride motorcylce. If brakes feel spongy, repeat procedure outlined in Bleeding the Hydraulic Brake System.

NOTE: The front brake lever is designed to have no free play before moving the push rod. See Adjustment.

k. This master cylinder assembly is equipped with a sight glass to visually check fluid level without removing cover. With the correct amount of brake fluid, the sight glass is filled half way with reservoir as level as possible.

12.7 REAR BRAKE MASTER CYLINDER REMOVAL/DISASSEMBLY

Fig 12.8 refers.

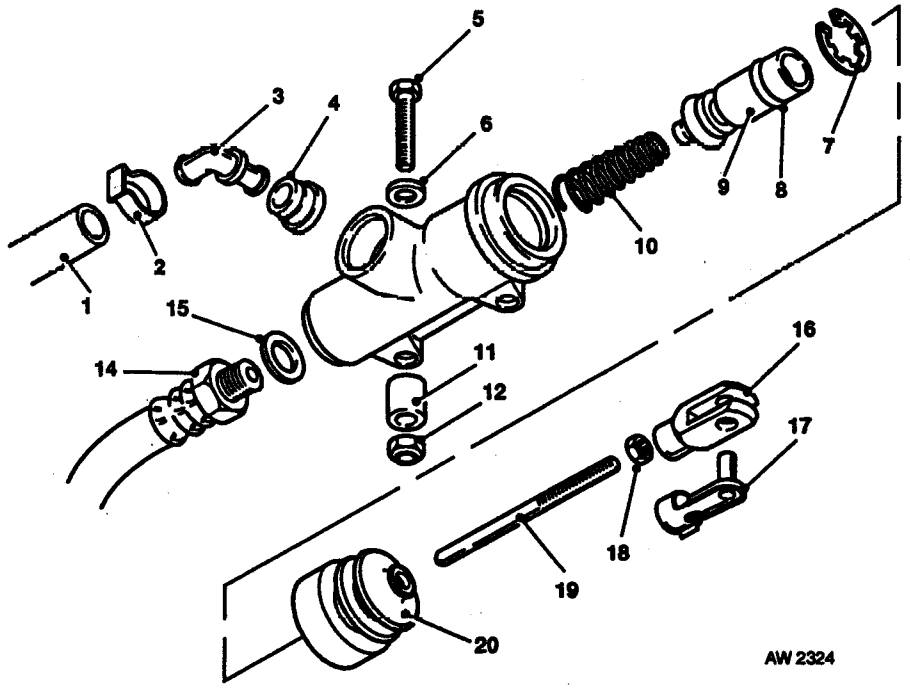
a. Loosen jamnut (18). Bend clevis pin (17) retainer and remove clevis pin from clevis (16). Remove clevis.

b. Disconnect brake hose fitting (14) and washer (15) at master cylinder (13) bottom and drain fluid from reservoir. Disconnect brake hose elbow (3) from grommet (4). Remove grommet.

c. Remove mounting screws (5), washers (6), spacers (11) and nuts (12). Master cylinder (13) may now be removed and disassembled on a clean work bench.

d. Remove push rod (19) and dust cover (20).

e. Remove retaining ring (7), piston (9), 'O' ring (8) and spring (10).



1.	Hose	11.	Spacer (2)
2.	Hose clamp	12.	Nut (2)
3.	Brake hose elbow	13.	Push rod
4.	Grommet	14.	Brake hose fitting
5.	Mounting screw (2)	15.	Washer
6.	Washer (2)	16.	Clevis
7.	Retaining ring	17.	Clevis pin
8.	'O' ring	18.	Jamnut
9.	Piston	19.	Push rod
10.	Spring	20.	Dust cover

Fig 12.8 Rear Brake Control

12.8 CLEANING, INSPECTION AND REPAIR

Fig 12.9 refers.

WARNING

Clean brake system components in denatured alcohol or brake fluid DO NOT use mineral base cleaning solvents such as gasoline or paint thinner. Use of mineral base solvents causes deterioration of rubber parts that continues after assembly and can result in component failure.

a. Inspect piston cup and piston (11) for softening, enlarging or wear. Replace piston if necessary.

b. Inspect cylinder bore for scratches and grooves. Replace if necessary.

c. Be sure push rod (11) and pedal assembly are not bent. Bent parts should be replaced.

