Kawasaki

PRAIRIE 400 4X4
PRAIRIE 400

All Terrain Vehicle
Service Manual

Quick Reference Guide

LIST OF ABBREVIATIONS

A	ampere(s)	lb	pound(s)
ABDC	after bottom dead center	m	meter(s)
AC	alternating current	min	minute(s)
ATDC	after top dead center	N	newton(s)
BBDC	before bottom dead center	Pa	pascal(s)
BDC	bottom dead center	PS	horsepower
BTDC	before top dead center	psi	pound(s) per square inch
°C	degree(s) Celsius	r	revolution
DC	direct current	rpm	revolution(s) per minute
F	farad(s)	TDC	top dead center
°F	degree(s) Fahrenheit	TIR	total indicator reading
ft	foot, feet	V	volt(s)
g	gram(s)	W	watt(s)
h	hour(s)	Ω	ohm(s)
L	liter(s)		

Read OWNER'S MANUAL before operating.

Foreword

This manual is designed primarily for use by trained mechanics in a properly equipped shop. However, it contains enough detail and basic information to make it useful to the owner who desires to perform his own basic maintenance and repair work. A basic knowledge of mechanics, the proper use of tools, and workshop procedures must be understood in order to carry out maintenance and repair satisfactorily. Whenever the owner has insufficient experience or doubts his ability to do the work, all adjustments, maintenance, and repair should be carried out only by qualified mechanics.

In order to perform the work efficiently and to avoid costly mistakes, read the text, thoroughly familiarize yourself with the procedures before starting work, and then do the work carefully in a clean area. Whenever special tools or equipment are specified, do not use makeshift tools or equipment. Precision measurements can only be made if the proper instruments are used, and the use of substitute tools may adversely affect safe operation.

For the duration of the warranty period, we recommend that all repairs and scheduled maintenance be performed in accordance with this service manual. Any owner maintenance or repair procedure not performed in accordance with this manual may void the warranty.

To get the longest life out of your Vehicle:

- Follow the Periodic Maintenance Chart in the Service Manual.
- Be alert for problems and non-scheduled maintenance.
- Use proper tools and genuine Kawasaki vehicle parts. Special tools, gauges, and testers that are necessary when servicing Kawasaki vehicles are introduced by the Special Tool Catalog or Manual. Genuine parts provided as spare parts are listed in the Parts Catalog.
- Follow the procedures in this manual carefully. Don't take shortcuts.
- Remember to keep complete records of maintenance and repair with dates and any new parts installed.

How to Use this Manual

In preparing this manual, we divided the product into its major systems. These systems became the manual's chapters. All information for a particular system from adjustment through disassembly and inspection is located in a single chapter.

The Quick Reference Guide shows you all of the product's system and assists in locating their chapters. Each chapter in turn has its own comprehensive Table of Contents.

The Periodic Maintenance Chart is located in the General Information chapter. The chart gives a time schedule for required maintenance operations.

If you want spark plug information, for example, go to the Periodic Maintenance Chart first. The chart tells you how frequently to clean and gap the plug. Next, use the Quick Reference Guide to locate the Electrical System chapter. Then, use the Table of Contents on the first page of the chapter to find the Spark Plug section.

Whenever you see these WARNING and CAUTION symbols, heed their instructions! Always follow safe operating and maintenance practices.

⚠WARNING

This warning symbol identifies special instructions or procedures which, if not correctly followed, could result in personal injury, or loss of life.

CAUTION

This caution symbol identifies special instructions or procedures which, if not strictly observed, could result in damage to or destruction of equipment.

This manual contains four more symbols (in addition to WARNING and CAUTION) which will help you distinguish different types of information.

NOTE

○ *This note symbol indicates points of particular interest for more efficient and convenient operation.*

● Indicates a procedural step or work to be done.
○ Indicates a procedural sub-step or how to do the work of the procedural step it follows. It also precedes the text of a NOTE.
★ Indicates a conditional step or what action to take based on the results of the test or inspection in the procedural step or sub-step it follows.

In most chapters an exploded view illustration of the system components follows the Table of Contents. In these illustrations you will find the instructions indicating which parts require specified tightening torque, oil, grease or a locking agent during assembly.

1

General Information

Table of Contents

Before Servicing

Before starting to service a vehicle, careful reading of the applicable section is recommended to eliminate unnecessary work. Photographs, diagrams, notes, cautions, warnings, and detailed descriptions have been included wherever necessary. Nevertheless, even a detailed account has limitations, a certain amount of basic knowledge is also required for successful work.

Especially note the following:

(1) Dirt

Before removal and disassembly, clean the vehicle. Any dirt entering the engine or other parts will work as an abrasive and shorten the life of the vehicle. For the same reason, before installing a new part, clean off any dust or metal filings.

(2) Battery Ground

Remove the ground (−) lead from the battery before performing any disassembly operations on the vehicle. This prevents:

(a) the possibility of accidentally turning the engine over while partially disassembled.

(b) sparks at electrical connections which will occur when they are disconnected.

(c) damage to electrical parts.

(3) Installation, Assembly

Generally, installation or assembly is the reverse of removal or disassembly. But if this Service Manual has installation or assembly procedures, follow them.

(4) Tightening Sequence

Generally, when installing a part with several bolts, nuts, or screws, start them all in their holes and tighten them to a snug fit. Then tighten them evenly in a cross pattern. This is to avoid distortion of the part and/or causing gas or oil leakage. Conversely when loosening the bolts, nuts, or screws, first loosen all of them by about a quarter of turn and then remove them. Where there is a tightening sequence indication in this Service Manual, the bolts, nuts, or screws must be tightened in the order and method indicated.

(5) Torque

When torque values are given in this Service Manual, use them. Either too little or too much torque may lead to serious damage. Use a good quality, reliable torque wrench.

(6) Force

Common sense should dictate how much force is necessary in assembly and disassembly. If a part seems especially difficult to remove or install, stop and examine what may be causing the problem. Whenever tapping is necessary, tap lightly using a rubber, wooden, or plastic-faced mallet. Use an impact driver for screws (particularly for the removal of screws held by a locking agent) in order to avoid damaging the screw heads.

(7) Edges

Watch for sharp edges, especially during major engine disassembly and assembly. Protect your hands with gloves or a piece of thick cloth when lifting the engine or turning it over.

(8) High-Flash Point Solvent

A high-flash point solvent is recommended to reduce fire danger. A commercial solvent commonly available in North America is Stoddard solvent (generic name). Always follow manufacturer and container directions regarding the use of any solvent.

(9) Gasket, O-Ring

Do not reuse a gasket or O-ring once it has been in service. The mating surfaces around the gasket should be free of foreign matter and perfectly smooth to avoid oil or compression leaks.

(10) Liquid Gasket, Non-Permanent Locking Agent

Follow manufacturer's directions for cleaning and preparing surfaces where these compounds will be used. Apply sparingly. Excessive amounts may block engine oil passages and cause serious damage. An example of a non-permanent locking agent commonly available in North America is Loctite Lock'n Seal (Blue).

(11) Press

A part installed using a press or driver, such as a wheel bearing (hub bearing), should first be coated with oil on its outer or inner circumference so that it will go into place smoothly.

(12) Ball Bearing, Needle Bearing

Do not remove a ball bearing or a needle bearing unless it is absolutely necessary. Replace any ball or needle bearings that were removed with new ones, as removal generally damages bearings.

Install bearings with the marked side facing out applying pressure evenly with a suitable driver. Only press on the race that forms the press fit with the base component to avoid damaging the bearings. This prevents severe stress on the balls or needles and races, and prevents races and balls or needles from being dented. Press a ball bearing until it stops at the stop in the hole or on the shaft.

(13) Oil Seal and Grease Seal

Replace any oil or grease seals that were removed with new ones, as removal generally damages seals.

When pressing in a seal which has manufacturer's marks, press it in with the marks facing out. Seals should be pressed into place using a suitable driver, which contacts evenly with the side of seal, until the face of the seal is even with the end of the hole. Before a shaft passes through a seal, apply a little high temperature grease on the lips to reduce rubber to metal friction.

(14) Circlip, Retaining Ring

Replace any circlips and retaining rings that were removed with new ones, as removal weakens and deforms them. When installing circlips and retaining rings, take care to compress or expand them only enough to install them and no more.

(15) Cotter Pin

Replace any cotter pins that were removed with new ones, as removal deforms and breaks them.

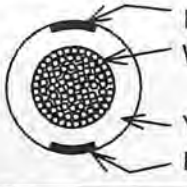
(16) Lubrication

Engine wear is generally at its maximum while the engine is warming up and before all the rubbing surfaces have an adequate lubricative film. During assembly, oil or grease (whichever is more suitable) should be applied to any rubbing surface which has lost its lubricative film. Old grease and dirty oil should be cleaned off. Deteriorated grease has lost its lubricative quality and may contain abrasive foreign particles.

Don't use just any oil or grease. Some oils and greases in particular should be used only in certain applications and may be harmful if used in an application for which they are not intended. This manual makes reference to molybdenum disulfide grease (MoS_2) in the assembly of certain engine and chassis parts. Always check manufacturer recommendations before using such special lubricants.

(17) Electrical Wires

All the electrical wires are either single-color or two-color and, with only a few exceptions, must be connected to wires of the same color. On any of the two-color wires there is a greater amount of one color and a lesser amount of a second color, so a two-color wire is identified by first the primary color and then the secondary color. For example, a yellow wire with thin red stripes is referred to as a "yellow/red" wire; it would be a "red/yellow" wire if the colors were reversed to make red the main color.

Wire (cross-section)	Name of Wire Color
	Yellow/Red

(18) Replacement Parts

When there is a replacement instruction, replace these parts with new ones every time they are removed. These replacement parts will be damaged or lose their original function once removed.

(19) Inspection

When parts have been disassembled, visually inspect these parts for the following conditions or other damage. If there is any doubt as to the condition of them, replace them with new ones.

Abrasion	Crack	Hardening	Warp
Bent	Dent	Scratch	Wear
Color change	Deterioration	Seizure	

(20) Specifications

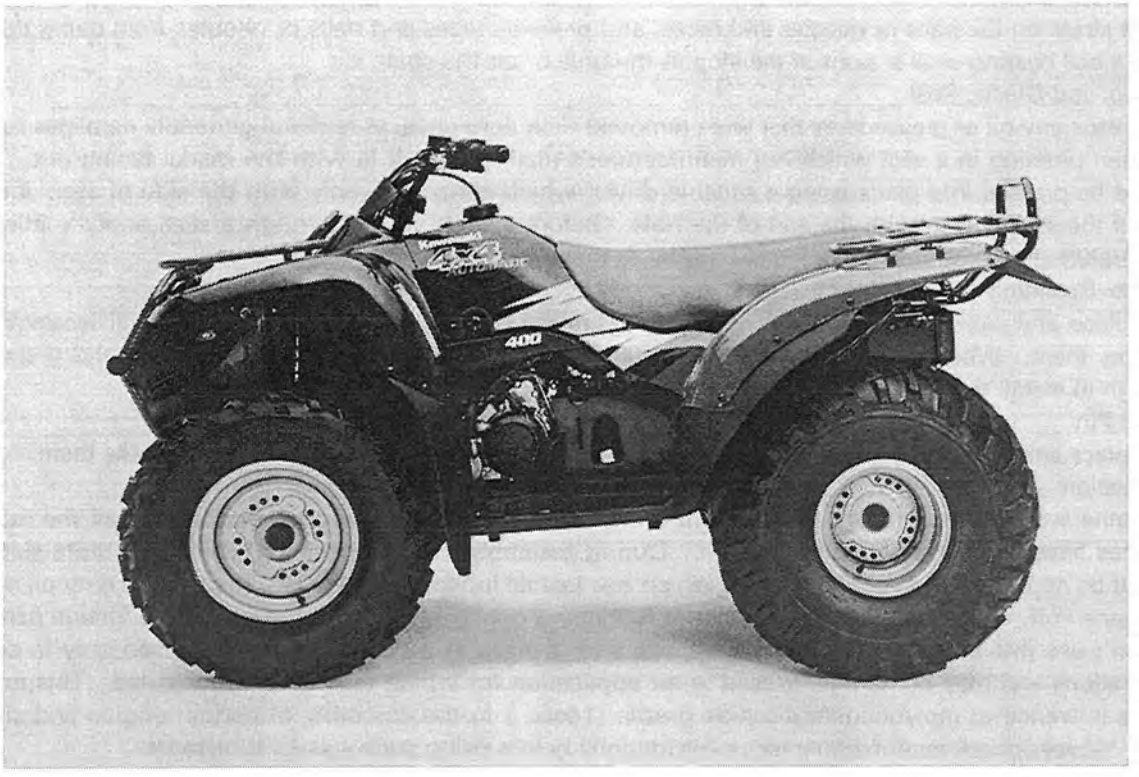
Specification terms are defined as follows.

"Standards" show dimensions or performances which brand-new parts or systems have.

"Service Limits" indicate the usable limits. If the measurement shows excessive wear or deteriorated performance, replace the damaged parts.

Model Identification

KVF400-A1



KVF400-A2

General Specifications

Item			KVF400-A1, A2
Dimensions:			
Overall length			2 065 mm
Overall width			1 190 mm
Overall height			1 145mm
Wheelbase			1 250 mm
Ground clearance			180 mm
Seat height			868 mm
Dry weight			271 kg, *274 kg
Curb weight:	Front		156 kg, *157 kg
	Rear		132 kg, *134 kg
Fuel tank capacity			14.0 L
Performance:			
Minimum turning radius			3.1 m
Engine:			
Type			4-stroke, SOHC, 1-cylinder
Cooling system			Liquid-cooled
Bore and stroke			81.0 x 76.0 mm
Displacement			391 mL
Compression ratio			9.0
Maximum horsepower			19.4 kW (26.5 PS) @6 500 r/min (rpm)
Maximum torque			32.3 N-m (3.3 kg-m, 23.8 ft-lb) @5 500 r/min (rpm), (US) –
Carburetion system			Carburetor, Keihin CVK34
Starting system			Electric starter & recoil starter
Ignition system			DC-CDI
Timing advance			Electronically advanced
Ignition timing			From 10° BTDC @1 300 r/min (rpm) to 30° BTDC @4 300 r/min (rpm)
Spark plug			ND X24EPR-U9, NGK DPR8EA-9 (US) ND X24EP-U9, NGK DP8EA-9
Valve timing:	Inlet	Open	27° BTDC
		Close	65° ABDC
		Duration	272°
	Exhaust	Open	56° BBDC
		Close	26° ATDC
		Duration	262°
Lubrication system			Forced lubrication (wet sump)
Engine oil:	Grade		SE, SF or SG class
	Viscosity		SAE 10W-30, 10W-40, 10W-50, 20W-40, or 20W-50
	Capacity		3.4 L
Drive Train:			
Primary reduction system:			
	Type		Belt converter
	Reduction ratio		4.16 ~ 0.92

Item			KVF400-A1, A2
Transmission:			
Type			2 speed plus reverse
Gear ratio:			
	Forward:	High	2.432 (37/27 × 41/33 × 20/14)
		Low	3.425 (37/27 × 42/24 × 20/14)
	Reverse		3.750 (33/22 × 42/24 × 20/14)
Final drive system:			
	Type		Shaft (four wheel drive)
	Reduction ratio		4.333 (39/9)
Overall drive ratio			
Forward:	High		43.807 ~ 9.688
	Low		61.736 ~ 13.653
Reverse			67.594 ~ 14.948
Front final gear case oil:		Type	API GL-5 Hypoid gear oil for LSD SAE140 or SAE90W-140
		Capacity	0.2 L
Rear final gear case oil:		Type	API GL-5 Hypoid gear oil SAE90 (above 5°C, 41°F) or SAE80 (below 5°C, 41°F)
		Capacity	0.2 L
Frame:			
Type			Double tubular
Caster (rake angle)			2.5°
Camber			0° @1 G
King pin angle			13°
Trail			15 mm
Tread	Front		880 mm
	Rear		890 mm
Front tire:	Type		Tubeless
	Size		AT 25 x 8 – 12
Rear tire:	Type		Tubeless
	Size		AT 25 x 11 – 10
Suspension:	Front	Type	MacPherson strut
		Wheel travel	170 mm
	Rear	Type	Swingarm
		Wheel travel	180 mm
Brake type:	Front		Disc (Hydraulic) x 2
	Rear		Drum (Mechanical, on right side)
Electrical Equipment:			
Battery			12 V 14 Ah, (CN) 12 V 19 Ah
Headlights:	Type		Semi-sealed beam
	Bulb		12 V 25/25 W x2
Taillight			12 V 8 W
Alternator:	Type		Three-phase AC
	Rated output		25 A @6 000 r/min (rpm), 14 V

Specifications are subject to change without notice, and may not apply to every country.
(CN): Canadian Model
(US): U.S. Model
*: KVF400-A2 Model

Periodic Maintenance Chart

The scheduled maintenance must be done in accordance with this chart to keep the vehicle in good running condition. **The first service is vitally important and must not be neglected.**

FREQUENCY / OPERATION	First Service	Regular Service			
	After 10 hrs. of use	Every 10 days of use	Every 30 days of use	Every 90 days of use	Every year of use
ENGINE					
Converter drive belt wear--check*				●	
Converter drive belt deflection--check*				●	
Converter driven pulley shoe--check*				●	
Air cleaner--service*	●	●			
Throttle lever play--check*	●	●			
Valve clearance--check	●			●	
Fuel system cleanliness--check*	●			●	
Engine oil--change*	●			●	
Oil filter--replace*	●			●	
Spark plug--clean and gap	●			●	
Spark arrester--clean					●
Radiator--clean*		●			
Radiator hoses and connections--check*	●			●	
Coolant--change	2 years				
Fuel hose--replace	2 years				
CHASSIS					
Joint boots--check*	●	●			
Rear brake adjustment--check*	●	●			
Rear brake lining wear--check*	●	●			
Cable adjustment*	●	●			
Bolts and nuts--tighten	●	●			
Front brake pad wear--check*	●		●		
Battery--check	●		●		
Steering--check	●			●	
Front and rear final gear case oil--change	●				●
General lubrication*			●		

OPERATION \ FREQUENCY	First Service	Regular Service			
	After 10 hrs. of use	Every 10 days of use	Every 30 days of use	Every 90 days of use	Every year of use
Brake fluid level--check			●		
Brake fluid--change					●
Brake master cylinder piston assembly and dust seal--replace	2 years				
Caliper piston seal and dust seal--replace	2 years				
Brake hose--replace	2 years				

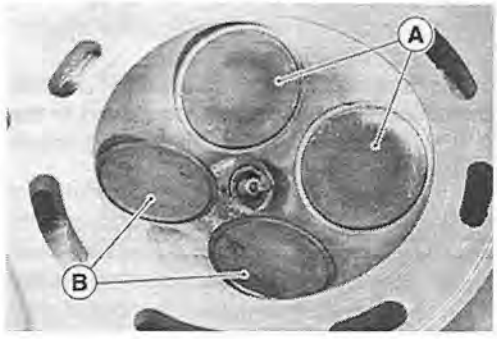
● = Clean, adjust, lubricate, torque, or replace parts as necessary.
* = Service more frequently when operated in mud, dust, or other harsh riding conditions.

Technical Information 1 – 4 Valves

Kawasaki's KVF400 engine is designed to have 4 valves per cylinder for more power at low and mid-range engine speeds, better driveability, and lower fuel consumption.

The 4-valve per cylinder design utilizing a combustion chamber of greater capacity provides greater intake and exhaust port area for increased breathing and combustion efficiency. One intake/exhaust valve per cylinder has a limitation in engine power output.

