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.

Quick Reference Guide

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

1

General Specifications

GENERAL

Overall Length	103 in. (2,616 mm)
Overall Width	40.5 in. (1,029 mm)
Overall Height (With Windshield)	35.5 in. (902 mm)
Dry Weight (Approximate)	365 pounds (165.5 kg)

ENGINE

Model	Type TA440C
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	7,100-7,300 RPM
Engine RPM at Idle Speed	2,500 RPM
Starter	Manual rewind

IGNITION

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

CARBURETOR

	LEFT SIDE	RIGHT SIDE
Carburetor Make	Mikuni	Mikuni
Carburetor Model	VM 32 Econo Jet	VM 32 Econo Jet
Identification Marking	L32/120	R32/121
Type of Carburetor	Open Vent	Open Vent
Main Jet	170	170
Air Jet	None	None
Jet Needle	6DH7-3	6DH7-3
Needle Jet	Q-0	Q-0
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. (2.5 mm)
Type of Float Chamber	Special	Special
Starter System	Cable	Cable
Econo (Power) Jet	150	130

FUEL/OIL

Gasoline	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	8.5 gallons (32.17 liters)

DRIVE CONVERTER

Engagement Speed (approximate rpm)	3700
Drive Converter rpm	7100-7300
Spring Part Number and Color (Standard)	92031-3001 (Yellow)
Spring Part Number and Color (Optional)	92081-3004 (Pink) 92081-3005 (Red) 92081-3006 (Blue) 92081-3002 (Black)
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) (110.1 mm)
Number of Spring Coils (All Colors)	5-1/2
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 (2.5kg)	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)
Spring Outside Diameter ± 0.025 in. (0.63 mm) All Colors	2.28 in. (57.9 mm)
Weight Part Numbers (Standard)	92019-008 462F0500A 110G0620
Ramp Part Number and Identification (Standard)	Production Part - No P/N C
Weight - Total gram weight (Standard)	61.1

Part Number	Weight Description	Gram Weight
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
110G0620	Bolt, steel, 6 x 20 mm	6.0
462F0600A	Washer, 6 mm	1.1
39152-3004	Ramp weight C′	50.7
Production Part - No P/N	Ramp weight C	51.7

DRIVE CONVERTER RAMP WEIGHT COMBINATIONS
(USING RAMP WEIGHT IDENTIFIED C)

WEIGHT	COMBINATION	PART NO.	WEIGHT	COMBINATION	PART NO.
51.7 grams	Weight Ramp Assy C	No P/N	58.3 grams	Weight Ramp Assy C Bolt - Alum. 6 x 20 mm Nut - Special 6 mm (2) Washers 6 mm	No P/N 92001-3003 92019-008 462F0600A
55.8 grams	Weight Ramp Assy C Bolt - Alum. 6 x 15 mm Nut - Special 6 mm	No P/N 92001-3009 92019-008	60.0 grams	Weight Ramp Assy C Bolt - Steel 6 x 20 mm Nut - Special 6 mm	No P/N 110G0620 92019-008
56.1 grams	Weight Ramp Assy C Bolt - Alum. 6 x 20 mm Nut - Special 6 mm	No P/N 92001-3003 92019-008	61.1 grams	Weight Ramp Assy C Bolt - Steel 6 x 20 mm Nut - Special 6 mm (1) Washer 6 mm	No P/N 110G0620 92019-008 462F0600A
57.2 grams	Weight Ramp Assy C Bolt - Alum. 6 x 20 mm Nut - Special 6 mm (1) Washer 6 mm	No P/N 92001-3003 92019-008 462F0600A	62.2 grams	Weight Ramp Assy C Bolt - Steel 6 x 20 mm Nut - Special 6 mm (2) Washers 6 mm	No P/N 110G0620 92019-008 462F0600A

DRIVE CONVERTER RAMP WEIGHT COMBINATIONS
(USING RAMP WEIGHT IDENTIFIED C')

WEIGHT	COMBINATION	PART NO.	WEIGHT	COMBINATION	PART NO.
50.7 grams	Weight Ramp Assy C'	39152-3004	59.0 grams	Weight Ramp Assy C' Bolt - Steel 6 x 20 mm Nut - Special 6 mm	39152-3004 110G0620 92019-008
54.8 grams	Weight Ramp Assy C' Bolt - Alum. 6 x 15 mm Nut - Special 6 mm	39152-3004 92001-3009 92019-008	60.1 grams	Weight Ramp Assy C' Bolt - Steel 6 x 20 mm Nut - Special 6 mm (1) Washer 6 mm	39152-3004 110G0620 92019-008 462F0600A
55.1 grams	Weight Ramp Assy C' Bolt - Alum. 6 x 20 mm Nut - Special 6 mm	39152-3004 92001-3003 92019-008			
56.2 grams	Weight Ramp Assy C' Bolt - Alum. 6 x 20 mm Nut - Special 6 mm (1) Washer 6 mm	39152-3004 92001-3003 92019-008 462F0600A	61.2 grams	Weight Ramp Assy C' Bolt - Steel 6 x 20 mm Nut - Special 6 mm (2) Washers 6 mm	39152-3004 110G0620 92019-008 462F0600A
57.3 grams	Weight Ramp Assy C' Bolt - Alum. 6 x 20 mm Nut - Special 6 mm (2) Washers 6 mm	39152-3004 92001-3003 92019-008 462F0600A			

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 Diameter	0.177 in. (4.5 mm)
Number of Spring Coils	7 ± 1/4
Spring Preload - Counterclockwise	150° B2 or C1

BELT

Part Number	59011-3502
Outside Circumference	46.62 ± 0.25 in. (1,184 ± 6.4 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

Minimum Brake Pad Thickness	1/16 in. (1.58 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)
Track Width	15 in. (381 mm)
Track Length	121 in. (3,073.4 mm)
Suspension	Slide Rail

ELECTRICAL COMPONENTS

Type	12 VAC, 120 W
Headlight Part	92069-3501 12 V, 60/60 W
Tail/Brake Light	G.E. 1157
Instrument Light	G.E. 53 12 V-3.4 W

FRAME

Frame	Aluminum alloy and HSLA steel construction

Service Specifications

ENGINE

Effective Compression Ratio	7.3 to 1
Top Ring/Groove Clearance	0.009 in. (max.) (0.22 mm)
Bottom Ring/Groove Clearance	0.008 in. (max.) (0.19 mm)
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 (max.)	0.015 in. (0.38 mm)
Crankshaft Run Out (max.)	0.002 in. (T.I.R.) (0.05 mm)

IGNITION

Spark Plug Gap	0.020-0.024 in. (0.5-0.6 mm)
Ignition Timing (Dynamic)	18° @ 6,500 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	128 ohms ± 20%
Pulser Coil	Red-White	23 ohms ± 20%

IGNITION COIL RESISTANCE TESTS

Item	Ohmmeter Leads Connected Between	Resistance
Primary winding	Blue-Ground	0.37 ohm ± 20%
†Secondary winding	High Tension-High Tension	10,200 ohms ± 20%
+Spark Plug Cap	Terminals at each end of cap	5,000 ohms ± 20%

CARBURETOR

Air Screw Setting (Initial)	1.5 Turns Open
Idle Screw Setting (Initial)	3 Turns off Seat
(Final)	2,500 R.P.M.
Float Arm Adjustment	Parallel to Body Gasket Surface

CHASSIS

Converter Offset Distance	0.588 in. (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. 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)

†Remove spark plug caps.

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.

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	95 in. lb (1.09 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	1	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 (0.058 kg·m)	
Tail lamp to bracket - nut	2	32 in. lb (0.37 kg·m)	
DRIVE CONVERTER			
Drive converter to crankshaft - bolt	1	60-70 ft lb (8.30-10 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 assy 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)	
Brake disc to hub mounting - screw	6	55-60 in. lb (0.6-0.7 kg·m)	
Clevis retainer to cam mounting - nut	1	40-50 in. lb (0.46-0.57 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 - nut	1	35 ft lb (4.84 kg·m)	
Bearing flange - bolt	3	105 in. lb (1.21 kg·m)	
Bearing locking collar - set screw	1	36 in. lb (0.41 kg·m)	222
Bearing lock collar (locking torque)	1	36 in. lb (0.41 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.

Description	Quantity	Torque	Loctite
SUSPENSION			
Rear pivot link - bolts	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)	
Limiter shaft - 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)	
Eyebolts to suspension brackets - nuts	2	Adjust	
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 - screws	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 damper - nut	1	35 ft lb (4.84 kg·m)	
DRIVESHAFT			
Bearing flange mounting - bolts	3	18 ft lb (2.5 kg·m)	
Speedometer drive adapter - nut	1	8-10 ft lb (1.1-1.4 kg·m)	
Bearing locking collar - set screw	1	72 in. lb (0.83 kg·m)	222
Bearing lock collar (locking torque)	1	72 in. lb (0.83 kg·m)	
SKI AND SPINDLE			
Ski attaching - nut and skeg (wear runner)	6	18 ft lb (2.5 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 - screw	4	46 ft lb (6.36 kg·m)	
Spindle to ski saddle - nut	2	35 ft lb (4.84 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)	
Upper steering post mounting - nuts	2	18 ft lb (2.5 kg·m)	
Lower steering post mounting - nuts	2	20 ft lb (2.77 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)	
Handlebar 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, 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.

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	95 in. lb (1.09 kg·m)	
Passenger handle attaching - nuts	4	18 ft lb (2.5 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 assy mounting - nuts	2	70 in. lb (0.81 kg·m)	
Primer pump - nut	1	30 in. lb (0.35 kg·m)	
CABLES			
Brake cable jam - nuts	2	95 in. lb (1.09 kg·m)	
Enrichener cable assy - nuts	2	15-20 in. lb (0.17-0.23 kg·m)	
Enrichener assy pal - nut	1	Hand Tighten	
Speedometer cable - nuts	1	Hand Tighten	
Throttle cable assy - nuts	2	15-20 in. lb (0.17-0.23 kg·m)	
FAN CASE AND AIR SHROUD			
Air shroud mounting screws	10	Use impact driver	222
Fan case to crankcase mounting nuts	4	10-12 ft lb (1.4-1.7 kg·m)	
HOOD			
Windshield mounting screws	10	15 in. lb (0.17 kg·m)	
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 & 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	12	32 in. lb (0.37 kg·m)	
Ignition panel - screws	2	32 in. lb (0.37 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	Use impact driver	
Exciter coil and pulser coil mounting - screws	2	Use impact driver	
Lighting coil mounting - screws	2	Use impact driver	
ELECTRICAL			
CDI igniter mounting - screws	2	60 in. lb (0.69 kg·m)	
Ignition coil mounting - screw	1	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	16-18 ft lb (2.2-2.5 kg·m)	
Starter mounting - bolts	4	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	Gear Ratio			1.90	1.80		
	Speed			*75 MPH	*80 MPH		
	Chain Pitch			64	64		
	Tensioner Spring			Red	Pink		
37	Gear Ratio	2.18	2.06	1.95		1.76	1.68
	Speed	*66 MPH	*69 MPH	*73 MPH		*81 MPH	*85 MPH
	Chain Pitch	64	64	64		66	66
	Tensioner Spring	Red	Pink	Green		Red	Pink
38	Gear Ratio	2.24	2.11		1.90	1.81	1.73
	Speed	*64 MPH	*68 MPH		*75 MPH	*79 MPH	*83 MPH
	Chain Pitch	64	64		66	66	66
	Tensioner Spring	Pink	Green		Red	Pink	Green
39	Gear Ratio			2.05	1.95	1.86	
	Speed			*70 MPH	*73 MPH	*77 MPH	
	Chain Pitch			66	66	66	
	Tensioner Spring			Red	Pink	Green	
40	Gear Ratio	2.35	2.22	2.11	2.00		
	Speed	*61 MPH	*64 MPH	*68 MPH	*72 MPH		
	Chain Pitch	66	66	66	66		
	Tensioner Spring	Pink	Pink	Green	Green		

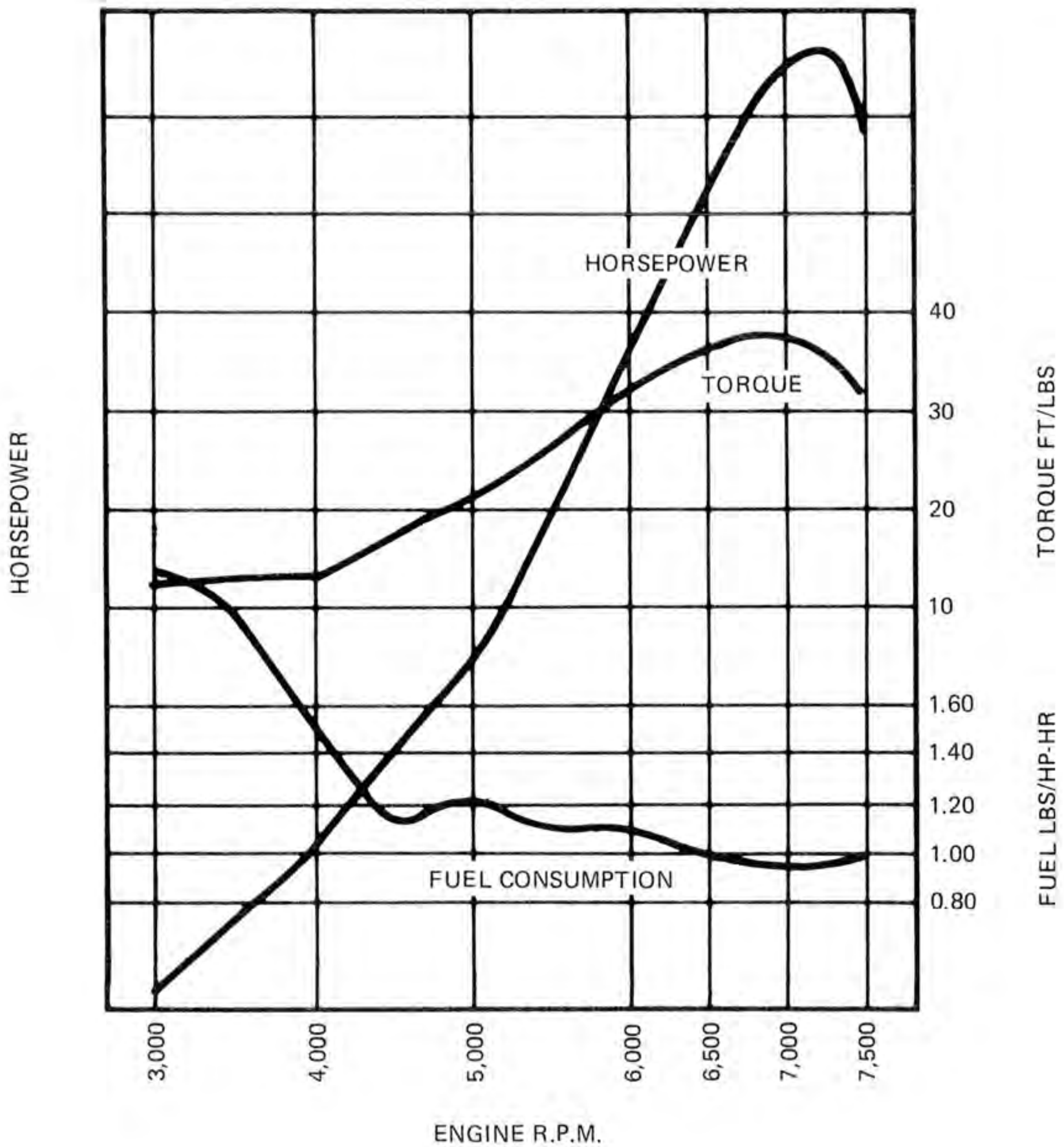
*Theoretical MPH at 7,200 RPM

NOTE: All top speeds based on 0.96 overdrive in converter and engine RPM at 7,200.

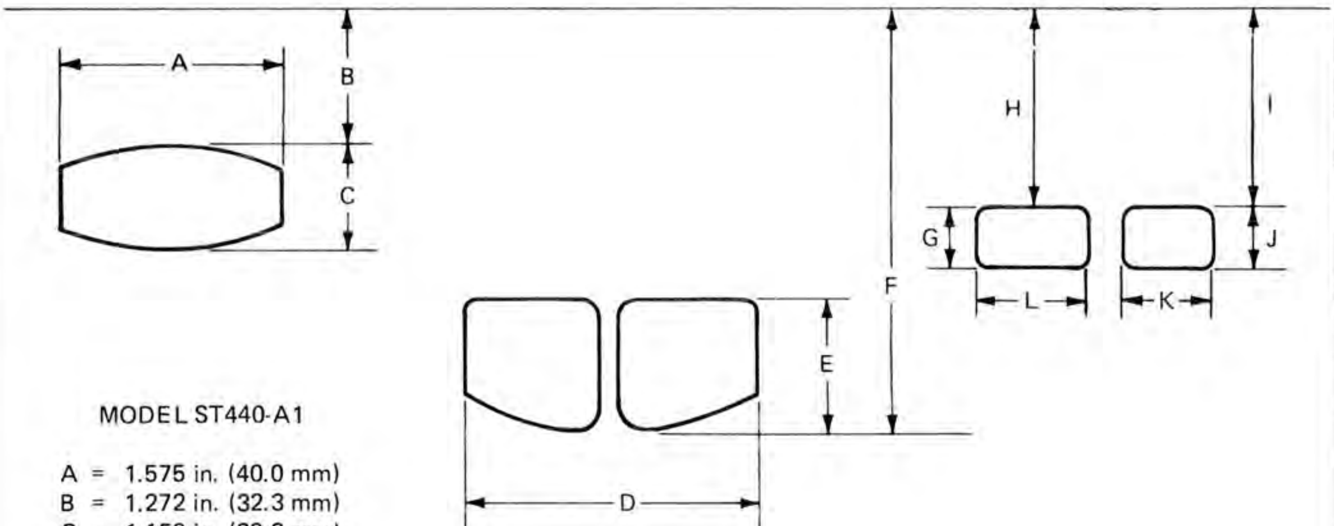
Chain Tensioner Springs

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)	0.049 in. (1.245 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



Port Dimensions



MODEL ST440-A1

A = 1.575 in. (40.0 mm)
B = 1.272 in. (32.3 mm)
C = 1.150 in. (29.2 mm)
D = 1.890 in. (48.0 mm)
E = 1.189 in. (30.2 mm)
F = 3.807 in. (96.7 mm)
G = 0.516 in. (13.1 mm)
H = 1.906 in. (48.4 mm)
I = 1.906 in. (48.4 mm)
J = 0.516 in. (13.1 mm)
K = 0.787 in. (20.0 mm)
L = 0.787 in. (20.0 mm)

Maintenance and Theory

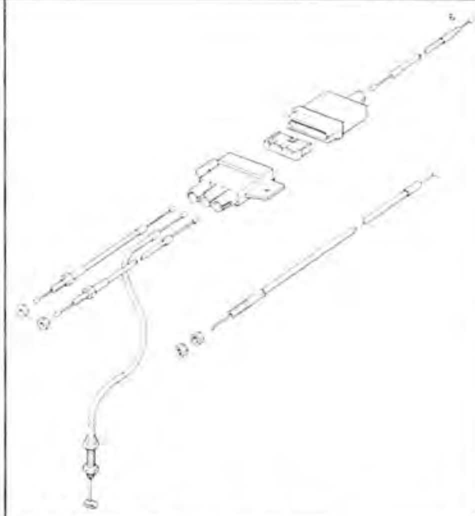
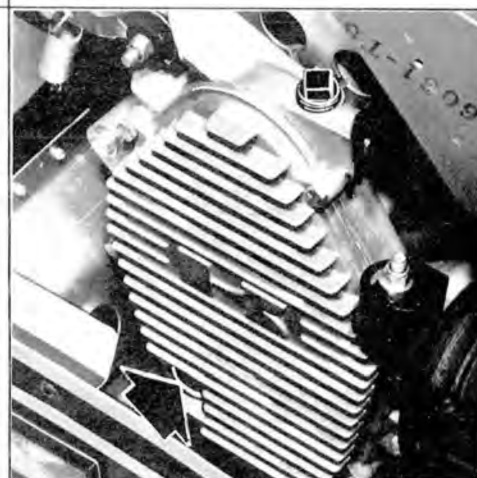
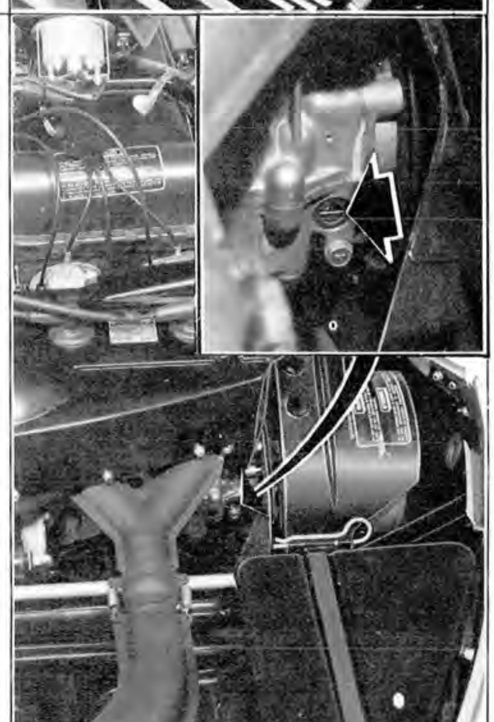
Table of Contents

2

Maintenance Chart

Frequency / Operation	Beginning of Each Season	First 50-100 Miles or 5-10 Hours Use	Every 300 Miles or 20 Hours Use	Every 600 Miles or 40 Hours Use	Every 900 Miles or 60 Hours Use	End of Each Season	Page Reference
Install new spark plugs	x			x			2-35
Check carburetor adjustment	x	x					2-30
Check throttle cable adjustment	x	x			x		2-31
Check enrichener cable adjustment	x	x			x		2-32
Replace fuel filter					x		2-30
De-carbon engine and exhaust						x	3-52
Check ignition timing		x					2-33
Replace drive belt (be sure converter pulleys are clean and dry)	x			x			2-42
Check drive converter and driven converter alignment	x				x		2-37
Check drive converter bushings for wear					x		3-71
Clean and inspect drive and driven converters						x	2-43
Check drive chain tensioner pads	x						2-44
Adjust track tension and check alignment	x	x	x				2-49
Check ski alignment	x			x			2-47
Adjust brake		x	x				2-43
Check fasteners for security (use torque chart as a guide)	x			x			1-8
Inspect ski runners for wear	x		x				2-48
Measure wear of slide rail wear strips	x		x				3-89
Adjust headlight	x						2-36
Check fan belt tension						x	3-49

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	Shell XL100 10W-30 non-foaming engine oil. 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 & refill at end of each season.	

Two-Cycle Engine Theory of Operation

Introduction

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.

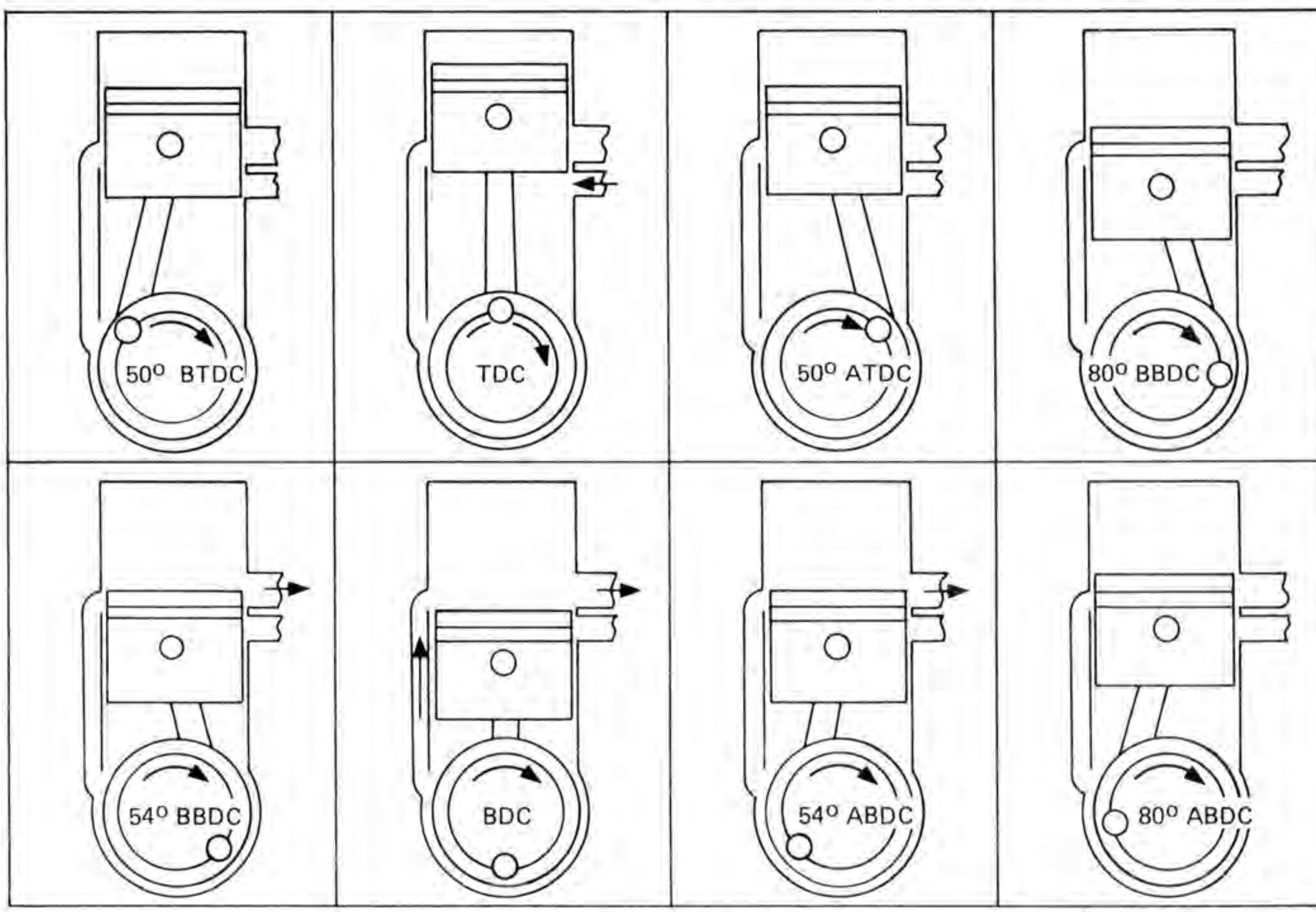


Figure 2-1

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 ataround 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.

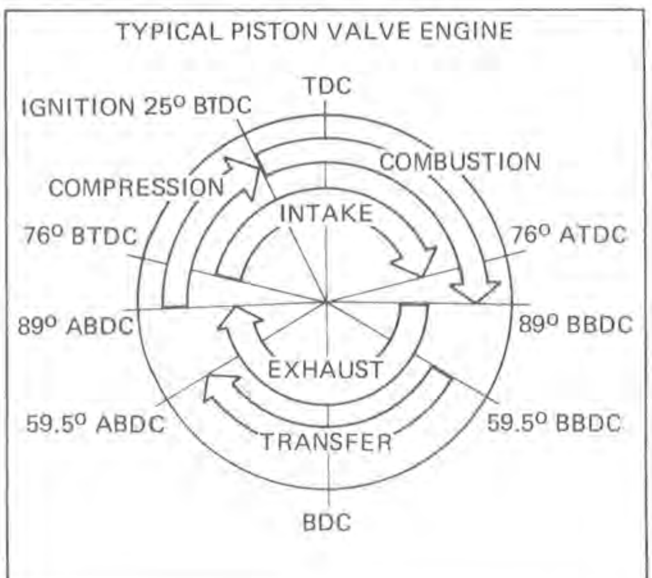


Figure 2-2

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 is 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.

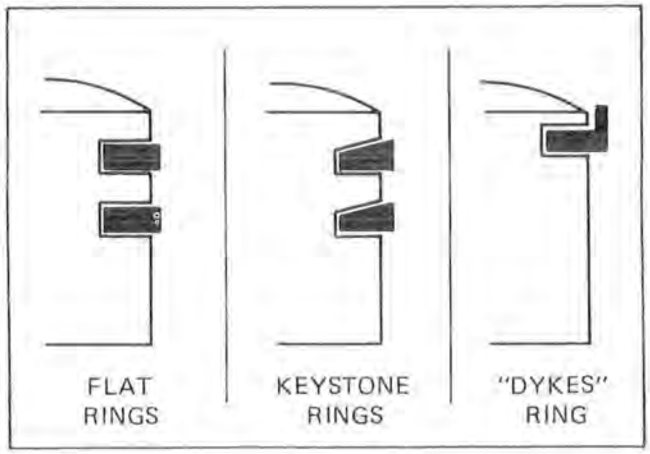


Figure 2-3

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.

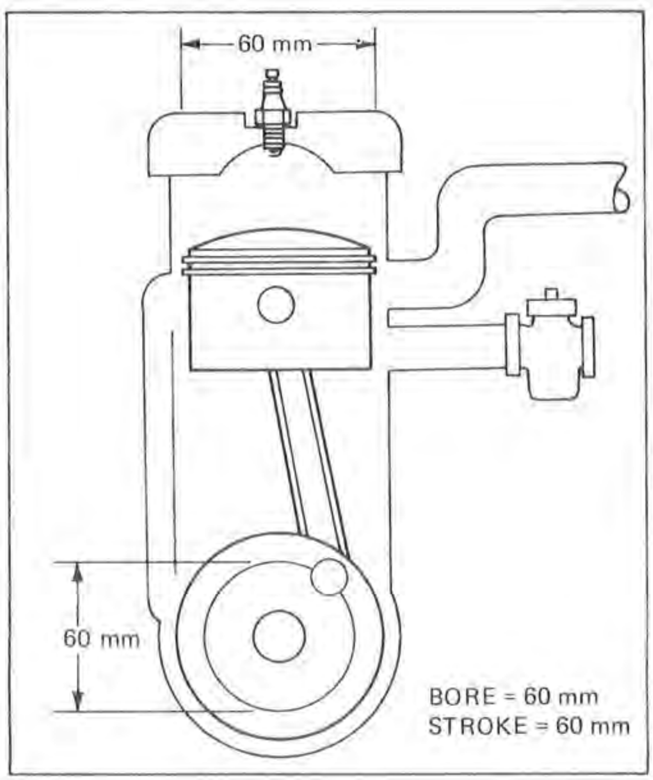


Figure 2-4

$V = \pi r^2 h$
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.)

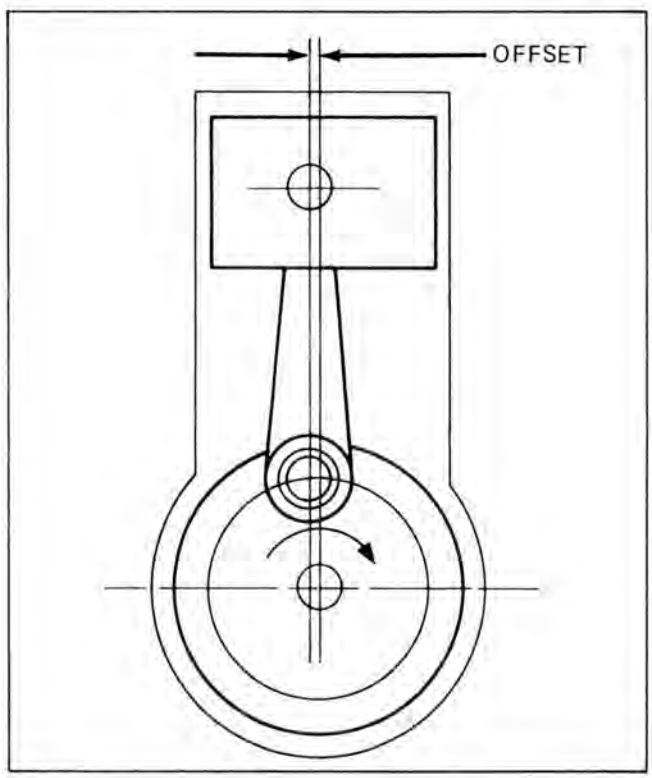


Figure 2-5

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.

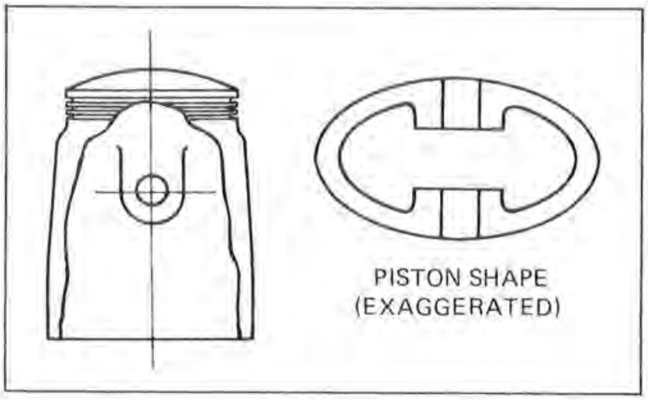


Figure 2-6

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 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.

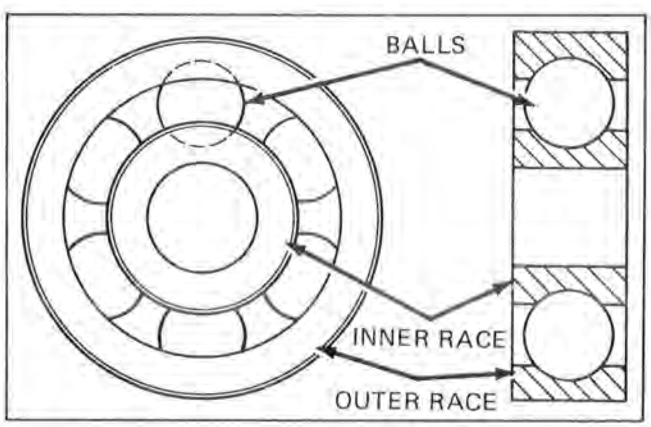


Figure 2-7

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.)

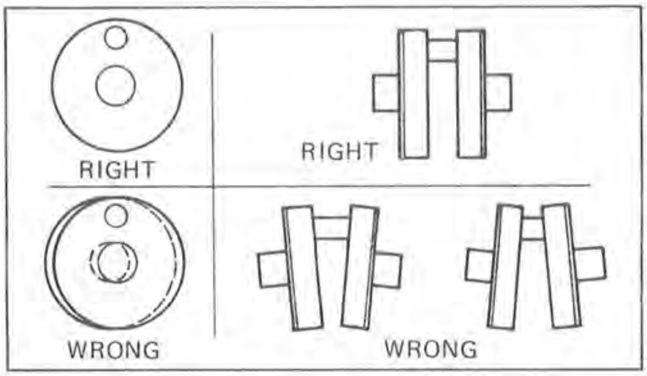


Figure 2-8

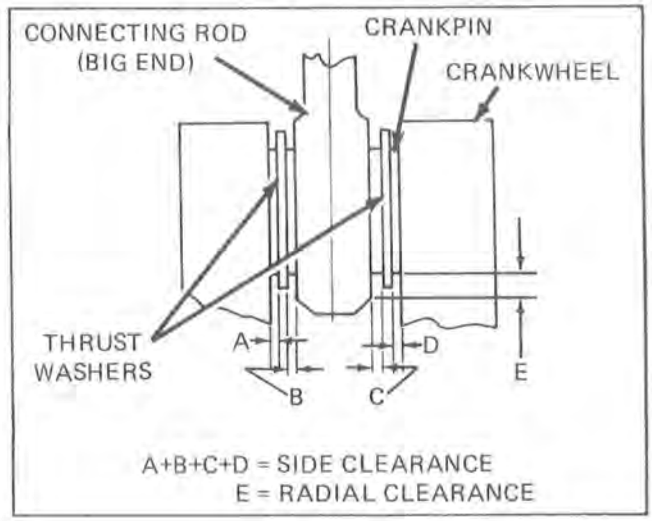


Figure 2-9

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.

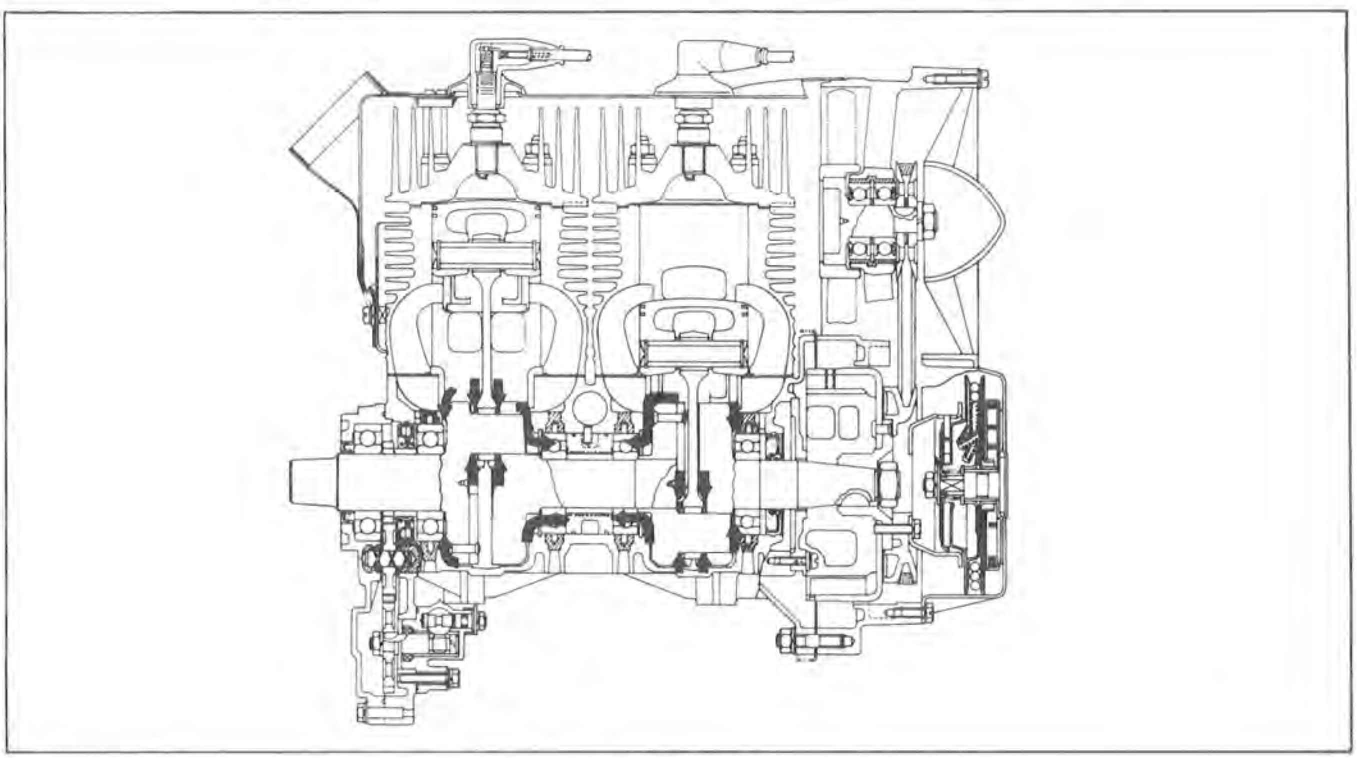


Figure 2-10

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.

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. During the intake cycle the fuel and oil mixture inside the crankcase lubricates the main bearings and big end of the connecting rod, before being transferred to the top of the piston for the compression cycle. (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.)

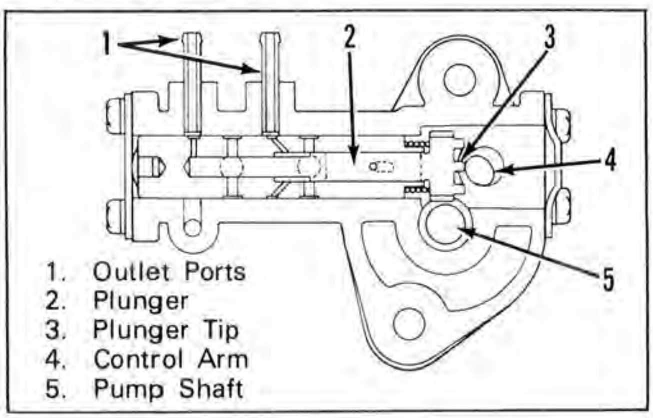


Figure 2-11

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.