12.9 ASSEMBLY/INSTALLATION

Fig 12.9 refers.

a. Dip all master cylinder internal parts in DOT 3 HYDRAULIC BRAKE FLUID.

b. Install 'O' ring (8) on piston (9). Install spring (10), and insert into master cylinder bore. Install retaining ring (7) and push rod (19).

c. Install master cylinder on motorcycle using bolts (5), washers (6), spacers (11) and nuts (12).

d. Install grommet (4) and brake hose elbow (3).

e. Install brake line (14) and washer (15). Tighten fitting to 70-80 in/lbs torque. Install jamnut (18), clevis (16) and clevis pin (17).

f. Fill reservoir with DOT 3 HYDRAULIC BRAKE FLUID and bleed system following the procedure outlined under **Bleeding the Hydraulic Brake System.**

g. Check and adjust brake pedal height and push rod free play as described under ADJUSTMENT given earlier.

12.10 BRAKE PAD REPLACEMENT REMOVAL

Fig 12.9 refers.

NOTE: The brake calipers do not have to be removed to replace the brake pads. However, before replacing ONLY the pads, inspect the assembly and be sure the other components do not need replacement.

WARNING

Brake pads must be replaced only in sets for correct and safe brake operation.

a. Use a screwdriver to remove dust cover (5) from caliper (13).

b. Remove circlip (8) from pad locator pin (7).

c. Remove spring tensioner (4).

d. Slide pads (2) out of caliper halves.

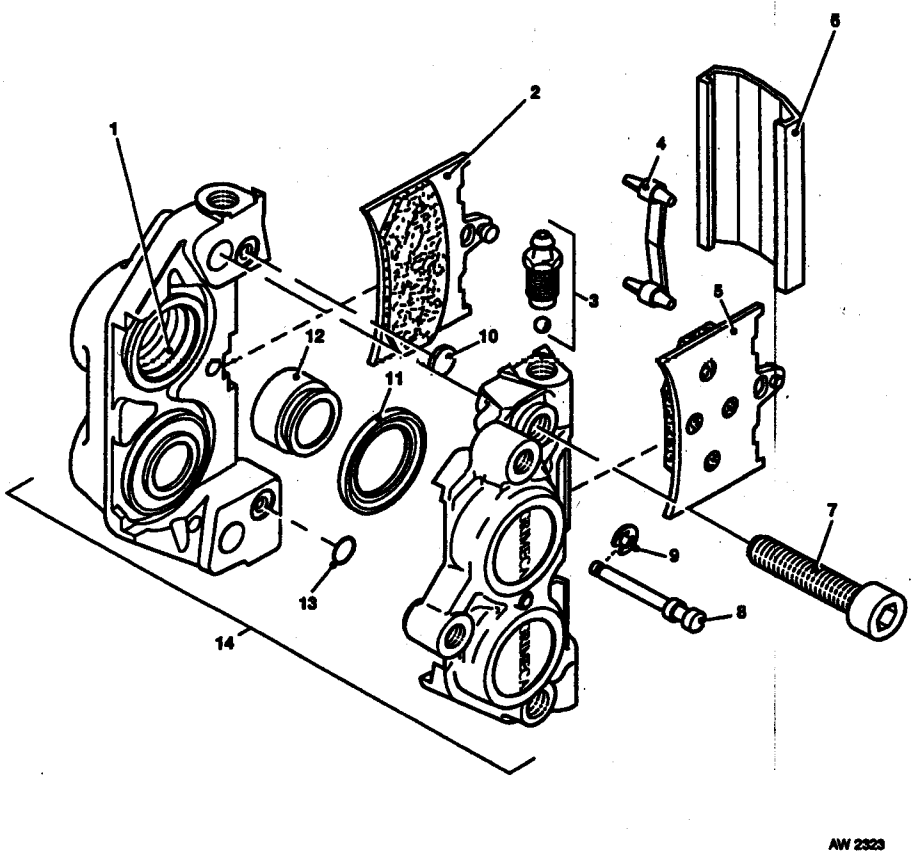
e. **Installation.**

(1) Slide pads into position in caliper.

(2) Install spring tensioner.

(3) Install pad locator pin (7). Be sure pin is ON TOP of the spring tensioner. Install washer and circlip on pin.

(4) Snap dust cover into place on caliper.



