Kawasaki

INTRUDER

ST440-A4



SNOWMOBILE SHOP MANUAL

Foreword

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

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

Whenever you see the symbols shown below, heed their instructions! Always follow safe operating and maintenance practices.

WARNING

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

CAUTION

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

NOTE: Indicates points of particular interest for more efficient and convenient operation.

This manual is divided into the following four sections:

(1) Specifications

This section contains general and technical specifications, a complete torque chart and engine performance curves.

(2) Maintenance and Theory of Operation

The procedures for inspection, adjustments and minor repair are described in this section. An explanation on the structure and function of each of the major components and assembly enables the mechanic to better understand what he is doing.

(3) Repair

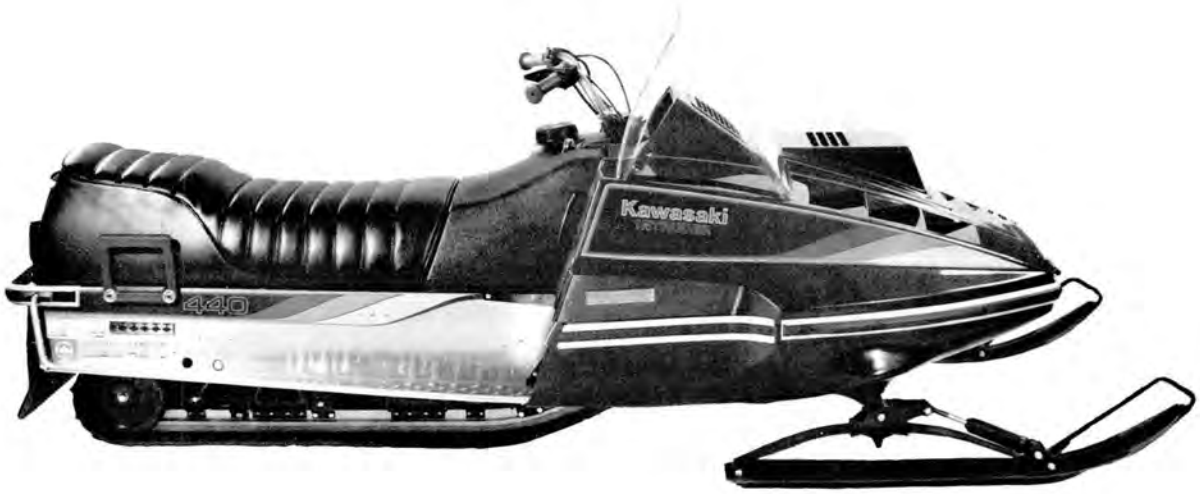
This section shows the best method for removal, disassembly, inspection, assembly, and installation which are necessary for proper maintenance and repair. Assembly and installation notes are provided to explain special points.

(4) Appendix

The appendix in the back of the manual contains miscellaneous information, including metric reference and conversion charts, special tools, wiring diagram, and an index.

This shop manual has been prepared to assist the mechanic in servicing the KAWASAKI snowmobiles. All procedures contained within should be followed closely.

Model Identification



ST440-A4

Quick Reference Guide

SECTION

Specifications 1

Maintenance and Theory 2

Repair 3

Appendix 4

Using the quick reference guide will assist you in quickly locating a desired topic or procedure contained within this shop manual. Bend the pages back until you match the desired section above with the black tab on the right hand side of the table of contents for that section. Refer to the table of contents for the exact page(s) to locate the specific topic or procedure required.

Specifications

Table of Contents

	Page
General Specifications	1-2
Service Specifications	1-7
Torque Chart	1-9
Gear Ratio Chart	1-13
Engine Performance Curves/Port Dimensions	1-14

1

General Specifications

GENERAL

Overall Length	103 in. (2616 mm)
Overall Width	40.5 in. (1029 mm)
Overall Height (With Windshield)	40.5 in. (1029 mm)
Dry Weight (Approximate)	425 lb (193 kg)

ENGINE

Model	TA440C-D201
Displacement	26.6 C.I. (436cc)
Bore x Stroke	2.677 x 2.362 in. (68 x 60 mm)
Number of Cylinders	2
Engine RPM at Full Throttle	7,100 to 7,300 RPM
Engine RPM at Idle Speed	2,500 RPM
Starter	Electric and Manual

IGNITION

Ignition System	Capacitor Discharge (C.D.)
Spark Plug	NGK BZ-9EV

CARBURETOR

	LEFT SIDE	RIGHT SIDE
Carburetor Make	Mikuni	Mikuni
Carburetor Model	VM 32 Econo Jet	VM 32 Econo Jet
Identification Marking	L32/185	R32/189
Type of Carburetor	Open Vent	Open Vent
Main Jet	155	155
Air Jet	None	None
Jet Needle	6DH7-3	6DH7-3
Needle Jet	Q-4	Q-4
Throttle Slide (Cut Away)	0.098 in. (2.5 mm)	0.098 in. (2.5 mm)
Pilot Jet	25	25
By Pass	0.055 in. (1.4 mm)	0.055 in. (1.4 mm)
Pilot Outlet	0.031 in. (0.8 mm)	0.031 in. (0.8 mm)
Air Screw	1.5 Turns	1.5 Turns
Float Valve Seat	0.059 in (1.5 mm)	0.059 in. (1.5 mm)
Starter Jet	0.059 in. (1.5 mm)	0.059 in. (1.5 mm)
Type of Float Chamber	Special	Special
Starter System	Dual Position Cable	Dual Position Cable
Econo (Power) Jet	140 Round-Reverse Type	120 Round - Reverse Type

FUEL/OIL

Gasoline	Premium or regular leaded (minimum pump posted octane number 89)
Oil	Kawasaki Snowmobile Oil (B.I.A. certified T.C.W.)
Gasoline/Oil Ratio	Oil Injection
Oil Tank Capacity	2.5 Quarts (2.37 liters)
Fuel Tank Capacity	8.0 Gallons (30.2 liters)

DRIVE CONVERTER

Engagement Speed (approximate RPM)	3600
Drive Converter RPM	7,100-7,300
Spring Part Number and Color (Standard)	92081-3001 (Yellow)
Spring Part Number and Color (Optional)	92081-3004 (Pink) 92081-3005 (Red) 92081-3006 (Blue) 92081-3002 (Black) 92081-3011 (White)
Spring Length - New with no load ± 0.25 in. (6.3 mm)	3.96 in. (Yellow) (100.5 mm) 3.54 in. (Pink) (89.9 mm) 3.74 in. (Red) (94.9 mm) 4.14 in. (Blue) (105.2 mm) 4.33 in. (Black) (110.0 mm) 4.74 in. (White) (120.4 mm)
Number of Spring Coils (All Colors)	6
Spring Wire Diameter ± 0.01 in. (0.2 mm) All Colors	0.197 in. (5.0 mm)
Spring Rate ± 2.8 lb in. (0.05 kg-mm) All Colors	56 lb in. (1.0 kg-mm)
Spring Compression ± 5.5 lb (2.5 kg)	77.2 lb @ 2.54 in. (35.6 kg @ 64.5 mm) (Yellow) 55.1 lb @ 2.54 in. (25.4 kg @ 64.5 mm) (Pink) 66.1 lb @ 2.54 in. (30.4 kg @ 64.5 mm) (Red) 88.2 lb @ 2.54 in. (40.7 kg @ 64.5 mm) (Blue) 99.2 lb @ 2.54 in. (45.6 kg @ 64.5 mm) (Black) 123.2 lb @ 2.54 in. (55.9 kg @ 64.5 mm) (White)
Spring Outside Diameter ± 0.025 in. (0.63 mm) All Colors	2.28 in. (57.9 mm)
Weight Part Numbers (Standard)	110G0628 13042-3002 92019-008
Ramp Part Number and Identification (Standard)	39152-3005 "E"
Weight - Total gram weight (Standard)	63.1 grams

DRIVE CONVERTER COMPONENT WEIGHT CHART

Part Number	Component	Gram Weight
13042-3001	Weight, 0.031 in. (0.8 mm) thick	0.5
13042-3002	Weight, 0.062 in. (1.6 mm) thick	1.0
92019-008	Nut, special 6 mm	2.3
92001-3009	Bolt, aluminum, 6 x 15 mm	1.8
92001-3003	Bolt, aluminum, 6 x 20 mm	2.1
92001-3015	Bolt, steel, 6 x 16 mm	5.3
110G0620	Bolt, steel, 6 x 20 mm	6.0
110G0628	Bolt, steel, 6 x 28 mm	7.3
39152-3005	Weight Assembly E	47.5

DRIVE CONVERTER RAMP WEIGHT COMBINATIONS USING BOLT PART NUMBER 92001-3015 (6 x 16 mm STEEL)

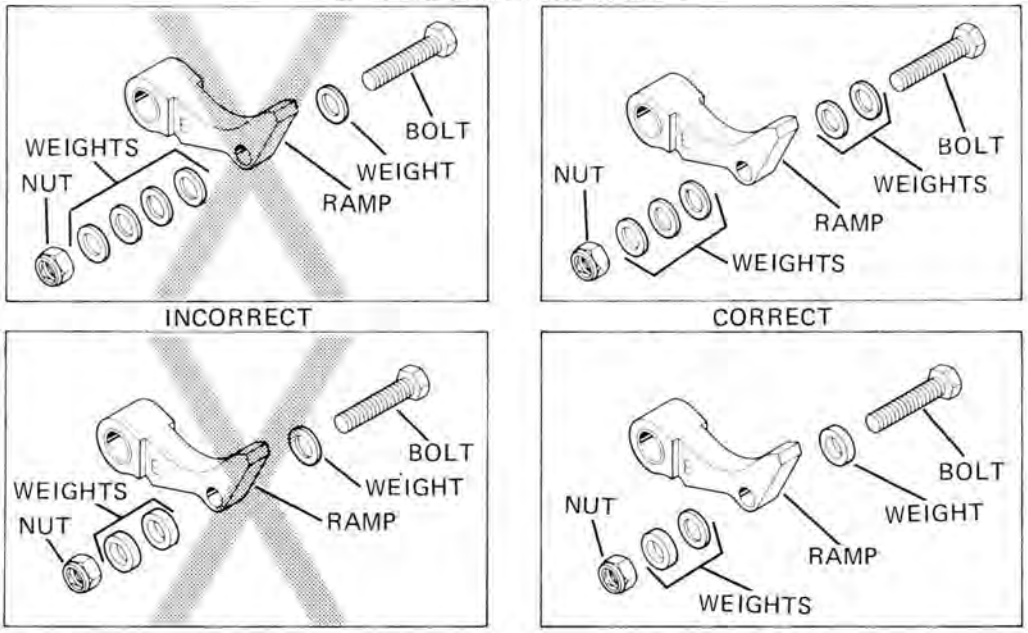
Total Ramp Weight-Grams	Number of Weights Installed	Weight (0.5 gram each) 0.031 in. (0.8 mm) thick Part Number 13042-3001	Bolt 6 x 16 mm Part Number 92001-3015	Nut Special Part Number 92019-008	Ramp Weight Part Number 39152-3005
55.1 grams	0	0	5.3 grams	2.3 grams	47.5 grams
55.6 grams	1	0.5 gram	5.3 grams	2.3 grams	47.5 grams
56.1 grams	2	1.0 gram	5.3 grams	2.3 grams	47.5 grams

CAUTION

To permit proper installation and security of nut, do not exceed a maximum of 2 installed weights Part Number 13042-3001 (0.031 in., 0.8 mm thick) on 6 x 16 mm bolts.

NOTE: Installed weight positioning must not exceed 0.5 gram difference on each side of ramp as shown in illustration.

RAMP WEIGHT POSITIONING



DRIVE CONVERTER RAMP WEIGHT COMBINATIONS USING BOLT PART NUMBER 110G0620 (6 x 20 mm STEEL)

Total Ramp Weight-Grams	Number of Weights Installed	Weight (0.5 gram each) 0.031 in. (0.8 mm) thick Part Number 13042-3001	Bolt 6 x 20 mm Part Number 110G0620	Nut Special Part Number 92019-008	Ramp Weight Part Number 39152-3005
55.8	0	0	6.0 grams	2.3 grams	47.5 grams
56.3	1	0.5 gram	6.0 grams	2.3 grams	47.5 grams
56.8	2	1.0 gram	6.0 grams	2.3 grams	47.5 grams
57.3	3	1.5 grams	6.0 grams	2.3 grams	47.5 grams
57.8	4	2.0 grams	6.0 grams	2.3 grams	47.5 grams
58.3	5	2.5 grams	6.0 grams	2.3 grams	47.5 grams
58.8	6	3.0 grams	6.0 grams	2.3 grams	47.5 grams
59.3	7	3.5 grams	6.0 grams	2.3 grams	47.5 grams

CAUTION

To permit proper installation and security of nut, do not exceed a maximum of 7 installed weights Part Number 13042-3001 (0.031 in., 0.8 mm thick) on 6 x 20 mm bolts.

NOTE: One weight Part Number 13042-3002 (0.062 in., 1.6 mm thick) may be substituted for two weights Part Number 13042-3001 (0.031 in., 0.8 mm thick) providing that installed weight positioning does not exceed 0.5 gram difference on each side of ramp as shown in illustration.

DRIVE CONVERTER RAMP WEIGHT COMBINATIONS USING BOLT PART NUMBER 92001-3003 (6 x 20 mm ALUMINUM)

Total Ramp Weight-Grams	Number of Weights Installed	Weight (0.5 gram each) 0.031 in. (0.8 mm) thick Part Number 13042-3001	Bolt 6 x 20 mm Part Number 92001-3003	Nut Special Part Number 92019-008	Ramp Weight Part Number 39152-3005
51.9 grams	0	0	2.1 grams	2.3 grams	47.5 grams
52.4 grams	1	0.5 gram	2.1 grams	2.3 grams	47.5 grams
52.9 grams	2	1.0 gram	2.1 grams	2.3 grams	47.5 grams
53.4 grams	3	1.5 grams	2.1 grams	2.3 grams	47.5 grams
53.9 grams	4	2.0 grams	2.1 grams	2.3 grams	47.5 grams
54.4 grams	5	2.5 grams	2.1 grams	2.3 grams	47.5 grams
54.9 grams	6	3.0 grams	2.1 grams	2.3 grams	47.5 grams
55.4 grams	7	3.5 grams	2.1 grams	2.3 grams	47.5 grams

CAUTION

To permit proper installation and security of nut, do not exceed a maximum of 7 installed weights Part Number 13042-3001 (0.031 in., 0.8 mm thick) on 6 x 20 mm bolts.

NOTE: One weight Part Number 13042-3002 (0.062 in., 1.6 mm thick) may be substituted for two weights Part Number 13042-3001 (0.031 in., 0.8 mm thick) providing that installed weight positioning does not exceed 0.5 gram difference on each side of ramp as shown in illustration.

DRIVE CONVERTER RAMP WEIGHT COMBINATIONS USING BOLT PART NUMBER 110G0628 (6 x 28 mm STEEL)

Total Ramp Weight-Grams	Number of Weights Installed	Weight (0.5 gram each) 0.031 in. (0.8 mm) thick Part Number 13042-3001	Bolt 6 x 28 mm Part Number 110G0628	Nut Special Part Number 92019-008	Ramp Weight Part Number 39152-3005
57.1 grams	0	0	7.3 grams	2.3 grams	47.5 grams
57.6 grams	1	0.5 gram	7.3 grams	2.3 grams	47.5 grams
58.1 grams	2	1.0 gram	7.3 grams	2.3 grams	47.5 grams
58.6 grams	3	1.5 gram	7.3 grams	2.3 grams	47.5 grams
59.1 grams	4	2.0 grams	7.3 grams	2.3 grams	47.5 grams
59.6 grams	5	2.5 grams	7.3 grams	2.3 grams	47.5 grams
60.1 grams	6	3.0 grams	7.3 grams	2.3 grams	47.5 grams
60.6 grams	7	3.5 grams	7.3 grams	2.3 grams	47.5 grams
61.1 grams	8	4.0 grams	7.3 grams	2.3 grams	47.5 grams
61.6 grams	9	4.5 grams	7.3 grams	2.3 grams	47.5 grams
62.1 grams	10	5.0 grams	7.3 grams	2.3 grams	47.5 grams
62.6 grams	11	5.5 grams	7.3 grams	2.3 grams	47.5 grams
63.1 grams	12	6.0 grams	7.3 grams	2.3 grams	47.5 grams
63.6 grams	13	6.5 grams	7.3 grams	2.3 grams	47.5 grams
64.1 grams	14	7.0 grams	7.3 grams	2.3 grams	47.5 grams
64.6 grams	15	7.5 grams	7.3 grams	2.3 grams	47.5 grams
65.1 grams	16	8.0 grams	7.3 grams	2.3 grams	47.5 grams
65.6 grams	17	8.5 grams	7.3 grams	2.3 grams	47.5 grams

CAUTION

To permit proper installation and security of nut, do not exceed a maximum of 17 installed weights Part Number 13042-3001 (0.031 in., 0.8 mm thick) on 6 x 28 mm bolts.

NOTE: One weight Part Number 13042-3002 (0.062 in., 1.6 mm thick) may be substituted for two weights Part Number 13042-3001 (0.031 in., 0.8 mm thick) providing that installed weight positioning does not exceed 0.5 gram difference on each side of ramp as shown in illustration.

DRIVEN CONVERTER

Cam Angle (Standard)	35°
Cam Angle (Optional)	30°
Spring Part Number	92081-3003
Spring Color	Black
Spring Length - New with no load	6.3 in. (160.0 mm)
Spring Wire Diamteer	0.177 in. (4.5 mm)
Number of Spring Coils	7 ± 1/8
Spring Preload - Counterclockwise	150° B2 or C1

BELT

Part Number	59011-3502
Outside Circumference	46.62 ± 0.19 in. (1.184 ± 4.8 mm)
Width of Top Surfaces	1.25 ± 0.03 in. (31.7 ± 0.8 mm)
Thickness - Top of belt to bottom of lug	0.53 ± 0.03 in. (13.5 ± 0.8 mm)
Belt Taper Angle	30°

BRAKE

Replace brake pads as a set when the distance from outer surface of brake pad tab to brake disc measures less than	1/4 in. (6.4 mm)

GEARING

Top Sprocket	21 Teeth
Lower Sprocket	39 Teeth
Sprocket Overall Ratio	1.86 to 1
Chain (Silent Type)	66 Pitch
Chain Tensioner Spring	Green
Drive Chain Tension	Self Adjusting

TRACK AND SUSPENSION

Track Type	Rubber (Internal Drive Lug) Molded in Fiberglass Bar
Track Width	15 in. (381 mm)
Track Length	121 in. (3,073.4 mm)
Suspension	Slide Rail

ELECTRICAL COMPONENTS

Type	12 VDC, 120 W
Headlight Bulb Part Number	92069-3501 12 V, 60/60 W
Tail/Brake Light	G.E. # 1157
Instrument Light	G.E.#1816
Battery	12 Volt 22 ampere/hours capacity @ 10 hour discharge rate
Electrolyte Volume	1.5 quarts (1.4 liters)

FRAME

Frame	Aluminum alloy and HSLA steel construction

Service Specifications

ENGINE

Effective Compression Ratio	7.3 to 1
Piston Ring End Gap (Top)	0.008-0.016 in. (0.2-0.4 mm)
Piston Ring End Gap (Bottom)	0.008-0.016 in.. (0.2-0.4 mm)
Piston Skirt Clearance	0.002-0.004 in. (0.05-0.10 mm)
Connecting Rod Radial Play	0.0008-0.001 in. (0.02-0.03 mm)
Connecting Rod Side Clearance	0.016-0.020 in. (0.4-0.5 mm)
Connecting Rod Small End Diameter	0.787-0.789 in. (20.0-20.5 mm)
Crankshaft End Play (maximum)	0.015 in. (0.38 mm)
Crankshaft Run Out (maximum)	0.002 in. (T.I.R.) (0.05 mm)
Cylinder Head Capacity*	18.3 + .4 cc

*Measured with standard spark plug installed.

IGNITION

Spark Plug Gap	0.024 in. (0.6 mm)
Ignition Timing (Dynamic)	18° @ 6500 R.P.M.
Ignition Timing (B.T.D.C.)	0.073 in. (1.86 mm)

MAGNETO RESISTANCE TESTS

Item	Ohmmeter Leads Connected Between	Resistance
Lighting Coil	Yellow-Yellow	0.18 ohm ± 20%
Exciter Coil	Red-Ground	160 ohms ± 20%
Pulser Coil	Red-White	17 ohms ± 20%

CDI IGNITER RESISTANCE TESTS

Item	Ohmmeter Leads Connected Between	Resistance
†Secondary winding	High Tension-High Tension	5,700 ohms ± 15%

†NOTE: Defective coils cannot always be detected using this test alone. Use of a coil tester which simulates operating conditions is the recommended test method.

CARBURETOR

Air Screw Setting (Initial)	1.5 Turns Open
Idle Screw Setting (Initial)	6 Turns Off Seat
(Final)	2,500 R.P.M.
Float Arm Adjustment	Parallel to Body Gasket Surface

CHASSIS

Converter Offset Distance	0.525 to 0.588 in. (13.3 to 14.9 mm)
Converter Center Distance	12 in. (305 mm)
Drive Chain Tension	Self Adjusting
Brake Lever Movement	3/4 in. (19 mm)
Track Tension	3/4 in. (19 mm) maximum deflection (5 to 8 lb pull)
Steering Alignment	Skis parallel or 1/8 in. toe out
Tie Rod End Adjustment Stud Jam Nut Dimension	1-1/4 in. (32 mm) maximum

GENERAL ENGINE TORQUE SPECIFICATIONS

Cylinder Head Bolts	16 ft lb (2.2 kg-m)
Crankcase Bolts and Nuts	16 ft lb (2.2 kg-m)
Flywheel Nut	60 ft lb (8.3 kg-m)
Recoil Bolt	50 in. lb (0.6 kg-m)
Spark Plug	20 ft lb (2.7 kg-m)
Holder (Carb.) Bolts	45 in. lb (0.5 kg-m)
Driven Gear Nut	12 ft lb (1.6 kg-m)
Gearcase Bolts (Socket Head)	12 ft lb (1.6 kg-m)

Torque Chart and Loctite Table

Description	Quantity	Torque	Loctite
ENGINE MOUNT AND EXHAUST			
Engine mount to damper - nuts	6	105 in. lb (1.21 kg·m)	
Muffler mounting - nuts	4	60-70 in. lb (0.69-0.81 kg·m)	
Engine mount to chassis - nuts	2	31 ft lb (4.28 kg·m)	
PTO mount to chassis - screw	5	80-90 in. lb (0.92-1.04 kg·m)	
ELECTRICAL SYSTEM			
Ignition switch - nut	1	30 in. lb (0.35 kg·m)	
Voltage regulator mounting - nut	2	105 in. lb (1.21 kg·m)	
Brake and throttle lever - lockscrew	1	20-25 in. lb (0.23-0.29 kg·m)	
Tail lamp lens mounting - screws	2	50 in. lb (0.57 kg·m)	
Tail lamp to door - nut	2	32 in. lb (0.37 kg·m)	
DRIVE CONVERTER			
Drive converter to crankshaft - bolt	1	65-70 ft lb (9.0-10 kg·m)	
Cover to movable sheave - bolt	6	8-10 ft lb (1.1-1.4 kg·m)	
Roller and pin assembly in movable sheave - bolt	6	8-10 ft lb (1.1-1.4 kg·m)	
Weight ramp and pin assembly to spider - bolt	6	6-8 ft lb (0.8-1.1 kg·m)	
Weight ramp - nut	3	4-5 ft lb (0.5-0.7 kg·m)	
DRIVEN CONVERTER AND BRAKE			
Driven converter to jackshaft - bolt	1	40-50 ft lb (5.53-6.92 kg·m)	
Coupling to fixed sheave - bolt	6	8-10 ft lb (1.1-1.4 kg·m)	
Coupling to flange - bolt	6	8-10 ft lb (1.1-1.4 kg·m)	
Caliper to chaincase - nut	2	35 ft lb (4.84 kg·m)	
CHAINCASE AND JACKSHAFT			
Chaincase mounting - nuts	4	18 ft lb (2.5 kg·m)	
Chaincase cover mounting - screws	6	70 in. lb (0.81 kg·m)	
Jackshaft bearing retainer to chassis - rear bolt	1	31 ft lb (4.28 kg·m)	
Jackshaft bearing retainer to chassis - front bolt	1	19 ft lb (2.63 kg·m)	
Top sprocket mounting - screw	1	40-50 ft lb (5.53-6.92 kg·m)	
Jackshaft - bearing retainer adjusting bolt - jamnut	1	10-20 ft lb (1.38-2.77 kg·m)	
Tensioner arm - bolt	2	70 in. lb (0.81 kg·m)	
Lower sprocket mounting - bolt	1	35 ft lb (4.84 kg·m)	
Bearing retainer cap - nut	2	105 in. lb (1.21 kg·m)	

NOTE: Loctite formulas are selected on the basis of the diameter of the fastener, and the strength of the bond required. Generally, No. 222 is used on fasteners up to 5/16 in. (8 mm) diameter. If a particularly strong bond is required, or the fastener diameter is greater than 5/16 in. (8 mm), No. 242 is specified. Loctite may significantly increase the torque necessary to remove a fastener. Be careful when applying extra force as this risks damaging the parts. Use only the specified formula on each fastener requiring Loctite. Loctite No. 222 and No. 242 are industrial designations. The consumer equivalent which may be substituted is Loctite "Lock 'n Seal," product number 21, blue.

TORQUE CHART (CONTINUED)

Description	Quantity	Torque	Loctite
SUSPENSION			
Rear suspension arm to track guard pipe - nuts	2	11 ft. lb. (1.52 kg·m)	
Rear suspension arm - bolt	2	30 ft. lb. (4.15 kg·m)	
Rear axle - bolts	2	25 ft. lb. (3.46 kg·m)	
Idler shaft - bolts	2	25 ft. lb. (3.46 kg·m)	
Shock absorber mounting - nuts	2	35 ft. lb. (4.84 kg·m)	
Swing arm - bolts	2	25 ft. lb. (3.46 kg·m)	
Wear strip attaching - nuts	2	25 in. lb. (0.29 kg·m)	
Cross shaft mounting - bolts	4	30 ft. lb. (4.15 kg·m)	
Front pivot shaft to chassis - bolts	2	25 ft. lb. (3.46 kg·m)	
Suspension brace - front and rear - bolts	4	25 ft. lb. (3.46 kg·m)	
Limiter strap - nuts	4	45 in. lb. (0.51 kg·m)	
DRIVE SHAFT			
Bearing housing - bolts	3	18 ft. lb. (2.5 kg·m)	
Locking collar set screw	2	72 in. lb. (0.83 kg·m)	222
SKI AND SPINDLE			
Ski skeg attaching - nut (wear runner)	6	120 in. lb. (1.4 kg·m)	
Front spring mount - bolt	2	25 in. lb. (0.29 kg·m)	
Shock absorber to ski and spindle - nut	4	31 ft. lb. (4.28 kg·m)	
Saddle to spring - bolt	4	46 ft. lb. (6.36 kg·m)	
Spindle to ski saddle - nut	2	46 ft. lb. (6.36 kg·m)	
Rear spring mount - bolt	2	31 ft. lb. (4.28 kg·m)	
STEERING			
Handle holder - bolt	1	35 ft. lb. (4.84 kg·m)	
Steering arm to spindle - bolt	2	30 ft. lb. (4.15 kg·m)	
Steering column to tie rod - nut	1	30 ft. lb. (4.15 kg·m)	
Steering arms to tie rods - nuts	2	30 ft. lb. (4.15 kg·m)	
Steering post mounting - bolts	4	18 ft. lb. (2.5 kg·m)	
Tie rod jam - nut (LH)	2	100-120 in. lb. (1.15-1.38 kg·m)	
Tie rod jam - nut (RH)	2	100-120 in. lb. (1.15-1.38 kg·m)	
RH tie rod to steering arm - nut	1	30 ft. lb. (4.15 kg·m)	
Handle bar to steering column mounting - screws	4	105 in. lb. (1.21 kg·m)	
Tie rod adjusting - nuts (RH)	2	100-120 in. lb. (1.15-1.38 kg·m)	
Tie rod adjusting - nuts (LH)	2	100-120 in. lb. (1.15-1.38 kg·m)	

NOTE: Loctite formulas are selected on the basis of the diameter of the fastener, and the strength of the bond required. Generally, #222 is used on fasteners up to 5/16 in. (8 mm) diameter. If a particularly strong bond is required, or the fastener diameter is greater than 5/16 in. (8 mm), #242 is specified. Loctite may significantly increase the torque necessary to remove a fastener. Be careful when applying extra force as this risks damaging the parts. Use only the specified formula on each fastener requiring Loctite. Loctite #222 and #242 are industrial designations. The consumer equivalent which may be substituted is Loctite "Lock 'n Seal," product number 21, blue.

Description	Quantity	Torque	Loctite
CHASSIS			
Snow flap to bulkhead - nut	2	50 in. lb (0.57 kg·m)	
Hood guide and trim mounting - screws	8	20 in. lb (0.23 kg·m)	
Hood guide, front bumper and hood hinge attaching - nuts	18	70 in. lb (0.8 kg·m)	
Passenger handle attaching - nuts	4	10 ft lb (1.38 kg·m)	
Pan brace attaching - screws	2	70 in. lb (0.81 kg·m)	
Rear stay attaching - bolts	2	19 ft lb (2.63 kg·m)	
Trim attaching - screws	2	20 in. lb (0.23 kg·m)	
Seat attaching - bolts	4	35 in. lb (0.40 kg·m)	
FUEL SYSTEM			
Fuel pump assembly mounting - nuts	2	35 in. lb (0.40 kg·m)	
Primer pump - nut	1	30 in. lb (0.35 kg·m)	
CABLES			
Brake cable jam - nuts	2	50 in. lb (0.57 kg·m)	
Enrichener cable assembly - nuts	2	15-20 in. lb (0.17-0.23 kg·m)	
Enrichener assembly pal - nut	1	Hand Tighten	
Speedometer cable - nuts	1	Hand Tighten	
Throttle cable assembly - nuts	2	15-20 in. lb (0.17-0.23 kg·m)	
FAN CASE AND AIR SHROUD			
Air shroud mounting bolts	12	60 in. lb (0.69 kg·m)	222
Fan case to crankcase mounting nuts	4	10-12 ft lb (1.4-1.7 kg·m)	
HOOD			
Hood hinge - nuts	6	25 in. lb (0.29 kg·m)	
Hood latch band - screws	4	Compress rubber 0.06 in. (1.55 mm)	
INSTRUMENT PANEL AND INSTRUMENTS			
Instrument panel bracket - nut	3	95 in. lb (1.09 kg·m)	
Gauges to panel - nuts	6	11 in. lb (0.13 kg·m)	
Instrument panel - screws	6	15 in. lb (0.17 kg·m)	
CRANKSHAFT			
Flywheel - nut	1	60 ft lb (8.30 kg·m)	
CRANKCASE AND CYLINDER			
Cylinder head - nuts	16	16 ft lb (2.2 kg·m)	
Spark plug	2	20 ft lb (2.77 kg·m)	
Crankcase - bolts	8	16 ft lb (2.2 kg·m)	

Description	Quantity	Torque	Loctite
EXHAUST			
Exhaust manifold - nuts	4	8-10 ft lb (1.11-1.38 kg·m)	
CDI MAGNETO			
Stator plate mounting - screws	2	5-6 ft lb (0.69-0.83 kg·m)	
Wire clamps to stator plate - screws	2	Hand tighten	
Exciter coil and pulser coil mounting - screws	2	35 in. lb (0.40 kg·m)	
Lighting coil mounting - screws	2	35 in. lb (0.40 kg·m)	
ELECTRICAL			
CDI igniter mounting - screws	2	60 in. lb (0.69 kg·m)	
Ignition coil mounting - screw	2	5-6 ft lb (0.69-0.83 kg·m)	
RECOIL STARTER			
Drive plate mounting - nut	1	8-10 ft lb (1.11-1.38 kg·m)	
Starter pulley mounting - bolts	3	5-6 ft lb (0.69-0.83 kg·m)	
Starter mounting - bolts	3	5-6 ft lb (0.69-0.83 kg·m)	

Gear Ratio Chart

DRIVEN SPROCKET – NUMBER OF TEETH	Drive Sprocket - Number of Teeth						
	17	18	19	20	21	22	
36			1.90 *75 MPH 64 Red	1.80 *80 MPH 64 Pink			Gear Ratio Speed Chain Pitch Tensioner Spring
37	2.18 *66 MPH 64 Red	2.06 *69 MPH 64 Pink	1.95 *73 MPH 64 Green		1.76 *81 MPH 66 Red	1.68 *85 MPH 66 Pink	Gear Ratio Speed Chain Pitch Tensioner Spring
38	2.24 *64 MPH 64 Pink	2.11 *68 MPH 64 Green		1.90 *75 MPH 66 Red	1.81 *79 MPH 66 Pink	1.73 *83 MPH 66 Green	Gear Ratio Speed Chain Pitch Tensioner Spring
39			2.05 *70 MPH 66 Red	1.95 *73 MPH 66 Pink	1.86 *77 MPH 66 Green		Gear Ratio Speed Chain Pitch Tensioner Spring
40	2.35 *61 MPH 66 Pink	2.22 *64 MPH 66 Pink	2.11 *68 MPH 66 Green	2.00 *72 MPH 66 Green			Gear Ratio Speed Chain Pitch Tensioner Spring

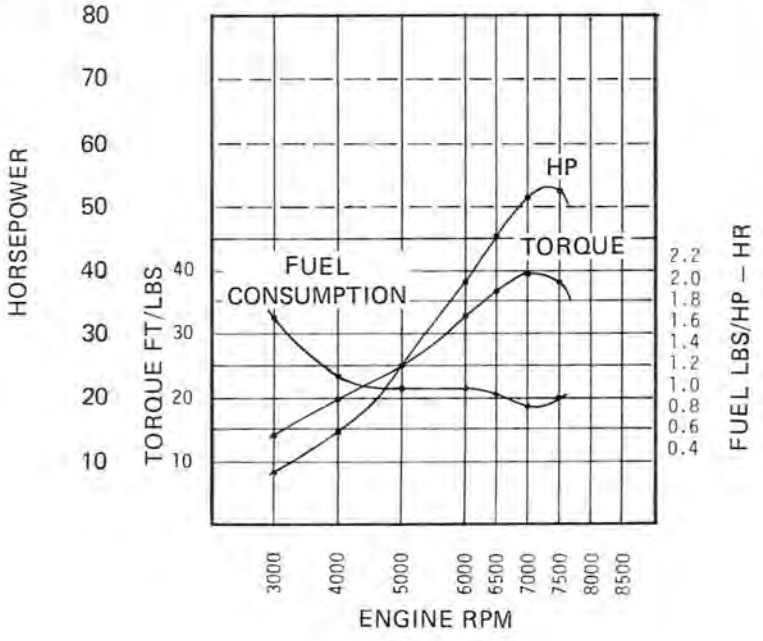
*Theoretical MPH at 7100 RPM

NOTE: All top speeds based on 0.96 overdrive in converter and engine RPM at 7100.

Chain Tensioner Springs

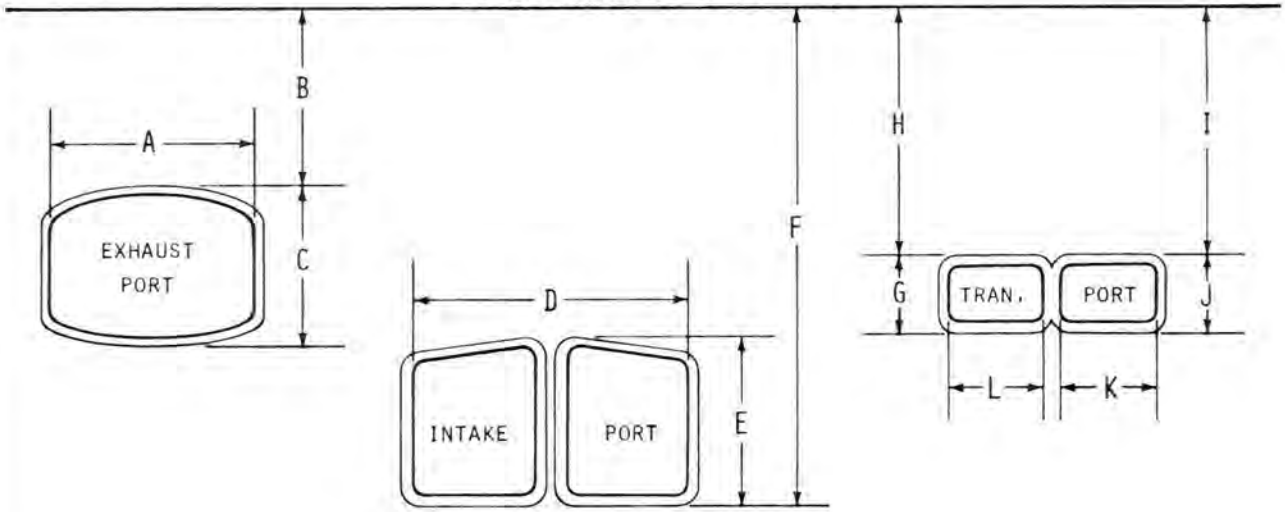
Color	Length	Wire Dia.
Black	2.50 in. (63.50 mm)	0.049 in. (1.245 mm)
White	2.50 in. (63.50 mm)	0.055 in. (1.397 mm)
Red	3.00 in. (76.20 mm)	0.049 in. (1.245 mm)
Orange	3.00 in. (76.20 mm)	0.055 in. (1.397 mm)
Pink	3.38 in. (85.85 mm)	0.049 in. (1.245 mm)
Yellow	3.38 in. (85.85 mm)	0.055 in. (1.397 mm)
Green	3.75 in. (95.25 mm)	0.049 in. (1.245 mm)
Blue	3.75 in. (95.25 mm)	0.055 in. (1.397 mm)

ENGINE PERFORMANCE CURVES



ST440-A4

PORT DIMENSIONS



A =	1.575 in. (40.0 mm)	G =	0.555 in. (14.1 mm)
B =	1.272 in. (32.3 mm)	H =	1.906 in. (48.4 mm)
C =	1.189 in. (30.2 mm)	I =	1.906 in. (48.4 mm)
D =	1.890 in. (48.0 mm)	J =	0.555 in. (14.1 mm)
E =	1.228 in. (31.2 mm)	K =	0.795 in. (20.2 mm)
F =	3.807 in. (96.7 mm)	L =	0.799 in. (20.3 mm)

NOTE: Port width does not include the chamfer. Port height and height location includes the chamfer. Port chamfer = 0.039 in. (1.0 mm)

Maintenance and Theory

Table of Contents

Maintenance Chart 2-3
Lubrication Chart 2-4
Engine Theory of Operation 2-5
Carburetor Theory of Operation 2-13
Ignition System Theory of Operation 2-23
Electrical System Theory of Operation .. 2-24
Charging and Instrument Circuits 2-27
Converter System Theory of Operation .. 2-30
Chaincase and Gearing Operation 2-32
Track, Suspension and Steering System Operation 2-32
Engine Inspection 2-34
- Crankcase Pressure Test 2-34
- Engine Gearcase 2-34
- Compression Check 2-35

Fuel System 2-35
- Carburetor Adjustments 2-35
- Fuel Filters 2-36
- Fuel Pump 2-36
- Fuel Pump Pressure Test 2-36
- Fuel Pump Output Test 2-37
- Primer Pump 2-37
- Fuel Tank & Liner 2-37
- Throttle Cable Adjustment 2-37

Oil Pump to Carburetor Synchronization 2-38
Enrichener Cable Adjustment 2-39
Ignition System 2-39
- Ignition Timing Check 2-39
- Ignition Timing Adjustment 2-40
- Cleaning, Inspection and Gapping the Spark Plug 2-41

Oil Injection System 2-41
- Oil Injection System Bleeding 2-42
- Oil Pump Outlet Tube Purging 2-42

Electrical System 2-43
- Key Switch 2-43
- Headlight Adjustment 2-43
- Bulb Replacement 2-44
- Tail/Brake Light 2-44
- Speedometer 2-44
- Voltage Regulation 2-44

Converter Alignment 2-45
- Converter Offset Alignment Without Special Tool P/N 57001-3503 2-45
- Converter Center Distance Without Special Tool P/N 57001-3503 2-46
- Jackshaft Bearing Retainer Shimming 2-47
- Converter Alignment Using Special Tool P/N 57001-3503 2-47
- Converter Center Distance Using Special Tool P/N 57001-3503 2-47
- Converter Offset Alignment Using Special Tool P/N 57001-3503 2-49
- Converter Parallelism 2-49
- Belt 2-50
- Converter Lubrication 2-51

Brake 2-52
- Brake Adjustment 2-52
- Brake Pad Wear Inspection 2-53

Chain Tension 2-53
Gear Ratio Chart 2-54
Steering System 2-55
- Ski Alignment 2-55
- Ski Skeg 2-56
- Ski Spring Preload 2-56

Suspension Adjustments 2-56
- Ride Adjustment 2-56
- Handling Adjustment 2-56
- Swing Arm Adjustment 2-57

Track Adjustments 2-57
- Track Tension Adjustment 2-58
- Track Alignment 2-58

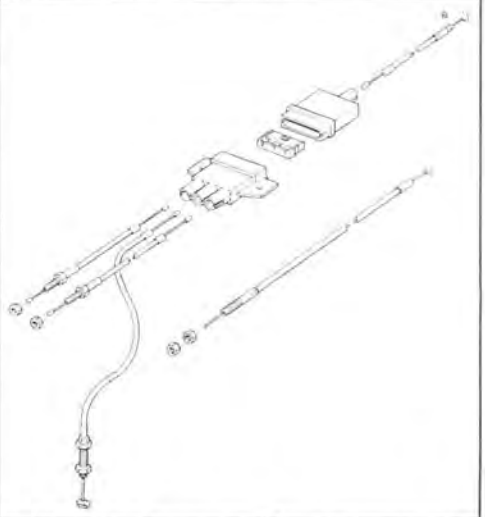
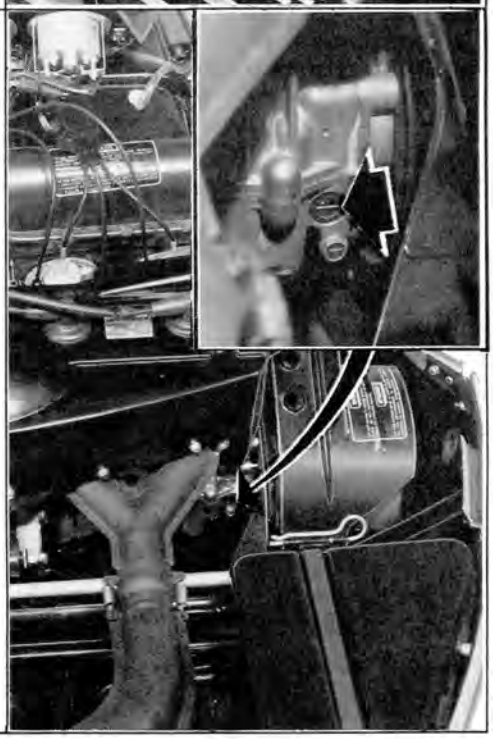
Storage 2-59
- Preparation for Storage 2-59
- Removal from Storage 2-60
- Carburetor Synchronization 2-61

2

Maintenance Chart

Frequency / Operation	Beginning of Each Season	First 80-160 km or 5-10 Hours Use	Every 480 km or 20 Hours Use	Every 960 km or 40 Hours Use	Every 1450 km or 60 Hours Use	End of Each Season	Page Reference
Install new spark plugs	x			x			2-41
Check carburetor adjustment	x	x					2-35
Check throttle cable adjustment	x	x			x		2-37
Check enrichener cable adjustment	x	x			x		2-39
Replace in-line fuel filter					x		2-36
Check ignition timing		x					2-39
Replace drive belt (be sure converter sheaves are clean and dry)	x			x			2-50
Check drive converter and driven converter alignment	x				x		2-45
Check drive converter bushings for wear					x		3-95
Clean and inspect drive and driven converters						x	3-96 3-103
Check drive chain tensioner guides	x						2-53
Adjust track tension and check alignment	x	x	x				2-58
Check ski alignment	x			x			2-55
Check brake adjustment		x	x				2-52
Check fasteners for security (use torque chart as a guide)	x			x			1-9
Inspect ski skegs for wear	x		x				2-56
Measure wear of slide rail wear strips	x		x				3-117
Adjust headlight	x						2-43
Check fan belt tension						x	3-67
Check battery electrolyte level	x		x			x	2-24

Lubrication Chart

Lubrication Point	Lubricant	Frequency	Illustration
CONTROL CABLES Inner cables	LPS, WD-40, Dri-Slide or similar low temperature lubricant.	Once a season and every 20 hours of operation.	
CHAINCASE HOUSING	DEXRON II automatic transmission fluid. Level should be above center of sight glass but not higher than the top.	Check level every 20 hours of operation.	
ENGINE GEAR-CASE OIL LEVEL	KAWASAKI ENGINE GEARCASE OIL or 10W-40 motor oil that meets or exceeds API service SE specifications, such as Shell FIRE AND ICE. Level should be above center of sight glass but not higher than the top.	Change after initial 100 miles. Check every 300 miles or 20 hours of use. Drain and refill at end of each season.	

Engine Theory of Operation

Introduction to Two-Stroke Engines

All internal combustion engines are characterized by a four part cycle of operation. The four parts are: 1. Intake, 2. Compression, 3. Combustion, and 4. Exhaust.

A fuel/air mixture must be drawn into the engine, compressed, burned, and exhausted.

A two-stroke engine uses only two strokes to accomplish all four parts.

Each of the four parts can be easily understood by following the path of the fuel/air mixture through the engine. (See Figure 2-1.)

1. Intake: On the upstroke of the piston a charge of fuel mixed with air is drawn into the engine through an open port in the cylinder.

2. Compression: Near the bottom of the downstroke, the intake port is closed, and the piston starts back up. This upstroke compresses the fuel/air mixture to a fraction of its former volume.

3. Combustion: When the mixture has been compressed, it is ignited and forces the piston down. This is called the power stroke.

4. Exhaust: After the power stroke, the burned gases exit through the now open exhaust port, and the cycle is ready to start again.

The piston is carried through each step from one power stroke to the next by the rotating inertia of the crankshaft.

The intake of a two-stroke engine is perhaps the most complex part of the cycle. After the fuel and air have been mixed in the carburetor, it is drawn into the crankcase. As the piston rises, a hole in the cylinder wall (the intake port) is uncovered by the lower edge of the piston. The rising piston effectively increases the volume of the crankcase, drawing in the mixture. On its return trip, the piston blocks the intake port and lightly compresses the mixture in the crankcase. At about 55°-60° BBDC (before bottom dead center), the upper edge of the piston uncovers ports in the cylinder wall that are connected to the crankcase. The mixture in the crankcase, under pressure, rushes through these transfer ports into the cylinder.

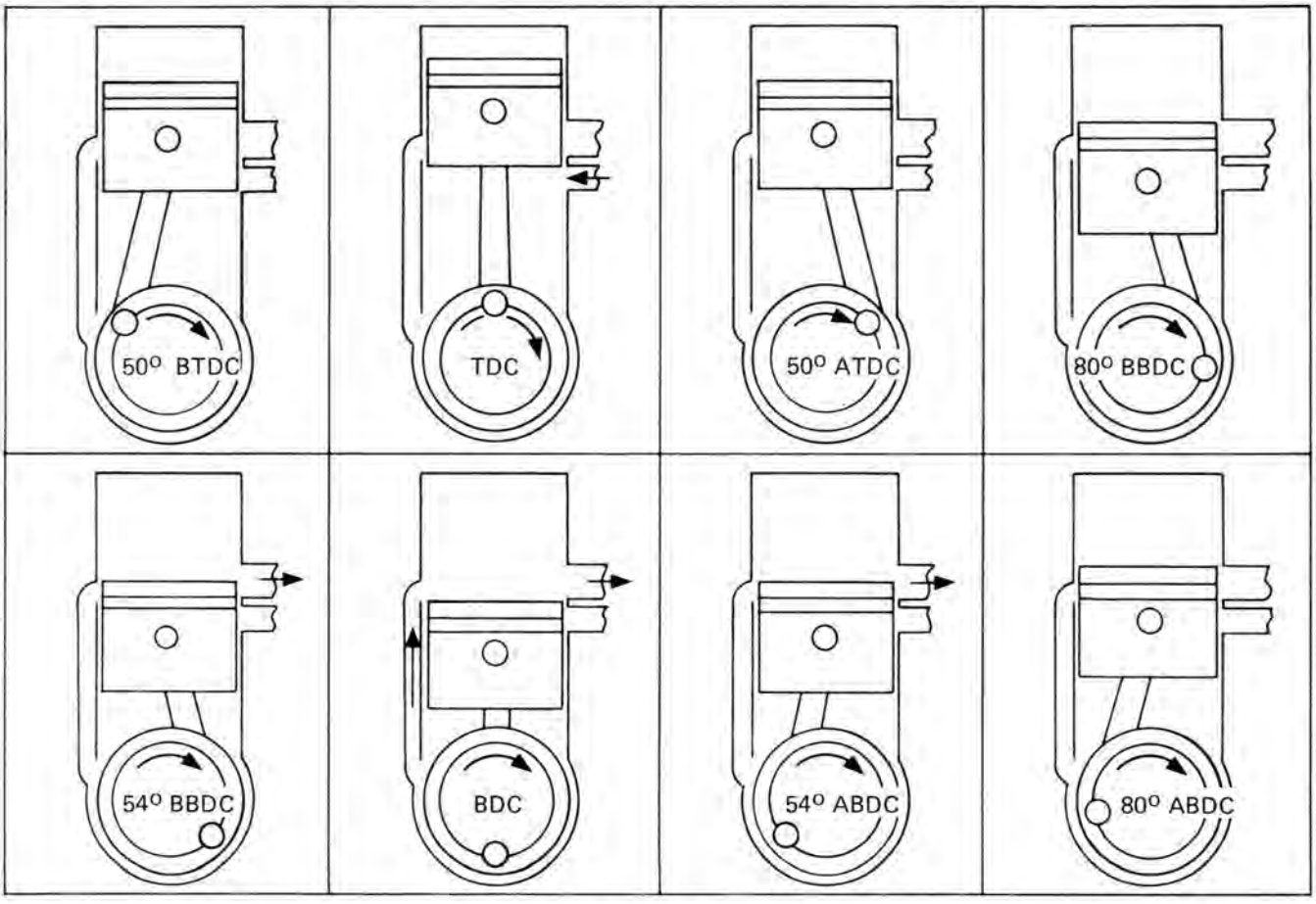


Figure 2-1

There are two separate intake actions: the first into the crankcase, and the second into the cylinder. In two-stroke terminology, only the first intake action is called the intake; the second is called the transfer or scavenging flow. The word "scavenge" is used because the new mixture flowing into the cylinder helps to clean the exhaust out of the combustion chamber. This is known as "scavenging" the exhaust.

After the piston passes BDC (bottom dead center) it rises, closing the transfer and exhaust ports, and opening the intake again. The mixture trapped above the piston is compressed as the piston nears TDC (top dead center), the spark plug is fired and the mixture starts burning.

The piston is driven downward by the combustion until the exhaust port is uncovered by the upper edge of the piston. The two-stroke engine goes through all four basic parts in just two strokes of the piston, and one complete rotation of the crankshaft.

Intake

A two-stroke engine's intake tract starts with the carburetor.

To get the mixture into the crankcase, there must be an opening from the crankcase to the carburetor bore. The intake timing is "symmetrical," it opens and closes the same number of degrees on either side of TDC. (See Figure 2-2.)

The fuel/air mixture in the intake tract has inertia, and takes a certain amount of time to get into the crankcase. The sooner the intake is opened, the more time there is to draw the mixture into the crankcase. If the intake is opened too soon, the crankcase pressure will be higher than atmospheric and the mixture will flow in the wrong direction. The transfers generally close at around 60° ABDC, which is the same as 120° BTDC. It would seem ideal to open the intake at about 115° BTDC, just after the transfer ports close. However, on a piston port engine this would require the intake to remain open until 115° ATDC as well, and all the crankcase pressure meant to transfer the mixture to the cylinder would be lost back out the open intake.

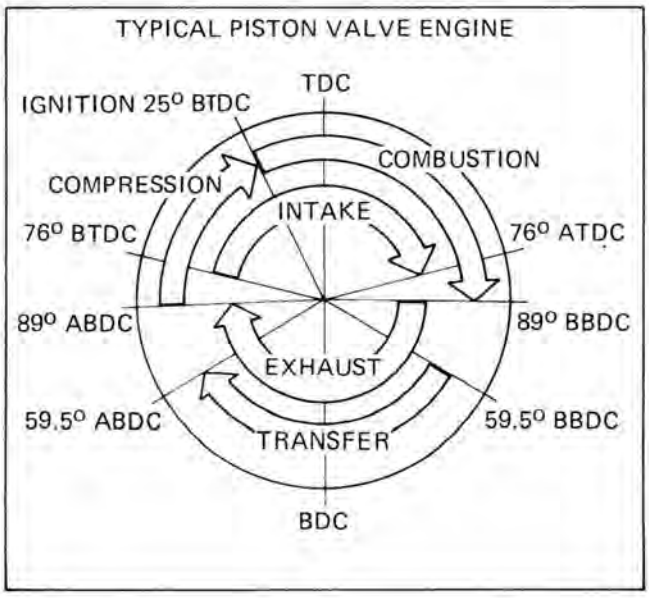


Figure 2-2

Transfer

Transfer ports are designed to move the fuel/air mixture from the crankcase to the cylinder, and to scavenge the exhaust from the cylinder. Because the exhaust port opens before the transfers do, the exhaust gases are already traveling in the right direction. As the pressure in the cylinder drops, the exhaust will no longer flow of its own accord. The transfer ports aim the incoming fuel/air mixture in such a way that it will sweep throughout the cylinder, pushing the exhaust gases toward the exhaust port.

The size and shape of the transfer ports are important for efficient scavenging. If they are too small, the transfer flow will be restricted. If the port is too large, the flow speed will drop. The lack of inertia of the gases will affect the direction of the flow after it leaves the port, resulting in poor scavenging. The transfer port passage is part of the crankcase volume. The larger the passage, the lower the crankcase pressure.

Timing of the transfer ports runs from about 60° BBDC to about 60° ABDC. The transfer ports cannot open until after the exhaust does or the exhaust would flow into the crankcase. This would mix the new charge and the exhaust, resulting in less power (or none at all). Transfer port timing is symmetrical about BDC. The closing point of the transfer port is important to good cylinder filling. If open too long, some of the mixture will flow back into the crankcase.

Compression

Compression occurs as the piston on its upstroke closes the intake and exhaust ports and compresses the fuel/air mixture in the cylinder to a fraction of its original volume. To achieve compression of any kind, the cylinder must be mechanically sealed.

The cylinder head, in most engines, is separate from the cylinder itself. The joining surface between the head and the cylinder is sealed against both compression and combustion by the "head gasket." This gasket must be capable of withstanding high temperatures and pressures. Some head gaskets are simply a sheet of copper or aluminum. Others are a sandwich of copper and asbestos sheets. The head must be fastened tightly to the cylinder, squeezing the head gasket with just the right amount of force to keep it from leaking.

The piston is a close fit in the cylinder bore, but the final seal is made by piston rings. These are special cast iron rings which circle the piston in grooves and press outward against the cylinder wall to prevent leakage of compression or combustion past the piston. The piston rings must withstand high temperatures and pressures without deforming while rubbing constantly up and down on the cylinder wall.

Most engines have one or two compression sealing piston rings. Their job is to seal the gap between the piston and cylinder.

New piston rings must be "broken in." The new rings do not conform exactly to tiny irregularities of the cylinder wall, but they gradually wear to fit. This initial wear is the break-in period.

The cross-section of a ring is an important part of its design. Rings having a rectangular cross-section are called "flat" rings. The groove for this type of ring has parallel walls. Another type of ring has a wedge-shaped cross-section. (See Figure 2-3). This type of ring called a "key-stone" ring and its groove has nonparallel walls. The shape of the ring and its groove are designed to force the ring outward against the cylinder wall during the combustion stroke for better sealing. Key-stone rings should not be installed upside down. Flat rings sometimes also have a "top" and "bottom" and should always be installed carefully following the manufacturer's instructions.

A third type of ring is the "Dykes" pattern ring. This ring is usually used alone on a single-ring piston. It is placed at the upper edge of the piston, so that one side of the "L" shape protrudes above the edge slightly. The ring is forced against the cylinder wall during the upstroke by the drag of the cylinder wall twisting the ring outward. During the combustion stroke the gas pressure on the inside of the upper leg of the "L" forces it out against the cylinder wall for a good seal.

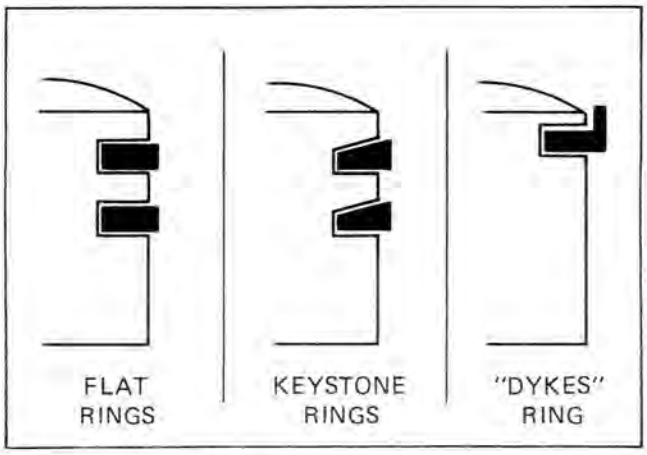


Figure 2-3

The compression ratio may be measured in two different ways. The entire cylinder displacement from BDC to TDC may be used, or just the displacement above the exhaust port. Kawasaki two-stroke engines are generally rated by the second method. As an example, imagine the engine in Figure 2-4 with a 60 mm stroke. Its displacement can be figured as shown.

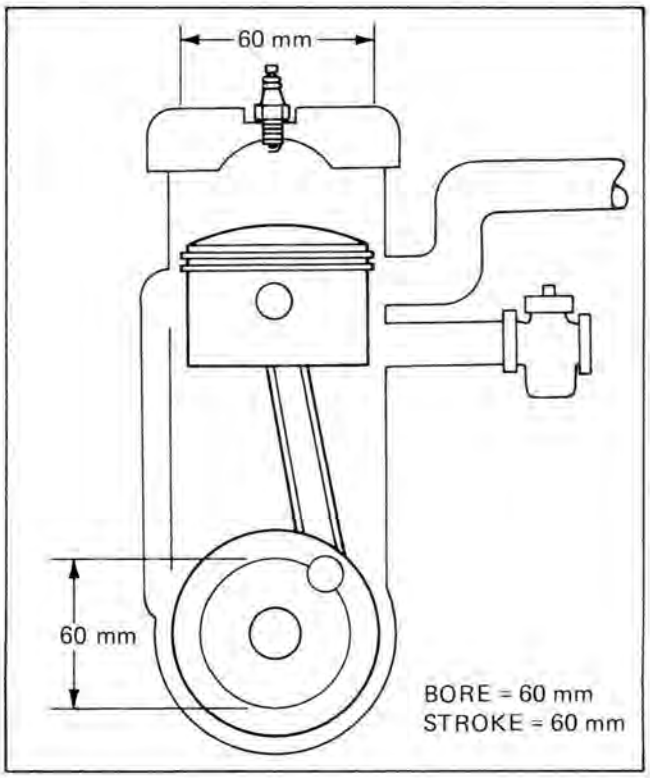


Figure 2-4

$V = \pi r^2 h$
WHERE:
V = displacement volume
r = 1/2 bore - 30 mm or 3 cm
h = stroke - 60 mm or 6 cm
π = 3.1416

V = (3.1416) (9) (6)
V = 169.6 cc or approximately 170 cc

If the engine has a total combustion chamber volume of 20 cc at TDC, then the compression ratio can be figured.

$$R = \frac{V_1 + V_2}{V_2}$$

WHERE:
R = compression ratio
V = displacement volume - 170 cc
V = volume at TDC - 20 cc

$$R = \frac{170 + 20}{20}$$

R = 9.5

This is called the "theoretical" compression ratio. However, if we measure the total volume of the cylinder at the closing of the exhaust port instead of at BDC, the compression ratio calculations might look like these.

$V = \pi r^2 h$
WHERE:
V = displacement volume above exhaust port
r = 1/2 bore - 30 mm or 3 cm
h = distance from top of cylinder to top of exhaust port - 40 mm or 4 cm
π = 3.1416

V = (3.1416) $(3)^2$ (4)
V = 113.1 cc or about 113 cc

$$R = \frac{V_1 + V_2}{V_2}$$

$$R = \frac{113 + 20}{20}$$

R = 6.7

This is usually called the "actual" compression ratio, and is always lower than the theoretical compression ratio.

The compression ratio of an engine is one measure of the efficiency of the engine. The higher the compression ratio, the more efficiently the engine will use its fuel, up to a certain point. An engine with a high compression ratio will put out more horsepower for its size and go further on a gallon of gas than an otherwise identical engine with a lower compression ratio.

The further the mixture is compressed before it is burned, the hotter the combustion will be and the more heat will be produced. Greater heat means more expansion of the combustion products, and that means more horsepower for the amount of fuel used and the engine size.

Combustion

Combustion is started by a spark across the electrodes of a spark plug in the combustion chamber. The spark plug receives a timed surge of high-voltage electricity to ignite the mixture at the right instant. If the ignition comes too soon the engine will try to run backward; too late and part of the power stroke will be lost. The ignition is timed to ignite the mixture at 18° before top dead center (at 6500 revolutions per minute and up). The reason for this lead is to start the mixture burning in time so that peak cylinder pressures will occur just after TDC at high speeds.

When the spark plug fires, it ignites the mixture that is between its electrodes. That burning mixture ignites the mixture around it, and a "flame front" travels across the combustion chamber. The flame front moves across the combustion chamber, burning the mixture as it goes.

Normal combustion is a single flame front traveling across the combustion chamber at just the right speed. There are several types of abnormal combustions and all are undesirable. The most common is detonation. Detonation sounds like a hard, metallic, hammering from the engine. The flame front travels almost instantaneously through the mixture resulting in an explosion rather than an even burning of the mixture. Detonation is related to the octane of the gasoline used.

The "octane" of a gasoline is a number which defines that gasoline's burning speed under a standard set of laboratory conditions. The higher the octane, the more resistant the gasoline is to detonation. Octane ratings are assigned according to a laboratory procedure which compares a fuel's ability to resist detonation to that of a mixture of two petroleum distillate fuels. Oil companies produce gasoline to meet octane requirements by adding tetra-ethyl of lead or certain high-octane petroleum distillates. The "lead" in the gasoline makes it burn more slowly, thus avoiding detonation.

When the mixture burns, a chemical reaction takes place. The molecules of fuel combine with oxygen molecules of the air to produce carbon-monoxide, carbon-dioxide, water, traces of other various compounds, and heat. Heat is absorbed by the engine and combustion products. Heat absorbed by the engine is wasted, but heat that goes into the combustion products increases their pressure, forcing them to expand. This expansion is what produces the actual power in the engine.

The shape of the engine's combustion chamber is a factor in its ability to resist detonation. A smooth chamber with few projections and irregularities is more resistant to detonation. Chambers that induce mixture turbulence are more highly detonation resistant; and chambers with less surface area per unit of volume detonate less than others.

Smoothly surfaced combustion chambers are easily designed. Mixture turbulence can be induced by having a squish area: that is a part of the combustion chamber roof that comes very close to the top of the piston (at TDC), causing the mixture to squirt out from between the piston and the chamber roof as the piston nears TDC. The shape with the lowest surface area per unit of volume is the sphere. An ideal combustion chamber would be a smoothly finished, almost spherical chamber, with a squish area around the edge. This design allows a smooth scavenging flow across the chamber, especially when scavenging flow is lowest.

Compression ratio is important to combustion. A high compression ratio requires a high octane fuel to avoid detonation. A low compression engine can use a lower octane gasoline.

The compression pressure produced by an engine is a more accurate measure of its resistance to detonation than its compression ratio. Compression pressure is the pressure in the combustion chamber, before ignition, produced by the rising piston.

Another type of abnormal combustion is preignition. If the combustion chamber becomes very hot, or a fleck of carbon on the chamber surface or on the head of the piston heats up, the mixture may be ignited before the plug fires. This starts a flame front traveling across the chamber. When the plug fires, its flame front meets the preignition flame front with a small, sharp sound. The preignition creates advanced timing, and the engine will soon overheat. Detonation and preignition can lead to serious engine damage.

Another consideration in combustion chamber design is spark plug placement. The spark plug should be placed near the center of the chamber so the flame front will have the shortest distance to travel to reach all points of the chamber. If the plug is on one edge of the chamber, the flame front has to travel all the way across. From the center, the flame front only has to travel half as far.

Part of the combustion chamber shape is determined by the top of the piston. It becomes the bottom of the chamber at TDC. The top of the piston is generally shaped in a gentle arc to strengthen its center. Some pistons have a raised center to take up space in the combustion chamber and raise the compression ratio.

As the piston is forced downward, the angularity of the connecting rod increases. The crankpin moves around its circle, away from the centerline of the cylinder and then back again. This results in the piston's being thrust against one side of the cylinder wall during combustion, and the other side during compression. The piston pin bore is slightly off-set, in the direction opposite the direction of crankpin travel near TDC. This lessens the impact of the piston's sideways motion against the cylinder wall. The piston reaches TDC slightly before the crankpin does, and piston "slap" at the instant of combustion is minimized. (See Figure 2-5.)

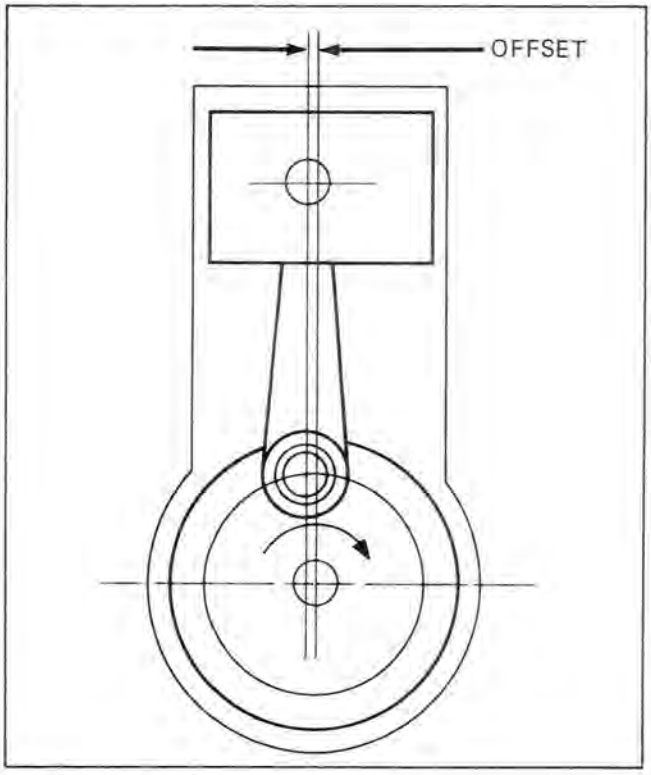


Figure 2-5

The piston cannot be made in a perfectly cylindrical shape or the piston would fit the cylinder only when the engine was cold, and not fit well when the engine was hot. A piston does not expand evenly as it heats up. Near the ring grooves and through the head, the piston walls are thicker for extra strength; the skirt is thin to save weight. (See Figure 2-6.) The upper part of the piston will expand more than the skirt, and must be smaller. The wall thickness near the piston pin bores is greater to handle the stresses of the reciprocating motion of the piston. The piston will expand more across the piston pin bores and must be made with an elliptical shape. As the piston heats up, it expands into a cylindrical shape and fits the cylinder.

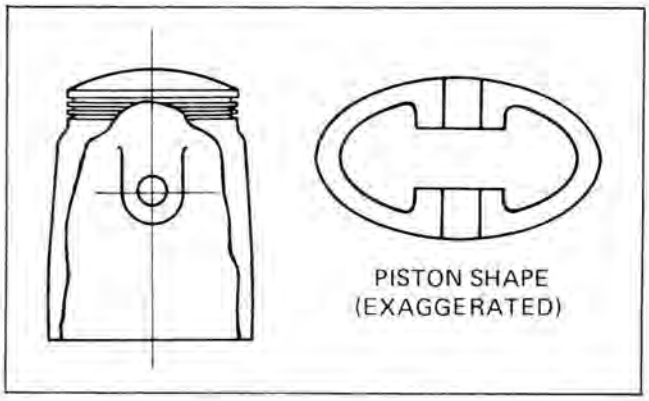


Figure 2-6

The rather odd shape of the piston when cold makes it important to know where to measure when checking piston to cylinder clearances. Usually the piston is measured with a micrometer across the skirt at 90° to the piston pin bores, about 0.1875 in. (5 mm) up from the bottom edge. The other half of piston clearance is the cylinder diameter. This is measured with a dial-bore gauge (if available) at four different positions, and in two directions at each position. The cylinder is measured not only for size, but for roundness and taper.

Exhaust

The design of the exhaust system and timing has a major effect on the characteristics of the engine. The speed range of the engine increases with the height of the exhaust port. Proportionately, the useful power range of the engine decreases. The exhaust port opens and closes at about 80° to 90° BBDC. The height of the port determines its timing. The higher the exhaust port, the wider the exhaust angle.

The last bit of pressure in the cylinder is released into the exhaust system with the opening of the exhaust port. This forces the gases to move in the right direction. After bottom dead center, the rising piston forces the rest of the burned gases out through the exhaust port.

The exhaust system consists of a passage from the exhaust port through the cylinder head, an exhaust manifold, and a muffler. It removes the exhaust gases quickly and easily while reducing excessive noise.

Engine Crankcase Design

Theory, function, and design of the upper portion of the engine are important, but not complete until the lower end (crankcase) functions are understood.

The crankcase contains the crankshaft, and supports the main bearings. Snowmobile engines use ball bearings for the main bearings.

These ball bearings are very strong and consist of two hardened steel races separated by a caged set of steel balls. The crankshaft is fitted to the inner race, and the crankcase carries the outer race. As the crank turns, the inner race rolls on the balls which roll on the outer race. The cage keeps the balls from rubbing against each other. (See Figure 2-7.)

The crankcase is designed to totally enclose the crankshaft. In order to install and remove the crankshaft, the crankcase is split horizontally.

The crankcase must be airtight and oiltight. The mating surfaces of the crankcase halves must match perfectly. A sealing compound is used, rather than a gasket, to insure airtightness on Kawasaki two-stroke engines. The crankshaft oil seals and cylinder base baskets have to be airtight.

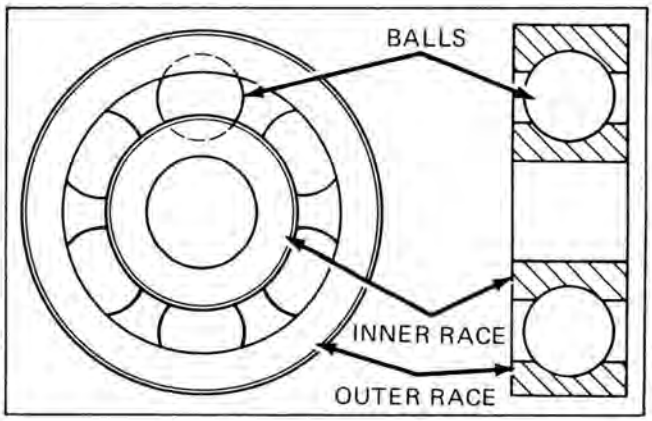


Figure 2-7

To achieve good crankcase compression, the crankwheels are designed to fill the crankcase as completely as possible. Between the crankwheels is the connecting rod. There is very little wasted space inside the crankcase.

The crankshaft is pressed together from separate parts. A caged needle bearing is used on the crankpin. The crankpin rolls on the needles, and the needles roll on the inside of the large end of the connecting rod. The connecting rod is located sideways, and held by two thrust washers, one on each side of the big end.

The crankshaft can twist or loosen and become misaligned because it consists of separate pieces pressed together. The crankwheels must be perfectly aligned on the crankpin. (See Figure 2-8.) There is a specified side and radial clearance for the big end bearing of the connecting rod. (See Figure 2-9.)

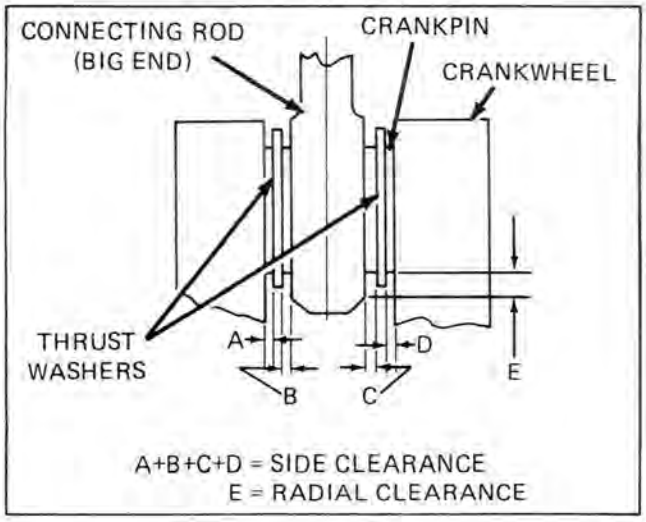


Figure 2-9

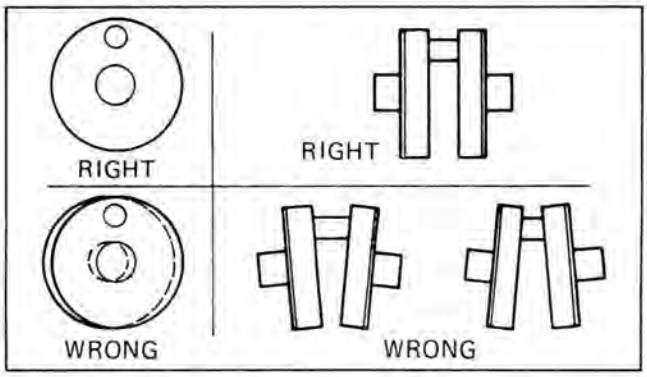


Figure 2-8

Engine Lubrication

This snowmobile engine is automatically lubricated by a variable pump which may change the mixture from about 110 to 1 to about 25 to 1, depending on engine speed and throttle opening. When the engine needs less oil, as at an idle, it gets less oil.

Under full throttle, the engine will be fed more oil. Automatic oiling is economical because it gives the engine only as much oil as it needs. This also cuts down on visible exhaust emissions.

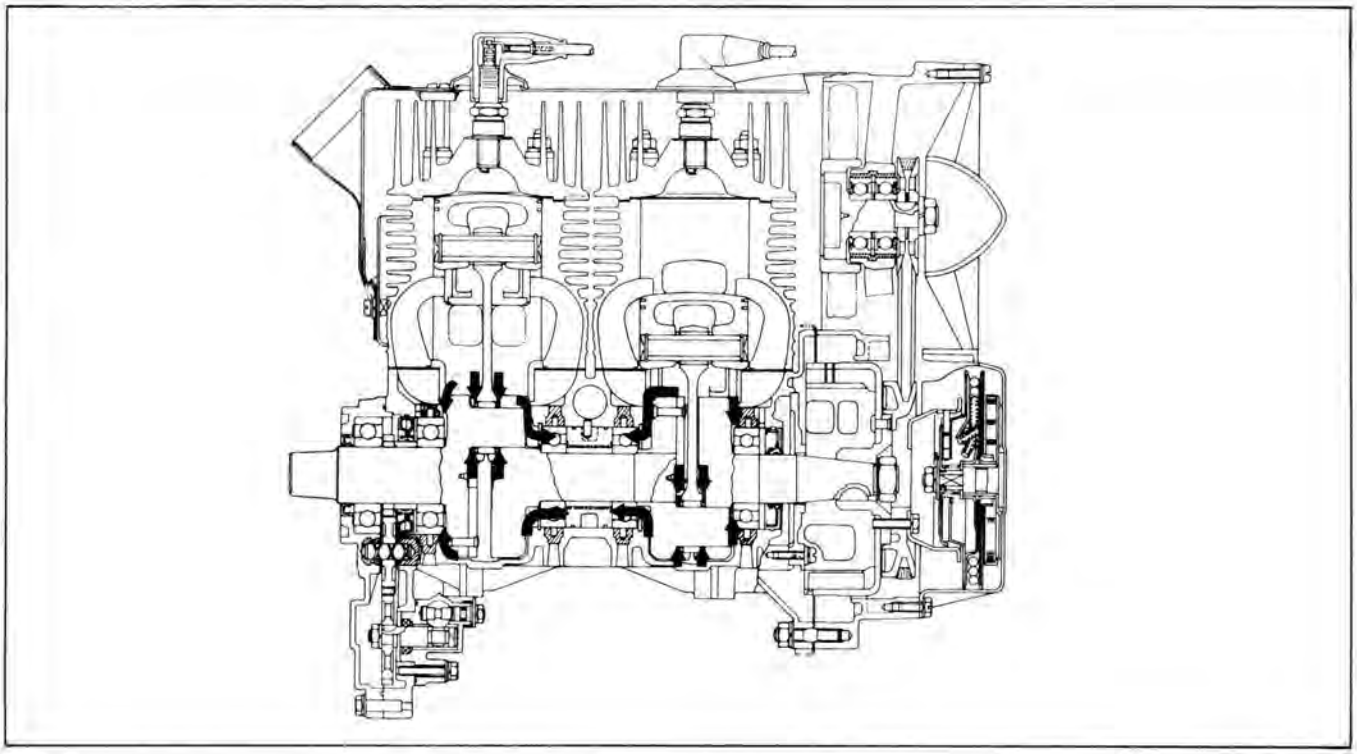


Figure 2-10

In the Kawasaki Injectolube System, oil is kept in a tank separate from the engine and pumped by an oil pump to the engine. It is then mixed with the fuel/air mixture from the carburetor, supplied directly to the crankshaft main bearings, and the connecting rod big end bearings.

The rate at which the oil is pumped is controlled by both throttle opening and engine speed. The quantity of oil will vary with the engine's requirements. With the ideal lubrication that results, engine performance is vastly improved. The fresh, high viscosity oil, supplied directly to the crankshaft bearings and connecting rod big end, increases engine durability. (See Figure 2-10.)

Oil Pump

The oil pump for the engine lubrication system is a plunger type. In this system, the oil pump output is controlled to regulate the ratio of oil to fuel/air mixture so that proper lubrication is achieved at all engine speeds and loads.

The oil pump output is controlled partially by the number of plunger strokes per minute. The number of plunger strokes is determined by the speed of oil pump shaft rotation. Since crankshaft rotation is transmitted directly to the oil pump shaft, the oil pump output changes in direct proportion to engine RPM. (See Figure 2-11.)

The other factor that controls oil pump output is the plunger stroke length. This length is determined by the oil pump cam position, which is controlled by the throttle lever, through the oil pump cable. (See Figure 2-11.)

As the cam is turned by its cable, the plunger stroke increases. When the cam is turned from the maximum flow to the minimum flow position, the plunger tip will strike the cam after less travel, thereby pumping less oil. Since there are two high points on the plunger cam face, there are two complete pumping cycles for each revolution of the plunger. A greater plunger stroke will pump more oil. (See Figure 2-11.)

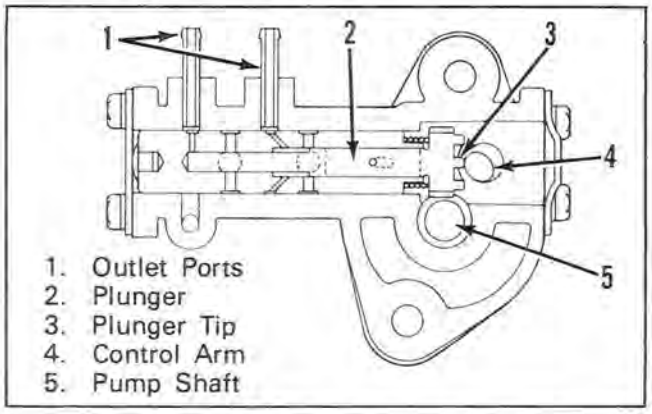


Figure 2-11

Engine Cooling

All snowmobile engines need to be cooled. More heat is produced by combustion than the combustion products can absorb in horsepower. This extra heat is absorbed by the piston, cylinder walls, and cylinder head.

The piston is cooled by the new fuel/air mixture coming from the bottom, by the new mixture flowing across the top during the scavenging, and by contact with the cylinder walls. The piston is usually hotter than the cylinder walls or the cylinder head, and is the first component damaged by overheating.

The most common form of engine damage caused by overheating is piston seizure. This is caused by the overheated piston expanding and pressing against the cylinder wall. Friction adds heat to the piston until it begins to melt. Pieces are rubbed off onto the cylinder wall and welded there by extreme heat. A piston will seize first on the exhaust side because that side runs hotter. Incorrect piston clearances and uneven cylinder expansion can also cause seizure. A mild seizure feels like a sudden loss of power. If the damage is slight, the piston can be cleaned and the cylinder bore may not be damaged. A more severe seizure may lock the engine solid. The damage from a severe seizure requires fitting a new piston and replacing the cylinder. A severe seizure can damage the connecting rod and crankshaft. These components should always be examined for damage.

The cylinder and head may be cooled by air or water. An air cooled engine has fins on the cylinder and head which increase the area exposed to air. The more area exposed, the more heat given up. If the cooling fins or fan intake system become clogged with foreign material, the engine may overheat.

The engine is cooled by the air flowing over it. A fan blows cooling air across the cylinders and heads and draws the heat out of the engine. The engine will not be cooled as effectively at an idle, and most snowmobile engines will gradually overheat if they are allowed to idle for an extended period of time.

The average snowmobile engine contains a high percentage of lightweight aluminum components. Aluminum conducts heat very quickly. An aluminum cylinder or head will run cooler than an identical iron one. The cylinder walls cannot be bare aluminum because they would be too soft and wear quickly. Aluminum cylinders have a chrome plate lining to make them wear acceptably.

Carburetor Theory of Operation

Introduction

The mixing of fuel and air in the amounts required for efficient combustion is the function of the carburetor.

A common method for referring to carburetors is the bore or venturi size. This method is used in snowmobiles. The measurement is the diameter of the smallest part of the venturi. (See Figure 2-12.)

The carburetor is the rider's primary control over the movement of his machine. The carburetor chooses the engine speed that will propel the machine at the desired rate. With a squeeze of the control the rider can choose a speed anywhere from a virtual crawl to flat out. The rider expects that the engine will respond instantly, anywhere within its operating range.

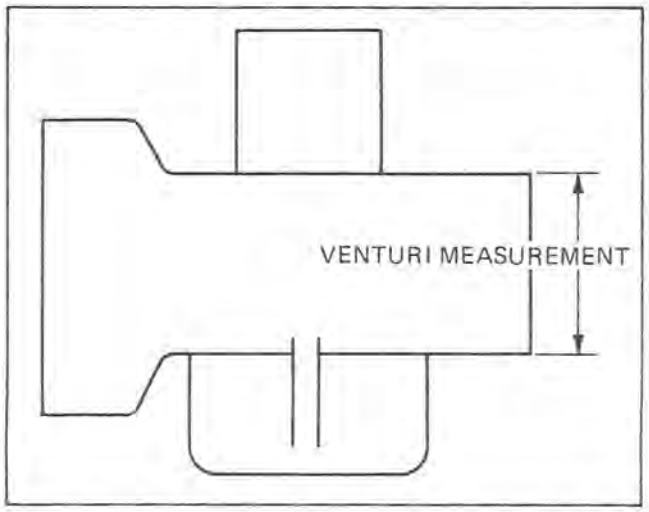


Figure 2-12

The carburetor receives the message from the rider in the form of a pull on a cable. This lifts a valve which uncovers the air passage to the engine. This valve, aided by numerous ports, passages, needles, and jets, regulates the flow of fuel and air into the engine. When the valve is lifted, a greater quantity of fuel/air mixture flows under the valve into the engine, causing it to produce more power. When the valve is lowered, less fuel/air mixture is admitted to the engine, causing it to reduce speed and power.

The carburetor controls the amount of fuel/air mixture which reaches the engine. (See Figure 2-13.)

The fuel/air ratio must be adjusted to meet the changing needs of the engine for particular conditions of load and speed. The ideal burning ratio of fuel to air is about 1:15 or one gram of fuel to each 15 grams of air. This is an "ideal" or "theoretical" mixing ratio, and is only achieved for a fraction of the time that the engine is running. Due to incomplete vaporization of fuel at low speeds or additional fuel required at high speeds, the actual operational fuel/air ratio is usually richer.

Within the acceptable fuel/air ratios that can be burned in the engine, a balance between power and economy must be reached. The amount of air entering the engine for combustion is the limiting factor for maximum performance. To take advantage of the limited amount of air available for combustion, it is necessary to surround each air molecule with enough fuel molecules to insure that all of the air is utilized. Maximum power is obtained by gaining maximum burning efficiency of the available air. Maximum economy is gained by surrounding each molecule of fuel with several molecules of air to insure maximum use from a given quantity of fuel. Maximum economy is maximum burning efficiency of the available fuel.

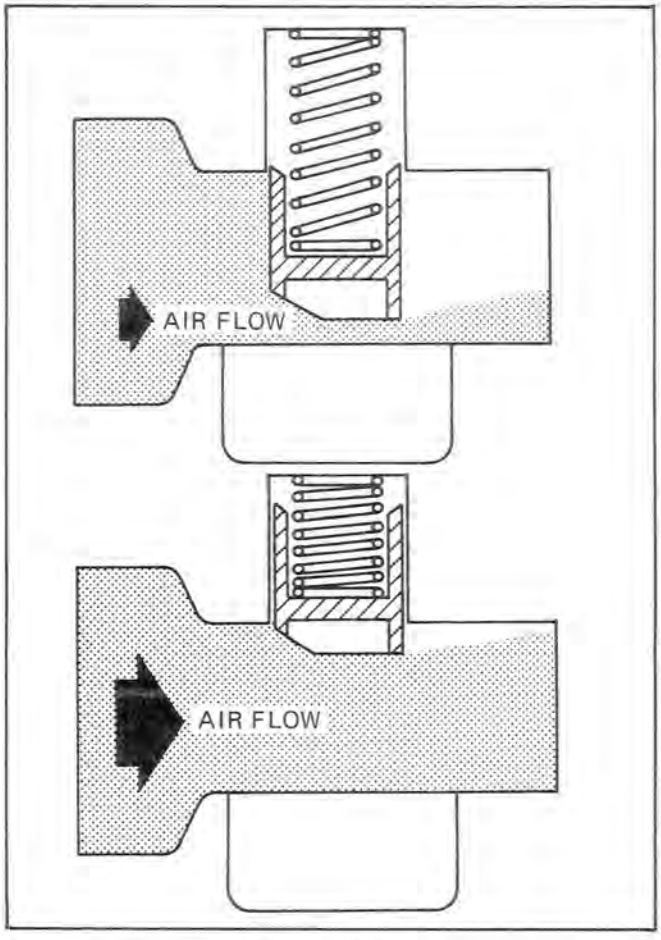


Figure 2-13

Somewhere between maximum power and maximum economy is where most snowmobiles are usually ridden. The range of fuel/air ratios that the engine receives at one time or another ranges from an extremely rich 1:6 to a very lean 1:17. (See Figure 2-14.) At very slow engine speeds the flow of air through the carburetor is slow and the fuel is broken up into small droplets. If the engine is cold, these droplets of fuel will not vaporize as they would in a warm engine. It is necessary to provide a very rich mixture to insure that some of the fuel will be burned.

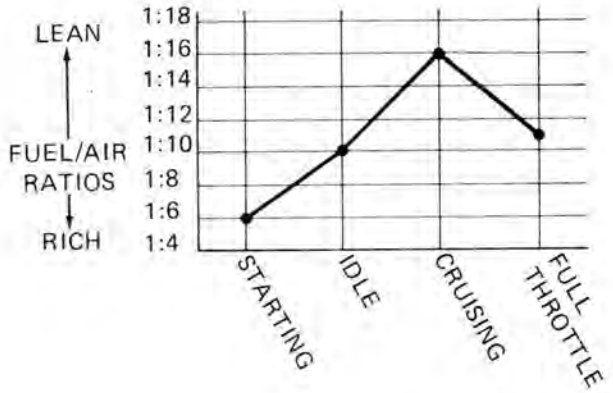


Figure 2-14

When warmed up, the engine speed at idle is low, and air flow through the carburetor is so low that incomplete atomization of the fuel occurs. The mixture at idle is rich, about 1:10. Under hard acceleration, when maximum power is being developed, the mixture ratio might be around 1:12. The actual amounts of fuel and air are much greater for high power operation. This is why fuel economy drops rapidly when a snowmobile is ridden at full throttle much of the time. At cruising speeds, air flow through the carburetor is substantial, but the fuel is metered sparingly. This results in a slightly lean mixture.

The carburetor must have the ability to meter the fuel and air for extremes of power or economy and somewhere in between. The carburetor responds to the rider's needs by supplying fuel and air to the engine in the exact quantities demanded by speed and load.

Carburetor operation is based on the basic principles of fluid dynamics. These principles state that when a fluid (such as air) is flowing through a tube and encounters an area of smaller diameter (known as a venturi or constriction), the fluid will undergo an increase in velocity and a decrease in pressure as it passes through the venturi. (See Figure 2-15.)

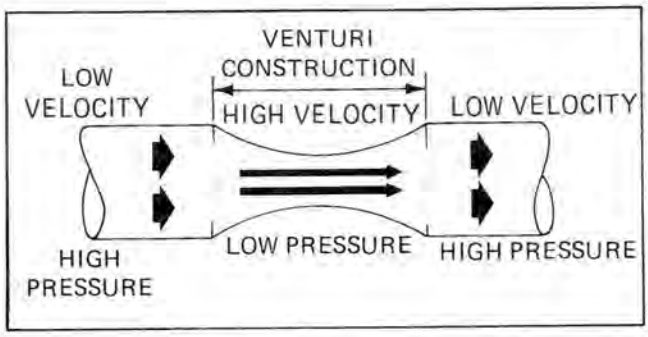


Figure 2-15

Air is drawn in from the air silencer into the engine. This air flows through the carburetor, both the large entry section and the smaller venturi section, with no loss. If 1000 cc of air flow past a point in the entry of the carburetor in one second, then the same amount of air (1000 cc) must flow past a point in the venturi in the same amount of time (one second). If only 900 cc could flow past the point in the venturi in one second, there would soon be a severe pressure build-up in front of the carburetor. To achieve the same flow volume, the air must flow faster through the venturi. Exactly how much faster depends on how much smaller the constriction or venturi is than the rest of the tube. The smaller the venturi, the faster the air flow.

Figure 2-16 shows a carburetor with a maximum entry diameter of 41 mm and a venturi of 26 mm The venturi dimension is the "size" of the carburetor.

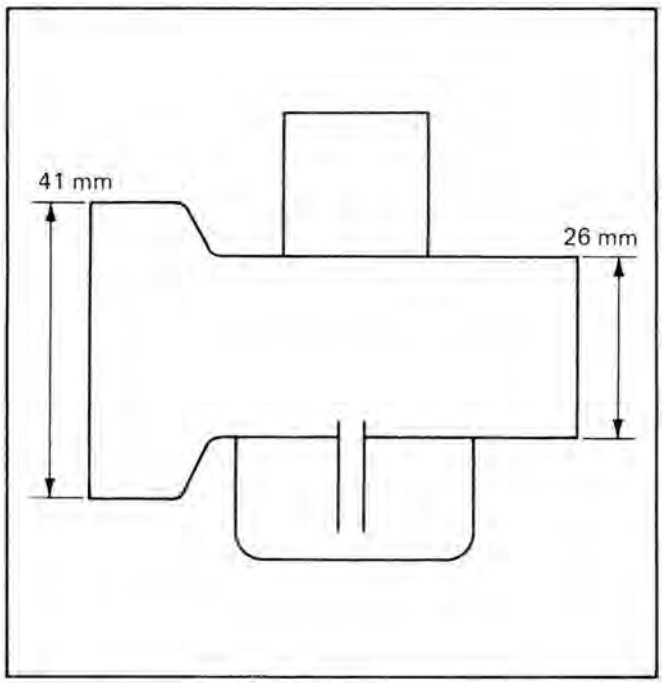


Figure 2-16

The velocity of the air (or a single "particle" in the air) is inversely proportional to the cross-sectional area of the tube. To find the cross-sectional area of the entry and the venturi use the following equations:

$A_1 = \pi r_1^2$

$A_2 = \pi r_2^2$

Where:

A_1 is the area of the entry

A_2 is the area of the venturi

r_1 is the radius (1/2 of the diameter) of the entry

r_2 is the radius of the venturi

π is a constant, 3.14

express A_1 and A_2 in a ratio to find how much larger the entry is than the venturi.

The cross-sectional area of the entry is:

$A_1 = 3.14 \times 20.5^2$

$A_1 = 3.14 \times 420.25$

$A_1 = 1319.585$ mm

The cross-sectional area of the venturi is:

$A_2 = 3.14 \times 13$

$A_2 = 3.14 \times 169$

$A_2 = 520.66$ mm

The ratio of A_1 to A_2 is:

$$\frac{A_1}{A_2} = \frac{1319.585}{520.66} = \frac{2.53}{1} \quad \text{or } 2.53{:}1.$$

The area of the venturi is about 2-1/2 times less than the area of the entry. Since the velocity is inversely proportional to the area, the velocity through the venturi is about 2-1/2 times greater than through the entry tube.

Occurring along with the velocity increase is a drop in air pressure in the venturi region. This reduced pressure allows the air flowing through the carburetor to accelerate through the venturi section. Under average conditions, the pressure in the venturi will be approximately 60% of the pressure in the entry (which is approximately the same as atmospheric pressure).

Float Bowl

The float bowl (or float chamber) is the source of fuel for all carburetor systems that mix fuel with air as it is needed by the engine. A pressure differential fuel pump supplies fuel from the fuel tank to the float bowl. The float chamber is attached to the bottom of the carburetor. The upper portion of the chamber cavity is vented to the atmosphere, so air pressure inside the bowl is the same as pressure outside the bowl.

Fuel level in the float bowl is controlled by floats and a needle valve.The lower end of the needle valve rides on the float arm, and the upper end seals against the needle valve seat. When the level of fuel in the bowl drops, the floats drop slightly, and the needle valve moves down away from the seat. This allows fuel pumped from the tank by the fuel pump to flow into the bowl. As fuel enters the bowl, the floats rise, pushing the needle valve into contact with the valve seat, shutting off the flow of fuel. (See Figure 2-17.)

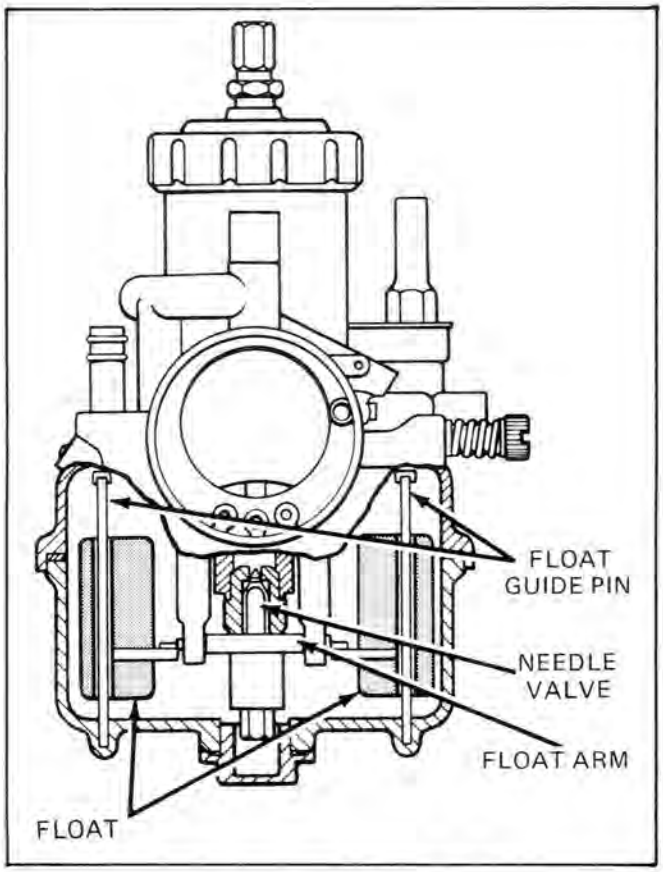


Figure 2-17

The fuel level affects how rich or lean the engine will run throughout its entire range. The reason for this is the drop in pressure that occurs in the venturi. The float bowl is vented to the atmosphere, so there is a pressure of 1.03 kg-cm (14.7 psi) pushing down on the surface of the fuel in the float bowl. When the engine is stopped, this pressure is on the surface of all the fuel in the float bowl, including the fuel inside the "feed tubes" which lead into the venturi. When the engine is running, the pressure in the venturi is less, and the pressure in the feed tubes is also less. The atmospheric pressure acting on the surface of the fuel in the bowl is much greater than the pressure acting on the fuel in the feed tube. Therefore, the level of fuel in the feed tube rises, pushing the fuel in the feed tube up into the venturi where it is released into the air stream as tiny droplets. (See Figure 2-18.)

The float level is important at low speeds. If too low, the decreased pressure in the venturi would not be able to pull enough fuel up out of the bowl and into the air stream. This would cause hard starting and lean mixture ratios. If the fuel level is too high, too much fuel is pulled into the venturi and the engine would run too rich. The float level is adjusted by bending the tab. Bending the tab towards the needle valve lowers the fuel level, and bending it away from the valve raises the level. Always set the fuel level at the correct level.

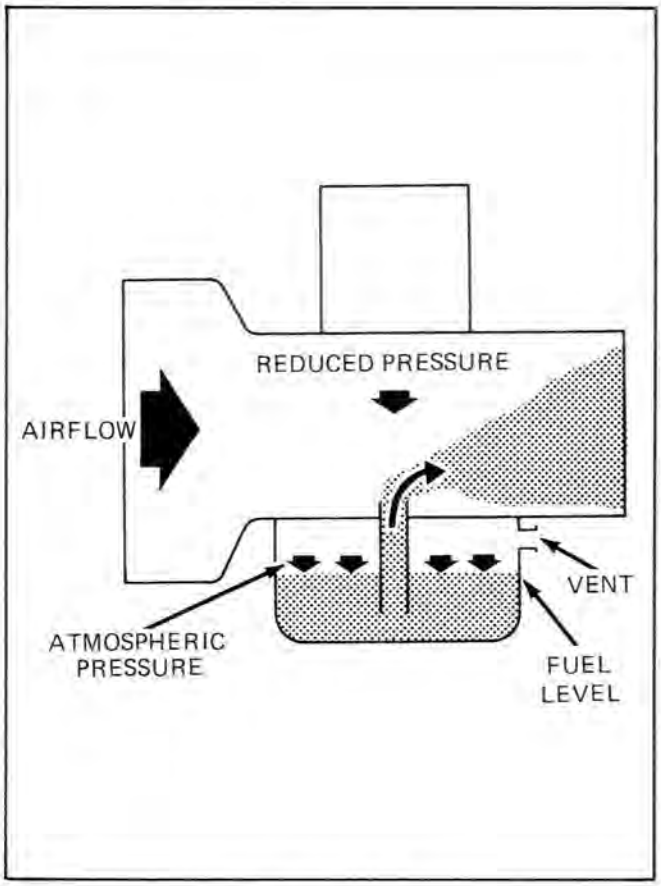


Figure 2-18

Metering System

Four separate systems meter the fuel and mix it with the air: The main system for normal running, the pilot system for low speed running, the econo jet system for additional fuel requirements during full throttle operation, and the enrichener system to assist starting a cold engine.

Metering the fuel and air in the proper amounts is performed by a number of components. Each component has a range of throttle positions in which it is effective, but the division between where one takes up and another leaves off is gradual. This "overlap" insures the transition from one range to another will be smooth. The metering components are: pilot jet, throttle valve cutaway, jet needle, needle jet, main jet, and econo jet. Figure 2-19 illustrates the overlap between the components.

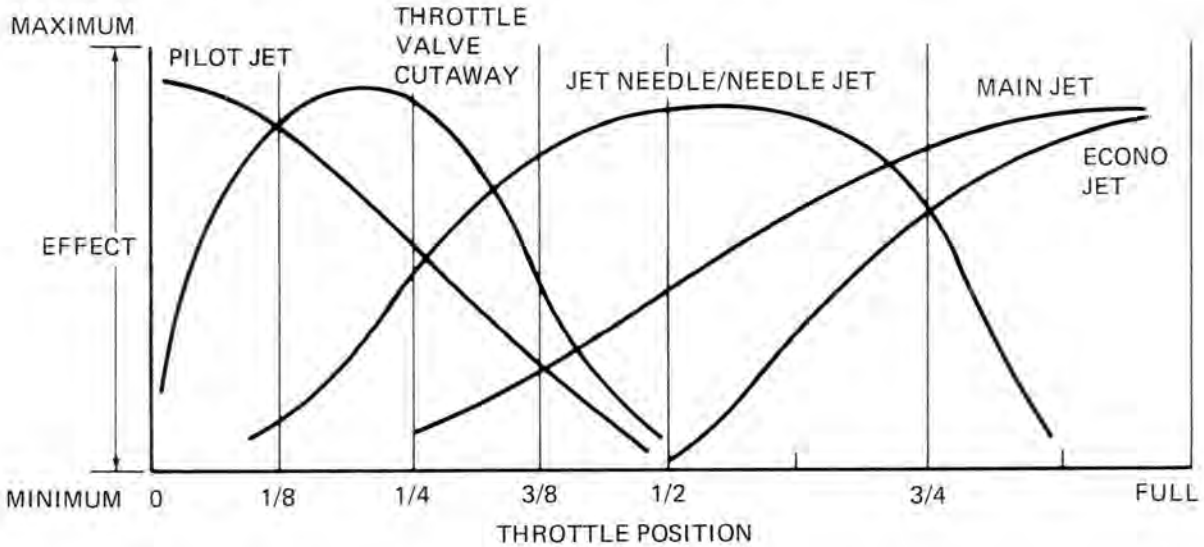


Figure 2-19

Throttle Valve

The amount of air entering the carburetor is determined by the throttle valve. The throttle valve rides in a closely fitting bore directly above the venturi in the carburetor body. The movement of the throttle valve is controlled by a cable and spring. In the "fully closed" position, little or no space remains under the throttle valve for the air to flow through the venturi. As the throttle valve is raised higher, more air will flow through the venturi and into the engine. When the throttle valve is in a lower position, it blocks part of the venturi, and the area under the throttle valve becomes a venturi in a venturi. The size of the actual venturi or air passage changes with the position of the throttle valve. This is known as a variable venturi type. It is the most common type found on snowmobiles and is used on all Kawasakis.

At lower throttle positions, the cutaway of the throttle valve affects mixture ratios. The effect of the cutaway is felt most from about 1/8 to 1/3 throttle. The higher the cutaway, the leaner the mixture will be at a constant throttle position. The higher cutaway offers less resistance to the incoming air. The fuel supply remains relatively constant at any constant throttle position, and the additional air results in a leaner mixture. The lower the cutaway, the greater air flow resistance, and a richer mixture. The valve cutaway provides for adjustment of the fuel/air ratio as the transition is made from idle to the full venturi action of the carburetor. (See Figure 2-20.)

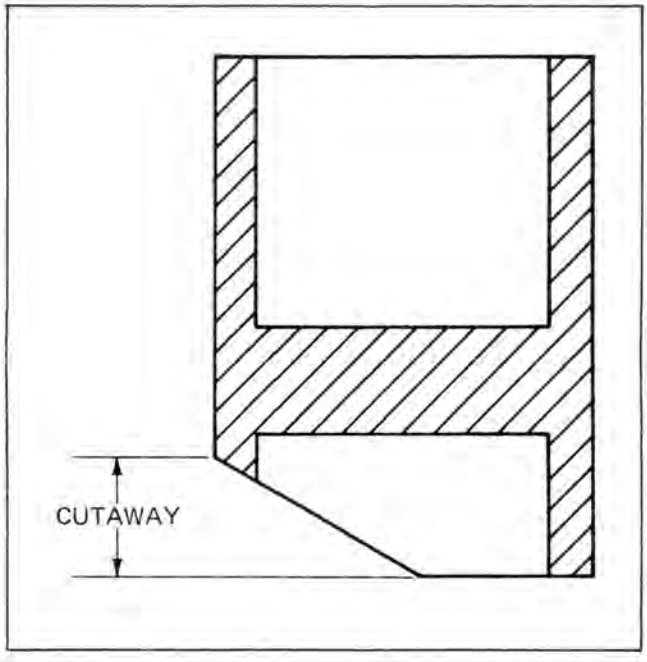


Figure 2-20

Main System

The largest portion of the metering is performed by the main system. The components are: The throttle valve, jet needle, needle jet, and the main jet. As soon as there is enough air flow through the venturi to draw fuel up into the main jet/needle jet assembly, the main system takes effect. The main system components meter fuel from 1/8 throttle to full throttle. The throttle valve is part of the main system only in that it carries the jet needle.

The jet needle rides in the throttle valve and moves up and down with the valve. The needle itself is tapered at its lower end and has grooves at its top end. Figure 2-21 shows a typical double taper jet

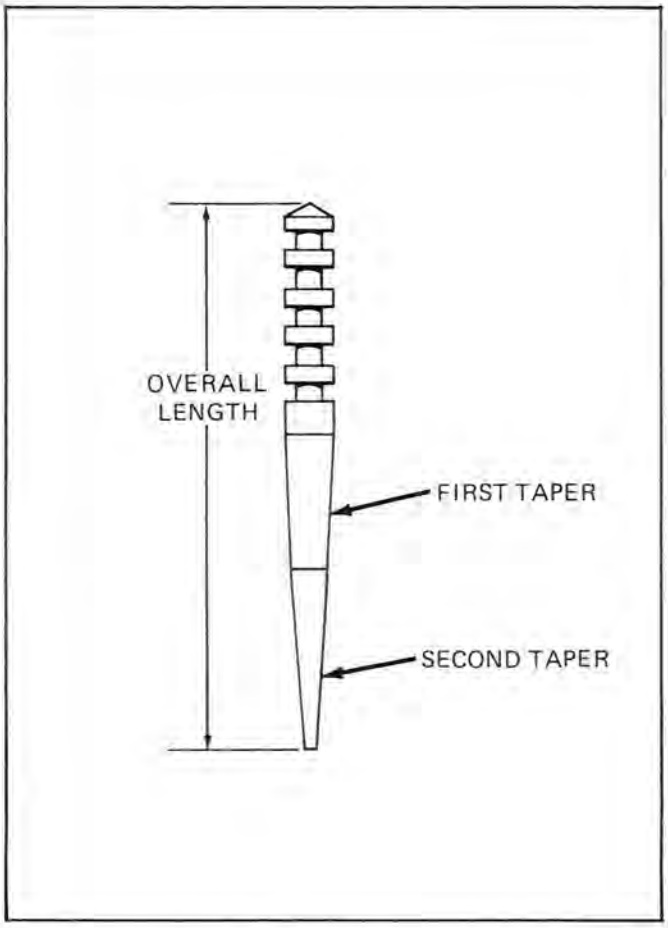


Figure 2-21

needle. The needle is tapered in two stages. This double taper needle is used in larger two-stroke engines. The markings on a needle indicate the length of the needle and the taper of both sections. The first number is the overall length of the

needle, rounded off to the lowest 10 mm. Thus a 5 indicates that the needle is at least 50 mm but less than 60 mm in length. The letters on the needle indicate the taper of each section. The first letter stands for the taper of the top section (closest to the grooves), and the second letter stands for the bottom taper. The taper angles are graduated in 15' (15 minute) increments with a taper of 15' indicated by the letter A, a taper of 30' indicated by the letter B and so on. A needle marked 6DH3 would be between 60 and 70 mm with a top taper of 1° and a bottom taper of 2°. Refer to chart showing the taper angles of the double taper needles used by Kawasaki. Needles are sometimes referred to with another number which is not actually stamped on the needle. This number indicates the groove in which the clip belongs. A 6DH3-3 would refer to the needle described, as well as telling that the clip should be in the third groove from the top.

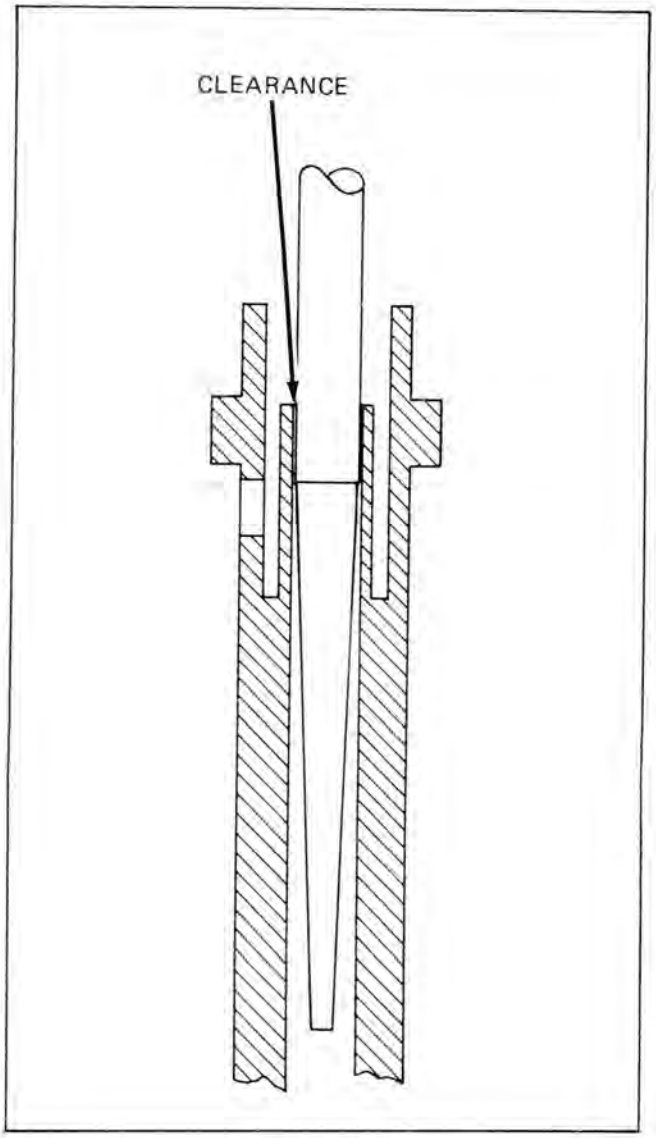


Figure 2-22

NEEDLE TAPER ANGLES

A 0° 15'	**I** 2° 15'
B 0° 30'	**J** 2° 30'
C 0° 45'	**K** 2° 45'
D 1° 0'	**L** 3° 0'
E 1° 15'	**M** 3° 15'
F 1° 30'	**N** 3° 30'
G 1° 45'	**O** 3° 45'
H 2° 0'	**P** 4° 0'

The top of the needle is fastened to the throttle valve, and the tapered end extends into the needle jet. The needle jet fits in the carburetor body in the center of the venturi. The lower end of the needle jet is fed fuel from the float chamber by the main jet. The inside diameter of the jet is greater than the non-tapered section of the needle. The inside diameter of the needle jet used is 2.680 mm and the outside diameter of the needle is 2.512 mm. Subtracting the diameter of the needle from the diameter of the jet gives the amount of clearance between them.

2.680 mm
-2.512 mm
0.168 mm

The clearance is 0.168 mm. As shown in Figure 2-22, the needle blocks the jet when the throttle valve is closed. When the valve is lifted, the needle rises out of the jet until the tapered section arrives at the upper end of the jet. The effect of the taper is to increase the clearance between the jet and the needle as the needle is lifted.

With the throttle valve raised, fuel from the float bowl is drawn by reduced pressure, up into the jet and through the clearance area between the jet and the needle. The double taper of the needle serves to accelerate the flow rate of the fuel so the amount of fuel can keep up with increasing amount of air in higher throttle positions.

Changing the position of the needle changes the amount of available fuel. The needle is moved by moving the clip up or down in the grooves on the needle. Moving the clip towards the top of the needle delays the fuel flow increase, leaning out the mixture. This is known as lowering the needle (because if the clip goes up, the needle sits lower). Raising the needle (lowering the clip) richens the mixture by advancing the fuel flow increase. (See Figure 2-23.)

Around 3/4 throttle, the clearance between the needle and the jet becomes greater than the cross-sectional area of the main jet. At this point, the fuel flow is determined by the size of the main jet.

