TVS

Apache RTR 160 4V

RACING DNA UNLEASHED.

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SERVICE MANUAL

SER.MAN/TVS APACHE RTR 160 4V / 160 Fi 4V - REVISION - 0

NOTICE

All information included in this publication is based on the latest product information available at the time of approval for printing.

All the illustrations given in this manual may vary from the actual vehicles.

TVS MOTOR COMPANY LIMITED reserves the right to make changes at any time without prior notice and without incurring any obligation whatsoever.

FOREWORD

We are happy to provide you the first edition of new **TVS APACHE RTR 160 4V / 160 Fi 4V** motorcycle's service manual.

This manual is prepared to provide the assistance during the process of servicing the new **TVS APACHE RTR 160 4V / 160 Fi 4V** motorcycles. This manual describes about the basic operations of this new product, do's and don't's, service limits of individual components and sub systems while servicing the **TVS APACHE RTR 160 4V / 160 Fi 4V** motorcycles. We request you to carefully go through this manual and follow the instructions given.

All the instructions and illustrations of this manual is prepared based on the recent information available during the preparation of manual. Modifications or any improvements on product will be communicated through '**SERVICE INFORMATION BULLETINS**' from time to time.

This manual will help to the technicians who already have technical knowledge about motorcycles.

While servicing, certain parts may require replacement. For ordering spares please refer **Parts catalogue of TVS APACHE RTR 160 4V / 160 Fi 4V** motorcycles. The illustrations in this manual may not give you the exact name, part number and quantities.

Incase, you face any critical problems during the course of servicing and if you need any further clarifications or technical assistance you may contact our area service personal.

You may also contact us at

TVS Motor Company Limited,
Marketing (Service) Department,
Post box No.4, Harita, Hosur - 635 109,
Tamilnadu, India.

HOW TO READ THIS MANUAL

This service manual is split into seven chapters as "General information", "Periodic maintenance", "Servicing of engine", "Fuel, lubrication and exhaust system", "Electrical system", "Diagnostics", "Chassis" and "Service information".

Mostly the pages run through two columns in the inside pages with instructions on left side and the illustrations on the right side. Some of the exploded views occupy full pages. In between the running instructions we have used the notations as per the examples given below:

Heading:- **CHAIN ASSEMBLY DRIVE**

Sub heading:- **Chain slackness**

Note :- This provides further clarification for clear understanding of any particular information/operation/data**.**

Note:
Inspect and set the idling speed after completing all other maintenance actions.

Caution / warning :- This indicates special procedures of precautions to be followed by the mechanics during the service. Avoiding these messages may cause injury to them as well as damage to the components.

Caution:
Check that the gasket inlet is intact and in good condition.

Hand tools :-

17 mm spanner

Special tools :-

Part number	Description
N231 002 0	Clutch nut tightening tool

Service limits :-

Service limit	0.05 mm

Chapter 1

GENERAL INFORMATION

TVS APACHE RTR 160 4V

Fig. 1.1 RIGHT SIDE

Fig. 1.2 LEFT SIDE

TVS APACHE RTR 160 Fi 4V

Fig. 1.3 RIGHT SIDE

Fig. 1.4 LEFT SIDE

VEHICLE IDENTIFICATION NUMBERS

LOCATIONS

FRAME NUMBER

- The frame serial number is stamped on the right side of the steering head tube. (Fig. 1.5)

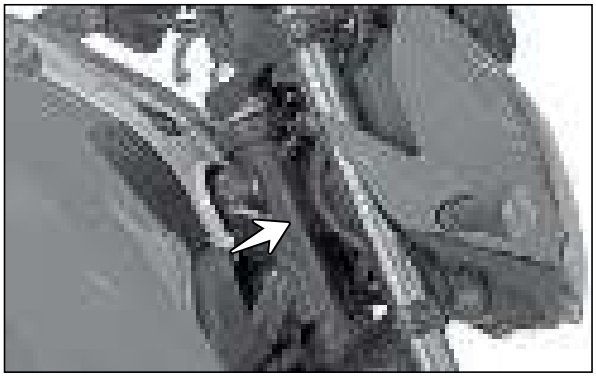


Fig. 1.5

ENGINE NUMBER

- The engine serial number is stamped on the left side crankcase assembly near cylinder block. (Fig. 1.6)

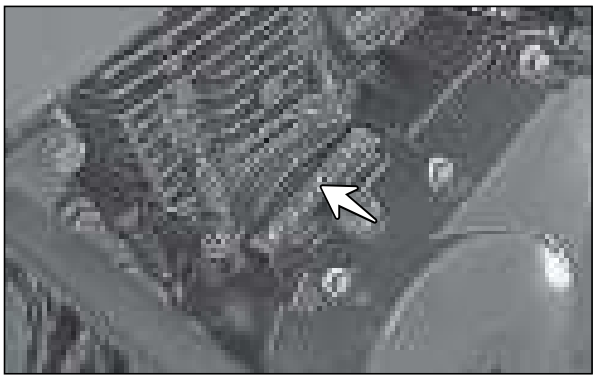
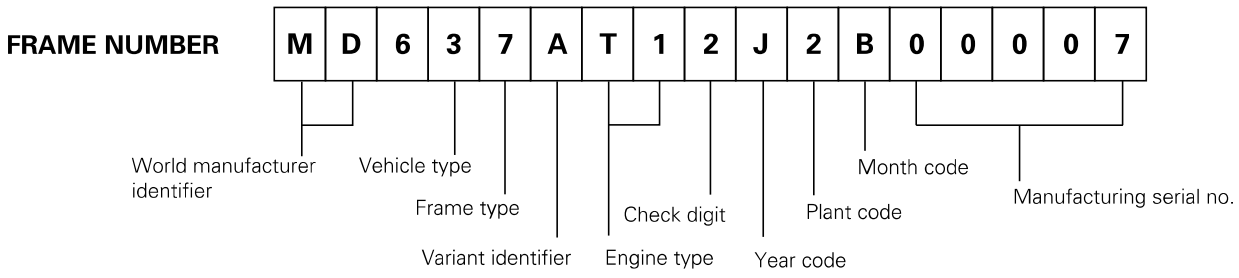
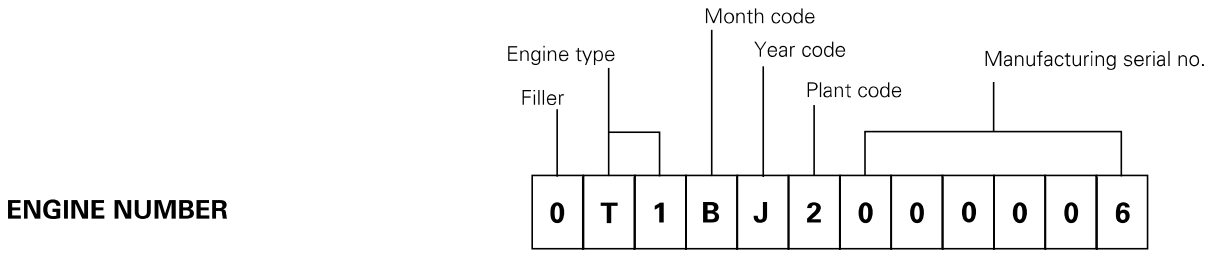


Fig. 1.6

FRAME AND ENGINE NUMBER CODES





YEAR AND MONTH CODES

CODE FOR THE PRODUCTION YEAR

CODE	YEAR
1	2001
2	2002
3	2003
4	2004
5	2005
6	2006
7	2007
8	2008
9	2009
A	2010
B	2011
C	2012
D	2013
E	2014
F	2015
G	2016
H	2017
J	2018
K	2019
L	2020
M	2021
N	2022
P	2023
R	2024
S	2025
T	2026
V	2027
W	2028
X	2029
Y	2030

CODE FOR THE PRODUCTION MONTH

CODE	MONTH
A	JANUARY
B	FEBRUARY
C	MARCH
D	APRIL
E	MAY
F	JUNE
G	JULY
H	AUGUST
K	SEPTEMBER
L	OCTOBER
N	NOVEMBER
P	DECEMBER

TECHNICAL SPECIFICATIONS

DIMENSIONS AND WEIGHT		Carburettor Version	Fi Version
Overall length		2050 mm	
Overall width		790 mm	
Overall height		1050 mm	
Seat height		800 mm	
Ground clearance		180 mm	
Wheel base		1357 mm	
Kerb weight (with toolkit and 90% of fuel)	Drum	143 kg	-
	Disc	145 kg	147 kg
Pay load		130 kg	
Maximum laden weight	Drum	273 kg	-
	Disc	275 kg	277 kg
ENGINE			
Type		4 Stroke, Oil cooled, Single cylinder OHC	
Bore		62 mm	
Stroke		52.9 mm	
Piston displacement		159.7 cc	
Compression ratio		10.15 : 1	
No. of valves		4	
Carburettor type		UCAL CV	-
Fuel injection type		-	Bosch closed loop
Air filter		Viscous Paper filter	
Oil filter		Wire mesh and micronic paper filter	
Lubrication system		Forced wet sump	
Maximum power in kW		12.14 (16.5 PS) @ 8000 rpm	12.35 (16.8 PS) @ 8000 rpm
Maximum torque in Nm		14.8 Nm @ 6500 rpm	
Maximum speed		113 km / h	
Engine idling rpm (under warm condition)		1500 ± 100 rpm	1600 ± 100 rpm
Starting system		Electric starter / kick starer	
Emission norms		BSIV	
TRANSMISSION			
Clutch		Wet - multiplate type	
Gear shift pattern		1 down and 4 up	
Primary transmission		Helical gears	
Secondary transmission		Chain and sprockets	

TECHNICAL SPECIFICATIONS

GEAR RATIO			Carburettor Version	Fi Version
First gear			2.917	
Second gear			1.857	
Third gear			1.333	
Fourth gear			1.050	
Fifth gear			0.880	
Primary reduction			3.095	
Secondary reduction			3.461	
CHASSIS				
Frame			Double Cradle Split Synchro STIFF (DCSSS)	
Front suspension			Telescopic oil damped	
Rear suspension			Gas charged Mono shock absorber, 7 step adjustable with rectangular swing arm	
Steering angle			35°	
Caster angle			26°	
Trail length			95.8 mm	
Brakes	Front		Hand operated, 270 mm petal disc	
	Rearr	Drum	Foot operated, 130 mm drum	
		Disc	Foot operated, 200 mm petal disc.	
Tyre	Front		90/90 - 17 49P Tubeless	
	Rear	Drum	110/80 - 17 Tubeless	
		Disc	130/70 - 17 M/C 62P Tubeless	
Tyre pressure	Front		1.75 kg/cm^2 (25 PSI)	
Rear		Solo	2.00 kg/cm^2 (28 PSI)	
		Dual	2.25 kg/cm^2 (32 PSI)	
ELECTRICAL				
Type			AC generator	
Ignition system			IDI - Engine load based digital ignition	ECU - 3D ignition timing map
Spark plug			BOSCH - UR4KE / NGK MR7E - 9	
Battery type			12V, 9 Ah	
Body earthing			Negative terminal	
Generator			Fly wheel magneto 12V, 130W	Fly wheel magneto 12V, 260W
Head lamp			12V, 35/35W HS1	12V, 60/55W H4
Position lamp			LED lamp (1W)	LED lamp (2W)
Tail / brake lamp			LED (1W max. / 2.5W max.)	
Turn signal lamp			12V, 10W x 4	

TECHNICAL SPECIFICATIONS

ELECTRICAL	Carburettor Version	Fi Version
Number plate lamp	12V, 5W x 1	
Instrument panel	LCD / LED indicators	
Horn	12V, DC x 2	
Fuse	12V, 15A and 10A	12V, 20A,15A and 10A x 2
CAPACITIES		
Fuel type	BSIV / Unleaded petrol	
Fuel tank capacity*	12 litres (including reserve)	
Reserve (applicable for carburettor version only)	2.5 litres	-
Engine cum transmission oil grade	TVS TRU4 FULLY SYNTHETIC oil (SAE 10W30 API-SL, JASO MA2)	
Engine cum transmission oil capacity	1200 ml (after draining) 1400 ml (incase of disassembly)	
Front fork oil grade	TRU Fork oil	
Front fork oil quantity	242 ± 2.5 cc	
Brake fluid	TVS Griling DOT 3 / DOT 4	

Note:
Specification are subject to change on account of continuous improvements in the product.

*** The fuel tank is not a measuring instrument and the capacity of the fuel tank may vary from the indicated capacity.**

ADVANTAGES AND SPECIAL FEATURES OF TVS APACHE RTR 160 4V / 160 Fi 4V

- 160 CC, 4 valve, lean burn engine with the peak power of 12.14 (16.5 PS) @ 8000 rpm and peak torque of 14.8 Nm @ 6500 rpm helps to achieve 0 to 60 kmph speed in 4.73 secs. (carburettor version)
- 160 CC, 4 valve, lean burn engine with the peak power of 12.35 (16.8 PS) @ 8000 rpm and peak torque of 14.8 Nm @ 6500 rpm helps to achieve 0 to 60 kmph speed in 4.73 secs. (FI version)
- IDI - Engine load based digital ignition (in carburettor version) / ECU - 3D Ignition timing map (in FI version) - tuned for smooth power delivery
- High combustion nanofriks-coated piston
- 5 plate clutch for racing launch
- 5 speed gear box for high speed
- Large intake resonator - boosts low-end torque
- Paper filter in air cleaner for increased durability
- Oil cooled along with ram air assisted cooling for optimum engine performance
- Stainless steel exhaust pipe exhaust system
- Double barrel exhaust engineered with European sound design techniques
- Race origin double cradle split syncro stiff frame
- Mono tube suspension for aggressive racing
- Roto petal disc brakes
- Race grip Remora tyres
- Interactive racing display
- All time 'ON' LED position lamp
- Aggressive tank cowl
- Longer wheel base for better stability

WARRANTY TERMS

TVS APACHE RTR 160 4V / 160 Fi 4V

60 months from the date of sale or 60,000 km, whichever of the two occurs earlier

RUNNING - IN PERIOD

The first 1000 km is a crucial part. Proper running-in operation during this period helps in ensuring a longer life and smooth performance of **TVS APACHE RTR 160 4V / 160 Fi 4V.**

The reliability and performance of **TVS APACHE RTR 160 4V / 160 Fi 4V** depends on special care and restrain exercised during running-in period. It is especially important that you avoid operating the engine in a manner, which could expose the engine parts to excessive heat. Maximum recommended speed upto 750 km is 50 km/h.

Do not ride at constant low speed for a longer time during any portion of the running-in period. Keep varying the engine speed for better mating of parts.

FUEL AND OIL RECOMMENDATIONS

TVS APACHE RTR 160 4V / 160 Fi 4V has a four stroke engine. Do not mix oil with petrol. Be sure to use the following specified fuel and oil.

Fuel:

- Unleaded petrol with octane number between 85 to 95 by research method.
- Use fuel additives **IFTEX** in petrol as recommended by the manufacturer for low carbon deposition.

Oils:

Application	Qty	Manufacturer	Brand
Engine cum transmission oil	1200 ml (during regular service) 1400 ml (incase of disassembly)	TVS-M	TVS TRU4 FULLY SYNTHETIC oil (SAE 10W30 API-SL, JASO MA2)
Front fork oil	242 ± 2.5 cc	TVS-M	TRU Fork oil
Disc brake oil	–	TVS Girling	DOT 3 / DOT 4

Other lubricant:

Application	Qty	Manufacturer	Brand
Grease	–	Bharat petroleum IOC Bechem Kluber Lubrication	MP Grease no. 3 Servo Gem no. 3 Bechem premium grade 3 Kluber Centoplex 2
Chain lubricant	–	TVS Motor Company	TRU SPRAY

PRECAUTIONS AND GENERAL INSTRUCTIONS

Observe the following precautions without fail when dismantling and reassembling.

- Do not run the engine indoors with little or no ventilation.
- Be sure to replace gaskets, O-rings, circlips and cotter pins with new ones, for safety.
- When tightening nuts and bolts, start first with the larger or centre ones. Tighten these to the specified torque using a crisscross pattern.
- Use specified special and common tools only.
- When engine and final drive components are disassembled and inspected, coat the mating surfaces with a lubricant to prevent corrosion.
- When assembling components, use recommended lubricants.
- After assembling, check every part for proper installation, movement and operation.
- Always ensure mutual safety when working with the partners.
- Use only genuine **TVS Motor Company** parts and recommended lubricants.

LIST OF HAND TOOLS REQUIRED

1. Flat head spanners:

7 mm, 8 mm, 10 mm, 12 mm, 14 mm and 21 mm

2. Ring spanners:

8 mm, 9 mm, 10 mm, 11 mm, 12 mm, 13 mm, 14 mm, 16 mm , 17 mm, 22 mm, 24 mm, 27 mm and 32 mm

3. Tubular spanners:

8 mm, 10 mm, 12 mm, 14 mm, 16 mm and 17 mm

4. Socket spanners:

12 mm, 14 mm, 17 mm, 22 mm, 27 mm and 32 mm

5. Allen keys:

3 mm, 4 mm, 6 mm, 8 mm, 10 mm and 12 mm

6. Screw drivers:

Flat screw driver-small, flat screw driver, phillips head screw driver no.1, phillips head screw driver no. 2 and phillips head screw driver no. 3

7. Hammers:

Nylon hammer, rubber mallet and metal hammer

8. Pliers:

Straight nose plier, combination plier, water pump plier, external circlip plier-6 inch and snap ring circlip plier-7 inch

9. Others:

Drift, chisel, plug spanner, compression gauge, special adopter, micrometer, vernier calliper, dial gauge, surface plate and hot plate

LIST OF SPECIAL TOOLS REQUIRED

Sl. no.	Part no.	Description
1	M131 002 0	Magneto puller
2	M131 007 0	Tappet adjuster
3	M131 011 0	Puller assembly crankcase
4	N231 001 0	Clutch holder tool
5	N231 002 0	Clutch nut tightening tool
6	N931 018 0	Tool fork oil seal
7	N931 011 0	Tool fork cylinder holder
8	N931 012 0	Tool pre-load adjuster
9	N931 013 0	Tool cone bottom installer
10	N931 014 0	Tool steering nut
11	N931 015 0	Tool swing arm service
12	N931 016 0	Tool steering cup remover
13	N931 017 0	Magneto tool assembly
14	NB31 004 0	Assembly tools steering cups
15	S131 002 0	Extractor inlet and exhaust valve
16	S131 050 0	Bearing installer set
17	S131 111 0	Main bearing extractor
18	031 180 0	Front fork oil level gauge
19	031 240 1	Universal oil seal remover

SPECIAL TOOLS & ITS APPLICATION

1. Magneto puller - M131 002 0 (Fig. 1.7A)

- Used to remove the magneto rotor from the crankshaft assembly. (Fig.1.7B)

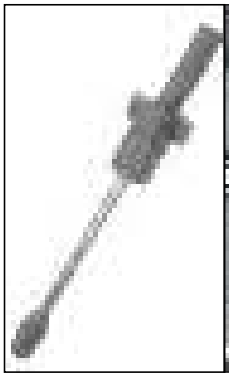


Fig. 1.7A

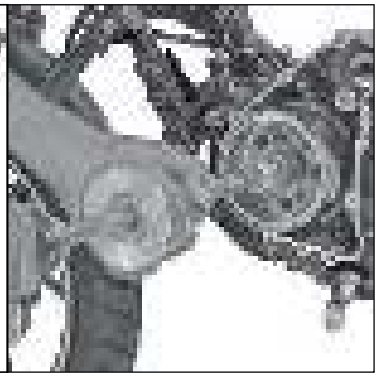


Fig. 1.7B

2. Tappet adjuster - M131 007 0 (Fig.1 .8A)

- Used to adjust the valve tappet clearance. (Fig. 1.8B)

Fig. 1.8A

Fig. 1.8B

3. Puller assembly crankcase - M131 011 0 (Fig. 1.9A)

- Used to separate the LH and RH side crankcases. (Fig. 1.9B)

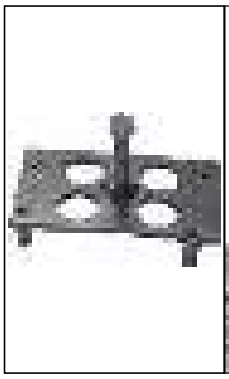


Fig. 1.9A

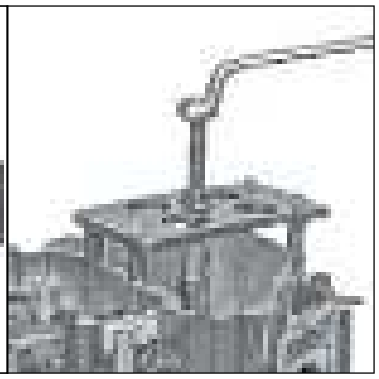


Fig. 1.9B

4. Clutch holder tool - N231 001 0 (Fig.1.10A)

- Used to hold the clutch assembly during clutch assembly mounting nut removal. (Fig. 1.10B)

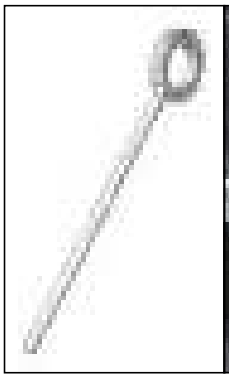


Fig. 1.10A

Fig. 1.10B

5. Clutch nut tightening tool - N231 002 0 (Fig.1.11A)

- Used to remove / reassemble the clutch nut during clutch servicing. (Fig. 1.11B)

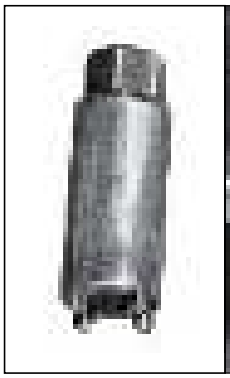


Fig. 1.11A

Fig. 1.11B

6. Tool fork oil seal - N931 018 0 (Fig. 1.12A)

- Used to assemble the front fork oil seal and dust cap. (Fig. 1.12B)

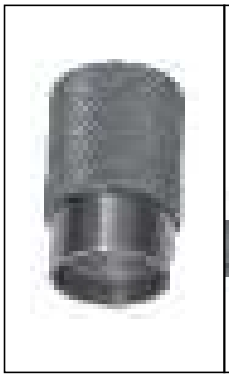


Fig. 1.12A

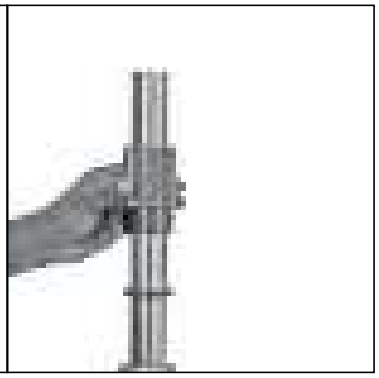


Fig. 1.12B

7. Tool fork cylinder holder - N931 011 0 (Fig. 1.13A)

- Used to hold the front fork cylinder during fork leg assembly dismantling. (Fig. 1.13B)

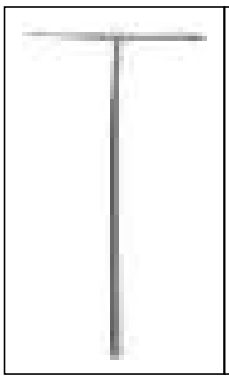


Fig. 1.13A

Fig. 1.13B

8. Tool pre-load adjuster - N931 012 0 (Fig. 1.14A)

- Used to adjust the rear mono-shock spring pre-load. (Fig. 1.14B)

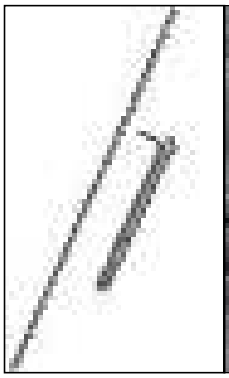


Fig. 1.14A

Fig. 1.14B

9. Tool cone bottom installer - N931 013 0 (Fig. 1.15A)

- Used to assemble the cone bottom to the steering stem. (Fig. 1.15B)

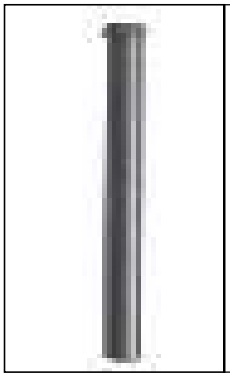


Fig. 1.15A

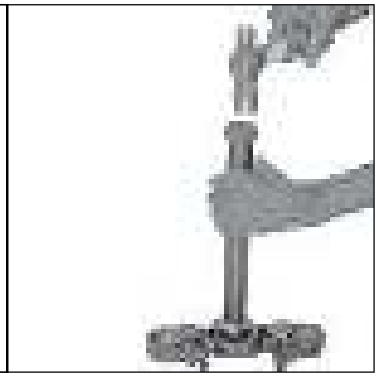


Fig. 1.15B

10. Tool steering nut - N931 014 0 (Fig. 1.16A)

- Used to remove / assemble the steering lock nut and arrester steering stem. (Fig. 1.16B)

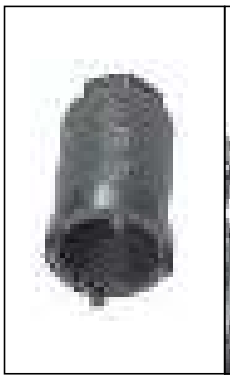


Fig. 1.16A

Fig. 1.16B

11. Tool swing arm service - N931 015 0 (Fig. 1.17A)

- Used to remove and reassemble the swing arm needle bearings. (Fig. 1.17B)

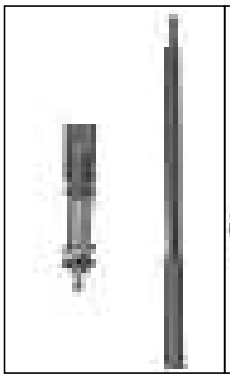


Fig. 1.17A

Fig. 1.17B

12. Tool steering cup remover - N931 016 0 (Fig. 1.18A)

- Used to remove the top and bottom steering cups. (Fig. 1.18B)

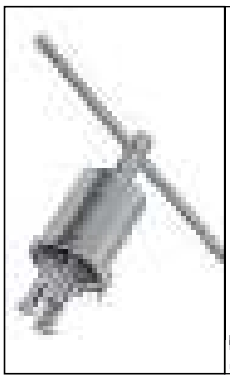


Fig. 1.18A

Fig. 1.18B

13.Magneto tool assembly - N931 017 0 (Fig. 1.19A)

- Used to hold the magneto rotor while removing/assembling the primary drive gear and magneto rotor nuts. (Fig. 1.19B)

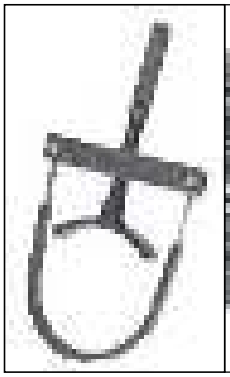


Fig. 1.19A

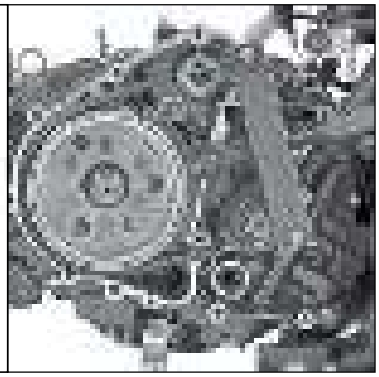


Fig. 1.19B

14.Assembly tool steering cups - NB31 004 0 (Fig. 1.20A)

- Used to assemble the cup bottom and race steering inner during servicing of steering. (Fig. 1.20B)

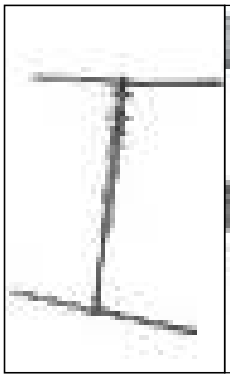


Fig. 1.20A

Fig. 1.20B

15.Extractor inlet and exhaust valve - S131 002 0 (Fig. 1.21A)

- Used to hold the compress the inlet and exhaust value spring during removal of valves. (Fig. 1.21B)

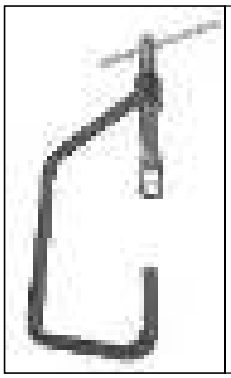


Fig. 1.21A

Fig. 1.21B

16.Bearing installer set - S131 050 0 (Fig. 1.22A)

- Used to remove / assemble the bearings, oil seals and bushes. (Fig. 1.22B)

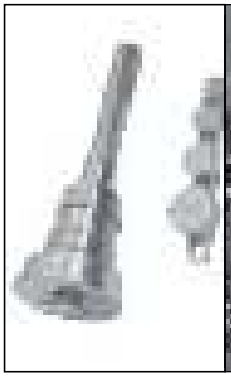


Fig. 1.22A

Fig. 1.22B

17.Main bearing extractor - S131 111 0 (Fig. 1.23A)

- Used to remove the main bearing from the crankshaft. (Fig. 1.23B)

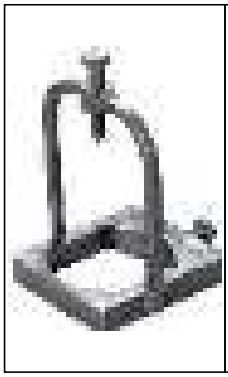


Fig. 1.23A

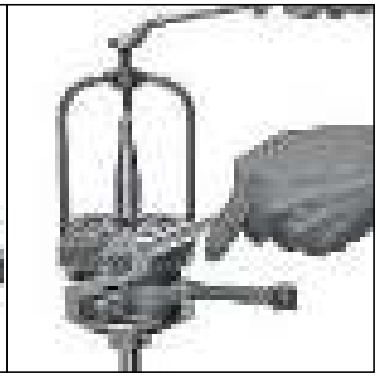


Fig. 1.23B

18.Front fork oil level gauge - 031 180 0 (Fig. 1.24A)

- Used to maintain the front fork oil level at the specified height. (Fig. 1.24B)

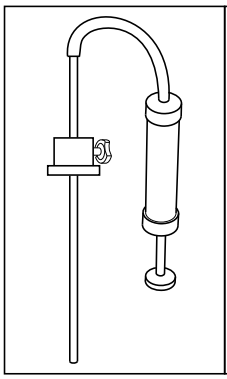


Fig. 1.24A

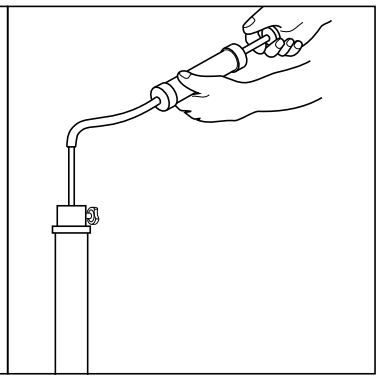


Fig. 1.24B

19.Universal oil seal remover - 031 240 1 (Fig. 1.25A)

- Used to remove the installed oil seals. (Fig. 1.25B)

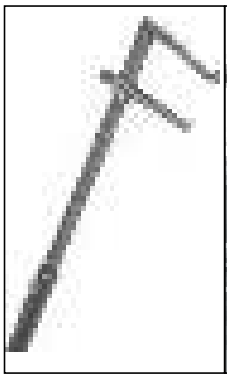


Fig. 1.25A

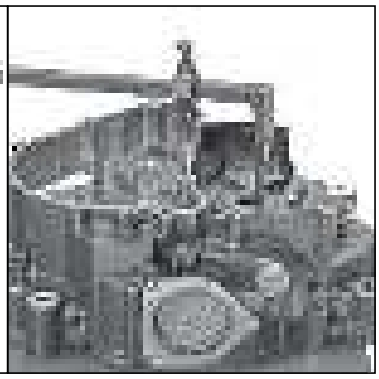


Fig. 1.25B

Chapter 2

PERIODIC MAINTENANCE

PERIODIC MAINTENANCE

For a trouble free performance of the vehicle and its longer life, the vehicle should be periodically inspected for wear of components, carbon deposits, stretched cables, etc. The worn-out components to be replaced or repaired and necessary adjustment to be made for certain items for better performance of the vehicle as indicated in the table.

Note:
More frequent maintenance checks may be performed on vehicles that are used in severe conditions like dusty environment, dense traffic conditions, sustained full throttle operation and un-metaled roads.

PERIODIC MAINTENANCE SCHEDULE

Item	In free service					After free service		Remarks
Service km	1st 500-750	2nd 2500-3000	3rd 5000-6000	4th 8500-9000	5th 11500-12000	Every 3000 km	Every 6000 km	
Period from the date of sale	1 month	3 months	6 months	9 months	12 months			
Engine cum transmission oil	R	I&T	R	I&T	R	I&T	R	
Oil filter (strainer)	C	–	C	–	C	–	C	
Oil filter (paper filter)	R	–	R	–	R	–	R	
Spark plug	–	–	–	–	R	–	–	Replace every 12000 km
Air cleaner element	–	–	–	–	R	–	–	Replace every 12000 km
SAI hose connections#	I	–	–	–	–	–	–	
Carburettor assembly#	–	–	–	–	C & A	–	–	C & A every 12000 km
Tappet clearance	I & A	–	I & A	–	I & A	–	I & A	
Oil cooler fins	–	–	I & C	I & C	I & C	I & C	–	
Oil cooler pipes	–	I	I	I	I	I	–	Inspect & replace if required every 15000 km
Clutch plates	–	–	–	–	–	–	–	Inspect & replace if required every 21000 km
Engine breather hose	I	I	I	I	I	I	–	Replace every 21000 km if required
Carburetor# / throttle body rubber ducts	–	I	I	I	I	I	–	Replace every 21000 km if required
Fuel cock sediment bowl*#	C	C	C	C	C	C	–	
Hose fuel with its clamps	I	I	I	I	I	I	–	Replace every two years or 21000 km
Clutch and throttle cable play[1]	I, A & L	I, A & L	I, A & L	I, A & L	I, A & L	I, A & L	–	
Throttle grip	–	–	L	–	L	–	L	Lubricate using grease
Choke operation#	I	I	I	I	I	I	–	
Steering smooth operation / play[2]	I & A	–	–	–	C, L & A	–	–	C & L with fresh Bechem premium grade 3 grease every 12000 km
Front fork oil	–	–	–	–	–	–	–	Replace every 18000 km
Front and rear suspension[3]	I	I	I	I	I	I	–	
All fasteners	I & TI	I & TI	I & TI	I & TI	I & TI	I & TI	–	Tighten if necessary
Drive chain**	C, L & A	C, L & A	C, L & A	C, L & A	C, L & A	C, L & A	–	Adjust if necessary

R - Replace; I - Inspect; T - Top up; C - Clean; A - Adjust; TI - Tighten; L - Lubricate; S - Set

1 Inspect for proper operation and adjust play. Lubricate ends using grease.

2 Inspect for smooth steering rotation, steering shake / noise. Adjust the steering if necessary.

3 Inspect for smooth and proper function of front and rear suspension. Also inspect for any visual damage and oil leakage.

* Replace fuel cock sediment filter and fuel cock filter every 15000 km#.

** Clean the drive chain with dry cloth and apply TRU SPRAY / TRU 4 oil as frequently as every 500 km for better chain life and smooth vehicle running.

Applicable only for carburettor version

Item / Service km / Period from the date of sale	In free service					After free service		Remarks
	1st 500-750 1 month	2nd 2500-3000 3 months	3rd 5000-6000 6 months	4th 8500-9000 9 months	5th 11500-12000 12 months	Every 3000 km	Every 6000 km	
All bulbs, horn and switches	I	I	I	I	I	I	–	Inspect for proper functioning
Head lamp beam	I & A	I & A	I & A	I & A	I & A	I & A	–	
Battery electrolyte level	I & T	I & T	I & T	I & T	I & T	I & T	–	
Specific gravity and voltage[4]	I	I	I	I	I	I	–	
Brake effectiveness	I	I	I	I	I	I	–	
Brake pedal shaft	L	L	L	L	L	L	–	Lubricate using TRU4 oil
Rear brake pedal play*[5]	I & A	I & A	I & A	I & A	I & A	I & A	–	
Brake pad / shoe* wear	I	I	I	I	I	I	–	Replace if necessary
Wheel freeness	I	I	I	I	I	I	–	
Front and rear brake fluid	I & T	I & T	I & T	I & T	I & T	I & T	–	Replace every 21000 km
Brake hose	I	I	I	I	I	I	–	Replace every three years
Master cylinder cups	–	–	–	–	–	–	–	Replace every 21000 km
Tyre pressure at cold condition	I & S	I & S	I & S	I & S	I & S	I & S	–	
Engine idling RPM	I & S	I & S	I & S	I & S	I & S	I & S	–	Set only incase of carburettor version
Idling CO%[6#]	I & S	–	–	–	I & S	–	–	I & S every 12000 km
Ball joint gear shift lever	–	–	L	–	L	–	L	Lubricate using grease
Centre / side stand pivot	L	L	L	L	L	L	–	Lubricate using grease
Swing arm bearings	–	–	–	–	–	–	–	C & L with fresh Bechem premium grade 3 grease every 2 years or 12000 km, whichever is earlier
Evaporative emission control system	I	I	I	I	I	I	–	Check for intactness of hoses and canister
Fuel tank assembly**	I & C	I & C	I & C	I & C	I & C	I & C	–	
Fuel filter[##]	I	I	I	I	I	I	–	Replace every 24000 km
Wheel balancing[7]	–	–	–	–	–	–	–	

R - Replace; I - Inspect; T - Top up; C - Clean; A - Adjust; TI - Tighten; L - Lubricate; S - Set

[4] Recharge if necessary.

[5] Clean and lubricate rear brake cam using grease every 6000 km.

[6] Idling CO% should be set with the help of exhaust gas analyser and tachometer only.

[7] It is advisable to balance the wheel balancing to be done every 1 year or every 12000 km and also after every tyre puncture or tyre replacement to have better high speed

* Applicable only for rear drum brake version

** Check for abnormal vehicle jerk / noise while opening the cap / leak. If found any, contact TVS Motor Company Authorised Main Dealer or Authorised Dealer.

\# Applicable only for carburettor version

\## Applicable only for FI version

SEAT ASSEMBLY

REMOVAL

- Insert the ignition key into the seat lock (A).
- Turn it in clockwise, lift the seat from the rear end and slide it backward to remove. (Fig. 2.1)
- To reassemble the f seat, reverse the removal procedure.

Caution:
Make sure that the seat is locked securely in position after installation.

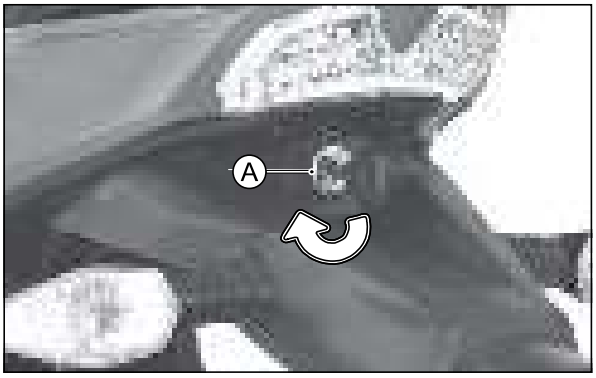


Fig. 2.1

COVER FRAME R & L

REMOVAL

- Remove the seat as explained earlier.
- Remove the CRR pan head screw (M6x16 - 3 Nos.) from the cover frame R. (Fig. 2.2)

Phillips head screw driver

- Take out the cover frame R by carefully dislocating it from the lugs.
- Remove the CRR pan head screw (M6x16 - 3 Nos.) from the cover frame L. (Fig. 2.3)

Phillips head screw driver

- Take out the cover frame L by carefully dislocating it from the lugs.
- To reassemble the cover frame R & L, locate the lugs of the cover frame at the holes provided on the fuel tank and install and tighten the screws.

Tightening torque	3 ± 1 Nm

Caution:
Make sure that the cover frame is locked securely in position after installation.

Note:
Ensure the availability of cushions in the cover frame front lug mounting area (at fuel tank).

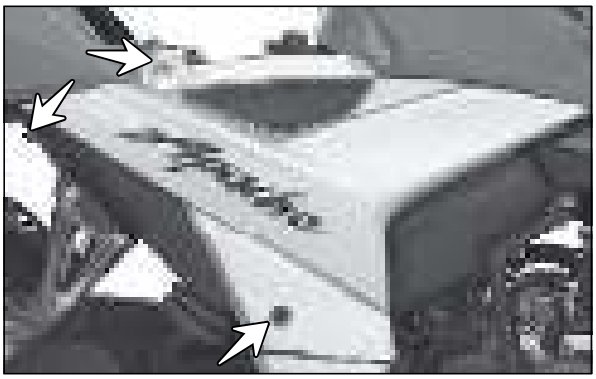


Fig. 2.2


Fig. 2.3

FUEL TANK COMPLETE

REMOVAL - Incase of Carburettor Version

- Remove the seat and cover frame assembly as explained in the previous page.
- Turn fuel cock knob to 'OFF' position and disconnect the fuel hose from the carburettor assembly. (Fig. 2.4A)
- Disconnect the hose purge valve from the carburettor assembly. (Fig. 2.4B)

Nose plier

- Remove the hexagonal screw (M6x30 - 2 Nos.) along with plain washers from the fuel tank rear mounting. (Fig. 2.5A)

10 mm spanner

Tightening torque	7 ± 1 Nm

- Remove the cushion fuel tank rear upper (2 Nos.)
- Carefully lift the rear portion of fuel tank and disconnect the fuel sender unit wiring socket. (Fig. 2.5B)
- Take out the cushion fuel tank rear lower (2 Nos.) from the fuel tank mounting.
- Remove fuel tank complete along with drain hose by sliding it out from both the cushion fuel tank front.

Note:
While reassembling fuel tank complete, ensure that fuel sender unit wiring socket is connected and fuel tank drain hose is routed properly as per the fitment in OE vehicle (refer Fig. 2.6 & 2.7).

Ensure the fitment of both lower and upper fuel tank cushions rear and proper seating of the fuel tank at cushion fuel tank front during reassembly.

Caution:
If the drain hose is not routed properly, it will lead to water entry in the tank.

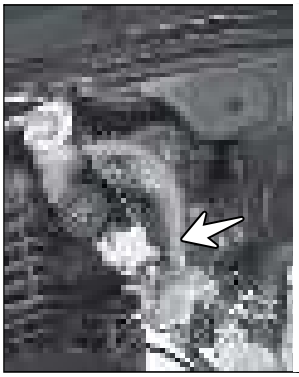


Fig. 2.4A

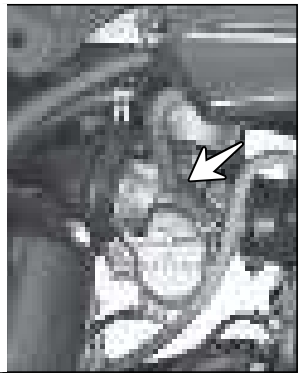


Fig. 2.4B

Fig. 2.5A

Fig. 2.5B

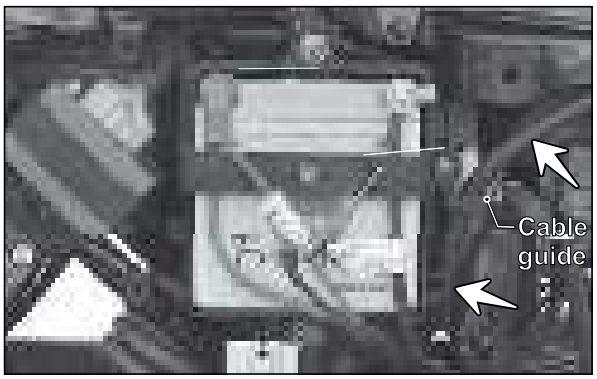


Fig. 2.6

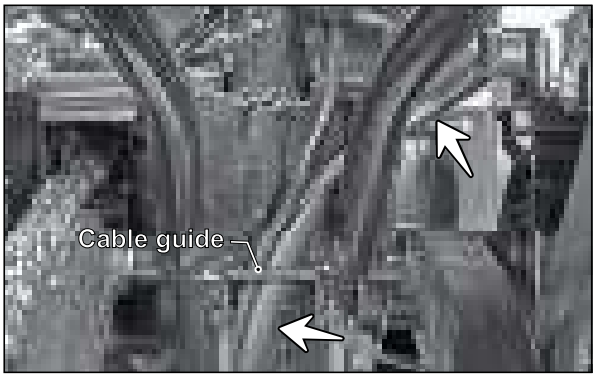


Fig. 2.7

REMOVAL - Incase of FI Version

- Remove the seats and cover frame assembly as explained earlier.
- Press and pull the fuel hose quick coupler (Fig. 2.8A) and disconnect the fuel hose from the fuel filter. (Fig. 2.8B)

Small screw driver

- Disconnect the fuel pump module sensor coupler. (Fig. 2.9A)
- Disconnect the hose (A) (connecting purge valve to throttle body) from the throttle body. Remove the clip (B) and pull out the purge valve coupler (C). (Fig. 2.9B)

Nose plier

- Remove the hexagonal screw (M6x30 - 2 Nos.) along with plain washers from the fuel tank rear mounting. (Fig. 2.10)

10 mm spanner

Tightening torque	7 ± 1 Nm

- Remove the cushion fuel tank rear upper (2 Nos.)
- Take out the cushion fuel tank rear lower (2 Nos.) from the fuel tank mounting.
- Remove fuel tank complete along with drain hose by sliding it out from both the cushion fuel tank front.

Note:
While reassembling fuel tank complete, ensure that fuel sender unit wiring socket is connected and fuel tank drain hose is routed properly as per the fitment in OE vehicle (refer fig. 2.11).

Ensure the fitment of both lower and upper fuel tank cushions rear and proper seating of the fuel tank at cushion fuel tank front during reassembly.

Caution:
If the drain hose is not routed properly, it will lead to water entry in the tank.

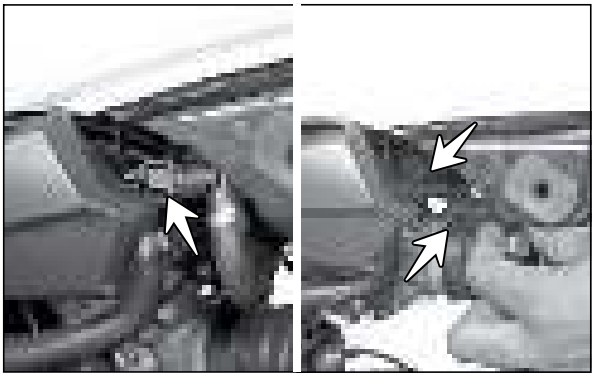


Fig. 2.8A Fig. 2.8B

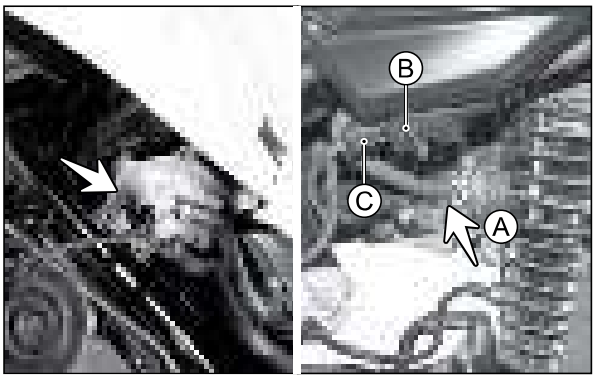


Fig. 2.9A Fig. 2.9B

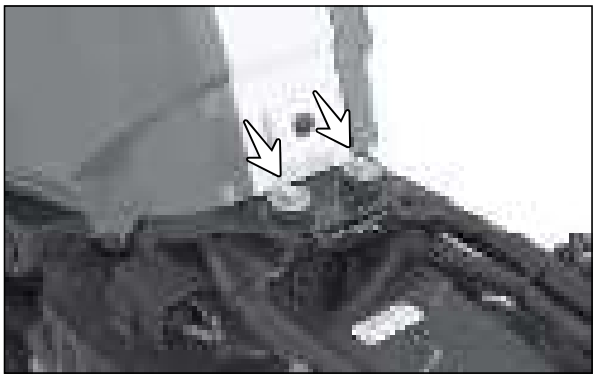


Fig. 2.10

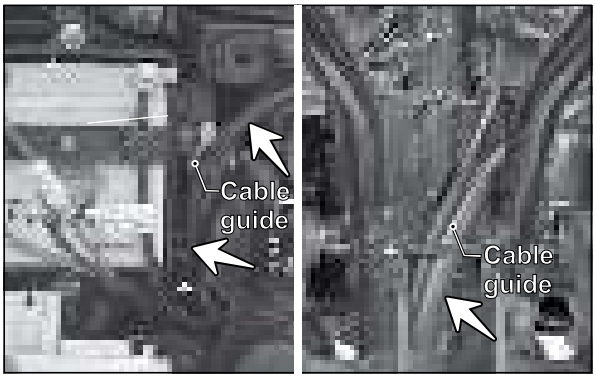


Fig. 2.11

COVER FUEL TANK ASSEMBLY

REMOVAL

- Remove the fuel tank as explained in the previous page.
- Remove the CRR flanged pan head tap screw (A) (ST4.2x13 - 2 Nos.) from the mounting of deflector. (Fig. 2.12)

Phillips head screw driver	
Tightening torque	1.5 ± 0.5 Nm

- Similarly, remove the CRR pan head screw (B) (M6x12 - 1 No.) from the mounting of deflector with cover fuel tank. (Fig. 2.12)

Tightening torque	3 ± 1 Nm

- Take out the deflector by carefully dislocating it from the lugs.
- Remove the CRR pan head screw (M6x12 - 1 No.) from the mounting of cover fuel tank inner L with the fuel tank. (Fig. 2.13)

Phillips head screw driver	
Tightening torque	3 ± 1 Nm

- Remove the CRR pan head screw (M6x12 - 2 Nos.) from the cover fuel tank front mounting. (Fig. 2.14)

Phillips head screw driver	
Tightening torque	3 ± 1 Nm

- Remove the CRR pan head screw (M6x12 - 3 Nos.) from the cover fuel tank rear mounting. (Fig. 2.15)

Phillips head screw driver	
Tightening torque	3 ± 1 Nm

Note:
Ensure the presence of retainer clips before installing the screws during re-assembly.

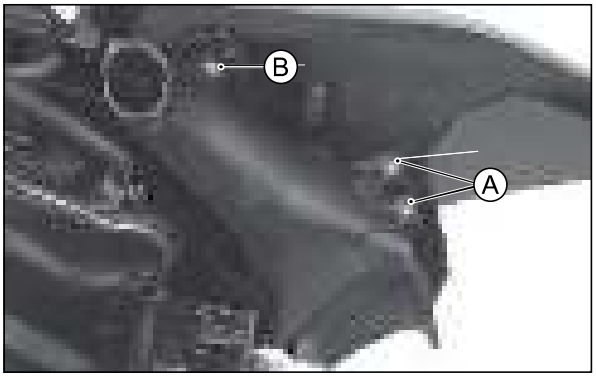


Fig. 2.12

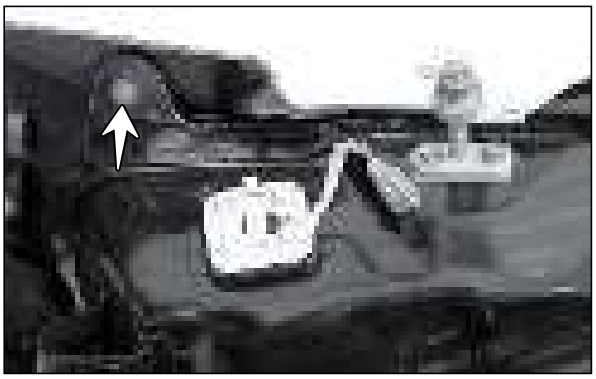


Fig. 2.13

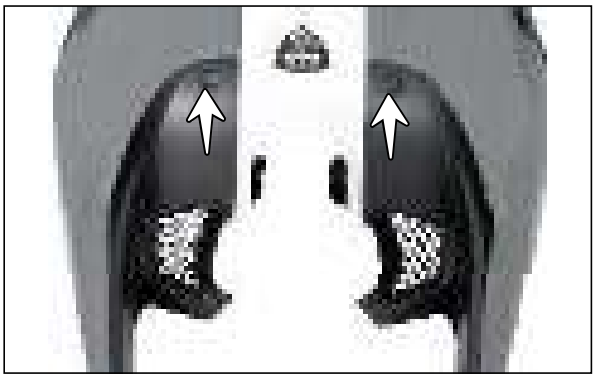


Fig. 2.14

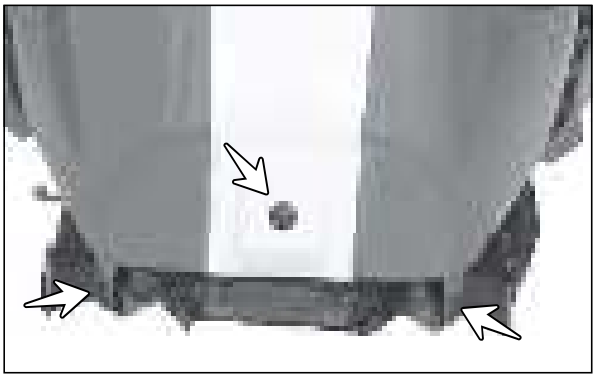


Fig. 2.15

- Remove hexagonal socket cap screw (M5x30 - 3 Nos.) from the mounting of fuel tank cap assembly. (Fig. 2.16)

4 mm allen key	
Tightening torque	4.5 ± 0.5 Nm

Note:
Remove only the (A, B and C) marked screws (refer Fig. 2.16). Do not disturb the other screws as they are for aesthetic purpose only and do not require any removal.

Caution:
Do not use the screws having more than 30 mm length as it may puncture the tank and lead to fuel leakage.

- Open the fuel tank cap by using the control key. (Fig. 2.17)
- Remove the CRR pan head screw (M5x12 - 1 No.) from the fuel tank cap inner mounting. (Fig. 2.18)

Phillips head screw driver	
Tightening torque	3 ± 1 Nm

- Take out the fuel tank cap assembly along with seal fuel tank cap.

Note:
Ensure the presence of seal in the fuel cap assembly before re-installing the cap.

- Carefully dislocate and remove the cover fuel tank assembly from the fuel tank.
- Remove the CRR flanged pan head tap screw (ST4.2x13 - 3 Nos.) from the mounting of cover fuel tank inner R. (Fig. 2.19)

Tightening torque	1.5 ± 0.5 Nm

- Dislocate the cover fuel tank inner R from the cover fuel tank assembly. In similar manner, remove the cover fuel tank inner L from the cover fuel tank assembly.

Note:
During reassembly, ensure the presence of clips before installing the screws.

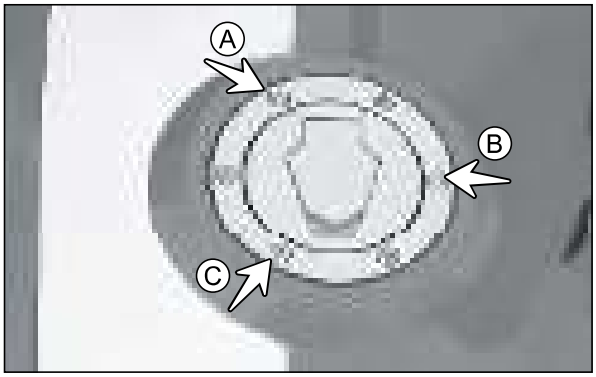


Fig. 2.16


Fig. 2.17


Fig. 2.18

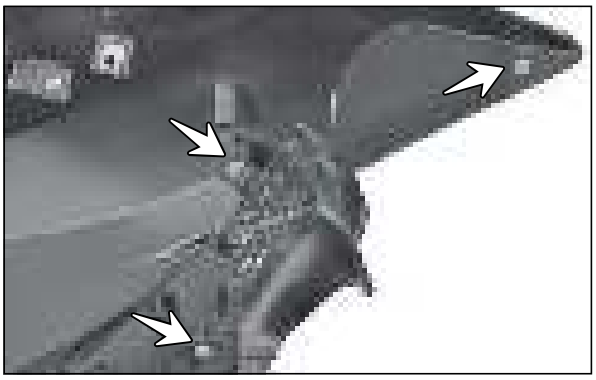


Fig. 2.19

- Remove the CRR flanged pan head tap screw (ST4.2x13 - 3 Nos.) from the mounting of cover fuel tank outer R. (Fig. 2.20)

Phillips head screw driver	
Tightening torque	1 ± 0.5 Nm

- Carefully dislocate and take out the cover fuel tank outer R from the cover fuel tank top.
- Remove the CRR flanged pan head tap screw (ST4.2x13 - 4 Nos.) from the mounting of cover fuel tank outer L. (Fig. 2.21)

Tightening torque	1 ± 0.5 Nm

- Carefully dislocate the cover fuel tank outer L from the cover fuel tank top.
- Remove the CRR flanged pan head tap screw (ST4.2x13 - 2 nos.) from the mounting of grill cover fuel tank R. (Fig. 2.22)

Tightening torque	1 ± 0.5 Nm

- Dislocate and take out the grill cover fuel tank from the cover fuel tank outer R.
- In similar manner, remove the grill cover fuel tank L from the cover fuel tank outer L.

FUEL TANK CAP ASSEMBLY - REMOVAL

- Remove the fuel tank complete and cover fuel tank assembly from the tank as explained earlier.
- Remove the CRR pan head screw (M5x12 - 3 nos.) from the mounting of inlet fuel tank complete and take out the inlet along with the 'O' ring. (Fig. 2.23)

Phillips head screw driver	
Tightening torque	4.5 ± 0.5 Nm

Caution:
Do not use the screws having more than 12 mm length as it may puncture the tank and lead to fuel leakage. Also, ensure to fix a new 'O' ring while reassembling the inlet to avoid leakages.

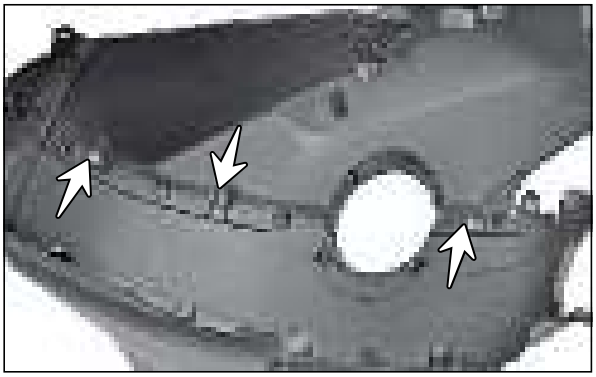


Fig. 2.20

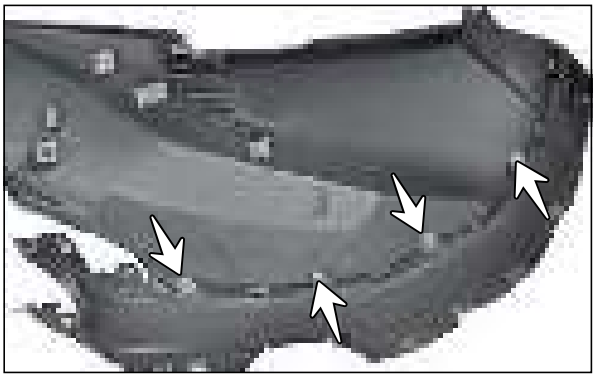


Fig. 2.21

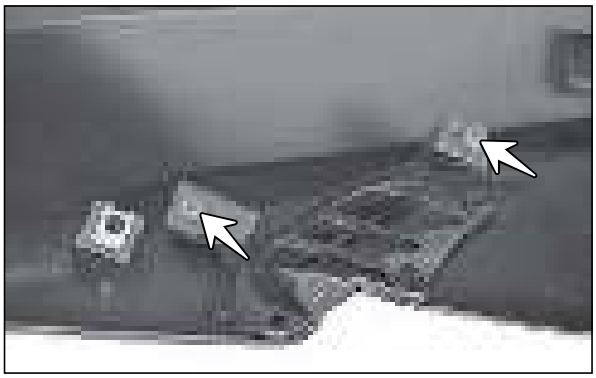


Fig. 2.22

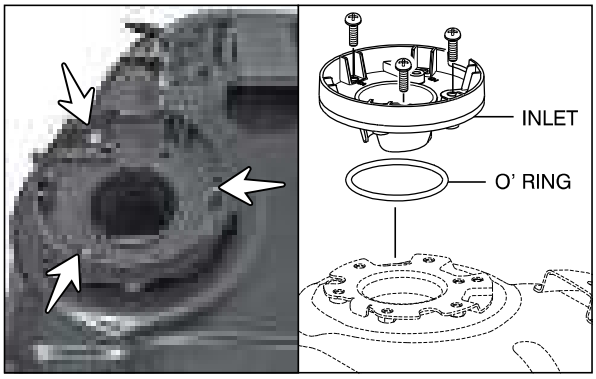


Fig. 2.23

REASSEMBLY

- For re-assembly, reverse the procedure removal. Assemble the covers separately and then assemble them as a set into the fuel tank.
- Refer exploded view for assembly details. (Fig. 2.24)

Note:
Before assembling the cover fuel tank assembly into the fuel tank. Ensure the availability of cushions at the respective places. Else it may create rattling noise.

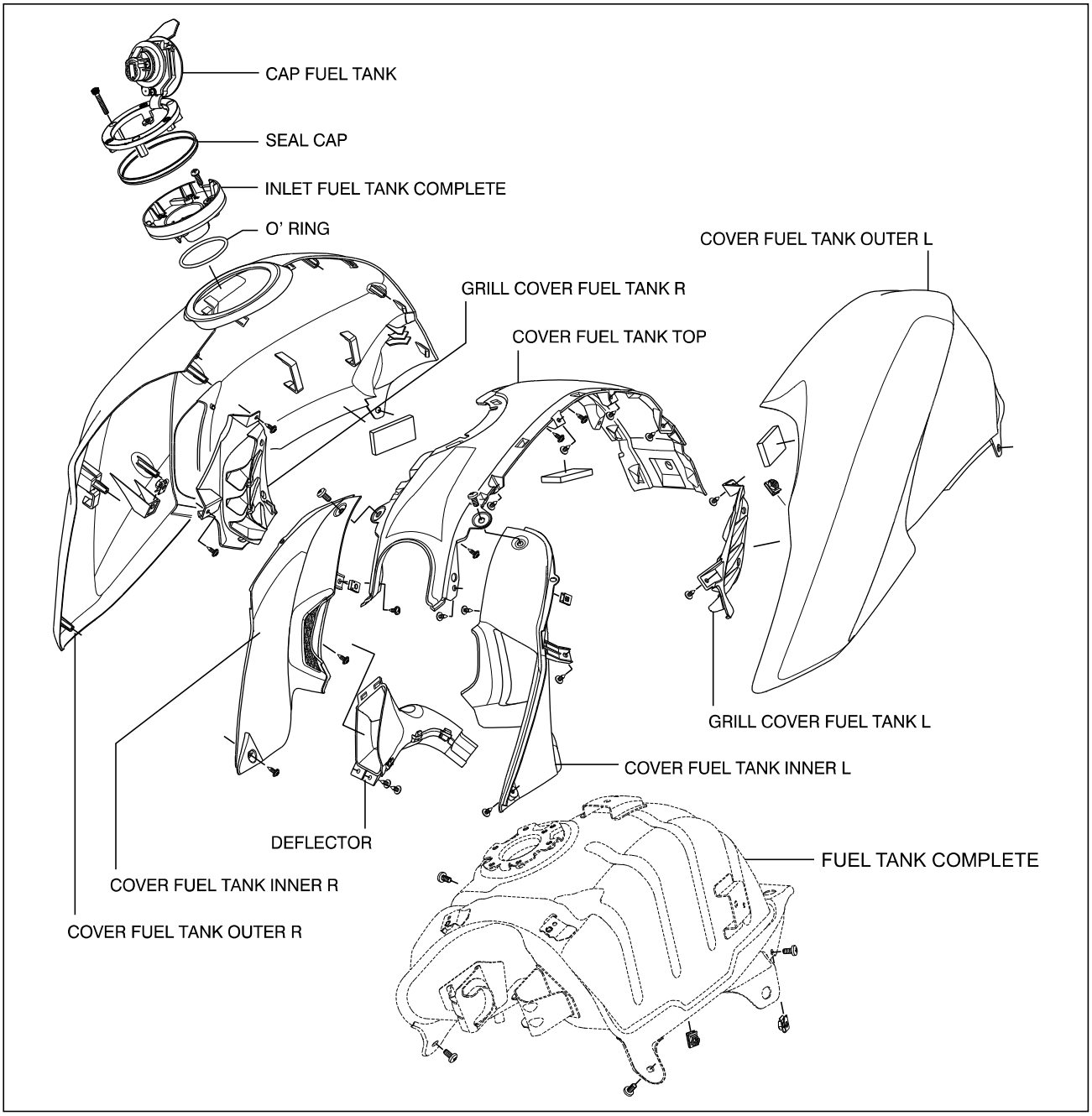


Fig. 2.24

TAIL COVER ASSEMBLY

REMOVAL

- Remove the seats and cover frame L & R as explained earlier (refer page nos. 2-3).

- Remove the hexagonal flange bolt (M 8 x 2 5 - 3 Nos.) from the mounting of pillion handle and take out the pillion handle. (Fig. 2.25)

12 mm spanner	
Tightening torque	22 ± 2 Nm

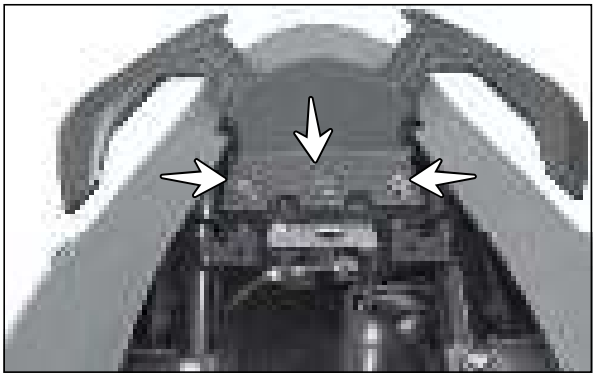


Fig. 2.25

- Remove the hexagonal bolt (M6x20 - 1 No.) along with the cup washer from the mounting of tail cover assembly with the chassis. (Fig. 2.26)

10 mm spanner	
Tightening torque	6 ± 2 Nm

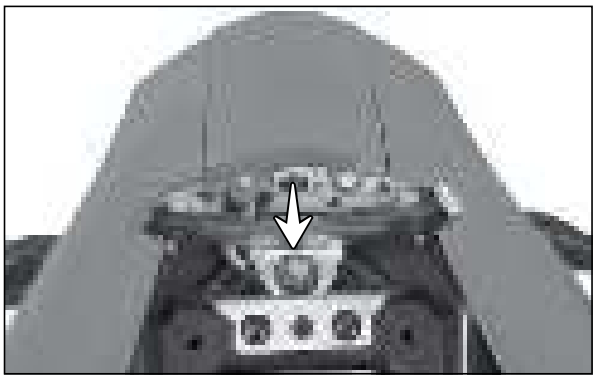


Fig. 2.26

- Remove the hexagonal bolt (M6x20 - 4 Nos.) along with the punched washers from the mounting the tail cover assembly with the chassis. (Fig. 2.27)

10 mm spanner	
Tightening torque	6 ± 2 Nm

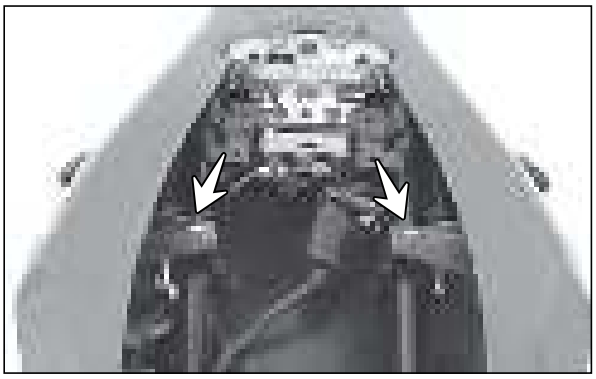


Fig. 2.27

- Disconnect the tail lamp coupler (A) from the main wiring harness. (Fig. 2.28)

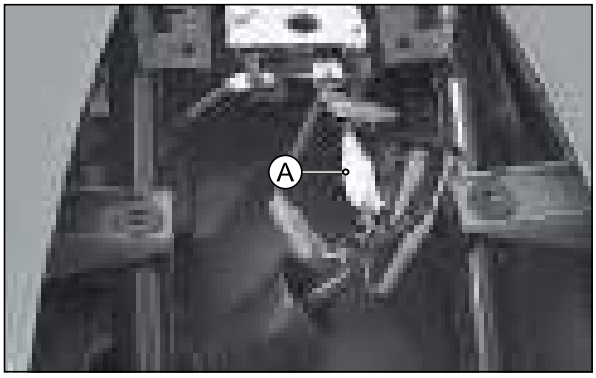


Fig. 2.28

- Remove the CRR pan head screw (M6x16 - 1 No.) from the tail cover center rear. (Fig. 2.29)

Phillips head screw driver

Tightening torque	3 ± 1 Nm

- Dislocate the tail cover centre rear from tail cover assembly.

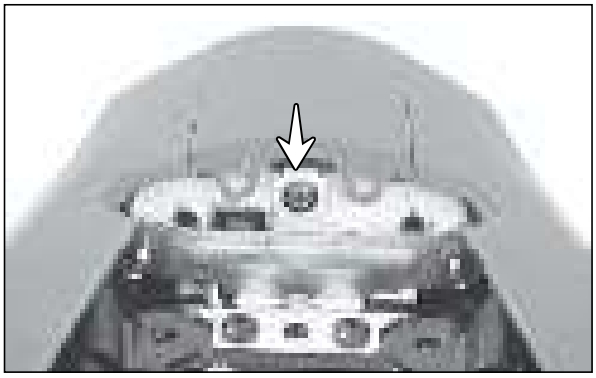


Fig. 2.29

- Loosen the screws of snap rivets and pull out all the four snap rivets from the tail cover mounting. (Fig. 2.30)
- Gently dislocate and take out the tail cover assembly from the vehicle.
- Reassemble the parts in the reverse order of removal.

Note:
Ensure the availability of cushions at the top mounting of tail cover assembly.

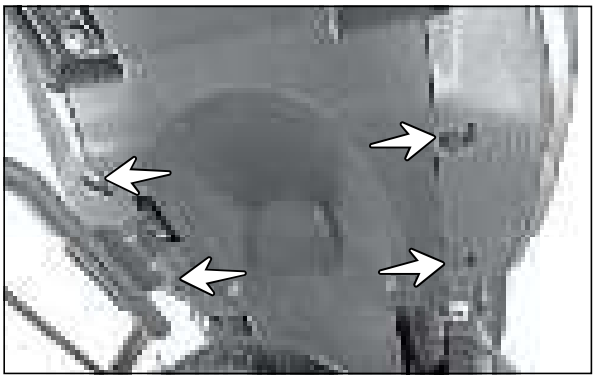


Fig. 2.30

PERIODIC MAINTENANCE AND TUNE-UP PROCEDURE

ENGINE CUM TRANSMISSION OIL

Replacement

Replace at initial 500 - 750 km and every 6000 km thereafter. Inspect and top-up every 3000 km.

After long period of use, the engine cum transmission oil will get contaminated and accelerates the wear of sliding and interlocking surface. Replace the engine cum transmission oil periodically by following the procedure given below:

- Place the vehicle on center stand. Using a clean cloth clean the surrounding surfaces of gauge oil level and plug complete oil drain. Start the engine and warm to normal operating temperature (oil temperature to 80° C) and switch 'OFF'.
- Remove the gauge oil level to facilitate easy draining of oil. (Fig. 2.31)
- Loosen and remove the hexagonal flange head bolts (M6x20 - 3 Nos.). (Fig. 2.32)

8mm spanner	
Tightening torque	10 ± 2 Nm

- Remove the cap oil strainer along with 'O' ring and drain the engine cum transmission oil.

Oil Filter (Strainer)

- Loosen the CRR pan head screw (M5x12 - 2 Nos.) and remove the strainer complete engine oil along with a 'O' ring. Inspect the strainer for any damage. Replace if necessary. Otherwise clean and reassemble the parts in the revers order of removal. (Fig. 2.33)

Phillips head screw driver	
Tightening torque	8 ± 2 Nm

Note:
Check the condition of the 'O' ring and replace if required. Ensure the availability of 'O' ring in the cap during reassembly.

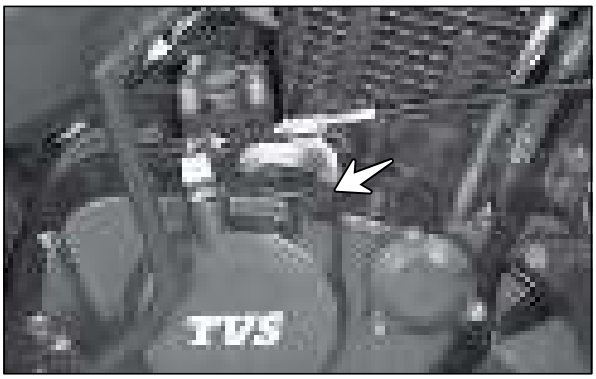


Fig. 2.31

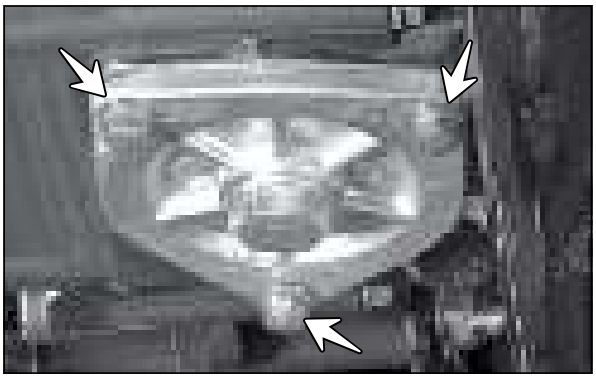


Fig. 2.32

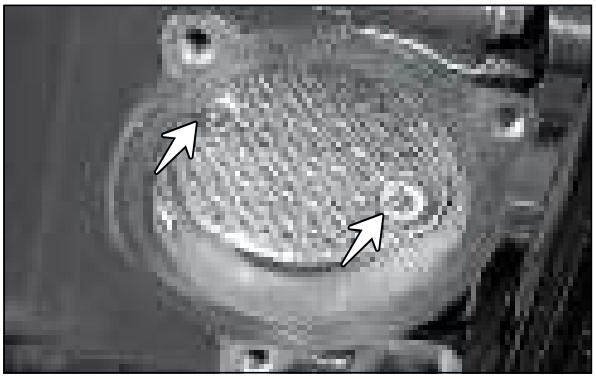


Fig. 2.33

- Fill TVS TRU4 FULLY SYNTHETIC oil (SAE 10W30 API-SL, JASO MA2).

Capacity	1200 ml (during regular service)
	1400 ml (incase of disassembly)

Note:
Before adding the fresh oil, replace the filter complete engine oil without fail.

- Refit gauge oil level.

Oil Level Check

- Ensure that the engine is in cold condition. Place the vehicle on center stand on a flat surface with front wheel touching the ground.
- Unscrew the gauge oil level and wipe it clean. Insert the gauge in its hole by threading it in completely.
- Check the oil level. The oil level should be between minimum and maximum levels. (Fig. 2.34)
- If the oil level is below the minimum level, top-up with the TVS TRU4 FULLY SYNTHETIC oil (SAE 10W30 API-SL, JASO MA2) upto the maximum level.

Note:
Check the condition of the 'O' ring (A) and replace if required. Ensure the availability of 'O' ring in the gauge during reassembly.

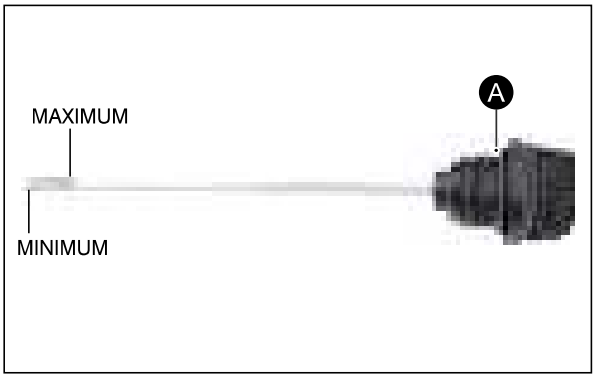


Fig. 2.34

FILTER COMPLETE ENGINE OIL

Replace at initial 500 - 750 km and every 6000 km there after.

- Before removing the filter complete engine oil, drain the engine cum transmission oil as per the guidelines mentioned above.
- Loosen and remove the hexagonal flange bolts (M6x16 - 2 Nos. and M6x75 - 1 No.). (Fig. 2.35)

8 mm spanner

Tightening torque	10 ± 2 Nm

- Remove the cap oil filter along with the 'O' ring and spring oil filter cap.

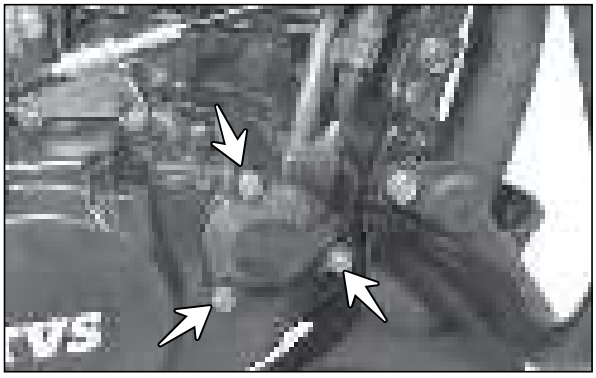


Fig. 2.35

- Remove the filter complete engine oil and 'O' ring (A). (Fig. 2.36)

Note:
Keep an oil bowl while opening the cap oil filter to collect the left over oil.

While reassembling, ensure to assemble the 'O' rings (A & C) and spring oil filter (B). (Fig. 2.37)

Locate the seal end (1) of the filter towards crankshaft. (Fig. 2.37)

Whenever the filter complete engine oil is replaced, it is recommended to replace the engine cum transmission oil along with it.

- Reassemble the parts in the reverse order of dismantling.

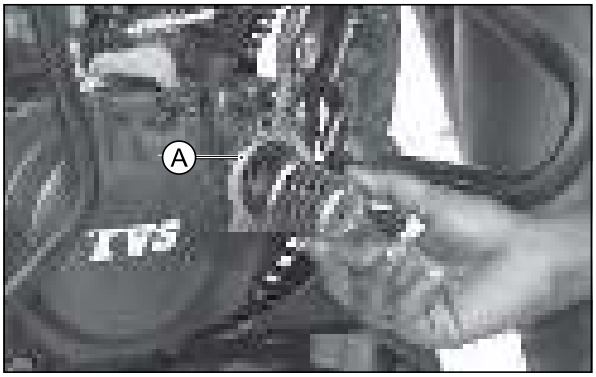


Fig. 2.36

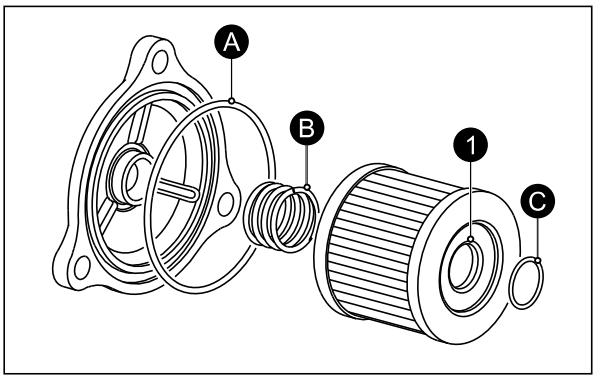


Fig. 2.37

SPARK PLUG

- Check the type of the spark plug.

Replace spark plug every 12000 km.

- Neglecting the spark plug leads to difficulty in starting and poor performance.
- Before removing the spark plug, clean the spark plug surroundings to prevent any foreign materials from falling inside the cylinder bore.
- Disconnect the sparkplug cap and remove the spark plug. (Fig. 2.38)

Plug spanner	
Tightening torque	12.5 ± 2.5 Nm

- Carbon deposits on the spark plug electrodes prevents good sparking and causes misfiring. Clean the deposits by blasting sand and compressed air using a spark plug cleaning machine as explained below:
- Ensure the air and power supply to the spark plug machine is on.

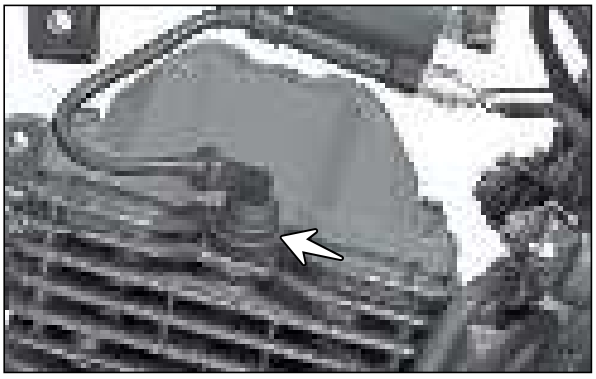


Fig. 2.38

Plate Clutch Driven

- Inspect the plates clutch driven for distortion using a feeler gauge as shown. (Fig. 3.19)
- Check every individual plates. Hold the plates with three fingers and insert the feeler gauge between the surface plate and driven plate at 3 to 4 locations to determine the distortion. If the distortion is more than the service limit, change the plate clutch driven as a set.

Service limit	0.100 mm (max)

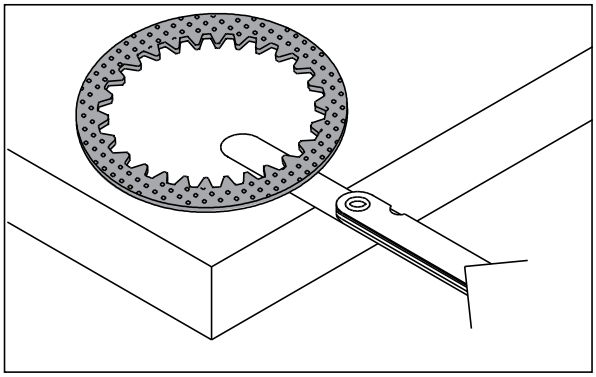


Fig. 3.19

Spring Clutch

- Check the free length of springs clutch using a vernier caliper. If the springs reaches service limit, replace all the spring as a set. (Fig. 3.20)

Service limit	38.57 mm (min)

Caution:
Clutch springs are graded and identified with different colour codes. While reassembling, ensure the springs of same colour codes are assembled.

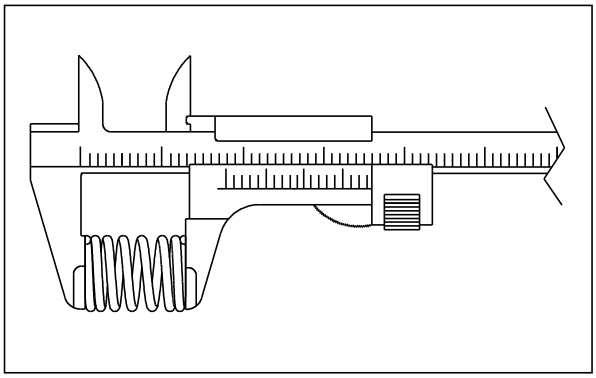


Fig. 3.20

Gear Assembly Primary Driven (Housing Clutch)

- Inspect housing clutch for the indents / cuts created by the plate clutch drive. (Fig. 3.21)

Note :
Check the primary drive gear play by rotating the gear portion. The play should be lesser than 6° with respect to the housing clutch (aluminum body). If it is found more, replace the primary driven gear assembly with a new one.

Fig. 3.21

Hub Clutch

- Inspect the hub clutch for wear. If any ridges or cuts formed on the hub clutch by the clutch plates, replace with a new one. Also check the lubrication holes for any blockage. (Fig. 3.22)

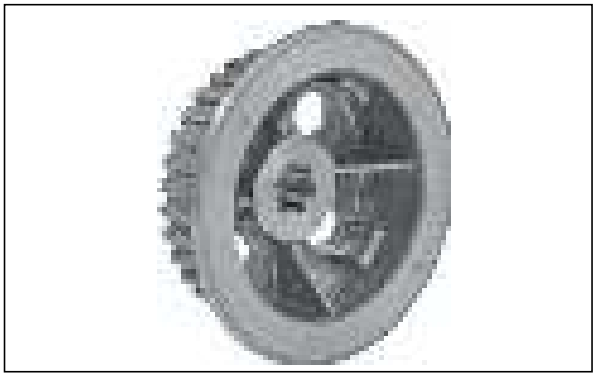


Fig. 3.22

REASSEMBLY

- Reassemble parts in the reverse order of disassembly.
- Before reassembling, inspect the clutch release plate bearing for any abnormal noise and smooth rotation. Replace bearing with a new one if found defective.
- Ensure the clutch plates are held firmly together by checking the play between the drive plates after tightening the plate clutch release bolts. (Fig. 3.23)
- Before reassembling cover clutch, ensure the assembly of a ball and pin clutch release inside the adopter clutch release. Replace the gasket cover clutch with a new one.
- Reconnect the clutch cable and adjust clutch play. Refer chapter "Periodic maintenance" page no. 2-27 for clutch adjustment procedure.
- Refill the engine cum transmission oil. Refer chapter "Periodic maintenance" page no. 2-12 for oil filling procedure.

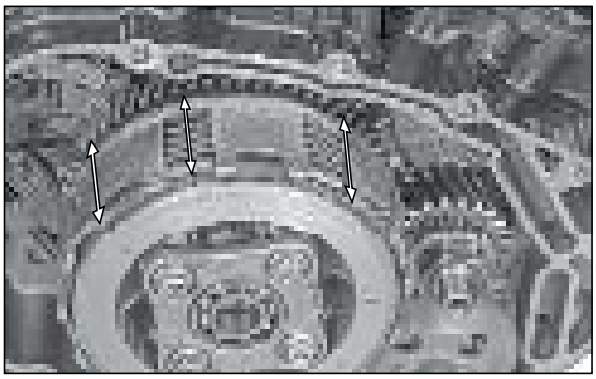


Fig. 3.23

CYLINDER HEAD ASSEMBLY - SERVICING

REMOVAL

- Remove the cover frame R & L as explained in chapter "Periodic maintenance" page no. 2-3.
- Remove the fuel tank as explained in chapter "Periodical maintenance" page no. 2-4 & 2-5.
- Disconnect the HT card from the spark plug and remove the spark plug. (Fig. 3.24)

Plug spanner

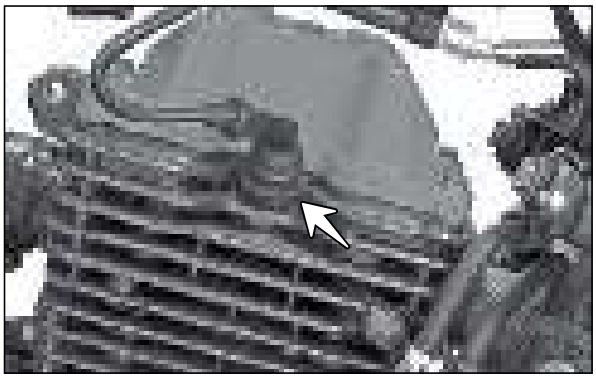


Fig. 3.24

Incase of Carburetor Model

- Loosen the hose clip (A) of tube air cleaner outlet and hose clip (B) of pipe intake complete. (Fig. 3.25)

Phillips head screw driver

- Gently pull out the carburettor along with the control cables and carefully hang it on the frame itself.

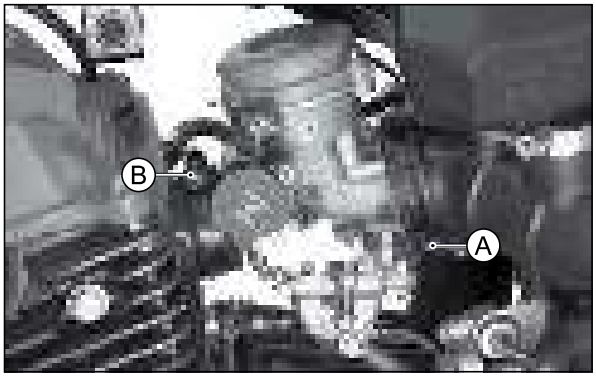


Fig. 3.25

Incase of EFI Model

- Disconnect sensors connectors from (4 Nos.) from throttle body assembly. (Fig. 3.26)

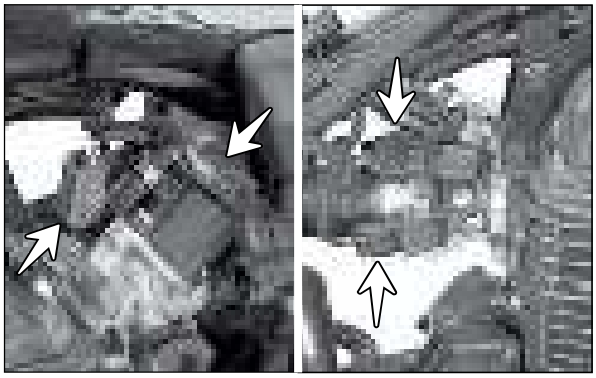


Fig. 3.26

- Loosen the hose clip (A) of tube air cleaner outlet and hose clip (B) of pipe intake complete. (Fig. 3.27)

Phillips head screw driver

- Gently pull out the throttle body assembly and carefully hang it on the frame itself.