1. Piston bore 'O' ring (2)
2. Pad (2)
3. Bleeder valve assy
4. Spring tensioner
5. Dust cover
6. Caliper bolt (2)
7. Pad locator pin
8. Circlip
9. Rubber washer (2)
10. Dust seal (2)
11. Piston (2)
12. 'O' ring
13. Caliper

Fig 12.9 Brake Caliper

12.11 FRONT BRAKE CALIPER REMOVAL

a. Disconnect brake line fitting and drain brake fluid.

b. Remove retaining bolts and washers.

3. Remove caliper.

12.12 FRONT BRAKE CALIPER INSTALLATION

a. Place caliper in position on fork leg and install retaining bolts and washers. Tighten to 28 ft/lbs torque.

b. Install brake line fitting.

c. Fill with DOT 3 Brake fluid and bleed the brake line. See BLEEDING THE HYDRAULIC BRAKE SYSTEM.

12.13 REAR BRAKE CALIPER REMOVAL

a. Disconnect brake line banjo bolt and drain brake fluid. If necessary, remove brake line clamp screw.

b. Remove retaining bolts, washers, and locknuts.

c. Remove caliper.

12.14 REAR BRAKE CALIPER INSTALLATION

a. Place caliper in position on brake torque arm and install retaining bolts, washers and locknuts. Tighten to 28 ft/lbs torque.

b. Install brake line banjo bolt.

c. Fill with DOT 3 brake fluid and bleed the brake line. See BLEEDING THE HYDRAULIC BRAKE SYSTEM.

12.15 BRAKE CALIPER DISASSEMBLY (FRONT AND REAR)

Fig 12.9 refers.

a. Remove caliper. See CALIPER REMOVAL.

b. Remove caliper bolts (6) and separate the caliper halves. Use a catch basin to catch remaining brake fluid.

c. Remove 'O' rings (12) and rubber washer (9).

d. Remove dust seal(s) (10).

e. Use internal expanding pliers and remove the pistons (11).

f. Remove piston bore 'O' rings (1).

12.16 CLEANING, INSPECTION AND REPAIR

a. If the brake pad friction material is worn to 1/16 in or less, replace the pads as a set.

b. Replace any parts that appear worn or damaged. Always replace dust seal if piston is removed.

> ***WARNING***
>
> ***Always use alcohol for cleaning metal parts. DO NOT use gasoline or other flammable substances.***

c. Clean all metal parts with alcohol and blow dry with compressed air.

> ***WARNING***
>
> ***Always clean brake system rubber parts by washing in denatured alcohol or DOT 3 Hydraulic Brake Fluid. DO NOT use mineral base cleaning solvents such as gasoline or paint thinner. Use of mineral base solvents will cause deterioration of the parts. Parts would continue to deteriorate after assembly which could result in component failure.***

d. Clean all rubber parts in denatured alcohol or brake fluid.

12.17 BRAKE CALIPER ASSEMBLY

> **CAUTION**
>
> **Lubricate all parts in DOT 3 Hydraulic Brake Fluid before assembly. This will ease assembly and help ensure parts are not damaged during assembly.**

a. Install piston bore 'O' ring(s). Be sure they are seated in their grooves.

b. Install pistons.

c. Install dust seals.

d. Install 'O' rings and rubber washer.

e. Install caliper bolts. Tighten front caliper bolts to 35 ft/lbs torque. Tighten rear caliper bolts to 25 ft/lbs torque.

f. Install caliper. See FRONT or REAR BRAKE CALIPER INSTALLATION.

WARNING

If machine is used for Cross Country use — front and rear disc pads must be checked for wear every 250 miles.

CHAPTER 13
Special Equipment

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LIST OF ILLUSTRATIONS

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13.1 GENERAL

Fig 13.1 shows comprehensive service and repair equipment.