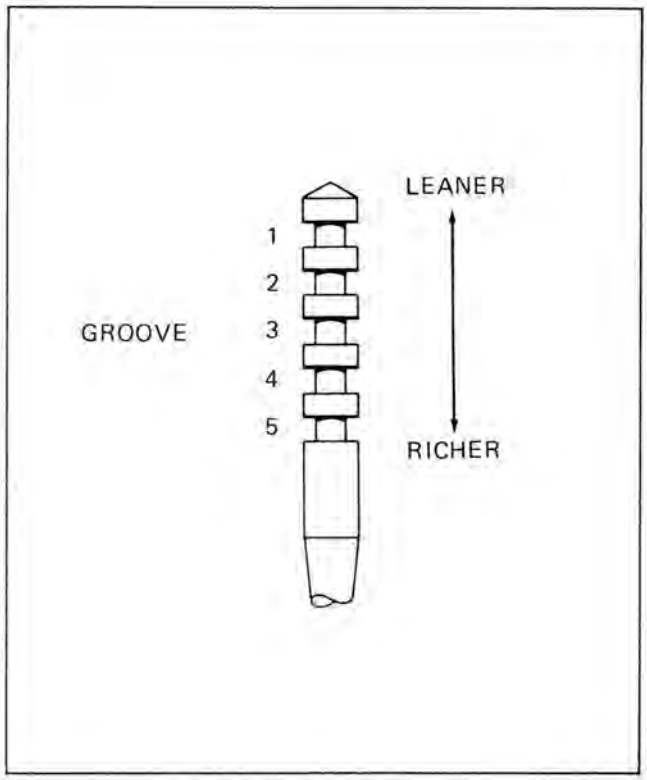


Figure 2-23

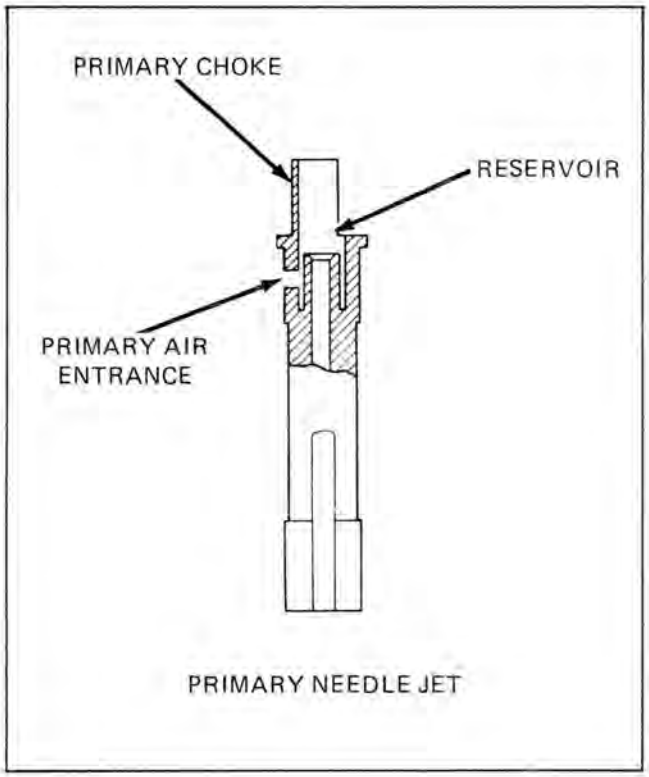


Figure 2-24

The needle jet preatomizes the fuel before it enters the venturi for final atomization into the engine. Fuel enters the venturi in a spray of tiny droplets rather than a flow or dribble. The atomized fuel spray is vaporized by the engine heat. The atomization of the fuel in the needle jet and venturi improves the burning efficiency of the engine.

Atomization of the fuel in a snowmobile carburetor is accomplished by use of a "primary type" needle jet. The primary type tends to flow more fuel, allowing richer mixtures, and is used mostly on larger two-stroke engines. (See Figure 2-24.)

The primary type needle jet has a "reservoir" which surrounds the point at which the fuel exits past the needle. This reservoir is connected by passages in the carburetor body to a very small air jet in the front (away from the engine) end of the carburetor. Air flows in this jet, through the passages and into the reservoir where it mixes with the fuel and is drawn into the venturi. The entrance to this passage is out at a point of near atmospheric pressure and the exit is subject to venturi depression. Air flow is aided by pressure differential. The size of the jet is very small, so the air arrives at the reservoir with high velocity. At the reservoir, air helps break up the drops of fuel as they leave the center metering portion of the needle jet. (See Figure 2-25.)

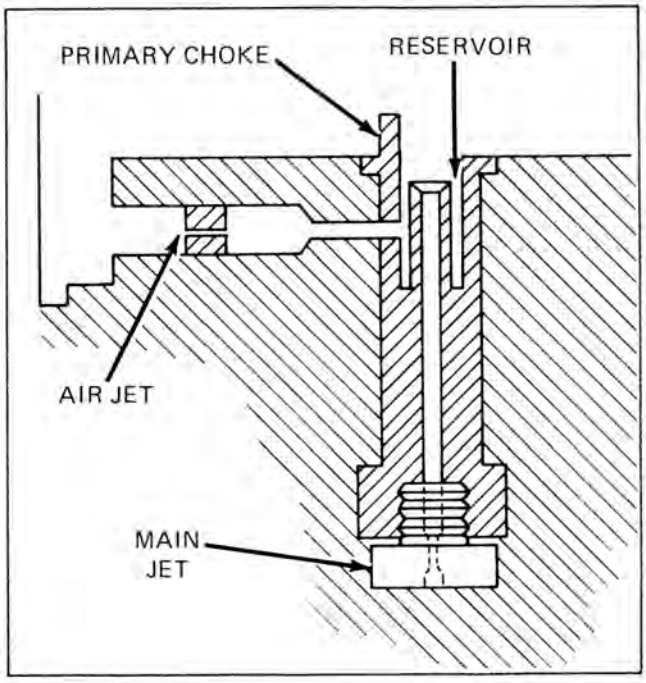


Figure 2-25

Surrounding two-thirds of the reservoir is a lip which extends up into the venturi in front of the needle. This lip generates turbulence which creates a greater vacuum behind the lip where the

reservoir and needle are located. At high RPM, this extra vacuum effect helps pull more fuel up from the float bowl. The lip on the needle jet is known as a primary choke. The height of the primary choke determines the amount of turbulence, and the amount of extra depression at the venturi exit of the needle jet. A taller primary choke will create more turbulence and suction, leading to a richening of the mixture at higher RPM. Using a taller primary choke allows use of a smaller main jet to achieve approximately the same mixture ratio at full throttle but a decrease in fuel consumption in the medium throttle position.

The needle jet is identified by its diameter. Figure 2-26 is a chart for identifying the size of needle jets of the primary type.

The last component of the main system is the main jet and the metering screw (not on all carburetors). The main jet is attached to the inside of the float bowl cover. An O-ring is used to seal the bottom of the needle jet assembly to the float cover to insure that fuel can enter the needle jet only through the main jet. The main jet meters all fuel to the main system.

When the main system begins to meter fuel, the throttle valve cutaway, needle, needle jet, and main jet determine the amount of fuel that should be delivered for the amount of air entering the engine. This working relationship continues until approximately 3/4 throttle. At this point, the cross-sectional area of the clearance between the needle and the needle jet becomes greater than the cross-sectional area of the main jet. When this occurs, there are no restrictions to fuel flow any greater than the restrictions of the main jet; and the size of the main jet determines how much fuel will be available.

Main jet size is indicated by the number stamped on the jet. There are different types of main jets, each with a different numbering system. Figure 2-27 shows each type of jet and Figure 2-28 compares their flow rates in cc per minute to the numbers stamped on the jets.

Use extreme care when changing main jets. Use a replacement of the same type. Matching only the numbers can result in total confusion as to why the engine will not run properly.

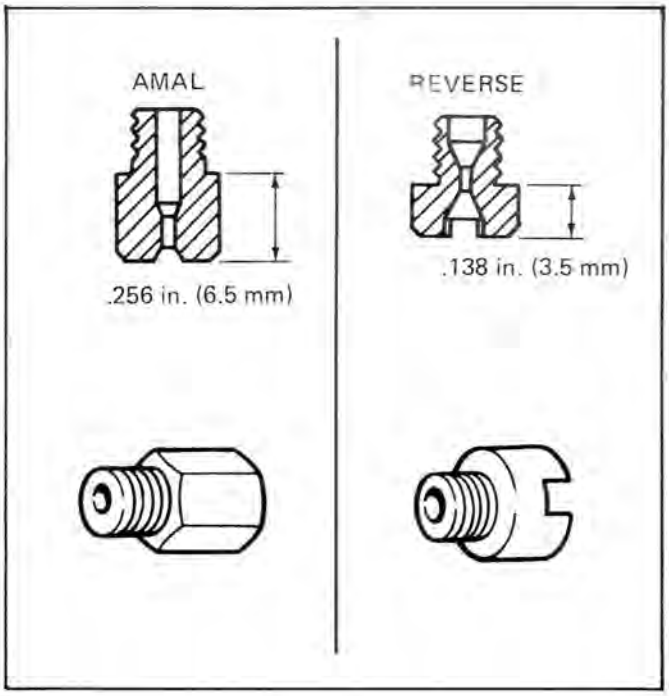


Figure 2-27

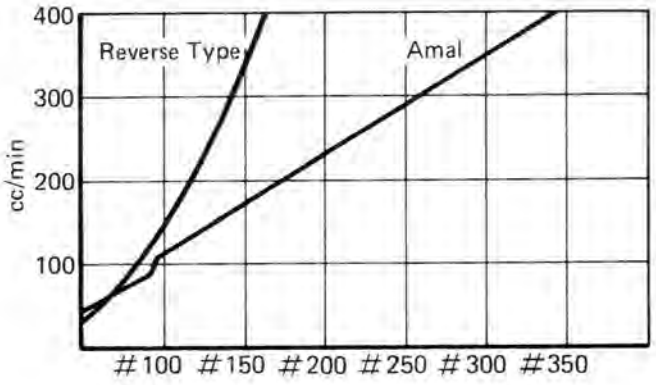


Figure 2-28

NEEDLE JET INSIDE DIAMETERS (MM)

	0	1	2	3	4	5	6	7	8	9
N	2.550	2.555	2.560	2.565	2.570	2.575	2.580	2.585	2.590	2.595
O	2.600	2.605	2.610	2.615	2.620	2.625	2.630	2.635	2.640	2.645
P	2.650	2.655	2.660	2.665	2.670	2.675	2.680	2.685	2.690	2.695
Q	2.700	2.705	2.710	2.715	2.720	2.725	2.730	2.735	2.740	2.745

Figure 2-26

Econo (Power) Jet System

The econo jet system is similar to the main system in that it only draws fuel when there is enough air flow through the venturi to draw fuel through the system. The fuel that passes through the system is metered by a reverse type jet. This system has the most effect during wide open throttle position when the engine is operating at engine speeds above 5000 RPM. Use of econo jet gives better engine response at high engine speeds (over 5000 RPM) and better fuel economy at lower engine speeds. At wide open throttle the main jet supplies approximately 70% of the engine fuel requirements while the econo jet supplies 30%. The econo jet stops feeding fuel below 1/2 throttle or 5000 RPM due to the reduced air flow through the carburetor bore at low throttle settings.

Pilot System (See Figure 2-29.)

Fuel and air supply at low speeds and small throttle openings is controlled by the pilot system, or slow system. The pilot system consists of a series of passageways in the carburetor body, a pilot jet to meter fuel, and a pilot air screw to meter air. At low engine speed and small throttle opening the main system can not provide the proper amount of fuel or air.

Fuel is drawn through the pilot jet which protrudes into the float chamber. The pilot jet has a series of holes drilled in its body at the point where the air is introduced from the passageways. These holes allow fuel to be mixed with air before it enters the venturi through the pilot outlet. (See Figure 2-30.)

Air for the pilot system enters from the front of the carburetor and is metered by the pilot air screw. The pilot air screw is tapered to provide a gradual increase in air flow as the screw is backed out. The taper fits in the center of a passageway, and turning the screw all the way in closes the passageway. The normal air screw setting is from 1 to 1-3/4 turns out from a lightly seated position. If the pilot mixture appears too rich, backing the air screw out further will lean the mixture. Turning the air screw in farther will cut down the amount of air supplied, resulting in a richer mixture. Adjustment of pilot mixtures can also be effected by changing pilot jets.

At idle speeds (very low, "closed" throttle position) air from the air passage in the front of the carburetor is supplemented by air from the pilot bypass. At these almost closed throttle settings, air enters from the pilot air passage and the bypass. When the throttle is opened, air flow through the venturi increases, and fuel/air mixture now exits from both the outlet and the bypass, where it mixes with the air flowing through the venturi.

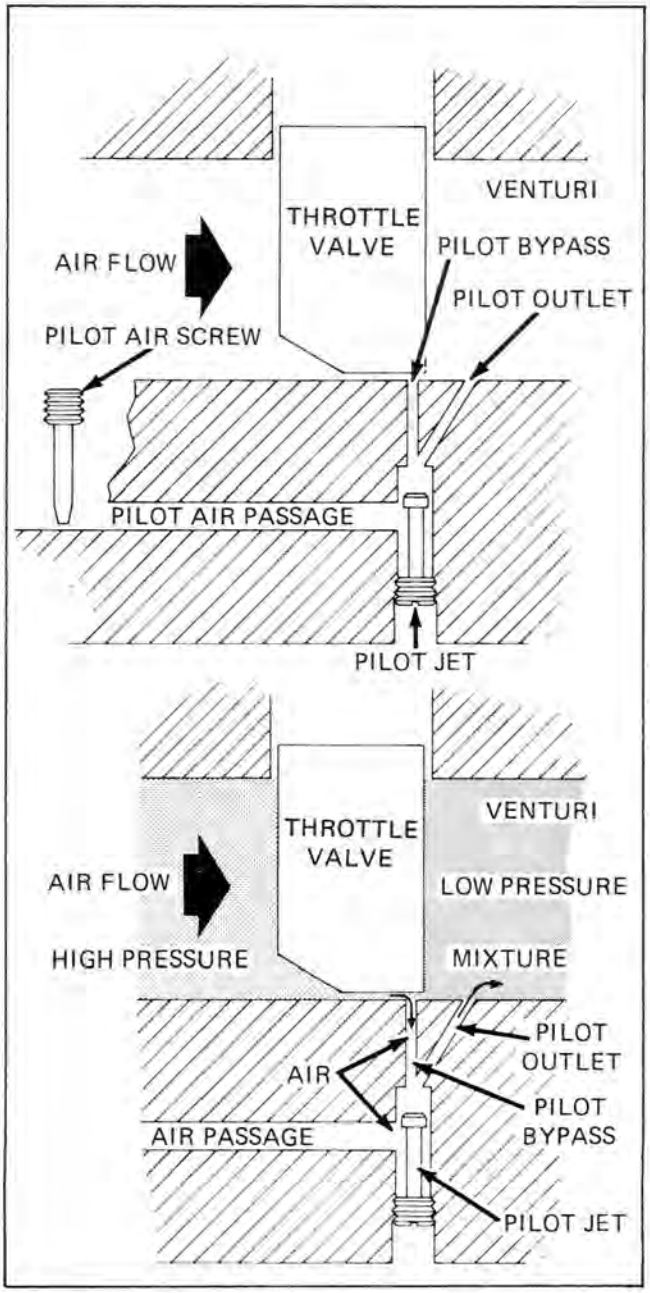


Figure 2-29

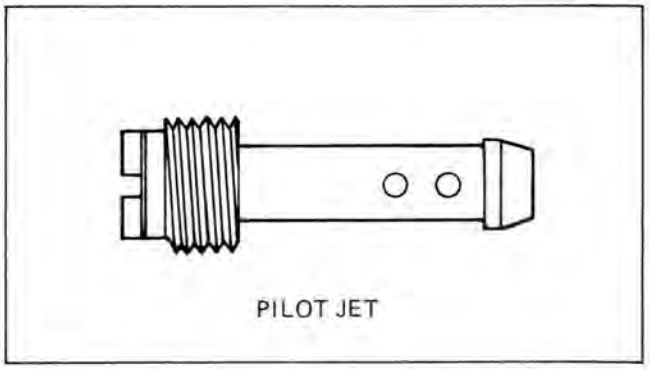


Figure 2-30

Fuel/air mixtures metered by the pilot system are somewhat richer than mid-range, partial throttle mixtures. Low engine speed at low throttle position does not promote good atomization of the fuel entering the engine.

Enrichener System

Starting a cold engine presents problems of low air flow and poor atomization that require a rich mixture. In a cold engine the engine parts are not hot enough to vaporize the droplets of fuel. To overcome these difficulties requires an even richer mixture than that provided by the pilot system. To provide these richer mixtures, an enrichener system is added to the carburetor. This system consists of a jet to meter the fuel, and a plunger which opens air passages from the front of the carburetor and into the venturi. The plunger is lifted by a cable. Lifting the plunger uncovers the air inlet passage and outlet to the venturi. If the throttle valve is closed, the air that goes to the engine must come through the enrichener passageways. This creates enough suction to draw fuel from the bowl into the chamber below the plunger. Here it is mixed with air from the front of the carburetor and drawn into the venturi and the engine. Atomization of fuel for enrichener mixture is aided by an emulsion tube, a long tube which protrudes into the fuel and through which the fuel is drawn. This tube has holes drilled in it, similar to the pilot jet and air bleed needle jet. These holes allow a small amount of air from the float chamber to be mixed with the fuel before it enters the chamber below the enrichener plunger. The atomization of the fuel allows it to flow more easily through small passages. (See Figure 2-31.)

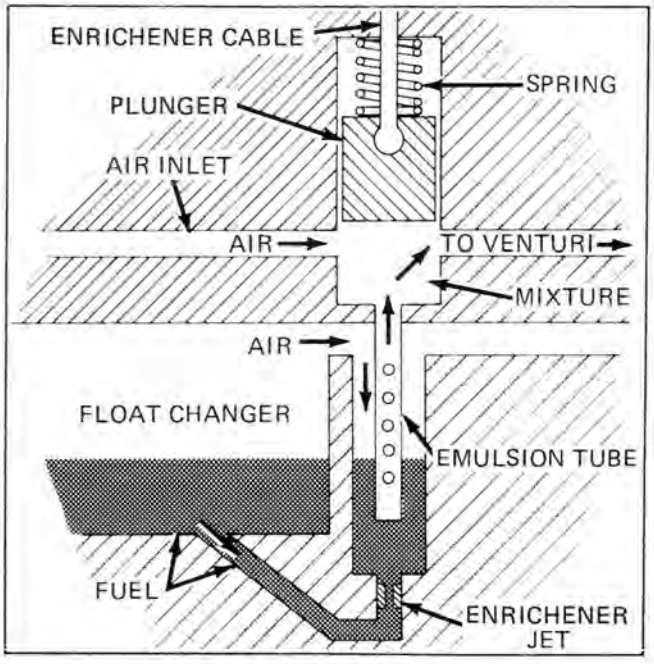


Figure 2-31

Primer System

The primer pump is located in the dash panel next to the key switch. This pump is used along with the enrichener for cold starts. It injects a measured amount of fuel into the carburetor venturi at a point just behind the throttle slide. (See Figure 2-32.)

For cold starting, pump the primer 2 to 4 strokes. The amount of priming necessary will vary in accordance with temperature and atmospheric conditions. Experience will indicate the correct number of strokes required to start your engine. Overpriming will cause engine flooding resulting in hard starting rather than assisting during cold starting, DO NOT overprime the engine.

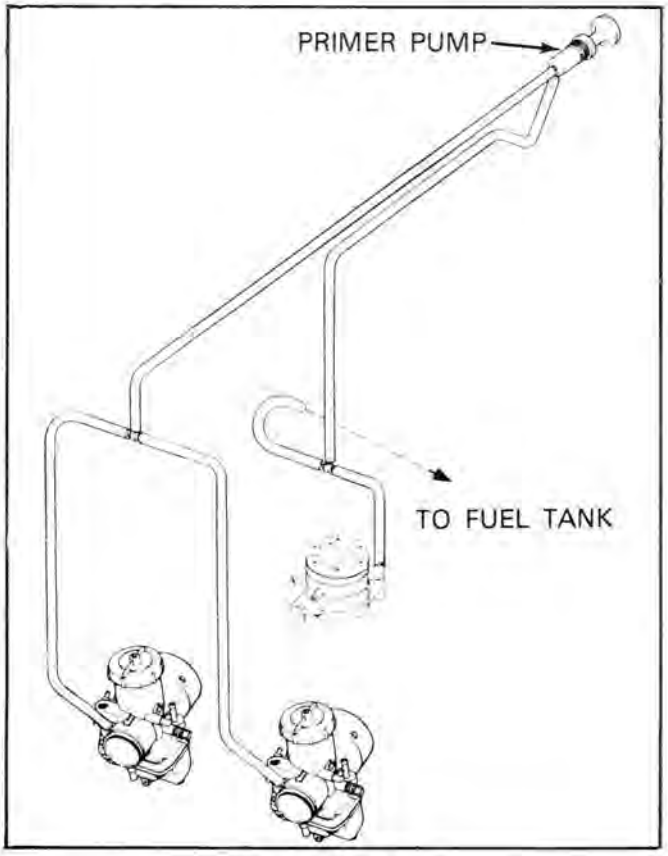


Figure 2-32

To operate the primer pump:

1. Pull out on the primer knob. Outward movement of the primer shaft draws fuel from the fuel tank to fill the primer pump cavity.

2. Push in on the primer knob. Inward movement of the primer shaft pumps fuel from primer to the fitting of each carburetor.

NOTE: Be sure the primer knob is pushed in, and contacting the body of the pump to prevent accidental siphoning of fuel through the primer pump during engine operation.

Ignition System Theory of Operation

The ignition system consists of the spark plugs, ignition coil, a capacitor discharge ignition (CDI) igniter, exciter coil, and a pulser coil. (See Figure 2-33.)

The CDI magneto assembly consists of a flywheel with four magnets evenly spaced about the circumference and a stator. The stator serves as a mount for three coils. The exciter coil charges the capacitor in the CDI igniter; the pulser coil signals the CDI igniter to fire the spark plugs (both spark plugs fire simultaneously); and the lighting coil supplies current to the lights. (See Figure 2-34.)

As the flywheel rotates, an alternating current is induced in the coils mounted on the stator.

The CDI igniter capacitor stores the charge generated by the exciter coil. The amount of charge the exciter coil gives the capacitor effects the intensity of the spark.

Current generated by the pulser coil causes the capacitor in the CDI igniter to release its stored charge to the ignition coil. The ignition coil primary induces a high voltage in the secondary winding, and causes a spark to jump across the spark plug electrodes.

This sequence occurs twice every rotation of the flywheel.

The pulser coil has no effect on the intensity of the spark. Its sole purpose is to signal the capacitor when to release its charge to the ignition coil.

Two switches (emergency stop and key) are connected to CDI igniter leads through the engine connector which comprise the "stop" circuit. Each switch functions independently of the other and when positioned to "stop" will complete a circuit preventing charge of the capacitor in the CDI igniter. If no charge is applied to the capacitor, there is no output from the CDI igniter to ignition coil resulting in no spark at the plugs.

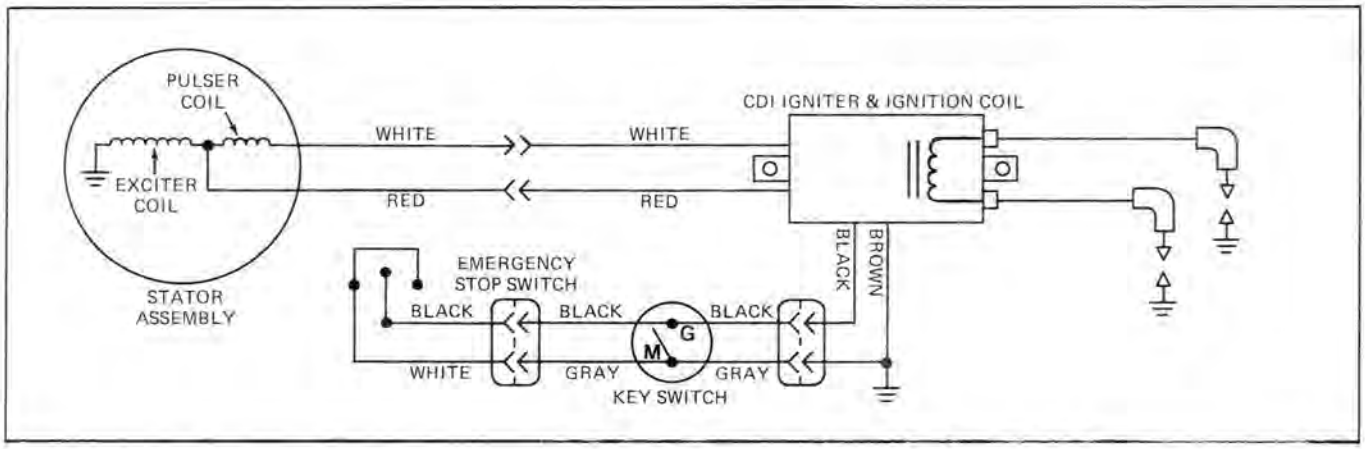
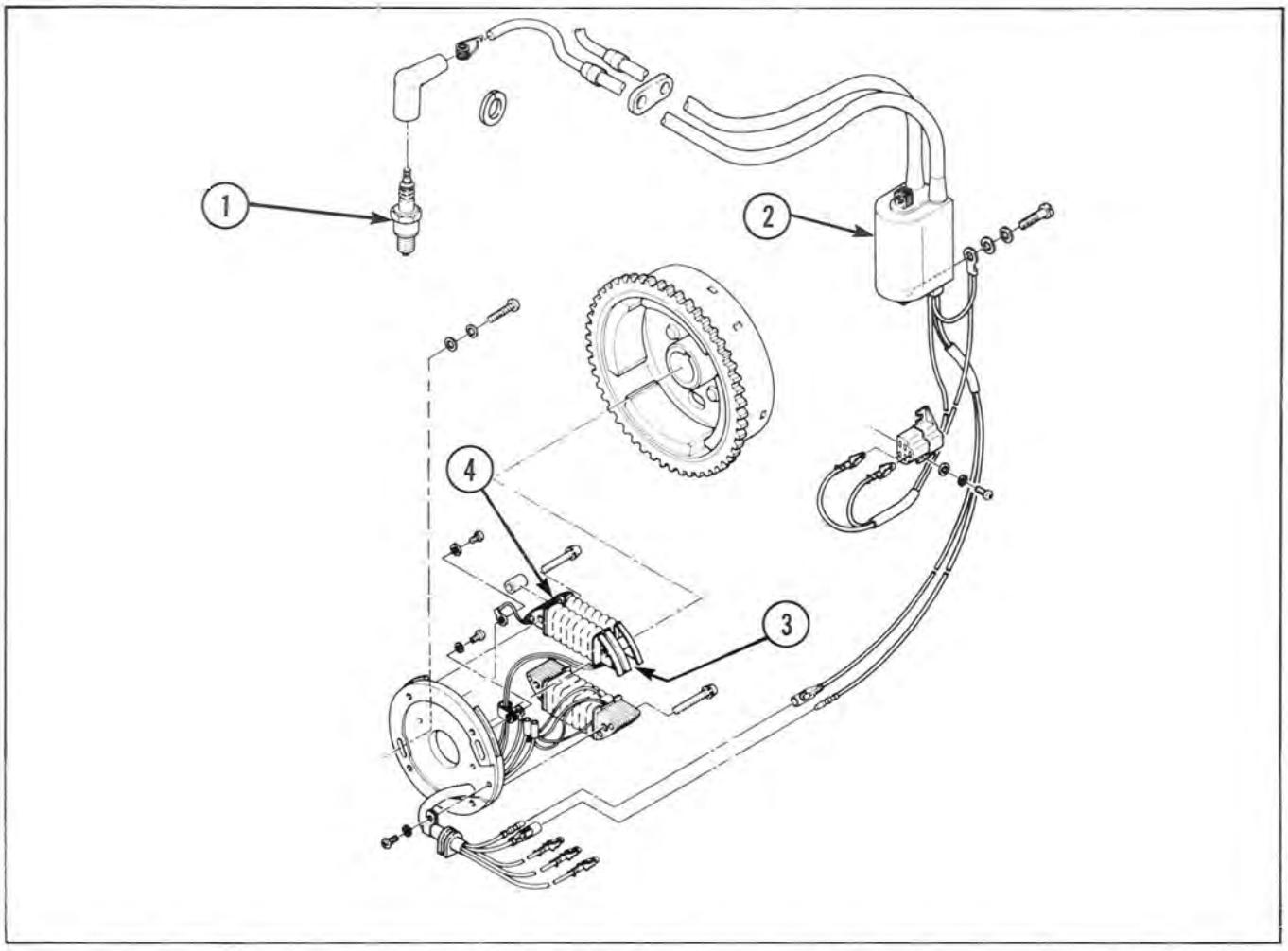


Figure 2-33



1. Spark Plug
2. CDI Igniter
3. Exciter Coil
4. Pulser Coil

Figure 2-34

Electrical System Theory of Operation

The snowmobile electrical system consists of a battery and the necessary circuits to operate lights, instruments, battery charging and electric starter.

Battery (See Figure 2-35)

WARNING

NEVER RUN ENGINE WITH BATTERY CABLES OR ELECTRICAL CONNECTORS DISCONNECTED. Doing so may damage the voltage regulator/rectifier. Sparks that may occur could cause a fire which may cause severe personal injury.



Figure 2-35

The battery stores electrical energy, 12 volts direct current (12 VDC), in a chemical form which is used for starter motor operation and serves as a back-up source of power for lights when the engine is not running. When the engine is running electrical energy from the charging circuit is sent to the battery (to replace current used to start engine) and to lighting system circuit.

With proper care, the battery can be expected to last several years, but it may be completely ruined long before that if it is mistreated. Following a few simple rules will greatly extend the life of the battery.

1. When the level of the electrolyte in the battery is low, add only distilled water to each cell, until the level is at the upper level line marked on the outside of the battery. Ordinary tap water is not a substitute for distilled water and will shorten the life of the battery.

2. Never add sulphuric acid solution to the battery. This will make the electrolyte solution too strong and will ruin the battery within a very short time.

3. Avoid quick-charging the battery. A quick-charge will damage the battery plates.

4. Never let a good battery stand for more than 30 days without giving it a supplemental charge, and never let a discharged battery stand without charging it. If a battery stands for any length of time, it slowly self-discharges. Once it is discharged, the plates sulphate (turn white), and the battery will no longer take a charge.

5. Keep the battery well-charged during cold weather so that the electrolyte does not freeze and crack open the battery. The more discharged the battery becomes, the more easily it freezes.

6. Always keep the battery vent hose free of obstruction, and make sure it does not get pinched or crimped shut. If battery gases cannot escape through this hose, they will explode the battery.

7. DON'T INSTALL THE BATTERY BACKWARDS. The negative side is grounded.

8. Do not install unapproved accessories. Certain items cause excessive drain on battery that charging circuit cannot replace.

WARNING

Do not attempt to "jump" start snowmobile with a booster battery and jumper cables. The battery generates hydrogen gas which can be flammable and explosive under certain conditions. Sparks from jumper cables may ignite this gas causing severe personal injury.

Lighting Circuit (See Figure 2-36)

Lighting circuit components consist of:

1. 12 VDC battery - power supply for lighting system when engine is not running.

2. Fuse - prevents damage to wiring harness and components by limiting current flow within system to 10 amps.

3. Key Switch - controls operation of lighting circuit by switching current flow ON or OFF.

4. Instrument Lights - illuminates numbered face of instrument.

5. Brake Light Switch - controls operation of brake light by allowing current to flow when brake lever on handlebar is activated.

6. Tail/Brake Light - tail light operates whenever key switch is in Run/Lights position. Brake light illuminates whenever brake light switch is closed.

7. Headlight Dimmer Switch - depending upon selected position, allows current flow to either HI or LOW beam of headlight. Current is available at dimmer switch only when key switch is in Run/Lights position.

8. Headlight - illuminates area ahead of snowmobile.

9. Wiring and Connectors - used to interconnect and complete the circuits of items in lighting system.

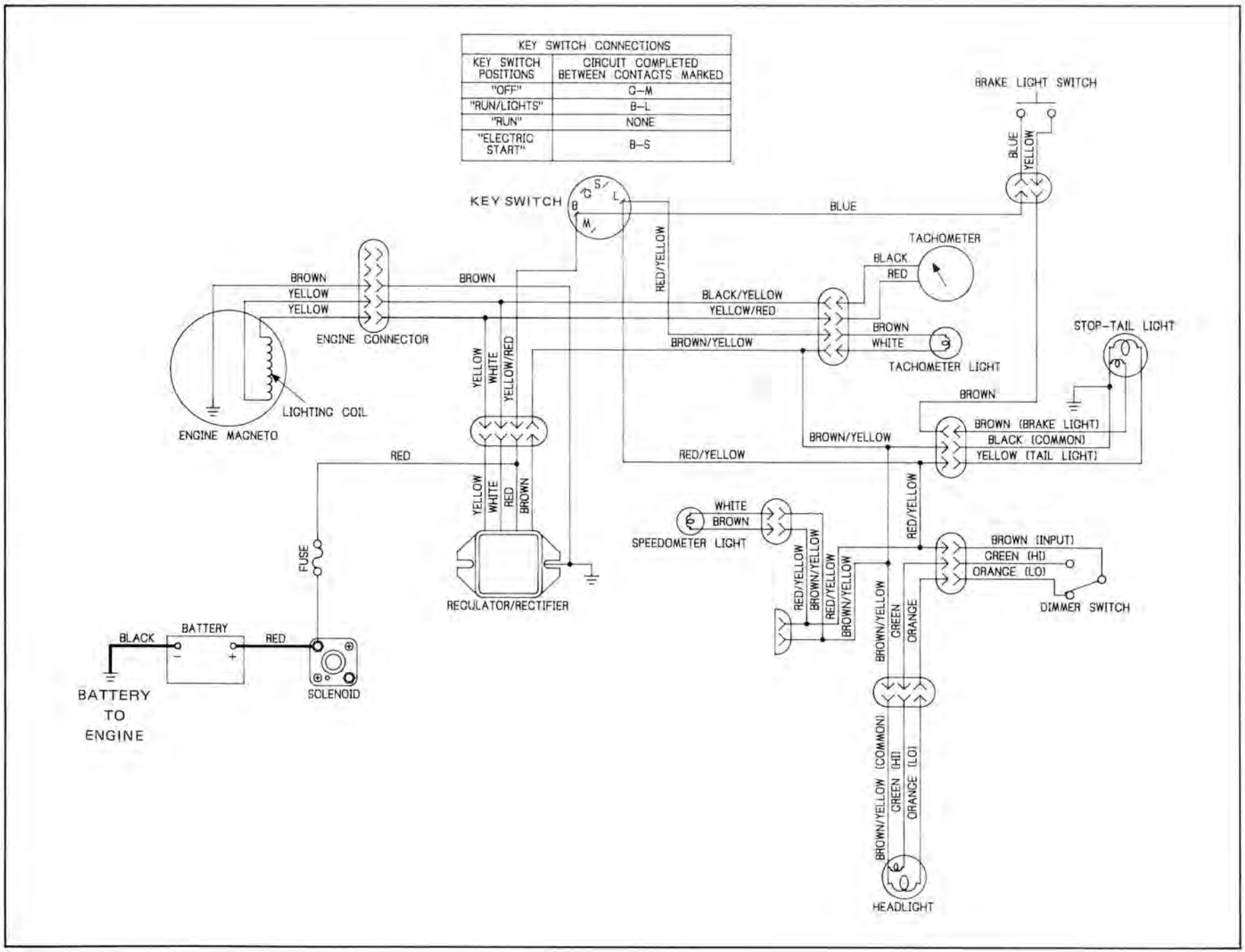

KEY SWITCH CONNECTIONS
KEY SWITCH POSITIONS
CIRCUIT COMPLETED BETWEEN CONTACTS MARKED
"OFF"
G–M
"RUN/LIGHTS"
B–L
"RUN"
NONE
"ELECTRIC START"
B–S
BRAKE LIGHT SWITCH
BLUE
YELLOW
KEY SWITCH
S
G
L
B
M
BLUE
RED/YELLOW
TACHOMETER
BLACK
RED
BROWN
YELLOW
YELLOW
BROWN
ENGINE CONNECTOR
BLACK/YELLOW
YELLOW/RED
BROWN/YELLOW
BROWN
WHITE
TACHOMETER LIGHT
STOP–TAIL LIGHT
BROWN
BROWN (BRAKE LIGHT)
BLACK (COMMON)
YELLOW (TAIL LIGHT)
BROWN/YELLOW
RED/YELLOW
YELLOW
WHITE
YELLOW/RED
LIGHTING COIL
ENGINE MAGNETO
RED
YELLOW
WHITE
RED
BROWN
WHITE
BROWN
SPEEDOMETER LIGHT
RED/YELLOW
BROWN/YELLOW
RED/YELLOW
BROWN/YELLOW
BROWN (INPUT)
GREEN (HI)
ORANGE (LO)
DIMMER SWITCH
FUSE
REGULATOR/RECTIFIER
BROWN/YELLOW
GREEN
ORANGE
BLACK
BATTERY
RED
BATTERY TO ENGINE
SOLENOID
BROWN/YELLOW (COMMON)
GREEN (HI)
ORANGE (LO)
HEADLIGHT

Figure 2-36

Operation

During engine operation the charging system supplies current to illuminate all lights as well as charge the battery. All lights will operate when the engine is not running, however, continued use will reduce battery state of charge to a point which may cause the battery to become unserviceable (discharged).

Brake light operation is independent from other lights and will illuminate anytime the brake light switch is activated. All other lights require that key switch be placed in Run/Lights position for operation.

If failure should occur to the 10 amp fuse, battery power will be disconnected from key switch and the lights will not operate when engine is not running. If engine is manually started, lights will operate from power received from charging system. Continued operation in this manner may overstress the electrical system components resulting in premature failure as well as permanently damaged battery. Troubleshoot electrical system as soon as possible to determine cause of fuse failure.

When key switch is placed in Run/Lights position, circuit is complete between contacts marked B and L, and power is available (from battery or charging system) for lights.

Charging and Instrument Circuits (See Figure 2-37.)

Charging and Instrument circuits consist of the following components:

1. Flywheel - contains four permanent magnets, evenly spaced about the circumference, which provides the magnetic field required to produce electrical energy in a magneto system.

2. Lighting Coil - a large coil of wire mounted on a plate near the flywheel magnets, which will produce single phase alternating current (AC), as the magnets pass by during flywheel rotation.

3. Tachometer - used to measure engine speed in revolutions per minute (RPM). Power to operate the tachometer is supplied by magneto lighting coil output (AC).

4. Regulator/Rectifier - converts AC from magneto lighting coil into DC to charge the battery. Monitors and controls battery voltage to predetermined safe level.

5. 12 VDC Battery - provides power necessary during electric starting of engine and operates lighting system when engine is not running.

6. Fuse - prevents damage to wiring harness and components by limiting current flow within system to 10 amps.

7. Wiring and Connectors - used to interconnect and complete the circuits of items in charging system.

Operation

As the flywheel rotates, magnetic fields surrounding the magnets cut through lighting coil windings, which generate alternating current with two cycles per flywheel revolution.

Current leaves the lighting coil and is sent to a solid-state Regulator/Rectifier. At low engine RPM a small charging voltage is generated and enters the Regulator/Rectifier where it is converted to DC, sent to the battery, and returns back to lighting coil. As engine RPM increases, charging voltage also increases. Left unchecked this voltage supply would soon exceed the battery's capacity causing it to overcharge and boil. Instead, when battery voltage reaches 14 to 14.5 volts the regulator circuit is activated which by-passes the battery and sends the excess current directly back to lighting coil reducing charge available to battery. Since there are no contacts or moving parts the Regulator/Rectifier never needs to be adjusted.

Current flow from the Regulator/Rectifier varies depending on key switch position as follows:

- Run position - current from charging system is available to charge battery, at B terminal of key switch and at brake light switch.

- Run/Lights position - current is available as described for Run position in addition to supplying power to all lights connected to L terminal of key switch.

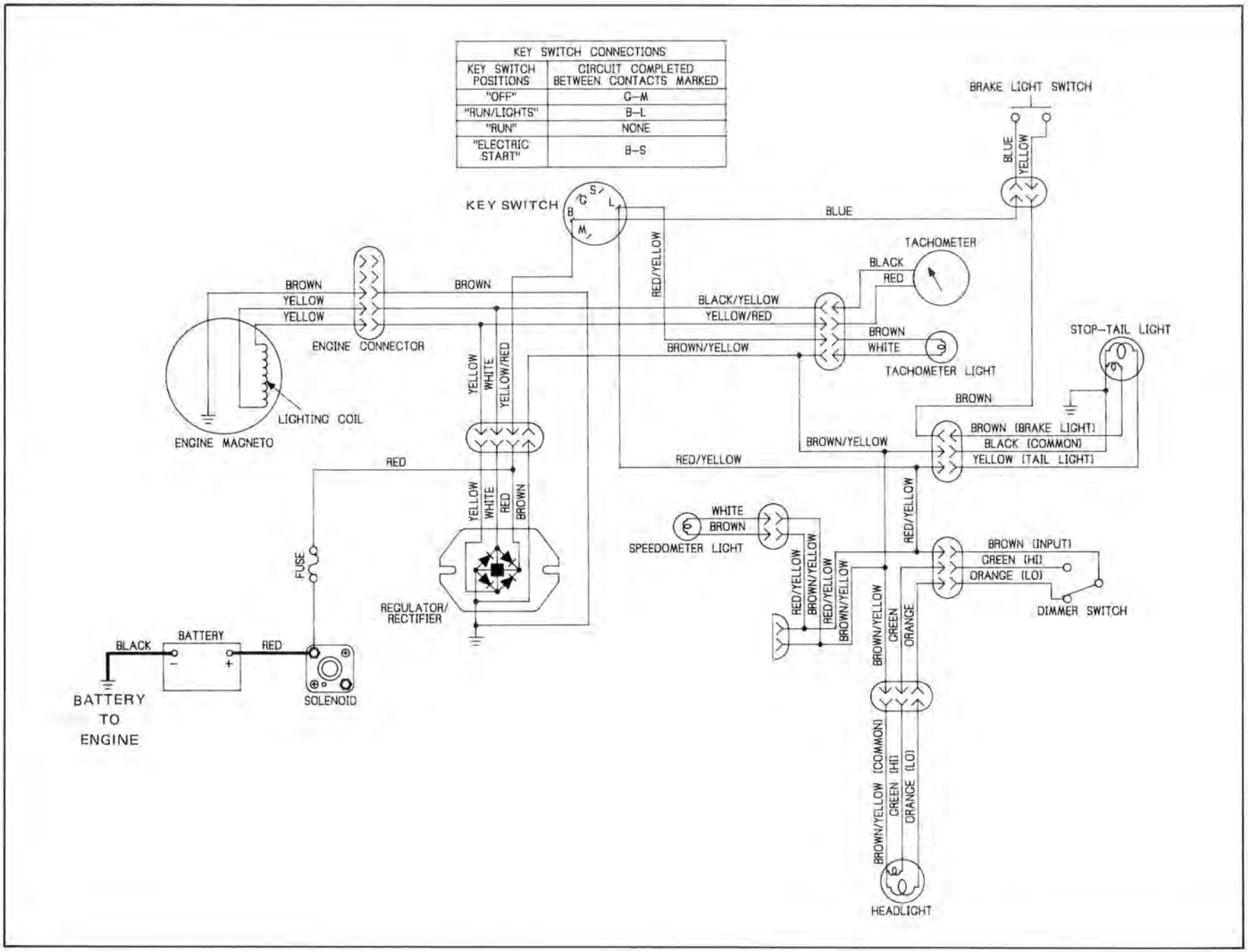

KEY SWITCH CONNECTIONS
KEY SWITCH POSITIONS
CIRCUIT COMPLETED BETWEEN CONTACTS MARKED
"OFF"
G–M
"RUN/LIGHTS"
B–L
"RUN"
NONE
"ELECTRIC START"
B–S
BRAKE LIGHT SWITCH
BLUE
YELLOW
KEY SWITCH
S
G
L
B
M
BLUE
TACHOMETER
BLACK
RED
RED/YELLOW
BROWN
YELLOW
YELLOW
BROWN
ENGINE CONNECTOR
BLACK/YELLOW
YELLOW/RED
BROWN
WHITE
TACHOMETER LIGHT
BROWN/YELLOW
STOP–TAIL LIGHT
YELLOW
WHITE
YELLOW/RED
LIGHTING COIL
ENGINE MAGNETO
BROWN
BROWN (BRAKE LIGHT)
BLACK (COMMON)
YELLOW (TAIL LIGHT)
BROWN/YELLOW
RED/YELLOW
RED
YELLOW
WHITE
RED
BROWN
WHITE
BROWN
SPEEDOMETER LIGHT
RED/YELLOW
BROWN (INPUT)
GREEN (HI)
ORANGE (LO)
DIMMER SWITCH
FUSE
REGULATOR/ RECTIFIER
RED/YELLOW
BROWN/YELLOW
RED/YELLOW
BROWN/YELLOW
BROWN/YELLOW
GREEN
ORANGE
BLACK
BATTERY
RED
BROWN/YELLOW (COMMON)
GREEN (HI)
ORANGE (LO)
BATTERY TO ENGINE
SOLENOID
HEADLIGHT

Figure 2-37

Starter Circuit (See Figure 2-38.)

Electric starter system components consist of:

1. 12 VDC Battery - provides power to operate electric starting circuit.
2. Fuse - prevents damage to wiring harness and components by limiting current flow within system to 10 amps.
3. Key Switch - controls current flow to energize starter solenoid switch.
4. Starter Solenoid Switch - controls current flow between battery and starter motor.
5. Starter - converts electrical energy from battery to mechanical power for engine rotation.
6. Wiring and Connectors - used to interconnect and complete the circuits of items in starter system.
7. Flywheel Ring Gear - means to temporarily join pinion gear of starter with flywheel to permit engine rotation for starting electrically.

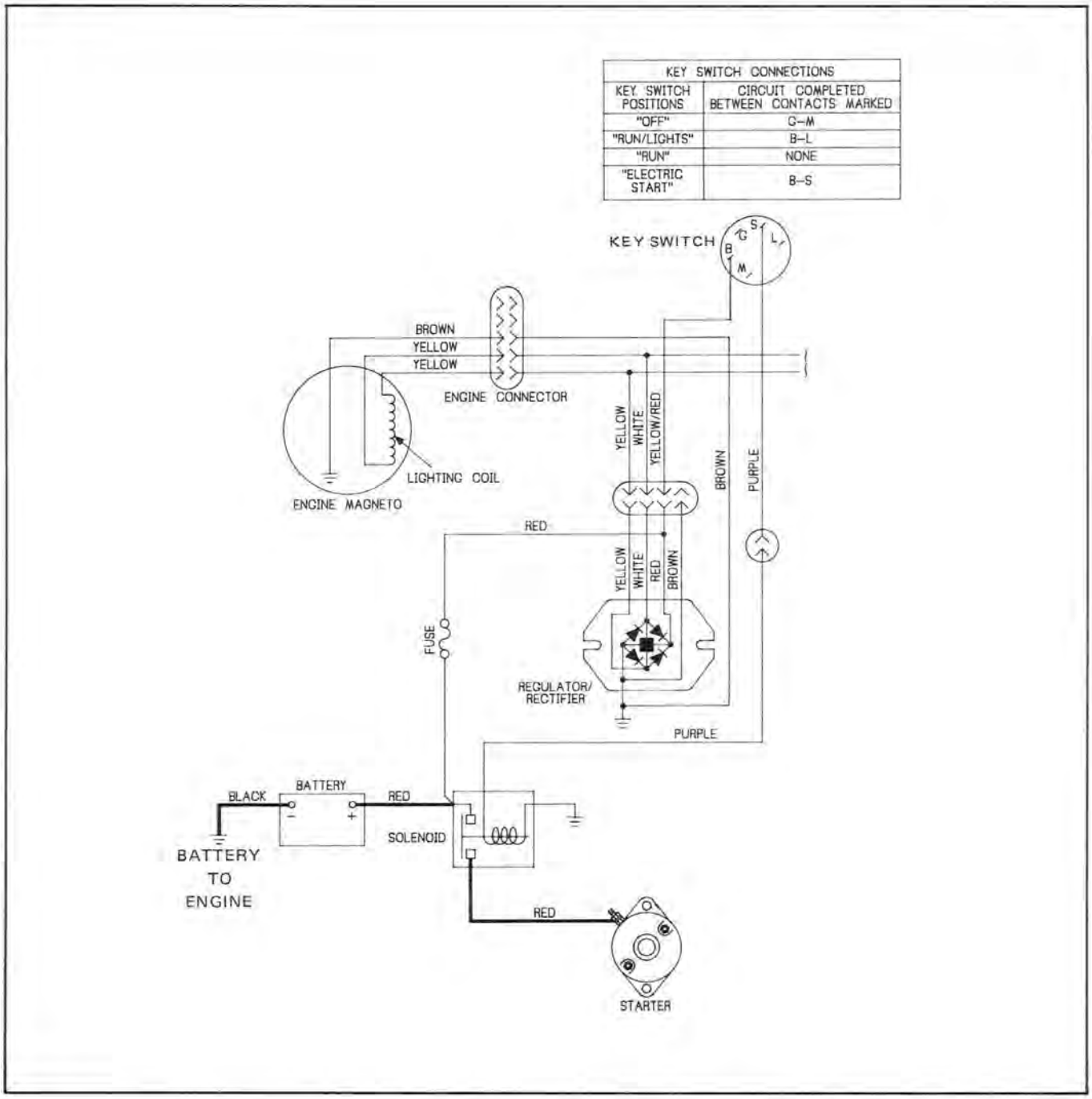


Figure 2-38

Operation

When the key switch is turned to START position it completes a circuit between B and S terminals of the switch. This allows a small amount of current flow from battery, through key switch, to solenoid switch. Current flow within solenoid windings magnetize the plunger, causing plunger to move against the contacts. The closed contacts complete a circuit between battery and starter motor allowing the motor to turn. Solenoid switch is required because of the high current flow requirement of starter motor. Since it is not practical to use a heavy duty switch with very large wires mounted on instrument panel, the key switch is designed to carry the low current necessary to energize the solenoid windings with heavy duty contacts inside the solenoid to carry the starter motor current.

Starter motor operation depends upon magnetic attraction and repulsion, which is determined by field windings, armature windings (commutator segments) and brushes. Direction in which wire is wound (wrapped) to form a coil and placement of each starter component with relationship to others, controls the effects of magnetic fields within the starter. (See Figure 2-39.)

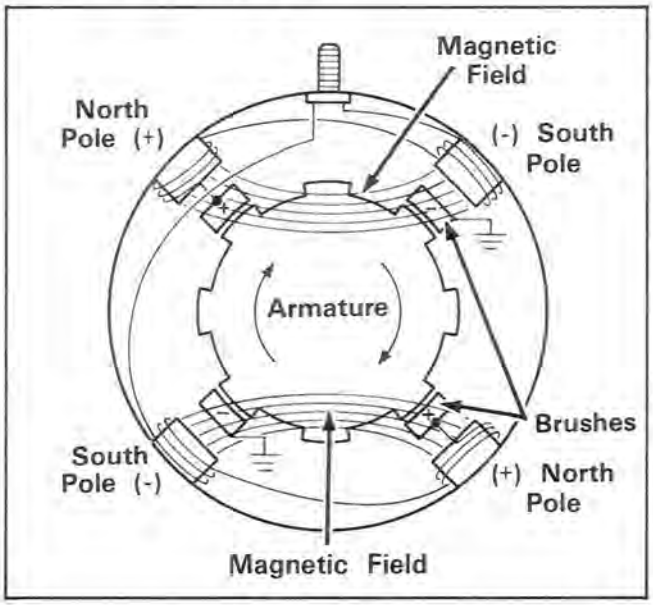


Figure 2-39

When current is applied to the field windings it causes magnetic lines of force to pass from one field winding (North pole) through the armature core to the opposite field winding (South pole). At the same time current passes through the brushes to armature winding conductors which generates a second magnetic field. The magnetic field around each armature conductor (being of the same polarity as the field winding) strongly repell each other resulting in armature rotation away from the magnetic force of field windings. As each armature conductor (commutator segment) exits the force from one field winding it approaches a force of opposite polarity from the adjoining field winding. The specific placement of brushes and commutator segments reverses the flow of current in the armature conductors which reverses the magnetic field and it will continue to contribute its force to the cranking power output.

During armature rotation the pinion gear is moved away from starter motor assembly and engages with flywheel ring gear to crank the engine. After the engine has started, the ring gear drives pinion assembly faster than armature shaft is rotating which causes the pinion to move out of mesh with the flywheel. An overrunning clutch is incorporated in pinion assembly to assist in preventing damaged gears if key switch is held in start position after engine has started.

CAUTION

DO NOT operate the starter continuously for more than 15 seconds or starter will overheat. After each 15 seconds of operation, allow starter to cool for 15 seconds. Never turn key switch to start position when engine is running or starter is still spinning. This will hasten wear and may cause starter to jam.

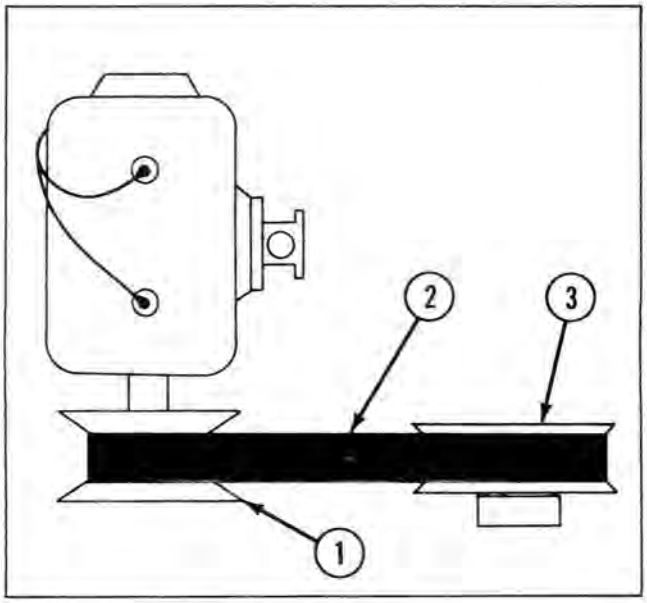
WARNING

Do not attempt to "jump" start snowmobile with a booster battery and jumper cables. The battery generates hydrogen gas which can be flammable and explosive under certain conditions. Sparks from jumper cables may ignite this gas causing severe personal injury.

Converter System Theory of Operation

A torque sensing, variable ratio, sheave-type torque converter is used to drive the snowmobile. This converter consists basically of a drive converter mounted to the power take-off of the engine, a driven converter which drives the track through the chaincase and gearing, and a V-belt which transmits rotary motion from the drive converter to the driven converter. (See Figure 2-40.)

The method of transmitting power from the drive converter by means of a belt to the driven converter enables multiplication of engine torque as needed by the track to pull the snowmobile through varying snow depths, and up and down hills. The converter automatically shifts to maintain maximum horsepower at all operating conditions.



1. Drive Converter
2. V-Belt
3. Driven Converter

Figure 2-40

Drive Converter

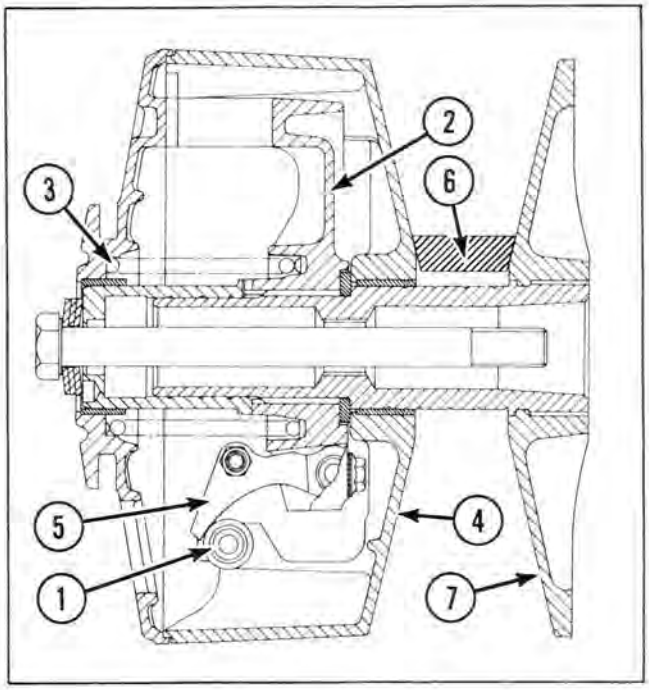
The drive converter on the snowmobile is designed to provide maximum performance under all types of snow and load conditions. (See Figure 2-41.)

There are three variables that will change the performance characteristics of the drive converter. They are as follows:

1. Spring
2. Weights
3. Ramps

The primary function of the spring is to control the initial engagement between the movable drive sheave and T.C. belt. The spring also affects engine RPM throughout the drive converter shift pattern. A weak or light spring will decrease both engagement speed and maximum engine RPM, resulting in speeding up the shift pattern.

A heavy or strong spring will increase engagement speed and maximum engine RPM, but slows down the shift pattern.



1. Roller
2. Spider Assembly
3. Spring
4. Movable Sheave
5. Weight Ramp
6. Drive Belt
7. Stationary Sheave

Figure 2-41

The drive converter contains three ramp weights that control engine RPM. Lighter ramp weight will increase engagement RPM, and maintain higher RPM throughout the total shift pattern. Care must be taken not to exceed specified engine RPM or engine damage will occur. By contrast, heavier ramp weights will decrease engagement RPM, and also lower engine RPM throughout the shift pattern. However, the main function of the ramp weights is to control the engine RPM through the shift pattern.

The ramp is designed so the shift pattern is within the peak torque curve of the engine. The ramp profile is the major factor in determining the characteristics of the shift pattern.

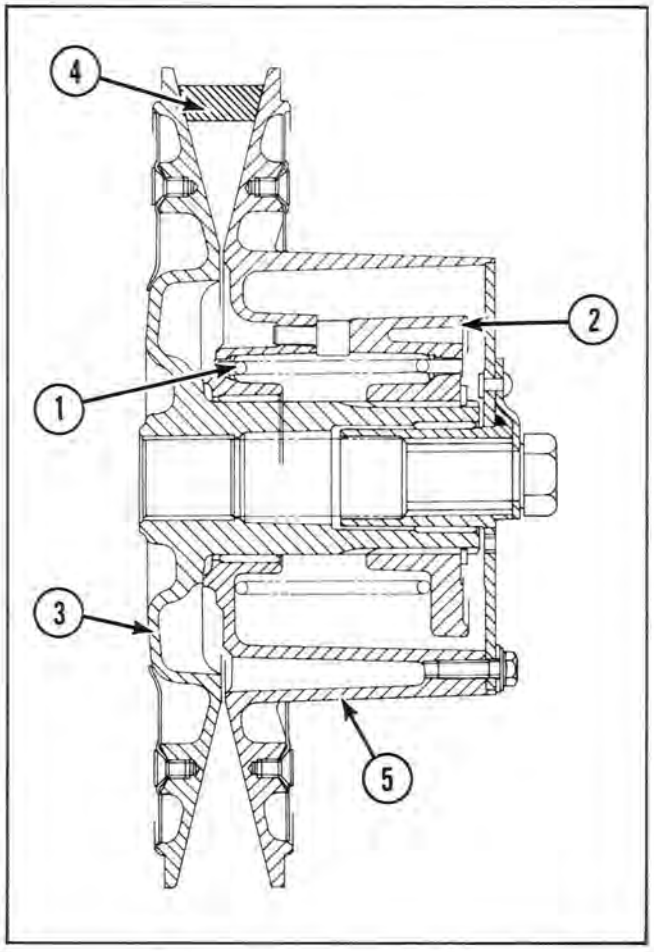
Driven Converter

The power that drives the track is transmitted from the drive converter through the T.C. belt to the driven converter. The driven converter is held closed by the driven torque converter spring. This positions the belt at idle, or with the engine off at the outside circumference of the driven flanges.

Spring positioning between the fixed sheave and ramp cap is variable which changes the preload (twist) of the movable sheave. If the engine RPM at 40 mph is 5,000, then winding the spring tighter will raise the RPM at the same vehicle speed. Reducing spring twist will result in lower RPM at the same vehicle speed.

Spring twist is controlled by placing the tab on each end of the spring in one of the hole selections provided in the ramp cap and fixed sheave. (See Figure 2-43.)

As the engine speed increases the sheave assembly is spread apart allowing the belt to ride on a smaller diameter of the flanges. This change of flange diameter varies the drive ratio, automatically providing the most favorable ratio between the drive and driven converter for the speed and load at which the machine is operating. (See Figure 2-42.)



1. Spring
2. Ramp
3. Movable Sheave
4. Drive Belt
5. Stationary Sheave

Figure 2-42

The driven converter has torque sensing capabilities accomplished through the design of the ramps on the fixed sheave and ramp cap. The angle of the ramps will change the torque sensing capabilities of the driven converter. The driven converter compares the amount of engine torque to track load, and shifts the converter into the best overall ratio for the conditions existing at that time.



1. Holes in Fixed Sheave
2. Holes in Ramp Cap

Figure 2-43

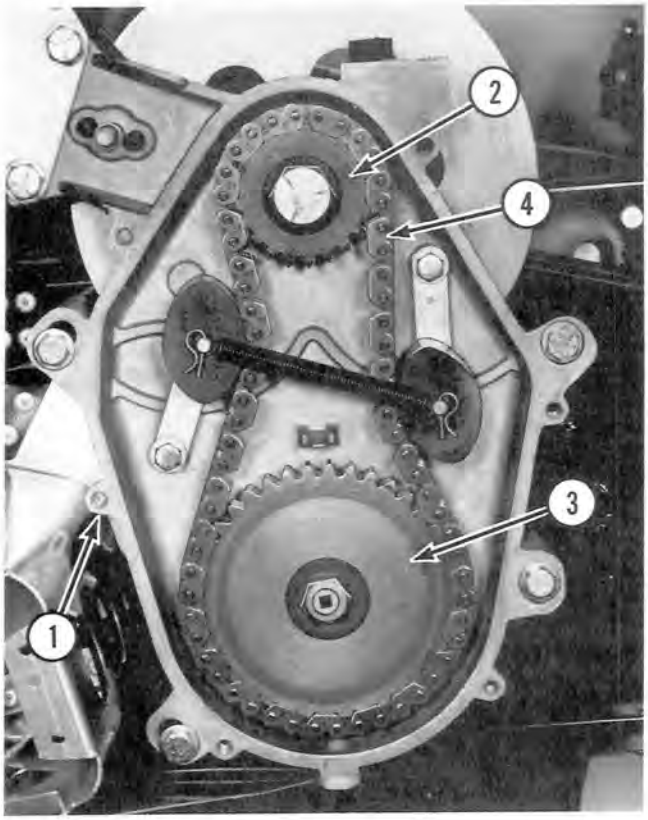
Chaincase and Gearing Operation

The chaincase provides a mounting for the RH end of the jackshaft and the front driveshaft. The drive sprocket, drive chain, and driven sprocket are housed within the sealed housing which contains lubricant for the drive chain. (See Figure 2-44.)

The upper (drive) sprocket in the chaincase is attached by splines to the jackshaft. The lower driven sprocket is attached to the track driveshaft by splines. The drive chain transfers power from the driven converter to the track driveshaft.

Track, Suspension, and Steering System Operation

The suspension system consists of the track, slide assembly and the skis. (See Figure 2-45.)



1. Chaincase
2. Drive Sprocket
3. Driven Sprocket
4. Drive Chain

Figure 2-44

The track provides floatation and propels the snowmobile. Support for the track and suspension is provided by the slide assembly. Turning the cam on the shock absorber spring adjusts the suspension for the weight of the rider(s). The suspension can also be adjusted for steering control by varying spring tension on the front suspension swing arm. Changing swing arm mounting position at the slide rail bracket effects weight transfer during acceleration and is a fine tuning feature available to satisfy operator perference governing the amount of ski lift under hard acceleration.

The bellcrank system used in this snowmobile gives full utilization of the shock absorber. The bellcrank design permits a 1:1 movement ratio between the slide rail upward travel, and the shock absorber piston and spring compression.

For each in. (25.4 mm) the suspension moves upward, the shock absorber piston and spring move 1 in. (25.4 mm).

A 1:1 movement ratio results in the following advantages:

1. Large amount of shock absorber piston travel - The more shock absorber piston movement available, the more effectively oscillations can be dampened, thus reducing the rebound normally associated when transversing bumps.

2. Rising rate coil spring - Full utilization of the load carrying capabilities permitted by the coil spring design to effectively reduce bottoming out when riding in rough terrain.

3. The snowmobile can be suspended lower while allowing a maximum amount of suspension travel with a low center of gravity.

Two skis are attached to the front of the snowmobile for steering control and flotation. A wear bar at the bottom of the ski protects the ski from wear and aids in steering control. The steering system connected to the ski consists of a spindle, steering arm, tie rod, and handlebars.



Figure 2-45

Engine Inspection

Check the engine for loose or missing hardware, etc.; replace if necessary and tighten hardware as specified on torque chart in Section 1.

Carefully inspect outside area of engine, paying particular attention to surfaces near mating flanges, seals and gaskets for signs of leakage. If leakage is evident, perform Crankcase Pressure Test and repair as required.

Crankcase Pressure Test

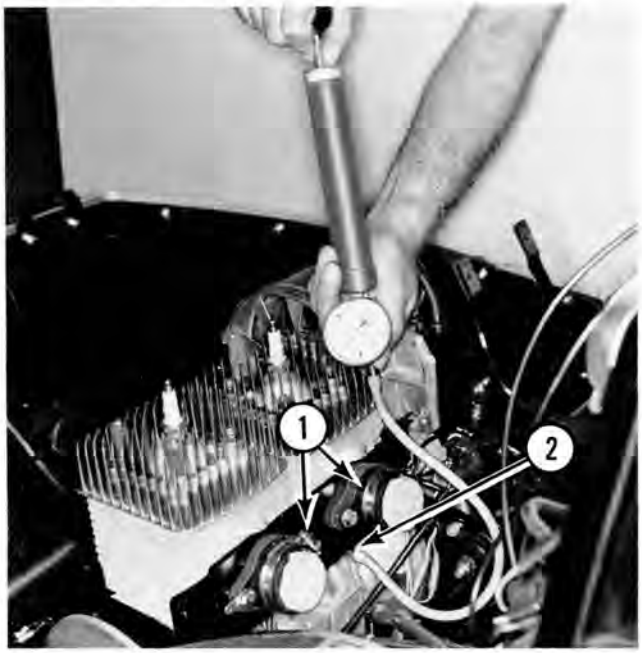
1. Remove muffler assembly, exhaust manifold, main upper shroud and exhaust side shroud. Discard the exhaust gaskets.

2. Seal the exhaust and intake passages of each cylinder to trap air inside engine assembly during test.

   a. Position rubber gasket (cut from old inner tube) on cylinder in place of exhaust gasket, and reinstall manifold.

   b. With carburetors removed, install 1-1/2 in. (38.1 mm) wooden plug (cut out of 2 x 4) into rubber carburetor holders and secure in position by tightening clamp screw.

3. Connect pressure tester and gauge to fuel pump pulse tube nipple on crankcase. (See Figure 2-46.)



1. Carburetor Holders
2. Fuel Pump Pulse Tube Nipple

Figure 2-46

4. Apply 7 to 10 psi (0.5 to 0.7 kg-cm^2) pressure to crankcase and observe gauge. If pressure is maintained for minimum of two minutes, crankcase is okay. Any pressure drop observed within two minutes indicates leakage and must be eliminated. Spray soapy water mixture along all sealing surfaces of engine to pinpoint leaking gasket or seal and repair as required.

5. Upon completion of test, reattach shrouds and exhaust system using new exhaust manifold gaskets and perform carburetor installation as described in Section 3.

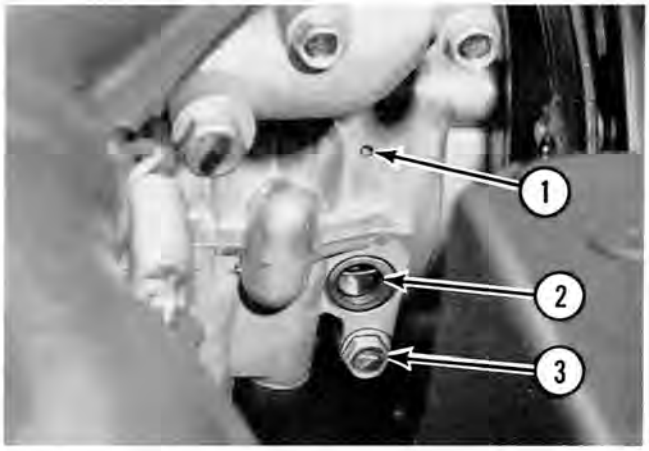
Engine Gearcase

Components inside the gearcase drive the oil injection pump.

CAUTION

Inspect the vent (breather) hole in the gearcase cavity above the sight gauge for obstructions. This hole must remain clear for proper operation of the seal between the crankcase and gearcase or gearcase damage will result. (See Figure 2-47.)

Lubricant level is correct when the oil appears above the center of the sight gauge, but not higher than the top. (See Figure 2-47.)



1. Vent Hole
2. Oil Level Sight Gauge
3. Drain Plug

Figure 2-47

To fill or add lubricant to the gearcase, remove fill plug (located on top of gearcase) and pour KAWASAKI ENGINE GEARCASE OIL into the filler opening to raise lubricant to proper level. Gearcase capacity is approximately 1.35 oz. (40 cc).

(See Figure 2-48.) If KAWASAKI ENGINE GEARCASE OIL is not available use a 10W-40 motor oil that meets or exceeds API service specifications, such as, Shell FIRE AND ICE.

Engine gearcase oil should be drained after the initial 100 miles of engine operation, and at the end of each season, to remove any impurities or foreign matter present in the gearcase cavity. To drain the gearcase, remove drain plug and raise rear of snowmobile to completely empty oil cavity. (See Figure 2-47.)



Figure 2-48

Compression Check

A simple compression check is to pull the starter rope slowly. The starter rope should display noticeable resistance on each cylinder as the piston approaches top dead center.

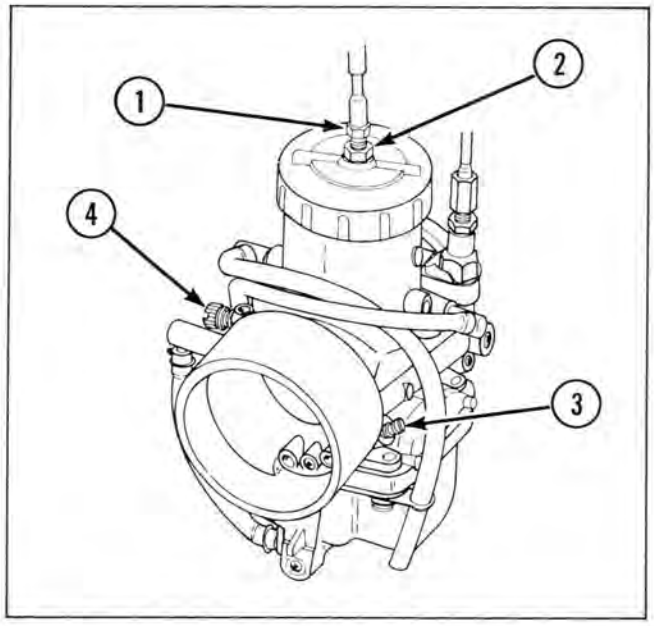
Use a compression gauge for accurate measurement. A compression reading of 90 to 95 psi (6.3 to 6.7 kg-cm^2) pressure. There should be no more than 10 percent difference between the two cylinders.

Fuel System

Carburetor Adjustments (See Figure 2-49)

Idle Stop Screw - Adjust idle stop screw by:

1. Turn idle stop screw into carburetor until spring is coil bound.



1. Throttle Cable Adjuster
2. Adjuster Locknut
3. Air Screw
4. Idle Stop Screw

Figure 2-49

2. Open idle stop screw (counterclockwise) 6 turns.

3. Final adjustment is achieved with engine warm, by turning idle stop screw on each carburetor equally to obtain 2500 RPM. Use tachometer to monitor engine speed.

NOTE: It is important that both throttle valves operate in unison for correct power output balance between LH and RH cylinders. The recommended method of carburetor synchronization is with a Kawasaki Mercury Synchro Tuner, Special Tool P/N 57001-3510. Refer to Carburetor Synchronization procedure.

Air Screw - To adjust air screw:

1. Turn air screw into carburetor (clockwise) until lightly seated.

2. Open air screw (counterclockwise) 1-1/2 turns.

3. Final adjustment is obtained with engine warm and operating at 2500 RPM. Use a tachometer to monitor engine idle speed and adjust idle stop screw if required.

4. Turn air screw on each carburetor equally to achieve stable idle as well as good acceleration response. To lean out fuel delivery open air screw. Close air screw to richen fuel delivery.

Fuel Filters (See Figure 2-50)

Water or dirt anywhere in the fuel system can cause hard starting, loss of power, or the engine to run a few minutes, then stop. A fuel tank filter, an in-line fuel filter and a fuel filter located in the fuel pump, have been installed to prevent foreign material from entering the carburetor.

Fuel Tank Filter – Hook the pick-up fuel line with a piece of wire and pull the filter through the filler neck. Check the filter for obstructions.

In-Line Filter - Replace at the beginning of each season or when contamination within filter is observed.

NOTE: Be sure filter is installed with arrow pointing towards fuel pump.

Internal Filter - Normally maintenance is not required, but if Fuel Pump Output Test specifications cannot be obtained, then disassemble fuel pump and inspect internal filter. Refer to Section 3 for Fuel Pump Repair procedure.

Fuel Pump

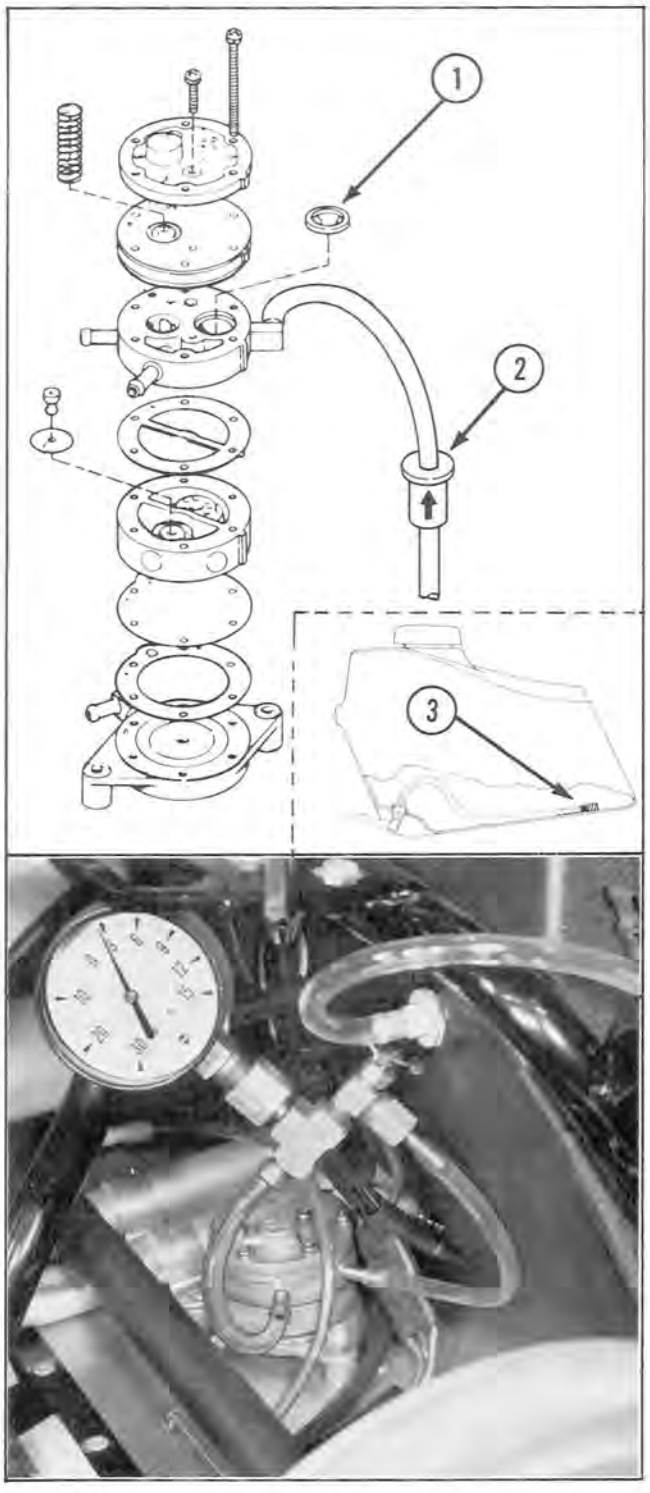
Fuel is drawn from fuel tank and delivered to the carburetors by a diaphragm type fuel pump. A pulse tube connects engine crankcase to fuel pump. Pressure pulses within crankcase (caused by up and down movement of piston) are applied to fuel pump diaphragms which create the pumping action.

Fuel pump output will be reduced by any of the following conditions:

1. Loose fitting fuel tubes.
2. Sharp bends (kinks) in fuel tube due to incorrect routing or length.
3. Fuel tank not venting.
4. Fuel filter contaminated.
5. Defective diaphragm (pinched or hole).
6. Check valves in fuel pump not seating.

Fuel Pump Pressure Test

1. Disconnect fuel pump output (fuel supply) tube from each carburetor.
2. Connect both output tubes to pressure gauge using T fitting. (See Figure 2-50.)
3. Start engine and run at idle speed for approximately 15 seconds, then stop engine and observe pressure gauge.
4. Gauge should maintain 7 to 9 psi (0.5 to 0.6 kg-cm^2) pressure for minimum of one minute. Any pressure drop observed within one minute after test indicates internal fuel pump leakage. Repair fuel pump as required to eliminate leakage.



1. Internal Fuel Filter
2. In-Line Filter
3. Fuel Tank Filter

Figure 2-50

Fuel Pump Output Test

1. Perform Fuel Pump Pressure Test to determine condition of internal components.

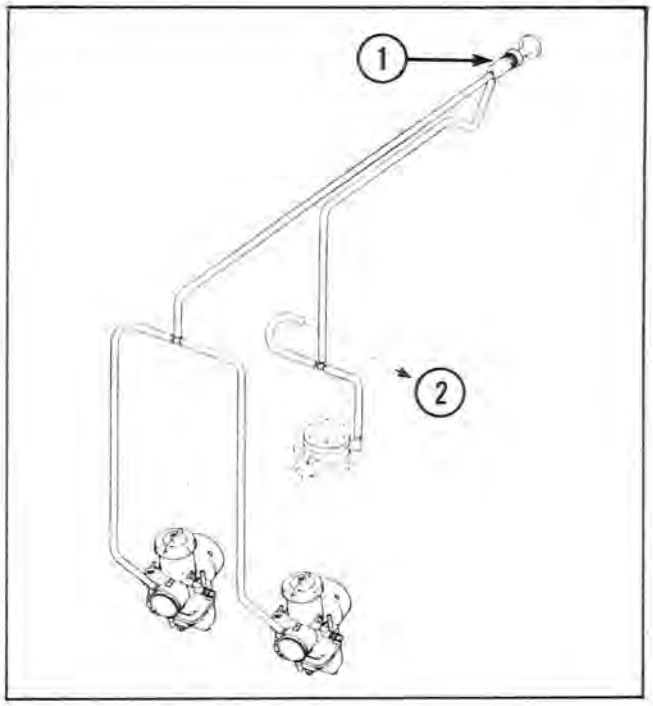
2. Disconnect fuel pump output (fuel supply) tube from each carburetor and place end of tubes into 1 quart (1 liter) container.

WARNING

Gasoline fumes are heavier than air and can become explosive if exposed to a pilot light from a furnace, hot water heater, clothes dryer, etc. Perform maintenance only in an area that is well ventilated and free from pilot lights and sparks.

3. Start engine and run at idle speed for approximately 30 seconds, then stop engine and measure fuel in container.

4. Fuel pump output is okay if volume measured is 16 oz. (473 cc) or more. If amount measured is less than 16 oz. (473 cc), inspect in-line filter, fuel pump filter, cavity below filter, fuel tank fittings, and tubes for obstructions.



1. Primer Pump
2. To Fuel Tank

Figure 2-51

Primer Pump

Check all the tube connections in the primer system for loose fits and leaks. Correct as necessary. (See Figure 2-51.)

Fuel Tank and Lines

Inspect the fuel tank for leaks. Also check all fuel lines and fuel tank fitting connections for leaks or kinks.

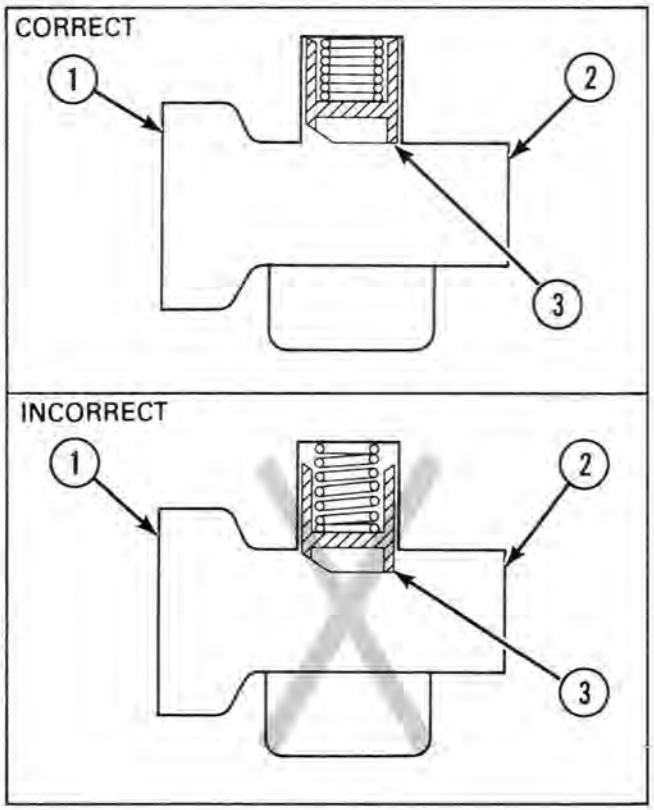
Throttle Cable Adjustment

WARNING

Do not operate the engine with the air intake silencer removed. Removal will result in engine damage, and may cause carburetor icing and a stuck throttle.

1. Remove instrument panel mounting screws and air silencer assembly, then hold the throttle lever at full throttle position and check that:

   a. Both throttle valves inside the carburetor bore open fully and equally. Be sure rear section of valve does not protrude into carburetor bore to restrict air flow at full throttle. (See Figure 2-52.)



1. From Air Silencer
2. To Engine
3. Throttle Valve

Figure 2-52

b. With the throttle lever at idle, there should be approximately 1/16 in. (1.5 mm) free play between the lever and housing.

c. Oil pump control arm must rest on stop pin with throttle lever at idle position. (See Figure 2-53.)

2. If either throttle valves, throttle lever, or oil pump control arm requires adjustment, follow procedures under Oil Pump to Carburetor Synchronization.

3. Install the air silencer assembly onto the carburetors and check that the rubber seals between air silencer body and carburetors fit securely during installation.

NOTE: Properly position the plastic adapters on carburetors prior to air silencer installation, to prevent breakage of the plastic econo jet fitting.

4. Secure air silencer into position with four springs. Install long springs on upper silencer tab retainers and short springs on lower silencer tab retainers.

CAUTION

Be certain air silencer intake hose is directed rearward and placed beneath brake and enrichener cables as incorrect position may result in engine damage.

5. Install the mounting screws to secure the instrument panel assembly.

6. Perform Carburetor Synchronization procedure.

Oil Pump to Carburetor Synchronization

Synchronization of the oil pump to carburetors is extremely important to assure adequate engine lubrication, peak performance and prevent excessive oil consumption.

Remove instrument panel mounting screws and air silencer assembly. Check Throttle Cable Adjustment prior to performing the following procedure.

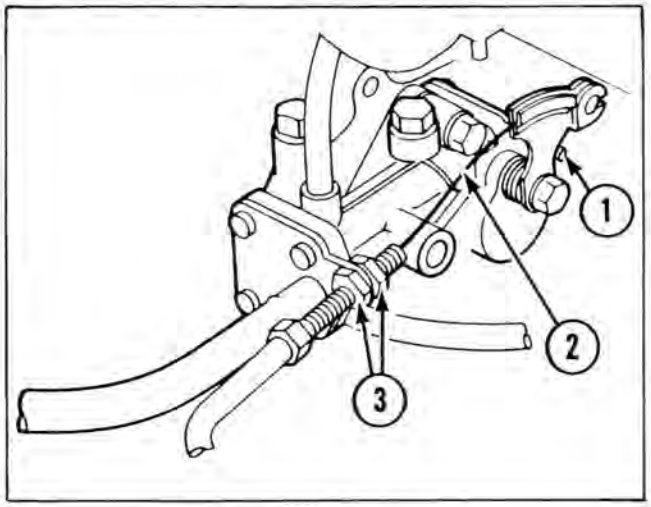
1. Lower each throttle valve completely so that it is resting on the bottom of carburetor bore by:

   a. Turn idle stop screw outward. (See Figure 2-49.)

   b. Loosen throttle cable adjuster lock nut and turn adjuster into carburetor.

2. Adjust throttle cable on the RH carburetor so that all of the slack is removed. The throttle valve should begin to raise as soon as the throttle lever on the handlebar is advanced. (See Figure 2-49.)

3. Push oil pump lever forward until it contacts the stop pin (if necessary loosen lock nuts on oil pump cable), this insures that oil pump is at the dead idle position. (See Figure 2-53.)



1. Lever Stop Pin
2. Slack Removed
3. Cable Locknuts

Figure 2-53

4. While holding oil pump lever against stop pin, remove all the slack. Adjustment is correct when lever on oil pump and throttle valve in RH carburetor move simultaneously as the throttle control lever is activated.

5. Adjust LH carburetor throttle cable so that oil pump lever and both throttle valves move simultaneously as the throttle control lever is activated.

6. Perform Carburetor Adjustments.

7. Install the air silencer assembly onto the carburetors and check that the rubber seals between air silencer body and carburetors fit securely during installation.

NOTE: Properly position the plastic adapters on carburetors prior to air silencer installation, to prevent breakage of the plastic econo jet fitting.

8. Secure air silencer into position with four springs. Install long springs on upper silencer tab retainers and short springs on lower silencer tab retainers.

CAUTION

Be certain air silencer intake hose is directed rearward and placed beneath brake and enrichener cables as incorrect position may result in engine damage.

9. Install mounting screws to secure the instrument panel assembly.

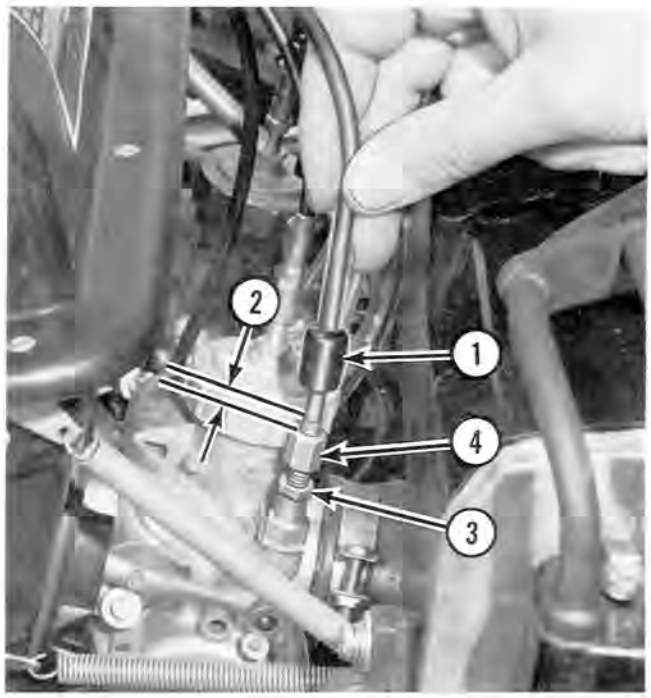
10. Perform Carburetor Synchronization procedure.

Enrichener Cable Adjustment

With the enrichener lever down, and boot slid up the casing the enrichener cable should have 1/16 in. (1.5 mm) of free movement when raised as shown. (See Figure 2-54.)

NOTE: Engine flooding may occur if the Enrichener Cable free movement is less than 1/16 in. (1.5 mm).

If adjustment is required, loosen locknut and turn adjusting screw to obtain the correct movement. After adjustment, or checking, reposition boot over enrichener fitting to prevent foreign matter from entering the enrichener system.



1. Boot
2. 1/16 In. (1.5 mm)
3. Locknut
4. Adjusting Screw

Figure 2-54

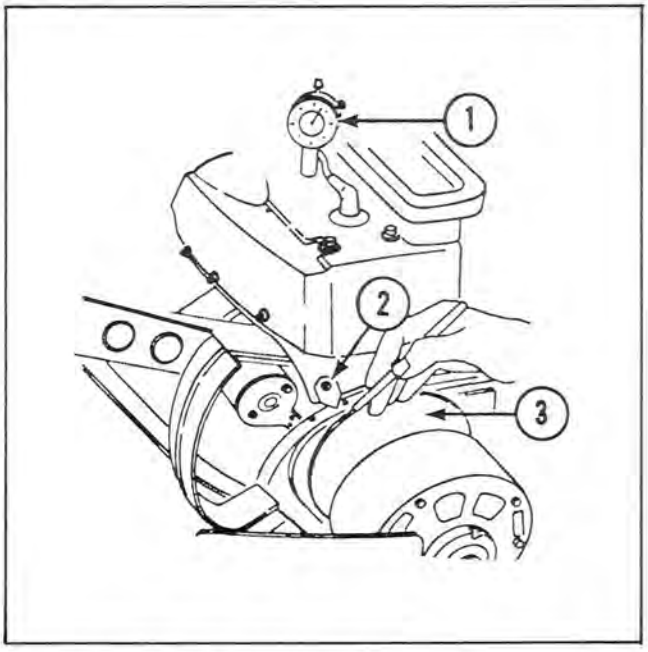
Ignition System

Since the CDI system has no mechanical parts, there are no parts to wear out, and no scheduled maintenance is required. If any of the CDI system components are defective, they must be replaced.

Ignition Timing Check

Remove drive belt prior to performing the following procedure.

1. Install a fabricated timing pointer onto engine. For accuracy, it is important to attach pointer to engine rather than chassis, so that pointer can move with the engine. (See Figure 2-55.)



1. Dial Indicator
2. Fabricated Pointer
3. Drive Converter Fixed Sheave

Figure 2-55

2. Remove both spark plugs and install a dial indicator into the RH cylinder spark plug hole.

3. Rotate drive converter in the normal direction of rotation (counterclockwise) to find TDC. Next, turn drive converter clockwise to 0.073 in. (1.85 mm) before TDC. Make a mark on drive converter fixed sheave opposite the timing pointer. (See Figure 2-55.)

4. Remove dial indicator, and before installing spark plugs, check that:

   a. Plug gap is properly adjusted to 0.024 in. (0.66 mm).

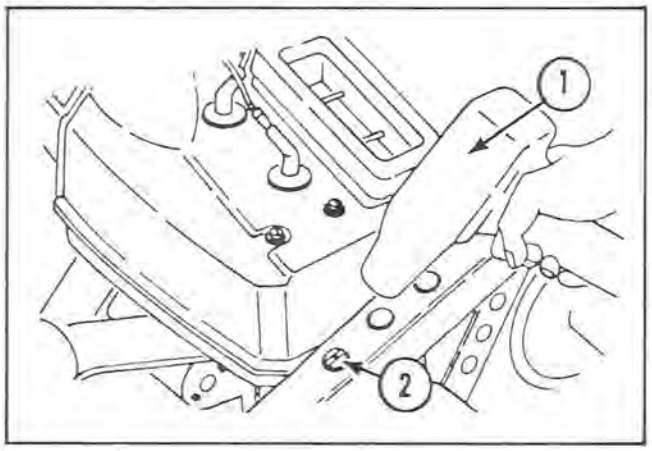
   b. Be sure washer is installed on plug and seat on the cylinder head is clean.

Install spark plugs and apply 18 to 20 ft lb (2.5 to 2.8 kg-m) torque.

WARNING

Do not touch the spark plug leads while engine is running as they will transmit a powerful electrical shock. Do not touch the hot exhaust system. A severe burn would result.

5. With drive belt removed and converter guard secured in place, run engine at 6,500 RPM. Direct timing light through opening in converter guard directly over the timing pointer. The timing is correct when mark on the converter aligns with pointer as the timing light flashes. (See Figure 2-56.) If timing is incorrect, refer to Ignition Timing Adjustment.

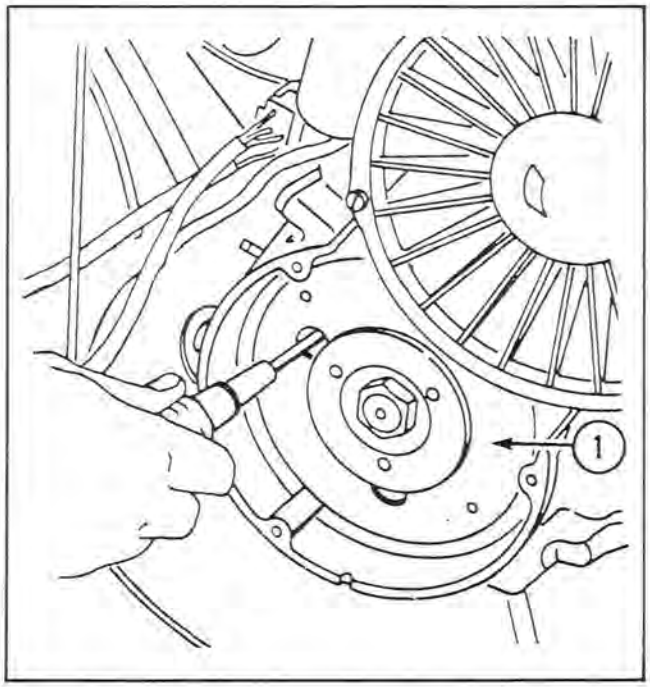


1. Timing Light
2. Mark on Drive Converter

Figure 2-56

Ignition Timing Adjustment

1. Remove muffler, recoil starter and starter pulley for access to openings in flywheel; then loosen stator plate mounting screws through holes in the flywheel. (See Figure 2-57.)



1. Flywheel

Figure 2-57

CAUTION

When adjusting the stator plate, take care not damage the coil windings.

2. Turn stator plate as required (clockwise to retard timing; counterclockwise to advance timing) to correct timing and tighten stator plate screws. Temporarily position muffler onto exhaust manifold, start engine using emergency starter rope, and recheck timing.

3. When ignition timing is correct, remove timing light, replace the recoil starter components and install muffler assembly.

NOTE: Make sure the lip on insulation washer is properly positioned in the slotted muffler bracket before tightening muffler mounting nuts.

4. Install drive belt and secure converter guard into proper position with clip pins.

Cleaning, Inspecting, and Gapping the Spark Plug

Normal plugs have brown to greyish-tan deposits and slight electrode wear. This indicates the correct spark plug heat range. (See Figure 2-58.)

Carbon fouled plugs show dry, fluffy black deposits which may be caused by overrich carburetion, overchoking, weak coil, or worn cables. (See Figure 2-59.)



Figure 2-58



Figure 2-59

Worn out, eroded electrodes and a pitted insulator are indications of long service. Replace old spark plugs for better fuel economy, quicker starting and smoother engine performance. (See Figure 2-60.)

Wet, oily deposits may be caused by the low speed carburetor adjustment being too rich, prolonged low speed operation, improper fuel-to-oil mixture, or weak ignition system. These plugs can usually be degreased and reinstalled. (See Figure 2-61.)



Figure 2-60



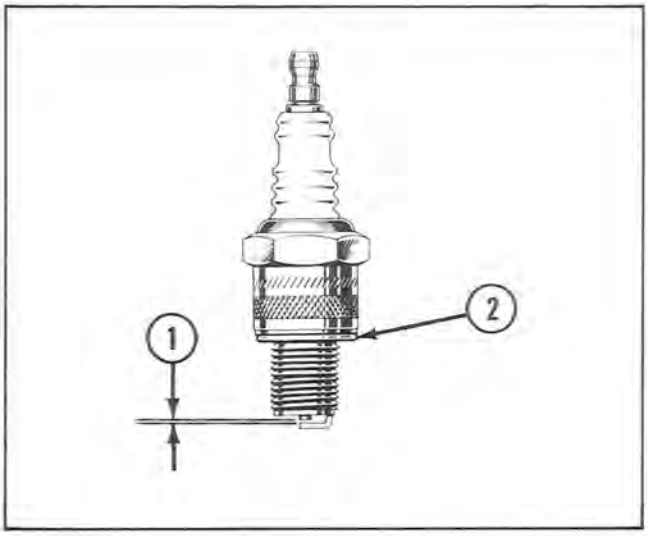
Figure 2-61

Burned or blistered insulator and badly eroded electrodes indicate overheating. Improper spark timing, low octane fuel or lean fuel/air mixtures can cause this condition. (See Figure 2-62.)

Inspect spark plugs for cracked porcelain and worn electrodes. Clean electrodes with a point file. Adjust gap to the specified 0.024 in. (0.6 mm). In regapping, adjust only the ground side electrode. Do not attempt to bend the center electrode; the insulation will crack. (See Figure 2-63.)



Figure 2-62



1. Gap
2. Washer

Figure 2-63

Before installing spark plugs, be sure the washer is installed and the seat on the cylinder head is clean. Install the spark plug, and tighten it 18 to 20 ft lb (2.5 to 2.7 kg-m).

CAUTION

Do not clean old spark plugs with a sandblaster. Grit may be released into the cylinder during engine operation causing severe damage.

Oil Injection System

After performing maintenance in oil injection system components or filling oil tank for the first time, follow procedure under Oil Injection System Bleeding to insure adequate engine lubrication and reliability.

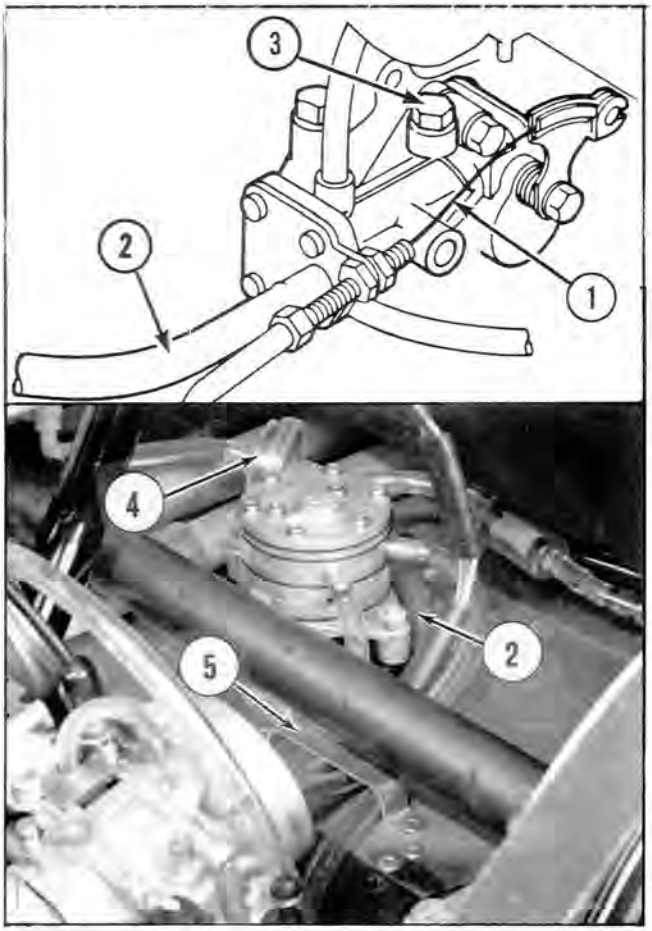
CAUTION

Failure to bleed trapped air from the oil injection system will result in severe engine damage.

Oil Injection System Bleeding

1. Remove instrument panel mounting screws and remove the air silencer assembly.

2. Loosen the clamp screw and separate the LH carburetor from its rubber holder.



1. Oil Pump Cable
2. Oil Supply Tube
3. Oil Pump Bleed Screw
4. Oil Supply Tube Filter
5. Fuel Line Cover Bracket

Figure 2-64

3. Remove oil supply tube from oil pump and pull supply tube out from under fuel tube cover. (See Figure 2-64)

4. Hold oil supply tube and filter in a vertical position, as oil fills the line and filter make sure all air in filter has been forced out.

5. Reinstall oil supply tube under fuel tube bracket.

6. Pinch off oil supply tube with a pair of pliers to prevent excessive oil spillage.

7. Reinstall oil supply tube on oil pump.

8. Remove bleed screw from oil pump and allow oil to drain until all air bubbles are removed from the oil pump supply tube. Visually check entire length of tube (from oil tank to pump) to be sure that all air has been removed; then reinstall bleed screw. (See Figure 2-64.)

9. Reinstall LH carburetor into rubber holder. Position carburetor so that float bowl does not contact front frame and tighten clamp screw.

10. Remove air from oil pump outlet tubes. Refer to Oil Pump Outlet Tube Purging procedure.

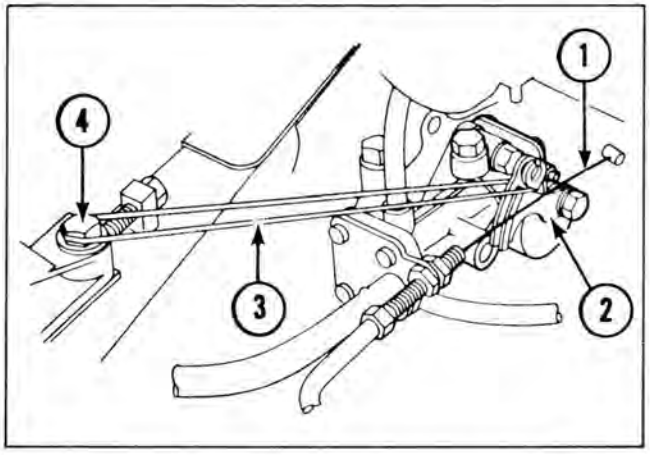
Oil Pump Outlet Tube Purging

Any air bubbles in the oil pump outlet tubes: may cause serious internal engine damage. Perform Oil Injection System Bleeding procedure, then proceed as follows:

WARNING

Failure to disconnect oil pump control cable when performing this procedure will damage the cable. The damaged oil pump control cable will prevent throttle from returning to idle position, resulting in automatic converter engagement when the engine is started, which may lead to personal injury.

1. The oil pump inner control cable must be disconnected from the control lever on the oil pump to prevent damage to cable. Do not disturb cable locknuts when removing inner cable. (See Figure 2-65.)



1. Oil Pump Inner Control Cable
2. Oil Pump Control Lever
3. Rubber Band
4. Mount Bolt

Figure 2-65

2. Attach a rubber band to hold the oil pump control lever in the wide open position. This will cause maximum flow of oil through the outlet tubes. (See Figure 2-65.)

CAUTION

Never run engine with air silencer removed from carburetor. Poor engine performance and engine damage will result.

3. Temporarily position air silencer onto the carburetor assemblies and secure converter guard into proper position with clip pins.

4. Operate the engine at idle speed for one minute, then stop the engine. This is ample time to purge all air from the oil pump outlet tubes.

5. Remove air silencer assembly; release rubber band, and reconnect oil pump inner control cable to the lever. Be sure to check operation of the oil pump control lever and cable by activating throttle control lever on the handlebar.

CAUTION

Be certain air silencer intake hose is directed rearward and placed beneath brake and enrichener cables as incorrect position may result in engine damage.

NOTE: Properly position plastic adapters on the carburetors prior to air silencer installation, to prevent breakage of plastic econo jet fitting.

6. Secure air silencer into position with four springs. Install long springs on upper silencer tab retainers and short springs on lower silencer tab retainers.

7. Install mounting screws to secure the instrument panel assembly.

3 Electrical System

Key Switch

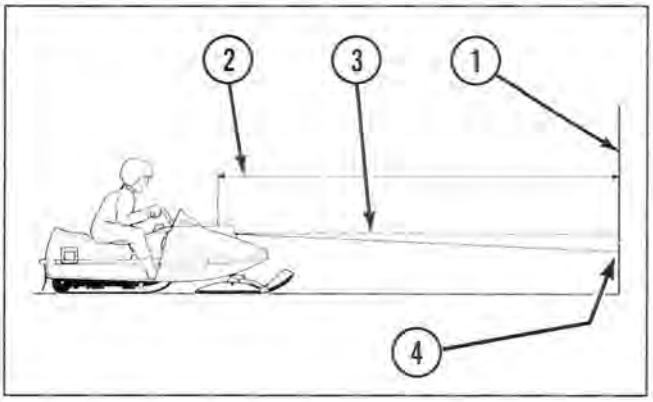
The key switch should be lubricated with graphite once a year. The graphite will also prevent freezing of the key switch in extremely cold weather.

NOTE: Do not use an excessive amount of lubricant.

Headlight Adjustment

Headlight adjustment is rarely required, but should be checked at least once a year to insure it is properly aimed. The high beam of the headlight is used for aiming, and can be adjusted on both the vertical and horizontal planes as follows:

1. Position the snowmobile as shown. (See Figure 2-66.)



1. Wall
2. 25 ft (7,620 mm)
3. Reference Mark (Center of Headlight to Floor)
4. 2 in. (51 mm) Below Reference Mark

Figure 2-66

2. Be sure the floor is level, then position the snowmobile so that the headlight is 25 ft (7,620 mm) from a wall.

3. Measure the distance from the floor to the center of the headlight and mark the wall at the dimension measured (reference mark).

WARNING

If adjusting the headlight indoors, provide proper ventilation to prevent possible carbon monoxide poisoning.

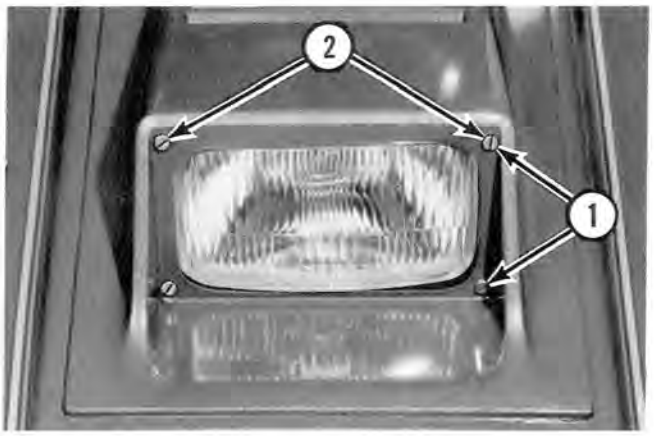
NOTE: Be sure an operator is seated on the snowmobile when the engine is running to prevent the vehicle from creeping ahead and to assure proper aiming.

4. Illuminate the headlight high beam. The headlight is properly aimed when the high beam is centered and aimed 2 in. (51 mm) below the reference mark on the wall.

CAUTION

Always turn headlight adjusting screws to the right (clockwise). Turning screws counterclockwise may back them out of the headlight, allowing the headlight to become loose or drop out of position.

5. If adjustment is required, turn adjusting screws as shown. (See Figure 2-67.)



1. Horizontal Adjusting Screws
2. Vertical Adjusting Screws

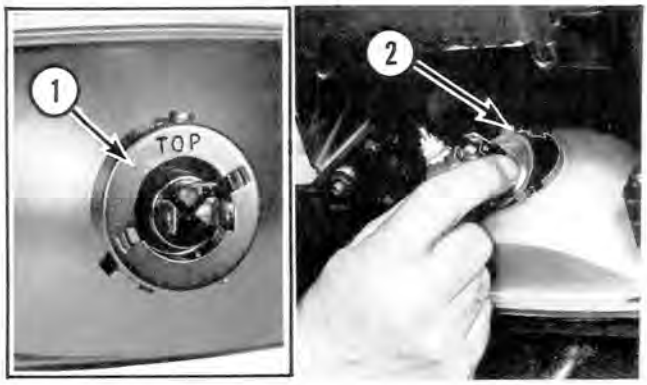
Figure 2-67

Bulb Replacement

Headlight bulb replacement should be performed from the rear of the headlight, from inside the hood. Replacing the bulb from inside the hood does not disturb the aiming of the headlight, thus adjustments will not be required. Replace the headlight bulb as follows:

1. Remove the wire harness connector from the headlight.
2. Push down while turning the retaining ring counterclockwise. The retaining ring is marked top for proper indexing during installation. (See Figure 2-68.)
3. With the retaining ring removed, the bulb and socket can be pulled out of the headlight. Note that the socket is installed with the wide tab towards the top. (See Figure 2-68.)

Install the headlight bulb in the reverse order of removal.



1. Retaining Ring
2. Wide Tab on Socket

Figure 2-68

Tail/Brake Light

Replace tail and brake light bulb by removing the lens, secured by 2 screws, and then removing lamp from the socket. (See Figure 2-69.)

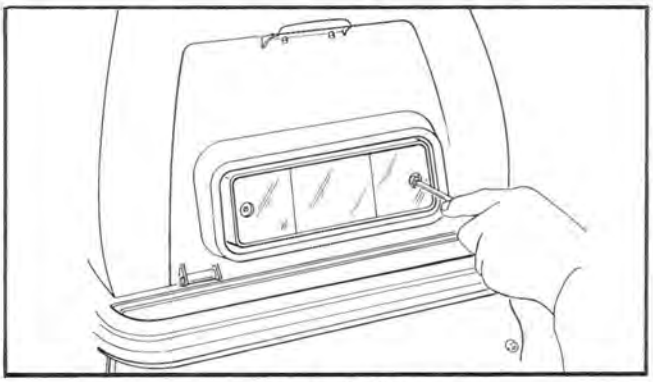


Figure 2-69

Speedometer

The speedometer cable should be lubricated once a year. Remove the cable from the rear of the speedometer and lubricate the cable with graphite.

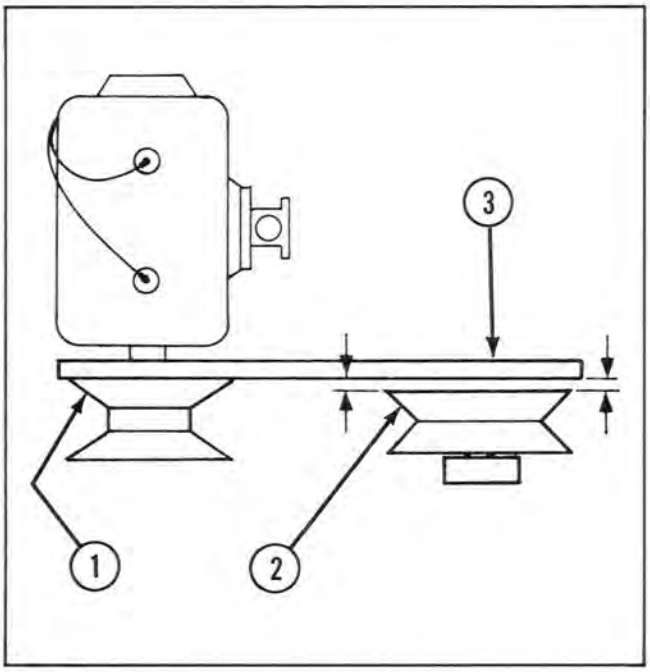
Voltage Regulator

Check the connection on the wiring harness from the voltage regulator. Make sure the connection is clean and tight.

Converter Alignment

Converter Offset Alignment Without Special Tool P/N 57001-3503

The converter alignment (offset) should be 0.525 to 0.588 in. (13.3 to 14.9 mm) as measured from the back face of fixed sheave on the drive converter to edge of driven converter movable sheave. (See Figure 2-70.)

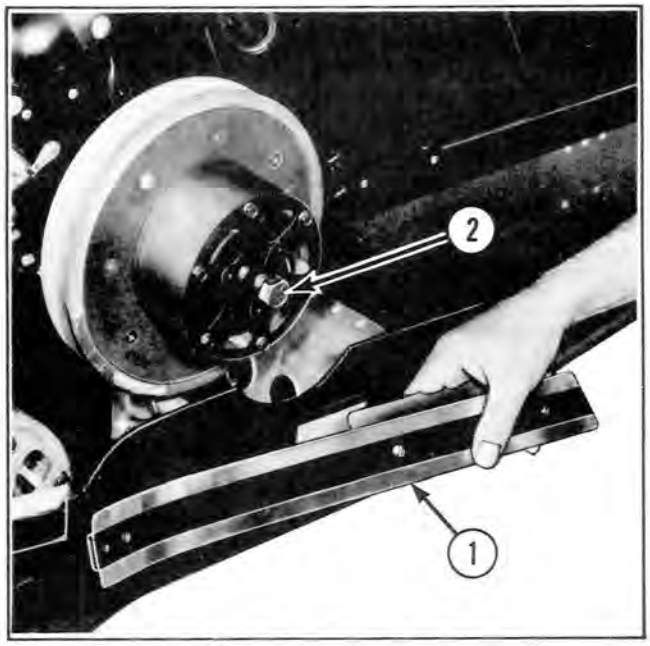


1. Fixed Sheave on Drive Converter
2. Movable Sheave on Driven Converter
3. Straight Edge

Figure 2-70

If adjustment to the converter alignment is required:

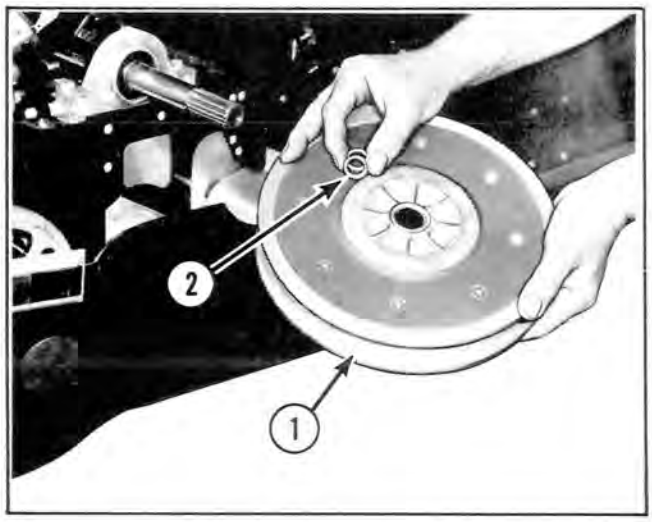
1. Remove the left side aluminum trim from lower pan. (See Figure 2-71.)
2. Remove the bolt securing driven converter to the jackshaft.
3. Slide the driven converter off of the jackshaft. Be careful not to lose the shims inside of the driven converter. Increase or decrease the number of shims as required to obtain the specified offset. (See Figure 2-72.)



1. Aluminum Trim
2. Retaining Bolt

Figure 2-71

4. Reinstall driven converter on jackshaft, and torque the bolt 40 to 50 ft lb (5.53 to 6.91 kg-m).
5. Position aluminum trim onto the lower pan and secure with screws and nuts. Be sure the special washers are installed under head of each screw to prevent damaging the decal pattern on the aluminum trim.