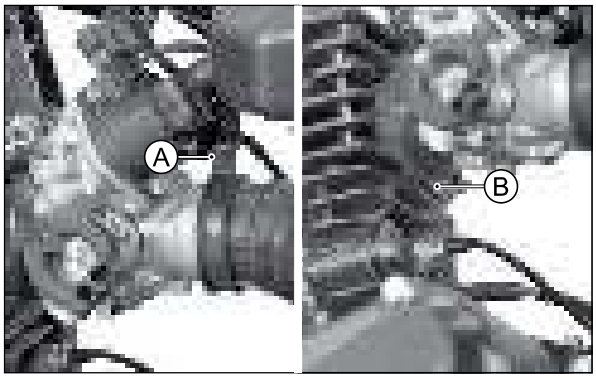


Fig. 3.27

- Remove the plug (A) using small flat screw driver from the adjuster assembly. (Fig. 3.28A)
- Using a small flat screw driver, lock the adjuster plunger by rotating it in clockwise direction. (Fig. 3.28B)

Small flat screw driver

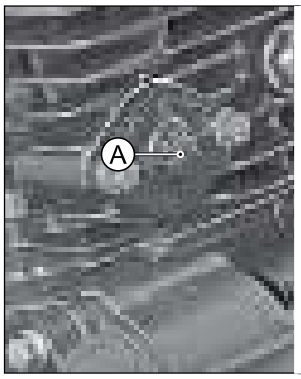


Fig. 3.28A

Fig. 3.28B

- Remove the hexagonal flange bolts (M6x16 - 2 Nos.) from the adjuster assembly mounting and take out the adjuster assembly along with a gasket. (Fig. 3.29)

8 mm spanner

Tightening torque	10 ± 2 Nm

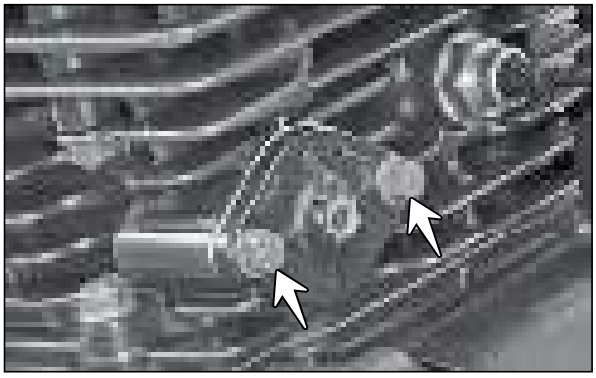


Fig. 3.29

- Remove the hose air cut valve of secondary air injection assembly by dislocating the hose clip. (Fig. 3.30)

Nose plier

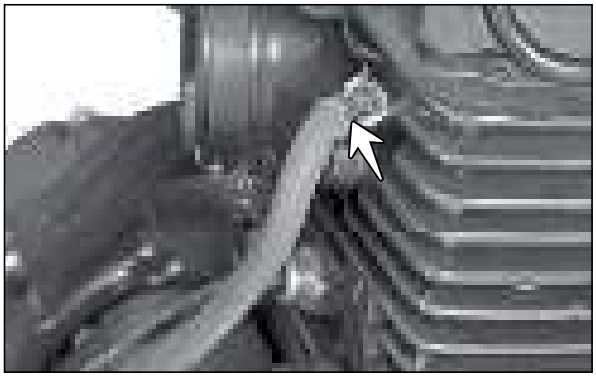


Fig. 3.30

- Remove the hexagonal bolt (M6x16 - 1 No.) along with wave spring washer from the mounting of pipe complete SAI (at cylinder block). (Fig. 3.31A)

- Remove the hexagonal bolt (M6x16 - 1 No.) from the mounting of pipe complete SAI (at magneto cover) and dislocate the pipe complete SAI. (Fig. 3.31B)

8 mm spanner	
Tightening torque	5.5 ± 0.5 Nm

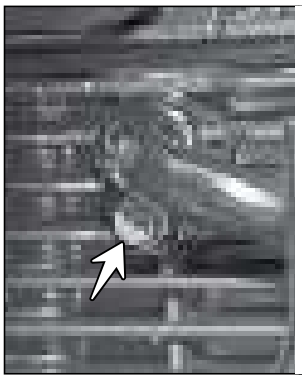


Fig. 3.31A

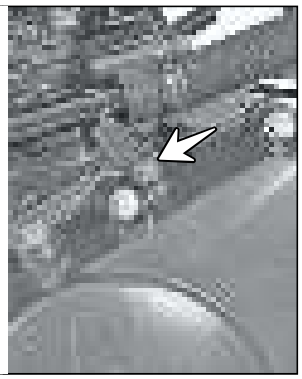


Fig. 3.31B

- Disconnect the wiring socket (A) of ignition coil from the wiring harness. (Fig . 3.32)

- Remove the hexagonal flange bolt (M6x20 - 2 Nos.) from the mounting of ignition coil assembly and take out the ignition coil. (Fig. 3.32)

10 mm spanner	
Tightening torque	5.5 ± 1 Nm

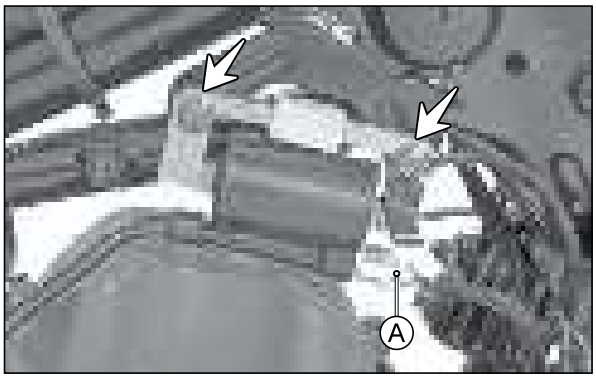


Fig. 3.32

- In-order to remove the muffler assembly, the engine guard needs to be removed.

- Remove the CRR pan head screw (M6x20 - 1 No.) along with plain washer from the top mounting of engine guard. (Fig. 3.33)

Phillips head screw driver	
Tightening torque	4.5 ± 1.5 Nm

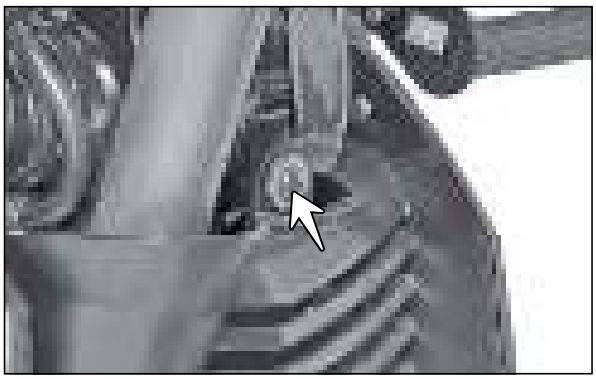


Fig. 3.33

- Remove the CRR pan head screw (M6x20 - 2 Nos.) along with plain washers from the LH and RH mounting of engine guard. (Fig. 3.34)

Phillips head screw driver	
Tightening torque	4.5 ± 1.5 Nm

- Gently takeout the engine guard as an assembly.

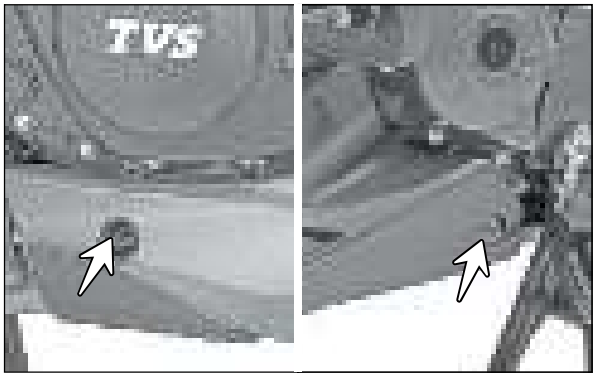


Fig. 3.34

- Pull the red color clip from the coupler and disconnect the O_2 sensor coupler from the wiring harness. (Fig. 3.35)

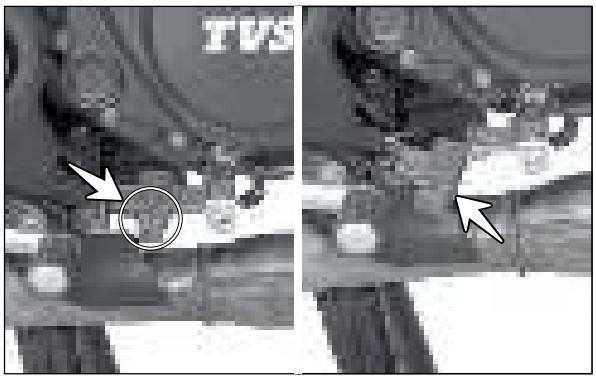


Fig. 3.35

- Remove the hexagonal socket head cap screw (M8x30 - 2 Nos.) from the muffler assembly front mounting. (Fig. 3.36A)
- Remove the hexagonal socket head cap screw (M8x25 - 1 No.) from the center mounting of muffler assembly with punched washer. (Fig. 3.36B)

6 mm allen key	
Tightening torque	18.1 ± 1.3 Nm

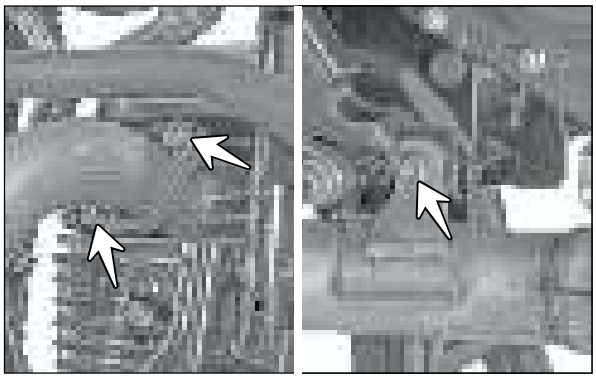


Fig. 3.36A Fig. 3.36B

- Remove the hexagonal bolt (M8x60 - 1 No.) from the muffler assembly rear mounting along with punched washer and 'U' nut. (Fig. 3.37)

12 mm spanner	
Tightening torque	19.6 ± 2 Nm

- Take out muffler assembly by dislocating from the cylinder head assembly.

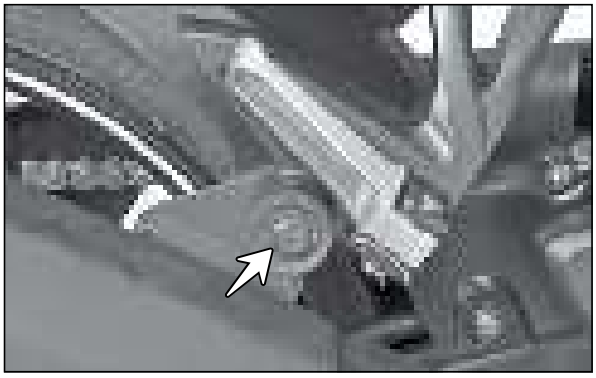


Fig. 3.37

- Remove the hexagonal flange nuts (2 Nos.) fastening the cylinder head assembly with the cylinder block. (Fig. 3. 38)

10 mm spanner	
Tightening torque	7 ± 1 Nm

Note:
Ensure to loosen the hexagonal flange nuts (2 Nos.) fastening the cylinder block with the crankcase first to avoid warpage of cylinder.

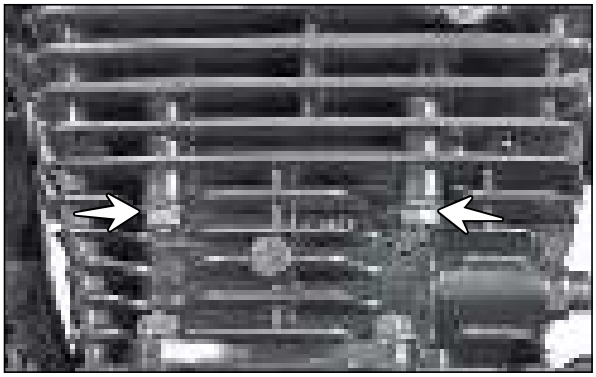


Fig. 3.38

- Remove the hexagonal flange bolt (M16x25 - 4 Nos.) from the cover cylinder head mounting. (Fig. 3.39)

10 mm spanner	
Tightening torque	10 ± 2 Nm

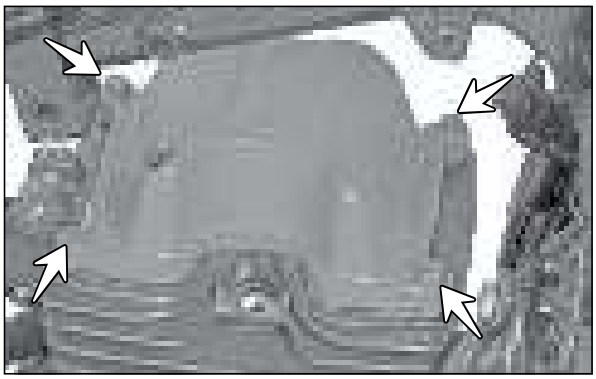


Fig. 3.39

- Dislocate the cover cylinder from the left hand side and take out.

- Take out the packing seal cover cylinder head. (Fig. 3.40)

Note:
While reassembling inspect the condition of the packing seal. If any distortion / damage is found, replace the packing with a new one.

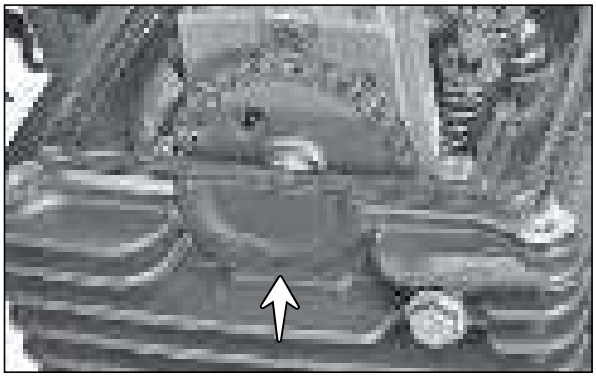


Fig. 3.40

- Slowly rotate the rear wheel and engage first gear.

- Now, remove the hexagonal flange bolt (M8x1.25 LH) from the cam shaft assembly. (Fig. 3.41)

10 mm spanner	
Tightening torque	18 ± 2 Nm

Caution:
Since left hand type thread is used in the bolt, it should be loosened in the opposite direction.

Note:
Apply ANABOND 112 thread locker during reassembly of the bolt.

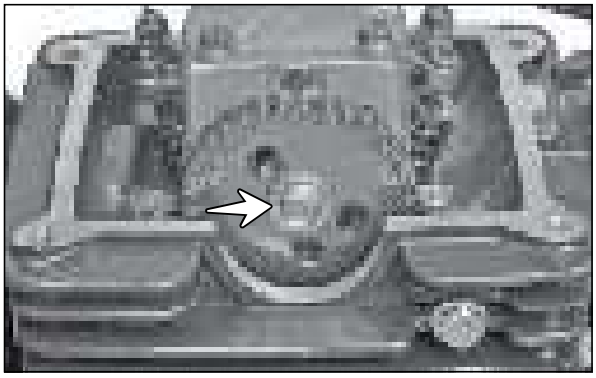


Fig. 3.41

- Gently pull out the sprocket cam shaft using nose plier and dislocate the cam chain from cam sprocket. (Fig. 3.42)

Caution:
Care should be taken not to drop the cam chain / spacer inside the crankcase assembly while dislocating.

Note:
Use a guide pin / screw driver to avoid falling of spacer

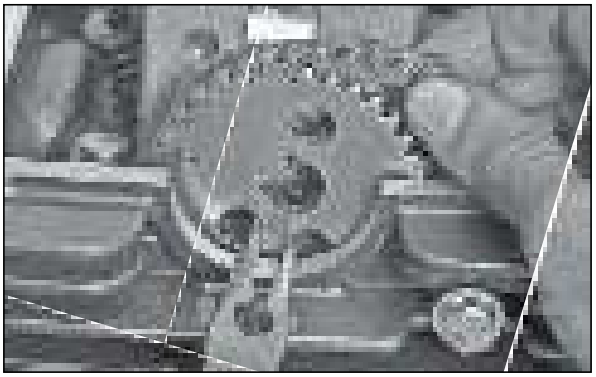


Fig. 3.42

- Hold the cam chain using a good quality copper wire to prevent the chain from falling into the crankcase assembly and hang it on the head assembly itself.

- Take out the washer camshaft sprocket from the camshaft. (Fig. 3.43)

Nose plier

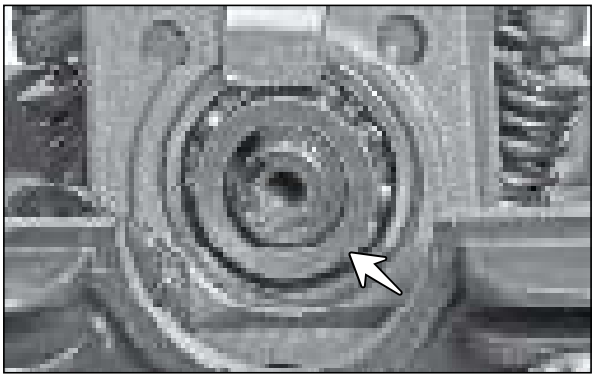


Fig. 3.43

- Take out the cam chain tensioner by removing the bolt cam chain tensioner along with washer cam chain tensioner. (Fig. 3.44)

12 mm spanner	
Tightening torque	12 ± 2 Nm

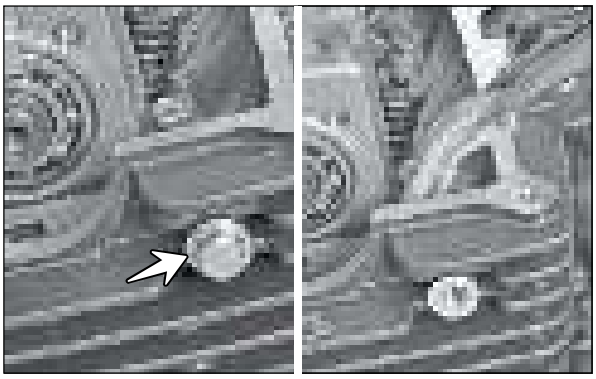


Fig. 3.44

- Remove the bolt cylinder head (4 Nos.) from the mounting of cylinder head complete. (Fig. 3.45)

12 mm spanner	
Tightening torque	24.5 ± 2.5 Nm

Note:
While reassembling, always tighten the cylinder head assembly bolts in criss-cross pattern to have uniform seating.

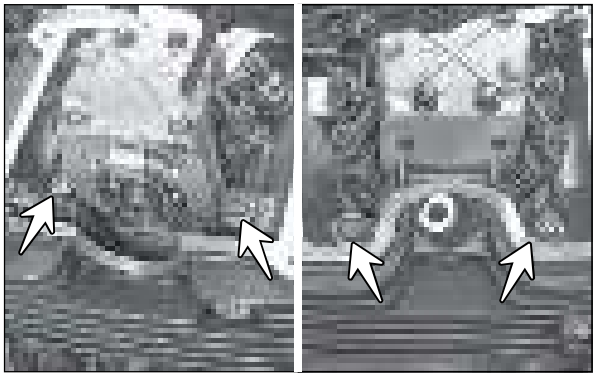


Fig. 3.45

- Remove punched washers (3 Nos.) and a copper washer (A) from the mounting surface of bolt cylinder head. (Fig. 3.46)

Caution:
While reassembling the bolt cylinder head at the right hand front side of the cylinder head assembly, always use copper washer to avoid oil leak.

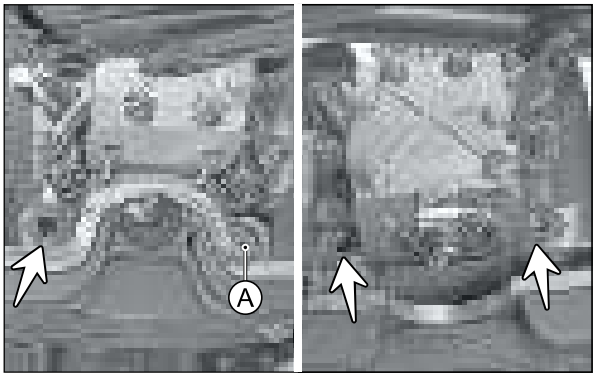


Fig. 3.46

- Gently lift and take out the cylinder head as an assembly while holding the cam chain. (Fig. 3.47)

Fig. 3.47

- Take out the tubular dowels (A) either from cylinder head assembly or from cylinder block. (Fig. 3.48)
- Take out the gasket cylinder head (B). (Fig. 3.48)

Note:
While reassembling, replace the gasket with a new one.

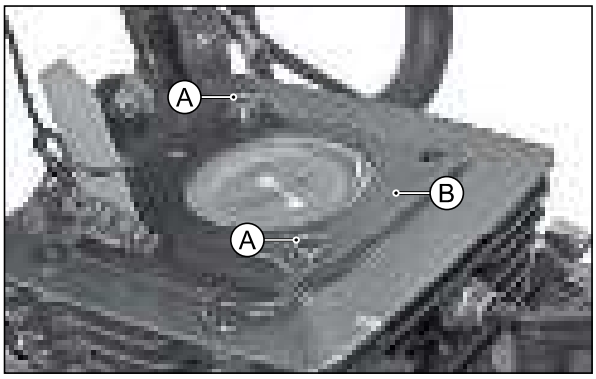


Fig. 3.48

CYLINDER HEAD ASSEMBLY

DISASSEMBLY

- Remove the REC CSK head screw (M6x16 - 2 Nos.) from the pipe intake complete mounting and take out the pipe intake along with a 'O' ring. (Fig. 3.49)

Phillips head screw driver	
Tightening torque	10 ± 2 Nm

Note:
While reassembling replace the 'O' ring with new one.

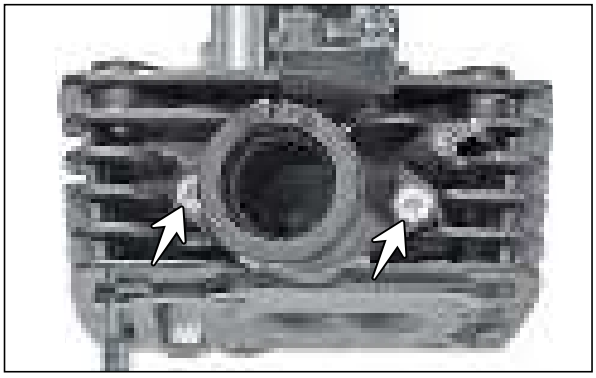


Fig. 3.49

- Remove hexagonal flange bolt (M6x25 - 4 Nos.) from the mounting of cylinder head assembly. (Fig.3.50)

8 mm spanner	
Tightening torque	7 ± 1 Nm

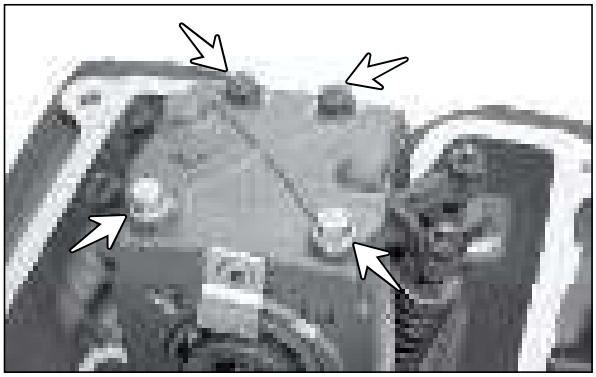


Fig. 3.50

- Remove the REC CSK head screw (M5x15 - 1 No.) from the stopper camshaft and dislocate and take out the stopper camshaft. (Fig. 3.51)

Phillips head screw driver	
Tightening torque	4 ± 1 Nm

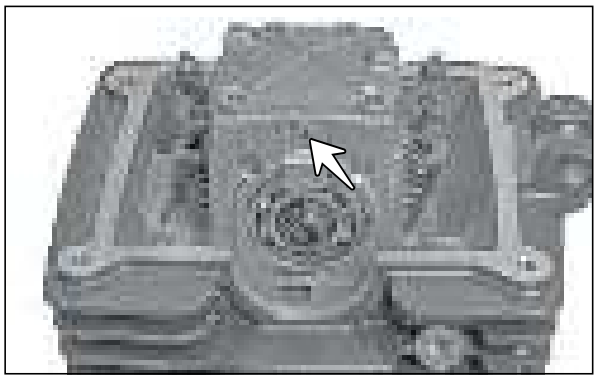


Fig. 3.51

- Take out the camshaft complete from the cylinder head complete.

- Using a flat screw driver, gently push out both the shaft rocker arms. (Fig. 3.52)

Caution :
While removing the shaft rocker arm, the needle bearing pins assembled inside the rocker arm may fall inside the cylinder head. Ensure to re-collect all the pins and fix it into the rocker arm without fail.

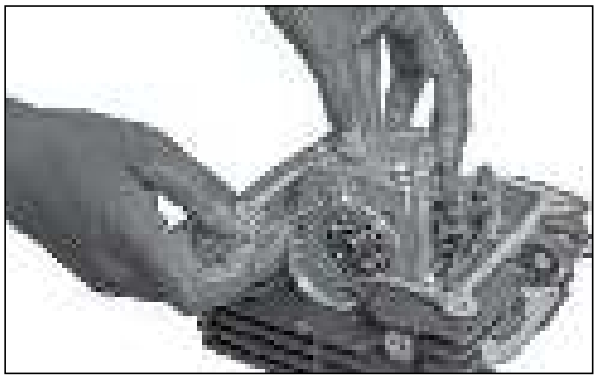


Fig. 3.52

- Take out both intake and exhaust rocker arm assemblies from the cylinder head assembly.

- Locate the special tool to remove the inlet valve as the movable jaw of the tool rests on the retainer valve spring (Fig. 3.53A) and the other end (fixed jaw) to rest at the center of the valve face. (Fig. 3.53B)

- Slowly tighten the special tool to compress the valve springs.

S131 002 0	Extractor assembly, inlet and exhaust valve

Caution:
Do not compress the spring more than required to prevent the spring from loss of tension

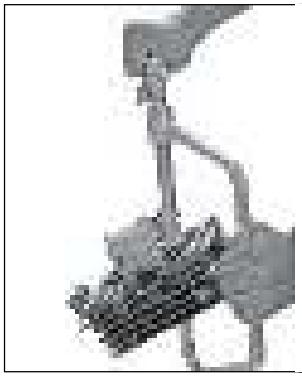


Fig. 3.53A

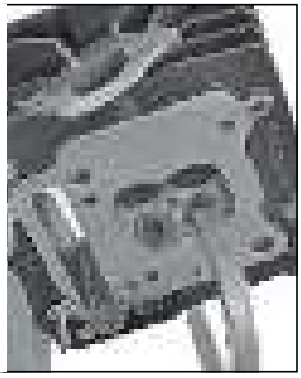


Fig. 3.53B

- Remove the cotter valves (2 Nos.) from the valve stem. (Fig. 3.54)

Nose plier

- Loosen and take out the special tool.
- Remove the cotters of other inlet valve in similar manner.

Fig. 3.54

- Remove the retainer valve springs and spring valves. (Fig. 3.55)

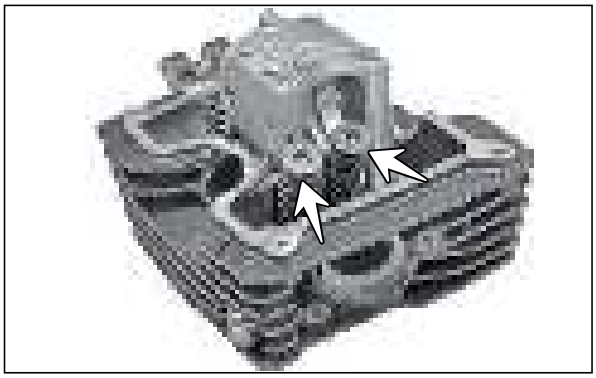


Fig. 3.55

- Gently push down the valves from the top and remove them from the combustion chamber side. (Fig. 3.56)

Note:
While removing the valves, check for the free movement of the valves. If there is no free movement, check the valves for bend and runout. Replace the valves incase of bend or runout.

Fig. 3.56

- Remove the seal valve stem oil from the valve guides. (Fig. 3.57)

Nose plier

Note:
While reassembling, replace the valve stem oil seals with a new ones.

Fig. 3.57

- Remove seat valve spring. (Fig. 3.58)

Nose plier

- Repeat the same procedure for removing the other side valves.

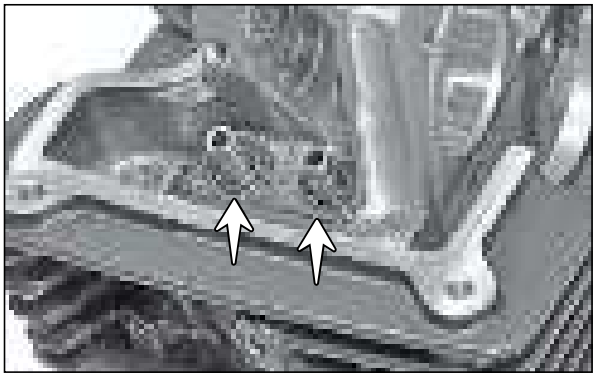


Fig. 3.58

- Using M6 nuts, remove stud bolt cylinder head (2 Nos.) from cylinder head complete. (Fig. 3.59)

10 mm spanner

Tightening torque	7 ± 1 Nm

Note:
Remove the stud bolts only if necessary. Else it may get spoiled.

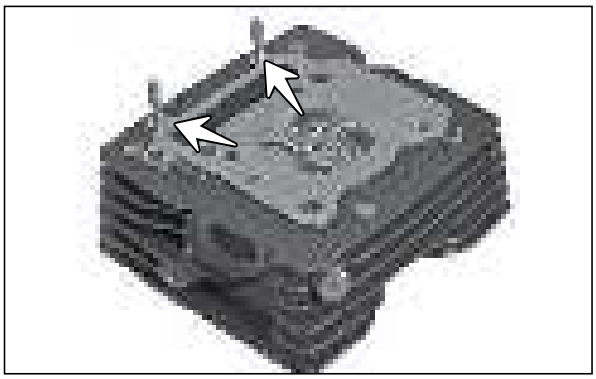


Fig. 3.59

DECARBONISING

Cylinder Head Complete

- Carbon deposits on the combustion chamber of the cylinder head complete will increase the compression ratio which will result in pre-ignition and overheating. Carbon deposited at the exhaust manifold will prevent smooth flow of exhaust, thereby reducing the engine power output.

- Decarbonise the combustion chamber of cylinder head complete using suitable decarbonising spray. (Fig. 3.60)

Note:
Decarbonise the head complete cylinder combustion chamber after removing both the valves. Use suitable cleaning solvent.

Caution:
Care should be taken not to damage the surface of the combustion chamber while decarbonising.

Fig. 3.60

Seat Valve

- Carbon deposition on valve seating will cause valves not to seat properly thereby causing leakage and affects idling, pickup and mileage. Also leads to erratic running and starting trouble.

Valve and Valve Guide

- Carbon deposits on the valve stem rubs continuously on guide valve and results in increased clearance between the stem and guide valve. Clean the valve stem with suitable cleaning solvent. (Fig. 3.61) Repeat with other valves.

- Clean the guide valve to remove any carbon buildup by using carbon removers. Clean other parts of head complete cylinder thoroughly with suitable cleaning solvent. Repeat with other valves.

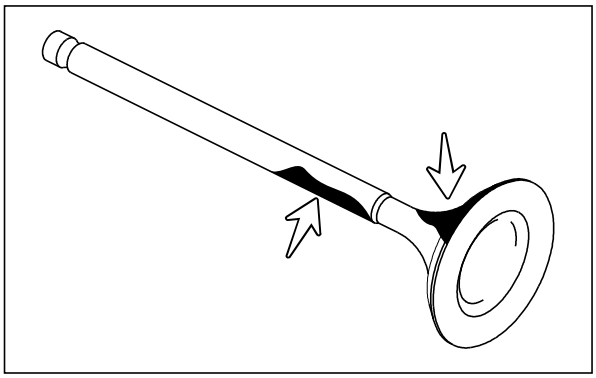


Fig. 3.61

INSPECTION

Head Complete Cylinder

- After cleaning the liquid gasket from the surface of the cylinder head complete, inspect the surface for any scratches, high and low spots. If noticed, remove them using a fine emery paper (400 grade) placed over the surface plate. (Fig. 3.62)

Surface plate

Fig. 3.62

- Using a feeler gauge, check for the distortion of surfaces of the cylinder head complete. If the reading exceeds the limit, replace the head complete cylinder with a new one. (Fig. 3.63)

Feeler gauge
Surface plate

Service limit	0.050 mm (max)

Fig. 3.63

Shaft Valve Rocker Arm

- Inspect the shaft valve rocker arm for any damage. Measure the outer diameter (OD) of shaft valve rocker arm. If the OD is less than the service limit, replace the shaft. (Fig. 3.64) Repeat with other rocker arm shafts.

Outside micrometer	
Service limit	8.000 ~ 7.991

Note:
The OD should be checked at the arm complete valve rocker seating area.

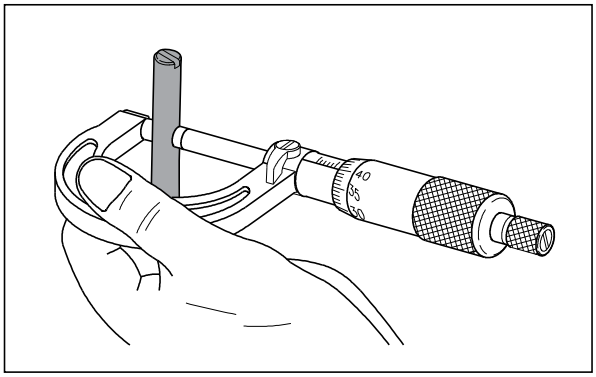


Fig. 3.64

Arm Complete Valve Rocker

- The arm complete valve rocker has a roller follower. The roller follower is a steel roller housed with a needle bearing. This has been provided to decrease the load exerted by the valve train on engine by reducing the friction. (Fig. 3.65)

- Inspect this roller for its free rotation and for any physical damage on its surface. Found if any replace the arm.

- There are needle bearings assembled on both the side of the arm at shaft seating area. Inspect these bearings for any abnormality. Replace the arm if found any abnormality.

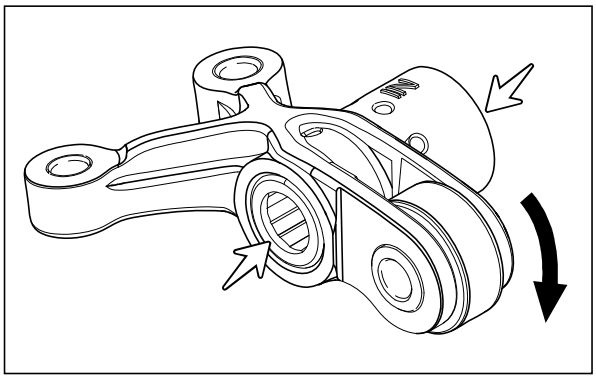


Fig. 3.65

Caution:
Each needle bearing of arm complete valve rocker has 20 needles in it. Ensure the availability of all the 20 needles before reassembling the arm as the needles may fall during removal of the arm from the cylinder head assembly.

Additional care should be taken during reassembly of the arm in the cylinder head because the rollers may fall during reassembly also.

Camshaft Assembly

- Check the camshaft assembly for runout, wear of cam lobes and journals. Any of these could cause the engine to produce abnormal noise, vibration or lack of power output.

- Measure the cam lobe height. If the lobe height is less than the service limit, replace the camshaft complete with a new one. (Fig. 3.66)

Outside micrometer

Service limit	
Inlet	33.35 mm (min)
Exhaust	33.20 mm (min)

- Inspect the ball bearings of camshaft for abnormal play, shake or pitting.

- Measure the runout of the camshaft with a dial gauge. Replace the camshaft with a new one if the runout exceeds the service limit. (Fig. 3.67)

V-block set (4"x3"x3")

Dial gauge (1/100 mm) / Magnetic stand

Service limit	0.080 mm (max)

Valve Intake and Valve Exhaust

- Inspect each valve for trueness, burning, scratches, abnormal wear or bend. Measure the outside diameter of valve stem on the operational area. (Fig. 3.68)

Outside micrometer

Service limit	
Inlet	4.470 ~ 4.455 mm (min)
Exhaust	4.485 ~ 4.470 mm (min)

- Using the special tools, measure the runout on valve stem and valve head. Replace the valve with new one if runout exceeds the service limit. (Fig. 3.69)

V-Block set (4"x3"x3")

Dial gauge (1/100 mm) / Magnetic stand

Service limit	
Runout on stem	0.050 mm (max)
Runout on head	0.075 mm (max)

- Check the valve for smooth movement in the guide valve.

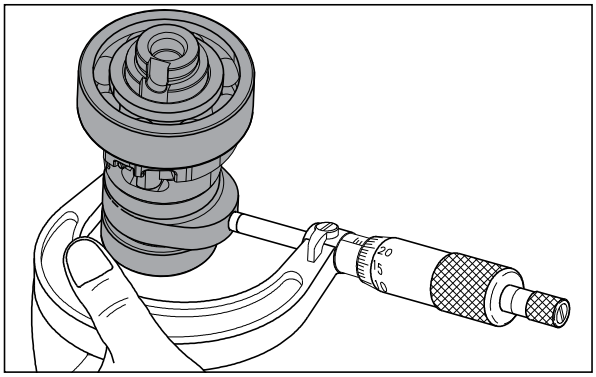


Fig. 3.66

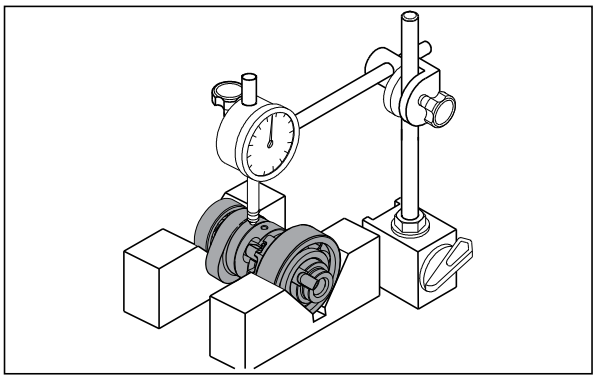


Fig. 3.67

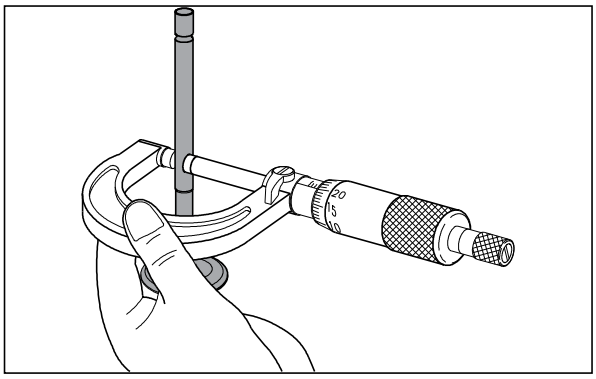


Fig. 3.68

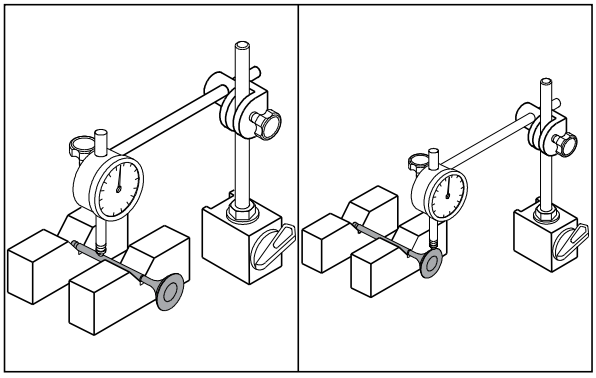


Fig. 3.69

- Measure the thickness of valve head. If the thickness is less than the service limit, replace the valve with a new one. (Fig. 3.70)

Vernier caliper

Service limit	
Inlet and exhaust	0.500 mm (min)

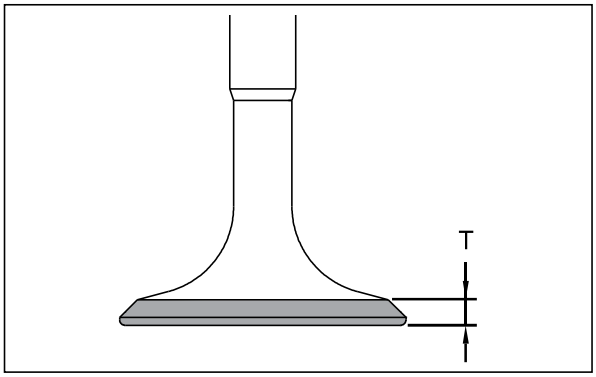


Fig. 3.70

Valve Stem Condition

- Inspect the valve stem end face (A) for pitting and wear. If pitting or wear noticed, replace the valve with a new one. (Fig. 3.71)

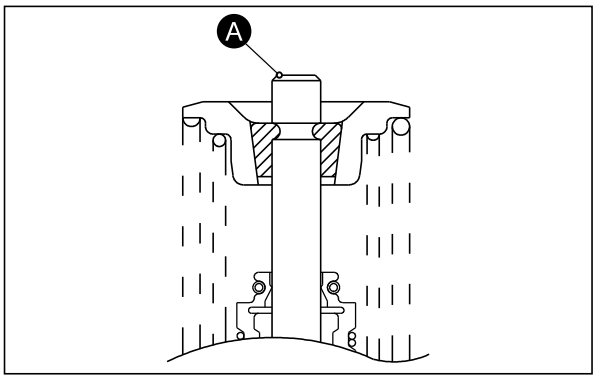


Fig. 3.71

Spring Valve

- Measure the free length of the valve springs. If the length is smaller than the service limit, replace the springs. (Fig. 3.72)

Vernier caliper

Service limit	
Spring length (inner)	38.75 mm (min)
Spring length (outer)	38.75 mm (min)

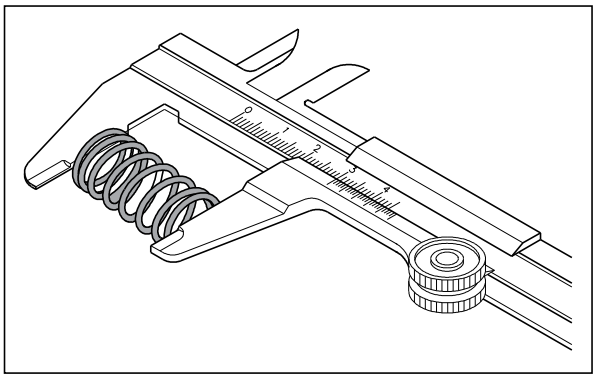


Fig. 3.72

Tensioner Cam Chain

- Inspect the tensioner cam chain for any distortion / damage, cuts or crack. If found any, replace the tensioner with new one. (Fig. 3.73)

- After assembling the tensioner cam chain, make sure it moves freely in the cylinder head assembly.

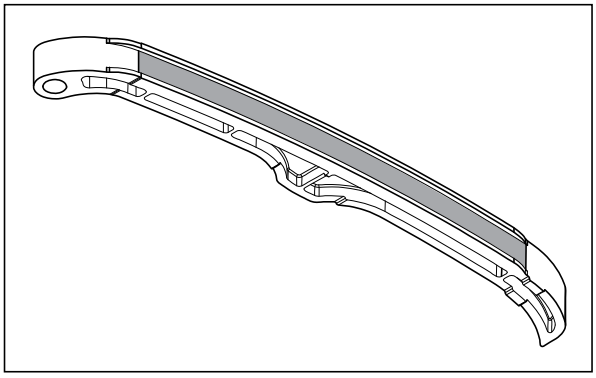


Fig. 3.73

Cam Chain

- Visually inspect the cam chain for loose pins, twist / seized links etc. If found any replace the cam chain with a new one. (Fig. 3.74)

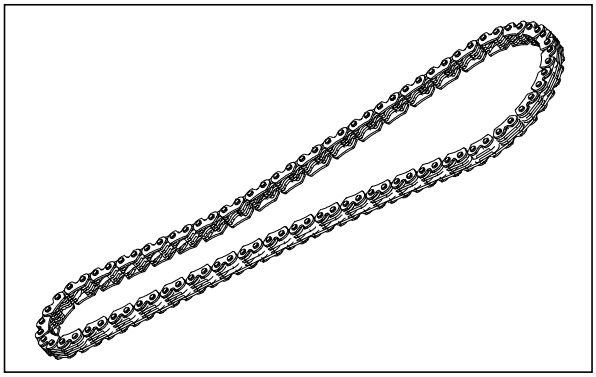


Fig. 3.74

REASSEMBLY

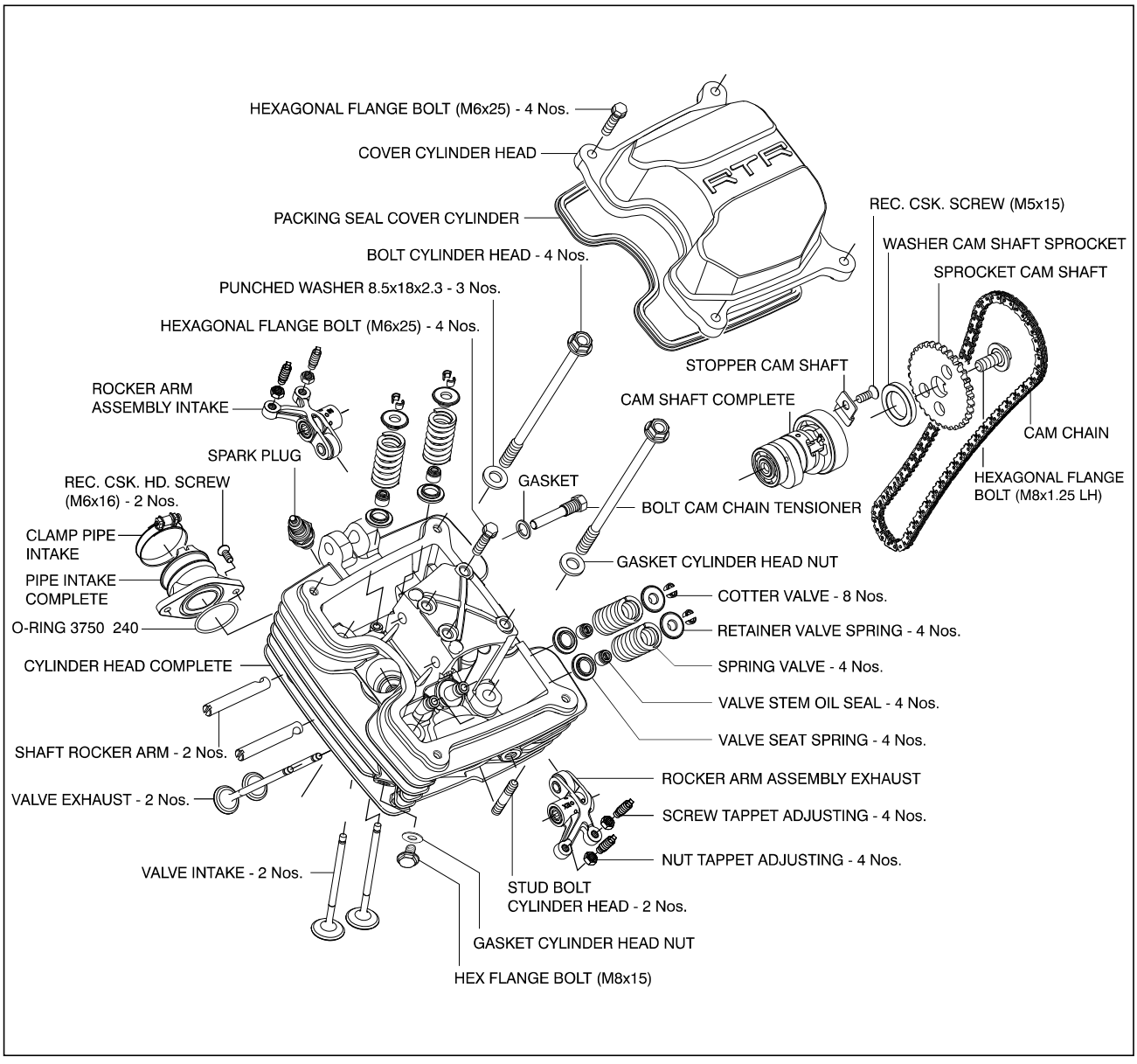


Fig. 3.75

Head Complete Cylinder

- For reassembly, reverse the disassembly procedure while taking care of the following instructions. Refer exploded view of cylinder head assembly for assembly details. (Fig. 3.75)

Note:
Use only new 'O' rings and oil seals. Do not use old ones.

- Assemble the seat valve spring and a new seal valve stem oil.
- While assembling the valves, insert smoothly into the guide to avoid any damage to the seal valve stem oil.
- Assemble the valve spring and retainer valve spring.
- Using the special tool compress the spring and assemble the cotter valves.

Note:
The diameter of intake valves are larger than the diameter of exhaust valves. Lubricate the valve stems before installing.

Ensure proper seating of the cotter valves in its groove by gently tapping on retainer valve spring. (Fig. 3.76)

Fig. 3.76

- After assembling the valves, pour petrol into the intake port and look for leakage of the petrol around valve intake seating. (Fig. 3.77)
- Similarly check the exhaust valves also.
- If any leakage noticed, replace the defective parts (valves or cylinder head assembly).

Note:
While checking the exhaust valves, close the secondary air injection port opening to avoid petrol leakage.

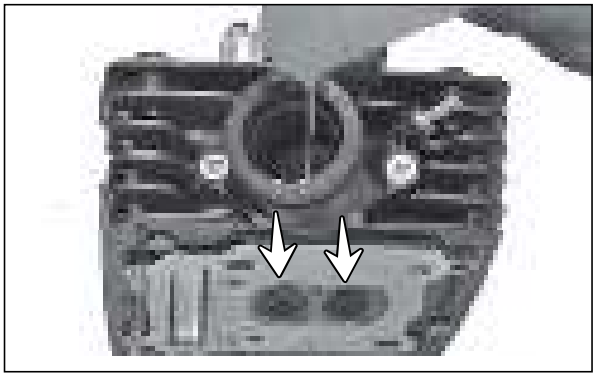


Fig. 3.77

CYLINDER HEAD ASSEMBLY - RE-FIXING

- Reassemble the parts carefully in the reverse order of removal.
- Remove plug TDC (A) along with the gasket. (Fig. 3.78)

17 mm spanner	
Tightening torque	27.5 ± 2.5 Nm

- Remove plug crankshaft hole (B). (Fig. 3.78)

10 mm allen key	
Tightening torque	10 ± 2 Nm

- Ensure that the transmission is in neutral and align the TDC mark (A) on rotor assembly with center of the inspection hole provided in the cover magneto by rotating the rotor assembly. (Fig. 3.79)

17 mm tubular spanner

- Assemble the sprocket camshaft along with the cam chain in the camshaft complete while aligning the sprocket camshaft mark (A) with the cylinder head surface (B) towards exhaust side. (Fig. 3.80)
- Apply Anabond 112 thread locker to the sprocket cam shaft mounting bolts and then assemble and tighten the mounting bolts.

10 mm spanner	
Tightening torque	18 ± 2 Nm

Caution:
Since left hand thread is used in the bolt, it should be tightened in the opposite direction.

- Set the tappet clearance as explained in chapter "Periodic maintenance" page no. 2-20.
- Reassemble the cover cylinder head, muffler assembly, ignition coil assembly and carburettor assembly.

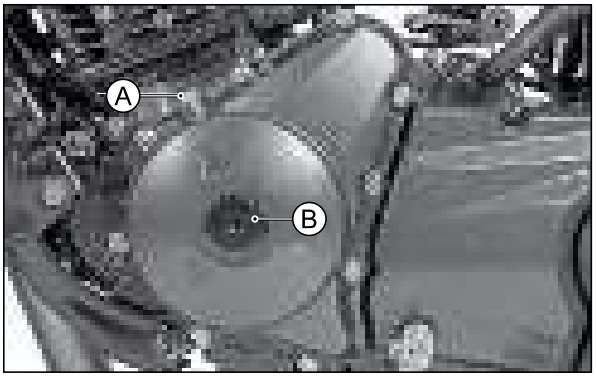


Fig. 3.78

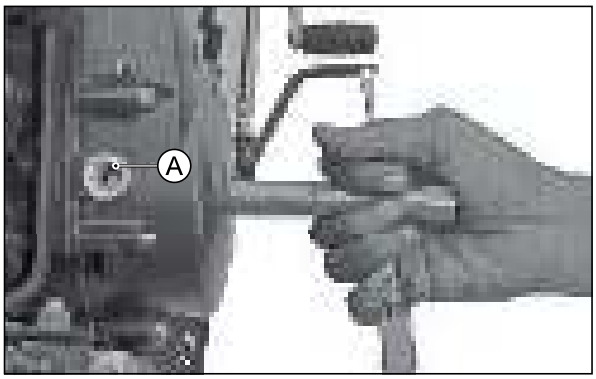


Fig. 3.79

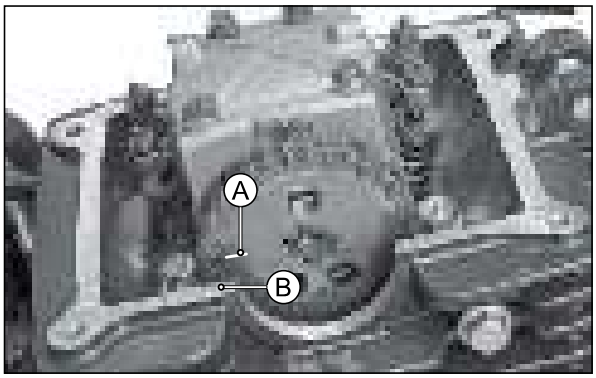


Fig. 3.80

- Assemble the spark plug and connect the suppressor cap.
- Reconnect the pipe complete SAI to the cylinder head assembly.
- Refill the engine cum transmission oil as explained in chapter "Periodic maintenance" page no. 2-12 and ensure its level.

CYLINDER BLOCK, PISTON AND RINGS
PISTON - SERVICING

REMOVAL

- Remove the cylinder head assembly as explained earlier.
- Disconnect the thermal sensor wiring socket from the main wiring harness. (Fig. 3.81)

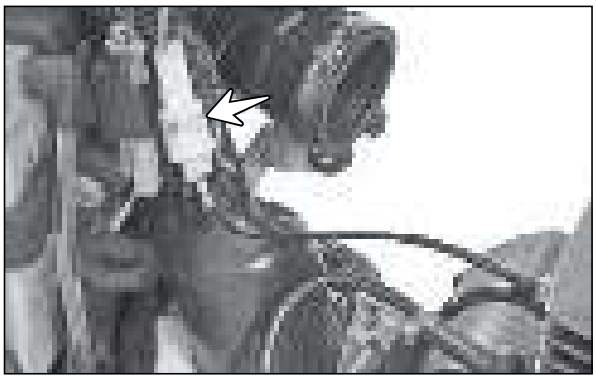


Fig. 3.81

- Pull out the guide cam chain (A) from the cylinder block. (Fig. 3.82)

Fig. 3.82

- Remove the hexagonal flange nut (M6 - 2 Nos.) from the mounting cylinder block with the crankcase. (Fig. 3.83)

10 mm spanner	
Tightening torque	7 ± 1 Nm

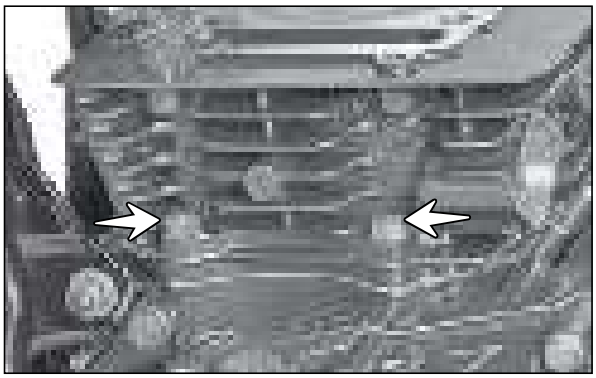


Fig. 3.83

- Gently pull out the cylinder block while holding the connecting rod by hand to avoid any damage to the piston assembly and crankcase. (Fig. 3.84)

Fig. 3.84

- Remove the gasket cylinder (A) and tubular dowel (B) (2 nos). (Fig. 3.85)

Nose plier

- Place a clean cloth in the crankcase assembly bore to prevent the circlip pin piston from falling inside the crankcase while removing.

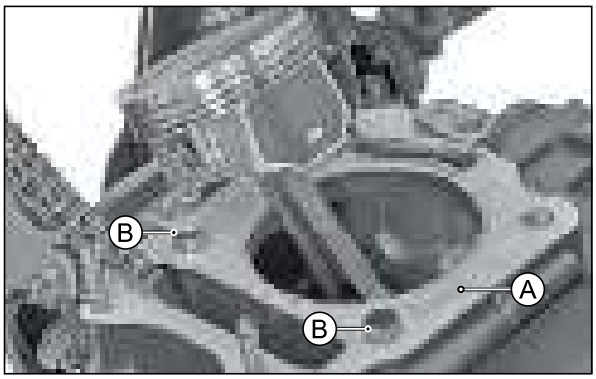


Fig. 3.85

- Remove the circlip pin piston from any one side of the piston. (Fig. 3.86)

Nose plier

Note:
Close the crankcase bore using clean cloth to avoid circlip falling inside the crankcase bore.

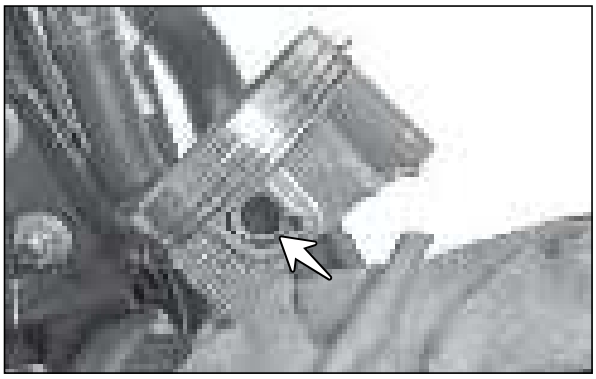


Fig. 3.86

- Gently push and take out the piston pin from the piston and then take out the piston along with the rings. (Fig. 3.87)

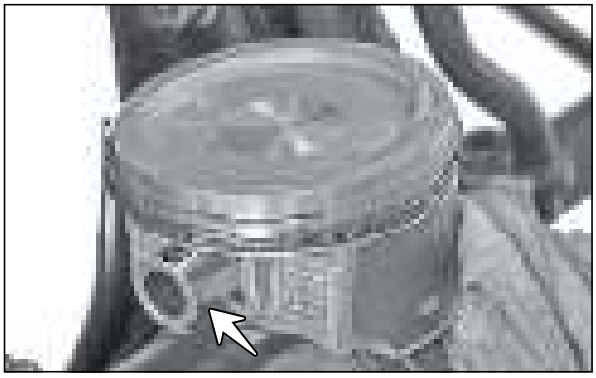


Fig. 3.87

INSPECTION

Guide Cam Chain

- Inspect the guide cam chain for any distortion / damage, cuts or crack. If found any, replace the guide with new one. (Fig. 3.88)

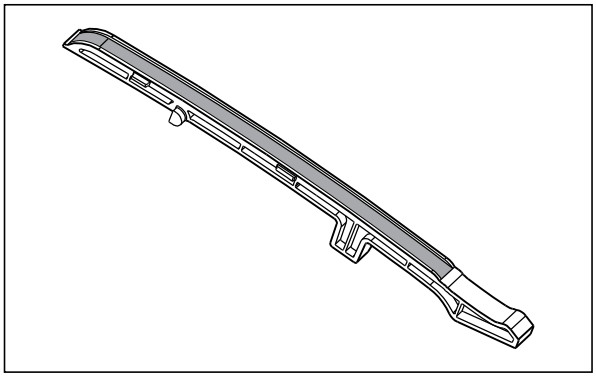


Fig. 3.88

Cylinder Block

- Clean the gasket cylinder and adjuster tensioner gasket seating areas if any gasket material is stuck. Do not scrape the surfaces.

- Measure the cylinder block ID (bore) using the bore gauge. Cylinder bore should be checked in two axis with reference to the cylinder axis at three locations as shown in the figure. (Fig. 3.89 & Fig. 3.90)

Bore gauge

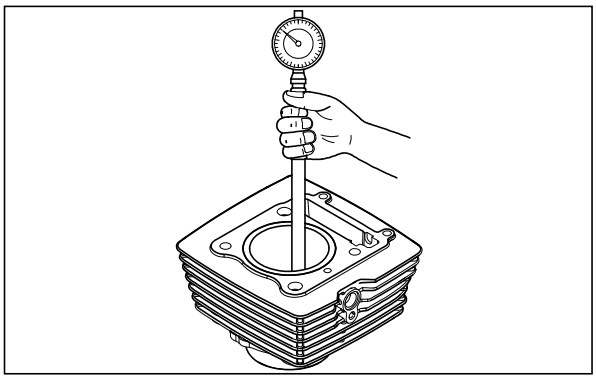


Fig. 3.89

- If the wear exceeds the service limit, replace the cylinder block or rework the cylinder to next oversize by using a boring machine. The cylinder must be honed after boring.

- The cylinder blocks are manufactured with slightly increasing diameters which are all identified with their respective colour and codes as below:

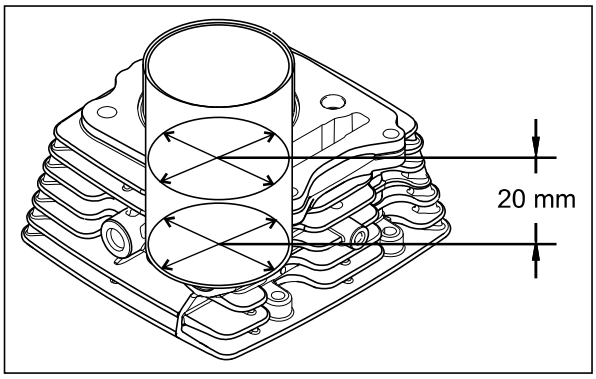


Fig. 3.90

Size	Grade	Standard (in mm)	Service Limit (in mm)
–	U	62.000 ~ 62.005	62.115
–	V	62.005 ~ 62.010	
–	W	62.010 ~ 62.015	
1st OS	PINK	62.256	–
2nd OS	WHITE	62.506	–

Note:
Minor surface flaws on the cylinder wall due to seizure or similar abnormalities may be corrected by using fine emery paper (400 grade). If the flaws are deep grooves, the cylinder must be reworked to the next oversize or replaced.

Piston

- Remove the ring piston top (1st) (A), piston ring 2nd (B) and oil rails (C) along with spacer (D). (Fig. 3.91)

Caution:
Do not expand the rings more, it may lose it's mechanical properties.

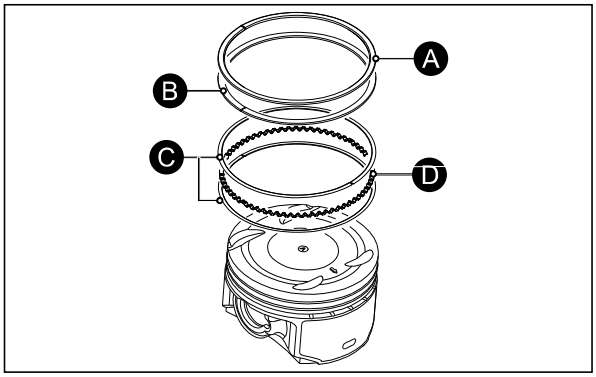


Fig. 3.91

- Decarbonise the piston and piston ring grooves. After cleaning the grooves, fit the rings and rotate them in their respective grooves to make sure that they rotate freely. (Fig. 3.92)

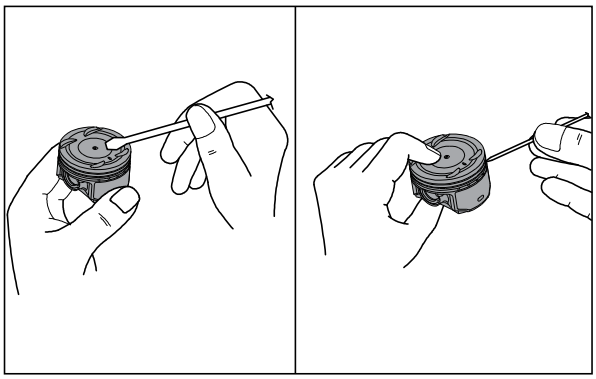


Fig. 3.92

- Carbon in the grooves is liable to cause the rings piston to stuck in the grooves, and this will lead to reduced engine power output.

Note:
While cleaning the ring grooves of the piston, take care not to damage the grooves. Use an old broken ring to clean the grooves.

- If a piston sliding surface is badly scored or scuffed due to overheating, it must be replaced. Shallow grooves or minor scuff can be removed by smoothening with a fine emery paper (400 grade). (Fig. 3.93) Inspect the piston for damage or crack. Replace if required.

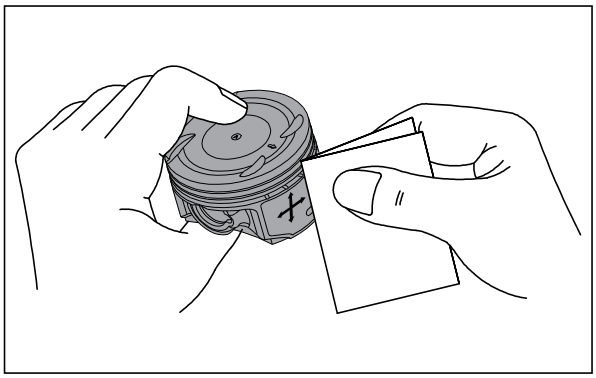


Fig. 3.93

- Measure the diameter at the right angle to the pin piston and at a point which is 10 mm from the bottom to check wear. If the diameter is lower than the service limit, replace the piston. (Fig. 3.94)

Outside micrometer

Size	Grade	Standard (in mm)	Service Limit (in mm)
–	U	61.965 ~ 61.970	61.875
–	V	61.970 ~ 61.975	
–	W	61.975 ~ 61.980	
1st OS	PINK	61.215 ~ 61.220	–
2nd OS	WHITE	61.465 ~ 61.470	–

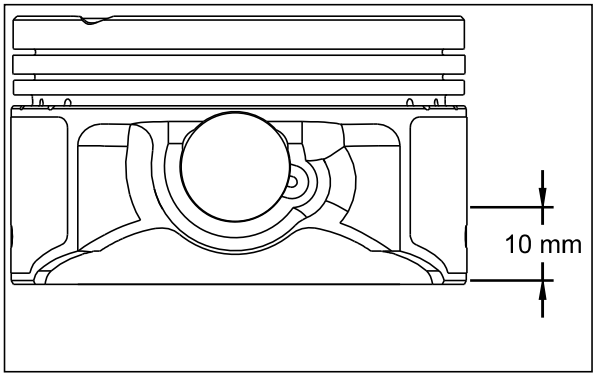


Fig. 3.94

- Cylinder to piston clearance is the difference between piston diameter and bore diameter.

- Check the pin piston bore ID of piston for wear. (Fig. 3.95)

Inside micrometer	
Service limit	15.030 mm (max)

- If the ID is more than the service limit, replace the piston with a new.

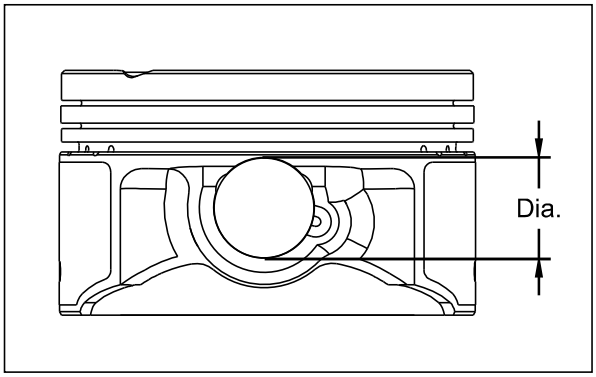


Fig. 3.95

Piston pin

- Check the piston pin OD using a micrometer. (Fig. 3.96) If the reading less than the service limit replace the pin piston. Other wise the pin may create unwanted noise.

Outside micrometer	
Service limit	14.992 mm (min)

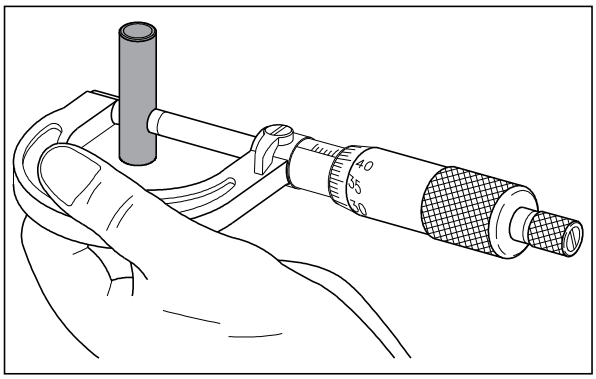


Fig. 3.96

Rings piston

- Inspect the piston rings for distortion, it will cause the rings to stick or roll in the grooves. Replace the distorted rings.
- As the rings wear out, its end gap increases resulting in reduced engine power output.
- The rings (Top and 2nd) closed end gap should be checked to assess the serviceability of the ring piston.
- Install the ring in the cylinder block, using the piston, push the ring into the cylinder block bore at 20 mm from the bottom. This will make the ring to seat squarely in the cylinder block. Using a feeler gauge measure the close end gap. (Fig. 3.97)
- If the gap exceeds the limit, replace rings with new ones.

Feeler gauge	
Service limit	0.700 mm (max)

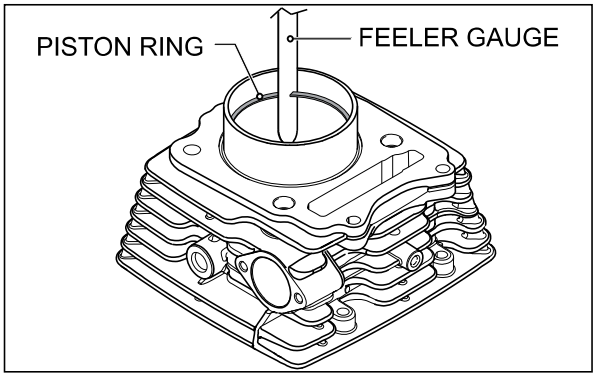


Fig. 3.97

REASSEMBLY

- Assemble back and align the piston rings in the following manner while taking care of the points given below:

> ***Note:***
> ***Avoid damage to the piston skirt surface and rings piston during installation.***

- Assemble the 4th ring (spacer) in the third groove of piston in such away that its triangle shaped end (butt end) facing upwards (triangle facing towards piston top). (Fig. 3.98)

> ***Caution:***
> ***Always assemble the 4th ring (spacer) first. Because this will accommodate the oil rails top and bottom.***

- Assemble the 5th ring (oil rail bottom) and ensure it is seated properly in the groove (at spacer). (Fig. 3.99)

- Now, assemble the 3rd ring (oil rail top) and ensure it is seated properly in the groove (at spacer). (Fig. 3.99)

- Install the ring piston 1st and ring piston 2nd with the marking on the ring 'TOP1' and 'TOP2' (Fig. 3.99 & Fig. 3.100) facing up (mark facing towards piston top).

> ***Note:***
> ***Before aligning the piston rings, ensure the rings are rotating freely in its grooves without any obstruction.***

- Align the ring piston 1st in such a way that the end gap of the ring is located at the inlet side of the piston (opposite to exhaust mark) as shown. (Fig. 3.101)

- In similar manner, align the ring piston 2nd in such a way that the end gap of the ring is located at 120 degree from the first ring end gap as shown. (Fig. 3.101)

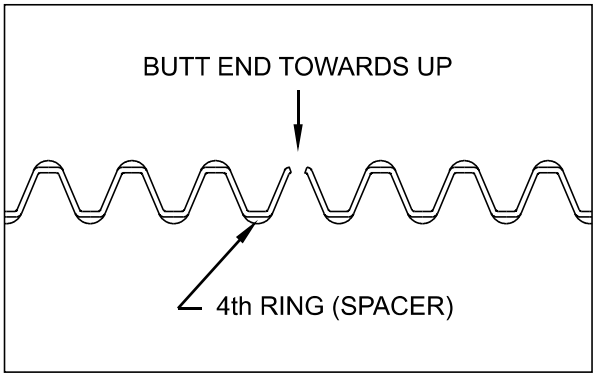


Fig. 3.98

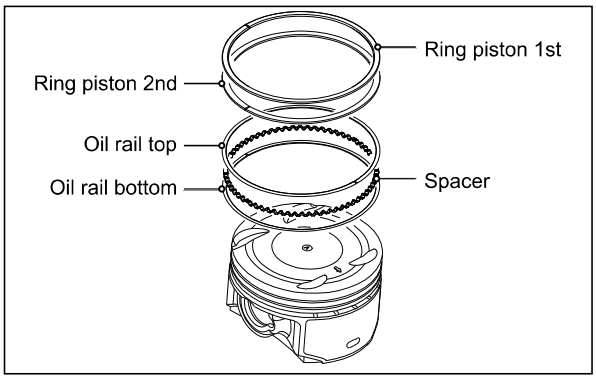


Fig. 3.99

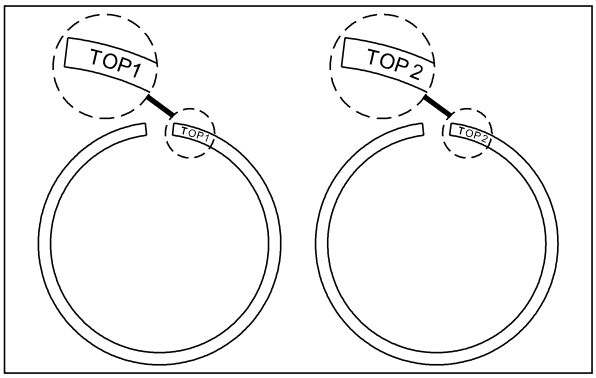


Fig. 3.100

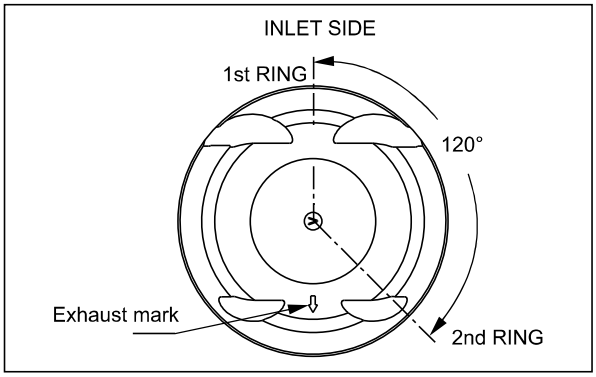


Fig. 3.101

- Align the end gap of 3rd ring (oil rail top) at 90 degree from the end gap of the second ring as shown. (Fig. 3.102)
- Similarly, align the end gap of 4th ring (spacer) at 90 degree from the end gap of the third ring as shown. (Fig. 3.102)

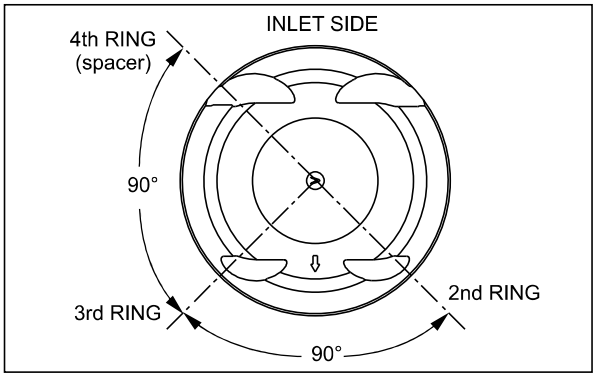


Fig. 3.102

- Align the end gap of 5th ring (oil rail bottom) at 90 degree from the end gap of the fourth ring (spacer) as shown. (Fig. 3.103)
- Assemble the piston into the crankshaft in such a way that the arrow mark indicated in the piston crown should face towards the exhaust port of the cylinder. (Fig. 3.104)

Note:
Carefully install the circlip pin piston in its groove. Else it may come out from piston during engine running and damage the cylinder block and piston assembly.

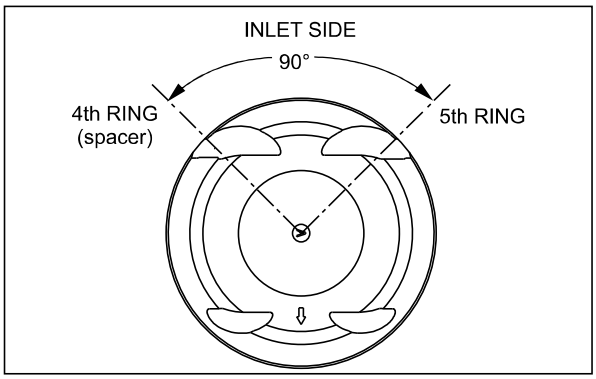


Fig. 3.103

- While installing the cylinder block slightly lubricate inner wall of the cylinder with fresh 4T oil.
- Reassemble the parts carefully in the reverse order of removal.
- Align the TDC mark on the rotor assembly with the crankcase mark by rotating the rotor assembly (refer page no. 3-24).
- Set the tappet clearance as explained in chapter "Periodic maintenance" page no. 2-20.
- Reassemble the cover cylinder head, muffler assembly, ignition coil assembly and carburettor assembly. Assemble the spark plug and connect the suppressor cap.
- Reconnect the pipe complete SAI to the cylinder head assembly.
- Refill the engine cum transmission oil as explained in chapter "Periodic maintenance" page no. 2-12 and ensure its level.

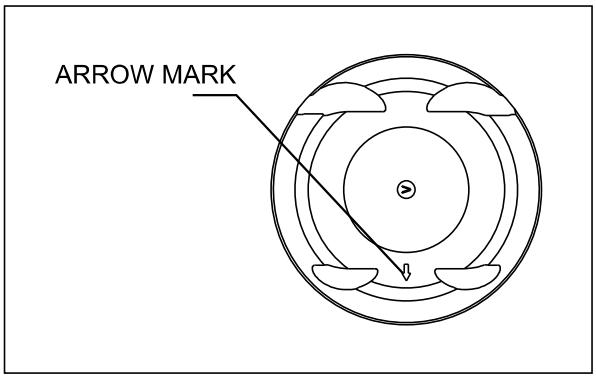


Fig. 3.104

GEAR BOX ASSEMBLY, CRANK SHAFT ASSEMBLY AND BALANCER SHAFT ASSEMBLY- SERVICING

- Only to repair or replace gears, clutch shaft assembly, drive shaft assembly, crankshaft assembly and the balancer shaft assembly, the crankcases needs to be separated.
- Remove the clutch assembly as explained earlier (refer page no. 3-2 for removal procedure).
- Remove the cylinder head assembly, cylinder block and piston as explained earlier (refer page. 3-8 & 3-25 for removal procedure).
- Refer chapter "Fuel lubrication and exhaust system" page no. 4-19 for SAI unit removal procedure.

REMOVAL OF ENGINE ASSEMBLY FROM THE VEHICLE

- Remove hexagonal screw (M6x20 - 1 No.) from the arm gear shifter lever mounting. (Fig. 3.105)

10 mm spanner	
Tightening torque	10 ± 2 Nm

- Gently pull out the gear shift lever from the shaft assembly gear shift.
- Remove CRR pan head screw (M6x20 - 2 Nos.) from the cover engine sprocket and take out cover engine sprocket. (Fig. 3.106)

Philips head screw driver	
Tightening torque	10 ± 2 Nm

- Remove hexagonal screw (M5x10 - 2 Nos.) from the lock plate engine sprocket mounting. (Fig. 3.107)

8 mm spanner	
Tightening torque	8 ± 1 Nm

- Take out the lock plate sprocket by rotating and dislocating it from the shaft complete drive grooves.

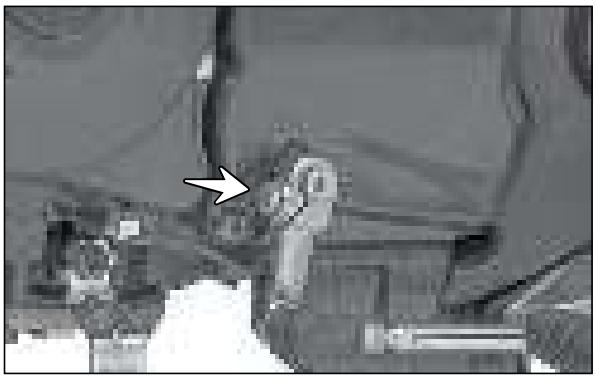


Fig. 3.105

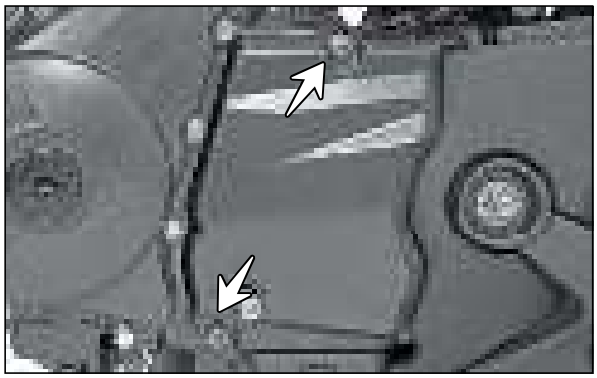


Fig. 3.106

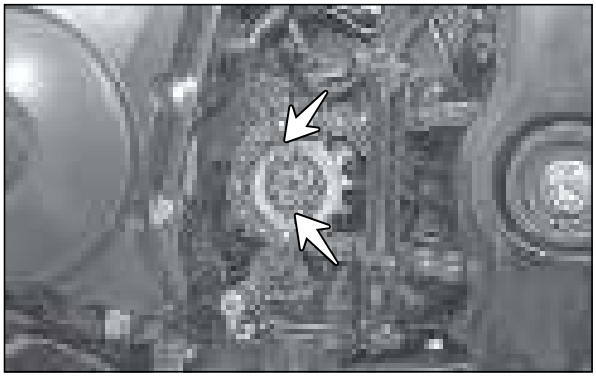


Fig. 3.107

- Pull out the sprocket engine along with drive chain assembly from shaft drive. (Fig. 3.108)
- Dislocate sprocket from the drive chain. Hang the drive chain in the frame itself.

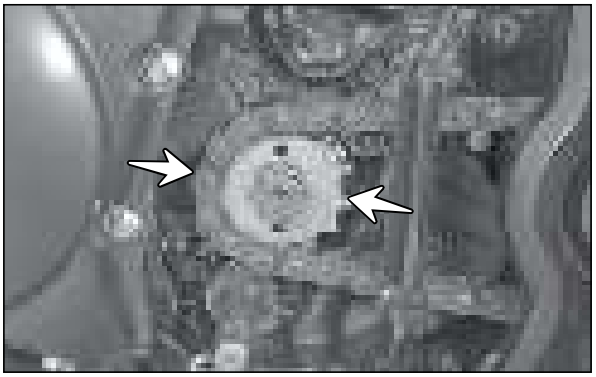


Fig. 3.108

- Disconnect the speed sensor wiring socket from the main wiring harness. (Fig. 3.109)

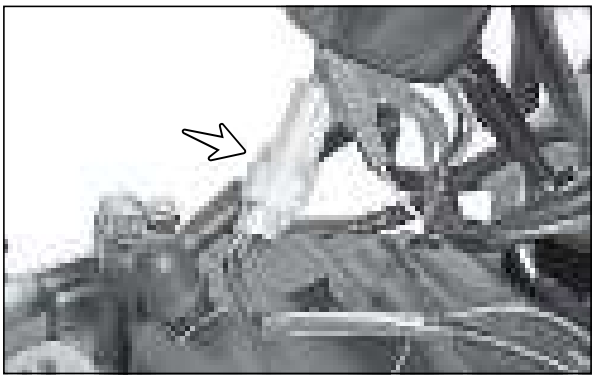


Fig. 3.109

- Remove hexagonal bolt (A) (M6x16 - 1 No.) and dislocate the guide speed sensor (B). (Fig. 3.110A)
- Remove the hexagonal bolt (C) (M6x16 - 2 Nos.) from the retainer oil seal drive shaft and take out the retainer (D). (Fig. 3.110B)

8 mm spanner	
Tightening torque	10 ± 2 Nm

- Gently pull out the speed sensor (E) along with guide speed sensor. (Fig. 3.110B)

Nose plier

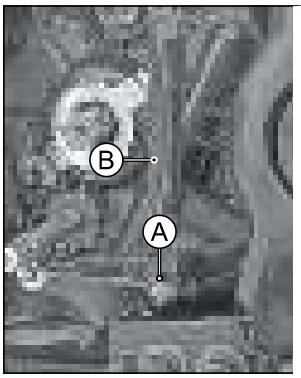


Fig. 3.110A

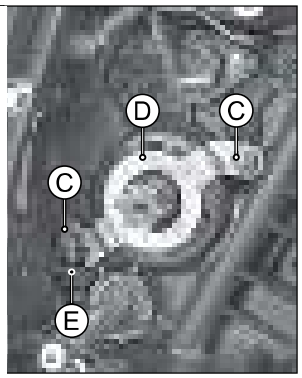


Fig. 3.110B

Incase of EFI Version.

- Remove the hexagonal flange bolt (M6x16 - 2 Nos.) and take out the switch gear position (A). (Fig. 3.111)

8 mm spanner	
Tightening torque	10 ± 2 Nm

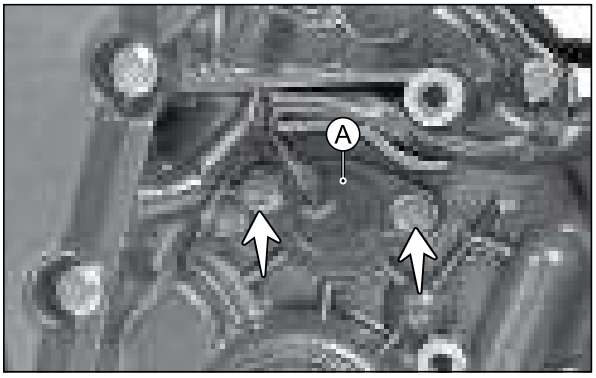


Fig. 3.111

- Remove the hexagonal bolt (M6x16 - 1 No.) (A) and take out contact complete gear shift switch (B). (Fig. 3.112)

8 mm spanner	
Tightening torque	4 ± 1 Nm

Note:
While reassembling contact complete gear shift, locate the projection of contact into the groove on shaft for proper indication of gear positions.

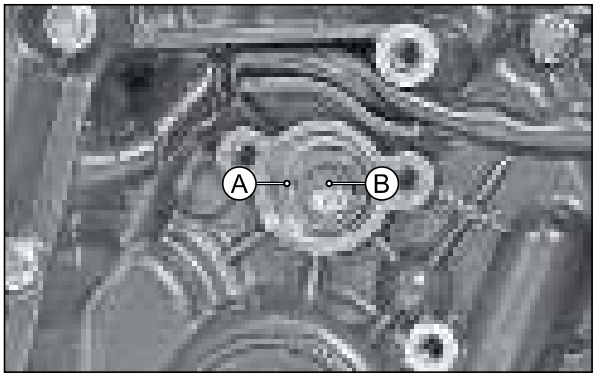


Fig. 3.112

- Remove the circlip (12x1) from shaft complete gear shift and take out the shim (12x26x1). (Fig. 3.113)

Snap ring plier - external

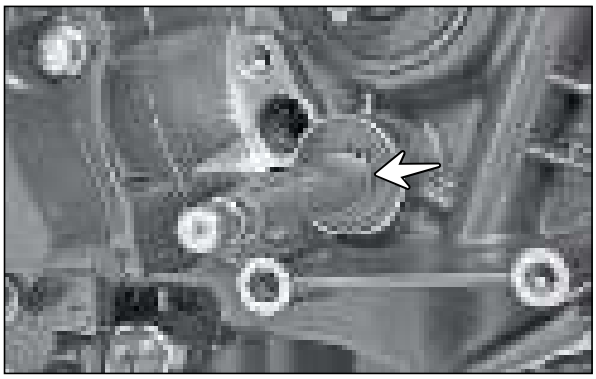


Fig. 3.113

- Disconnect all the wiring sockets from magneto assembly connected to wiring harness. (Fig. 3.114)

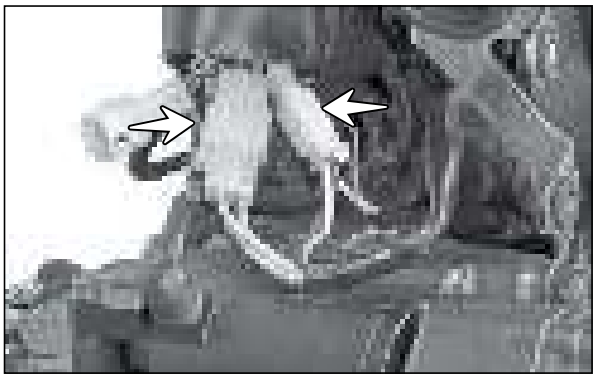


Fig. 3.114

- Remove the hexagonal flange bolts (M6x40 - 9 Nos.) from the cover magneto mounting. (Fig. 3.115)

8 mm spanner	
Tightening torque	10 ± 2 Nm

- Take out the cover magneto by gently tapping with the nylon hammer along with starter assembly.