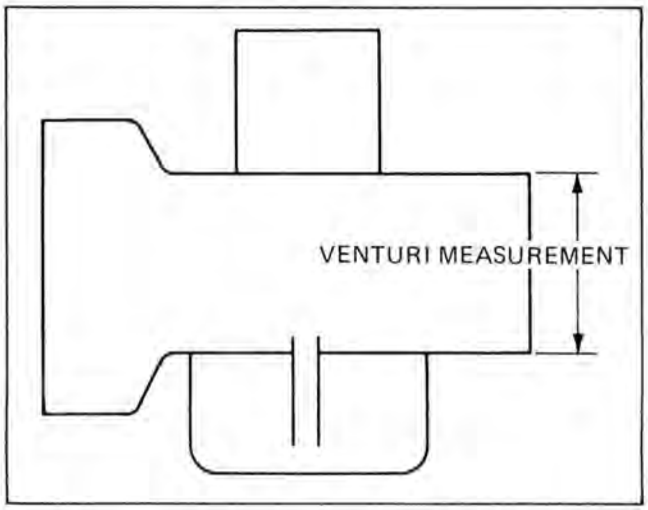


Figure 2-12

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

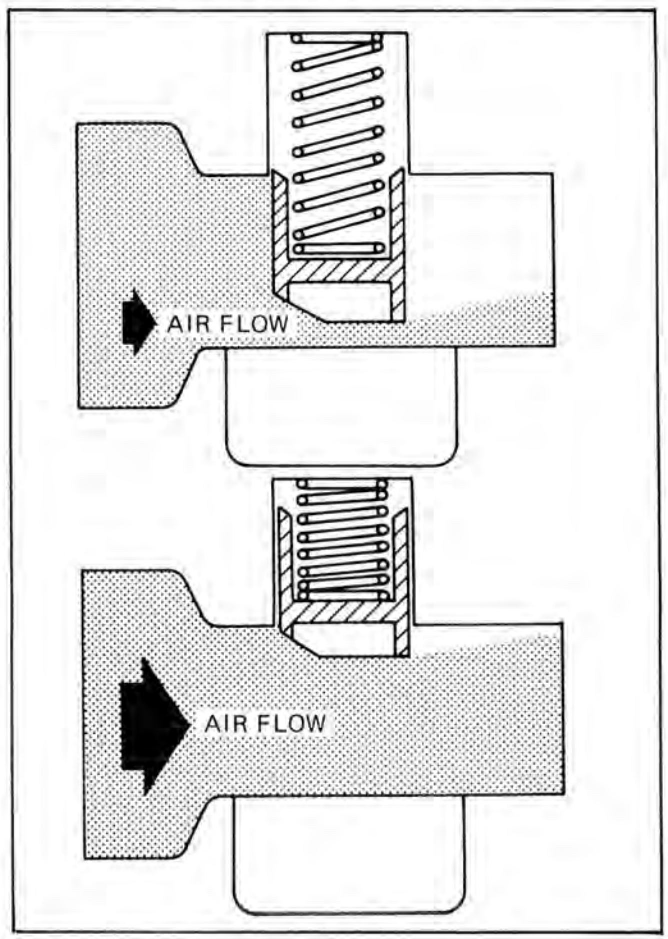


Figure 2-13

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.

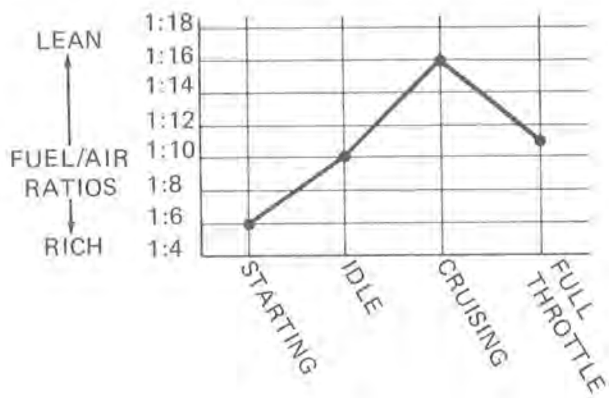


Figure 2-14

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.)

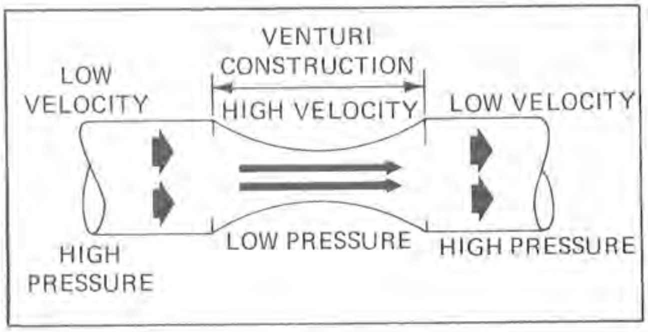


Figure 2-15

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.

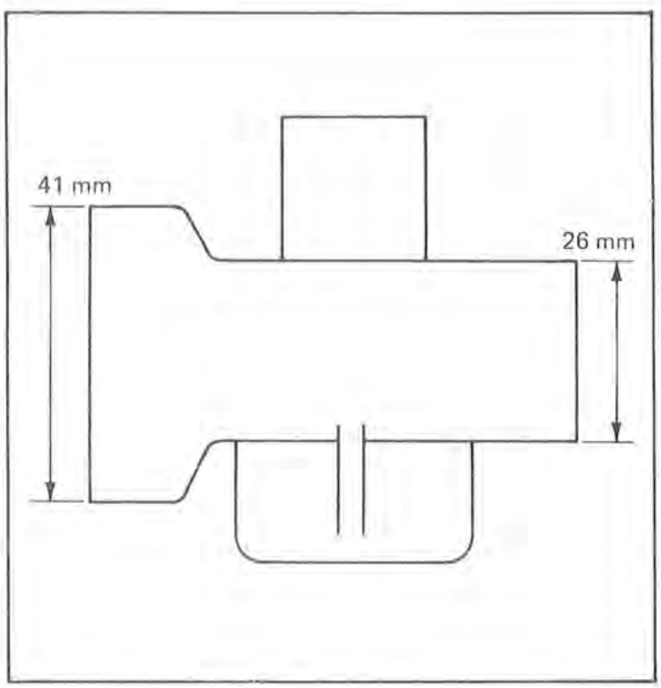


Figure 2-16

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_1 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).

Metering System

The carburetor consists of a number of separate systems to supply fuel and air as required. Fuel supply is handled by a fuel pump and float bowl. The main system, pilot system, and starter system mix fuel with air as it is needed by the engine.

Float Bowl

The float bowl (or float chamber) is the source of fuel for the other systems which meter the fuel; the main and pilot systems; and the starter system. 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 seal. 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.)

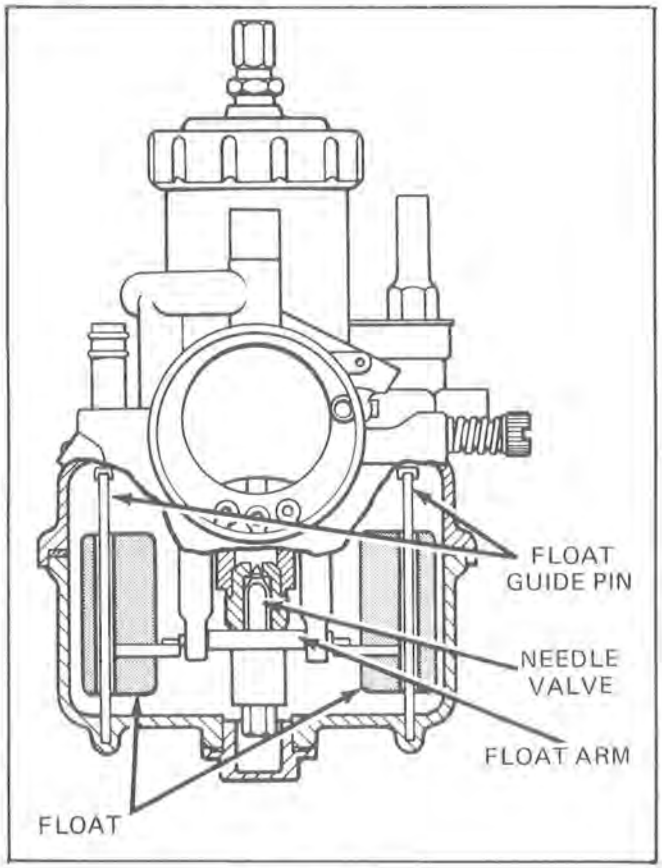


Figure 2-17

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.)

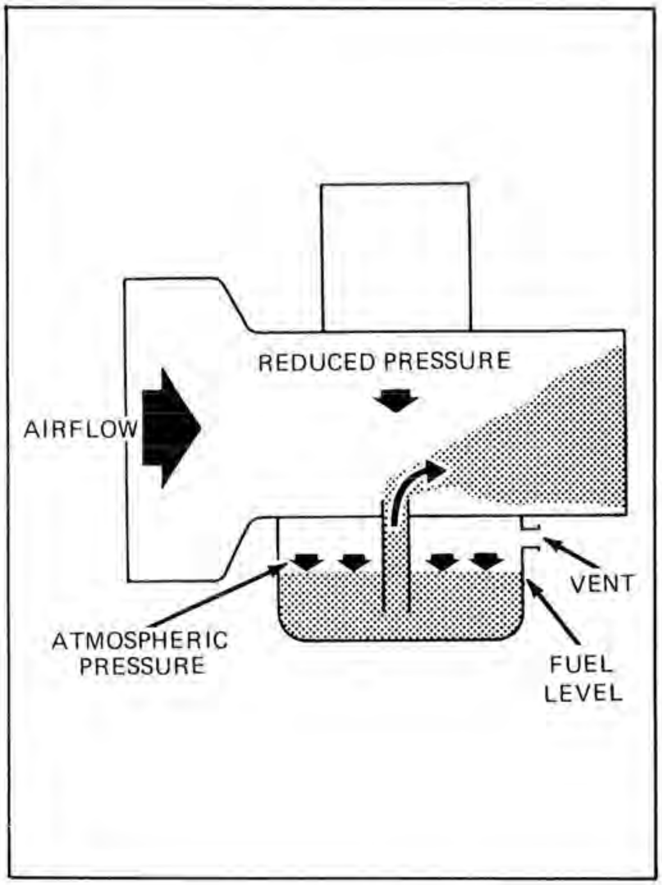


Figure 2-18

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.

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

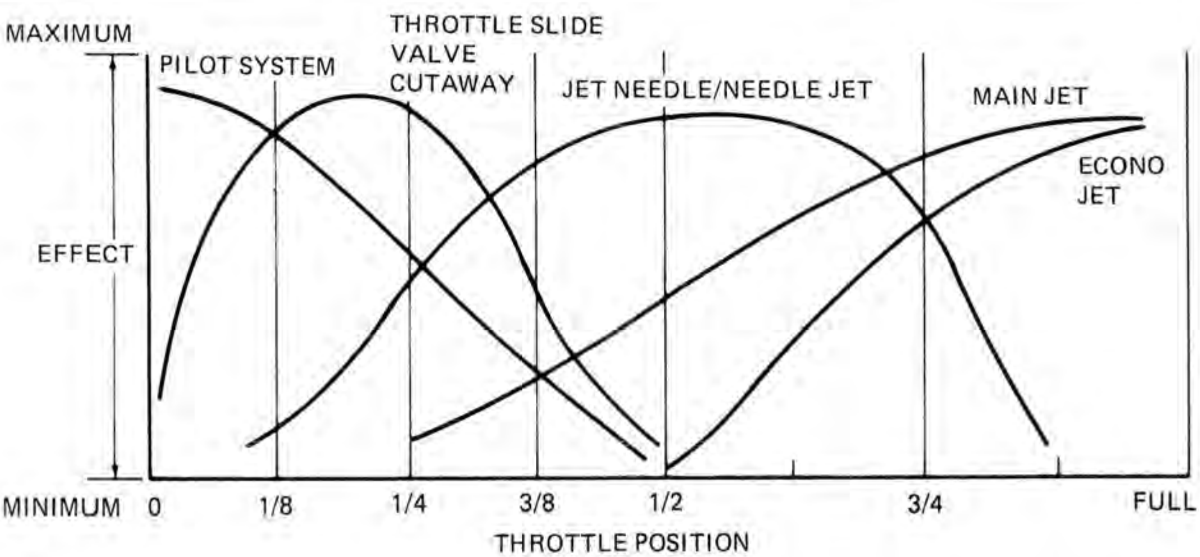


Figure 2-19

Throttle Slide

The amount of air entering the carburetor is determined by the throttle slide. The throttle slide rides in a closely fitting bore directly above the venturi in the carburetor body. The movement of the slide is controlled by a cable and spring. In the "fully closed" position, little or no space remains under the slide for the air to flow through the venturi. As the slide is raised higher, more air will flow through the venturi and into the engine. When the slide is in a lower position, it blocks part of the venturi, and the area under the slide becomes a venturi in a venturi. The size of the actual venturi or air passage changes with the position of the slide. 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 slide 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 slide 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.)

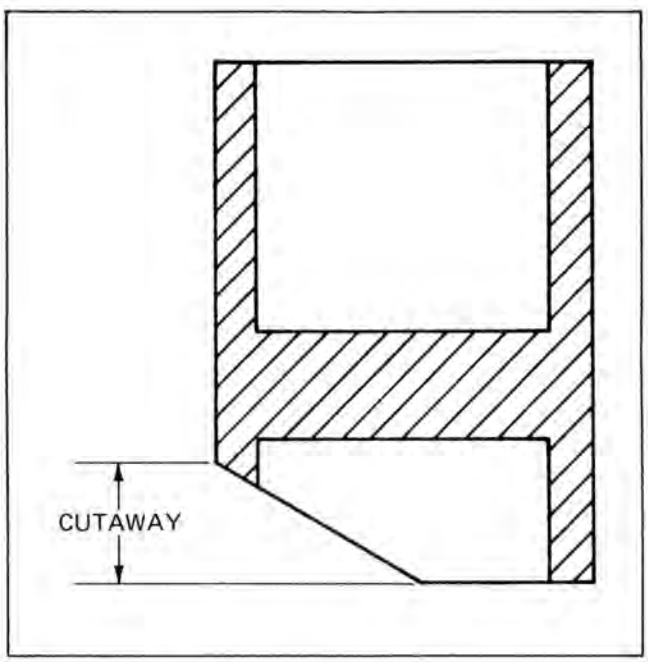


Figure 2-20

Main System

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 starter system to assist starting with a cold engine.

The largest portion of the metering is performed by the main system. The components are: The throttle slide, 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 slide is part of the main system only in that it carries the jet needle.

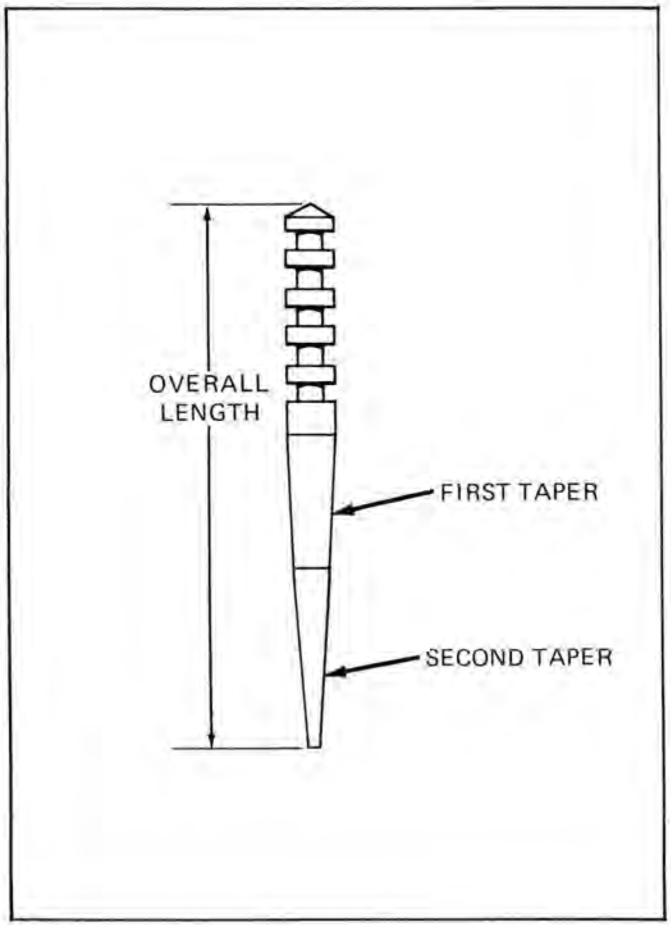


Figure 2-21

The jet needle rides in the throttle slide and moves up and down with the slide. 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 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.

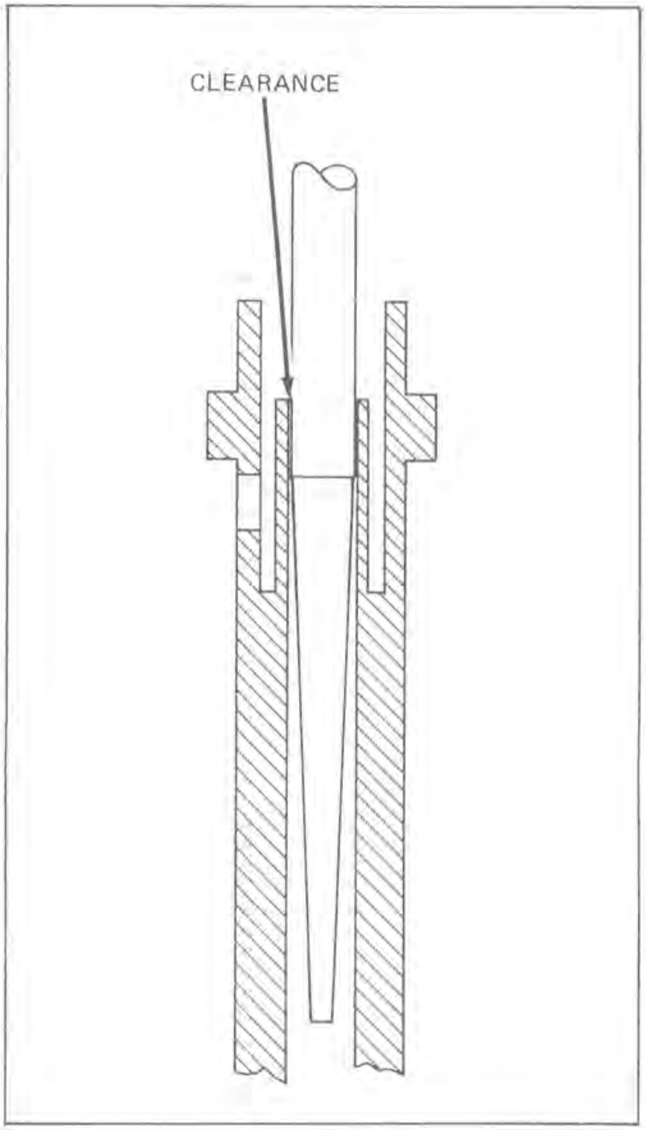


Figure 2-22

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 slide, 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.

$$\begin{array}{r} 2.680 \text{ mm} \\ \underline{-2.512 \text{ mm}} \\ 0.168 \text{ mm} \end{array}$$

The clearance is 0.168 mm. As shown in Figure 2-22, the needle blocks the jet when the throttle slide is closed. When the slide 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 slide 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.

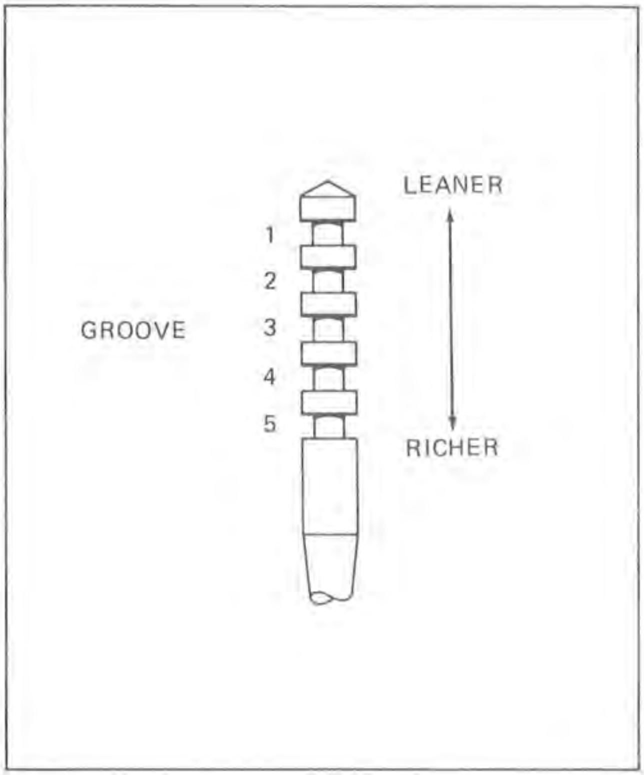


Figure 2-23

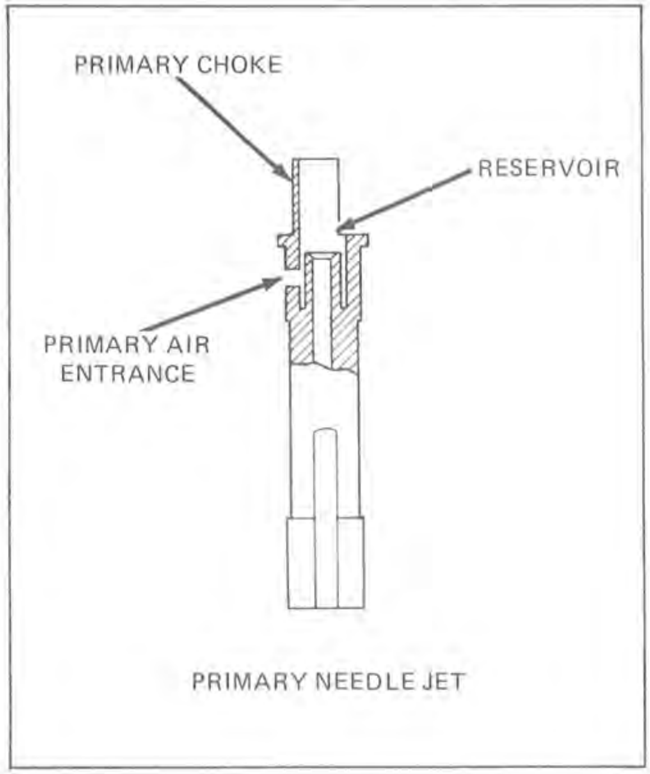


Figure 2-24

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.)

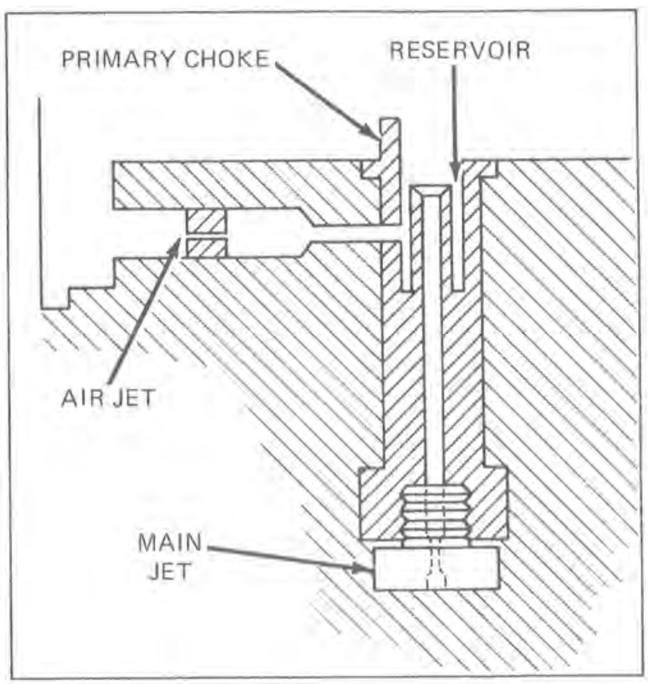


Figure 2-25

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 slide 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.

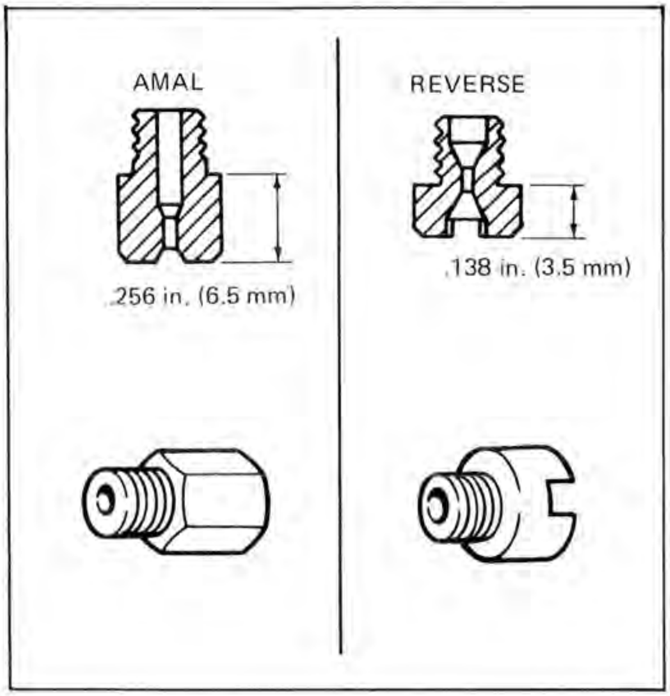


Figure 2-27

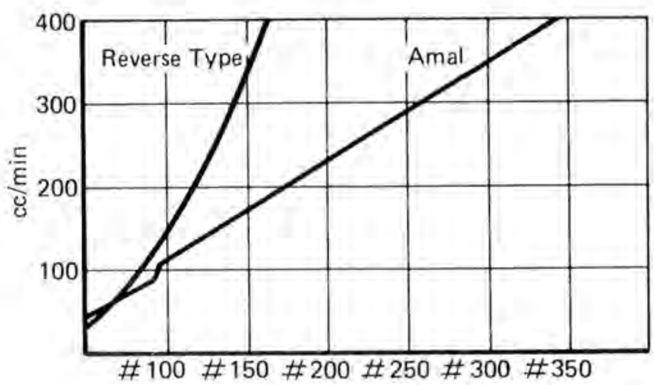


Figure 2-28

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.

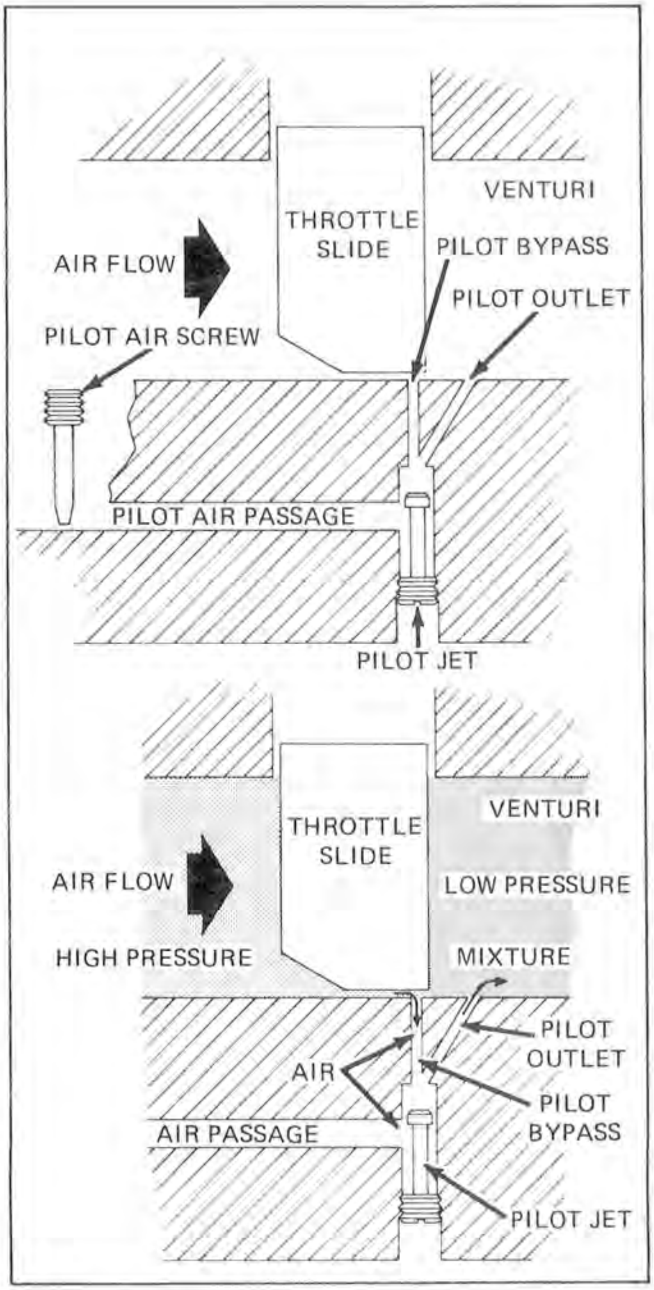


Figure 2-29

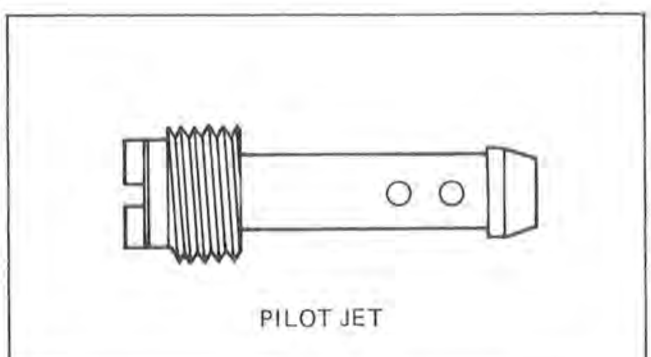


Figure 2-30

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.

Starter 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, a starter system is added to the carburetor. The starter 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 slide is closed, the air that goes to the engine must come through the starter 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 starter mixtures is aided by an emulsion tube, a long tube which protrudes into the fuel and through which the fuel from the starter jet 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 starter plunger. The atomization of the fuel allows it to flow more easily through small passages. (See Figure 2-31.)

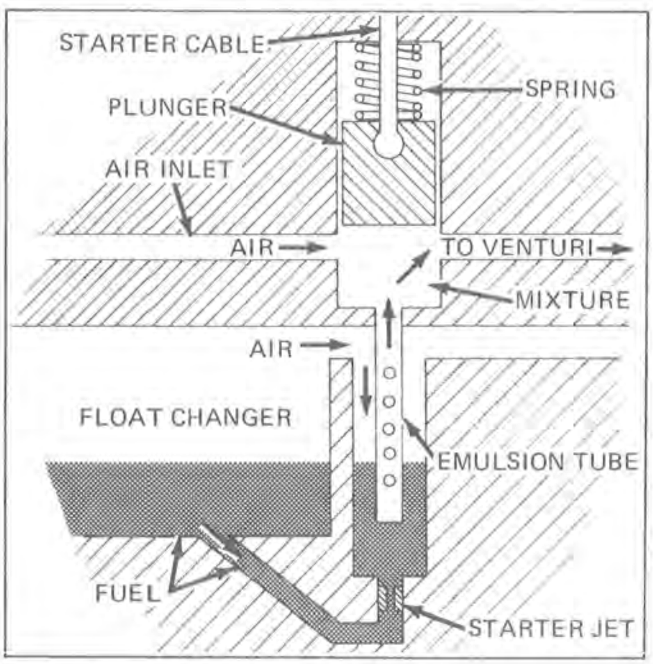


Figure 2-31

Primer System

The primer pump is located in the dash panel next to the ignition key switch. This pump is used along with the enrichener (Starting System) 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 4 to 6 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.

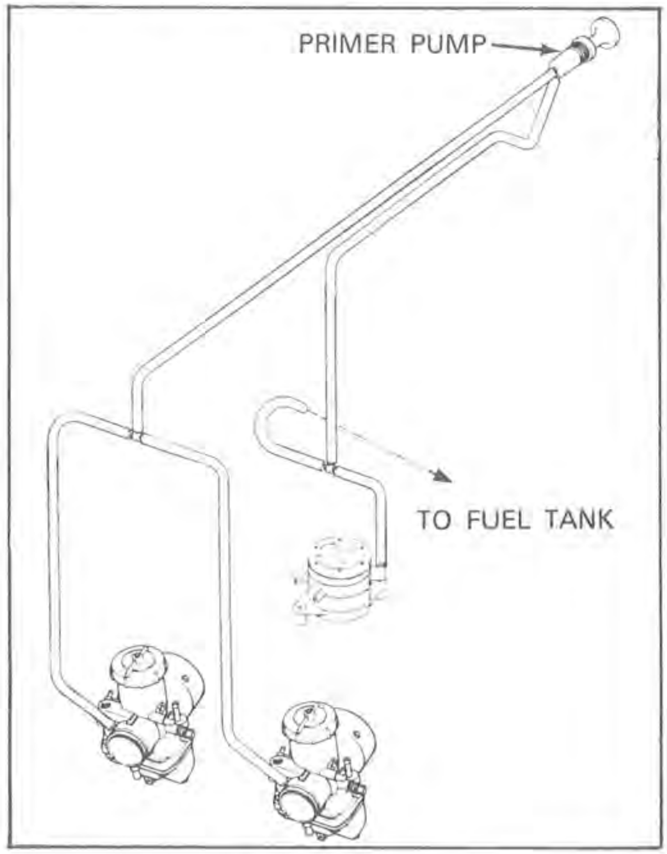


Figure 2-32

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.

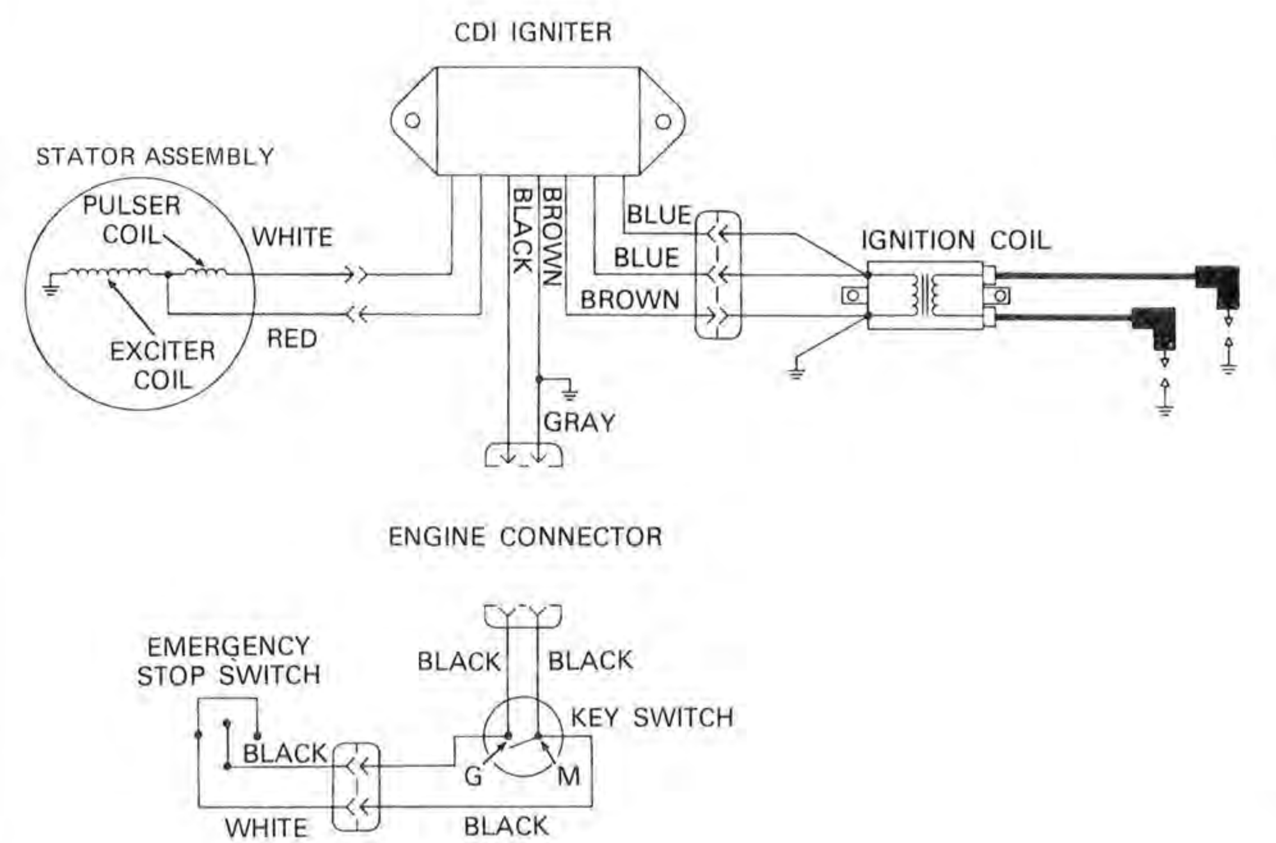
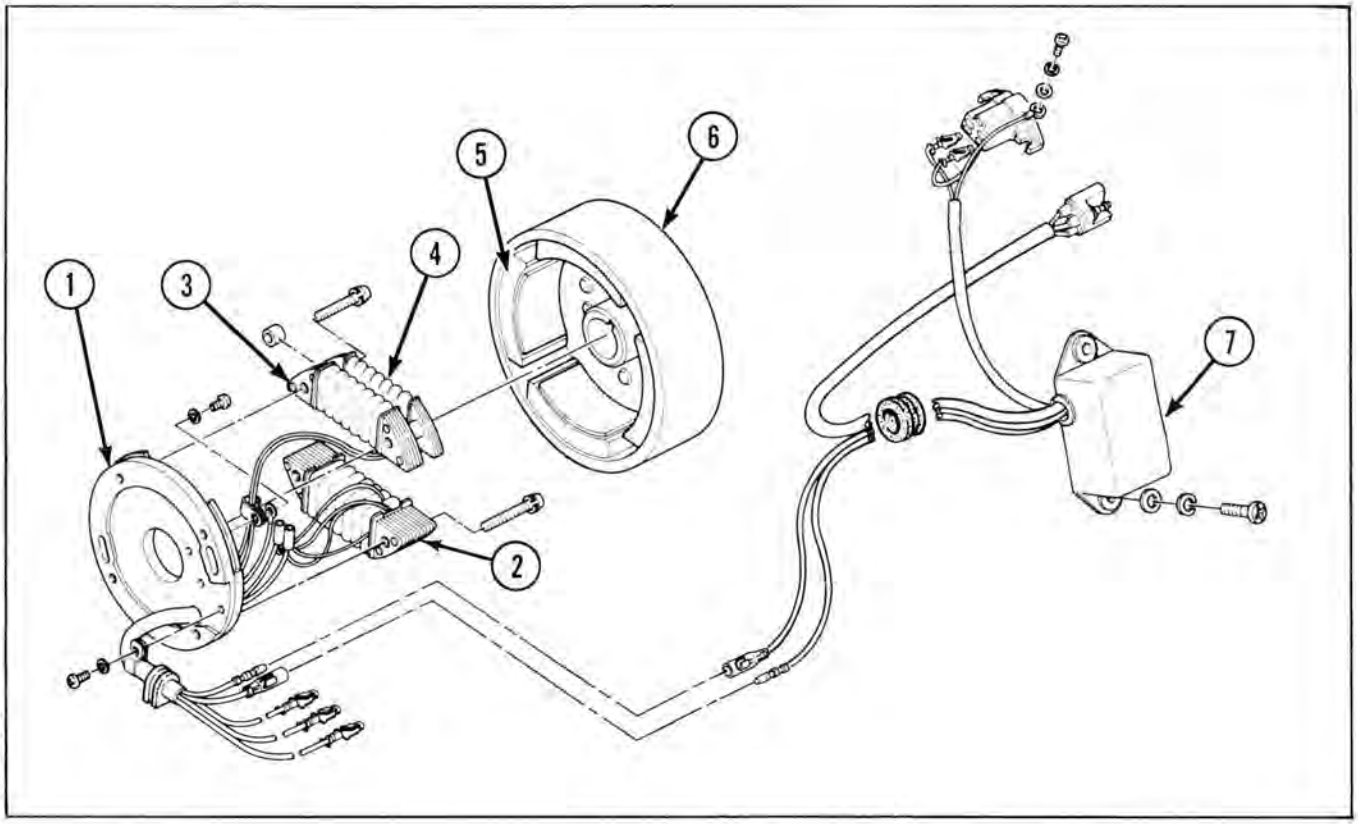


Figure 2-33



1. Stator Plate
2. Lighting Coil
3. Exciter Coil
4. Pulser Coil
5. Magnet
6. Flywheel
7. CDI Igniter

Figure 2-34

Electrical System Theory of Operation

The snowmobile electrical system consists of a tail/stop light, headlight, brake light switch, head light dimmer switch, emergency stop switch, speedometer, tachometer, key switch, and a light regulator. A schematic representation of the snowmobile electrical system is shown in Section 4, Electrical Lighting System.

AC current to operate the electrical lighting components is generated in the lighting coil on the stator plate.

The schematic shown in Figure 2-35 shows all of the components in the lighting system.

1. The AC current from the lighting coils is routed through the voltage regulator which adjusts the flow of current according to the demands of the system. This regulator operates all the time. If it is not operating, the tachometer and brake light will malfunction.

2. With the key switch in the RUN position, the current is routed from the regulator to the key switch, tachometer, and brake light switch.

3. With the key switch in the RUN/LIGHTS position, the current is routed to the instrument lights, tail light, and dimmer switch.