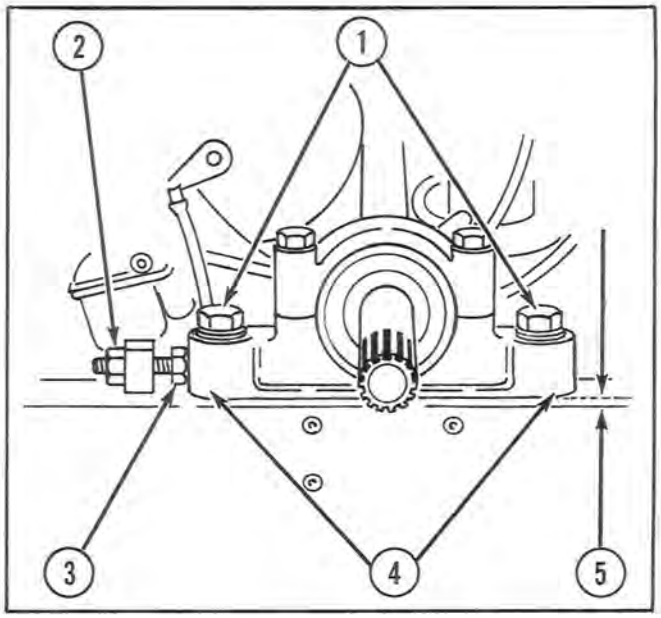


1. Driven Torque Converter
2. Shims

Figure 2-72

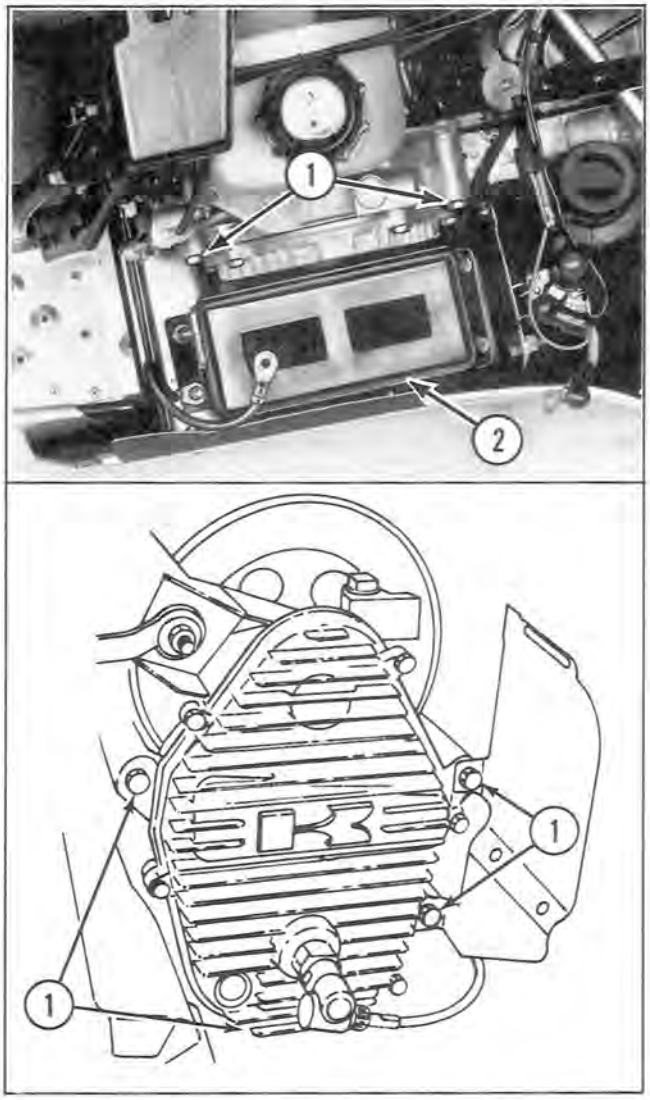
If adjustment of the converter center distance is required:

1. Loosen the jackshaft bearing retainer mounting bolts and the adjusting bolt locknut. (See Figure 2-77.)



1. Bearing Retainer Mounting Bolts
2. Adjusting Bolt Locknut
3. Adjusting Bolt
4. Bearing Retainer Shims
5. Parallel

Figure 2-77



1. Chaincase Mounting Bolts
2. Lower Battery Bracket

Figure 2-78

2. With the battery removed (refer to Battery Removal) loosen four mounting bolts securing lower battery bracket, then remove the bracket and black cable for access to chaincase mounting bolts. (See Figure 2-78.)

3. Loosen all four chaincase mounting bolts and move the jackshaft bearing retainer and chaincase forward or rearward, as required, to obtain 12.0 in. (304.8 mm) center distance.

4. To insure correct center distance is maintained, turn adjusting bolt so that the head of the bolt contacts the jackshaft bearing retainer flange, and tighten locknut. (See Figure 2-77.)

CAUTION

To prevent premature jackshaft bearing failure, reshim the bearing retainer after changing center distance.

5. Tighten chaincase mounting bolts and torque 18 ft lb (2.5 kg-m). Reinstall lower battery bracket with black cable connected as shown. (See Figure 2-78.)

6. Install the battery (refer to Battery Installation). Perform procedure for Jackshaft Bearing Retainer Shimming.

Converter Offset Alignment Using Special Tool P/N 57001-3503

Correct offset distance is obtained when surface of the shallow notch on alignment gauge touches base of fixed sheave of the drive converter. (See Figure 2-79.)

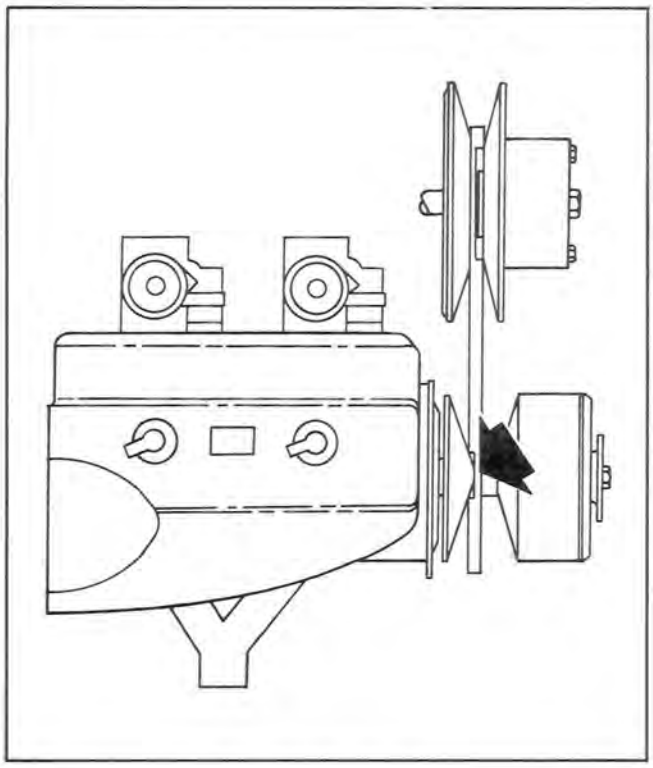


Figure 2-79

If adjustment to the offset distance is required:

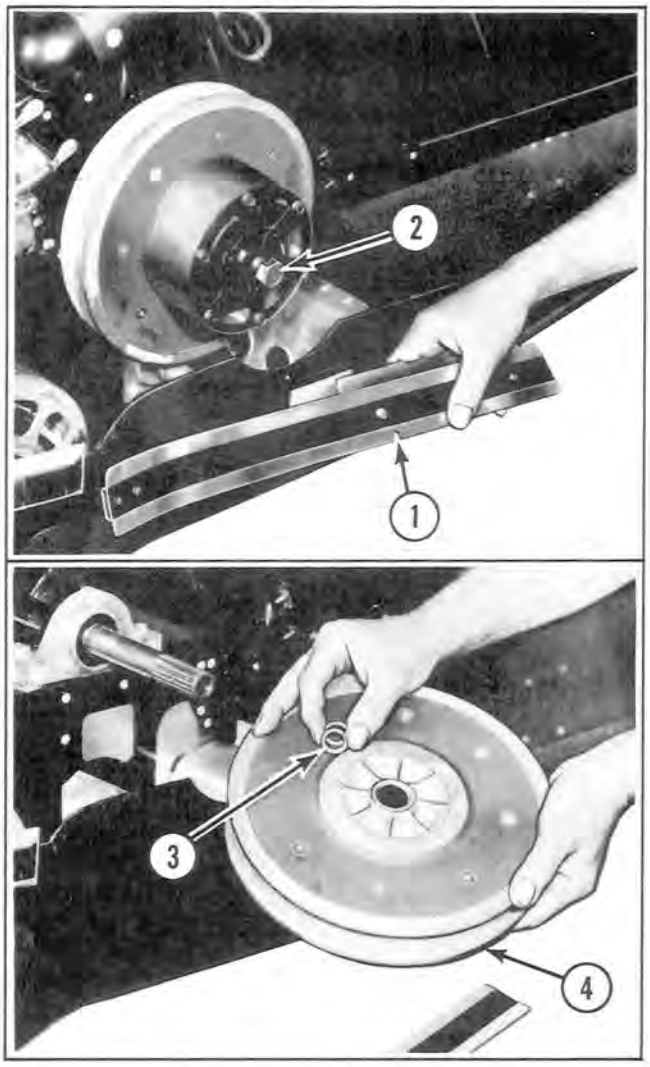
1. Remove the left side aluminum trim from lower pan, and unscrew the bolt securing driven converter to the jackshaft. (See Figure 2-80.)

2. Slide driven converter from jackshaft and add or remove shims, as required, from bore of driven converter to obtain correct converter offset. (See Figure 2-80.)

3. Reinstall driven converter, and torque mounting bolt 40 to 50 ft lb (5.53 to 6.91 kg-m).

4. Position aluminum trim onto the lower pan and secure with screws and nuts. Be sure special washers are installed under head of each screw to prevent damaging the decal pattern on the aluminum trim.

5. Inspect drive and driven converters for correct parallelism.



1. Aluminum Trim
2. Retaining Bolt
3. Shims
4. Driven Torque Converter

Figure 2-80

Converter Parallelism

1. After checking the center-to-center and offset distance, parallelism must be checked by measuring dimensions A and B as shown. (See Figure 2-81.) Compare dimensions A and B against Notes I and II.

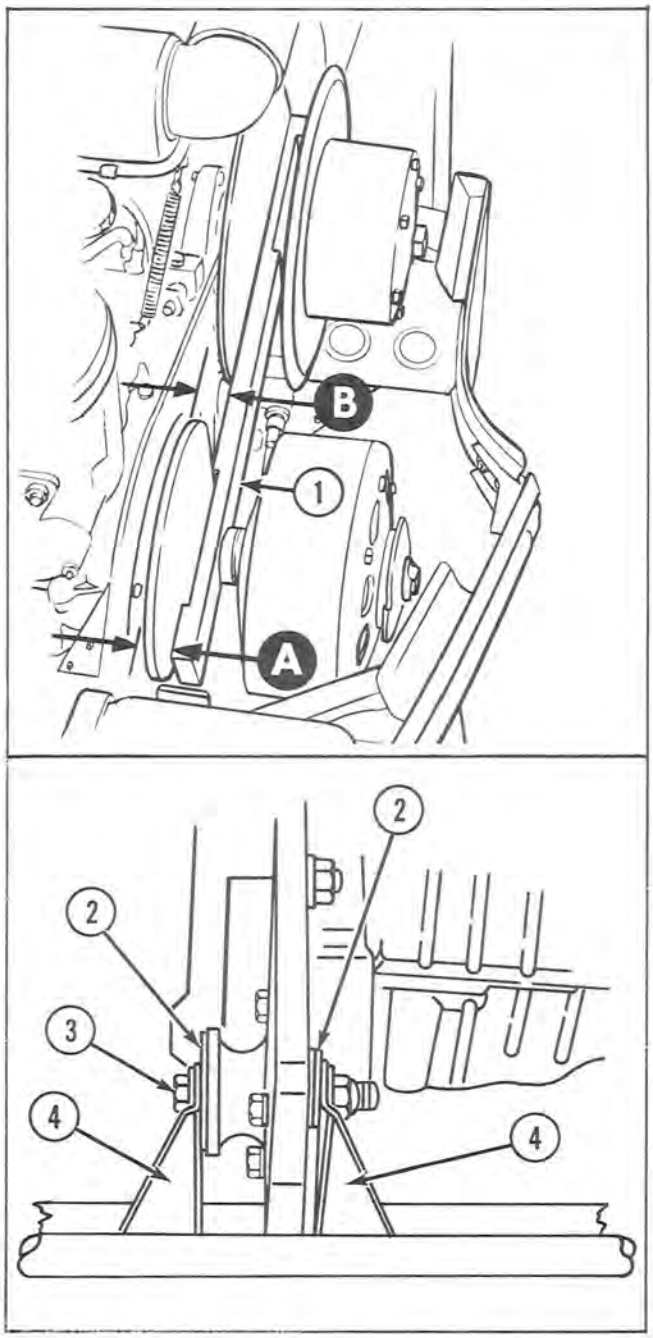
NOTE I: Dimension A must be equal to or more than dimension B.

NOTE II: Dimension A must never exceed dimension B by more than 0.030 in. (0.8 mm).

2. If parallelism between drive and driven converters is not correct, parallelism must be adjusted as follows:

   a. Loosen the large bolt in each of the two engine mounts on the right side of the engine.

b. Move right side engine either toward the front or rear whichever is necessary. After converters are parallel, install shims as required on either side of mount to fill the space between the engine mount and the slotted engine mount brackets on the chassis. (See Figure 2-81.)



1. Alignment Gauge P/N 57001-3503
2. Shims
3. Engine Mount Bolt
4. Engine Mounting Bracket

Figure 2-81

c. Securely tighten the large bolts in the two engine mounts after parallelism is obtained.

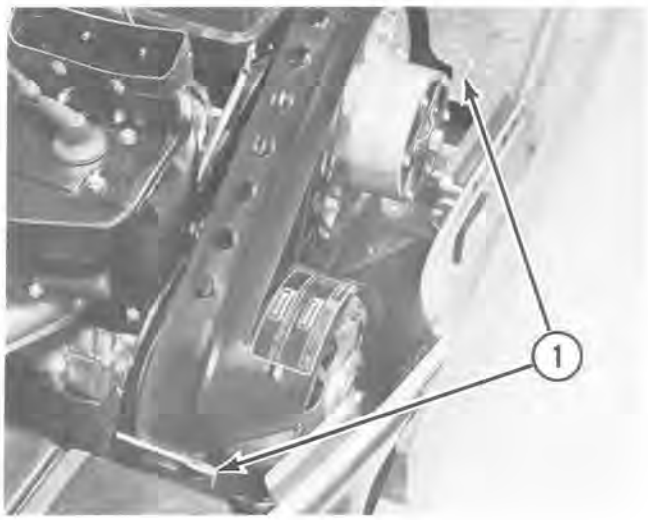
Belt

Inspect the drive belt for worn areas, cracks between the teeth, or ply separations. Replace the belt when worn 0.125 in. (3.18 mm) from new specifications.

Remove the drive belt as follows:

NOTE: Prior to removal, observe markings on belt so that it may be installed on converters to rotate in the same direction as orginal installation.

1. Remove safety pin securing belt guard at the rear, and swing belt guard forward. (See Figure 2-82.)



1. Safety Pin

Figure 2-82

2. Rotate movable half of driven converter towards rear of vehicle while pushing it towards the steering post. Assistance of another may be required to apply the brake while rotating sheave. (See Figure 2-83.)

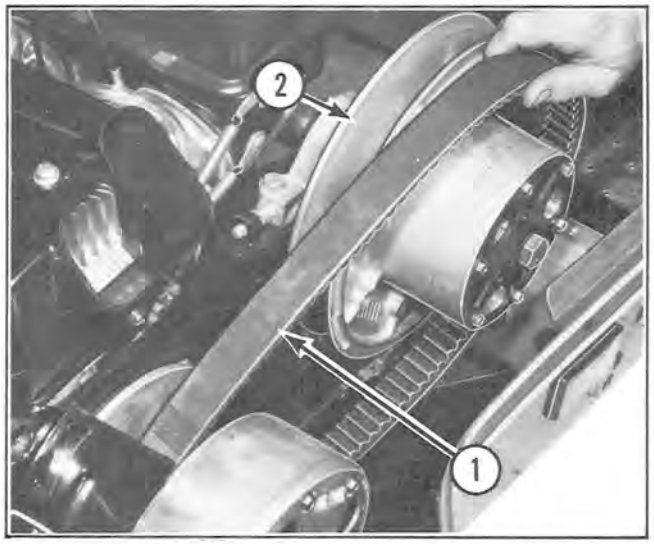
WARNING

Use caution when removing the drive belt from the driven converter sheave since it is under a heavy spring load. Keep fingers and hands clear when releasing sheave.



Figure 2-83

3. Roll drive belt up and off of driven converter, then slowly release the movable sheave. (See Figure 2-84.)



1. Drive Belt
2. Driven Converter Movable Sheave

Figure 2-84

4. Work drive belt past driven converter hub, then remove it from the drive converter. (See Figure 2-85.)

Install a replacement drive belt as follows:

NOTE: Always reinstall used belt so it will rotate in the same direction as it did originally.

1. With drive belt in position around the drive converter, work the belt past the driven converter hub.

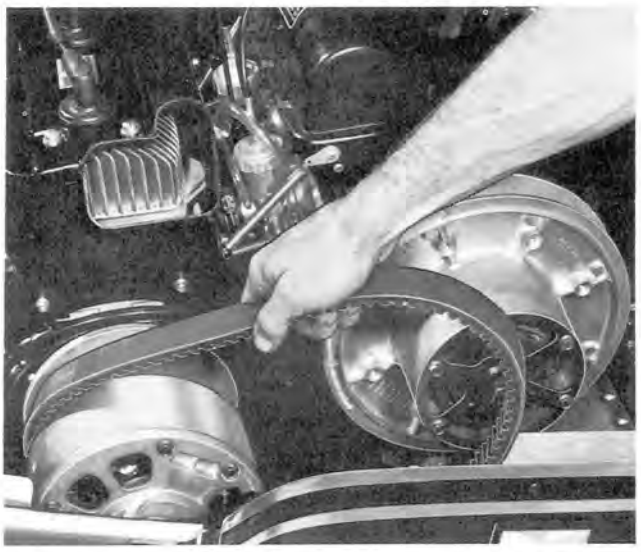


Figure 2-85

2. Open the driven converter movable sheave to ease installation of the drive belt.

3. Roll the drive belt over the top of the movable sheave, being careful not to pinch your fingers, and into position in the driven converter. Place the drive belt into "low gear ratio" by working the belt around the drive and driven converters until flush with outside diameter of the driven converter. This procedure prevents excessive wear to the sides of the belt during initial drive converter engagement.

4. Position the converter guard and secure it with the safety clip.

5. Close the hood and lock it into position with the hood latches.

Converter Lubrication

CAUTION

DO NOT LUBRICATE THE DRIVE OR DRIVEN CONVERTER. Any lubricant applied to the drive or driven converters will drastically change the shifting characteristics, resulting in converter failure and reduced drive belt life.

Clean the drive and driven converter sheave surfaces once a year. Use a rag dipped in acetone liquid cleaner to remove water and oil. Remove rust or rubber with No. 260 and No. 320 emery cloth and polish with No. 400 emery cloth.

Brake System

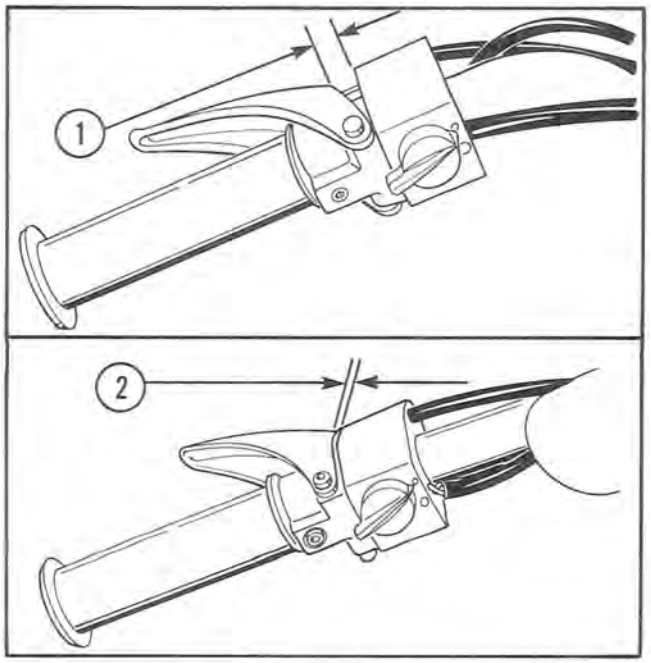
Braking action is applied to the brake disc by a mechanically operated caliper. The brake disc and hub assembly float (free left to right movement) on the jackshaft to maintain proper alignment between the brake caliper pads. This movement may cause a rattling sound during vehicle operation which is normal.

Brake Adjustment

The INTRUDER is equipped with a self-adjusting disc brake. To check proper operation, apply the brake firmly and measure the movement which should be 3/4 in. (19 mm) when brake is fully applied. Release the brake handle and measure distance. This dimension should be no greater than 1/8 in. (3.2 mm). Perform Brake Adjustment if required. (See Figure 2-86.)

WARNING

Improper brake adjustment may cause brake failure leading to possible personal injury and damage to snowmobile or its components.



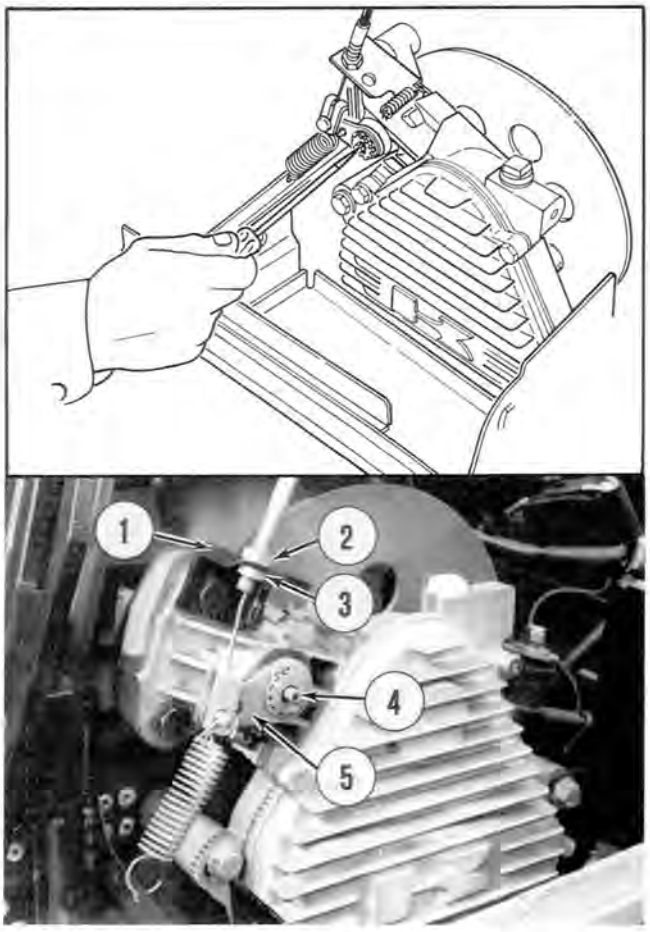
1. 3/4 in. (19 mm) Brake ON
2. 1/8 in. (3.2 mm) Brake OFF

Figure 2-86

1. Back both brake cable jam nuts away from bracket about 1/4 in. (6.4 mm). See Figure 2-87)
2. Remove cable slack by pulling brack cable upward without moving brake cam lever and snug upper jam nut to bracket.
3. Turn lower jam nut up to bracket and torque both jam nuts to 50 in. lb (0.6 kg-m).
4. Check handlebar brake lever for correct dimension. (See Figure 2-86.)
5. Apply brake firmly and turn manual adjuster until correct measurement of 3/4 in. (19 mm) is achieved. (See Figure 2-87.)

NOTE: Clockwise rotation of the adjuster screw increases the handlebar brake lever measurement, and counter-clockwise rotation decreases the measurement.

6. Perform Brake Pad Wear Inspection.

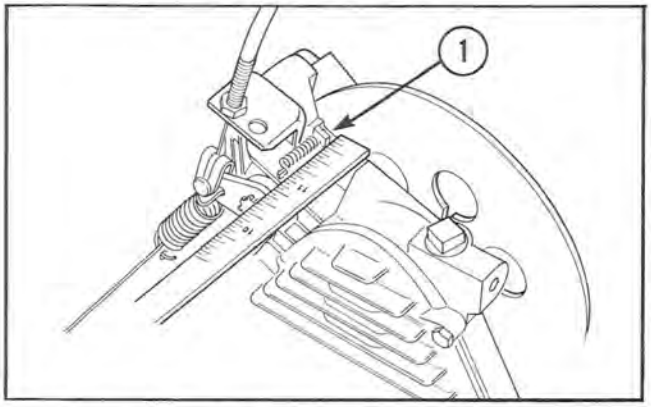


1. Brake Cable Bracket
2. Upper Jam Nut
3. Lower Jam Nut
4. Adjusting Screw
5. Brake Lever

Figure 2-87

Brake Pad Wear Inspection

Measure movable brake pad thickness. Apply brake firmly, then measure pad thickness from outer surface of brake pad tab to brake disc. If measurement is less than 1/4 in. (6.4 mm) replace both brake pads. (See Figure 2-87A.) For brake pad replacement see Self Adjusting Brake, Section 3.

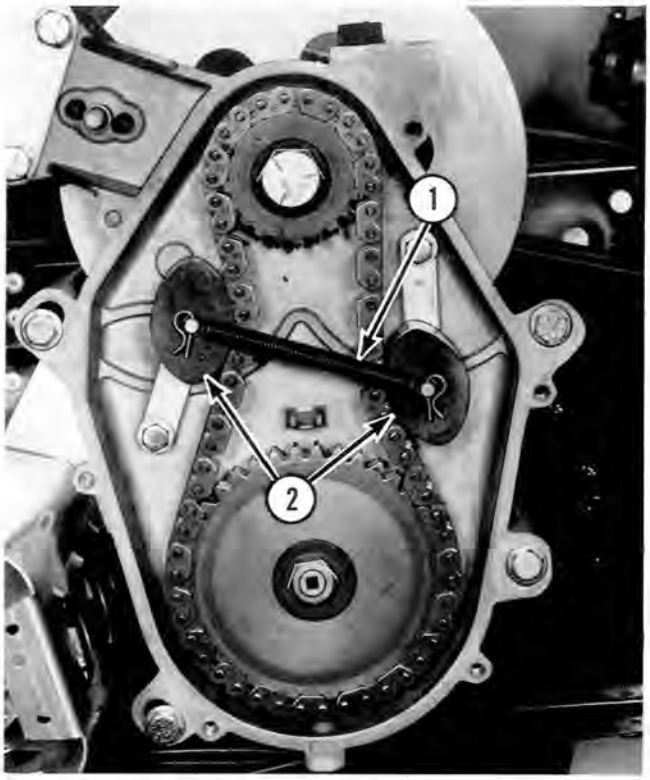


1. 1/4 in. minimum thickness

Figure 2-87A

Chain Tension

The drive chain is self-adjusting for tension but the plastic chain guides should be inspected for wear. Turn or replace if necessary. (See Figure 2-88.)

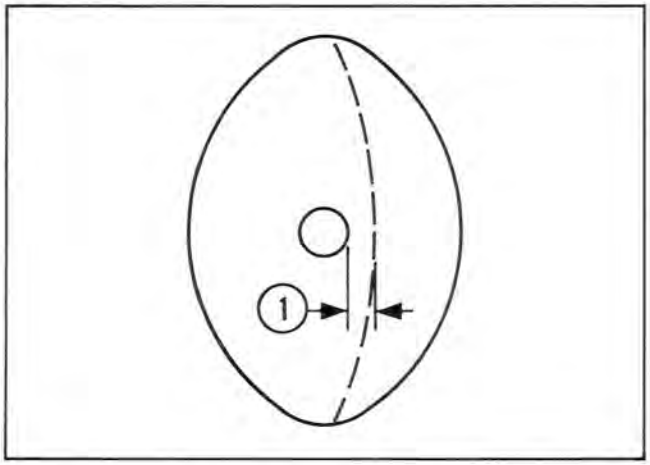


1. Tensioner Spring
2. Chain Guides

Figure 2-88

1. Remove the chaincase cover bolts and cover to allow the oil to drain out of the chaincase and through the hole in lower pan.

2. The chain guides should be turned 180° (to use the unworn portion of the guide) when one side is worn to within 0.12 in. (3.0 mm) of the tensioner arm pin. (See Figure 2-89.)



1. 0.12 In. (3.0 mm)

Figure 2-89

When both sides of the chain guides are worn to this dimension they must be replaced.

3. Clean any plastic sediment and dirt from the chaincase and cover.

4. Replace the O-ring in the cover if cut or damaged, then reinstall chaincase cover.

5. Fill the chaincase to the center but not above the top of the chaincase cover sight gauge with DEXRON II automatic transmission fluid.

Gear Ratio Chart

DRIVEN SPROCKET – NUMBER OF TEETH	Drive Sprocket Number of Teeth						
	17	18	19	20	21	22	
36			1.90 *75 MPH 64 Red	1.80 *80 MPH 64 Pink			Gear Ratio Speed Chain Pitch Tensioner Spring
37	2.18 *66 MPH 64 Red	2.06 *69 MPH 64 Pink	1.95 *73 MPH 64 Green		1.76 *81 MPH 66 Red	1.68 *85 MPH 66 Pink	Gear Ratio Speed Chain Pitch Tensioner Spring
38	2.24 *64 MPH 64 Pink	2.11 *68 MPH 64 Green		1.90 *75 MPH 66 Red	1.81 *79 MPH 66 Pink	1.73 *83 MPH 66 Green	Gear Ratio Speed Chain Pitch Tensioner Spring
39			2.05 *70 MPH 66 Red	1.95 *73 MPH 66 Pink	1.86 *77 MPH 66 Green		Gear Ratio Speed Chain Pitch Tensioner Spring
40	2.35 *61 MPH 66 Pink	2.22 *64 MPH 66 Pink	2.11 *68 MPH 66 Green	2.00 *72 MPH 66 Green			Gear Ratio Speed Chain Pitch Tensioner Spring

*Theoretical MPH at 7100 RPM

NOTE: All top speeds based on 0.96 overdrive in converter and engine RPM at 7100.

Chain Tensioner Springs

Color	Length	Wire Dia.
Black	2.50 in. (63.50 mm)	0.049 in. (1.245 mm)
White	2.50 in. (63.50 mm)	0.055 in. (1.397 mm)
Red	3.00 in. (76.20 mm)	0.049 in. (1.245 mm)
Orange	3.00 in. (76.20 mm)	0.055 in. (1.397 mm)
Pink	3.38 in. (85.85 mm)	0.049 in. (1.245 mm)
Yellow	3.38 in. (85.85 mm)	0.055 in. (1.397 mm)
Green	3.75 in. (95.25 mm)	0.049 in. (1.245 mm)
Blue	3.75 in. (95.25 mm)	0.055 in. (1.397 mm)

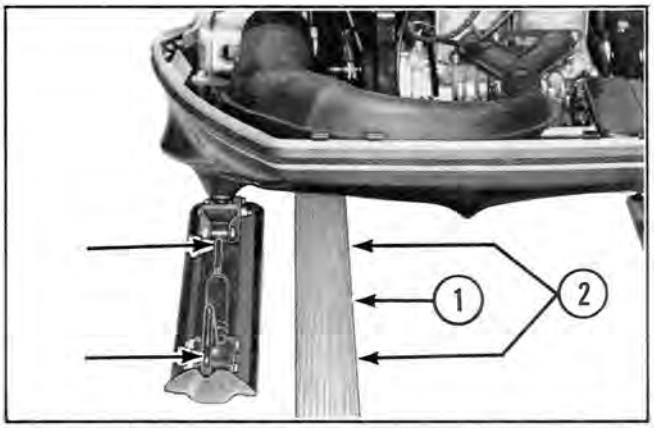
Steering System

The steering system components should be checked periodically for excessive wear and security of fasteners (nuts, bolts, etc.). Proper ski alignment cannot be maintained with worn components.

Ski Alignment

Alignment should be checked at the beginning of each season, whenever the ski is subjected to a hard side impact, or when steering system components are replaced. Check the ski alignment as follows:

1. Place a long board (or suitable straightedge) against the right hand edge of track, and measure the clearance between board and center line of the ski. Position ski so that the distance measured between the ski center line and edge of board is the same at front and rear of the ski. (See Figure 2-90.)



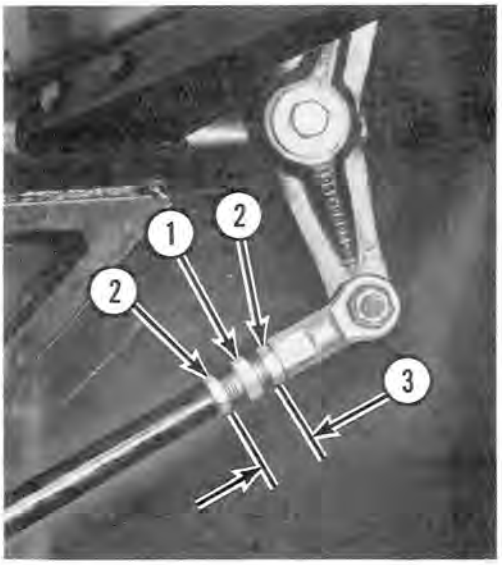
1. Straightedge Against Track
2. Measure Distance Here

Figure 2-90

2. When center line of the ski is parallel to outside edge of track, check the steering handlebar for centering.

3. If handlebar requires centering, loosen lock (jam) nuts and turn tie rod length adjusting stud in direction necessary to center the handlebar. (See Figure 2-91.)

NOTE: Be sure ski remains parallel to the straightedge while turning the tie rod end adjusting stud.



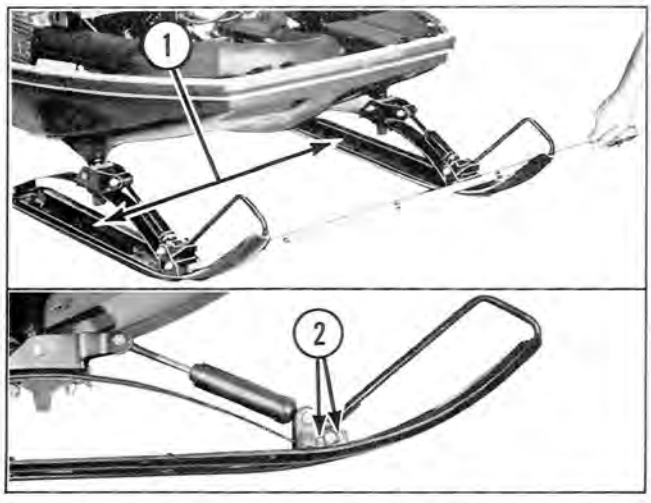
1. Tie Rod Length Adjusting Stud
2. Locknuts
3. 1-1/4 in. (32 mm) Maximum

Figure 2-91

WARNING

If the dimension shown in Figure 2-91 exceeds 1-1/4 in. (32 mm), refer to Section 3 and check for damaged steering system components.

4. To align other ski, move both ski tips towards center of the snowmobile to remove steering linkage play. Loosen locknuts and turn the tie rod to obtain an equal distance from ski center to ski center when measured at the front and rear of the skis. (See Figure 2-92.)



1. Equal Distance Front and Rear
2. Spring Mounting Positions

Figure 2-92

5. Tighten all hardware (nuts, bolts, etc.) in the steering system. Torque the lock (jam) nuts on tie rod assemblies 100 to 120 in. lb (1.1 to 1.4 kg-m). Refer to torque chart for recommended torque values of other fasteners in the steering system.

Ski Skeg

Excessively worn ski skeg can greatly reduce the handling of the snowmobile and may result in premature wear to rear portion of ski. The skeg on the bottom of each ski should be inspected often, since the wear rate depends on the surface the snowmobile is operated on. Replacement is recommended when skeg is more than 3/4 worn at any point. Refer to Section 3 for ski skeg replacement.

Ski Spring Preload

Three positions have been provided for the front ski spring mounting bolt:

Center Hole Position - During factory assembly, bolt was installed in center hole in the ski and normally no change is required for general snowmobiling. (See Figure 2-92.)

Rear Hole Position - Installation of the bolt in rear hole of the ski will reduce spring preload, increase spring arch, and result in a softer ride with greater spring travel. This position is recommended for deep snow operation or slow speed trail riding.

Front Hole Position - Placing bolt in front hole of the ski will increase spring preload, reduce spring arch, and result in a stiffer ride with less spring travel. This position should be used for maximum stability during high speed operation.

NOTE: Always mount front ski spring bolt into the same position on each ski.

To change preload of the ski spring, be sure weight of snowmobile is on the skis, and proceed as follows:

1. Remove nut front front spring mounting bolt.
2. Open hood and with assistance from another, stand on front bumper to relieve spring tension from mounting bolt.
3. With weight still on front bumper, remove bolt, slide spring rub strip to align with desired hole position of ski, and insert bolt.
4. Install nut and torque 25 in. lb (0.29 kg-m).

Suspension Adjustments

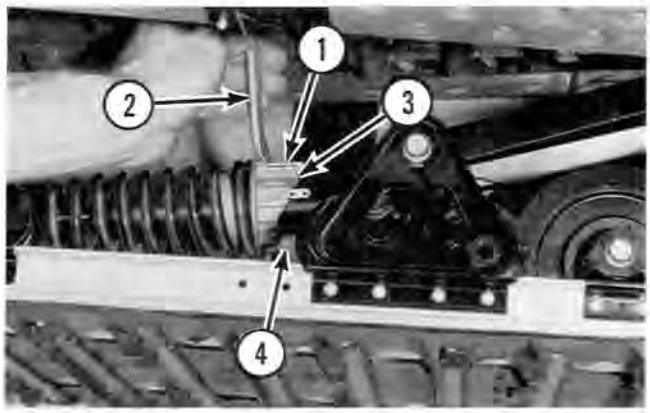
The slider suspension is fully adjustable for rider comfort.

The adjustments consist of changing preload on the suspension springs. A suspension spring is on each side of the front suspension arm and a cam adjustment on the rear spring over the shock absorber.

Ride Adjustment

Ride Adjustment may be varied by changing position of the shock absorber spring adjusting cam, using the special tool provided in tool kit. Rotating cam towards heavy pre-load position will increase spring pre-load, resulting in a stiffer ride. If cam is rotated towards light pre-load position, this will decrease spring pre-load, resulting in a softer ride for the operator. (See Figure 2-93.)

NOTE: An optional heavy-duty shock absorber spring kit is available to increase the load carrying capacity of the snowmobile.



1. Spring Cam
2. Cam Adjusting Tool
3. Heavy Pre-load Position
4. Light Pre-load Position

Figure 2-93

Handling Adjustment

The handling adjustment is controlled by changing the spring tension of front suspension springs. Increasing spring tension causes the suspension to press harder on the ground, resulting in less ski pressure. Reducing spring tension causes the front of the suspension to have less pressure on the ground and ski pressure to increase. A change in ski pressure will affect the vehicle steering response.

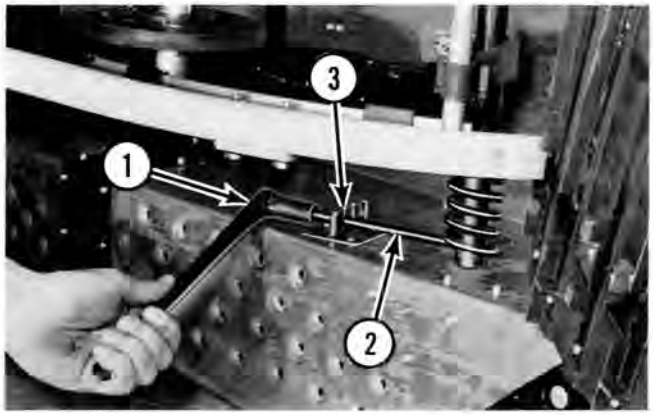
The spring arm on each side of the suspension should be positioned as required, to achieve desired steering response and effort for existing terrain and snow conditions in your area.

CAUTION

Always adjust the preload (tension) of the front springs on each side of the suspension arm equally. Excessive tension of one spring can cause spring breakage or excessive wear to one side of the slide wear strips. (See Figure 2-94.)

To change spring tension:

1. Install spring adjusting tool, P/N 57001-3507 onto the end of the spring arm as shown. (See Figure 2-94.)



1. Spring Adjusting Tool
2. Spring Arm
3. Spring Retainer

Figure 2-94

WARNING

Front suspension springs are under heavy spring load and improper adjusting techniques may result in personal injury.

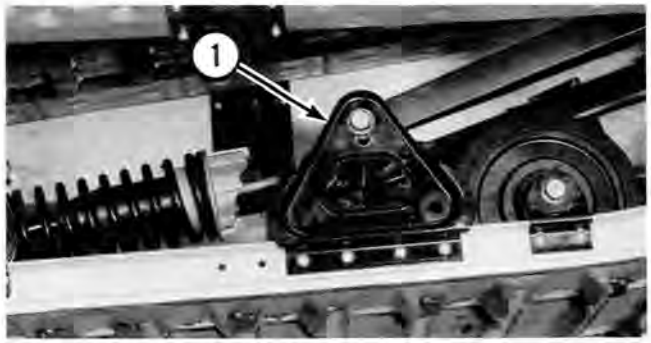
2. Apply a firm grip on the spring adjusting tool, with both hands and carefully lift spring arm out of detent in spring retainer. Be prepared for the heavy spring load to be transferred to spring adjusting tool as spring arm is lifted out of the retainer detent.

3. Insert spring arm into retainer detent necessary to obtain the handling characteristics desired.

Swing Arm Adjustment

Changing mounting position of the front swing arm will affect the amount of ski lift along with ride characteristics of the snowmobile. During factory assembly, front swing arm was positioned in lower hole of the front suspension bracket. This position was selected since it results in the best overall acceleration and ride characteristics of the snowmobile.

Changing swing arm to upper hole location causes less weight transfer from skis to suspension during acceleration. Less weight transfer decreases ski lift allowing increased steering stability during acceleration. (See Figure 2-95.)



1. Front Suspension Bracket

Figure 2-95

WARNING

Front suspension arm is under heavy spring load. Remove spring tension from the front suspension springs before relocating the front swing arm assembly to prevent possible personal injury. Refer to Handling Adjustment procedure.

Track Adjustments

For optimum performance and for long track life, proper adjustments must be maintained. Since the track is made of rubber and subjected to high torque loads, a certain amount of track stretch is expected. Track tension will compensate for stretch. Once correctly tensioned, the track must be aligned in the chassis to prevent wear to one side of the track.

WARNING

When raising the rear of the snowmobile off the ground, place the ski tips against a stationary object and be sure the vehicle is properly secured to prevent personal injury.

Track Tension Adjustment

WARNING

To prevent personal injury, never adjust track tension with the engine running.

1. Raise the rear of the vehicle so the track is off the ground for its entire length and securely brace the snowmobile so it cannot fall.

NOTE: Do not position the snowmobile on its side to adjust track tension as it would be impossible to get an accurate adjustment.

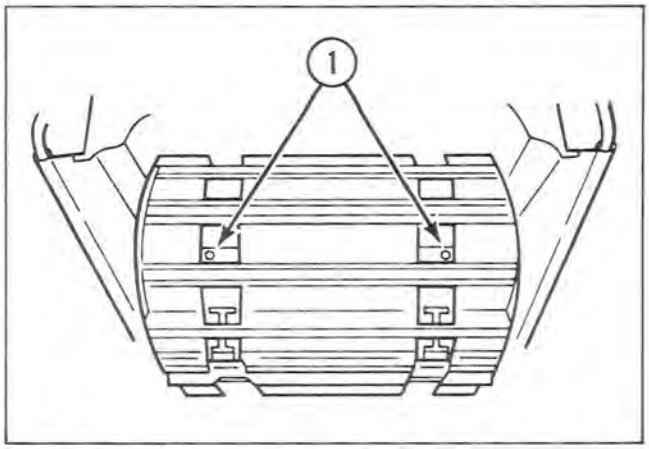
2. With a 5 to 8 lb (2.2 to 3.6 kg) weight hanging from mid point of the track, clearance from bottom of wear strip to the top edge of track should be 3/4 in. (19 mm). This dimension should be measured in the area directly below the rear suspension pivot arm bolt. (See Figure 2-96.)



1. 3/4 in. (19 mm)

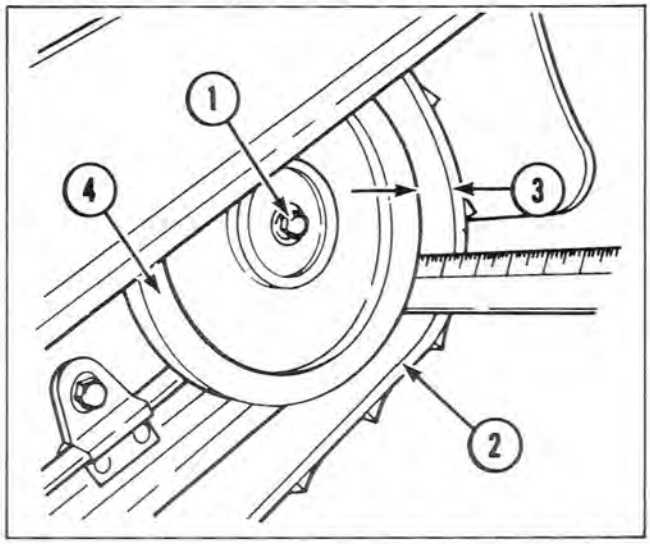
Figure 2-96

3. Loosen the rear axle wheel locking bolt on either end of rear axle. Turn rear axle adjusting nuts through rear track openings, clockwise, to decrease the clearance between the wear strip and track. (See Figures 2-97 and 2-98.)



1. Rear Axle Adjusting Nuts

Figure 2-97



1. Rear Axle Locking Bolts
2. Edge of Track
3. Dimension Equal on Both Sides
4. Idler Wheel

Figure 2-98

4. When the proper tension is attained, be sure the same number of exposed threads protrude through adjusting nuts on each side. This is a good starting point for track alignment.

5. Remove weight from the track.

WARNING

To avoid possible personal injury, do not stand behind snowmobile while track is rotating. Remove all tools and foreign matter from track area before starting engine.

6. Start the engine and push on the throttle lever only enough to turn the track slowly a few revolutions. Stop the engine and perform the Track Alignment check.

NOTE: If ratcheting (slippage or jumping between the drive lugs on track and drive sprockets) occurs during hard acceleration or braking, tighten the track slightly.

Track Alignment

WARNING

To prevent injury, never measure track alignment while the engine is running.

Track alignment is correct when distance between rear idler wheel and edge of the track is equal on both sides. (See Figure 2-98.)

After performing Track Tension procedures, adjust track alignment as follows:

If measurement on one side is larger, loosen rear axle locking bolts. Tighten rear axle adjusting nut on side with the larger measurement about 1/2 turn.

Restart engine and recheck alignment. Repeat adjustment as necessary until alignment is correct.

CAUTION

If track alignment requires considerable adjustment, track tension should be rechecked to prevent damage to drive or suspension system.

When track alignment is correct, tighten the rear axle locking bolts to 25 ft lb (3.5 kg-m).

NOTE: After rear axle bolts have been tightened, check to be sure that spacers (tubing) over rear axle squeeze against slide rail brackets, preventing spacers from rotating. Loose spacers will permit rear axle to float and proper track alignment cannot be maintained.

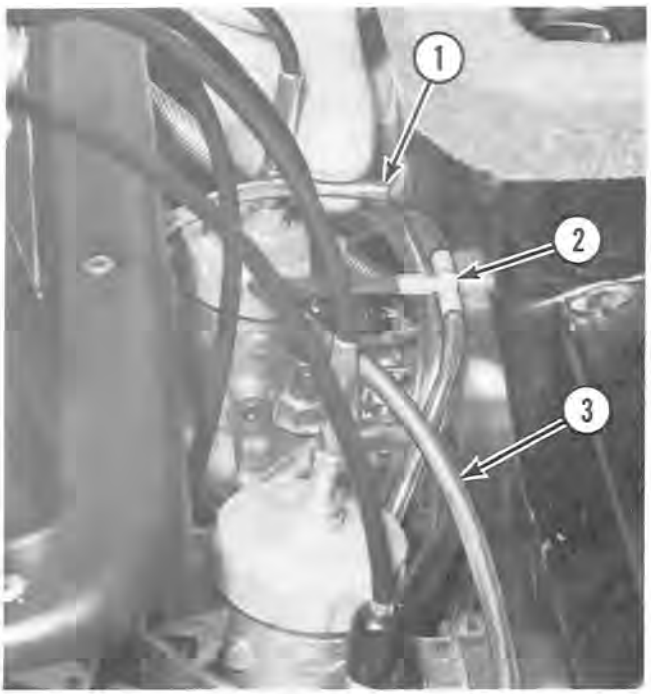
Storage

Preparation for Storage

1. Thoroughly clean the snowmobile by hosing off all dirt and grime from the suspension and the engine compartment.

2. Siphon the fuel from the fuel tank.

3. Remove fuel tube from primer T fitting. Attach a length of fuel tube to the primer T fitting and the other end into a container filled with Kawasaki Snowmobile Oil. (See Figure 2-99.)



1. Primer Tube (Disconnected)
2. T Fitting
3. Length of Tubing (To Oil)

Figure 2-99

WARNING

To prevent severe personal injury while the engine is running, stay clear of moving parts and do not contact the hot exhaust system components.

4. Start engine and run at idle until it stops. This procedure lubricates the internal engine compartments of each cylinder to prevent rust.

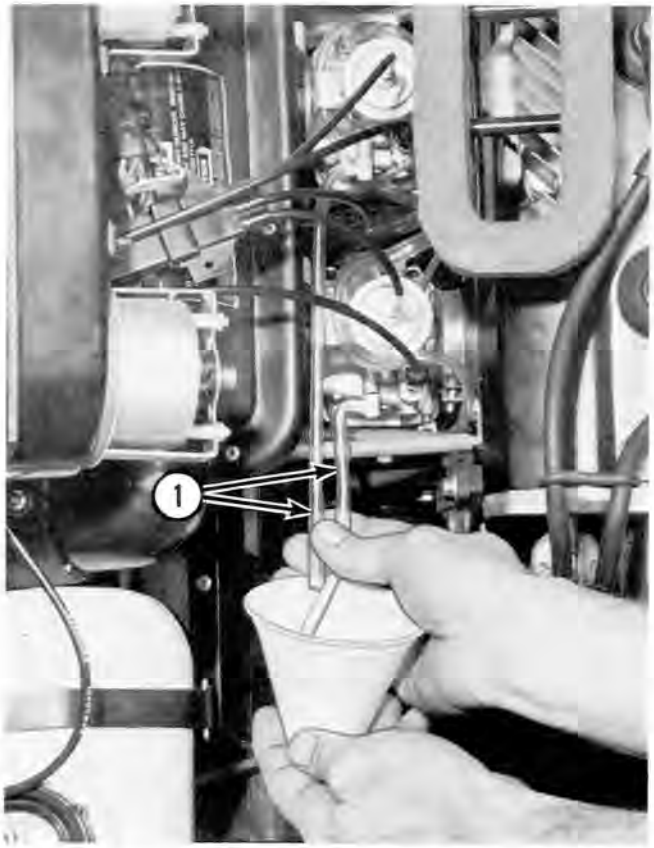
5. Reinstall the fuel tube from the primer to the T fitting.

6. With a rag or masking tape, plug the openings of the air intake silencer and muffler outlet.

CAUTION

Failure to drain fuel from carburetors prior to long term storage may cause restrictions in carburetor passageways and jets. This can lead to lean fuel-to-air intake mixtures that may cause severe engine damage.

7. Position snowmobile on its side and drain fuel from carburetors through the vent tubes as shown. (See Figure 2-100.) Properly position vent tubes into retainers on carburetors after all fuel is drained.



1. Vent Tubes
Figure 2-100

8. Check the chaincase lubricant level.

9. Remove the drive belt.

CAUTION

DO NOT LUBRICATE THE DRIVE CONVERTER OR DRIVEN CONVERTER.

10. Drain and refill engine gearcase.

11. Remove battery and store in cool, dry area that is well ventilated. The battery will discharge when not in use so a boosting charge should be given about once each month. Refer to Battery Section for proper removal and charging procedures.

12. Block the rear of the snowmobile off the ground to remove weight from the suspension.

13. Loosen the rear axle locking bolt on either end of rear axle then loosen adjusting nuts to relieve track tension.

14. If paint is scratched, use touch-up paint to restore original finish, and wax the hood and chassis using an automotive type wax.

15. Cover your snowmobile to protect it from dirt and dust.

16. Protect track clips from rusting and extend slide wear strip service life by applying a moisture remover or anti-rust product (such as WD-40, LPS or equivalent) to all exposed areas of each track clip.

Removal From Storage

1. Check battery state of charge and charge if necessary. Install battery. Refer to Battery Section for proper procedures.
2. Fill the fuel tank with fresh fuel.
3. Fill the oil tank with Kawasaki Snowmobile Oil.
4. Check the oil tube connecting the oil tank to oil pump for air bubbles. If any air is present, bleed the oil tube and pump.
5. Check and fill engine oil pump gearcase. Use KAWASAKI ENGINE GEARCASE OIL. Level should be above center of sight gauge but not higher than the top.
6. Remove the plugs (masking tape or rags) from the air intake silencer and muffler outlet.
7. Using a suitable solvent, clean the converter sheaves. The converter sheaves must be clean and dry.
8. Install a new drive belt. Use the one removed last year as a spare.
9. Adjust the track tension.

WARNING

To avoid possible personal injury, never allow anyone to stand behind snowmobile while track is rotating. Be sure engine has stopped before checking or adjusting track alignment. Remove all tools and foreign matter from track area before starting engine.

10. Start the engine and rotate the track several revolutions, at low speed only, then stop engine and check the track alignment.
11. Lower the vehicle from blocks.

12. Operate the snowmobile with the old spark plugs for the first 1/2 hour of operation. This will allow the oil used while storing the snowmobile to collect on the old spark plugs. Install new spark plugs, refer to the Specifications page for the recommended heat range and gap adjustment.

Carburetor Synchronization

It is extremely important that both carburetors function in unison. For maximum power and efficiency both cylinders must work equally. The most effective method of synchronizing the carburetors is to use a Mercury Synchro Tuner, Kawasaki P/N 57001-3510.

The Mercury Synchro Tuner measures vacuum within the engine intake system. Measurement of this vacuum will vary depending on the position of the carburetor throttle valve. Raising the throttle valve position reduces the restriction on air flow resulting in a lower vacuum measurement. A lower throttle valve position restricts air flow which causes a higher vacuum measurement.

At idle the throttle valves are positioned by the idle stop screws. The throttle cables hold the throttle valves in position when the throttle lever is actuated.

Adjust idle screws and throttle cables so that vacuum measures equally at idle and partial throttle positions for both carburetors by performing the following procedure:

CAUTION

Air silencer assembly should be properly installed and drive belt removed. Secure converter guard in position with clip pins.

1. For proper adjustment and ease of starting engine during synchronization procedure, start engine and allow it to warm up.

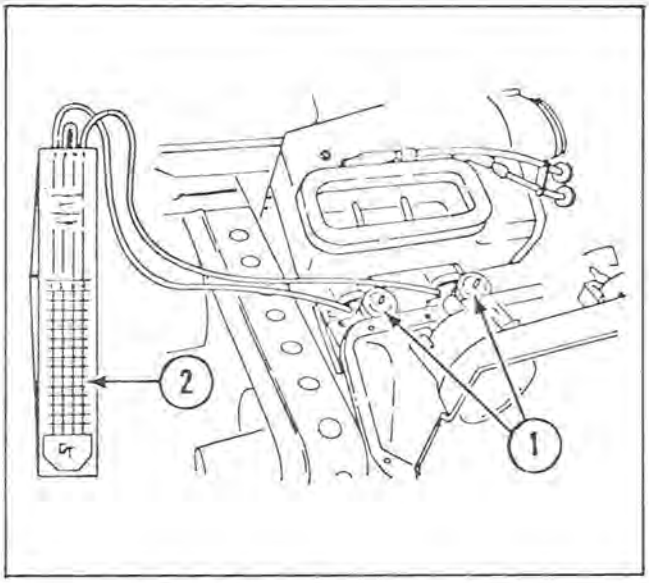
WARNING

Avoid personal injury. Do not touch rotating or hot engine parts.

2. Turn engine off and disconnect primer tubes from carburetor fittings.

3. Connect one tube from the Synchro Tuner to each carburetor primer fitting. (See Figure 2-101.)

NOTE: It may be necessary to install a short piece of primer tubing into the Synchro Tuner tubing ends to insure good seal.



1. Carburetors
2. Mercury Synchro Tuner

Figure 2-101

4. Start engine and observe the vacuum indications on the Synchro Tuner at idle speed.

5. Adjust idle stop screws on both carburetors to obtain an equal vacuum at 2,500 RPM. (See Figure 2-102.)

NOTE: Turn idle screw inward to raise the throttle valve position. This will increase RPM and lower the vacuum. Turn idle screw out to lower RPM and increase vacuum.

6. Use a small piece of wood to wedge throttle lever slightly open (approximately 5,000 RPM). Observe vacuum indications on Synchro Tuner.

7. Loosen LH carburetor throttle cable jam nut. Turn LH carburetor throttle cable adjuster until vacuum indication is equal to RH carburetor. (See Figure 2-103.)

NOTE: Turn adjuster inward to increase the vacuum or outward to lower the vacuum.

8. Actuate throttle lever to check for equal vacuum at different throttle positions. Readjust LH throttle cable if necessary. Torque LH carburetor throttle cable jam nut 15 to 20 in. lb (0.17 to 0.23 kg-m).

9. Reinstall primer tubes to carburetors.

10. Install drive belt and secure belt guard into proper position with clip pins.

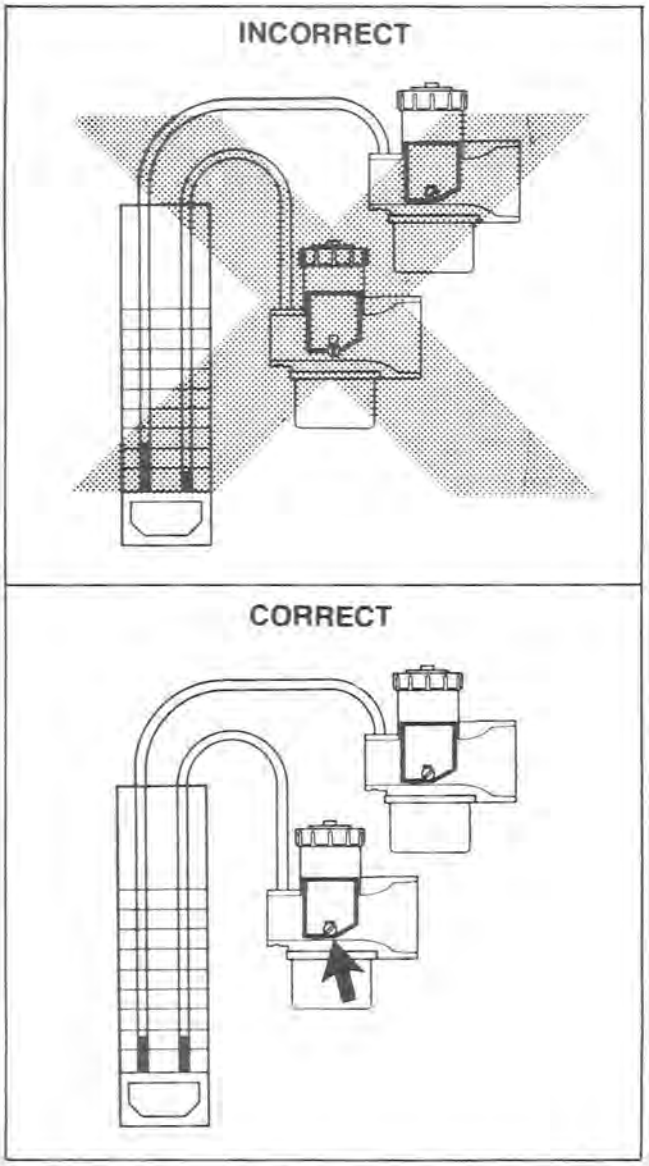


Figure 2-102

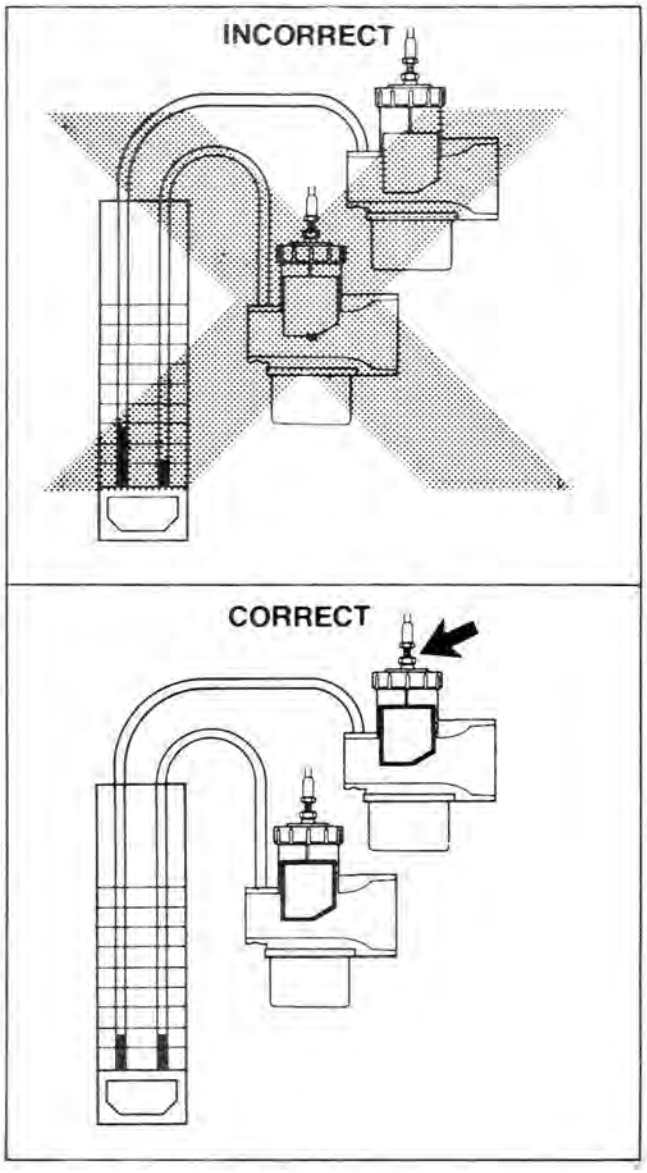


Figure 2-103

Repair

Table of Contents

	Page
General Troubleshooting	3-2
Ignition Troubleshooting	3-9
Ignition Troubleshooting using CD Ignition Tester	3-11
Ignition Troubleshooting Using an Ohmmeter	3-20
Electrical System	3-22
Battery	3-25
Charging System	3-29
Lighting Coil	3-31
Solenoid Switch	3-35
Starter Motor	3-36
Flow Charts	3-46
Muffler	3-49
Silencer	3-49
Carburetor	3-50
Fuel Pump	3-57
Engine Removal	3-59
Engine Installation	3-60
Starter Assembly	3-60
Stator Assembly	3-64
Fan Belt Tension	3-67
Air Shrouds	3-68
Fan Housing	3-69
Carburetor Holders	3-71
Cylinder Head Cylinder and Piston	3-72
Oil Injection System	3-77
Crankshaft Assembly	3-82
Brake Light Switch, Dimmer Switch, or Brake Lever Assembly	3-85
Emergency Stop Switch or Throttle Lever Assembly	3-85
Headlamp	3-86
Key Switch	3-86
Speedometer	3-88
Tachometer	3-88
Tail Lamp	3-88
Regulator/Rectifier Replacement	3-88
Throttle Cable and Oil Pump Cable	3-89
Brake Cable	3-91
Enricher Cable	3-92
Primer Pump	3-93
Driver Converter	3-94
Driven Converter	3-99
Chaincase	3-107
Self-Adjusting Brake	3-110
Brake Pad Replacement	3-116
Chain Replacement	3-117
Suspension	3-117
Idler Wheels (Swing & Pivot Arms)	3-118
Limiter Straps	3-124
Rear Axle and Wheels	3-124
Shock Absorber and Spring	3-125
Springs and Cam Plate Assembly	3-126
Swing Arm	3-126
Suspension Rails	3-127
Bumper	3-129
Suspension Installation	3-129
Driveshaft and Track	3-130
Jackshaft and Disc Brake	3-133
Steering System	3-134
Seat	3-138
Fuel Tank	3-138
Oil Tank	3-139

3

General Troubleshooting

Isolating a malfunction is as important as correcting the trouble. Use a good systematic approach to locate the problem in the minimum amount of time. All service operations can be solved by following these three steps:

1. Identify the problem
2. Determine cause of the problem
3. Correct the problem

Obtain from the owner an accurate description of the trouble, operating conditions, and maintenance history. In many cases, these will help to isolate the trouble. Sometimes solving the problem is not enough, and the cause has created other undetected problems. Use the Troubleshooting Charts as a guide in solving the problem. If additional interrelated problems exist, refer to appropriate portion of Section 3 for major repair procedures.

Problem Isolation Chart

Engine Problem	Condition	Remedy
Engine does not start - no spark.	1. Key switch not ON or malfunctioning.	1. Turn switch ON or replace.
	2. Emergency stop switch in OFF position or malfunctioning.	2. Move switch to ON or replace stop switch.
	3. Spark plug(s) fouled, oiled or damaged.	3. Replace spark plug(s).
	4. Plug cap(s) damaged or leaking	4. Replace plug cap(s).
	5. High tension wire(s) loose, grounded or shorted.	5. Service high tension wire(s)/ coil(s).
	6. Defective CD igniter.	6. Replace CD igniter.
	7. Defective exciter coil.	7. Replace exciting coil.
	8. Defective pulser coil.	8. Replace pulser coil.
	9. Weak flywheel magnets.	9. Replace the flywheel.
Engine will not start - does not get fuel.	1. Fuel tank empty.	1. Fill fuel tank with fuel.
	2. Cracked, broken or pinched fuel line.	2. Replace the fuel line.
	3. Obstructed or damaged fuel filter.	3. Clean or replace fuel filter.
	4. Carburetor jets plugged or fuel pump malfunctioning.	4. Service the carburetor or the fuel pump.
	5. Impulse line is cracked, broken or pinched.	5. Replace the impulse line.
	6. Carburetor adjusted incorrectly.	6. Adjust the carburetor.

Engine Problem (Continued)	Condition	Remedy
Engine will not start - fuel will not ignite.	1. Air leak between carburetor, silencer seal or cylinder.	1. Tighten mounting bolt and nuts.
	2. Carburetor adjusted incorrectly.	2. Adjust the carburetor.
	3. Water in carburetor.	3. Disassemble and clean carburetor.
	4. Engine is flooded.	4. Turn key switch OFF, remove spark plugs and dry them - crank engine over 5-10 times. Install spark plugs and start engine. If engine continues to flood, check carburetor.
	5. No compression (worn or broken rings, scored piston, hole in piston or damaged cylinder).	5. Check compression, replace worn or damaged parts.
	6. Blown head gasket.	6. Replace head gasket.
Engine does not idle or idle RPM fluctuates.	1. Air screw adjusted incorrectly.	1. Adjust air screw.
	2. Idle screw adjusted incorrectly.	2. Adjust idle screw.
	3. Defective fuel pump (check valve).	3. Service the fuel pump (check valve).
	4. Belt dust restricting passages in caburetor bore.	4. Disassemble and clean carburetor passages.
	5. Impulse line cracked, kinked or broken.	5. Replace or repair impulse line.
	6. Enrichener cable adjusted incorrectly.	6. Adjust enrichener cable.
	7. Oil seals leaking.	7. Replace oil seals.
	8. Air leak (pressure check engine).	8. Disassemble and replace worn, defective, or damaged parts.
	9. Carburetors not synchronized.	9. Synchronize carburetors.
Engine develops power loss or runs on one cylinder.	1. Fouled or defective spark plug(s).	1. Replace the spark plug(s).
	2. Obstruction inside of muffler.	2. Remove obstruction or replace muffler.
	3. Defective CDI igniter.	3. Replace CDI igniter.

GENERAL TROUBLESHOOTING (CONT)

Engine Problem (Continued)	Condition	Remedy
Engine develops power loss or runs on one cylinder (Continued).	4. Filter obstructed.	4. Clean or replace filter.
	5. Excessive carbon buildup in exhaust port(s).	5. Clean exhaust port(s).
	6. Damaged or worn rings.	6. Replace the rings.
	7. Low crankcase pressure.	7. Check crankcase for leaks; replace oil seal or gasket.
	8. Damaged piston.	8. Replace piston and related component(s).
	9. Damaged head gasket.	9. Replace gasket.
	10. Broken (shorted) high tension leads.	10. Replace complete CDI igniter.
	11. Defective plug cap(s).	11. Replace cap(s).
Engine overheats.	1. Incorrect spark plug(s).	1. Install correct spark plug(s).
	2. Cooling fins obstructed.	2. Clean cooling fins.
	3. Air leak between carburetor and cylinders.	3. Replace gaskets, tighten mounting hardware.
	4. Caburetor adjusted incorrectly.	4. Adjust carburetor.
	5. Excessive carbon deposits in combustion chamber, exhaust port or muffler.	5. Clean affected components.
	6. Damaged rings caused by excessive carbon buildup.	6. Clean or replace rings.
	7. Fan belt loose or broken.	7. Adjust tension or replace belt.
Engine backfires; has irregular running condition. Note: Engine may eventually overheat.	1. High tension lead wire shorting out.	1. Replace complete CDI igniter.
	2. Fouled or incorrect spark plug (heat range too hot).	2. Replace spark plug or install spark plug having colder heat range.
	3. Air leak between carburetor and cylinder.	3. Pressure test crankcase.
Engine four-cycles.	1. Carburetor incorrectly adjusted.	1. Adjust carburetor.
	2. Dirt between needle valve and valve seat.	2. Service carburetor.

Engine Problem (Continued)	Condition	Remedy
Engine stops (suddenly) after running.	1. Obstruction in fuel tank or fuel filter.	1. Clean or replace filter.
	2. Fuel line obstructed or pinched.	2. Remove obstruction, remove pinched area from fuel line.
	3. Defective CDI igniter.	3. Replace CDI igniter.
	4. Spark plug bridged.	4. Replace spark plug.
	5. Seized piston(s).	5. Replace piston and any affected components.
	6. Seized crankshaft.	6. Replace crankshaft and any affected components.
	7. Defective exciter coil.	7. Replace exciter coil.
	8. Defective pulser coil.	8. Replace pulser coil.
Engine stops (gradually) after running.	1. Obstruction in fuel tank or fuel filter.	1. Clean or replace filter.
	2. Fuel line obstructed or pinched.	2. Remove obstruction, remove pinched area from fuel line.
	3. Damaged head gasket(s).	3. Replace head gasket(s).
	4. Loose cylinder head.	4. Tighten cylinder head nuts to correct torque.
	5. Loose spark plug(s).	5. Tighten spark plug(s) to correct torque.

Drive Converter Problem	Condition	Remedy
Drive converter engages before specified RPM.	1. Incorrect spring.	1. Install correct spring.
	2. Weak or damaged spring.	2. Replace spring.
	3. Incorrect weights.	3. Install correct weights.
Drive converter engages after specified RPM.	1. Incorrect spring.	1. Install correct spring.
	2. Incorrect weights.	2. Install correct weights.
	3. Dirty movable sheave.	3. Clean movable sheave.
	4. Worn (flat spots) rollers and ramps.	4. Replace rollers and ramps.
	5. Bushing in housing worn excessively on inside diameter.	5. Replace components as required.

Drive Converter Problem (Continued)	Condition	Remedy
Maximum drive converter RPM too high.	1. Incorrect weights (too light).	1. Install correct weights.
	2. Short belt or incorrect center to center distance.	2. Install new belt and establish correct offset and center to center distance.
Maximum drive converter RPM too low.	1. Incorrect weights (too heavy).	1. Install correct weights.
	2. Long belt or incorrect center to center distance.	2. Install new belt and establish correct offset and center to center distance.
Shifting too quickly.	1. Incorrect weights (too heavy).	1. Install correct weights.
	2. Weak drive spring.	2. Replace spring.
	3. Driven spring preload incorrect (too loose).	3. Correct spring preload.
Shifting too slowly.	1. Incorrect weights (too light).	1. Install correct weights.
	2. Spring too strong.	2. Replace spring.
	3. Driven spring preload too tight.	3. Decrease spring preload.
Belt deposits on stationary sheave and movable sheave.	1. Wrong offset and center to center distance.	1. Remove belt deposits and establish correct offset and center to center distance.
Drive converter will not disengage at idle - engine starts hard and stalls because of belt drag.	1. Drive belt outside circumference below specifications.	1. Replace drive belt.
	2. Thickness of belt on inside diameter exceeds specifications.	2. Check drive belt specifications (belt thickness on inside diameter).
Drive Belt Problem	**Condition**	**Remedy**
Side of belt glazed or baked - not normal, caused by excessive heat buildup.	1. Incorrect belt - excessive slippage.	1. Install correct drive belt.
	2. Too much throttle applied under heavy load - excessive slippage.	2. Tell driver to decrease throttle under heavy load condition; install new belt.
	3. Weak drive converter spring.	3. Perform spring pressure test; install new spring if spring is weak.
	4. Drive converter engagement RPM too low.	4. Adjust engagement RPM - See Specifications.

Drive Belt Problem (Continued)	Condition	Remedy
Side of belt glazed or baked - not normal, caused by excessive heat buildup (continued).	5. Improper drive converter operation (sticking, etc.).	5. Remove and repair drive converter; install new belt if one is needed.
	6. Drive converter and driven converter "offset/center to center" is incorrect.	6. Check and adjust, install new belt if one is needed.
	7. Oil or grease on drive converter or driven converter sheave surface.	7. Clean sheaves; install new belt if one is needed.
Lugs worn off inside of belt.	1. Drive converter engages suddenly (engagement speed too high).	1. Remove and repair drive converter; install new belt, if one is needed.
	2. Center to center distance too far apart or belt too short.	2. Alter center to center distance or install longer belt.
Belt worn in one spot.	1. Track frozen to slide rails, front drive or ground.	1. Free track and install new belt.
	2. Incorrect track tension.	2. Adjust track tension and install new belt.
	3. Idle speed too high.	3. Reduce idle RPM and install new belt.
	4. Improper operation of drive converter.	4. Repair or replace drive converter and install new belt.
Cracks at base of belt lug.	1. Continuous overrevving when snowmobile is operated.	1. Decrease RPM and install new belt.

Chaincase Problem	Condition	Remedy
Rattle in chaincase.	1. Incorrect chain tension.	1. Check chain guides and tensioner springs.
	2. Chain stretched beyond adjustable limit.	2. Install new chain and sprockets.
Chain slippage.	1. Incorrect chain tension.	1. Check chain guides and tensioner springs.
	2. Chain stretched beyond adjustable limit.	2. Install new chain and sprockets.
	3. Sprocket teeth worn.	3. Install new sprockets and chain.

Chaincase Problem (Continued)	Condition	Remedy
Chain slips off sprockets.	1. Incorrect chain tension.	1. Check chain guides and tensioner springs.
	2. Sprocket teeth worn.	2. Install new sprockets and chain.
	3. Sprockets misaligned.	3. Align top sprocket with bottom sprocket.
Track Problem	**Condition**	**Remedy**
Edge of track is frayed.	1. Track is misaligned.	1. Set track tension and alignment.
Track is grooved (worn) or burnt on inside surface.	1. Track tension is too tight.	1. Set track tension and alignment.
	2. Rear idler wheels do not turn or otherwise damaged.	2. Install new rear idler wheels and set track tension and alignment.
Track ratchets or hits on body tunnel (top).	1. Track tension is too loose.	1. Set track tension and alignment.
Accelerated rail strip wear.	1. Slide rail(s) bent.	1. Straighten slide rail(s) or install new rails.
	2. Track is misaligned.	2. Set track tension and alignment.
Driven Converter Problem	**Condition**	**Remedy**
Low engine RPM yet belt shifts completely through driven converter operating range.	1. Weak spring or broken spring.	1. Rotate end of spring clockwise on driven converter to increase spring tension or install new spring.
High engine RPM yet belt takes too long to shift through driven converter range.	1. Incorrect spring - too heavy.	1. Install correct spring.
	2. Dirt on movable or stationary sheave.	2. Clean sheaves.
	3. Excessively worn movable or stationary sheave.	3. Install new components.

Ignition Troubleshooting

NOTE: The following tips may help isolate ignition problems quickly.

1. A defective exciter coil, CD igniter/ignition coil, key switch or emergency stop switch can be the cause of no spark, weak spark or intermittent spark.

2. A defective pulser coil may cause no spark or intermittent spark but not a weak spark.

Preliminary Procedures

When an ignition problem is present, prior to performing elaborate troubleshooting try to solve problems by performing the easy tests first as follows:

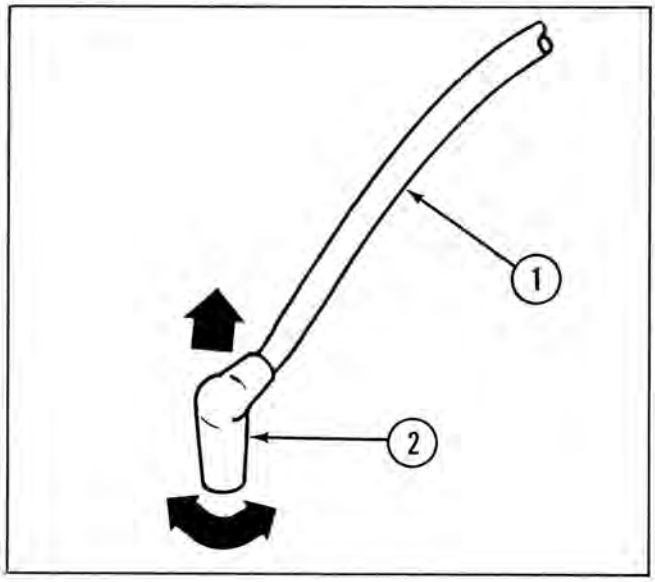
Spark Plug Cap

Each ignition coil lead is secured to spark plug tip by a small spring terminal inside the spark plug cap. Incorrect spark plug cap removal will damage the terminal which may result in ignition system malfunction or premature component failure.

CAUTION

Do not twist or force spark plug cap off by pulling on lead wire as this will damage the connection.

Twist cap back and forth while pulling straight upward to remove from spark plug. (See Figure 3-1.)



1. Lead Wire
2. Spark Plug Cap

Figure 3-1

Check spring terminal for correct installation to ignition coil lead as follows:

1. Slide cap off lead wire.

2. Ends of spring terminal must be at 90° angle to insure correct engagement with inner wire. (See Figure 3-2.)

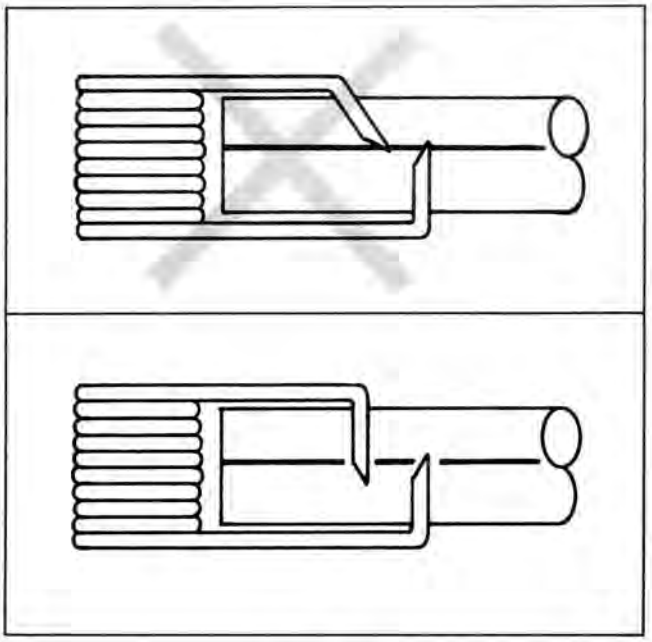


Figure 3-2

3. Both arms of spring terminal must enter ignition coil lead at centerline to insure contact with inner wire. (See Figure 3-3.)

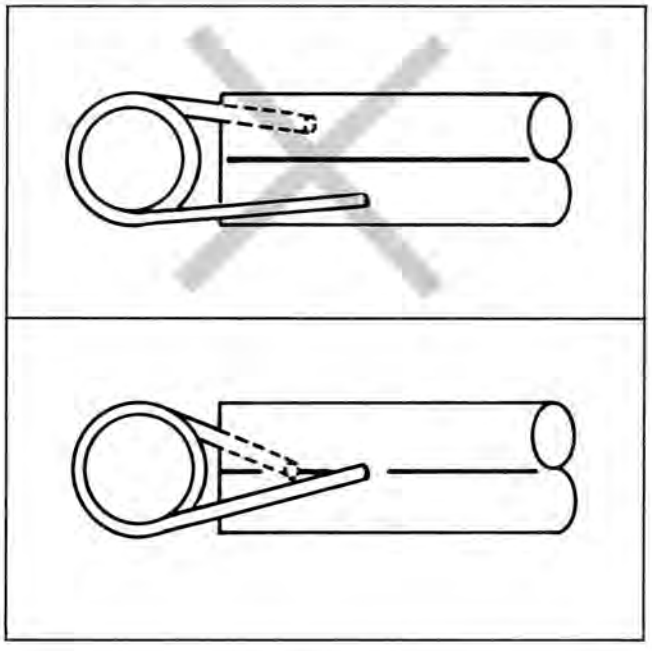


Figure 3-3

4. Slide spark plug cap onto ignition coil lead to cover spring terminal. Lubricate spark plug cap with LPS or WD-40 to ease installation.

CAUTION

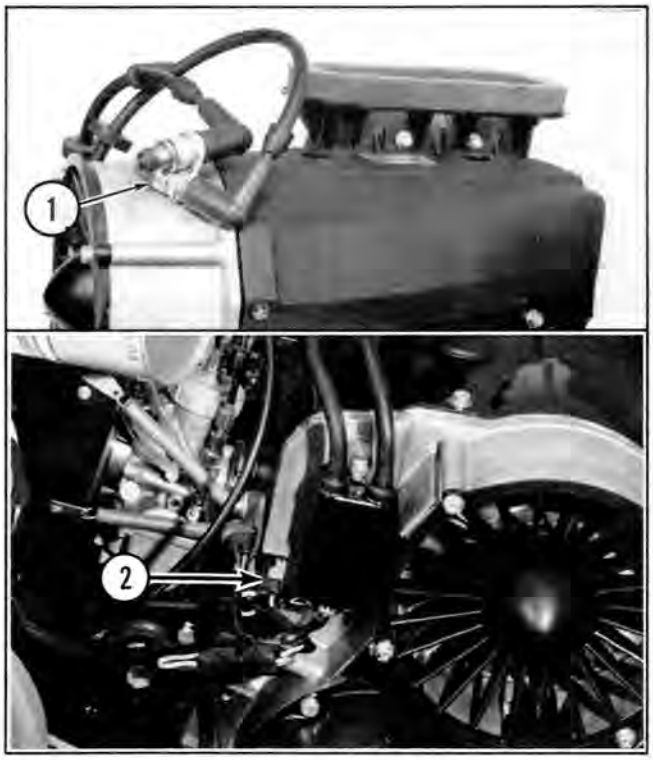
To prevent ignition system malfunction do not apply oil or grease to spark plug cap during installation.

Spark Test

Check ignition coil output to spark plugs by performing the following:

1. Connect test spark plug to each spark plug cap. Ground the spark plugs to the fan housing. (See Figure 3-4.)

NOTE: Fabricate test spark plug by removing ground electrode. This increases distance spark must jump from center electrode to ground, working the ignition system harder than jumping standard spark plug gap.



1. Test Spark Plugs
2. Wiring Harness Connector

Figure 3-4

2. Crank engine and observe spark.

   a. Blue colored spark jumps gap of test spark plug indicates ignition system should start and run engine if timing is correct.

   b. No spark observed, continue trouble-shooting procedure.

Stop Circuit Elimination Test

Remove key switch and emergency stop switch circuits from the system. Separate wiring harness connector on the engine. (See Figure 3-4.)

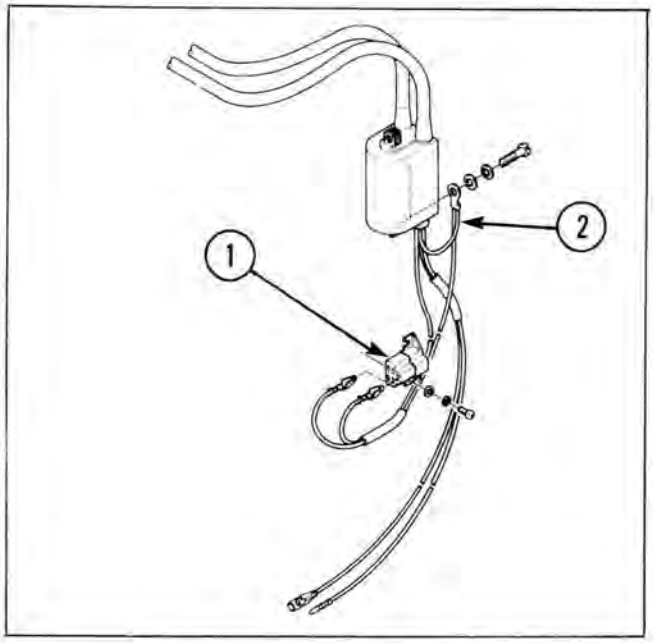
1. Crank engine. If spark occurs with the connector separated, ignition components on the engine are okay, defective component must be key switch, emergency stop switch or the wiring. Refer to Key Switch and Emergency Stop Switch Tests.

2. If no spark is observed, test ignition components mounted on engine.

Ground Wire Test

Check the grounded BROWN and GRAY wires at main engine connector ring terminal for condition and secure mounting. (See Figure 3-5.)

A loose connection will cause intermittent spark while a broken connection will result in no spark.



1. Main Wiring Connector
2. Brown and Gray Wires

Figure 3-5

Ignition Troubleshooting Using CD Ignition Tester PN T56019-201

GENERAL DESCRIPTION

The Kawasaki Ignition Tester P/N T56019-201 is an electrical energy measuring device capable of measuring the peak energy output of the CD igniter, magneto exciter, and pulser coils.

Ignition energy output pulses occur at a speed of microsecond duration and cannot be accurately measured by a voltmeter. The Kawasaki Ignition Tester P/N T56019-201 is solid state construction capable of measuring energy peaks of less than one microsecond in duration.

The Kawasaki Ignition Tester P/N T56019-201 performs as a comparator. The energy output values for all CD Ignition components were derived from tests conducted by Kawasaki. Using this tester, it can be determined if each ignition component is functioning properly. The test results can be compared with the standard values given.

Tester Controls and Accessories

1. High-Low Range Switch

   The tester has two input ranges selected by a toggle switch. The Low range is sensitive to AC or DC voltages from 0.5 to 27 volts. The High range is sensitive to AC or DC voltages from approximately 75 to 500 volts.

High Scale Test:

a. Plug the test simulator into a 115 VAC electric outlet for ten seconds.

b. Place toggle switch of the tester in the High position.

c. Remove the simulator from the outlet, and connect the P and N leads from the tester to the simulator as indicated on the bottom of the simulator.

d. Set the tester dial to 50, or below. Depress the button on the simulator. The indicator lamp on the tester should light.

Low Scale Test:

a. Place switch in Low position.

b. Set tester dial to 50, or below.

c. Connect yellow lead to negative terminal of 12 volt battery. Connect red lead to positive terminal. Indicator lamp should light.

If lamp does not light in either the High or Low scale tests, check tester battery installation. Check the clip leads for faulty connections. If no faults can be found, refer to the warranty statement for instructions in sending the tester back to Electro-Specialties, Inc. for repair.

2. Indicator Dial and Light

   The ignition energy output is referenced against a 0-100 scale on the tester. The greater the energy output, the greater the value indication on the scale. The indication is in the form of an incandescent lamp that lights when the scale dial is set at the position corresponding to the energy output.

Indicator Dial Alignment:

Check indicator dial alignment by turning the dial to the full clockwise position. The white mark on the dial must line up with the 100 on the face. If the mark does not line up with the 100, loosen the dial setscrew, remove the dial, turn the indicator dial shaft fully clockwise, replace the dial, lining up the mark on the dial with the 100, and tighten the setscrew. Do not force the dial to turn without first loosening the setscrew.

Due to manufacturing tolerances, do not be concerned if the white mark on the dial, when turned fully in the counterclockwise direction, does not align exactly with the zero.

3. Test Simulator

The test simulator is used as a source of energy for testing the high range of the ignition tester. It is charged up by being plugged into a 115 VAC outlet.

Do not touch the plug pins on the simulator while depressing the button. A mild shock will result. For each test performed by the simulator, it must be recharged. The tester will not be damaged if the test switch is placed in the Low position and high voltage output tests are made.

4. Load Coil

The CD ignition load coil is used in conjunction with the tester and is designed to provide an output load for the CD igniter unit. The load coil will cause a marginal capacitor to malfunction, but will not effect a good unit.

5. MM-1 Clip

The MM-1 clip determines the relative amount of energy present in the spark plug wires. Engines in various stages of wear will indicate a different energy reading than new engines. As the engine compression goes down, the energy necessary to fire the plugs goes down also.

Readings lower than standard indicate low coil output (caused by a fault anywhere in the ignition system, faulty spark plug or ignition wire, or low compression). Readings higher than standard indicate higher coil output or larger than standard spark plug gap.

GENERAL TEST INSTRUCTIONS

Engine Accessory Circuits

Before beginning test procedures, check all primary and secondary ignition wiring, key switches, and engine stop switches to eliminate them as possible causes of ignition failure.

Cranking Engine

Removal of the spark plugs will allow the engine to turn over faster, raising the level of output from the ignition system. Vigorous cranking raises the output over that of cranking without compression. If output results are marginal, output can be measured with and without compression. Values listed in the test procedures are taken against compression. Always crank vigorously as in actual starting.

Analysis of Test Results

Indicator Lamp Lights at Specified Setting:

After every test that lights the indicator lamp, reset the indicator circuit by depressing the Reset button. The Indicator lamp will light at all points downscale from the highest indication.

Test results should repeat within five points of the specified setting. If readings do not repeat, output of the ignition system is erratic.

Indicator Lamp Does Not Light Unless Dial Is Turned Downscale From Specified Setting:

This indicates that the output is less than that designed to operate the engine in a satisfactory manner. The engine may run at a lower setting, but be subject to hard starting and/or misfiring. Be certain that correct engine cranking conditions were met.

Indicator Lamp Does Not Light:

Output of the system is too low to operate the tester indicator circuit.

Multiple or Intermittent Ignition Problems

In dealing with intermittent ignition problems there is no easy way. Problems that occur only during hot engine operation will have to be tested on a hot engine. In some cases of temperature and/or vibration failure, only parts replacement can solve the problem as most of these failures return to normal at engine shut off.

Low test readings indicate ideal conditions for engine misfire and hard starting.

There is always the possibility of more than one component of the ignition system failing. Careful repeat of the test procedures and troubleshooting of the accessory circuits will uncover any additional problems.

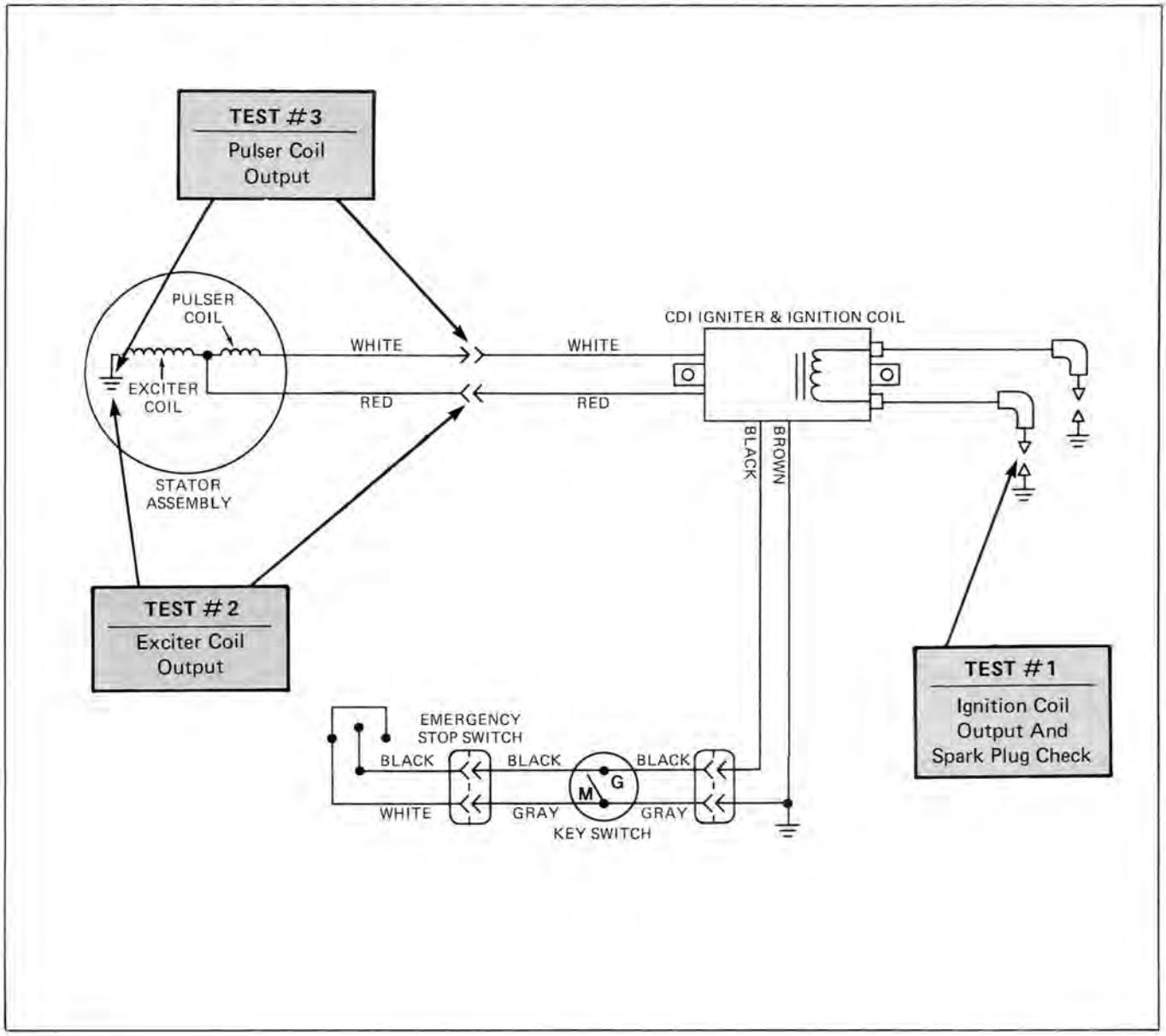
WARNING

Magneto and CDI igniter output voltages are high enough to cause an uncomfortable shock. Always see that clip lead insulators cover the clips so they do not contact the operator or vehicle frame.

CAUTION

Never connect the tester directly to the coil secondary output (spark plug). Always use the MM-1 clip when testing the ignition coil output.

Test Sequence - Using CD Ignition Tester P/N T56019-201

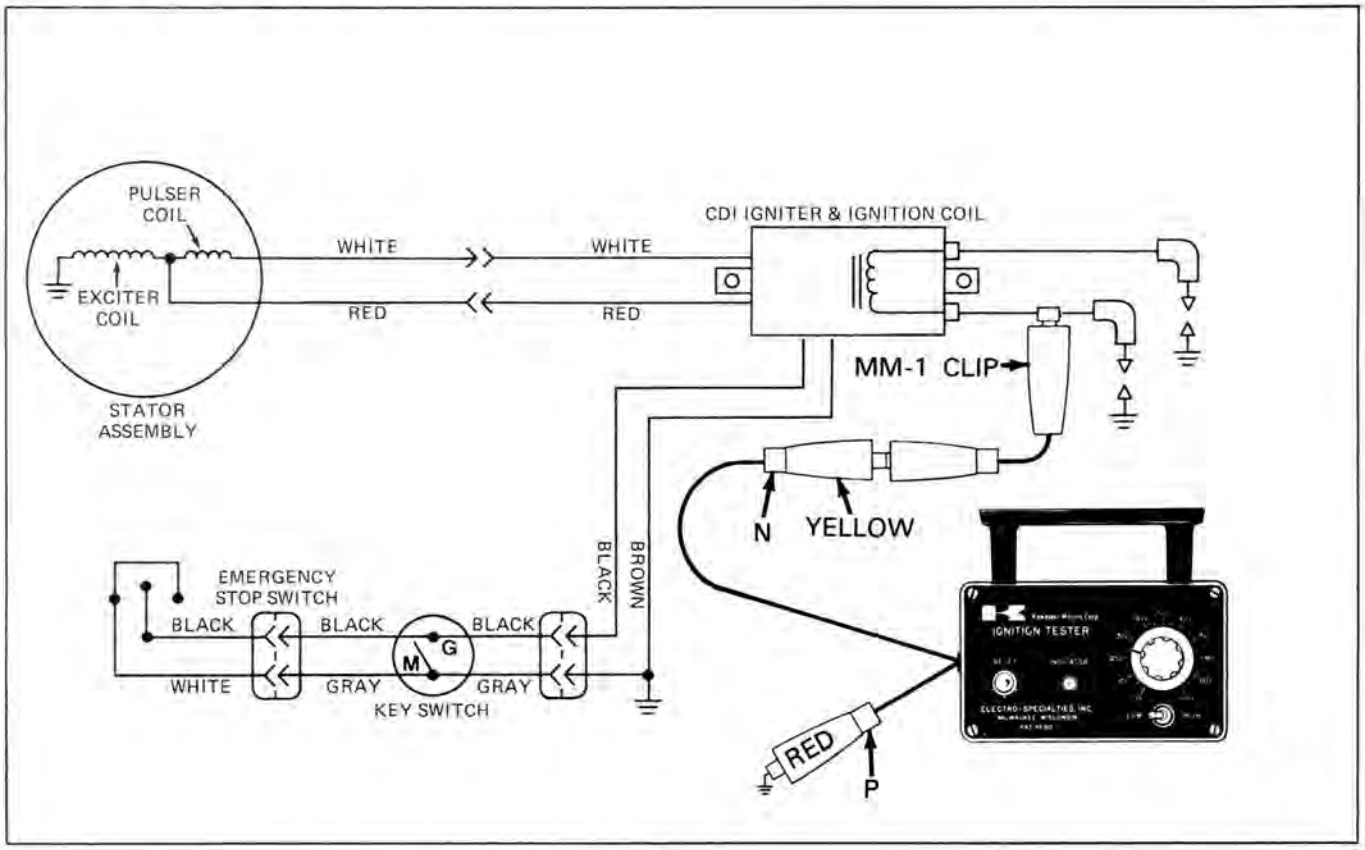


TEST #1		TEST #2		TEST #3	
RANGE	DIAL SETTING	RANGE	DIAL SETTING	RANGE	DIAL SETTING
Low	25	High	35	Low	90

NOTE: Refer to following pages for detailed testing procedure.

Test No. 1

Ignition Coil Output and Spark Plug Check



TEST CONNECTIONS

1. Connect the MM-1 adaptor to the tester N (yellow) lead wire.
2. Connect the tester P (red) lead wire to a good ground on the engine.
3. Clamp the MM-1 adaptor around either spark plug wire as close to the spark plug as possible. If insulation sleeving is over the spark plug wire, push the sleeving back so that the clip encircles the spark plug wire directly. Do not allow any metal portion of the MM-1 clip to touch the engine.
4. Before proceeding, be certain that the engine stop switch, ground wires, and all primary and secondary ignition wiring are not contributing to the problem.

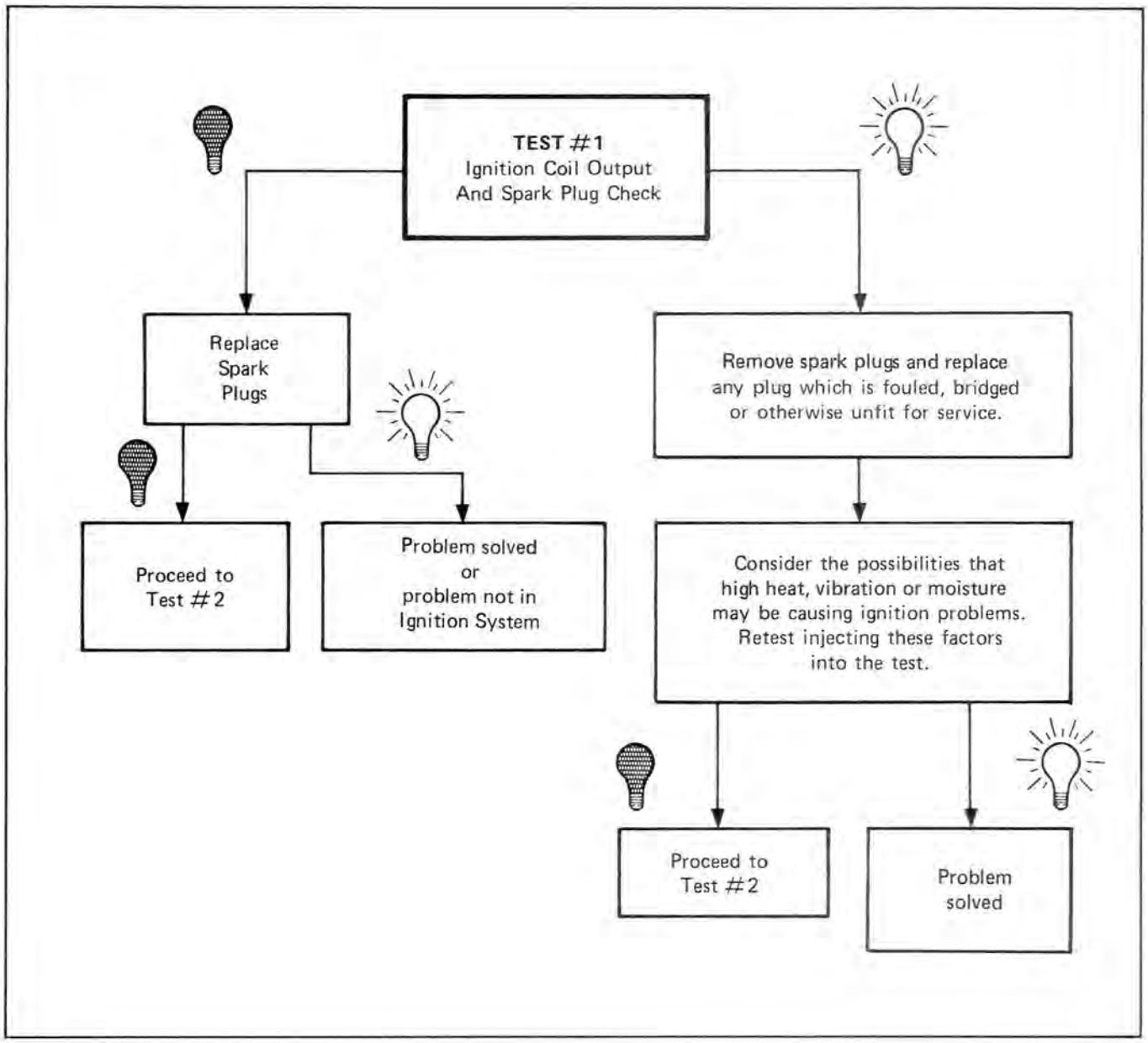
TEST PROCEDURE

NOTE: After each test that lights the Indicator Lamp, push the Reset button to turn the lamp off in preparation for the next test.

1. Set the toggle switch to the Low range. Set the tester dial to 25.
2. Pull the recoil starter handle to turn the engine over. If the engine starts, allow it to idle only. Repeat this test three times to verify consistent output.

   a. If the lamp lights consistently at or above 25 on the scale, the ignition system up to the spark plugs is operating properly. Remove the spark plugs and replace any plug which is fouled, bridged, or otherwise unfit for service. Consider the possibilities that high heat, vibration, or moisture may be causing ignition problems and repeat Test No. 1 incorporating these factors into the test.

   b. If the lamp does not light consistently above the specified value or does not light at all, follow the steps on the next page.





No Lamp or Low/Inconsistent Reading



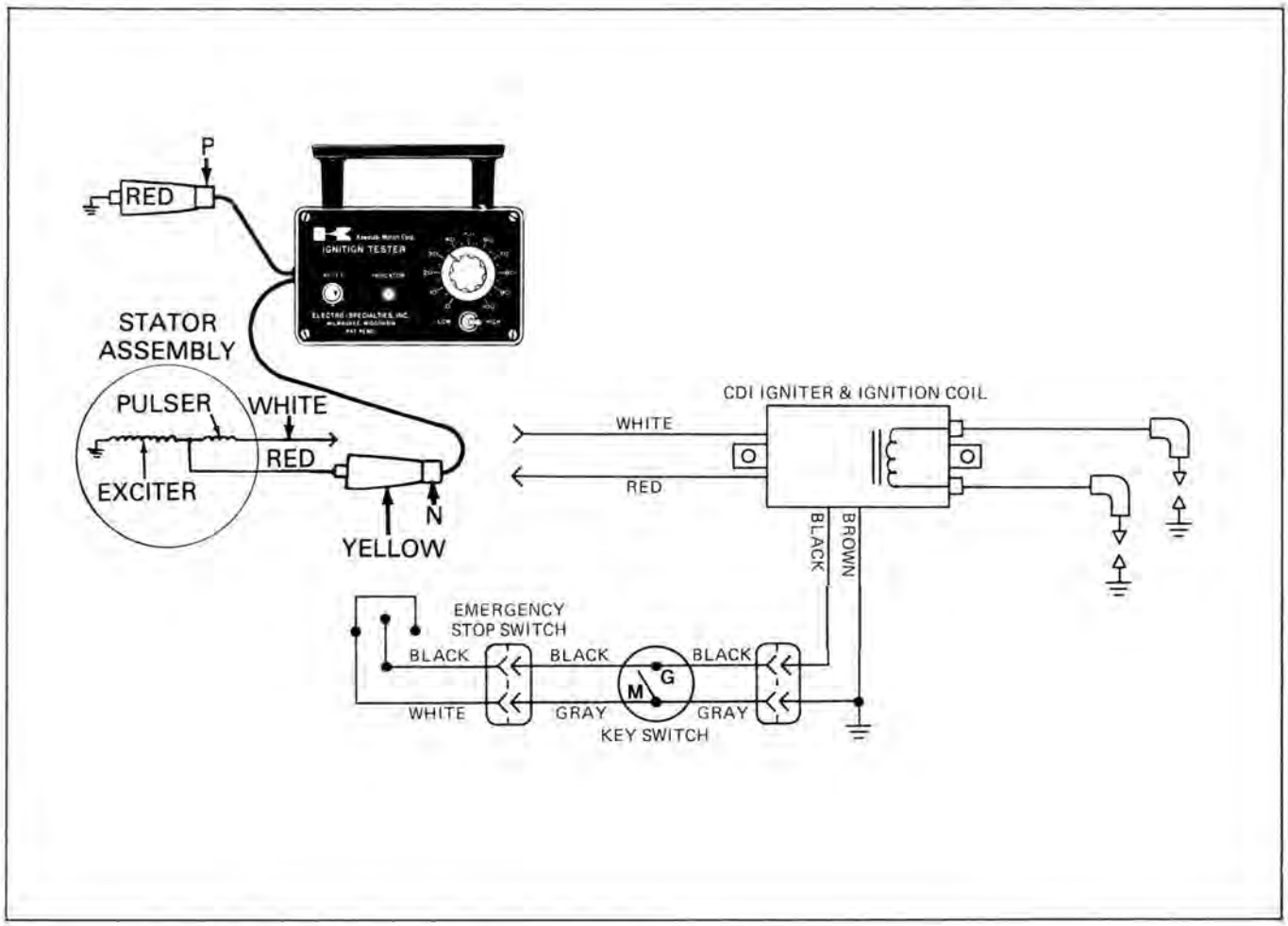
Lamp Lights at Specified Value

STANDARD VALUE TEST #1

RANGE	VALUE
Low	25

Test No. 2

Exciter Coil Output



TEST CONNECTIONS

1. Disconnect the red and white wires between the magneto assembly and the CD igniter.
2. Connect the tester N (yellow) lead wire to the red wire on the magneto end of the connector.
3. Connect the tester P (red) lead wire to a good engine ground.

TEST PROCEDURE

1. Set the toggle switch to the High range. Set the tester dial to 35.
2. Turn over the engine while observing the Indicator Lamp on the tester.

   a. If the lamp lights, push the Reset button to turn the lamp off and repeat Test No. 2 three times. If the lamp lights consistently at 35, magneto exciter coil is good, proceed to Test No. 3.

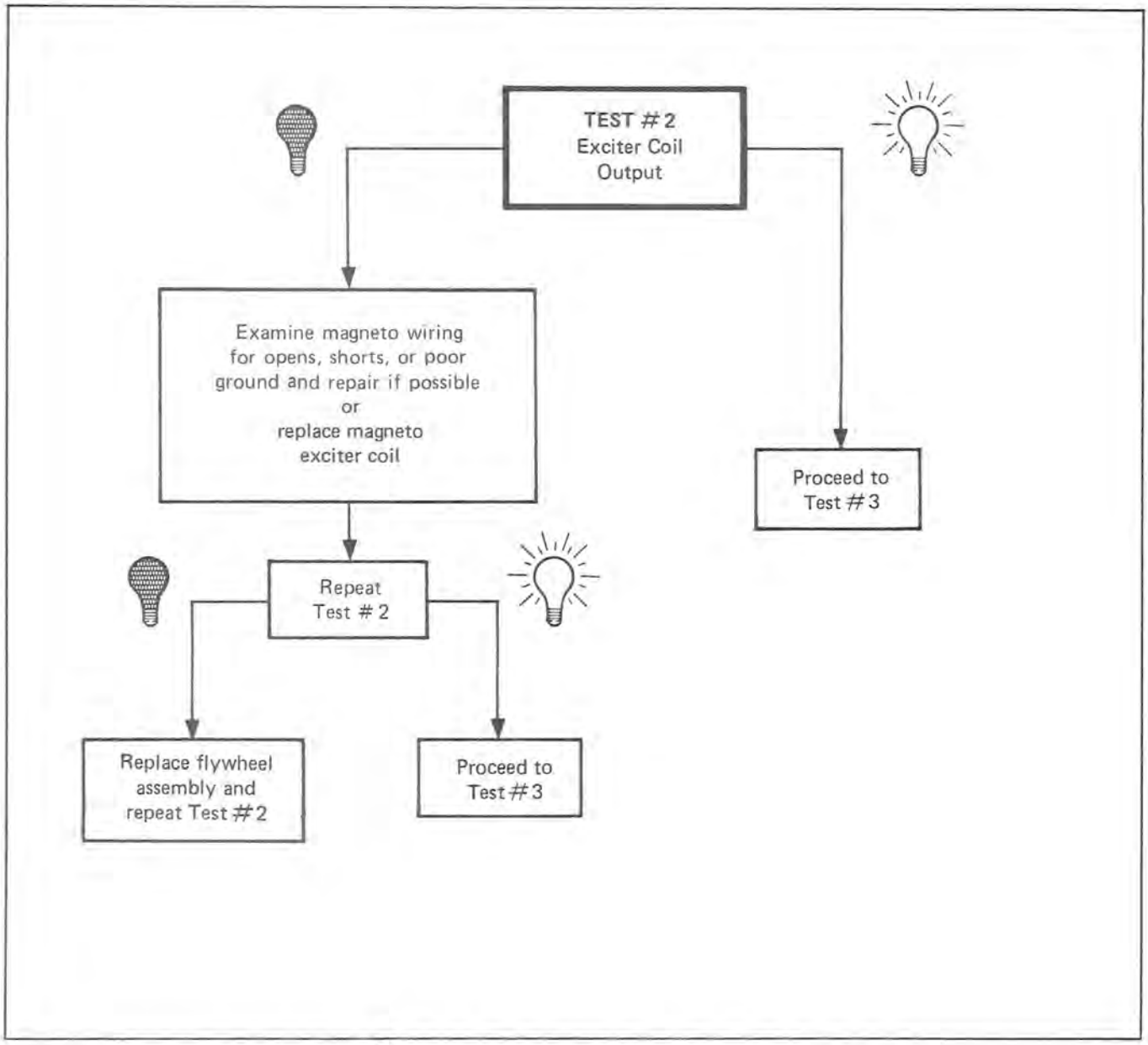
   b. If the Indicator Lamp gives inconsistent readings at any dial setting or does not light at all, this indicates the following:

   1. A defective exciter coil (check the ohms). Replace the exciter coil.

   2. Defective wiring. Check the wiring.

   3. Defective flywheel magnets. Replace the flywheel.

Follow the steps in the chart on the next page.