Nylon hammer

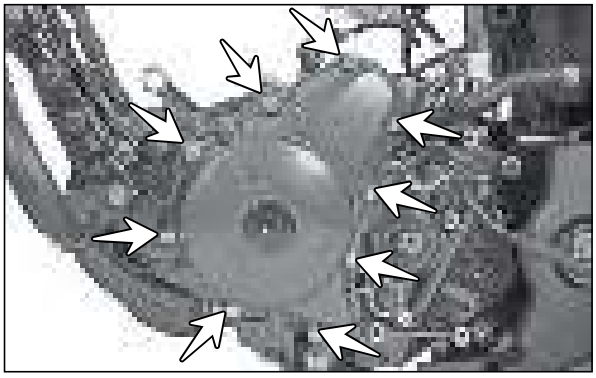


Fig. 3.115

- Take out gasket magneto cover and dowel pin (A) (2 Nos.). (Fig. 3.116)

Nose plier

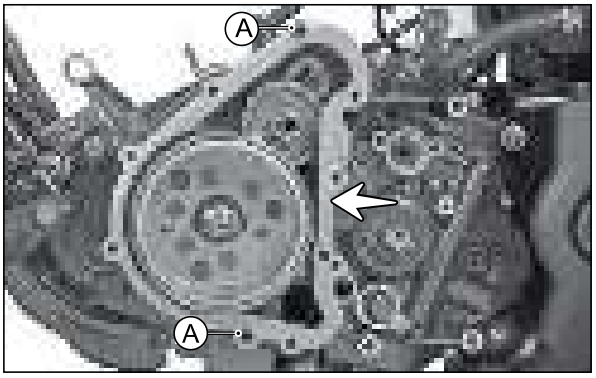


Fig. 3.116

- Take out the spacer starter idle gear (A), pin magneto cover (B) and gear starter idle (C) either from the crankcase or from the cover magneto. (Fig. 3.117A)

Nose plier

- Remove the stopper starter gear (D). (Fig. 3.117B)

Note:
While reassembling the gear starter idle ensure to assemble the stopper starter gear (D). (Fig. 3.117B)

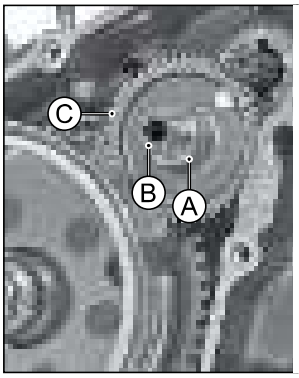


Fig. 3.117A

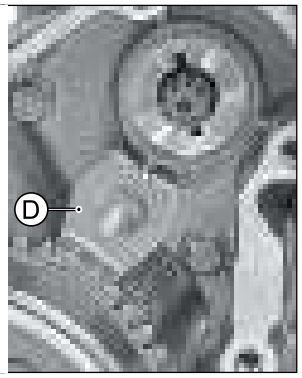


Fig. 3.117B

- Remove bolt gear shift cam stopper and take out stopper complete gear shift along with spring gear shift cam stopper and shim. (Fig. 3.118)

10 mm spanner	
Tightening torque	6 ± 1 Nm

Note:
While reassembling, ensure that shim is located properly under the stopper complete gear shift, before tightening the bolt gear shift cam stopper. After tightening check cam stopper for free movement.

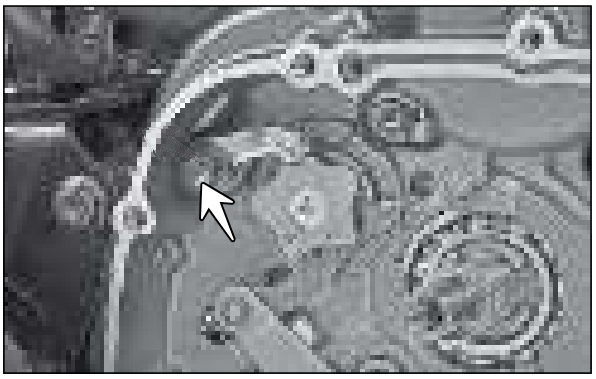


Fig. 3118

- Remove recessed CSK head screw (M6x20 - 1 No.) from the index star mounting and take out the index star. (Fig. 3.119)

Philips head screw driver	
Tightening torque	8 ± 2 Nm

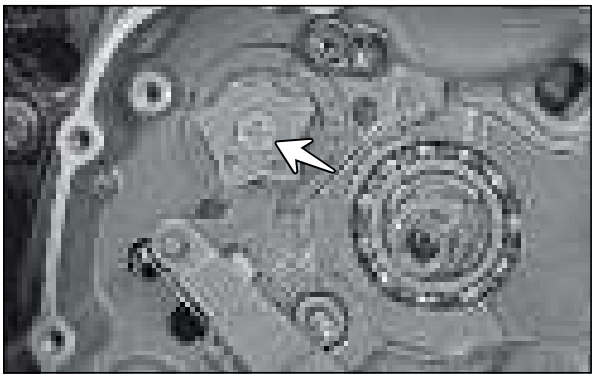


Fig. 3.119

- Carefully pull out the shaft complete gear shift. (Fig. 3.120)

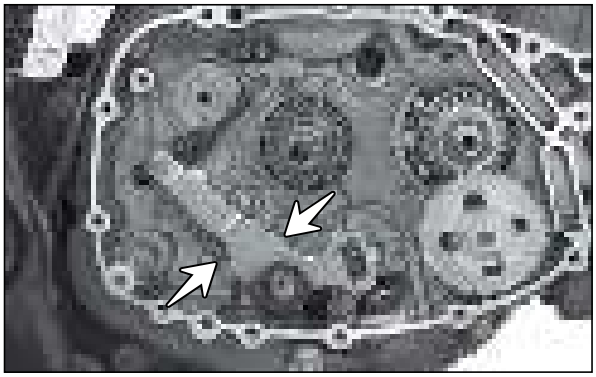


Fig. 3.120

- Take out the pin holder complete from the cam gear shift. (Fig. 3.121)

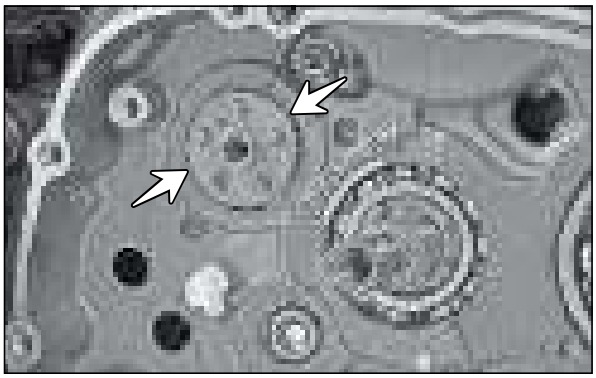


Fig. 3.121

- Remove the E-ring from the oil pump shaft and take out gear oil pump driven. (Fig. 3.122)

Small flat screw driver

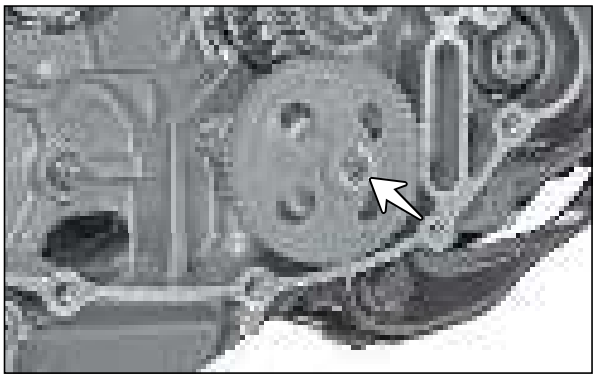


Fig. 3.122

- Remove the pin oil pump driven gear (A). (Fig. 3.123)

Nose plier

- Remove hexagonal flange bolt (3 Nos.) from the pump assembly oil and pull out pump assembly. (Fig. 3.123)

8 mm spanner

Tightening torque	9 ± 1 Nm

Note:
While reassembling the oil pump ensure the presence of pin oil pump.

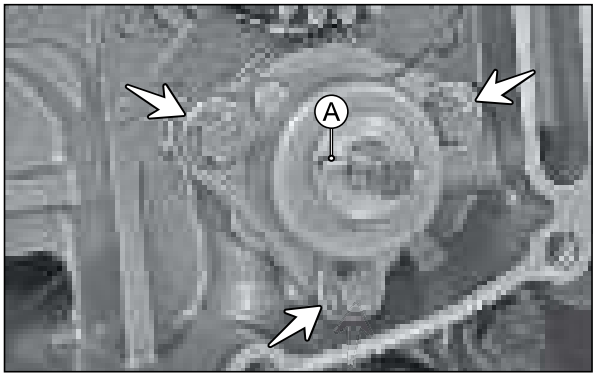


Fig. 3.123

- Disconnect both the terminals from the battery assembly. (Fig. 3.124)

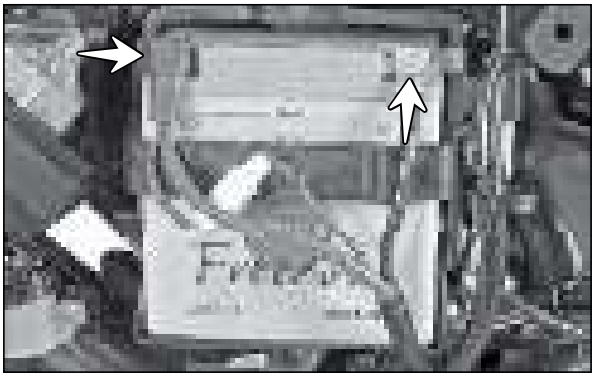


Fig. 3.124

- Dislocate the boot (A) from the starter motor terminal. (Fig. 3.125A)
- Remove the special screw (B) along with washer from the starter motor positive terminal and disconnect positive terminal. (Fig. 3.125B)

8 mm spanner	
Tightening torque	10 ± 2 Nm

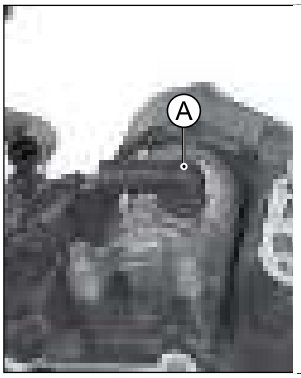


Fig. 3.125A

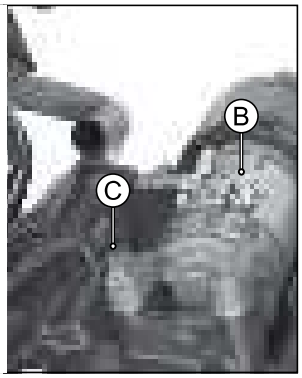


Fig. 3.125B

- Remove the hexagonal flange bolt (M6x25 - 1 No.) (C) from the starter motor mounting and remove the negative terminal from the starter motor. (Fig. 3.125B)

8 mm spanner	
Tightening torque	10 ± 2 Nm

- Dislocate the hose clip (A) and disconnect the hose breather PCV (B) from the engine assembly. (Fig. 3.126)

Nose plier

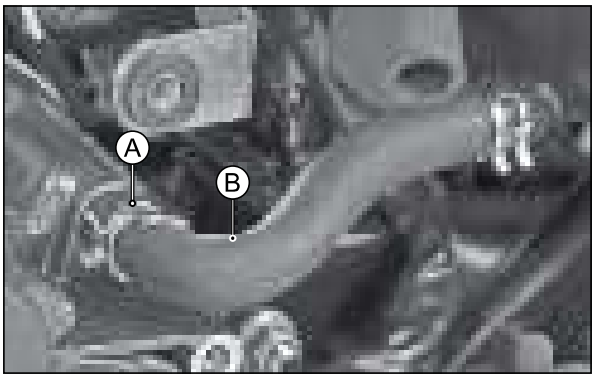


Fig. 3.126

- Remove the hexagonal flange bolt (M6x25 - 1 No.) from pipe complete inlet of engine oil cooler and dislocate the pipe complete inlet from the crank case assembly R. (Fig. 3.127)

8 mm spanner	
Tightening torque	10 ± 2 Nm

Note:
An 'O' ring is fitted on the pipe complete inlet end. Ensure the condition and availability of 'O' ring during reassembly.

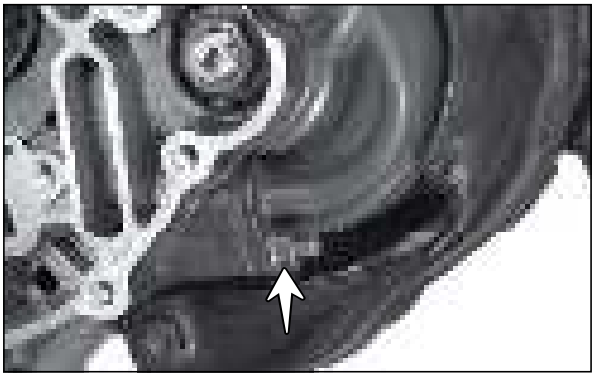


Fig. 3.127

- Remove the hexagonal flange bolt (M6x25 - 1 No.) from the starter motor and remove the motor assembly starter along with a 'O' ring. (Fig. 3.128)

8 mm spanner	
Tightening torque	10 ± 2 Nm

Note:
While reassembling the motor assembly starter, make sure the presence of 'O' ring.

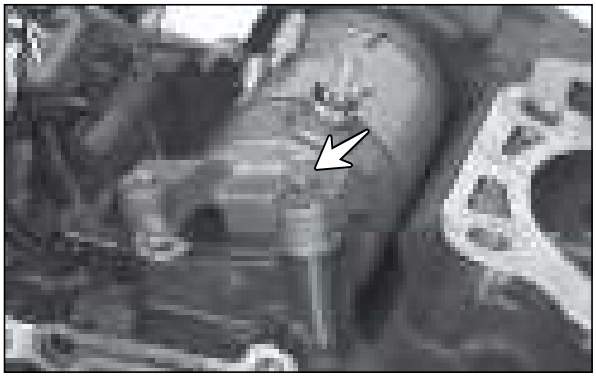


Fig. 3.128

- Unfold washer primary driven gear. (Fig. 3.129)

Chisel / metal hammer

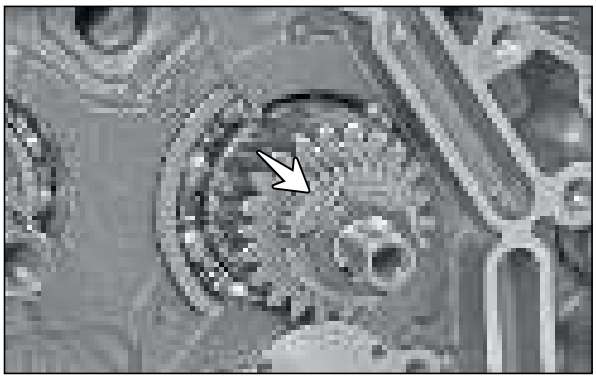


Fig. 3.129

- Using the special tool, hold the rotor assembly and remove hexagonal nut (M16 LH). (Fig. 3.130A & 130B)

N931 017 0	Magneto tool assembly
22 mm spanner	
Tightening torque	60 ± 5 Nm

- Take out washer primary drive gear.

Note:
While reassembling, replace the washer with a new one.

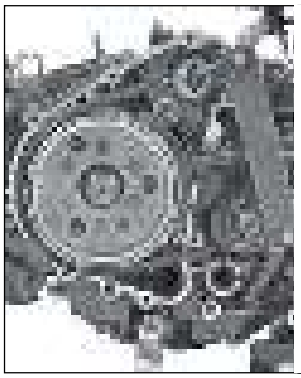


Fig. 3.130A

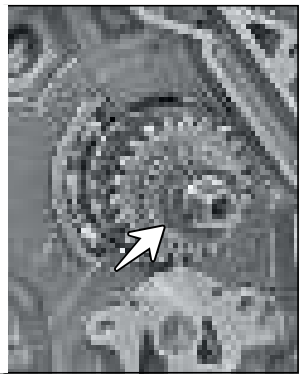


Fig. 3.130B

- Remove gear oil pump drive (A). (Fig. 3.131)
- Remove gear primary drive (B). (Fig. 3.131)

Note:
While reassembling the primary drive gear, assemble the primary gear in such a way that its stepped side is facing towards crankshaft bearing.

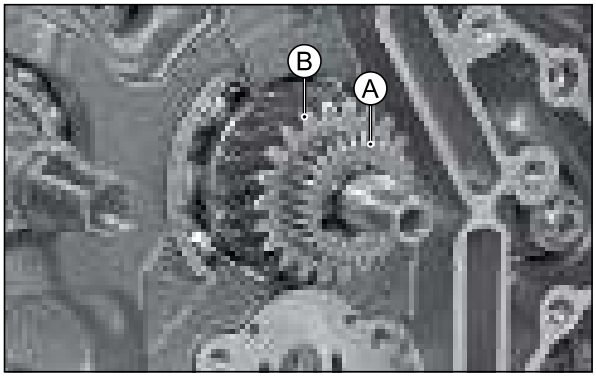


Fig. 3.131

- Take out key (4x4x15) from the crankshaft assembly. (Fig. 3.132)

Nose plier

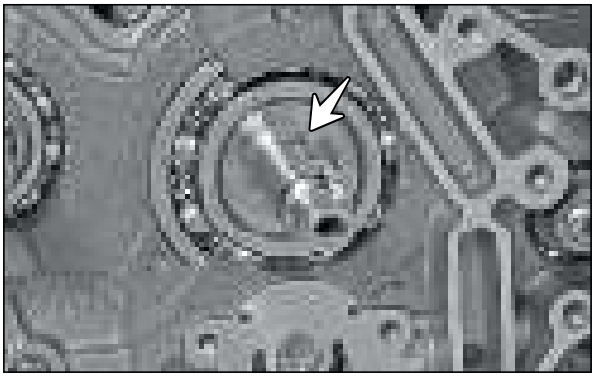


Fig. 3.132

- Using the special tool, hold the rotor assembly as explained earlier and remove the hexagonal flange nut (M12x1.25) from the balancer shaft assembly. (Fig. 3.133)

17 mm spanner	
Tightening torque	55 ± 5 Nm

Note:
Apply ANABOND 112 thread locker during reassembly of the nut.

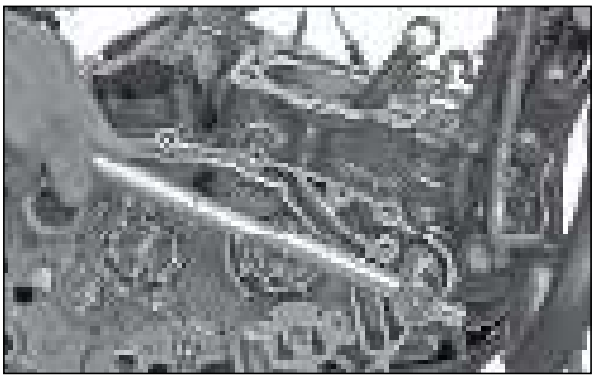


Fig. 3.133

- Using the special tool, hold the rotor assembly and remove the rotor assembly mounting hexagonal flange nut (M12x1.25). (Fig. 3.134)

N931 017 0	Magneto tool assembly
17 mm spanner	
Tightening torque	80 ± 5 Nm

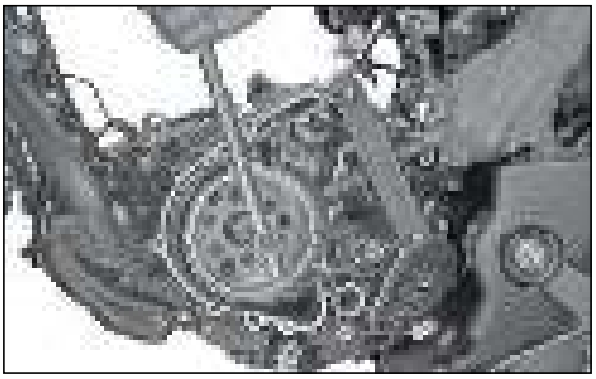


Fig. 3.134

- Using the special tool, remove the rotor assembly along with gear complete starter clutch. (Fig. 3.135)

M131 002 0	Puller assembly rotor

Note:
Always keep rotor assembly on a non metallic surface with open side facing upwards.

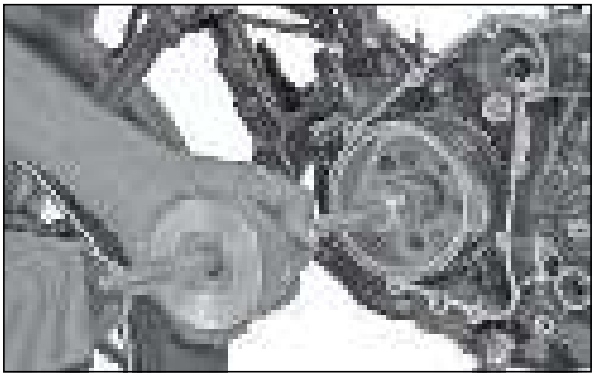


Fig. 3.135

- If required, separate the gear complete starter clutch and remove the one way clutch from rotor assembly by removing the hexagonal socket head cap screw (M6x16 - 3 Nos.) along with punched washers. (Fig. 3.136)

5 mm allen key	
Tightening torque	12 ± 1 Nm

Note:
Do not separate the gear complete starter clutch from one way clutch until it is necessary, to avoid falling of rollers from one way clutch. Always keep them in assembled condition.

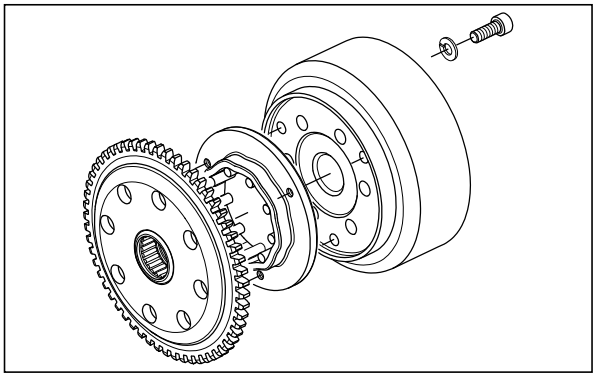


Fig. 3.136

- Take out the cam chain (A) and woodruff key (B) from the crankshaft complete. (Fig. 3.137)

Nose plier

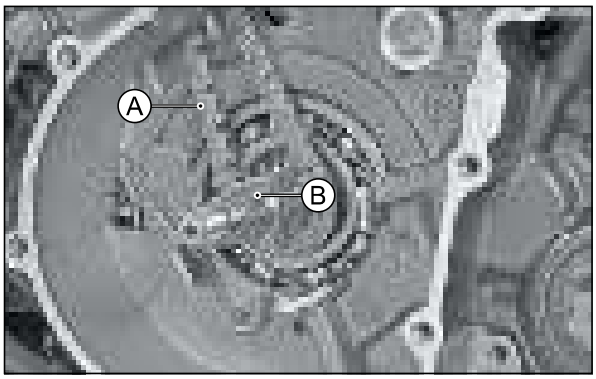


Fig. 3.137

- Remove the hexagonal flange bolt (A) (M8x25 - 2 Nos.) along with spring washer from LH side top and bottom mounting of crash guard. (Fig. 3.138)
- Remove the hexagonal flange bolt (B) (M8x25 - 1 No.) along with spring washer from RH side top mounting of crash guard and dislocate the cable guide (C). (Fig. 3.138)
- Remove the hexagonal flange bolt (D) (M8x25 - 1 No.) along with spring washer from RH side bottom mounting of crash guard and take out the crash guard. (Fig. 3.138)

12 mm spanner	
Tightening torque	27 ± 3 Nm

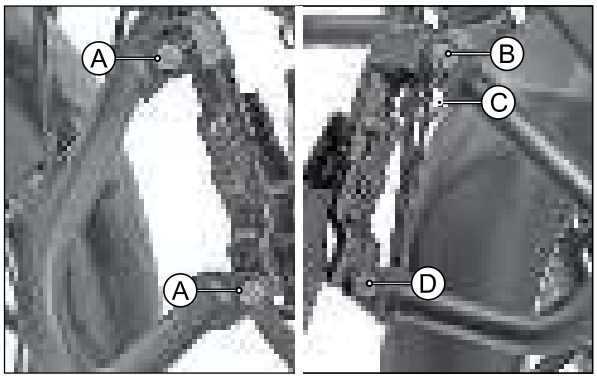


Fig. 3.138

- Remove the hexagonal flange bolt (M8x55 - 2 Nos.) from the mounting of bracket crash guard RH and take out the bracket. (Fig. 3.139)

12 mm spanner	
Tightening torque	27 ± 3 Nm

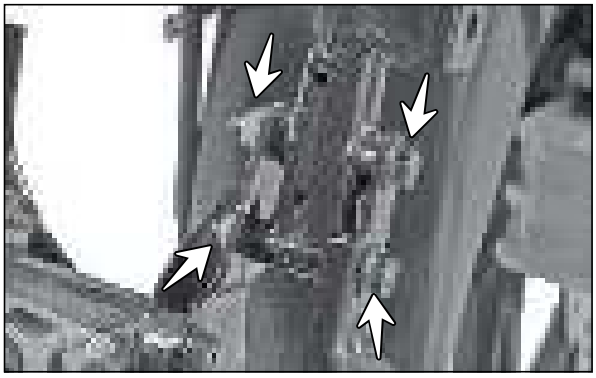


Fig. 3.139

- Remove the hexagonal flange bolt (M8x100 - 1 No.) and (M8x120 - 1 No.) from the mounting of bracket engine mounting RH and take out the bracket. (Fig. 3.140)

12 mm spanner	
Tightening torque	32.5 ± 2.5 Nm

- Remove the hexagonal flange bolt (M18x100 - 1 No.) and (M8x120 - 1 No.) from the rear mounting of the engine assembly. (Fig. 3.141)

12 mm spanner	
Tightening torque	32.5 ± 2.5 Nm

Note:
While removing mounting bolts, always remove the bottom bolt first.

Once the 'U' nuts are removed from their mounting, they should be replaced with new ones.

- Gently lift the engine assembly with both the hands and take out from the right hand side of the vehicle. Place the engine assembly on a engine rest.

ENGINE - DISASSEMBLY

- Remove the CRR pan head screw (M6x12 - 1 No.) from the retainer guide T/M oil and remove the guide T/M oil. (Fig. 3.142)

Phillip head screw driver	
Tightening torque	8 ± 2 Nm

- Remove the hexagonal flange bolt (M6x55 - 1 No.) from the crankcase assembly mounting (RH side). (Fig. 3.143)

8 mm spanner	
Tightening torque	10 ± 2 Nm

- Turn the engine to the other side (magneto side).

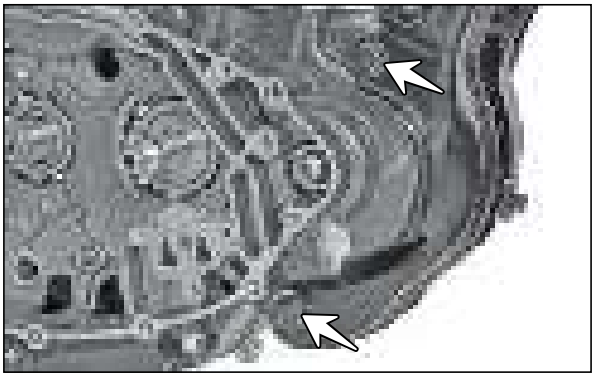


Fig. 3.140

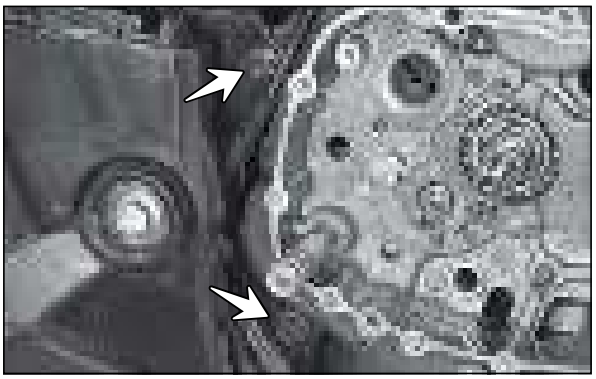


Fig. 3.141

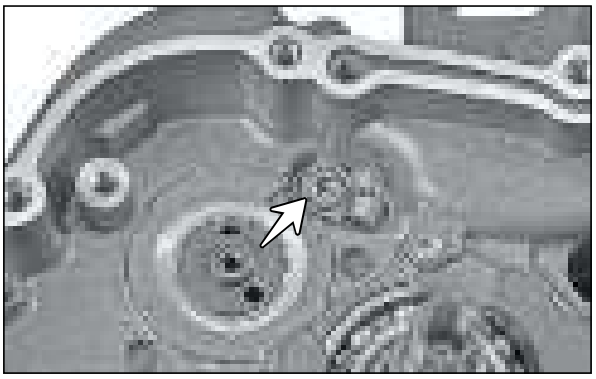


Fig. 3.142

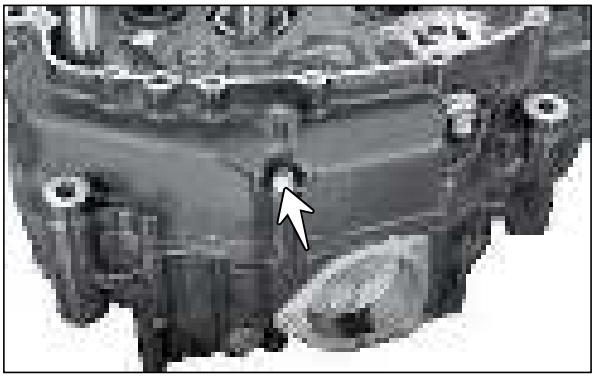


Fig. 3.143

- Remove hexagonal flange bolts (M6x55 - 5 Nos. (A), M6x40 - 4 Nos. (B), M6x75 - 4 Nos (C) and M6x95 - 1 No. (D) from the crankcase mounting. (Fig. 3.144)

8 mm spanner	
Tightening torque	10 ± 2 Nm

Note:
While reassembling, insert all the bolts first and check equal height of bolts from their respective seating surfaces.

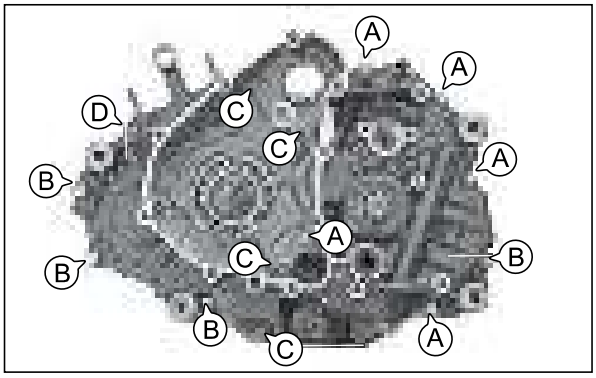


Fig. 3.144

- Using special tool, separate the crankcase assemblies by pulling the crankcase complete L. (Fig. 3.145)

M131 011 0	Puller assembly

17 mm spanner

8 mm spanner

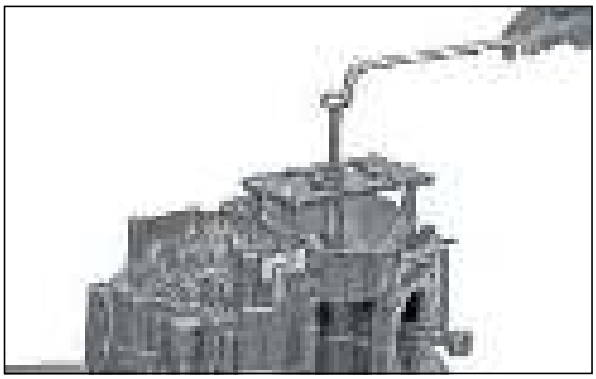


Fig. 3.145

- Take out the tubular dowel (2 Nos.).

- Take out shim (15x27x0.5) (A) and retainer spring (B) from the balancer shaft. (Fig. 3.146)

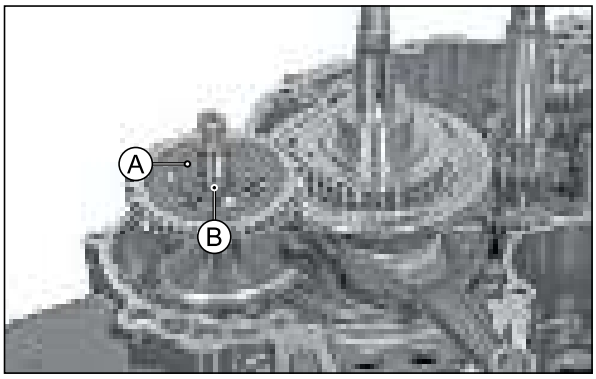


Fig. 3.146

- Take out the thrust washer (A) from the drive shaft assembly. (Fig. 3.147)

- Take out the bearing kick starter driven gear (B) along with thrust washer and shim from the counter (clutch) shaft assembly. (Fig. 3.147)

- Take out shim (16x30.5x0.5) (C) from the shaft kick starter. (Fig. 3.147)

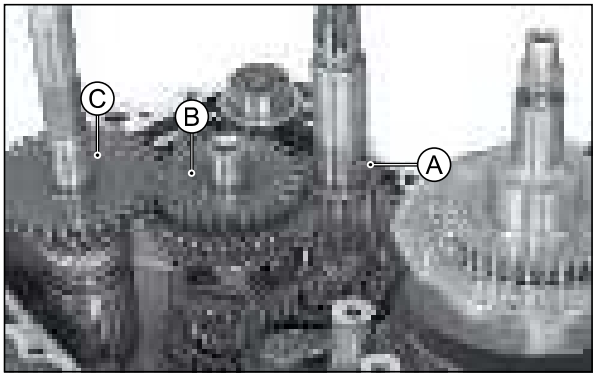


Fig. 3.147

- Take out gear kick starter drive from the shaft kick starter. (Fig. 3.148)

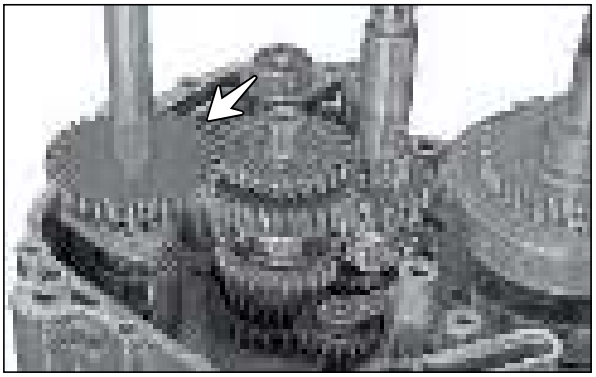


Fig. 3.148

- Take out gear assembly balancer shaft driven from the balancer shaft. (Fig. 3.149)

Caution:
While reassembling the gear assembly balancer shaft driven, align the balancer drive and driven gears to match the dot / punch marks in one line as shown in the illustration without fail to avoid costly damages to the engine. (Fig. 3.150)

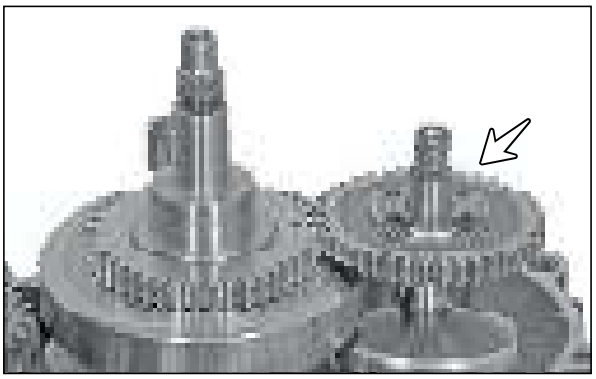


Fig. 3.149

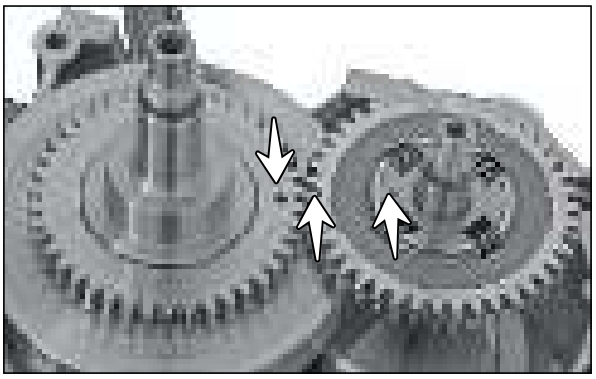


Fig. 3.150

- Remove the wood ruff key (A) from the balancer shaft assembly. (Fig. 3.151)

Nose plier

- Take out the retainer spring (B) from the balancer shaft assembly. (Fig. 3.151)

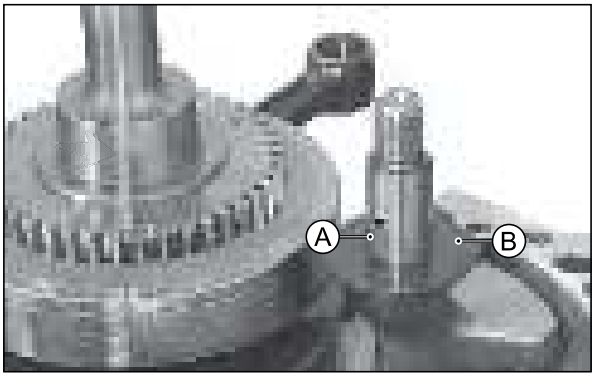


Fig. 3.151

- Pull out both the shaft shift forks from the fork gear shifts. (Fig. 3.152)

Nose plier

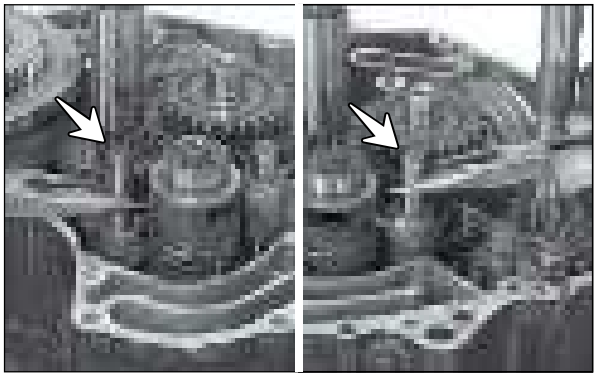


Fig. 3.152

- Dislocate the fork gear shift no.1, fork gear shift no. 2 and fork gear shift high speed from cam gear shift and take out the cam gear shift (A). (Fig. 3.153)

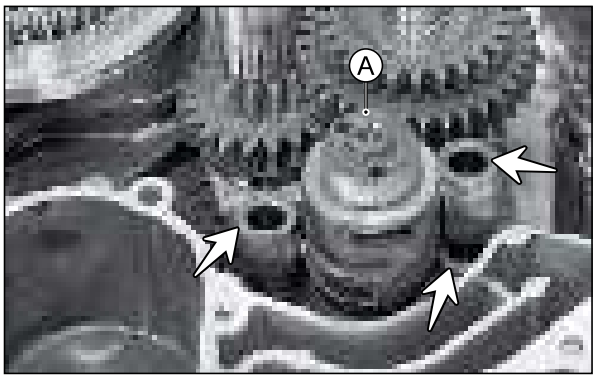


Fig. 3.153

- Take out fork gear shift no.1, fork gear shift no. 2 and fork gear shift high speed from gears. (Fig. 3.154)

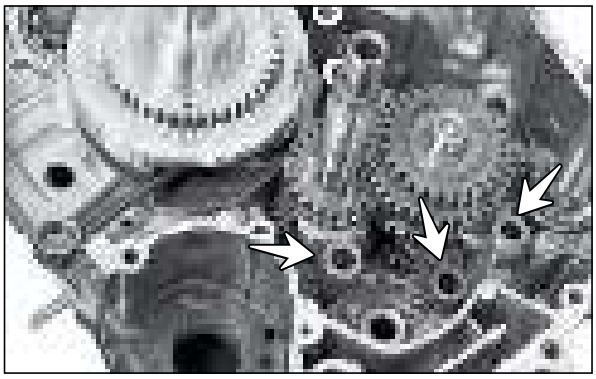


Fig. 3.154

- Take out drive shaft assembly and the counter (clutch) shaft assembly along with the gears as a set. (Fig. 3.155)

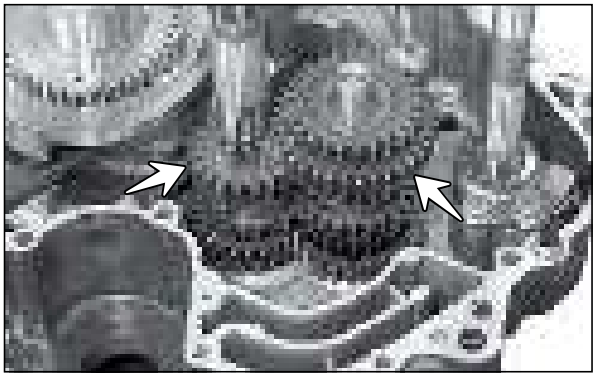


Fig. 3.155

- Take out the gear 2nd driven. (Fig. 3.156)

Note:
Since the gear idler (speed sensor gear) locks the 2nd driven gear, it will not come along with the drive shaft assembly during the shaft removal. Hence the gear has to be taken separately.

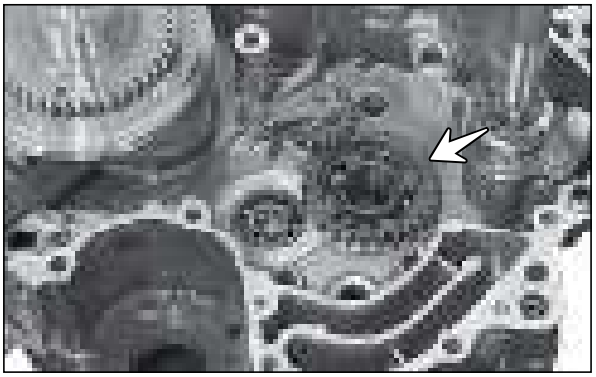


Fig. 3.156

- Take out thrust washer from the drive shaft assembly gear 2nd driven seating area. (Fig. 3.157)

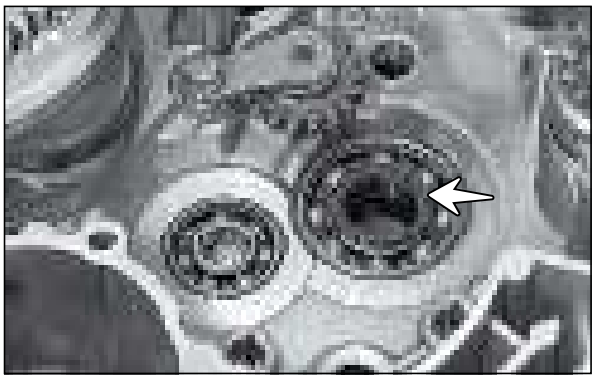


Fig. 3.157

- Pull out crankshaft assembly from the crankcase assembly LH by gently tapping it from the other side. (Fig. 3.158)

Note:
While removing the crankshaft assembly, ensure that the balancer shaft is rotated to the other side and not obstructing the crankshaft.

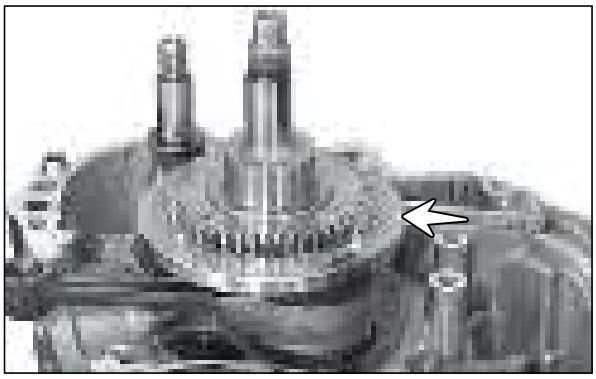


Fig. 3.158

- Take out the balancer shaft complete as an assembly. (Fig. 3.159)

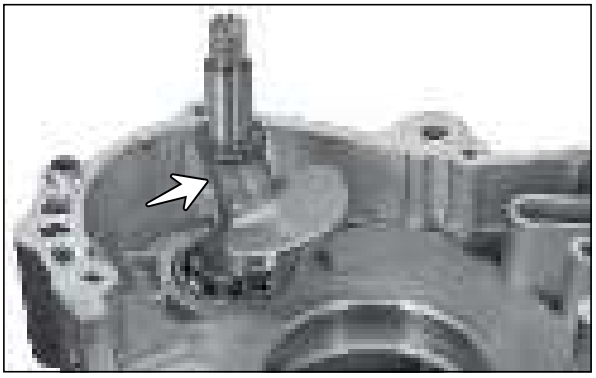


Fig. 3.159

- Rotate the shaft kick starter using lever assembly kick starter and release the starter kick from the guide kick starter. (Fig. 3.160)

Fig. 3.160

- Take out starter kick and spring kick starter from the shaft kick starter. (Fig. 3.161)

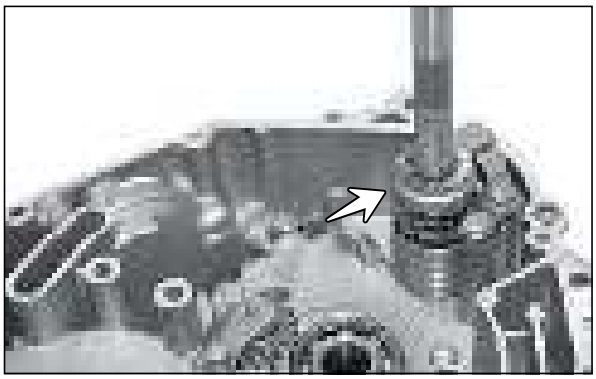


Fig. 3.161

- Pull out shaft kick starter along with shim, spring kick shaft return and guide kick starter spring. (Fig. 3.162)

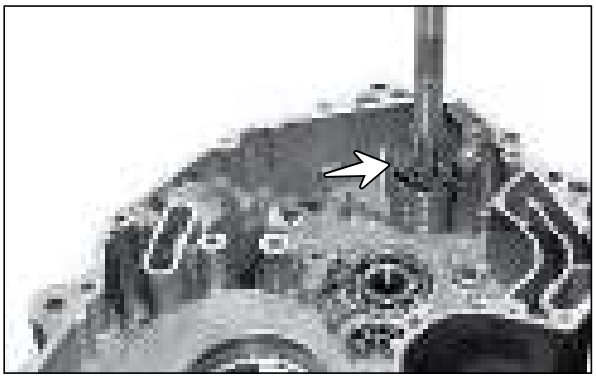


Fig. 3.162

- Remove hexagonal bolt (M6x16 - 1 No.) from the bracket idler gear mounting and dislocate the bracket idle gear. (Fig. 3.163)

8 mm spanner	
Tightening torque	10 ± 2 Nm

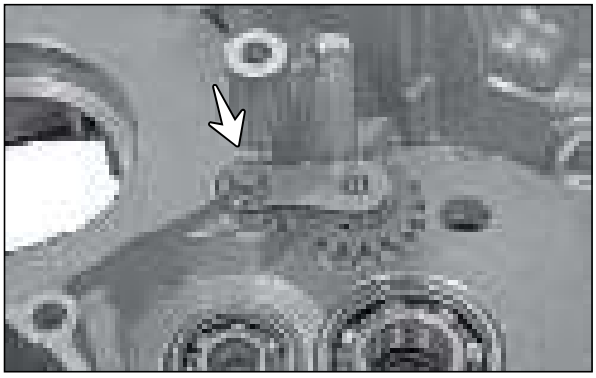


Fig. 3.163

- Take out the idler gear along with shims (11.2x18.5x1 - 2 Nos.). (Fig. 3.164)

Note:
While reassembling the idler gear ensure the presence of shims on both side.

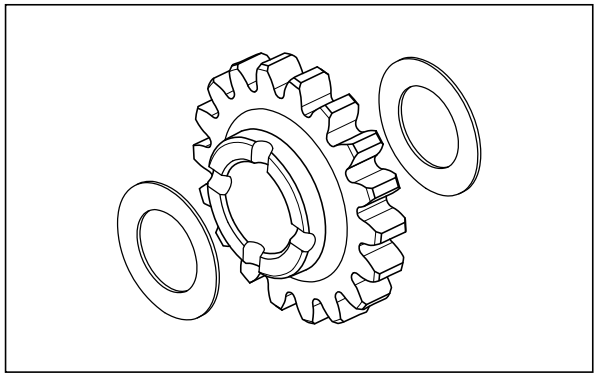


Fig. 3.164

- Using the special tool, remove the ball bearing (6207) from the crankshaft assembly (in case if the bearing comes with crankshaft). (Fig. 3.165)

S131 111 0	Extractor main bearing
17 mm spanner	

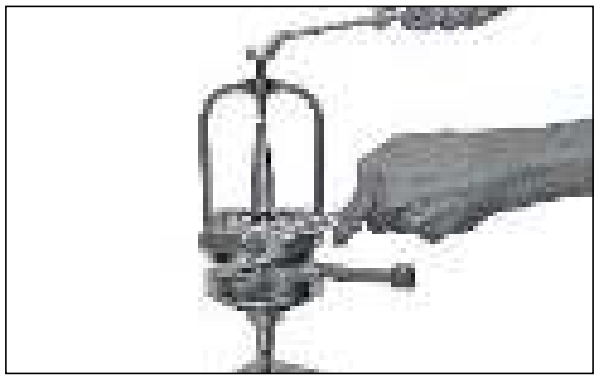


Fig. 3.165

- Using the special tool (bearings installer set), bearings and oil seals can be removed and reassembled. (Fig. 3.166)

S131 050 0	Bearing installer set
Metal hammer	

Note:
Remove the bearings, only if they need to be replaced. Unnecessary removal of bearings should be avoided, otherwise can damage the bearings and can cause deterioration to the interference fit. It is sufficient to clean and lubricate the bearings in assembled condition.

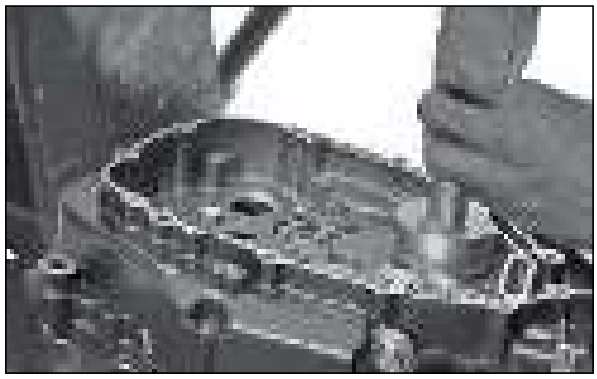


Fig. 3.166

- Using the special tool (universal oil seal remover), the oil seals can be removed. (Fig. 3.167)

031 240 1	Universal oil seal remover

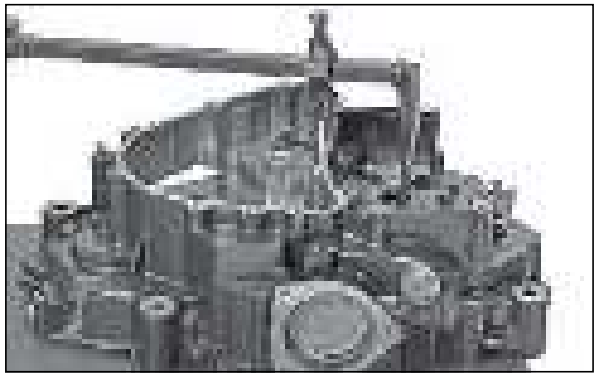


Fig. 3.167

GEAR ASSEMBLY BALANCER SHAFT DRIVEN

- Gear balancer shaft driven can be separated from the race balancer gear driven by pressing it out.

Note:
While reassembling the gear balancer shaft ensure that the dots (A) on the race balancer gear driven and gear balancer driven should be aligned and the pin balancer shaft driven (B) should be placed opposite to each other. (Fig. 3.168)

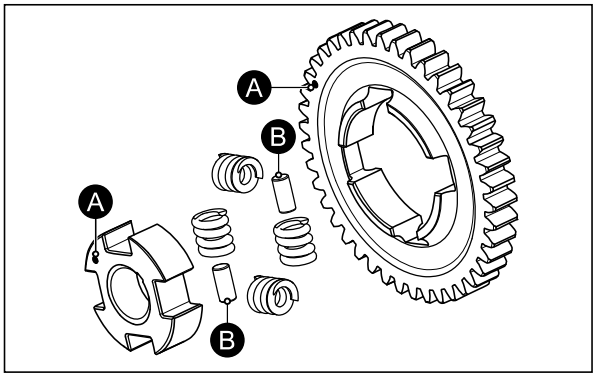


Fig. 3.168

SHAFT COMPLETE DRIVE - DISASSEMBLY

- Take out the gear 4th driven. (Fig. 3.169)

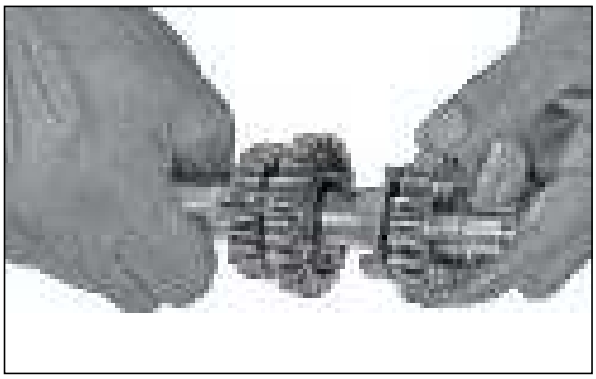


Fig. 3.169

- Remove the circlip (20x1.2). (Fig. 3.170)

Snap ring plier - External

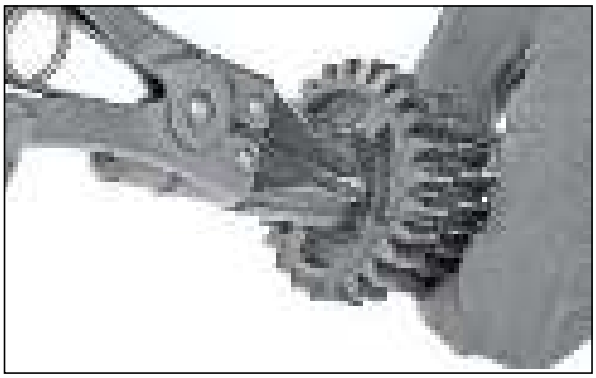


Fig. 3.170

- Take out the shim (A). (Fig. 3.171)
- Take out the gear 3rd driven (B). (Fig. 3.171)

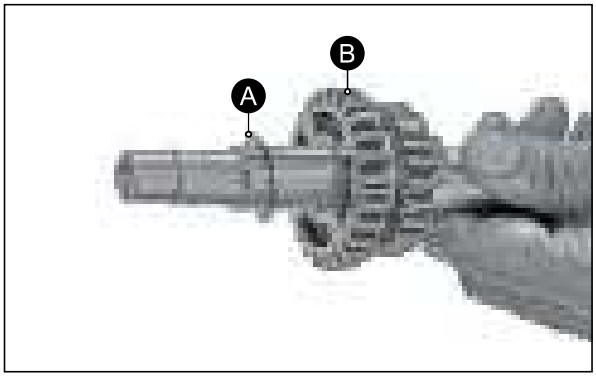


Fig. 3.171

- Take out the star bush. (Fig. 3.172)

Fig. 3.172

- Take out the gear 5th driven. (Fig. 3.173)

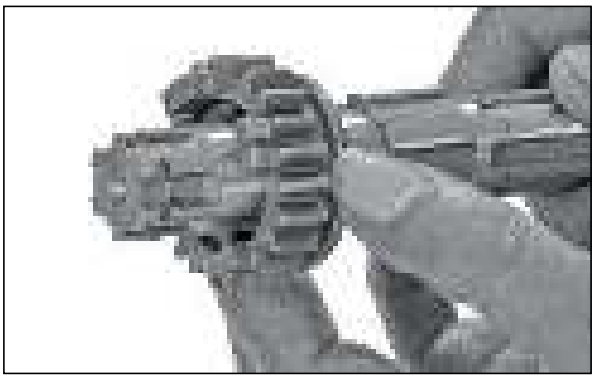


Fig. 3.173

INSPECTION

- Shaft complete drive / shaft complete counter (assembly) / cam gear shift / drive gears and driven gears.
- Before inspection, clean all the components thoroughly with cleaning solvent.
- Carefully inspect all the parts for any scoring marks, breakage, wear of splined surfaces of shafts / gear teeth. Replace damaged parts with the new ones.
- Using a feeler gauge, check the clearance between fork gear shift and its seating groove on the gear. (Fig. 3.174)
- If the measured clearance exceeds the service limit, determine whether the gear or the fork gear shift should be replaced with a new one.

Feeler gauge

Description	Service limit
Fork gear shift to groove clearance	0.300 mm (max)

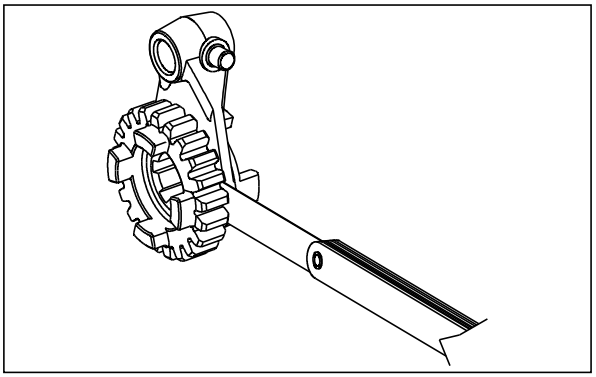


Fig. 3.174

REASSEMBLY

- Reverse the removal procedure of gears for re-assembly.
- While reassembling the gears, attention must be given to the locations and positions of washers and circlips.

Caution:
Never reuse circlips after removing from the shaft.

While installing a new circlip, care should be taken not to expand the end gap larger than the required to slip over the shaft.

After installing a new circlip, always ensure that it is completely seated in its groove and securely being locked. The flat surface of the circlip should always face towards the component being locked.

- The exploded view will serve as a reference for correct mounting of the gears, washers and circlips. (Fig. 3.175)

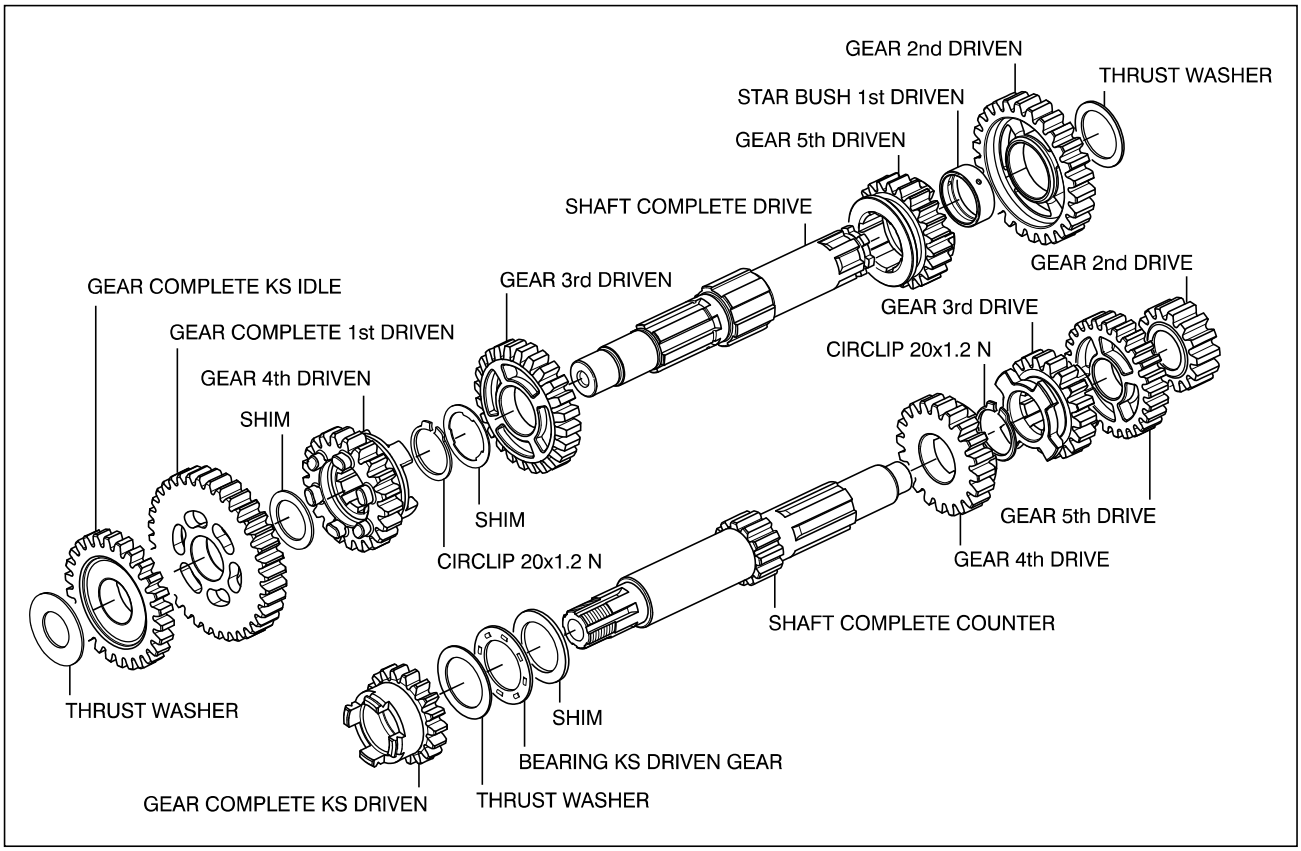


Fig. 3.175

SHAFT KICKSTARTER ASSEMBLY - DISASSEMBLY

- Remove the guide kick starter spring from shaft kick starter. (Fig. 3.176)

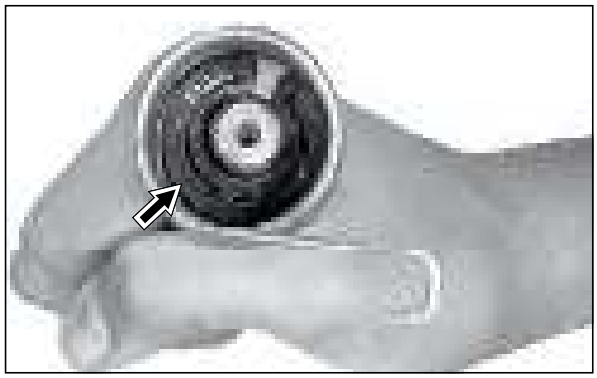


Fig. 3.176

- Remove the spring kick shaft return and shim (16x30x0.5) from shaft kick starter. (Fig. 3.177)

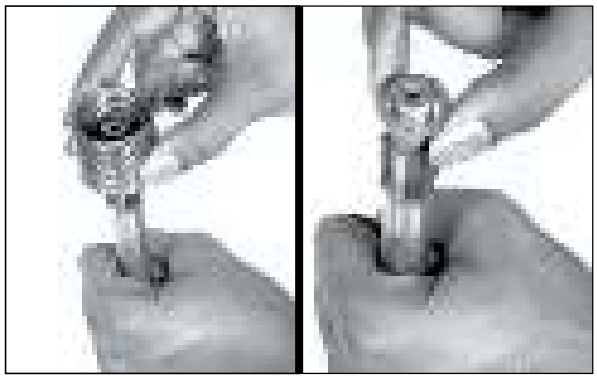


Fig. 3.177

SHAFT KICKSTARTER I GEAR KICKSTARTER DRIVE AND RATCHET KICKSTARTER - INSPECTION

- Before inspection, clean all the components thoroughly with cleaning solvent.
- Carefully inspect all parts for any scoring marks, breakage, wear and tear of splined surface of the shafts I gear teeth. Replace the damaged parts with new.

REASSEMBLY

- Reverse the removal procedure for reassembly. While reassembling, attention must be give to the locations and positions of washers and circlips.
- The engine exploded view on page no. 3.55 will serve as a references for correct mounting of the washer and circlips.

Note:
While reassembling ratchet kickstarter match the mark (A) on the ratchet with the punch mark (B) on the shaft kickstarter. (Fig. 3.178)

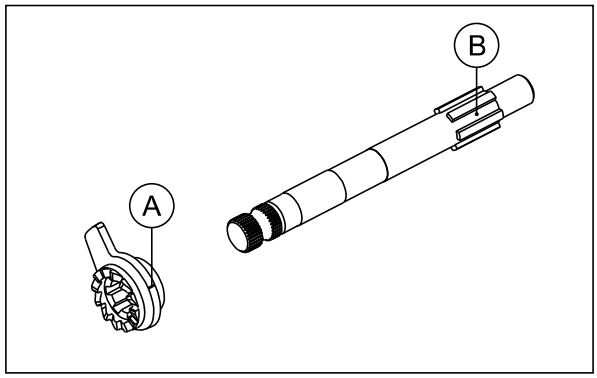


Fig. 3.178

ENGINE COMPONENTS - INSPECTION

Bearings

- Wash bearings with a cleaning solvent and lubricate them with engine oil before inspecting.
- Inspect the play of each bearing before fixing it. Hold inner race and rotate the outer race by hand and observe for any abnormal noise and smooth rotation. Replace bearing with a new one if found defective. (Fig. 3.179)

Note:
Do not use compressed air to clean the bearings.

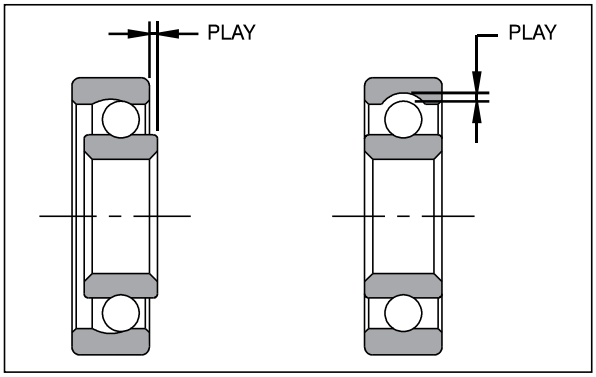


Fig. 3.179

Oilseal

- Damage to the oil seal lip (A) may result in leakage of oil. Inspect the oilseals for the damage of lip and always replace oilseals with the new ones during reassembly. (Fig. 3.180)

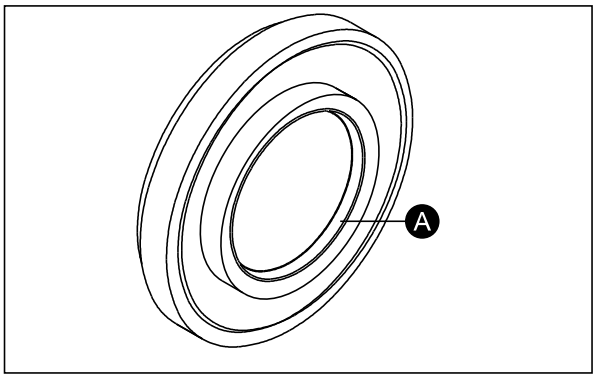


Fig. 3.180

Crankshaft Assembly - Runout

- Support crankshaft assembly with 'V' blocks or anvil.
- Mount the dial indicator at positions shown to read the runout. Runout should be within the service limit. (Fig. 3.181)
- Excessive runout of crankshaft assembly causes abnormal engine vibration and bearing noises. Such vibration shortens the engine life.

V - block set (4"x3"x3")
Dial gauge (1/100 mm)
Magnetic stand

Service limit	0.100 mm (max)

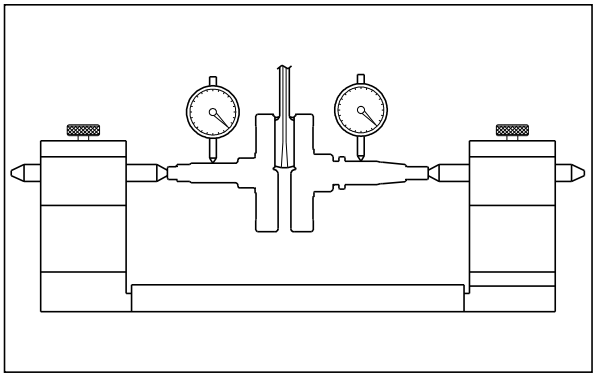


Fig. 3.181

Condition of the Big End Bearing - Crankshaft Assembly

- Hold the crankshaft assembly in hand, shake the connecting rod to find out the radial play. If any play is noticed, then replace the crankshaft assembly with a new one. (Fig. 3.182)

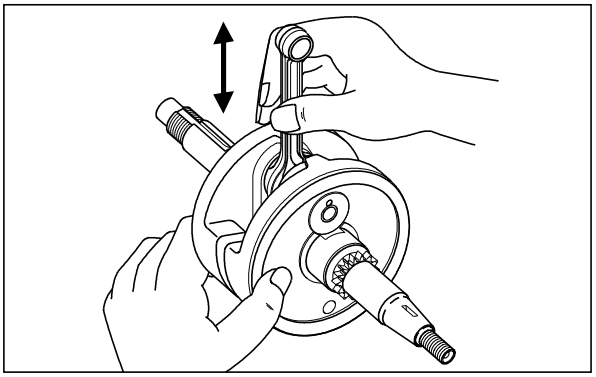


Fig. 3.182

- Measure connecting rod big end side clearance with a feeler gauge. If the clearance exceeds the service limit, replace the crankshaft assembly with a new one. (Fig. 3.183)

Feeler gauge	
Service limit	0.650 mm (max)

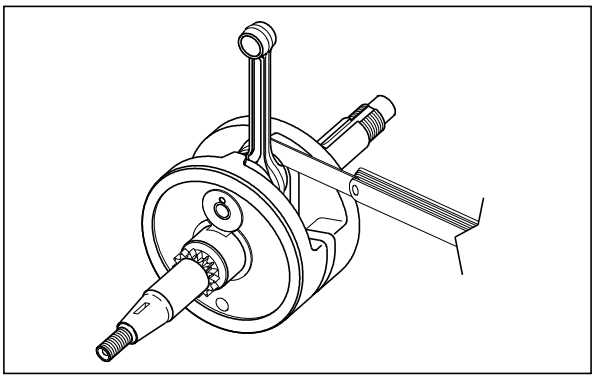


Fig. 3.183

Connecting Rod Small End Diameter

- Measure internal diameter (ID) of the connecting rod small end. If ID is more than the service limit, replace the crankshaft assembly with a new one. (Fig. 3.184)

Service limit	15.040 mm (max)

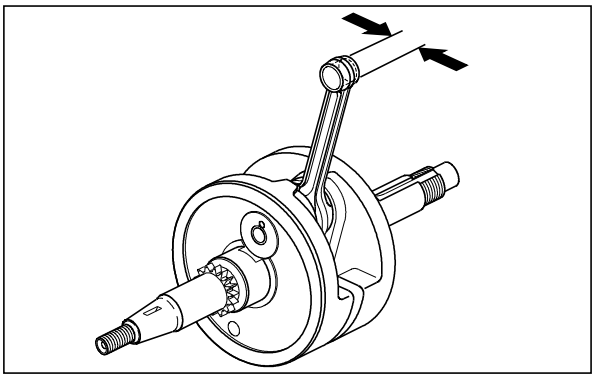


Fig. 3.184

Balancer Shaft - Inspection

- Inspect the balancer shaft for any twist or bend. If found any replace the balancer shaft assembly.
- Inspect the balancer shaft bearing for free rotation and any abnormal noise. If found any replace the bearing. (Fig. 3.185)

Note:
Replace both LH & RH bearings together (one bearing is assembled on the shaft and the other one is on the RH side crankcase).

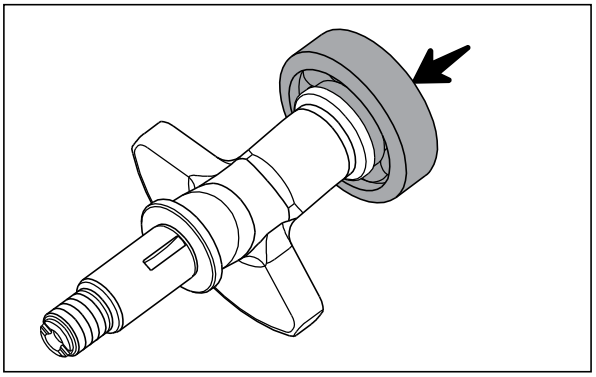


Fig. 3.185

ENGINE ASSEMBLY - REASSEMBLY

- Refer engine exploded view for assembly details. (Fig. 3.186)
- Reassemble parts carefully in the reverse order of disassembly.
- Never reuse gaskets, circlips, 'O' rings and oilseals when the engine is overhauled.
- After installing a circlip, ensure that it is seated properly in its groove by rotating it.
- Always use recommended special tools.

Bearings

For reassembling bearings use a special tool.

> ***Note:***
> ***Whenever bearings are replaced it is recommended that both LH & RH bearings are replaced as a set to have better results. Make sure that the bearings are not misaligned with the fitting.***

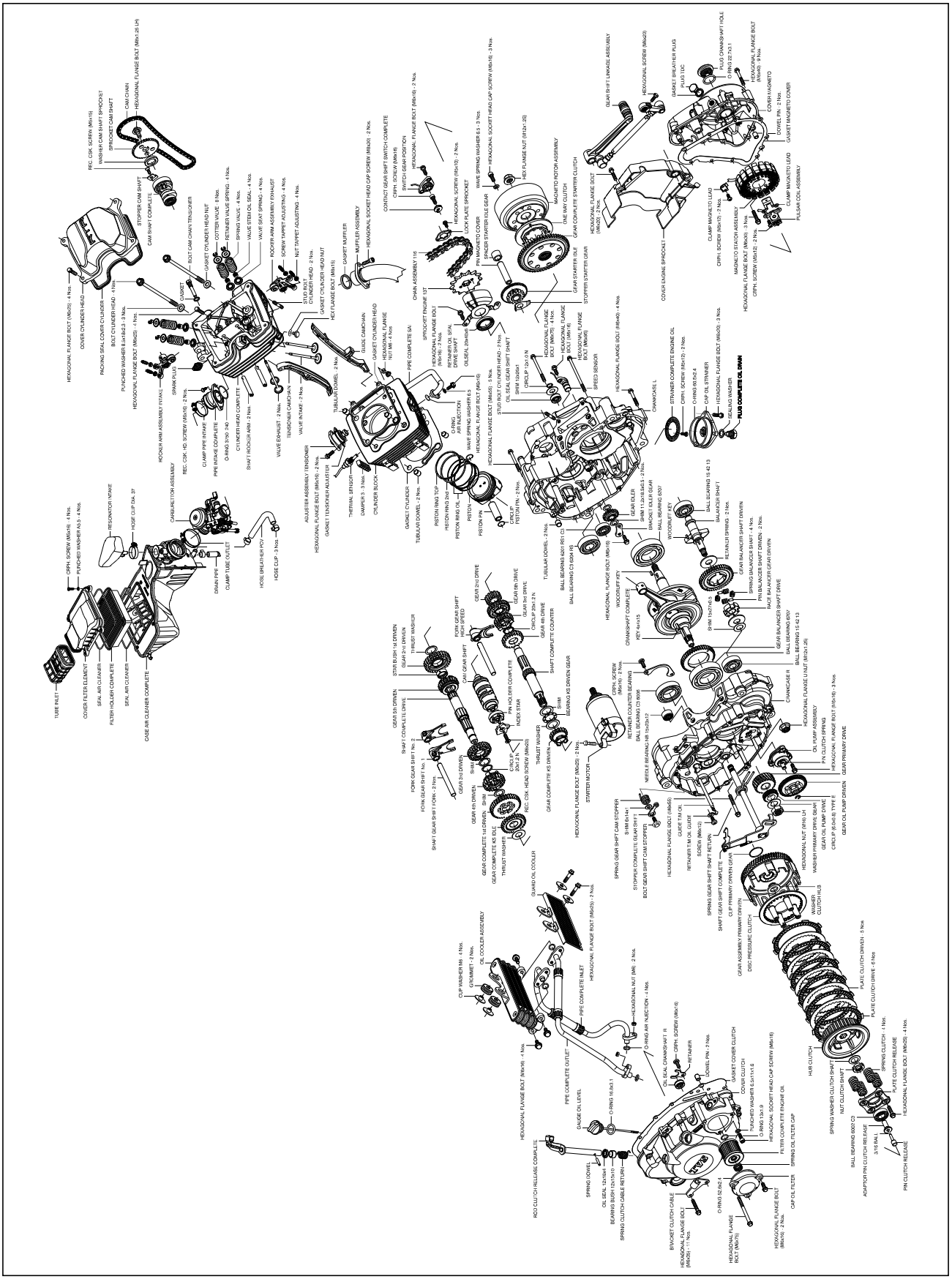
Oil Seals

While assembling the oilseals to the crankcase follow the procedure given below:

- Apply grease to the lip of oilseal.
- Use only specified special tool for assembling the oilseals.
- When fixing the oilseal over the shaft check that the lip seats over the shaft perfectly all around the circumference without any distortion.
- Apply engine oil on each running and sliding part before installing them during reassembly.

Fasteners

- Tighten all fasteners to the specified torque using torque wrench (refer torque chart in page no. 8-8 & 8-10 for torque specification).



CRANKCASE ASSEMBLY LH & RH - REASSEMBLY

- Remove the gasket material on the mating surfaces of crankcase assembly L & R and thoroughly remove oil stains.

- Assemble the idle gear on the crankcase assembly LH and secure it with the bracket idle gear using hexagonal flange bolt (M6x16) and tighten it to the specified torque. (Fig. 3.187)

8 mm spanner	
Tightening torque	10 ± 2 Nm

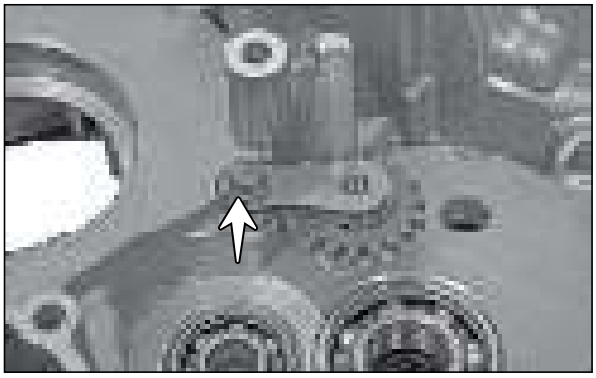


Fig. 3.187

- Assemble the balancer shaft complete as an assembly in the crankcase assembly LH. (Fig. 3.188)

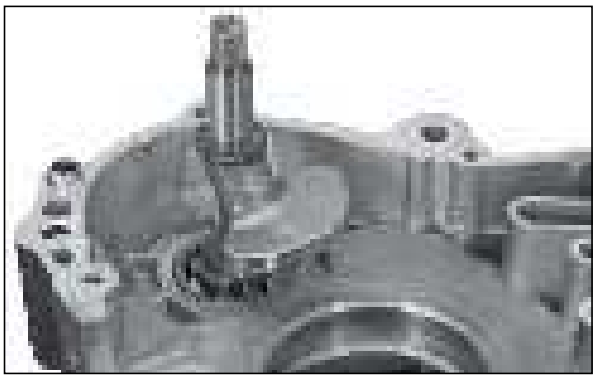


Fig. 3.188

- Rotate the balancer shaft to other side as shown and assemble the crankshaft assembly in the crankcase assembly LH. (Fig. 3.189)

Note:
While assembling the crankshaft take extra care not to cause any dent, damage and scratches to the machined surfaces.

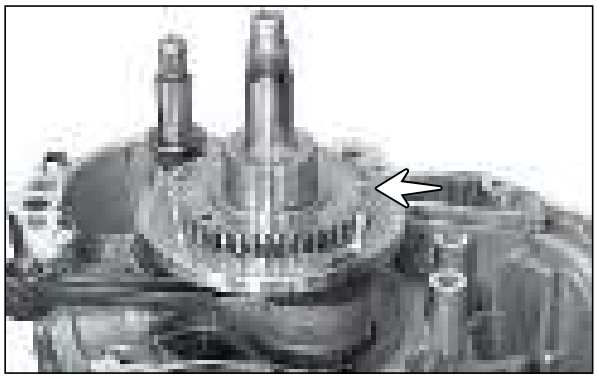


Fig. 3.189

- Assemble the retainer spring on the balancer shaft and secure it with the wood ruff key (A). (Fig. 3.190)

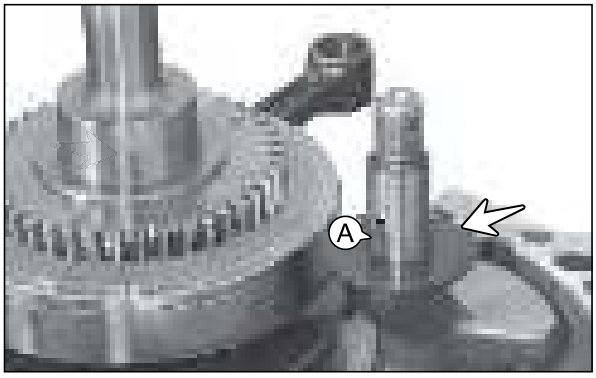


Fig. 3.190

- Assemble the gear balancer shaft driven assembly to the balancer shaft. (Fig. 3.191)

Caution:
While reassembling, align balancer drive and driven gears to match dot/punch marks (A) in one line as shown in the figure. (Fig. 3.191)

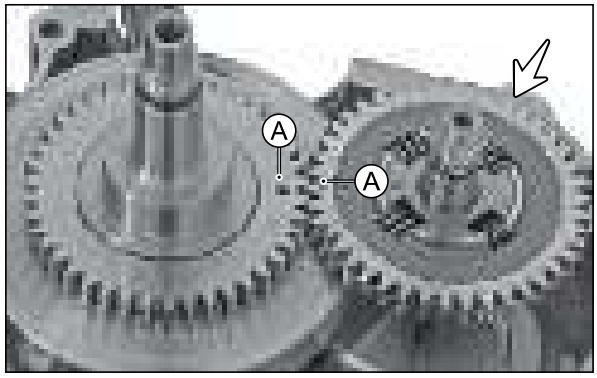


Fig. 3.191

- Assemble the retainer spring (A) and the shim (B) to the balancer shaft. (Fig. 3.192)

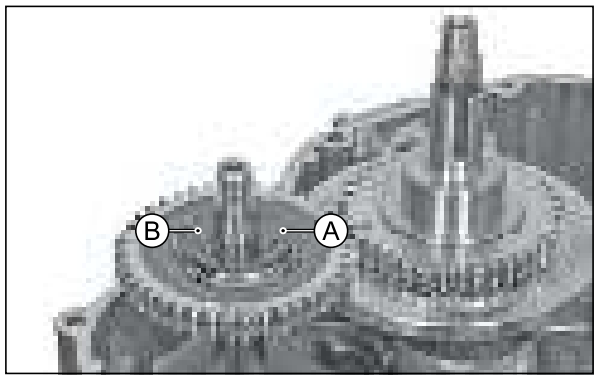


Fig. 3.192

Kick Starter

- Refer exploded view for assembly sequence.
- Assemble shaft kick starter, guide kick starter spring, spring kick shaft return and shim in the reverse order of dismantling. (Fig. 3.193)

Note:
While assembling ensure that spring kick starter return hook is located on the lug (A) provided in the crankcase assembly.

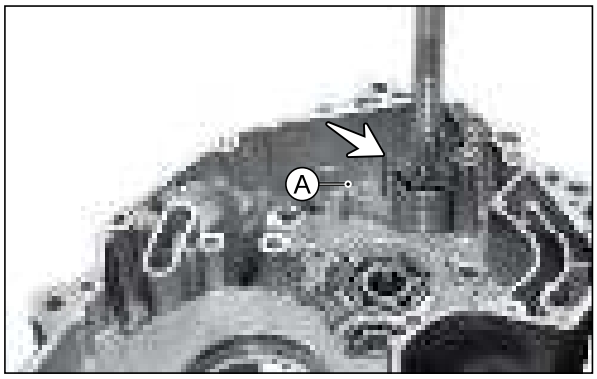


Fig. 3.193

- Assemble spring kick starter and starter kick in shaft kick starter assembly. (Fig. 3.194)

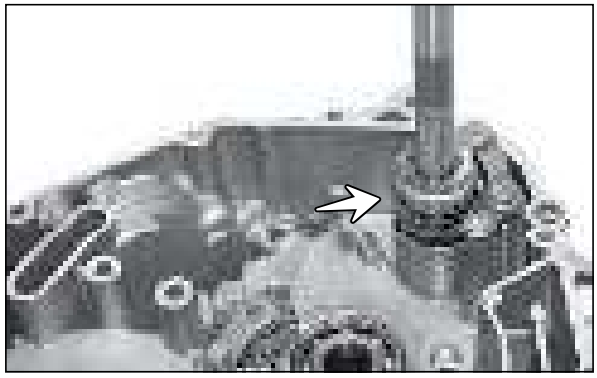


Fig. 3.194

- After assembling starter kick on the shaft, rotate shaft by one full clockwise rotation with the lever kick starter. Holding shaft in the same position, press the starter kick and lock it under the guide kick starter (A). (Fig. 3.195)

Fig. 3.195

- Place a thrust washer on the crankcase assembly LH at shaft complete drive seating area (above the ball bearing). (Fig. 3.196A)
- Place the gear 2nd driven on the crankcase assembly LH at shaft complete drive seating area (above the thrust washer). (Fig. 3.196B)

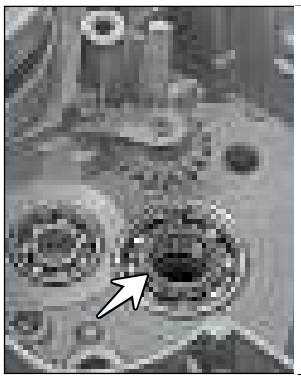


Fig. 3.196A

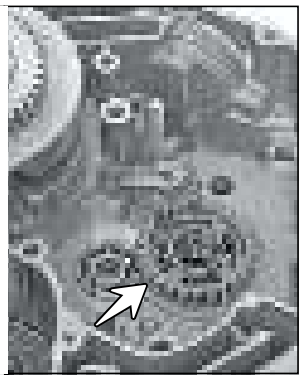


Fig. 3.196B

- Assemble the counter shaft assembly (clutch shaft) and drive shaft assembly as set in crankcase assembly LH. (Fig. 3.197)

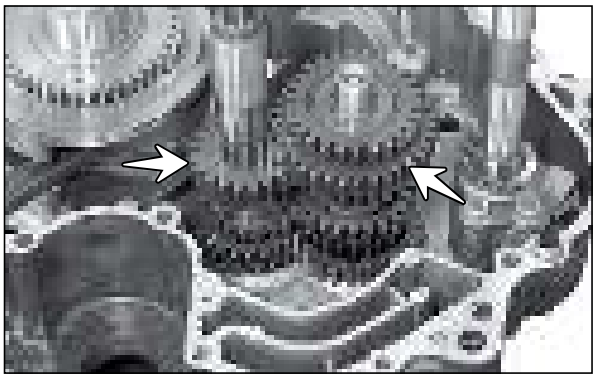


Fig. 3.197

- Assemble the fork gear shift no.1, fork gear shift no. 2 and fork gear shift high speed on their respective position. (Fig. 3.198)

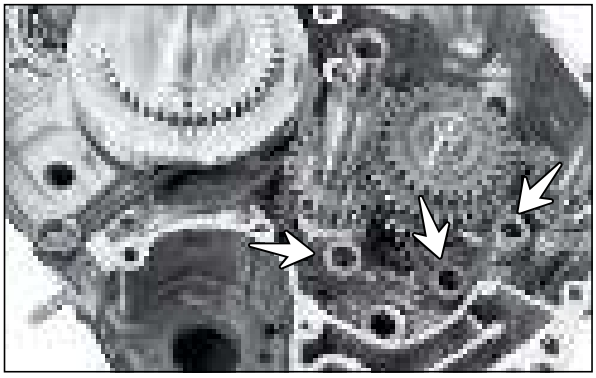


Fig. 3.198

- Assemble cam gear shift (A) in the crankcase assembly. (Fig. 3.199) and locate all the fork gear shifts into their respective grooves on the cam complete gear shift.

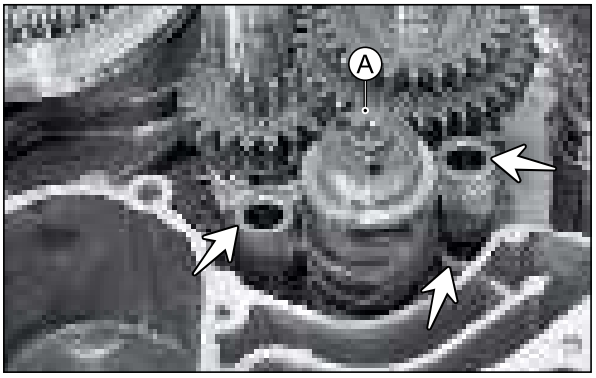


Fig. 3.199

- Assemble both the shaft shift forks in the crankcase assembly LH through fork gear shifts. (Fig. 3.200)

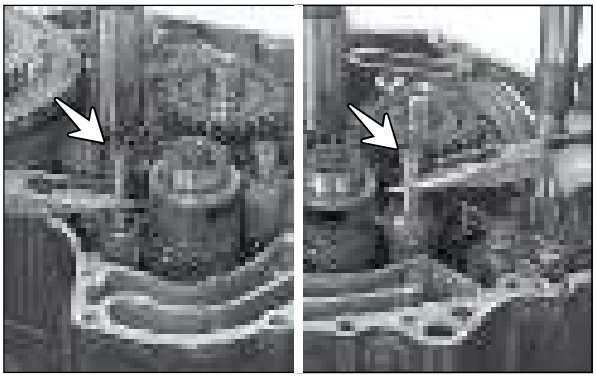


Fig. 3.200

- Assemble gear kick starter drive (A) and shim (B) on the shaft kick starter. (Fig. 3.201)
- Assemble the shim (C) on the shaft complete drive. (Fig. 3.201)
- Assemble bearing kick starter driven gear along with shim and thrust washer (D) on the shaft complete counter. (Fig. 3.201)

Note:
While assembling the shim and thrust washer, assemble the shim below the bearing kick starter driven gear and thrust washer on the top.

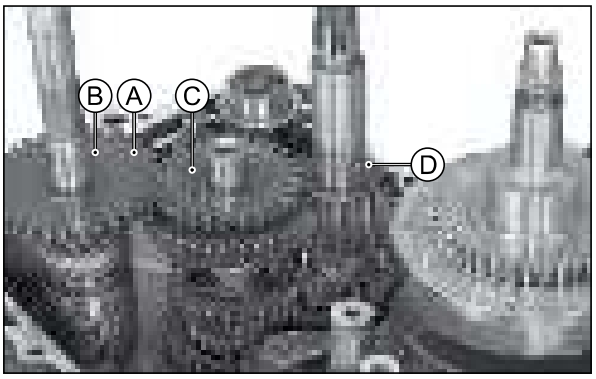


Fig. 3.201

- Assemble tubular dowel (2 Nos.) in the crankcase assembly LH and fix gasket crankcase.