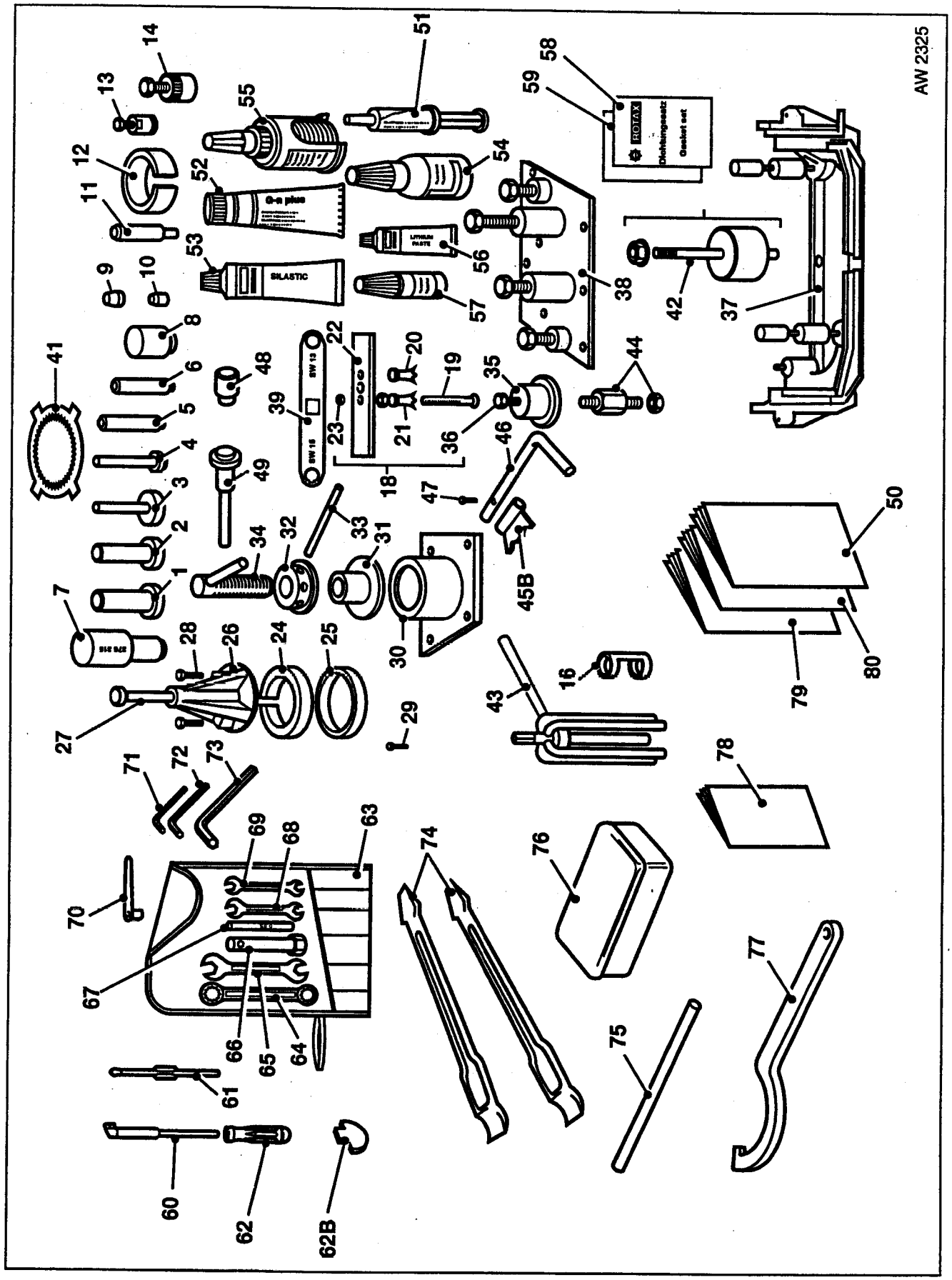

Fig 13.1 Tools, Service Items

TABLE 8 PART NUMBERS FOR TOOLS, SERVICE ITEMS

INDEX No	PART No	NAME	Qty	NATO No
N1	876-660	Insertion Jig Assy 850 055 CS	1	
N2	277-861	Insertion Jig Assy 230 395, MS	1	
N3	276-322	Insertion Jig Assy 930 715, CS	1	7AMG 5120-99-306-3829
N4	276-330	Insertion Jig Assy Kick Start	1	7AMG 5120-01-338-0858
N5	276-340	Insertion Jig 230 870, Oil Pump	1	
N6	276-250	Insertion Jig Oil Seal 230-690	1	
N7	276-315	Insertion Jig Needle Bushing, Cam	1	
N8	276-310	Insertion Jig 850 055 Cam	1	7AMG 5120-99-725-9384
N9	277-970	Guide Sleeve MS	1	7AMG 5120-99-725-9389
N10	276-450	Guide Sleeve Oil Pump Shaft	1	
N11	276-300	Guide Bolt	1	
N12	276-720	Piston Ring Compressor, 79·5 mm	1	7AMG5120-99-300-8422
N13	276-445	Puller Assy	1	7AMG 5120-99-725-9388
N14	277-807	Puller Assy M35x1·5	1	7AMG 5120-99-730-0940
N16	276-470	Valve Spring Push Tool	1	
N18-23	276-360	Puller Assy, Cl & Balancer Shft	1	
N19	276-380	Bolt M10	1	
N20	276-370	Extractor Sleeve 6303	1	
N21	276-375	Extractor Sleeve 6304	1	
N22	276-390	Support Plate	1	
N23	242-090	Hex Nut M10	2	
N24	977-477	Ring Half 6207E	2	
N25	977-490	Ring	1	
N26-28	876-298	Puller Assy, Ball Bearings	1	
N27	940-755	Hex Screw M16x1·5x150	1	
N28	840-681	Allen Screw M8x40	4	
N29	241-965	Fixation Screw M8x40	1	7AMG 5306-21-879-6022
N30	276-535	Puller Plate Assy	1	
N31	276-560	Puller Bell	1	
N32	276-550	Puller Ring	1	
N33	276-155	Bolt 12x250	1	
N34	276-127	Pull-in Spindle M18x1·5 Assy	1	
N35-36	277-087	Puller Assy Balancer Gear	1	
N36	841-700	Hex Screw M10x60	1	
N37	277-917	Trestle Assy	1	
N38	276-436	Puller Plate Assy, CS Halves	1	
N39	277-070	Ring Wrench $^{13}/_{16}$	1	7AMG 5120-99-732-0549
N41	277-887	Clutch Hub Locking Tool	1	

INDEX No	PART No	NAME	Qty	NATO No
N42	276-405	Camshaft Puller Assy	1	7AMG 5120-99-950-2516
N43	277-180	Ball Bearing Puller Set	1	
N44	276-855	Pressure Nipple Assy Comp Air	1	