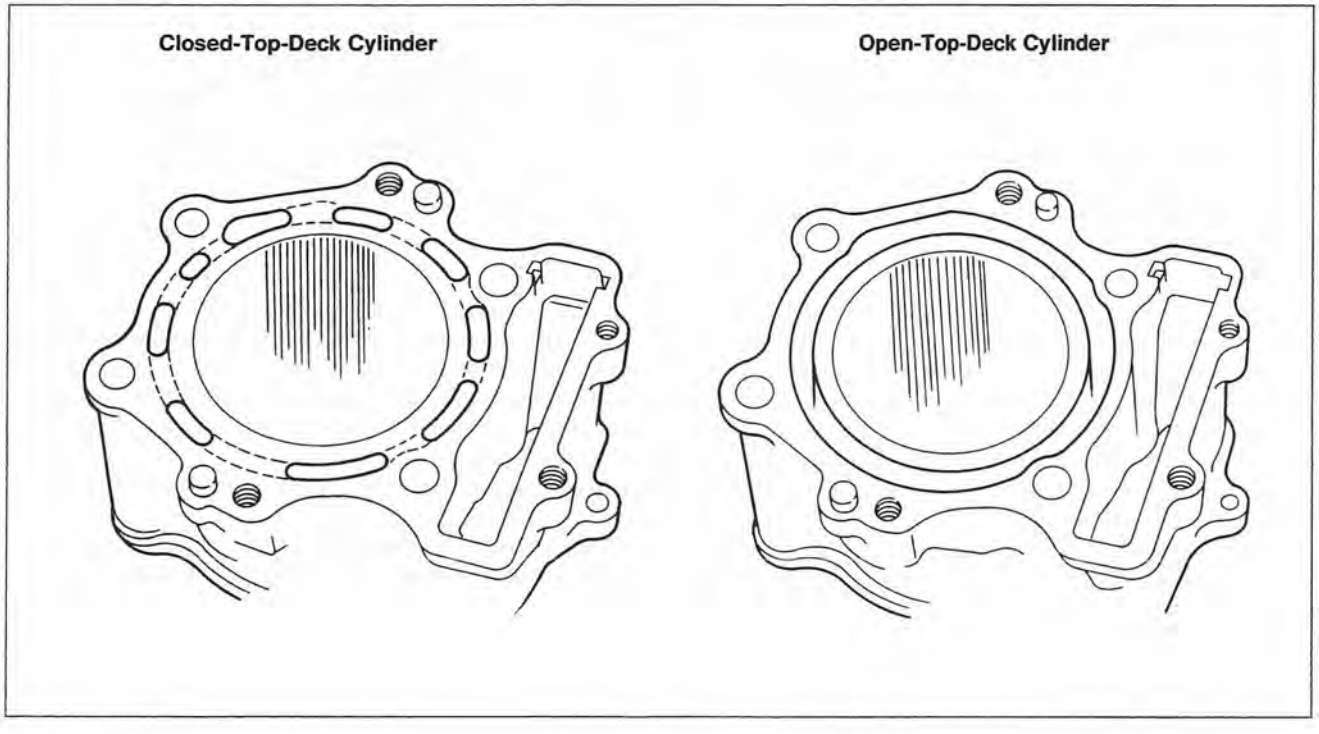
Intake Valves [A] Exhaust Valves [B]



Technical Information 2 – Open-Top-Deck Cylinder

The coolant passages on the cylinder top are fully opened by removing obstacles such as ribs which might hinder coolant flow. This cylinder is called an "open-top-deck cylinder" compared with a "closed-top-deck cylinder."

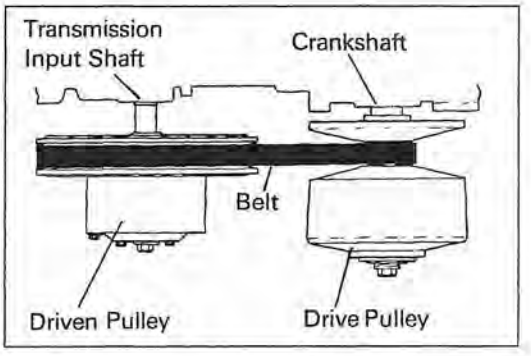
In the "open-top-deck cylinder", the better coolant flow cools even top of the cylinder which otherwise might become very hot.



Technical Information 3 - Torque Converter

A drive pulley and driven pulley constantly compensate for vehicle load and engine speed to provide the proper primary drive reduction ratio required for different conditions.

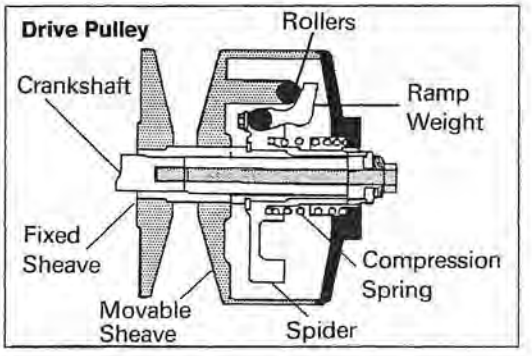
The torque converter consists of a drive pulley mounted to the crankshaft and a driven pulley mounted to the transmission input shaft. A V-belt transmits power from the crankshaft (drive pulley) to the transmission input (driven pulley).



Drive Pulley:

The drive pulley is made of a fixed sheave and a movable sheave. Ramp weights, rollers, and a compression spring control the movable sheave. The ramp weights pivot on the spider pushing against the rollers closing the sheaves. The compression spring opens the sheaves.

A fan on the end of the drive pulley draws air into the torque converter through an air intake pipe located under the front fender. This insures cool, consistent operating temperatures for maximum power and long converter life.

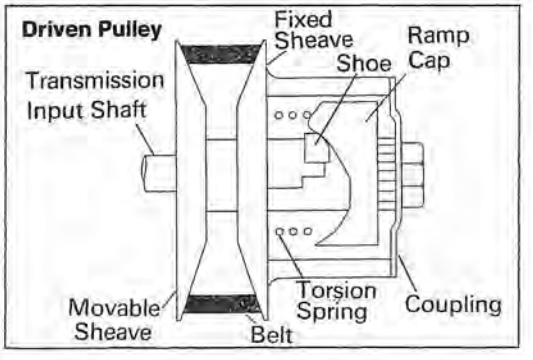


Driven Pulley:

The driven pulley consists of a fixed sheave, a movable sheave, a ramp cap, a torsion spring, and a coupling.

The coupling is bolted to the transmission input shaft and carries the fixed sheave. The movable sheave is installed so it can slide on the boss area of the coupling and on the input shaft.

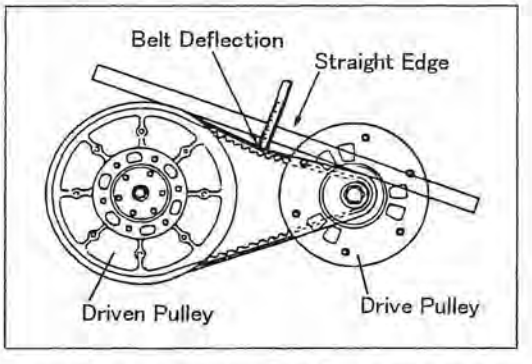
The ramp cap is splined to the end of the movable sheave, and held by a snap ring. Three shoes inside the fixed sheave ride against the ramps of the ramp cap.



Drive Belt Deflection:

Belt deflection refers to how much slack the belt has when the torque converters are in the at-rest (neutral) position. The amount of belt deflection can have a significant effect on the performance characteristics of the vehicle. Simply put, as belt deflection increases (which occurs normally as the belt wears), vehicle performance decreases. If belt deflection becomes excessive, the vehicle will suffer a noticeable loss in acceleration and possibly top speed.

For best performance, we have found that belt deflection on the KVF400 should be 25 ~ 30 mm. Refer to Converter System chapter for measurement of the deflection.



If belt deflection is greater than 30 mm, the vehicle may exhibit some "flat spots" when accelerating from a stop to top speed. The first will occur immediately off idle and may feel like a throttle hesitation or "bog" when in fact the excessive belt deflection is just causing the vehicle to take off at too high a gear ratio. The second flat spot occurs just before the vehicle reaches top speed. In this case, the excessive belt deflection allows the torque converters to upshift fully too quickly (before the vehicle has reached the proper speed). Engine rpm drops momentarily and the rider feels a flat spot in acceleration. This is especially noticeable in high load conditions such as climbing a grade.

Less than 25 mm of belt deflection could result in the vehicle creeping at idle and gears grinding when shifting from neutral into forward or reverse.

Belt deflection will increase during initial break-in of a new belt, so adjustments should always be done with a "worn-in" belt. We strongly suggest you check and adjust belt deflection at the first service interval. Adjustment of belt deflection on the KVF400 is not too tough.

Technical Information 4 - DC-CDI (Direct Current-Capacitor Discharge Ignition System)

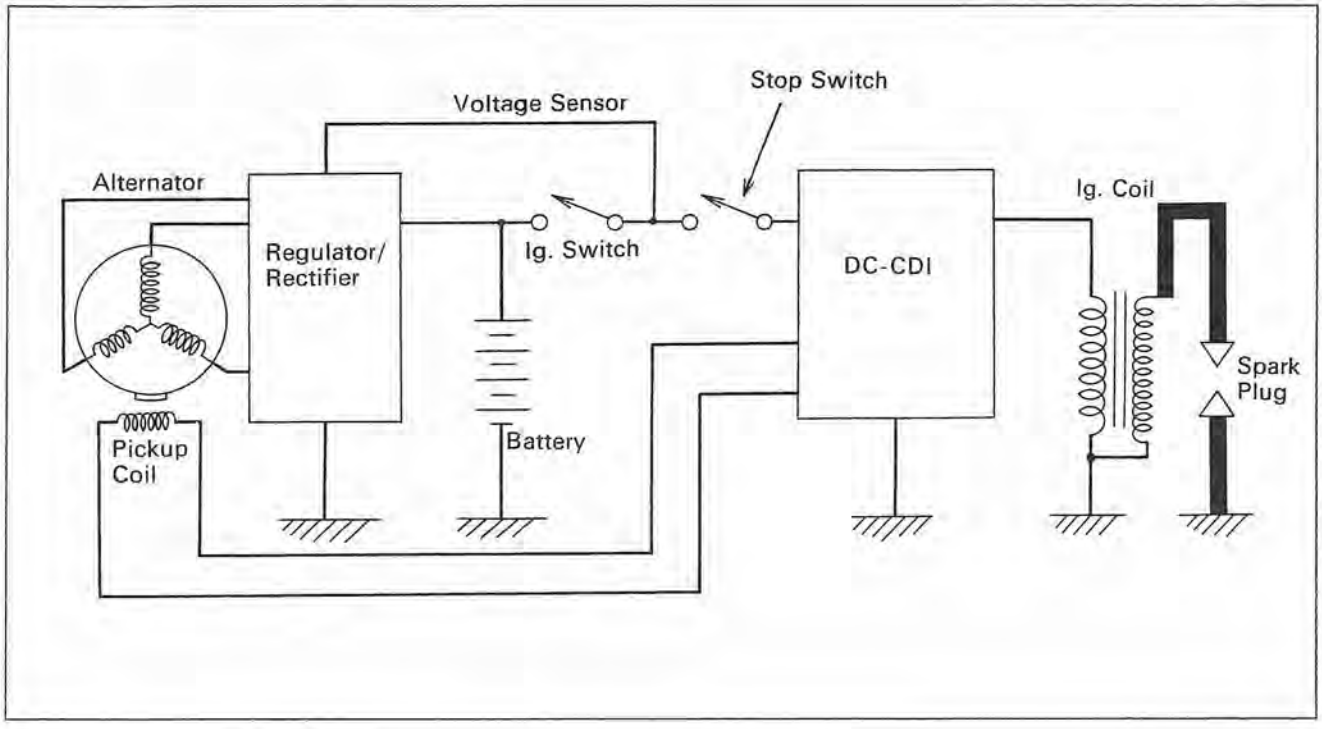
The KVF400 has a DC-CDI system. Unlike the conventional CDI, the DC-CDI uses a battery instead of a magneto as a power source.

Description:

- The DC-CDI powered by a battery generates strong ignition spark even at low engine speeds. The conventional CDI, which uses AC voltage supplied by an exciter coil, generates less ignition spark at low engine speeds.
- The DC-CDI has a built-in DC-DC converter which changes battery voltage or battery-charging voltage into high voltage AC. Even if the battery loses its charge, the DC-CDI can use battery-charging voltage.
- The DC-CDI doesn't have an exciter coil, a power consumer, therefore the battery is charged better.

Ignition System:

The DC-CDI is connected as shown.



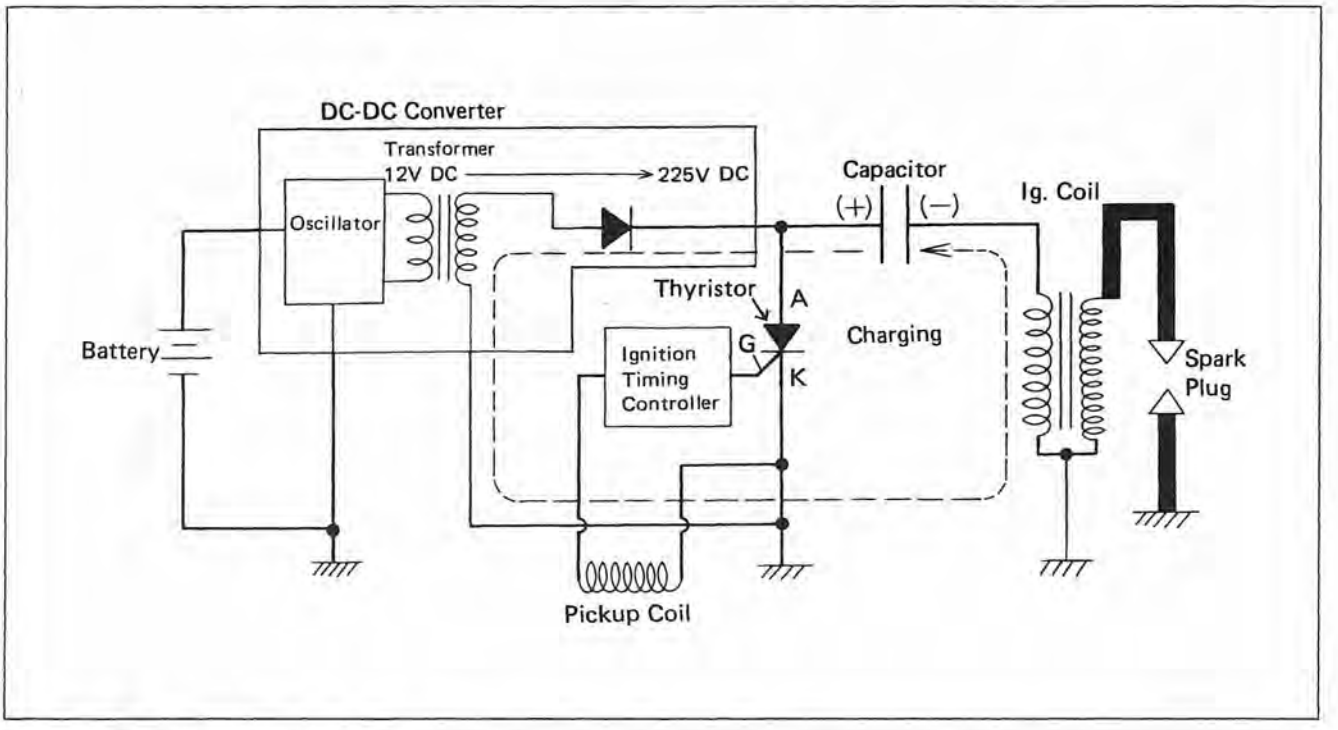
Operation:

The DC-CDI circuit consists of a battery, a DC-DC converter, a diode, a capacitor, an ignition timing controller, a pickup coil, a thyristor, an ignition coil, a spark plug, an ignition switch, and an engine stop switch. If the ignition switch or the engine stop switch is turned to the OFF position, the battery power supply is cut off, and no spark is generated.

The DC-DC converter has a built-in transformer, which changes 12 V battery voltage or battery-charging voltage into AC voltage. The diode converts the AC voltage into about 225 V DC to charge the capacitor.

First step – Charging the Capacitor

The converter generates the current to charge the capacitor through the diode with 225 V DC. During this process, the current changes slowly through the primary coil winding so that the secondary coil winding does not produce enough voltage to fire the spark plug.

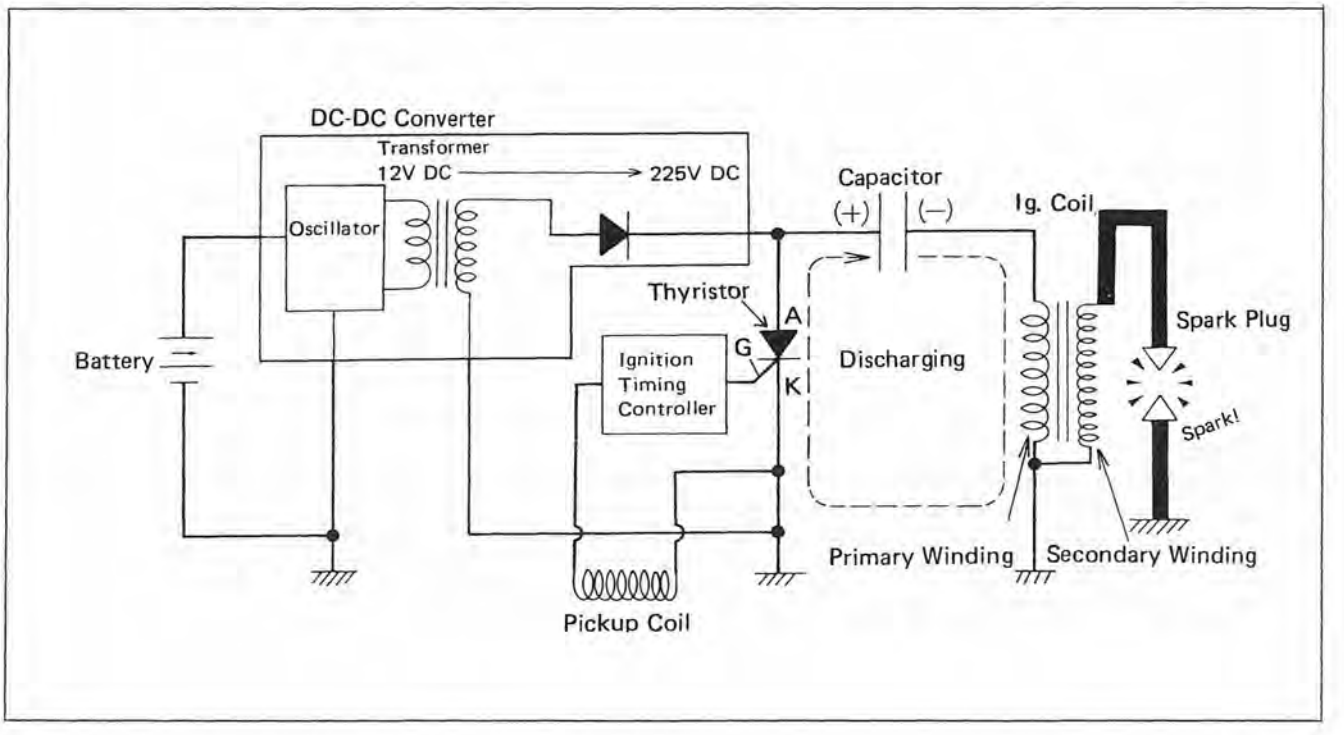


Second step – Thyristor conducts

After charging, the pickup coil and ignition timing controller send a trigger signal to the gate through the cathode (K → G in the figure) in the thyristor. When this happens, the current flows from the cathode to the anode (K → A) in the thyristor.

Third step – Surging current into the Primary Winding

When the thyristor conducts, the charge stored in the capacitor is released suddenly, flowing through the primary winding, back through the thyristor to the capacitor.