4. The current is routed by the dimmer switch to the appropriate head light beam or filament.

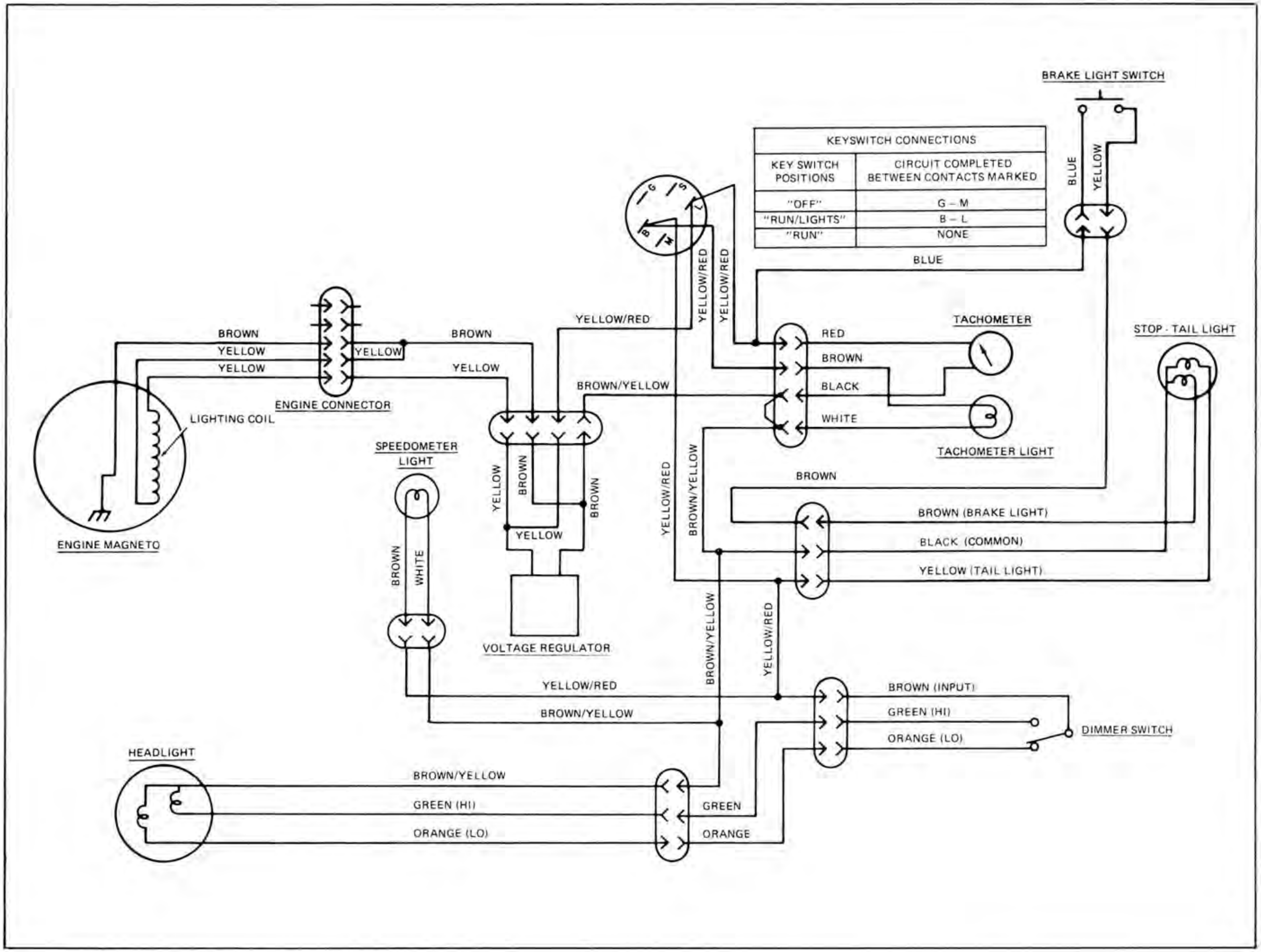

BRAKE LIGHT SWITCH
KEYSWITCH CONNECTIONS
KEY SWITCH POSITIONS
CIRCUIT COMPLETED BETWEEN CONTACTS MARKED
"OFF" G – M
"RUN/LIGHTS" B – L
"RUN" NONE
BLUE
YELLOW
TACHOMETER
STOP - TAIL LIGHT
RED
BROWN
BLACK
WHITE
TACHOMETER LIGHT
YELLOW/RED
BROWN/YELLOW
ENGINE CONNECTOR
LIGHTING COIL
ENGINE MAGNETO
SPEEDOMETER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

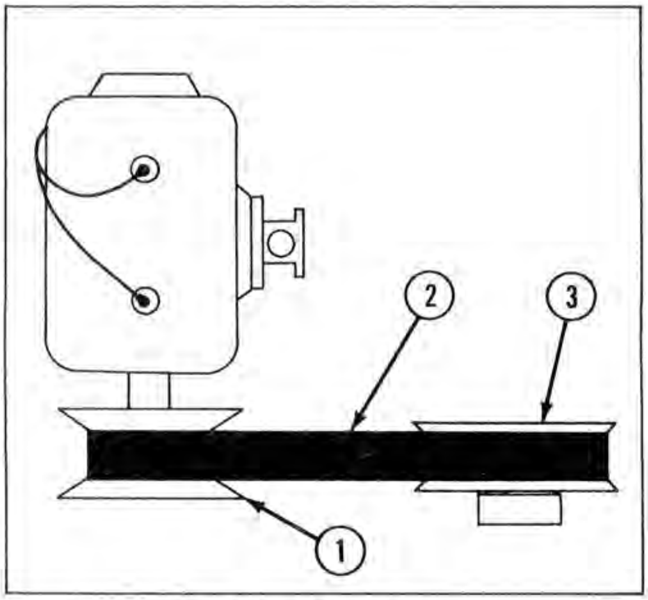
Figure 2-35

Drive System Theory of Operation

Torque Converter

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 2-36.)

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 clutch automatically shifts to maintain maximum horsepower at all operating conditions.



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

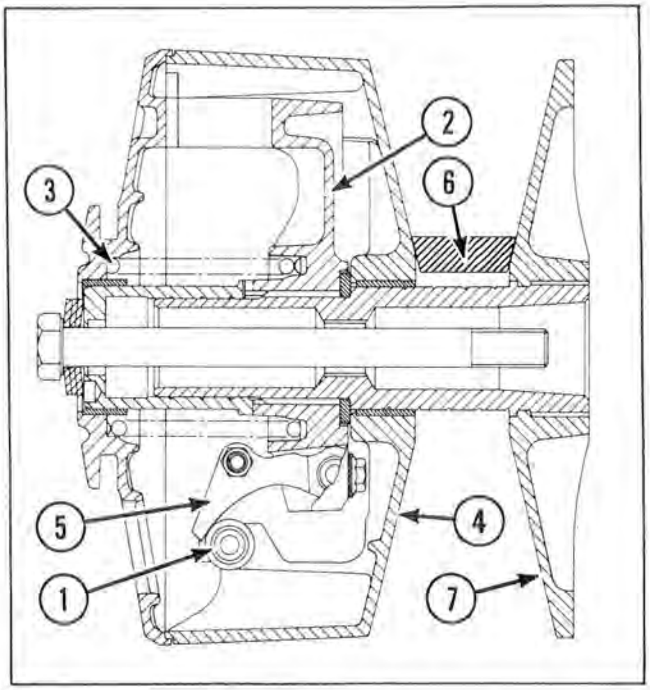
Figure 2-36

Drive Converter

The drive converter on the snowmobile is designed to provide maximum performance under all types of snow and load conditions. (See Figure 2-37.)

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

1. Spring
2. Weights
3. Ramps



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

Figure 2-37

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.

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.

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

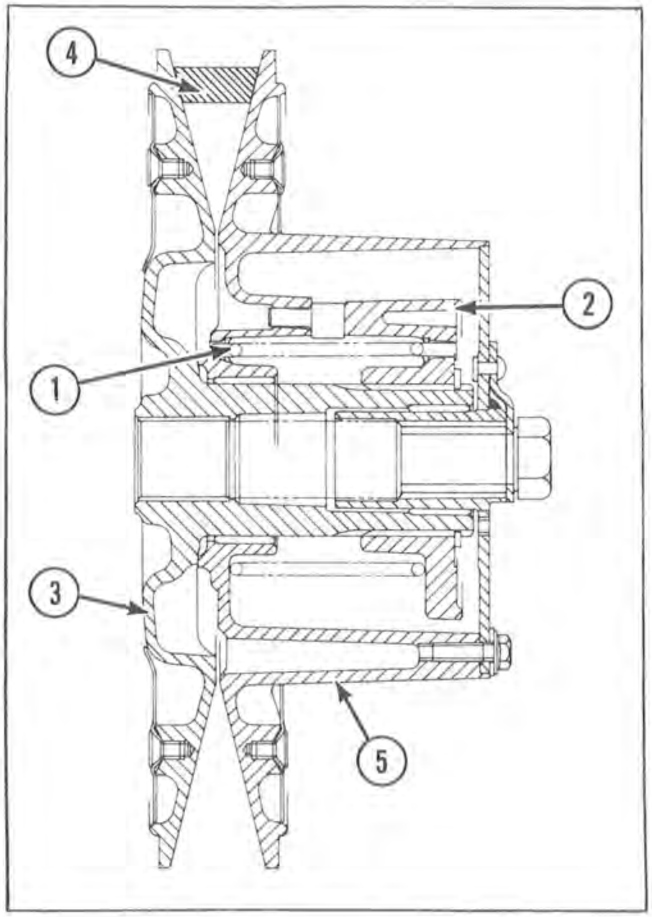
The power that drives the track is transmitted from the drive converter through the T.C. belt to the driven converter. The driven converter is held closed by the driven torque converter spring. This positions the belt at idle, or with the engine off at the outside circumference of the driven flanges.

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 2-39.)

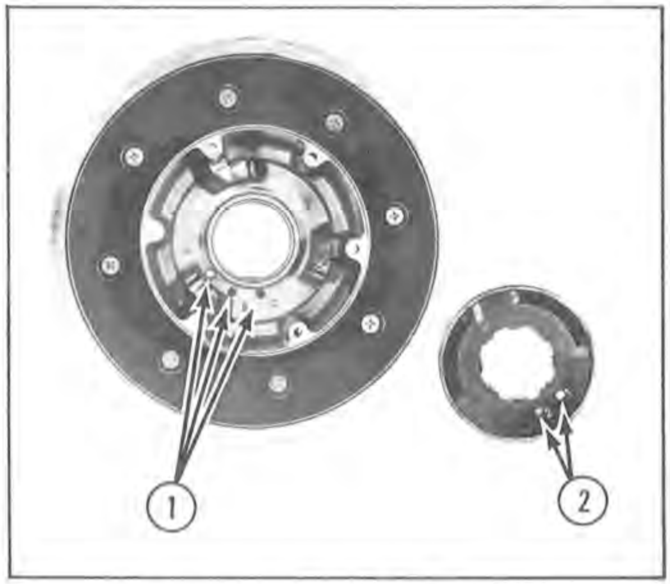
As the engine speed increases the sheave assembly is spread apart allowing the belt to ride on a smaller diameter of the flanges. This change of flange diameter varies the drive ratio, automatically providing the most favorable ratio between the drive and driven converter for the speed and load at which the machine is operating. (See Figure 2-38.)

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

Figure 2-38



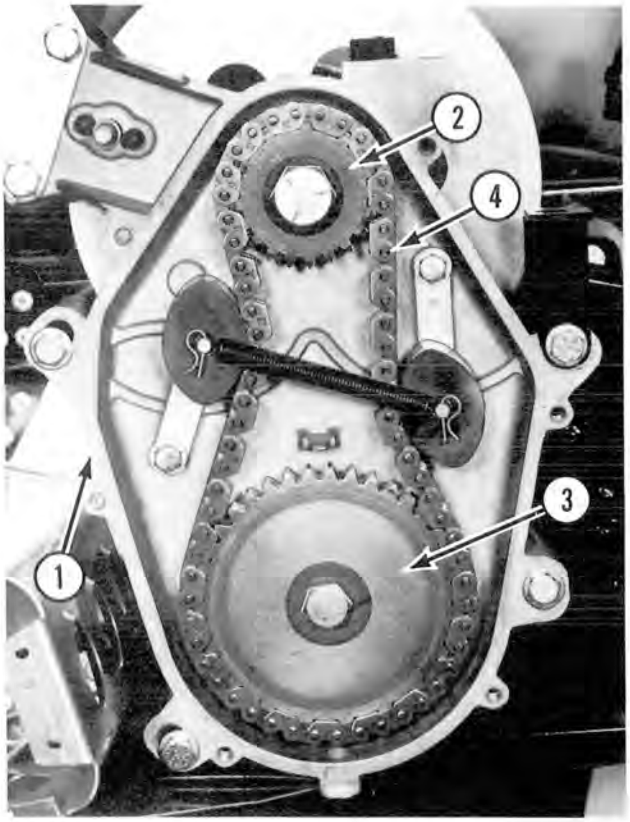
1. Holes in Fixed Sheave
2. Holes in Ramp Cap

Figure 2-39

Chaincase and Gearing

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 2-40.)

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.



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

Figure 2-40

Track, Suspension, and Steering System Theory of Operation

The suspension system consists of the track, slide assembly and the skis. (See Figure 2-41.)

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 snow conditions and steering control by varying spring tension on the front suspension arms and changing the adjustment of the travel limiter.

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). (See Figure 2-42.)

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

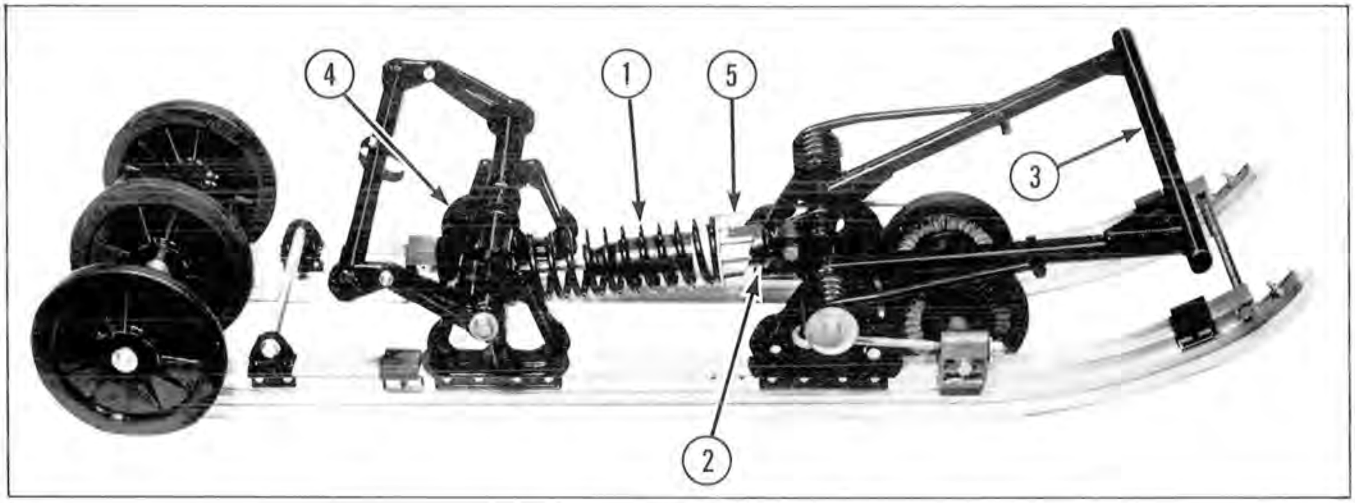
1. Large amount of shock absorber piston travel - The more shock absorber piston movement available, the more effectively oscillations can be dampened, thus reducing the rebound normally associated when transversing bumps.

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 2-41



1. Shock Absorber Spring
2. Shock Absorber
3. Front Suspension Arm
4. Bellcrank
5. Spring Adjustment Cam

Figure 2-42

Two-Cycle Engine Maintenance

Inspection

Inspect the engine and mating flanges for oil residue around flanges. Replace seals if leakage is evident. Check the engine for loose or missing hardware etc.; tighten or replace as necessary. Check the cooling system for coolant leaks, repair or replace as necessary. Inspect oil level of the engine gearcase and correct as required.

CAUTION

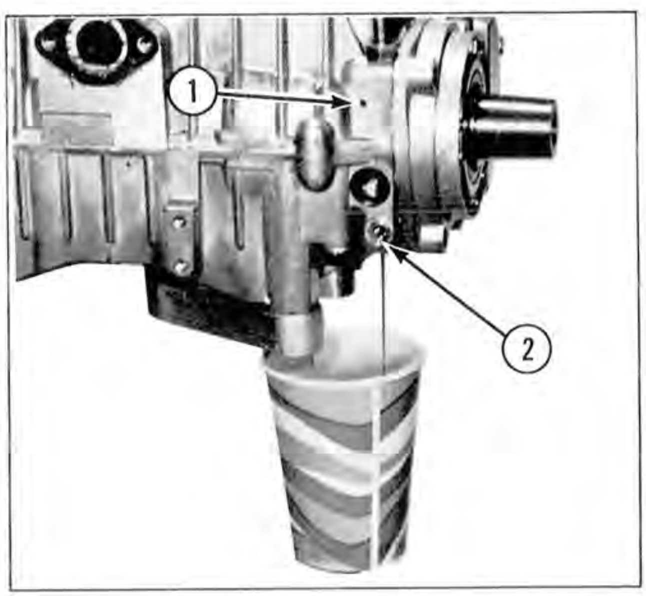
Inspect the vent (breather) hole in the gearcase cavity above the sight glass for obstructions. This hole must remain clear for proper operation of the seal between the crankcase and gearcase or gearcase damage will result. (See Figure 2-43.)

To drain the engine gearcase:

1. Remove the drain plug. (See Figure 2-43.)
2. Raise the back of the snowmobile approximately 3 feet to completely empty oil cavity.
3. Reinstall the drain plug.

To fill the engine gearcase:

1. Remove the fill plug from the top of the gearcase.
2. Pour Shell XL100 10W30 nonfoaming engine oil into the gearcase until the level is half way up the sightglass in the engine gearcase. Fill the gearcase cavity while the snowmobile is level. Do not overfill. The oil level should not be higher than the top of the sight glass window in gearcase. (See Figure 2-44).
3. Install and tighten the gearcase fill plug.



1. Vent Hole
2. Drain Plug

Figure 2-43

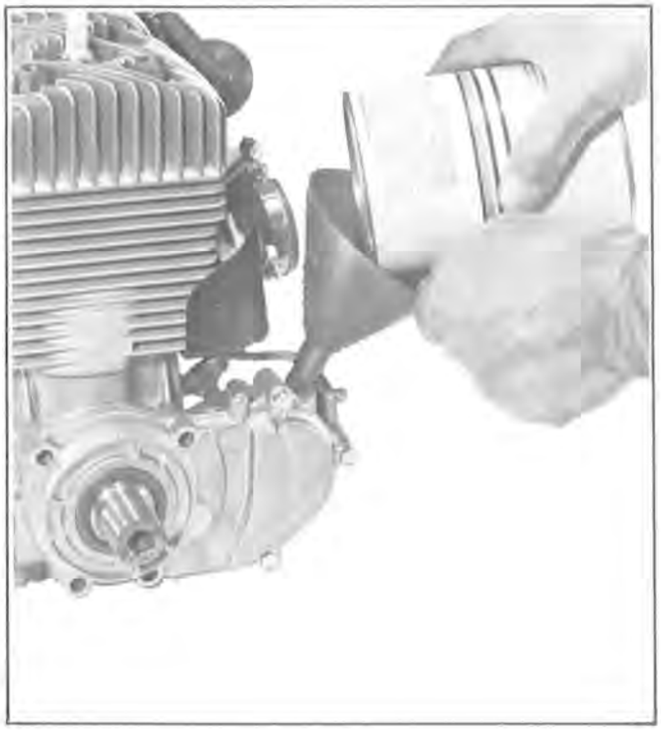


Figure 2-44

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 gage for accurate measurement. A compression reading of 90 to 95 psi per cylinder is minimum. There should be no more than 10 percent difference between the two cylinders.

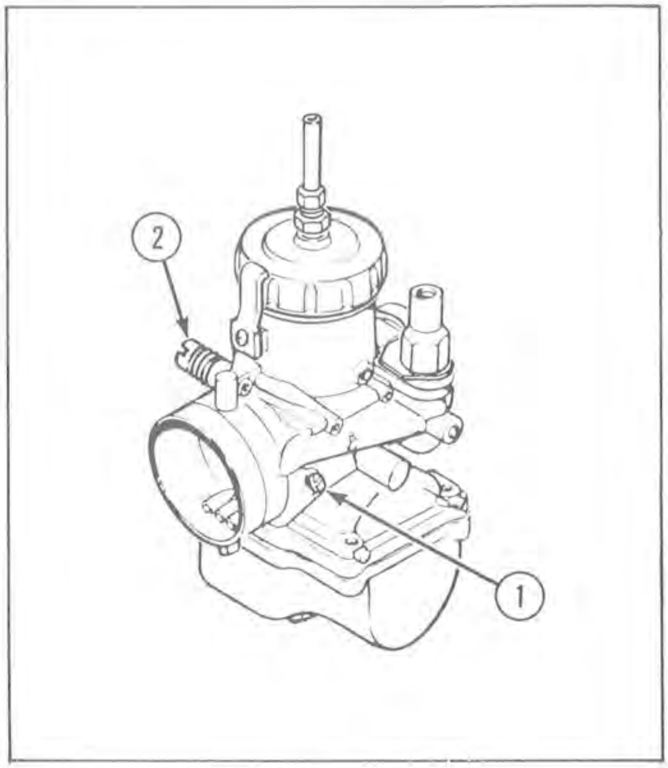
Fuel System Maintenance

Carburetor

The pilot air screw should normally be positioned 1/2 to 2 turns out from the seated position. An engine may idle smoothly out of these settings; however, problems may occur in the transition to midrange throttle operation. The pilot air screw should be adjusted for best idle within the correct adjustment range. (See Figure 2-45.)

Turn the idle stop screws, on both carburetors, in until the spring is coil bound. Then, back off each screw three complete turns (initial adjustment). Final adjustment is performed with the engine running; turn each screw out equally until the engine idles at 2,500 RPM.

NOTE: It is important that both slide valves open equally to properly balance the LH and RH cylinders. Use a tachometer to measure engine speed and adjust the idle speed screws so that the engine idle speed is 2,500 RPM. (See Figure 2-45.)



1. Air Screw
2. Idle Stop Screw

Figure 2-45

Fuel Pump

Inspect the fuel pump and pulse line clamps for loose fit or leaks.

Fuel Filter

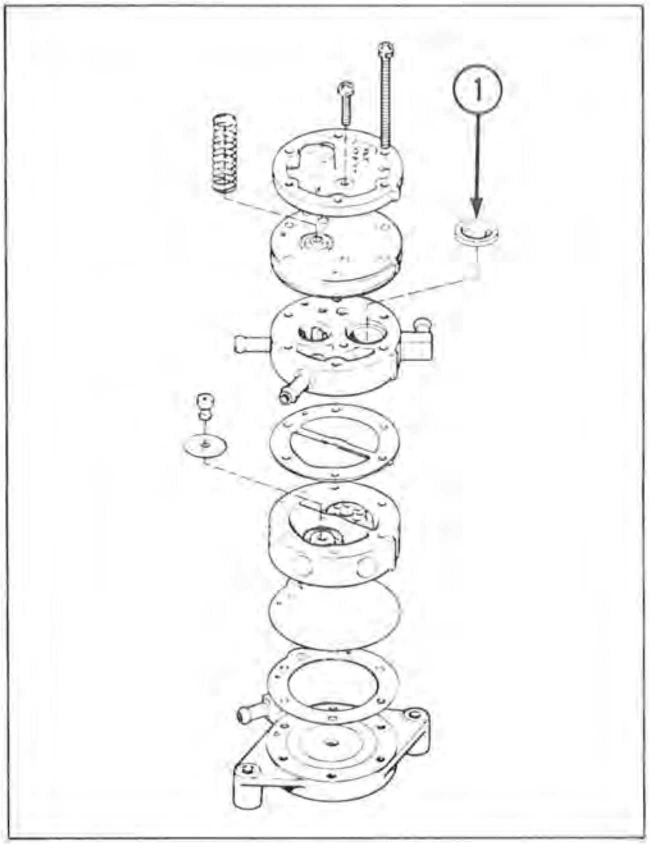
Remove the fuel filter from inside the fuel pump and inspect it. Clean the filter if it is dirty. Replace the filter if it is damaged. (See Figure 2-46.)

Primer Pump

Check all the tube connections in the primer system for loose fits and leaks. Correct as necessary. (See Figure 2-47.)

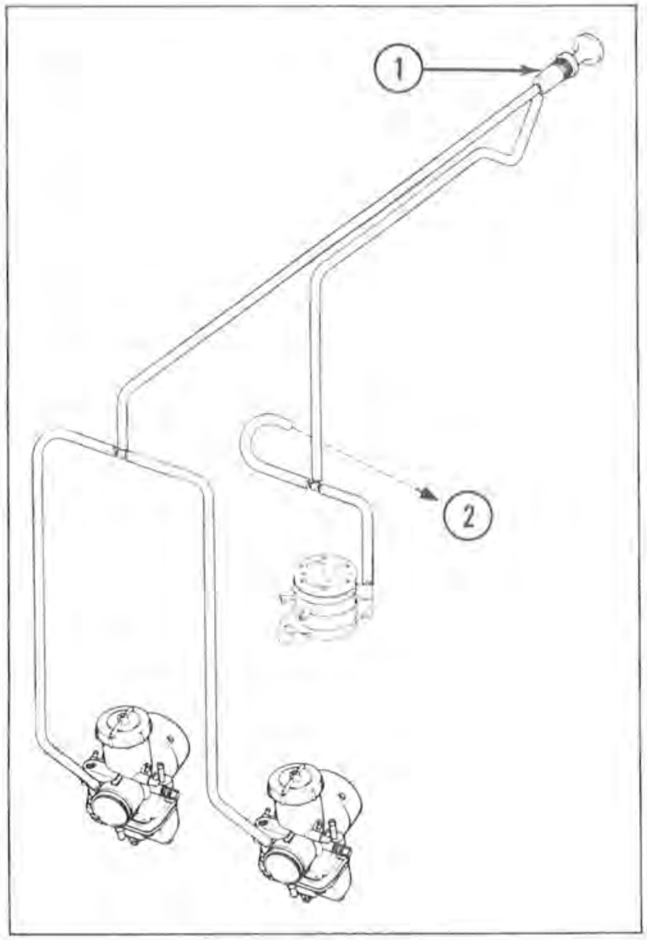
Fuel Tank and Lines

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



1. Fuel Filter

Figure 2-46



1. Primer Pump
2. To Fuel Tank

Figure 2-47

Throttle Control Cable

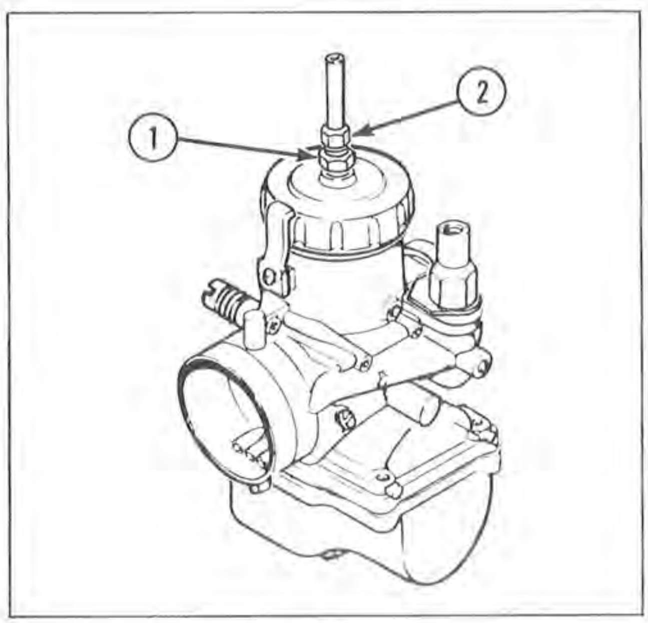
WARNING

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.

With the engine off and the air silencer removed from the carburetor, hold the throttle lever at the full throttle position and check that:

1. Both throttle slides inside the carburetor bore opens fully and equally.

2. With the throttle lever at idle, there should be approximately 1/16 in. (1.5 mm) free play between the lever and housing. The oil pump control arm must rest on the stop pin with the throttle at the idle position. If either carburetor slide, the throttle lever or oil pump control arm requires adjustment, follow the procedure under Synchronization of Oil Pump and Carburetors.



1. Locknut
2. Adjusting Screw

Figure 2-48

CAUTION

While installing the air intake silencer, check that:

1. The cover is securely fastened to the silencer body and properly sealed.

2. The rubber seals between silencer body and carburetors fit securely during installation.

3. The intake hose is directed rearward.

Failure to comply with the above steps will cause engine failure.

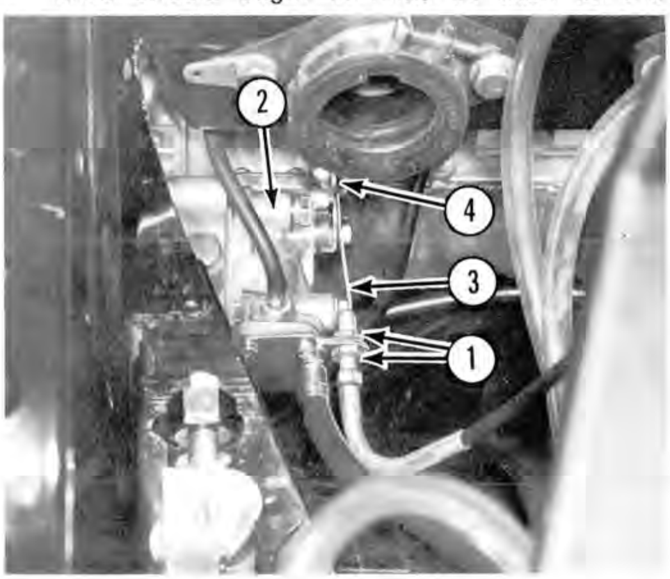
Synchronization of Oil Pump and Carburetors

Synchronization of the carburetors and oil pump is extremely important to assure adequate oil to the engine. Proceed as follows:

1. Remove the air silencer and loosen the idle stop screws so that both throttle slides bottom out.

2. Push the oil pump bellcrank forward until it contacts the stop pin, this insures the oil pump is at the dead idle position.

3. Adjust the throttle cable on the LH carburetor so that all of the slack is removed. The throttle slide should begin to raise as soon as the throttle lever on the handlebar is advanced. (See Figure 2-48.)



1. Locknuts
2. Oil Pump
3. Control Cable
4. Bellcrank

Figure 2-49

4. Loosen the locknuts on the oil pump cable, and remove all the slack. Adjustment is correct when the bellcrank on the oil pump and the throttle slide in the LH carburetor move simultaneously as the throttle control lever is activated. (See Figure 2-49.)

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

CAUTION

While installing the air intake silencer, check that:

1. The cover is securely fastened to the silencer body and properly sealed.

2. The rubber seals between silencer body and carburetors fit securely during installation.

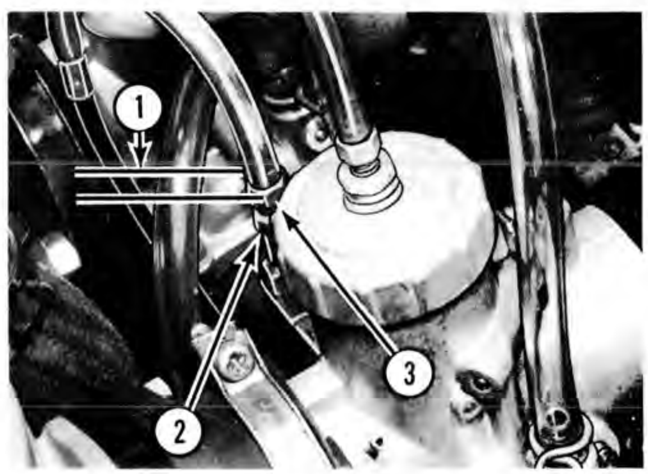
3. The intake hose is directed rearward.

Failure to comply with the above steps will cause engine failure.

6. Turn the idle screw out 3 turns from the coil bound for initial setting. Final adjustment is 2,500 RPM idle speed.

Enrichener Control Cable

With the enrichener lever at off, the outer casing of the enrichener cable should have 1/16 in. (1.5 mm) of free movement when raised. (See Figure 2-50.)



1. 1/16 in. (1.5 mm)
2. Locknut
3. Adjusting Screw

Figure 2-50

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

If adjustment of the enrichener cable is required, loosen the locknut and turn the adjusting screw to obtain the correct clearance.

Ignition System Maintenance

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 Adjustment

1. Remove recoil starter. Remove the right hand side spark plug and install a dial indicator in the spark plug hole. (See Figure 2-51.)

2. Position the recoil side piston at 0.073 in. (1.86 mm) before top dead center.

3. Check that the F mark on the flywheel aligns with fixed mark on the magneto housing.

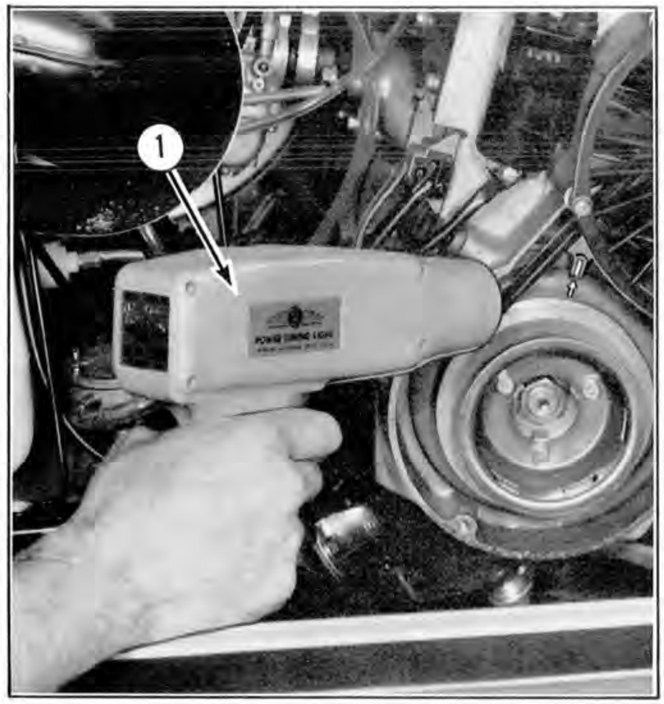
1. Dial Indicator

Figure 2-51

NOTE: If the F mark on the flywheel is off slightly, loosen the four nuts securing the magneto cover to the crankcase and shift the cover accordingly. If the mark position is not corrected with this procedure, replace the flywheel. After the mark is corrected, check the timing with a timing light.

4. Remove the dial indicator and replace the spark plug and lead wire.

5. Connect a strobe type timing light to the right hand side spark plug lead, follow light manufacturer's instructions. (See Figure 2-52.) Use the snowmobile tachometer to measure RPM.



1. Timing Light

Figure 2-52

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.

6. With torque converter belt removed and guard secured in place, start the engine with emergency start rope on drive converter, run at approximately 6,500 RPM, and direct the timing light at the fixed mark on the magneto housing. The ignition timing is correct when the F mark on the flywheel appears in alignment with the fixed mark on the magneto housing as the light flashes. Shut off engine.

7. If the timing is incorrect, loosen the stator plate screws through holes in the flywheel, and reposition the stator plate as required (clockwise to retard timing - counterclockwise to advance timing) to correct the timing. (See Figure 2-53.)

CAUTION

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

8. Tighten the stator plate screws and recheck timing.

9. When the ignition timing is correct, remove the timing light and replace the recoil starter.

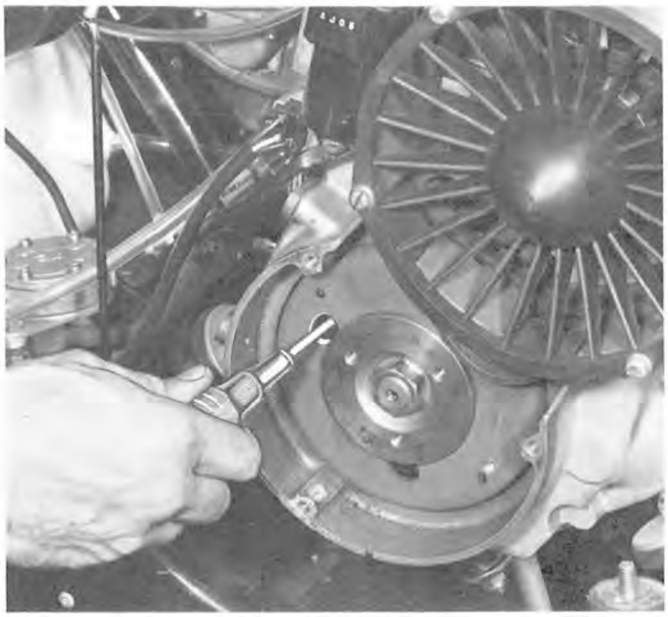


Figure 2-53

Alternate Method of Timing Adjustment

1. Remove the drive belt and install a fabricated pointer onto the engine as shown. (See Figure 2-54.) For accuracy, it is important to attach the pointer to the engine rather than the chassis so the pointer can move with the engine on its mounting system.

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

3. Rotate the drive converter in the normal direction of rotation (counterclockwise) to find TDC. Rotate the drive converter clockwise to 0.073 in. (1.86 mm) before TDC. Mark the drive converter opposite the timing pointer. (See Figure 2-54.)

Figure 2-54

4. Remove the dial indicator, and reinstall the spark plug.

5. With the converter guard secured in place, run the engine at 6,500 RPM. Direct the timing light through the opening in the converter guard directly over the timing pointer. The timing is correct when the mark on the converter aligns with the pointer as the timing light flashes. (See Figure 2-55.)

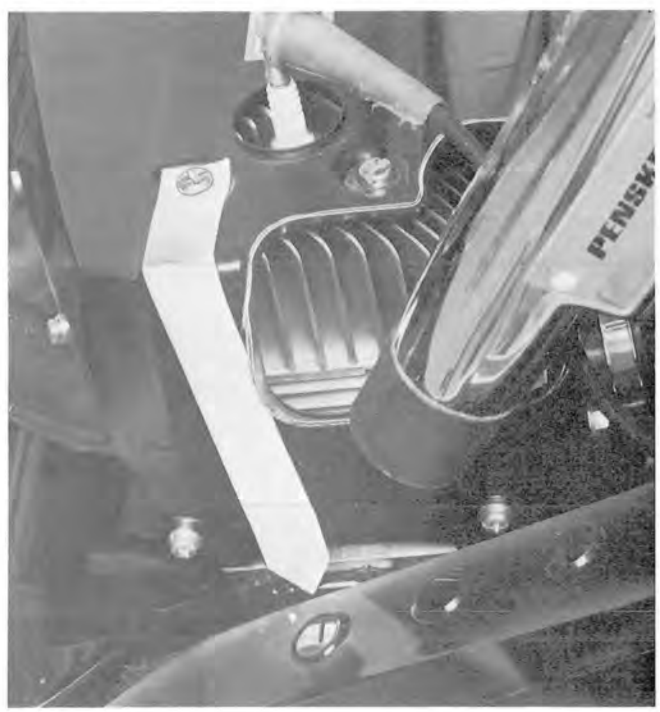


Figure 2-55

6. If the timing is incorrect, remove the manual starter and loosen the stator plate mounting screws through the holes in the flywheel. Then, turn the stator plate as required (clockwise to retard timing, counterclockwise to advance timing) to correct the timing.

7. Recheck the timing after the above adjustment. If the timing is correct, remove the timing light and reinstall the drive belt and recoil starter.

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 2-56.)

Carbon fouled plugs show dry, fluffy black deposits which may be caused by overrich carburetion, overchoking, weak coil, or worn cables. (See Figure 2-57.)


Figure 2-56


Figure 2-57

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 2-58.)

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 2-59.)


Figure 2-58


Figure 2-59

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 2-60.)

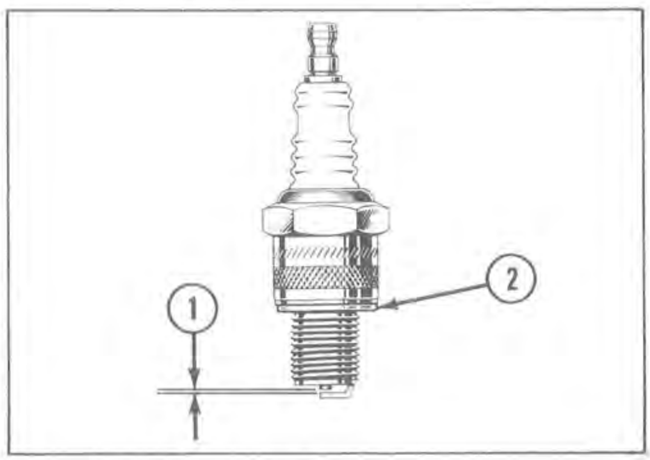

Figure 2-60

Inspect spark plugs for cracked porcelain and worn electrodes. Clean the electrodes with a point file. Adjust the gap to the specified 0.020 to 0.024 in. (0.5 to 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 2-61.)

Before installing the spark plugs, be sure the washer is installed and the seat on the cylinder head is clean. Install the spark plug, and tighten it to 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.



1. Gap
2. Washer

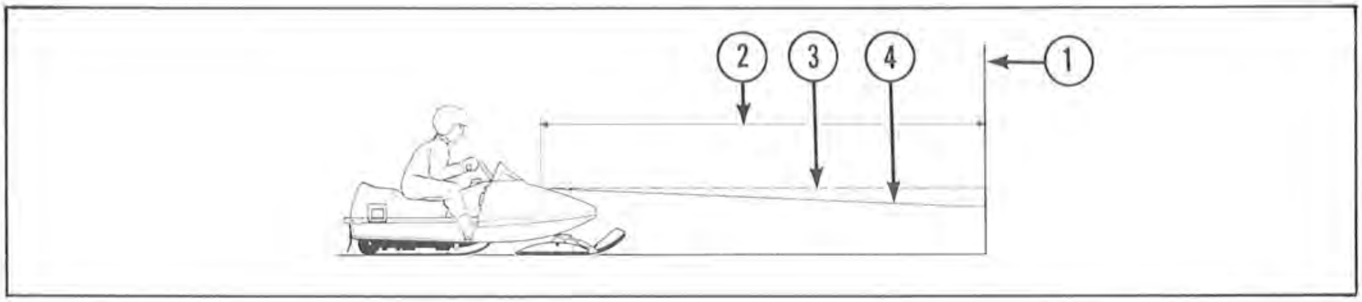
Figure 2-61

Electrical System Maintenence

Ignition Switch

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

NOTE: Do not use an excessive amount of lubricant.



