

**aprilia**

**1122 3**

00/2003-09

**QUASAR 125 - 180**

[www.serviceaprilia.com](http://www.serviceaprilia.com)

**workshop** manual



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## FOREWORD

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0.1 RELEASE 00/2003-09 UPDATE

Issue date of original release (Release 00) and subsequent releases:

First edition (Release 00)..... September 2003

0.1.1 MANUAL UPDATES

Always keep manual updated to the latest release you have received.

**Add the latest release pages to the manual and destroy all superseded pages (even if they belong to the release before last).**

**⚠ WARNING**

**Failure to keep the manual up-to-date or to eliminate superseded pages will make the manual more difficult to consult and creates a risk of improper servicing.**

0.1.2 LIST OF MANUAL PAGES AND UPDATE NUMBERS

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0.2 FOREWORD

- This manual provides the information required for normal servicing.
- The information and illustrations contained in this manual will be updated through subsequent releases, see see 0.1 (RELEASE 00/2003-09 UPDATE).
- This manual is intended for use by **Aprilia** Dealers and their qualified mechanics. Certain information has been omitted intentionally, as this manual does not purport to provide a comprehensive treatise on mechanics. The persons who will use this manual must be fully conversant with the basics of mechanics and with the basic procedures of motorcycle repair. Repairing or inspecting a motorcycle when one does not possess such basic knowledge or training could result in improper servicing and make the motorcycle unsafe to ride. For the same reason, certain basic precautions have been omitted in the descriptions of repair and inspection procedures. Take special care to avoid damage to motorcycle components or injury to persons. **Aprilia's** mission is to constantly enhance the riding pleasure of final users through the on-going improvement of its products as well as of the relevant technical literature. All **Aprilia** Points of Sale and Subsidiaries worldwide are kept updated on major engineering changes and modifications to repair procedures. Such changes and modifications are then reflected in the next release of the relevant manual. When in doubt about an inspection or repair procedure, please contact the **Aprilia** Consumer Service (A.C.S.) Department, who will be glad to provide full information on the procedure in question as well as on any updates or engineering changes affecting the motorcycle under consideration.

**Aprilia** reserves the right to make changes to its products at any time, barring any such changes as may alter the essential features of a product as specified in the relevant manual.

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For further information, see 0.3 (REFERENCE MANUALS).

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0.3 REFERENCE MANUALS

0.3.1 OWNER'S MANUALS

<b>Aprilia part# (description)</b>
<b>Model year 2003</b>
8104713 <b>UK</b> <b>E</b> <b>D</b> <b>F</b>

0.3.2 SPARE PARTS CATALOGUE

<b>Aprilia part# (description)</b>
<b>Model year 2003</b>
A 60200 <b>UK</b> <b>E</b> <b>D</b> <b>F</b>

## 0.4 ABBREVIATIONS/SYMBOLS/CONVENTIONS

#	= number
<	= is less than
>	= is more than
≤	= is less than or equal to
≥	= is more than or equal to
~	= approximately
∞	= infinite
°C	= degrees Celsius (centigrade)
°F	= degrees Fahrenheit
±	= plus or minus
AC	= Alternated Current
A	= Ampere
Ah	= Ampere per hour
API	= American Petroleum Institute
HT	= high tension
AV/DC	= Anti-Vibration Double Countershaft
bar	= pressure measurement (1 bar =100 kPa)
DC	= Direct Current
cm <sup>3</sup>	= cubic centimeters
CO	= carbon oxide
CPU	= Central Processing Unit
DIN	= German industrial standards (Deutsche Industrie Norm)
DOHC	= Double Overhead Camshaft
ECU	= Electronic Control Unit
rpm	= revolutions per minute
HC	= unburnt hydrocarbons
ISC	= Idle Speed Control
ISO	= International Standardization Organization
Kg	= kilograms
Kgm	= kilogram per metre (1 kgm =10 Nm)
km	= kilometres
kph	= kilometres per hour
kΩ	= kiloohm
kPa	= kiloPascal (1 kPa =0.01 bar)
KS	= clutch side (from the German "Kupplung Seite")
kW	= kiloWatt
ℓ	= litres
LAP	= racetrack lap
LED	= Light Emitting Diode
LEFT	
SIDE	= left side
m/s	= metres per second
max	= maximum
mbar	= millibar (1 mbar =0.1 kPa)
mi	= miles
MIN	= minimum
MPH	= miles per hour
MS	= flywheel side
MΩ	= megaohm
N.A.	= Not Available
N.O.M.M.	= Motor Octane Number
N.O.R.M.	= Research Octane Number
Nm	= Newton per metre (1 Nm =0.1 kgm)
Ω	= ohm
PICK-UP	= pick-up
BDC	= Bottom Dead Centre
TDC	= Top Dead Centre
PPC	= Pneumatic Power Clutch
RIGHT	
SIDE	= right side
SAE	= Society of Automotive Engineers
TEST	= diagnostic check
T.B.E.I.	= crowned-head Allen screw
T.C.E.I.	= cheese-headed Allen screw

<b>T.E.</b>	= hexagonal head
<b>T.P.</b>	= flat head screw
<b>TSI</b>	= Twin Spark Ignition
<b>UPSIDE- DOWN</b>	= inverted fork
<b>V</b>	= Volt
<b>W</b>	= Watt
<b>Ø</b>	= Diameter



GENERAL INFORMATION

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## GENERAL INFORMATION

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1.1 CONVENTIONS USED IN THE MANUAL

- This manual is divided in sections and subsections, each covering a set of the most significant components.
- For quick reference, see the summary of sections on page 0-1.
- Unless expressly specified otherwise, assemblies are reassembled by reversing the dismantling procedure.
- The terms "right" and "left" are referred to the rider seated on the vehicle in the normal riding position.
- Motorcycle operation and basic maintenance are covered in the "OWNER'S MANUAL".
- ★ Any operations preceded by the star symbol must be repeated on the opposite side of the motorcycle.

In this manual any variants are identified with these symbols:

Frame Quasar 125 HP:ZD4KY10003TXXXXXX (STARTING FROM MODEL YEAR 2003);  
 Frame Quasar 125 Grip:ZD4KY11003TXXXXXX (STARTING FROM MODEL YEAR 2003);  
 Frame Quasar 180 HP:ZD4KY00003TXXXXXX (STARTING FROM MODEL YEAR 2003);  
 Frame Quasar 180 Grip:ZD4KY01003TXXXXXX (STARTING FROM MODEL YEAR 2003).

**ASD** automatic light switching version (Automatic Switch-on Device)  
**OPT** optional

VERSION:

- |                          |                        |                                     |
|--------------------------|------------------------|-------------------------------------|
| <b>I</b> Italy           | <b>GR</b> Greece       | <b>MAL</b> Malaysia                 |
| <b>UK</b> United Kingdom | <b>NL</b> Holland      | <b>RCH</b> Chile                    |
| <b>A</b> Austria         | <b>CH</b> Switzerland  | <b>HR</b> Croatia                   |
| <b>P</b> Portugal        | <b>DK</b> Denmark      | <b>AUS</b> Australia                |
| <b>SF</b> Finland        | <b>J</b> Japan         | <b>USA</b> United States of America |
| <b>B</b> Belgium         | <b>SGP</b> Singapore   | <b>BR</b> Brazil                    |
| <b>D</b> Germany         | <b>SLO</b> Slovenia    | <b>RSA</b> Republic of South Africa |
| <b>F</b> France          | <b>IL</b> Israele      | <b>NZ</b> New Zeland                |
| <b>E</b> Spain           | <b>ROK</b> South Korea | <b>CDN</b> Canada                   |

1.2 SAFETY WARNINGS

The following precautionary warnings are used throughout this manual in order to convey the following messages:

**!** Safety warning. When you find this symbol on the vehicle or in the manual, be careful to the potential risk of personal injury. Disregarding the instructions identified by this symbol may compromise the safety of the user, the motorcycle and third parties.

**! CAUTION**

Indicates a potential hazard which may result in serious injury or even death.

**! WARNING**

Indicates a potential hazard which may result in minor personal injury or damage to the vehicle.

**NOTE** The word "NOTE" in this manual precedes important information or instructions.

### 1.3 GENERAL SAFETY RULES

#### 1.3.1 CARBON OXIDE

When an operation must be performed with the engine running, position the motorcycle out of doors or in a well-ventilated area. Never operate the engine indoor.

Use an exhaust emission extraction plant when working indoor.

#### **⚠ CAUTION**

**Exhaust emissions contain carbon oxide, which is a poisonous gas and may lead to loss of conscience or even death.**

Operate the engine out of doors or, if working indoors, use an exhaust emission extraction plant.

#### 1.3.2 FUEL

#### **⚠ CAUTION**

**The fuel used to operate engines is highly flammable and becomes explosive under particular conditions.**

**Refuelling and engine service should take place in a well-ventilated area with the engine stopped.**

**Do not smoke when refuelling or in the proximity of sources of fuel vapours. Avoid contact with bare flames, sources of sparks or any other source which may ignite the fuel or lead to explosion.**

**DO NOT RELEASE FUEL INTO THE ENVIRONMENT.**

**KEEP AWAY FROM CHILDREN.**

#### 1.3.3 HOT COMPONENT PARTS

The engine and exhaust component parts become hot when the engine is running and will stay hot for some time after the engine has been stopped.

Wear heat gloves before handling these components or allow for the engine and exhaust system to cool down before proceeding.

#### 1.3.4 TRANSMISSION OIL

Use  PONTIAX HDI SAE 85W - 140 or  Agip POTRAIMP 85W-140. As an alternative to recommended fluids it is possible to use high-quality fluids having equal or higher ratings with respect to A.P.I. GL-4 specifications.

#### **⚠ WARNING**

**Insufficient lubrication or the use of unsuitable lubricants may result in irreparable damage due to increased wear and tear of the moving parts.**

**Do not overtighten the drain plug as this could damage the crankcase.**

**Used oil contains substances that are harmful to the environment, even small quantities must be disposed of in compliance with the regulations in force.**

**To avoid serious skin damage due to prolonged contact with oil, accurately wash your hands after handling the lubricant.**

**KEEP AWAY FROM CHILDREN.**

### 1.3.5 ENGINE OIL

Use  SUPERMOTOROIL SAE 15W - 40 or  F1 SUPERMOTOROIL 15W-40.

As an alternative to recommended fluids it is possible to use high-quality fluids having equal or higher ratings with respect to A.P.I. SJ/eF specifications.

#### WARNING

Insufficient lubrication or the use of unsuitable lubricants may result in irreparable damage due to increased wear and tear of the moving parts.

Do not overtighten the drain plug as this could damage the crankcase.

Used oil contains substances that are harmful to the environment, even small quantities must be disposed of in compliance with the regulations in force.

To avoid serious skin damage due to prolonged contact with oil, accurately wash your hands after handling the lubricant.

KEEP AWAY FROM CHILDREN.

### 1.3.6 HYDROGEN GAS AND BATTERY ELECTROLYTE

#### CAUTION

Battery electrolyte fluid is toxic and caustic. It contains sulphuric acid and can cause burns if spilled on the skin.

Wear close-fitting gloves and protective clothing when handling the battery electrolyte.

If any battery fluid gets on your skin, rinse the affected area with abundant fresh water.

Take special care to protect your eyes - even a small amount of battery acid can cause blindness. If battery fluid is spilled into your eyes, flush with abundant water for fifteen minutes and contact an eye specialist immediately.

If battery fluid is swallowed accidentally, drink abundant water or milk. Seek medical advice immediately and keep drinking magnesia milk or vegetable oil in the meantime. The battery gives off explosive gases. Keep the battery well away from any sources of ignition, such as flames, sparks, or any heat sources. Do not smoke near the battery.

Make sure the area is well-ventilated when servicing or charging the battery.

KEEP AWAY FROM CHILDREN.

Battery fluid is corrosive.

Avoid spillage. Take special care not to spill battery fluid on plastic parts.

Ensure that the electrolyte fluid you are using is suitable for your battery.

### 1.3.7 GENERAL PRECAUTIONS AND INFORMATION

Follow these instructions closely when repairing, disassembling or reassembling the motorcycle or its components.

#### CAUTION

Using bare flames is strictly forbidden when working on the motorcycle. Before servicing or inspecting the motorcycle: stop the engine and remove the key from the ignition switch; allow for the engine and exhaust system to cool down; where possible, lift the motorcycle using adequate equipment placed on firm and level ground. Be careful of any parts of the engine or exhaust system which may still be hot to the touch to avoid scalds or burns.

#### CAUTION

Never put any mechanical parts or other vehicle components in your mouth when you have both hands busy. None of the motorcycle components is edible. Some components are harmful to the human body or toxic.

If not expressly indicated otherwise, for the reassembly of the units repeat the disassembly operations in reverse order. Where a procedure is cross-referred to relevant sections in the manual, proceed sensibly to avoid disturbing any parts unless strictly necessary. Do not use polishing paste on matt paint.

Never use fuel instead of solvent to clean the motorcycle.

Do not use alcohol, petrol or solvents to clean the rubber and plastic parts and the seat: use only water and mild soap.

Always disconnect the battery negative (-) lead before soldering any electrical components.

When two or more persons service the same motorcycle together, special care must be taken to avoid personal injury. Read carefully 1.4 (WARNINGS REGARDING FUEL, LUBRICANTS AND OTHER COMPONENTS).

### 1.3.8 BEFORE DISASSEMBLING ANY COMPONENTS

- Clean off all dirt, mud, and dust and clear any foreign objects from the vehicle before disassembling any components.
- Use the model-specific special tools where specified.

### 1.3.9 DISASSEMBLING THE COMPONENTS

- Never use pliers or similar tools to slacken and/or tighten nuts and bolts. Always use a suitable spanner.
- Mark all connections (hoses, wiring, etc.) with their positions before disconnecting them. Identify each connection using a distinctive symbol or convention.
- Mark each part clearly to avoid confusion when refitting.
- Thoroughly clean and wash any components you have removed using a detergent with low flash point.
- Mated parts should always be refitted together. These parts will have seated themselves against one another in service as a result of normal wear and should never be mixed up with other similar parts on refitting.
- Certain components are matched-pair parts and should always be replaced as a set.
- Keep the motorcycle and its components well away from heat sources.

### 1.3.10 REASSEMBLING THE COMPONENTS

#### ⚠ WARNING

**Never reuse a circlip or snap ring. These parts must always be renewed once they have been disturbed. When fitting a new circlip or snap ring, take care to move the open ends apart just enough to allow fitment to the shaft. Make it a rule to check that a newly-fitted circlip or snap ring has located fully into its groove.**

Never clean a bearing with compressed air.

**NOTE** *All bearings must rotate freely with no hardness or noise. Replace any bearings that do not meet these requirements.*

- Use ORIGINAL **Aprilia** SPARE PARTS only.
- Use the specified lubricants and consumables.
- Where possible, lubricate a part before assembly.
- When tightening nuts and bolts, start with the largest or innermost nut/bolt and observe a cross pattern. Tighten evenly in subsequent steps until achieving the specified torque.
- Replace any self-locking nuts, gaskets, seals, circlips or snap rings, O-rings, split pins, bolts and screws which have a damaged thread.
- Abundantly lubricate parts subject to wear before fitting the bearings.
- Make it a rule to check that all components you have fitted are correctly in place.
- After repairing the motorcycle and after each service inspection, perform the preliminary checks, and then operate the motorcycle in a private estate area or in a safe area away from traffic.
- Clean all joint surfaces, oil seal edges and gaskets before assembly.
- Apply a light coat of lithium grease along the edges of oil seals. Fit oil seals and bearings with the brand or serial number facing outwards (in view).

### 1.3.11 ELECTRICAL CONNECTORS

Disconnect electrical connectors as follows; failure to follow the instructions can seriously damage the connectors and the wiring:

- ◆ Press down on the locking tab, where fitted.

#### ⚠ WARNING

**Never separate two connectors by pulling on the wiring.**

- ◆ Grasp both connectors and pull them in opposite directions until they become separated.
- ◆ Remove any dirt, rust, moisture, etc. from inside the connector blowing with compressed air.
- ◆ Ensure that the wires are securely crimped to the terminals inside each connector.

**NOTE** *A connector will only locate properly into the matching connector when it is inserted in the correct mounting position.*

- ◆ Reconnect the two connectors and ensure that they are fully engaged (where fitted, the locking tab should click audibly into place).

### 1.3.12 TORQUE FIGURES

#### ⚠ CAUTION

**Do not forget that the tightening torques of all fasteners on wheels, brakes, wheel spindles and other suspension components are essential to ensure safe operation of the motorcycle and must be set to the indicated values. Regularly check the tightening torques on all fasteners, and always use a torque wrench when fitting them. Failure to observe these instructions can result in parts coming loose or off, thus jamming a wheel or creating other problems which could affect the handling of the motorcycle, potentially resulting in serious injury or death.**

## 1.4 WARNINGS REGARDING FUEL, LUBRICANTS AND OTHER COMPONENTS

### 1.4.1 FUEL

#### **⚠ CAUTION**

The fuel used to operate engines is highly flammable and becomes explosive under particular conditions.

Refuelling and engine service should take place in a well-ventilated area with the engine stopped.

Do not smoke when refuelling or in the proximity of sources of fuel vapours. Avoid contact with bare flames, sources of sparks or any other source which may ignite the fuel or lead to explosion.

Take care not to spill fuel out of the filler, or it may ignite when in contact with hot engine parts.

In the event of accidental fuel spillage, make sure the affected area is fully dry before starting the engine. Fuel expands from heat and when left under direct sunlight. Never fill the fuel tank up to the rim. Tighten the filler cap securely after each refuelling.

Avoid contact with skin. Do not inhale vapours. Do not swallow fuel. Do not transfer fuel between different containers using a hose.

In case of contact with the eyes, rinse abundantly with clean water and immediately seek medical attention.

If accidentally swallowed, do not induce vomiting.

Drink abundant milk or cool water and seek medical attention immediately.

**DO NOT RELEASE FUEL INTO THE ENVIRONMENT.**

**KEEP AWAY FROM CHILDREN.**

Use only premium-grade unleaded fuel with a minimum octane rating of 95 (N.O.R.M.) and 85 (N.O.M.M.).

#### **ENGINE OIL**

Engine oil may cause serious damage to the skin if handled daily and for long periods.

Wash your hands carefully after use.

Do not release oil into the environment.

Put it in a sealed container and take it to the filling station where you usually buy it or to an oil salvage centre.

In case any maintenance operation should be required, it is advisable to use latex gloves.

Change engine oil after running-in, namely after two weeks of usage, and then every six months, see 2.3 (PERIODIC MAINTENANCE CHART), see 1.8 (LUBRICANT CHART).

Change oil every three months if the vehicle is used in rainy or dusty areas, on uneven surfaces or on racetracks.

## 1.4.2 LUBRICANTS

### **⚠ CAUTION**

Correct lubrication is essential to the safety of the motorcycle.

Failure to maintain the lubricant level or the use of incorrect, old or dirty lubricant can cause the engine or transmission to seize, resulting in accidents, serious injury or death.

Prolonged or repeated contact with lubricant may cause severe skin damage.

Wash your hands thoroughly after handling engine oil.

Do not release into the environment.

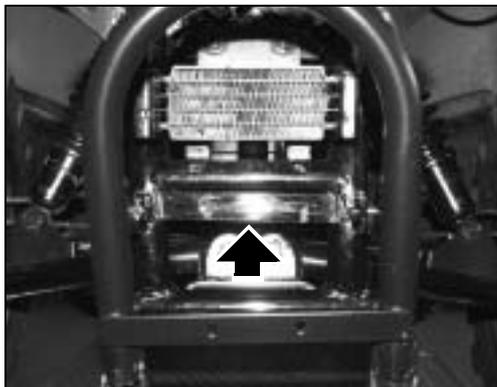
Dispose of engine oil through the nearest waste oil reclamation firm or through the supplier.

### **⚠ WARNING**

When filling the vehicle with lubricant, make sure not to spill it. Immediately clean up spilled oil, as it can damage the motorcycle paint.

Oil on the tyres can make them very slippery and dangerous to use.

In case of oil leaks, do not use the motorcycle. Identify the cause of the leak and repair it.



## 1.5 LOCATION OF SERIAL NUMBERS

These numbers are necessary for vehicle registration.

**NOTE** *Altering the identification numbers of vehicle or engine is a legal offence punishable by heavy fines and penalties. In addition, altering the frame number (VIN) results in immediate warranty invalidation.*

### 1.5.1 FRAME NUMBER

The motorcycle's frame number is stamped on the front part of the frame under front mudguard support.

### 1.5.2 ENGINE NUMBER

The engine number is stamped on the crankcase, on the left side of the motorcycle.



## 1.6 SPARE PARTS

Use Original **Aprilia** Spare Parts only for repairs.

Original **Aprilia** spare parts are high-quality components designed and built expressly for **Aprilia** motorcycles.

### **⚠ WARNING**

**Using any parts OTHER THAN original Aprilia parts may lead to loss of performance and damage.**

## 1.7 TECHNICAL DATA

	QUASAR 125	QUASAR 180
<b>DIMENSIONS</b>		
Length	1790 mm GRIP 1675 mm (HP)	1790 mm GRIP 1675 mm (HP)
Width	970 mm (GRIP/HP)	970 mm (GRIP/HP)
Max. height (to handlebars)	1060 mm (GRIP/HP)	1060 mm (GRIP/HP)
Wheel base	1065 mm (GRIP/HP)	1065 mm (GRIP/HP)
Min. ground clearance	160 mm (GRIP/HP)	160 mm (GRIP/HP)
Weight ready for starting	174 Kg (GRIP) - 171 kg (HP)	174 Kg (GRIP) - 171 kg (HP)
<b>ENGINE</b>		
Type	4-stroke	4-stroke
Number of valves	2	2
Number of cylinders	horizontal single cylinder	horizontal single cylinder
Total displacement	125 cm <sup>3</sup>	169 cm <sup>3</sup>
Bore/stroke	52,4 mm x 57,8 mm	61 mm x 57,8 mm
Compression ratio	9,1±1:1	9,1±1:1
Starting	electric + kick starter	electric + kick starter
Engine idling rpm	1800 ± 100 giri/min	1800 ± 100 giri/min
Clutch	automatic, dry centrifugal	automatic, dry centrifugal
Gearbox	automatic converter transmission	automatic converter transmission
Lubrication circuit	wet casing, forced circulation via mechanical pump	wet casing, forced circulation via mechanical pump
Cooling	air	air
<b>CAPACITY</b>		
Fuel (reserve included)	8 l	8 l
Fuel reserve	1,5 l	1,5 l
Transmission oil	200 cm <sup>3</sup>	200 cm <sup>3</sup>
Engine oil		
1) engine oil change only	0,9 l	0,9 l
2) change for engine overhaul	1,2 l	1,2 l
Seats	2	2
Vehicle max. load (driver + possible luggage)	98 Kg (GRIP) - 98 kg (HP)	98 Kg (GRIP) - 98 kg (HP)
<b>TRANSMISSION</b>		
Converter	automatic continuous	automatic continuous
Primary	with trapezoidal belt	with trapezoidal belt
Ratios		
1) minimum for continuous variable transmission	3	3
2) maximum for continuous variable transmission	0,789	0,789
Secondary	gear-type	gear-type
Final	chain-type	chain-type
<b>FUEL SUPPLY</b>		
Fuel	premium grade unleaded petrol, number DIN 51607, min. O.N. 95 (N.O.R.M.) and 85 (N.O.M.M.).	premium grade unleaded petrol, number DIN 51607, min. O.N. 95 (N.O.R.M.) and 85 (N.O.M.M.).
<b>CARBURETTOR</b>		
Type	WALBRO	WALBRO
Choke	Ø 22 mm	Ø 22 mm
<b>FRAME</b>		
Type	tube	tube
<b>SUSPENSIONS</b>		
Front	with independent arms	with independent arms
Rear	hydraulic monoshock absorber	hydraulic monoshock absorber
<b>BRAKES</b>		
Front	Ø 110 mm mechanically driven drum brake	Ø 110 mm mechanically driven drum brake
Rear	Ø 130 mm mechanically driven drum brake	Ø 130 mm mechanically driven drum brake

	QUASAR 125	QUASAR 180
<b>WHEEL RIMS</b>		
Type	steel	steel
Front	10X5.5	10X5.5
Rear	8X8.0	8X8.0
<b>TYRES</b>		
Type	tubeles	tubeles
Front HP	21x7-10	21x7-10
Rear HP	22x11-8	22x11-8
Front GRIP	AT 21x7-10	AT 21x7-10
Rear GRIP	AT 21x10-8	AT 21x10-8
Inflating pressure	20 - 25 kPa (0,20 - 0,25 bar)	30 kPa (0,30 bar)
<b>IGNITION</b>		
Type	C.D.I.	C.D.I.
Ignition advance	13° ± 2°	13° ± 2°
<b>SPARK PLUG</b>		
Standard	NGK CR8HSA	NGK CR8HSA
Spark plug gap	0,6 - 0,7 mm	0,6 - 0,7 mm
<b>ELECTRIC SYSTEM</b>		
Battery	12 V - 9 Ah	12 V - 9 Ah
Fuse	15 A	15 A
Generator (with permanent magnet)	12 V - 110 W	12 V - 110 W
<b>BULBS</b>		
Parking light	12 V - 5 W	12 V - 5 W
Low/high beam	12 V - 35/35 W	12 V - 35/35 W
Direction indicators	12 V - 10 W	12 V - 10 W
Rear parking lights/Stoplight	12 V - 5/21 W	12 V - 5/21 W
Number plate light	12 V - 5 W	12 V - 5 W

1.8 LUBRICANT CHART

LUBRICANT	PRODUCT
Transmission oil	<p><b>RECOMMENDED:</b>  PONTIAX HDI SAE 85W - 140 or  Agip ROTRA MP 85W-140. As an alternative to recommended fluids it is possible to use high-quality fluids having equal or higher ratings with respect to A.P.I. GL-5 specifications.</p>
Engine oil	<p><b>RECOMMENDED:</b>  SUPERMOTOROIL SAE 15W - 40 or  Agip F1 SUPERMOTOROIL 15W-40. As an alternative to recommended oil it is possible to use high-quality oil having equal or higher ratings with respect to A.P.I. SJ/eF specifications.</p>
Bearings and other lubrication points	<p><b>RECOMMENDED:</b>  AUTOGREASE MP or  Agip GREASE 30. As an alternative to recommended fluids it is possible to use high-quality grease for bearings, temperature range -30°C...+140°C, dripping point 150°C...230°C, highly corrosion protectant, good waterproof and oxidization-proof ability.</p>
Battery lead protection	Use neutral grease or vaseline.
Aerosol chain lubricant	<p><b>RECOMMENDED:</b>  CHAIN SPRAY or  Agip CHAIN LUBE.</p>

1.9 SPECIAL TOOLS

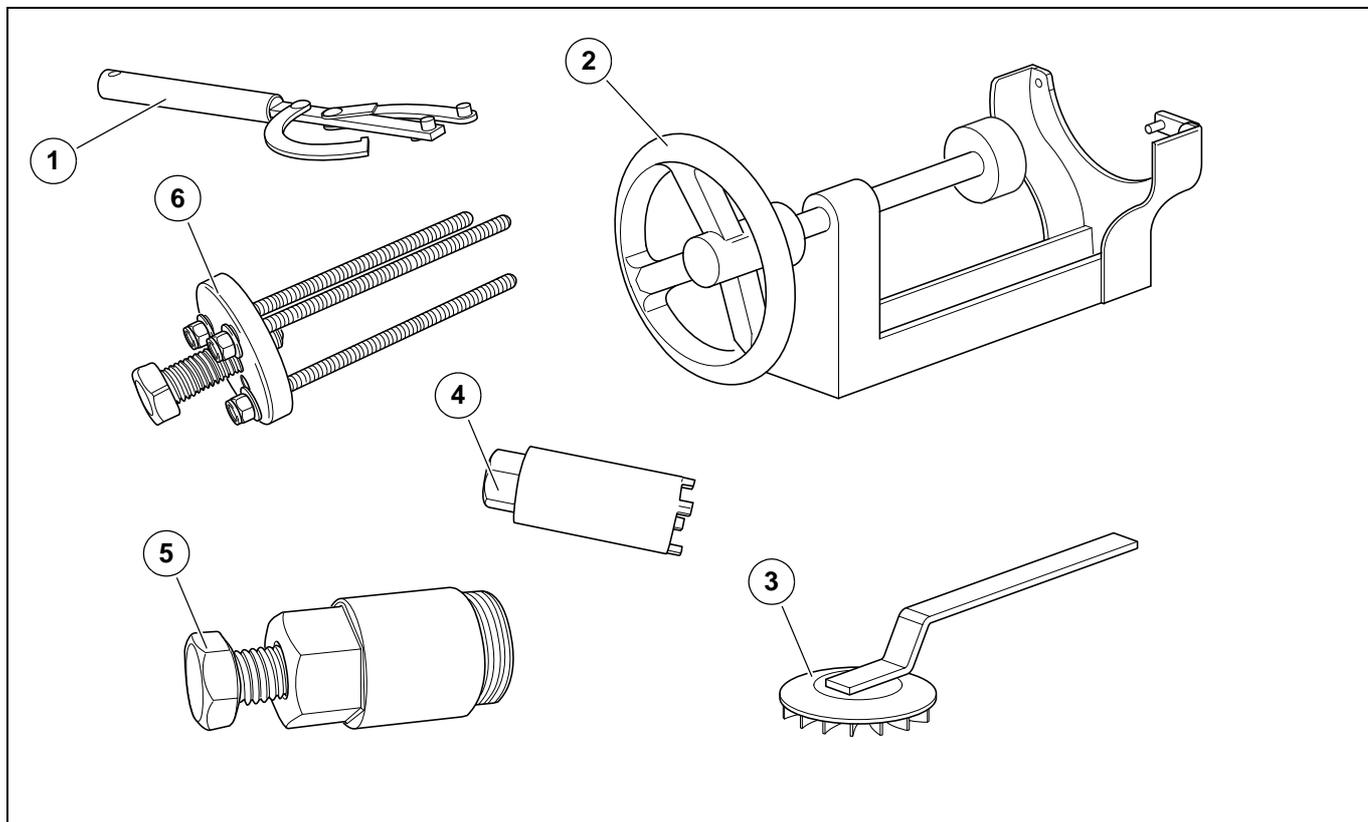
Special tools have been developed to ensure proper disassembly, re-assembly and adjustment without the risk of damaging any components.

Using inadequate tools and/or improvised procedures may lead to irreparable damage. Model-specific special tools for this vehicle are listed below.

If needed, order the brand-specific special tools (see Special Tools Catalogue).

**⚠ WARNING**

Always read the instructions supplied with the special tools before use.



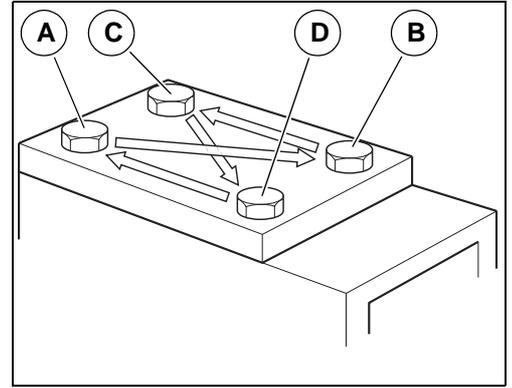
**TOOLS**

Ref.	Tool designation and application	Part number
1	Flywheel and clutch housing locking tool	8900675
2	Universal clutch assembly/disassembly tool	8900674
3	Converter locking tool	8900673
4	Ring nut spanner	8910599
5	Flywheel puller	8910600
6	Starting gear puller	8910601

1.10 TORQUE FIGURES

The table below reports the standard torque figures for metric size screws and bolts in accordance with ISO standards.

Screw or bolt	Spanner	Tightening torque	
		Nm	kgm
M 6	10	6	0.6
M 8	12	15	1.5
M 10	14	30	3.0
M 12	17	55	5.5
M 14	19	85	8.5
M 16	22	130	13.0



For vehicle-specific fastenings see 2.2 (FASTENERS).

Unless otherwise specified, torque figures are intended for application to clean, dry threads at room temperature.

**NOTE** Follow the instructions below to avoid distortion and/or improper fit:

- ◆ Screw all fasteners finger-tight.
- ◆ Tighten the opposing parts to half the prescribed torque: (A) and (B); (C) and (D).
- ◆ Repeat sequence tightening to specified torque.

**NOTE** This way, the load generated by the fasteners is applied evenly across joint surface.



PERIODIC MAINTENANCE

2

## PERIODIC MAINTENANCE

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Outlined in this section are the recommended procedures for the periodic maintenance of the key components of the motorcycle.

### **⚠ CAUTION**

**Before proceeding to maintain or inspect the motorcycle, stop the engine and remove the ignition switch key. Ensure that the engine and exhaust system have cooled down. Wherever possible, place the motorcycle on firm and level ground and lift it using suitable equipment. Be careful of any parts of the engine or exhaust system which may still be hot to the touch to avoid scalds or burns.**

**All component parts of the vehicle are inedible. Do not bite, suck, chew or swallow any vehicle parts. If not expressly indicated otherwise, for the reassembly of the units repeat the disassembly operations in reverse order.**

## 2.1 PERIODIC MAINTENANCE CHART

In order to preserve the motorcycle in sleek running order, **Aprilia** recommends that you strictly observe the periodic maintenance intervals recommended for the different component parts.

## 2.2 FASTENERS

**⚠ CAUTION**

The fasteners reported in the chart must be tightened to the specified torque using a torque wrench. Items highlighted with ( ■ ) are especially important for safety.

ENGINE			
Component	Nm	kgm	Note
Spark plug	20	2,0	
Throttle control covers	13	1,3	
Oil filter cover	15	1,5	
Flywheel retaining nut	38	3,8	
Camshaft flange nut	27	2,7	
Mobile belt roller nut	38	3,8	
Valve adjusting nut	5	0,5	
Cylinder head nut	27	2,7	
Primary drive gear nut	38	3,8	
Head stud bolt	13	1,3	
Oil bleeder	25	2,5	
Right casing screw	10	1,0	
Left casing screw	10	1,0	
Valve cover screw	14	1,4	
Converter cover screw	10	1,0	
Oil cooler retaining screw	9	0,9	
Starter motor screw	14	1,4	
Oil pump screw	14	1,4	
Stator screw	14	1,4	
Engine mount screw	28	28	

FRAME			
Component	Nm	kgm	Note
Upper handlebars braces	4	0,4	
Steering stem nut	10	1,0	
Rear shock absorber retaining nut	40	4,0	
Front hub retaining nut	60	6,0	
Rear hub retaining nut	95	9,5	
Front wheel retaining nut	38	3,8	
Rear wheel retaining nut	38	3,8	
Steering stem flange nut	25	2,5	
Swinging arm spindle nut	90	9,0	
Chain adjusting nut	22	2,2	
Handlebars lower fastener	10	1,0	
Front brake lever	10	1,0	
Rear brake lever	10	1,0	
Rear axle (inner) retaining screw	9	0,9	
Rear axle (outer) retaining screw	15	1,5	
Front shield retaining screw	4	0,4	
Steering arm retaining screw	30	3,0	
Headlight retaining screw	16	1,6	
Muffler retaining screw	25	2,5	
Footpeg retaining screw	4	0,4	
Front suspension screw	40	4,0	

2.3 PERIODIC MAINTENANCE CHART

Components	Post running-in checks (after 2 weeks)	Monthly	Six-monthly	Yearly
Throttle and brake cables	①	①		
Battery	①	①		
Spark plug			①	
Carburettor/idle speed	①		②	
Drive chain	①	Every 10 hours of operation: ①		
Air cleaner		②		③
Engine oil filter			②	
Light system	①	①		
Stop light switch	①	①		
Engine oil	③		③	
Tyres pressure	①	Always check before use		
Fuel indicator	①	①		
Ignition advance				④
Transmission cables ●	①		①	
Brake drums/blocks		Always check before use		
Drive belt				①
Steering tube bearing and steering clearance	①		①	
Ties				①
Fuel filter			③	
Clutch				①
Vehicle general operation	①		①	
Valve clearance	④			④
Greasing				
Exhaust pipe / exhaust silencer				①
Transmission oil ●	③		③	①
Rear belt roller pins				③
Fixed mobile front belt roller				③
Converter rollers				③
Bolt/screw/nut tightening	①		①	
Suspensions			①	
Fuel line	①		①	

KEY

- ① Check, clean and lubricate, adjust, top up or change if necessary.
- ② Cleaning.
- ③ Replace.
- ④ Adjustment.
- Run monthly in case of use on muddy, wet or rough surfaces (off-road).

**⚠ WARNING**

Service the motorcycle more frequently when you ride in the rain, on dusty or bumpy roads, or in competition trials.

## 2.4 LUBRICATION

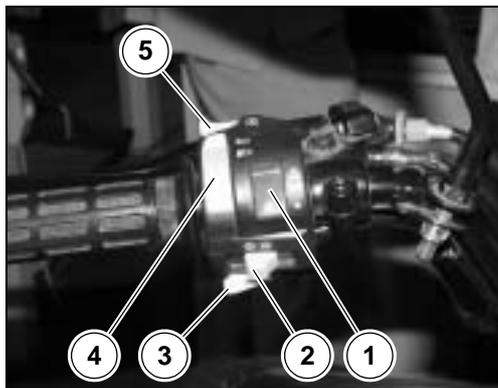
Proper lubrication is critical to ensuring smooth operation and preserving vehicle life.

**NOTE** Before lubricating any part, clean off any oxidation deposits, grease, dirt or dust.

Parts subject to oxidation must be lubricated with engine oil or grease, see 1.8 (LUBRICANT CHART).

### 2.4.1 SWITCH

**NOTE** Electrical components will only operate with the main switch at the "O" position.



**1) HAZARD LIGHT SWITCH (△)**

Press down the top (marked with the symbol) to flash all indicators at once.

**2) DIRECTION INDICATOR LIGHT SWITCH (⇄)**

Turn the switch to the left to indicate turning to the left; to the right to indicate turning to the right. Press the switch to turn off the indicators.

**3) HORN BUTTON (☡)**

Press to sound the horn.

**4) LIGHT DIP SWITCH (☞ - ☜)**

Turn the light switch to "☞" to activate the parking and low beam lights.  
Turn the switch to "☜" to activate high beam.

**NOTE** The light dip switch is only enabled when the main switch is in the "☞" position.

**5) STARTING BUTTON (Ⓢ)**

Press the "Ⓢ" button: the starter motor will turn over the engine.

**2.4.2 MAIN SWITCH**

The main switch (1) is at the right side of the motorcycle, on the front fairing.

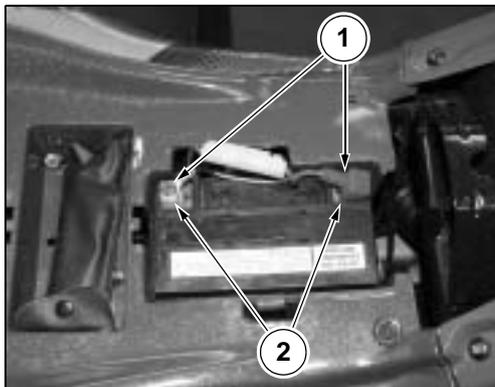
**NOTE** The key turns on the main switch and enables the use of the light dip switch, when it is in the "☀️" position.

The motorcycle is delivered with two keys (one spare key).

**NOTE** Keep the spare key separate from the motorcycle.



Position	Function	Removing the key
	The engine and lights cannot be operated.	The key may be removed.
	The engine may be started.	The key may not be removed
	The parking and low beam lights are operating and the high beam lights may be turned on and the engine started.	The key may not be removed



## 2.5 BATTERY

Read carefully 1.3.6 (HYDROGEN GAS AND BATTERY ELECTROLYTE).

### **⚠ CAUTION**

**Risk of fire.**

**Keep fuel and other flammable substances away from the electrical components.**

**Never invert the connection of the battery cables.**

**Connect and disconnect the battery with the main switch in position "⊗", otherwise some components may be damaged.**

**Connect first the positive cable (+) and then the negative cable (-).**

**Disconnect following the reverse order.**

**NOTE** *This vehicle is provided with a maintenance-free battery and no operation is necessary, excepting occasional checks and the recharge when required.*

If the motorcycle is not to be used for some time, disconnect the battery terminals.

### **CHECKING AND CLEANING THE TERMINALS**

◆ Remove the seat, see 6.1.1 (REMOVING THE SEAT).

◆ Ensure the main switch is in the "⊗" position.

Make sure that the cable terminals (1) and the battery terminals (2) are:

- in good conditions (and not corroded or covered with deposits);
- covered with neutral grease or vaseline.

If necessary, proceed as follows:

- Disconnect the negative (-) and positive (+) leads in this order.
- Clean off corrosion deposits using a wire brush.
- Reconnect the positive (+) and negative (-) leads in the order.
- Cover the terminals of the cables and of the battery with neutral grease or vaseline.

## 2.6 CHECKING THE ELECTROLYTE BATTERY LEVEL

The vehicle is equipped with a maintenance-free battery, which does not require any check of the electrolyte level.

### 2.6.1 RECHARGING THE BATTERY

**NOTE** You can tell that the battery is nearly flat when you hear a rattling sound from the starter relay when pressing the starter button "Ⓢ".

Do not remove the battery plugs or the battery may damage.

- ◆ Remove the battery, see 6.1.9 (REMOVING THE BATTERY).
- ◆ Prepare an appropriate battery charger.
- ◆ Set the charger for the desired type of recharge (see table).
- ◆ Connect the battery to the battery charger.

#### ⚠ CAUTION

**Charge or use the battery in a well-ventilated place. Do not inhale the gases produced by the battery under charging.**

- ◆ Switch on the battery charger.

Charge rate	Ampere rating	Time (hours)
Normal	0.4	5
Fast	4	0.5

#### ⚠ CAUTION

**Reassemble the battery only 5/10 minutes after disconnecting the recharge apparatus, since the battery continues to produce gas for a short lapse of time.**

#### INSTALLING THE BATTERY.

- ◆ Ensure the main switch is in the "Ⓢ" position.
- ◆ Remove the seat, see 6.1.1 (REMOVING THE SEAT).

**NOTE** The battery must be positioned in its compartment with the terminals directed towards the right side of the vehicle.

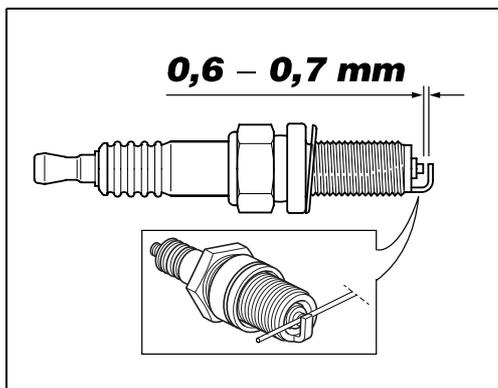
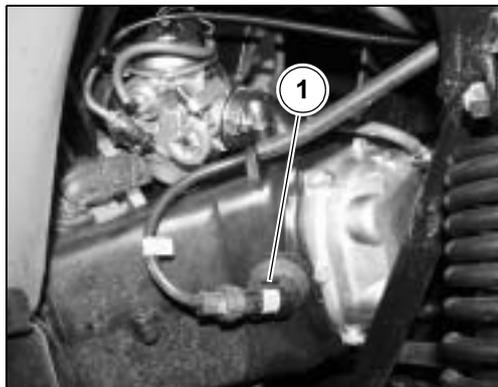
- ◆ Place the battery in its compartment.
- ◆ Refit the battery securing elastic band (1).

#### ⚠ CAUTION

**On refitting, connect the positive (+) lead first, then the negative (-) lead.**

- ◆ Connect the positive terminal (+) with its screw.
- ◆ Connect the negative terminal (-) with its screw.
- ◆ Cover the terminals of the cables and of the battery with neutral grease or vaseline.
- ◆ Put back the red protection element (2).
- ◆ Refit the seat.





## 2.7 SPARK PLUG

Read carefully 1.3 (GENERAL SAFETY RULES).

Check the spark plug every six months, remove carbon deposits and replace if necessary.

Removal and cleaning.

### ⚠ CAUTION

**Before carrying out the following operations, let the engine and the exhaust pipe cool down until they reach room temperature, in order to avoid burns.**

**Never remove a spark plug cap while the engine is running. Shock hazard.**

- ◆ Remove the spark plug cap (1).
- ◆ Remove any trace of dirt from the spark plug base.
- ◆ Unscrew the spark plug and extract it from its seat, taking care to prevent dust or other substances from getting inside the cylinder.
- ◆ Make sure that there are neither carbon deposits, nor corrosion marks on the electrode and on the spark plugs ceramics; if necessary, clean with a plug cleaner or wire brush.

Blow out with compressed air to stop residues getting into the engine itself.

If the spark plug has crackings on the insulating material, corroded electrodes or excessive deposits, it must be changed.

Check the electrode gap with a thickness gauge.

Electrode gap should be **0.6 -0.7 mm (0.02-0.03 in)**. If it needs adjusting, bend the earth electrode carefully.

Make sure the washer is in good condition. Fit the washer and screw the spark plug finger-tight to avoid damaging the thread.

Tighten the spark plug by means of the spanner you will find in the tool kit, giving it half a turn to compress the washer. Unscrew and tighten to the prescribed torque.

 **Spark plug torque: 19 Nm (1.9 kgm).**

### ⚠ CAUTION

**The spark plug must be well tightened, otherwise the engine may overheat and be seriously damaged. Replace only with spark plugs of the type indicated in this manual.**

Position the spark plug cap properly, so that it does not come off due to the vibrations of the engine.

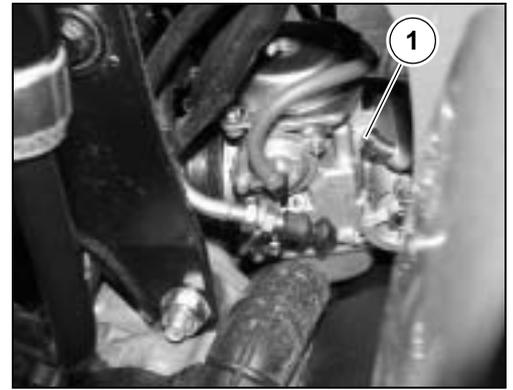
## 2.8 IDLING ADJUSTMENT

Read carefully 1.3 (GENERAL SAFETY RULES).

Adjust the idling every time it is irregular.

To carry out this operation, proceed as follows:

- ◆ Ride the motorcycle for a few kilometres to allow it to warm up, then adjust the screw (1) from the front of the vehicle.
- ◆ BY SCREWING IT IN (clockwise), you increase the rpm;
- ◆ BY UNSCREWING IT (anticlockwise), you decrease the rpm.
- ◆ With the brakes engaged, accelerate and decelerate a few times to check the operation of the throttle and to check if the idling speed is constant.