This sudden change in the primary current induces a primary voltage (counterelectromotive force) which is equal to the capacitor voltage (about 225 V) but against the discharging current. The primary voltage induces a high secondary voltage in the secondary coil, generating spark in the spark plug gap. The secondary voltage multiplied by winding ratio (about 90 : 1) reaches about 20 000V.

Final step – Thyristor resets

After the charge stored in the capacitor is completely released, the cathode to anode voltage is removed in the thyristor and the thyristor stops conducting and automatically resets. Then, the DC-DC converter charges the capacitor again.

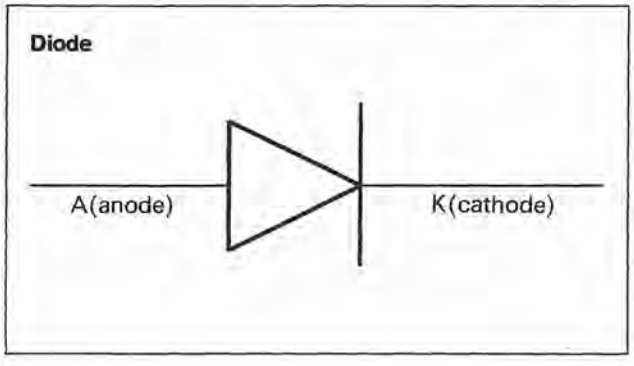
Explanation of Semiconductors

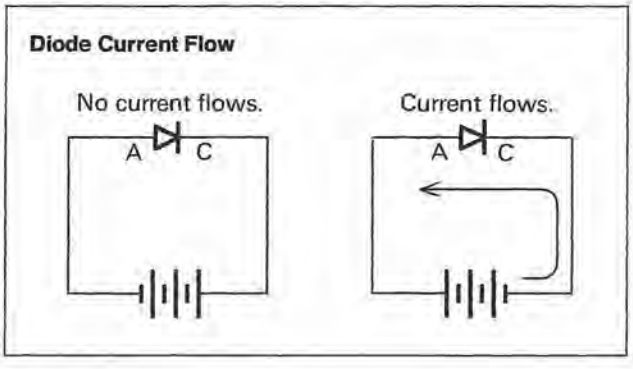
Diode

A diode functions as an electrical check valve. It conducts current easily from its cathode to its anode, but it will not permit current flow in the opposite direction. Since electricity attempts to flow from negative (−) to positive (+), a circuit with a diode will conduct current only when the polarity is correct, i.e., when the negative charge is applied to the diode's cathode.

NOTE

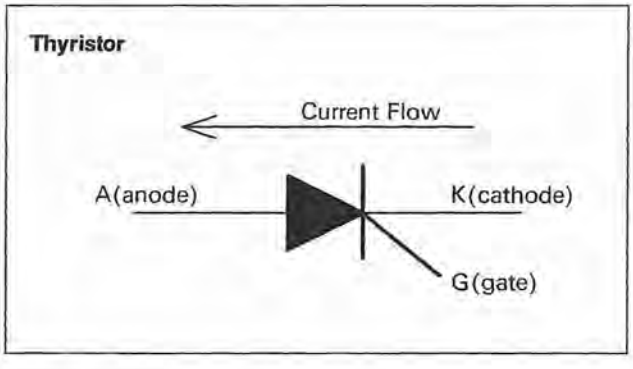
○ *This manual doesn't use the conventional current flow concept, but the electron theory current flow concept; current is supposed to flow minus (−) to plus (+) in this text.*





Thyristor (SCR)

Current will flow from the cathode to anode but will not flow in the reverse direction. The thyristor differs from a diode in two respects: (a) even though a voltage of the correct polarity – negative to cathode – may be applied, the thyristor will not conduct until a signal is applied to the gate input lead; (b) once started, it will not stop conducting (even if the gate lead signal voltage stops) until the cathode to anode voltage is removed or reversed.



The control of Ignition Timing

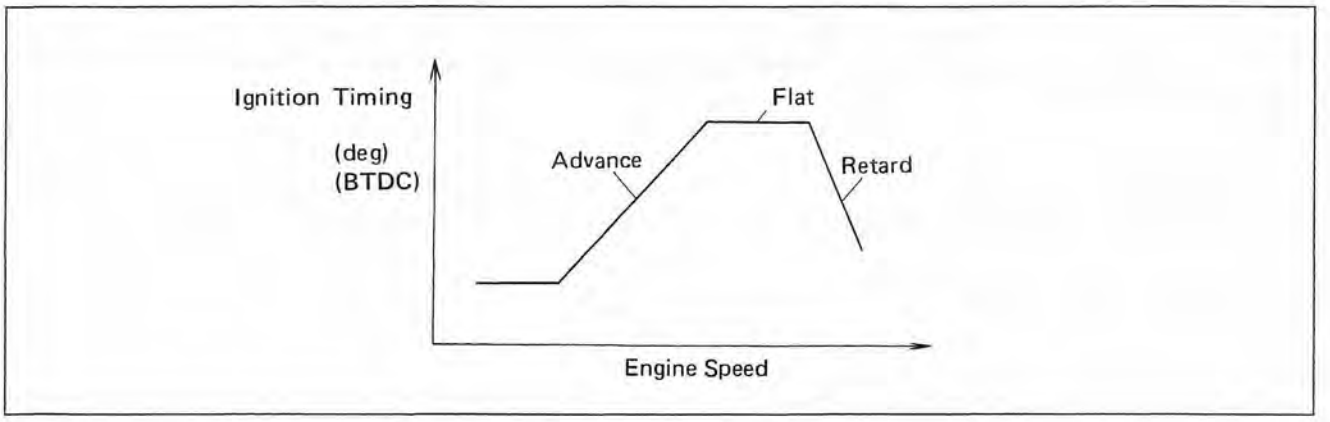
Since the ignition timing is electronically advanced or retarded, this system has no mechanical parts such as a cam or contact breakers and there are no parts to wear out and no periodic maintenance is required. So, there is never any need to adjust the timing once it has been installed correctly.

Generally, the spark plug must be fired at a proper crank angle before top dead center (BTDC).

At low and mid-range engine speeds, the faster the engine runs, the further the ignition timing advances. This prevents knocking and preignition, and provides better engine performance.

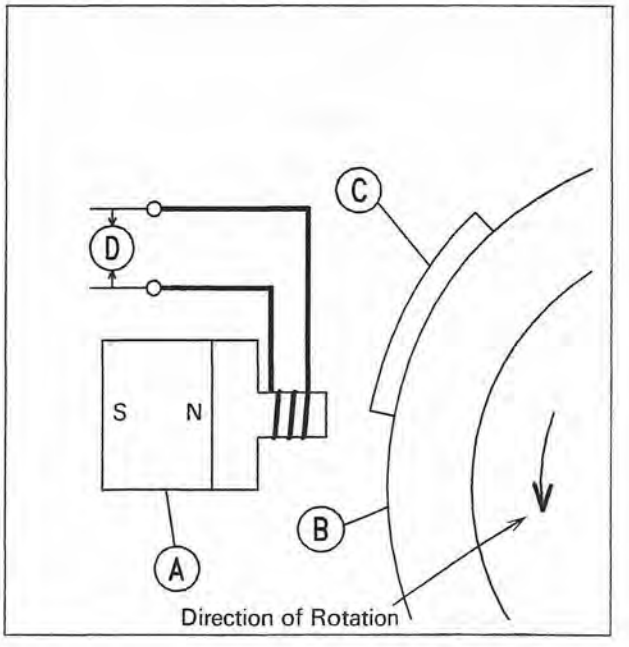
If the engine speed increases further, no timing advance is required because the engine can breathe in and burn the fuel/air mixture in a shorter time. The ignition timing does not increase further and the timing advance stops. This also provides better engine performance.

At high engine speeds, the faster the engine runs, the further the ignition timing retards. This prevents the engine from overrunning and overheating.

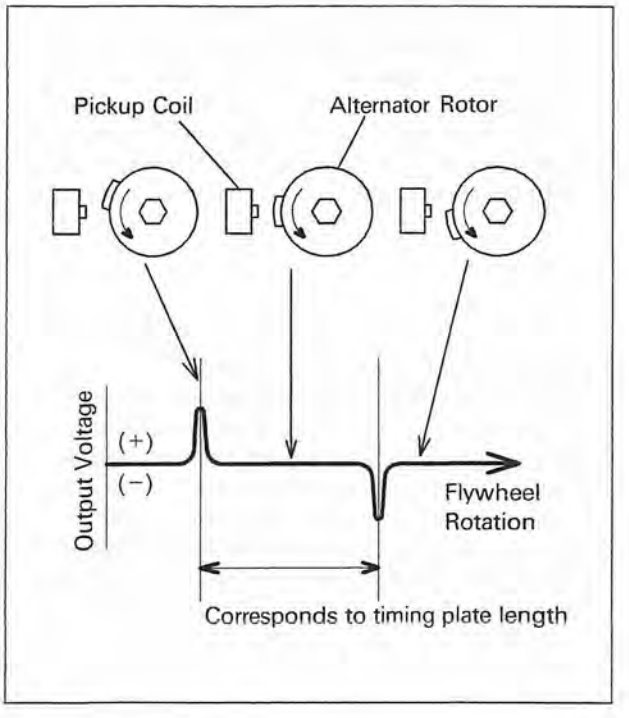


The pickup coil is installed on the alternator cover so that it will be close to the alternator rotor. One side of the pickup coil core has a permanent magnet and the other side has a coil to signal the CDI unit.

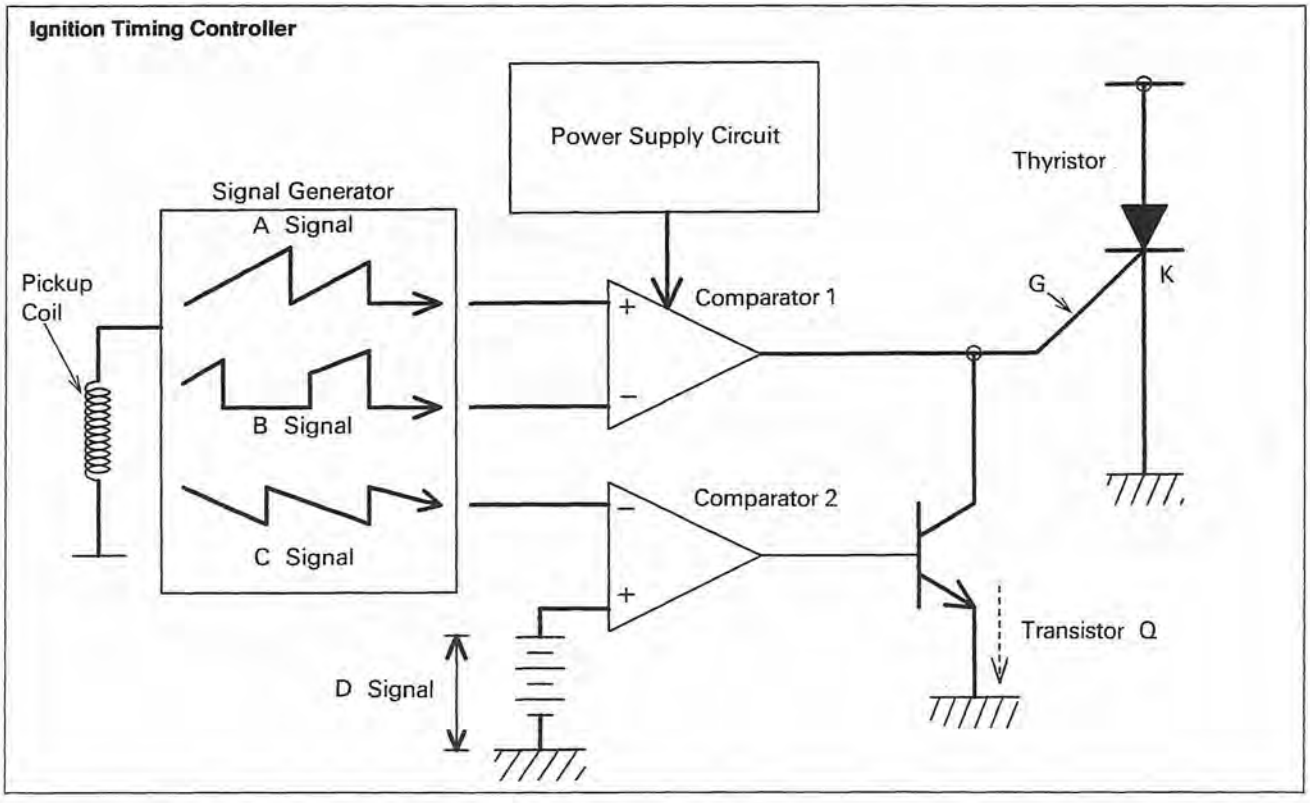
Pickup Coil [A]
Alternator Rotor [B]
Timing Plate [C]
Output Voltage [D]



Every time either end of the timing plate on the rotor passes by the pickup coil, a pulse is generated and sent to the CDI unit, that is, two pulses are generated per one revolution of the rotor. One is a positive pulse [A] and the other is a negative pulse [B].

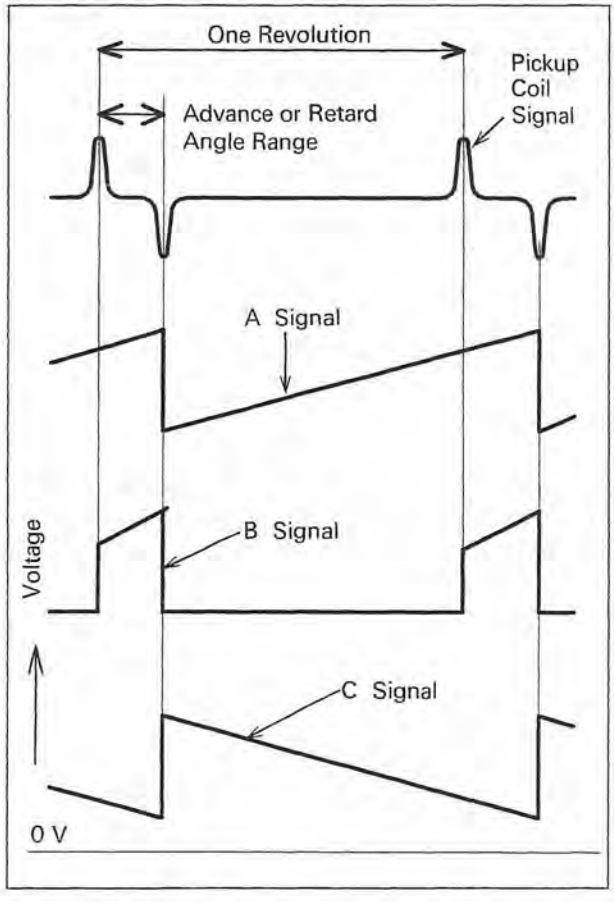


The pickup coil, signal generator, and voltage comparators determine the ignition timing in the ignition timing controller. The power supply circuit is the power source for the signal generator and the voltage comparators.



The pickup coil generates a pickup coil signal and sends it to the signal generator. The signal generator generates A, B, and C signals synchronized with the pickup coil signal. These signals are shown in the figure.

That is to say, the signal generator changes the pickup coil signal into A, B, and C signals.



(Ignition Timing Advancing)

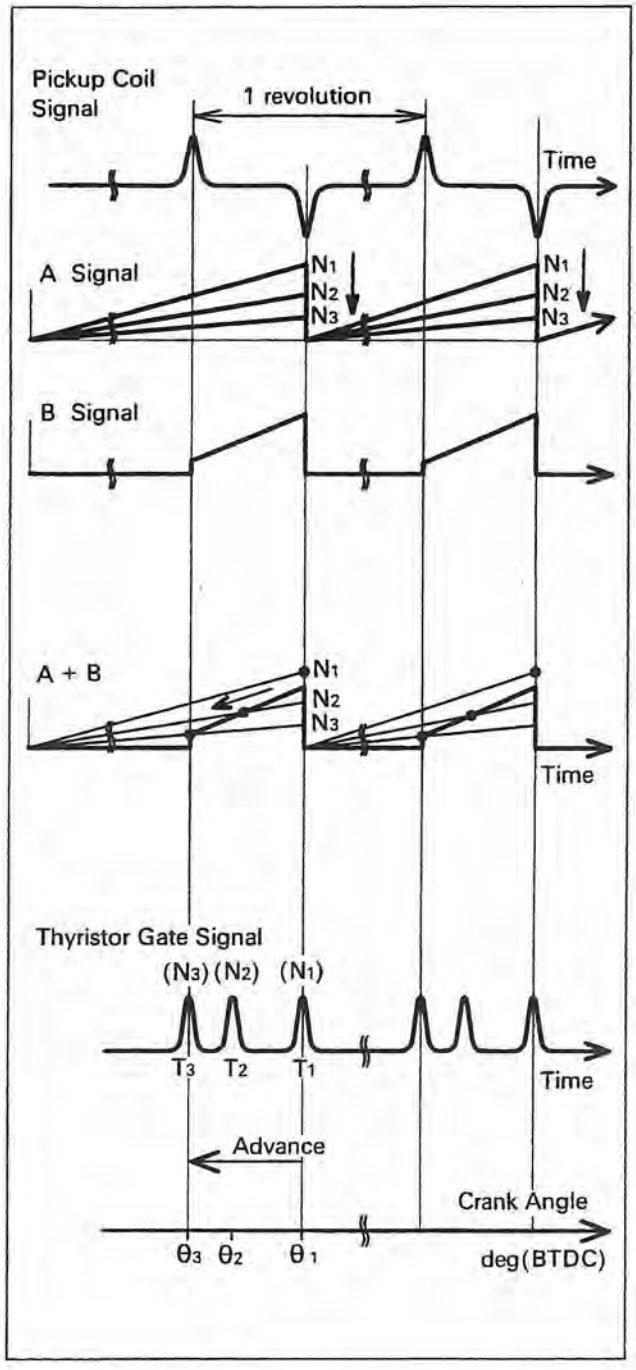
A signal and B signal in comparator 1 advance the ignition timing.

The signal generator decreases A signal as the engine rpm increases from N1, to N3 as shown, but keeps B signal unchanged.

A and B signals are shown with the signals overlapped.

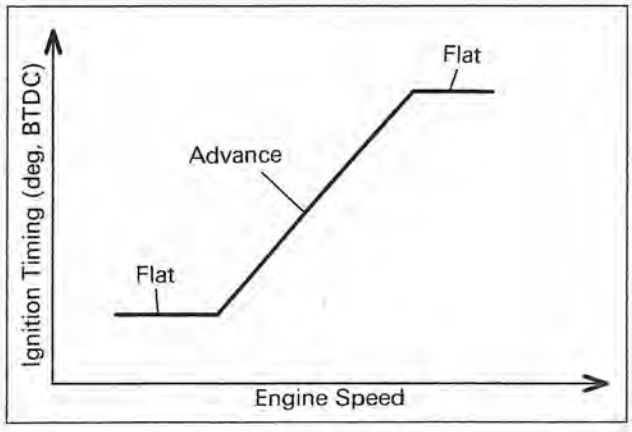
Comparator 1 compares A signal with B signal. When A signal voltage becomes equal to or less than B signal voltage, comparator 1 sends a trigger signal to the gate in the thyristor, firing the spark plug.

The intersection point between A and B signals indicates the timing when the spark plug fires. This point moves left (the timing advances) as the engine rpm increases from N1 to N3 as shown.



Before or after advancing period, the ignition timing is determined by the pickup coil signal and the ignition timing remains constant.

The figure shows the advancing chart.