N45	276-880	Valve Spring Spanner Assy	1	
N46	276-990	Spring Spanner Lever	1	
N47	243-360	Rivet 5x25	1	
N48-49	877-017	Circlip Install Tool Assy	1	
N48	877-022	Circlip Install Sleeve 22mm	1	
N49	877-012	Circlip Install Pusher 22mm	1	
N50	299-035	Repair Manual Assy, Engine	1	
N51	297-431	Loctite Anti-Seize 10 gr	1	
N52	297-433	Molykote G-N 100 gr, Slide Paste	1	
N53	297-386	Silastic 732 RTV, 100 gr	1	
N54	899-785	Loctite 221 Violet 10 cc	1	H1 8030 99 224 8425
N55	899-784	Loctite 574 Orange 50 cc	1	
N56	897-330	Lithium-Base Grease, 250 gr	1	
N57	899-788	Loctite 648 Green 5 gr	1	
N58	295-301	Gasket Set, Cylinder Head	1	7AMG 5330-99-814-9370
N59	295-300	Gasket Set Head (Engine)	1	7AMG 533-99-667-1223
N60-77	84771062	Tool Kit MT350	1	
N60	84753479	Air Pressure Gauge	1	7AMG 4910-99-152-4660
N61	277-837	Screwdriver Blade - Combination	1	7AMG 5120-99-549-7341
N62	277-845	Grip for Screwdriver	1	7AMG 5120-99-663-3593
N62B	277-340	Plug Remove	1	7AMG 5120-99-020-7001
N63	876-195	Tool Bag	1	
N64	277-825	Ring Wrench 22/24 mm	1	7AMG 5120-99-139-8692
N65	276-090	Fork Wrench 17/19 mm	1	7AMG 5120-99-721-6818
N66	84770171	Spark Plug Wrench 18 mm	1	7AMG 5120-99-860-5045
N67	276-295	Valve Gauge .05 mm	1	7AMG 5210-01-338-0760
N68	876-230	Fork Wrench 11/13 mm	1	7AMG 5120-99-721-5693
N69	276-065	Fork Wrench 10/13 mm	1	
N70	276-040	Wrench Clutch Adjustment	1	
N71	876-360	Wrench 5, Int Hex Screw	1	7AMG 5120-99-799-7679
N72	277-810	Wrench 6, Int Hex Screw	1	F1/5120-99-124-3483
N73	84770114	Wrench 8, Int Hex Screw	1	F1/5120-99-122-6467
N74	84770197	Tyre Lever	2	6MT2 5120-99-401-3139
N75	84770163	Tommy Bar	1	7AMG 5120-99-721-5695
N76	84770205	Puncture Repair Kit	1	6MT6 2640-99-805-7604
N77	84770213	'C' Wrench Rear Shock Absorber	2	7AMG 5120-99-799-7678
N78	84771054	Operator's Manual MT350	1	2340-H-200-201
N79	84771039	MT350 Service Manual	1	2340-H-200-302
N80	84771047	MT350 Part Book	1	2340-H-200-721