Note:
Apply little grease on the gasket crankcase for better seating.

- Assemble the crankcase assembly RH to the crankcase assembly LH by gently tapping. (Fig. 3.202)

Nylon hammer

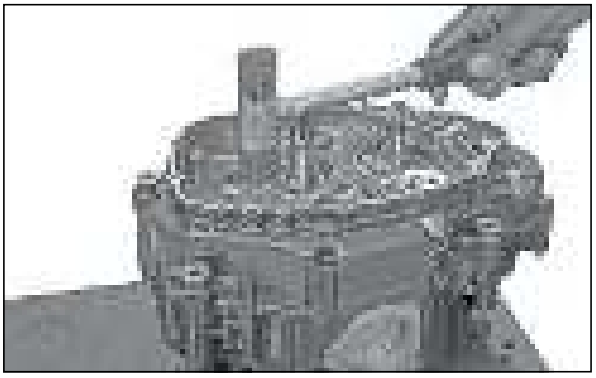


Fig. 3.202

- Assemble and tighten hexagonal flange bolts (M6x55 - 5 Nos., M6x40 - 4 Nos., M6x75 - 4 Nos. and M6x95 - 1 No.) on the crankcase complete LH. (Fig. 3.203)

8 mm spanner	
Tightening torque	10 ± 2 Nm

Note:
Tighten the screws in crisscross pattern.

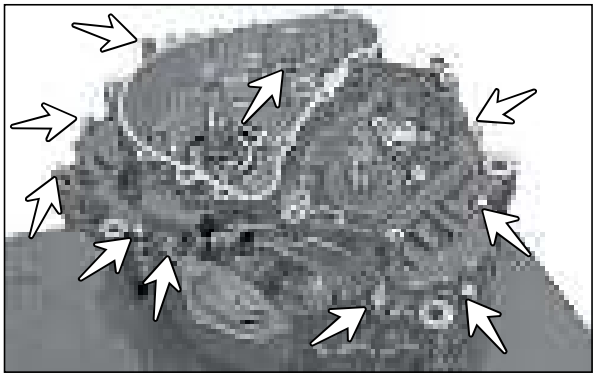


Fig. 3.203

- Assemble and tighten hexagonal flange bolt (M6x55 - 1 No.) on the crankcase complete RH. (Fig. 3.204)

8 mm spanner	
Tightening torque	10 ± 2 Nm

Note:
After tightening crankcase bolts, check for the free rotation of shaft complete drive, and shaft complete counter and crankshaft assembly.

If large resistance is felt, gently tap on the shaft complete drive and shaft complete counter assemblies with nylon hammer.

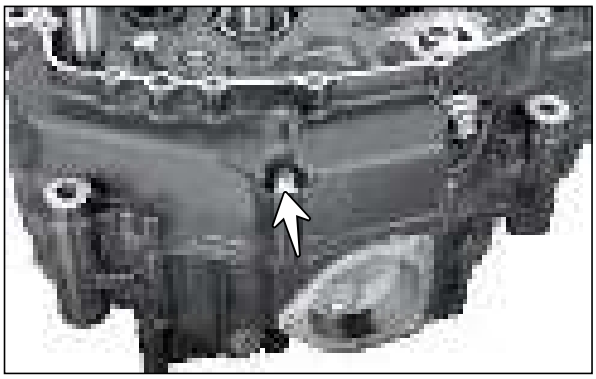


Fig. 3.204

CLUTCH

- Before assembling the cover clutch, ensure that adopter clutch release and ball are assembled on the clutch assembly. (Fig. 3.205A)

- Also ensure that pin clutch release is assembled on the cover clutch. (Fig. 3.205B)

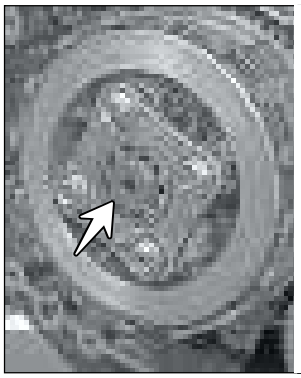


Fig. 3.205A

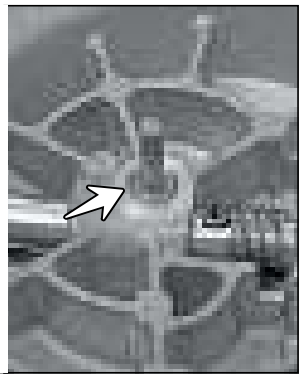


Fig. 3.205B

VALVE TIMING AND VALVE CLEARANCE

Valve Timing

- While reassembling sprocket cam shaft, follow the below given procedures:
- Rotate rotor assembly and match the TDC mark (A) on rotor assembly and the mark (B) on crankcase assembly LH. (Fig. 3.206A)
- At this position, ensure that the mark (C) on sprocket cam shaft matches with the surface edge of head complete cylinder (D). (Fig. 3.206B)

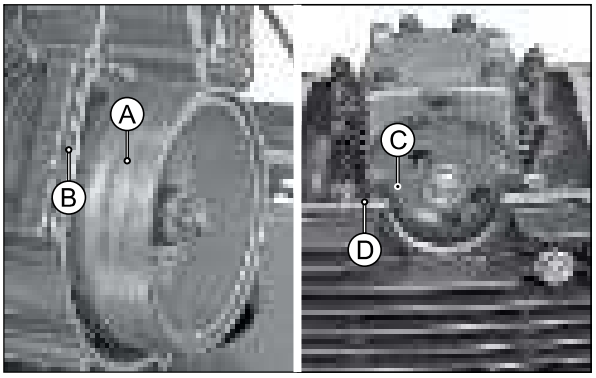


Fig. 3.206A

Fig. 3.206B

Valve Clearance

- Adjust valve clearance to the specified limit (refer chapter "Periodic maintenance" page no. 2-20 for procedure and specification)
- Before starting the vehicle, fill up engine cum transmission oil and carry out all the other adjustments. Tune the engine as prescribed in chapter "Periodic maintenance" page no. 2-18.

RUNNING-IN AFTER OVERHAUL

- The rebuilt / overhauled engine should undergo running-in.
- Do not overload the engine immediately after overhaul as it may result in rapid wear of components due to overstrain, overheat and overload.
- This will have a impact through out the life of the rebuilt components resulting in under performance of vehicle.

Chapter 4

FUEL, LUBRICATION AND EXHAUST SYSTEM

FUEL SYSTEM

FUEL TANK COMPLETE

Incase of Carburettor Model

- The fuel tank complete is located on frame tube near the steering pivot with a lockable cap assembly (A) and manually operated fuel cock assembly (B) at the bottom left side of the tank. (Fig. 4.1)
- The cap can be opened with the ignition key.
- A fuel sender unit is mounted at the bottom side of the fuel tank. (Fig. 4.2)

Tank capacity	
Main	12 liters
Reserve	2.5 liters

- Clean the fuel tank periodically. Inspect the tank for any leakage. If any leakage is noticed, replace the fuel tank with a new one.

REMOVAL

- Drain the petrol completely.
- Remove the fuel tank assembly as explained in chapter "Periodic maintenance" page no. 2-4.
- Remove the hexagonal flanged bolts (M6x16 - 2 Nos.) along with gaskets from the fuel cock assembly mounting and take out the fuel cock assembly. (Fig. 4.3)

10 mm spanner	

Tightening torque	7 ± 1 Nm

Note:
While reassembling the fuel cock, ensure the presence of joint packing in the fuel cock body and gasket in hexagonal bolts.

Caution:
Replace the joint packing with new one while reassembling if found damage.

Care should be taken not to damage the painted surfaces of the fuel tank assembly during removal, cleaning and reassembly.

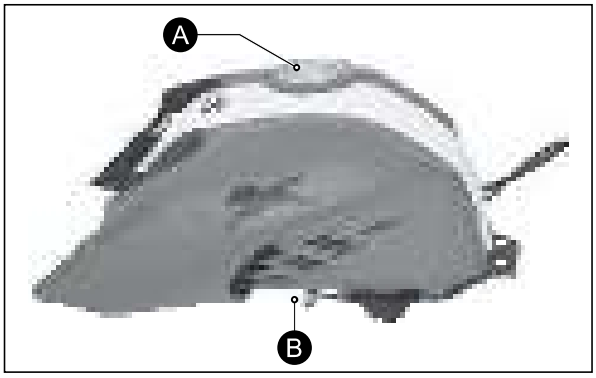


Fig. 4.1

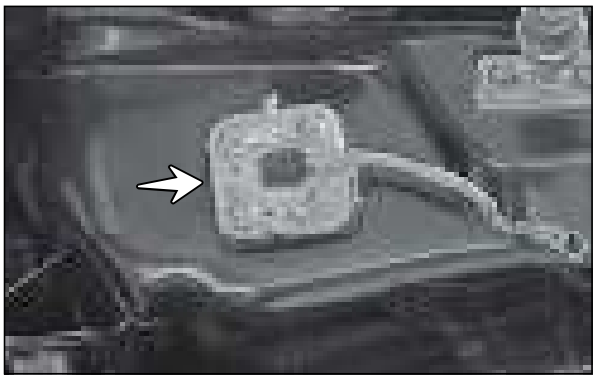


Fig. 4.2

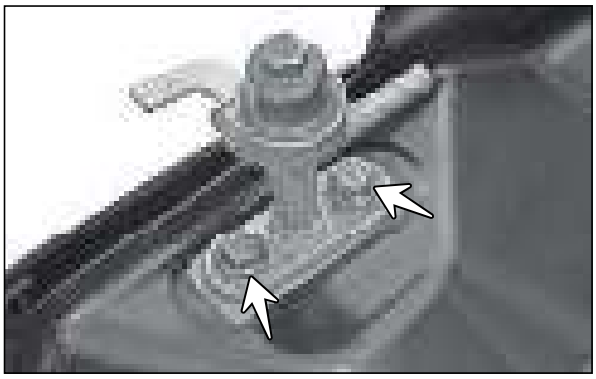


Fig. 4.3

- Dislocate the hose clamp and disconnect the hose drain from the fuel tank assembly. (Fig. 4.4)

Nose plier

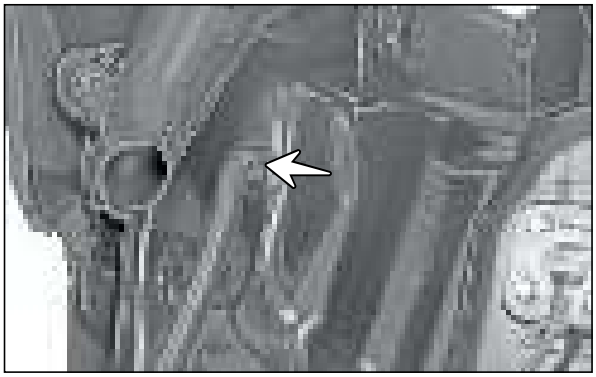


Fig. 4.4

- Remove hexagonal flange bolt (M5x14 - 4 Nos.) from the fuel sender unit mounting. (Fig. 4.5)

8 mm spanner	
Tightening torque	2.5 ± 0.5 Nm

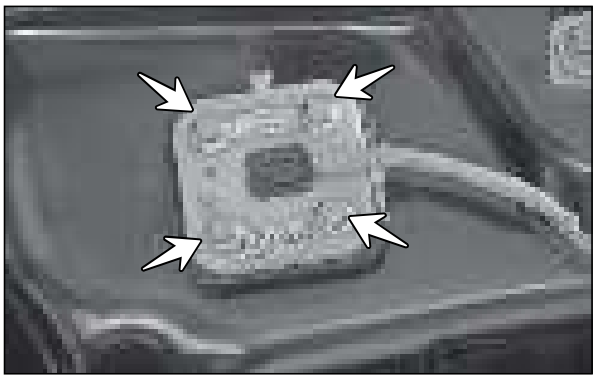


Fig. 4.5

- Carefully take out the fuel sender unit along with the gasket.

Caution:
Care should be taken not to damage the fuel sender unit during removal / reassembly. Otherwise it may lead to malfunction of fuel gauge.

CLEANING

- Clean the fuel tank assembly thoroughly with a suitable cleaning solvent.

Note:
Before reassembling fuel tank complete, the solvent used for cleaning should be cleaned and dried completely.

Fuel Cock Assembly

- A pencil filter (A) is fixed to the fuel cock assembly and inserted inside the fuel tank. The fuel cock also has a filter inside the fuel cock sediment bowl (B). (Fig. 4.6)

- Generally impurities are collected in petrol. Pencil filter helps in filtering the fine impurities in petrol before they enter the fuel cock assembly.

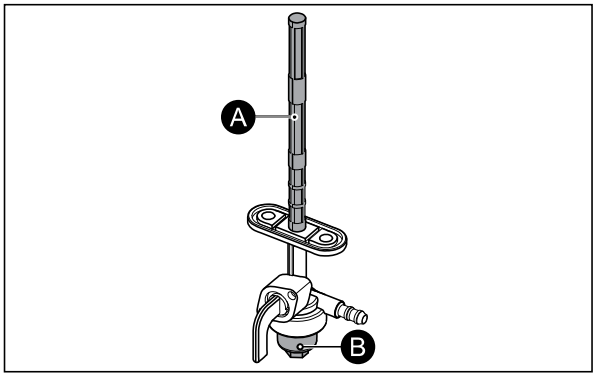


Fig. 4.6

- Clean the pencil filter periodically. Visually inspect for any damage. Incase any abnormality is found the filter and the fuel cock assembly must be replaced with a new one.

- Sediments filtered by the filter inside the fuel cock sediment bowl will get deposited in the bowl. Therefore the bowl and the filter inside the bowl must be removed and cleaned periodically to avoid dust entry into the carburettor assembly. (Fig. 4.7)

10 mm spanner

Caution:
Replace the 'O' ring with new one while reassembling. (Fig. 4.7)

- Use compressed air to clean any obstruction in the passage of the fuel cock assembly. Reassemble the components in the reverse order of dismantling.

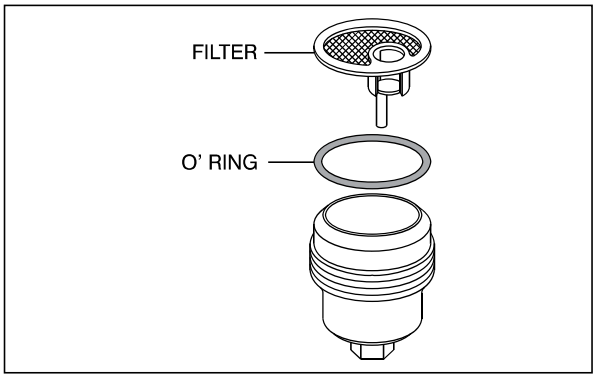


Fig. 4.7

HOSE FUEL

- Visually inspect the hose fuel for crack or leakage at its mounting points. If any crack or leakage noticed replace hose fuel with a new one. Refer chapter "Periodic maintenance" page no. 2-26.

Incase of Fi Model

- The fuel tank complete is located on frame tube near the steering pivot with a lockable cap assembly fuel tank (A) and fuel filter with hose injector (B) at the bottom left side of the tank. (Fig. 4.8)

- The cap assembly fuel tank can be opened with the ignition key.

- A fuel pump module is mounted at the bottom side of the fuel tank. (Fig. 4.9)

Tank capacity	
Main	12 liters

- Clean the fuel tank complete periodically. Inspect the tank for any leakage. If any leakage is noticed, replace the fuel tank with a new one.

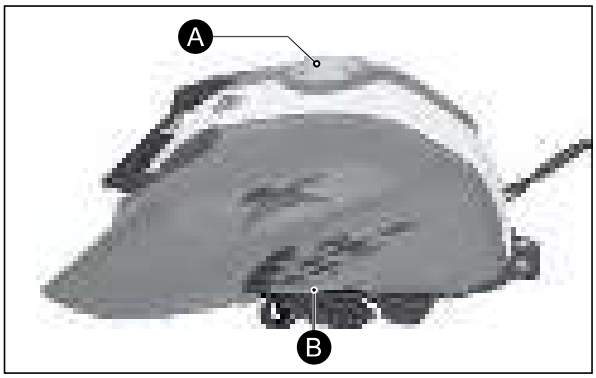


Fig. 4.8

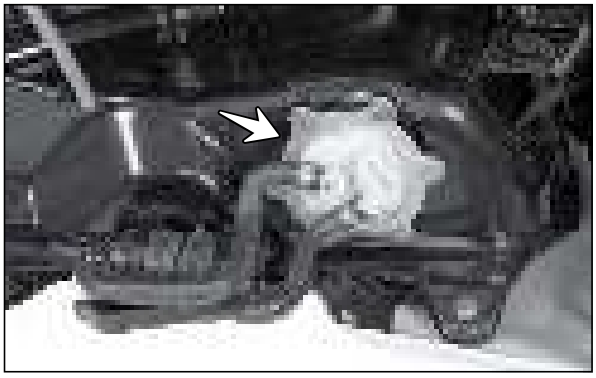


Fig. 4.9

REMOVAL

- Drain the petrol completely.
- Remove the fuel tank assembly as explained in chapter "Periodic maintenance" page no. 2-5.
- Remove fuel filter assembly as explained in chapter "Periodic maintenance" page no. 2-53.
- Remove the hexagonal flanged bolt (M6x10 - 6 Nos.) along with the gasket from the fuel pump module. (Fig. 4.10)

10 mm spanner

Tightening torque	8 ± 1 Nm

- Take out the plate carefully (A). (Fig. 4.10)
- Take out the fuel pump module along with the two 'O' rings. (Fig. 4.11)
- While reassembling the fuel pump, assemble all the six screws by hand and engage two minimum threads and then tighten them to 2 to 3 Nm in a diagonal sequence.
- Again tighten screws to 7 to 9 Nm in a same diagonal sequence.

Note:
While reassembling the fuel pump module, ensure both the 'O' rings are replaced with new ones.

Ensure the slot A, B, C of the pump in same line. (Fig. 4.12)

- Dislocate the hose clamp and disconnect the hose drain from the fuel tank assembly. (Fig. 4.13)

Nose plier

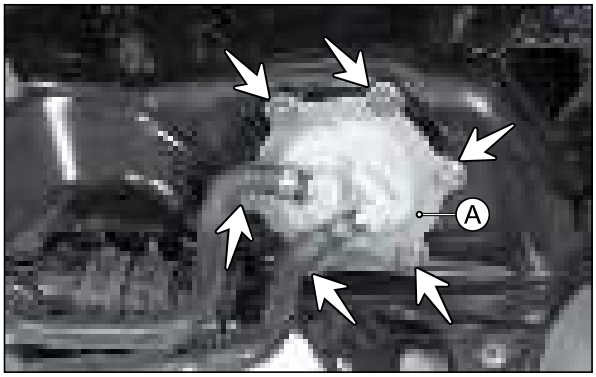


Fig. 4.10

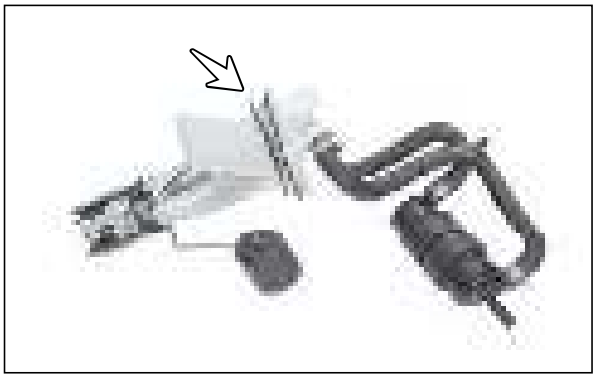


Fig. 4.11

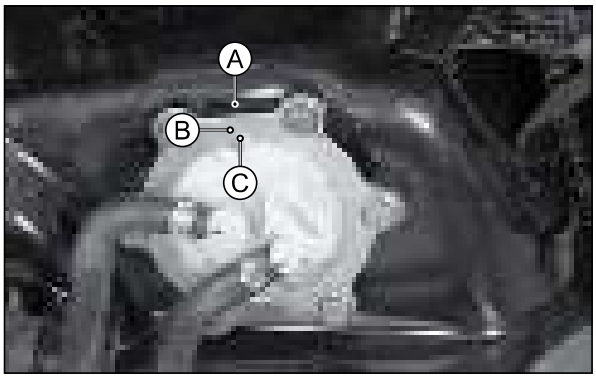


Fig. 4.12

Fig. 4.13

HOSE FUEL

- Visually inspect the hose fuel for crack or leakage at its mounting points. If any crack or leakage noticed replace hose fuel with a new one. Refer chapter "Periodic maintenance" page no. 2-26.

CARBURETTOR ASSEMBLY (Applicable for Carburettor Version)

Removal from the vehicle

- The maintenance of the carburettor assembly requires cleaning periodically in order to avoid blockage of jets, passages and setting idle CO% recommended by the manufacturer.

Note:
Before removing the carburettor assembly, turn the fuel cock knob to 'OFF' position and disconnect the fuel hose from carburettor assembly.

- Remove the seat and cover frame L & R by referring the chapter "Periodic maintenance" page no. 2-3.

- Fully loosen the throttle cable lock nut (A) while holding the adjuster (B). (Fig. 4.14)

10 mm spanner

- Dislocate the hose clip and pull out the air vent hose from the air cleaner assembly. (Fig. 4.15)

Nose plier

Carburettor specifications	
Description	**Specification**
Carburettor type	BS
Main jet	107.5
Needle jet	P0
Jet needle	4DHL1
E- ring position	Centre
Pilot jet	20
Piston valve	--
MCS screw turns	1½ ~ 3½ turns
Idling rpm	1500 ± 100 rpm
Idling CO% (with SAI)	1.0 ~ 3.0% by volume

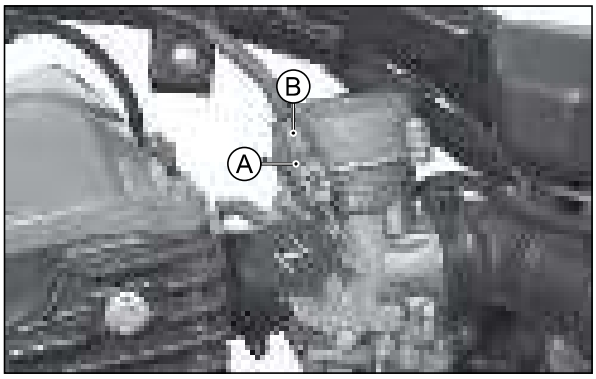


Fig. 4.14

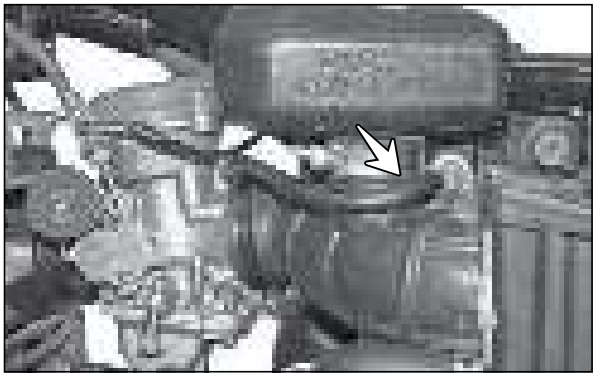


Fig. 4.15

- Loosen the clamp outlet pipe and dislocate the tube outlet pipe of air cleaner from the carburettor assembly. (Fig. 4.16A)

Phillips head screw driver	
Tightening torque	1.75 ± 0.25 Nm

- Similarly, loosen the clamp intake pipe and gently pull out the carburettor assembly from the intake pipe. (Fig. 4.16B)

Tightening torque	2.25 ± 0.25 Nm

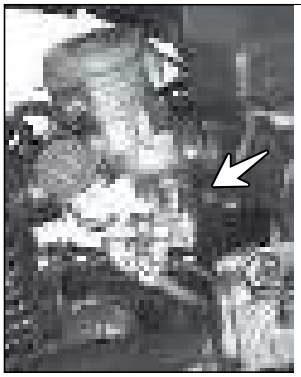


Fig. 4.16A

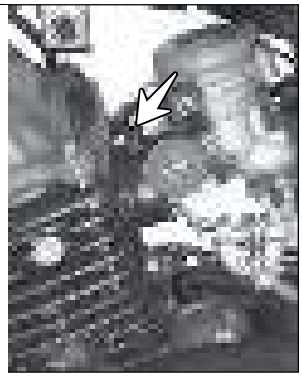


Fig. 4.16B

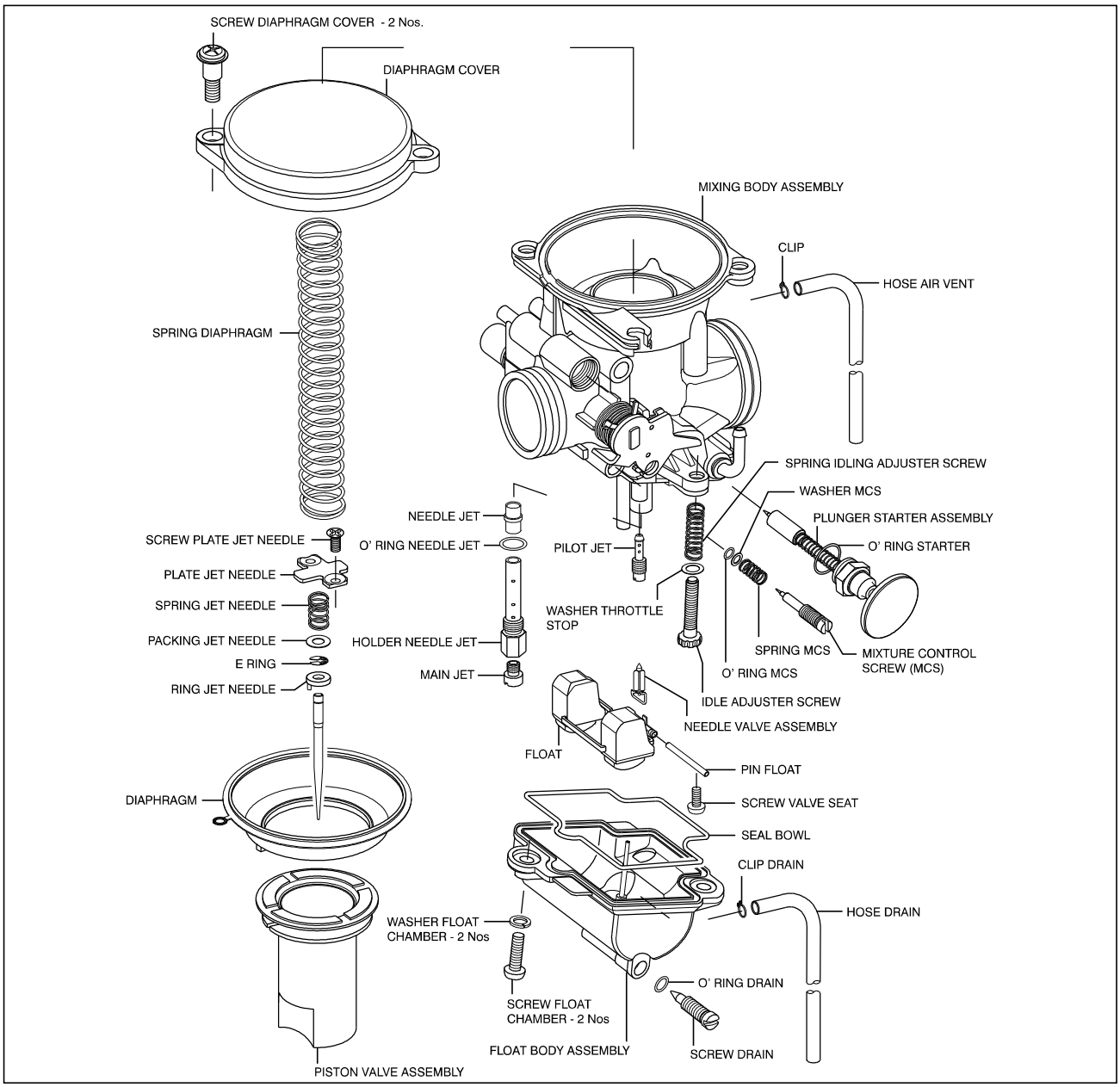


Fig. 4.17

DISASSEMBLY

- Pull out the hose air vent (A) and drain hose (B) by dislocating clips. (Fig. 4.18)

Nose plier

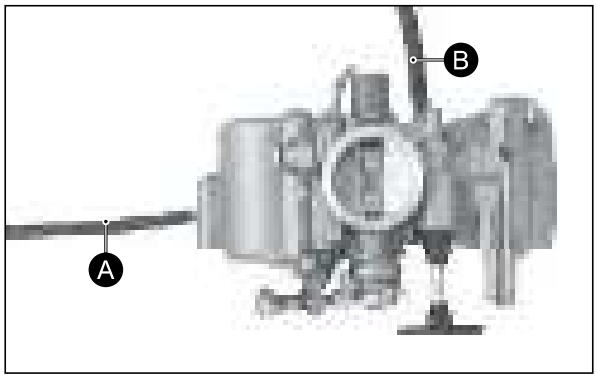


Fig. 4.18

- Remove CRR pan head screws (2 Nos.) and take out cover diaphragm. (Fig. 4.19)

Phillips head screw driver

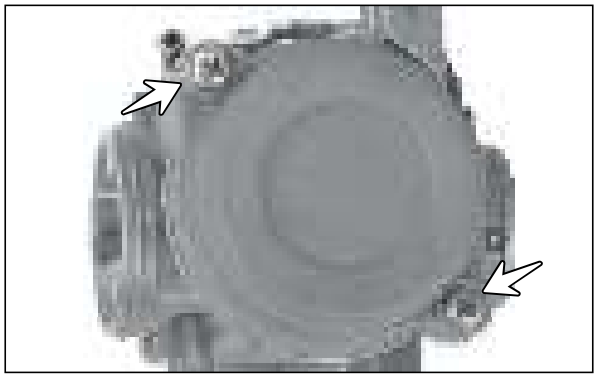


Fig. 4.19

- Take out spring piston valve. (Fig. 4.20A)
- Remove piston valve assembly along with the diaphragm. (Fig. 4.20B)

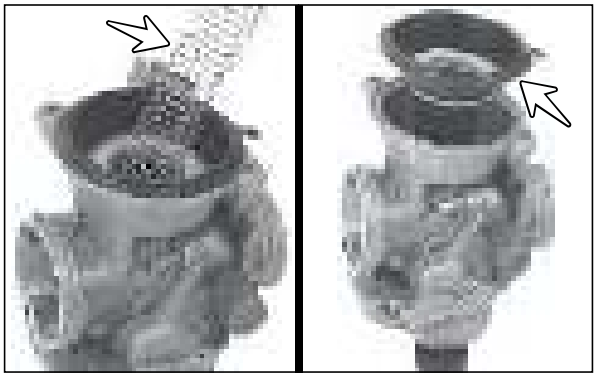


Fig. 4.20A Fig. 4.20B

- Remove the adjuster pilot screw (mixture control screw) (A) along with spring, washer, and 'O' ring. (Fig. 4.21)

Small flat screw driver

- Loosen and remove idle adjuster screw (B) along with spring and washer. (Fig. 4.21)

Note:
While reassembling the pilot screw ensure to replace the 'O' ring with a new one.

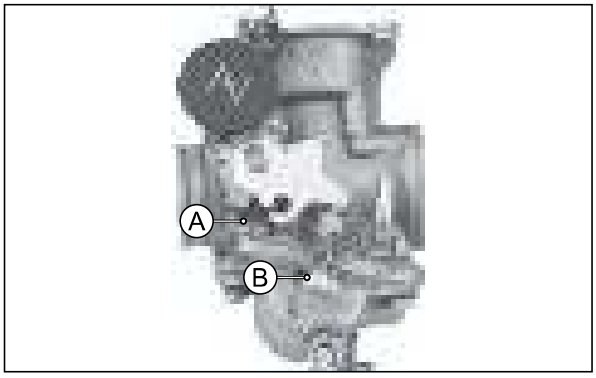


Fig. 4.21

- Remove the CRR pan head screws (2 Nos.) from the float chamber mounting and take out the float chamber along with the gasket. (Fig. 4.22)

Phillips head screw driver

Note:
While reassembling the float chamber, inspect the condition of gasket float chamber and replace if required.

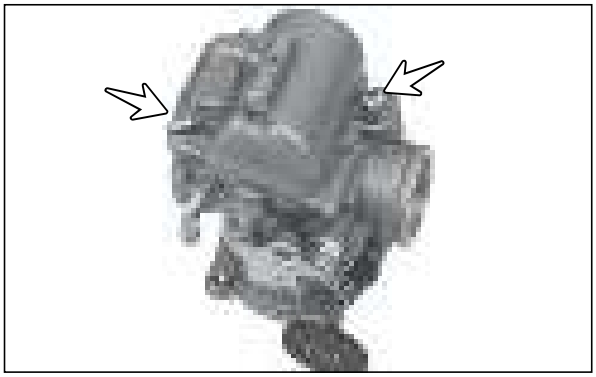


Fig. 4.22

- Remove the CRR pan head screw and take out the float along with pin float, float needle (needle valve assembly). (Fig. 4.23)

Phillips head screw driver

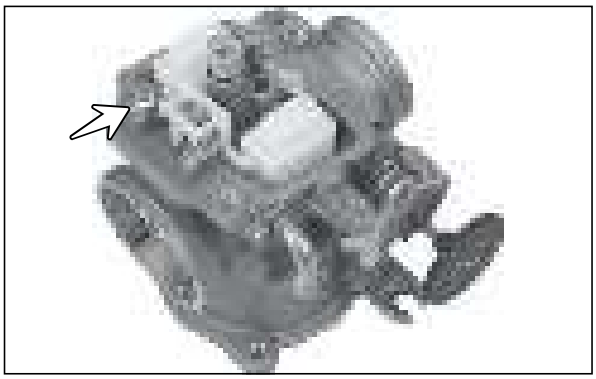


Fig. 4.23

- Using a small flat screw driver, carefully remove pilot jet. (Fig. 4.24)

Flat screw driver (small)

Caution:
During reassembly of the pilot jet do not tighten more than required as it may damage the seating surface.

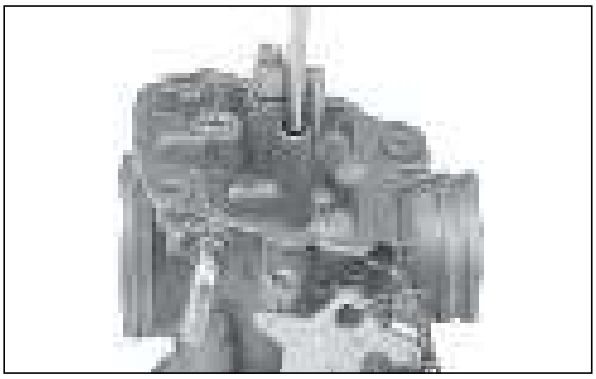


Fig. 4.24

- Remove main jet (A) while holding holder jet needle. (Fig. 4.25)

Flat screw driver

- Remove holder needle jet (B) and take out needle jet.

7 mm spanner

Note:
The holder needle jet and the needle jet needs to be removed only if necessary.

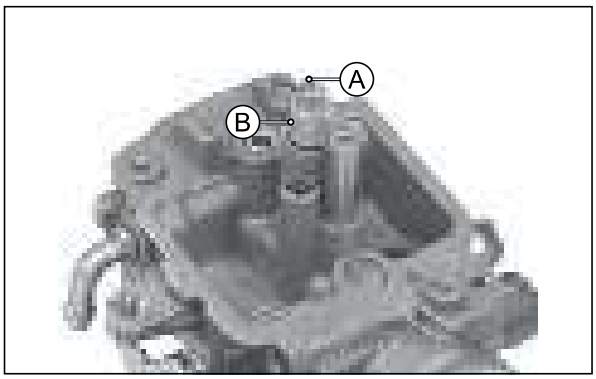


Fig. 4.25

Piston Valve - Disassembly

Warning:
It is recommended not to disassemble the piston valve assembly during every carburettor service. Disassemble only if necessary.

- Remove ring piston valve and carefully remove diaphragm from the piston valve. (Fig. 4.26)

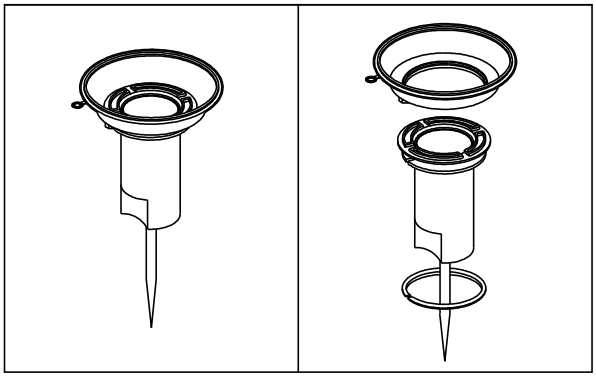


Fig. 4.26

Note:
While re-fixing the diaphragm into the piston valve, ensure the proper seating of steps of diaphragm (A & B) to the groove of the piston valve (C & D). (Fig. 4.27)

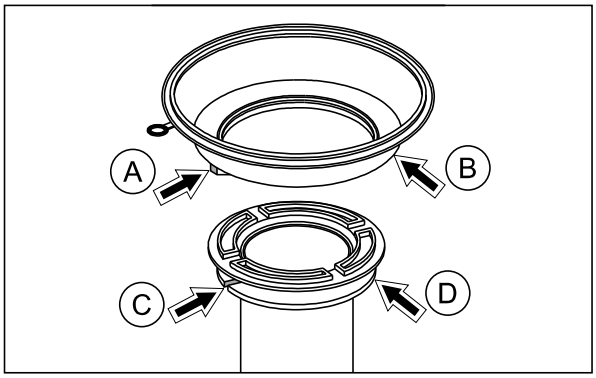


Fig. 4.27

- Remove screw plate jet needle (2 Nos.) and take out plate jet needle, spring jet needle and packing jet needle. (Fig. 4.28)

Phillips head screw driver

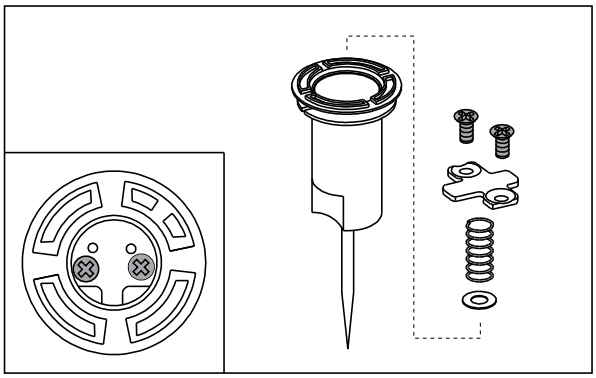


Fig. 4.28

- Push jet needle from the bottom and remove the jet needle with 'E' ring jet needle and ring jet needle. (Fig. 4.29A)
- Reassemble piston valve assembly in the reverse order of the removal.
- Do not change the position of the 'E' ring on jet needle (2nd from the top notch) (Fig. 4.29B) and jet sizes which will have effect on the engine performance and lead to premature wear of engine parts, decreased fuel economy and poor pick-up.

Note:
While reassembling locate the projection of ring jet needle in the hole provided in the piston valve.

- After assembling, make sure that the jet needle moves up and down on side ways by light finger force.

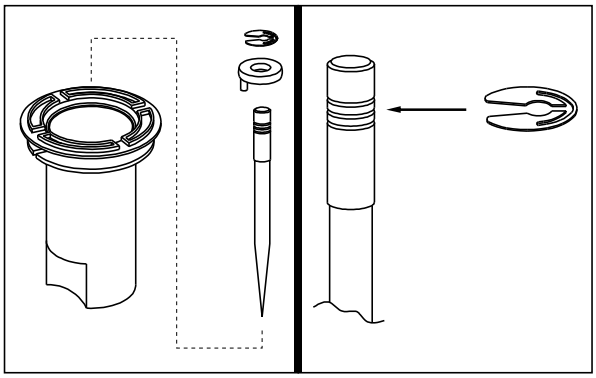


Fig. 4.29A Fig. 4.29B

MAINTENANCE

- Maintaining full level of fuel in the fuel tank does not allow it to rust and also reduces the rust deposition in the carburettor assembly.
- While the choke lever is in 'ON' position, do not open the throttle otherwise it may cause flooding of the carburettor.
- Clean the filter complete air cleaner regularly, since the blocked or damaged air filter will have adverse effect on carburettor assembly and results in reduced engine performance.

CLEANING

- Spray the carburettor cleaner in all passages of the carburettor body (Fig. 4.30) to ensure no blockage due to dust, dirt, gum or carbon deposit.
- After cleaning the carburettor pages properly using the cleaner, blow the compressed air to clean the passages thoroughly. (Fig. 4.31)

Caution:
Do not use wires to clean the jets.

Remove all rubber parts from the carburettor assembly before cleaning it with a cleaning solution. This will prevent damage or deterioration of the rubber parts.

Do not use compressed air on an assembled carburettor which may cause damage to the float system.

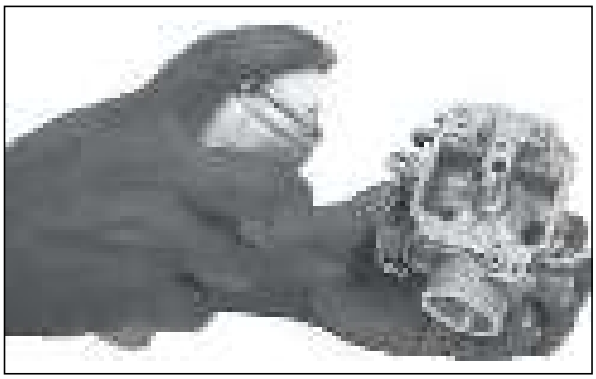


Fig. 4.30

Fig. 4.31

INSPECTION

Needle Valve Assembly

- Any foreign particles on float needle (needle valve assembly) and its seating may cause improper sealing resulting in over flow of petrol. Similar kind of problem also occurs in case of float needle and its seating area are worn-out.
- Conversely if the float needle sticks, the petrol does not flow into the float chamber.

- If the float needle is worn-out as shown (Fig. 4.32), replace it with a new one.

- Inspect piston valve, needle jet, jet needle, pilot jet, main jet, pilot screw and 'O' rings for any wear or abnormal damage. If any damage is noticed, replace damaged parts with new ones.

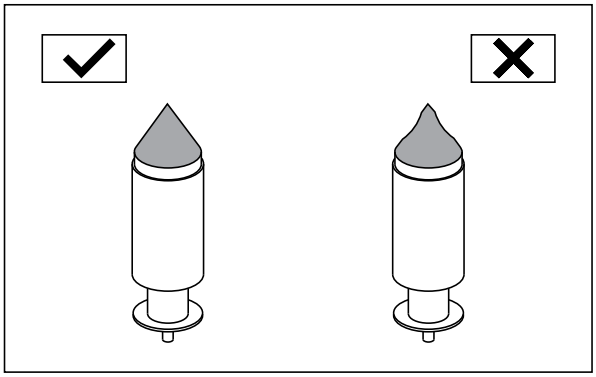


Fig. 4.32

REASSEMBLY

- Reassemble parts in the reverse order of dismantling while ensuring the following:

- Refer carburettor assembly exploded view on page no. 4-6 for assembly details.

> ***Note:***
> ***Ensure that the pilot jet is not tightened too much as this will cause damage to its head. Removal from the mixing body becomes very difficult.***

- While reassembling the carburettor always use new 'O' rings and sealing rings.

- Assemble piston valve in such a way that the hook like projection of diaphragm matches with the groove of carburettor body. (Fig. 4.33)

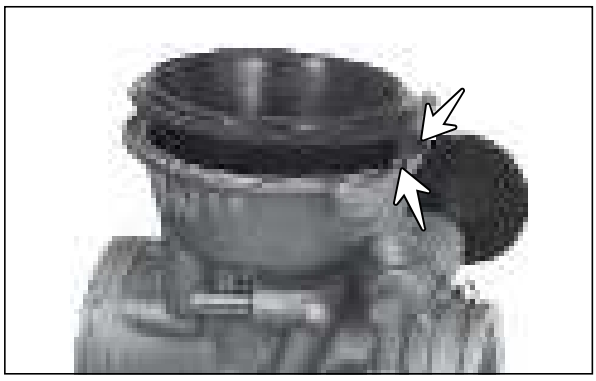


Fig. 4.33

- Remount carburettor assembly on the vehicle in the reverse order of removal.

> ***Note:***
> ***While reassembling, check for smooth movement of choke lever and piston valve in the carburettor body.***

- After remounting the carburettor assembly on the vehicle, properly route the hose air vent and hose drain.

- Check for smooth operation of throttle grip and choke. Check and adjust the throttle play if required (refer chapter "Periodic maintenance" page no. 2-27).

IDLING ADJUSTMENT

- After remounting the carburettor assembly on the vehicle, tune the carburettor as explained in detail in the chapter "Periodic maintenance" page no. 2-18.

THROTTLE BODY ASSEMBLY (Applicable for Fi Version)

Removal from the Vehicle

- **Replace the entire throttle body assembly incase found any abnormality. Individual part replacement is not recommended.**

> ***Note:***
> ***Before removing the throttle body assembly, disconnect the hose injector from fuel filter.***

- Remove the seat and cover frame L & R by referring the chapter "Periodic maintenance" page no. 2-3.

- Disconnect all the couplers fixed to the throttle body (A, B, C & D). (Fig. 4.34)

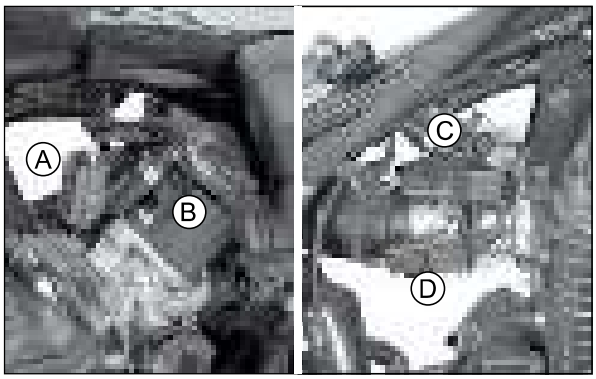


Fig. 4.34

- Fully loosen the throttle cable lock nut (A) while holding the adjuster (B). (Fig. 4.35)

10 mm spanner

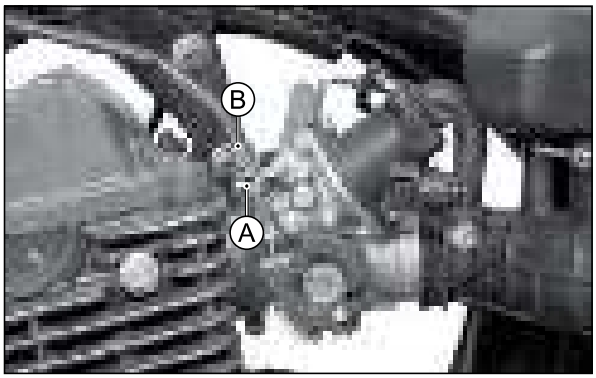


Fig. 4.35

- Loosen the clamp intake pipe and gently pull out the throttle body assembly from the intake pipe. (Fig. 4.36A)

Phillips head screw driver

Tightening torque	2.25 ± 0.25 Nm

- Similarly, loosen the clamp outlet pipe and dislocate the tube outlet pipe of air cleaner from the throttle body assembly. (Fig. 4.36B)

Tightening torque	1.75 ± 0.25 Nm

- Now take out the Throttle body assembly.

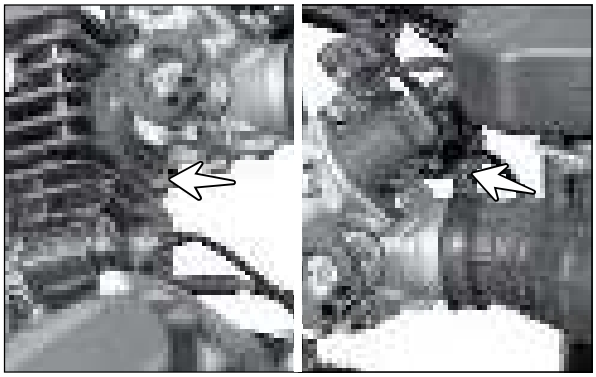


Fig. 4.36A

Fig. 4.36B

EVAP SYSTEM

What is EVAP?

The EVAPORATIVE EMISSION CONTROL (EVAP) is used to prevent petrol vapors from escaping into the atmosphere from the fuel tank and fuel system. BS IV norms require EVAP systems on bikes because petrol vapors contain a variety of different hydrocarbons (HC). These substances react with air and sunlight to form smog.

The EVAP system totally eliminates fuel vapors as a source of air pollution by sealing off the fuel system from the atmosphere. Vent lines from the fuel tank route vapors to the EVAP storage canister, where they are trapped and stored until the engine is started. When the engine is warm and the vehicle is going down the road, the purge valve opens allowing the vapors to be siphoned from the storage canister into the intake manifold. The fuel vapors are then burned in the engine.

- The EVAP system in Apache RTR 200 consist of following.
  - Canister
  - Purge control valve (in carburettor version)
  - Electronic purge valve (in Fi version)
- Remove the fuel tank assembly by referring the chapter "Periodic maintenance" page no. 2-4 & 2-5.
- Disconnect the wiring socket from the purge valve assembly (applicable only for Fi version)
- Disconnect the hose (A and B) from the purge valve. (Fig. 4.37)

Nose plier

- Disconnect the hose (A, B, C and D) form the canister. Now take out the canister along with purge valve. (Fig. 4.38)

Nose Plier

Note:
If any damage found in any of the hoses, canister and purge valve replace with a new ones.

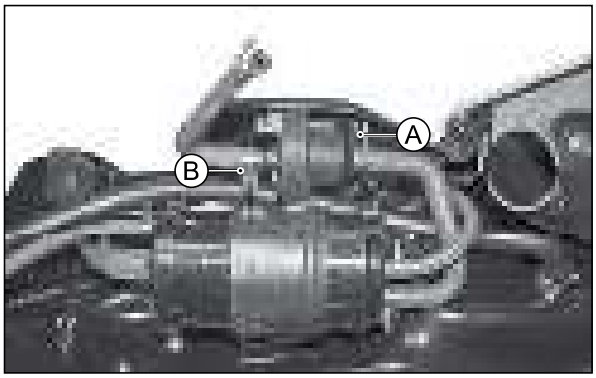


Fig. 4.37

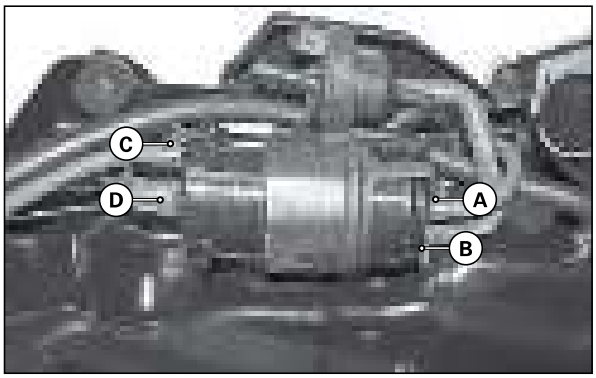


Fig. 4.38

LUBRICATION SYSTEM

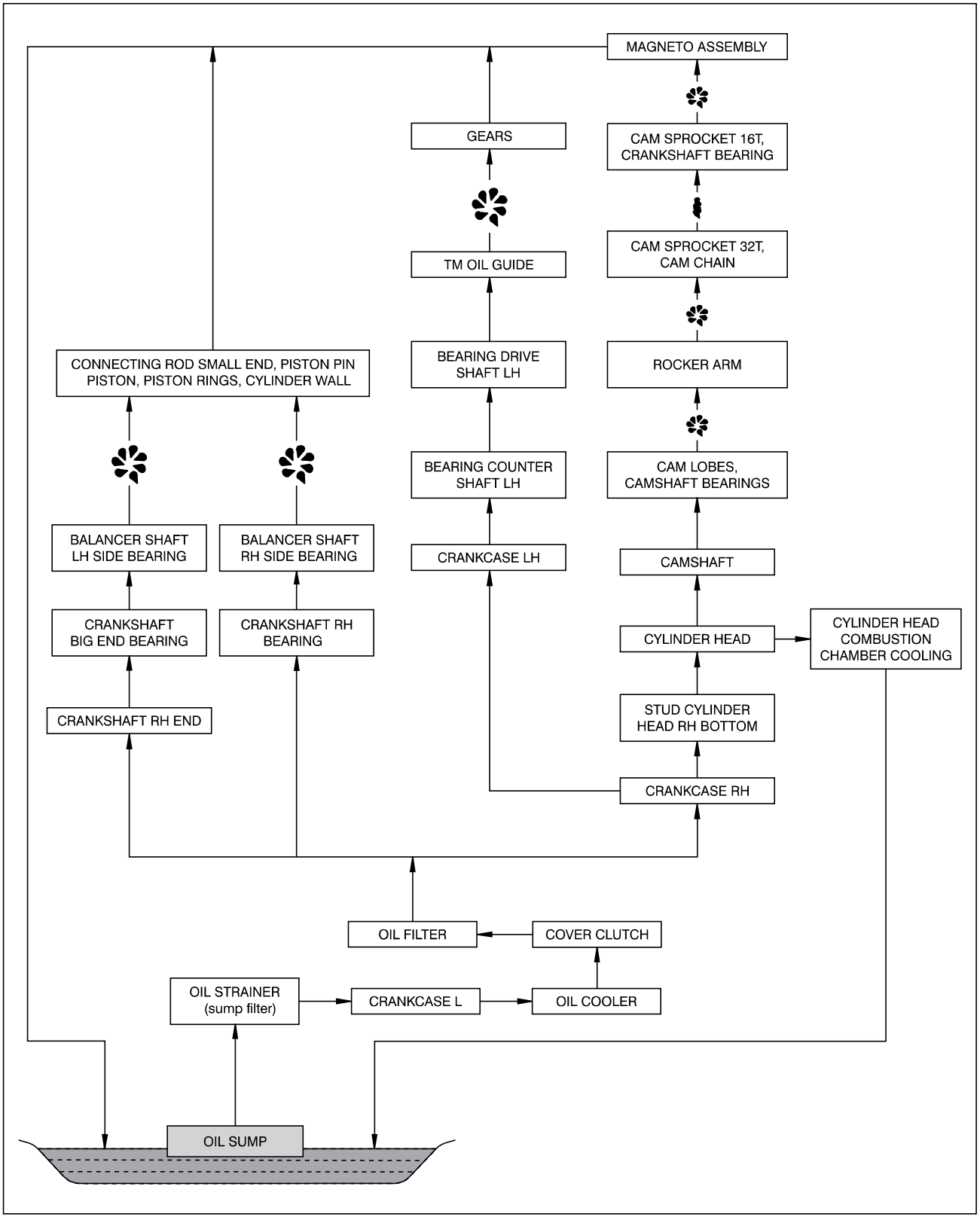


Fig. 4.39

- Lubrication system is very important to any engine which helps the engine to perform well even at higher speeds and temperature. So maintaining the lubrication system is essential to safeguard the engine.
- In this bike, the lubrication system is called as positive lubrication system. It contains a trochoid oil pump which delivers oil to the lubrication circuit from the sump.
- It has an oil filter in the inlet side of the pump. Also it has paper filter at the outlet of the oil pump. The oil travels through various systems of the engine to cool.
- The oil circuit is shown in the figure.(Fig. 4.39)
- Always clean the oil passages whenever service or opening the crankcase.
- Replace or replenish the lubricating oil as per the periodical maintenance schedule.

OIL FILTER (STRAINER)

- Oil filter is provided on the right side crankcase at the bottom, inside the cap oil strainer. (Fig. 4.40)
- Clean the oil filter as specified in the periodic maintenance schedule (refer chapter "Periodic maintenance" page no. 2-12 for removal and cleaning procedure).

OIL PUMP ASSEMBLY

- The pump assembly oil is mounted on the right side crankcase, just below the gear primary drive. (Fig. 4.41)
- Oil pump is the prime member which delivers oil to the lubrication system from the sump. It is driven by a separate gear (gear oil pump drive) through a plastic gear. Inspect the oil pump driven gear and the oil pump surface for any damage. Tighten the oil pump mounting screws to the specified torque while reassembling.

Tightening torque	9 ± 1 Nm

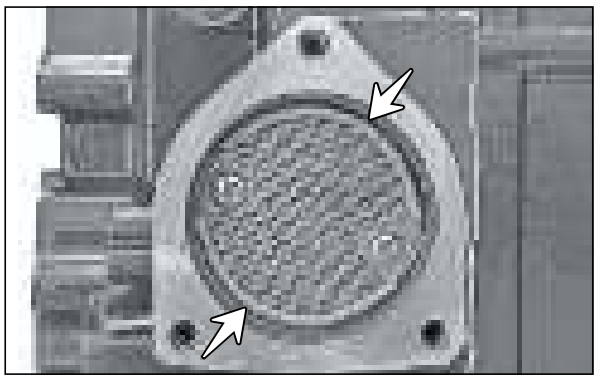


Fig. 4.40

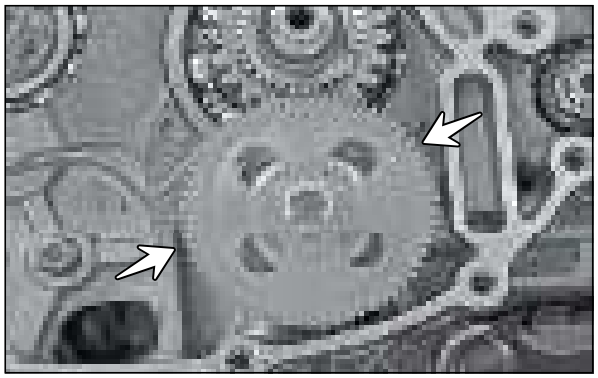


Fig. 4.41

- To ensure supply of oil to cylinder head components, the oil flow can be checked at the cylinder head by following the procedure given below:
- Start the engine and run for a few seconds.
- Slowly loosen the hexagonal flange bolt (M8x15 - 1 No.) along with the copper gasket and look for the flow of oil. (Fig. 4.42)

14 mm spanner	
Tightening torque	12 ± 2 Nm

Note:
Do not open the bolt suddenly as the oil may splash out through the hole.

Do not keep the oil inspection hole open for longer period as it may lead to more amount of oil drain.

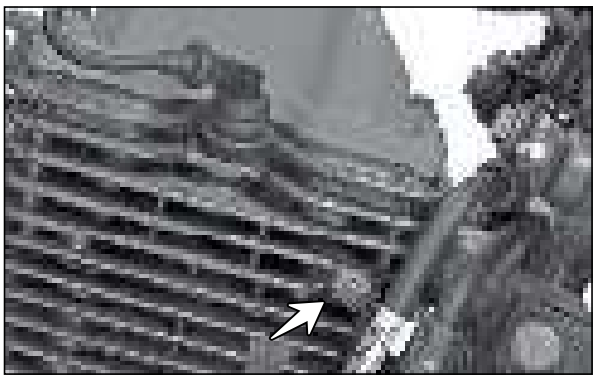


Fig. 4.42

- If there is no oil flow through the inspection hole, check for proper working of oil pump, clogged oil filter and for any block in the oil flow passages.

OIL COOLER ASSEMBLY

- The oil cooler assembly is mounted on the frame below the fuel tank near the steering head column. (Fig. 4.43)
- The oil from the engine is pumped through the oil cooler assembly, cooled down and sent back to the engine.
- Visually inspect the oil cooler fins for any blockage. If found any, clean them using a small blunt tool and compressed air.
- Inspect the oil cooler fins for any deformations, straighten them with a thin, flat head screw driver.
- Visually inspect the cooler assembly inlet and outlet pipes for any crack, leakage, damage or deformation. If found any, replace them with new ones.
- Refer chapter "Periodic maintenance" page no. 2-22 for removal, inspection and rectification procedure of oil cooler assembly.

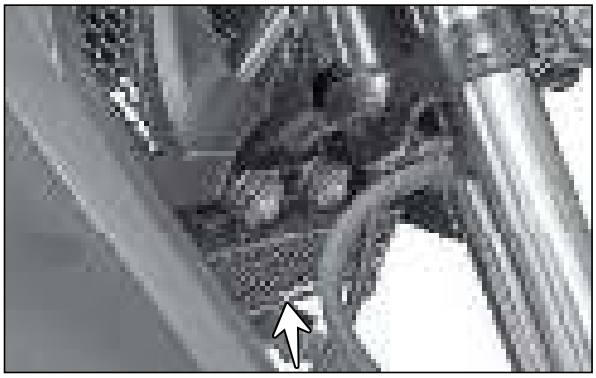


Fig. 4.43

FILTER COMPLETE ENGINE OIL

- The filter complete engine oil should be periodically inspected and changed if necessary with a new one. (Fig 4.44)

> ***Note:***
> ***Whenever the filter complete engine oil is replaced, it is recommended that engine oil is also to be replaced.***

- The procedure for changing oil and filter complete engine oil is explained in detail in chapter "Periodic maintenance" page no. 2-12 & 2-13.

Fig. 4.44

EXHAUST EMISSION CONTROL

- The pollutants emitted from the exhaust system are harmful to environment. If combustion is absolutely complete, there would not be any atmospheric pollution from the exhaust system. Water and carbon dioxide are the products of perfect and complete combustion. However, complete combustion is difficult to achieve in internal combustion engines.

- There are three major pollutants in the exhaust emission. They are:-

  1. Unburnt hydrocarbons (HC)
  2. Carbon monoxide (CO)
  3. Nitrogen oxides (NO_x)

WHY DOES THE GASOLINE FAIL TO BURN COMPLETELY?

There are several reasons for incomplete combustion. Some of them are:-

1. Weak spark
2. Improper air-fuel mixture ratio
3. Adulterated petrol
4. Wrong ignition timing
5. Low compression
6. Excessive valve over lap
7. Improper idle speed
8. Incorrect exhaust system

POLLUTION CONTROL

- With the enforcement of various motor vehicle rules, standards have been set for allowable percentage of CO emitted from the exhaust gases as shown below:

By mass	Below 0.83 gm / km
By volume	Below 3.0 %

EXHAUST SYSTEM

- The exhaust system consist of parts right from the exhaust valve to muffler assembly through which the exhaust gasses passes through.

- Normally in four stroke vehicle, the muffler will not be as dirty as two stroke vehicles unless the system is corrupted because of oil or other thing mixing with petrol unknowingly. But whenever the muffler is removed from the engine, the exhaust gasket should be replaced to avoid leakage.

SECONDARY AIR INJECTION VALVE (Incase of Carburetor Version)

- Secondary air injection valve is mounted on the frame below the fuel tank near the air cleaner assembly. (Fig. 4.45)

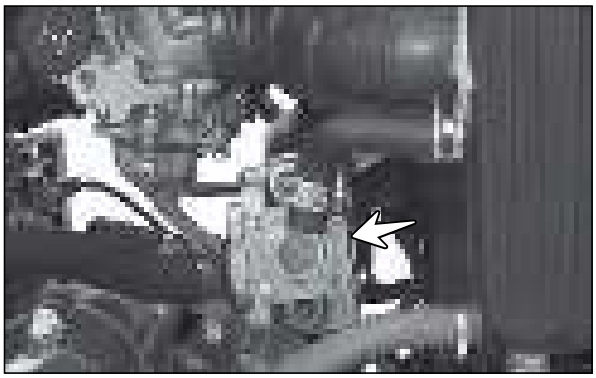


Fig. 4.45

WORKING PRINCIPLE

- This is the unit used in exhaust emission control system. The secondary air injection system induces filtered air into the exhaust manifold. Whenever there is a negative pressure pulses in the exhaust system, the fresh air will be taken into the exhaust. This charge of fresh air dilutes considerable amount of hydrocarbons (HC) and carbon monoxide (CO) in the exhaust gases into carbon dioxide (CO_2) and water (H_2O). (Fig. 4.46)

- There is a reed valve which acts as a check valve, prevents reverse airflow from exhaust. Only fresh air is allowed into the exhaust manifold.

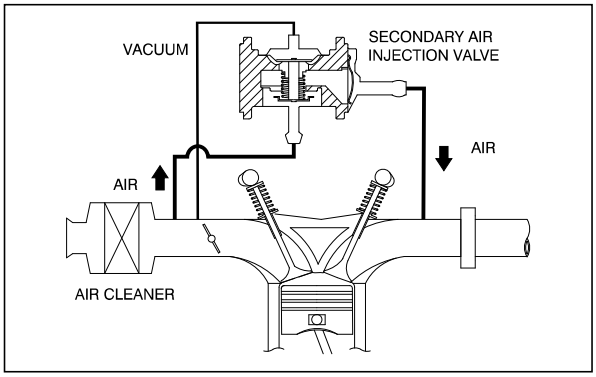


Fig. 4.46

- There is also a diaphragm assembly in this valve. Under sudden closure of throttle, high vacuum is generated in the intake manifold. Because of this high vacuum, the diaphragm assembly is pulled up and the fresh air intake to exhaust is cut off.

- Under the sudden closed throttle condition, some amount of high density unburnt gases are exhausted. These unburnt gases when come in contact with fresh air in the hot exhaust, they ignite and create a bursting sound (after burn).

- Because of this after burn, high temperature is created in this system and this high temperature causes pre-ignition in the combustion chamber. Because of this pre-ignition, knocking effect is created and thus the efficiency of the engine is decreased. Fresh air cut off at the closed throttle condition, will help to avoid the after burn.

FUNCTION

- Clean air from the air cleaner assembly is passed through the inlet port (A). The outlet (B) which has a reed valve connected to exhaust manifold. Another line from intake manifold is connected to chamber (C). The port (D) has a smaller orifice than the other ports. The fresh and filtered air passes from port (A) to port (B) through this orifice. When there is a suction in chamber (C) the diaphragm is pulled up, closing the valve at port (D). The airflow from port (A) to (B) is stopped. Depending upon the amount of vacuum created in the intake manifold, the amount of airflow from port (A) to (B) is controlled. (Fig. 4.47)

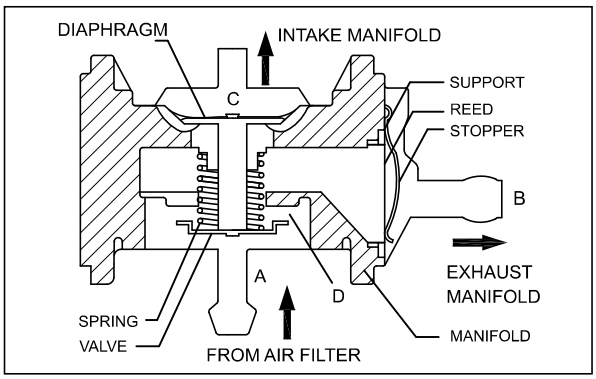


Fig. 4.47

REMOVAL

- Dislocate the hose clip (A) from hose air inlet and disconnect the hose from secondary air injection valve. (Fig. 4.48)

- Similarly, dislocate the hose clip (B) from hose air outlet and disconnect the hose from secondary air injection valve. (Fig. 4.48)

Nose plier

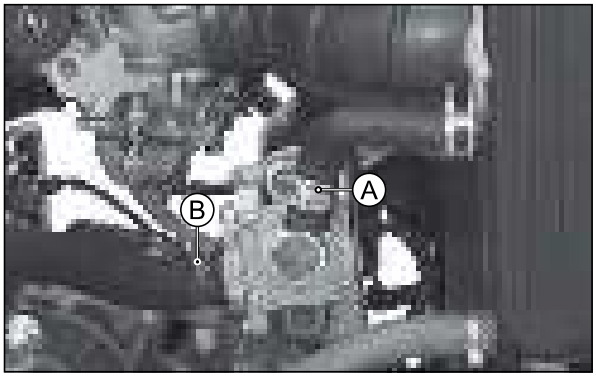


Fig. 4.48

- Remove hexagonal bolt (M6x30 - 2 Nos.) from secondary air injection valve mounting and take out the valve along with punched washers (2 Nos.). (Fig. 4.49)

10 mm spanner

Tightening torque	7.5 ± 1 Nm

Note:
While reassembling ensure the availability of cushions and spacers at the mounting location of the valve.

- Dislocate the clip (A) from the hose air cut valve and disconnect the hose from secondary air injection valve. (Fig. 4.50)

Nose plier

- For reassembly, reverse the removal sequence.

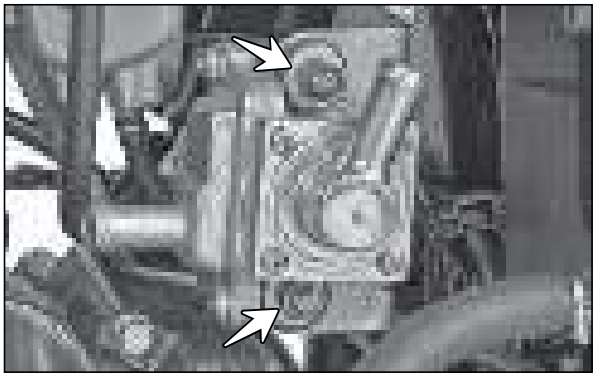


Fig. 4.49

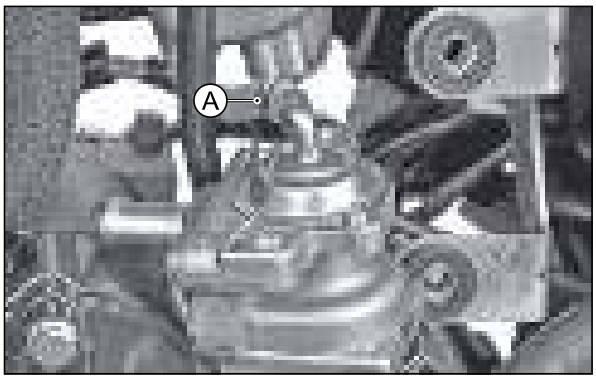


Fig. 4.50

PREVENTIVE MAINTENANCE (EMISSION)

- While every new vehicle leaving the factory is certified and is meeting the exhaust emission standards, the CO level in the exhaust gases may get altered depending upon altitude and also over a period of time depending upon usage or lack of maintenance. It is therefore necessary whenever the vehicle is serviced, inspect the CO level and tune up the engine to maintain the emission standards.

Caution:
Increased CO level in exhaust gases not only pollutes the air badly but also affects the engine performance.

MEASURING CO LEVEL IN EXHAUST EMISSION

- When the engine performance is generally good, tuning of carburettor assembly by adjustment of pilot screw (mixture control screw) and idling screw will help to control the CO level in exhaust gases. Many equipments are available to measure CO level in exhaust gases. Before measuring the emission, it is important to understand the measuring procedure, controls and maintenance aspects of that equipment by referring to the individual manufacturer's manual.

TO CHECK AND SET THE CO%:-

- Use the emission tuning kit (K310440) supplied by TVS-M and follow the guidelines given below:-

- (Refer standard operating procedure manual, which is supplied with the mileage testing kit part no. K310520. Also the same procedure can be referred in "TVS Scooty Pep service manual" chapter "Fuel, lubrication and exhaust system" page no. 4-20).

Guidelines:

1. Warm up the vehicle by running the engine in idling speed for 5 - 8 minutes or run the vehicle for 3 to 4 kms at 40 kmph speed.

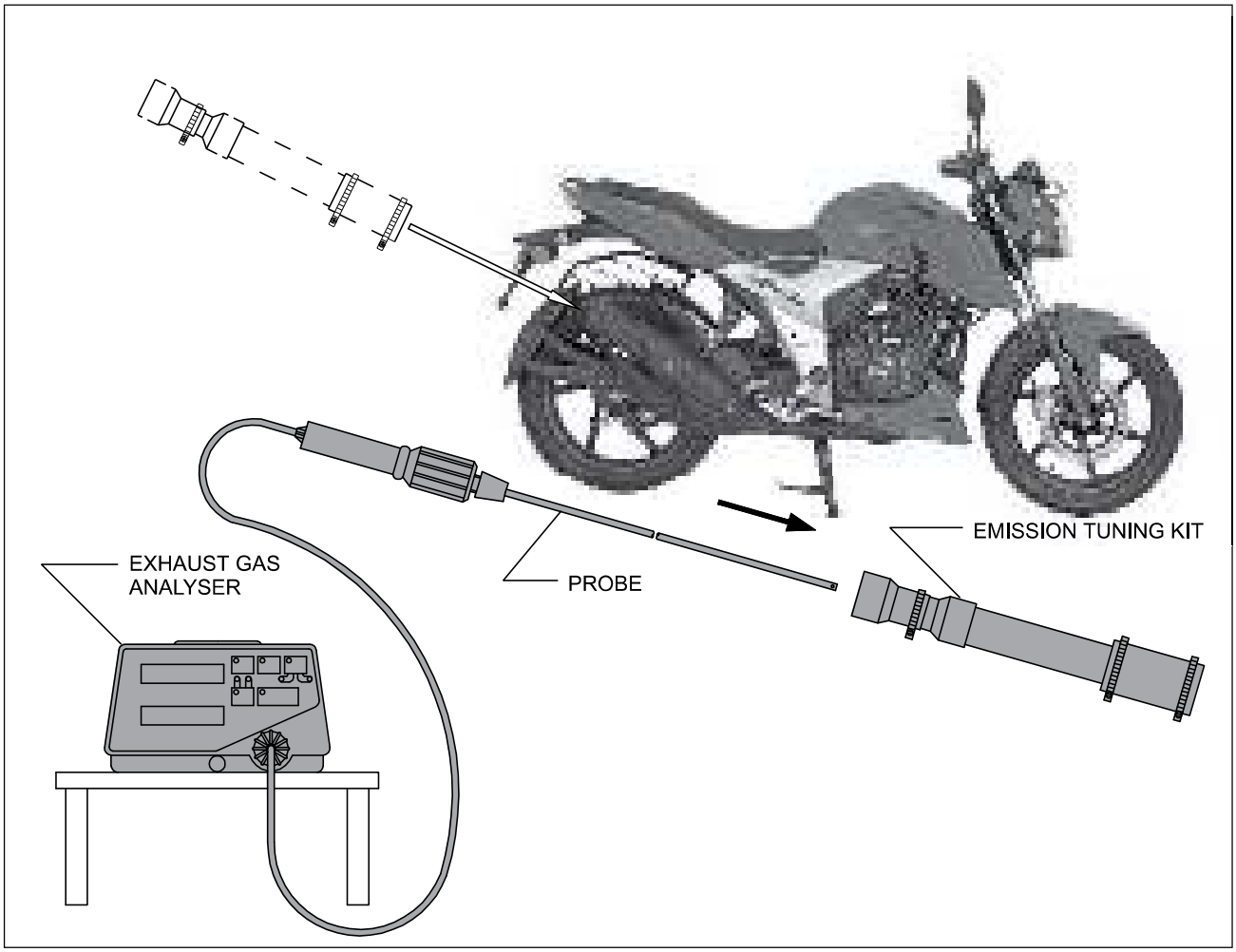


Fig. 4.51

2. Check the idling rpm with the help of tachometer. If required adjust idling rpm as per the specification (refer chapter "Periodic maintenance" page no. 2-18 for details).

3. Incase of erratic idling (variation beyond spec.), set right the same before proceeding for setting the CO.

4. Fix the tube extension on to the silencer. Tighten the clamps to avoid any leakage.

5. Insert the probe of exhaust gas analyser into the extension tube to the extent of 30 to 60 cms.

6. Press the key 'M' for Horiba or 'Enter Key' for Hermann exhaust gas analyser to measure the CO emission.

7. Wait for few seconds till the reading stabilizes on the screen.

8. Note the CO and HC readings are shown on the screen.

Note:
On completion of CO check, keep the analyser in 'measurement mode' for approximately 30 minutes for fresh air circulation and then turn the power 'OFF' of the machine.

Chapter 5

ELECTRICAL SYSTEM

WIRE COLOUR CODE INDEX

S.NO.	CODE	WIRE COLOUR
01	B	BLACK
02	BW	BLACK WITH WHITE TRACER
03	BBr	BLACK WITH BROWN TRACER
04	BY	BLACK WITH YELLOW TRACER
05	Bl	BLUE
06	BlB	BLUE WITH BLACK TRACER
07	BlG	BLUE WITH GREEN TRACER
08	BlR	BLUE WITH RED TRACER
09	BlW	BLUE WITH WHITE TRACER
10	Br	BROWN
11	BrBl	BROWN WITH BLUE TRACER
12	G	GREEN
13	GB	GREEN WITH BLACK TRACER
14	GR	GREEN WITH RED TRACER
15	GW	GREEN WITH WHITE TRACER
16	GY	GREEN WITH YELLOW TRACER
17	Gr	GREY
18	GrR	GREY WITH RED TRACER
19	Lbl	LIGHT BLUE
20	Lg	LIGHT GREEN
21	Or	ORANGE
22	OrB	ORANGE WITH BLACK TRACER
23	OrGr	ORANGE WITH GREEN TRACER
24	P	PINK
25	R	RED
26	RB	RED WITH BLACK TRACER
27	RW	RED WITH WHITE TRACER
28	RY	RED WITH YELLOW TRACER
29	V	VIOLET
30	W	WHITE
31	WR	WHITE WITH RED TRACER
32	WG	WHITE WITH GREEN TRACER
33	WB	WHITE WITH BLACK TRACER
34	Y	YELLOW
35	YBl	YELLOW WITH BLUE TRACER
36	YB	YELLOW WITH BLACK TRACER
37	YOr	YELLOW WITH ORANGE TRACER
38	YR	YELLOW WITH RED TRACER
39	YW	YELLOW WITH WHITE TRACER

CAUTION

CONNECTOR

- When connecting a connector, be sure to push it in until a click sound is felt. (Fig. 5.1)
- Inspect connector for corrosion, contamination and breakage on its cover.

COUPLER

- With a lock type coupler, be sure to release the lock before disconnecting it and push it in fully till it gets lock with click feel. (Fig 5.2A)
- When disconnecting a coupler, be sure to hold the coupler itself and do not pull the lead wires.
- Inspect each terminal on the coupler for being loose or bent. Inspect each terminal for corrosion and contamination.
- Water proof couplers are provided at the important connections. (Fig. 5.2B) Ensure the presence of water proof seals in the couplers before reconnecting them.

FUSE

- When a fuse blows, always investigate the cause, correct it and then replace the fuse. (Fig 5.3)
- Do not use a fuse of a different capacity. Do not use wire or any other substitute for the fuse or it may cause melting / burning of wires.

SEMICONDUCTOR EQUIPPED PART

- Be careful not to drop the parts with a semiconductor built in such as TCI unit, regulator cum rectifier and others. (Fig. 5.4)
- When inspecting these parts, follow the inspection instruction strictly. Neglecting proper procedure may cause damage to these parts.

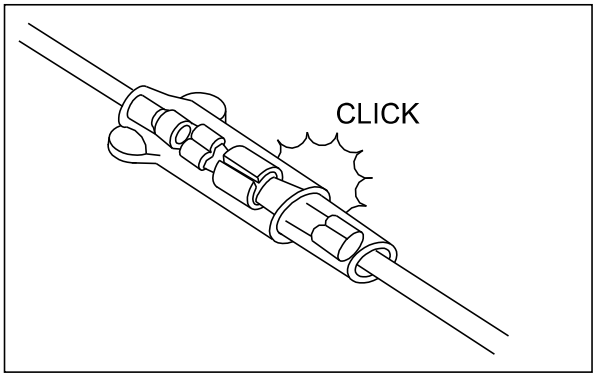


Fig. 5.1

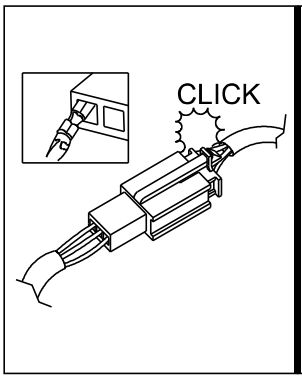


Fig. 5.2A

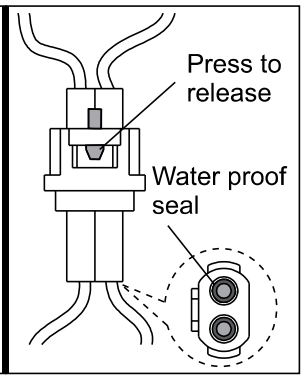


Fig. 5.2B

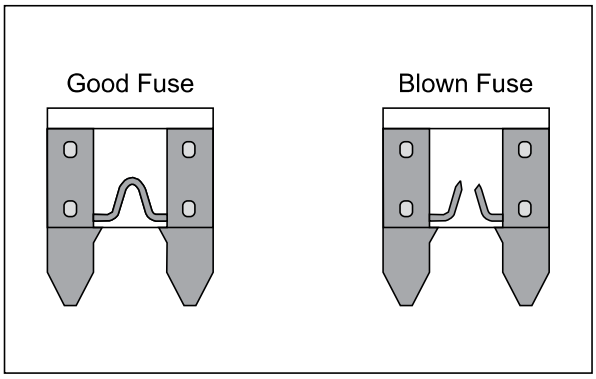


Fig. 5.3

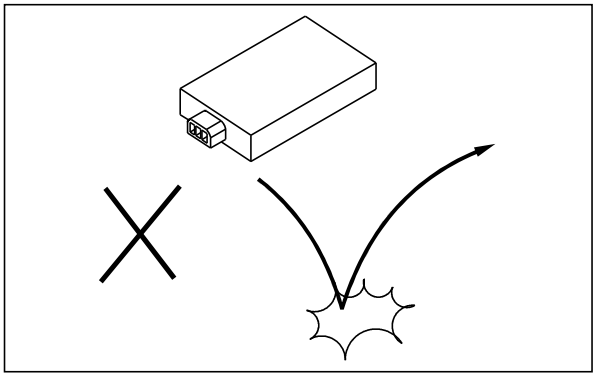


Fig. 5.4

CONNECTING BATTERY

- For battery disassembly or servicing, be sure to disconnect the negative terminal first. When connecting the terminals to the battery, connect the negative terminal last.
- If any terminal of the battery is found corroded, remove the battery, pour warm water over it and clean with wire brush.
- Apply petroleum jelly on the terminals after completion of connection and cover the positive terminal with the boot. (Fig. 5.5)

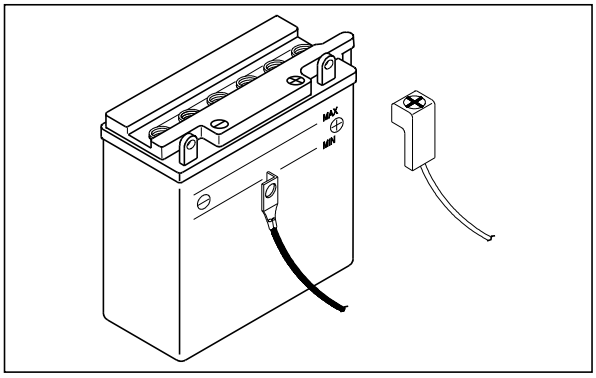


Fig. 5.5

TVS APACHE RTR 160 4V - CARBURETTOR VERSION

TVS Apache RTR 160 4V Carbuerttor Version's electrical system is divided in to four basic systems (circuits) named:

1. Ignition circuit 2. Lighting circuit 3. Charging circuit 4. Electric starter circuit

IGNITION SYSTEM

The ignition system of carburettor version is consists of magneto assembly, regulator cum rectifier unit (RR unit), fuse 15A, battery, ignition lock, engine kill switch, TCI unit, ignition coil and a spark plug. (Fig. 5.6)

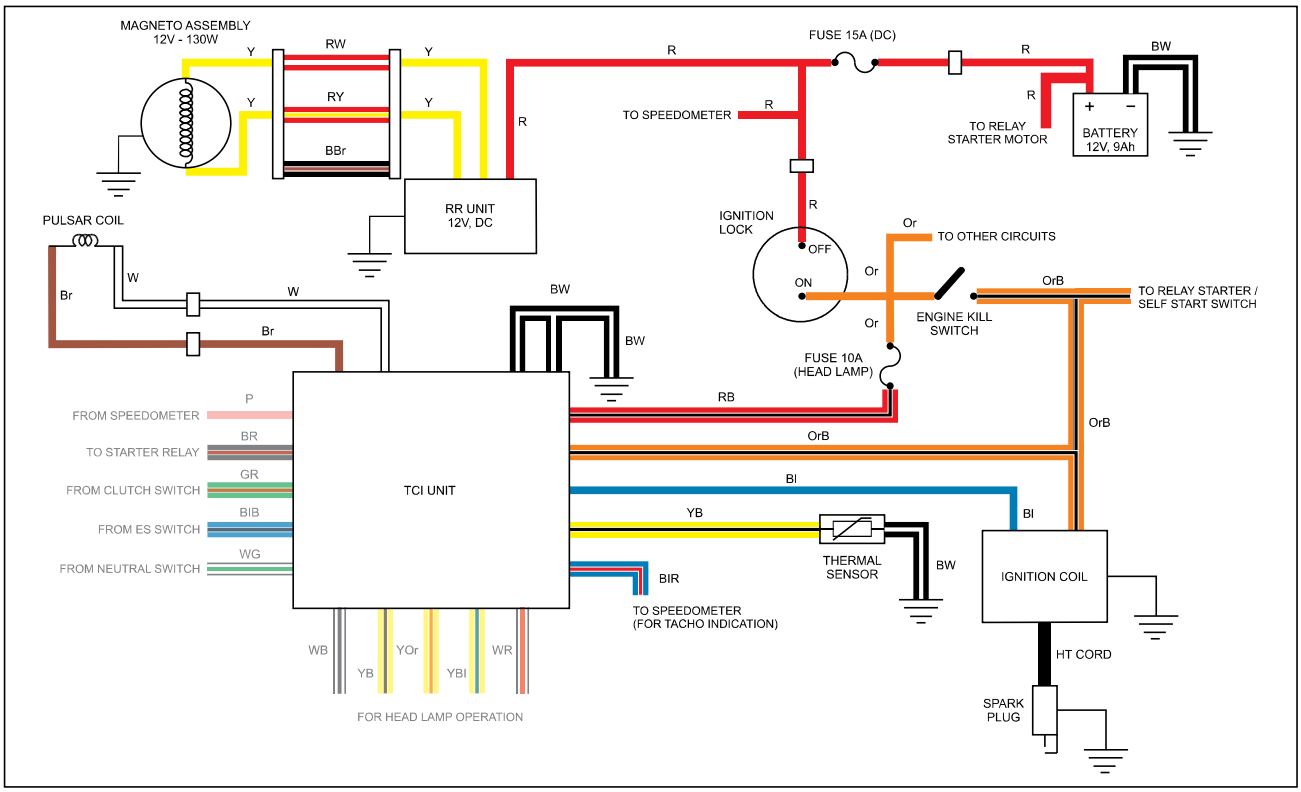


Fig. 5.6

The output from the pulsar coil of magneto assembly is directly connected to the TCI unit. The DC output from the battery is connected to the engine kill switch through a 15 amps fuse and ignition lock. The output of the engine kill switch is connected to the TCI unit, ignition coil, relay starter and the self start switch. Whenever the ignition lock and engine kill switch is turned 'ON' the battery output will be supplied to the TCI unit and ignition coil.

The pulsar coil produces the voltage signals whenever the pip on the magneto periphery passes nearer to it. Based on these signals, the micro controller equipped in the TCI unit collapses the primary winding voltage of ignition coil in fraction of seconds. This in-turn develops a high voltage across the secondary winding of ignition coil due to mutual induction. This high voltage is given to sparkplug through HT cord.

When the ignition lock is in 'OFF' condition or the engine kill switch is turned 'OFF' there will not be any flow of current to the TCI unit and ignition coil hence the engine will not start.

IGNITION LOCK

- The ignition lock is located near the speedometer assembly. (Fig. 5.7)
- Disconnect the coupler of ignition lock from the main wiring harness and inspect the lock for continuity with the pocket tester (multimeter).

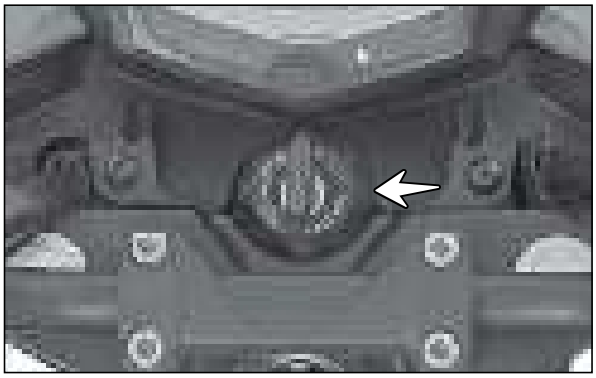


Fig. 5.7

Pocket tester

LOCK POSITION	R	Or
OFF	O	O
ON	O———	———O

- Replace the ignition lock if there is no continuity found.

ENGINE KILL SWITCH

- Engine kill switch is located at the right side of the handle bar assembly on the switch assembly handle RH. (Fig. 5.8)
- Disconnect the switch assembly handle RH coupler from main wiring harness and inspect the switch for continuity with pocket tester.

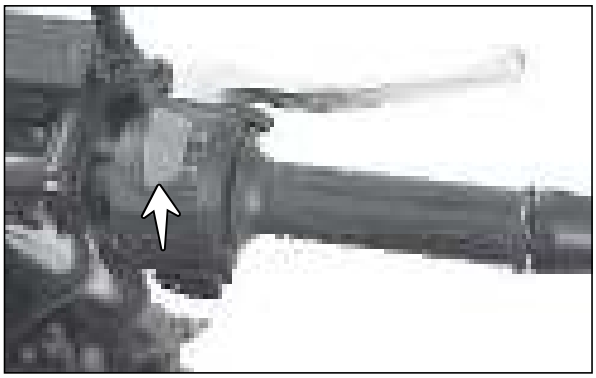


Fig. 5.8

Pocket tester

LOCK POSITION	R	Or
PRESS UP (⊗)	O	O
PRESS DOWN (◯)	O———	———O

- Replace the switch assembly handle RH if there is no continuity.