No Lamp or Low/Inconsistent Reading

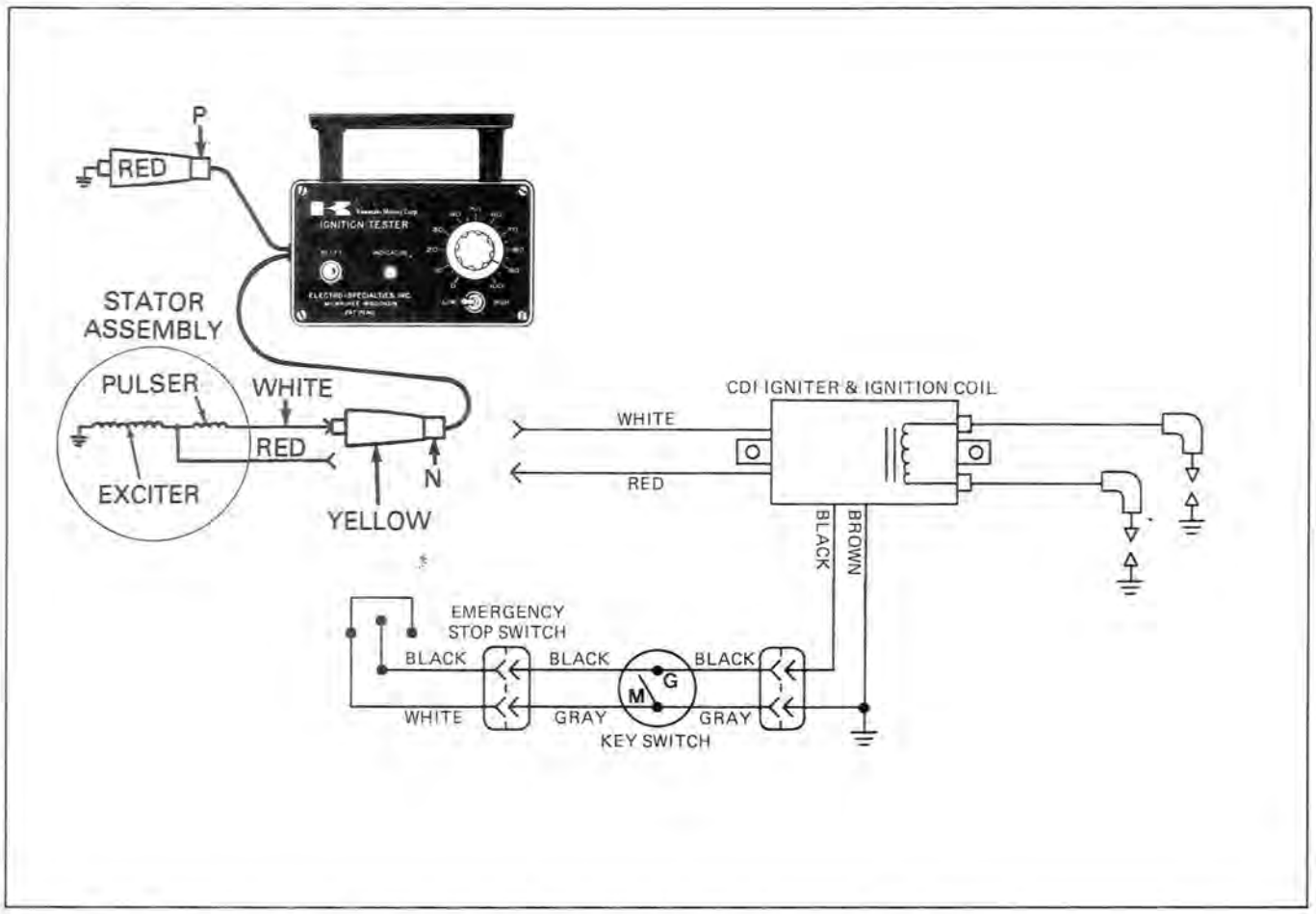
Lamp Lights at Specified Value

STANDARD VALUE TEST #2

RANGE	VALUE
High	35

Test No. 3

Pulser Coil Output



TEST CONNECTIONS

1. With both the red and white wires still disconnected, connect the tester N (yellow) lead wire to the white wire on the magneto end of the connector.

2. Connect the tester P (red) lead wire to a good engine ground.

TEST PROCEDURE

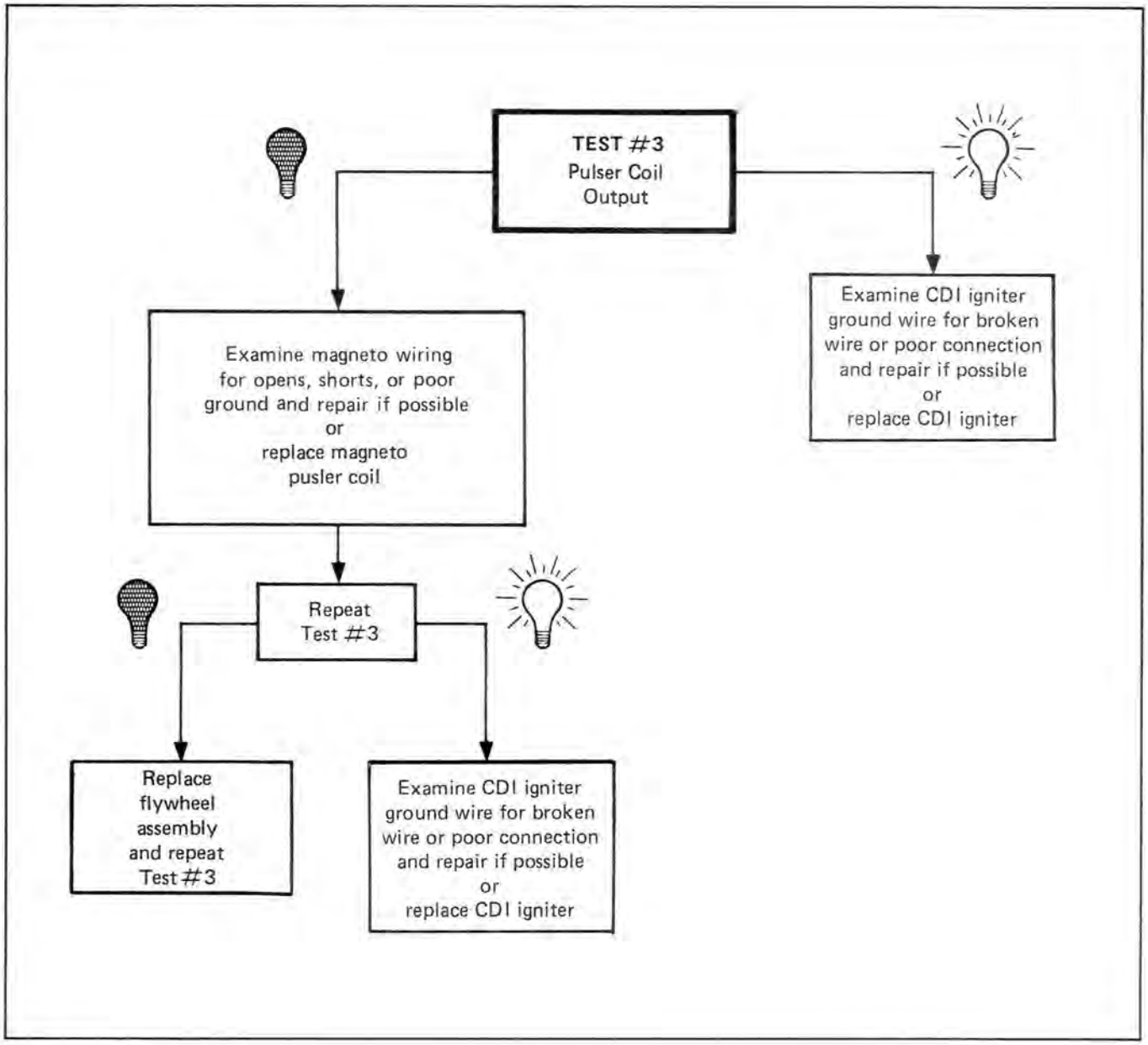
1. Set the toggle switch to the Low range. Set the tester dial to 90.

2. Turn over the engine while observing the Indicator Lamp on the tester.

a. If the Indicator Lamp lights, push the Reset button to turn the lamp off and repeat Test No. 3 three times. If the lamp lights consistently at 90 the pulser coil is good.

NOTE: Check CDI igniter ground wire for broken wire, corrosion or poor connection.

b. If the Indicator Lamp gives inconsistent readings or does not light at all, follow the steps on the next page.



No Lamp or Low/Inconsistent Reading

Lamp Lights at Specified Value

STANDARD VALUE TEST #3

RANGE	VALUE
Low	90

Ignition Troubleshooting Using an Ohmmeter

General Description

If the Kawasaki CD ignition tester is not available, the exciter coil, pulser coil and ignition coil may be checked using an ohmmeter. This type of test is not as accurate or sophisticated as using the Kawasaki CD tester and the results are not 100% conclusive.

NOTE: Exercise care to prevent an electrical shock from the CD igniter. Handle the CD igniter carefully. If you should drop it, the incorporated electronic components will be damaged.

The following test procedures are alternate checks designed for locating ignition system malfunction using an ohmmeter.

1. WIRING CONNECTIONS - Check all wiring connectors to insure connections are clean, secure, and correct. (See Figure 3-6.)

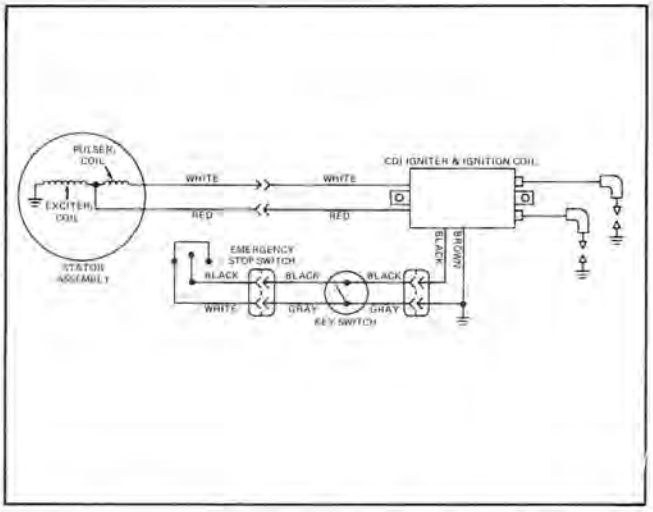
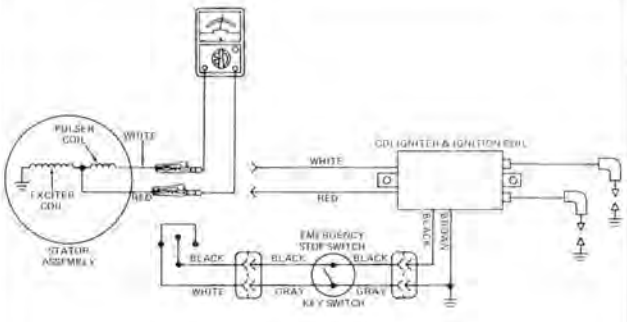


Figure 3-6

2. EXCITER AND PULSER COILS - To locate the cause of trouble (broken wire, short circuit, etc.) measure the resistance of each coil winding and check AC voltage output as specified in the following illustration. Repair defective wire or replace coil not within specifications. (See Figure 3-7.)

CAUTION

Do not use an improper tester (insulation resistance testers or other testers with a battery of large capacity). The use of a large capacity tester may ruin components during test.



PART TO BE MEASURED	EXCITER	PULSER COIL
OHMMETER LEADS CONNECTED BETWEEN	RED BROWN (GROUND)	WHITE RED
RESISTANCE Ω	160 Ω ± 20%	17 Ω ± 20%
*VOLTAGE AC	40 VAC	4 VAC

*Measure at cranking speed with spark plugs installed.

Figure 3-7

Troubleshooting Table

Problem	Condition	Remedy
No spark is produced	1. Defective exciter coil	1. Replace exciter coil
	2. Defective pulser coil	2. Replace pulser coil
	3. Defective CD igniter	3. Replace CD igniter
	4. Spark plug is shorted - resistance between electrodes should be 1 M Ω or more	4. Replace spark plug
	5. Wrong wire connections	5. Connect wires correctly
The engine starts but will not pick up speed	1. Defective exciter coil	1. Replace exciter coil.
	2. Defective pulser coil	2. Replace pulser coil
	3. Improper timing	3. Adjust timing
	4. Defective CD igniter	4. Replace CD igniter
	5. Shorted spark plugs. Resistance between electrodes should read 1 M Ω or more	5. Replace spark plugs
The engine is cranked again but will not start	1. Defective exciter coil	1. Replace exciter coil
	2. Defective pulser coil	2. Replace pulser coil
The engine tends to kick back	1. Defective CD igniter	1. Replace CD igniter

Electrical System

Key Switch Tests

The G and M terminals of the key switch control the RUN and OFF circuit of the ignition system. Lights are operated through terminals marked B and L. Starter solenoid is activated through terminals B and S. (See Figure 3-9.)

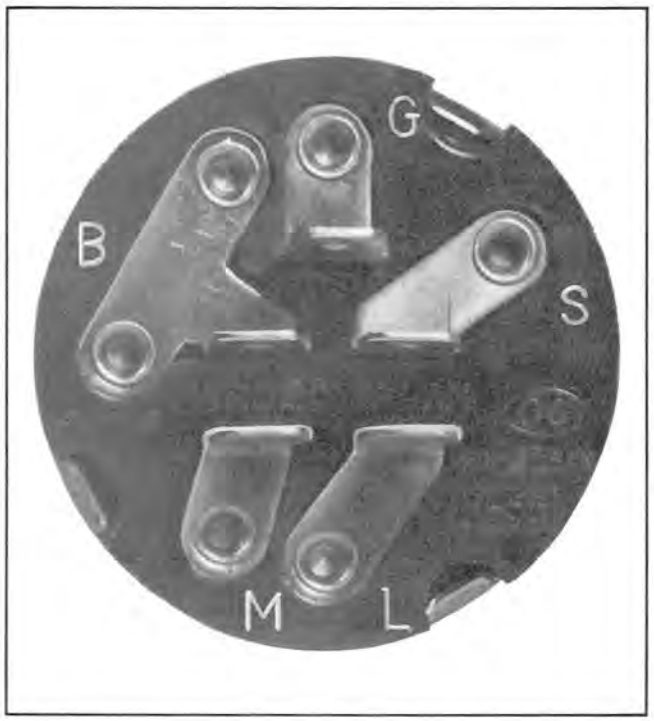


Figure 3-9

To test the key switch:

NOTE: Prior to performing key switch tests follow the procedure for Key Switch Removal to obtain access at terminals on switch.

1. Remove the main wiring harness connector from the key switch terminals.
2. Set the ohmmeter to high ohm scale (X100) and connect one ohmmeter lead to the key switch G terminal and the other ohmmeter lead to M. (See Figure 3-10.)
3. With the key switch in the RUN position, the ohmmeter should show open circuit (∞). Replace the switch if the needle moves off of infinity (∞).
4. Turn the key switch to OFF position. Meter should now indicate closed circuit (0). Replace the switch if the needle does not move to 0.



Figure 3-10

5. Set the ohmmeter to low ohm scale (X1) and connect one ohmmeter lead to the key switch B terminal and the other lead to L. (See Figure 3-11.)



Figure 3-11

6. Turn the key switch to RUN/LIGHTS position. The ohmmeter should indicate a closed circuit (0). Replace the key switch if the meter does not indicate 0.

7. With the key switch positioned in RUN or OFF, the ohmmeter must indicate an open circuit (∞). Replace the key switch if ∞ is not observed.

8. With ohmmetor still on low ohm scale (X1) connect one ohmmeter lead to B terminal and other lead to S.

9. Turn the key switch to START position. The ohmmeter should indicate a closed circuit (0). Replace the key switch if the meter does not indicate 0.

10. With the key switch positioned in OFF, RUN, or RUN/LIGHTS the ohmmeter must indicate an open circuit (∞). Replace the key switch if ∞ is not observed.

11. Reconnect the main wiring harness connector to switch terminals and refer to Key Switch Installation.

Emergency Stop Switch Test

The emergency stop switch is used to stop the engine quickly in an emergency, and operates independent of the key switch. Both the key switch and emergency stop switch must be ON for the engine to operate. To stop the engine, turn the emergency stop switch to STOP.

TO TEST THE EMERGENCY STOP SWITCH:

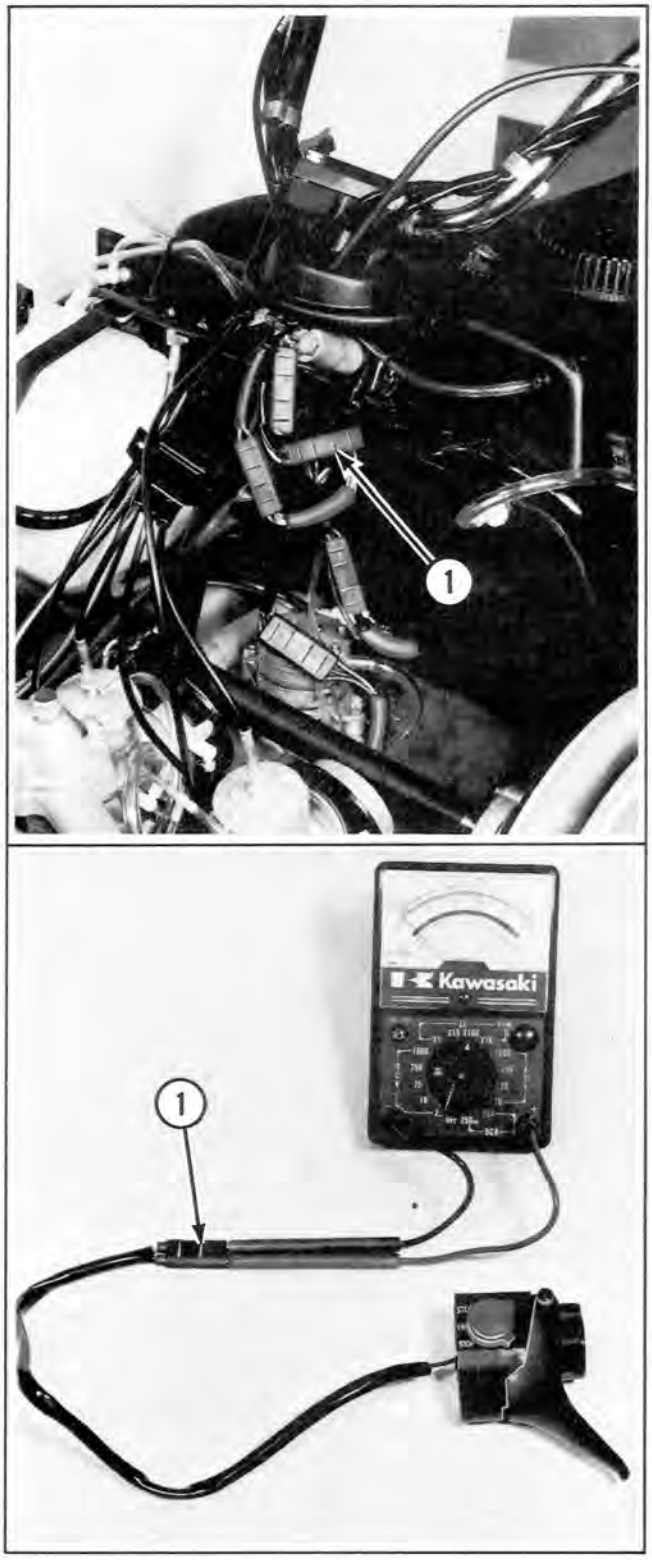
1. Disconnect the molded connector between the key switch and emergency stop switch.

2. Set the ohmmeter to high ohm scale (X100). Connect one ohmmeter lead to one terminal in the stop switch half of the connector. Connect the other lead to the other terminal in the stop switch half of the connector. (See Figure 3-12.)

3. Position the stop switch to ON. The ohmmeter should indicate an open circuit (∞). Replace the switch if the ohmmeter needle moves off of infinity (∞).

4. Position the stop switch to STOP. The ohmmeter should now indicate a closed circuit (0). If the ohmmeter needle does not indicate to 0, replace the emergency stop switch.

5. Connect the molded connector between the emergency stop switch and key switch.



1. Emergency Stop Switch Connector

Figure 3-12

Dimmer Switch Test

1. Disconnect the dimmer switch from the main harness.

2. Set ohmmeter to low ohm scale (X1). Connect one ohmmeter lead to the brown wire terminal in the dimmer switch half of connector. Connect other lead to orange wire terminal in connector. (See Figure 3-13.)

3. Turn the dimmer switch to low beam, the ohmmeter should indicate a closed circuit (0).

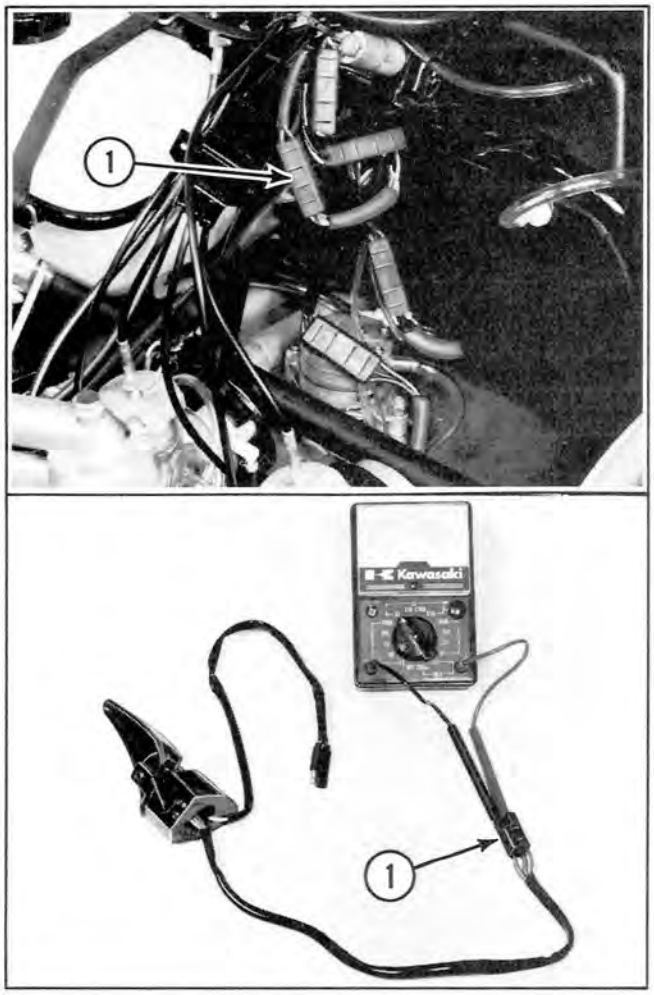
4. Turn the dimmer switch to high beam, the ohmmeter should indicate open circuit (∞).

5. Move the ohmmeter lead from the orange wire terminal to the green wire terminal in the dimmer switch half of the connector.

6. Turn the dimmer switch to high beam, the ohmmeter should indicate a closed circuit (0).

7. Turn the dimmer switch to low beam, the ohmmeter should indicate an open circuit (∞).

8. If any of the tests in steps 3, 4, 6, or 7 were faulty, replace the dimmer switch.



1. Dimmer Switch Connector

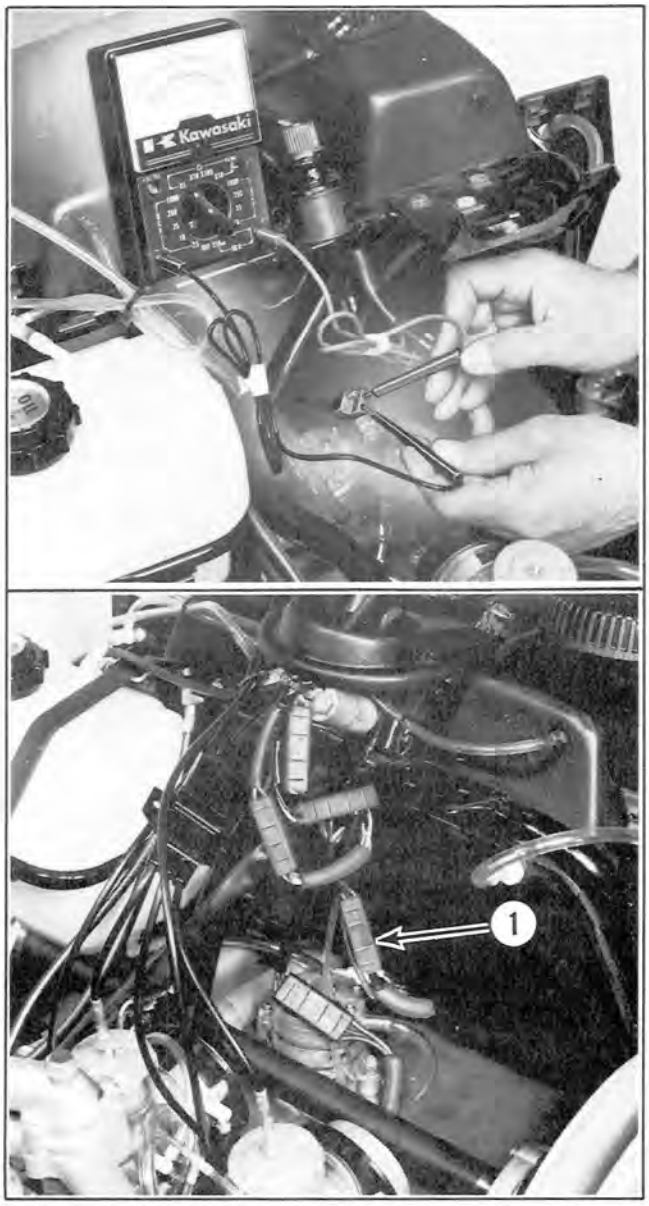
Figure 3-13

Stop/Tail Light Harness Test

1. Check stop/tail light bulb before testing and make sure it is making a good connection in the socket.

2. Disconnect the tail light connector from the main harness.

3. To check the wiring to the tail light, set the ohmmeter on low ohm scale (X1). Connect one ohmmeter lead to the black wire terminal in the tail light half of the connector. Connect the other ohmmeter lead to the yellow wire terminal of the connector. (See Figure 3-14.) Ohmmeter should indicate 2 to 3 ohms.



1. Stop/Tail Light Harness Connector

Figure 3-14

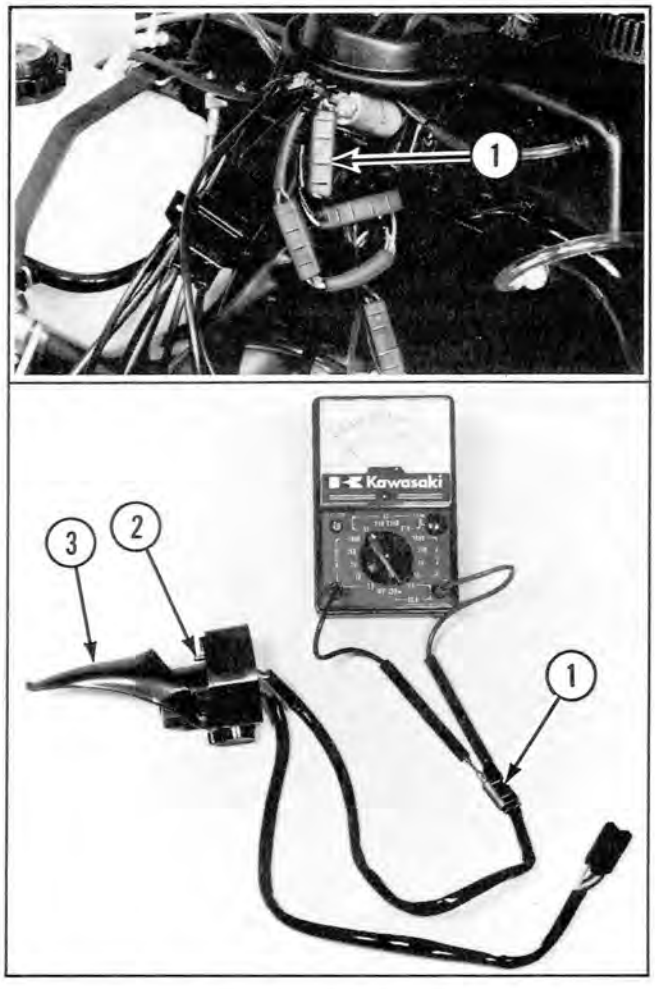
4. To check the wiring to the stoplight, move the ohmmeter lead from the yellow to the brown wire terminal in the tail light half of the wire terminal connector. Ohmmeter should indicate 1 to 2 ohms.

5. If the readings in steps 3 and 4 read higher than specified or indicate an open circuit (∞), the problem is in the wiring to the tail/stop light. Remove the seat and inspect the wiring to the tail light. (Check the bulb contacts again.)

6. If the reading in step 4 was okay, proceed to the test for the brake light switch.

Brake Switch Test

Before proceeding with this test, make sure the brake lever is adjusted so it makes good contact with the brake switch located in the handlebar brake lever assembly.



1. Brake Switch Connector
2. Brake Switch
3. Brake Lever

Figure 3-15

1. Disconnect the brake switch from the main harness.

2. Set the ohmmeter to low ohms (X1). Connect an ohmmeter lead to the yellow wire terminal in the brake switch half of the connector. Connect the other ohmmeter lead to the blue wire terminal in the connector. (See Figure 3-15.)

3. The ohmmeter should indicate an open circuit (∞).

4. Operate the brake lever. The ohmmeter should indicate a closed circuit (0).

5. If the readings in steps 3 and 4 are not obtained, replace the brake light switch.

Battery

Removal

1. Unfasten clamp and remove battery cover assembly. (See Figure 3-16.)

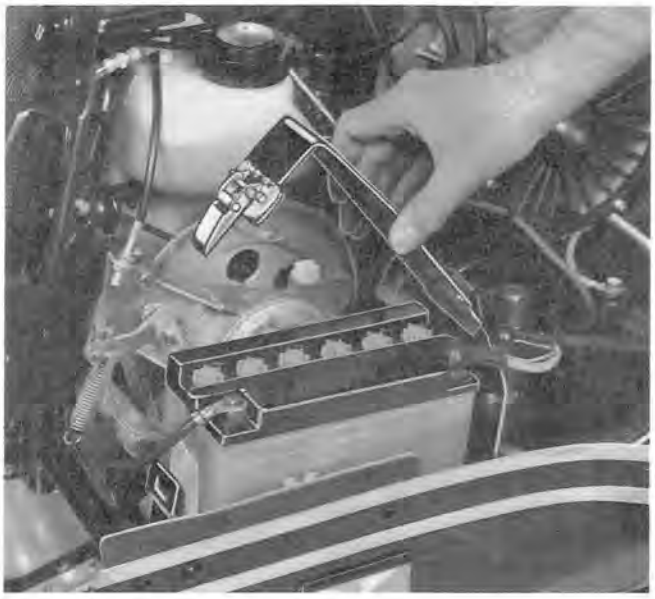
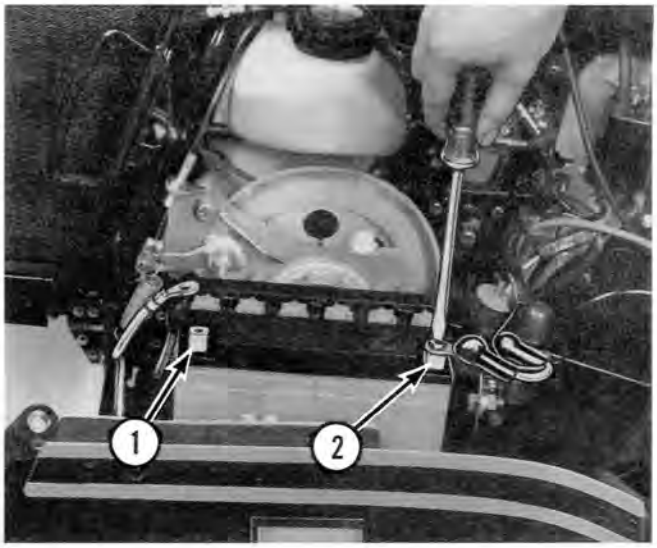


Figure 3-16

WARNING

Prevent possible personal injury and damage to electrical components by always removing negative (-) cable from battery first, then positive (+) cable.

2. Disconnect cables from terminals of battery. Carefully lift battery out of mounting bracket. (See Figure 3-17.)



1. Negative (-) Terminal
2. Positive (+) Terminal

Figure 3-17

3. If corrosion or dirt are present on terminals and top surface of battery follow recommended cleaning procedures.

Cleaning

Accumulation of dirt on top surface of battery and corrosion on terminals can shorten battery life and reduce its performance. Always keep outside of battery as clean and dry as possible.

To clean battery proceed as follows:

1. Remove battery from snowmobile. If battery is not removed, damage may occur to chassis components.
2. With a wire brush, clean corrosion from terminals of battery and cable ends. Finish cleaning by applying solution of one part baking soda to four parts water, but use care to prevent cleaning solution from entering cells of battery.
3. Rinse entire battery with clear water.
4. Completely dry outer surface of battery.

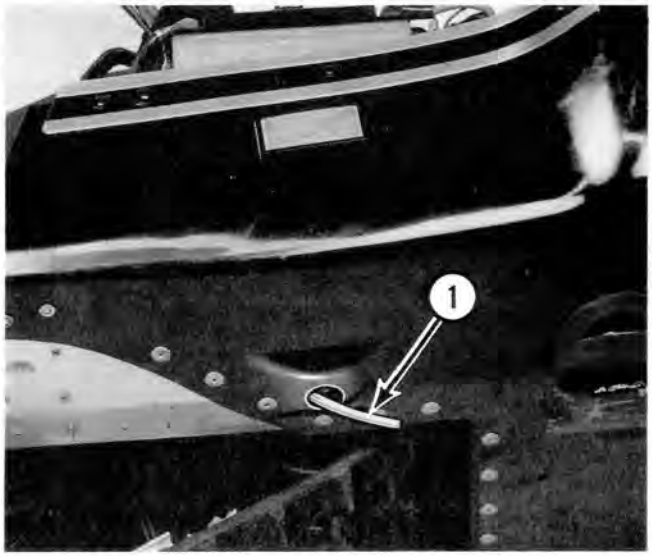
Installation

Prior to battery installation be sure terminals are free of corrosion, outer surface is clean and dry and battery is fully charged.

1. Be sure protective pads are properly positioned under battery and hold down cover assembly.
2. Lower battery into mounting case assembly while guiding vent tube downward through chaincase drain plug hole.

CAUTION

Incorrect routing of battery vent tube could result in corrosion to chassis components from expelled electrolyte. (See Figure 3-18.)



1. Battery Vent Tube

Figure 3-18

3. Secure battery by fastening clamp of cover assembly.

CAUTION

Do not reverse battery connections or damage to the voltage regulator/rectifier will result.

4. Connect RED cable and fuse wire to positive (+) terminal. Coat terminal with grease to prevent corrosion. Slide rubber boot over terminal for protection.
5. Connect BLACK cable to negative (-) terminal and coat terminal with grease to prevent corrosion.

Testing

WARNING

Battery electrolyte contains sulfuric acid which is poisonous and causes severe burns. When installed in the battery, electrolyte generates Hydrogen gas which under certain conditions is flammable and explosive. Keep all flames and sparks (cigarettes, etc.) away and always wear eye protection when working on or near the battery.

POISON/DANGER
KEEP OUT OF REACH OF CHILDREN

ANTIDOTE

EXTERNAL - Flush with water for at least 5 minutes.

INTERNAL - Drink large quantity of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil.

CALL PHYSICIAN IMMEDIATELY.

EYES - Flush with water for 15 minutes.

GET PROMPT MEDICAL ATTENTION.

The electrolyte is dilute sulphuric acid. Water in this solution changes to a gaseous mixture due to chemical action in the battery and escapes, which concentrates the acid in a charged battery. Consequently, when the level of the electrolyte becomes low, only distilled water should be added. If sulphuric acid is added, the solution will become too strong for proper chemical action and will damage the plates. Metal from the damaged plates collects in the bottom of the battery. This sediment will eventually cause an internal short circuit.

Specific gravity of the electrolyte is measured with a hydrometer and is the most accurate indication of battery condition. Specific gravity varies with temperature due to expansion and contraction of electrolyte, and must therefore be measured using a hydrometer with a built-in thermometer to determine electrolyte temperature.

Test specific gravity of each battery cell by:

NOTE: Do not check specific gravity immediately after adding water to battery as incorrect readings will result.

1. Insert hydrometer into cell, be sure tube is vertical to prevent float from rubbing inside of tube, and draw only enough electrolyte into tube to permit float to raise freely.
2. Remove hydrometer and observe specific gravity of electrolyte. Hold hydrometer at eye level and take reading at bottom of meniscus (curved surface of fluid). (See Figure 3-19.)

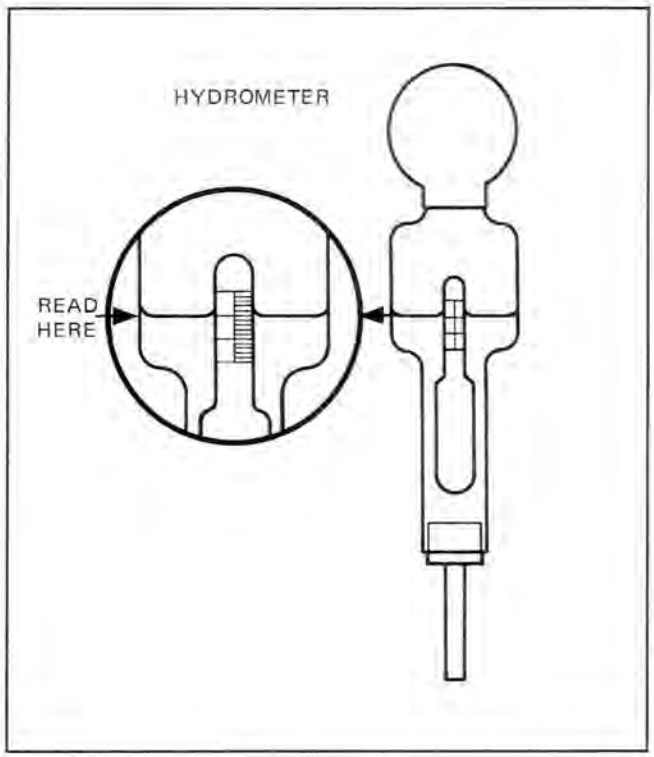


Figure 3-19

3. Observe temperature of electrolyte and correct reading. (See Figure 3-20.)
4. Interpret readings as follows:
   a. 1.260 or above battery is good and should perform correctly. (See Figure 3-20.)
   b. All cell readings uniform and above 1.200 battery is serviceable but requires charging.
   c. All cell readings uniform and below 1.200 battery must be charged and retested.
   d. Variation of more than 50 points (0.050) between any cells means serviceability is questionable. Charge battery and retest. If 50 point variation remains, replace battery.

NOTE: If plates inside battery are sulphated (turned white) it will no longer accept and hold a charge.

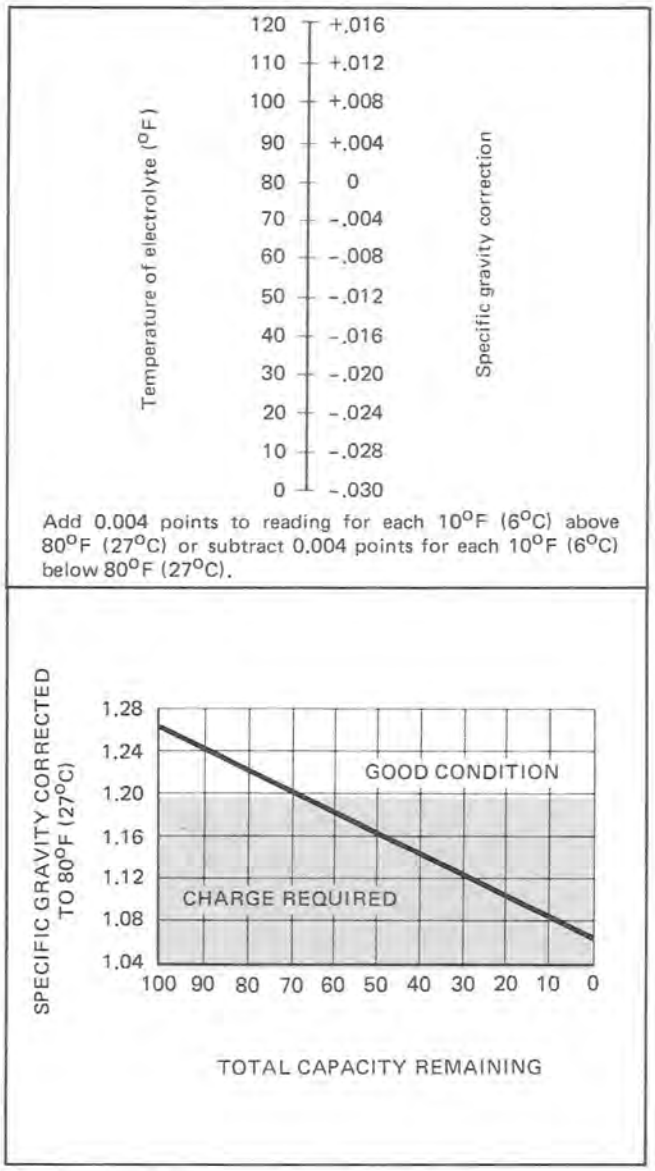


Figure 3-20

Charging

WARNING

Battery electrolyte contains sulfuric acid which is poisonous and causes severe burns. When installed in the battery, electrolyte generates Hydrogen gas which under certain conditions is flammable and explosive. Keep all flames and sparks (cigarettes, etc.) away and always wear eye protection when working on or near the battery.

POISON/DANGER
KEEP OUT OF REACH OF CHILDREN

ANTIDOTE

EXTERNAL - Flush with water for at least 5 minutes.

INTERNAL - Drink large quantity of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil.

CALL PHYSICIAN IMMEDIATELY.

EYES - Flush with water for 15 minutes.

GET PROMPT MEDICAL ATTENTION.

NOTE: Remove battery to prevent spillage of electrolyte during charging. Refer to Battery Removal procedure.

1. If electrolyte level is low in any cell add distilled water as necessary to raise level to lower line on battery case. Do not overfill battery as level will raise during charging.
2. Cover filler openings with a cloth, paper towel, etc., to prevent splashing of electrolyte during charging.

CAUTION

Charging battery at higher rate than specified may damage the battery. The higher charging rate causes excess heat, which can warp the plates creating internal short circuits. Also, the plates may shed active material, accumulating deposits that cause internal short circuits.

3. Connect 12 volt charger to battery. Set charging rate to 3 through 4 amps and charge between 3 and 5 hours. (See Figure 3-21.)



Figure 3-21

NOTE: If electrolyte temperature rises above 115°F (45°C) during charging, reduce charge rate to lower the temperature. Increase charging time.

4. Disconnect charger and measure battery voltage. The voltage should be 12 to 13 volts. Check specific gravity of each cell with a hydrometer. A hydrometer reading of 1.26 or above is good. A lower indication means additional charging is necessary.

5. Install battery as outlined in Installation procedure.

Charging System

WARNING

NEVER RUN ENGINE WITH BATTERY CABLES OR ELECTRICAL CONNECTORS DISCONNECTED. Doing so may damage the voltage regulator/rectifier. Sparks that may occur could cause a fire which may cause severe personal injury.

Output from the charging system supplies power to operate tachometer, charge battery and illuminate lights. Defects in any of preceding components will reduce charging system output which is usually described as an uncharged battery. Perform the following tests in the sequence provided to determine if charging system is operating properly.

Regulator/Rectifier

NOTE: A worn out or badly sulphated battery will produce numerous problems that cannot be corrected until the battery is replaced. **ALWAYS CHECK BATTERY CONDITION BEFORE CONDEMNING OTHER PARTS OF THE SYSTEM. A FULLY CHARGED BATTERY IS A MUST FOR CONDUCTING ACCURATE SYSTEMS TESTS.** Refer to Battery Testing procedure to evaluate condition.

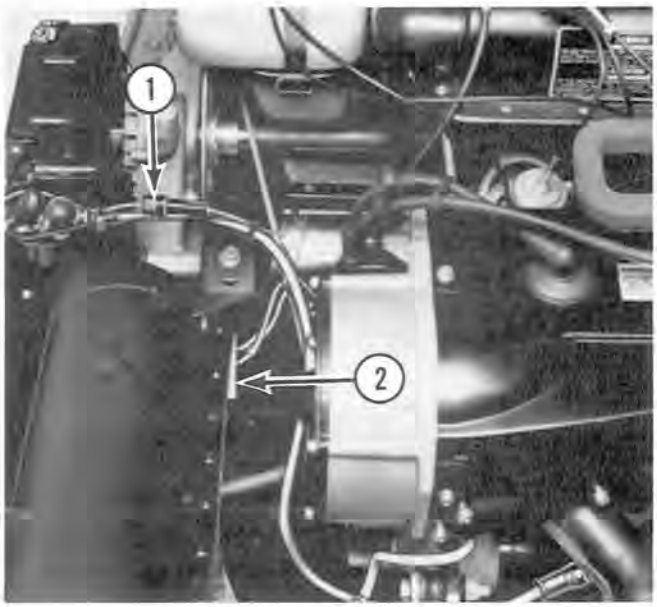
Three separate tests must be conducted to determine operation of regulator/rectifier.

1. Leakage Test

   a. Place key switch in OFF position.

   b. Disconnect holder and remove fuse at regulator/rectifier. (See Figure 3-22.)

   c. Momentarily touch fuse terminals inside holder together to detect possible arcing as terminals make and break contact. If any sparks are observed, replace regulator/-rectifier. (See Figure 3-23.)



1. Fuse Holder
2. Regulator/Rectifier

Figure 3-22

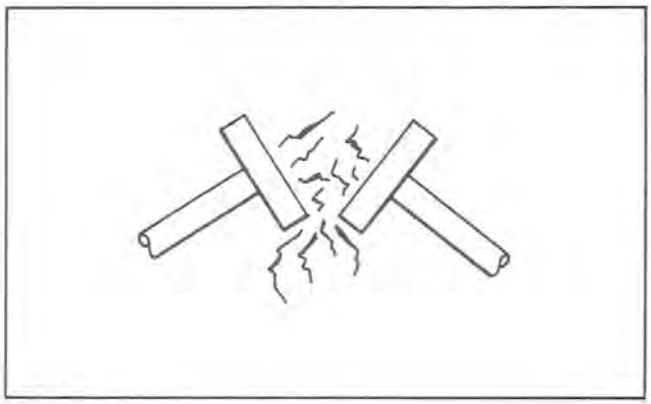


Figure 3-23

CAUTION

If meter leads are connected backwards (reversed polarity) meter damage will result.

   d. Connect DC milliampere meter (250 milliamp range) to terminals at fuse holder observing polarity as shown. (See Figure 3-24.)

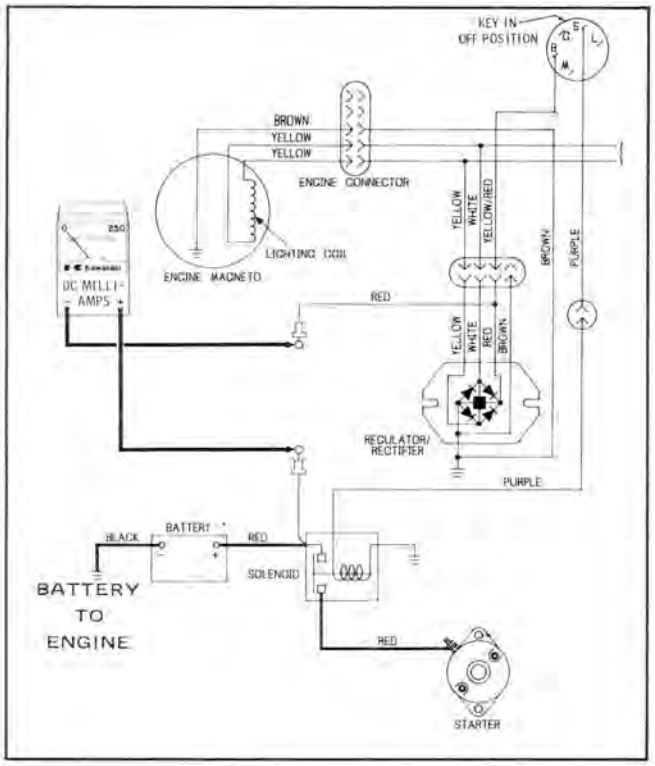


Figure 3-24

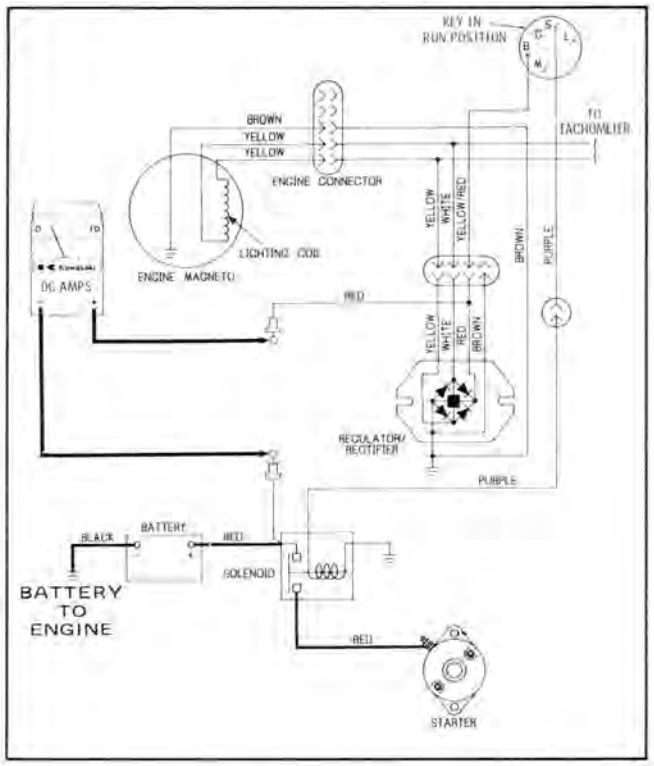


Figure 3-25

e. Meter needle should remain at zero (0). Any needle movement indicates leakage which will drain battery charge when engine is not running. Replace regulator/rectifier if necessary.

f. Perform Current Output Test.

2. Current Output Test

NOTE: This procedure requires engine to operate at high RPM. Remove drive belt and secure converter guard in normal position with clip pins.

a. Perform Leakage Test procedure.

b. Disconnect holder and remove fuse at regulator/rectifier.

CAUTION

If meter leads are connected backwards (reversed polarity) meter damage will result.

c. Connect DC ammeter (10 amp range) to terminals at fuse holder observing polarity as shown. (See Figure 3-25.)

d. Place key switch in RUN position (no lights).

CAUTION

Do not use electric starter to crank engine as damage to meter will result.

e. Manually start engine and operate at 5,000 RPM.

f. Observe system output and interpret meter indication as follows:

- 2 to 3 amps - current output is good, perform Voltage Control Test.
- 5 to 7 amps - battery state of charge low. Install new or fully charged battery and retest. Output remains high, perform Voltage Control Test.
- No Output
  - ☐ Unplug tachometer and retest.
  - ☐ Check Lighting Coil.
  - ☐ Inspect main wiring harness for broken (open) or pinched (shorted) wire between main engine connector terminals and regulator/rectifier connector.

g. Insert fuse and secure with holder cap.

h. Perform Voltage Control Test.

3. Voltage Control Test

NOTE: This procedure requires engine to operate at high RPM. Remove drive belt and secure converter guard in normal position with clip pins.

a. Perform Leakage Test and Current Output Test procedures.

CAUTION

If meter leads are connected backwards (reversed polarity) meter damage will result.

b. Connect DC voltmeter (20 volt range) to battery terminals as shown. (See Figure 3-26.)

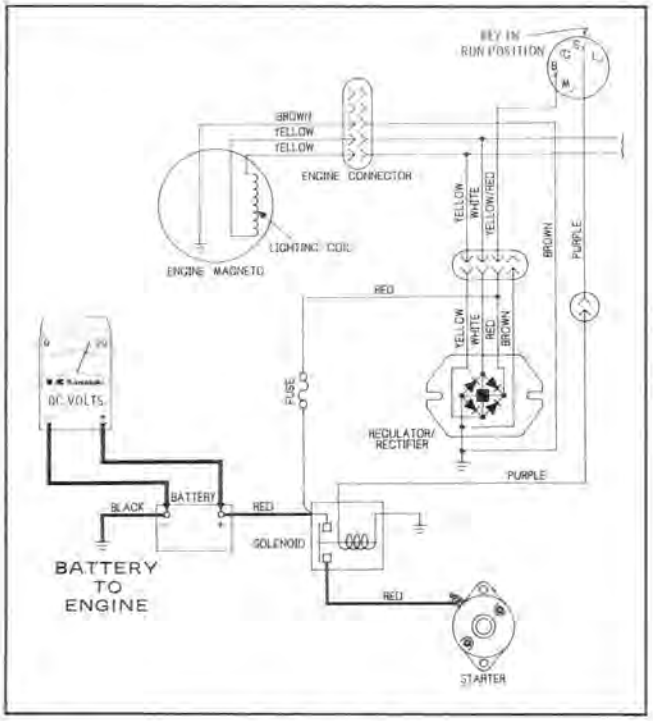


Figure 3-26

c. Start engine and operate at 5,000 RPM.

d. Place key switch in RUN position (no lights).

e. Observe voltage and interpret indication as follows:

- 14 to 15 volts - voltage control circuit is good. Charging System operating normal.
- Above 15.5 volts - voltage control circuit defective. Replace regulator/rectifier assembly and retest.
- Below 13.5 volts - voltage control circuit defective. Replace regulator/rectifier assembly and retest.

f. Disconnect voltmeter and reinstall drive belt.

Lighting Coil

A defective lighting coil may result in any of the following conditions:

- Inoperative or erratic tachometer.
- Battery consistantly undercharged or dead.
- Lights will not illuminate or are dim.

Test lighting coil for two conditions, continuity through wires and that no wires contact ground (shorted).

CONTINUITY

1. Separate main engine connector.
2. Set ohmmeter to low ohm scale (X1) and connect one ohmmeter lead to a yellow wire in engine half of connector. (See Figure 3-27.)

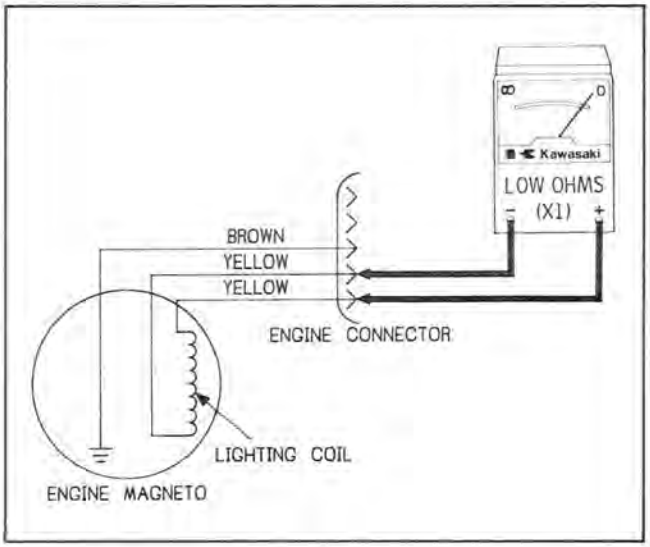


Figure 3-27

3. Connect remaining ohmmeter lead to other yellow wire in engine half of connector and observe meter reading.

a. Resistance of 0.18 ± 20%, lighting coil has good continuity, check for shorts to ground.

b. No resistance reading (∞), very high reading, or (0) indication means lighting coil should be replaced.

4. Perform shorts to ground test.

SHORTS TO GROUND

1. Complete continuity test prior to proceeding.

2. Set ohmmeter to high ohm scale (X100) and connect one ohmmeter lead to a yellow wire in engine half of connector. (See Figure 3-28.)

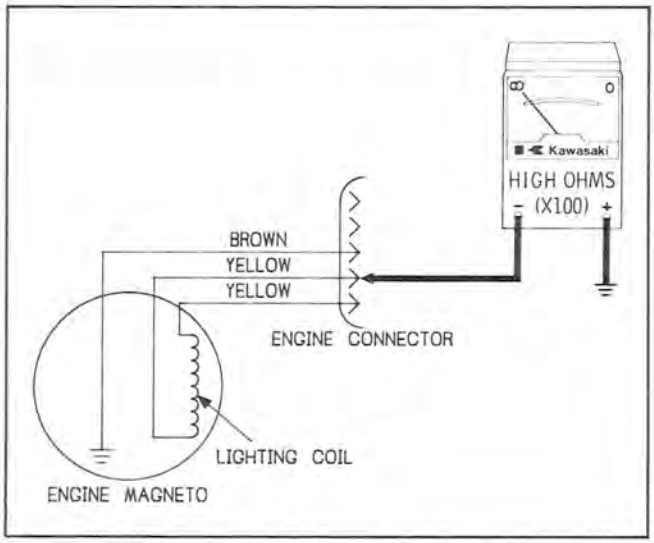


Figure 3-28

3. Connect remaining ohmmeter lead to engine ground and observe meter.

   a. No needle movement (indicates ∞), lighting coil wires are not contacting ground and coil is good.

   b. Needle moves off of infinity (∞), indicates coil or wires are touching ground. Repair wires or replace coil.

4. Reconnect main engine connector.

Lighting Circuit

Defects in the lighting circuit such as an open (broken) wire or shorts could result in any of the following conditions:

- Fuse in regulator/rectifier fails when lights are turned on.
- Dim lights or lights do not illuminate.
- Intermittent operation of lights.

A simple test can be conducted on the lighting circuit to determine defective component by using a portable battery charger meeting these minimum requirements:

- 12 volts 7 amps output capacity.
- Self tapering (reducing) charge.
- Built-in automatic reset circuit breaker.
- Built-in ammeter.

NOTE: If battery charger is not available a 12 volt battery and jumper leads with an ammeter can be used as a substitute. Be sure to install a fuse (10 amp) in one of the jumper leads to prevent damage to ammeter and vehicle wiring harness during test.

Perform lighting circuit test as follows:

1. Place key switch in RUN position.

2. Disconnect four wire connector to separate voltage regulator/rectifier from main wiring harness. (See Figure 3-29.)



1. Voltage Regulator Connector

Figure 3-29

3. Connect battery charger leads to main wiring harness half of regulator/rectifier connector as shown. (See Figure 3-30.)

NOTE: Be sure positive (+) and negative (-) leads from power source are connected to correct wires of main wiring harness.

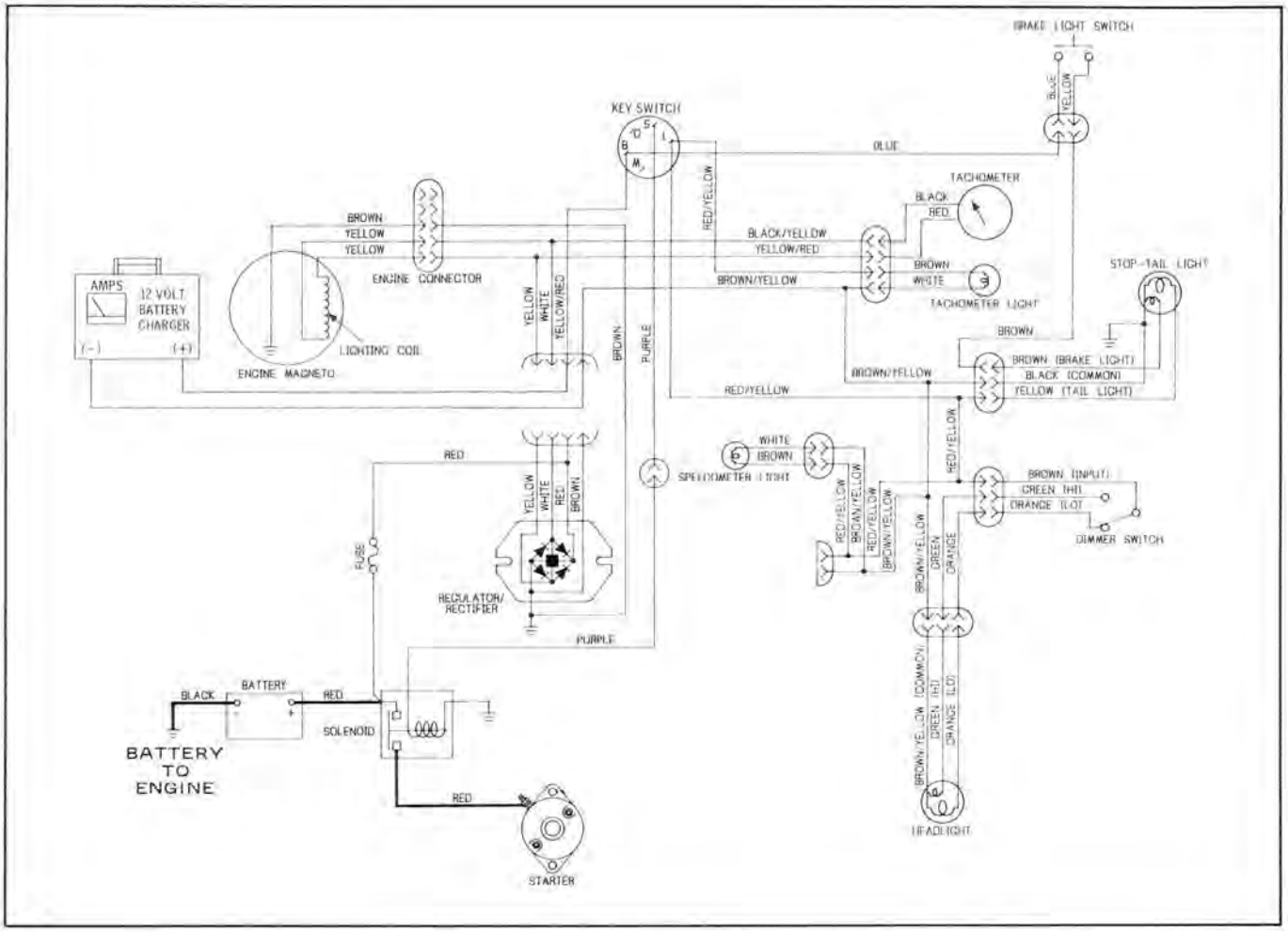
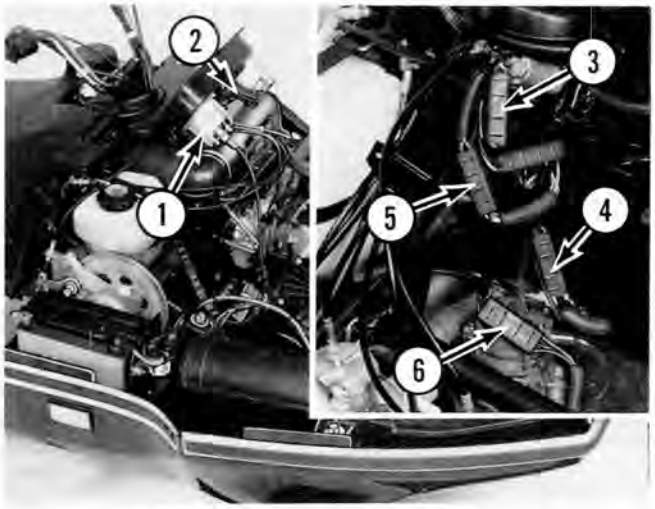


Figure 3-30

4. Observe ammeter indication and interpret as follows:
   a. Meter indicates (0), proceed to next step.
   b. Meter indicates amps or circuit breaker fails, proceed to step 7.
5. Activate brake light switch, observe ammeter and interpret as follows:
   a. Meter indicates 2 amps (approximately) proceed to next step.
   b. No meter indication or circuit breaker fails, proceed to step 7.
6. Turn key switch to RUN/LIGHTS, observe ammeter and interpret as follows:
   a. Meter indicates 5 amps (approximately), all lights illuminate, lighting circuit is good. Pull and twist on wiring harnesses and connectors while watching ammeter for intermittent indications. Refer to Lighting Coil and Regulator/Rectifier tests for defects.
   b. Lights do not operate, meter indicates (0), problem is key switch or broken wire in main harness. Refer to Key Switch tests.
   c. Dim lights (low ammeter reading) indicates high resistance in key switch or main harness. Refer to Key Switch tests.
   d. Circuit breaker fails (high amps) indicates shorted wiring harness or key switch. Proceed to next step.
7. Turn key switch to RUN position and disconnect the following component connectors from the main wiring harness. (See Figure 3-31.
   - Speedometer light.
   - Tachometer light.
   - Brake light switch.
   - Tail/brake light harness
   - Headlight dimmer switch.
   - Headlight harness.



1. Speedometer Light
2. Tachometer Light
3. Brake Light Switch
4. Tail/Brake Light Harness
5. Headlight Dimmer Switch
6. Headlight Harness

Figure 3-31

8. Turn key switch to RUN/LIGHTS position, observe ammeter and interpret as follows: (See Figure 3-32.)

   a. Circuit breaker fails (high amps) indicates shorted main wiring harness or key switch. Refer to Key Switch test.

   b. Meter indicates (0), proceed to next step.

9. Plug in connectors one at a time in the sequence shown (begin with connector No. 1, then add No. 2, then add No. 3 etc.) and compare current draw with amps shown in chart after completing each connection. (See Figure 3-33.)

   a. Current draw higher than recommended or circuit breaker fails indicates component connected has short circuit. Refer to appropriate test procedure to determine cause.

   b. If circuit breaker fails when dimmer switch or brake light switch is activated, short circuit exists either in switch leads or main harness. Refer to appropriate switch test to determine cause.

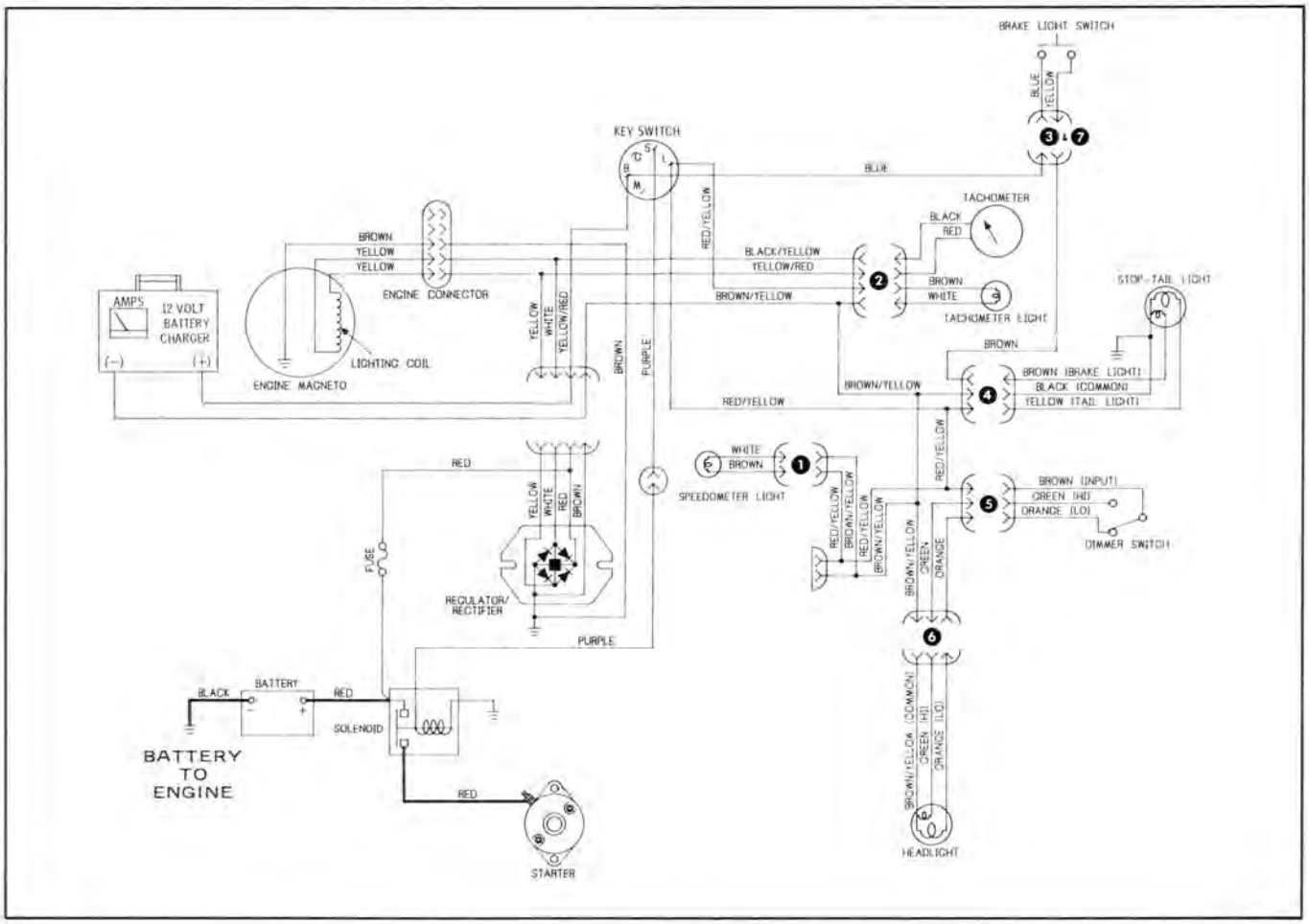


Figure 3-32

COMPONENT CONNECTION SEQUENCE

	❶ Speed-ometer Light	❷ Tachometer Light	❸* Brake Light Switch	❹ Tail Light	❺* Dimmer Switch	❻ Headlight Harness Low or High Beam	❼ Brake Light
Approximate Current Draw (amps) of Each Component	0.25						
		0.25					
			0				
				0.5			
					0		
						3.5	
							2.0
Total Current	0.25	0.50	0.50	1.0	1.0	4.5	6.5

*Connect and activate switch

Figure 3-33

c. No current draw indicates open circuit (broken wire) in lead to component connected.

10. Remove battery charger and reconnect regulator/rectifier connector.

Solenoid Switch Test

1. Disconnect cable from battery negative (-) terminal.
2. Unplug small (purple) wire connector to separate solenoid switch from main wiring harness.
3. Remove wires from both terminals on top of solenoid switch.
4. Set ohmmeter to low ohm scale (X1) and connect meter leads to test solenoid coil winding as shown. (See Figure 3-34.)
5. Observe meter indication and interpret as follows:
   a. 3.5 ohms (±0.4) - solenoid coil winding is good, proceed to next step.
   b. If resistance reading is other than specified, replace solenoid switch.

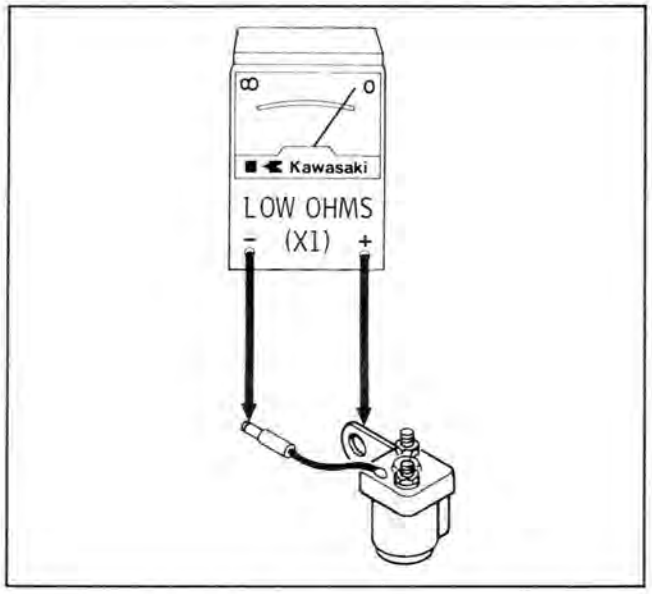


Figure 3-34

6. With ohmmeter still on low ohm scale (X1), connect meter leads to solenoid terminals as shown. (See Figure 3-35.)

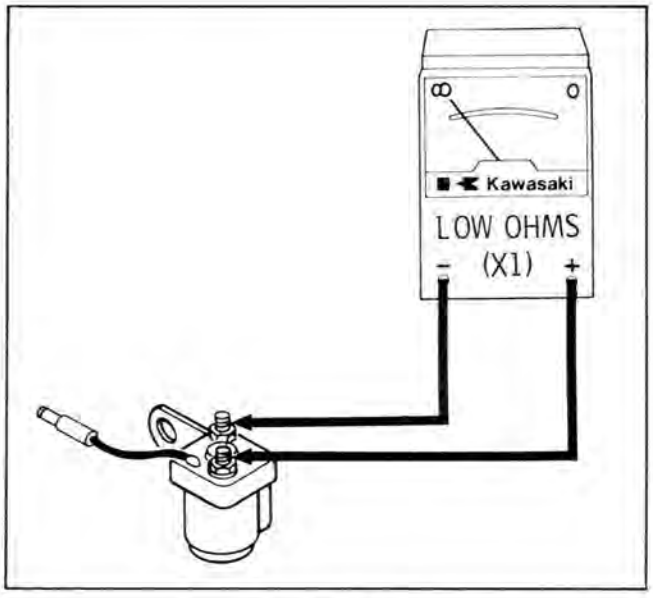


Figure 3-35

7. Observe meter indication and interpret as follows:
   a. Open circuit (∞) - contacts in off position, solenoid good, proceed to next step.
   b. Meter indicates low resistance - solenoid defective, will not turn off current to electric starter motor. Replace solenoid.

8. With ohmmeter leads still connected to solenoid terminals, activate solenoid winding by connecting battery as shown. (See Figure 3-36.)

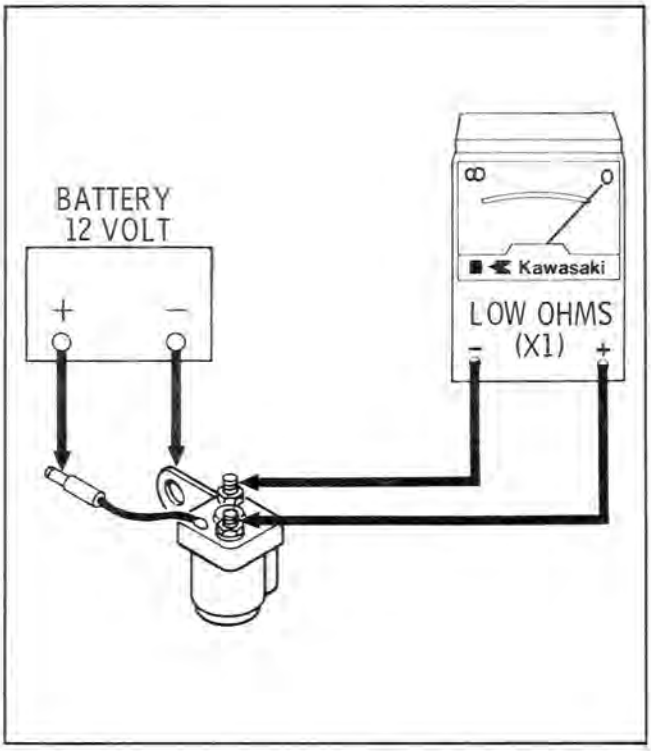


Figure 3-36

9. Interpret results as follows:

   a. Solenoid clicks and ohmmeter indicates closed circuit (0), solenoid assembly is good.

   b. Meter indicates open circuit (∞), solenoid is defective and must be replaced.

10. Reconnect cable to battery negative (-) terminal.

Starter Motor Circuit Test

Poor starter motor performance in many cases results from HIGH RESISTANCE at wire connections or within component contacts. High resistance is usually caused by loose or corroded connections.

The following procedure provides a systematic approach to test entire starting circuit to detect defective wires or components.

PRELIMINARY STEPS

1. Place emergency stop switch to STOP position to prevent engine from starting during test.

2. Attach voltmeter leads to threaded terminal studs rather than to connector on end of wire to detect presence of high resistance.

3. Battery must be fully charged. Refer to Battery Charging procedure if battery measures less than 12 volts.

CAUTION

If meter leads are connected backwards (reversed polarity) meter damage will result.

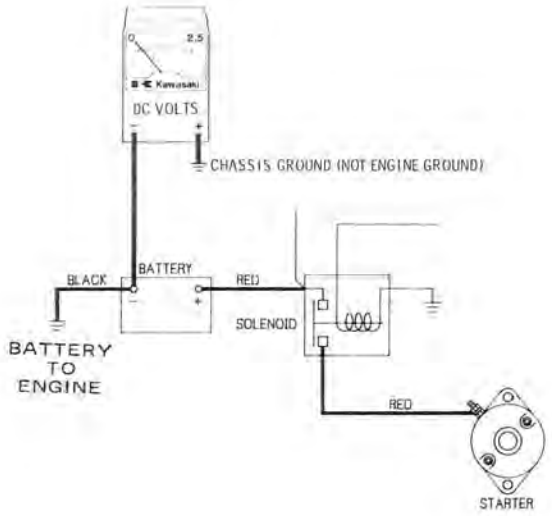
4. If voltage drop is greater than specified:

   a. Clean and retighten connection.

   b. Replace cable or component having high internal resistance.

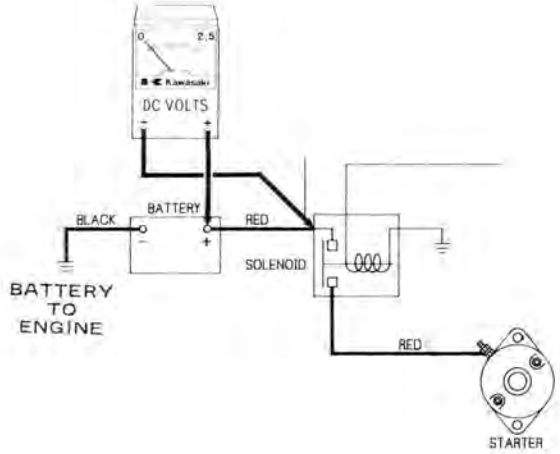
5. Set voltmeter to DC volts, low range (2.5) and proceed as follows:

TEST 1 OF 4



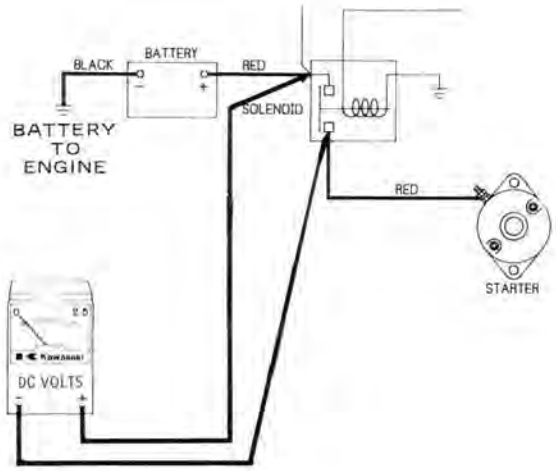
1. Connect meter as shown.
2. Turn key to crank engine and observe voltage indication.
3. If voltage exceeds 0.25 volt, clean connections or replace battery ground cable.

TEST 2 OF 4



1. Connect meter as shown.
2. Turn key to crank engine and observe voltage indication.
3. If voltage exceeds 0.25 volt, clean connections or replace battery positive cable.

TEST 3 OF 4

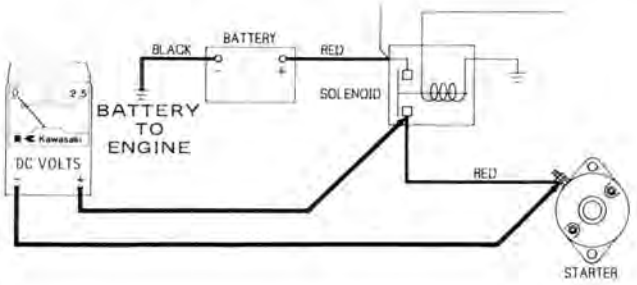


CAUTION

To prevent meter damage connect leads to solenoid switch only WHILE engine is cranking and remove leads before disengaging electric starter.

1. Connect meter (+) lead to solenoid as shown.
2. Attach meter (-) lead to solenoid while engine is cranking and remove lead before disengaging electric starter. Observe voltage indication.
3. If voltage exceeds 0.25 volt replace solenoid switch assembly.

TEST 4 OF 4



1. Connect meter as shown.
2. Turn key to crank engine and observe voltage indication.
3. If voltage exceeds 0.25 volt, clean connections or replace solenoid to starter cable.

Starter Motor

WARNING

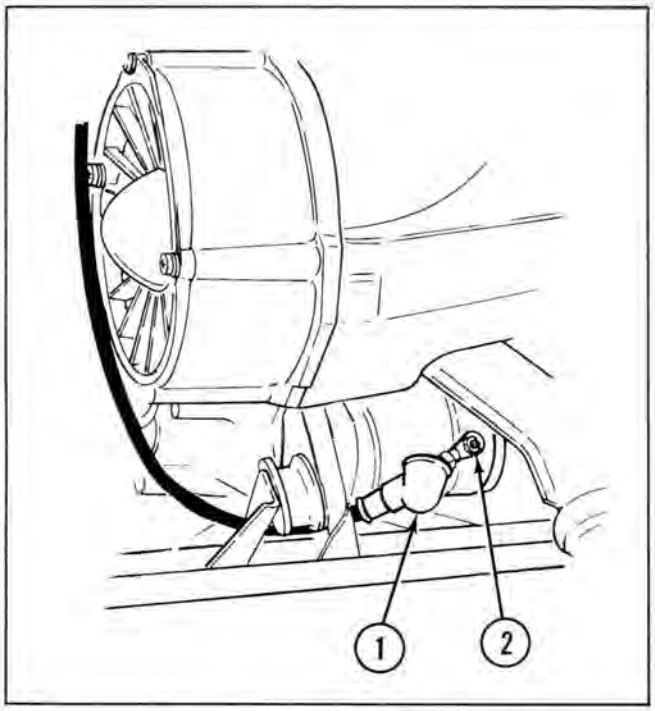
Do not attempt to jump start snowmobile with a booster battery and jumper cables. The battery generates hydrogen gas which can be flammable and explosive under certain conditions. Sparks from jumper cables may ignite this gas causing severe personal injury.

CAUTION

DO NOT operate the starter continuously for more than 15 seconds or starter will overheat. After each 15 seconds of operation, allow starter to cool for 15 seconds. Never turn key switch to start position when engine is running or starter is still spinning. This will hasten wear and may cause starter to jam.

Removal

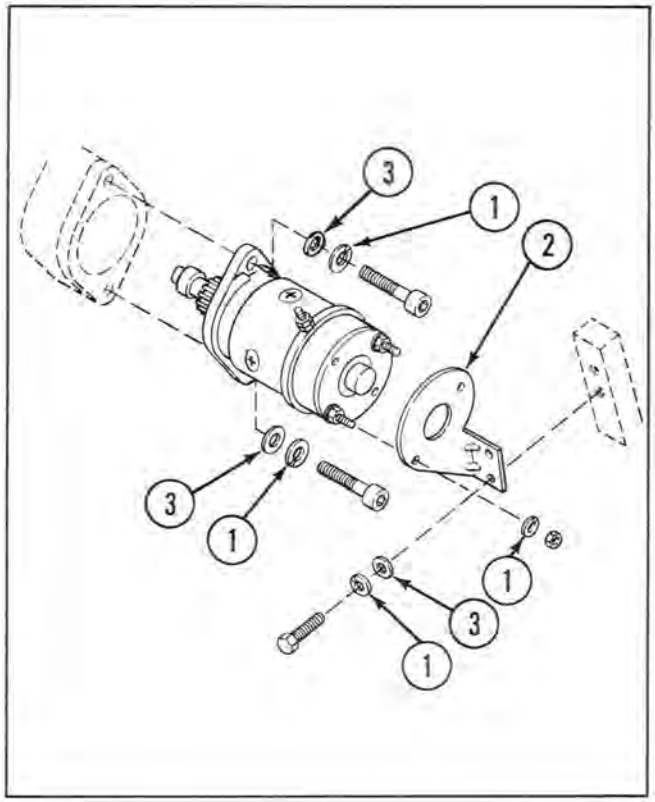
1. Slide boot off from terminal and disconnect solenoid to starter motor cable. (See Figure 3-37.)



1. Protector Boot
2. Starter Motor Terminal

Figure 3-37

2. Remove bolts securing rear starter motor bracket to crankcase. (See Figure 3-38.)
3. Unscrew bolts (use care not to lose washers) and slide starter out from engine boss. (See Figure 3-38.)



1. Spring Washer
2. Rear Bracket
3. Plain Washer

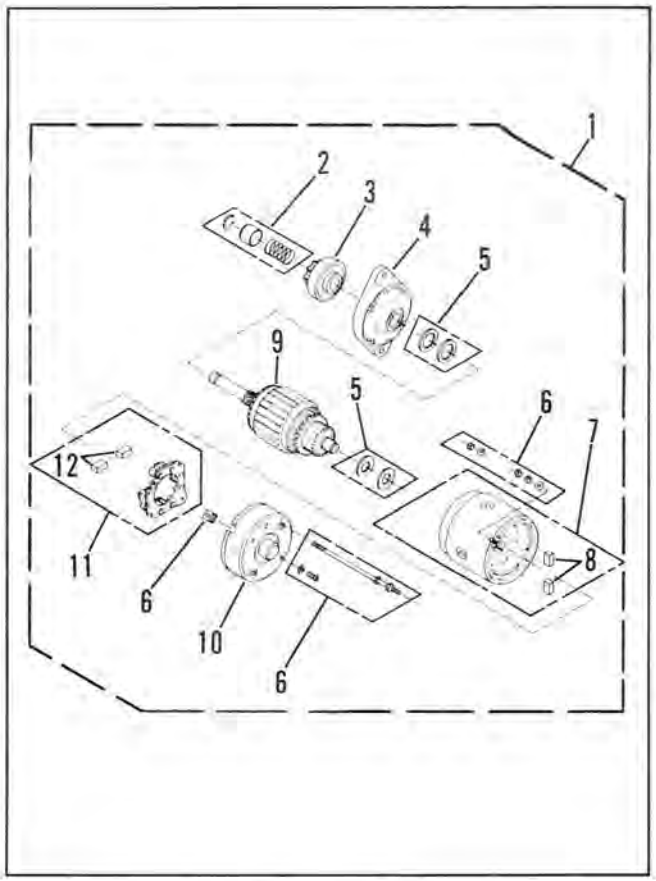
Figure 3-38

Installation

Install starter motor by reversing removal procedure.

Inspection

1. Worn brushes or weak springs will result in poor contact with armature commutator segments, which causes poor starter performance. Replace brushes when they measure 1/4 in. (6.3 mm) or less. (See Figure 3-39.)



1. Starter Assembly
2. Pinion Stopper
3. Pinion Gear
4. Front Cover
5. Washer Kit
6. Bolt Kit
7. Yoke
8. Positive Brush Set
9. Armature
10. Rear Cover
11. Brush Holder Assembly
12. Negative Brush Set

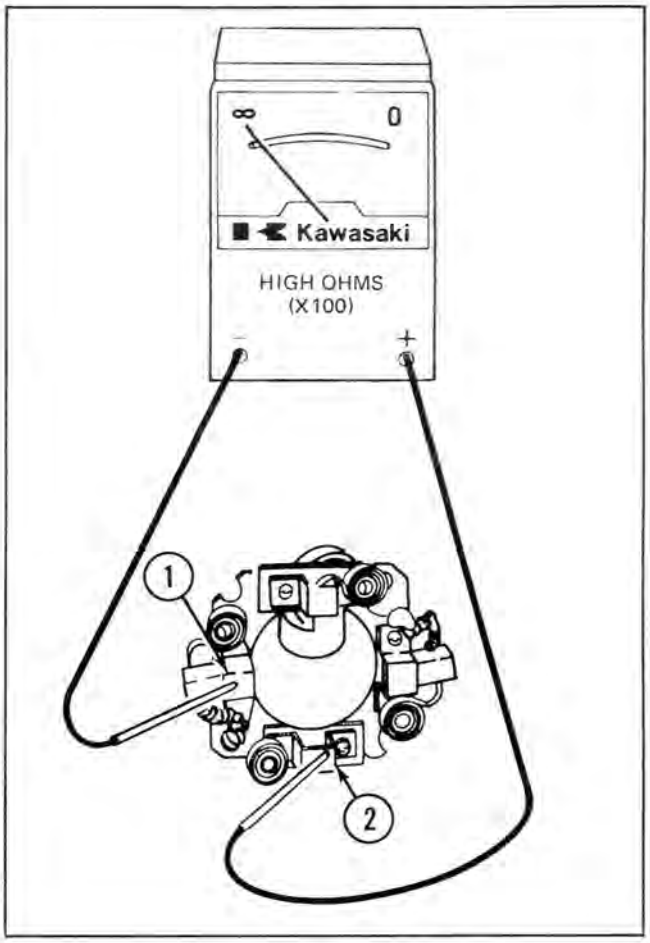
Figure 3-39

2. Thoroughly clean holder of all brush dust etc. and inspect as follows:

   a. Spring tension is considered good if it will snap brush firmly into place.

   b. Set ohmmeter to high ohm scale (X100) and connect one meter lead to positive holder (insulated) with other meter lead to negative brush. (See Figure 3-40.)

   c. Any needle movement indicates faulty insulation and holder must be replaced. No needle movement (indicates ∞) brush holder is good.



1. Negative Brush
2. Positive Brush Holder (Insulated)

Figure 3-40

   d. Repeat procedure for remaining two brush holders.

3. Test yoke field windings as follows:

   a. Set ohmmeter to high ohm scale (X100) and connect one meter lead to housing (ground) with other meter lead to positive brush. (See Figure 3-41.)

   b. Any needle movement indicates a short to ground and yoke assembly must be replaced.

   c. Repeat procedure for other positive brush.

   d. Set ohmmeter to low ohm scale (X1) and secure one meter lead to field terminal stud with other meter lead to a positive brush. (See Figure 3-42.)

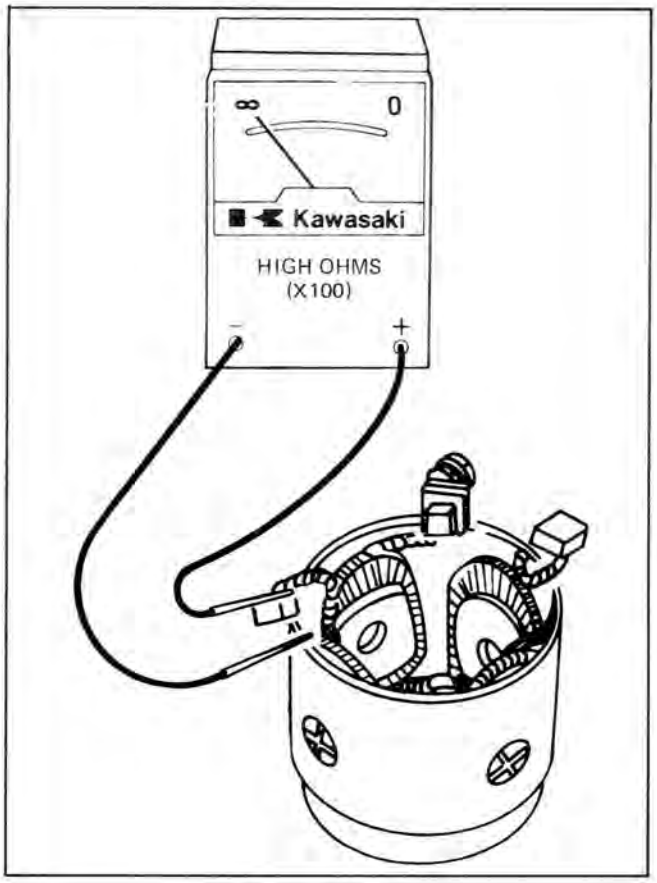


Figure 3-41

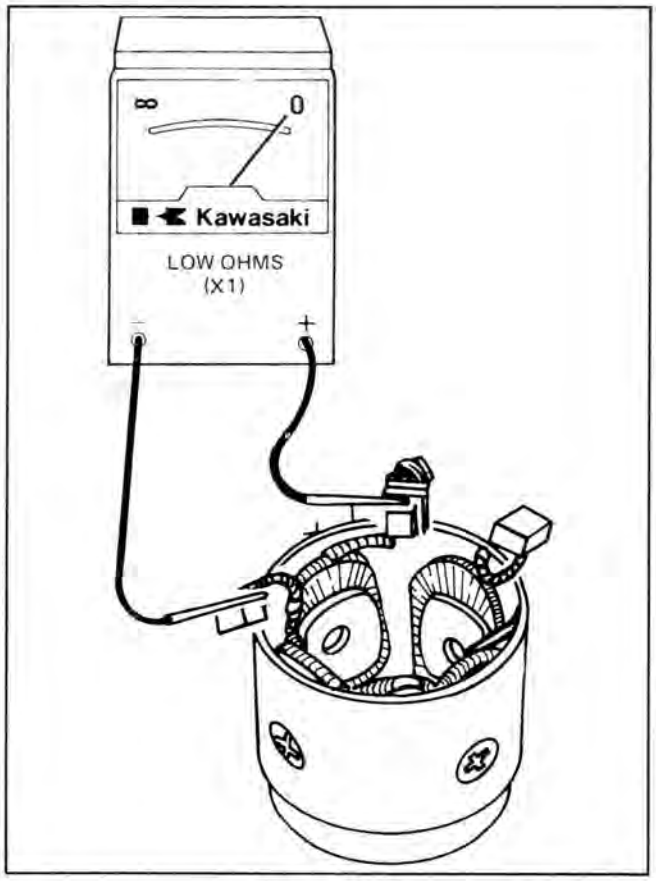


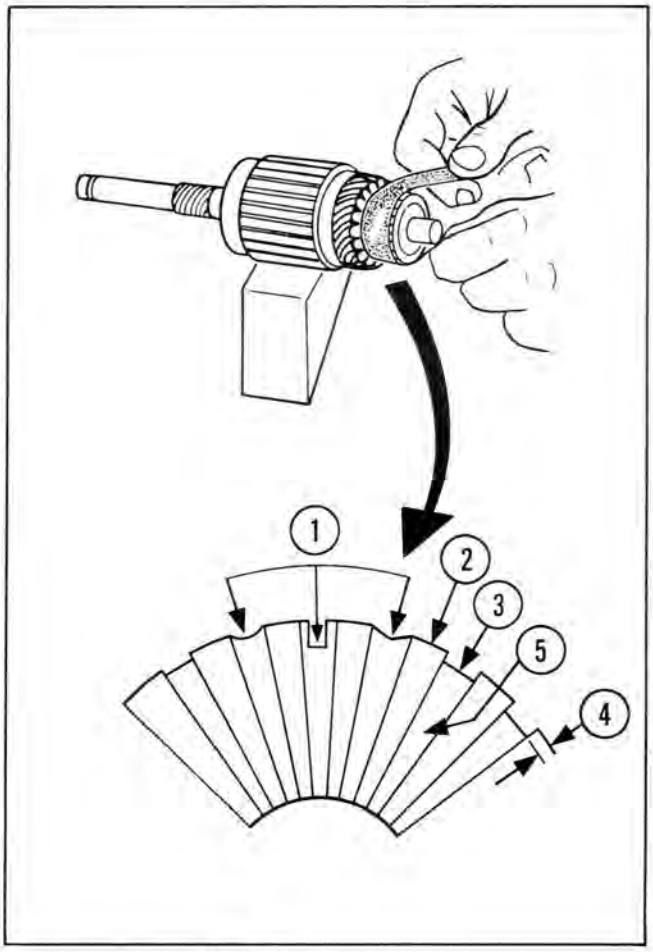
Figure 3-42

e. Needle movement indicates good continuity. No needle movement indicates open circuit (broken wire) and yoke assembly must be replaced.

f. Repeat procedure for other positive brush.

4. Armature Commutator - A dirty or damaged commutator will result in poor brush contact and cause the brushes to wear down quickly. In addition, particles from brush wear accumulating between commutator segments may cause partial shorts.

   a. Smooth the commutator surface if necessary with fine emery cloth, and clean out the grooves as illustrated. (See Figure 3-43.) Determine as accurately as possible the depth of the grooves between commutator segments. Replace the armature with a new one if the groove depth is less than 0.008 in. (0.2 mm).



1. Bad
2. Segment
3. Good
4. 0.008 in. (0.2 mm)
5. Mica

Figure 3-43

b. Set ohmmeter to low ohm scale (X1) and touch meter leads on any two commutator segments. (See Figure 3-44.)

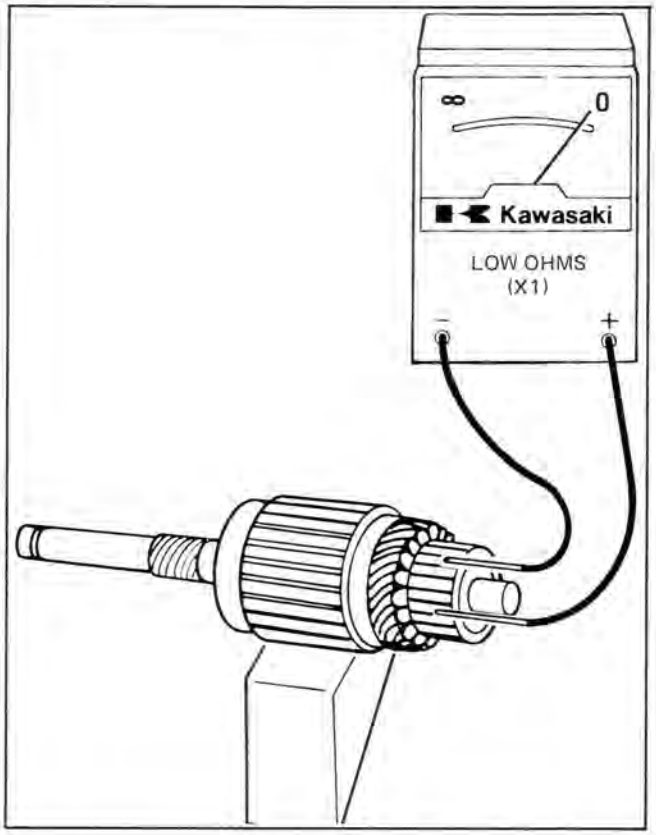


Figure 3-44

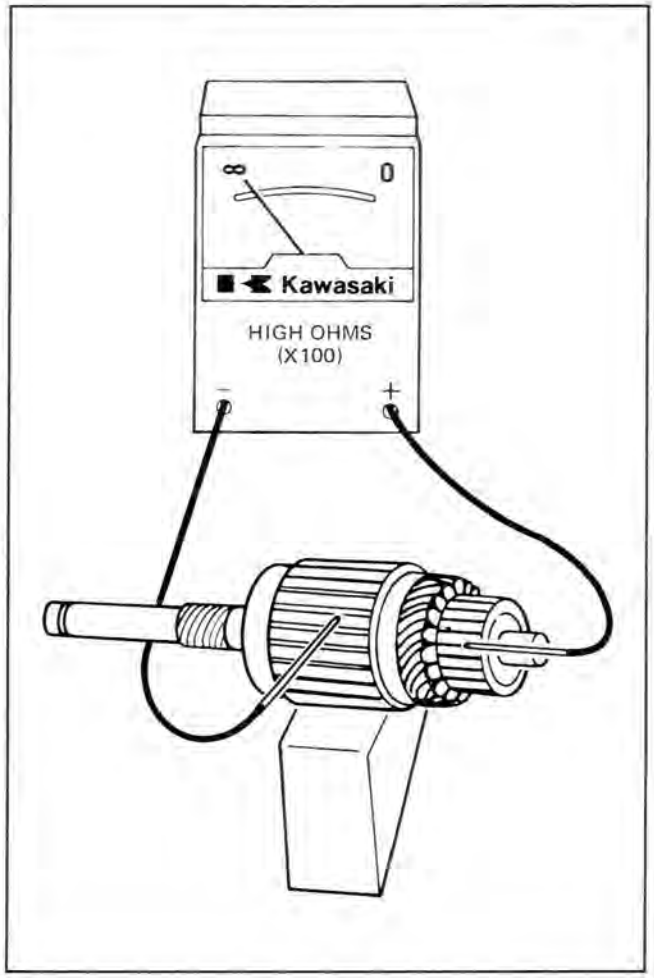


Figure 3-45

c. No needle movement (∞) indicates open winding and armature must be replaced.

d. Repeat procedure by moving meter leads until all commutator segments have been tested.

e. Set ohmmeter to high ohm scale (X100) and touch one meter lead to any commutator segment with other meter lead to armature core or shaft. (See Figure 3-45.)

f. Any needle movement indicates grounded (shorted) winding and armature must be replaced.

g. To detect possible shorts between windings place armature on growler. Hold a thin metal strip (hack saw blade) on top of armature. (See Figure 3-46.)

h. Turn on growler and rotate armature one complete turn. If the metal strip vibrates windings are internally shorted to each other and armature must be replaced.

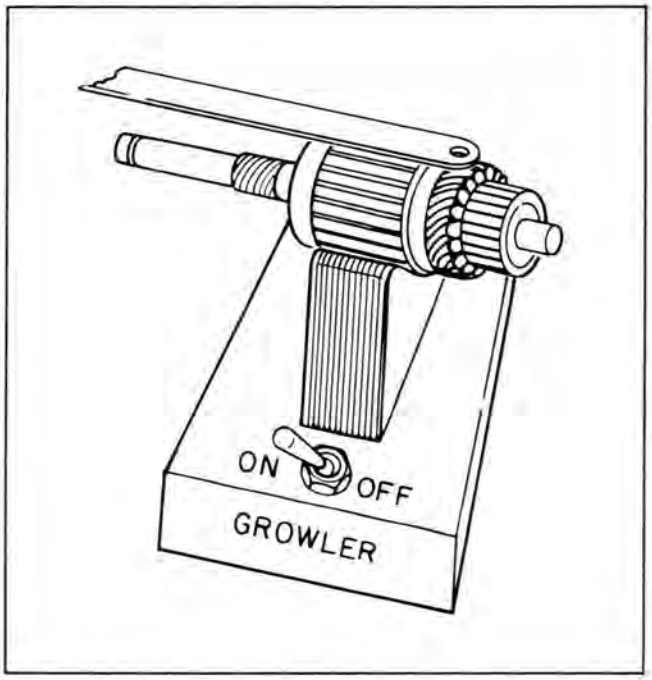
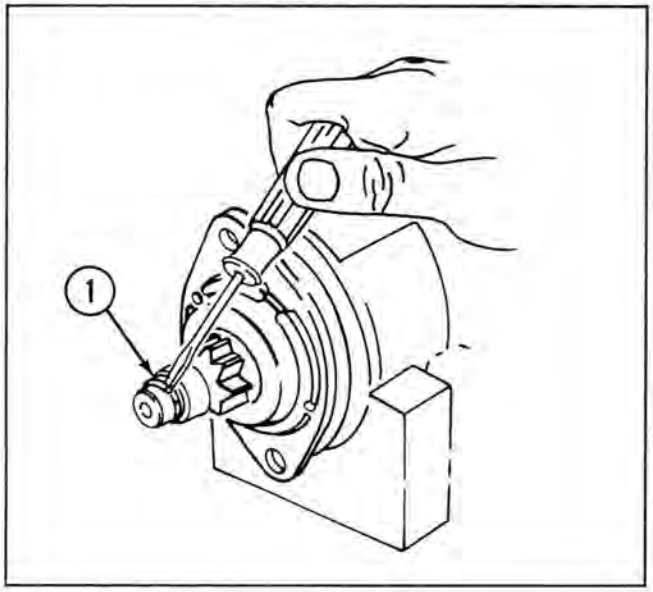


Figure 3-46

Disassembly

1. Slide pinion stopper collar rearward on armature shaft to expose retaining ring. If necessary, use an appropriate size socket and hammer to initially move collar.

2. While holding collar rearward, pry retaining ring from armature groove using a small screwdriver. (See Figure 3-47.)



1. Chamfered End of Collar

Figure 3-47

3. Remove pinion gear and stopper assembly from starter motor. (See Figure 3-48.)

4. Unscrew nuts and remove bracket from rear cover.

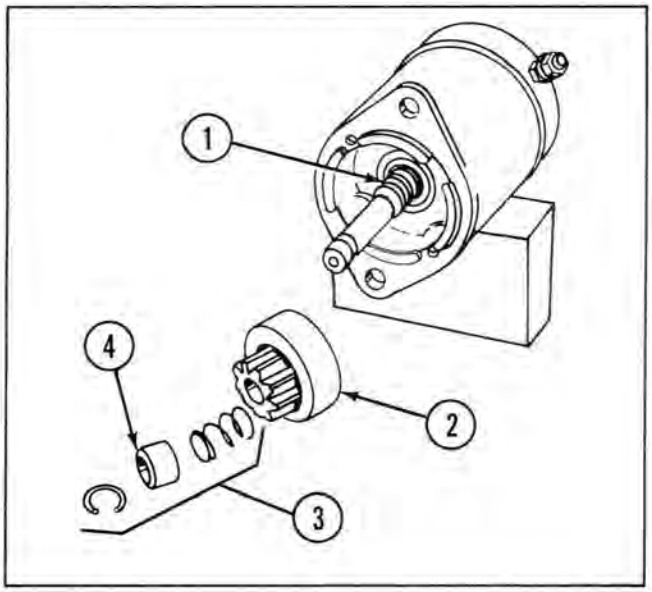
5. Remove screws securing rear cover to brush holder. (See Figure 3-49.)

6. Front cover can be removed by unscrewing through bolts. (See Figure 3-49.)

CAUTION

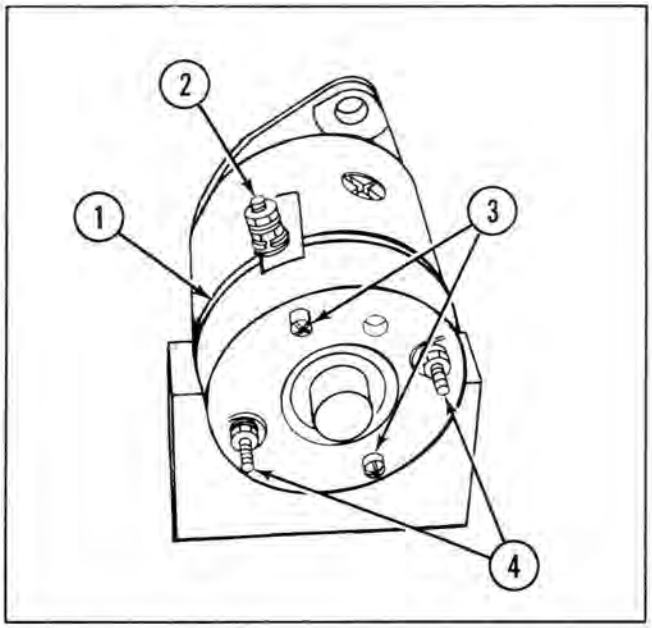
To prevent damaging field terminal during rear cover removal cut sealer around insulator using a sharp utility knife. (See Figure 3-49.)

7. Carefully remove rear cover from yoke by lightly tapping cover along mating edge with a drift and small mallet. (See Figure 3-49.)



1. Pinion Gear Helix
2. Pinion Gear
3. Pinion Stopper
4. Chamfer Toward End of Shaft

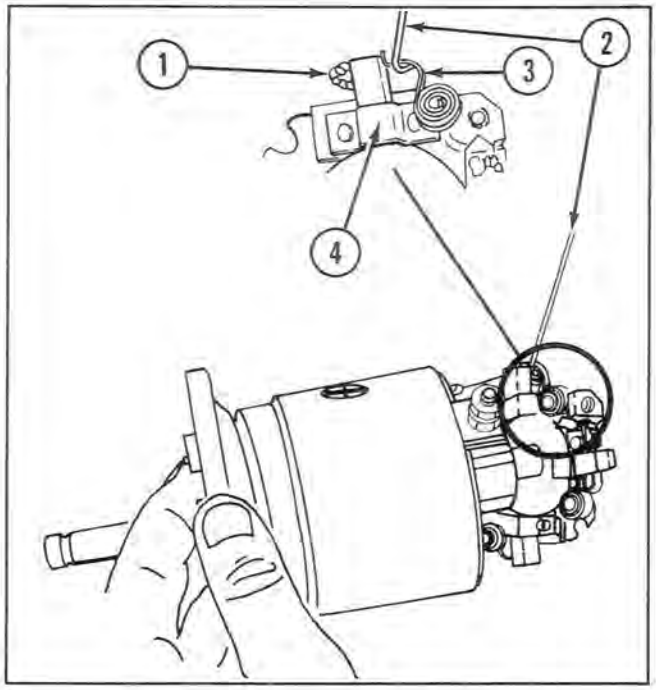
Figure 3-48



1. Tap Here
2. Yield Terminal Stud
3. Cover to Brush Holder Screws
4. Through Bolts

Figure 3-49

8. Using a hooked wire, release spring tension and slide positive brushes (brushes fastened to yoke) out of holder. (See Figure 3-50.)



1. Brush
2. Hooked Wire
3. Brush Spring
4. Holder Guide

Figure 3-50

9. Remove thrust washers from rear of armature shaft. Washers may have come off when removing rear cover. Inspect inside rear cover if necessary.

10. Slide armature out of yoke (field housing).

11. Perform Inspection Procedure.

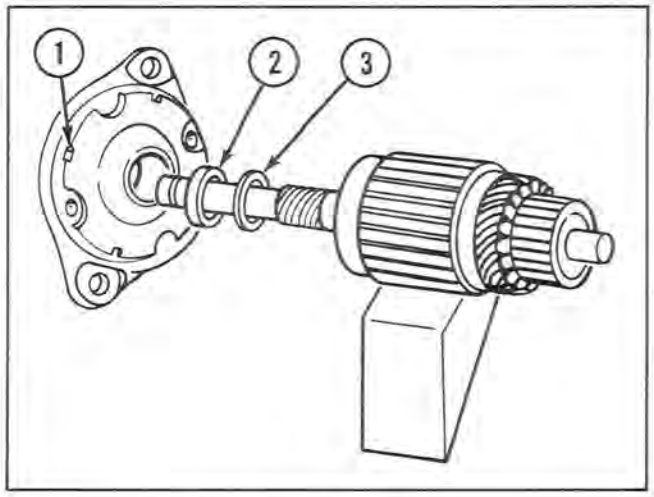
Reassembly

NOTE: If brushes require replacement use a large capacity soldering gun (300 to 400 watts) with 60-40 ROSIN CORE type solder. Acid core (flux) is corrosive and should not be used on electrical connections.

1. Check armature shaft end play as follows:

   a. Install front cover and washers onto armature as shown. (See Figure 3-51.)

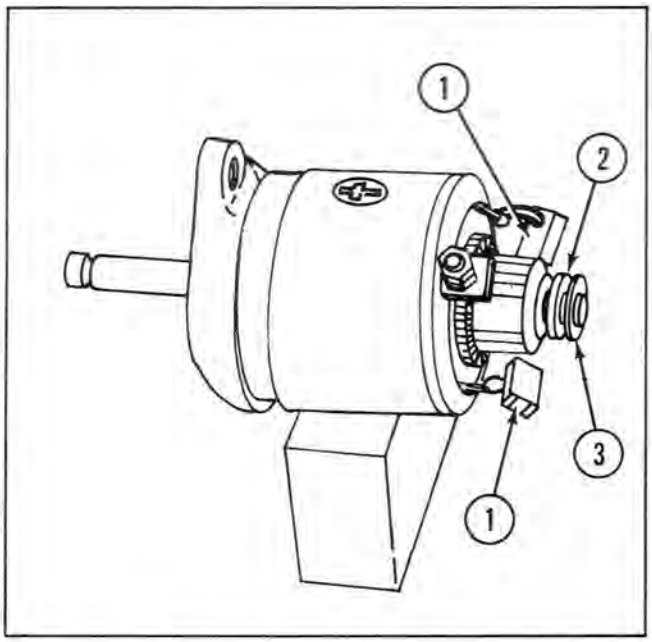
   b. While inserting front cover and armature into yoke align notch in cover with boss on yoke housing to insure correct assembly indexing. (See Figure 3-51.)



1. Notch in Cover
2. Phenolic Washer
3. Steel Washer (Large I.D.)

Figure 3-51

   c. Place shims on rear armature shaft as shown. (See Figure 3-52.)



1. Positive Brushes
2. Thick Steel Washer (Small I.D.)
3. Thin Steel Washer (Small I.D.)

Figure 3-52

   d. Install rear cover and secure with long through bolts. (See Figure 3-53.)

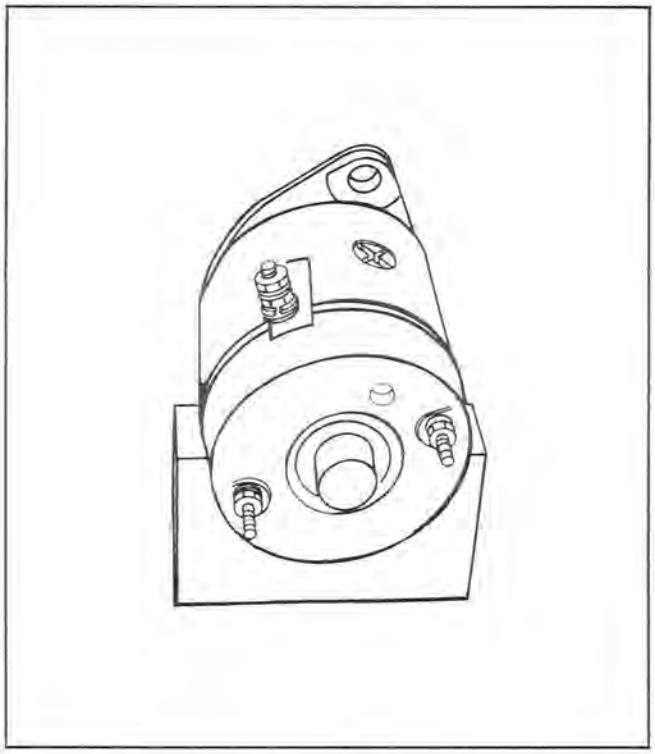


Figure 3-53

e. End play is correct if armature shaft total movement (pushed completely inward then pulled completely outward) is 0.001 to 0.007 in. (0.02 to 0.18 mm).

f. If necessary to adjust end play, add or remove thin steel washer from rear of armature shaft. (See Figure 3-52.)