TABLE 9 CONVERSION TABLES

TORQUE

Nm	lb ft	Nm	lb ft
10	7·4	66	49
11	8·1	67	49
12	8·9	68	50
13	9·6	69	51
14	10·3	70	52
15	11·1	71	52
16	11·8	72	53
17	12·5	73	54
18	13·3	74	55
19	14·0	75	55
20	14·8	76	56
21	15·5	77	57
22	16·2	78	58
23	17·0	79	58
24	17·7	80	59
25	18·4	81	60
26	19·2	82	60
27	20·0	83	61
28	20·6	84	62
29	21·4	85	63
30	22·1	86	63
31	23	87	64
32	24	88	65
33	24	89	66
34	25	90	66
35	26	91	67
36	27	92	68
37	27	93	69
38	28	94	69
39	29	95	70
40	30	96	71
41	30	97	72
42	31	98	72
43	32	99	73
44	32	100	74
45	33	101	75
46	34	102	75
47	35	103	76
48	35	104	77
49	36	105	77
50	37	106	78
51	38	107	79
52	38	108	80
53	39	109	80
54	40	110	81
55	41	111	82
56	41	112	83
57	42	113	83
58	43	114	84
59	44	115	85
60	44	116	86
61	45	117	86
62	46	118	87
63	46	119	88
64	47	120	89
65	48		

LENGTH

mm	inch
0·05	0·00197
0·06	0·00236
0·07	0·00276
0·08	0·00315
0·09	0·00354
0·10	0·00394
0·20	0·00787
0·30	0·01181
0·40	0·01575
0·50	0·01969
0·60	0·02362
0·70	0·02756
0·80	0·03150
0·90	0·03543
1	0·03937
2	0·07874
3	0·11811
4	0·15748
5	0·19685
6	0·23622
7	0·27559
8	0·31496
9	0·35433
10	0·39370

PRESSURE

mbar	in hg
1·0	14·5
1·1	16·0
1·2	17·5
1·3	19·0
1·4	20·5
1·5	22·0
1·6	23·0
1·7	24·5
1·8	26·0
1·9	27·5
2·0	29·0
2·1	30·5
2·2	32·0
2·3	33·5
2·4	35·0
2·5	36·0
2·6	37·5
2·7	39·0
2·8	40·5
2·9	42·0
3·0	43·5
3·1	45·0
3·2	46·5
3·3	48·0

VACUUM

mbar	in hg	mbar	in hg
50	1·48	330	9·75
55	1·63	335	9·90
60	1·77	340	10·05
65	1·92	345	10·20
70	2·07	350	10·35
75	2·22	355	10·49
80	2·36	360	10·64
85	2·51	365	10·79
90	2·66	370	10·94
95	2·81	375	11·08
100	2·96	380	11·23
105	3·10	385	11·38
110	3·25	390	11·53
115	3·40	395	11·68
120	3·55	400	11·82
125	3·69	405	11·97
130	3·84	410	12·12
135	3·99	415	12·27
140	4·14	420	12·42
145	4·29	425	12·56
150	4·43	430	12·71
155	4·58	435	12·86
160	4·73	440	13·01
165	4·88	445	13·15
170	5·03	450	13·30
175	5·17	455	13·45
180	5·32	460	13·60
185	5·47	465	13·75
190	5·62	470	13·89
195	5·76	475	14·04
200	5·91	480	14·19
205	6·06	485	14·34
210	6·21	490	14·48
215	6·36	495	14·63
220	6·50	500	14·78
225	6·65		
230	6·80		
235	6·95		
240	7·09		
245	7·24		
250	7·39		
255	7·54		
260	7·69		
265	7·83		
270	7·98		
275	8·13		
280	8·28		
285	8·42		
290	8·57		
295	8·72		
300	8·87		
305	9·02		
310	9·16		
315	9·31		
320	9·46		
325	9·61		