(Ignition Timing Retarding)

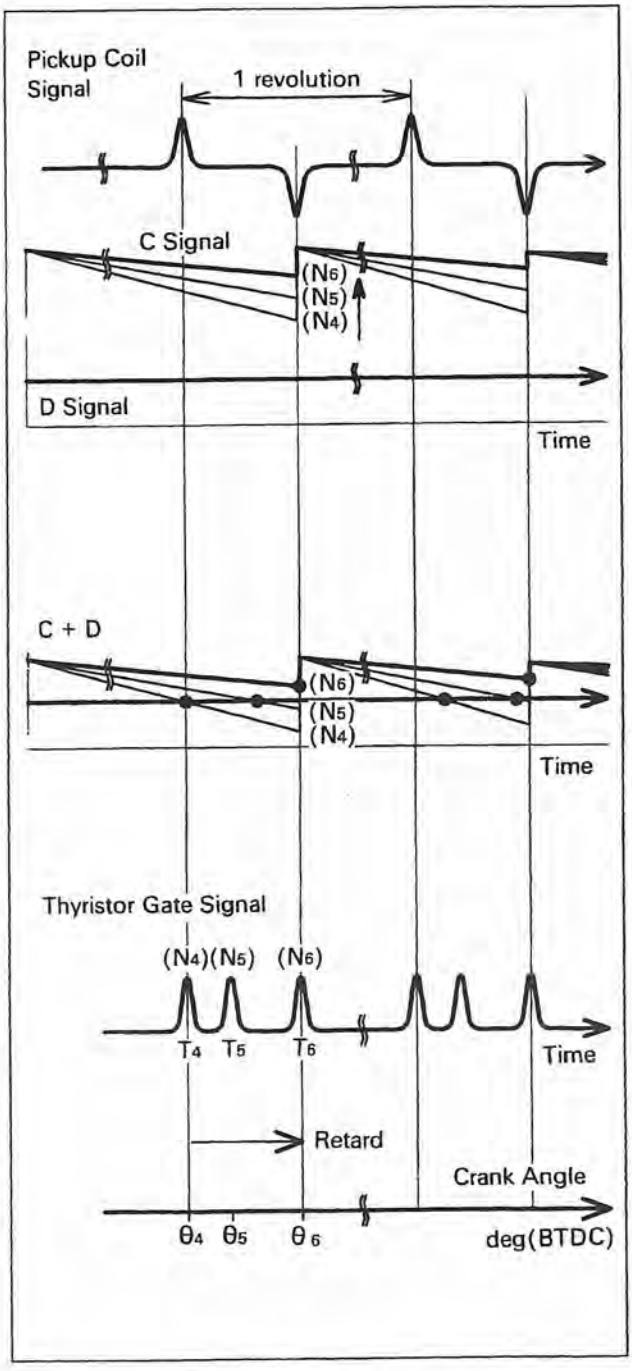
When the engine speed reaches the high-speed range, comparator 2 and transistor Q retard the ignition timing.

The signal generator increases C signal as the engine rpm increases from N4 to N6 as shown. D signal remains unchanged.

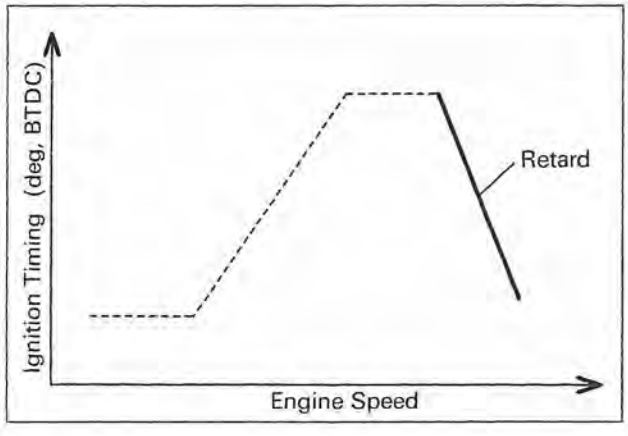
C and D signals are shown with the signals overlapped. Comparator 2 compares C signal with D signal. When C signal voltage is more than D signal voltage, transistor Q is turned ON, a trigger signal escapes from comparator 1 through transistor Q and no spark is generated.

But when C signal voltage is equal to or less than D signal, transistor Q is turned OFF, and comparator 1 sends a trigger signal to the thyristor, firing the spark plug.

The intersection point between C and D signals indicates the timing when the spark plugs fires. This point moves right (the timing retards) as the engine rpm increases from N4 to N6 as shown.



The figure shows the retarding chart.



Technical Information 5 - Reverse Power Control System

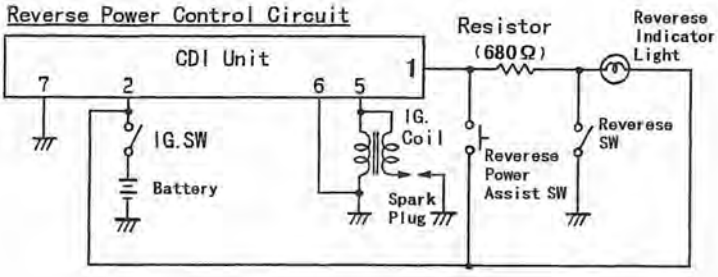
This vehicle has a reverse power control system. The system limits engine speed to 3,600 rpm in reverse, no matter how far the throttle is opened. Holding the Reverse Power Assist Switch IN turns OFF the system, allowing the engine to exceed 3,600 rpm in reverse. When the switch is released, the system turns ON again.

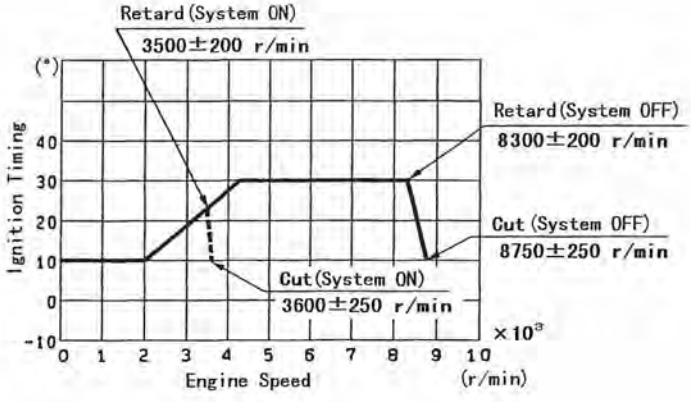
CDI Unit

Input Voltage (Terminal 1)	Control System	Engine Speed (rpm)	Ignition Timing
less than 3 V	ON	3,500 ± 200	retard
		3,600 ± 250	cut
more than 6 V	OFF	8,300 ± 200	retard
		8,750 ± 250	cut

When in reverse, the input voltage at the terminal 1 on the CDI unit is about 1.2 V and the system is on.

While the reverse power assist switch is being held, the input voltage at the same terminal is about 12 V by the current flow from the battery through the 680 Ω resistor and the system is off.





The reverse switch is located at the back of the coolant reserve tank to the left of the engine.

The reverse power assist switch is located on the left hand side of the handlebar.

The resistor (680 Ω) is in the main harness along the left frame under the front fender.

Torque and Locking Agent

The following tables list the tightening torque for the major fasteners requiring use of a non-permanent locking agent or liquid gasket.

Letters used in the "Remarks" column mean:

L : Apply a non-permanent locking agent to the threads.
LG : Apply liquid gasket to the threads.
Lh : Left-hand threads.
M : Apply molybdenum disulfide grease.
O : Apply an oil to the threads and seating surface.
S : Tighten the fasteners following the specified sequence.
SS : Apply silicone sealant.
St : Stake the fasteners to prevent loosening.
R : Replacement parts

The table below, relating tightening torque to thread diameter, lists the basic torque for the bolts and nuts. Use this table for only the bolts and nuts which do not require a specific torque value. All of the values are for use with dry solvent-cleaned threads.

Basic Torque for General Fasteners

Threads dia. (mm)	Torque		
	N-m	kg-m	ft-lb
5	3.4 ~ 4.9	0.35 ~ 0.50	30 ~ 43 in-lb
6	5.9 ~ 7.8	0.60 ~ 0.80	52 ~ 69 in-lb
8	14 ~ 19	1.4 ~ 1.9	10.0 ~ 13.5
10	25 ~ 34	2.6 ~ 3.5	19.0 ~ 25
12	44 ~ 61	4.5 ~ 6.2	33 ~ 45
14	73 ~ 98	7.4 ~ 10.0	54 ~ 72
16	115 ~ 155	11.5 ~ 16.0	83 ~ 115
18	165 ~ 225	17.0 ~ 23.0	125 ~ 165
20	225 ~ 325	23 ~ 33	165 ~ 240

Fastener	Torque			Remarks
	N-m	kg-m	ft-lb	
Fuel System:				
Throttle Lever Bolt	6.9	0.70	61 in-lb	
Carburetor Holder Bolts	15	1.5	11.0	
Fuel Tap Plate Screws	0.8	0.08	7 in-lb	
Cooling System:				
Water Hose Clamp Screws	2.0	0.20	17 in-lb	
Coolant Air Bleeder Bolt	7.8	0.80	69 in-lb	
Coolant Drain Plug (Water Pump)	8.8	0.90	78 in-lb	
Thermostat Housing Bolts	9.8	1.0	87 in-lb	
Radiator Fan Switch	18	1.8	13.0	
Coolant Temperature Warning Light Switch	7.8	0.80	69 in-lb	SS
Water Pump Impeller Bolt	7.8	0.80	69 in-lb	L
Water Pump Cover Bolts	8.8	0.90	78 in-lb	L
Engine Top End:				
Spark Plug	14	1.4	10.0	
Rocker Case Bolts	9.8	1.0	87 in-lb	S
Bracket Bolt and Nut	42	4.3	31	
Damper Bolt and Nut	42	4.3	31	
Chain Tensioner Mounting Bolts	8.8	0.90	78 in-lb	
Chain Tensioner Cap	22	2.2	16.0	
Valve Adjusting Screw Locknuts	12	1.2	104 in-lb	
Camshaft Sprocket Bolts	12	1.2	104 in-lb	L
Valve Adjusting Cap Bolts	8.8	0.90	78 in-lb	
Water Hose Fitting Bolts (Cylinder)	9.8	1.0	87 in-lb	
Water Hose Clamp Screws	2.0	0.20	17 in-lb	
Coolant Temperature Warning Light Switch	7.8	0.80	69 in-lb	SS
Rocker Case Oil Pipe Banjo Bolt	15	1.5	11.0	
Oil Pipe Banjo Bolts	20	2.0	14.5	
Cylinder Head Bolts: 10 mm	39	4.0	29	S, M
8 mm	25	2.5	18.0	S, M
Rocker Shafts	25	2.5	18.0	
Cylinder Head Jacket Plug	20	2.0	14.5	L
Camshaft Chain Guide Pivot Bolts	9.8	1.0	87 in-lb	
Camshaft Chain Guide Plate Screws	4.4	0.45	39 in-lb	

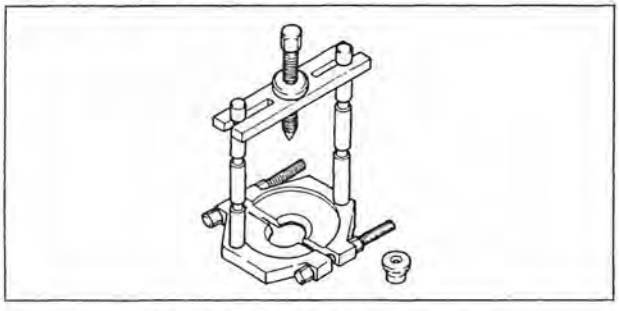
Fastener	Torque			Remarks
	N-m	kg-m	ft-lb	
Cylinder Base Bolts	12	1.2	104 in-lb	
Thermostat Housing Bolts	9.8	1.0	87 in-lb	
Carburetor Holder Bolts	15	1.5	11.0	
Fitting Bolt ('98 Model~)	20	2.0	14.5	L
Converter System:				
Converter Cover Bolts	1.5	0.15	13 in-lb	
Drive Pulley Cover Bolts	13	1.3	113 in-lb	
Drive Pulley Bolt	93	9.5	69	R
Ramp Weight Mounting Bolts	13	1.3	113	
Weight Nut	6.9	0.70	61	
Driven Pulley Bolt	93	9.5	69	L
Driven Pulley Coupling Bolts	13	1.3	113 in-lb	
Engine Left Side:				
Recoil Starter Mounting Bolts	12	1.2	104 in-lb	
Recoil Starter Flange Nut	8.3	0.85	74 in-lb	
Starter Clutch Allen Bolts	34	3.5	25	L
Alternator Rotor Bolt	125	13.0	94	
Engine Lubrication System:				
Engine Drain Plug	20	2.0	14.5	
Oil Filter	Hand-Tight	←	←	R
	or 9.8	1.0	87 in-lb	
Oil Filter Mounting Bolt	9.8	1.0	87 in-lb	
Oil Pressure Relief Valve	20	2.0	14.5	L
Oil Pump Cover Screws	4.4	0.45	39 in-lb	
Rocker Case Oil Pipe Banjo Bolt	15	1.5	11.0	
Oil Pipe Banjo Bolts	20	2.0	14.5	
Oil Pipe Holder Bolts	8.8	0.90	78 in-lb	
Engine Removal/Installation:				
Engine Mounting Bolts and Nuts (8 mm)	25	2.5	18.0	
Engine Mounting Nuts (10 mm)	42	4.3	31	
Engine Mounting Bracket Bolts and Nuts (10 mm)	42	4.3	31	
Engine Mounting Bracket Bolts and Nuts (8 mm)	25	2.5	18.0	
Front Final Gear Case Bracket Bolts	29	3.0	22	
Crankshaft/Transmission:				
Engine Drain Plug	20	2.0	14.5	
Rocker Case Oil Pipe Banjo Bolt	15	1.5	11.0	
Oil Pipe Holder Bolts	8.8	0.90	78 in-lb	
Oil Pipe Banjo Bolt	20	2.0	14.5	
Crankcase Bolts	8.8	0.90	78 in-lb	
Transmission Cover Bolts (8 mm)	20	2.0	14.5	
Transmission Cover Bolts (6 mm)	8.8	0.90	78 in-lb	
Oil Pump Drive Gear Nut	20	2.0	14.5	
Shift Arm Positioning Bolts	32	3.3	24	
Shift Lever Bracket Mounting Bolts	20	2.0	14.5	
Shift Lever Nut	30	3.1	22	
Shift Lever Bracket Shaft Nut	20	2.0	14.5	
Bearing Holder Bolts	12	1.2	104 in-lb	
Tie-Rod End Lever Bolts	14	1.4	10	

Fastener		Torque			Remarks
		N-m	kg-m	ft-lb	
Wheels/Tires:					
Wheel Nuts		52	5.3	38	
Front Axle Nuts		145	15.0	110	L
Rear Axle Nuts		145	15.0	110	L
Tie-Rod Adjusting Sleeve Locknuts		27	2.8	20	
Tie-Rod End Nuts		47	4.8	35	
Final Drive:					
(Output Bevel Gear Case)					
Output Bevel Gear Case Bolts		26	2.7	19.5	
Bearing Holder		135	14.0	100	L
Front Nut		135	14.0	100	EO
Slotted Nut		155	16.0	115	L
Engine Output Shaft Nut		135	14.0	100	EO
Oil Seal Holder Nuts		25	2.5	18.0	
(Front Final Drive)					
Oil Filler Cap		29	3.0	22	
Oil Drain Plug		20	2.0	14.5	
Front Final Gear Case Nuts		42	4.3	31	
Ring Gear Cover Bolts:	10 mm	47	4.8	35	S
	8 mm	25	2.6	19.0	S
Pinion Gear Bearing Holder		98	10.0	72	ST
Differential Case Torx Bolts		32	3.3	24	L
Ring Gear Bolts		49	5.0	36	
Pinion Gear Nut		110	11.0	80	L
(Rear Final Drive)					
Rear Final Gear Case Mounting Nuts		44	4.5	33	
Rear Axle Pipe Nuts		44	4.5	33	
Rear Axle Bracket Bolts		52	5.3	38	L
Oil Filler Cap		29	3.0	22	
Oil Drain Plug		20	2.0	14.5	
Pinion Gear Bearing Holder		120	12.0	87	O
Pinion Gear Bearing Holder Set Plug		7.8	0.80	69 in-lb	
Ring Gear Cover Bolts:		25	2.5	18.0	
Pinion Gear Nut		69	7.0	51	O, St, R
Speedometer Gear Holder Screw		7.8	0.80	69 in-lb	(CN)
Brakes:					
Bleed Valves		5.4	0.55	48 in-lb	
Brake Hose Banjo Bolts		25	2.5	18.0	
Brake Lever Pivot Bolt		5.9	0.60	52 in-lb	
Brake Lever Pivot Bolt Locknut		5.9	0.60	52 in-lb	
Parking Lever Lock Mounting Screw		–	–	–	L
Master Cylinder Clamp Bolts		8.8	0.90	78 in-lb	S
Reservoir Cap Screws		1.5	0.15	13 in-lb	
Caliper Mounting Bolts		25	2.5	18.0	
Pad Mounting Bolts		18	1.8	13.0	
Disc Mounting Bolts		37	3.8	27	L
Rear Brake Drum Drain Bolt		29	3.0	22	
Brake Panel Bolts		30	3.1	22	L
Rear Axle Nuts		145	15.0	110	L
Caliper Holder Shaft		18	1.8	13.0	
Caliper Holder Shaft (Allen Bolt)		23	2.3	16.5	
Brake Drum Nuts		145	15.0	110	L (out side)

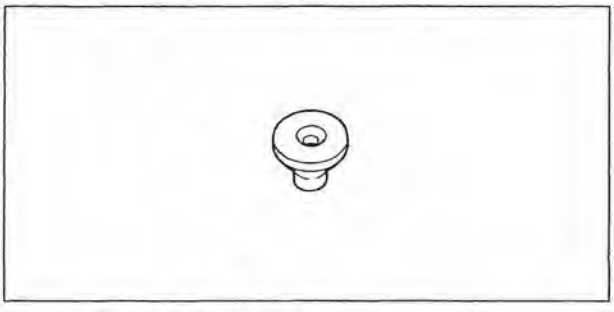
Fastener	Torque			Remarks
	N-m	kg-m	ft-lb	
Suspension:				
Suspension Arm Pivot Bolts	88	9.0	65	
Front Shock Absorber Clamp Bolts and Nuts	52	5.3	38	
Front Shock Absorber Mounting Nut	74	7.5	54	
Rear Shock Absorber Mounting Nut	62	6.3	46	
Suspension Arm Pivot Bolts	88	9.0	65	
Steering Knuckle Joint Nut	42	4.3	31	
Swingarm Shafts	4.9	0.50	43 in-lb	
Swingarm Shaft Nuts	110	11.0	80	
Steering:				
Front Shock Absorber Clamp Nut	52	5.3	38	
Suspension Arm Pivot Bolts	88	9.0	65	
Steering Stem Clamp Allen Bolts	25	2.5	18.0	
Steering Stem Bottom End Nut	29	3.0	22	
Steering Stem Bearing Housing Bolts	20	2.0	14.5	
Tie-Rod End Nuts	47	4.8	35	
Tie-Rod Adjusting Sleeve Locknuts	27	2.8	20	
Steering Knuckle Joint Nuts	42	4.3	31	
Handle Holder Bolts	27	2.8	20	
Frame:				
Guard Mounting Bolts	20	2.0	14.5	
Lower Guard Mounting Bolts (Upper)	6.9	0.70	61 in-lb	
Lower Guard Mounting Bolts (Lower)	20	2.0	14.5	
Carrier Mounting Bolts	20	2.0	14.5	
Electrical System:				
Spark Plug	14	1.4	10.0	
Alternator Rotor Bolt	125	13.0	94	
Alternator Stator Bolts	13	1.3	113 in-lb	
Alternator Stator Lead Clamp Screws	4.4	0.45	39 in-lb	
Starter Motor Terminal Nut	4.9	0.50	43 in-lb	
Starter Motor Terminal Locknut	6.9	0.70	61 in-lb	
Starter Relay Terminal Nut	4.9	0.50	43 in-lb	
Starter Motor Through Bolts	4.9	0.50	43 in-lb	
Radiator Fan Switch	18	1.8	13.0	
Coolant Temperature Warning Light Switch	7.8	0.80	69 in-lb	SS
Neutral Switch	15	1.5	11.0	
Reverse Switch	15	1.5	11.0	

