YAMAHA

XT & TT500 SINGLES · 1976-1981

SERVICE • REPAIR • MAINTENANCE

Chapter One
General Information 1

Chapter Two
Troubleshooting 2

Chapter Three
Periodic Maintenance and Tune-up 3

Chapter Four
Engine 4

Chapter Five
Clutch and Transmission 5

Chapter Six
Fuel and Exhaust Systems 6

Chapter Seven
Electrical System 7

Chapter Eight
Front Suspension and Steering 8

Chapter Nine
Rear Suspension 9

Supplement
1978 and Later Service Information 10

Index 11

CONTENTS

QUICK REFERENCE DATA VII

CHAPTER ONE
GENERAL INFORMATION 1

Manual organization
Service hints
Tools
Expendable supplies
Safety hints

CHAPTER TWO
TROUBLESHOOTING 5

Operating requirements
Starting difficulties
Poor idling
Misfiring
Flat spots
Power loss
Overheating
Engine noises
Piston seizure
Excessive vibration
Clutch slip or drag
Transmission
Poor handling
Brake problems
Electrical problems
Troubleshooting guide

CHAPTER THREE
PERIODIC MAINTENANCE AND TUNE-UP 10

Periodic maintenance
Tune-up

CHAPTER FOUR
ENGINE 34

Tools
Parts
Removal
Installation
Upper end disassembly
Cylinder head inspection
Valve lapping
Leak test
Valve guide replacement
Valve seat grinding
Cylinder head assembly
Piston and cylinder inspection
Upper end assembly
Bottom end disassembly
Bottom end inspection
Bottom end assembly

CHAPTER FIVE
CLUTCH AND TRANSMISSION 78

Clutch
Transmission

CHAPTER SIX
FUEL AND EXHAUST SYSTEMS **99**

Air cleaner
Carburetor
Fuel valve (petcock)
Fuel tank
Exhaust system

CHAPTER SEVEN
ELECTRICAL SYSTEM **107**

Battery
Charging system (XT models)
Lighting system
Switches
Fuse
Ignition

CHAPTER EIGHT
FRONT SUSPENSION AND STEERING **117**

Front wheel
Front forks
Seal replacement
Steering
Brake
Brake adjustment

CHAPTER NINE
REAR SUSPENSION **131**

Rear wheel
Shock absorbers
Swing arm
Drive chain
Drive sprockets
Brake
Brakelight switch

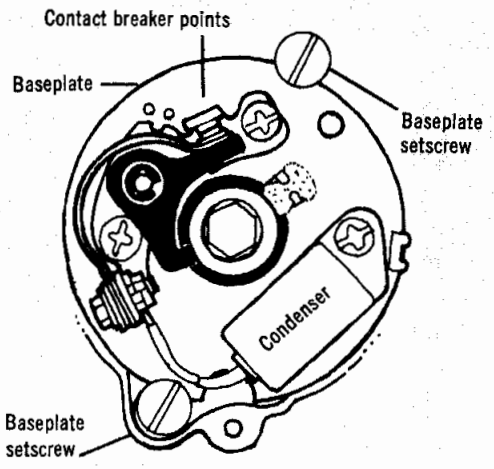
SUPPLEMENT
1978 *AND LATER* SERVICE INFORMATION **143**

INDEX **174**

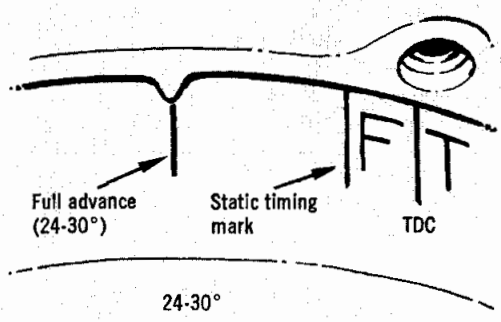
WIRING DIAGRAMS ..... **END OF BOOK**

QUICK REFERENCE DATA

BREAKER POINTS



TIMING MARKS



TUNE-UP SPECIFICATIONS

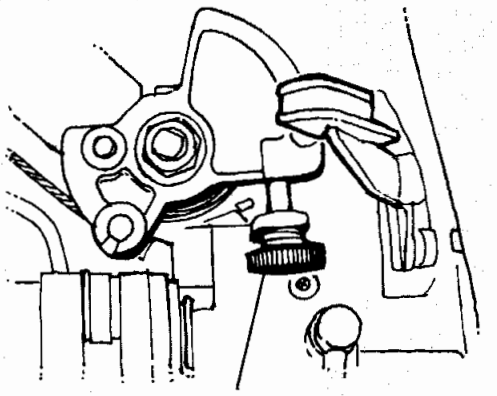
Cylinder head and cover torque

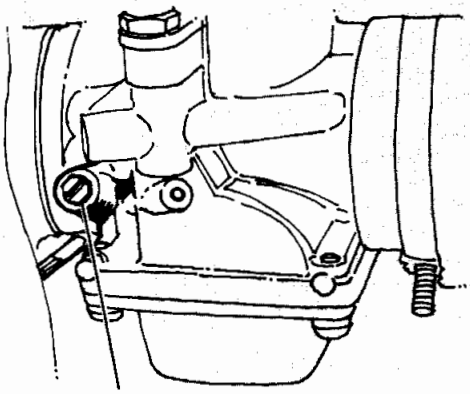
6 mm bolts	0.8-1.2 mkg (6.9 ft.-lb.)
10 mm stud bolt	2.0 mkg (14 ft.-lb.)
10 mm nut	4.0 mkg (29 ft.-lb.)
8 mm stud bolt	1.5 mkg (11 ft.-lb.)
8 mm nut	2.0 mkg (14 ft.-lb.)

Valve clearance

Intake	0.07-0.12 mm (0.003-0.005 in.)
Exhaust	0.12-0.17 mm (0.005-0.007 in.)

Spark plugs	NGK BP-7ES
Type	Champion N-7Y
	ND W22-EP
Gap	0.7-0.8 mm (0.028-0.031 in.)
Contact breaker gap (if so equipped)	0.35 mm (0.014 in.)
Ignition timing	7°
Advanced	
1976-1977	24-30° @ 2,800-3,200 rpm
1978-on	17-23° @ 2,800-3,200 rpm
Idle speed	
1976	1,100 rpm
1977-on	1,200 rpm


Idle speed adjustment screw


Pilot screw

FASTENER TORQUES

Fastener	mkg	ft.-lb.
Engine		
Drain plug	2.0-4.0	14-29
Countershaft sprocket	4.0-8.0	29-58
Engine mounting bolt		
10 mm bolt	4.0-5.5	29-40
8 mm nut	2.1-2.9	15-21
8 mm bolt	1.6-2.2	12-16
Chassis		
Front axle	7-10	51-72
Rear axle	6.0-9.5	43-69
Swing arm pivot nut	6.0-9.5	43-69
Steering head bolt	4.2-6.5	30-47
Steering head pinch bolt	1.8-2.9	13-21
Wheel sprocket nut	2.7-3.3	20-24

RECOMMENDED LUBRICANTS

Engine/transmission	
Above 40° F	SAE 20W-40 or 20W-50
Below 40° (sustained)	SAE 10W-30
Fork oil	
XT models,	
1976-1978 TT models	SAE 20W fork oil
1979-on TT models	SAE 10W fork oil
Grease	Lithium soap base grease

APPROXIMATE REFILL CAPACITIES

Engine oil	2.1 quarts (2.0 liters)
Without filter change	2.2 quarts (2.1 liters)
With filter change	
Fork oil	
XT models	217 cc (7.34 oz.)
1976	223 cc (7.5 oz.)
1977-1979	238 cc (8.0 oz.)
1980-on	
TT models	217 cc (7.34 oz.)
1976	224 cc (7.6 oz.)
1977-1978	247 cc (8.35 oz.)
1979-on	

ELECTRICAL

Item*	Rating
Headlamp	
1976-1978	30W/30W
1979-on	35W/35W
Tail/stoplamp	
1976-1978	5.3W/17W
1979-on	5.3W/25W
Directional lamps	17W
Directional indicator	3W
Instrument lamps	3W
High-beam indicator	3W
Neutral indicator	3W
Fuse	10 amps

* All bulbs rated 6 volts.

NOTE: If you own a 1978 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER ONE

GENERAL INFORMATION

This manual is designed to help owners service and repair the Yamaha XT and TT 500 cc motorcycles. Specific service procedures range from simple to complex operations which can be performed by the owner/rider.

The main body of this book (Chapters One through Ten) contains service information for 1976-1977 non-emission controlled motorcycles. The supplement at the end of the book contains information for 1978 non-emission and emission controlled bikes and all 1979-on emission controlled bikes. If you have a 1978 bike, you can use the information in the supplement and your bike's frame number to determine whether it is an early or late 1978 model.

If a procedure does not appear in the supplement, then it remains the same as for earlier models.

MANUAL ORGANIZATION

The service procedures in this manual are grouped by major subassembly (e.g., engine, transmission, fuel system, etc.) to speed work. In addition, an easy-to-use troubleshooting guide is provided. Common maintenance tasks and tune-up are covered in a single chapter because they are the most frequently performed tasks.

Dimensions, capacities, and weights are expressed both metrically and in terms familiar to American mechanics. When working with critical dimensions (cylinder-to-piston clearance, crankshaft journal diameter, etc.), the metric values should be used to ensure accuracy.

SERVICE HINTS

Most of the service procedures described can be performed by anyone reasonably handy with tools. It is suggested, however, that you carefully consider your own capabilities before attempting any operation which involves major disassembly of the engine or transmission.

Some operations, for example, *require* the use of a press. It would be wiser to have them performed by a shop equipped for such work, rather than to try to do the job yourself with makeshift equipment. Other procedures require precision measurements, and unless you have the skills and equipment to make them, it would be better to have a motorcycle shop help in the work.

Repairs can be made faster and easier if the motorcycle is clean before you begin work. There are special cleaners for washing the

engine and related parts. Just brush or spray on the solution, let it stand, then rinse it away with a garden hose. Clean all oily or greasy parts with cleaning solvent as you remove them.

WARNING

Never use gasoline as a cleaning agent. It presents an extreme fire hazard.

Always work in a well-ventilated area when using cleaning solvent. Keep a fire extinguisher, rated for gasoline fires, handy just in case.

Special tools are required for some service procedures. Some of these may be purchased through Yamaha dealers. If you are on good terms with the dealer's service department, you may be able to borrow or rent some.

Much of the labor charge for repairs made by dealers is for removal and diassembly of other parts to reach the defective one. It is frequently possible to do all of this yourself, then take the affected subassembly to the dealer for repair.

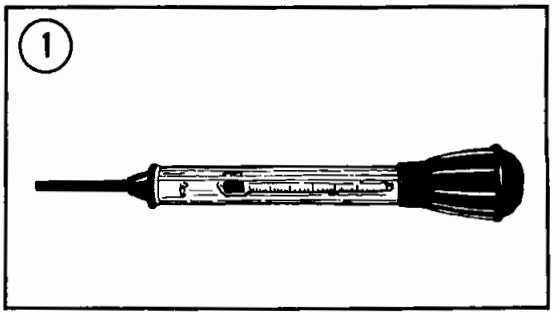
Once you decide to tackle a job yourself, read the entire section in this handbook pertaining to it. Study the illustrations and the text until you have a thorough idea of what's involved. If special tools are required, make arrangements to get them before you begin work. It's frustrating to get part way into a job and then discover that you are unable to complete it.

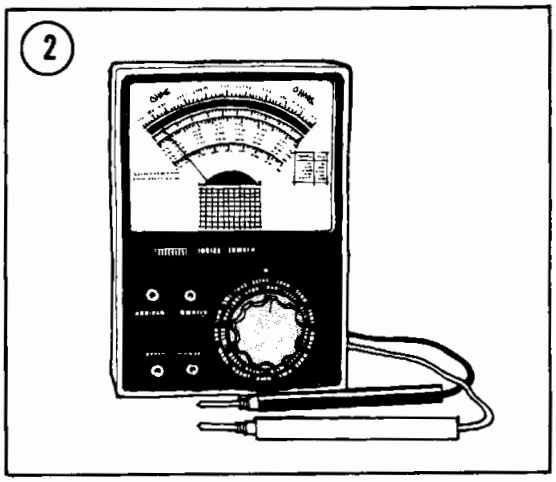
Collect the necessary tools, parts, lubricants, and cleaning supplies before starting a job. It's to your advantage to have your work area scrupulously clean to reduce the possibility of contamination of precision parts and critical surfaces. You'll also find that a few metal baking pans or sandwich bags and tape are worth their weight in gold for organizing and storing nuts, bolts, washers, and small bits and pieces as they are removed from the motorcycle.

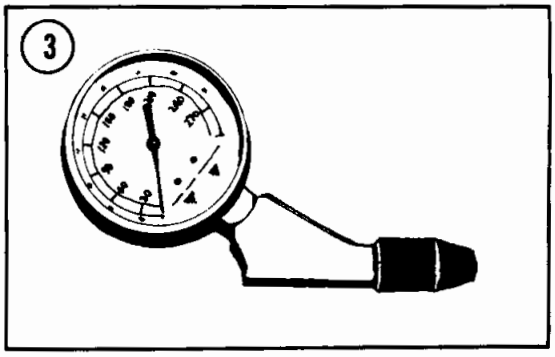
TOOLS

To properly service your motorcycle, you will need an assortment or ordinary hand tools. As a minimum, these include:

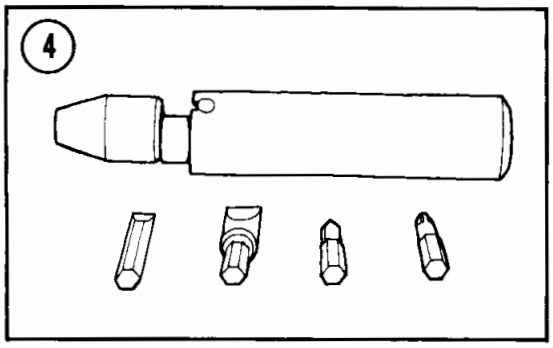
a. Combination wrenches (metric)
b. Socket wrenches (metric)
c. Plastic mallet

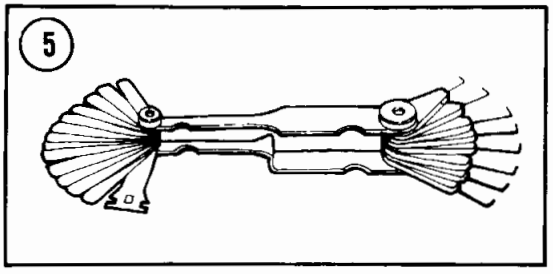






d. Small hammer
e. Snap ring pliers
f. Phillips screwdrivers
g. Slot screwdrivers
h. Impact driver
i. Allen wrenches (metric)
j. Pliers
k. Feeler gauges
l. Spark plug gauge
m. Spark plug wrench





n. Dial indicator
o. Drift

An original equipment tool kit is available through most Yamaha dealers and is suitable for minor servicing.

Special tools necessary are shown in the chapters covering the particular repair in which they are used.

Electrical system servicing requires a voltmeter, ohmmeter, or other device for determining continuity and a hydrometer for assessing battery condition.

Engine tune-up and troubleshooting procedures require a few more tools.

Hydrometer

This instrument (**Figure 1**) measures state of charge of the battery, and tells much about battery condition. Such an instrument is available at any auto parts store and through most large mail order outlets.

Multimeter or VOM

This instrument (**Figure 2**) is invaluable for electrical system troubleshooting and service. A few of its functions may be duplicated by locally fabricated substitutes, but for the serious hobbyist, it is a must. Its uses are described in the applicable sections of this book. Multimeters are available at electronics hobbyist stores and mail order outlets.

Compression Gauge

An engine with low compression cannot be properly tuned and will not develop full power. A compression gauge (**Figure 3**) measures engine compression. Inexpensive ones are available at auto accessory stores or by mail order from large catalog order firms.

Impact Driver

This tool (**Figure 4**) might have been designed with the motorcyclist in mind. It makes removal of tight nuts and screws easy, and eliminates damaged screw heads. Good ones are available at larger hardware stores.

Ignition Gauge

This tool (**Figure 5**) measures point gap. It also has round wire gauges for measuring spark plug gap.

Other Special Tools

A few special tools may also be required for major engine service. They are available at Yamaha dealers.

EXPENDABLE SUPPLIES

Certain expendable supplies are required. These include grease, oil, gasket cement, wiping rags, cleaning solvent, and distilled water. Ask your dealer for the special locking compounds, silicone lubricants, and commercial cable and chain lube products which make motorcycle maintenance simpler and easier. Solvent is available at most service stations and distilled water for the battery is available at most supermarkets.

SAFETY HINTS

A professional mechanic can work for years and never sustain a serious injury. If you observe a few rules of common sense and

safety, you can enjoy many hours safely servicing your own machine. You can also hurt yourself or damage your motorcycle if you ignore these rules.

1. Never use gasoline as a cleaning solvent.
2. Never smoke or use a torch around flammable liquids, such as cleaning solvent.
3. Never smoke or use a torch in areas where batteries are being charged. Highly explosive hydrogen gas is formed during the charging process. Never arc the terminals of a battery to see if it has a charge; the sparks can ignite the explosive hydrogen as easily as an open flame.
4. If welding or brazing is requried on the motorcycle, remove the fuel tank and set it a safe distance away — at least 50 feet.
5. Always use the correct size wrench for turning nuts and bolts, and when a nut is tight, think for a moment what would happen to your hand if the wrench were to slip.
6. Keep your work area clean and uncluttered.
7. Wear safety goggles in all operations involving drilling, grinding, the use of a chisel, or an air hose.
8. Don't use worn tools.
9. Keep a fire extinguisher handy. Be sure it is rated for gasoline and electrical fires.

CHAPTER TWO

TROUBLESHOOTING

Diagnosing mechanical problems is relatively simple if you use orderly procedures and keep a few basic principles in mind.

The troubleshooting procedures in this chapter analyze typical symptoms, and show logical methods of isolating causes. These are not the only methods. There may be several ways to solve a problem, but only a systematic, methodical approach can guarantee success.

Never assume anything. Don't overlook the obvious. If you are riding along and the bike suddenly quits, check the easiest, most accessible problem spots first. Is there gasoline in the tank? Is the gas petcock in the ON or RESERVE position? Has the spark plug wire fallen off? Check the ignition switch. Sometimes the weight of keys on a key ring may turn the ignition off suddenly.

If nothing obvious turns up in a cursory check, look a little further. Learning to recognize and describe symptoms will make repairs easier for you or a mechanic at the shop. Describe problems accurately and fully. Saying that "it won't run" isn't the same as saying "it quit on the highway at high speed and wouldn't start," or that "it sat in my garage for three months and then wouldn't start."

Gather as many symptoms together as possible to aid in diagnosis. Note whether the engine lost power gradually or all at once, what color smoke (if any) came from the exhaust, and so on. Remember that the more complicated a machine is, the easier it is to troubleshoot because symptoms point to specific problems.

After the symptoms are defined, areas which could cause problems are tested and analyzed. Guessing at the cause of a problem may provide the solution, but it can easily lead to frustration, wasted time, and a series of expensive, unnecessary parts replacements.

You don't need fancy equipment or complicated test gear to determine whether repairs can be attempted at home. A few simple checks could save a large repair bill and time lost while the bike sits in a dealer's service department. On the other hand, be realistic and don't attempt repairs beyond your abilities. Service departments tend to charge heavily for putting together a disassembled engine that may have been abused. Some won't even take on such a job — so use common sense, and don't get in over your head.

OPERATING REQUIREMENTS

An engine needs three basics to run properly; correct gas/air mixture, compression, and a spark at the right time. If one or more are missing, the engine won't run. The electrical system is the weakest link of the three basics. More

problems result from electrical breakdowns than from any other source. Keep that in mind before you begin tampering with carburetor adjustments and the like.

If a bike has been sitting for any length of time and refuses to start, check the battery for a charged condition first, and then look to the gasoline delivery system. This includes the tank, fuel petcock, lines, and the carburetor. Scale may have formed in the tank, obstructing fuel flow. Gasoline deposits may have gummed up carburetor jets and air passages. Gasoline tends to lose its potency after standing for long periods. Condensation may contaminate it with water. Drain the old gas and try starting with a fresh tankful.

TROUBLESHOOTING INSTRUMENTS

Chapter One lists many of the instruments needed and detailed instructions on their use.

STARTING DIFFICULTIES

Check gas flow first. Remove the gas cap and look into the tank. If gas is present, remove the float bowl from the carburetor and see if gas flows freely. If none comes out, the fuel tap may be shut off, blocked by rust or foreign matter, or the fuel line may be stopped up or kinked. If the carburetor is getting usable fuel, turn to the electrical system next.

Check that the battery is charged by turning on the lights or by beeping the horn. Refer to your owner's manual for starting procedures with a dead battery. Have the battery recharged if necessary.

Pull off the spark plug cap, remove the spark plug, and reconnect the cap. Lay the plug against the cylinder head so its base makes a good connection, and turn the engine over with the kickstarter. A fat, blue spark should jump across the electrodes. If there is no spark, or only a weak one, there is electrical system trouble. Check for a defective plug by replacing it with a known good one. Don't assume a plug is good just because it's new.

Once the plug has been cleared of guilt, but there's still no spark, start backtracking through the system. If the contact at the end of spark plug wire can be exposed, it can be held about ⅛ inch from the head while the engine is turned over to check for a spark. Remember to hold the wire only by its insulation to avoid a nasty shock. If the plug wires are dirty, greasy, or wet, wrap a rag around them so you don't get shocked. If you do feel a shock or see sparks along the wire, clean or replace the wire and/or its connections.

If there's no spark at the plug wire, look for loose connections at the coil and battery. If all seems in order there, check next for oily or dirty contact points. Clean points with electrical contact cleaner or a business card. With the ignition switch turned on, open and close the points manually with a screwdriver. Look for spark across the point gap.

No spark at the points with this test indicates a failure in the ignition system. Refer to Chapter Three (*Periodic Maintenance and Tune-up*) for checkout procedures for the entire system and individual components. Refer to the same chapter for checking and setting ignition timing.

Note that a spark plug of the incorrect heat range (too cold) may cause hard starting. Set the gap to specifications. If you have just ridden through a puddle or washed the bike and it won't start, dry off the plug and plug wire. Water may have entered the carburetor and fouled the fuel under these conditions, but a wet plug and wire are the more likely problem.

If a healthy spark occurs at the right time, and there is adequate gas flow to the carburetor, check the carburetor itself at this time. Make sure all jets and air passages are clean; check float level and adjust if necessary. Check that the carburetor is mounted snugly and no air is leaking past the manifold.

> NOTE: *For this check, the engine must be started and run at idle. Spray WD-40 around the manifold joints and listen for changes in engine idle speed. Changes indicate an air leak.*

Check for a clogged air filter.

Compression, or the lack of it, usually enters the picture only in the case of older machines. Worn or broken pistons, rings, and cylinder bores could prevent starting. Generally a gradual power loss and harder starting will be readily apparent in this case.

Compression may be checked in the field by turning the kickstarter by hand and noting that an adequate resistance is felt.

An accurate compression check gives a good idea of the condition of the basic working parts of the engine. To perform this test, you need a compression gauge. Follow the procedure in Chapter Three, *Compression Test*.

If the compression does not rise, one or both valves are probably not seating correctly.

Valve adjustments should be checked next; sticking, burned, or broken valves may hamper starting. As a last resort, check valve timing.

POOR IDLING

Poor idling may be caused by incorrect carburetor adjustment, incorrect timing, or ignition system defects. Check the gas cap vent for an obstruction. Check for low compression.

MISFIRING

Misfiring can be caused by a weak spark or dirty plug. Check for fuel contamination. Run the machine at night to check for spark leaks along plug wire and under spark plug cap.

WARNING

Do not run engine in a closed garage to check for spark leaks. There is considerable danger of carbon monoxide poisoning.

If misfiring occurs only at certain throttle settings, refer to the fuel system chapter for the specific carburetor circuits involved. Misfiring under heavy load, as when climbing hills or accelerating, is usually an indication of bad spark plugs.

FLAT SPOTS

If the engine seems to die momentarily when the throttle is opened and then recovers, check for a dirty main jet in the carburetor, water in the fuel, or an excessively lean mixture. Check the metering rod position.

POWER LOSS

Poor condition of rings, piston, or cylinder will cause a lack of power and speed. Ignition timing should be checked.

OVERHEATING

If the engine seems to run too hot all the time, be sure you are not idling it for long periods. Air-cooled engines are not designed to operate at a standstill for any length of time. Heavy stop and go traffic is hard on a motorcycle engine. A spark plug of the wrong heat range can burn the piston. An excessively lean gas mixture may cause overheating. Check ignition timing. Don't ride in too high a gear. Broken or worn rings may permit compression gases to leak past them, heating the cylinder excessively. Check oil level and use the proper grade lubricants.

ENGINE NOISES

Experience is needed to diagnose accurately in this area. Noises are hard to differentiate and harder yet to describe. Deep knocking noises usually mean bearing failure. A slapping noise generally comes from a loose piston. A light knocking noise during acceleration may be a bad connecting rod bearing. Pinging, caused by low octane fuel or too advanced timing, should be corrected immediately or damage to the piston will result. Compression leaks at the head-cylinder joint will sould like a rapid on-and-off squeal.

PISTON SEIZURE

Piston seizure is caused by incorrect piston clearances when fitted, fitting rings with improper end gap, too thin an oil being used, incorrect spark plug heat range, or incorrect ignition timing. Overheating from any cause may result in seizure.

EXCESSIVE VIBRATION

Excessive vibration may be caused by loose motor mounts, worn engine or transmission bearings, loose wheels, worn swinging arm bushings, a generally poor-running engine, broken or cracked frame, or one that has been damaged in a collision. See also *Poor Handling*.

CLUTCH SLIP OR DRAG

Clutch slip may be due to incorrect clutch adjustment, worn or glazed plates, or weak

springs. Clutch drag may be caused by incorrect adjustment or warped plates.

All clutch problems, except adjustments or cable replacement, require removal to identify the cause and make repairs.

1. ***Slippage*** — This condition is most noticeable when accelerating in high gear at relatively low speed. To check slippage, drive at a steady speed in 4th or 5th gear. Without changing the throttle position, pull in the clutch lever just long enough to let engine speed increase. Then let the clutch out rapidly. If the clutch is good, engine speed will drop quickly or the bike will jump forward. If the clutch is slipping, engine speed will drop slowly and the bike will *not* jump forward.

Slippage results from insufficient clutch lever free play, worn plates, or weak springs. Riding the clutch can cause the plate surfaces to become glazed, resulting in slippage.

2. ***Drag or failure to release*** — This trouble usually causes difficult shifting and gear clash especially when downshifting. The cause may be excessive clutch lever free play, warped plates, stretched clutch cable, or broken or loose linings.

3. ***Chatter or grabbing*** — Check for worn or warped plates.

> NOTE: *Clutch wear is accelerated if the transmission is habitually left in gear with the clutch disengaged while waiting for long-duration traffic lights. Instead, shift the transmission to neutral and release the clutch until the cross-traffic amber light indicates that the light is about to change. In addition to reducing clutch wear, a measure of safety is gained in that it precludes a cable failure, most certain to occur when the clutch lever is pulled in.*

TRANSMISSION

Transmission problems are usually indicated by one or more of the following symptoms.

a. Difficulty shifting gears
b. Gear clash when downshifting
c. Slipping out of gear
d. Excessive noise in neutral
e. Excessive noise in gear

Transmission symptoms are sometimes hard to distinguish from clutch symptoms. Be sure the clutch is not causing the trouble before working on the transmission.

POOR HANDLING

Poor handling may be caused by improper tire pressures, a damaged frame or swinging arm, worn shocks or front forks, weak fork springs, a bent or broken steering stem, misaligned wheels, loose or missing spokes, worn tires, bent handlebar, worn wheel bearing, or dragging brakes.

Poor handling is also caused by the steering head being adjusted too tight or too loose, or by the races and balls being excessively worn. Also, if the frame has been recently repainted, overspray on the bearing races will prevent the bearings from seating correctly and make accurate adjustment impossible.

Worn or frozen swing arm bearings will also cause handling problems. They can be checked by removing the wheel and shocks, and then moving the arm right and left by hand. If the free play is greater than 1mm (0.04 in.) replace the bearings.

> NOTE: *A worn or loose swing arm pivot will usually be felt through a tendency for the motorcycle to weave from side to side. A high-rate wobble indicates front end trouble.*

In addition to the checks mentioned, make certain the tires are mounted correctly and that the beads are seated evenly on the rims. Tires have alignment indicator ribs around the bead and an incorrectly seated bead will be visually apparent. If this condition exists, deflate the tire and reseat the bead before inflating it.

The increasingly common practice of cutting rain grooves into road surfaces has added a totally new handling problem for most motorcycles, no matter how well tuned the suspension. It is most easily solved by using tires that do not have a center groove. If the motorcycle tends to snake, as though the swing arm pivot were loose or worn, the problem usually lies with the rear tire. If the steering is imprecise and mushy, the front tire is at fault. If all other handling factors are correct, a change of tread pattern will almost always correct the situation.

BRAKE PROBLEMS

Sticking brakes may be caused by broken or weak return springs, improper cable or rod adjustment, or dry pivot and cam bushings. Grabbing brakes may be caused by greasy linings which must be replaced. Brake grab may also be due to out-of-round drums or linings which have broken loose from the brake shoes. Glazed linings will cause loss of stopping power.

Stopping power is also greatly reduced with drum brakes when the angle of the cable and the brake arm exceed 90° with the brake fully applied. Front and rear brake adjustment is covered in Chapter Three.

ELECTRICAL PROBLEMS

Bulbs which continuously burn out may be caused by excessive vibration, loose connections that permit sudden current surges, poor battery connections, installation of the wrong type bulb, or a faulty voltage regulator.

A dead battery or one which discharges quickly may be caused by a faulty alternator or rectifier. Check for loose or corroded terminals. Shorted battery cells or broken terminals will keep a battery from charging. Low water level will decrease a battery's capacity. A battery left uncharged after installation will sulphate, rendering it useless.

A majority of light and horn or other electrical accessory problems are caused by loose or corroded ground connections. Check those first, then substitute known good units for easier troubleshooting.

TROUBLESHOOTING GUIDE

The following summarizes the troubleshooting process. Use it to outline possible problem areas, then refer to the specific chapter or section involved.

Loss of Power

1. ***Poor compression*** — Check piston rings and cylinder, cylinder head gasket, and valve leaks.
2. ***Overheated engine*** — Check lubricating oil supply, air leaks, ignition timing, clogged cooling fins, slipping clutch, and carbon in the combustion chamber.
3. ***Improper mixture*** — Check for dirty air cleaner, restricted fuel flow through the jets, or clogged gas cap vent hole.

Gearshifting Difficulties

1. ***Clutch*** — Check clutch adjustment, clutch spring, and plates.
2. ***Transmission*** — Check oil quantity and type, oil grade, gearshift mechanism adjustment, return spring, and gear change forks.

Brake Troubles

1. ***Poor brakes*** — Check brake adjustment, brake drum out-of-round, oil or water on brake linings, and loose brake linkage or cables.
2. ***Noisy brakes*** — Check for worn or scratched linings, scratched drums, and dirt in brakes.
3. ***Unadjustable brakes*** — Check for worn linings, drums, and brake cams.
4. ***Miscellaneous*** — Check for dragging brakes and tight wheel bearings.

Steering Problems

1. ***Hard steering*** — Check steering head bearings, steering stem head, and correct tire pressures.
2. ***Pulls to one side*** — Check for worn swing arm bearings and make sure they are properly adjusted. Check also for bent swing arm, bent steering head, and bent frame. Check the alignment of the front and rear wheels.
3. ***Shimmy*** — Check for loose, broken, or missing spokes, deformed wheel rims, worn wheel bearings, and incorrect wheel balance.

Low-speed shimmy is usually caused by the steering head adjustment being too loose. This is a critical adjustment (see Chapter Eight) and if you are unsure of your ability to accurately carry it out, refer the matter to a dealer.

NOTE: If you own a 1978 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER THREE

PERIODIC MAINTENANCE AND TUNE-UP

Regular maintenance is the best guarantee of a trouble-free, long-lasting motorcycle. An afternoon spent now, cleaning and adjusting, can prevent costly mechanical problems in the future, and unexpected breakdowns on the road, trail, or track. **Table 1** summarizes all required scheduled maintenance.

The tune-up procedures presented in this chapter should hold no terror for an owner with average mechanical skills. The operations are outlined step-by-step and are easy to follow.

Instruments and measuring devices calibrated to the metric system, rather than the inch-foot system, will be easier to work with when measuring parts and comparing them to the specifications, and when tightening nuts and bolts to the proper torque.

PERIODIC MAINTENANCE

The periodic maintenance tasks that follow should be performed at the intervals shown in **Table 1**.

Engine Oil and Filter Change

The engine oil should be changed every 2,000 miles, or 60 days, whichever occurs first. These recommendations assume operation in moderate climates. In extremely cold climates, change oil every 30 days regardless of the mileage. The time interval is more important than the mileage interval because acids formed by gasoline and water vapor from condensation will contaminate the oil even if the motorcycle is not run for several months. Also, if the motorcycle is operated under dusty conditions the oil will get dirty more quickly, so change it more often.

Use only a detergent oil with an API rating of SE, SD, or SC. These quality ratings are stamped on the top of the can. Always try to use the same brand of oil. The use of oil additives is not recommended.

SAE 20W-40 oil is recommended for normal operation in moderate climates. The factory recommends SAE 10W-30 if the temperature remains below 60°F (15°C).

Lubrication service requires a filter (C and D models use different filters), 2¼ quarts of oil, and a clean funnel.

1. Run the engine for a few minutes. Warm oil drains faster and carries more sludge with it than cold oil.

2. Remove the skid plate. Remove the dipstick from the frame (**Figure 1**). Place a drip pan of at least 3 quart capacity beneath the engine drain plug located at the bottom rear of the oil pan (**Figure 2**). Remove the bleeder screw (**Figure 3**).

Table 1 MAINTENANCE/LUBRICATION SCHEDULE

Every 1,000 miles

- Check engine oil.
- Check cam chain adjustment.
- Clean and oil air filter.
- Adjust brakes.
- Check front fork condition.
- Check rear shock absorber condition.
- Check rim runout.
- Check spoke tension.
- Check drive chain tension.
- Clean and lubricate drive chain.
- Clean fuel valve (petcock).
- Check battery (XT models).
- Check lights (XT models).

Every 2,000 miles

- Change engine oil.
- Adjust valves.
- Adjust clutch.
- Adjust carburetor.
- Check compression release.
- Check, lubricate, and adjust cables.
- Check breaker points.
- Check and adjust ignition timing.
- Check wiring connections.
- Check spark plug.

Every 4,000 miles

- Change oil filter.
- Clean oil strainer.
- Check compression.
- Check cylinder head fastener torque.
- Check exhaust system.
- Check oil pressure.
- Change fork oil.
- Check swing arm.
- Check steering head.
- Lubricate swing arm pivot.

As necessary (see text)

- Clean carburetor.
- Check flywheel nut tightness.
- Replace air filter.
- Check wheel bearings.
- Replace drive chain.
- Clean fuel tank.

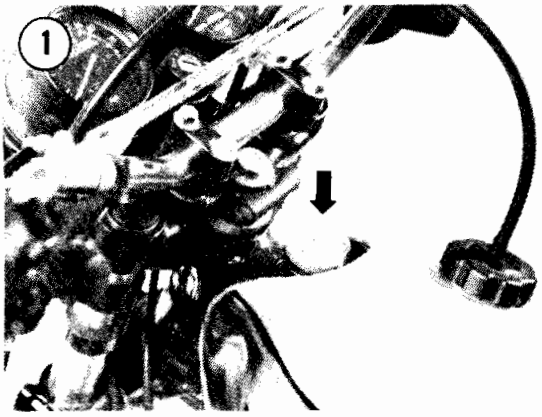
COMPETITION MOTORCYCLES

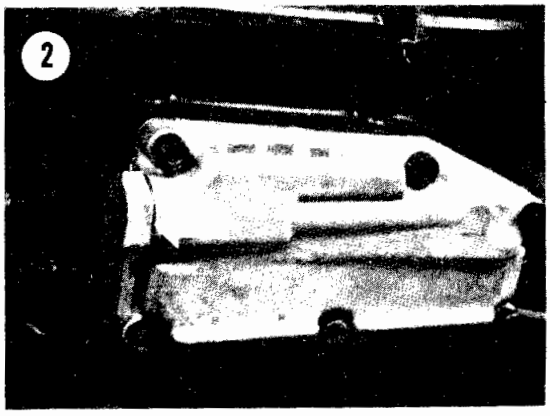
Before every practice

- Check engine oil level.
- Check high-tension lead tightness.
- Adjust clutch.
- Adjust carburetor.
- Check suspension and steering.
- Check rims and spokes.
- Check tire pressures.
- Check brake adjustment.
- Check drive chain adjustment.

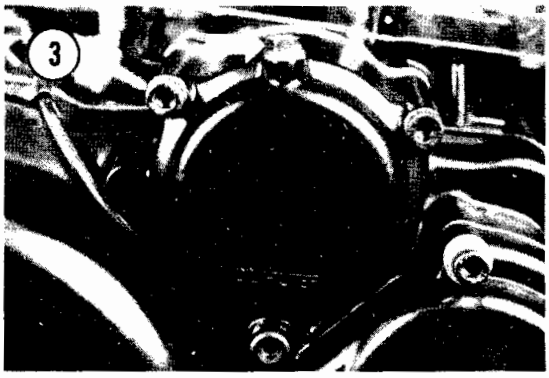
Before every race

- All "before practice" items.
- Check ignition timing.
- Check contact breaker gap.
- Check spark plug condition and gap.
- Clean air filter.
- Check, lubricate, and adjust cables.
- Inspect chain and sprockets.
- Check exhaust system.
- Check fuel connections.
- Check fasteners for tightness, broken or missing lockwashers and safety wire.



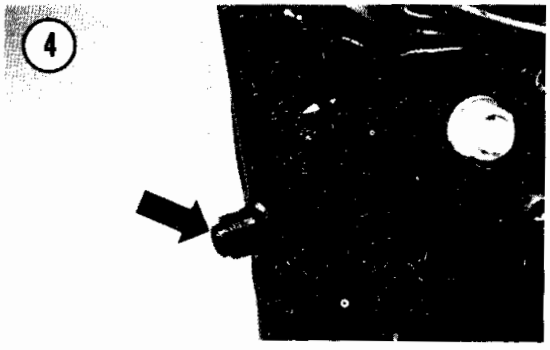


3. Remove the oil drain plug from the oil pan, allow the oil to drain, and clean the plug of metal particles. Move the drain pan to the frame drain and remove the plug (**Figure 4**). Allow the oil to drain.
4. Unscrew the screws and remove the filter cover (**Figure 5**). Remove the filter.
5. Inspect the O-rings and replace them if they are damaged. Install a new filter cartridge. Install the cover.
6. Crank the engine several times with the kickstarter to force out any oil trapped in the engine's internal recesses.

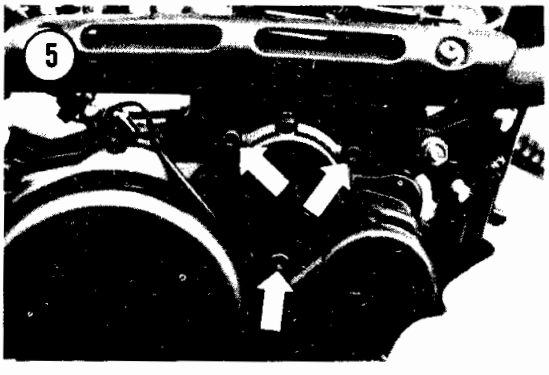


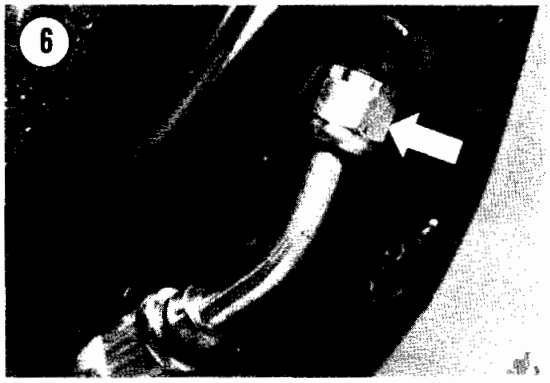
NOTE

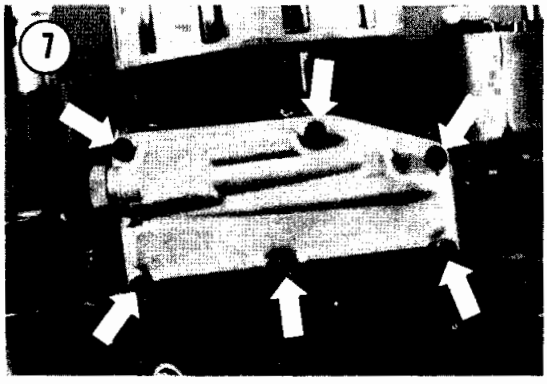
Pour the used oil into plastic bottles, such as those used for laundry bleach. Cap tightly and take to a service station for recycling.

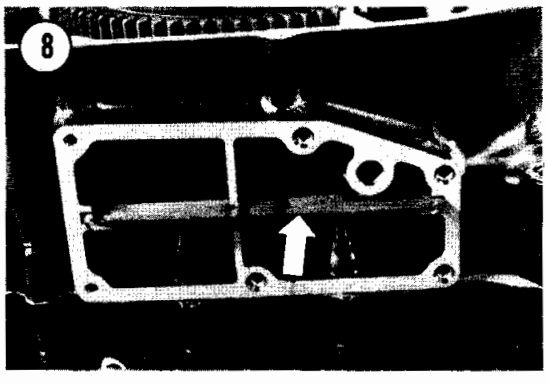


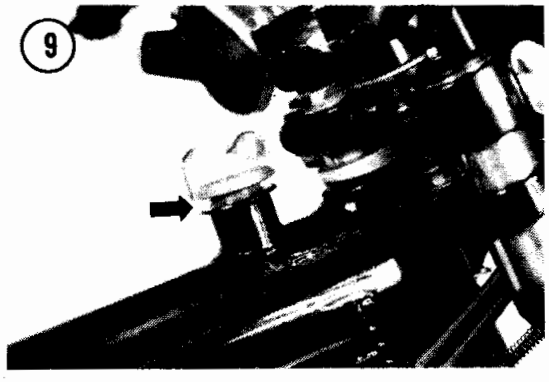
7. Disconnect the oil pipe from the front frame downtube (**Figure 6**). Remove the filter screen and clean it. The tool kit supplied with the bike contains a box wrench for this purpose.
8. Unscrew the Allen bolts from the sump cover (**Figure 7**) and remove the cover. Remove the oil strainer (**Figure 8**). Clean the strainer in solvent and install it and the cover. This is necessary at every oil change.
9. Install the frame filter screen drain plugs, bleeder screw, and skid plate.
10. Pour fresh oil into the filter pipe on the top frame tube. Check the oil level by inserting the oil level gauge/cap assembly into the oil. Do not screw the gauge into the oil tank when taking the oil level measurements.

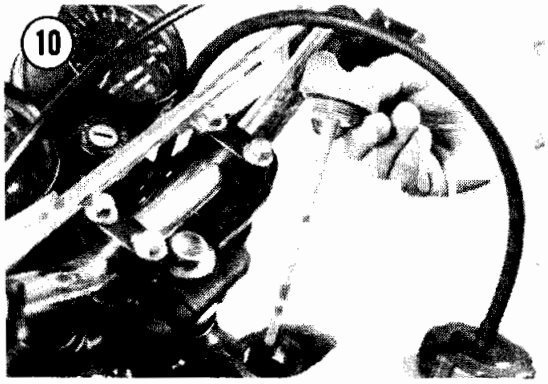












See **Figure 9.** Slowly add oil until the correct level is obtained. The correct refill amount is 2.1 liters (2.2 U.S. quarts; 1.8 Imp. quarts).

11. Start the engine and allow it to warm up. Check for seepage around the drain plugs, the filter cover, sump cover, and the oil pipe on the front frame downtube. Correct any leaks or seepage. Check the oil level with the dipstick and add oil if the level is not between the two lines. See **Figure 10.**

CAUTION

Do not overfill. Excess oil could cause seals to blow out.

Carburetor Service

The carburetor should be cleaned and inspected at least every six months, or when varnish and lead deposits on the outside of the carburetor can no longer be removed with regular cleaning solvent; the condition of the outside of the unit often indicates similar deposits will be found on the inside. Major carburetor service appears in Chapter Six. Routine adjustments (idle mixture, idle speed, and throttle cable free play) are covered under *Carburetor Adjustment* in this chapter.

Exhaust System Service

The exhaust system should be cleaned and inspected every 2,000 miles. This is covered in Chapter Six.

Flywheel Nut

The torque of the flywheel nut should be checked during tune-up — every 2,000 miles.

1. Remove the left-front engine cover.

2. Hold the flywheel with a strap wrench to prevent it from turning and then tighten the nut to 7-9 mkg (51-65 ft.-lb.). See **Figure 11**. Install the cover.

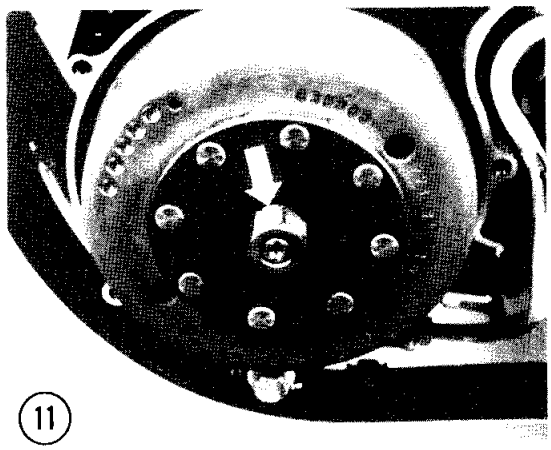
Compression Release

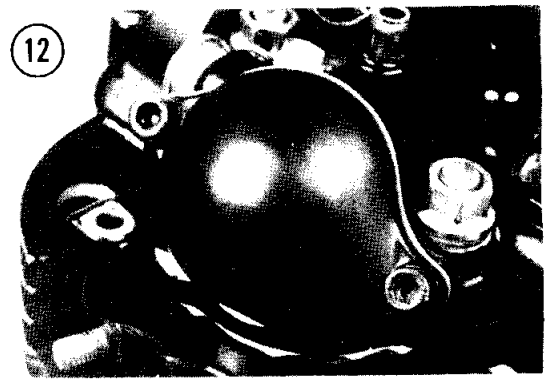
The compression release should be checked and adjusted if necessary every 2,000 miles. The release raises the exhaust valve rocker, partially opening the exhaust valve to make starting easier. If it is adjusted too tight (no free play) it can prevent the exhaust valve from sealing, resulting in a loss of power, reluctance to start, or burning of the valve. If it is too loose, it will not open the exhaust valve and will make starting difficult.

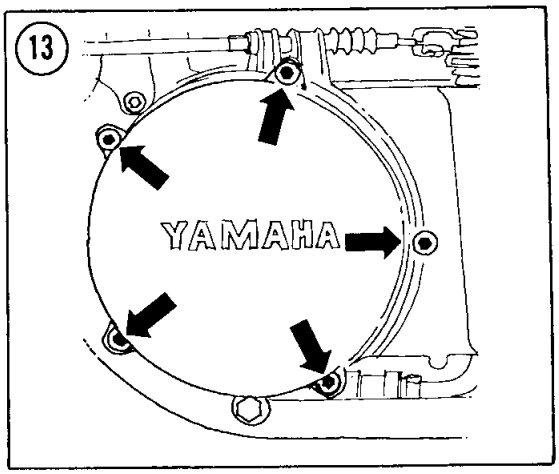
1. Remove the rocker adjuster covers **(Figure 12)**, the left engine cover **(Figure 13)**, and the spark plug.
2. Rotate the crankshaft and line up the "T" mark on the flywheel with the fixed mark on the crankcase **(Figure 14)** to bring the piston to TDC on the compression stroke.

> NOTE: *Check both rockers for free play. If the exhaust rocker is tight, rotate the crankshaft an additional 360° and line up the "T" mark once again. Recheck the rockers; they should both now have free play, indicating that the piston is at* TDC *on compression.*

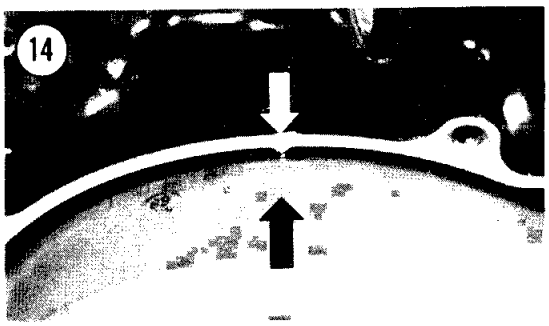
3. Turn the front wheel to full left lock. Loosen the locknut on the adjuster at the control lever and turn the adjuster in or out until free play is 5-10mm (0.2-0.4 in.). See **Figure 15**.

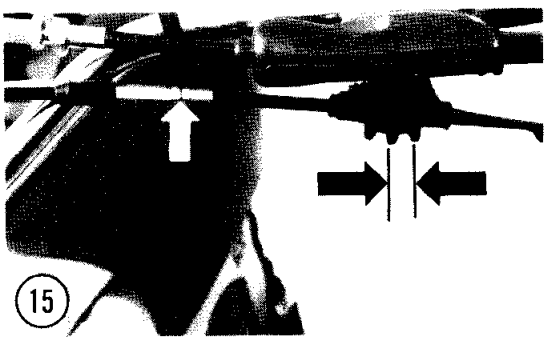

11

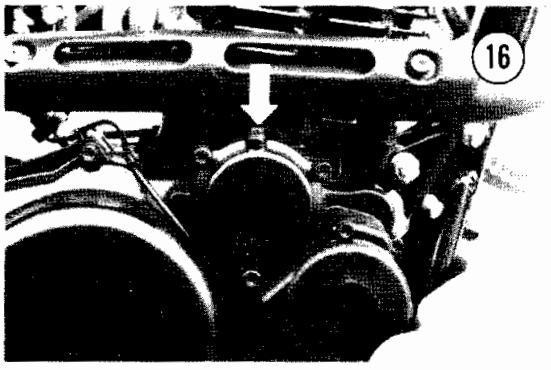

12

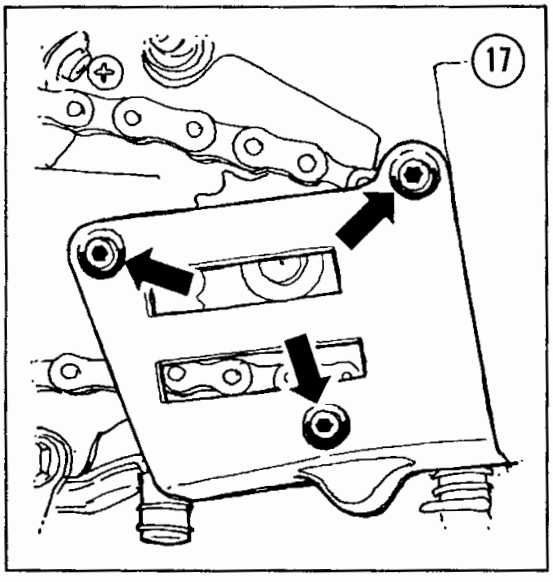


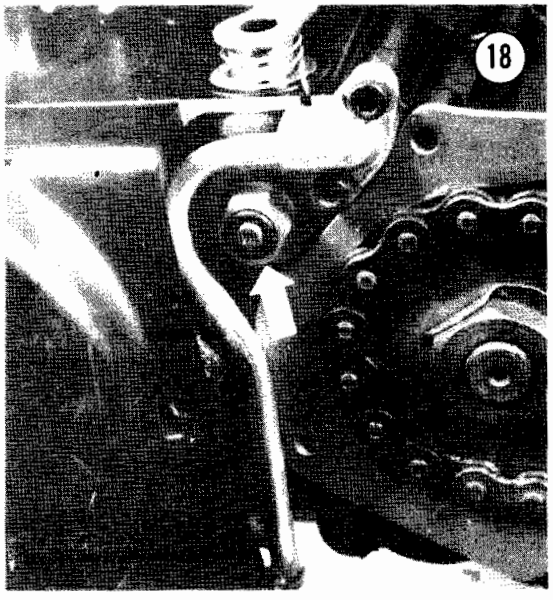
13


14


15







Then tighten the locknut without further turning the adjuster. Install the rocker adjuster covers and the engine side cover.

Oil Pressure

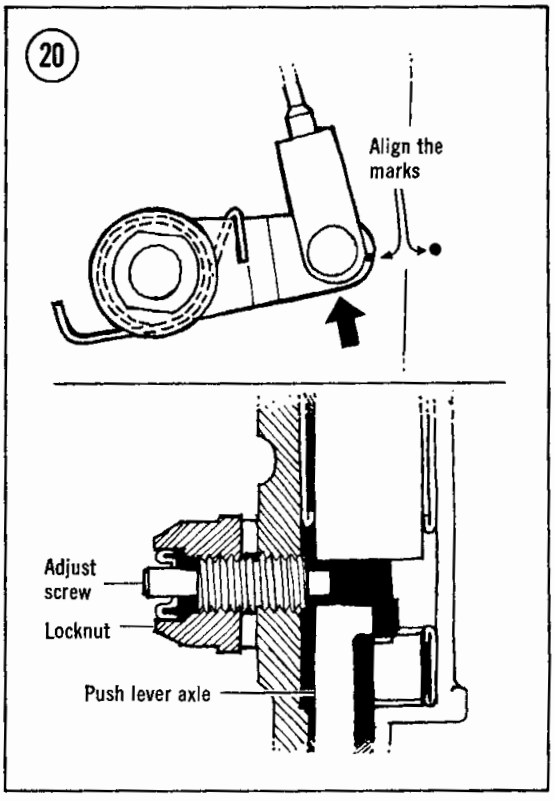
Oil pressure should be checked at 2,000-mile intervals. Remove the bleed screw from the oil filter cover (**Figure 16**) and install an oil pressure test gauge. Start the engine and allow it to warm up. Slowly increase engine speed from idle and observe the gauge. The pressure should increase from about 2.5 psi to 14 psi. If the pressure does not increase, the pump or any of the pressure-fed bearings may be worn. If the pressure increases much beyond 14 psi, the bypass valve may not be operating. In either case, a thorough inspection of the pump and oil system, along with the bearings and journals is indicated.

Clutch Adjustment

Correct clutch adjustment ensures that there is sufficient free play in the clutch operating mechanism to prevent slipping and unnecessary wear of the plates and release mechanism, and not so much free play that the clutch tends to drag or grab when disengaged. The basic adjustment of the clutch release mechanism should be checked and corrected first, then the cable should be adjusted for correct free play.

1. Remove the left-rear engine cover (**Figure 17**).
2. Loosen the locknut on the clutch adjuster screw (**Figure 18**) and turn the adjuster in just until it makes contact. *Don't overtighten it; it can be easily stripped.*
3. Push the clutch arm forward until it stops (**Figure 19**).
4. Turn the adjuster screw (which is an eccentric) until the mark on the arm lines up with the mark on the crankcase (**Figure 20**). Then, hold the adjuster to prevent it from turning further and tighten the locknut. Install the side cover.
5. Loosen the knurled locknut on the cable adjuster at the control lever (**Figure 21**) and turn the adjuster in or out until there is about $\frac{3}{16}$ in. (5mm) of free play. Tighten the locknut without further turning the adjuster.





6. If the cable has stretched to the extent where it is no longer possible to correctly adjust free play with the control lever adjuster, loosen the locknut on the adjuster in the cable sheath (**Figure 22**) and turn this adjuster in or out until the free play is correct. Then tighten the locknut without further turning the adjuster.

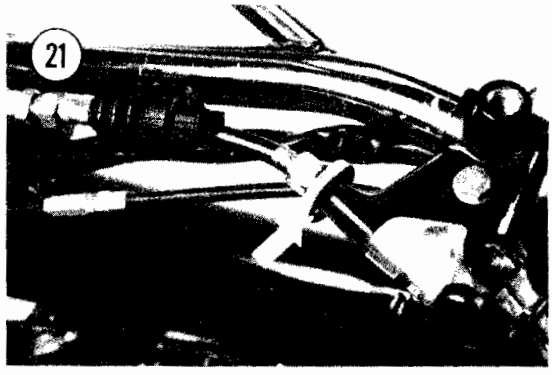
Front Brake Adjustment

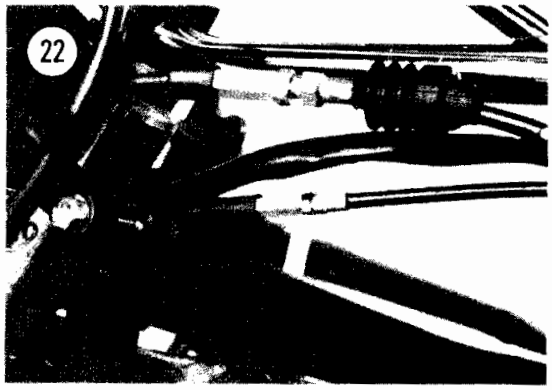
Front brake adjustment is largely a matter of personal preference; however, the procedure that follows offers a good starting point.

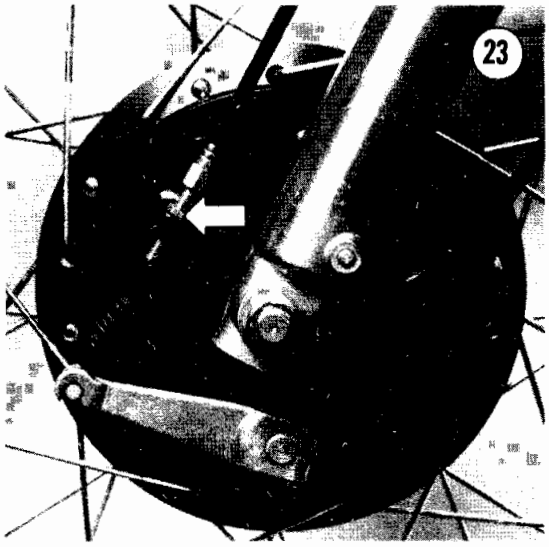
1. Loosen the locknut on the adjuster at the control lever. Screw the adjuster about ⅓ of the way out of the lever base.

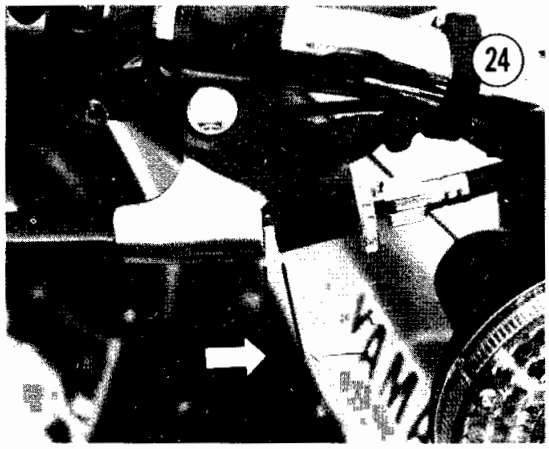
2. Loosen the locknut on the brake adjuster on the backing plate (**Figure 23**) and turn the adjuster in or out until there is 5-8mm (0.2-0.3 in.) of free play at the lever (**Figure 24**). Then tighten the locknut without further turning the adjuster. Tighten the locknut on the control lever adjuster.

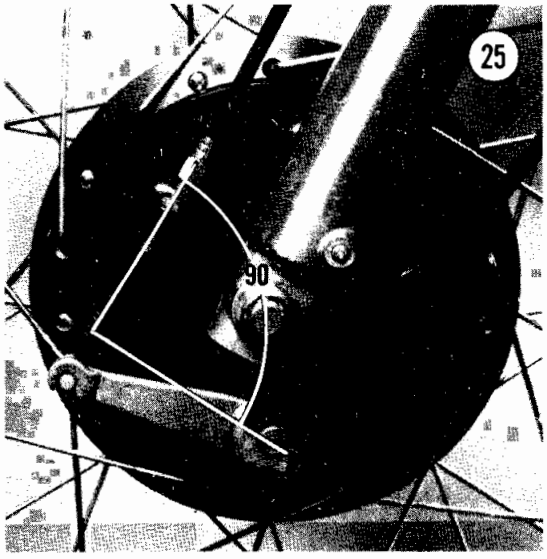
3. Fully apply the front brake and check the position of the brake arm on the backing plate.

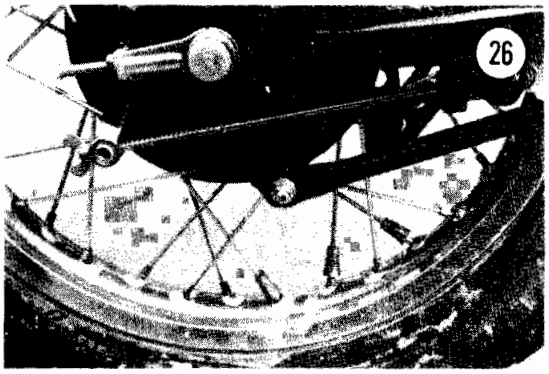


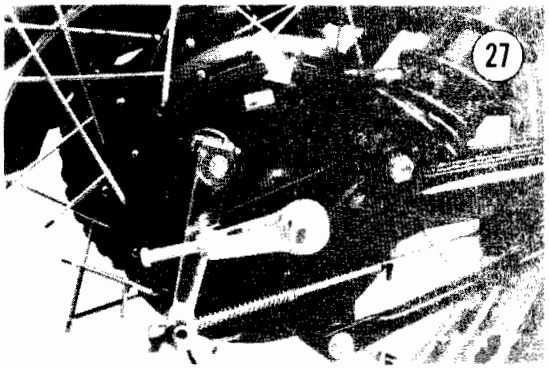












It should be about 90° to the cable (**Figure 25**) for maximum braking effectiveness. If it is not, it may be necessary to remove the arm from the brake cam shaft and rotate it on the splines.

Rear Brake Adjustment

The rear brake should be adjusted so there is 20-30mm (0.8-1.2 in.) of free play at the forward end of the pedal.

If adjustment is required, turn the wing nut (**Figure 26**) as required. With the brake fully applied, check the relationship of the brake arm to the cable. It should be 90° for maximum effectiveness. If it is not, remove the arm and rotate it on the brake cam shaft splines as necessary. Then, readjust the free play.

> NOTE: *Brake adjustment should be checked after drive chain free play has been adjusted.*

Brake Lining Condition

To check the condition of the brake linings, remove the inspection plug from the backing plate (**Figure 27**) and measure the thickness of

the lining with a caliper. The linings should be replaced when they are less than 2mm (0.08 in.) thick. See Chapters Eight and Nine.

Front Fork and Steering Inspection

The front fork and steering should be checked for looseness and damage and the steering adjusted, if necessary, every 2,000 miles of light to moderate use (street and easy trail riding), or every 1,000 miles of hard trail use or competition. The procedures are covered in Chapter Eight.

Fork Oil Changing

The oil in the front fork legs should be changed every 4,000 miles or when loss of damping indicates that the oil level may be low.

> NOTE: *If oil loss is rapid, the fork seals may be severely worn. Refer to Chapter Eight,* ***Seal Replacement***

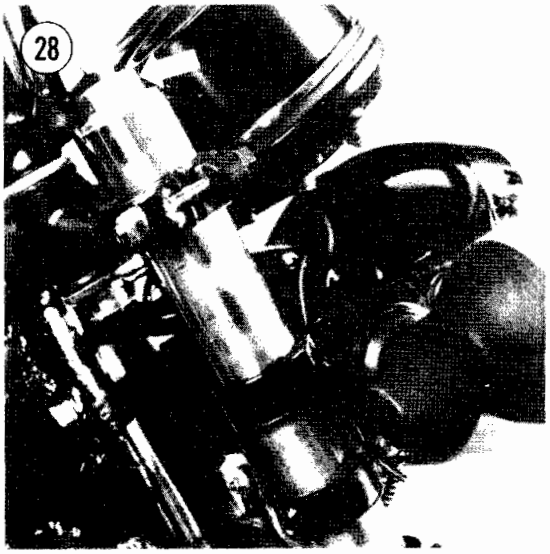
1. Block up the motorcycle so the front wheel is clear of the ground.
2. Unscrew the caps from the top of the fork tubes (**Figure 28**).
3. Place a drip pan beneath one ofthe fork legs and unscrew the drain plug (**Figure 29**). Check the condition of the plug gasket and replace it if it is damaged. Allow several minutes for the oil to drain, and then slowly pump the fork up and down to expel any remaining oil. Do the same for the opposite leg, then install the drain plugs.
4. Refer to **Table 2** and fill each fork leg with the correct amount of SAE-20W fork oil.

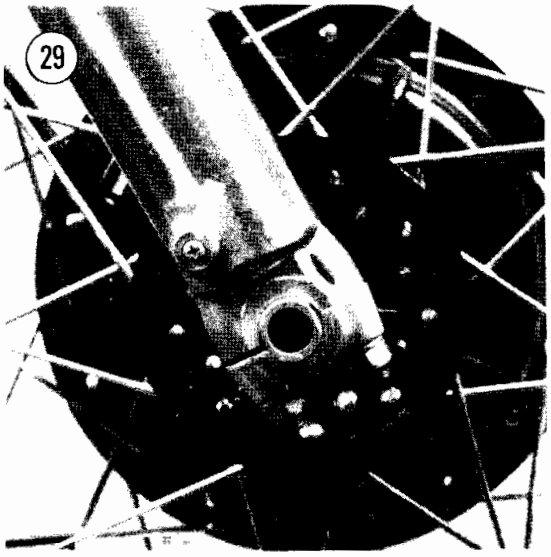
> NOTE: *If damping is not to your liking, alter it with a change in viscosity — not quantity. For example, if damping is too harsh, try a 10W oil, and if it is insufficient, try a 30W oil.*

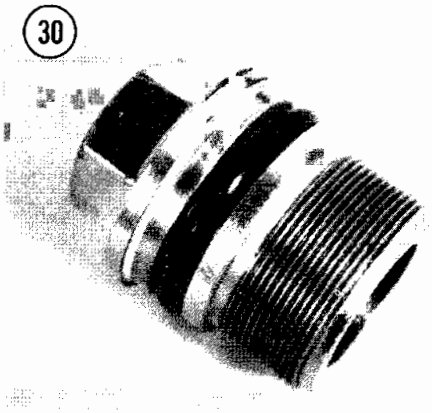
5. Inspect the O-rings on the caps (**Figure 30**) and replace them if they are damaged.

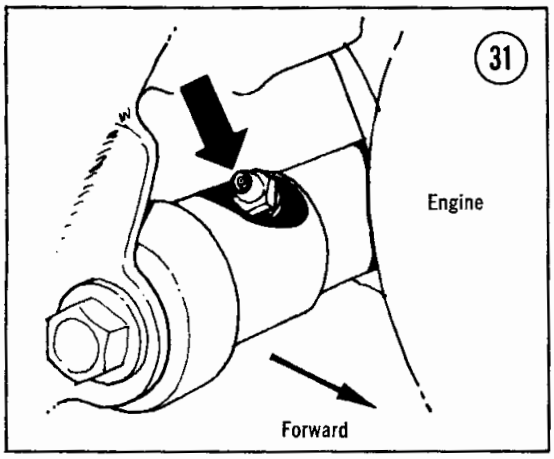
Table 2 FORK OIL CAPACITY

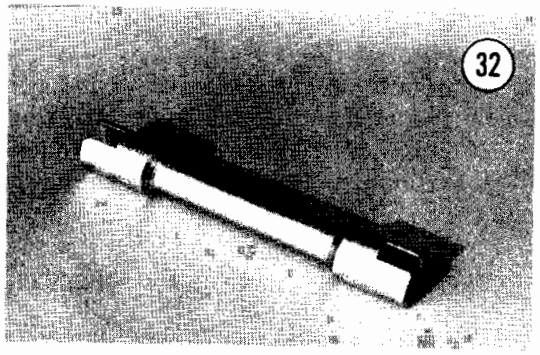
Model	Quantity (per leg)
XT/TT500C	217cc (7.34 oz.)
XT/TT500D	223cc (7.54 oz.)

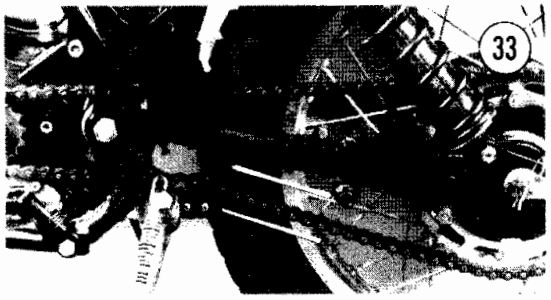












6. Install the caps and tighten them to 1.5-2.5 mkg (10-18 ft.-lb.).

7. Place the motorcycle back on both wheels and pump the front end up and down to distribute the oil. Check the drain plugs for leakage and correct the condition if necessary.

Rear Suspension Inspection

The rear suspension units (shock absorbers) should be checked every 2,000 miles of light to moderate use (every 1,000 miles for hard trail use or competition) for bending or damage to the damper rods and tightness of the attachment points. Removal and installation are covered in Chapter Nine.

Swing Arm Bearings Inspection

The swing arm bearings should be checked for looseness and wear every 4,000 miles, or when handling problems indicate that replacement may be necessary. This is usually experienced as a tendency for the motorcycle to "throttle steer" (pull to the left during acceleration and to the right during deceleration and braking). Inspection and replacement procedures are covered in Chapter Nine.

Swing Arm Lubrication

Lubricate the swing arm pivot every 4,000 miles using a pressure or pump type grease gun filled with lithium base grease. Pump the grease into the arm through the fitting located on the right side (**Figure 31**).

Wheels and Spokes

Check wheel rims for bends and other signs of damage. Check for broken or bent spokes. Replace damaged ones immediately. See Chapter Eight, *Spoke Replacement*.

Tap each spoke lightly with a small hammer or wrench. All spokes should emit the same sound. A spoke that is too tight will have a higher pitch than the others; one that is too loose will have a lower pitch. If only one or two spokes are slightly out of adjustment, adjust them with a spoke wrench (**Figure 32**). If more are affected, the wheel should be removed and trued by a specialist.

Check the rim runout as described in Chapter Eight, *Spoke Adjustment and Rim Runout*.

Refer to Chapter Eight, *Front Wheel — Inspection*, or Chapter Nine, *Rear Wheel — Inspection*, and inspect the wheel bearings for wear and damage. If radial play can be felt, or if the bearings are noisy when they are rotated, they should be replaced as described.

Drive Chain Adjustment

1. Have someone hold the motorcycle upright, with it sitting on both wheels.

2. Check the up and down movement of the chain (**Figure 33**). It should be 30-40mm

(1.2-1.6 in.). If it is more or less, adjust it by first loosening the axle nut (**Figure 34**). On XT models, first remove the lock clip or cotter key.

3. Loosen the adjuster locknuts (**Figure 35**) and turn the adjusters in or out equally until the movement of the chain is correct. Rotate the wheel as you check and adjust the chain at its tightest point.

4. Check the alignment of the wheel with relationship to the drive sprocket by sighting along the chain from the rear (**Figure 36**). If the alignment is correct (A), tighten the locknuts. If the wheel is cocked to the left (B), loosen the left adjuster and tighten the right. If the wheel is cocked to the right (C), loosen the right adjuster and tighten the left. When the alignment and chain movement are correct, tighten the locknuts and the axle nut, and install the clip or cotter key (XT models).

5. Refer to *Rear Brake Adjustment* and adjust the free play of the brake pedal after the chain movement has been adjusted.

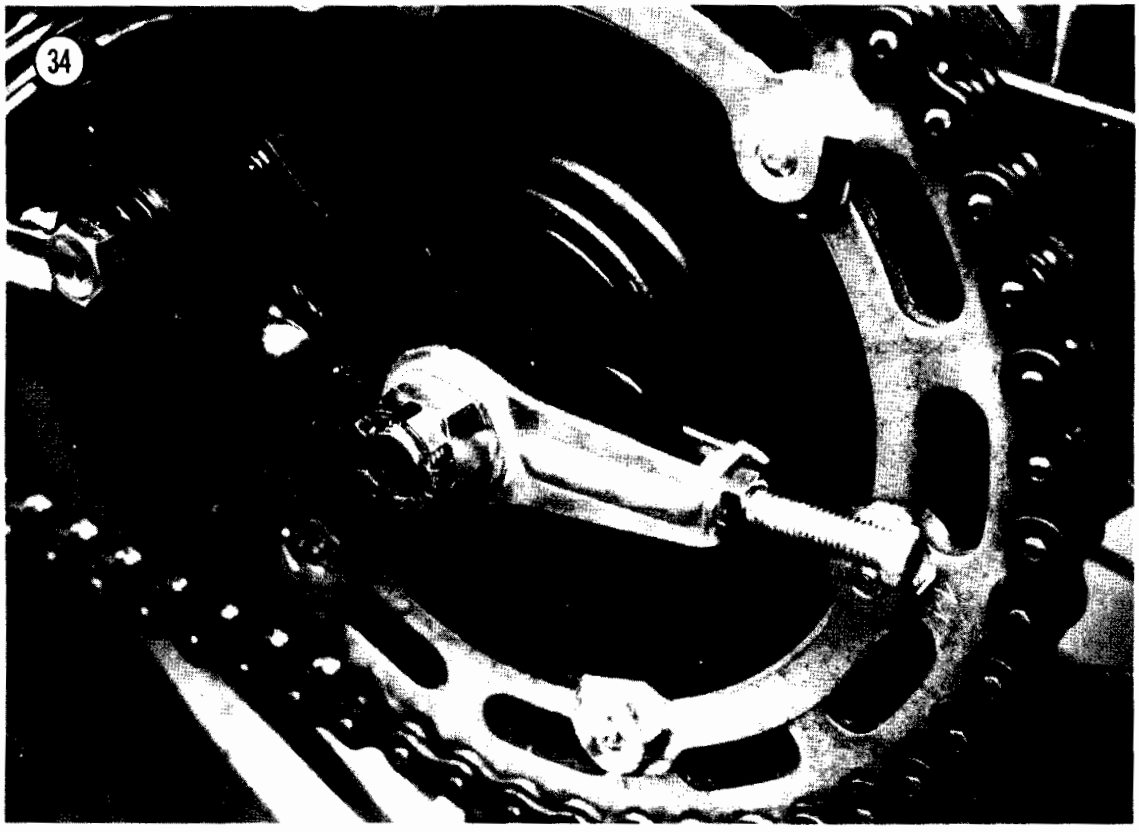
Drive Chain Cleaning and Lubrication

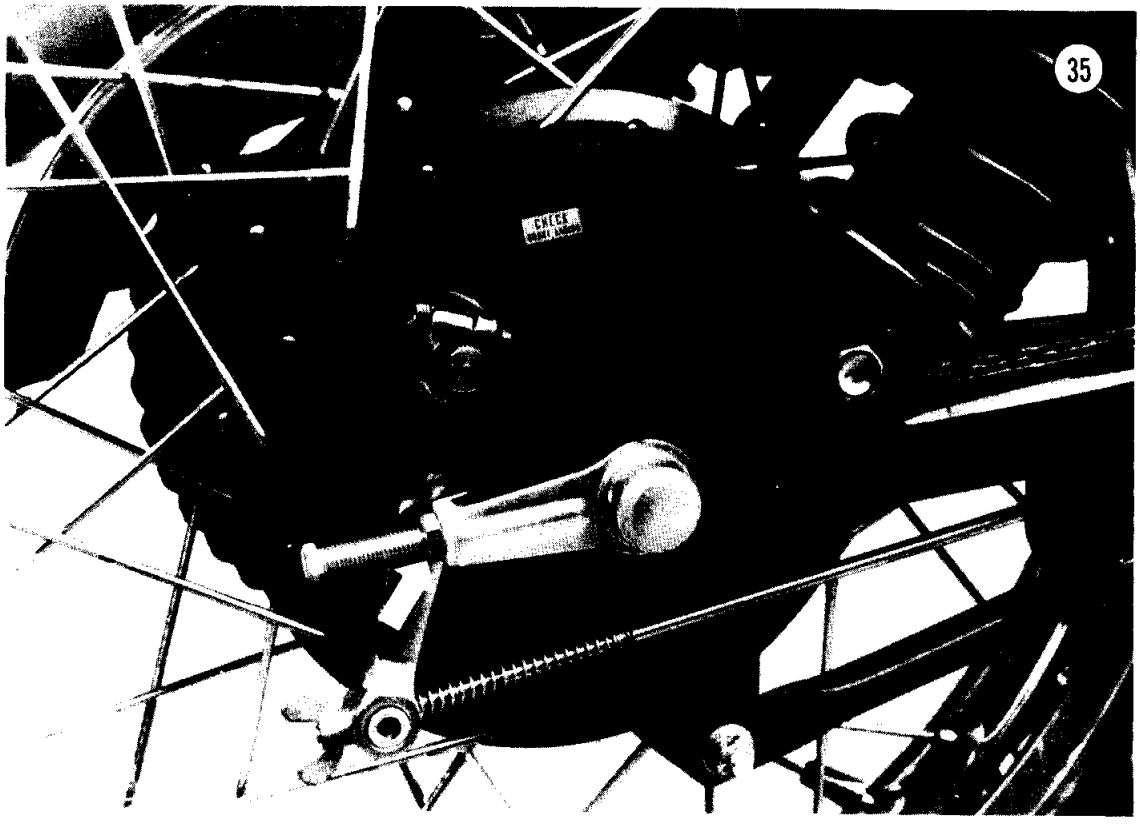
The drive chain should be removed, cleaned, and lubricated every 2,000 miles of normal operation. In the meantime, the chain should be periodically lubricated with a good quality chain lube, and the manufacturer's instructions should be followed. For severe use (off-road, in mud, water, deep sand, etc.), chain service intervals should be as frequent as 100-200 miles to ensure maximum chain life.

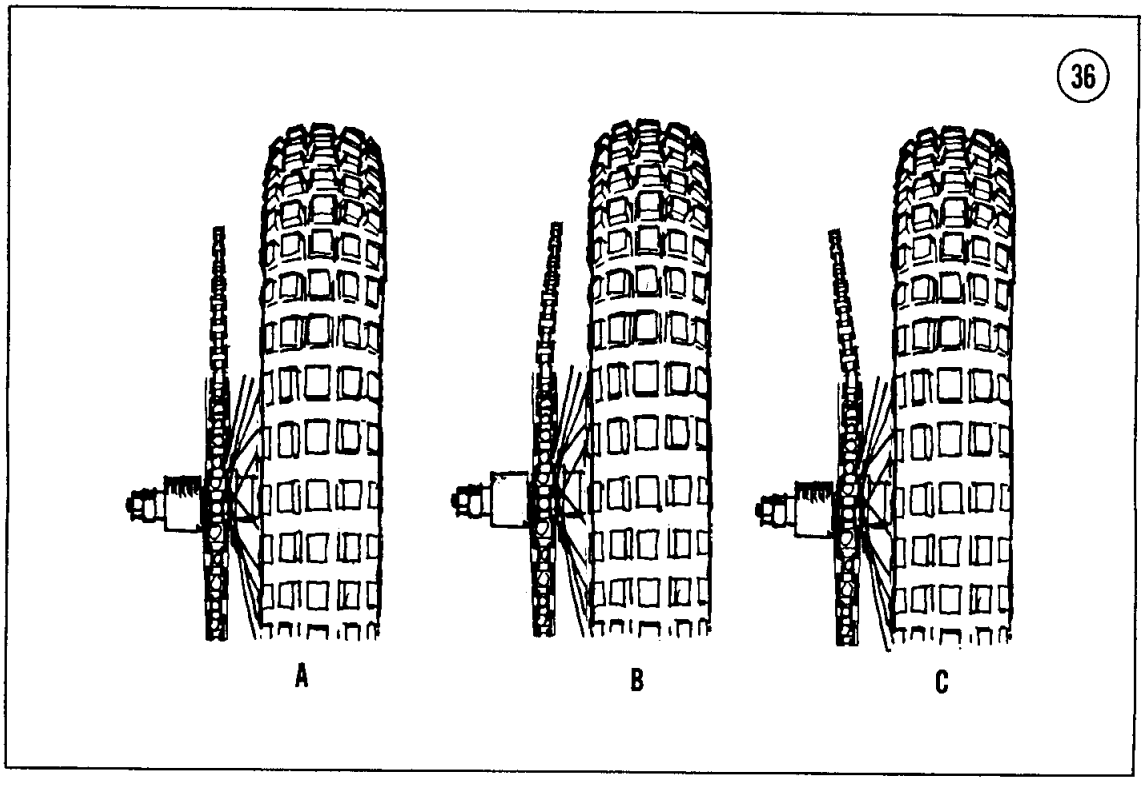
1. Remove the chain from the motorcycle and clean it thoroughly with solvent. Use a stiff brush to remove dirt from the side plates and rollers.

2. Hang up the chain by one end and dry it with compressed air.

3. Immediately lubricate the chain, either with a commercial chain lube or with 30W engine oil. If oil is used, submerge the chain in an oil-filled container and allow it to sit for several minutes to allow the oil to penetrate the pins and rollers. Then, hang up the chain and wipe excess oil off the outside with a clean shop rag.




35


36
A
B
C

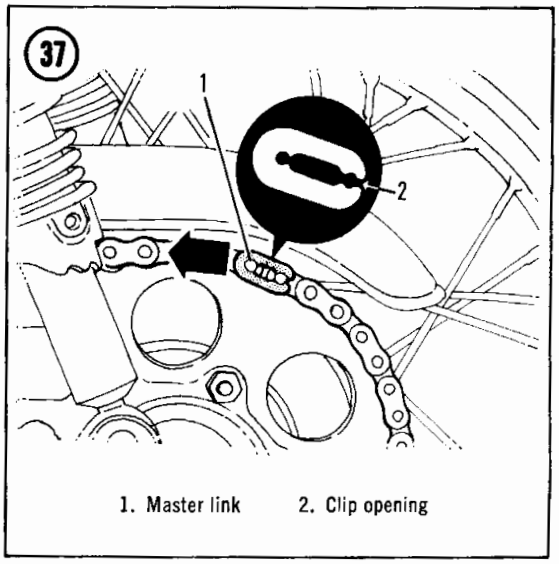
4. Install the chain. Install the lock clip on the master link with the closed end of the link facing in the direction of chain travel (**Figure 37**) to prevent chain acceleration from throwing the clip off.
5. Adjust the chain as described above.

Drive Chain Replacement

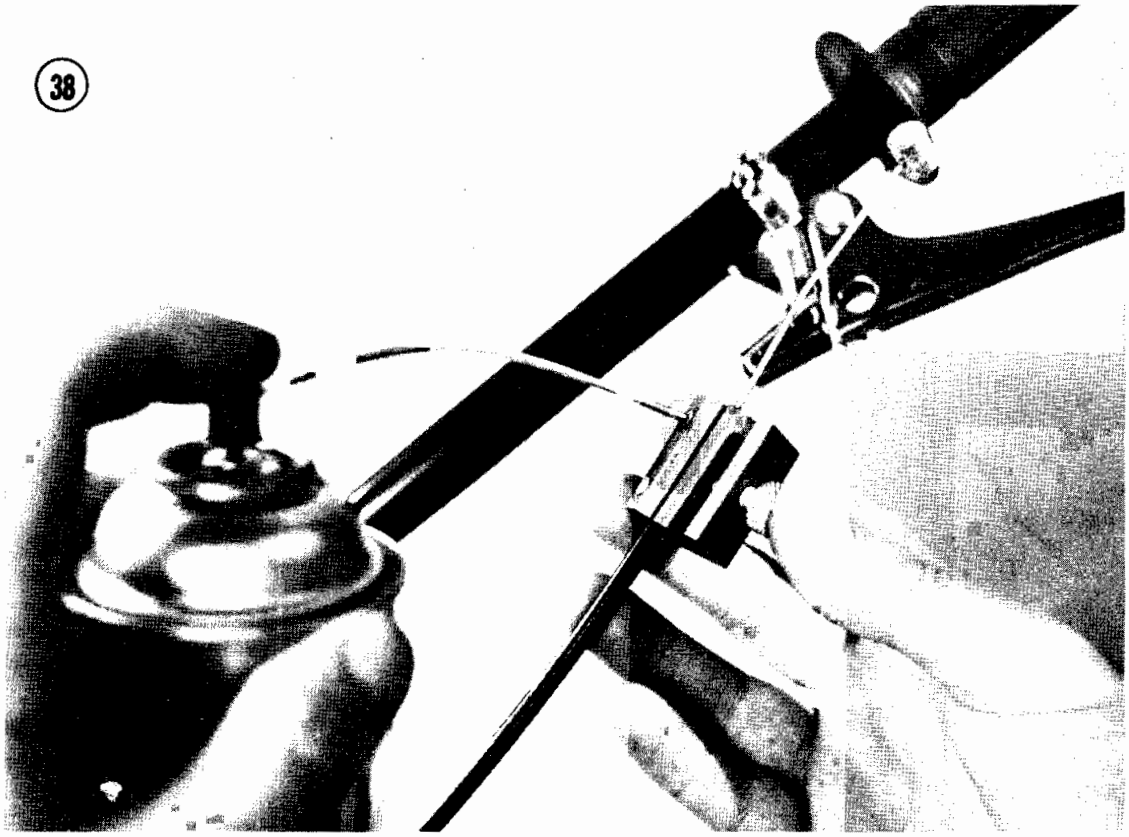
The drive chain should be replaced when cleaning and lubrication will not work out kinks or when it has stretched to the point that it can be pulled ½ tooth length away from the rear of the rear sprocket.

Control Cable Lubrication

Control cables should be lubricated at 2,000-mile intervals. Disconnect the cable that is to be lubricated from its control (throttle, brake lever, clutch lever, or compression release lever), and attach a cable lubricator like the one shown in **Figure 38**. This is the only certain method of ensuring complete lubrication. (There are several lubricators of this type available through dealers.) Force lubricant through the cable until it runs out the other end, then reconnect the cable and adjust it as described earlier.



1. Master link 2. Clip opening



Fuel Tank and Fuel Valve

At least annually, the fuel tank and fuel valve should be removed and cleaned with fresh gasoline. The procedures are covered in Chapter Six, *Fuel Tank — Cleaning* and *Fuel Valve — Cleaning*.

Electrical System

The electrical system should be inspected every 2,000 miles for loose or corroded connections, chafed or burned insulation that could lead to a short, or poor battery condition and charge lever (see *Battery — Care and Inspection* and *Testing* in Chapter Seven).

Chapter Seven also covers test procedures for individual components in the charging system.

TUNE-UP

A complete tune-up should be performed every 2,000 miles of normal riding (combination of highway and city). More frequent tune-ups may be required if the motorcycle is used primarily in stop-and-go city traffic.

For maximum performance and fuel economy, the expendable ignition parts (spark plug, points, and condenser) should be replaced during the tune-up and you should have them on hand before beginning. If replacement is impractical, the old parts can be reused once if their condition is satisfactory as described later. Tune-up specifications appear in **Table 3**.

Because different systems in an engine interact, the procedures should be done in the following order:

1. Tighten cylinder head nuts and bolts.
2. Adjust cam chain tension.
3. Adjust valve clearance.
4. Work on ignition system.
5. Adjust carburetor.

NOTE: *The engine must be cold at the beginning of the tune-up procedure. If it is not, head fastener torque and valve clearance will be affected.*

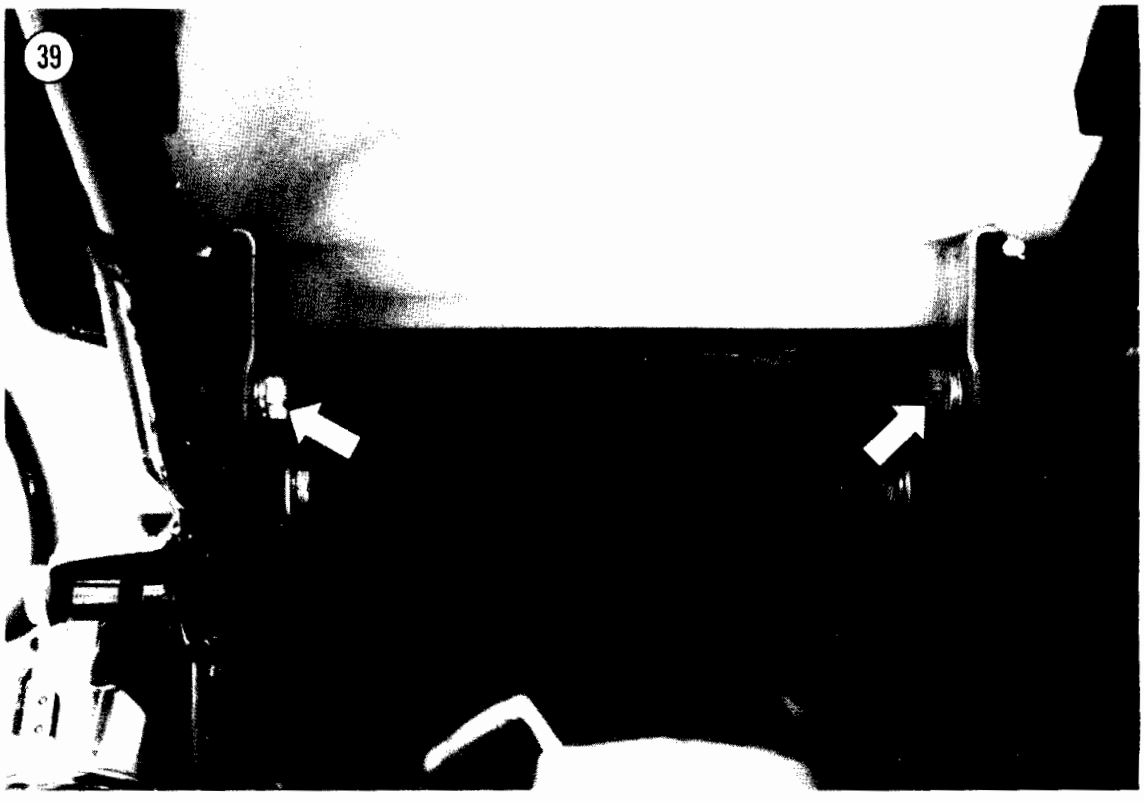
Parts required for a tune-up are a spark plug, a set of points and a condenser.