TABLE 10 TORQUE VALUES

LOCATION/DESCRIPTION	TORQUE VALUES	
	Nm	Ft/lbs
Cylinder Head Nut M10	35 Nm	26 Ft/lbs
Cylinder Head Nut M8	20 Nm	15 Ft/lbs
Flywheel Nut	100 Nm	74 Ft/lbs
Gearbox Sprocket Nut	100 Nm	74 Ft/lbs
Kickstarter Stop Hex Screw	75 Nm	55 Ft/lbs
Clutch Shaft Nut	120 Nm	89 Ft/lbs
Countershaft Nut	60 Nm	44 Ft/lbs
Timing Pulley Nut, 15 tooth	100 Nm	74 Ft/lbs
Timing Pulley Nut, 30 tooth	35 Nm	26 Ft/lbs
Transmission Sprocket Retaining Nut	100 Nm	74 Ft/lbs
Drive Sprocket Mounting Bolts	24 Nm	18 Ft/lbs
Downtube Drain Plug	20 Nm	15 Ft/lbs
Engine Crankcase Drain Plug	20 Nm	15 Ft/lbs
Filter Cover Screws	8 Nm	6 Ft/lbs
Muffler Mounting Bolt M10	51 Nm	38 Ft/lbs
Exhaust/Muffler Clamp Bolt M8	20 Nm	15 Ft/lbs
Exhaust Engine Nut	24 Nm	18 Ft/lbs
Exhaust Manifold Clamp Bolt M6	12 Nm	9 Ft/lbs
Heat Shield Screw M6	10 Nm	7·5 Ft/lbs
Flywheel Retaining Nut	95 Nm	70 Ft/lbs
Magneto Cover Screws	10 Nm	7 Ft/lbs
Stator Assembly Screws	8 Nm	6 Ft/lbs
Damper Retaining Bolt	14 Nm	10 Ft/lbs
Sidestand Pivot Bolt/Nut	27 Nm	20 Ft/lbs
Swing Arm Pivot Nut	68 Nm	50 Ft/lbs
Front Axle Nut	68 Nm	50 Ft/lbs
Upper Yoke Steering Stem Pinch Bolt	20–27 Nm	15–20 Ft/lbs
Handlebar Clamp, Bolt M8	24–27 Nm	18–20 Ft/lbs
Pinch Bolt	24 Nm	18 Ft/lbs
Spindle Clamp Nut/Stud	14 Nm	10 Ft/lbs
Steering Stem Nut	102 Nm	75 Ft/lbs
Main Fork Retaining Screw	61 Nm	45 Ft/lbs
Oil Drain Screw	11 Nm	8 Ft/lbs
Steering Stem Pinch Screw M8	24 Nm	18 Ft/lbs
Handlebar Clamp, Bolt M10	51 Nm	38 Ft/lbs
Seat Bracket Screws	8 Nm	6 Ft/lbs
Fender Retaining Screws	8 Nm	6 Ft/lbs
Headlamp Retaining Screws	6·8 Nm	5 Ft/lbs
Indicator Light Jam Nut	41 Nm	30 Ft/lbs
Brake Disc Screws	14–16 Nm	10–12 Ft/lbs
Front Axle	68 Nm	50 Ft/lbs
Rear Axle Nut	68–81 Nm	50–60 Ft/lbs
Caliper Mounting Bolt	27 Nm	20 Ft/lbs

TABLE 10 TORQUE VALUES (Continued)

LOCATION/DESCRIPTION	TORQUE VALUES	
	Nm	Ft/lbs
FOR ALL OTHER FASTENERS NOT SPECIFIED ABOVE, USE FOLLOWING VALUES FOR STANDARD SIZES:		
M5	7–8 Nm	5–6 Ft/lbs
M6	11–14 Nm	8–10 Ft/lbs
M8	24–27 Nm	18–20 Ft/lbs
M10	51–54 Nm	38–40 Ft/lbs