Special Tools, Sealant

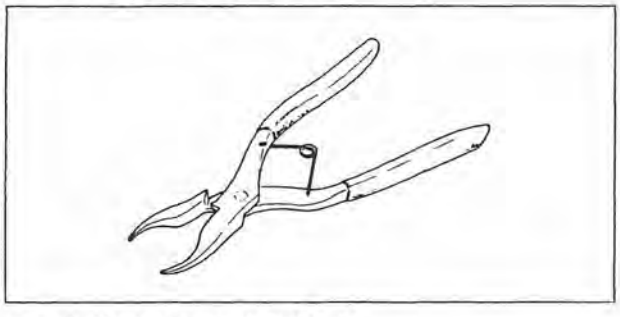
Bearing Puller: 57001-135



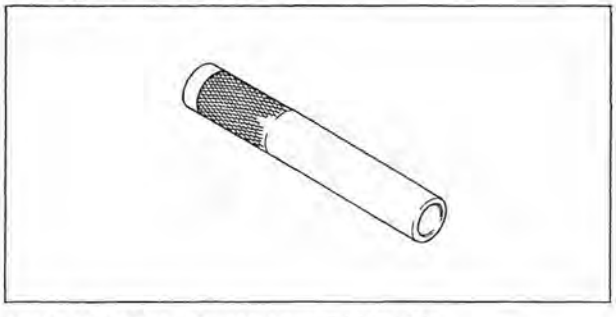
Bearing Puller Adapter: 57001-317



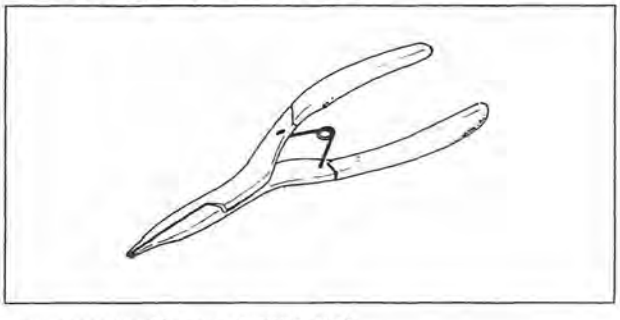
Inside Circlip Pliers: 57001-143



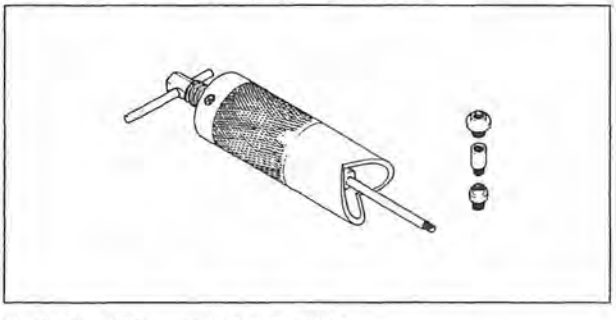
Bearing Driver: 57001-382



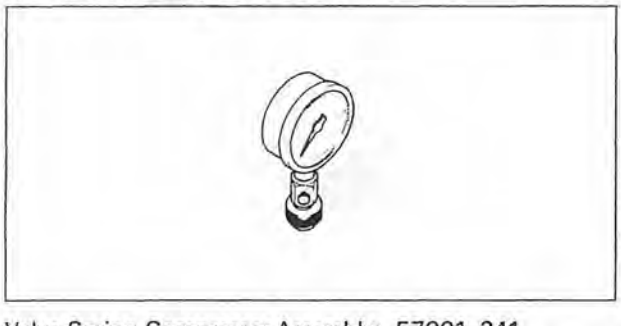
Outside Circlip Pliers: 57001-144



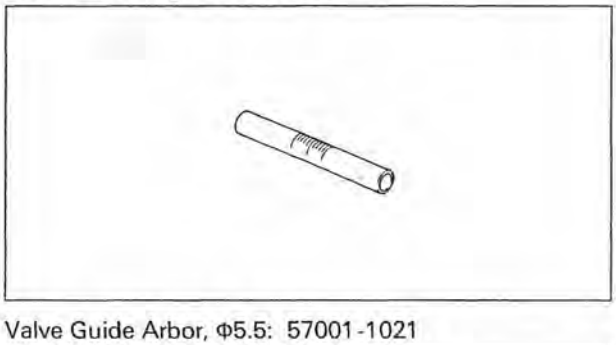
Piston Pin Puller Assembly: 57001-910



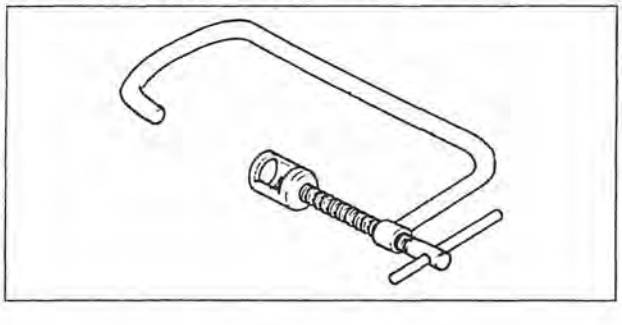
Compression Gauge: 57001-221



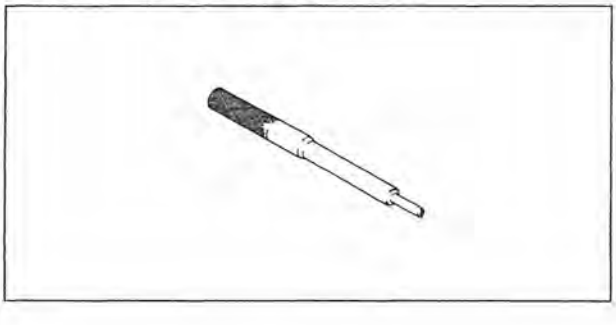
Fuel Level Gauge: 57001-1017



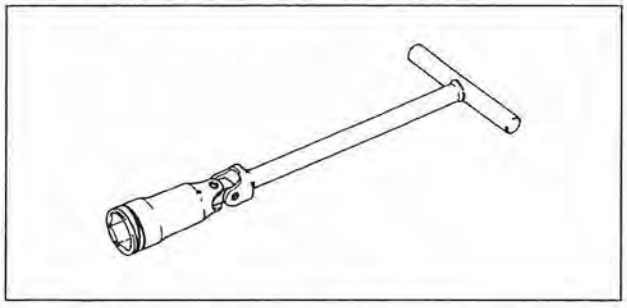
Valve Spring Compressor Assembly: 57001-241



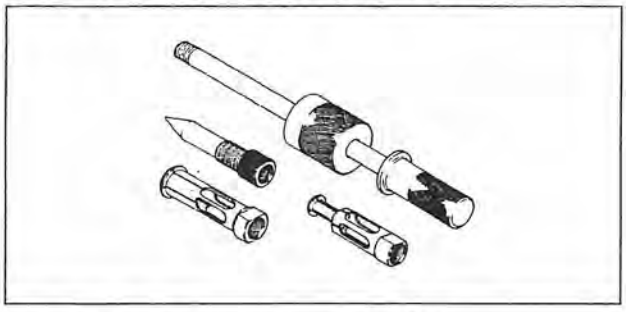
Valve Guide Arbor, Φ5.5: 57001-1021



Spark Plug Wrench, Hex 18: 57001-1024

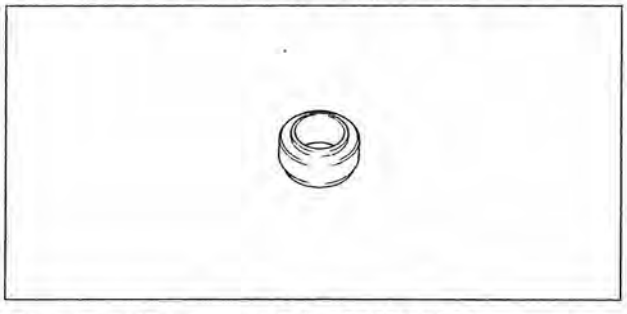


Oil Seal & Bearing Remover: 57001-1058

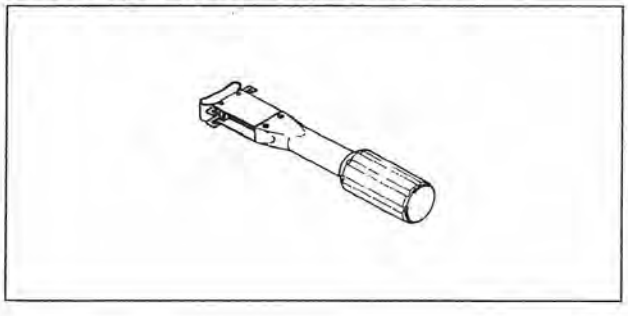


Valve Guide Reamer, Φ5.5: 57001-1079

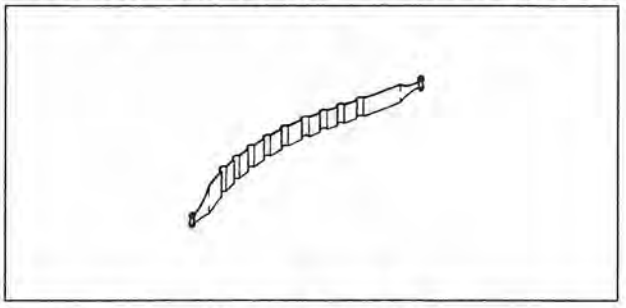
Steering Stem Bearing Driver Adapter: 57001-1092



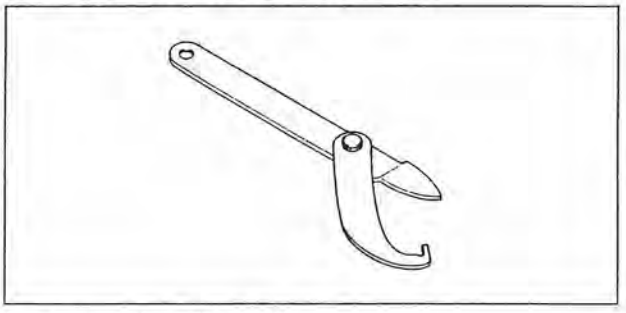
Piston Ring Compressor Grip: 57001-1095



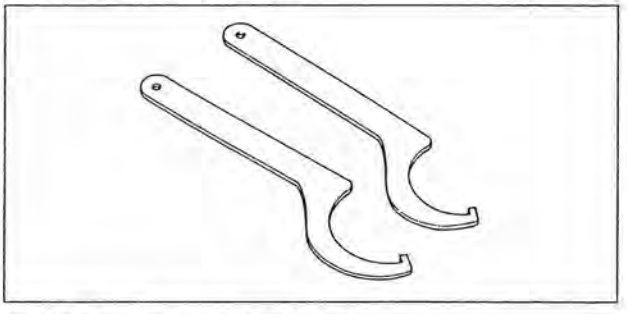
Piston Ring Compressor Belt, Φ67 ~ Φ79: 57001-1097



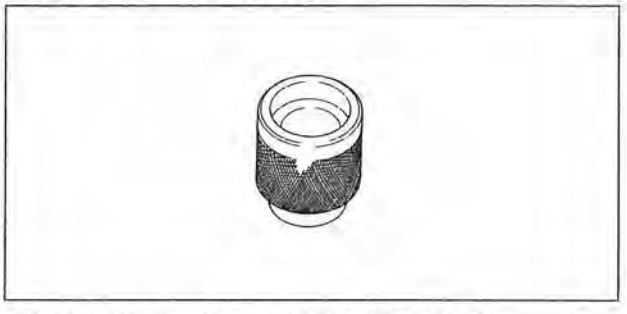
Steering Stem Nut Wrench: 57001-1100



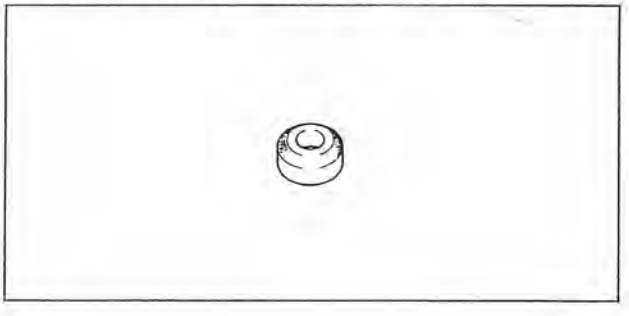
Hook Wrench: 57001-1101



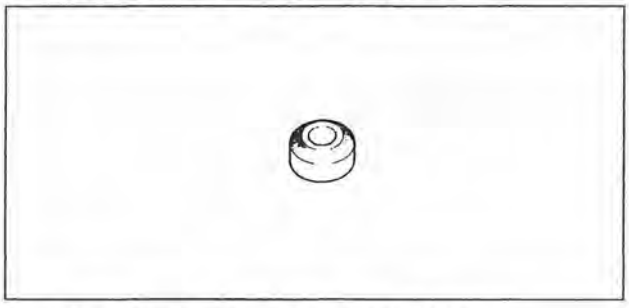
Fork Oil Seal Driver: 57001-1104



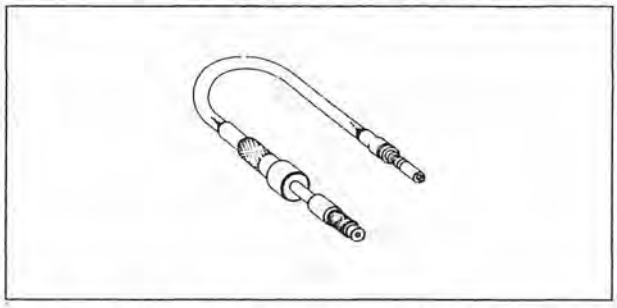
Valve Seat Cutter, 45° – Φ27.5: 57001-1114



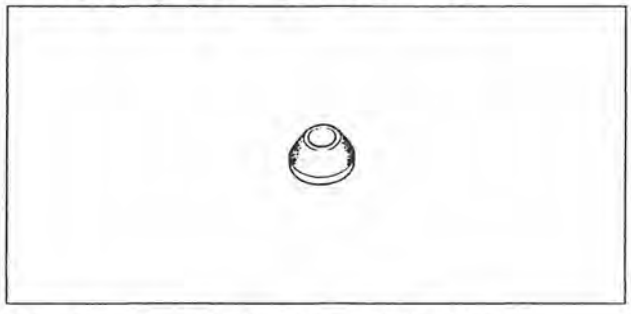
Valve Seat Cutter, 32° – Φ28: 57001-1119



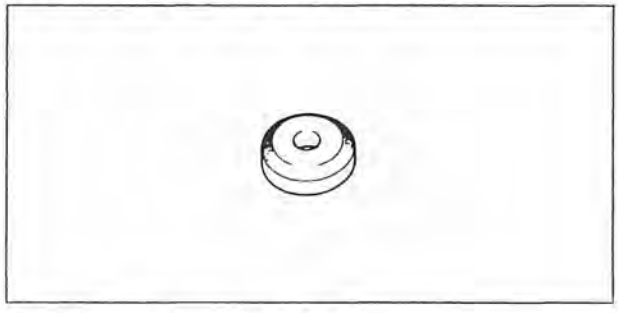
Compression Gauge Adapter, M12 x 1.25: 57001-1183



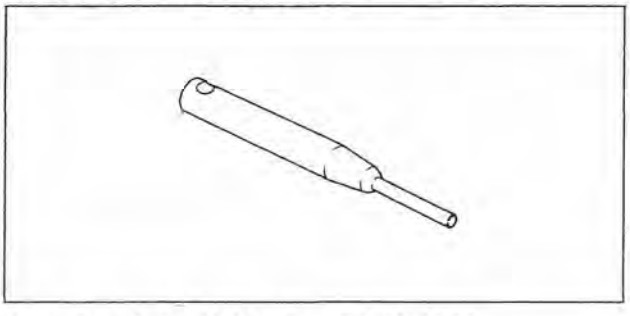
Valve Seat Cutter, 60° – Φ30: 57001-1123



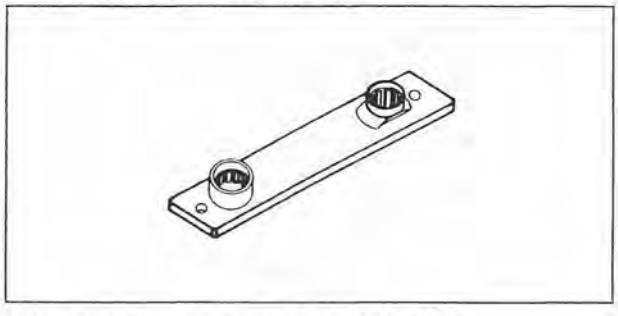
Valve Seat Cutter, 45° – Φ30: 57001-1187



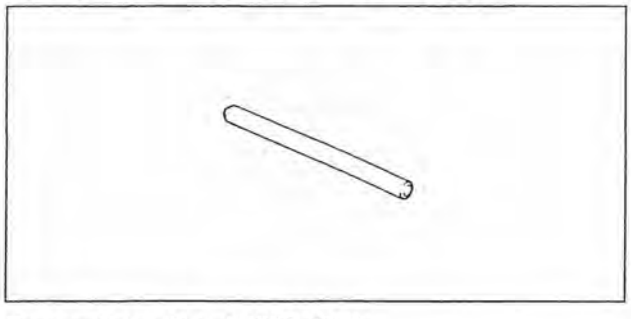
Valve Seat Cutter Holder, Φ5.5: 57001-1125



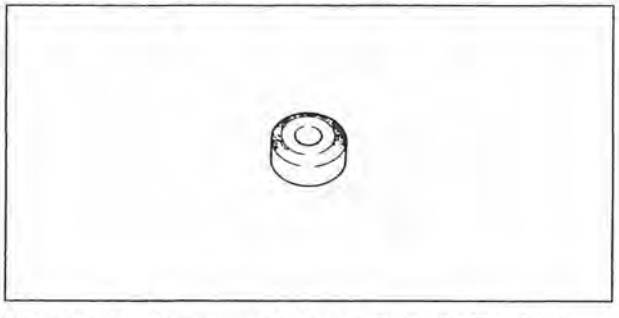
Bevel Gear Holder: 57001-1193



Valve Seat Cutter Holder Bar: 57001-1128

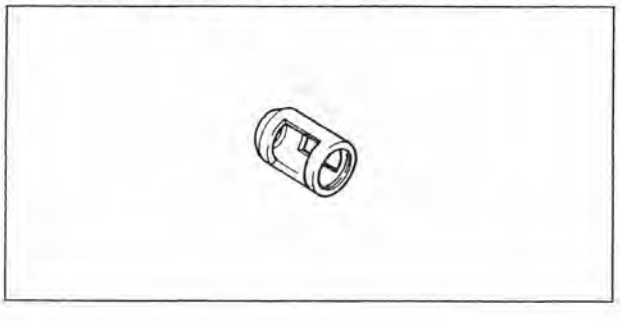


Valve Seat Cutter, 32° – Φ33: 57001-1199

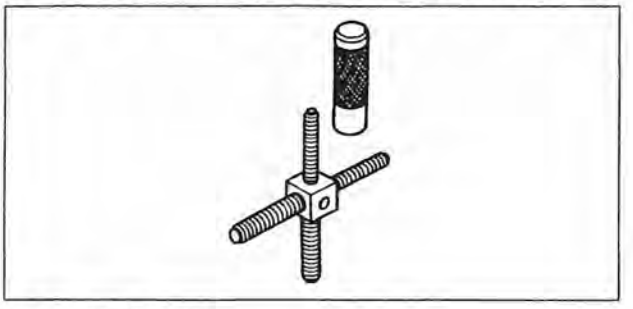


Bearing Driver Set: 57001-1129

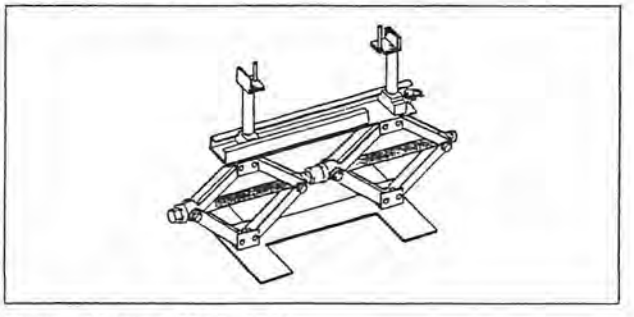
Valve Spring Compressor Adapter, Φ22: 57001-1202