2. Reassemble starter motor by reversing disassembly procedures along with the following:

   a. After step 9, push negative brushes outward through holder guide for clearance when installing holder over armature. Position spring on side of brush to simplify installation. (See Figure 3-50.)

   b. After step 8, push brushes into proper position against commutator segments.

   c. After step 7, apply silicone sealer along field terminal stud insulator to prevent moisture from entering starter motor.

   d. During step 6, install washers onto armature front shaft and align notch in front cover with boss on yoke housing to insure correct assembly indexing. (See Figure 3-51.)

   e. During step 3, lightly lubricate pinion helix grooves on armature shaft and install stopper collar with chamfered edge facing front end of armature shaft. (See Figure 3-48.)

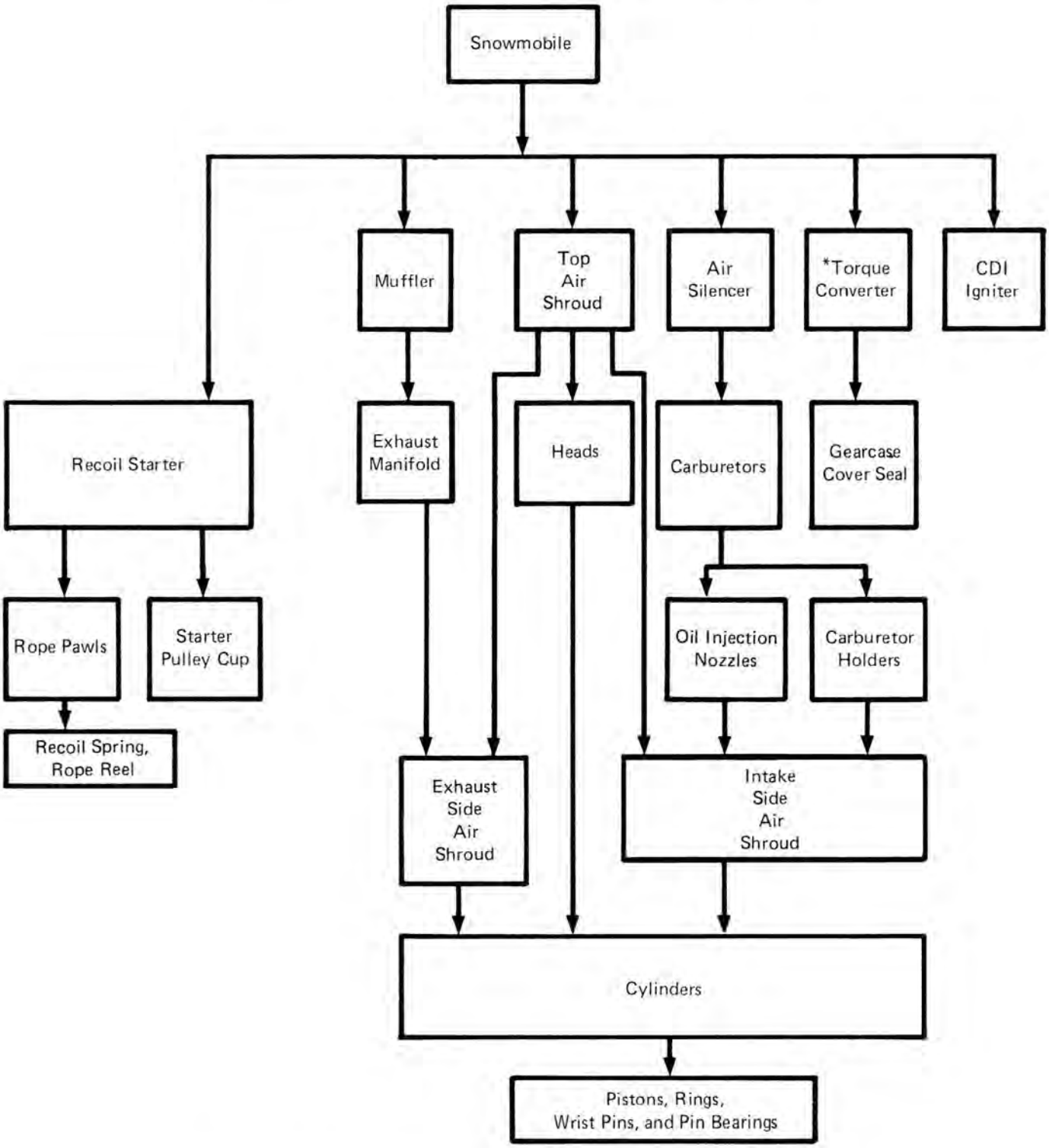
   f. After step 2, slide collar forward to cover retaining ring.

3. When reassembly is complete check that:

   a. Pinion gear moves smoothly when rotated towards end of shaft and springs back into rest position when released.

   b. Armature must rotate freely and smoothly by hand pressure only.

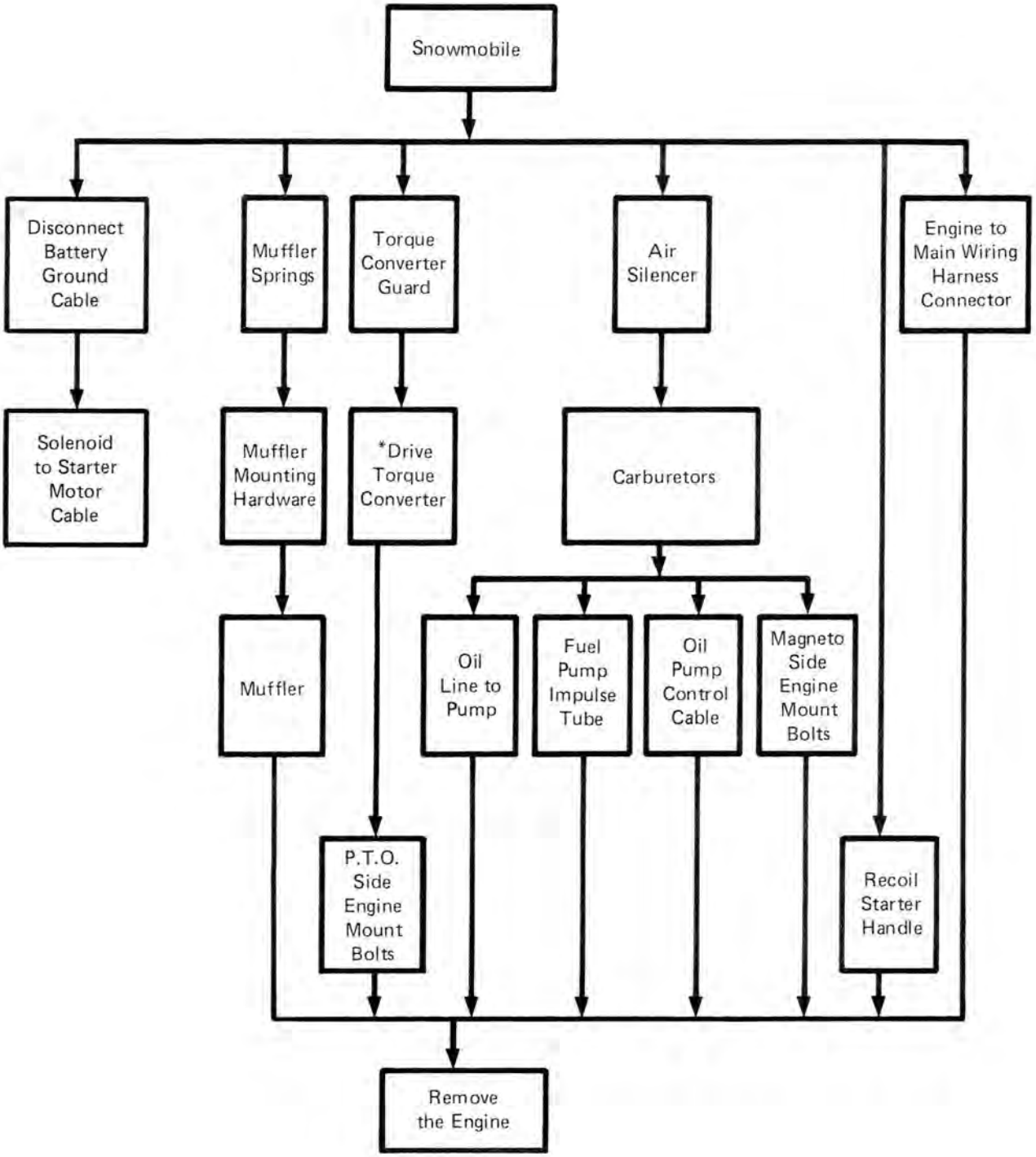
Flow Chart
Disassembly - Engine Installed



*Removal, installation, disassembly, or assembly requires use of special tool(s).

NOTE: This chart is designed to aid in proper removal sequence. Select the component you wish to remove and follow the arrows leading to that point on the chart.

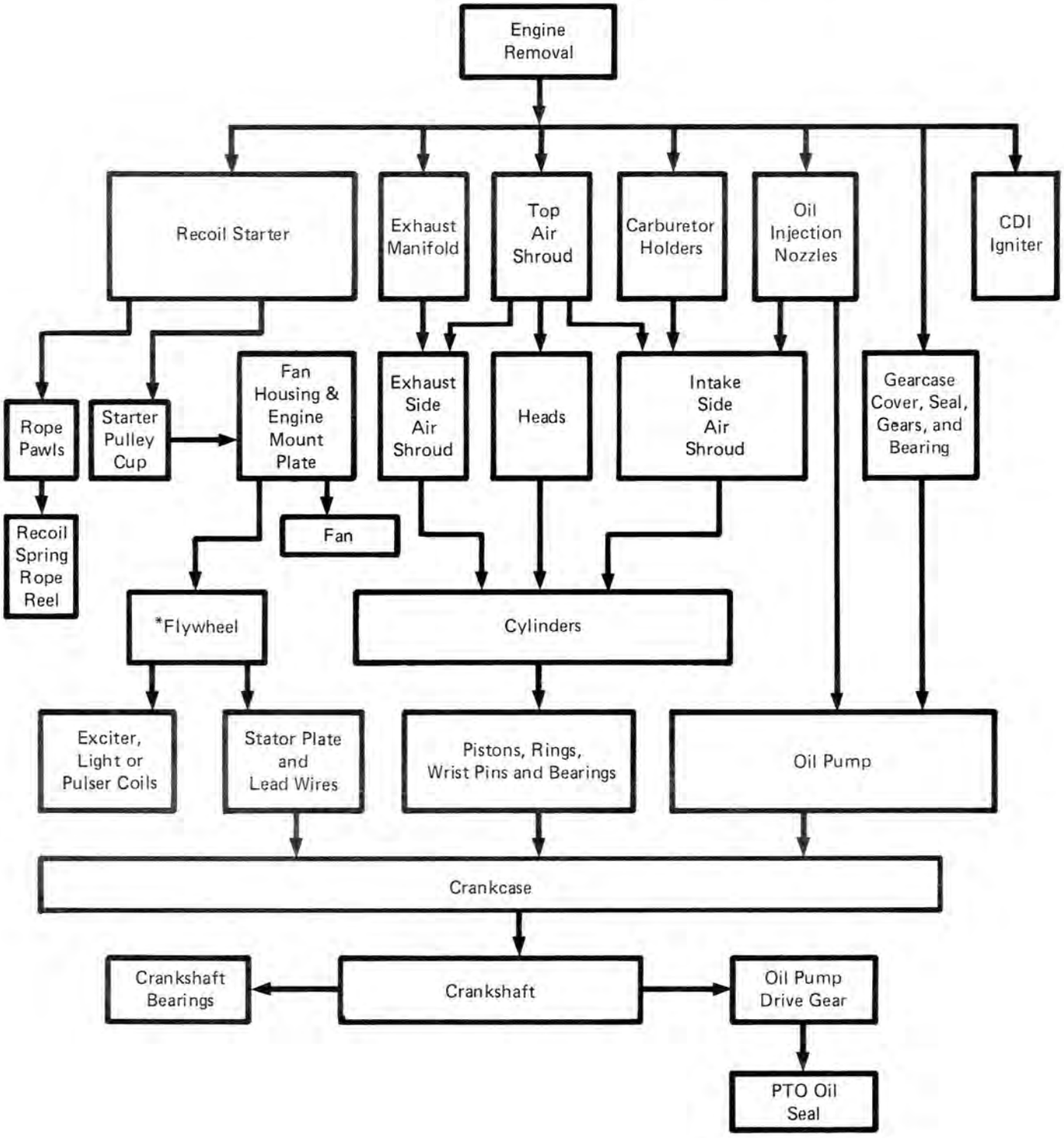
Flow Chart
Engine Removal



*Removal, installation, disassembly, or assembly requires use of special tool(s).

NOTE: This chart is designed to aid in proper removal sequence. Select the component you wish to remove and follow the arrows leading to that point on the chart.

Flow Chart
Disassembly - Engine Removed



*Removal, installation, disassembly, or assembly requires use of special tool(s).

NOTE: This chart is designed to aid in proper removal sequence. Select the component you wish to remove and follow the arrows leading to that point on the chart.

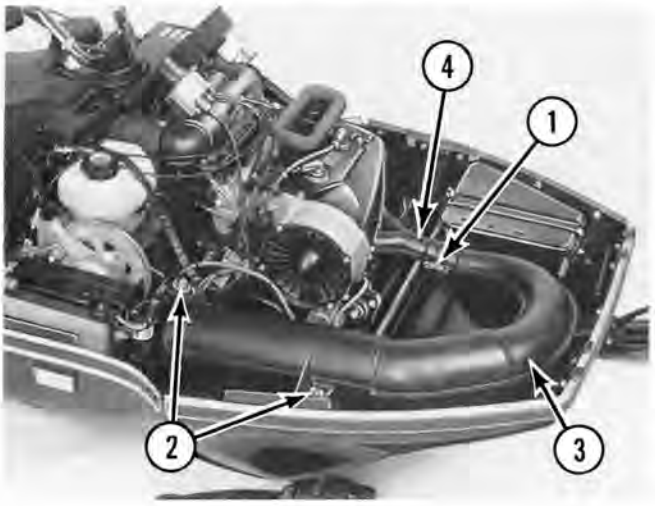
Muffler

Removal

1. Remove the springs that secure the muffler to the exhaust manifold. (See Figure 3-54.)

2. Remove the nuts and washers that secure the muffler to the mounting brackets.

3. Remove the muffler from the snowmobile by separating it from the exhaust manifold flange, and guiding outlet pipe out of exhaust outlet boot.



1. Spring
2. Nut and Washer
3. Muffler
4. Exhaust Manifold

Figure 3-54

Inspection

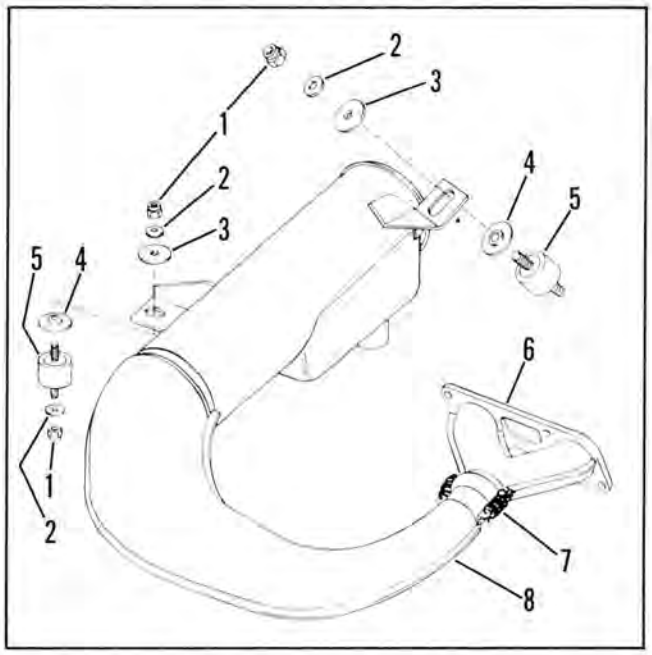
1. Visually check muffler assembly along welds and seams for signs of leakage. Repair any leakage by welding as required.

2. Lightly tap muffler on floor and listen for rattling or ringing inside muffler indicating loose internal components. Replace muffler if loose internal components are suspected.

3. Inspect outlet pipe for restrictions and repair as necessary.

Installation

Install the muffler by reversing the removal procedure. Make sure the insulation washers are properly positioned on each side of the muffler brackets. (See Figure 3-55.)



1. Nut
2. Washer
3. Insulating Flat Washer
4. Insulating Shoulder Washer
5. Exhaust Mount Damper
6. Exhaust Manifold
7. Exhaust Joint Spring
8. Tuned Muffler Assembly

Figure 3-55

Silencer

Removal

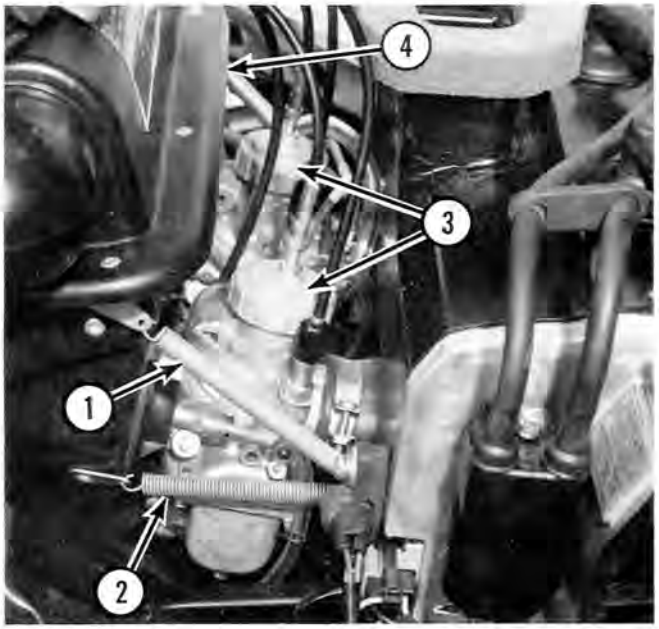
1. Remove the drive converter belt guard.

NOTE: Instrument panel mounting screws must be removed to provide adequate clearance for air silencer removal.

2. Disconnect springs securing air silencer to carburetor holders and remove silencer. (See Figure 3-56.)

CAUTION

Never run the engine with the air intake silencer removed from the carburetor. Poor engine performance and engine damage will result. Be sure the silencer hose is directed to the rear and is positioned underneath the cables. Incorrect hose position will result in engine damage.



1. Spring (Long)
2. Spring (Short)
3. Carburetor
4. Air Intake Silencer

Figure 3-56

Installation

CAUTION

While installing the air intake silencer, check that:

a. The rubber seals between silencer body and carburetors are properly positioned and fit securely.

b. Intake hose is directed rearward and positioned underneath the cables.

Failure to comply with the above steps will cause engine failure.

NOTE: Properly position the plastic adapters on the carburetors prior to air silencer installation, to prevent breakage of the plastic econo jet fitting.

1. Secure air silencer into position with four springs. Install long springs on upper silencer tab retainers and short springs on lower silencer tab retainers.
2. Install mounting screws to secure the instrument panel assembly.
3. Secure converter guard into position with clip pins.

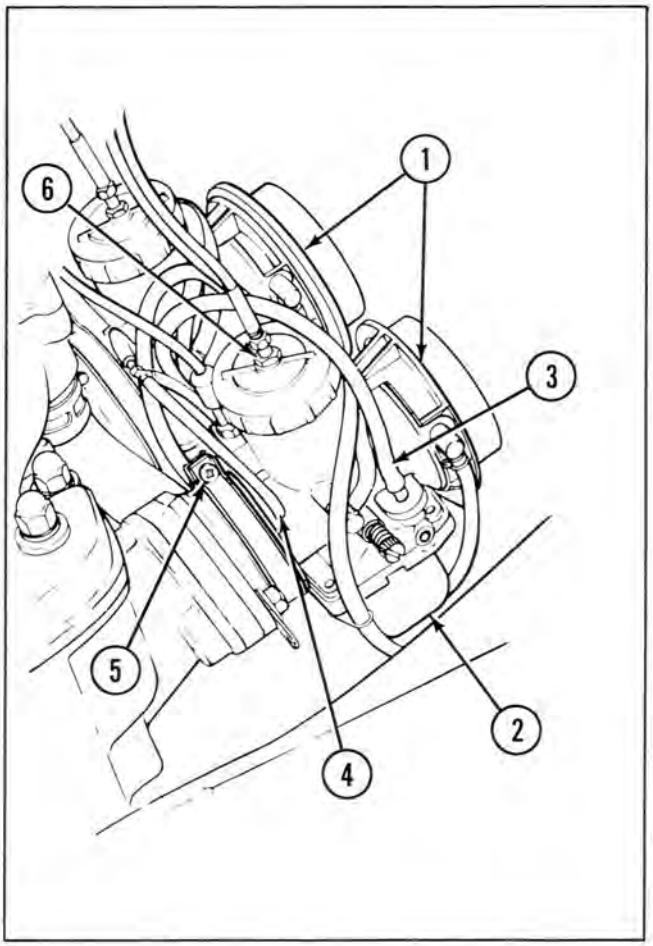
Carburetor

This engine is equipped with twin Mikuni VM32 econo jet carburetors.

Removal

Remove the instrument panel mounting screws and air intake silencer assembly.

Remove the carburetor fuel supply tube and the primer tube from the carburetor fittings. Plug the fuel tube opening. (See Figure 3-57.)



1. Plastic Adaptors
2. Clearance Between Carburetor and Frame
3. Fuel Supply Tube
4. Primer Tube
5. Carburetor Holder Clamp Screw
6. Throttle Cable Adjuster Jam Nut

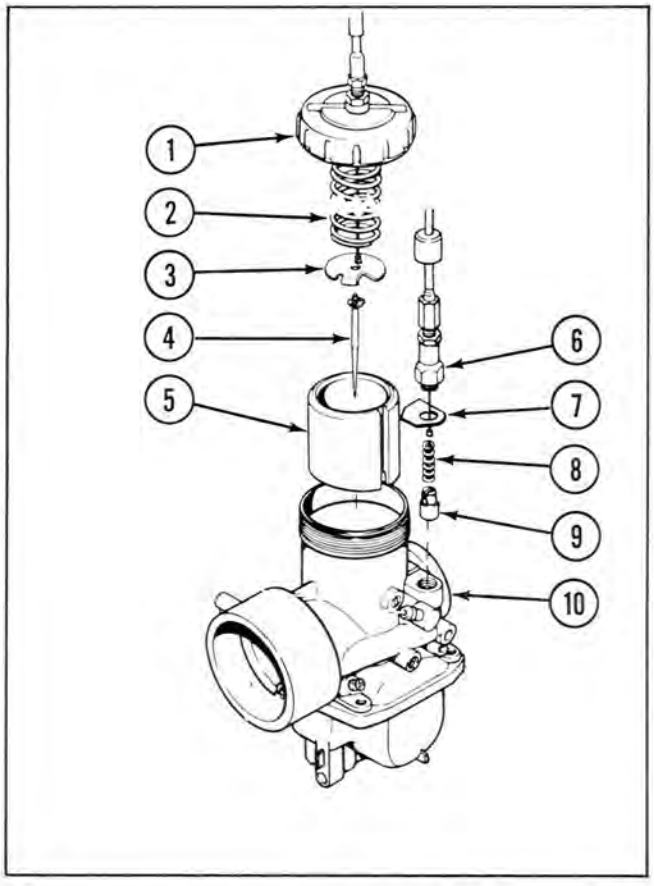
Figure 3-57

Unscrew the mixing body cap assembly and pull out the throttle valve. (See Figure 3-58.)

Compress the throttle spring and pull the spring from its seat. Slip the throttle cable through the slot in the throttle. Remove the spring, seat plate, and jet needle from the throttle valve. (See Figure 3-58.)

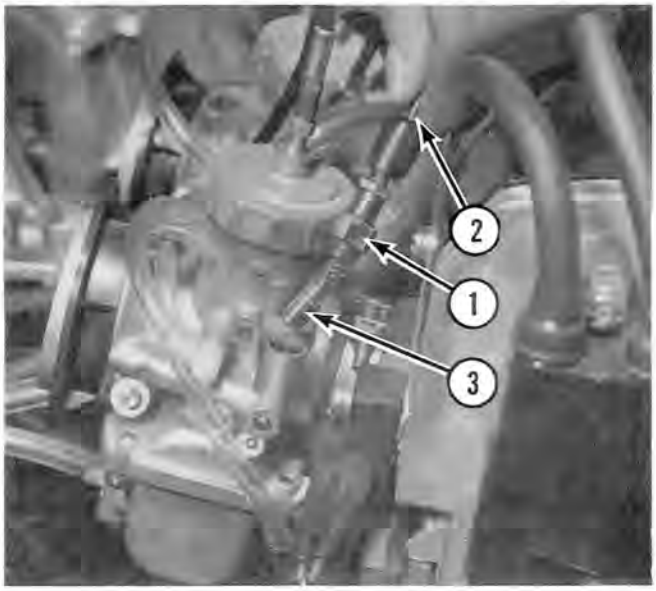
Slide the plastic cap up the enrichener cable. Unscrew the enrichener plunger cap and remove the enrichener plunger. The cable can be slid out of the enrichener plunger slot and the plunger cap unscrewed from the enrichener cable. (See Figures 3-58 and 3-59.)

Loosen the screw on the carburetor holder clamp and remove the carburetor from the engine mount. (See Figure 3-57.)



1. Mixing Chamber Cap
2. Throttle Valve Spring
3. Spring Seat Plate
4. Needle
5. Valve
6. Enrichener Plunger Cap
7. Cap Washer
8. Enrichener Plunger Spring
9. Enrichener Plunger
10. Mixing Chamber

Figure 3-58



1. Enrichener Plunger Cap
2. Enrichener Cable
3. Enrichener Plunger

Figure 3-59

Carburetor Disassembly

1. Select a clean work area for disassembling the carburetor. Most carburetor problems are caused by dirt in the system.

2. Clean the carburetor with fuel and blow dry with compressed air before disassembling. Do not blow high pressure air through the carburetor until it is disassembled.

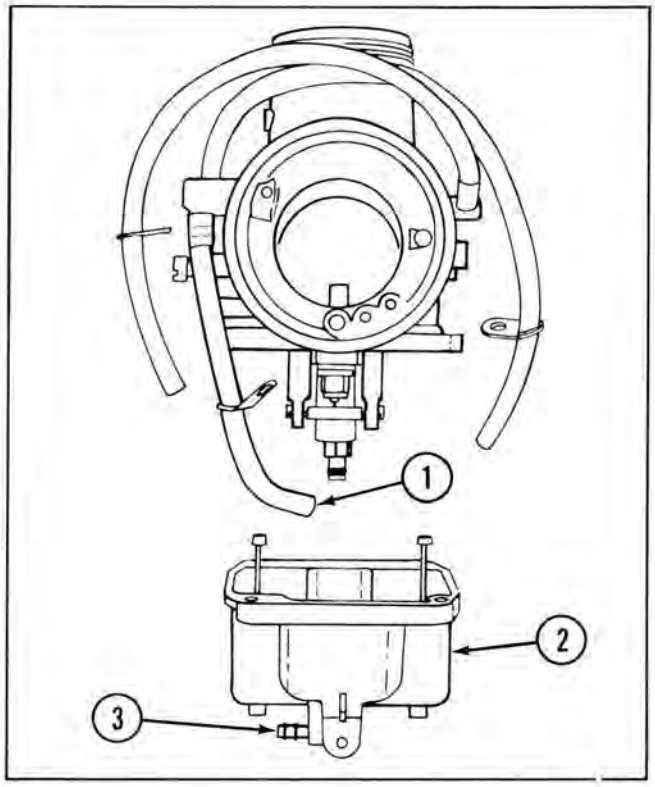
3. Disconnect econo jet tube from float chamber fitting. (See Figure 3-60.)

4. Remove screws and separate float chamber from upper carburetor body. Discard float chamber gasket. (See Figure 3-60.)

5. Carefully pry float retainers off from pins and remove floats. (See Figure 3-61.)

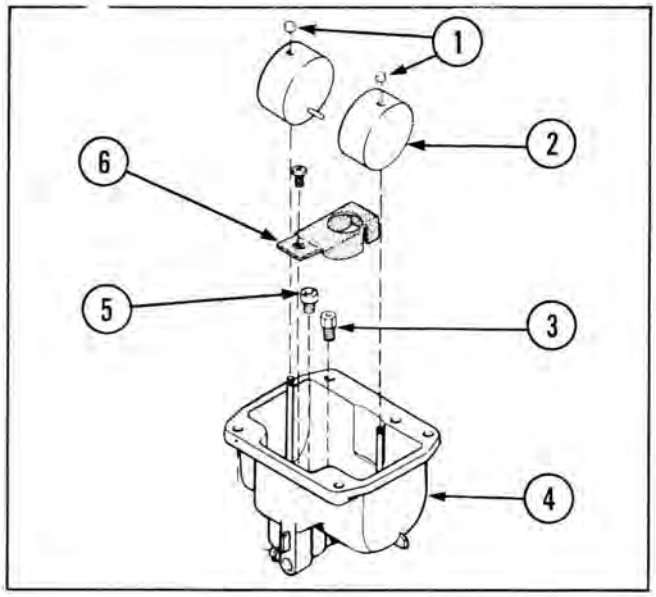
6. Remove main jet baffle. Unscrew hex main jet and round econo jet from float chamber. (See Figure 3-61.)

7. Remove needle jet holder and washer, then push needle jet up through opening in top of carburetor for removal. (See Figure 3-62.)



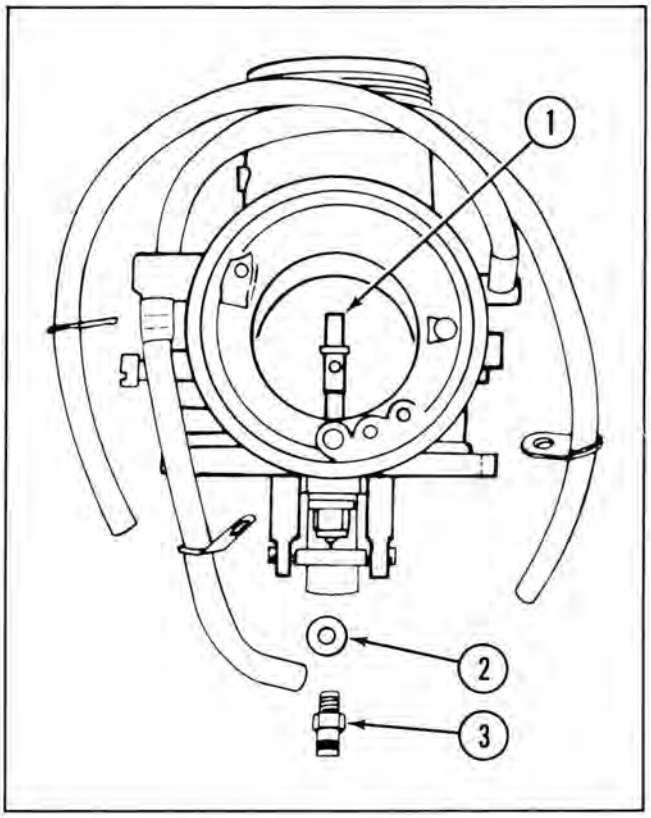
1. Econo Jet Tube
2. Float Chamber
3. Float Chamber Fitting

Figure 3-60



1. Float Retainer
2. Float
3. Main Jet
4. Float Chamber
5. Econo Jet
6. Baffle

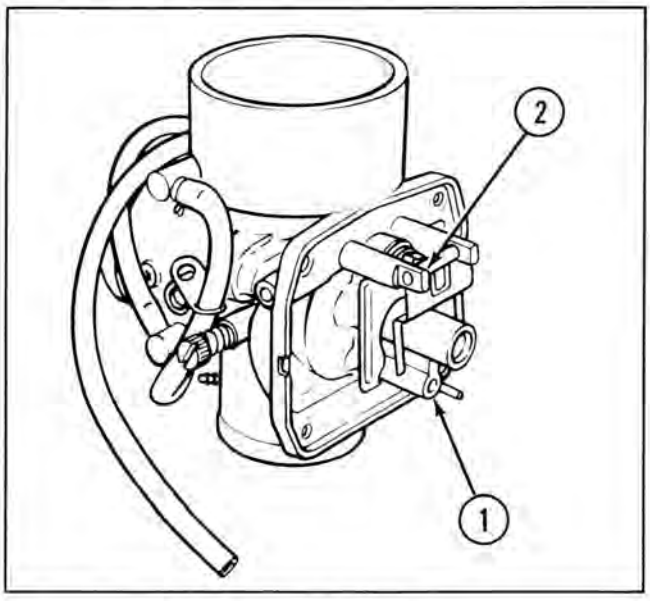
Figure 3-61



1. Needle Jet
2. Holder Washer
3. Needle Jet Holder

Figure 3-62

8. Using a thin blade screwdriver, unscrew pilot jet. (See Figure 3-63.)



1. Pilot Jet Location
2. Pin Head Side Boss

Figure 3-63

9. Release float arm by lightly taping pin out of boss in upper carburetor body. Support boss (on pin head side) to prevent breakage during pin removal. (See Figure 3-63.)

10. Remove float valve assembly, baffle and gaskets. (See Figure 3-64.)

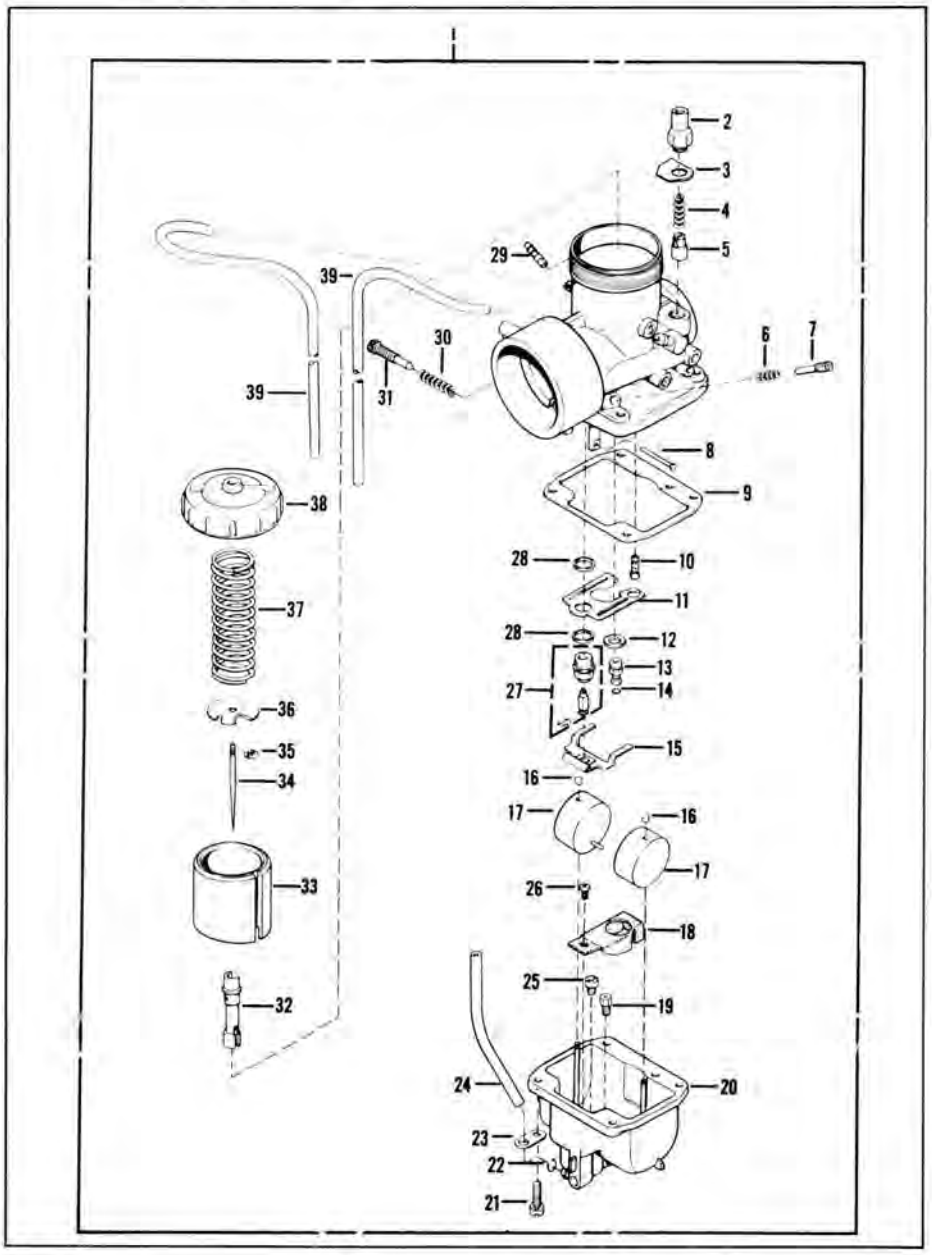
11. Remove throttle stop screw with spring and pilot air screw with spring. (See Figure 3-64.)

Carburetor Cleaning

Thoroughly clean all parts with a mild solvent or fuel/oil mixture. Inspect all drilled holes, openings and fuel passages in the body. Blow compressed air through the passages. Remove any sediment from the fuel bowl.

Use of carburetor cleaners may be necessary to remove gum and varnish build-up from the jets and float chamber. DO NOT USE DRILLS OR WIRES to clean the jets or damage to the jets will result.

Inspect float valve needle tip for wear or damage in the sealing (tapered) area. Replace float valve assembly if needle shows signs of wear or damage, such as groove or scratches.



1. Carburetor Assembly
2. Enrichener Plunger Cap
3. Cap Washer
4. Enrichener Plunger Spring
5. Enrichener Plunger
6. Air Screw Spring
7. Pilot Air Screw
8. Float Pin
9. Float Chamber Gasket
10. Pilot Jet
11. Baffle
12. Holder Washer
13. Carb Needle Holder
14. Holder O-Ring
15. Float Arm
16. Float Retainer
17. Float
18. Baffle
19. Main Jet
20. Float Chamber
21. Special Screw
22. Econo Jet Tube Clamp
23. Tube Retainer
24. Tube
25. Econo Jet
26. Special Screw
27. Float Valve Assembly
28. Float Valve Gasket
29. Primer Tube Fitting
30. Throttle Screw Spring
31. Throttle Stop Screw
32. Jet Needle
33. Valve
34. Needle
35. Carburetor Needle Clip
36. Spring Seat
37. Throttle Valve Spring
38. Mixing Chamber Cap
39. Tube

Figure 3-64

VM32 CARBURETOR

Carburetor Reassembly

Check carburetor parts for proper identification markings prior to reassembly. If the correct components are not installed the carburetor cannot be calibrated properly. For location of identification markings refer to Figure 3-65.

1. Place the spring on the throttle stop screw and install in the carburetor body. (See Figure 3-64.) Turn in the screw about 10 turns.

2. Insert the spring and pilot air screw in the carburetor body. Turn the screw all the way in. Then turn out 1-1/2 turns for initial adjustments.

3. Install pilot jet. (See Figure 3-63.)

4. Position new gaskets, with baffle plate on the upper carburetor body. Install the float valve assembly. Tighten 25 to 30 in. lb (0.29 to 0.35 kg-m). (See Figure 3-64.)

5. Install the float arm and secure with float pin. Be sure the pin is securely seated.

6. Invert the carburetor and check the alignment between the float arm and the base of the carburetor. The float arm must be parallel to the base. Bend the tab of the float arm to adjust. (See Figure 3-66.)

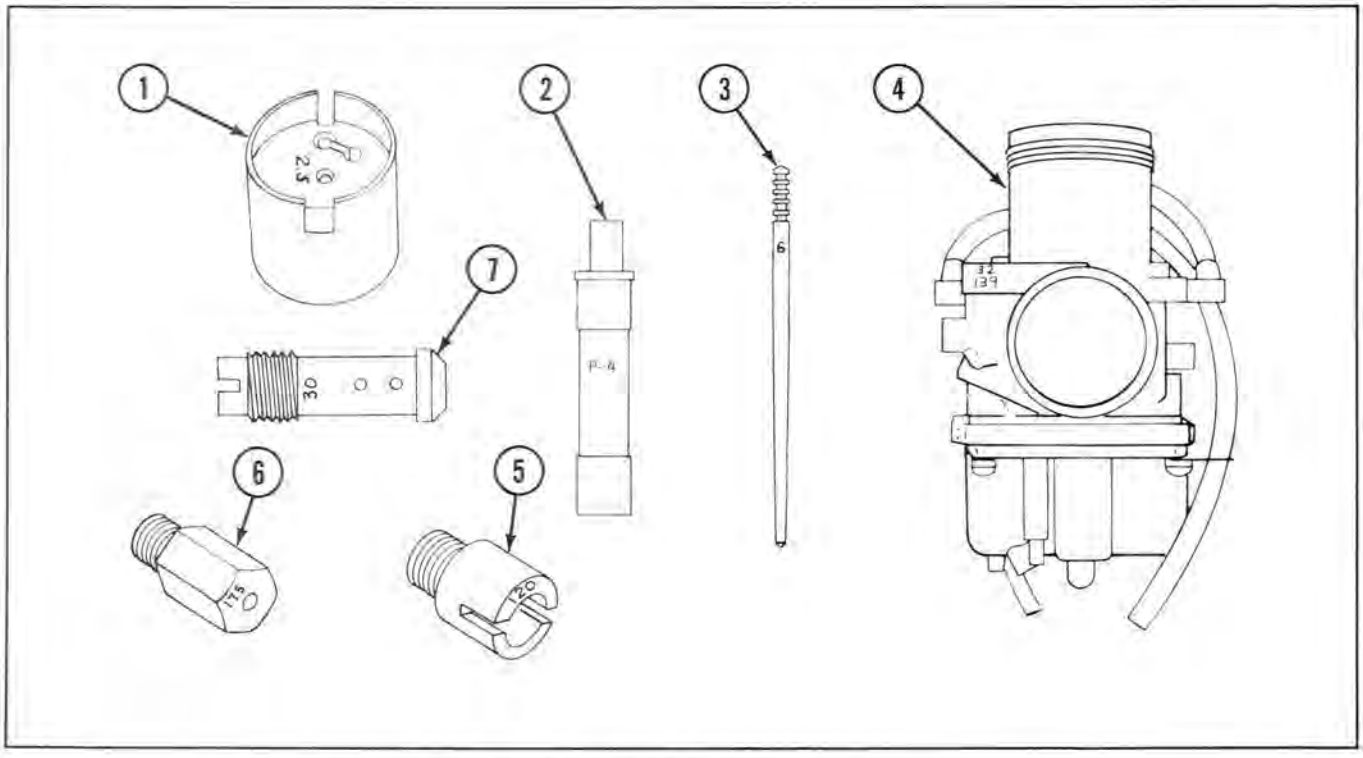
7. Insert the needle jet down through the top of the carburetor, aligning the needle jet with the guide pin. Hold the needle jet in position while installing the needle jet holder and washer. (See Figure 3-62.)

8. Install new O-ring on needle jet holder and lubricate with oil. (See Figure 3-67.)

NOTE: Effective O-ring seal in econo jet carburetors is absolutely necessary. Damaged O-ring will cause overly rich fuel-to-air mixture resulting in poor engine performance.

9. Position floats on float chamber pins with brass rods at the bottom and secure with retainers. (See Figure 3-67.)

10. Install round econo jet into hole closest to center of float chamber. (See Figure 3-67.)

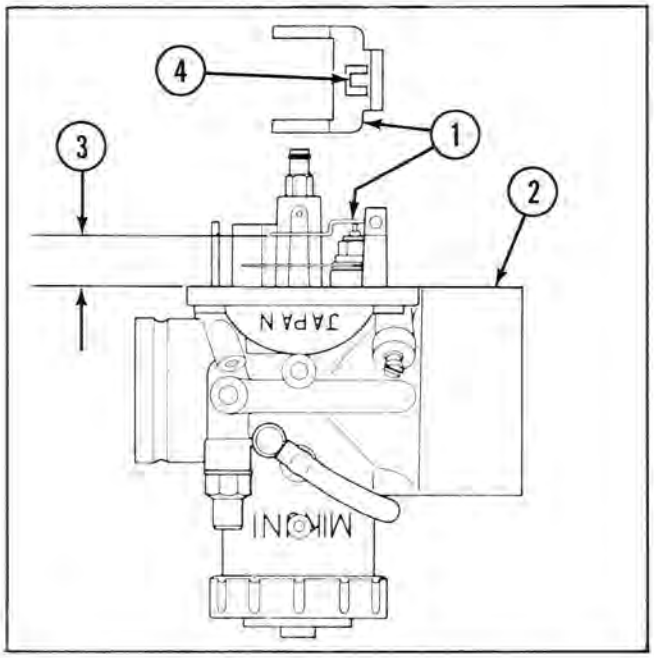


1. Throttle Valve - 2.5
2. Needle Jet - Q-4
3. Needle - 6DH7
4. Carburetor Body - L 32/185, R 32/189
5. Econo Jet - 140 LH Carb, 120 RH Carb
6. Main Jet - No. 155
7. Pilot Jet - No. 25

Figure 3-65

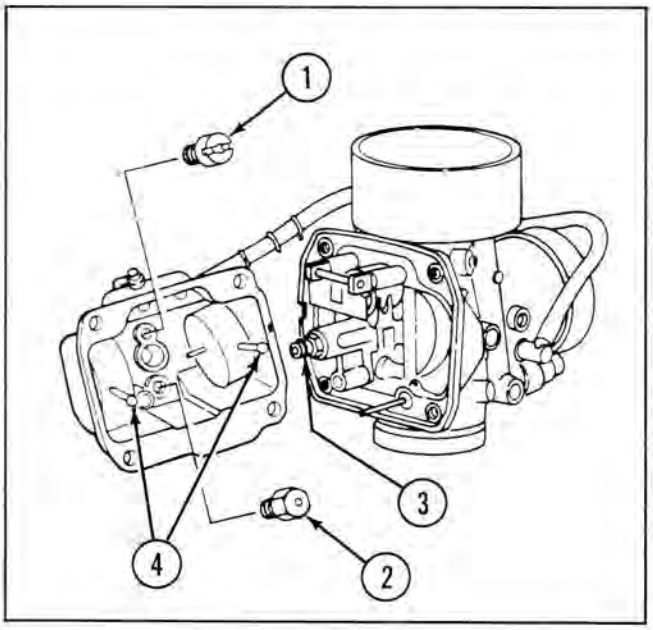
11. Install hex main jet into hole farthest away from center of float chamber. (See Figure 3-67.)

12. Install the main jet baffle and mounting screw into the float chamber.



1. Float Arm
2. Carburetor Base Surface
3. Parallel to Base
4. Float Arm Tab

Figure 3-66



1. Econo Jet
2. Main Jet
3. Needle Holder O-ring
4. Float Retainers

Figure 3-67

13. Place new float chamber gasket in position on mixing chamber and align float chamber to mixing chamber. Gently push castings together keeping them properly aligned.

NOTE: Slight pressure should be felt as needle holder O-ring squeezes into position.

14. Secure float chamber to upper mixing chamber with screws.

15. Connect econo jet tube to float chamber fitting and secure with clamp.

16. Perform Carburetor Installation procedure.

Installation

1. Install the carburetor into rubber holder and tighten the clamp screw to secure the carburetor. Position carburetor so float bowl does not contact front frame. (See Figure 3-57.)

2. Screw the mixing body cap assembly to the throttle cable. (See Figure 3-58.)

3. Insert the jet needle into the throttle valve.

4. Hold the throttle cable and mixing body cap assembly in one hand. Place the spring in the cap and compress the spring so the throttle cable tip extends beyond the spring. (See Figure 3-58.)

5. Guide the throttle valve over the throttle cable tip. Insert the end of the cable through the hole in the throttle valve slot.

6. While keeping the spring compressed, release the throttle valve and install the spring seat plate. Then release the spring. (See Figure 3-58.)

7. Install the throttle valve into the carburetor so the slot in the throttle valve mates with the locating pin inside the throttle valve bore. Install the mixing body cap assembly and tighten finger tight. Tighten the throttle cable locknut. (See Figures 3-57 and 3-58.)

8. Slide the enrichener plunger cap, washer and spring over the end of the enrichener cable. (See Figures 3-58 and 3-59.) Inspect plunger and check condition of rubber seal on plunger end for damage or wear. Replace plunger if defects are observed.

9. Place the hole in the starter plunger over the cable end and spring. Insert the plunger into the carburetor body and tighten the starter plunger cap. Bend washer plate against cap. (See Figures 3-58 and 3-59.) Adjust enrichener cable as specified in Section 2.

10. Connect the fuel supply and primer tubes onto the proper carburetor fittings. (See Figure 3-57.)

CAUTION

While installing the air intake silencer, check that:

a. Rubber seals between silencer body and carburetors are properly positioned and fit securely.

b. Intake hose must be directed rearward and positioned underneath the cables.

Failure to comply with the above steps will cause engine failure.

NOTE: Properly position the plastic adapters on the carburetors prior to air silencer installation, to prevent breakage of the plastic econo jet fitting. (See Figure 3-57.)

11. Secure air silencer into position with four springs. Install long springs on upper silencer tab retainers and short springs on lower silencer tab retainers. (See Figure 3-56.)

12. Install mounting screws to secure the instrument panel assembly.

WARNING

While raising the snowmobile off the ground, place the skis against a stationary object, and be sure the vehicle is properly secured, to prevent personal injury.

13. Raise the rear of the snowmobile off the ground. Start the engine and perform the carburetor adjustments as described in Section 2.

Troubleshooting

Carburetor related malfunctions can be identified as too rich or too lean a fuel mixture. Symptoms are as follows:

When the fuel/air mixture is too rich:

1. Engine noise is dull and intermittent.
2. The condition grows worse when the engine is hot.
3. The condition grows worse when the enrichener is opened.
4. The condition may improve slightly when the air silencer is removed.
5. Exhaust gases are heavy.
6. Spark plugs become fouled.

When fuel/air mixture is too lean,

1. The engine becomes overheated.
2. The condition improves when the enrichener is opened.
3. Acceleration is poor.
4. Spark plugs burn.
5. The revolutions of the engine fluctuate and lack of power is noticed.

If a carburetor is experiencing too rich or too lean fuel mixture problems, first check to see that the throttle is working properly. Then disassemble and clean the carburetor. A rich or lean fuel mixture is usually caused by a clogged air or fuel passage. If cleaning does not improve carburetor performance, carburetor tuning may be necessary.

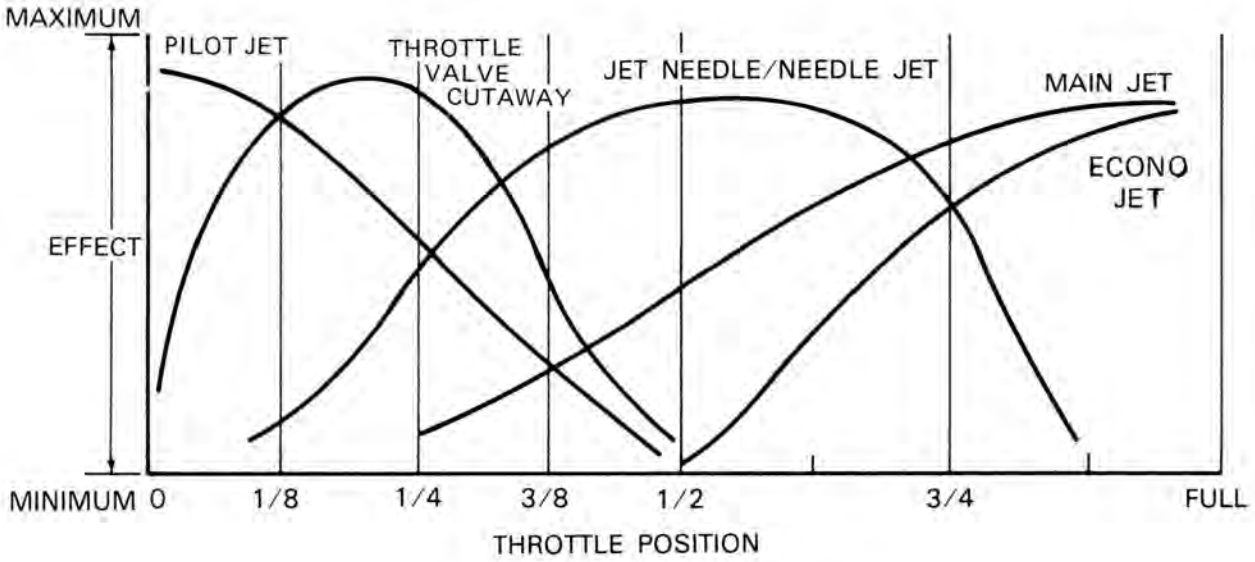
Tuning

Different fuel metering components function according to the throttle setting:

1. Pilot Jet - from closed throttle to one half (1/2) throttle opening.
2. Throttle Valve Cutaway - from closed throttle to one half (1/2) throttle opening.
3. Jet Needle and Needle Jet - one eighth (1/8) to seven eighths (7/8) throttle opening.
4. Main Jet - one quarter (1/4) to full throttle opening.
5. Econo Jet - one half (1/2) to full throttle opening.

Tuning enables adjustment of the fuel/air mixture at any throttle setting by replacing the standard fuel metering devices with parts designed to meter more or less fuel than standard. Because a change in one fuel metering system can affect the performance of other systems, all systems should be checked whenever a change is made to one fuel metering system.

PILOT AIR SCREW - regulates air that mixes with fuel from the pilot jet. Turning the pilot air screw in richens the fuel/air mixture. Turning out leans the mixture. The pilot air screw should be normally positioned 1/2 to 2 turns from full in. Less than 1/2 turn indicates the pilot jet is too small. More than two turns out indicates the pilot jet is too large.



JET NEEDLE SYSTEM - can be tuned by changing the position of the clip on the jet needle. There are five grooves at the top of the needle. The grooves are numbered 1 through 5 from top to bottom. The clip is normally installed in the No. 3 groove. Moving the clip to a higher position on the needle leans out the fuel/air mixture. Moving the clip to a lower position richens the fuel/air mixture.

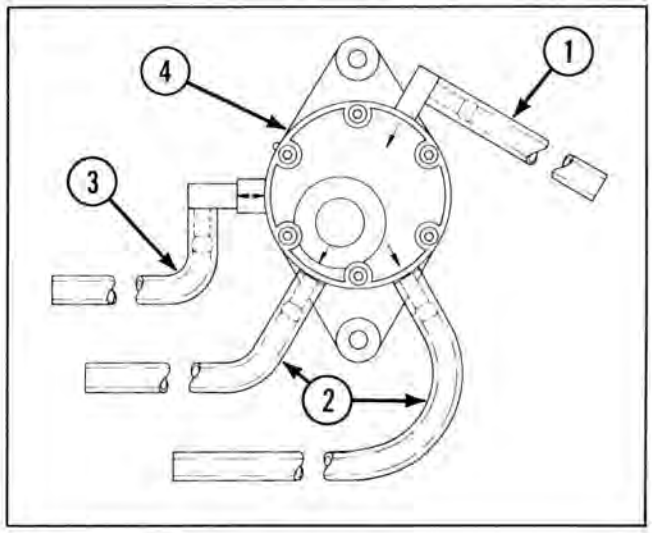
MAIN JET SYSTEM - the main jet meters all of the fuel to the main system. The main fuel system components meter fuel from 1/8 throttle to full throttle.

ECONO (POWER) JET SYSTEM - is similar to the main system in that it only draws fuel when there is enough air flow through the venturi to draw fuel through the system. The fuel that passes through the system is metered by a reverse type jet. This system has the most effect during wide open throttle position when the engine is operating at engine speeds above 5000 RPM. Use of econo jet gives better engine response at high engine RPM's (over 5000 RPM) and better fuel economy at lower engine RPM. At wide open throttle the main jet supplies approximately 70% of the engines fuel requirements while the econo jet supplies 30%. The econo jet stops feeding fuel below 1/2 throttle or 5000 RPM due to the reduction of air flow through the carburetor bore at reduced throttle settings.

Fuel Pump

Removal

1. Remove the instrument panel mounting screws and air intake silencer from carburetor.
2. Remove fuel inlet line from fuel pump. Plug end of fuel line. (See Figure 3-68.)
3. Remove fuel outlet line and impulse line from fuel pump.
4. Remove two fuel pump mounting nuts.

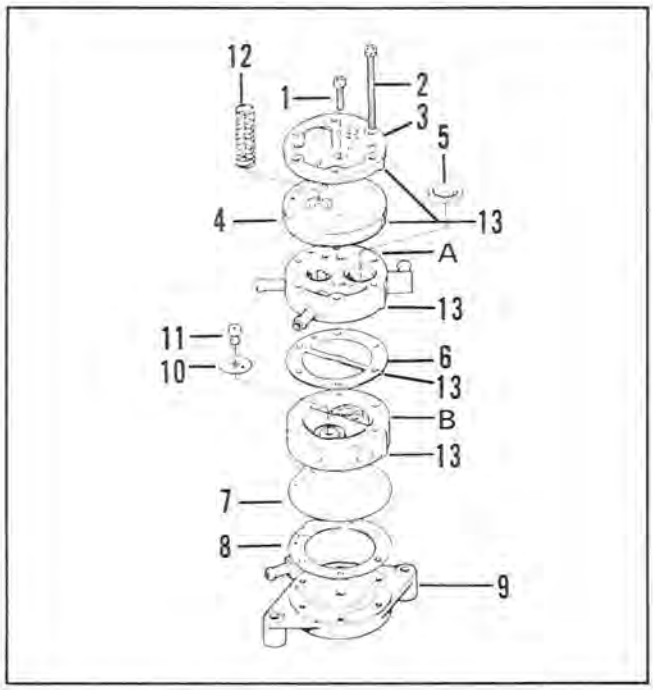


1. Fuel Inlet Line
2. Fuel Outlet Lines
3. Impulse Line
4. Fuel Pump

Figure 3-68

Disassembly

1. Remove the eight retainer screws. (See Figure 3-69.)



BODY A
BODY B

1. Screw
2. Screw
3. Cap
4. Diaphragm Assembly
5. Filter
6. Gasket
7. Diaphragm
8. Gasket
9. Bottom Body
10. Valve
11. Grommet
12. Spring
13. Alignment Tabs

Figure 3-69

2. Lift off body cover. Remove spring and diaphragm assembly.

3. Remove filter from body A. Inspect cavity directly below filter for obstructions. Be sure all passages and holes are clear.

4. Remove body A, gasket, body B, diaphragm and gasket. Note the position of the gasket in relation to body B.

NOTE: Once removed, the grommets cannot be reinstalled - Be sure to have replacements on hand before removing them.

5. Remove grommets and check valves from body B only if damaged or required for thorough cleaning.

Cleaning

Clean the body castings A and B, the cap and the bottom body with a mild solvent. Clean filter or replace if necessary.

CAUTION

Do not clean rubber diaphragms with solvent. Damage to diaphragms will occur.

Be sure fuel line and impulse line fittings are clear of any obstructions.

Reassembly

1. Install lower gasket and diaphragm on bottom body. (See Figure 3-69.)

2. Install check valves using new grommets in body B. Position body B on bottom body.

3. Install gasket and body A onto body B. Be sure alignment tabs on gasket, body A, and body B are indexed during assembly.

4. Install filter into body A.

5. Install diaphragm assembly onto body A. Be sure alignment tabs on body A and diaphragm are indexed during assembly.

6. Install spring into diaphragm assembly.

7. Install cap onto diaphragm assembly. Be sure alignment tabs on cap, diaphragm assembly, body A, gasket, and body B are indexed properly.

8. Install eight retaining screws and tighten in a crisscross pattern.

Installation

1. Connect impulse line to front fitting.

2. Install fuel inlet line and fuel outlet lines. Arrows on top of body cover indicate direction of fuel flow. (See Figure 3-68.)

3. Install two fuel pump mounting nuts.

4. Replace air intake silencer to carburetor.

CAUTION

While installing the air intake silencer, check that:

a. *Rubber seals between silencer body and carburetors are positioned properly and fit securely.*

b. *Intake hose must be directed rearward and positioned underneath the cables.*

Failure to comply with the above steps will cause engine failure.

5. Secure air silencer into position with four springs. Install long springs on upper silencer tab retainers and short springs on lower silencer tab retainers.

6. Install mounting screws to secure the instrument panel assembly.

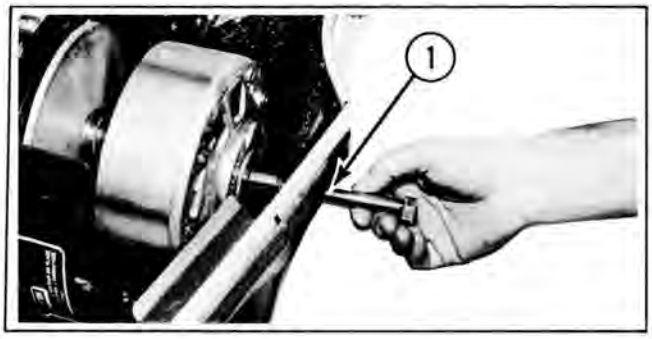
Engine Removal

1. Remove belt from converters. Refer to Belt Removal procedure in Section 2.

2. Unscrew converter mounting bolt while preventing converter from rotating using a strap wrench.

3. Remove converter from engine crankshaft using special puller bolt. (See Figure 3-70.)

NOTE: Be sure you use the correct puller with metric threads. Damage to the converter could result from the wrong puller. Hold the converter with a strap wrench and remove the converter.



1. Drive Converter Puller Bolt

Figure 3-70

4. Remove the four bolts from the LH engine mount. (See Figure 3-71.)

5. Remove the instrument panel mounting screws and air silencer from carburetors.



1. Engine Mount Screws

Figure 3-71

6. Loosen clamps on the carburetor holders. Remove carburetors from engine and place near jackshaft to prevent kinking throttle cables.

7. Loosen locknuts on control cable assembly at the oil pump. Remove cable assembly from oil pump.

8. Remove inlet tube from the oil pump. Insert a bolt into end of tube to prevent loss of oil.

9. Disconnect fuel pump pulse tube from the crankcase fitting.

10. Separate main wiring harness from engine connector.

11. Guide starter handle through the control console. Unwind rope from the coil guide. Allow rope and handle assembly to recoil up to the starter.

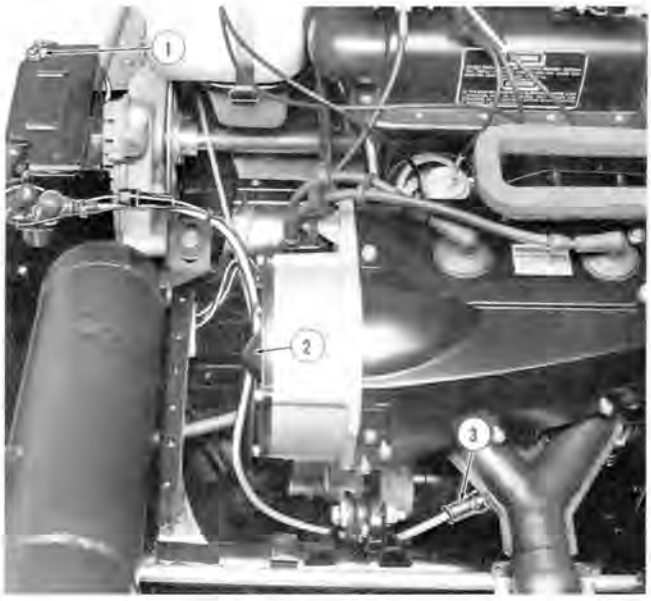
12. Remove springs securing muffler to exhaust manifold. Unscrew mounting hardware and remove muffler.

13. Disconnect battery to engine ground cable at RH engine mount.

14. Remove solenoid to starter motor cable at starter motor terminal. (See Figure 3-72.)

15. Remove two bolts from the RH engine mount. Be careful not to lose the U-shaped shims and note positioning for proper location during installation.

16. Raise RH side of the engine and pull LH side out of the engine mount. Lift engine out of the chassis.



1. Battery Ground Cable
2. Cable to Fan Screen Tie Band
3. Starter Motor Terminal

Figure 3-72

Engine Installation

NOTE: Prior to installing engine assembly, perform Crankcase Pressure Test (refer to Section 2) to insure no air leaks are present.

Install engine by reversing removal procedures along with the following:

☐ After step 15, check Engine Gearcase lubricant level. Refer to Section 2.

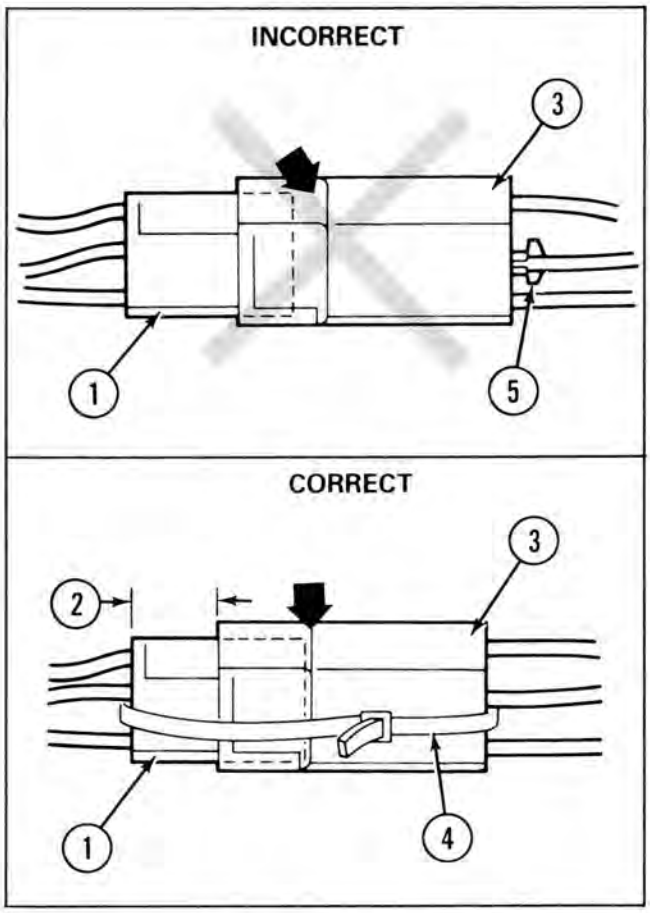
☐ During step 14, secure solenoid to starter motor cable at fan screen with tie band. (See Figure 3-72.)

☐ During step 12, apply a continuous bead of high temperature silicone sealer on ball joint of manifold before installing mufflers to prevent leakage and obtain correct exhaust tuning.

☐ After step 10, check to be sure connector is fully seated and no terminals are out of position. Secure connectors together with cable tie band as shown. (See Figure 3-73.)

CAUTION

Improper connections could result in premature electrical component failure or malfunction in ignition shut off circuit (emergency stop switch or key switch.)



1. Wiring Harness Connector
2. 1/2 in. (12.70 mm)
3. Engine Connector
4. Tie Band
5. Terminal

Figure 3-73

☐ After step 8, perform Oil Injection System Bleeding. Refer to Section 2.

☐ After step 6, perform Carburetor and Oil Pump Synchronization procedure. Refer to Section 2.

☐ After step 4, follow procedure for Drive Converter Installation. Refer to Section 3.

☐ After step 1, check lights for correct operation and verify that electric starter operates properly.

Starter Assembly

Removal

1. Remove three slotted hex head bolts securing starter assembly to engine and remove starter assembly. (See Figure 3-74.)



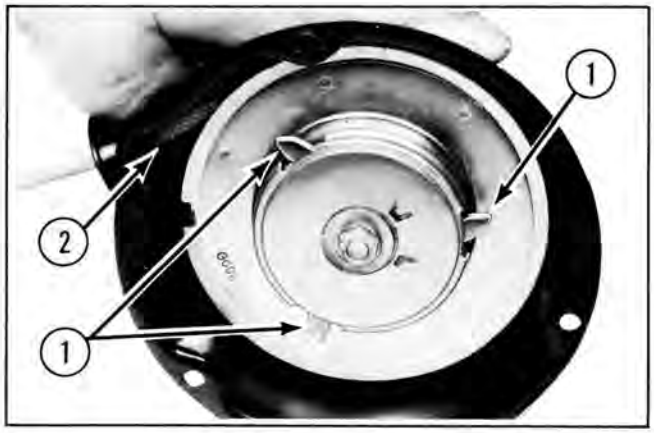
1. Slotted Hex Head Bolts

Figure 3-74

2. Remove starter handle and tie knot in starter rope to prevent rope from suddenly retracting into the recoil case.

Inspection

Pull the starter rope out 3 to 5 in. (76.2 to 127.0 mm) and examine the starter pawls for chips or excessive wear. (See Figure 3-75.) Listen for any grinding noise which might indicate a broken or worn starter spring. Examine the starter rope for excessive wear or frayed condition.



1. Starter Pawls
2. Starter Rope

Figure 3-75

Disassembly

1. Release return spring tension by removing handle from starter rope and allow rope to retract slowly.

2. Exert slight downward pressure on friction plate, then remove securing nut and washers while slowly removing cover.

3. Remove the plate return spring, friction spring, pawl springs, pawls and thrust washer from starter assembly. (See Figure 3-76.) Check the return spring and pressure spring for breaks, rust, distorted or weakened condition.

WARNING

Exercise care when removing recoil reel from starter assembly. All spring tension should be released to prevent spring from accidently disengaging and causing injury. Wear safety glasses when repairing starter assembly components.

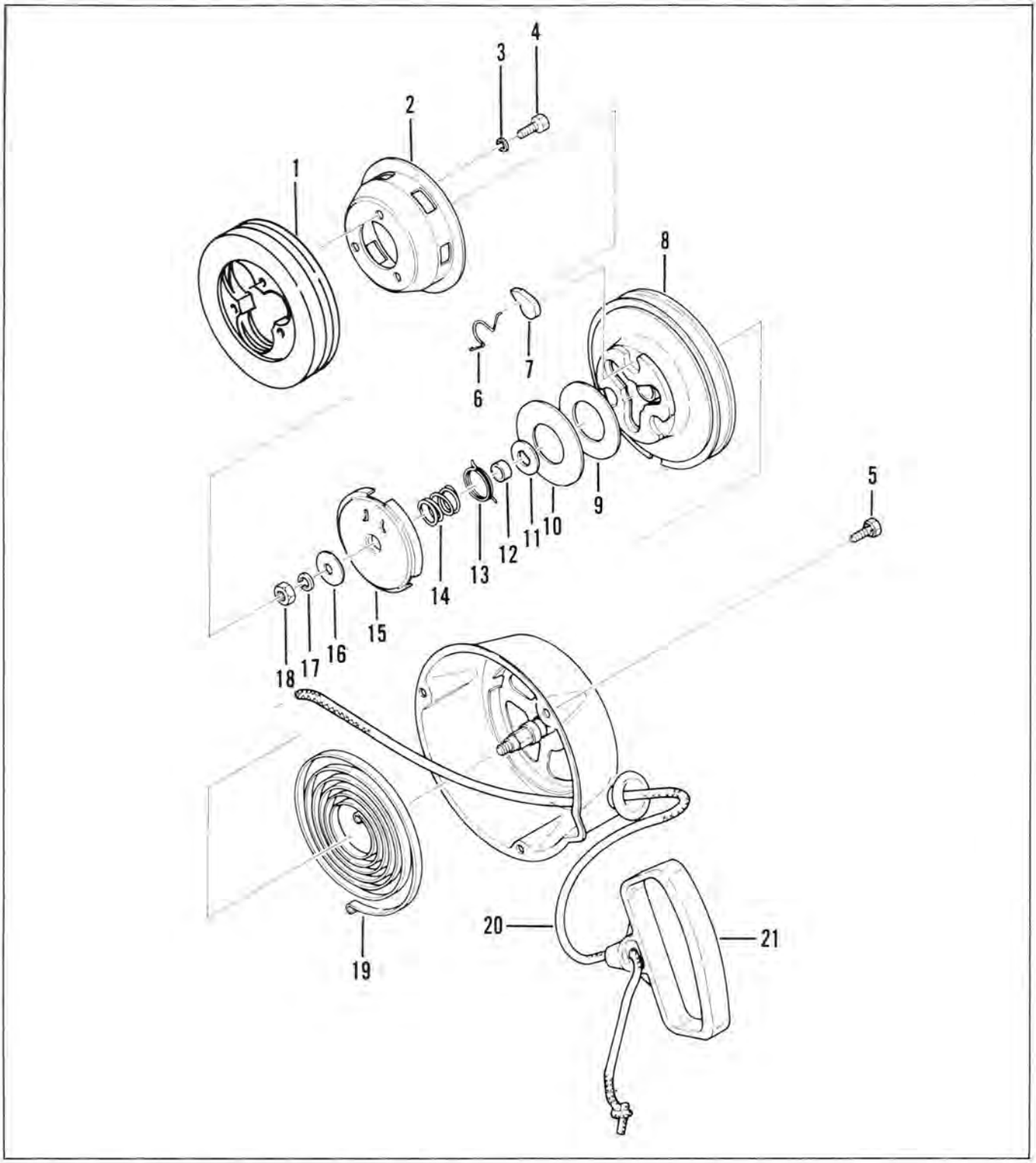
4. To replace starter rope, remove recoil reel from starter assembly. Untie knot and remove starter rope. Install new starter rope and tie a securing knot.

5. With recoil reel removed, examine recoil spring for cracks, crystallization or abnormal bends. Exercise care when handling recoil case to prevent recoil spring from accidently disengaging. Spring should remain in the recoil case.

6. To remove return spring, hold starter housing approximately 2 in. (50.8 mm) above work bench with flat surface of housing towards palm of hand. Slap mounting surface of housing against bench to release spring from housing.

Reassembly

1. Thoroughly clean all parts removed prior to reassembling starter. Reassemble components in sequence shown in Figure 3-76.



1. Fan Belt Pulley
2. Starter Pulley
3. Spring Washer
4. Bolt
5. Bolt
6. Pawl Return Spring
7. Pawl
8. Recoil Reel
9. Slide Plate, Small OD
10. Slide Plate, Large OD
11. Thrust Washer
12. Nylon Bushing
13. Plate Return Spring
14. Friction Spring
15. Friction Plate
16. Thrust Washer
17. Spring Washer
18. Nut
19. Return Spring
20. Rope
21. Rope Handle

Figure 3-76

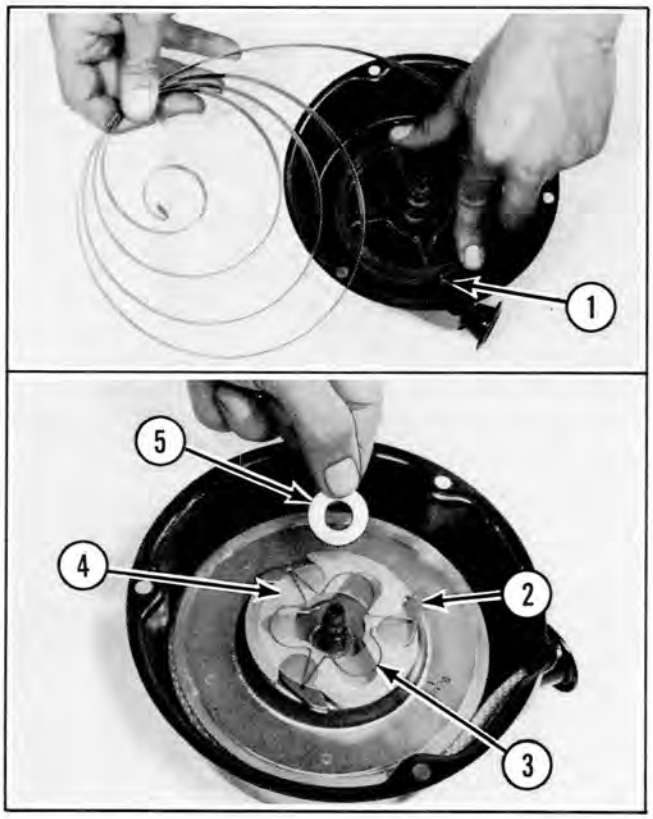
2. To install spring, insert outside spring hook into housing slot, and carefully wind spring in direction shown, while applying pressure with fingers to prevent spring from jumping out of housing. (See Figure 3-77.)

3. Apply light coat of grease to spring and housing.

NOTE: Use extreme pressure (EP) type grease diluted 50% with Kawasaki Snowmobile oil to ensure proper operation in cold temperature.

4. With the rope installed on reel, insert reel assembly into housing. Be sure to engage reel with spring hook near center of housing.

5. Assemble starter pawls, small OD slide plate, pawl return springs and thrust washer. (See Figure 3-77.)



1. Spring Hook in Slot
2. Pawl
3. Pawl Return Spring
4. Small OD Slide Plate
5. Thrust Washer

Figure 3-77

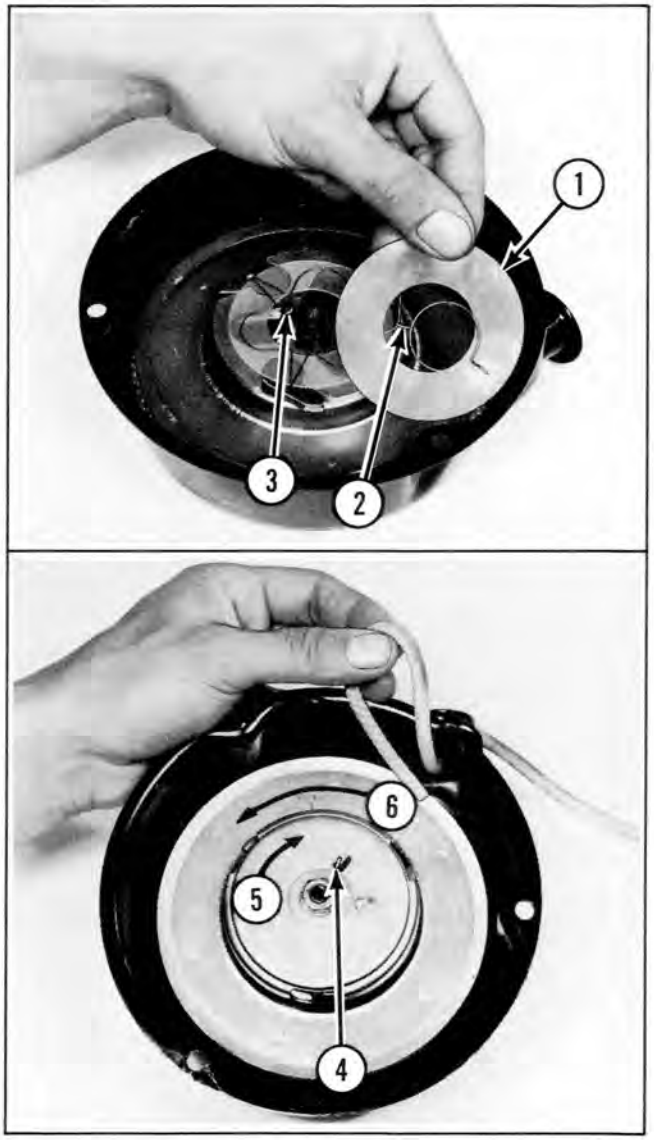
6. Next, position plate return spring onto large OD slide plate. (See Figure 3-78.)

7. Insert straight end of plate return spring into hole of reel. (See Figure 3-78.)

NOTE: Apply grease to dimples in friction plate side of thrust washer prior to performing next step.

8. Install nylon bushing and friction spring onto stub in recoil housing, then carefully position friction plate onto reel assembly as follows:

   a. lower friction plate only until bent end of plate return spring enters slot shown in Figure 3-78.



1. Large OD Slide Plate
2. Straight End of Spring
3. Hole in Reel
4. End of Spring Through Slot
5. Rotate 1/3 Turn
6. Rotate Until Handle Meets Housing

Figure 3-78

b. preload friction plate by turning plate 1/3 turn clockwise. (See Figure 3-78.)

c. with preload applied to friction plate, lower plate completely into position (guide cut-outs in plate over end of pawls) and secure.

NOTE: After assembly check to be sure pawl return springs remained properly positioned by moving tip of pawl outward and release. If pawl does not return to disengaged position remove friction plate and repeat steps 5 thru 8.

9. Fasten handle to rope with knot, then apply preload to return spring by placing rope in notch of recoil reel and rotate reel counter-clockwise until handle retracts into housing. (See Figure 3-78.)

10. Pull starter handle and check starter assembly for proper operation.

Installation

NOTE: Before bolts are tightened pull slightly on starter rope to engage pawls, then tighten bolts securely.

1. Secure starter assembly to engine using three hex head bolts.

2. Insert starter rope through guide in chassis. Pull starter a few times and observe starter operation.

Stator Assembly

Removal

NOTE: Remove engine assembly from chassis. Refer to Engine Removal Flow Chart or follow procedure for Engine Removal.

1. Remove recoil starter.

2. Using hammer and chisel, bend washer tab securing flywheel nut outward.

3. Unscrew flywheel nut. Insert a bar through slots in starter pulley cup to prevent flywheel from rotating. (See Figure 3-79.)

4. Remove starter cup and fan belt drive pulley. (See Figure 3-80.)

5. Separate fan housing and engine plate from crankcase as an assembly by performing the following:

   a. Remove air shroud securing bolts from fan housing end only.

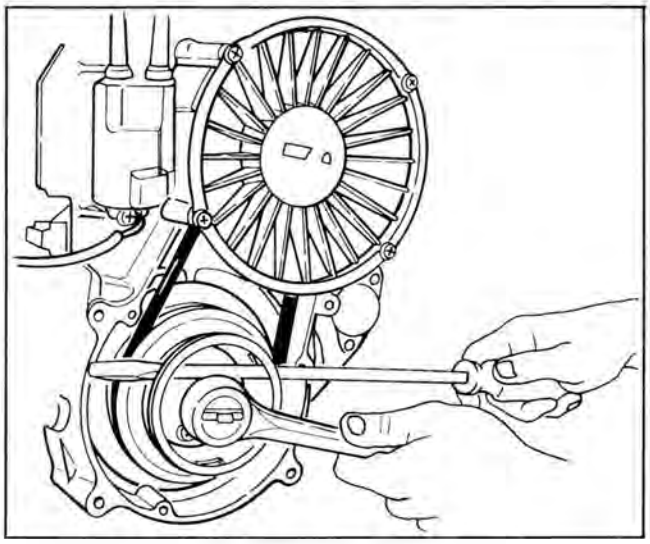


Figure 3-79



Figure 3-80

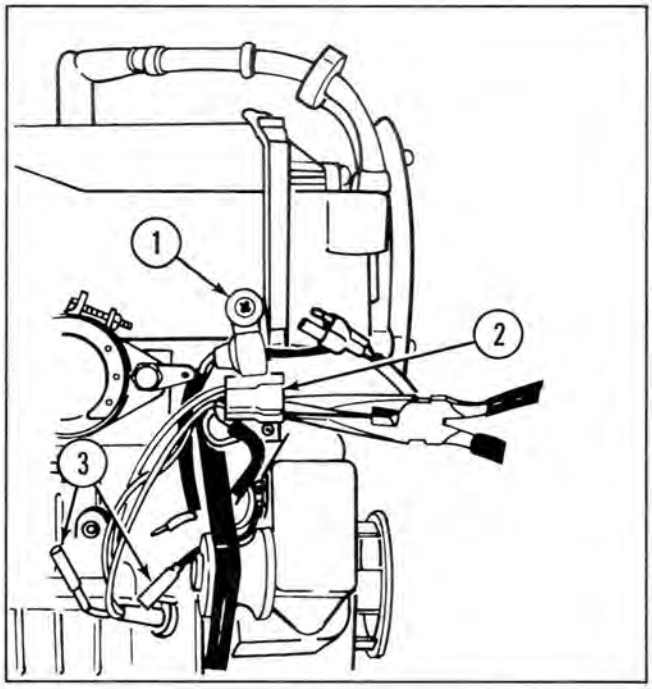
   b. Disconnect yellow and brown wires from engine connector using needle nosed pliers. (See Figure 3-81.)

   c. Separate red and white wire connectors between stator assembly and CDI igniter. (See Figure 3-81.)

   d. Remove nuts securing fan housing to crankcase. Use care not to lose washers. (See Figure 3-82.)

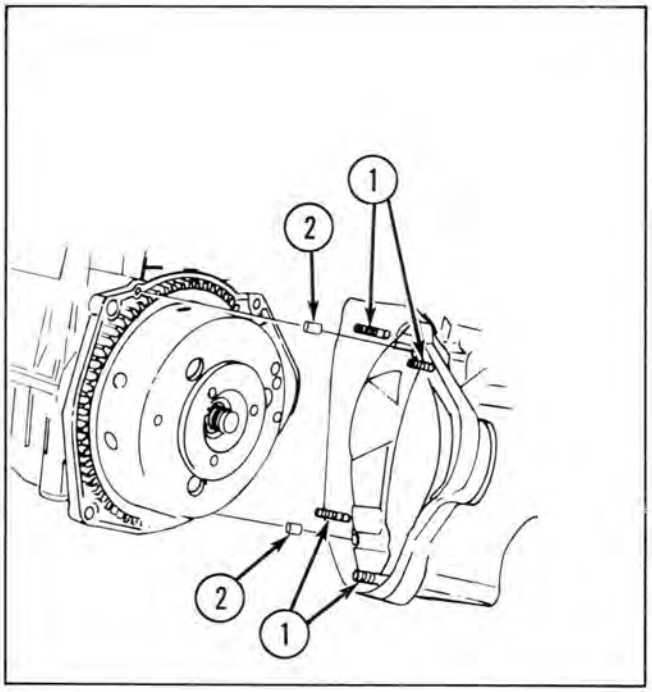
6. Bolt the flywheel puller (special tool P/N 57001-3509) to flywheel with the three flywheel puller bolts (P/N 110P0620). Pull flywheel, remove the puller, then examine flywheel keyway for damage. (See Figure 3-83.)

7. Scribe a mark on the stator plate and the crankcase boss for proper indexing during reassembly. (See Figure 3-84.)



1. Fan Housing End Shroud Bolts
2. Engine Connector
3. Red and White Wires

Figure 3-81



1. Fan Housing Mounting Studs (4)
2. Engine Plate Dowel Pins (2)

Figure 3-82

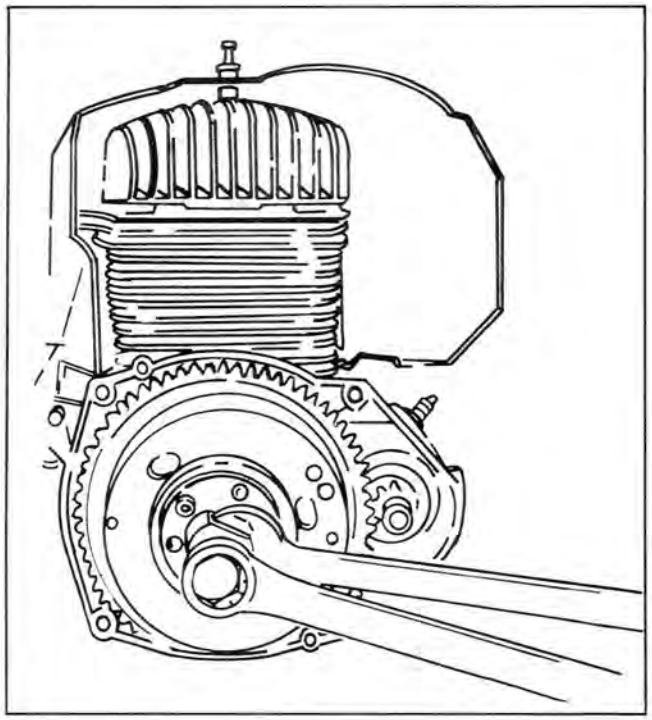


Figure 3-83



1. Scribe Mark

Figure 3-84

8. Remove the two screws securing the stator plate to the crankcase. (See Figure 3-85.)



Figure 3-85

9. Remove the stator plate. (See Figure 3-86.)



Figure 3-86

Disassembly

Refer to Figure 3-87 for disassembly sequence of magneto components.

Inspection

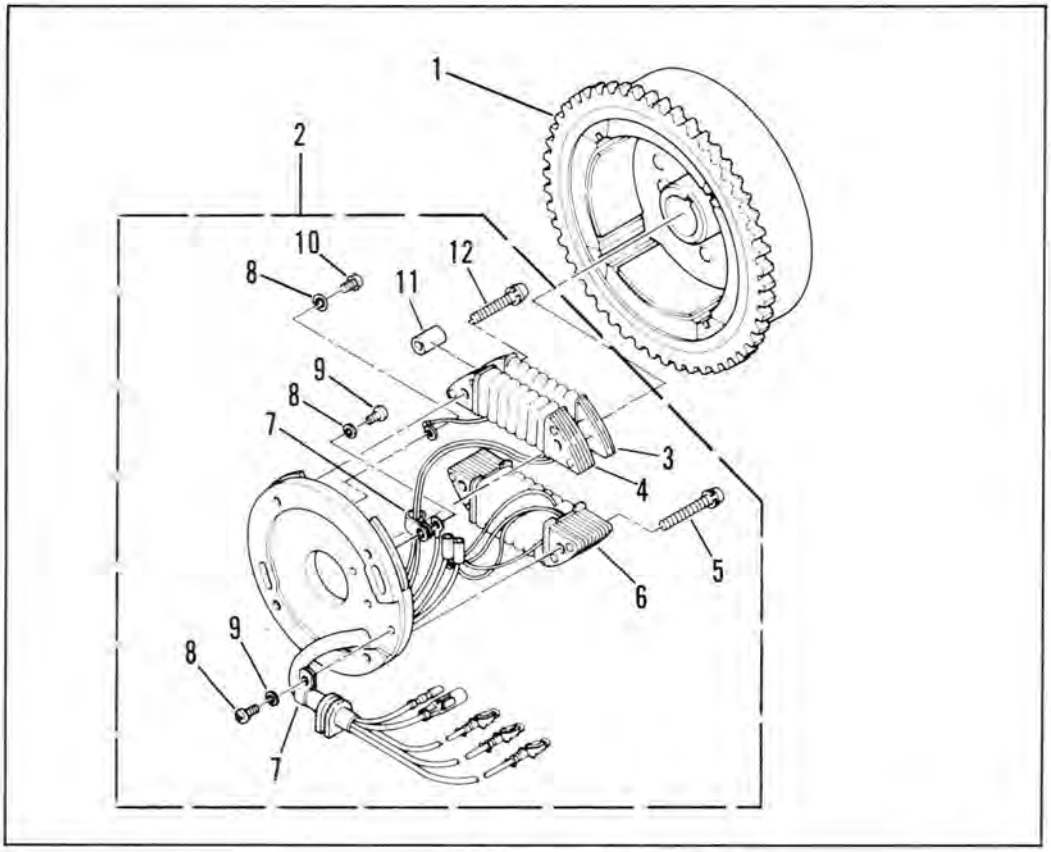
1. Check woodruff key for damage.
2. Check magnets in flywheel assembly. Thoroughly clean magnet area to remove any metal filings or particles that the magnets might have attracted.
3. Perform a visual check of all wires for frayed condition.

Reassembly

Reinstall all components removed from the stator plate. (See Figure 3-87.) Tighten all screws securely. Be sure connections are clean and tight.

Installation

1. Reassemble stator assembly to crankcase. Be sure to align marks between stator assembly and crankcase made during removal. If these marks are not aligned ignition timing will be incorrect and may result in engine damage. Torque the two screws to 5 ft lb (0.7 kg-m).
2. Install woodruff key into crankshaft. Check wire routing to insure grommet is properly located in the crankcase. If the grommet is not in place, the wires can be rubbed by the flywheel or pinched during assembly.
3. Position flywheel onto crankshaft by aligning keyway in flywheel with key in crankshaft. Check for correct stator reassembly by rotating flywheel by hand to detect rubbing or scraping. Flywheel must rotate without binding.



1. Flywheel
2. Stator Assembly
3. Pulser Coil
4. Exciter Coil
5. Pan Head Screw
6. Lighting Coil
7. Clamp
8. Spring Washer
9. Pan Head Screw
10. Pan Head Screw
11. Coil Spacer Collar
12. Pan Head Screw

Figure 3-87

4. Retain flywheel in correct position by installing washer and turning flywheel nut finger tight.

5. Install fan housing and engine plate to crankcase by performing the following:

   a. Be sure dowel pins are positioned in fan housing. (See Figure 3-82.)

   b. While installing fan housing, guide dowel pins into crankcase holes and be sure to push rubber seal on intake side shroud behind fan housing. (See Figure 3-82.)

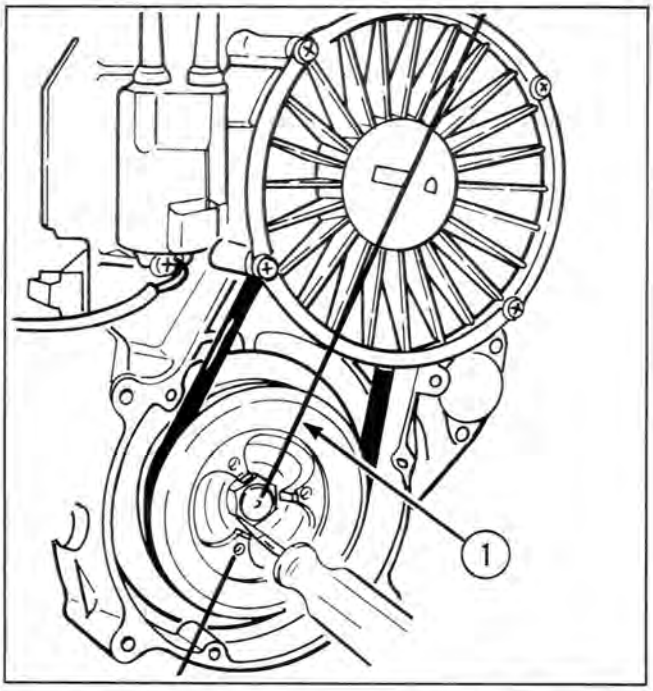
   c. Install washers and tighten fan housing mounting nuts.

   d. Install bolts securing air shroud at fan housing end. (See Figure 3-81.)

   e. Insert yellow and brown wires into engine connector. Match colors with main harness half of connector to determine proper wire location. (See Figure 3-81.)

   f. Secure red and white wire connectors between CDI igniter and stator assembly.

6. Install fan belt drive pulley using a screwdriver to pry pulley into position. Align hole in pulley with centerline of crankshaft and fan shaft as shown to simplify installation effort. (See Figure 3-88.)



1. Centerline of Crankshaft and Fan Shaft

Figure 3-88

7. Install starter pulley cup and tighten mounting screws.

8. Torque flywheel nut to 60 ft lb (8.3 kg-m) then bend tab on lockwasher against nut to prevent loosening.

9. Mount recoil starter assembly. Pull starter rope and listen for scraping sound which indicates incorrect assembly or alignment.

10. Install engine assembly into chassis. Refer to Engine Installation.

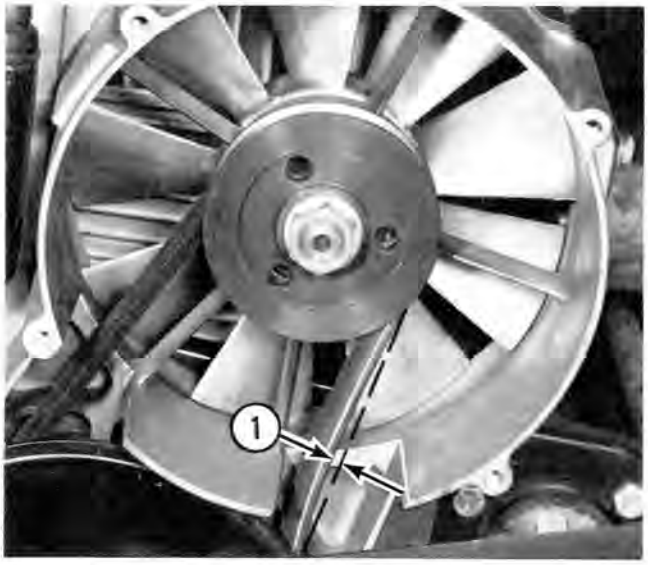
11. Perform ignition timing check.

Fan Belt Tension

Check fan belt tension by measuring belt deflection with 11 pounds (5 kg) force applied to belt. Correct belt deflection should be 5/32 in. (4.0 mm). (See Figure 3-89.) If adjustment is required remove the fan pulley nut, and outside half of pulley. (See Figure 3-90.) Add or remove spacers between fan pulley halves until correct measurement is obtained. Removing spacers will increase belt tension.

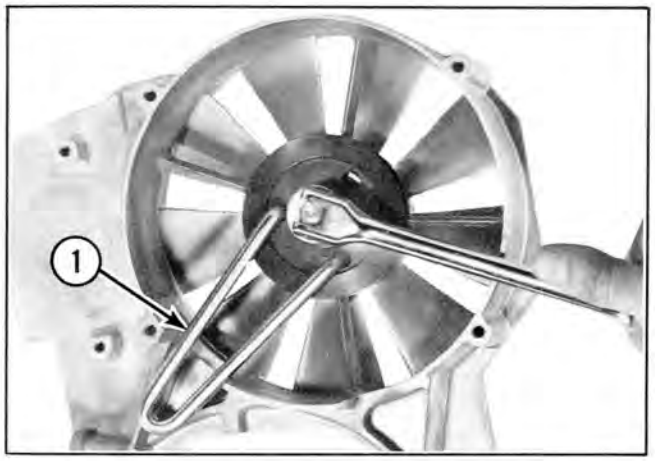
CAUTION

To prevent fan belt damage, remove spark plugs and rotate engine crankshaft while torquing outer pulley mounting nut.



1. 5/32 in. (3.969 mm) Deflection

Figure 3-89



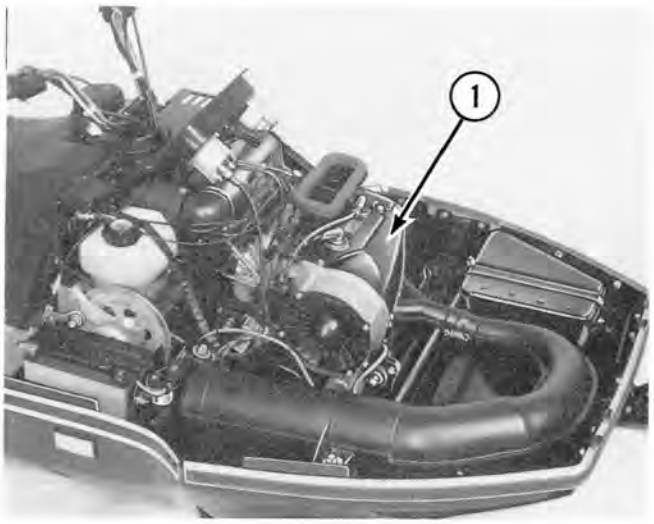
1. Fan Pulley Holder Tool No. 57001-3506

Figure 3-90

Air Shrouds

Removal

1. Remove bolts, washers and intake and exhaust shroud plates securing upper shroud to engine. Note that each mounting hole in the air shroud has a collar.

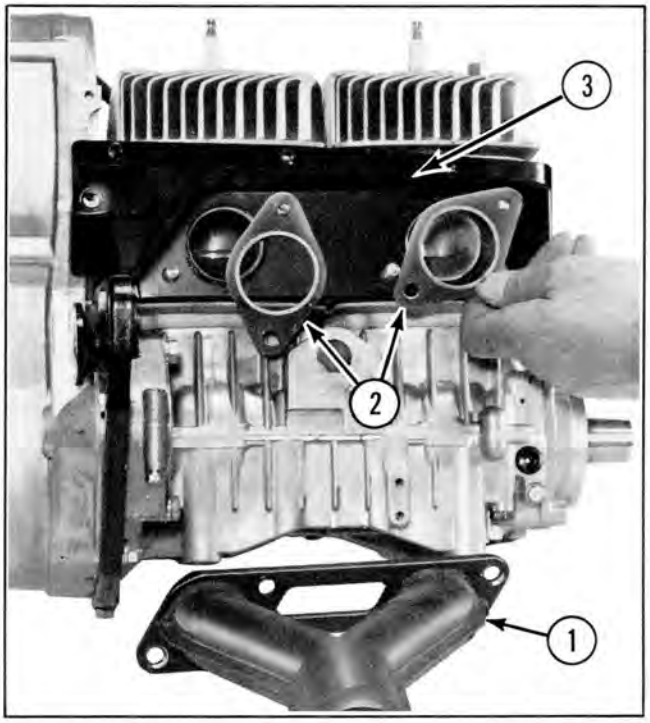


1. Upper Air Shroud

Figure 3-91

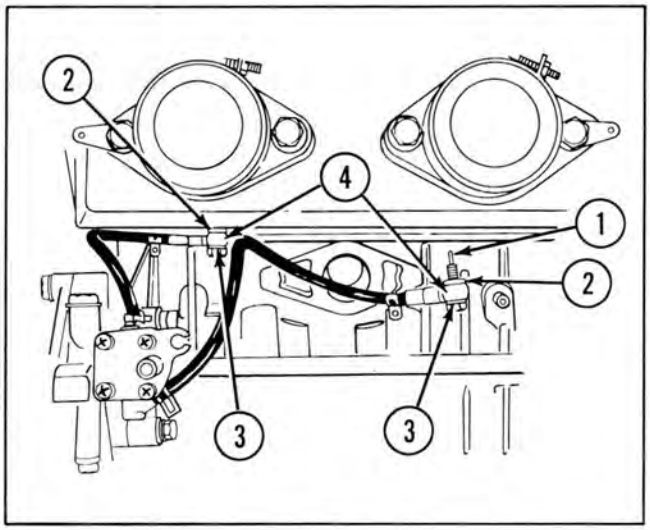
2. Remove four nuts and lockwashers securing exhaust manifold, gaskets and exhaust air shroud to engine. (See Figure 3-92.) Discard gaskets.

NOTE: Remove the oil injection nozzles from each cylinder. If the engine will be disassembled for a long period of time, cover the nozzles with a plastic bag or other suitable cover to prevent foreign matter from entering the system. (See Figure 3-93.)



1. Exhaust Manifold
2. Gaskets
3. Exhaust Air Shroud

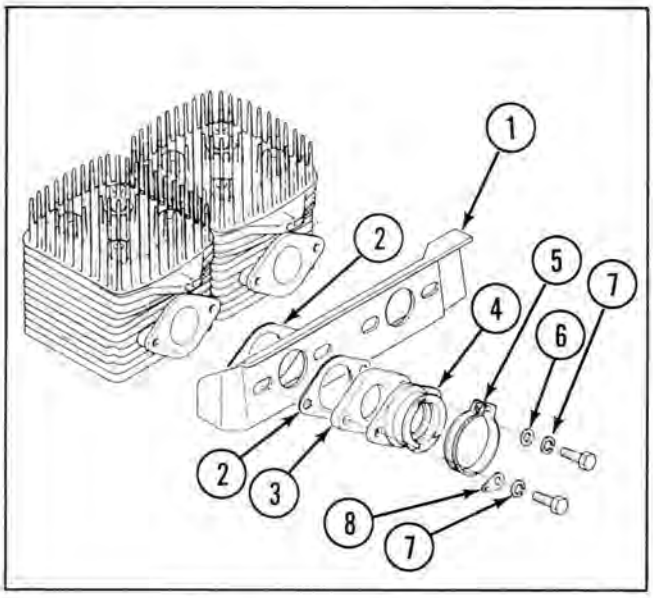
Figure 3-92



1. Nozzle
2. Thick Gasket
3. Thin Gasket
4. Banjo Fitting

Figure 3-93

3. Remove four bolts and washers securing carburetor holders, insulator blocks, gaskets and intake air shroud to engine. Discard gaskets. (See Figure 3-94.)



1. Intake Air Shroud
2. Gaskets
3. Insulator Block
4. Carburetor Holder
5. Carburetor Holder Clamp
6. Plain Washer
7. Spring Washer
8. Silencer Spring Washer

Figure 3-94

Inspection

1. Thoroughly clean air shrouds in a solvent and blow dry using compressed air.

2. Inspect air shrouds for cracks, distortion or rust.

3. Check carburetor holders and exhaust manifolds for cracks. Check gasket surfaces and clean using a scraper.

Installation

1. Reassemble air shrouds, and exhaust manifold to engine. Using new gaskets, assemble one on each side of exhaust air shroud. Secure using hardware previously removed. Torque exhaust manifold mounting nuts 8 to 10 ft lb (1.11 to 1.38 kg-m).

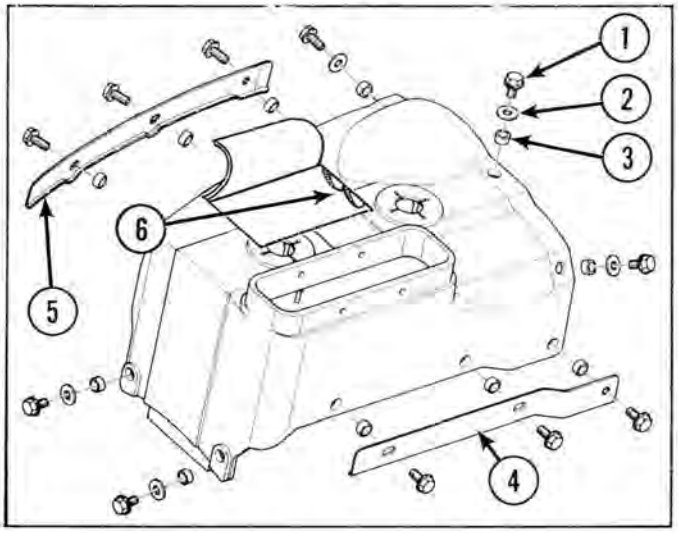
2. Position new gaskets on each side of intake shroud. Use silicone sealer to hold gaskets to shroud during assembly. (See Figure 3-94.)

3. Install insulator blocks and carburetor holders with bolts and washers in the sequence shown. (See Figure 3-94.)

4. Torque carburetor holder mounting bolts to 45 in. lb (0.5 kg-m).

5. Install upper air shroud. Fit internal shroud dampeners into cylinder cooling fins. Position collars in shroud mounting holes and install retaining bolts, washers and shroud plates. (See Figure 3-94A.)

6. Secure oil injection nozzles to each cylinder. Be sure thick and thin gaskets are positioned in sequence shown to insure adequate clearance between banjo fitting and intake shroud. (See Figure 3-93.)



1. Bolt
2. Washer
3. Collar
4. Intake Shroud Plate
5. Exhaust Shroud Plate
6. Shroud Dampeners

Figure 3-94A

Fan Housing

Disassembly

NOTE: Remove engine assembly from chassis. Refer to Engine Removal Flow Chart or follow procedure for Engine Removal.

1. Remove recoil starter.

2. Remove starter cup and fan belt drive pulley. (See Figure 3-80.)

3. Separate fan housing and engine plate from crankcase as an assembly by performing the following:

   a. Remove air shroud securing bolts from fan housing end only.

b. Disconnect yellow and brown wires from engine connector using needle nosed pliers. (See Figure 3-81.)

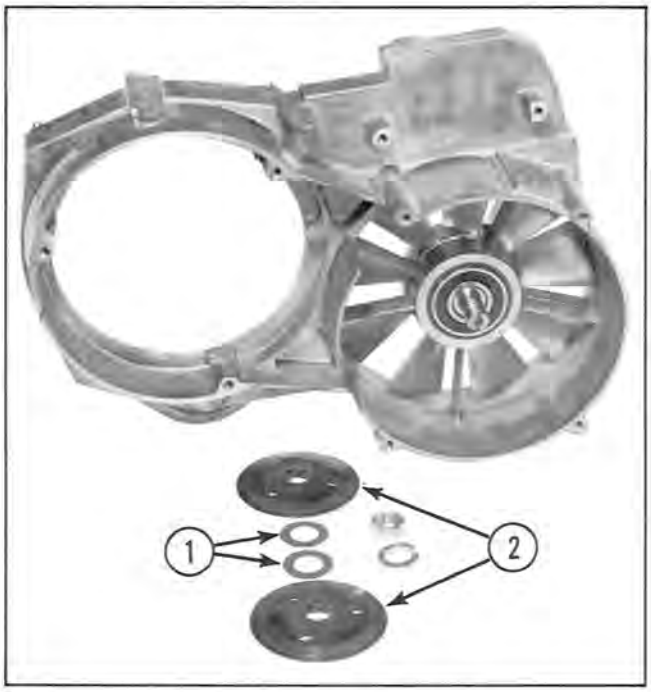
c. Separate red and white wire connectors between stator assembly and CDI igniter. (See Figure 3-81.)

d. Remove nuts securing fan housing to crankcase. Use care not to lose washers. (See Figure 3-82.)

4. Using fan pulley holder tool No. 57001-3506 remove nut and washer securing fan assembly to fan housing. (See Figure 3-90.)

5. Remove fan pulley halves and spacers from fan shaft. (See Figure 3-95.)

NOTE: Spacers are used between the fan pulley halves to adjust fan belt tension. Using fewer spacers increases fan belt tension.



1. Belt Tension Spacers
2. Pulley Halves

Figure 3-95

6. Using a heat gun or propane torch, heat aluminum fan case allowing bearings to be removed from fan case.

WARNING

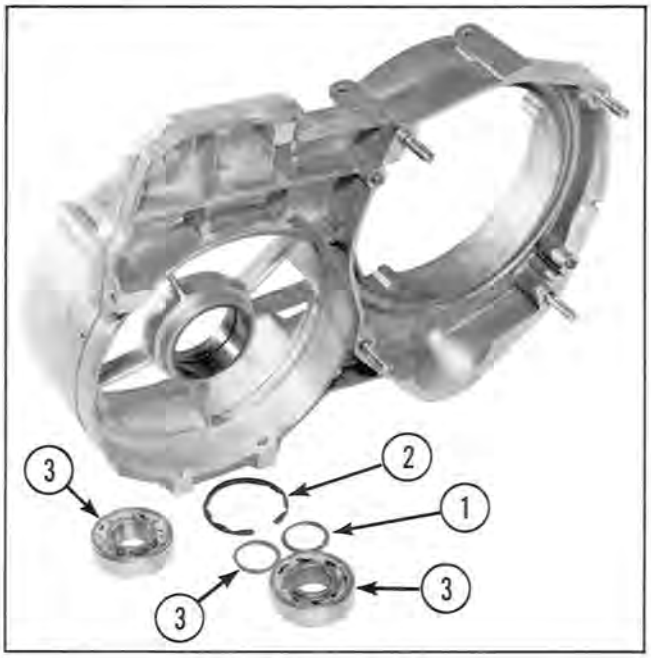
Do not contact heated fan housing with bare hands or severe burn could result.

7. Using Tru-Arc or circlip pliers remove circlip and two spacers from fan housing. (See Figure 3-96.)

NOTE: Circlip is used to correctly position bearings. Spacers are installed between bearings to eliminate side loads when shaft nut is tightened.

Inspection

1. Inspect fan housings for cracks or distortion.
2. Check bearings for discoloration and wear.
3. Check fan belt for excessive wear.
4. Check cooling fan assembly for missing or damaged blades.
5. Check threads on all mounting studs for damage.



1. Spacers (2)
2. Circlip
3. Bearings

Figure 3-96

Reassembly

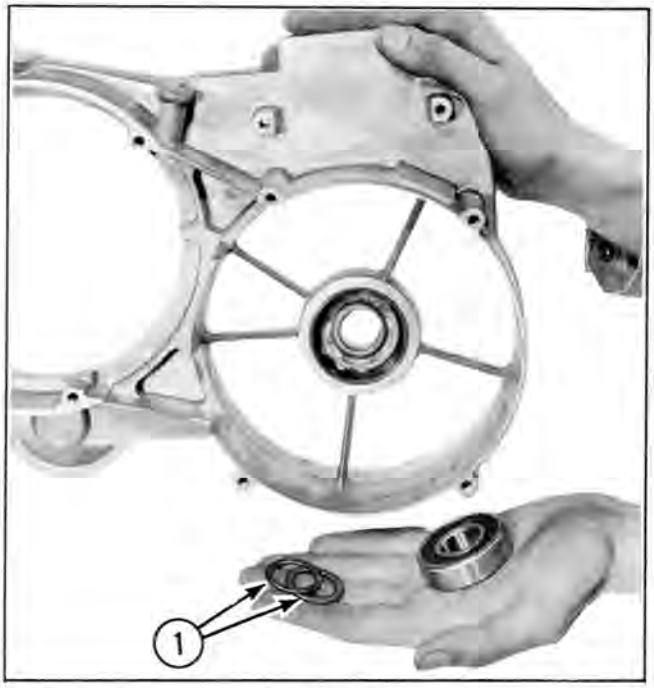
1. Install circlip in fan housing.
2. Using a heat gun or propane torch heat aluminum fan case housing and insert bearing on fan side first, insert fan, install spacers, and then the second bearing.

NOTE: Insert two spacer washers between bearings to eliminate side loads when shaft nut is tightened. (See Figure 3-97.)

3. Attach inner pulley half to fan shaft. Assemble same number of spacer washers to shaft as previously removed then install outer pulley half to shaft. Secure pulley halves to shaft using washer and nut. Torque to 60 ft lb (8.3 kg-m).

4. Install fan housing and engine plate to crankcase by performing the following:

   a. Be sure dowel pins are positioned in fan housing. (See Figure 3-82.)



1. Spacers

Figure 3-97

   b. While installing fan housing, guide dowel pins into crankcase holes and be sure to push rubber seal on intake side shroud behind fan housing. (See Figure 3-82.)

   c. Install washers and tighten fan housing mounting nuts.

   d. Install bolts securing air shroud at fan housing end. (See Figure 3-81.)

   e. Insert yellow and brown wires into engine connector. Match colors with main harness half of connector to determine proper wire location. (See Figure 3-81.)

   f. Secure red and white wire connectors between CDI igniter and stator assembly.

5. Install fan belt drive pulley using a screwdriver to pry pulley into position. Align hole in pulley with centerline of crankshaft and fan shaft as shown to simplify installation effort. (See Figure 3-88.)

6. Install starter pulley cup and tighten mounting screws.

7. Check fan belt tension. Refer to Fan Belt Tension procedure.

8. Secure recoil starter. Pull starter rope and listen for scraping sound which indicates incorrect assembly or alignment.