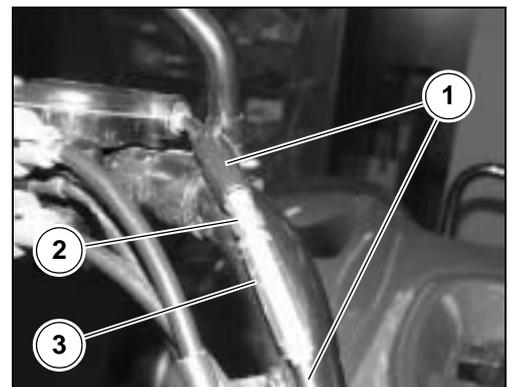
## 2.9 ADJUSTING THE THROTTLE CONTROL

**NOTE** Perform the maintenance operations more frequently if the vehicle is used in rainy or dusty areas, on uneven surfaces or on racetracks.

The idle stroke of the throttle lever must be **2-6 mm**.

If not, proceed as follows:

- ◆ Withdraw the protection elements (1).
- ◆ Slacken the locknut (2).
- ◆ Rotate the adjuster (3) in such a way as to restore the prescribed value.
- ◆ After the adjustment, tighten the lock nut (2) and check the idle stroke again.
- ◆ Refit the protection elements (1).

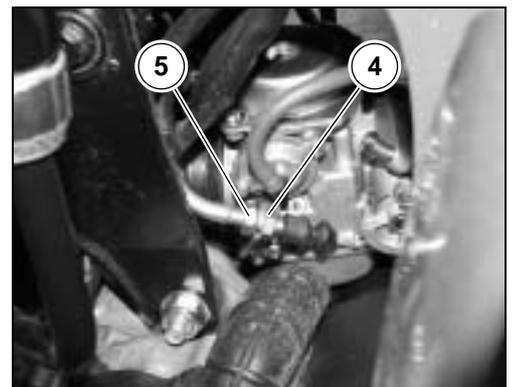


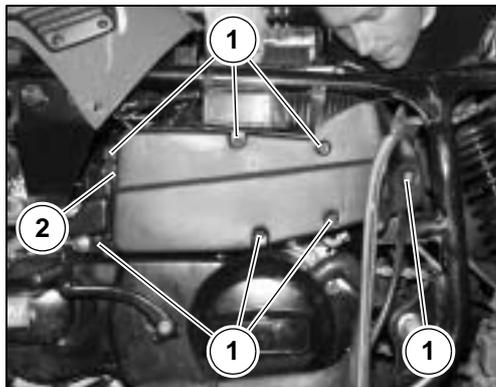
### **⚠ CAUTION**

**After the adjustment, make sure that the rotation of the handlebar does not modify the engine idling rpm and that the throttle lever returns smoothly and automatically to its original position after being released.**

If necessary, turn the carburettor adjuster:

- ◆ Loosen locking nut (4).
- ◆ Turn nut (5) to adjust.
- ◆ Tighten nut (4).





## 2.10 AIR CLEANER

Read carefully 1.3 (GENERAL SAFETY RULES).

Check the condition and cleanliness of the air cleaner every month, replace, if needed.

### ⚠ WARNING

Plug the opening with a clean cloth, in order to prevent any foreign matter to get into the suction ducts.

Upon reassembly, before positioning the filter case cover, make sure that you have not left the cloth or other objects inside the filter case.

### ⚠ WARNING

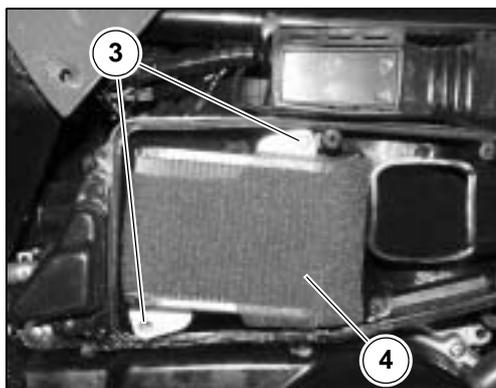
Make sure that the filtering element is positioned correctly, in such a way as to prevent non-filtered air from entering.

Remember that the untimely wear of the piston rings and the cylinder may be caused by a faulty or incorrectly positioned filtering element.

- ◆ Remove the rear shield, see 6.1.6 (REMOVING THE REAR SHIELD).
- ◆ Release and remove the seven screws (1).
- ◆ Remove the filter case cover (2).
- ◆ Loosen and remove the two screws (3) on the case.
- ◆ Remove the filter (4).

### ⚠ WARNING

Change the filter with one having the same features.



## 2.11 FUEL VAPOURS FILTER

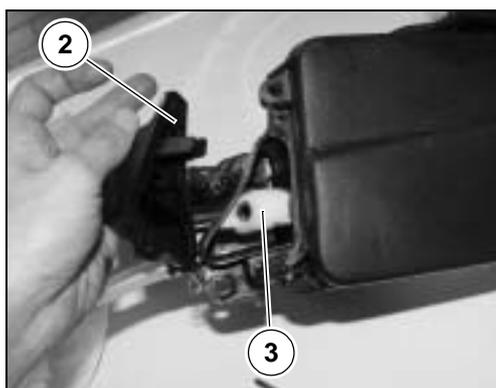
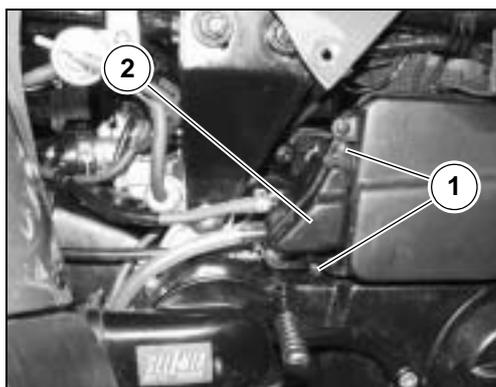
Carefully read 1.3 (GENERAL SAFETY RULES).

- ◆ Loosen and remove the two screws (1).
- ◆ Remove filter cover (2).
- ◆ Remove fuel vapours filter (3).

### ⚠ WARNING

When cleaning the filtering element, make sure that it is not torn or otherwise damaged. Otherwise, change the filtering element.

- ◆ Clean filter (3) outer surface using special tools for absorbing filters.
- ◆ If necessary, change the fuel vapours filter with one having the same features.



### 2.11.1 ENGINE OIL

Carefully read 1.3 (GENERAL SAFETY RULES).

Change engine oil after the first two weeks (after running-in period) and then every six months, 2.3 (PERIODIC MAINTENANCE CHART).

**NOTE** Use only recommended oil, see 1.8 (LUBRICANT CHART).

When topping up engine oil, do not exceed the "MAX" level mark.

#### CHECKING THE ENGINE OIL LEVEL

- ◆ Position the vehicle on a firm and level ground.

#### **⚠ WARNING**

**Allow for the engine and the exhaust system to cool down.**

- ◆ Stop the engine and let it cool down. This will allow the oil to settle into the oil pan and cool down.

**NOTE** Accurate oil level measurement is only ensured when the above procedures are observed.

- ◆ Unscrew and extract the plug/dipstick (1).
- ◆ Clean the dipstick portion in touch with oil with a clean cloth.
- ◆ Fully screw plug/dipstick inside filler opening (2).
- ◆ Remove plug/dipstick (1) again and read the oil level on the stick:

**MAX** = maximum level;

**MIN** = minimum level.

- ◆ The level is correct when the oil almost reaches the "MAX" mark on the dipstick.

#### **⚠ CAUTION**

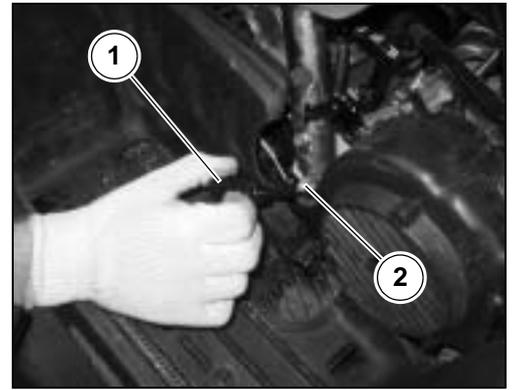
**Never exceed the "MAX" mark, nor leave the oil below the "MIN" mark, in order to avoid serious damage to the engine.**

- ◆ If necessary, top up the engine oil.

#### TOPPING UP

- ◆ Pour a small amount of oil inside the filler opening (2) and wait for about one minute to allow oil to uniformly settle down into the pan.
- ◆ Check engine oil level and, if necessary, top up.
- ◆ Top up with small amounts of oil until reaching the recommended level.
- ◆ Once finished, screw and tighten plug/dipstick (1).

**NOTE** Do not use the vehicle with a poor lubrication or with contaminated or improper lubricants, as these factors make the moving parts wear more rapidly and can lead to severe and irreparable damages.



### 2.11.2 CHANGING THE ENGINE OIL AND THE ENGINE OIL FILTER

Carefully read 1.3 (GENERAL SAFETY RULES).

Clean engine oil filter every six months.

- ◆ Place the vehicle on firm and level ground.

#### ⚠ WARNING

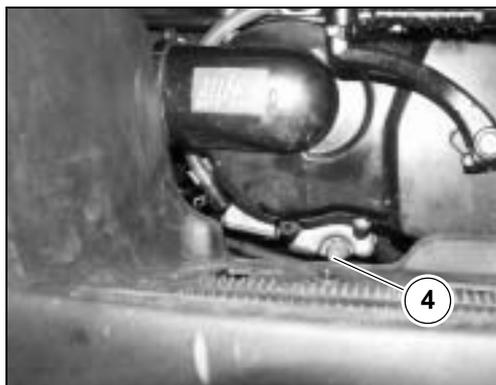
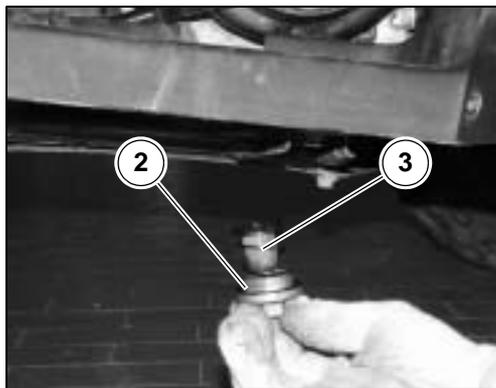
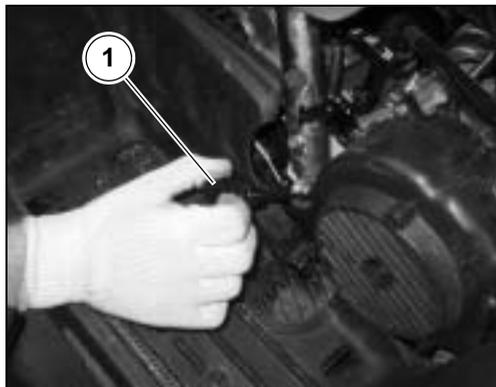
**Allow for the engine and the exhaust system to cool down.**

- ◆ Stop the engine and let it cool down. This will allow the oil to settle into the oil pan and cool down.
- ◆ Unscrew and extract the plug/dipstick (1).
- ◆ Place a container for collection under engine oil filter.
- ◆ Unscrew and remove plug (2). Save engine oil filter (3).

#### ⚠ WARNING

**Used oil contains dangerous substances for the environment, dispose of used oil in compliance with environment protection regulations in force.**

- ◆ Unscrew and remove the oil drain plug (4) and then drain off all engine oil.
- ◆ Clean oil mesh filter (3) with special detergents and refit filter (3) and plug (2).
- ◆ Screw and tighten engine oil drain plug (4).
- ◆ Pour about 0.9 litres of oil into the filler opening.
- ◆ Screw and tighten the oil dipstick (1).
- ◆ Start the engine and let it run for several minutes. Stop the engine and let it cool down.
- ◆ Check engine oil level, see 2.3 (PERIODIC MAINTENANCE CHART).



## 2.12 CHECKING THE TRANSMISSION OIL LEVEL

**DO NOT RELEASE OIL INTO THE ENVIRONMENT**

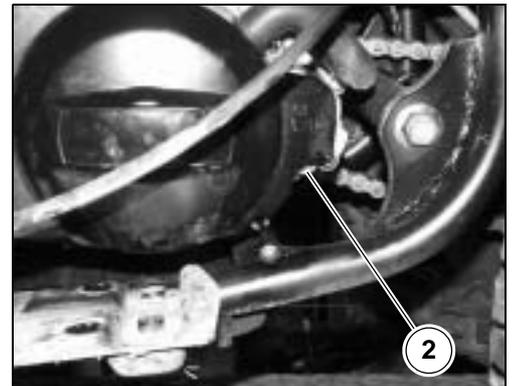
Carefully read 1.3 (GENERAL SAFETY RULES), 1.4.2 (LUBRICANTS) and 1.8 (LUBRICANT CHART).

Check the bottom part of the transmission: if any oil residue is found, then replace the oil seal, see 3.6.11 (REMOVING THE FINAL DRIVE GEARS)  
Run a transmission oil change every sixth months. Run monthly in case of use on muddy, wet or rough surfaces (off-road).

- ◆ Ride for a few miles until reaching the normal running temperature, then stop the engine.
- ◆ Place a graduated container no smaller than 200 cm<sup>3</sup> (12.2 cu.in) under the drain plug (1).
- ◆ Release the filler cap (2) as well as the drain plug (1).
- ◆ Allow the oil to completely drain out of the crankcase and measure the quantity; if less than 200 cm<sup>3</sup> (12.2 cu.in), refill to level with the missing amount, see 1.8 (LUBRICANT CHART).
- ◆ Tighten the drain plug (1).
- ◆ Use a syringe or similar to inject the oil through the input hole.

**NOTE** To facilitate filling the crankcase, engage forward gear and turn the wheels by hand.

- ◆ Refit and tighten the filler cap (2).



**⚠ WARNING**

**Tighten down the filler cap and drain plug carefully and check for leaks. Check the crankcase cover gasket periodically for leaks. Do not use the vehicle if insufficiently lubricated or if the oil is dirty or of the wrong type, as this will increase the wear of moving parts and can result in serious damage.**

## 2.13 CHECKING AND ADJUSTING THE BRAKES

Read carefully 1.3 (GENERAL SAFETY RULES).

**⚠ CAUTION**

**The brakes are essential to safety and must be kept in perfect working condition. Always check them before using the motorcycle.**

The motorcycle is equipped with three drum brakes, two front and one rear. Check brake efficiency before every use.

If the thickness of the friction material is worn down to nearly 1 mm, replace the blocks.

**ADJUSTING THE FRONT BRAKES**

Operate the right hand brake lever:

- ◆ Loosen the lock nuts (1).
- ◆ Adjust the brake adjuster (2).
- ◆ Loosen the lock nuts (1).

**ADJUSTING THE REAR BRAKE**

Adjust the adjuster (3) at the side of the rear brake drum.

- ◆ Adjust the left side brake adjuster (3).

**ADJUSTING THE BRAKE PEDAL**

There are two adjustments:

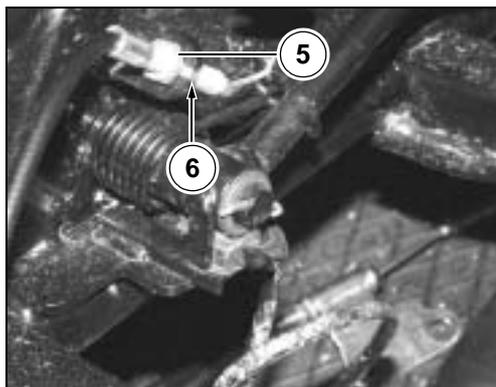
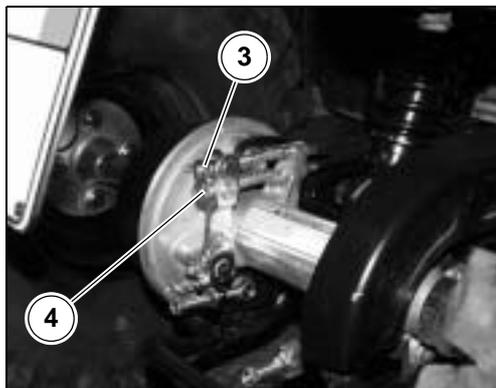
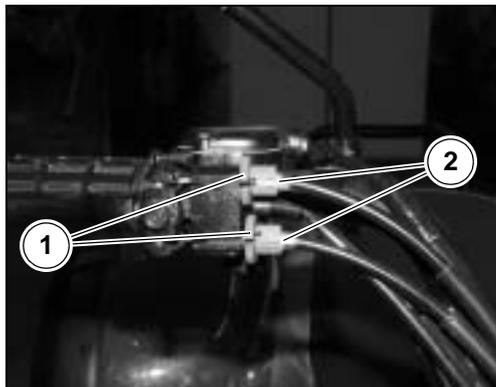
- brake pedal adjuster (5);
- rear brake adjuster (4).

The first of these adjusts all three brakes:

- ◆ Slacken the lock nut (6).
- ◆ Adjust the adjuster (5).
- ◆ Tighten the lock nut (6).

The second only adjusts the rear brake:

- ◆ Adjust the adjuster (4).

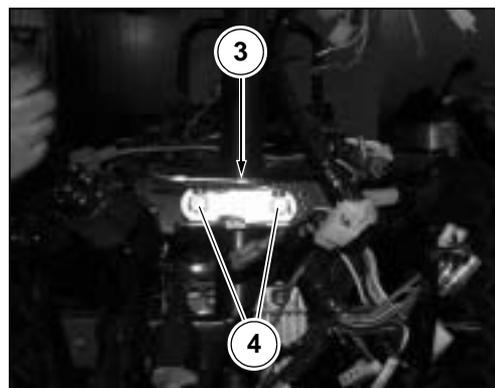
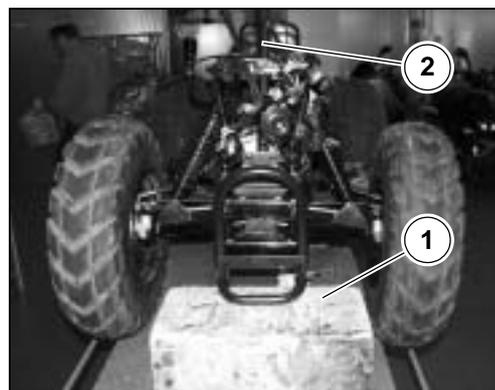


## 2.14 CHECKING THE STEERING

Read carefully 1.3 (GENERAL SAFETY RULES).

Run the first check after the first two weeks, then every six months thereafter.

- ◆ Place a support (1) under the frame at the front, so as to leave the wheels free to turn.
- ◆ Move the bottom yoke (2) in the direction of travel.
- ◆ If any play is evident, check the wear of the bush (3) and the tightness of the nuts (4).
- ◆ Rotate the base of the headstock (2) manually in both directions.
- ◆ Check that the headstock base turns freely and evenly without noise, otherwise replace the bearings, see 6.2.1 (REMOVING STEERING YOKE WITH STEM).



## 2.15 INSPECTING THE FRONT SUSPENSIONS

Read carefully 1.3 (GENERAL SAFETY RULES).

Check the suspension every six months.

Check that the shock absorbers are not scratched or grooved. If they are, replace the damaged parts.

Carry out the following checks.

With pulled front brake lever, press the handlebar repeatedly, thrusting the two suspensions downwards.

The stroke must be gentle and there must be no trace of oil on the rods.

Check the fastening of all the components and the functionality of the front suspension joints, see 6.2 (STEERING SYSTEM).

## 2.16 INSPECTING THE REAR SUSPENSION

Read carefully 1.3 (GENERAL SAFETY RULES).

Check the rear suspension every six months.

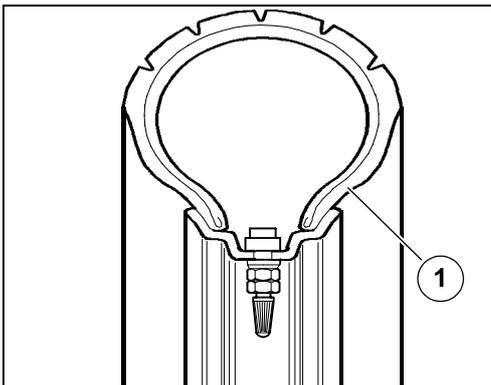
Check that the shock absorber is not leaking oil, or scratched or grooved.

Check the fastening of all the components and the functionality of the rear suspension joints, see 6.3.1 (REMOVING THE REAR SHOCK ABSORBER).

## 2.17 WHEELS

Read carefully 1.3 (GENERAL SAFETY RULES).

- Check the wheels for dents and distortions. If necessary replace them.
- Check the eccentricity of the wheels.
- Check the condition of the wheels and bearings.
- Check the balance of the wheels.
- Turn the wheel slowly several times and observe the point at which it stops.
- If the wheel is not statically balanced it will always stop at the same point. Fit a balancing weight at the lightest (highest) point.



### 2.17.1 TYRES

This vehicle is fitted with tubeless tyres.

#### ⚠ CAUTION

Check the tyre inflation pressures at regular intervals when the tyres are cold, see 1.7 (TECHNICAL DATA). Checking pressure on hot tyres will result in inaccurate measurement.

Take care to check tyre pressures before and after a long journey. An overinflated tyre will provide a harsh ride, transmitting shock to the handlebar and reducing riding comfort and stability when cornering.

An underinflated tyre will extend the contact patch to include a larger portion of the tyre wall (1). This can result in cuts, the tyre moving on the rim, or coming away from it, thus leading to the rider losing control of the vehicle.

The tyre may even slip off the rim under hard braking. Lastly, the vehicle may skid in a bend. Inspect tread surface and check for wear. Badly worn tyres adversely affect traction and handling. Enquire about correct wear inspection procedure with your supplier. Visually inspect the treads and replace if too worn. If the tyres are old, even if they are not completely worn down, they can harden and lose grip. In this case, replace the tyres. Always change a worn tyre. A tyre that becomes punctured in the tread area should be changed when the puncture is larger than 5 mm (0.2 in). The wheels must be balanced after each tyre repair. Use only tyres of the size indicated by the Manufacturer, see 1.7 (TECHNICAL DATA). Never use tube tyres on tubeless tyre rims. Always check that the caps are in place on the valves, or the tyres may deflate suddenly. Tyre replacement and repair, and wheel servicing and balancing are delicate operations. They should be carried out using adequate tools and are best left to experienced mechanics. New tyres may be coated with an oily film: drive carefully for the first several kilometres.

2.18 DRIVE CHAIN

**⚠ WARNING**

An excessive slackening of the chain may cause noise or make the chain rattle.

Periodically check the slack and adjust it if necessary.

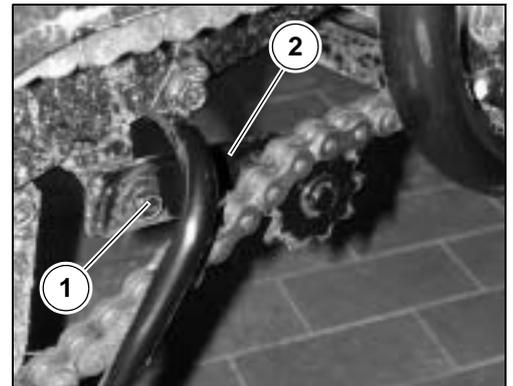
Incorrect maintenance may cause the untimely wear of the chain and/or damages to the front and/or the rear sprocket.

**NOTE** Perform the maintenance operations more frequently if the vehicle is used in rainy or dusty areas, on uneven surfaces or on racetracks.

**CHECKING THE SLACK**

To check the slack, proceed as follows:

- ◆ Stop the engine.
- ◆ Loosen and remove screw (1).
- ◆ Remove chain tensioner (2). Take care not to damage the return spring.
- ◆ Make sure that the vertical oscillation, in an intermediate point between front and rear sprocket in the upper part of the chain, is about **50-60 mm**.
- ◆ Move the vehicle forwards, or turn the wheel, in order to be able to check the vertical oscillation of the chain even when the wheel turns; the slack must be constant in all the rotation phases of the wheel.
- ◆ Refit chain tensioner (2) with spring and tighten screw (1).



**⚠ WARNING**

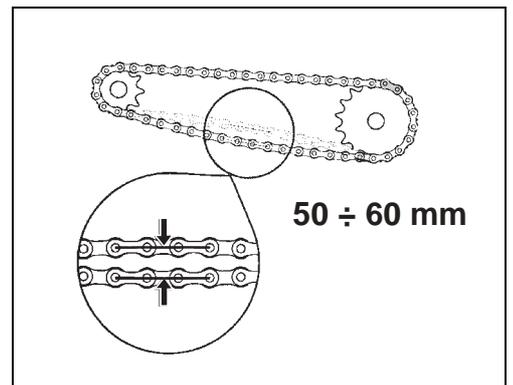
If in some positions the slack is higher than in others, this means that there are crushed or seized links; in this case, replace the chain, see 6.7.1 (DISASSEMBLING THE CHAIN). To prevent the risk of seizures, lubricate the chain frequently.

If the slack is even, but exceeding the maximum limit allowed, adjust it.

**ADJUSTMENT**

If after the check it is necessary to adjust the chain tension, proceed as follows:

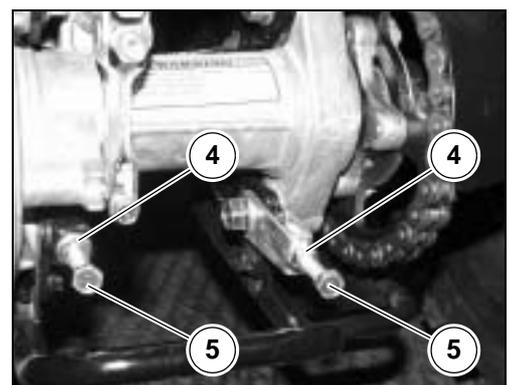
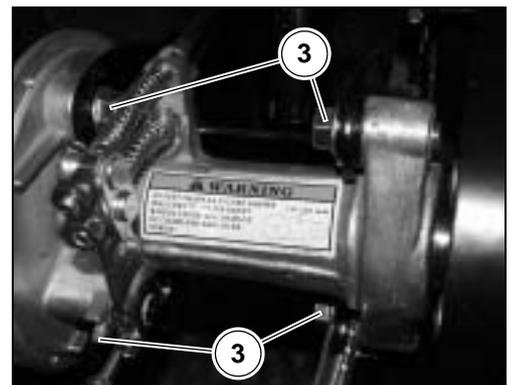
- ◆ Slacken the four screws (3).
- ◆ Partly slacken the two lock nuts (4) on the tensioners (5).
- ◆ Adjust the chain tension with the tensioners (5).
- ◆ After the adjustment, tighten the lock nuts (4).
- ◆ Tighten the four screws (3).
- ◆ Check that the slack is now within the maximum limit allowed.



**CHECKING THE DRIVING CHAIN, FRONT AND REAR SPROCKET WEAR**

Further, check the following parts and make sure that chain, front and rear sprockets do not show:

- damaged rollers;
- loose pins;
- dry, rusty, crushed or seized links;
- excessive wear;
- sprocket or teeth excessively worn or damaged.



**⚠ WARNING**

If the chain rollers are damaged, the pins are loose and/or the O-rings are damaged or missing, it is necessary to change the whole chain unit (both sprockets and chain).

Lubricate the chain frequently, especially if there are dry or rusty parts.

**CLEANING AND LUBRICATION****⚠ WARNING**

Carry out the adjustment, lubrication, cleaning and change of the chain with great care.

Never wash the chain with water jets, steam jets, high-pressure water jets and highly inflammable solvents.

- ◆ Wash the chain with naphtha or kerosene.
- ◆ After washing and drying the chain, lubricate with spray grease, see 1.8 (LUBRICANT CHART).
- ◆ Do not use the vehicle soon after lubricating the chain, since due to the centrifugal force the lubricant would be sprayed outwards and dirty the surrounding areas.
- ◆ If it tends to rust quickly, intensify the maintenance intervals.

**2.19 MULTIFUNCTION COMPUTER**

The vehicle is equipped with an electronic device to measure the vehicle speed, the elapsed time and to store the distance covered.

**⚠ WARNING**

When the vehicle is unused, always keep the dial protected against direct sun rays.

**⚠ WARNING**

Never remove any part of the multifunction computer, battery cover excluded.

**⚠ WARNING**

Before using the vehicle, make sure that all the parts composing the multifunction computer are correctly assembled.

**NOTE** Switch the multifunction computer on before starting the vehicle. If this is not the case, the operation of the computer itself could be impaired. The multifunction computer is provided with an automatic shutoff device in case the instrument is left unused for more than 5 minutes.

**NOTE** When the vehicle is unused or left unattended, always remove the dial from its mount.

**Main components**

- 1) "SET / RESET" push button for timer start/stop
- 2) Function selection "MODE" push button
- 3) Speed display
- 4) Units of measurement of the displayed speed
- 5) Time display
- 6) Function indicator
- 7) Battery cover
- 8) Contacts

**Accessories:**

- mounting support
- speed sensor
- clip
- magnet
- steel ring
- rubber seal
- cable tie
- screw
- battery

**Setting the units of measurement**

To select the desired units of measurements, press push button (1). Confirm by pressing push button (2).

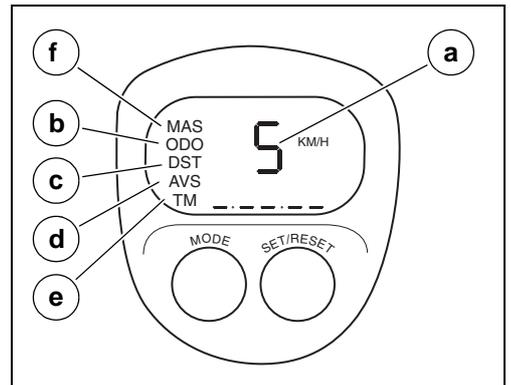
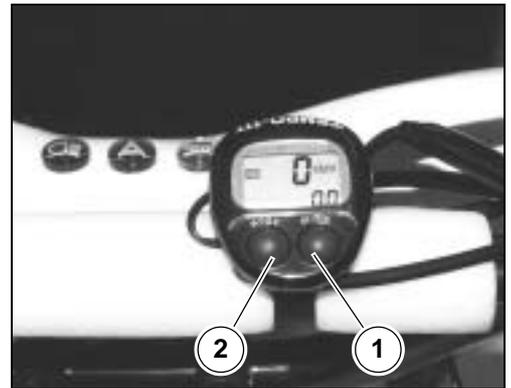
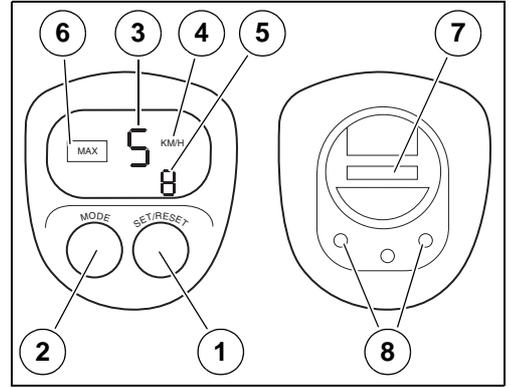
**NOTE** When setting the units of measurements, the instrument will also display the reset value of the wheel diameter; press push button (1) to set this value to 168 and store the set data by pressing push button (2).

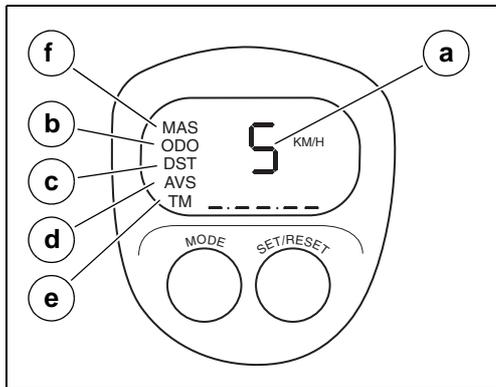
**Main functions**

Before carrying out any setting or adjustment on the multifunction computer, working from below, fit the dial on its mount on the vehicle.

Press push button (2) repeatedly so as to make the following functions appear in the following order.

To start storing data, press push button (1) (the units of measurement indicator is flashing). To stop data storing, press push button (1) again (the units of measurement indicator is not flashing).





**Speed function (a)**

The speed function is automatically enabled upon battery installation.

**ODO function (b)**

The ODO function indicates the total distance covered by the vehicle. The counter will be automatically reset when reaching 10,000 Km.

**NOTE** When the multifunction computer battery is removed, all stored values will be deleted.

**DST function (c)**

The DST function indicates the partial distance covered by the vehicle. The counter will be automatically reset when reaching 1,000 Km.

To manually reset counter, press push buttons (1) and (2) at the same time.

**AVS function (d)**

The AVS function indicates the trip average speed.

To reset the stored speed value, press push buttons (1) and (2) at the same time.

**TM function (e)**

The TM function indicates the time vehicle is being used.

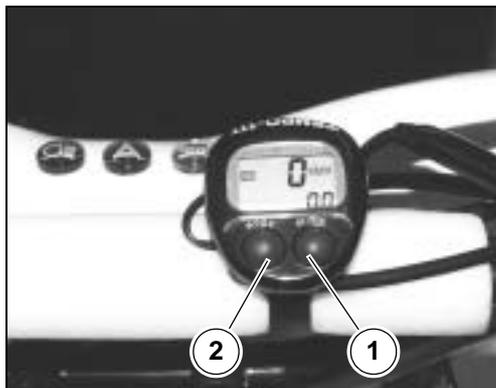
The counter will be automatically reset when reaching 12 hours.

To manually reset counter, press push buttons (1) and (2) at the same time.

**MAS function (f)**

The MAS function indicates the maximum speed.

To manually reset counter, push buttons (1) and (2) at the same time.

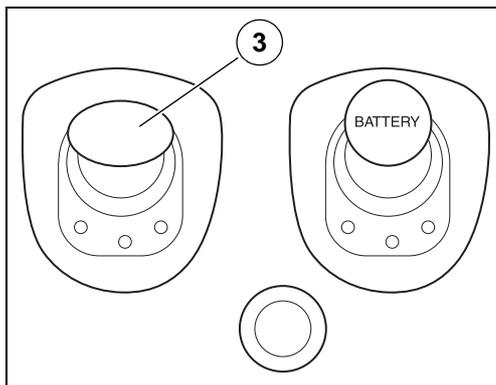


**Installing battery**

Using a coin, undo the battery cover (3).

Install battery (3 V) inside its compartment. Take care to position positive pole (+) pointing upwards and negative pole (-) pointing downwards.

Once finished, close battery cover (3) again.



## 2.20 TOE IN

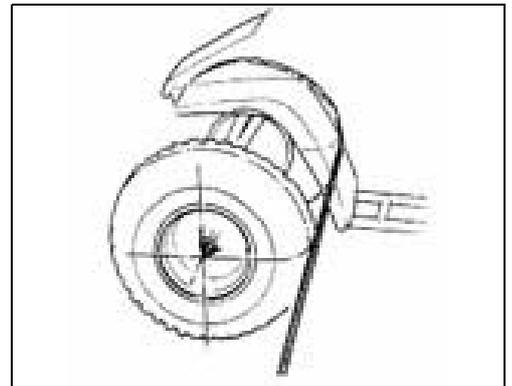
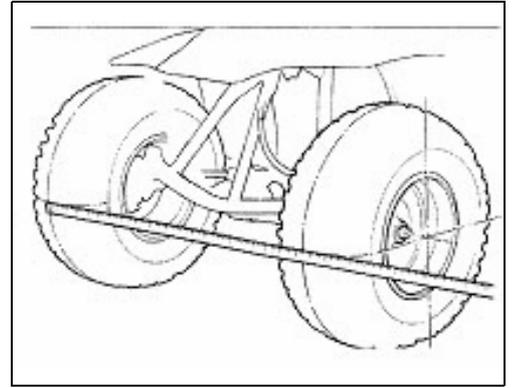
Park the vehicle on an even ground with the front wheels facing ahead.  
Mark wheels centre to indicate the axle height.

Measure the wheelbase between the two marks.

Carefully move the vehicle back, turning the wheels by 180° so as to align the wheel marks with the axle height.

Measure the wheelbase between the two marks.  
Calculate the difference between the reading at the back and at the front.

Toe in: 5 mm  $\pm$  10



If the value is outside the specified limits, turn both linkages to equally change their length. Keep ball-joint locked while turning.

Tighten check nuts.

Tightening torque: 35-43 Nm





ENGINE

3

## ENGINE

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**ENGINE**

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### 3.1.1 COMPONENTS THAT CAN BE REMOVED WITH THE ENGINE INSTALLED

The parts listed below can be removed with the engine installed in the frame.

#### TOP END

- Carburettor
- Intake manifold
- Starter
- Chain tensioner

#### FRONT END

- Tappet cover
- Camshaft
- Engine oil cooler

#### BOTTOM END

- Exhaust system

#### RIGHT-HAND SIDE

- Fan guard
- Sprocket
- Air scoop
- Flywheel
- Stator coil
- Gearbox

#### LEFT-HAND SIDE

- Transmission cover
- Speed converter unit
- Clutch unit
- Drive belt
- Converter pan
- Kick-start

### 3.1.2 REMOVING THE ENGINE FROM THE FRAME

Read carefully 1.3 (GENERAL SAFETY RULES).

#### ⚠ CAUTION

Switch off the engine and wait for the engine and exhaust system to cool down.

- ◆ Remove both shields, see 6.1.5 (REMOVING THE FRONT SHIELD) and see 6.1.6 (REMOVING THE REAR SHIELD).
- ◆ Remove both footpegs, see 6.1.7 (REMOVING THE FOOTREST).

#### ⚠ WARNING

To clean the outer parts of the engine use a degreaser, brushes and wipers.

Ensure that no rubber or plastic parts come in contact with detergents and corrosive or penetrating solvents.

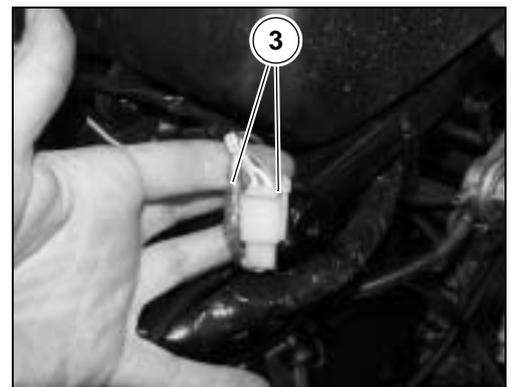
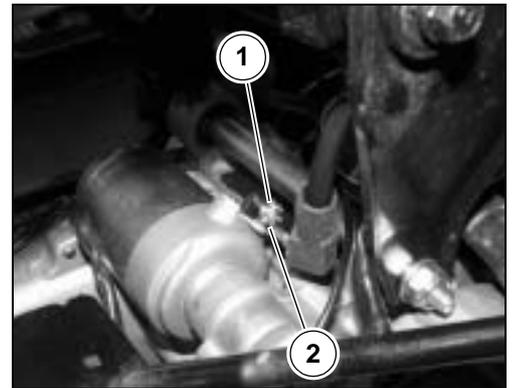
Should you need a steam cleaner, do not direct water, steam or high-pressure air jets towards any of the following parts: wheel hubs, handlebar controls, main warning lights, exhaust silencer, main switch.

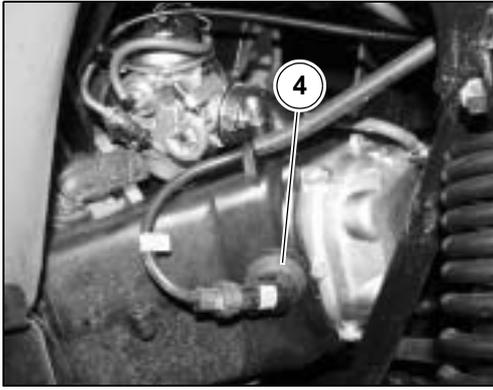
- ◆ Remove the exhaust system, see 6.1.21 (REMOVING THE EXHAUST PIPE).
- ◆ Remove the airbox, see 2.10 (AIR CLEANER).

#### ⚠ WARNING

Mark cables, hoses and pipes to avoid confusing them when refitting.

- ◆ Loosen and remove screw (1) and remove clip (2).
- ◆ Disconnect the alternator connectors (3).



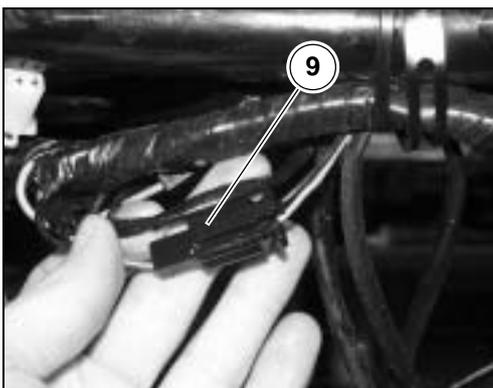
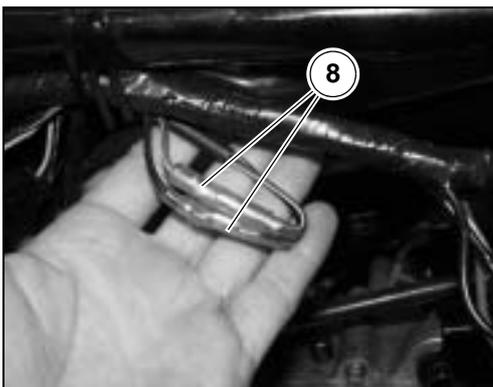
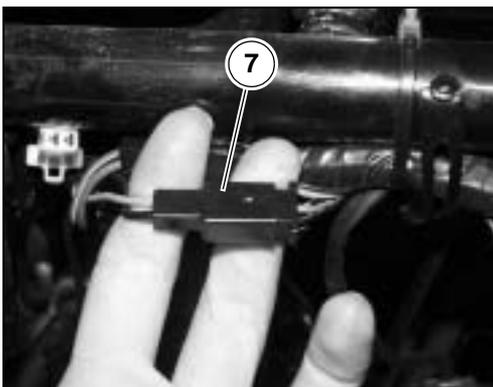
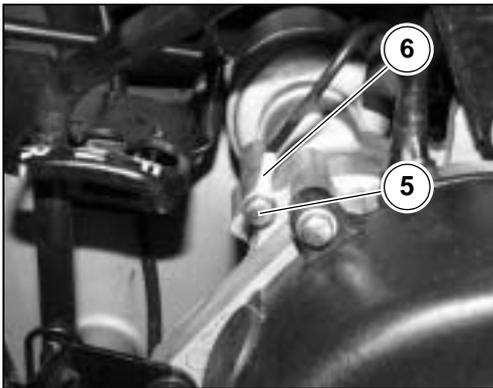


- ◆ Disconnect the spark plug cap (4).

### ⚠ CAUTION

Due to the weight and size of the parts, work with the greatest care. Block off all openings of engine and hoses to prevent the ingress of dirt.

- ◆ Remove carburettor, see 4.3 (REMOVING THE CARBURETTOR).
- ◆ Loosen and remove screw (5) and remove clip (5).
- ◆ Disconnect neutral light connector (7).
- ◆ Disconnect reverse gear connectors (8).
- ◆ Disconnect pedal stop switch connector (9).
- ◆ Release wirings from ties.



- ◆ Remove chain, see 6.7.1 (DISASSEMBLING THE CHAIN).
- ◆ Loosen and remove the five screws (10) and remove bottom panel (11).
- ◆ Drain off all engine oil, see 2.11.1 (ENGINE OIL).
- ◆ Remove engine oil lines, see 3.8.2 (REMOVING THE ENGINE OIL LINES).
- ◆ ★ Loosen and remove the rear screw (12) between engine and frame.
- ◆ Loosen and remove the bottom screw (13) between engine and frame.
- ◆ ★ Loosen and remove the two top screws (14).

**⚠ CAUTION**

All fixings have now been removed.

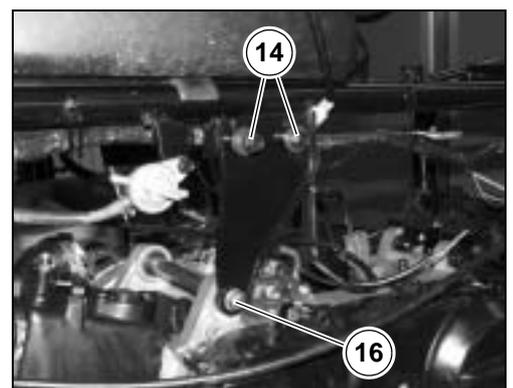
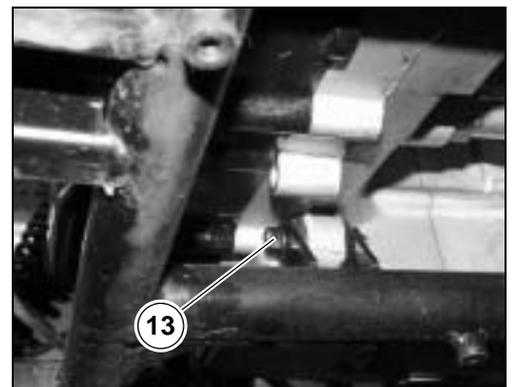
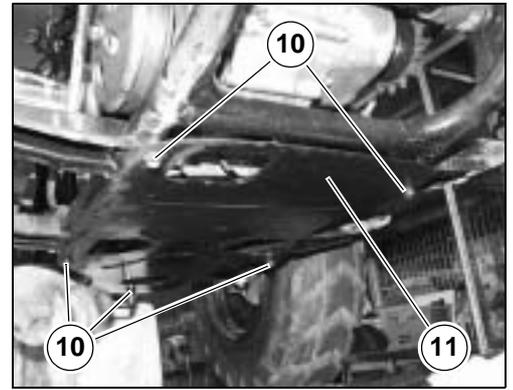
Handle with care. Be careful to avoid injury to your hands, arms and legs.

Clear all tools from the area. Thoroughly clean the area of the floor where the engine is to be placed.

- ◆ Working on the left side, loosen and remove nut (15) on vehicle right side. Save pin (16), spacer and the two brackets.

**⚠ CAUTION**

When refitting, seat the elements properly on the pin (16).



### 3.1.3 FITTING THE ENGINE IN THE FRAME

Read carefully 1.3 (GENERAL SAFETY RULES).

**NOTE** *To refit the engine in the frame, reverse the removal procedure, see 3.1.2 (REMOVING THE ENGINE FROM THE FRAME). Before proceeding, however, you will have to perform the operations detailed below.*

#### **⚠ CAUTION**

**Handle with care.**

**Be careful to avoid injury to hands, arms and legs.**

- ◆ Check the tension of the drive chain and adjust if necessary, see 2.18 (DRIVE CHAIN)

#### **⚠ WARNING**

**Inspect any parts you have removed, paying special attention to these components:**

- wiring must be properly fastened with wire ties.