CHECKING THE PULSAR COIL WITH POCKET TESTER (MULTIMETER)

Pocket tester

- Set pocket tester at 2000 ohms position.
- Disconnect the pulsar coil socket from the main wiring harness.
- Connect pocket tester '+ve' lead to the brown wire (Br) of pulsar coil and '–ve' lead to white wire (W) of pulsar coil. (Fig. 5.9)
- Measure the resistance. If resistance measured is not within the specified limit, replace pulsar coil with a new one.

Pulsar coil (Br - W)	180 ~ 220 ohms

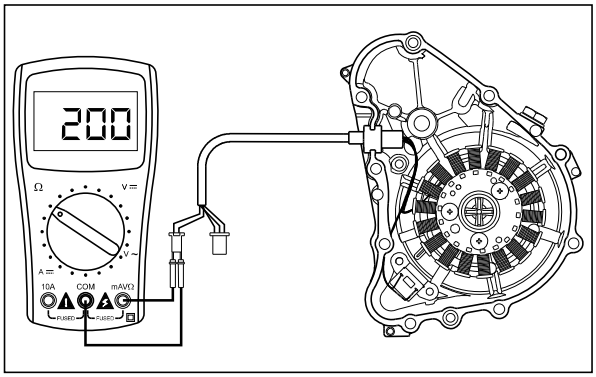


Fig. 5.9

CHECKING THE STATOR ASSEMBLY WITH POCKET TESTER

- Disconnect the stator assembly socket from the main wiring harness.
- Set the pocket tester knob at 200 ohms position.

Pocket tester

- There are two yellow wires (Y) coming out of the stator assembly. Connect the pocket tester (+ve) lead to the first yellow wire (Y) and (-ve) lead to second yellow wire (Y) and measure the resistance. (Fig. 5.10) If resistance is not within the specified limit, replace the magneto stator assembly with a new one.

Resistance across two phase	0.6 to 0.8 ohms

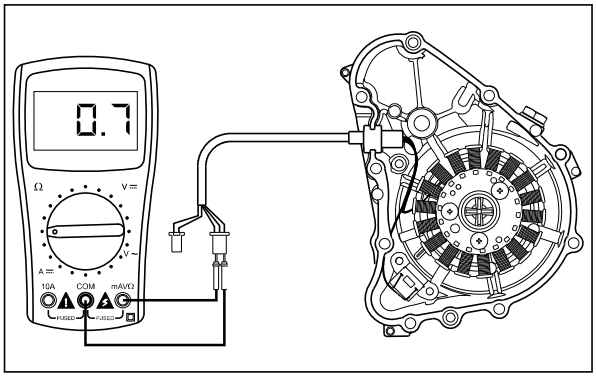


Fig. 5.10

CHECKING THE IGNITION COIL ASSEMBLY WITH POCKET TESTER

- The ignition coil is mounted on the right side of the frame below the fuel tank assembly, near the cylinder head assembly. (Fig. 5.11)
- Disconnect the wiring socket connecting TCI unit and the ignition coil. Also disconnect the HT cord from the spark plug.

Pocket tester

- Set Pocket tester at 200 ohms position.
- Connect the pocket tester's '+ve' and '–ve' lead to the terminals of the ignition coil coupler as shown to measure the primary winding resistance. (Fig. 5.12) If the resistance is not within the specified limit, replace the ignition coil assembly with a new one.

Primary resistance	4.05 ~ 4.95 ohms

- If primary winding resistance is OK, then check the secondary winding resistance.
- Set pocket tester at 20k ohms position.
- Remove the suppressor cap from the HT card. Connect the pocket tester's '+ve' lead to the HT cord and '–ve' lead to any terminal of the ignition coil coupler and measure the resistance. (Fig. 5.13)

Secondary resistance	8.96 ~ 13.44 k ohms

- If the resistance of windings are not within the limit, replace the ignition coil with a new one.

SPARK PLUG

- Neglecting the sparkplug leads to poor performance of engine. If the sparkplug is used for a longer period, the electrodes gradually burn away and carbon builds up along the inside part (refer chapter "Periodic maintenance" page no. 2-14 for cleaning and maintenance of spark plug).

Caution:
Always use recommended make and type of sparkplug only.

Spark plug	BOSCH UR4KE & NGK MR7E-9

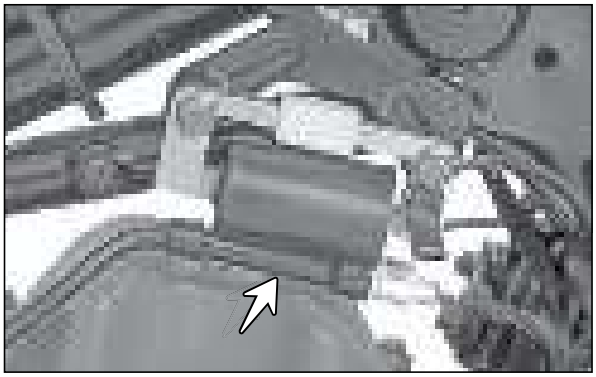


Fig. 5.11

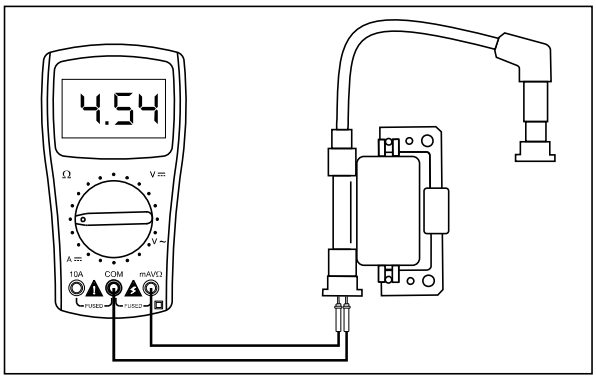


Fig. 5.12

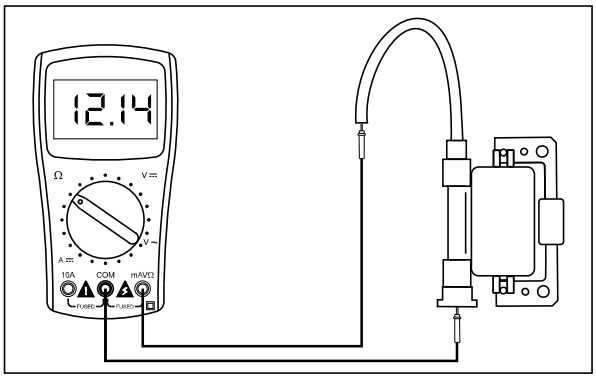


Fig. 5.13

TCI UNIT

- TCI unit (transistor control unit) is placed below the fuel tank assembly near the battery. TCI unit can be checked by doing a good (or) bad analysis (replacing existing with a new one). (Fig.5.14)

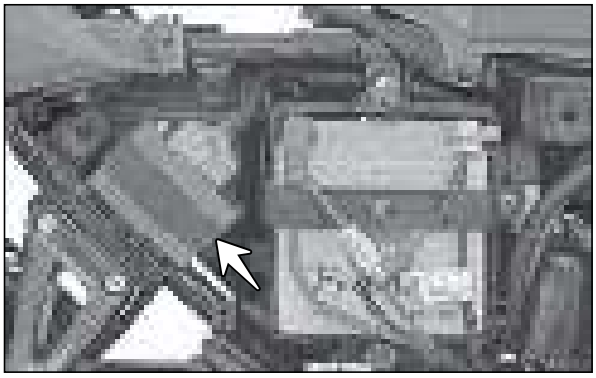


Fig. 5.14

THERMAL SENSOR

- A thermal sensor fixed on the cylinder block to sense the engine temperature and give input to the TCI unit in the form of resistance. (Fig. 5.15) Check the resistance of the thermal sensor in the following manner:

- Set the pocket tester at 20k ohms position.

Pocket tester

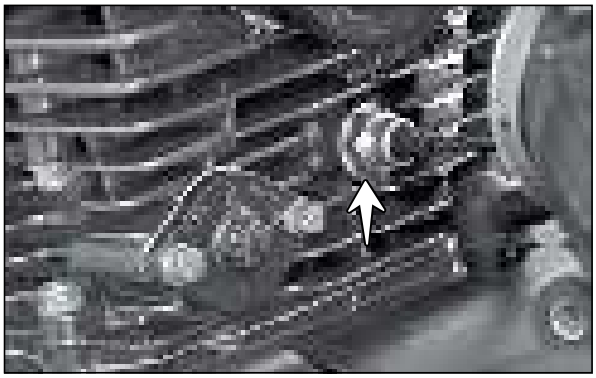


Fig. 5.15

- Disconnect the thermal sensor coupler from main wiring harness. Connect the pocket tester's '+ve' lead to the yellow red (YR) wire and '–ve' lead to the white red (WR) of the thermal sensor coupler and measure the resistance when engine is in cold condition. (Fig. 5.16)

Resistance	3.0 k ~ 14 k ohms

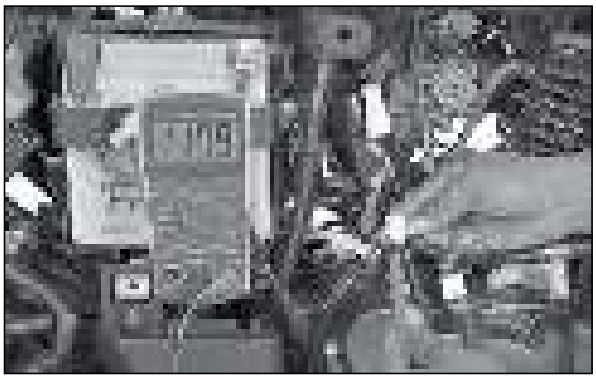


Fig. 5.16

- If the resistance measured is not within the specified limit, replace the thermal sensor with a new one.

LIGHTING SYSTEM

The lighting system consists of magneto assembly, regulator cum rectifier unit (RR unit), battery, ignition lock, fuse 10A (head lamp), TCI unit and control switches. The working of lighting system of the TVS Apache RTR 160 4V carburettor version are as follows. (Fig. 5.17)

A DC output from the battery is connected to the ignition lock through a 15A fuse (DC fuse). When the ignition lock is turned ON, the output from the lock is connected to a 10A fuse (fuse head lamp) and the engine kill switch. The output from both the fuse and the engine kill switch is connected to the TCI unit.

When the ignition lock is turned 'ON', one more DC output from the lock is supplied to the switch beam control, pass-by switch, tail lamp, number plate lamp and the speedometer for back illumination.

Since the tail lamp, number plate lamp and the speedometer (back illumination) is directly given with the DC input and negative supply from common earth junction, they start to glow once the ignition lock is turned ON.

On receipt of the DC current from ignition lock and engine kill switch, the TCI unit checks for the input from the pulsar coil to determine the engine running condition because the head lamp works only when the engine is in running condition. The TCI unit also checks the switch beam control to determine its position.

If the beam control switch is in 'High' position, the TCI unit will not get any input signal from switch and supplies the power to the head lamp 'High beam' and make the high beam to glow. If the beam control switch is in 'Low' position, the TCI unit gets an input signal from the switch and supplies power to the head lamp 'Low beam' and make the low beam to glow.

When the pass-by switch is pressed, a DC signal is sent to the TCI unit. Now, if the head lamp is glowing in 'low beam', the TCI unit cuts 'OFF' the power supply to the 'low beam' and supplies to the 'high beam' (toggles). If the head lamp is glowing in 'high beam' the TCI unit does it in vice-versa. If the pass-by switch is pressed when the engine is not running, the head lamp glows only with 50% illumination.

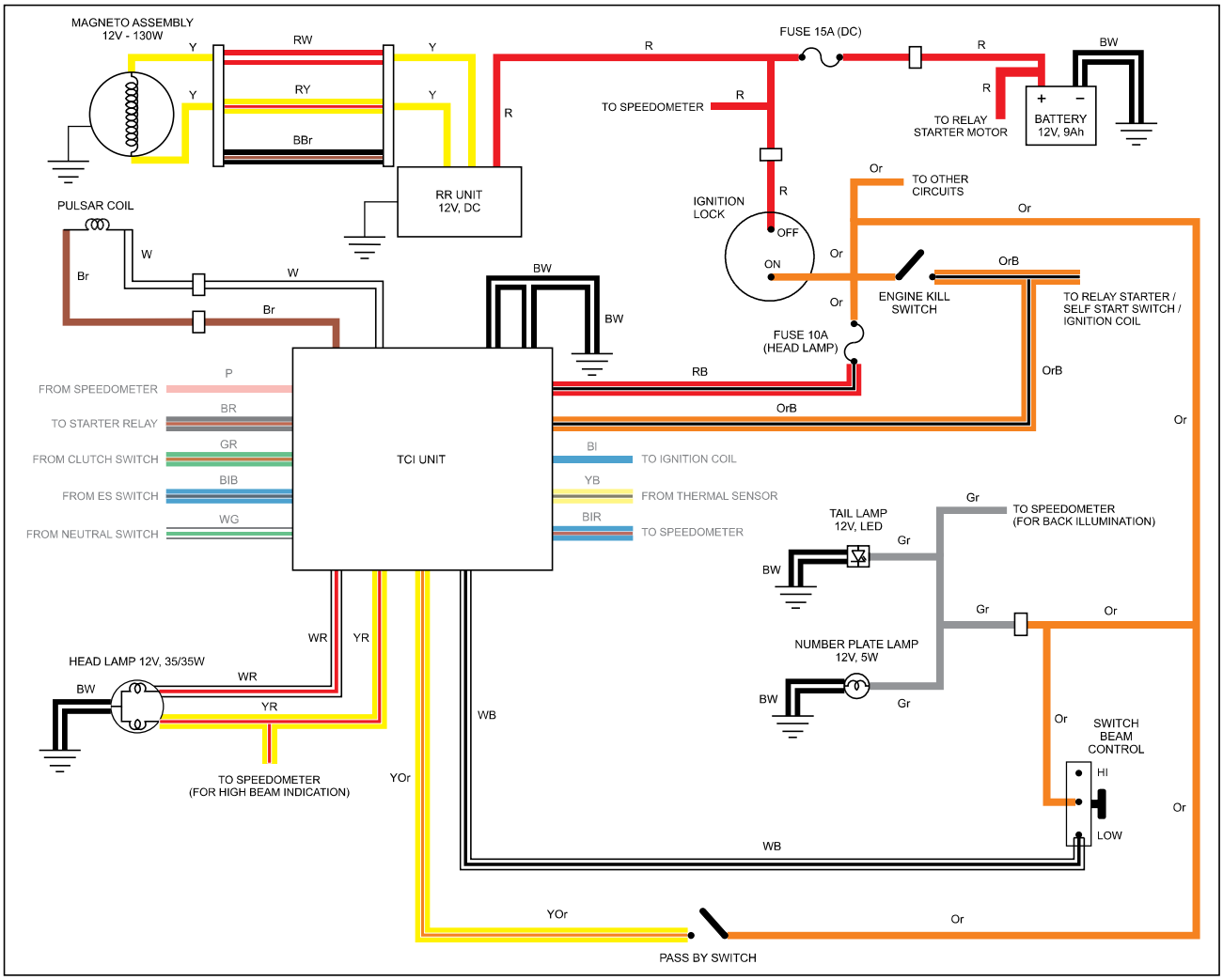


Fig. 5.17

SWITCH BEAM CONTROL

- Switch beam control is provided on the switch assembly LH on the left hand side of the handle bar. (Fig. 5.18)
- Check the switch for continuity with the pocket tester.

Fig. 5.18

Pocket tester		
SWITCH POSITION	**Or**	**WB**
PRESS UP ( ) - HIGH	O	O
PRESS DOWN ( ) - LOW	O———	———O

- If there is no continuity is found, replace the LH switch assembly.

PASS-BY SWITCH

- Pass-by switch is provided on the switch assembly handle LH on the left side of the handle bar. (Fig. 5.19)
- Check the switch for continuity with the pocket tester.

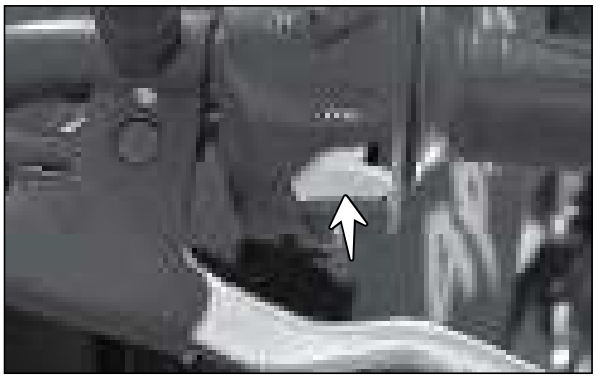


Fig. 5.19

Pocket tester		
SWITCH POSITION	**Or**	**YOr**
PRESS - ON	O———	———O
RELEASE - OFF	O	O

- If there is no continuity is found, replace the LH switch assembly.

12V REGULATION SYSTEM

REGULATOR CUM RECTIFIER (RR UNIT)

- The RR unit (regulator cum rectifier) is fitted below the seat assembly near the tail lamp assembly. (Fig. 5.20)
- The RR unit consists as the name implies, regulator which regulates the voltage between 12V to 14V constantly, and rectifier used for converting AC current to DC for charging and other purpose.

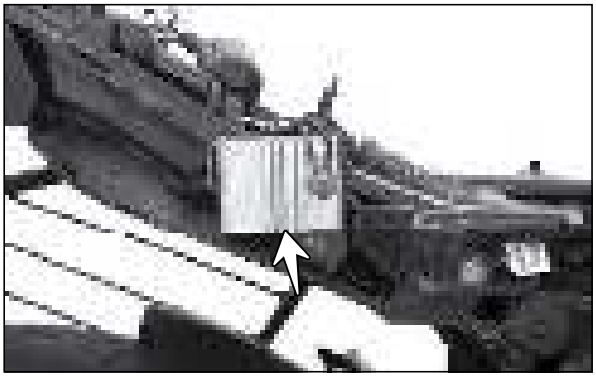


Fig. 5.20

CHARGING AND DC SYSTEM

The DC system consists of magneto assembly, regulator cum rectifier unit (RR unit), battery, ignition lock, fuse 15A (main fuse) and the control switches. A DC output from the battery is directly connected to the speedometer through a 15A fuse for the memory and other functions of speedometer.

Another DC output from the battery is connected to the ignition lock through the same 15A fuse. When the ignition lock is turned 'ON' the DC output from the ignition lock is supplied to the speedometer assembly, position lamps, horns, electronic flasher unit, brake lamp switches front and rear and other DC operated components. (Fig. 5.21)

A negative input from the common earth junction is directly connected to the position lamps. The position lamps glows automatically once the ignition lock is turned. When the brake lamp switch front or rear is operated (brake applied), the DC current from either of the switch is supplied to the brake lamp. A negative earth connection from the common earth junction is connected to the brake lamp and hence the lamp glows. Similarly, when the horn button is pressed, the negative input from the common earth junction is connected to the horns. Since the horns are connected to the ignition lock's DC output directly, on pressing the switch, the horns blow.

A DC output from the ignition lock is connected to the speedometer assembly for its operation. A input signal from the gear position sensor is connected to the speedometer and the TCI unit for gear position sensing. A neutral indication signal is connected to the TCI unit from the speedometer for electric start operation. The fuel level indicator in the speedometer gets an input signal in the from of variable resistance from the fuel sender unit. Based on these signals the fuel level indicator shows the fuel level indication.

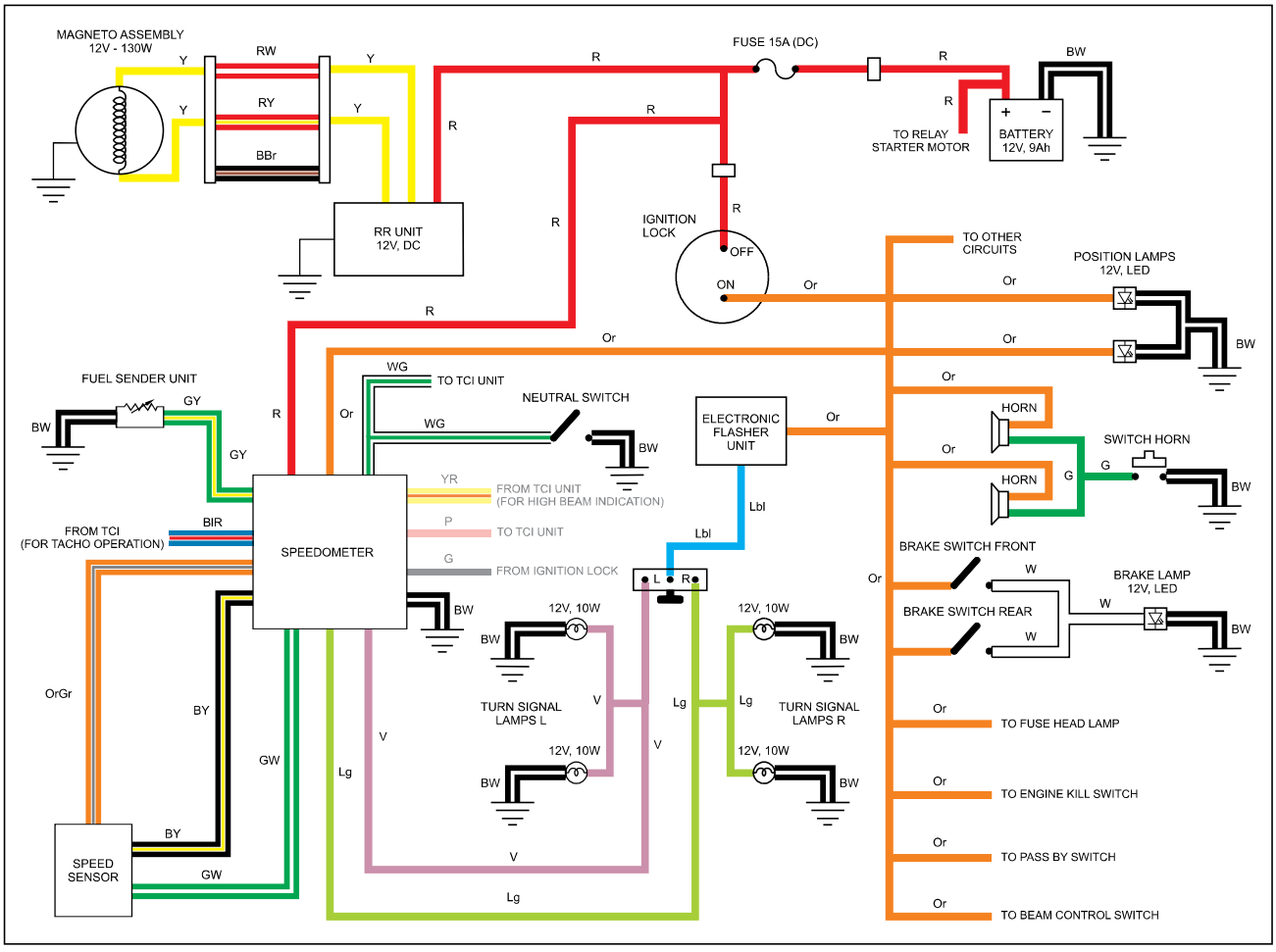


Fig. 5.21

An input voltage and a negative supply are given to the speed sensor from the speedometer. The output signal from the speed sensor is connected to the speedometer. Based on these signals the speed indication is shown. Speedometer shows engine rpm based on the engine speed signal received from the TCI unit.

A DC output from the ignition lock is connected to the electronic flasher unit. The output from the flasher unit is connected to the switch turn signal. When the switch is slid to the 'right' or 'left' the respective front and rear turn signal lamps glows along with the turn signal indicator on the speedometer .

HORNS (12V DC)

- The horns are mounted on the frame at the front side of the vehicle below the fuel tank. (Fig. 5.22)
- The DC output orange wire (Or) from the ignition lock is connected to the horns directly and the negative green wire (G) from the horns is connected to earth through the horn switch.

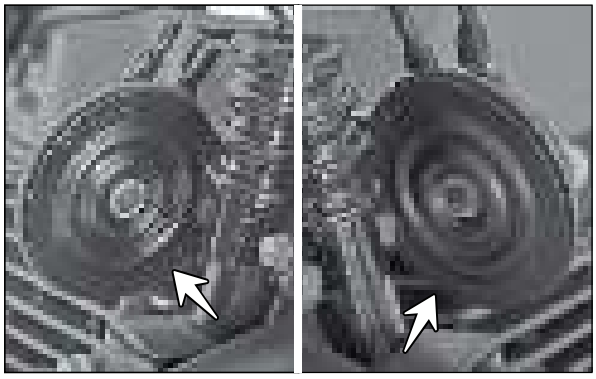


Fig. 5.22

- The horn switch is located on the switch assembly handle LH. (Fig. 5.23)
- Check the switch for continuity with the pocket tester.

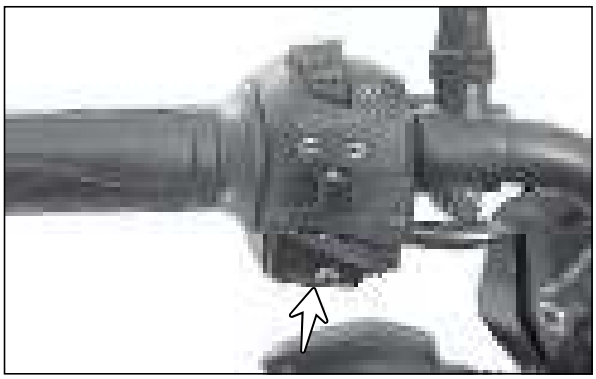


Fig. 5.23

Pocket tester		
SWITCH POSITION	**G**	**BW**
PRESS - ON	O———	———O
RELEASE - OFF	O	O

- If there is no continuity is found, replace the LH switch assembly.

TURN SIGNAL LAMPS FRONT AND REAR

- The DC output from the ignition lock is connected to the switch turn signal through a electronic flasher unit mounted below the seat assembly near the battery. (Fig. 5.24)
- The DC output wire orange (Or) from the ignition lock is connected to the flasher unit and the output from the flasher unit is connected to the switch turn signal through a light blue wire (Lbl).

Fig. 5.24

- The switch turn signal is located on the switch assembly handle LH. (Fig. 5.25)
- Inspect the switch for continuity with the pocket tester.

Pocket tester

SWITCH POSITION	V	Lbl	Lg
TO LEFT (◄)	O——O		
PRESS RELEASE		O	
TO RIGHT(►)		O——O	

- If there is no continuity is found, replace the LH switch assembly.

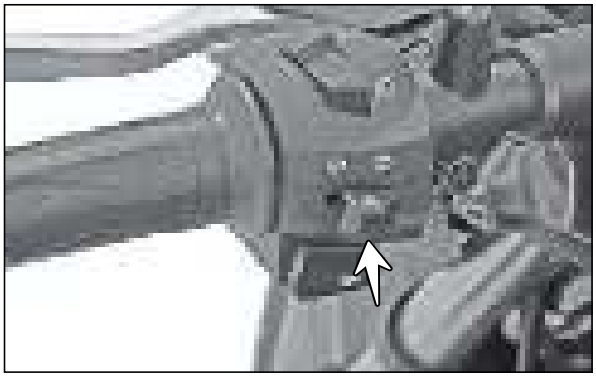


Fig. 5.25

NEUTRAL SWITCH

- The neutral switch is mounted on the crankcase assembly LH below the cover engine sprocket. (Fig. 5.26)
- In neutral position a resistance value will be sent to the digital speedometer and the TCI unit through a white green wire (WG). To measure this resistance value follow the procedure given below:
- Set the pocket tester at 20k ohms position.

Pocket tester

- Disconnect the neutral switch socket from the main wiring harness.
- Connect pocket tester's '+ve' lead to the white green wire (WG) of neutral switch and '–ve' lead to body earth. (Fig. 5.27)

GEAR POSITION	RESISTANCE
Neutral	0.75 k ohms

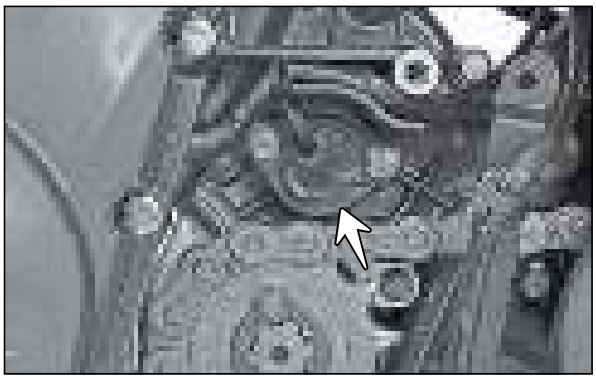


Fig. 5.26

Fig. 5.27

SWITCH ASSEMBLY STOP LAMP FRONT AND REAR (BRAKE SWITCHES)

- The DC output from ignition lock is connected to the stop lamp through switch assembly stop lamp front and rear. Stop lamp switch front is fitted on the lever bracket assembly RH. (Fig. 5.28)

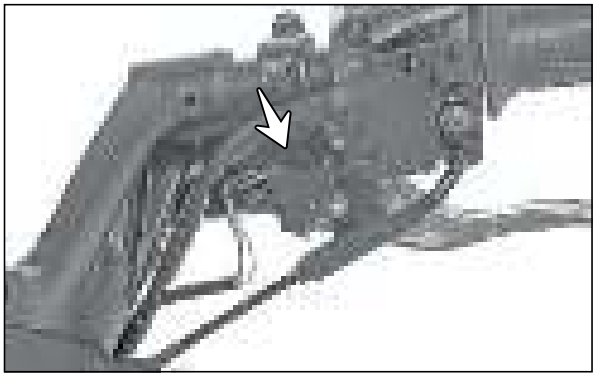


Fig. 5.28

- Switch assembly stop lamp rear is fitted on the frame below the battery assembly near the mounting of the swing arm complete and operated by the brake pedal. (Fig. 5.29)

- Inspect the switch for continuity with the pocket tester.

Pocket tester

SWITCH POSITION	G	BW
APPLY BRAKE - ON	O———	———O
RELEASE - OFF	O	O

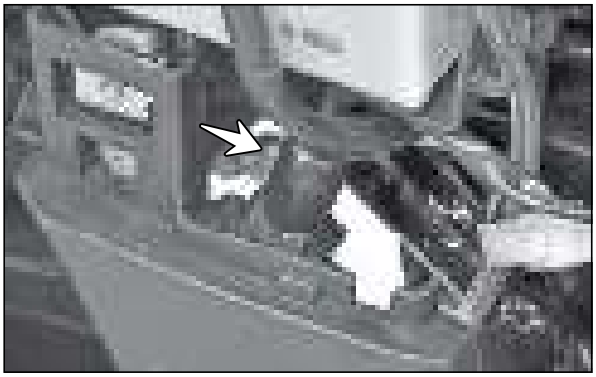


Fig. 5.29

FUEL LEVEL INDICATOR

- Fuel level indicator and fuel warning lamp are provided in the digital speedometer.

- Fuel level indicator and the warning lamp works based on the variable resistance signal received from the fuel sender unit. Fuel sender unit resistance alters the resistance in accordance with the amount of fuel available in the fuel tank.

- The fuel sender unit is fitted at the bottom of the fuel tank. (Fig. 5.30)

- To inspect the fuel sender unit, fuel tank complete must be removed (refer chapter "Fuel, lubrication and exhaust system" page no. 4-1 for removal procedure).

- Inspect the fuel sender unit for continuity with pocket tester by connecting '+ve' lead of pocket tester to green yellow wire (GY) and '-ve' lead to the black white wire (BW).

Pocket tester

- Set pocket tester at 200 ohms position and check the resistance of fuel sender unit. If the resistance value is not within the specified limit, replace the sender unit with new one. (Fig. 5.31)

Resistance	Full	4 ~ 6 ohms
	Empty	108 ~ 112 ohms

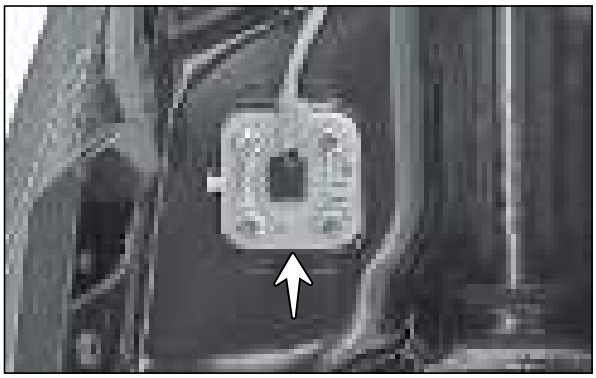


Fig. 5.30

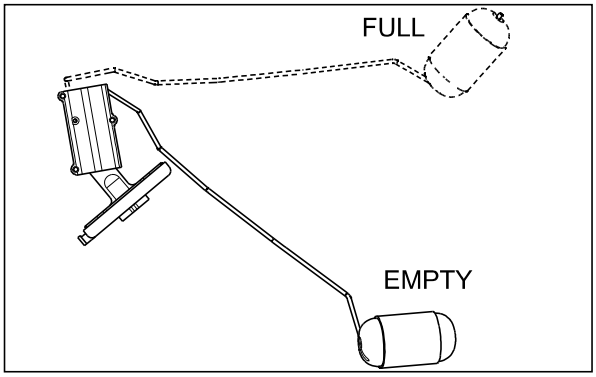


Fig. 5.31

SPEED SENSOR

- Speed sensor is mounted on the crank case LH near engine sprocket. (Fig. 5.32)

To check the speed sensor:

- Set pocket tester at DC 20 V range.

Pocket tester

- Check and ensure the battery voltage is within the specifications.

Battery voltage	12.9 volts

- If the battery voltage is found less than the specified voltage, recharge the battery as explained in page no. 5-40.

- Disconnect the speed sensor coupler from the main wiring harness. (Fig. 5.33)

- Turn 'ON' the ignition.

- Connect the pocket tester's '+ve' lead to the orange grey wire (OrGr) of speed sensor coupler at the wiring harness side and '–ve' lead to the black yellow wire (BY) of speed sensor coupler at the wiring harness side and measure the voltage. (Fig. 5.34)

The voltage should be:

Voltage	9 ± 1 Volt

- Then connect the pocket tester's '+ve' lead to the white green wire (WG) of speed sensor coupler at the wiring harness side and '–ve' lead to the black yellow wire (BY) of speed sensor coupler at the wiring harness side and measure the voltage. (Fig. 5.35)

The voltage should be:

Voltage	5 ± 1 Volt

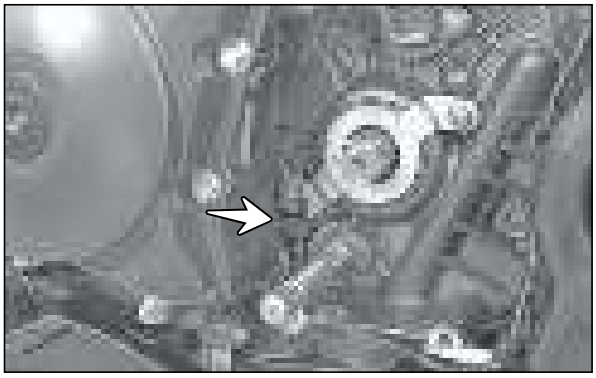


Fig. 5.32

Fig. 5.33

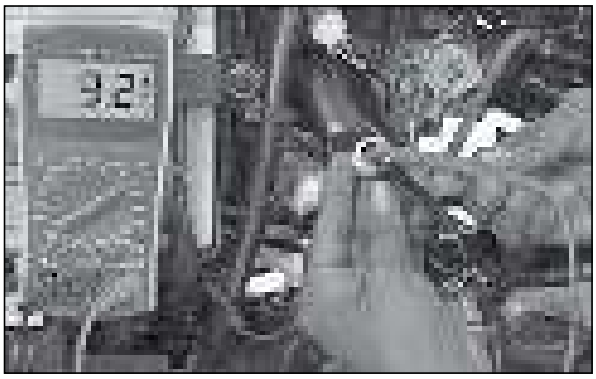


Fig. 5.34

Fig. 5.35

- If there is no voltage output found in the speed sensor coupler. Then check the continuity of wiring harness between speed sensor coupler and speedometer coupler.

WIRE COLOUR	SPEEDO COUPLER	SPEED SENSOR COUPLER
OrGr	O———	———O
BY	O———	———O
GW	O———	———O

- If there is no continuity in the wiring harness, replace the wiring harness and check for speed indication in the speedometer.
- If the continuity is found OK, replace the speedometer and check for speed indication in the speedometer.
- If the voltage is found OK while checking with the pocket tester, then check speed senor in the following manner:
- Reconnect the speed sensor coupler.
- Set pocket tester knob at DC 20 V range.
- Connect the pocket tester's '+ve' lead to the orange grey wire (OrGr) and '–ve' lead to the black yellow wire (BY) of speed sensor coupler and measure the voltage. (Fig. 5.36)

The voltage should be:

Voltage	9 ± 1 Volt

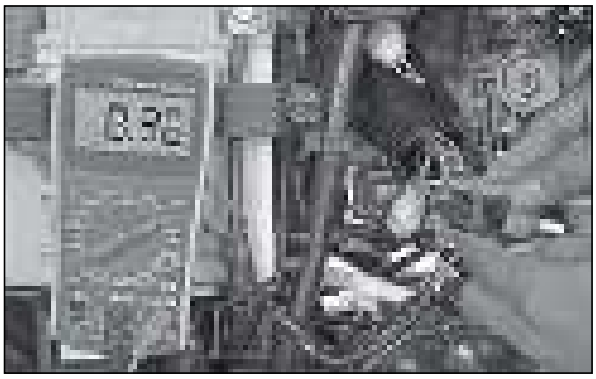


Fig. 5.36

- Then connect pocket tester's '+ve' lead to the white green wire (WG) and '–ve' lead to the black yellow wire (BY) of speed sensor coupler and measure the voltage. (Fig. 5.37)

The voltage should be either level A or level B.

LEVEL	VOLTAGE LEVEL
A	5 ± 0.5 Volt
B	0.1 ± 0.5 Volt

Fig. 5.37

- Now slowly rotate the rear wheel. If the voltage indicated in the pocket tester is at **level A** then it should change to **level B** or vice versa.

- Now rotate the rear wheel little faster. If the voltage indicated in the pocket tester is not as per the specification. Then replace the speed sensor and check the speedometer for proper speed indication.

Voltage	2.5 ± 0.5 Volt

CHARGING PERFORMANCE CHECK

- Set the pocket tester at DC 200 V range.

- Remove the cover frame RH (refer chapter "Periodic maintenance" page no. 2-3 for removal procedure).

- Connect the pocket tester's '+ve' lead of to positive terminal of the battery and '–ve' lead of pocket tester to the negative terminal of the battery. (Fig. 5.38)

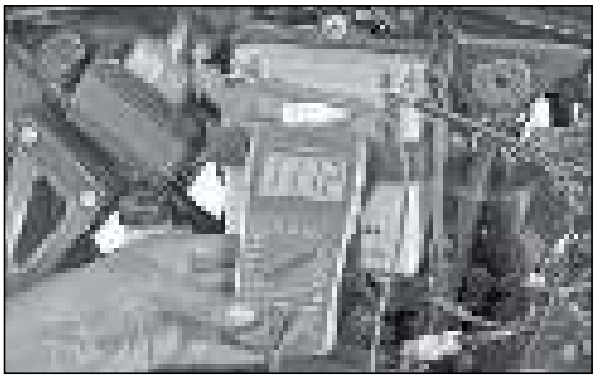


Fig. 5.38

- Start and warm up the engine. Switch on the head lamp high beam.

- Gradually increase the throttle while observing the rpm indicator of speedometer. Once the rpm reaches 4000, check the pocket tester reading. The reading should be

Charging performance	14.5 ± 0.3V at 2500 rpm and above

Note:
While checking the charging current, switch on the head lamp high beam to know the correct reading.

- If the reading measured is not within the limit, check the stator coil resistance as explained in page no. 5-5 .

- If the stator coil resistance found OK, then replace the RR unit with a new one and re-check.

- Reassemble the cover frame RH.

ELECTRIC STARTER SYSTEM

Electric starter system consists of battery, ignition lock, engine kill switch, electric starter switch, neutral switch, clutch switch, speedometer assembly, TCI unit, relay starter motor and the starter motor assembly. (Fig. 5.39) A DC output from the battery is connected to the ignition lock through a 15A fuse. When the ignition lock is turned 'ON', this DC output is connected to the TCI unit, electric starter switch and relay starter motor through the engine kill switch.

A DC output from the battery is directly connected to the relay starter motor and the output of the relay is connected to the starter motor through thick wires. A negative is connected to the starter motor from the common earth junction. When the relay energises, the battery output is supplied to the starter motor and the motor works. Based on the resistance input from the neutral switch, the neutral position is sensed by the speedometer and the speedometer supplies a negative input to the TCI unit for activating the electric start circuit. A negative output from the clutch switch is supplied to the TCI unit when the switch is operated. In the absence of neutral indication from the speedometer, this negative input is taken by the TCI unit for activating the self start circuit.

While pressing the electric starter switch, the DC supply from the electric starter switch flows to the TCI unit. On receipt of this DC input signal, the TCI unit checks the availability of negative input either from the speedometer or from the clutch switch. If any one of these input is available, the TCI unit connects a negative supply to the relay starter motor and energises the relay. Even though all the above conditions are met by the TCI unit, if the engine is in running condition (if there is a pulsar coil input to the TCI unit), the TCI unit cuts 'OFF' the negative supply to the starter relay to avoid the cranking of motor during engine running condition and protects the motor from damage.

If the electric start switch is pressed continuously either in neutral or in clutch applied condition, the TCI unit energies the starter relay for 3 seconds and switches 'OFF' automatically and energises again after 3 seconds for battery saving.

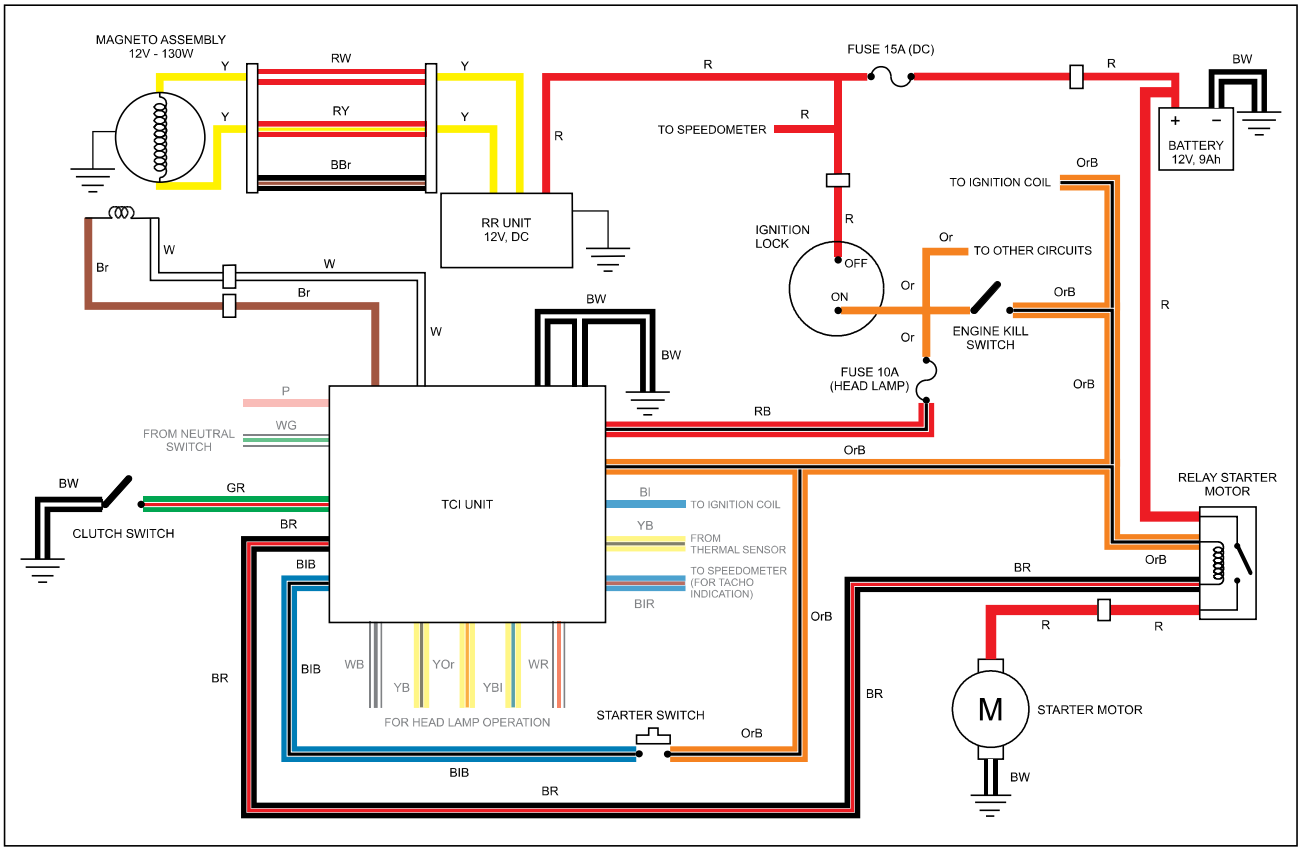


Fig. 5.39

ELECTRIC STARTER SWITCH

- Electric starter switch is located at the bottom side of switch assembly RH on the right hand side of the handle bar. (Fig. 5.40)
- Inspect switch for continuity using pocket tester with the engine kill switch is in 'ON'.

SWITCH POSITION	Or	BIB
PRESS - ON	O——O	
RELEASE - OFF	O	O

- If there is no continuity is found, replace the LH switch assembly.

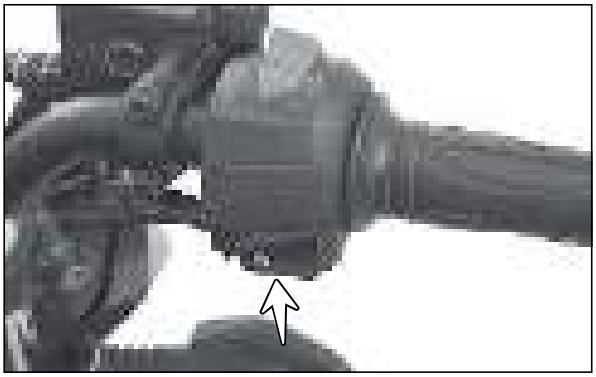


Fig. 5.40

SWITCH ASSEMBLY CLUTCH

- Switch assembly clutch is located in the bracket clutch lever which is mounted on handle bar LH. (Fig. 5.41)
- Inspect the switch for continuity with the pocket tester.

SWITCH POSITION	GR	BIB
PRESS - ON	O——O	
RELEASE - OFF	O	O

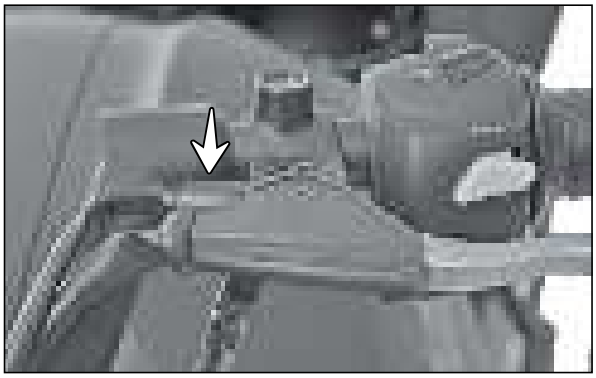


Fig. 5.41

RELAY SELF STARTER (STARTER RELAY)

- Relay self starter is located on the right side of the vehicle on top of the air cleaner assembly. (Fig. 5.42)
- Inspect relay by checking the continuity using pocket tester.

RELAY CONDITION	R	R
NOT ENERGIZED	O	O
ENERGIZED	O——O	

(To energise the starter relay keep the vehicle in neutral condition, press and hold the starter switch with the ignition lock and engine kill switch in 'ON' condition.)

- If there is no continuity found, replace the starter relay and once again check for continuity. Again, if problem persists, then replace the TCI unit and check.

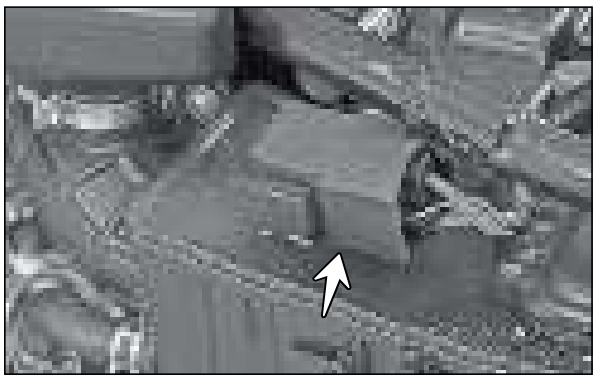


Fig. 5.42

TVS APACHE RTR 160 Fi 4V - Fi VERSION

TVS Apache RTR 160 Fi 4V's electrical system is also divided in to four basic systems (circuits) named:

1. EMS circuit 2. Lighting circuit 3. Charging circuit 4. Electric starter circuit

EMS SYSTEM

The EMS system of the new TVS Apache RTR 160 Fi 4V consists of engine control unit (ECU), battery, fuses, ignition lock, main relay, relay fuel pump, fuel pump module, ignition coil, fuel injector, Oxygen sensor (O_2), inlet air control valve (IACV), manifold absolute pressure and manifold air temperature sensor (MAP and MAT sensor), throttle position sensor (TPS), thermal sensor (ETS), suppressor cap and spark plug. (Fig. 5.43)

The output 12V DC power supply from the battery passes through a 20A fuse (DC fuse) and supplied to the ignition lock, speedometer and 10A EMS fuse. Then the output from the EMS fuse is supplied to both the input terminal of main relay.

A negative connection is given to the ECU unit from a common earth junction through a black white wire for its working.

When the ignition lock is turned ON, the DC output from the battery is supplied to the engine kill switch through a 15A fuse (fuse lighting loads) and to the diagnostic coupler. On switching 'ON' the engine kill switch, the DC output from the switch is supplied to the ECU. On receipt of this power supply, the ECU connects a negative supply to the main relay through a red black wire and the fuel pump relay through a brown green wire.

On receipt of these positive and negative supply, the main relay gets activated and the main relay output gets supplied to the fuel pump relay, O_2 sensor, fuel injector, ignition coil, purge valve and ECU Unit.

On receipt of both the positive and negative supply, the fuel pump relay gets activated and starts supplying the power input to the fuel pump module. Since a negative supply is already connected to the fuel pump module, the fuel pump starts running.

On starting the vehicle using self-starter, the crankshaft and the magneto rotor connected with it starts rotating. When the magneto rotor rotates, the pip on the magneto rotor periphery passes the pulsar coil. The pulsar coil starts producing the voltage signals whenever the pip of the magneto rotor passes it. These signals are supplied to the ECU unit through brown and white wires as a signals. .

The manifold absolute pressure and the manifold temperature sensor (MAP and MAT senor) is used to find the inlet air temperature and manifold pressure. Findings of these information are given to the ECU unit for its processing.

The engine temperature is calculated through a thermal senor which is available at the cylinder block of the engine. This data also supplied to the ECU unit.

The throttle position is calculated trough a throttle position sensor (TPS) and these readings are also given the ECU unit.

On receipt of all the above signals, the ECU unit operates the fuel injector. The ECU unit also collapses the ignition coil primary winding voltage for a fraction of a second. This in-turn develops a high voltage across the secondary winding of ignition coil due to mutual induction. This high voltage is given to the spark plug through the HT cord and the spark plug produces the spark. This spark is produced just before the top dead center of the piston.

Now the engine starts running and the ECU operates the inlet air control valve (IACV) which is fitted on the throttle body to maintain a stable idling RPM by controlling the inlet air through the throttle body.

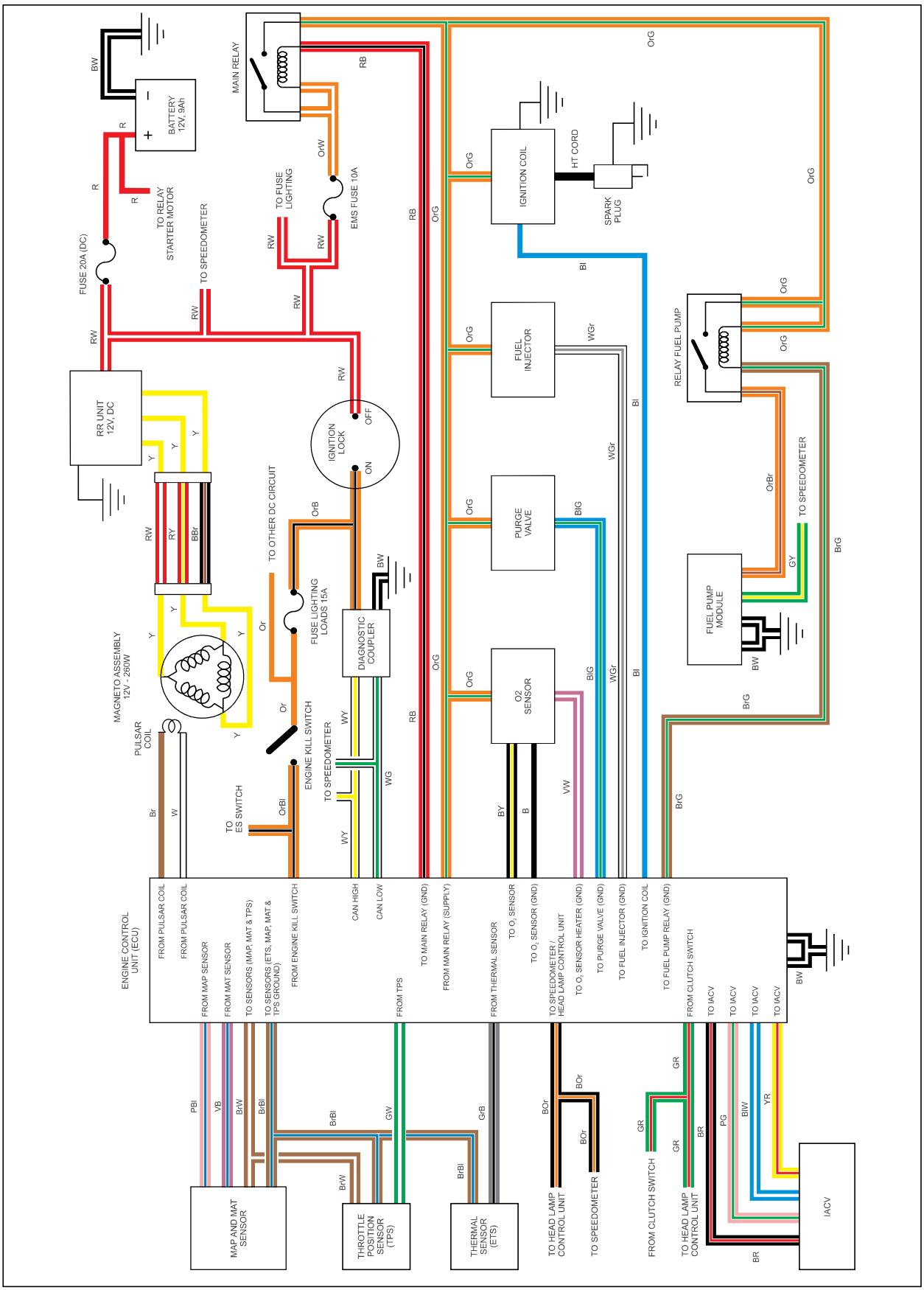

BATTERY 12V, 9Ah
MAIN RELAY
FUSE 20A (DC)
TO RELAY STARTER MOTOR
TO SPEEDOMETER
TO FUSE LIGHTING
EMS FUSE 10A
IGNITION COIL
HT CORD
SPARK PLUG
RR UNIT 12V, DC
IGNITION LOCK
OFF
ON
FUEL INJECTOR
RELAY FUEL PUMP
MAGNETO ASSEMBLY 12V - 260W
PULSAR COIL
TO OTHER DC CIRCUIT
FUSE LIGHTING LOADS 15A
DIAGNOSTIC COUPLER
PURGE VALVE
FUEL PUMP MODULE
TO ES SWITCH
ENGINE KILL SWITCH
TO SPEEDOMETER
O2 SENSOR
ENGINE CONTROL UNIT (ECU)
FROM PULSAR COIL
FROM PULSAR COIL
FROM MAP SENSOR
FROM MAT SENSOR
TO SENSORS (MAP, MAT & TPS)
TO SENSORS (IETS, MAP, MAT & TPS GROUND)
FROM ENGINE KILL SWITCH
CAN HIGH
CAN LOW
FROM TPS
TO MAIN RELAY (GND)
FROM MAIN RELAY (SUPPLY)
FROM THERMAL SENSOR
TO O2 SENSOR (GND)
TO SPEEDOMETER / HEAD LAMP CONTROL UNIT
TO O2 SENSOR HEATER (GND)
TO PURGE VALVE (GND)
TO FUEL INJECTOR (GND)
TO IGNITION COIL
TO FUEL PUMP RELAY (GND)
FROM CLUTCH SWITCH
TO IACV
TO IACV
TO IACV
TO IACV
MAP AND MAT SENSOR
THROTTLE POSITION SENSOR (TPS)
THERMAL SENSOR (IETS)
TO HEAD LAMP CONTROL UNIT
TO SPEEDOMETER
FROM CLUTCH SWITCH
TO HEAD LAMP CONTROL UNIT
IACV

Fig. 5.43

The oxygen sensor (O_2 sensor) fitted on the muffler calculates the volume of unburnt fuel coming out from the combustion chamber and these reading are given to the ECU unit. Based on the O_2 sensor inputs the ECU unit changes the ignition timing and the fuel flow to the combustion chamber through the fuel injector.

When the ignition lock is in 'OFF' condition or the engine kill switch is in 'OFF' condition, the DC output from the battery to the ECU unit and the other sensors are disconnected, thus the vehicle will not start.

IGNITION LOCK AND ENGINE KILL SWITCH

- Check the ignition lock and engine kill switch for the continuity.
- Refer page no. 5-4 for the checking procedure of ignition lock and engine kill switch.
- Replace the ignition lock and engine kill switch (switch assembly RH) if there is no continuity.

CHECKING THE PULSAR COIL WITH POCKET TESTER (MULTIMETER)

Pocket tester

- Set the pocket tester at 2000 ohms position.
- Disconnect the pulsar coil socket from wiring harness.
- Connect pocket tester '+ve' lead to the brown wire (Br) of pulsar coil and '–ve' lead to white wire (W) of pulsar coil. (Fig. 5.44)
- Measure the resistance. If the resistance measured is not within the specified limit, replace the pulsar coil with a new one.

Pulsar coil (Br - W)	360 ~ 440 ohms

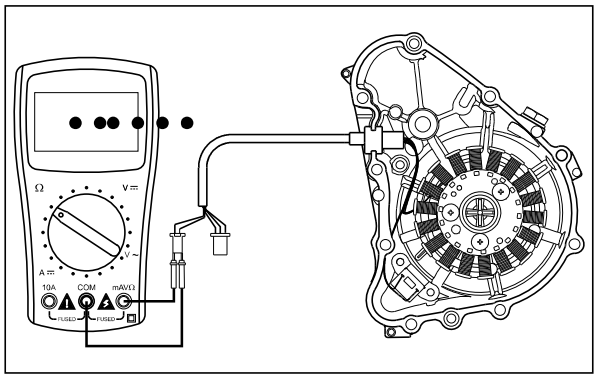


Fig. 5.44

CHECKING THE STATOR ASSEMBLY WITH POCKET TESTER

- Since there is a 3 phase magneto assembly used in this vehicle, the stator assembly checking procedure is entirely different from other vehicles. The resistance of the stator assembly is to be checked between all the three faces. Follow the procedure given bellow:
- Disconnect the stator assembly coupler from the main wiring harness.

- Set the pocket tester knob at 200 ohms position.

Pocket tester

- There are three yellow wires (Y) coming out of the stator assembly. Connect the pocket tester (+ve) lead to the first yellow wire (Y) and (-ve) lead to second yellow wire (Y) and measure the resistance. (Fig. 5.45)

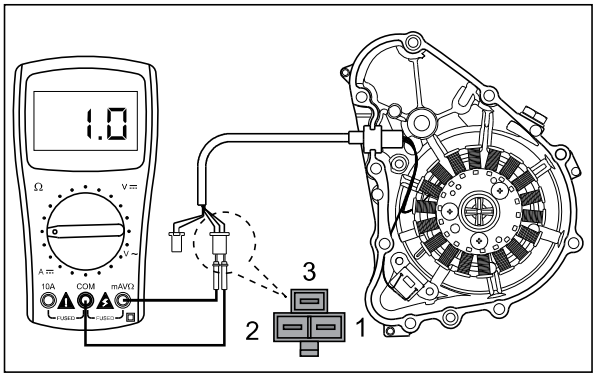


Fig. 5.45

- Similarly, check the resistance between second and third yellow wires. Also the third and first yellow wires. If any one phase resistance is not within the limit, replace the magneto stator assembly with a new one.

Resistance across any two phase	0.2 ~ 1.2 ohms

IGNITION COIL

- The ignition coil is mounted on the right side of the frame below the fuel tank assembly, near the cylinder head assembly.

- Check the ignition coil primary and secondary winding resistance. Refer the page no. 5-6 for the checking procedure of ignition coil primary and secondary winding.

ENGINE CONTROL UNIT (ECU)

- ECU (engine control unit) is placed below the rider seat assembly near the battery. ECU unit can be checked by diagnostic tool. (Fig.5.46)

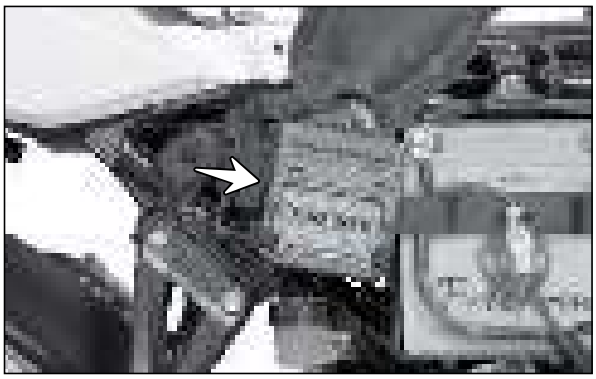


Fig. 5.46

SPARK PLUG

- Neglecting the sparkplug leads to poor performance of engine. If the sparkplug is used for a longer period, the electrodes gradually burn away and carbon builds up along the inside part (refer chapter "Periodic maintenance" page no. 2-14 for cleaning and maintenance of spark plug).

Caution:
Always use recommended make and type of sparkplug only.

Spark plug	BOSCH UR4KE & NGK MR7E-9

THROTTLE BODY

- The throttle body has the following sensor attached.
  - Throttle position sensor (TPS)
  - Manifold pressure sensor and Manifold air temperature senor (MAP & MAT)
  - Fuel injector
  - Idle air control valve (IACV)

Throttle Position Sensor (TPS)

- A throttle position sensor gives exact position of the throttle to the ECU in the form of variable resistance. (Fig.5.47) Check the resistance of the throttle position sensor in the following manner:

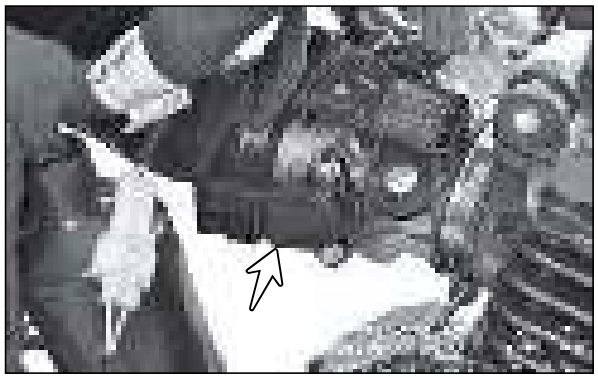


Fig. 5.47

- Disconnect the TPS coupler of main wiring harness. Connect the pocket tester's '+ve' lead to the pin no. 3 and '–ve' lead to the pin no. 1 of the throttle position sensor and measure the resistance when engine is in cold condition. (Fig. 5.48)
- Set the pocket tester at 20k ohms position.

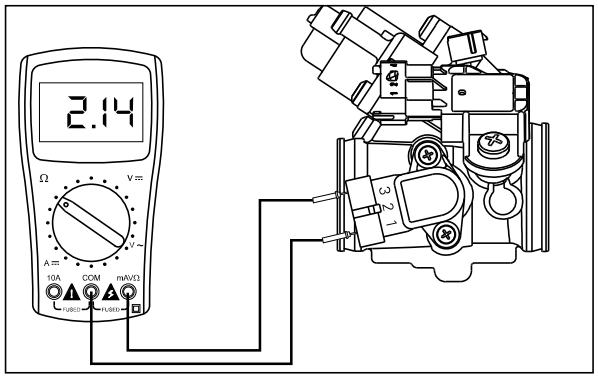


Fig. 5.48

Pocket tester	
Resistance	1.17 ~ 2.6 k ohms

Manifold Pressure Sensor and Manifold Air Temperature Senor (MAP & MAT)

- The MAP sensor is used to find the pressure in the combustion chamber and the pressure difference is given to ECU in the form of voltage. MAP sensor can be checked by doing a good (or) bad analysis. (Fig. 5.49)

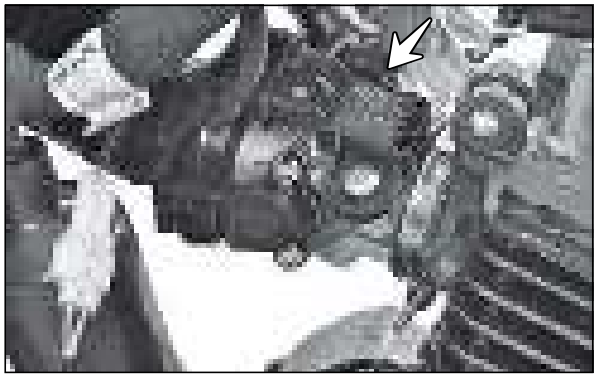


Fig. 5.49

- The MAT sensor is used to find the temperature of the air in the manifold and the temperature data is given to the ECU in the form of resistance. Check the resistance of the MAT sensor in the following manner:

- Set the pocket tester at 20k ohms position.

Pocket tester

- Disconnect the MAT coupler of wiring harness. Connect the pocket tester's '+ve' lead to the pin no. 1 and '–ve' lead to the pin no. 2 of the MAT sensor coupler and measure the resistance when engine is in cold condition. (Fig. 5.50)

Resistance	2.375 ~ 2.625 k ohms

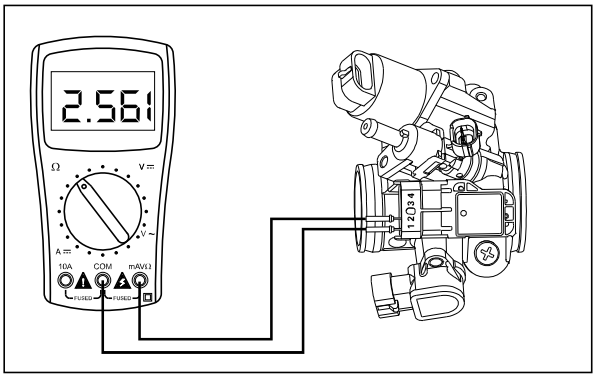


Fig. 5.50

Fuel Injector

- The fuel injector is used to inject the fuel into the combustion chamber based on the signal from the ECU. (Fig. 5.51) Check the resistance of the fuel injector in the following manner:

- Set the pocket tester at 200 ohms position.

Pocket tester

- Disconnect the fuel injector coupler from the injector and check the resistance between two terminals of the injector.(Fig. 5.52)

Resistance	11.4 ~ 12.6 ohms

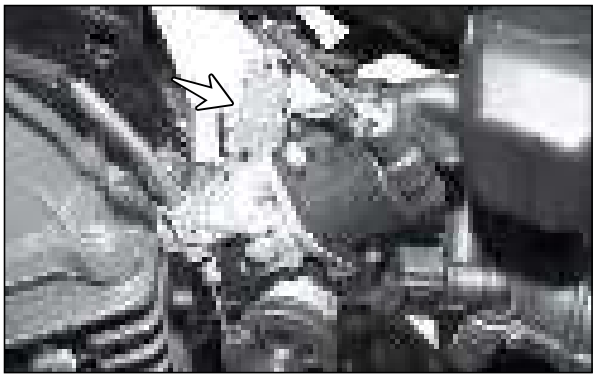


Fig. 5.51

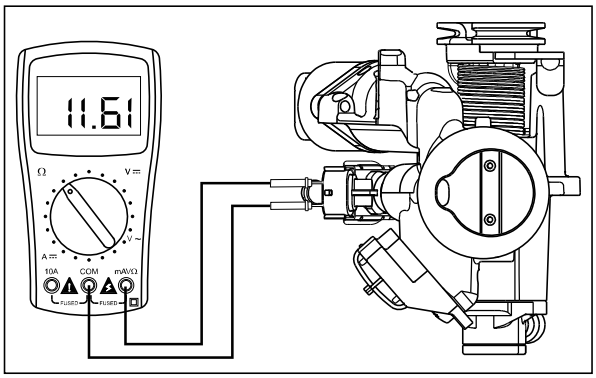


Fig. 5.52

Idle Air Control Valve (IACV)

- The Idle air control valve controls the amount of air flow into the combustion chamber based on the ECU signals. (Fig. 5.53) Check the resistance of the IACV in the following manner:
- Set the pocket tester at 200 ohms position.

Pocket tester

- Disconnect the IACV coupler of wiring harness from the IACV unit and measure the resistance between IACV terminals A&D and B&C as shown. (Fig. 5.54)

Resistance	45.9 ~ 56.1 ohms

- Incase if any of the component value is not within the specified limit, replace the entire throttle body assembly.

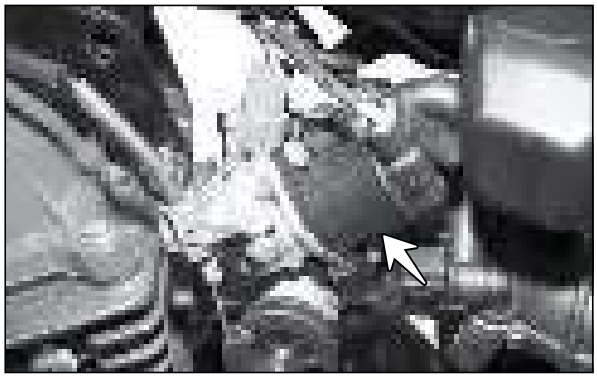


Fig. 5.53

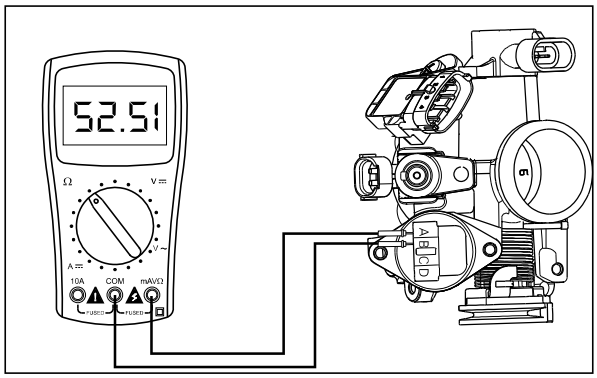


Fig. 5.54

FUEL PUMP MODULE

- The fuel pump module is fitted in the fuel tank, used to pressurize the fuel available in the fuel tank and supplied to the fuel injector. (Fig. 5.55)
- The fuel gauge is also fitted along with fuel pump.
- Use the diagnostic tool to check the fuel pump working (refer chapter "Diagnostic & Trouble shooting" page no. 7-1 for details).
- Incase of any malfunction, refer chapter "Fuel, lubrication and exhaust system" page no. 4-4 for removal and reassembly procedure.

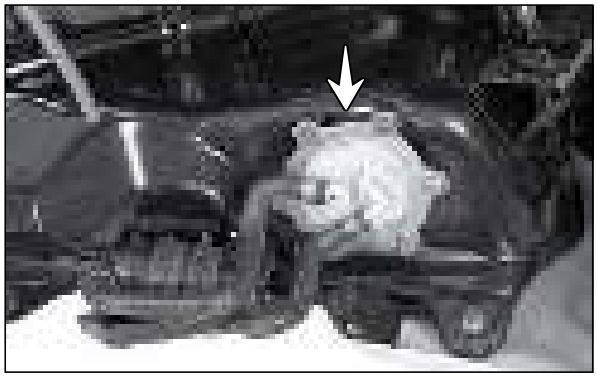


Fig. 5.55

O2 SENSOR

- A O2 sensor is fitted on muffler assembly is used to measure the amount the unburnt fuel coming out the combustion chamber. (Fig. 5.56) Check the resistance of the O2 sensor in the following manner:

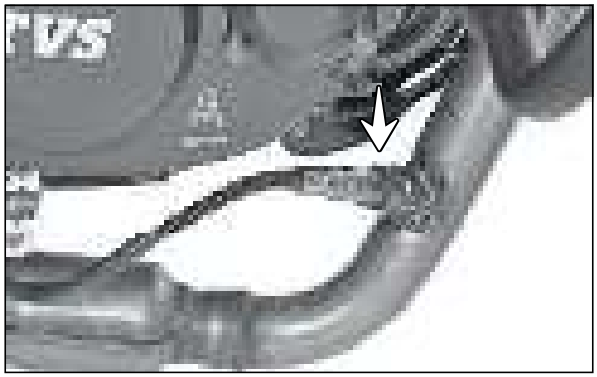


Fig. 5.56

- Dislocate the O2 senor coupler form the bracket engine guard mouthing RH. (Fig. 5.57A)

- Pull the lock (A) from the sensor coupler and separate the O2 sensor coupler from the wiring harness. (Fig. 5.57B)

Fig. 5.57A Fig. 5.57B

- Connect the pocket tester's '+ve' lead and '–ve' lead to the white wires of the O2 sensor coupler. (Fig. 5.58)

- Set the pocket tester at 200 ohms position.

Pocket tester	
Resistance	7.2 ~ 10.8 ohms

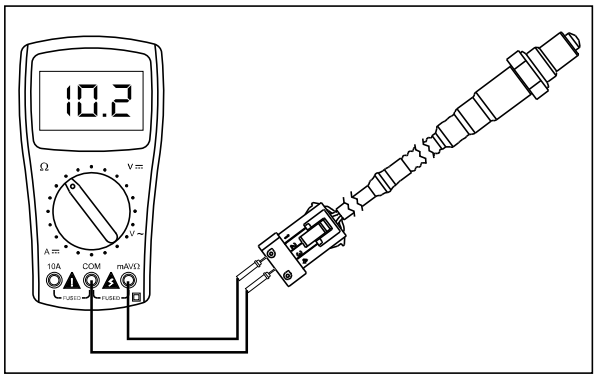


Fig. 5.58

THERMAL SENSOR (ETS)

- A thermal sensor fixed on the cylinder block to sense the engine temperature and give input to the TCI unit in the form of resistance. Check the resistance of the thermal sensor as explained in page no. 5-7. (Fig. 5.59)

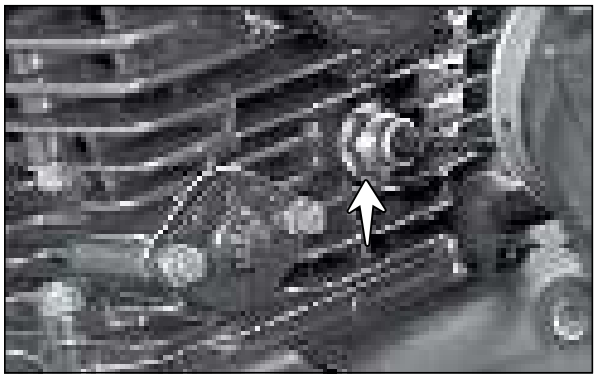


Fig. 5.59

PURGE VALVE

- Purge valve is fitted below the fuel tank assembly along with the canister. (Fig. 5.60)

- Remove the fuel tank assembly by referring the chapter "Periodic maintenance" page no. 2-5 for accessing the purge valve.

- Incase of any abnormality is found in the purge valve, replace it by following the procedure given in chapter "Fuel, lubrication and exhaust system" page no. 4-13.

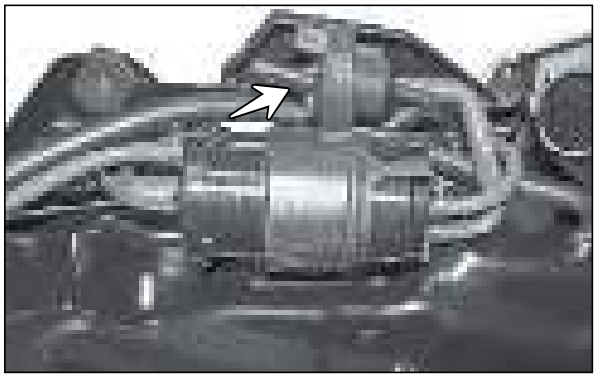


Fig. 5.60

MAIN RELAY & RELAY FUEL PUMP

- Main relay and relay fuel pump is fitted on case air cleaner and located below the cover frame L. (Fig. 5.61)
- Remove the cover frame L as explained in chapter "Periodic maintenance" page no. 2-3 for accessing the relays.
- Inspect relays by checking the continuity using pocket tester.

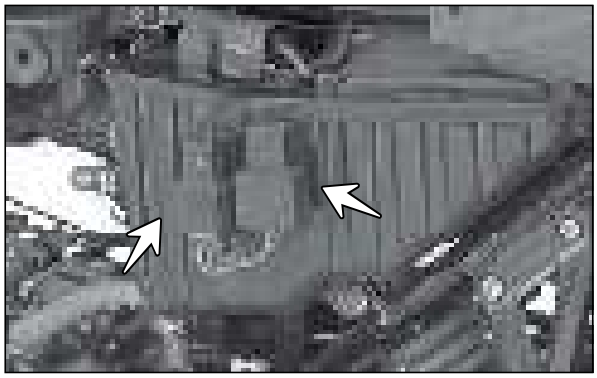


Fig. 5.61

Main Relay

RELAY CONDITION	OrW	OrG
NOT ENERGIZED	O	O
ENERGIZED	O———	———O

Relay Fuel Pump

RELAY CONDITION	OrG	OrBr
NOT ENERGIZED	O	O
ENERGIZED	O———	———O

(To energise the main relay and relay fuel pump keep the vehicle in neutral condition and turn 'ON' the ignition lock and engine kill switch).

- If there is no continuity found, replace the respective relay and once again check for continuity. Again, if problem persists, inspect the continuity if wiring harness. Else, replace the ECU and check.

LIGHTING SYSTEM

The lighting system consists of magneto assembly, regulator cum rectifier unit (RR unit), battery, ignition lock, fuse 10A (lighting fuse), fuse 15A (lighting loads), head lamp control unit and control switches. The working of lighting system of the TVS Apache RTR 160 Fi 4V are as follows. (Fig. 5.62)

A DC output from the battery is connected to a 10A fuse (lighting fuse). The output of the lighting fuse is directly connected to the head lamp control unit. When the ignition lock is turned 'ON', another DC output from the ignition lock is supplied to head lamp control unit, switch beam control, tail lamp, number plate lamp, speedometer back illumination and the pass-by switch through a 15A fuse (fuse lighting load). Since the number plate lamp, speedometer back illumination and the tail lamp is connected with the negative supply directly, they starts to glow once the ignition lock is turned 'ON'.

The head lamp control unit checks for the input from the pulsar coil on turning 'ON' the ignition lock to determine the engine running condition because the head lamp works only for 10 seconds with 50% intensity when the engine is in 'OFF' condition.

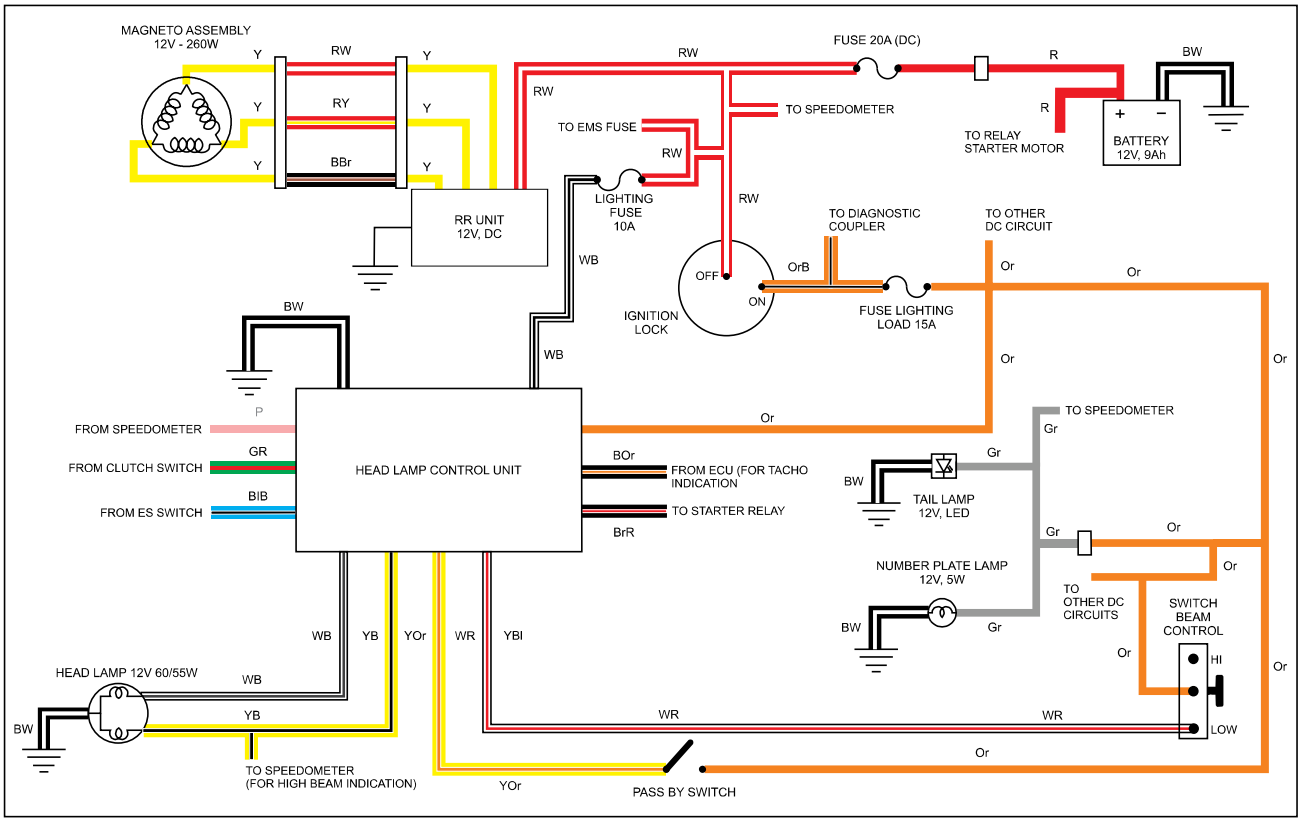


Fig. 5.62

If the beam control switch is in 'high' position, the head lamp control unit will not get any input signal from switch beam control and supplies the power to the head lamp 'high beam' and the high beam glows. If the beam control switch is in 'low' position, the head lamp control unit gets an input signal from the switch and supplies power to the head lamp 'low beam' and the low beam glows.

When the pass-by switch is pressed, a DC input is sent to the head lamp control unit. Now, if the head lamp is glowing in 'low beam', the head lamp control unit cuts 'OFF' the power supply to the 'low beam' and supplies to the 'high beam' (toggles). If the head lamp is glowing in 'high beam' the head lamp control unit does it in vice-versa. If the pass-by switch is pressed when the engine is not running, the head lamp glows only with 50% illumination.

When the engine is not running, the head lamp control unit checks for the input from the switch beam control to determine the head lamp beam ('High' or 'Low'). Based on the switch beam controls position the head lamp glows for 10 seconds with only 50% intensity. If the self start switch is pressed within this 10 seconds the head lamp goes 'OFF' and gets 'ON' after the engine starting with 100% intensity. If the vehicle is kept in engine idling condition for more than 20 seconds with the head lamp 'ON', the head lamp reduces the illumination by 50% and gains it back to 100% once the vehicle is moved or when the throttle is opened.

SWITCH BEAM CONTROL AND SWITCH PASS-BY

- Inspect the switch beam control and switch pass-by for its continuity as explained in page no. 5-9.

HEAD LAMP CONTROL UNIT

- Head lamp control unit is placed below the seat assembly near the fuse holder. Head lamp control unit can be checked by doing a good (or) bad analysis (replacing existing with a new one). (Fig.5.63)

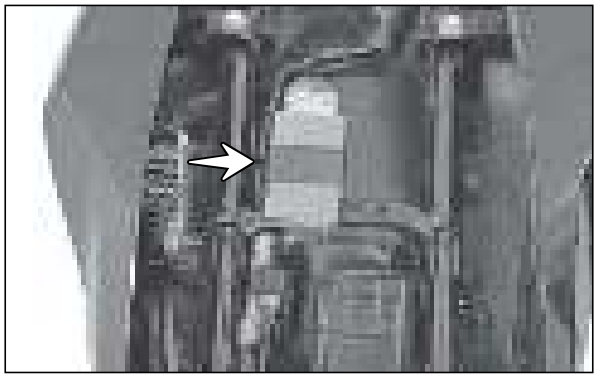


Fig. 5.63

CHARGING AND DC SYSTEM

The DC system consists of magneto assembly, regulator cum rectifier unit (RR unit), battery, ignition lock, fuse 20A (main fuse), fuse15A (fuse lighting load) and the control switches. A DC output from the battery is directly connected to the speedometer through a 20A fuse for the memory and other functions of speedometer. Another DC output from the battery is connected to the ignition lock through the same 20A fuse. When the ignition lock is turned 'ON' the DC output from the ignition lock is supplied to the position lamps, brake lamp switches front and rear, horns, speedometer assembly, electronic flasher unit and other DC operated components through a 15A fuse (lighting load). (Fig. 5.64)

A negative input from the common earth junction is directly connected to the position lamps. By switching 'ON' the ignition lock, the lamps glow directly.

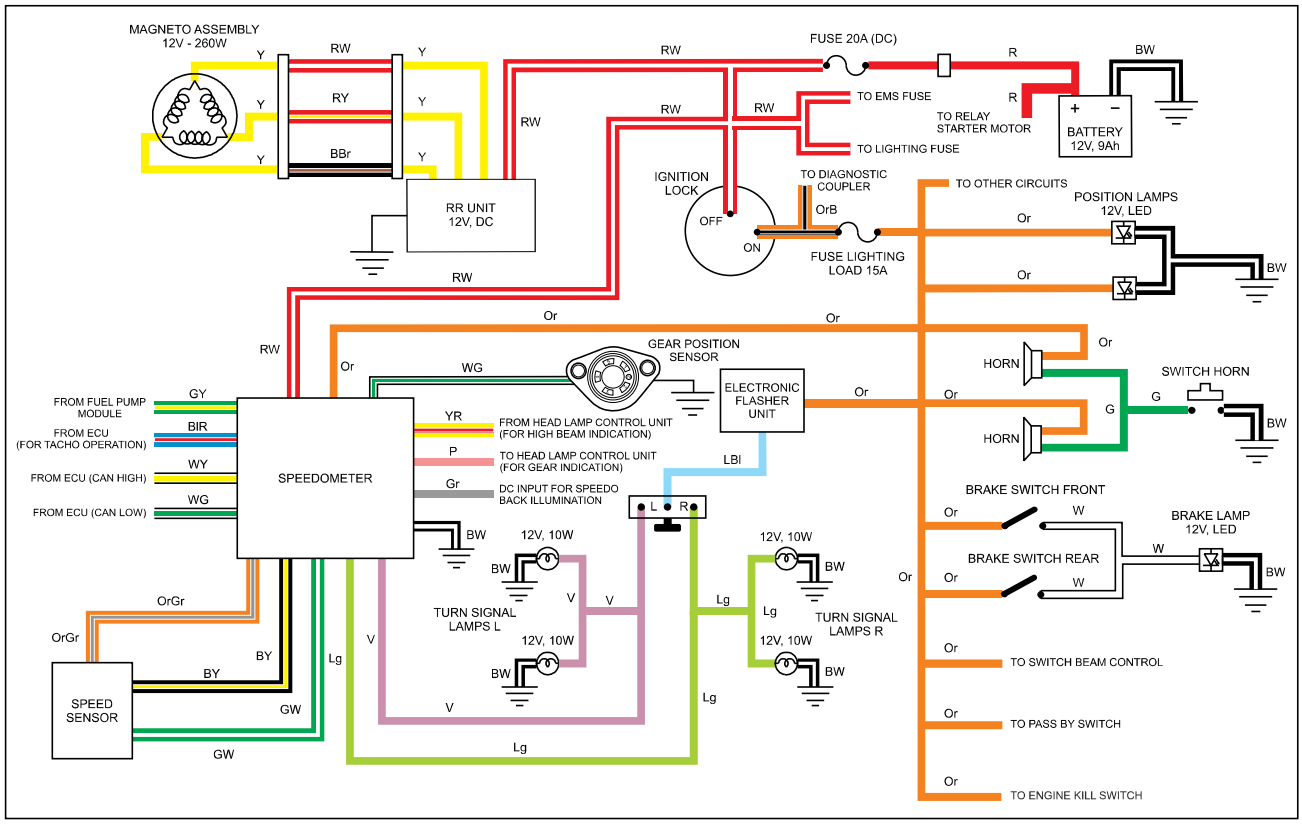


Fig. 5.64

When the brake lamp switch front or rear is operated (brake applied), the DC current from either of the switch is supplied to the brake lamp. A negative earth connection from the common earth junction is connected to the lamp and hence the lamp glows.