CYLINDER HEAD FASTENER TORQUE

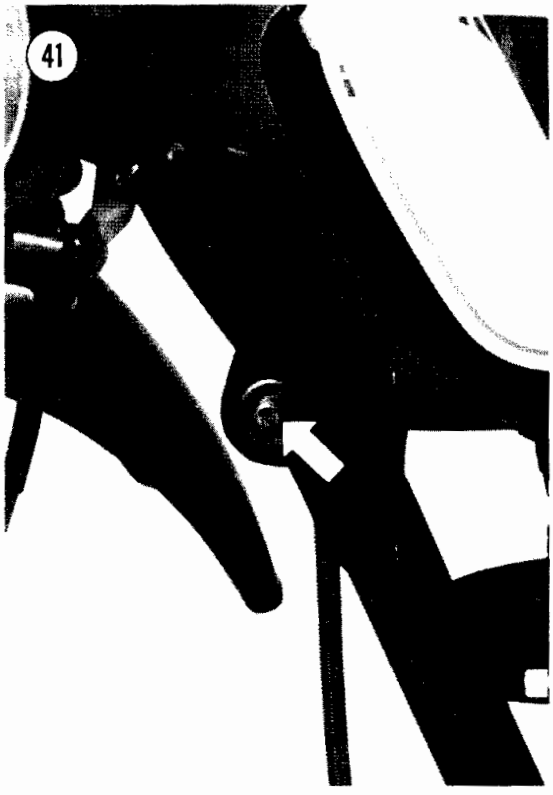
1. Turn the fuel tap to OFF and disconnect the line. Remove the seat **(Figure 39)** and the fuel tank **(Figures 40 and 41)**.

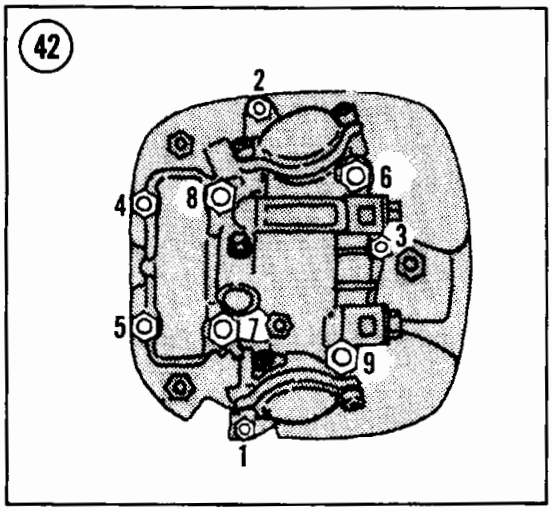
Table 3 TUNE-UP SPECIFICATIONS

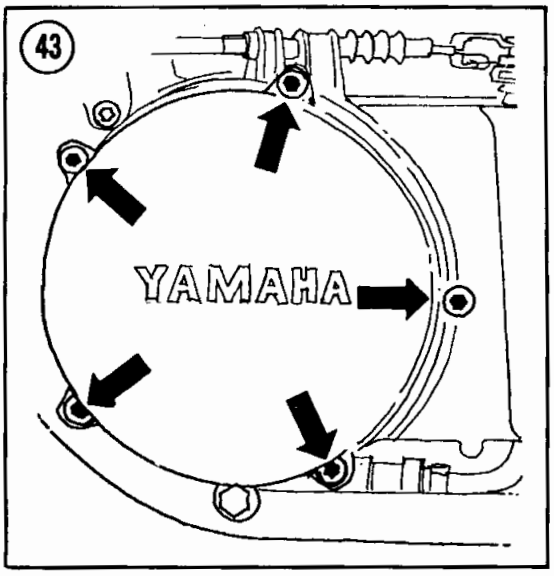
Cylinder head fastener torque	
10mm nuts	3.5-4.0 mkg (25-29 ft.-lb.)
6mm bolts	0.8-1.2 mkg (6-9 ft.-lb.)
Valve clearance	
Intake	0.07-0.12mm (0.003-0.005 in.)
Exhaust	0.12-0.17mm (0.005-0.007 in.)
Spark plugs	
Type	NGK BP-7ES Champion N-7Y ND W22-EP
Gap	0.7-0.8mm (0.028-0.032 in.)
Contact breaker (point) gap	0.35mm (0.014 in.)
Ignition timing	
Idle	7°
Advanced	24-30° at 2,800-3,200 rpm
Idle speed	
C models	1,100 rpm
D models	1,200 rpm

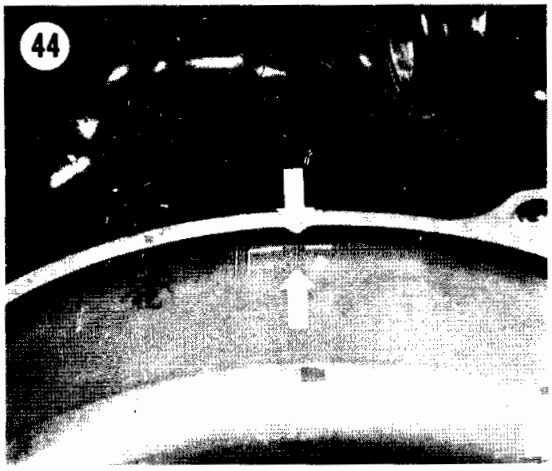

39


40


41



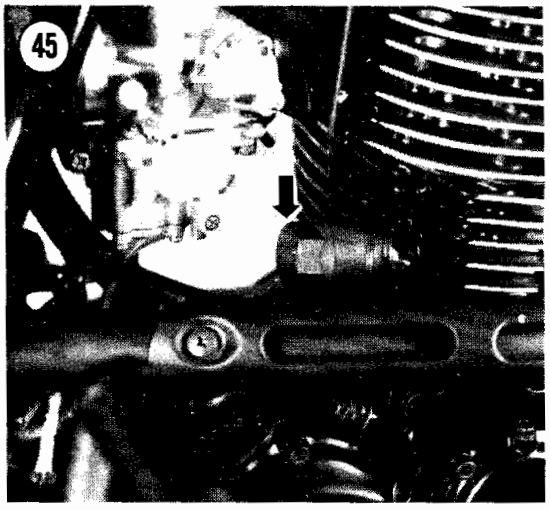


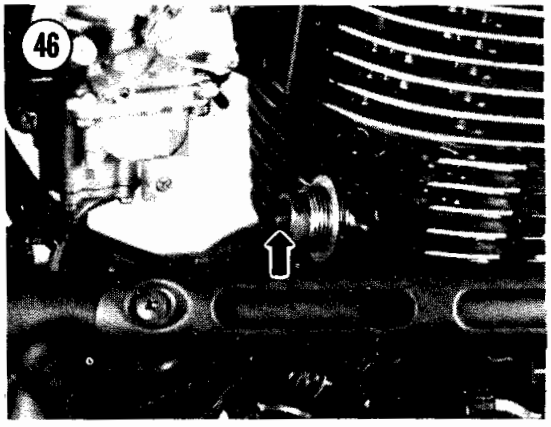


2. Check the torque of the cylinder head nuts and Allen bolts in the pattern shown in **Figure 42**. The 10 mm nuts should be tightened to 3.5-4.0 mkg (25-29 ft.-lb.); tighten the 6 mm Allen bolts to 0.8-1.2 mkg (6-9 ft.-lb.).

CAM CHAIN ADJUSTMENT

1. Remove the left engine cover (**Figure 43**). On D models, first remove the skid plate.
2. Rotate the crankshaft counterclockwise (viewed from the left side) and line up the "T" mark on the flywheel with the fixed pointer on the crankcase (**Figure 44**). The slack portion of the timing chain is now positioned in the area of the tensioner.
3. Remove the cap from the chain adjuster and loosen the locknut (**Figure 45**). Screw in the adjuster until it is flush with the pushrod (**Figure 46**).





4. Start the engine and allow it to idle. Watch the pushrod; it should move slightly. If it does not, the adjuster is too tight. Loosen the locknut and turn the adjuster until pushrod movement is apparent. Shut off the engine, tighten the locknut and install the cap. Allow the engine to cool before proceeding with valve adjustment.

NOTE

The valve clearance must be checked and set with the engine cold.

VALVE ADJUSTMENT

1. Remove the intake and exhaust adjuster covers (**Figure 47**).
2. Align the "T" mark on the flywheel with the fixed pointer on the crankcase with both valves closed. Check the rockers for movement. If the exhaust rocker cannot be moved, rotate the crankshaft 360°. The engine should now be at TDC on compression. Recheck the rockers; they should both move now.
3. Check the clearance of the rocker adjusters (**Figure 48**). The intake clearance should measure 0.07-0.12mm (0.003-0.005 in.). Exhaust clearance should be 0.12-0.17mm (0.005-0.007 in.). If adjustment is required, loosen the locknut and turn the adjuster in or out until it is correct. There should be a slight resistance felt when the feeler gauge is drawn from between the adjuster and the valve tip. Hold the adjuster to prevent it from turning further and tighten the locknut. Recheck the clearance to make sure the adjuster did not move.
4. Install the adjuster covers. Install the fuel tank and the seat and connect the fuel line.

COMPRESSION CHECK

Compression should be checked at 4,000-mile intervals. The best time to do this is just after removing the spark plug for a tune-up.

1. Remove the plug and clean out any dirt or grease.
2. Insert the tip of the compression gauge into the hole, making sure it is seated correctly.
3. Open the throttle all the way and make sure the choke on the carburetor is open.
4. Crank the engine several times and record the highest pressure reading on the gauge.



5. The normal compression is 135-150 psi. If the reading is significantly lower than 135 psi, proceed to the next step.

6. Pour a tablespoon of motor oil into the cylinder, turn the engine over several times to distribute the oil, and record the compression.

If oil raises compression significantly — 10 psi in an old engine — the rings are worn and should be replaced.

If the compression does not rise, one or both valves are probably not seating correctly.

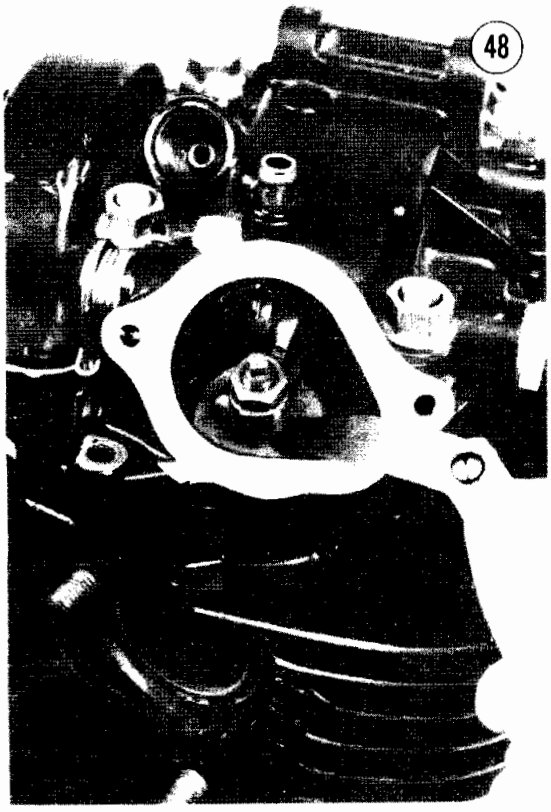
SPARK PLUG

Removal

1. Blow out any debris from the recesses around the spark plug.

2. Carefully remove the spark plug lead. Do not jerk it; the wire could be pulled out of the insulator cap. Check the wire for broken or cracked insulation. Replace it if its condition is in doubt.

3. Unscrew the spark plug with a socket that has a rubber insert to grip the insulator.



Inspection

The normal color of the tip of the spark plug insulator ranges from light tan to chocolate brown, depending on the concentration of lead in the gas being used.

Figure 49 (next page) shows some abnormal tip conditions, along with probable causes.

Plug Types

Recommended spark plugs are shown in **Table 3**.

Old Plugs

If the old plug is to be used, inspect it for cracked insulators, damaged threads, or eroded electrodes. Discard it if any of these conditions are present.

Cleaning

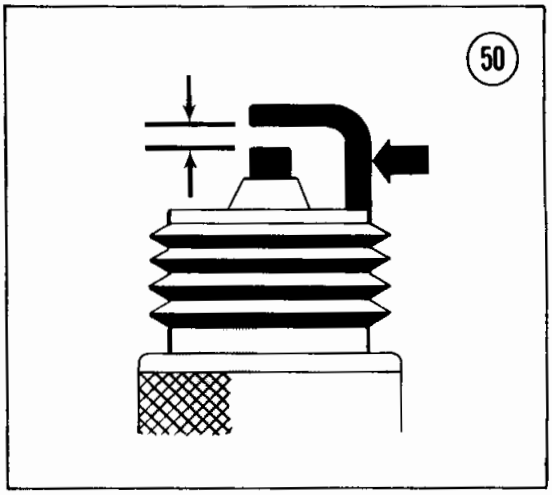
Clean the tip of the plug with a sandblasting machine — some gas stations have them — or with a wire brush and solvent, followed by compressed air.

CAUTION

When blowing solvent and debris out of the plug with compressed air, hold the plug so the electrode end is pointed away from you.

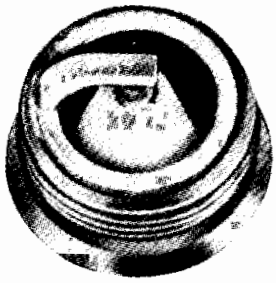
Gapping and Installation

1. Adjust the spark plug gap to 0.7-0.8mm (0.028-0.032 in.) using a wire feeler gauge (**Figure 50**).



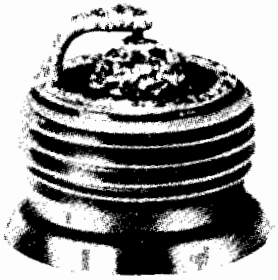
(49)

SPARK PLUG CONDITION



NORMAL

•Identified by light tan or gray deposits on the firing tip.
•Can be cleaned.



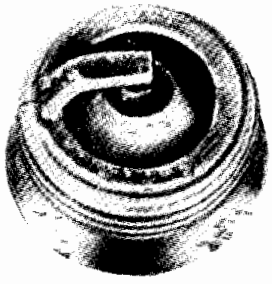
GAP BRIDGED

•Identified by deposit buildup closing gap between electrodes.
•Caused by oil or carbon fouling. If deposits are not excessive, the plug can be cleaned.

OIL FOULED

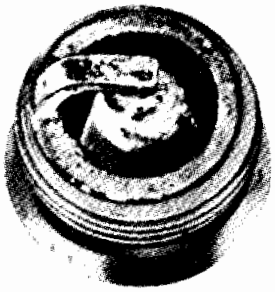


•Identified by wet black deposits on the insulator shell bore and electrodes.
•Caused by excessive oil entering combustion chamber through worn rings and pistons, excessive clearance between valve guides and stems, or worn or loose bearings. Can be cleaned. If engine is not repaired use a hotter plug.



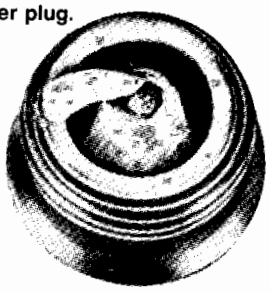
CARBON FOULED

•Identified by black, dry fluffy carbon deposits on insulator tips, exposed shell surfaces and electrodes.
•Caused by too cold a plug, weak ignition, dirty air cleaner, too rich a fuel mixture, or excessive idling. Can be cleaned.



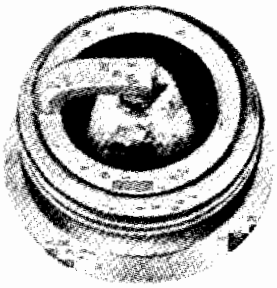
LEAD FOULED

•Identifed by dark gray, black, yellow, or tan deposits or a fused glazed coating on the insulator tip.
• Caused by highly leaded gasoline. Can be cleaned.



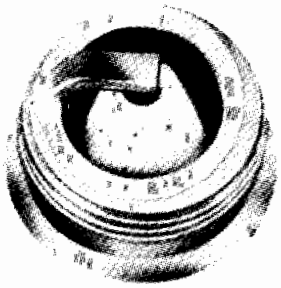
WORN

•Identified by severely eroded or worn electrodes.
•Caused by normal wear. Should be replaced.



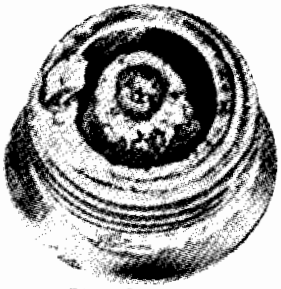
FUSED SPOT DEPOSIT

•Identified by melted or spotty deposits resembling bubbles or blisters.
•Caused by sudden acceleration. Can be cleaned.



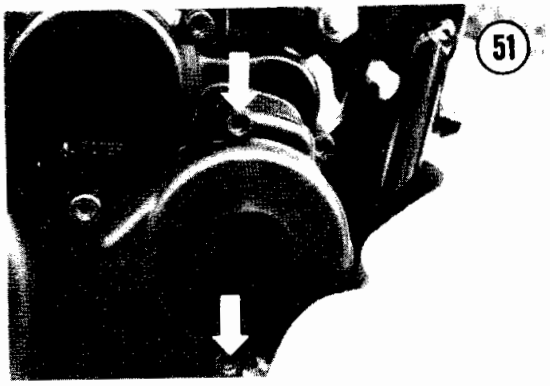
OVERHEATING

•Identified by a white or light gray insulator with small black or gray brown spots and with bluish-burnt appearance of electrodes.
•Caused by engine overheating, wrong type of fuel, loose spark plugs, too hot a plug, or incorrect ignition timing. Replace the plug.



PREIGNITION

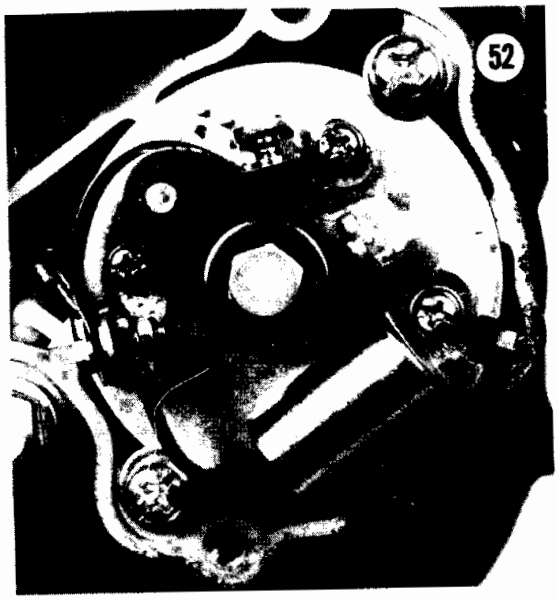
•Identified by melted electrodes and possibly blisterd insulator. Metallic deposits on insulator indicate engine damage.
•Caused by wrong type of fuel, incorrect ignition timing or advance, too hot a plug, burned valves, or engine overheating. Replace the plug.



NOTE: *Vary the gap by bending only the outside electrode. The gap is correct when the gauge slips through with a slight amount of drag.*

2. Use a new gasket and screw the plug back into the cylinder head, turning the socket by hand until the plug is seated. Then tighten ½ to ¾ of a turn more. If a torque wrench is used, tighten the plug to 2.5-3.0 mkg (18-22 ft.-lb.).

NOTE: *If a tune-up is being performed, don't install the spark plug at this time.*

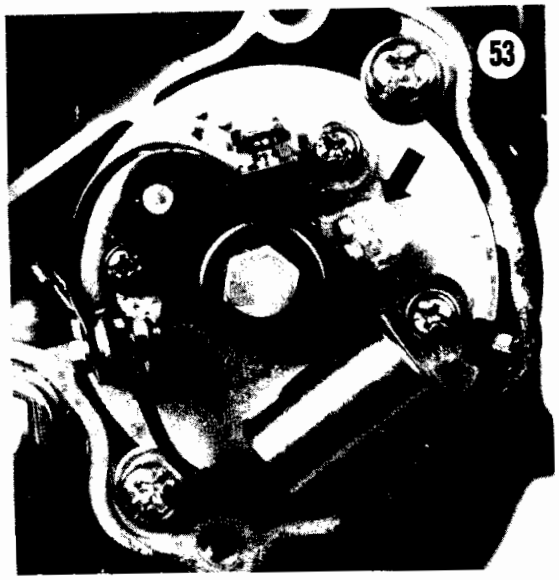


CONTACT BREAKER

Through normal use, contacts gradually pit and burn. If this condition is not too serious, they can be dressed with a few strokes of a point file. Do not use emery cloth or sandpaper; they tend to round off the contacts, and abrasive particles will remain on them, causing arcing and burning. If the contacts cannot be dressed with just a few strokes, replace them.

If the contacts are still serviceable after filing, remove all residue with lacquer thinner or special contact breaker cleaner. Close the contacts on a piece of strong, white paper, such as a business card. Pull the card through the contacts until no particles or discoloration remain. Finally, rotate the crankshaft and observe the contacts as they open and close. If they do not meet squarely and slight bending of the movable contact will not correct the condition, replace them.

Adjust the contact gap and ignition timing as described below.



Replacement

The condenser should be routinely replaced when the contact breaker assembly is replaced.

1. Remove the contact breaker cover (**Figure 51**).

2. Unscrew the small terminal bolt and disconnect the primary ignition lead (**Figure 52**). Remove the condenser mounting screw and the two contact breaker mounting screws. Remove the condenser and breaker.

3. Install the new breaker assembly and condenser. Connect the primary lead. Apply a couple of drops of contact breaker lube to the cam lubricator wick (**Figure 53**).

Gap Adjustment

1. Rotate the flywheel until the contacts are at their widest opening. Measure the gap with a flat feeler gauge. The gap should be 0.35mm (0.014 in.).
2. If adjustment is required, loosen the two contact breaker mounting screws (**Figure 54**).
3. Insert the tip of a screwdriver between the raised knobs on the stationary plate and the notch in the moveable breaker plate (**Figure 55**) and carefully twist the screwdriver clockwise or counterclockwise until the gap is correct. Then, tighten the mounting screws and double check the gap.

IGNITION TIMING

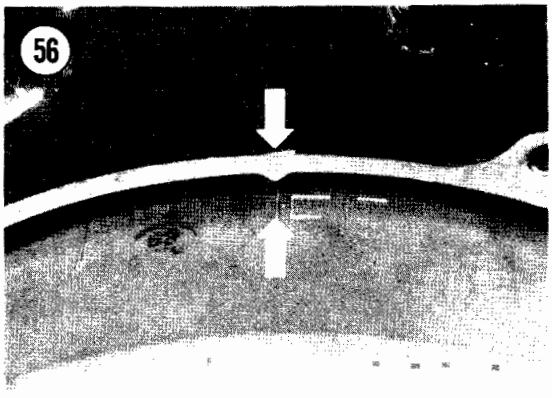
1. Align the "F" mark on the flywheel with the fixed pointer on the crankcase (**Figure 56**).
2. Connect a continuity checker or lamp, or buzz box as shown in **Figure 57**.
3. Slightly loosen the two baseplate screws (**Figure 58**). Slowly turn the baseplate until the points just begin to open (the lamp will go out or the buzzer will stop). Tighten the screws.
4. Rotate the flywheel back and forth. The points should just begin to break or make contact each time the "F" mark passes the stationary mark, as indicated by the lamp or buzzer.
5. Install the fuel tank and connect the lines. Install the seat. Install the spark plug in the cylinder head (see *Spark Plug-Gapping and Installation*) and connect the high-tension lead.

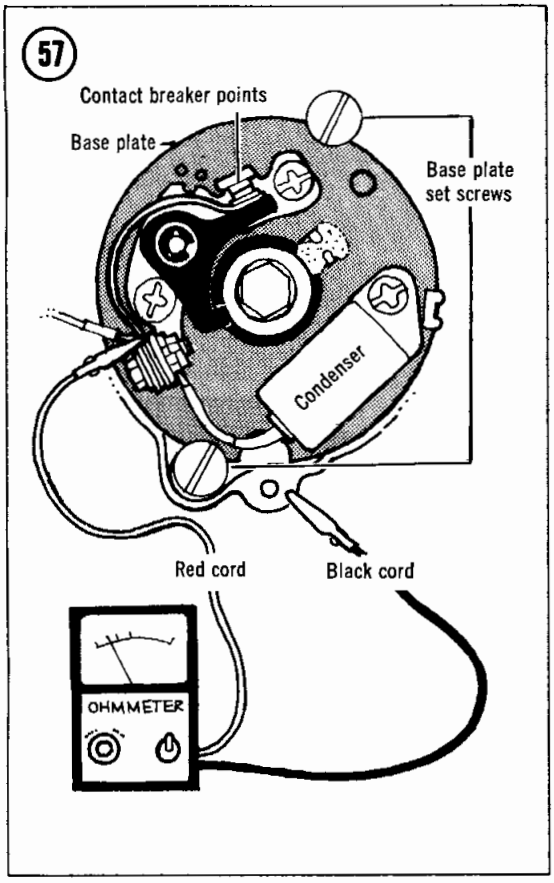
NOTE: *After all the tune-up steps have been performed and the engine has been restored to running condition, connect a timing light in accordance with the light manufacturer's instructions. Start the engine and allow it to idle. Direct the light at the timing marks on the flywheel and crankcase. The "F" mark should line up with the fixed mark (**Figure 56**).*

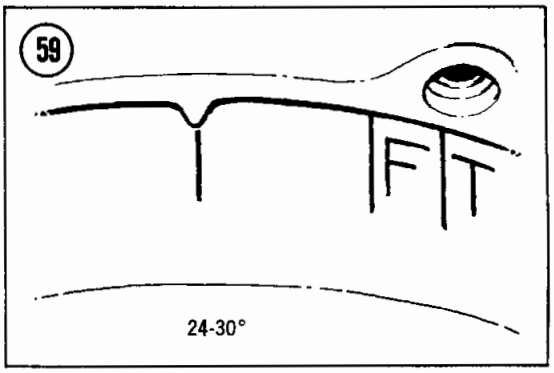
*Increase engine speed to 2,800-3,200 rpm and observe the movement of the "F" mark (**Figure 59**). It should advance to 24-30°. If it does not, advance unit should be checked as described in Chapter Seven.*

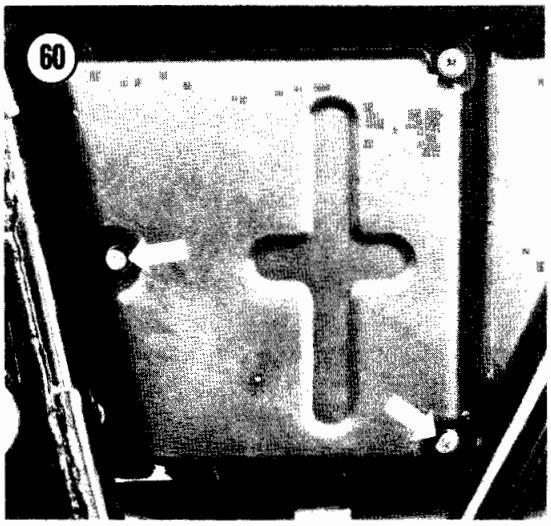


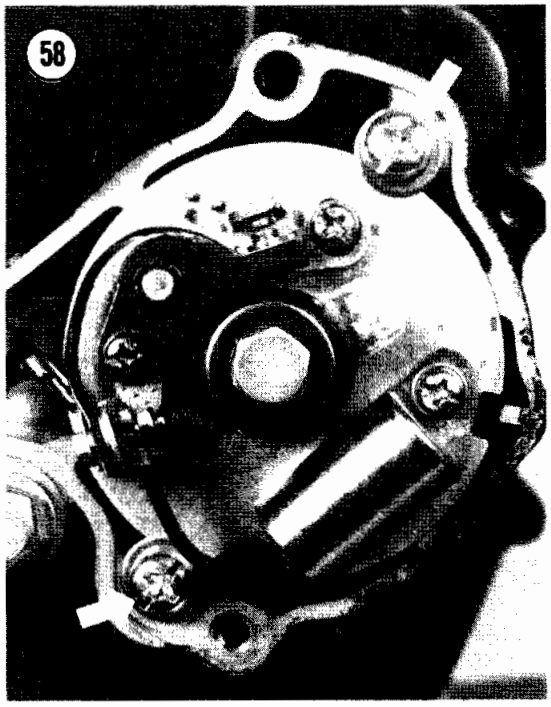












AIR CLEANER

The air cleaner should be cleaned and reoiled every 2,000 miles of normal operation. If the motorcycle is operated under extremely dusty conditions, the air cleaner should be checked more frequently and cleaned when caking begins to appear on the outer surface. It is essential that the cleaner be serviced before the carburetor is adjusted; if it is dirty it will affect the fuel/air mixture ratio.

1. Remove the right cover and unscrew the 3 screws from the air box cover (**Figure 60**). Remove the cover and the air cleaner assembly.

2. Remove the wire mesh from the filter element (**Figure 61**). Thoroughly clean all of the parts in solvent and blow them dry with compressed air. Thoroughly wash the element itself in solvent and gently squeeze it to remove solvent and dirt. *Do not wring the element to remove solvent; it can very easily tear.*

3. Oil the element with motor oil and carefully work it into the entire element. The element must be damp but it should not drip oil. Install the wire mesh.

4. Coat the sealing surfaces of the filter with water-proof grease (**Figure 62**).

5. Assemble the filter and install it in the air box. Install the air box cover and outer cover.

CARBURETOR ADJUSTMENT

All the preceeding steps under *Tune-Up* must be carried out before the carburetor can be satisfactorily adjusted.

1. Turn the pilot screw in until it just contacts its seat (**Figure 63**). *Don't tighten it; it can be easily stripped.* Then, back the screw out 1¼-¾ turns.

2. Start the engine and allow it to warm up at idle. Then, turn the idle speed screw (**Figure 64**) until the idle speed is 1,100 rpm (for C models) or 1,200 rpm (D models).

3. Turn the pilot screw either in or out until the engine speed increases to its highest idle point. If, for instance, the speed increases as the pilot screw is turned out ¾ turn but then begins to drop as you continue to turn it out, turn it back in slowly until the speed again increases. The idle mixture, controlled by the pilot screw, is correct when the idle speed is highest, without altering the position of the idle speed screw.

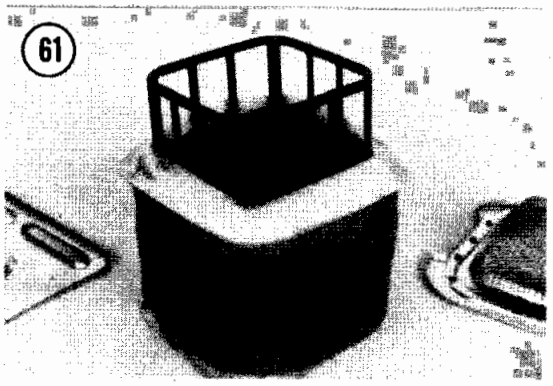
4. When the pilot screw adjustment is correct, readjust the idle with the idle speed screw (1,100 rpm for C models; 1,200 rpm for D models).

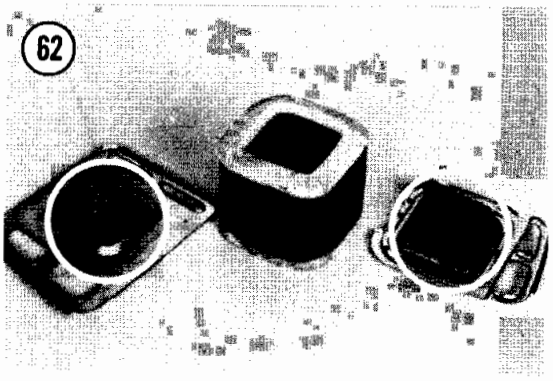
THROTTLE CABLE ADJUSTMENT

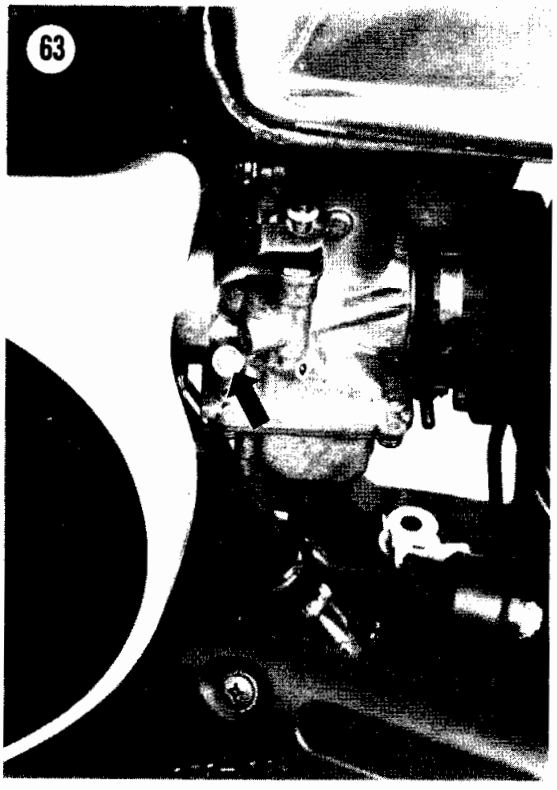
1. Check the throttle cable free play (**Figure 65**). It should be 2-5mm (0.08-0.20 in.).

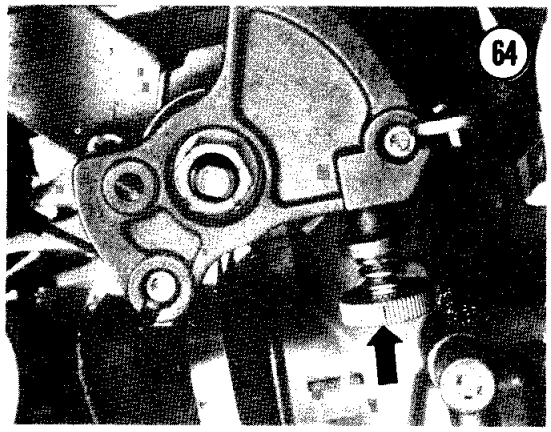
2. If adjustment is required, loosen the locknut on the cable adjuster beneath the fuel tank (**Figure 66**) and turn the adjuster in or out until the free play is correct.

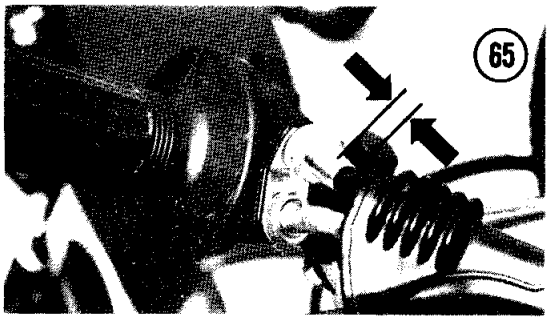
3. If cable stretch makes adjustment impossible with the basic adjustment, loosen the locknut on the adjuster in the throttle quadrant (**Figure 67**) and turn the adjuster in or out until the free play is correct. Then, tighten the locknut and secure the rubber cover.

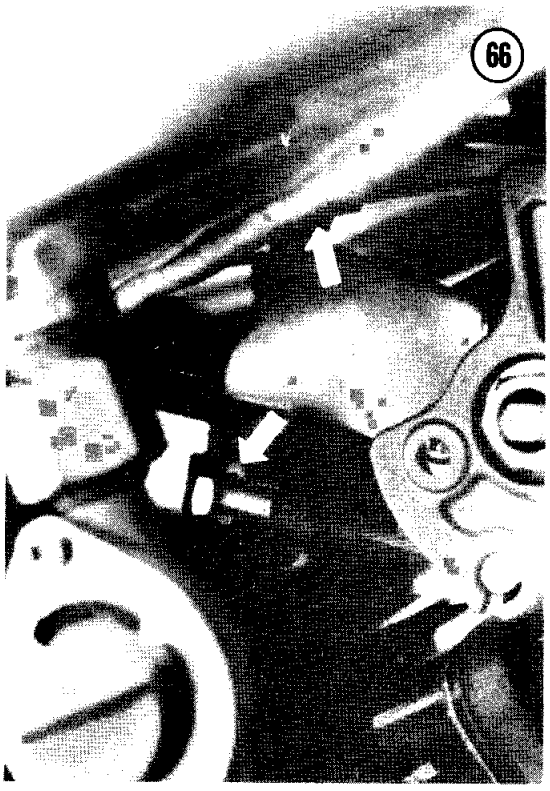


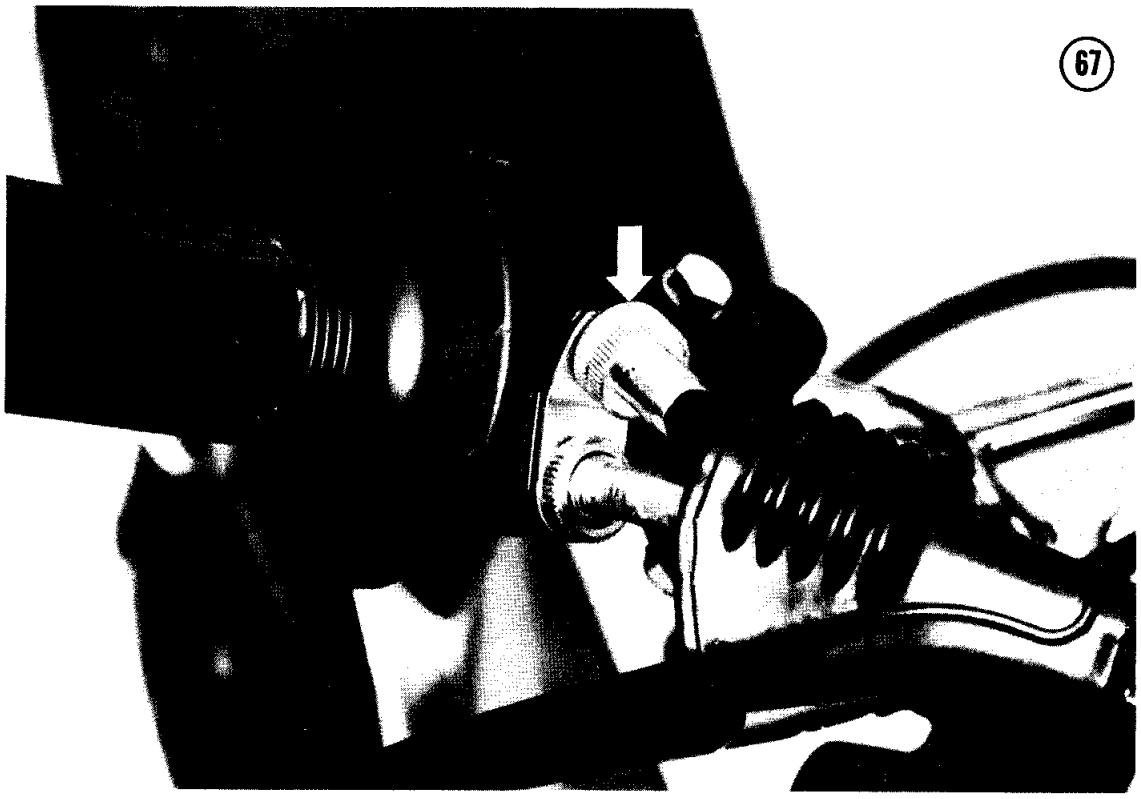





64


65


66


67

NOTE: If you own a 1978 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER FOUR

ENGINE

TOOLS

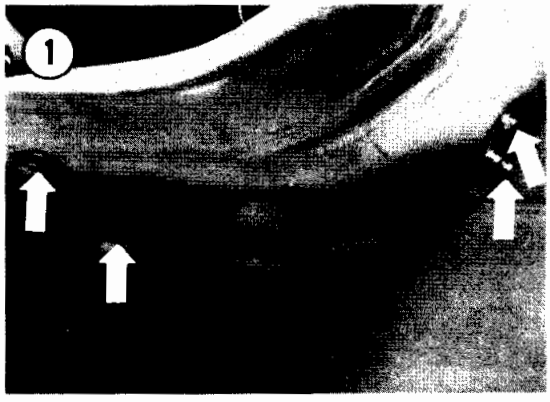
The Yamaha four-stroke 500 single can be easily serviced, from tune-up to major rebuild, without the use of a lot of special tools. The many tools that are available through dealers are designed to speed the work of a professional mechanic working in an agency shop. The hobbyist, who is not as concerned with time, can get by with only the flywheel puller (Yamaha part No. 90890-01189) and a universal puller that can be used to separate the crankcase halves and press out the crankshaft.

PARTS

Most parts must be purchased from a Yamaha dealer. Some bearings and seals, however, are standard throughout the world and may be purchased at any large bearing supply house and many large auto parts stores. See **Table 1** for part numbers.

Table 1 ENGINE SEAL AND BEARING IDENTIFICATION

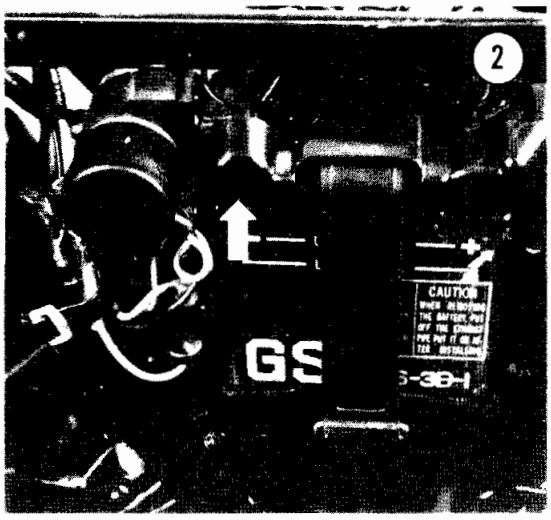
Item	ID Number or Size
Camshaft bearing (left)	6005C3
Camshaft bearing (right)	6005C3 with groove
Big end bearing	34 x 42 x 24mm
Main bearing (left)	6306 special
Main bearing (right)	6307C4 special
Crankshaft oil seal (left)	SD-30-60-6
Crankshaft oil seal (right)	S-14-25-5.5 special
Kickstarter seal	SD-20-35-7
Compression release seal	SD-12-17-2.5-2NR
Contact breaker shaft seal	SD-15-26-5

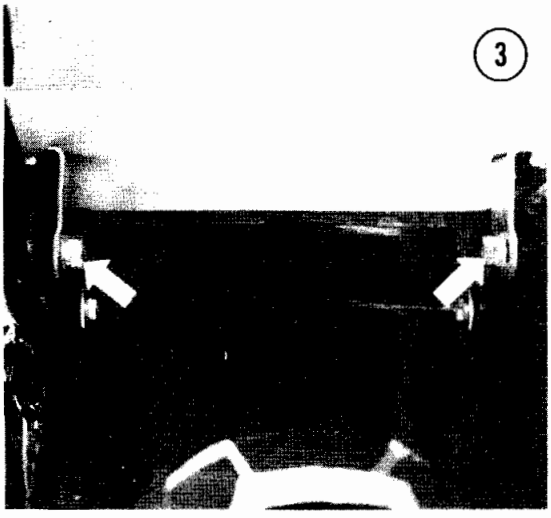


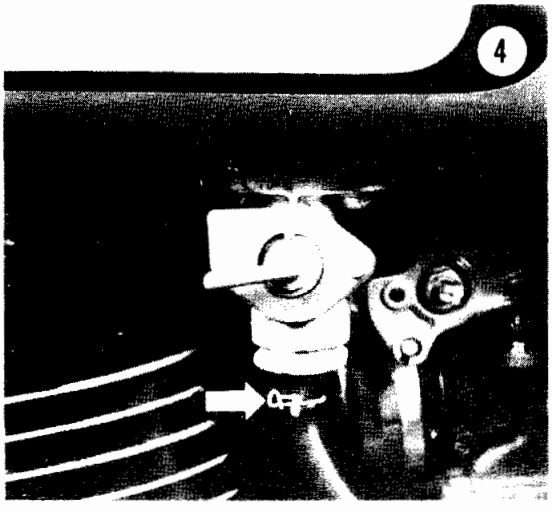
ENGINE REMOVAL

1. Drain the oil and remove the filter as described in Chapter Three. This requires removal of the skid plate **(Figure 1)**.

2. Disconnect the ground lead from the battery **(Figure 2)**.





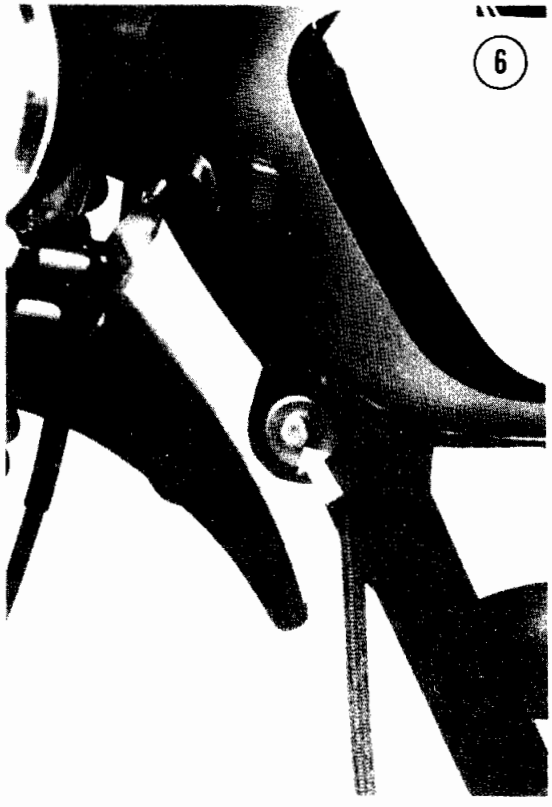


3. Unscrew the two bolts beneath the seat **(Figure 3)** and remove the seat.

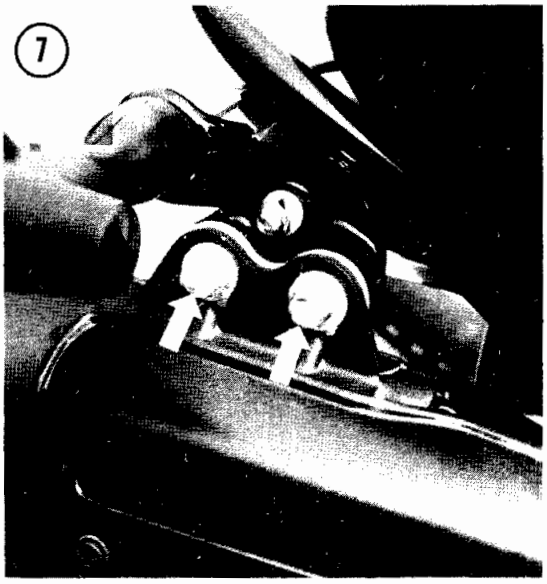
4. Turn the fuel tap to OFF and disconnect the fuel line and breather **(Figure 4)**.

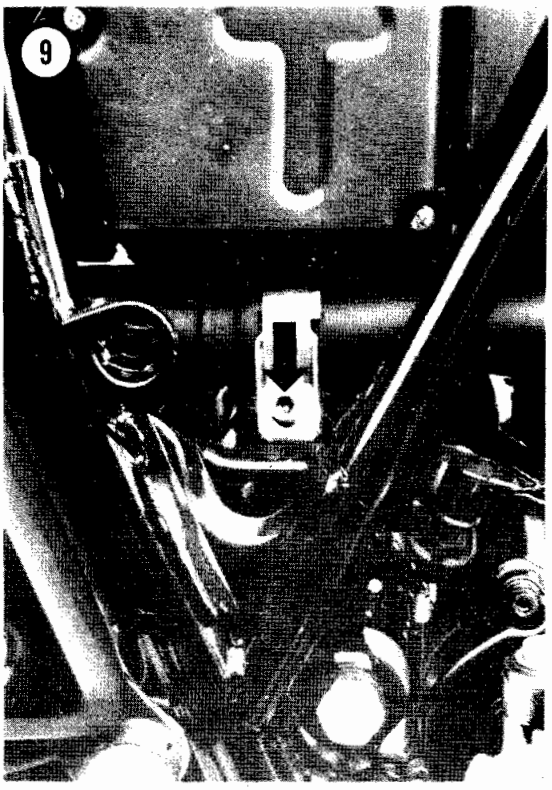
5. Unscrew the fuel tank mounting bolts and remove the fuel tank **(Figures 5 and 6)**.



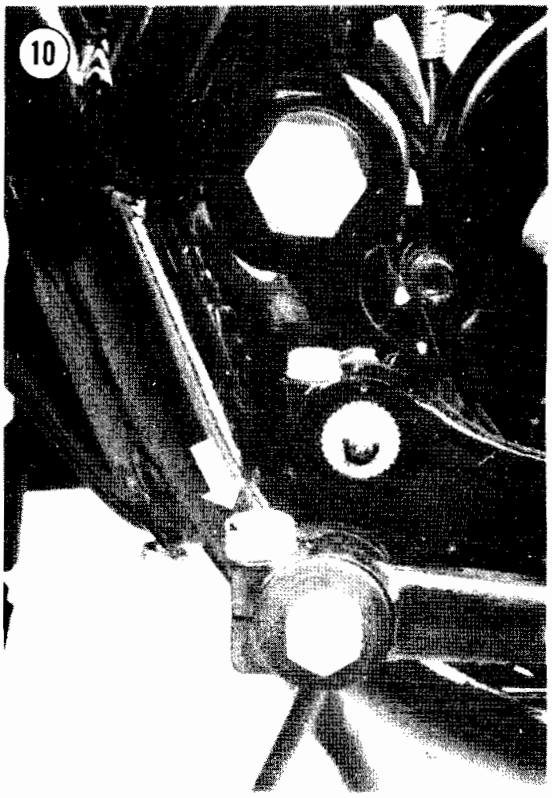


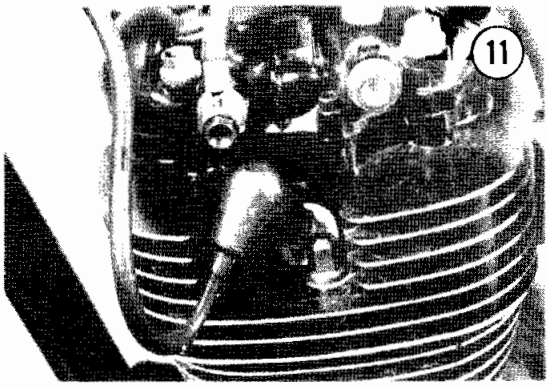
6. Remove the spark arrestor (**Figure 7**).
7. Unscrew the head pipe nuts (**Figure 8**).
8. Loosen the head pipe/muffler clamp (**Figure 9**). Remove the muffler and the head pipe.
9. Remove the right footpeg (**Figure 10**).











10. Disconnect high-tension lead from spark plug (**Figure 11**) and route it out of the way.

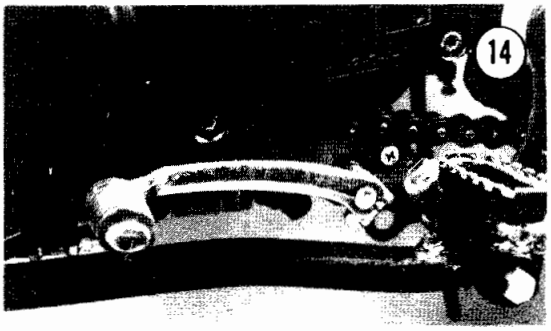
11. Disconnect the compression release (**Figure 12**) and the tachometer drive (**Figure 13**).

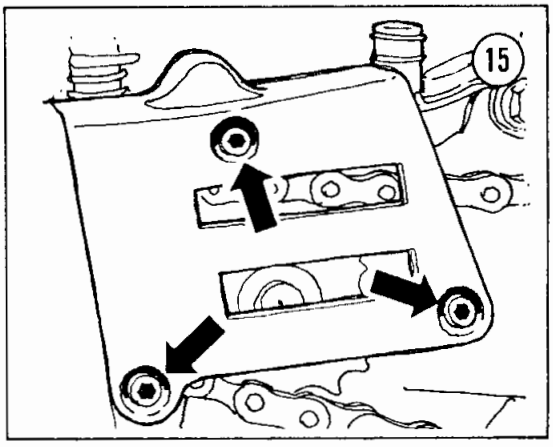
12. Remove the gear selector pedal (**Figure 14**). The bolt must be completely removed; there is a notch in the selector shaft that the bolt engages.

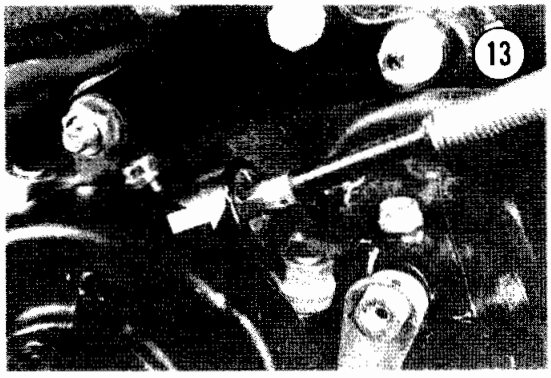
13. Remove the left engine cover (**Figure 15**).

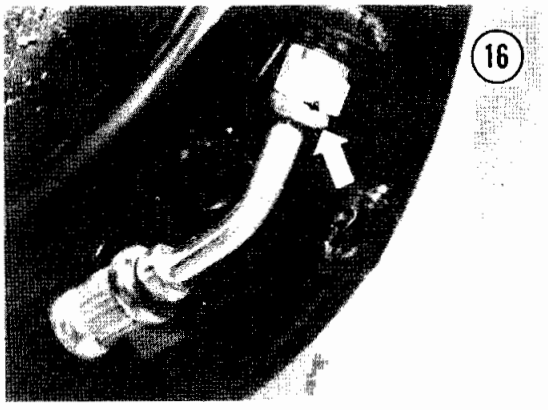
14. Disconnect the oil inlet pipe from the frame (**Figure 16**).



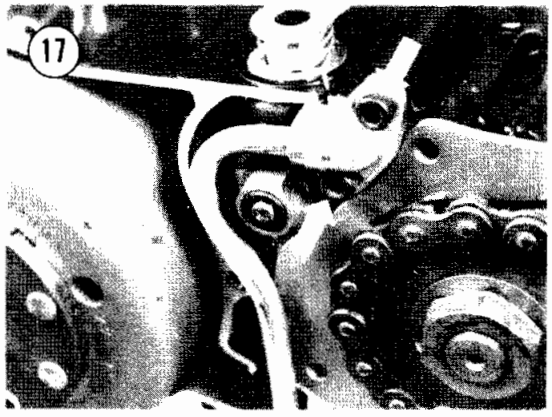


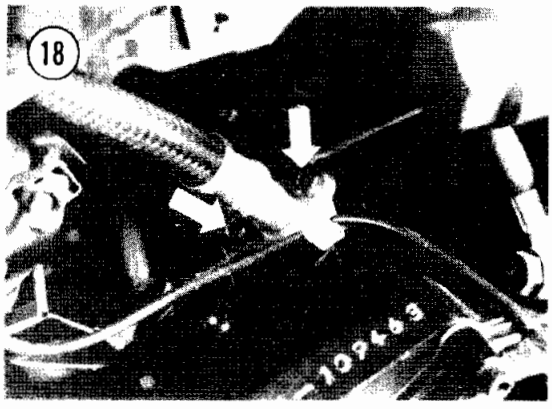


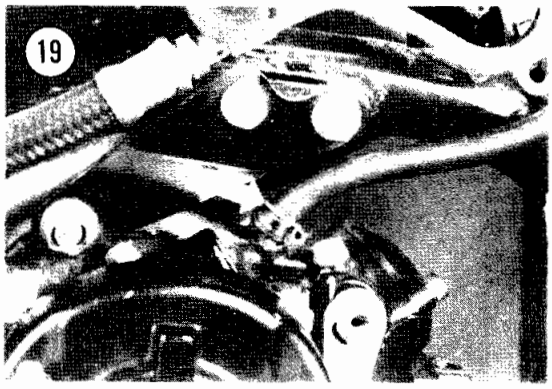


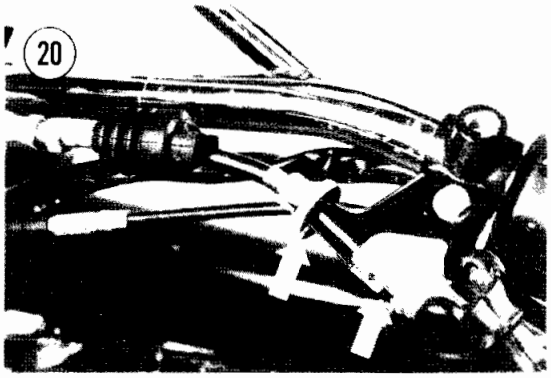


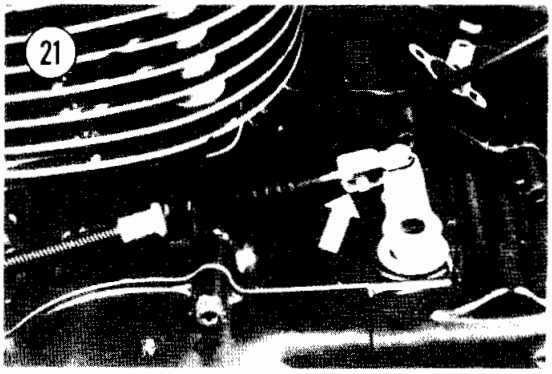
15. Remove the bolts that attach the oil inlet pipe to the engine (**Figure 17**).
16. Disconnect the oil outlet line (**Figure 18**).
17. Disconnect the vent hose (**Figure 19**).
18. Disconnect the clutch cable at the lever (**Figure 20**) and the engine (**Figure 21**).
19. Remove the engine breather (**Figure 22**).
20. Disconnect the cables from the carburetor (**Figure 23**).

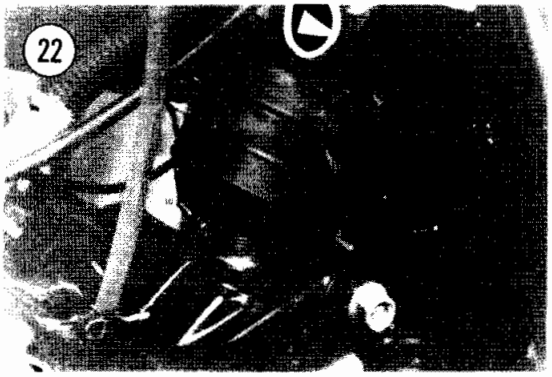


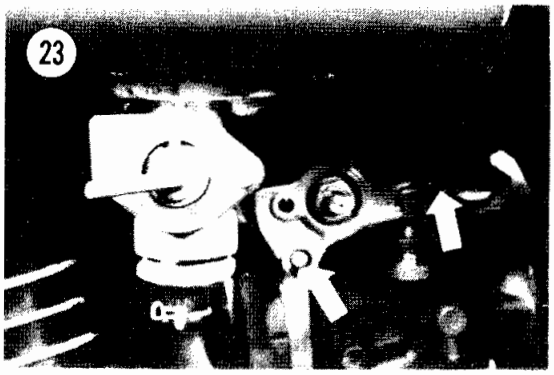


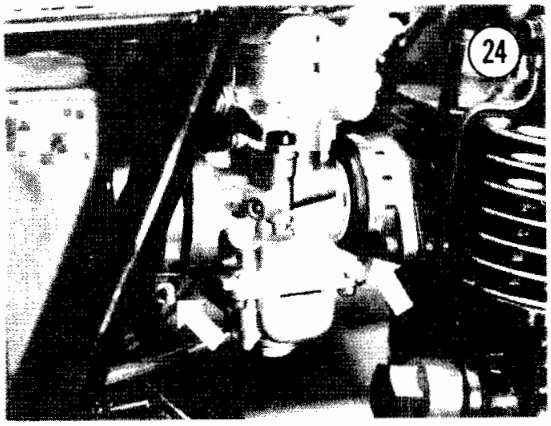




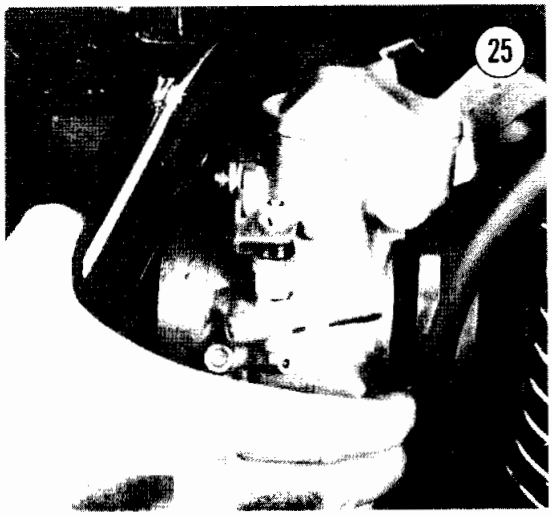


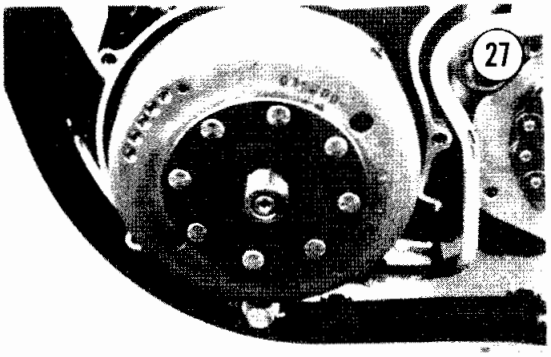


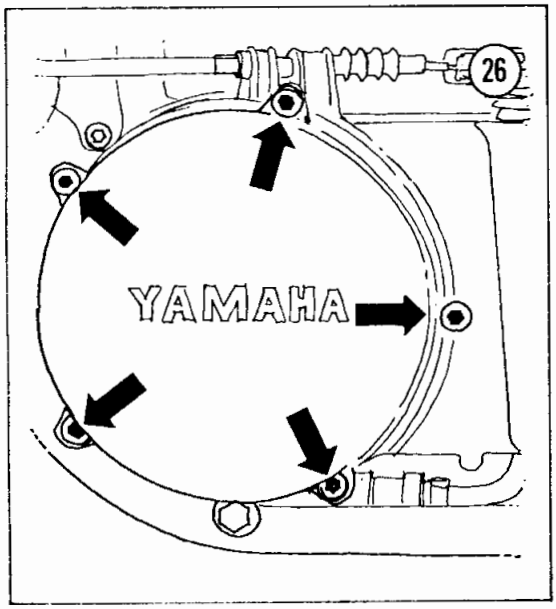


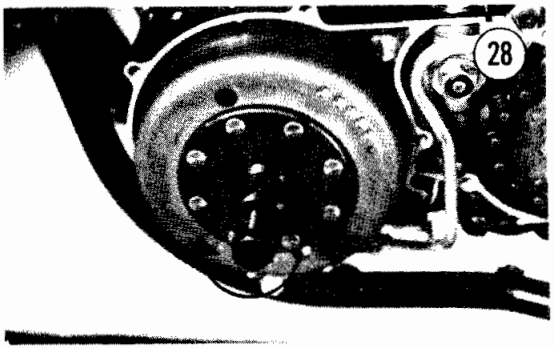


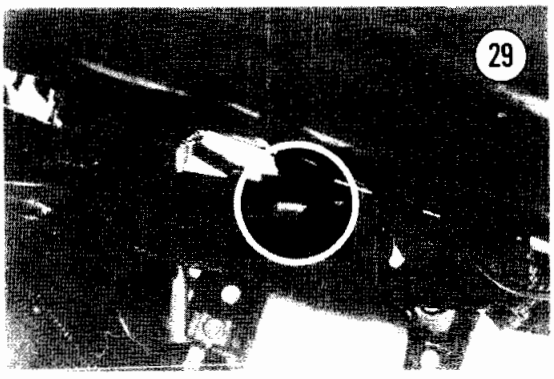
21. Loosen the carburetor clamps at the air box and manifold (**Figure 24**).
22. Remove the carburetor (**Figure 25**).
23. Remove the flywheel cover (**Figure 26**).
24. Unscrew the flywheel nut (**Figure 27**).
25. Install the flywheel puller (Yamaha tool No. 90890-01189) on the flywheel and remove the wheel by turning the puller bolt clockwise (**Figure 28**). Remove the stator from the engine. Set the stator in the flywheel, wrap them in clean newpaper, and set them out of the way.
26. Disconnect the magneto kill wire from the connector (**Figure 29**).



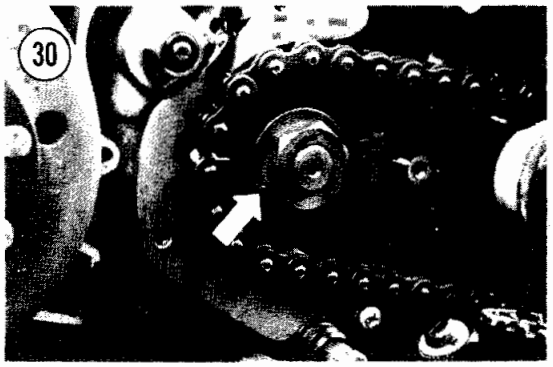


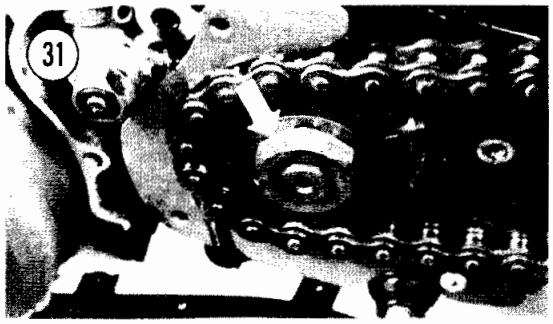


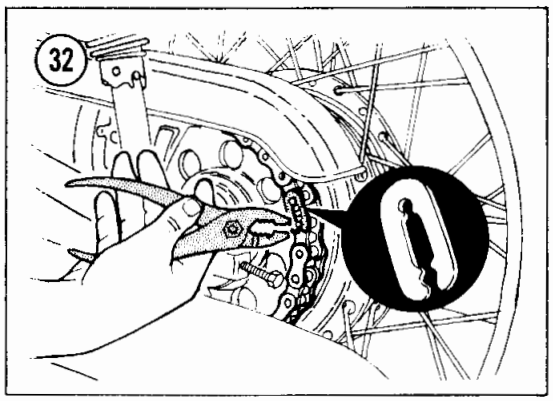


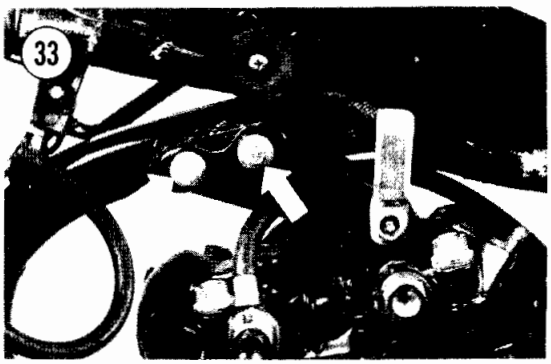


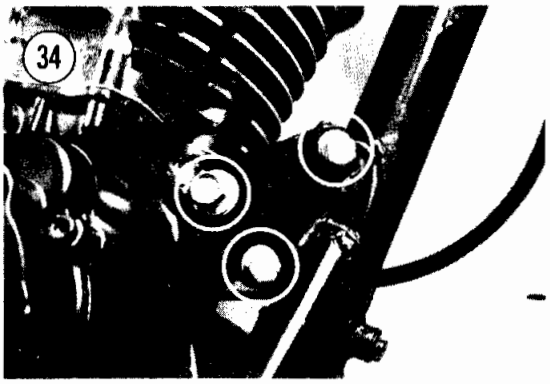
27. Straighten the locktab on the countershaft sprocket nut **(Figure 30)**. Lock the rear wheel with the brake to prevent it from turning and unscrew the sprocket nut **(Figure 31)**.
28. Part the chain at the master link **(Figure 32)** and remove the chain and the countershaft sprocket.
29. Remove the top engine mounting bolts **(Figure 33)**.
30. Remove the front engine mount bolts **(Figure 34)**.
31. Remove the bottom engine mount bolt **(Figure 35)**.

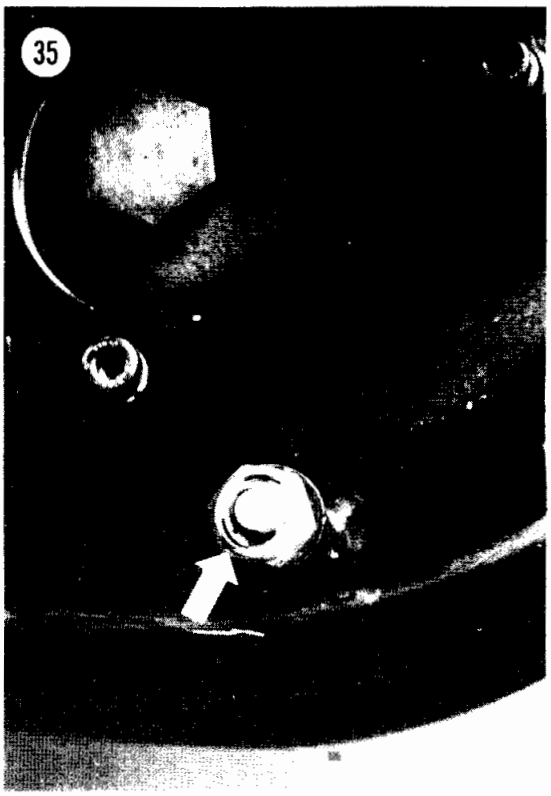


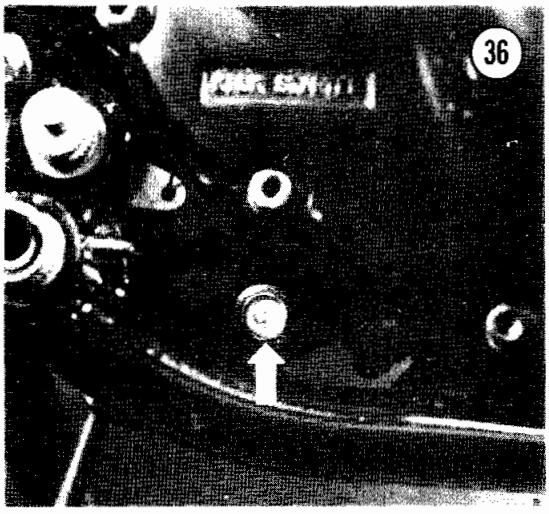


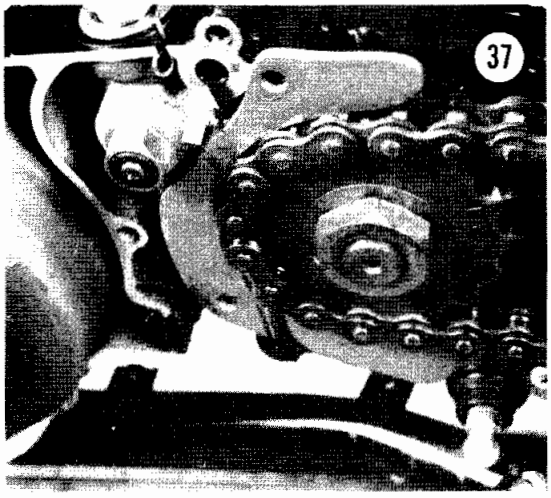












32. Remove the rear engine mount bolts (**Figure 36**).

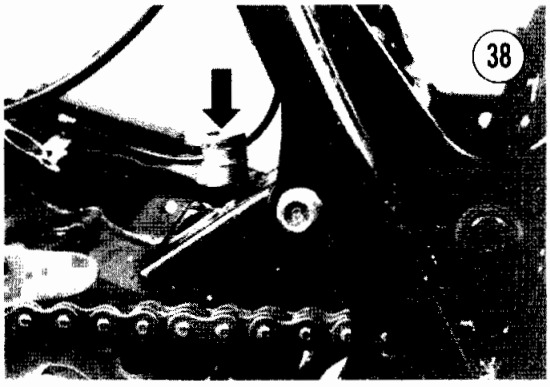
33. With assistance, tilt the engine to the right and remove it from the motorcycle.

ENGINE INSTALLATION

Engine installation is the reverse of the removal procedure. Install all of the engine mounting bolts before tightening them. Refer to **Table 2** for the correct torque values.

1. Before installing the inlet line on the engine, squirt several ounces of fresh engine oil into the passage (**Figure 37**). Make certain the O-ring is in the groove in the line fitting.

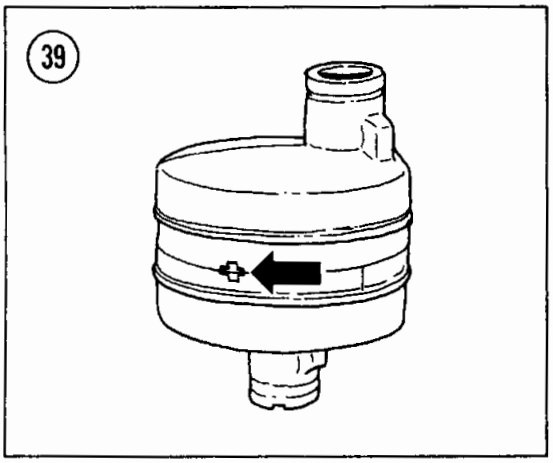
2. Pour one quart of fresh engine oil into the crankcase/transmission through the breather hose boss (**Figure 38**). Install the breather and align the marks on the breather and the engine (**Figure 39**).



4

TABLE 2 TIGHTENING TORQUES

	Torque
Engine mounting bolts	
10mm nut	4.0-5.5mkg (29-40 ft.-lb.)
8mm nut	2.1-2.9mkg (15-21 ft.-lb.)
8mm bolt	1.6-2.2mkg (12-16 ft.-lb.)
Cylinder head/cam cover fasteners	
10mm nut	3.5-4.0mkg (25-29 ft.-lb.)
8mm nut	1.8-2.2mkg (13-16 ft.-lb.)
6mm bolt	0.8-1.2mkg (6-9 ft.-lb.)
Camshaft sprocket bolt	4.5-5.5mkg (33-40 ft.-lb.)
Crankcase bolts	1.0-1.4mkg (7-10 ft.-lb.)
Primary drive gear nut	5-7mkg (36-50 ft.-lb.)
Clutch hub nut	5-7mkg (36-50 ft.-lb.)
Clutch bolts	1mkg (7 ft.-lb.)



3. Install the kickstarter and footpeg. Align the marks on the footpegs with the marks on the mounting stubs (**Figure 40**).

4. Install the countershaft sprocket, lock plate, and screw on the nut finger-tight. Install the chain, lock the rear wheel with the brake, and tighten the sprocket nut. Bend a portion of the lock plate over against one of the flats on the nut (**Figure 41**).

5. Install the engine covers, filter, cover, advance unit and contact breaker assembly and the gear selector pedal.

6. Install the skid plate, exhaust system, fuel tank, and seat. Connect the fuel line and breather.

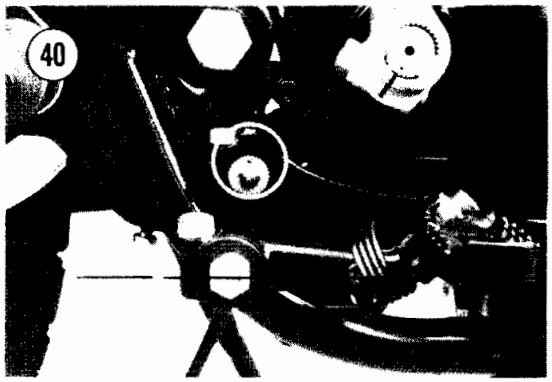
7. Pour about 1.5 quarts of fresh engine oil into the filler pipe in the frame (**Figure 42**).

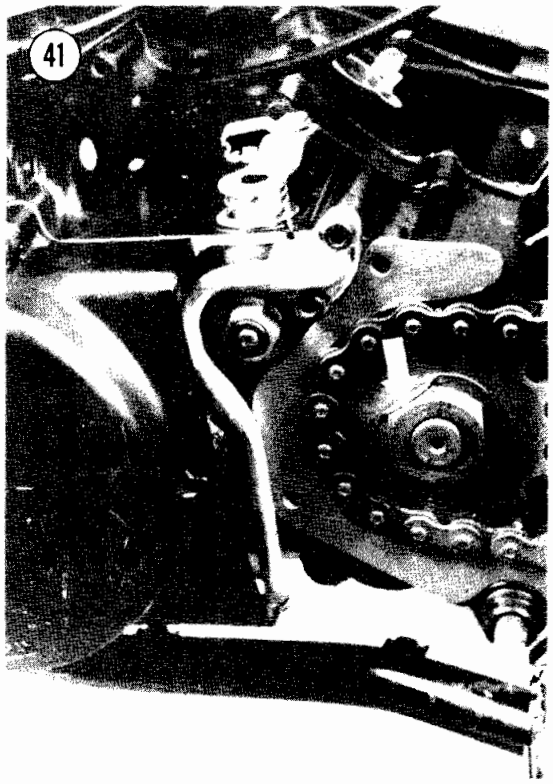
8. Double check all electrical, fuel, and control connections. Then, start the engine and check for oil leaks. Adjust the cam chain tensioner and ignition timing as described in Chapter Three. Check the oil level and top it up if necessary with fresh oil until the level is between the 2 marks on the dipstick (**Figure 43**).

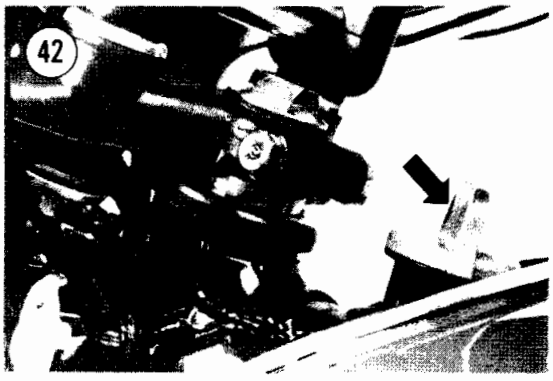
9. Refer to Chapter Three and perform routine maintenance and adjustments as described, along with a tune-up.

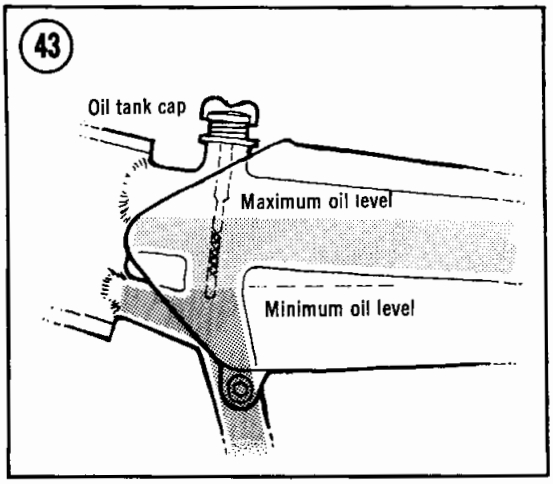
10. Test ride the motorcycle for several miles, then recheck connections and fasteners and tighten any that are loose.

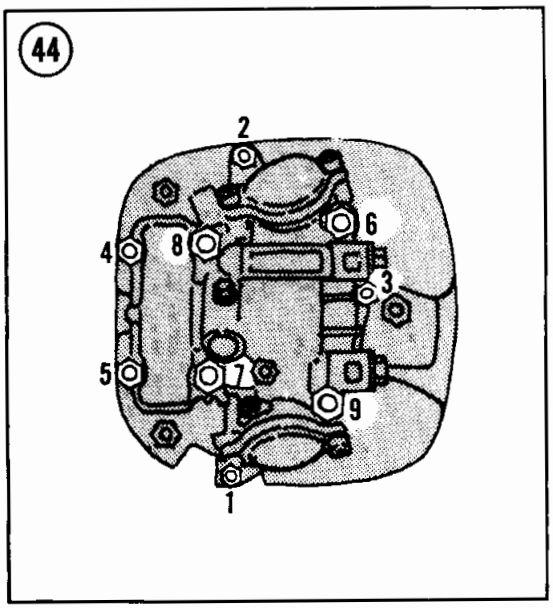
NOTE: *If the engine was rebuilt, either partially or completely, while it was removed from the motorcycle, it should be broken in carefully, just as though it*

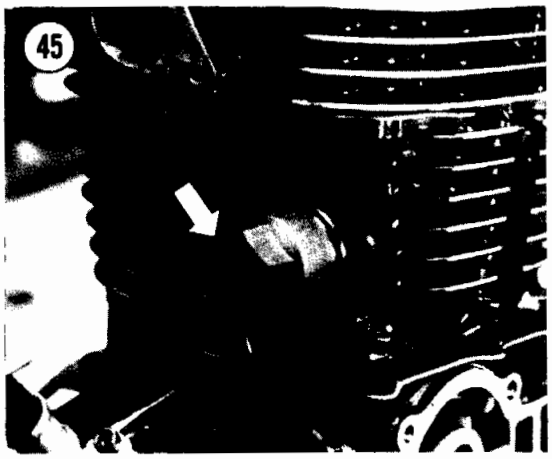


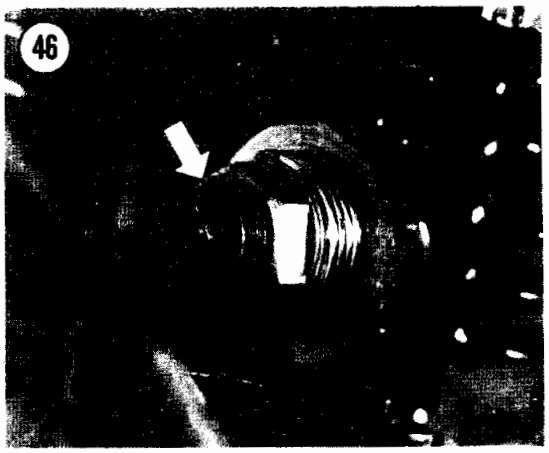


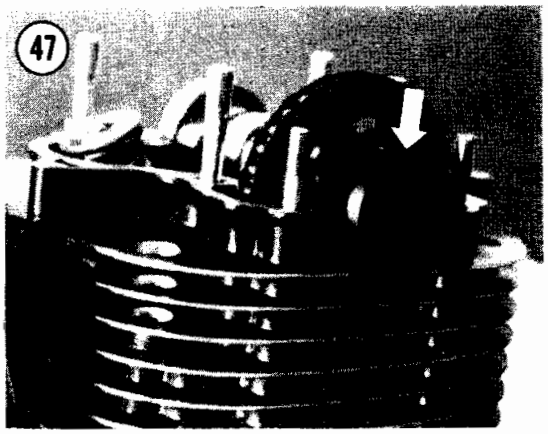












were new. Pay particular attention to oil level during break-in. Allow ample low and medium speed riding time for the parts to bed in before subjecting the engine to high loads. During break-in, the oil should be changed after 300 miles, and then every 2,000 miles thereafter.

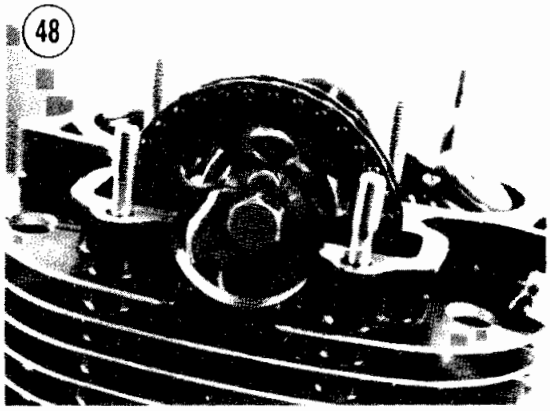
UPPER END DISASSEMBLY

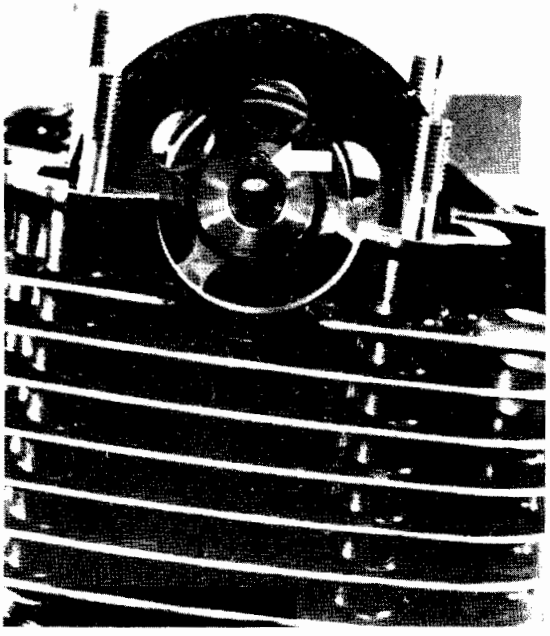
While the upper end can be worked on with the engine in the motorcycle, there is little to be gained in time. Also, it is easier to work on the engine if it is on a bench.

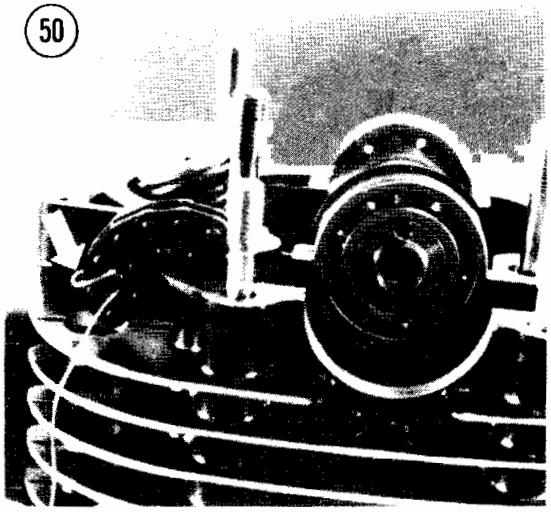
1. Unscrew the bolts from the cam cover and remove the cover **(Figure 44)**.
2. Remove the cover from the cam chain tensioner **(Figure 45)**. Unscrew the tensioner and remove it from the engine **(Figure 46)**.
3. Remove the cam window cover **(Figure 47)**.

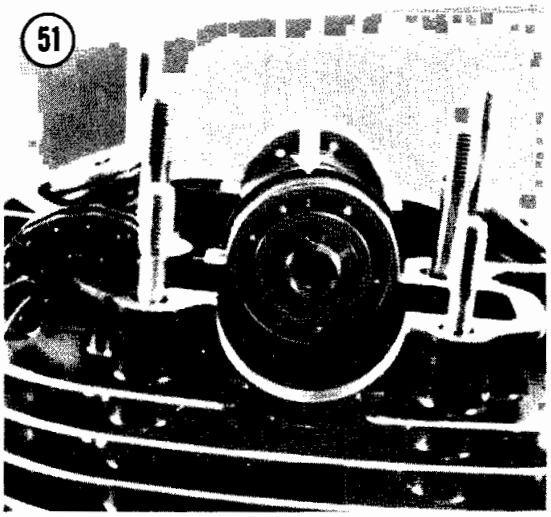
4

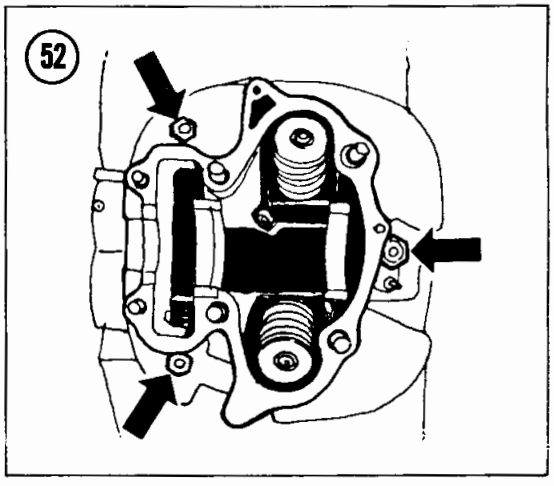
4. Unscrew the cam sprocket bolt **(Figure 48)**, and remove the washer and kick indicator.
5. Remove the cam sprocket and collect the pin **(Figure 49)**.
6. Thread a length of wire through the cam chain and secure it to the engine so it won't fall into the chain gallery **(Figure 50)**.
7. Remove the camshaft **(Figure 51)**.
8. Unscrew the remaining cylinder head bolts **(Figure 52)**.

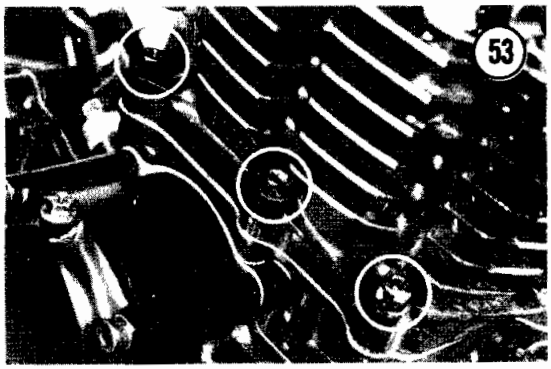








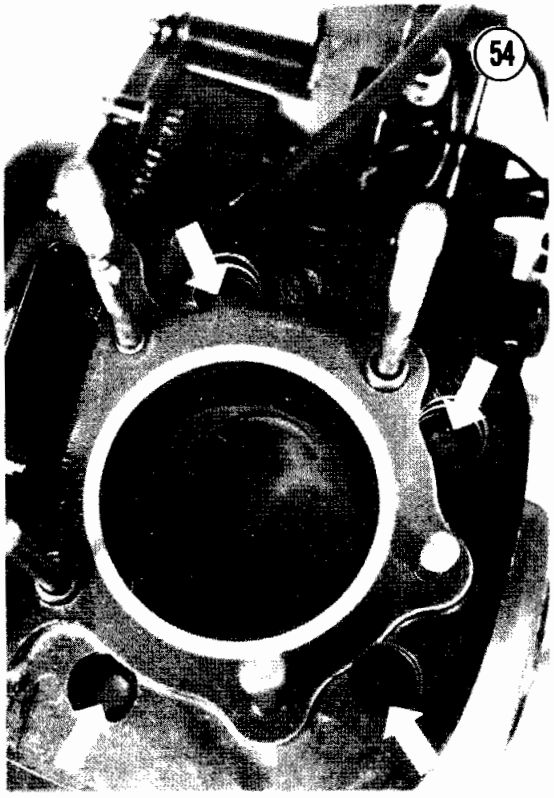


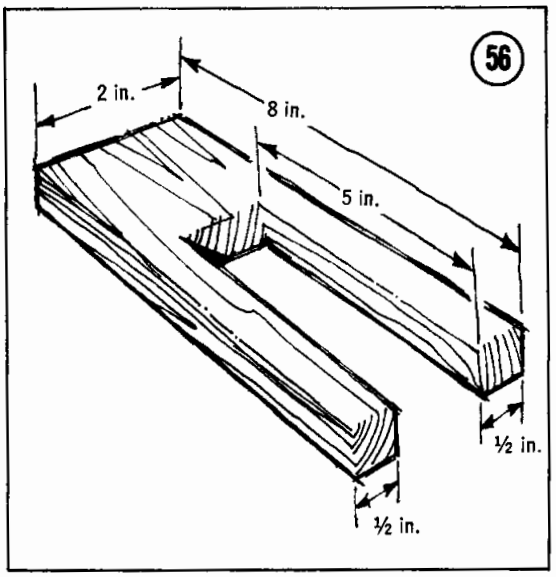


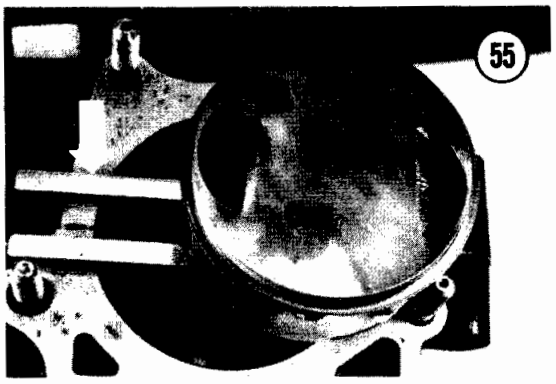
9. Remove the Allen screws (**Figure 53**) and nuts (**Figure 54**). Remove the cylinder head and cylinder.