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 2-62

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:

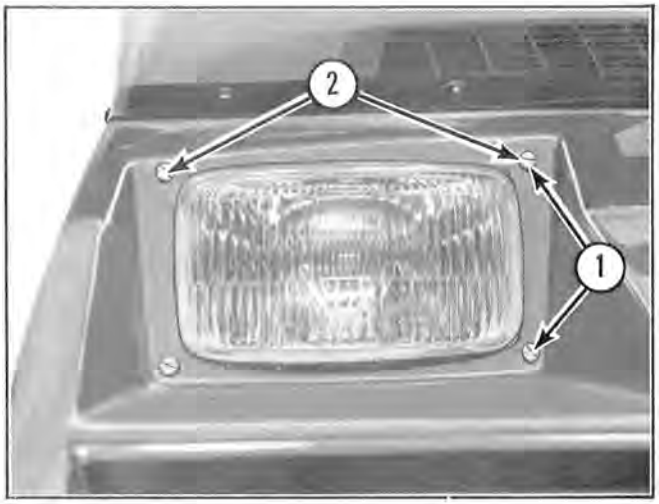
1. Position the snowmobile as shown. (See Figure 2-62.)
2. Be sure the floor is level, then position the snowmobile so that the headlight is 25 ft (7,620 mm) from a wall.
3. Measure the distance from the floor to the center of the headlight and mark the wall at the dimension measured (reference mark).

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.
5. If adjustment is required, turn adjusting screws as shown. (See Figure 2-63.)



1. Horizontal Adjusting Screws
2. Vertical Adjusting Screws

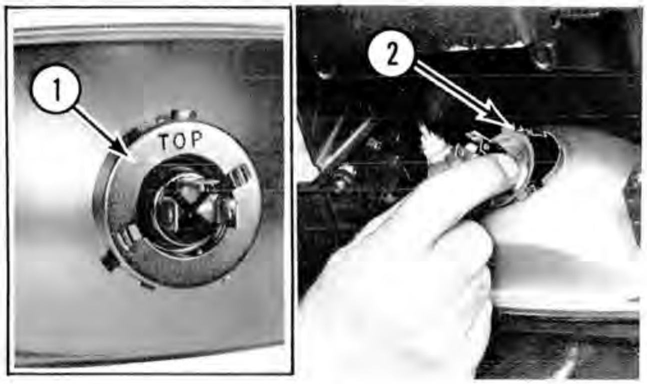
Figure 2-63

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 2-64.)
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 2-64.)

Install the headlight bulb in the reverse order of removal.



1. Retaining Ring
2. Wide Tab on Socket

Figure 2-64

Tail/Brake Light

Replace the tail and brake light bulb by removing the lens, secured by 2 screws, and then removing the lamp from the socket. (See Figure 2-65.)

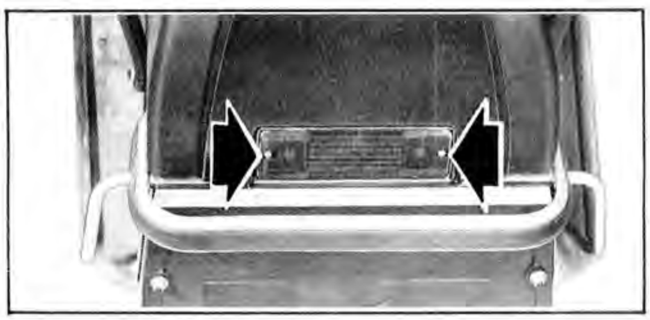


Figure 2-65

Speedometer and Voltage Regulator Maintenance

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.

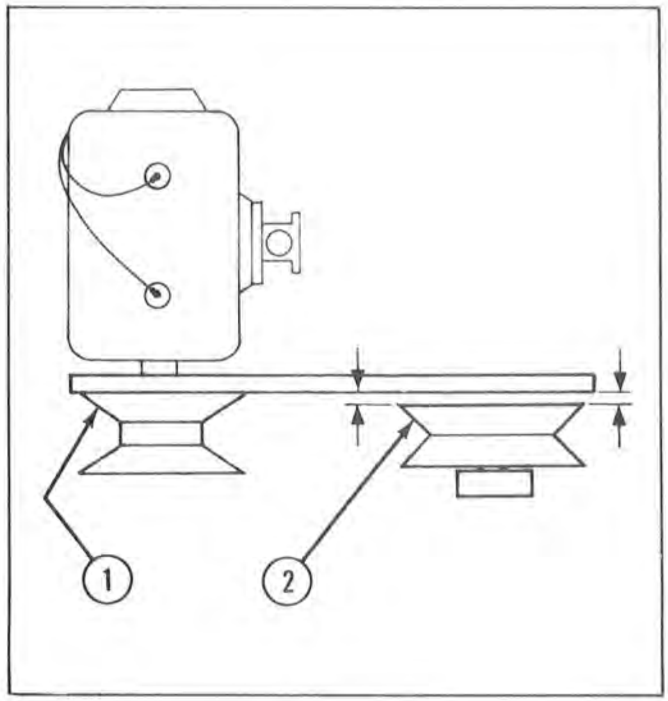
Voltage Regulator

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

Drive System Maintenance

Drive Converter and Driven Converter Alignment

The converter alignment (offset) should be 0.588 in. (14.9 mm) as measured from the back face of the fixed sheave on the drive converter to the edge of the driven converter movable sheave. (See Figure 2-66.)

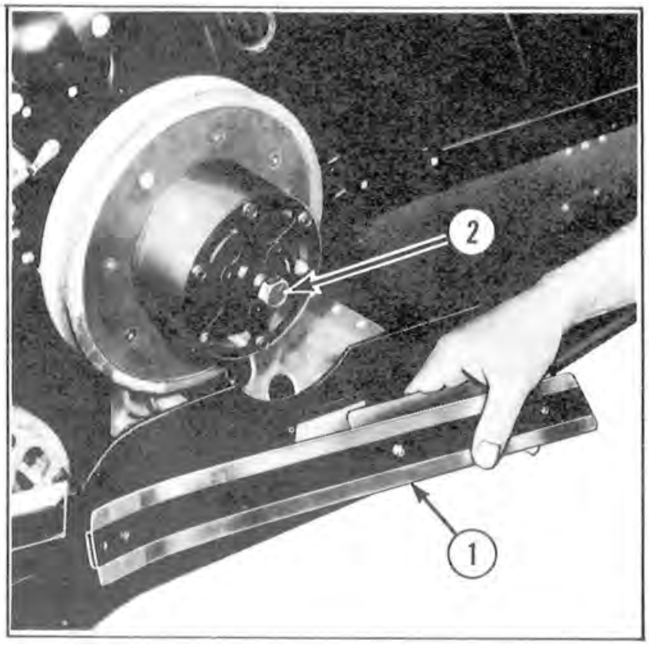


1. Fixed Sheave on Drive Converter
2. Movable Sheave on Driven Converter

Figure 2-66

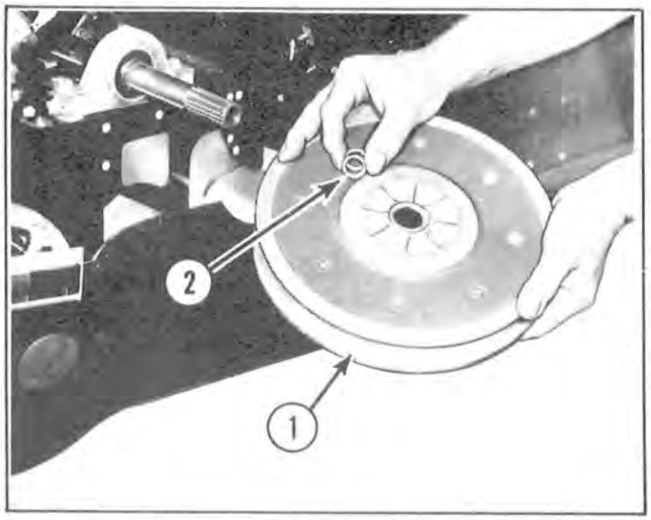
If adjustment to the converter alignment is required:

1. Remove the left side aluminum trim from lower pan. (See Figure 2-67.)
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 0.588 in. (14.9 mm) offset. (See Figure 2-68.)
4. Reinstall the driven converter on the jackshaft, and torque the bolt 40 to 50 ft lb (5.53 to 6.91 kg-m).



1. Aluminum Trim
2. Retaining Bolt

Figure 2-67



1. Driven Torque Converter
2. Shims

Figure 2-68

Converter Center Distance Adjustment

The converter center distance should be 12 in. (304.8 mm). (See Figure 2-69.)

Figure 2-69

If adjustment of the converter center distance is required:

Figure 2-69

1. Loosen the jackshaft adjusting bolt and locknut, the two bolts on the jackshaft bearing retainer, and the four bolts holding the chaincase to the chassis. (See Figures 2-70 and 2-71.)

2. Move the bearing retainer and chaincase forward or rearward, as required, to obtain 12 in. (304.8 mm) center distance.

CAUTION

When moving or removing the jackshaft bearing retainer, remember the number and placement of the shims between the retainer and the frame. The bearing retainer should be shimmed until the jackshaft centerline is 6.62 in. (168.15 mm) above the track driveshaft centerline.

3. Check the shimming of the jackshaft bearing retainer as follows:

   a. Remove the shims below the bearing retainer.

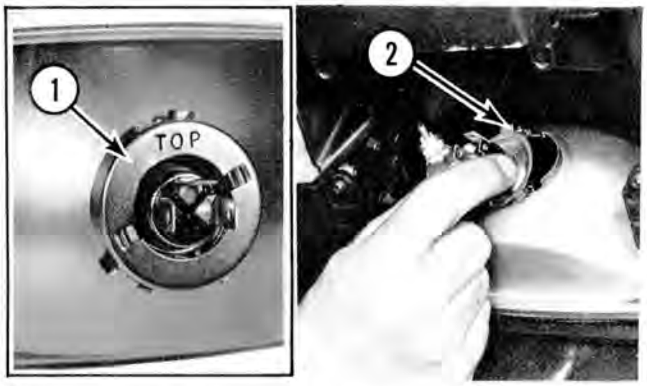
   b. Position the bottom of the retainer parallel to the top of the chassis.

   c. Install U shaped shims, as required, to fill the space between the bottom of retainer and top of chassis.

This procedure will prevent excessive preloading of jackshaft bearing at chaincase end of shaft.

4. Turn the adjusting bolt so the head of the bolt contacts the jackshaft bearing retainer flange and tighten the jam nut.

5. Tighten all bolts and locknut on the jackshaft bearing retainer and chaincase.



1. Retaining Ring
2. Wide Tab on Socket

Figure 2-64

Tail/Brake Light

Replace the tail and brake light bulb by removing the lens, secured by 2 screws, and then removing the lamp from the socket. (See Figure 2-65.)

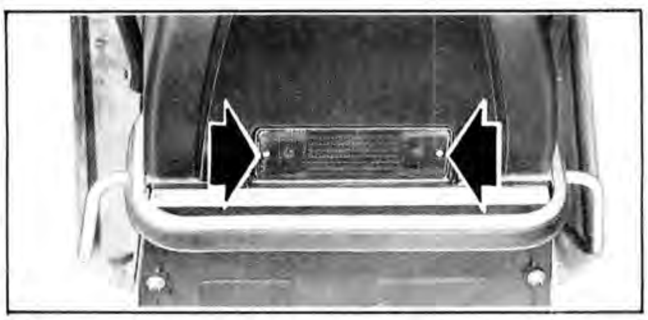


Figure 2-65

Speedometer and Voltage Regulator Maintenance

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.

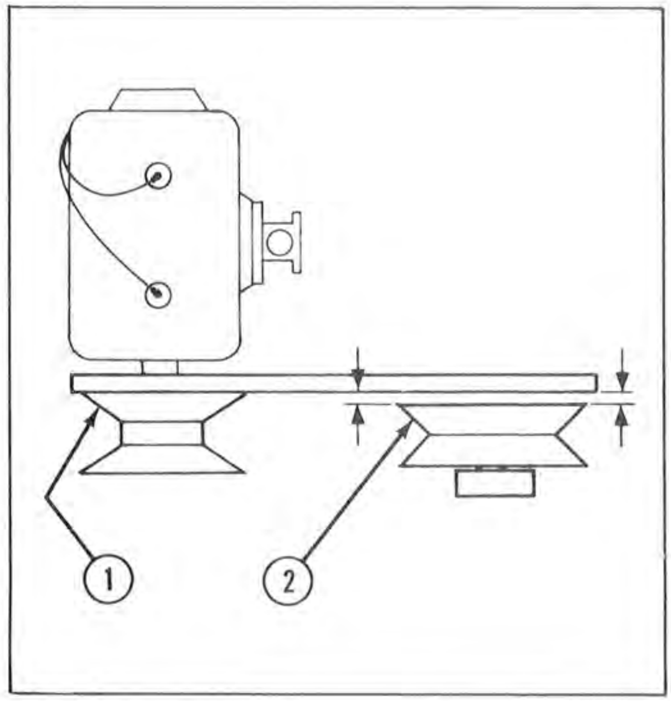
Voltage Regulator

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

Drive System Maintenance

Drive Converter and Driven Converter Alignment

The converter alignment (offset) should be 0.588 in. (14.9 mm) as measured from the back face of the fixed sheave on the drive converter to the edge of the driven converter movable sheave. (See Figure 2-66.)

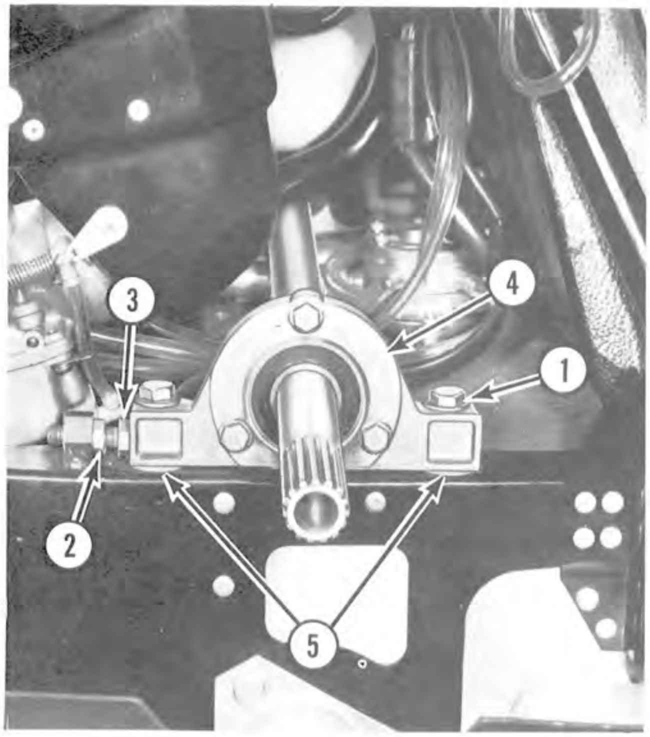


1. Fixed Sheave on Drive Converter
2. Movable Sheave on Driven Converter

Figure 2-66

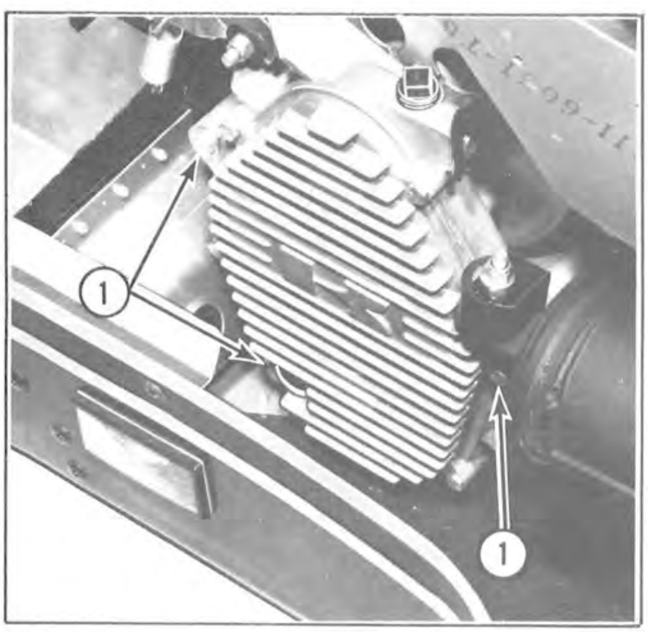
If adjustment to the converter alignment is required:

1. Remove the left side aluminum trim from lower pan. (See Figure 2-67.)
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 0.588 in. (14.9 mm) offset. (See Figure 2-68.)
4. Reinstall the driven converter on the jackshaft, and torque the bolt 40 to 50 ft lb (5.53 to 6.91 kg-m).



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

Figure 2-70

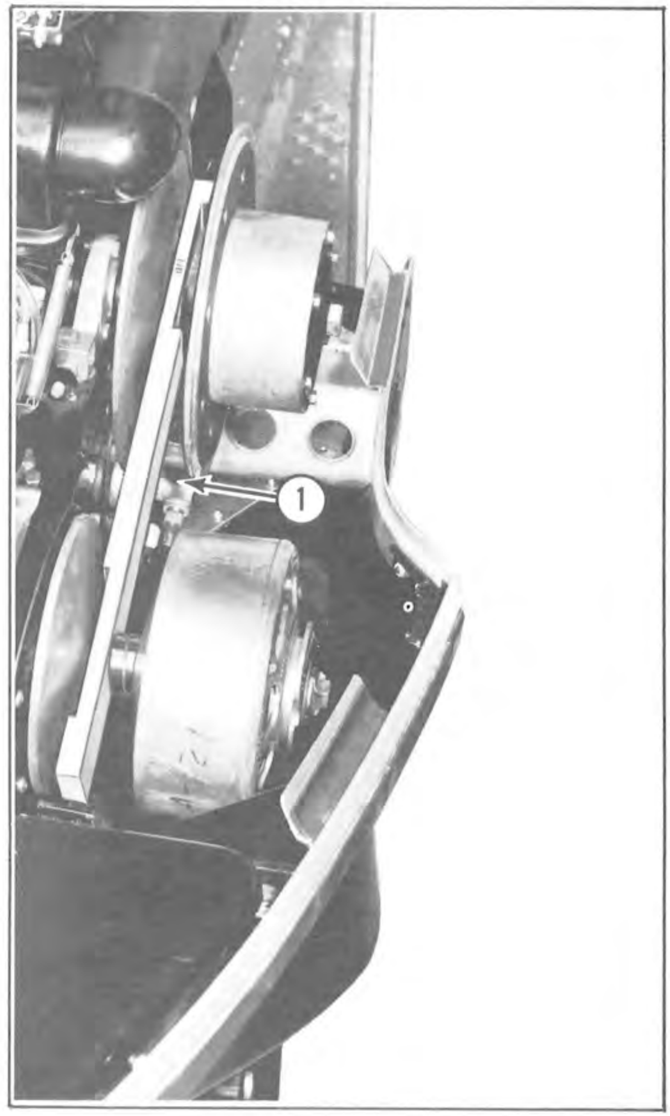


1. Mounting Bolts

Figure 2-71

Drive and Driven Converter Alignment Using Special Alignment Gauge P/N 57001-3503

Correct converter center-to-center distance of 12.0 in. (304.8 mm), and converter offset distance 0.588 in. (14.9 mm) is obtained when alignment gauge P/N 57001-3503 is correctly installed between drive and driven converter sheaves. (See Figure 2-72.)



1. Alignment Gauge P/N 57001-3503

Figure 2-72

CENTER-TO-CENTER DISTANCE

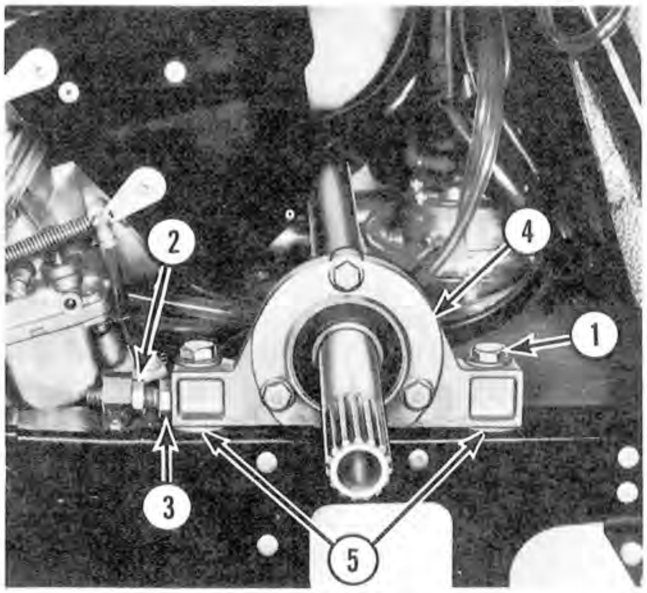
1. Remove the belt guard and drive belt.

2. Rotate the driven converter movable sheave clockwise, and insert the alignment bar between the sheaves with the deep notch facing the stationary sheave. Carefully release the movable sheave, allowing the spring tension to keep the gauge in position between the stationary and movable sheaves.

3. The center distance is correct if the notch in the bar fits over the shaft on the drive converter.

If adjustment of the converter center distance is required:

1. Loosen the jackshift adjusting bolt and locknut, the two bolts on the jackshaft bearing retainer, and the four bolts holding the chaincase to the chassis. (See Figures 2-73 and 2-74.)



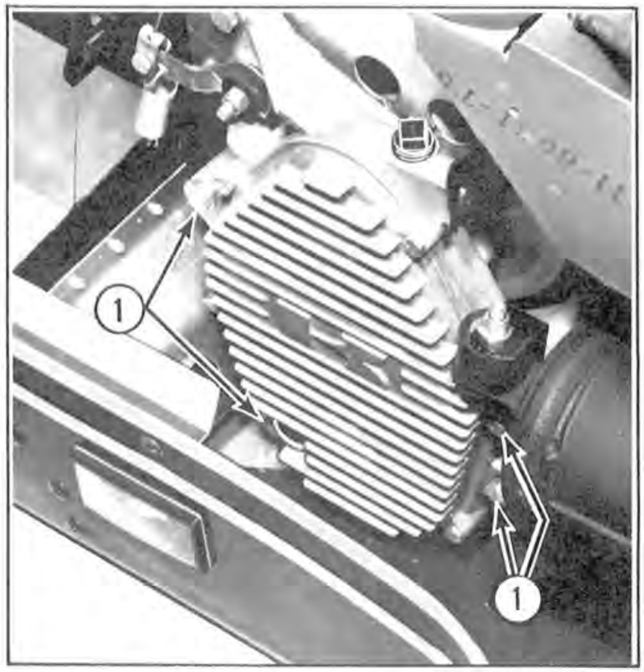
1. Bearing Retainer Bolts
2. Adjusting Bolt Locknut
3. Adjusting Bolt
4. Bearing Support
5. Shims

Figure 2-73

2. Move the bearing retainer and chaincase forward or rearward, as required, to obtain 12.0 in. (304.8 mm) center distance.

CAUTION

When moving or removing the jackshaft bearing retainer, remember the number and placement of the shims between the retainer and the frame. The bearing retainer should be shimmed until the jackshaft centerline is 6.62 in. (168.15 mm) above the track driveshaft centerline.



1. Mounting Bolts

Figure 2-74

3. Check the shimming of the jackshaft bearing retainer as follows:

   a. Remove the shims below the bearing retainer.

   b. Position the bottom of the retainer parallel to the top of the chassis.

   c. Install U shaped shims, as required, to fill the space between the bottom of retainer and top of chassis.

This procedure will prevent excessive preloading of jackshaft bearing at chaincase end of shaft.

4. Turn the adjusting bolt so the head of the bolt contacts the jackshaft bearing retainer flange, and tightens the jam nut.

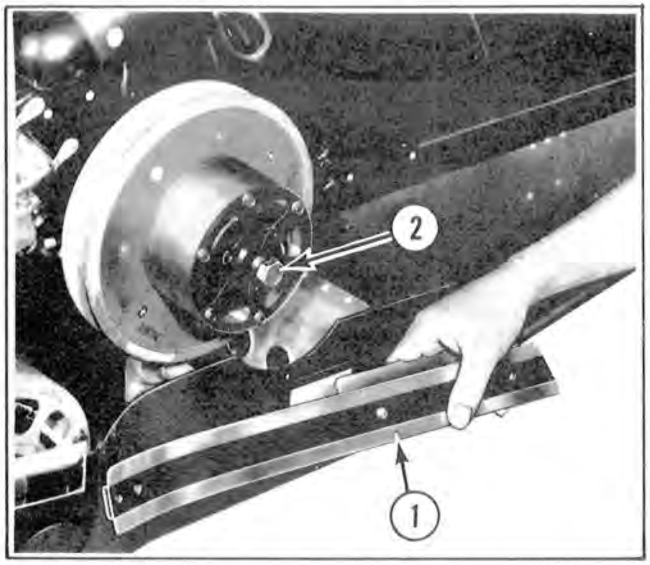
5. Tighten all bolts and locknut on the jackshaft bearing retainer and chaincase.

OFFSET DISTANCE

Correct offset distance is obtained when the surface of the shallow notch on the alignment bar touches the base of the fixed sheave of the drive converter.

If adjustment to the offset distance is required:

1. Remove the left side aluminum trim from lower pan. (See Figure 2-75.)



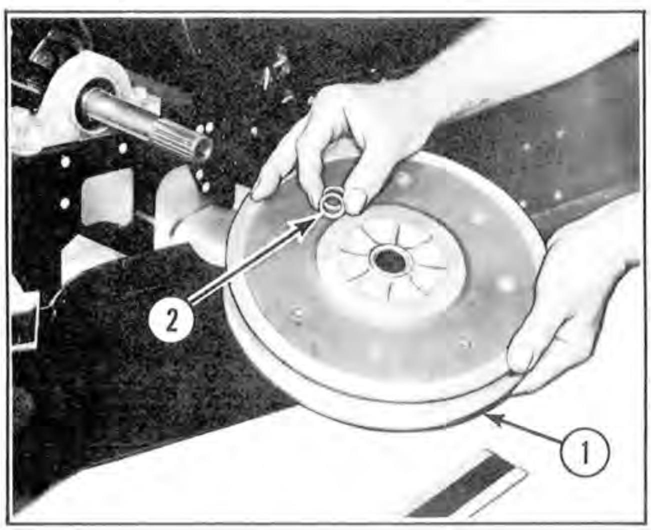
1. Aluminum Trim
2. Retaining Bolt

Figure 2-75

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 0.588 in. (14.9 mm) offset. (See Figure 2-76.)

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

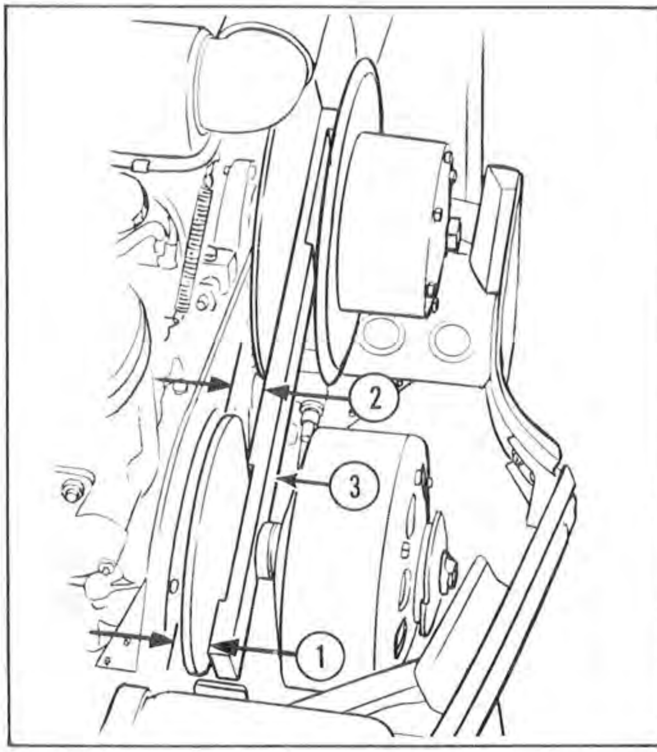


1. Driven Torque Converter
2. Shims

Figure 2-76

PARALLELISM

1. When checking the center-to-center and offset distances, parallelism must be checked by measuring dimensions A and B as shown in Figure 2-77. Compare dimensions A and B against Notes I and II.



1. Distance A
2. Distance B
3. Alignment Gauge P/N 57001-3503

Figure 2-77

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 0.02 in. (0.5 mm).

2. If dimension A is less than dimension B, parallelism between engine crankshaft and jackshaft 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 the right side of the engine either toward the front or rear whichever is necessary. After the converters are parallel, install the shims as required on either side of the mount to fill the space between the engine mount and the slotted engine mount brackets on the chassis.

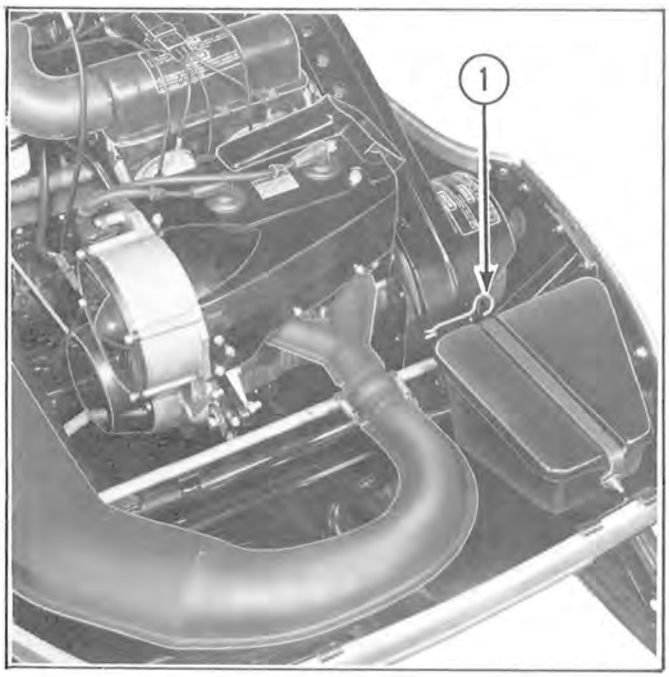
c. Securely tighten the large bolts in the two engine mounts after parallelism is obtained.

Drive 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:

1. Remove the safety pin securing the belt guard at the rear, and swing the belt guard forward. The belt guard must be swung around the intake silencer hose. (See Figure 2-78.)
2. Rotate the movable half of the driven converter towards the rear of the vehicle while pushing it towards the steering post. Assistance of another may be required to apply the brake while rotating sheave. (See Figure 2-79.)



1. Safety Pin

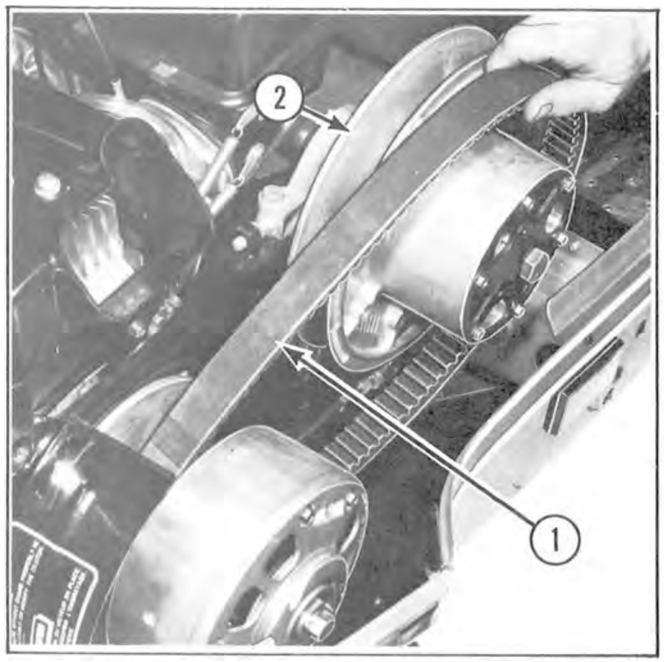
Figure 2-78

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 2-79

3. Roll the drive belt up and off of the driven converter, then slowly release the movable sheave. (See Figure 2-80.)



1. Drive Belt
2. Driven Converter Movable Sheave

Figure 2-80

4. Work the drive belt past the driven converter hub, then remove it from the drive converter. (See Figure 2-81.)

Figure 2-81

Install a replacement drive belt as follows:

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

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

3. Roll the drive belt over the top of the sheave, being careful not to pinch your fingers, and into position in the driven converter.

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

CAUTION

Be certain the intake silencer hose is directed to the rear after the converter guard is reinstalled, as incorrect position may result in engine damage.

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

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

Drive and Driven 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

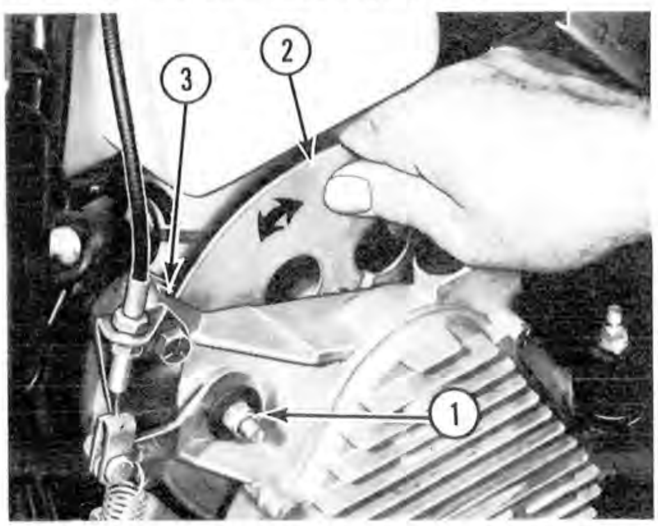
Check the brake adjustment to be sure the brake disc can be moved back and forth with just a very slight brake drag on the brake disc and that the brake lever movement is less than 3/4 in. (19 mm) when applying the brake. (See Figure 2-82.)

Figure 2-82

WARNING

DO NOT OVERTIGHTEN the brake because damage to components, or personal injury could result

If brake adjustment is required, turn the adjusting nut while simultaneously moving the brake disc back and forth until the brake pads just begin to move with the disc. (See Figure 2-83.)

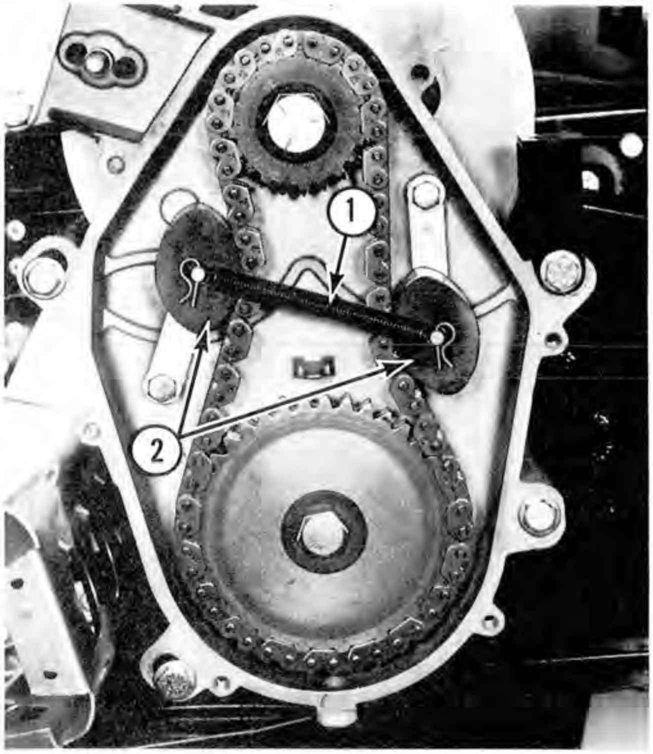


1. Brake Adjusting Nut
2. Brake Disc
3. Brake Pads

Figure 2-83

Drive Chain Tension

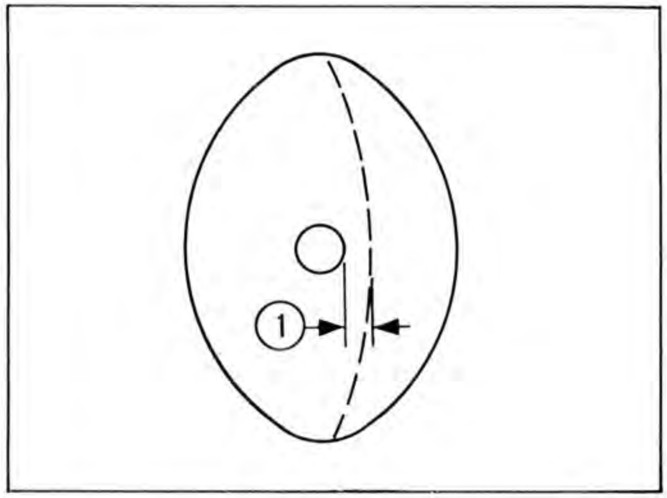
The drive chain is self-adjusting for tension but the plastic chain guides should be inspected for wear. Turn or replace if necessary.



1. Tensioner Spring
2. Chain Guides

Figure 2-84

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 2-85.)



1. 0.12 in. (3.0 mm)

Figure 2-85

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	Gear Ratio Speed Chain Pitch Tensioner Spring			1.90 *75 MPH 64 Red	1.80 *80 MPH 64 Pink		
37	Gear Ratio Speed Chain Pitch Tensioner Spring	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
38	Gear Ratio Speed Chain Pitch Tensioner Spring	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
39	Gear Ratio Speed Chain Pitch Tensioner Spring			2.05 *70 MPH 66 Red	1.95 *73 MPH 66 Pink	1.86 *77 MPH 66 Green	
40	Gear Ratio Speed Chain Pitch Tensioner Spring	2.35 *61 MPH 66 Pink	2.22 *64 MPH 66 Pink	2.11 *68 MPH 66 Green	2.00 *72 MPH 66 Green		

*Theoretical MPH at 7,200 RPM

NOTE: All top speeds based on 0.96 overdrive in converter and engine RPM at 7,200.

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)	0.049 in. (1.245 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)

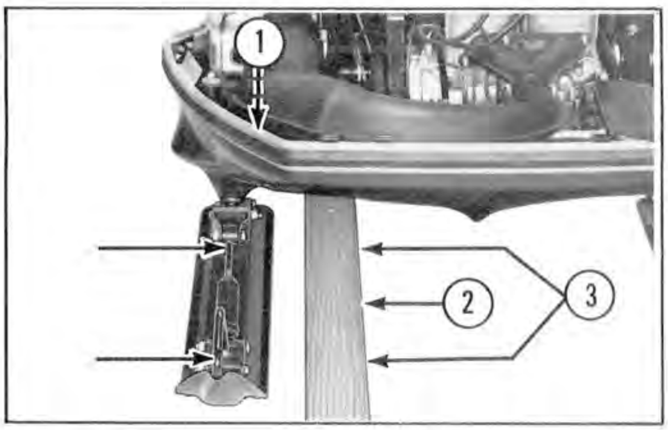
Track, Suspension, and Steering System Maintenance

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 the track, and measure the clearance between the board and center line of the ski. Position the ski so that the distance measured between the ski center line and edge of the board is the same at the front and rear of the ski. (See Figure 2-86.)



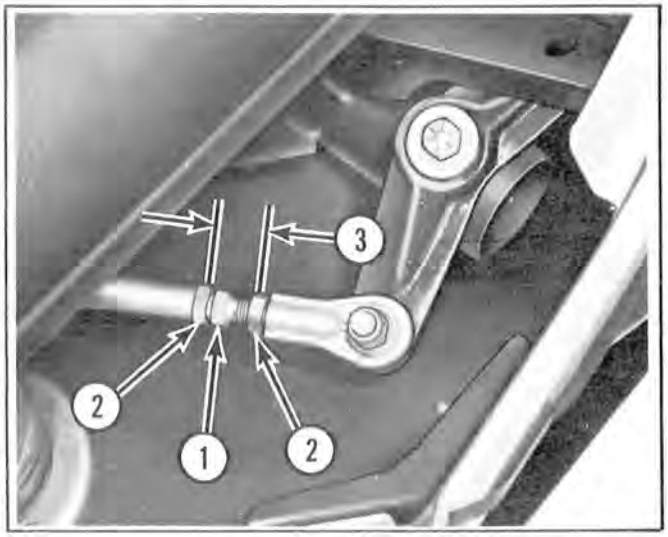
1. Tie Rod End
2. Straightedge Against Track
3. Measure Clearance Here

Figure 2-86

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

3. If the handlebar requires centering, loosen the lock (jam) nuts and turn the tie rod length adjusting stud in the direction necessary to center the handlebar. (See Figure 2-87.)

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



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

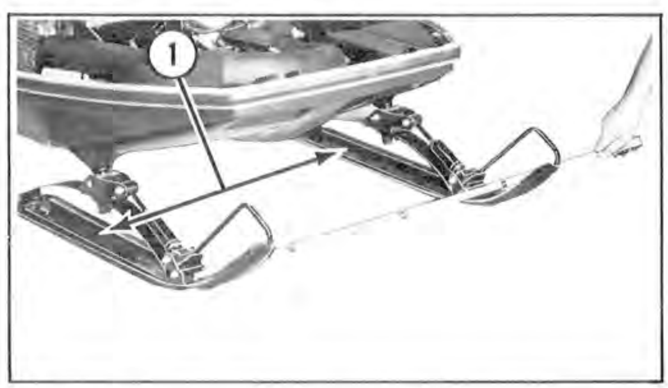
Figure 2-87

WARNING

If the dimension shown in Figure 2-87 exceeds 1-1/4 in. (32 mm), refer to Section 3 and check for damaged steering system components.