9. Reinstall engine into chassis. Refer to Engine Installation procedure.

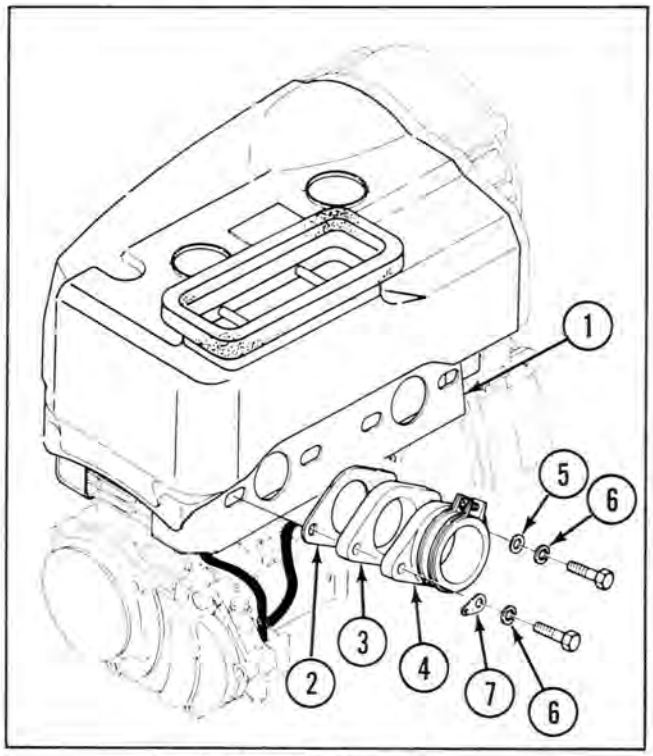
Carburetor Holders

Removal

1. Remove silencer assembly from carburetors as described under silencer removal.

2. Separate carburetors from holders by loosening clamp screw.

3. Unscrew the two bolts securing each carburetor holder to the cylinders. (See Figure 3-98.)



1. Intake Air Shroud
2. Gasket
3. Insulator Block
4. Carburetor Holder
5. Plain Washer
6. Spring Washer
7. Silencer Spring Washer

Figure 3-98

4. Remove carburetor holders, insulator blocks and gaskets from intake side air shroud. (See Figure 3-98.)

Inspection

Inspect the carburetor holders for cracks or deterioration. Replace if necessary.

Installation

1. Position the carburetor holder, insulator blocks and gaskets onto the air intake shroud. Secure with the two bolts and washers previously removed. Be sure the air silencer spring retaining washers are located on the outside bolt of each carburetor holder. (See Figure 3-98.)

2. Tighten bolts to torque specified in Section 1.

3. Reinstall carburetors into rubber holders. Position carburetors so float bowls do not touch front frame and tighten clamp screw.

4. Follow procedure for Carburetor and Oil Pump Synchronization as described in Section 2.

Cylinder Heads, Cylinders And Pistons

Cylinder Heads

REMOVAL

1. Remove air shrouds. Refer to Air Shroud Removal procedure.

2. Remove eight nuts, lockwashers and washers securing cylinder heads to cylinders. Carefully remove cylinder heads and gaskets. Discard gaskets. (See Figure 3-99.)

INSPECTION

1. Remove excessive carbon from inside cylinder head using a nonferrous carbon scraper.

2. Inspect cooling fins for damage.

3. Wash cylinder head in solvent and blow dry using compressed air.

4. Place a straight edge across the gasket surface of the head to detect any warpage. Measure in several spots. If slight distortion is present it can be corrected by using No. 400 sandpaper on a surface plate and rubbing head in a circular motion to remove high spots.

NOTE: Dull spots (unsanded areas) indicate low portions or warpage.

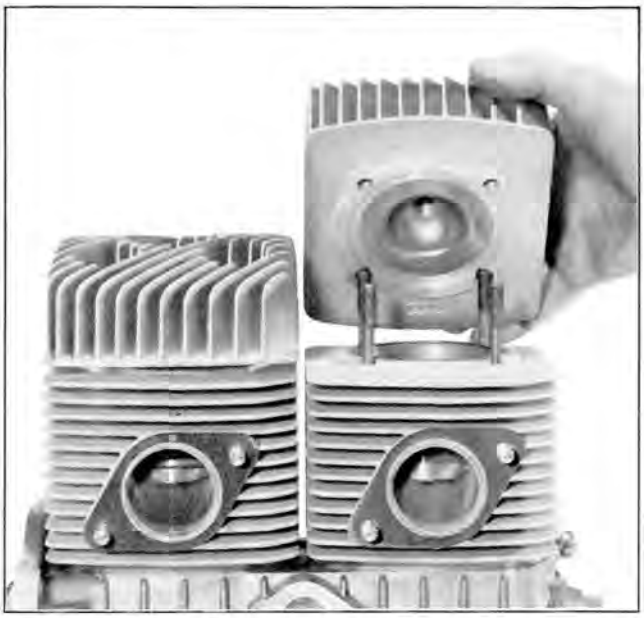


Figure 3-99

Cylinders

REMOVAL

1. Remove the cylinders as shown in Figure 3-100. Using a mallet gently tap bottom of cylinder to allow for easy removal of the cylinder. Mark each cylinder left or right to allow for proper reassembly.

NOTE: It is advisable to place a clean rag beneath the piston. This will prevent any carbon or broken part from falling into the crankcase.



Figure 3-100

2. Carefully remove cylinders from crankcase studs. Hold piston during cylinder removal to prevent piston from suddenly contacting studs or crankcase. (See Figure 3-101.)

3. Remove and discard cylinder base gaskets.

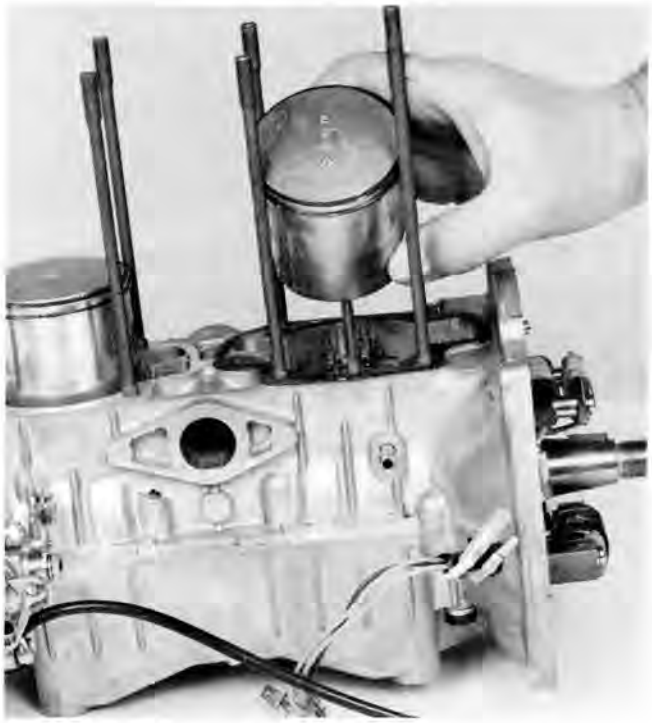


Figure 3-101

INSPECTION

1. Check all cooling fins and remove any obstruction.

2. Thoroughly clean all carbon deposits from the exhaust ports and cylinder walls.

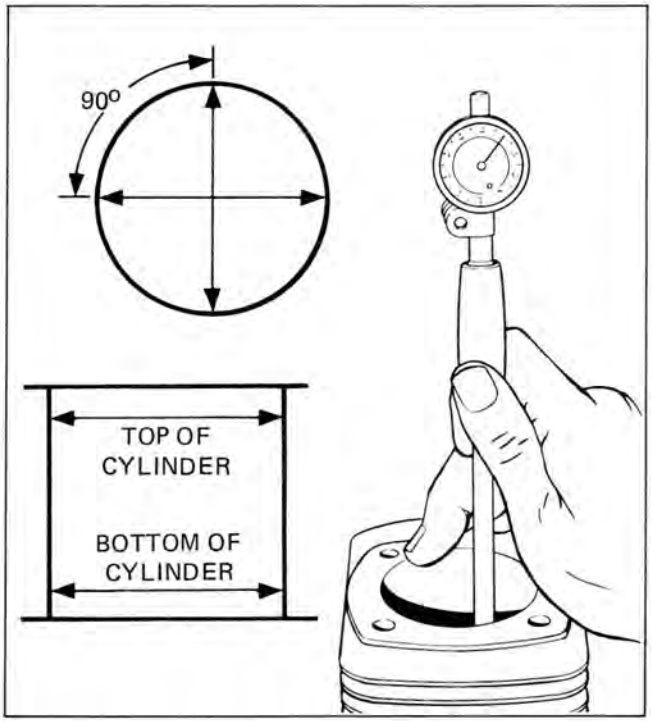
3. Check the cylinder wall for excessive scoring.

4. Using a dial bore gauge check the cylinder bore for wear. If the cylinder diameter exceeds the dimension shown under Service Limit in Figure 3-102, replace the cylinder.

To check for out of round of the cylinder bore move the bore gauge in a circular direction, 90° at a time. The difference in measurements obtained should not exceed 0.002 in. (0.05 mm).

To check for taper of the cylinder bore, move the bore gauge from the top to the bottom of the cylinder. The difference in the measurements obtained (between top and bottom) should not exceed 0.002 in. (0.05 mm).

NOTE: The cylinders in this engine are aluminum with chrome plated bores. They cannot be honed or rebored.



CYLINDER BORE DIAMETER TOLERANCES

Standard (New)	Service Limit (Used)
2.6774 - 2.6781 inch (68.005 - 68.023 mm)	2.681 inch (68.10 mm)

Figure 3-102

Piston

REMOVAL

1. Mark one of the pistons to ensure that it will be reinstalled into the same location during reassembly.

2. With a small scribe or screwdriver, remove the piston pin retainers.

3. Push the pin out of the piston. If a burr was formed during removal of the pin retainers it will be necessary to use the piston pin puller listed under special tools.

4. Remove piston from connecting rod.

5. Remove the needle bearings from the small connecting rod end.

6. Remove the piston ring from the piston by spreading it open with your fingers and lifting off the piston.

INSPECTION

1. Remove all carbon from piston dome, ring groove and piston skirt.

NOTE: If piston dome or skirt is scored or damaged replace the piston and piston ring.

2. Check the piston-to-cylinder wall clearance. Measure the smallest inside diameter of the cylinder bore. Using a micrometer measure the largest outside diameter of the piston. Place micrometer 0.4 in. (10 mm) above the bottom of the piston skirt. (See Figure 3-103.) If the difference in the measurements obtained is less than 0.002 in. (0.05 mm) or more than 0.004 in. (0.10 mm) replace the piston. If the piston skirt is less than the Service Limit listed in Figure 3-103 replace the piston.



PISTON SKIRT DIAMETER TOLERANCES

Standard (New)	Service Limit (Used)
2.6744 - 2.6752 in. (67.929 - 67.950 mm)	2.670 in. (67.82 mm)

Figure 3-103

3. Measure the diameter of the piston pin at the center and near the end. If the dimensions measured is less than the Service Limit shown in Figure 3-104 replace the piston pin.

4. Measure the piston pin bore diameter. If the dimension measured exceeds the Service Limit given in Figure 3-105, replace the piston.



PISTON PIN DIAMETER TOLERANCES

Standard (New)	Service Limit (Used)
0.6297 - 0.6299 in. (15.994 - 16.000 mm)	0.628 in. (15.96 mm)

Figure 3-104



PISTON PIN BORE DIAMETER TOLERANCES

Standard (New)	Service Limit (Used)
0.6299 - 0.6301 in. (15.999 - 16.005 mm)	0.633 in. (16.08 mm)

Figure 3-105

5. Measure the connecting rod small end bore diameter with an inside micrometer. If the diameter is larger than the Service Limit shown in Figure 3-106 replace the crankshaft and connecting rod assembly.



CONNECTING ROD SMALL END BORE DIAMETER TOLERANCES

Standard (New)	Service Limit (Used)
0.7875 - 0.7880 in. (20.003 - 20.015 mm)	0.789 in. (20.05 mm)

Figure 3-106

6. Check piston ring gap by inserting piston ring into cylinder horizontally. Insert a feeler gauge in the opening between the ends of the piston ring. (See Figure 3-107.) If maximum ring gap exceeds the Service Limits when measured at the top and the bottom of the cylinder bore, replace the rings.

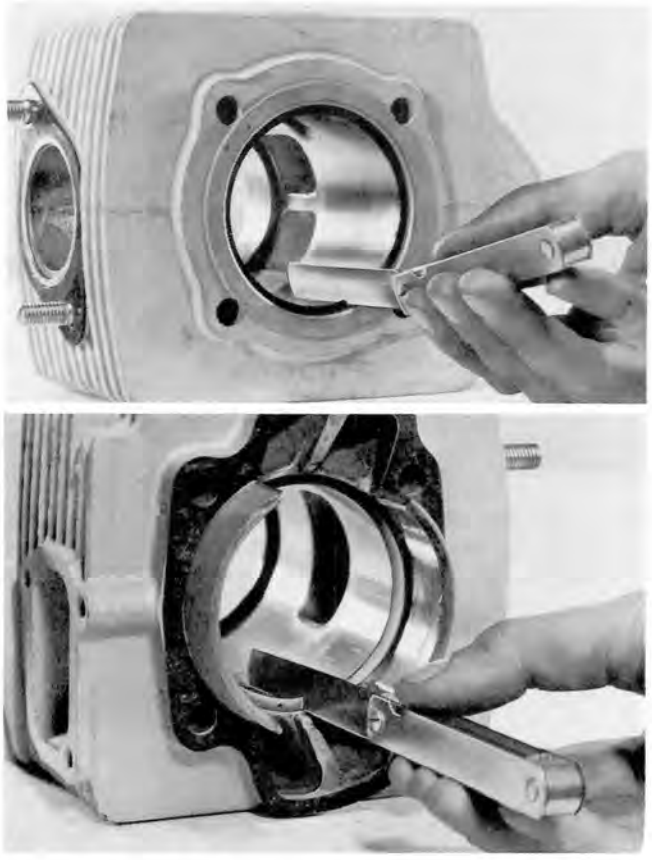
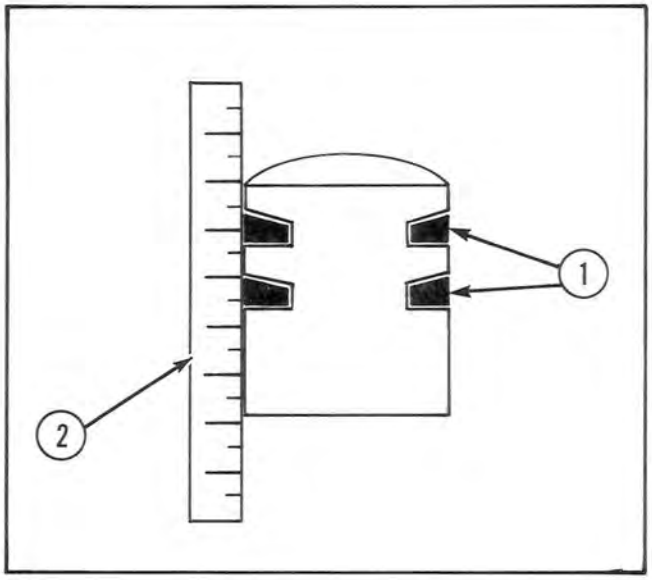


Figure 3-107

PISTON RING END GAP (RING WIDTH) UPPER AND LOWER RING WIDTH TOLERANCES

Standard (New)	Service Limit (Used)
0.008 - 0.016 in. (0.2 - 0.4 mm)	0.028 in. (0.7 mm)

7. When installing new piston rings, assure that the correct ring type is being used. Install the rings on the piston with the ring end gaps positioned over the ring alignment pins. Hold a straightedge as shown. Verify that the rings will fit flush with the piston outside diameter. (See Figure 3-108.)



1. Keystone Rings
2. Straightedge

Figure 3-108

REASSEMBLY

1. Install the piston rings on the piston. The rings are keystone type and have a wedge-shaped cross section. Position the ring end gaps over the alignment pins in the piston ring grooves. (See Figure 3-108.)

NOTE: These rings are very fragile and should be handled accordingly.

2. Assemble bearings to upper connecting rod ends. Lubricate bearings with Kawasaki Snowmobile Oil.

3. Attach piston and ring assemblies to connecting rods and insert piston pins. Secure piston pins with piston clips. (See Figure 3-109.)

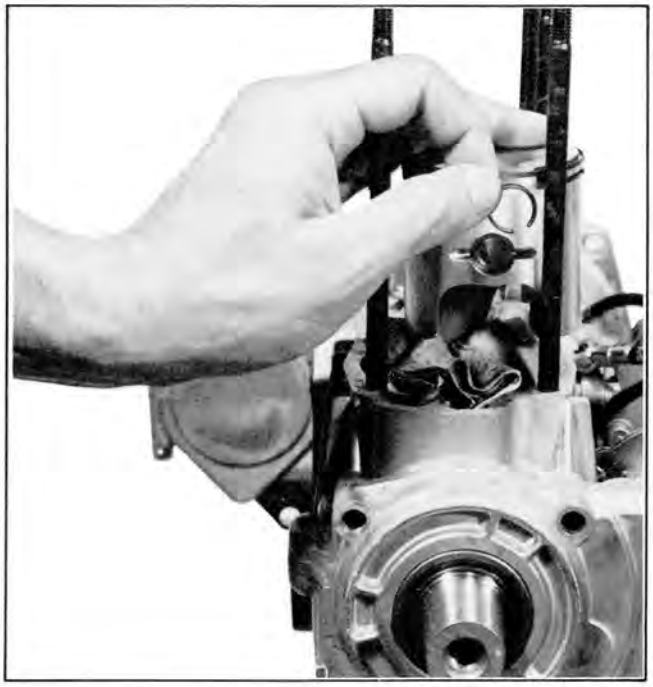


Figure 3-109

NOTE: Install the pistons with the letter E and the arrow mark to the exhaust side (front) of the engine. (See Figure 3-110.)

4. Install new cylinder base gaskets on the crankcase.

5. Lubricate the cylinder bores with Kawasaki Snowmobile Oil.

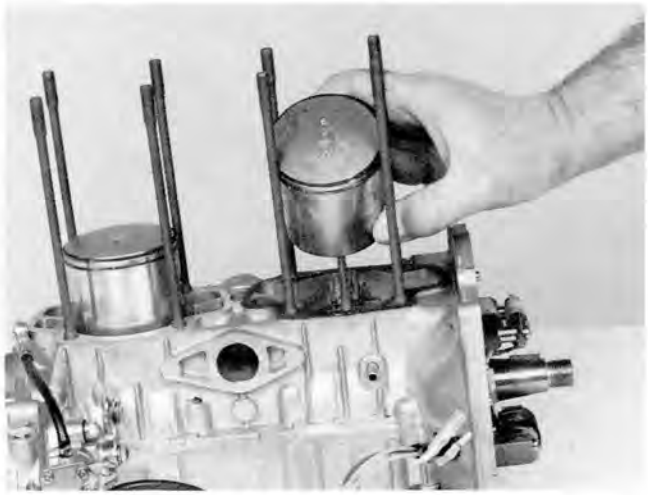


Figure 3-110

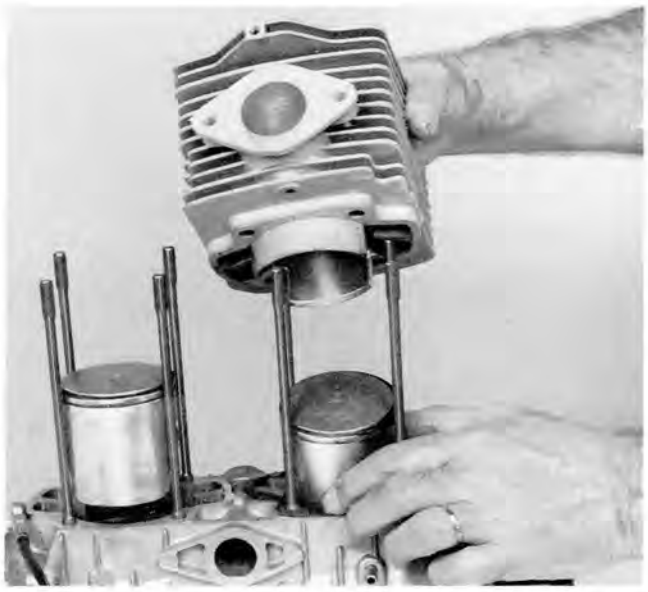
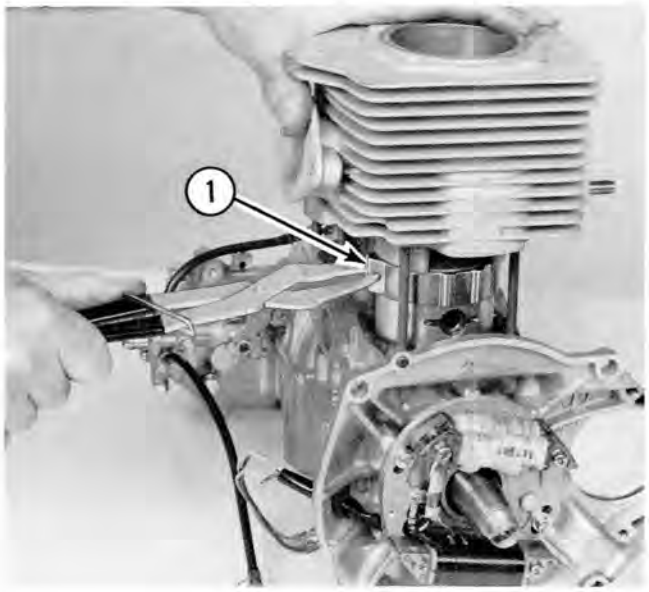


Figure 3-111

6. Lubricate the pistons, big end bearings of connecting rod, and rings with Kawasaki Snowmobile Oil. Match up the match marks scribed into the crankcase and cylinders before disassembly. (See Figure 3-111.) With the appropriate ring compressor install the cylinders. Be sure that the intake port of the cylinder is facing the rear of the crankcase. (See Figure 3-112.)

NOTE: Check for broken rings after cylinder is installed. Push on the ring with your thumb through the exhaust port if the ring springs back the ring is okay.



1. Ring Compressor

Figure 3-112

7. Install a new cylinder head gasket. (See Figure 3-113.)
8. Install the cylinder heads. Do not torque the head nuts at this time.
9. Install cylinder head nuts. Align the cylinders by placing a straight edge across the exhaust ports. Torque the nuts to 16 ft lb (2.2 kg-m). Torque the cylinder head nuts in 1/3 increments of the above torque using a crosscross pattern. (See Figure 3-114.)
10. Install the air shrouds and carburetor holders as described earlier in this section.

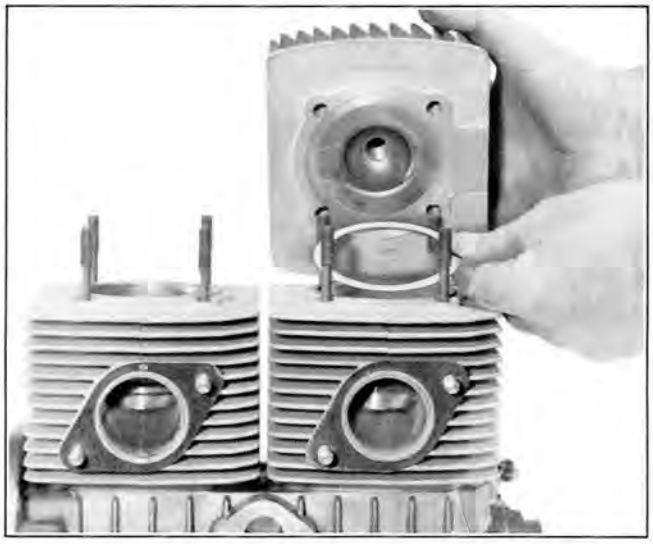


Figure 3-113

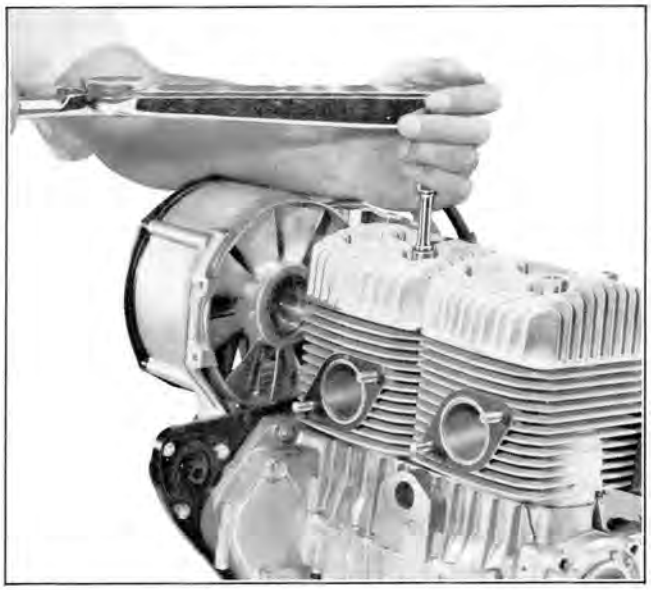


Figure 3-114

11. Install oil injection nozzles to each cylinder and perform procedure for Check Valve (Banjo Fitting) Inspection described in Section 3 to insure proper cylinder lubrication during operation.
12. Perform Crankcase Pressure Test procedure as described in Section 2.

NOTE: After reassembly operate the engine on premixed fuel/oil to insure adequate lubrication following rebuild. The recommended 40 to 1 gasoline-to-oil ratio is obtained by thoroughly mixing 1 pint (0.47 liter) of Kawasaki Snowmobile Oil with 5 gallons (18.9 liters) of gasoline. Pre-mixing gasoline and oil will no longer be required after the initial five gallons of gasoline and oil mix have been consumed.

CAUTION

After completing engine rebuild, perform procedure for Oil Injection System Bleeding.

Oil Injection System

Oil Pump Output Test

1. For this test it is necessary to run engine using premixed fuel and oil at a 40 to 1 ratio. To obtain the 40 to 1 ratio, thoroughly mix 1 pint (0.47 liter) of Kawasaki Snowmobile Oil with 5 gallons (18.9 liters) of gasoline.

2. Disconnect oil pump outlet tubes at oil pump fittings.

3. Install one end of 24 in. (610 mm) length of test tubing on oil pump fitting and insert other end into calibrated container capable or measuring approximately 5 cc.

NOTE: Use separate container and length of test tubing for each oil pump outlet fitting.

4. Secure oil pump lever at WIDE OPEN position, then start engine and adjust idle speed to 3000 RPM. Run engine long enough to purge test tubes (oil is discharged from outlet of tubes).

5. After purging the test tubes and securing the oil pump lever WIDE OPEN, start engine and operate at 3000 RPM for ONE MINUTE then stop engine and measure output from pump.

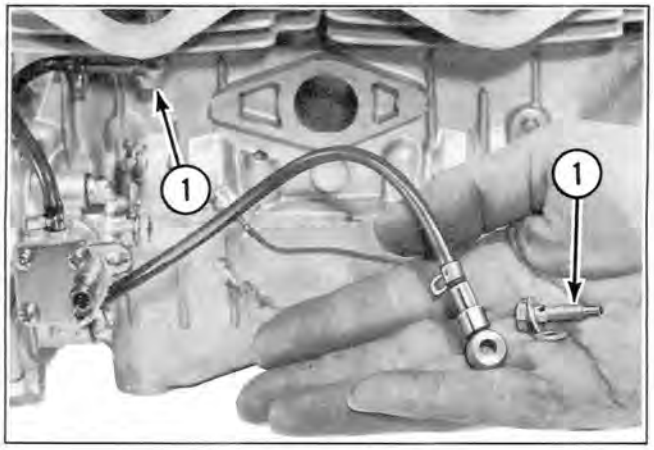
6. Oil pump output should be 3.35 to 4.06 cc from each tube.

7. Replace oil pump not meeting these specifications. If output is okay, remove test tubes and install correct output tubes to oil pump.

Disassembly

NOTE: Access to oil pump drive gear and mounting bolts requires engine removal. Refer to Engine Removal procedure or follow Flow Charts in Section 3.

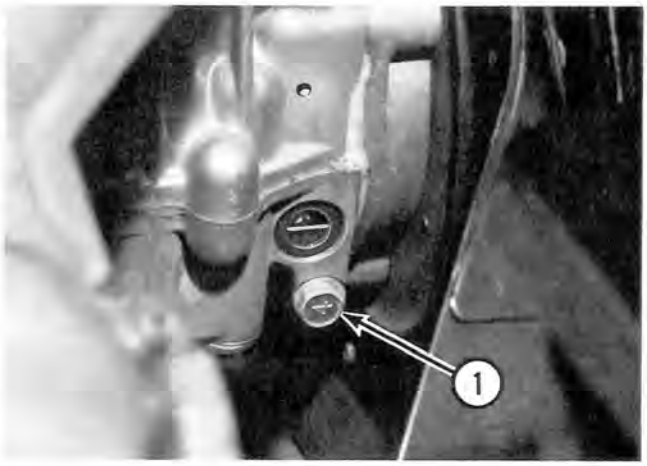
1. Remove the oil injection nozzles from the cylinders. (See Figure 3-115.)



1. Injection Nozzle

Figure 3-115

2. Remove the drain plug on the front of the gearcase and drain the case. (See Figure 3-116.)



1. Drain

Figure 3-116

3. Remove the bolts securing the gearcase cover to the crankcase and remove the gearcase cover. (See Figure 3-117.) Check to see if the small spacer used on the idler gear came off with the cover and if so, remove it so it will not become lost. (See Figure 3-117.)

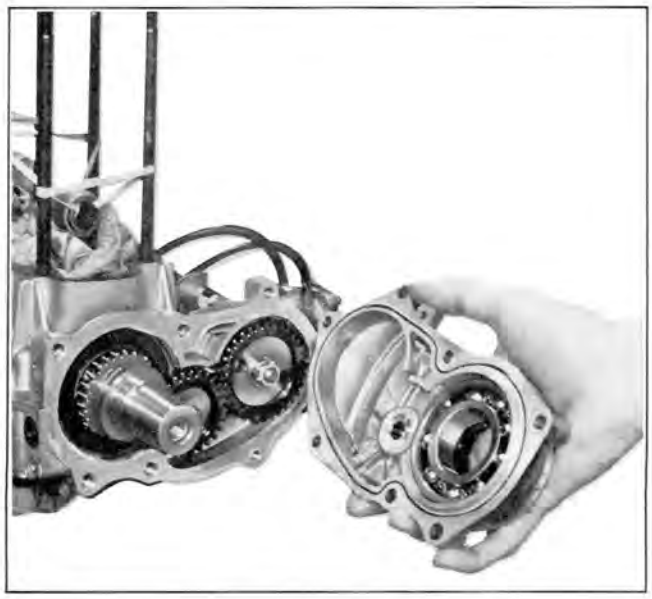
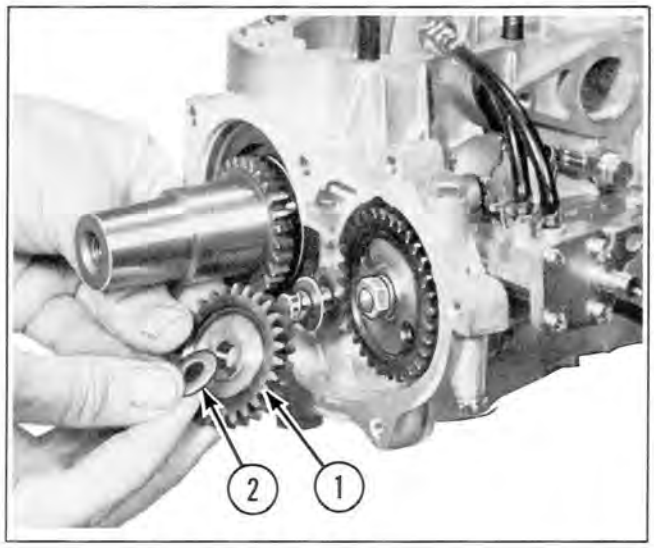


Figure 3-117

4. Remove the idler gear. Take care not to lose the spacer in back of the gear. (See Figure 3-118.)



1. Idler Gear
2. Spacer

Figure 3-118

5. Install the fan puller holder tool No. 57001-3506 into the two holes in the oil pump gear. Remove the nut securing the gear to the pump shaft and remove the gear.

6. Remove the two bolts securing the oil pump to the crankcase and remove the pump. (See Figures 3-119 and 3-120.)

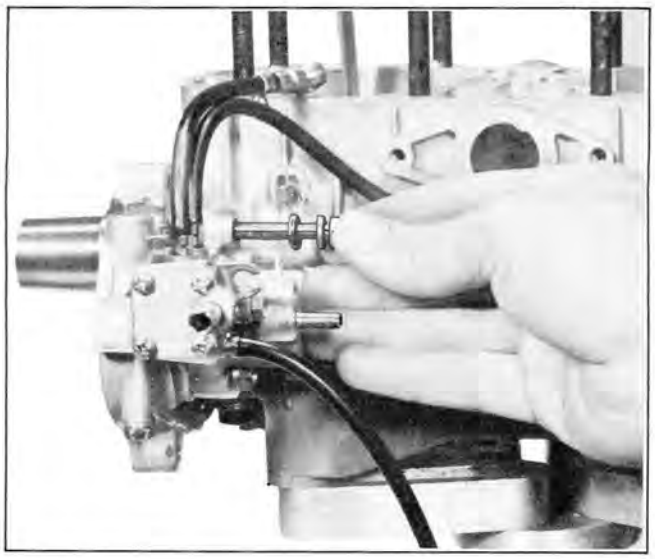
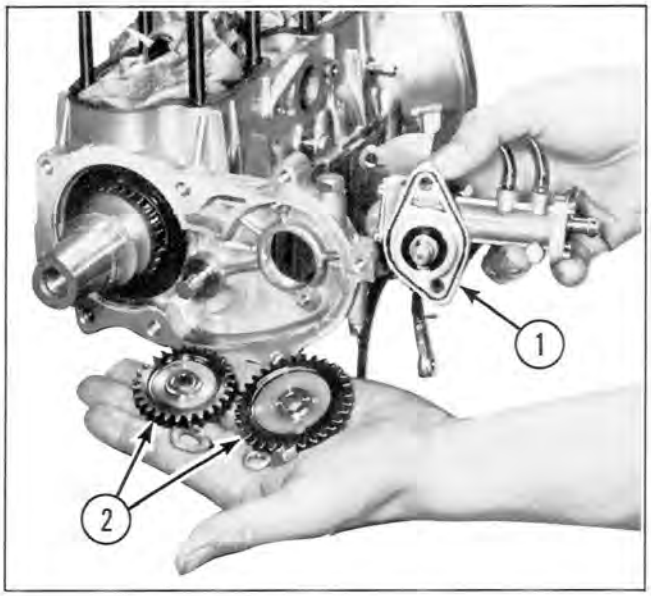


Figure 3-119



1. Oil Pump
2. Gears

Figure 3-120

Check Valve (Banjo Fitting)

The check valve is needed to prevent oil from bleeding back to the pump when the engine stops. The check valve retains oil in the hose between the oil pump and cylinder for when the engine restarts. A small capacity, hand held pressure tester is recommended for testing the check valves. Only 3 to 6 PSI is required to move the check valve off its seat. If the valve does not check out good replace the valve. (See Figure 3-121.)

CAUTION

Do not use high pressure compressed air on the check valve. High pressure air will damage the valve which will result in engine failure.

Inspection

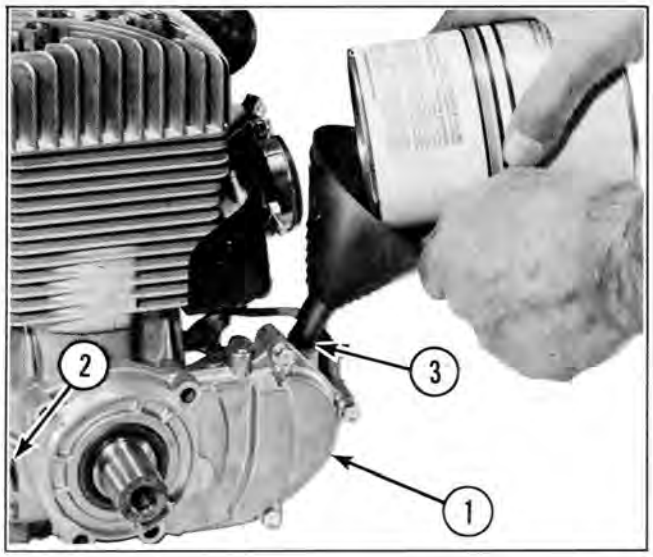
Check the gears, bearings and seals for wear or damage and replace if necessary.

6. Install gearcase cover and secure with bolts removed previously.

7. Reinstall the oil pump nozzles to the cylinders.

8. Fill gearcase to just above center of sight glass but not higher than the top with KAWASAKI ENGINE GEARCASE OIL. (See Figure 3-126.) The gearcase oil should be changed after the first 100 miles and thereafter at the end of each season. Capacity is approximately 1.35 oz. (40 cc).

9. Reinstall engine into chassis. Refer to Engine Installation.



1. Gearcase
2. Sight Glass
3. Fill Hole

Figure 3-126

Crankshaft Assembly

Removal

1. Remove pistons. Refer to Cylinder Head, Cylinder and Piston Removal procedure.

2. Remove stator from crankcase. Refer to Stator Assembly Removal procedure.

3. Drain the gearcase assembly. Remove the bolts securing the gearcase cover to the crankcase and remove the cover. Remove the idler gear, spacers and idle shaft.

4. Remove the driven gear from the oil pump shaft and remove the oil pump.

5. Remove the bolts securing the crankcase halves together. Remove the lower crankcase from the upper crankcase.

6. Use a mallet or a soft hammer to break the crankcase seal and separate the two halves. (See Figure 3-127.)

7. Lift the crankshaft assembly straight up and out of the crankcase.

CAUTION

To prevent internal crankcase damage lift the crankshaft equally at each end during removal process.

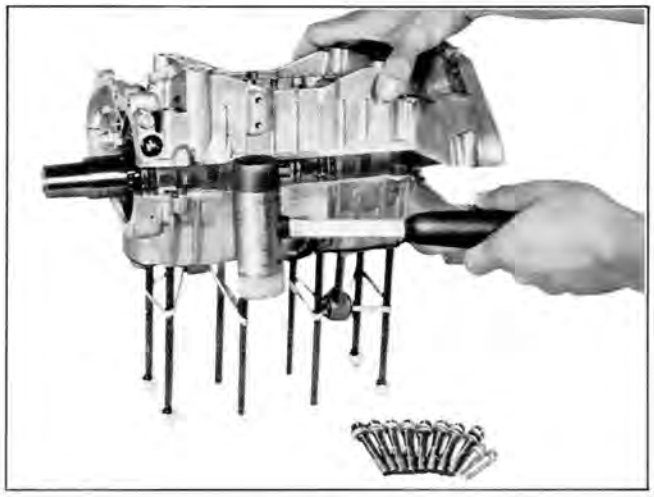


Figure 3-127

Inspection

1. With a feeler gauge check the side clearance of the connecting rods. (See Figure 3-128.) The correct tolerance is 0.016 to 0.020 in. (0.4 to 0.5 mm). If the clearance is greater than this replace the crankshaft assembly.



Figure 3-128

2. Check the crankshaft center bearings for wear or rough spots. If the center bearings show wear or have rough spots replace the crankshaft assembly.

3. To check the connecting rod radial clearance, set up the crankshaft as shown in Figure 3-129 with a dial indicator. With the connecting rod perpendicular pull the connecting rod up toward the dial indicator. Then push the connecting rod down towards the crank pin. The difference between these two readings is the radial clearance. The allowable radial clearance is 0.0008 to 0.001 in. (0.02 to 0.03 mm), if the radial clearance exceeds these dimensions replace the crankshaft assembly.

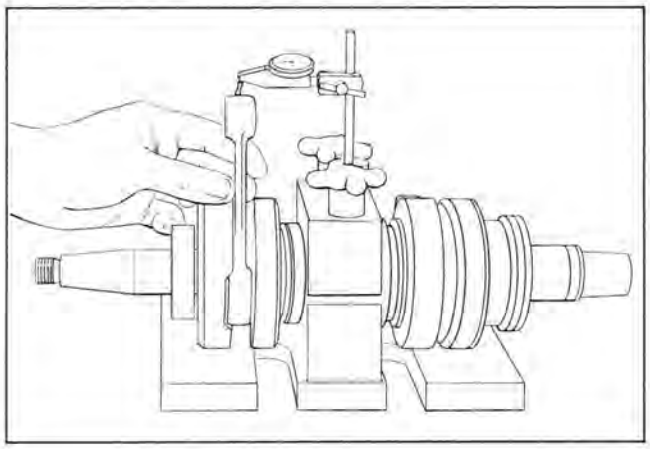


Figure 3-129

4. If the outer bearings, seals or oil pump drive gear require replacement, remove these parts with a bearing puller. (See Figure 3-130.) Never hammer on the bearings or crankshaft to remove these parts.

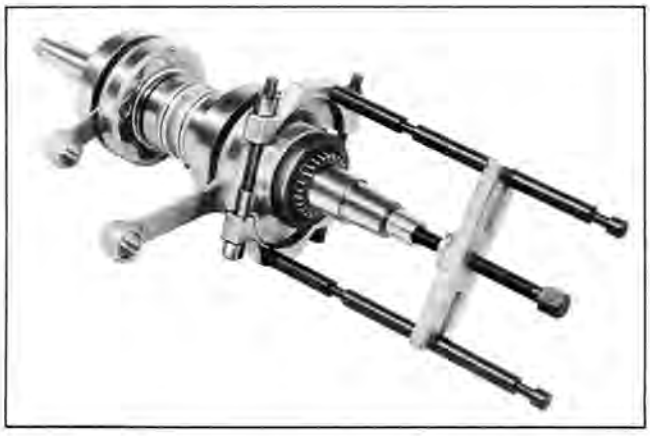


Figure 3-130

When installing the bearing or gear, heat the parts with a heat gun or place on top of a light bulb. The parts will expand for easy installation.

5. If the outer bearings on either end have been replaced or a new oil pump drive gear has been pressed onto the crankshaft, the crankshaft must be checked for alignment. Place the crankshaft on V-blocks and use a dial indicator as shown in Figure 3-131 to check the alignment. Maximum run out permissable is 0.002 in. (0.05 mm) TIR (Total Indicated Reading). If the run out exceeds this dimension replace the crankshaft assembly.

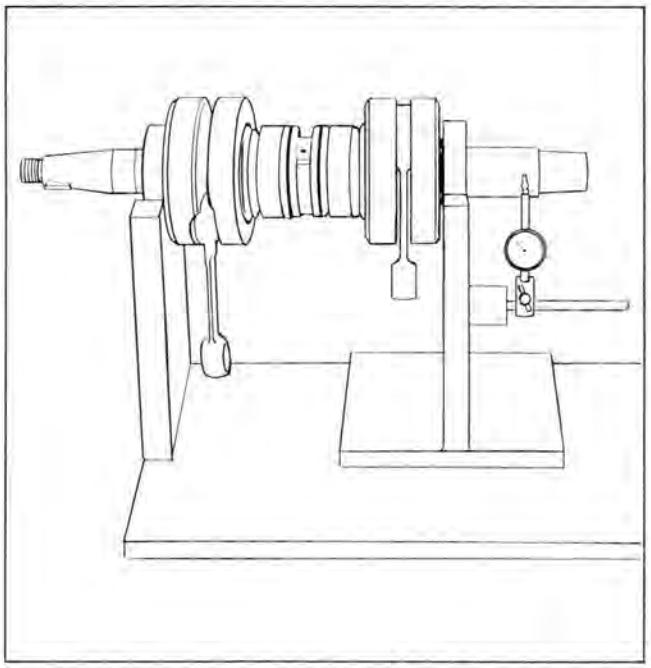
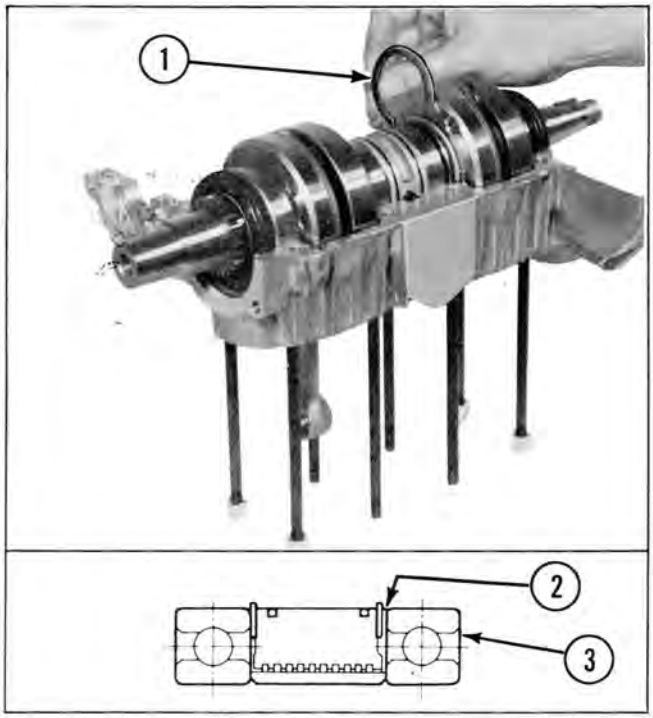


Figure 3-131

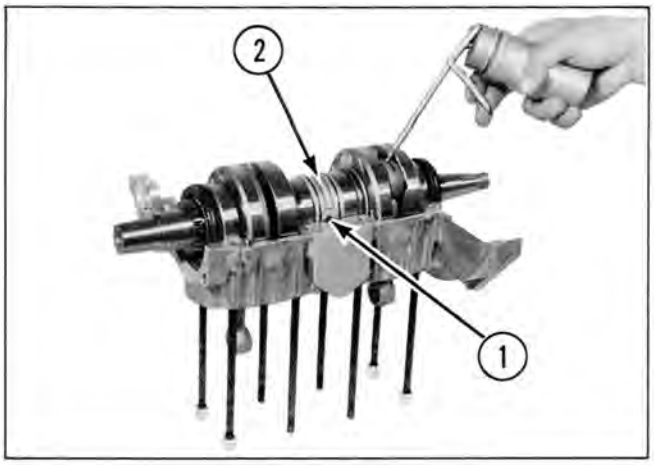
6. When reinstalling crankshaft into crankcase measure crankshaft end play. The end play can be measured with a feeler gauge between the center bearing and the thrust washer at the magneto end. The end play can also be measured by placing a dial indicator against one end of the crankshaft and moving it to one end of the crankcase and then back to the other end of the crankcase. The difference in the two readings is end play. Select a shim from the chart below to permit 0.003 to 0.005 in. (0.08 to 0.13 mm) end play. Maximum allowable end play is 0.015 in. (0.38 mm). Install the selected shim between the thrust washer and the crankshaft center bearing on the magneto end. (See Figure 3-132.) Use only one shim to control crankshaft end play.

"Shim" to be used	
Thickness	Part No.
0.0276 ± 0.0012 inch (0.7t ± 0.03 mm)	92025-3001
0.0315 ± 0.0012 inch (0.8t ± 0.03 mm)	92025-3002
0.0354 ± 0.0016 inch (0.9t ± 0.04 mm)	92025-3003
0.0393 ± 0.0016 inch (1.0t ± 0.04 mm)	92025-3004
0.0472 ± 0.0020 inch (1.2t ± 0.05 mm)	92025-3005



1. Shim
2. Insert Shim Here
3. Magneto End

Figure 3-132



1. Dowel Pin
2. Labyrinth Seal

Figure 3-133



Figure 3-134

Installation

1. Place the crankshaft assembly into the crankcase. Be sure the dowel pin on labyrinth seal is properly located in the notch of the upper crankcase half. Apply a liberal amount of oil to all the bearings on the crankshaft assembly. Be sure that the lips of the oil seals and the thrust washers near the center main bearings are properly seated in the grooves in the upper crankcase half. (See Figure 3-133.)

2. Apply a continuous thin bead of Kawasaki Sealer to the upper crankcase half. (See Figure 3-134.)

3. Install the lower half of the crankcase. Torque the bolts in a criss-cross pattern as shown in Figure 3-135. Bolts numbered one through eight torque to 16 ft lb (2.2 kg-m). Bolts numbered nine and ten torque 5 to 6 ft lb (0.7 to 0.8 kg-m).

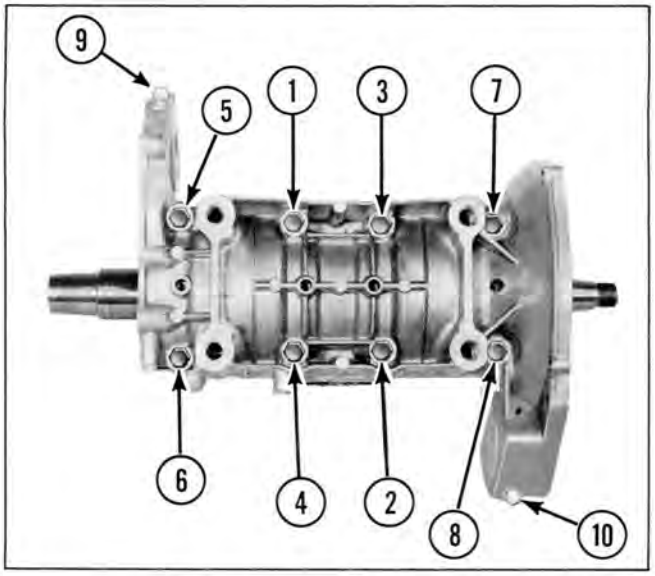


Figure 3-135

4. Reinstall stator assembly. Refer to Stator Assembly Installation procedure.

5. Install pistons, cylinders, and heads, as previously described in this section.

Brake Light Switch, Dimmer Switch, or Brake Lever Assembly

Removal

NOTE: Separate components of the brake lever assembly, the brake light switch or the dimmer switch are available and can be replaced. To replace either switch, the lever assembly must be removed from the handlebar.

1. Remove brake cable from brake lever assembly.

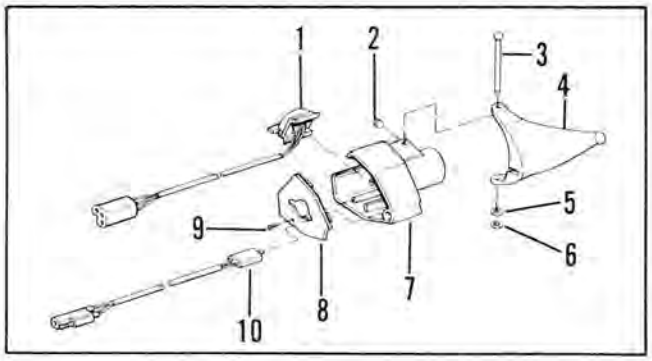
2. Insert a screwdriver between handle grip and handlebar to loosen the grip from the bar, and pull handle grip from handlebar.

3. Disconnect the brake and dimmer switch connectors from the main harness.

4. Loosen lock screw and slide brake lever assembly from handlebar. (See Figure 3-136.)

5. Remove screw securing brake case plate to the case, and remove the plate. Either switch can now be slid out of the case and a replacement slid in.

6. To replace the lever, remove retainer, washer and pin.



1. Dimmer Switch
2. Lock Screw
3. Lever Pin
4. Brake Lever
5. Pin Washer
6. Pin Retainer
7. Brake Case
8. Brake Case Plate
9. Plate Screw
10. Brake Light Switch

Figure 3-136

Installation

1. Install the components and the brake lever assembly in the reverse order of removal. Torque the lock screw to 25 in. lb (0.29 kg-m).

2. Check the brake adjustment as described in Section 2.

Emergency Stop Switch or Throttle Lever Assembly

Removal

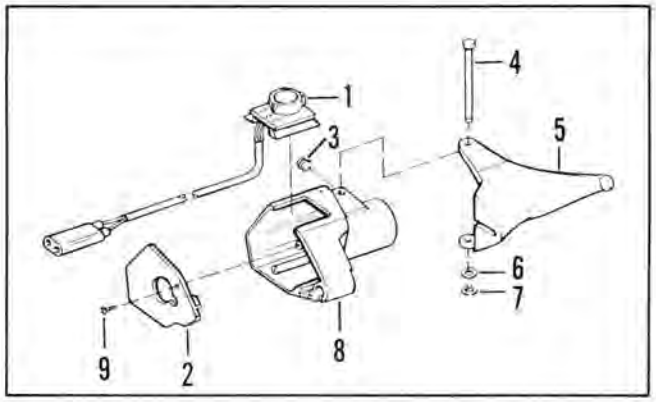
NOTE: Separate components of the throttle lever assembly and the emergency stop switch are available and can be replaced. To replace the switch the lever assembly must be removed from the handlebar.

1. Remove throttle cable from throttle lever assembly.

2. Insert a screwdriver between handle grip and handlebar to loosen the grip from the bar, and pull handle grip from handlebar.

3. Disconnect the emergency stop switch connector from the main harness.

4. Loosen lock screw, and slide throttle lever assembly from the handlebar. (See Figure 3-137.)



1. Emergency Stop Switch
2. Throttle Case Plate
3. Lock Screw
4. Lever Pin
5. Throttle Lever
6. Pin Washer
7. Pin Retainer
8. Throttle Case
9. Plate Screw

Figure 3-137

5. Remove the screw securing throttle case plate to the case and remove the plate. The emergency stop switch can now be slid out of the case and a replacement slid in.

6. To replace the lever, remove retainer, washer and pin.

Installation

1. Install the components and the throttle lever assembly in the reverse order of removal. Torque the lock screw to 25 in. lb (0.29 kg-m).

2. Check the Throttle Cable Adjustment as described in Section 2.

Headlamp

Removal

1. To remove just the headlamp assembly, disconnect the headlamp harness from the headlamp.

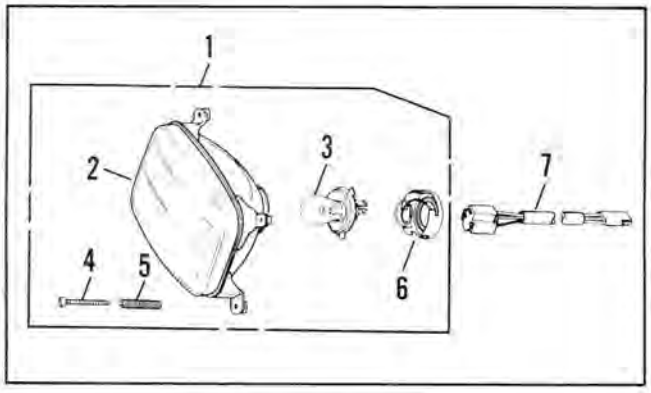
2. Remove the four adjusting screws and springs. The headlamp assembly can now be removed from the hood.

Disassemble headlamp as illustrated in Figure 3-138.

Installation

1. Reassemble headlamp in reverse order of removal. (See Figure 3-138.)

2. Adjust headlamp in accordance with Section 2.



1. Headlamp Assembly
2. Headlamp Lens
3. Headlamp Bulb
4. Upper Adjusting Screw
5. Adjustment Spring
6. Retainer
7. Headlamp Harness

Figure 3-138

Key Switch

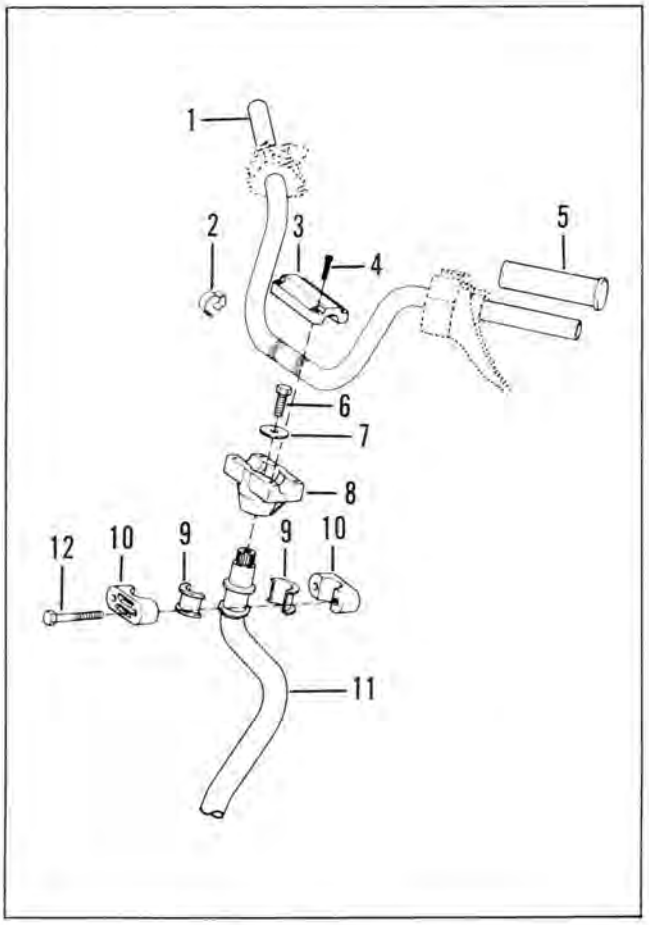
Removal

1. Remove upper and lower handlebar holders from steering pole. (See Figure 3-139.)

2. Disconnect cable from speedometer head. Prevent nut from sliding down cable by applying tape around outer cable casing.

3. Remove instrument panel mounting screws.

4. Disconnect springs, and remove air silencer assembly.

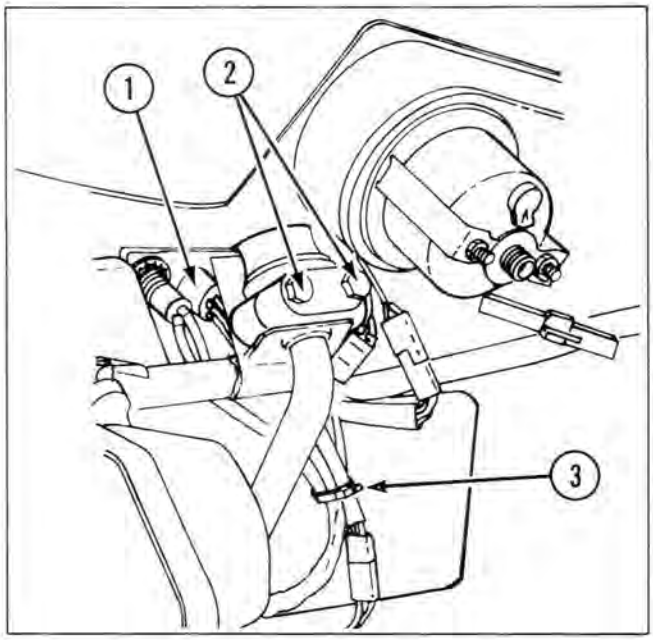


1. Steering Handle
2. Wire Clamp
3. Handle Holder
4. Screw
5. Handle Grip
6. Bolt
7. Special Washer
8. Handle Holder
9. Bushing
10. Mount Block
11. Steering Pole Assembly
12. Bolt

Figure 3-139

5. Unscrew bolts from upper steering pole mount block to free key switch panel. (See Figure 3-140.)

NOTE: Do not lose bushing when removing outer mount block from steering pole.



1. Key Switch
2. Upper Steering Mount Bolts
3. Cable Tie Band

Figure 3-140

6. Slide key switch forward out of panel by removing face nut.

7. Pull instrument panel upward for access, and remove key switch connector. (See Figure 3-141.)

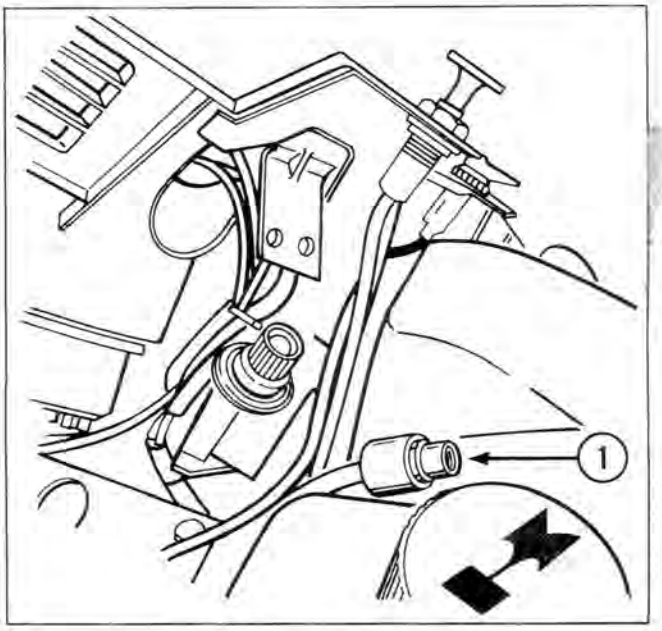
NOTE: Additional panel movement can be obtained by cutting tie band that secures primer pump tubes and wire harness near steering pole. (See Figure 3-140.)

Installation

1. Secure connector onto rear of switch.

2. Guide switch into panel. To simplify process, insert key into switch and turn to run position, then use key to pull switch into proper location. Tighten face nut 20 to 30 in. lb (0.3 to 0.4 kg-m).

3. Locate key switch bracket between steering pole mount block and upper steering mount.



1. Key Switch

Figure 3-141

4. Apply a low temperature grease to bushings. (See Figure 3-139.)

WARNING

Bolts used in steering system are grade 8 self locking type. Use of incorrect hardware may result in steering system failure causing personal injury.

5. Secure bushings and mount block to steering mount by tightening bolts 18 ft lb (2.5 kg-m).

6. Install cable tie band to secure primer pump tubes and wire harness near steering pole. (See Figure 3-140.)

7. Install lower handlebar holder and tighten bolt 35 ft lb (4.8 kg-m). (See Figure 3-139.)

8. Secure handlebars to steering pole by installing upper holder with screws torqued to 105 in. lb (1.2 kg-m). Be sure handlebar is placed in a comfortable driving position.

9. Install air silencer assembly. Refer to Silencer Installation.

10. Install screws to secure instrument panel.

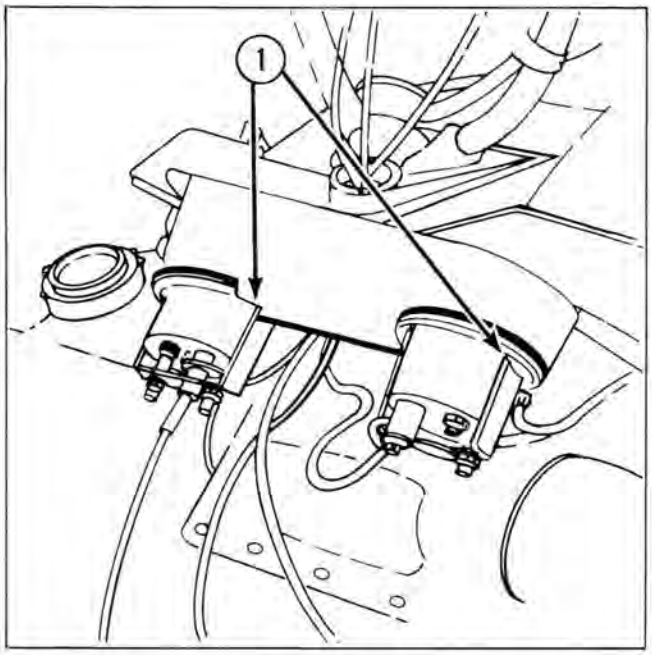
11. Reconnect speedometer cable. Turn nut hand tight only.

12. Start engine and test operation of lights and ignition.

Speedometer

Removal

1. Disconnect cable from speedometer head. Prevent nut from sliding down cable by applying tape around outer cable casing.
2. Unplug light from speedometer.
3. Remove mount bracket and slide speedometer from instrument panel. (See Figure 3-142.)



1. Mount Bracket

Figure 3-142

Installation

1. Install speedometer into panel and install the mount bracket. Tighten nuts to 11 in. lb (0.1 kg-m).
2. Install the light bulb assembly. Connect the speedometer cable and hand-tighten. (See Figure 3-142.)

Tachometer

Removal

1. Remove the light bulb assembly from the tachometer, and disconnect wires from the tachometer.
2. Remove the tachometer bracket and remove the tachometer from the console.

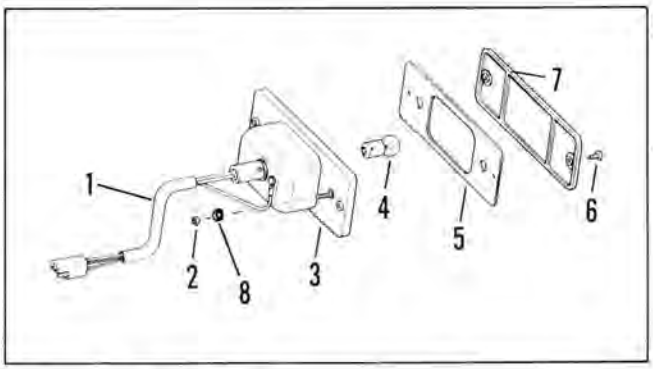
Installation

1. Install the tachometer in reverse order of removal. Tighten mount nuts to 11 in. lb (0.1 kg-m).

Tail Lamp

Removal

1. Disconnect tail lamp harness from the main harness.
2. Remove the seat.
3. Remove the tail lamp lens and gasket. (See Figure 3-143.)
4. Remove the nuts securing the tail lamp assembly and remove the tail lamp assembly.



1. Harness
2. Nut
3. Tail Lamp Body Assembly
4. Bulb
5. Gasket
6. Screw
7. Lens
8. Lockwasher

Figure 3-143

Installation

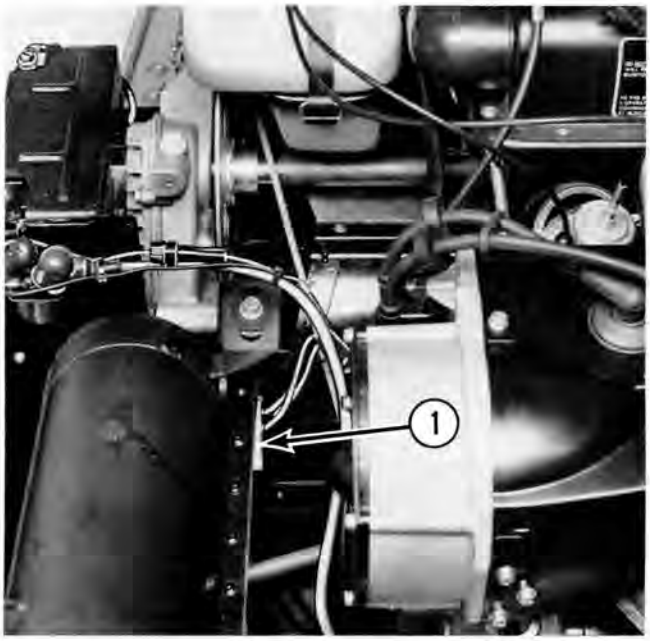
Install tail lamp assembly in the reverse order of removal. During reinstallation of the seat carefully torque the four mounting bolts as the nuts inside the seat can be easily stripped.

Regulator/Rectifier Replacement

1. Disconnect the regulator/rectifier connector from the main harness.

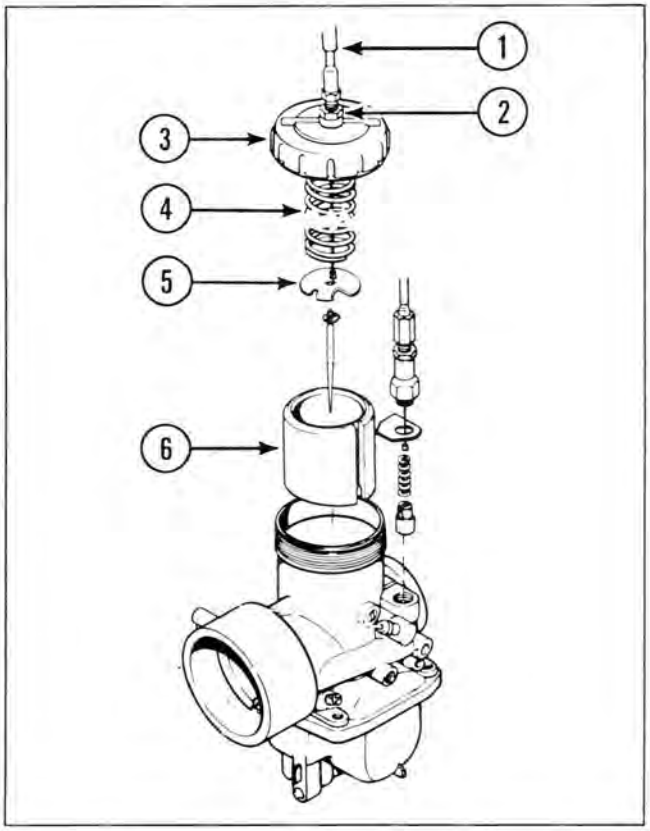
2. Remove machine screw, lockwasher and locknut, and remove the regulator/rectifier. (See Figure 3-144.)

3. Install regulator/rectifier in the reverse order of removal. Position washer under head of bolt to insure good ground. Tighten machine screw to 95 in. lb (1.09 kg-m).



1. Regulator/Rectifier

Figure 3-144



1. Throttle Cable
2. Throttle Cable Jam Nut
3. Mixing Body Cap
4. Spring
5. Spring Seat Plate
6. Valve

Figure 3-145

Throttle Cable and Oil Pump Cable

Removal

1. To remove the throttle cable from each carburetor, unscrew the mixing body cap assembly and pull out the throttle valve assembly. (See Figure 3-145.)

2. Compress the throttle spring and remove the throttle spring seat plate.

3. Slide the throttle cable tip to the larger hole in the base of the throttle valve and separate the throttle cable from the throttle valve.

4. Loosen the throttle cable jam nut and unscrew the throttle cable from the mixing body cap assembly. (See Figure 3-145.) Loosen clamp screw and remove LH carburetor from carburetor holder.

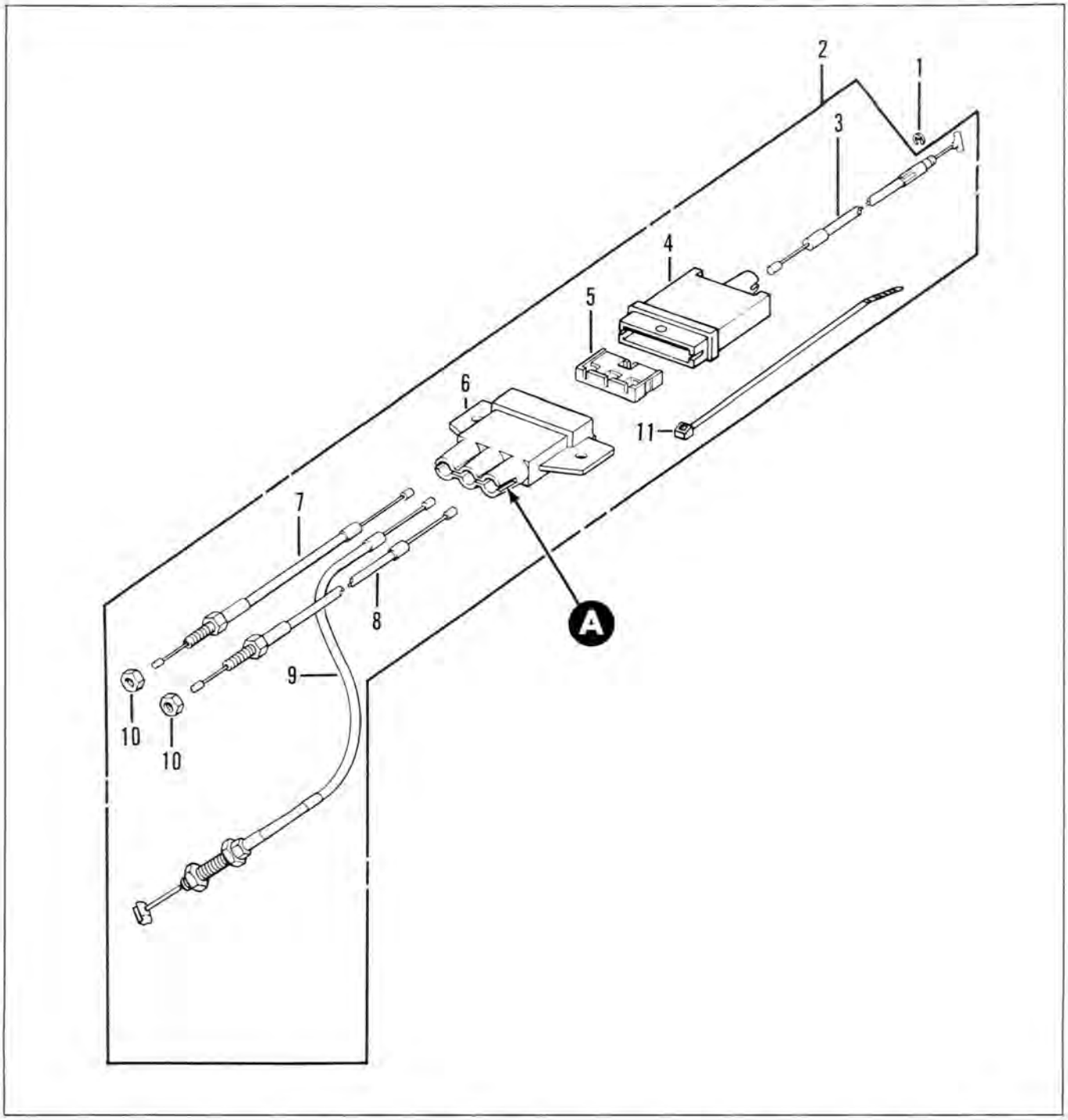
5. Loosen front locknut of the oil pump cable.

6. Remove the cable from the inlet plate bracket. Move the oil pump control lever to the full on position and disconnect the cable from it.

7. Remove snap ring and disconnect the throttle cable end from the throttle lever. (See Figure 3-146.)

8. Any of the cables can be removed from the assembly by cutting the tie band and inserting a screwdriver in slot (A) then prying the lower cable housing apart while pulling on cable for removal. (See Figure 3-146.)

9. During reassembly, secure throttle housings with cable tie band.

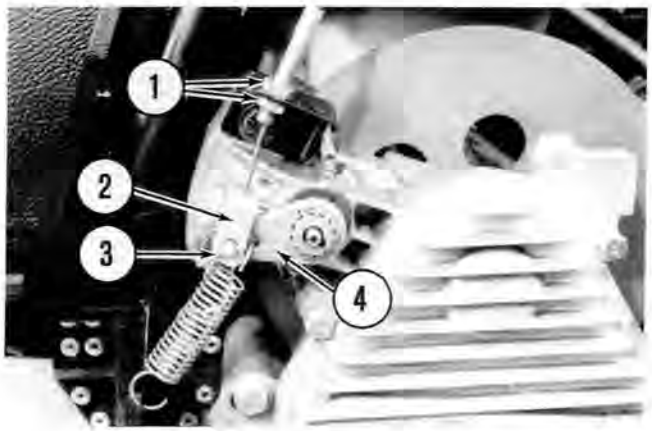


1. Snap Ring
2. Throttle Cable Assembly
3. Upper Throttle Cable
4. Upper Cable Housing
5. 1-3 Cable Connector
6. Lower Cable Housing
7. RH Carb Throttle Cable
8. LH Carb Throttle Cable
9. Oil Pump Cable
10. Special Jam Nut
11. Cable Tie Band

Figure 3-146

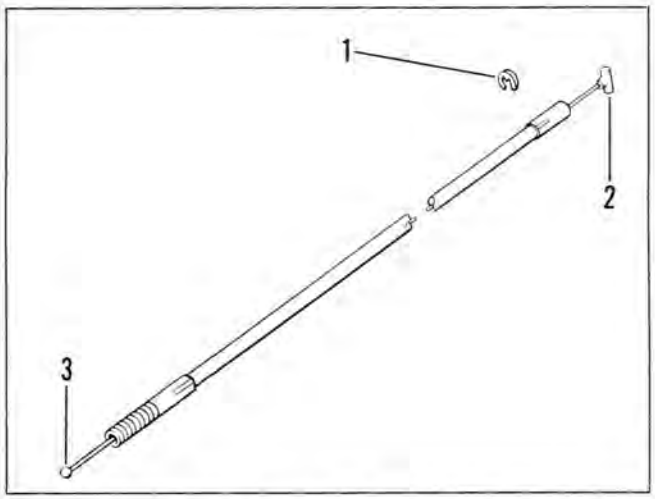
Installation

1. Slide the throttle cable through the throttle lever assembly and install the snap ring. (See Figure 3-146.)
2. Connect the throttle cable end to the throttle lever.
3. Reconnect the oil pump cable to the oil pump. Install the LH carburetor and secure to holder assembly by tightening the clamp screw.
4. Screw the throttle cable into the mixing body cap assembly. (See Figure 3-145.)
5. Hold the throttle cable and mixing body cap assembly in one hand. Place the spring in the cap and compress the spring so the throttle cable extends beyond the spring.
6. Guide the throttle valve over the throttle cable. Insert the end of the cable through the hole in the throttle valve slot.
7. While keeping the spring compressed, release the throttle valve and install the spring seat plate. Then release the spring.
8. Install the throttle valve into the carburetor so the slot in the throttle valve mates with the locating pin in the throttle valve bore. Install the mixing body cap assembly and tighten finger tight.
9. Check cable routing to insure that:
   a. Cables operate without binding and return freely with handlebar in any steering position.
   b. Outer casing of cables have no sharp bends or kinks.
   c. Cables are secured with tie bands to prevent rubbing or chafing of outer casing which may lead to malfunction.
10. Perform Oil Pump to Carburetor Synchronization precedure in Section 2.



1. Locknuts
2. Retainer
3. Hair Pin
4. Brake Lever

Figure 3-147



1. Snap Ring
2. Brake Cable End
3. Brake Cable Tip

Figure 3-148

Brake Cable

Removal

1. Remove hair pin and slide brake cable tip from retainer clevis. (See Figure 3-147.)
2. Remove the locknuts from the brake cable.
3. Remove the snap ring and disconnect the brake cable end from the brake lever. (See Figure 3-148.)

Installation

1. Place the end of the brake cable through the brake lever assembly and install the snap ring.
2. Connect the brake cable end to the brake lever.
3. Install one locknut on the end of the brake cable and place it through the brake cable bracket. (See Figure 3-147.)

4. Install the second locknut on the end of the brake cable.

5. Install brake cable tip to the retainer. Position the retainer on the brake lever with the slot facing the chaincase. Install clevis pin from chaincase side and secure with hair pin. (See Figure 3-147.)

WARNING

The retainer, clevis pin and hair pin must be installed as noted. A loss of braking may occur if these components are incorrectly installed.

6. Check cable routing to insure that:

   a. Cable operates without binding and returns freely with handlebar in any steering position.

   b. Outer casing of cable has no sharp bends or kinks.

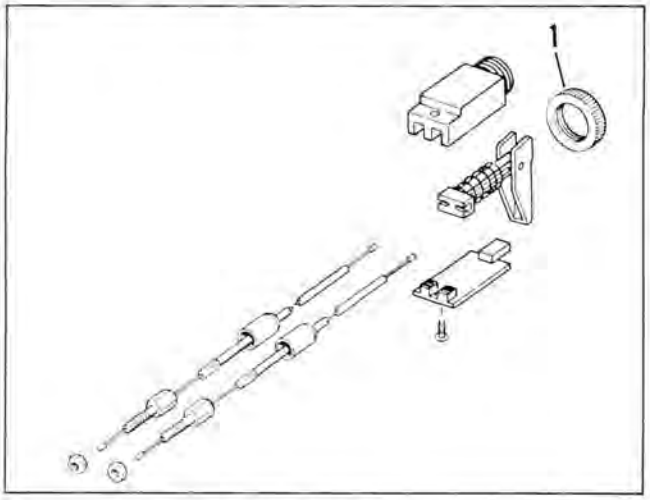
   c. Cable is secured with tie bands to prevent rubbing or chafing of outer casing which may lead to malfunction.

7. Adjust the brake as described in Section 2.

Enrichener Cable

Removal

1. Unscrew the enrichener mounting nut and separate the enrichener cable from the panel. (See Figure 3-149.)

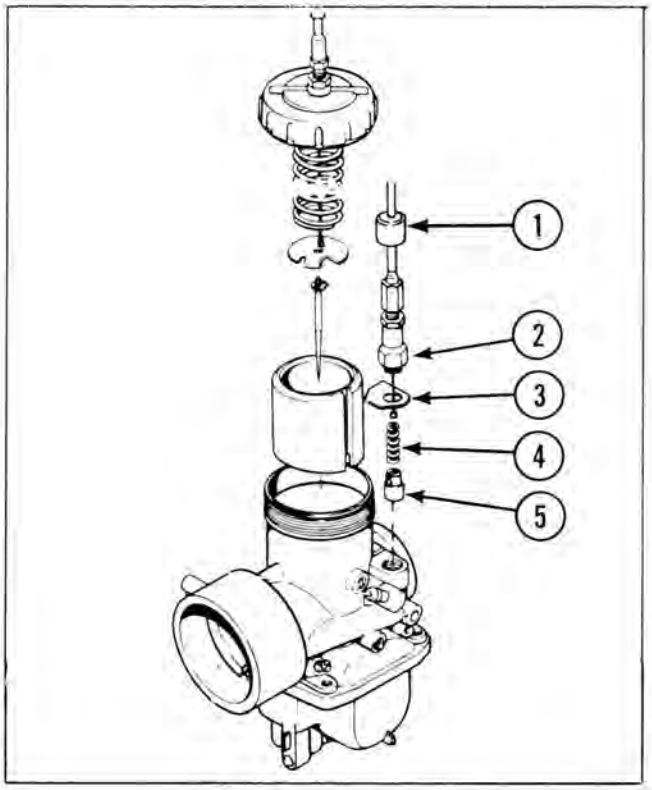


1. Mounting Nut

Figure 3-149

2. Slide the plastic cap up from the enrichener cable and unscrew the enrichener plunger cap. (See Figure 3-150.) Remove the enrichener plunger assembly from the carburetor.

3. Unscrew the fitting, compress the enrichener plunger spring and disconnect the enrichener cable from the plunger.



1. Plastic Cap
2. Plunger Cap
3. Washer
4. Spring
5. Plunger

Figure 3-150

Installation

1. Slide the enrichener cable through the hole in the panel and install the enrichener mounting nut. (See Figure 3-149.)

2. Slide the enrichener plunger cap, washer and spring over the end of the enrichener cable. (See Figure 3-150.)

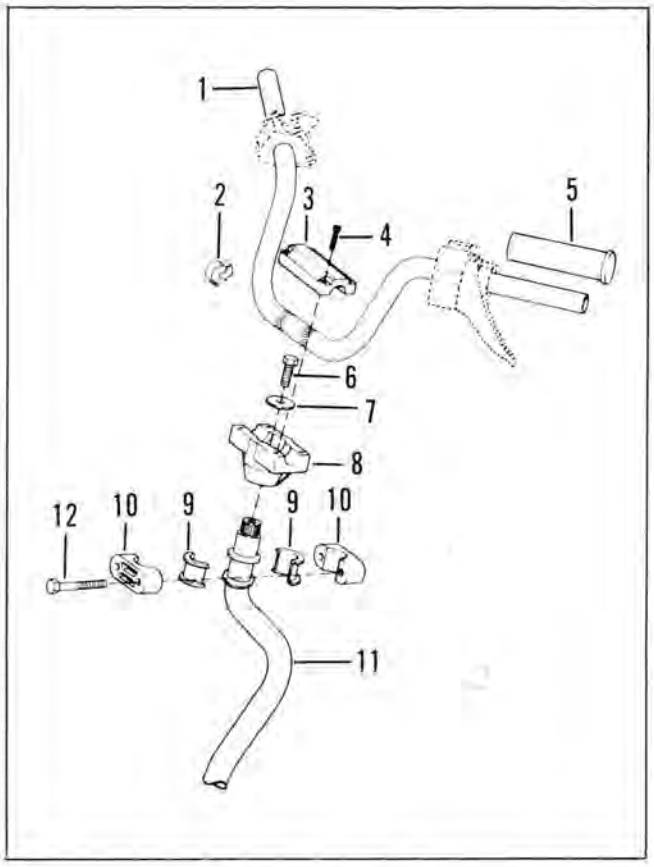
3. Place the hole in the enrichener plunger over the cable end and spring. Insert the plunger into the carburetor body and tighten the plunger cap. Bend washer against cap and slide plastic cap down over plunger cap.

4. Check enrichener cable adjustment as described in Section 2.

Primer Pump

Removal

1. Remove upper and lower handlebar holders from steering pole. (See Figure 3-151.)



1. Steering Handle
2. Wire Clamp
3. Handle Holder
4. Screw
5. Handle Grip
6. Bolt
7. Special Washer
8. Handle Holder
9. Bushing
10. Mount Block
11. Steering Pole Assembly
12. Bolt

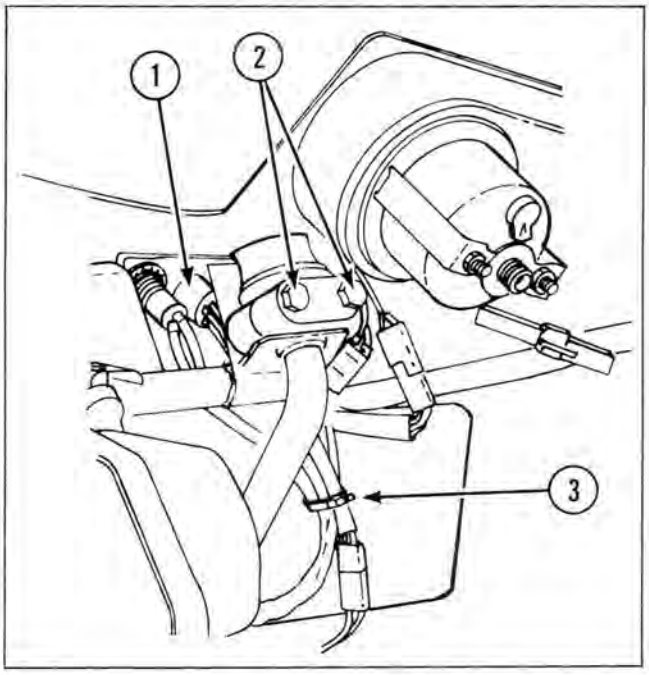
Figure 3-151

2. Disconnect cable from speedometer head. Prevent nut from sliding down cable by applying tape around outer cable casing.

3. Remove instrument panel mounting screws.

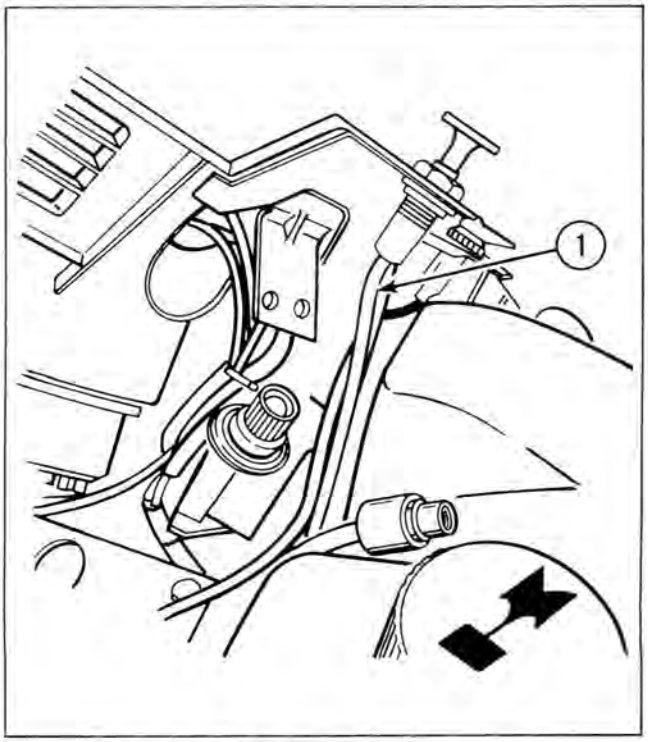
4. Disconnect springs, and remove air silencer assembly.

5. Unscrew bolts from upper steering pole mount block to free key switch panel. (See Figure 3-152.)



1. Key Switch
2. Upper Steering Mount Bolts
3. Cable Tie Band

Figure 3-152



1. Fuel Tubes

Figure 3-153

NOTE: Do not lose bushing when removing outer mount block from steering pole.

6. Slide key switch forward out of panel by removing face nut.

7. Pull instrument panel upward for access, and remove fuel tubes from primer pump. (See Figure 3-153.)

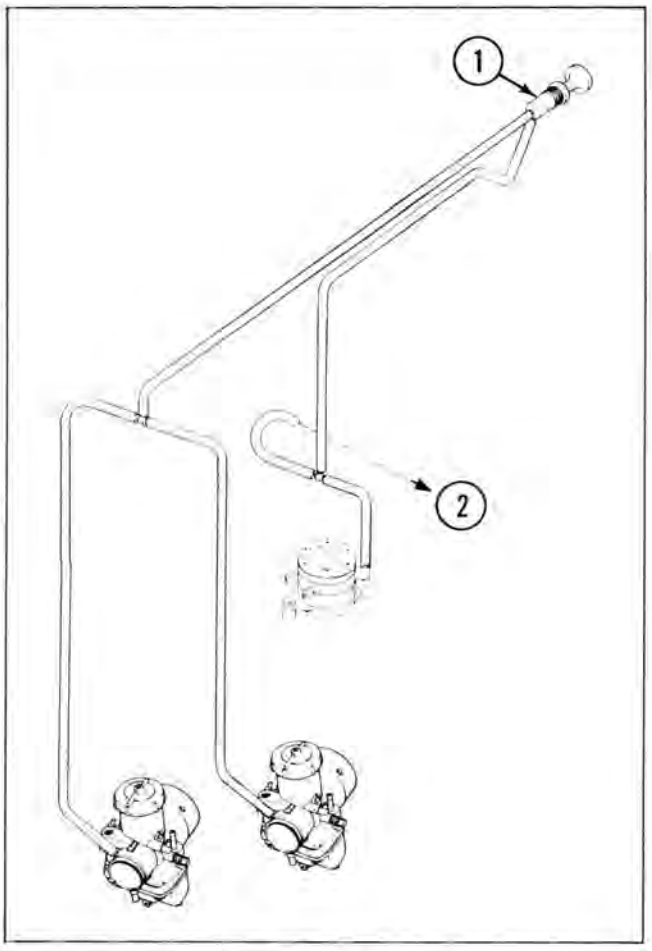
NOTE: Additional panel movement can be obtained by cutting tie band that secures primer pump tubes and wire harness near steering pole. (See Figure 3-152.)

8. Unscrew nut and remove primer from instrument panel.

Installation

1. Secure primer pump to instrument panel. Tighten nut 25 to 30 in. lb (0.3 to 0.4 kg-m).

2. Connect fuel tubes to primer. (See Figure 3-154.)



1. Primer Pump
2. To Fuel Tank

Figure 3-154

3. Guide switch into panel. To simplify process, insert key into switch and turn to run position, then use key to pull switch into proper location. Tighten face nut 20 to 30 in. lb (0.3 to 0.4 kg-m).

4. Locate key switch bracket between steering pole mount block and upper steering mount.

5. Apply a low temperature grease to bushings. (See Figure 3-151.)

WARNING

Bolts used in steering system are grade 8 self-locking type. Use of incorrect hardware may result in steering system failure causing personal injury.

6. Secure bushings and mount block to steering mount by tightening bolts 18 ft lb (2.5 kg-m).

7. Install cable tie band to secure primer pump tubes and wire harness near steering pole. (See Figure 3-152.)

8. Install lower handlebar holder and tighten bolt 35 ft lb (4.8 kg-m). (See Figure 3-151.)

9. Secure handlebars to steering pole by installing upper holder with screws torqued to 105 in. lb (1.2 kg-m). Be sure handlebar is placed in a comfortable driving position.

10. Install air silencer assembly. Refer to Silencer Installation.

11. Install screws to secure instrument panel.

12. Reconnect speedometer cable. Turn nut hand tight only.

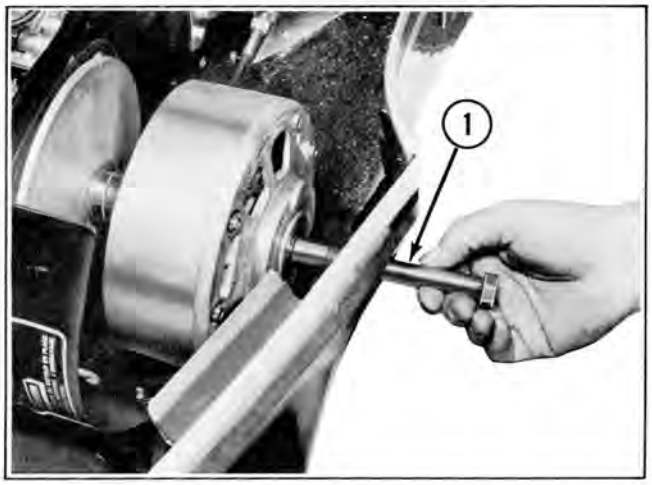
Drive Converter

Removal

1. Remove the drive belt.

2. Remove the drive converter mounting bolt and conical washers.

3. Install the drive converter puller bolt (tool No. 57001-3502) and screw in to remove the drive converter. (See Figures 3-155 and 3-156.)



1. Drive Converter Puller Bolt

Figure 3-155

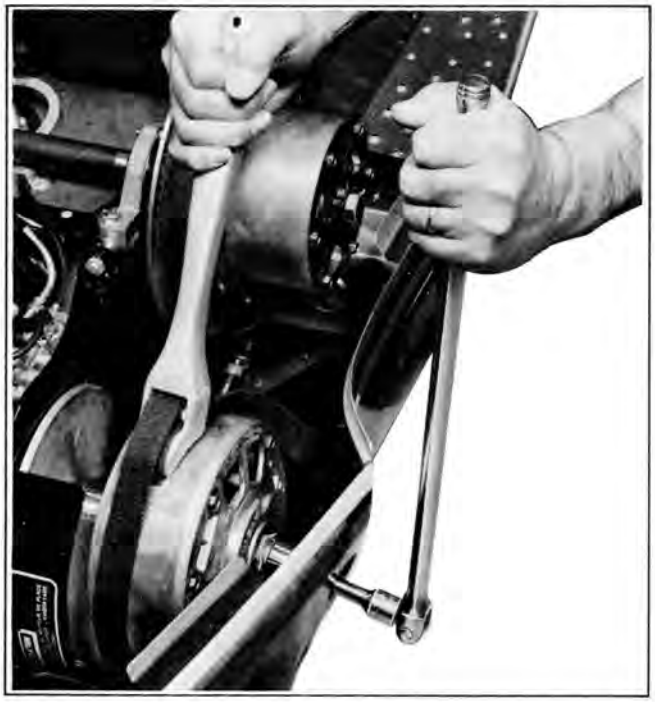


Figure 3-156

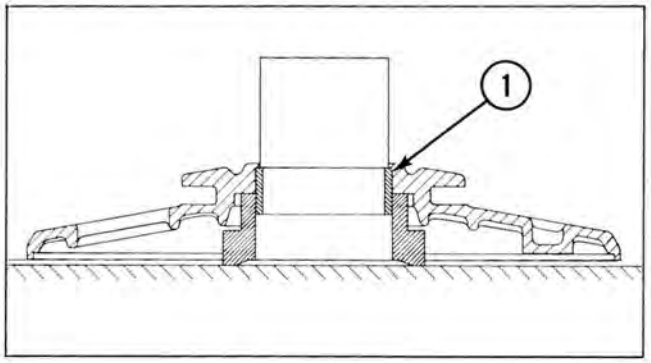
Disassembly and Inspection (See Figure 3-163)

WARNING

Do not let go of the cover suddenly as the cover can pop up and cause personal injury.

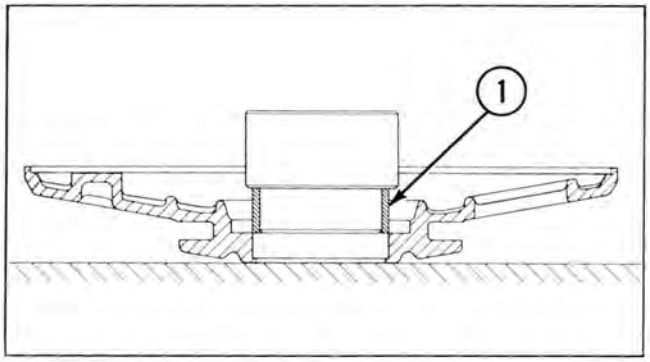
1. With a firm grip on the cover to prevent the spring from pushing the cover off, remove the bolts that secure the cover on the converter.
2. Remove the spring.
3. Check the cover bushing for excessive wear. A quick check can be made by placing the cover over the sleeve, if excessive wobbling is noticed the bushing should be replaced. For an accurate check measure the outside diameter of the sleeve and the inside diameter of the bushing with micrometers. If the difference between the two readings is 0.02 in. (0.5 mm) or larger replace the bushing. See Figure 3-157 for bushing removal. See Figure 3-158 for bushing installation.

NOTE: Bushings used in converter are split type. During inspection do not mistake bushing line as a cracked bushing.



1. Removing Bushing

Figure 3-157



1. Installing Bushing

Figure 3-158

4. Lift the sleeve out of the converter and remove the spider assembly.
5. Remove the wear guides and check for excessive wear, replace if worn excessively. (See Figure 3-159.) Maximum wear allowable is 0.008 in. (0.2 mm) on each arm.

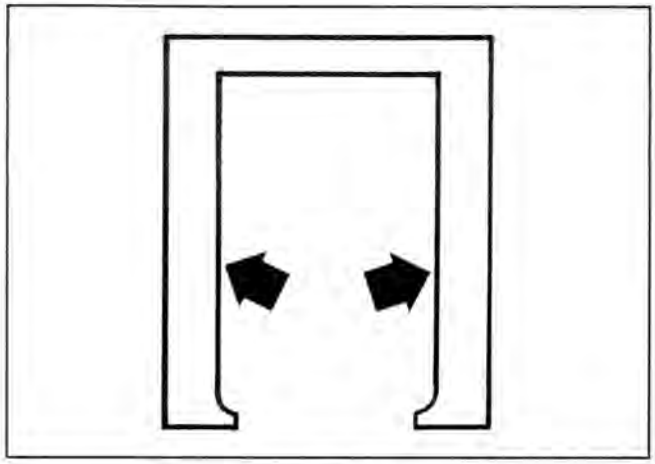


Figure 3-159

6. Remove the split washer. Before removing the movable sheave, check the bushing for excessive wear by wobbling sheave from side to side. If excessive movement is noticed replace the bushing. For an accurate measurement, measure the diameter of the shaft on the fixed sheave and the inside diameter of the bushing in the movable sheave. If the difference between the two readings is 0.02 in. (0.5 mm) or larger replace the bushing. See Figure 3-160 for bushing removal. See Figure 3-161 for bushing installation.

NOTE: Bushings used in converter are split type. During inspection do not mistake bushing line as a cracked bushing.

7. Remove washer tabs, pins, spacers and rollers from moveable sheave. Replace any part that shows signs of excessive wear.

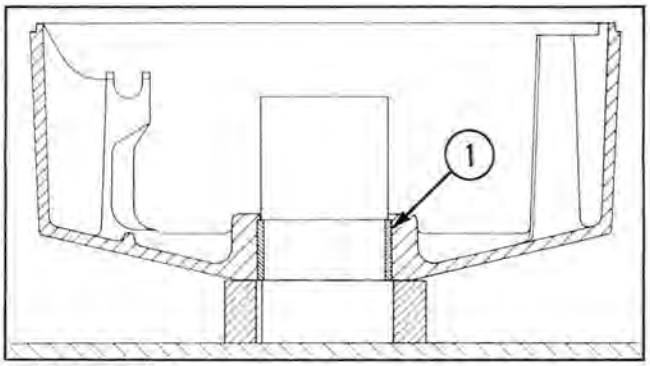
   a. Spacers - measure thickness with a micrometer. They should measure 0.032 ± 0.004 in. (0.8 ± 0.1 mm). Replacement is required when they measure 0.016 in. (0.4 mm) or less.

   b. Pins and Rollers - Maximum clearance allowed between pin and roller is 0.02 in. (0.5 mm).

8. Remove washer tabs, pins, spacers and ramp weights from spider assembly. Replace any part that shows signs of excessive wear.

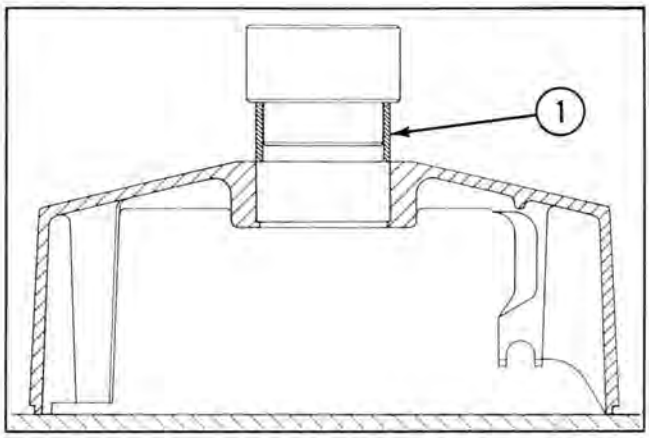
   a. Spacers - measure thickness with a micrometer. They should measure 0.032 ± 0.004 in. (0.8 ± 0.1 mm). Replacement is required when they measure 0.016 in. (0.4 mm) or less.

   b. Pins and Ramp Weights - Maximum clearance allowed between pin and ramp bushing is 0.02 in. (0.5 mm).



1. Removing Bushing

Figure 3-160



1. Installing Bushing

Figure 3-161

Cleaning (See Figure 3-162)

NOTE: Accumulation of foreign matter on sliding surfaces or moving components within converter will alter the shifting characteristics, which will affect vehicle performance throughout the shifting range. Contamination of converter components may cause the vehicle to display any of the following symptoms:

   a. Bog (hesitation) during acceleration.

   b. Poor back shift.

   c. Low top speed.

1. Remove all grease and dirt by wiping the components with a rag dipped in cleaning solvent. Dry parts with compressed air or a clean cloth.

CAUTION

DO NOT soak components with bushings in cleaning solvents, since some solvents can damage the bushing resulting in converter failure.

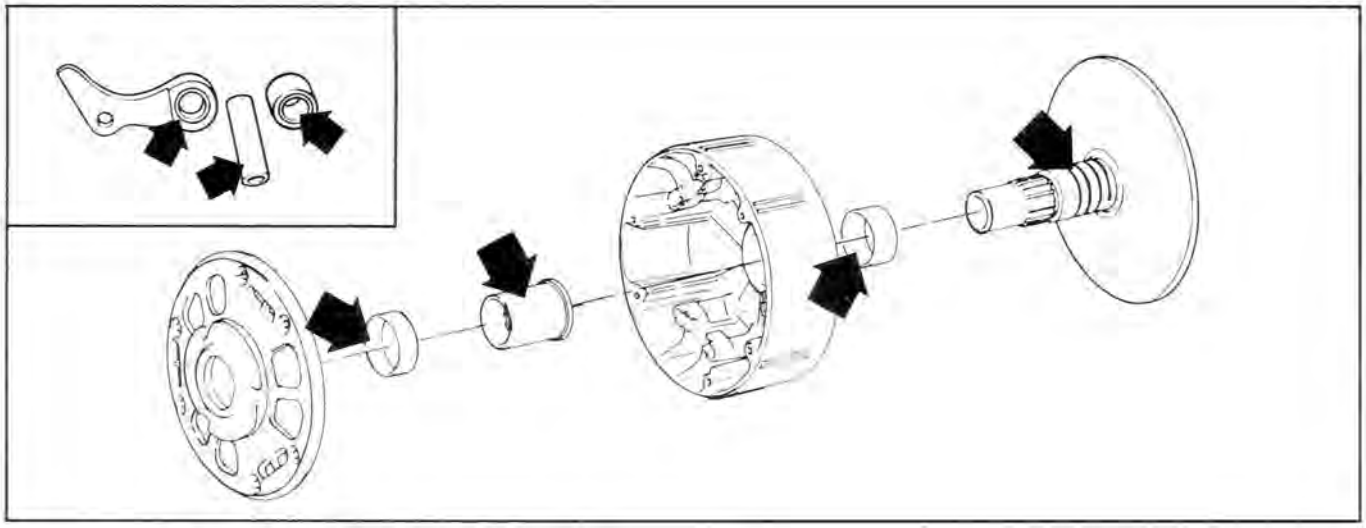


Figure 3-162

2. Remove drive belt accumulations from the stationary sheave and movable sheave with cleaning solvent.

3. Remove rust and drive belt accumulations from the steel shaft of the stationary sheave with cleaning solvent or a fine grade of steel wool.

4. Thoroughly clean pins and bushings for roller and ramp weight assemblies. (See Figure 3-162.)

Reassembly (See Figure 3-163)

NOTE: All of the major components have arrows cast into them. It is very important during reassembly to ensure that all of the arrows are in line so that the balance of the converter will not be disturbed.

1. Assemble the roller assemblies, pins and spacers and place into the movable sheave with the pins in the pin grooves. Secure with bolts removed in disassembly. Torque the bolts 8 to 10 ft lb (1.1 to 1.4 kg-m).

2. After torquing the bolts, check that the roller can rotate freely.

3. Assemble the weights to each weight ramp. Refer to Section 1 for Standard Weight Part Numbers and proper positioning. Torque the bolts to 4 to 5 ft lb (0.5 to 0.7 kg-m). Install the pin spacers, and washer into position in the spider assembly with the pin in the pin groove. Secure with bolts removed in disassembly. Torque the bolts 6 to 8 ft lb (0.8 to 1.1 kg-m). Check after torquing to assure that the weight ramp can move freely.

4. After inspecting for any dents or damage place the fixed sheave on a work bench, with shaft up.

5. Align the arrows between fixed and movable sheaves, then place the movable sheave over the shaft of the fixed sheave. (See Figure 3-164.) Coat the splined portion of the shaft and the ID of split washer with NEVER-SEEZ. Install the split washer and check to be sure it seats in the groove.

6. Place plastic guides onto spider and apply NEVER-SEEZ to the bottom portion of the spider which contacts the split washer.

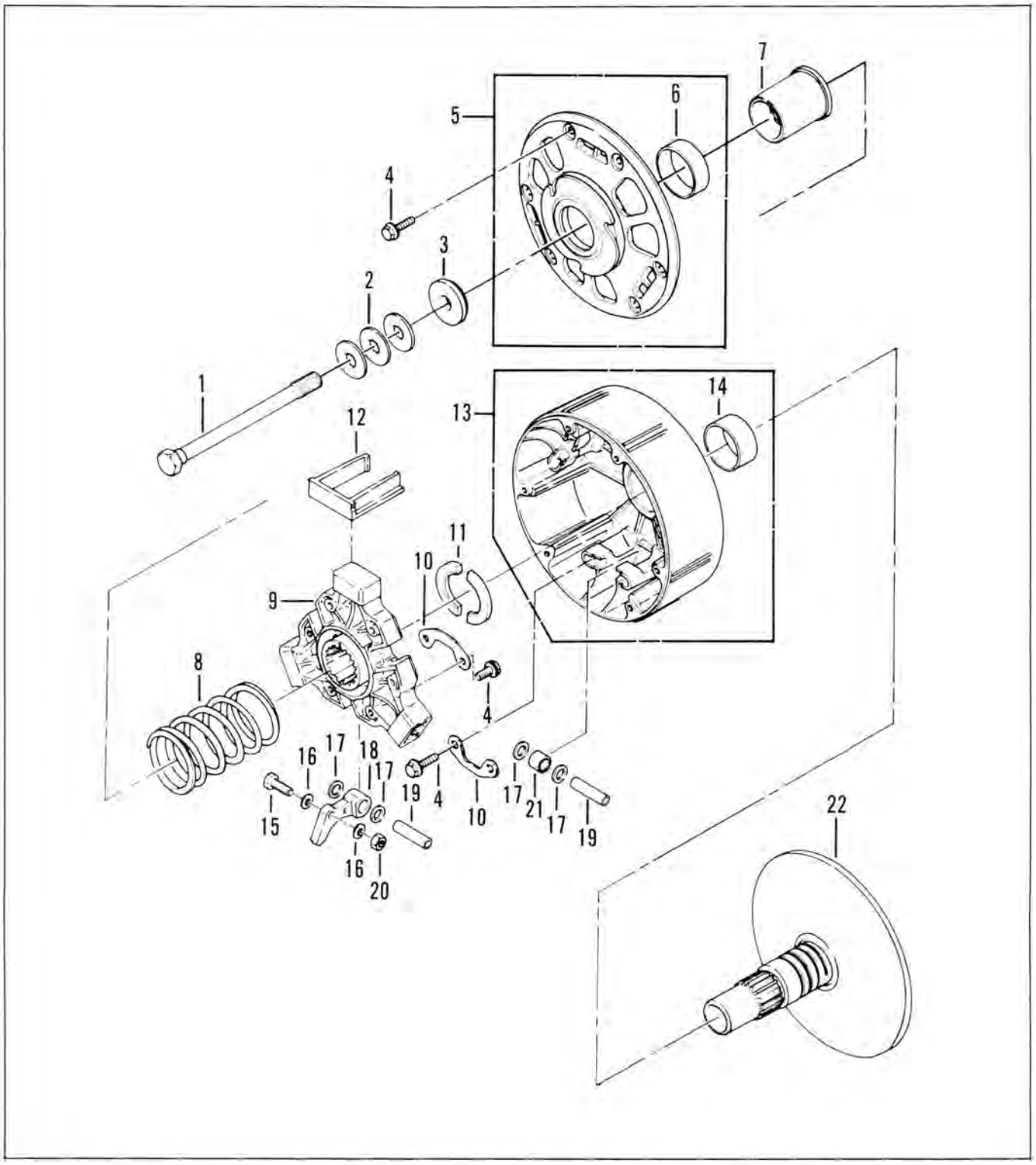
7. Hold the three ramp weights up, align arrows between spider and movable sheave, then install the spider over splined portion of shaft. After locating spider, push plastic guides into correct position.

NOTE: Due to the indexing of the splines the arrows may not align perfect. Align as close as possible.

8. Apply NEVER-SEEZ to the oil groove area filling the grooves and the bottom surface of the sleeve. Install the sleeve.

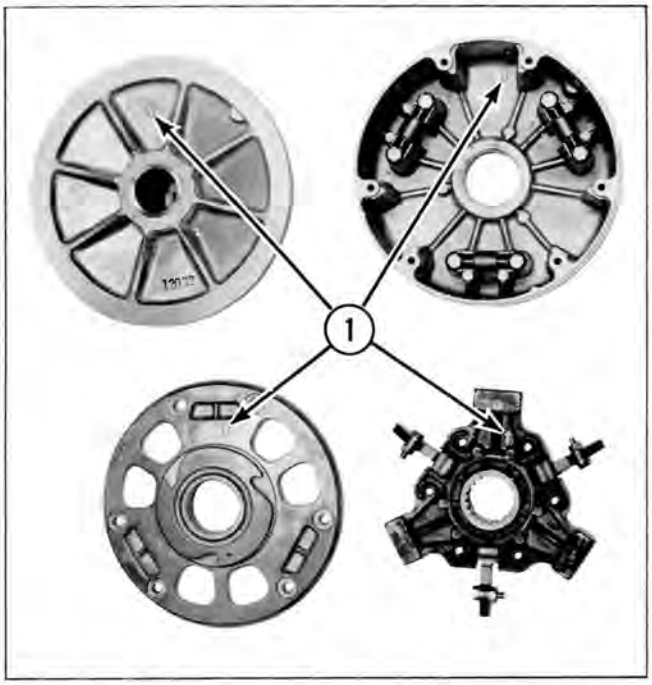
9. Install the spring into the groove in the spider.

10. Align the arrow on the cover with the other arrows in the assembly and press cover down onto sheave. Securely hold cover onto the sheave assembly and install the six bolts removed in disassembly. Torque the bolts 8 to 10 ft lb (1.1 to 1.4 kg-m).



1. Bolt
2. Special Conical Washer
3. Sleeve Washer
4. Flanged Bolt
5. Cover Assembly
6. Bushing
7. Sleeve
8. Yellow Spring
9. Spider
10. Spider and Roller Washer
11. Split Washer
12. Wear Guide
13. Movable Sheave Assembly
14. Bushing
15. Steel Bolt
16. Weight
17. Spacer
18. Ramp Weight Assembly
19. Pin
20. Special Lock Nut
21. Roller Assembly
22. Fixed Sheave

Figure 3-163



1. Align Arrows During Assembly

Figure 3-164

11. After assembly install sleeve washer and check to be sure cover surface is approximately flush with sleeve washer. If sleeve washer extends beyond cover surface, push sleeve down into proper position. (See Figure 3-165.)