Similarly, when the horn button is pressed, the negative input from the common junction is connected to the horns. Since the horns are connected to the ignition lock's DC output directly, on pressing the switch, the horns blow.

A DC output from the ignition lock is connected to the speedometer assembly for its operation. A input signal from the gear position sensor is connected to the speedometer and the ECU for gear position sensing. A neutral indication signal is connected to the ECU from the speedometer for electric start operation. The fuel level indicator in the speedometer gets an input signal in the from of variable resistance from the fuel pump module. Based on these signals the fuel level indicator shows the fuel level indication.

An input voltage and a negative supply is given to the speed sensor from the speedometer. The output signal from the speed sensor is connected to the speedometer. Based on these signals the speed indication is shown. Speedometer shows engine rpm based on the engine speed signal received from the ECU.

A DC output from the ignition lock is connected to the electronic flasher unit. The output from the flasher unit is connected to the switch turn signal. When the switch is slid to the 'right' or 'left' the respective front and rear turn signal lamps glow along with the turn signal indicator on the speedometer .

DC SYSTEM COMPONENTS INSPECTION

- For the inspecting procedure of DC circuit related components and the switches, refer page no. 5-11.

GEAR POSITION SENSOR

- The gear position sensor is mounted on the crankcase assembly LH below the cover engine sprocket. (Fig. 5.65)

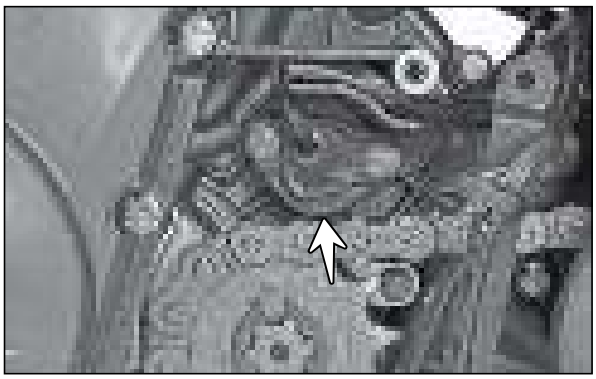


Fig. 5.65

- Gear position sensor senses the exact position of the gear and generates the resistance accordingly. These resistance are sent to the digital speedometer and the TCI unit through a white green wire (WG). To measure the resistance level of gear position sensor at various position follow the procedure given below:
- Set the pocket tester at 20k ohms position.

Pocket tester

- Disconnect the gear position sensor's socket from wiring harness.

- Connect pocket tester's '+ve' lead to the green white wire (GW) of gear position sensor and '–ve' lead to body earth. (Fig. 5.66)

- The resistance of gear position sensor at various position are as follows:

GEAR POSITION	RESISTANCE
First gear	0.075 kilo ohms
Neutral	0.75 kilo ohms
Second gear	1.5 kilo ohms
Third gear	2.7 kilo ohms
Fourth gear	5.6 kilo ohms
Fifth gear	15 kilo ohms

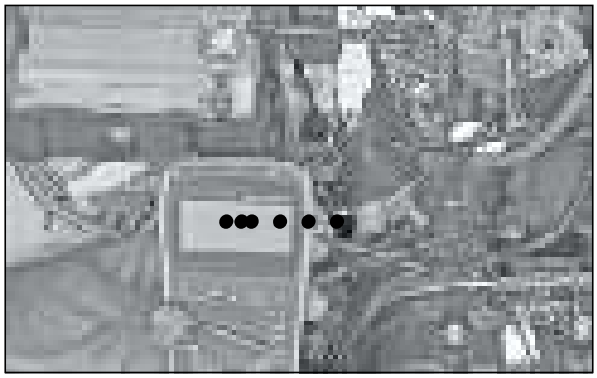


Fig. 5.66

FUEL PUMP MODULE (in Fi version)

- Fuel level indicator and fuel warning lamp are provided in the digital speedometer.

- Fuel level indicator and the warning lamp works based on the variable resistance signal received from the fuel level sensor. Fuel level sensor resistance alters the resistance in accordance with the amount of fuel available in the fuel tank.

- The fuel level sensor is in fuel pump module, it is fitted at the bottom of the fuel tank. (Fig. 5.67)

- To inspect the fuel pumps fuel gauge, fuel tank complete must be removed (refer chapter "Fuel, lubrication and exhaust system" page no. 4-4 for removal procedure).

- Inspect the fuel sender unit for continuity with pocket tester by connecting '+ve' lead of pocket tester to green yellow wire (GY) and '-ve' lead to the black white wire (BW).

Pocket tester

- Set pocket tester at 200 ohms position and check the resistance of fuel sender unit. If the resistance value is not within the specified limit, replace the sender unit with new one. (Fig. 5.68)

Resistance	Full	18 ~ 22 ohms
	Empty	316.5 ~ 323.5 ohms

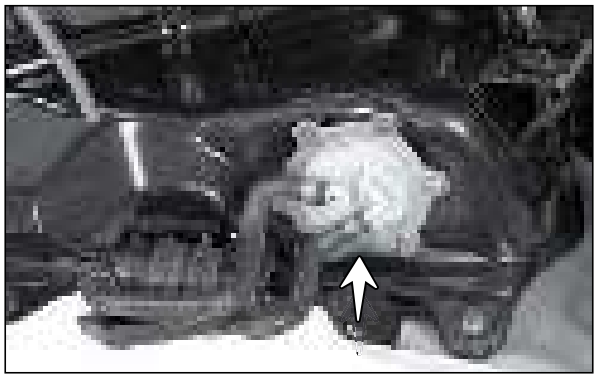


Fig. 5.67

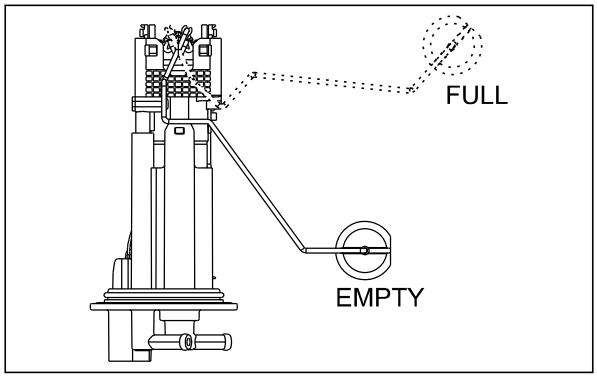


Fig. 5.68

ELECTRIC STARTER SYSTEM

Electric starter system consists of battery, ignition lock, engine kill switch, electric starter switch, gear position sensor, clutch switch, head lamp control unit, relay starter motor and the starter motor assembly. (Fig. 5.69)

A DC output from the battery is connected to the ignition lock through a 20A fuse. When the ignition lock is turned 'ON', this DC output is connected to the head lamp control unit, engine kill switch, electric starter switch and relay starter motor through a 15A fuse (fuse lighting load). A DC output from the battery is directly connected to the relay starter motor and the output of the relay is connected to the starter motor through thick wires. A negative is connected to the starter motor from the common earth junction. When the relay energises, the battery output is supplied to the starter motor and the motor works.

Based on the resistance input from the gear position sensor, the neutral position is sensed by the speedometer and the speedometer supplies a negative input to the head lamp control unit for activating the electric start circuit. A negative output from the clutch switch is supplied to the head lamp control unit when the switch is operated. In the absence of neutral indication from the speedometer, this negative input is taken by the head lamp control unit for activating the self start circuit in geared condition.

While pressing the electric starter switch, the DC supply from the electric starter switch flows to the head lamp control unit. On receipt of this DC input signal, the head lamp control unit checks the availability of negative input either from the speedometer or from the clutch switch. If any one of these input is available, the head lamp control unit connects a negative supply to the relay starter motor and energises the relay. Even though all the above conditions are met by the head lamp control unit, if the engine is in running condition (if there is a pulsar coil input to the ECU), the ECU unit cuts 'OFF' the negative supply to the starter relay to avoid the cranking of motor during engine running condition and protects the motor from damage. If the electric start switch is pressed continuously either in neutral or in clutch applied condition, the head lamp control unit energies the starter relay for 3 seconds and switches 'OFF' automatically and energises again after 3 seconds for battery saving.

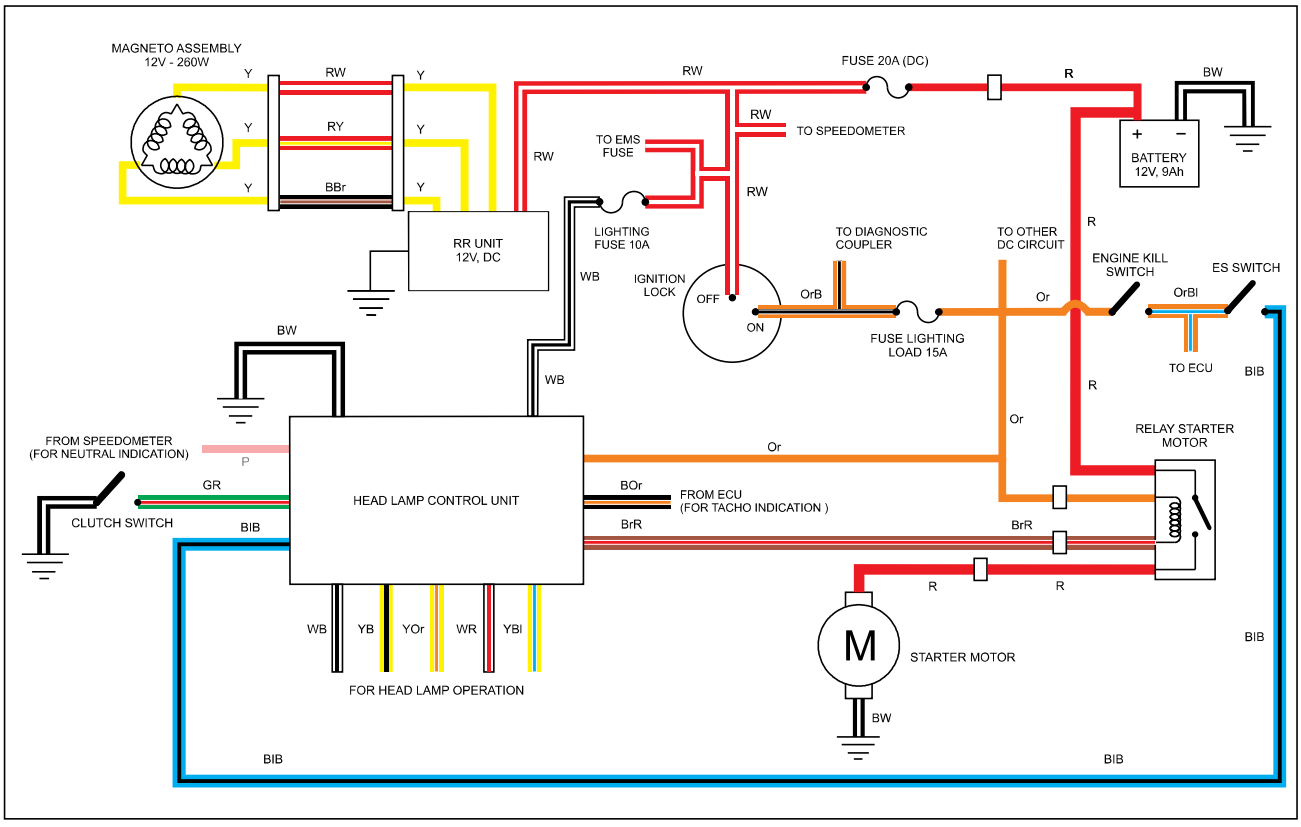


Fig. 5.69

ELECTRIC STARTER SYSTEM COMPONENTS INSPECTION

- For the inspecting procedure of electric starter system related components and the switches, refer page no. 5-18.

BULBS REPLACEMENT

LAMP ASSEMBLY TURN SIGNAL - BULB

- Remove the self tapping screw from turn signal lamp housing and take off the lens along with the holder assembly and bulb. (Fig. 5.70)

Phillips head screw driver

Fig. 5.70

- Rotate and pullout the bulb holder from the housing and replace the bulb with a new one. (Fig. 5.71)

Turn signal lamp	12V, 10W

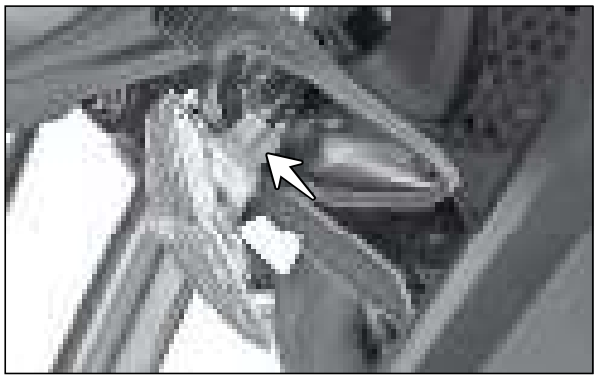


Fig. 5.71

- Reassemble the parts and tighten the self tapping screw.
- Same procedure can be followed for replacing the turn signal lamp's bulbs.

HEAD LAMP ASSEMBLY - BULB

- Remove the CRR pan head screw (M6x25 - 2 Nos.) housing head lamp front top mounting. (Fig. 5.72)

Phillips head screw driver

Tightening torque	3 ± 1 Nm

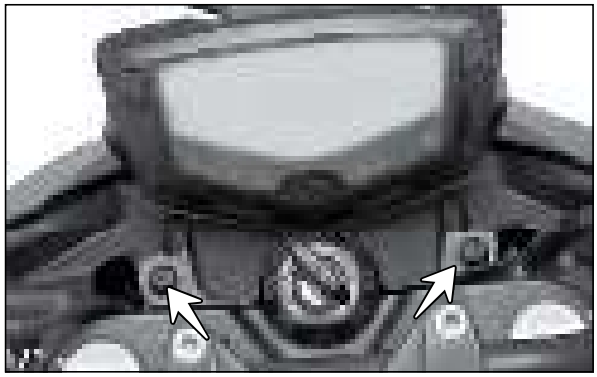


Fig. 5.72

- Loosen the hexagonal flange bolt (M6x16 - 2 Nos.) from the bottom mounting housing head lamp (both LH and RH) and tilt the housing head lamp forward. (Fig. 5.73)

10 mm spanner	
Tightening torque	4.5 ± 1.5 Nm

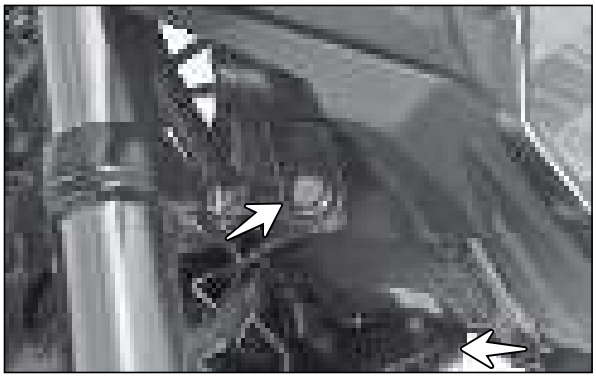


Fig. 5.73

- Pullout the socket head lamp (A) from head lamp bulb and dislocate the dust cap (B) of head lamp assembly. (Fig. 5.74)

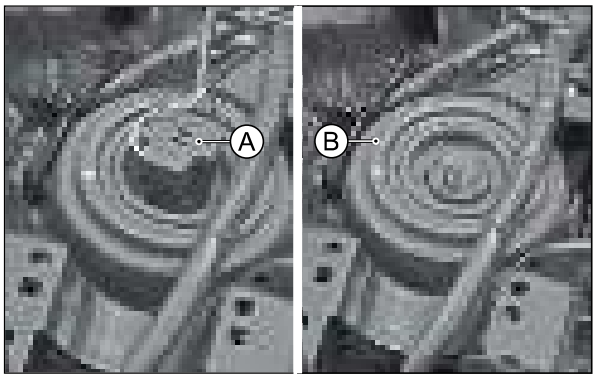


Fig. 5.74

- Take out head lamp bulb by snapping out the clip (A) and replace with a new one. (Fig 5.75)

Head lamp bulb	12V, 35/35W HS1 (160 4V)
	12V, 60/55W H4 (160 Fi 4V)

- Reassemble the parts in the reverse order of removal.

Note:
After reassembling head lamp, readjust the head lamp beam as explained in chapter "Periodic maintenance" page 2-38)

Do not touch the halogen bulb as it will reduce its life and performance.

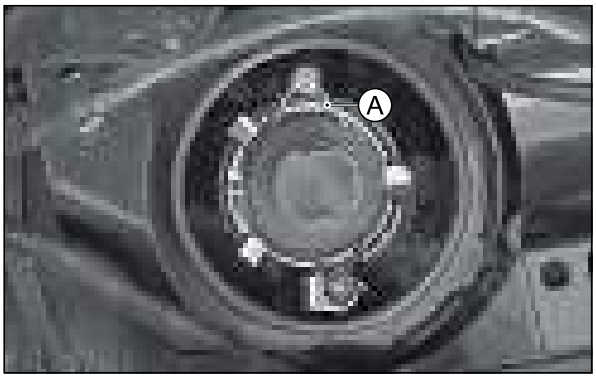


Fig. 5.75

POSITION LAMPS - REPLACEMENT

- Remove the CRR pan head screw (M5x16 - 2 Nos.) from the housing speedometer rear mounting and remove the housing speedometer rear. (Fig. 5.76)

Phillips head screw driver	
Tightening torque	3 ± 1 Nm

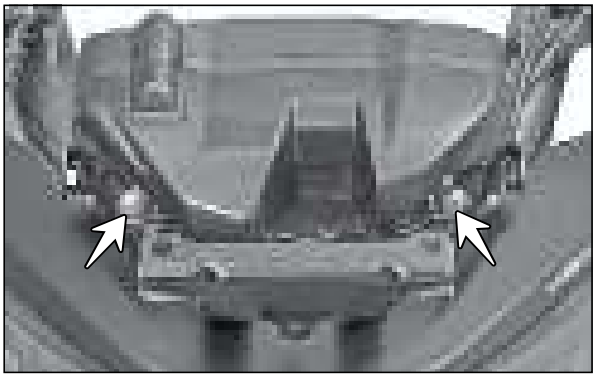


Fig. 5.76

- Remove the housing head lamp front top and bottom mounting bolts and tilt the housing head lamp as explained in the pervious page.

- Remove the hexagonal nuts (M6 - 4 Nos.) from the bracket housing head lamp along with the punched washer. (Fig. 5.77)

10 mm spanner	
Tightening torque	3 ± 1 Nm

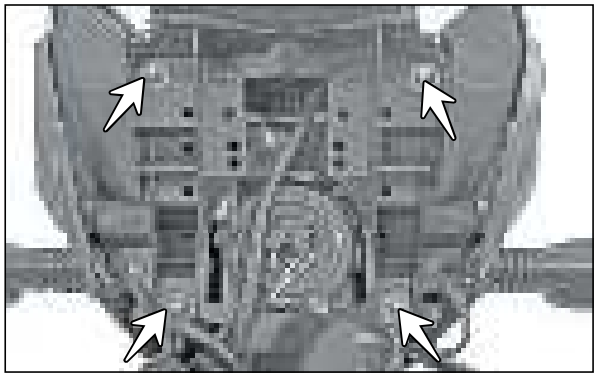


Fig. 5.77

- Remove the CRR pan head tap screw (M6x16 - 2 Nos.) from the bracket housing head lamp. (Fig. 5.78)

Phillips head screw driver	
Tightening torque	1.5 ± 0.5 Nm

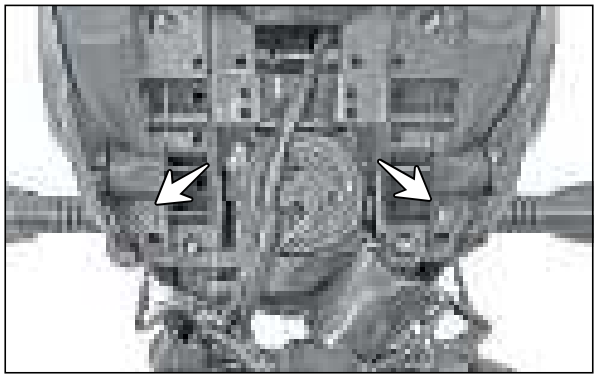


Fig. 5.78

- Gently pull out the turn signal lamp by dislocating it from the lugs and separate the housing head lamp front and rear.

- Disconnect the position lamp assembly connector. (Fig. 5.79)

- Remove the CRR flanged pan head tap screw (ST4.2x13 - 3 Nos.) and takeout the position lamp assembly LH. (Fig. 5.80)

Phillips head screw driver	
Tightening torque	1 ± 0.2 Nm

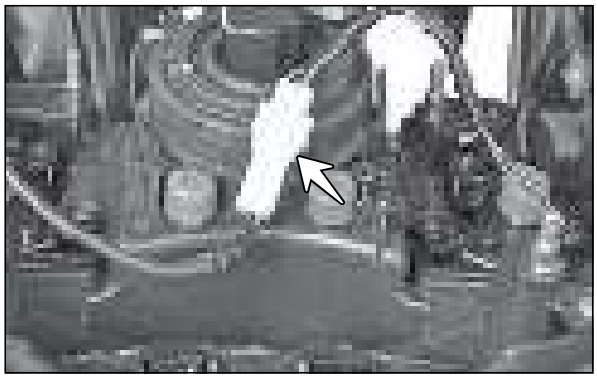


Fig. 5.79

- Replace the position lamp LH with a new one and reassemble housing head lamp front.

- In similar manner the position lamp RH can be removed and replaced.

- Reassemble the parts in the reverse order of removal.

Note:
After reassembling head lamp assembly, readjust the head lamp beam as explained in chapter "Periodic maintenance" page 2-38).

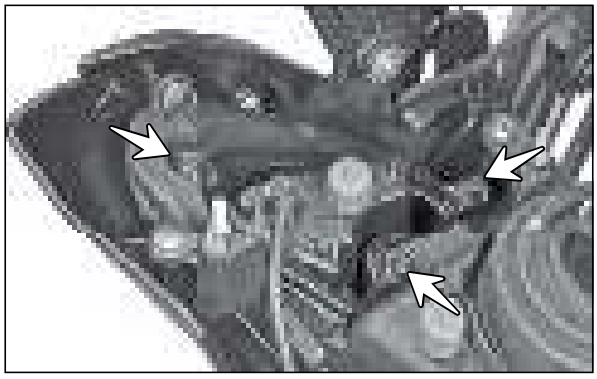


Fig. 5.80

DIGITAL SPEEDOMETER ASSEMBLY

Since the digital speedometer is provided with LED indicators, it is not possible to replace them individually. Recommended to replace the entire speedometer assembly, incase of any failure.

REMOVAL

- Remove the CRR pan head screw (M5x16 - 2 Nos.) from the mounting of housing speedometer rear and take out the housing speedometer. (Fig. 5.81)

Phillips head screw driver	
Tightening torque	3 ± 1 Nm

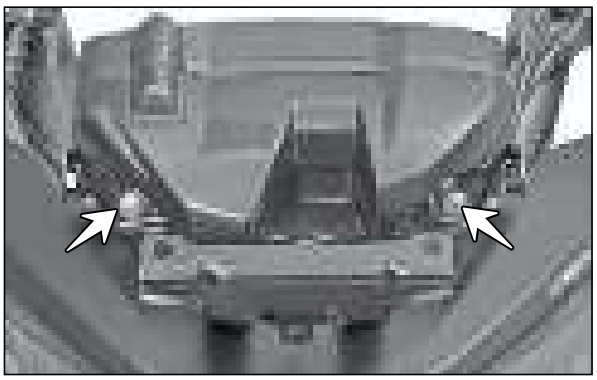


Fig. 5.81

- Remove the hexagonal nut (M6 - 3 Nos.) along with plain washers from the mounting of speedometer assembly. (Fig. 5.82)

10 mm spanner	
Tightening torque	3 ± 1 Nm

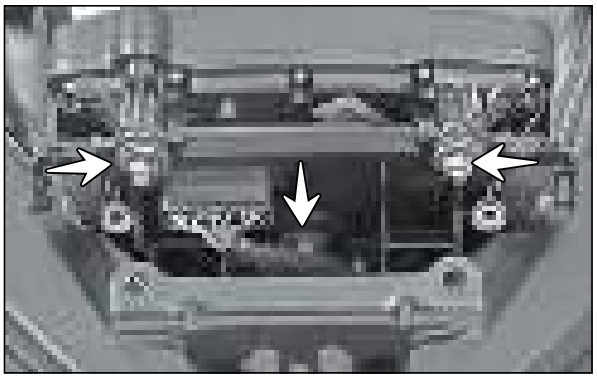


Fig. 5.82

- Disconnect coupler from the speedometer assembly by gently pressing the lock and take out the digital speedometer. (Fig. 5.83)
- Replace the new speedometer.
- Reassemble the parts in the reverse order of removal procedure.

Note:
After reassembling the head lamp, readjust the head lamp beam as explained in chapter "Periodic maintenance" page 2-38).

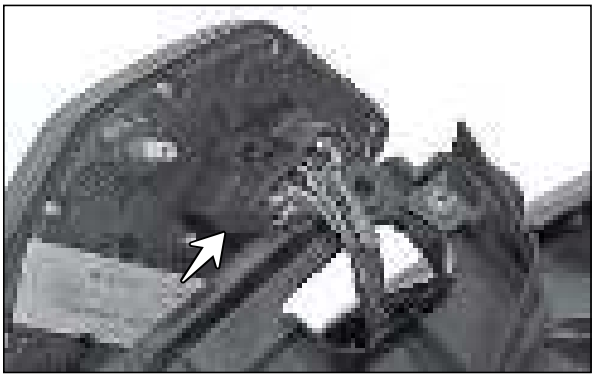


Fig. 5.83

TAIL LAMP ASSEMBLY

- Refer the chapter "Periodic maintenance" page 2-10 for tail cover assembly removal procedure.
- Remove the hexagonal flange nut (M6 - 2 Nos.). (Fig. 5.84)

10 mm spanner	
Tightening torque	2.5 ± 0.5 Nm

- Remove the CRR pan head screw (M6x16 - 2 Nos.) from the tail assembly mounting. (Fig. 5.85)

Phillips head screw driver	
Tightening torque	3 ± 1 Nm

- Replace lamp assembly with new one.
- Reassemble the parts in the reverse order of dismantling.

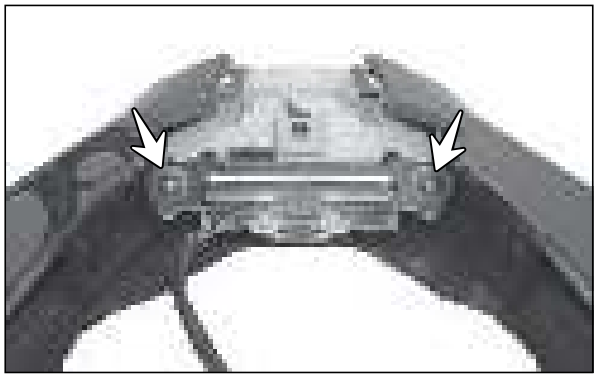


Fig. 5.84

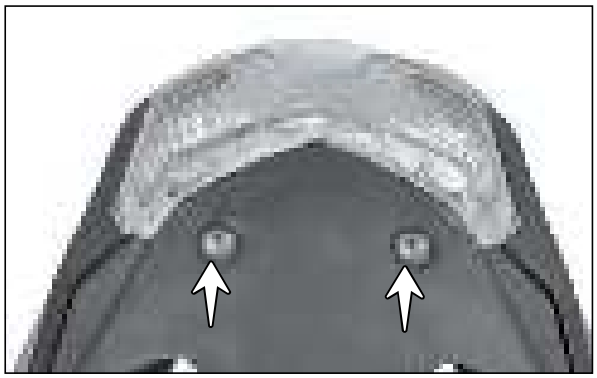


Fig. 5.85

NUMBER PLATE ILLUMINATOR - BULB

- Remove the rear seat assembly.
- Disconnect the number plate lamp couplers from the main wiring harness. (Fig. 5.86)
- Remove mounting nuts (M6 - 2 Nos.) and take out the number plate illuminator as an assembly and pull out the rubber grommet. (Fig. 5.87A)

10 mm spanner	
Tightening torque	3 ± 1 Nm

- Pull out bulb holder along with the bulb. (Fig. 5.87B)
- Remove bulb from the holder and replace with a new one (12V, 5W).

Note:
While reassembling ensure that the presence of the grommet in the tail cover.

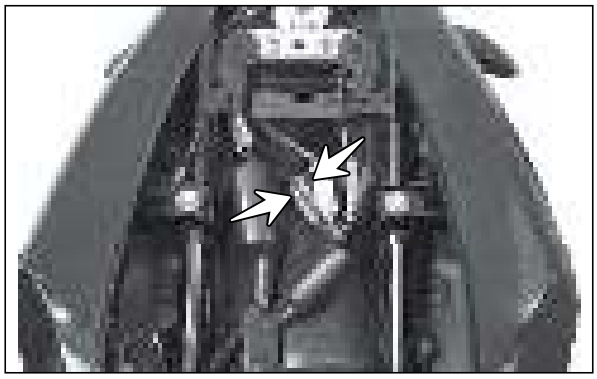


Fig. 5.86

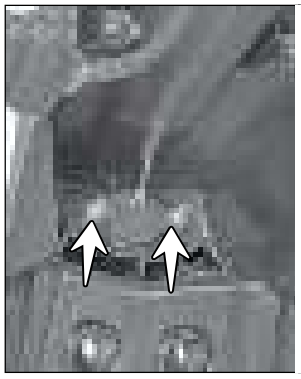


Fig. 5.87A

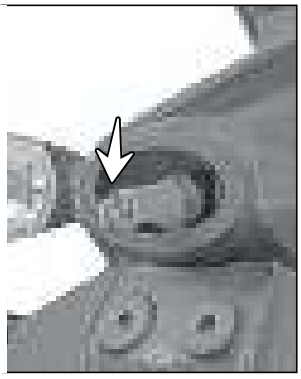


Fig. 5.87B

ADJUSTMENTS

HEAD LAMP BEAM

- Adjust the head lamp beam as per the specification by referring procedure given in chapter "Periodic maintenance" page no. 2-38 for the adjustment procedures.

SWITCH ASSEMBLY STOP LAMP - REAR

- The switch assembly stop lamp rear can be adjusted by turning the adjuster nut (A) in or out, so that the brake lamp glows when the rear brake is applied. (Fig. 5.88)

Note :
While adjusting the switch assembly, do not turn the body switch assembly (B) holding the adjuster nut (A).

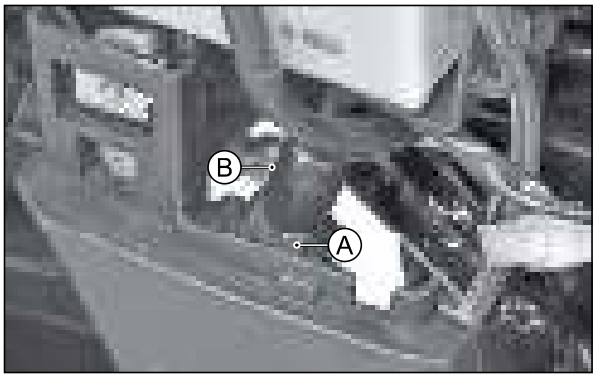


Fig. 5.88

BATTERY

- Remove the cover frame RH (refer chapter "Periodic maintenance" page no. 2-3)

- Disconnect the battery's negative terminal (A) first and then positive terminal (B). (Fig. 5.89)

10 mm spanner	
Tightening torque	3 ± 1 Nm

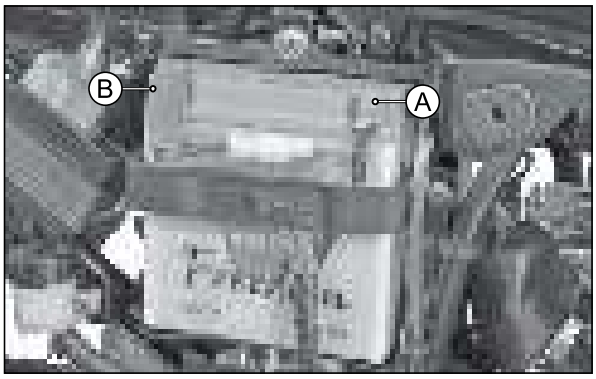


Fig. 5.89

- Remove the clamp by removal of the CRR pan head screw (M6x16 - 1 No.) (A) and take out the battery assembly. (Fig. 5.90)

Phillips head screw driver	
Tightening torque	3 ± 1 Nm

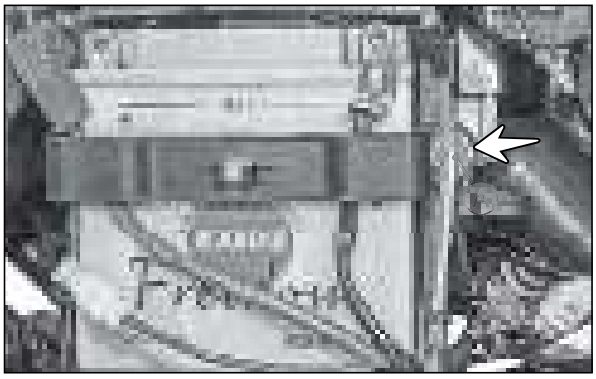


Fig. 5.90

- Remove the battery from the vehicle and clean it thoroughly.

- Visually inspect the surface of the battery assembly for any sign of cracking or electrolyte leakage. If any sign of cracking or electrolyte leakage from side walls of the battery is noticed, replace the battery with a new one.

- Measure the open circuit voltage of battery using pocket tester. (Fig. 5.91)

Open circuit voltage	12.9 Volts

- If the voltage measured is less than 12 volts, then charge the battery using constant current battery charger as explained below:
- If the battery lead terminals are rusty or covered with an acidic white powdery substance, then clean them with sand paper / warm water.
- The electrolyte level must be between the minium level and maximum level mark provided on the battery case. (Fig. 5.92)
- Add distilled water as necessary, to ensure the electrolyte is above the minimum level line but not above the maximum level line. (Fig. 5.92)

Caution:
Add only distilled water for topping up the electrolyte level.

- Check the electrolyte specific gravity reading using the hydrometer. (Fig. 5.93) If the reading is not within the specified limit, it indicates that the battery needs charging.

Hydrometer

Electrolyte specific gravity at 20°C

Battery type	Normal	Under charged
12V, 9.0 Ah	1.28	1.25

Note:
To read the specific gravity on the hydrometer, bring the electrolyte in the hydrometer to eye level (Fig. 5.94) and read the graduations on the float scale bordering on the lower meniscus.

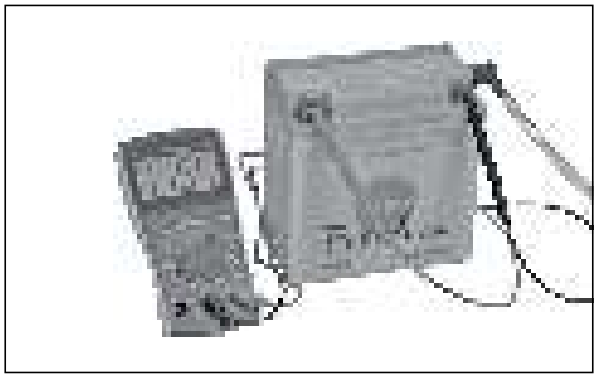


Fig. 5.91

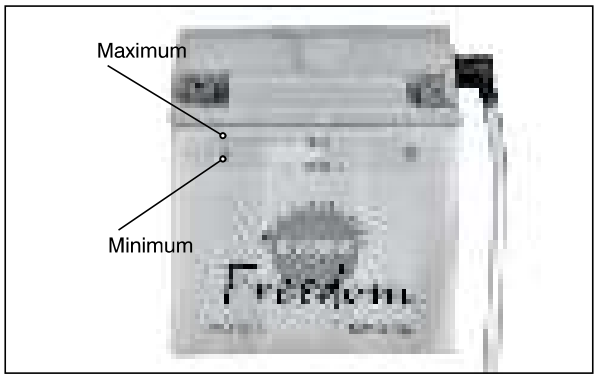


Fig. 5.92

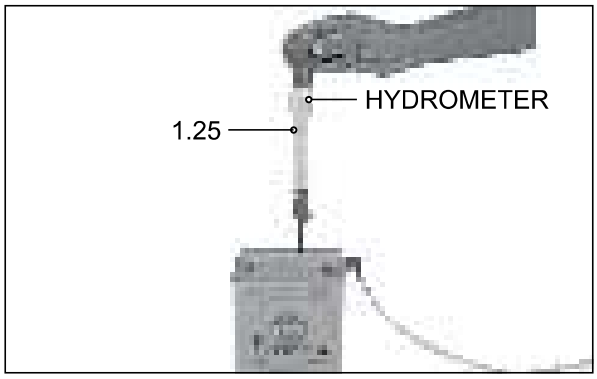


Fig. 5.93

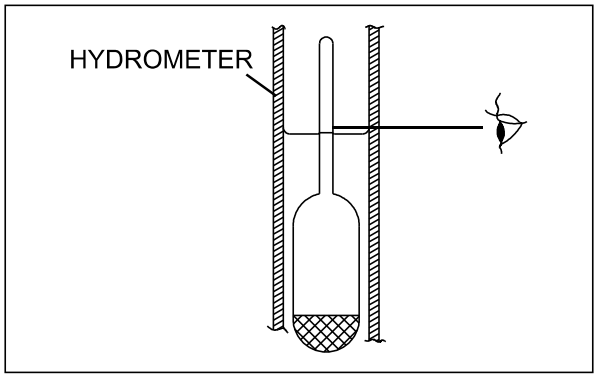


Fig. 5.94

BATTERY CHARGING

- Constant current battery charger having the current output of 0.9 amps must be used for charging the 12V, 9 AH battery.

Caution:
Use only constant current battery charger. Do not use constant voltage battery charger.

- If the battery charger has multiple battery charging facility (0.25A/0.5A/0.9A), then select the output current according to the battery connected for charging at each bay.

Charging procedure

- Remove the filler cover strip of battery and connect the positive lead of the battery charger (red colour) to the positive terminal (+) of the battery and the negative lead of the charger (black colour) to the negative terminal (-) of the battery as shown in the figure. (Fig. 5.95)

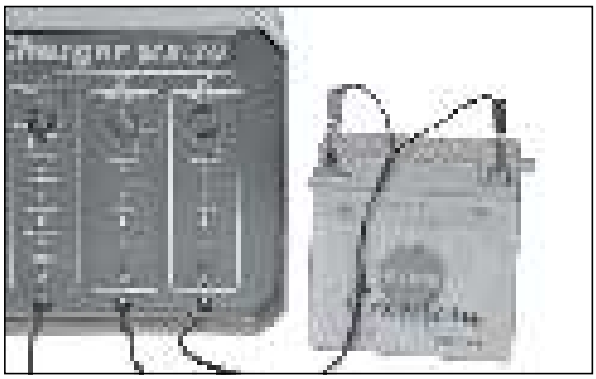


Fig. 5.95

Caution:
Care should be taken not to connect the battery charger in reverse order ie. positive lead to negative terminal and vice versa.

Incase, if the battery is connected in the reverse order, the reverse polarity indicator of the charger (if available in the charger) glows and the protection fuse (if available in the charger) blows.

Correct the connection and replace the fuse before charging. Otherwise the battery may not get charged.

- Turn the selector knob (A) of the charger to the 0.9 amps position incase of multiple battery charger. (Fig. 5.96)

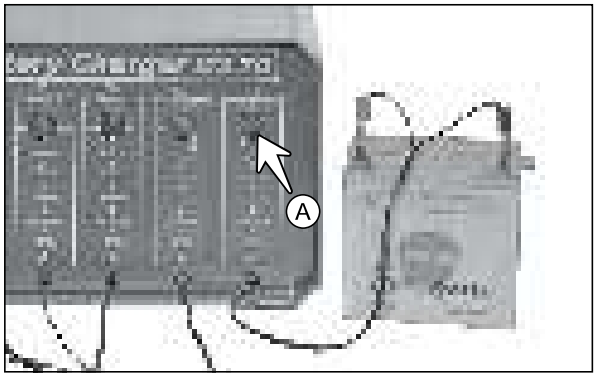


Fig. 5.96

Caution:
Ensure to select the charging current based the battery amphere only. If more or less current is selected the battery may get damaged.

- Connect the battery charger to the power supply and switch on the power.

- Switch on the 'MAINS ON-OFF' switch (A) and ensure that the 'MAINS-ON' LED indicator (B) is glowing. (Fig. 5.97) If this indicator is not glowing, then check the main fuse of the charger and replace the fuse if required.

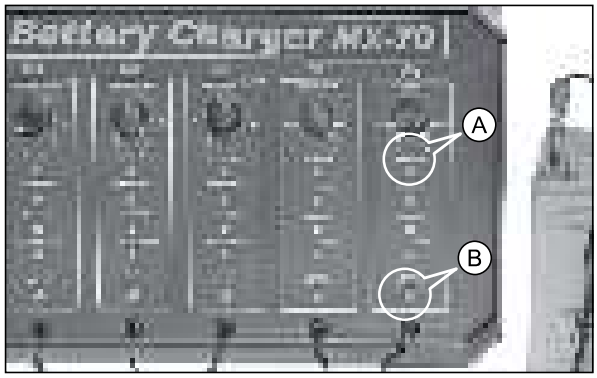


Fig. 5.97

- Now, the 'CHARGING' LED indicator (A) glows and indicates the battery is getting charged. If this indicator is not glowing, check whether 'LO-BATTERY' LED indicator (B) is glowing. (Fig. 5.98)
- If the 'LO-BATTERY' LED indicator is glowing, it indicates that the battery voltage is very less and it can't be charged further. Replace the battery with a new one.

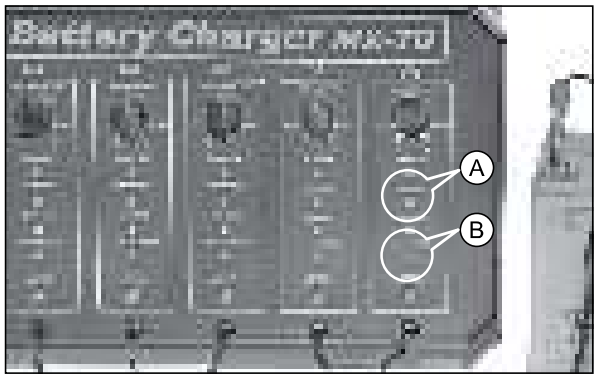


Fig. 5.98

- After charging the battery for few hours (time may vary based on the battery voltage and capacity) 'CHARGED' LED indicator (A) of charger glows and indicates that the battery is charged. (Fig. 5.99)

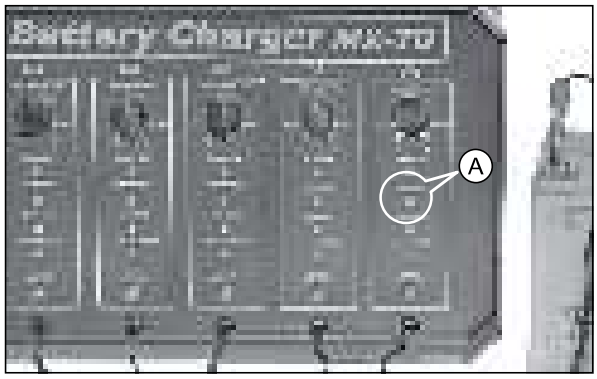


Fig. 5.99

Indication of full charge

- The following are the indication of full charge.
- Battery can be considered to be fully charged when three consecutive specific gravity (SG) readings taken at intervals of 30 minutes each, indicating a reading of 1.28. (Fig. 5.100)
- Free gassing of electrolyte.

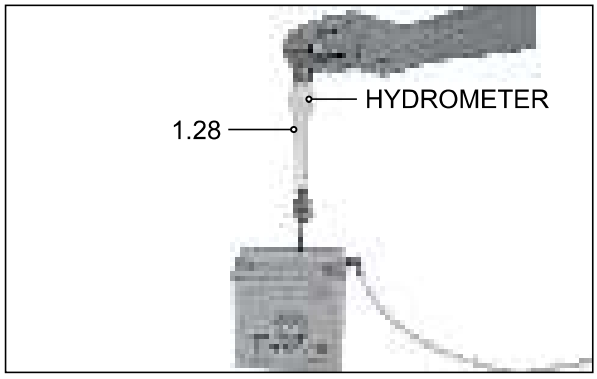


Fig. 5.100

- The stable consecutive readings showing 12.8 Volt or more with 30 minutes of interval. (Fig. 5.101)

Note:
If the battery voltage is less than 11 volt, irrespective of correct specific gravity reading, then the battery needs to be replaced with a new one.

- After charging re-fix the battery assembly and connect the positive terminal first followed by the negative terminal.
- Apply petroleum jelly to the terminals to avoid corrosion.
- Reassemble the parts in the reverse order of removal.

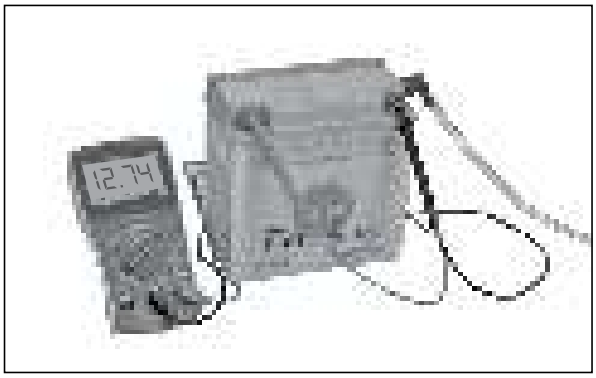


Fig. 5.101

Chapter 6

WHEEL ASSEMBLY - FRONT

REMOVAL

- Support the motorcycle by center stand and place a jack or block to keep the front wheel off the ground.
- Remove the front wheel axle nut along with punched washer. (Fig. 6.1)

17 mm spanner

Tightening torque	76 ± 18 Nm

- Draw out the axle front along with punched washer. (Fig. 6.2)
- Take out the wheel assembly front along with disc plate and spacer complete LH.

Note:
While taking out the front wheel keep some cushion in between the brake pads, to avoid binding.

Disc Replacement

- Remove the special screw (M8 - 6 Nos.) from the disc plate mounting and take out disc plate from the alloy wheel front. (Fig. 6.3)

6 mm allen key

Tightening torque	31 ± 3 Nm

Note:
While reassembling the mounting bolts apply thread locker without fail.

Removal of Bearings

Warning:
Bearings should be removed only in case of replacement.

- Heat the wheel assembly front upto 125° C by placing the wheel on a hot plate. (Fig. 6.4)

Hot plate

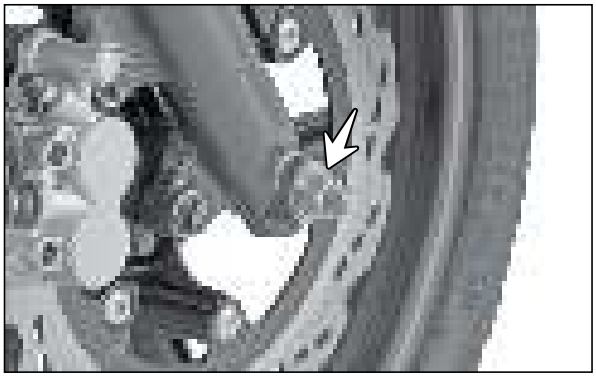


Fig. 6.1

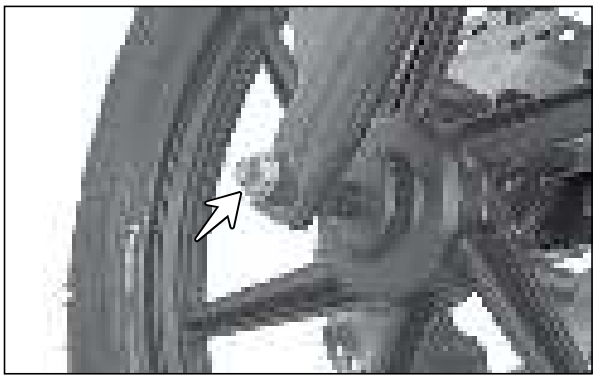


Fig. 6.2

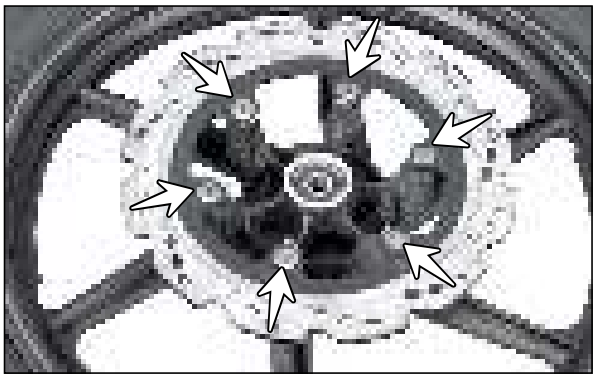


Fig. 6.3

Fig. 6.4

- Gently tap out bearing left and right and spacer complete front hub with a suitable mandrel. (Fig. 6.5)

Nylon hammer
Drift

Fig. 6.5

INSPECTION

Before inspection, clean all necessary components with suitable cleaning solvent and lubricate them.

Wheel Bearings

- Inspect the wheel bearings inner race for play by hand while fixing it in the hub complete front wheel. (Fig. 6.6)

- Rotate the inner race by hand to inspect whether abnormal noise occurs or rotating smoothly. Replace bearing if found defective.

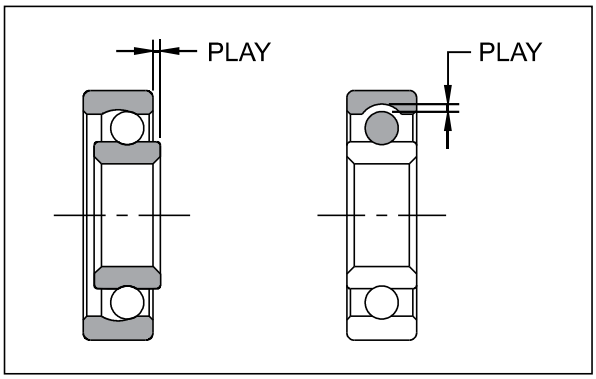


Fig. 6.6

Axle Front

- Using the special tools, check the axle front for run out (straightness) and replace the axle with a new one if run out exceeds the limit. (Fig. 6.7)

Dial gauge (0.01mm)	
Magnetic stand	
V-block-4"x3"x3"	
Service limit	0.25/100 mm

Warning:
Do not attempt to straighten a bent axle.

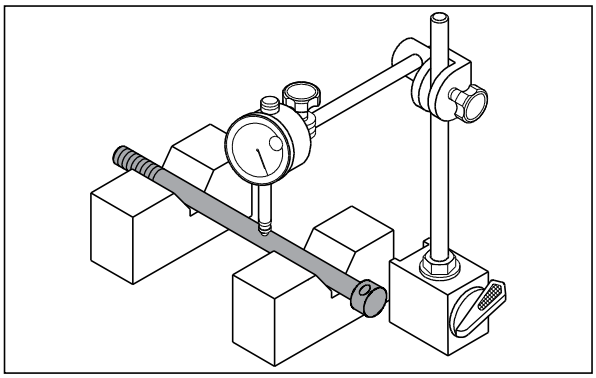


Fig. 6.7

Alloy Wheel Front

- Using the special tools, measure the run-out of alloy wheel front. Excessive run-out is usually due to a bent alloy wheel. (Fig. 6.8)

Dial gauge (0.01mm)	
Magnetic stand	
Service limit	1 mm

- Replace the alloy wheel if found defective.

Fig. 6.8

Tyre Front

- Using the vehicle with excessively worn-out tyres will decrease riding stability and consequently invite a dangerous situation due to loss of control. It is highly recommended to replace the tyre with a new one when the groove depth of tyre from tread surface reaches the following specifications: (Fig. 6.9)

Tyre depth gauge / Vernier caliper	
Service limit	1 mm

Note:
Tyre depth can also be checked by tyre wear indicator (TWI). (Fig. 6.10)

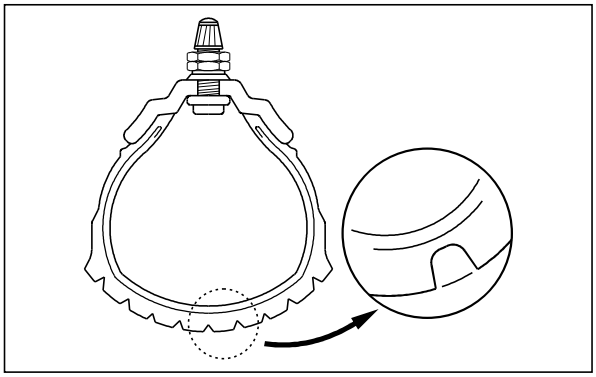


Fig. 6.9

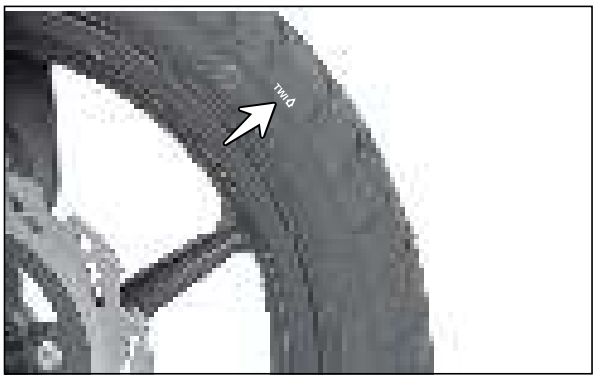


Fig. 6.10

Tyre Inflation Pressure

- Inflation pressure affects the tyre life to a greater extent. So it is necessary to maintain proper inflation pressure. (Fig. 6.11)

Tyre pressure gauge

Pressure:

Single and dual	1.75 kg/cm² (25 PSI)

Note:
Tyre pressure should be checked only when the tyre is cold.

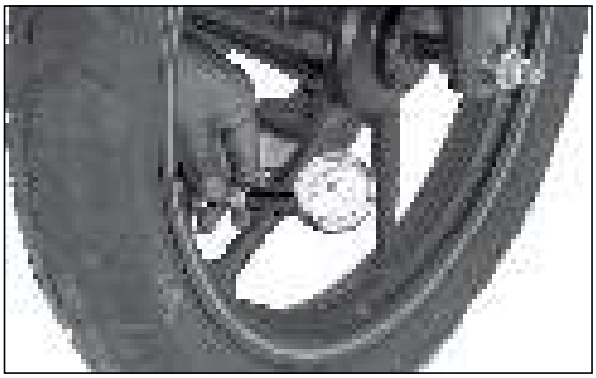


Fig. 6.11

Tubeless Tyre

- Refer page no 6-36 & 6-37 for puncture repairing procedure and replacement of valve tubeless tyre.

REASSEMBLY

- Reassemble the wheel assembly front in the reverse order of disassembly and removal. Before assembling front wheel assembly, lubricate the axle front and bearings.

- Before tightening axle nut, stroke the fork assembly front several times to check for proper fork action. Tighten the axle nut only after ensuring the fork action.

Note:
While remounting front wheel assembly locate the disc in between the brake pads after removing cushion.

Wheel balancing to be done whenever the tyre is removed and reassembled from the wheel rim (alloy wheel).

- Refer the exploded view for details. (Fig. 6.12)

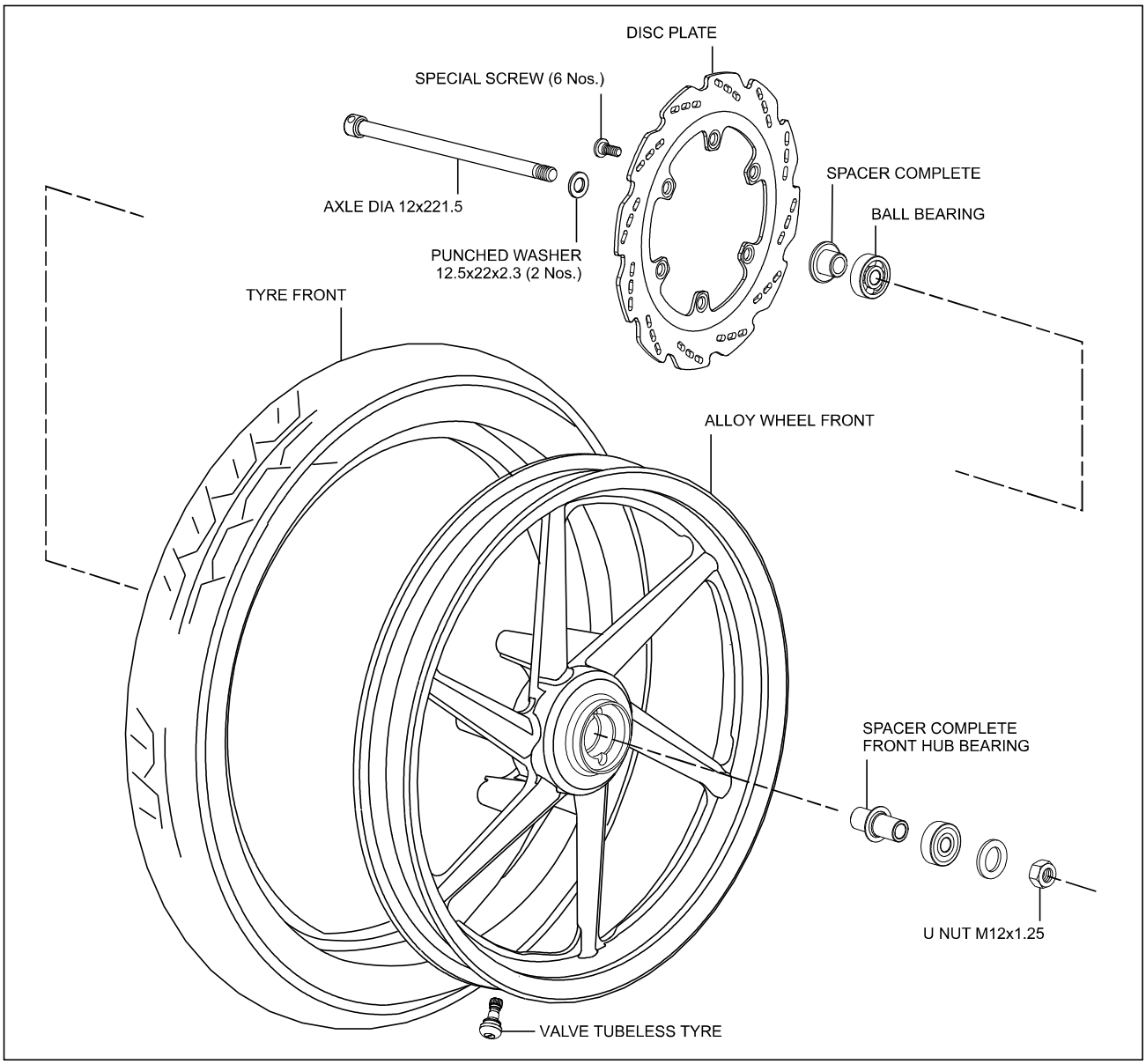


Fig. 6.12

DISC BRAKE SYSTEM - FRONT

BRAKE PADS

- Take out lever RH (front brake lever) by removing the mounting bolt and flange nut. (Fig. 6.13)

10 mm spanner	
Tightening torque	11 ± 0.5 Nm

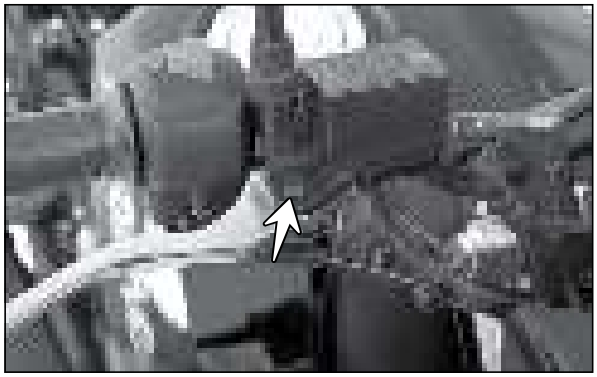


Fig. 6.13

- Remove the caliper assembly mounting bolts (M8x27 - 2 Nos.) and take off the caliper assembly. (Fig. 6.14)

12 mm spanner	
Tightening torque	23 ± 5 Nm

Note:
Wash off the mud and dust around the front wheel assembly and caliper assembly before dismantling them.

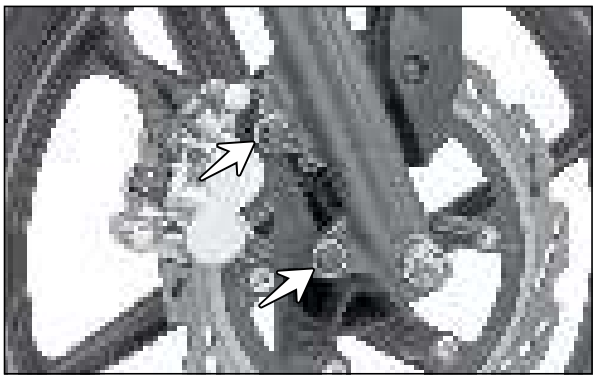


Fig. 6.14

- Remove the plug pin (2 Nos.) from the caliper body. (Fig. 6.15)

Flat head screw driver	
Tightening torque	2.5 ± 0.5 Nm

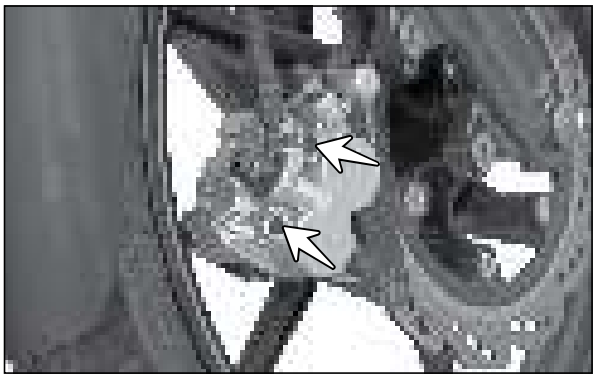


Fig. 6.15

- Remove pin hanger (2 Nos.). (Fig. 6.16)

5 mm allen key	
Tightening torque	17.5 ± 2.5 Nm

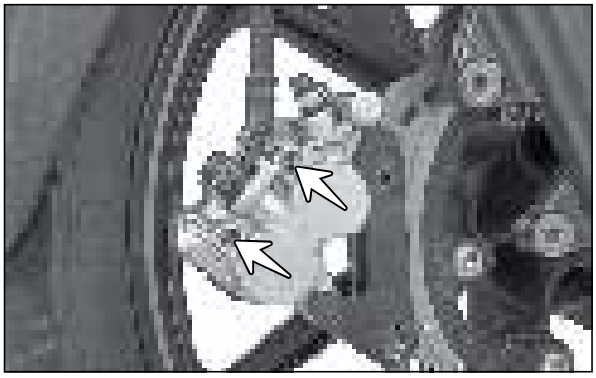


Fig. 6.16

- Pull out the pad complete inner and pad complete outer by hand. (Fig. 6.17)

Fig. 6.17

Inspection of Brake Pads

- Observe the wear limit line marked on the pad and check the wear condition of brake pads. (Fig. 6.18) When the wear exceeds the limit line, replace the pads with new ones.

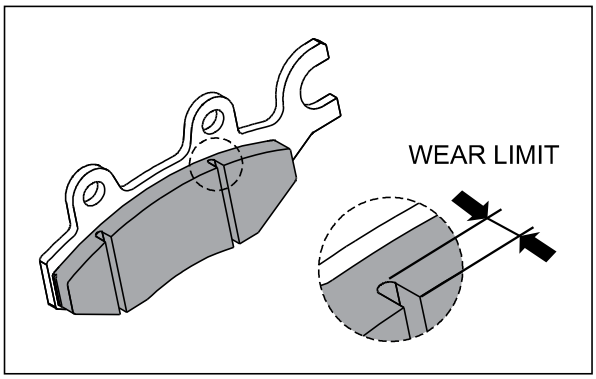


Fig. 6.18

BRAKE FLUID AND ITS HANDLING

Inspecting Brake Fluid Level

- Before inspecting the brake fluid level, place your motorcycle firmly on the centre stand with the handlebar kept straight.

- Inspect the brake fluid level in the reservoir, If the oil level is found to be lower than the 'Lower level' mark provided on the reservoir, replenish the reservoir with the brake fluid graded below. (Fig. 6.19)

TVS Grilling DOT 3 or DOT 4

Caution:
Since the brake system of this motorcycle has glycol based brake fluid, do not use or mix different types of brake fluid such as silicon based and petroleum-based fluid for refilling the system, otherwise damage sustained will be serious.

Do not use any brake fluid taken from old or used or unsealed containers.

Do not squeeze the brake lever while the reservoir cap is removed. Otherwise brake fluid will sometimes spout out.

Fig. 6.19

Caution:
Do not place the removed reservoir cap on the speedometer or on any other painted surfaces. Brake fluid will damage the instrument cluster lenses and painted parts.

Ensure no water enters the brake fluid container. Because brake fluid has hygroscopic property, and its boiling point falls excessively if water is mixed with it.

Check the brake hose for cracks and hose joints for leakage. If found any, replace the hose.

Air Bleeding From the Brake System

- If the front brake lever travel becomes more or if any soft or spongy feel is observed in the lever, you must carry out the air bleeding from the brake system. Follow the procedure given below for bleeding the air:

Note:
It is best, if two persons perform air bleeding. Keep the fluid level in the reservoir just above the 'Lower level' mark during the bleeding procedure.

1. Dislocate the bleeder cap and attach a bleeder tube to the bleeder screw as shown in figure (Fig. 6.20). A transparent tube is useful in finding air bubble expelled from the system. The tube must be submerged in a clean container partially filled with brake fluid.

2. Fill the reservoir with the brake fluid. Fix back the reservoir cap to prevent spout of brake fluid and entry of dust.

3. Allow the pressure in the hydraulic system by stroking the brake lever rapidly several times and then hold the lever tight.

4. Unscrew (open) the bleeder by half a turn and depress the lever all the way down. Do not release the lever until the bleeder valve is screwed in (tighten) again. (Fig. 6.21)

10 mm spanner

5. Repeat steps 3 and 4 until air bubbles disappear from the bleeder tube or container. Tighten the bleeder securely.

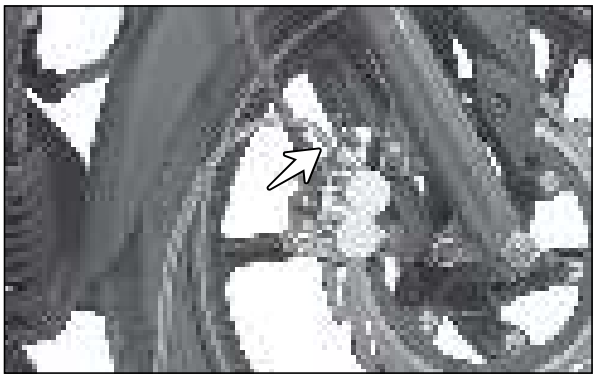


Fig. 6.20

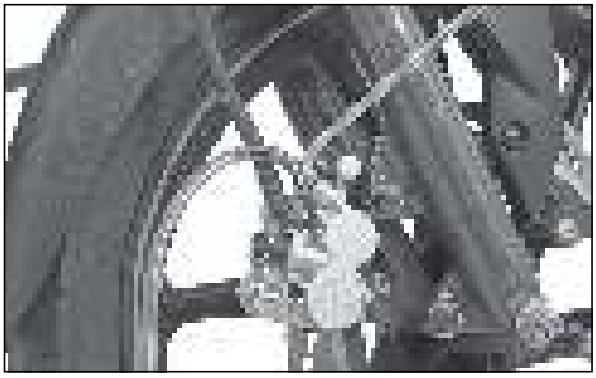


Fig. 6.21

6. Remove the bleeder tube and install the cap bleeder.

7. After completing the bleeding operation, check the fluid level in the reservoir and replenish if necessary.

Caution:
Do not reuse the brake fluid drained from the system.

Brake Fluid Replacement

- Boiling point of brake fluid falls considerably with absorption of moisture which may take place during a long period of use. Therefore, it is recommended to replace old brake fluid with new one periodically.

Replace brake fluid every 21000 km

- On changing brake fluid, extreme attention should be paid so as not to mix any foreign materials because they would block the return port of the master cylinder resulting in the brake dragging or squeaking.

Perform the following procedure to change the brake fluid:

1. Attach a bleeder tube to the bleeder. Drain out the old brake fluid by squeezing the brake lever with bleeder opened until the brake fluid disappears in the bleeder tube.

2. After old brake fluid is drained out from the system completely, carry out the same procedure as described in 'air bleeding' from the brake system.

HOSE COMPLETE BRAKE (BRAKE HOSE) - FRONT

- Inspect the hose complete brake for any crack or leakage. If leakages found, replace the hose as below:

- Flush the brake fluid out by opening the bleeder at caliper assembly with a tube on the bleeder head to a clean container (refer brake bleeding).

- Remove the banjo bolt (2 Nos.) along with gaskets (2 Nos. on each side) from both the ends of the hose complete brake. (Fig. 6.22)

12 mm spanner	
Tightening torque	30 ± 2 Nm

Note:
Ensure the reassembly of new gaskets while reconnecting the hose without fail to avoid leakage.

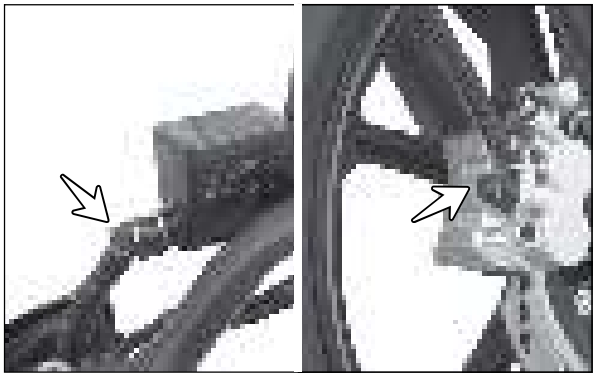


Fig. 6.22

- Dislocate the hose complete brake from the clamp hose under bracket (Fig. 6.23A) and clamp brake hose. (Fig. 6.23B)

- Dislocate and take out the brake hose from the vehicle.

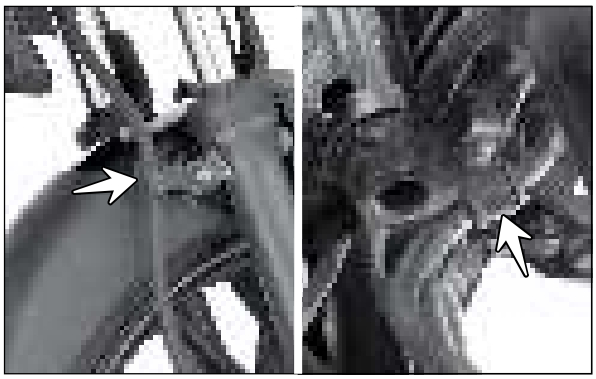


Fig. 6.23A Fig. 6.23B

Caution:
Immediately and completely wipe off any brake fluid contacting any part of the motorcycle. The fluid reacts chemically with paint, plastics, rubber materials etc., and will damage them severely.

- Reassemble the new brake hose in the reverse order of dismantling.

- Assemble and tighten the banjo bolts at both the ends of the hose along with gaskets.

Caution:
Assemble only new gaskets with the banjo bolts during reassembly. Do not use old ones.

- Bleed the air from the brake circuit after reassembly of brake hose (refer air bleeding procedure on page no. 6-7).

Replace brake hose every 3 year

CALIPER ASSEMBLY - REMOVAL AND DISASSEMBLY

- Remove the banjo bolt along with gaskets and take off the hose from the caliper assembly. (Fig. 6.24)

12 mm spanner	
Tightening torque	30 ± 2 Nm

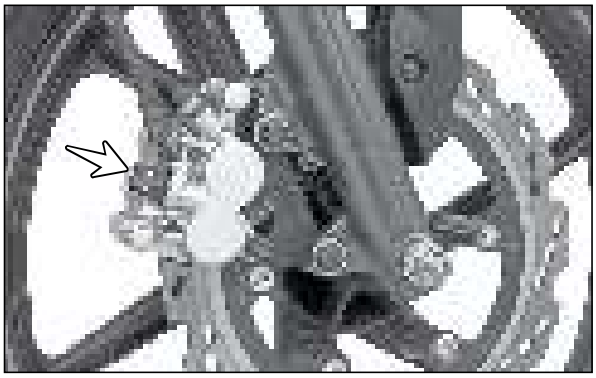


Fig. 6.24

- Remove caliper assembly mounting bolts and brake pads as explained in page no. 6-5.
- Remove the spring pad from the caliper housing. (Fig. 6.25)

Nose plier

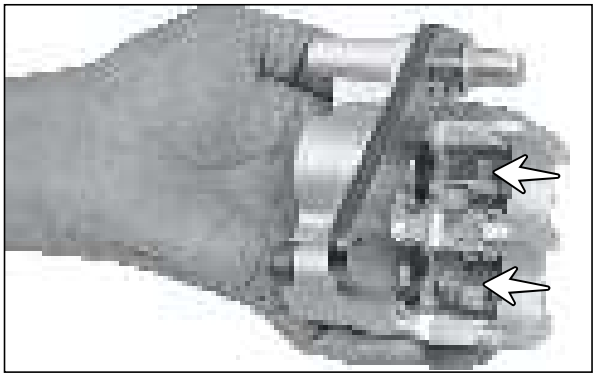


Fig. 6.25

- Dislocate the boot-B and bush boot pin from the pin grooves and slide out the bracket complete front. (Fig. 6.26)

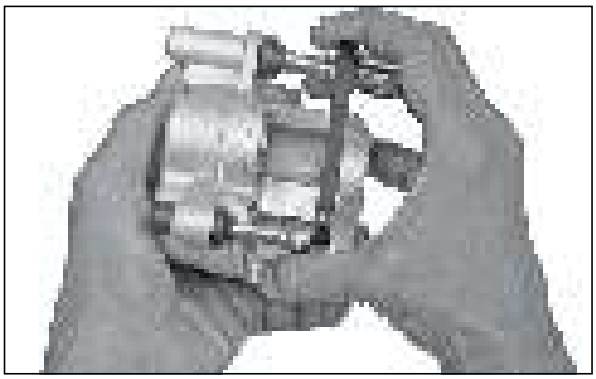


Fig. 6.26

- Carefully pull out the boots from the caliper assembly housing. (Fig. 6.27)

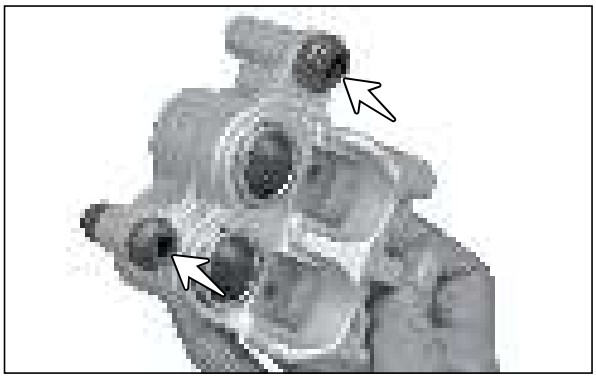


Fig. 6.27

- Insert a spacer in between the piston caliper and the caliper body (at pad position) and then apply compressed air through inlet port of the caliper to slide both the pistons out. (Fig. 6.28)

Caution:
Be careful while applying compressed air as it pushes the pistons forcefully. Do not use high pressure air which may damage to pistons.

Note:
Do not try to pull out single piston as the compressed air cannot push the second piston.

Do not use nose plier to pull out the pistons as it damages the piston.

Fig. 6.28

- Remove the dust seals 1 and 2 with a bent plastic / brass tool to avoid scratches in the caliper bore. (Fig. 6.29)

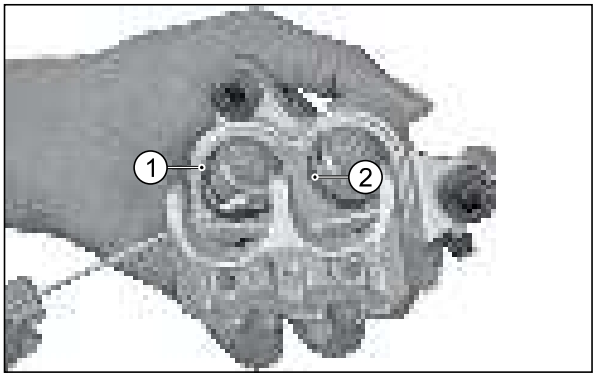


Fig. 6.29

- Remove the bleeder screw. (Fig. 6.30)

10 mm spanner	
Tightening torque	5.5 ± 1.5 Nm

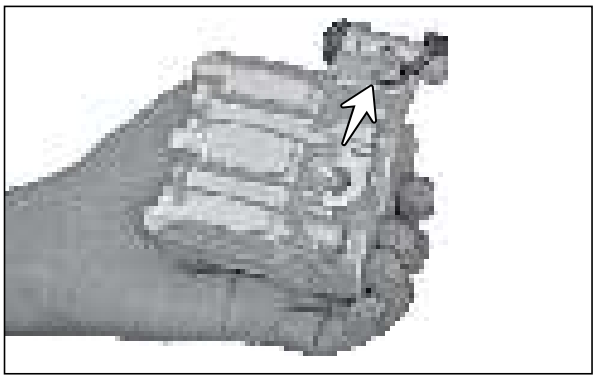


Fig. 6.30

- Clean parts thoroughly with the fresh brake fluid.

Caution:
Never use kerosene, petrol or other solvents for cleaning the brake system. Otherwise rubber parts will be damaged. Do not wash the pads and also take care that brake fluid is not splashed on pads.

Caliper Assembly Inspection

Inspect the following parts:

- Pin hangers for any bend.
- Bracket complete front for loose lugs.
- Piston and caliper bore for any scratches.
- Piston and dust seals for any damage.

- Replace the defective parts after necessary inspection.

Caliper Assembly - Reassembly

- Insert the dust seal - 1 and dust seal - 2 into the caliper body seal grooves and ensure perfect seating without any twist (refer exploded view on page no. 6-16 for assembly details).

- Smear the piston with fresh TVS Girling DOT 3 or DOT 4 brake fluid and slowly insert into the bore of caliper body without tapering. Ensure the piston is sliding easily into the bore.

- Assemble the spring pad in the caliper body and fix back the boot-B and bush boot pin.
- Apply little grease on the pin bolts and assemble the bracket complete front into the caliper body while ensuring the proper seating of both the boots in the pin bolt grooves.
- Assemble the pad inner and pad outer. Locate the pin hangers properly into the holes of pad inner and pad outer and assemble it. Fix back plug pins and bleeder screw.
- Remount the caliper assembly into the fork leg and reconnect the brake hose along with gaskets. Bleed the system thoroughly.

DISC PLATE - SERVICING

Inspection (with Disc Mounted on Wheels)

- Face out of the disc plate should not be more than the limit specified below. Measure the disc plate face out on the largest periphery of the disc plate with a dial indicator. (Fig. 6.31)
- If the face out exceeds the limits, check whether the cause lies in the front wheel bearing or the disc plate itself. Replace defective parts.

Magnetic stand

Dial gauge (0.01)

Standard	0.2 mm
Service limit	0.3 mm

Note:
Wipe out the disc plate surface with a dry soft cloth before inspection.

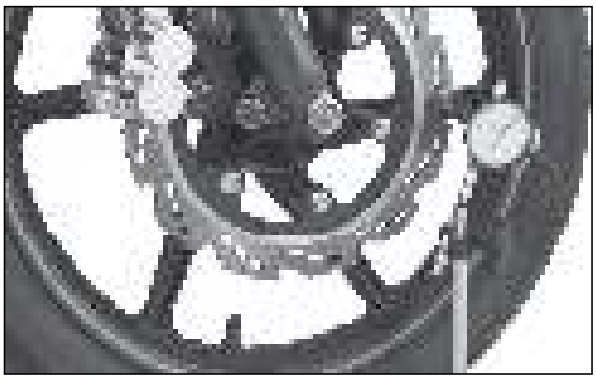


Fig. 6.31

- Measure the thickness of disc plate at the worn-out portion as shown. (Fig. 6.32)
- If the thickness measured is less than the limits, replace the disc plate (refer page no. 6-1 for disc plate removal procedure).

Micrometer

Standard	Front - 4 mm & Rear - 4.5 mm
Service limit	Front - 3.5 mm & Rear - 4 mm

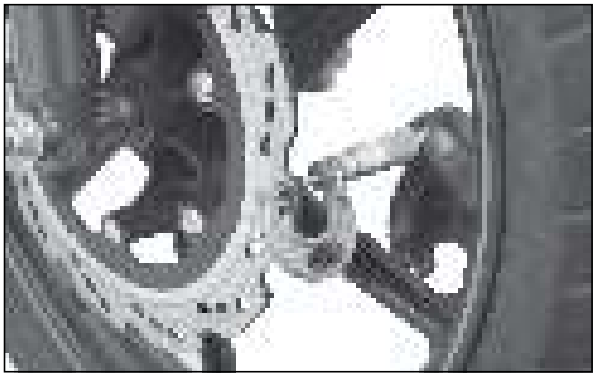


Fig. 6.32

MASTER CYLINDER - REMOVAL AND DISASSEMBLY

- Dislocate the dust cap (A) and loosen the lock nut of rear view mirror. Now, remove the rear view mirror gently. (Fig. 6.33)

14 mm spanner	
Tightening torque	28.5 ± 6.5 Nm

Caution:
While reassembling the mirror care should be taken not to damage the mounting threads of the master cylinder.

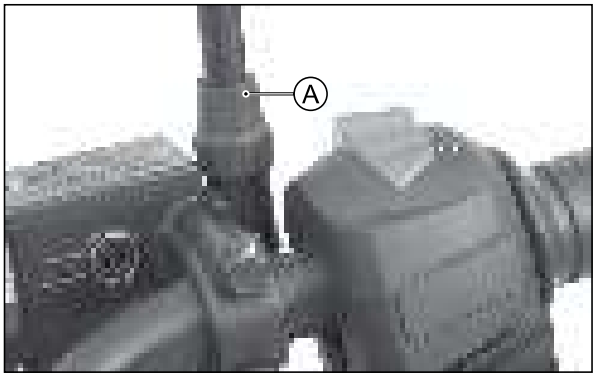


Fig. 6.33

- Bleed out the brake system completely as explained earlier.

- Remove the banjo bolt and brake hose from the master cylinder assembly along with the gaskets (2 Nos.). (Fig. 6.34)

12 mm spanner	
Tightening torque	30 ± 2 Nm

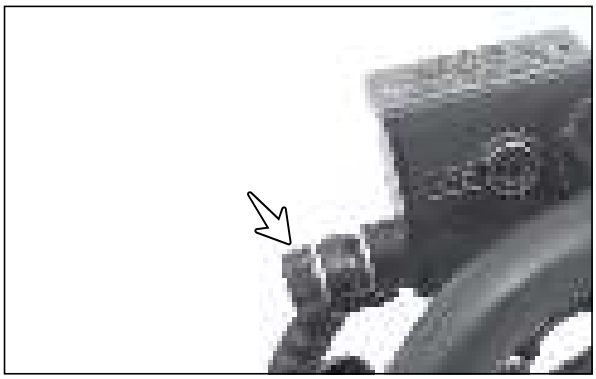


Fig. 6.34

- Disconnect the wiring harness of the stop lamp switch from the switch terminal. (Fig. 6.35)

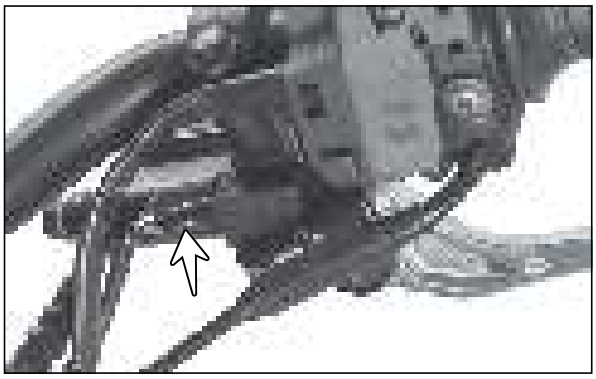


Fig. 6.35

- Take out the lever RH (front brake lever) by removing the mounting bolt and flange nut. (Fig. 6.36)

10 mm spanner	
Tightening torque	11 ± 0.5 Nm

Fig. 6.36

- Remove the master cylinder fluid reservoir cap by unscrewing screws (2 Nos.). (Fig. 6.37)

Phillips head screw driver	
Tightening torque	1.5 ± 0.5 Nm

- Take out the plate diaphragm and diaphragm from the reservoir.

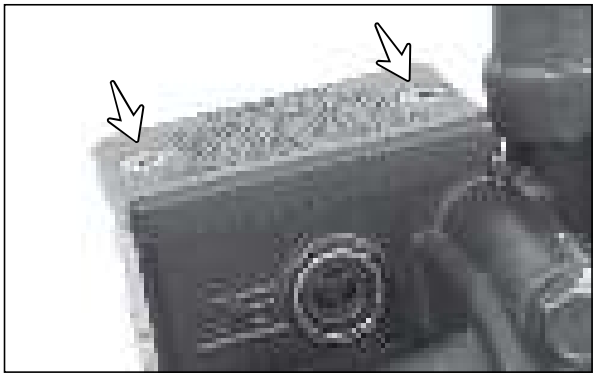


Fig. 6.37

- Take out the master cylinder by unscrewing the mounting bolts (2 Nos.) of holder master cylinder. (Fig. 6.38)

10 mm spanner	
Tightening torque	10 ± 2 Nm

Note:
Hold the master cylinder while removing the holder mounting bolts in-order to avoid falling.

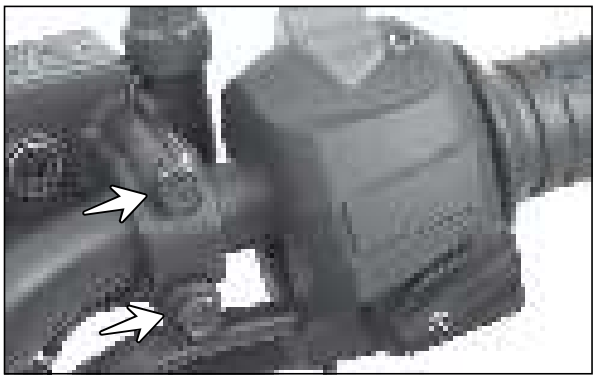


Fig. 6.38

- Remove the mounting screw of stop lamp switch and take out the stop lamp switch. (Fig. 6.39)

Phillips screw driver

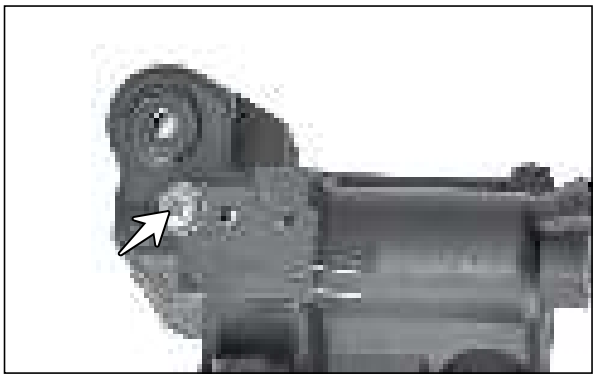


Fig. 6.39

- Remove the dust boot from the master cylinder using a blunt tool. (Fig. 6.40)

Note:
While removing boot, care must be taken not to damage it.

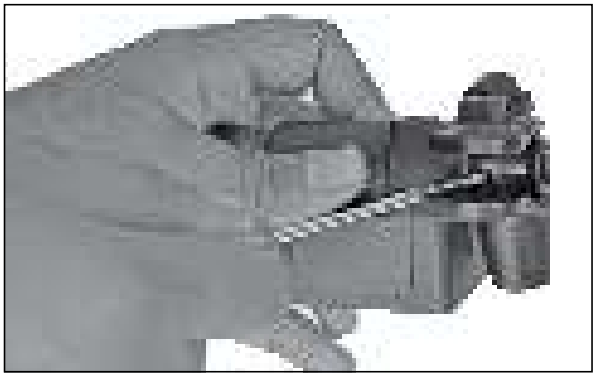


Fig. 6.40

- Holding the master cylinder by hand slightly press the piston with thumb finger and remove the circlip from the master cylinder using a circlip plier without damaging the piston and the cylinder. (Fig. 6.41)

Circlip plier

Note:
Ensure that the circlip is seated properly in its position after installation.

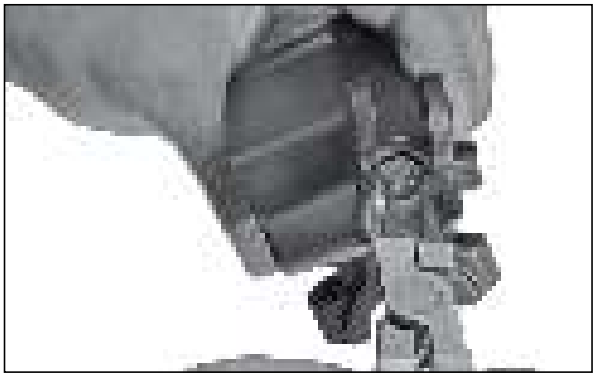


Fig. 6.41

- Slowly pull out the piston along with the P - cup, S - cup and spring. (Fig. 6.42) Clean the system thoroughly using fresh brake fluid.

Fig. 6.42

Caution:
Never use kerosene, petrol or other solvents for cleaning the brake system. Otherwise rubber parts will get damaged.

Do not wash the brake pads. Ensure that the brake fluid is not in contact with the pads surface.