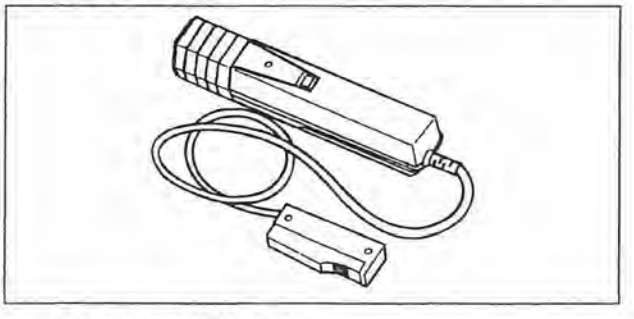
Rotor Puller, M16/M18/M20/M22 x 1.5: 57001-1216



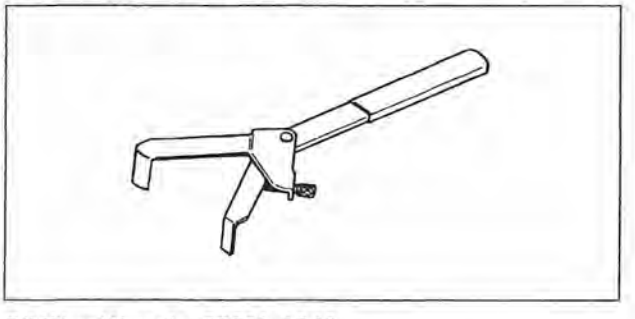
Jack: 57001-1238



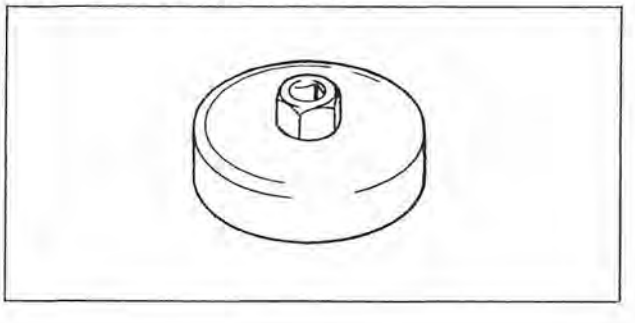
Timing Light: 57001-1241



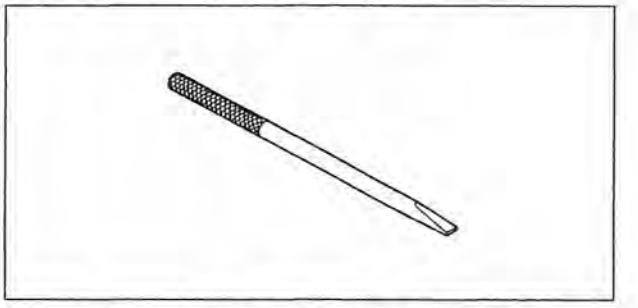
Clutch Holder: 57001-1243



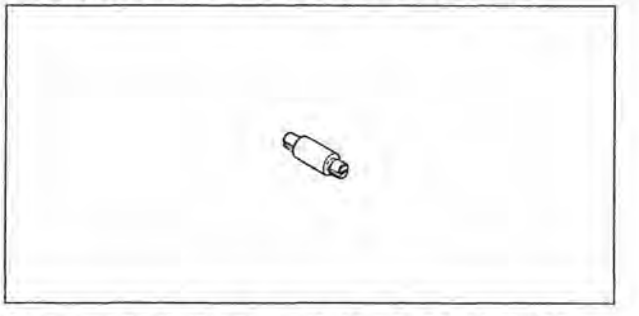
Oil Filter Wrench: 57001-1249



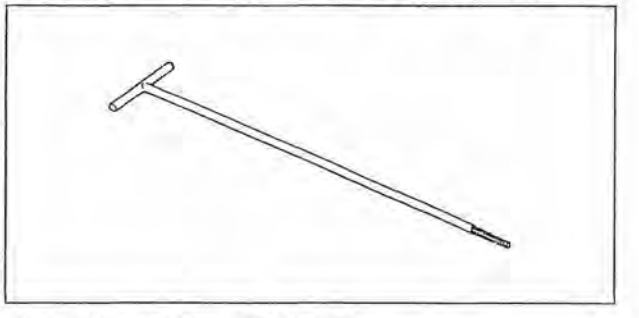
Bearing Remover Shaft, Φ9: 57001-1265



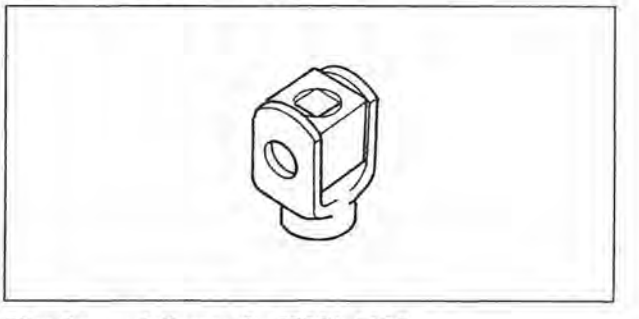
Bearing Remover Head, Φ10 x Φ12: 57001-1266



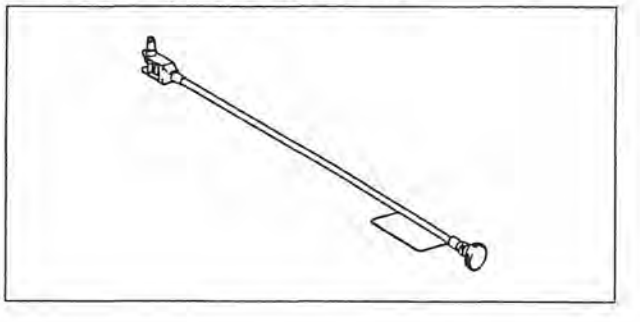
Carburetor Drain Plug Wrench, Hex 3: 57001-1269



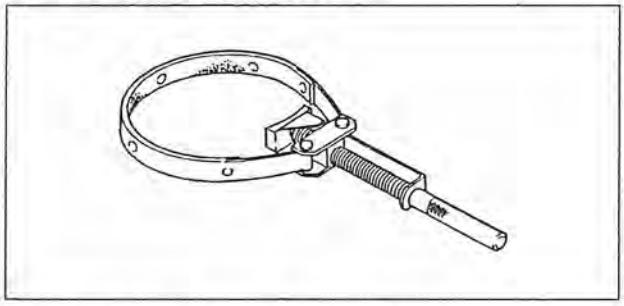
Pinion Gear Holder: 57001-1281



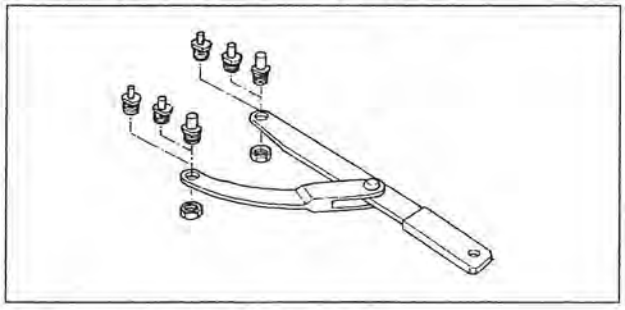
Pilot Screw Adjuster, C: 57001-1292



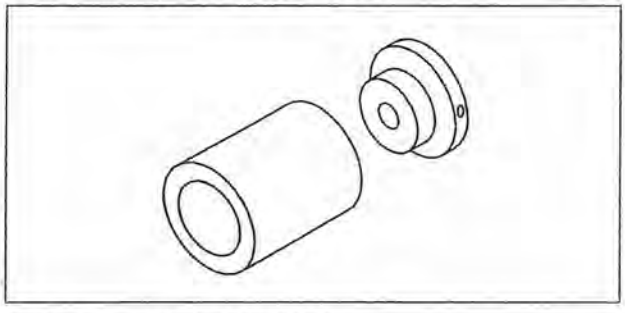
Flywheel Holder: 57001-1313



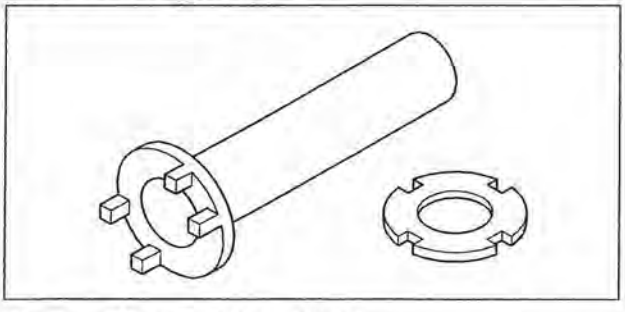
Flywheel & Pulley Holder: 57001-1343



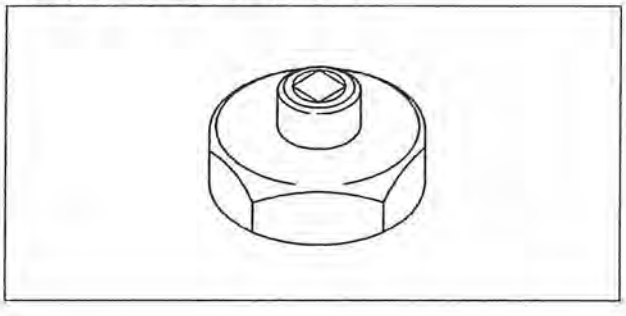
Case Assembly Tool: 57001-1353



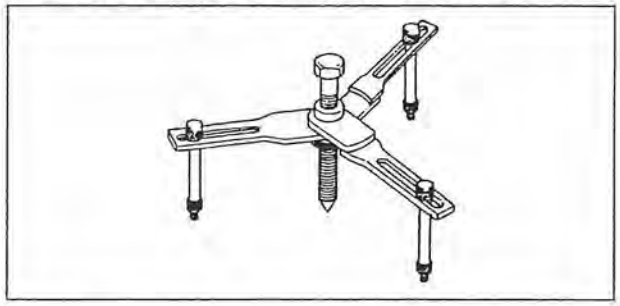
Socket Wrench: 57001-1354



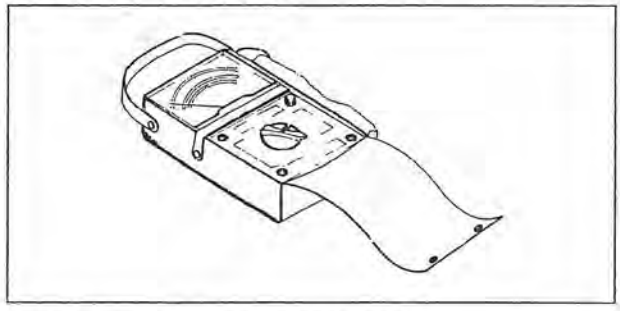
Hexagon Wrench: 57001-1355



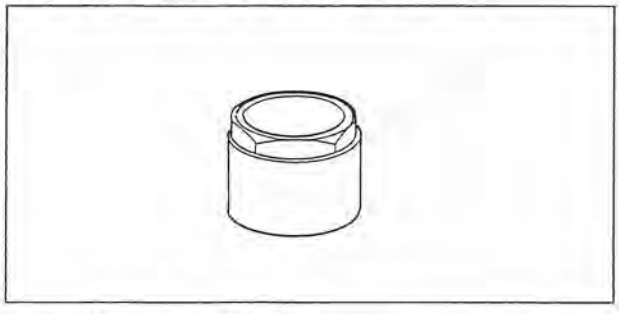
Crankcase Splitting Tool Assembly: 57001-1362