4. To align the other ski, move both ski tips towards the center of the snowmobile to remove the steering linkage play. Loosen the 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 2-88.)

5. Tighten all the hardware (nuts, bolts, etc.) in the steering system.



1. Equal Distance Front and Rear

Figure 2-88

Ski Runners

Excessively worn ski runners can greatly reduce the handling of your snowmobile. The runners 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 the runners are more than 3/4 worn at any point. Refer to Section 3 for ski runner replacement.

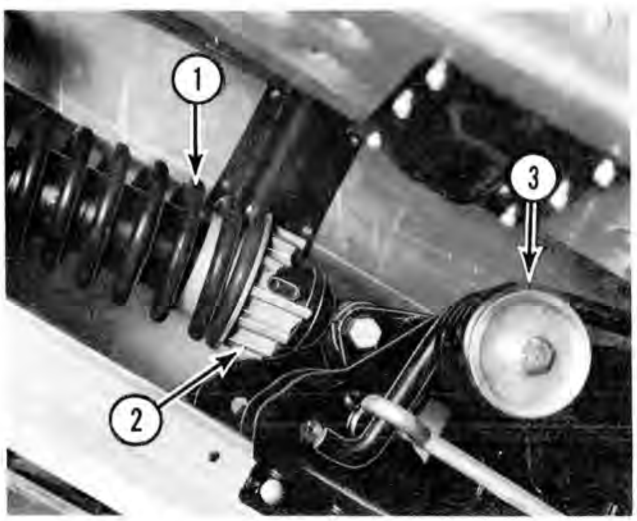
Suspension Adjustment

The slider suspension is fully adjustable for rider comfort.

The adjustments consist of changing the 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 is controlled by changing spring tension of the rear cam. Tightening the adjustment cam with the cam wrench will stiffen the ride and carry more driver or passenger weight. (See Figure 2-89.)

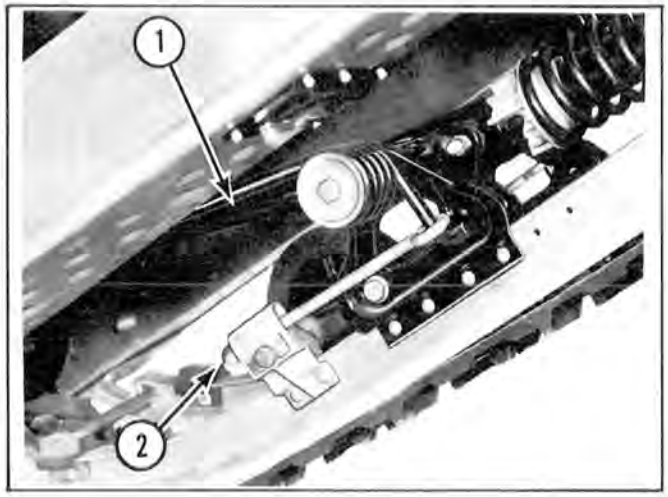


1. Shock Absorber Spring
2. Adjustment Cam (Ride)
3. Front Suspension Springs

Figure 2-89

Handling Adjustment

The handling adjustment is controlled by changing the spring tension of the front arm only. (See Figure 2-90.)



1. Front Suspension Arm
2. Adjustment Nut (Handling)

Figure 2-90

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 2-90.)

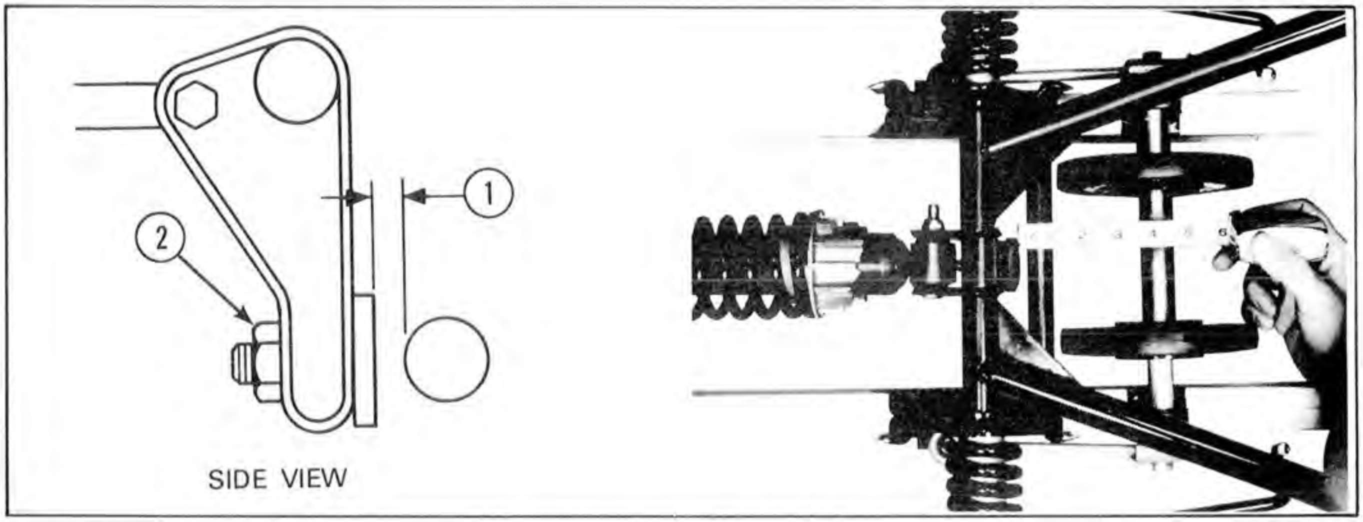
Any changes to the adjusting nuts will change the snowmobile's handling characteristics. If the nuts are tightened, the front of the suspension presses harder on the ground and results in less ski pressure. Loosening the nuts causes the front of the suspension to have less pressure on the ground, causing the ski pressure to increase. A change in ski pressure will affect the vehicle steering response.

Travel Limiter

The travel limiter limits the amount of ski lift during acceleration. For general riding the clearance between the rubber washer and the stop should be 1/4 in. (6.35 mm) or less. For riding on ice, this clearance can be decreased to allow the skis to remain on the surface. When riding in powder snow, this clearance can be increased to allow the skis to ride higher. (See Figure 2-91.) This adjustment will have an effect on the steering response during acceleration. Adjust the travel limiter with the weight of the snowmobile on the ground.

CAUTION

Clearance between the rubber washer and the stop should never exceed 1/2 in. (12.7 mm), serious damage to the slide rails or track could occur.



1. 1/4 in. (6.35 mm)
2. Adjusting Nut

Figure 2-91

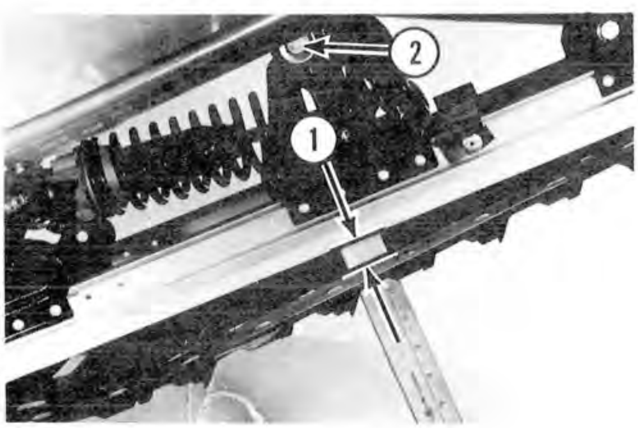
Track Tension Adjustment

WARNING

While raising the snowmobile off the ground, place the skis against a stationary object and secure the vehicle to prevent personal injury.

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.

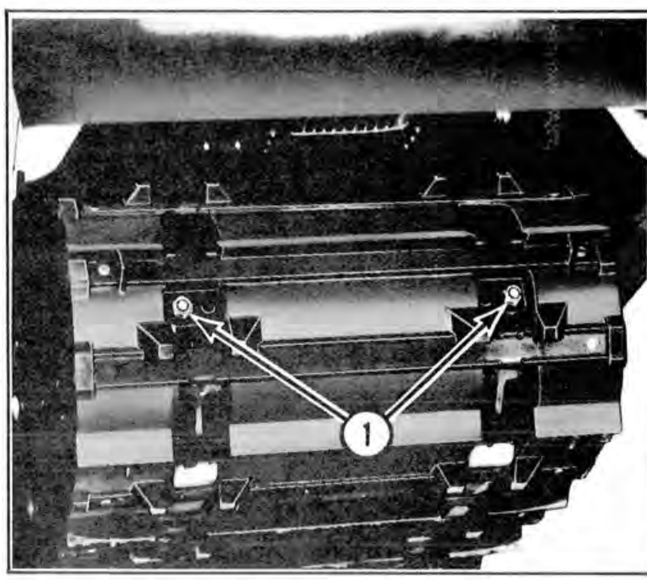
2. With a 5 to 8 lb (2.2 to 3.6 kg) weight hanging from the center of the track, the clearance from the bottom of the wear strip to the top of the track should be 3/4 in. (19 mm). This dimension should be measured in the area directly below the rear suspension pivot arm bolt. (See Figure 2-92.)



1. 3/4 in. (19 mm)
2. Rear Pivot Bolt

Figure 2-92

3. Loosen the rear axle wheel assembly mounting bolt on either end of the rear axle. Turn the rear axle adjusting nuts through rear track openings, clockwise, to decrease the clearance between the wear strip and track. (See Figure 2-93.)



1. Rear Axle Adjusting Nuts

Figure 2-93

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

5. Remove the weight from the track.

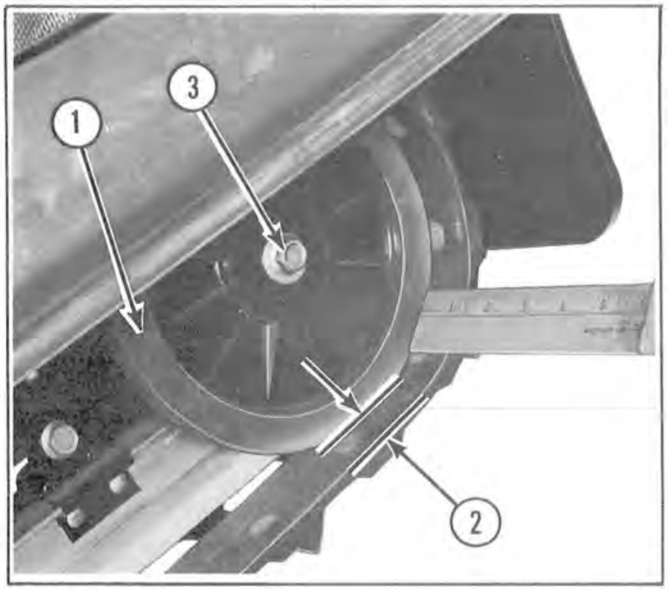
6. Start the engine and push on the throttle only enough to turn the track slowly a few revolutions. Stop the engine and perform the Track Alignment check.

Track Alignment

WARNING

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

Track alignment is correct when the distance between the rear idler wheel and edge of the track is equal on both sides. (See Figure 2-94.)



1. Idler Wheel
2. Dimension Equal on Both Sides
3. Rear Axle Wheel Assembly Mounting Bolts

Figure 2-94

If the track runs to one side, tighten the rear axle adjusting nut on the same side, approximately 1/2 turn, then restart the engine and recheck the alignment.

When track alignment is correct, tighten the rear axle wheel assembly mounting bolts.

Storage

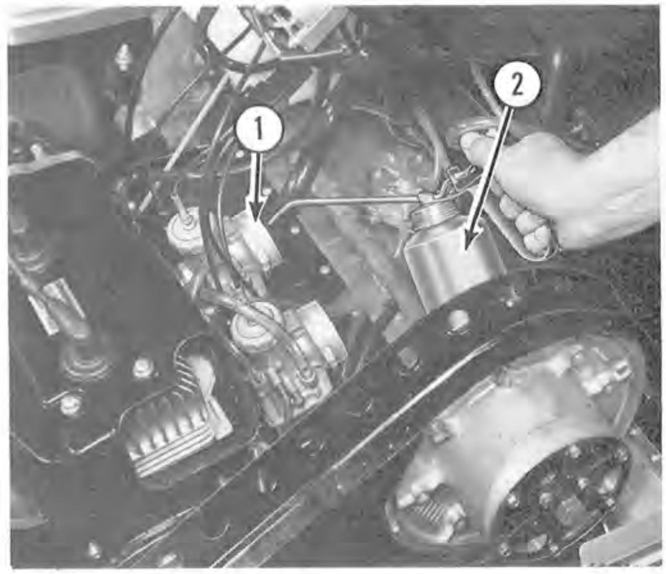
Preparation for Storage

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 the air intake silencer from the carburetor.

4. Start the engine. With the engine running at idle speed, slowly inject Kawasaki Snowmobile Oil into the carburetor opening. (See Figure 2-95.) Stop the engine when excessive smoking from the muffler outlet pipe is noticed. This procedure lubricates the internal engine components to prevent rust



1. Carburetor
2. Oil Can

Figure 2-95

5. Install the air intake silencer to the carburetor.

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

7. Check the chaincase lubricant level.

8. Remove the drive belt.

CAUTION

DO NOT LUBRICATE THE DRIVE CONVERTER OR DRIVEN CONVERTER.

9. Drain and refill engine gearcase.

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

11. Loosen the rear axle wheel assembly mounting bolt on either end of rear axle then loosen adjusting nuts to relieve track tension.

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

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

Removal From Storage

1. Fill the fuel tank with fresh fuel.

2. Fill the oil tank with Kawasaki Snowmobile Oil.

3. 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.

4. Check and fill engine oil pump gearcase. Use Shell XL100 10W-30 non-foaming engine oil. Level should be above center of sight gauge but not higher than the top.

5. Remove the plugs (masking tape or rags) from the air intake silencer and muffler outlet.

6. Using a suitable solvent, clean the driven converter pulleys. The converter pulleys must be clean and dry.

7. Install a new drive belt. Use the one removed last year as a spare.

8. Adjust the track tension.

WARNING

Be sure engine has stopped before checking or adjusting track alignment.

9. Start the engine and rotate the track several revolutions, at low speed only, then stop engine and check the track alignment.

10. Lower the vehicle from blocks.

11. 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 for the recommended heat range and gap adjustment.

Repair

Table of Contents

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.

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, leaking or shorted.	4. Replace plug cap(s).
	5. High tension wire(s) loose, grounded or shorted.	5. Service high tension wire(s)/ coil(s).
	6. Defective CDI igniter.	6. Replace CDI igniter.
	7. Defective exciter coil.	7. Replace exciter coil.
	8. Defective pulser coil.	8. Replace pulser coil.
	9. Defective ignition coil.	9. Replace ignition coil.
	10. Weak flywheel magnets.	10. 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 pump filter.	3. Clean or replace fuel pump 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. Idle screw broken and embedded in main carburetor body casting.	4. Replace the idle screw and the main carburetor body casting.
	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. Throttle slide valves not synchronized.	9. Synchronize throttle slide valves.
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.

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. Defective pulser coil.	6. Replace pulser coil.
	7. Damaged or worn rings.	7. Replace the rings.
	8. Low crankcase pressure.	8. Check crankcase for leaks; replace oil seal or gasket.
	9. Damaged piston.	9. Replace piston and related component(s).
	10. Damaged head gasket.	10. Replace gasket.
	11. Broken (shorted) high tension leads.	11. Replace complete ignition coil.
	12. Defective plug cap(s).	12. 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.	1. High tension lead wire shorting out.	1. Replace complete ignition coil.
Note: Engine may eventually overheat.	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. Check carburetor holder to make sure it is not warped.
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. Defective ignition coil.	1. Replace ignition coil.
	2. Obstruction in fuel tank or fuel filter.	2. Clean or replace filter.
	3. Fuel line obstructed or pinched.	3. Remove obstruction, remove pinched area from fuel line.
	4. Defective CDI igniter.	4. Replace CDI igniter.
	5. Spark plug bridged.	5. Replace spark plug.
	6. Seized piston(s).	6. Replace piston and any affected components.
	7. Seized crankshaft.	7. Replace crankshaft and any affected components.
	8. Defective exciter coil.	8. Replace exciter coil.
	9. Defective pulser coil.	9. 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). 2. Short belt or incorrect center to center distance.	1. Install correct weights. 2. Install new belt and establish correct offset and center to center distance.
Maximum drive converter RPM too low.	1. Incorrect weights (too heavy). 2. Long belt or incorrect center to center distance.	1. Install correct weights. 2. Install new belt and establish correct offset and center to center distance.
Shifting too quickly.	1. Incorrect weights (too heavy). 2. Weak drive spring. 3. Driven spring preload incorrect (too loose).	1. Install correct weights. 2. Replace spring. 3. Correct spring preload.
Shifting too slowly.	1. Incorrect weights (too light). 2. Spring too strong. 3. Driven spring preload too tight.	1. Install correct weights. 2. Replace spring. 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. 2. Thickness of belt on inside diameter exceeds specifications.	1. Replace drive belt. 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. 2. Too much throttle applied under heavy load - excessive slippage. 3. Weak drive converter spring. 4. Drive converter engagement rpm too low.	1. Install correct drive belt. 2. Tell driver to decrease throttle under heavy load condition; install new belt. 3. Perform spring pressure test; install new spring if spring is weak. 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. 2. Sprocket teeth worn. 3. Sprockets misaligned.	1. Check chain guides and tensioner springs. 2. Install new sprockets and chain. 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. 2. Rear idler wheels do not turn or otherwise damaged.	1. Set track tension and alignment. 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. 2. Track is misaligned.	1. Straighten slide rail(s) or install new rails. 2. Set track tension and alignment.
Driven Converter Problem	**Condition**	**Remedy**
Low engine RPM yet belt shifts completely through driven converter operating range (1 to 1 ratio).	1. Weak spring or broken spring.	1. Rotate end of spring clockwise in 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 to 1 ratio).	1. Incorrect spring - too heavy. 2. Dirt on movable or stationary sheave. 3. Excessively worn movable or stationary sheave.	1. Install correct spring. 2. Clean sheaves. 3. Install new components.

Electrical Troubleshooting

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 CDI 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 CDI 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 CDI ignition load coil is used in conjunction with the tester and is designed to provide an output load for the CDI 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.

Starting With Magneto Ignition

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.

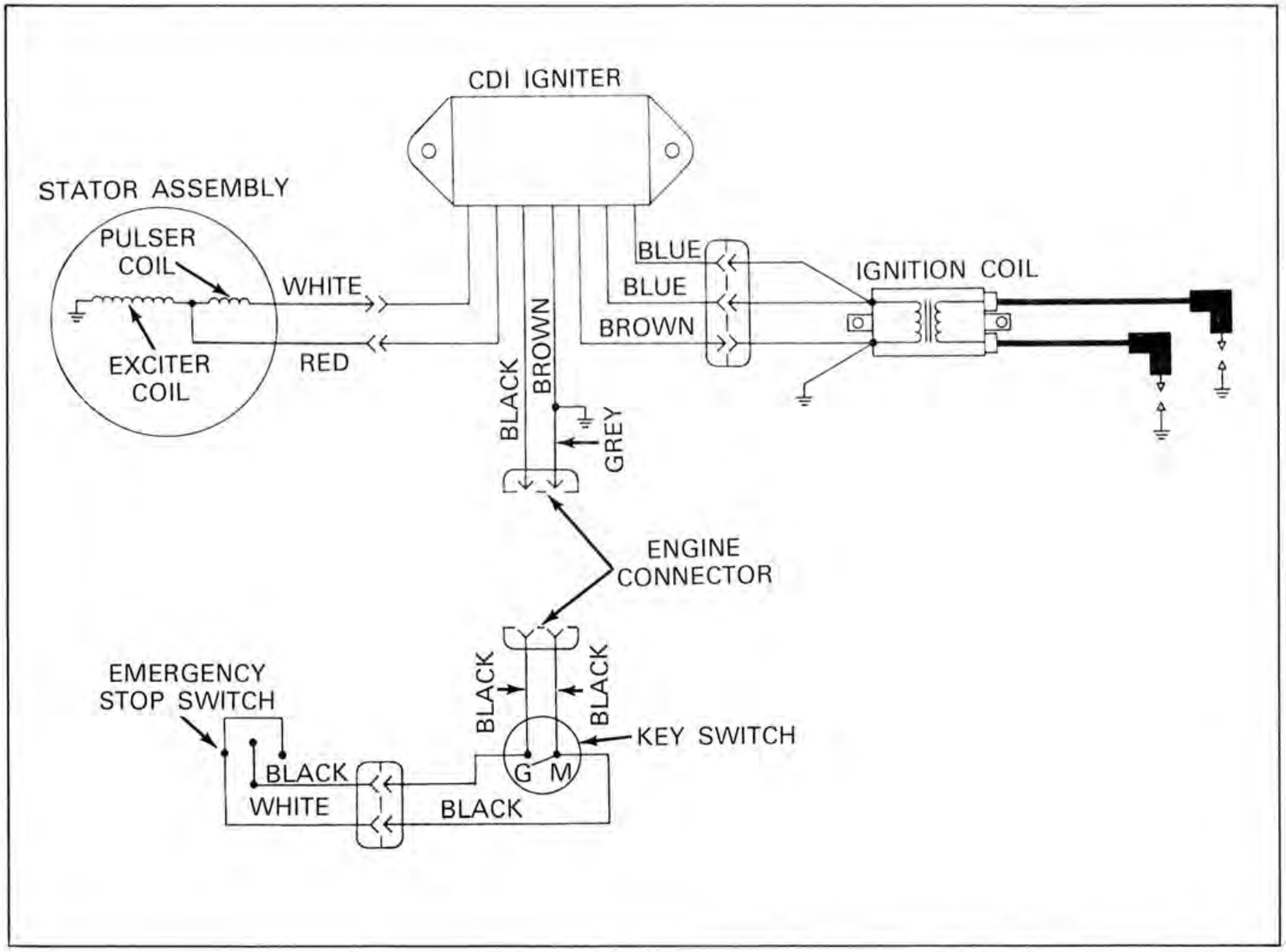
CAUTION

Never perform tests on the CDI igniter without the ignition coil or the tester connected to the output connections. This will prevent internal damage to the CDI igniter.

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.

Preliminary Ignition Troubleshooting Procedures

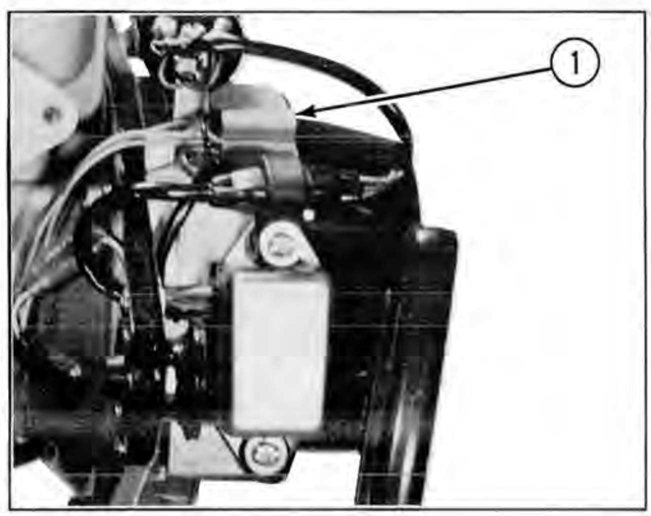


When an ignition problem is present, prior to performing elaborate troubleshooting try to solve your problems by performing the easy tests first.

1. Remove the key switch and emergency stop switch circuits from the system. (See Figure 3-1.) Separate wiring harness connector on the engine.

   a. Start the engine. If the engine runs properly with the connector separated, ignition components on the engine are ok, then it must be the key switch, the emergency stop switch or the wiring. Refer to Key Switch and Emergency Stop Switch Tests.

   b. If the engine ignition problem still exists, test the ignition components mounted on the engine.



1. Engine Wiring Connector

Figure 3-1

2. Check the condition of the grounded BROWN wire between the ring terminal at the engine connector and the ring terminal on the primary of the ignition coil.

   a. Remove the screw securing each ring terminal to ground.

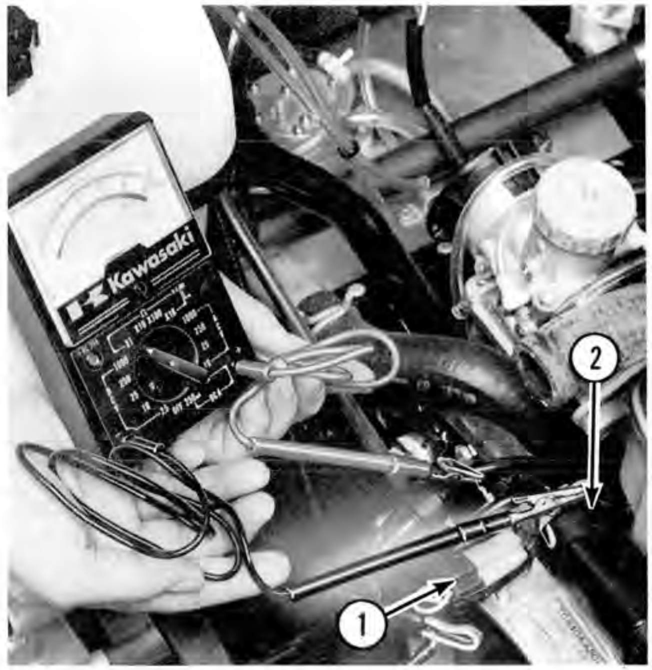
   b. Set meter to low ohms scale (X1). Connect one ohm meter lead to the ring terminal removed from the ground at the ignition coil. Connect the other ohm meter lead to the ring terminal removed from the ground at the engine connector. (See Figure 3-2.)

   c. If ohmmeter indicates closed circuit (0), BROWN ground wire between the engine connector and the ignition coil is okay.

   d. If ohmmeter indicates open circuit (∞) or high resistance, BROWN ground wire is defective. Check BROWN wire connection at the ring terminals, the three wire connector between CDI igniter and ignition coil. If the wire checks okay, replace the CDI igniter.

The following tips can help you locate your ignition problem.

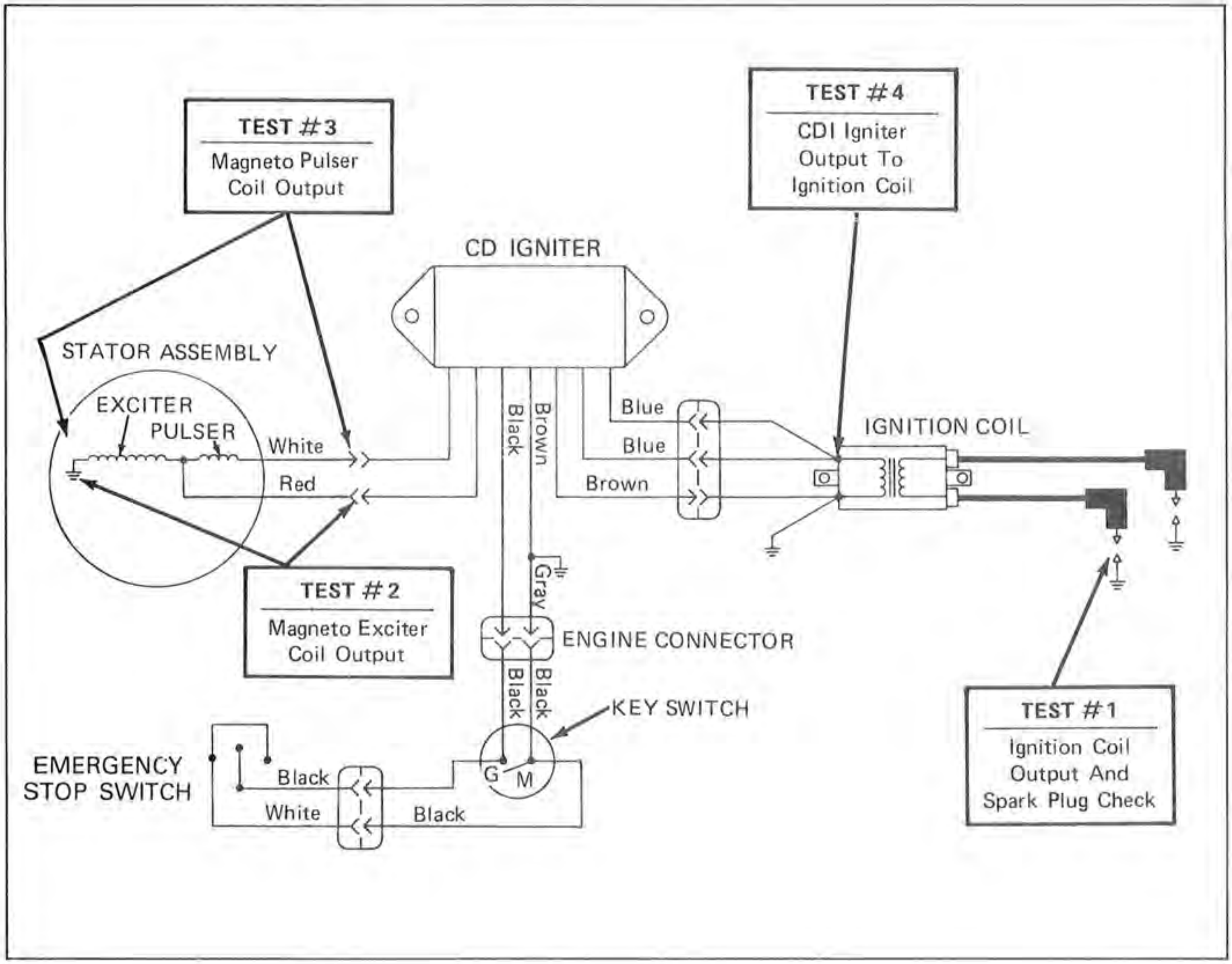
1. A defective exciter coil, CDI igniter, ignition coil, key switch or emergency stop switch can be the cause of no spark, weak spark or intermittent spark.
2. A defective pulser coil can be the cause of no spark or intermittent spark but not a weak spark.



1. Engine Connector
2. Ignition Coil

Figure 3-2

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

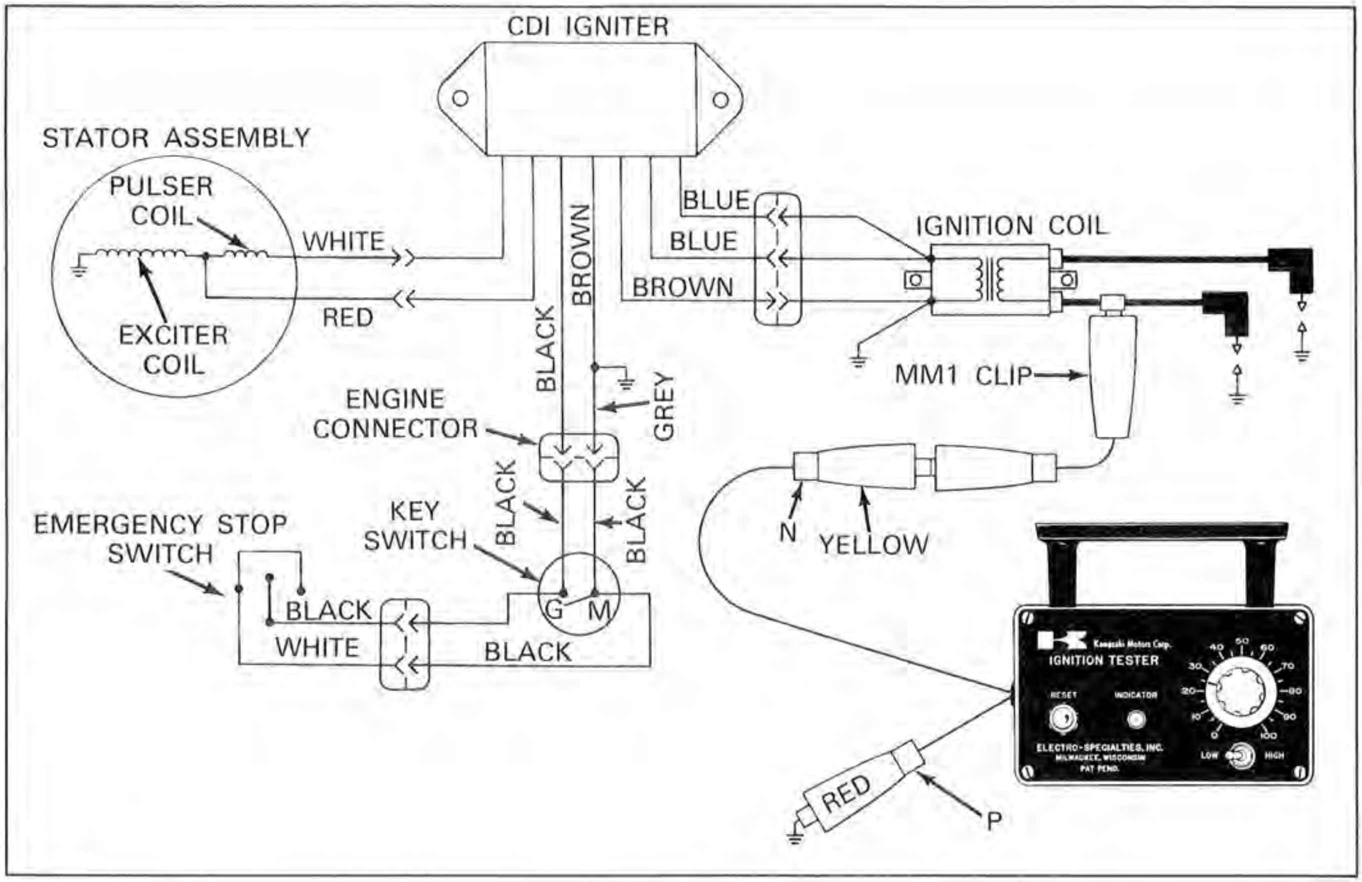


TEST #1		TEST #2		TEST #3		TEST #4	
RANGE	DIAL SETTING	RANGE	DIAL SETTING	RANGE	DIAL SETTING	RANGE	DIAL SETTING
Low	25	High	50	Low	90	High	55

NOTE: Refer to following pages for detailed testing procedures.

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.

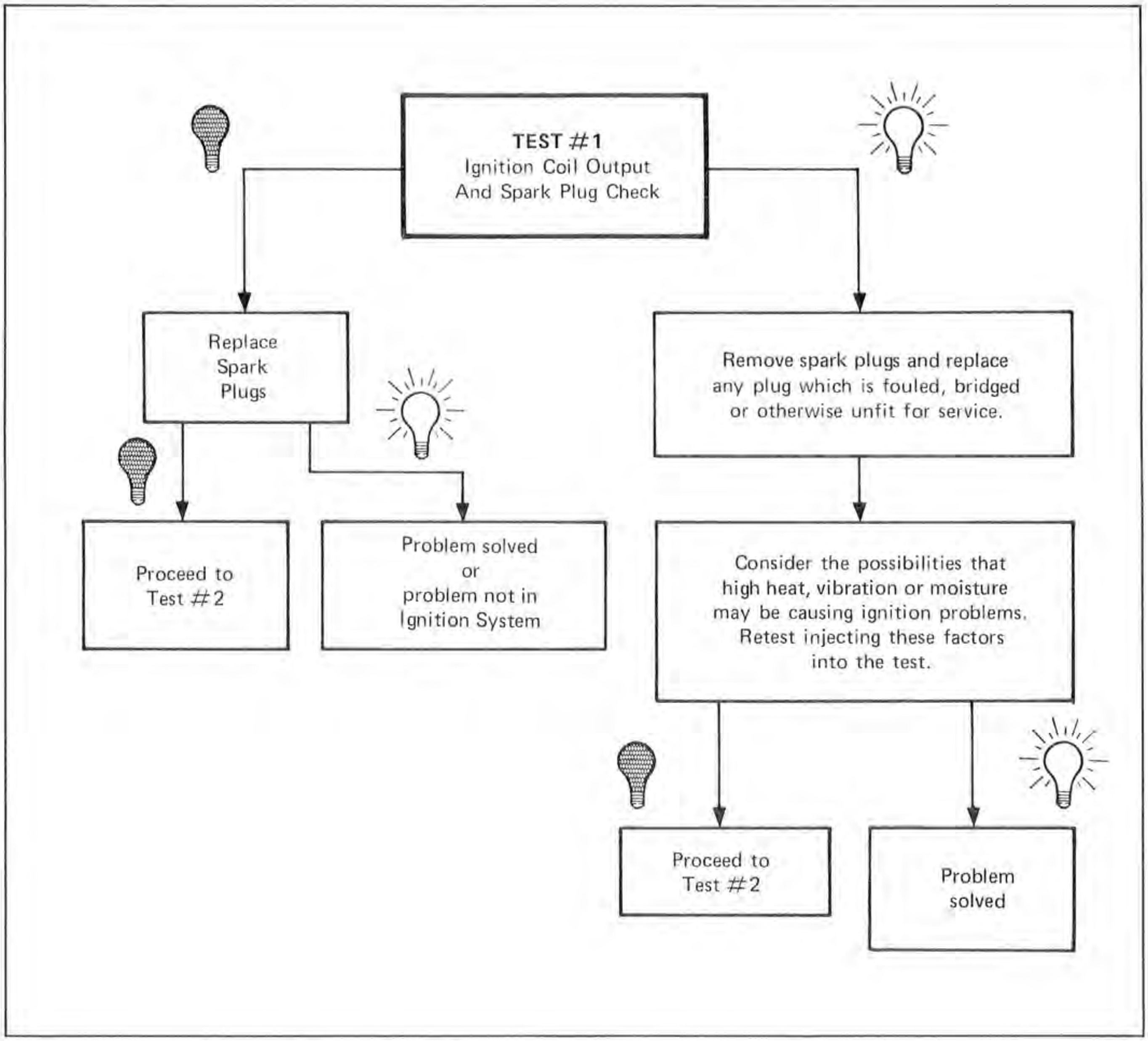
TEST PROCEDURE

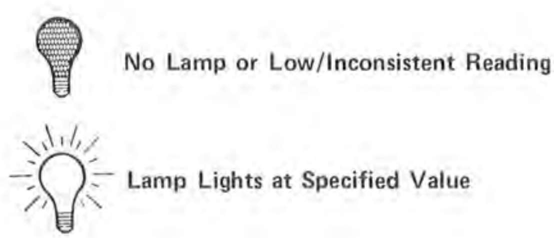
NOTE: After each test that lights the Indicator Lamp, push the Reset button to turn the lamp off in preparation for the next test.

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.

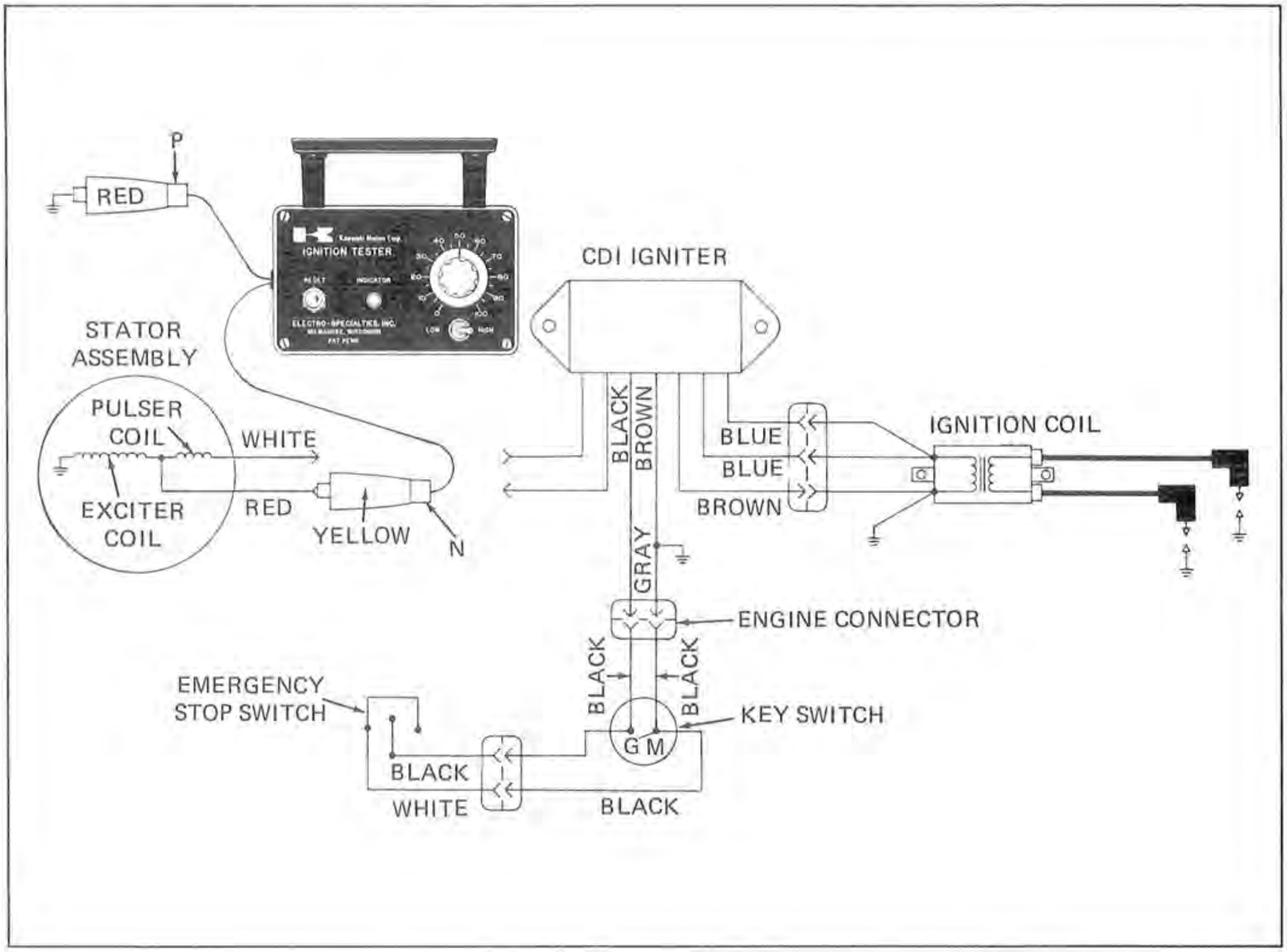




STANDARD VALUE TEST #1

RANGE	VALUE
Low	25

Test No. 2
Magneto Exciter Coil Output



CAUTION

Do not turn over the engine unless either coil or tester is connected to the CDI igniter.