#### **⚠ WARNING**

**Wires and hoses must not be twisted and/or crushed.**

- Electrical connectors must be fitted to the matching connectors;
- Hoses and pipes and couplings must be securely in place and fastened with suitable clips;
- The throttle cables must slide smoothly inside their housings and must not bind when handlebars are turned.

- ◆ Restore engine oil level, see 2.11.1 (ENGINE OIL) and, if necessary, top up transmission oil see 2.12 (CHECKING THE TRANSMISSION OIL LEVEL).

#### FOREWORD

Engine parts shall be disassembled working on a bench. The operations that can be carried out with the engine assembled on frame will be accompanied by a note.

#### **⚠ WARNING**

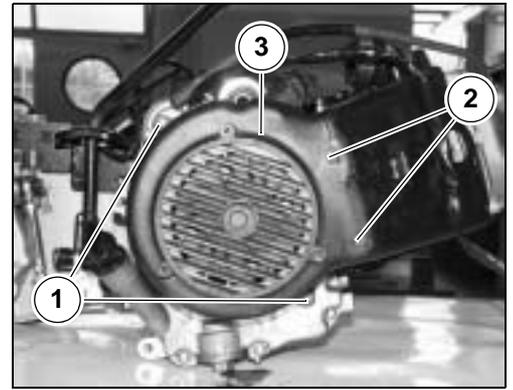
**The manufacturer declines all responsibility for any damages originated by engine disassembly and reassembly operations carried out with unsuitable tools.**

## 3.2 HEAD UNIT

### 3.2.1 REMOVING PROTECTION FAN

**NOTE** Engine can be left assembled on frame.

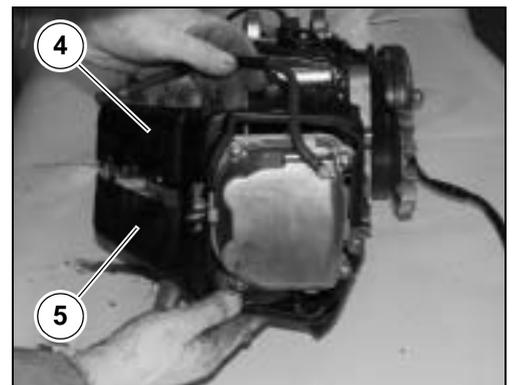
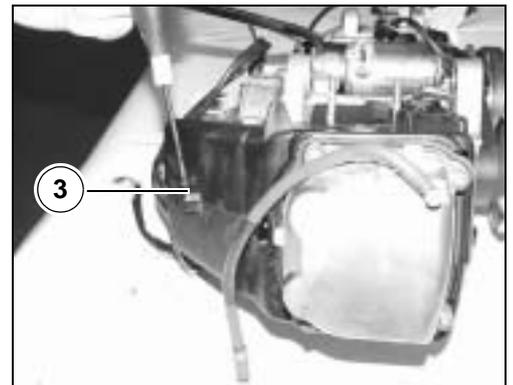
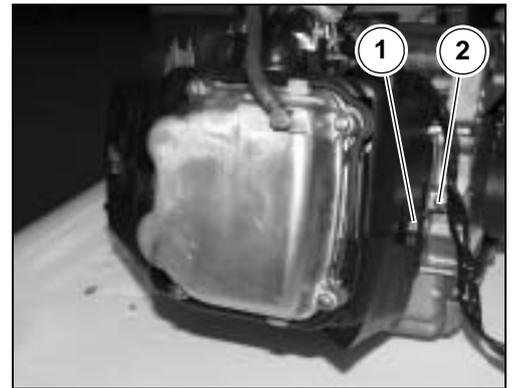
- ◆ Remove right footrest, 6.1.7 (REMOVING THE FOOTREST).
- ◆ Loosen and remove the four screws (1- 2).
- ◆ Remove flywheel housing (3)



### 3.2.2 REMOVING FLYWHEEL UPPER AND LOWER HOUSINGS

**NOTE** Engine can be left assembled on frame.

- ◆ Remove flywheel housing, see 3.2.2 (REMOVING FLYWHEEL UPPER AND LOWER HOUSINGS).
- ◆ Remove intake manifold, see 3.2.3 (REMOVING THE INTAKE MANIFOLD).
- ◆ Loosen and remove screws (1-2).
- ◆ Loosen and remove screw (3).
- ◆ Remove upper (4) and lower (5) housing.

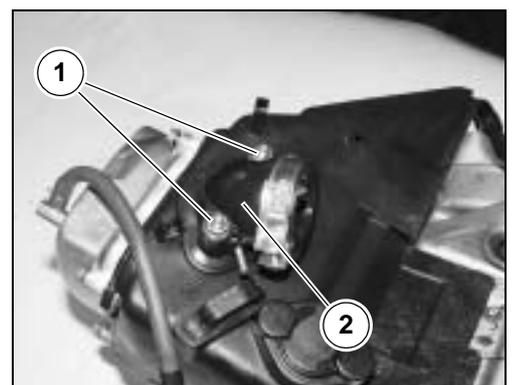


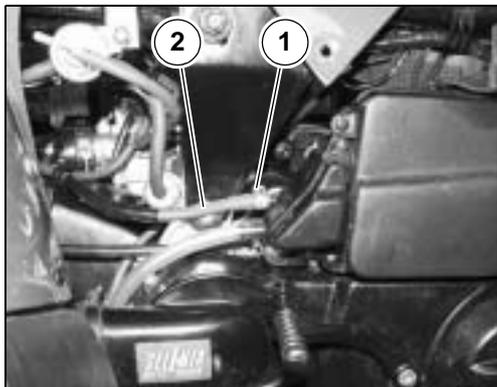
### 3.2.3 REMOVING THE INTAKE MANIFOLD

**NOTE** Engine can be left assembled on frame.

- ◆ Remove carburettor, see 4.3 (REMOVING THE CARBURETTOR).
- ◆ Loosen and remove the two screws (1).
- ◆ Remove the intake manifold (2) and save the O-ring.

**NOTE** Change the O-ring at every reassembly.



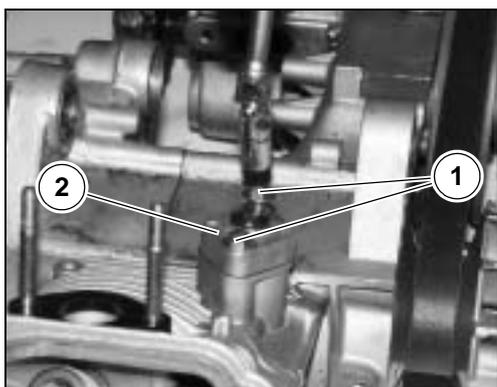
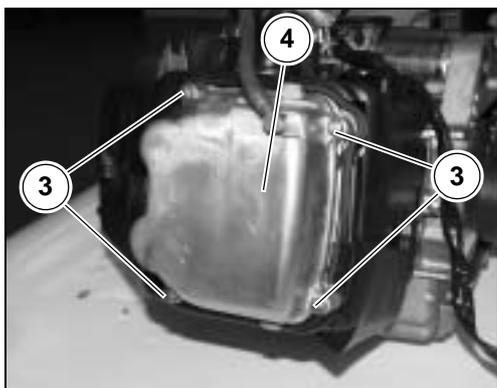


### 3.2.4 REMOVING THE HEAD

**NOTE** Engine can be left assembled on frame.

- ◆ Drain off all engine oil, see 2.11.1 (ENGINE OIL).
- ◆ Put a cloth under the head.
- ◆ Remove clip (1) and disconnect pipe (2).
- ◆ Loosen and remove the four screws (3).
- ◆ Remove head cover (4).

**NOTE** Change the seal at every reassembly.



### 3.2.5 REMOVING THE TENSIONER

**NOTE** Engine can be left assembled on frame.

- ◆ Remove flywheel upper housing, see 3.2.2 (REMOVING FLYWHEEL UPPER AND LOWER HOUSINGS).
- ◆ Loosen and remove the two screws (1).
- ◆ Remove chain tensioner (2).

**NOTE** Change the seal at every reassembly.

### 3.2.6 REMOVING CAMSHAFT COMPLETE MOUNT

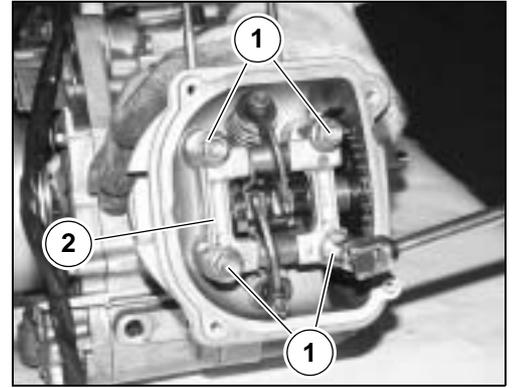
**NOTE** Engine can be left assembled on frame.

- ◆ Remove head cover, see 3.2.1 (REMOVING PROTECTION FAN).
- ◆ Loosen and remove the four screws (1).

 **Screws (1) tightening torque: 9 Nm (0.9 kgm).**

- ◆ Remove camshaft complete mount (2).

**NOTE** At reassembly, position the mount with the two "E-X" letters facing the exhaust pipe.

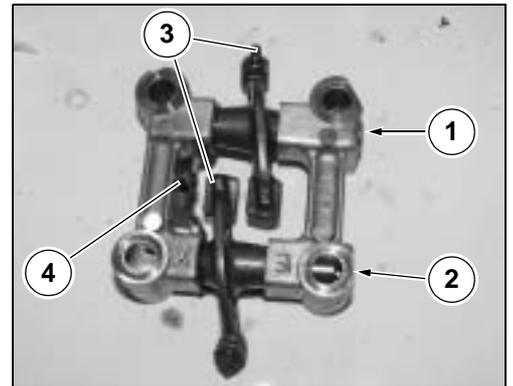


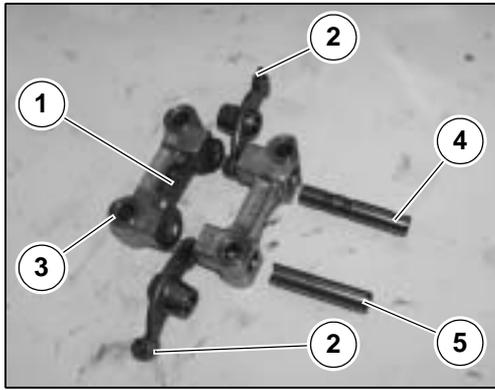
### 3.2.7 REMOVING THE ROCKER ARMS

**NOTE** Engine can be left assembled on frame.

- ◆ Remove camshaft complete mount, see 3.2.9 (REMOVING THE CAMSHAFT).
- ◆ Position camshaft complete mount on a resting surface.
- ◆ Remove the two shafts (1-2) and save the two rocker arms (3) and plate (4).

**NOTE** While removing, check the position of the two shafts (1-2) not to mismatch them at reassembly.



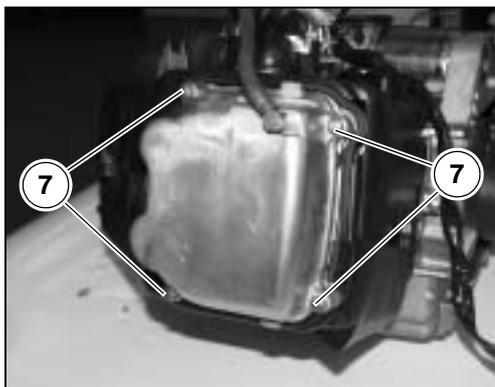
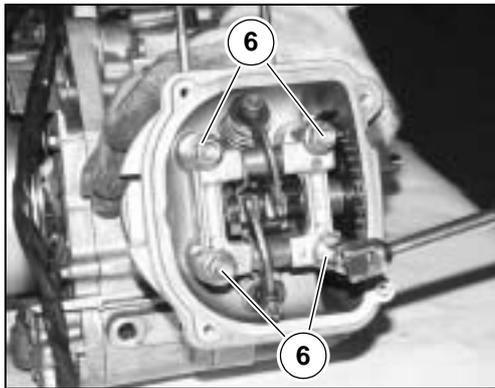


### 3.2.8 REFITTING THE ROCKER ARMS

- ◆ Position plate (1) and the two rocker arms (2) onto mount (3).
- ◆ Install the two shafts (4-5).

**NOTE** Make sure that the two shafts (4-5) are correctly positioned.

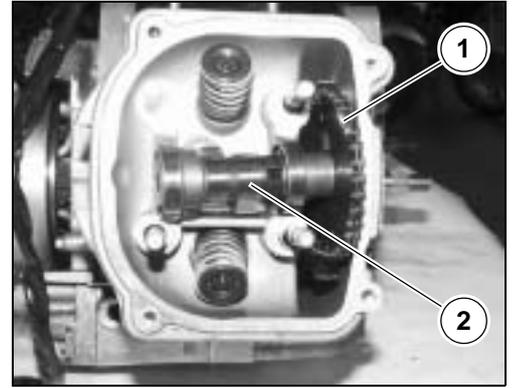
- ◆ Refit the complete camshaft mount and tighten the four screws (6) crossways.
- ◆ Refit head cover and tighten the four screws (7) crossways.



### 3.2.9 REMOVING THE CAMSHAFT

**NOTE** Engine can be left assembled on frame.

- ◆ Remove chain tensioner, see 3.2.5 (REMOVING THE TENSIONER).
- ◆ Remove the complete camshaft mount, see 3.2.6 (REMOVING CAMSHAFT COMPLETE MOUNT).
- ◆ Remove chain (1) from camshaft (2) ring gear.
- ◆ Remove camshaft (2).



### 3.2.10 CHECKING BEARING PARTS

Rotate bearings (1-2) by hand. They must run smoothly, must not jam at any positions and/or be quiet.

No axial play shall be present.

Change the camshaft if bearings are noisy, run hard or have play.

#### CAMS

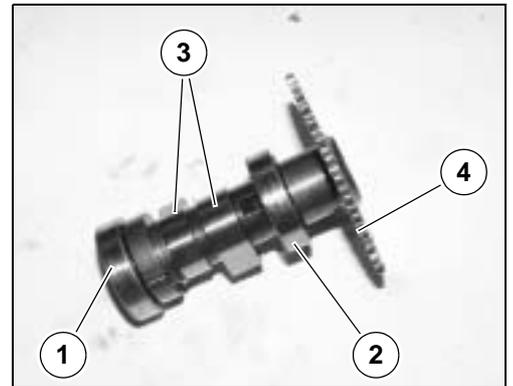
Check cams (3) for wear. If excessively worn, scored or scratched, change the camshaft.

#### TOOTHED GEAR

Check gear (4) teeth for wear. If excessively worn, change the camshaft.

#### ROCKER ARMS

Check the amount of wear on the rocker arm surface in touch with the cams. If excessively worn, change the camshaft.



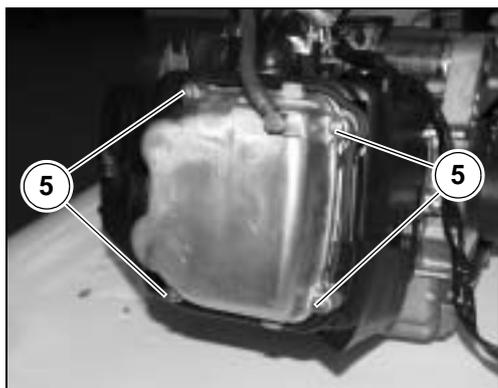
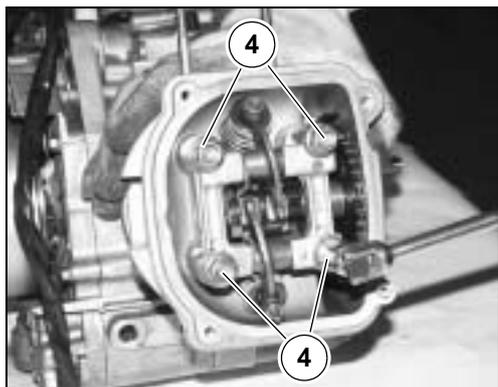
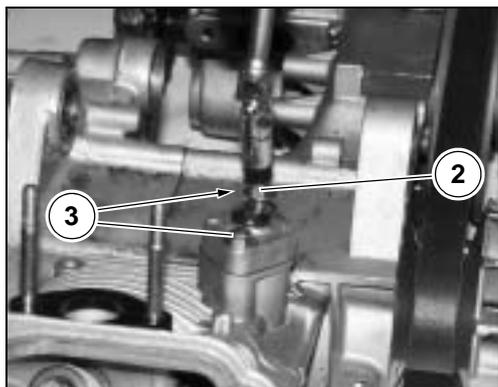
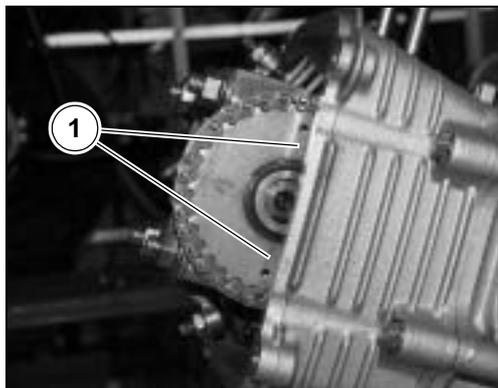
### 3.2.11 REFITTING THE CAMSHAFT

- ◆ Remove flywheel housing, see 3.2.2 (REMOVING FLYWHEEL UPPER AND LOWER HOUSINGS).
- ◆ Move piston to bottom dead centre, by taking care that the flywheel notch (T) is opposite (180°) to the pan fin.
- ◆ Turn camshaft so as to fully close both valves.
- ◆ Drive chain onto toothed gear by taking care that, after being installed onto camshaft, the reference marks (1) are parallel with the head edge.
- ◆ Remove tensioner top screw (2) and remove the spring from the inside.
- ◆ Push on the stop tooth to move back rocker arm.
- ◆ Change seal and refit mount. Tighten the two screws (3).
- ◆ Fit spring and tensioner screw, then manually turn crankshaft by 3 or 4 turns and check once more timing reference marks correct positioning.

#### **⚠ WARNING**

**Before turning crankshaft by hand, check that spark plug is not into its location.**

- ◆ Proceed to valve adjustment, see 3.2.12 (ADJUSTING VALVE CLEARANCE).
- ◆ Refit the complete camshaft mount and, working crossways, tighten the four screws (4).
- ◆ Refit head cover and, working crossways, tighten the four screws (5).



### 3.2.12 ADJUSTING VALVE CLEARANCE

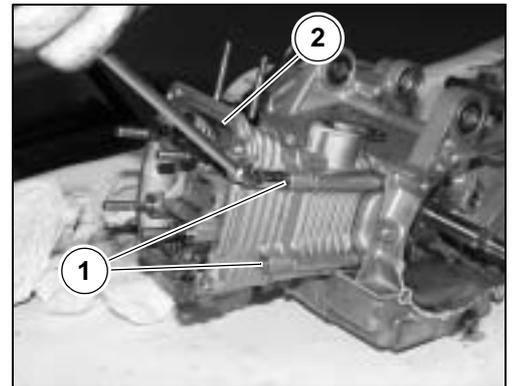
Turn engine by hand and re-align the reference marks on toothed gear and camshaft mount, then proceed to valve clearance adjustment. Using a feeler gauge, measure the gap between rocker arm and valve stem. Perform this operation on both valves. Clearance must be: 0.08 mm (0.003 in).

### 3.2.13 REMOVING THE HEAD

- ◆ Remove camshaft, see 3.2.9 (REMOVING THE CAMSHAFT).
- ◆ Loosen and remove the two screws (1).
- ◆ Remove head (2).

### 3.2.14 CHECKING VALVES SEALING CAPACITY

To perform this test, fill intake and exhaust ducts with fuel. In case of leaks, proceed to grinding, see 3.2.19 (GRINDING).





### 3.2.15 REMOVING VALVES

- ◆ Remove the head, see 3.2.13 (REMOVING THE HEAD).
- ◆ Use the special tool to compress valve springs.

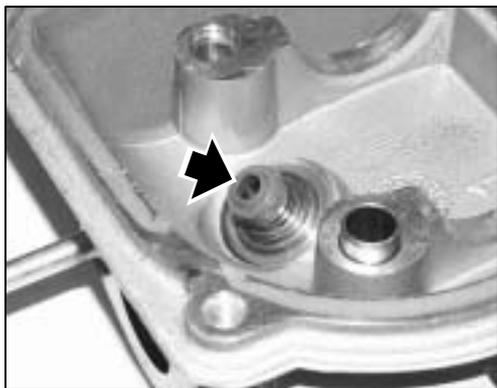
#### ⚠ WARNING

To avoid valve wrong positioning after disassembly, mark intake and exhaust valves.

- ◆ Remove intake valve guide oil seal.
- ◆ Remove exhaust valve guide oil seal.
- ◆ Thoroughly clean mating surfaces. Do not damage them.
- ◆ Thoroughly clean the combustion chamber. Remove any carbon deposits.

#### ⚠ WARNING

Take care not to score valve seats while cleaning these parts.



### 3.2.16 CHECKS

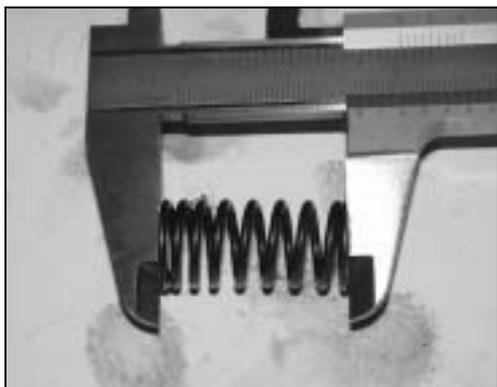
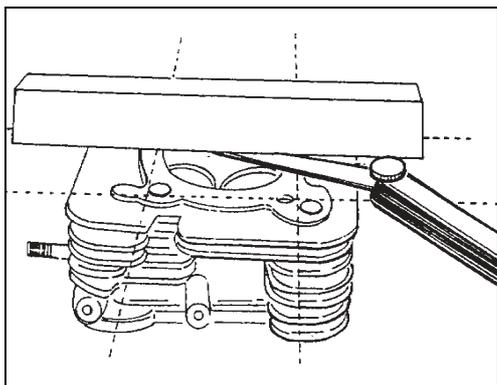
Check the combustion chamber for cracks or damage.

Using a scale, check that cylinder head bottom surface is perfectly flat. Take measurements as shown in the figure, see 3.2.20 (CHECKING THE HEAD AND CYLINDER).

### 3.2.17 VALVE SPRINGS FREE LENGTH

Measure springs length:

- inner spring 31.2 mm (1.228 in)
- outer spring 34.1 mm (1.342 in)



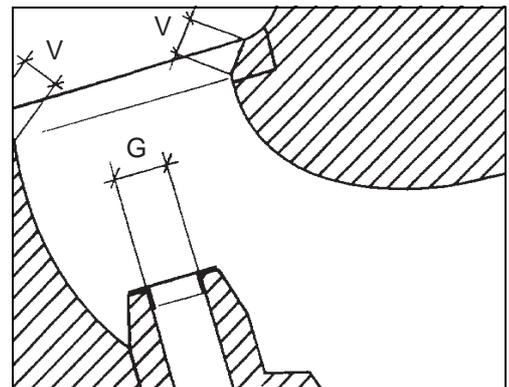
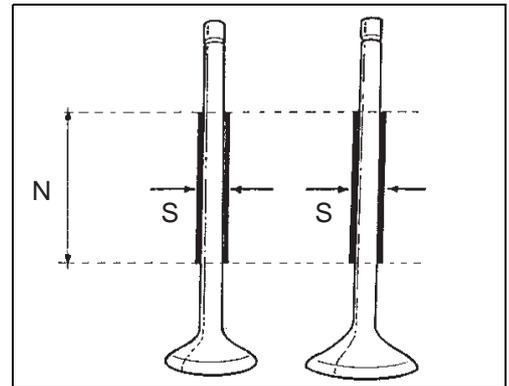
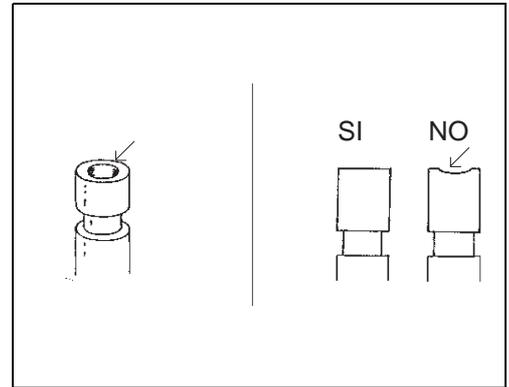
**3.2.18 CHECKING VALVES AND VALVE SEATS**

Valves must show no signs of burning, grooves or deformation.  
 Clean off any carbon deposits.  
 Check valve seats on valve head.

**NOTE** Measurements must be taken at valve stems working area ("N") end, radially and in different positions.

Check valve seats for cracks or damage.  
 Check valve stem "S" diameter and valve guide "G" inner diameter.  
 Measurements must be taken at working area end.  
 Calculate the gap between stem and guide. Allowed limit: intake 0.08 mm (0.003 in) exhaust 0.10 mm (0.004 in).

**NOTE** If excessively worn, change head and valves.

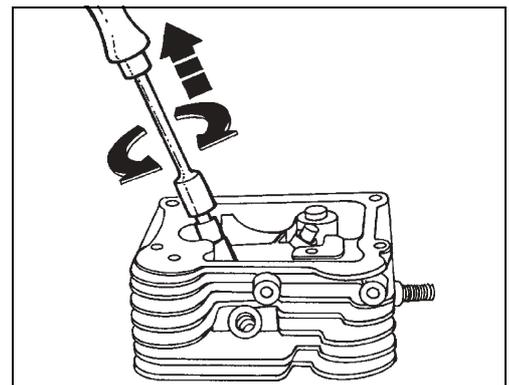


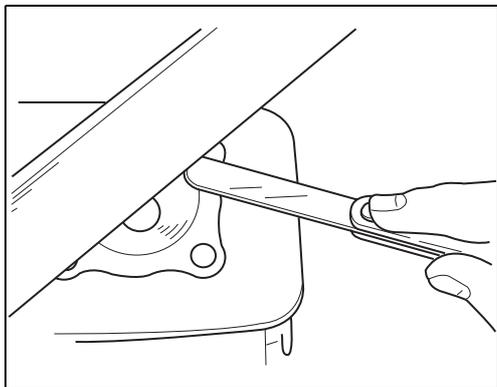
**3.2.19 GRINDING**

To ensure optimum sealing, proceed to valve grinding. Use fine lapping compound with extreme care. While carrying out this operation, keep the head with valve axes in horizontal position in order to avoid any lapping compound residues from entering between valve guide and stem (see figure).

**⚠ WARNING**

To avoid any scores on the mating surface, stop turning the valve when the lapping compound is over. Thoroughly wash head and valve using a product compatible with the lapping compound used.





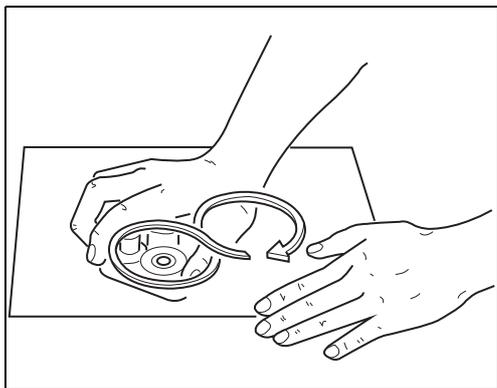
### 3.2.20 CHECKING THE HEAD AND CYLINDER

Using a rounded soft scraper, remove any carbon deposits from the head. Take care not to damage the spark plug thread and to avoid aluminium parts. Remove any deposits from the cylinder head combustion chamber. Then measure head flatness. If necessary, restore head flatness - 0.05 mm limit - as follows:

- rest a metal scale on cylinder head and check flatness with a feeler gauge. If the value is outside the specified limits, restore flatness using 400-600 soaked emery cloth and working following a "8" movement.

Repeat the same check on the cylinder.

Check that cylinder wall is not seized, worn or scored.



**3.2.21 REFITTING VALVES AND HEAD**

- ◆ Fit plate and oil seal.
- ◆ Lubricate valve stems and install them into valve guides.
- ◆ Fit exhaust valve oil seal, springs, upper seals and collets.
- ◆ Fit valves using the special tool.

**⚠ CAUTION**

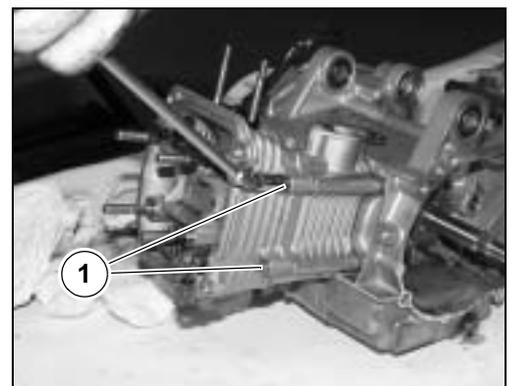
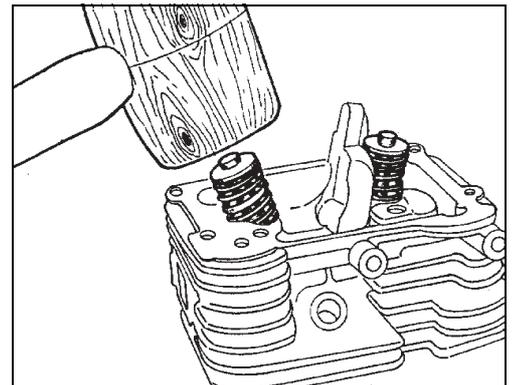
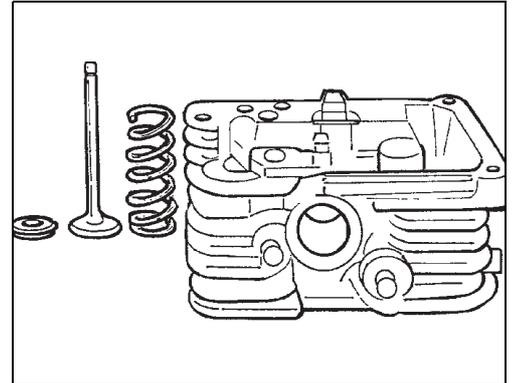
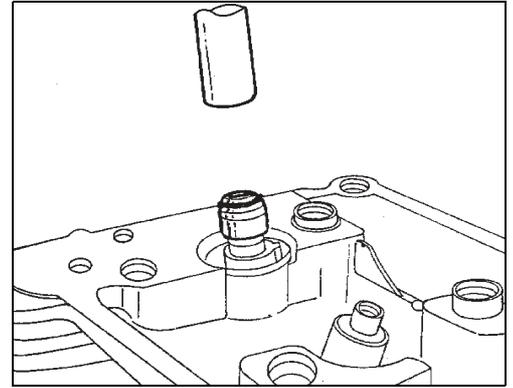
Make sure that collets are perfectly assembled; spring underneath, which is compressed, could suddenly slip off its seat and injure the operator.

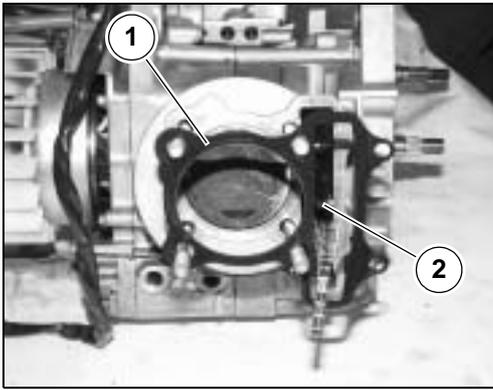
- ◆ Using a plastic or a wood hammer, gently tap on valve stems to settle collets into their seats. Make sure that valve is free to move inside its working area.

**⚠ CAUTION**

Carry out this operation with great care since parts could be damaged and the operator injured.

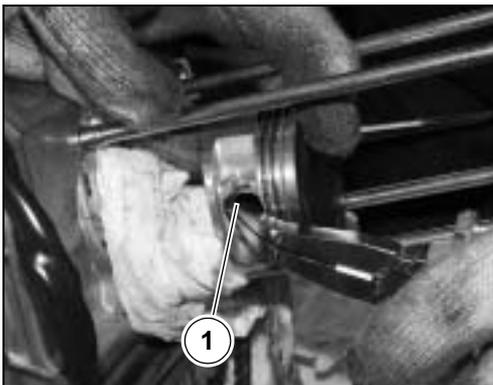
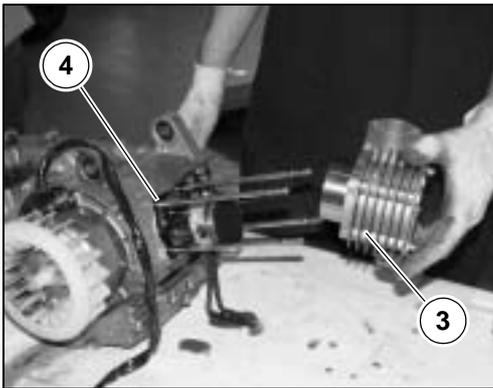
- ◆ Refit head to engine. Change head gasket.
- ◆ Tighten the two screws (1).
- ◆ Refit camshaft, see 3.2.11 (REFITTING THE CAMSHAFT).





### 3.2.22 REMOVING THE CYLINDER

- ◆ Remove the head, see 3.2.13 (REMOVING THE HEAD).
- ◆ Remove seal (1).
- ◆ Remove upper sliding shoe (2).
- ◆ Remove cylinder (3).
- ◆ Remove seal (4).



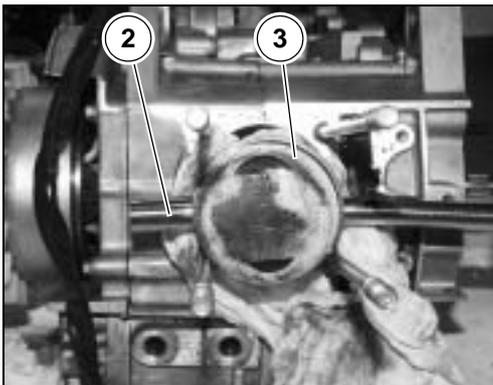
### 3.2.23 REMOVING THE PISTON

- ◆ Remove the cylinder, see 3.2.22 (REMOVING THE CYLINDER).

#### ⚠ WARNING

Before removing gudgeon pin circlips, block off casing opening with a clean cloth to prevent them from falling into the engine.

- ◆ Remove gudgeon pin (2) circlip (1).
- ◆ Remove gudgeon pin (2).
- ◆ Remove piston (3).



### 3.2.24 CHECKING THE CYLINDER

Check that cylinder inner walls are not seized or excessively worn. Measure cylinder inner diameter using a bore gauge.

Wear limit 0.10 mm (0.004 in) beyond cylinder nominal size (see Coupling table).

Measure the diameter at three different positions along the cylinder height and, at each position, take the reading along the circumference.

### 3.2.25 CHECKING THE PISTON

Remove piston rings taking care not to over-enlarge them.

Then, using a rounded scraper, remove any carbon deposits from piston crown. To clean piston rings seats, use a waste piston ring.

Do not use silundum emery cloth to clean piston crowns or seats as a too high amount of metal would be removed and the silundum particles settling inside the piston will lead to an early wear of cylinder bore and thus to piston corrosion.

Thoroughly inspect piston skirt. If hard carbon deposits are present, soak the whole piston in a suitable liquid, such as that used to clean carburetors.

#### **⚠ CAUTION**

**Hard carbon detergents are very dangerous; their vapours can cause severe diseases and the contact with skin or eyes causes immediate severe injuries. Always use the recommended protective equipment, such as goggles and gloves and thoroughly follow the instructions and the warnings written on the detergent container.**

After cleaning, some light scores could still be present on the piston skirt. Do not care.

In case of deep scores, change the piston.

Measure the piston diameter at 5 mm from piston lower edge using a micrometer gauge, as shown.

**Piston-cylinder coupling shall not be above 0.10 mm.**





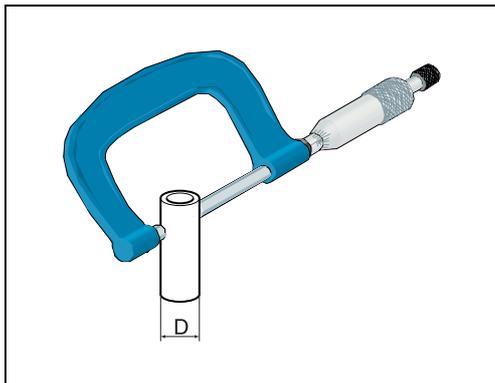
### 3.2.26 CHECKING PISTON RINGS

Measure piston rings side clearance with a feeler gauge.

Side clearance: 0.12 mm

Check piston rings carefully. Distance between the two ends shall be 0.5 mm. To check, use a feeler gauge and insert the piston ring horizontally inside the cylinder. To do so, position the piston ring squarely with the cylinder using the bare piston.

Position piston ring inside its original location on cylinder upper side.



### 3.2.27 CHECKING PISTON GUDGEON PIN

Carefully inspect gudgeon pin: it must be perfectly smooth, without scorings, steps or blueish stains due to overheating. In case of scores or steps, or if blueish/greyish stains are present, change the gudgeon pin. In case the gudgeon pin colour is slightly matt, do not change it.

Measure gudgeon pin outer diameter (D).

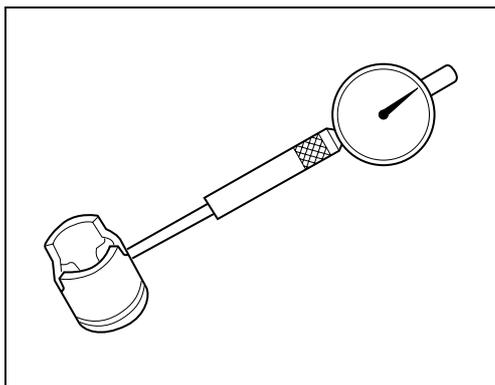
Gudgeon pin outer diameter:

14.960 mm.

Check gudgeon pin seat diameter.

Gudgeon pin seat diameter:

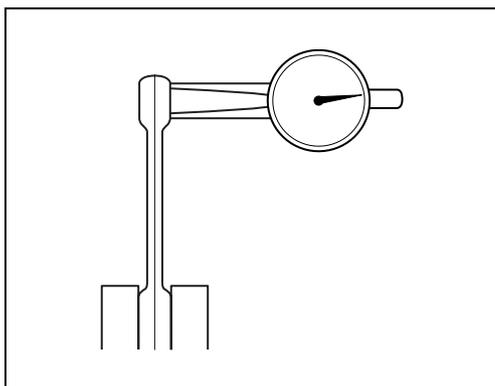
15.04 mm.



Check gudgeon pin seat diameter inside the connecting rod.

Connecting rod inner diameter:

15.06 mm.



**3.2.28 REFITTING THE PISTON**

- ◆ Refit piston rings as shown in the figure and taking care not to damage them.

**NOTE** *Piston rings are correctly assembled when the reference mark is facing up.*

**⚠ WARNING**

After assembling, piston rings can move freely into their seats.

**⚠ WARNING**

Centre ring shall be fitted with the tooth facing down.

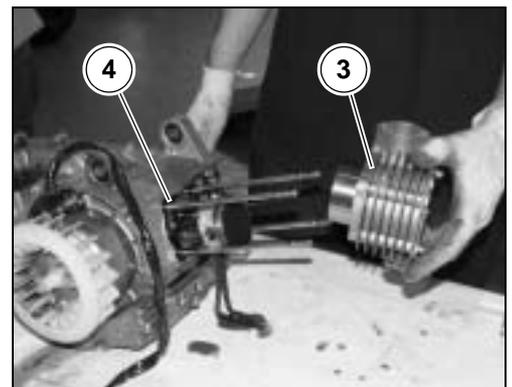
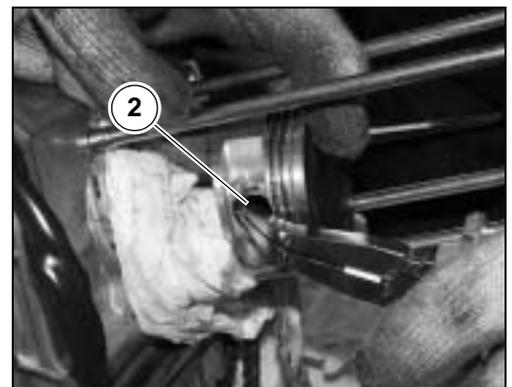
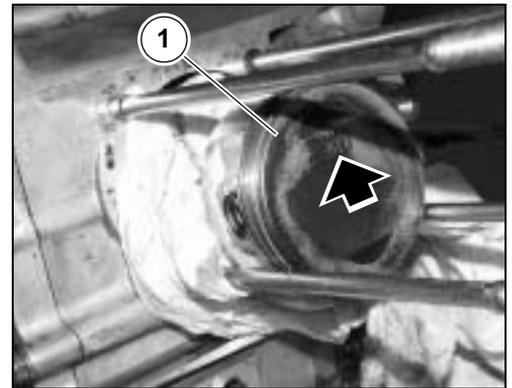
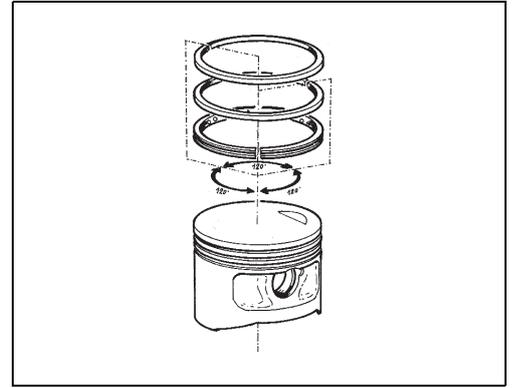
- ◆ Fit piston (1) with the "IN" mark on intake valve side.
- ◆ Install gudgeon pin and fit the new gudgeon pin circlips (2).

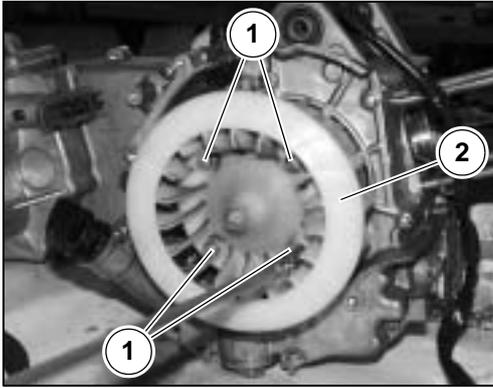
**⚠ WARNING**

Position gudgeon pin circlip opening along the cylinder axis.

**NOTE** *When fitting the gudgeon pin-piston assembly, block off the casing opening with a clean cloth to prevent gudgeon pin circlips from falling inside the engine.*

- ◆ Fit cylinder (3) with engine block gasket (4).
- ◆ Refit head, see 3.2.21 (REFITTING VALVES AND HEAD).





### 3.3 ALTERNATOR

#### 3.3.1 REMOVING THE COOLING FAN

**NOTE** Engine can be left assembled on frame.

- ◆ Remove the fan guard, see 3.2.1 (REMOVING PROTECTION FAN).
- ◆ Loosen and remove the four screws (1). Save the washers.
- ◆ Remove cooling fan (2).

#### 3.3.2 REMOVING THE ALTERNATOR

- ◆ Remove the cooling fan, see 3.3.1 (REMOVING THE COOLING FAN).
- ◆ Remove the flywheel nut (1) with washer.
- ◆ Using the special "Flywheel puller" (part no. 8910600), remove the flywheel and save the key.

#### **⚠ WARNING**

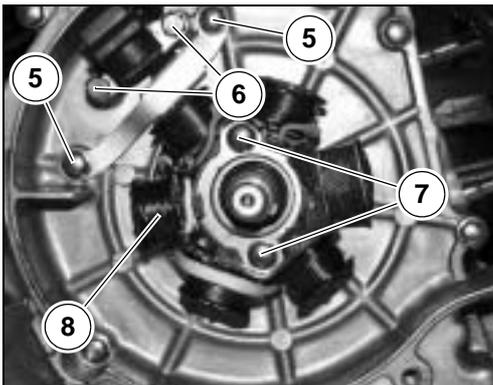
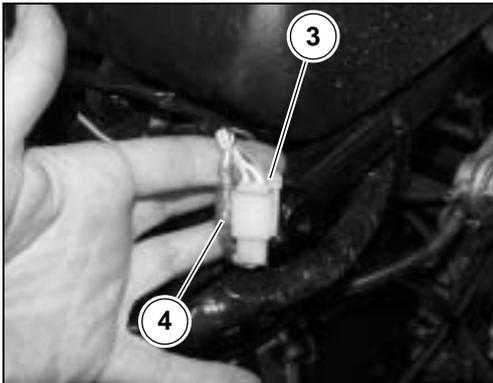
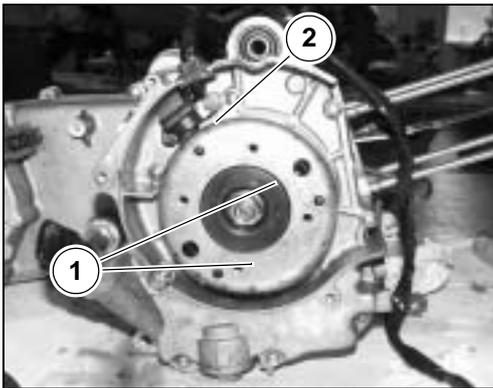
The flywheel nut is strongly tightened; proceed with extreme care not to hurt your hands.

- ◆ Disconnect connectors (3 - 4) from wiring.

#### **⚠ WARNING**

Take care not to damage seal and cable.

- ◆ Loosen and remove the two screws (5). Save the plate.
- ◆ Loosen and remove the two screws (6).
- ◆ Loosen and remove the two screws (7).
- ◆ Remove the stator (8).