10. Stuff a clean shop rag down into the crankcase and install a piston block beneath the piston to prevent it from hitting the opening in the crankcase (**Figure 55**). The block shown is aluminum; however, a suitable block can be made of wood. Dimensions are shown in **Figure 56**.

11. Remove the clips from the piston pin bosses (**Figure 57**). Press the pin out and remove the piston.









12. Remove the rocker shaft cover bolts (**Figure 58**).

13. Screw a 6mm screw into the end of each rocker and pull it out of the cam cover. Collect the rockers.

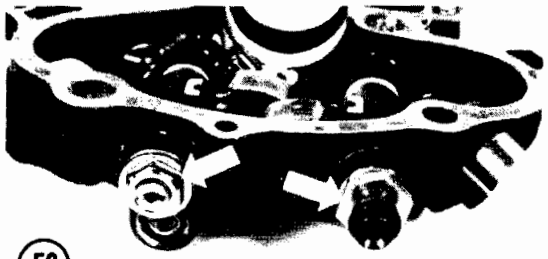
14. Compress the valves with a valve spring compressor and remove the valve keepers (**Figure 59**).

15. Remove the valve assemblies from the head (**Figure 60**).

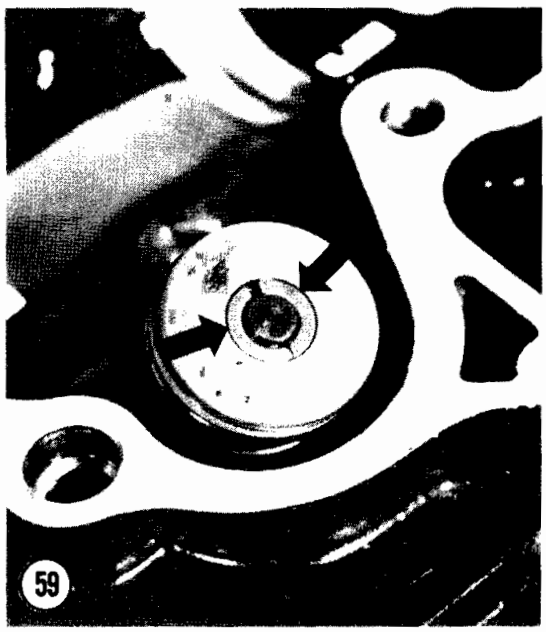
CYLINDER HEAD INSPECTION

1. Inspect the cam shoes of the rockers for wear and galling (**Figure 61**).

2. Measure the bore in the rocker (**Figure 62**). If it exceeds 12.05mm (0.474 in.), or if there is damage or excessive wear on the contact shoe, the rocker should be replaced.

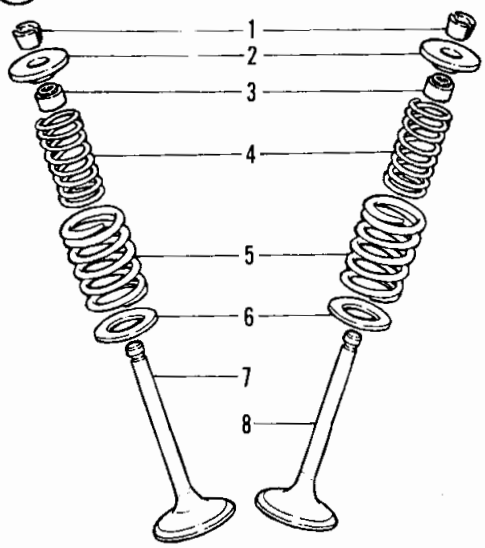


58

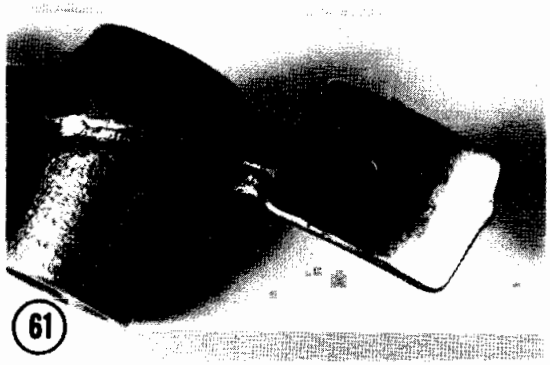


59

60

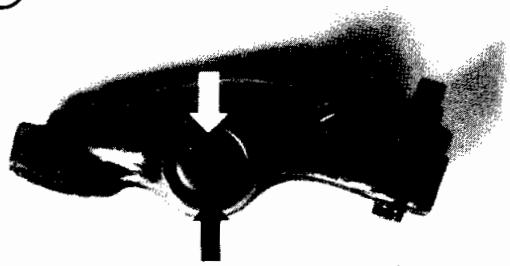


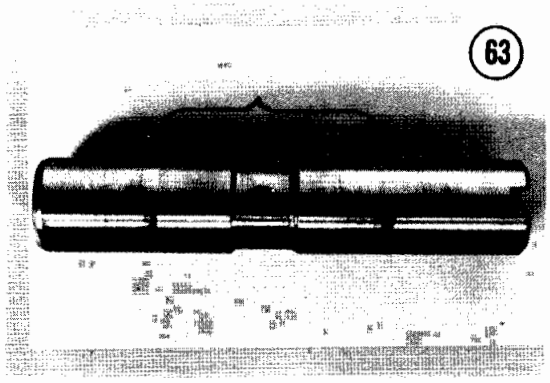
1. Valve keepers
2. Valve collar
3. Seal
4. Inner spring
5. Outer spring
6. Spring seat
7. Exhaust valve
8. Intake valve

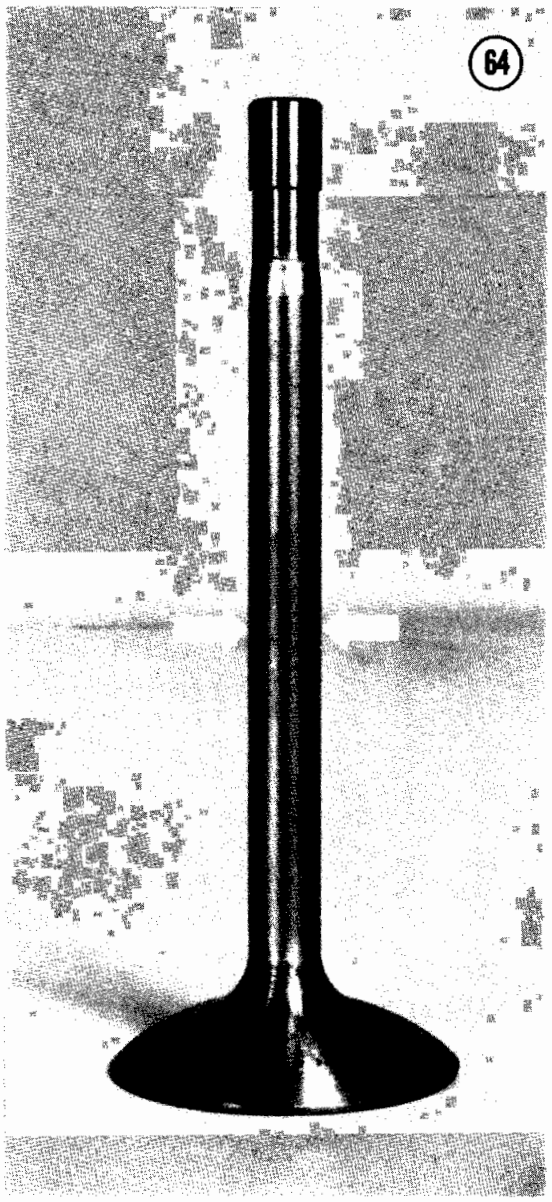


61

62





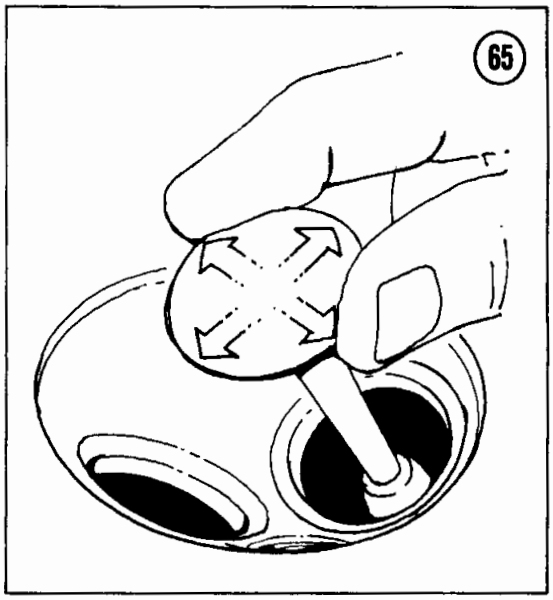


3. Check the rocker shaft for wear or discoloration in the area where the rocker rides (**Figure 63**). If wear or roughness can be felt, the shaft should be replaced. Measure the shaft with a micrometer. If it is less than 11.96mm (0.4709 in.), replace it. Also, compare the rocker bore dimension to the shaft OD; if the clearance is greater than 0.11mm (0.0043 in.), replace one or both parts, depending on the extent of wear.

4. Measure the valve stems with a micrometer (**Figure 64**), at 3 locations along the stem. The intake valve stem should be 7.97-7.99mm (0.3138-0.3146 in.) in diameter. The exhaust valve stem should measure 7.96-7.97mm (0.3134-0.3138 in.) in diameter. Check the stem also for bending and grooves running along its length in the area of guide contact. Check the valve stem end for signs of excessive wear or galling. Replace the valves if they are worn or damaged.

5. Inspect the valve contact areas. The pattern should be uniform and free from nicks and erosion. Slight imperfections may be lapped away, but serious damage or wear indicates replacement is necessary. See *Valve Lapping* and *Leak Test* which follow.

6. Insert each valve in its guide. Hold the valve just slightly off its seat and rock it sideways, in one direction and then 90° to that direction (**Figure 65**). If the valve rocks more than



slightly, the guide is probably worn and should be replaced. You can check the internal diameter with a snap gauge or, lacking this tool, take the head to a dealer for measurement of the guides. A new guide will be 8.01-8.02mm (0.3154-0.3157 in.) internal diameter. Guides should be replaced when the ID exceeds 8.05mm (0.3169 in.). See *Valve Guide Replacement*.

7. Measure the free length of the valve springs (**Figure 66**) and compare the actual values to **Table 3**. If the free length of any spring is 2mm (0.080 in.) less than specified, the spring should be replaced. It's a good idea to replace the springs as a set — both inner and outer.

8. Inspect the camshaft lobes for discoloration (blueing), pitting, galling, or other signs of abnormal wear (**Figure 67**). If wear is present, the camshaft should be replaced. However, it's important to analyze the reasons for wear and take corrective action to prevent it from reoccuring. Normal wear, which can't be prevented, will appear as a slight burnish on the cam lobes as well as the lifter contact shoes. Improper lubrication will usually appear as discoloration of the lobes and shoes, along with galling. Improper lubrication need not necessarily be the fault of the lubrication system; revving the engine immediately after start-up, before the oil has had a chance to circulate up to the cam box will create this type of wear and damage. A definite scored line across the lifter shoe is usually an indication that the valve clearance is too tight. If the clearance is too loose, the ends of the valve stems may appear "mushroomed" from the hammering they experience.

9. Measure the cam lobes with a micrometer, across the base circle (**Figure 68**) and at 90°, to the peak of the lobes (**Figure 69**), even though the cam lobes do not appear to be worn. Excessive normal wear can affect both valve timing and lift. The standard dimensions are shown in **Table 4**. If the actual dimensions are less than shown, the camshaft should be replaced.

10. Clean and dry the camshaft bearings, using solvent and compessed air.

WARNING

When drying the bearings with compressed air, do not apply the air jet to the bearings in such a way as to cause

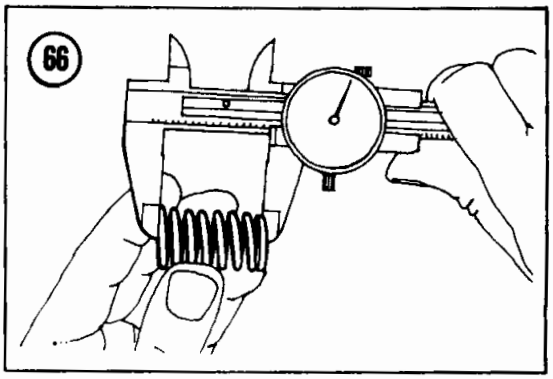
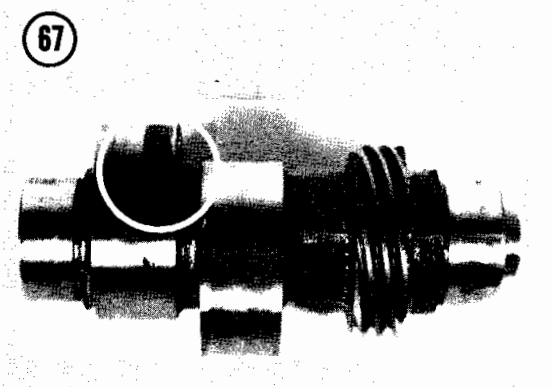
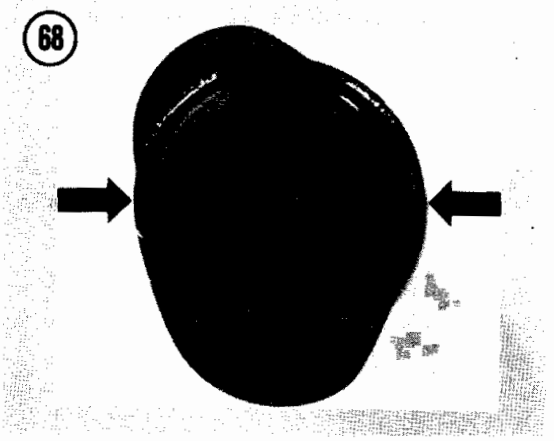
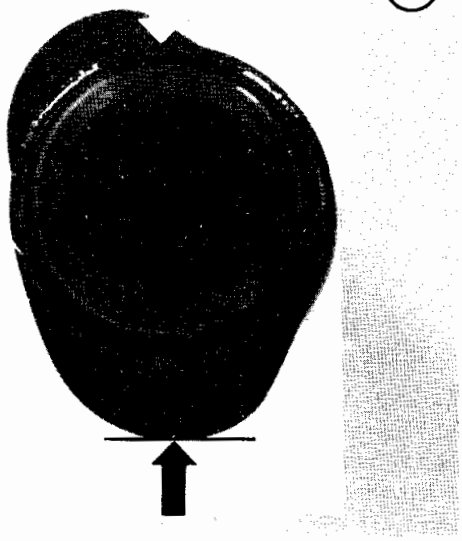


TABLE 3 VALVE SPRING FREE LENGTH

Model	Outer Spring	Inner Spring
XT/TT500C	45.15mm (1.778 in.)	45.25mm (1.781 in.)
XT/TT500D	44.6mm (1.756 in.)	45.3mm (1.783 in.)









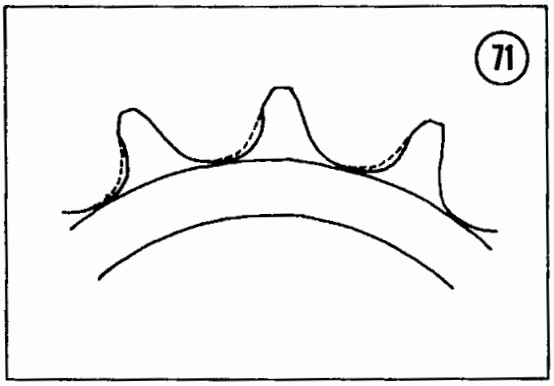


TABLE 4 CAMSHAFT DIMENSIONS

Intake	
Across base circle	32.08mm (1.2630 in.)
Lobe height	39.08mm (1.5386 in.)
Exhaust	
Across base circle	32.13mm (1.2650 in.)
Lobe height	39.10mm (1.5394 in.)

the bearings to spin. The air jet is capable of spinning the bearings at speeds far greater than those for which they were designed; an over-revved bearing may very likely disintegrate and cause severe damage and serious injury to anything or anyone it strikes.

Inspect the bearings for signs of pitting, galling, and rust. Spin the bearings by hand and feel for roughness and excessive play. The bearings should turn smoothly and play should be hardly felt. If there is doubt about the condition of a bearing, replace it. After the bearings have been inspected, and if they are found to be serviceable, oil them with assembly lube or engine oil and rotate them to distribute the oil over all surfaces to prevent rusting before they are reinstalled.

11. Examine the teeth of the cam drive and driven sprockets **(Figure 70)** for damage or wear to the teeth. Pay particular attention to undercutting of the teeth **(Figure 71)**.

VALVE LAPPING

If the condition of the valve sealing surface and the valve seat is good, a light lap will ensure good sealing. Also, if the valve or seat was replaced or repaired, the valve should be lapped.

1. Install the valve in its guide and apply coarse lapping compound to the valve sealing surface.
2. With a lap stick applied to the head of the valve, rotate the stick back and forth until the contact pattern is uniform. Every 10 seconds during lapping, release the stick and turn it a full 90°. This ensures that the lap is uniform.
3. Rinse away the coarse compound and lap the valve again with fine compound until the contact surfaces are uniform.

4. When lapping is completed, thoroughly clean the head and, in particular, the valve guides with fresh, clean solvent.

WARNING

If lapping compound remains in the guides, it will rapidly wear the guides and the valve stems. Make absolutely certain that all of the compound is removed.

5. Apply machinist's blue dye to the contact surface of the valve and rotate the valve against the seat until the dye is rubbed off the valve. In this manner, the correctness of the lap can be verified.

LEAK TEST

Install the valves in the cylinder head. Invert the head and fill the combustion chamber with clean solvent. Allow the head to sit for several hours if possible, and then check to see if any solvent has leaked past the valves. If it has, the valves should be lapped once again and the leak test repeated until the valves do not leak.

VALVE GUIDE REPLACEMENT

If a valve guide is worn (see *Cylinder Head Inspection*), replace it. This should be entrusted to a dealer; however, if you have experience and the necessary tools, follow the procedure below.

1. Heat the cylinder head in an oven to about 200°F (100°C).

WARNING

Do not heat the head with a torch or other localized heat source; it is likely to warp.

2. With a suitable drift, drive the old guide out of the head, working from the combustion chamber.

3. With the head still hot, drive a new guide into the head. Make sure the guide is fitted with a new O-ring.

4. Ream the new guide with an 8mm guide reamer. Check the clearance with the valve as described in *Inspection*. When the fit is correct, grind the valve seat as described below and lap the valve to the seat (see *Valve Lapping*).

VALVE SEAT GRINDING

The valve seats must be ground if they are damaged, worn, or if the valves are ground or replaced. Also, the seat should be checked, and ground if necessary, if the valve guide was replaced. Pressure on the cutter should be even and firm to prevent the cutter from chattering and making a rippled cut around the seat.

1. Refer to **Figure 72**. Cut "A" is a flat cut and should be done with a radius cutter or flat cutter.

2. Cut "B" requires a 30-degree cutter.

3. Make cut "C" with a 45-degree cutter.

4. Coat the sealing surface of the valve with machinist's blue dye and put a small amount of fine valve grinding compound around the seat. Insert the valve into the guide and turn it back and forth with a lap stick until the blue dye has been removed uniformly around the valve. Thoroughly clean the valve and guide. Measure this area on the valve to determine the actual valve seat width. The width should be 1.3mm (0.051 in.).

If the seat is too wide or not centered on the valve (**Figure 73**), use the flat and 30-degree cutters to reduce it. If the seat is centered but too narrow (**Figure 74**), use the 45-degree cutter to increase it. If the seat is too narrow and near the top of the valve (**Figure 75**), use the flat cutter first and then the 45-degree cutter. If the seat is too narrow and near the bottom of the valve (**Figure 76**), use the 30-degree cutter and then the 45-degree cutter.

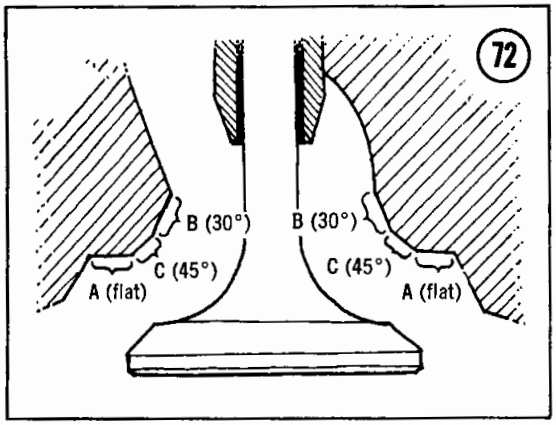
5. When the valve seat is the correct width and correctly located with respect to the valve, refer to *Valve Lapping* and carefully lap the valve to the seat.

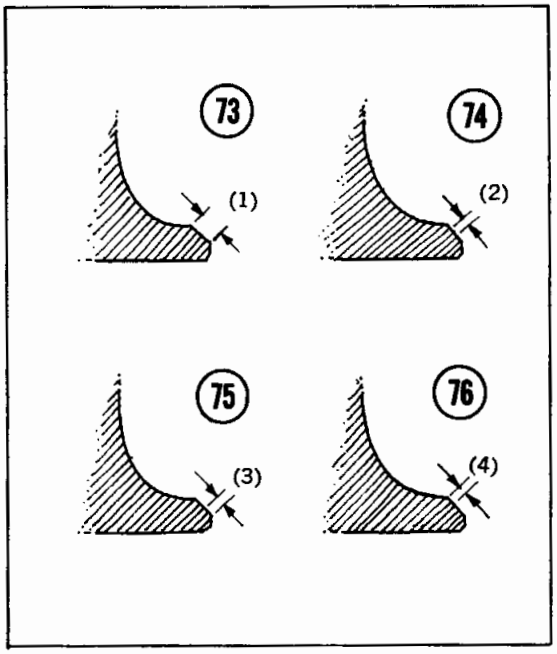
CAUTION

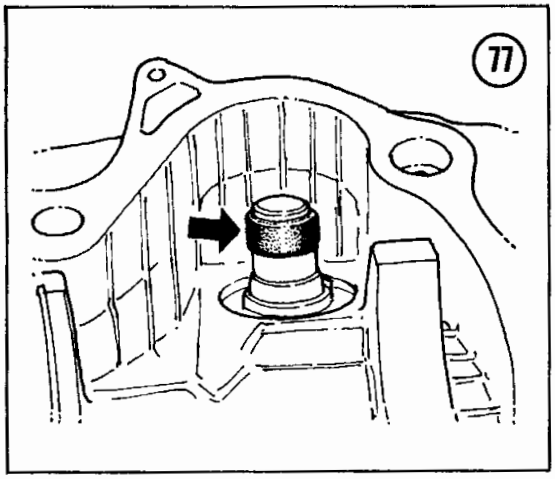
After completing lapping, thoroughly flush all lapping compound out of the head and particularly the guides to ensure that no compound remains that would rapidly wear out the guides and valve stems.

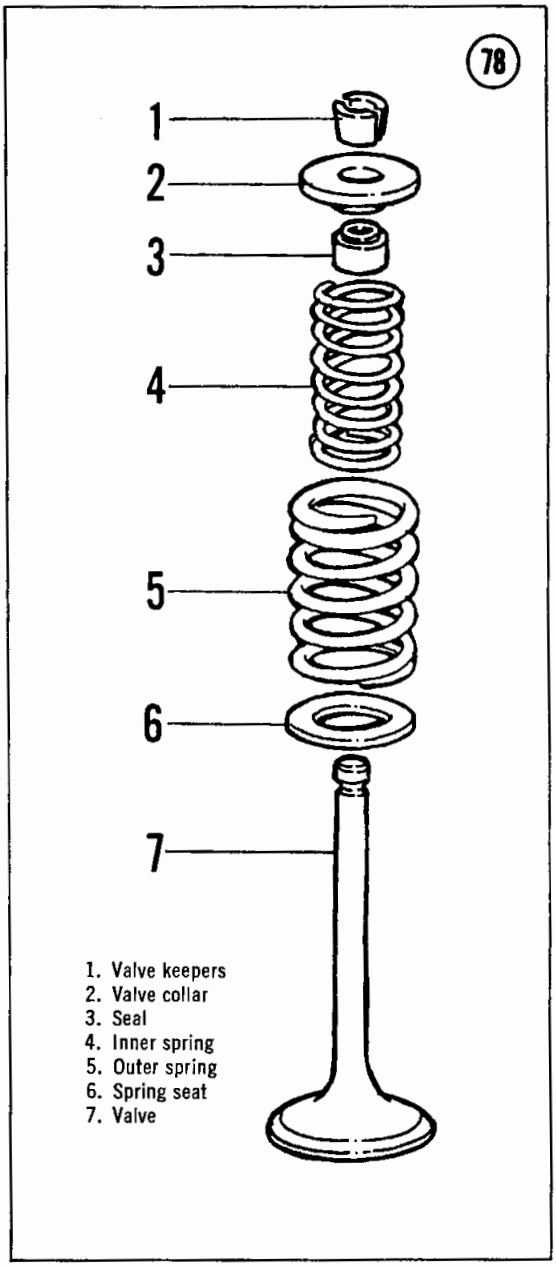
CYLINDER HEAD ASSEMBLY

1. Install the valves in the head. Install new seals on the valve stems (**Figure 77**).



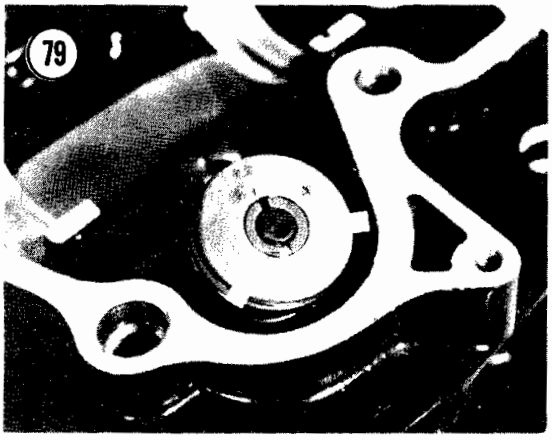


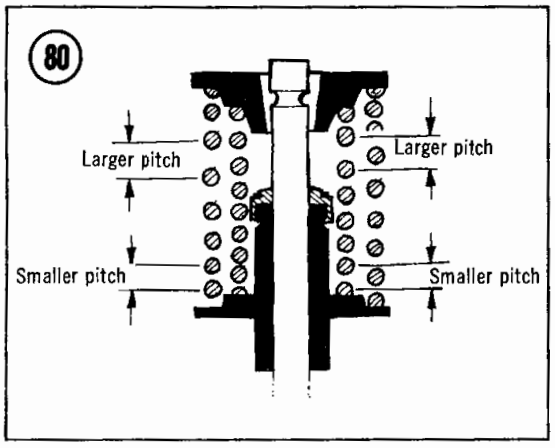




2. Refer to **Figure 78** and install the spring seat, inner and outer springs, and valve collar. Compress the valve with a spring compressor and install the valve stem keepers (**Figure 79**). Remove the compressor and rap sharply on the end of the valve stem to ensure that the keepers are seated.

NOTE: *The valve springs are variable rate. The wider pitch must be at the top, away from the head (**Figure 80**).*





3. Coat the rocker shafts and shaft bores in the rockers with assembly oil and install the rockers and shafts in the head. Screw in and tighten the rocker shaft end bolts. Lightly coat the rocker shoes and adjusters with assembly oil, wrap the cylinder head in clean newspaper, and set it aside until it is to be installed.

PISTON AND CYLINDER INSPECTION

1. Inspect the bore for abrasion, scratches, and scores. If vertical scores are apparent, the cylinder should be rebored.

2. Measure the bore at three levels, in two planes 90° apart (**Figure 81**). This will determine wear, taper, and ovality or out-of-roundness. The wear and taper limits are shown in **Table 5**. If the cylinder dimensions are beyond the wear limits, the cylinder must be rebored to the next oversize. Oversize dimensions are shown in **Table 6**.

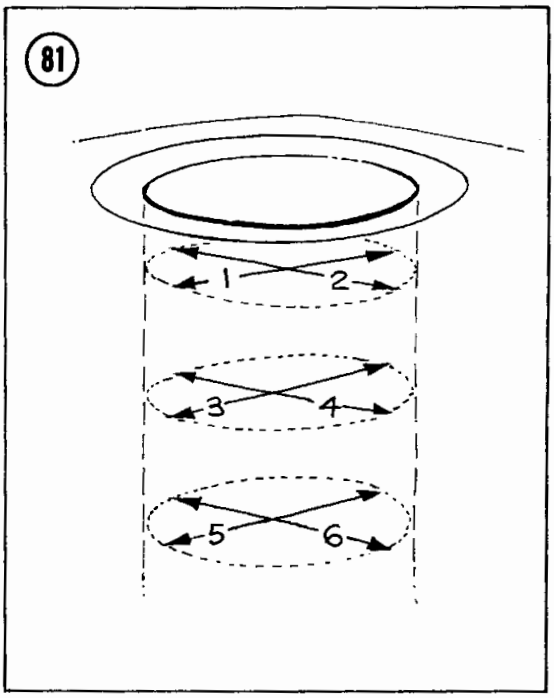


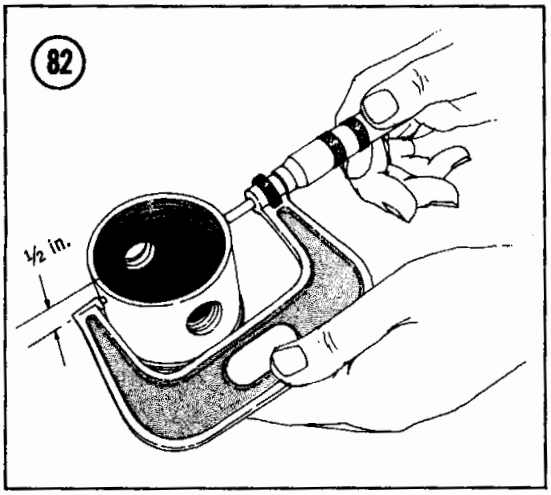
TABLE 5 CYLINDER DIMENSIONS

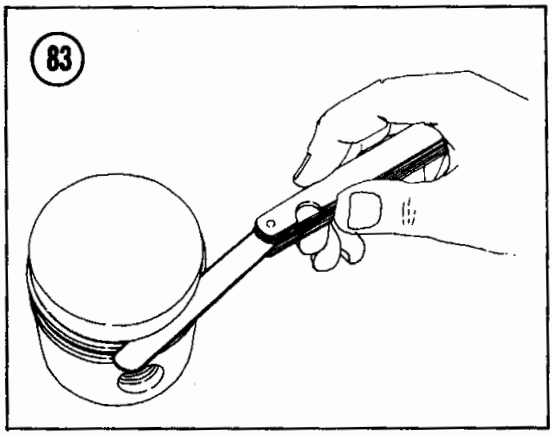
	Standard	Wear Limit
Bore	87.00-87.02mm (3.425-3.426 in.)	87.10mm (3.429 in.)
Taper	—	0.05mm (0.002 in.)

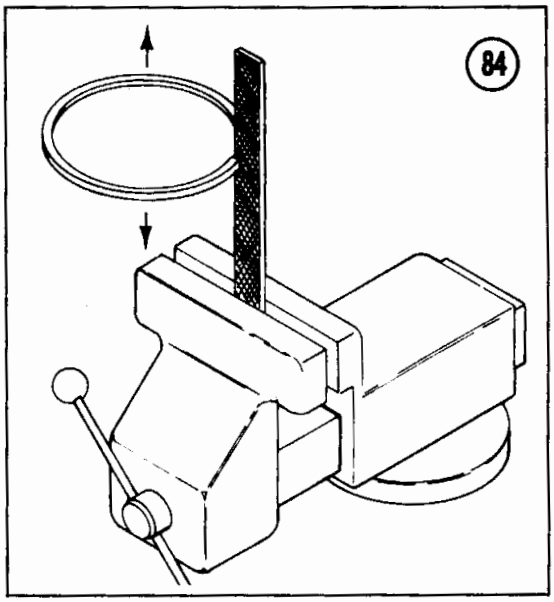
TABLE 6 PISTON SIZES

Standard	87.00mm (3.425 in.)
1st oversize	87.25mm (3.435 in.)
2nd oversize	87.50mm (3.445 in.)
3rd oversize	87.75mm (3.455 in.)
4th oversize	88.00mm (3.465 in.)

NOTE: *Before having the cylinder bored, obtain the new piston. (Manufacturing tolerances can vary, from piston to piston, even though they are of the same grade size.) This is essential in order that the piston can be measured and the bore adjusted accordingly so the piston-to-bore fit is correct. Piston-to-bore clearance should be 0.050-0.055mm (0.0020-0.0022 in.).*







4

3. Measure the OD of the piston at the skirt, 90° from the centerline of the pin (**Figure 82**). Measurement should be made at the point shown in the illustration. Piston dimensions are shown in **Table 6**.

4. Measure the ring-to-groove fit of the 2 top rings in the grooves (**Figure 83**) using a flat feeler gauge. The service limit for both compression rings is 0.15mm (0.006 in.). Oversize piston rings are shown in **Table 7**. The identifying color for oil control rings is on the expander portion of the 3-piece ring.

5. Set the compression rings into the bore (one ring at a time) and line them up square with the bore by pushing them into place with a piston. The ring should be placed about ½ in. from the top of the bore. Measure the ring end gap with a flat feeler gauge and compare the actual measurement with **Table 8**. If clearance is too great, the ring must be replaced. If the clearance is too small, material can be removed from the ring ends by carefully drawing the ring across a file held in a vise (**Figure 84**).

TABLE 7 OVERSIZE PISTON RINGS

Compression	
1st oversize	0.25mm (0.0098 in.)
2nd oversize	0.50mm (0.0197 in.)
3rd oversize	0.75mm (0.0295 in.)
4th oversize	1.00mm (0.0394 in.)
Oil control	
1st oversize	Brown
2nd oversize	Blue
3rd oversize	Black
4th oversize	Yellow

TABLE 8 RING END GAP

Ring	Standard	Wear Limit
Compression (both)	0.3-0.5mm (0.012-0.020 in.)	0.80mm (0.03 in.)
Oil (rails only)	0.2-0.9mm (0.008-0.035 in.)	—

NOTE: *Ring measurements should be made for new rings as well as old to ensure that they are correct. Don't assume that they are correct simply because they are new.*

6. The expander and oil ring rails cannot actually be measured. However, they should be set into the bore and checked visually, and if the gap is very large, the expander and rails should be replaced as a set.

7. Roll the rings in their respective grooves **(Figure 85)** to ensure that they do not bind.

8. Oil the piston pin and install it in the connecting rod **(Figure 86)**. Attempt to rock the pin and check for play. If any play is present, measure the pin OD in the center. The OD should be 19.99-20.00mm (0.7970-0.7974 in.). If it is less than 19.96mm (0.786 in.), it is worn and should be replaced. If the pin dimension is correct and play is present, the smaller end of the connecting rod is worn and the rod should be replaced. This is a job for a dealer; an hydraulic press is required to separate and assemble the crankshaft assembly.

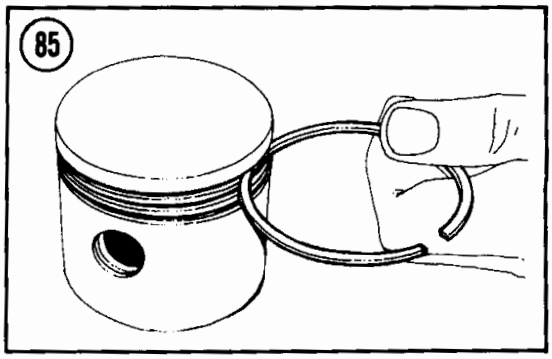
9. Install the pin in the piston and check for play. If play is present, measure the pin as described above. If the pin is beyond the wear limit, it should be replaced. If the pin dimension is correct, the piston should be replaced.

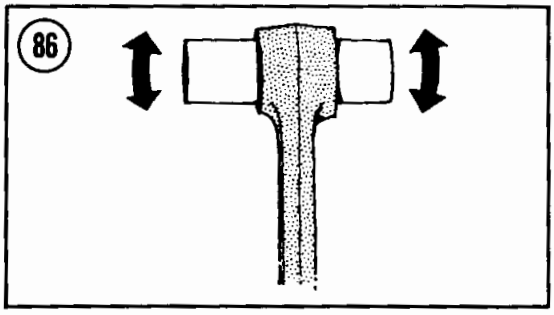
NOTE

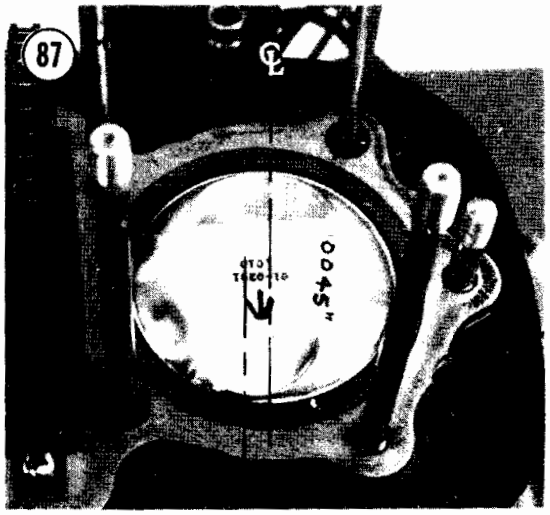
The piston and pin should be replaced as a set. Usually, the wear is not confined to just one of the components.

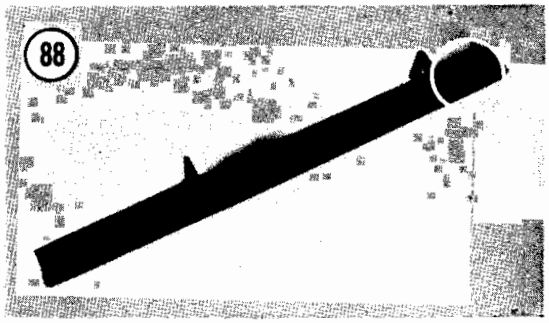
UPPER END ASSEMBLY

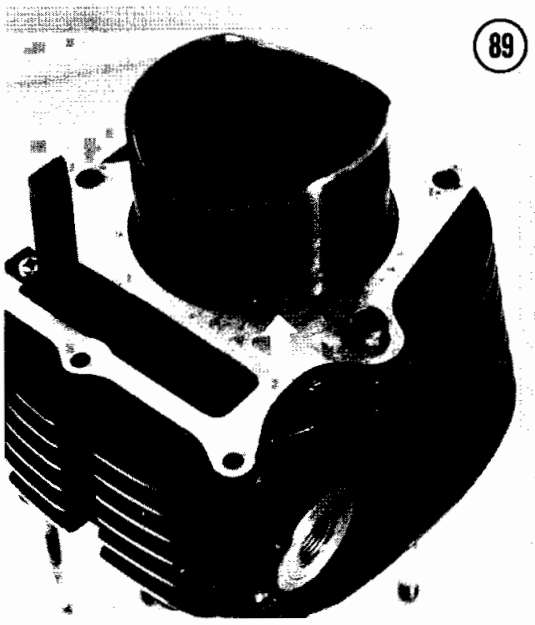
1. Install the rings on the piston. Set the piston over the connecting rod. Note that the intake valve cutaway in the piston lines up with the centerline of the engine and the exhaust valve cutaway is offset to the right **(Figure 87)**. If the piston is installed backwards, serious engine damage could and most likely will result when the engine is started. Lightly oil the pin and push it into the piston, carefully aligning the piston pin bore in the connecting rod. Install the piston pin circlips, rotate them to ensure that they are seated, and place one end of the clip over the removal cutout to facilitate removal later on.





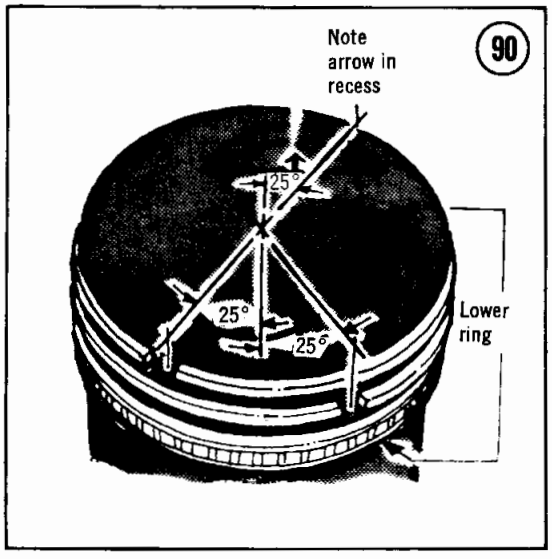




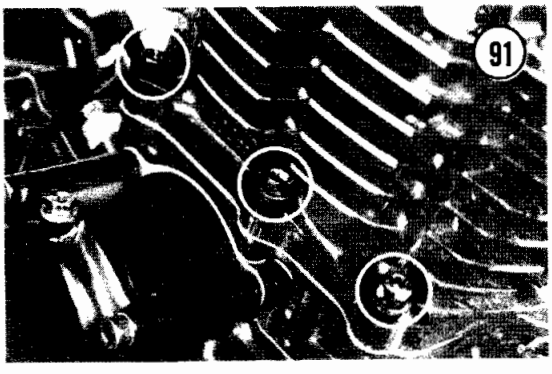


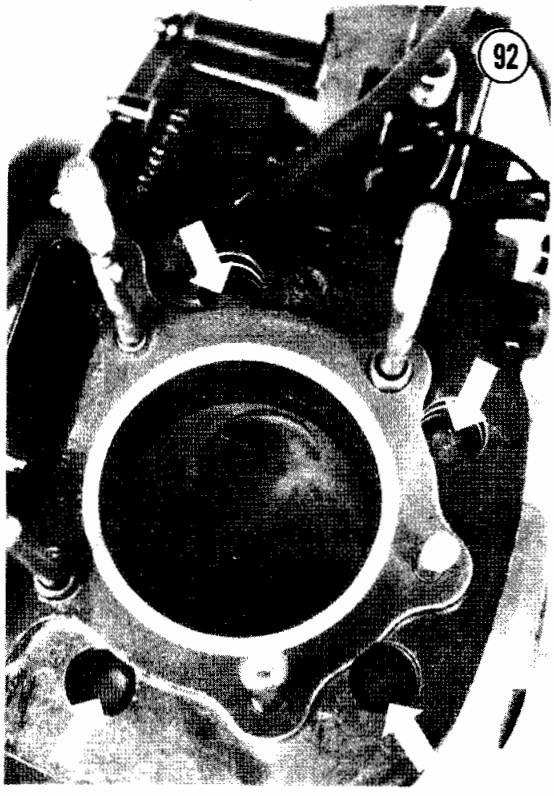
2. If the cam chain guide was removed from the cylinder, install it with the arrow pointing up (**Figure 88**).
3. Install a new O-ring on the cylinder spigot (**Figure 89**). Then install a new base gasket on the cylinder.
4. Stagger the ring gaps as shown in **Figure 90**. Connect a length of wire to the timing chain and feed it through the chain gallery in the cylinder. Slide the cylinder down over the piston, carefully compressing the rings. Screw in and tighten the nuts and bolts shown in **Figure 91** and **Figure 92** to the values shown in **Table 2**.
5. Install a new cylinder head gasket and the alignment dowels (**Figure 93**). Rotate the crankshaft to bring the piston to TDC with the points just beginning to break.

4



NOTE: *If the points are not about to break with the piston at* TDC, *the basic timing is 180° out. In such a case rotate the crankshaft an additional 360° to bring the piston to* TDC *with the points just beginning to open.*



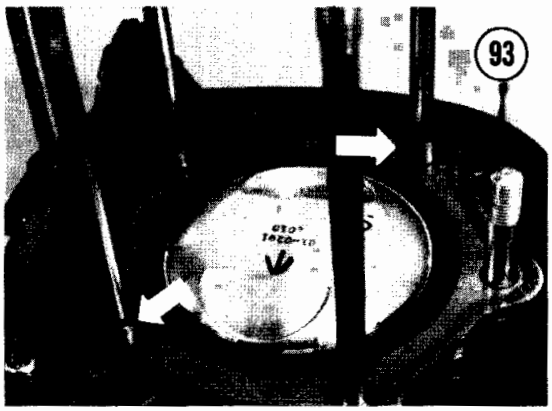


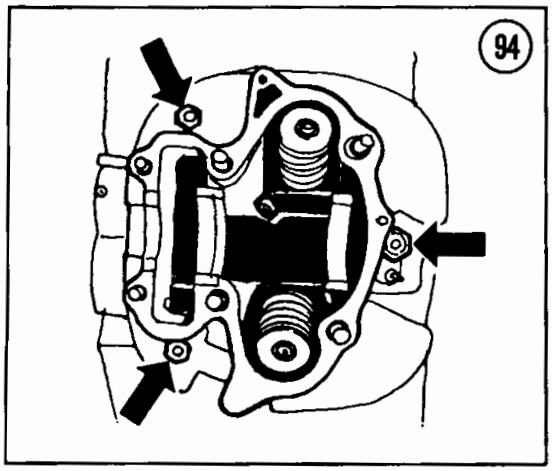
6. Install the cylinder head and tighten the nuts and bolts shown in **Figure 94** to the values shown in **Table 2**.

7. Install the camshaft and sprocket in the head and align the timing marks as shown in **Figure 95**. Place a clean shop rag in the top of the chain gallery before installing the pin, washer, pointer, and bolt. Make certain the bearing with the locating clip engages the groove in the right bearing boss (**Figure 96**).

NOTE: *Double check to make sure the chain is engaged with the drive sprocket on the crankshaft. The chain slips off the sprocket easily when it is slack and will usually fall behind the sprocket and out of engagement.*

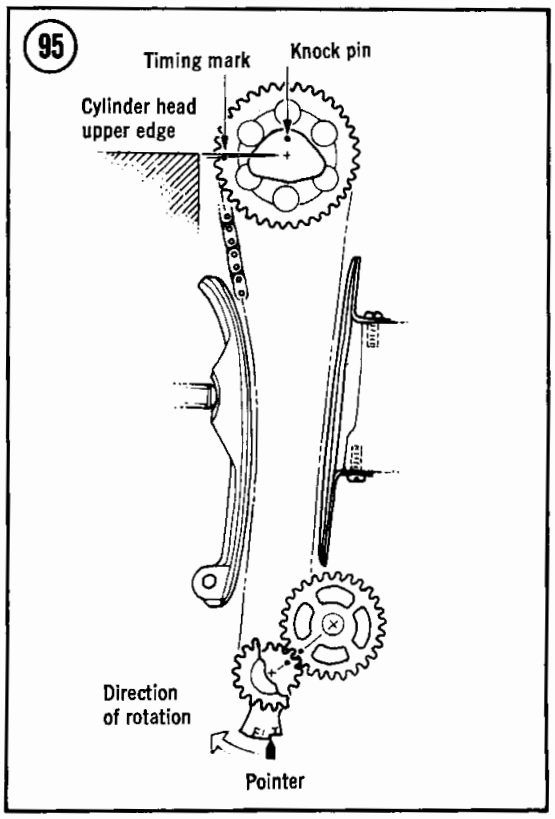
8. Install the alignment pin, kick indicator, washer, and screw the bolt into the camshaft (**Figure 97**). Tighten the bolt to 4.5-5.5 mkg (33-40 ft.-lb.).

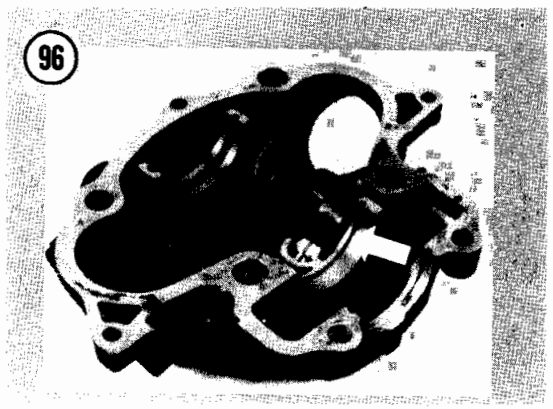


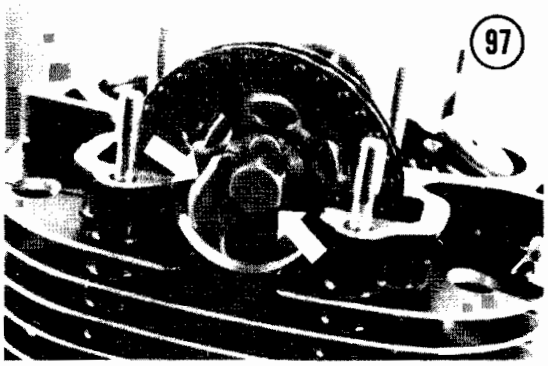


9. Assemble the chain tensioner (**Figure 98**) and install it in the cylinder.

10. Rotate the crankshaft counterclockwise (viewed from the left) and line the "T" mark on the flywheel with the fixed pointer on the crankcase (**Figure 99**). The slack portion of the timing chain is now in the area of the tensioner. Loosen the locknut (**Figure 100**) and screw in the adjuster until it is flush with the pushrod.



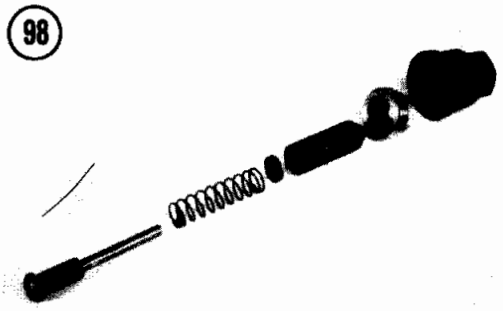


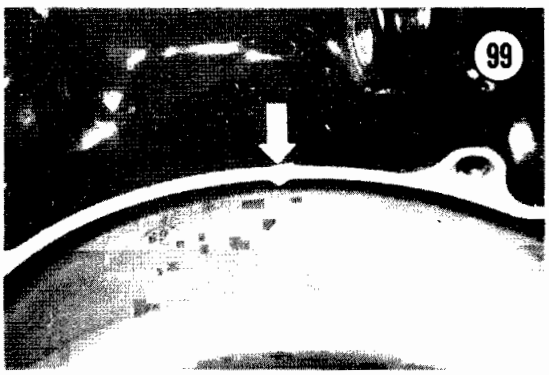


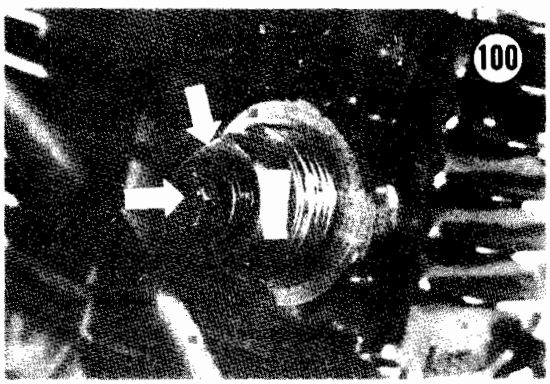
This is the basic setting. Its accuracy must be checked when the engine is running. At idle, the pushrod should pulsate slightly. If it does not, loosen the adjuster until slight movement is apparent. Then tighten the locknut and install the cap.

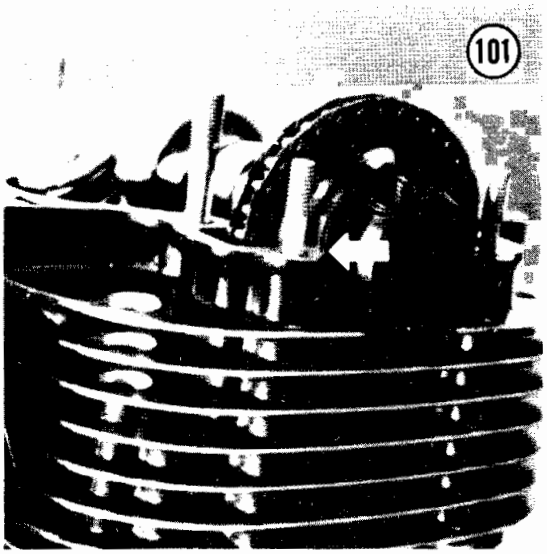
11. On C models, install the plug in the right side of the cylinder head. On D models, install the kick indicator window with the mark aligned as shown in **Figure 101**.

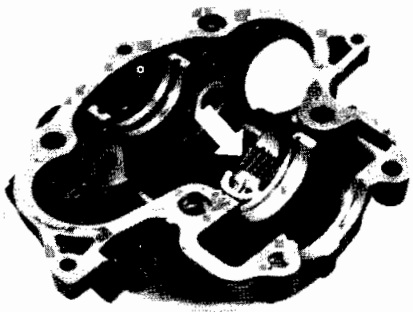
12. Coat the mating surfaces of the cylinder head and cam cover with non-hardening gasket cement. Install the cover, making sure the tachometer drive in the cover **(Figure 102)** engages the gear on the end of the camshaft.









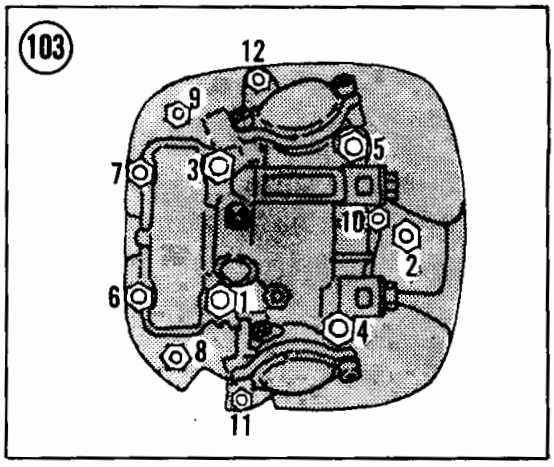


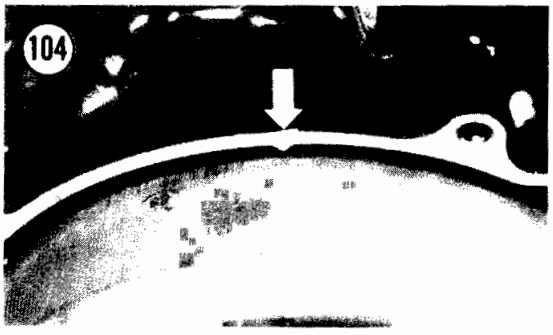
13. Install the nuts and bolts and tighten them in the pattern shown (**Figure 103**) to the values shown in **Table 2.**

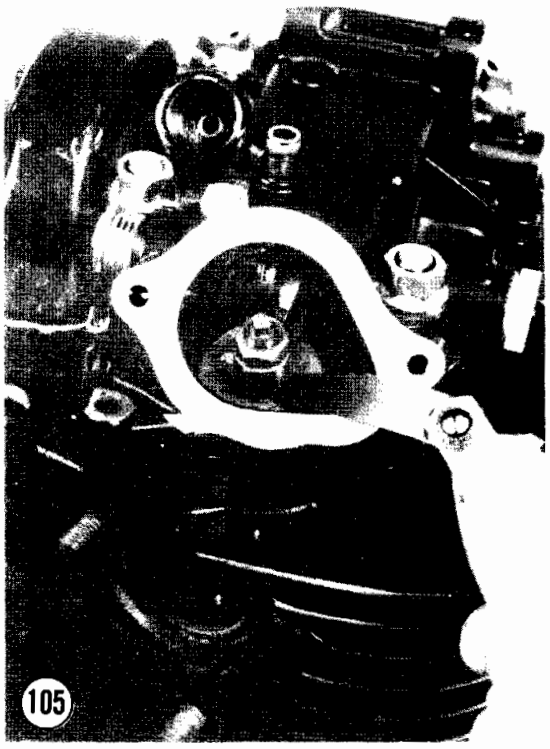
14. Align the "T" mark on the flywheel with the fixed pointer on the crankcase (**Figure 104**) with both valves closed. Check the rockers for movement. If the exhaust rocker cannot be moved, rotate the crankshaft 360°. The engine should now be at TDC on compression. Recheck the rockers; they should both move now.

15. Check the clearance of the tappet adjusters. See **Figure 105**. Intake clearance should measure 0.07-0.12mm (0.003-0.005 in.). Exhaust clearance should measure 0.12- 0.17mm (0.005-0.007 in.). If adjustment is required, loosen the locknut and turn the adjuster until it is correct. Then, without further turning the adjuster, tighten the locknut. Recheck the clearance to make sure the adjuster did not move. Install the tappet covers. See **Figure 106**.

16. Install the engine in the motorcycle as described earlier in this chapter (*Engine Installation*). Refer to Chapter Three and conduct a complete routine maintenance and lubrication program. Install a new oil filter and fill the engine with oil; carry out a complete tune-up; adjust the free play of the control cables and the clutch; adjust the drive chain; road test the motorcycle and check for and correct oil leaks.







BOTTOM END DISASSEMBLY

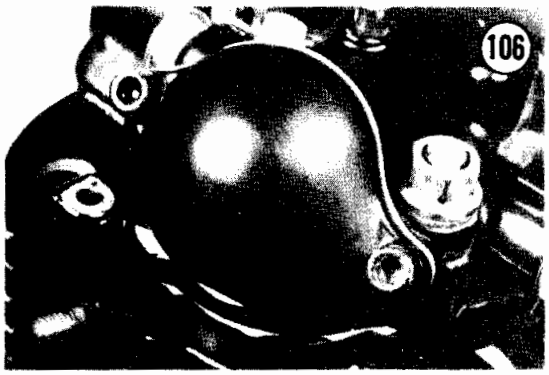
Service to the bottom end of the engine requires that the engine be removed from the motorcycle. The only special tool that is required for bottom-end work is the flywheel puller (Yamaha tool No. 90890-01189).

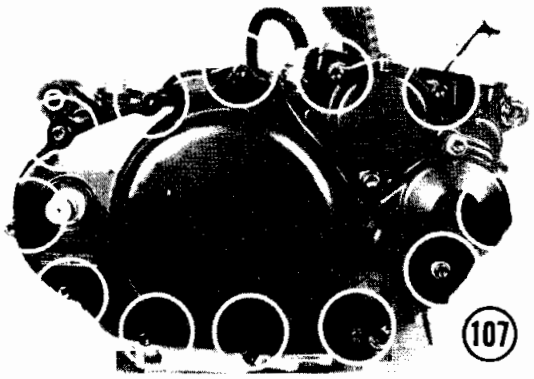
Before removing the engine for bottom-end service, remove the engine covers, flywheel, and clutch assembly; the motorcycle makes an excellent workstand while they are being removed, and the reduced weight makes the engine easier to handle.

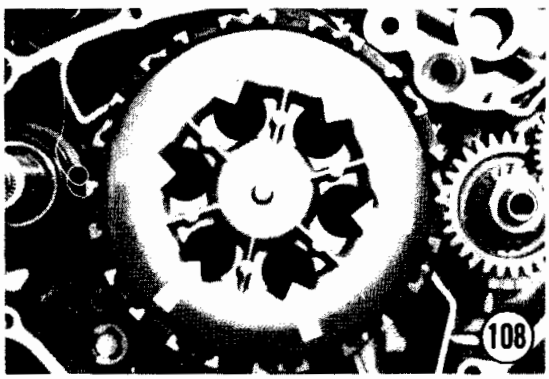
1. Carry out engine removal Steps 1-26 (see *Engine Removal*).

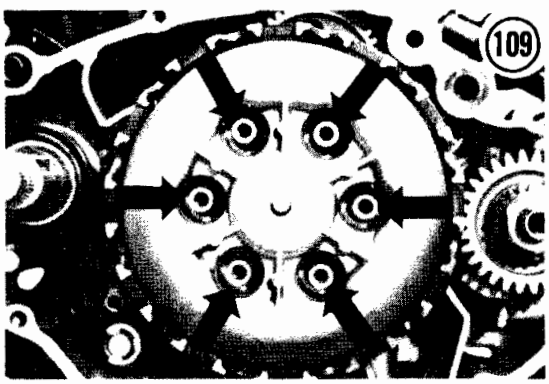
2. Remove the right engine cover (**Figure 107**).

3. Lock the rear wheel to prevent the engine from turning, and unscrew the clutch pressure plate bolts (**Figure 108**).





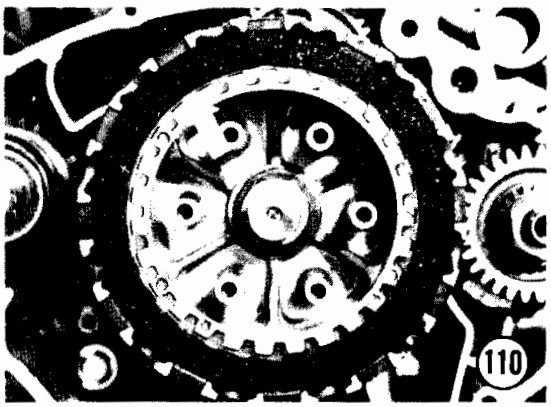


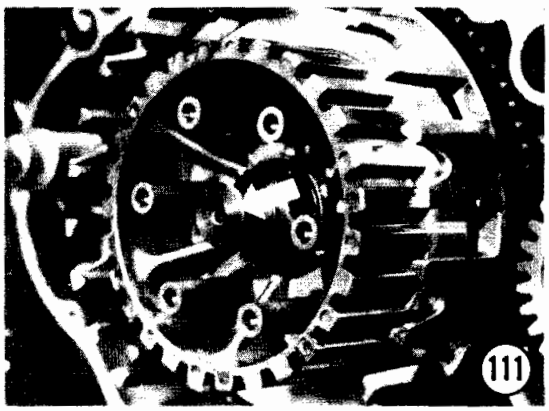


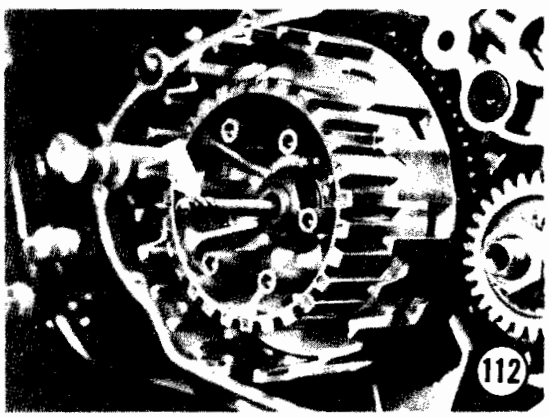
4. Remove the clutch springs (**Figure 109**) and the pressure plate.

5. Remove the clutch plates (**Figure 110**) and the clutch release (**Figure 111**) and rod (**Figure 112**).

NOTE: *Carry out the remaining engine removal steps and set the engine on a bench.*

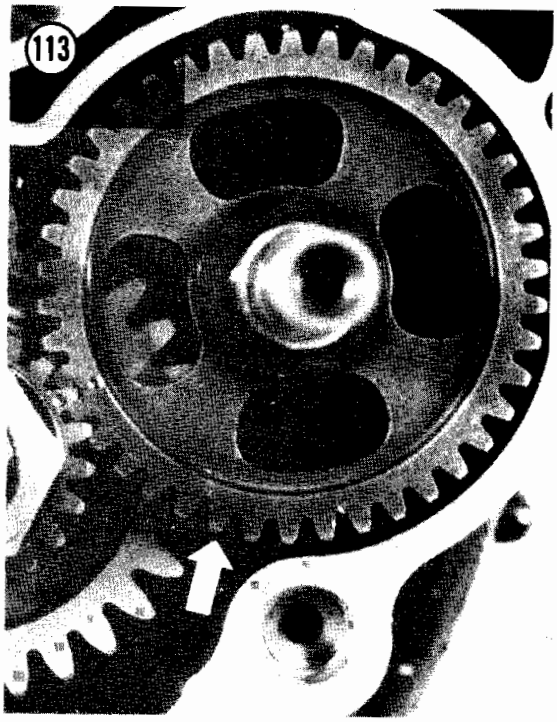


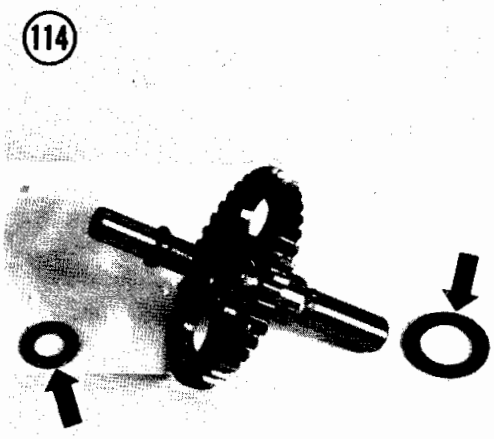


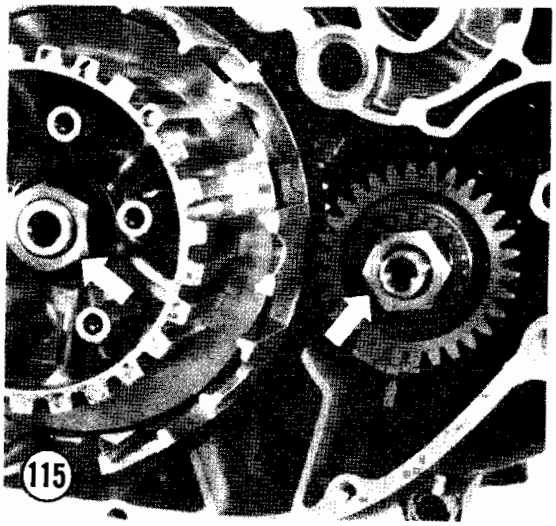


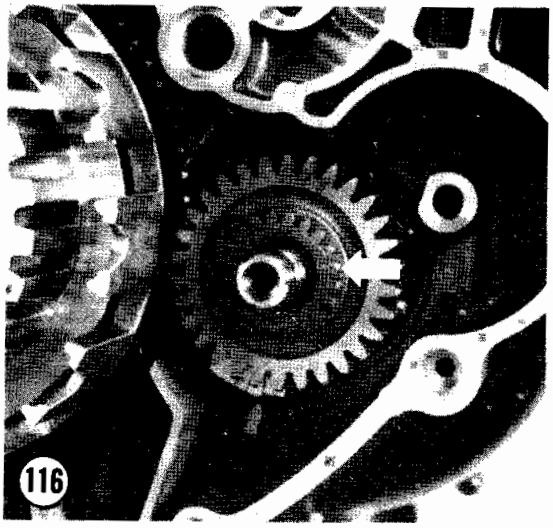
6. Remove the distributor cam driven gear (**Figure 113**) and collect the spacers (**Figure 114**).

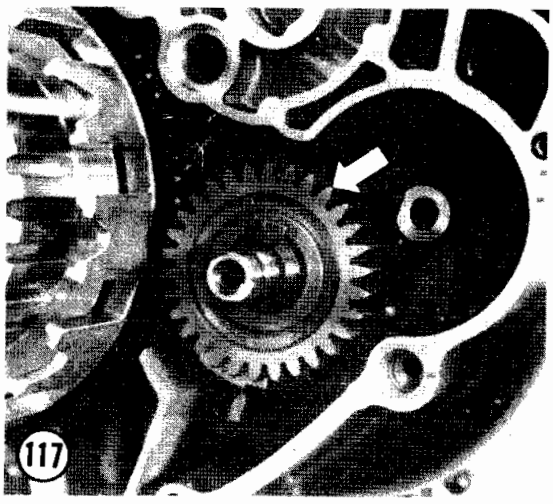
7. Lock the primary drive gear and the clutch gear with a shop rag jammed into the teeth and unscrew the drive gear nut and the clutch hub nut (**Figure 115**). Remove the distributor drive gear (**Figure 116**) and the primary drive gear (**Figure 117**).

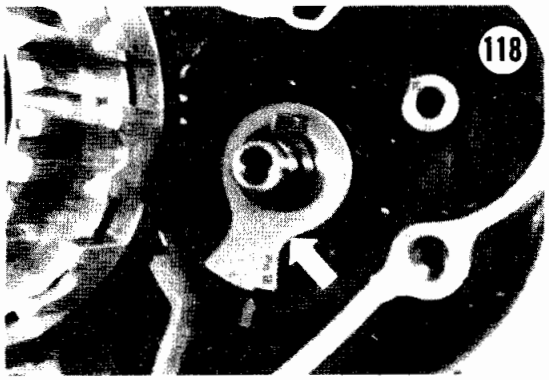


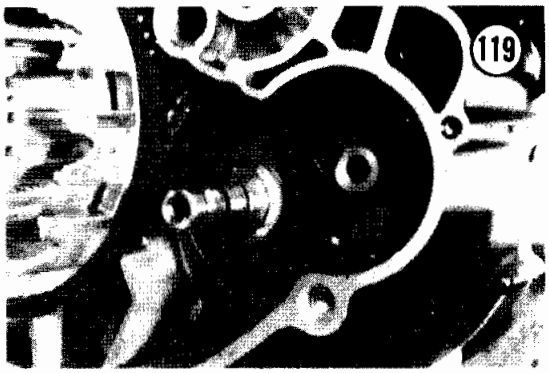


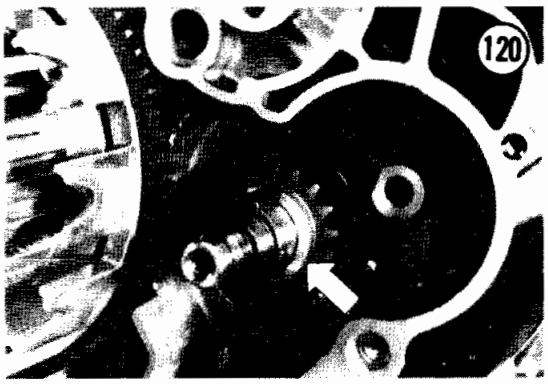


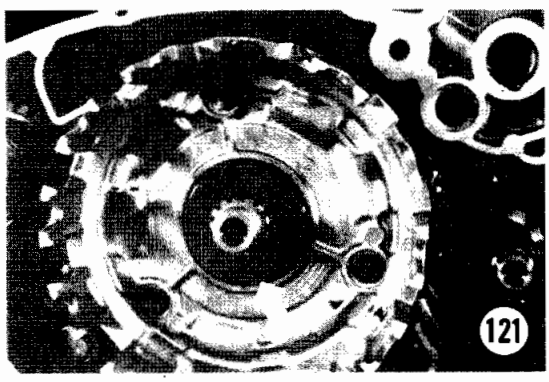








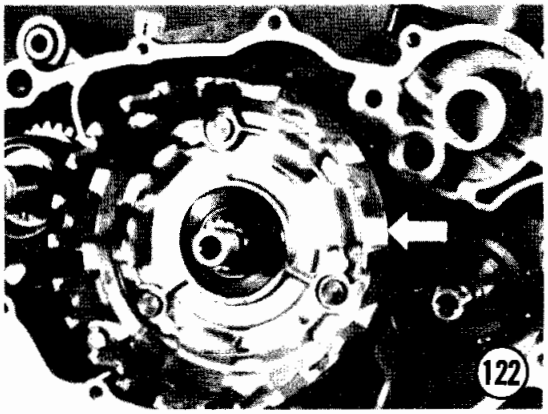


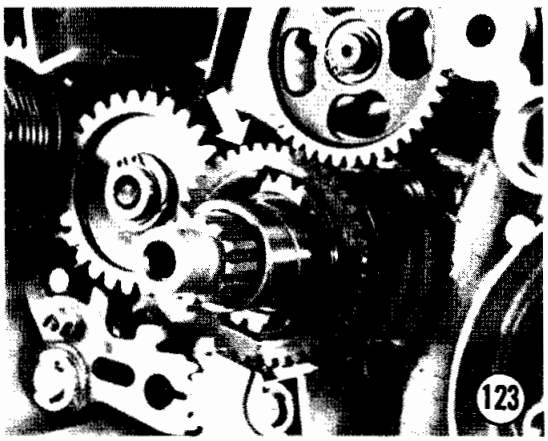


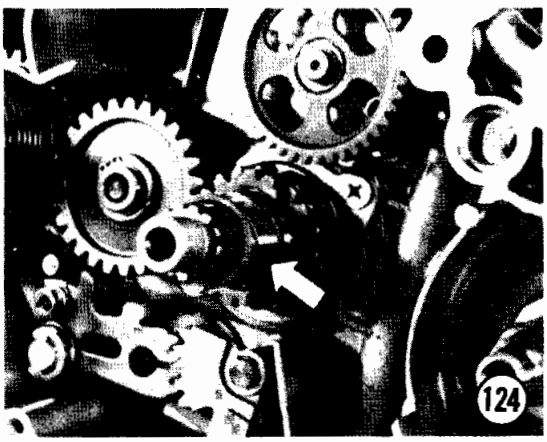
8. Remove the timing plate (**Figure 118**), disconnect the chain (**Figure 119**) and remove the drive sprocket (**Figure 120**).

9. Remove the washer (**Figure 121**) and the clutch basket (**Figure 122**).

10. Remove the starter gear (**Figure 123**). Remove the spacer from the shaft (**Figure 124**).





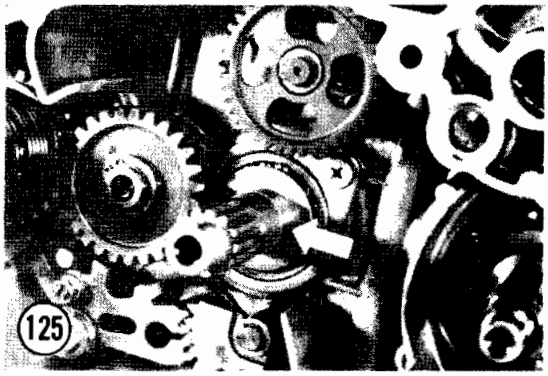


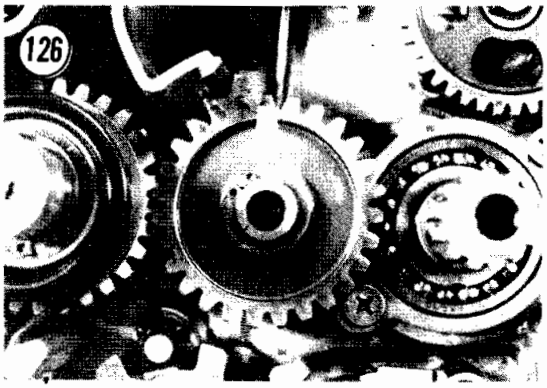
Remove the flat race located behind it (**Figure 125**).

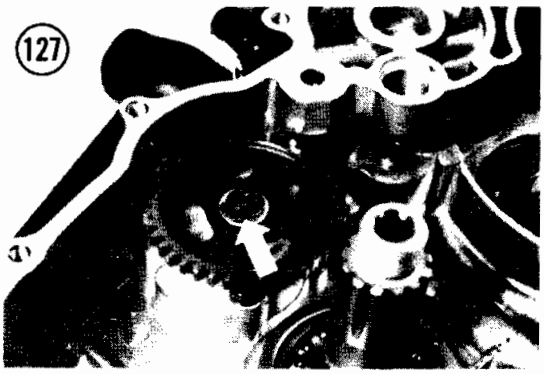
11. Remove the circlip from the starter idler gear (**Figure 126**) and remove the gear.

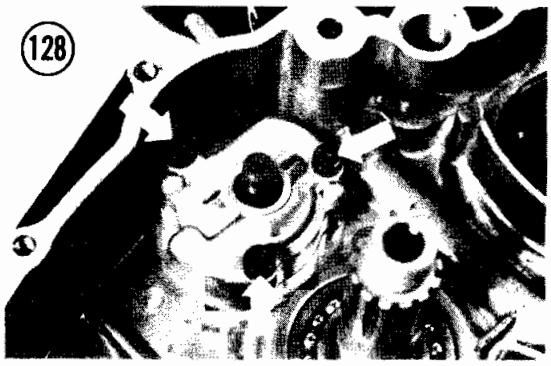
12. Remove the circlip from the oil pump drive gear (**Figure 127**) and remove the gear.

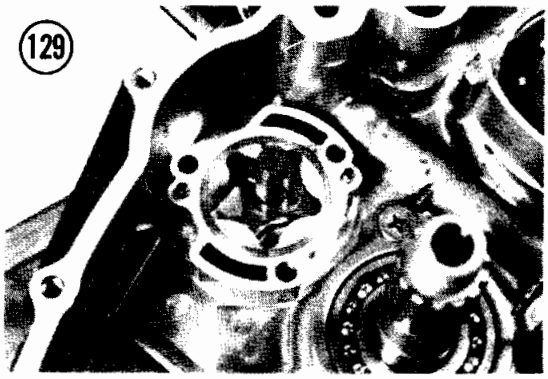
13. Unscrew the screws from the oil pump cover (**Figure 128**) and remove the cover. Remove the outer rotor and housing (**Figure 129**), and remove the inner rotor and shaft (**Figure 130**).



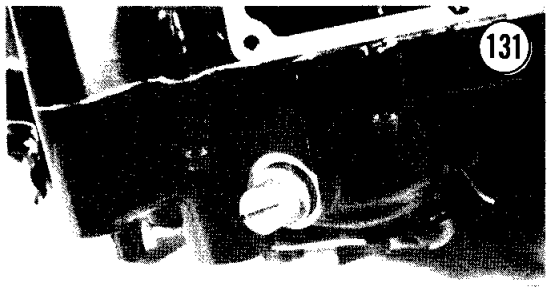


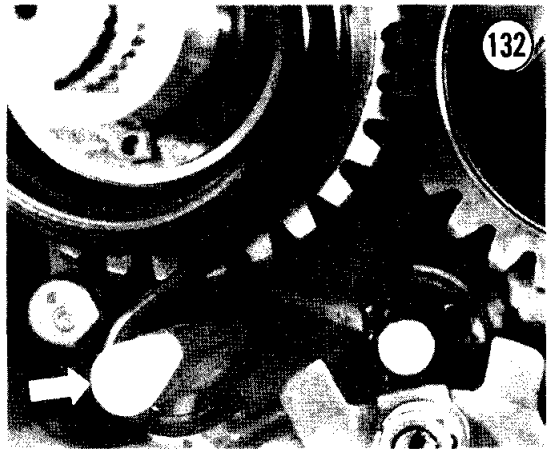


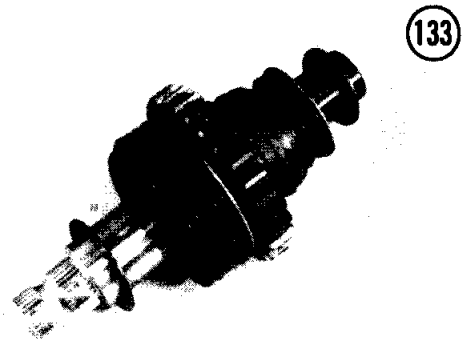


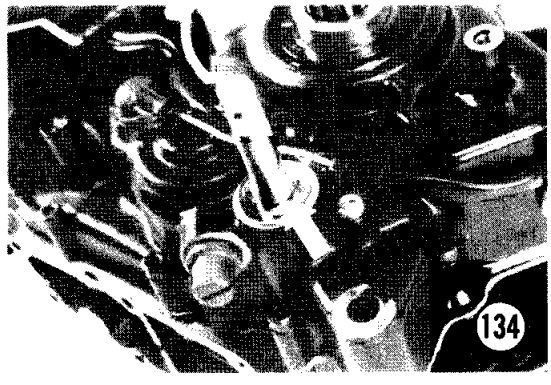












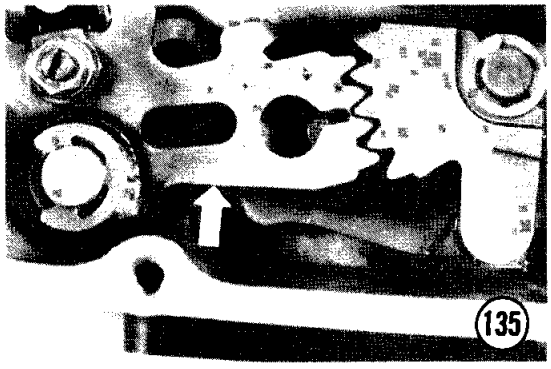
14. Unscrew the shifter detent from the bottom of the engine **(Figure 131)**.

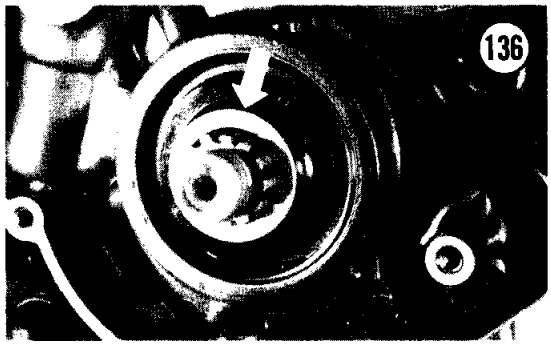
15. Disconnect the kickstarter return spring from the knob in the case **(Figure 132)** and remove the assembly **(Figure 133)**.

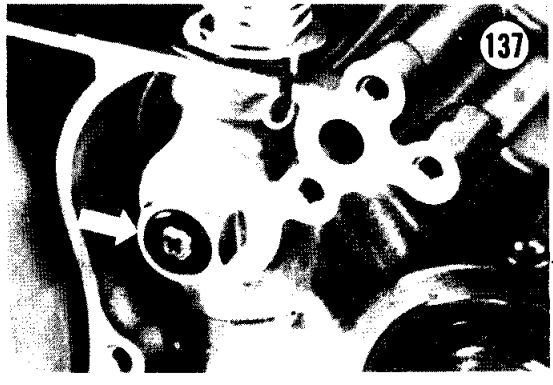
16. Remove the clip from the left end of the selector shaft **(Figure 134)**.

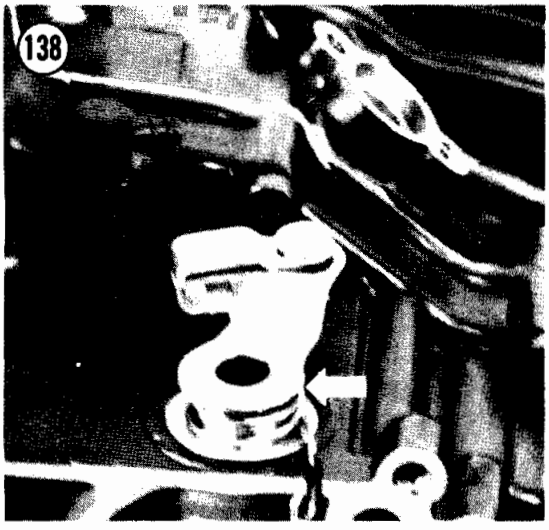
17. Pull the gear selector shaft and quadrant out of the case **(Figure 135)**.

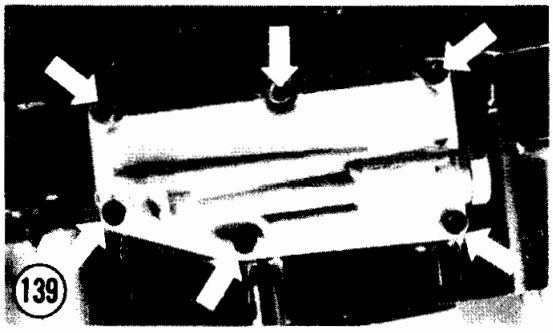
18. Remove the countershaft spacer **(Figure 136)**. Unscrew the clutch adjuster **(Figure 137)**. Pull up on the clutch arm **(Figure 138)** and remove it from the case.

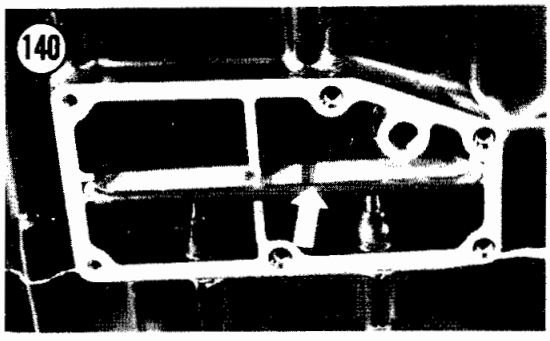












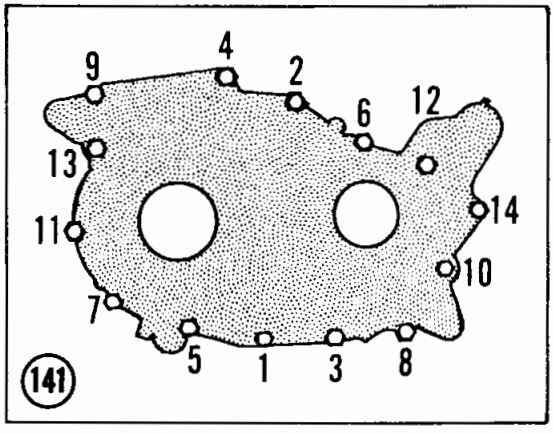
19. Unscrew the bolts that attach the oil screen cover (**Figure 139**), and remove the cover and the screen (**Figure 140**).

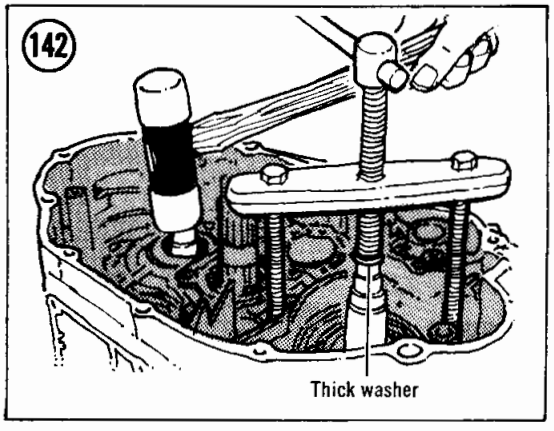
20. Loosen each of the 14 crankcase bolts ¼ turn in the pattern shown (**Figure 141**) until all bolts are loose. Then unscrew them completely.

21. Install a crankcase separator like that shown in **Figure 142**. The Yamaha tool number is 90890-01135; however, a universal puller fitted with 12mm bolts will work as well. Insert a large flat washer between the puller bolt and the end of the crankshaft before applying pressure. Otherwise, the end of the shaft could be damaged. Apply pressure and tap on the ends of the transmission shafts, the shift drum, and the front engine mounting lug.

CAUTION

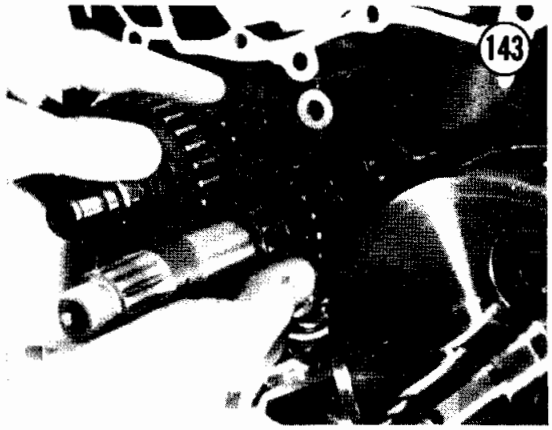
Use only a soft-face mallet. Do not strike the cover sealing surfaces. Make sure the cases seperate evenly; if they do not, release the pressure on the puller bolt and make the case halves parallel before commencing.

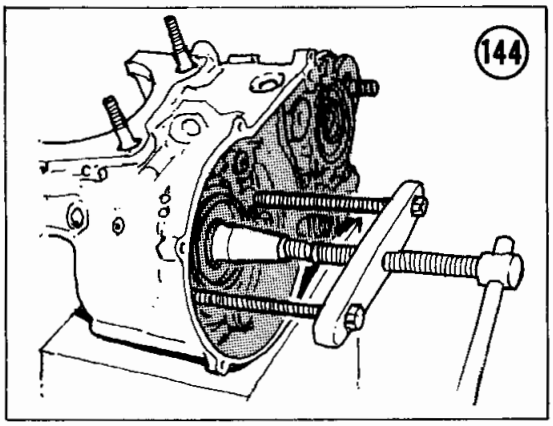


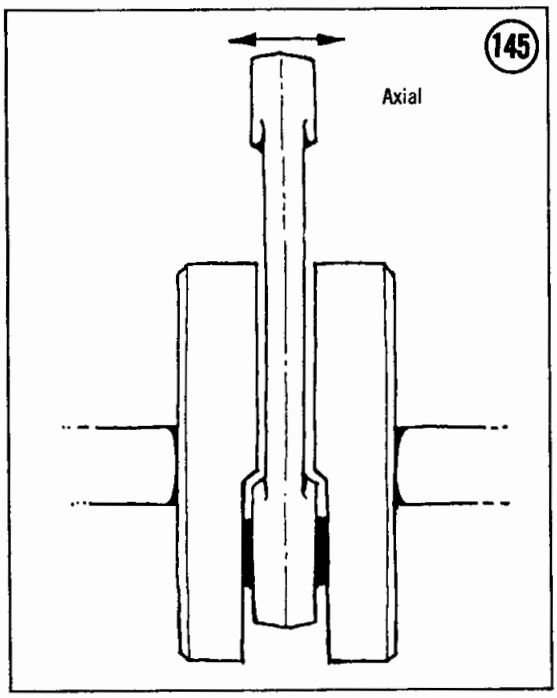


22. Remove the transmission gearsets and shifting mechanism all together (**Figure 143**). If necessary, tap lightly on the left end of the output shaft with a soft-face mallet.

23. Install the case separator on the outside of the left case half (**Figure 144**) and press the crankshaft out of the case. Use a flat washer between the puller bolt and the end of the crankshaft to prevent damage to the shaft.







BOTTOM END INSPECTION

With the exception of seal replacement and some preliminary checks, crankshaft service should be entrusted to a dealer. The crankshaft is pressed together and requires a press to separate and assemble it, as well as considerable experience to ensure that it is correctly aligned.

1. Clean all of the parts in fresh solvent and blow them dry with compressed air. Clean old gasket and sealer off all mating surfaces, taking care not to damage the surfaces.

NOTE: *Before cleaning the case halves, inspect the areas around the seals on the outside of the cases. If they are excessively oily, the seals are probably worn and should be replaced.*

2. Inspect the cases for cracks and damage. If necessary, the aluminum cases may be repaired by a professional welding service with experience working with precision aluminum castings.