TEST CONNECTIONS

1. Disconnect the red and white wires between the magneto assembly and the CDI 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 50.
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 50, magneto exciter coil is good, proceed to Test No. 3.

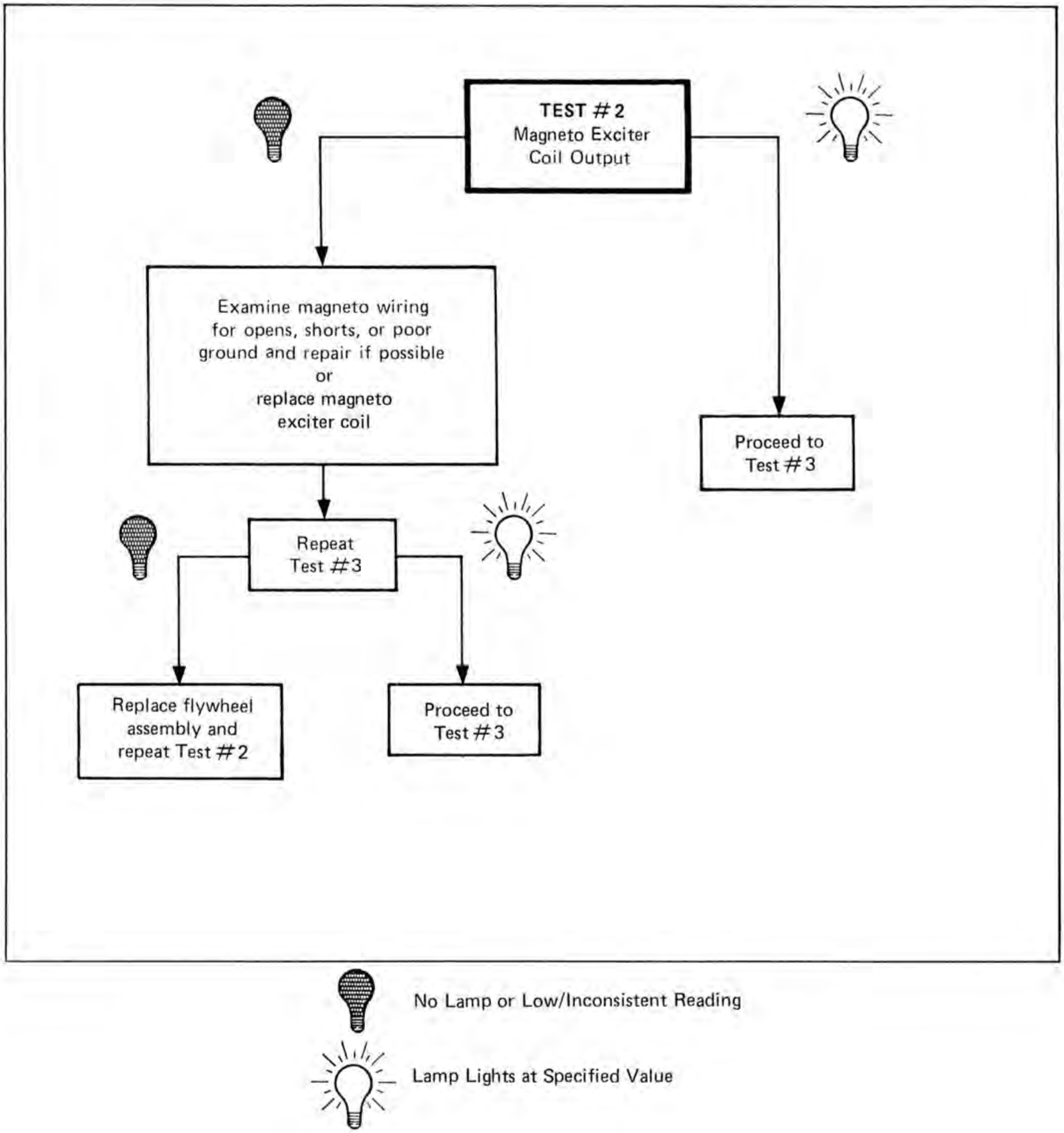
   b. If the Indicator Lamp gives inconsistent readings at any dial setting or does not light at all, this indicates the following:

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

   (2) Defective wiring. Check the wiring.

   (3) Defective flywheel magnets. Replace the magnets.

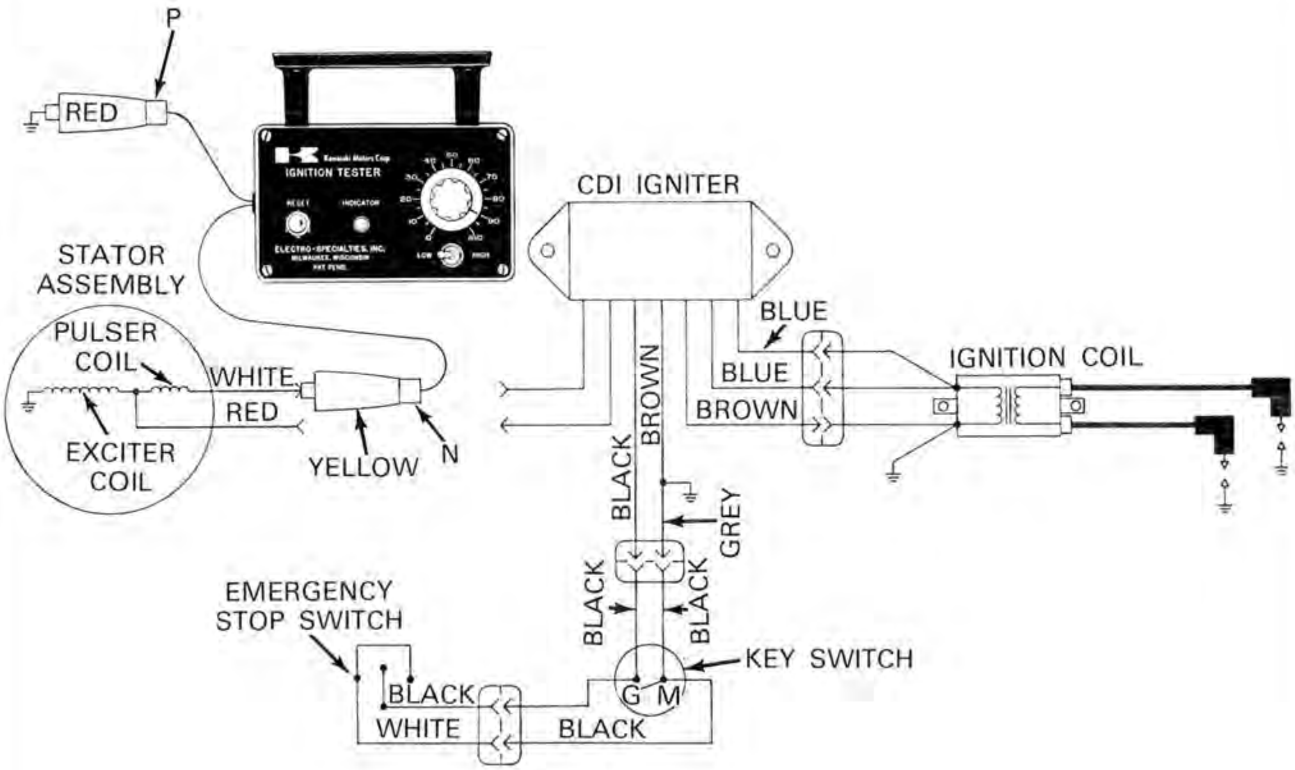
Follow the steps in the chart on the next page.



STANDARD VALUE TEST # 2

RANGE	VALUE
High	50

Test No. 3
Magneto 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.

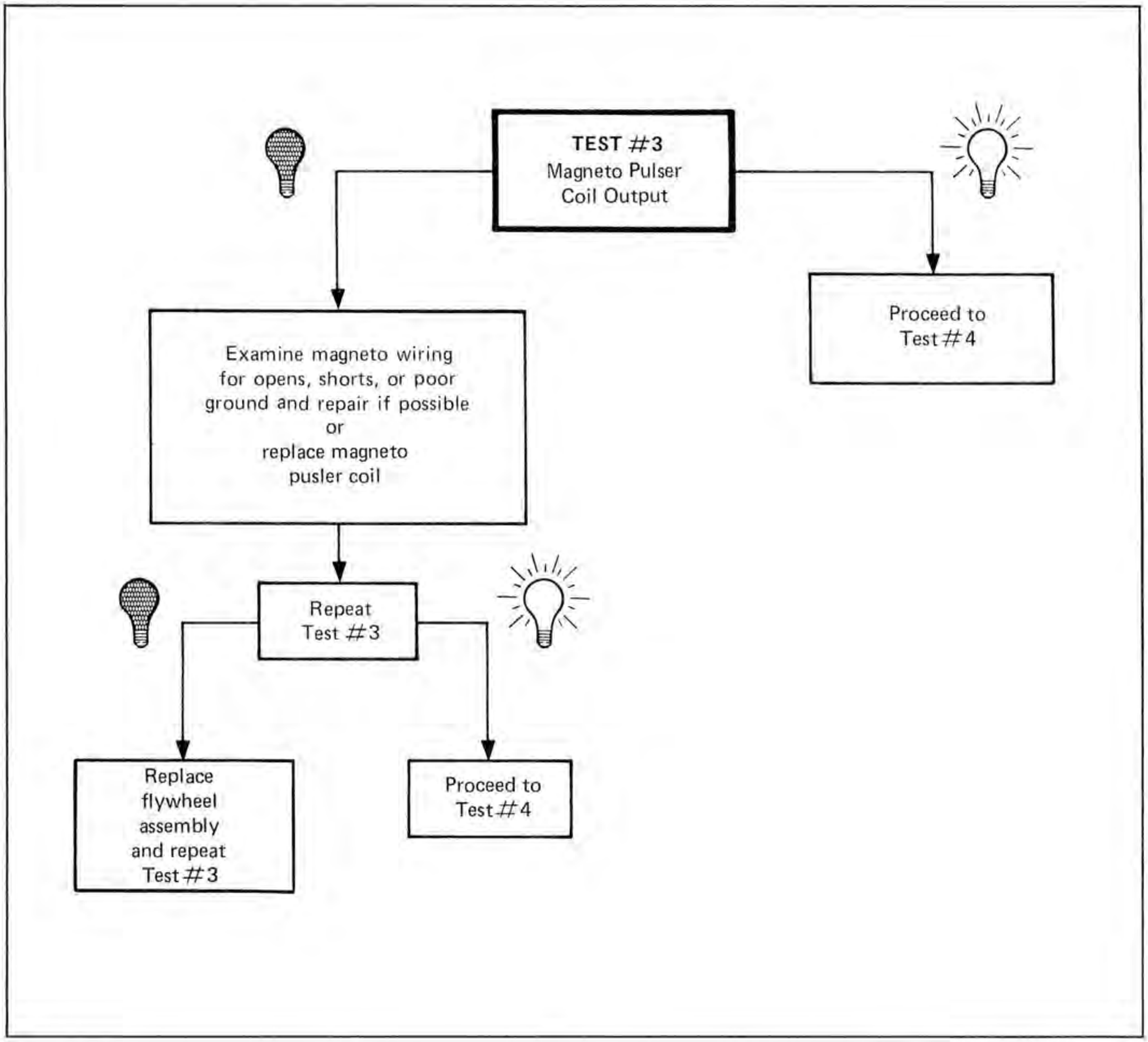
TEST PROCEDURE

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, proceed to Test No. 4.

   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

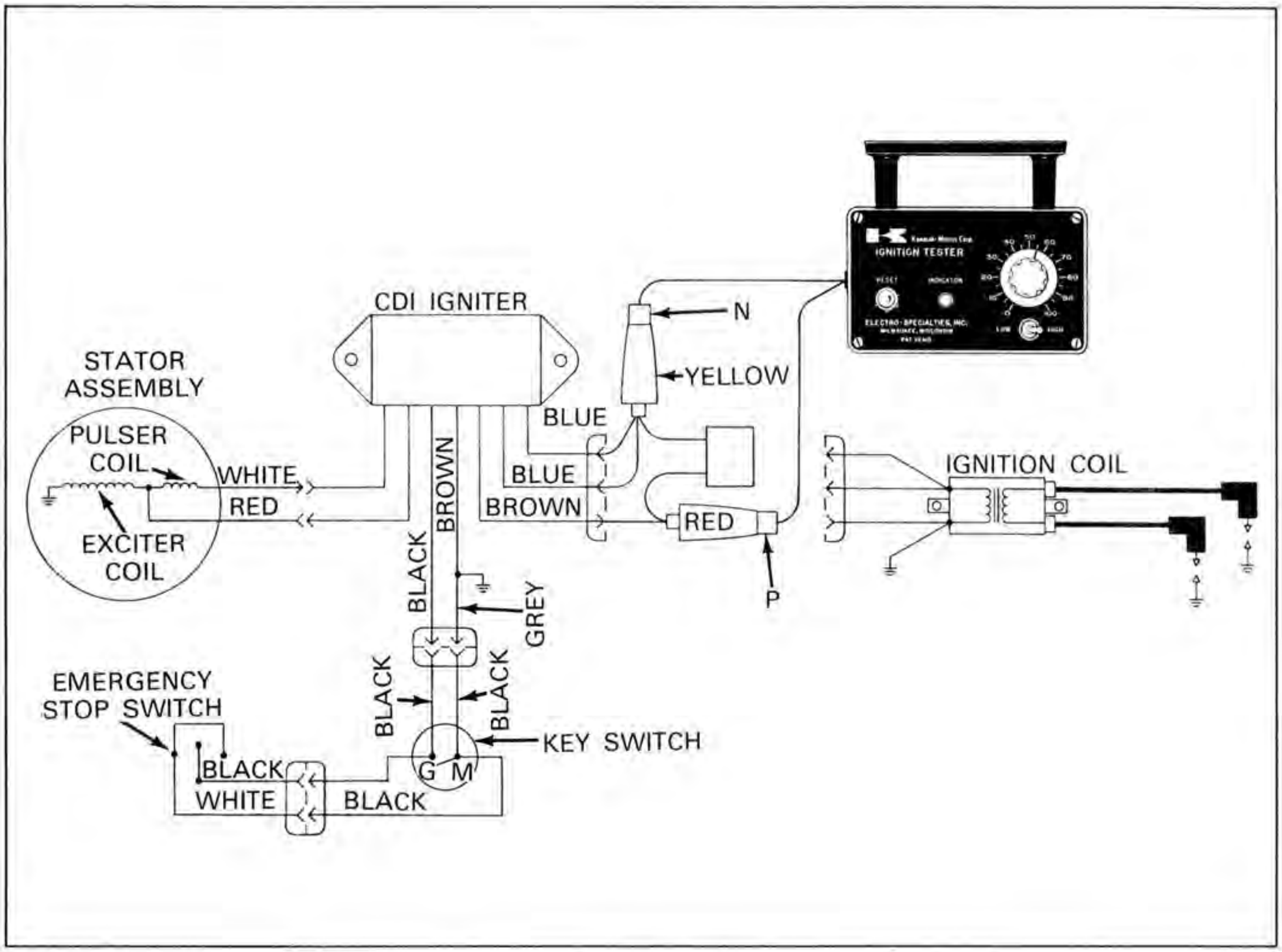
Lamp Lights at Specified Value

STANDARD VALUE TEST #3

RANGE	VALUE
Low	90

Test No. 4

CDI Igniter Output To Ignition Coil



TEST CONNECTIONS

1. Disconnect the three-wire connector between the CDI igniter and the ignition coil.

2. Connect the tester N (yellow) lead to both blue wire terminals in the CDI igniter half of the three-wire connector. Form the test jumper into a loop to aid in this connection.

4. Connect the tester P (red) lead to the brown wire terminal in the CDI igniter half of the three-wire connector.

5. Connect the load coil between the tester P (red) and N (yellow) lead wires.

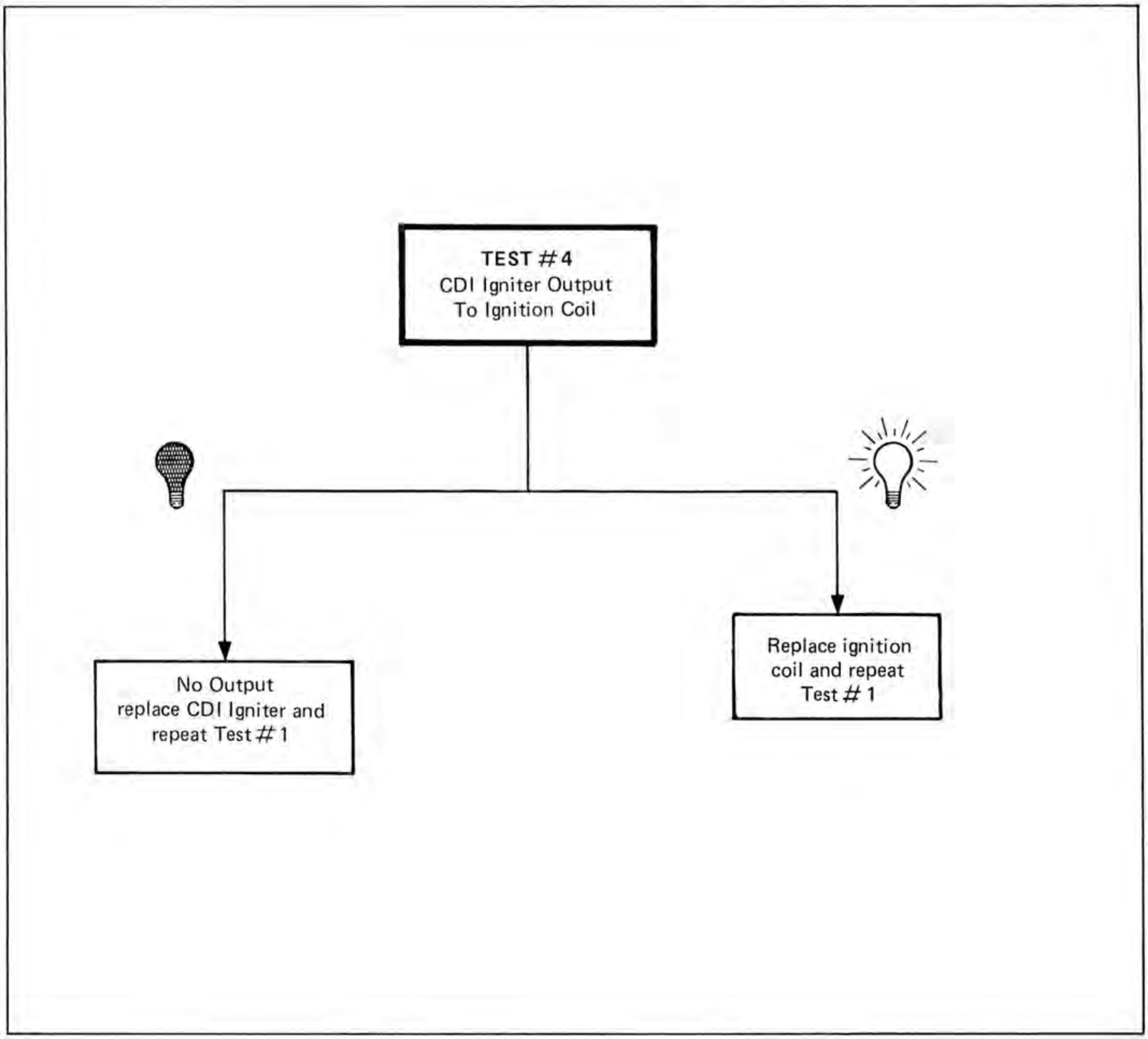
TEST PROCEDURE

1. Set the toggle switch to the High range. Set the tester dial to 55.

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 4 three times. If the lamp lights consistently at 55 the CDI igniter is good. Replace the ignition coil and repeat Test No. 1.

   b. If the Indicator Lamp gives low/inconsistent readings or does not light at all, replace the CDI igniter.



No Lamp or Low/Inconsistent Reading

Lamp Lights at Specified Value

STANDARD VALUE TEST # 4

RANGE	VALUE
High	55

Ignition Troubleshooting Using an Ohmmeter

GENERAL DESCRIPTION

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

If the Kawasaki CDI 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 CDI tester and the results are not 100% conclusive. Resistance and AC voltage readings that meet the specified value in the chart indicate that the coil "should" operate okay. AC voltage tests are performed with the spark plug installed and cranking the engine with normal starting effort.

Observe the following notes when performing the troubleshooting procedures.

NOTE: Use the flywheel puller (special tool) to remove the flywheel. Never attempt to remove using a hammer. The flywheel or crankshaft will be damaged.

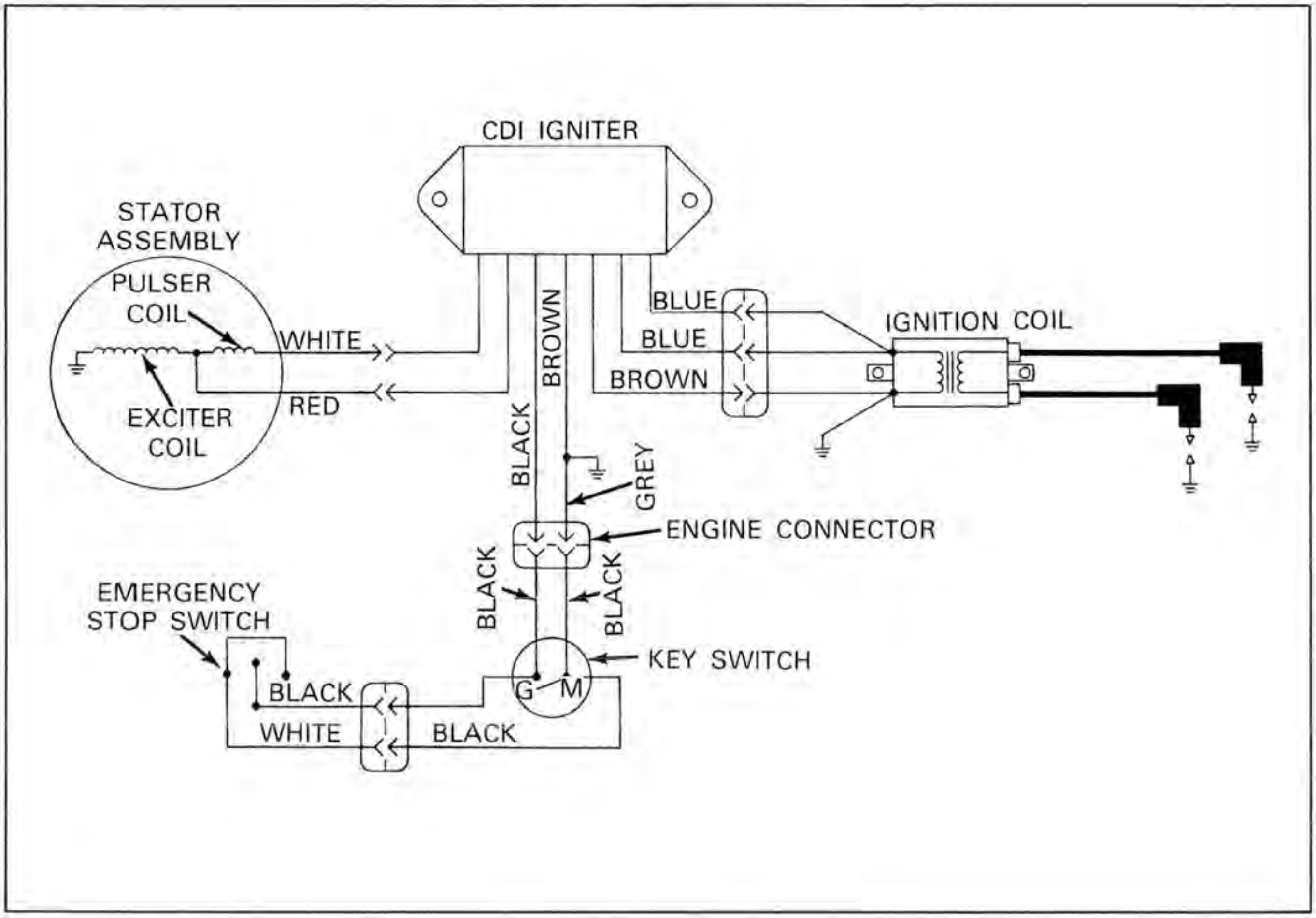
NOTE: Exercise care to prevent an electrical shock from the CDI igniter. Handle the CDI igniter carefully. If you should drop it, the incorporated electronic components will be damaged.

The troubleshooting table lists ignition problems and possible conditions which would cause them. To determine whether the magneto or ignition coils are defective, check the resistance readings values listed on the following page. If the resistance readings obtained are not within the range given in the tables, the component is defective and must be replaced.

1. CHECKING CDI WIRING CONNECTIONS

   The wiring between the magneto, CDI igniter, and ignition coil uses couplers to prevent any wrong connection. All wiring connections must be done accurately. Only wires of like colors should be connected together by the couplers.

CDI WIRING CONNECTIONS

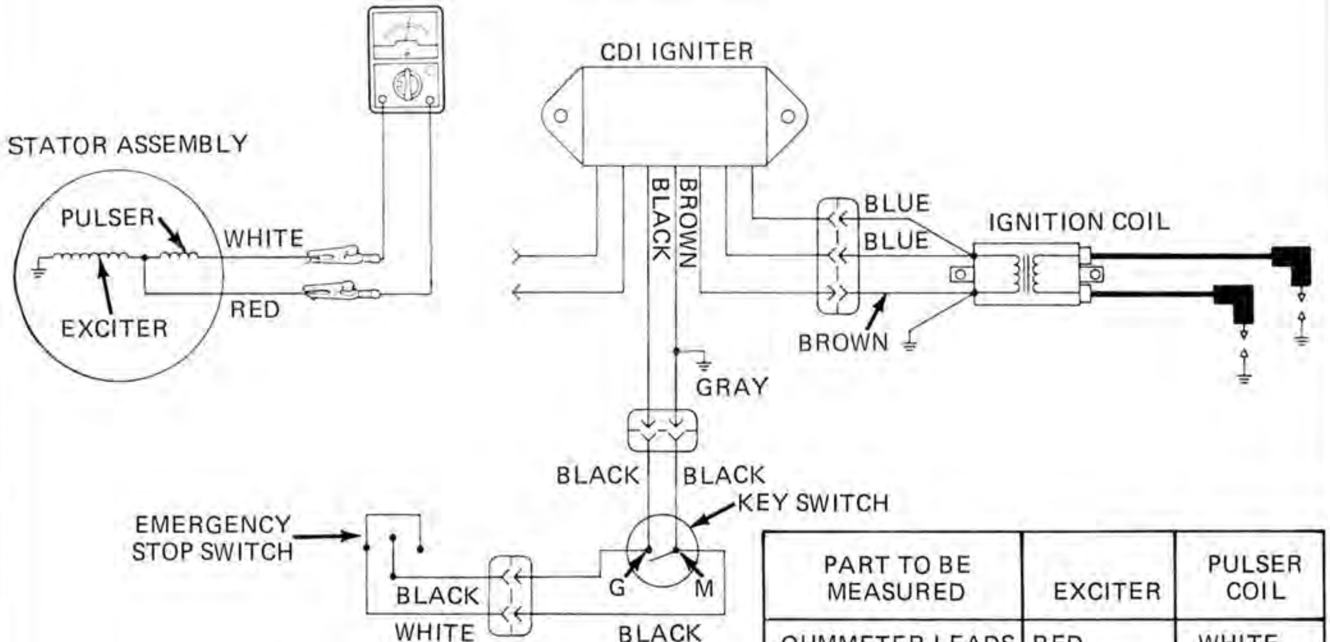


2. CHECKING THE MAGNETO AND IGNITION COIL

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 the CDI igniter.

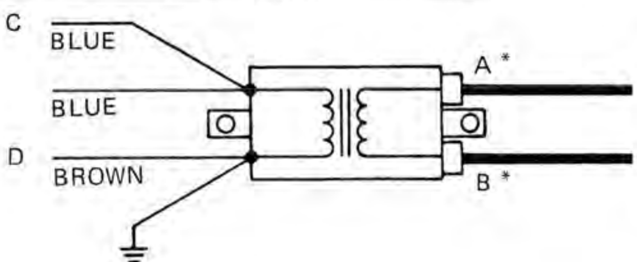
To locate the cause of trouble (broken coil, short circuit, etc.) measure the resistance of each coil winding.



PART TO BE MEASURED	EXCITER	PULSER COIL
OHMMETER LEADS CONNECTED BETWEEN	RED BROWN (GROUND)	WHITE RED
RESISTANCE Ω	128 Ω ± 20%	23 Ω ± 20%
*VOLTAGE AC	40 VAC	4 VAC

*Measure at cranking speed with spark plugs installed.

3. CHECKING THE IGNITION COIL



PARTS TO BE MEASURED	PRIMARY WINDING C– (GROUND D)	SECONDARY WINDING A–B*
RESISTANCE**	0.37 Ω ± 20%	10.2K Ω ± 20%

*With spark plug caps removed.
**Defective coils cannot always be detected using this test alone. Use of coil tester which simulates operating condition is the most reliable test method.

4. SPARK PLUG CAP

Unscrew the spark plug cap from the high tension wire and test for 5,000 $\Omega \pm 20\%$ resistance between the terminals at each end of the cap. (See Figure 3-3.)

Figure 3-3

ELECTRICAL TROUBLESHOOTING

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 ignition coil primary winding	3. Replace ignition coil
	4. Defective ignition coil secondary winding	4. Replace ignition coil
	5. Defective CDI igniter	5. Replace CDI igniter
	6. Spark plug is shorted - resistance between electrodes should be 1 M Ω or more	6. Replace spark plug
	7. Wrong wire connections	7. 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 CDI igniter	4. Replace CDI 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 CDI igniter	1. Replace CDI igniter

Electrical System Checks

Key Switch Tests

The G and M terminals of the key switch control the RUN and OFF circuit of the ignition system. The lights are operated through the terminals marked B and L. (See Figure 3-4.)

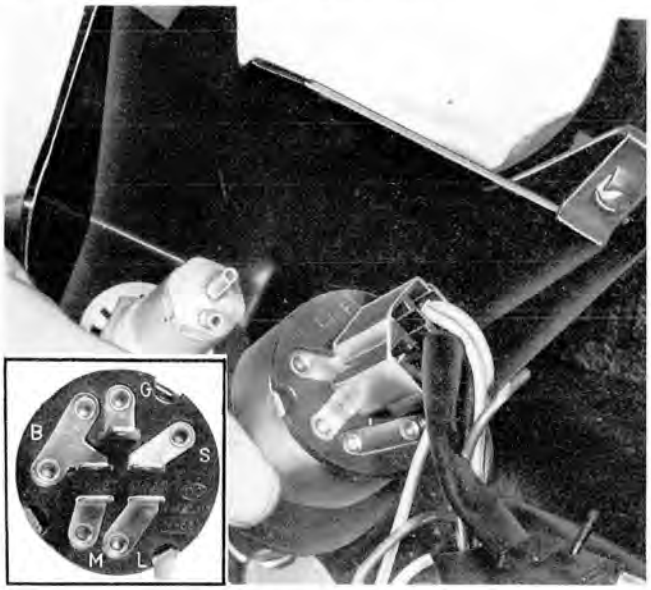


Figure 3-4

To test the key 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 3-5.)

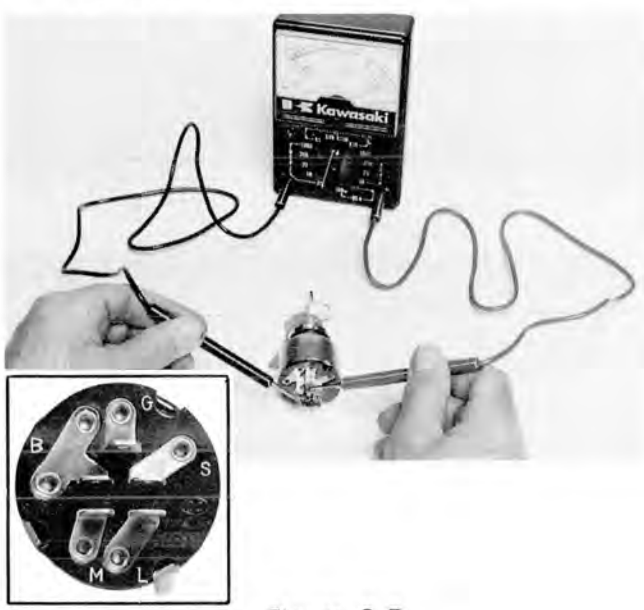


Figure 3-5

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.
5. Set the ohmmeter to low ohmscale (X1) and connect one ohmmeter lead to the key switch B terminal and the other lead to L. (See Figure 3-6.)

Figure 3-6

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. Reconnect the main wiring harness connector to the key switch terminals.

Emergency Stop Switch Test

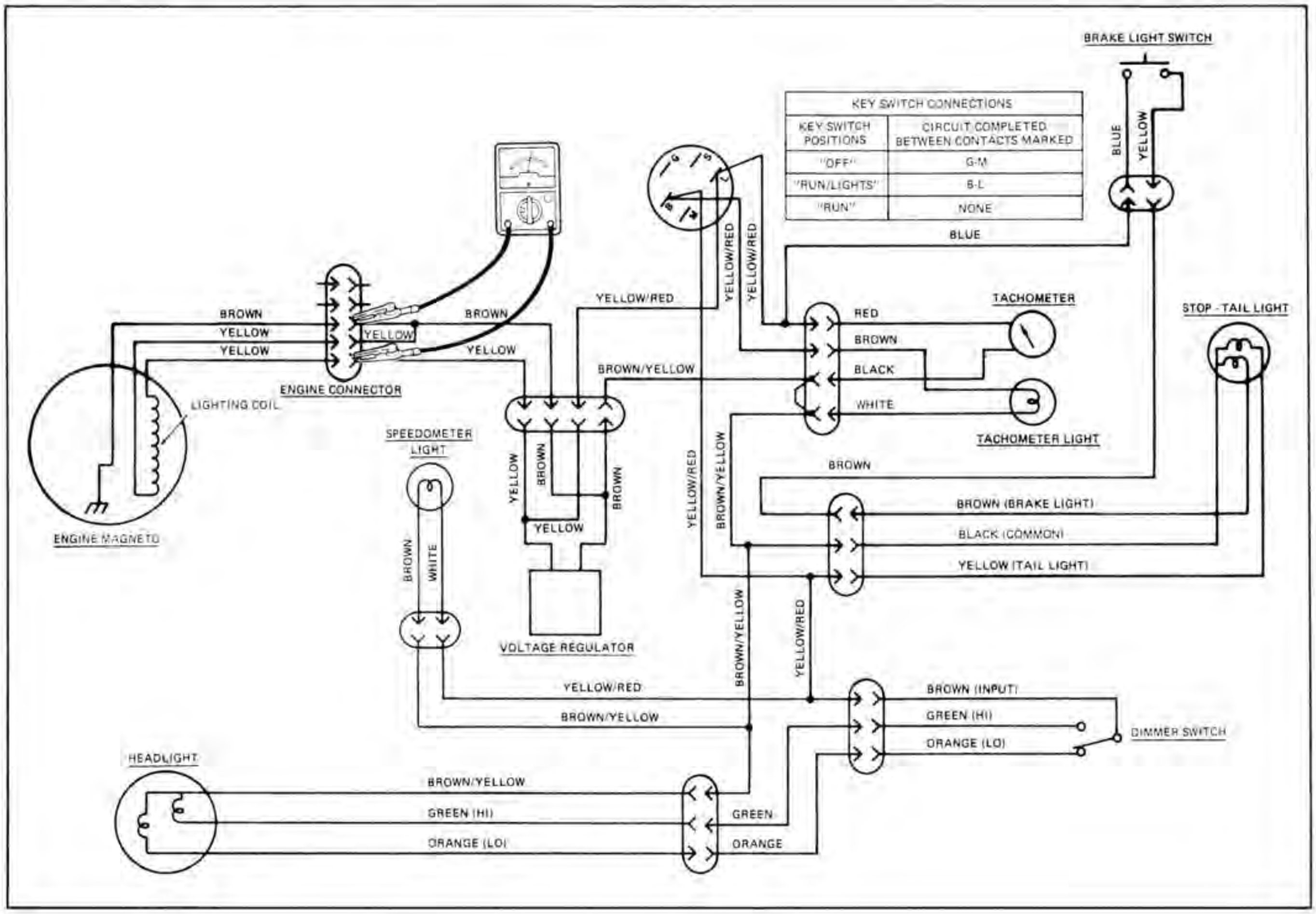
The emergency stop switch is used to stop the engine quickly in an emergency, and operates independent of the key switch. Both the key switch and emergency stop switch must be ON for the engine to operate. To stop the engine, turn the emergency stop switch to STOP.

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 3-7.)
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 (O). 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.

Figure 3-7

Magneto Alternator and Light Regulator Tests



These tests should be conducted if the bulbs burn out consistently or all the lights are extremely dim (filaments barely light). Bulbs which fail due to over-voltage usually have melted filaments rather than broken ones.

1. Raise the rear of the snowmobile. Make sure the track is free to rotate.

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.

2. Set the multimeter to measure 25 volts A.C. and attach one multimeter lead to the yellow wire in the main harness half of the engine connector. DO NOT SEPARATE THE MAIN HARNESS FROM THE ENGINE CONNECTOR.

3. Connect the other multimeter lead to the brown wire with yellow jumper in the main harness half of the engine connector.

4. Turn the key switch to RUN position. Do not activate the brake light during test.

5. Start the engine. DO NOT RUN OVER 2000 RPM. The multimeter should indicate 8 to 11 volts AC. If the needle indicates 8 to 11 volts, the lighting coil and the voltage regulator are okay. If it reads less than 8 to 11 volts, proceed to step 6.

   If the meter indicates higher, the voltage regulator may be open and not working. Increase the RPM slowly. DO NOT EXCEED 3000 RPM. If the voltage reading did not stabilize or exceeded 22 volts, the regulator should be replaced. (Before replacing the regulator, make sure the connector on the regulator to the main harness is in good condition and that the case is properly grounded.)

6. With the engine still running at 2,000 RPM, disconnect the voltage regulator from the main wiring harness. With the voltage regulator disconnected, the meter indication should increase to 14 to 20 volts. If the voltage does not increase, the problem is in the magneto lighting coil circuit. If the voltage does increase, the regulator may be shorted and should be replaced.

Headlight Circuit Test

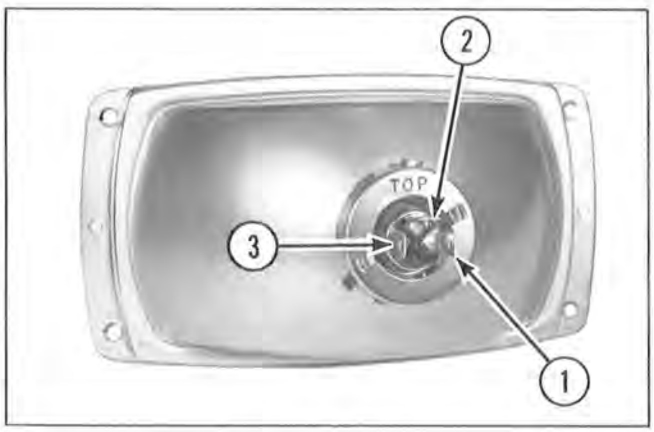
Before proceeding with the following tests, be sure the magneto alternator and voltage regulator are working properly.

1. Check to see if the headlight bulb filaments are good.

   a. Disconnect the headlight connector.

   b. Set the ohmmeter scale to ohms X1.

   c. Connect one lead of the ohmmeter to the ground terminal of the headlight. (See Figure 3-8.)



1. High Beam
2. Low Beam
3. Ground

Figure 3-8

   d. Connect the other lead of the ohmmeter to the high beam terminal.

   e. If the ohmmeter reads infinity (∞) or more than 2 ohms, the filament is faulty.

   f. Test the low beam in the same manner by moving the ohmmeter lead from the high beam terminal to the low beam terminal. If the needle indicates infinity (∞) or more than 2 ohms, replace the bulb.

   g. If the headlight malfunction still exists, proceed with step 2.

2. Check to make sure voltage is present at the headlight connector.

   a. Raise the rear of the snowmobile. Make sure the track is free to rotate.