WARNING

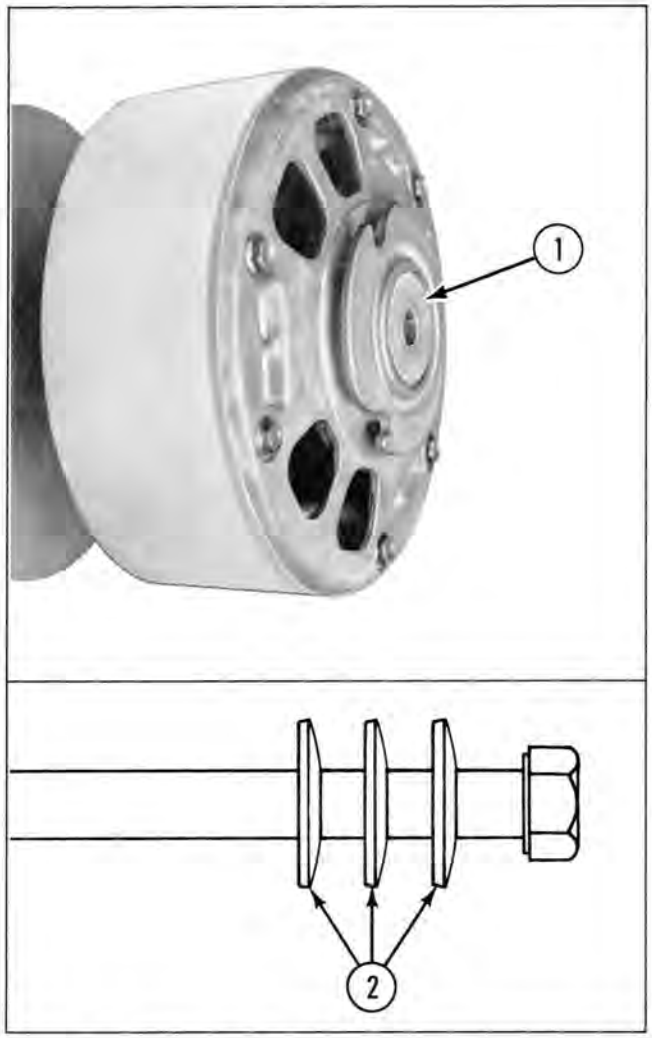
If sleeve washer extends out beyond cover surface mis-assembly of drive converter is indicated which may cause failure or malfunction during operation resulting in personel injury. Check split washer and spider assembly to insure they are properly seated on fixed sheave shaft.

12. Apply approximately 110 lb (50 kg) of force to movable sheaves and cover assembly while checking for smooth shifting action (movement) of converter.

Installation

CAUTION

In order to maintain proper torque on bolt and to prevent possible bolt failure or converter malfunction, install the THREE conical washers on converter mounting bolt as shown in Figure 3-165.



1. Washer Flush with Cover
2. Conical Washer Properly Positioned

Figure 3-165

1. Clean taper inside converter and on crankshaft to remove oil, dust, etc. Tapers must be clean and dry.

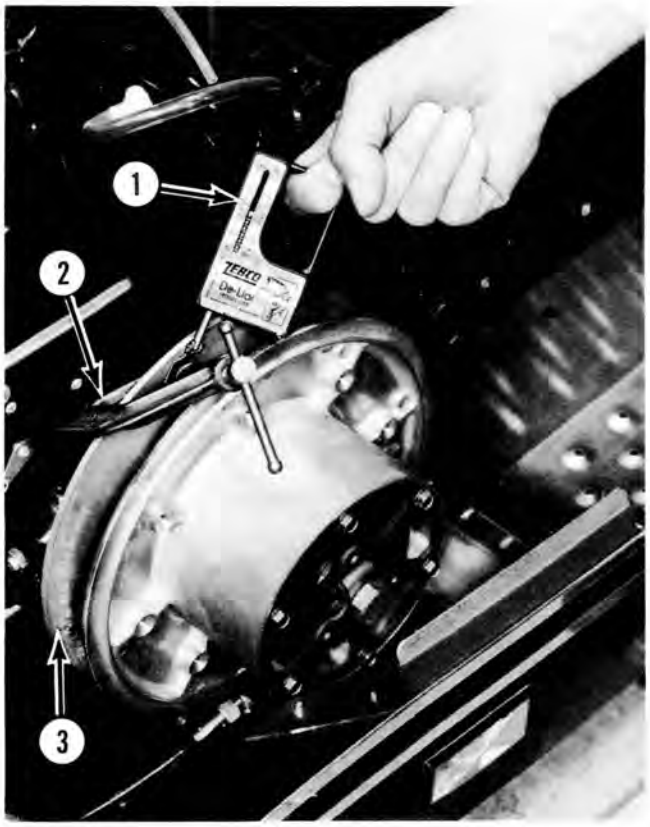
2. Install the drive converter on the crankshaft and secure with bolt and three, properly installed conical washers. Torque the bolt 65 to 70 ft lb (9.0 to 10.0 kg-m).

3. Check Converter Alignment and install drive belt. Refer to Section 2.

Driven Converter

NOTE: Driven converter spring test is based on production setting for movable sheave twist (preload). Standard twist setting is 150° (spring tabs positioned in holes identified as B-2 or C-1).

Before removing the driven converter check the converter spring. Use a C clamp to attach spring loaded scale to the flange of the movable sheave approximately 1/8 in. in from the edge. Pull in a clockwise direction with the scale. It should take 12 ± 0.5 lb to begin to move the sheave. If it takes less replace the spring. (See Figure 3-166.)



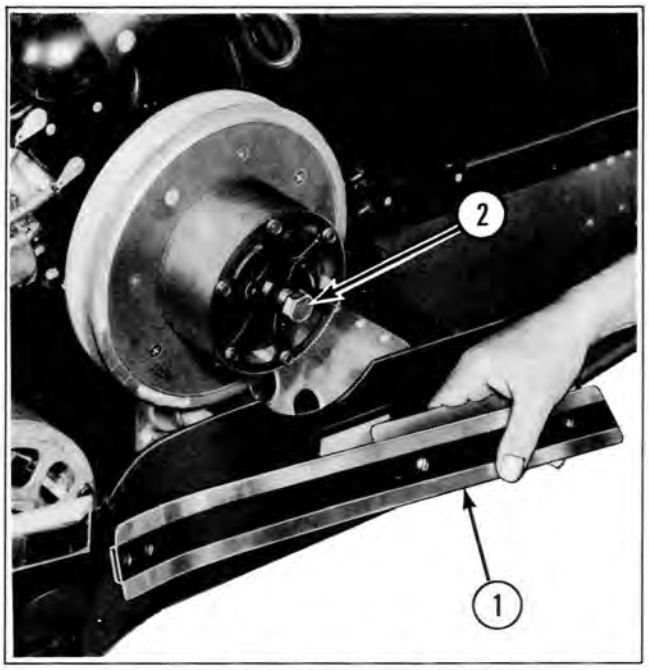
1. Scale
2. C Clamp
3. Movable Sheave

Figure 3-166

Removal

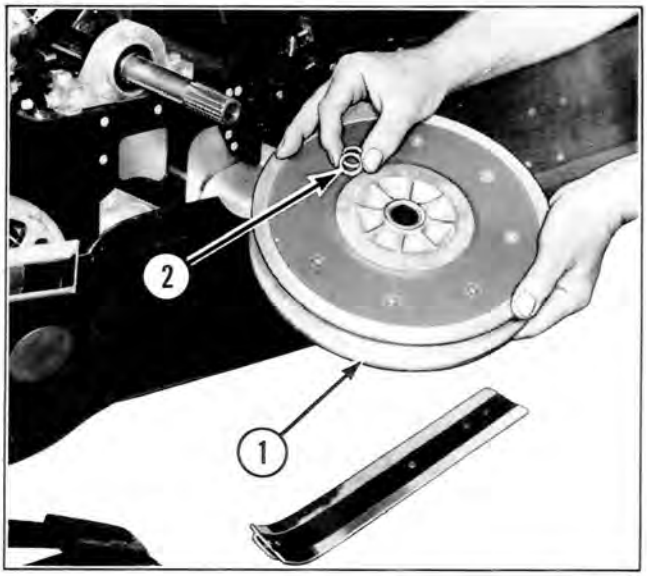
To remove the driven converter, remove left side aluminum trim from lower pan by removing mounting hardware. (See Figure 3-167.) Lower pan is notched to allow driven converter removal.

Remove the large bolt that retains the driven converter to the jackshaft and remove the driven converter. (See Figures 3-167 and 3-168.) Be careful not to lose the shims inside the driven converter. (See Figure 3-168.)



1. Aluminum Trim
2. Retaining Bolt

Figure 3-167



1. Driven Torque Converter
2. Shims

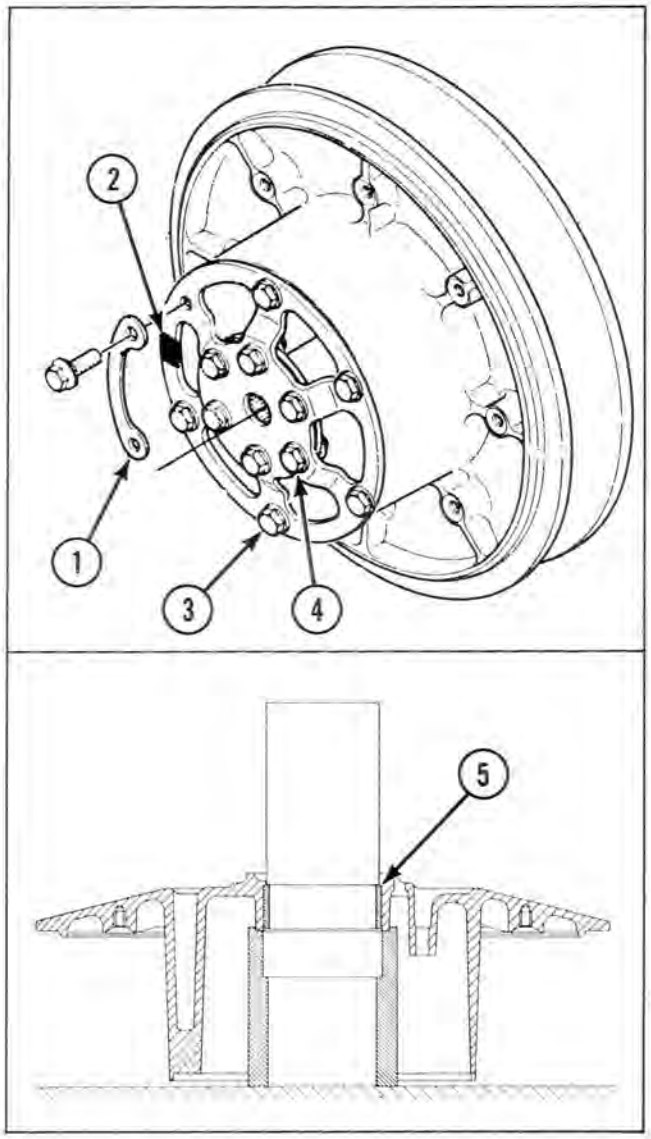
Figure 3-168

Disassembly

NOTE: Some driven converters have a balancer plate installed under the coupling mounting bolts. The balancer plate, installed during production as-

sembly, is required in some applications to maintain correct driven converter balance. Mark balancer location prior to disassembly to insure correct positioning during reassembly. (See Figure 3-169.)

1. Unscrew six outside bolts securing coupling to fixed sheave and remove the coupling. DO NOT remove six inner coupling bolts as converter unbalance will result. If bolts were loosened inadvertently, refer to Coupling Assembly Procedure. (See Figure 3-169.)



1. Balancer Plate
2. Balancer Plate Location Mark
3. Coupling Outer Bolts
4. Coupling Inner Bolts
5. Removing Bushing

Figure 3-169

WARNING

Do not release the ramp suddenly as personal injury could result.

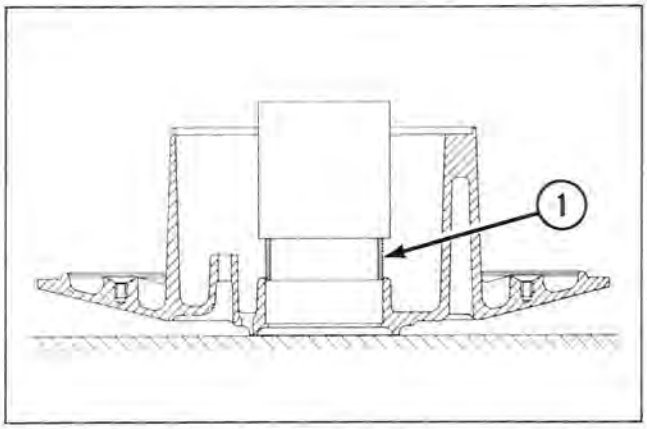
2. Twist the fixed sheave counterclockwise and the movable sheave clockwise and secure.

NOTE: Apply a reference mark (magic marker, machinist dye, etc.) onto the splined shaft of movable sheave. Align reference mark with arrows cast into fixed sheave and ramp cap. (See Figure 3-178.)

Press the ramp down slightly and remove the retainer ring. Slowly release the ramp and remove.

3. Before removing the fixed sheave move the sheave from side to side to check for a worn bushing. If there is excessive movement replace the bushing. For an accurate check measure the diameter of the shaft of the movable sheave and the inside diameter of the bushing with micrometers. If the difference between the two readings is 0.02 in. (0.5 mm) or more replace the bushing. (See Figures 3-169 and 3-170.)

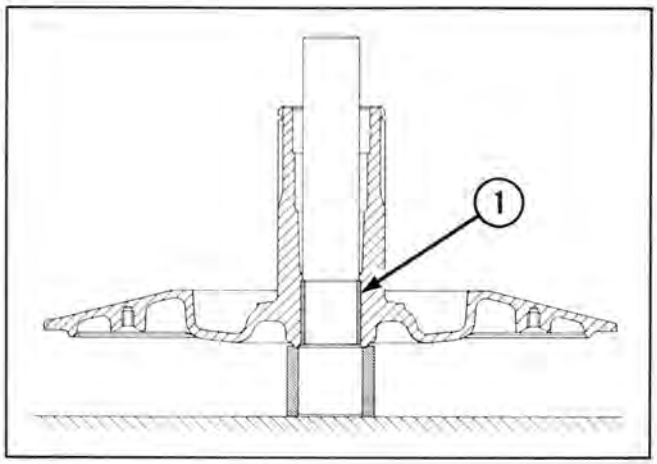
NOTE: Bushings used in converter are split type. During inspection do not mistake bushing split line as a cracked bushing.



1. Installing Bushing

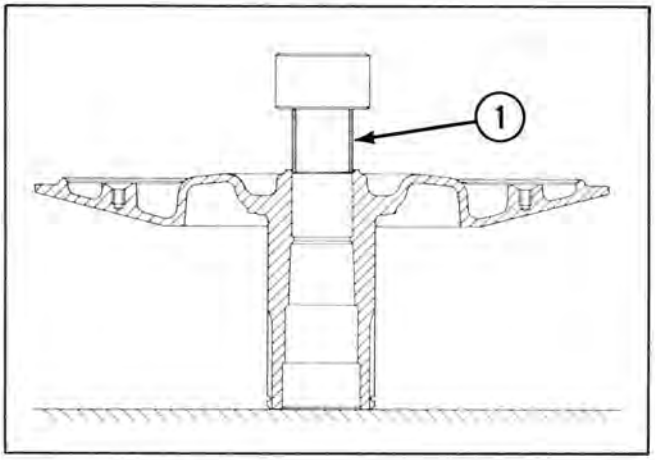
Figure 3-170

4. Measure the inside diameter of the lower bushing in the movable sheave and the diameter of the jackshaft if the difference between the readings is 0.02 in. (0.5 mm) or greater replace the bushing. (See Figures 3-171 and 3-172.)



1. Removing Bushing

Figure 3-171



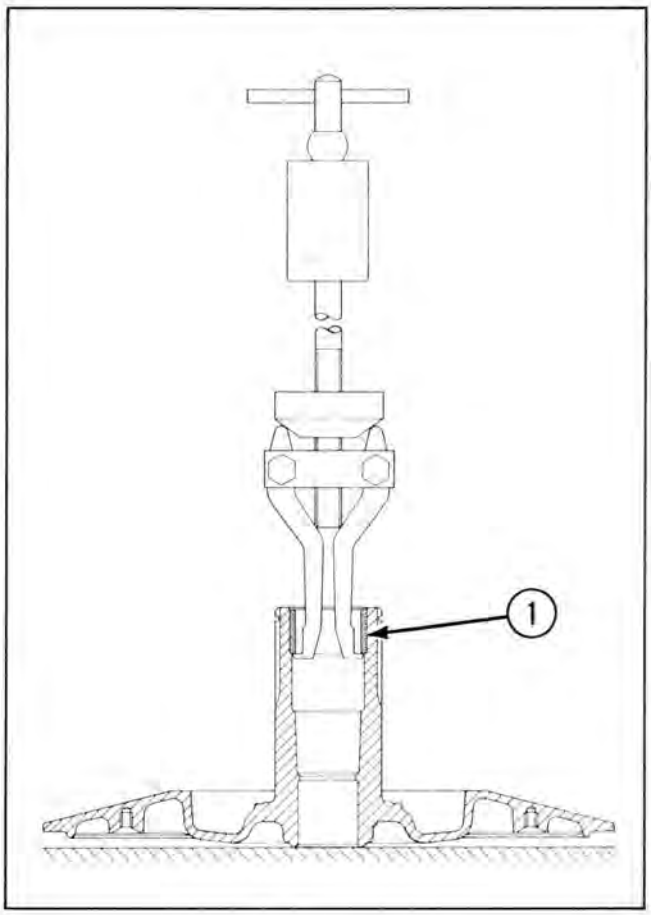
1. Installing Bushing

Figure 3-172

5. Place the shaft end of the coupling into the end of the shaft on the movable sheave and move from side to side if there is excessive movement, replace the bushing. For an accurate check, measure the outside diameter of the coupling shaft and the inside diameter of the bushing with micrometers. If the difference between the two readings is 0.02 in. (0.5 mm) replace the bushing. (See Figures 3-173 and 3-174.)

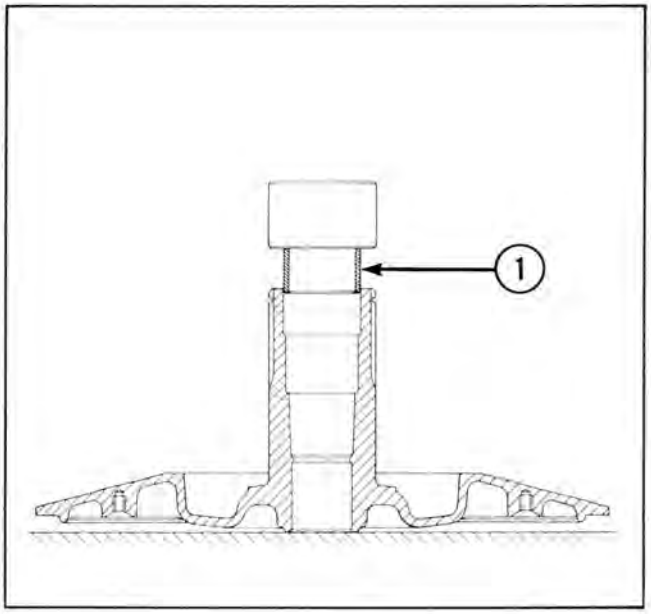
NOTE: Bushings used in converter are split type. During inspection do not mistake bushing split line as a cracked bushing.

6. Check the wear shoes if they are excessively worn replace them. Maximum wear allowable is 0.060 in. (1.5 mm). (See Figure 3-175.) Push the wear shoes out from the back of the fixed sheave with a hammer and punch.



1. Removing Bushing

Figure 3-173



1. Installing Bushing

Figure 3-174

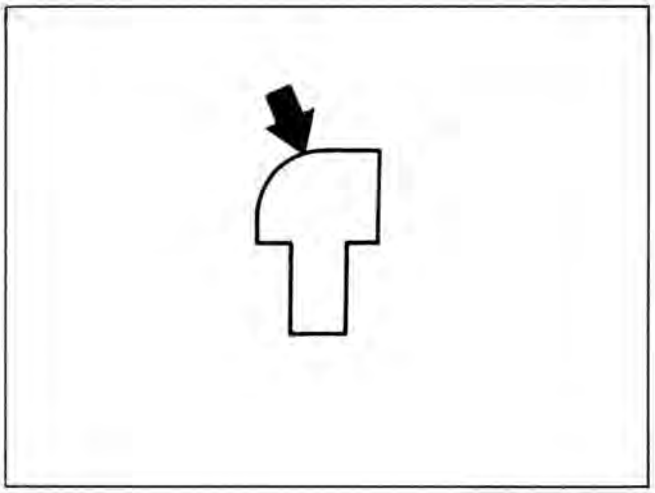


Figure 3-175

Cleaning (See Figure 3-176)

NOTE: Accumulation of foreign matter on sliding surfaces or moving components within converter will alter the shifting characteristics, which will affect vehicle performance throughout the shifting range. Contamination of converter components may cause the vehicle to display any of the following symptoms:

a. Bog (hesitation) during acceleration.

b. Poor back shift.

c. Low top speed.

1. Remove all grease and dirt by wiping the components with a rag dipped in cleaning solvent. Dry parts with compressed air or a clean cloth.

CAUTION

DO NOT soak components with bushings in cleaning solvents, since some solvents can damage the bushing resulting in converter failure.

2. Remove drive belt accumulations from the stationary sheave and movable sheave with cleaning solvent.

3. Thoroughly clean rust and drive belt accumulations from coupling assembly, converter bushings, and jackshaft surfaces.

Reassembly (See Figure 3-177)

1. Start the wear shoes in by hand then press shoe in until it bottoms on the sheave casting. Be careful when assembling sheave not to scratch and nick its face.

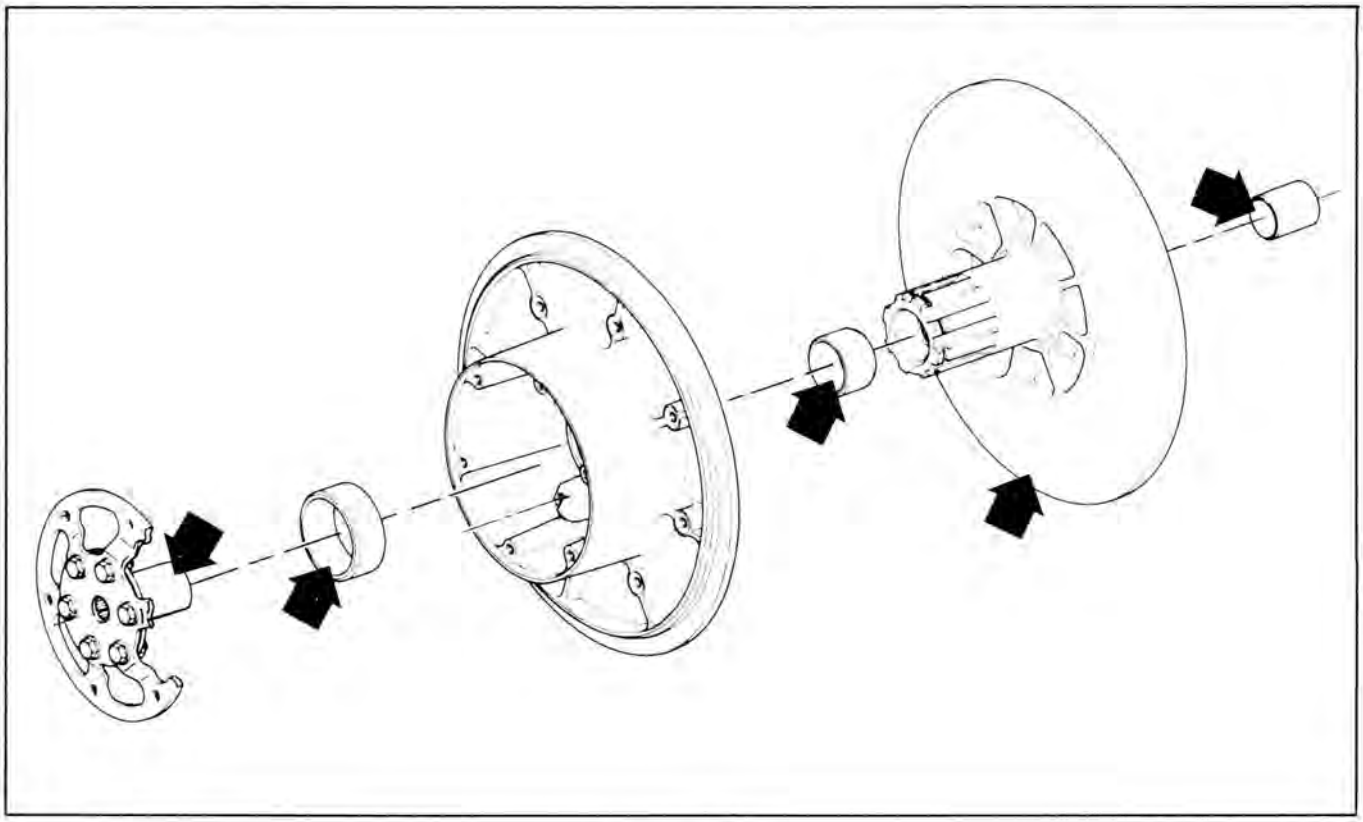
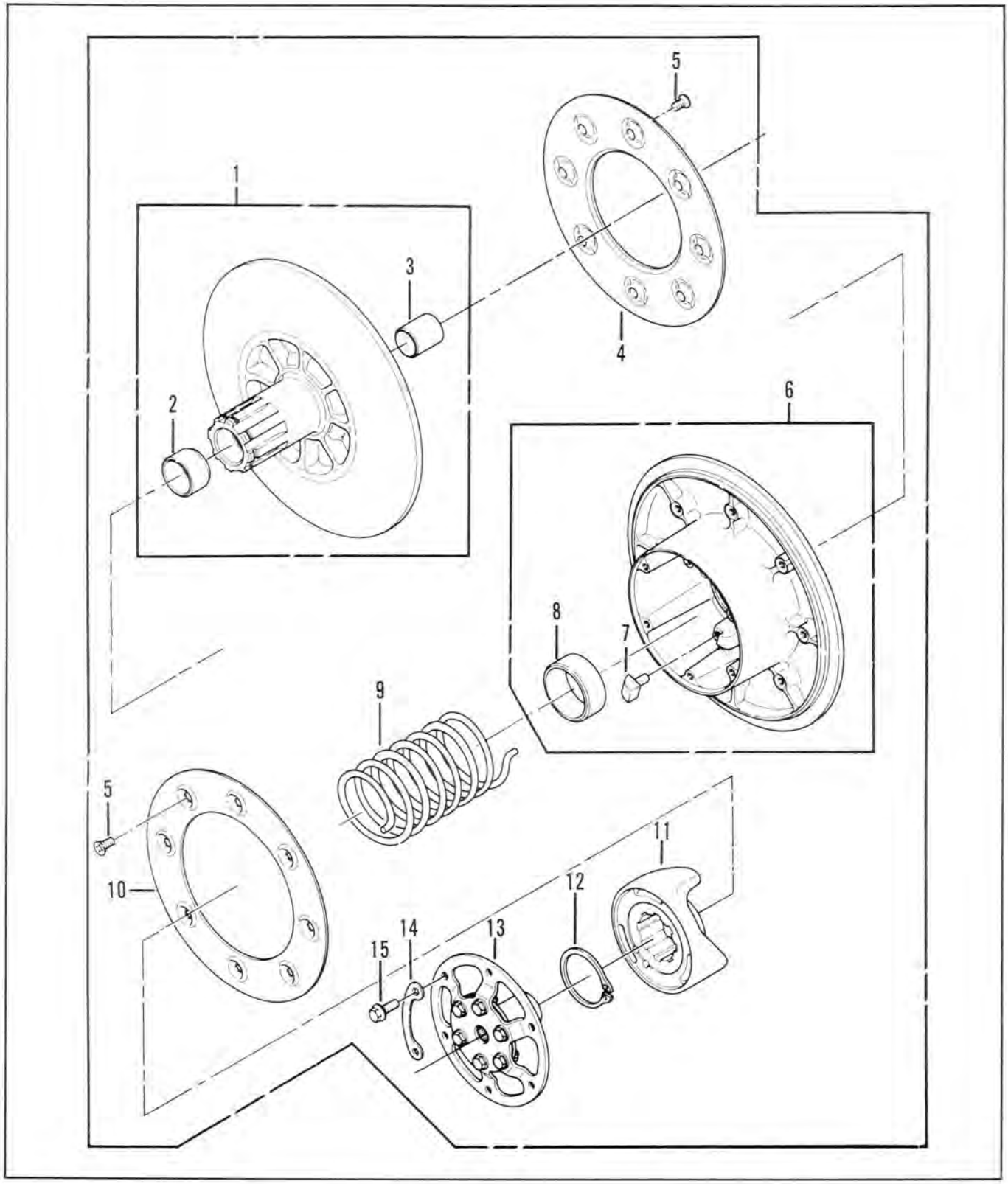


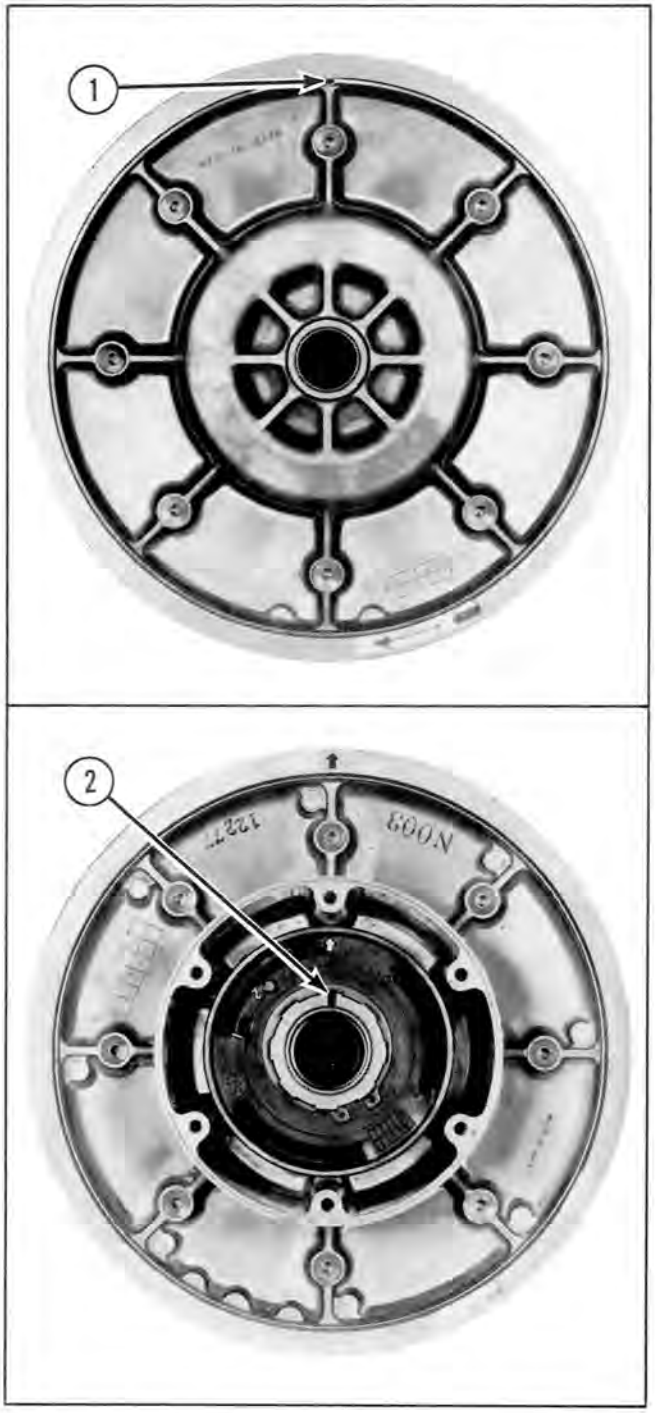
Figure 3-176



1. Movable Sheave Assembly
2. Bushing
3. Bushing
4. Movable Sheave Cover
5. Screw
6. Fixed Sheave Assembly
7. Wear Shoe
8. Bushing
9. Driven Converter Spring
10. Fixed Sheave Cover
11. Ramp Cap
12. Circlip
13. Coupling
14. Coupling Balancer
15. Flange Bolt

Figure 3-177

2. Very important: Locate the small oval protrusion (width 0.060 in. [1.5 mm], length 0.118 in. [3.0 mm]) on the ridge on the back side of the movable sheave. (See Figure 3-178.) The oval protrusion should be in line with the reference mark applied to splined shaft during disassembly. Use reference mark to simplify reassembly process.



1. Oval Protrusion
2. Mark on Movable Sheave Shaft

Figure 3-178

3. Place the fixed sheave onto the movable sheave. Position the arrow on the fixed sheave 150° clockwise from the oval protrusion (or reference mark on shaft of movable sheave) when viewing from the splined end.

NOTE: Check to be sure the parts have no holes or dents.

4. Insert the spring. Place tang of spring into hole marked B in the fixed sheave. (See Figure 3-179.) Apply NEVER-SEEZ to the splines in the ramp cap. Insert the tang on the other end of the spring into hole number 2 in the ramp cap. (See Figure 3-179.) This is the standard specification for this converter.

NOTE: To increase top end RPM move spring to position C-2, which increases twist to 180°. To decrease top end RPM move spring to A-2 (120°) or A-1 (90°) decrease of twist. See Chart below.

A-1 = 90°
A-2 = 120°
B-1 = 120°
B-2 = 150°
C-1 = 150°
C-2 = 180°

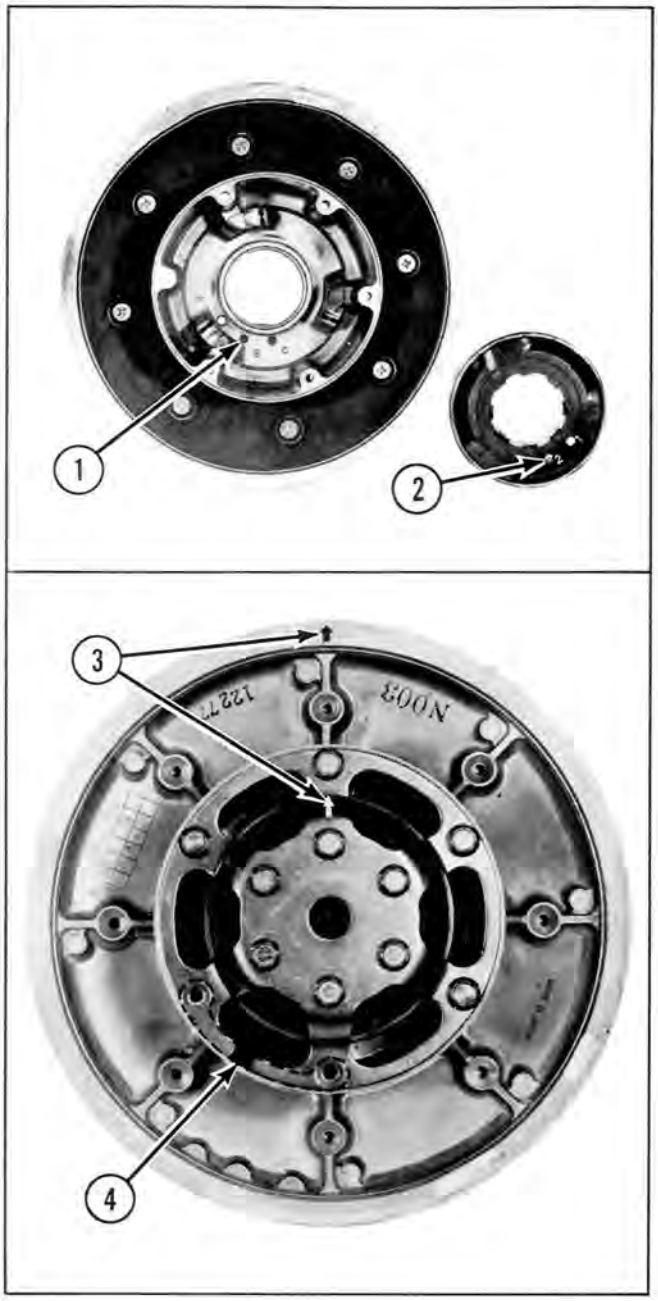
5. Align the arrow on the ramp cap with the oval protrusion (or reference mark) on the movable sheave. Match the splines nearest this position and lower the ramp cap 3/8 in. (10 mm) onto splined area of movable sheave. Secure the movable sheave onto the workbench and turn the fixed sheave counterclockwise approximately 150° to 160° to align the oval protrusion (or reference mark) on the movable sheave with the arrow of the fixed sheave. Push the ramp all the way down and install the retainer ring. (See Figure 3-178.)

NOTE: Be sure to twist the sheave in the correct direction. Install the retainer ring with the sharp or square edges out and make sure it seats completely into the groove.

6. Install the coupling. Be sure to align the arrow on the coupling with the arrows on the assembly. (See Figure 3-179.)

CAUTION

Position balancer plate onto coupling at location identified during disassembly. DO NOT use balancer plate unless installed during production assembly or vibration during operation will result. (See Figures 3-169 and 3-179.)



1. Hole B
2. Hole 2
3. Arrows Aligned
4. Balancer Plate Mark

Figure 3-179

Install the six bolts and torque 8 to 10 ft lb (1.1 to 1.4 kg-m).

7. Check to see if the fixed sheave will return properly when it is turned counterclockwise.

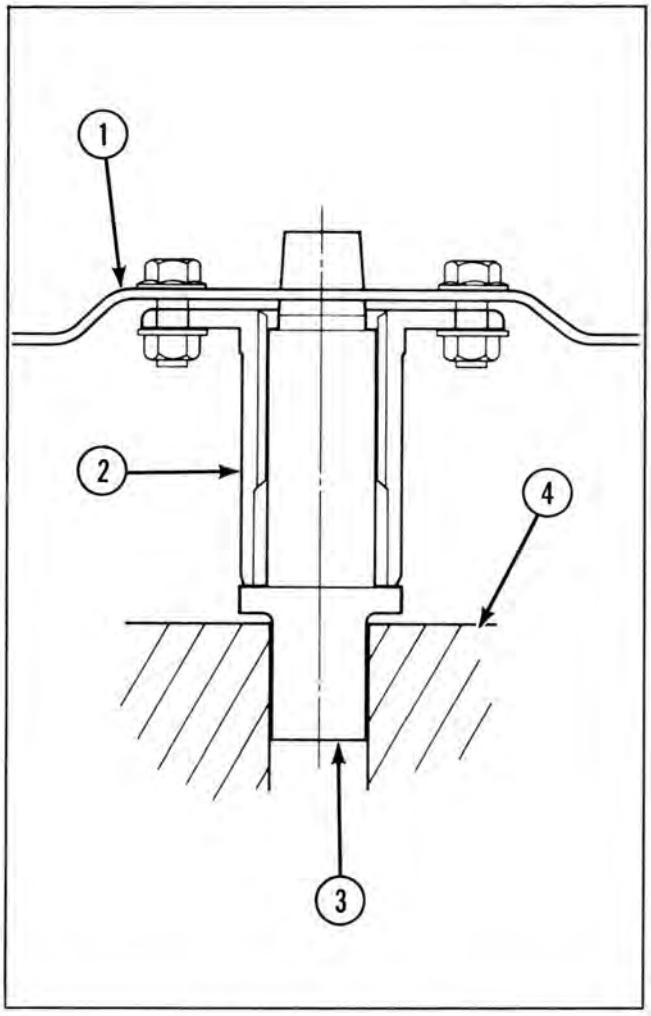
NOTE: The 35° ramp is standard. A 30° ramp for high altitudes is available, this ramp will also produce a quicker downshift and a slower upshift.

Coupling Assembly

If the inner bolts on the coupling assembly have been loosened or removed, then centering pilot (special tool P/N 57001-3506) must be used for reassembly, to insure correct concentricity (alignment) between shaft hub and coupler plate. Align coupler assembly as follows:

1. Loosen the six inner nuts.
2. Position shaft hub and coupler plate on centering pilot as shown. (See Figure 3-180.)
3. Tighten bolts 8 to 10 ft lb (1.1 to 1.4 kg-m).

NOTE: Concentricity between outside diameter of coupler plate and outside diameter of shaft hub must be within 0.016 in. (0.40 mm) total indicated reading.



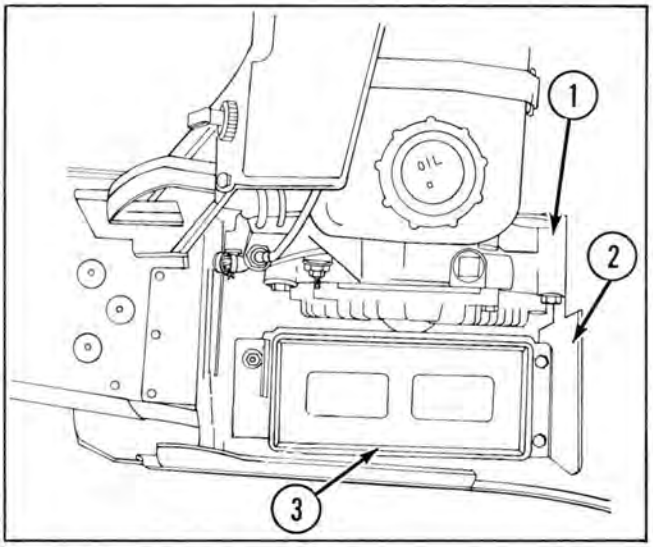
1. Coupler Plate
2. Shaft Hub
3. Centering Pilot
4. Vise

Figure 3-180

Chaincase

Removal

1. With the battery removed (refer to Battery Removal) loosen four mounting bolts securing lower battery bracket, then remove the bracket for access to chaincase mounting bolts (See Figure 3-181.)



1. Chaincase
2. Heat Shield Bracket
3. Lower Battery Bracket

Figure 3-181

2. Remove brake return spring.

3. Disconnect brake cable from clevis retainer and brake cable bracket. (See Figure 3-182.)

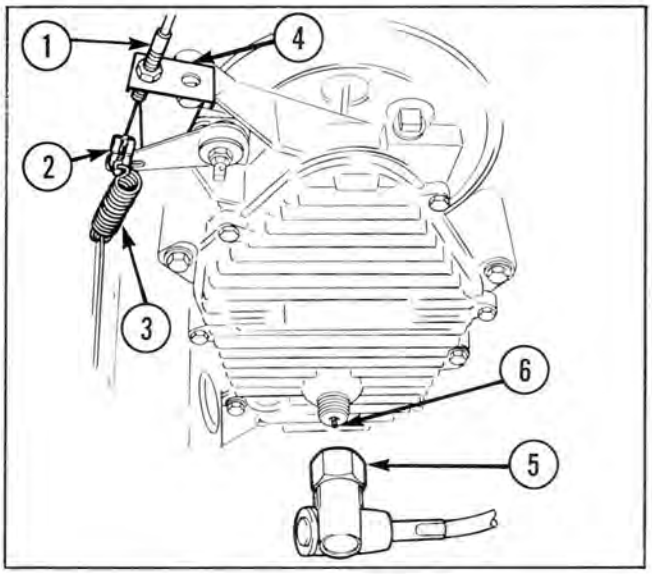
4. Remove speedometer drive adapter and cover to drain the oil from the chaincase. (See Figure 3-182.)

5. Remove all tension from the track. Refer to section 2.

6. Remove tensioner spring, chain, top and bottom sprockets. Use care not to lose spacer behind sprockets. (See Figure 3-183.)

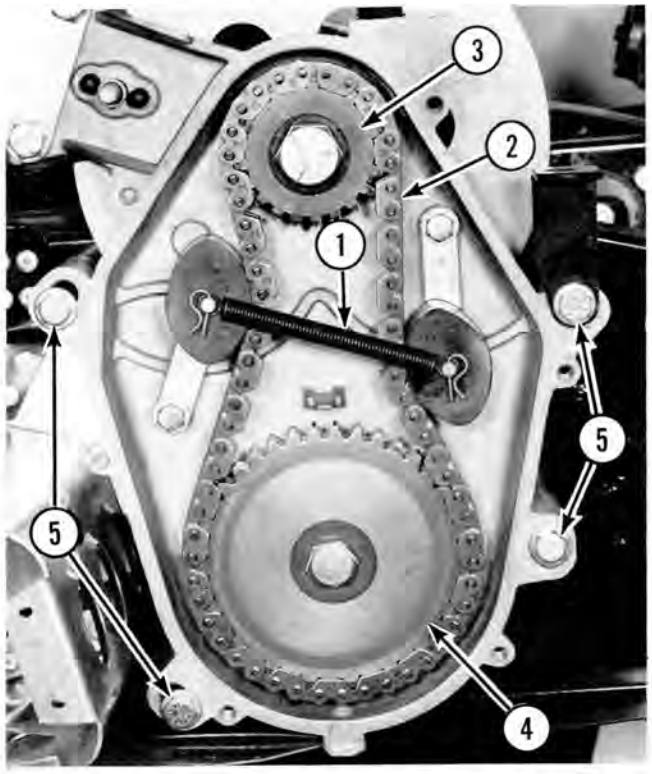
7. Remove the four bolts holding the chaincase to the frame. (See Figure 3-183).

8. Pull chaincase away from frame and remove from the snowmobile. The brake disc will slide off of jackshaft along with chaincase.



1. Brake Cable
2. Clevis Retainer
3. Return Spring
4. Brake Cable Bracket
5. Speedometer Adapter
6. Speedometer Key

Figure 3-182



1. Tensioner Spring
2. Chain
3. Top Sprocket
4. Bottom Sprocket
5. Chaincase Mounting Bolts

Figure 3-183

Chaincase Disassembly (See Figure 3-184)

1. Remove brake cam, spring and pins.
2. Remove brake caliper, movable pad and back-up plate.
3. Remove tensioner arms with chain guides.
4. Remove upper and lower bearing retainer ring from chaincase by prying end of ring with a screwdriver.
5. Using an appropriate puller remove the bearings and seals. All bearings must be removed towards the chaincase cover.

NOTE: It is not recommended to remove the bearings or seals unless replacement is required. The bearings and seals are press-fitted and repeated removal may damage the bearings and seals or the chaincase. Heating chaincase with a high intensity light, heat gun, or small propane torch will ease removal of the bearings.

Cleaning and Inspection

1. Clean metal parts in solvent and dry all parts except bearings with compressed air. Allow bearings to air dry.
2. Inspect bearings for scoring and wear.
3. Inspect sprocket and splined shaft for chipped, broken or missing teeth or splines.

Reassembly (See Figure 3-184)

1. If removed, install new seals and bearings. Heating the chaincase with a high intensity light, heat gun, or small propane torch will ease installation of the bearings.

NOTE: The lower chaincase seal is a double lip type. Be sure area between lips is packed with grease to prevent premature driveshaft wear.

2. Insert upper and lower bearing retainer rings into chaincase. Insure rings are fully seated within groove of chaincase.
3. Install tensioner arms with bolt, washer, sleeve and nut. Do not over tighten. The arm must swing freely.
4. Install back-up plate and movable brake pad into chaincase and install fixed caliper and brake cable bracket with bolts and nuts.
5. Insert push pins into brake housing and install spring, guide, brake cam, washer and nut.

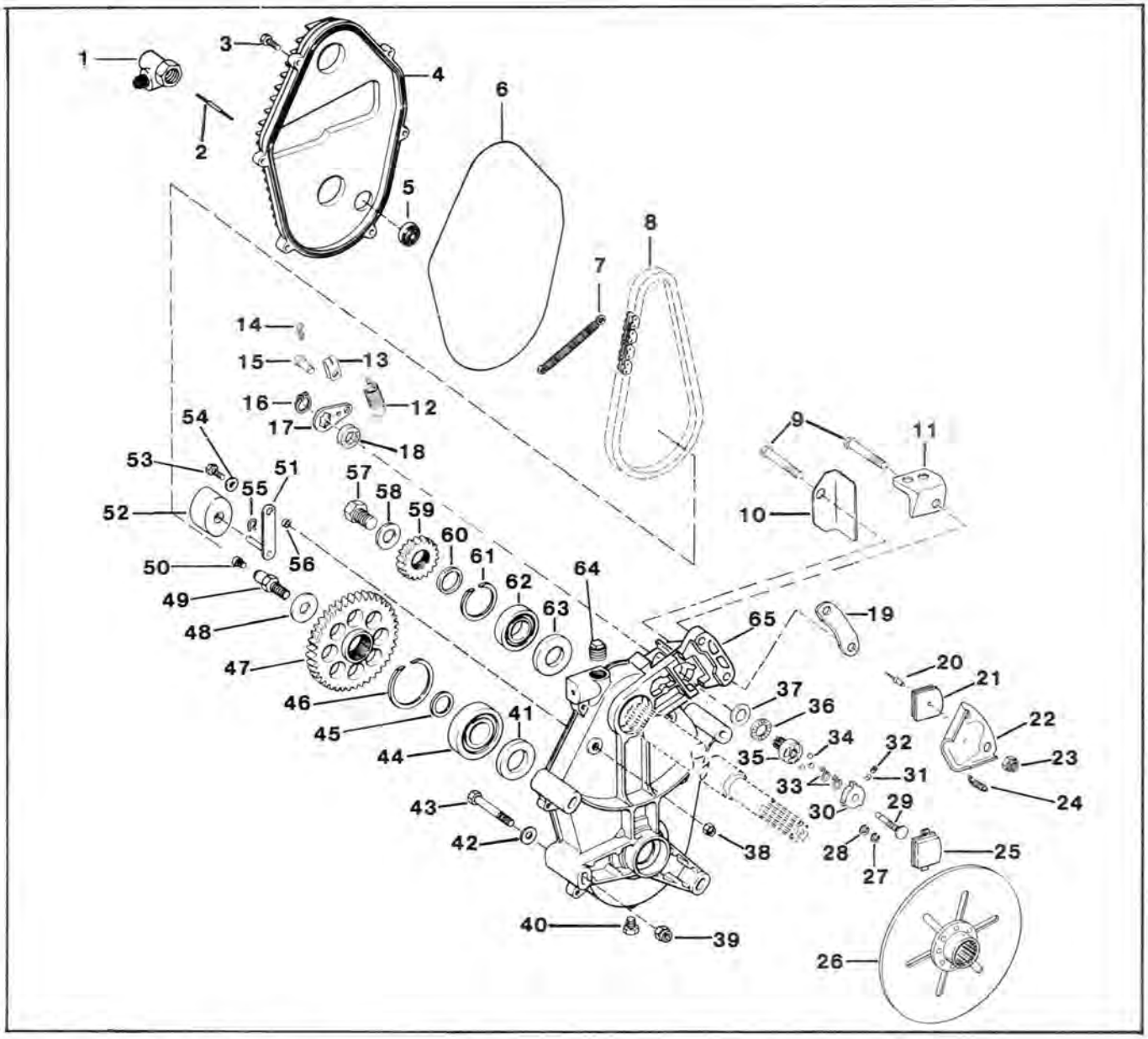
NOTE: Lubricate pins and underside of brake cam with NEVER-SEEZ lubricant.

9 Installation (See Figure 3-184)

1. Install the chaincase and brake disc onto the jackshaft as an assembly.
2. Position battery heat shield bracket onto chaincase then insert chaincase to chassis mounting bolts. (See Figure 3-185.)
3. Tighten chaincase mounting bolts to 18 ft lb (2.5 kg-m)
4. Install the upper and lower sprocket spacers. Thick spacer for the top sprocket, thin spacer for bottom sprocket.
5. Install the upper sprocket, lower sprocket, (lip on the lower sprocket goes toward the bearing) and the chain as a unit. Install the lower sprocket bolt and washer, torque 35 ft lb (4.84 kg-m). Install the upper sprocket bolt and washer, torque 40 to 50 ft lb (5.53 to 6.92 kg-m).
6. Install the chain guides, tensioner spring and hair pin retainers.
7. Install the chaincase cover and new O-ring seal. Fill the chaincase with DEXRON II automatic transmission fluid to the center of the sight gauge. Reinstall the fill plug.
8. Insert speedometer key through chaincase cover hole while rotating key to align with square hole in lower sprocket mount bolt. (See Figure 3-182.)

NOTE: Speedometer key should be centered within chaincase cover hole and cannot be rotated when properly engaged with lower sprocket mount bolt.

9. Position speedometer drive adapter near mounting threads on cover, insert end of flexible key into square hole of adapter, and slide adapter into position on cover. Do not use force during assembly. When components are properly aligned, adapter will slide easily into position. (See Figure 3-182.)
10. Install brake cable clevis retainer and return spring. Refer to Brake Cable Installation procedure in Section 3.
11. Secure lower battery bracket to footrest and heat shield bracket with mounting hardware installed in sequence shown (See Figure 3-186.)
12. Install battery. Refer to Battery Installation procedure in Section 2.
13. Perform track tension and alignment procedures. Refer to Track Adjustments in Section 2.



1. Speedometer Drive Adapter
2. Speedometer Adapter Key
3. Bolt
4. Chaincase Cover
5. Oil Level Gauge
6. O-Ring Seal
7. Pink Tensioner Spring
8. Chain
9. Bolt
10. Brake Disc Guard
11. Brake Cable Bracket
12. Brake Return Spring
13. Clevis Retainer
14. Hair Pin
15. Clevis Pin
16. Snap Ring
17. Brake Lever
18. Neoprene Washer
19. Calper Spacer
20. Rivet
21. Pad
22. Caliper
23. Nut
24. Pad Return Spring
25. Movable Pad
26. Brake Disc Assy
27. Ring
28. Retaining Ring
29. Brake Shaft
30. Stator
31. Friction Plug
32. Friction Plug Screw
33. Torsion Spring
34. Ball
35. Rotor
36. Thrust Bearing
37. Thrust Washer
38. Nut
39. Insert Nut
40. Drain Plug
41. Lower Oil Seal
42. Special Washer
43. Bolt
44. Lower Ball Bearing
45. Lower Sprocket Spacer (Thin)
46. Bearing Retainer Ring
47. Lower Sprocket
48. Washer
49. Special Bolt
50. Speedometer Adapter Key
51. Tensioner Arm
52. Chain Guide
53. Bolt
54. Plain Washer
55. Hair Pin
56. Tensioner Arm Sleeve
57. Bolt
58. Special Washer
59. Upper Sprocket
60. Upper Sprocket Spacer (Thick)
61. Bearing Retainer Ring
62. Upper Ball Bearing
63. Upper Oil Seal
64. Fill Plug
65. Chaincase

Figure 3-184

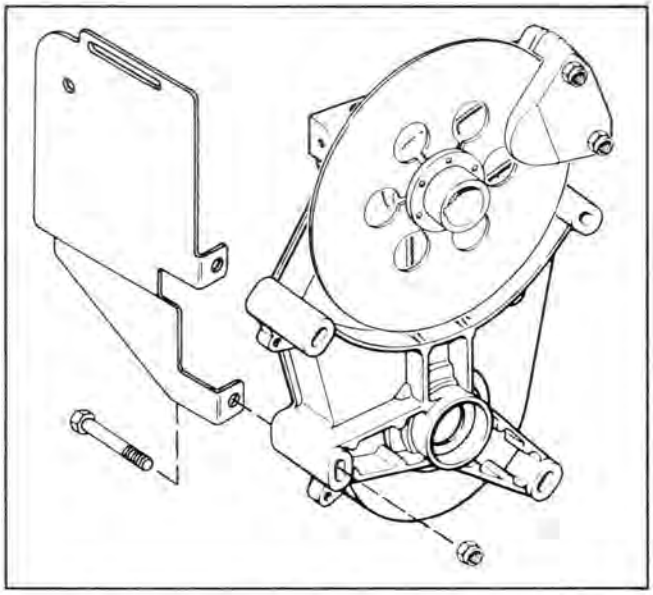
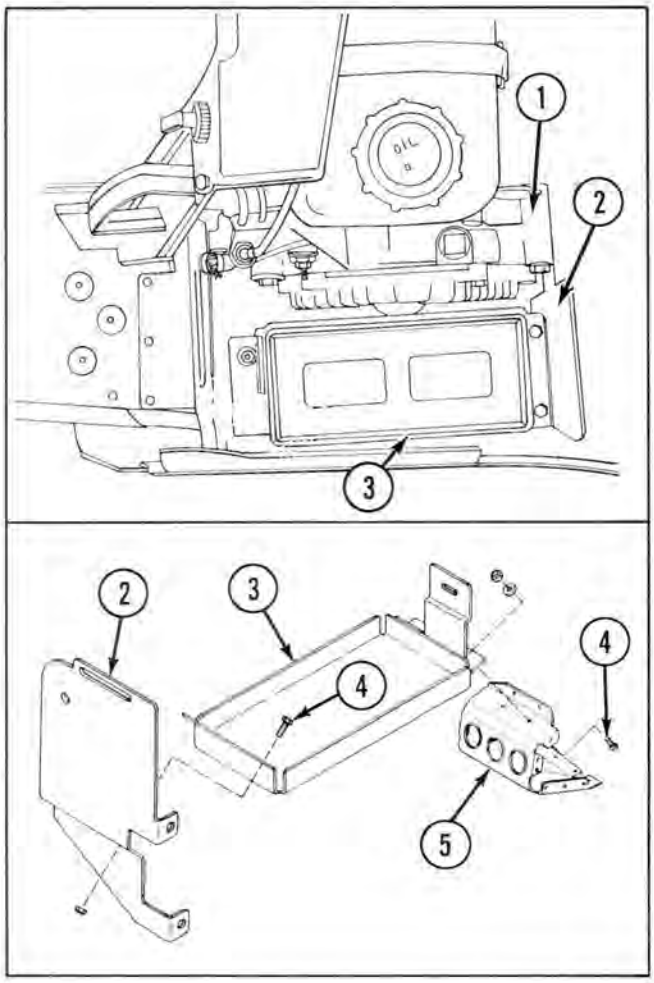


Figure 3-185



1. Chaincase
2. Heat Shield Bracket
3. Lower Battery Bracket
4. Bolt
5. Foot Rest

Figure 3-186

Self-Adjusting Brake

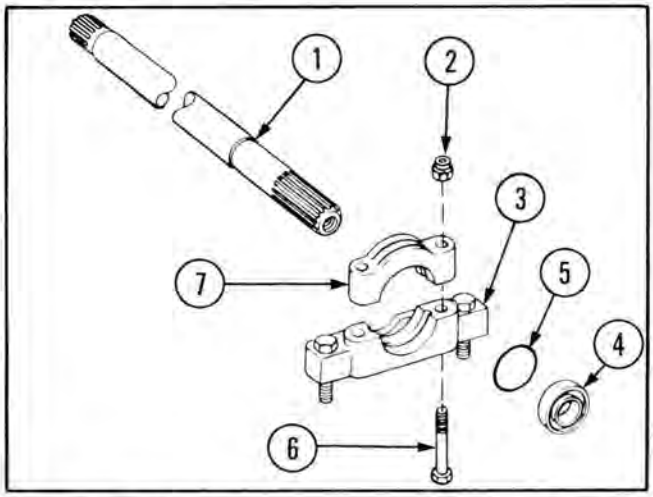
NOTE: Before disassembling self-adjusting brake, perform Brake Pad Wear Inspection. Refer to Section 2.

Disassembly

1. Remove battery. Refer to Battery Removal.
2. Remove lower battery bracket and mounting bolts. (See Figure 3-181.)
3. Remove speedometer drive adaptor and key. (See Figure 3-182.)
4. Place an oil drain pan under hole in lower pan and remove chaincase cover to drain oil.
5. Remove chain tensioner spring. (See Figure 3-183.)
6. Unbolt top sprocket. Remove the sprocket and the spacer located behind the sprocket. (See Figure 3-183.)

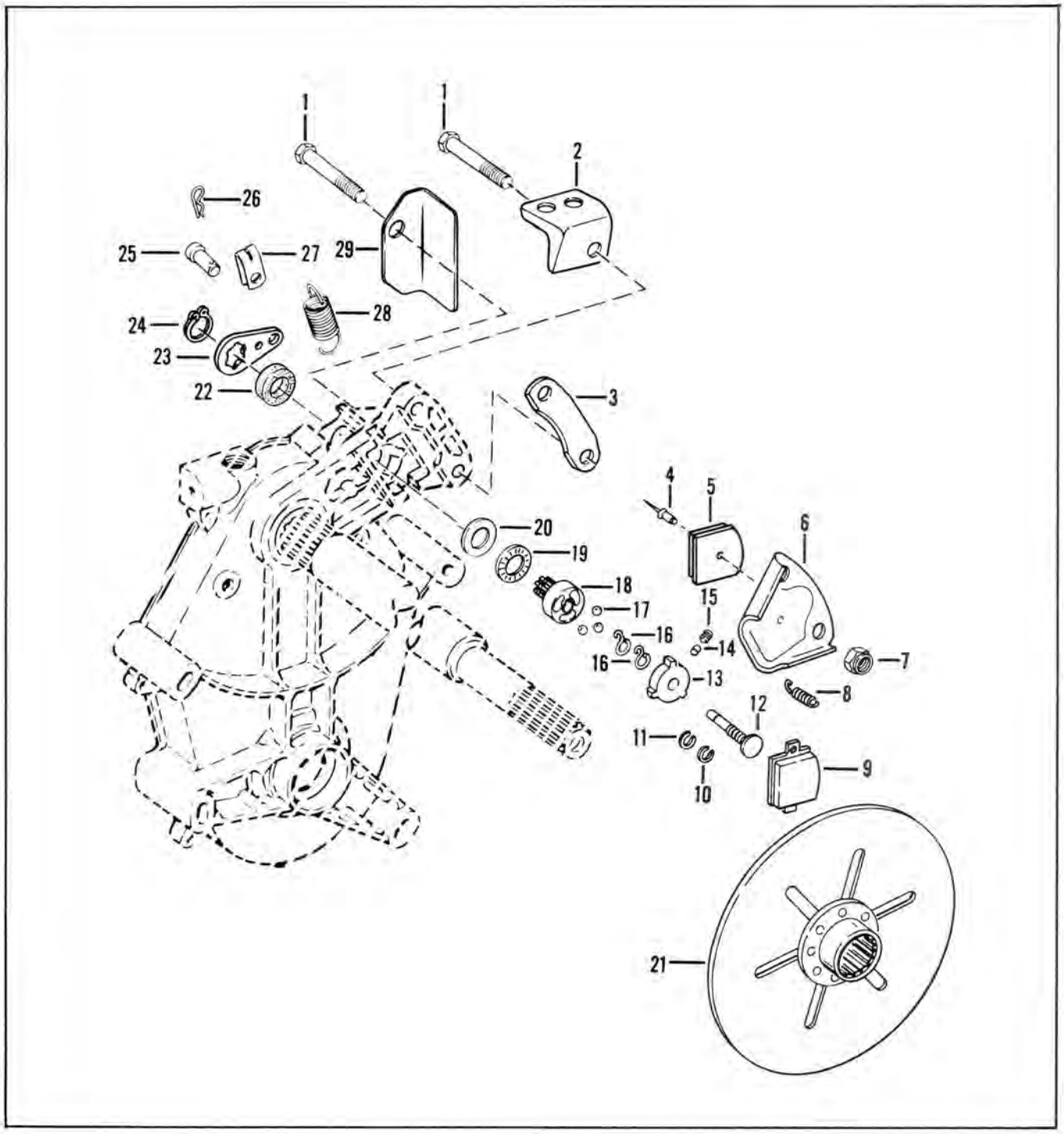
NOTE: It may be necessary to remove the lower sprocket also.

7. Remove air silencer. Refer to Silencer Removal.
8. Remove drive belt. Refer to Belt, Section 2.
9. Remove left side trim from lower pan.
10. Remove the jackshaft bearing retainer cap and slide the jackshaft out of the chaincase far enough to remove the brake disc. (See Figure 3-187.)



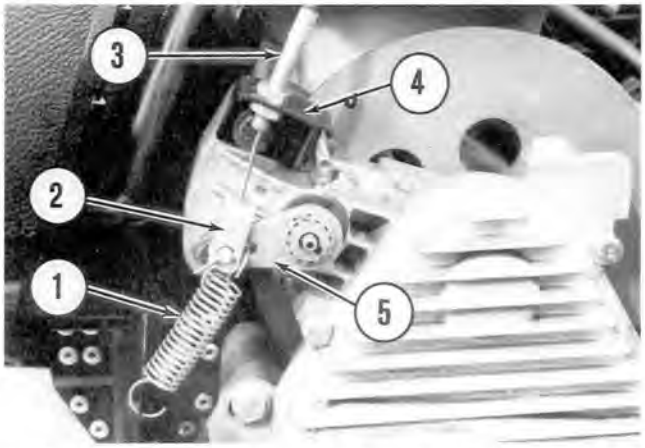
1. Bearing Cap Nut
2. Bearing Retainer
3. O-Ring
4. Bearing
5. Bearing Cap

Figure 3-187



1. Bolt
2. Brake Cable Bracket
3. Caliper Spacer
4. Rivet
5. Pad
6. Caliper
7. Nut
8. Pad Return Spring
9. Movable Pad
10. Ring
11. Retaining Ring
12. Brake Shaft
13. Stator
14. Friction Plug
15. Friction Plug Screw
16. Torsion Spring
17. Ball
18. Rotor
19. Thrust Bearing
20. Thrust Washer
21. Brake Disc Assy
22. Neoprene Washer
23. Brake Lever
24. Snap Ring
25. Clevis Pin
26. Hair Pin
27. Clevis Retainer
28. Brake Return Spring
29. Brake Disc Guard

Figure 3-188A



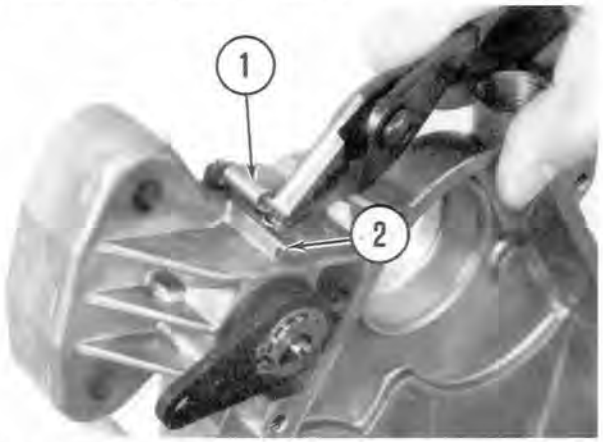
1. Return Spring
2. Retainer
3. Brake Cable
4. Brake Cable Bracket
5. Brake Lever

Figure 3-188B

11. Unhook brake return spring and remove brake cable from bracket. (See Figure 3-188B.)

12. Unbolt caliper from chaincase and remove brake cable bracket, caliper spacer and disc guard. (See Figure 3-188A.)

13. Place a rag behind the chaincase under the brake mechanism. Unhook moveable brake pad springs from chaincase pegs and remove pad. (See Figure 3-188C.)



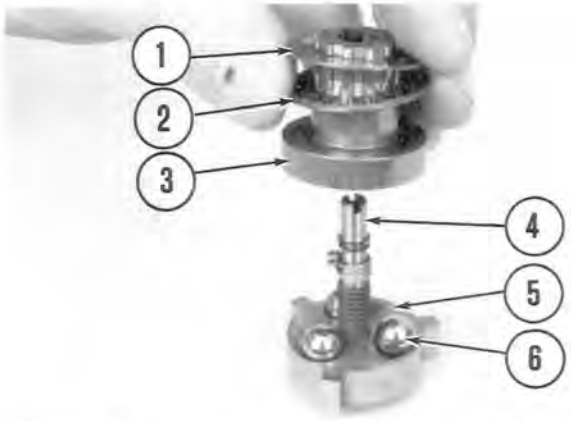
1. Top Brake Pad Spring
2. Peg

Figure 3-188C

14. Remove snap ring, brake lever and neoprene washer from rotor. Push self-adjusting mechanism as an assembly out of the chaincase. (See Figure 3-188A.)

NOTE: Be careful not to lose the three steel balls when removing the self-adjusting mechanism.

15. Remove thrust bearing and thrust washer from rotor. Separate rotor and three steel balls from stator and brake shaft. (See Figure 3-188D.)



1. Thrust Washer
2. Thrust Bearing
3. Rotor
4. Brake Shaft
5. Stator
6. Steel Ball

Figure 3-188D

16. Use the following procedure to disassemble brake shaft from stator:

    □ Remove retaining rings from shaft. (See Figure 3-188E.)



1. Stator
2. Torsion Springs
3. Brake Shaft
4. Retaining Rings

Figure 3-188E

    □ Remove torsion springs from shaft by turning in the direction shown. Be careful not to distort their shape. (See Figure 3-188F.)



1. Torsion Springs
2. Brake Shaft
3. Stator

Figure 3-188F

☐ Remove socket head set screw from stator. Unscrew stator from shaft (lefthand thread). Use a scribe or similar tool to push friction plug out of stator. (See Figure 3-188G.)



1. Stator
2. Friction Plug
3. Set Screw

Figure 3-188G



1. Brake Shaft Adjust Slot
2. Torsion Spring "Eyes"

Figure 3-188H

Inspection

Clean metal parts in solvent.

WARNING

Do not subject brake pads to solvent, oil or grease. Braking action will be impaired by oily or greasy pads.

1. Check steel balls, thrust bearing and thrust washer for discoloration or pitting. Replace the thrust bearing if any bearing needles are missing or worn.
2. Inspect stator and shaft for worn ball pockets, damaged threads and broken or distorted torsion springs.
3. Inspect rotor for worn ball pockets and splines.
4. Check brake pads for excessive or uneven wear.

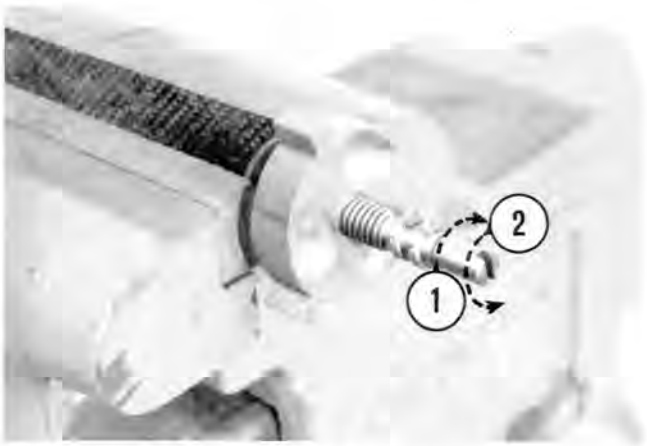
Assembly

1. Thread stator on shaft (lefthand thread).
2. Install torsion springs on shaft with eyes of springs facing slotted end of shaft. (See Figure 3-188H.)

WARNING

The torsion springs must be installed as shown in Figure 3-188H. Incorrect installation of torsion springs will result in loss of braking.

3. Test torsion springs for correct installation and tension. (See Figure 3-188I.)



1. Torsion Springs Turn
2. Torsion Springs Won't Turn

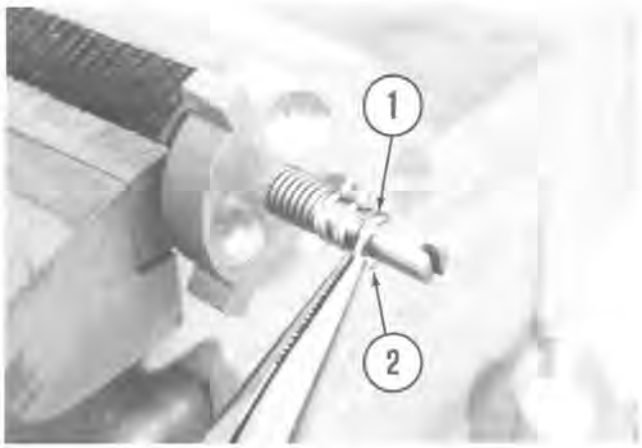
Figure 188I

☐ Hold the shaft in a vise.

☐ Turn torsion springs by hand in direction 1. The torsion springs should turn on the shaft.

☐ Attempt to turn springs by hand in direction 2. Replace torsion springs if they turn on shaft in direction 2.

4. Assemble the retaining rings on the shaft. The full circle ring is installed first. The C-type ring fits in the groove. (See Figure 3-188J.)



1. Ring (Full Circle)
2. Ring (C-Type)

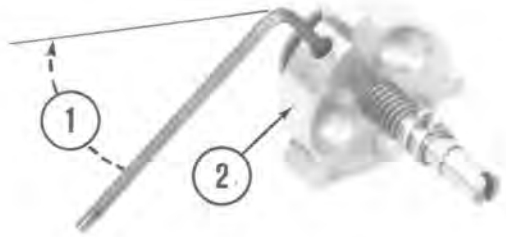
Figure 3-188J

5. Insert friction plug and socket head set screw into stator. Use one of the following methods for adjusting the set screw torque.

   - ☐ Torque set screw to 1.9 in. lb.

   OR

   - ☐ Use a hex key wrench to bottom set screw on friction plug, then tighten 1/8 turn. Do not overtighten set screw. (See Figure 3-188K.)



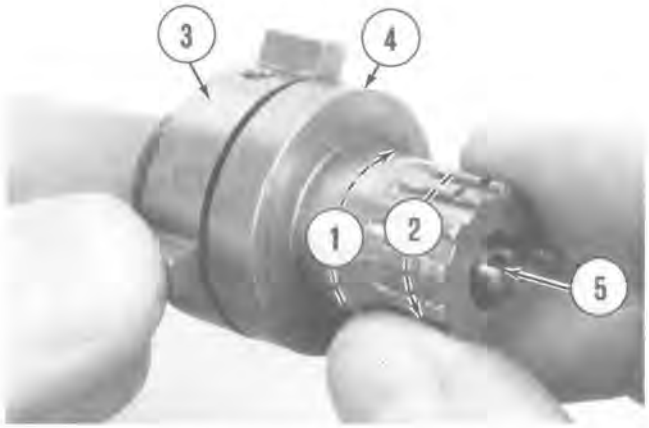
1. Tighten 1/8 Turn
2. Stator

Figure 3-188K

NOTE: The resistance between the stator and shaft is critical to the operation of the self-adjusting brake. If the set screw is too loose, the brake will not self-adjust. If the set screw is too tight, the brake will not self-adjust, the brake pads may drag and overheat and the brake cable may not return causing the brake light to remain on.

6. Test for proper set screw torque.

   - ☐ Position the stator so it is threaded about two-thirds of the way on shaft (left hand thread).
   - ☐ Temporarily install rotor on the shaft. Do not install the three steel balls.
   - ☐ Hold the stator securely in your hand and turn the rotor in alternating directions. (See Figure 3-188L.)

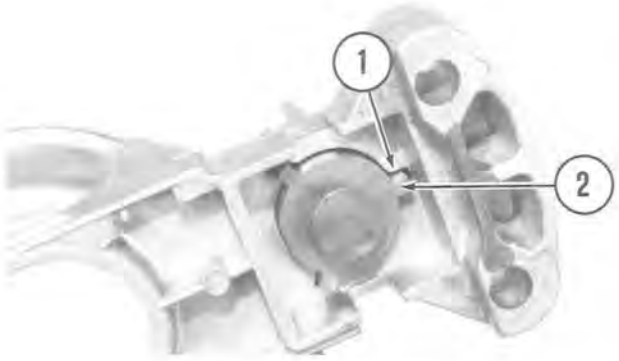


1. Brake Shaft Must Not Turn
2. Brake Shaft Must Turn
3. Stator
4. Rotor
5. Brake Shaft

Figure 3-188L

   - ☐ When turning the rotor in direction 1, the shaft must not turn. If the shaft turns the set screw is too loose.
   - ☐ When turning the rotor in direction 2, the shaft must turn. If the shaft does not turn, the set screw is too tight.
   - ☐ Adjust set screw as necessary to meet the above requirements.
   - ☐ Remove temporarily installed rotor. Thread stator completely onto shaft.

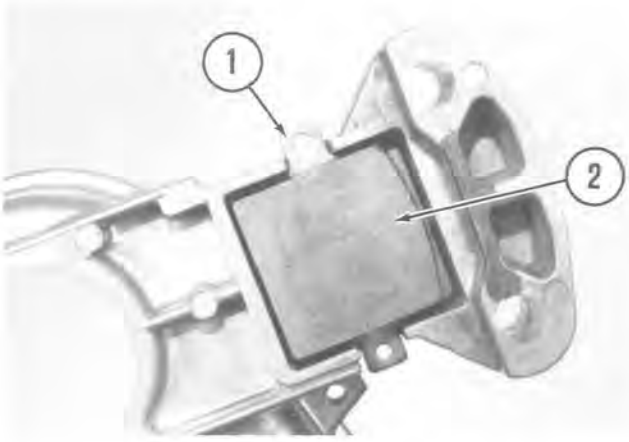
7. Lightly coat ball pockets of rotor and stator with lithium grease.
8. Place the three steel balls in the stator ball pockets.
9. Install the rotor on the stator. The torsion springs fit into the slot on the rotor. Turn the rotor until the balls fit into the deepest part of the ball pockets.
10. Place a rag behind the chaincase under the brake mechanism. Align the tabs of the stator with the slots in the chaincase and push the self-adjusting mechanism into place. (See Figure 3-188M.)



1. Chaincase Slots
2. Stator Tabs

Figure 3-188M

11. Install moveable brake pad and return springs as shown.(See Figure 3-188N, 3-188O.)



1. Moveable Brake Pad
2. Brake Pad Radius

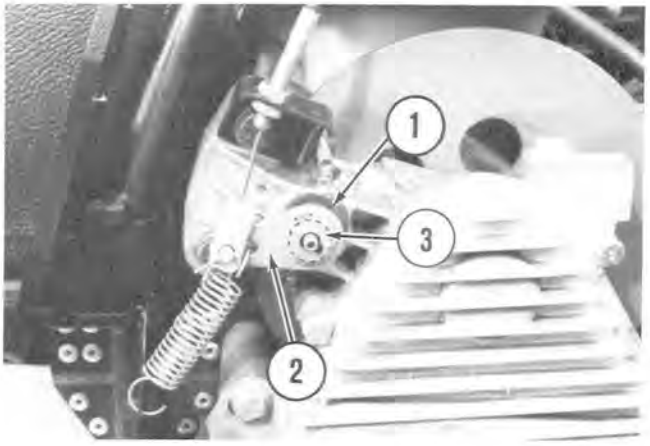
Figure 3-188N



1. Return Spring

Figure 3-188O

12. Install neoprene washer, brake lever and snap ring. Note correct position of brake lever. (See Figure 3-188P.)



1. Neoprene Washer
2. Brake Lever
3. Snap Ring

Figure 3-188P

13. Assemble brake caliper, caliper spacer, brake cable bracket and disc guard to chaincase. (See Figure 3-188A.)

14. Install bearing retainer O-ring on bearing. (See Figure 3-187.)

15. Apply coating of NEVER-SEEZ to brake disc splines. Position brake disc between brake pads. Slide jackshaft through the disc into the chaincase. Fit O-ring into groove of bearing retainer.

16. Install top sprocket and spacer. Torque top sprocket bolt 40 to 50 ft lbs (5.5 to 6.9 kg-m). (See Figure 3-183.)

17. Replace the jackshaft bearing retainer cap, fitting O-ring into cap groove. Torque nuts to 18 ft lbs (2.5 kg-m).

18. Install left side trim to lower pan.

19. Install the tensioner spring and hair pin retainers.

20. Install the chaincase cover and new O-ring seal. Fill the chaincase with DEXRON II automatic transmission fluid to the center of the sight gauge. Reinstall the fill plug.

21. Insert speedometer key through chaincase cover hole while rotating key to align with square hole in lower sprocket mount bolt. (See Figure 3-182.)

NOTE: Speedometer key should be centered within chaincase cover hole and cannot be rotated when properly engaged with lower sprocket mount bolt.

22. Position speedometer drive adapter near mounting threads on cover, insert end of flexible key into square hole of adapter, and slide adapter into position on cover. Do not use force during assembly. When components are properly aligned, adapter will slide easily into position. (See Figure 3-182.)

23. Install brake cable and return spring. Refer to Brake Cable Installation procedure, Section 3.

WARNING

The brake cable and related components must be installed as described in the Brake Cable Installation procedure. A loss of braking may occur if these components are incorrectly installed.

24. Secure lower battery bracket to footrest and heat shield bracket with mounting hardware installed in sequence shown. (See Figure 3-186.)

25. Install battery. Refer to Battery Installation procedure in Section 2.

Brake Pad Replacement

NOTE: Before disassembling self-adjusting brake, perform Brake Pad Wear Inspection. Refer to Section 2.

WARNING

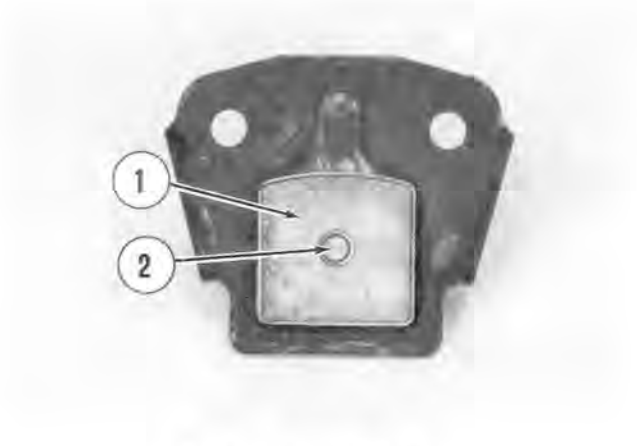
The fixed and moveable brake pads have been designed to require replacement at the same time. Always replace brake pads as a set to insure good braking action.

Disassembly

1. Refer to Self-Adjusting Brake Disassembly. Perform steps 1 through 13.

Fixed Brake Pad Replacement

1. Drill out brake pad rivet from back side of fixed caliper. (See Figure 3-188Q.)



1. Fixed Brake Pad
2. Rivet

Figure 3-188Q

2. Position new brake pad on caliper as shown. (See Figure 3-188Q.)

3. Use a drift to hold the head of a new rivet. Spread the rivet with a punch. (See Figure 3-188R.)



1. Rivet

Figure 3-188R

Assembly

1. Install moveable brake pad and springs. (See Figure 3-188N, 3-188O.)

2. Make sure brake lever is correctly positioned. (See Figure 3-188P.)

3. Refer to Self-Adjusting Brake Assembly procedure, Perform steps 13 through 25.

Chain Replacement

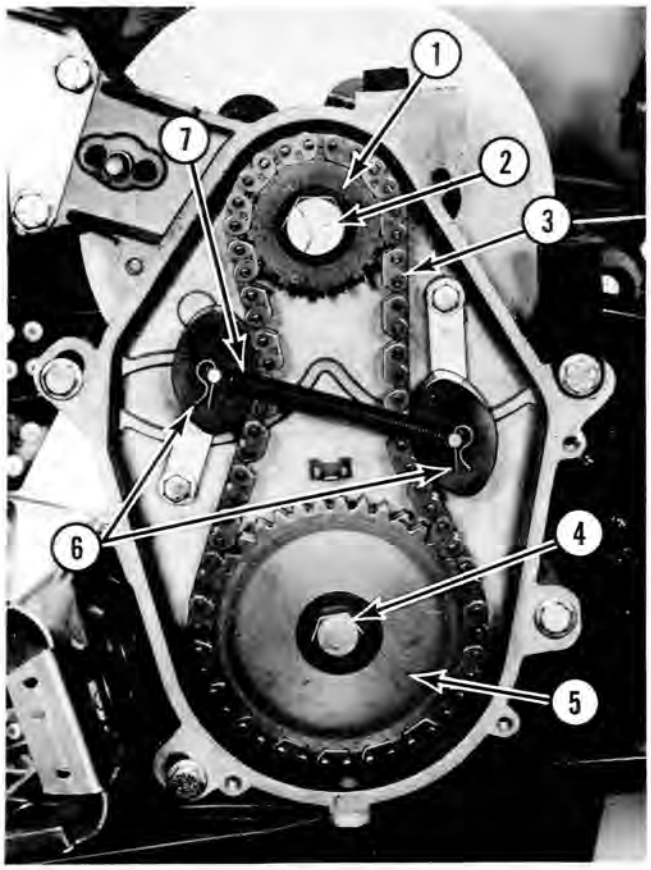
Removal

1. With the battery removed (refer to Battery Removal) loosen four mounting bolts securing lower battery bracket, then remove the bracket for access to chaincase cover mounting bolts. (See Figure 3-181.)

2. Remove speedometer drive adapter and cover to drain the chaincase oil.

3. Remove tensioner spring pins and spring.

4. Remove lower sprocket retaining bolt, upper sprocket retaining bolt and remove sprockets and chain. (See Figure 3-189.)



1. Upper Sprocket
2. Retaining Bolt
3. Chain
4. Retaining Bolt
5. Lower Sprocket
6. Spring Pins
7. Tensioner Spring

Figure 3-189

Installation

1. Install the upper and lower sprocket spacers. Thick spacer for top sprocket, thin spacer for bottom sprocket.

2. Install the upper sprocket, lower sprocket (lip on the lower sprocket goes towards the bearing) and the chain as a unit. Install the lower sprocket bolt and washer, torque 35 ft lb (4.84 kg-m). Install the upper sprocket bolt and washer, torque 40 to 50 ft lb (5.53 to 6.92 kg-m).

3. Install tensioner spring and spring pins. Install the chaincase cover and new O-ring seal.

4. Fill the chaincase with DEXRON II automatic transmission fluid to the center of the sight gauge.

5. Insert speedometer key through chaincase cover hole while rotating key to align with square hole in lower sprocket mount bolt. (See Figure 3-182.)

NOTE: Speedometer key should be centered within chaincase cover hole and cannot be rotated when properly engaged with lower sprocket mount bolt.

6. Position speedometer drive adapter near mounting threads on cover, insert end of flexible key into square hole of adapter, and slide adapter into position on cover. Do not use force during assembly. When components are properly aligned, adapter wll slide easily into position. (See Figur e 3-182.)

7. Secure lower battery bracket to footrest and heat shield bracket with mounting hardware installed in sequence shown. (See Figure 3-186.)

8. Install battery. Refer to Battery Installation procedure in Section 2.

Suspension

Wear Strips (Hi-Fax)

Slide bar wear strips should be replaced when thickness of material measures 1/8 in. (3 mm) or less at any point along its length.

Removal

1. Raise rear of snowmobile off ground.

WARNING

When raising the rear of the snowmobile off the ground, place the ski tips against a stationary object and be sure the vehicle is properly secured to prevent personal injury.

2. Loosen track tension. Refer to Track Tension procedure in Section 2.

3. Remove screw and nut securing wear strip to front of slide rail.

4. With a hammer and chisel, notch side of wear strip near front end of suspension. (See Figure 3-190.)

CAUTION

Use care when cutting wear strips to prevent damage to slide rails.

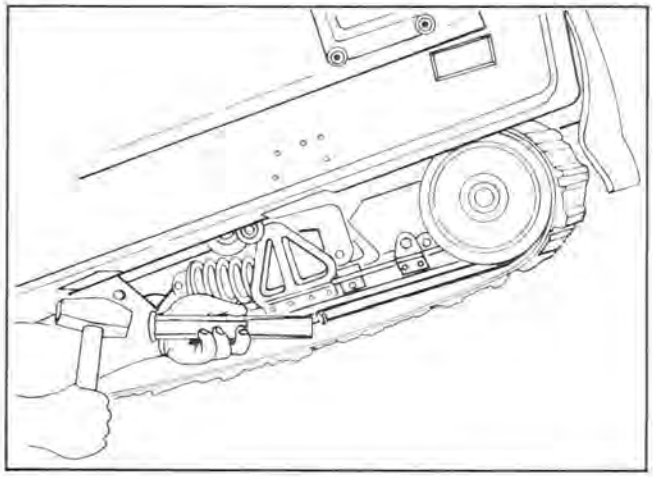


Figure 3-190

5. Align opening between track clips with wear strip at rear of suspension, then tap wear strip rearward off from slide rail. (See Figure 3-191.)

Installation

NOTE: Be sure track tension has been loosened to provide clearance necessary between track clips for wear strip installation.

1. Insert wear strip through track openings at rear of suspension onto slide rails. Reduce effort required during installation by lubricating wear strip and slide rail.

2. Tap wear strip forward until holes between wear strip and slide rail are aligned.

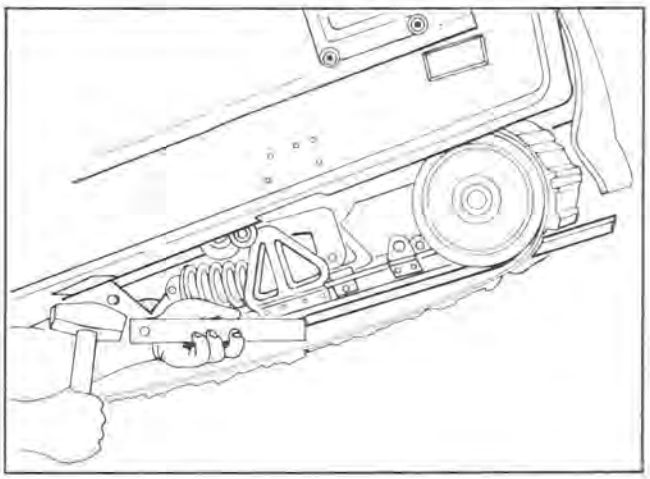


Figure 3-191

3. Secure wear strip to slide rail by installing screw and nut tightened to 25 in. lb (0.3 kg-m).

4. Tension track. Refer to Track Tension procedure in Section 2.

Idler Wheels (Swing & Pivot Arms)

Inspection

1. Replace idler wheel if rubber is excessively worn.

2. Spin idler wheels on the shaft, and check for noise, excessive slop between shaft and bearing, or binding. Replace bearings or spacers if necessary.

3. Inspect the shaft for damage and straightness.

Removal and Disassembly

1. Remove bolts from the end of the shaft. (See Figure 3-192.)

2. Lightly tap mounting bolt spacer out from the wheel assemblies.

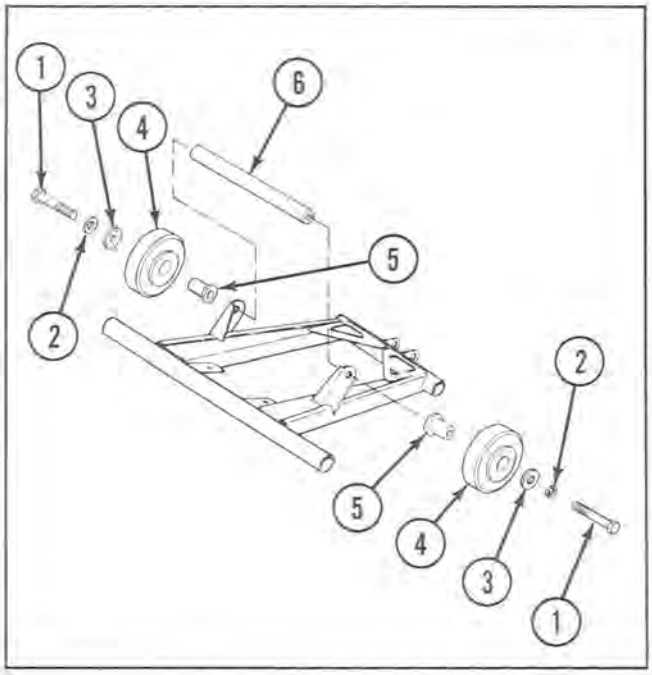
3. To remove bearing from wheel, remove outside and inside spacers, snap ring, then press the bearing out of the wheel. (See Figure 3-195B.)

Reassembly and Installation

1. Press the new bearings into the wheels and secure with snap ring, then install the outside and inside spacers.

NOTE: Effort required to install bearing can be reduced by placing wheel on light bulb to expand bearing bore.

2. Assemble mounting bolt spacers, wheel assemblies, and mounting hardware to suspension in sequence shown. (See Figure 3-192.)



1. Bolt
2. Spring Lockwasher
3. Plain Washer
4. Idler Wheel
5. Mounting Bolt Spacer
6. Shaft

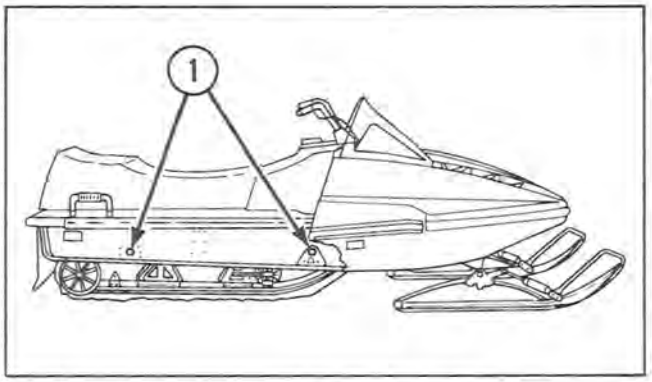
Figure 3-192

NOTE: Be sure large diameter spacer on wheel assembly is installed toward outside of suspension.

3. Tighten mount bolts to 25 ft lb (3.5 kg-m).

Suspension Removal

1. Remove four bolts (two on each side of snowmobile) securing suspension to chassis. (See Figure 3-193.)



1. Suspension Mounting Bolts

Figure 3-193

2. Position snowmobile on its side on a protective surface and lift suspension out of chassis. Figure 3-194 shows the complete suspension assembly after it has been removed from the snowmobile.

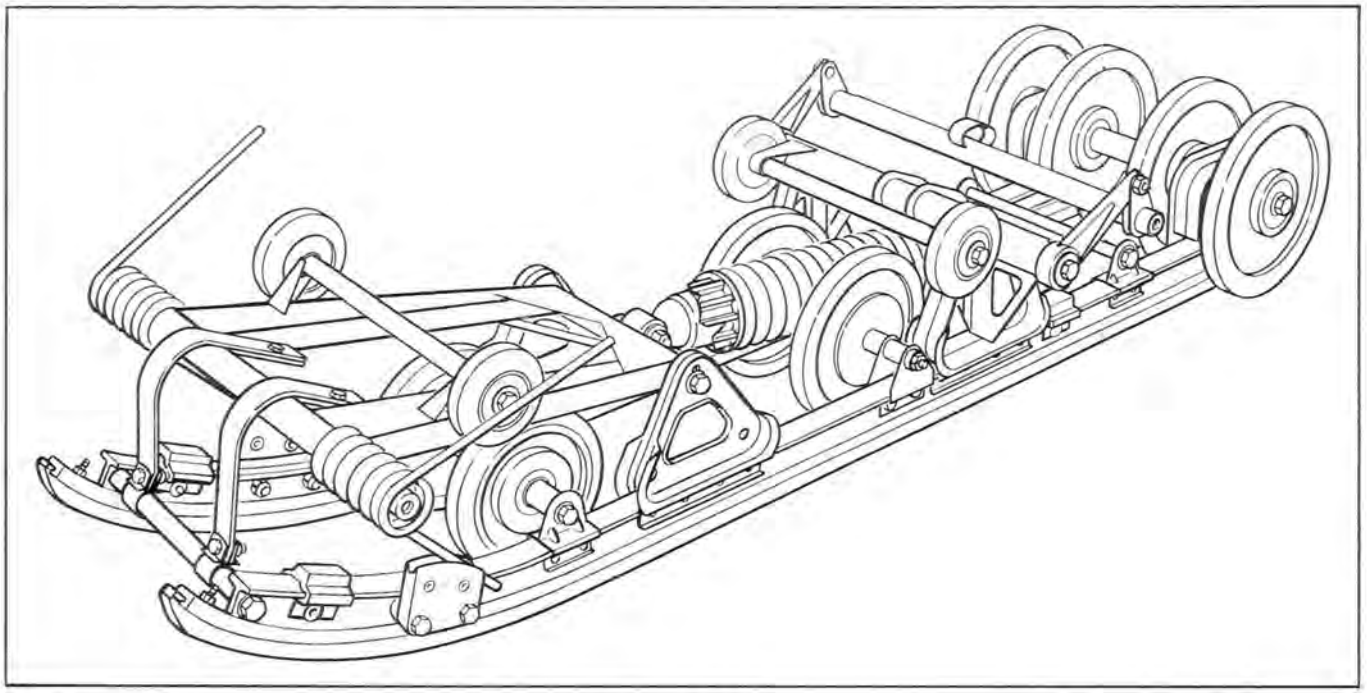


Figure 3-194

Inspection

Check wheel bearing for binding. If the suspension binds, locate the problem and refer to the appropriate repair procedure. Refer to Figure 3-195 for parts location and identification when repairing the suspension.

NOTE: The following repairs are performed with the slide rail suspension removed from the snowmobile.

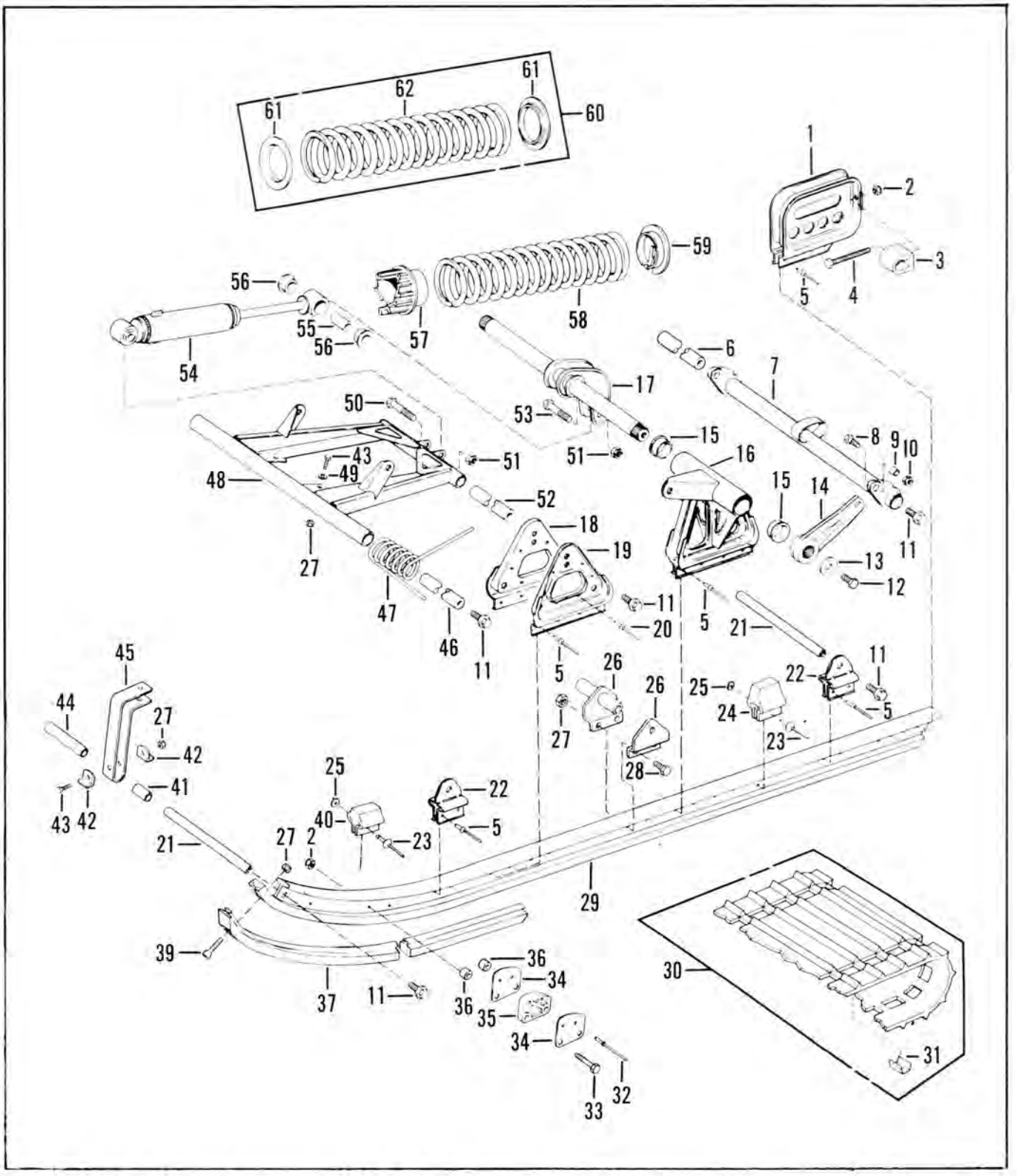
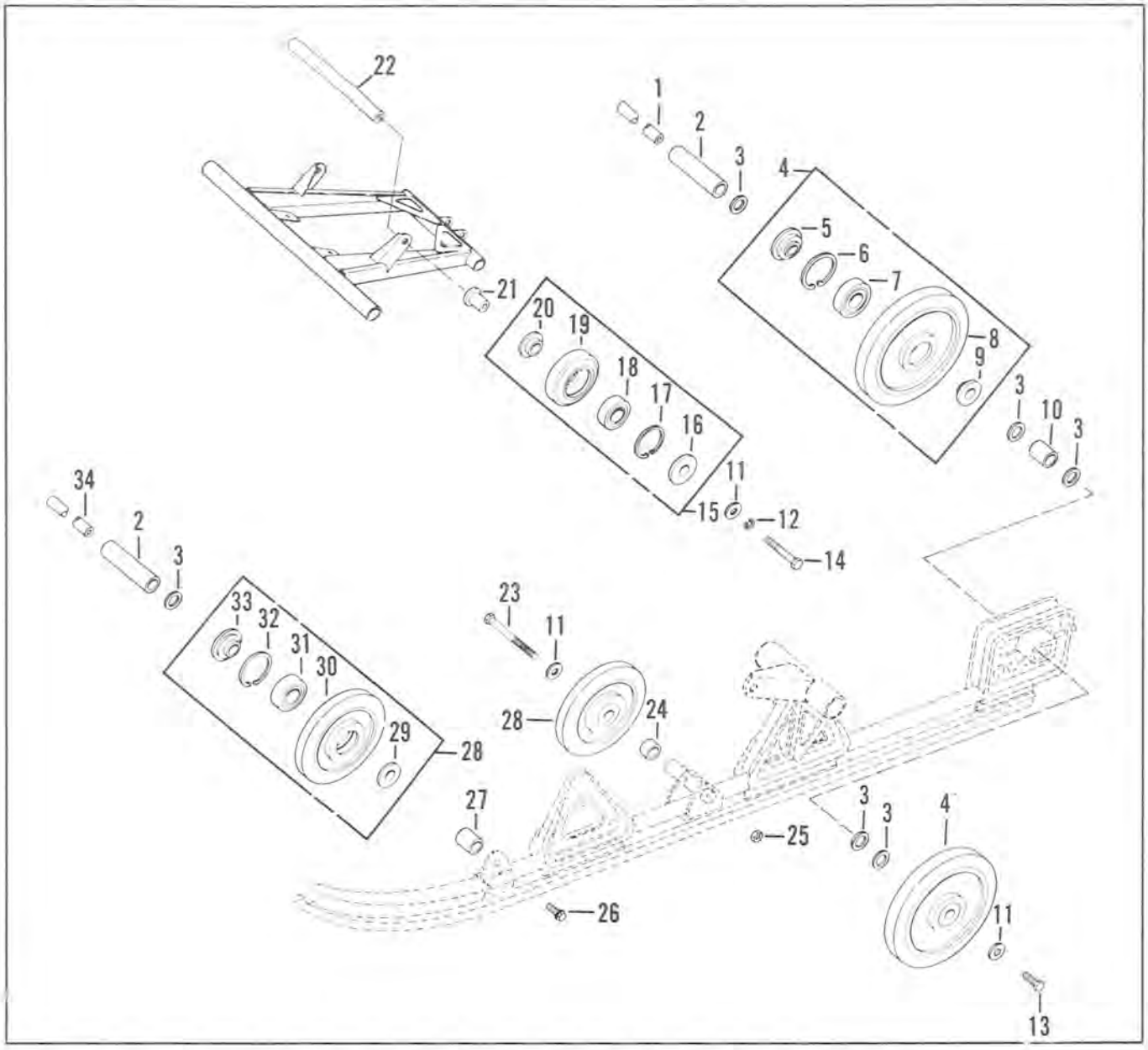


Figure 3-195A

1. Rear Axle Bracket
2. Insert Nut
3. Track Adjusting Bracket
4. Special Bolt, 5/16-24 x 2.75
5. Rivet
6. Pivot Shaft
7. Track Guard Pipe
8. Special Screw
9. Suspension Arm Spacer
10. Special Nut
11. Special Bolt, 3/8-16 x 1.00
12. Special Bolt, 3/8-24 x 1.00
13. Special Washer
14. Rear Suspension Arm
15. Pivot Arm Bushing
16. Rear Suspension Bracket
17. Pivot Arm Assembly
18. Front Suspension Inside Bracket
19. Front Suspension Outside Bracket
20. Rivet
21. Suspension Rail Brace
22. Front, Rear Brace Bracket
23. Rivet
24. Stopper Bumper
25. Special Back Up Washer
26. Center Idler Wheel Bracket Assembly
27. Insert Nut
28. Bolt, 1/4-28 x .75
29. Suspension Rail
30. Snow Track
31. Track Clip Shoe
32. Rivet
33. Bolt, 5/16-24 x 2.75
34. Front Spring Cam Plate
35. Front Spring Cam
36. Front Spring Cam Spacer
37. Rail Wear Strip
38. Snow Track
39. Special Screw
40. Stopper Bumper
41. Short Spacer
42. Special Limiter Washer
43. Bolt, 1/4-28 x 1.00
44. Long Spacer
45. Strap Limiter
46. Front Pivot Shaft
47. Spring
48. Swing Arm Assembly
49. Plain Washer
50. Bolt, 3/8-24 x 2.25
51. Insert Nut
52. Shaft
53. Bolt, 3/8-24 x 2.00
54. Suspension Shock Absorber
55. Shock Absorber Sleeve
56. Shock Absorber Bushing
57. Shock Absorber Cam
58. Shock Absorber Spring
59. Spring Retainer
60. Shock Absorber Spring Kit
61. Spring Retainer
62. Shock Absorber Spring

Figure 3-195A



1. Rear Axle
2. Front and Rear Wheels Spacer, 3.75 Long
3. Washer
4. Rear Axle Wheel Assembly, 8.00 O.D.
5. Large O.D. Spacer
6. Snap Ring
7. Sealed Bearing
8. Rear Axle Wheel, 8.00 O.D.
9. Small O.D. Spacer
10. Rear Axle Wheel Spacer, 1.19 Long
11. Plain Washer
12.
13. Bolt, 3/8-16 x 1.00
14. Bolt, 3/8-16 x 2.50
15. Idler Wheel Assembly, 3.25 O.D.
16. Large O.D. Spacer
17. Snap Ring
18. Sealed Bearing
19. Idler Wheel, 3.25 O.D.
20. Small O.D. Spacer
21. Spacer
22. Idler Wheel Shaft
23. Bolt, 3/8-24 x 4.00
24. Spacer, 0.62 Long
25. Insert Nut
26. Special Bolt, 3/8-16 x 1.00
27. Front Idler Wheel Spacer, 1.28 Long
28. Idler Wheel Assembly, 6.08 O.D.
29. Small O.D. Spacer
30. Idler Wheel, 6.08 O.D.
31. Sealed Bearing
32. Snap Ring
33. Large O.D. Spacer
34. Shaft

Figure 3-195B

Idler Wheels (Suspension Rail)

Inspection

1. Replace idler wheel if rubber is excessively worn.
2. Spin wheels on the shaft and check for noise, excessive slop between shaft and bearing, or binding. Replace bearings or spacers if necessary.
3. Inspect the shaft for damage and straightness.

Removal

1. Remove idler wheels from the suspension by unscrewing bolts. (See Figure 3-196.)
2. Lightly tap wheels from shaft. Use care not to lose spacers and washers.

Disassembly

To remove the bearing from the idler wheel, remove the outside and inside spacers, snap ring and press the bearing out of the wheel. (See Figure 3-195B.)

Reassembly and Installation

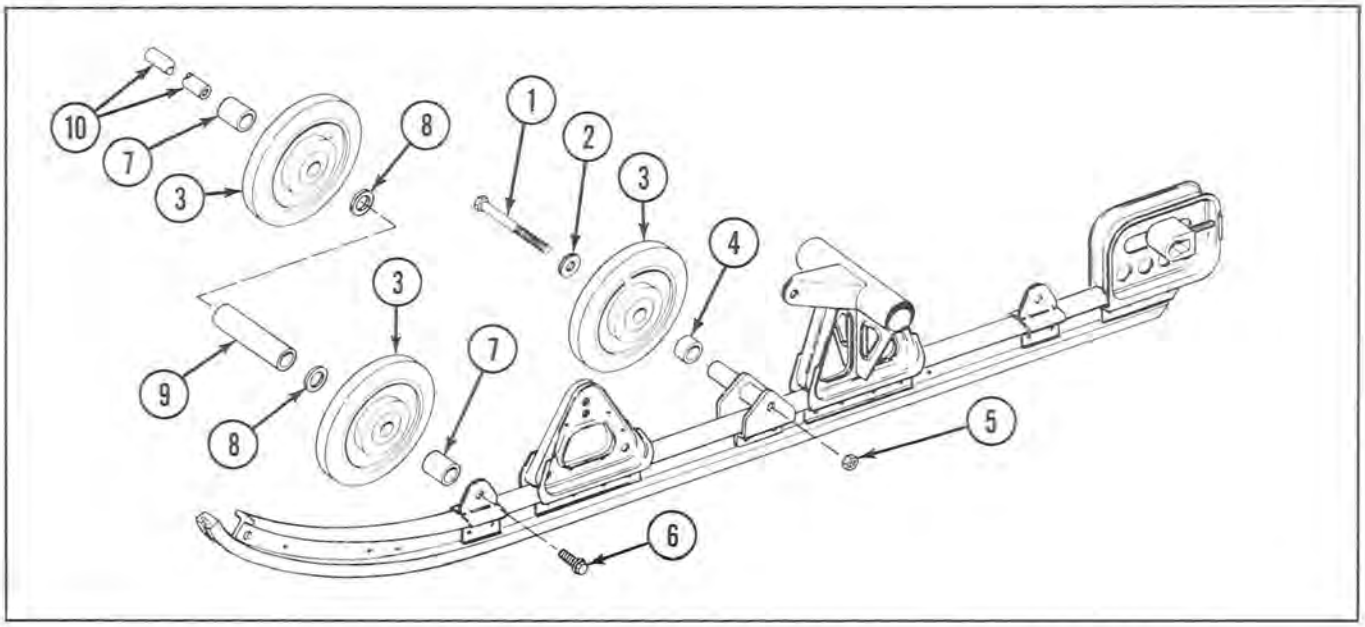
1. Press the new bearings into the wheels and secure with snap ring, then install the outside and inside spacers.

NOTE: Effort required to install bearing can be reduced by placing wheel on light bulb to expand bearing bore.

2. Position wheel assemblies, spacers, and washers onto shaft in sequence shown. (See Figure 3-196.)

NOTE: Be sure small diameter wheel bearing spacers face to outside of suspension.

3. Secure idler wheels and shaft assembly to suspension rail. Torque bolts to 25 ft lb (3.5 kg-m).



1. Bolt
2. Plain Washer
3. Wheel, 6.08 OD (4)
4. Spacer, 0.62 in. (15.88 mm) Long
5. Nut
6. Bolt
7. Spacer, 1.28 in. (32.5 mm) Long
8. Washer
9. Spacer, 3.75 in. (95.25 mm) Long
10. Shaft

Figure 3-196

Limiter Straps

NOTE: The following repairs are performed with the slide rail suspension removed from the snowmobile.

Inspection

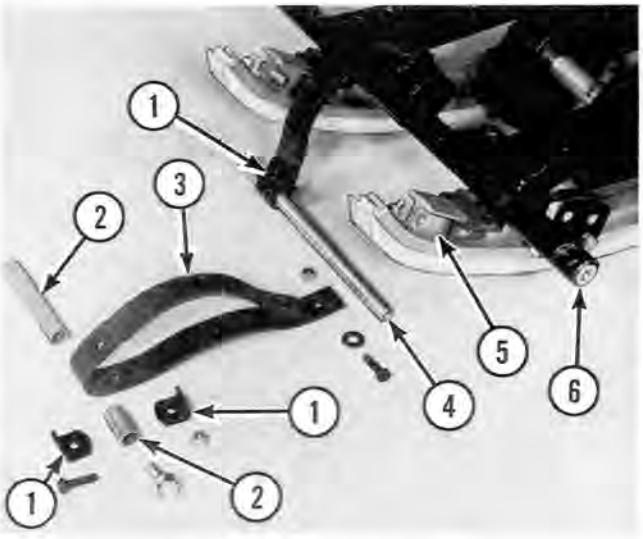
1. Inspect limiter straps for deterioration and damage. Replace as required.

2. Check the limiter cross shaft brace and spacers for distortion.

Removal

1. To remove the limiter straps, unscrew nuts at each end, then remove strap from front swing arm and cross shaft brace. (See Figure 3-197.)

2. To remove the limiter cross shaft brace and spacers, unscrew bolts securing them to the suspension rails. (See Figure 3-197.)



1. Special Washers
2. Spacers
3. Limiter Strap
4. Cross Shaft Brace
5. Suspension Rail
6. Swing Arm

Figure 3-197

Reassembly

1. Reinstall limiter straps on to swing arm and cross shaft brace. Position spacers and special washers as shown in Figure 3-197.

2. Tighten limiter strap nuts to 45 in. lb (0.51 kg-m) torque.

3. Reinstall limiter cross shaft brace and torque mounting bolt to 25 ft lb (3.46 kg-m).

Rear Axle and Wheels

NOTE: The following repairs are performed with the slide rail suspension removed from the snowmobile.

Inspection

1. Replace rear idler wheel if rubber is excessively worn.

2. Spin rear idler wheels on the shaft, and check for noise, excessive slop between shaft and bearing, or binding. Replace bearings or spacers if necessary.

3. Inspect the shaft for damage and straightness.

Removal and Disassembly

1. Remove the bolts from the end of the axle. (See Figure 3-198.)

2. Lightly tap the rear axle out from the wheel assemblies and remove axle spacers and washers.

3. To remove bearing from wheel, remove outside and inside spacers, snap ring, then press the bearing out of the wheel. (See Figure 3-195B.)