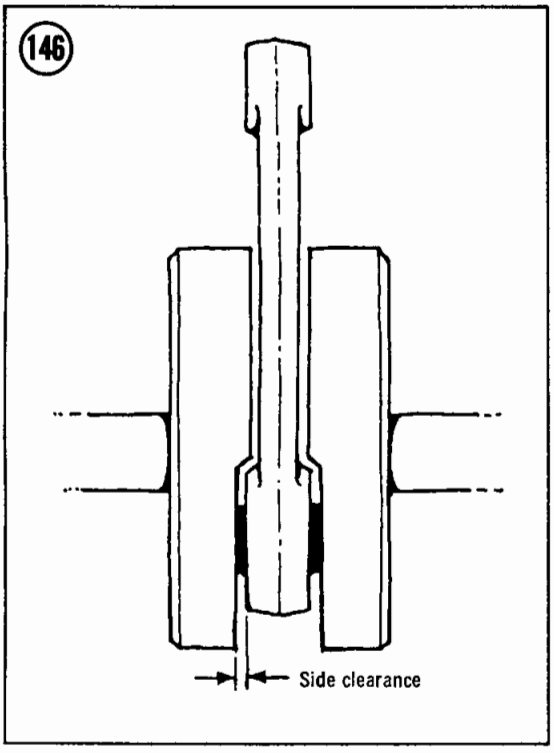
WARNING

The outer covers, stamped MAGNESIUM, *are not repairable if damaged or cracked. Discard them; do not attempt to repair them or have them repaired by welding. Magnesium is an unpredictable alloy and is very likely to explode if subjected to high heat.*

3. Check the axial (side-to-side) play of the connecting rod bearing by measuring the movement of the rod at the small end (**Figure 145**). If the play exceeds 2mm (0.08 in.), refer the crankshaft to a dealer for detailed inspection and service.

4. Move the big end of the connecting rod to one side as far as it will go and check the side clearance with a flat feeler gauge (**Figure 146**). It should be 0.35-0.65mm (0.014-0.026 in.).

5. Support the crankshaft assembly in a lathe or other centering device and measure runout with a dial indicator (**Figure 147**). The indicator readings, from one side to the other, should be within 0.03mm (0.0012 in.). If they are not, alignment can be corrected by tapping the wheels with a heavy, brass hammer (**Figure 148**). If there is any doubt about your ability to handle this rather tricky job, entrust it to your dealer.

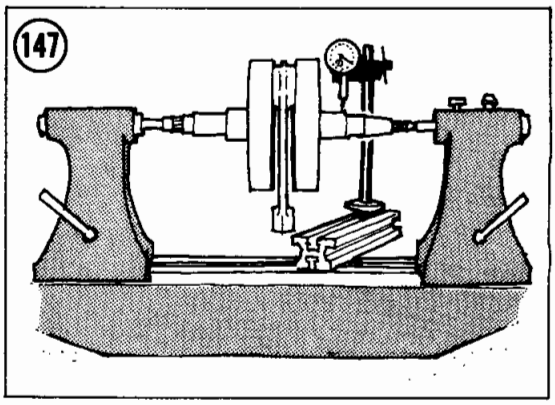


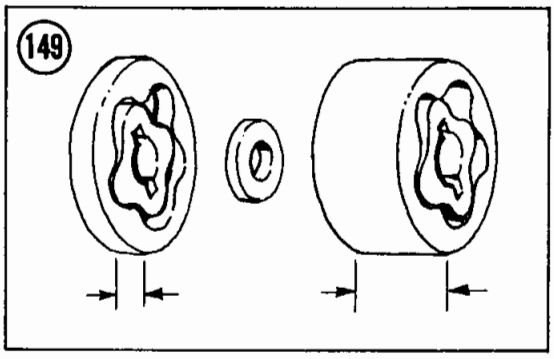
6. Rotate the bearings by hand and check for roughness and play. They should turn smoothly, quietly, and with no appreciable radial play. If they do not, replace them. To remove and replace press-fit bearings, first pry out the seal, and heat the case in an oven to about 250°F. This ensures uniform heating and helps prevent warpage. When the case is warm, rap it sharply on a soft surface such as a wood and the bearing will dislodge. If the bearing is stubborn, use a socket as a drift and tap out the bearing. Install the new bearing while the case is still warm. Apply lithium grease to the balls.

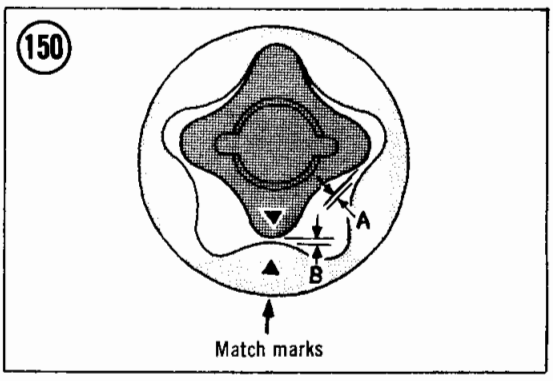
Bearings that are secured by a retainer usually do not require heating. Just remove the retainer and then remove the bearing. During installation, stake the retainer screws after they have been tightened.

To install a seal, first clean the seal bore thoroughly. Apply lithium grease to the seal lip. Align the seal with the bore squarely, open side facing in. Use a socket that will bear on the seal outer lip as a driver and carefully tap the seal into place.

NOTE: *The right-side crankshaft seal is installed with lip facing out.*





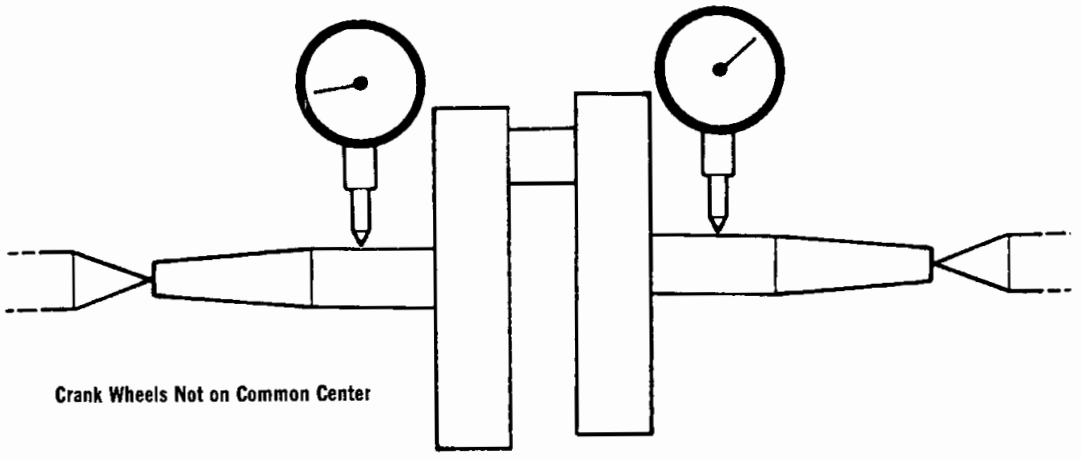


7. Measure the thickness of inner and outer rotors of both the feed and scavenger pumps for wear (**Figure 149**). If the feed pump is less than 3.95mm (0.1555 in.) thick, replace it. If the scavenger pump is less than 17.95mm (0.7067 in.) thick, replace it.

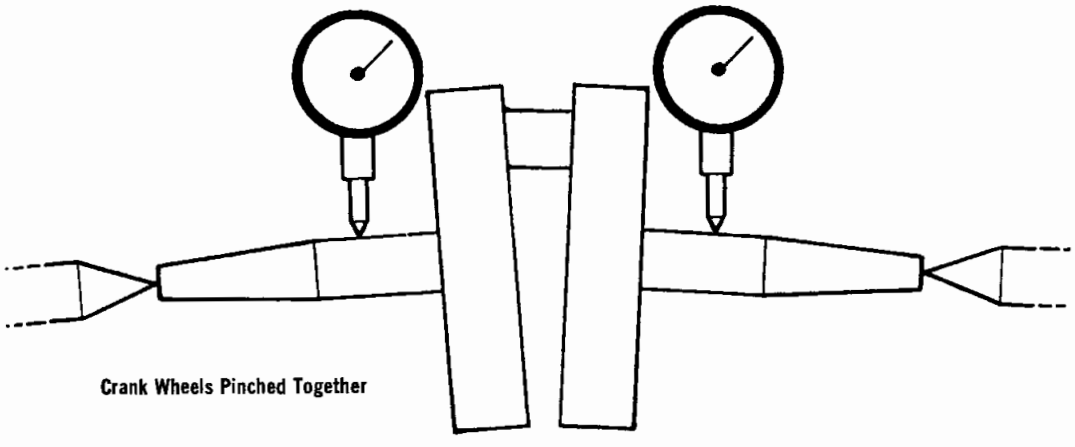
8. For each pump, set the inner rotor in the outer rotor with the marks aligned (**Figure 150**); measure the clearance at locations A and B. If the clearance measured at either location is greater than 0.35mm (0.038 in.), replace the pump.

CRANKSHAFT ALIGNMENT PROBLEMS

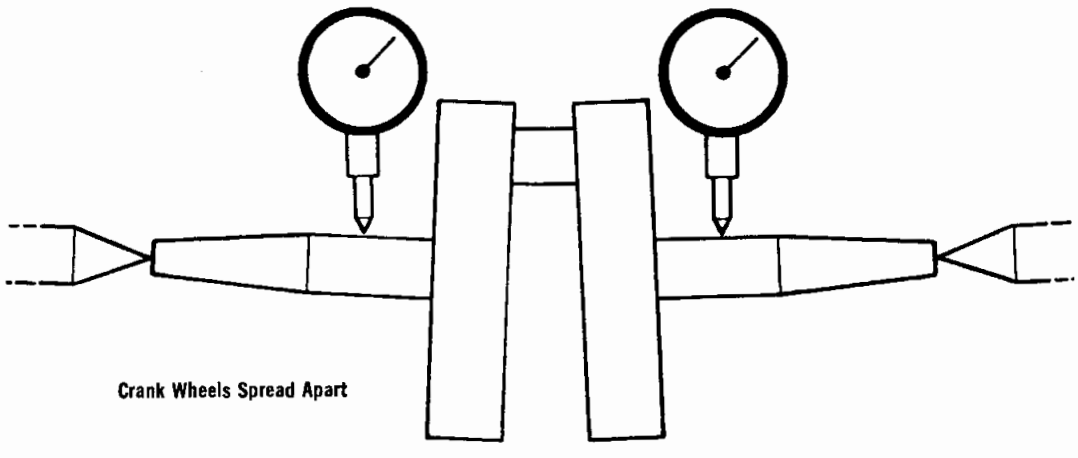
148



Crank Wheels Not on Common Center



Crank Wheels Pinched Together



Crank Wheels Spread Apart

4

9. Inspection of primary drive, clutch, and transmission components are covered in Chapter Five.

BOTTOM END ASSEMBLY

Assembly is essentially the reverse of disassembly. The points and steps that follow will ensure accurate work.

1. Install the oil passage cover on the right case half (**Figure 151**). Apply thread locking compound such as Loctite Lock N' Seal to the screws beforehand.

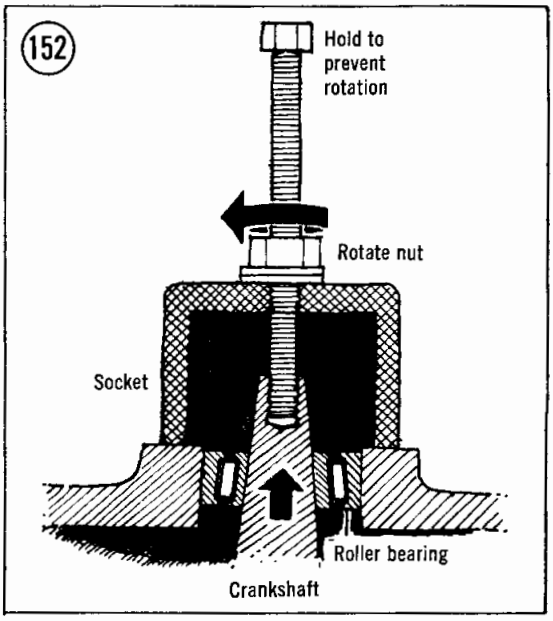
> NOTE: *Several steps specify the use of a non-hardening gasket sealer. Yamaha Bond No. 4 and Gasgacinch are both excellent for this job, and are available from your dealer.*

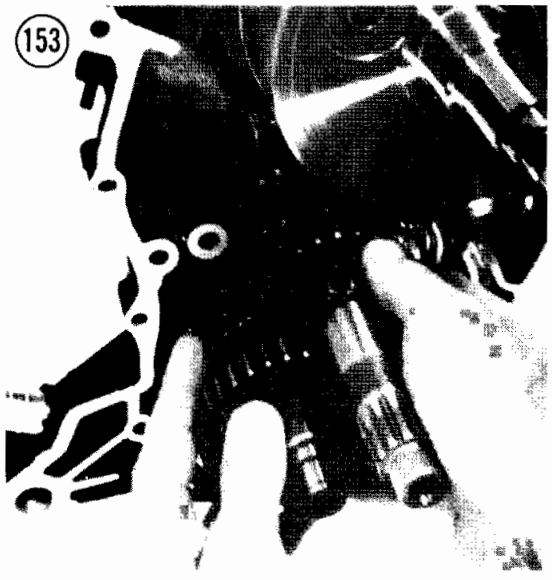
2. Set crankshaft assembly into left case half. If Yamaha installer and bolt are not available (tool No. 90890-01012 and 90890-01017), a tool like the one shown in **Figure 152** can be fabricated. It is important that the crankshaft assembly be drawn into the case rather than tapped in from the inside; misalignment of the crank wheels is likely to occur if the shaft assembly is tapped in.

As the crankshaft is being drawn into the case, hold it to prevent it from rotating. The shaft is correctly installed when it bottoms against the left side bearing.

3. Mesh the 2 gearsets and install them in the case together (**Figure 153**).

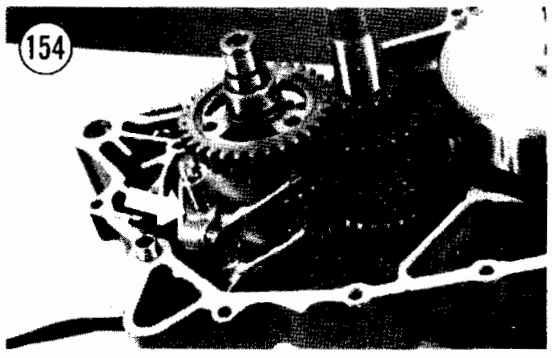
4. Install the shifting forks on the rear pivot shaft (**Figure 154**). Note that the odd fork, with

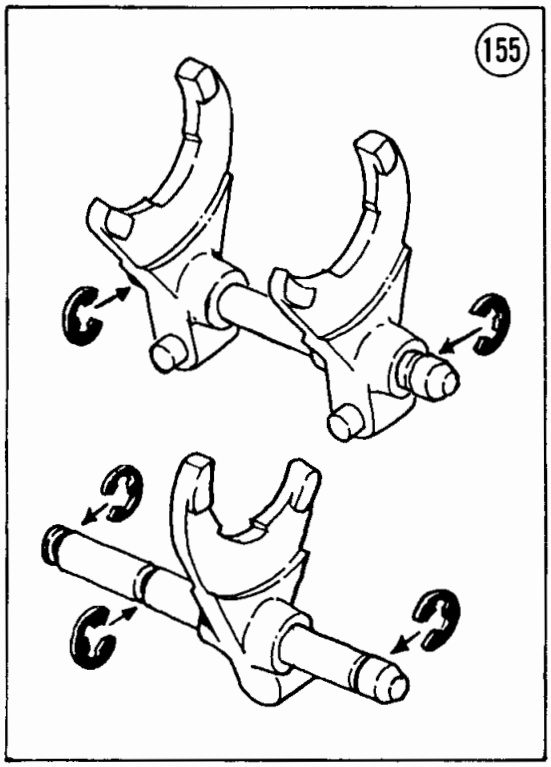




151







the boss extensions only on the left side, goes to the right. Make certain the circlips are correctly installed (**Figure 155**).

5. Install the other shifting fork (**Figure 156**).

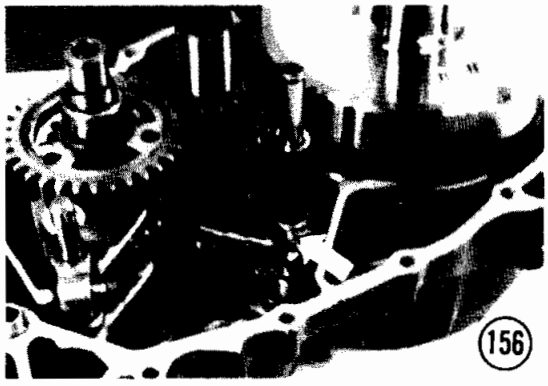
6. Install the shifting drum, making sure the pathways in the drum engage the knobs on the forks (**Figure 157**). Rotate the gearsets to ensure that there is no binding. It will be necessary to move the sliding gears in and out of engagement for the shafts to turn freely.

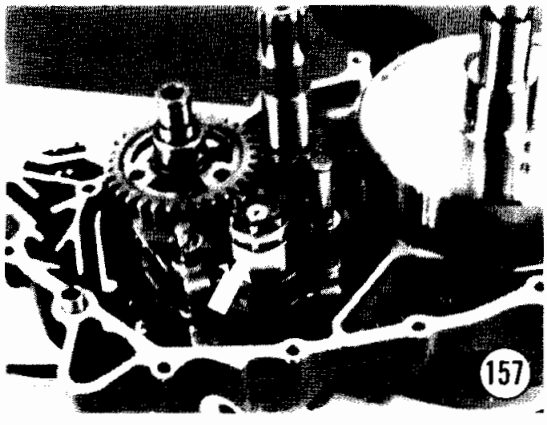
7. Install new O-rings on the engine mount spacer (**Figure 158**). Install the spacer in the left case half (**Figure 159**).

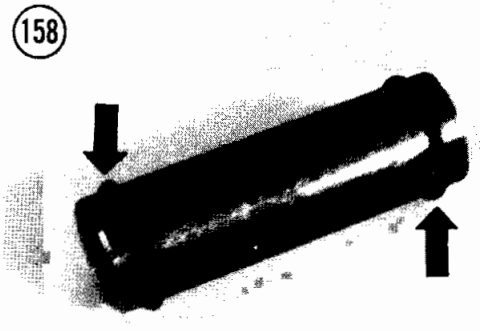
8. Oil the transmission bearings, gears, shafts, forks, and any other sliding or rotating components with fresh engine oil. Also oil the connecting rod big-end bearing.

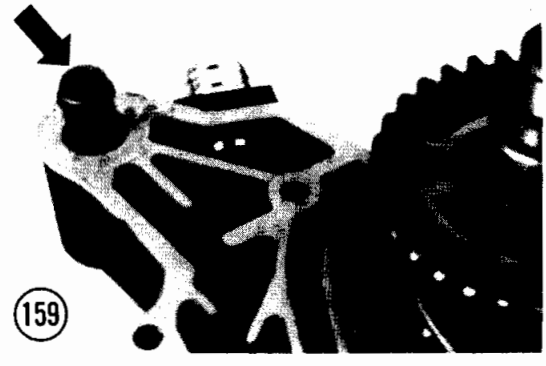
9. Coat the sealing surfaces of both cases with a good grade of non-hardening gasket sealer such as Yamaha Bond No. 4.

10. Start the right crankcase half over the gearshafts and crankshaft. Press it down evenly all around. It will probably be necessary to tap the case down into place, but tap only around the









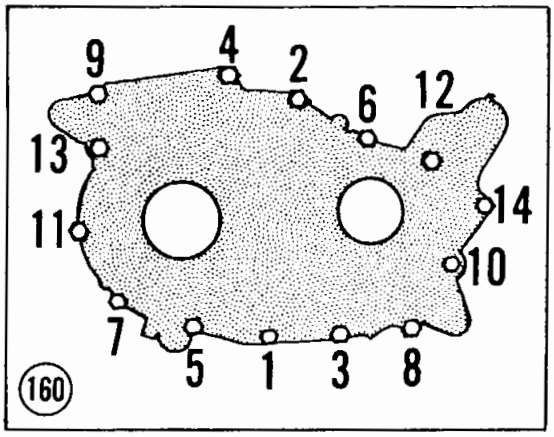
bearing bores or the large reinforced mounting lugs. Do not tap on the crankshaft or the case cover mating surfaces.

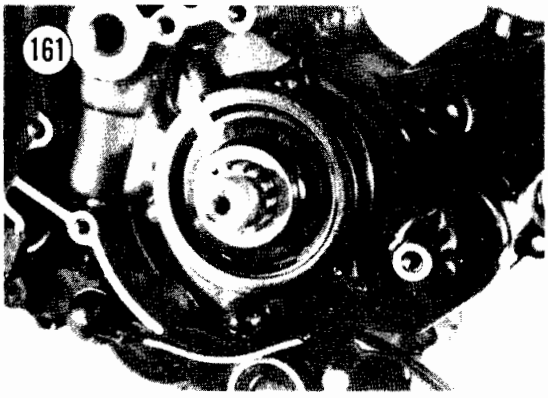
11. When the case halves meet, screw in the 14 bolts and tighten them progressively in the pattern shown (**Figure 160**). When all of the bolts are snug, tighten them to 1.0-1.4 mkg (7.2-10.0 ft.-lb.) in the same pattern.

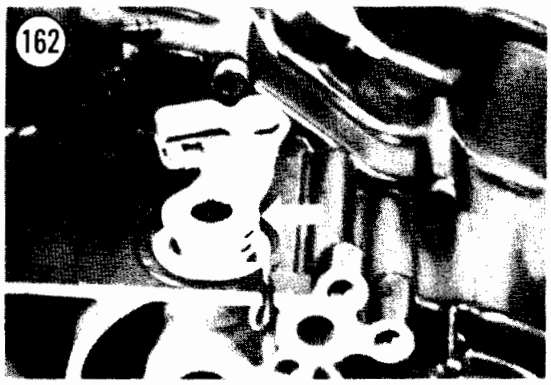
12. Check to make sure the crankshaft and transmission shafts turn freely without binding. If binding is felt, separate the case halves and find the trouble. There is no point in continuing with assembly until the problem has been located and corrected.

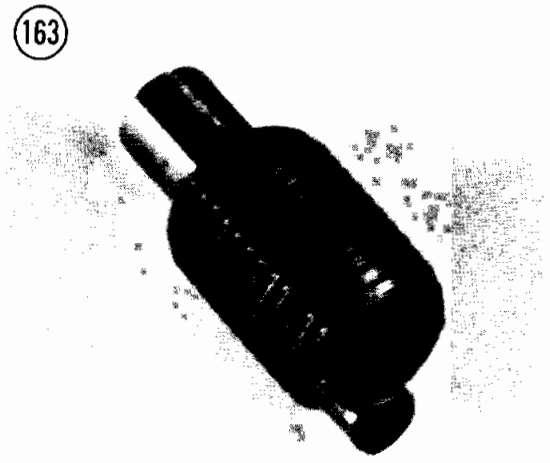
13. Install the countershaft spacer (**Figure 161**). Install the clutch arm (**Figure 162**). Screw the clutch adjuster into the case. Note that it has an eccentric knob that must engage with the groove in the clutch arm shaft (**Figure 163**).

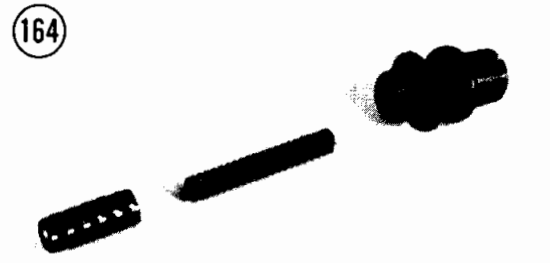
14. Install the shifter detent (**Figures 164 and 165**).

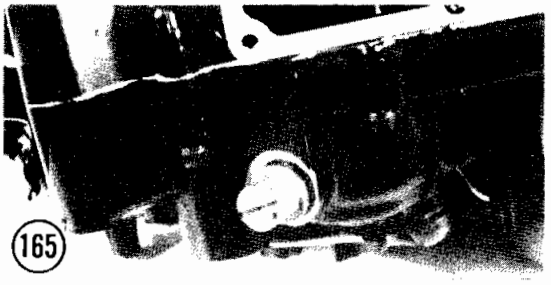


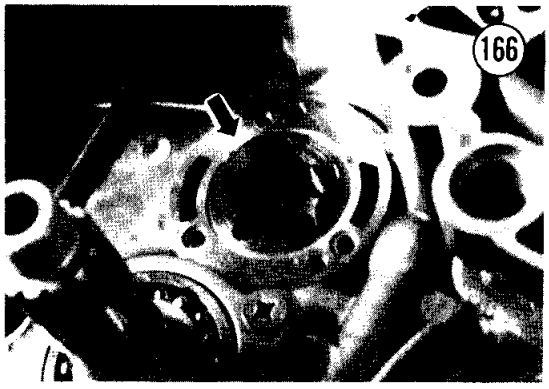








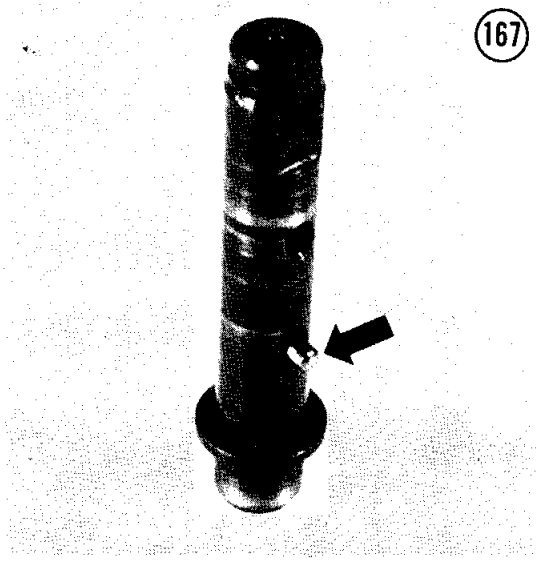


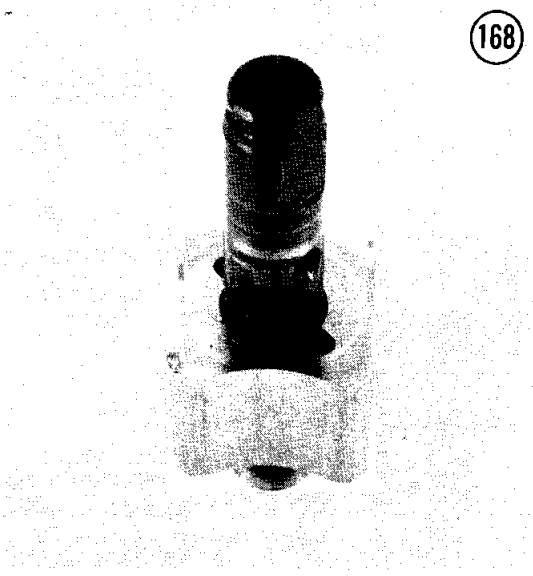


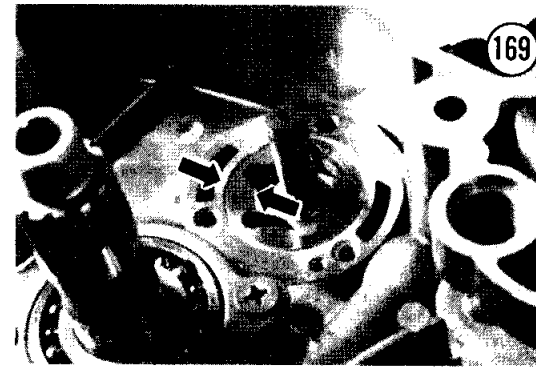
15. Oil the oil pump cavity and the rotors and shaft. Install the thick scavenge outer rotor in the cavity (**Figure 166**). Set the pin in the inside hole in the pump shaft (**Figure 167**), install the thick inner rotor on the shaft with the slot in the rotor engaging the pin (**Figure 168**), and install the assembly in the cavity with the marks on the rotors aligned (**Figure 169**).

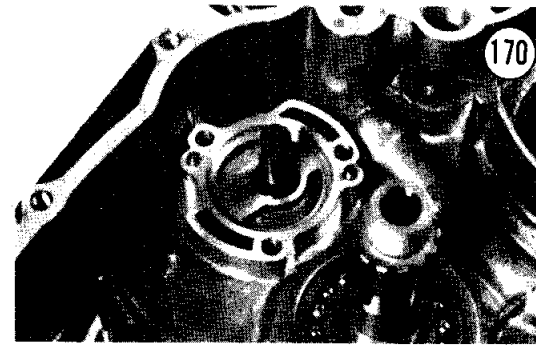
16. Install the pump body with the machined recess facing up (**Figure 170**). Install the outer pin in the pump shaft.

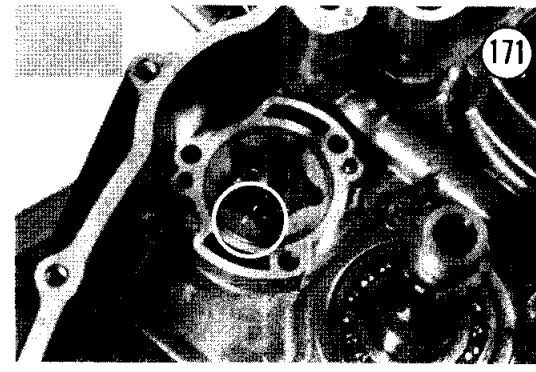
17. Install the feed rotors with their marks aligned (**Figure 171**). Coat the sealing surface of





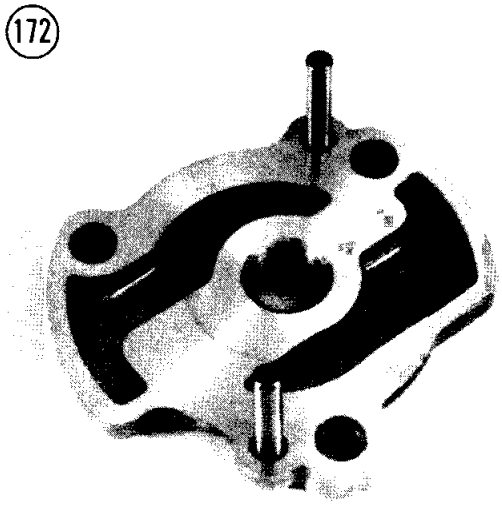




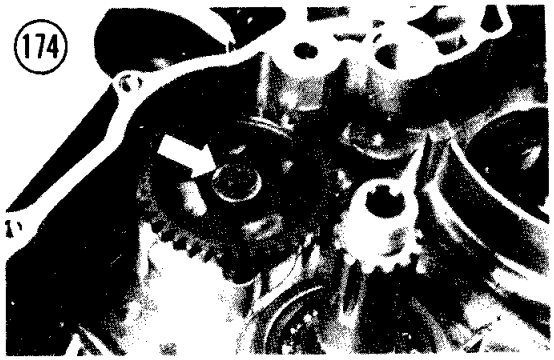


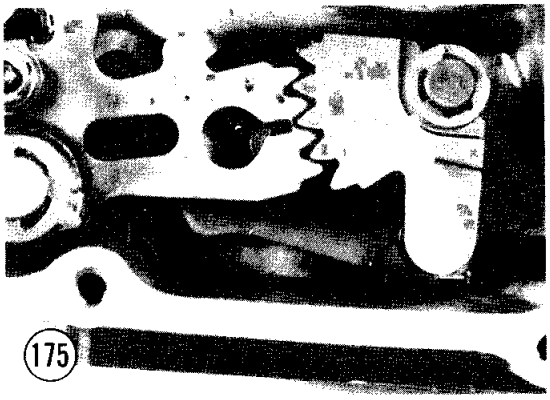
the outer cover with non-hardening gasket cement and install the alignment pins (**Figure 172**). Install the cover, coat the threads of the screw with thread-locking compound, and screw them in tight (**Figure 173**). Install the oil pump drive gear and the circlip (**Figure 174**).

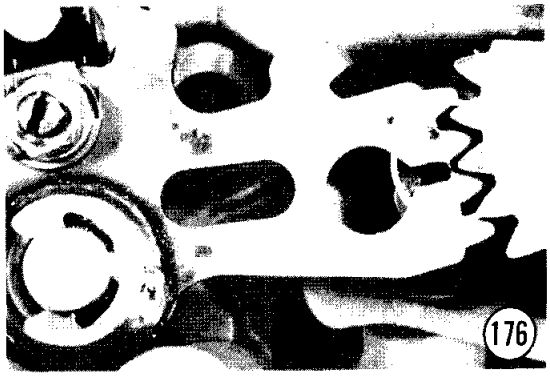
18. Install the selector slave segment and E-clip (**Figure 175**). Install the selector master segment and shaft with the marks aligned (**Figure 176**). Install the clip on the left end of the selector shaft (**Figure 177**).

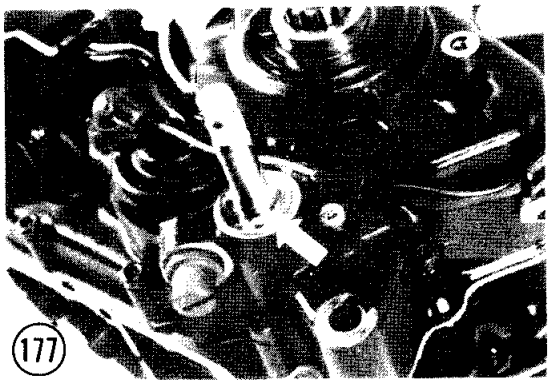


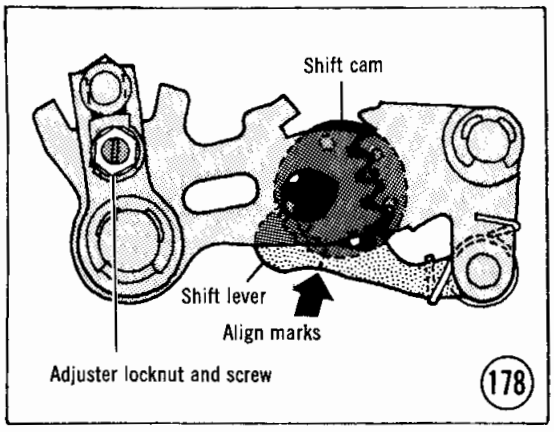










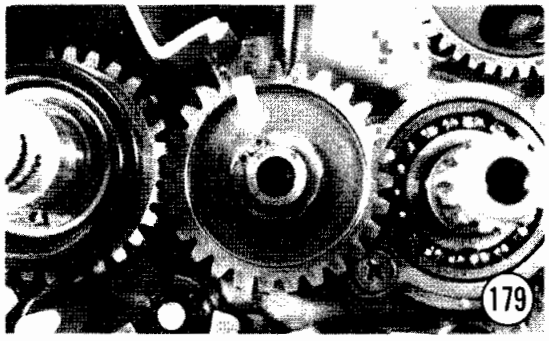


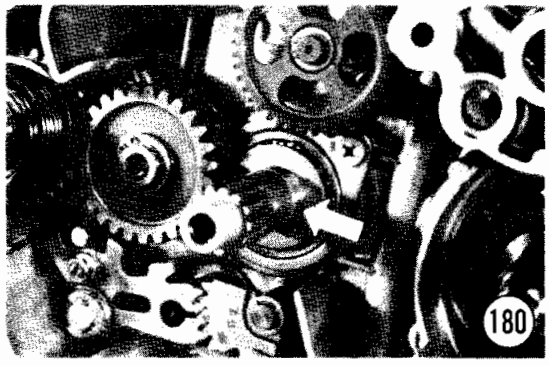
19. Fit the gear selector pedal to the shaft and engage second gear **(Figure 178)**. Turn the adjuster on the master shift lever until the marks align. Then tighten the locknut.

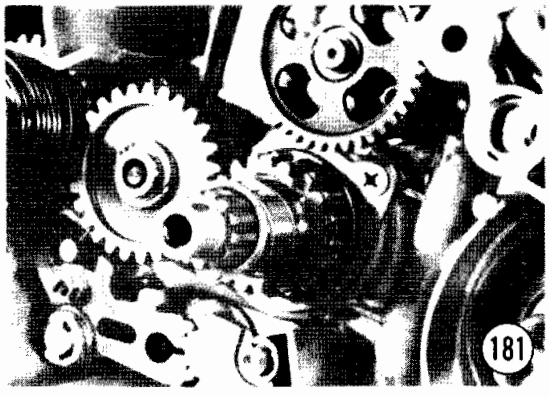
20. Install the starter idler gear and circlip **(Figure 179)**.

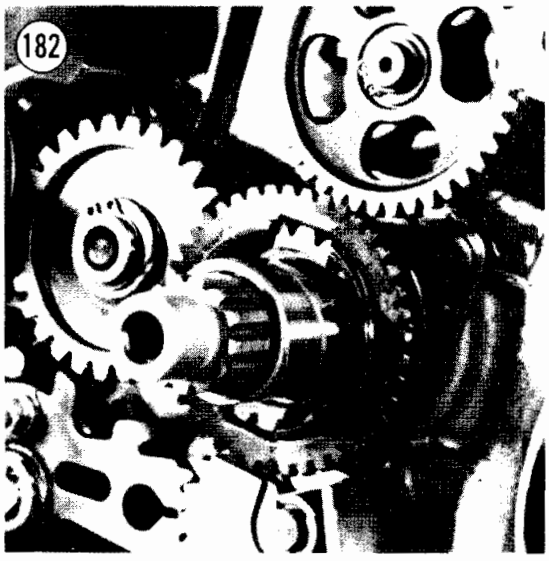
21. Install the flat race on the input shaft **(Figure 180)**. Install the spacer **(Figure 181)**. Install the starter gear **(Figure 182)**. Install the clutch basket and washer **(Figure 183)**. Screw on the clutch hub nut but do not tighten it yet.

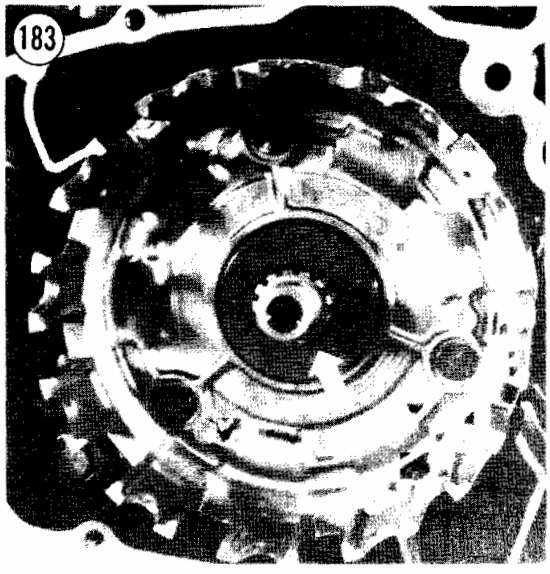
22. Slide the cam drive chain down into the gallery. Install the chain drive sprocket on the









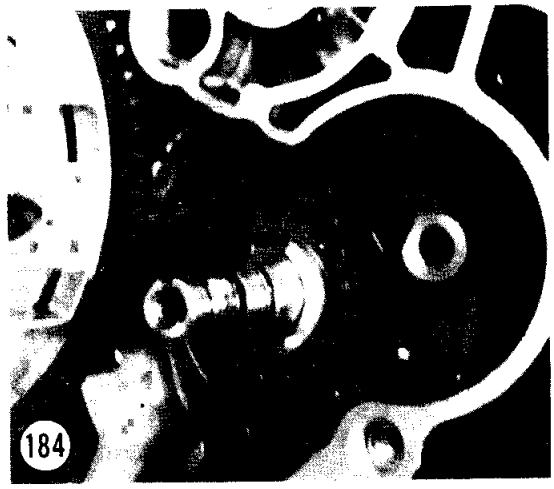


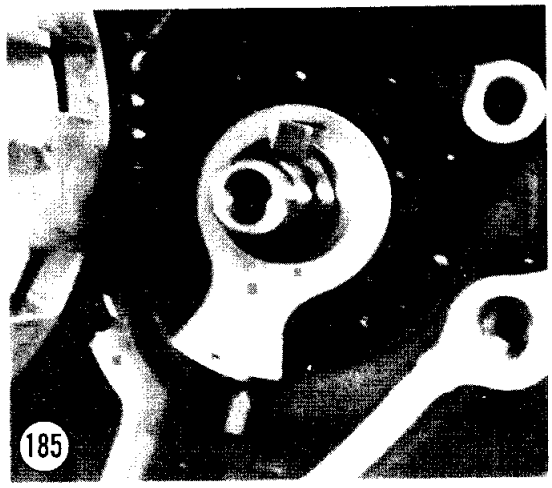
crankshaft and engage it with the chain (**Figure 184**). Install the timing plate (**Figure 185**). Install the primary drive gear (**Figure 186**) and the contact breaker drive gear (**Figure 187**), taking care to align their slots with the key in the crankshaft before pressing them into place.

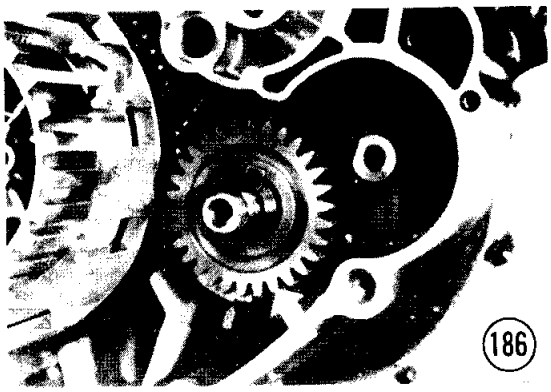
23. Lock the primary drive gear and the clutch gear with a shop rag jammed into the teeth. Screw on and tighten the primary drive gear nut to 5-7 mkg (36-50 ft.-lb.). Tighten the clutch hub nut to 5-7 mkg (36-50 ft.-lb.). Remove the shop rag.

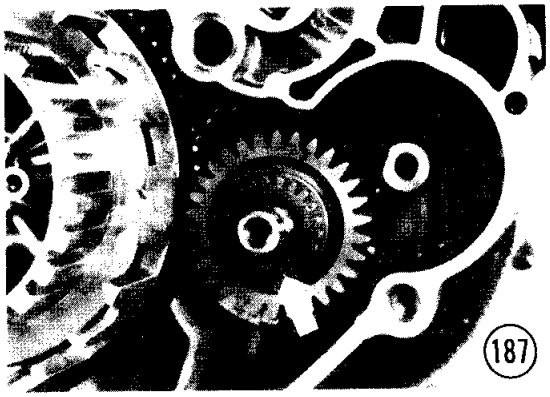
24. Install the distributor cam driven gear and spacers. Align the mark on the driven gear with the mark on the drive gear (**Figure 188**).

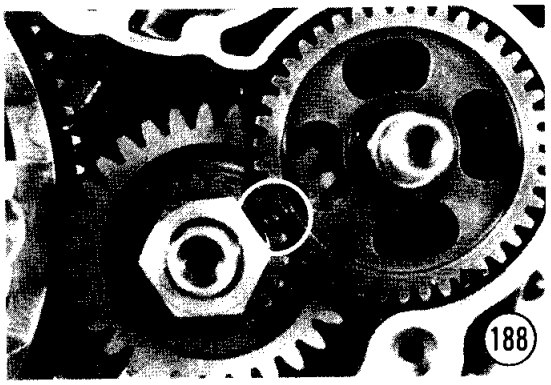
25. Install the kickstarter assembly, making sure the end of the spring engages the knob in the case (**Figure 189**).

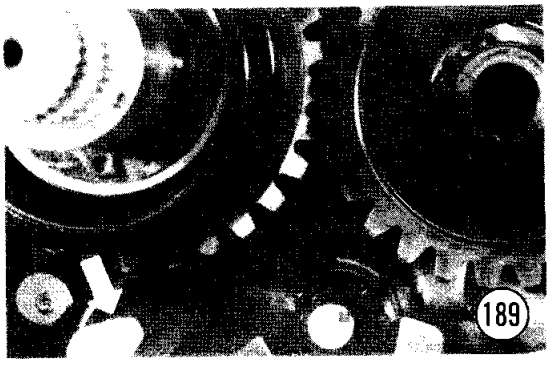


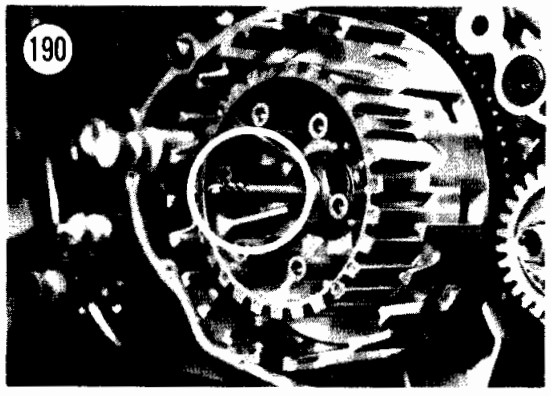


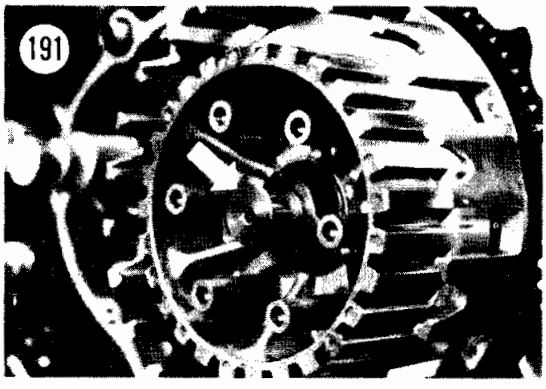


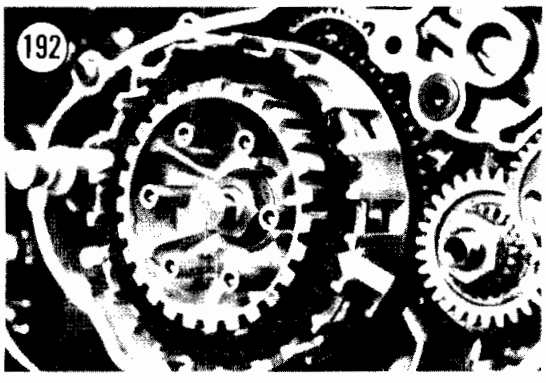


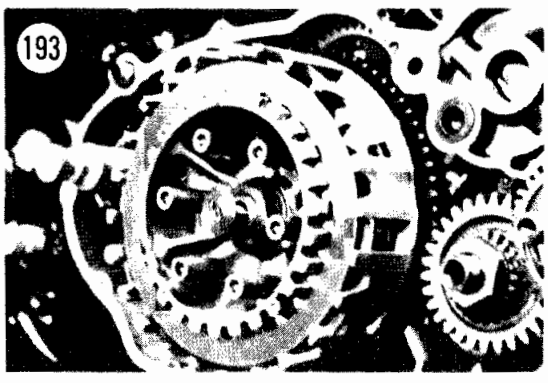








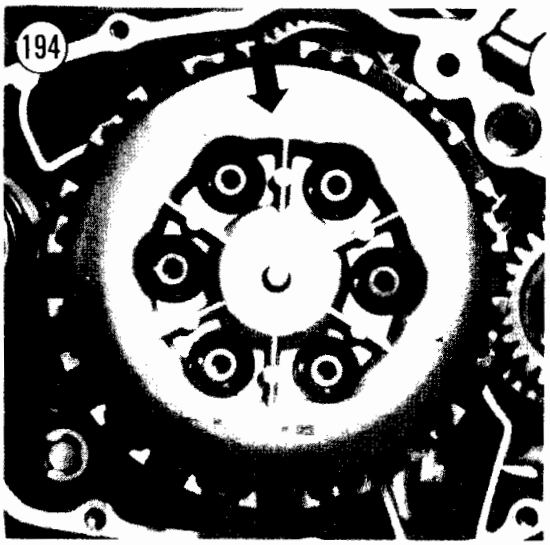


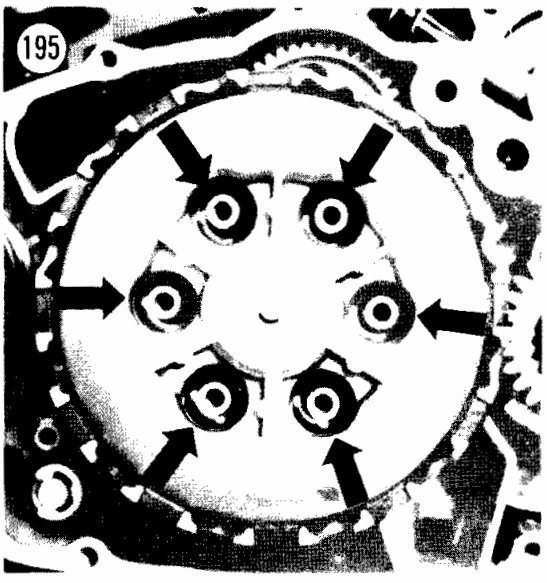


NOTE: *Refer to* ***Upper End Assembly*** *and perform the steps described. Refer to* ***Engine Installation*** *and install the engine in the motorcycle before proceeding with assembly.*

26. Install the clutch rod in the shaft with the spiral-cut end out (**Figure 190**). Install the throwout (**Figure 191**).

27. Install the clutch plates — first a friction plate (**Figure 192**), and then a steel plate (**Figure 193**), alternating them until all 15 are installed. Install the pressure plate (**Figure 194**), the springs (**Figure 195**), and the clutch bolts





(**Figure 196**). Install the countershaft sprocket and drive chain as described in *Engine Installation*. Lock the rear wheel with the brake and tighten the clutch bolts in a crisscross pattern to 1 mkg (7.2 ft.-lb.).

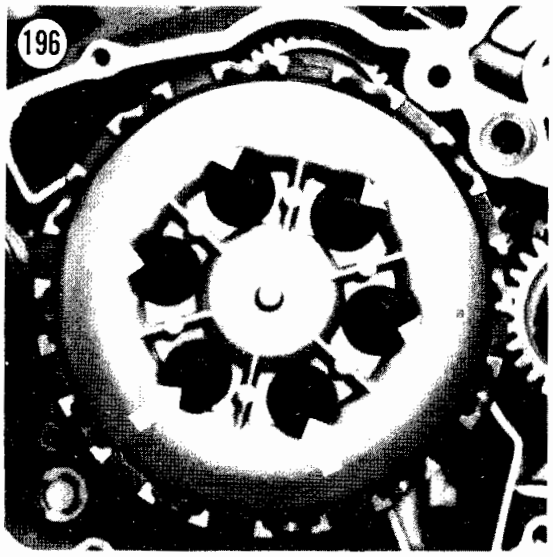
28. Coat the mating surface of the engine cover with a non-hardening gasket sealer, such as Yamaha Bond No. 4. Install cover and screw in and tighten bolts in a crisscross pattern.

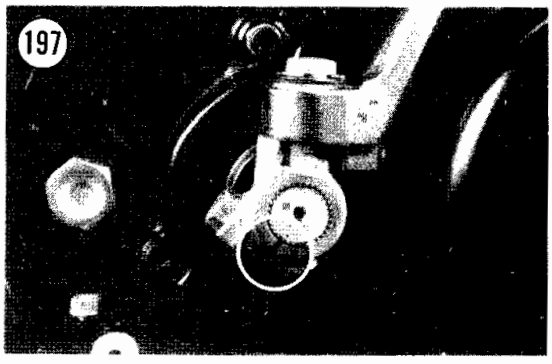
29. Install the kickstarter (**Figure 197**). Line up the mark on the shaft with the slot.

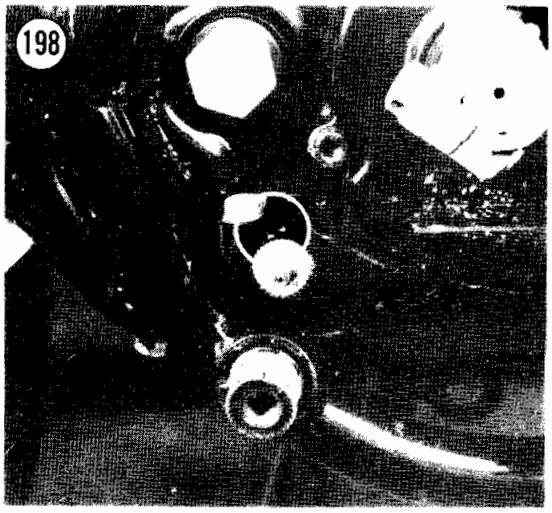
30. Install the brake pedal with the mark on the pedal lined up with the mark on the shaft (**Figure 198**).

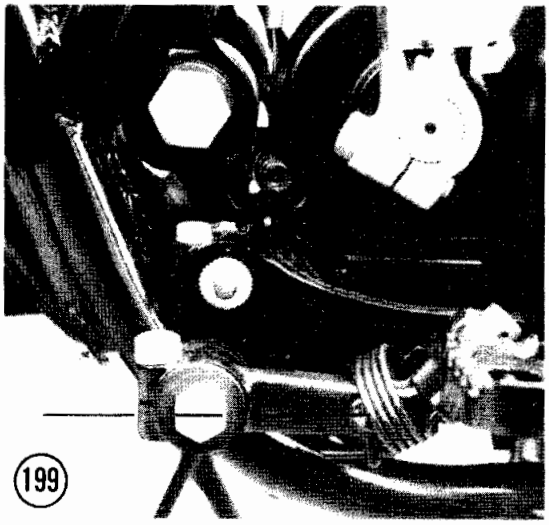
31. Install the footpeg and line it up so that it is horizontal (**Figure 199**).

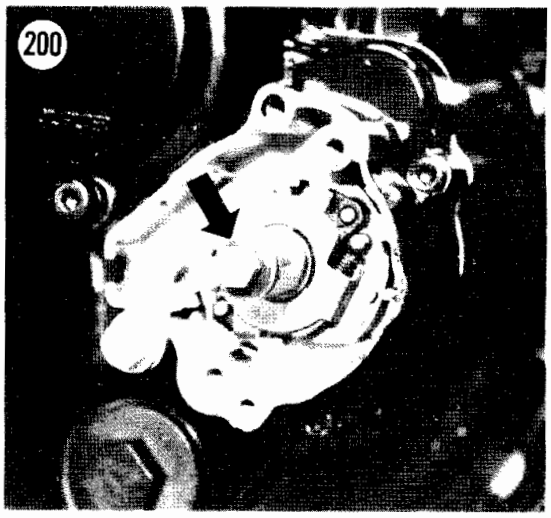
32. Install the advance unit on the contact breaker cam shaft and screw in and tighten the bolt (**Figure 200**).

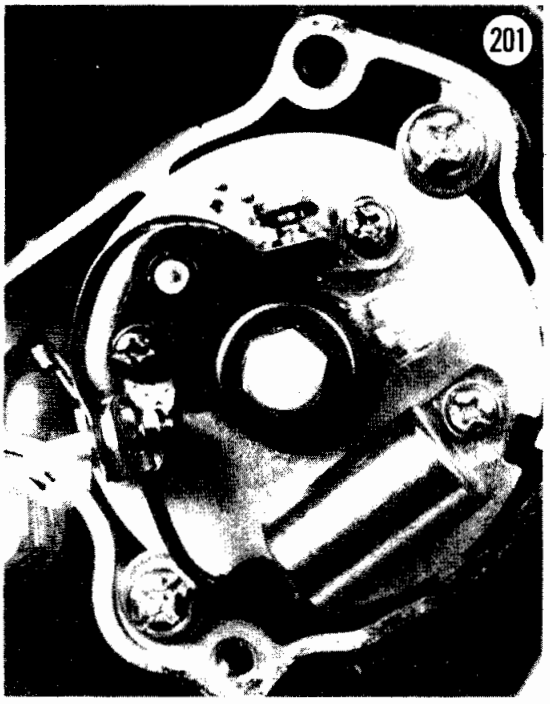












33. Install the contact breaker unit (**Figure 201**) and connect the primary ignition lead. Leave the breaker cover off until the breaker gap has been set and the ignition timed.

34. Install a new oil filter, fill the engine with oil, time the ignition, and adjust the clutch as described in Chapter Three.

35. Test ride the motorcycle for several miles; recheck connections and fasteners and tighten any that are loose.

NOTE: *If the engine was rebuilt, either partially or completely, while it was removed from the motorcycle, it should be broken in carefully, just as though it was new. Pay particular attention to oil level during break-in. Allow ample low and medium speed riding time for the parts to bed in before subjecting the engine to high loads. During break-in, the oil should be changed after the initial 300 miles, and then every 2,000 miles thereafter.*

CHAPTER FIVE

CLUTCH AND TRANSMISSION

Service and repair to the clutch can be carried out with the engine in the motorcycle. Service and repair to the transmission requires that the engine be removed and disassembled.

Clutch adjustment is covered in Chapter Three.

Most parts for the clutch and transmission must be purchased from a Yamaha dealer. Some bearings and seals however, are standard throughout the world and may be purchased at any large bearing supply house and many large auto parts stores. See **Table 1** for part numbers.

TABLE 1 TRANSMISSION SEAL AND BEARING IDENTIFICATION

Item	ID Number or Size
Clutch arm bearing (2)	17 x 21.5 x 15mm
Clutch arm seal	SD-17-28-6
Gear selector shaft seal	SDO-14-24-6
Transmission main shaft bearing	
Left	20 x 32 x 12mm
Right	4205
Countershaft bearing	
Left	6305 special
Right	20 x 36 x 12mm
Countershaft seal	SD-35-62-10

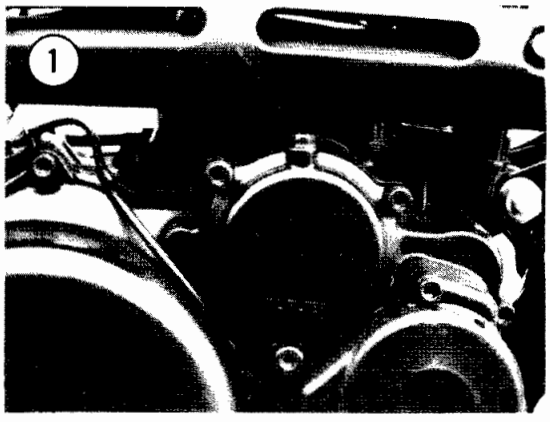
CLUTCH

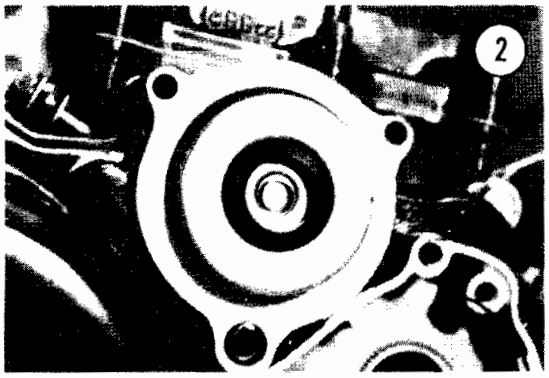
The clutch is a multi-disc, wet type — that is, it runs in an oil bath that is common to the engine, transmission, and primary drive. Service to the clutch, other than adjustment, therefore requires that the engine oil be drained beforehand, as described in Chapter Three.

Disassembly

1. Remove the filter cover (**Figure 1**) and the filter (**Figure 2**).

2. Remove the ignition cover (**Figure 3**). Disconnect the ignition primary lead from contact post on the breaker plate, unscrew the 2



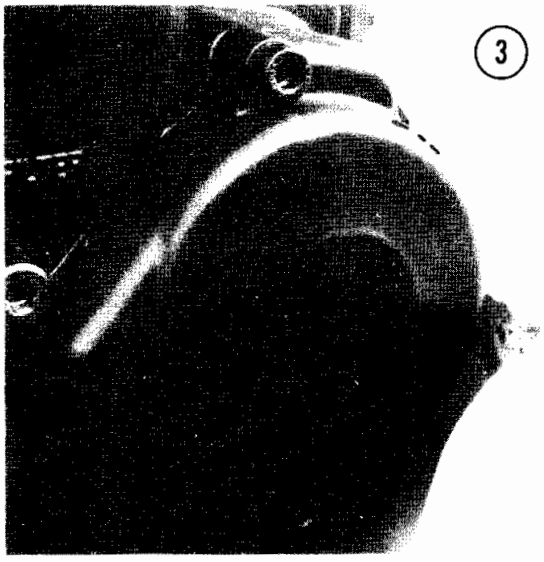


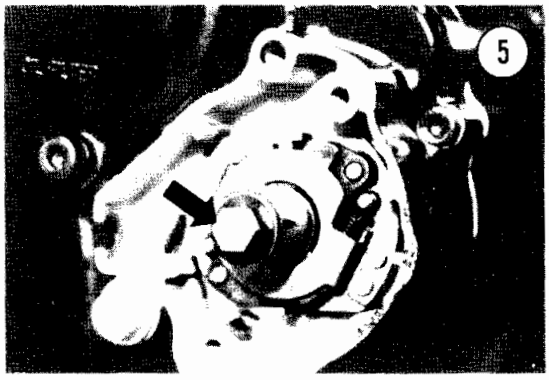
screws that attach the stationary ignition plate (**Figure 4**) and remove the breaker plate assembly.

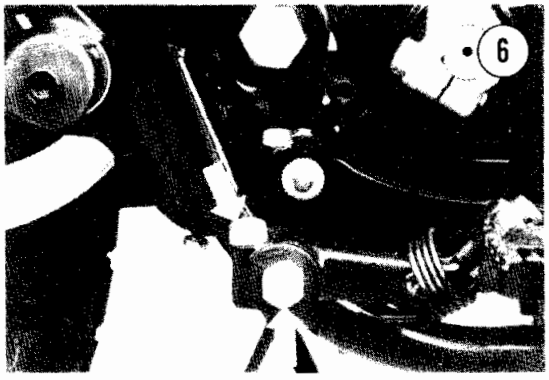
3. Unscrew the bolt from the end of the breaker camshaft (**Figure 5**) and remove the advance unit.

4. Remove the right footpeg (**Figure 6**). The bolt must be completely removed; it engages a slot in the splined shaft.

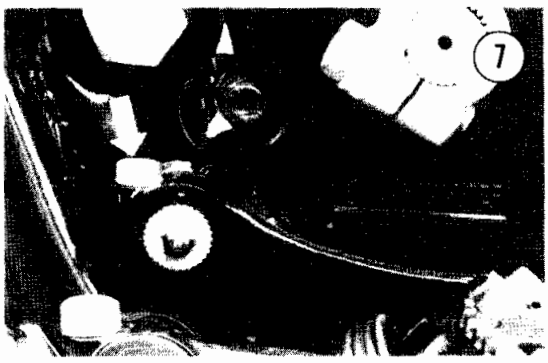
5. Remove the rear brake pedal (**Figure 7**). The bolt must be completely removed; it engages a slot in the pivot shaft.







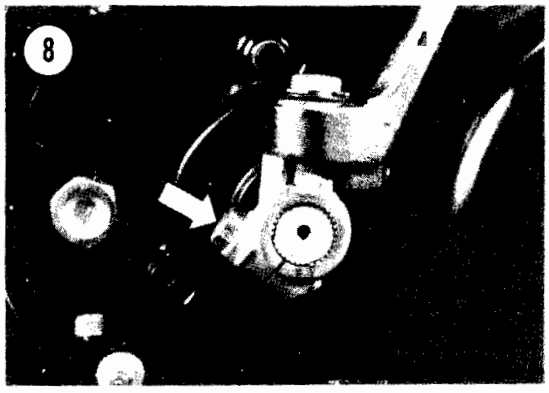


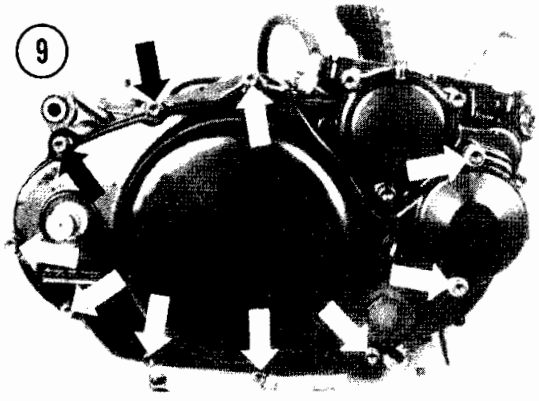


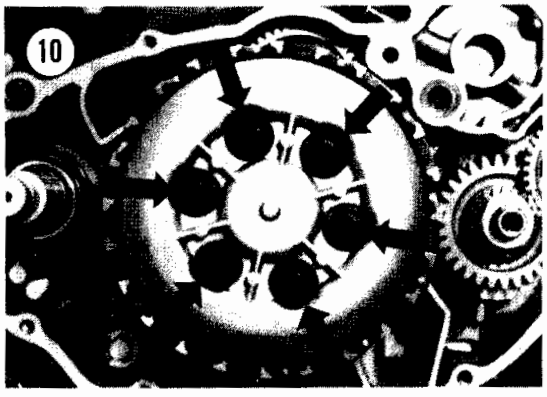
6. Remove the kickstarter (**Figure 8**). The bolt must be completely removed; it engages a slot in the shaft.

7. Unscrew the right engine cover screws (**Figure 9**) and remove the cover. It may be necessary to tap lightly around the edge of the cover with a soft-faced mallet to break it loose.

8. Lock the rear wheel with the brake to prevent the engine from turning and unscrew the clutch pressure plate bolts (**Figure 10**).

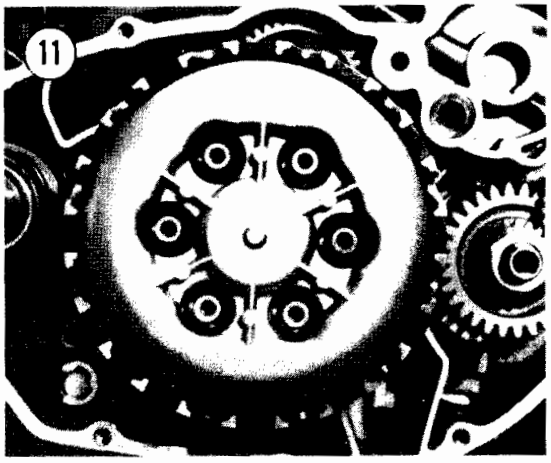


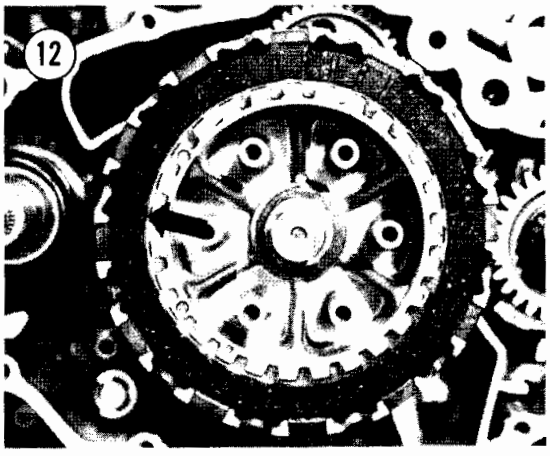


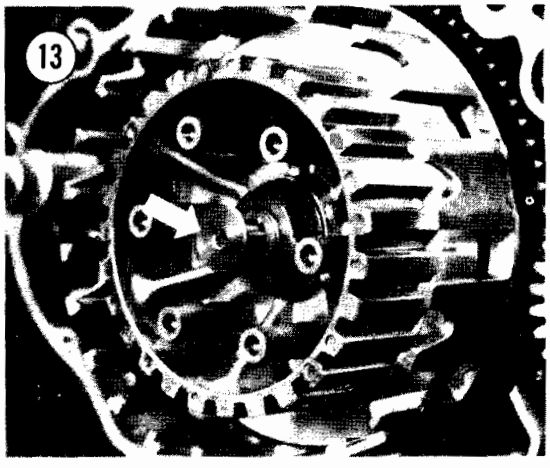


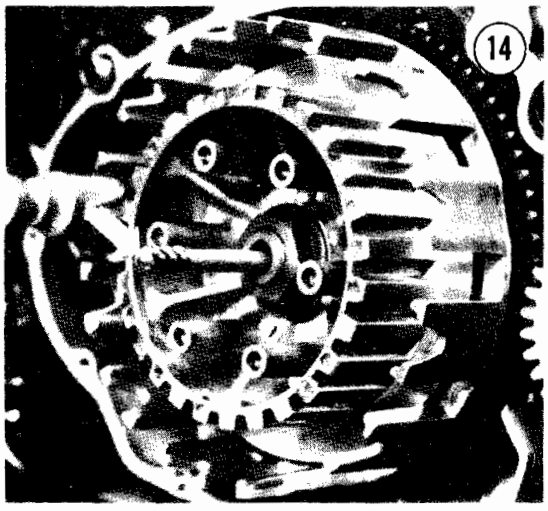
9. Remove the clutch springs and the pressure plate (**Figure 11**).

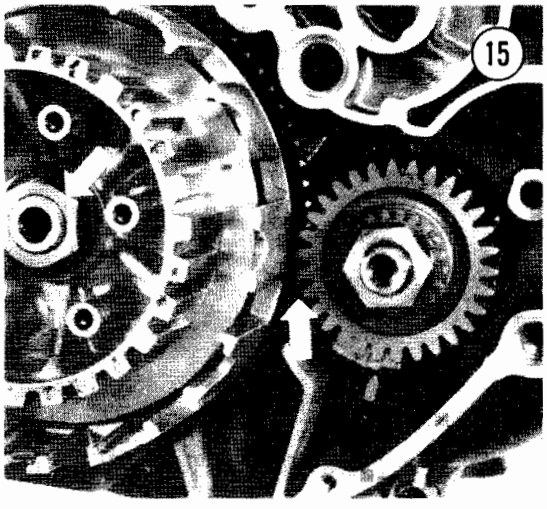
10. Remove the clutch plates (**Figure 12**), the clutch release (**Figure 13**), and rod (**Figure 14**).

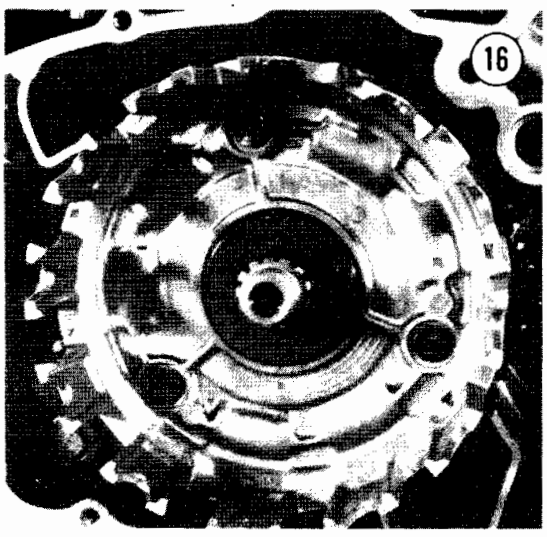








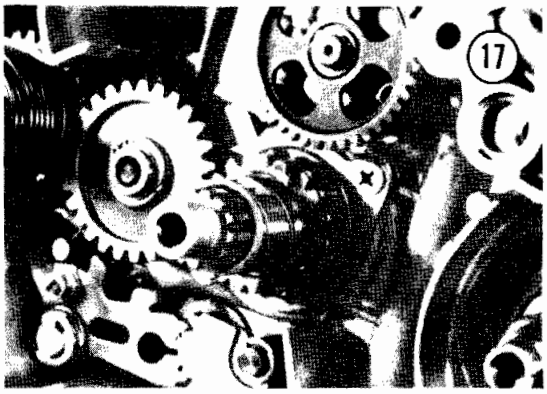


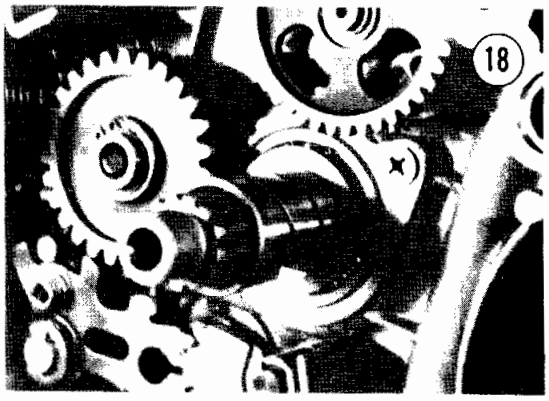


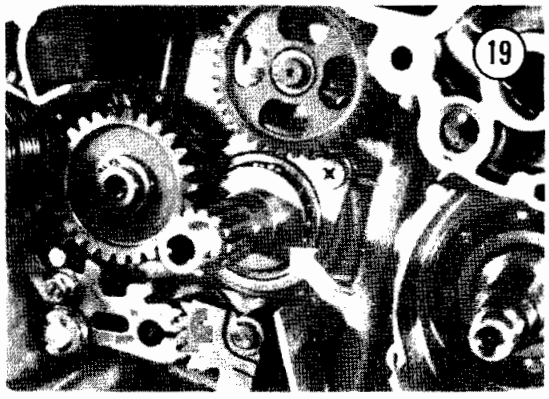
11. Lock the primary drive gear and the clutch driven gear with a shop rag jammed into the teeth and unscrew the clutch hub nut **(Figure 15)**.

12. Remove the washer and the clutch gasket **(Figure 16)**.

13. Remove the starter idler gear **(Figure 17)**. Remove the spacer from the shaft **(Figure 18)**. Remove the flat race located behind it **(Figure 19)**.







Inspection

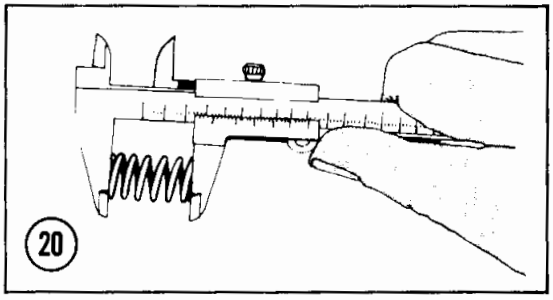
1. Thoroughly clean all of the parts in solvent and dry them with compressed air.

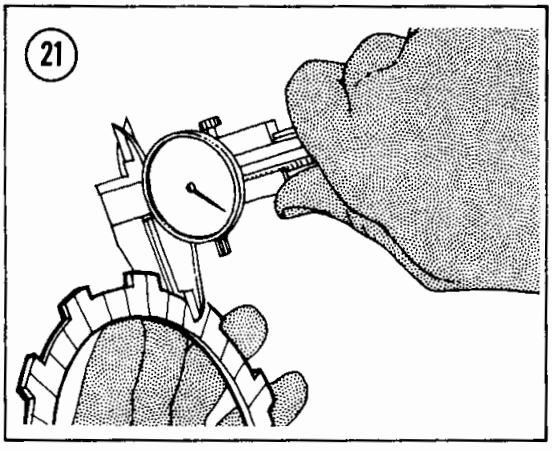
2. Measure the free length of the clutch springs (**Figure 20**). The standard length is 41.2mm (1.622 in.). If the springs are less than 40.2mm (1.583 in.), replace them.

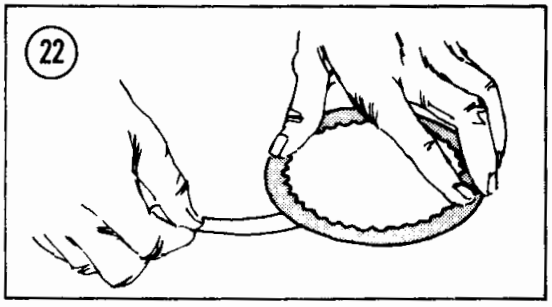
3. Measure the thickness of the friction plates (**Figure 21**). The standard thickness is 2.8mm (0.11 in.). Replace a plate if it is worn unevenly, glazed, or burned, or is less than 2.5mm (0.098 in.) thick.

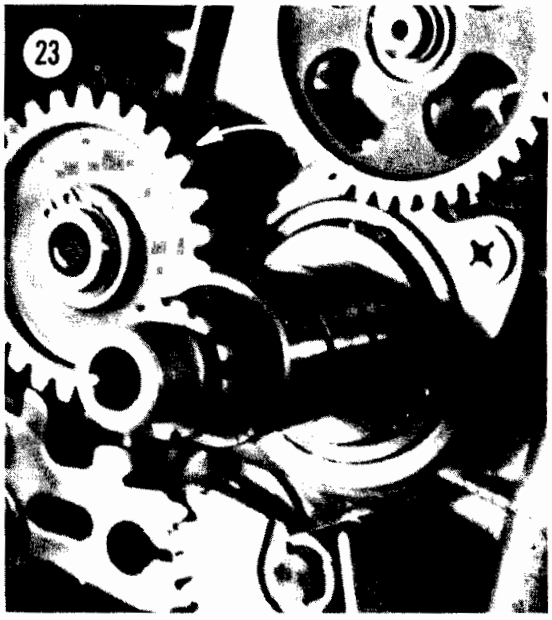
4. Measure the distortion of the steel plates with a flat feeler gauge (**Figure 22**). If the distortion is greater than 0.05mm (0.002 in.), replace the plates.

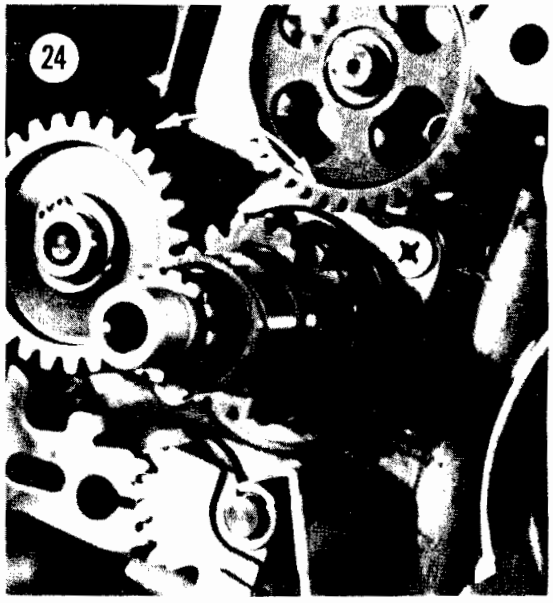
5. Check the clutch spacer for wear. It should rotate freely on the shaft (**Figure 23**). The starter idler gear should rotate freely on the spacer (**Figure 24**), and the spacer should rotate freely in the clutch basket. If there is slight roughness on the spacer, dress it with fine emery cloth or an oilstone. If it is severely scored or worn, replace it.



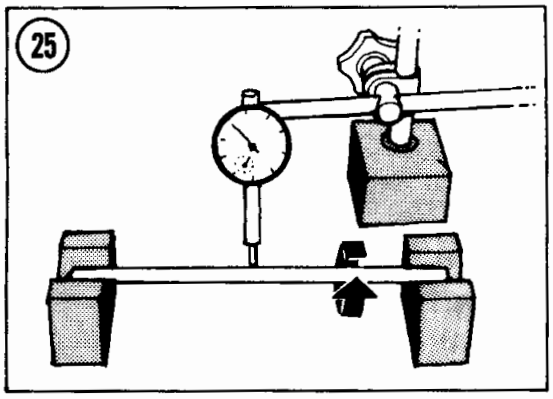


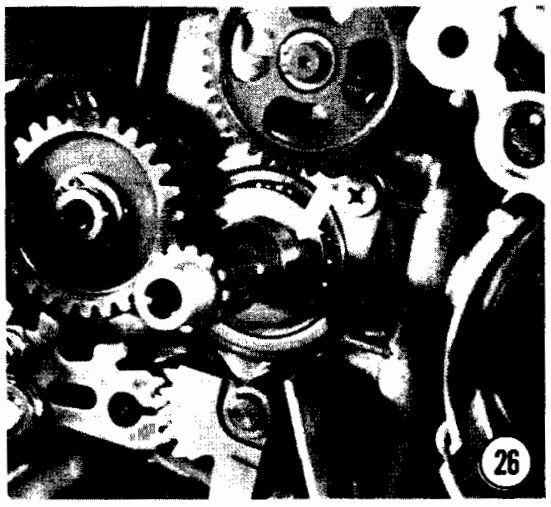


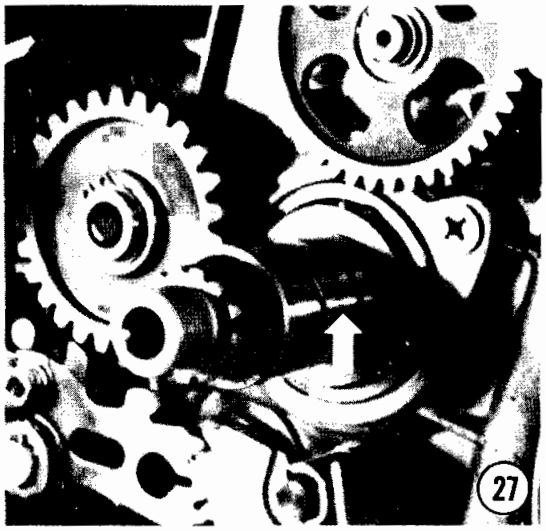




6. Check the runout of the clutch pushrod (**Figure 25**). Replace rod if runout is 0.2mm (0.0079 in.) or greater.

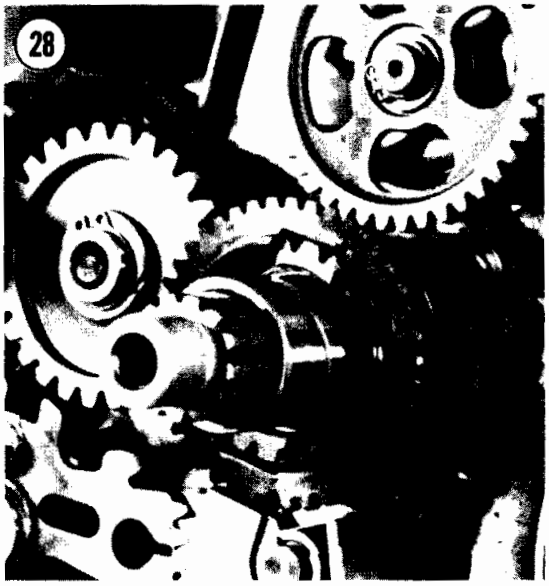


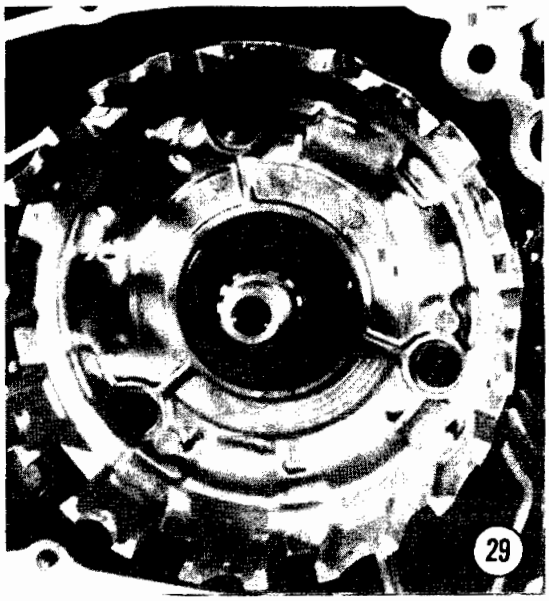




Assembly

1. Lightly oil the input shaft, spacer, flat race starter gear, and clutch basket bore.
2. Install the flat race on the shaft (**Figure 26**). Install the spacer (**Figure 27**) and the starter gear with the lugs facing out (**Figure 28**).
3. Install the clutch basket and washer (**Figure 29**). Screw on the clutch hub nut, lock the clutch and primary drive gears with a shop rag jammed into the teeth, and tighten the nut to 5-7 mkg (36-50 ft.-lb.). Remove the shop rag.

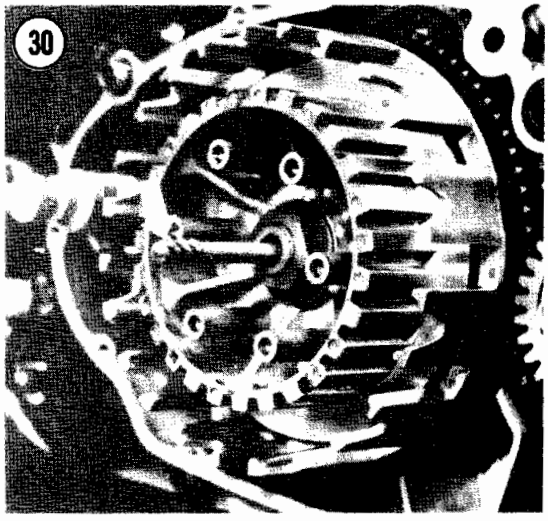


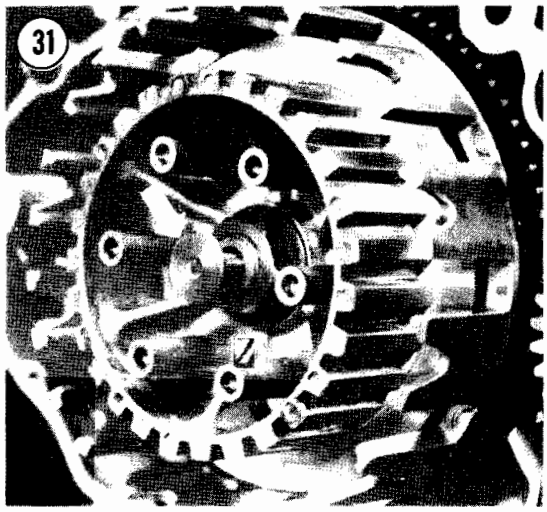


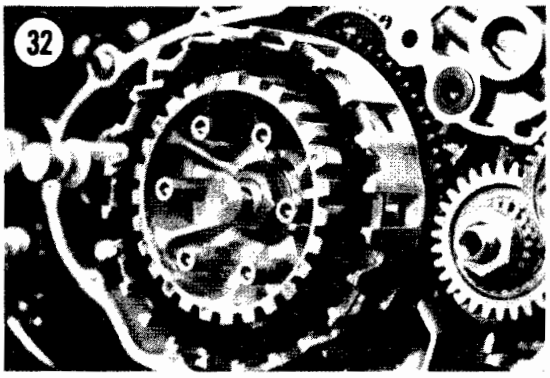
4. Oil the clutch rod and install it in the shaft with the spiral-cut end out (**Figure 30**). Oil the throwout and install it (**Figure 31**).

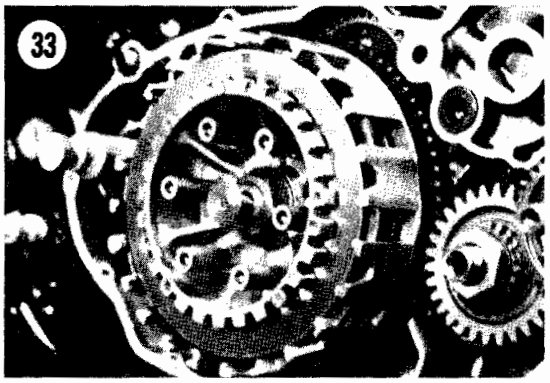
5. Install the clutch plates — first a friction plate (**Figure 32**), and then a steel plate (**Figure 33**), alternating them until all 15 are installed. Install the pressure plate and springs (**Figure 34**), and the clutch bolts (**Figure 35**). Lock the rear wheel with the brake and tighten the clutch bolts in a crisscross pattern to 1 mkg (7.2 ft.-lb.).

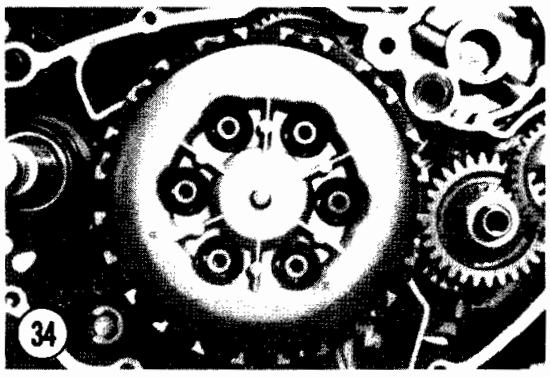
6. Coat the mating surface of the engine cover with a non-hardening gasket cement, such as Yamaha Bond No. 4. Install the cover and screw in and tighten the bolts in a crisscross pattern.

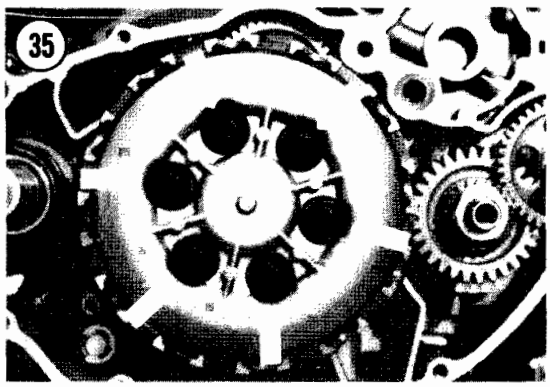


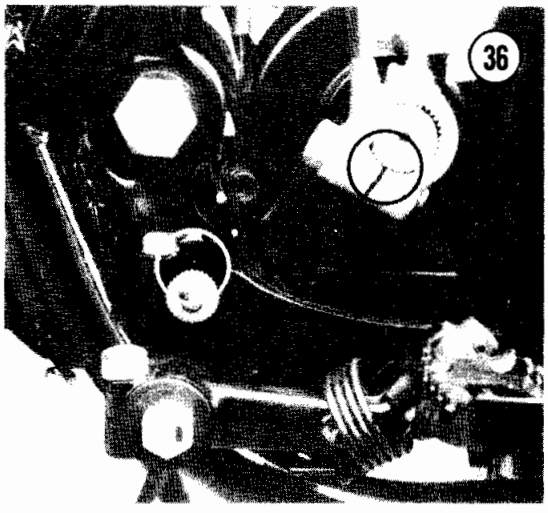


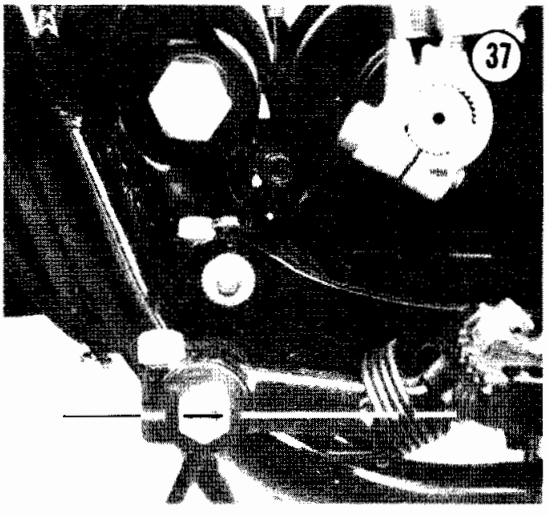


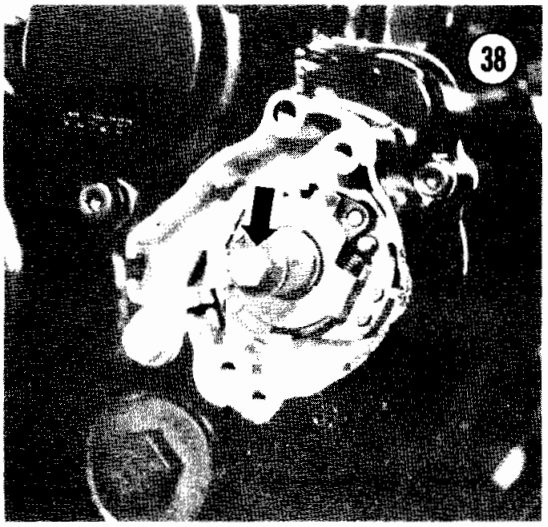












7. Install the kickstarter (**Figure 36**). Line up the mark on the shaft with the slot.

8. Install the brake pedal (**Figure 36**), taking care to line up the mark on the pedal with the mark on the shaft.

9. Install the footpeg (**Figure 37**) and line it up horizontally.

10. Install the advance unit on the contact breaker camshaft and screw in and tighten the bolt (**Figure 38**).

11. Install the contact breaker unit (**Figure 39**) and connect the primary ignition lead. Leave the breaker cover off until the breaker gap has been set and the ignition timed.