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.

   b. Run the engine at 2000 RPM.

   c. Set multimeter to measure 25 volts AC.

   d. Check for voltage between brown/yellow and orange wire (low beam) and brown/yellow and green wire (high beam). (See Figure 3-9.)

   Be sure the key switch is turned to RUN/LIGHTS position and that the dimmer switch is set to the proper beam, either high or low.

   e. If voltage is not present at either the high or low beam, check the headlight harness for a good connection to the main harness and check for burned or shorted wires in the headlight harness. If the harness is good, proceed to the tests for the dimmer switch.

Figure 3-9

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 3-10.)

Figure 3-10

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.

9. If all of the above tests were okay and there is no power to the headlight, and the headlight circuit, magneto alternator, voltage regulator, and key switch tests were okay, the problem is in the main harness. The main harness should be removed and inspected or replaced.

Stop and Tail Light

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 3-11.) Ohmmeter should indicate 2 to 3 ohms.

Figure 3-11

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 3 was ok and the tail light, headlight and instrument lights do not function, proceed to the tests for the magneto alternator, voltage regulator and the key switch tests. If only the tail light does not function, the problem is in the main harness. Remove and inspect the main harness or replace.

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

8. If the brake light switch tests okay and the other lights function okay, the problem is in the main harness. Remove and inspect the main harness or replace.

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. 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 3-12.)

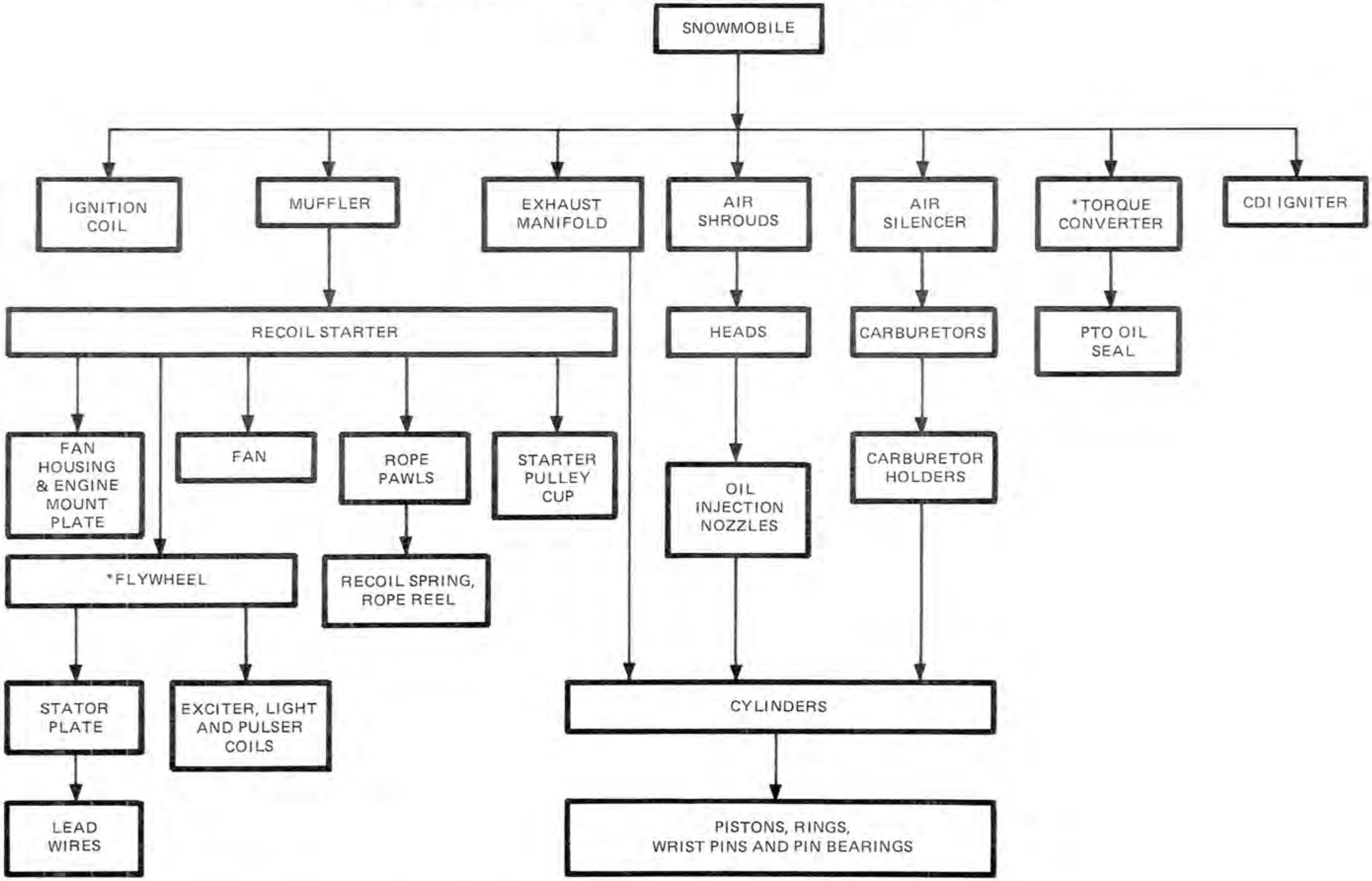
3. The ohmmeter should indicate an open circuit (∞).

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.

Figure 3-12

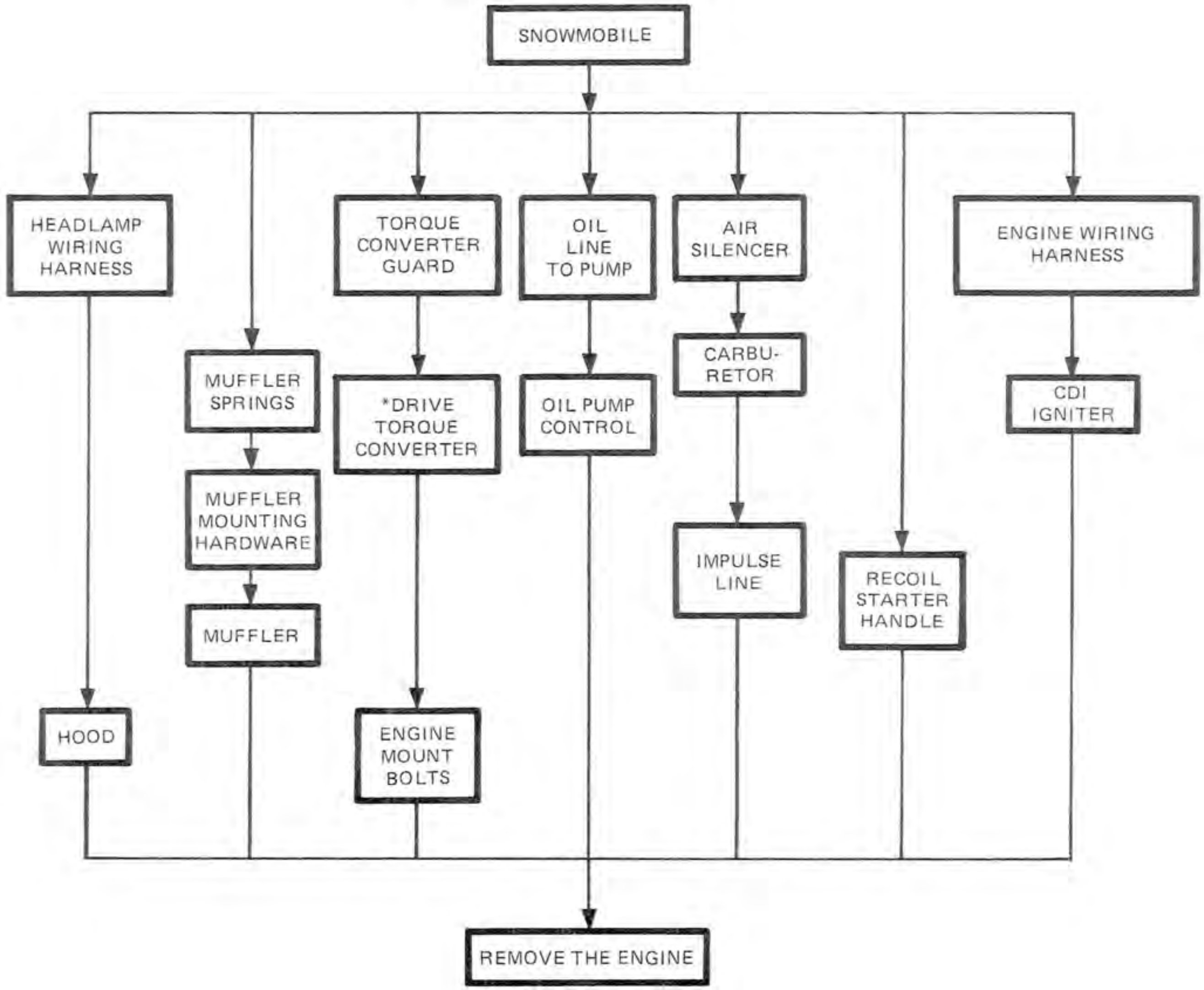
Flow Chart
Disassembly - Engine Installed



*Removal, installation, disassembly, or assembly requires use of special tool(s)

NOTE: This chart is designed to aid in determining proper removal sequence. Select the component you wish to remove and follow the arrows leading to that point on the chart.

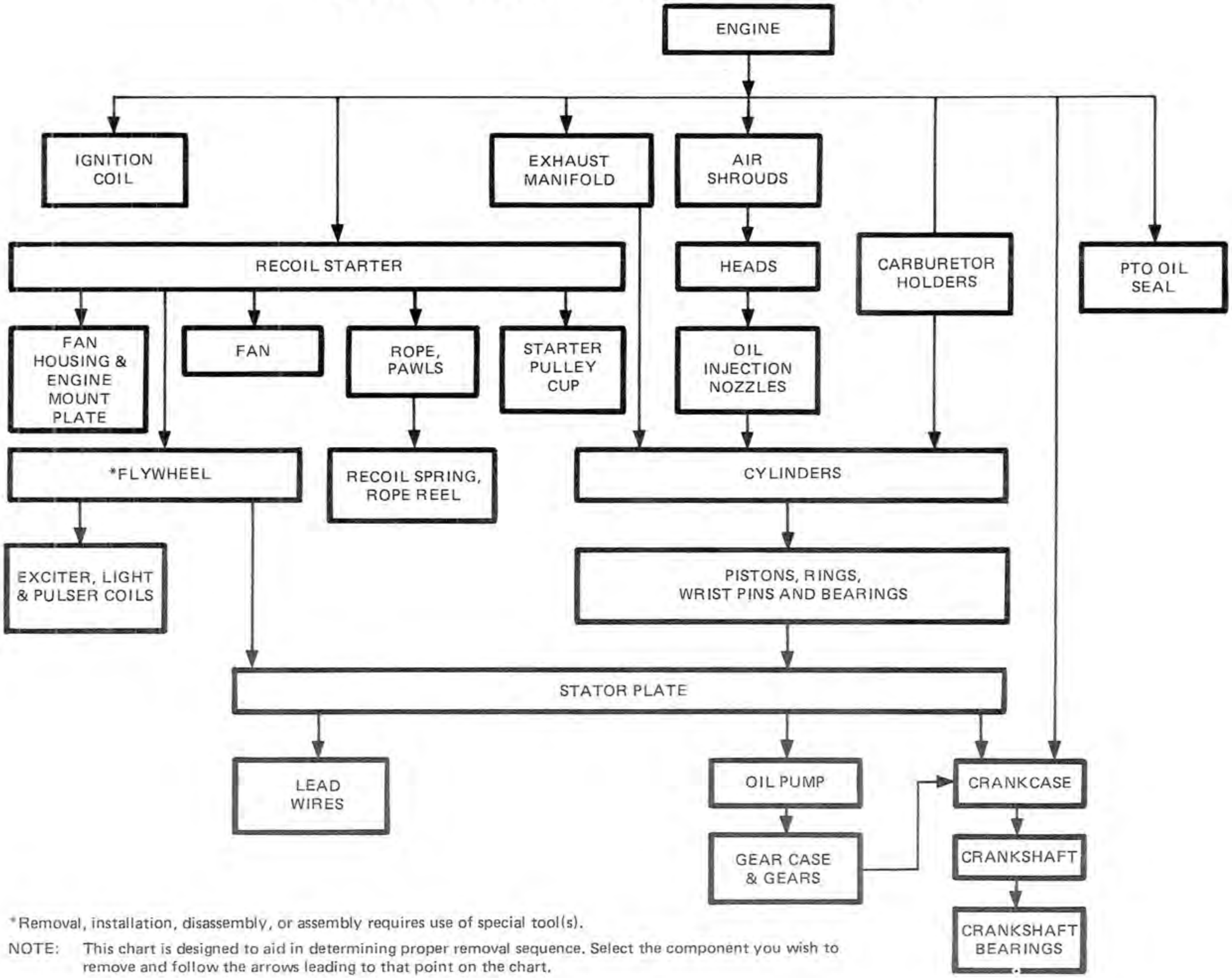
Flow Chart
Engine Removal



*Removal, installation, disassembly, or assembly requires use of special tool(s).

NOTE: This chart is designed to aid in determining 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



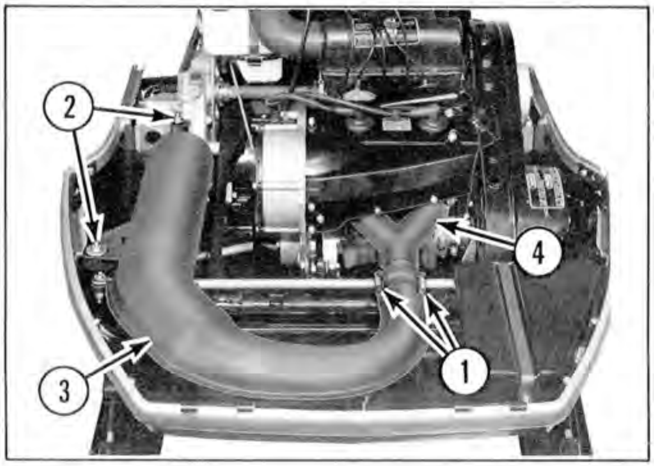
*Removal, installation, disassembly, or assembly requires use of special tool(s).

NOTE: This chart is designed to aid in determining proper removal sequence. Select the component you wish to remove and follow the arrows leading to that point on the chart.

Muffler

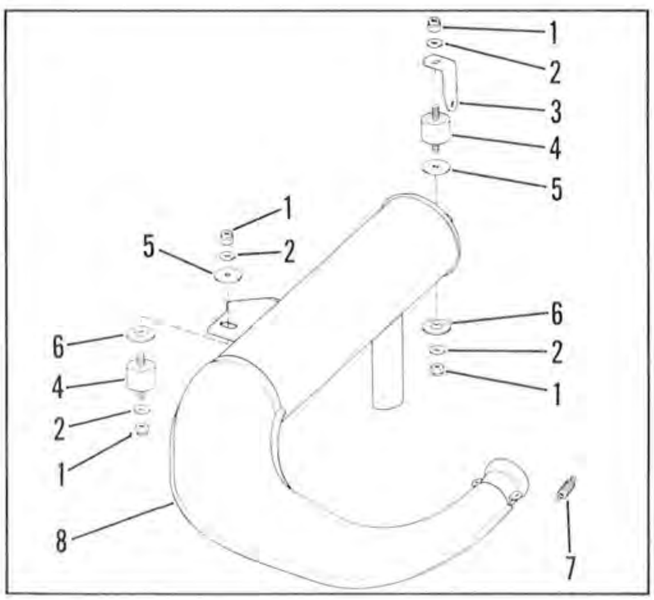
Removal

1. Remove the springs that secure the muffler to the exhaust manifold. (See Figure 3-13.)



1. Spring
2. Nut and Washer
3. Muffler
4. Exhaust Manifold

Figure 3-13



1. Nut
2. Washer
3. Rear Muffler Bracket
4. Damper
5. Insulating Washer
6. Insulating Shoulder Washer
7. Spring
8. Muffler

Figure 3-14

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.

Installation

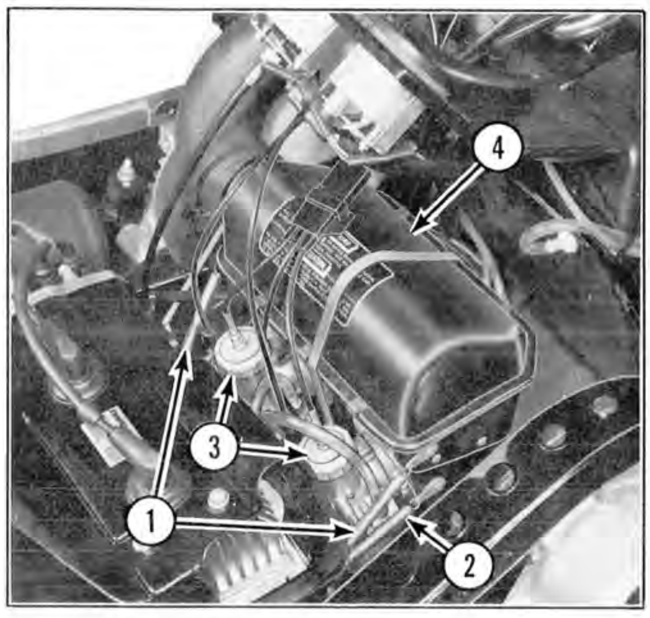
Install the muffler by reversing the removal procedure. Make sure the insulation washers are properly positioned on each side of the muffler brackets. (See Figure 3-14.)

Air Intake Silencer

Removal

1. Remove the drive belt guard.

2. Disconnect the springs from the intake silencer. Note position of long and short springs. Remove the air intake silencer from the snowmobile. Check the seal in between the upper and lower halves of the intake silencer. If there is any sign of a possible air leak reseal the two halves with silicone sealer. Install a new cable tie band around the silencer assembly to securely fasten the cover to the silencer body. (See Figure 3-15).



1. Long Spring
2. Short Spring
3. Carburetor
4. Air Intake Silencer

Figure 3-15

CAUTION

Never run the engine with the air intake silencer removed from the carburetor. Poor engine performance and engine damage will result. Be certain the intake silencer hose is directed to the rear after the converter guard is reinstalled, as incorrect position may result in engine damage.

Installation

Prior to installing air intake silencer, be sure the plastic adapter is installed on the carburetor. This is necessary to prevent breakage of the econo jet fitting.

CAUTION

While installing the air intake silencer, check that:

1. The cover is securely fastened to silencer body and properly sealed.

2. The rubber seal between silencer body and carburetor fits securely during installation.

3. Intake hose is directed rearward.

Failure to comply with the above steps will cause engine failure.

Install the air intake silencer by reversing the removal procedure. When securing the silencer, the long spring is installed on the top and the short spring on the bottom.

Carburetor

This engine is equipped with twin Mikuni VM32 econo jet carburetors.

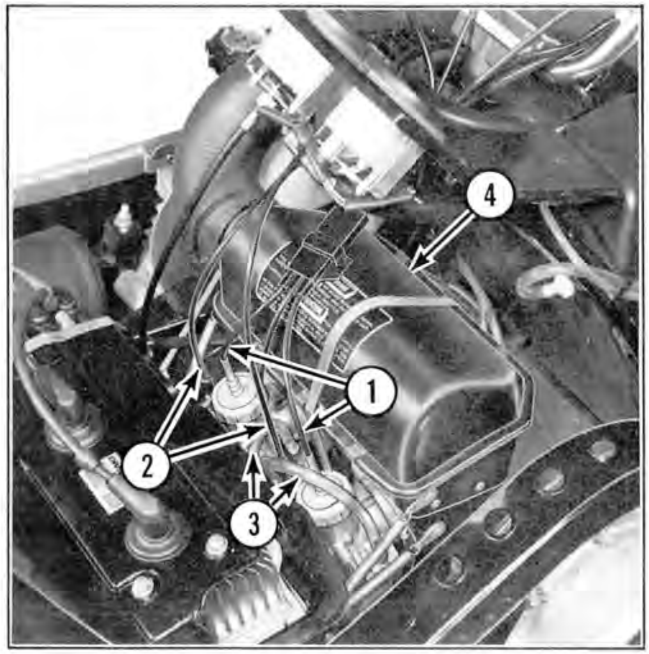
Removal

Remove the air intake silencer.

Remove the carburetor fuel supply line and the primer line from the carburetor fittings. Plug the fuel tube opening. (See Figure 3-16.)

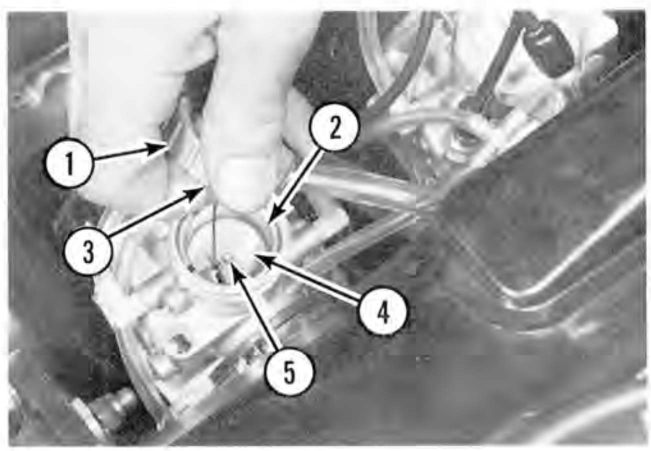
Unscrew the mixing body top assembly and pull out the throttle slide valve. (See Figure 3-17.)

Compress the throttle spring and pull the spring from its seat. Slip the throttle cable through the slot in the throttle slide. Remove the spring, seat plate, and jet needle from the throttle slide valve.



1. Throttle Cable
2. Enrichener Cable
3. Fuel Supply Tube
4. Silencer/Carburetor Seal

Figure 3-16

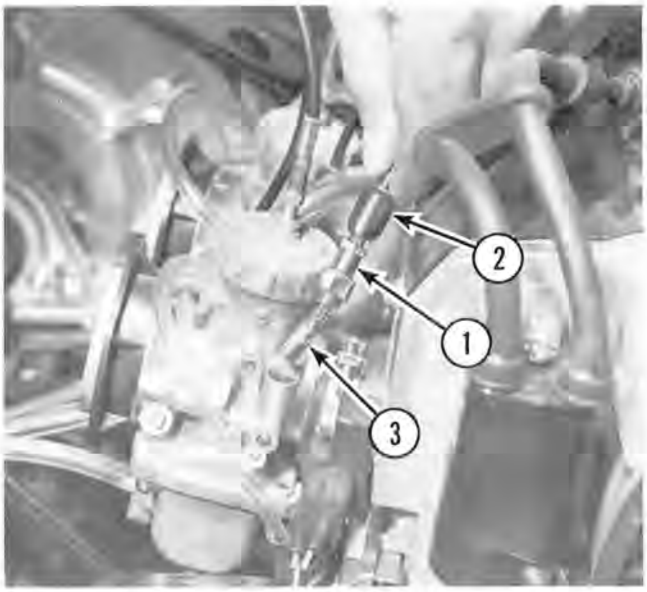


1. Mixing Body Top Assembly
2. Throttle Slide Valve
3. Throttle Spring
4. Spring Seat Plate
5. Jet Needle

Figure 3-17

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 Figure 3-18.)

Loosen the screw on the carburetor holder clamp and remove the carburetor from the engine mount.



1. Enrichener Plunger Cap
2. Enrichener Cable
3. Enrichener Plunger

Figure 3-18

Disassembly of VM32 Econo Jet Carburetor

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. Remove four screws with spring assemblies (See Figure 3-20.) Separate the float chamber body from the upper carburetor body. Remove the two vent tubes and econo jet tube from upper carburetor body. Remove the gasket.

4. If replacement is necessary, push out the float pin and remove the float arm.

5. Remove the two floats from the float chamber body.

6. Remove the needle jet holder. This will release the needle jet. If necessary, tap the carburetor body to loosen the needle jet, and push the needle jet out through the top of the carburetor body.

7. Carefully remove the float valve assembly. Remove washers and float chamber plate from the carburetor body.

8. Remove the pilot jet, throttle stopscrew, spring, pilot air screw, spring, main econo jet, main jet, cap, fuel adjusting screw and spring.

Cleaning VM32 Carburetor

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.

Reassembly of VM32 Carubretor Left 32/120 and Right 32/121

Check carburetor parts for proper identification markings prior to reassembly. If the correct components are not installed the carburetor cannot be calibrated properly.

1. Throttle Slide Valve - CA2.5
2. Needle - 6DH7-3
3. Needle Jet - Q-0
4. Pilot Jet - No. 25
5. Main Jet - No. 170
6. Econo (Power) Jet - LH No. 150, RH No. 130
7. Carburetor Body - L 32/120, R 32/121

1. Place the spring on the throttle stop screw and install in the carburetor body. Turn in the screw about 10 turns. (See Figure 3-20.)

2. Insert the spring and pilot air screw in the carburetor body. Turn the screw all the way in. Then turn out 1-3/4 turns for initial adjustments.

3. Install pilot jet, main/econo jet, main jet, new O-ring, spring, fuel adjusting screw and cap.

4. Position a new gasket, washers and baffle plate on the upper carburetor body. Install the float valve assembly. Tighten 25-30 in. lb (0.29-0.35 kg-m).

5. If the float arm was removed, install the float arm and secure with float pin. Be sure the pin is securely seated.

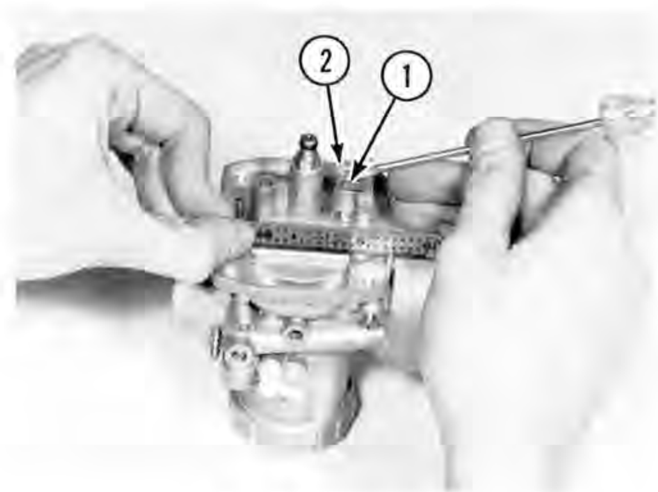
6. Invert the carburetor and check the alignment between the float arm and the base of the carburetor. The float arm must be parallel to the base. Bend the tab of the float arm to adjust. (See Figure 3-19.)

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.

8. Position the floats on the float chamber pins. Install the floats with the brass pins at the bottom.

9. Lubricate O-ring with light oil.

10. Place the upper carburetor body on the float chamber body. Hold the two castings together and invert the carburetor. Check for proper alignment of the castings. Secure three tube plates with four screws. Attach two vent tubes and power jet tube to upper carburetor body. Secure power jet tube to float bowl and carburetor body with clamps.



1. Adjusting Tab
2. Float Arm

Figure 3-19

Installation

1. Install the carburetor on the rubber flange and tighten the clamp screw to secure the carburetor to holder.

2. Screw the mixing body top assembly to the throttle cable. (See Figure 3-17.)

3. Insert the jet needle into the throttle slide valve.

4. Hold the throttle cable and mixing body top assembly in one hand. Place the spring in the top and compress the spring so the throttle cable extends beyond the spring.

5. Guide the throttle slide valve over the throttle cable. Insert the end of the cable through the hole in the throttle slide valve slot.

6. While keeping the spring compressed, release the throttle valve and install the spring seat plate. Then release the spring.

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 top assembly and tighten finger tight. Tighten the throttle cable locknut.

8. Slide the enrichener plunger cap, washer and spring over the end of the enrichener cable. (See Figure 3-18.)

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.

10. Connect the fuel supply and primer tubes onto the proper carburetor fittings. Install the air silencer and belt guard. (See Figure 3-16.)

CAUTION

While installing the air intake silencer, check that:

1. *The cover is securely fastened to silencer body and properly sealed.*
2. *The rubber seal between silencer body and carburetor fits securely during installation.*
3. *Intake hose must be directed rearward.*

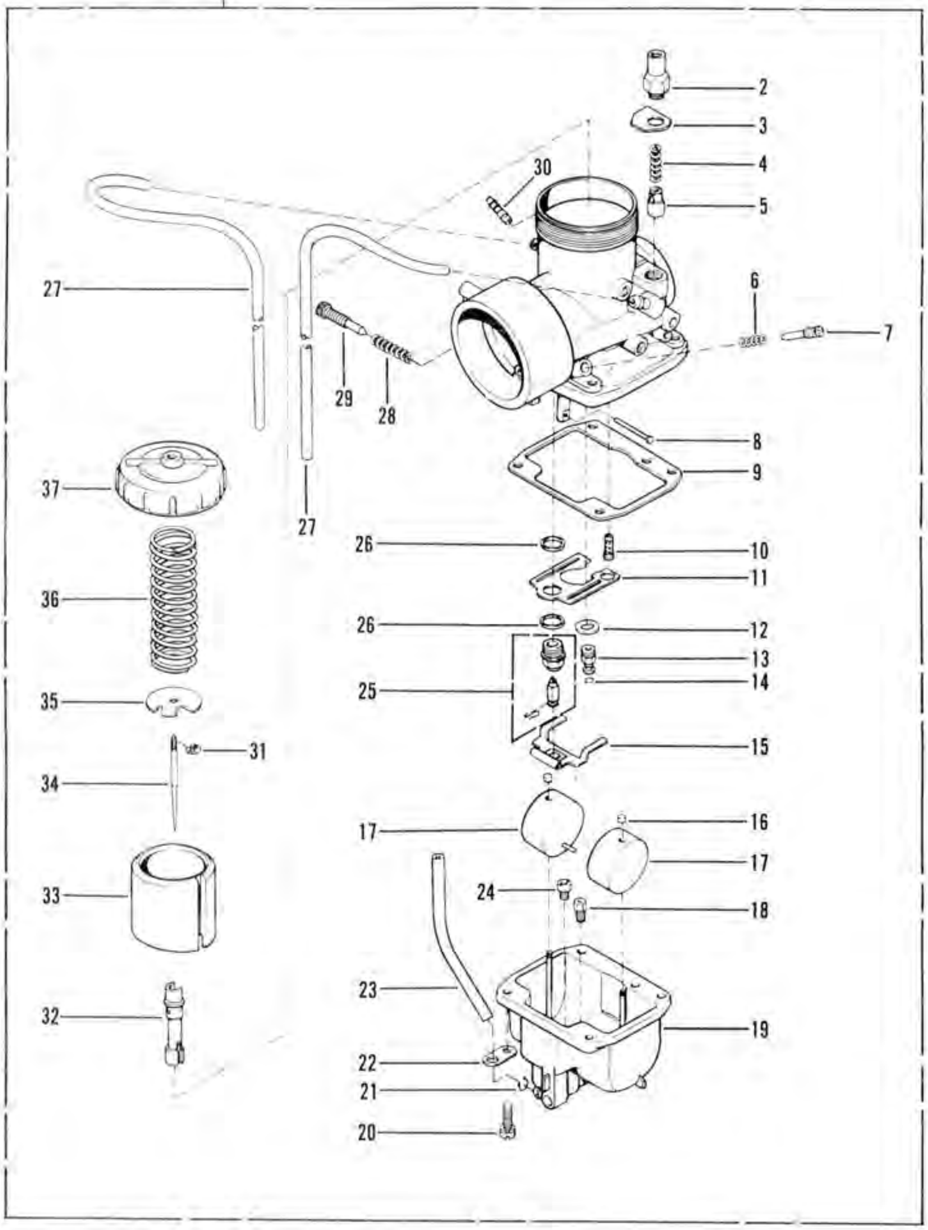
Failure to comply with the above steps will cause engine failure.

Install the short spring on the bottom and the long spring on the top.

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.

11. Raise the rear of the snowmobile off the ground. Start the engine and perform the carburetor adjustments as described in Section 2.



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. Main Jet
19. Float Chamber
20. Special Screw
21. Power Jet Tube Clamp
22. Tube Retainer
23. Tube
24. Econo Jet
25. Float Valve Assembly
26. Float Valve Gasket
27. Tube
28. Throttle Screw Spring
29. Throttle Stop Screw
30. Primer Tube Fitting
31. Carburetor Needle Clip
32. Needle Jet
33. Valve
34. Needle
35. Spring Seat
36. Throttle Valve Spring
37. Mixing Chamber Cap

Figure 3-20

VM32 CARBURETOR

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

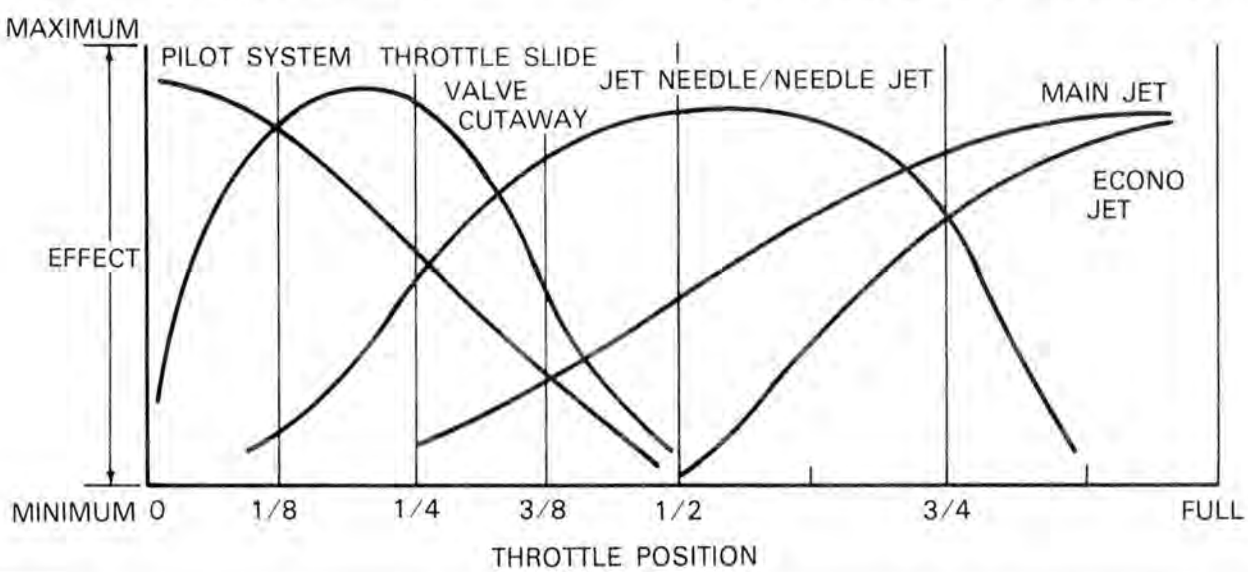
Different fuel metering components function according to the throttle setting:

1. Pilot Air Screw - from closed throttle to one half throttle opening.
2. Throttle Valve Cutaway - from closed throttle to one half throttle opening.
3. Jet Needle and Needle Jet - one eighth to seven eighths throttle opening.
4. Main Jet - one quarter to full throttle opening.
5. Econo Jet - one half 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.



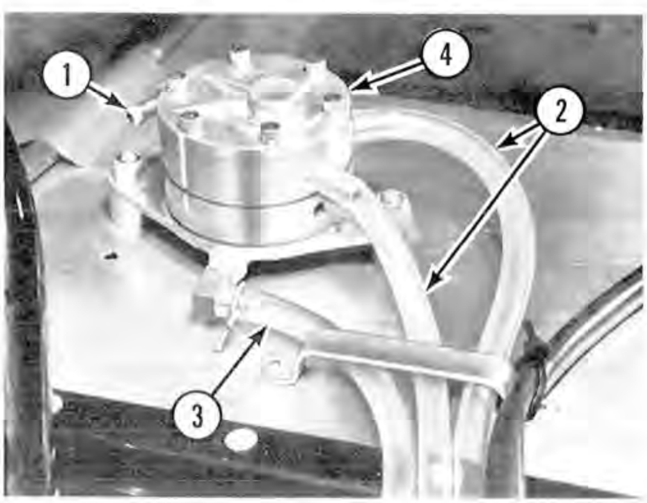
MAIN JET SYSTEM - the main jet meters all of the fuel to the main system. The main fuel system components meter fuel from 1/8 throttle to full throttle.

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 air intake silencer from carburetor.
2. Remove fuel inlet line from fuel pump. Plug end of fuel line. (See Figure 3-21.)
3. Remove fuel outlet line and impulse line from fuel pump.
4. Remove two fuel pump mounting nuts.

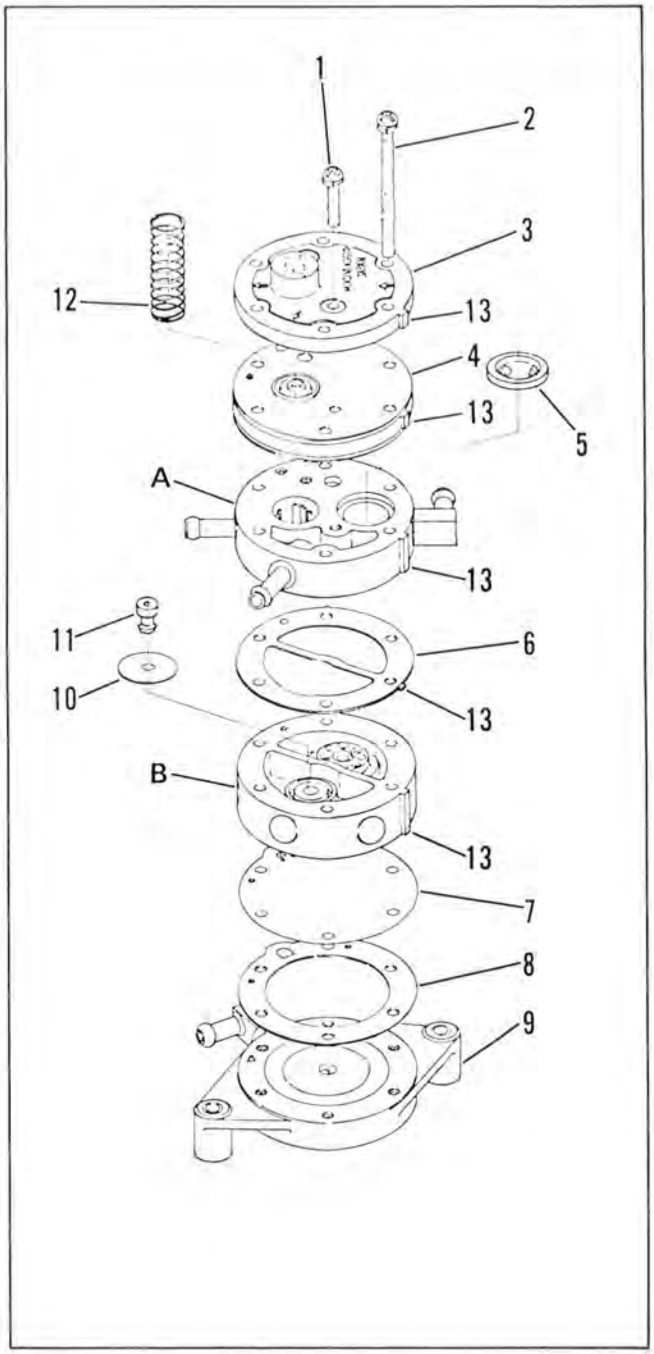


1. Fuel Inlet Line
2. Fuel Outlet Lines
3. Impulse Line
4. Fuel Pump

Figure 3-21

Disassembly

1. Remove the eight retainer screws. (See Figure 3-22.)



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 3-22

2. Lift off body cover. Remove spring and diaphragm assembly.

3. Remove filter from body A.

4. Remove body A, gasket, body B, diaphragm and gasket. Note the position of the gasket in relation to body B.

5. Once removed, the grommets cannot be reinstalled - Be sure to have replacements on hand before removing them. Remove grommets and check valves from body B.

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 3-22).

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 3-22.)

3. Install two fuel pump mounting nuts.

4. Replace air intake silencer to carburetor.

CAUTION

While installing the air intake silencer, check that:

1. The cover is securely fastened to silencer body and properly sealed.

2. The rubber seal between silencer body and carburetor fits securely during installation.

3. Intake hose must be directed rearward.

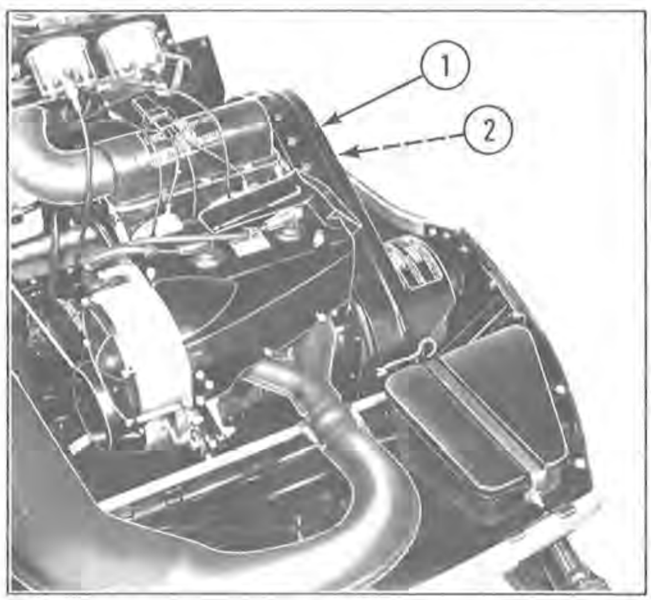
Failure to comply with the above steps will cause engine failure. Install the short spring on the bottom and the long spring on the top.