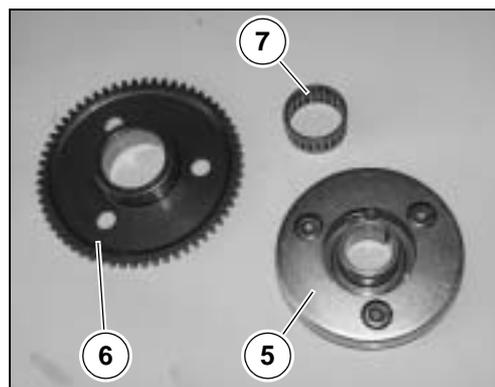
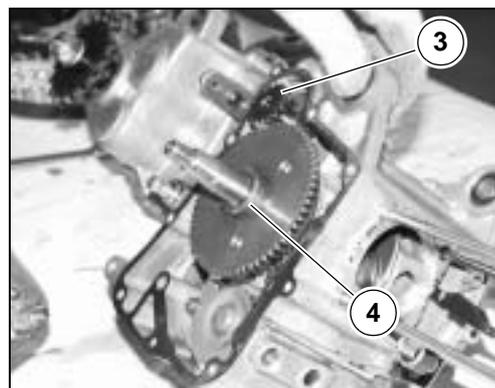
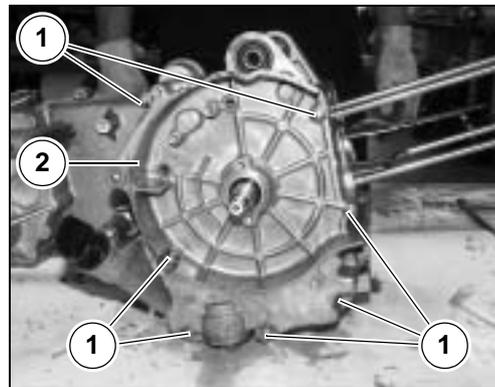


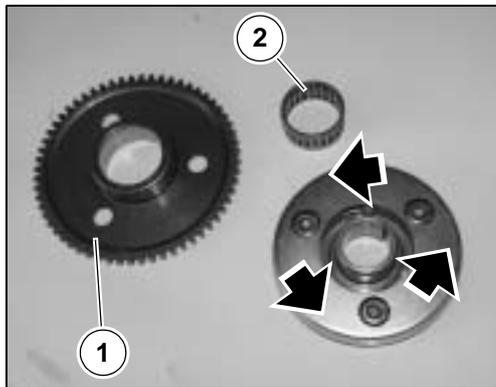
#### 3.3.3 CHECKING THE FLYWHEEL

Proceed to a mechanical check of all flywheel components. Check key seat and keyway on crankshaft for wear. Change those parts which are excessively worn.

### 3.3.4 REMOVING THE FREEWHEELING CLUTCH

- ◆ Remove the alternator, see 3.3.2 (REMOVING THE ALTERNATOR).
- ◆ Loosen and remove the seven screws (1).
- ◆ Remove the casing (2).
- ◆ Remove the starter motor gear (3).
- ◆ Loosen and remove the locking ring nut (4) using the special tool "Ring nut spanner" (part no. 8910599). Save the spacer.
- ◆ Remove the freewheeling clutch (5) with the toothed gear (6) and the roller bearing (7).



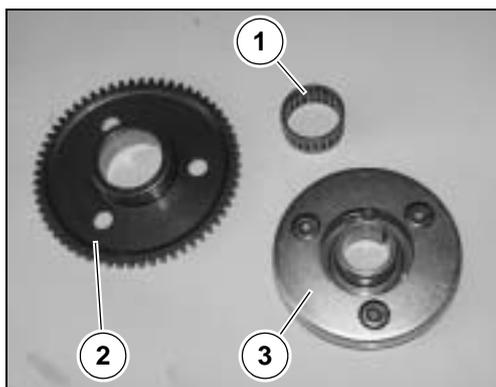


### 3.3.5 CHECKING THE STARTER CLUTCH

Check the starter clutch. Push needle roller bearings along the arrows direction and check that they can move freely inside their seat and go back to their original position. If necessary, change them.

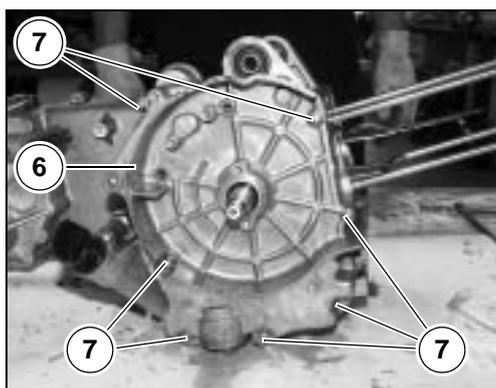
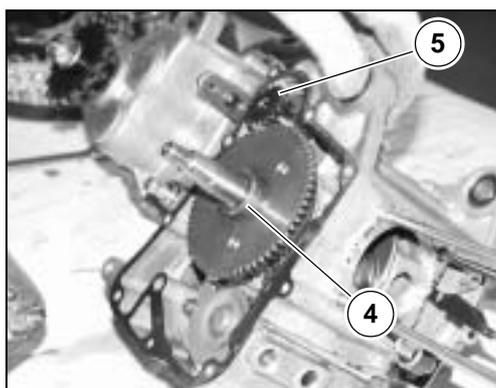
Check gear teeth, freewheeling clutch (1) outer and inner surface and roller bearing for wear. If excessively worn, change them.

Check roller bearing (2) for wear.



### 3.3.6 REFITTING THE FREEWHEELING CLUTCH

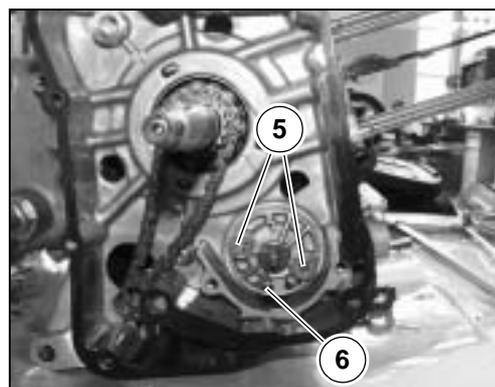
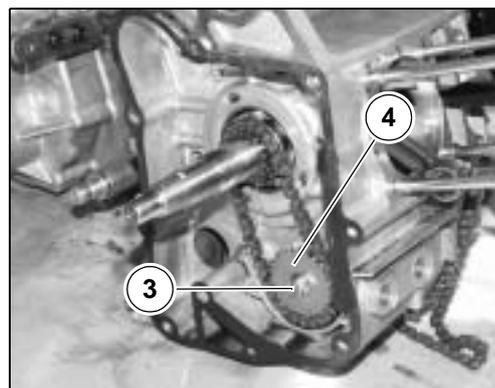
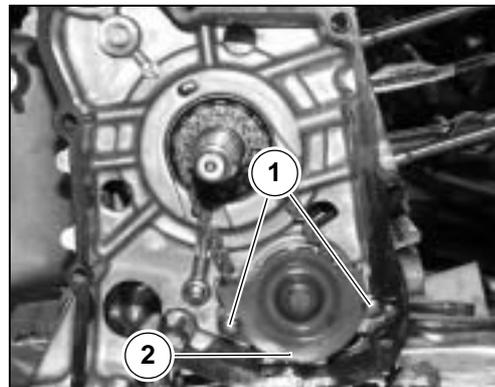
- ◆ Fit the roller bearing (1) and the toothed gear (2) on the freewheeling clutch (3).
- ◆ Fit the complete freewheeling clutch on the crankshaft.
- ◆ Position shim and tighten locking ring nut (4).
- ◆ Fit starter motor gear (5).
- ◆ Change gasket and fit casing (6). Tighten the seven screws (7).
- ◆ Refit the alternator, see 3.3.2 (REMOVING THE ALTERNATOR).



## 3.4 OIL PUMP

## 3.4.1 REMOVING THE OIL PUMP

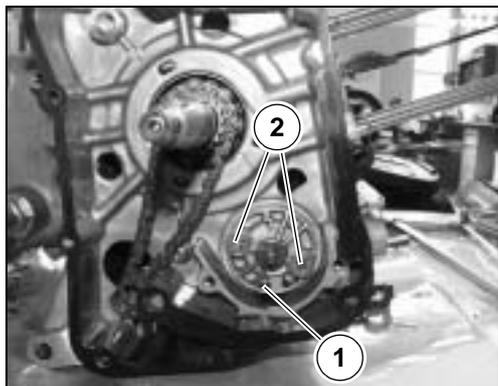
- ◆ Drain off all engine oil, see 2.11.2 (CHANGING THE ENGINE OIL AND THE ENGINE OIL FILTER).
- ◆ Remove starter clutch, see 3.6.5 (REMOVING THE CLUTCH AND THE SECONDARY BELT ROLLER).
- ◆ Loosen and remove the two screws (1). Save the plate (2).
- ◆ Loosen and remove nut (3).
- ◆ Remove the toothed gear (4). Save the chain.
- ◆ Loosen the two screws (5).
- ◆ Remove the oil pump (6).



### 3.4.2 CHECKING THE OIL PUMP

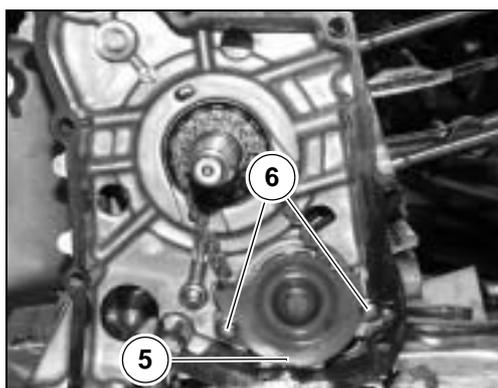
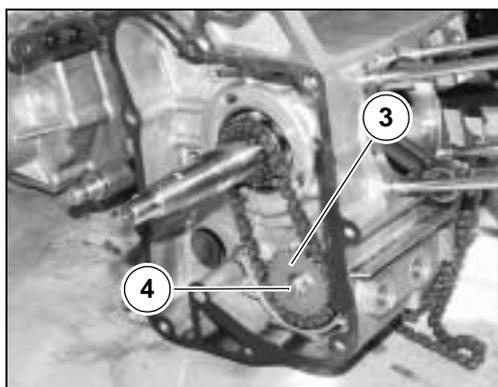
Carefully check the oil pump. Even if really seldom, excessive wear or malfunctioning can modify pump calibrating values.

In case pump does not seem to work properly, check the pump drive gear for wear and, if necessary, change it.



### 3.4.3 REFITTING THE OIL PUMP

- ◆ Fit pump (1) and tighten the two screws (2).
- ◆ Fit the toothed gear (2) with chain and tighten nut (4).
- ◆ Fit plate (5) and tighten the two screws (6).
- ◆ Refit the starter clutch, see 3.6.5 (REMOVING THE CLUTCH AND THE SECONDARY BELT ROLLER).
- ◆ Fill engine oil, see 2.11.2 (CHANGING THE ENGINE OIL AND THE ENGINE OIL FILTER).



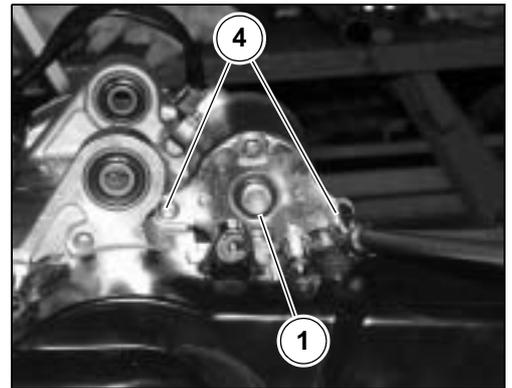
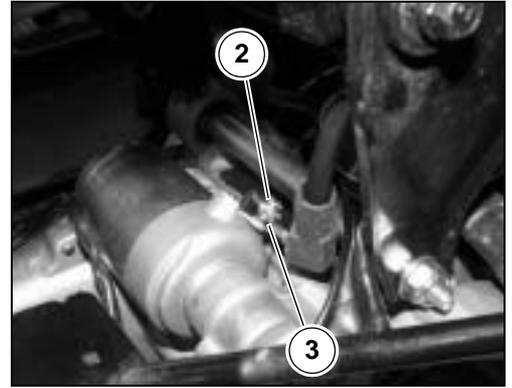
3.5 STARTER MOTOR

3.5.1 REMOVING THE STARTER MOTOR

**NOTE** Engine can be left assembled on frame.

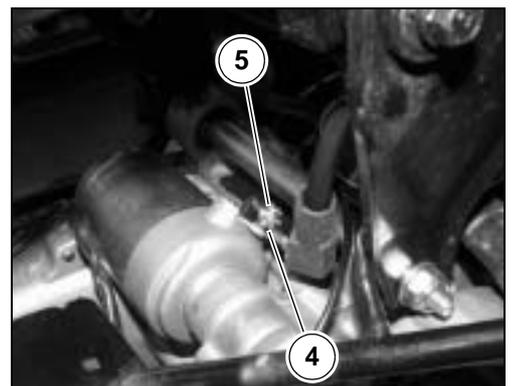
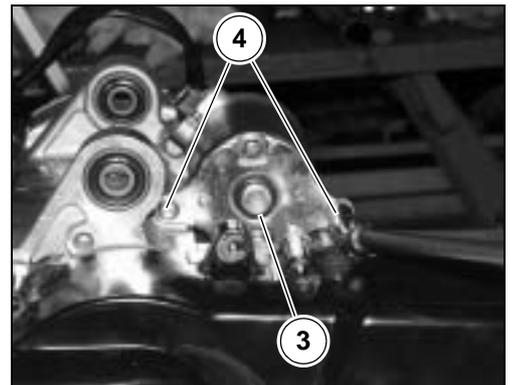
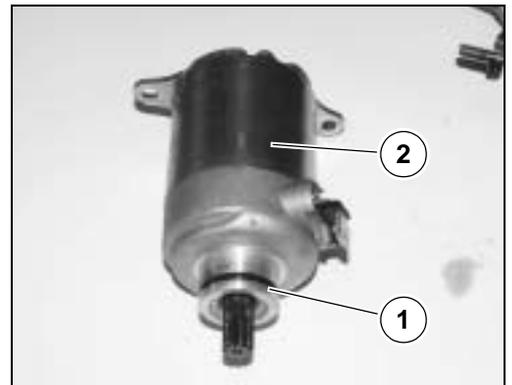
In case of starter motor (1) faulty operation, before removing this part, check electrical connections and, if necessary, restore them.

- ◆ Loosen and remove the screw (2).
- ◆ Disconnect connector (3).
- ◆ Loosen and remove the two screws (4).



3.5.2 REFITTING THE STARTER MOTOR

- ◆ Make sure that the O-ring (1) is correctly seated, apply a thin layer of special grease for oil seals, see 1.8 (LUBRICANT CHART). Refit the starter motor (2).
- ◆ Position and tighten the two screws (3).
- ◆ Reconnect connector (4) and tighten screw (5).



## 3.6 STARTING SYSTEM

## 3.6.1 REMOVING THE STARTING SYSTEM

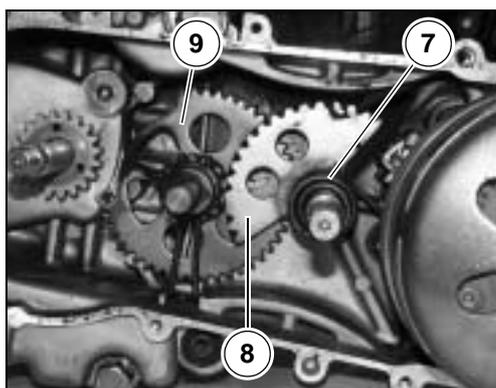
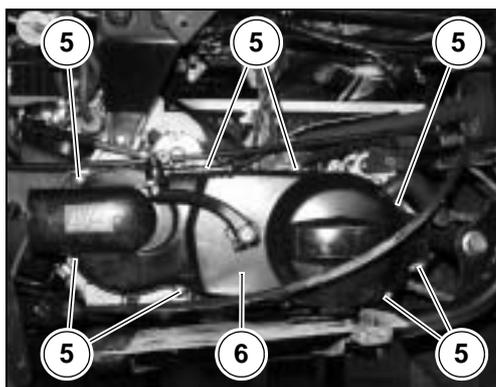
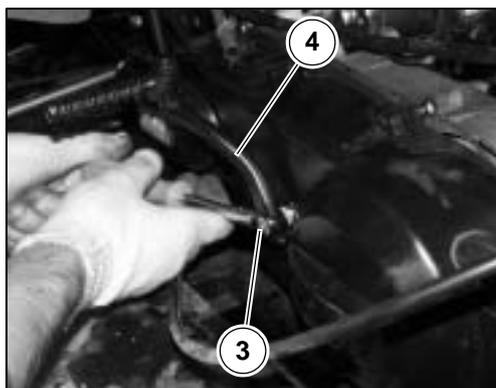
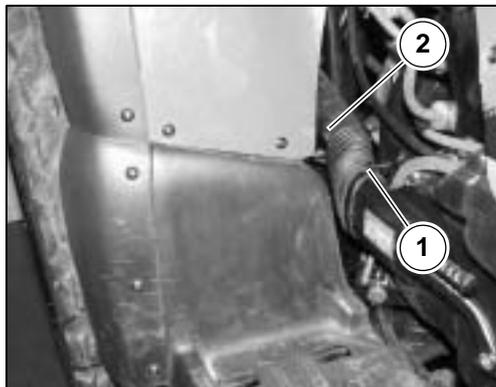
**NOTE** Engine can be left assembled on frame.

- ◆ Remove left footrest, see 6.1.7 (REMOVING THE FOOTREST).
- ◆ Loosen clip (1) and remove filter (2).
- ◆ Loosen and remove screw (3). Remove the kick-start pedal (4).
- ◆ Loosen and remove the eight screws (5).
- ◆ Remove the casing (6).
- ◆ Remove the converter, see 3.6.3 (REMOVING THE PRIMARY BELT ROLLER).

**⚠ WARNING**

**Spring (7) is pre-loaded.**

- ◆ Using a pair of pincers, release the lever (7) return spring.
- ◆ Remove the starter shaft (8).
- ◆ Remove the sliding gear (9).



### 3.6.2 REFITTING THE STARTING SYSTEM

- ◆ Refit the return spring (1) first, and then the starter shaft (2).

**NOTE** Make sure that the reference mark (3) on the starter shaft (2) is facing the sliding gear (4) axis.

- ◆ Hook-up the return spring (1) to the starter shaft (2) and, using a stretching hook, secure the other spring end on the shaft.

**NOTE** When refitting the spring (1), take care not to over-stretch it while hooking.

#### ⚠ WARNING

If over-stretched, the spring could yield.

#### ⚠ CAUTION

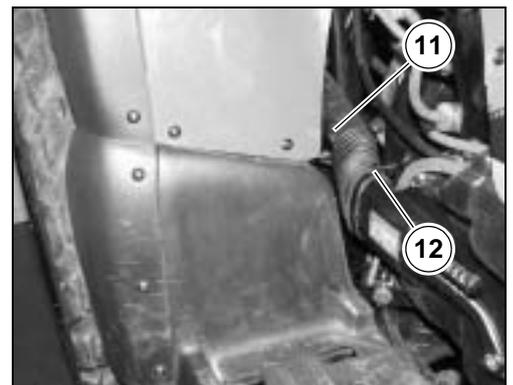
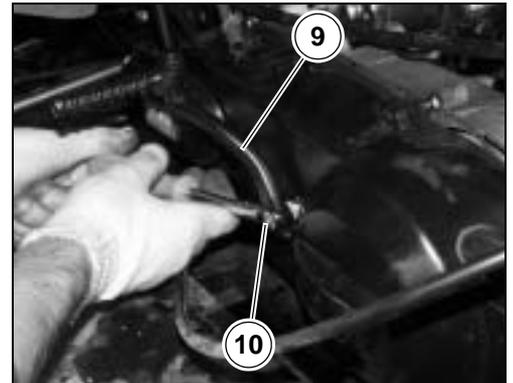
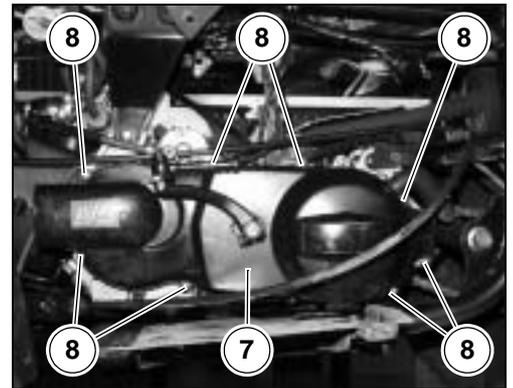
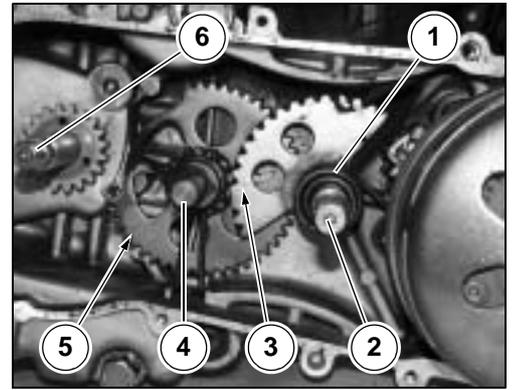
**Danger.**

Refit the sliding gear (4) first and then the spring. Slightly move the starter shaft (2) so as to make gear fitting easier.

**NOTE** Make sure that the reference mark (5) on the sliding gear is facing the crankshaft (6) axis.

**NOTE** Grease the spring and the toothed part with the recommended grease, see 1.8 (LUBRICANT CHART).

- ◆ Refit the converter, see 3.6.3 (REMOVING THE PRIMARY BELT ROLLER).
- ◆ Refit the casing (7).
- ◆ Position and tighten the eight screws (8).
- ◆ Fit the kick-start pedal (9) and tighten the screw (10).
- ◆ Refit the filter (11) and tighten the clip (12).
- ◆ Refit the left footrest, see 6.1.7 (REMOVING THE FOOTREST).



### 3.6.3 REMOVING THE PRIMARY BELT ROLLER

**NOTE** Engine can be left assembled on frame.

- ◆ Remove the converter casing, see 3.6.1 (REMOVING THE STARTING SYSTEM).
- ◆ Loosen and remove the belt roller nut (1) using the special tool (converter locking spanner part no. 8900673).
- ◆ Remove the tapered washer (2).

**NOTE** At reassembly, make sure that washer (2) is correctly positioned.

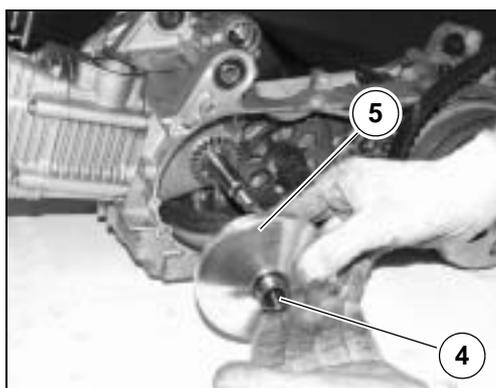
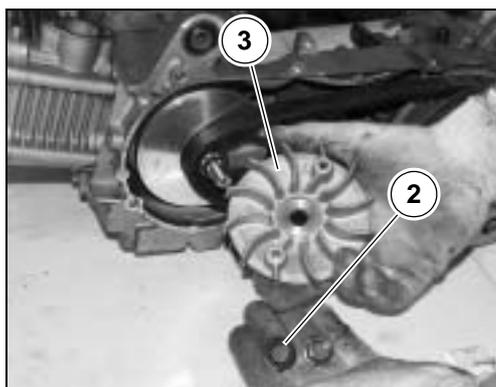
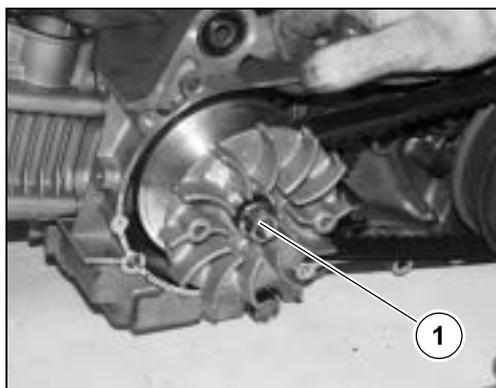
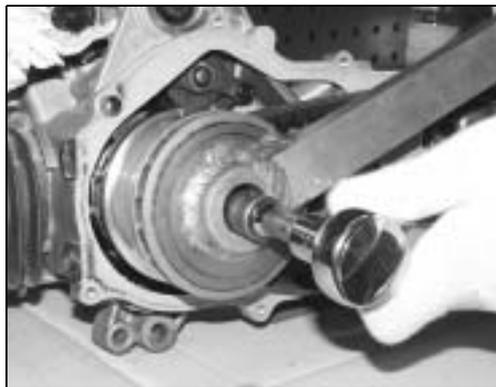
- ◆ Remove primary (fixed) belt roller (3).
- ◆ Remove bushing (4), primary (mobile) belt roller (5) and block holder at the same time.

#### **⚠ WARNING**

**Do not disassemble belt roller from block holder as the six inner blocks could fall to the ground.**

- ◆ Separate belt roller from block holder and remove the six inner blocks.

**NOTE** At reassembly, change the seal.



### 3.6.4 CHECKING THE PRIMARY BELT ROLLER

Check the primary (fixed and mobile) belt roller and the bushing for wear, cracks, scores or other damages. Change, if necessary.

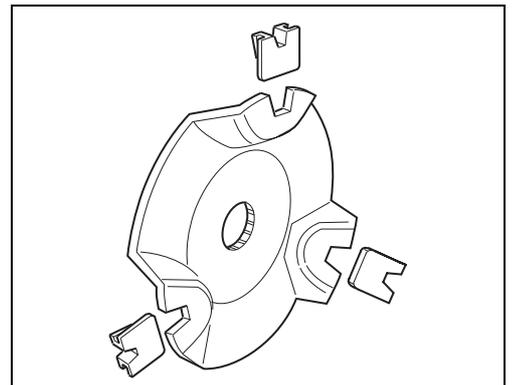
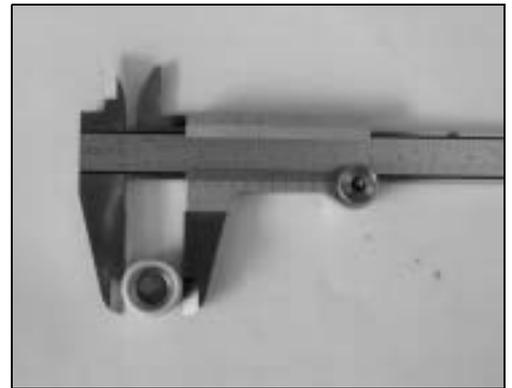
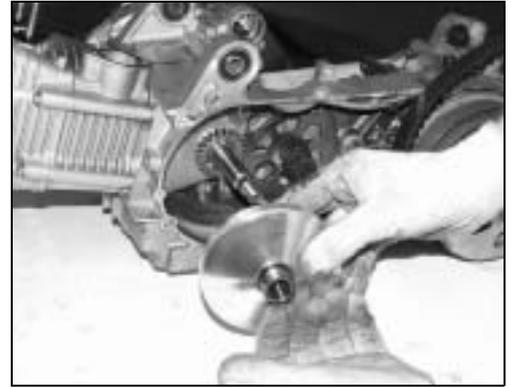
Check that bushing runs smoothly and without jams inside the primary (mobile) belt roller. If it runs hard or in case of excessive play, change both belt roller and bushing.

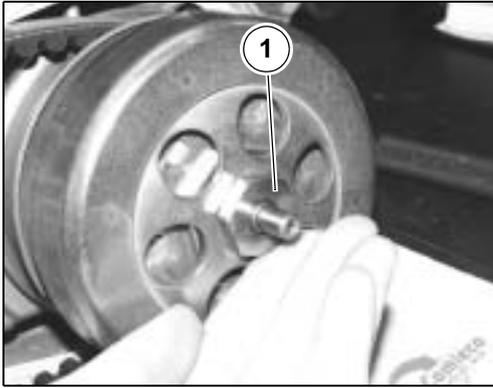
Check block outer diameter: it shall not be below the max. wear limit. If necessary, change them.

Change blocks in case their cylindrical side is faceted.

Wear limit: 14.6 mm.

Check block holder and the 3 driving blocks for wear. If excessively worn, change them.





### 3.6.5 REMOVING THE CLUTCH AND THE SECONDARY BELT ROLLER

- ◆ Remove the converter casing, see 3.6.1 (REMOVING THE STARTING SYSTEM).
- ◆ Loosen and remove nut (1) with the special tool (clutch housing and flywheel locking tool part no. 8900675).

#### ⚠ WARNING

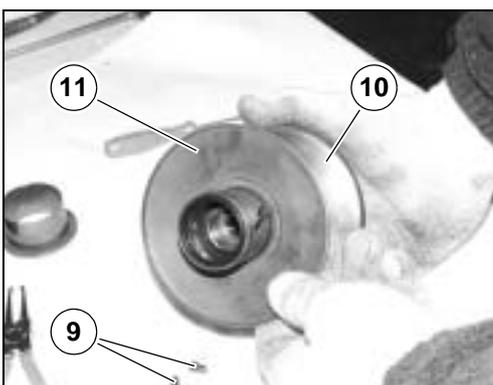
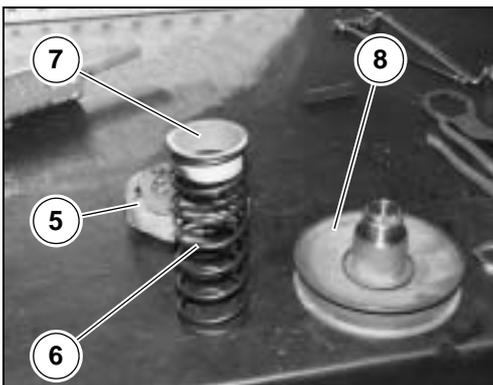
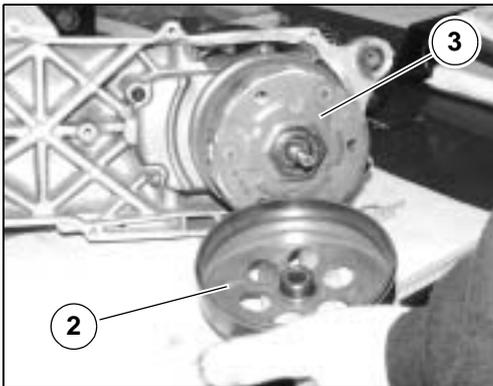
The clutch nut is strongly tightened; proceed with extreme care not to hurt your hands.

- ◆ Slide out belt and remove clutch housing (2).
- ◆ Remove the secondary belt roller unit (3).
- ◆ Compress the unit with the special tool (universal tool to disassemble/assemble clutch units part no. 8900674) and remove the clutch nut (4).

#### ⚠ CAUTION

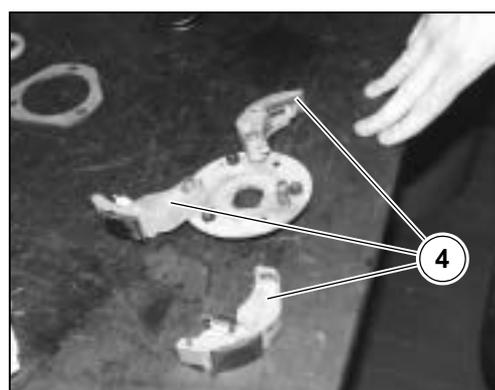
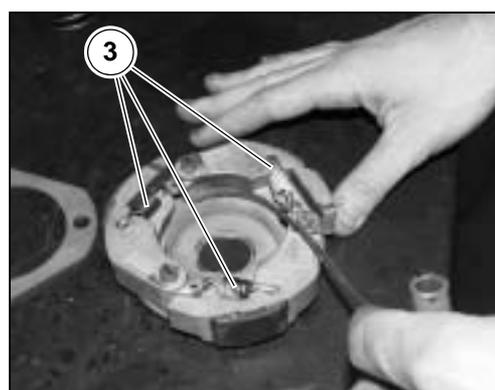
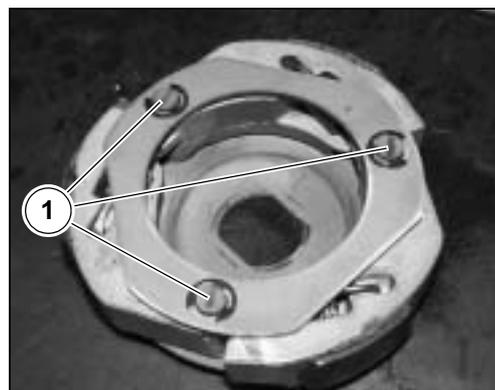
The spring is compressed.

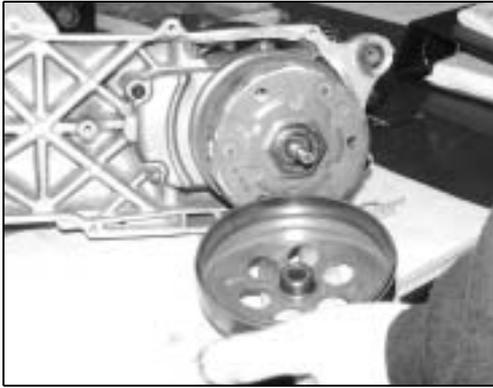
- ◆ Remove the clutch blocks mount (5) first, then the counter spring (6), the spring seat (7) and the complete secondary belt roller (8).
- ◆ Remove the two stop teeth (9) and separate the fixed secondary belt roller (10) from the mobile one (11).



### 3.6.6 CHANGING THE CLUTCH BLOCKS

- ◆ Remove the clutch, see 3.6.5 (REMOVING THE CLUTCH AND THE SECONDARY BELT ROLLER).
- ◆ Remove the three snap rings (1).
- ◆ Remove plate (2).
- ◆ Release the three springs (3) with a stretching hook.
- ◆ Remove the three blocks (4).





### 3.6.7 CHECKING THE CLUTCH

Check clutch inner surface. In case of scoring or rust, remove and clean with emery cloth. Then measure inner diameter.

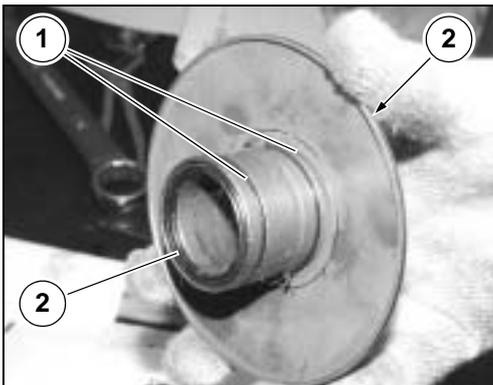
Wear limit: 125.5 mm.

Check clutch blocks. If necessary grind with rough emery cloth and, once finished, thoroughly clean the unit.

Clean clutch blocks with a jet of compressed air. If vitrified, remove the deposits with emery cloth.

**NOTE** Once vitrified deposits have been removed, blow with compressed air to thoroughly clean the blocks from grinding residues.

If necessary, change clutch blocks, see 3.6.6 (CHANGING THE CLUTCH BLOCKS).



### 3.6.8 CHECKING THE SECONDARY BELT ROLLER

Check that the secondary belt roller is not worn and that it runs smoothly and without jams. If it runs hard or if excessively worn, change the belt roller.

Check the groove, the stop teeth, the two O-rings (1) and the two oil seals (2). If damaged or worn, change them.

Measure (secondary belt roller) counter spring free length. If outside the specified limits, change the spring.

Free length: 164.0 mm.



### 3.6.9 CHECKING THE BELT

Check that the belt is free from cuts, cracks, excessive wear and oil. If not so, change it.

Measure the head width at different positions of the belt. If outside the specified limits, change the belt.

Standard width: 19.0 mm.



### 3.6.10 REFITTING THE SECONDARY BELT ROLLER

Before fitting the belt roller, thoroughly clean the sliding surface and, if necessary, apply some grease inside the fixed split belt roller (1) see 1.8 (LUBRICANT CHART).

#### **⚠ WARNING**

**Apply a stripe of adhesive tape around the belt roller end to avoid oil seal lips overturning while fitting the belt roller.**

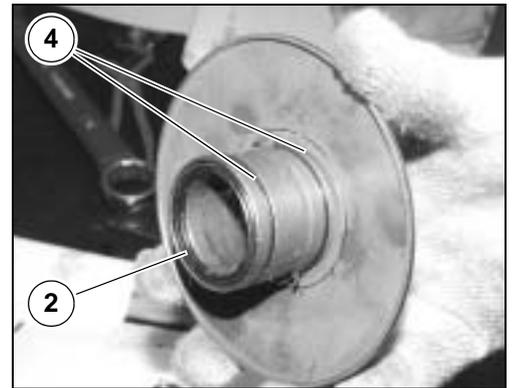
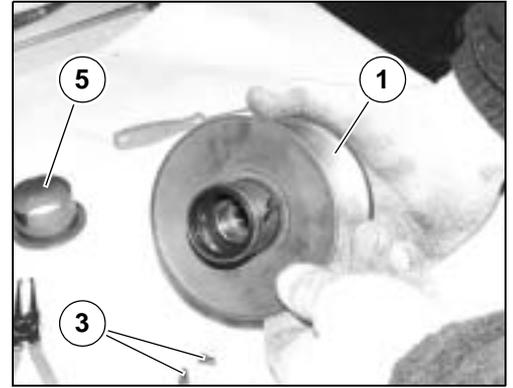
Fit the two stop teeth (3) and apply some grease inside the mobile belt roller (2) groove.

Before assembling, grease also the O-rings (4) on the mobile secondary belt roller.

Fit the spring (5) seat and check that belt roller and return spring run smoothly.

#### **⚠ WARNING**

**Remove any exceeding grease.**



### 3.6.11 REMOVING THE FINAL DRIVE GEARS

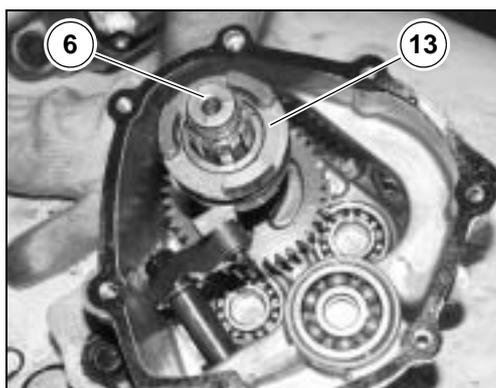
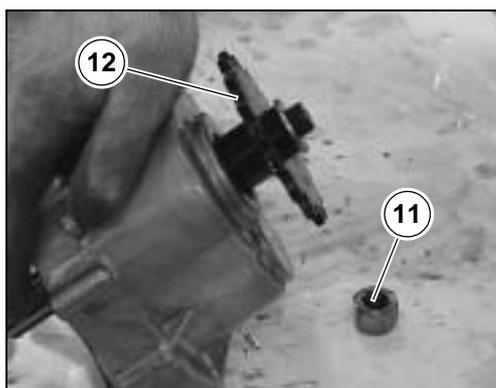
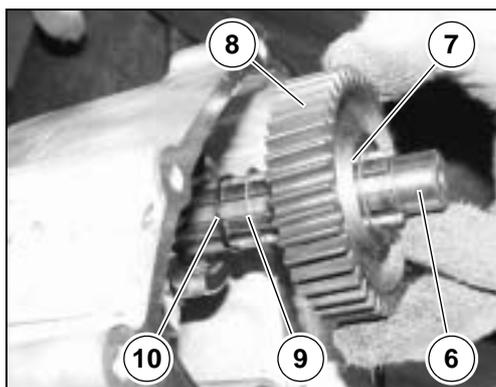
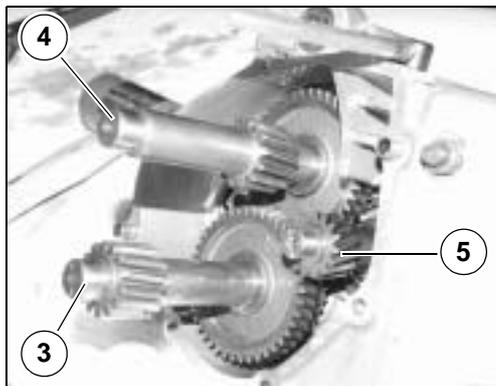
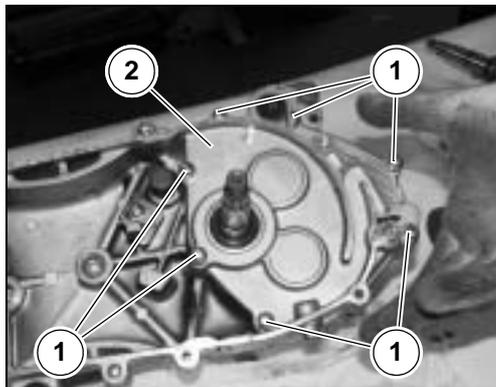
- ◆ Drain off all transmission oil, see 2.12 (CHECKING THE TRANSMISSION OIL LEVEL).
- ◆ Remove clutch, see 3.6.5 (REMOVING THE CLUTCH AND THE SECONDARY BELT ROLLER).

**NOTE** Block off the final drive casing with a cloth to collect any oil leaks.

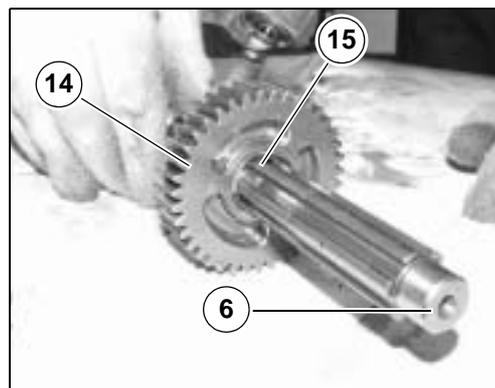
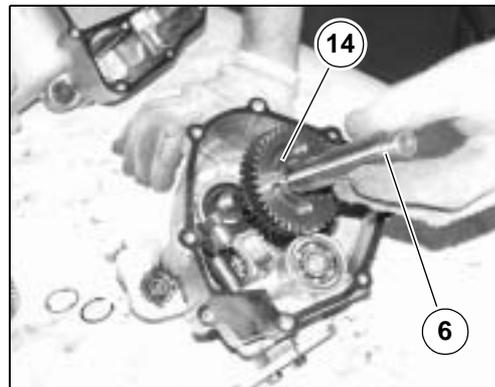
- ◆ Loosen and remove the seven screws (1).
- ◆ Remove the right casing (2).
- ◆ Working on the left casing, remove the following parts in the given order:
  - reverse gear shaft (3)
  - forward gear shaft (4)
  - clutch shaft (5)

The following operations apply to the right casing.

- ◆ Remove from shaft (6) the following parts in the given order:
  - the snap ring
  - the fixed washer (7)
  - the toothed gear (8)
  - the fixed washer (9)
  - the snap ring (10).
- ◆ Loosen and remove nut (11). Save the washer.
- ◆ Remove the rear sprocket (12).
- ◆ Remove the selector belt roller (13).

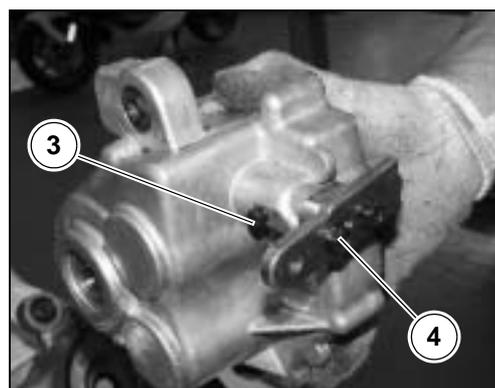
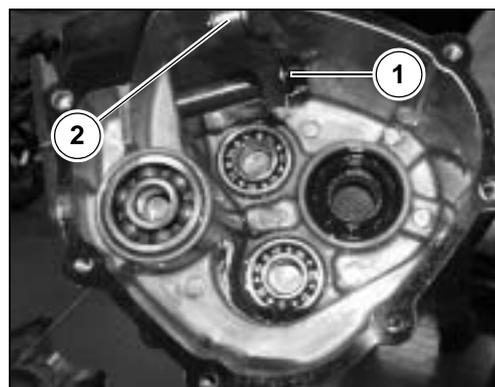


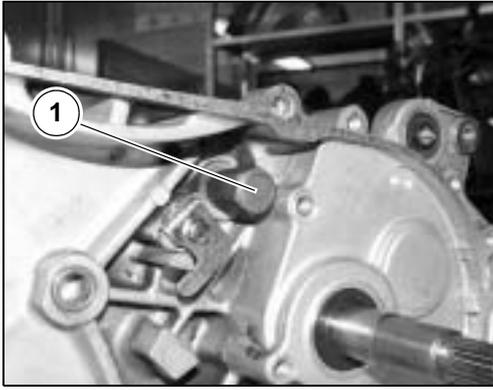
- ◆ Remove shaft (6) with toothed gear (14).
- ◆ Remove the circlip (15).
- ◆ Remove the toothed gear (14) from shaft (6).



### 3.6.12 REMOVING THE SELECTOR SHAFT

- ◆ Remove the final drive gears, see 3.6.11 (REMOVING THE FINAL DRIVE GEARS).
- ◆ Loosen and remove nut (1).
- ◆ Remove arm (2).
- ◆ Loosen and remove screw (3).
- ◆ Remove the complete selector shaft (4).

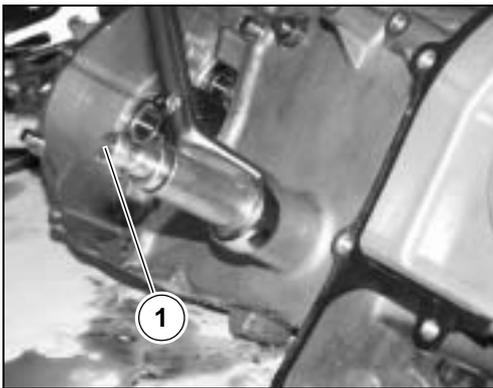
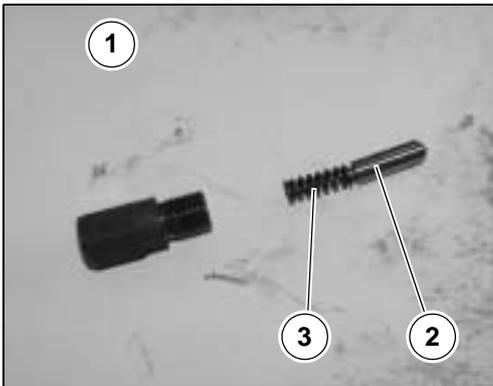




### 3.6.13 REMOVING THE GEAR SELECTOR SPINDLE

**NOTE** *Engine can be left assembled on frame.*

- ◆ Remove clutch, see 3.6.5 (REMOVING THE CLUTCH AND THE SECONDARY BELT ROLLER).
- ◆ Loosen and remove the gear selector spindle seat (1).
- ◆ Remove the gear selector spindle (2) and the spring (3).



### 3.6.14 REMOVING THE GEAR LEVER MOUNT

**NOTE** *Engine can be left assembled on frame.*

- ◆ Remove the lever.
- ◆ Loosen and remove mount (1).