12. Install a new oil filter, fill the engine with oil, time the ignition, and adjust the clutch as described in Chapter Three.

TRANSMISSION

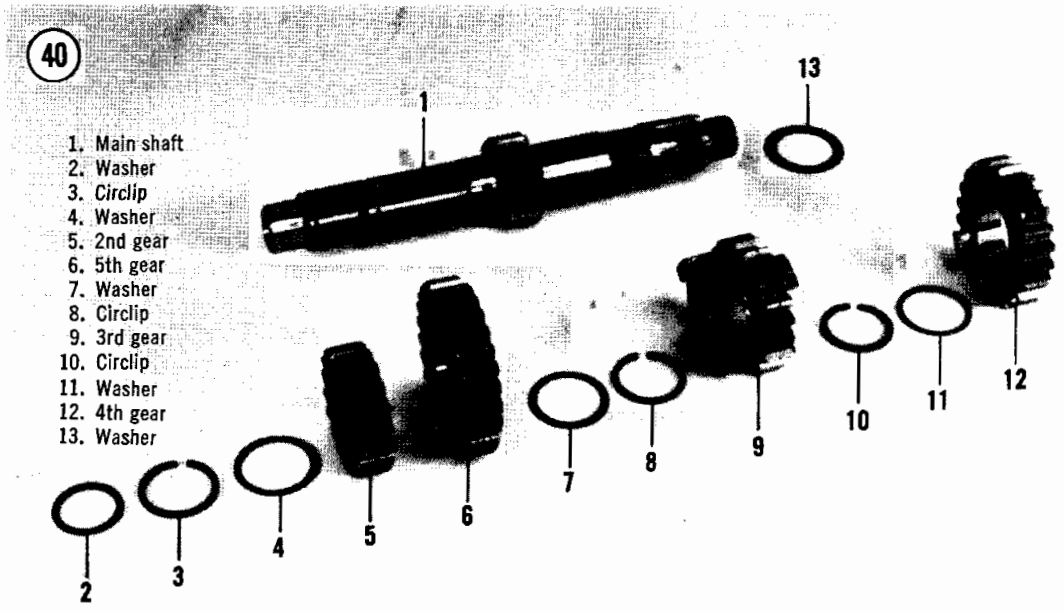
The transmission is a five-speed, constant-mesh unit. It shares a common oil supply with the engine and primary drive. The engine must be removed from the motorcycle and the crankcase halves separated to gain access to the transmission.

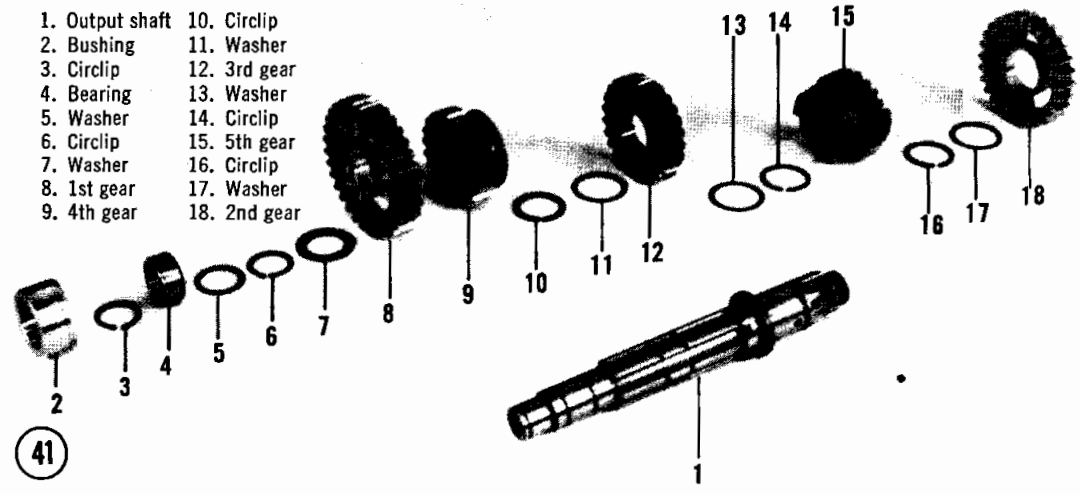


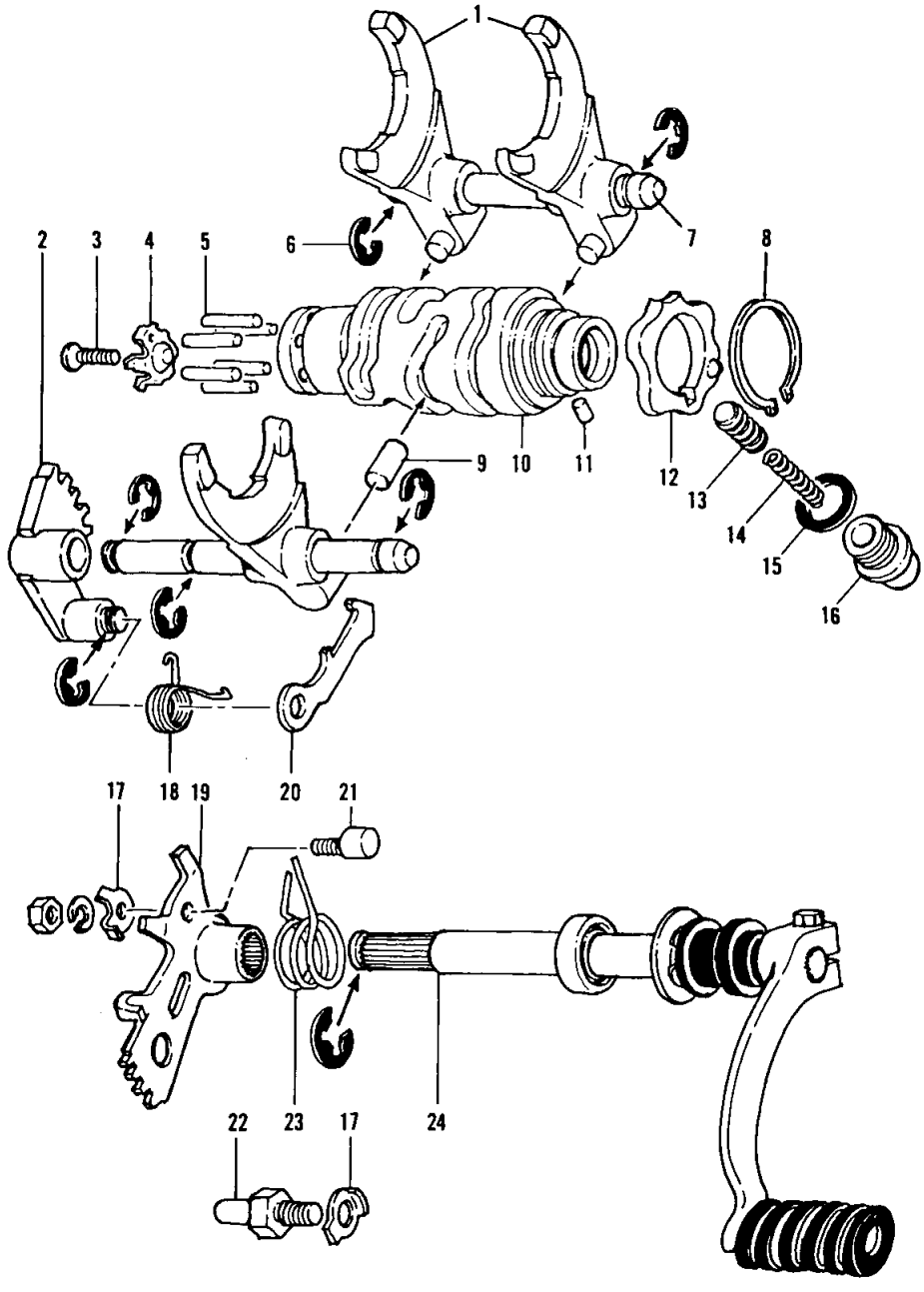
Disassembly

Refer to Chapter Four — *Engine Removal*, *Upper End Disassembly*, and *Bottom End Disassembly* through Step 22 (there's no need to remove the crankshaft assembly from the left case half).

1. Refer to **Figure 40** and disassemble the transmission main shaft. Note that there is a circlip retaining 2nd and 5th gear on the shaft; a circlip that retains 3rd gear; and another that retains 4th gear. Refer to *Inspection* which follows; clean and inspect the gearset, and then referring to *Assembly*, assemble it before proceeding with the next step; this is a precaution against mixing the parts from the 2 gearsets.
2. Refer to **Figure 41** and disassemble the transmission output shaft (countershaft). Note the circlips that retain the right end bearing, 1st and 4th gears, 3rd gear, 5th gear, and 2nd gear.
3. The entire selector mechanism is shown in an exploded view in **Figure 42** for reference. Unless wear or damage is found during inspection, there is no need to disassemble the units.

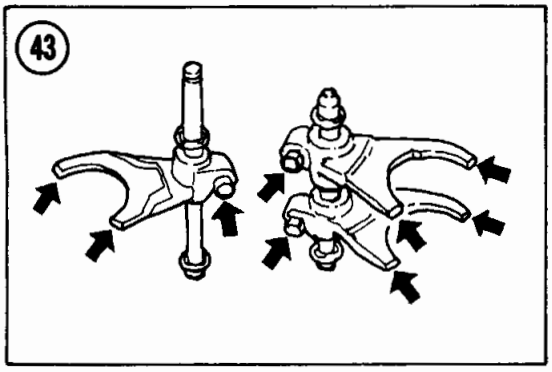


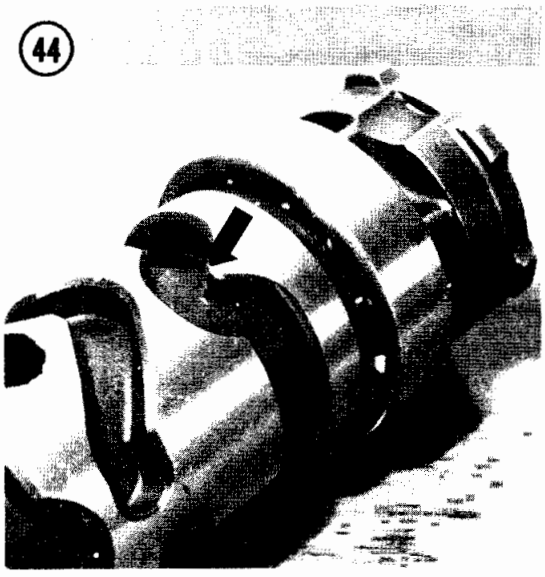


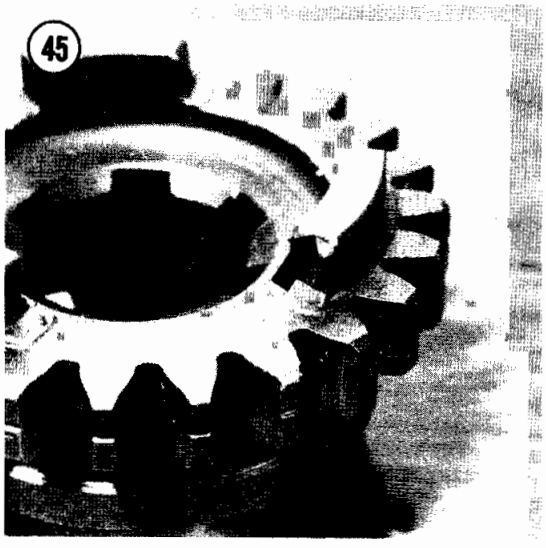


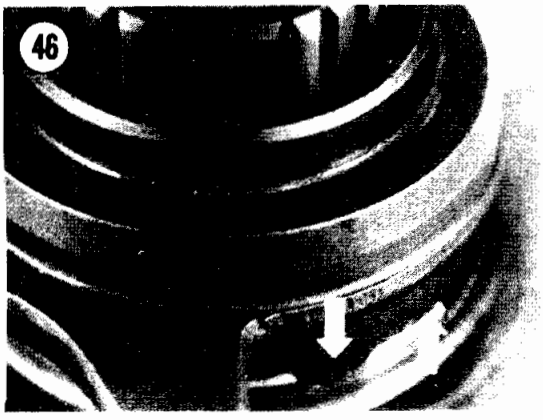
GEAR SELECTOR MECHANISM

1. Shifting forks
2. Slave quadrant
3. Bolt
4. Lock plate
5. Shifter pins
6. E-clip
7. Fork shaft
8. Circlip
9. Cam follower
10. Selector drum
11. Lock pin
12. Stopper plate
13. Plunger
14. Detent spring
15. Washer
16. Detent body
17. Lockplate
18. Pawl spring
19. Master quadrant
20. Pawl
21. Eccentric adjuster
22. Stopper
23. Return spring
24. Selector shaft









Inspection

1. Thoroughly clean all of the parts with solvent and dry them with compressed air.

2. Check the shifting forks for galling and wear on the contact points **(Figure 43)**. Inspect the cam followers and the pathways in the shift drum for wear and damage **(Figure 44)**. Check the dowels in the end of the selector cam for wear and replace them as a set if wear is present.

3. Check the transmission shafts for runout, using a lathe or other centering device, and a dial indicator. If bending is apparent, the affected shaft should be replaced.

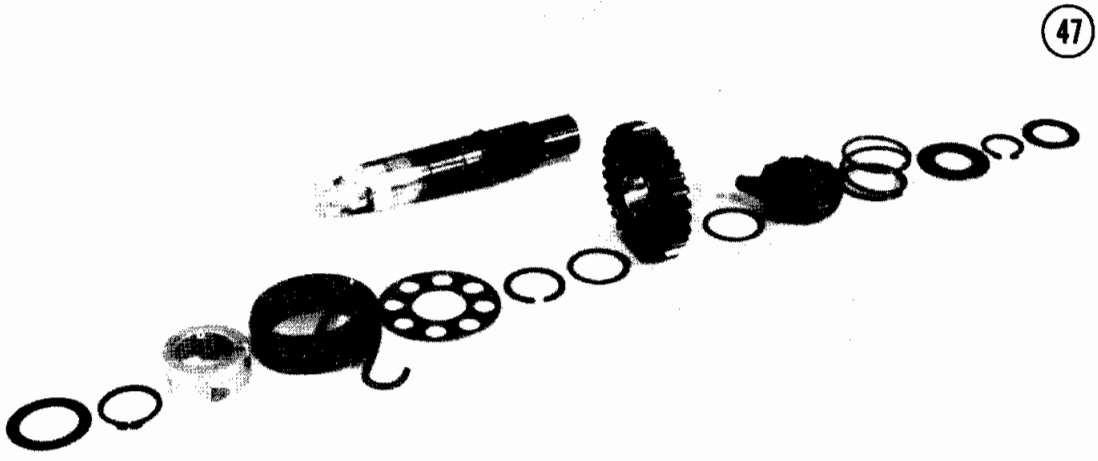
4. Check the gears for damaged shift dogs **(Figure 45)**. Usually, the corners of the dogs will begin to wear first, resulting in missed shifts. Replace any gear that has damaged or worn dogs.

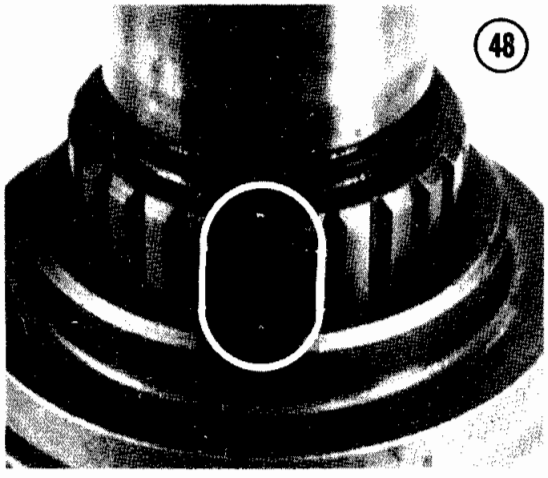
5. Check gear teeth for wear, scores, galling, and discoloration. Any damaged gears should be replaced.

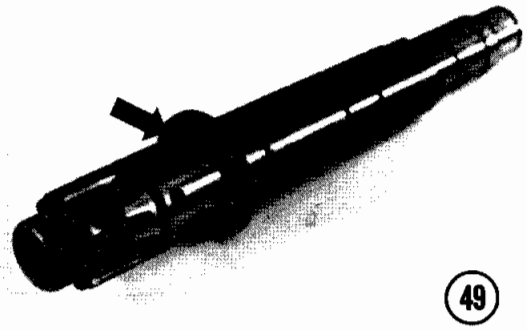
6. Check the splines on the shafts and in the sliding gears for scoring and wear and replace any that are less than perfect.

7. Check the movement of each gear on its respective shaft. Sliding gears should slide freely throughout the length of the splines, and rotating gears should spin freely and quietly.

8. Inspect the engagement dogs of the kickstarter ratchet **(Figure 46)** for damage and wear. To disassemble the kickstarter, remove the large circlip from the spring end of shaft (outboard) and remove the individual pieces **(Figure 47)**. If wear and damage are not evident, there is no need to disassemble the kickstarter.







9. Inspect the bearings. They should turn freely and quietly. Replace any unsatisfactory bearings as described in Chapter Four, *Bottom End*.

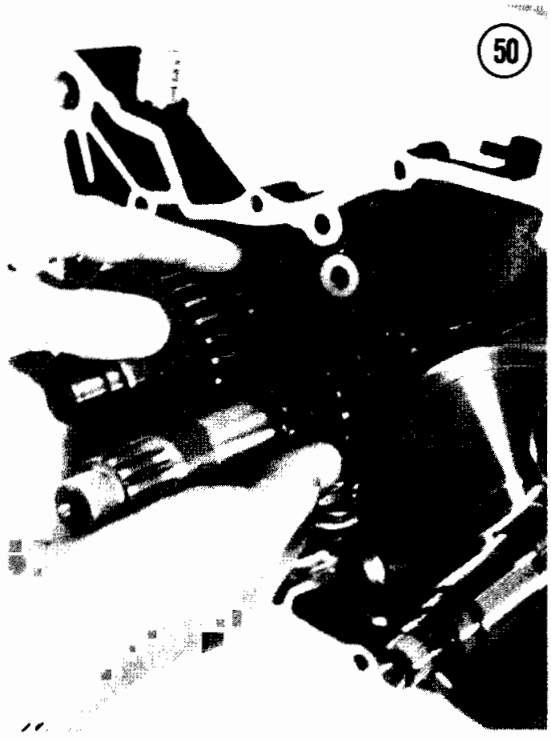
Assembly

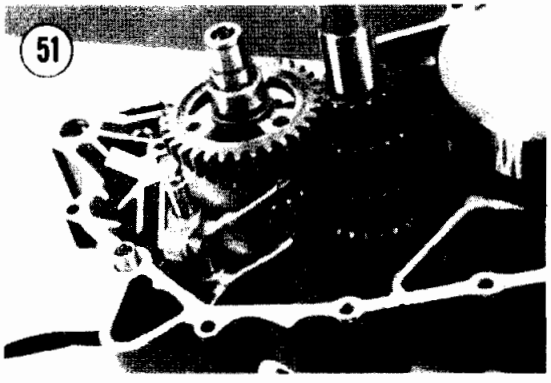
1. Lightly oil all of the parts. Refer to **Figure 40** and assemble the transmission main shaft gearset. Install 4th gear, the washer, and circlip. Install 3rd gear and a circlip. Install a washer, 5th gear, 2nd gear, another washer, and a circlip. Install the left end washer and bearing.

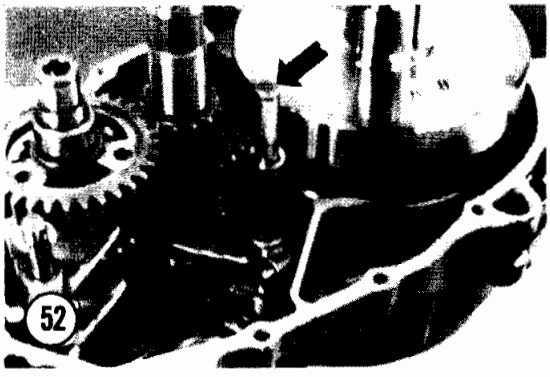
2. Refer to **Figure 41** and assemble the output shaft gearset. Install 2nd gear, a washer, and a circlip. Install 5th gear, a circlip, and a washer. Install 3rd gear, a washer, and a circlip. Install 4th gear, 3rd gear, a washer, and a circlip. Install another washer, right end bearing, and circlip.

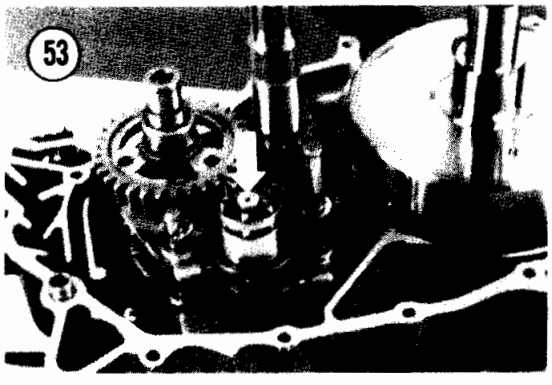
3. When assembling the starter mechanism (if disassembled), line up the mark on the pawl with the mark on the shaft (**Figure 48**). Install a new O-ring on the sprocket end of the countershaft (**Figure 49**).

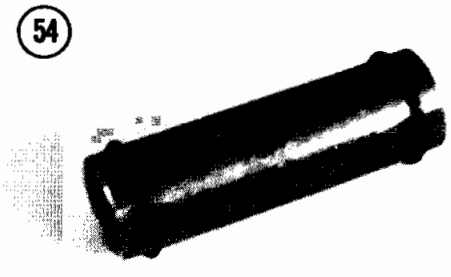
4. Mesh the 2 gearsets and install them in the case together (**Figure 50**).











5. Install the rear shifting fork assembly (**Figure 51**), checking to make sure the circlips are correctly seated in their grooves. Install the forward shifting fork assembly (**Figure 52**), and install the shift drum (**Figure 53**). Make sure the pathways in the drum engage the knobs (cam followers) on the forks.

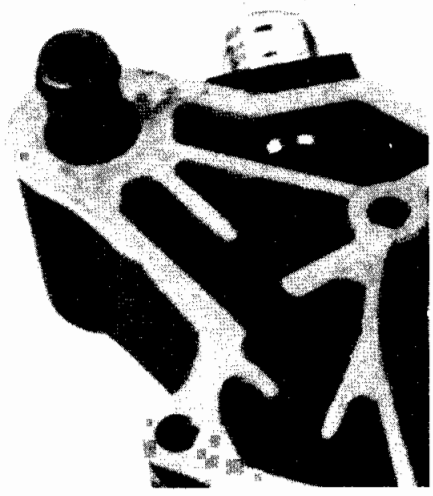
6. Rotate the gearsets to ensure that there is no binding. It will be necessary to move the sliding gears in and out of engagement for the gears to mesh and turn freely.

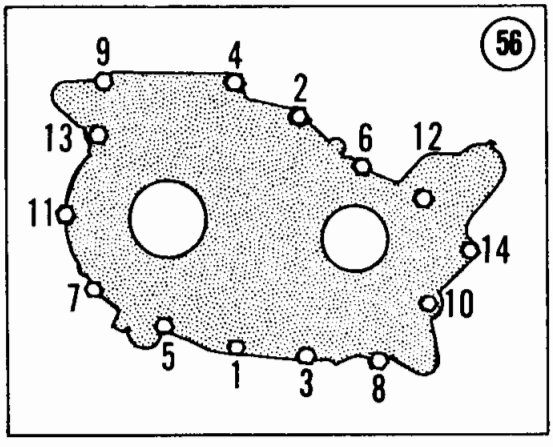
7. Install new O-rings on the engine mount spacer (**Figure 54**) and install the spacer in the left case half (**Figure 55**).

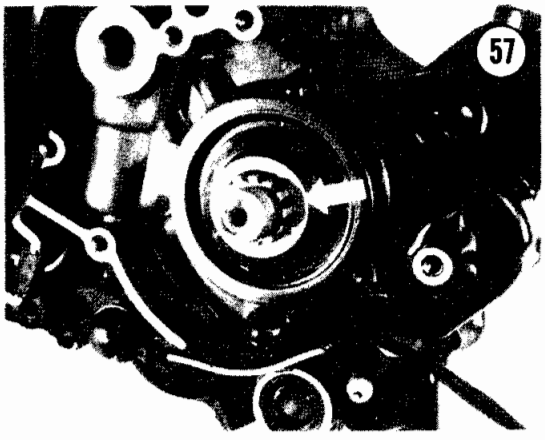
8. Coat the sealing surfaces of both case halves with a good grade, non-hardening gasket cement, such as Yamaha Bond No. 4.

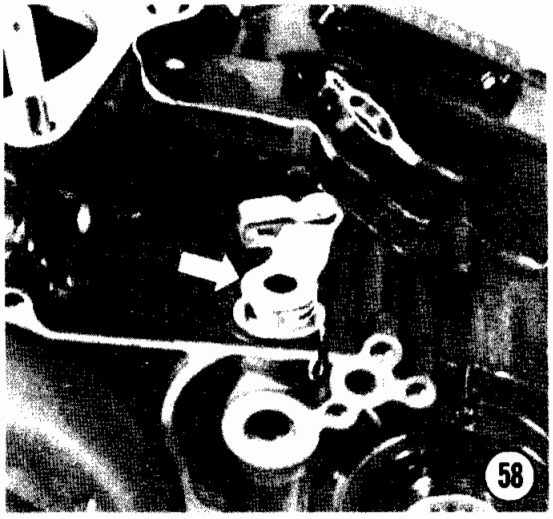
9. Start the right crankcase half over the gearshafts and crankshaft. Press it down evenly all around. It will probably be necessary to tap the case down into place, but tap only around the bearing bores or the large reinforced mounting lugs. Do not tap on the crankshaft or the case cover mating surfaces.

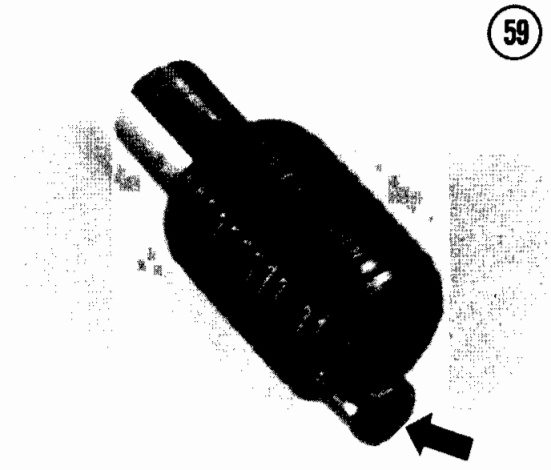
10. When the case halves meet, screw in the 14 bolts and tighten them progressively in the pat-









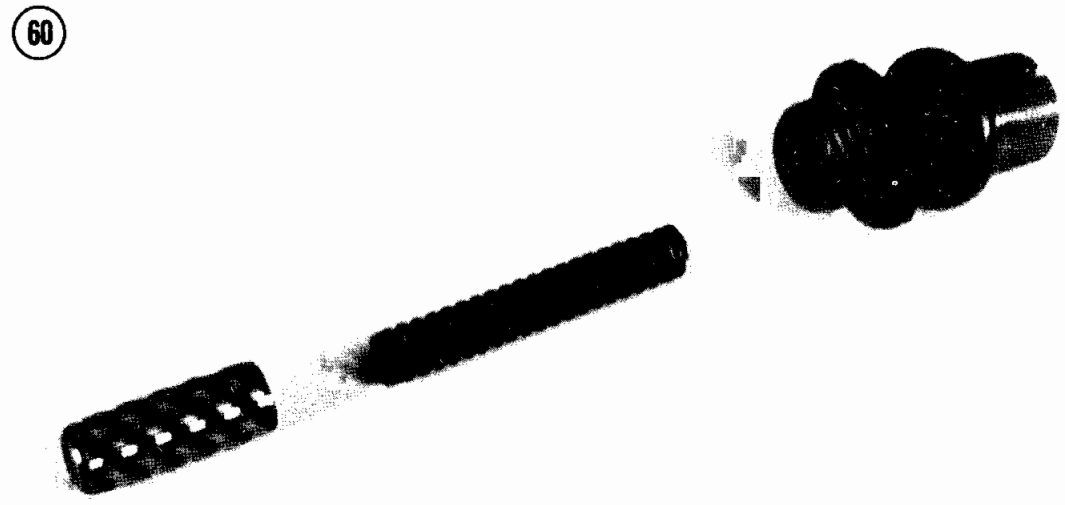


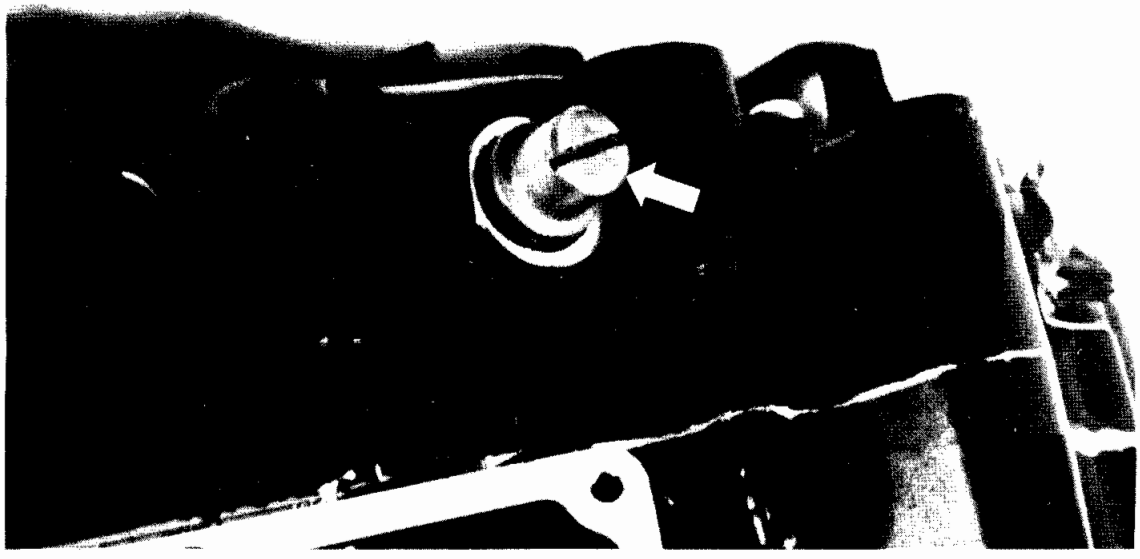
tern shown (**Figure 56**). When all of the bolts are snug, tighten them to 1.0-1.4 mkg (7.2-10.0 ft.-lb.) in the same pattern.

11. Check to make sure the crankshaft and transmission shafts turn freely without binding. If binding is felt, separate the case halves and find the trouble. There is no point in continuing with assembly until the problem has been located and corrected.

12. Install the countershaft spacer (**Figure 57**). Install the clutch arm (**Figure 58**). Screw the clutch adjuster into the case. Note that it has an eccentric knob that must engage with the groove in the clutch arm shaft (**Figure 59**).

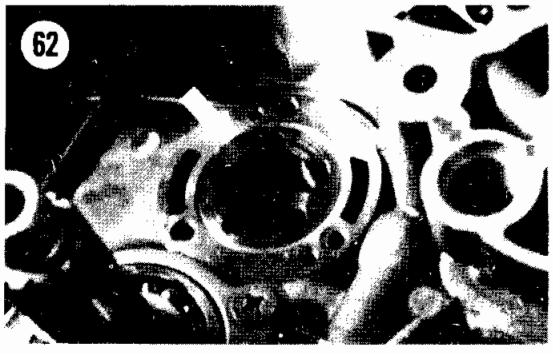
13. Assemble, oil, and install the shifter detent (**Figures 60 and 61**).

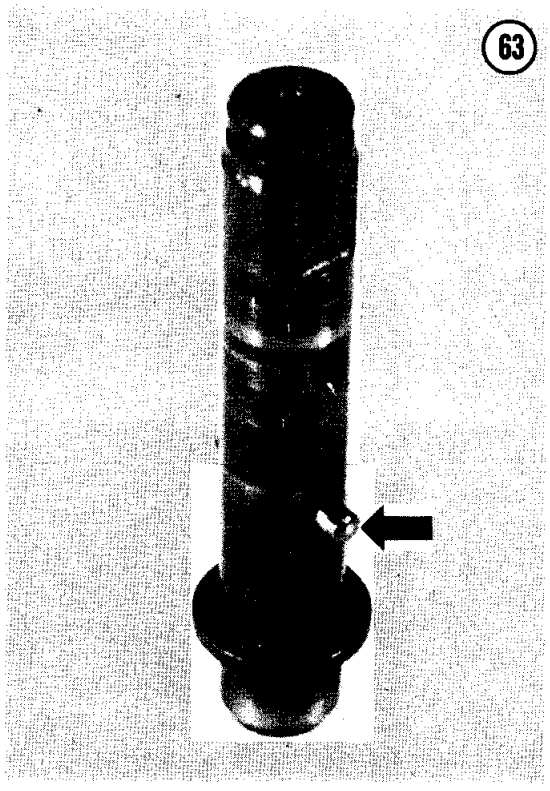


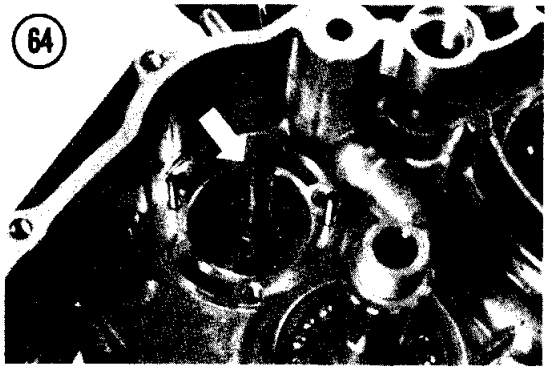


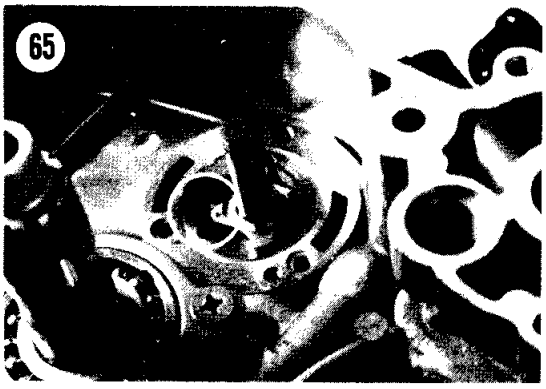
14. Oil the oil pump cavity and the rotors and shaft. Install the thick scavenge outer rotor in the cavity (**Figure 62**). Set the pin in the inside hole in the pump shaft (**Figure 63**), install the thick inner rotor on the shaft with the slot in the rotor engaging the pin (**Figure 64**), and install the assembly in the cavity with the marks on the rotors aligned (**Figure 65**).

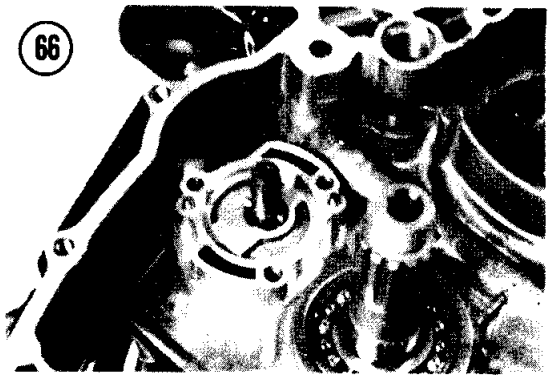
15. Install the pump body with the machined recess facing up (**Figure 66**). Install the outer pin in the pump shaft.

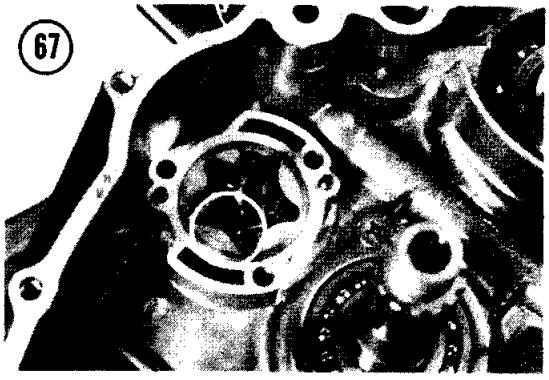


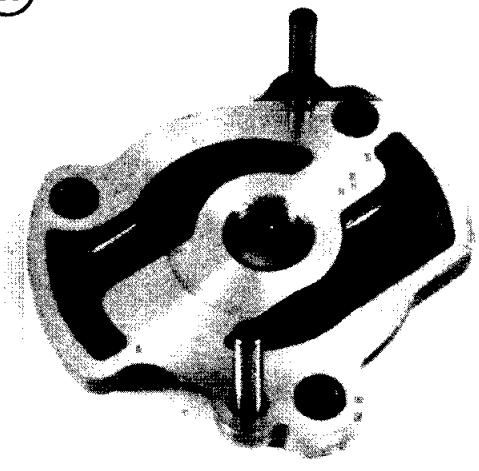












16. Install the feed rotors with their marks aligned (**Figure 67**). Coat the sealing surface of the outer cover with non-hardening gasket cement and install the alignment pins (**Figure 68**). Install the cover, coat the threads of the screw with thread-locking compound, and screw them

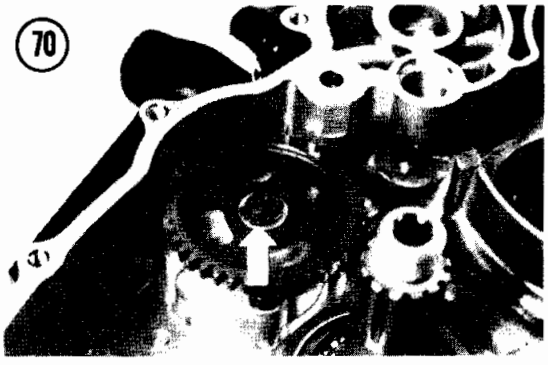
in tight (**Figure 69**). Install the oil pump drive gear and the circlip (**Figure 70**).

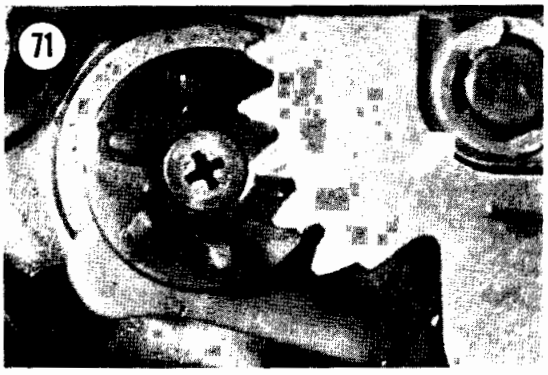
17. Install the selector slave segment and E-clip (**Figure 71**). Install the selector master segment and shaft with the marks aligned (**Figure 72**). Install the clip on the left end of the selector shaft (**Figure 73**).

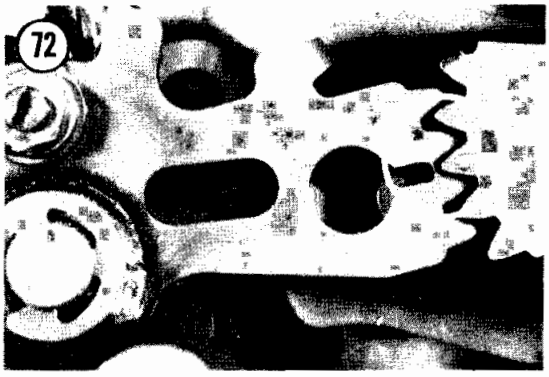
18. Fit the gear selector pedal to the shaft and engage second gear (**Figure 74**). Turn the adjuster on the master shift lever until the marks align. Then tighten the locknut.

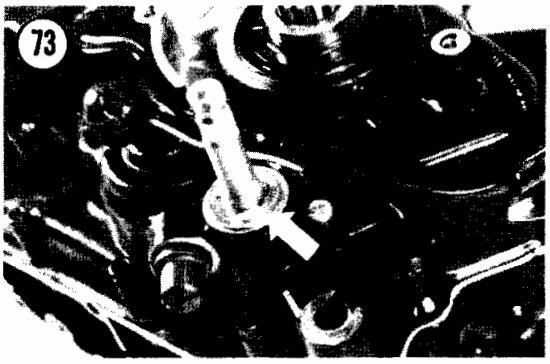
19. Install the starter idler gear and circlip (**Figure 75**).

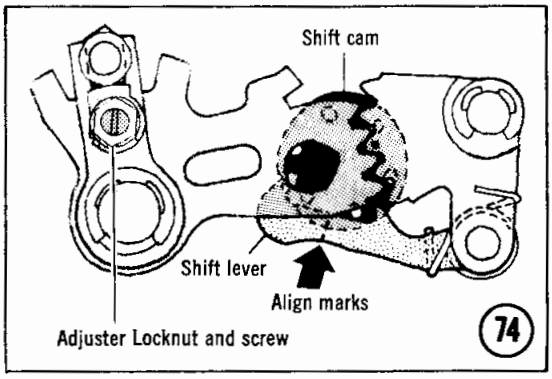


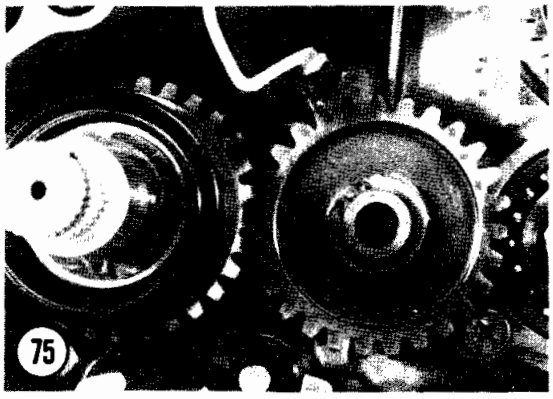


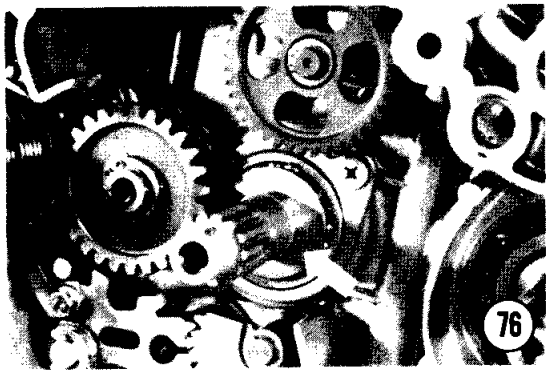


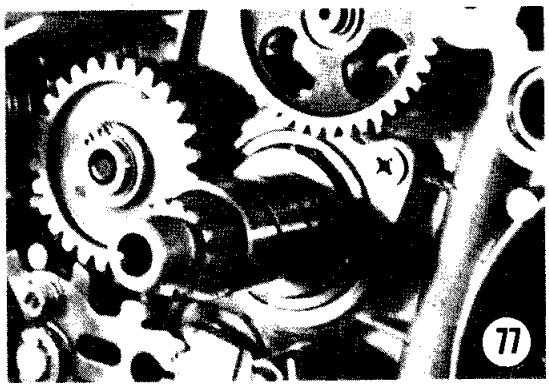


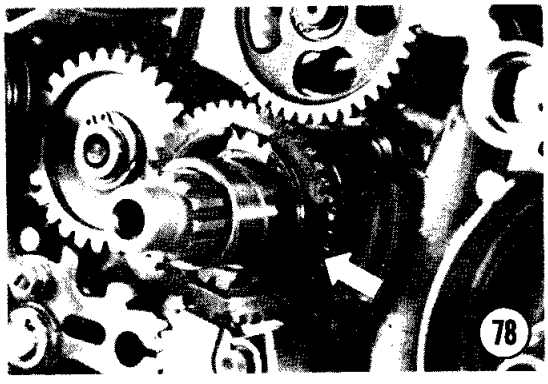


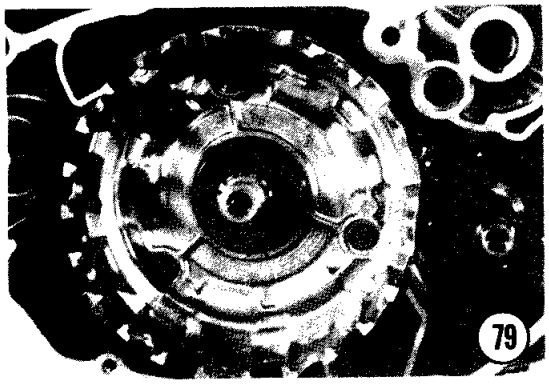






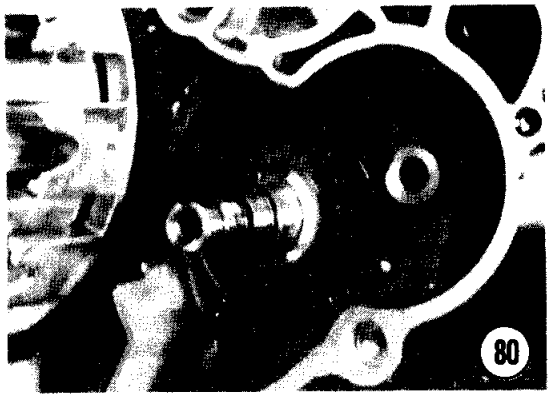


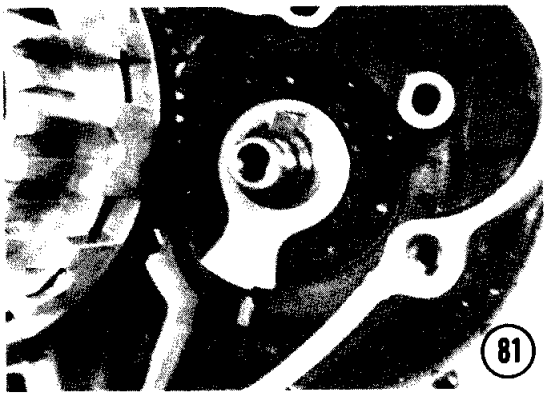


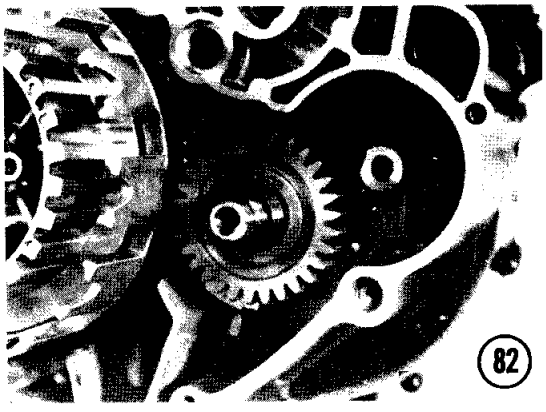


20. Install the flat race on the input shaft (**Figure 76**). Install the spacer (**Figure 77**). Install the starter gear (**Figure 78**). Install the clutch basket and washer (**Figure 79**). Screw on the clutch hub nut but do not tighten it yet.

21. Slide the cam drive chain down into the gallery. Install the chain drive sprocket on the crankshaft and engage it with the chain (**Figure 80**). Install the timing plate (**Figure 81**). Install the primary drive gear (**Figure 82**) and the







contact breaker drive gear (**Figure 83**), taking care to align their slots with the key in the crankshaft before pressing them into place.

22. Lock the primary drive gear and the clutch gear with a shop rag jammed into the teeth. Screw on and tighten primary drive gear to 5-7 mkg (36-50 ft.-lb.). Tighten the clutch hub nut to 5-7 mkg (36-50 ft.-lb.). Remove the shop rag.

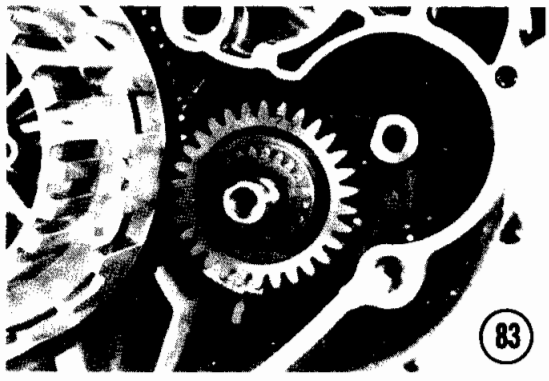
23. Install the distributor cam driven gear and spacers. Align the mark on the driven gear with the mark on the drive gear (**Figure 84**).

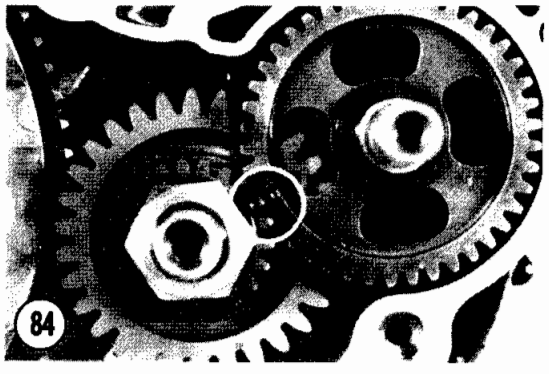
24. Install the kickstarter assembly, making sure the end of the spring engages the knob in the case (**Figure 85**).

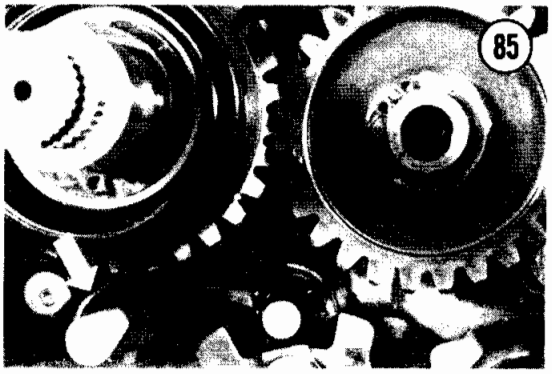
> NOTE: *Refer to* ***Upper End Assembly*** *and perform the steps described. Refer to* ***Engine Installation*** *and install the engine in the motorcycle before proceeding with assembly.*

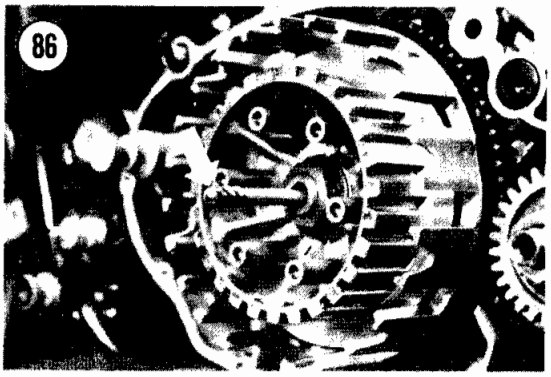
25. Install the clutch rod in the shaft with the spiral-cut end out (**Figure 86**). Install the throwout (**Figure 87**).

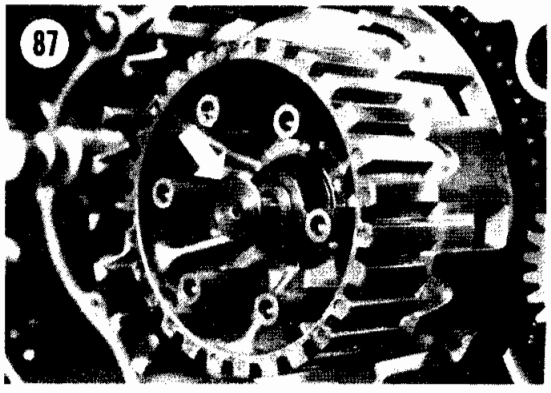
26. Install the clutch plates — first a fiber plate (**Figure 88**), and then a steel plate (**Figure 89**),

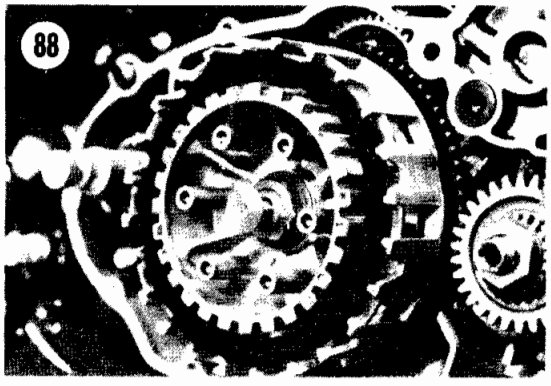


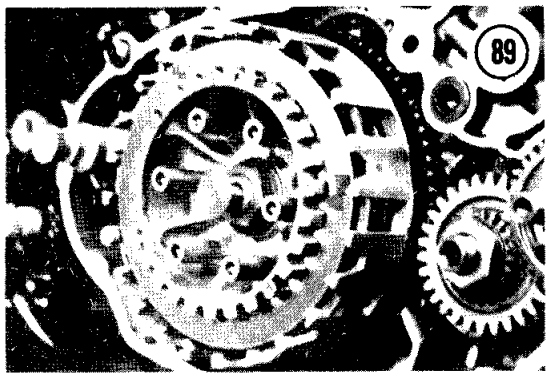


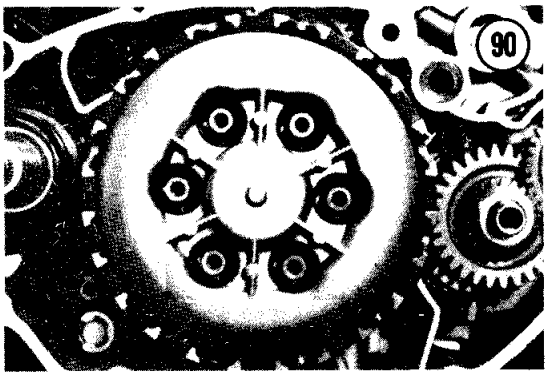


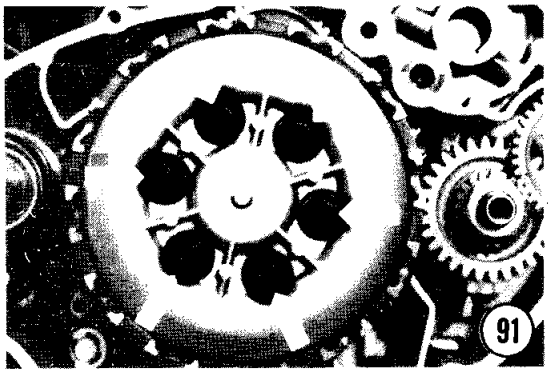


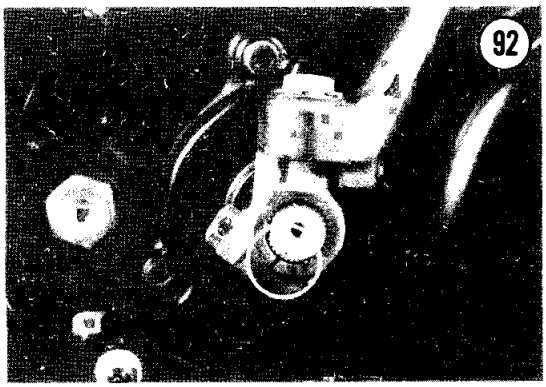












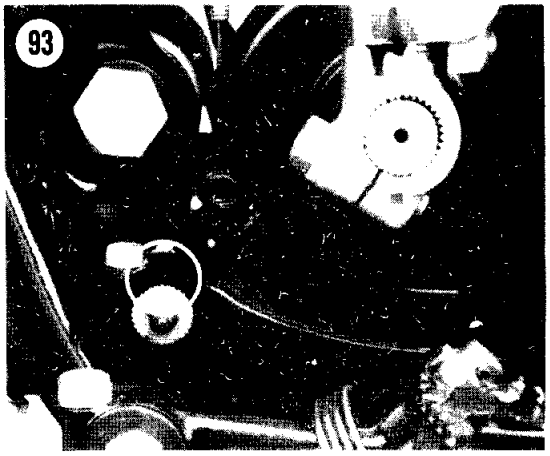
alternating them until all 15 are installed. Install the pressure plate and springs (**Figure 90**), and the clutch bolts (**Figure 91**). Install the countershaft sprocket and drive chain as described in *Engine Installation*. Lock the rear wheel with the brake and tighten the clutch bolts in a crisscross pattern to 1 mkg (7.2 ft.-lb.).

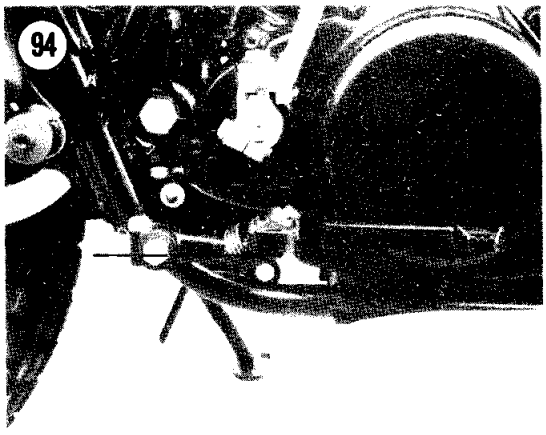
27. Coat the mating surface of the engine cover with a non-hardening gasket cement, such as Yamaha Bond No. 4. Install the cover and screw in and tighten the bolts in a crisscross pattern.

28. Install the kickstarter (**Figure 92**). Line up the mark on the shaft with the slot.

29. Install the brake pedal with the mark on the pedal lined up with the mark on the shaft (**Figure 93**).

30. Install the footpeg and line it up so that it is horizontal (**Figure 94**).



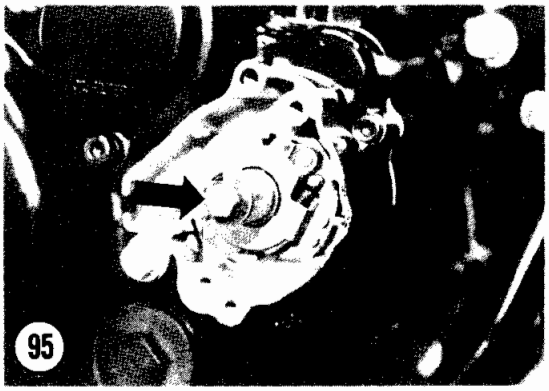


31. Install the advance unit on the contact breaker cam shaft and screw in and tighten the bolt **(Figure 95)**.

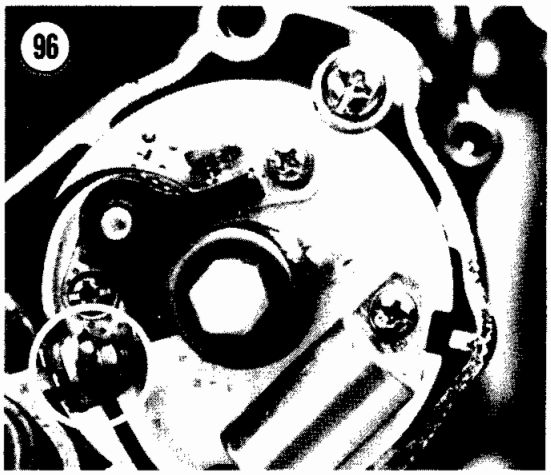
32. Install the contact breaker unit **(Figure 96)** and connect the primary ignition lead. Leave the breaker cover off until the breaker gap has been set and the ignition timed.

33. Install a new oil filter, fill the engine with oil, time the ignition, and adjust the clutch as described in Chapter Three.

34. Test ride the motorcycle for several miles, then recheck connections and fasteners and tighten any that are loose.



NOTE: *If the engine was rebuilt, either partially or completely, while it was removed from the motorcycle, it should be broken in carefully, just as though it was new. Pay particular attention to oil level during break-in. Allow ample low and medium speed riding time for the parts to bed in before subjecting the engine to high loads. During break-in, the oil should be changed after the initial 300 miles, and then every 2,000 miles thereafter.*



NOTE: If you own a 1978 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER SIX

FUEL AND EXHAUST SYSTEMS

The fuel system consists of the fuel tank, fuel valve (petcock), carburetor, and air cleaner.

The exhaust system consists of the head pipe, muffler, and spark arrester.

AIR CLEANER

The air cleaner element should be cleaned and serviced every 2,000 miles of normal operation. For adverse conditions, such as sustained operation in dust, the cleaner should be checked and serviced every 100-200 miles. Service is described in Chapter Three — *Air Cleaner*.

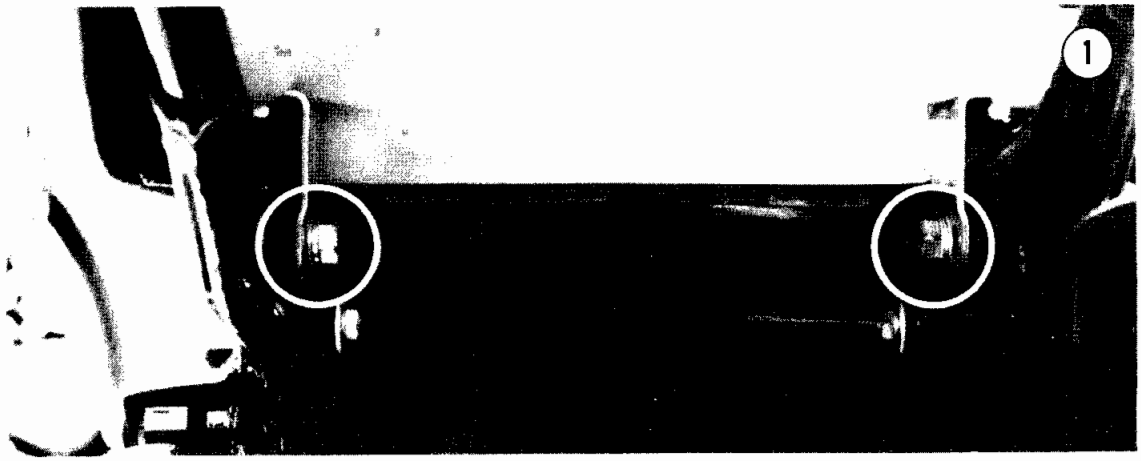
CARBURETOR

Basic carburetor service (idle mixture and idle speed adjustment) should be performed at each tune-up. This is covered in Chapter Three, *Carburetor Adjustment*.

Major carburetor service — removal, cleaning, and inspection — should be performed at least annually for normal use. For severe or competition use, major service should be conducted at more frequent intervals.

Removal/Installation

1. Unscrew the seat bolts and remove the seat **(Figure 1)**.

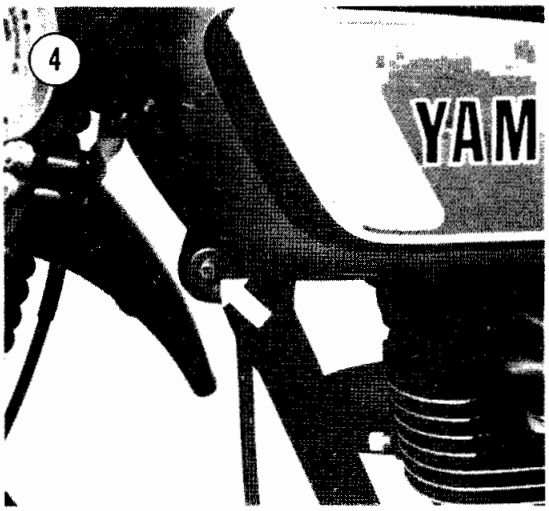


2. Turn the fuel tap to OFF and disconnect the fuel line and breather (**Figure 2**). Unscrew the 3 fuel tank mounting bolts (**Figures 3 and 4**) and remove the fuel tank.

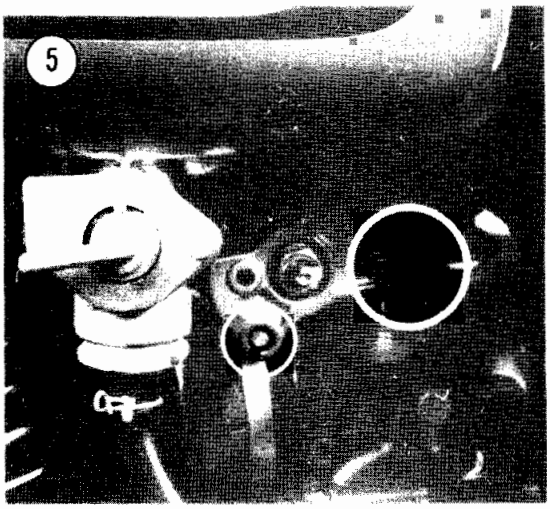
3. Loosen the cable adjusters and disconnect the cables from the quadrant (**Figure 5**).

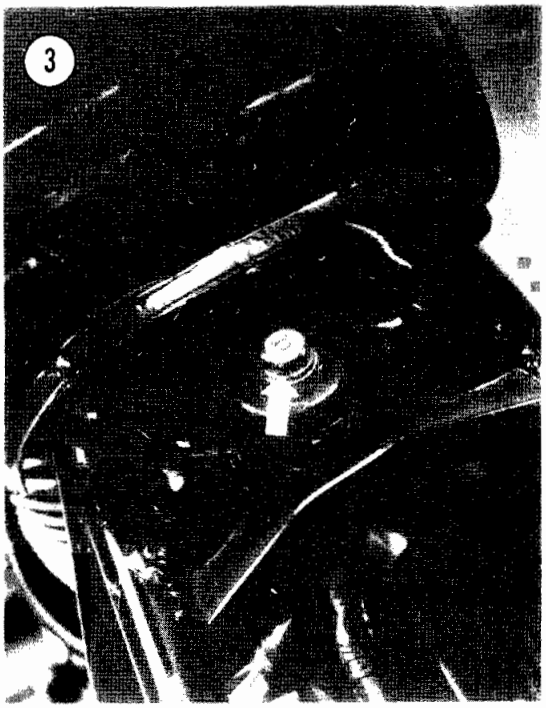
4. Loosen the carburetor clamping bands at the air cleaner and manifold (**Figure 6**) and remove the carburetor.

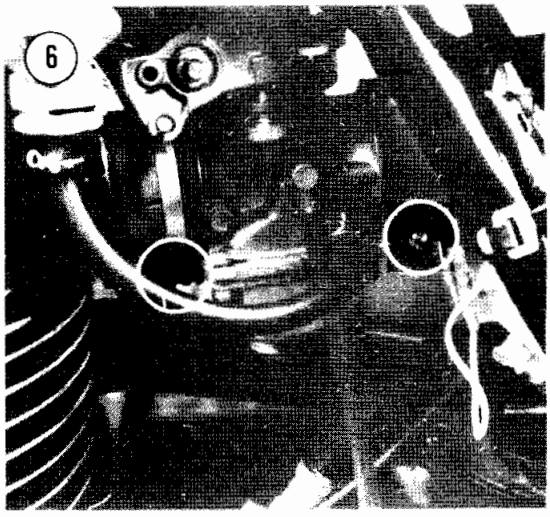
5. Reverse the above to install the carburetor. Route the float bowl vent hose between the rear of the engine and the swing arm pivot. Make certain the carburetor is vertical before tightening the clamping bands.

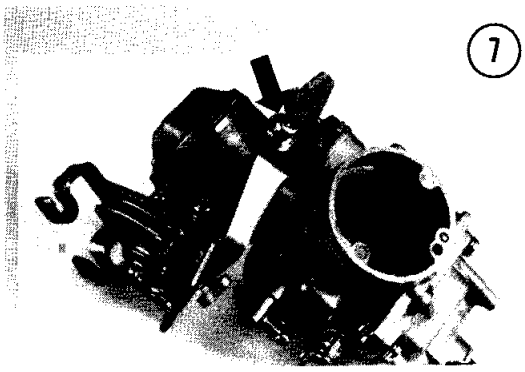


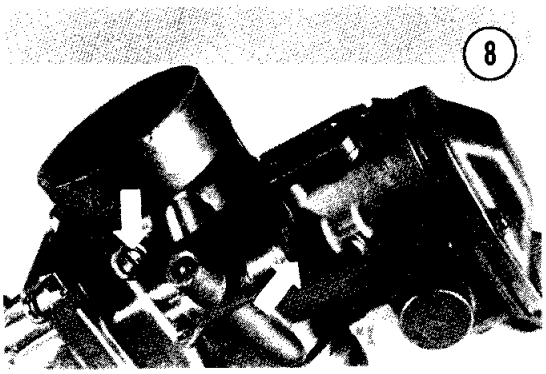


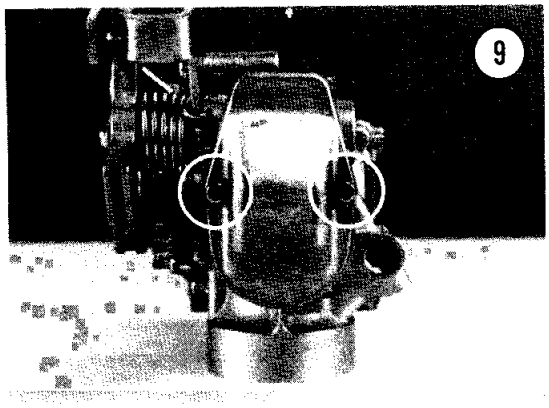


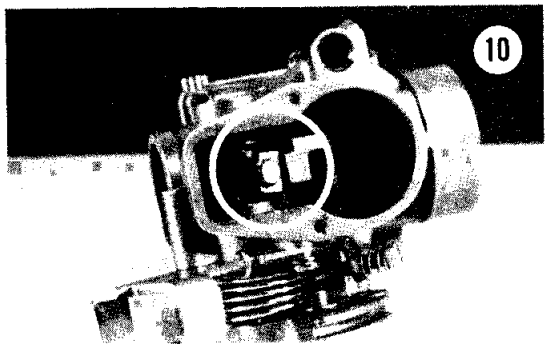








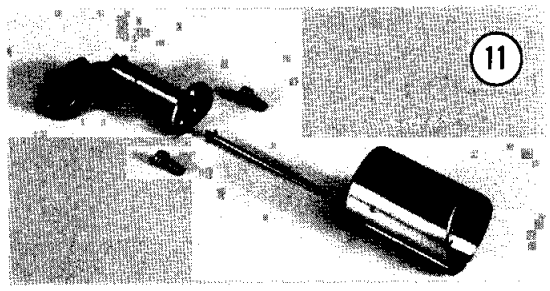


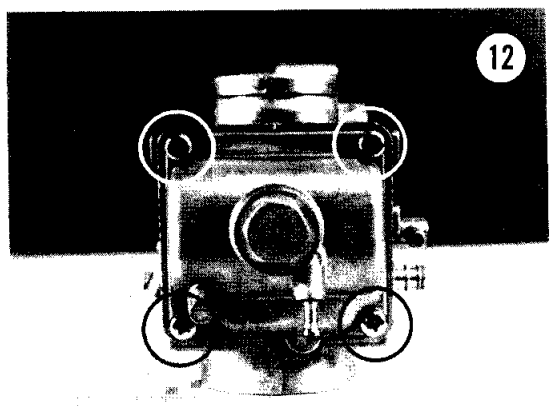


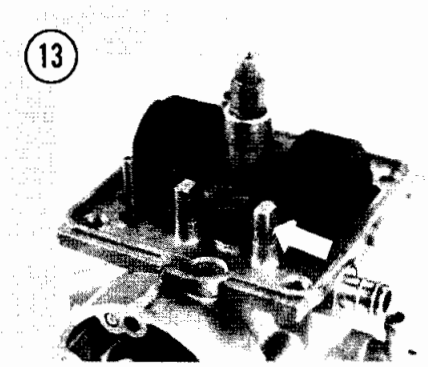
6. Refer to Chapter Three, *Carburetor Adjustment*, and adjust the idle mixture, idle speed, and throttle cable free play. Check for air leaks at the manifold by spraying the connection with WD-40 or an equivalent with the engine idling. If the idle speed changes, an air leak is present; correct it by further tightening the clamp, or if this does not work, remove the carburetor and check for foreign matter around the mounting flange.

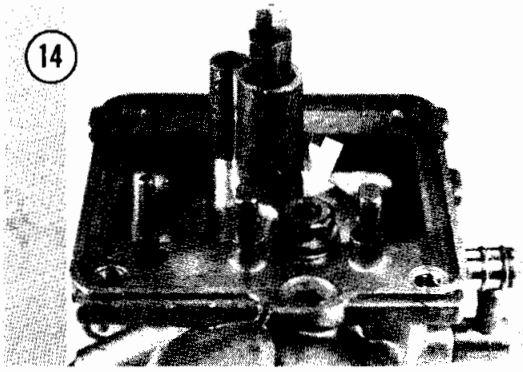
Disassembly

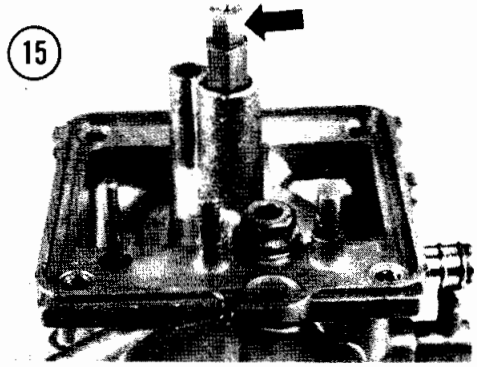
1. Remove the carburetor as described above.
2. Remove the choke lever (**Figure 7**). Unscrew the choke from the body (**Figure 8**) and unscrew the air screw.
3. Remove the carburetor top (**Figure 9**). Straighten the lock tab on the slide lifter lockbolt and unscrew the bolt (**Figure 10**). Pull out the throttle shaft and remove the slide and lifter assembly (**Figure 11**).
4. Remove the float bowl (**Figure 12**). Push out the float pivot pin (**Figure 13**) and remove the float. Remove the float needle valve (**Figure 14**).

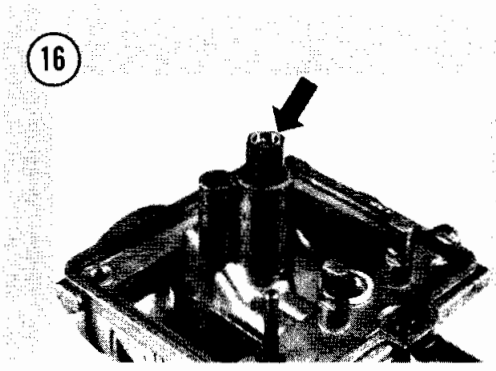






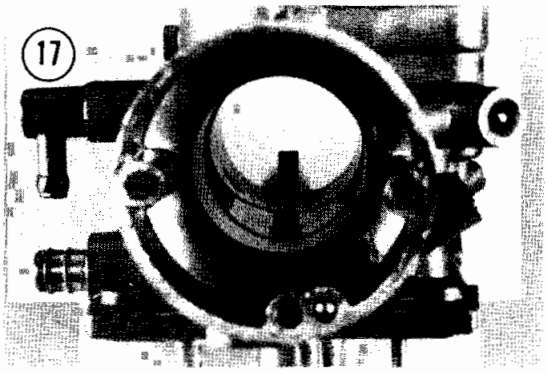


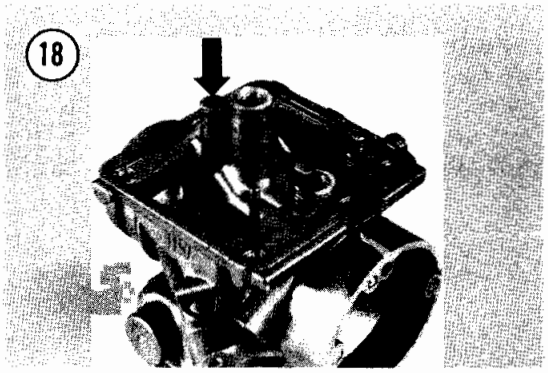




5. Unscrew the main jet **(Figure 15)**, and the needle jet **(Figure 16)**. Push the spray nozzle out of the carburetor from inside the venturi **(Figure 17)**.

6. Unscrew the pilot jet **(Figure 18)**.





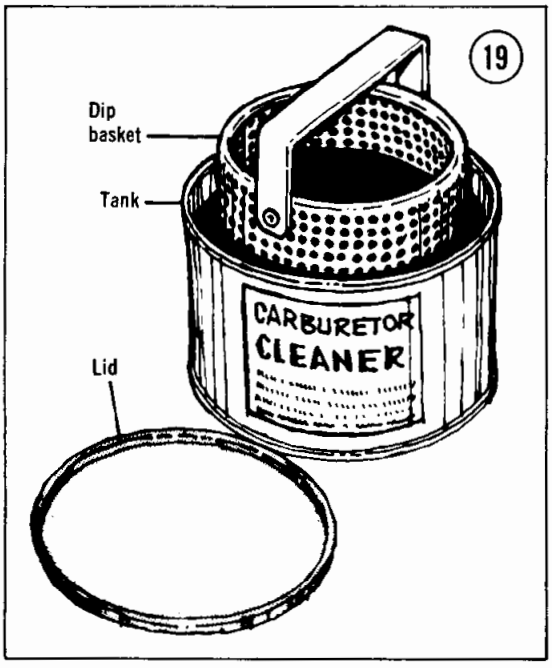
Inspection

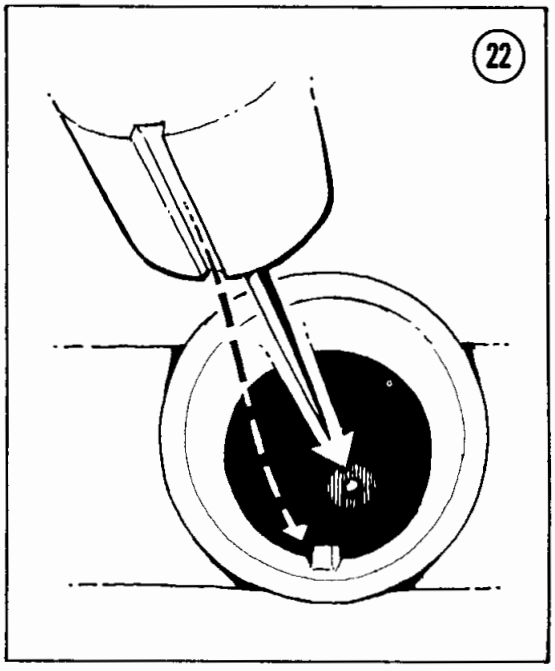
1. Soak all of the metal components in carburetor cleaning solution. This solution is available through automotive parts and supply stores, in a small, resealable tank with a dip basket, for just a few dollars **(Figure 19)**. If it is tightly sealed when not in use, the solution will last for several carburetor cleanings.

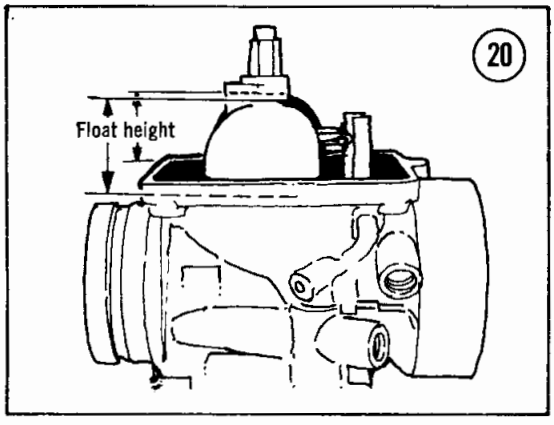
CAUTION

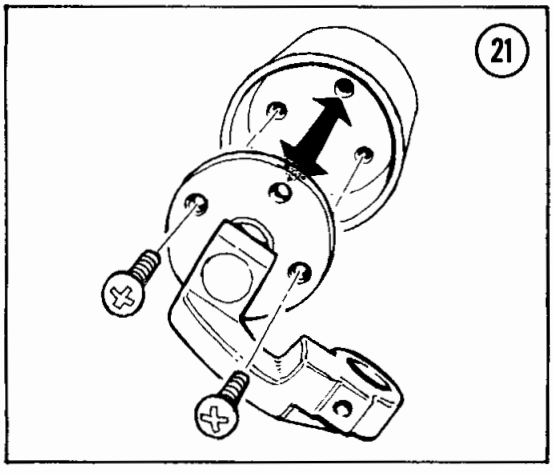
Do not put non-metallic parts such as floats, gaskets, and O-rings in the solution. It may attack and ruin them.

2. Dry the parts with compressed air. Blow out the jets and passages. *Do not use wire or sharp instruments to clean them.* They can be easily burred and very likely their sizes will be altered, thus affecting air/fuel mixture.









3. Check the slide and bore for wear. Generally, many thousands of miles of use are necessary before this sort of wear is apparent; however, if apparent at an early stage, check for a leaking air filter or a damaged intake hose.

4. Inspect the O-rings and seals for damage. Replace them if they are damaged or have hardened to the extent that their ability to seal is doubtful.

5. Install the float needle valve and the float and check the float level with a vernier caliper **(Figure 20)**. Distance should be 19.5- 24.5mm (0.768-0.964 in.). If it is incorrect, bend the tang that contacts the end of the needle valve.

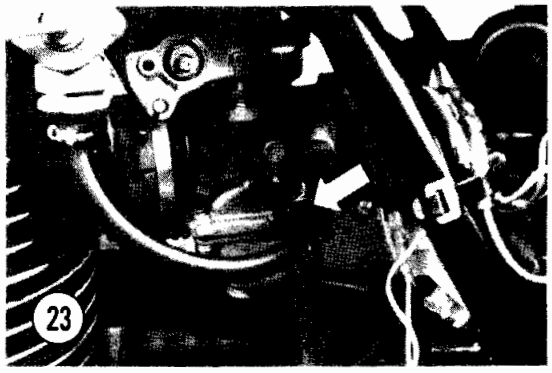
Assembly

1. Assemble the carburetor by reversing the disassembly steps. *Do not overtighten the soft brass jets.*

2. After installing the needle in the slide, position the slide lifter so that the third hole in the lifter lines up with the third hole in the slide **(Figure 21)**.

3. When installing the slide and lifter assembly in the carburetor, make sure the needle fits into the needle jet and the lug in the carburetor body lines up with the groove in the slide **(Figure 22)**.

4. Install the carburetor as described earlier, and adjust the idle mixture, idle speed, and throttle cable free play as described in Chapter Three.

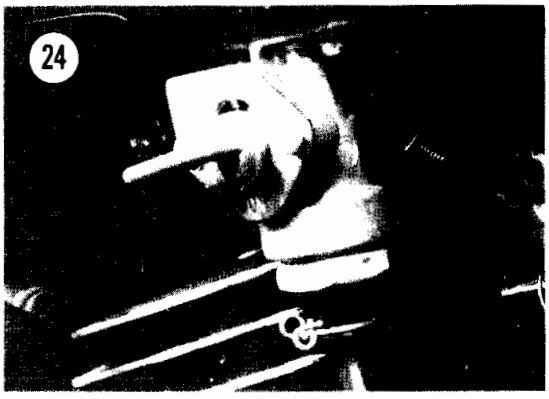


FUEL VALVE (PETCOCK)

The fuel valve should be removed, disassembled, and cleaned each time the carburetor receives major service, or when fuel delivery problems indicate the valve may be dirty.

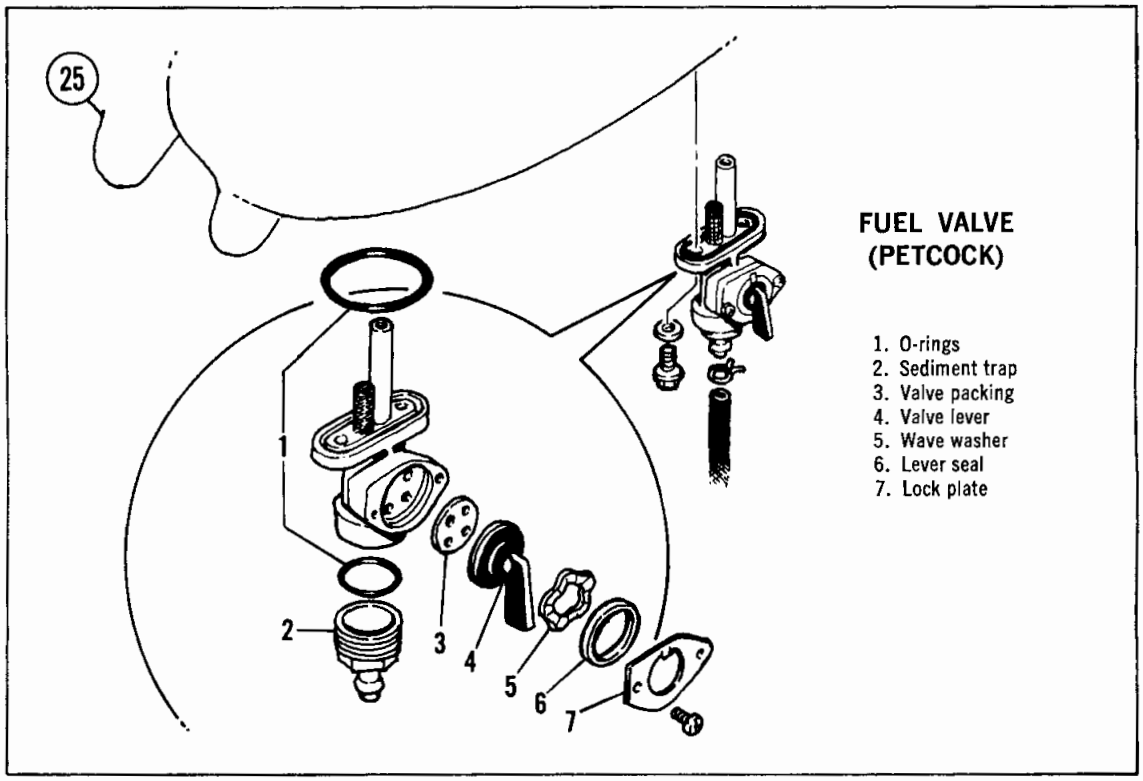
Removal/Installation

1. Turn the fuel valve to OFF and disconnect the line at the carburetor (**Figure 23**). Remove the fuel tank filler cap. Turn the fuel valve to RES and drain the fuel into a safe, sealable container.



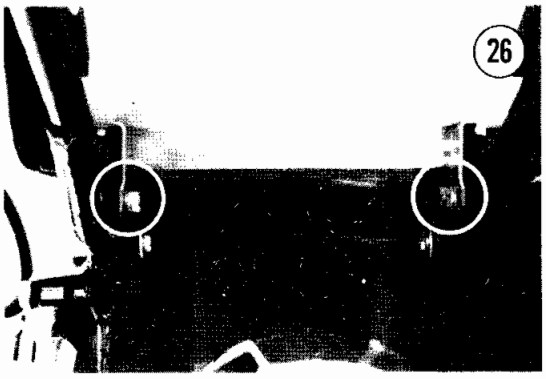
2. Unscrew the fuel valve from the tank (**Figure 24**), disassemble, and clean it (refer to **Figure 25**).

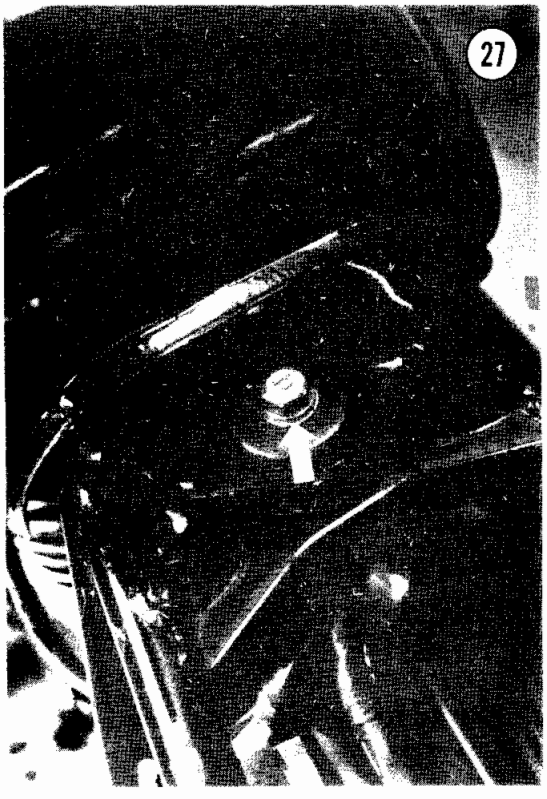
3. Reverse the above to assemble and install the valve. If dirt and contamination were found in the valve and on the screen, do not reuse the

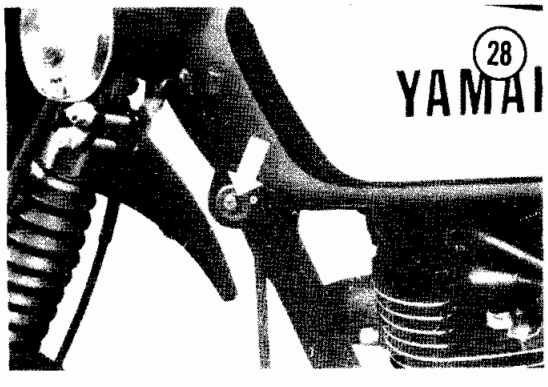


FUEL VALVE (PETCOCK)

1. O-rings
2. Sediment trap
3. Valve packing
4. Valve lever
5. Wave washer
6. Lever seal
7. Lock plate







fuel that was drained from the tank; dispose of it at a service station. Remove and clean the fuel tank as described below before filling it with fresh fuel.

FUEL TANK

The fuel tank should be removed and cleaned each time the carburetor and fuel valve are cleaned, or when fuel delivery problems indicate that the tank may be dirty or contain moisture.

Removal/Installation

1. Turn the fuel valve *off* and disconnect the line at the carburetor. Remove the filler cap. Turn the fuel valve to RES and drain the fuel into a safe, sealable container.
2. Unscrew the 2 seat bolts (**Figure 26**) and remove the seat.
3. Unscrew the fuel valve from the tank and clean it as described above.
4. Unscrew the fuel tank mounting bolts (**Figures 27 and 28**), and remove the tank.
5. Reverse the above to install the tank and assemble the fuel delivery system. After partially filling the tank with fresh fuel, check for and correct any leaks.

Cleaning

Flush the tank with fresh fuel. Slosh the fuel around for a couple of minutes to loosen scale or dirt. Then drain it into a safe, sealable container. Dry the tank with compressed air.