Reassembly and Installation

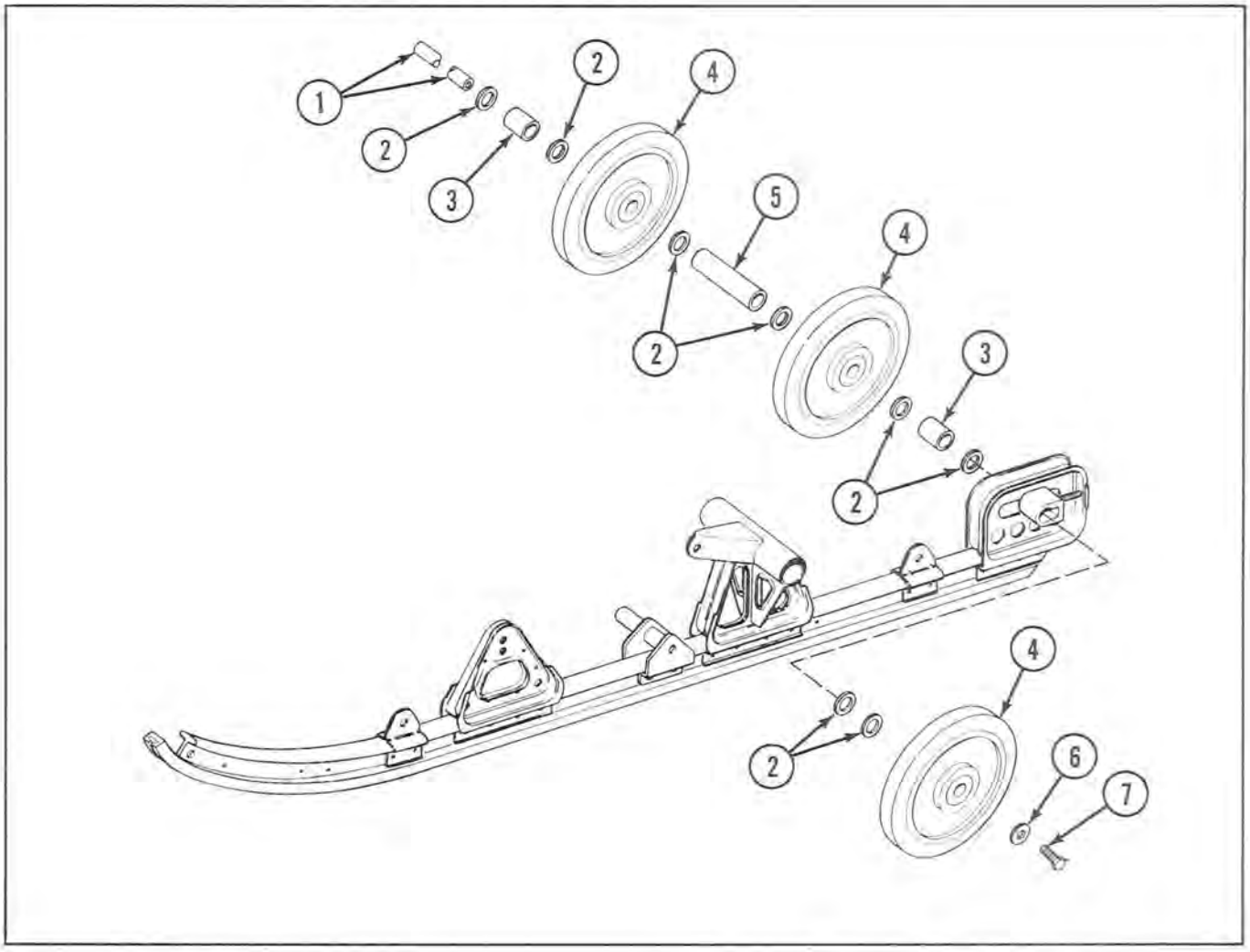
1. Press the new bearings into the wheels and secure with snap ring, then install the outside and inside spacers.

NOTE: Effort required to install bearing can be reduced by placing wheel on light bulb to expand bearing bore.

2. Install the axle spacers, washers and wheels onto the rear axle in sequence shown in Figure 3-198.

NOTE: When installing wheels on suspension, position large diameter spacer outward for wheels mounted outside slide rails. Wheels mounted between slide rails must have small diameter spacer facing outward.

3. Secure with the bolts previously removed. Torque the bolts 25 ft lb (3.5 kg-m). (See Figure 3-198.)



1. Axle
2. Washer
3. Spacer, 1.19 in. (30.2 mm) Long
4. Wheel 8.00 in. OD (4)
5. Spacer, 3.75 in. (95.25 mm) Long
6. Plain Washer
7. Bolt

Figure 3-198

Shock Absorber and Spring

Inspection

1. Examine shock absorber shaft for warpage.
2. Examine shock absorber for leakage and cracked or worn rubber.
3. Examine shock absorber spring for cracks, wear or damage.
4. Inspect bellcrank attaching points at each end of shock for damage. Replace if necessary.

Removal

1. Remove the bolt from the shock absorber in pivot arm end of assembly.
2. Remove the bolt securing shock absorber to the swing arm assembly and remove the shock absorber.
3. To remove the spring from the shock absorber:
   a. Insert shock absorber assembly into spring compressor (Special tool P/N 57001-3504) as shown in Figure 3-199.

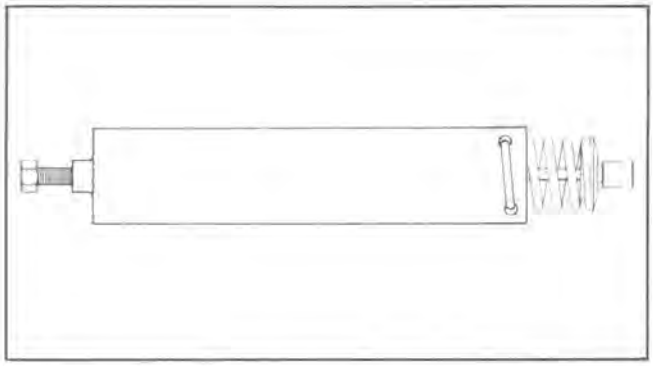


Figure 3-199

b. Turn bolt to compress the spring. Remove the spring retainer then slowly release spring and remove the spring and adjusting cam.

Reassembly and Installation

1. Reassemble shock absorber in the reverse order of removal.
2. Install shock absorber assembly onto suspension and torque bolts to 35 ft lb (4.84 kg-m).
3. Adjust shock absorber spring tension by following procedure for Suspension Ride Adjustment. Refer to Section 2.

Springs and Cam Plate Assembly

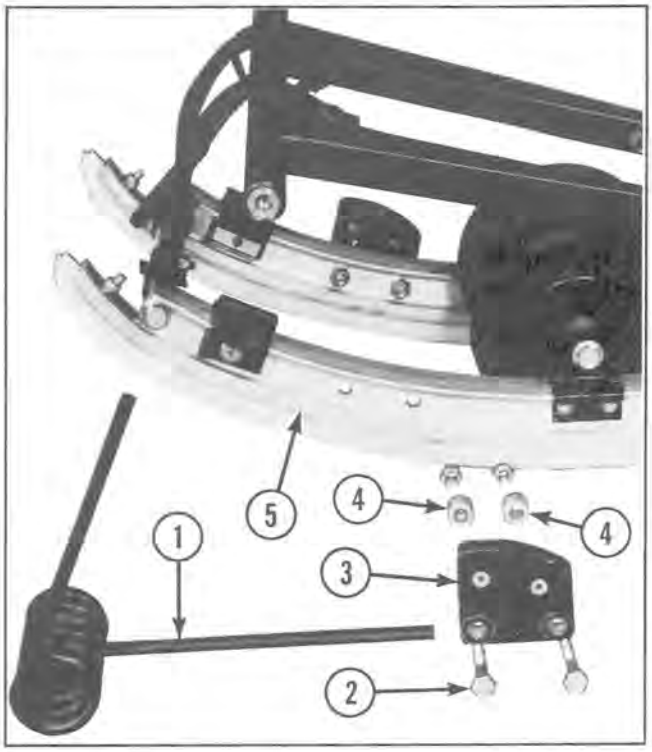
Inspection

NOTE: The following repairs are performed with the slide rail suspension removed from the snowmobile.

1. Check spring, cam, and cam plates for distortion or wear. (See Figures 3-195A and 3-200.)
2. Replace distorted or worn components.

Removal

1. Unscrew nuts to remove spring cam and plate assembly from suspension rails. (See Figure 3-200.)
2. To replace cam or plates, drill rivet heads using 3/16 in. drill bit.



1. Front Spring
2. Mounting Bolts
3. Cam Plate Assembly
4. Spacers
5. Suspension Rail

Figure 3-200

Installation

1. Secure plates to spring cam using new rivets. (See Figure 3-195A.)
2. Position spacers between outside of suspension rail and cam plate assembly, then install mounting bolts and torque to 18 ft lb (2.5 kg-m). (See Figure 3-200.)

Swing Arm

NOTE: The following repairs are performed with the slide rail suspension removed from the snowmobile.

Inspection (See Figure 3-201)

1. Measure swing arm as shown. If dimension "X" is different than dimension "Y" by 1/8 in. (3.2 mm) or more, replace swing arm. Examine swing arms for distortion, cracks or broken welds. Repair or replace if necessary.

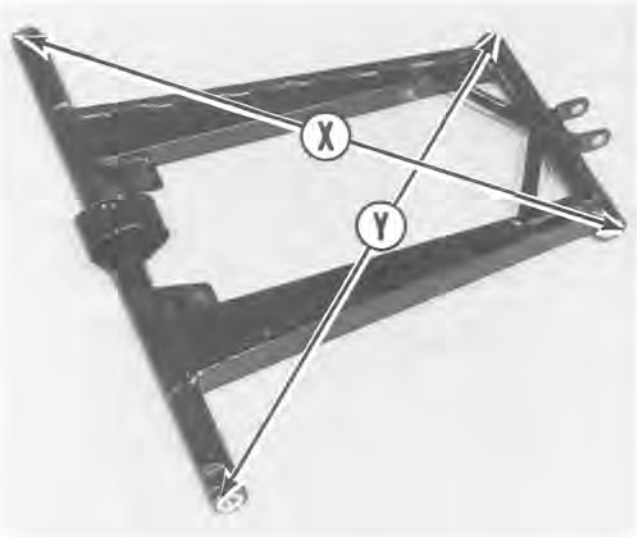


Figure 3-201

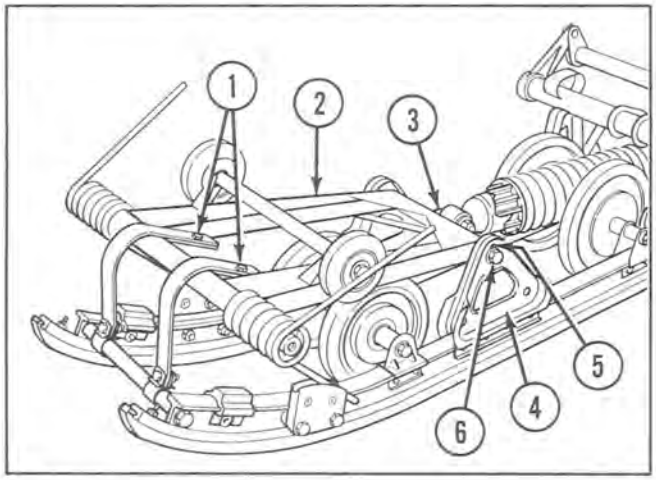
2. Remove and examine the pivot shafts for wear or damage. Replace if necessary.

3. Examine the front suspension brackets for bends or cracks. Replace if necessary.

Removal

1. Remove limiter straps and shock absorber from swing arm. (See Figure 3-202.)

2. Unscrew bolts securing swing arm to suspension rail brackets and remove swing arm.



1. Limiter Strap Mounting Bolts
2. Swing Arm
3. Shock Absorber Mounting Bolt
4. Suspension Rail Bracket
5. Upper Mounting Hole
6. Lower Mounting Hole

Figure 3-202

Installation

1. Install the swing arm in the reverse order of removal.

NOTE: Lubricate pivot shafts before installation.

2. Changing the mounting position of the front swing arm will affect the amount of ski lift along with the ride characteristics of the snowmobile. During factory assembly, the front swing arm was positioned in the lower hole of the front suspension bracket. This position was selected since it results in the best overall riding characteristics of the snowmobile. (See Figure 3-202.) If swing arm location is changed to the upper mounting hole, the snowmobile becomes less sensitive to weight transfer during acceleration, resulting in reduced ski lift.

Suspension Rails

NOTE: The following repairs are performed with the slide rail suspension removed from the snowmobile.

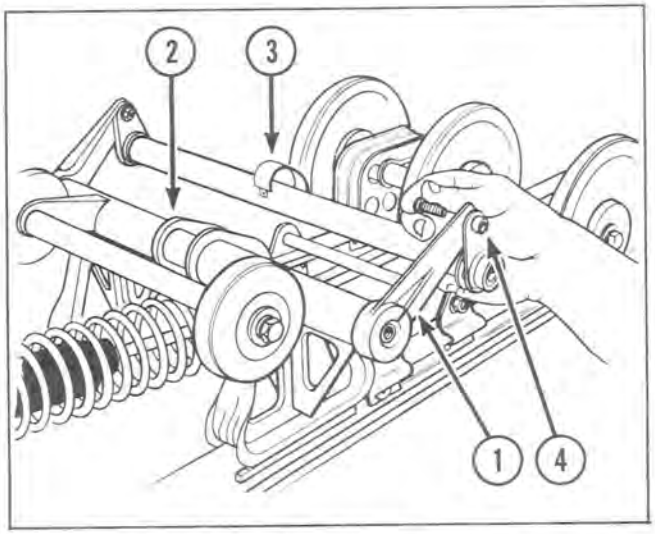
Inspection

Inspect suspension rails for distortion and damage.

Removal

1. Remove rear suspension arm from pivot arm shaft and track guard pipe.

NOTE: Apply reference mark to shaft and arm for proper spline indexing during reassembly. (See Figure 3-203.)



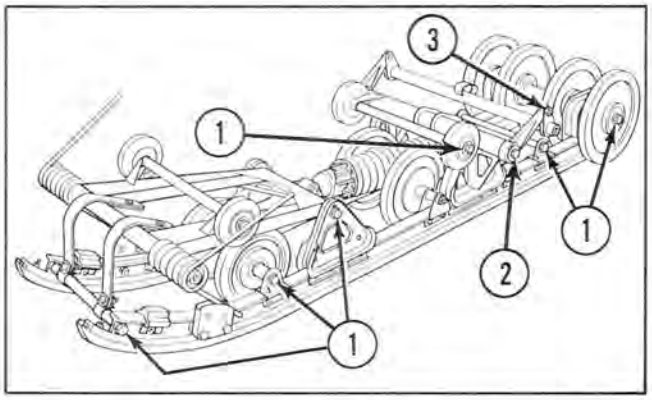
1. Rear Suspension Arm
2. Pivot Arm Assembly
3. Track Guard Pipe
4. Suspension Arm Spacer

Figure 3-203

2. Remove rail wear strips.

3. Remove seven bolts which secure suspension rails, then remove rails. (See Figure 3-204.)

4. Drill rivets using 3/16 in. drill bit to remove brackets from suspension rails. (See Figure 3-205.)



1. 25 ft lb (3.5 kg-m)
2. 30 ft lb (4.2 kg-m)
3. 11 ft lb (1.5 kg-m)

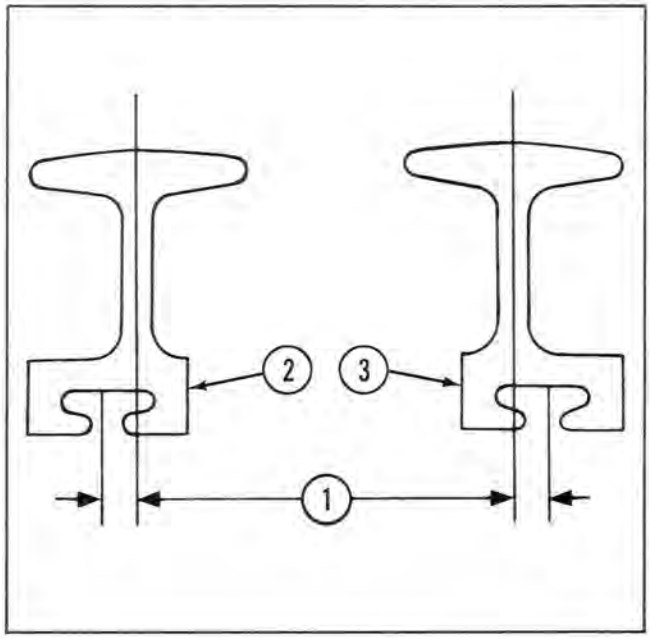
Figure 3-204

Inspection

1. Check rail I beam and all brackets for distortion or cracks. Inspect bumpers for wear and deterioration. Repair or replace damaged item.

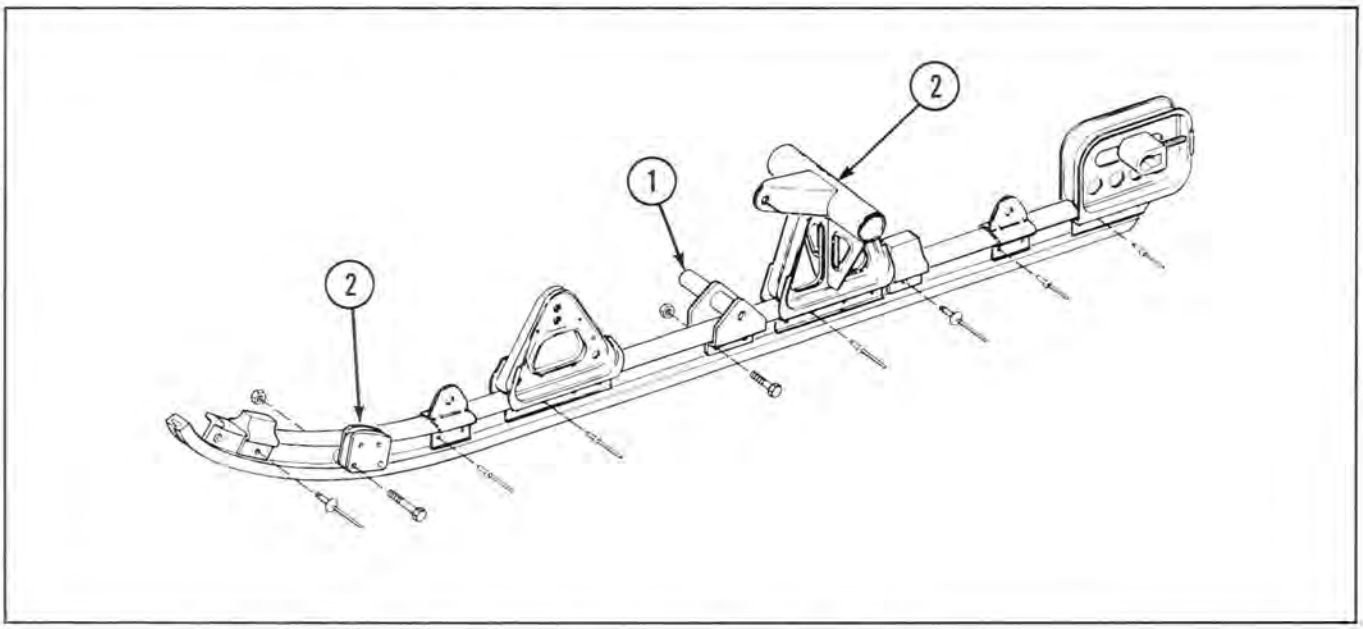
Reassembly

NOTE: Left and Right suspension rails are not interchangeable since I beam portion of rail is offset. (See Figure 3-206.)



1. Offset (Viewed from rear to front)
2. LH Suspension Rail
3. RH Suspension Rail

Figure 3-206



1. Mounted toward INSIDE on each rail
2. Mounted toward OUTSIDE on each rail

Figure 3-205

1. Assemble brackets, cams and bumpers onto left or right suspension rail in sequence shown. (See Figure 3-205.)

NOTE: Left hand rail assembly sequence shown.

2. Secure components to suspension rails using recommended hardware. Refer to Parts Catalog for ordering information. (See Figure 3-205.)

3. Install rail wear strips. Tighten bolt to 25 in. lb (0.29 kg-m).

4. Install suspension arm to pivot arm shaft while aligning reference marks for proper spline indexing.

CAUTION

To prevent excessive damage to edge of track, be sure head of special bolt is positioned on inside of arm. (See Figure 3-203.)

5. Secure track guard pipe to suspension arm by installing spacer and special bolt. Tighten to 11 ft lb (1.5 kg-m) torque. (See Figure 3-203.)

6. Tighten all bolts to torque shown. (See Figure 3-204.)

7. Check for proper assembly by measuring distance between rails several places along length to insure parallelism.

Bumper

Inspection

1. Check bumper for wear or deterioration. Replace if necessary.

Removal

1. Drill out the pop rivet securing the bumper to the rail.

Installation (See Figure 3-205)

1. Position bumper and special back up washer onto the rail and pop rivet into place.

Suspension Installation

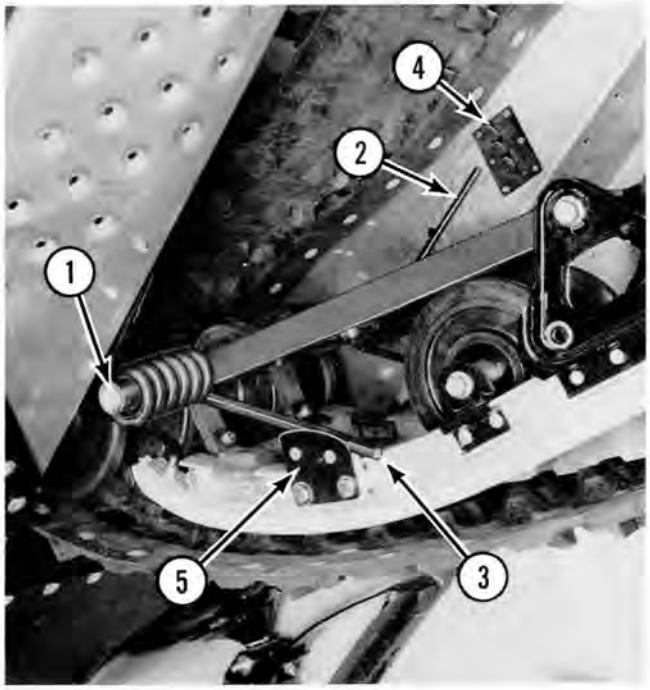
NOTE: There are no lubrication fittings on the suspension system, therefore lubricate the shafts before installing.

1. Place the snowmobile on its right side and slide suspension between the track. Be sure lugs on track are properly mated with drive lugs on sprockets. (See Figure 3-207.)



Figure 3-207

2. Position suspension spring arms into proper position. (Long end of each spring over cam plate assembly and short end of each spring into same detent position of spring bracket on tunnel.) (See Figure 3-208.)



1. Pivot Shaft
2. Pivot Shaft Mounting Holes
3. Long Arms
4. Spring Bracket
5. Cam Plate Assembly

Figure 3-208

3. Align front pivot shaft with holes in side of tunnel. Secure with whiz lock bolts. Torque to 25 ft lb (3.4 kg-m).

4. Align rear track guard pipe and pivot shaft with mounting holes inside tunnel. Secure with whiz lock bolts. Torque to 30 ft lb (4.15 kg-m).

5. Adjust the track and suspension in accordance with Section 2.

Driveshaft and Track

Removal

1. With the battery removed (refer to Battery Removal) loosen four mounting bolts securing lower battery bracket, then remove the bracket for access to chaincase cover mounting bolts. (See Figure 3-181.)

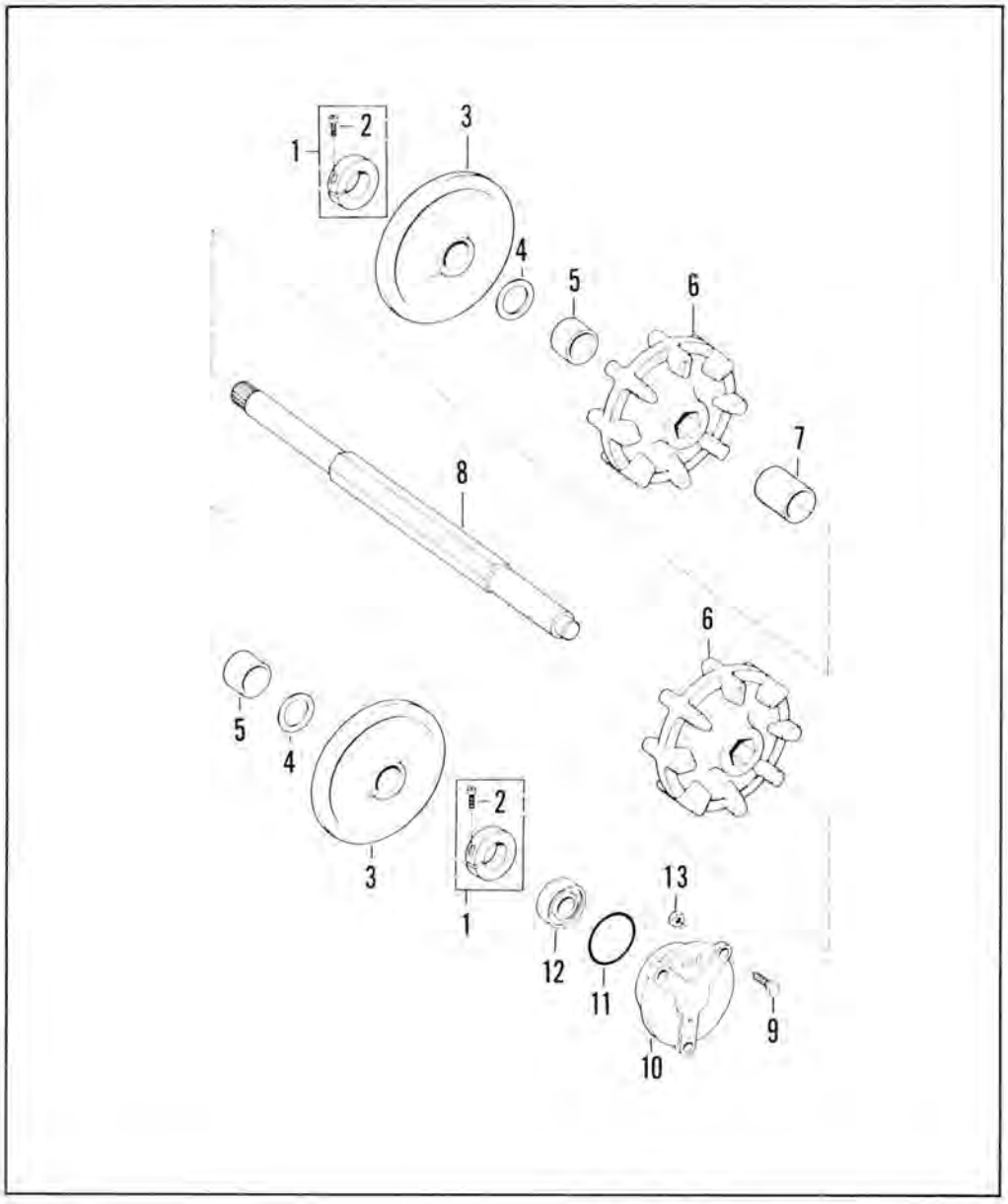
2. Remove suspension.

3. Place snowmobile on its left side and remove chaincase cover, sprockets and chain.

4. Remove three bolts, nuts and the bearing housing. (See Figure 3-209.)

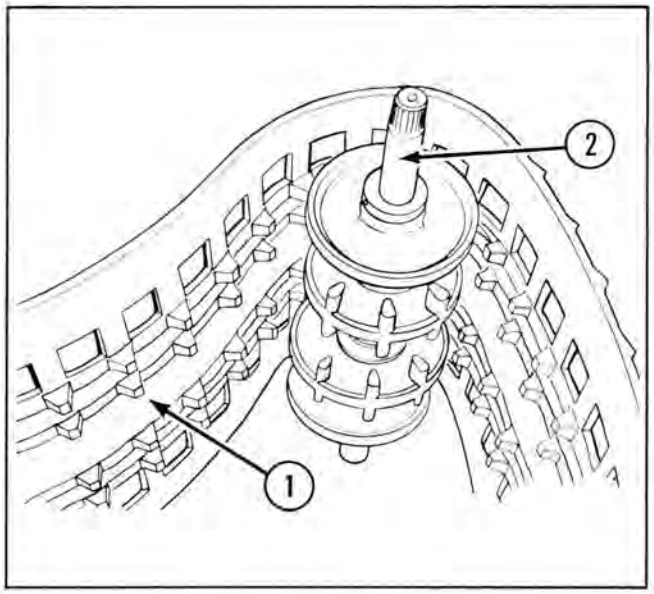
5. Reach between the track and slide the driveshaft from the chaincase and remove. (See Figure 3-210.)

6. Remove the track.



1. Collar Assembly
2. Screw
3. Idler Wheel
4. Special Washer
5. Outer Spacer Pipe
6. Track Drive Sprocket
7. Center Spacer Pipe
8. Track Drive Shaft
9. Bolt
10. Bearing Housing
11. O-Ring Seal
12. Bearing
13. Insert Nut

Figure 3-209



1. Track
2. Driveshaft

Figure 3-210

Driveshaft Repair

1. Turn the bearing by hand. If the bearing binds, has excessive end play or is rough, it must be replaced. Bearing is press fit onto shaft.

2. Check the driveshaft for distortion. Check the splined end for chipped, nicked or broken splines.

3. Check idler wheels for excessive wear. To remove the idler wheels, remove collar assembly and tap idler wheels and washers off the driveshaft.

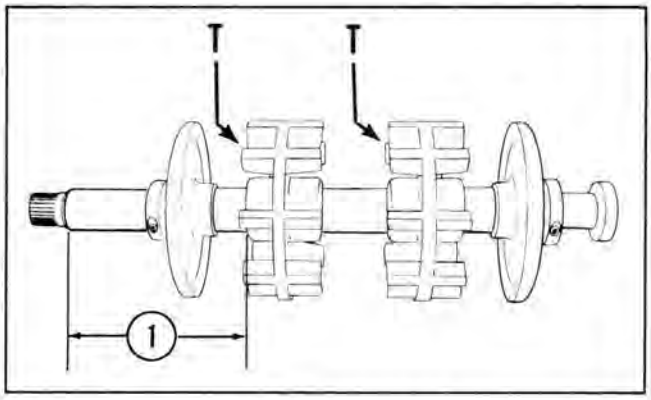
4. Check the drive sprockets for excessive wear. To remove drive sprockets, position the driveshaft vertically on a wood block to protect the driveshaft. Lightly tap off the sprockets and spacers with a rubber mallet.

5. When reassembling the drive sprockets, make sure the index marks (T) are aligned as shown in Figures 3-209 and 3-211.

6. Install spacers, washers and wheels in sequence shown. (See Figure 3-209.)

7. Position collar assembly on shaft at dimension shown and tighten to 70 in. lb (0.8 kg-m). (See Figure 3-211.)

NOTE: After assembly wheel must be free to turn but space between wheel and collar assembly must not exceed 0.02 in. (0.5 mm).



1. 6.59 ± 0.04 in. (167.6 ± 1.0 mm)

Figure 3-211

Track Repair

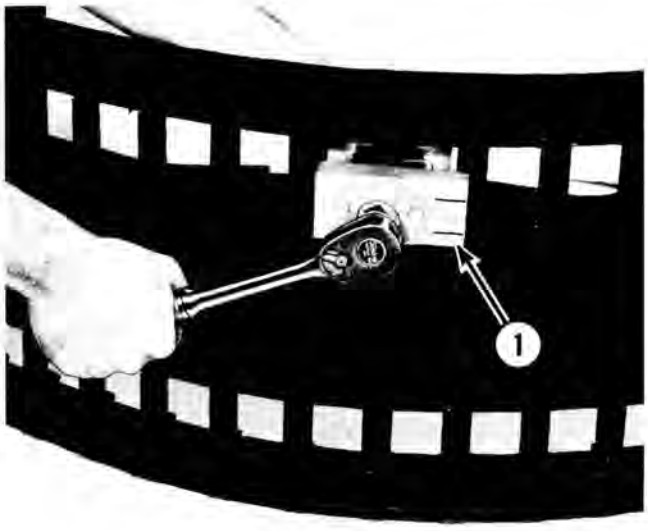
1. Check track for cracks, tears and gouges. Rubber portion of track is not repairable. Replace track if rubber damage is observed.

2. Check for broken, worn or missing clips. Remove old clips.

   a. To remove clips from track, drill a series of indentations across top of clip, then use hammer and chisel to split clip along indentations.

NOTE: It is not necessary to drill completely through clip, small indentations are sufficient to permit the clip to split.

   b. To install new clip, position it on track and compress with track clip tool assembly (tool No. 57001-3513) as shown in Figure 3-212.

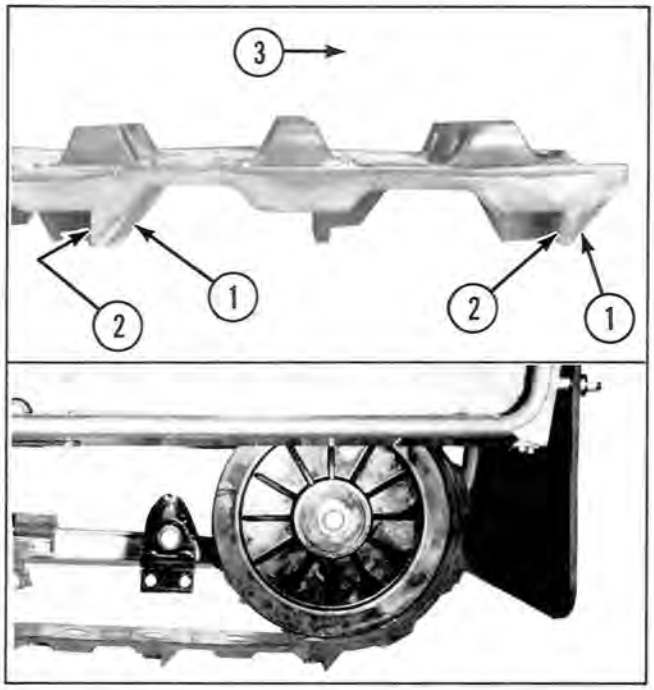


1. Track Clip Tool Assembly

Figure 3-212

Installation

1. Insert track into tunnel and position the track profile as shown in Figure 3-213.



1. Angled Side of Drive Rib
2. Aggressive Side of Drive Rib
3. Track Rotation

Figure 3-213

NOTE: Install track so that angled side of drive rib rotates towards rear of snowmobile. Advantages of installing track in this direction are:

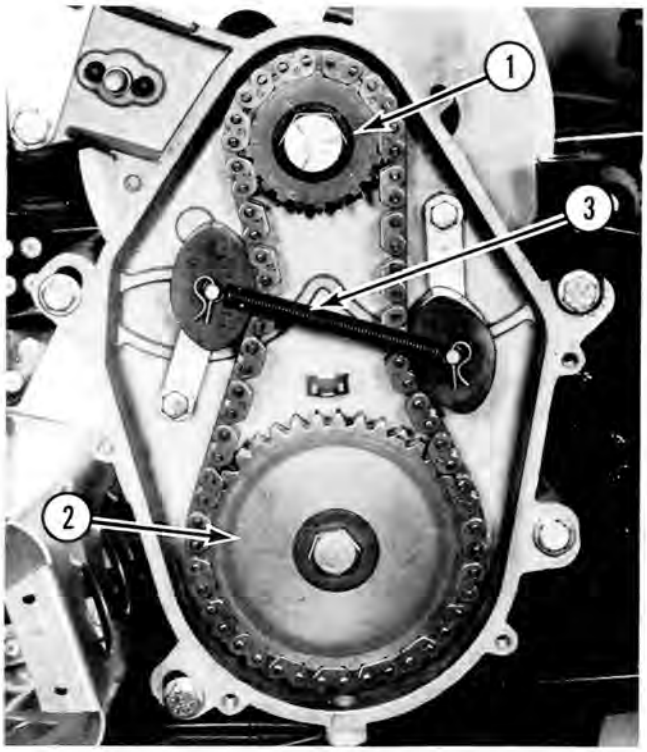
- Air turbulence inside the tunnel is reduced which means that less horsepower is required to turn the track at high speed.
- Float in deep snow is better
- Braking action is noticeably improved
- Track damage from abuse is minimized

Reversing the track results in:

- Wasted horsepower at high speeds
- Reduced traction for braking
- Track rib damage in marginal snow conditions
- Inadequate float in deep loose snow
- Improved acceleration traction on hard packed snow

NOTE: The lower chaincase seal is a double lip type. Be sure area between lips is packed with grease to prevent premature driveshaft wear.

2. Insert driveshaft bearing end through hole in front frame, then carefully guide splined end of shaft into chaincase using care not to damage seal.
3. Lubricate O-ring inside bearing housing with grease then slide housing over bearing with word TOP facing upward. (See Figure 3-209.)
4. Tighten bearing housing bolts to 18 ft lb (2.6 kg-m).
5. Install upper and lower sprocket spacers. Thick spacer for top sprocket, thin spacer for bottom sprocket.
6. Install the upper sprocket, lower sprocket, (lip on the lower sprocket goes toward the bearing) and the chain as a unit. Install the lower sprocket bolt and washer, torque 35 ft lb (4.84 kg-m). Install the upper sprocket bolt and washer, torque 40 to 50 ft lb (5.53 to 6.92 kg-m). (See Figure 3-214.)
7. Install the chain guides, tensioner spring and hair pin retainers. (See Figure 3-214.)



1. Upper Sprocket
2. Lower Sprocket
3. Tensioner Spring

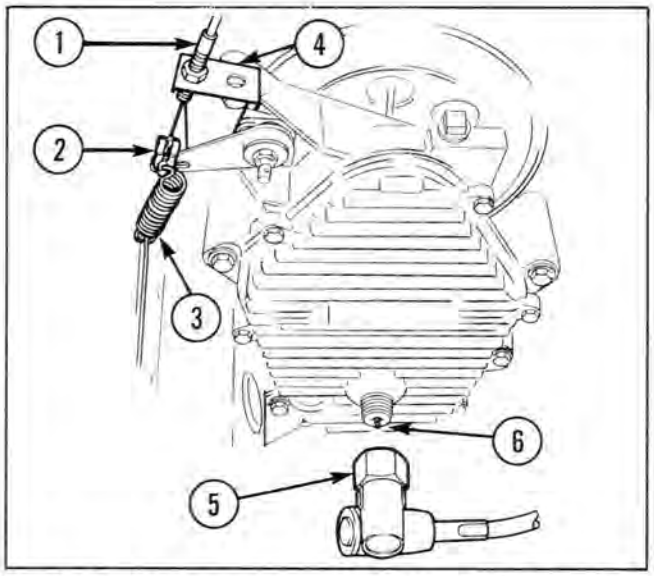
Figure 3-214

8. Install the chaincase cover and new O-ring seal. Fill the chaincase with DEXRON II automatic transmission fluid to the center of the sight gauge. Reinstall the fill plug.

9. Insert speedometer key through chaincase cover hole while rotating key to align with square hole in lower sprocket mount bolt. (See Figure 3-215.)

NOTE: Speedometer key should be centered within chaincase cover hole and cannot be rotated when properly engaged with lower sprocket mount bolt.

10. Position speedometer drive adapter near mounting threads on cover, insert end of flexible key into square hole of adapter, and slide adapter into position on cover. Do not use force during assembly. When components are properly aligned, adapter will slide easily into position. (See Figure 3-215.)



1. Brake Cable
2. Clevis Retainer
3. Spring
4. Brake Cable Bracket
5. Speedometer Adapter
6. Speedometer Key

Figure 3-215

11. Secure lower battery bracket to footrest and heat shield bracket with mounting hardware installed in sequence shown. (See Figure 3-186.)

12. Install suspension.

13. Adjust track tension and alignment. Refer to Track Adjustments.

14. Install battery. Refer to Battery Installation procedure in Section 2.

Jackshaft and Brake Disc

Removal

1. Remove battery. Refer to Battery Removal procedure.

2. Remove lower battery bracket and mounting bolts.

3. Remove belt guard and drive belt.

4. Remove left side trim from lower pan.

5. Remove driven converter.

6. Remove speedometer adapter and key. (See Figure 3-215.)

7. Remove the chaincase cover to drain the chaincase.

8. Remove chain tensioner spring and upper chain sprocket and spacer.

NOTE: It may be necessary to remove the lower sprocket also.

9. Unscrew nuts and lift cap from jackshaft bearing retainer. (See Figure 3-216.)

10. Remove jackshaft from the chaincase. Remove the brake disc from between the calipers.

Cleaning and Inspection

1. Turn the bearing by hand. If the bearing binds, has excessive end play or is rough, it must be replaced. Bearing is press fit onto shaft.

2. Clean the brake disc with solvent and dry. Do not allow oil or grease on disc as it impairs braking action. Replace the disc assembly if the disc is scored or warped.

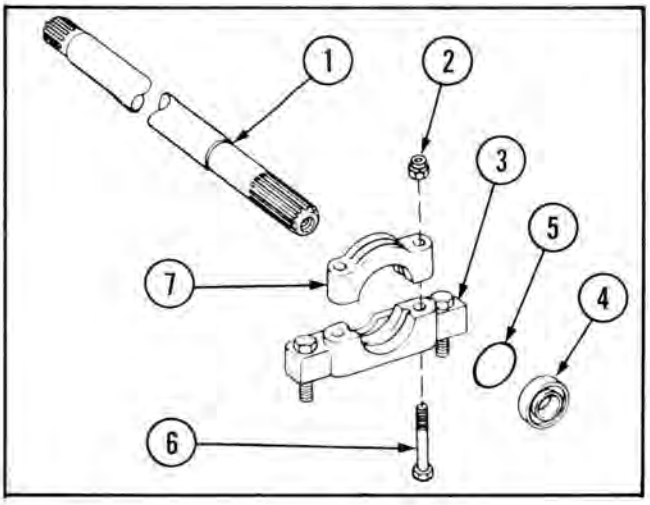
3. Check shaft for straightness by placing on a flat surface. Shaft must roll easily and smoothly. Repair or replace defective shaft.

4. Inspect splines and threads on shaft for cracks or distortion. Replace shaft if necessary.

Installation

1. If removed, press bearing onto jackshaft until bearing contacts shoulder for correct positioning. (See Figure 3-216.)

NOTE: Effort required to install bearing can be reduced by placing bearing on hot light bulb to expand inner race.



1. Bearing Shoulder
2. Bearing Cap Nut
3. Bearing Retainer
4. Bearing
5. O-Ring
6. Retainer to Cap Bolt
7. Bearing Cap

Figure 3-216

2. Install bearing retainer O-ring on bearing. (See Figure 3-216.)

3. Slide brake disc assembly between brake calipers.

4. Slide jackshaft through brake disc assembly into chaincase. Fit O-ring into groove of bearing retainer.

5. Install sprocket spacers, (thick for top sprocket, thin for bottom sprocket), sprockets, chain and tensioner. Torque the upper sprocket mounting bolt 40 to 50 ft lb (5.53 to 6.92 kg-m). Torque the lower sprocket mounting bolt to 35 ft lb (4.84 kg-m). (See Figure 3-214.)

6. Install chaincase cover and fill chaincase with fluid until fluid is half way up window in the chaincase cover.

7. Insert speedometer key through chaincase cover hole while rotating key to align with square hole in lower sprocket mount bolt. (See Figure 3-215.)

NOTE: Speedometer key should be centered within chaincase cover hole and cannot be rotated when properly engaged with lower sprocket mount bolt.

8. Position speedometer drive adapter near mounting threads on cover, insert end of flexible key into square hole of adapter, and slide adapter into position on cover. Do not use force during assembly. When components are properly aligned, adapter, will slide easily into position. (See Figure 3-215.)

9. Install bearing cap onto jackshaft bearing retainer (be sure O-ring is placed in cap groove) and torque nuts to 18 ft-lbs. (2.5 kg-m).

10. Install driven converter and check alignment as described in Section 2.

11. Install left side trim to lower pan.

12. Perform Brake Adjustment procedure in Section 2.

13. Install lower battery bracket and mounting bolts.

14. Install battery. Refer to Battery Installation.

Steering System

Handlebars and Steering Pole Removal (See Figure 3-217)

1. Disconnect electrical connectors from the main harness so handlebars can be removed.

2. Disconnect the control cables from the handles.

3. Remove four mounting screws from the handle holder. The handlebars can now be removed.

4. Remove bolt and washer securing lower handlebar holder to top of steering pole and lift off lower holder.

5. Removal of the steering pole requires the prior removal of the intake silencer and engine as previously described in this section.

6. Remove the bolt and nut holding the tie rod assembly to the steering pole.

7. Remove the bolts from the upper and lower mounting blocks.

8. Remove upper split bushings and then withdraw steering pole upward.

Installation (See Figure 3-217)

1. Reinstall steering pole reversing order of removal.

2. Install tie rod to steering pole. Torque mounting nut to 30 ft lb (4.2 kg-m).

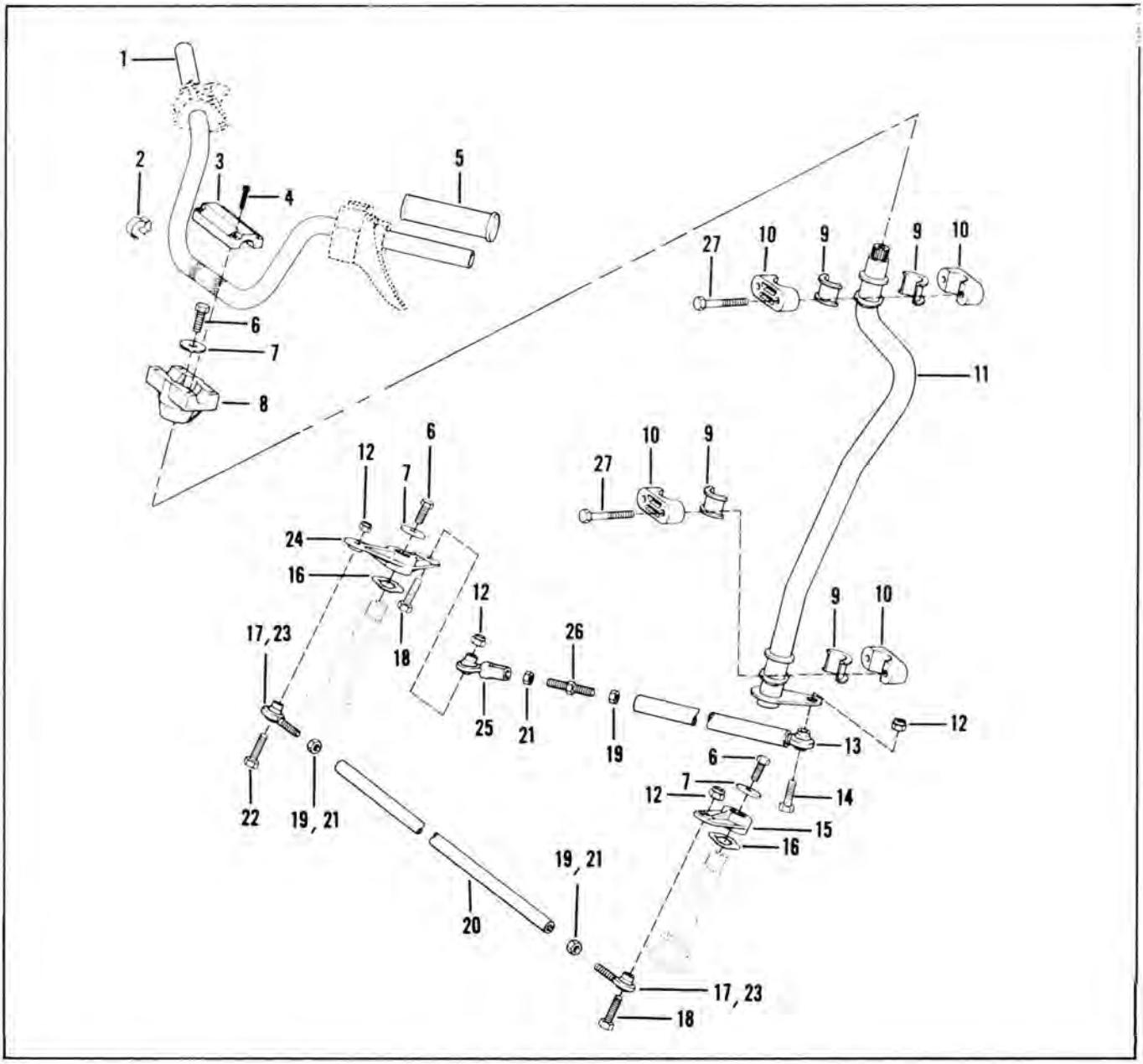
3. Locate key switch bracket between steering pole mount block and upper steering mount.

4. Apply a low temperature grease to bushings.

WARNING

Bolts used in steering system are grade 8 self locking type. Use of incorrect hardware may result in steering system failure causing personal injury.

5. Secure bushings and mount block to steering mount by tightening bolts 18 ft lb (2.5 kg-m).
6. Reconnect electrical connectors for handlebar controls.
7. Install cable tie band to secure primer pump tubes and wire harness near steering pole.



1. Steering Handle
2. Wire Clamp
3. Handle Holder
4. Screw
5. Handle Grip
6. Bolt
7. Special Washer
8. Handle Holder
9. Bushing
10. Mount Block
11. Steering Pole Assembly
12. Insert Nut
13. Tie Rod
14. Bolt
15. Left Steering Arm
16. Wave Washer
17. Tie Rod End
18. Bolt
19. Nut
20. Tie Rod
21. Special Nut
22. Bolt
23. Tie Rod End
24. Right Steering Arm
25. Tie Rod End
26. Adjusting Stud
27. Bolt

Figure 3-217

8. Install lower handlebar holder and tighten bolt 35 ft lb (4.8 kg-m).

9. Secure handlebars to steering pole by installing upper holder with screws torqued to 105 in. lb (1.2 kg-m). Be sure handlebar is placed in a comfortable driving position.

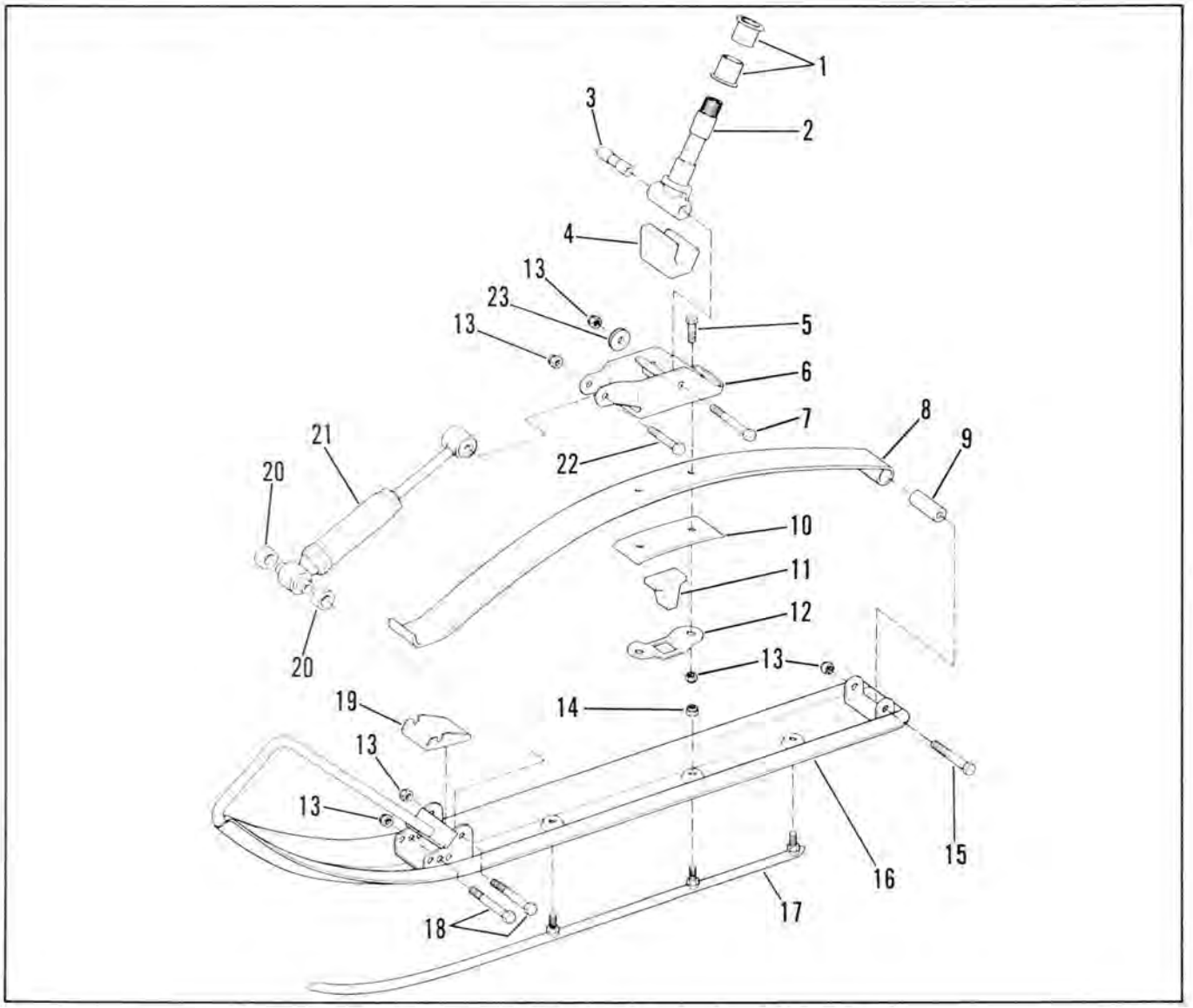
10. Install engine and air silencer assembly.

11. Start engine and test operation of lights and ignition.

12. Align skis and center handlebars by performing Ski Alignment procedure in Section 2.

Steering Arm and Spindle Removal

1. Remove the tie rods from the steering arms. (See Figure 3-217.)



1. Spindle Bushing
2. Ski Spindle
3. Spindle Sleeve
4. Damper
5. Bolt
6. Ski Saddle
7. Bolt
8. Monoleaf Spring
9. Spring Sleeve
10. Back-Up Plate
11. Ski Bumper
12. Bumper Retainer
13. Insert Nut
14. Insert Nut
15. Bolt
16. Ski
17. Skeg
18. Bolt
19. Rub Strip
20. Shock Absorber Spacer
21. Ski Shock Absorber
22. Bolt
23. Washer

Figure 3-218

2. Loosen the bolts securing the steering arms to the spindles approximately 3 turns but do not remove. (See Figure 3-217.)

3. Position the snowmobile on its side. Drive the ski and spindle assembly from the steering arm by tapping on the bolt head until the spindle assembly loosens from the splines in the steering arm. (See Figure 3-218.)

4. Remove spindle from saddle assembly.

5. Remove spindle bushings from top and bottom of spindle bosses. (See Figure 3-218.)

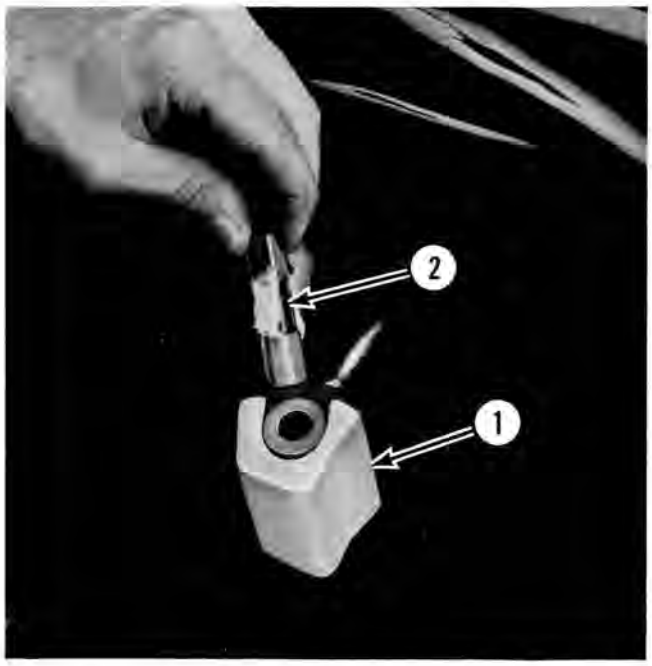
Installation

1. Slide one bushing onto ski spindle and insert into spindle boss on chassis. Slide remaining bushing onto spindle.

2. Install steering arm to spindle, matching large spline of arm to corresponding spline on spindle, and securing with bolt and washer. Torque bolt to 30 ft lb (4.2 kg-m).

3. Install tie rod to steering arms. Torque mounting nut to 30 ft lb (4.2 kg-m). (See Figure 3-217.)

4. Install the ski attitude damper. Apply silicone spray or soapy water on the damper to ease installation of the ski saddle over the damper. (See Figures 3-218 and 3-219.)



1. Ski Attitude Damper
2. Grease Groove

Figure 3-219

5. Fill the grease groove or cut away area of the spindle sleeve with a low temperature extreme pressure (EP) grease, and insert sleeve into the spindle. (See Figure 3-219.)

6. Secure the ski assembly to the spindle. Be sure the nut and large flat washer are installed on the inboard side of the ski assembly, then torque the nut 45 to 47 ft lbs (6.2 to 6.5 kg-m). (See Figure 3-218.)

7. Align skis and center steering pole as described in Section 2. Check mounting bolts for proper torque.

Ski Removal (See Figure 3-218)

1. Remove bolts at each end of spring.

2. Unscrew bolt securing lower end of shock absorber to ski, and remove ski.

Installation (See Figure 3-218)

1. Position rub strip in ski and install front of ski over shock absorber and spring. Tighten shock absorber mounting bolt to 31 ft lb (4.3 kg-m) torque, but do not install front spring mount bolt at this time.

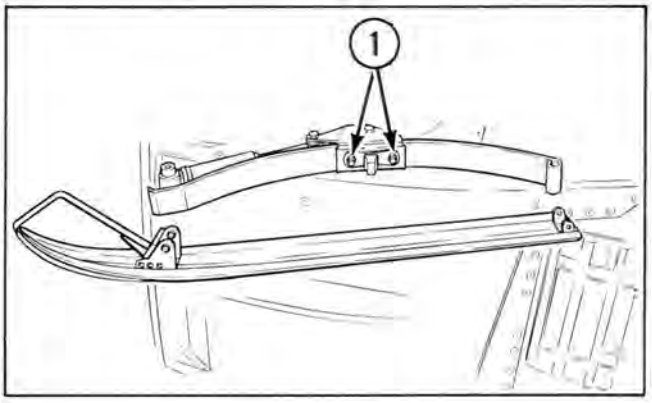
2. Install rear spring sleeve and mounting bolt then torque to 31 ft lb (4.3 kg-m) to secure spring to ski.

3. Adjust spring preload while installing front spring mounting bolt. Refer to Ski Spring Preload procedure in Section 2.

Ski Spring Removal

1. Remove ski. Refer to Ski Removal procedure.

2. Unscrew spring mounting bolt nuts to separate spring from saddle. (See Figure 3-220.)



1. Spring Mounting Bolts

Figure 3-220

Installation (See Figure 3-218)

1. Install spring mounting bolts into saddle.
2. Next, position spring, back-up plate, bumper and bumper retainer under saddle and secure with nuts. Tighten nuts to 46 ft lb (6.3 kg-m) torque.
3. Install ski. Refer to Ski Installation procedure.

Skeg Removal (See Figure 3-218)

1. Remove nuts securing skeg to ski and remove skeg.

Installation

1. Insert front of skeg into hole near tip of ski.
2. Align studs on skeg with mounting holes in bottom of ski.
3. Install nuts and tighten to 120 in. lb (1.4 kg-m) torque.

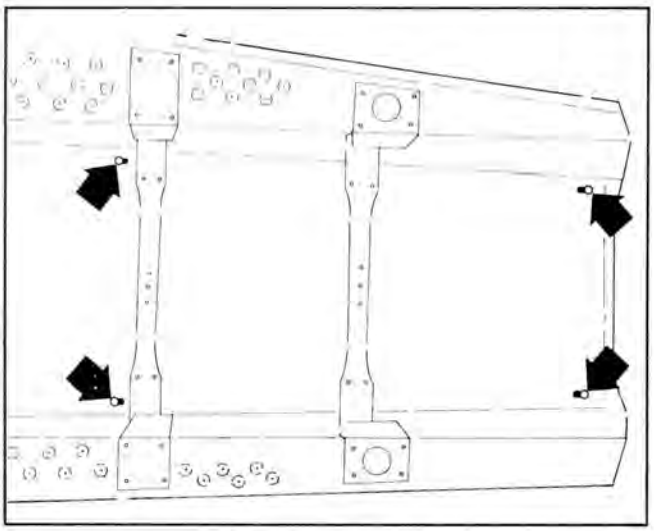
Seat

Removal (See Figure 3-221)

1. Remove the four seat mounting bolts.
2. Lift the seat from the snowmobile.

Installation

1. Position the seat on the snowmobile.
2. Secure seat with the four seat mounting bolts. Do not overtighten mounting bolts as "blind nuts" used in the seat can be easily stripped. If "blind nuts" become accidentally stripped, replacement of seat frame is required.



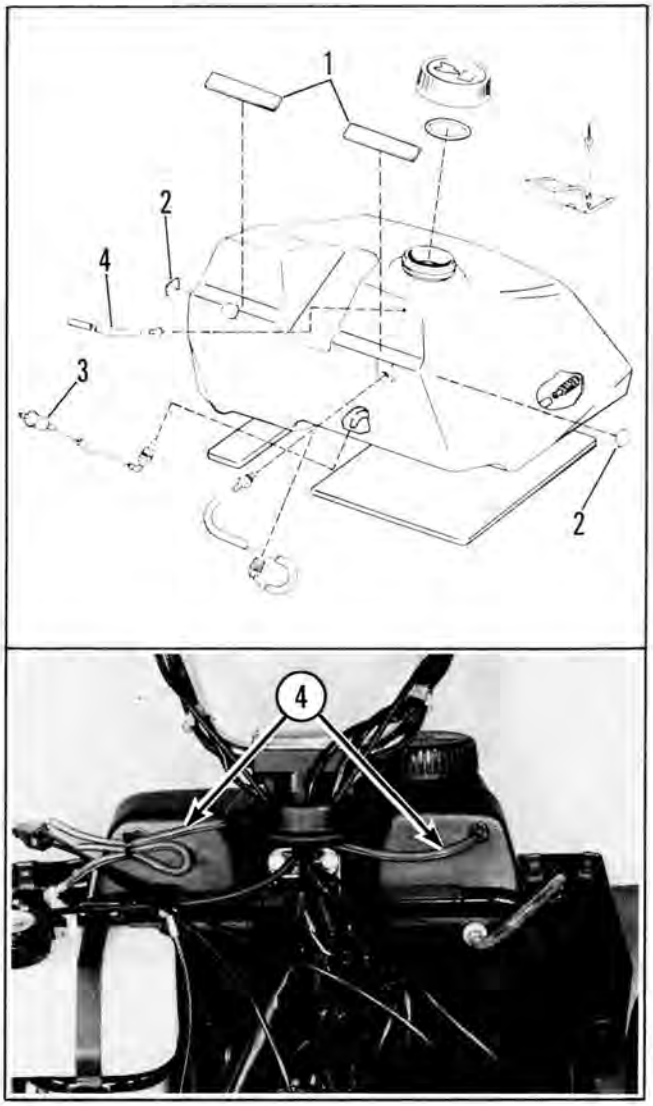
Seat Mounting Bolts

Figure 3-221

Fuel Tank

Removal

1. Remove the seat.
2. Drill rivets from bracket at rear of tank holding tank to chassis and remove bracket.
3. Lift tank to allow access to feedline fitting at lower front of tank. Disconnect tank to fuel filter tube, and connect another suitable length of 1/4 in. tube and allow fuel to drain into a proper container.
4. Disconnect remaining fuel tubes from fittings of tank, and lift tank from snowmobile.



1. Pads Front
2. Pads Side
3. In-Line Filter
4. Vent Tube

Figure 3-222

Installation

1. Position tank on chassis, with tank slightly raised. Reconnect fuel tubes to tank, and route fuel tank vent tube as shown in Figure 3-222.
2. Position tank on chassis. Check to be sure the four rubber pads are installed at the front of the tank. These pads protect the tank from damage by the steering hoop. (See Figure 3-222.)
3. Remount the bracket at the rear of the tank.
4. Install seat assembly.

Oil Tank

Removal

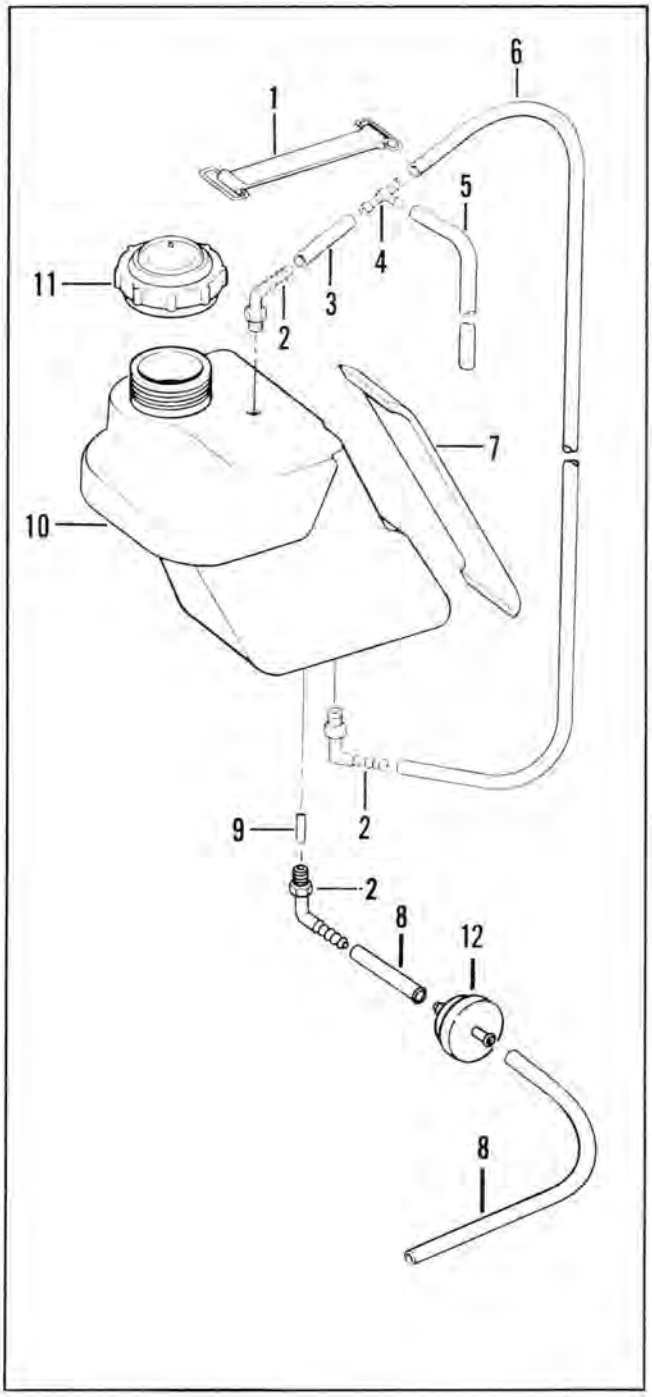
1. Remove oil tank retaining band, and lift tank to allow access to elbow fittings on bottom. (See Figure 3-223.)
2. Pull oil level tube from fitting at the top of tank and allow oil to drain into a container of sufficient capacity to hold the entire 2-1/2 quarts (2.37 liters) of oil tank capacity if necessary. (See Figure 3-223.)
3. Disconnect remaining vent and feed tubes and remove tank.

Inspection

1. Wash remaining oil and residue from tank with a mild solvent.
2. Examine tank for damage, cracks or leaks. Repair or replace as necessary. Allow solvent to dry from tank if the tank is to be reused.
3. Be sure pick up pipe is installed in the fitting that supplies oil to the oil pump. (See Figure 3-224.)

CAUTION

If pick up pipe is not installed in the supply line fitting foreign matter may enter oil pump resulting in engine failure.

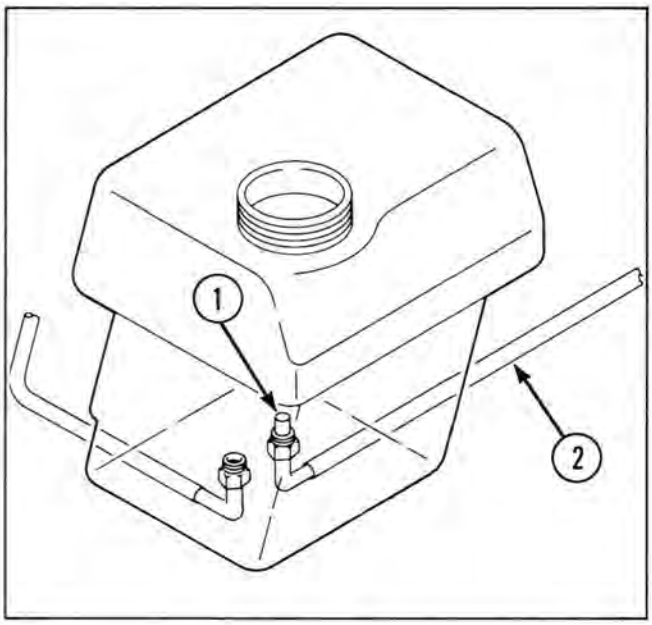


1. Oil Tank Band
2. Elbow Fitting
3. Tube (Tank to Tee)
4. T Fitting
5. Tube (Vent)
6. Tube (Oil Level)
7. Oil Tank Pad
8. Tube (Oil Pump Supply)
9. Pick Up Pipe
10. Oil Tank
11. Oil Tank Cap
12. Oil Filter

Figure 3-223

Installation

1. Reconnect vent, level, and feed tubes noting that feed tube is to be connected to the left hand fitting on the tank bottom, as this fitting has a stand pipe which prevents any tank sediment from entering lubrication system. (See Figure 3-224.)



1. Pick Up Pipe
2. Tank to Oil Pump Tube

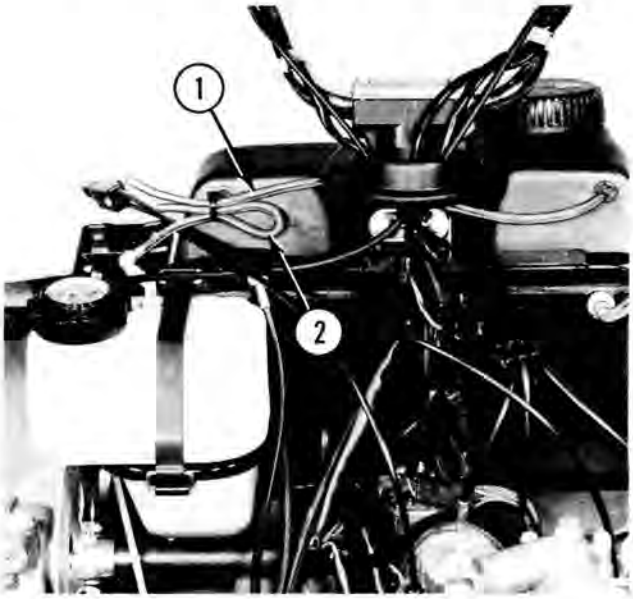
Figure 3-224

NOTE: Check the oil tank vent tube for:

a. Proper Routing - Sharp bends or kinks in the vent tube will reduce oil flow to the oil pump.

b. Tie Band Installation - Tie band may pinch off tube, reducing oil flow to the oil pump, if installed too tight.

c. Vent Tube Position - To prevent siphoning action possible under certain conditions position end of vent tube higher than top of oil tank and away from brake components (disc and pads). (See Figure 3-225.)



1. Vent Tube (Fuel Tank)
2. Vent Tube (Oil Tank)

Figure 3-225

2. Resecure tank with band, and refill with Kawasaki Snowmobile Oil.

CAUTION

Failure to bleed trapped air from the oil injection system will result in severe engine damage.

3. Bleed air from oil injection system by preforming Oil Injection System Bleeding procedure. Refer to Section 2.

Appendix

Table of Contents

	Page
Fuel and Oil Recommendations	4-2
Break-In Procedure	4-3
Conversion Chart	4-4
Drill Sizes	4-5
English to Metric Conversions	4-6
Unit Conversion Table	4-7
List of Abbreviations	4-7
Special Service Tools	4-8
Wiring Diagram	4-9
Index	4-10

Fuel and Oil Recommendations

WARNING

Gasoline is extremely flammable and highly explosive under certain conditions. Insure adequate ventilation when fueling the snowmobile and never smoke or allow sparks or open flame near fuel system.

Your Kawasaki Snowmobile uses a two cycle engine which means oil must be mixed with the gasoline to provide proper internal engine lubrication and cooling.

Oil

We recommend using Kawasaki snowmobile oil. This oil is specially formulated to give minimum piston ring varnish and combustion chamber deposits along with excellent lubrication qualities (See Figure 4-1).

In an emergency situation when Kawasaki Snowmobile Oil is not available, a B.I.A. certified TC-W oil may be substituted. All certified oils will indicate the TC-W rating on the container. If the B.I.A. certification does not appear on the container, THE OIL MUST NOT BE USED



Figure 4-1

The use of lubricants such as "tune-up tonics" and "super oils" is NOT RECOMMENDED.

The oil tank has no filter. DO NOT ALLOW DIRT TO ENTER WHILE FILLING. Oil tank capacity is 2-1/2 quarts (2.37 liters).

Check the oil tank vent tube for:

1. Proper Routing - Sharp bends or kinks in the vent tube will reduce oil flow to the oil pump
2. Tie Band Installation - Tie band may pinch off tube, reducing oil flow to the oil pump, if installed to tight.
3. Vent Tube Position - To prevent siphoning action possible under certain conditions position end of vent tube higher than top of oil tank and away from brake components (disc and pads.)

Fuel

Use regular or premium gasoline with a minimum PUMP POSTED OCTANE NUMBER of 89.

WARNING

Gasoline fumes are heavier than air and can become explosive if exposed to a pilot light from a furnace, hot water heater, etc. Fill the fuel tank only in an area that is well ventilated and free from pilot lights and sparks.

Before removing filler cap from the fuel tank, remove any ice, snow, or water from around the fuel tank opening to prevent contamination of fresh fuel mixture.

Fill the fuel tank slowly and pour the fuel into the tank using a funnel with a fine mesh screen.

CAUTION

Each time the fuel tank is filled, gasoline antifreeze must be added to the fuel system. Moisture contained in fuel system components (fuel tank, lines, fuel pump or carburetor) could freeze and may result in severe damage.

A major brand of Gasoline Antifreeze (such as Heet) should be added to the fuel tank by following the manufacturer's recommendations on the container for proper mix ratio of gasoline with antifreeze. (See Figure 4-2.)



Figure 4-2

Fuel/Oil Mixture (Ratio)

These snowmobile engines are automatically lubricated by a variable pump which may change the mixture from about 110 to 1 to about 25 to 1, depending on engine speed and throttle opening. When the engine needs less oil, as at an idle, it gets less oil.

Under full throttle, the engine will be fed more oil. Automatic oiling is economical because it gives the engine only as much oil as it needs. This also cuts down on visible exhaust emissions.

CAUTION

Each time gas tank is filled - check for adequate oil level in the oil tank. A full oil tank assures proper fuel/oil ratio will be maintained to prevent serious engine damage

Break-in Procedure

NOTE: To insure adequate lubrication of internal engine components during early break-in, a 25-to-1 gasoline-to-oil ratio is recommended for the first three (3) gallons of gasoline. This ratio can be obtained by thoroughly mixing 1 pint (0.47 liter) of Kawasaki Snowmobile Oil with three (3) gallons (11.4 liters) of gasoline. Pre-mixing gasoline and oil will no longer be required after the initial three gallons of gasoline and oil mix have been consumed.

25 to 1 Gasoline to Oil Mixture, Break-in Only	
Oil	Gasoline
1 pint (U.S.)	3 gal. (U.S.) 2.6 gal. (Imp.)
1 pint (Imp.)	3 gal. (Imp.) 3.75 gal. (U.S.)

During the first 10 hours of operation, do not subject the snowmobile engine to continued full speed, do not ride with passengers in deep snow, and do not break trail.

For proper engine break-in, run machine on hard packed snow at approximatey 3/8 to 1/2 throttle, with occasional bursts to full speed. Limit the full speed operation to 1-1/2 to 2 minutes then return to cruising speed for 10 to 15 minute interval. After 10 hours of operation, or 2 tanks of gasoline are used, break-in is complete.

Conversion Chart/Fraction Inch to Decimal Inch to mm

Frac. Inch	Dec. Inch	mm.	Frac. Inch	Dec. Inch	mm.	Frac. Inch	Dec. Inch	mm.	Frac. Inch	Dec. Inch	mm.
	.000400	.0100	13/32	.406250	10.3187		.984259	25.0000		1.800000	45.7196
	.000800	.0200	27/64	.421875	10.7156	63/64	.984375	25.0031		1.811037	46.0000
	.001200	.0300		.433074	11.0000	1	1.000000	25.4001	1-13/16	1.812500	46.0376
	.001600	.0400	7/16	.437500	11.1125		1.023629	26.0000	1-27/32	1.843750	46.8313
	.002000	.0500		.450000	11.4300	1-1/32	1.031250	26.1938		1.850000	46.9896
	.002400	0600	29/64	.453125	11.5094		1.050000	26.6699		1.850407	47.0000
	.002800	.0700	15/32	.468750	11.9062	1-1/16	1.062500	26.9876	1-7/8	1.875000	47.6251
	.003100	.0800		.472444	12.0000		1.062999	27.0000		1.889777	48.0000
	.003500	.0900	31/64	.484375	12.3031	1-3/32	1.093750	27.7813		1.900000	48.2596
	.003900	.1000	1/2	.500000	12.7000		1.100000	27.9397	1-29/32	1.906250	48.4188
1/128	.007900	.2000		.511814	13.0000		1.102369	28.0000		1.929147	49.0000
	.011800	.3000	33/64	.515625	13.0969	1-1/8	1.125000	28.5751	1-15/16	1.937500	49.2126
1/64	.015625	.3969	17/32	.531250	13.4937		1.141739	29.0000		1.950000	49.5296
	.015700	.4000	35/64	.546875	13.8906		1.150000	29.2097		1.968522	50.0000
	.019700	.5000		.550000	13.9700	1-5/32	1.156250	29.3688	1-31/32	1.968750	50.0063
	.023600	.6000		.551184	14.0000		1.181113	30.0000	2	2.000000	50.8001
	.027600	.7000	9/16	.562500	14.2875	1-3/16	1.187500	30.1626		2.007892	51.0000
1/32	.031250	.7937	37/64	.578125	14.6844		1.200000	30.4797	2-1/32	2.031250	51.5939
	.031500	.8000		.590554	15.0000	1-7/32	1.218750	30.9563		2.047262	52.0000
	.035400	.9000	19/32	.593750	15.0812		1.220483	31.0000		2.050000	52.0695
	.039370	1.0000		.600000	15.2400	1-1/4	1.250000	31.7501	2-1/16	2.062500	52.3876
3/64	.046875	1.1906	39/64	.609375	15.4781		1.259853	32.0000		2.086632	53.0000
	.050000	1.2700	5/8	.625000	15.8750	1-9/32	1.281250	32.5438	2-3/32	2.093750	53.1814
1/16	.062500	1.5875		.629924	16.0000		1.299223	33.0000		2.100000	53.3395
5/64	.078125	1.9844	41/64	.640625	16.2719		1.300000	33.0197	2-1/8	2.125000	53.9751
	.078740	2.0000		.650000	16.5100	1-5/16	1.312500	33.3376		2.126002	54.0000
3/32	.093750	2.3812	21/32	.656250	16.6687		1.338593	34.0000		2.150000	54.6095
	.100000	2.5400		.669294	17.0000	1-11/32	1.343750	34.1313	2-5/32	2.156250	54.7688
7/64	.109375	2.7781	43/64	.671875	17.0656		1.350000	39.2897		2.165372	55.0000
	.118110	3.0000	11/16	.687500	17.4625	1-3/8	1.375000	34.9251	2-3/16	2.187500	55.5626
1/8	.125000	3.1750		.700000	17.7800		1.377963	35.0000		2.200000	55.8795
9/64	.140625	3.5719	45/64	.703125	17.8594		1.400000	35.5597		2.204712	56.0000
	.150000	3.8100		.708664	18.0000	1-13/32	1.406250	35.7188	2-7/32	2.218750	56.3564
5/32	.156250	3.9687	23/32	.718750	18.2562		1.417333	36.0000		2.244112	57.0000
	.157418	4.0000	47/64	.734375	18.6531	1-7/16	1.437500	36.5126	2-1/4	2.250000	57.1501
11/64	.171875	4.3656		.748034	19.0000		1.450000	36.8297	2-9/32	2.281250	57.9439
3/16	.187500	4.7625	3/4	.750000	19.0500		1.456703	37.0000		2.283482	58.0000
	.196850	5.0000	49/64	.765625	19.4469	1-15/32	1.468750	37.3063		2.300000	58.4195
	.200000	5.0800	25/32	.781250	19.8437		1.496073	38.0000	2-5/16	2.312500	58.7376
13/64	.203125	5.1594		.787409	20.0000	1-1/2	1.500000	38.1001		2.322852	59.0000
7/32	.218750	5.5562	51/64	.796875	20.2406	1-17/32	1.531250	38.8938	2-11/32	2.343750	59.5314
15/64	.234375	5.9531		800000	20.3200		1.535443	39.0000		2.350000	59.6895
	.236220	6.0000	13/16	.812500	20.6375		1.550000	39.3696		2.362226	60.0000
1/4	.250000	6.3500		.826779	21.0000	1-9/16	1.562500	39.6876	2-3/8	2.375000	60.3251
17/64	.265625	6.7469	53/64	.828125	21.0344		1.574817	40.0000		2.400000	60.9594
	.275590	7.0000	27/32	.843750	21.4312	1-19/32	1.593750	40.4813		2.401596	61.0000
9/32	.281250	7.1437		.850000	21.5900		1.600000	40.6396	2-13/32	2.406250	61.1189
19/64	.296875	7.5406	55/64	.859375	21.8281		1.614187	41.0000	2-7/16	2.437500	61.9126
	.300000	7.6200		.866149	22.0000	1-5/8	1.625000	41.2751		2.440966	62.0000
5/16	.312500	7.9375	7/8	.875000	22.2250		1.650000	41.9096		2.450000	62.2294
	.314960	8.0000	57/64	.890625	22.6219		1.653557	42.0000	2-15/32	2.468750	62.7064
21/64	.328125	8.3344		.900000	22.8600	1-21/32	1.656250	42.0688		2.480336	63.0000
11/32	.343750	8.7312		.905519	23.0000	1-11/16	1.687500	42.8626	2-1/2	2.500000	63.5001
	.350000	8.8900	29/32	.906250	23.0187		1.692927	43.0000		2.519706	64.0000
	.354330	9.0000	59/64	.921875	23.4156		1.700000	43.1796	2-17/32	2.531250	64.2939
23/64	.359375	9.1281	15/16	.937500	23.8125	1-23/32	1.718750	43.6563		2.550000	64.7694
3/8	.375000	9.5250		.944889	24.0000		1.732297	44.0000		2.559076	65.0000
25/64	.390625	9.9219		.950000	24.1300	1-3/4	1.750000	44.4501	2-9/16	2.562500	65.0876
	.393704	10.0000	61/64	.953125	24.2094		1.771667	45.0000	2-19/32	2.593750	65.8814
	.400000	10.1600	31/32	.968750	24.6062	1-25/32	1.781250	45.2438		2.598446	66.0000

Frac. Inch	Dec. Inch	mm.	Frac. Inch	Dec. Inch	mm.	Frac. Inch	Dec. Inch	mm.	Frac. Inch	Dec. Inch	mm.
	2.600000	66.0394		2.952780	75.0000	3-5/16	3.312500	84.1377		3.661449	93.0000
2-5/8	2.625000	66.6751	2-31/32	2.968750	75.4064	3-11/32	3.343750	84.9314	3-11/16	3.687500	93.6627
	2.637816	67.0000		2.992150	76.0000		3.346485	85.0000		3.700000	93.9792
	2.650000	67.3094	3	3.000000	76.2002		3.350000	85.0892		3.700819	94.0000
2-21/32	2.656250	67.4689	3-1/32	3.031250	76.9939	3-3/8	3.375000	85.7252	3-23/32	3.718750	94.4564
	2.677186	68.0000		3.031520	77.0000		3.385855	86.0000		3.740189	95.0000
2-11/16	2.687500	68.2626		3.050000	77.4693		3.400000	86.3592	3-3/4	3.750000	95.2502
	2.700000	68.5794	3-1/16	3.062500	77.7877	3-13/32	3.406250	86.5189		3.779559	96.0000
	2.716556	69.0000		3.070890	78.0000		3.425225	87.0000	3-25/32	3.781250	96.0439
2-23/32	2.718750	69.0564	3-3/32	3.093750	78.5814	3-7/16	3.437500	87.3127		3.800000	96.5192
2-3/4	2.750000	69.8501		3.100000	78.7393		3.450000	87.6292	3-13/16	3.812500	96.8377
	2.755930	70.0000		3.110260	79.0000		3.464595	88.0000		3.818929	97.0000
2-25/32	2.781250	70.6439	3-1/8	3.125000	79.3752	3-15/32	3.468750	88.1064	3-27/32	3.843750	97.6314
	2.795300	71.0000		3.149635	80.0000	3-1/2	3.500000	88.9002		3.850000	97.7891
	2.800000	71.1194		3.150000	80.0093		3.503965	89.0000		3.858299	98.0000
2-13/16	2.812500	71.4376	3-5/32	3.156250	80.1689	3-17/32	3.531250	89.6939	3-7/8	3.875000	98.4252
	2.834670	72.0000	3-3/16	3.187500	80.9627		3.543339	90.0000		3.897669	99.0000
2-27/32	2.843750	72.2314		3.189005	81.0000		3.550000	90.1691		3.900000	00.0591
	2.850000	72.3893		3.200000	81.2793	3-9/16	3.562500	90.4877	3-29/32	3.906250	99.2189
	2.874040	73.0000	3-7/32	3.218750	81.7564		3.582709	91.0000		3.937043	100.0000
2-7/8	2.875000	73.0251		3.228375	82.0000	3-19/32	3.593750	91.2814	3-15/16	3.937500	100.0130
	2.900000	73.6593	3-1/4	3.250000	82.5502		3.600000	91.4392		3.950000	100.3291
2-29/32	2.906250	73.8189		3.267745	83.0000		3.622079	92.0000	3-31/32	3.968750	100.8060
	2.913410	74.0000	3-9/32	3.281250	83.3439	3-5/8	3.625000	92.0752		3.976413	101.0000
2-15/16	2.937500	74.6126		3.300000	83.8192		3.650000	92.7092	4	4.000000	101.6000
	2.950000	74.9293		3.307115	84.0000	3-21/32	3.656250	92.8639			

Drill Sizes/Inch Decimal Equivalent

80	.0135	61	.039	42	.0935	23	.154	4	.209		
79	.0145	60	.040	41	.096	22	.157	3	.213		
78	.016	59	.041	40	.098	21	.159	2	.221		
77	.018	58	.042	39	.0995	20	.161	1	.228	O	.316
76	.020	57	.043	38	.1015	19	.166			P	.323
75	.021	56	.0465	37	.104	18	.1695	A	.234	Q	.332
74	.0225	55	.052	36	.1065	17	.173	B	.238	R	.339
73	.024	54	.055	35	.110	16	.177	C	.242	S	.348
72	.025	53	.0595	34	.111	15	.180	D	.246	T	.358
71	.026	52	.0635	33	.113	14	.182	E	.250	U	.368
70	.028	51	.067	32	.116	13	.185	F	.257	V	.377
69	.02925	50	.070	31	.120	12	.189	G	.261	W	.386
68	.031	49	.073	30	.1285	11	.191	H	.266	X	.397
67	.032	48	.076	29	.136	10	.1935	I	.272	Y	.404
66	.033	47	.0785	28	.1405	9	.196	J	.277	Z	.413
65	.035	46	.081	27	.144	8	.199	K	.281		
64	.036	45	.082	26	.147	7	.201	L	.290		
63	.037	44	.086	25	.1495	6	.204	M	.295		
62	.038	43	.089	24	.152	5	.2055	N	.302		

English to Metric Conversions

METRIC EQUIVALENTS

m indicates one meter
cm indicates one hundredth of a meter
mm indicates one thousandth of a meter
km indicates one thousand meters

LENGTH

1 mm. = 0.03937 In.
Cm. = 0.3937 In.
Meter = 3.28 Ft.
Meter = 1.094 Yd. (39.37 In.)
Kilom. = 0.621 Mile

In. = 2.54 Cm.
Ft. = 0.3048 Meter
Yd. = 0.9144 Meter
Mile = 1.61 Kilom.

AREA

Sq. Cm. = 0.1550 Sq. In.
Sq. M. = 10.76 Sq. Ft.

Sq. In. = 6.45 Sq. Cm.
Sq. Ft. = 0.0929 Sq. M.

VOLUME

Cu. Cm. = 0.061 Cu. In.
Cu. M. = 35.315 Cu. Ft.

Cu. In. = 16.38 Cu. Cm.
Cu. Ft. = 0.028 Cu. M.

CAPACITY

Liter = 0.0353 Cu. Ft.
Liter = 0.2642 Gallons (U.S.)
Liter = 61.023 Cu. In.
Liter = 2.202 lb. of fresh water at 62°F.
Liter = 1,000 CC
Liter = 35.19 Fl. Oz. (Imp.)
Liter = 33.82 Fl. Oz. (U.S.)

Gal. (U.S.) = 3.785 Liters
Gal. (Imp.) = 4.546 Liters
Cu. Ft. = 28.32 Liters
Cu. In. = 0.0164 Liter
Fl. Oz. (U.S.) = 29.57 CC
Fl. Oz. (Imp.) = 28.41 CC

WEIGHT

Gram = 15.432 Grains
Gram = 0.0353 Oz.

Kilogram = 2.2046 lbs.
Kilogram = 0.0011 Ton (Sht)
Met. Ton = 1.1025 Ton (Sht)
Grain = 0.0648 Gram

Oz. = 28.35 Gram
Lb. = 0.454 Kilgm.
Ton (Sht) = 907.18 Kilgm.
Ton (Sht) = 0.907 Metric Ton
Ton (Sht) = 2000 lb.

PRESSURE

1 Kilogram per Sq. Cm. = 14.2233 Lbs. per Sq. In.
1 Lb. per Sq. In. = 0.070307 Kilgms. per Sq. Cm.
1 Kilogram per Sq. Meter = 0.20482 Lbs. per Sq. Ft.
1 Lb. per Sq. Ft. = 4.8824 Kilgms. per Sq. Meter
1 Kilgm. per Sq. Cm. = 0.96784 Standard Atmosphere
1 Standard Atmosphere = 1.033228 Kilgm. per Sq. Cm.
1 Metric Atmosphere = 1.033228 Kilgm. per Sq. Cm.
1 Std. Atmosphere = 4.6959 Lbs. per Sq. In.

CONVERSION TABLES

	GALLON	QUART	PINT	LITER
U.S.	1	= 4	= 8	= 3.785
	1/4	= 1	= 2	= 0.946
	1/8	= 1/2	= 1	= 0.473
	0.264	= 1.056	= 2.113	= 1
IMP.	1	= 4	= 8	= 4.546
	1/4	= 1	= 2	= 1.136
	1/8	= 1/2	= 1	= 0.568
	0.220	= 0.880	= 1.760	= 1

U.S.
1 Gallon = 128 oz. = 3,785.41 cc 1 Quart = 32 oz. = 946.35 cc 1 Pint = 16 oz. = 473.18 cc
IMP.
1 Gallon = 160 oz. = 4,546.09 cc 1 Quart = 40 oz. = 1,136.52 cc 1 Pint = 20 oz. = 568.26 cc

CONVERSION FACTORS

Inches to centimeters (cm)	Multiply by 2.54
Meters (m) to yards	Multiply by 70 and divide by 64
Kilometers (km) to miles	Multiply by 5 and divide by 8
Cubic inches to cubic centimeters	Multiply by 16.39
Grams to ounces	Multiply by 567 and divide by 20
Liters to U.S. pints	Multiply by 95 and divide by 20
Degrees Centigrade to degrees Fahrenheit	Multiply by 9, divide by 5 and add 32
Degrees Fahrenheit to degrees Centigrade	Subtract 32, multiply by 5 and divide by 9

Unit Conversion Table

cc	x	.0610	=	cu.in.
cc	x	.03519	=	fl.oz. (imp.)
cc	x	.03381	=	fl.oz. (U.S.)
cu. in.	x	16.39	=	cc
fl. oz.(imp.)	x	28.41	=	cc
fl. oz.(U.S.)	x	29.57	=	cc
ft-lbs	x	12	=	in-lbs
ft-lbs	x	.1383	=	kg-m
gal. (imp.)	x	4.546	=	liters
gal. (imp.)	x	1.201	=	gal. (U.S.)
gal. (U.S.)	x	3.7853	=	liters
gal. (U.S.)	x	.8326	=	gal. (imp.)
grams	x	.03527	=	oz.
in.	x	25.40	=	mm
in-lbs	x	.0833	=	ft-lbs
in-lbs	x	.0115	=	kg-m
kg	x	2.2046	=	lb.
kg	x	35.274	=	oz.
kg-m	x	7.233	=	ft-lbs
kg-m	x	86.796	=	in-lbs
kg/cm^2	x	14.22	=	lbs/sq.in.
km	x	.6214	=	miles
lb.	x	.4536	=	kg
lb/sq. in.	x	.0703	=	kg/cm^2
liter	x	35.19	=	fl.oz. (imp.)
liter	x	33.81	=	fl.oz. (U.S.)
liter	x	.8799	=	qt. (imp.)
liter	x	1.0567	=	qt. (U.S.)
meter	x	3.281	=	ft.
mile	x	1.6093	=	km
mm	x	.03937	=	in.
oz.	x	28.35	=	grams
qt. (imp.)	x	1.1365	=	liters
qt. (imp.)	x	1.201	=	qt. (U.S.)
qt. (U.S.)	x	.9463	=	liters
qt. (U.S.)	x	.8326	=	qt. (imp.)
fl. oz. (U.S.)	x	1.04	=	fl. oz. (imp.)

List of Abbreviations

ABDC	after bottom dead center
ATDC	after top dead center
BBDC	before bottom dead center
BDC	bottom dead center
BTDC	before top dead center
cc	cubic centimeters
cu. in.	cubic inches
fl. oz.	fluid ounces
ft.	foot, feet
ft-lbs	foot-pounds
gal.	gallon, gallons
hp	horsepower
in.	inch, inches
in-lbs	inch-pounds
kg	kilogram, kilograms
kg/cm^2	kilograms per square centimeter
kg-m	kilogram-meters
km	kilometer
kph	kilometers per hour
lb., lbs.	pound, pounds
lbs/sq.in.	pounds per square inch
ℓ	liter
m	meter, meters
mi.	mile, miles
mm	millimeters
mph	miles per hour
oz.	ounce, ounces
psi	pounds per square inch
qt.	quart, quarts
r.p.m.	revolutions per minute
sec.	second, seconds
SS	standing start
TDC	top dead center
"	inch, inches

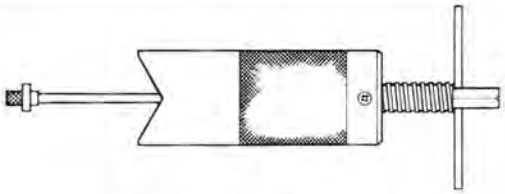
Special Service Tools



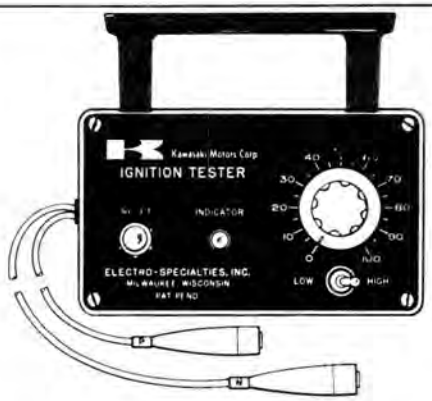
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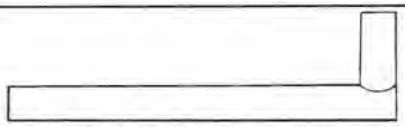
Part No. 57001-3502 Drive converter puller



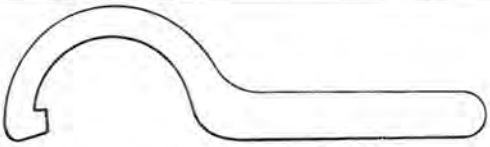
Part No. T57001-910 Piston pin puller



Part No. T56019-201 CD Ignition tester



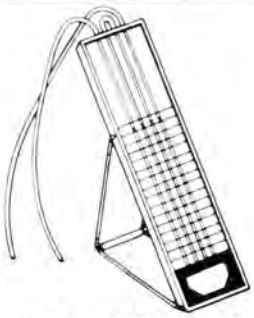
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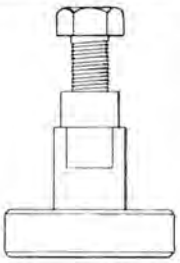
Part No. 57001-3501 Shock cam adjuster



Part No. 57001-983
Multimeter



Part No. 57001-3510
Tuner Assembly



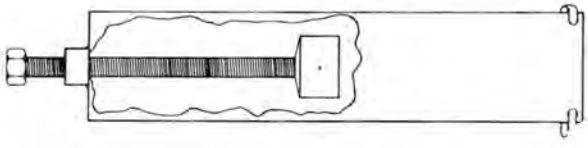
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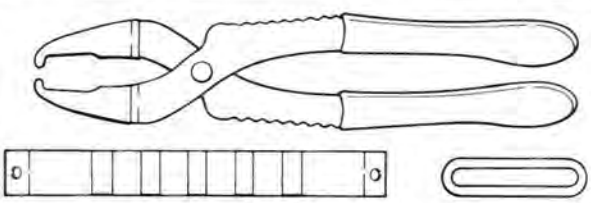
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110P0620
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bolt



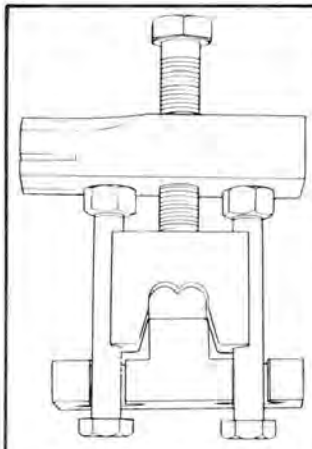
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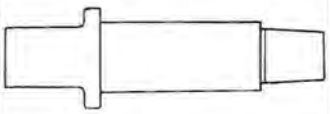
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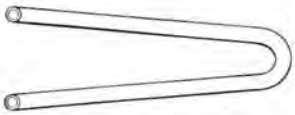
Part No. T57001-130 Piston ring compressor set



Part No. 205088
Track Clip Tool Assembly

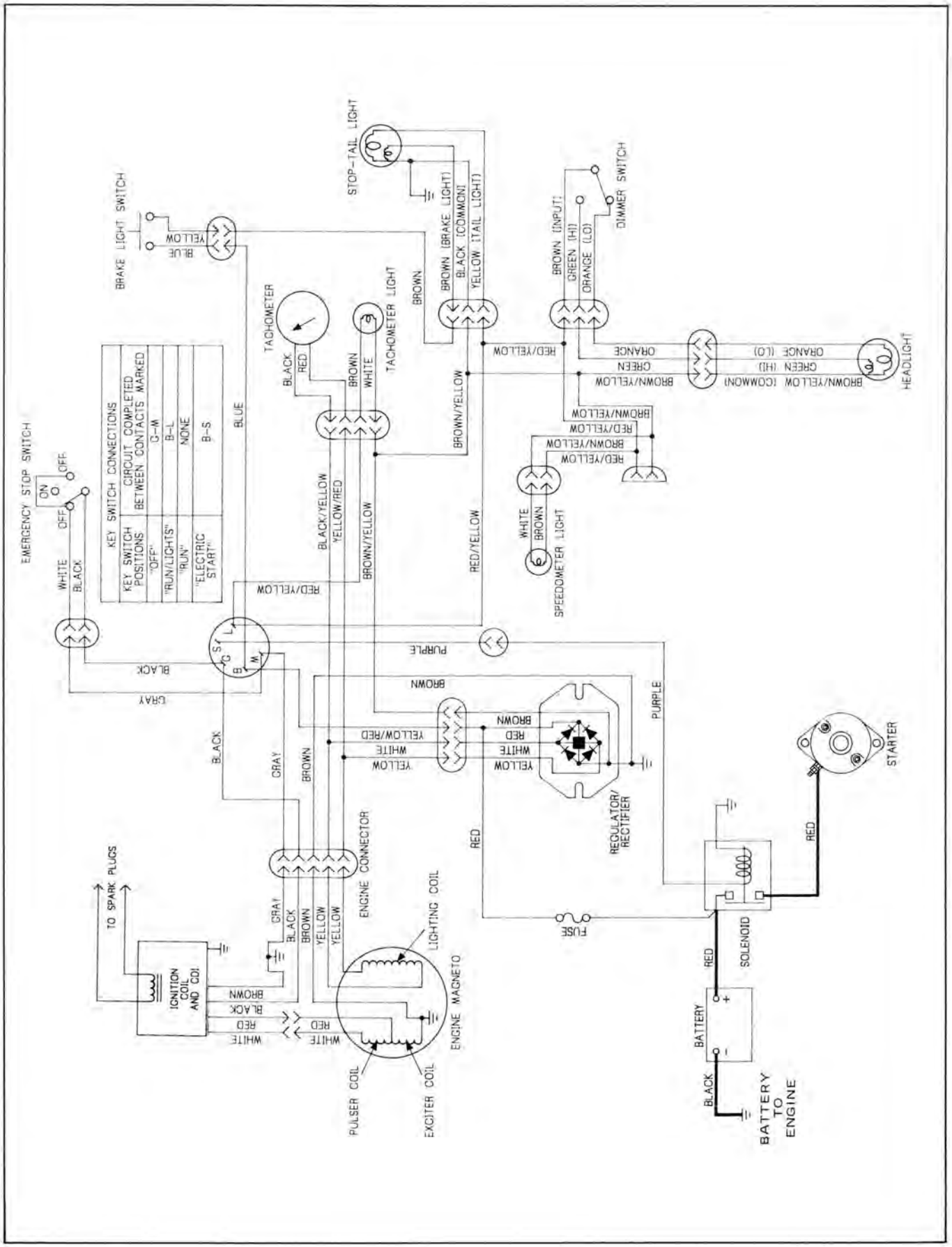


Part No. 57001-3508
Centering pilot



Part No. 57001-3506
Fan Pulley Holder

Wiring Diagram



INDEX

Page

Air Shrouds 3-68
Inspection 3-69
Installation 3-69
Removal 3-68
Battery 3-25
Charging 3-28
Cleaning 3-26
Removal 3-25
Testing 3-27
Battery Theory of Operation 2-24
Belt 2-50
Belt Specifications 1-6
Brake Adjustment 2-52
Brake Cable 3-91
Installation 3-91
Removal 3-91
Brake Light Switch, Dimmer Switch or Brake Lever Assembly 3-85
Installation 3-85
Removal 3-85
Brake Pad Replacement 3-116
Brake Pad Wear Inspection 2-53
Brake Specifications 1-6
Brake Switch Test 3-25
Brake System 2-52
Break In Procedure 4-3
Bulb Replacement 2-44
Bumper 3-129
Inspection 3-129
Installation 3-129
Removal 3-129
Carburetor 3-50
Carburetor Adjustments 2-35
Carburetor Cleaning 3-53
Carburetor Disassembly 3-51
Carburetor Exploded View 3-53
Carburetor Holders 3-71
Inspection 3-72
Installation 3-72
Removal 3-71
Carburetor Installation 3-55
Carburetor Reassembly 3-54
Carburetor Removal 3-50
Carburetor Service Specifications 1-8
Carburetor Specifications 1-2
Carburetor Synchronization 2-61
Carburetor Theory of Operation 2-13
Carburetor Trouble Shooting 3-56
Carburetor Tuning 3-56
Chain Replacement 3-117
Installation 3-117
Removal 3-117
Chain Tension 2-53
Chain Tensioner Springs 1-13
Chain Tensioner Springs 2-54
Chaincase 3-107
Chaincase Disassembly 3-108
Cleaning and Inspection 3-108

Page

Exploded View 3-109
Installation 3-108
Reassembly 3-108
Removal 3-107
Chaincase and Gearing Operation 2-32
Chassis Service Specifications 1-8
Cleaning, Inspection and Gapping the Spark Plug 2-41
Combustion Theory of Operation 2-8
Compression Check 2-35
Compression Theory of Operation 2-6
Conversion Chart 4-4, 4-5
Converter Alignment 2-45
Converter Alignment Using Special Tool P/N 57001-3503 2-47
Converter Center Distance Without Special Tool P/N 57001-3503 2-46
Converter Center Distance Using Special Tool P/N 57001-3503 2-47
Converter Lubrication 2-51
Converter Offset Alignment Without Special Tool P/N 57001-3503 2-45
Converter Offset Alignment Using Special Tool P/N 57001-3503 2-49
Converter Parallelism 2-49
Converter System Theory of Operation 2-30
Crankcase Pressure Test 2-34
Crankshaft Assembly 3-82
Inspection 3-82
Installation 3-84
Removal 3-82
Cylinder Heads, Cylinders and Pistons 3-72
Cylinders 3-72
Cylinder Heads 3-72
Pistons 3-73
Reassembly 3-76
Dimmer Switch Test 3-23
Drill Sizes 4-5
Drive Converter 3-94
Cleaning 3-96
Disassembly and Inspection 3-95
Exploded View 3-98
Installation 3-99
Reassembly 3-97
Removal 3-94
Drive Converter Component Weight Chart 1-3
Drive Converter Ramp Weight Combinations ..... 1-4 TO 1-5
Drive Converter Specifications 1-3
Drive Converter Theory of Operation 2-31
Driven Converter 3-99
Cleaning 3-103
Coupling Assembly 3-106
Disassembly 3-100

Page

Exploded View 3-103
Reassembly 3-103
Removal 3-100
Charging and Instrument Circuits 2-29
Operation 2-27
Charging System 3-31
Driven Converter Specifications 1-6
Driven Converter Theory of Operation 2-31
Driveshaft and Track 3-130
Driveshaft Repair 3-131
Installation 3-132
Removal 3-130
Track Repair 3-131
Econo (Power) Jet System Theory of Operation 2-21
Electrical Components Specifications 1-7
Electrical System 2-43
Electrical System Theory of Operation 2-24
Electrical System 3-22
Emergency Stop Switch or Throttle Lever Assembly 3-85
Installation 3-87
Removal 3-85
Emergency Stop Switch Test 3-23
Engine Cooling Theory of Operation 2-12
Engine Crankcase Design Theory of Operation 2-10
Engine Gearcase 2-34
Engine Inspection 2-34
Engine Installation 3-60
Engine Lubrication Theory of Operation 2-11
Engine Performance Curves 1-14
Engine Removal 3-59
Engine Service Specifications 1-7
Engine Specifications 1-2
Engine Theory of Operation 2-5
English to Metric Conversions 4-6
Enrichener Cable 3-92
Installation 3-92
Removal 3-92
Enrichener Cable Adjustment 2-39
Enrichener System Theory of Operation 2-22
Exciter Coil Output 3-16
Exhaust Theory of Operation 2-10
Fan Belt Tension 3-67
Fan Housing 3-69
Disassembly 3-69
Inspection 3-70
Reassembly 3-70
Float Bowl Theory of Operation 2-15
Flow Chart Disassembly - Engine Installed 3-46
Flow Chart Disassembly - Engine Removed 3-48
Flow Chart Engine Removal 3-47

Page

Frame Specifications 1-7
Fuel 4-2
Fuel and Oil Recommendations 4-2
Fuel Filters 2-36
Fuel Pump 2-36
Fuel Pump 3-57
Cleaning 3-58
Disassembly 3-57
Installation 3-58
Reassembly 3-58
Removal 3-57
Fuel Pump Output Test 2-37
Fuel Pump Pressure Test 2-36
Fuel System 2-35
Fuel Tank 3-138
Installation 3-139
Removal 3-138
Fuel Tank and Lines 2-37
Fuel/Oil Mixture (Ratio) 4-3
Fuel/Oil Specifications 1-3
Gear Ratio Chart 1-13
Gear Ratio Chart 2-54
Gearing Specifications 1-6
General Engine Torque Specifications 1-8
General Specifications 1-2
General Troubleshooting 3-2
Ground Wire Test 3-10
Handling Adjustment 2-56
Headlamp 3-86
Exploded View 3-86
Installation 3-86
Removal 3-86
Headlight Adjustment 2-43
Idler Wheels (Suspension Rail) 3-123
Disassembly 3-123
Inspection 3-123
Reassembly and Installation 3-123
Removal 3-123
Ignition Coil Output and Spark Plug Check 3-14
Ignition Service Specifications 1-8
Ignition Specifications 1-2
Ignition System 2-39
Ignition System Theory of Operation 2-23
Ignition Timing Adjustment 2-40
Ignition Timing Check 2-39
Ignition Troubleshooting 3-9
Ignition Troubleshooting Using CD Ignition Tester P/N T56019-201 3-11
Ignition Troubleshooting Using An Ohmmeter 3-20
Troubleshooting Table 3-21
Intake Theory of Operation 2-6
Introduction to Two Stroke Engines 2-5
Jackshaft and Brake Disc 3-133
Cleaning and Inspection 3-133
Installation 3-133
Removal 3-133

Page

Jackshaft Bearing Retainer Shimming 2-47
Key Switch 2-43
Key Switch 3-86
Installation 3-87
Removal 3-86
Key Switch Tests 3-22
Lighting Circuit 3-32
Lighting Circuit Theory of Operation 2-25
Lighting Coil 3-31
Continuity 3-31
Shorts to Ground 3-32
Limiter Straps 3-124
Inspection 3-124
Reassembly 3-124
Removal 3-124
List of Abbreviations 4-7
Lubrication Chart 2-4
Main System Theory of Operation 2-17
Maintenance Chart 2-3
Metering System Theory of Operation 2-16
Muffler 3-49
Inspection 3-49
Installation 3-49
Removal 3-49
Oil 4-2
Oil Injection System 2-41
Oil Injection System 3-79
Oil Injection System Bleeding 2-42
Oil Pump Outlet Tube Purging 2-42
Oil Pump Output Test 3-77
Assembly 3-81
Check Valve (Banjo Fitting) 3-79
Disassembly 3-78
Inspection 3-79
Oil Pump Theory of Operation 2-12
Oil Pump to Carburetor Synchronization 2-38
Oil Tank 3-139
Inspection 3-139
Installation 3-140
Removal 3-139
Pilot System Theory of Operation 2-21
Port Dimensions 1-14
Preparation for Storage 2-59
Primer Pump 2-37
Primer Pump 3-93
Installation 3-94
Removal 3-93
Primer System Theory of Operation 2-22
Problem Isolation Chart 3-2
Pulser Coil Output 3-18
Rear Axle and Wheels 3-124
Inspection 3-124
Reassembly and Installation 3-124
Removal and Disassembly 3-124
Regulator/Rectifier 3-29
Removal From Storage 2-60

Page

Ride Adjustment 2-56
Seat 3-138
Installation 3-138
Removal 3-138
Self-Adjusting Brake 3-110
Assembly 3-113
Disassembly 3-110
Exploded View 3-111
Inspection 3-113
Service Specifications 1-7
Shock Absorber and Spring 3-125
Inspection 3-125
Reassembly and Installation 3-126
Removal 3-125
Silencer 3-49
Installation 3-50
Removal 3-49
Skeg 3-138
Installation 3-138
Removal 3-138
Ski 3-137
Installation 3-137
Removal 3-137
Ski Alignment 2-55
Ski Skeg 2-56
Ski Spring 3-137
Installation 3-138
Removal 3-137
Ski Spring Preload 2-56
Solenoid Switch Test 3-35
Spark Plug Cap 3-9
Spark Test 3-10
Special Service Tools 4-8
Speedometer 2-44
Speedometer 3-88
Installation 3-88
Removal 3-88
Springs and Cam Plate Assembly 3-126
Inspection 3-126
Installation 3-126
Removal 3-126
Starter Assembly 3-60
Disassembly 3-61
Exploded View 3-62
Inspection 3-61
Installation 3-64
Reassembly 3-61
Removal 3-60
Starter Circuit 2-29
Operation 2-30
Starter Motor 3-39
Disassembly 3-43
Reassembly 3-44
Removal 3-39
Starter Motor Circuit Test 3-36
Stator Assembly 3-64
Disassembly 3-66
Exploded View 3-66
Inspection 3-66
Installation 3-66

Page

Reassembly 3-66
Removal 3-64
Steering Arm and Spindle 3-136
Exploded View 3-136
Installation 3-137
Removal 3-136
Steering System 2-55
Steering System 3-134
Exploded View 3-135
Handlebars and Steering Pole Removal 3-134
Installation 3-134
Stop Circuit Elimination Test 3-10
Stop/Tail Light Harness Test 3-24
Storage 2-59
Suspension 3-117
Exploded View ..... 3-120 & 3-122
Inspection 3-120
Removal 3-119
Suspension Adjustments 2-56
Suspension Installation 3-129
Suspension Rails 3-127
Inspection ..... 3-127 & 3-128
Reassembly 3-128
Removal 3-127
Swing Arm 3-126
Inspection 3-126
Installation 3-127
Removal 3-127
Swing Arm Adjustment 2-57

Page

Tachometer 3-88
Installation 3-88
Removal 3-88
Tail Lamp 3-88
Installation 3-88
Removal 3-88
Tail/Brake Light 2-44
Test Sequence Using CD Ignition Tester P/N T56019-201 3-13
Throttle Cable Adjustment 2-37
Throttle Cable and Oil Pump Cable 3-89
Exploded View 3-90
Installation 3-91
Removal 3-89
Throttle Valve Theory of Operation 2-17
Torque Chart ..... 1-9 TO 1-12
Track Adjustment 2-57
Track Alignment 2-59
Track and Suspension Specifications 1-6
Track Suspension and Steering Systems Operation 2-32
Track Tension Adjustment 2-58
Transfer Theory of Operation 2-6
Unit Conversion Table 4-7
Voltage Regulator 2-44
Voltage Regulator Replacement 3-88
Wear Strips 3-117
Installation 3-118
Removal 3-117
Wiring Diagram 4-9