### 3.6.15 CHECKING THE TRANSMISSION UNIT

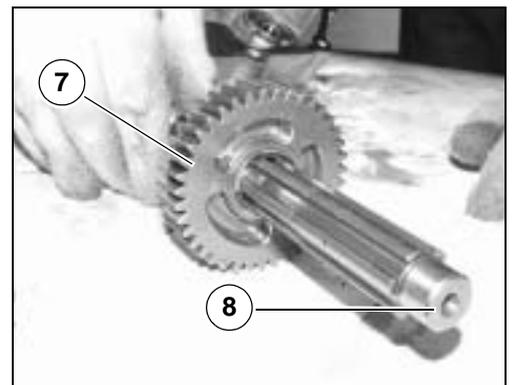
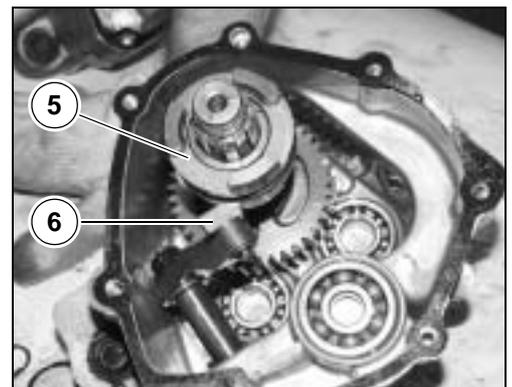
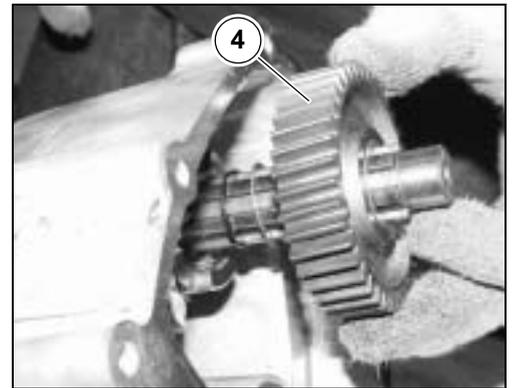
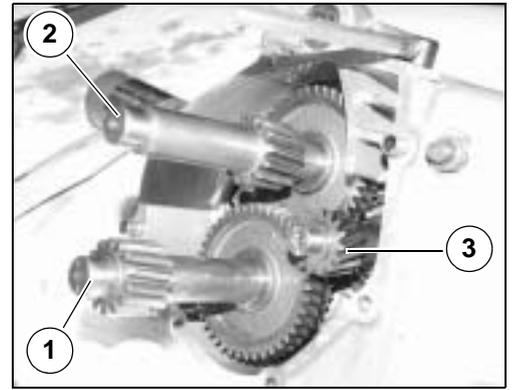
Check that the following gears:

- reverse gear shaft (1)
- forward gear shaft (2)
- clutch shaft (3)
- forward gear toothed gear (4)
- gear selector lever (5) and gear disengagement mechanism (6)
- reverse gear toothed gear (7)
- chain sprocket shaft (8)

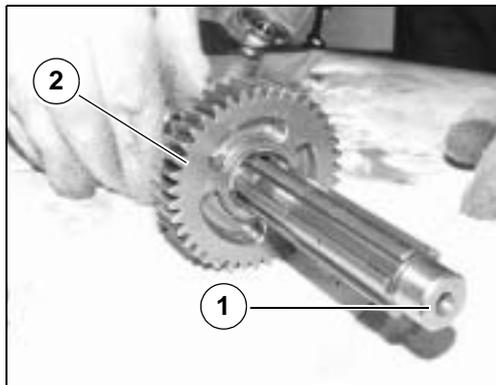
are not worn. Change those parts which are excessively worn.

Check bearings for scores and seizure. If necessary, change them.

Check that gear selector can run smoothly and, in case of malfunctioning, change it.

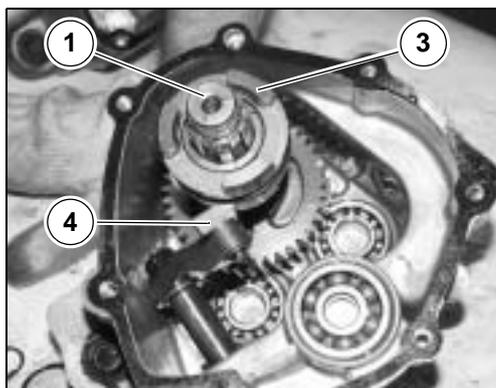


## 3.6.16 REFITTING THE TRANSMISSION UNIT



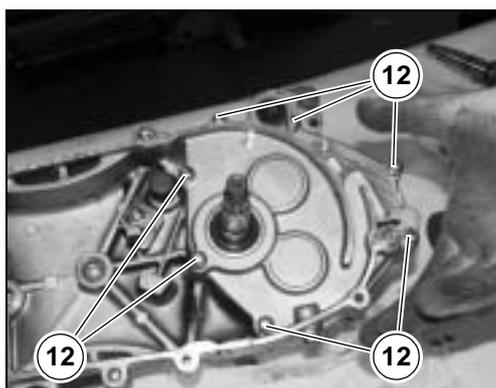
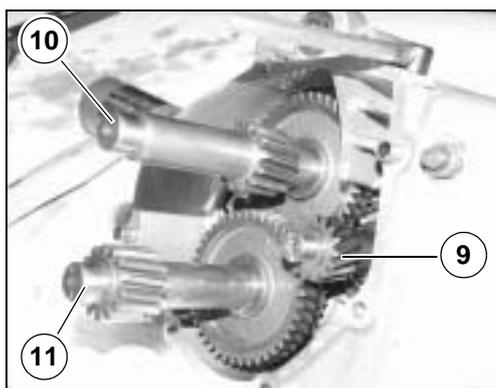
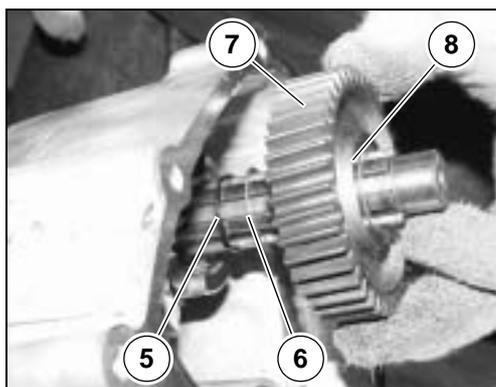
The following operations apply to the right casing.

- ◆ Fit toothed gear (2) onto shaft (1) using snap ring.
- ◆ Install the complete shaft (1) inside casing.
- ◆ To fit selector (3) to shaft (1), engage the selector arm tooth (4) with the selector (3) slot.
- ◆ Fit the following parts onto shaft (1) in the given order:
  - snap ring (5)
  - fixed washer (6)
  - toothed gear (7)
  - fixed washer (8)
  - snap ring.



The following operations apply to the left casing.

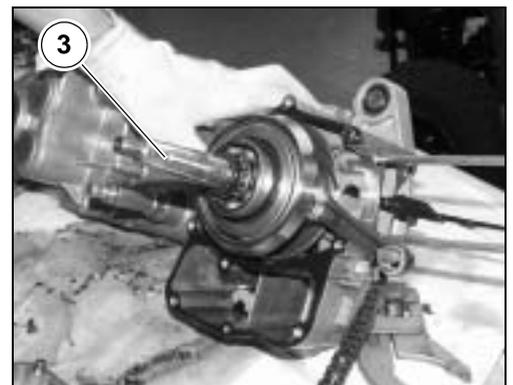
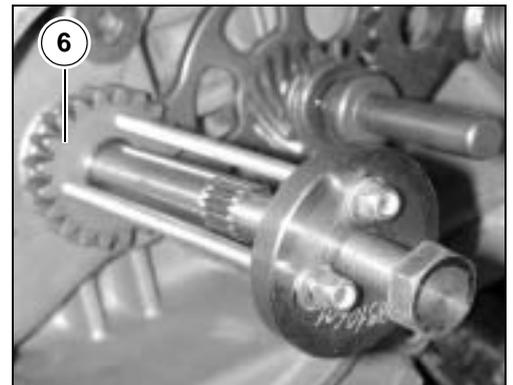
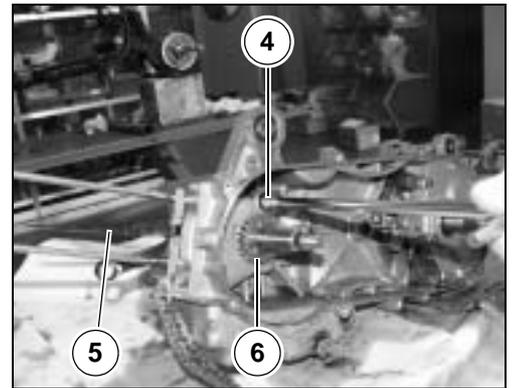
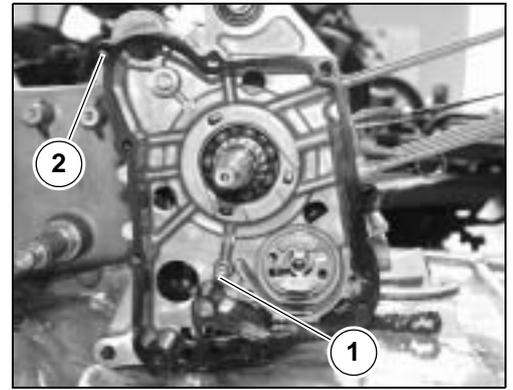
- ◆ Fit the clutch shaft (9) first and then the oil seal.
- ◆ Then fit the forward gear (10) and the reverse gear (11).
- ◆ Join the two pans. Change the gasket.
- ◆ Tighten screws (12) working crossways.



## 3.7 CRANKCASE - CRANKSHAFT

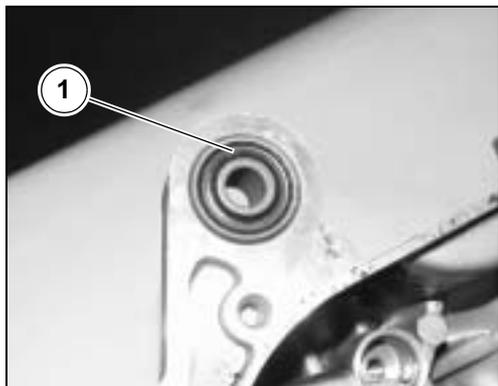
## 3.7.1 REMOVING THE CRANKSHAFT

- ◆ Remove piston, see 3.2.23 (REMOVING THE PISTON).
- ◆ Remove the complete oil pump, see 3.4.1 (REMOVING THE OIL PUMP).
- ◆ Remove the starting system, see 3.6.1 (REMOVING THE STARTING SYSTEM).
- ◆ Remove the oil pump gear and the drive chain, see 3.4.1 (REMOVING THE OIL PUMP).
- ◆ Loosen and remove screw (1).
- ◆ Gently tap with a rubber hammer on the right casing (2) to separate it from crankshaft (3).
- ◆ Loosen and remove screw (4) on lower chain sliding shoe (5).
- ◆ Remove lower chain sliding shoe (5).
- ◆ Using special tool ("Gear puller" part no. 8910601), remove kick-start pedal gear (6).
- ◆ Gently tap with a rubber hammer on the crankshaft (3) from outside the left casing and remove the complete crankshaft (3).



### 3.7.2 CHECKING THE CRANKCASE, THE CRANKSHAFT AND THE CONNECTING ROD

- Thoroughly check crankshaft main bearings. Turn them and, in case of jamming, change both crankshaft and bearings.
- Check bearing seats on crankshaft for wear or scoring.
- Check connecting rod. It shall not be bent, and must perfectly run at right angles with the crankshaft.



### 3.7.3 REMOVING ENGINE RUBBER BUSHING

**NOTE** *The following operations refer to the removal of a single rubber bushing, but apply to the four of them.*

- ◆ Heat the casing with an automatic heater up to about 150°C (~ 10 minutes).
- ◆ Using an hydraulic press, remove rubber bushing (1) working from the outside to the inside and pressing all around the rubber bushing.

## 3.7.4 REFITTING THE CRANKCASE

**⚠ WARNING**

Grease oil seals and oil bearings to prevent crankshaft (1) from being scored and to make assembly operation easier.

- ◆ Heat the left casing with an automatic heater up to about 150°C (~ 10 minutes).
- ◆ To fit crankshaft (1) to left casing (2), install valve drive chain.
- ◆ Heat up right casing, as previously described for the left one, and fit it to crankshaft.
- ◆ Tighten retaining screw (3).

To carry out the following operations, work on engine left side.

- ◆ Install kick-start pedal gear (4), with the chamfered edge facing downwards, onto crankshaft.
- ◆ Refit lower chain sliding shoe (5) and secure it in place with screw (6).
- ◆ Refit kick-start pedal system, see 3.6.2 (REFITTING THE STARTING SYSTEM).

To carry out the following operations, work on engine right side.

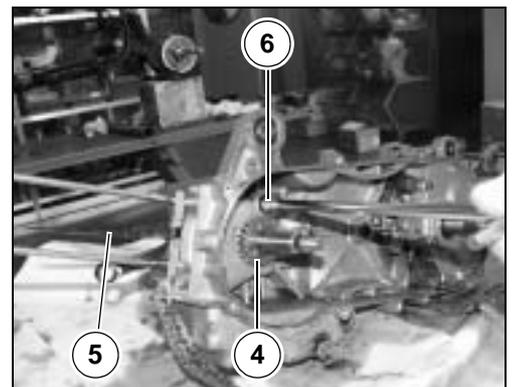
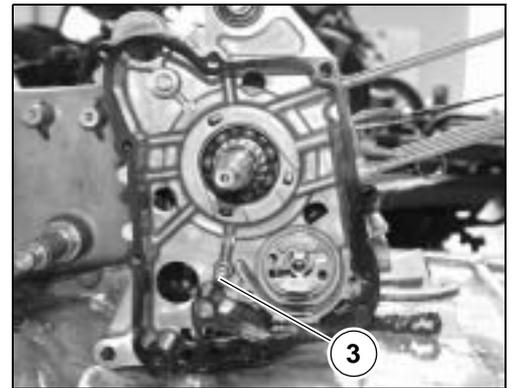
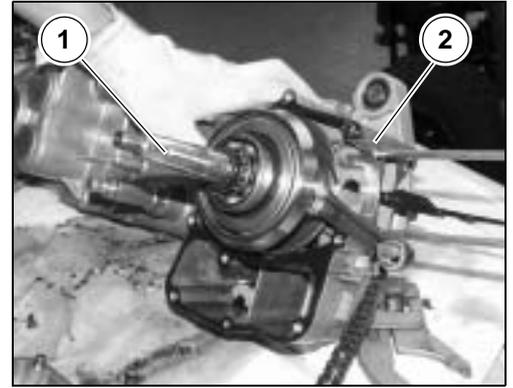
- ◆ Refit gear and pump drive chain, see 3.4.3 (REFITTING THE OIL PUMP).
- ◆ Refit the electric starting system, see 3.6.2 (REFITTING THE STARTING SYSTEM).
- ◆ Refit the piston, see 3.2.28 (REFITTING THE PISTON).

Once finished, check for crankshaft (1) correct positioning. It shall be free to turn without any jamming.

**NOTE** If needed, restore axial play with a mallet.

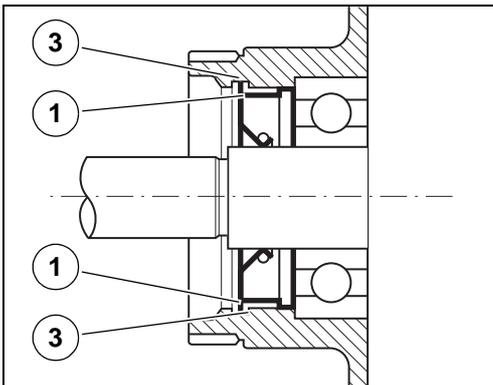
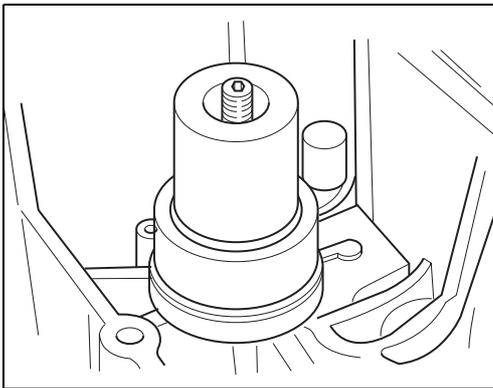
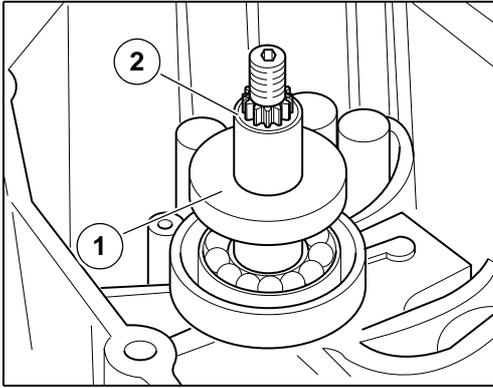
**⚠ WARNING**

Do not use any metal mallet, but a rubber or plastic mallet. Never tap directly on the crankshaft.



### 3.7.5 REFITTING THE CRANKSHAFT OIL SEAL

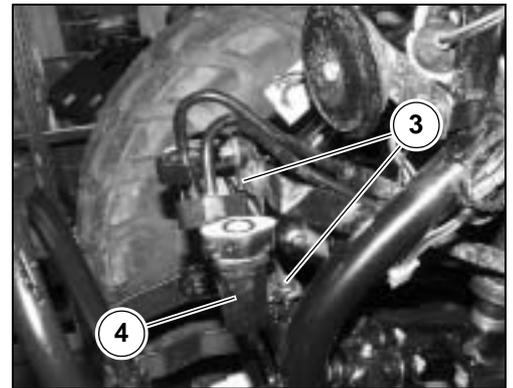
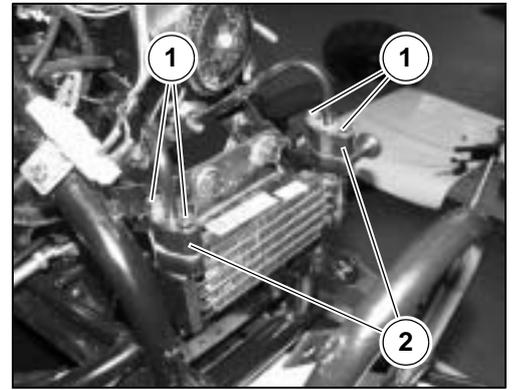
- ◆ Working on engine left side, refit the oil seal (1) first, then the snap ring and the centring bushing (2). Grease the oil seal lip, see 1.8 (LUBRICANT CHART).
- ◆ To make this operation easier, use a tube with a suitable diameter.
- ◆ Once finished, make sure that the oil seal (1) lip is properly seated inside the casing (3), as shown in the figure.
- ◆ Working on engine right side, fit the oil seal as described above.



3.8 LUBRICATION SYSTEM

3.8.1 REMOVING THE ENGINE OIL COOLER

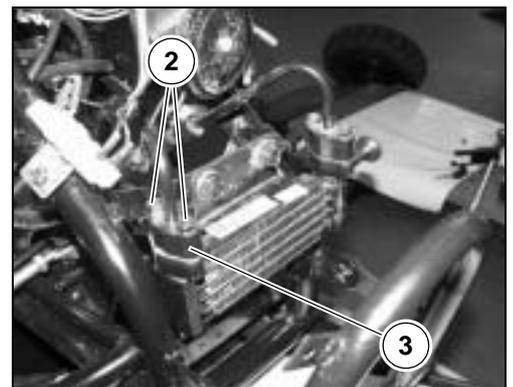
- ◆ Put a container under the oil cooler.
- ◆ Loosen and remove the four screws (1).
- ◆ Keep pipes (2) up and remove them. Save the two O-rings.
- ◆ ★ Loosen and remove the two screws (3).
- ◆ Remove the oil cooler (4).



3.8.2 REMOVING THE ENGINE OIL LINES

- ◆ Drain all oil out of the circuit, see 2.11.2 (CHANGING THE ENGINE OIL AND THE ENGINE OIL FILTER).
- ◆ Put a container under the engine oil pipe.
- ◆ Loosen and remove screw (1). Save the two washers.
- ◆ Loosen and remove the two screws (2).
- ◆ Remove engine oil pipe (3). Save the O-rings.

If necessary, repeat the same procedure on the other pipe.





FUEL SYSTEM

4

**FUEL SYSTEM****CONTENTS**

4.1	MAINTENANCE.....	4-3-00
4.2	DRAINING THE FUEL TANK.....	4-3-00
<b>4.2.1</b>	<b>CARBURETTOR .....</b>	<b>4-4-00</b>
<b>4.2.2</b>	<b>CARBURETTOR FEATURES.....</b>	<b>4-4-00</b>
4.3	REMOVING THE CARBURETTOR.....	4-5-00

## 4.1 MAINTENANCE

Check the condition of the fuel system hoses every six months. Hoses which are dried out, cracked or cut must be replaced. Make sure the hoses are not twisted or crushed. Periodically check and clean the fuel filter.

## 4.2 DRAINING THE FUEL TANK

Read carefully 1.3 (GENERAL SAFETY RULES).

### ⚠ CAUTION

**Risk of fire. Allow for the engine and exhaust silencer to cool down completely. Fuel vapours are harmful to human health. Ensure that the room is well ventilated before proceeding. Do not inhale fuel vapours. Do not smoke or use bare flames near fuel vapours.**

### DO NOT RELEASE FUEL INTO THE ENVIRONMENT.

- ◆ The engine should be off and completely cold.
- ◆ Prepare a container of more than adequate capacity to contain the amount of fuel in the tank. Place the container on the floor on the right-hand side of the motorcycle.
- ◆ Remove the fuel tank filler cap (1).
- ◆ Use a manual pump or similar system to drain the fuel tank.

### ⚠ CAUTION

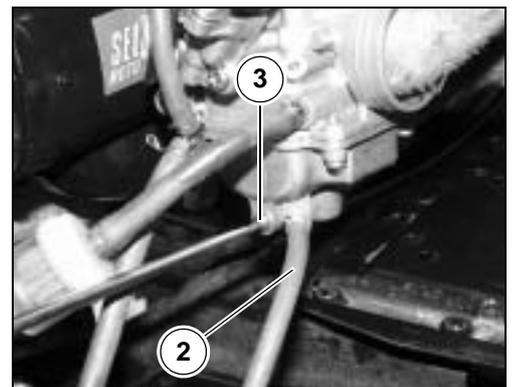
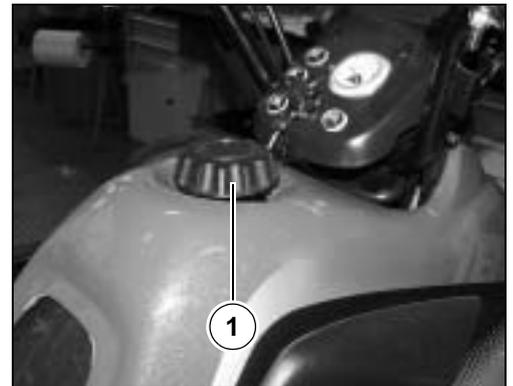
**After draining the tank, close the fuel filler cap (1).**

To drain the carburettor completely, proceed as follows:

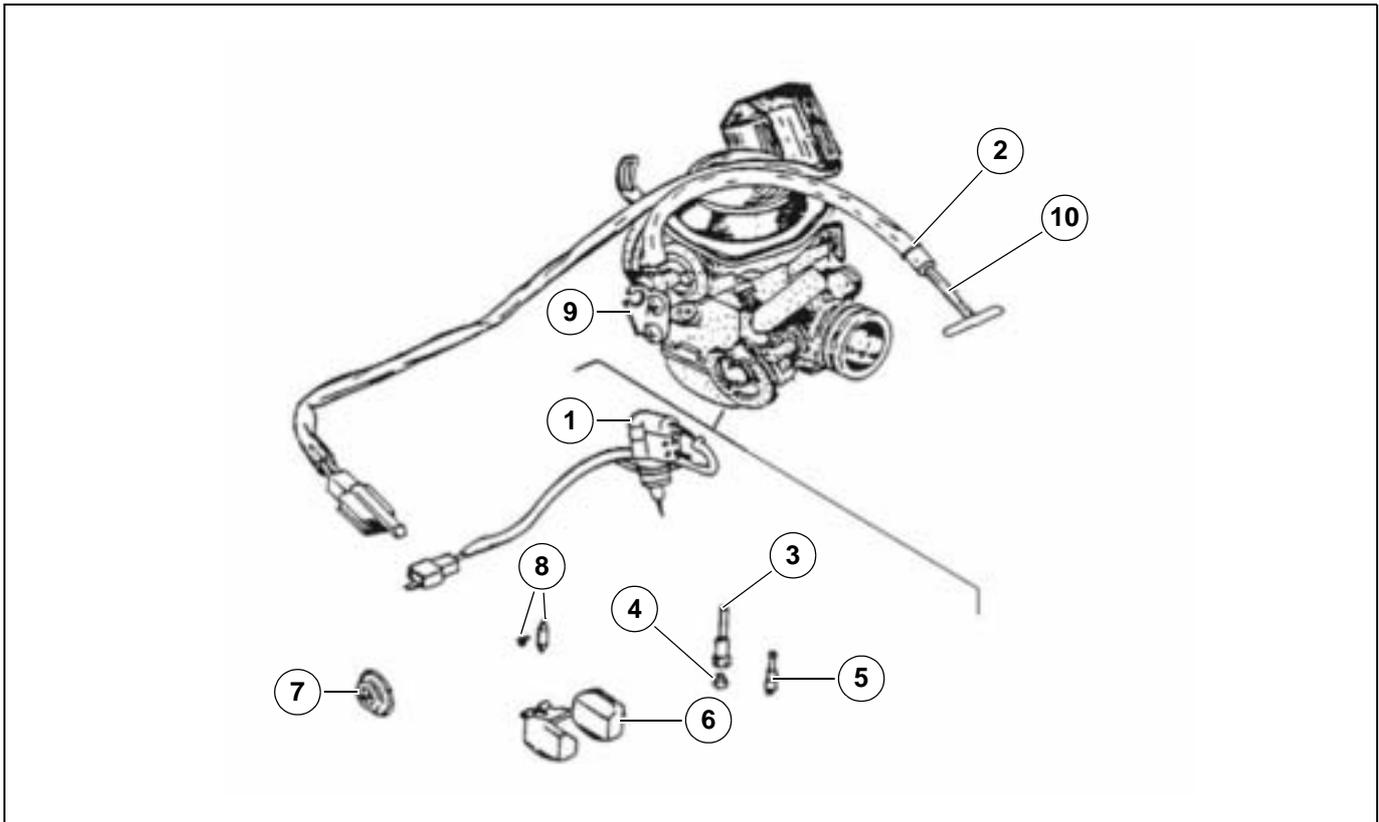
- ◆ Place the free end of the hose (2) into a container.
- ◆ Working on the left-hand side of the vehicle front, open the fuel drain by releasing the drain screw (3) below the tank.
- ◆ When all the fuel in the carburettor has drained out, fully tighten down the drain screw (3).

### ⚠ WARNING

**Tighten the drain screw (3) to avoid fuel leaks from the carburettor when refilling.**



4.2.1 CARBURETTOR



Key:

- 1) Starter valve
- 2) Circlip
- 3) Choke
- 4) Maximum flow #110
- 5) Maximum flow #35
- 6) Float
- 7) Filter
- 8) Needle valve
- 9) Cable guide
- 10) Fitting

4.2.2 CARBURETTOR FEATURES

COMPONENTS	FEATURES
Intake manifold	ø 22.2 (23.0 x 21.0)
Throttle valve	ø 24.0
Intake hole	ø 38.0
Maximum flow	# 110
Maximum air flow	# 90
Taper needle	MGM 3/3
Nozzle	ø 2.6
Minimum flow	# 35
Minimum air flow	# 90
Fuel level	29.5
Air screw	2 1/2 turn
Float	6 g

### 4.3 REMOVING THE CARBURETTOR

**NOTE** Close the fuel tap to avoid fuel leaks.

**⚠ WARNING**

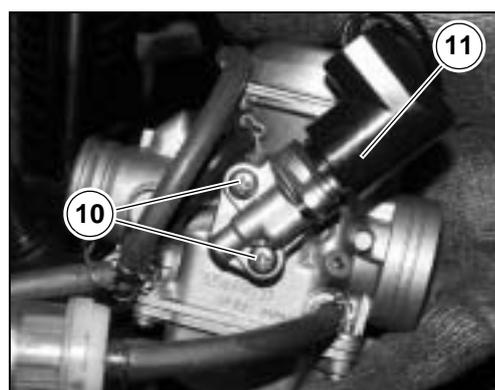
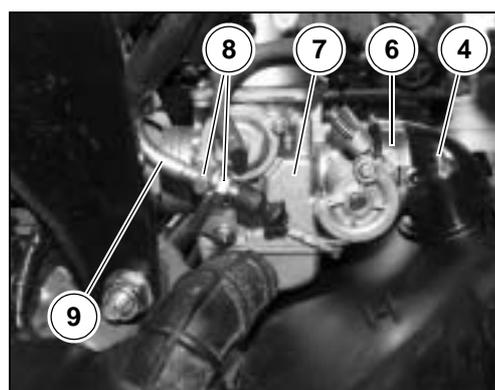
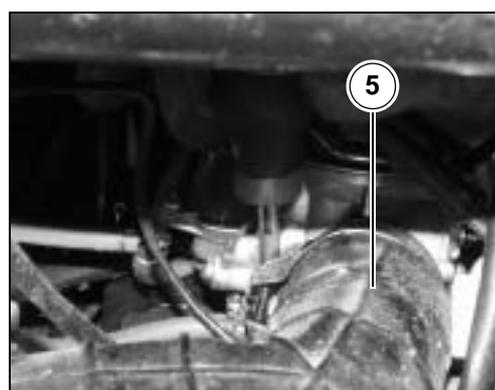
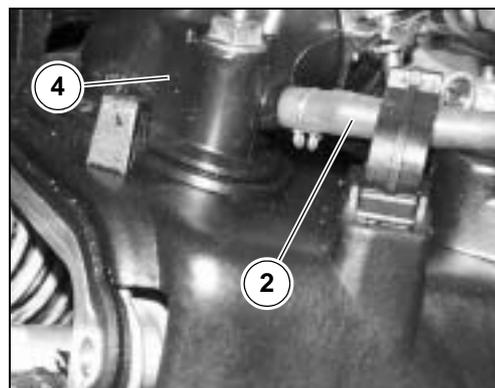
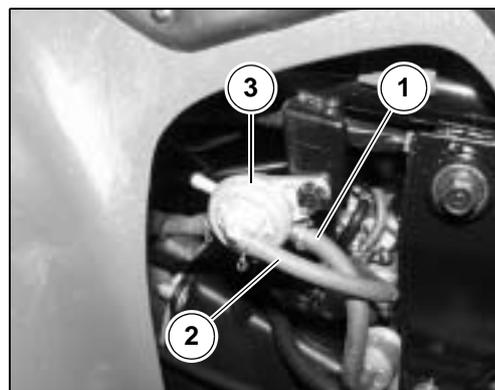
Place a cloth below the carburettor to collect any spillage.

- ◆ Disconnect fuel (1) and vacuum (2) lines from tap (3).
- ◆ Disconnect vacuum line (2) from manifold (4).
- ◆ Loosen clip and disconnect air hose (5).
- ◆ Loosen clip (6) and remove carburettor (7) from manifold (4).

**⚠ WARNING**

Plug the intake hose (4) with a clean cloth.

- ◆ Loosen the two nuts (8).
- ◆ Slide out cable (9).
- ◆ Remove the carburettor (7).
- ◆ Loosen and remove the two screws (10) and remove the automatic starter (11) from carburettor (7).





ELECTRIC SYSTEM

5

## ELECTRIC SYSTEM

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## 5.1 FOREWORD

Please read the following information before reading this section.

**NOTE** For ease of reference, the same numbering is used in the specific wiring diagrams and in the general schematics.

### 5.1.1 CABLE COLOURS

<b>Ar</b>	Orange
<b>Az</b>	Light blue
<b>B</b>	Blue
<b>Bi</b>	White
<b>g</b>	Yellow
<b>Gr</b>	Grey
<b>M</b>	Brown
<b>N</b>	Black
<b>R</b>	Red
<b>Ro</b>	Pink
<b>V</b>	Green
<b>Vi</b>	Purple

### 5.1.2 ELECTRICAL CONNECTORS

Disconnect the electrical connectors as follows:

- ◆ Press down on the locking tab, where fitted.

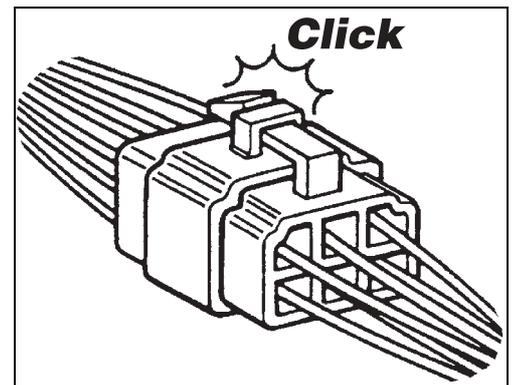
#### **⚠ WARNING**

**Never separate two connectors by pulling on the wiring.**

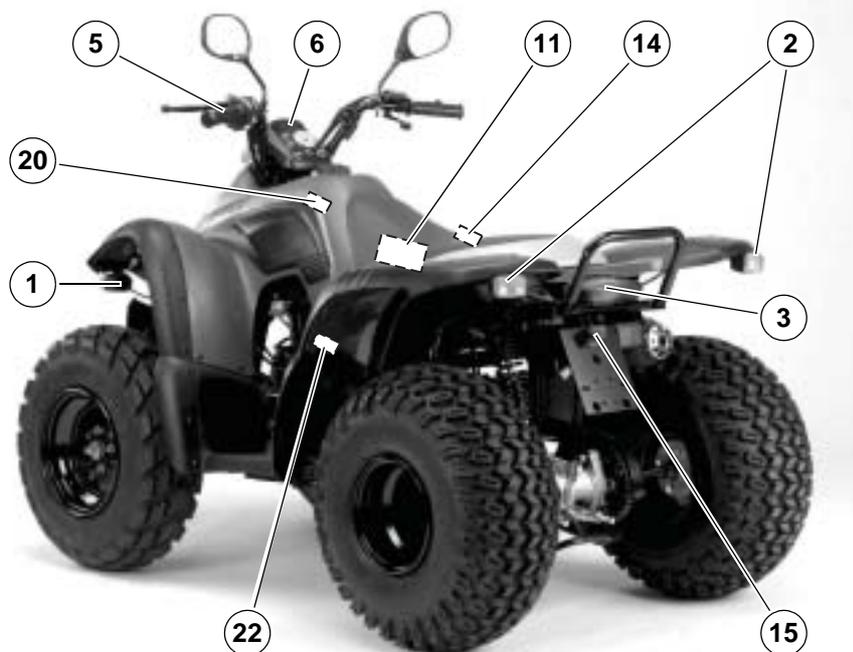
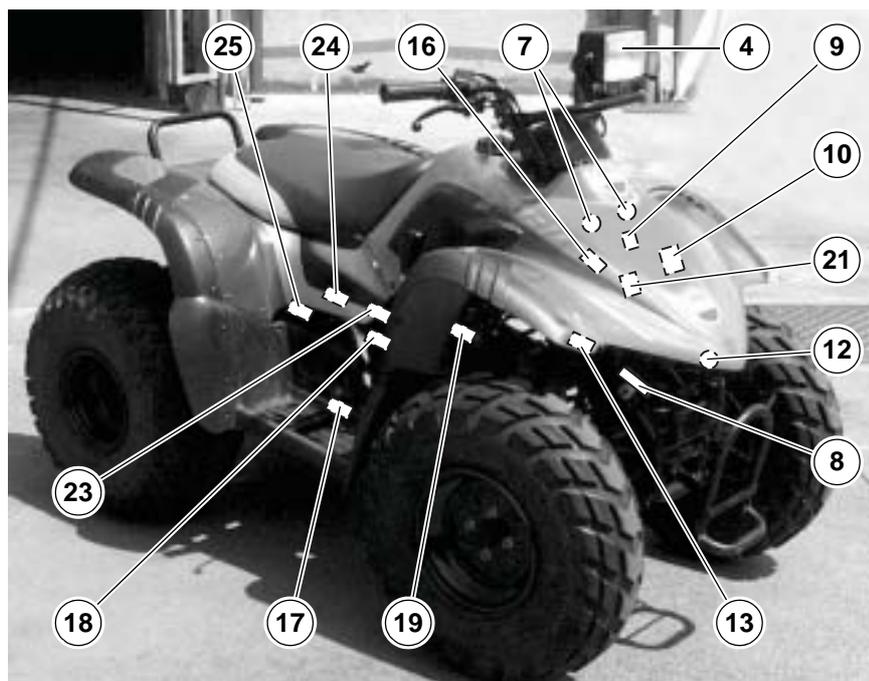
- ◆ Grasp both connectors and pull them in opposite directions until they become separated.
- ◆ Remove any dirt, rust, moisture, etc. from inside the connector blowing with compressed air.
- ◆ Ensure that the wires are securely crimped to the terminals inside each connector.

**NOTE** A connector will only locate properly into the matching connector when it is inserted in the correct mounting position.

- ◆ Reconnect the two connectors and ensure that they are fully engaged (where fitted, the locking tab should click audibly into place).



## 5.2 ELECTRICAL COMPONENTS

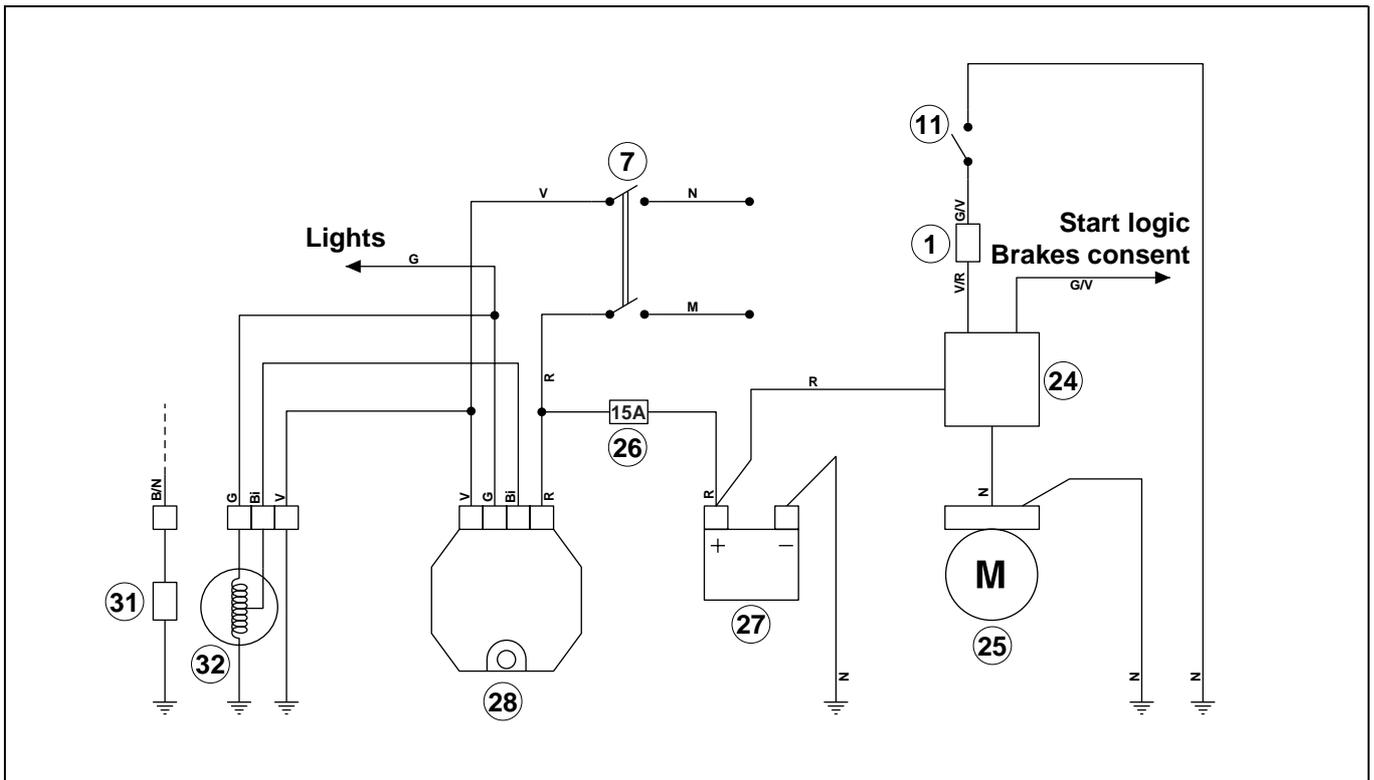
**Key:**

- 1) Front direction indicators
- 2) Rear direction indicators
- 3) Tail light
- 4) Headlight
- 5) Left-hand switch
- 6) Dashboard
- 7) Hazard lights relay
- 8) Voltage stabiliser
- 9) Rectifier
- 10) Engine Control Unit
- 11) Battery
- 12) Warning horn
- 13) Starting relay
- 14) Fuse
- 15) Number plate light
- 16) Coil

- 17) Stoplight switch
- 18) Starter motor
- 19) Spark plug
- 20) Fuel sensor
- 21) Sensors control unit
- 22) Automatic starter
- 23) Earth
- 24) Neutral sensor
- 25) Reverse gear sensor

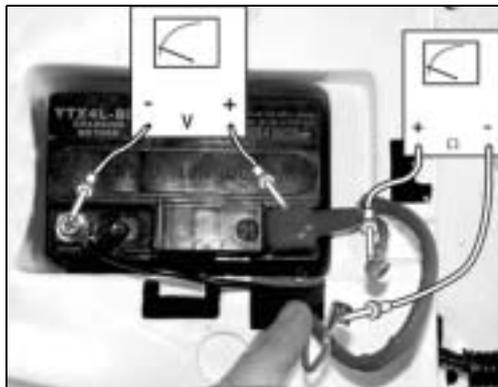
5.3 TROUBLESHOOTING

5.3.1 STARTER MOTOR - BATTERY RECHARGE - GENERATOR



**Key:**

- 1) Jumper
- 7) Key-operated switch
- 11) Left dip switch
- 24) Starter relay
- 25) Starter motor
- 26) Fuse
- 27) Battery
- 28) Voltage regulator
- 31) Pick-Up sensor
- 32) Generator

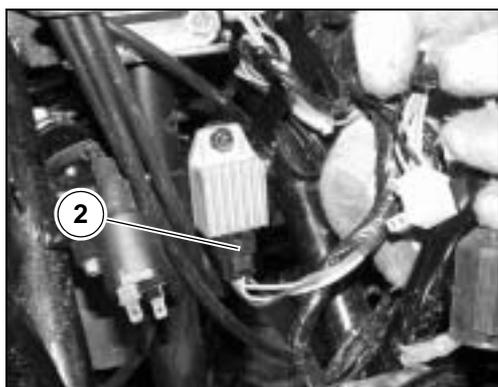


### 5.3.2 CHECKING THE CHARGE VOLTAGE

- ◆ After having completely charged the battery, see 2.5 (BATTERY).
- ◆ Connect a multimeter between the positive (+) and negative (-) battery terminals.
- ◆ After starting the engine, disconnect the fuse and connect an ammeter to the ends of the wires.
- ◆ Using a revolution counter, accelerate and measure the charge voltage and current.

**13.0 ~ 15.0 V / 1.0 A below 5000 rpm.**

If the measured value is incorrect, check the rectifier, see 5.3.3 (RECTIFIER).



### 5.3.3 RECTIFIER

- ◆ Disconnect the four-way connector (1) (coloured green).
- ◆ Set a multimeter to the x 1 M. range and measure the resistance of each terminal from the rectifier side (inner male terminals).

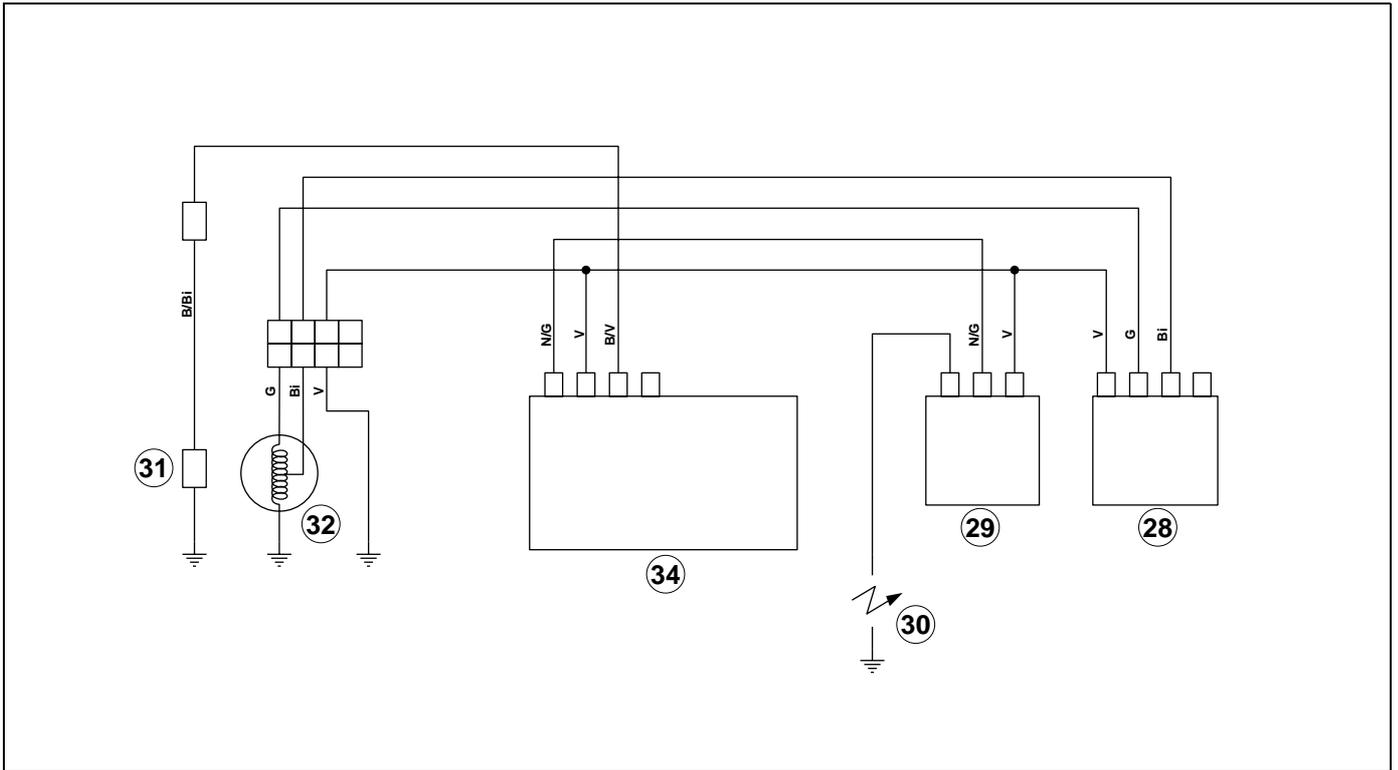
		Connect meter (+) to:				
		-	White	Yellow	Red	Green
Connect meter (-) to:	-	-	White	Yellow	Red	Green
	White	-	∞	∞	∞	∞
	Yellow	∞	-	∞	∞	5 M
	Red	1,8 M	∞	-	∞	∞
	Green	∞	4,64 M	∞	-	-

#### **⚠ WARNING**

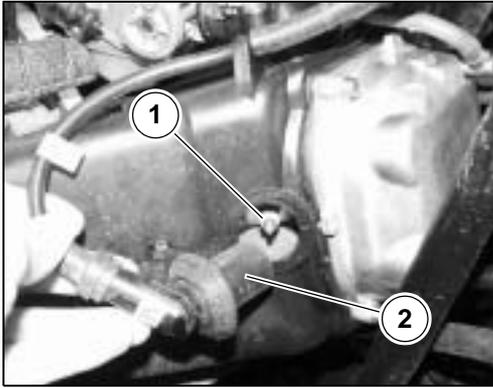
**This test method provides an approximate measure of resistance. Where possible, fit a substitute rectifier known to be in good working order to test the charge system.**

If the reading found deviates from the specified value, change the rectifier.