EXHAUST SYSTEM

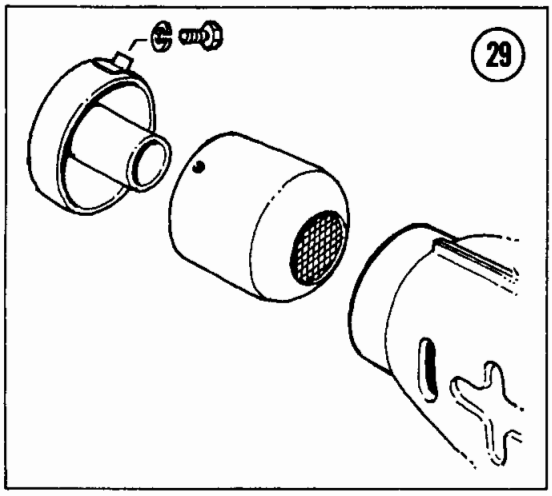
Service to the exhaust system involves cleaning the spark arrester and replacement of damaged or deteriorated components.

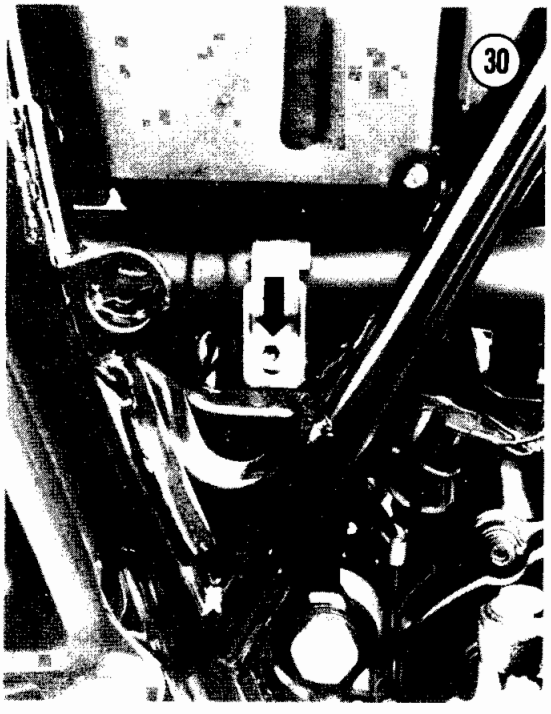
Spark Arrester Cleaning

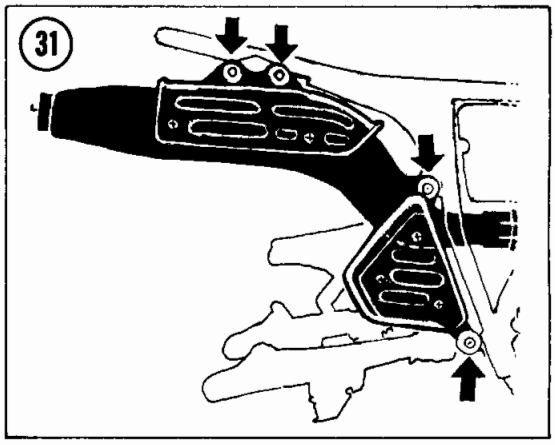
1. Unscrew the lockbolt from the spark arrester cap and remove the cap (**Figure 29**) and the arrester element.
2. Clean the element in solvent and shake out the carbon particles that have become trapped. Dry the unit with compressed air.
3. Install the arrester element and the cap and tighten the bolt securely.

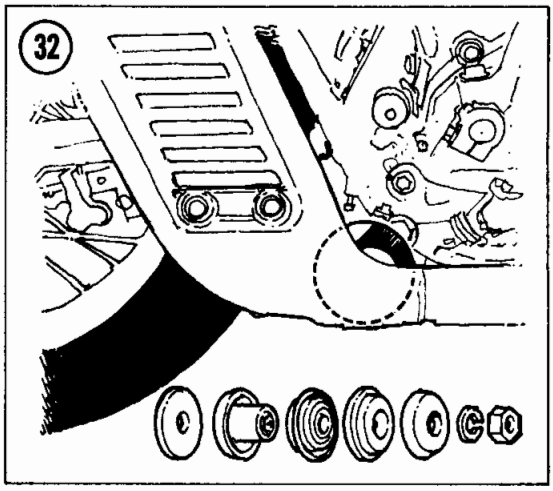
System Removal/Installation

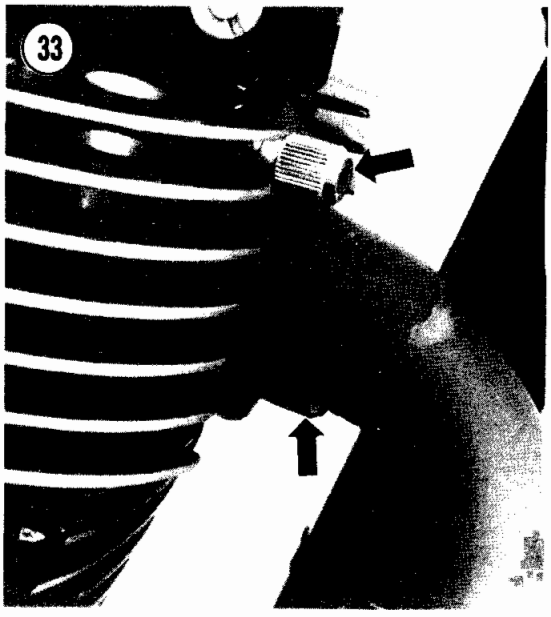
1. Remove the side cover and loosen the muffler-to-head pipe clamp (**Figure 30**).
2. Unscrew the muffler mounting bolts (**Figure 31** — D models; **Figure 32** — C models). Remove the muffler.
3. Unscrew the headpipe bolts from the cylinder (**Figure 33**) and remove the head pipe.
4. Reverse the above to install the exhaust system.











NOTE: If you own a 1978 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER SEVEN

ELECTRICAL SYSTEM

XT models are equipped with an electrical system that incorporates an alternator with ignition and lighting coils; a silicon rectifier that changes the AC produced by the alternator to DC that is used to charge the battery and power the lights and horn; an AC voltage regulator; battery; horn; and light and control switches. The ignition portion of the system consists of a coil and contact breakers assembly.

TT models are equipped with an electrical system that incorporates an alternator with both ignition and lighting coils, but without the lighting, voltage control, and battery. The ignition portion of the TT system also consists of a coil and a contact breaker assembly.

The XT and TT electrical systems are shown schematically at the end of the chapter. Electrical component identification and specifications are shown in **Table 1**.

BATTERY

Care and Inspection

1. Remove the left cover and visually check the battery (**Figure 1**). The electrolyte level should



Table 1 ELECTRICAL SPECIFICATIONS

Spark plugs	NGK BP-7ES Champion N-7Y ND W22-EP
Charging system (XT models)	
Charging amperage	
Lights off	0.8 amp or greater @ 2,000 rpm 2 amp or less @ 8,000 rpm
Lights on	0.8 amp or greater @ 2,000 rpm 3.2 amps or less @ 8,000 rpm
Battery voltage	
Lights off	8.4 volts @ 2,000 rpm 8.5 volts @ 8,000 rpm
Lights on	8.4 volts @ 2,000 rpm 8.8 volts @ 8,000 rpm
Lighting output	6.5 volts or greater @ 2,500 rpm 7.6 volts or less @ 8,000 rpm
Lighting system*	
Headlamp	30W/30W
Tail/stoplamp	5.3/17W
Directional lamps	17W
Directional indicator	3W
Instrument lamps	3W
High beam indicator	3W
Neutral indicator	3W
Fuse	10 amps

* All bulbs 6 volts.

be above the plates and between the level lines. If it is not, top it up with distilled water.

2. Check the plates for color. If they are white, the battery is seriously sulfated and should be replaced. Check also for deposits in the bottom of the case that may be in contact with the plates. If this condition exists, the battery is sulfated and the plates shorted. Replace it.

3. Disconnect the battery terminals — ground first, then positive (**Figure 2**). Unfasten the battery holddown strap and remove the battery. Note the routing of the vent tube.

4. Clean the top of the battery with a solution of baking soda and water. Scrub off any stubborn deposits with a wire brush and rinse the battery with clear water. Dry it thoroughly.

CAUTION

Keep cleaning solution out of the battery cells or the electrolyte will be severely weakened.

5. Clean the battery leads with a stiff wire brush.

6. Inspect the battery case for cracks. If any are found, the battery should be replaced. Its condition will deteriorate rapidly and leaking electrolyte will damage painted, plated, and polished surfaces as well as electrical insulation.

7. If the battery is in good condition, install it and connect the leads, positive first then ground.

8. Coat the terminals with petroleum jelly, such as Vaseline.

Testing

Hydrometer testing is the best way to check the condition of the battery. Use a hydrometer with numbered graduations from 1.100 to 1.300 rather than one with color-coded bands. To use the hydrometer, squeeze the rubber bulb, insert the tip in the cell, and release the bulb. Draw

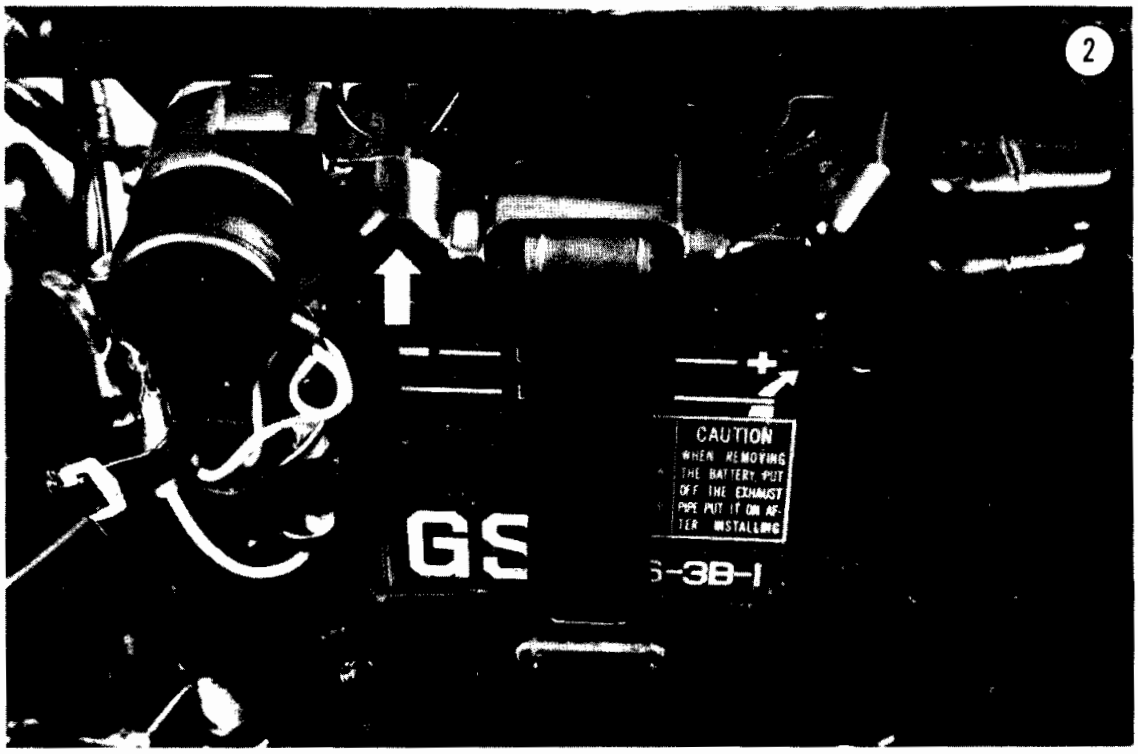


TABLE 2 STATE OF CHARGE

Specific Gravity	State of Charge
1.110-1.130	Discharged
1.140-1.160	Almost discharged
1.170-1.190	One-quarter charged
1.200-1.220	One-half charged
1.230-1.250	Three-quarters charged
1.260-1.280	Fully charged

enough electrolyte out of the cell to float the weighted float inside the hydrometer. Note the number in line with the surface of the electrolyte; this is the specific gravity for this cell. Return the electrolyte to the cell from which it came. Test each cell in the same manner.

The specific gravity of the electrolyte in each battery cell is an excellent indication of that cell's condition. A fully charged cell will read 1.275-1.380, while a cell in good condition may read 1.250-1.280. A cell in fair condition reads 1.225-1.250 and anything below 1.225 is practically dead.

Specific gravity varies with temperature. For each 10° that electrolyte exceeds 80°F, add 0.004 to reading indicated on the hydrometer. Subtract 0.004 for each 10° below 80°F.

If the cells test in the poor range, the battery requires recharging. The hydrometer is also useful for checking the progress of the charging operation. **Table 2** shows the approximate state of charge.

7

Charging

The battery can be charged while installed in the motocycle; however, it is so easily removed after the leads have been disconnected it is not worth the risk of damaging the motorcycle finish with electrolyte during charging.

CAUTION

If the battery is charged while installed in the motorcycle, disconnect both leads before connecting the charger.

WARNING

Charge the battery only in a well-ventilated area. Make certain open flame

and cigarettes, etc., are kept away from the battery during charging. Highly explosive hydrogen gas is formed during charging. Never arc the terminals to determine if the battery has charge; the resulting spark could ignite the gas.

1. Connect the charger — positive to positive and negative to negative (**Figure 3**).
2. Remove the caps from the cells and check and correct the electrolyte level if necessary by adding only distilled water. Leave the caps off during charging to vent the cells.
3. If the charger output is variable, select a low rate 1.5-3 amps, select 6 volts, turn on the charger and allow the battery to charge as long as possible. If it is severely discharged, as long as 8 hours may be required to charge it completely.
4. When charging is complete, test the battery with the hydrometer as described above. If the specific gravity level is satisfactory, wait an hour and test it again, and if the level is still good, the battery is fully charged and in good condition. If the specific gravity drops between the tests, it is likely that one or more cells are sulfated. In such case, replace the battery as soon as possible.

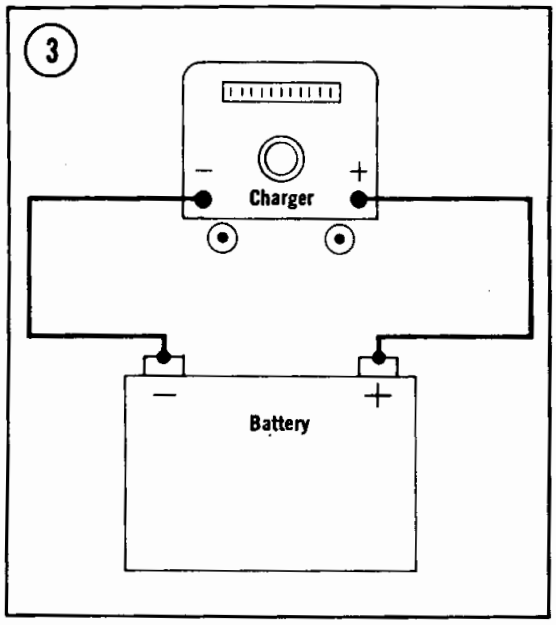
Battery Storage

If the motorcycle is stored for a long period of time or not ridden for a month or more, the battery should be removed and serviced as described earlier. It must also be fully charged beforehand. Store it in a cool, dry place where there is no possibility of the temperature falling to freezing or below. Periodically check the battery for charge condition and recharge it if necessary. If it is allowed to remain discharged, it will sulfate and become useless.

CHARGING SYSTEM (XT MODELS)

The XT charging system is shown in **Figure 4**. It consists of an alternator, rectifier, regulator, and battery.

The alternator generates an alternating current (AC) which the rectifier converts to direct current (DC). The regulator regulates the amount of current going to the rectifier and



consequently to the battery and load (lights, ignition, etc.) at a constant voltage regardless of variations in engine speed and load.

Whenever charging system trouble is suspected, make sure the battery is fully charged and in good condition before beginning (see *Battery*). Also make certain all connections are clean, dry, and tight.

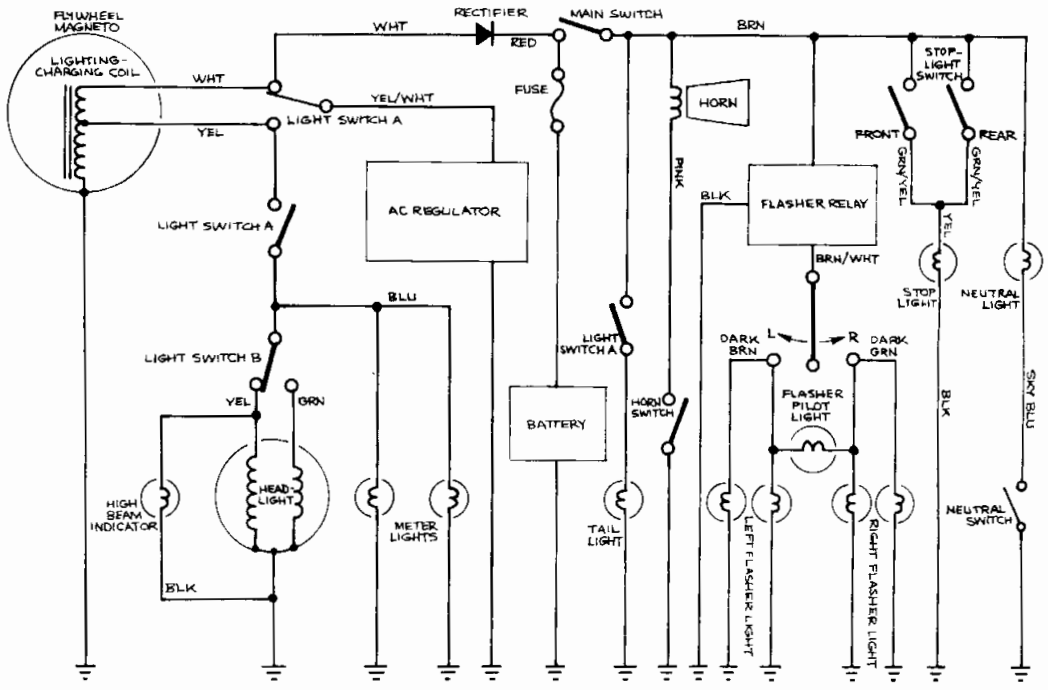
NOTE: *An alternator cannot raise the voltage level of a battery if it has dropped below the required system voltage, in the case 8.4 volts. The alternator simply maintains the required level, and if it is less than 8.4 volts, test results will be invalid.*

Alternator Output Test

1. Remove the left cover and connect the leads of a voltmeter as shown in **Figure 5**.
2. Turn the ignition switch on and start the engine. Record the readings at the various engine speeds noted in **Figure 6**.
3. Turn the switch to the lights-on position and again record the readings at the various engine speeds.
4. If the actual readings are well below those shown in the graph, the alternator output is too low. It's likely that the alternator charging coil is faulty and should be replaced.

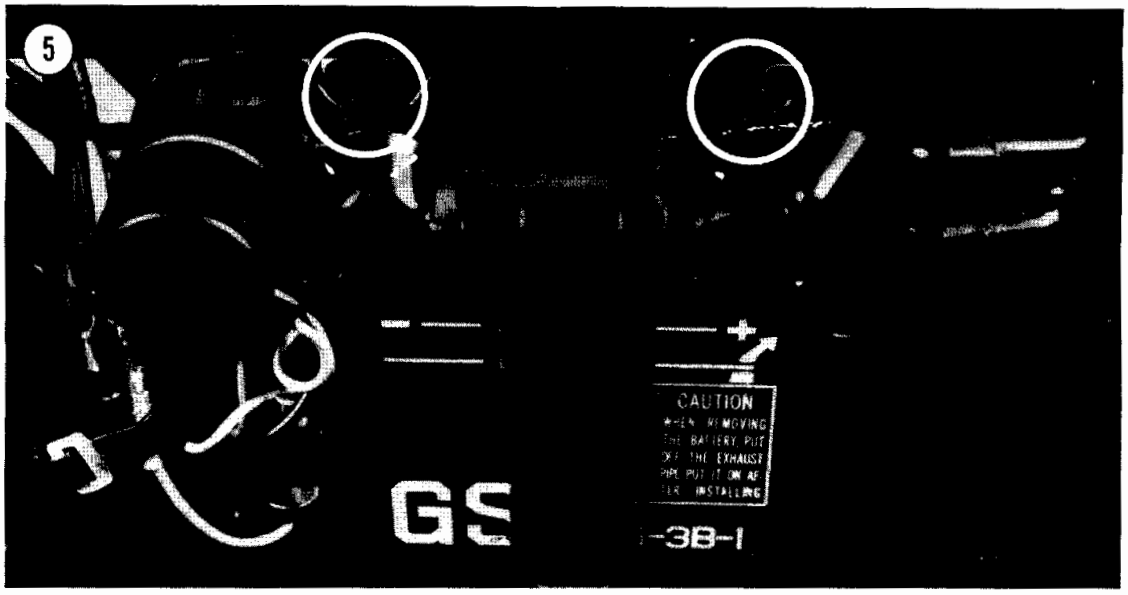
4

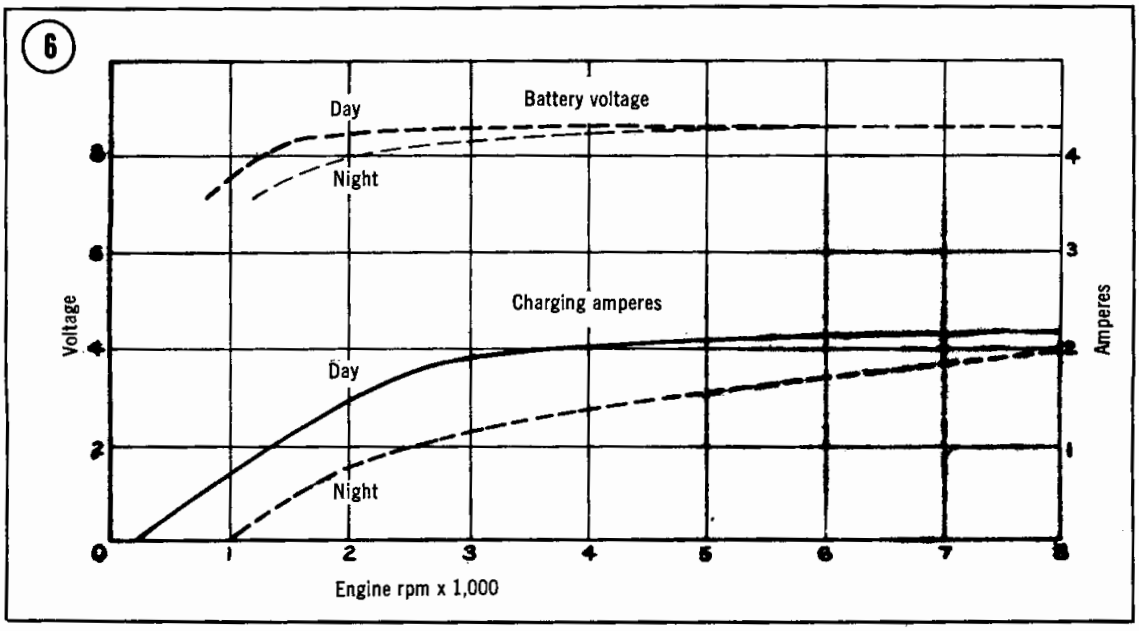
XT500 AND XT500D LIGHTING/CHARGING CIRCUIT



7

5





Rectifier Test

1. Connect the positive (+) lead of an ohmmeter to the red lead of the silicon rectifier. Do not disconnect the rectifier from the system. Connect the negative (−) lead of the ohmmeter to the white rectifier lead and compare the reading to **Figure 7**.
2. Reverse the ohmmeter connections and again compare the reading to **Figure 7**. If the reading was incorrect in either case, replace the rectifier.

Voltage Regulator Test

A regulator tester is required to accurately test a regulator. Have your dealer test it.

Lighting Coil Test

1. Connect the positive (+) lead of a voltmeter to the yellow lead between the switch and the headlight. Connect the negative (−) lead to ground (**Figure 8**).
2. Start the engine and turn on the lights. Check the voltage at 2,500 rpm; it should be 6.5 volts or greater. Check the voltage at 8,000 rpm; it should be no more than 7.6 volts.
3. If the voltage is incorrect in either case, check the resistance of the lighting coil with an ohmmeter. Connect the positive (+) lead to the yellow wire from the alternator, and the negative (−) lead to ground. Set the ohmeter on the "X 1" scale and check for resistance. If resistance (very low) is present, have the condition of the coil verified by a dealer or automotive electrical specialist. If the meter indicates an open, replace the coil.

LIGHTING SYSTEM

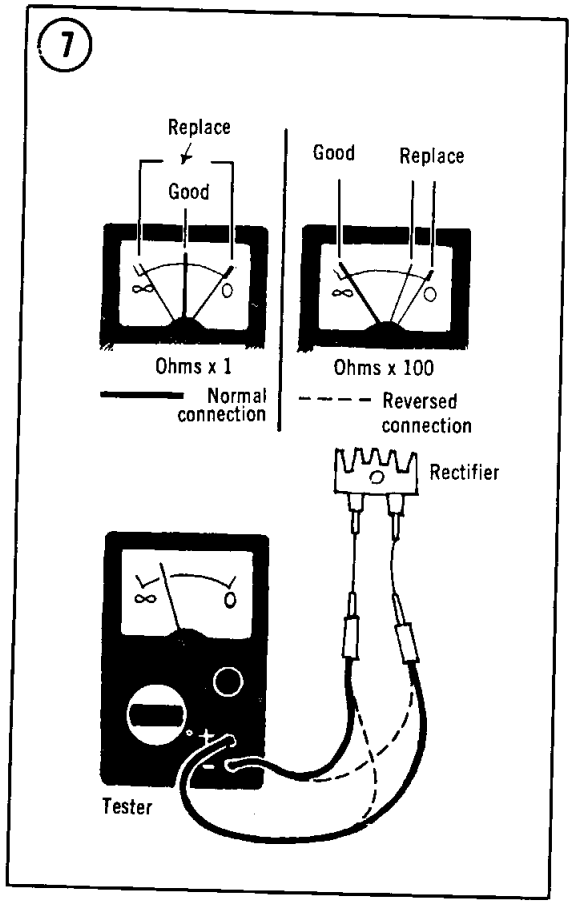
Troubleshooting

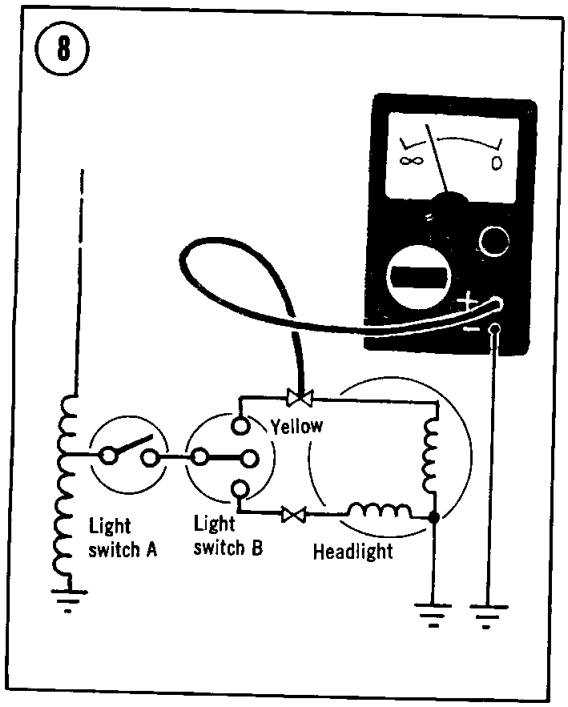
There is no magic involved in successfully troubleshooting lighting problems. First, look for the obvious; is the bulb filament all right? Even if the filament appears to be intact, the bulb may be faulty because of a gas leak. Check with a bulb that is known to be good.

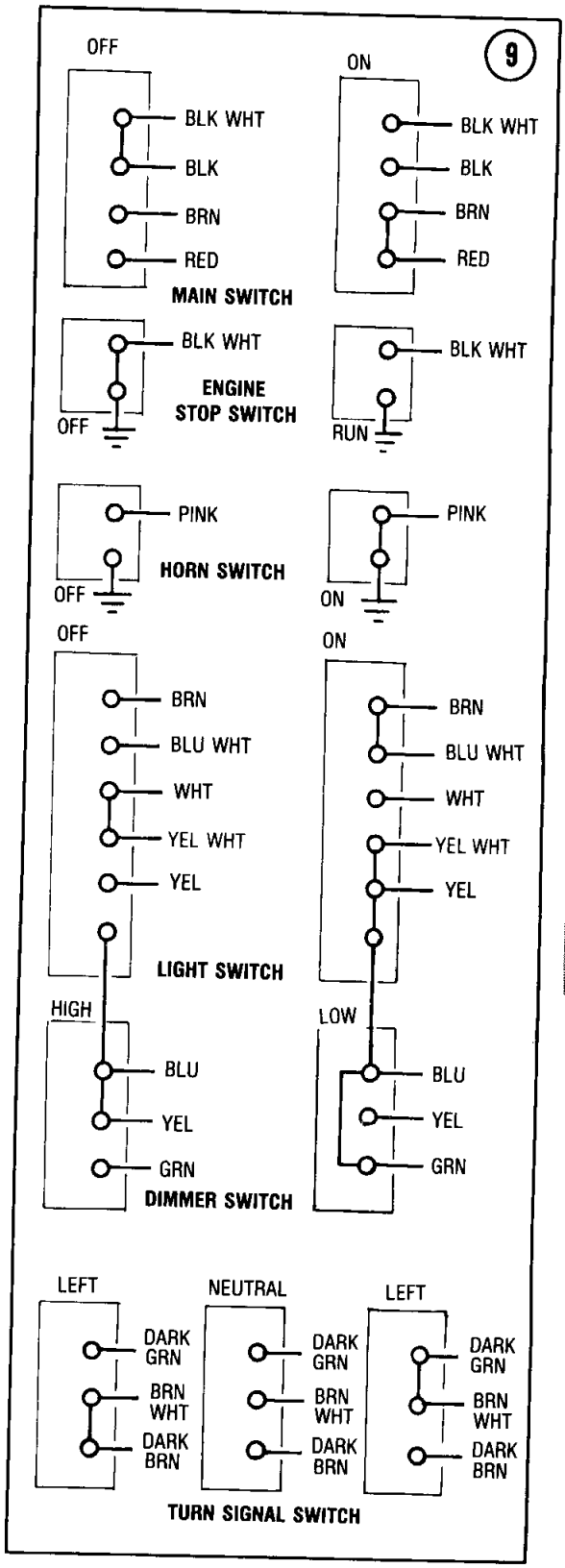
Check connections to make sure they are clean, tight, and dry. Check the electrical leads for worn or broken insulation that could cause a short.

Check the line voltage with a voltmeter. If the battery is in good condition, the line voltage should be 6 volts.

If all conditions seem satisfactory but there is no line voltage from the ignition switch to the affected light, test the ignition switch terminal continuity in each of its operating positions; use an ohmmeter indexed on the "X 1" scale. Refer to **Figure 9** for the appropriate switch positions and terminals.


7
Replace
Good
Ohms x 1
Normal connection
Good
Replace
Ohms x 100
Reversed connection
Rectifier
Tester

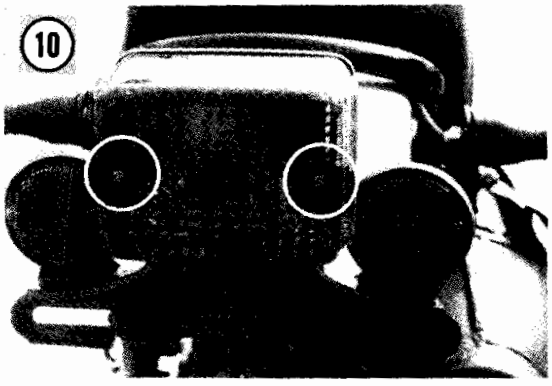

8
Yellow
Light switch A
Light switch B
Headlight


9
OFF
ON
BLK WHT
BLK
BRN
RED
MAIN SWITCH
ENGINE STOP SWITCH
OFF
RUN
PINK
HORN SWITCH
BRN
BLU WHT
WHT
YEL WHT
YEL
LIGHT SWITCH
HIGH
LOW
BLU
GRN
DIMMER SWITCH
LEFT
NEUTRAL
DARK GRN
BRN WHT
DARK BRN
TURN SIGNAL SWITCH

7

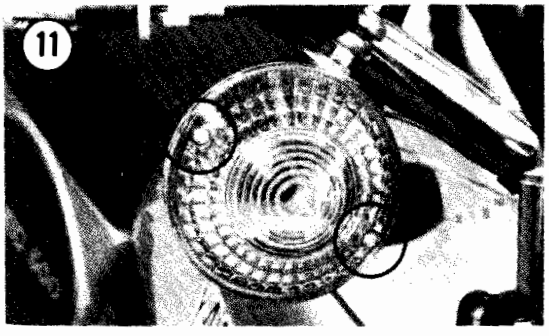
Stop/Taillamp Replacement

1. Unscrew the 2 screws that hold the lens in place (**Figure 10**) and remove the lens carefully so the gasket will not be damaged.
2. Press in on the bulb and turn it counterclockwise to unlock it from its socket. Clean the socket thoroughly. If corrosion is present in the socket, remove it with emery cloth wrapped around a pencil. Then, blow out all debris with compressed air. Clean the reflector and the lens with a mild soap or glass cleaner.
3. Reverse the above to install the bulb and the lens. Do not overtighten the lens screws, or the lens will crack.



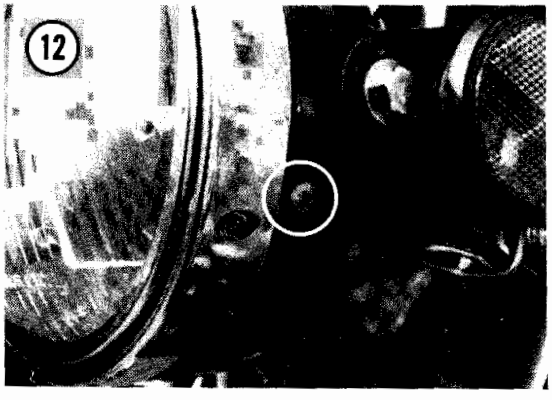
Turn Signal Bulb Replacement

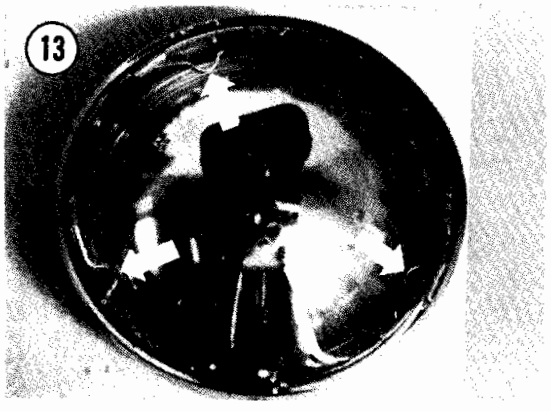
1. Unscrew the screws from the lens (**Figure 11**) and carefully remove the lens to prevent damage to the gasket.
2. Press in on the bulb and turn it counterclockwise to unlock it from the socket. Clean the socket thoroughly. If corrosion is present in the socket, remove it with emery cloth wrapped around a pencil. Blow out all of the debris with compressed air. Clean the reflector and the lens with mild soap.
3. Reverse the above to install the bulb and the lens. Do not overtighten the lens screws or the lens will crack.

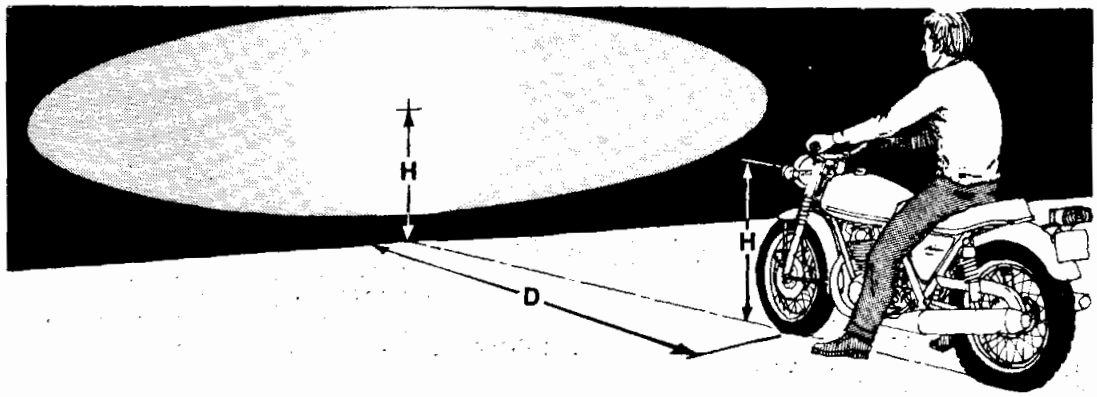


Headlamp Replacement

1. Remove the screw that locks the headlamp bezel in place (**Figure 12**). Remove the bezel and lamp as an assembly after unplugging the connector from the rear of the headlamp.
2. Remove the clips that lock the headlamp into the bezel (**Figure 13**). Remove the lamp.
3. Install a new lamp in the bezel with the location nub on the lamp engaged with the cutout in the bezel. Install the clips to lock the lamp in place.
4. Reconnect the plug, install the lamp in the housing and secure it with the screw. Adjust the headlight beam as described below.

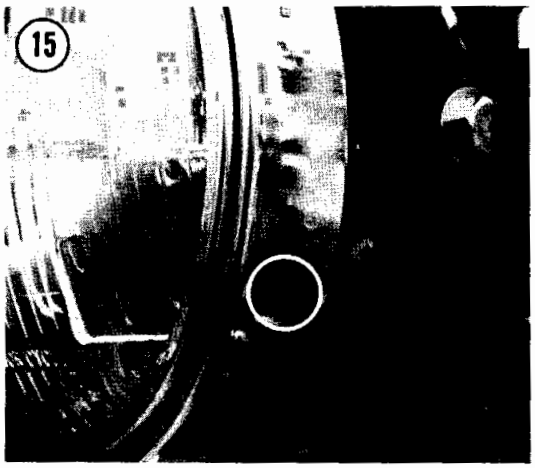


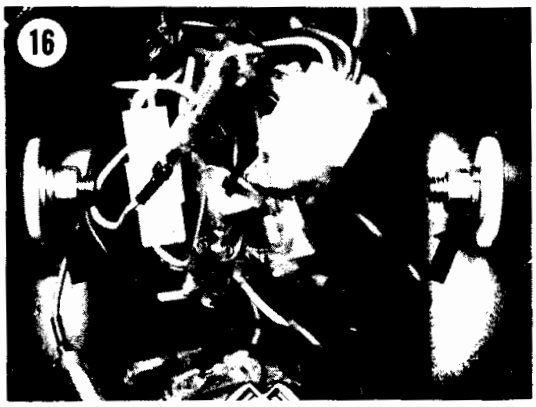




HEADLIGHT ADJUSTMENT

H = Height from center of headlight to floor
D = Distance from headlight to wall (25 ft.)





Headlight Beam Adjustment

Adjust the headlight beam horizontally and vertically to comply with the motor vehicle regulations in your area. See **Figure 14.**

The screw in the side of the headlamp body (**Figure 15**) controls the beam horizontally.

To alter the height of the beam, remove the lamp and loosen the 2 nuts inside the headlamp body (**Figure 16**). When the beam is correct, tighten them securely without further moving the headlamp body.

SWITCHES

The switches are not repairable. If a switch continuity test (described earlier under *Lighting System Troubleshooting*) indicates that a switch is faulty, replace it.

FUSE

A single main fuse is located in an in-line holder next to the battery. If there is no current in the system, check the fuse and replace it if it has blown. Replace it with a fuse of the same rating.

IGNITION

Ignition service and adjustments are covered in Chapter Three under *Engine Tune-Up*. Addi-

tional tests can be conducted to locate trouble. Of these, spark gap testing which determines the performance of the ignition coil, requires a special test machine; this should be referred to a dealer or automotive electrical specialist if the coil is felt to be faulty. Before doing this, however, carry out the simple tests that follow. If the results are inconclusive (simple ohmmeters can't read very low design resistance accurately), have the condition of the affected component verified by a dealer or electrical specialist.

Coil Winding Resistance Test

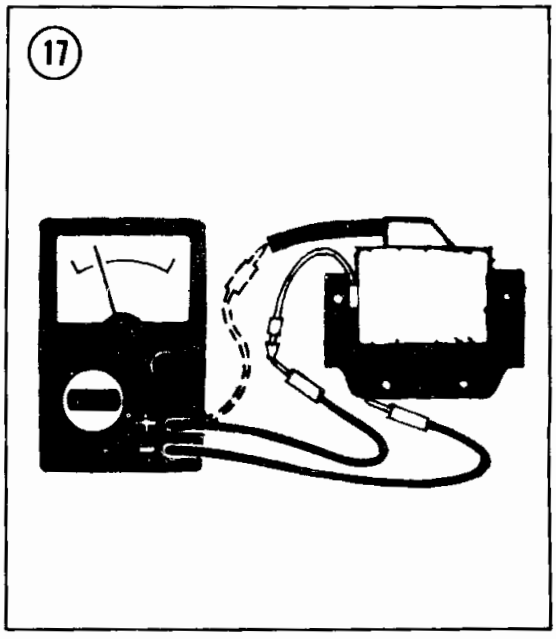
The resistance of the coil windings can be checked with an ohmmeter to determine if further testing is necessary or if the coil should be replaced. Index the meter to the "X 1" scale. Connect the meter leads to the coil terminals as shown in **Figure 17**, first to the primary lead and ground, then to the high-tension lead and ground.

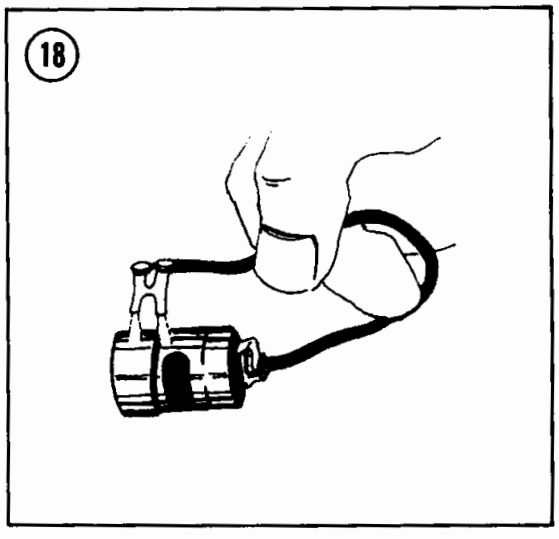
At room temperature (68°F), the primary resistance should be 0.68-0.84 ohms; however, most meters cannot accurately read resistance this small. Instead, if resistance is present, the meter will indicate it. If it indicates no resistance, there is an open in the primary winding.

The resistance of the secondary winding should be 4560-6840 ohms. If resistance is present in the primary winding, and the resistance is within range in the secondary, or high-tension, winding but the coil is still suspect, have the spark gap tested by a dealer or automotive electrical specialist. If the primary winding is open, or the secondary resistance is not within range, replace the coil.

Condenser Field Test

While the condenser is considered an expendable item that should be routinely replaced when the contact breaker is replaced, a simple field test can save time when troubleshooting the ignition when testers are not available.





Remove the condenser, touch the case to one battery terminal and the contact to the other terminal. After a few seconds, touch the lead to the case and check for a spark (**Figure 18**). If there is a spark, the condenser is at least operable. If there is no spark, the condenser is faulty.

WIRING DIAGRAMS

Wiring diagrams for XT and TT models are found at the back of the book.

NOTE: If you own a 1978 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER EIGHT

FRONT SUSPENSION AND STEERING

The condition of the front suspension and steering is critical to safety and good handling. A loose fork stem, worn wheel bearings, bent fork tubes, or low damping oil level can cause serious handling and steering problems.

This chapter includes repair, replacement, and service procedures for the front wheel, forks, steering, and brakes.

Seal and bearing identification information appears in **Table 1**.

FRONT WHEEL

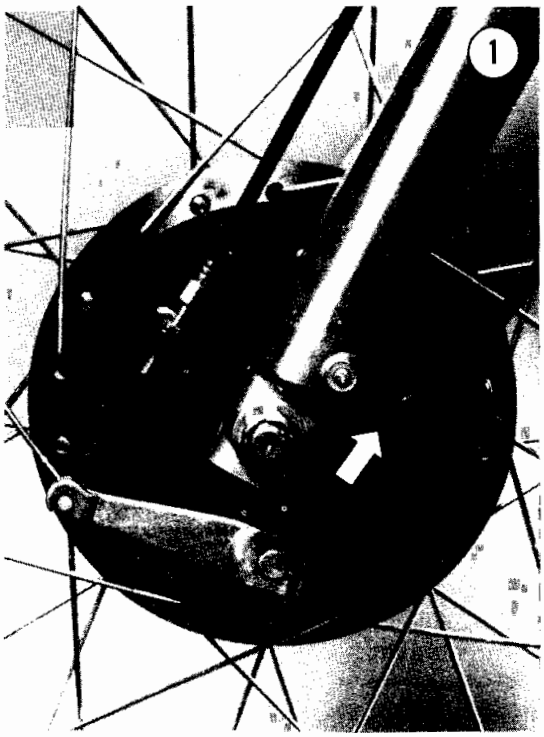
Removal/Installation

1. Block up the front end to raise the wheel off the ground.

TABLE 1 FRONT WHEEL SEAL AND BEARING IDENTIFICATION

Item	ID Number or Size
Front fork seal (2)	SD-38-48-10.5
Front wheel bearing (left)	6202RS
Front wheel bearing (right)	6202
Front wheel oil seal (left—XT models only)	SDD-50-62-7
Front wheel oil seal (right—all models)	SD-20-35-7
Speedometer drive seal (XT)	SO-7-14-4

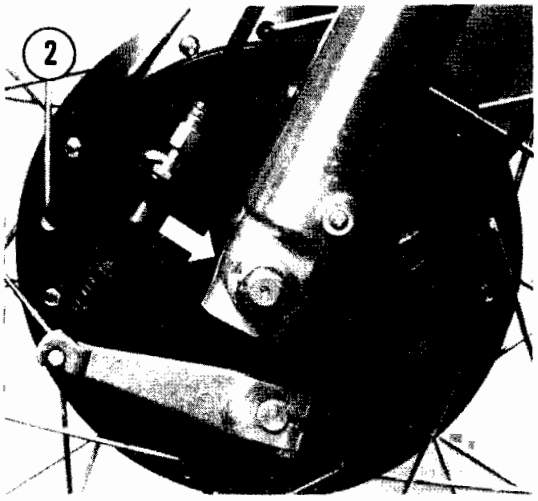
2. Disconnect the speedometer cable from the brake backing plate (**Figure 1**). Loosen the locknut on the brake cable adjuster, screw in the adjuster to slacken the cable, and disconnect the cable from the brake arm and then the backing plate.



3. Remove the cotter key from the axle (**Figure 2**) and discard the key. Then unscrew the axle nut.

4. Unscrew the nuts that hold the axle cap in place (**Figure 3**), remove the cap, pull out the axle, and remove the wheel.

5. Reverse the above to install the wheel. When installing the axle cap nuts, run the front nut up until the cap contacts the fork leg. Then run the rear nut up snug. See **Figure 4**. Tighten the axle nut to 7-10 mkg (50-70 ft.-lb.) and install a new cotter key. Then tighten the front axle cap nut to 1.6-2.2 mkg (12-16 ft.-lb.), then tighten the rear nut to the same value. Refer to Chapter Three and adjust the front brake cable free play.



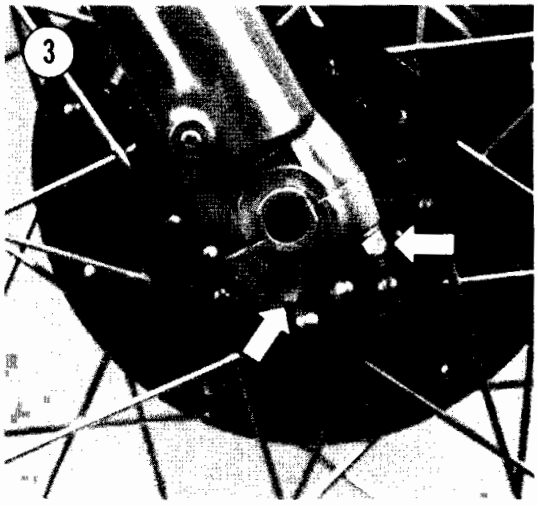
Disassembly

1. Remove the brake assembly from the wheel. Remove the dust cover and spacer from the right side of the hub. Refer to **Figure 5** — XT models; or **Figure 6** — TT models.

2. On XT models, remove the large seal, washer, speedometer drive, and circlip from the left side of the hub.

3. On all models, insert a soft drift through the left-side bearing and push the floating interior spacer aside. Tap around the outer race of the right bearing to remove it and the seal.

4. From the right side, tap out the left-side bearing.



Inspection

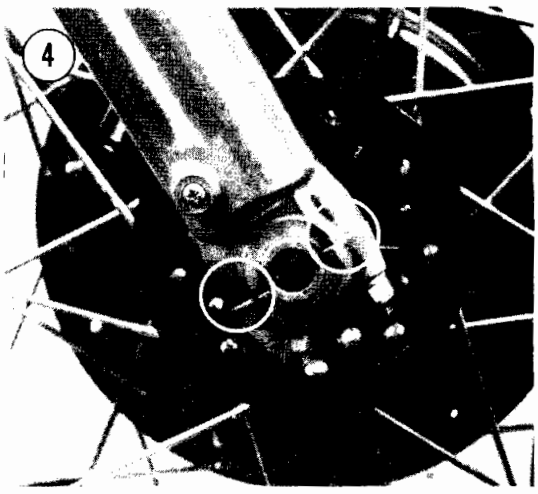
1. Clean all of the parts thoroughly (except the sealed left-side bearing) in clean solvent and blow them dry with compressed air.

WARNING

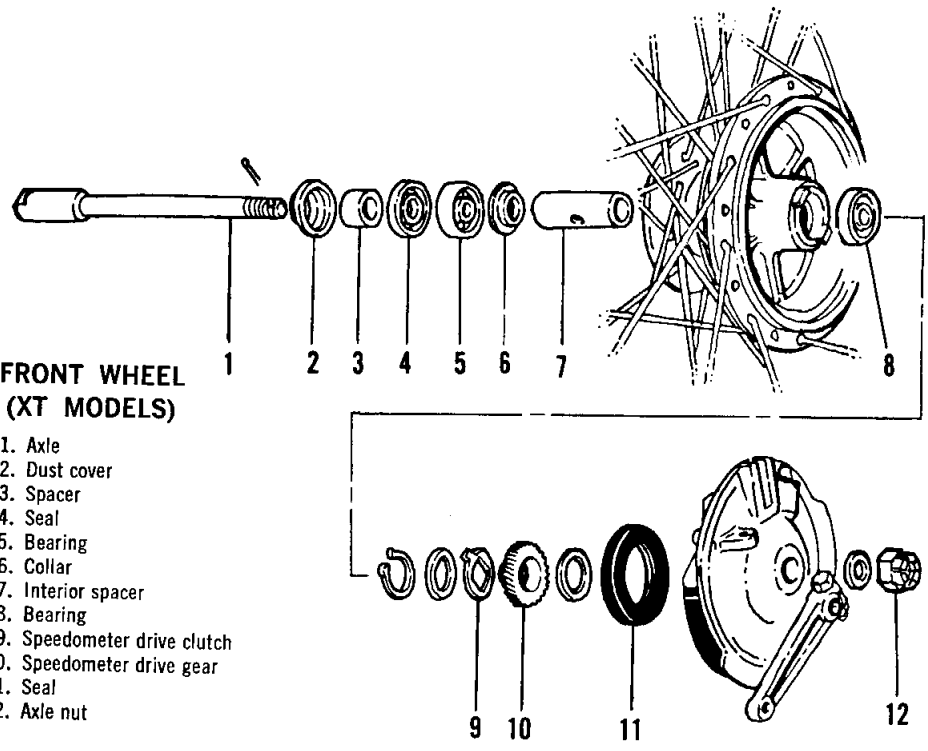
Do not spin the bearings with the air jet. It is capable of rotating them at speeds far in excess of those for which they were designed, and they may very likely break apart and cause serious injury and damage to anyone or thing they strike.

2. Rotate the bearings by hand and check for play, noise, and roughness. If they do not spin smoothly and quietly, replace them.

3. Check the seals for wear and damage and replace them if they are less than perfect.



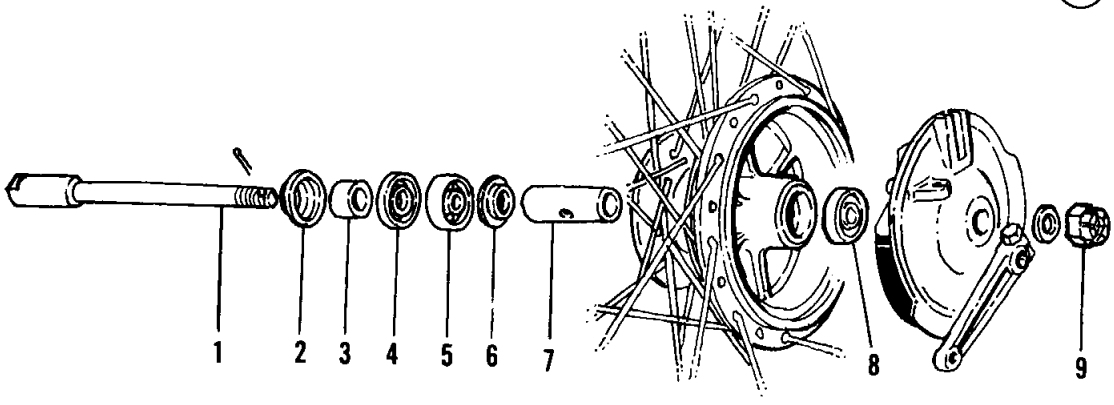
5



FRONT WHEEL (XT MODELS)

1. Axle
2. Dust cover
3. Spacer
4. Seal
5. Bearing
6. Collar
7. Interior spacer
8. Bearing
9. Speedometer drive clutch
10. Speedometer drive gear
11. Seal
12. Axle nut

6



FRONT WHEEL (TT MODELS)

1. Axle
2. Dust cover
3. Spacer
4. Seal
5. Bearing
6. Collar
7. Interior spacer
8. Bearing
9. Axle nut

8

Assembly

1. Thoroughly grease the bearings with waterproof grease. Fill the open face of each seal with grease, and grease the inside of the hub and the inside and outside of the spacers.

2. Line up the left-side bearing squarely with its bore in the wheel and tap it in evenly, using a socket that will bear on the outer race as a drift.

3. Install the interior spacer and flange and right-side bearing on the axle, insert the axle into the right side of the hub and gently tap the bearing part-way into the bore; this aligns the spacer. *Do not drive it all the way in with the axle; it bears on the inner race and excessive force could damage the bearing.* Remove the axle and finish driving the bearing in with a socket that bears oniy on the outer race of the bearing.

4. Tap the seal into the right side of the hub using a socket for a drift. Install the spacer and the dust cover.

5. On XT models, install the circlip in the left side of the hub. Grease the speedometer drive components and install them. Install the flat washer and the large seal.

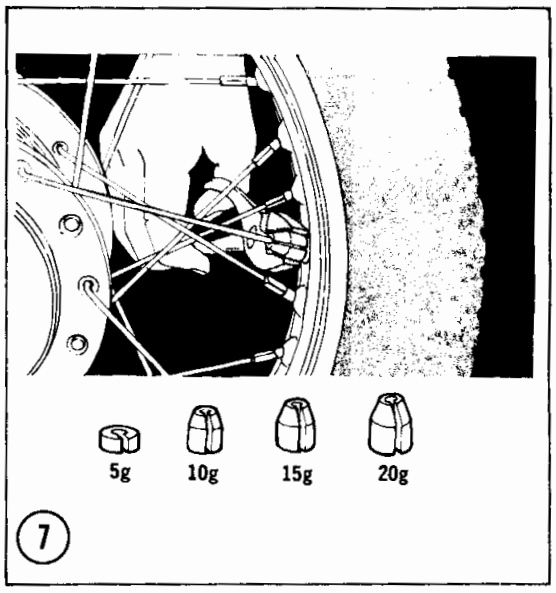
6. Install the brake assembly in the wheel and install the wheel as described earlier. Adjust the brake as described in Chapter Three — *Front Brake Adjustment.*

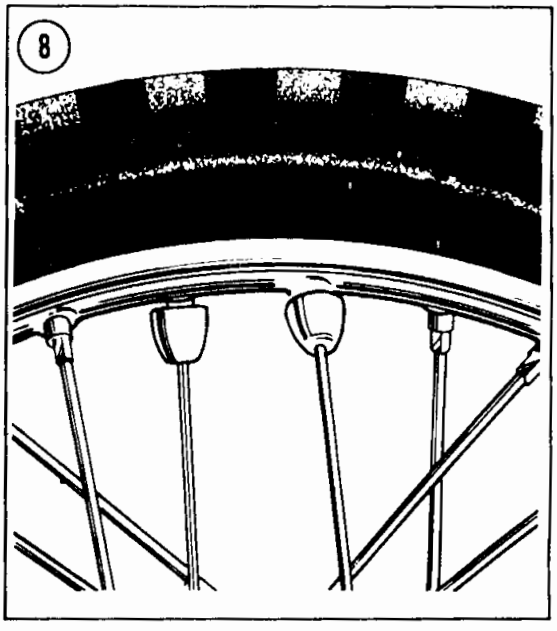
Wheel Balancing

An unbalanced wheel can be dangerous. Depending upon the degree of unbalance and speed, the rider may experience anything from mild vibration to violent shimmy. In severe cases, the rider can lose control.

Wheels are relatively easy to balance without special equipment. Your dealer has an assortment of balance weights which attach to the spokes. Some crimp onto the light side of the wheel with ordinary gas pliers (**Figure 7**). Others are chrome plated and simply slide onto the spoke; friction holds them in place. Buy a couple of each weight available (**Figure 8**). If they are undamaged, you can return the unused weights.

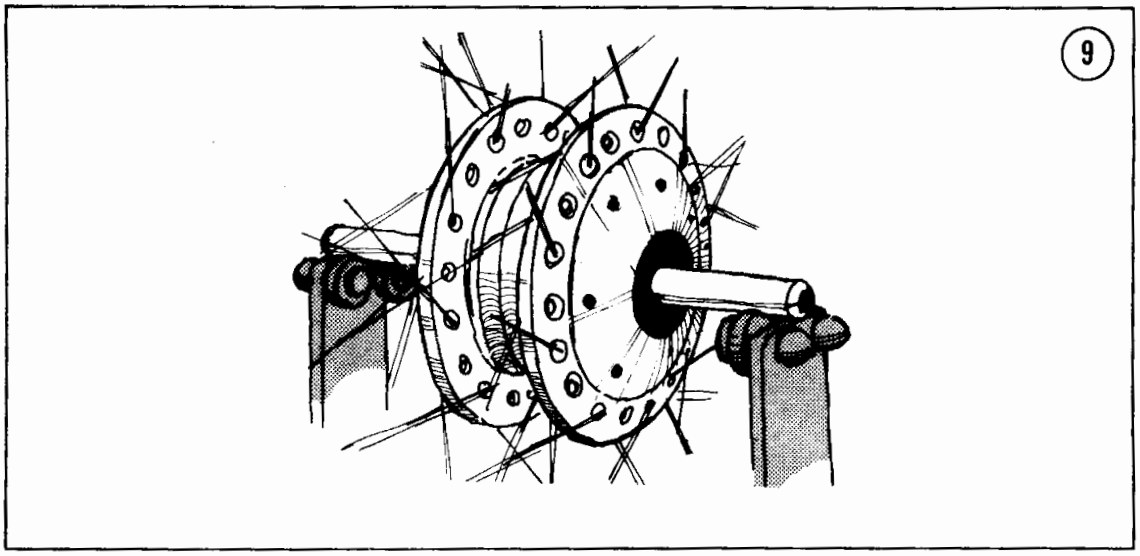
Before balancing the wheel, make sure the bearings are in good condition and properly lubricated.

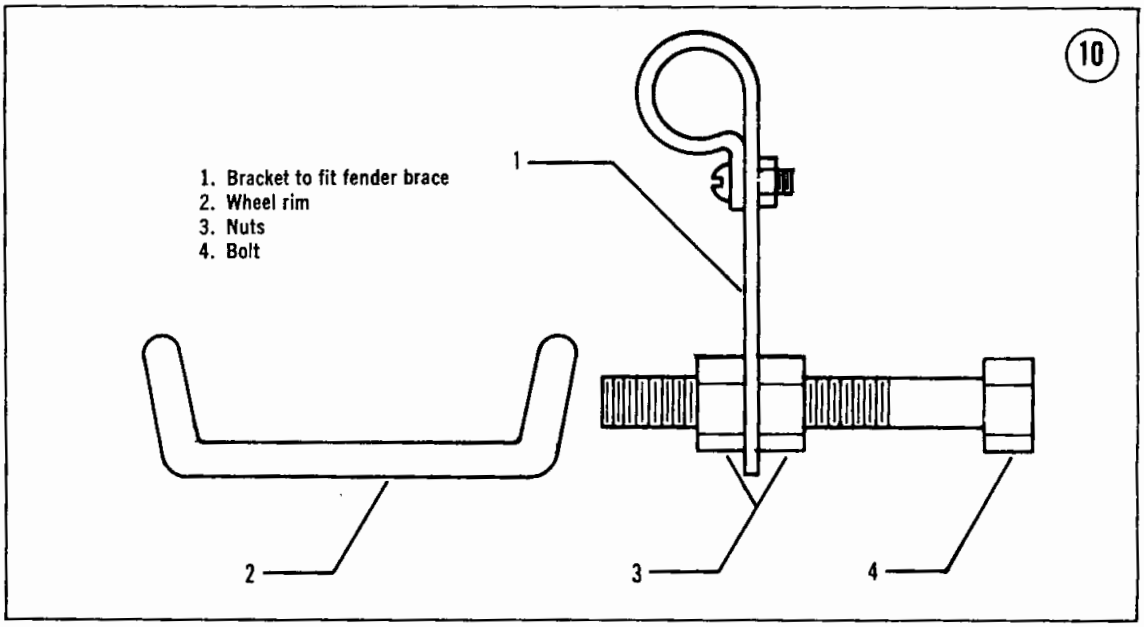




1. Support the ends of the axle so the wheel can turn freely (**Figure 9**).

2. Rotate the wheel slowly and allow it to come to rest by itself. Make a chalk mark on the tire at the 6 o'clock position and rotate the wheel as before, several times, noting the position of the chalk mark each time the wheel comes to rest. If it stops at different positions each time, the wheel is balanced.





3. If the chalk mark stops at the same position — 6 o'clock — each time, add weight at the 12 o'clock position until the chalk mark stops at a different position each time.

4. Install the wheel and road test the motorcycle on a smooth, straight road.

Spoke Adjustment and Rim Runout

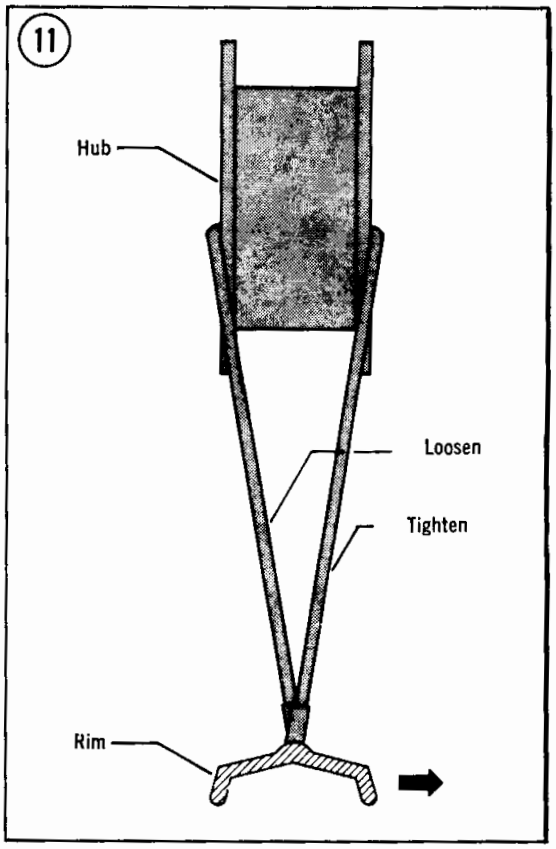
Spokes loosen with use and should be checked periodically. If all spokes appear to be loose, tighten all spokes on one side of the hub, then tighten all the spokes on the other side. One-half to one turn should be sufficient; don't overtighten.

After tightening the spokes, check rim runout to be sure you haven't pulled the rim out of shape. One way to check runout is to mount a dial indicator on one of the fork legs so that the indicator rod bears on the rim.

If you don't have an indicator, improvise as shown in **Figure 10**. Adjust the position of the bolt until it just clears the rim. Rotate the wheel and notice if the clearance increases or

decreases. Mark the tire at points where the clearance is large or small. The clearance should not vary by more than 2mm (0.08 in.).

To pull the rim out, tighten the spokes which terminate on the same side of the hub and loosen spokes which terminate on the opposite side of the hub. See **Figure 11**. In most cases, only a slight amount of adjustment is necessary to true the rim. After adjustment, rotate the wheel and make sure another area has not been pulled out of true. Continue adjusting and checking until runout does not exceed 2mm (0.08 in.).



Spoke Replacement

If one or two spokes are broken or severely bent, they can be replaced without removing and dismantling the wheel. However, this should be considered a temporary "fix" and should not be done if more than a couple of spokes require replacement.

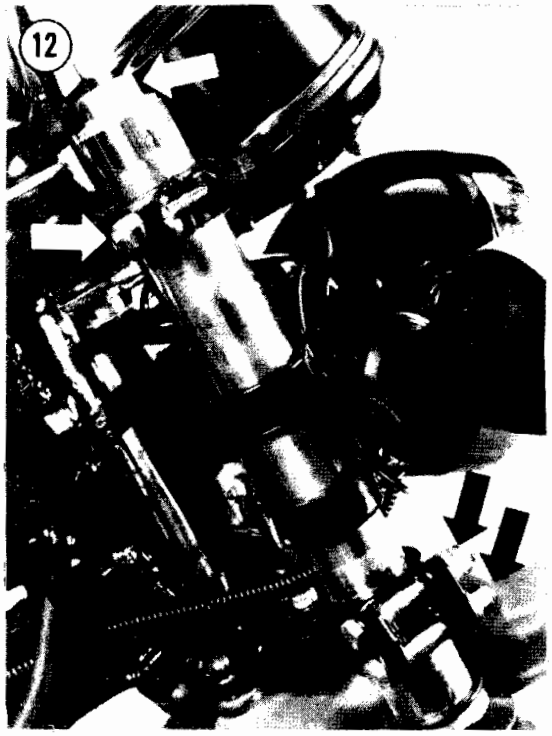
1. Inflate the tire to 20 psi to hold the nipple up into the rim.
2. Unscrew the nipple until the end of the spoke is free. Then bend the spoke and pull it out of the nipple.
3. Disconnect the spoke from the hub.
4. Trim the threaded end of a new spoke so that it is about two or three turns shorter than the old spoke; this will permit some stretching of the new spoke and minimize the risk of it puncturing the inner tube.
5. Install the new spoke in the hub and gently bow it so that it can be inserted in the nipple. Screw the nipple onto the spoke and adjust it as described above.

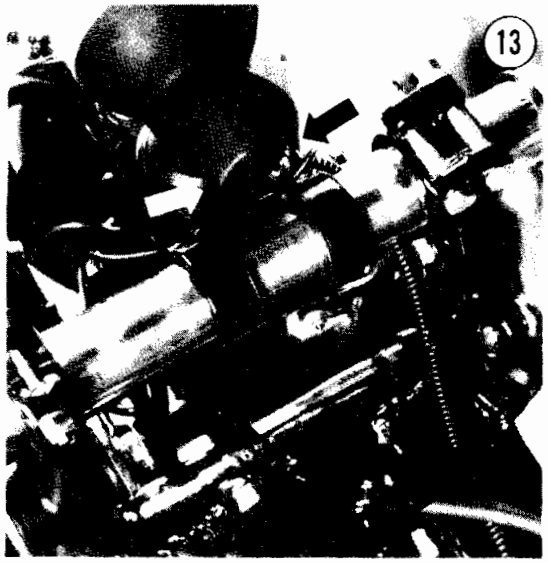
FRONT FORKS

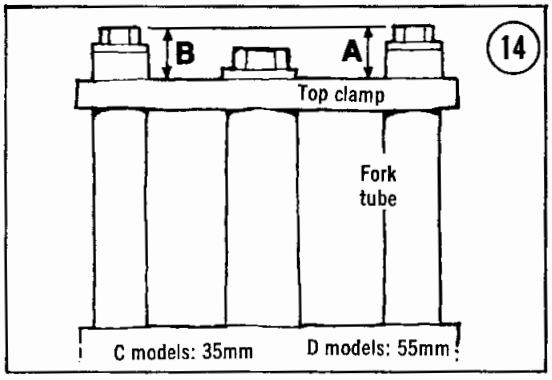
Changing front fork damping oil is described in Chapter Three. Removal, disassembly, inspection, and seal replacement are covered in this chapter.

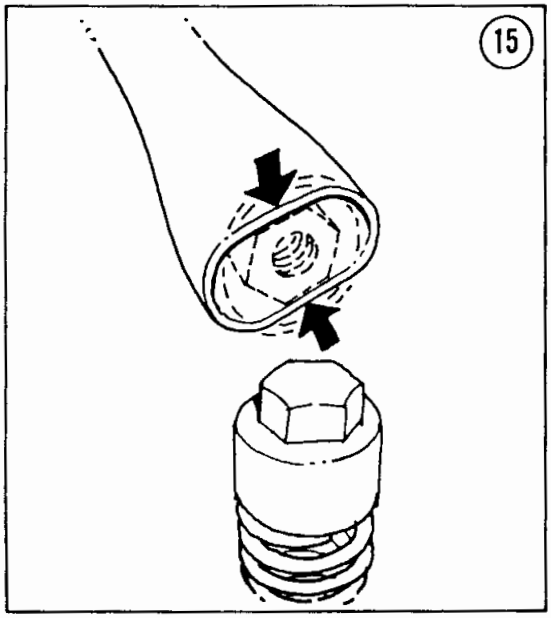
Removal/Installation

1. Remove the front wheel as described above.
2. Loosen the fork cap bolts (**Figure 12**).
3. Loosen the fork pinch bolts in the top and bottom clamps (**Figure 13**). On XT models,









loosen the headlamp bracket screws. Wrap the headlamp housing in shop rags to prevent damage to the finish.

4. Pull the fork legs down and out of the clamps.

5. Reverse the above to install the fork legs. The height of the tube above the top clamp must be the same for both sides (**Figure 14**). The factory-recommended heights are:

C models — 35mm (1.38 in.)
D models — 55mm (2.17 in.)

However, personal preference may dictate a height other than that recommended. Greater height will make the steering quicker for better maneuvering; less height will give the bike better straight-line stability. The important point is that the height be the same for both sides.

6. Tighten the upper pinch bolts to 1.8-2.9 mkg (13-21 ft.-lb.). Tighten the lower pinch bolts to 2.0-2.5 mkg (14.5-18 ft.-lb.).

7. Install the front wheel and align it with the forks as described earlier. Refer to Chapter Three and fill the forks with damping oil.

Disassembly

1. Remove the fork tubes as described above. Remove the top caps and drain the forks by inverting them.

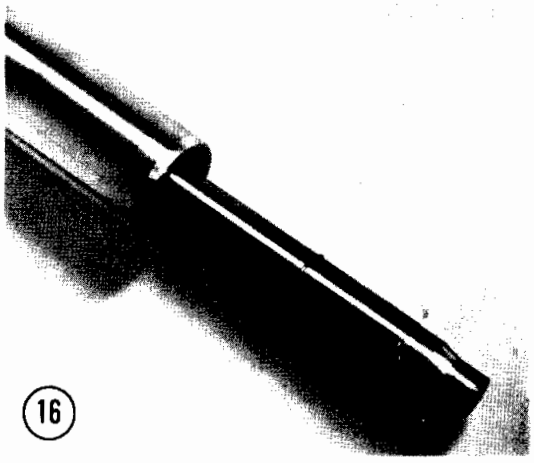
2. Make a holding tool like the one shown in **Figure 15**. This is required to lock the damper assembly in place while the bottom Allen bolt is removed and installed. Unscrew the bolt from the bottom of the fork leg.

3. Remove the circlip from the bottom of the fork leg (**Figure 16**). Disassemble the tube components as shown in **Figure 17**. Remove the damper rod from the top of the fork tube (**Figure 18**).

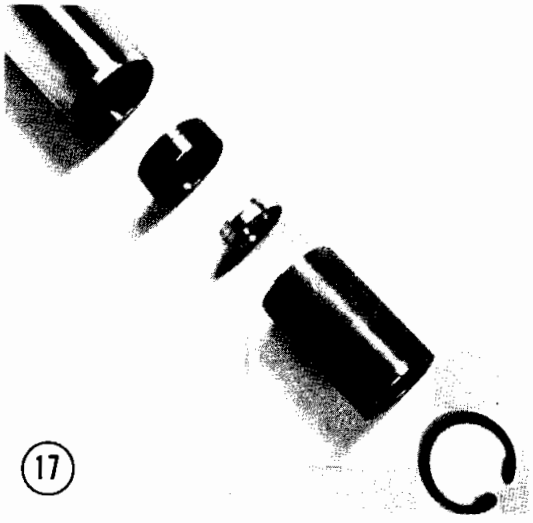
4. Remove the lock ring from the top of the fork slider and carefully pry out the seal with a screwdriver (**Figure 19**). A simple protector (**Figure 20**) can be made from soft aluminum. Place this over the rim of the slider and let the screwdriver shaft bear against it.

Inspection

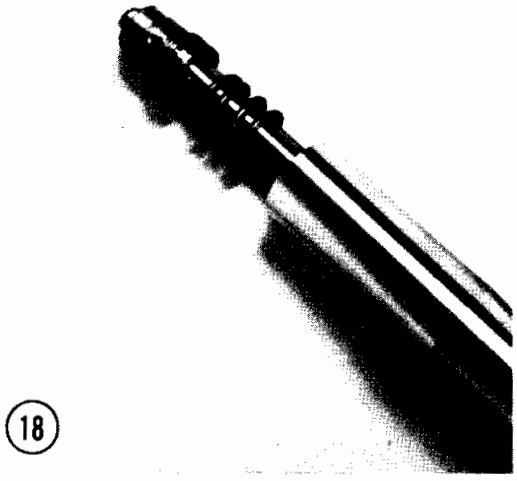
1. Thoroughly wash all the parts in clean solvent and blow them dry with compressed air.



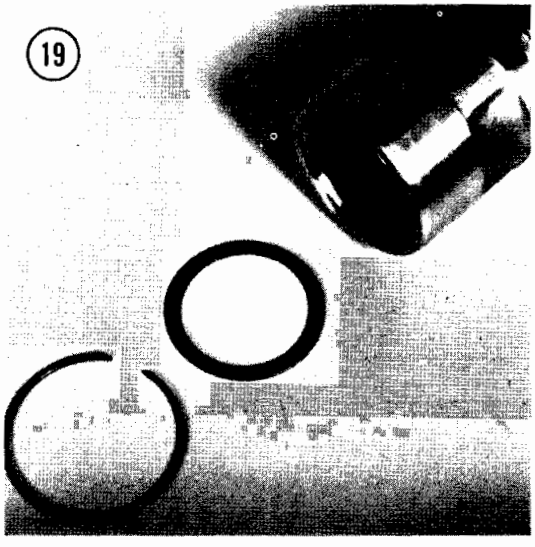
16



17



18



19

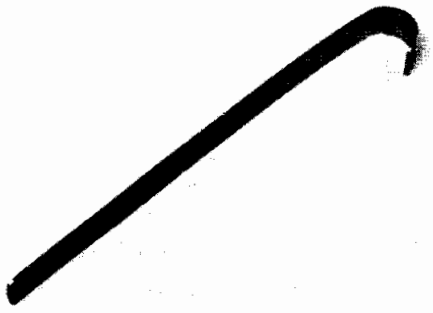
2. Check the sliding surface of the upper fork tubes. If they are scuffed and worn, they should be replaced.

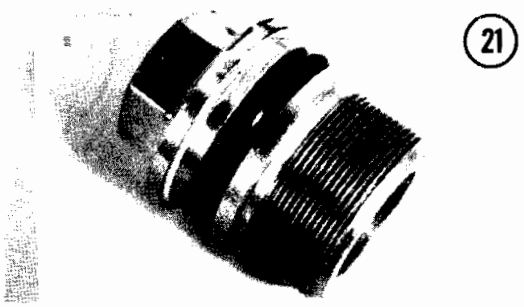
3. Inspect all of the sliding parts for scoring, galling, and wear and replace any that are less than perfect.

4. Roll the fork tubes and the damper rods on a smooth, flat surface and check for bending. Don't attempt to straighten any part that is bent; bending and straightening fatigues the part and it will be prone to failure under heavy loading.

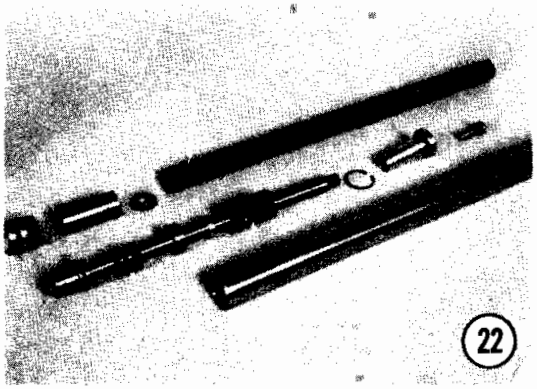
5. Inspect the O-rings on the top caps (**Figure 21**). If they are damaged or have hardened to the point that they will no longer seal correctly, replace them.

20

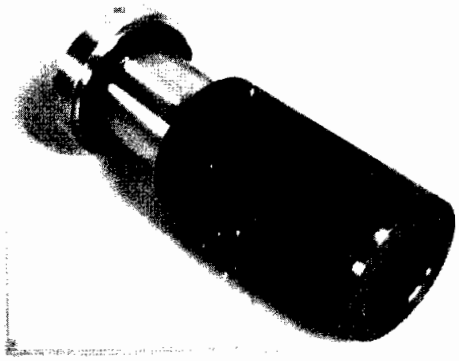




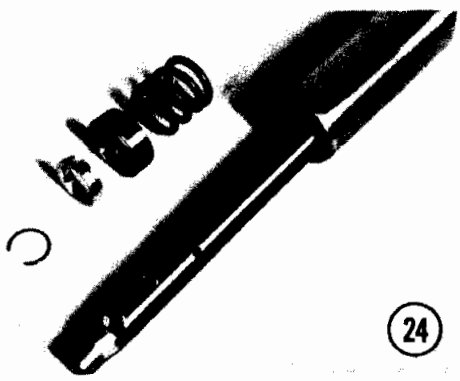
21



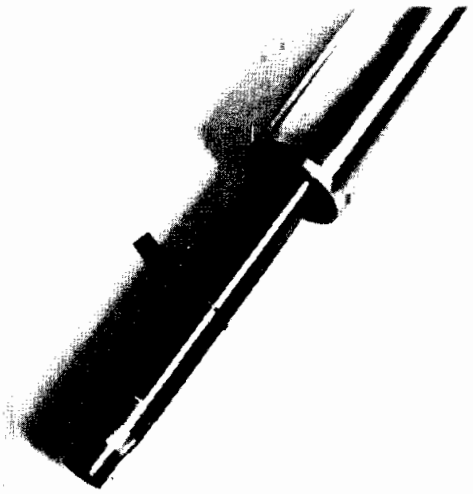
22



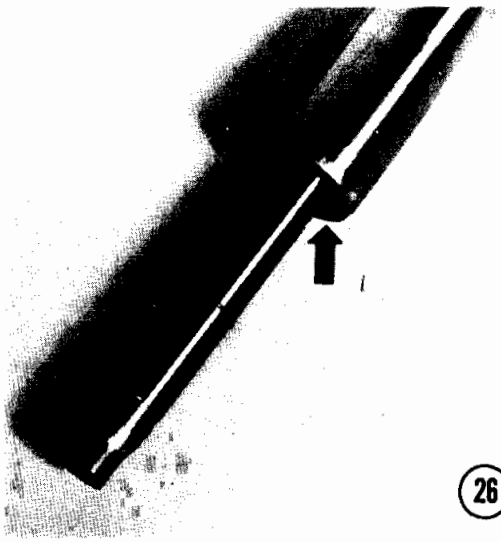
23



24



25



26

8

Assembly

1. Assembly is the reverse of disassembly. **Figure 22** shows the relationship of the components.

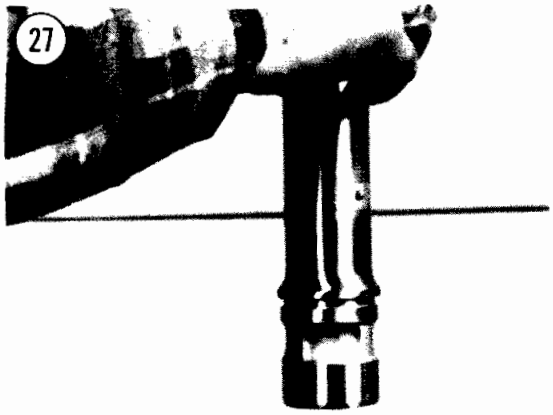
2. Assemble the cone and sleeve portion of the valve with the flanged end of the sleeve up **(Figure 23)**.

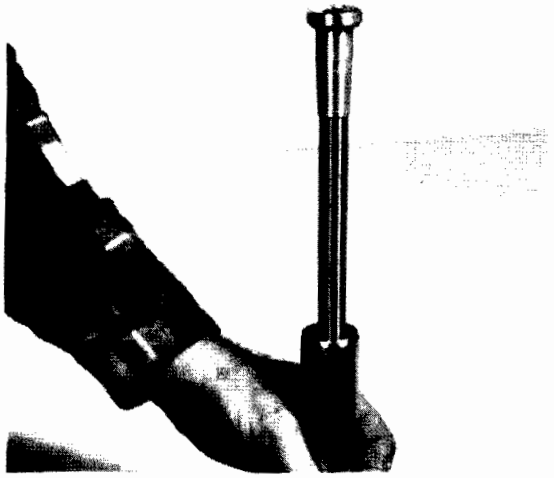
3. After assembling the rebound spring and valve on the damper rod **(Figure 24)**, install the small clip on the damper rod **(Figure 25)** and make sure it is correctly seated. Install the valve sleeve in the tube and lock it in place with a circlip **(Figure 26)**.

4. Press a new seal into the top of each slider, with the open lip of the seal facing down. Install the lock ring and make sure it is seated in its groove.

5. Install the main spring in the fork leg and screw in the top cap to extend the damper. Invert the tube and slide the slider over the damper (**Figure 27**). Line up the hole in the bottom of the slider with the hole in the end of the damper and screw in the Allen bolt. Remove the cap and spring from the fork tube, lock the top of the damper with the special holder (**Figure 28**) and tighten the Allen bolt.

6. Install the forks and front wheel as described above. Refer to Chapter Three and fill the fork legs with the correct amount of damping oil.





SEAL REPLACEMENT

The forks need not be removed and disassembled to replace the seals.

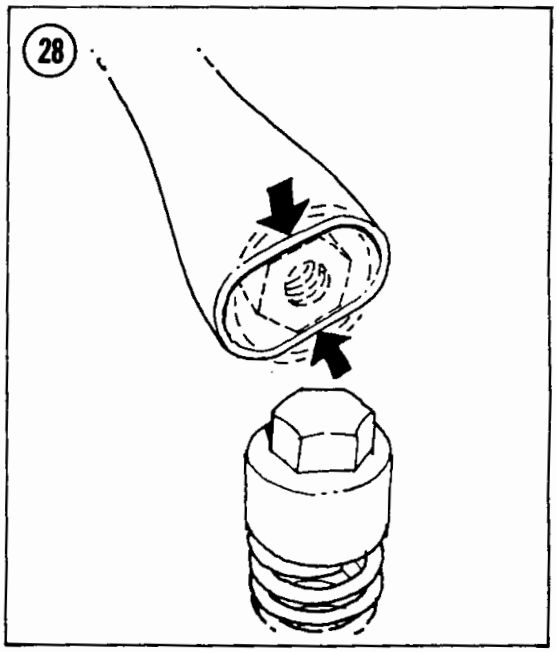
1. Remove the front wheel as described earlier. Remove the drain plugs from the fork legs and allow them to drain. Unscrew the Allen bolt in the bottom of the fork leg, disconnect the dust boot, and slide the leg down off the tube.

2. Remove the lock ring from the top of the slider (leg) (**Figure 19**), and carefully pry out the seal. Press in a new seal, using a socket as a drift. Make sure the seal is square with the bore before driving it in. The open lip of the seal must face down. Install the clip. Install the slider on the fork tube and screw in and tighten the Allen bolt in the bottom.

> NOTE: *If spring pressure is insufficient to prevent the damper from turning, refer to* ***Front Forks — Assembly*** *and hold the damper with the tool shown in* ***Figure 28.***

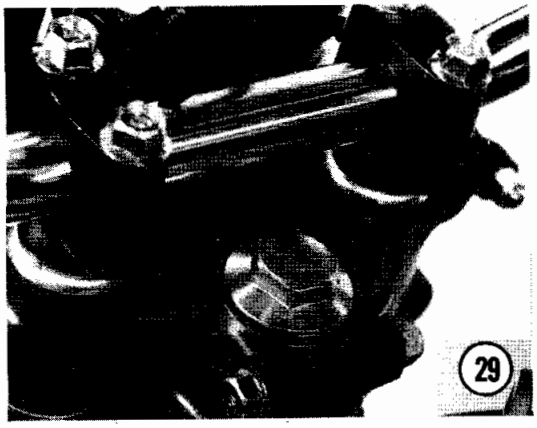
3. Refer to Chapter Three, *Fork Oil Changing* and fill the forks with damping oil.

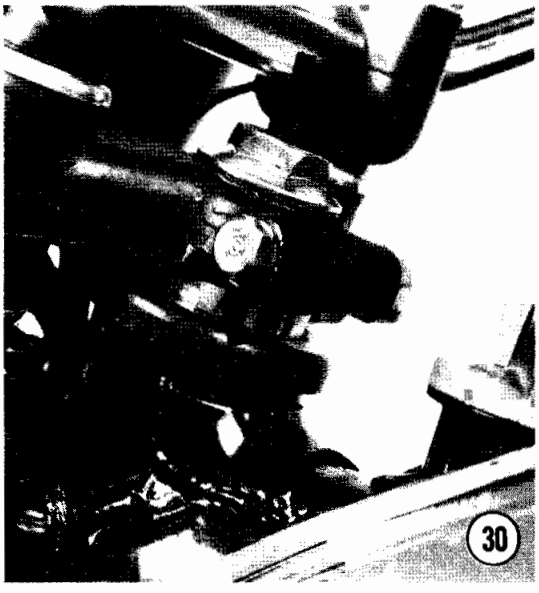
4. Install the wheel as described earlier. Refer to Chapter Three, *Front Brake Adjustment*, and adjust the brake.

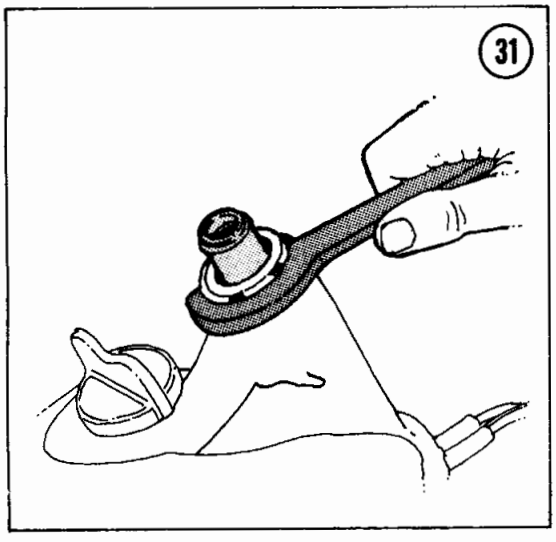


STEERING

The steering should be checked every 4,000 miles, or when the steering feels imprecise,







stiff, or when roughness is apparent when the front wheel is turned from side to side.

Disassembly

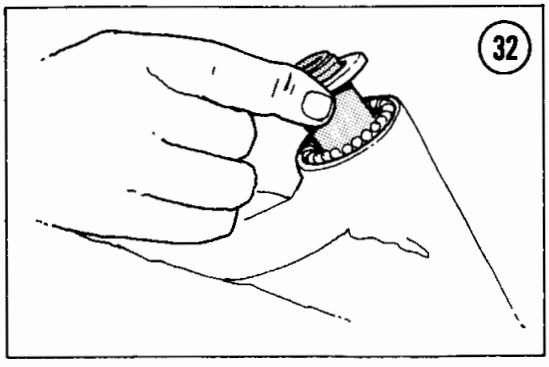
1. Block up the front of the motorcycle so the wheel is off the ground. Remove the wheel and the fork tubes as described earlier.

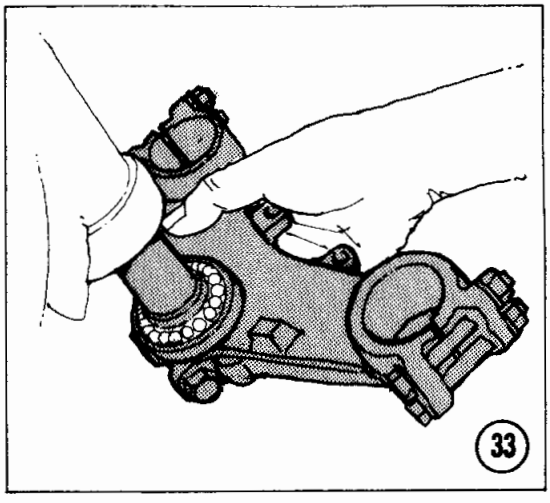
2. Unscrew the bolts from the handlebar mounts (**Figure 29**). Wrap the handlebars in shop rags and hold them in place with masking tape. Tape shop rags over the fuel tank to protect its finish and lay the handlebars on the tank.

3. Remove the stem bolt and loosen the pinch bolt (**Figure 30**). Remove the top clamp.

4. Hold the bottom clamp in place in the steering head and unscrew the ring nut (**Figure 31**). Remove the top bearing cover and the balls from the top race (**Figure 32**).

5. Pull the bottom clamp and stem down and out of the steering head (**Figure 33**).





Inspection

1. Thoroughly clean the races, balls, stem, and steering head with solvent.

2. Examine the balls for pits, flat spots, and rust. If just one ball is defective, replace all balls and the races with new pieces.