Inspection of Master Cylinder

Inspect the following parts:

- Master cylinder for any scratches or any other damages.
- Piston and cup surface for scratches or other damages.
- Piston boot and other components for wear and damages.
- Master cylinder recuperation and feed port for any blockage, if so clear the block using compressed air.

- After the above inspection, if found any defect, replace the respective parts.

REASSEMBLY

- Reassemble the master cylinder in the reverse order of dismantling. Refer (Fig. 6.43) for assembly details.

Caution:
Apply the brake fluid to the cylinder bore and all internal parts before inserting piston assembly into the bore.

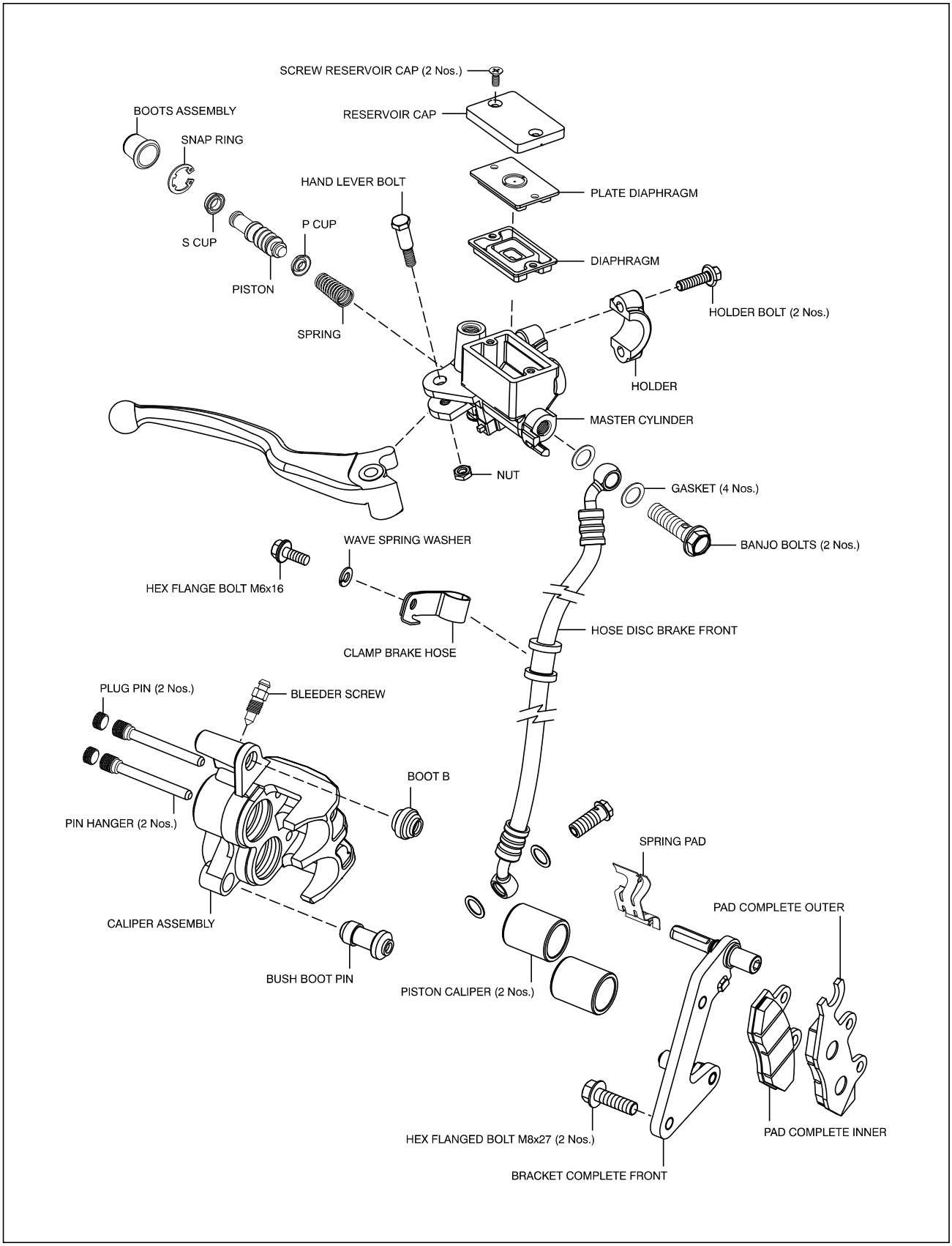

SCREW RESERVOIR CAP (2 Nos.)
RESERVOIR CAP
BOOTS ASSEMBLY
SNAP RING
HAND LEVER BOLT
PLATE DIAPHRAGM
S CUP
P CUP
DIAPHRAGM
PISTON
SPRING
HOLDER BOLT (2 Nos.)
HOLDER
MASTER CYLINDER
NUT
GASKET (4 Nos.)
BANJO BOLTS (2 Nos.)
WAVE SPRING WASHER
HEX FLANGE BOLT M6x16
CLAMP BRAKE HOSE
HOSE DISC BRAKE FRONT
PLUG PIN (2 Nos.)
BLEEDER SCREW
BOOT B
PIN HANGER (2 Nos.)
SPRING PAD
PAD COMPLETE OUTER
CALIPER ASSEMBLY
BUSH BOOT PIN
PISTON CALIPER (2 Nos.)
HEX FLANGED BOLT M8x27 (2 Nos.)
PAD COMPLETE INNER
BRACKET COMPLETE FRONT

Fig. 6.43

- Remount the master cylinder to the handle bar and fix the holder in 'UP' direction. (Fig. 6.44)

10 mm spanner

Tightening torque	10 ± 2 Nm

Note:
Always tighten the top bolt first and then the bottom one.

Mount master cylinder to the handle bar such that reservoir becomes horizontal when the bike is placed on centre stand and steering is kept straight.

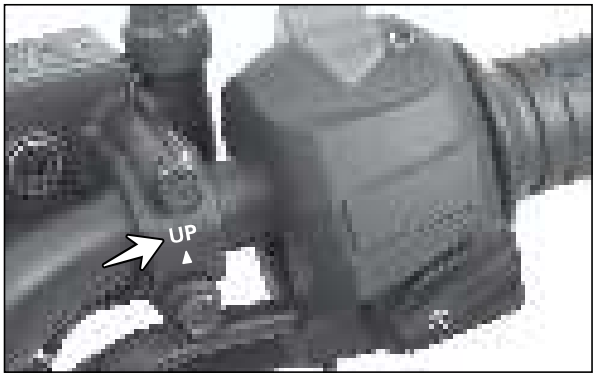


Fig. 6.44

Fig. 6.45

- Fix the brake hose to the master cylinder outlet port along with the banjo bolt and gaskets.
- Fill the reservoir with fresh TVS Girling DOT3 or DOT4 brake fluid above the level 'LOWER' mark on the reservoir and bleed the system thoroughly. (Fig. 6.45)
- Fix the reservoir cap along with diaphragm and plate diaphragm and tighten screws. Connect the wiring harness to the brake light switch.
- Replace the following parts every 21,000 km
  - Piston along with P-cup, S-cup, spring and boot.
  - Reservoir cap and diaphragm.
  - Caliper dust seal - 1 and dust seal - 2.

FORK ASSEMBLY FRONT

OIL CHANGE

- Dismantle the wheel assembly front (refer page no 6-1 for dismantling procedure).
- Remove caliper assembly along with hose complete brake. Keep some cushion in between the brake pads to avoid binding.
- Remove the CRR pan head screws (M6x16 - 2 Nos.) from the fender front L & R. (Fig. 6.46)

Phillips screw driver

Tightening torque	3 ± 1 Nm

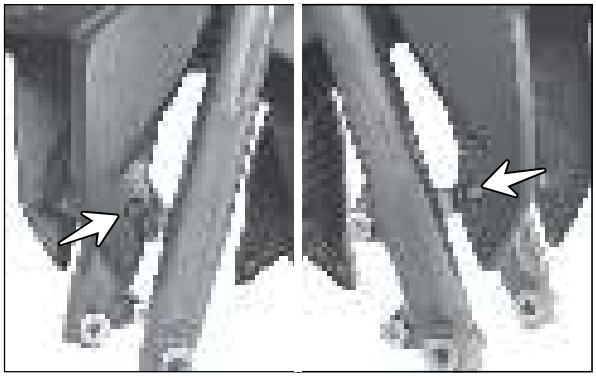


Fig. 6.46

- Remove hexagonal screws (M8x20 - 4 Nos.) along with wave spring washer (4 Nos.) from the fender front mounting. (Fig. 6.47)

13 mm spanner	
Tightening torque	18 ± 3 Nm

- Take out the brace front fender along with spacer front fender (4 Nos.).

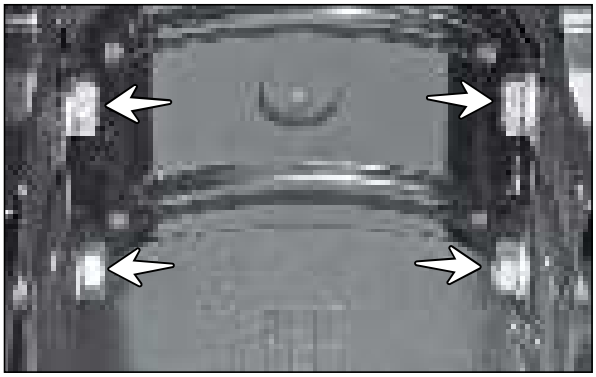


Fig. 6.47

- Loosen hexagonal socket head screws (A & B) (M8x45 - 2 Nos.) from the upper bracket complete mounting (fork upper mounting). (Fig. 6.48)

6 mm allen key	
Tightening torque	19 ± 2 Nm

Fig. 6.48

- Loosen the hexagonal screws (M10x40 - 2 Nos.) of lower bracket complete (fork lower mounting). (Fig. 6.49)

14 mm spanner	
Tightening torque	36 ± 4 Nm

Note:
Hold the fork leg assembly while loosening the bottom mounting bolts. Else it may fall.

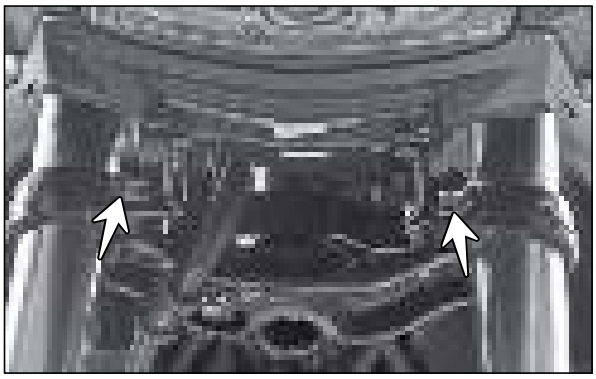


Fig. 6.49

- Slightly pull out the fork leg assembly RH from the under bracket till the top nut is accessible and tighten the lower bracket hexagonal bolt again. (Fig. 6.50)

Caution:
Ensure no damage on the inner tube. Do not over tight the lower mounting bolt, as it may damage the inner tube assembly of fork leg.

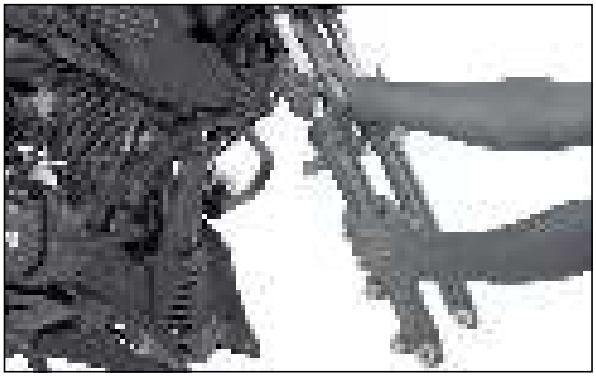


Fig. 6.50

- Using a 17 mm spanner, loosen the cap nut of front fork leg assembly to facilitate easy dismantling of fork leg. (Fig. 6.51)

17 mm spanner	
Tightening torque	23 ± 3 Nm

- Now, once again loosen the lower mounting screw and pull out the fork leg assembly RH.

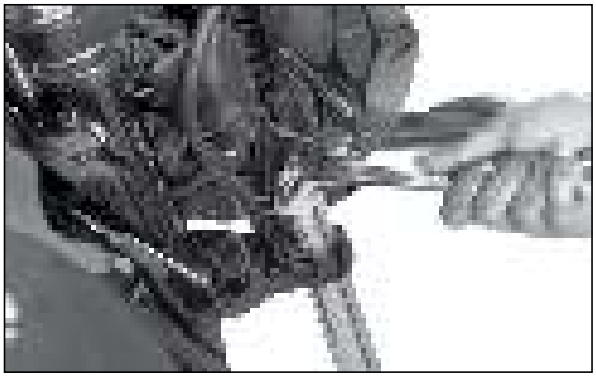


Fig. 6.51

- Remove the fork cap nut along with 'O' ring from the leg assembly front fork. (Fig. 6.52)

Caution:
Remove the cap nut with constant handgrip on nut. The nut is subject to spring load and may jump out incase of loose handling.

Fig. 6.52

- In similar manner, remove and dismantle the fork leg assembly LH.

- Take out the spring front fork. (Fig. 6.53)

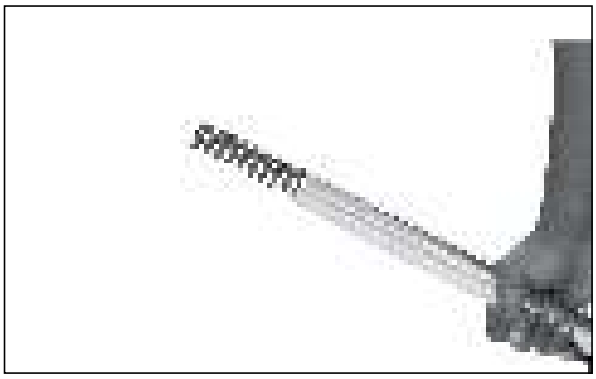


Fig. 6.53

- Turn the leg assembly front fork upside down. Holding the outer tube by hand, pump inner tube 'in' and 'out' to drain the oil completely. (Fig. 6.54A)

Note:
Hold the leg assembly front fork inverted for few minutes to drain the oil completely.

- Clean the leg assembly front fork with kerosene and drain the kerosene completely.

- Fill little more than the specified amount of fresh fork oil i.e more than 242 cc in fork leg assembly. (Fig. 6.54B)

Oil specification	TRU FORK oil

- Now, stroke the inner tube up and down 10 times to remove the air bubble.

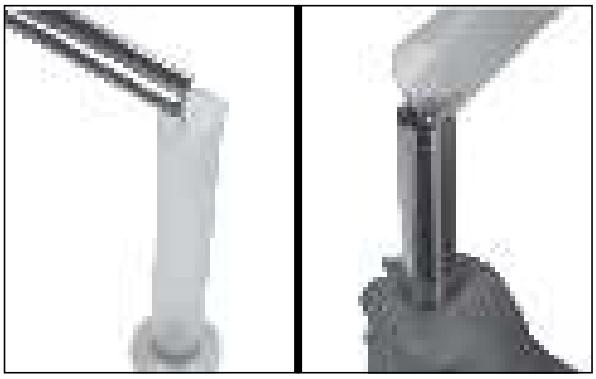


Fig. 6.54A Fig. 6.54B

- Adjust the special tool (oil level gauge) to the specified height. Hold the front fork vertically and take out the excess oil from the front fork using the special tool as shown. (Fig. 6.55)

Note :
When adjusting the oil level, compress the inner tube fully.

031 180 0	Fork oil level gauge

Oil level	130 mm

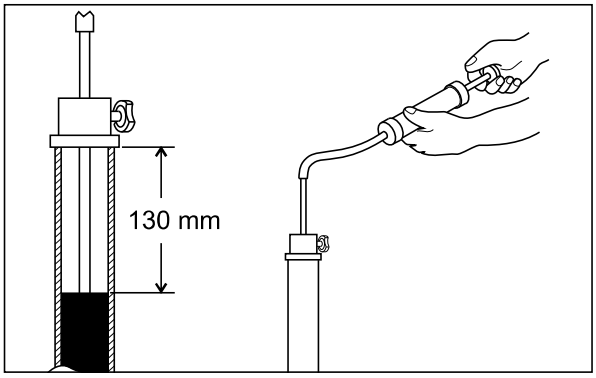


Fig. 6.55

Fig. 6.56

- Check spring front fork length (refer page no. 6-22 for checking procedure).
- Install spring front fork with its smaller pitch end facing upward. (Fig. 6.56)
- Assemble washer spring seat, spacer front fork and washer.
- Before installing cap nut front fork, lightly apply grease to the 'O' ring. Remount for leg assembly LH & RH.
- Tighten top mounting screws (fork upper mounting) to the specified torque (refer chapter "Service information page no. 8-10 for torque sheet).
- Tighten hexagonal bolts of lower bracket (fork bottom mounting) to the specified torque (refer chapter "Service information page no. 8-10 for torque sheet).
- Reassemble the front fender and front wheel assembly in the reverse order of removal.
- Re-fix the caliper assembly front fork and ensure the proper working of brake.

LEG ASSEMBLY FRONT FORK-DISASSEMBLY

- Remove both the LH and RH leg assembly front (refer page no. 6-17).
- Drain out the front fork oil as explained earlier.
- Remove cover front tube. (Fig. 6.57)

Caution:
Ensure no damage on cover front fork and inner tube working zone during removal.

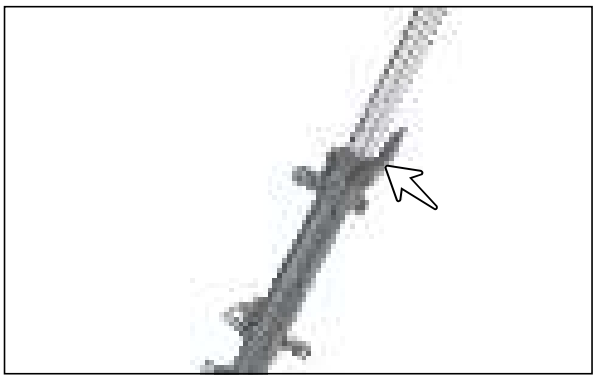


Fig. 6.57

- Remove the seal dust front fork (dust seal) from the outer tube while ensuring no damage to the dust seal, inner surface of outer tube and outer surface of inner tube. (Fig. 6.58A)

- Remove the snap ring from the outer tube while ensuring no damage to the inner surface of outer tube and outer surface of inner tube. (Fig. 6.58B)

Flat screw driver

Caution:
While reassembling, replace the dust seal if any damage is found.

- Using the special tool, hold the piston and remove the hexagonal allen screw connecting fork outer tube and inner tube. (Fig. 6.59)

M131 016 0	Tool front cylinder holder

6 mm allen key

Tightening torque	20 ± 5 Nm

Note:
Please remember to replace the gasket with a new one while reassembling.

- Hold the inner and outer tube using both the hands. Pull out the tube inner (inner tube) from the tube outer (outer tube) along with cylinder front fork (piston front fork), oil seal, DU bush and washer DU bush.

- Remove the spindle tapper from the bottom of the piston front fork. If it does not come out with piston, remove it from the fork outer tube. (Fig. 6.60)

- Remove the piston front fork and spring front fork from the inner tube assembly. (Fig. 6.61)

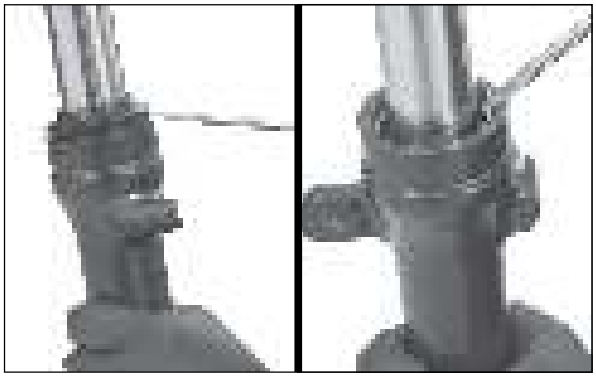


Fig. 6.58A Fig. 6.58B

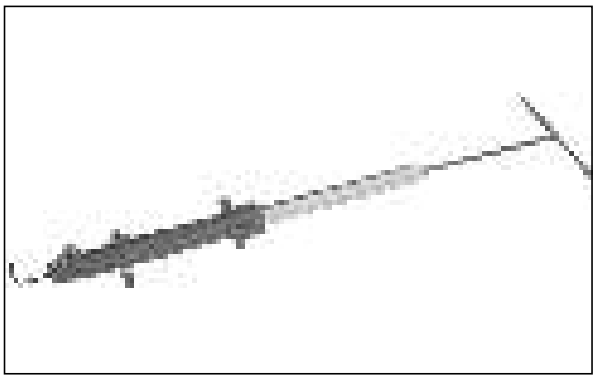


Fig. 6.59

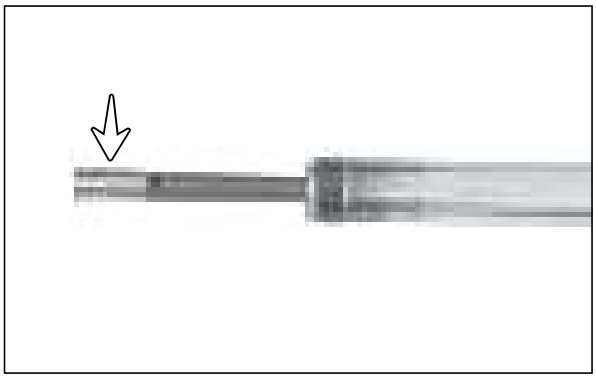


Fig. 6.60

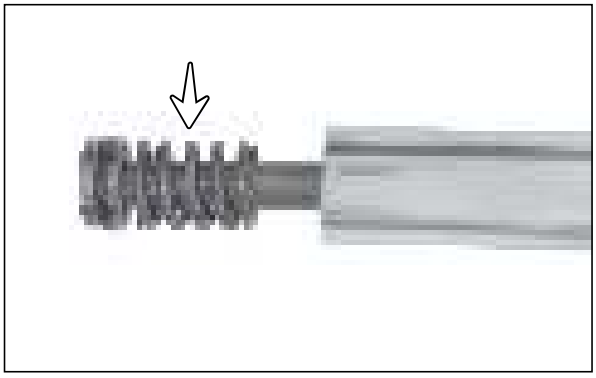


Fig. 6.61

INSPECTION

- Before inspection, clean all the components with a cleaning solvent (kerosene).
- Inspect the piston front fork and ring damper piston for wear and any damage. (Fig.6.62) Replace with new ones if any damage is noticed.
- Inspect the outer surface of inner tube and sliding surface (inner surface) of outer tube for any scuffing, scratches, dents, plating peel off etc. Replace the inner tube or outer tube if it has surface defects / flaws. If the inner tube has damage / dent on surface, replace the oil seal and inner tube together.
- Similarly, inspect the DU bush of outer tube for any damage or wear. Replace if found any.

Spring Front Fork

- Measure the free length (A) of the spring front fork. If the length is shorter than service limit or deformation of spring, replace it with a new one. (Fig. 6.63)

Service limit length (A)	502 mm

REASSEMBLY

Reassemble and remount the leg assemblies front fork in the reverse order of disassembly while carrying out the following steps.

- Refer leg assembly front fork exploded view (Fig. 6.64) for assembly details.
- Make sure all the components are clean. Lubricate the inner surface of the outer tube and outer surface of the inner tube.
- Insert the fork piston along with the rebound spring slowly, so that it slides down into the tube inner and protrudes from the bottom.
- Assemble the spindle tapper in the piston. Now insert the outer tube in the inner tube along with DU bush.
- **Fix a new copper washer** and apply thread lock to the allen screw of the piston before assembling it.

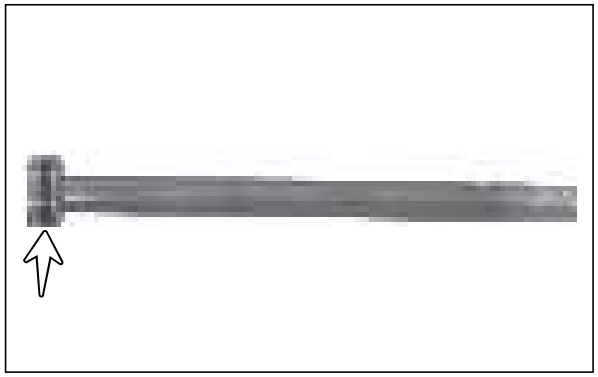


Fig. 6.62

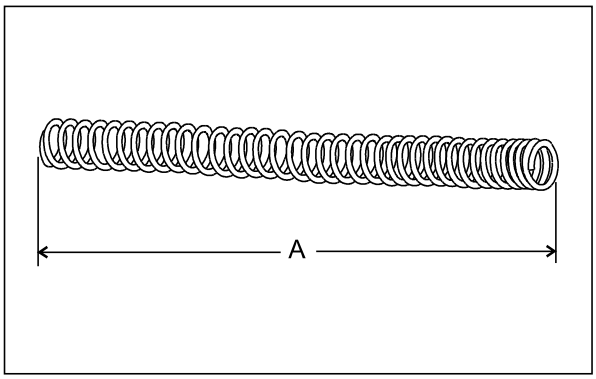


Fig. 6.63

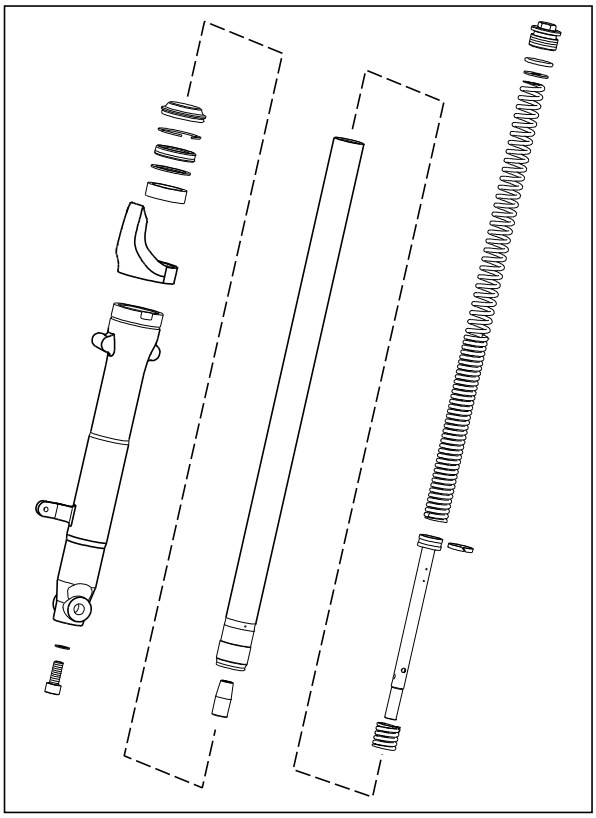


Fig. 6.64

- Assemble the washer DU bush and install the new oil seal using the special tool. (Fig. 6.65A)

N931 018 0	Tool fork oil seal

Note:
Before installing the oil seal, apply little grease (MOS_2) on the lip of oil seal.

- Assemble the snap ring.
- Reassemble the dust seal using special tool. (Fig. 6.65B)

N931 018 0	Tool fork oil seal

- Fill up the fork oil as per specification.

Note:
After filling up, slowly pump the leg assembly front fork up and down 10 times to remove air lock / gaps. Install the spring with its smaller pitch up-ward. Before installing the lock nut, apply grease to the 'O' ring.

- Remount the front fork assembly.

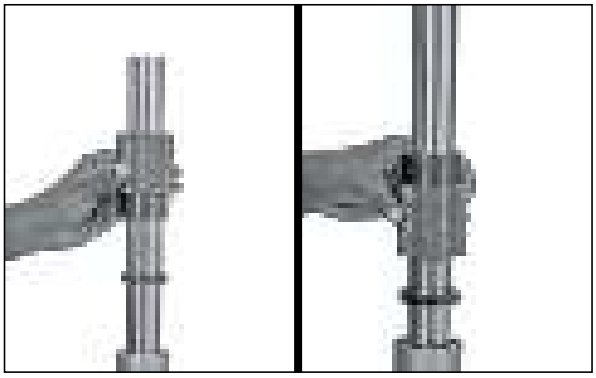


Fig. 6.65A Fig. 6.65B

LOWER BRACKET COMPLETE (STEERING STEM) - DISASSEMBLY

- Remove the CRR pan head screw (M5x16 - 2 Nos.) from the housing speedometer rear mounting and remove the housing speedometer rear. (Fig. 6.66)

Phillips head screw driver

Tightening torque	3 ± 1 Nm

- Disconnect wiring socket from the speedometer assembly.
- Remove the CRR pan head screw (M6x25 - 2 Nos.) housing head lamp front top mounting. (Fig. 6.67)

Phillips head screw driver

Tightening torque	3 ± 1 Nm

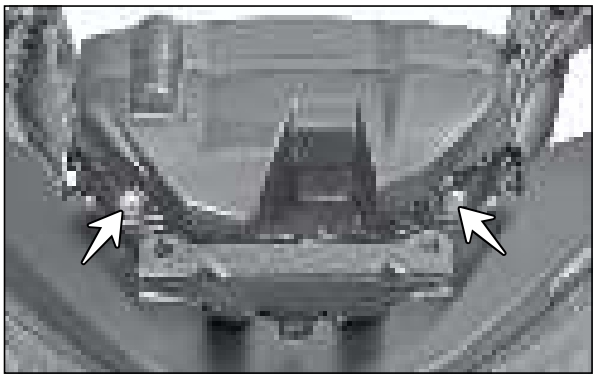


Fig. 6.66

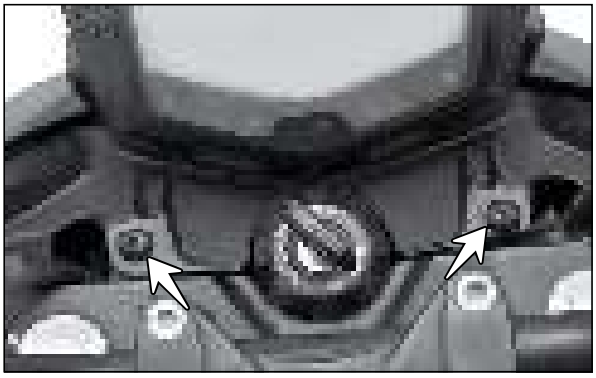


Fig. 6.67

- Remove the hexagonal flange bolt (M6x16 - 2 Nos.) from the bottom mounting of housing head lamp (both LH and RH) while holding the housing by one hand. (Fig. 6.68)

10 mm spanner	
Tightening torque	4.5 ± 1.5 Nm

- Take out the housing head lamp by gently disconnecting and dislocating the wiring sockets of main wiring harness.
- Remove both the leg assembly front fork (refer page no. 6-17).
- Take out cap lock nut (A) and remove lock nut steering along with the special washer. (Fig. 6.69)

32 mm spanner	
Tightening torque	80 ± 20 Nm

- Gently lift the handle bar assembly, support and hang it at the side of the fuel tank complete while taking care of painted surface of the tank.

Note:
Ensure that the control cables are not stretched too much or bent.

- Unlock the lock washer arrester steering using a blunt tool. (Fig. 6.70A)
- Remove the arrester steering stem top using a special tool. (Fig. 6.70B)

N931 014 0	Tool steering nut

- Take out the lock washer arrester steering. (Fig. 6.71A)
- Remove the arrester steering stem using the special tool while holding the lower bracket complete and draw out bracket. (Fig. 6.71B)

N931 014 0	Tool steering nut

Note:
Steering balls tend to fall during bracket removal, hence they should be collected carefully.

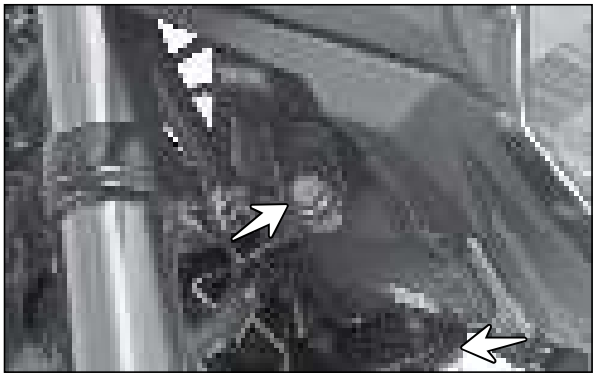


Fig. 6.68

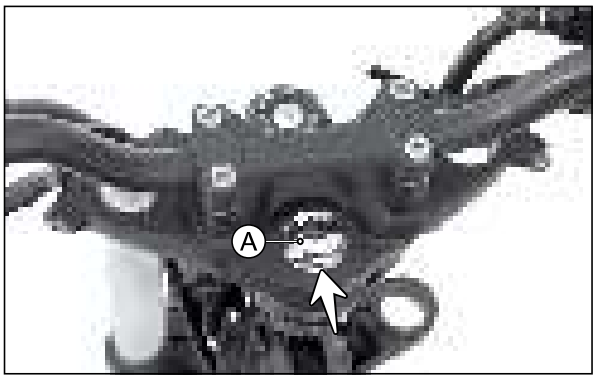


Fig. 6.69

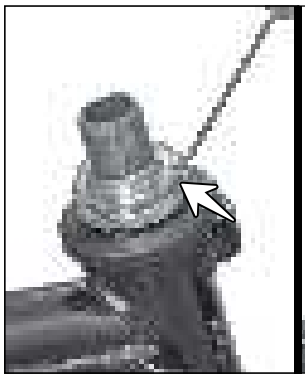


Fig. 6.70A

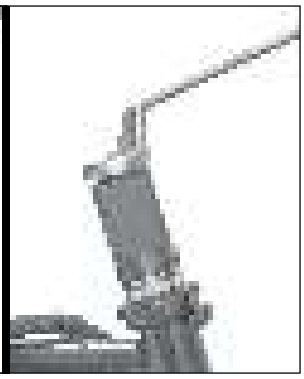


Fig. 6.70B

Fig. 6.71A

Fig. 6.71B

- Remove the dust seal steering upper. (Fig. 6.72A)
- Remove cone top. (Fig. 6.72B)
- Remove the upper and lower steering balls.

Position	Qty	Size
Upper	18 nos	6.35 mm
Lower	18 nos	6.35 mm

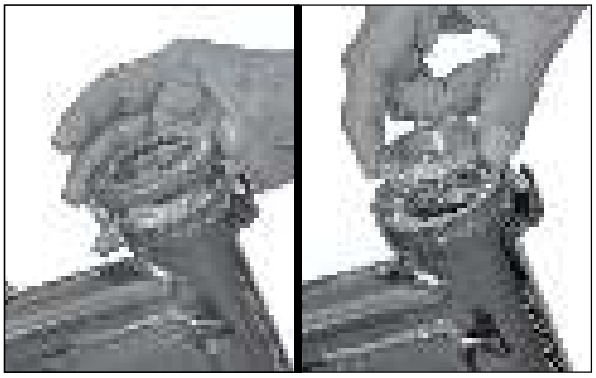


Fig. 6.72A Fig. 6.72B

- Assembly the special tool on the frame and slowly draw out the cup top from the steering pivot pipe (frame). (Fig. 6.73)

M931 016 0	Remover steering cup

Note:
While fixing the special tool, ensure that the tool is seated properly on the steering pivot tube and the lock plate of the tool is locked with the steering stopper properly.

Fig. 6.73

- In similar manner, remove the cup bottom from the frame.
- Remove the cone bottom and dust seal steering lower fitted on the lower bracket complete. (Fig. 6.74)

Chisel / metal hammer

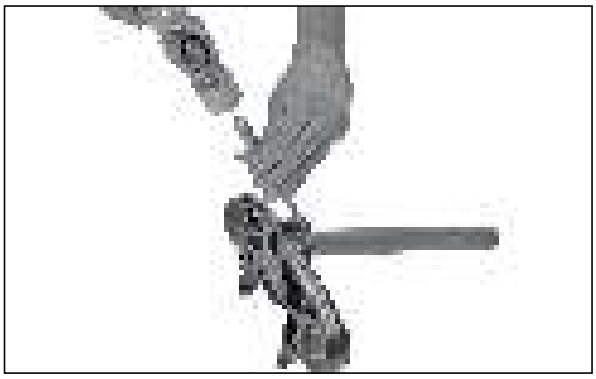


Fig. 6.74

INSPECTION

Before inspection clean all the components with kerosene. Inspect the removed parts for the following abnormalities and replace the defective with new ones.

- Handle bar distortion.
- Races and cones for wear, pitting, rusting and indentation. (Fig. 6.75)
- Worn or damaged steel balls / ball cage and rusting. (Fig. 6.75)

Note:
Always replace the cup, cone and races as a set only.

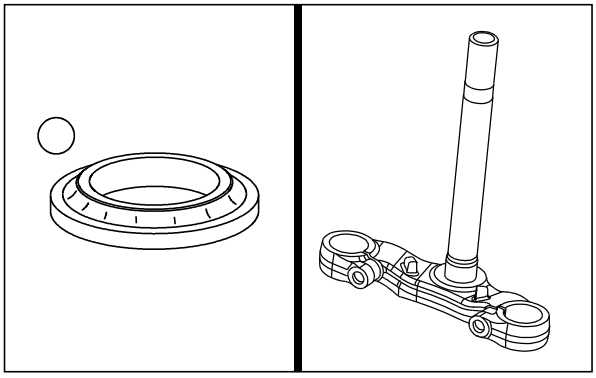


Fig. 6.75

REASSEMBLY

- Reassemble the lower bracket complete, leg assembly front fork LH & RH, handle bar assembly and wheel assembly front in the reverse order of disassembly while carrying out the following steps:

- Refer lower bracket complete exploded view (Fig. 6.76) for assembly details.

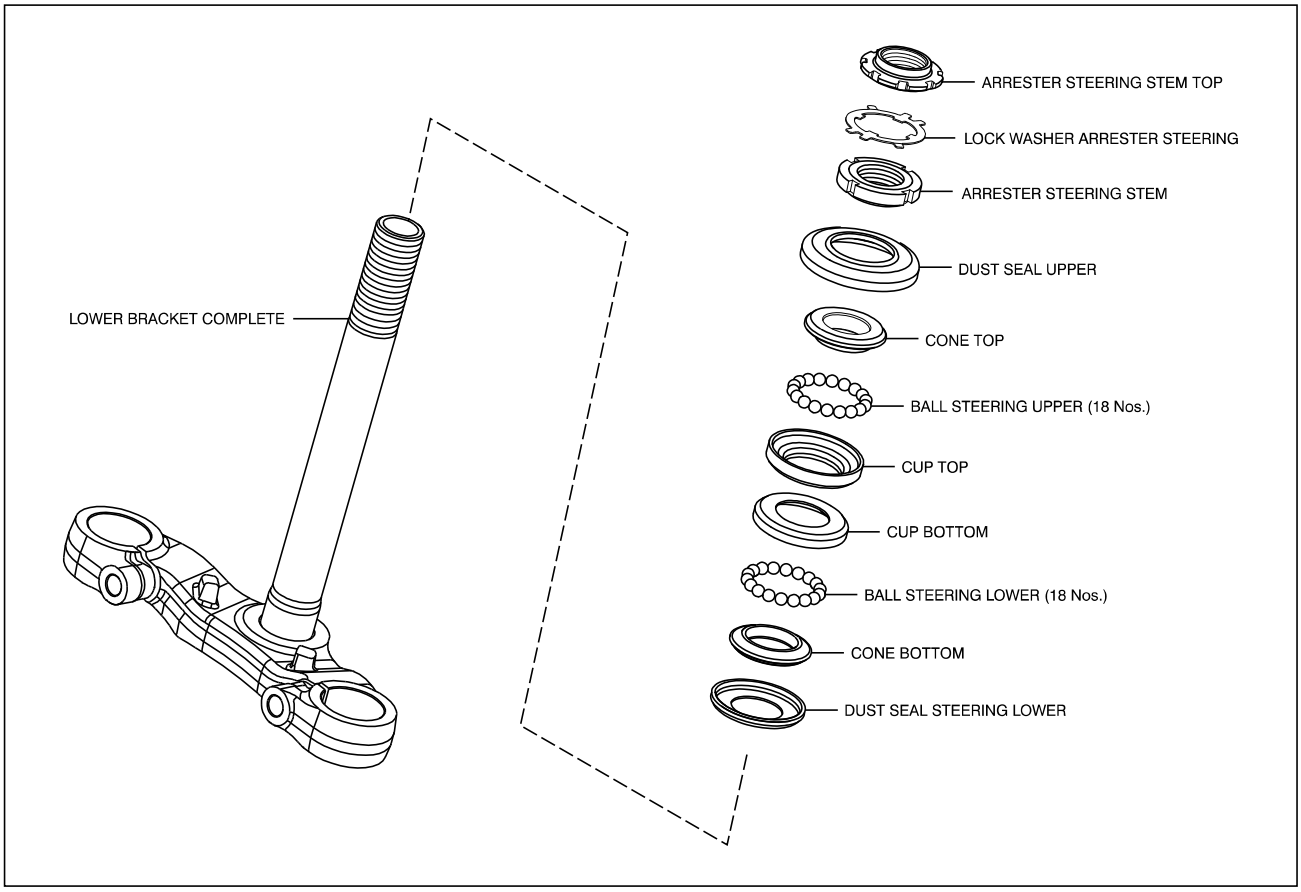


Fig. 6.76

Cup Bottom and Cup Top

- Assemble the cup bottom and cup top by using a special tool. (Fig. 6.77)

NB31 004 0	Assembly tool steering cups

Note:
Always replace the cup, cone and races as a set.

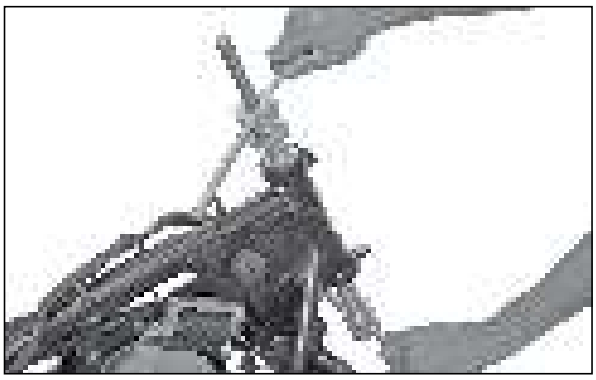


Fig. 6.77

Steering Balls

- Apply grease to the cup top and cup bottom. (Fig. 6.78)

Bechem premium grade 3

- Install specified quantity of steering balls at cup top and cup bottom (refer page no. 6-25 for the specified quantity).

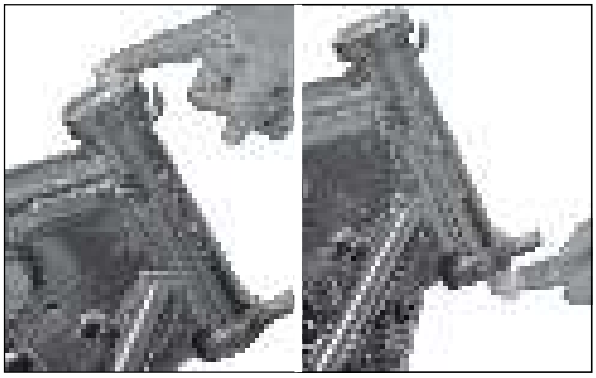


Fig. 6.78

Cone Bottom

- Install cone bottom to the lower bracket complete (steering stem) by using the special tool and apply grease. (Fig. 6.79)

N931 013 0	Tool cone bottom installer

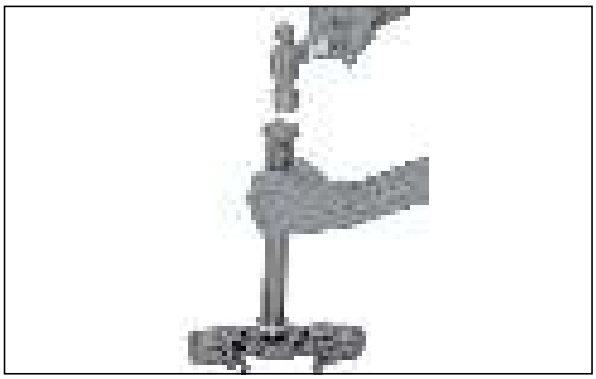


Fig. 6.79

- Reassemble the lower bracket complete along with cone top and dust seal upper in the reverse order of disassembly. Assemble and tighten the arrester steering stem to 30 ~ 40 Nm.

N931 014 0	Tool steering nut

- Loosen the arrester steering to 0 Nm (fully loosen) and re-tight it to 6 ~ 8 Nm.
- Turn the lower bracket complete to the right and left, five or six times for proper seating of steering ball (Fig. 6.80) and re-tight the arrester to 6 ~ 8 Nm torque again.
- Now, assemble the lock washer arrester steering and assemble the steering arrester top and tighten it till it touches lock washer.
- Now, loosen the steering arrester top and align the grooves till it matches with the next tab in the lock washer.
- Fold the lock washer tabs upside and match with the grooves in the arrester steering top.
- Assemble the upper bracket along with handle bar assembly. Finally tighten the locknut steering to the specified torque (60 ~ 100 Nm).

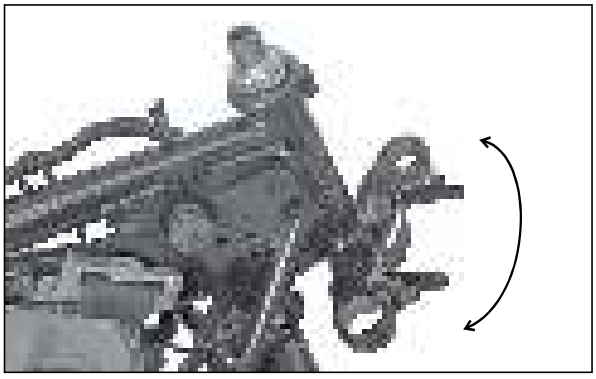


Fig. 6.80

Warning:
Bottom steering adjuster must be tightened with the handle bar assembly removed condition only.

Warning:
Do not use C-clamps for tightening the arrester steering because it leads to clearance between arrester system and upper bracket followed by steering shake / noise and durability complaint.

Steering should be adjusted correctly for smooth movement of handlebar and safe riding. Stiff steering prevents smooth movement of handlebar resulting in poor directional stability and too loose steering will cause vibration and damage to the steering races .

Note:
After adjustment, ensure the handlebar moves smoothly without any jerk or sticky. When slowly moved by hand it moves freely from center position to either left or right with its own weight.

WHEEL ASSEMBLY REAR - REMOVAL

Incase of Disc Brake Model

- Remove the chain (refer chapter "Periodic maintenance" page no. 2-33 for chain removal procedure).
- Loosen the chain adjusting screw from chain adjuster complete LH and RH. (Fig. 6.81)

12 mm spanner

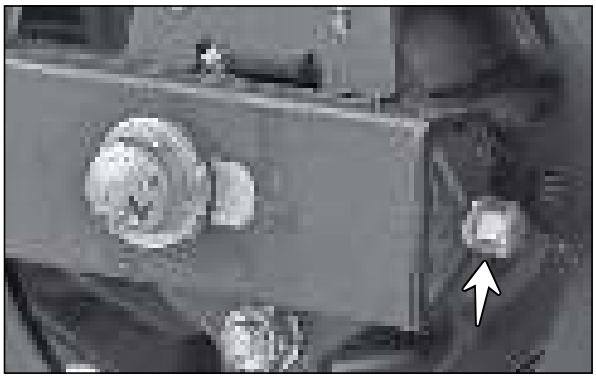


Fig. 6.81

- Remove 'U' nut (M14x1.50) from the axle complete rear along with washer. (Fig. 6.82A)

22 mm spanner

Tightening torque	78 ± 18 Nm

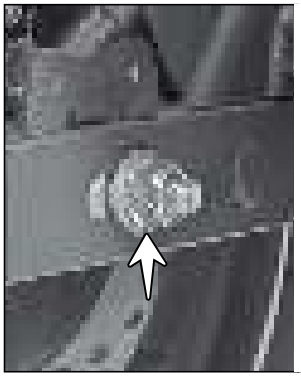


Fig. 6.82A

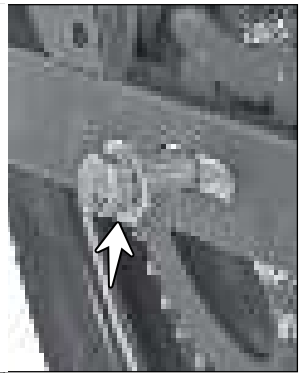


Fig. 6.82B

- Pull out the axle complete rear by gently tapping at other end. (Fig. 6.82B)
- Dislocate the caliper assembly from the slot provided on swing arm by pulling it towards rear side. Take out the wheel assembly rear.
- Remove the sprocket drum assembly from the wheel along with spacer rear axle LH.

DISC REPLACEMENT

- Remove spacer rear axle R (A). (Fig. 6.82)

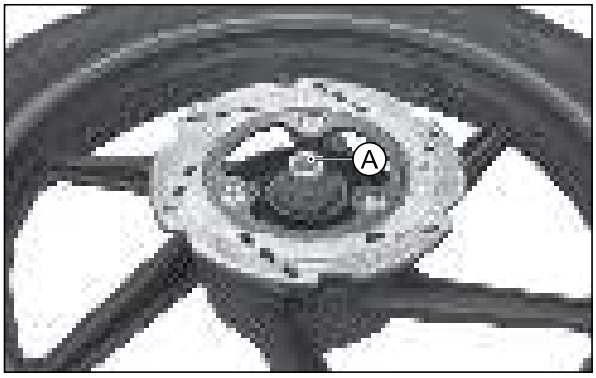


Fig. 6.82

- Remove the screw special (M8 - 3 Nos.) from the disc plate mounting and take out disc plate from the alloy wheel rear. (Fig. 6.83)

6 mm allen key	

Tightening torque	31 ± 3 Nm

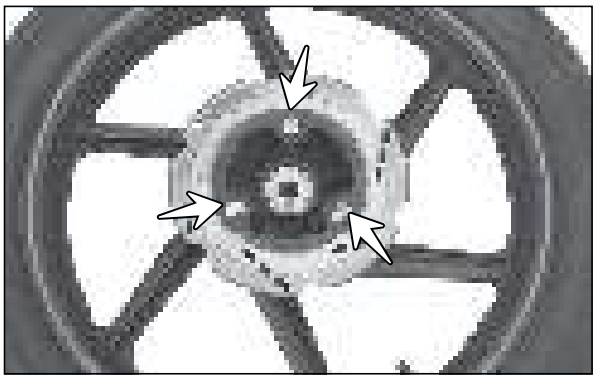


Fig. 6.83

Incase of Drum Brake Model

- Before removing the wheel assembly rear observe effectiveness of brake and wear of shoe complete brake.
- Remove the nut rear brake rod adjuster (A). (Fig. 6.84)

14 mm spanner

- Remove the spilt pin (B) from the torque link complete rear mounting. (Fig. 6.84)

Nose plier

- Remove the hexagonal nut (M8) (C) along with wave spring washer and take out the bolt torque. (Fig. 6.85)

14 mm spanner

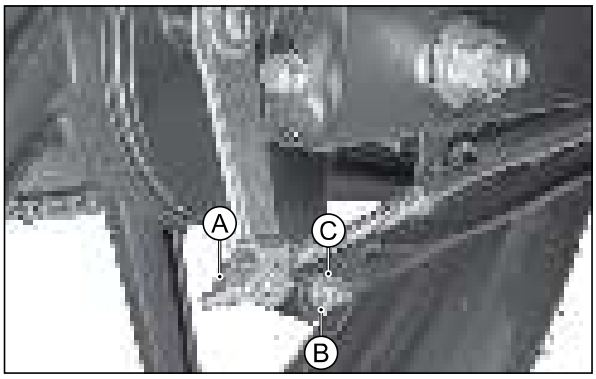


Fig. 6.85

- Disconnect the rod rear complete from the lever cam brake rear. Take out the pin rear brake connect, spring rear brake rod adjuster and punched washer.
- Remove the hexagonal flange 'U' nut (M14x1.5) from the rear axle along with the washer. (Fig. 6.86)

22 mm spanner

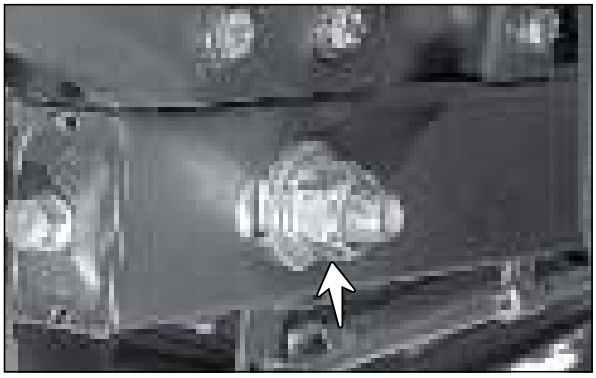


Fig. 6.86

- Pull out the rear axle by gently tapping. (Fig. 6.87)

Nylon hammer

- Remove the spacer rear axle R. Slightly tilt the motorcycle to the left and slide out the wheel assembly rear.

- Separate the panel assembly rear from wheel assembly rear.

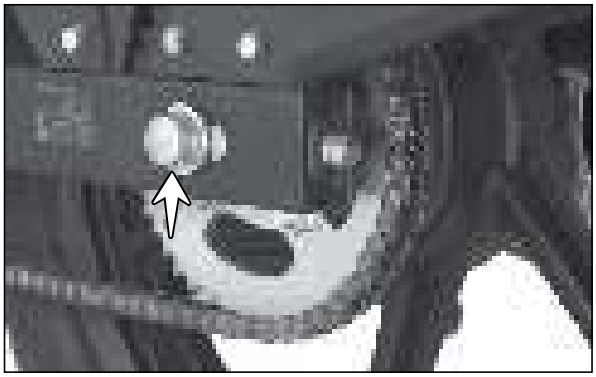


Fig. 6.87

Wheel Bearing Removal

Warning:
It is recommended to remove the bearings only in case of replacement.

Note:
Before heating the wheel assembly rear it is recommended to remove the absorber rear wheel hub shock. (Fig. 6.88)

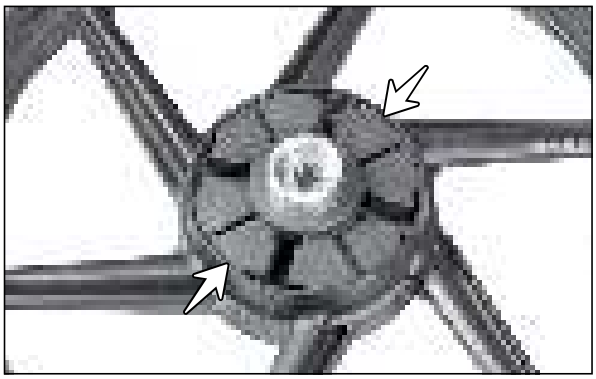


Fig. 6.88

- Place the wheel assembly rear (brake drum) on a hot plate and heat to approximately 125°C. (Fig. 6.89)

Hot plate

Fig. 6.89

- Draw out the bearing from the wheel assembly rear. (Fig. 6.90)

Drift

Nylon hammer

Fig. 6.90

BRAKE PANEL ASSEMBLY REAR - DISMANTLING

- Remove brake shoe set (rear) from the panel assembly rear along with spring brake shoe. (Fig. 6.91A)
- Remove hexagonal nut M6. (Fig. 6.91B)

10 mm spanner

Tightening torque	13 ± 3 Nm

- Remove punched washer and hexagonal bolt (M6x33). (Fig. 6.91B)
- Pull out lever rear brake cam (A) and remove cam brake (B) by gently tapping. (Fig. 6.92)
- Remove 'O' ring brake cam (C) and pinched washer (D). (Fig. 6.92)

Nylon hammer

Note:
Apply little grease to the cam brake before installing.

Warning:
Do not apply too much grease on the cam brake. If the grease gets on to the lining brake, slippage will occur.

SPROCKET DRUM ASSEMBLY - DISASSEMBLY

- Take out the spacer rear axle LH from the sprocket drum assembly. (Fig. 6.93)
- Remove the dust seal using special tool. (Fig. 6.94)

031 240 1	Universal oil seal remover

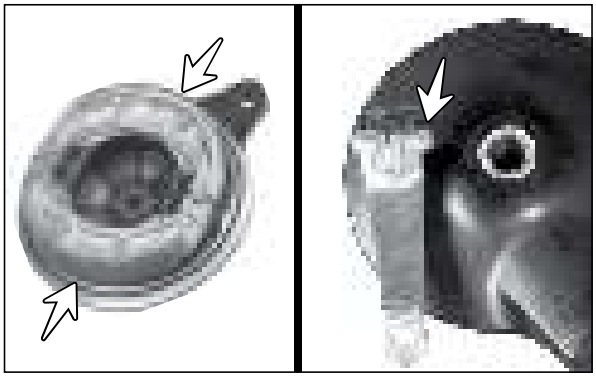


Fig. 6.91A Fig. 6.91B

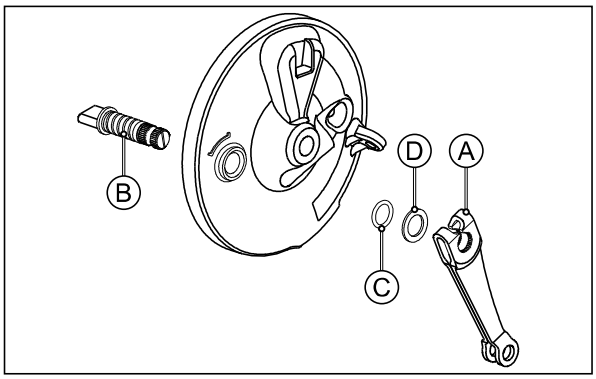


Fig. 6.92

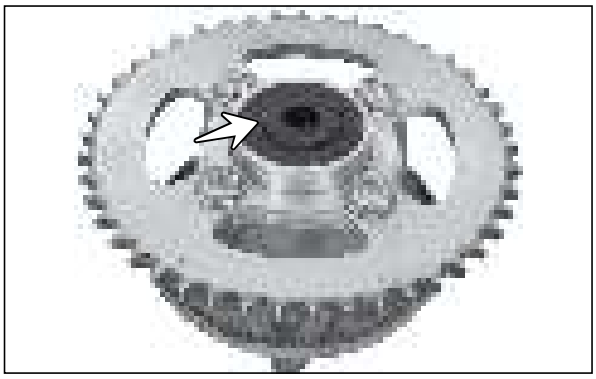


Fig. 6.93

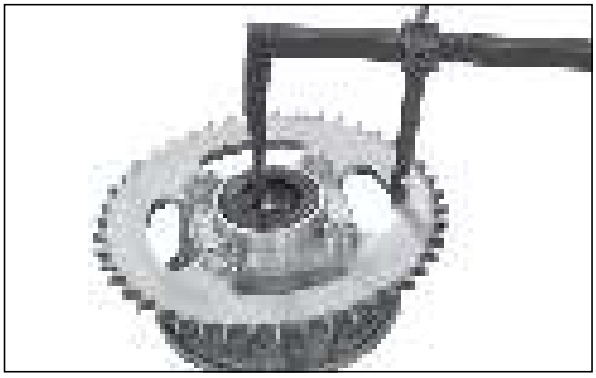


Fig. 6.94

- Remove the flanged 'U' nut (M10 - 4 Nos.). (Fig. 6.95)

12 mm spanner

Tightening torque	48 ± 2 Nm

- Take out the sprocket rear and bolt rear sprocket (4 Nos.).

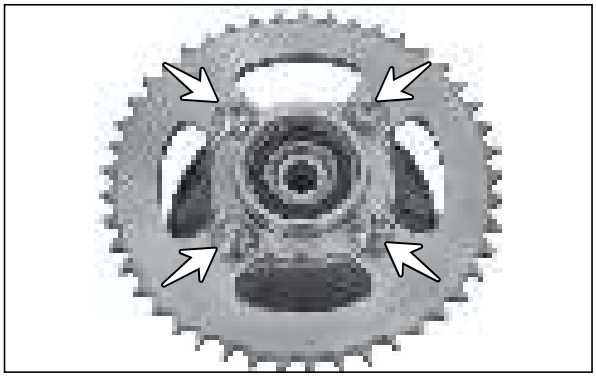


Fig. 6.95

- Heat the drum rear sprocket on a hot plate to approximately 125° C. (Fig. 6.96A)

Hot plate

- Draw out the ball bearing along with shaft rear sprocket from drum rear sprocket. (Fig. 6.96B)

Drift

Nylon hammer

Fig. 6.96A

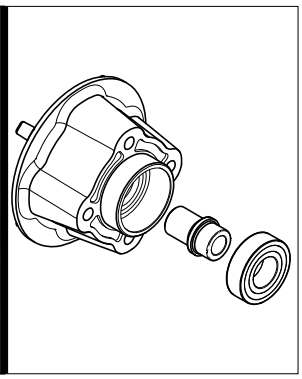


Fig. 6.96B

INSPECTION

Before inspection, clean all the components with kerosene and lubricate the bearings immediately after cleaning.

- Inspect wheel bearings, axle complete rear and alloy wheel rear (refer page no. 6-2 for checking procedure).

- Clean and inspect the drive chain as explained in chapter "Periodic maintenance" page 2-33.

Sprocket Rear

- Inspect sprocket rear teeth for wear. If they are worn-out as illustrated (Fig. 6.97), replace the sprocket with a new one.

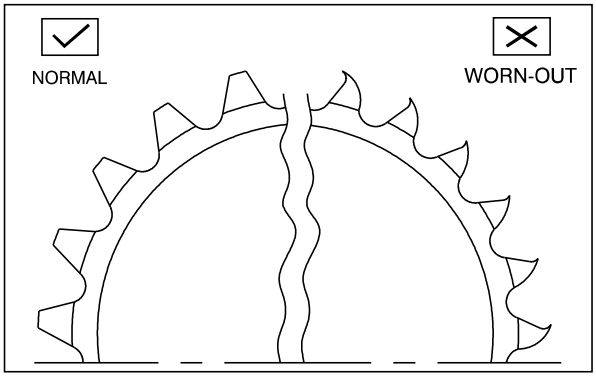


Fig. 6.97

Absorber Rear Wheel Hub Shock

- Inspect the absorber rear wheel hub shock for wear, deformation or damage. Replace with new one if required. (Fig. 6.98)

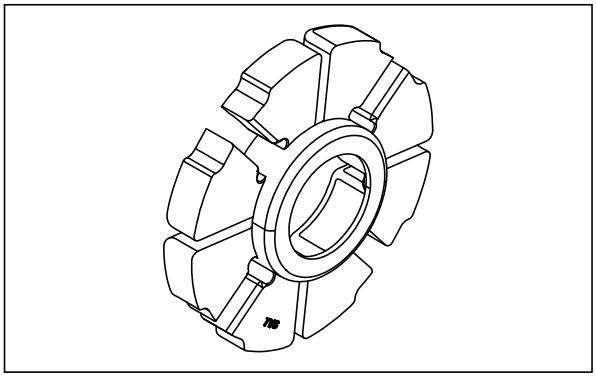


Fig. 6.98

Tyre inflation pressure

- Tyre inflation pressure affects the tyre life to a great extent. So it is necessary to maintain the proper tyre pressure. (Fig. 6.99)

Tyre pressure gauge

Tyre pressure	
Solo riding	2.00 kg/cm^2 (28 PSI)
Dual riding	2.25 kg/cm^2 (32 PSI)

Note:
Tyre pressure should be checked when the tyre is cold. Low tyre pressure consumes more fuel.

Fig. 6.99

REASSEMBLY

- Reassemble and remount the wheel assembly rear in the reverse order of disassembly. Refer wheel assembly exploded view (Fig. 6.100 & 6.101) for assembly details.

- Before assembling rear wheel assembly, lubricate the axle rear and bearings.

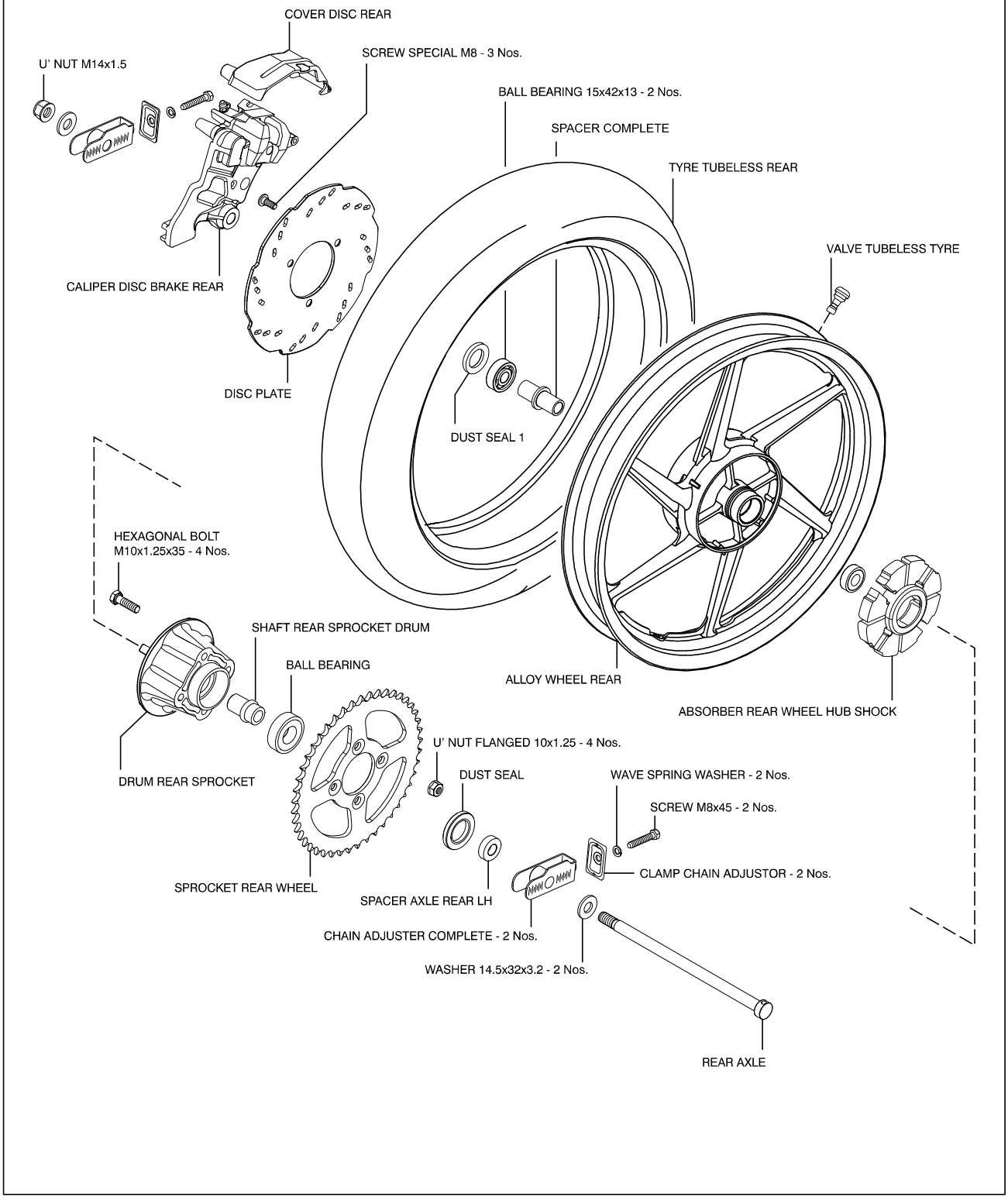

COVER DISC REAR
U' NUT M14x1.5
SCREW SPECIAL M8 - 3 Nos.
BALL BEARING 15x42x13 - 2 Nos.
SPACER COMPLETE
TYRE TUBELESS REAR
VALVE TUBELESS TYRE
CALIPER DISC BRAKE REAR
DISC PLATE
DUST SEAL 1
HEXAGONAL BOLT
M10x1.25x35 - 4 Nos.
SHAFT REAR SPROCKET DRUM
BALL BEARING
ALLOY WHEEL REAR
ABSORBER REAR WHEEL HUB SHOCK
U' NUT FLANGED 10x1.25 - 4 Nos.
DUST SEAL
WAVE SPRING WASHER - 2 Nos.
SCREW M8x45 - 2 Nos.
DRUM REAR SPROCKET
SPROCKET REAR WHEEL
SPACER AXLE REAR LH
CLAMP CHAIN ADJUSTOR - 2 Nos.
CHAIN ADJUSTER COMPLETE - 2 Nos.
WASHER 14.5x32x3.2 - 2 Nos.
REAR AXLE

Fig. 6.100

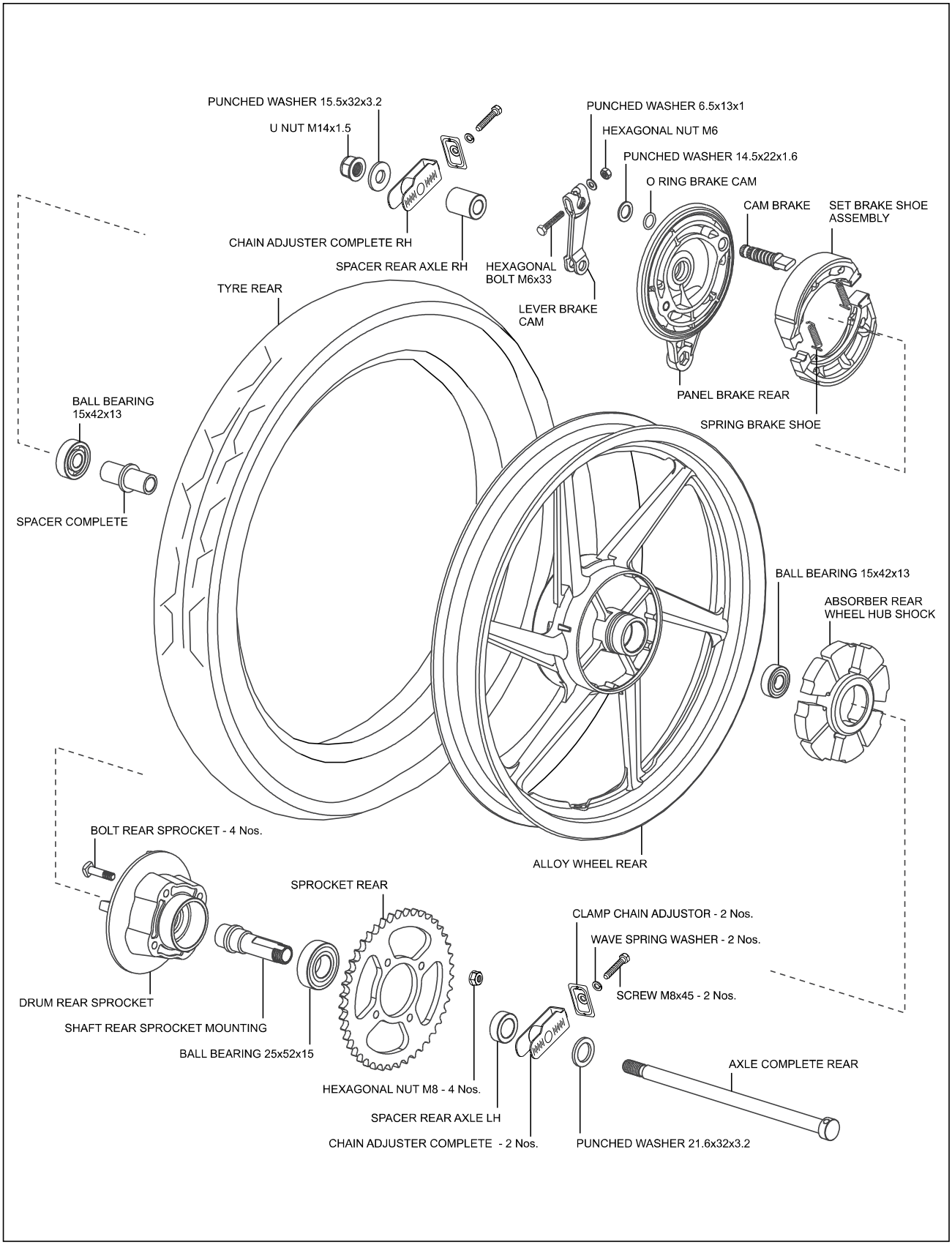

PUNCHED WASHER 15.5x32x3.2
U NUT M14x1.5
CHAIN ADJUSTER COMPLETE RH
SPACER REAR AXLE RH
PUNCHED WASHER 6.5x13x1
HEXAGONAL NUT M6
PUNCHED WASHER 14.5x22x1.6
O RING BRAKE CAM
HEXAGONAL BOLT M6x33
LEVER BRAKE CAM
CAM BRAKE
SET BRAKE SHOE ASSEMBLY
PANEL BRAKE REAR
SPRING BRAKE SHOE
TYRE REAR
BALL BEARING 15x42x13
SPACER COMPLETE
BALL BEARING 15x42x13
ABSORBER REAR WHEEL HUB SHOCK
ALLOY WHEEL REAR
BOLT REAR SPROCKET - 4 Nos.
SPROCKET REAR
CLAMP CHAIN ADJUSTOR - 2 Nos.
WAVE SPRING WASHER - 2 Nos.
SCREW M8x45 - 2 Nos.
DRUM REAR SPROCKET
SHAFT REAR SPROCKET MOUNTING
BALL BEARING 25x52x15
HEXAGONAL NUT M8 - 4 Nos.
SPACER REAR AXLE LH
CHAIN ADJUSTER COMPLETE - 2 Nos.
PUNCHED WASHER 21.6x32x3.2
AXLE COMPLETE REAR

Fig. 6.101

- Make sure that the slot (A) in the bracket complete caliper assembly fits over the stopper (B) on the swing arm assembly. (Fig. 6.102)

Note:
While reassembling the disc plate apply specified thread lock to the disc plate mounting bolts.

After remounting the wheel assembly rear, readjust the chain slackness (refer chapter "Periodic maintenance" page no. 2-33).

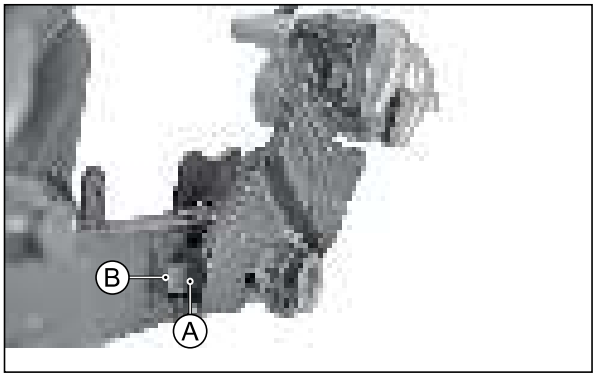


Fig. 6.102

TUBELESS TYRE

PUNCTURE REPAIR

Tubeless tyre provides the benefit of easy repairing the punctured tyre without removing the wheel assembly. Hence repairing can be performed with the vehicle stand still condition and repairing procedure is as follows:

- Keep the bike firmly on center stand.
- Identify the punctured location and make a visible mark. (Fig. 6.103A)
- Pull out nail or puncture causing object from the tyre using a combination plier. (Fig. 6.103B)

Combination plier

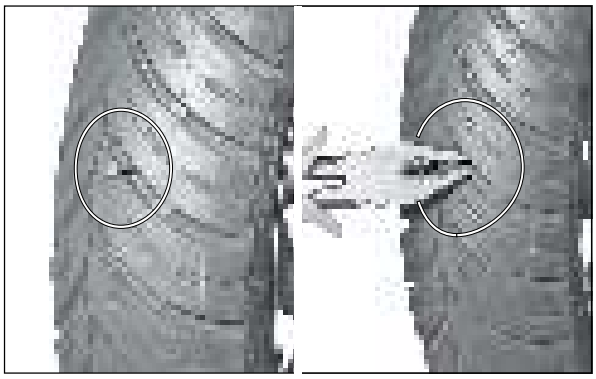


Fig. 6.103A Fig. 6.103B

- Insert the reaming tool exactly into the punctured point and carefully ream the punctured hole. (Fig. 6.104)

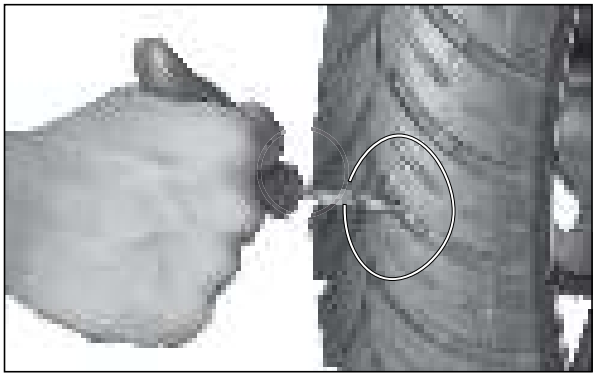


Fig. 6.104

- Take a cold mending strip and insert it between the strip holding jaws of strip inserting tool. (Fig. 6.105)

Note:
After inserting the strip, ensure that strip is held at the middle point of strip length. (Fig. 6.105)

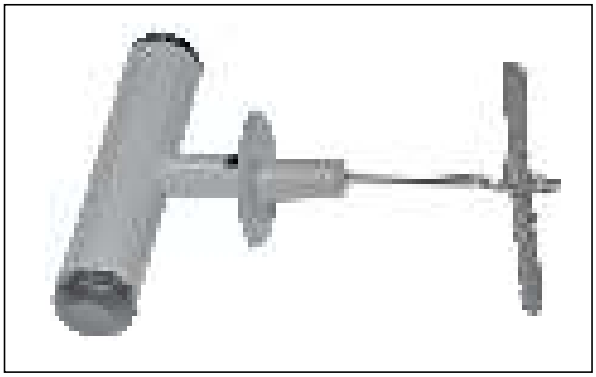


Fig. 6.105

- Insert the strip inserting tool along with strip into the reamed hole till the strip goes inside at least more than half of its folded length. (Fig. 6.106)

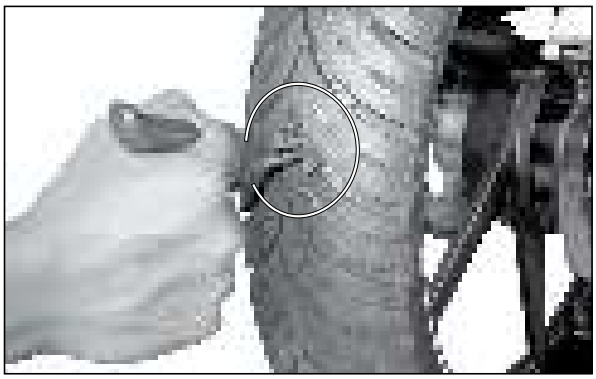


Fig. 6.106

- Leaving the strip in that position, gently pull out the strip inserting tool.

Note:
While pulling out the strip inserting tool, ensure that the strip does not come out along with the tool.

- Take out the tool completely and cut remaining strip leaving 5 mm from surface of tyre. (Fig. 6.107)

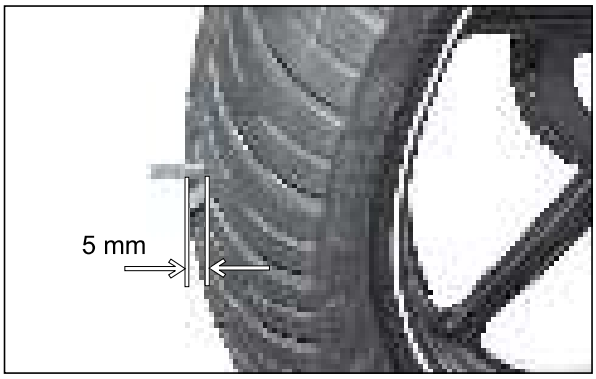


Fig. 6.107

- Fill air to the specified limit and checkout for any leakage.

Caution:
Ensure the wheel assembly is checked for proper balancing after every tyre puncture repair or tyre replacement for better vehicle stability (refer chapter "Periodic maintenance" page no. 2-50 for detailed procedure of wheel balancing).

REPLACEMENT OF VALVE TUBELESS TYRE

Valve tubeless tyre in RTR 160 alloy wheel can be replaced by following below given procedure:

- Remove wheel assembly from the vehicle (refer page no. 6-1 & 6-28 for wheel assembly removal procedure).

- Remove the tyre from the alloy wheel.

Caution:
Use of normal tyre levers for removal of tubeless tyre by any puncture repair shop may cause severe damage to the tyre seating area of alloy wheel, which leads to improper sealing and loss of air. Hence it is recommended that removal of tubeless tyre is performed by using a tyre removal machine.

- Keep the alloy wheel on a level surface.

- Applying gentle load on the valve tail and cut the valve tubeless tyre at the alloy wheel neck area and take out the separated piece. (Fig. 6.108A)

Hand knife

- Push out remaining part of valve from the alloy wheel using a suitable tool. (Fig. 6.108B)

Fig. 6.108A

Fig. 6.108B

- Locate and seat new valve tubeless tyre to the valve mounting hole from outer periphery of alloy wheel. (Fig. 6.109A)

- Using a suitable mandrel, gently tap the valve head and ensure that valve is seated properly. (Fig.6.109B)

- Reassemble parts in reverse order of disassembly.

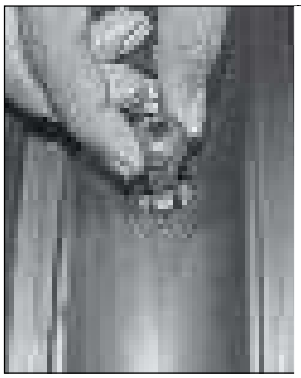


Fig. 6.109A

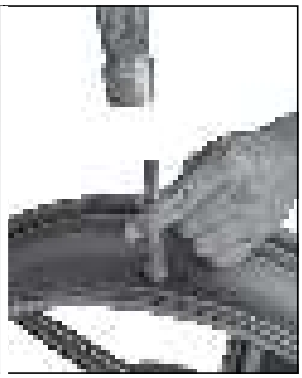


Fig. 6.109B

Note:
While reassembling the tyre, ensure that the arrow mark (A) on the tyre faces the direction of wheel rotation. (Fig. 6.110)

It is recommended to apply a little amount of soap solution over the alloy wheel at the tyre seating area for ease of tyre assembly.

Caution:
Ensure, the wheel assembly is checked for proper balancing after every tyre puncture repair or tyre replacement for better vehicle stability (refer chapter "Periodic maintenance" page no. 2-50 for detailed procedure of wheel balancing).

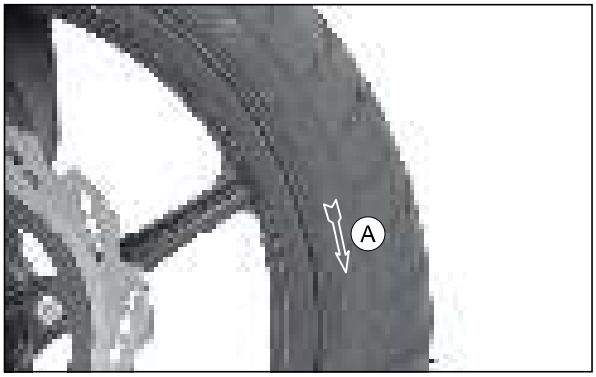


Fig. 6.110

DISC BRAKE SYSTEM - REAR

BRAKE PADS

- Remove wheel assy rear along with the disc plate (refer page no. 6-28 for wheel assy rear removal procedure).
- Take out the bracket complete along with the caliper assembly and take out the caliper cover.
- Remove the plug pin from the caliper housing. (Fig. 6.111)

Flat head screw driver	
Tightening torque	2.5 ± 0.5 Nm

- Remove the pin hanger. (Fig.6.112)

5 mm spanner	
Tightening torque	17.5 ± 2.5 Nm

- Take out the pad complete inner and pad complete outer. (Fig. 6.113)

Fig. 6.111

Fig. 6.112

Fig. 6.113

Inspection of Brake Pads

- Observe the wear limit line marked on the pad and check the wear condition of brake pads. (Fig. 6.114) When the wear exceeds the limit line, replace the pad with new ones.

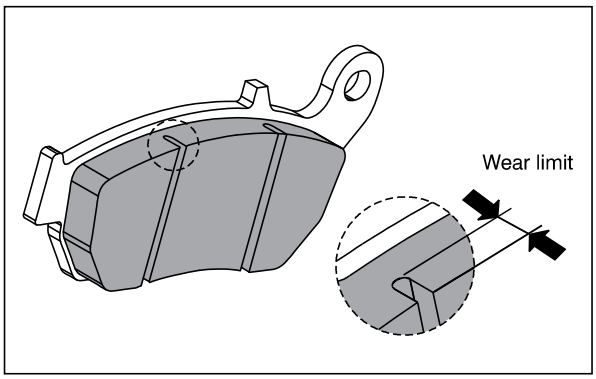


Fig. 6.114

BRAKE FLUID

Inspection of Brake Fluid Level

- Remove the cover frame R (refer chapter "Periodic maintenance" page 2-3 for removal procedure). Place the vehicle in center stand. Inspect the brake fluid level in thereservoir.
- The brake fluid level in the reservoir should be at the maximum mark provided in the reservoir. (Fig. 6.115)
- If the level is below lower level mark, replenish the level up to the maximum level.
- Remove the cap and take out the diaphragm and fill fresh brake fluid of recommended grade. (Fig. 6.116)

Brake fluid	TVS Griling DOT3 / DOT4

Fig. 6.115

Fig. 6.116

Air Bleeding

- If the rear brake pedal travel becomes more or if any soft or spongy feel is observed in the lever, you must carry out the air bleeding from the brake system.

Brake Fluid Replacement

- Boiling point of brake fluid falls considerably with absorption of moisture which may take place during a long period of use. Therefore, it is recommended to replace the old brake fluid with new periodically.

Replace brake fluid every 21000 km

- Refer page 6-6, 6-7 & 6-8 for brake fluid handling, air bleeding from the brake system and brake fluid replacement procedure.

HOSE COMPLETE BRAKE - REAR

- Inspect the hose complete brake for any crack or leakage. If leakages found, replace the hose as described below:
- Flush the brake fluid out by opening the bleeder at caliper assembly with a tube on the bleeder head to a clean container (refer brake bleeding).

- Remove the banjo bolt (2 Nos.) along with gaskets (2 Nos. on each side) from both the ends of the hose complete brake. (Fig. 6.117)

12 mm spanner	
Tightening torque	30 ± 2 Nm

Note:
Ensure the reassembly of new gaskets while reconnecting the hose without fail to avoid leakage.

- Dislocate the hose complete brake rear from the clamps of swing arm assembly and care fully take out.

Caution:
Immediately and completely wipe off any brake fluid contacting any part of the motorcycle. The fluid reacts chemically with paint, plastics, rubber materials etc., and will damage them severely.

- Reassemble the new brake hose in the reverse order of dismantling.

- Assemble and tighten the banjo bolts at both the ends of the hose along with new gaskets.

Caution:
Assemble only new gaskets with the banjo bolts during reassembly. Do not use old ones.

- Bleed the air from the brake circuit after reassembly of brake hose (refer air bleeding procedure on page no. 6-7).

Replace brake hose every 3 year

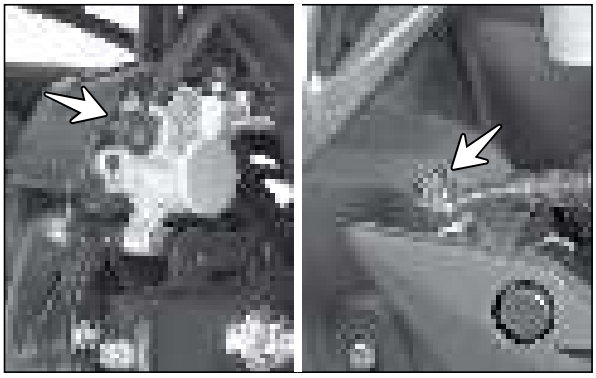


Fig. 6.117

CALIPER ASSEMBLY - REMOVAL AND DISASSEMBLY

- Bleed out brake fluid from the brake system.