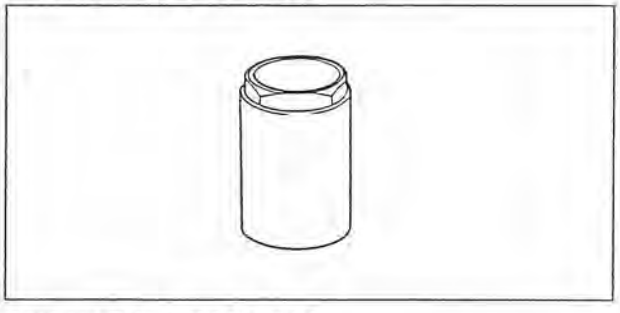
Hand Tester: 57001-1394



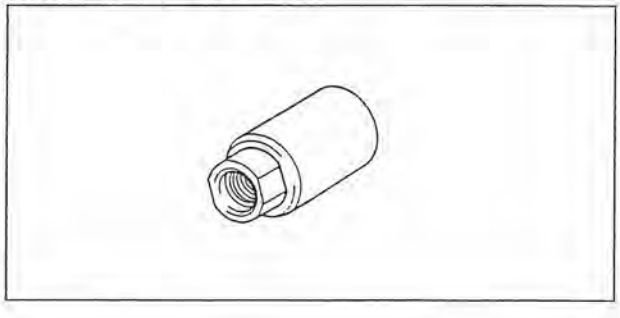
Socket Wrench, Hex 48: 57001-1401



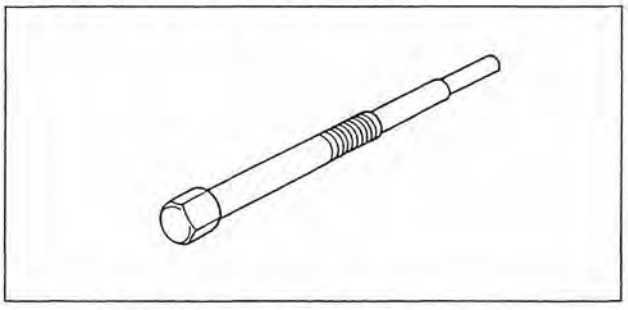
Socket Wrench: 57001-1402



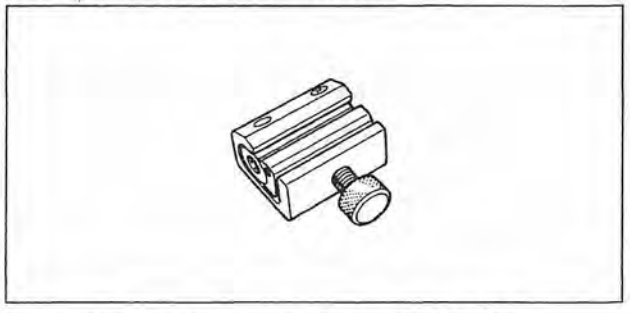
Flywheel Puller: 57001-1403



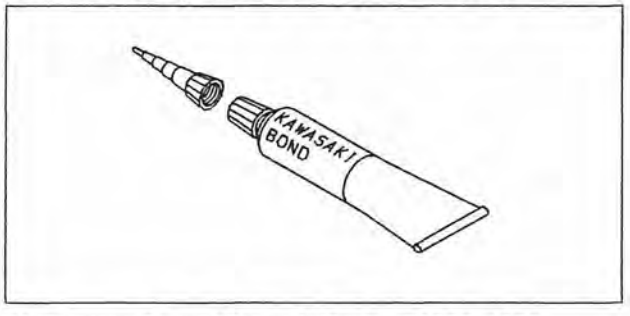
Drive Pulley Puller Bolt: 57001-1404



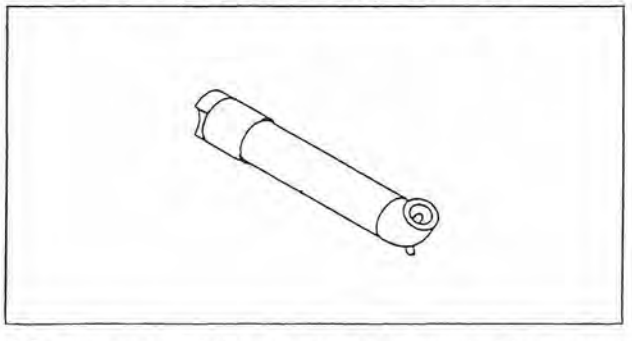
Pressure Cable Luber: K56019-021



Kawasaki Bond (Silicone Sealant): 56019-120

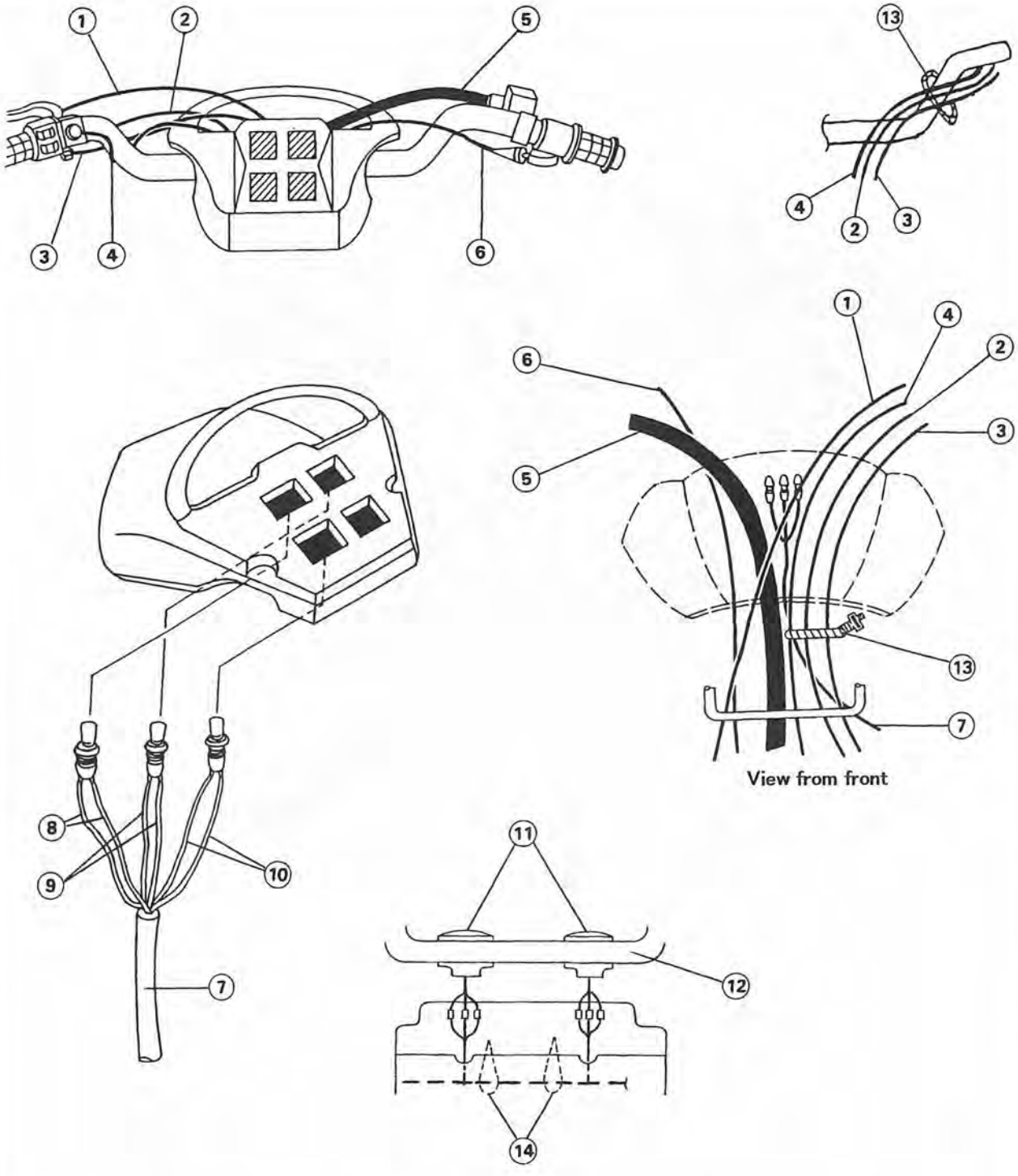


Air Pressure Gauge (Owner's Tool): 52005-1082

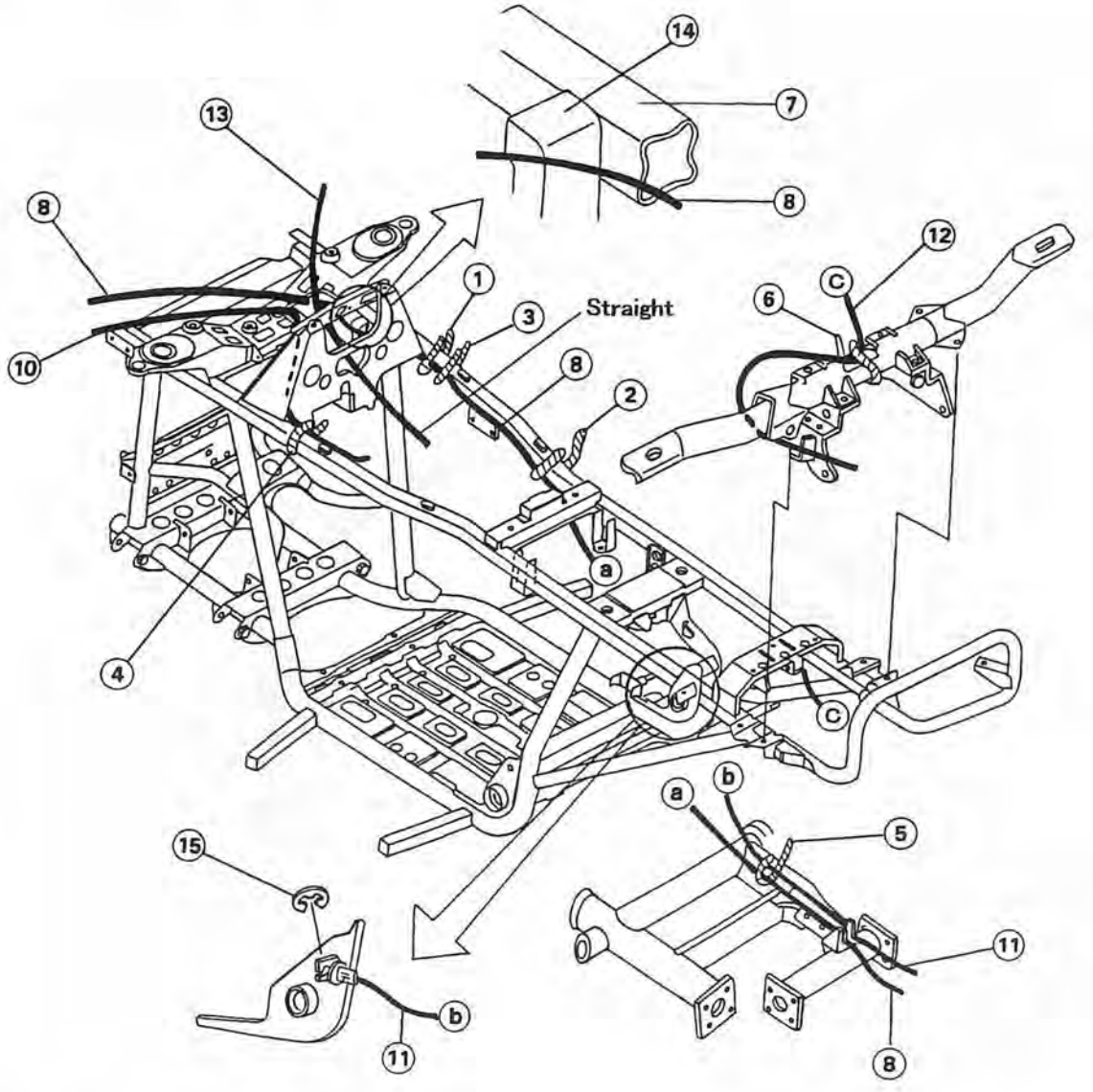


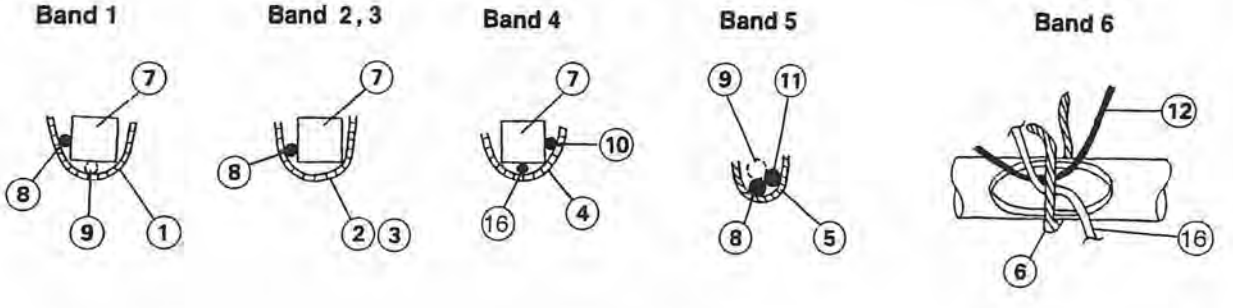
O Be sure to use this gauge for low pressure tire instead of the conventional air pressure gauge.

Cable, Wire, and Hose Routing

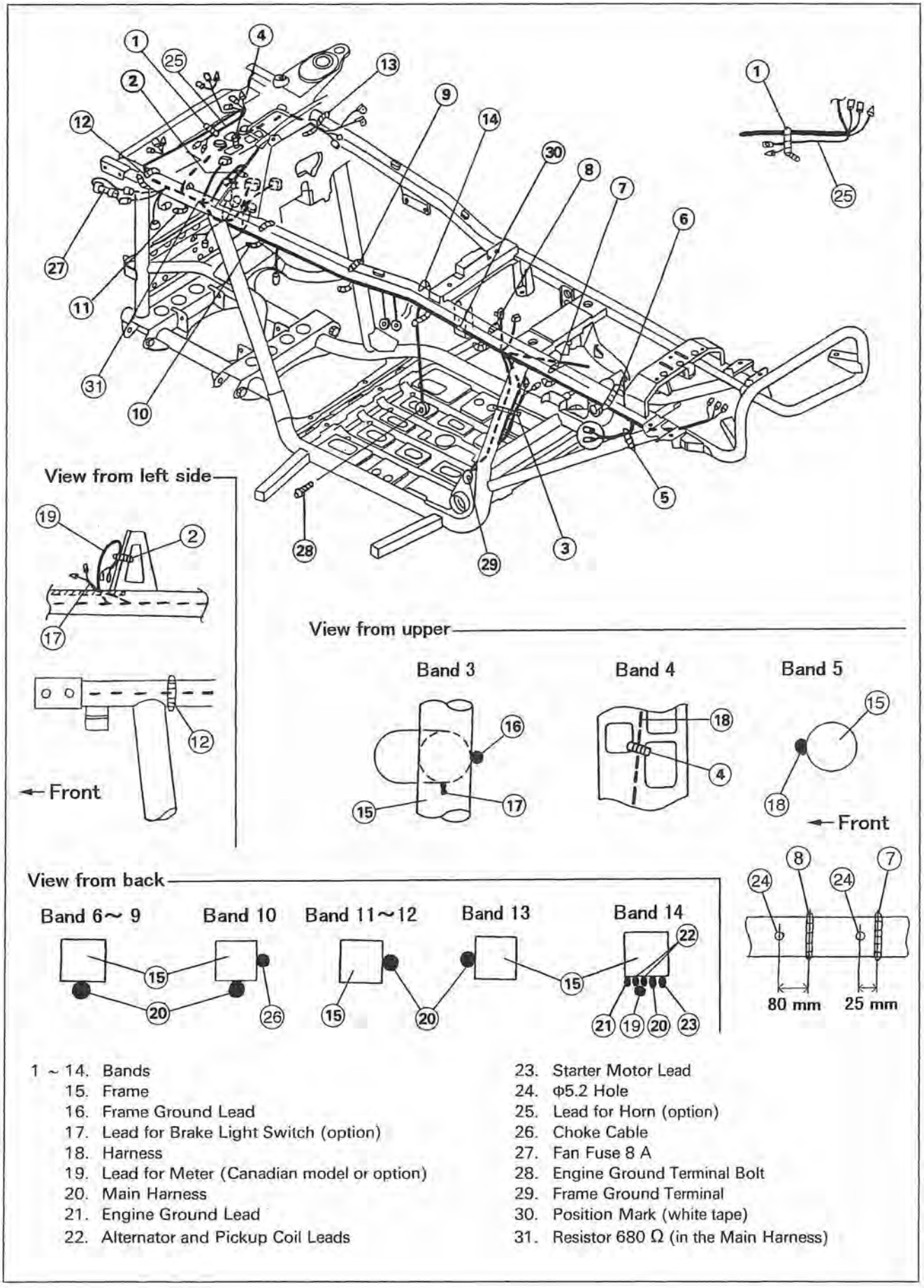


1. Brake Lever Cable
2. Left-Hand Switch Housing Lead
3. Choke Cable
4. Reverse Power Assist Switch Lead
5. Brake Hose
6. Throttle Cable
7. Indicator Light Lead
8. Neutral Indicator Light Leads (LG, BR)
9. Reverse Indicator Light Leads (R/W, BR)
10. Coolant Warning Indicator Light Leads (W/G, BR)
11. Headlights
12. Front Guard
13. Band
14. Clamp

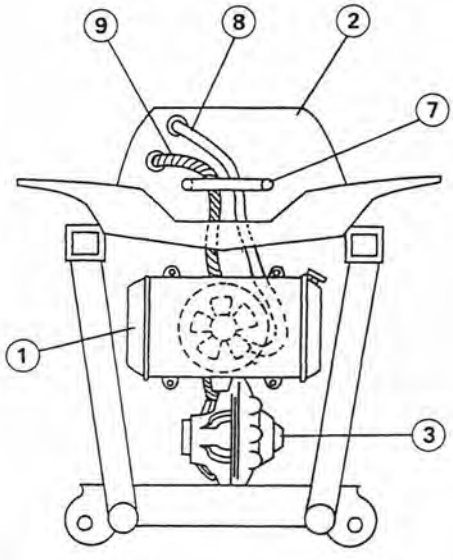


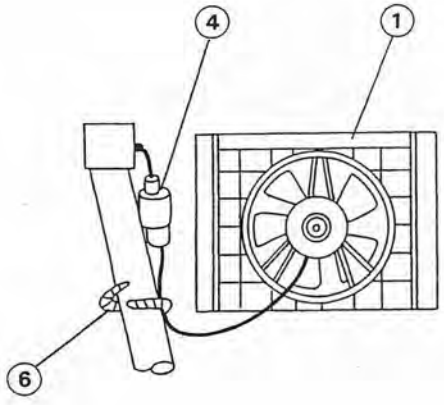


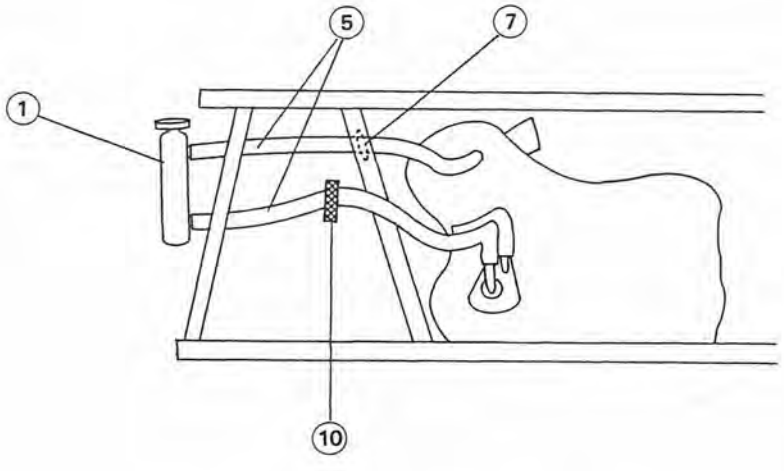
1 ~ 6. Bands
7. Frame
8. Brake Lever Cable
9. Rear Brake Panel Breather Hose
10. Choke Cable
11. Brake Pedal Cable
12. Seat Lock Cable
13. Throttle Cable
14. Duct
15. Circlip
16. Main Harness



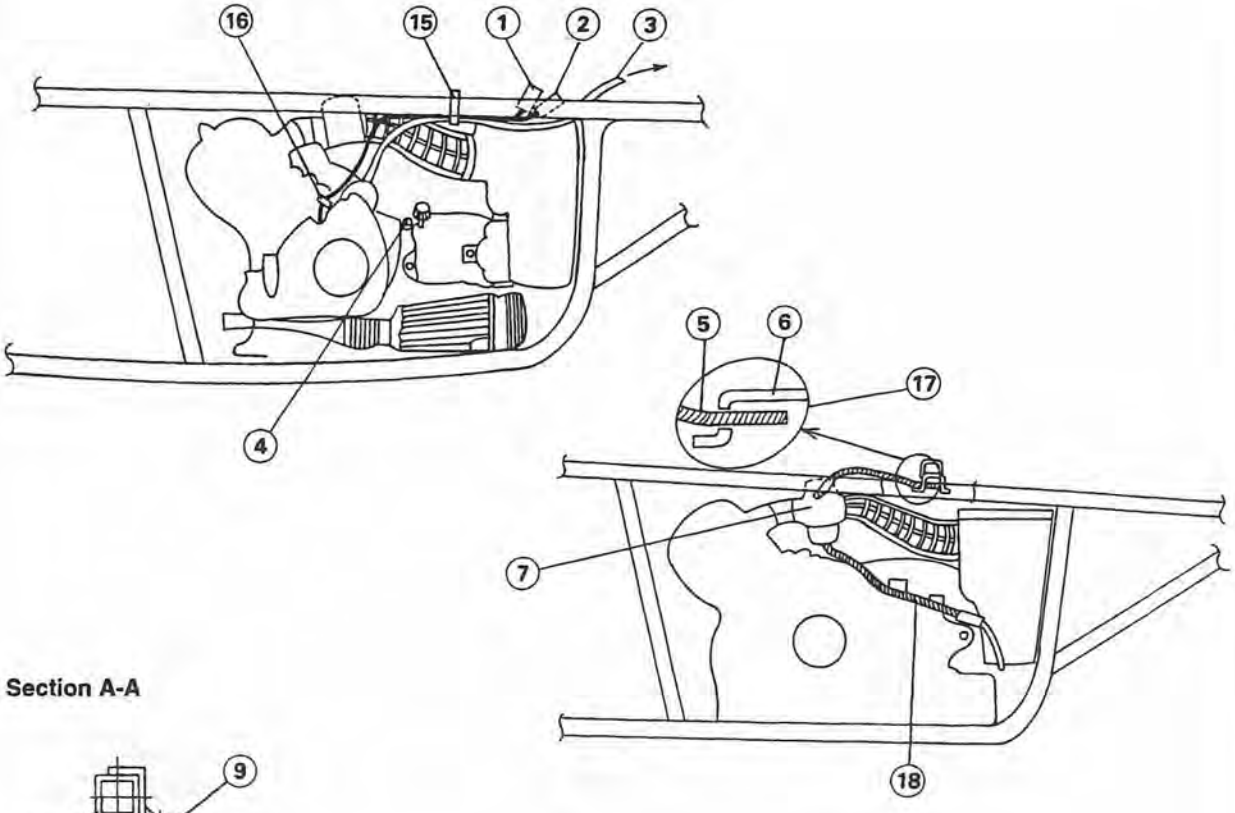
1 ~ 14. Bands
15. Frame
16. Frame Ground Lead
17. Lead for Brake Light Switch (option)
18. Harness
19. Lead for Meter (Canadian model or option)
20. Main Harness
21. Engine Ground Lead
22. Alternator and Pickup Coil Leads
23. Starter Motor Lead
24. Φ5.2 Hole
25. Lead for Horn (option)
26. Choke Cable
27. Fan Fuse 8 A
28. Engine Ground Terminal Bolt
29. Frame Ground Terminal
30. Position Mark (white tape)
31. Resistor 680 Ω (in the Main Harness)



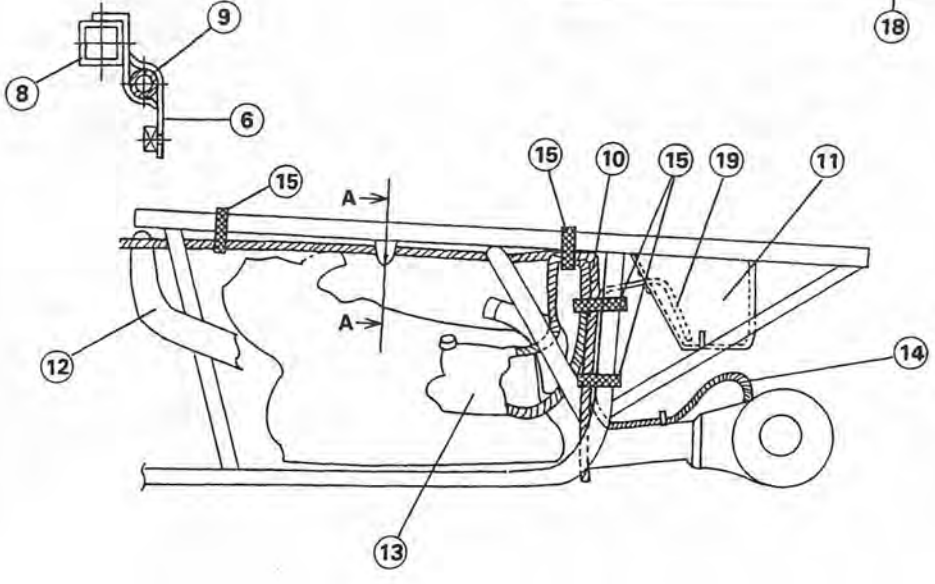




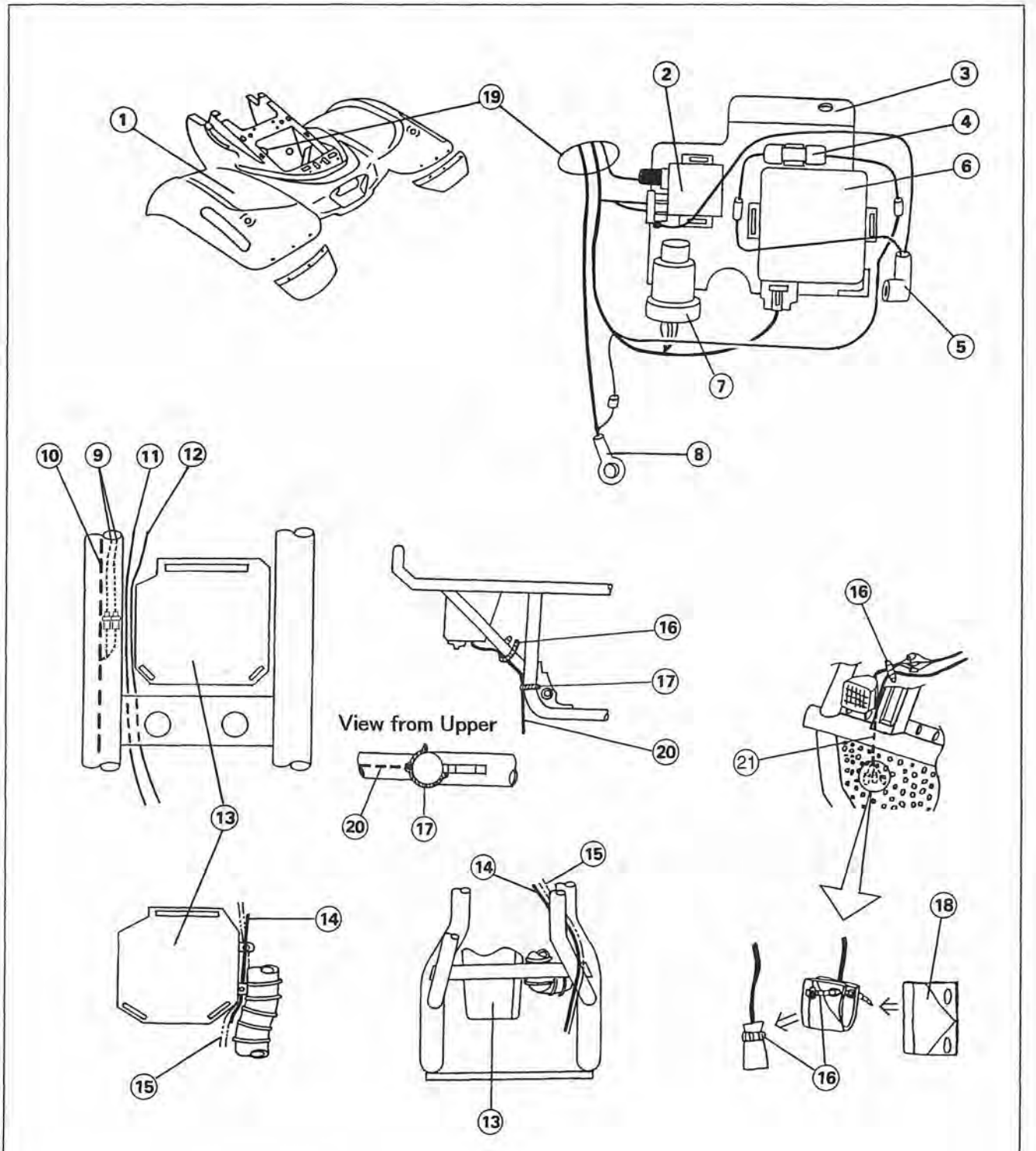
1. Radiator
2. Bracket
3. Front Final Gear Case
4. Radiator Fan Motor Lead Connector
5. Coolant Hoses
6. Band
7. Clamp
8. The radiator fan breather hose (clear) should go through the clamp on the frame, and should be put into the upper hole on the bracket.
9. The front final gear case breather hose (black) should go through the clamp on the frame, and should be put into the lower hole on the bracket.
10. Clamp: Install the clamp on the left front side cover.