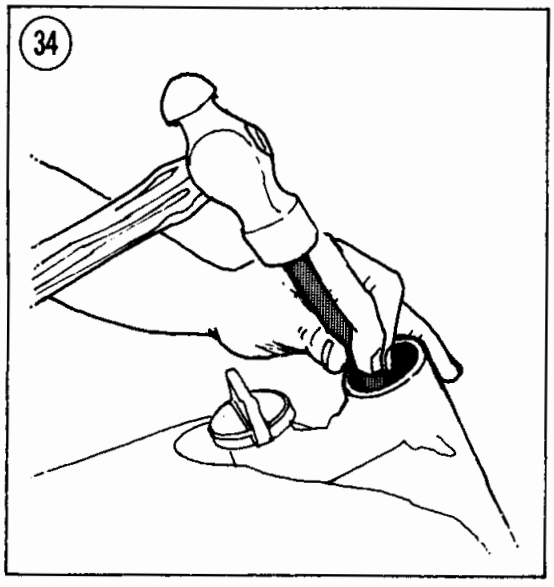
3. Inspect the races for wear, galling, and rust and replace both races and all balls if one race is less than perfect. To remove the races from the steering head, tap them out with a long drift applied from the opposite end of the head (**Figure 34**). Remove the bottom race from the stem by prying it up progressively with 2 screwdrivers. Tap new races into place evenly so they won't bind (**Figure 35**).

Assembly

1. Grease all the races with waterproof grease. Set the balls into the upper race and apply grease to the top of them. There should be 22 balls. Set the top race in place over the balls.

2. Install 19 balls on the lower race on the stem and coat them with grease.

3. Carefully slide the stem up into the steering head, taking care not to dislodge any balls or the top bearing upper race. Set the bearing cover in place and screw on the ring nut. Tighten the ring nut until there is no play in the steering head but the bottom clamp will turn freely from lock to lock.



4. Reverse the disassembly steps and complete assembly of the front end. Refer to *Steering Head Adjustment*, below, and adjust the steering head.

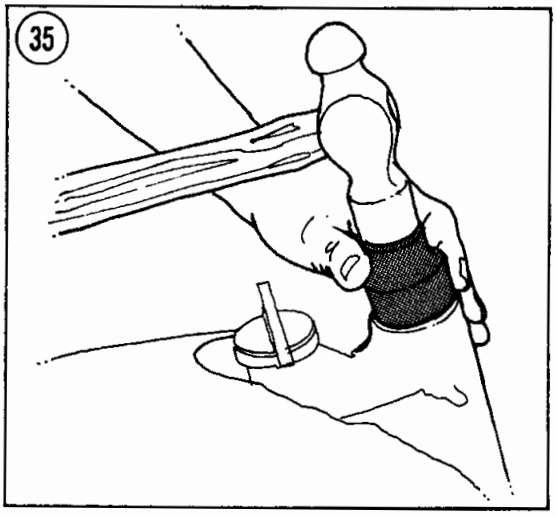
Steering Head Adjustment

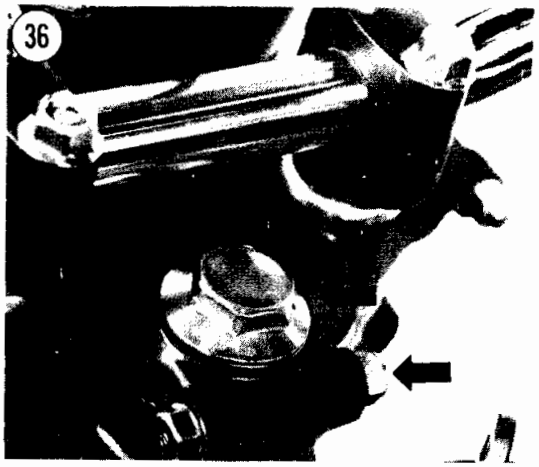
1. Block up the front of the motorcycle so the wheel is clear of the ground and free to turn from side to side.

2. Loosen the stem bolt and the pinch bolt (**Figure 36**).

3. Tighten the ring nut (**Figure 37**) until there is no movement in the steering when the fork sliders are grasped at the axle and pushed back and forth. The front end should turn freely from side to side, under its own weight.

4. Tighten the stem bolt and the pinch bolt.





BRAKE

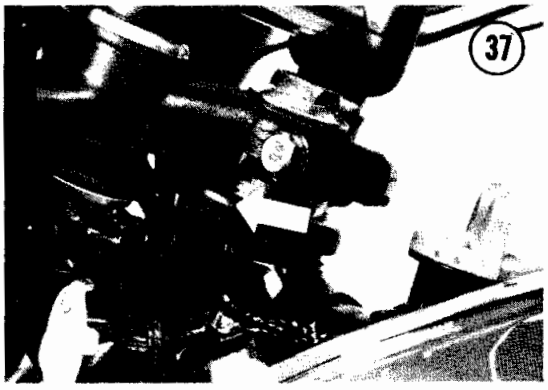
The front brake on XT and TT models is a single-leading shoe drum type.

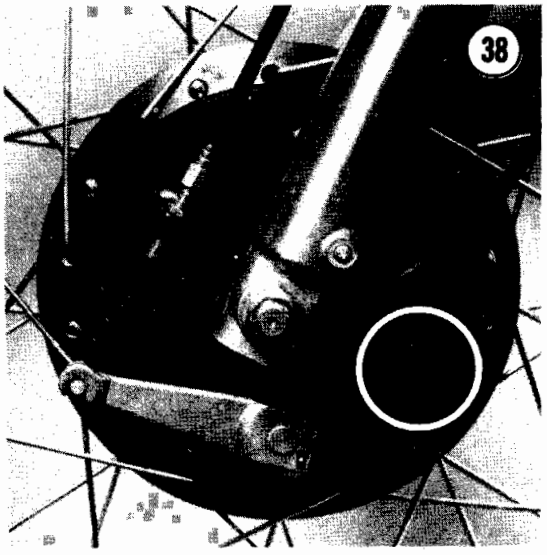
Removal

Remove the wheel as described under *Front Wheel — Removal/Installation*. Remove the backing plate and brake assembly as a unit.

Inspection

1. XT models have an inspection port in the backing plate (**Figure 38**). To check the serviceability of the lining, remove the blanking plug and measure the lining thickness with a caliper. On TT models, remove the front wheel as described earlier and measure the thickness of the lining. If it is less than 2mm (0.08 in.) thick, replace it.





NOTE: *For the following inspection steps, the wheel on XT models must be removed.*

2. Check the brake linings for glazing, gouges, and scores, and for oil soaking. Glazing can be removed with a stiff wire brush, but scores and oil soaking require the lining to be replaced.

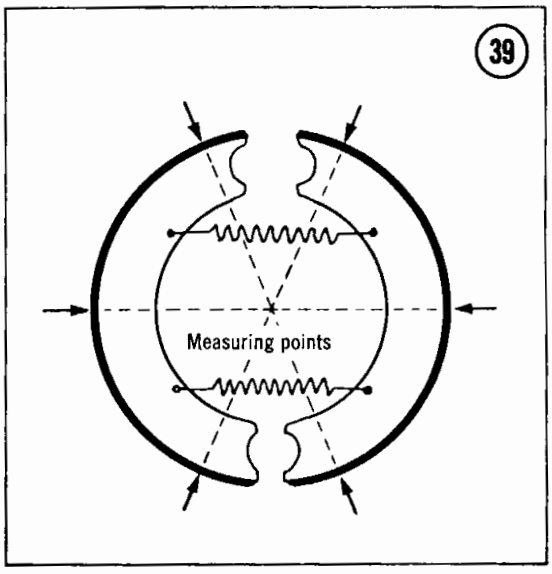
3. If the lining appears to be satisfactory, measure it as shown in **Figure 39**. If the diameter is less than 126mm (4.96 in.) for TT models, or 156mm (6.14 in.) for XT models, replace the brake shoes and linings as a set.

NOTE: *If the brake shoes are replaced, they must be arced to the contour of the drum. In addition, the drum should be checked and trued if necessary (see below).*

4. Inspect the drum for scores. If the scores are deep enough to snag a fingernail, the drum should be turned and new linings and shoes arced to the contour of the drum. This is a job for your dealer. Minor scores can be removed with emery cloth. The drum should then be cleaned thoroughly to remove all traces of abrasive.

WARNING

The inside diameter of the drum, after being turned, should not exceed 132mm (5.2 in.) for TT models, or 162mm (6.4 in.) for XT models. If the diameter is



greater, braking effectiveness may be severely reduced.

Also check the drum for oil and grease and remove them, if present, with lacquer thinner or brake component cleaner.

5. Check the brake cam for wear and galling and replace it if it is deeply scored or galled.

Brake Shoe Replacement

1. Remove the wheel as described earlier in this chapter. Refer to *Inspection*, and if the brake shoes and linings must be replaced, lift up on the shoes together (**Figure 40**) to disconnect them from the pivot and cam.

2. To install the shoes, assemble them with their springs, set them in place beneath the pivot and cam washers, and swing them down into place against the backing plate.

Installation

1. Grease the brake cam with high-temperature grease. Don't overdo it; excess grease could find its way onto the linings.

2. Recheck the inside of the drum and the surface of the linings and clean off any foreign matter. Set the brake assembly into the drum and install wheel as described earlier in this chapter (*Front Wheel — Removal/Installation*).

3. Adjust the brake as described in Chapter Three, *Front Brake Adjustment*.

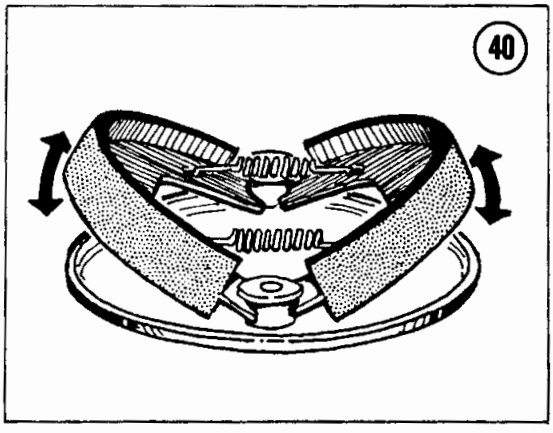
Cable Replacement

When the cable has stretched to the extent that it can no longer be adjusted, it should be replaced. Loosen both of the adjusters, at the hand control and on the brake backing plate. Disconnect the cable ends. Connect the ends of a new cable. Adjust the cable free play as described in Chapter Three, *Front Brake Adjustment*.

NOTE: *The hand control adjuster should be turned out several turns before the cable is adjusted on the backing plate; this permits minor adjustment while underway.*

BRAKE ADJUSTMENT

Brake adjustment is covered in Chapter Three, *Front Brake Adjustment*.



NOTE: If you own a 1978 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER NINE

REAR SUSPENSION

This chapter includes repair and replacement procedures for the rear wheel and rear suspension. Seal and bearing identification information appears in **Table 1**.

REAR WHEEL

Removal/Installation

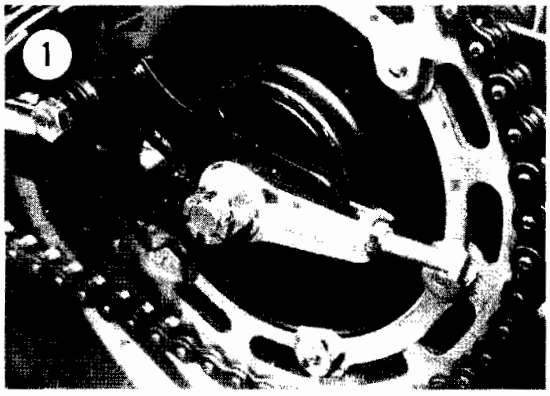
1. Block up the motorcycle so that the rear wheel is clear of the ground.
2. Remove the cotter key or lock pin from the left end of the axle. Unscrew the axle nut **(Figure 1)**.
3. Disconnect the brake anchor from the backing plate and unscrew the brake adjuster wing nut **(Figure 2)**.
4. Separate the rear chain at the master link and remove the chain.
5. Pull out the axle and remove the wheel from the motorcycle.
6. Reverse the above to install the wheel. Adjust the chain tension as described later in this chapter.

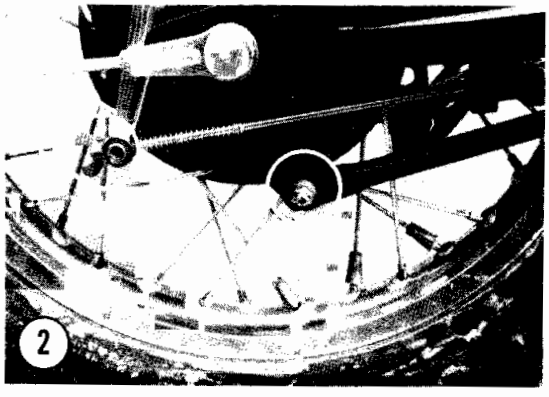
Disassembly

1. On XT models, remove the grease cover from the sprocket carrier **(Figure 3)**. Remove

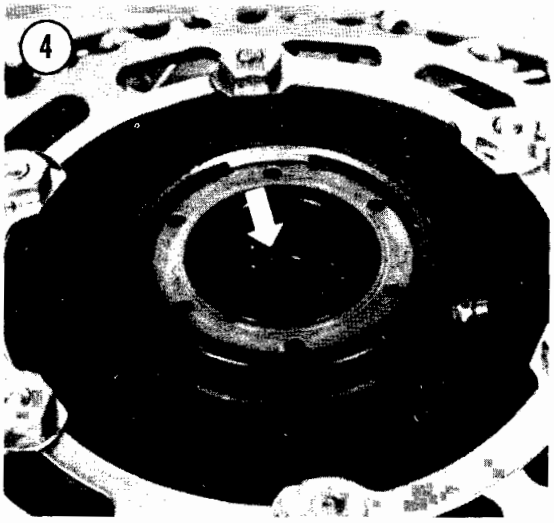
TABLE 1 REAR WHEEL AND SWING ARM SEAL AND BEARING IDENTIFICATION

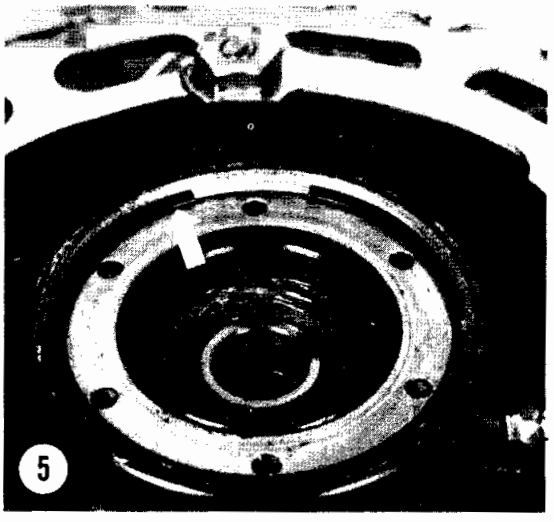
Item	ID Number or Size
Rear wheel bearing (left)	
Inside (all models)	6203
Outside (TT models)	6203Z
(XT models)	6203RS
Rear wheel bearing (right)	
Inside (TT models)	6203
Inside (XT models)	6203RS (one bearing only on right)
Outside (TT models)	6203Z
Swing arm bearing — inner (2)	LR 22 x 29 x 20mm (needle roller)
Swing arm bearing — outer (2)	LR 22 x 40.15 x 6mm (needle thrust)
Swing arm seal (2)	LR OSO-35-41.5-8

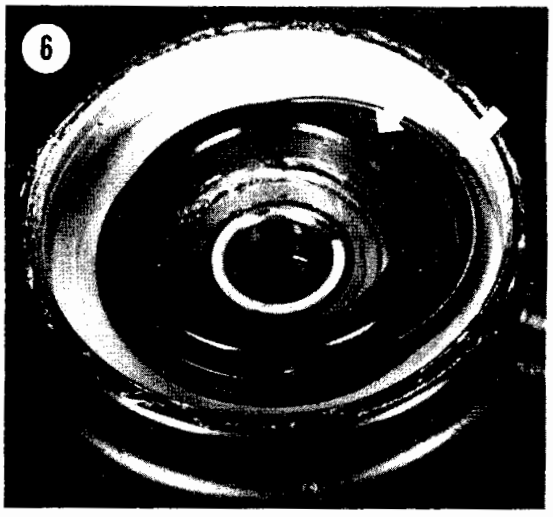






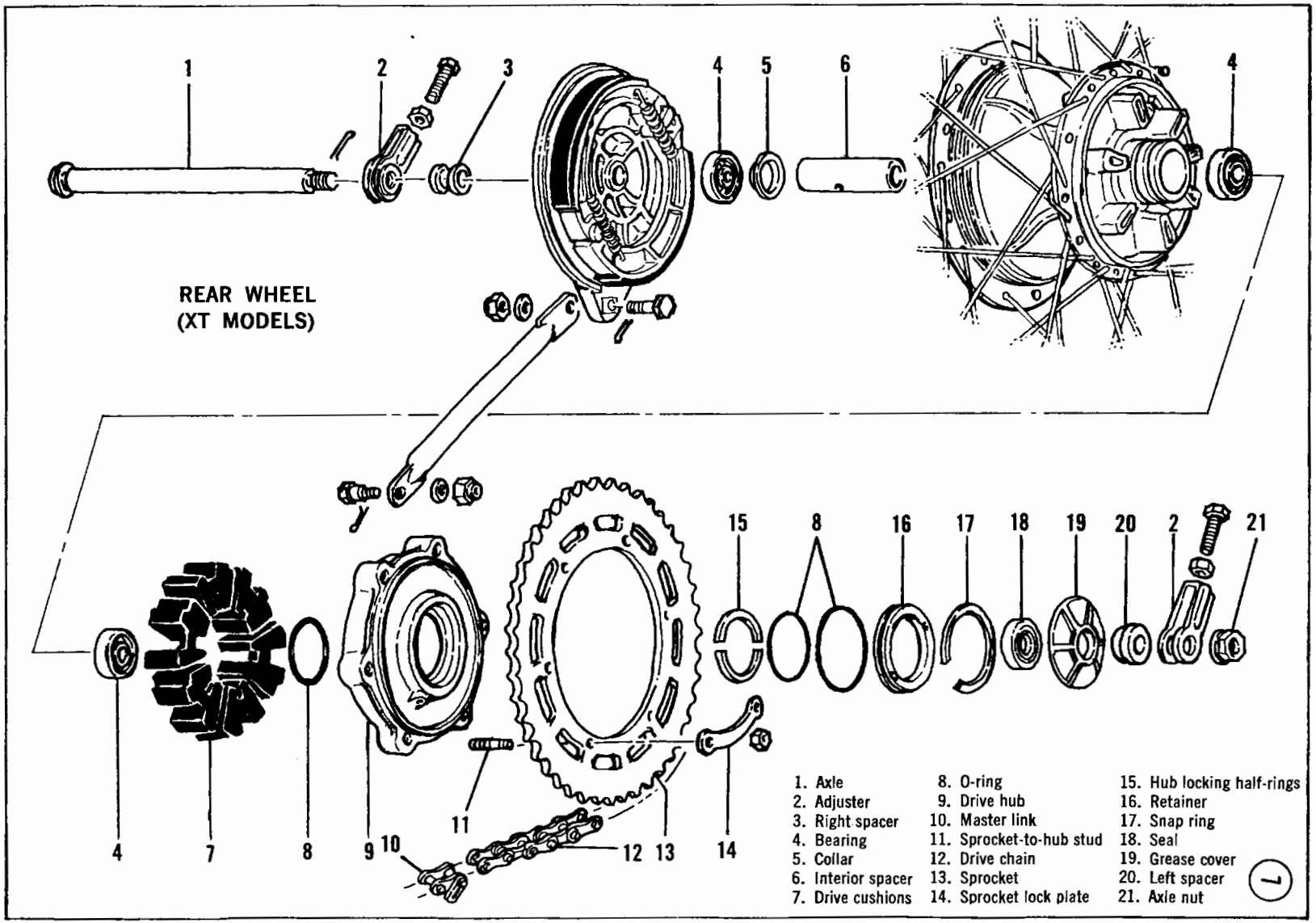






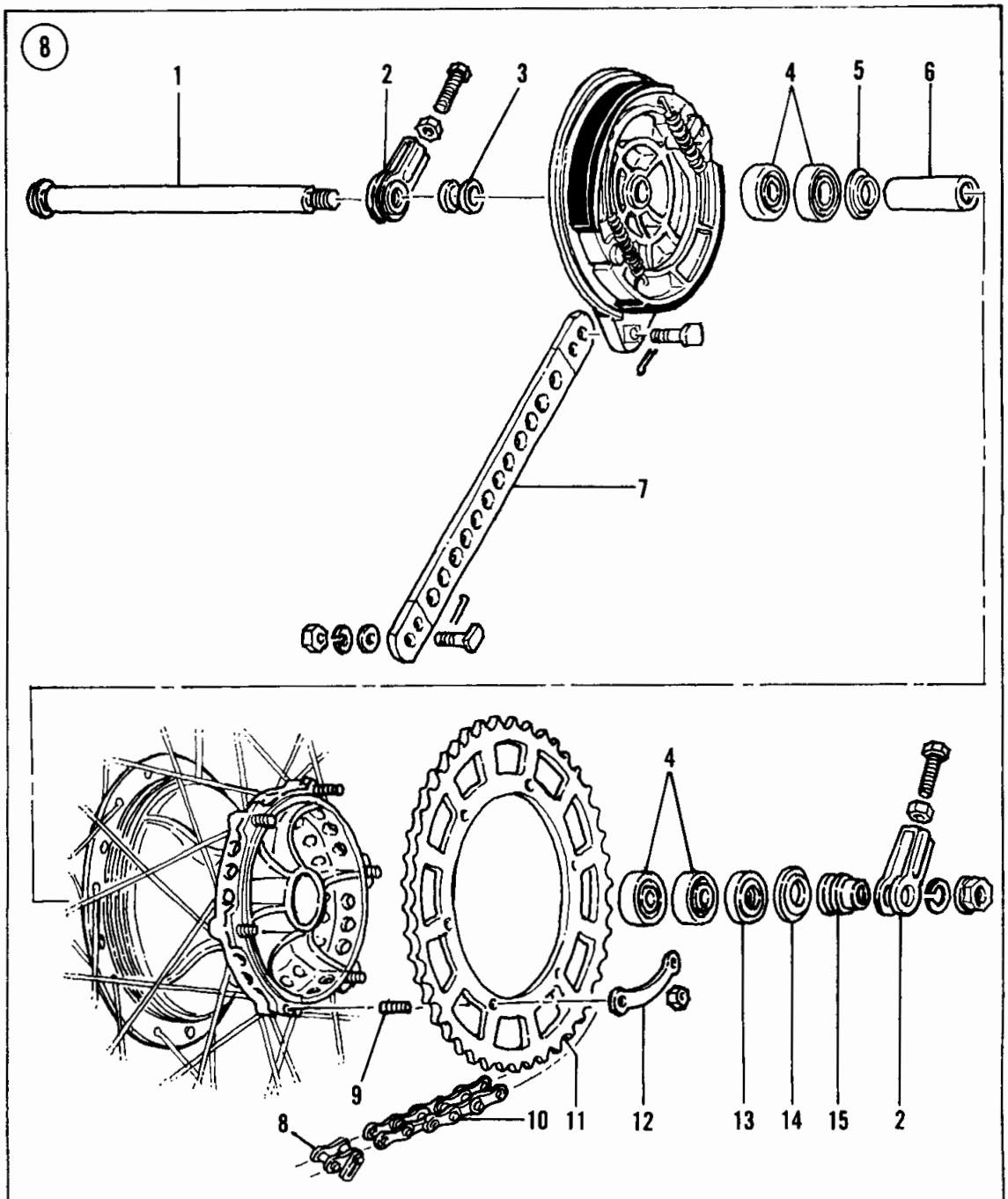
the seal (**Figure 4**). Remove the snap ring (**Figure 5**) and retainer. Remove the half rings that lock the carrier into the hub (**Figure 6**) and remove the carrier.

2. On all models, insert a soft drift into the hub from the left side, displace the floating spacer, and drift out the right side bearing by tapping around the outer race. The two wheel types are shown in **Figure 7** (XT models) and **Figure 8** (TT models).



1. Axle
2. Adjuster
3. Right spacer
4. Bearing
5. Collar
6. Interior spacer
7. Drive cushions
8. O-ring
9. Drive hub
10. Master link
11. Sprocket-to-hub stud
12. Drive chain
13. Sprocket
14. Sprocket lock plate
15. Hub locking half-rings
16. Retainer
17. Snap ring
18. Seal
19. Grease cover
20. Left spacer
21. Axle nut

(7)



REAR WHEEL
(TT MODELS)

1. Axle
2. Adjuster
3. Right spacer
4. Bearing
5. Collar
6. Interior spacer
7. Brake anchor arm
8. Master link
9. Sprocket-to-hub stud
10. Drive chain
11. Sprocket
12. Lock plate
13. Seal
14. Collar
15. Left spacer

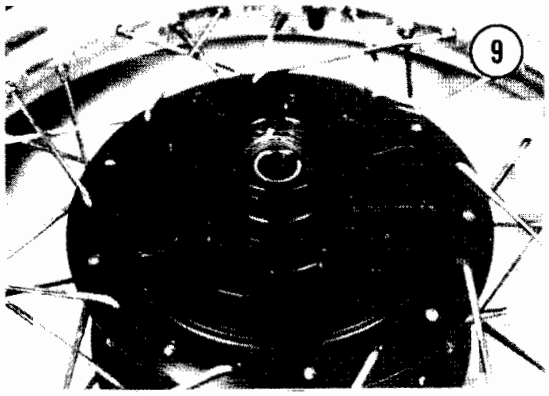
3. Drive out the opposite bearing in the same manner.

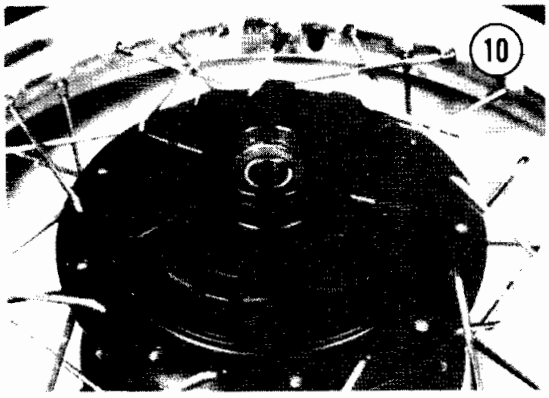
Inspection

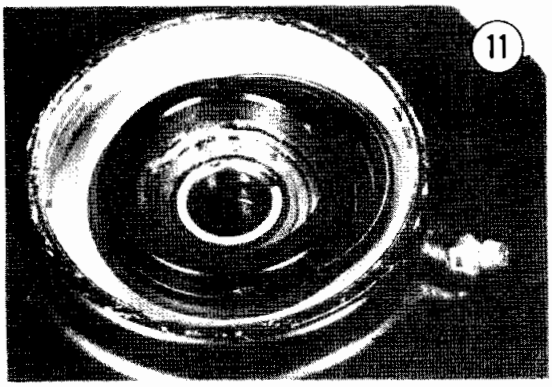
1. Clean all the parts except sealed bearings in fresh solvent and blow them dry with compressed air.

WARNING

Do not spin the bearings with the air jet. It is capable of rotating them at speeds far in excess of those for which they were designed, and they may very likely break apart and cause serious injury or damage to anyone or thing they strike.







2. Rotate the bearings by hand and check for play, noise, and roughness. If they do not spin smoothly and quietly, replace them.

3. Check the seals for wear and damage and replace them if they are less than perfect.

4. For XT models, check the O-rings in the carrier for wear and damage and replace them if necessary. Also inspect the rubber blocks in the cushion drive for damage and wear, although it is unlikely that they will need to be replaced for many thousands of miles.

Assembly

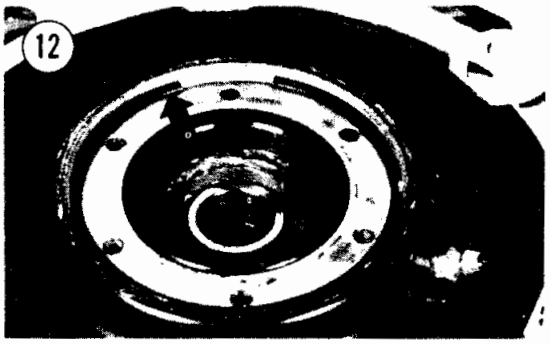
1. Thoroughly grease the bearings with waterproof grease. Fill the open face of each seal with grease. Grease the inside of the hub and the inside and outside of the spacers.

2. Line up the unsealed left-side bearing with the bore in the wheel and tap it in evenly, using a socket that will bear on the outer race as a drift. Do the same with the sealed outer bearing. On TT models, install the left-side seal.

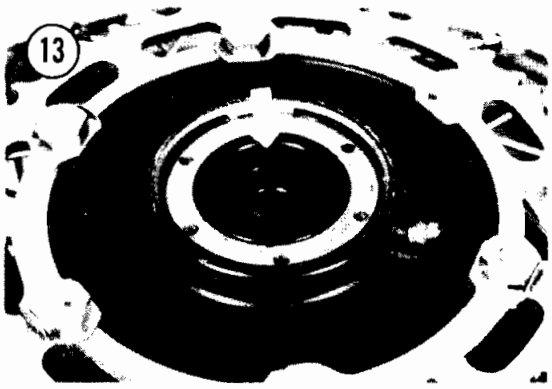
3. On all models, install the interior spacer and flange and right-side bearing on the axle, insert the axle into the right side of the hub and gently tap the bearing part way into the hub; this aligns the spacer. *Do not drive it all the way in with the axle; it bears on the inner race and excessive force could damage the bearing.* Now, remove the axle and finish driving the bearing in with a socket that bears only on the outer race of the bearing.

4. On XT models, lay the wheel down with the drive side up (**Figure 9**). Install the cushion drive blocks (**Figure 10**). Set the carrier in place and lock it to the hub with the 2 half-rings (**Figure 11**). Install the retainer and snap ring (**Figure 12**). Install the seal (**Figure 13**) and the grease cover and spacer (**Figure 14**).

5. On all models, install the brake assembly in the hub. Install the wheel as described earlier. Adjust the brake as described in Chapter Three — *Rear Brake Adjustment*. On XT models, grease the rear wheel with a pump-type grease gun (**Figure 15**).









Wheel Balancing

An unbalanced wheel can be dangerous. Depending on the degree of unbalance and speed, the rider may experience anything from mild vibration to violent shimmy. In severe cases, the rider can lose control.

Wheel balancing is described in detail in Chapter Eight, *Wheel Balancing*.

Spoke Adjustment and Rim Runout

Spokes loosen with use and should be checked periodically as described in Chapter Eight, *Spoke Adjustment*.

Spoke Replacement

Individual spokes can be replaced with the wheel assembled and installed in the motorcycle. See *Spoke Replacement* in Chapter Eight.

SHOCK ABSORBERS

The shock absorbers are spring/shock absorber units. The shock absorbers contain nitrogen gas under high pressure.

WARNING

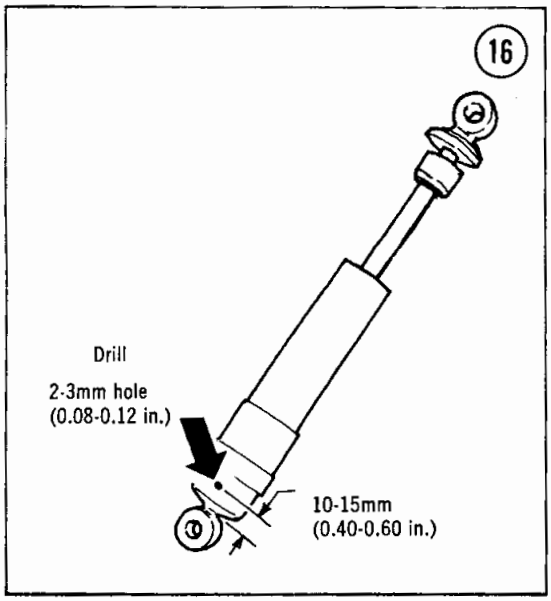
*The nitrogen-filled shock absorbers are potentially dangerous if subjected to a high-heat source, or if they are punctured. They are non-rebuildable, and before they are discarded, the gas pressure must be released by drilling a small hole about ½ in. from the bottom of the cylinder (**Figure 16**). When venting the shocks, wear eye protection to prevent eye injury.*

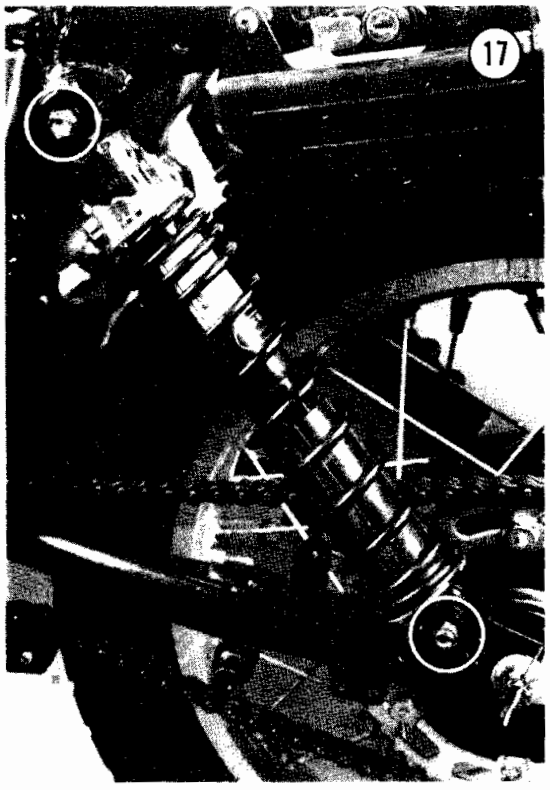
Removal/Installation

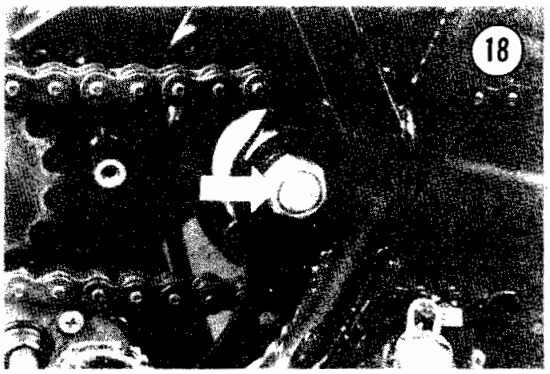
1. Block up the rear of the motorcycle so the rear wheel is off the ground.
2. Unscrew the top and bottom mounting bolts and remove the shock absorber (**Figure 17**).
3. Reverse the above to install the shock absorbers.

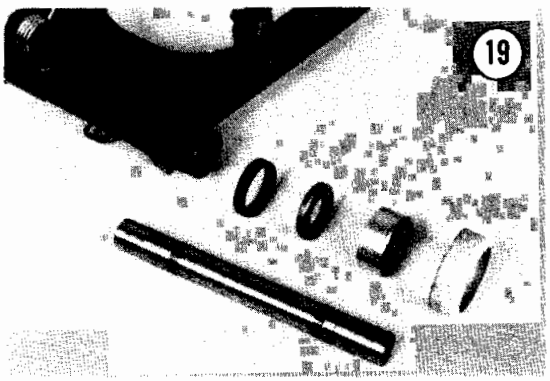
SWING ARM

The swing arm pivot should be checked and lubricated every 4,000 miles, or if poor handling, such as throttle steering, indicates that the pivot bearings may be worn.







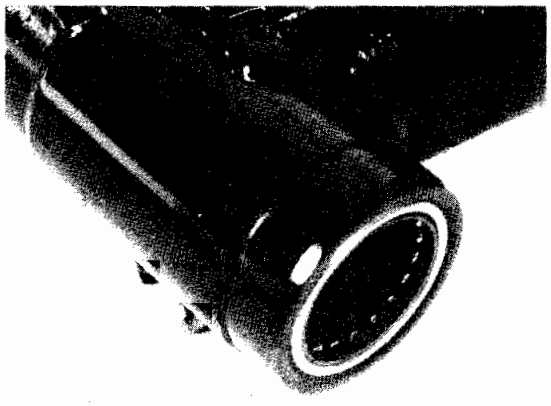


Inspection

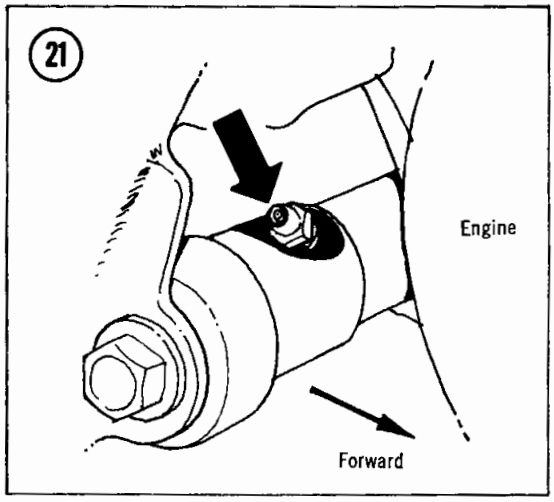
Remove the rear wheel and the shocks as described above. Grab the ends of the swing arm and attempt to move them from side to side. If play is present, disassemble the arm and check the bearings and replace them if necessary.

Removal/Installation

1. Remove the rear wheel and the shocks as described above.
2. Unscrew the nut from the left end of the pivot bolt (**Figure 18**). Tap the bolt out and remove it from the pivot.
3. Disassemble the swing arm (**Figure 19**).
4. Clean the parts thoroughly in solvent and blow them dry with compressed air. Check the pivot tube for wear and damage and replace it if necessary. Rotate the bearings (**Figure 20**) by hand and check for roughness. If they do not turn smoothly, replace by driving them out of the swing arm with a long drift inserted through the opposite end of the tube. Line up the new bearings squarely before tapping them in.
5. Grease the bearings, pivot tube, and the insides of the seals with waterproof grease.
6. Reverse the removal steps to assemble and install the swing arm. Then tighten the pivot bolt to 6.0-9.5 mkg (43-69 ft.-lb.).



20



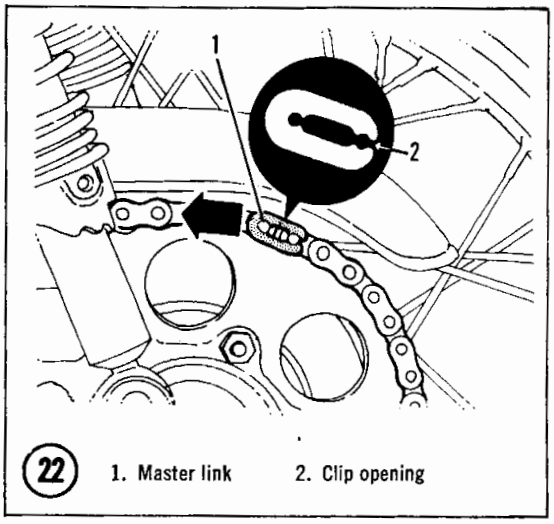
7. Install the shocks and rear wheel as described earlier. Grease the swing arm with a pump-type grease gun. Inject grease (**Figure 21**) until it begins to ooze past the seals.

DRIVE CHAIN

Cleaning and Lubrication

The drive chain should be removed, cleaned, and lubricated every 2,000 miles of normal street operation. In the meantime, the chain should be periodically lubricated with a good quality chain lube, and the manufacturer's instructions should be followed. For severe use (off-road, in mud, water, deep sand, etc.), chain service intervals should be 100-200 miles to ensure maximum chain life.

1. Remove the chain from the motorcycle and clean it thoroughly with solvent. Use a stiff brush to remove dirt from the side plates and rollers.
2. Hang up the chain by one end and dry it with compressed air. When the chain is dry, hold it in the middle and check for kinks. Minor kinks may work out with lubrication, but unless every link moves freely, replace the chain.
3. After cleaning and inspecting the chain, lubricate it immediately, either with a commercial chain lube, or with 30W engine oil. If oil is used, submerge the chain in an oil-filled container and allow it to sit for several minutes to allow the oil to penetrate the pins and rollers. Then, hang up the chain and wipe excess oil off the outside with a clean shop rag.

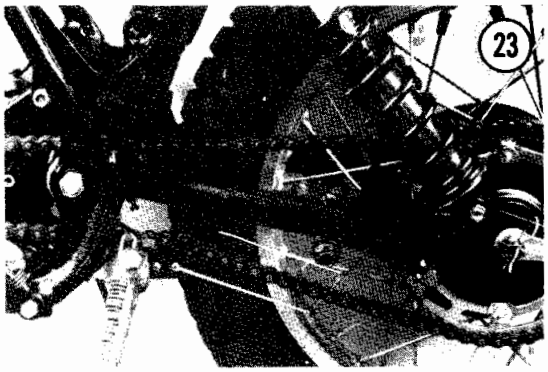


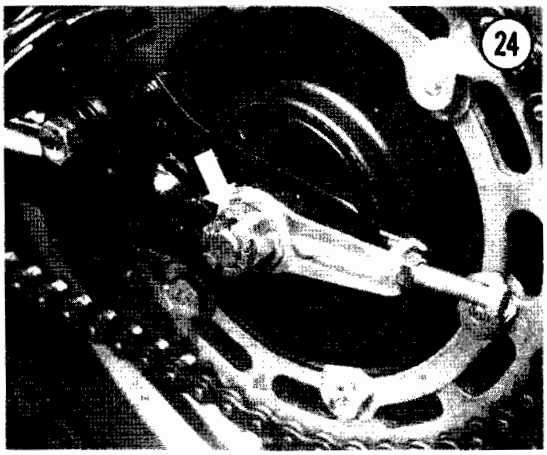
22 1. Master link 2. Clip opening

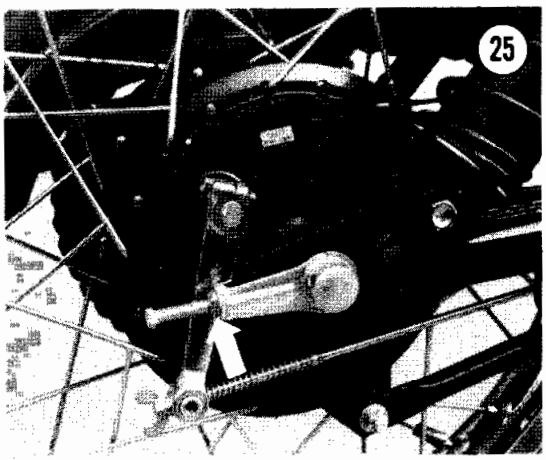
4. Install the chain. Install the lock clip on the master link with the closed end of the clip facing in the direction of chain travel (**Figure 22**) to prevent chain acceleration from throwing the clip off.
5. Adjust the chain as described below.

Adjustment

1. Have someone hold the motorcycle upright, with it sitting on both wheels.
2. Check the up and down movement of the chain (**Figure 23**). It should be 30-40mm (1¼-1¾ in.). If it is more or less, adjust it by

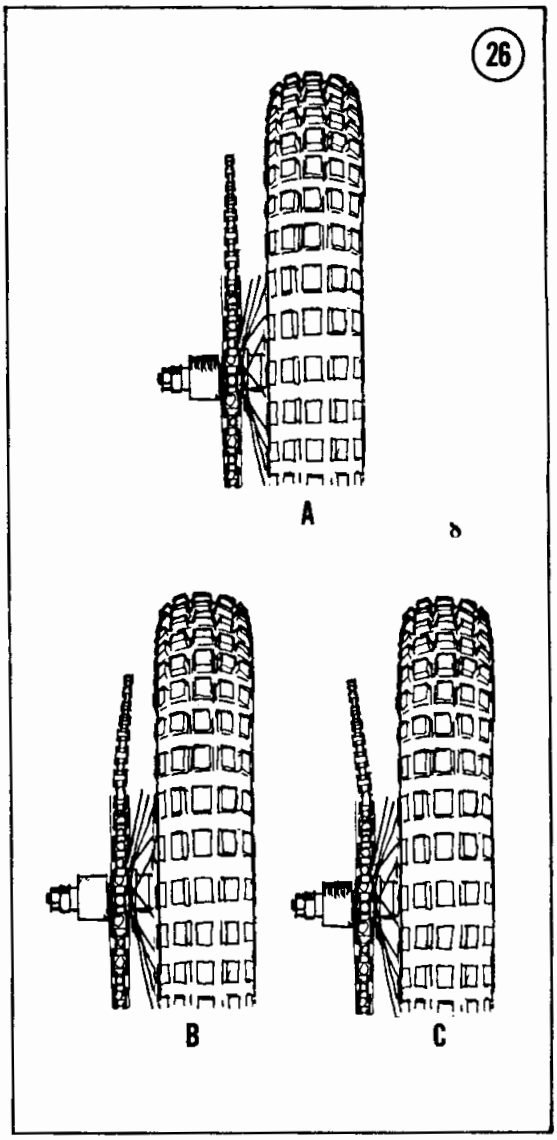






first loosening the axle nut (**Figure 24**). On XT models, first remove the lock clip or cotter key.

3. Loosen the adjuster locknuts (**Figure 25**) and turn the adjusters in or out equally until the movement of the chain is correct. Rotate the wheel as you check, and adjust the chain at its tightest point.



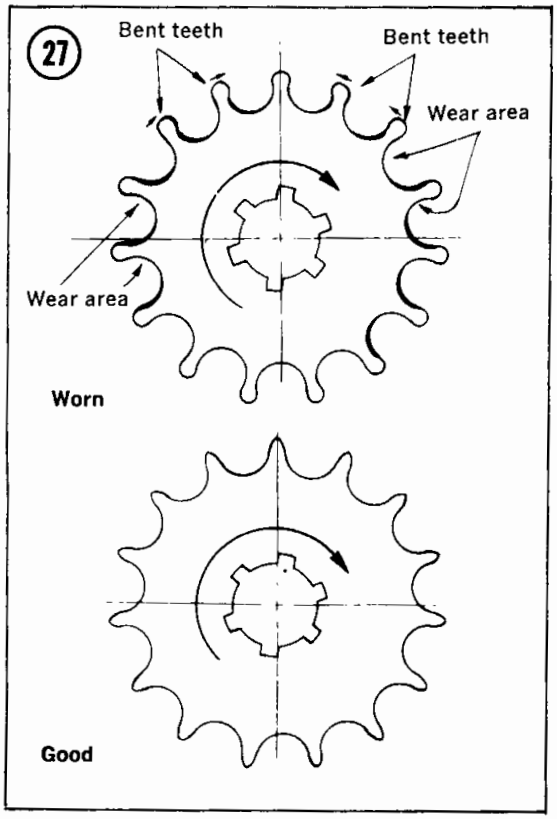
4. Sight along the drive sprocket from the rear to check the alignment of the rear wheel. See **Figure 26**. If the alignment is correct (A), tighten the locknuts. If the wheel is cocked to the left (B), loosen the left adjuster and tighten the right. If the wheel is cocked to the right (C), loosen the right adjuster and tighten the left. When the alignment and chain movement are correct, tighten the locknuts and the axle nut, and install the clip or cotter key (XT models).

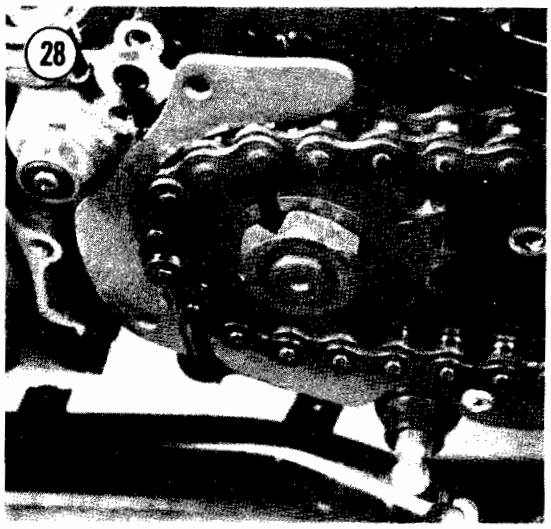
5. Refer to *Rear Brake Adjustment* in Chapter Three and adjust the free play of the brake pedal after the chain movement has been adjusted.

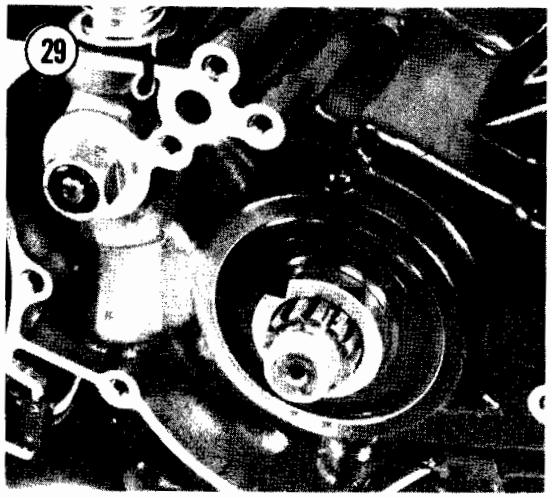
DRIVE SPROCKETS

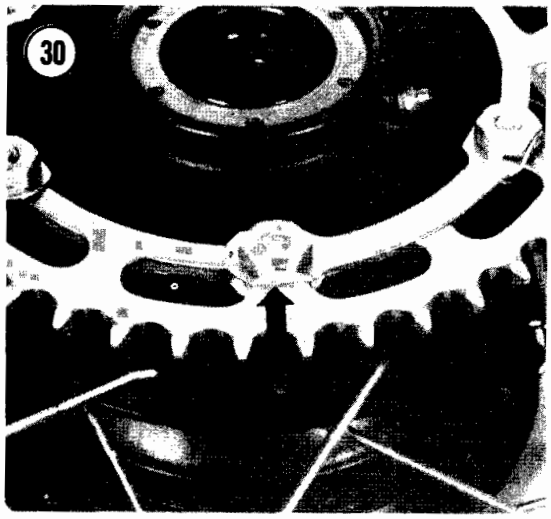
Check both the countershaft and wheel sprockets for undercutting of the teeth (**Figure 27**). If wear is evident, replace the sprockets.

1. Straighten the lock tab on the countershaft sprocket nut and unscrew the nut (**Figure 28**) while holding the rear wheel with the brake to prevent it from turning.
2. Remove the chain as described above. Remove the sprocket from the shaft. Note the spacer located behind it (**Figure 29**).
3. *Install* a new sprocket on the shaft, followed by the tab washer, and then the nut; run the nut down finger-tight.
4. Remove the rear wheel from the motorcycle as described earlier. Straighten the lock tab on each of the sprocket bolts (**Figure 30**), unscrew the bolts, and remove the sprocket.
5. Install a new sprocket and then tighten the nuts to 2.7-3.3 mkg (20-24 ft.-lb.). Bend a tab over against a flat on each nut to lock it in place. Install the wheel.









6. Install the chain as described earlier. Lock the rear wheel with the brake to prevent it from turning and tighten the countershaft sprocket nut to 4-8 mkg (30-58 ft.-lb.). Bend the tab washer over against a flat on the nut.

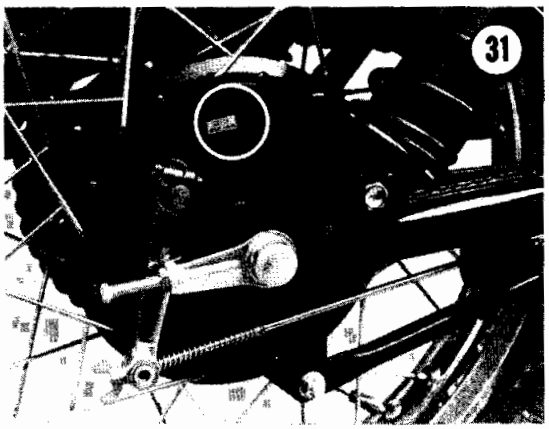
7. Adjust the chain as described earlier. Refer to Chapter Three, *Rear Brake Adjustment*, and adjust the brake.

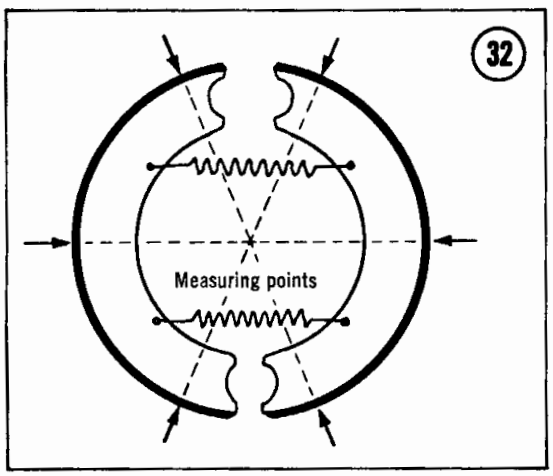
BRAKE

The rear brake on XT and TT models is a single-leading shoe drum type.

Removal

Remove the wheel as described under *Rear Wheel — Removal/Installation*. Remove the backing plate and brake assembly from the hub as a unit.





Inspection

1. XT models have an inspection port in the backing plate **(Figure 31)** for checking lining thickness. On TT models, the wheel must be removed to inspect the lining. Measure the lining with a caliper and replace it if it measures less than 2mm (0.08 in.) thick.

> NOTE: *For the following steps, the wheel on XT models should be removed if it has not been.*

2. Check the brake lining for glazing, gouges, and scores, and for oil soaking. Glazing can be removed with a stiff wire brush, but scores and oil soaking require lining to be replaced.

3. If the lining appears to be satisfactory, measure it as shown in **Figure 32**. If the diameter is less than 156mm (6.14 in.) for TT models, or 146mm (5.75 in.) for XT models, replace the brake shoes and linings as a set.

> NOTE: *If the brake shoes are replaced, they must be arced to the contour of the drum. In addition, the drum should be checked and trued if necessary (see below).*

4. Inspect the drum for scores. If the scores are deep enough to snag a fingernail, the drum should be turned and new linings and shoes arced to the contour of the drum. This is a job for your dealer. Minor scores can be removed with emery cloth. The drum should then be cleaned thoroughly to remove all traces of abrasive.

> WARNING
>
> *The inside diameter of the drum, after being turned, should not exceed 162mm (6.4 in.) for TT models, or 152mm (6.0 in.) for XT models. If the diameter is greater, braking effectiveness may be severely reduced.*

Also check the drum for oil and grease and remove them, if present, with lacquer thinner or brake component cleaner.

5. Check the brake cam for wear and galling and replace it if it is deeply scored or galled.

Brake Shoe Replacement

1. Remove the wheel as described earlier in this chapter. Refer to *Inspection*, and if the brake

shoes and linings must be replaced, lift up on the shoes together **(Figure 33)** to disconnect them from the pivot and cam.

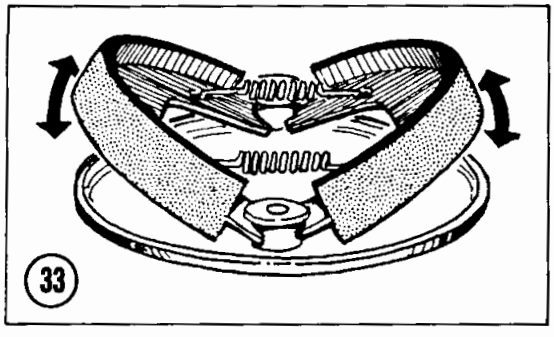
2. To install the shoes, assemble them with their springs, set them in place beneath the pivot and cam washers, and swing them down into place against the backing plate.

Installation

1. Grease the brake cam with high-temperature grease. Don't overdo it; excess grease could find its way onto the linings.

2. Recheck the inside of the drum and the surface of the linings and clean off any foreign matter. Set the brake assembly into the drum and install the wheel as described earlier in this chapter. See *Rear Wheel — Removal/Installation*.

3. Adjust the brake as described in Chapter Three, *Rear Brake Adjustment*.

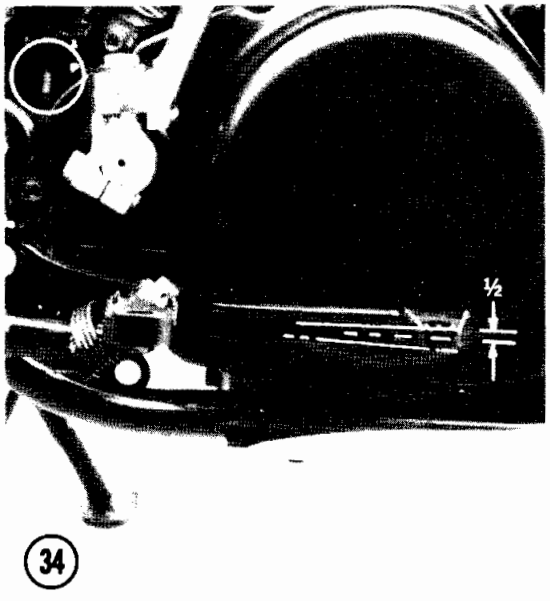


BRAKE LIGHT SWITCH XT MODELS

The rear brake on XT models is equipped with a brake light switch. The switch should be adjusted so the brake light will operate when the pedal has been moved ½ of its free play **(Figure 34)**.

BRAKE ADJUSTMENT

Brake adjustment is covered in Chapter Three, *Rear Brake Adjustment*.



SUPPLEMENT
1978 AND LATER SERVICE INFORMATION

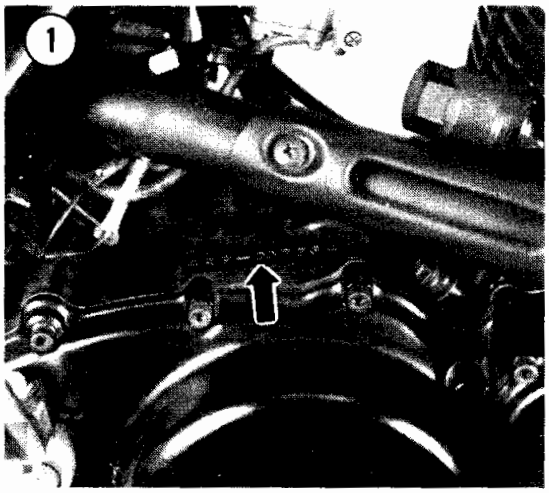
The following supplement provides additional information for servicing the 1978 and later XT500 and TT500 models. Other service procedures remain the same as described in the basic book, Chapters One through Ten.

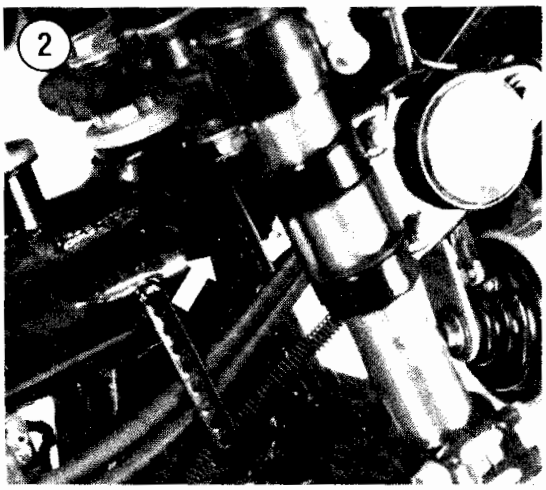
The chapter headings in this supplement correspond to those in the main portion of this book. If a chapter is not referenced in this supplement, there are no changes affecting that chapter.

If your bike is covered by this supplement, carefully read the supplement and then read the appropriate chapter in the basic book before beginning any work.

CHAPTER ONE

GENERAL INFORMATION





All motorcycles manufactured on or after January 1, 1978 with an engine displacement of 50 cc or larger designed for street use are to conform to certain emission control standards. If your motorcycle is emission controlled, it is important for you to follow all procedures specifically designated for your bike. If you do not follow the maintenance schedule in this book, if you do not perform a tune-up according to these procedures or if you alter engine parts or change their basic settings from the standard factory specifications (ignition timing, carburetor air screw, etc.), your bike may not comply with Federal emissions standards.

In addition, since many emission controlled bikes are carburetted on the lean side, any changes to emission-related parts (such as exhaust system modifications) could cause the engine to run so lean that overheating and engine damage could result.

During the 1978 model year, there was an early and a late production run of XT models. Early models (non-emission controlled) run consecutively with the engine/frame numbers 1E6-200101 through 1E6-20500. Late models (emission controlled) began production with the engine/frame number 1E6-205001.

Engine numbers are stamped on the right-hand side of the engine (**Figure 1**). Frame numbers are stamped on the steering head (**Figure 2**).

CHAPTER THREE

LUBRICATION, MAINTENANCE AND TUNE-UP

SERVICE SPECIFICATIONS

XT Models

Refer to **Table 1** for suggested lubrication intervals and to **Table 2** for suggested emission-related maintenance. Use these tables as a minimum schedule only. If you ride in dusty areas, at high speeds or make a lot of short 5-10 minute rides, service the items more often.

Perform the maintenance at each *time* or *mileage* interval, whichever comes first.

TT Models

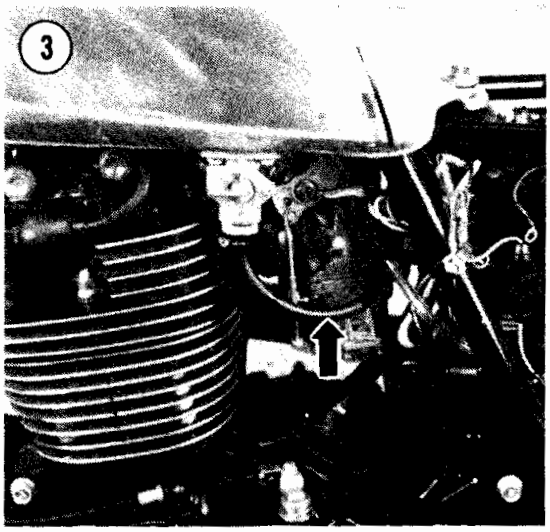
The only change in periodic maintenance for the TT models is to clean and lubricate the drive chain and chain tensioner pivot shaft at the initial 300 mile (500 km) and 2,000 mile (3,000 km) intervals; thereafter service as required.

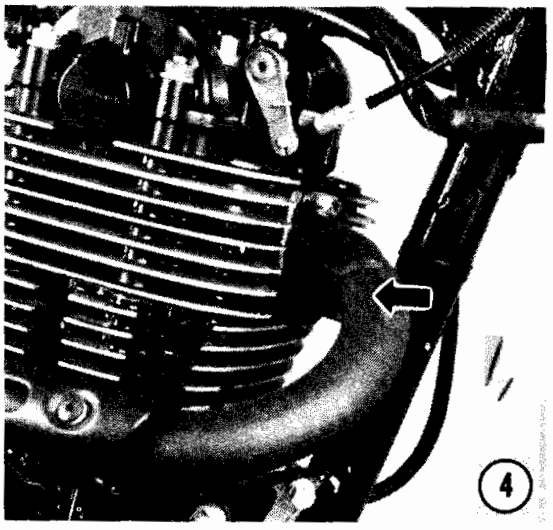
EMISSION CONTROL RELATED MAINTENANCE (XT MODELS)

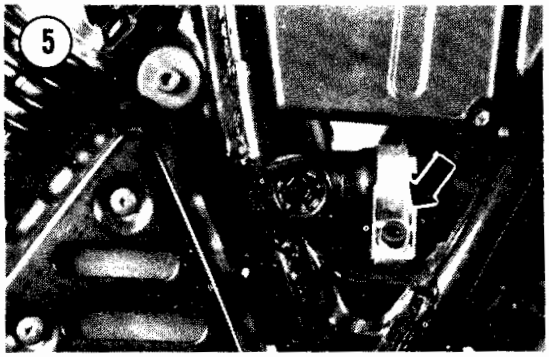
The following emission control components should be checked at the intervals specified in **Table 2.**

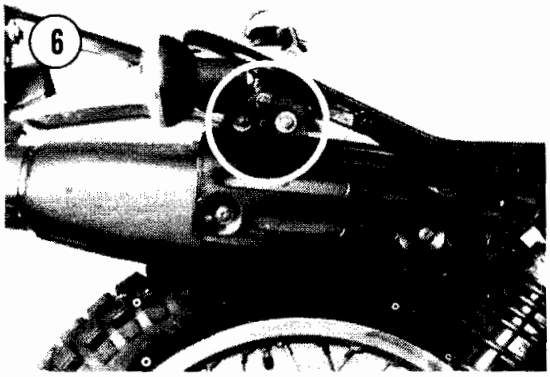
Fuel Line

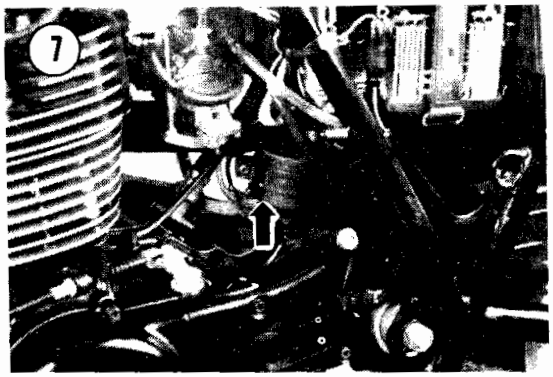
Check the fuel line (**Figure 3**) from the fuel valve to the carburetor. Replace the fuel line and/or line clamps if necessary.

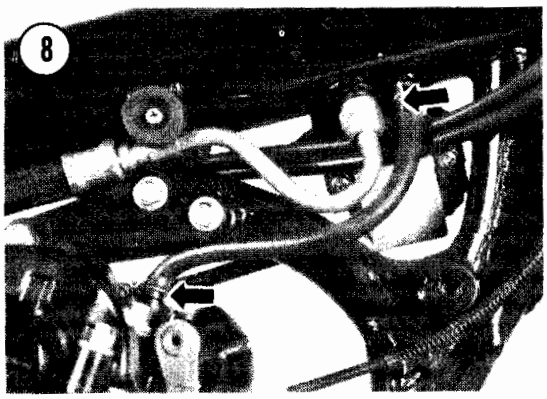


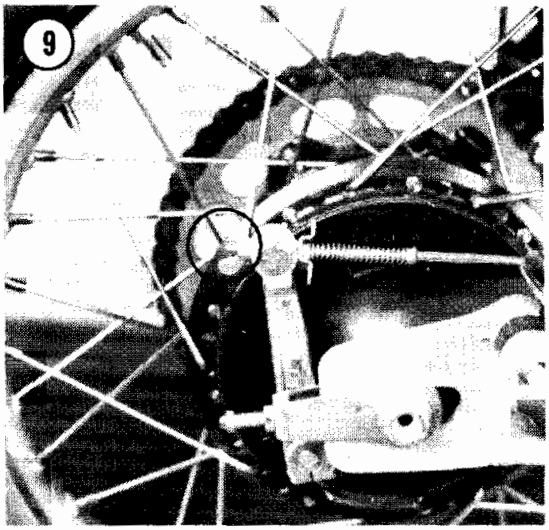












Exhaust System

Check the exhaust system for any looseness, component damage or gasket leakage. Replace or retighten parts as required. See **Figure 4** and **Figure 5** for typical leakage points. See **Figure 6** for muffler bolts.

Crankcase Ventilation Assembly

Check the breather assembly from the engine to the air cleaner (**Figure 7**) and the ventilation pipe from the cylinder head cover to the oil tank (**Figure 8**) for any cracks or damage. Replace all parts as required.

PERIODIC MAINTENANCE

Drive Chain Adjustment (1979-on TT Models)

Chain adjustment procedures for 1979-on models are the same as for previous models, except that you must first loosen the rear brake adjuster (**Figure 9**) before adjusting the chain. After adjusting the chain, adjust the rear brakes as described under *Rear Brake Adjustment* in Chapter Three of the main book.

Fork Oil

Procedures used to change the fork oil are the same as for previous models. Some fork oil capacities have changed. See **Table 3**.

IGNITION TIMING (XT MODELS)

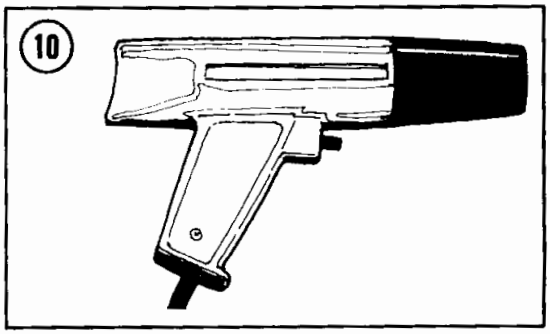
Emission controlled motorcycles should be timed with a stroboscopic timing light (**Figure 10**).

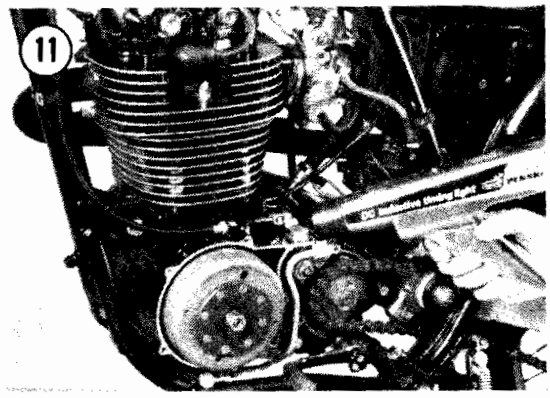
Contact Point Ignition

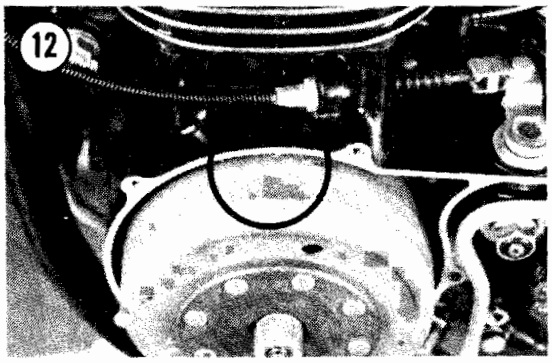
1. Clean and adjust the points as described in Chapter Three of the basic book before inspecting ignition timing. Set the point gap to 0.012-0.016 in. (0.3-0.4 mm).
2. Connect a tachometer to the engine following the manufacturer's instructions.
3. Connect a stroboscopic timing light to the cylinder's spark plug lead.
4. Start the engine and check the idle speed. It should be 1,200 rpm. Adjust, if necessary, as described in this supplement under *Idle Speed.*
5. Point the timing light at the crankcase and flywheel timing marks (**Figure 11**). The light should flash and freeze the flywheel as it lines up with the "F" mark (**Figure 12**).
6. If adjustment is required, remove the breaker point cover (**Figure 13**) and loosen the 2 breaker point plate screws (**Figure 14**). Then move the breaker point plate until the "F" mark aligns as described in Step 5. Tighten the screws and recheck the setting.
7. Ignition timing is now set. Install all parts previously removed.

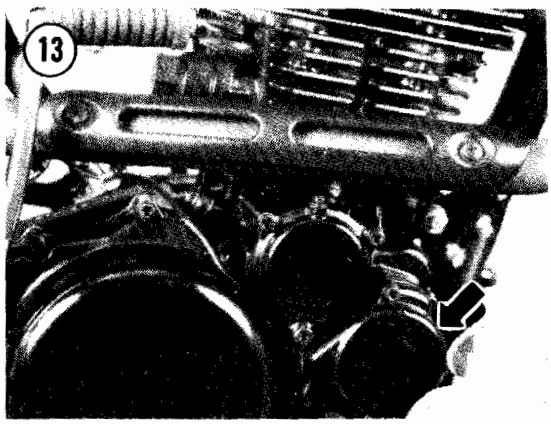
Electronic Ignition

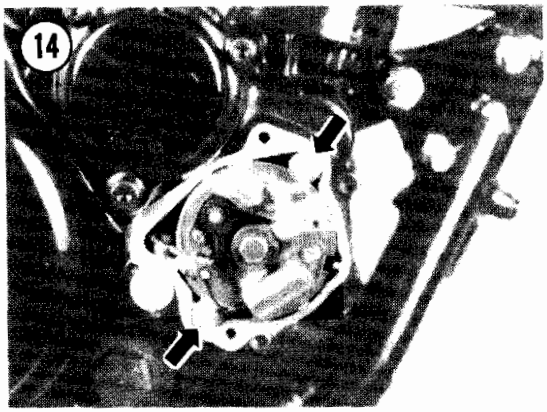
The ignition timing on these models is not adjustable. The magneto base plate is secured to the crankcase with special bolts and no adjustment slots are provided in the stator plate. Ignition timing can be checked with a timing light to verify that it is correct.
1. Connect a tachometer to the engine following manufacturer's instructions.
2. Connect a stroboscopic timing light to the cylinder's spark plug lead.
3. Start the engine and check the idle speed. It should be 1,200 rpm. Adjust, if necessary, as described in this supplement under *Idle Speed.*
4. Point the timing light at the crankcase and flywheel timing marks (**Figure 11**). The light

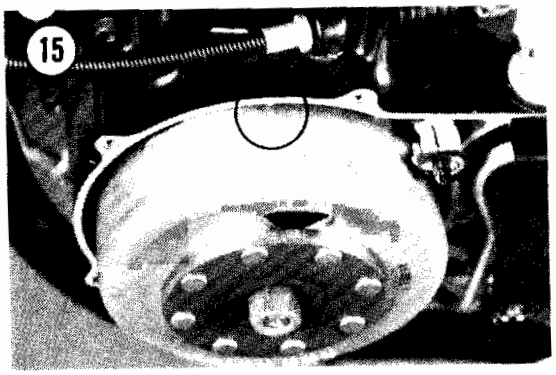


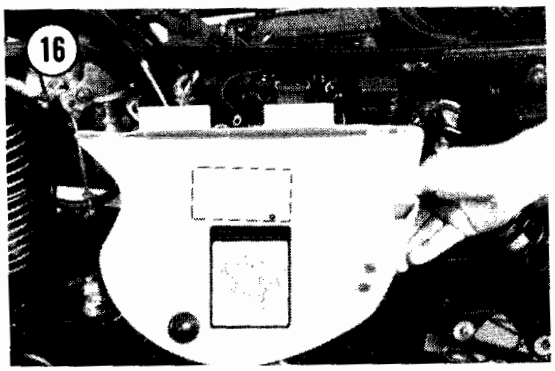


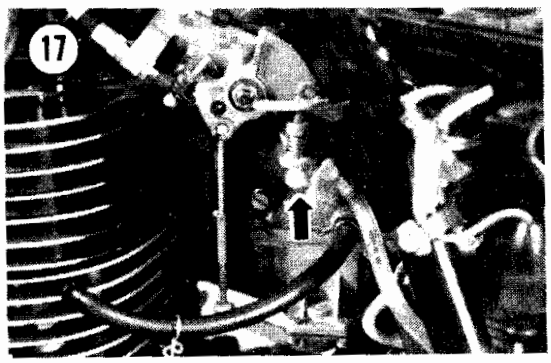












should flash and freeze the flywheel as it lines up with the "F" mark (**Figure 15**).

5. If the timing is incorrect, check for a damaged flywheel Woodruff key or a worn crankshaft bearing (Chapter Four). Refer to *Flywheel Removal/Installation* in the Chapter Seven section of this supplement. If the Woodruff key and crankshaft bearings are in good condition, refer to *Electronic Ignition Troubleshooting* in the Chapter Seven section of this supplement.

CARBURETOR

The following procedures should be performed at every tune-up.

Idle Air Mixture (XT Models)

The idle air mixture adustment is preset at the factory to ensure compliance with emission standards. No adjustment is required.

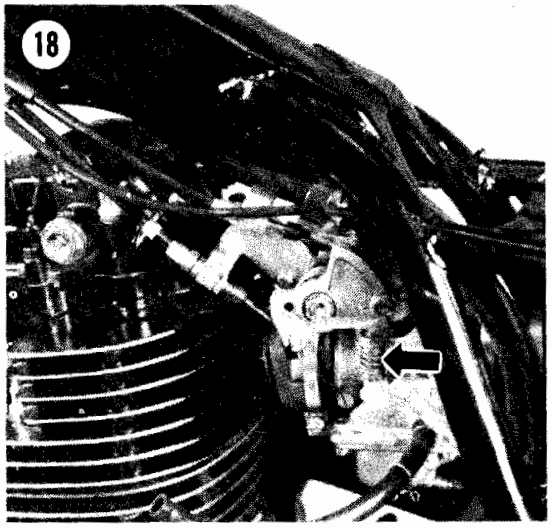
Idle Speed (XT Models)

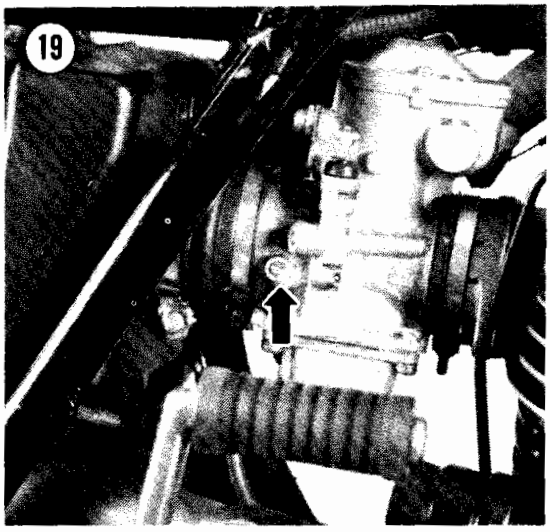
Idle speed for all emission controlled models is specified on the Vehicle Emission Control Information label (**Figure 16**).

1. Start the engine and allow it to warm to normal operating temperature. On 1979 and later models, the warm engine starter button (**Figure 17**) must be pulled (down) to the off position.
2. Turn the idle stop screw (**Figure 18**) until the idle speed is 1,200 rpm.

Idle Mixture/Idle Speed Adjustment (1979-on TT Models)

1. Turn the pilot screw in (clockwise) until it lightly seats. Then back it out 1 3/4 turns (counterclockwise). See **Figure 19**.
2. Attach a tachometer to the engine following manufacturer's instructions.
3. Start the engine and allow it to warm to normal operating temperature. The warm engine starter button (**Figure 17**) must be pulled down to the off position.
4. Turn the throttle stop screw (**Figure 18**) as required to bring the engine speed to 1,200 rpm.





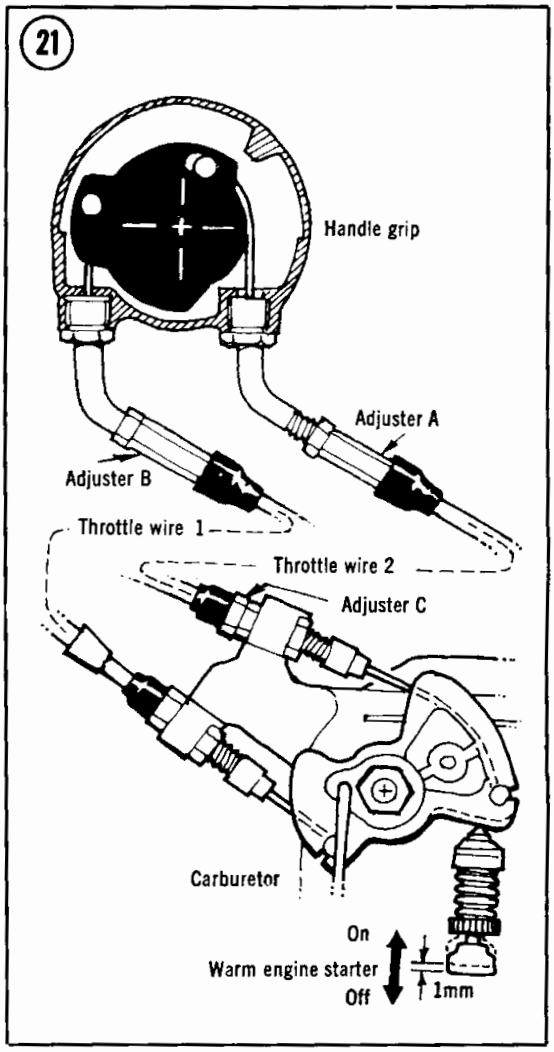
5. Turn the pilot screw (**Figure 19**) in or out to obtain the highest possible idle rpm. There is no specified rpm reading. Instead watch the tachometer when turning the pilot screw.

6. When the highest engine rpm is obtained by turning the pilot screw (Step 5), turn the throttle stop screw to bring the engine rpm to 1,200 rpm.

Throttle Cable Adjustment (All 1979-on Models)

When the idle speed has been correctly adjusted, adjust the throttle cable free play.

1. Slowly turn the throttle and feel for free play. It should be 1/8-1/4 in. (2-5 mm) with the warm engine starter off. See **Figure 20** and **Figure 21**.
2. If adjustment is required, loosen the locknuts on adjusters B and C (**Figure 21**) and turn them all the way. Then tighten the locknuts.
3. Loosen the locknut on adjuster A and turn it in or out until the free play is correct. Then tighten the locknut.
4. Set the warm engine starter on, close the throttle grip and check the free play. Then turn the warm engine starter off and check the free play once again. If necessary, continue to adjust the free play until it is correct.



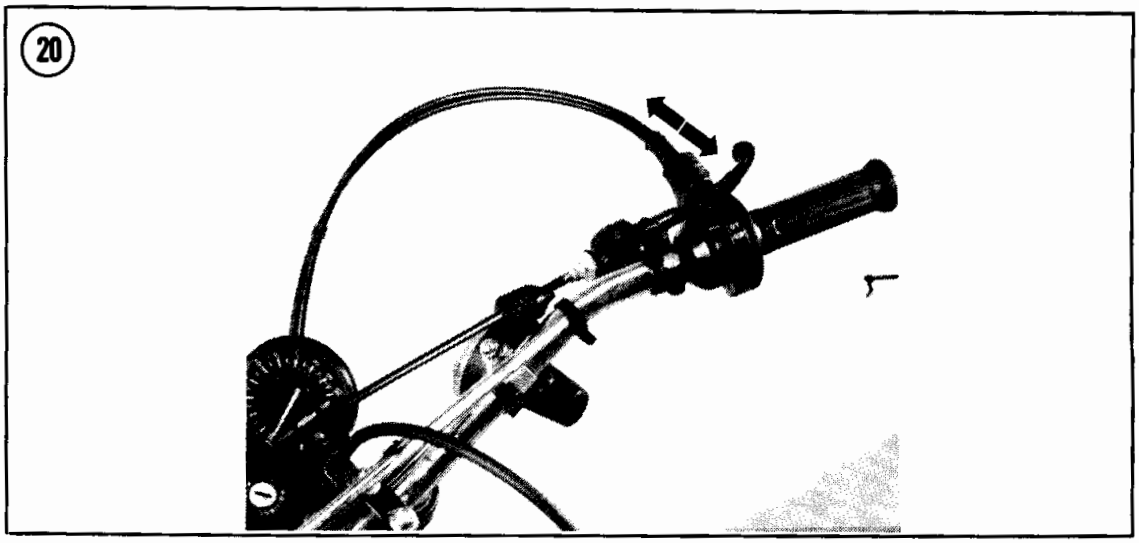


Table 1 MAINTENANCE AND LUBRICATION INTERVALS

Every 300 miles (500 km)*
- Check chain drive tension and lubricate

First 600 miles (1,000 km) or 1 month
- Change engine oil
- Change oil filter and oil strainer
- Clean and re-oil air filter
- Inspect brake system, adjust free play
- Adjust clutch cable
- Lube control and meter cables

Every 2,500 miles (4,000 km) or 6 months
- Change engine oil
- Clean and re-oil air filter
- Inspect brake system, adjust free play
- Adjust clutch cable
- Lube control and meter cables
- Lube side stand and kickstand and kickstarter pivots
- Inspect steering bearings for loosensss
- Inspect wheel bearings for looseness or damage
- Inspect battery's specific gravity, inspect vent tube

First 3,000 miles (5,000 km) or 7 months
- Lube swing arm pivot shaft
- Lube brake and shift pedal shafts
- Lube side and kickstand and kickstarter pivots
- Lube rear wheel damper
- Inspect steering bearings for looseness
- Inspect wheel bearings for looseness or damage
- Inspect battery's specific gravity, inspect vent tube

(continued)

Table 1 MAINTENANCE AND LUBRICATION INTERVALS (continued)

Every 5,000 miles (8,000 km) or 12 months
- Lube swingarm pivot shaft
- Lube brake and shift pedal shafts
- Lube rear wheel damper

Every 10,000 miles (16,000 km) or 24 months
- Change fork oil
- Repack steering bearings

*XT models only; TT models adjust chain as required.

Table 2 EMISSION-RELATED MAINTENANCE

First 600 miles (1,000 km) or 1 month
- Check/adjust cam chain tension
- Check/adjust valve clearance
- 1978-1979: Check/adjust breaker points if necessary
- 1978-1979: Check/adjust ignition timing
- Check exhaust for leakage; replace gaskets if necessary
- Check/adjust throttle cable free play and idle speed

Every 2,500 miles (4,000 km) or 6 months
- Check/adjust cam chain tension
- Check/adjust valve clearance
- 1978-1979: Check/adjust breaker points if necessary
- 1978-1979: Check/adjust ignition timing
- Check exhaust for leakage; replace gaskets if necessary
- Check/adjust throttle cable free play and idle speed

First 3,000 miles (5,000 km) or 7 months
- All 600-mile service items
- Check/adjust/replace spark plugs if necessary
- Check crankcase ventilation hose for cracks; replace if necessary
- Check fuel hose for cracks or damage; replace if necessary

Every 5,000 miles (8,000 km) or 12 months
- All 2,500-mile service items
- Check/adjust/replace spark plugs if necessary
- Check crankcase ventilation hose for cracks; replace if necessary
- Check fuel hose for cracks or damage; replace if necessary

Table 3 FORK OIL CAPACITY

Model	Quantity (per leg)
XT models	
1979	223 cc (7.5 oz.)
1980-on	238 cc (8.0 oz.)
TT models	
1978	224 cc (7.6 oz.)
1979-on	247 cc (8.35 oz.)

CHAPTER FOUR

ENGINE

BOTTOM END ASSEMBLY

Crankshaft Oil Seal (Right Side)

On 1979-on TT models and 1980-on XT models, the right side crankshaft seal should be installed with the manufacture or number markings facing outward.

CHAPTER SIX

FUEL AND EXHAUST SYSTEMS

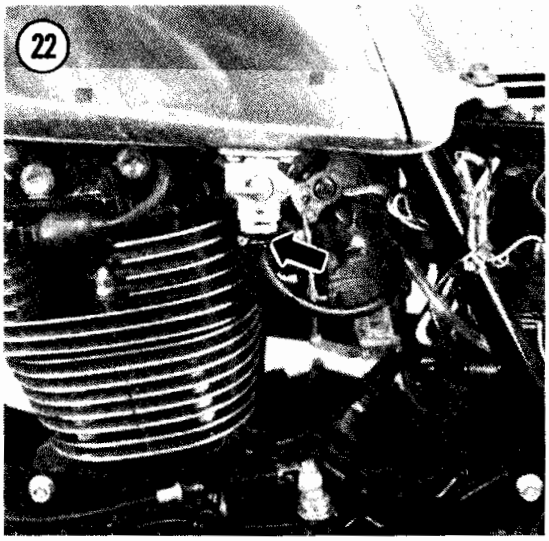
CARBURETOR

The 1979 and later XT500 models are equipped with a VM32SS Mikuni carburetor that incorporates an accelerator pump, a pump safety valve, and a coasting enricher.

Operation

When the throttle is opened quickly, such as during acceleration from a standing start, the accelerator pump provides a fuel-rich mixture that eliminates throttle lag and "stumble," allowing the engine to accelerate smoothly.

The accelerator pump safety valve prevents raw gas from being injected into the carburetor venturi if the throttle is operated when the engine is not running.

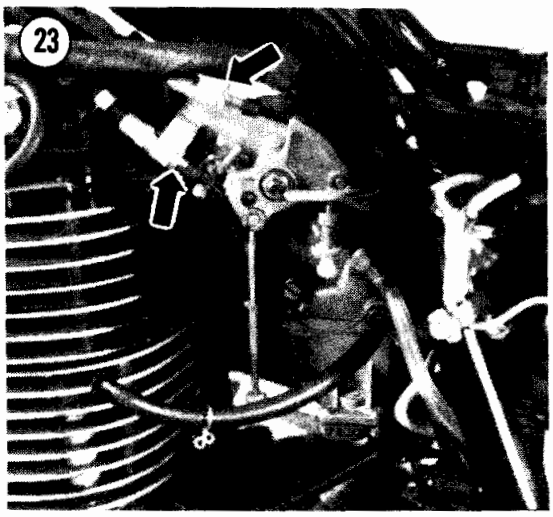


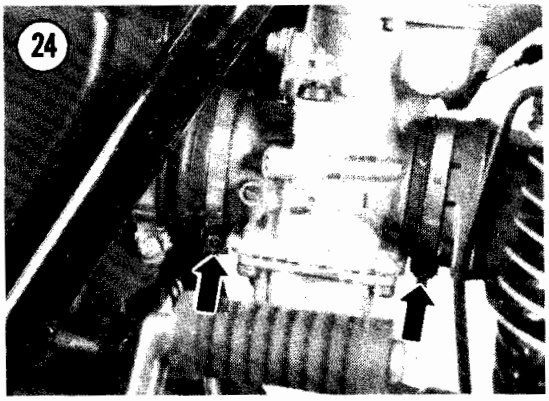
MAJOR CARBURETOR SERVICE

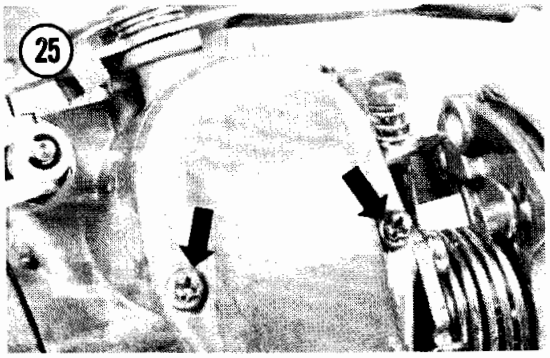
Major carburetor service (removal, cleaning, and inspection) should be performed at least annually.

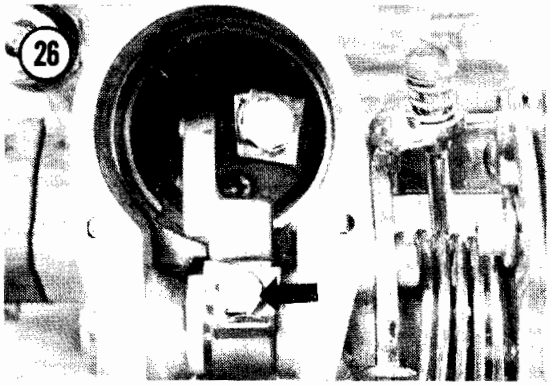
Removal/Installation

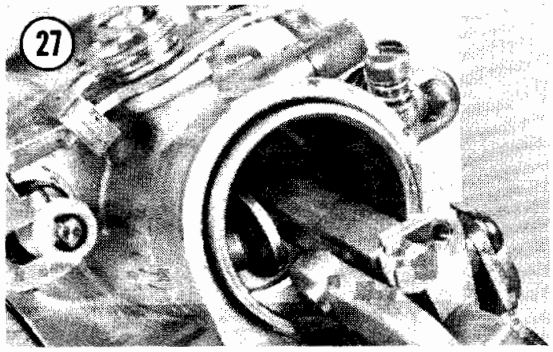
1. Remove the seat.
2. Turn the fuel tap to ON or RUN and disconnect the fuel and vacuum lines from the carburetor (**Figure 22**). Unscrew the tank mounting bolts and remove the fuel tank.
3. Loosen the cable adjuster locknuts, loosen the adjusters, and disconnect the cables from the throttle quadrant (**Figure 23**).
4. Loosen the carburetor clamping bands at the air cleaner and the manifold (**Figure 24**).