- Remove the banjo bolt and take out the gaskets. (Fig. 6.118)

12 mm spanner	
Tightening torque	30 ± 2 Nm

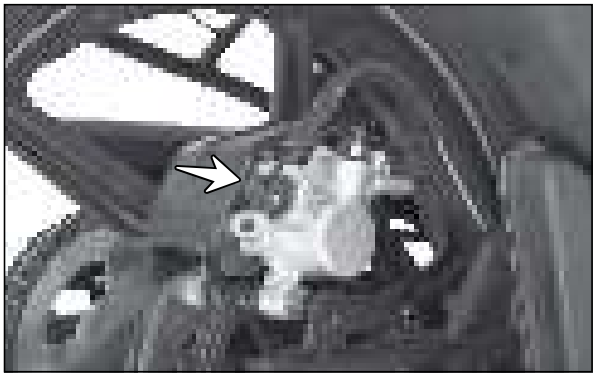


Fig. 6.118

- Remove the wheel assembly rear along with the disc plate (refer page no. 6-28 for wheel assy rear removal).
- Take out the bracket complete along with the caliper assembly.
- Remove the plug pin from the caliper housing. (Fig. 6.119)

Flat head screw driver	
Tightening torque	2.5 ± 0.5 Nm

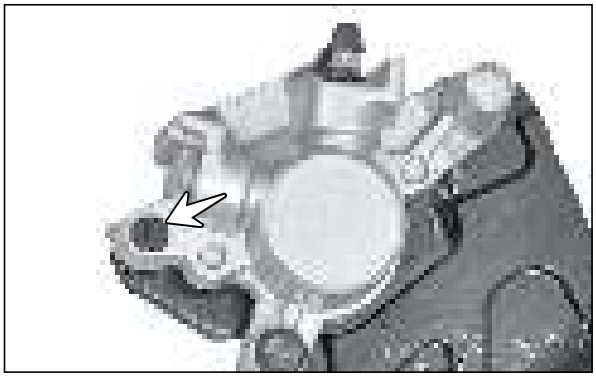


Fig. 6.119

- Remove the pin hanger. (Fig.6.120)

5 mm spanner	
Tightening torque	17.5 ± 2.5 Nm

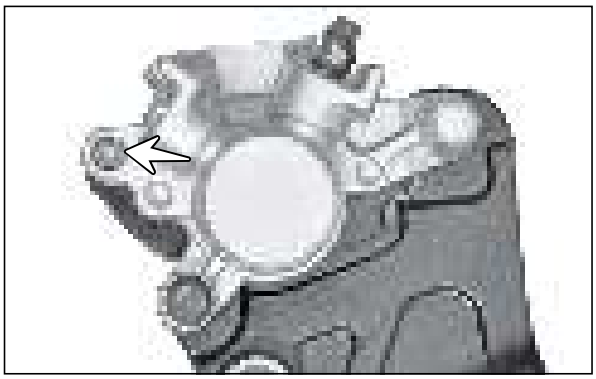


Fig. 6.120

- Take out the pad complete inner and pad complete outer. (Fig. 6.121)

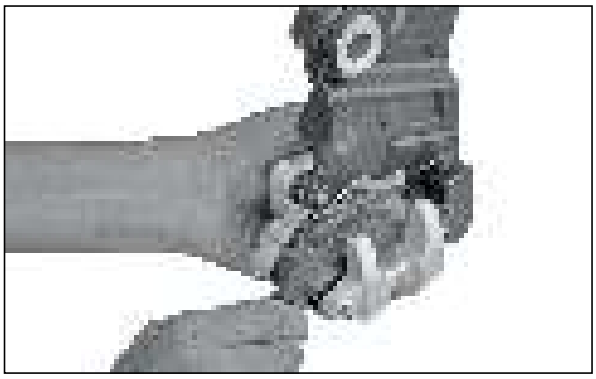


Fig. 6.121

- Remove the spring pad from the caliper housing. (Fig. 6.122)

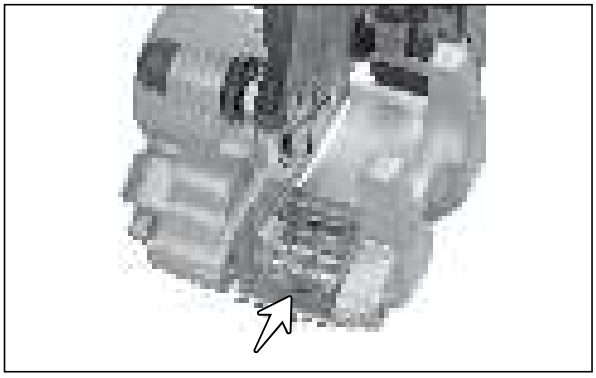


Fig. 6.122

- Remove the bracket complete rear caliper by sliding out after dislocating boot-B and bush boot pin from the pin grooves. (Fig. 6.123)

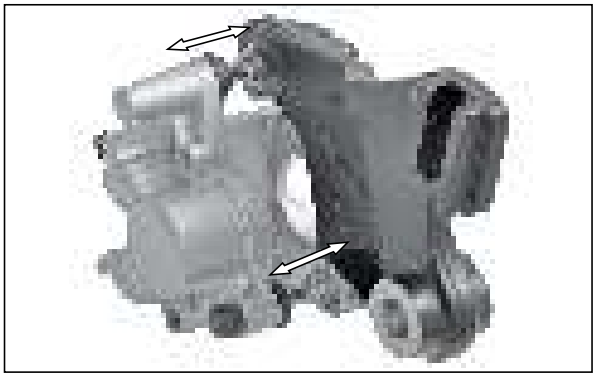


Fig. 6.123

- Carefully pull out the cap piston (A) and boots (B) from the caliper assembly housing. (Fig. 6.124)

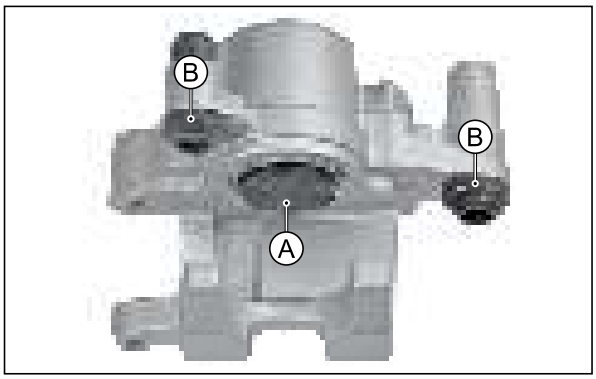


Fig. 6.124

- Insert a spacer between piston caliper and the caliper housing (at pad position) and then apply compressed air through the inlet port of the caliper to slide pistons out. (Fig. 6.125)

Caution:
Be careful while applying compressed air as it will shoot the piston forcefully. Do not use high pressure air to prevent damage to the piston.

Do not use nose plier to pull out the piston as it may cause scratches.

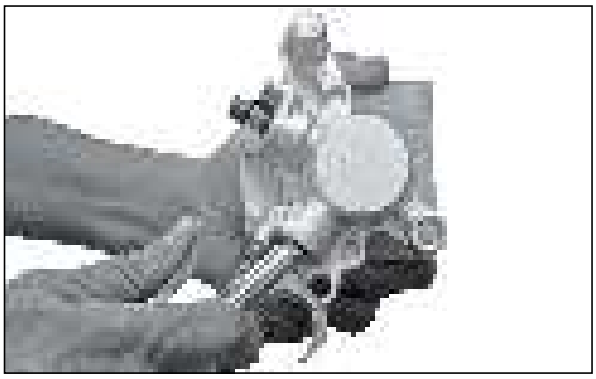


Fig. 6.125

- Remove the dust seals with a bent plastic / brass tool to avoid scratches on the caliper bore. (Fig. 6.126)

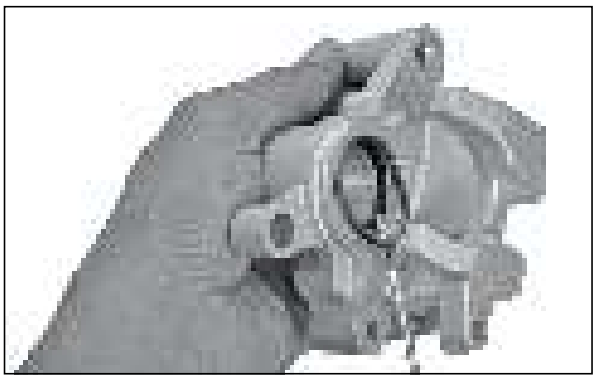


Fig. 6.126

- Unplug cap bleeder and remove bleeder screw. (Fig. 6.127)

8 mm spanner	
Tightening torque	5.5 ± 1.5 Nm

- Clean the parts thoroughly with fresh brake fluid.

Caution:
Never use kerosene, petrol or other solvents for cleaning the brake system. Otherwise rubber parts will be damaged. Do not wash the pads and also take care that the brake fluid is not splashed on the pads.

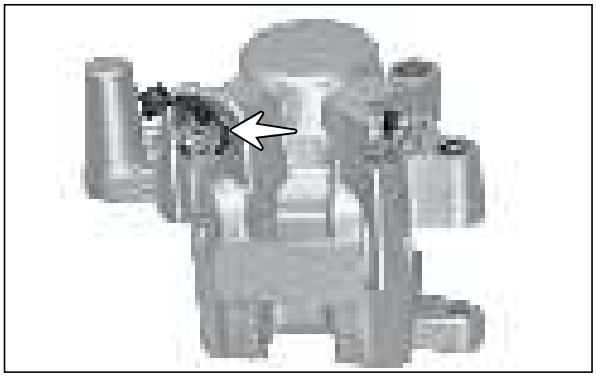


Fig. 6.127

Caliper Assembly Inspection

Inspect the following parts:

- Pin hangers for any bend.
- Bracket complete front for loose lugs.
- Piston and caliper bore for any scratches.
- Piston and dust seals for any damage.

- After completion of above inspection, replace the defective parts as required.

Caliper Assembly - Reassembly

- Insert the dust seals in the caliper housing grooves and ensure perfect seating without any twist of the seals (refer exploded view on page no. 6-48 for details).

- Smear the piston with fresh TVS Girling DOT 3 or DOT 4 brake fluid and slowly insert into the bore of caliper body without tapering. Ensure the piston is sliding easily into the bore.

- Assemble the spring pad in the caliper housing. Assemble boot-B and bush boot pin in the caliper housing.

- Apply little grease to the pin bolts of bracket complete caliper and assemble the bracket by ensuring proper seating of both the boots in their respective grooves.

- Assemble the pad inner and pad outer.

- Remove the split pin and take out cotter pin from the rear master cylinder. (Fig. 6.128)

Nose plier

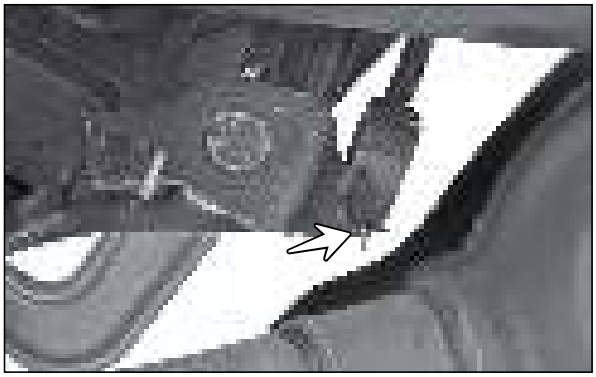


Fig. 6.128

- Remove the clip hose (A) and take out hose oil (B). (Fig. 6. 129)

Nose plier

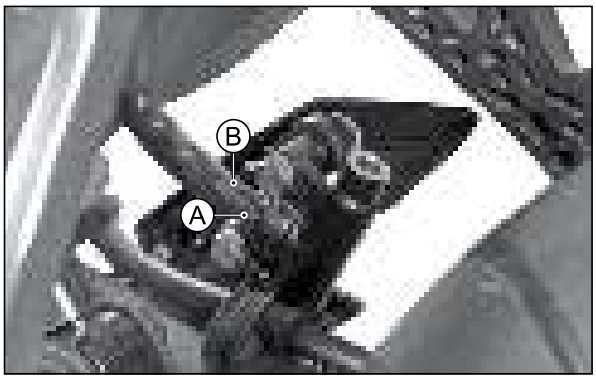


Fig. 6.129

- Remove the hexagonal screws (M6x40 - 2 Nos.) along with punched washers. (Fig. 6.130)

13 mm spanner	
Tightening torque	30 ± 2 Nm

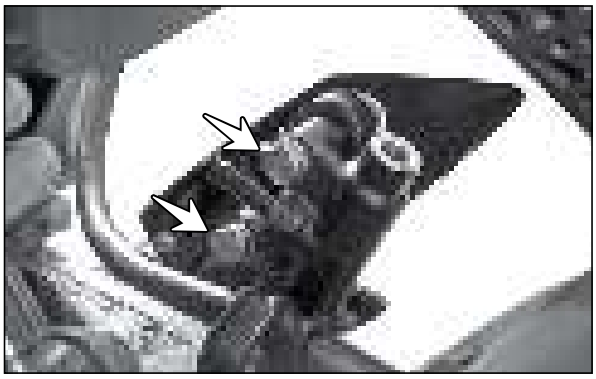


Fig. 6.130

- Take out master cylinder assembly from the pillion footrest assembly RH.

- By firmly holding master cylinder housing, remove the circlip (A) by using circlip plier. (Fig. 6.131)

Circlip plier

- Take out the insert (B) from the master cylinder assembly. (Fig. 6.131)

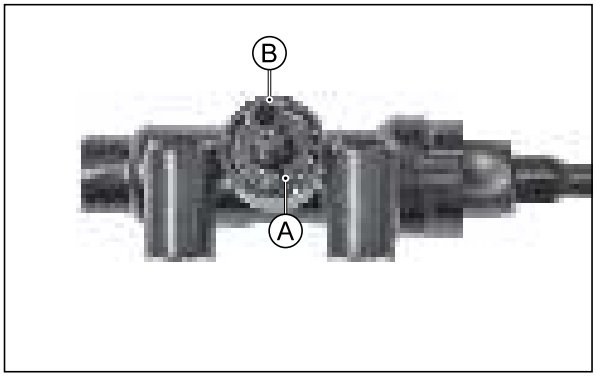


Fig. 6.131

- Assemble the pin hangers by locating it properly in the holes of the pad inner and outer.
- Fix the plug pins, bleeder screw and cap bleeder.
- Remount wheel assembly rear along with spacer RH.
- Remount caliper assembly rear by locating the slot provided on bracket comp caliper with the stopper provided on swing arm complete. Assemble the axle and tighten the 'U' nut of rear axle.
- Remount brake hose along with the gaskets and bleed the system by referring the procedure explained on page no. 6-7.

DISC PLATE - SERVICING

Inspection (with Disc Mounted on Wheels)

- Inspect the disc plate as explained in front disc plate servicing (refer page 6-12 for disc plate inspection).

Disc Plate Replacement

- Replace the disc plate if found to be defective (refer page no. 6-29 for removal procedure).

MASTER CYLINDER REAR (REAR DISC BRAKE) - REMOVAL AND DISASSEMBLY

- Remove the cover frame RH (refer chapter "Periodic maintenance" page no 2-3 for cover frame R removal procedure).
- Bleed the brake system completely.
- Remove the banjo bolt along with gasket (2 Nos. on each side) from the master cylinder rear. (Fig. 6.132)

12 mm spanner	
Tightening torque	30 ± 2 Nm

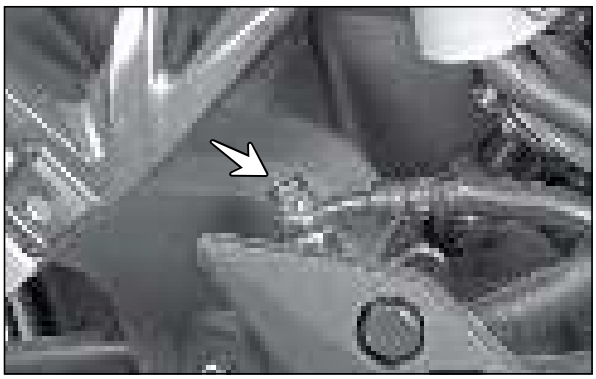


Fig. 6.132

- Take out the 'O' ring from the master cylinder assembly. (Fig. 6.133)

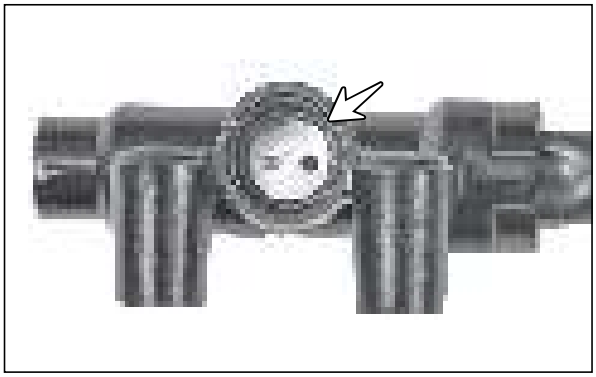


Fig. 6.133

- Carefully lift the boot from the cylinder by using a blunt tool. (Fig. 6.134A)

Note:
While removing the boot care should be taken not to damage it.

- While firmly holding the master cylinder by hand, slightly press the push rod and remove circlip by using a circlip plier without damaging the cylinder. (Fig. 6.134B)

Circlip plier

Fig. 6.134A

Fig. 6.134B

- Slowly pull out the piston along with P - cup, S - cup and spring. (Fig. 6.135)

- Clean the system thoroughly using fresh brake fluid.

Caution:
Never use kerosene, petrol or other solvents for cleaning the brake system. Otherwise rubber parts get damaged.

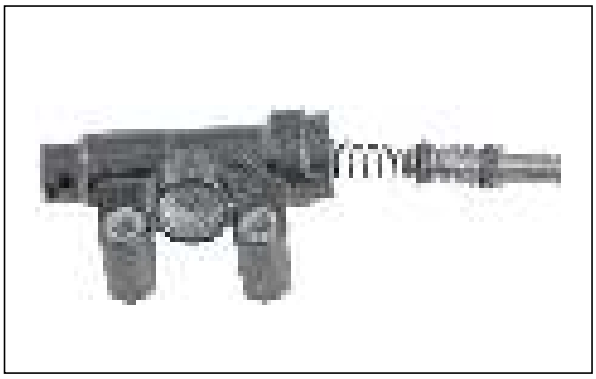


Fig. 6.135

INSPECTION

Inspect the following parts:

- Master cylinder for any scratches or other damage.
- Piston and cup surface for scratches or other damage.
- Piston boot and other components for wear and damage.
- Master cylinder recuperation and feed port for any blockage, if so clear the blockage using compressed air.

- After completion of above inspection, replace defective parts as required.

REASSEMBLY

- Reassemble master cylinder in the reverse order of dismantling. Refer exploded view for assembly details. (Fig. 6.136)

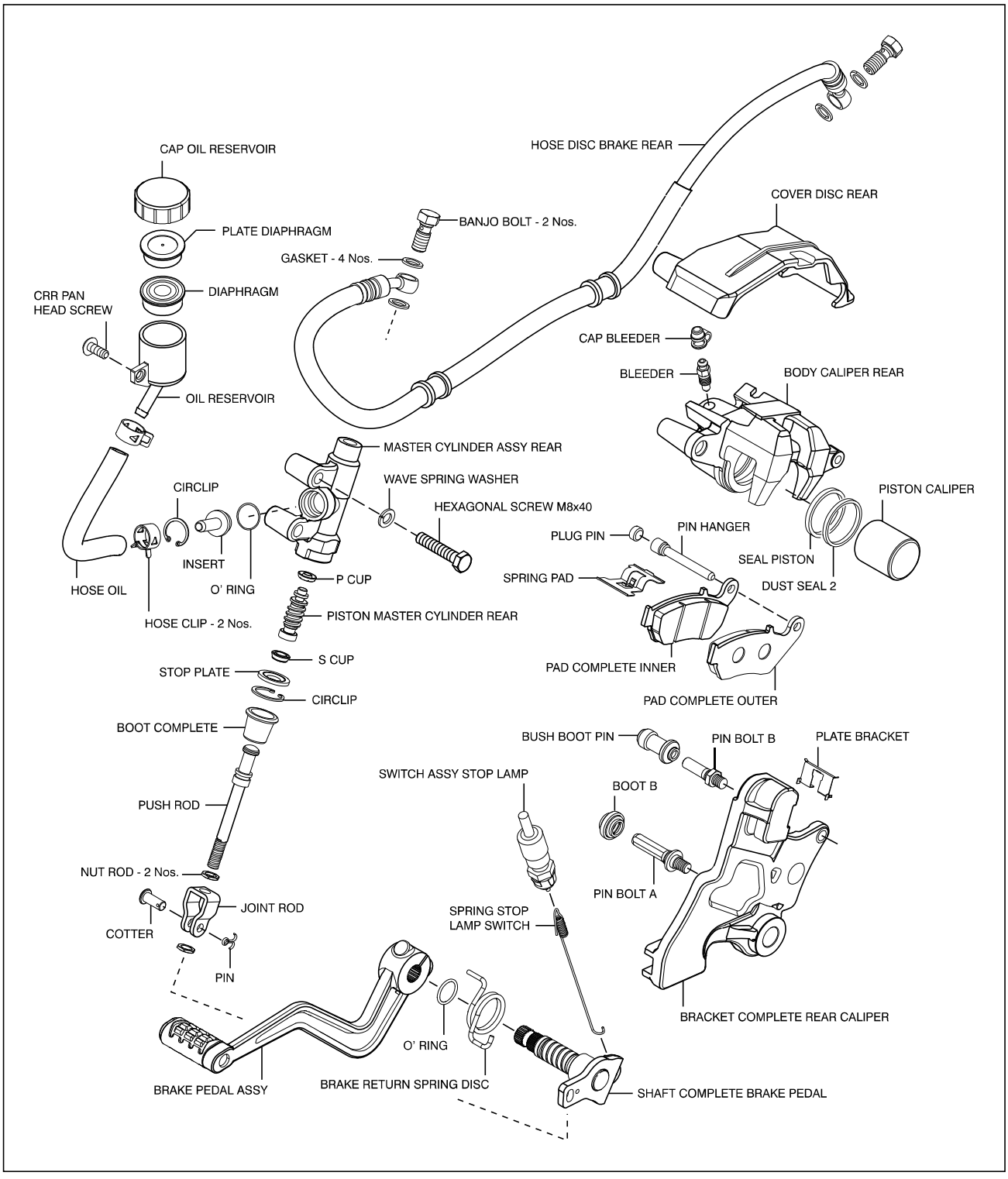


Fig. 6.136

Caution:
Apply brake fluid to the cylinder bore and all internal parts before inserting the piston into the bore.

- Fix the hose complete brake rear to the master cylinder outlet port along with the banjo bolt and new gaskets.
- Fill the reservoir with DOT3 or DOT4 brake fluid upto the level 'MAXIMUM' marked on the reservoir.
- Fix the reservoir cap along with plate diaphragm and diaphragm.
- Bleed the system tho.roughly by referring the bleeding procedure on page no. 6-7.
- Once again inspect and if required top-up the brake fluid and tighten reservoir mounting screw.

Replace following parts at every 21,000 km.

- Piston along with P-cup, S-cup, spring and boot assembly.
- Diaphragm plate and diaphragm.
- Caliper seal piston and dust seal-2.

REAR SHOCK ABSORBER - REMOVAL

- Remove the rear wheel assembly as explained in page no. 6-28.
- Dislocate the starter relay from the air filter assembly. (Fig. 6.137)
- Loosen the clamp tube outlet screw and dislocate the tube outlet from the carburettor assembly. (Fig. 6.138)

Philips head screw driver

- Remove hose clip (A) from hose air inlet and pull out the hose from air cleaner assembly. (Fig. 6.138)
- Remove hose clip (B) from hose engine breather and pull out the hose from air filter cleaner assembly. (Fig. 6.138)

Nose plier

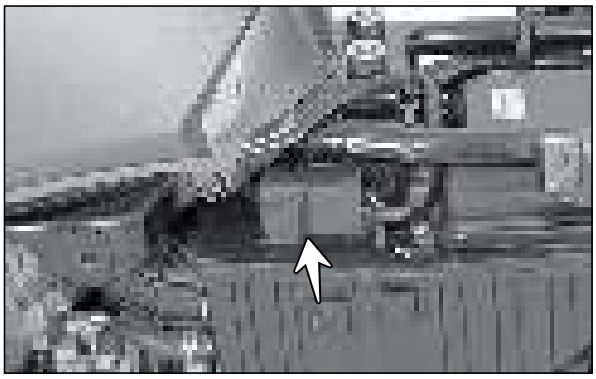


Fig. 6.137

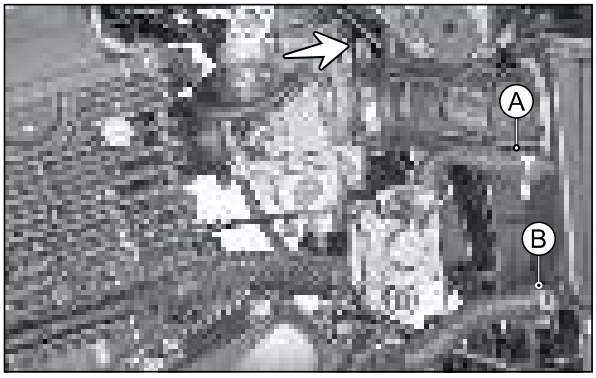


Fig. 6.138

- Remove the CRR pan head screw (M6x16 - 2 Nos.) along with the punched washers and take out the air cleaner assembly. (Fig. 6.139)

Philips head screw driver	
Tightening torque	5 ± 1 Nm

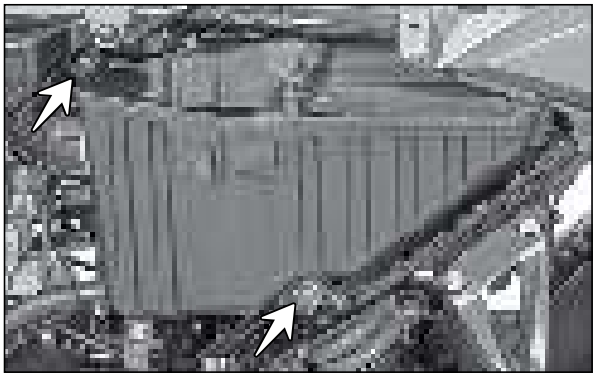


Fig. 6.139

- Remove the hexagonal bolts (M6x20 - 4 Nos.) along with the washers from the chain guard assembly and gently dislocate the chain guard. (Fig. 6.140 & 6.141)

10 mm spanner	
Tightening torque	8 ± 2 Nm

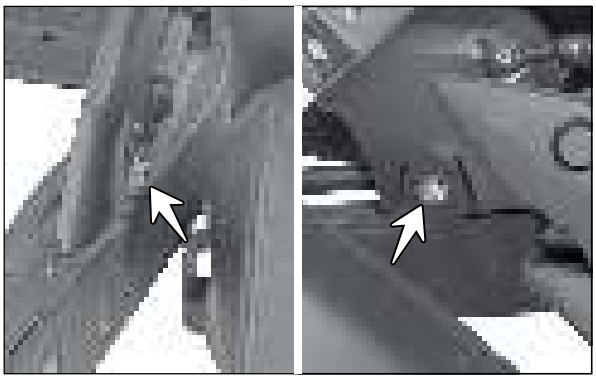


Fig. 6.140

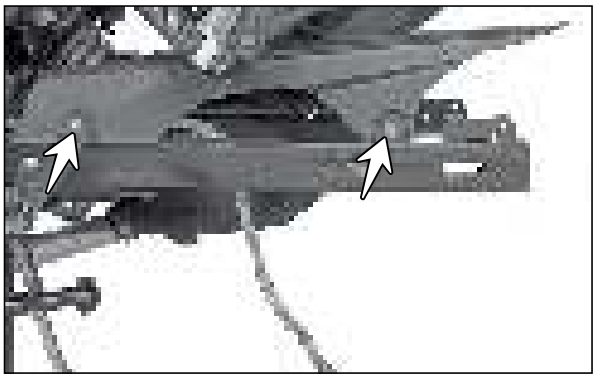


Fig. 6.141

- Remove the hexagonal flange bolt (M12x52) from the shockabsorber mounting top. (Fig. 6.142)

15 mm spanner	
Tightening torque	60 ± 4 Nm

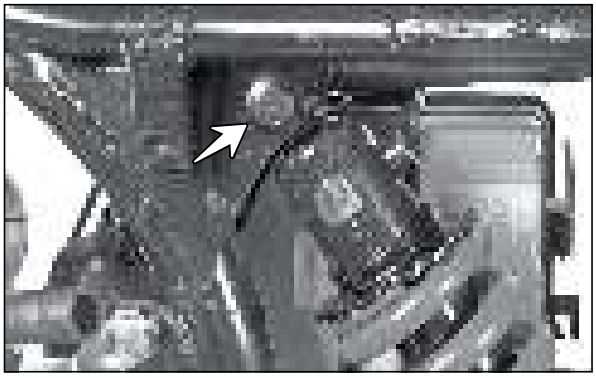


Fig. 6.142

- Remove the hexagonal flange bolt (M12x52) from the bottom mounting of shockabsorber rear shock absorber. (Fig. 6.143)

- Dislocate and take out the rear shock absorber.

15 mm spanner	
Tightening torque	60 ± 4 Nm

- Reassemble the rear shock absorber and other parts in the reverse order of removal.

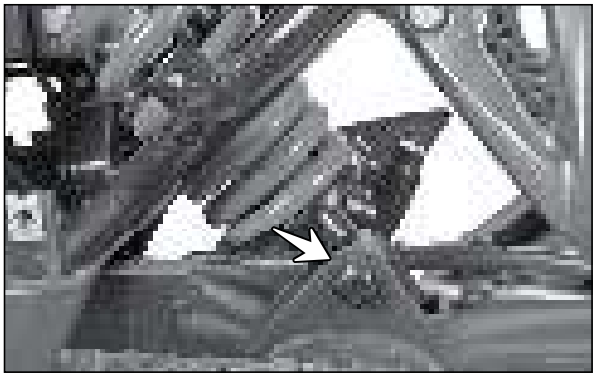


Fig. 6.143

SWING ARM COMPLETE

REMOVAL

- Remove the rear wheel assembly along with the disc plate and dislocate the caliper assembly rear. Refer page no. 6-28.

- Remove the CRR pan head screw from the reservoir mounting and take out the reservoir. (Fig. 6.144)

Phillips head screw driver	
Tightening torque	3 ± 1 Nm

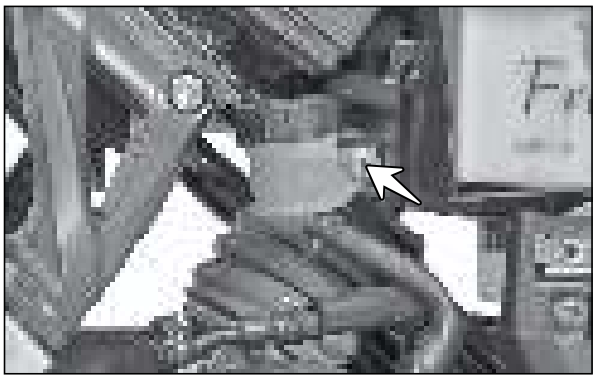


Fig. 6.144

- Remove CRR pan head screw from the rider foot rest assembly RH and dislocate the rider foot rest assembly RH. (Fig. 6.145)

Phillips head screw driver	
Tightening torque	3 ± 1 Nm

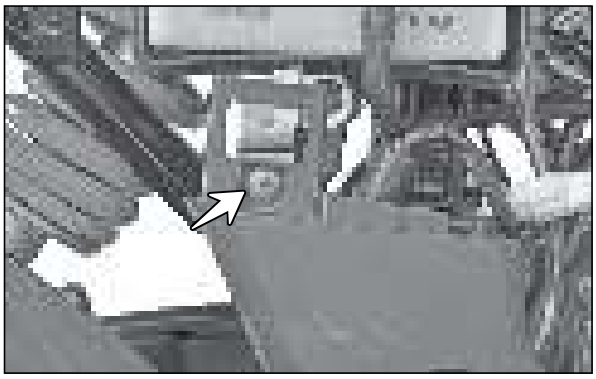


Fig. 6.145

- Loosen the shock absorber rear top mounting flange hexagonal bolt (M12x52). (Fig. 6.146)

15 mm spanner	
Tightening torque	60 ± 4 Nm

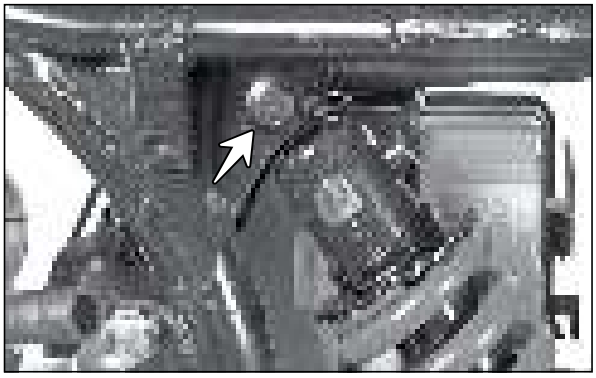


Fig. 6.146

- Remove hexagonal flange bolt (M12x52 - 1 No.) of shockabsorber rear lower mounting from swing arm complete. (Fig. 6.147)

15 mm spanner	
Tightening torque	60 ± 4 Nm

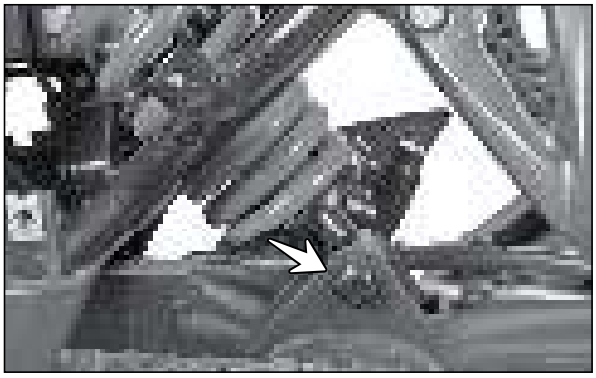


Fig. 6.147

- Remove 'U' nut (M12) rear swing arm pivot mounting. (Fig. 6.148

17 mm spanner	
Tightening torque	40 ± 4 Nm

- Take out nut and the punched washer.

Fig. 6.148

- Draw out the shaft complete swing arm along with punched washer by gently tapping at the other side. (Fig. 6.149)

Nylon hammer

- Dislocate the brake hose from the swing arm complete.
- Take out swing arm complete from the frame assembly.

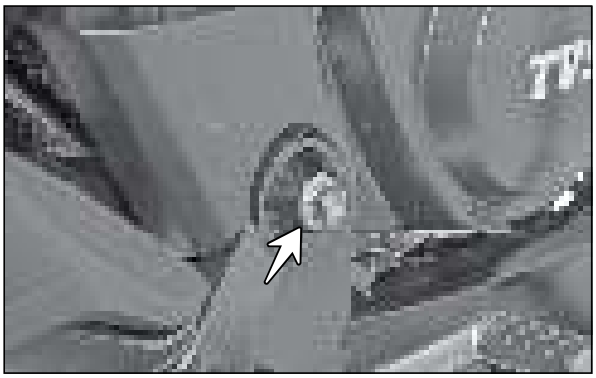


Fig. 6.149

- Remove CRR pan head screw (M6x16 - 1 No.) (A) along with the punched washer and take out buffer chain (B) from the swing arm assembly. (Fig . 6.150)
- Draw out both the bush swinging arm (Fig. 6.150) and check the needle bearing for any damage or abnormality. If found any replace the needle bearing as set. Follow the below procedure described below:

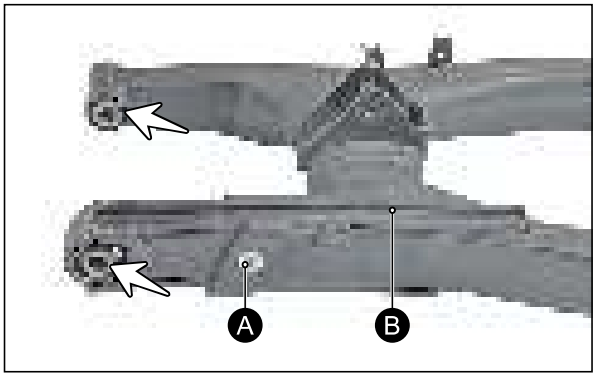


Fig. 6.150

- Remove the dust seal (2 Nos.) from swing arm assembly. (Fig. 6.151)

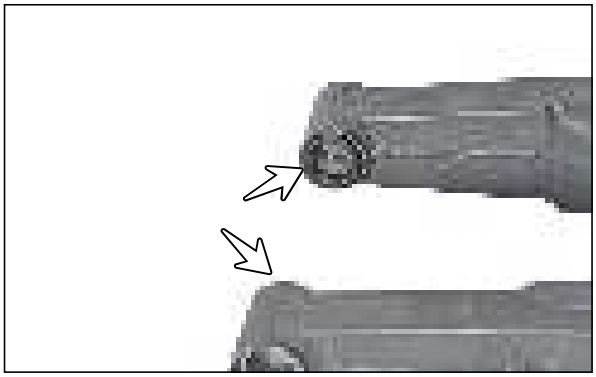


Fig. 6.151

- Using the special tool remove the needle bearing (2 Nos.) from the swing arm assembly. (Fig. 6.152)

N931 015 0	Tool swing arm service

Note:
Swing arm needle bearing should be removed only in case of replacement.

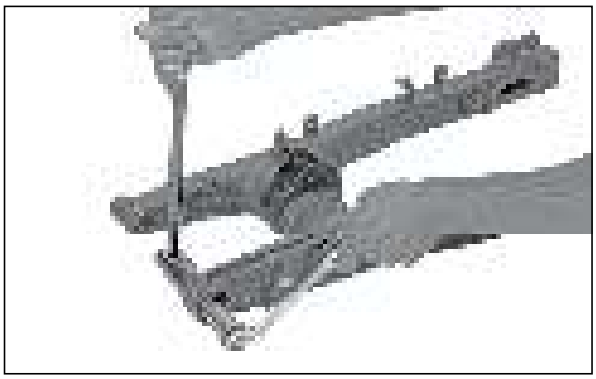


Fig. 6.152

- Reassemble the needle bearing using the special tool. (Fig. 6.153)

N931 015 0	Tool swing arm service

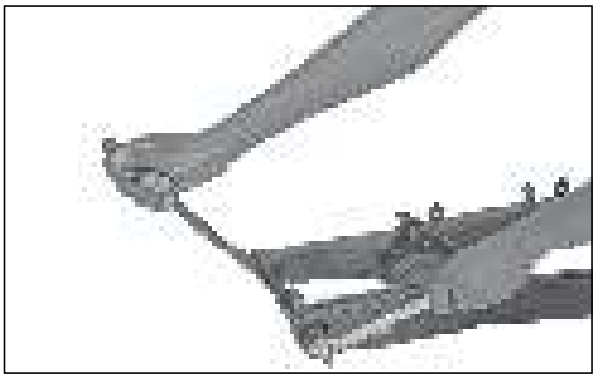


Fig. 6.153

INSPECTION

Shaft Complete Swing Arm

- Using the special tools, check shaft complete swing arm for run-out and replace it with a new one if run-out exceeds the limit. (Fig. 6.154)

Dial gauge (0.01mm)
Magnetic stand
V - block

Service limit	0.6 mm

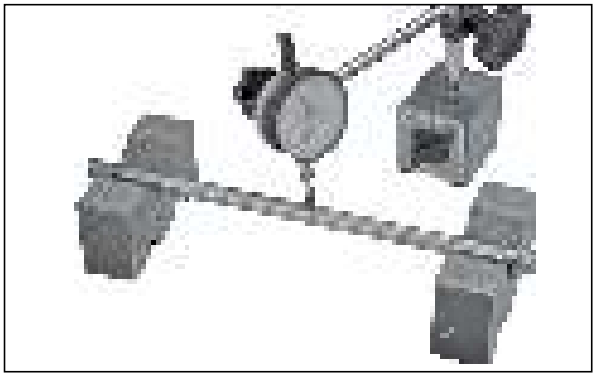


Fig. 6.154

REASSEMBLY

- Reassemble and remount the swing arm complete in the reverse order of removal. Refer exploded view for assembly details. (Fig. 6.155)

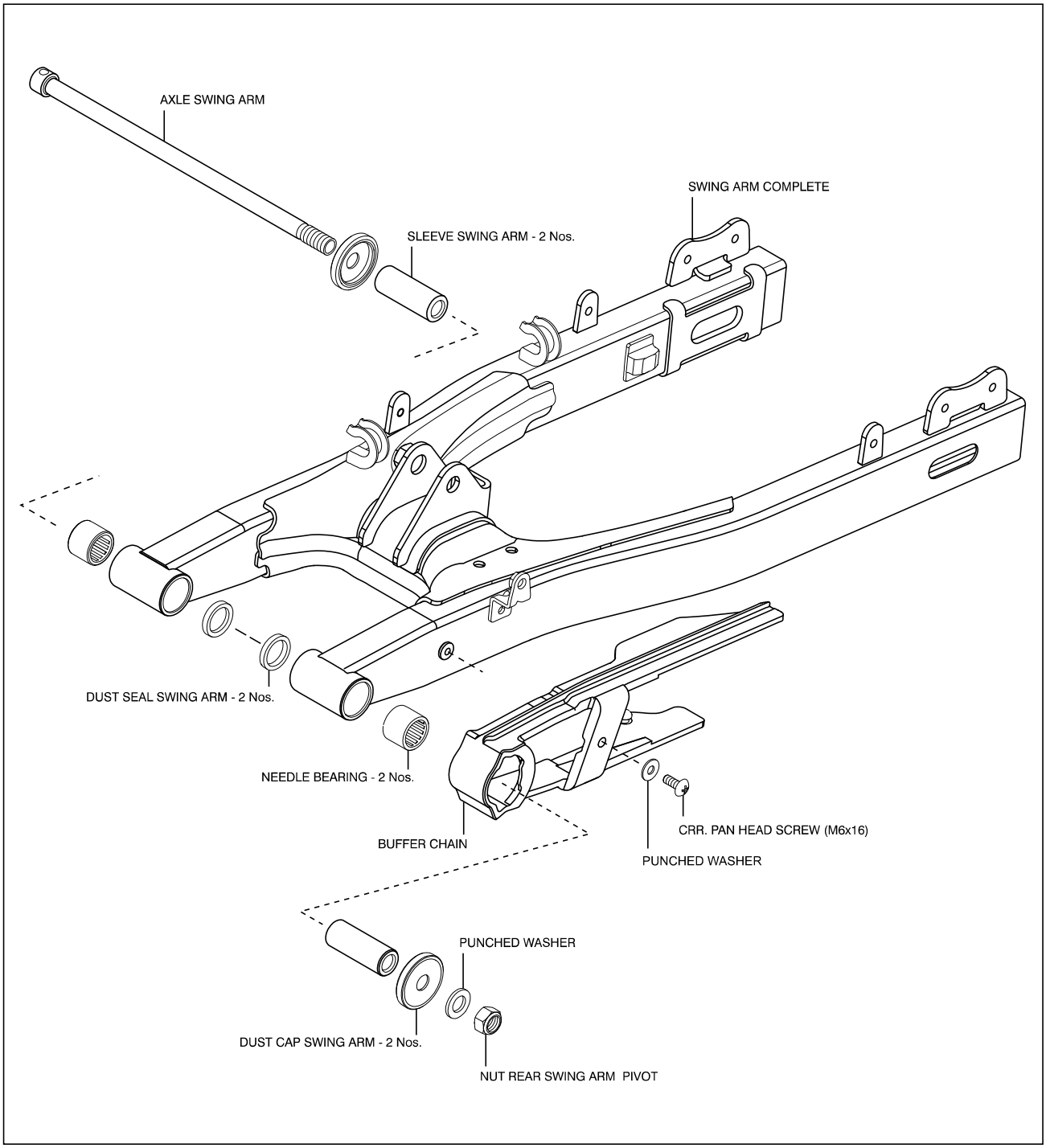


Fig. 6.155

REAR SHOCKABSORBER ADJUSTMENT

- Insert the ignition key into the seat lock (A).
- Turn it in clockwise, lift the seat from rear end and slide it backward to remove. (Fig. 6.156)

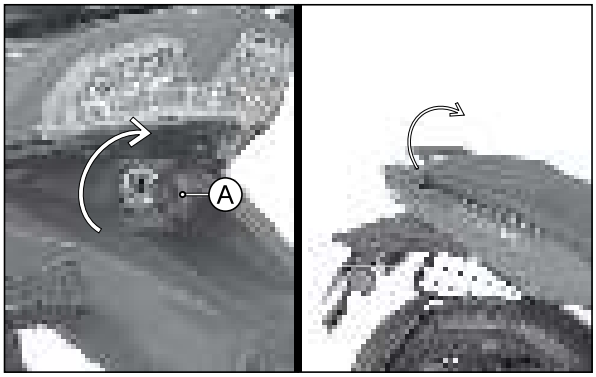


Fig. 6.156

- Insert the pre-load adjuster service tool's protrusion to the lug on the rear shockabsorber as shown. (Fig. 6.157)

N931 012 0	Tool pre-load adjuster

- Align the service tool with a teeth to the left or right of the one available directly below. (Fig. 6.157)

Fig. 6.157

- Apply torque to rotate the adjuster plate for adjustment until the desired pre-load is obtained. (Fig. 6.158)

Caution:
Adjust step by step. Do not go at a stretch as it will damage the cam.

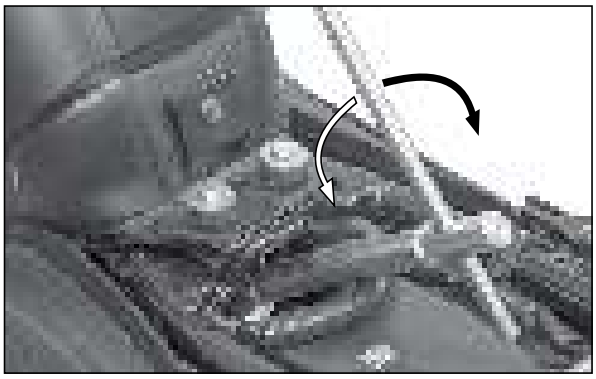


Fig. 6.158

- To reassemble the front seat, reverse the removal procedure.

Caution:
Make sure that the seat is locked securely in position after installation.

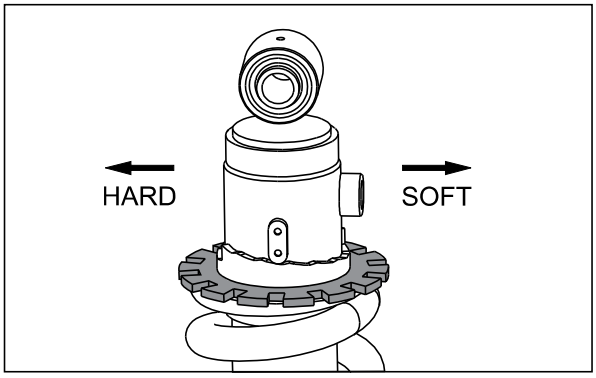


Fig. 6.159

Chapter 7

DIAGNOSITC

DIAGNOSTIC TOOL

- If the malfunction indicator (A) in the speedometer assembly of **TVS Apache RTR 160 Fi 4V** starts blinking after completion of speedometer's self check cycle, indicates that there is a malfunction in the EFI system of the vehicle. (Fig. 7.1)

- If the malfunction indicator is glowing, then the errors can be checked manually on the vehicle refer chapter "periodic maintenance" page no. 2-64 for checking procedure.

- The malfunctions can be checked in detail using 'Ride Scan' tool. The ride scan tool consist of the following items: (Fig . 7.2)

  1. Vehicle Communication Interface device (VCI)
  2. Diagnostic tool charging cable with adapter.
  3. 6 pin to 16 pin connector cable
  4. Hand held Tool (Samsung tablet with pre installed ride scan App.)

- Assemble VCI and connector cable as shown (6 to 16 pin). (Fig. 7.3)

Note:
Care should be taken not to damage VCI pins during assembly and disassembly.

- Connect the connector cable of the tool to the diagnostic coupler (A) located below the seat assembly. (Fig. 7.4) Refer chapter "Periodic maintenance" page no. 2-3 for the removal procedure of seat assembly.

- Once connection is made to the vehicle and ensured, switch 'ON' the ignition key.

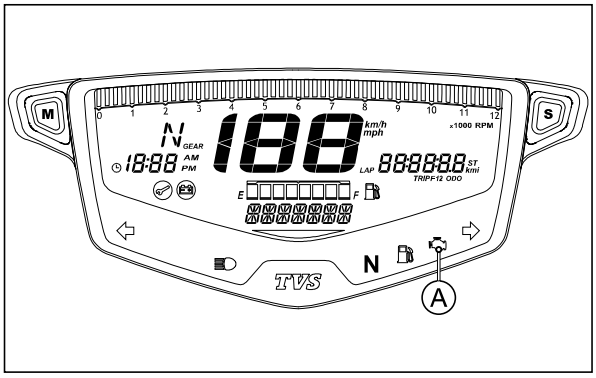


Fig. 7.1

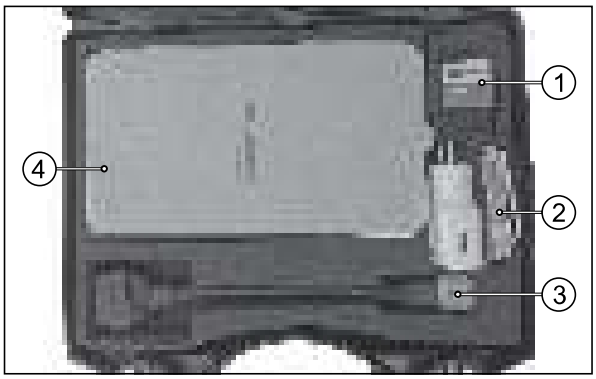


Fig. 7.2

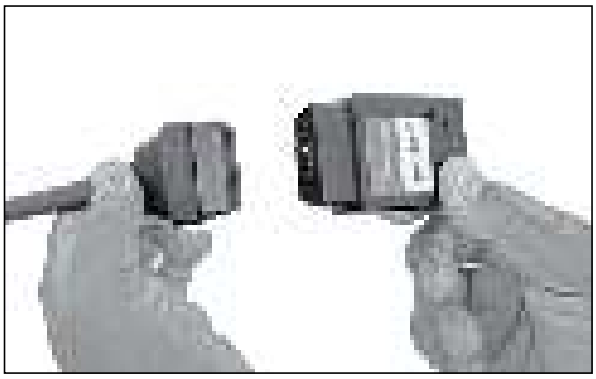


Fig. 7.3

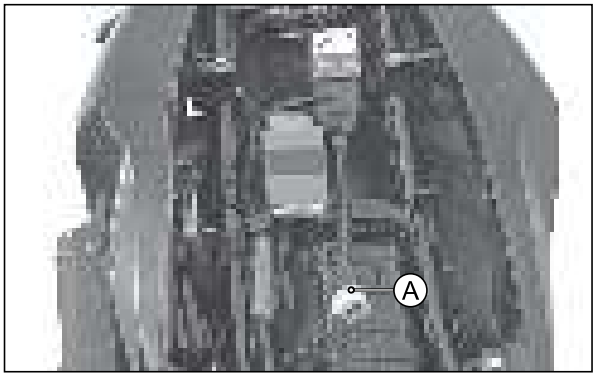


Fig. 7.4

- The LED indicator (A) of VCI blinks in red colour and indicates that the VCI is ready to be connected to hand held tool. (Fig. 7.5)

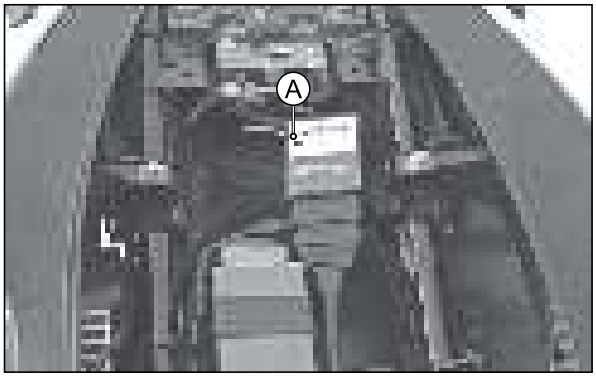


Fig. 7.5

- Open the tool (Tab) and navigate to the pages and find out the'Ride scan' icon.
- Now, press the ride scan App icon to start the application. (Fig. 7.6)
- When the application is opened for the first time, it will ask for the Email ID. Key in the registered Email ID. (Fig. 7.7)

Note:
Registered Email ID is the ID which is given during the purchase of your diagnostic tool.

Fig. 7.6

Fig. 7.7

- The App will verify the Email ID entered and send you the one time password (OTP) if the Email entered is correct one.

Note:
Incase of any problem, contact the diagnostic tool manufacturer's customer care.

- On receipt of OTP, enter the OTP and set your own password for the App. (Fig. 7.8)

Fig. 7.8

- Once the password is set or when the App. is opened again the App. will go to the process screen and asks for a password. Key in the password. (Fig. 7.9)

Note:
Ensure that the serial number (A) matches with the VCI before entering the password.

Fig. 7.9

- On entering the password, the App. will ask for a bluetooth pairing request with VCI. Press OK to proceed further. (Fig. 7.10)

Note:
Once the VCI is connected with the tool the VCI LED indicator will glow green.

Fig. 7.10

- Then select the vehicle that needs to be diagnosed with the tool. (Fig. 7.11)

Fig. 7.11

- Following icons appears on the screen once the pairing is done. (Fig. 7.12)

  Live parameters
  Read DTC's
  Write ECU data
  IO Control
  Secured Access

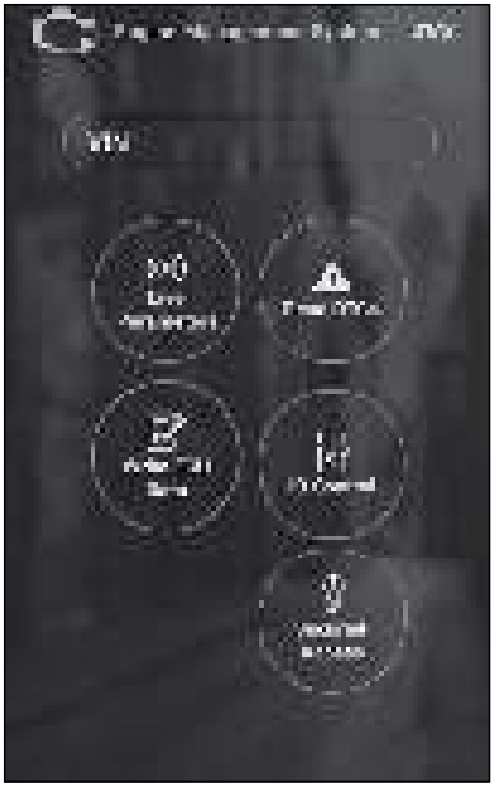


Fig. 7.12

Live Parameters

- Press the live parameters icon, the following icons appears on the screen. (Fig. 7.13)

  Modules
  Graph view

Fig. 7.13

- On pressing the modules, the App. will display the following icons. (Fig. 7.14)

  OBD
  Intake
  Sensors & switches
  Exhaust
  History
  ECU ID
  Fueling & ignition
  Cranking
  Current status

- On pressing any of the listed icons the App. displays the reading of the selected items.

Fig. 7.14

- On pressing the graph view, the App. displays a checklist, in which select any four and click submit. (Fig. 7.15)

Fig. 7.15

- On submission, the graph view will be displayed as shown in App. (Fig. 7.16)

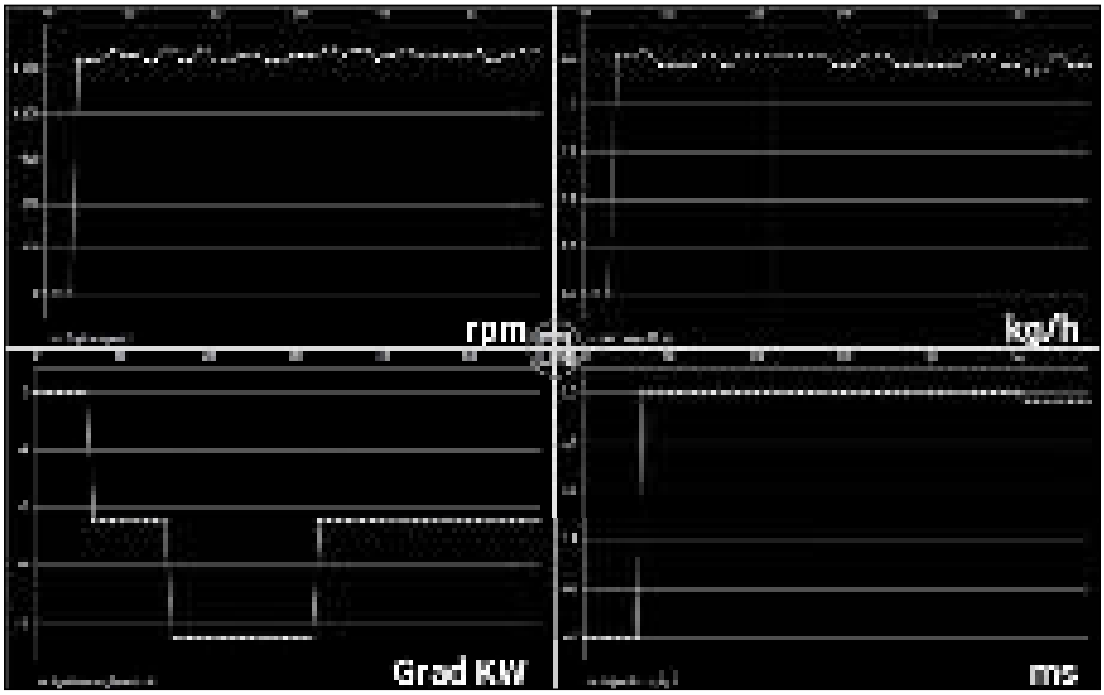


Fig. 7.16

Read DTC's

- On pressing the read DTC's icon, the App. reads the active DTC codes of the vehicle. If any DTC is active, the respective DTC code and description of the code will be displayed in the App. as shown. (Fig. 7.17)

- The App. also displays the pending, confirmed and history of the DTC codes that has been recorded in the vehicle (refer chapter page no. 7-9 for P - Codes). The history of the DTC codes can be deleted by pressing the clear DTC's icon.

Fig. 7.17

IO control

- On pressing the IO control, the following icons will be displayed. (Fig. 7.18)

  Fuel pump relay ON
  MIL lamp ON
  Upstream lambda heater ON

- On pressing 'Fuel pump relay ON icon', the fuel pump relay will be activated and the fuel pump runs for few seconds.

- On pressing 'MIL lamp ON icon', the 'MIL' lamp in the speedometer glows for few seconds.

- On pressing 'Upstream lambda heater ON' icon, the heater in the O2 sensor is activated.

Fig. 7.18

ERROR CODE TABLE

P - Code	Description
P0642	Sensor supply short to Ground
P1643	Sensor supply short to Battery
P0201	Injector Open circuit
P0261	Injector short to Ground
P0262	Injector short to Battery
P0627	Fuel Pump relay Open circuit
P0628	Fuel Pump relay short to Ground
P0629	Fuel Pump relay short to Battery
P0113	Intake Air temperature sensor Open circuit / Short to Battery
P0112	Intake Air temperature sensor short to Ground
P0134	O2 sensor Open circuit
P0131	O2 sensor short to Ground
P0132	O2 sensor short to Battery
P0130	O2 sensor signal error
P0123	TPS Open circuit / Short to Battery
P0122	TPS short to Ground
P1238	Engine Temperature Sensor Open circuit / Short to Battery
P1239	Engine Temperature Sensor short to Ground
P2300	Ignition coil short to Ground
P0030	O2 heater Open circuit
P0031	O2 heater short to Ground
P0032	O2 heater short to Battery
P0511	IACV Open circuit
P0508	IACV short to Ground
P0509	IACV short to Battery
P0108	MAP sensor Open circuit / Short to Battery
P0107	MAP sensor short to Ground
P1336	Crank sensor error

Chapter 8

SERVICE INFORMATION

SERVICE DATA

VALVE AND VALVE GUIDE

Unit : mm

S.No.	DESCRIPTION		STANDARD	SERVICE LIMIT
1	Valve diameter	Inlet Exhaust	22.500 19.300	–
2	Valve clearance	Inlet Exhaust	0.06 0.06	–
3	Valve stem (OD)	Inlet Exhaust	4.470 ~ 4.455 4.485 ~ 4.470	–
4	Guide valve (ID)	Inlet Exhaust	4.500 ~ 4.512	–
5	Guide valve to valve stem clearance	Inlet Exhaust	0.045 ~ 0.057 0.027 ~ 0.042	0.086 0.080
6	Valve stem runout	Inlet Exhaust	–	0.050
7	Valve head thickness	Inlet Exhaust	–	0.500 (min)
8	Valve head radial runout	Inlet Exhaust	0.030	0.075
9	Spring valve free length	Inner Outer	39.75	< 38.75

CAM SHAFT COMPLETE & HEAD COMPLETE CYLINDER (CYLINDER HEAD)

Unit : mm

S.No.	DESCRIPTION		STANDARD	SERVICE LIMIT
1	Cam lobe height	Inlet Exhaust	33.402 ~ 33.422 33.251 ~ 33.271	33.35 33.20
2	Cam shaft complete runout	–	–	0.080
3	Shaft valve rocker arm (OD)	Inlet Exhaust	8.000 ~ 7.991	–
4	Cam chain elongation (20 pitch)	–	–	128.20
5	Head complete cylinder distortion	–	–	0.050

CYLINDER, PISTON AND RINGS PISTON **Unit : mm**

S.No.	DESCRIPTION		STANDARD	SERVICE LIMIT
1	Compression pressure	–	90 ~ 120 psi @ 640 RPM (6.3 ~ 8.4 kg/cm²)	<90 psi (<6.3 kg/cm²)
2	Cylinder to piston clearance	–	0.030 ~ 0.040	0.120
3	Cylinder bore diameter	–	62.000 ~ 62.015	62.115
4	Piston dia. (measure 10 mm from skirt end)	–	61.965 ~ 61.980	61.875
5	Cylinder complete distortion	–	–	0.050
6	Ring piston closed end gap	Top 2nd	0.150 ~ 0.300 0.350 ~ 0.500	0.700 0.700
7	Ring to groove clearance	Top 2nd	0.025 ~ 0.065 0.015 ~ 0.055	0.120 0.100
8	Ring piston groove width	Top 2nd Oil Ring	0.8005 ~ 0.8025 0.8005 ~ 0.8025 1.5050 ~ 1.5200	–
9	Ring piston thickness	Top & 2nd	0.760 ~ 0.780 0.770 ~ 0.790	–
10	Piston pin hole (ID)	–	15.002 ~ 15.008	15.030
11	Pin piston (OD)	–	14.996 ~ 15.000	14.992

CRANKSHAFT COMPLETE AND BALANCER SHAFT **Unit : mm**

S.No.	DESCRIPTION	STANDARD	SERVICE LIMIT
1	Connecting rod small end (ID)	15.003 ~ 15.009	15.040
2	Connecting rod big end side clearance	0.200 ~ 0.350	0.650
3	Connecting rod big end width	17.950 ~ 18.000	–
4	Crank web to web width	53 ± 0.1	–
5	Crankshaft complete runout	0.040	0.100

CLUTCH **Unit : mm**

S.No.	DESCRIPTION	STANDARD	SERVICE LIMIT
1	Cable clutch free play at lever end (in engin cold condition)	8 ~ 13	–
2	Plate clutch drive thickness	2.920 ~ 3.080	2.600
3	Plate clutch drive claw width	15.750 ~ 15.850	15.300
4	Plate clutch driven distortion	0.05	0.100
5	Spring clutch free length	39.17	38.57

TRANSMISSION SPECIFICATION

S.No.	DESCRIPTION	SPECIFICATION
1	Primary reduction ratio	3.095 (65/21)
2	Final reduction ratio	3.461 (45/13)
3	Gear ratio	
	First gear	2.917 (35/12)
	Second gear	1.857 (26/14)
	Third gear	1.333 (24/18)
	Fourth gear	1.050 (21/20)
	Fifth gear	0.880 (22/25)

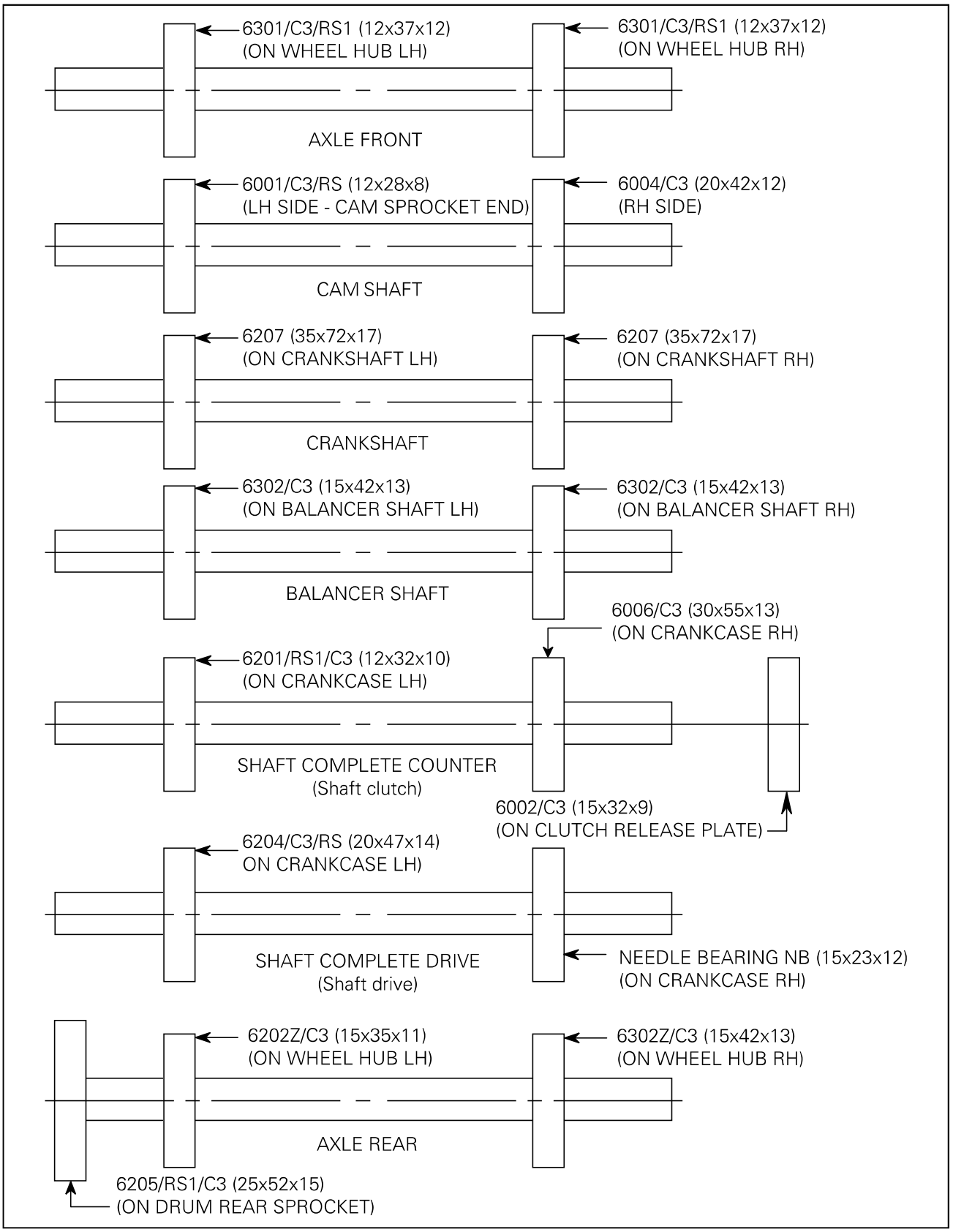
TRANSMISSION **Unit : mm**

S.No.	DESCRIPTION		STANDARD	SERVICE LIMIT
1	Shift fork to groove clearance	Fork No. 1 & 2 Fork high speed	–	0.300
2	Drive chain - 20 pitch length		317.5	323
3	Drive chain slack		20 ~ 25	–

SUSPENSION **Unit : mm**

S.No.	DESCRIPTION	STANDARD	SERVICE LIMIT
1	Front fork stroke length	130	–
2	Front fork spring length	512.7	502
3	Front fork oil grade	TRU Fork oil	
4	Front fork oil capacity (each leg)	242 ± 2.5 cc	

BEARING SPECIFICATION



CARBURETTOR ASSEMBLY (Applicable for Carburettor Version)

S.No.	DESCRIPTION	SPECIFICATION
1	Carburettor type	BS
2	Main Jet	107.5
3	Needle jet	P0
4	Jet needle	4DHL1
5	E - Ring position	Centre
6	Pilot Jet	20
7	Piston valve	–
8	MCS screw turns	1½ ~ 3½ turns
9	Idling rpm	1500 ± 100 rpm
10	Idling CO % (with SAI and CAT)	1.0 ~ 3.0% by volume
11	Cable assembly throttle free play	1 ~ 2 mm

ELECTRICAL

S.No.	DESCRIPTION		SPECIFICATION
1	Spark plug type		BOSCH UR4KE / NGK MR7E-9
2	Spark plug gap		0.8 ~ 0.9 mm
3	Pulsar coil resistance	Carburettor Version Fi Version	180 ~ 220 ohms 360 ~ 440 ohms
4	Stator coil resistance	Carburettor version Fi version	0.6 ~ 0.8 ohms 0.2 ~ 1.2 ohms
5	Ignition coil resistance	Primary winding Secondary winding	4.05 ~ 4.95 ohms 8.96 ~ 13.44 k ohms
6	Thermal sensor resistance		3 ~ 14 k ohms
7	Throttle position sensor resistance		1.17 ~ 2.6 k ohms
8	MAT sensor resistance		2.375 ~ 2.625 k ohms
9	Fuel injector resistance		11.4 ~ 12.6 ohms
10	Idle air control valve (IACV) resistance		45.9 ~ 56.1 ohms
11	O2 sensor (heater) resistance		7.2 ~ 10.8 ohms
12	Gear position sensor	First gear Neutral Second gear Third gear Fourth gear Fifth gear	0.075 k ohms 0.75 k ohms 1.5 k ohms 2.7 k ohms 5.6 k ohms 15 k ohms
13	Fuel pump module resistance (Fi)	Full Empty	18 ~ 22 ohms 316.5 ~ 323.5 ohms
14	Charging performance		14.5 ± 0.3V @ 2500 rpm and above
15	Battery (Type / Amp.)		12V, 9 Ah
16	Battery open circuit voltage	Full charge Needs charging	12.9 Volts 12 Volts
17	Battery electrolyte specific gravity	Full charge Needs charging	1.28 1.25
18	Fuel sender unit resistance	Full Empty	4 ~ 6 ohms 108 ~ 112 ohms
19	Generator	Carburettor Version Fi Version	12V, 130W 12V, 260W
20	Head lamp	Carburettor Version Fi Version	12V, 35/35W HS1 12V, 60/55W H4
21	Position lamps		LED lamp
22	Tail lamp / brake lamp		LED indicator (1W max. / 2.5W max.)
23	Turn signal lamp		12V, 10W x 4
24	Number plate lamp		12V, 5W
25	Instrument panel		LCD / LED indicators
26	Horn		12V, DC x 2
27	Fuse	Carburettor Version Fi Version	12V, 15A and 10A each one (blade type) 12V, 20A, 15A and 10A x 2

BRAKES AND WHEEL ASSEMBLY **Unit : mm**

S.No.	DESCRIPTION		STANDARD	SERVICE LIMIT
1	Disc plate face out		0.2	0.3
2	Disc plate thickness	Front Rear	4.0 4.5	3.5 4.0
3	Disc pad thickness	Front Rear	6.2 7.3	1.4 1.4
4	Alloy wheel runout (front and rear)	Axial Radial	0.8 0.8	1.0 1.0
5	Axle runout	Front Rear	0.15 / 100 mm	0.25 / 100
6	Tyre size (tubeless)	Front Rear - Disc Rear - Drum	90/90 - 17 49P 130/70 - 17 M/C 62P 110/80 - 17	– –
7	Tyre tread depth	Front Rear	– –	1.0 1.0
8	Tyre pressure - Front	Solo Dual	1.75 kg/cm² (25 psi)	–
9	Tyre pressure - Rear	Solo Dual	2.00 kg/cm² (28 psi) 2.25 kg/cm² (32 psi)	– –
10	Swing arm axle runout		0.6	–
11	Front fork oil level (height)		130 mm	–

Note:
Any part in use is subject to wear and tear. The maximum amount of acceptable wear is called "Service Limit". Any part which is within the service limit is expected to provide a satisfactory period of service life.

TIGHTENING TORQUE

ENGINE

S.No.	DESCRIPTION	QUANTITY	TORQUE IN Nm
1	Spark plug	1	12.5 ± 2.5
2	Plug complete oil drain	1	22.5 ± 2.5
3	Bolt, cap oil strainer	3	10 ± 2
4	CRR pan head screw, oil strainer	2	8 ± 2
5	Bolt, oil flow inspection	1	12 ± 2
6	Bolt, adjuster assembly tensioner	2	10 ± 2
7	Nut, cylinder head mounting (at side)	2	7 ± 1
8	Bolt, cover cylinder head mounting	4	10 ± 2
9	Bolt, camshaft sprocket mounting	1	18 ± 2
10	Bolt, cylinder head mounting	4	24.5 ± 2.5
11	Bolt, cam chain tensioner	1	12 ± 2
12	Bolt, rocker arm shaft	4	7 ± 1
13	CRR csk head screw, camshaft holder	1	4 ± 1
14	CRR csk head screw, pipe intake	2	10 ± 2
15	Stud, cylinder head	4	7 ± 1
16	Nut, cylinder mounting (at side)	2	7 ± 1
17	Bolt, oil cooler outlet and inlet pipe mounting (at clutch cover)	2	10 ± 2
18	Bolt , cover oil filter	3	10 ± 2
19	Bolt, cover clutch mounting	11	10 ± 2
20	Hexagonal socket head cap screw, cover clutch mounting	1	10 ± 2
21	Bolt, plate clutch release	4	10 ± 2
22	Nut, clutch assembly mounting	1	75 ± 5
23	Bolt, oil pump mounting	3	9 ± 1
24	Bolt, gear shit cam stopper mounting	1	6 ± 1
25	CRR csk head screw, index star mounting	1	8 ± 2
26	Nut, gear primary drive mounting	1	60 ± 5
27	Nut, balancer shaft mounting	1	55 ± 5
28	Bolt, lever assembly gear shift	1	10 ± 2
29	CRR pan head screw, cover engine sprocket	2	10 ± 2
30	Hexagonal screw, sprocket engine mounting	2	8 ± 1
31	Bolt, retainer oil seal drive shaft	2	10 ± 2
32	Bolt, switch gear position	2	10 ± 2
33	Bolt, guide speed sensor	1	10 ± 2
34	Bolt, speed sensor	2	10 ± 2
35	Bolt, contact complete gear shift	1	4 ± 1
36	Bolt, cover magneto mounting	9	10 ± 2

TIGHTENING TORQUE

ENGINE

S.No.	DESCRIPTION	QUANTITY	TORQUE IN Nm
37	Hexagonal flange nut, magneto rotor mounting	1	80 ± 5
38	Bolt, one way clutch	3	12 ± 1
39	Bolt, stator coil mounting	3	10 ± 2
40	Plug TDC	1	27.5 ± 2.5
41	Plug crankshaft hole	1	10 ± 2
43	U nut, engine mounting	4	32.5 ± 2.5
44	Bolt, starter motor assembly	2	10 ± 2
45	Hexagonal flange bolt, crankcase mounting	15	10 ± 2
46	Bolt, bracket idler gear	1	10 ± 2
47	Bolt, pipe complete inlet and outlet (mounting at oil cooler)	4	10 ± 2
48	Bolt, oil cooler mounting	2	10 ± 2
49	Bolt, Kick starter	1	23.5 ± 1.5
50	Bolt, SAI pipe complete mounting with cylinder head	1	5.5 ± 0.5
51	Screw, starter motor positive terminal mounting	1	10 ± 2
52	Screw, retainer guide TM oil mounting	1	8 ± 2
53	Clamp outlet pipe air cleaner	1	1.75 ± 0.25
54	Clamp pipe intake (carburettor / throttle body mounting)	1	2.25 ± 0.25

TIGHTENING TORQUE

CHASSIS

S.No.	DESCRIPTION	QUANTITY	TORQUE IN Nm
1	U nut, axle front	1	76 ± 18
2	Special screw, disc plate mounting (front wheel)	6	31 ± 3
3	Special screw, disc plate mounting (rear wheel)	3	31 ± 3
4	Hexagonal socket head cap screw, front fork upper mounting (upper bracket)	2	19 ± 2
5	Bolt, front fork lower mounting (lower bracket)	2	36 ± 4
6	Lock nut, steering	1	80 ± 20
7	Hexagonal socket head cap screw, handle bar mounting	2	16 ± 2
8	Bolt, caliper assembly mounting (front)	2	23 ± 5
9	Cap nut, front fork	1	23 ± 3
10	Allen bolt, fork leg assembly (cylinder mounting)	1	20 ± 5
11	Lock nut, rear view mirror	2	28.5 ± 6.5
12	Bolt, brake / clutch lever mounting	1	11 ± 0.5
13	Bolt, master cylinder mounting (front)	2	10 ± 2
14	CRR pan head screw, housing head lamp top mounting	2	3 ± 1
15	Bolt, housing head lamp bottom mounting	2	4.5 ± 1.5
16	CRR screw, front fender mounting	2	3 ± 1
17	Bolt, front fender mounting	4	18 ± 3
18	Bolt, fuel tank mounting	2	7 ± 1
19	Screw, fuel tank cap mounting	3	4.5 ± 0.5
20	Screw, inlet fuel tank mounting	3	4.5 ± 0.5
21	Bolt, fuel cock mounting	2	7 ± 1
22	Bolt, fuel sender unit mounting	4	2.5 ± 0.5
23	Bolt, ignition coil mounting	2	5.5 ± 1
24	Bolt, SAI assembly mounting	2	7.5 ± 1
25	Nut, side stand mounting	1	37 ± 3
26	Bolt, center stand mounting	2	37 ± 3
27	CRR screw, reservoir rear	1	3 ± 1
28	Bolt, hugger rear mounting	4	8 ± 2
29	Bolt, chain guide mounting	2	8 ± 2
30	Bolt, master cylinder mounting (rear)	2	30 ± 2
31	Banjo bolt, master cylinder and caliper mounting (front & rear)	4	30 ± 2
32	Nut, swing arm assembly mounting	1	40 ± 4
33	Hexagonal socket head cap screw, front foot rest mounting	2	18 ± 3
34	Bolt, shockabsorber mounting	2	60 ± 4
35	Bolt, saree guard mounting (at frame)	4	27 ± 3
36	Screw, engine guard top mounting	3	4.5 ± 1.5

TIGHTENING TORQUE

CHASSIS

S.No.	DESCRIPTION	QUANTITY	TORQUE IN Nm
37	Hexagonal socket head cap screw, pillion handle mounting	4	22 ± 2
38	Nut, axle complete rear	1	78 ± 18
39	Bolt, chain case complete mounting	4	8 ± 2
40	Nut, muffler assembly mounting (at rear)	1	19.6 ± 2
41	Hexagonal socket head cap screw, muffler mounting (at front)	2	18.1 ± 1.3
42	Hexagonal socket head cap screw, muffler mounting (at frame)	1	18.1 ± 1.3
43	Bolt, bracket crash guard	4	27 ± 3
44	Bolt, fuel pump module mounting	6	8 ± 1
45	Nut, rear sprocket mounting	4	48 ± 2
46	Screw, cover frame L & R mounting	2	3 ± 1
47	Screw, deflector mounting (self tapping)	2	1.5 ± 0.5
48	Screw, deflector mounting	1	3 ± 1
49	Screw, cover fuel tank L & R mounting	2	3 ± 1
50	Screw, fuel tank cap inner mounting	1	3 ± 1
51	Screw, cover fuel tank inner L & R mounting	6	1.5 ± 0.5
52	Screw, cover fuel tank outer L & R mounting	7	1.5 ± 0.5
53	Screw, tail cover assembly mounting with chassis	5	6 ± 2
54	Screw, tail cover center mounting with chassis	1	3 ± 1
55	Screw, cover air cleaner mounting	4	2 ± 0.2
56	Screw, throttle cable locking	1	2.25 ± 0.25
57	Screw, throttle case upper and lower mounting	2	1.75 ± 0.25
58	Bolt, brake cam lever mounting	1	7 ± 1
59	Nut, torque link mounting	2	13 ± 3

SPECIAL MATERIAL REQUIRED FOR MAINTENANCE

The following recommended materials are required for maintenance work on TVS Apache RTR 160 4V / 160 Fi 4V and should be kept in hand for ready use.

S.No.	APPLICATION	MATERIAL
LUBRICANTS		
1	Front fork oil seal lip	Kluber Centoplex 2 or equivalent
2	Swingarm assembly pivot, throttle grip, speedo cable, brake cams and control levers	BP MP Grease No.3, Servo Gem (IOC) No.3 and Bechem premium grade 3
3	Steering races, steering cup and steering cone	Bechem premium grade 3
4	Centre stand / side stand pivot and kick starter pedal pivot	TVS TRU4 FULLY SYNTHETIC oil
5	Engine cum transmission oil	TVS TRU4 FULLY SYNTHETIC oil (SAE10W30 SL-JASO MA2)
6	Front fork oil	TRU Fork oil
7	Drive chain lubricant	TVS TRU SPRAY
ADHESIVES		
1	Liquid gasket	Locktite 5020 (or) Equivallant
2	Packing seal cover cylinder head	Locktite 5205
3	Fastening nuts adhesion	Anabond 112 or Locktite 270 or Specfit grade 680
4	Fastening rubber, plastics and ceramic	Anabond (Eng) Cyanoacrylate adhesive 202 and 201 Dendrite adhesive
5	Bearing fitment adhesive	Specfit
CLEANING SOLVENTS		
1	Crankcase, shafts, gears and filter air cleaner	Inflammable solvent like kerosene
2	Piston and rings	Carbon tetra chloride and Acetone carbon chloride
3	Carburettor	Carbon tetra chloride
BRAKE FLUID		
1	TVS Girling	DOT 3 / DOT 4

USE OF GENUINE TVS MOTOR COMPANY PARTS

When replacing any part of the machine, always use TVS-M genuine parts only. Non genuine parts will reduce the performance of TVS Apache RTR 160 4V / 160 Fi 4V and cause failures.

FUEL

ITEM	SPECIFICATION
Fuel type	Unleaded Petrol
Fuel tank capacity including reserve	12 litres
Reserve (only in Carburettor Version)	2.5 litres

TROUBLE SHOOTING

A. STARTING TROUBLE - Incase of Carburettor Version

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
A1	Self starter not working	Battery voltage is less	Charge the battery / replace
		Loose connection	Tighten
		Defective starter motor	Replace
		Defective starter relay	Replace
		Defective starter switch	Replace
		Defective neutral switch	Replace
		Defective TCI	Replace
		No continuity of wiring in harness	Replace
A2	No fuel flow to carburettor	No fuel in fuel tank	Fill petrol
		Clogged fuel cock filter / sediment filter	Clean
		Blockage of EVAP system	Check and Correct
A3	No spark / weak spark / intermittent spark	Battery dead	Replace
		Incorrect spark plug gap	Replace
		Dirty spark plug	Clean
		Bridging of electrodes	Replace
		Loose suppressor cap	Correct / fix properly
		Water entry between suppressor cap and spark plug	Clean
		Oily sparkplug	Check oil leakages through rings, valves into combustion chamber and correct
		Defective engine kill switch	Correct / Replace
		Defective ignition coil	Replace
		Defective ignition switch	Replace
		Defective TCI	Replace
		Defective pulsar coil	Replace
A4	Incorrect valve timing	Valve timing marks not matching	Correct valve timing
		Improper valve tappet clearance	Adjust tappets
A5	Induction leakage	Loose carburettor mounting	Tighten
		Damaged intake pipe and gasket	Replace

TROUBLE SHOOTING

A. STARTING TROUBLE - Incase of Carburettor Version (Contd.)

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
A6	Improper carburation	Sticky / worn out float needle	Clean / replace
		Loose main jet / pilot jet	Tighten
		Blocked passages	Clean the passages
		Incorrect MCS adjustment	Tune up correctly
		Excessive CO	Tune up correctly
		Incorrect jet size	Replace with specified size
		Incorrect float height	Correct
		Blockage of air filter inlet	Correct
A7	Poor compression	Leakage through head gasket	Tighten nuts / replace gasket
		Incorrect valve clearances	Adjust to specification
		Worn out piston rings	Replace
		Worn out cylinder and piston	Replace
		Leakage through valve	Do lapping and correct

B. STARTING TROUBLE - Incase of Fi Version

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
B1	Self starter not working	Battery voltage is less	Charge the battery / replace
		Loose connection	Tighten
		Defective starter motor	Replace
		Defective starter relay	Replace
		Defective starter switch	Replace
		Defective gear position sensor	Replace
		Defective ECU / Headlamp control unit	Replace
		No continuity of wiring in harness	Replace
B2	No fuel flow to injector	No fuel in fuel tank	Fill petrol
		Clogged fuel filter	Clean
		Improper working of fuel pump	Check and Correct
		Blockage of EVAP system	Check and Correct

TROUBLE SHOOTING

B. STARTING TROUBLE - Incase of Fi Version (Contd.)

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
B3	No spark / weak spark / intermittent spark	Battery dead	Replace
		Incorrect spark plug gap	Replace
		Dirty spark plug	Clean
		Bridging of electrodes	Replace
		Loose suppressor cap	Correct / fix properly
		Water entry between suppressor cap and spark plug	Clean
		Oily sparkplug	Check oil leakages through rings, valves into combustion chamber and correct
		Defective engine kill switch	Correct / Replace
		Defective ignition coil	Replace
		Defective ignition switch	Replace
		Defective ECU	Replace
		Defective pulsar coil	Replace
B4	Incorrect valve timing	Valve timing marks not matching	Correct valve timing
		Improper valve tappet clearance	Adjust tappets
B5	Induction leakage	Loose throttle body mounting	Tighten
		Damaged intake pipe and gasket	Replace
B6	Improper carburation	Blockage of air filter inlet	Correct
B7	Poor compression	Leakage through head gasket	Tighten nuts / replace gasket
		Incorrect valve clearances	Adjust to specification
		Worn out piston rings	Replace
		Worn out cylinder and piston	Replace
		Leakage through valve	Do lapping and correct

TROUBLE SHOOTING

C. POOR PICK-UP

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
C1	No free movement of vehicle	Brake binding	Adjust both brakes
		Low tyre pressure	Inflate to specification
		Jammed wheel bearings	Replace / lubricate
		Tight chain	Adjust free play
		Tight drive shaft	Check and correct circlip seating
C2	Improper ignition	Refer complaint No. A3 & B3	
		Refer complaint No. A4 & B4	
C3	Improper carburation	Refer complaint No. A6 & B6	
C4	Clutch slippage	Incorrect free play	Adjust as per specification
		Burnt drive, driven plates	Check and replace
C5	Poor compression	Refer complaint No. A7 & B7	
C6	Poor engine response on acceleration	Block at air cleaner inlet below the cover frame	Remove blockage
C7	Jerking at particular RPM	Blockage of carburettor breather hose and improper routing	Clean / correct

D. GEAR SHIFTING RELATED

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
D1	Gear shifting hard	Improper free play in clutch lever	Adjust free play to specification
		Gear shift lever fouling with foot rest	Inspect and correct
		Poor engine oil quality	Replace
		Improper drive chain slackness	Inspect and adjust
D2	Neutral lamp not working	Contact gear shift switch defective	Correct / Replace
		Gear position sensor / neutral switch defective	Replace
		Loose connection	Correct
		No continuity in wiring harness	Replace
		Neutral lamp LED not working	Replace speedometer

TROUBLE SHOOTING

E. SMOKY EXHAUST (WHITE SMOKE)

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
E1	Burning of oil in combustion chamber	Oil mixed in fuel	Replace fuel in tank and clean
		Adulterated fuel	Replace fuel in tank and clean
		Improper routing / clogged breather pipe	Correct routing / clean
		Damaged seal valve stem oil / valve stem	Replace
		Incorrect fitment of 2nd and Oil rings	Fit properly
		Worn out piston rings	Replace Rings
		Worn out cylinder and piston	Replace cylinder and piston
		Engine oil level exceeded maximum limit	Fill to the specified level

F. SMOKY EXHAUST (BLACK SMOKE) - Incase of Carburettor Version

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
F1	Very rich mixture	Sticky / worn out float needle	Correct / replace
		Worn out jets	Replace
		Clogged air filter	Clean / replace
		Punctured float	Replace
		Choke plunger stuck	Correct

G. ENGINE OVER HEATING

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
G1	Poor cooling	Cooling fins covered with mud	Clean
G2	No free movement of vehicle	Refer complaint No. C1	
G3	Incorrect ignition	Refer complaint No. A3 & B3	
G4	Poor lubrication	Incorrect type of oil	Use recommended oil
		Low quantity / poor quality	Top up / replace as specified
		Oil filter clogged	Clean / replace
		Defective oil pump	Replace
		Blocked oil passages	Clean / Correct
G5	Clutch slippage	Refer complaint No. C4	
G6	High compression pressure	Excessive carbon deposition	Decarbonise engine & muffler
G7	Incorrect valve timing	Improper valve clearance	Check and adjust
G8	Incorrect sparkplug	Wrong heat range of sparkplug	Replace

TROUBLE SHOOTING

H. HIGH FUEL CONSUMPTION

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
H1		Refer complaint Nos. C1, 2, 3, 4, 5, 6 & 7	
H2	Fuel leakages	Leakage through fuel tank, fuel hoses	Correct leakages
		Leakage through fuel cock and carburettor (only in Carburettor Version)	Correct leakages

I. EXCESSIVE CO

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
I1	Improper carburation	Refer complaint No. A6 & B6	
I2	Malfunctioning of exhaust gas analyser	Wrongly selected settings / accessories	Correct
I3	Rich mixture	Refer complaint No. F1	

J. JERKY MOVEMENT / ABNORMALITY OF ENGINE RPM-Incase of Carburettor Version

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
J1	Excessive CO	Improper idling rpm	Adjust idling

K. HEAD LAMP NOT WORKING

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
K1	Bulb fused	Defective bulb	Replace
K2	No power supply to bulb	Loose contact in bulb holder / switch	Correct contacts
		Loose contact in wiring couplers	Correct contacts
		Defective TCI / Head lamp control unit	Replace
		Wiring cut	Replace wiring harness
		No power supply from stator coil	Check stator coil resistence
		Defective RR unit	Replace
		Defective switches	Replace

L. KICKSTARTER RELATED

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
L1	Kickstater slippage	Negative clutch play	inspect / adjust
		Poor quality engine oil	Replace
		Defective / worn out clutch plates	Replace
		Negative valve clearance / valve leakage	Inspect and correct
		Compression leak (weak)	Inspect and correct

TROUBLE SHOOTING

M. HORN NOT WORKING

STEP	REASON	POSSIBLE CAUSE	COUNTER MEASURE
M1	No sound	Blown fuse	Replace
		No / discharged battery	Fix / recharge
		Defective horn	Replace
		Defective horn button	Correct / replace
		Wiring cut / disconnected terminal	Replace / connect
M2	Weak / irregular sound	Loose connection	Correct
		Discharged battery	Recharge
		Incorrect tuning of horn	Tune properly (lock the nut after tuning)
M3	Rippling noise	Defective connections	Check each terminal
		Defective horn	Replace
		Loose clamp	Correct