5.4 IGNITION SYSTEM



- Key:**  
 28) Voltage regulator  
 29) Coil  
 30) Spark plug  
 31) Pick-Up sensor  
 32) Generator  
 34) C.D.I.



### 5.4.1 HIGH TENSION COIL

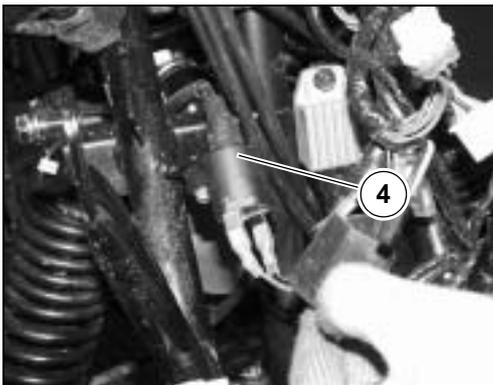
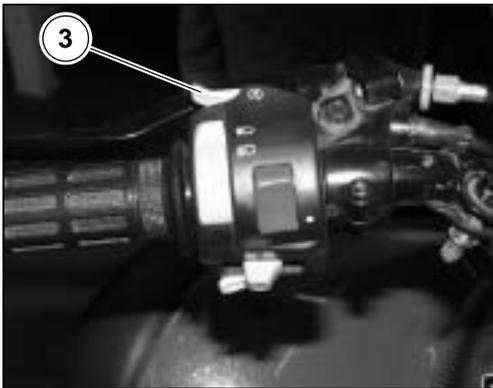
Read carefully 1.3 (GENERAL SAFETY RULES).

- ◆ Remove the cylinder guard, see 3.2.2 (REMOVING FLYWHEEL UPPER AND LOWER HOUSINGS).
- ◆ Remove the spark plug (1) and refit its cap (2).
- ◆ Touch the spark plug to the head fins.

#### **⚠ CAUTION**

**Do not touch the metal parts. Electrical shock hazard. Hold the spark plug only by its cap (2).**

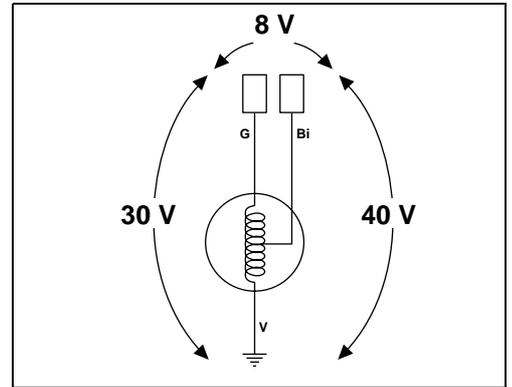
- ◆ Turn the key to "○" and press the start button "Ⓢ" (3).
- ◆ Check that the electrodes spark.
- ◆ If this does not happen, replace the coil (4).



5.5 CHECKING THE GENERATOR IDLE OPERATION

- ◆ Disconnect regulator cables connector.
- ◆ Start engine and reach 3000 rpm, with the gear in neutral.
- ◆ Using a portable tester, measure voltage along the cables (alternate current a.c.).

Standard idle voltage: above the values specified in the diagram.



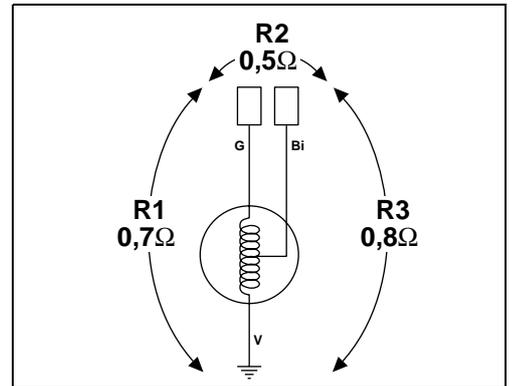
5.6 CHECKING THE ALTERNATOR CONTINUITY

With the engine off:

- ◆ Disconnect the regulator cables connector.
- ◆ Using a portable tester, check the continuity between stator cables.
- ◆ Check also stator mount isolation.

R1, R2, R3 resistance standard value: 0.1-1 Ω

Resistance between stator cables and mount standard value: ∞



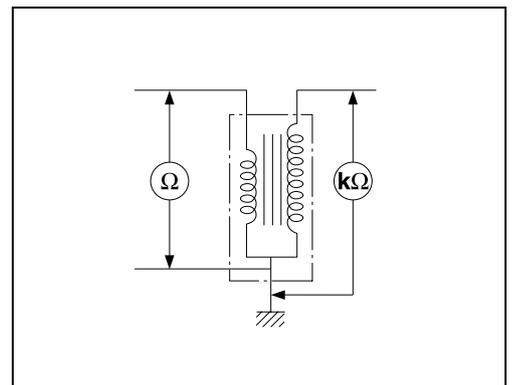
5.7 CHECKING THE IGNITION COIL

- ◆ Carry out this test with a portable tester. Check primary and secondary windings continuity. The reading, expressed in ohm, shall not be perfect but, if the windings are not damaged, the following ohm resistance values shall be measured.

Coil winding resistance	
Primary	0.2 ohm ± 10%
Secondary	3 Kohm ± 10%

**⚠ WARNING**

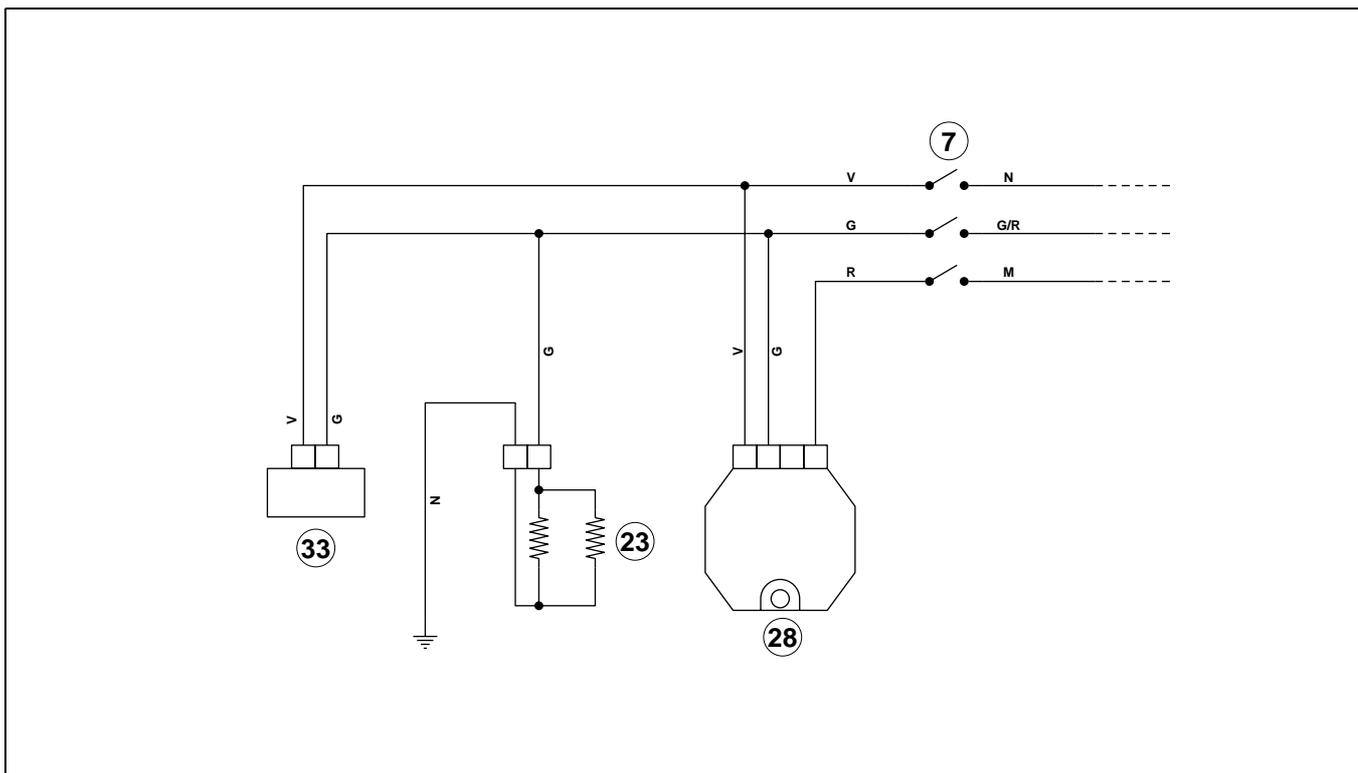
Disconnect spark plug before any reading.



5.7.1 CHECKING THE PICK-UP SENSOR

- ◆ Disconnect the pick-up sensor connector.
- ◆ Using a portable tester (1000 ohm range), measure the resistance between the blue/green and blue/white terminals resistance between 148 ohm ± 10% (at 20 °C).
- ◆ If the resistance value is infinite or below the recommended value, change the pick-up sensor.

## 5.8 AUTOMATIC STARTER

**Key:**

- 7) Key-operated switch
- 23) Resistor
- 28) Voltage regulator
- 33) Automatic starter

Disconnect the red two-way connector and, using a portable tester, measure the ambient temperature resistance ( $\sim 24^{\circ}\text{C}$ ).

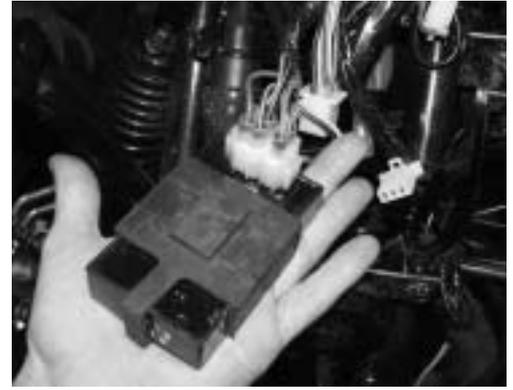
$$R = 31\Omega \pm 10\%$$

## 5.9 CHECKING THE C.D.I. CONTROL UNIT

- ◆ The ignition control unit is of the capacitive discharge type, with digitally-controlled ignition advance based on engine rpm. The control unit is equipped with two connectors.

A - Starting enabling  
B - Earth

- 1)Coil control
- 2)Earth
- 3)Pick-up sensor input
- 4)Gear shift logic



### 5.9.1 CHECK DATA

Checking the ignition relay

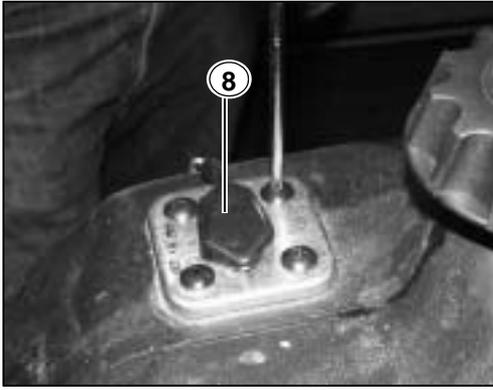
To check relay correct operation, proceed as follows:

- ◆ Feed the two terminals with 12 V.
- ◆ Using a tester, set on the resistance meter function, check the continuity between the two terminals.

**Correct value of the powered relay: 0  $\Omega$**

**Correct value of the unpowered relay:  $\infty$**

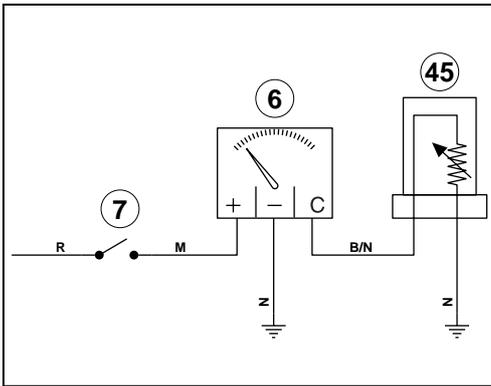
If the values are outside the specified limits, change the relay.



## 5.10 FUEL LEVEL SENSOR

- ◆ Disconnect the two-way connector (8) from the fuel level sensor (45).
- ◆ Check pointer
- ◆ With a  $5.6 \Omega$  resistance, connect the white/black (B/N) and black (N) cables of connector (8) (wiring side). Check that pointer (6) goes on 4/4 with a  $\pm 5^\circ$  tolerance.
- ◆ Repeat this operation using a  $100 \Omega$  resistance and check that pointer (6) goes to 0 (zero) with a  $\pm 5^\circ$  tolerance.

Between cables	Resistance	Correct reading
White/Black (B/N) - Black (N)	$5.6 \Omega$	$4/4 \pm 5^\circ$
White/Black (B/N) - Black (N)	$84.1 \Omega$	$0 \pm 5^\circ$



- 6) Fuel level instrument  
 7) Key-operated switch  
 45) Fuel level sensor

5.11 SWITCHES

◆ Using a portable tester, check switches continuity. Please, refer to the special diagram.  
In case of faults, change the part.

1) Horn button (🔊)

Cables Rs	RO	N
🔊	○	○

2) Dip switch (☰☑ ☷☑)

Cables Rs	G/N	G/R	V/N	G
☰☑		○	○	○
☷☑	○	○		

3) Direction indicators

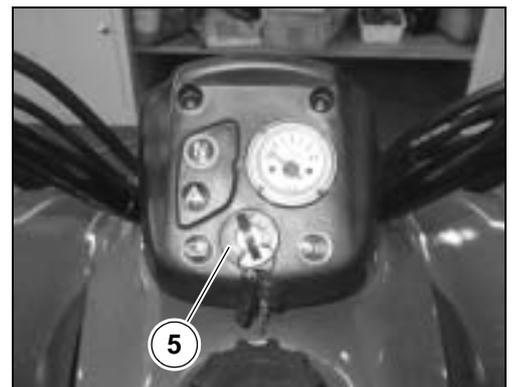
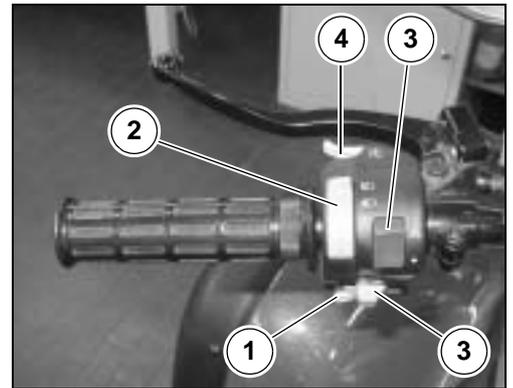
Cables Rs	M/ Bi	Gr scr	V scr	Gr	Gr scr	V scr
⚠	○	○	○	○		
↶	○	○			○	
↷	○		○			○

4) Start button

Cables Rs	B/Bi	N
Ⓜ	○	○

5) Ignition switch

Cables Rs	Ar	V
○	○	○
⊗		
🔒		
OPEN		





## 6) Front Stop switch

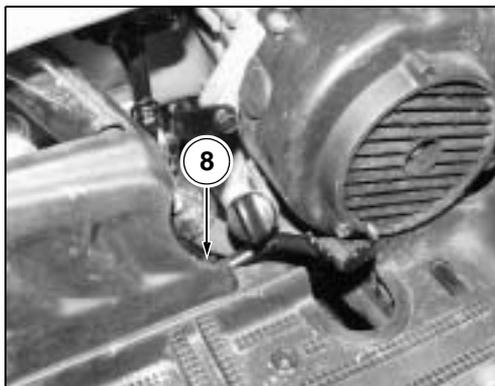
Cables Rs	V/G	M
ON		

## 7) Rear Stop switch

Cables Rs	V/R	V/G
ON		

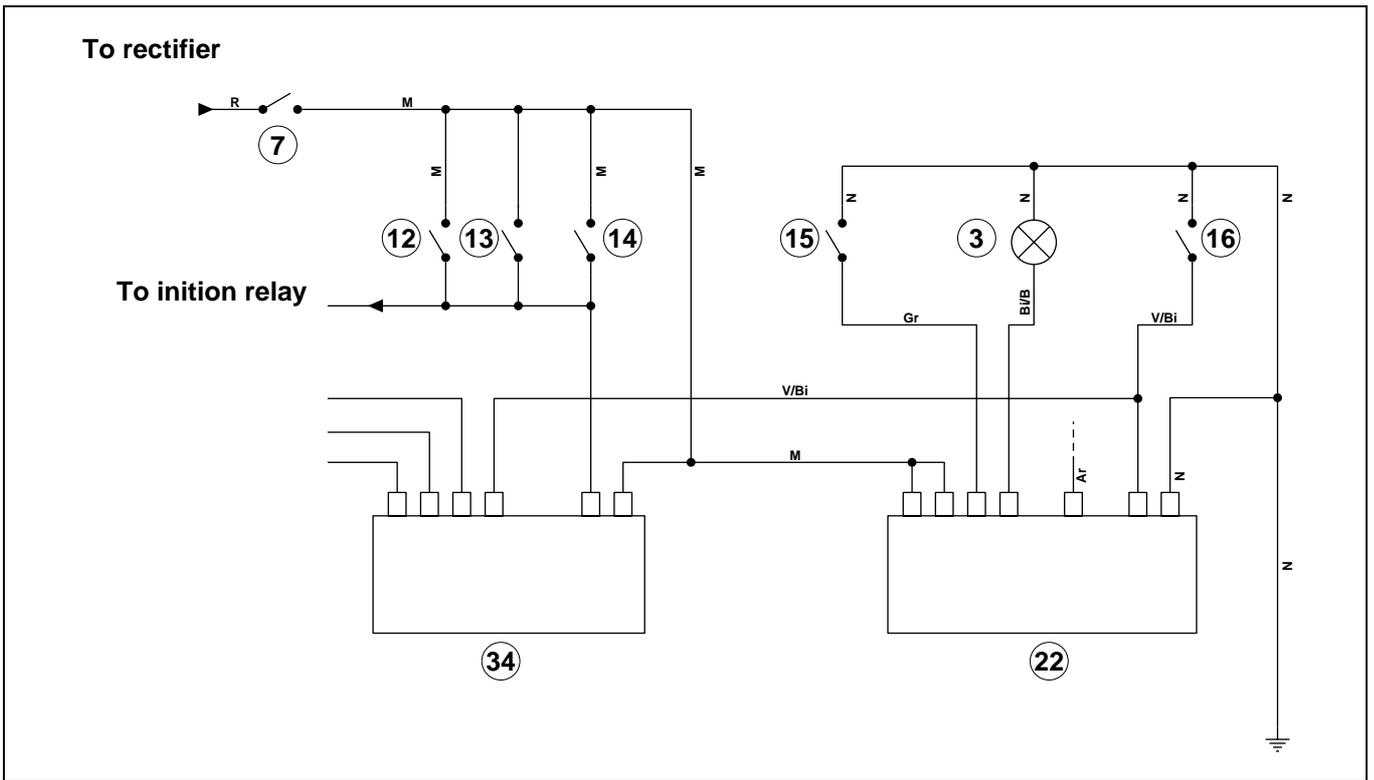
## 8) Pedal stop switch

Cables Rs	V/G	M
ON		



5.12 STARTING CIRCUIT

5.12.1 WIRING DIAGRAM



**Key**

- 3) Neutral repeater light
- 7) Key-operated switch
- 12) Left Stop switch
- 13) Right Stop switch
- 14) Integral braking Stop switch
- 15) Neutral switch
- 16) Reverse gear switch
- 34) C.D.I.

**NOTE** To ensure max. safety, the engine can be started by pressing button "Ⓢ" only after one of the two brake levers has been pulled.

### 5.12.2 TROUBLESHOOTING

#### THE STARTER MOTOR DOES NOT RUN

- ◆ Check the ignition relay.
- ◆ Check battery (CHECKING THE BATTERY).
- ◆ Check the 15A fuse.
- ◆ Check starter motor cables connectors.
- ◆ Check the ignition relay (CHECKING THE IGNITION RELAY).
- ◆ Check start button “” (CHECKING THE START BUTTON).
- ◆ Check stop switches (CHECKING THE STOP SWITCHES).

#### THE STARTER MOTOR RUNS BUT THE ENGINE DOES NOT RUN

- ◆ Check starter motor, freewheeling clutch and freewheeling clutch gear.

#### THE STARTER MOTOR RUNS WITHOUT HAVING MADE ANY OPERATION

- ◆ Check starter motor cables connectors.
- ◆ Check the ignition relay (CHECKING THE IGNITION RELAY).

### 5.12.3 CHECK DATA

#### CHECKING THE IGNITION RELAY

- ◆ Disconnect all cables from relay (1).
- ◆ Using a tester, set on resistance meter function, measure the continuity between power terminals (screws M5). Correct value: infinite resistance.
- ◆ Feed (connector) control cables with a 12 V battery.
- ◆ Using a tester, set on resistance meter function, measure the continuity between power terminals. Correct value: 0  $\Omega$ .

#### CHECKING THE STARTER MOTOR

- ◆ Disconnect spark plug cap, turn ignition switch to ON and start the engine with the resistance meter connected to the starter motor system.
- ◆ Standard values: 45 A in a steady state  $\pm$  15 %.
- ◆ Using a tester, set on resistance meter function, check the resistance between starter motor positive and negative terminals. Standard value: 0.3  $\Omega \pm$  10 %.

**CHECKING THE RESISTORS**

- ◆ Disconnect the two-way connector positioned close to resistors.
- ◆ Measure resistance on yellow and black cables.

Standard values:  $4.5 \Omega \pm 10 \%$ .

**CHECKING THE START BUTTON " Ⓢ "**

- ◆ Disconnect button connector.
- ◆ Using a tester, set on resistance meter function, check the continuity between the contacts in the pressed and released positions based on the existing connections (MAIN WIRING DIAGRAM).

**THE STOP LIGHT IS ALWAYS ON**

- ◆ Check connections on tail light.
- ◆ Check front STOP switch (CHECKING THE FRONT AND REAR STOP SWITCH).
- ◆ Check the rear STOP switch (CHECKING THE FRONT AND REAR STOP SWITCH).

**THE STOP LIGHT DOES NOT COME ON**

- ◆ Check bulb and bulb holder.
- ◆ Check stop light circuit cables connectors.
- ◆ Check main power supply circuit.
- ◆ Check the front STOP switch (CHECKING THE FRONT AND REAR STOP SWITCH).
- ◆ Check the rear STOP switch (CHECKING THE FRONT AND REAR STOP SWITCH).

## 5.13 BULBS

Read carefully 1.3 (GENERAL SAFETY RULES).

**⚠ CAUTION**

Risk of fire. Keep fuel and other flammable substances away from the electrical components.

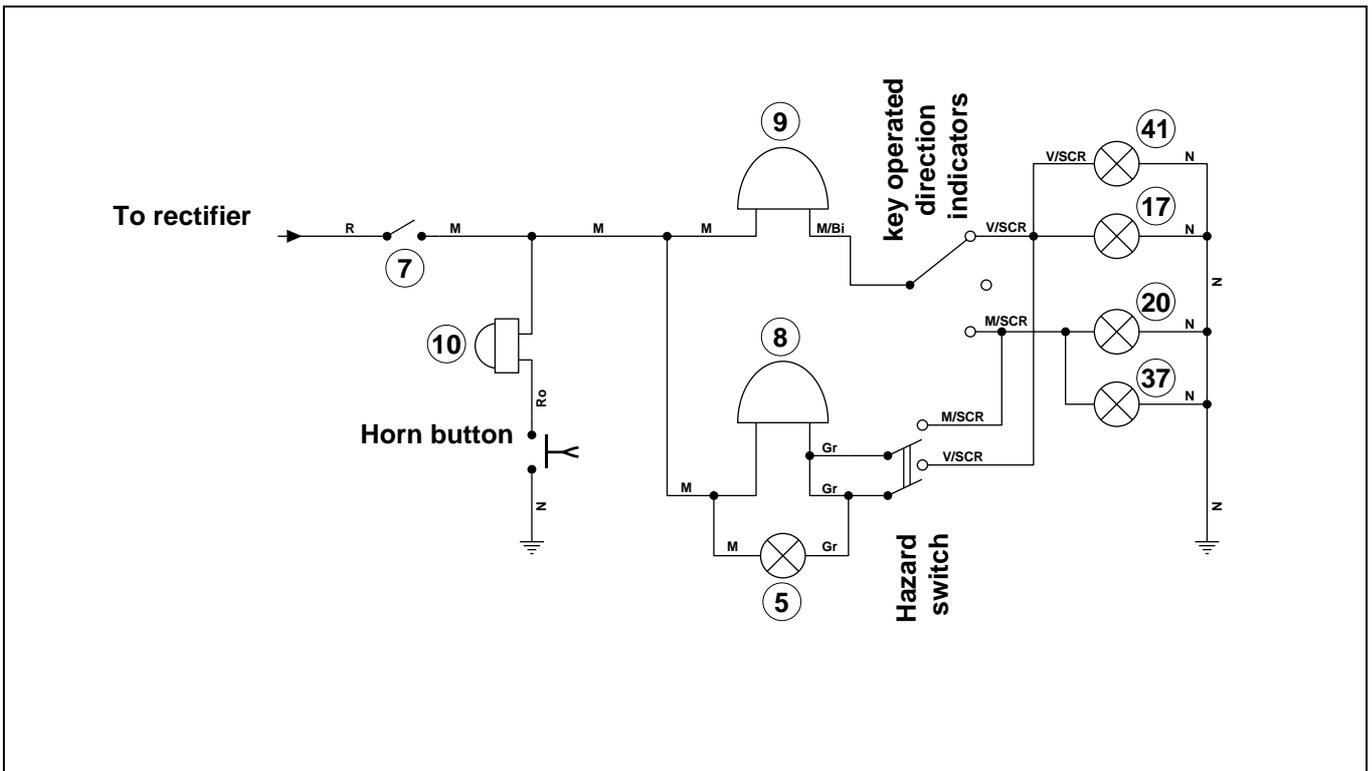
**⚠ WARNING**

Before changing a bulb, move the main switch to position "⊗" and wait a few minutes, so that the bulb cools down. Change the bulb wearing clean gloves or using a clean and dry cloth. Do not leave fingerprints on the bulb, since these may cause its overheating and consequent breakage. If you touch the bulb with bare hands, remove any fingerprint with alcohol, in order to avoid any damage.

**DO NOT FORCE THE ELECTRIC CABLES.**

**NOTE** Before changing a bulb, check the fuse, see 5.13.6 (CHANGING THE FUSES).

5.13.1 CHANGING THE DIRECTION INDICATOR BULBS



Parts:

- 5)Hazard repeater light
- 7)Key-operated switch
- 8)Hazard flasher with buzzer
- 9)Flasher with buzzer
- 10)Horn
- 17)Right rear direction indicator
- 20)Left rear direction indicator
- 37)Left front direction indicator
- 41)Right front direction indicator

Read carefully 5.13 (BULBS).

- ◆ Remove the protection screen (1) from the indicator mount by pushing on its sides with a screwdriver.

**⚠ WARNING**

**Make sure not to damage the protection screen, while removing it.**

- ◆ Extract the damaged bulb and replace it with a new one of the same type.

**NOTE** When refitting, assemble the protection screen (1) carefully to its mount.



**5.13.2 CHANGING THE HEADLIGHT BULBS**

Read carefully 5.13 (BULBS).

The headlight contains:

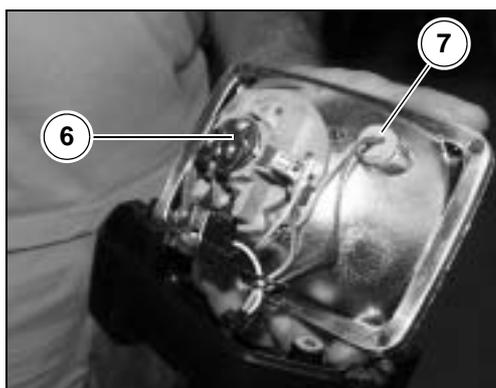
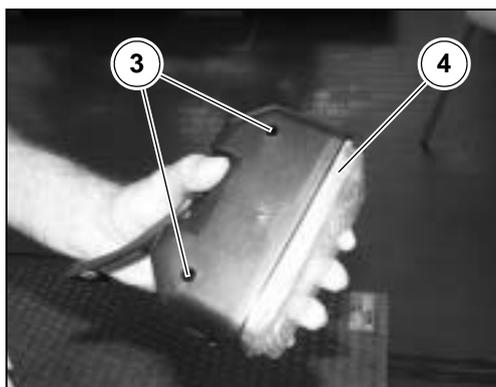
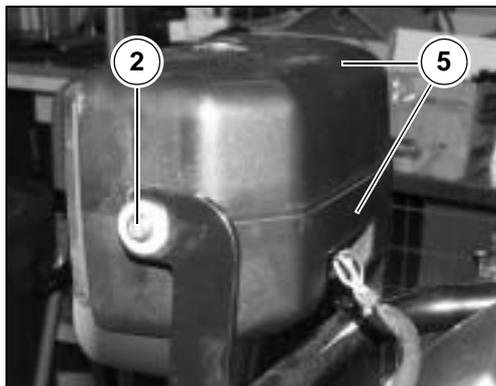
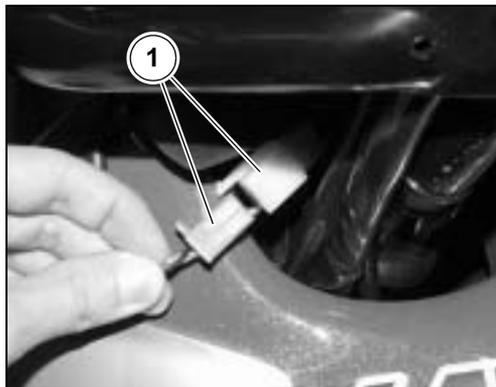
- a high / low beam bulb;
- a parking light bulb.
- ◆ Disconnect connector (1).
- ◆ ★ Loosen and remove screw (2). Save washer.
- ◆ Loosen and remove the two screws (3).
- ◆ Remove the headlight body (4) from the two shells (5).

**HALOGEN HIGH / LOW BEAM BULB.**

- ◆ To remove the bulb holder (6), turn it counter-clockwise.
- ◆ Remove bulb and change it with one of the same rating.

**PARKING LIGHT**

- ◆ Grasp the bulb holder (7) and pull to extract.
- ◆ Withdraw the bulb and replace it with one of the same type.

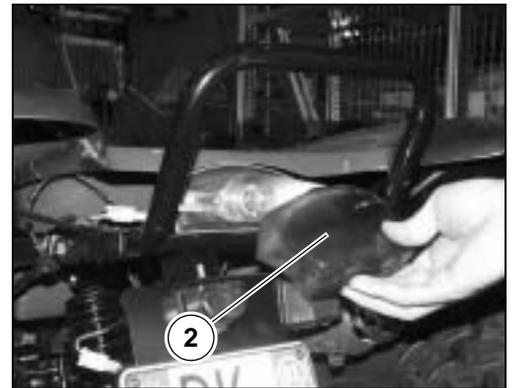
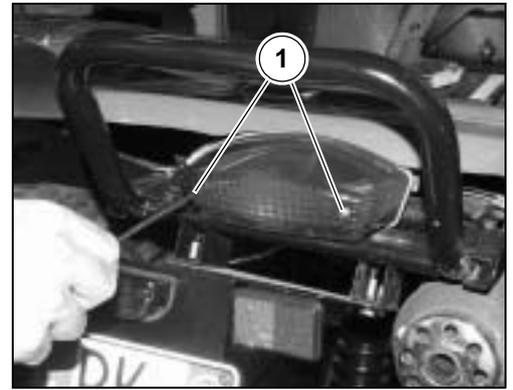


**5.13.3 CHANGING THE TAIL LIGHT BULB**

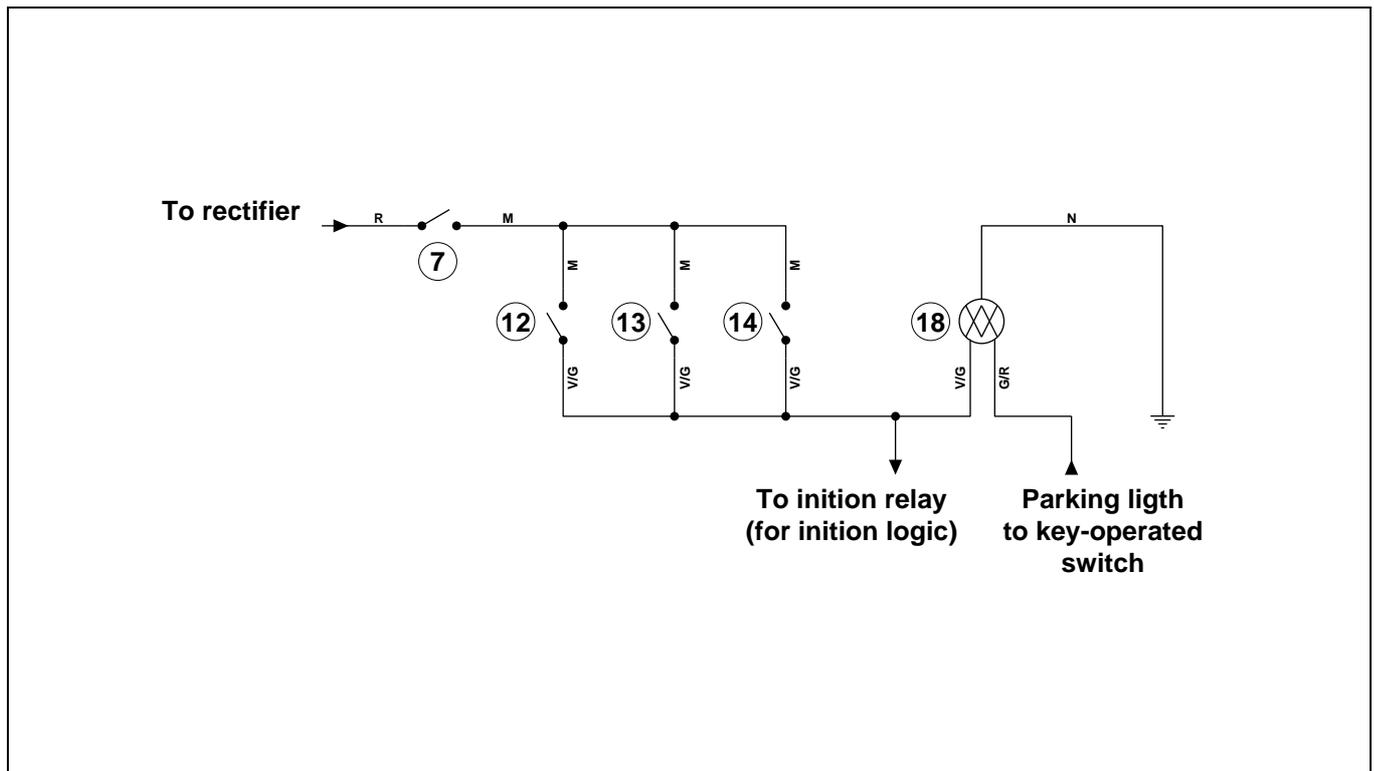
Read carefully 5.13 (BULBS).

**To change the bulb, proceed as follows:**

- ◆ Release and remove the two screws (1).
- ◆ Remove the lens (2).
- ◆ Extract the damaged bulb and replace it with a new one of the same type.



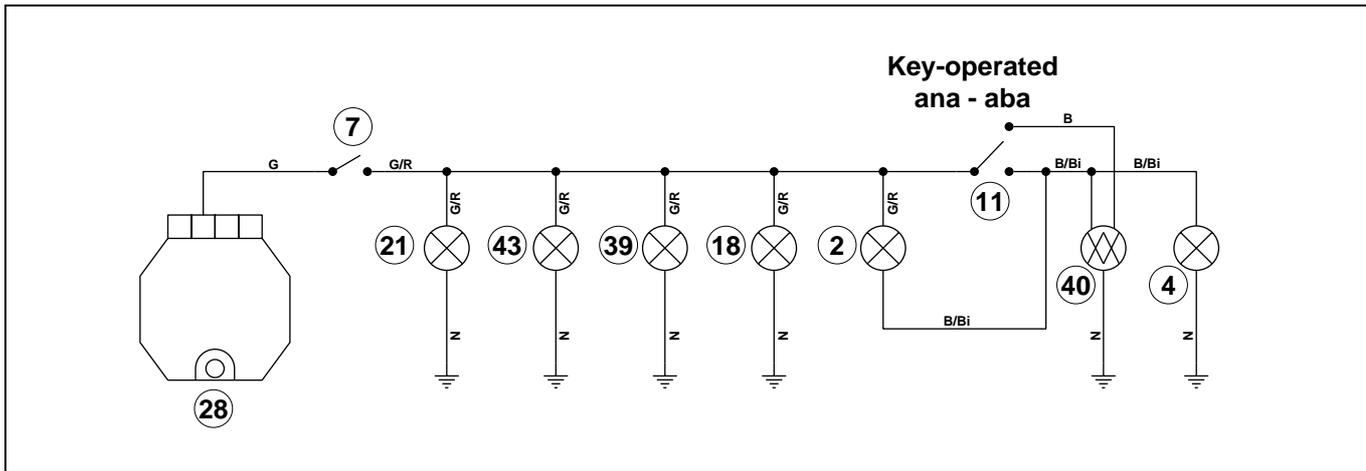
**STOP LIGHTS**



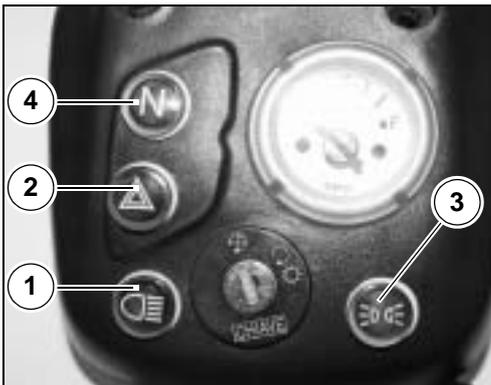
**Parts:**

- 7)Key-operated switch
- 12)Left Stop switch
- 13)Right Stop switch
- 14)Integral braking Stop switch
- 18)Rear twin-light bulb

## HIGH-LOW BEAM - PARKING LIGHTS

**Parts:**

- 2) High beam repeater light
- 4) Parking light repeater light
- 7) Key-operated switch with parking light switch
- 11) Left dip switch
- 18) Rear twin-light bulb
- 21) Number plate light
- 28) Voltage regulator
- 39) Front parking light bulb
- 40) Front twin-light bulb
- 43) Odometer light

**5.13.4 CHANGING THE HANDLEBAR COVER LIGHTS**

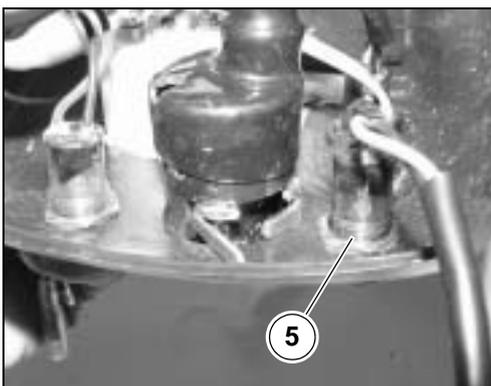
The handlebar cover contains:

- 1) High beam warning light (blue)
- 2) Hazard light (red)
- 3) Parking/low beam warning light (green)
- 4) Neutral light (green)

**To change the bulbs, proceed as follows:**

**NOTE** Remove the handlebar cover, see 6.1.2 (REMOVING THE DASHBOARD).

- ◆ Disconnect the two connectors for the warning light being replaced.
- ◆ Unscrew the nut (5).
- ◆ Remove the warning light from the handlebar cover.



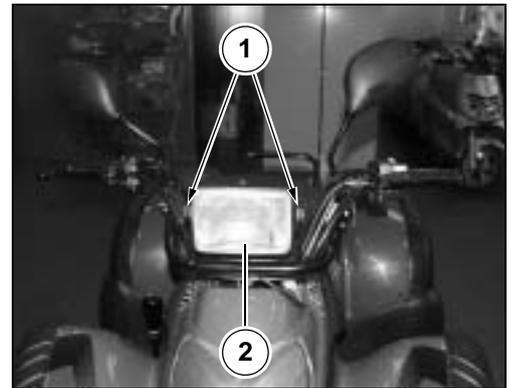
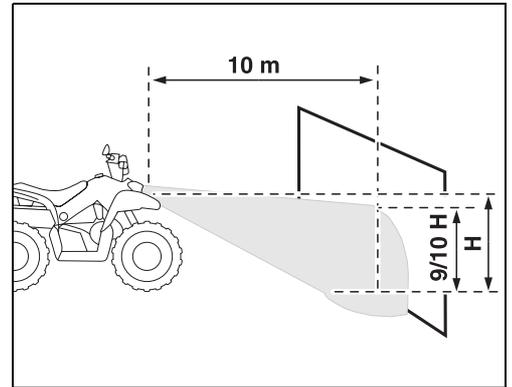
### 5.13.5 ADJUSTING THE HEADLIGHT BEAM

To rapidly check the correct direction of the beam, place the vehicle on flat ground, 10 m away from a wall.

Turn on the low beam, sit on the vehicle and make sure that the beam projected on the wall is slightly under the horizontal line of the headlight (about 9/10th of the total height).

To adjust the headlight beam:

- ◆ Loosen the two screws (1) on headlight (2) and mounts.
- ◆ Adjust headlight beam angle.
- ◆ Tighten the two screws (1).



### 5.13.6 CHANGING THE FUSES

Read carefully 1.3 (GENERAL SAFETY RULES).

#### **⚠ WARNING**

**Do not repair faulty fuses.**

**Never use fuses different from the recommended ones.**

**The use of unsuitable fuses may cause damages to the electric system or, in case of short circuit, even a fire.**

**NOTE** *If a fuse blows frequently, there probably is a short circuit or an overload in the electric system.*

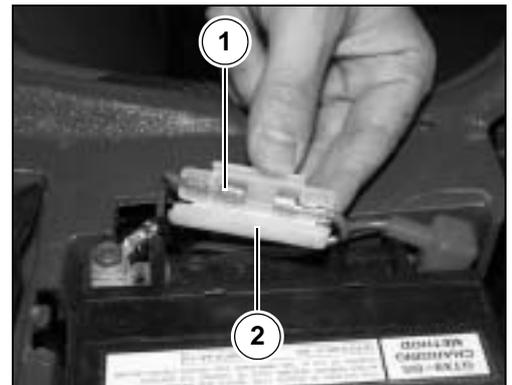
If an electric component does not work or works irregularly, or if the vehicle fails to start, it is necessary to check the fuse.

**For the check, proceed as follows:**

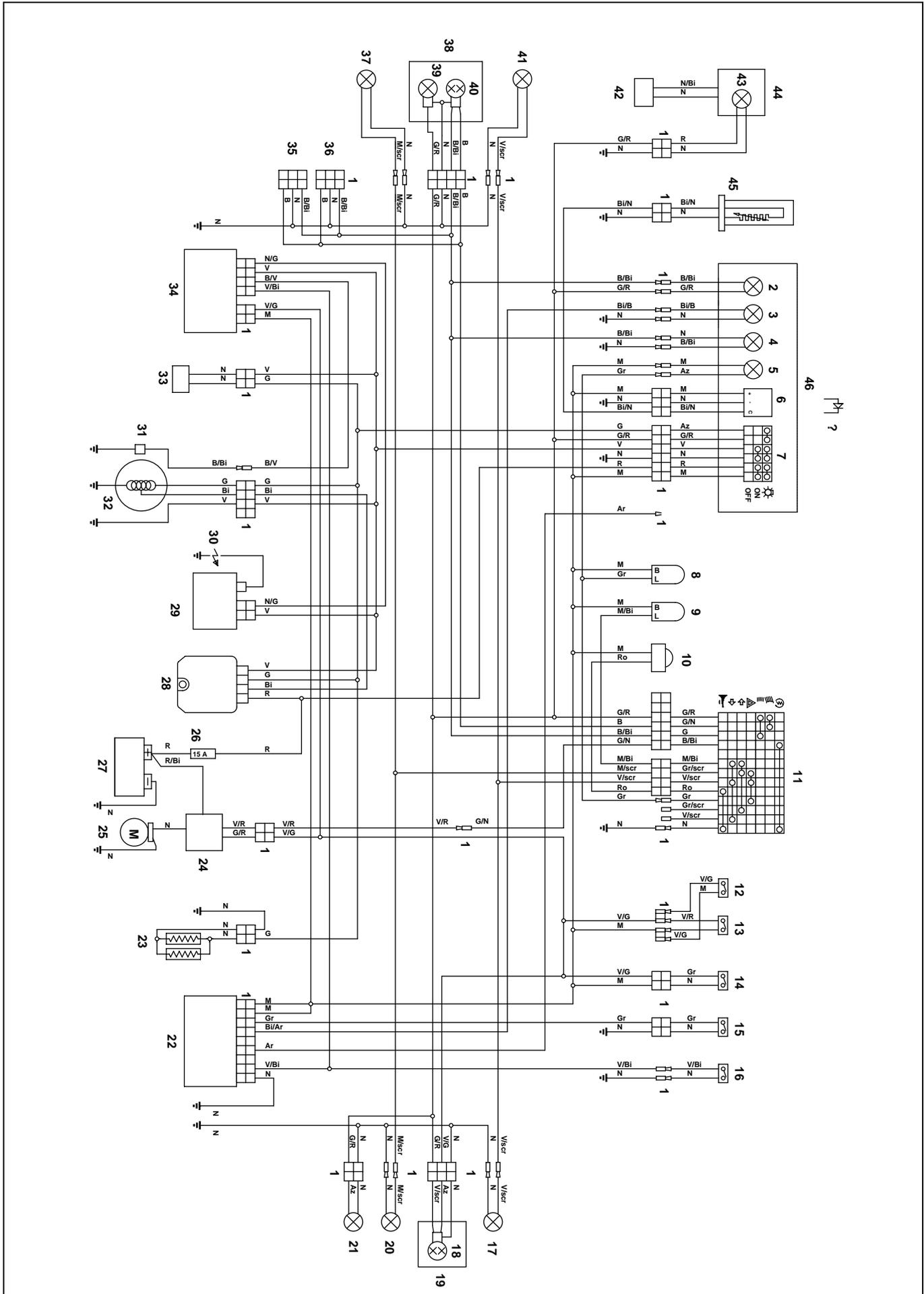
- ◆ Remove the seat, see 6.1.1 (REMOVING THE SEAT).
- ◆ Disconnect the battery cables, see 6.1.9 (REMOVING THE BATTERY).
- ◆ Extract the fuse (1) from the fuse carrier (2).