Section A-A

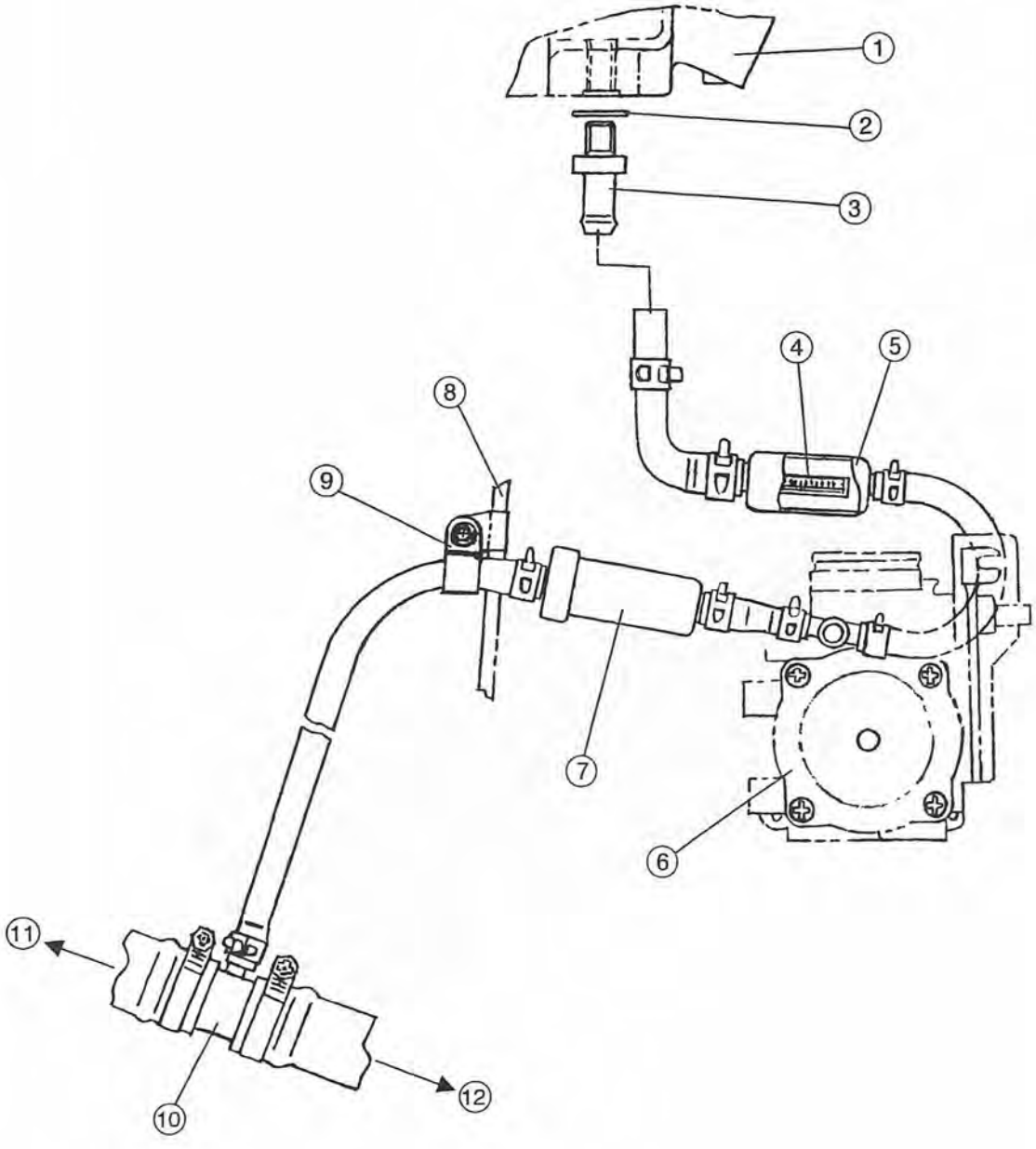


1. Alternator Lead
2. Pickup Coil Lead
3. Starter Motor Lead
4. Engine Ground Terminal
5. Carburetor Vent Hose
6. Bracket
7. Carburetor
8. Frame
9. Reserve Tank Hose
10. Reserve Tank Vent Hose
11. Battery Case
12. Snorkel Duct
13. Coolant Reserve Tank
14. Breather Hose
15. Band
16. Clamp: Install the clamp with the crankcase bolt.
17. Put the carburetor vent hose into the left side hole on the bracket.
18. Run the carburetor overflow hose on the location in accordance with the figure.
19. Insert the top end of the breather hose into the battery case.



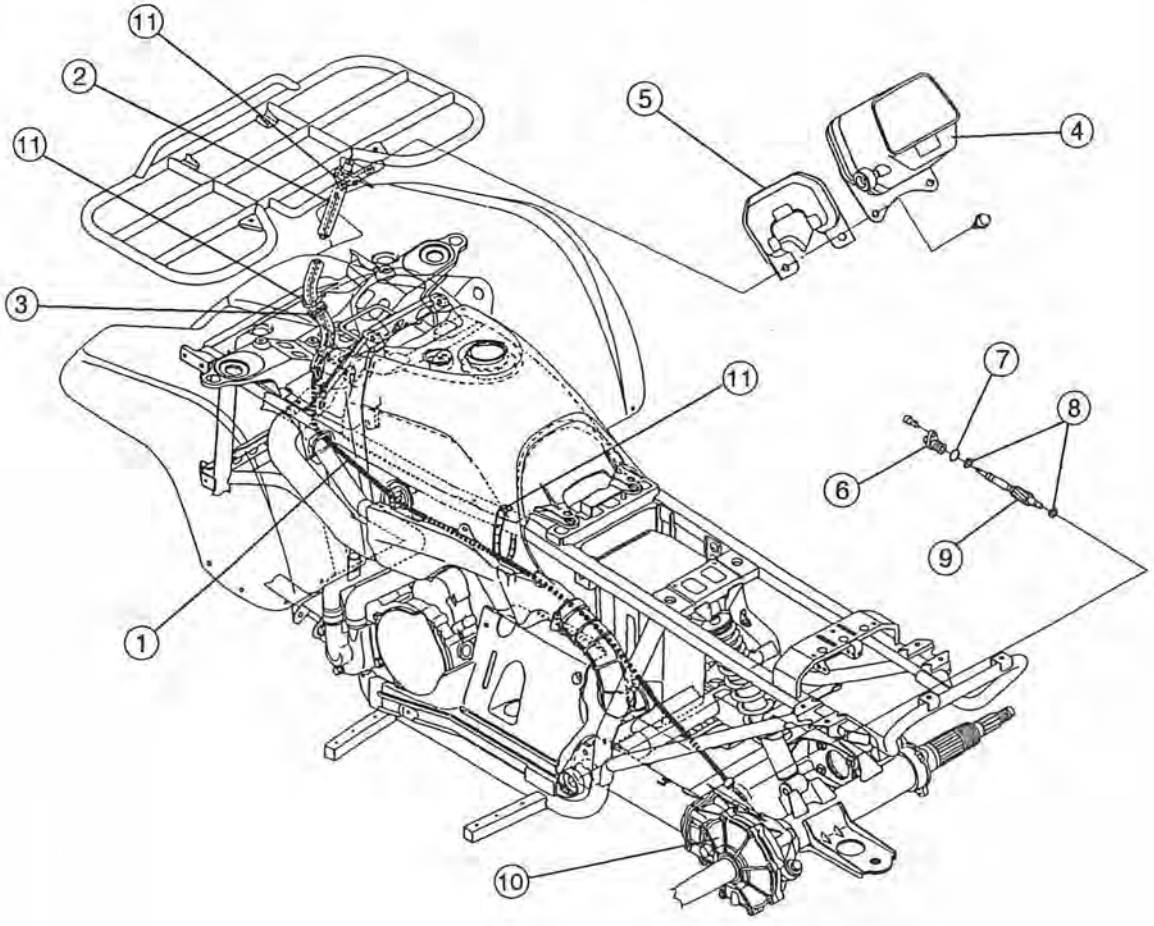
1. Rear Fender
2. Starter Relay
3. Bracket
4. Main Fuse 30 A
5. Battery (+) Lead
6. CDI Unit
7. Starter Circuit Relay
8. Battery (−) Lead
9. Alternator and Pickup Coil Leads
10. Main Harness
11. Starter Motor Lead
12. Engine Ground Lead
13. Air Cleaner
14. Brake Lever Cable
15. Brake Panel Breather Hose
16. Band
17. Clamp
18. Connector Cover
19. All harness and leads go through this hole.
20. Battery Vent Hose
21. Lead for Work Light (option)

Icing Prevention System ('98 Model~)



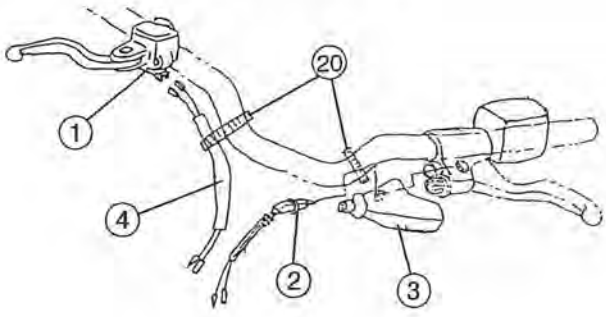
1. Cylinder Head
2. Gasket
3. Fitting Bolt
4. Coolant Filter
5. Coolant Filter Body
6. Carburetor
7. Coolant Valve
8. Oil Pipe
9. Clamp
10. Pipe
11. to Radiator
12. to Water Pump

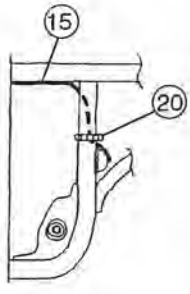
Canadian Model/Optional Parts (other than Canadian Model)



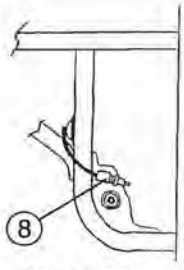
1. Speedometer Cable
2. Tube
3. Grommet
4. Speedometer
5. Cover
6. Gear Bushing
7. O-ring
8. Washers
9. Gear
10. Rear Final Gear Case
11. Band

Brake Light System (Optional Parts)

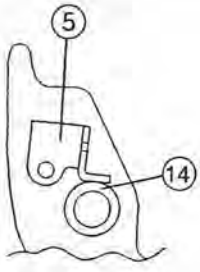




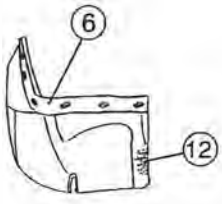
Left Side

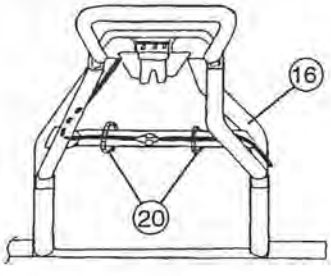


Right Side

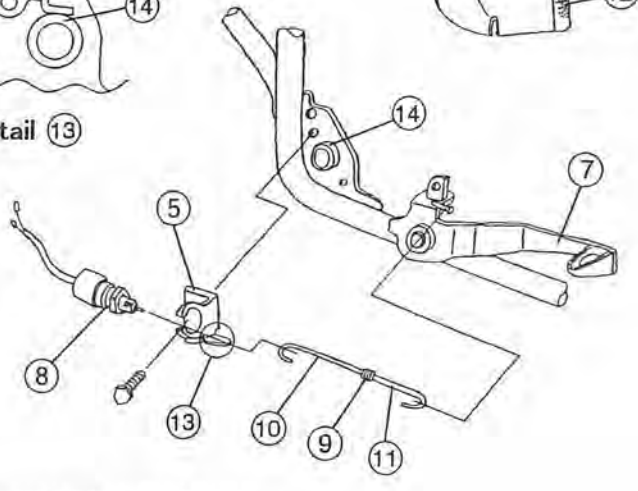


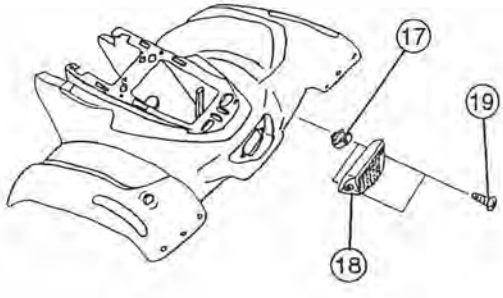
Detail (13)





View from Back





1. Front Brake Light Switch
2. Rear Brake Light Switch (Hand)
3. Boot
4. Harness
5. Switch Bracket
6. Flap
7. Brake Pedal
8. Rear Brake Light Switch (Foot)
9. Spring
10. Long Side
11. Short Side
12. Cut off this area with the inside of the line and pass the spring through there.
13. Put this part to the boss.
14. Boss
15. Main Harness
16. Frame
17. Nuts
18. Tail/Brake Light
19. Screws
20. Band

Fuel System

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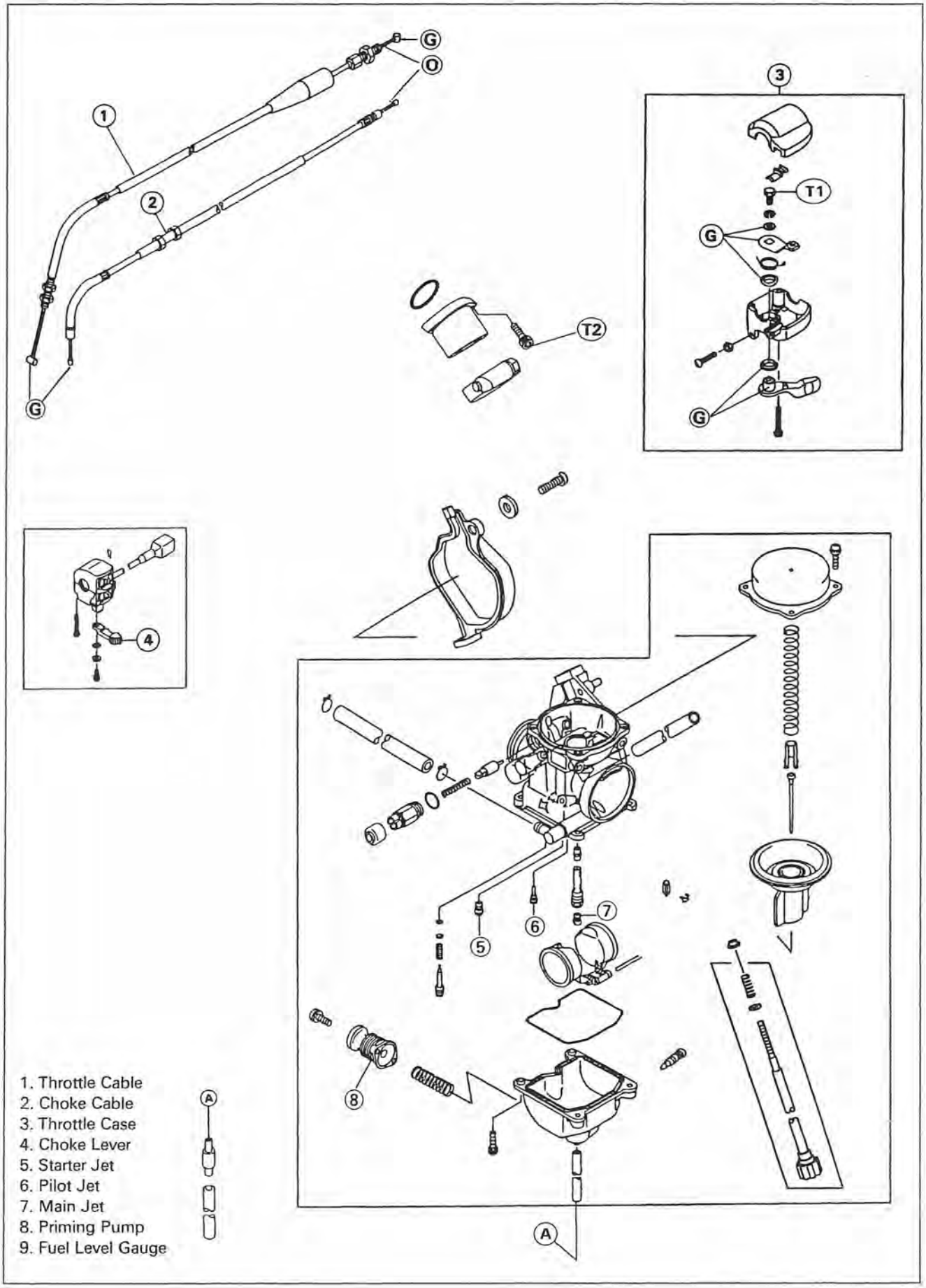
Exploded View



1. Throttle Cable
2. Choke Cable
3. Throttle Case
4. Choke Lever
5. Starter Jet
6. Pilot Jet
7. Main Jet
8. Priming Pump
9. Fuel Level Gauge