Pull the carburetor out of the manifold first and then disconnect it from the air cleaner boot.

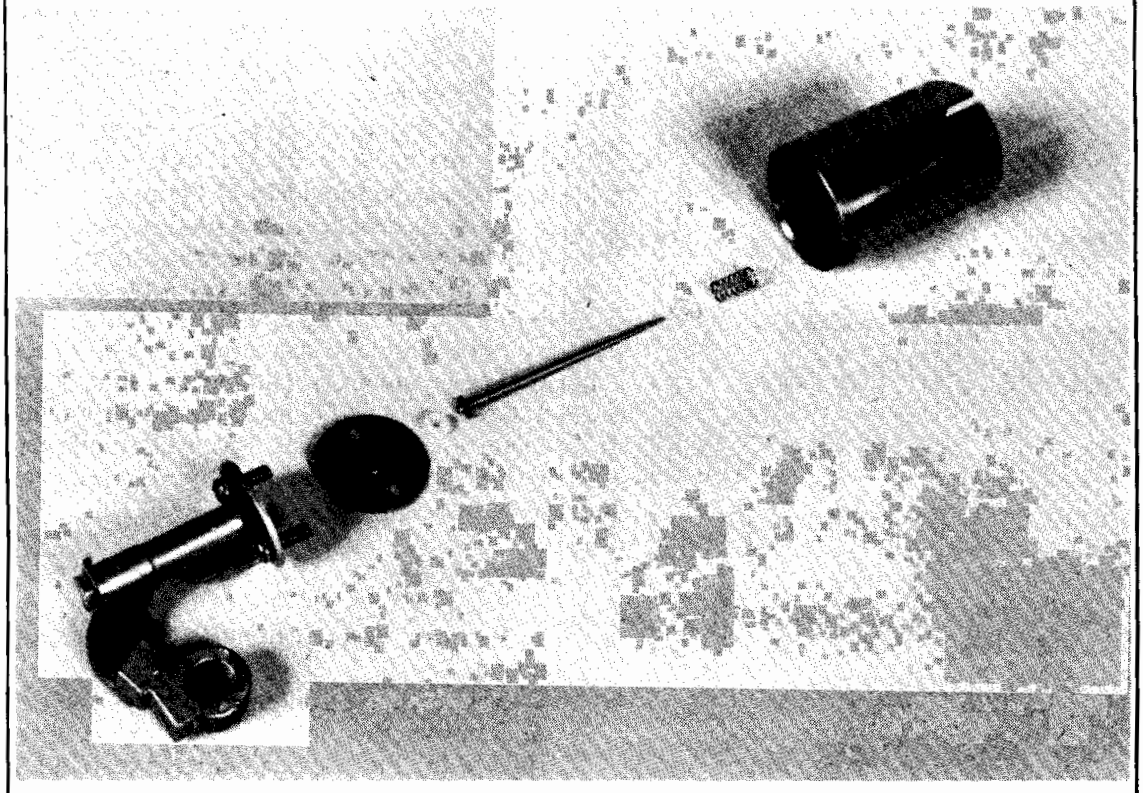
5. Reverse the above to install the carburetor. Route the float bowl vent hose between the rear of the engine and the swing arm pivot. Make certain the carburetor is vertical before tightening the clamping bands.

6. Refer to the Chapter Three section and adjust the idle speed and throttle cable free play. Check for air leaks at the manifold by spraying the connection with WD-40 or an equivalent with the engine idling. If the idle speed changes, an air leak is present; correct it by further tightening the clamp. If this does not work, remove the carburetor and check for foreign matter around the mounting flange and for cracks and holes in the rubber mount. Small holes can be closed with silicone sealer, but if the flange is badly damaged or deteriorated, replace it.

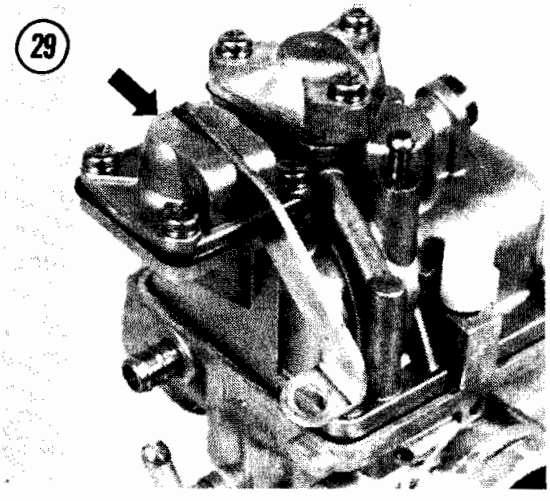
Disassembly

1. Remove the carburetor as described above.
2. Remove the carburetor top (**Figure 25**).
3. Remove the bolt from the slide lifter (**Figure 26**). Pull the quadrant and shaft out of the carburetor. Disconnect the accelerator pump rod from the quadrant.
4. Pull the lifter and slide out of the carburetor (**Figure 27**). The slide assembly is shown in **Figure 28** for reference. Normally, it is not necessary to disassemble the slide unless the needle position is being changed.
5. Remove the accelerator pump body (**Figure 29**) and the pump diaphragm (**Figure 30**). Note the spring above the diaphragm for reference during assembly (**Figure 31**).
6. Remove the valve body from the bottom of the float bowl (**Figure 32**). Remove the spring (**Figure 33**) and the diaphragm (**Figure 34**) and note their positions for reference during assembly.
7. Remove the starting lever (**Figure 35**) and the enrichment valve (**Figure 36** and **Figure 37**).
8. Remove the vacuum valve body from the side of the carburetor (**Figure 38**). Remove the spring (**Figure 39**), diaphragm (**Figure 40**),

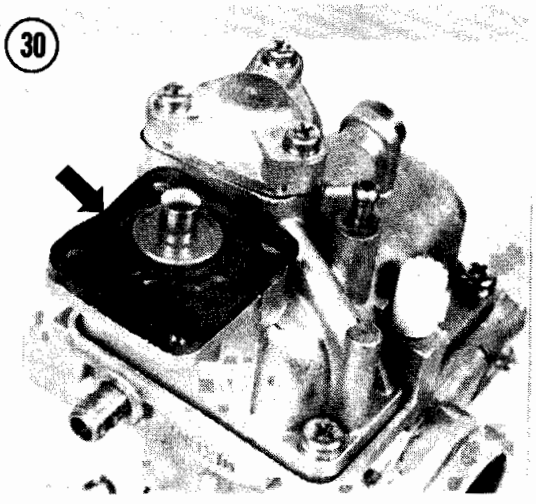
28



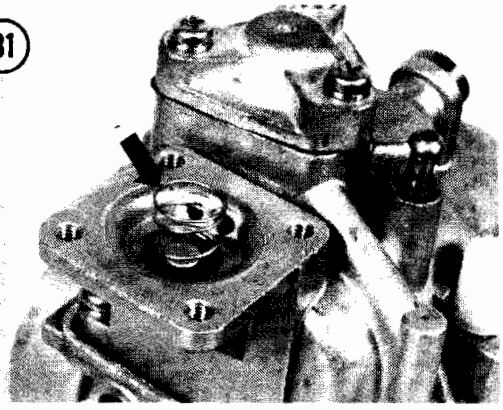
29



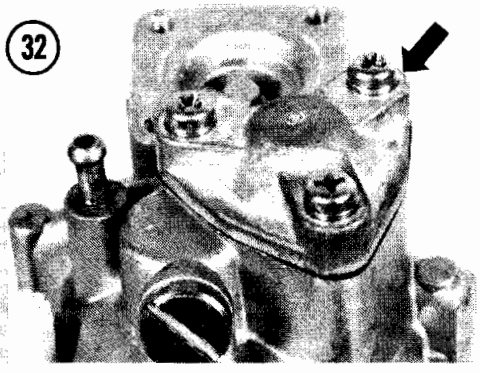
30



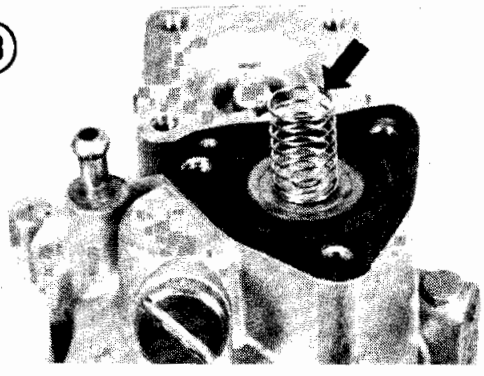
31



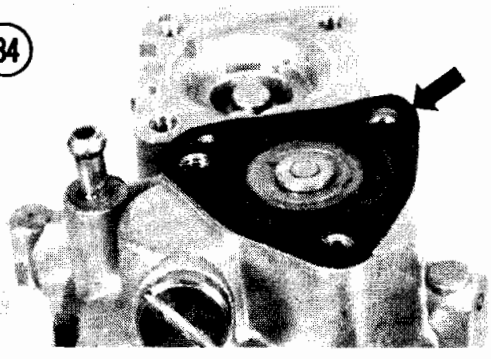
32



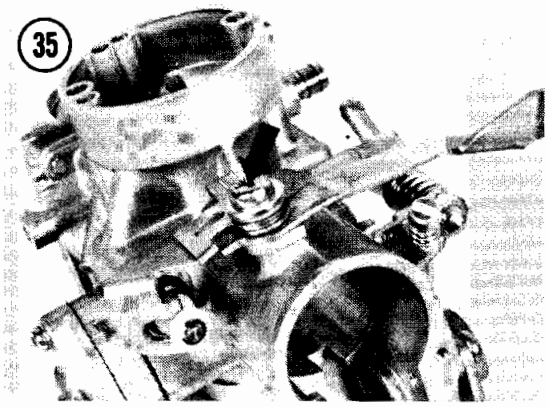
33



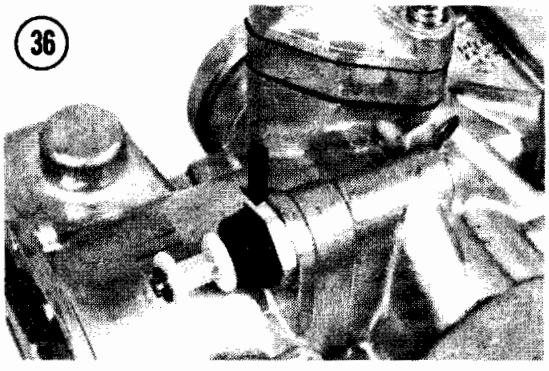
34



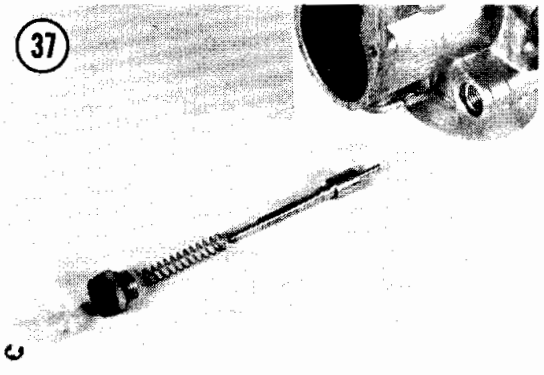
35



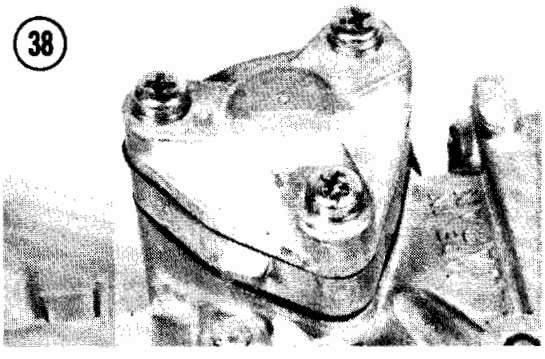
36

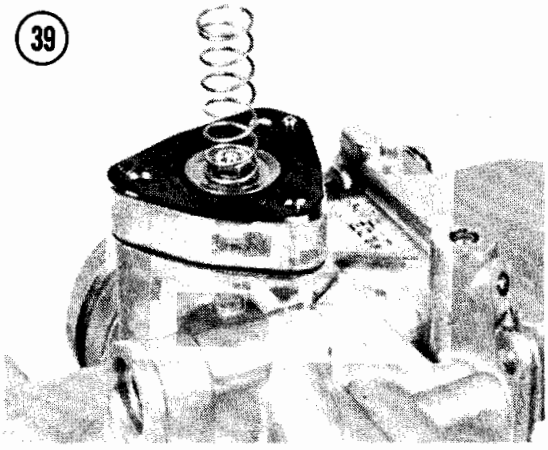


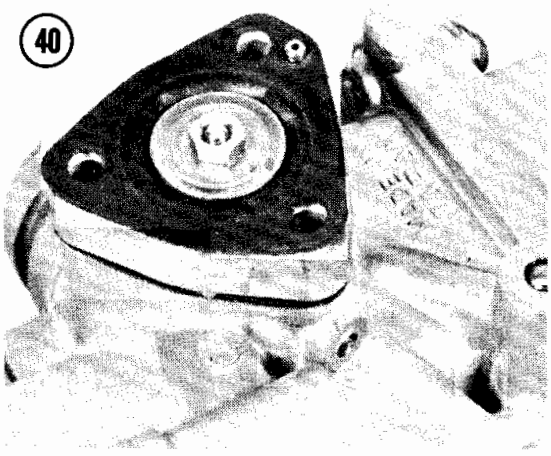
37



38







and gasket (**Figure 41**) and note their locations for reference during assembly.

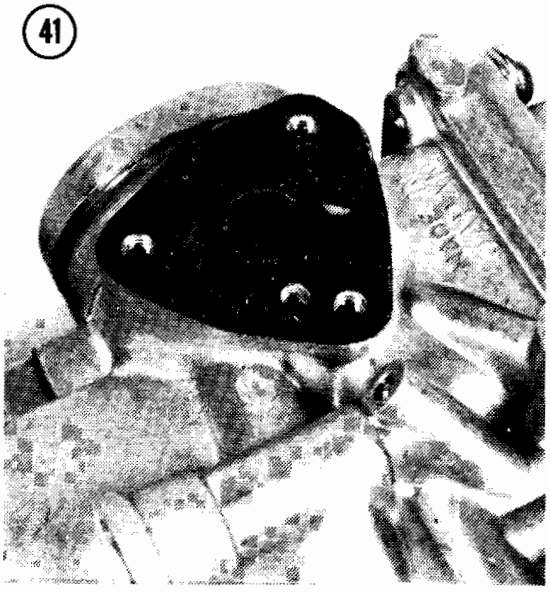
9. Remove the screws that attach the float bowl to carburetor and remove the bowl (**Figure 42**).

10. Remove the float pin (**Figure 43**) and the float and needle. Remove the needle seat (**Figure 44**).

11. Unscrew the main jet and needle jet as a unit (**Figure 45**). There is no need to separate the 2 unless jet size is being changed.

12. From inside the carburetor venturi, press the spray nozzle out of the main jet/needle jet bore (**Figure 46**).

13. Unscrew the low-speed jet (**Figure 47**).

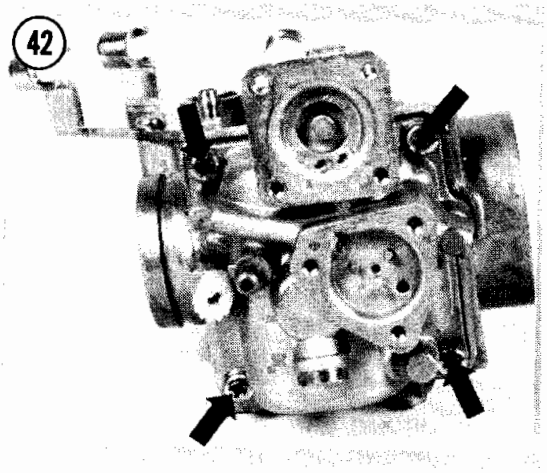


Inspection

1. Soak all of the metal components in carburetor cleaning solution. This solution is available through auto parts stores, in a small, resealable tank with a dip basket, for just a few dollars (**Figure 48**). It is tightly sealed when not in use, the solution will last for several carburetor cleanings.

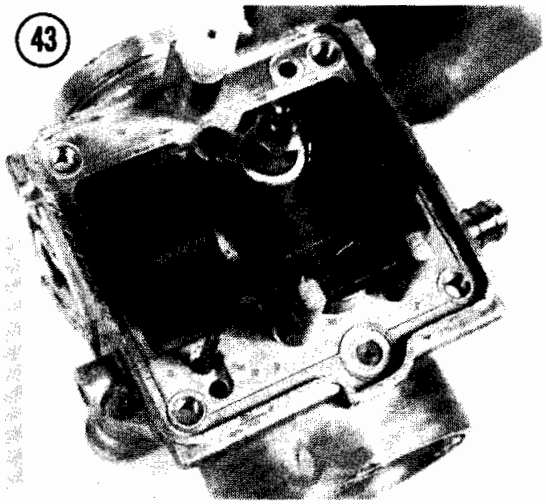
CAUTION

Do not put non-metallic parts such as floats, gaskets, diaphragms, and O-rings in the solution. It will likely ruin them.

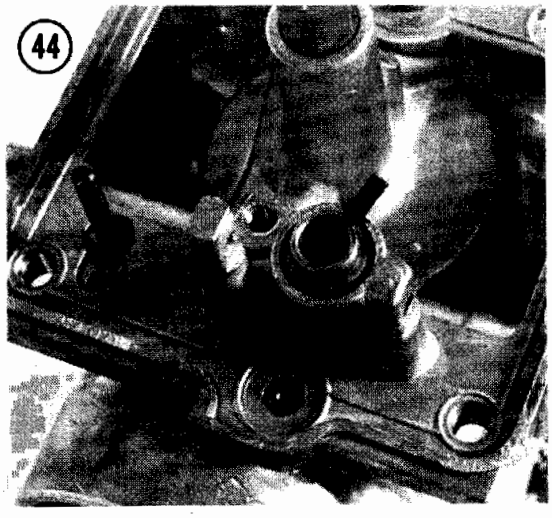


2. Dry the parts with compressed air. Blow out the jets and passages. *Do not use wire or sharp*

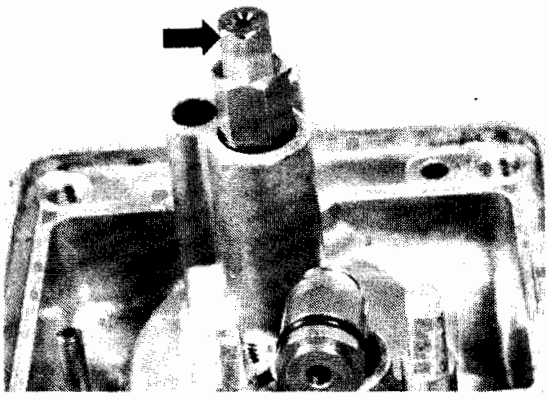
43



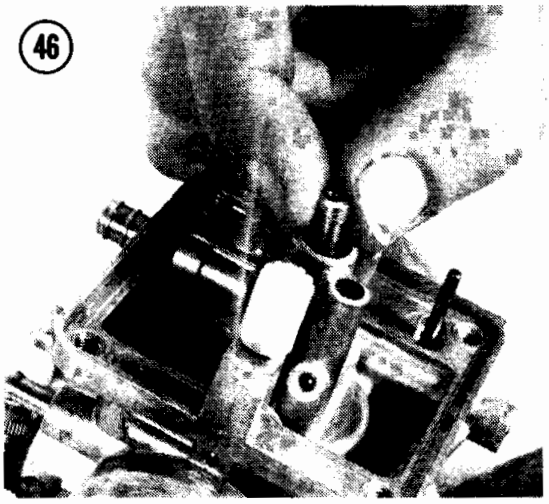
44



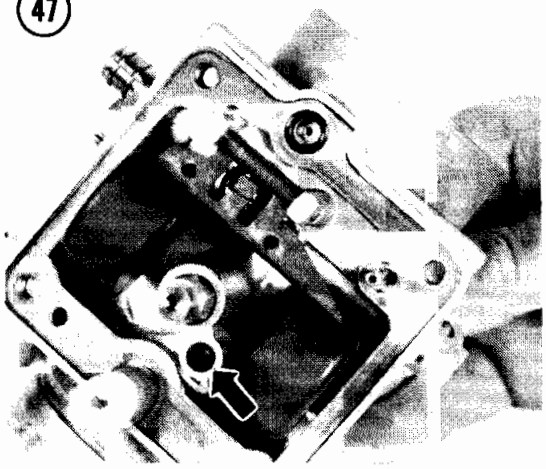
45



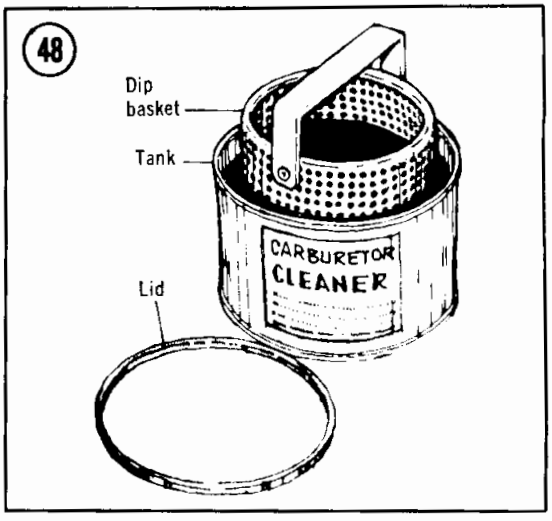
46



47



48



instruments to clean them. They are very easily burred which will alter their sizes and affect air/fuel mixture.

3. Check the slide bore for wear. Generally, many thousands of miles of use are necessary before this sort of wear is apparent. However, if it is apparent at an early stage, check for a leaking air filter or a damaged intake boot.

4. Inspect the O-rings, diaphragms, and seals for damage. Replace them if they are damaged or if they have hardened and can no longer seal and function.

5. Install the float needle valve and the float. Check the float level with a vernier caliper (**Figure 49**). The distance should be 22.5-24.5 mm (0.89-0.96 in.). If it is incorrect, bend the tang that contacts the end of the needle valve.

Assembly

1. Assemble the carburetor by reversing the disassembly steps. *Do not overtighten the soft brass jets*.

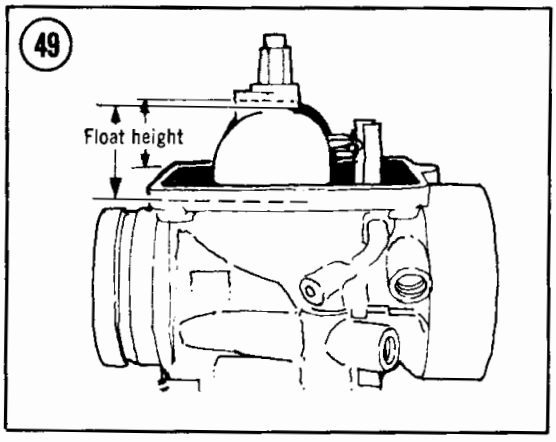
2. After installing the needle in the slide, position the lifter so that the third hole in the lifter lines up with third hole in the slide (**Figure 50**).

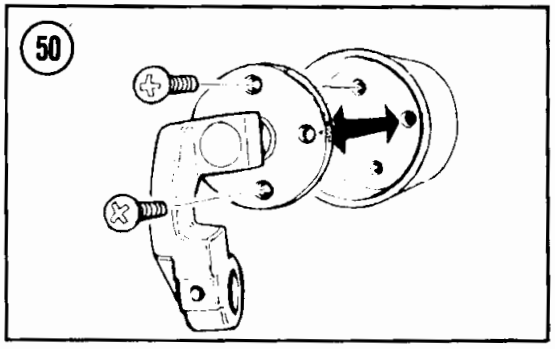
3. When installing the slide and lifter assembly in the carburetor, make sure the needle fits into the needle jet and the lug in the carburetor body lines up with the groove in the slide (**Figure 51**).

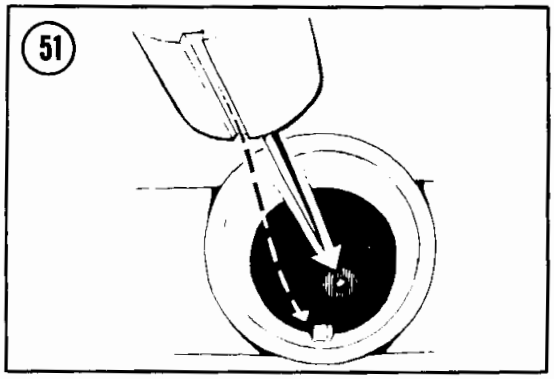
4. When assembling the accelerator pump and vacuum valve, pay particular attention to the order and orientation of the pieces; don't guess — carefully study the illustration accompanying the disassembly steps.

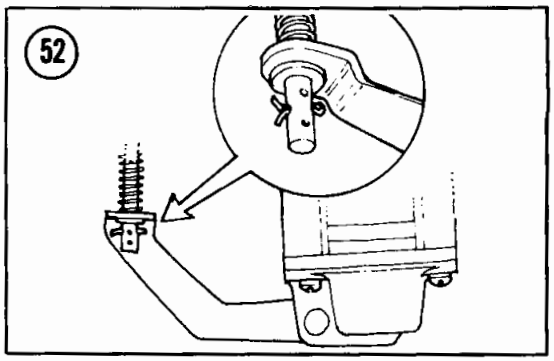
5. Before installing the throttle quadrant in the carburetor, engage the lower end of the accelerator pump rod with the pump arm. Make sure there is a Teflon washer on either side of the arm and the end of the the tiny cotter key is bent over (**Figure 52**).

6. Install the carburetor as described earlier, and adjust the idle speed and throttle cable free play as described in the Chapter Three section.



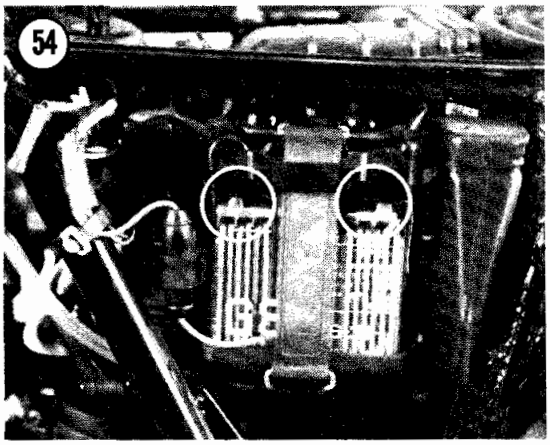






CHAPTER SEVEN

ELECTRICAL SYSTEM



New electrical system specifications are found in **Table 4**.

CHARGING CIRCUIT (XT MODELS)

The charging circuit for all 1978 and later XT models is shown in **Figure 53**.

Testing (1980-on)

1. Remove the left-hand side cover.
2. Connect a voltmeter to the battery terminals (**Figure 54**) following the manufacturer's instructions.
3. Start the engine. Next accelerate the engine to approximately 2,000 rpm and read the voltmeter. It should be 6.9-7.5 volts.

CAUTION

Do not disconnect the battery terminals leads when performing Step 3 or anytime the engine is running. An increase in voltage across the magneto terminals will destroy the stator assembly.

4. If the voltage tested incorrectly in Step 3, perform the *Magneto Coil Testing* procedures in this section of the supplement.
5. When test procedures are complete and the system is working correctly, remove all test equipment and install all parts previously removed.

FLYWHEEL (1980-ON XT MODELS)

Removal/Installation

On 1980 models, the stator plate is permanently mounted to the crankcase with special shear bolts. These bolts were changed back to Phillips head screws during the 1981 model year. This procedure can be used to remove the flywheel assembly on 1981 models, disregarding Step 5.

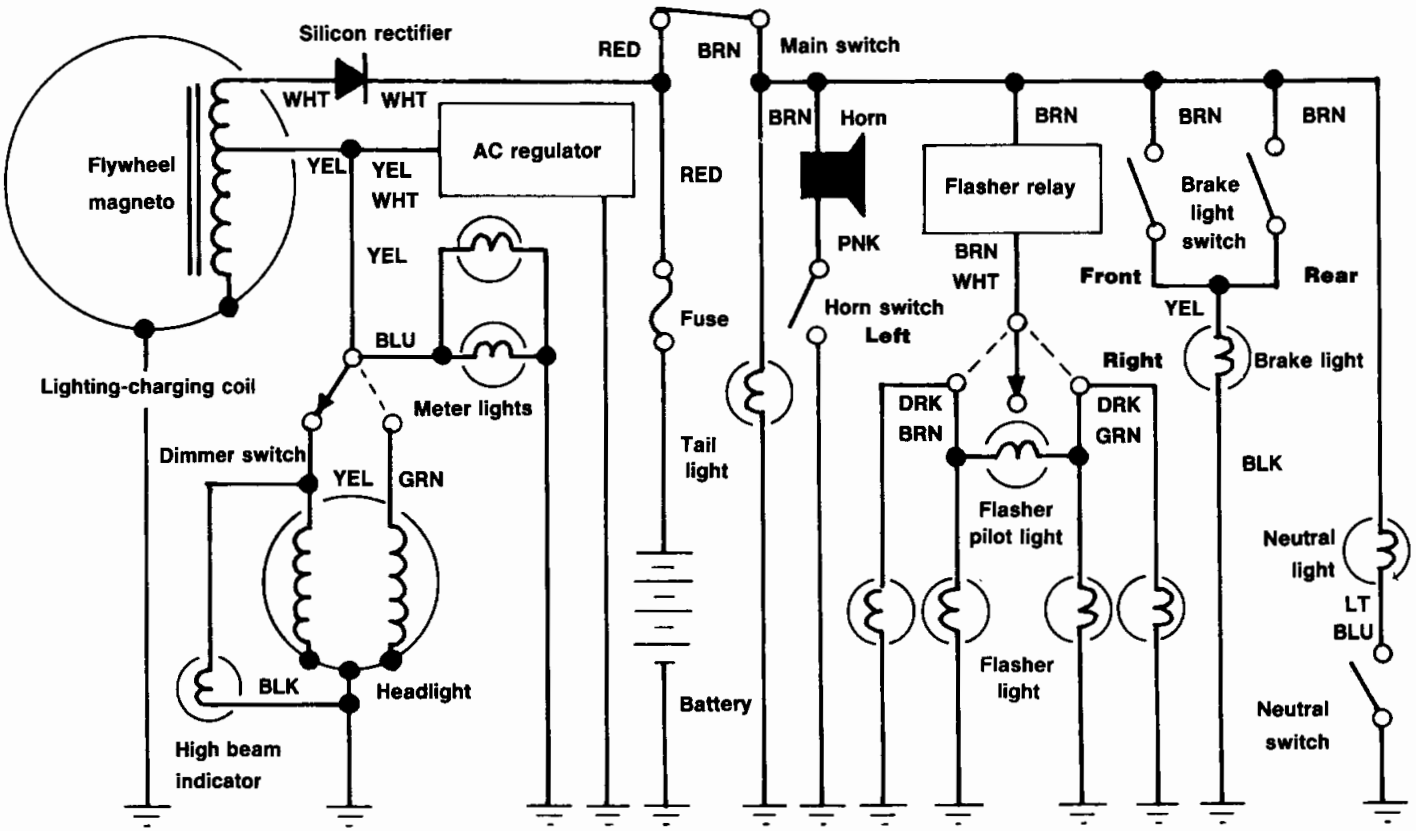
1. Remove the skid plate (**Figure 55**).
2. Remove the flywheel cover (**Figure 56**).
3. Secure the flywheel with a universal holding tool (**Figure 57**) and remove the flywheel nut (A, **Figure 58**).
4. Thread a suitable flywheel puller into the flywheel and remove it (B, **Figure 58**).
5. If the stator plate is secured with 3 special shear bolts (**Figure 59**), perform the following:

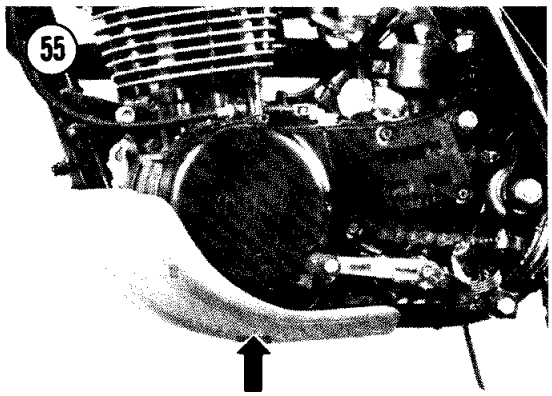
NOTE

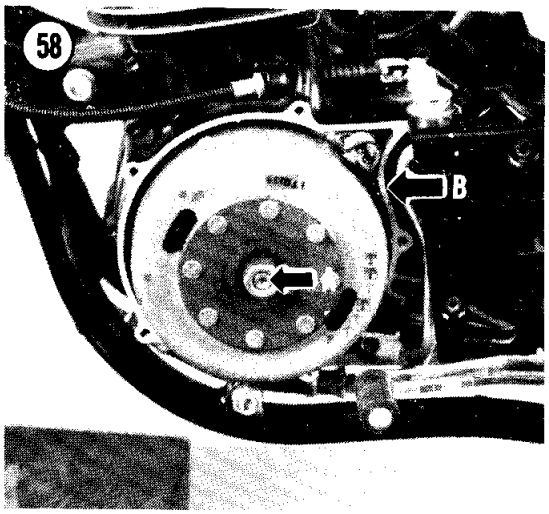
*Do not remove the pointer assembly (**Figure 60**).*

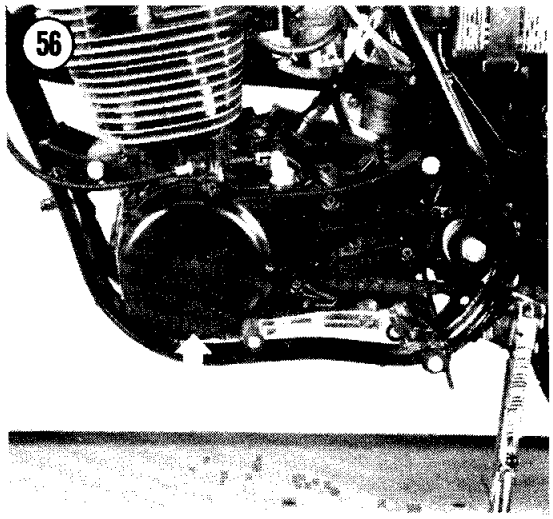
(53)

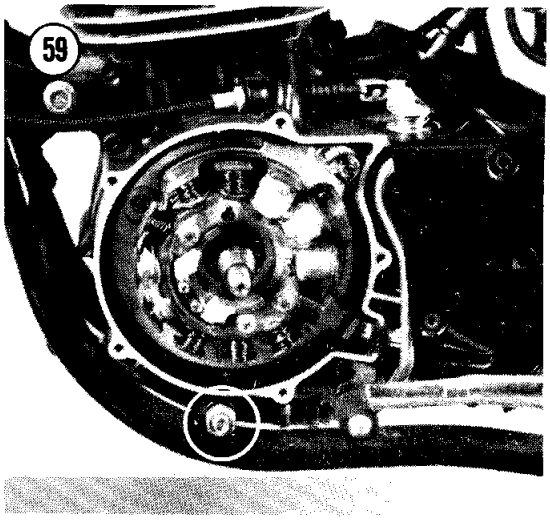
XT500C AND XT500D
LIGHTING/CHARGING CIRCUIT

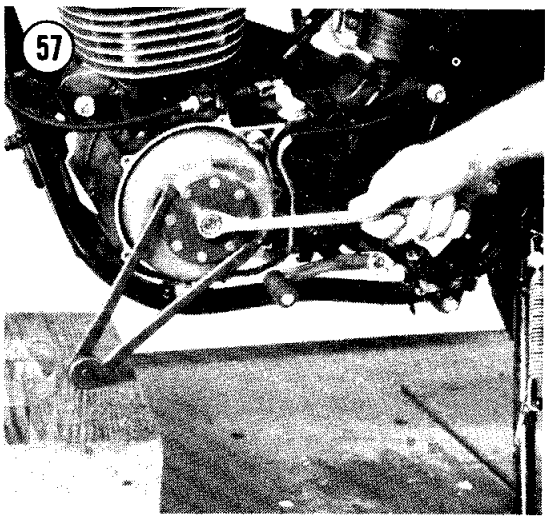


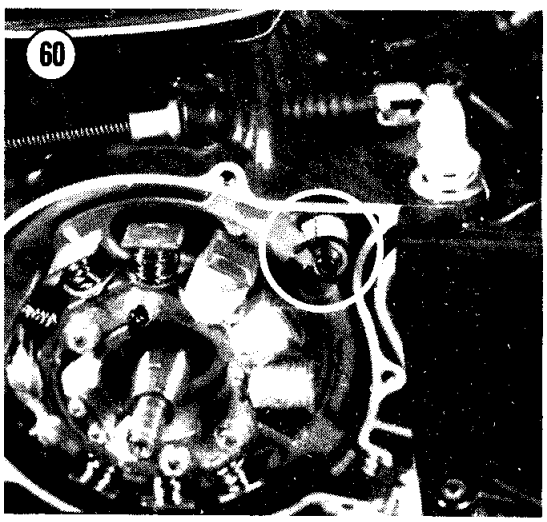

55


58
B


56

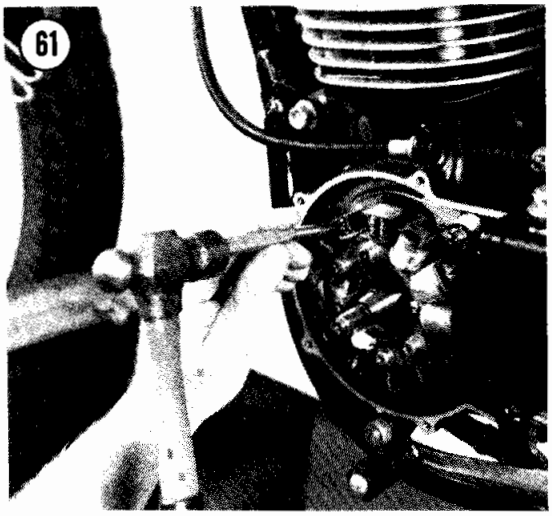

59

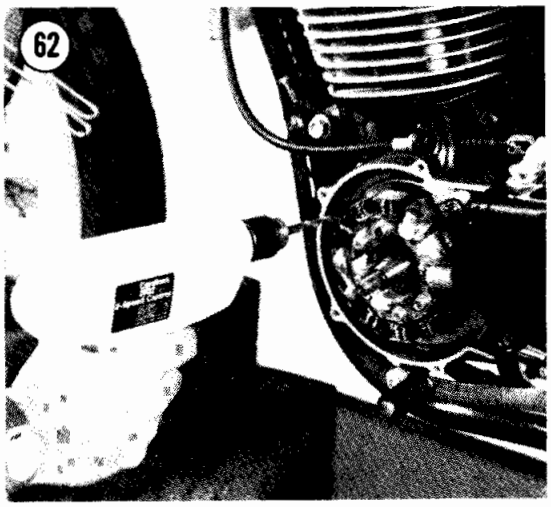

57

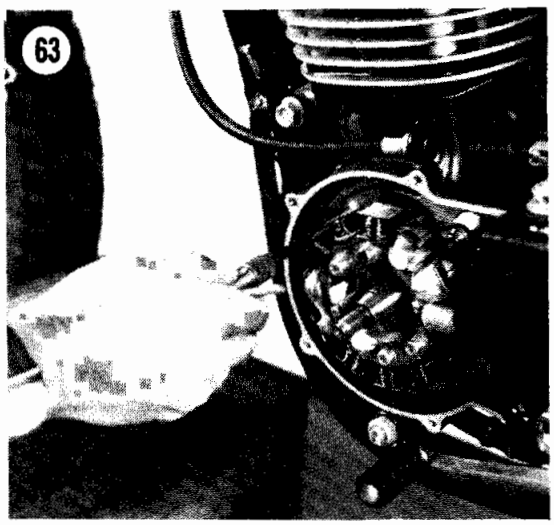

60

a. Smooth the surface of the special bolt head with a file or punch.
b. Centerpunch the bolt in the center of the head (**Figure 61**). It is critical to place the punch mark as near the center of the bolt as possible.
c. Using a 0.12 in. (3 mm) drill bit, drill a hole approximately 7/16 in. (10 mm) in the bolt. See **Figure 62**.
d. Using a suitable size screw extractor, remove the bolt. See **Figure 63**.
e. Repeat for the remaining stator plate bolts and remove the stator plate.

6. If the stator plate is secured with Phillips head screws, remove the screws and the stator plate.
7. Install the stator plate onto the crankcase and align its top mark with the mark on the crankcase (**Figure 64**). Then install 3 new base plate fasteners and tighten *lightly*. Do not tighten shear bolts tightly at this point as the head will break off. You first have to check ignition timing.
8. Install the flywheel Woodruff key (**Figure 65**) and install the flywheel, making sure to align the keyway in the flywheel with the Woodruff key. Install the flywheel nut and tighten to 58 ft.-lb. (80 N•m). See **Figure 66**.
9. Using a stroboscopic timing light, check the ignition timing as described in the Chapter Three section of this supplement. If the ignition timing is incorrect, remove the flywheel and make sure the stator plate is positioned correctly. Adjustment of the stator plate to change ignition timing is not possible.
10. When the ignition timing is correct, remove the flywheel once again and tighten the 3 magneto base plate fasteners. If installing new shear bolts, tighten them until the heads snap off (use Yamaha special socket part No. 90890-01308-00).
11. Install all parts previously removed.

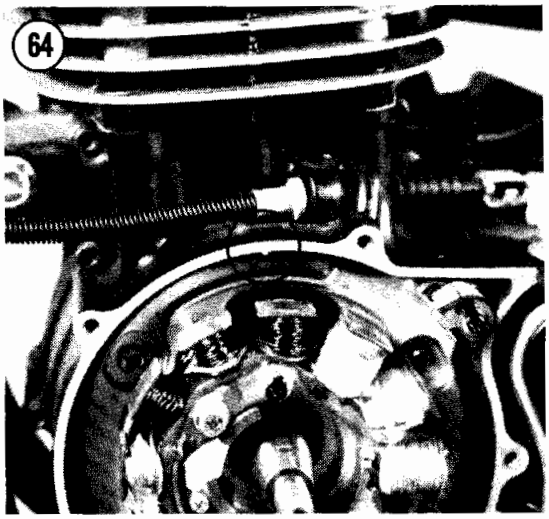


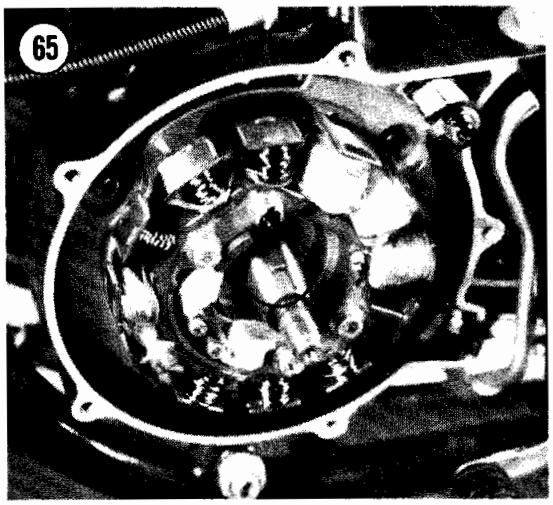


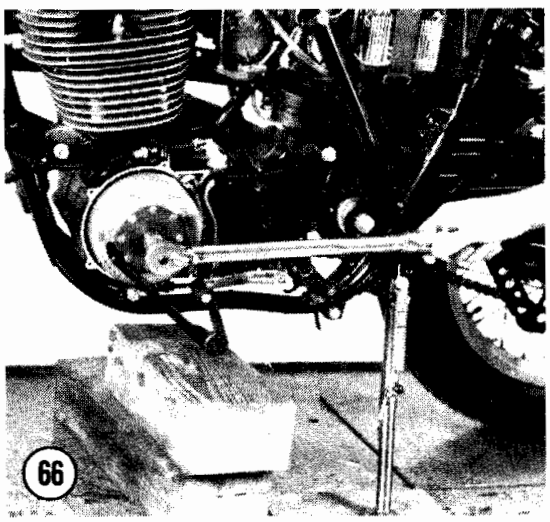


ELECTRONIC IGNITION TROUBLESHOOTING (1980-ON XT MODELS)

Basic ignition system and spark plug troubleshooting information can be found in Chapter Two and Chapter Three of the main







book. The following procedures, together with the troubleshooting procedures included in Chapter Two, can help you to determine the system or component which is operating incorrectly. If the ignition system is operating incorrectly, test procedures unique to the Yamaha electronic ignition system are found in this section and can be used to troubleshoot and locate the problem source. An ohmmeter (described in Chapter One) is required to perform many of the test procedures.

Before starting actual troubleshooting, read the entire test procedures (**Figure 67** and **Figure 68**). When required, the diagnostic chart(s) will refer you back to a test procedure found in this section.

Magneto Coil Testing

It is not necessary to remove the stator plate to perform the following tests. Instead disconnect the stator plate wire connectors. If any of the following tests show an incorrect reading, the stator plate must be replaced. To replace the stator plate on 1980-on models, refer to *Flywheel Removal/Installation* in this supplement.

Pulser coil

Use an ohmmeter set at R×10 and check resistance between the following terminals.

a. High speed winding: White/red to black—16 ohms ±10%.
b. Low speed winding: White to green/black—91 ohms ±10%.

Charging coil

Use an ohmmeter set at R×100 and check resistance between the following terminals.

a. High speed winding: Red to black—390 ohms ±10%.
b. Low speed winding: Brown to black—381 ohms ±10%.

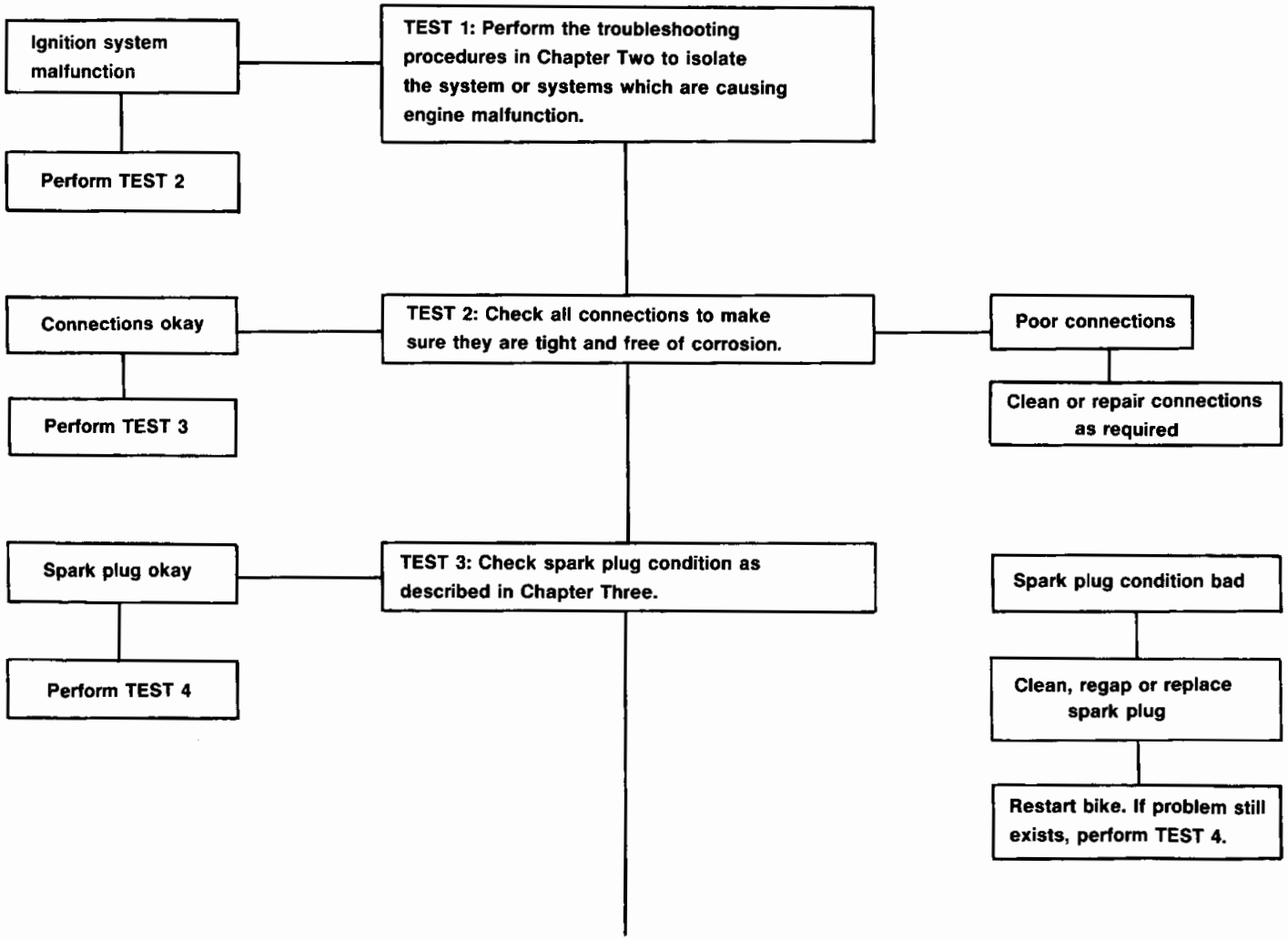
Charging/lighting coil

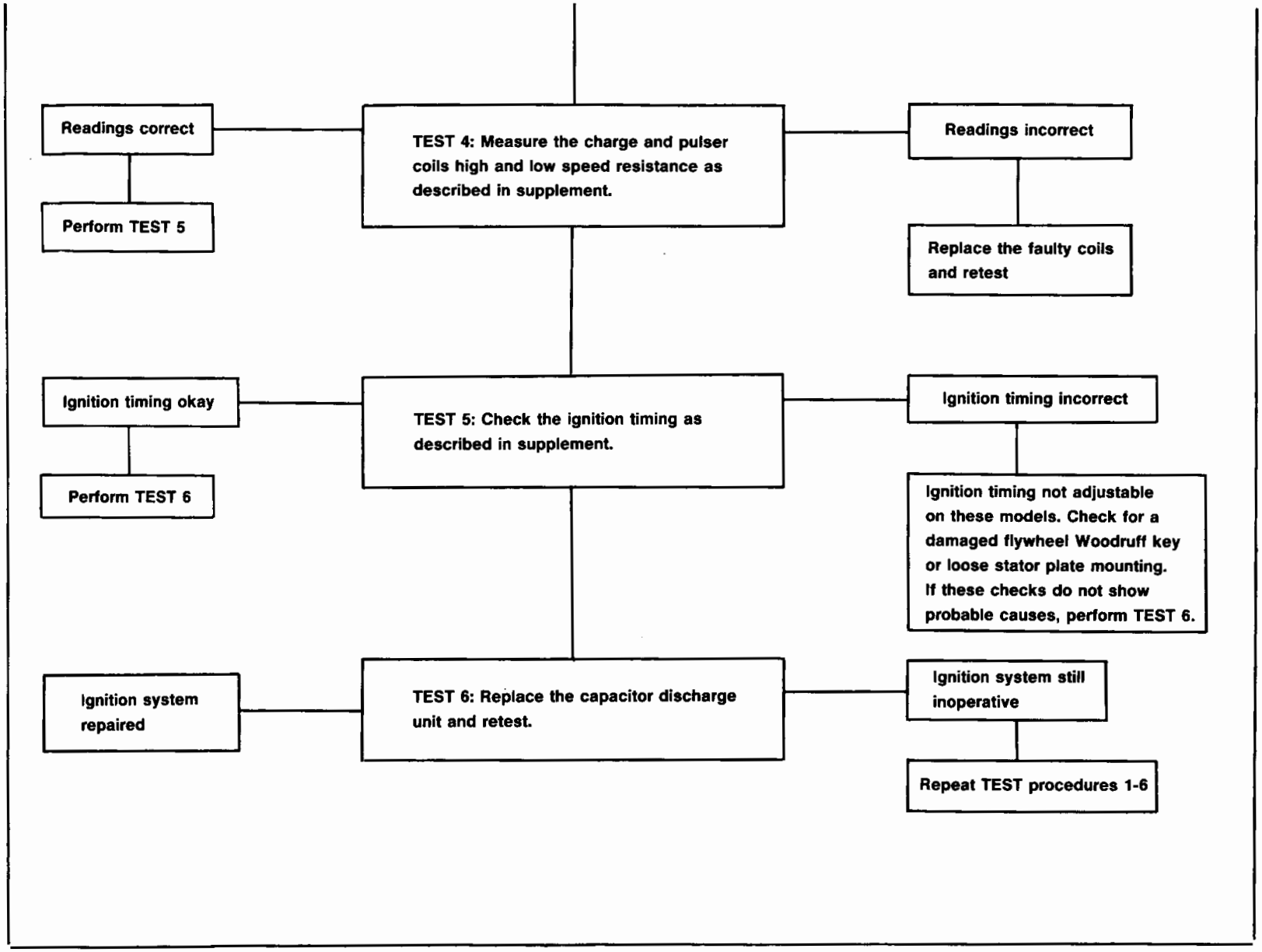
Use an ohmmter set at R×10 and check resistance between the following terminals.

ELECTRONIC IGNITION SYSTEM DIAGNOSIS

(67)

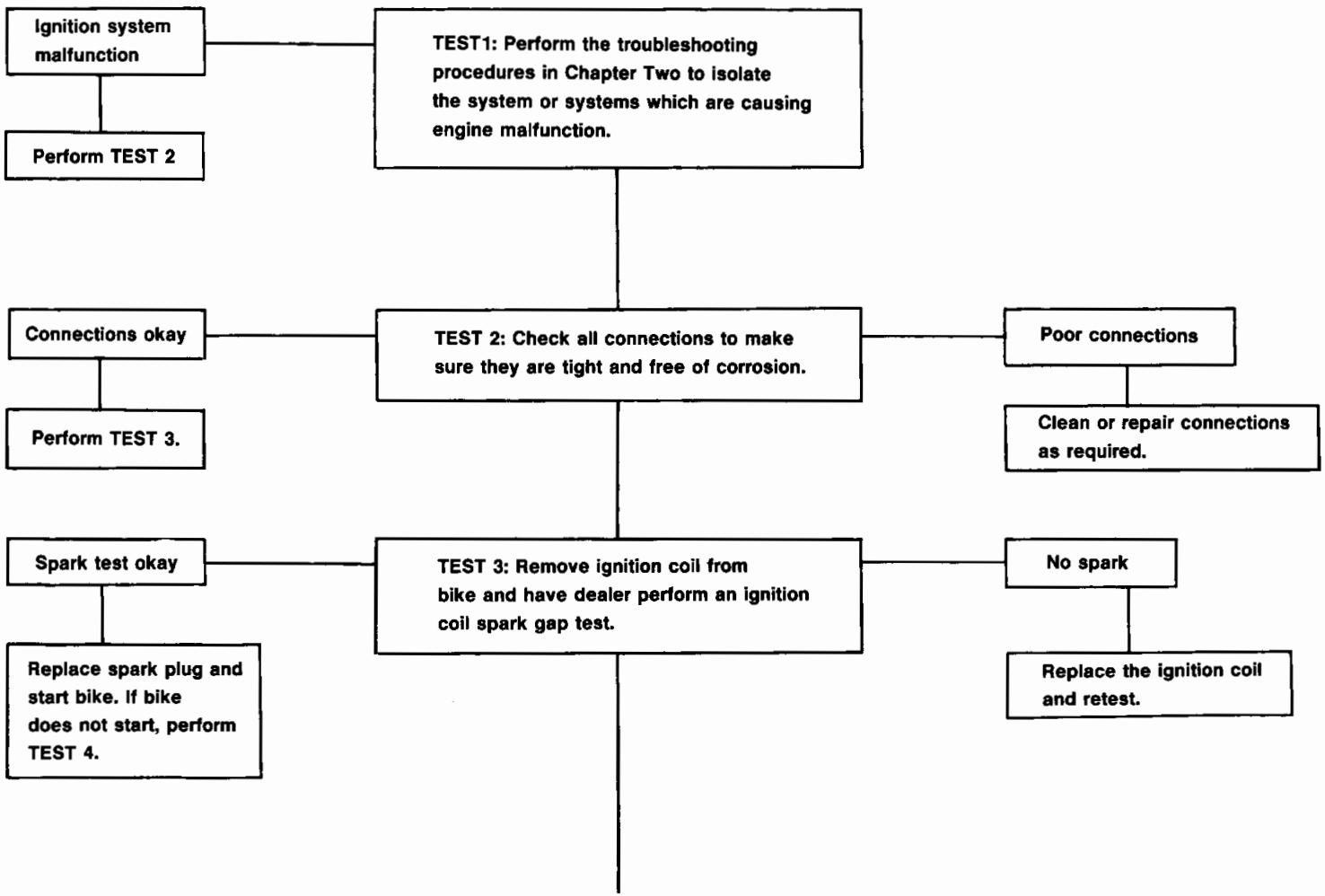
PROBLEM: ENGINE STARTS BUT WILL NOT GAIN SPEED

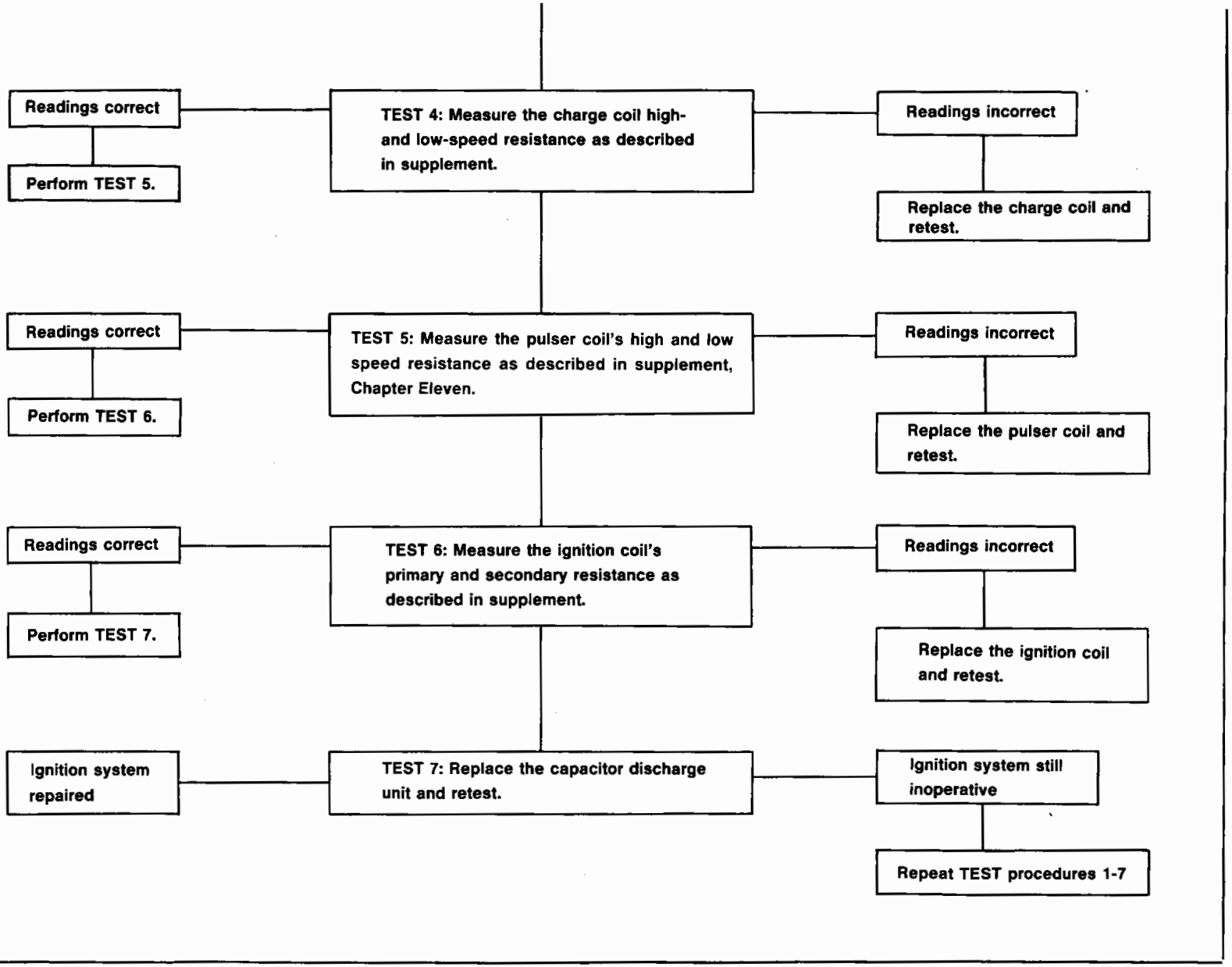



Readings correct
Perform TEST 5
TEST 4: Measure the charge and pulser coils high and low speed resistance as described in supplement.
Readings incorrect
Replace the faulty coils and retest
Ignition timing okay
Perform TEST 6
TEST 5: Check the ignition timing as described in supplement.
Ignition timing incorrect
Ignition timing not adjustable on these models. Check for a damaged flywheel Woodruff key or loose stator plate mounting. If these checks do not show probable causes, perform TEST 6.
Ignition system repaired
TEST 6: Replace the capacitor discharge unit and retest.
Ignition system still inoperative
Repeat TEST procedures 1-6

ELECTRONIC IGNITION SYSTEM DIAGNOSIS

PROBLEM: WEAK SPARK OR NO SPARK AT ALL



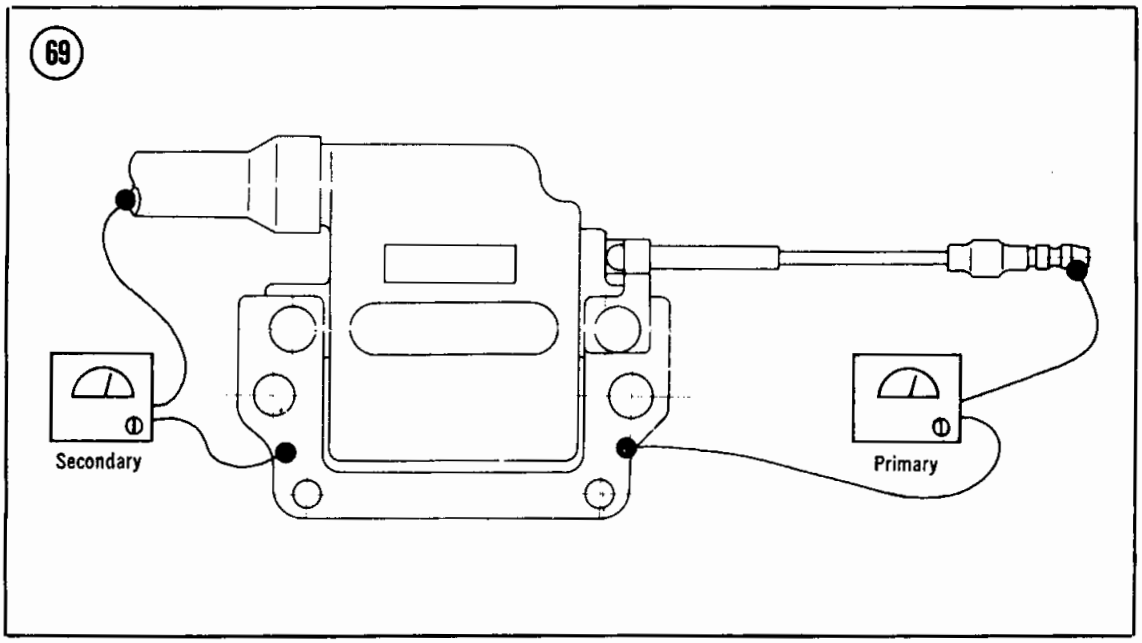

Readings correct
Perform TEST 5.
TEST 4: Measure the charge coil high- and low-speed resistance as described in supplement.
Readings incorrect
Replace the charge coil and retest.
Readings correct
Perform TEST 6.
TEST 5: Measure the pulser coil's high and low speed resistance as described in supplement, Chapter Eleven.
Readings incorrect
Replace the pulser coil and retest.
Readings correct
Perform TEST 7.
TEST 6: Measure the ignition coil's primary and secondary resistance as described in supplement.
Readings incorrect
Replace the ignition coil and retest.
Ignition system repaired
TEST 7: Replace the capacitor discharge unit and retest.
Ignition system still inoperative
Repeat TEST procedures 1-7

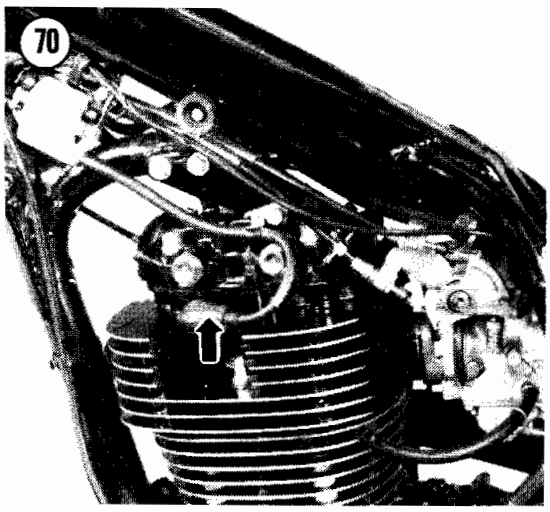
a. Charging coil windings: Black to white—0.28 ohms ± 10%.
b. Lighting coil windings: Black to yellow—0.24 ohms ± 10%.

Ignition Coil Testing

Refer to **Figure 69** for this procedure. Disconnect the ignition coil wires before testing. See **Figure 70** (secondary wire) and **Figure 71** (primary wires).

1. Measure the coil primary resistance using an ohmmeter set at R×1. Measure the resistance between the primary terminal and the mounting flange. The value should be 0.98 ohms ± 20%.
2. Measure the secondary resistance using an ohmmeter set at R×100. Measure the resistance between the secondary lead (spark plug lead) and the mounting flange. The value should be 14K ohms ± 20%.
3. If the coil resistance does not meet these specifications, the coil must be replaced. If the coil exhibits visible damage, it should be replaced.





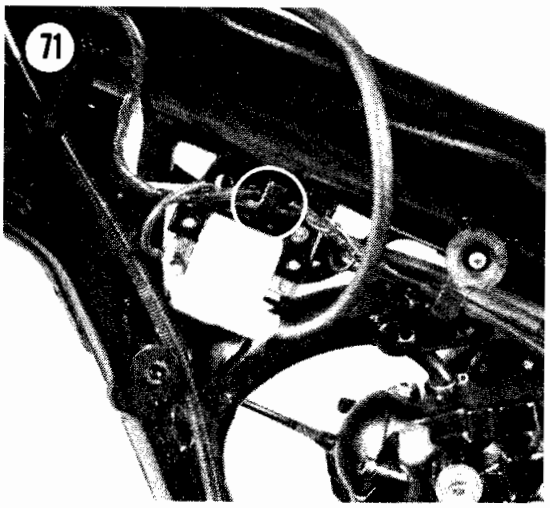


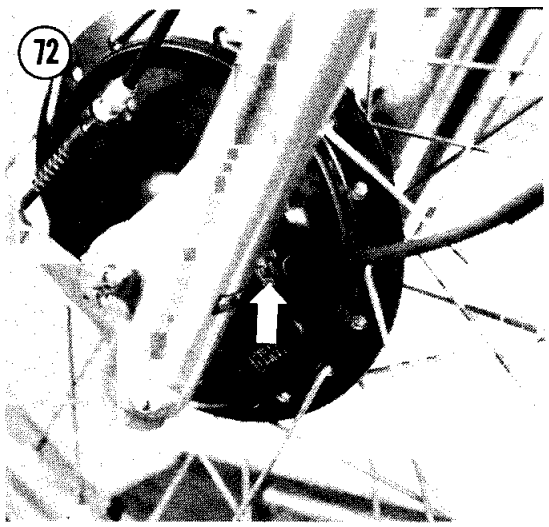
Table 4 ELECTRICAL SYSTEM

Item*	Rating
Headlamp	
1978	30W/30W
1979-on	35W/35W
Tail/stoplamp	
1978	5.3W/17W
1979-on	5.3W/25W
Directional lamps	17W
Directional indicator	3W
Instrument lamps	3W
High-beam indicator	3W
Neutral indicator	3W
Fuse	10 amps

* All bulbs rated 6 volts.

CHAPTER EIGHT

FRONT SUSPENSION AND STEERING



FRONT WHEEL (1979-ON MODELS)

Removal/Installation

1. Block up the front end to raise the wheel off the ground.

NOTE

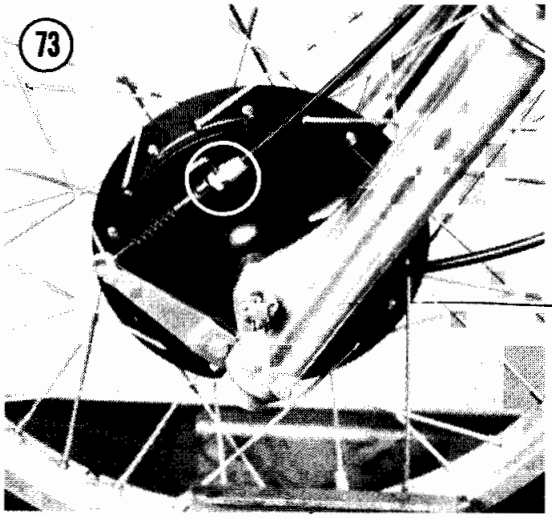
Step 2 and Step 3 are necessary only if the brake backing plate is to removed from the bike for cleaning or wear inspection.

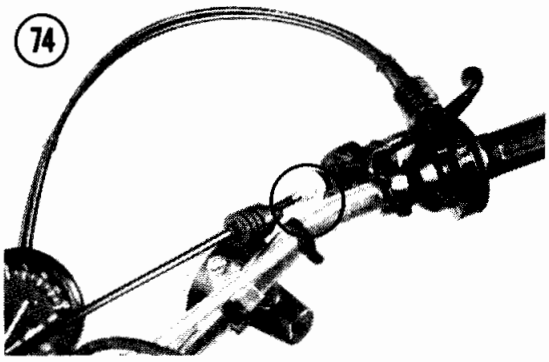
2. *XT models*: Disconnect the speedometer cable from the brake backing plate (**Figure 72**).
3. At the wheel, loosen the brake cable adjuster locknut and screw in the adjuster to

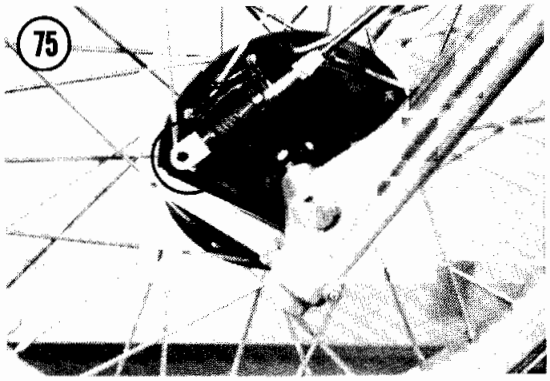
10

slacken the cable. Then disconnect the cable from the brake arm and backing plate. See **Figure 73**. If sufficient cable slack cannot be obtained at the brake arm, slacken the brake cable at the handlebar brake adjuster (**Figure 74**). Then remove the cotter pin and clevis pin from the brake arm and separate the arm from the brake cable (**Figure 75**).

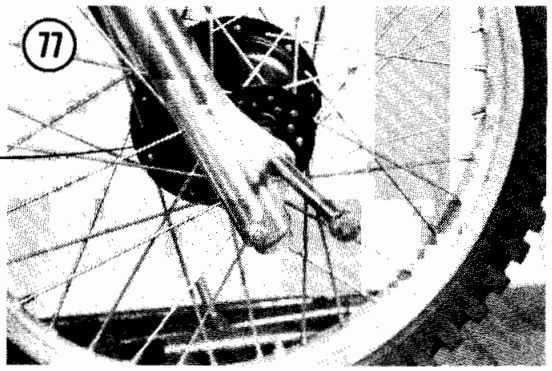
4. Remove and discard the cotter key from the axle (**Figure 76**). Remove the axle nut.
5. Pull the axle out (**Figure 77**) and remove the spacer from the right side of the wheel (**Figure 78**).
6. Remove the backing plate (**Figure 79**) and the front wheel (**Figure 80**).
7. Installation is the reverse of Steps 1-6, noting the following:
   a. When installing the brake backing plate, align it with the torque stopper on the left-hand side fork tube (**Figure 81**).
   b. Tighten the axle nut to 61 ft.-lb. (85 N•m).
   c. Adjust the front brake cable as described in Chapter Three under *Front Brake Adjustment.*
   d. On XT models, inspect the O-ring on the end of the tachometer cable (**Figure 82**) and replace it if necessary.
   e. Make sure the brake and tachometer cable (if so equipped) are routed properly. See **Figure 83** (XT) or **Figure 84** (TT).
   f. Always install new cotter pins.

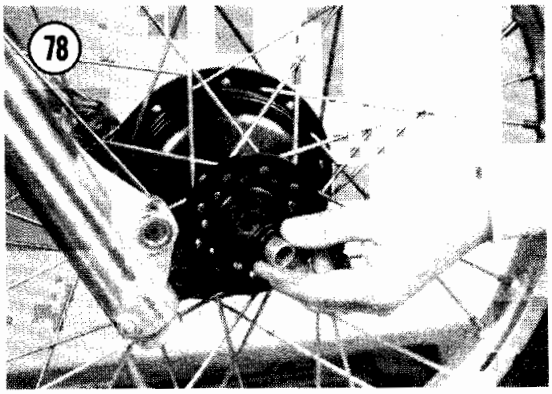


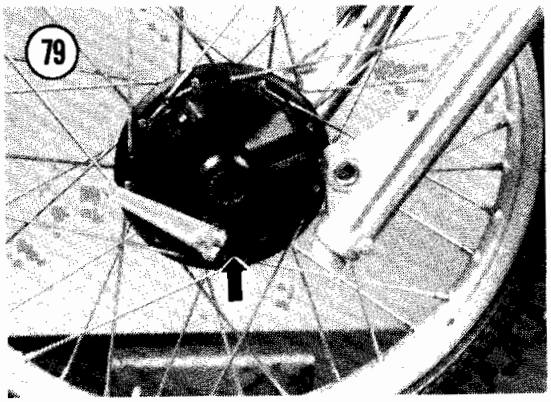


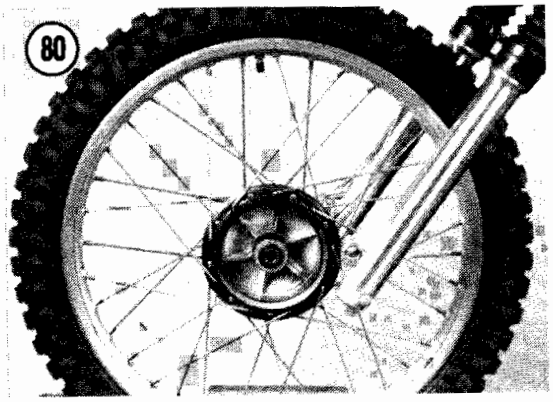


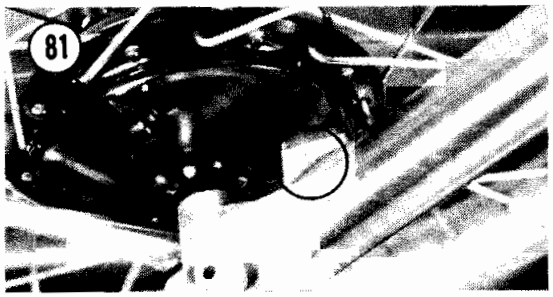


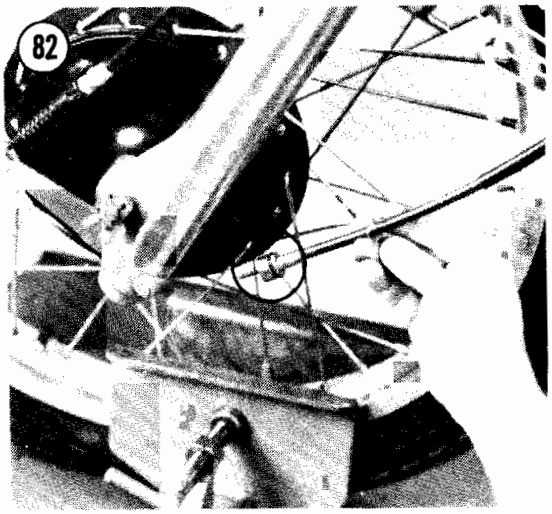


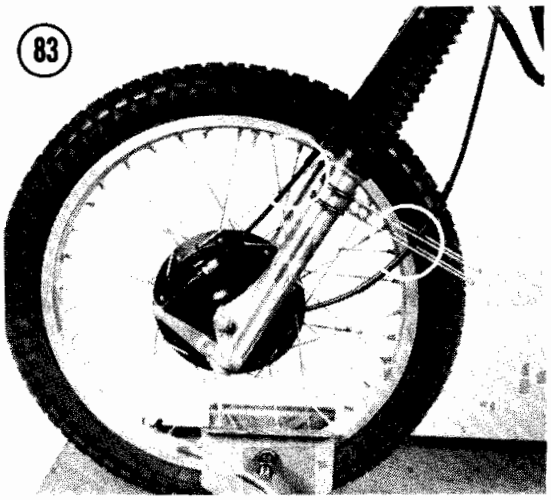

78

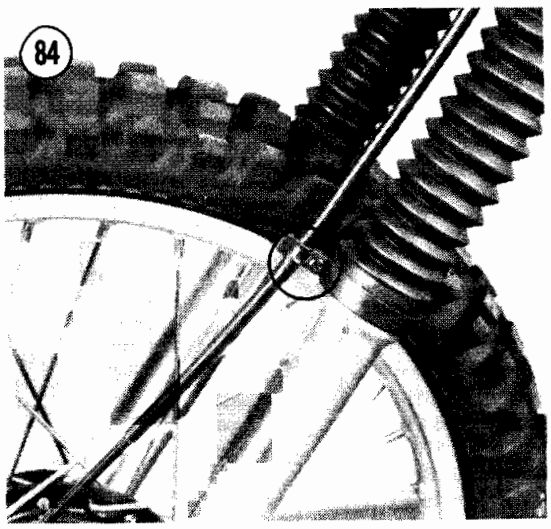

79


80


81


82


83


84

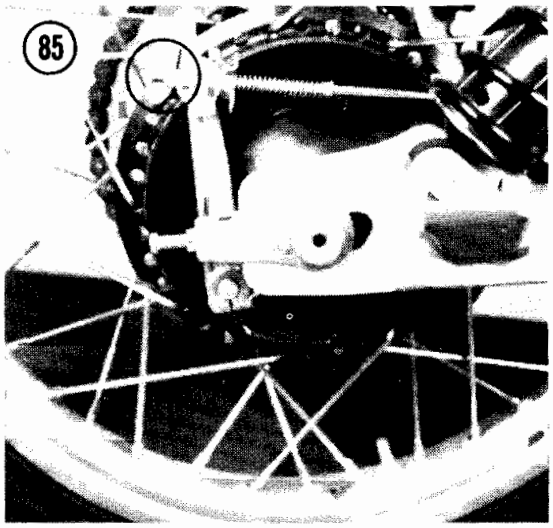
CHAPTER NINE

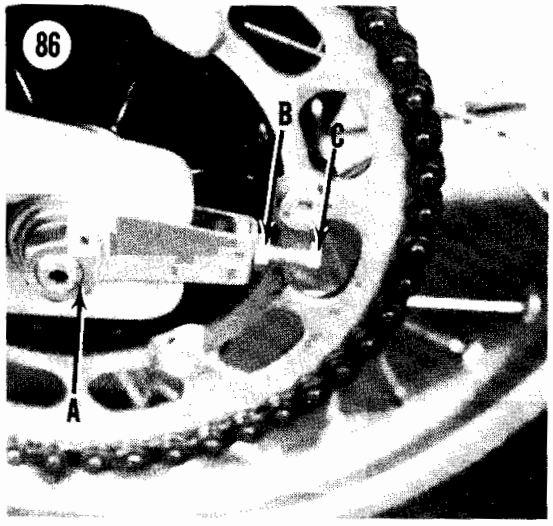
REAR SUPENSION

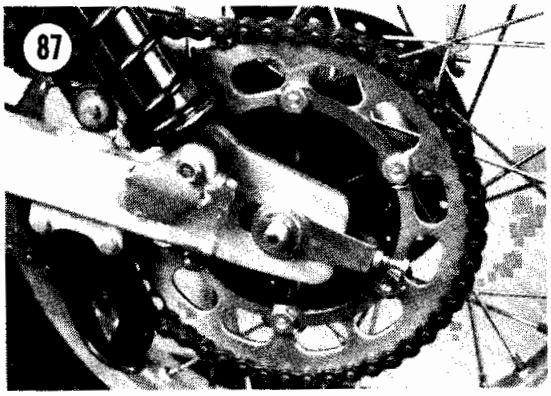
REAR WHEEL (1979-ON TT MODELS)

Removal/Installation

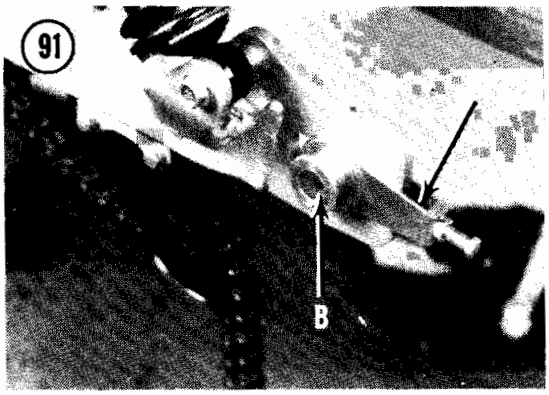
1. Block up the motorcycle so that the rear wheel is clear of the ground.
2. Disconnect the brake rod at the brake lever (**Figure 85**).
3. Remove the axle nut (A, **Figure 86**) and washer (**Figure 87**).
4. Loosen the left and right side axle adjuster locknuts (B, **Figure 86**). Then loosen the chain adjusters (C, **Figure 86**).
5. If it is necessary to remove the chain, disconnect the master link and slide the chain out of the bike.
6. Pull out the axle (**Figure 88**). Then remove the spacers from the right (**Figure 89**) and left (**Figure 90**) sides.
7. Installation is the reverse of these steps, noting the following:
   a. Make sure the chain adjuster (A, **Figure 91**) and spacer (B, **Figure 91**) are installed on both sides of the swing arm.
   b. Make sure to engage the boss on the swing arm (**Figure 92**) with the locating slot on the brake shoe backing plate (**Figure 93**).
   c. When installing the drive chain, make sure the master link clip closed end is facing the direction of rotation. See **Figure 94**.
   d. Adjust the drive chain as described in the Chapter Three section of this supplement.



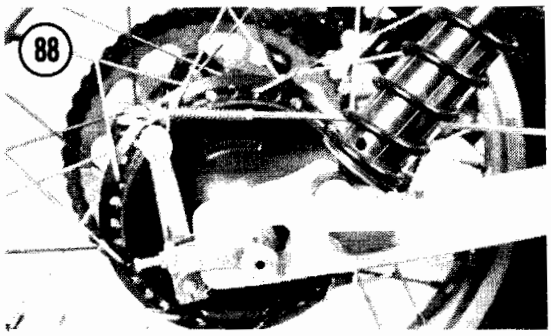




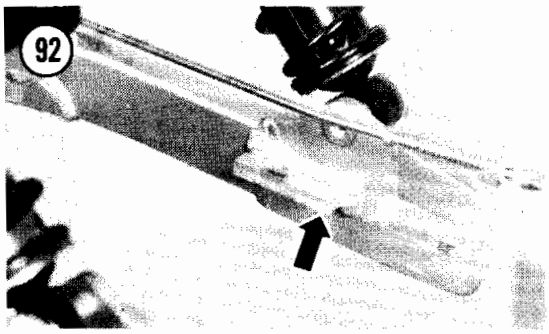
87



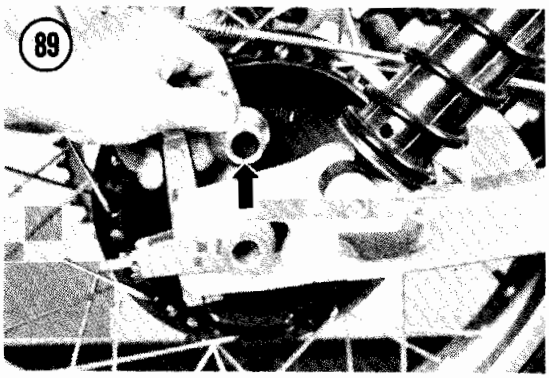
91



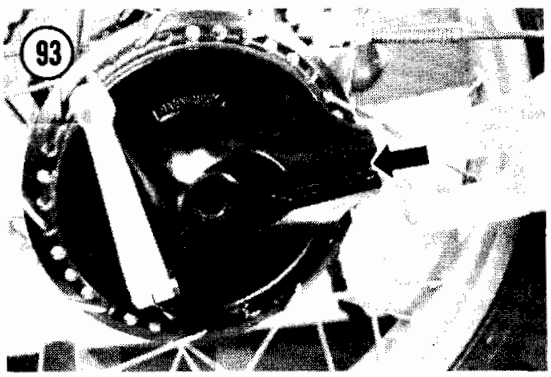
88



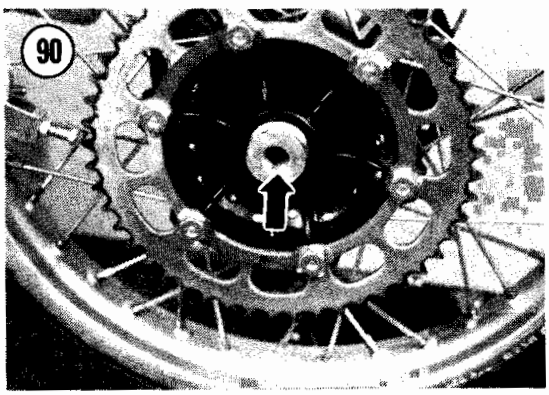
92



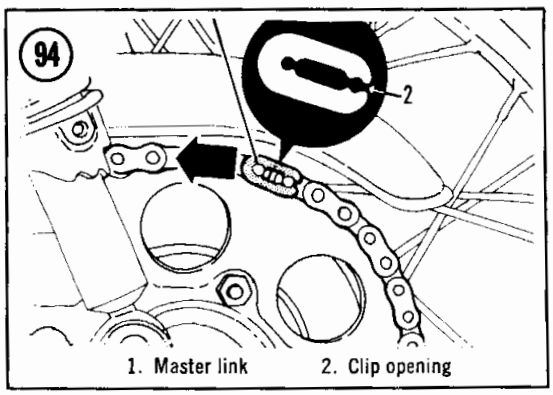
89



93



90



94

1. Master link 2. Clip opening

INDEX

A

Air cleaner 31-32, 99

B

Battery 107-110
Brake, front 16-17, 129-130
Brake lining condition 17-18
Brake problems 9
Brake, rear 17, 141-142

C

Carburetor 32, 99-104, 152-158
Carburetor service 13, 147-149
Charging system 110-112, 159
Clutch 78-85
  Adjustment 15-16
  Assembly 83-85
  Disassembly 78-82
  Inspection 82-83
  Slip or drag 7-8
Compression release 14-15
Control cable lubrication 22

D

Drive chain 19-22, 138-139, 145
Drive sprockets 140-141

E

Electrical system
  Maintenance 23
  Problems 9
Engine
  Bottom end assembly 68-77, 151
  Bottom end disassembly 58-65
  Bottom end inspection 65-68
  Cylinder head assembly 50-52
  Cylinder head inspection 46-49
  Installation 41-43
  Leak test 50
  Misfiring 7
  Noises 7
  Overheating 7
  Parts 34
  Piston and cylinder inspection 52-54
  Piston seizure 7
  Power loss 7
  Removal 34-41
  Upper end assembly 54-58
  Upper end disassembly 43-46
  Valve guide replacement 50
  Valve lapping 49-50
  Tools 34
  Tune-up 23-32
  Vibration 7
Exhaust system 13, 105-106, 145

F

Flywheel 13-14, 159-162
Fork oil changing 18-19, 145
Forks, front 18, 112-126
Fuel line 144
Fuel tank 23, 105
Fuel valve 23, 104-105
Fuse 115

I

Idling 7
Ignition 115-116
Ignition timing 30, 146-147
Ignition troubleshooting 162-169

L

Lighting system 112-115

M

Maintenance
- Brake (front) adjustment 16-17
- Brake lining condition 17-18
- Brake (rear) adjustment 17
- Carburetor service 13
- Clutch adjustment 15-16
- Compression release 14-15
- Control cable lubrication 22
- Drive chain 19-22
- Electrical system 23
- Exhaust system service 13
- Flywheel nut 13-14
- Front fork and steering inspection 18
- Fork oil changing 18-19
- Fuel tank and fuel valve 23
- Oil and filter change 10-12
- Oil pressure 15
- Suspension (rear) inspection 19
- Swing arm 19
- Wheels and spokes 19
- 1978 and later service information 144

O

Oil and filter change 10-12
Oil pressure 15
Overheating 7

P

Petcock 104-105

S

Seal replacement 126
Shock absorbers 136
Spark plug 27-29
Spokes 19
Starting difficulties 6-7
Steering 18, 126-129
Suspension (rear) inspection 19
Swing arm 19, 136-138
Switches 115

T

Throttle cable adjustment 32, 148-149
Tools 2-3, 6, 34
Transmission 85-98
- Assembly 89-98
- Disassembly 86-87
- Inspection 88-89
- Troubleshooting 8

Tune-up 23-32
- Air cleaner 31-32
- Cam chain adjustment 25-26
- Carburetor adjustment 32
- Compression check 26-27
- Contact breaker 29-30
- Cylinder head fastener torque 23-25
- Ignition timing 30
- Spark plug 27-29
- Throttle cable adjustment 32
- Valve adjustment 26

V

Valve adjustment 26
Valve guide replacement 50
Valve lapping 49-50

W

Wheel, front 117-112, 169-171
Wheel, rear 131-136, 172-173
Wheels and spokes 19
Wiring diagrams 116

NOTES