**NOTE** *When you find a blown fuse, determine and rectify the cause before fitting a new fuse.*

- ◆ Replace the damaged fuse with a new one having the same amperage.



5.14 WIRING DIAGRAM



**Key:**

- 1) Multiple connectors
- 2) Parking light repeater light
- 3) Neutral repeater light
- 4) High beam repeater light
- 5) Hazard repeater light
- 6) Fuel level instrument
- 7) Key-operated switch with parking light switch
- 8) Hazard flasher with buzzer
- 9) Flasher with buzzer
- 10) Horn
- 11) Left dip switch
- 12) Left Stop switch
- 13) Right Stop switch
- 14) Integral braking Stop switch
- 15) Neutral light switch
- 16) Reverse gear switch
- 17) Right rear direction indicator
- 18) Rear twin-light bulb
- 19) Tail light
- 20) Left rear direction indicator
- 21) Number plate light
- 22) Gear shift logic control unit
- 23) Resistor
- 24) Starting relay
- 25) Starter motor
- 26) Fuse
- 27) Battery
- 28) Voltage regulator
- 29) Coil
- 30) Spark plug
- 31) Pick-up sensor
- 32) Generator
- 33) Automatic starter
- 34) C.D.I.
- 35) Right (supplementary) front headlight connector
- 36) Left (supplementary) front headlight connector
- 37) Left front direction indicator
- 38) Headlight
- 39) Front parking light bulb
- 40) Front twin-light bulb
- 41) Right front direction indicator
- 42) Odometer sensor
- 43) Odometer light
- 44) Odometer
- 45) Fuel level sensor
- 46) Dashboard



CYCLE PARTS

## CYCLE PARTS

## CONTENTS

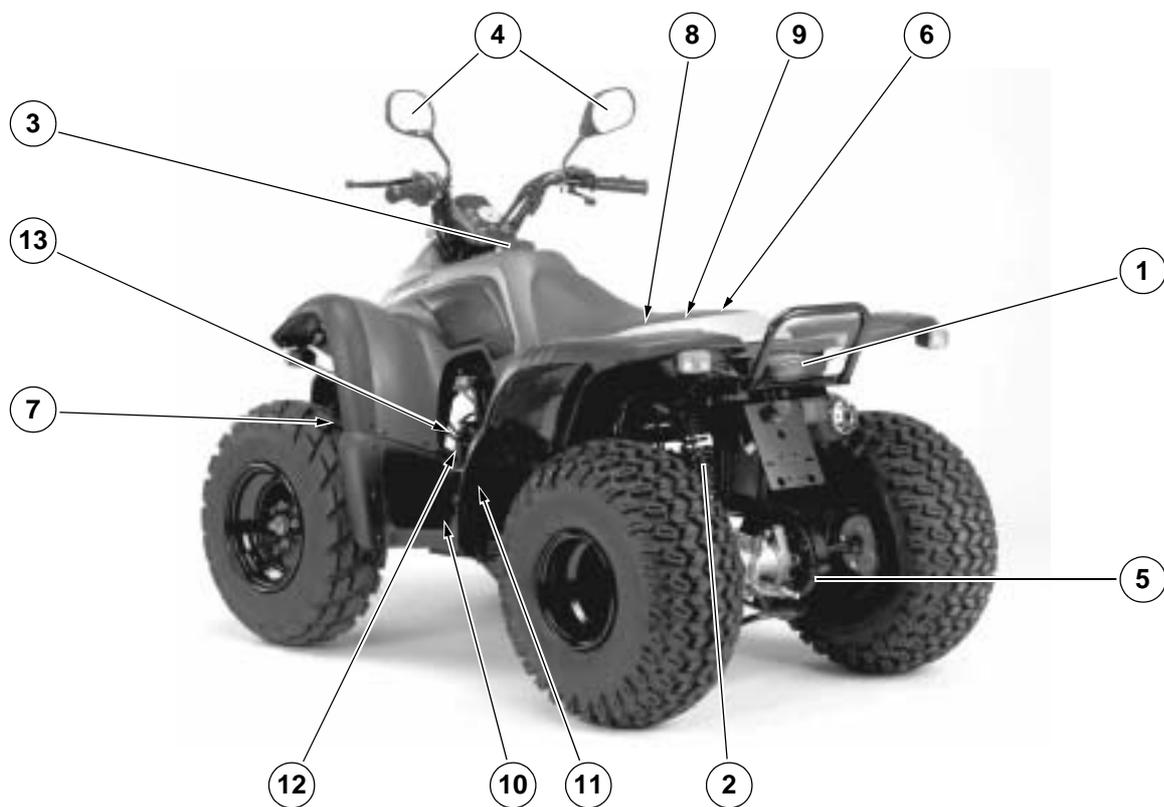
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6.1 BODYWORK



**KEY**

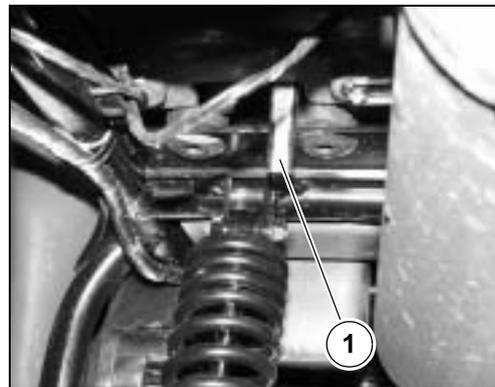
- 1) Headlight
- 2) Front shield
- 3) Seat
- 4) Horn
- 5) Right front shock absorber
- 6) Front and rear brake pedal
- 7) Right footpeg
- 8) Rear shield
- 9) Gear lever
- 10) Fuel tank
- 11) Dashboard

**KEY**

- 1) Tail light
- 2) Rear shock absorber
- 3) Fuel tank cap
- 4) Rear-view mirrors
- 5) Drive chain
- 6) Glove /tool kit compartment
- 7) Left front shock absorber
- 8) Battery
- 9) Fuse
- 10) Left footpeg
- 11) Kick start lever
- 12) Transmission air cleaner
- 13) Air cleaner

### 6.1.1 REMOVING THE SEAT

- ◆ Use lever (1) to unhook the seat.
- ◆ Remove the seat (2).

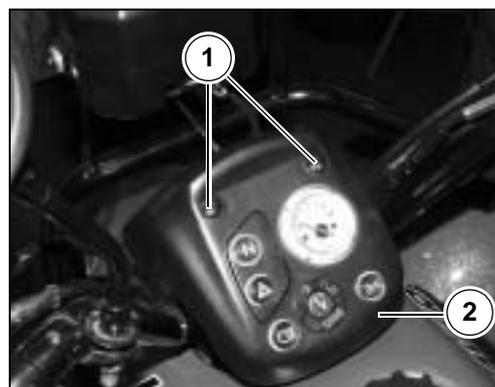


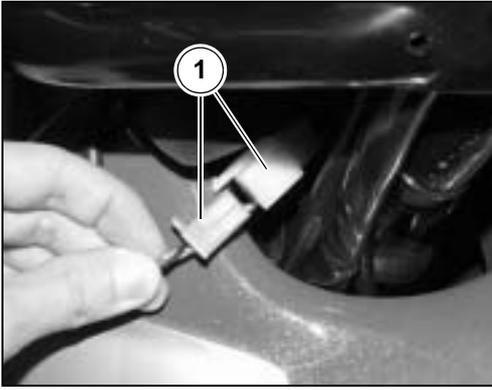
### 6.1.2 REMOVING THE DASHBOARD

- ◆ Loosen the two screws (1).
- ◆ Remove the dashboard (2).
- ◆ Disconnect the dashboard connectors.

**⚠ WARNING**

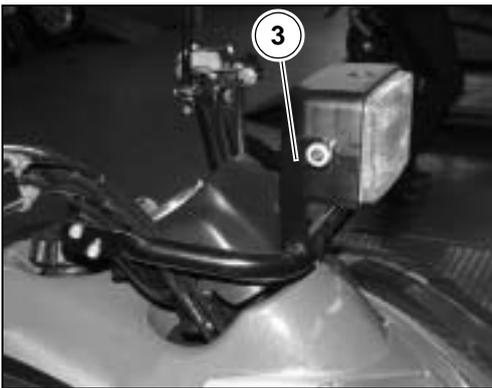
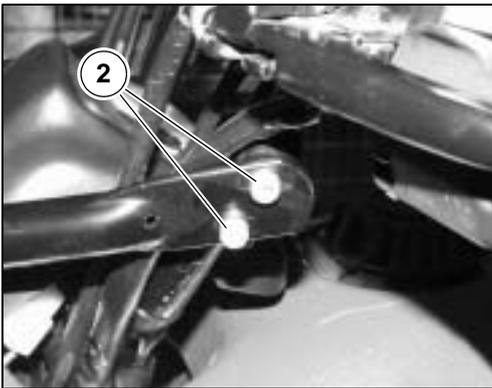
Mark cables to avoid their wrong positioning at reassembly.





### 6.1.3 REMOVING THE HEADLIGHT

- ◆ Disconnect connector (1).
- ◆ ★ Loosen and remove the two screws (2).
- ◆ Remove the complete headlight with subframe (3).

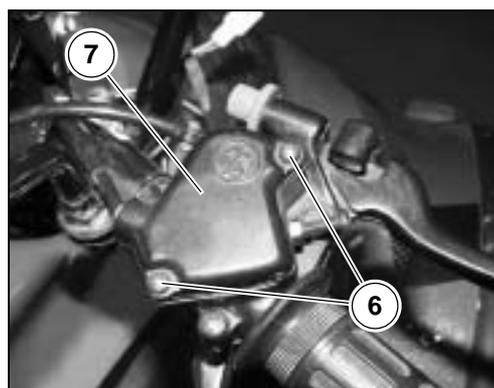
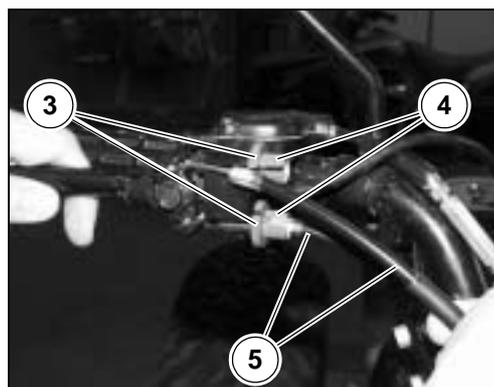
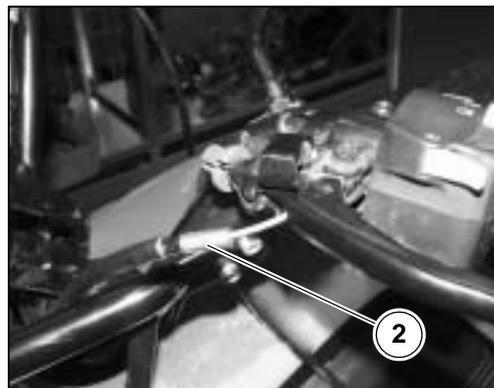
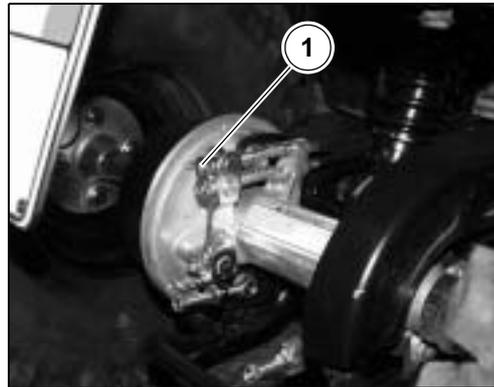


**6.1.4 REMOVING THE HANDLEBARS**

- ◆ Remove the dashboard, see 6.1.2 (REMOVING THE DASHBOARD).
- ◆ Remove headlight, see 6.1.3 (REMOVING THE HEADLIGHT).
- ◆ Loosen adjusting nut (1).
- ◆ Remove rear brake cable (2) from its seat.
- ◆ Fully loosen the two locking washers (3).
- ◆ Fully tighten the two adjusters (4).
- ◆ Remove front brake cables (5).
- ◆ Loosen the two screws (6).
- ◆ Remove cover (7).
- ◆ Remove throttle cable (8) from its seat.
- ◆ Disconnect switch, stop light and direction indicators connectors.

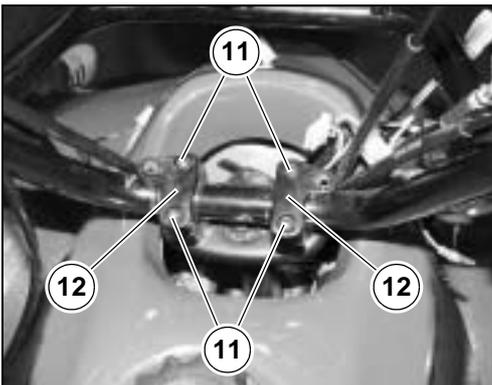
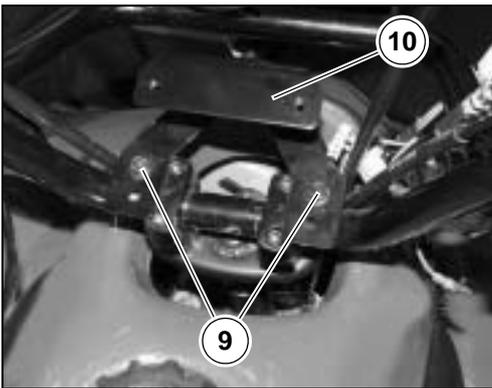
**⚠ WARNING**

Mark cables to avoid their wrong positioning at reassembly.





- ◆ Loosen and remove the two screws (9).
- ◆ Remove mount (10).
- ◆ Loosen and remove the four screws (11).
- ◆ Remove the two braces (12).
- ◆ Remove handlebars.

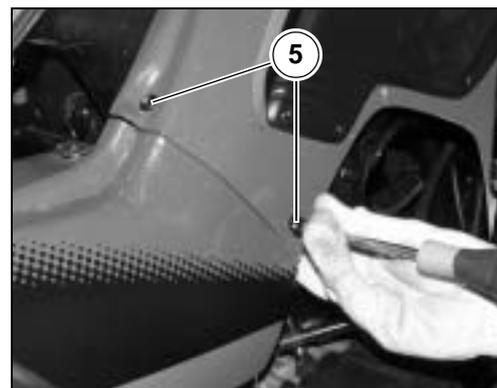
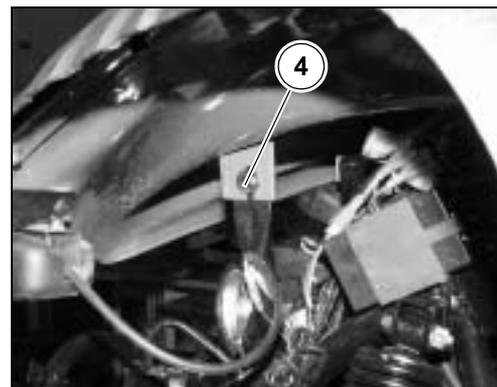
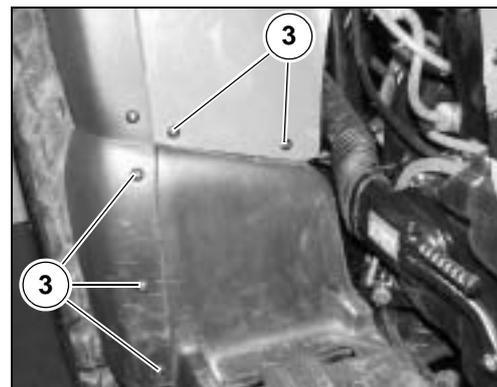
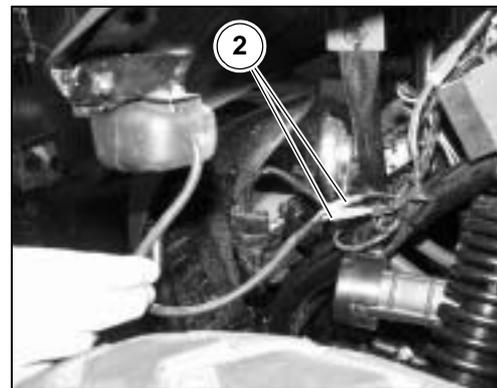
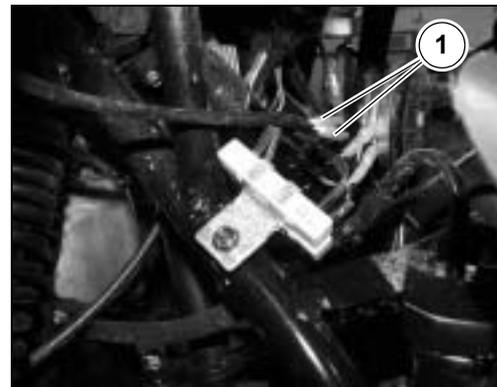


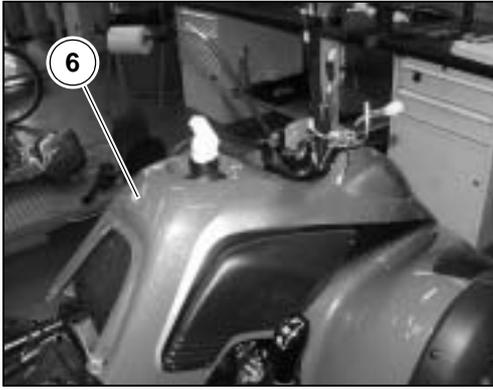
### 6.1.5 REMOVING THE FRONT SHIELD

- ◆ Remove handlebars see 6.1.3 (REMOVING THE HEADLIGHT).
- ◆ Disconnect direction indication connectors (1-2).
- ◆ Loosen and remove the five screws (3). Save washers and nuts.
- ◆ Loosen and remove the front screw (4). Save the washer.
- ◆ Loosen and remove the two screws (5).
- ◆ Loosen and remove fuel tank cap.

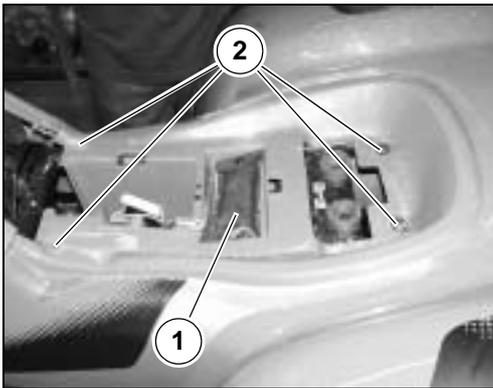
**⚠ WARNING**

Block off tank opening to avoid any foreign matter from entering.



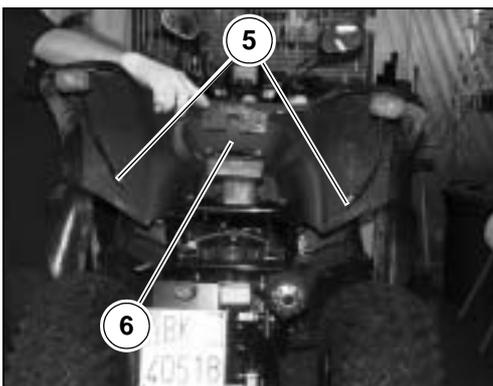
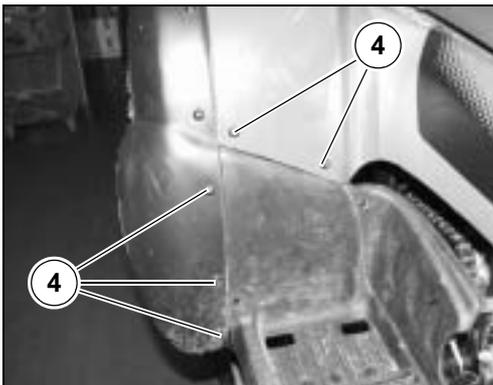
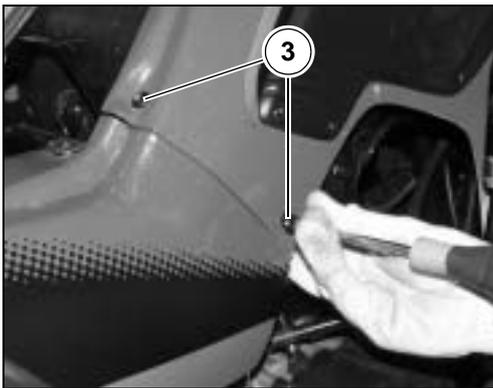


- ◆ Remove the front shield (6).



### 6.1.6 REMOVING THE REAR SHIELD

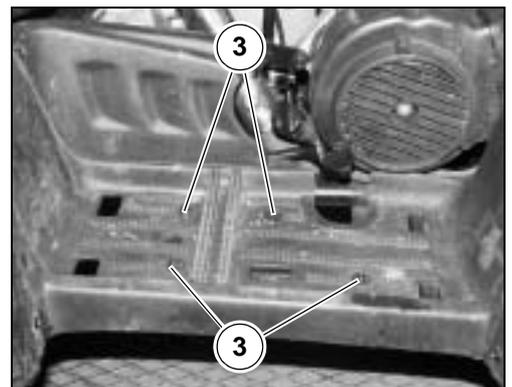
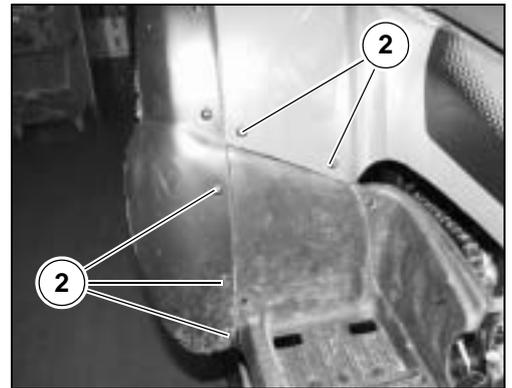
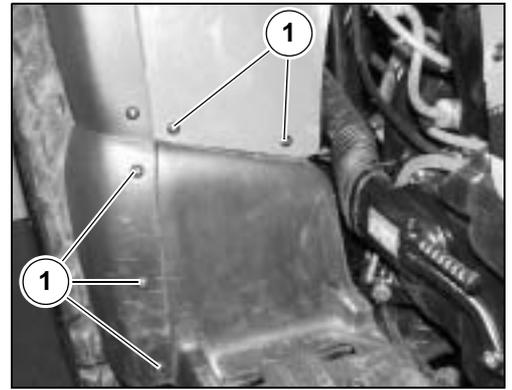
- ◆ Remove the battery, see 6.1.9 (REMOVING THE BATTERY).
- ◆ Release tool kit elastic strip.
- ◆ Remove the supplied tool kit (1).
- ◆ Loosen and remove the four screws (2).
- ◆ ★ Loosen and remove the two screws (3).
- ◆ ★ Loosen and remove the five screws (4). Save nuts and washers.
- ◆ Disconnect direction indicator connectors (5).
- ◆ Remove the rear shield (6).



**6.1.7 REMOVING THE FOOTREST**

- ◆ Loosen and remove the five screws (1). Save washers and nuts.
- ◆ Loosen and remove the five screws (2). Save washers and nuts.
- ◆ Loosen the four screws (3). Save washers and nuts.
- ◆ Remove the footrest.

**NOTE** If necessary, repeat the above procedure to remove the other footrest.

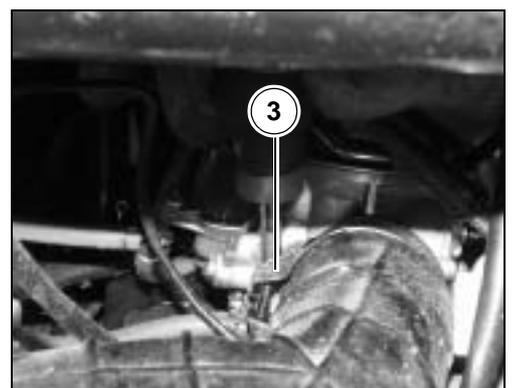
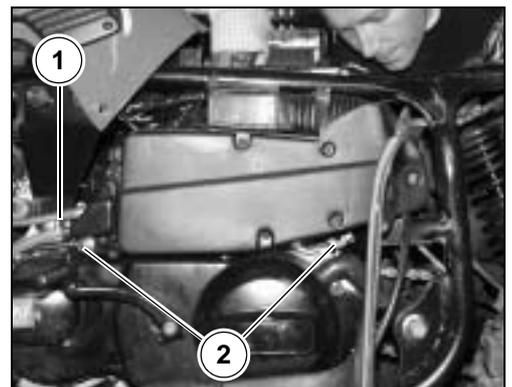


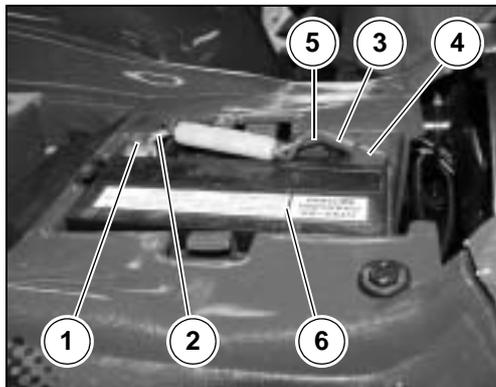
**6.1.8 REMOVING THE AIR FILTER CASE**

- ◆ Remove the rear shield, see 6.1.6 (REMOVING THE REAR SHIELD).
- ◆ Remove pipe (1).
- ◆ Remove breather from its seat.
- ◆ Loosen and remove the two screws (2). Save the two washers.
- ◆ Loosen clip (3).
- ◆ Remove filter case.

**⚠ WARNING**

Block off intake manifold with a clean cloth to prevent any foreign matter from entering the intake ducts. At reassembly, make sure that the cloth or any other object is not inside the filter case, then refit filter case cover.





### 6.1.9 REMOVING THE BATTERY

- ◆ Turn main switch to "⊗".
- ◆ Remove the seat, see 6.1.1 (REMOVING THE SEAT).
- ◆ Release the elastic strip.
- ◆ Loosen and remove screw (1) on negative terminal (-).
- ◆ Move negative cable (2) aside.
- ◆ Raise the red protective gaiter (3).
- ◆ Loosen and remove screw (4) on positive terminal (+).
- ◆ Move positive terminal (5) aside.

#### **⚠ WARNING**

**Do not overpull electric cables.**

- ◆ Wear latex gloves and grasp battery (6). Raise it to remove it from its compartment.

#### **⚠ CAUTION**

**Store the removed battery in a safe place and out of the children's reach.**

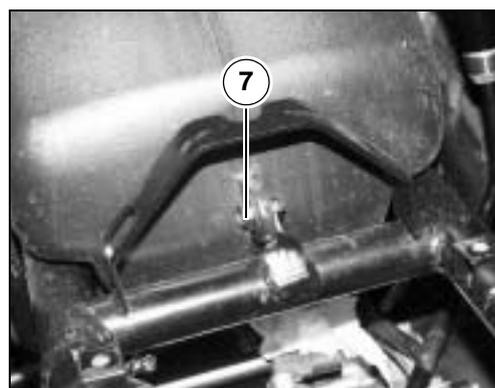
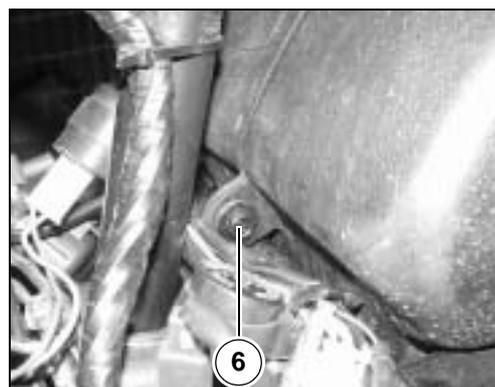
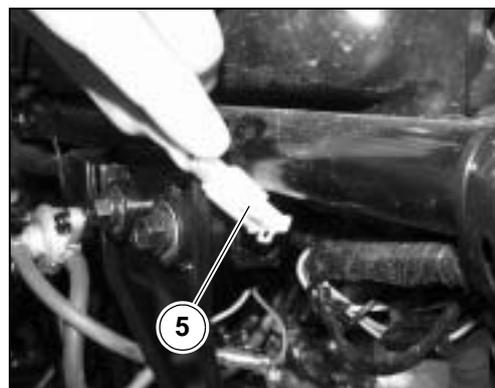
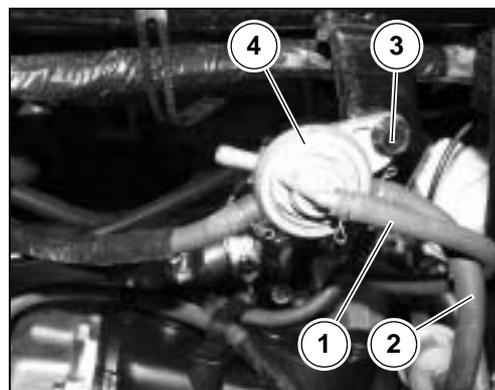
#### **⚠ WARNING**

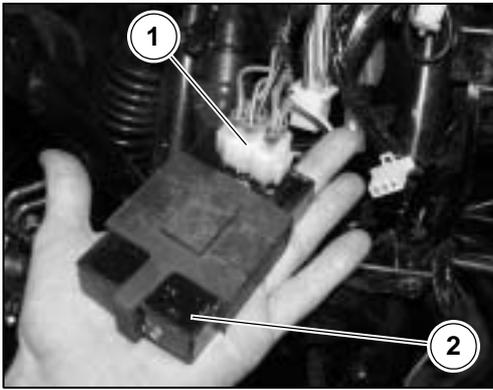
**At reassembly connect the cable on positive terminal (+) first and then that on the negative terminal (-).**

**NOTE** *Change the rubber battery profile if damaged.*

### 6.1.10 REMOVING THE FUEL TANK

- ◆ Remove the front shield, see 6.1.5 (REMOVING THE FRONT SHIELD).
- ◆ Release clips and remove carburettor (1) and vacuum (2) pipes.
- ◆ Loosen and remove pressure tap (4) screw (3).
- ◆ Disconnect fuel level sensor connector (5).
- ◆ Loosen and remove tank front screw (6). Save washer.
- ◆ Loosen and remove tank rear screw (7).
- ◆ Remove fuel tank with tap.





### 6.1.11 REMOVING THE CONTROL UNIT

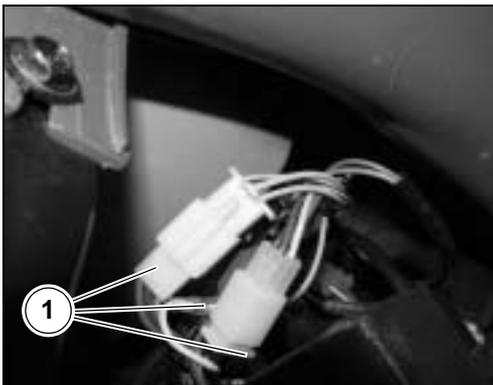
Carefully read see 1.3 (GENERAL SAFETY RULES).

- ◆ Turn main switch to "⊗".
- ◆ Disconnect control unit (1) connectors.

#### **⚠ WARNING**

**At reassembly, make sure that connectors are properly coupled.**

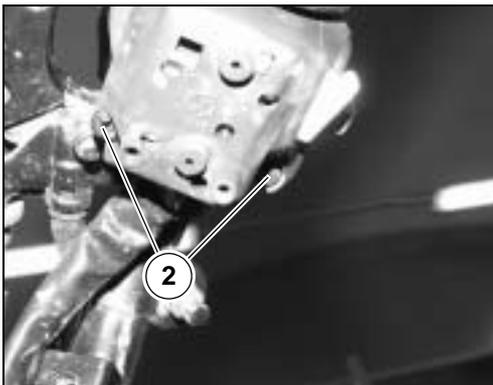
- ◆ To remove control unit (2), slide it out of frame.



### 6.1.12 REMOVING THE ELECTRICAL CONTROLS

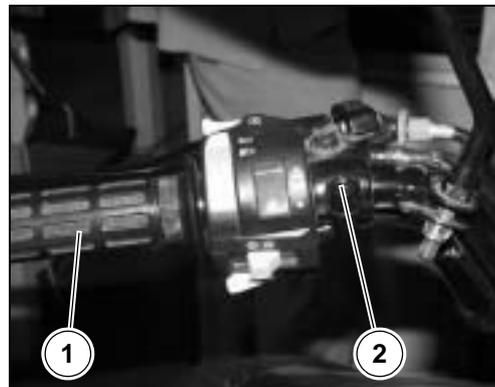
Carefully read see 1.3 (GENERAL SAFETY RULES).

- ◆ Turn main switch to "⊗".
- ◆ Disconnect the three electrical connectors (1).
- ◆ Loosen and remove the two screws (2).
- ◆ Remove the two shells.



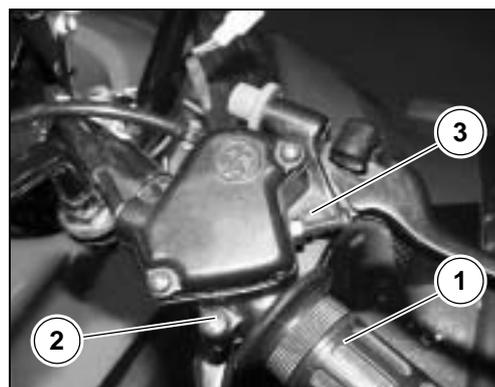
### 6.1.13 REMOVING THE REAR BRAKE LEVER

- ◆ Disconnect brake cable, see 6.1.4 (REMOVING THE HANDLEBARS).
- ◆ Remove the switch, see 6.1.12 (REMOVING THE ELECTRICAL CONTROLS).
- ◆ Remove twistgrip (1).
- ◆ Loosen and remove screw (2).
- ◆ Remove brake lever.



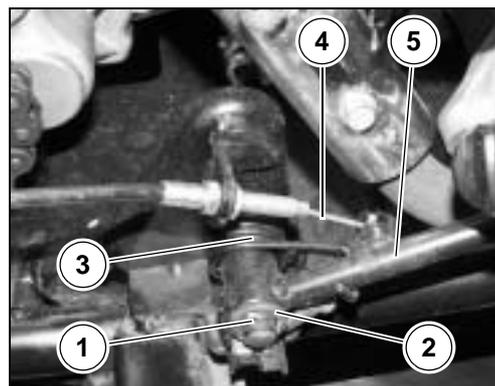
### 6.1.14 REMOVING THE RIGHT CONTROL

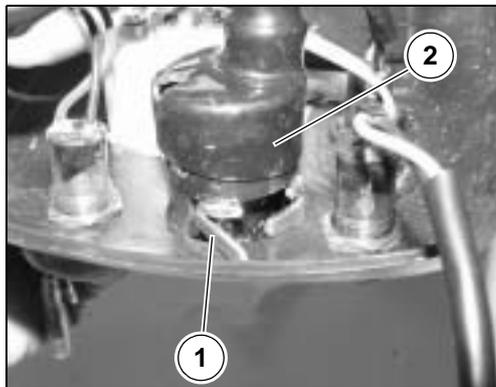
- ◆ Disconnect brake and throttle cables and the stop switch wiring, see 6.1.4 (REMOVING THE HANDLEBARS).
- ◆ Remove twistgrip (1).
- ◆ Loosen and remove screw (2).
- ◆ Take out right control (3).



### 6.1.15 REMOVING THE BRAKE PEDAL

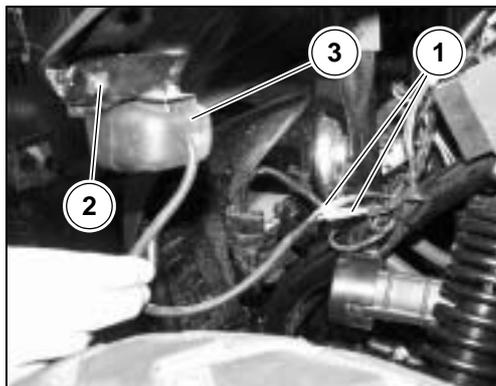
- ◆ Remove right footrest, see 6.1.7 (REMOVING THE FOOTREST).
- ◆ Remove spring pin (1). Save washer (2).
- ◆ Release spring (3).
- ◆ Release brake cable (4).
- ◆ Remove brake pedal (5).
- ◆ Save spring (3).





### 6.1.16 REMOVING THE MAIN SWITCH

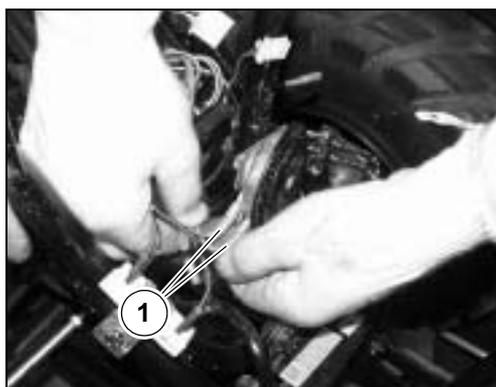
- ◆ Remove ignition key.
- ◆ Remove the dashboard, see 6.1.2 (REMOVING THE DASHBOARD).
- ◆ Straighten retainer (1) reeds.
- ◆ Remove retainer (1).
- ◆ Remove main switch (2) from outside the dashboard.



### 6.1.17 REMOVING THE FRONT DIRECTION INDICATORS

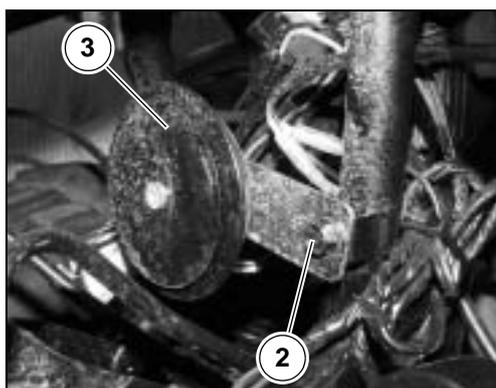
- ◆ Disconnect the two connectors (1).
- ◆ Loosen and remove screw (2).
- ◆ Remove direction indicator (3).

**NOTE** If necessary, repeat the above procedure to remove the other direction indicator.



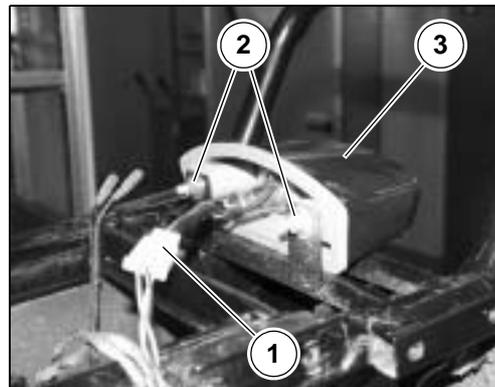
### 6.1.18 REMOVING THE HORN

- ◆ Disconnect the two electrical connectors (1).
- ◆ Loosen and remove screw (2).
- ◆ Remove horn (3).



### 6.1.19 REMOVING THE TAIL LIGHT

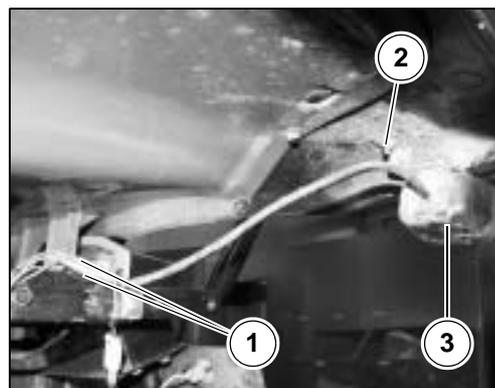
- ◆ Turn main switch to "⊗".
- ◆ Disconnect connector (1).
- ◆ Loosen and remove the two nuts (2). Save washers.
- ◆ Remove tail light (3).

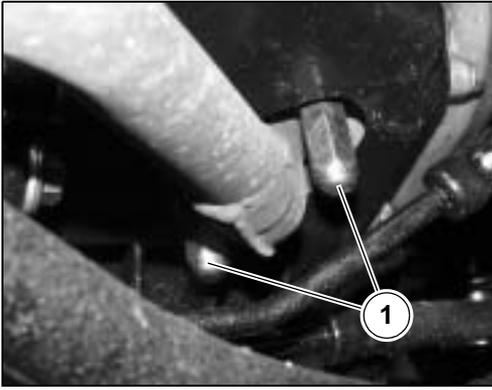


### 6.1.20 REMOVING THE REAR DIRECTION INDICATORS

- ◆ Disconnect the two electrical connectors (1).
- ◆ Loosen and remove nut (2). Save screw.
- ◆ Remove direction indicator (3).

**NOTE** *If necessary, repeat the above operations to remove the other direction indicator.*

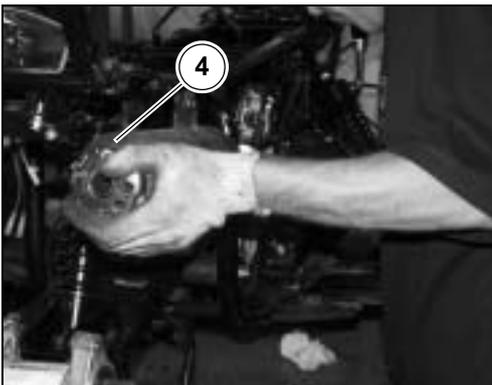
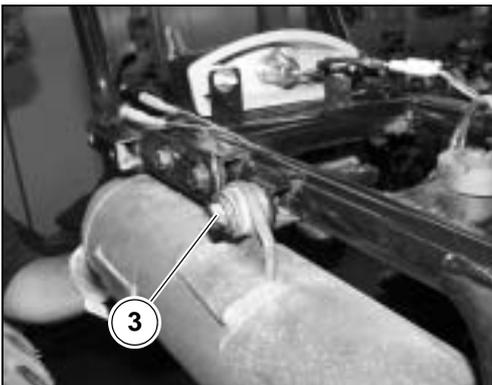
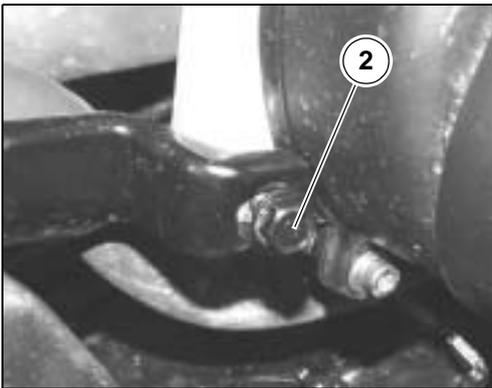




### 6.1.21 REMOVING THE EXHAUST PIPE

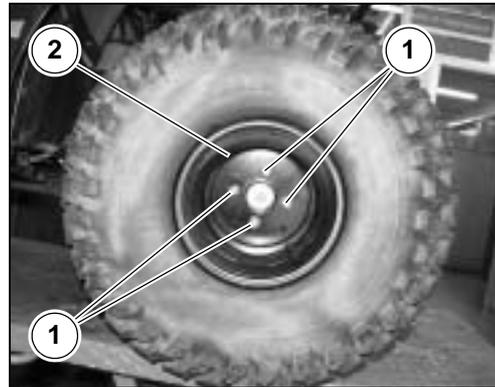
- ◆ Remove the rear shield, see 6.1.6 (REMOVING THE REAR SHIELD).
- ◆ Remove right footrest, see 6.1.7 (REMOVING THE FOOTREST).
- ◆ Loosen and remove the two screws (1).
- ◆ Loosen and remove screw (2).
- ◆ Loosen and remove screw (3). Save washer.
- ◆ Push down brake pedal.
- ◆ Turn the exhaust pipe (4) slightly and remove it from behind.

**NOTE** At reassembly, change the gasket between exhaust pipe and engine.



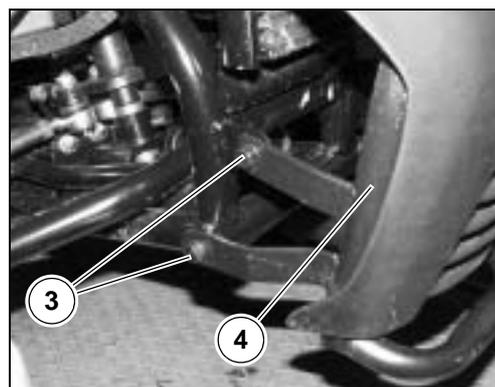
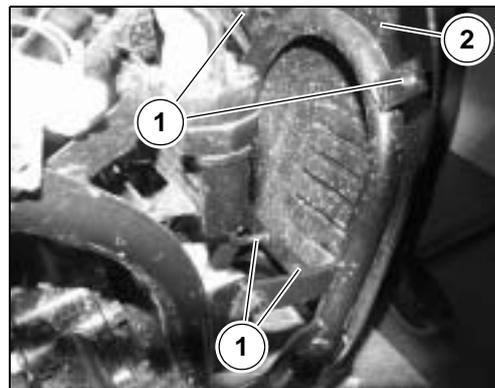
**6.1.22 REMOVING THE WHEELS**

- ◆ To remove one or both front wheels, raise the front part of frame with a suitable stand, while to remove one or both rear wheels, place the stand under the rear axle.
- ◆ Loosen and remove the four screws (1). Save washers.
- ◆ Remove wheel (2).



**6.1.23 REMOVING THE FRONT SUBFRAME**

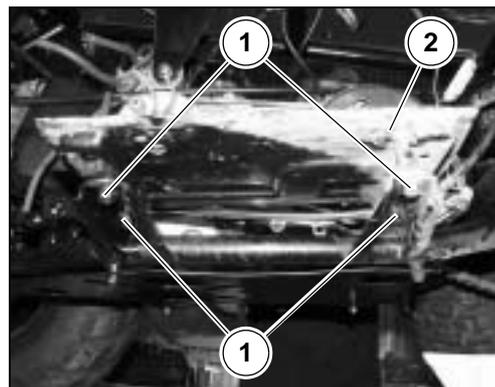
- ◆ Loosen and remove the four screws (1).
- ◆ Remove visor (2).
- ◆ ★ Loosen and remove the two screws (3).
- ◆ Remove front subframe (4).

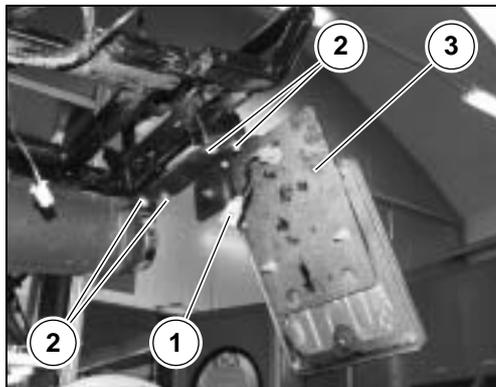


**6.1.24 REMOVING THE FOOTREST MOUNT**

- ◆ Remove footrest, see 6.1.7 (REMOVING THE FOOTREST).
- ◆ Loosen and remove the four screws (1).
- ◆ Remove the footrest mount (2).

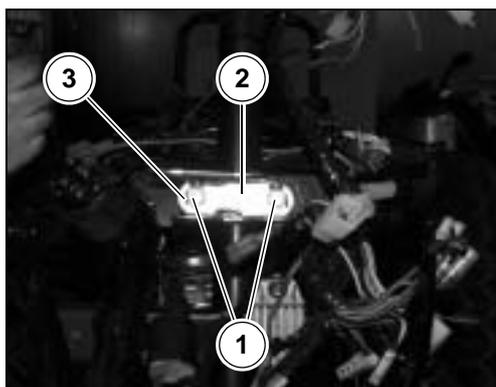
**NOTE** If necessary, repeat the above procedure to remove the other footrest mount.





### 6.1.25 REMOVING THE FRAME

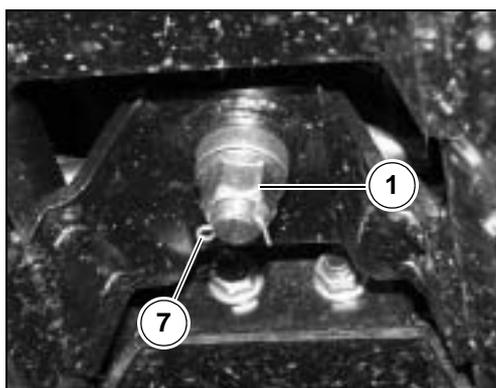
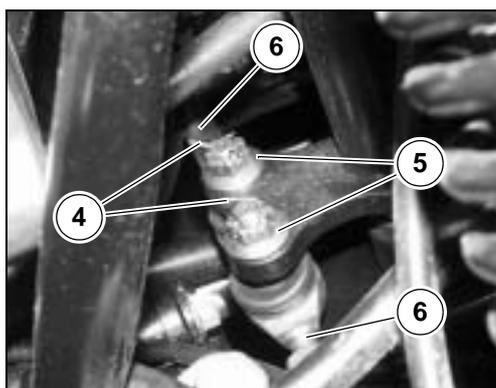
- ◆ Remove engine, see see 3.1.2 (REMOVING THE ENGINE FROM THE FRAME).
- ◆ Remove horn, see 6.1.18 (REMOVING THE HORN).
- ◆ Remove the steering unit, see 6.2 (STEERING SYSTEM).
- ◆ Remove the rear swinging arm, see 6.3 (SWINGING ARM).
- ◆ Remove the front subframe, see 6.1.23 (REMOVING THE FRONT SUBFRAME).
- ◆ Remove both footrest mounts, see 6.1.24 (REMOVING THE FOOTREST MOUNT).
- ◆ Disconnect number plate holder light connector (1).
- ◆ Loosen and remove the four screws (2).
- ◆ Remove the number plate holder (3).
- ◆ Remove electrical parts from frame and release all cable clips.



## 6.2 STEERING SYSTEM

### 6.2.1 REMOVING STEERING YOKE WITH STEM

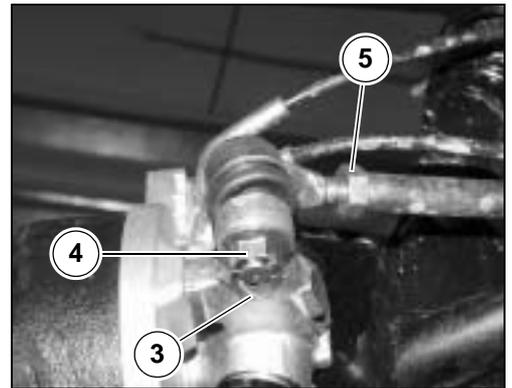
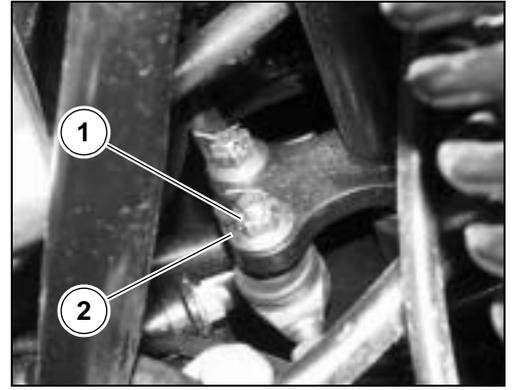
- ◆ Remove the front shield, see 6.1.5 (REMOVING THE FRONT SHIELD).
- ◆ Loosen and remove the two nuts (1). Save plate (2), cable ring (3), clamp and bushing.
- ◆ Take out the two split pins (4).
- ◆ Loosen and remove the two nuts (5).
- ◆ Remove the two arms (6) from steering yoke.
- ◆ Remove split pin (7).
- ◆ Loosen and remove nut (8).
- ◆ Remove steering yoke with stem.



### 6.2.2 REMOVING THE STEERING ARM

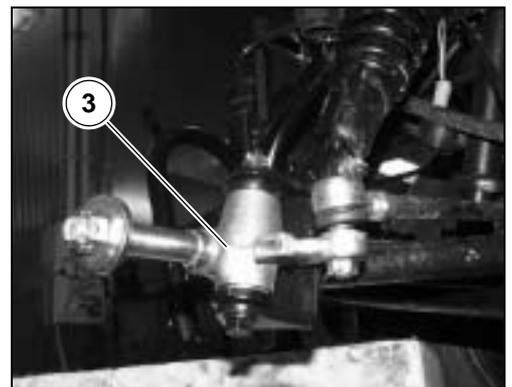
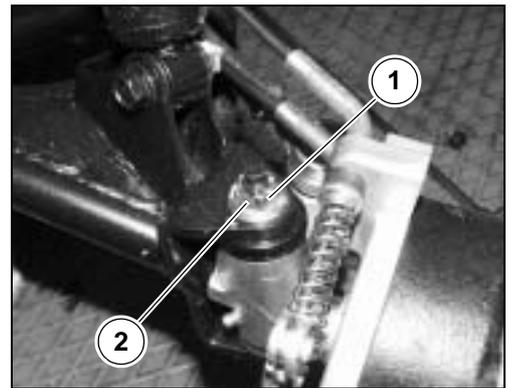
- ◆ Remove split pin (1).
- ◆ Loosen and remove nut (2).
- ◆ Remove split pin (3).
- ◆ Loosen and remove nut (4).
- ◆ Remove steering arm (5).

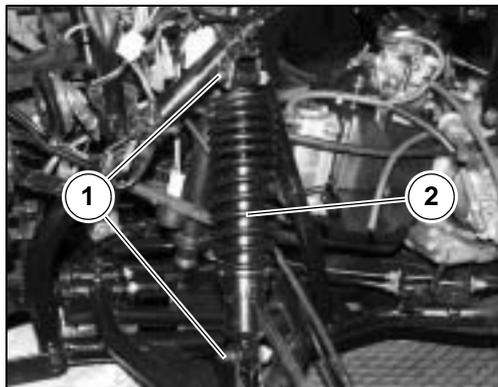
**NOTE** If necessary, repeat the above procedure to remove the other steering arm.



### 6.2.3 REMOVING THE BALL JOINT

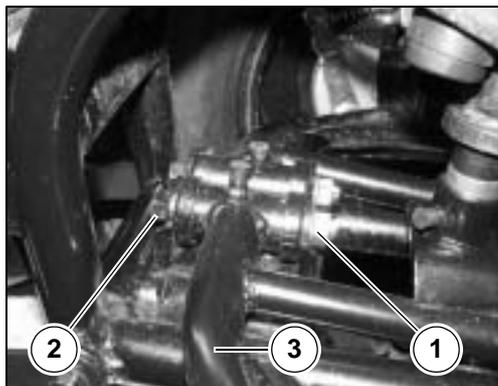
- ◆ Remove the brake, see 6.4.1 (REMOVING THE BRAKE).
- ◆ Remove split pin (1).
- ◆ Loosen and remove nut (2).
- ◆ Remove steering arm, see 6.2.2 (REMOVING THE STEERING ARM).
- ◆ Remove the ball joint (3).





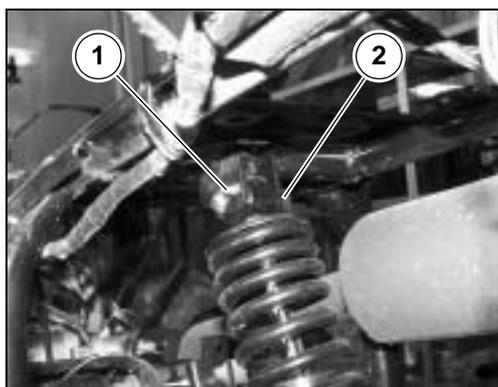
### 6.2.4 REMOVING THE FRONT SHOCK ABSORBER

- ◆ Raise frame front part on a suitable stand.
- ◆ Loosen and remove the two screws (1). Save washers and nuts.
- ◆ Remove front shock absorber (2).



### 6.2.5 REMOVING SUSPENSION ARM

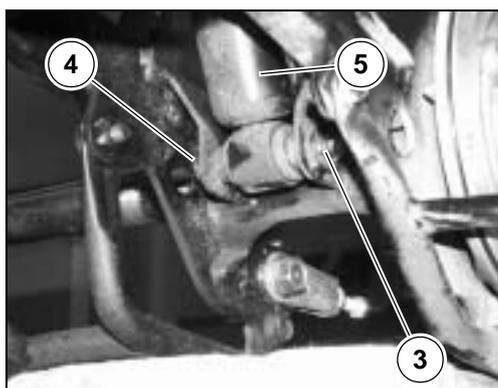
- ◆ Remove front shock absorber, see 6.2.4 (REMOVING THE FRONT SHOCK ABSORBER).
- ◆ Remove ball joint, see 6.2.3 (REMOVING THE BALL JOINT).
- ◆ Loosen and remove screw (1). Save nut.
- ◆ Loosen and remove screw (2). Save nut.
- ◆ Remove suspension arm (3).



## 6.3 SWINGING ARM

### 6.3.1 REMOVING THE REAR SHOCK ABSORBER

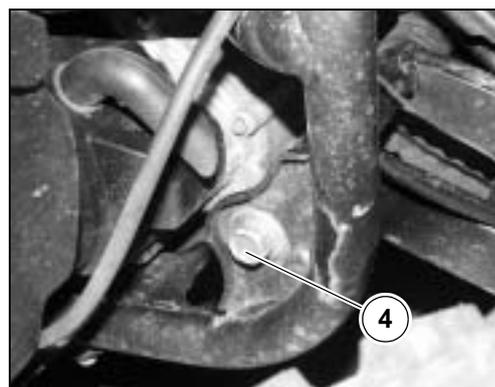
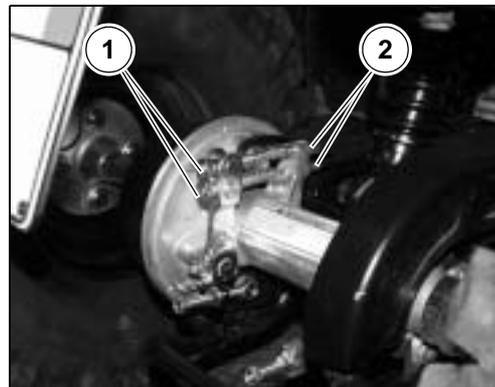
- ◆ Raise frame rear part on a suitable stand.
- ◆ Loosen and remove nut (1). Save screw (2).
- ◆ Remove split pin (3) and remove spindle (4).
- ◆ Remove the rear shock absorber (5).



### 6.3.2 REMOVING THE SWINGING ARM

- ◆ Remove chain, see 6.7.1 (DISASSEMBLING THE CHAIN).
- ◆ Loosen and remove the two nuts (1).
- ◆ Loosen and remove the two cables (2). Save springs.
- ◆ Remove rear shock absorber, see 6.3.1 (REMOVING THE REAR SHOCK ABSORBER).
- ◆ Loosen and remove nut (3).
- ◆ Remove swinging arm spindle (4). Save washer.
- ◆ Remove the complete swinging arm.

**NOTE** *If necessary, remove the single parts.*

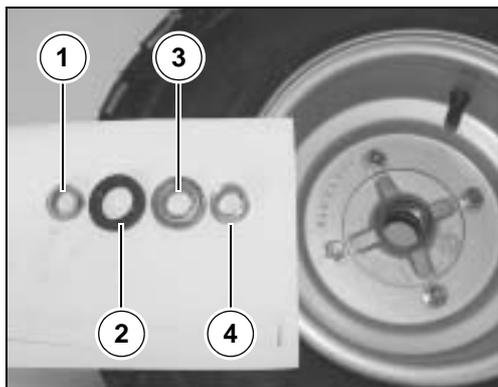
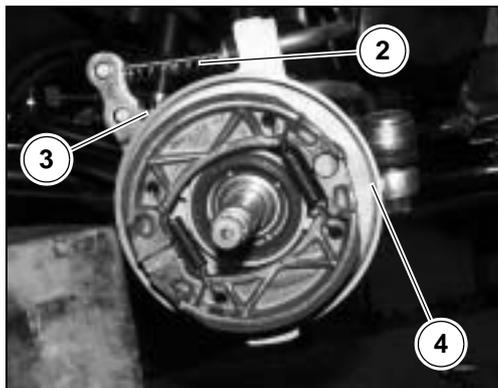
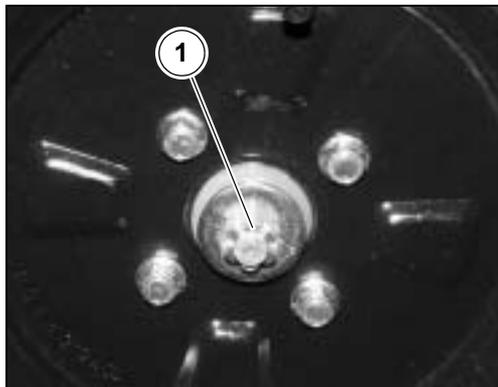


## 6.4 FRONT BRAKES

## 6.4.1 REMOVING THE BRAKE

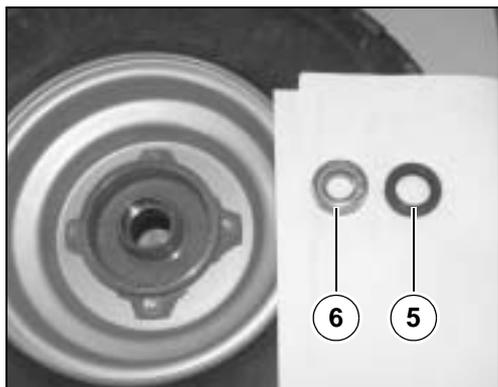
**NOTE** The following operations apply to both brakes.

- ◆ Raise frame front part on a suitable stand.
- ◆ Remove split pin.
- ◆ Loosen and remove nut (1). Save washer.
- ◆ Remove wheel with brake drum.
- ◆ Disconnect the two brake cables (2-3).
- ◆ Remove the brake block plate (4).



## 6.4.2 DISASSEMBLING THE BRAKE DRUM

- ◆ Remove the complete wheel, see 6.4.1 (REMOVING THE BRAKE).
- ◆ Working from outside the wheel, remove the following parts in the given order:
  - spacer (1);
  - oil seal (2);
  - bearing (3);
  - spacer (4).
- ◆ Working from inside the wheel, remove the following parts in the given order:
  - oil seal (5);
  - bearing (6).



**6.4.3 CHECKING THE PARTS**

**BRAKE DRUM**

- ◆ Check sliding surface: it shall be free from scoring and /or cracks. In case of minor scores, grind surface with soaked emery cloth (grain 1).
- ◆ In case of deep scores, change hub (1).

**BEARINGS**

- ◆ Turn inner ring (4) by hand. It should run smoothly, silently and should not jam at any position. Check also for any axial play. Change any faulty bearing.

**SEALS**

- ◆ Check seals for wear. If excessively damaged or worn, change them.

**BRAKE BLOCKS**

- ◆ Check friction material (5) for wear.

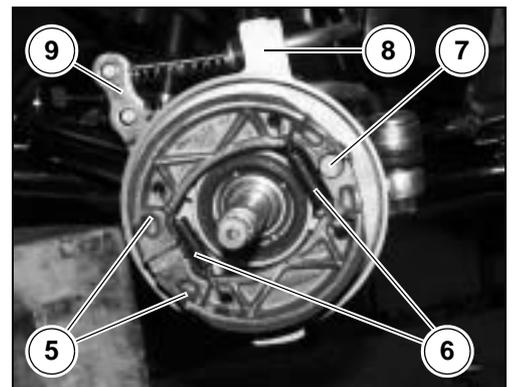
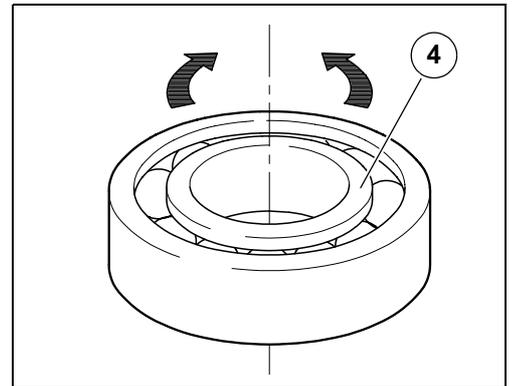
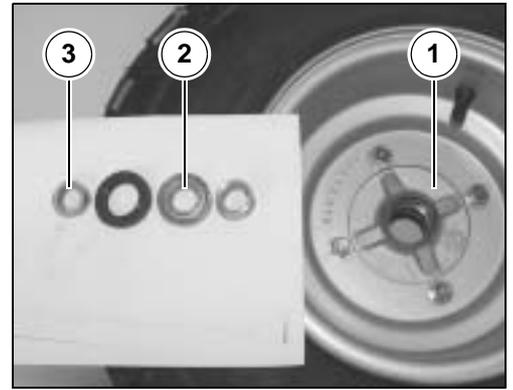
**Min. thickness: 1mm.**

- ◆ Check springs (6). Change them if yielded.

Check the following parts for wear:

- brake cam (7);
- block holder plate (8);
- brake lever (9);
- spacers (2-3).

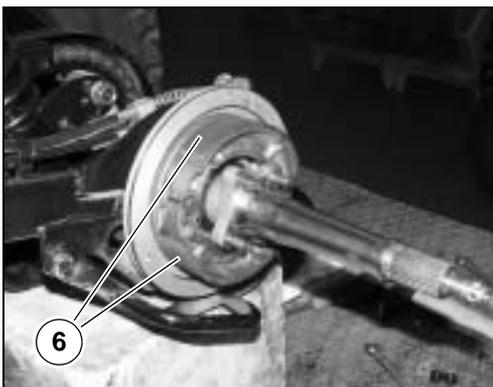
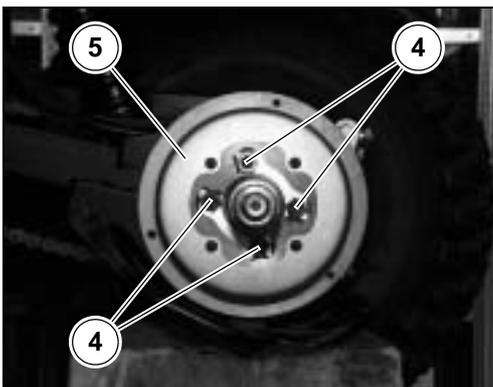
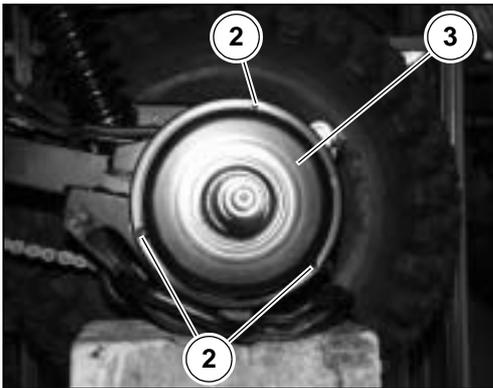
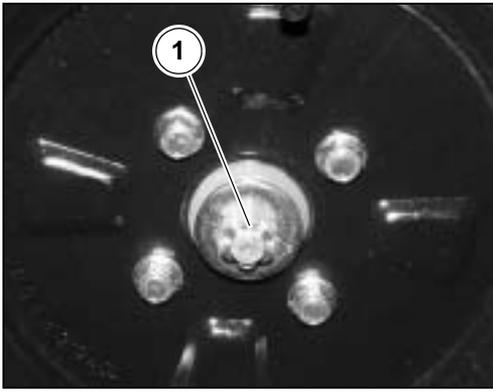
Change those parts which are excessively worn or damaged.



## 6.5 REAR BRAKE

## 6.5.1 REMOVING THE BRAKE

- ◆ Raise frame rear part on a suitable stand.
- ◆ Disconnect brake cables, see 6.3.2 (REMOVING THE SWINGING ARM).
- ◆ Remove split pin.
- ◆ Loosen and remove nut (1). Save washer.
- ◆ Remove the complete left wheel.
- ◆ Loosen and remove the three screws (2).
- ◆ Remove drum cover (3).
- ◆ Bend washer so as to loosen nuts.
- ◆ Loosen and remove the four screws (4).
- ◆ Working from left side, remove the following parts in the given order: brake drum (5) and brake blocks (6).



6.6 CHECKING THE PARTS

**BRAKE DRUM**

- ◆ Check sliding surface: it shall be free from scoring and /or cracks. In case of minor scores, grind surface with soaked emery cloth (grain 1). In case of deep scores, change drum (1).

**SEALS**

- ◆ Check seals for wear. If excessively damaged or worn, change them.

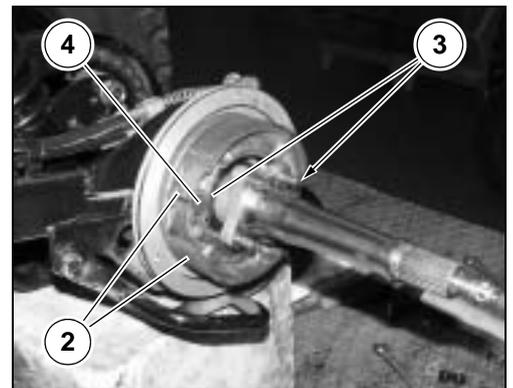
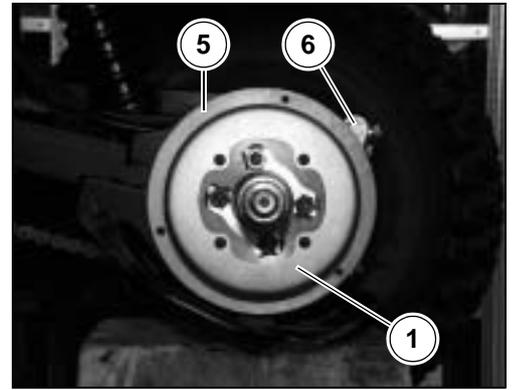
**BRAKE BLOCKS**

Check friction material (2) for wear.

**Min. thickness: 1mm.**

- ◆ Check springs (3). Change them if yielded.
- ◆ Check the following parts for wear:
  - brake cam (4);
  - block holder plate (5);
  - brake lever (6).

Change those parts which are excessively worn or damaged.



6.7 CHAIN

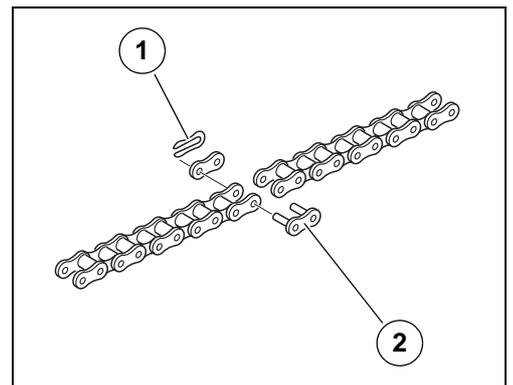
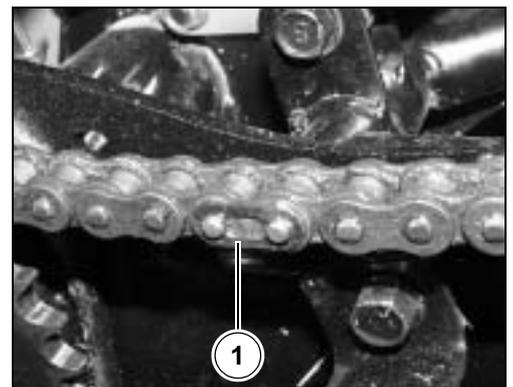
**6.7.1 DISASSEMBLING THE CHAIN**

Carefully read see 1.3 (GENERAL SAFETY RULES).

- ◆ Slacken chain tension, see 6.7 (CHAIN).
- ◆ Turn rear wheels until having the master link exposed.
- ◆ Remove clip (1) and the plate underneath.
- ◆ Working on the opposite side, remove the master link (2).
- ◆ Remove chain.

**⚠ WARNING**

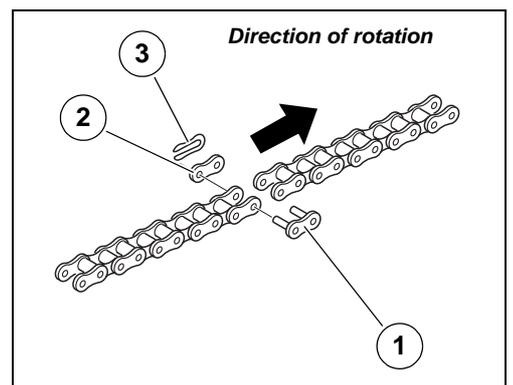
If the chain is excessively worn, change the whole unit (front and rear sprockets and chain).



**6.7.2 REFITTING THE CHAIN**

- ◆ Make sure that chain is correctly positioned on front and rear sprockets.
- ◆ Proceed to chain positioning: the two free ends to be joined together shall be in a central point between front and rear sprockets, in the chain upper section.
- ◆ Join the two chain ends and insert master link (1) pins from the inside to the outside.
- ◆ Install plate (2) onto pins.
- ◆ Fit clip (3) onto pins.

**NOTE** Master link clip (3) opening shall be opposite to the direction of travel.





TROUBLESHOOTING

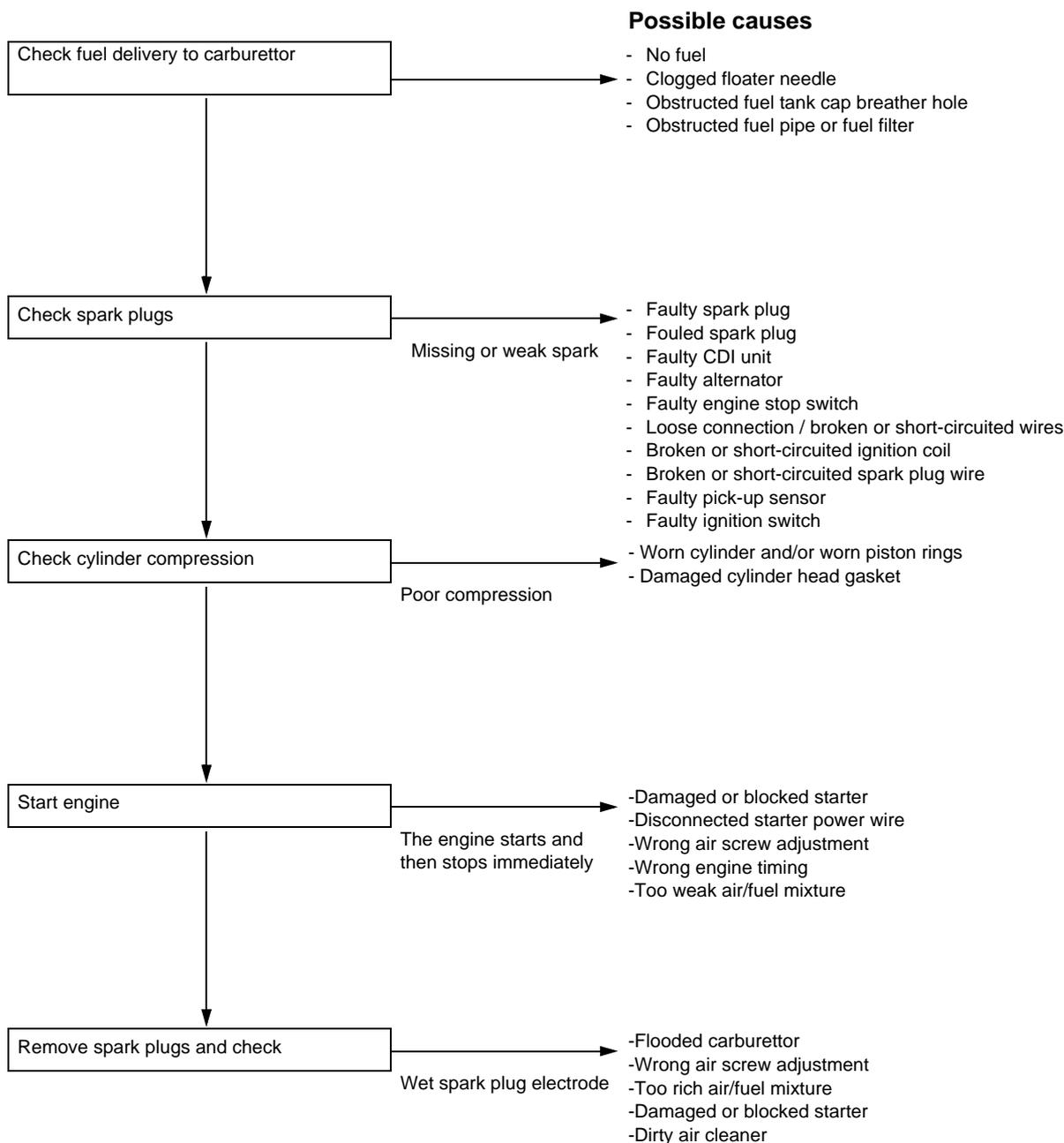
7

## TROUBLESHOOTING

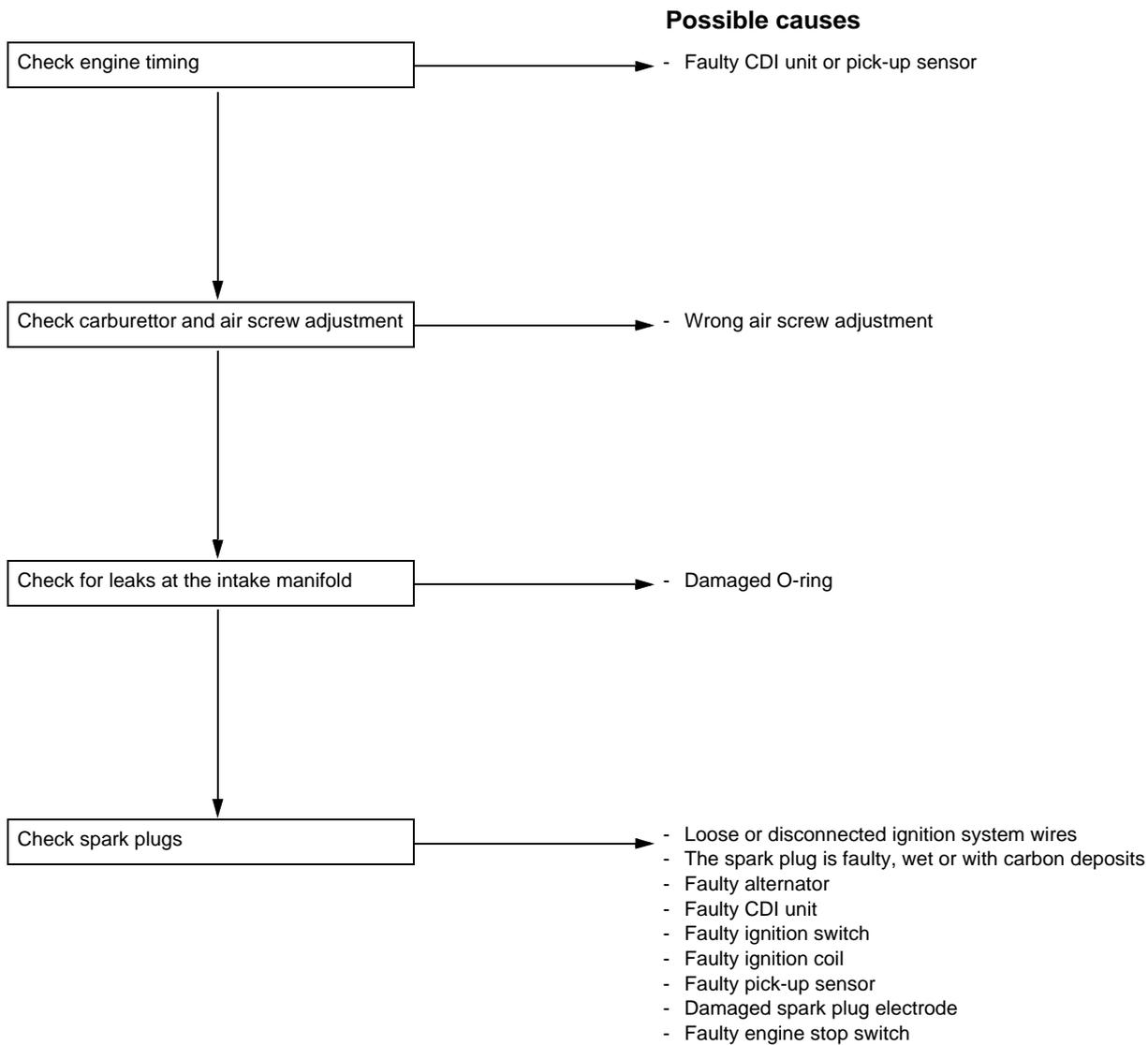
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7.6	LOW POWER .....	7-7-00
7.7	POOR VEHICLE MANEUVERABILITY .....	7-8-00

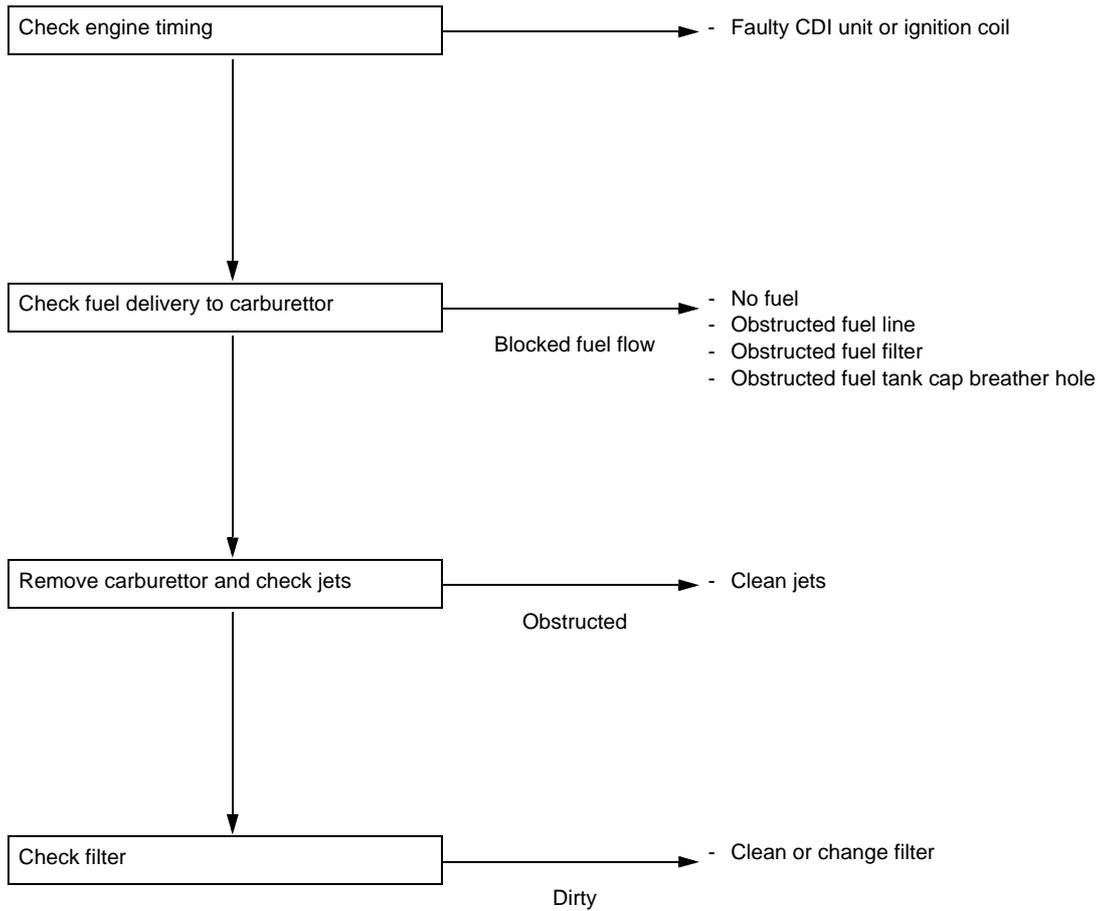
## 7.1 THE ENGINE DOES NOT START



## 7.2 POOR PERFORMANCE AT IDLE AND LOW SPEED



## 7.3 POOR PERFORMANCE AT HIGH SPEED

**Possible causes**

## 7.4 EXCESSIVE NOISE LEVEL

Excessive noise level

**Possible causes**

- Worn valve adjustment
- Jammed valve or broken valve spring
- Damaged rocker arms or shaft or camshaft
- Damaged or worn chain
- Damaged or worn chain tensioner
- Worn camshaft sprocket teeth

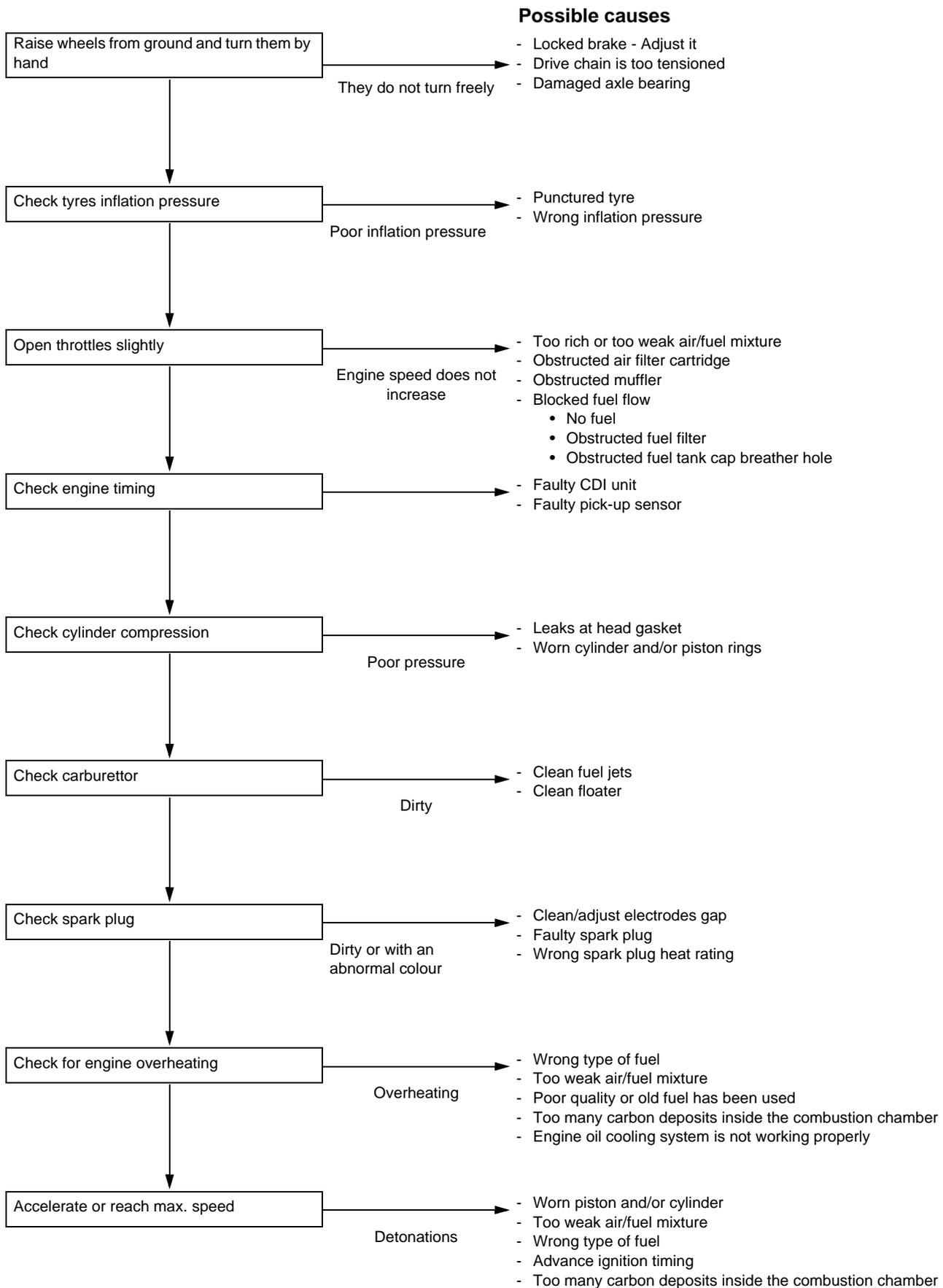
## 7.5 EXCESSIVE FUMES

Excessive fumes

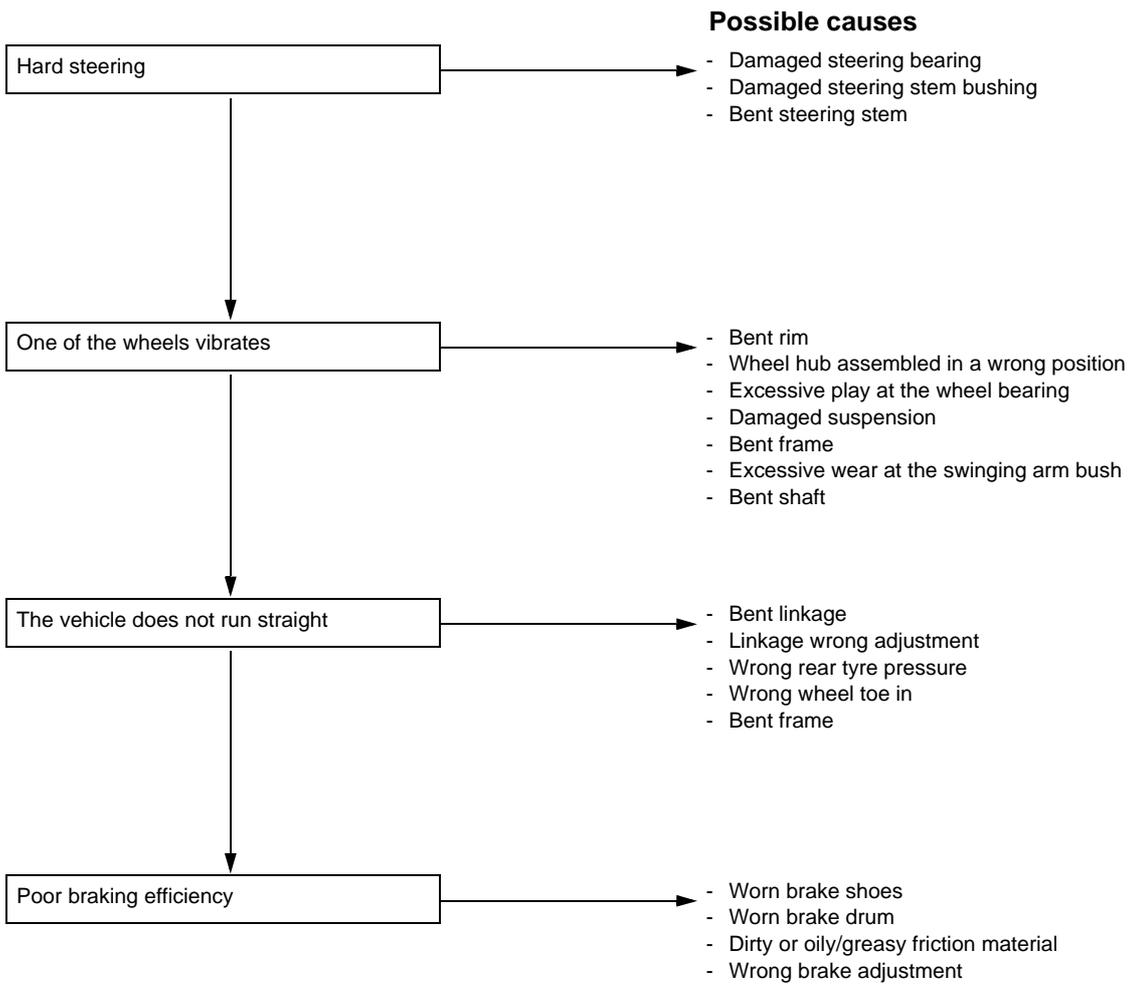
**Possible causes**

- Worn cylinder, piston or piston rings
- Wrong piston ring assembly
- Scores or scratches on piston or on cylinder walls
- Damaged valve stem seal

## 7.6 LOW POWER



## 7.7 POOR VEHICLE MANEUVERABILITY









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