Engine Removal

1. Unplug the harness from the rear of the headlight. Open the clamps securing the harness to the hood. Remove the harness from the hood.

2. Disconnect the hood lanyard from the engine shroud. Remove the hinge pins from the hinges. Remove the hood.

3. Remove the retainer pins and remove the drive belt guard. (See Figure 3-23.) Remove the drive belt.



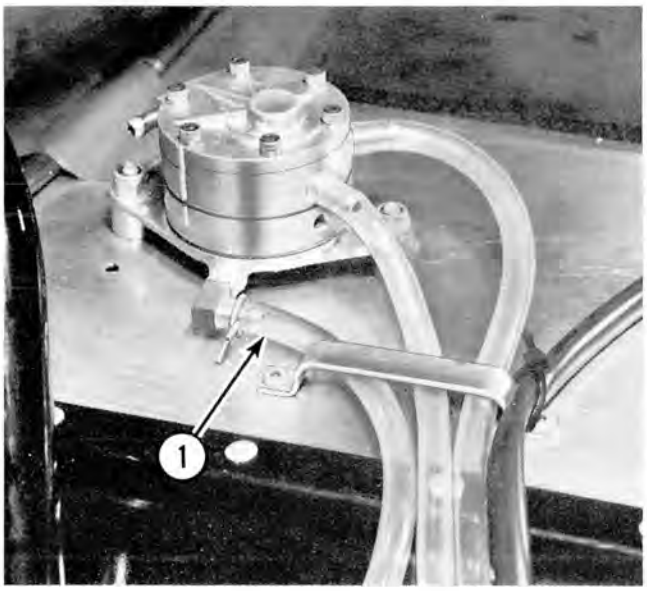
1. Drive Belt Guard
2. Drive Belt

Figure 3-23

4. Disconnect the wiring harness from the engine.

5. Slide the starter handle sideways through the dash panel. Remove the rope from the guide.

6. Disconnect the fuel impulse line from the engine as shown in Figure 3-24.



1. Impulse Line

Figure 3-24

7. Remove the carburetors from the engine by loosening clamp screws and pulling from the engine. If carburetors are to be removed, refer to the carburetor repair instructions.

8. Disconnect control cable from oil pump. Remove the oil inlet tube from the oil pump. Insert a bolt into the line to prevent oil loss.

9. Use a spring puller tool or a long wire hook to disconnect the two exhaust springs.

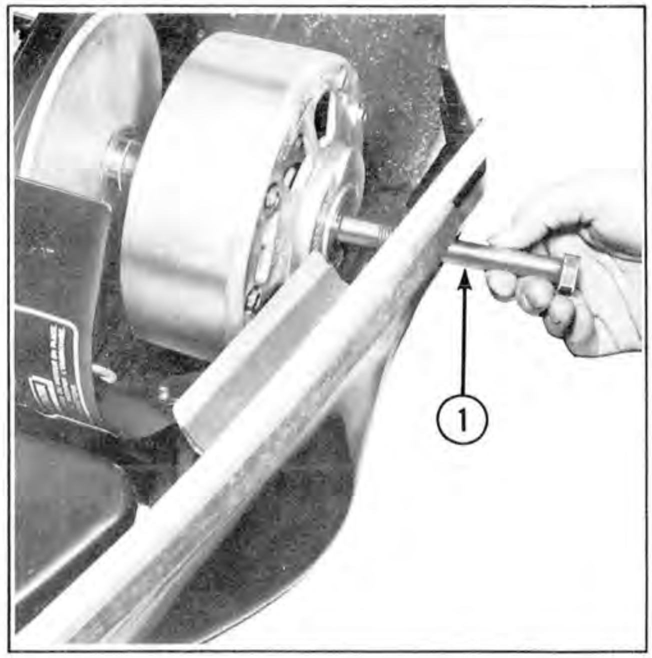
10. Remove the drive converter mounting bolt and lockwasher. Install the drive converter puller bolt (tool No. 57001-3502) and screw in to remove the drive converter. (See Figure 3-25.) Remove drive converter.

11. Remove the four engine mounting screws from PTO mount. (See Figure 3-26.)

12. Remove the two right hand side engine mounting bolts and shims.

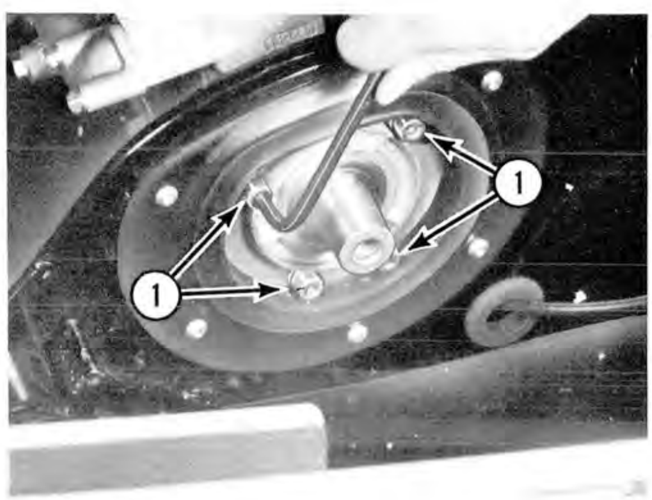
13. Remove the engine from the snowmobile.

14. Reinstall engine in reverse order of removal. When reconnecting the wiring harness, be sure the main wiring harness connector is fully engaged to the engine wiring harness connector. Install cable tie band around connectors to prevent separation during engine operation.



1. Drive Converter Puller Bolt

Figure 3-25



1. Engine Mount Screws

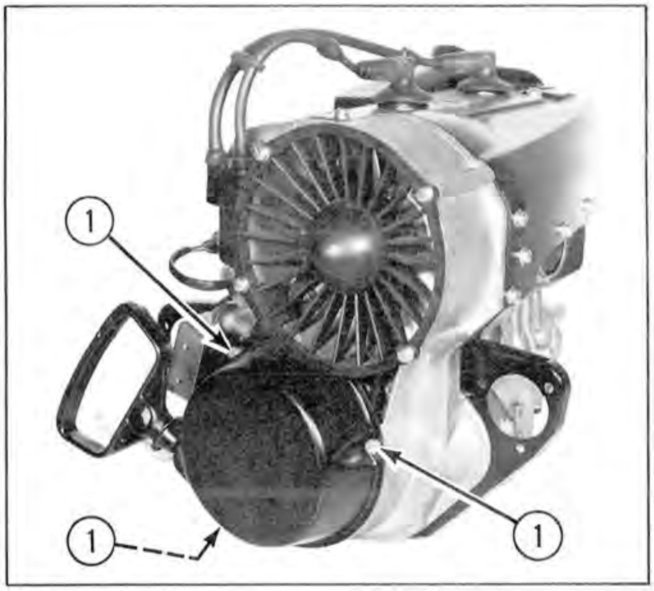
Figure 3-26

Recoil Starter

Removal

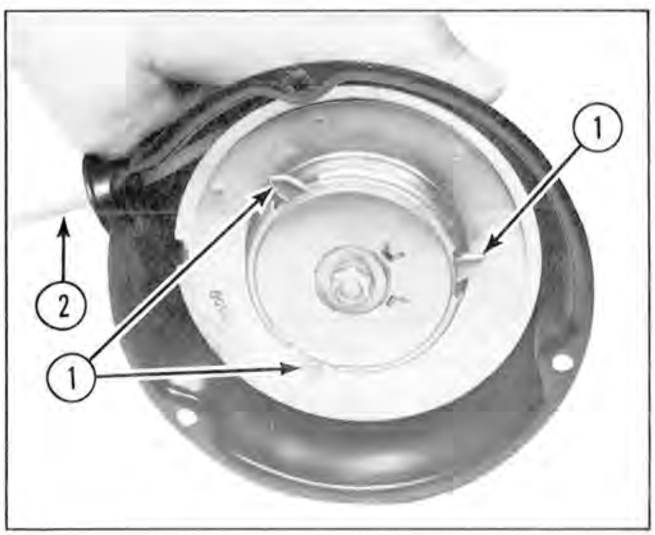
1. Remove starter handle and tie knot in starter rope to prevent rope from suddenly retracting into the recoil case.

2. Remove three slotted hex head bolts securing starter assembly to engine and remove starter assembly. (See Figure 3-27.)



1. Slotted Hex Head Bolts

Figure 3-27



1. Starter Pawls
2. Starter Rope

Figure 3-28

Inspection

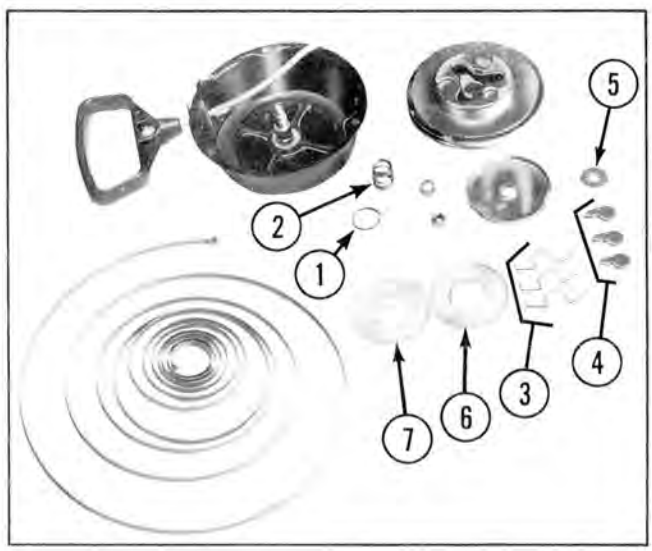
1. Pull the starter rope out 3-5 in. (76.2-127.0 mm) and examine the starter pawls for chips or excessive wear. (See Figure 3-28.) Listen for any grinding noise which might indicate a broken or worn starter spring. Examine the starter rope for excessive wear or frayed condition.

Disassembly

1. Release recoil spring tension by removing handle from starter rope and allowing recoil reel to spin slowly.

2. Remove the nut and washers securing the retaining cover to the starter assembly. Exert slight downward pressure on cover to remove spring tension from retaining cover and slowly remove cover.

3. Remove the return spring, pressure spring, starter pawl springs, pawls and washer from starter assembly. (See Figure 3-29.) Check the return spring and pressure spring for breaks, rust, distorted or weakened condition.



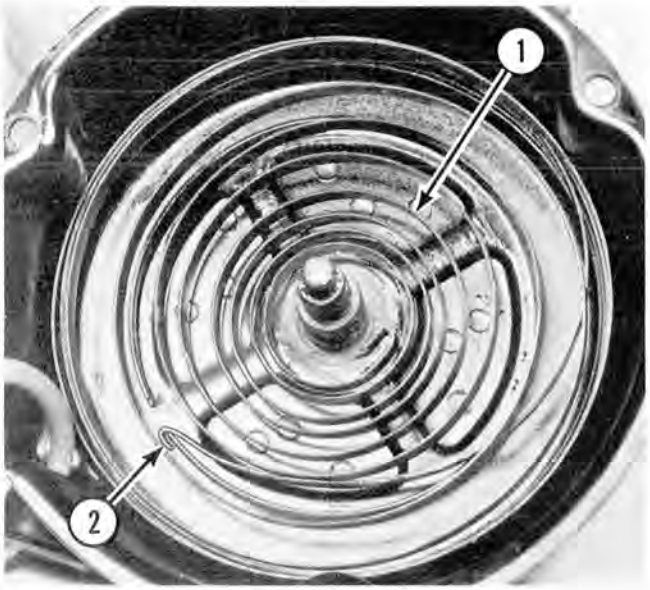
1. Return Spring
2. Pressure Spring
3. Starter Pawl Springs
4. Pawls
5. Washer
6. Recoil Slide Plate A
7. Recoil Slide Plate B

Figure 3-29

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 as shown in Figure 3-28.



1. Recoil Spring
2. Spring Hook

Figure 3-30

5. With recoil reel removed, as shown in Figure 3-30, 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. When installing a new recoil spring, attach hook in recoil spring to recoil case.

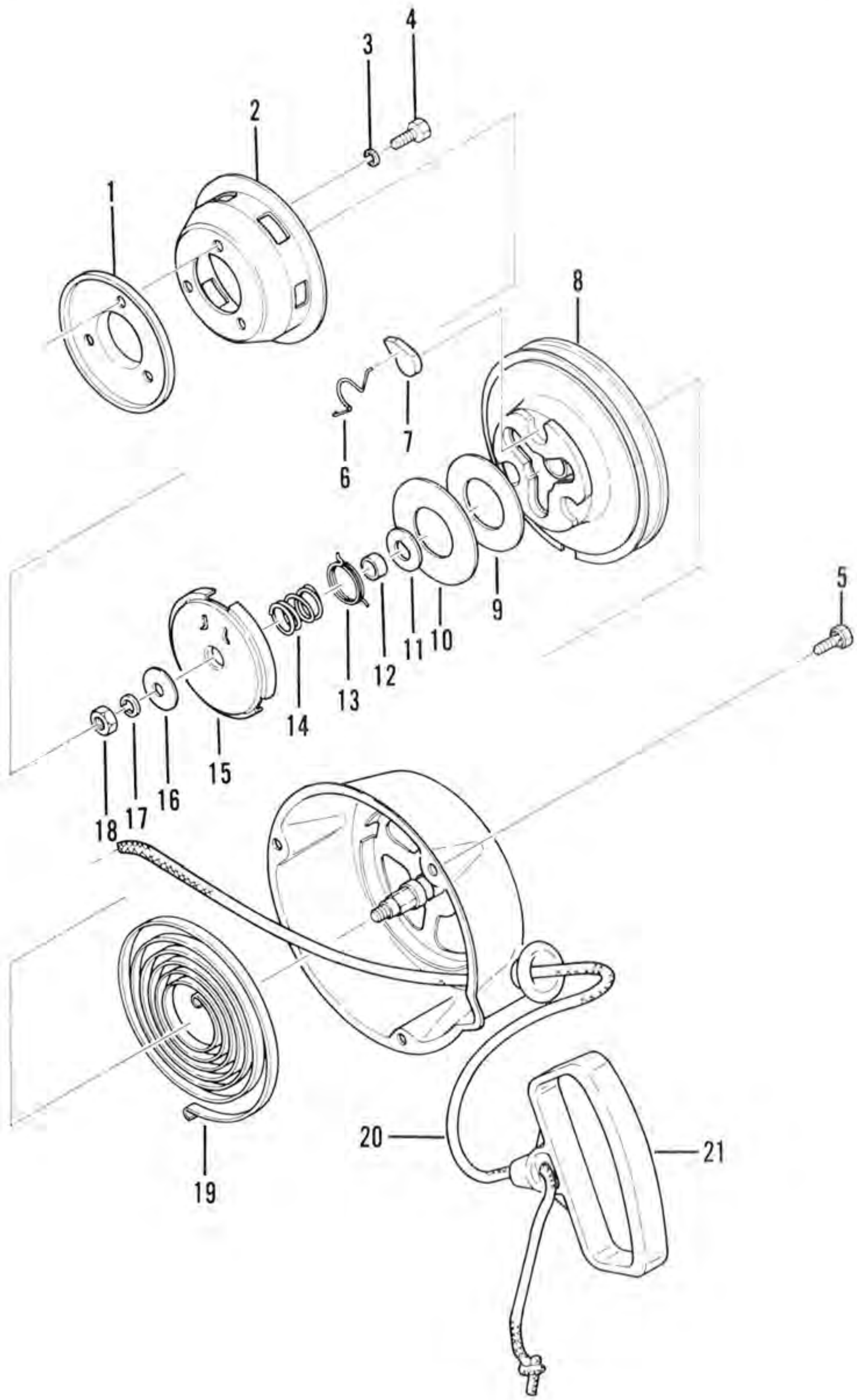
Reassembly

1. Thoroughly clean all parts removed prior to reassembling starter. Reassemble components as shown in Figure 3-31. Apply a light coat of low-temperature grease (Texaco 2346EP or equivalent) on recoil reel and recoil spring.

2. Apply correct recoil spring tension by placing rope in notch of recoil reel and rotate reel COUNTERCLOCKWISE four turns. Release rope from notch and allow rope to rewind.

NOTE: Before bolts are tightened pull slightly on starter rope to engage pawls, then tighten bolts securely.

3. Secure starter assembly to engine using three hex head bolts. Insert starter rope through guide in chassis and attach starter handle to starter rope. Pull starter a few times and observe starter operation.



1. Spacer Flange
2. Starter Pulley
3. Washer
4. Bolt
5. Bolt
6. Return Spring
7. Pawl
8. Recoil Reel
9. Slide Plate B
10. Slide Plate A
11. Washer
12. Bushing
13. Return Spring
14. Spring
15. Friction Plate
16. Washer
17. Washer
18. Nut
19. Recoil Spring
20. Starter Rope
21. Starter Handle

Figure 3-31

CDI Magneto

Removal

1. Remove recoil starter assembly. Remove flywheel nut. Insert a bar through slots in starter pulley to prevent flywheel from rotating. (See Figure 3-32.)

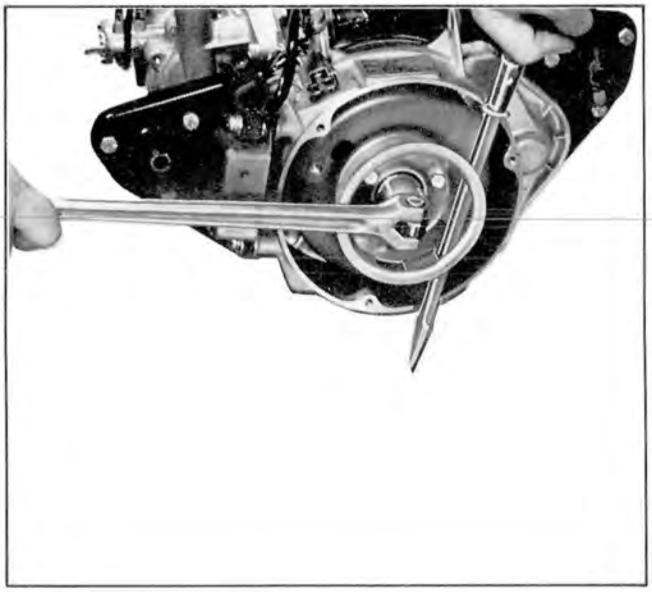


Figure 3-32

2. Remove three bolts securing starter pulley to flywheel. Removal will be much easier if a bar is inserted through the slots in the starter pulley to prevent the pulley from rotating.

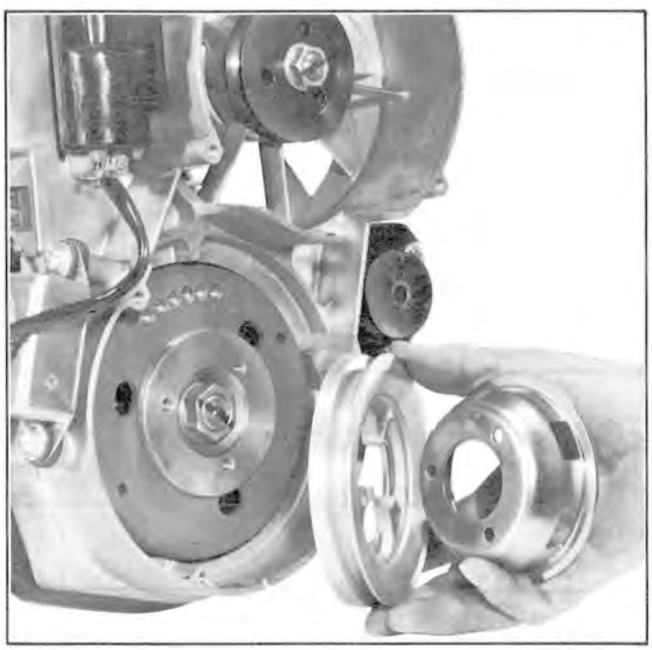
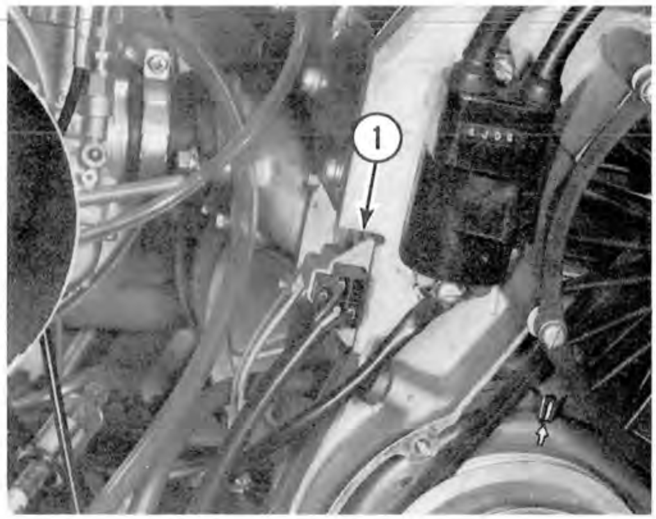


Figure 3-33

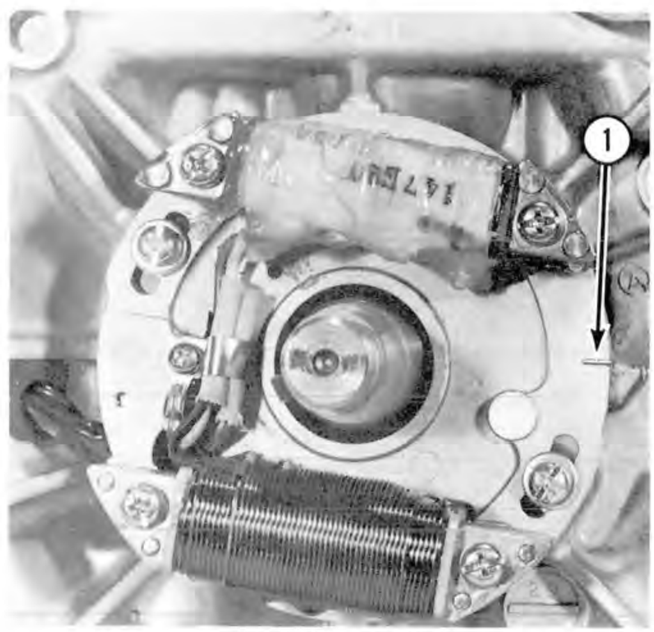
3. Bolt the flywheel puller (special tool No. T56019-01) to the flywheel with the three flywheel puller bolts (No. 110G0630). The starter pulley and fan drive pulley are still in position under the flywheel puller. Pull the flywheel and remove the puller, starter pulley and fan drive pulley. (See Figure 3-33.) Examine flywheel keyway for damage.

4. Disconnect the red and white coil wire connectors and remove the brown and yellow (lighting coil) wires from the engine plug. Be sure to mark the grey plastic connector so the lighting coil wires will be reinstalled properly. (See Figure 3-34.)



1. Plastic Connector

Figure 3-34



1. Scribe Mark

Figure 3-35

5. Remove the nuts securing fan housing to crankcase. Remove the fan housing and engine mount as an assembly.

6. Scribe a mark on the stator plate and the crankcase boss for proper indexing during reassembly. (See Figure 3-35.)

7. Remove the two screws securing the stator plate to the crankcase. (See Figure 3-36.)

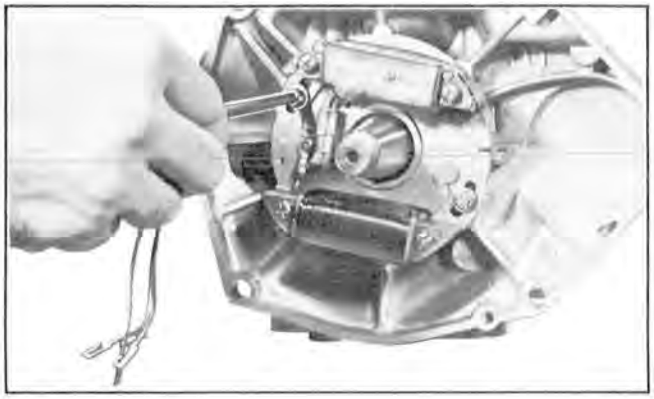


Figure 3-36

8. Remove the stator plate. (See Figure 3-37.)

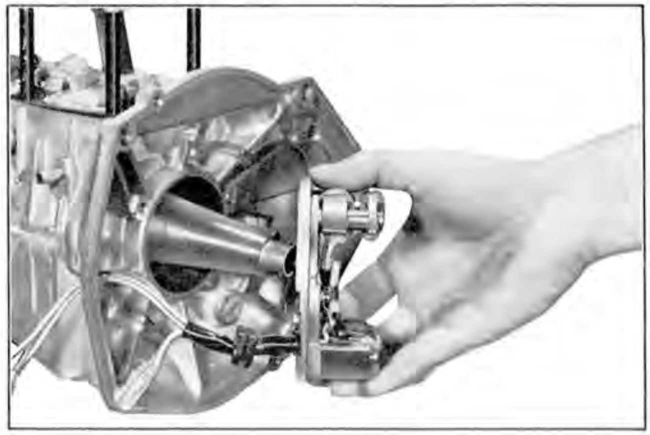
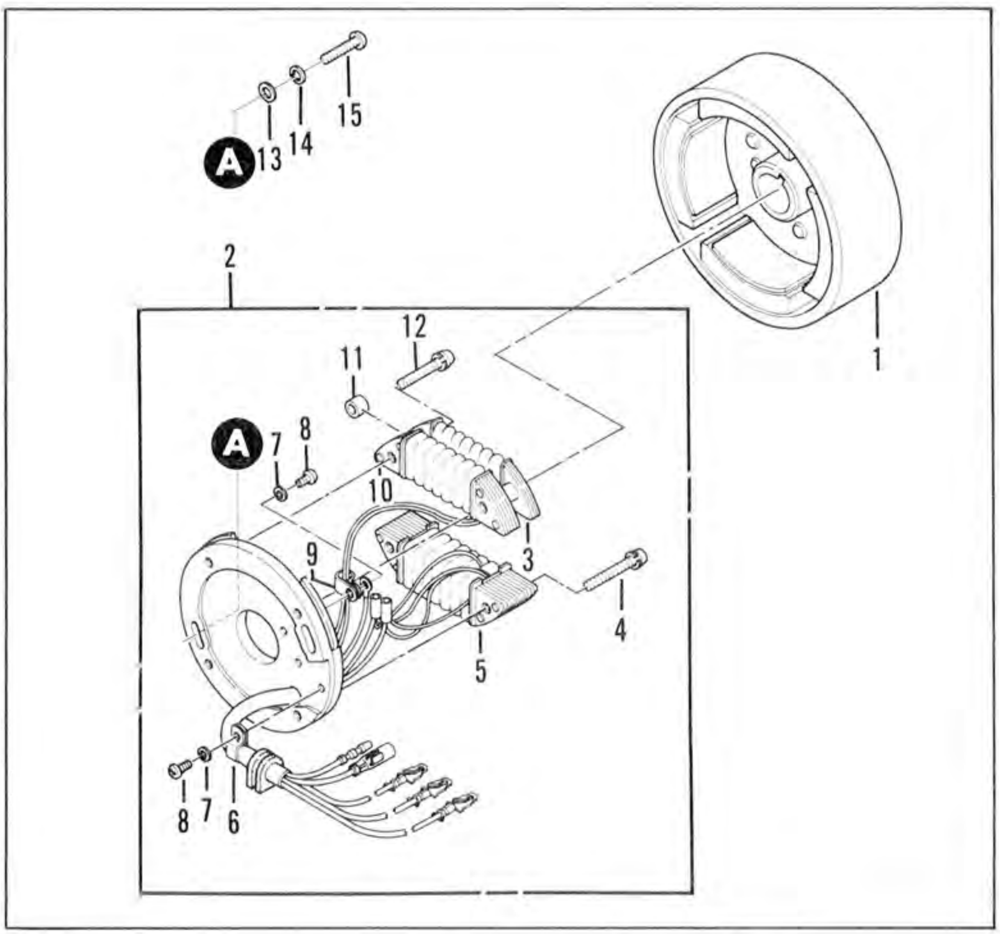


Figure 3-37

Disassembly

Refer to Figure 3-38 for disassembly sequence of magneto components.



1. Flywheel
2. Stator Assembly
3. Pulser Coil
4. Pan Head Screw
5. Lighting Coil
6. Stator Harness Clamp
7. Spring Washer
8. Pan Head Screw
9. Coil Wire Clamp
10. Exciter Coil
11. Coil Spacer Collar
12. Pan Head Screw
13. Plain Washer
14. Spring Washer
15. Pan Head Screw

Figure 3-38

Inspection

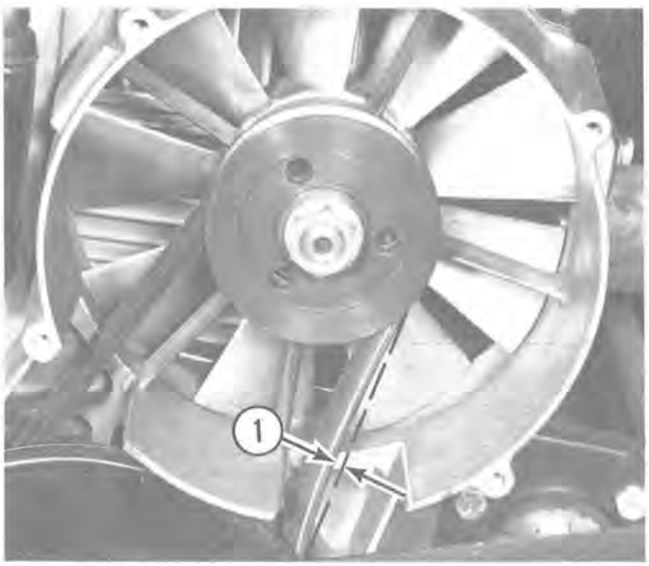
1. Check woodruff key for damage.
2. Check magnets in flywheel assembly. Thoroughly clean magnet area to remove any metal filings or particles that the magnets might have attracted.
3. Perform a visual check of all wires for frayed condition.

Reassembly

1. Reinstall all components removed from the stator plate. (See Figure 3-38.) Tighten all screws securely.
2. Reassemble stator assembly to crankcase. Be sure to align marks between stator assembly and crankshaft 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).
3. 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.

NOTE: Install fan drive pulley with machined shoulder toward flywheel.

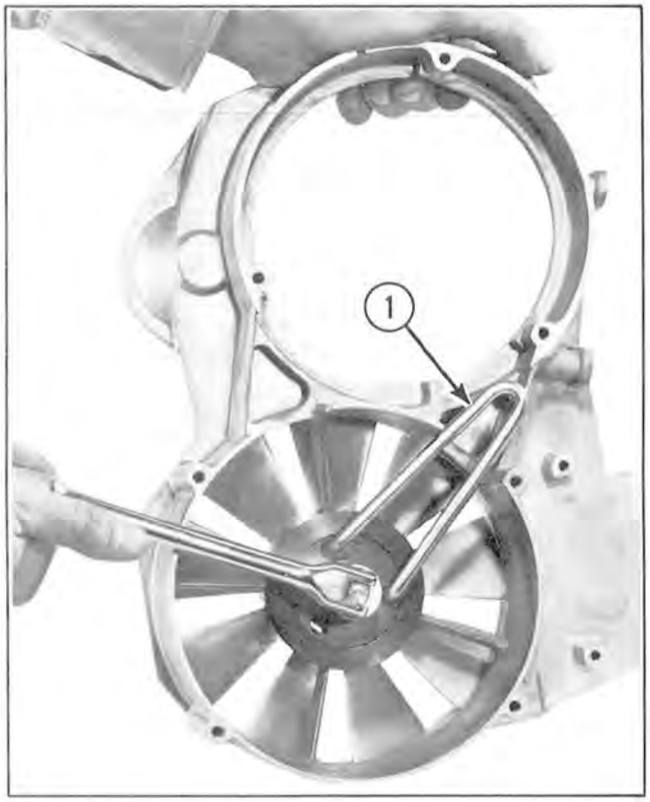
4. Reinstall starter pulley and fan drive pulley onto flywheel. Secure with the three bolts.
5. Assemble flywheel to the crankshaft. Torque flywheel nut to 60 ft lb (8.3 kg-m).



1. 5/32 in. (3.969 mm) Deflection

Figure 3-39

6. Install fan belt.
7. 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. (3.969 mm). (See Figure 3-39.) If adjustment is required remove the fan pulley nut, and outside half of pulley. (See Figure 3-40.) Add or remove spacers between fan pulley halves until correct measurement is obtained. Removing spacers will increase belt tension.



1. Fan Pulley Holder Tool No. 57001-3506

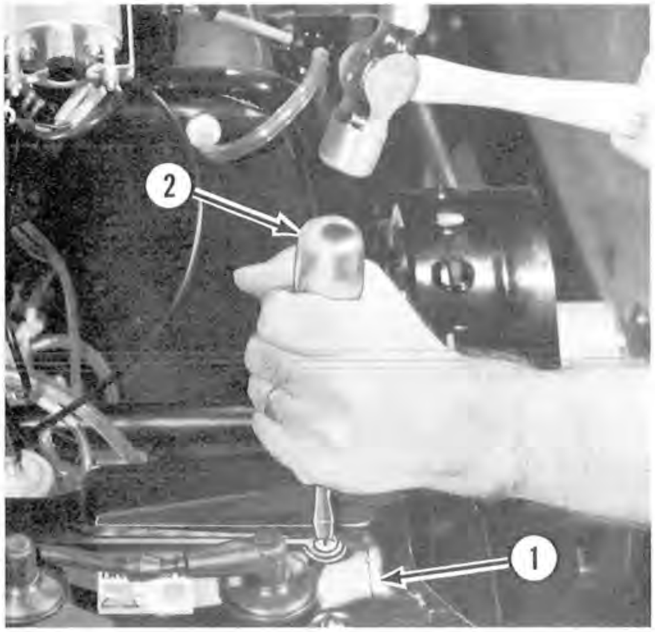
Figure 3-40

Air Shrouds

Removal

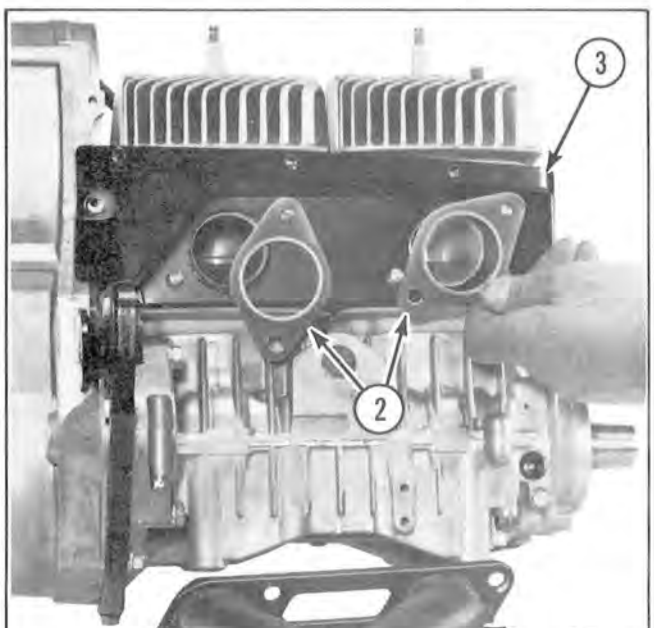
1. Using an impact driver, remove twelve screws, lockwashers and washers securing main shroud to engine. (See Figure 3-41.) Impact driver must be used to prevent stripping the screw heads because Loctite was applied to screws during assembly.

2. Remove four nuts and lockwashers securing exhaust manifold, gaskets and exhaust air shroud to engine. (See Figure 3-42.) Discard gaskets.



1. Main Engine Shroud
2. Impact Driver

Figure 3-41



1. Exhaust Manifold
2. Gaskets
3. Exhaust Air Shroud

Figure 3-42

3. Remove four bolts and flat washers securing carburetor holders, gaskets and intake air shroud to engine. Discard gaskets.

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.

Reassembly

1. Reassembly 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 a new gasket between cylinder and intake air shroud. Install the carburetor holders on the outside of the intake shroud with the silencer spring washers mounted on the outboard side. Torque the bolts to 45 in. lb (0.5 kg-m).

NOTE: Apply Loctite to main air shroud screws. Use an impact driver to assure main air shroud screws are tight.

Always use new gaskets during reassembly to ensure proper sealing between components.

Fan Housing

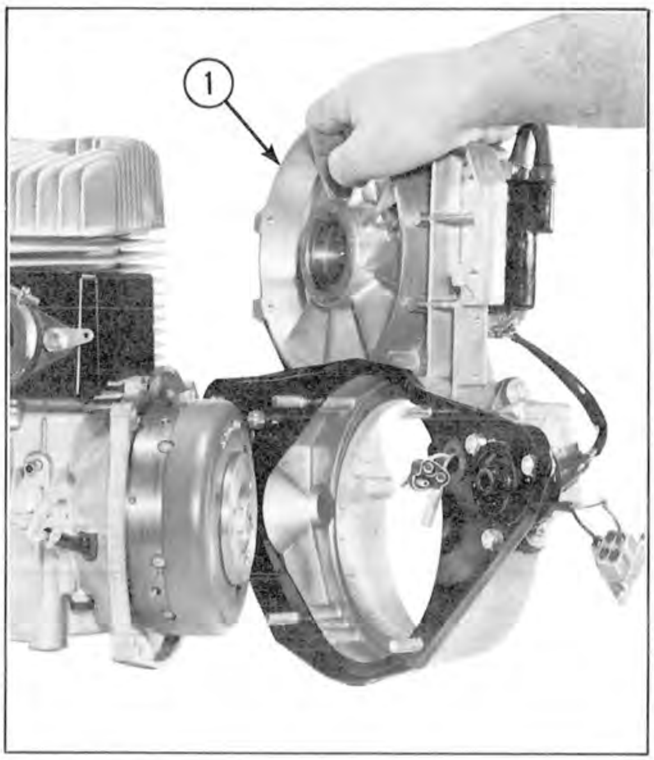
Removal

1. Remove four nuts and washers securing fan housing to crankcase and remove fan housing. (See Figures 3-43 and 3-44.)

2. Using fan pulley holder tool No. 57001-3506 remove nut and washer securing fan assembly to fan housing. (See Figure 3-40.)

3. Remove fan pulley halves and spacers from fan shaft. (See Figure 3-45.)

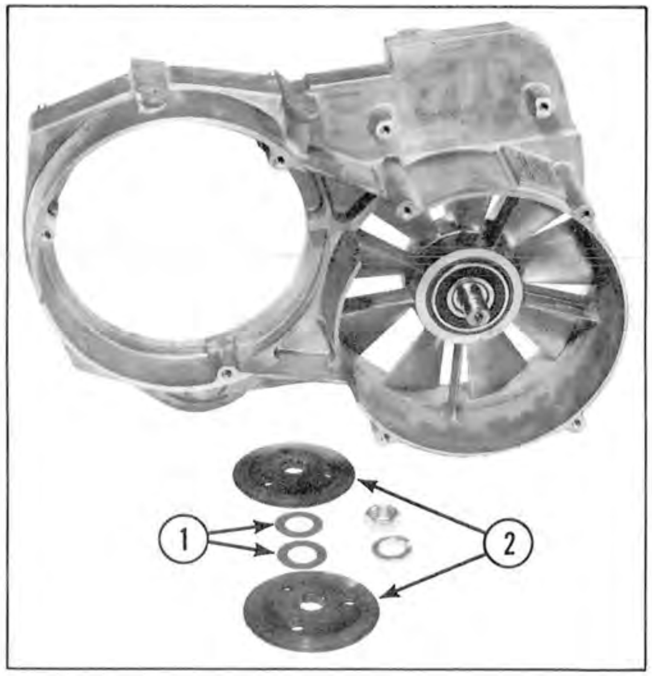
Figure 3-43



1. Fan Housing

Figure 3-44

NOTE: Spacers are used between the fan pulley halves to adjust fan belt tension. Using fewer spacers increases fan belt tension. During reassembly place half of the spacers removed behind the inside pulley half and the balance outboard of the outside pulley half to maintain proper belt alignment.



1. Spacers
2. Pulley Halves

Figure 3-45

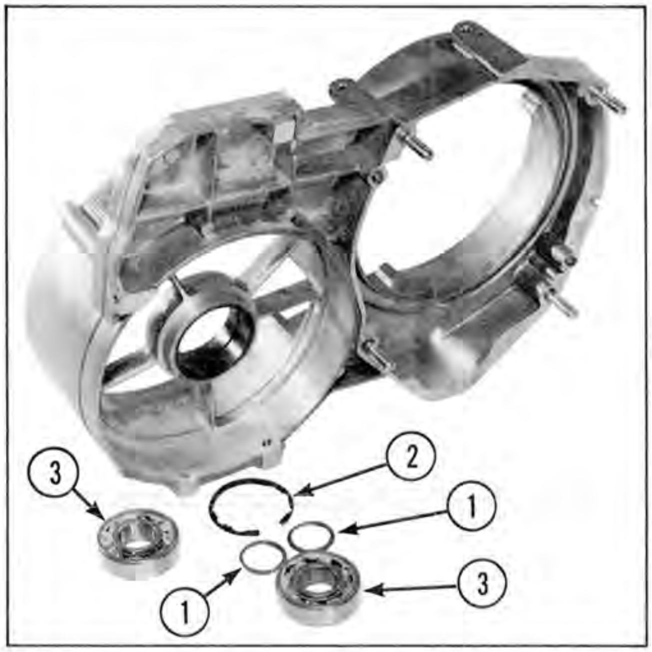
4. Using a heat gun or propane torch, heat aluminum fan case allowing bearings to be removed from fan case.

WARNING

Do not contact heated fan housing with bare hands or severe burn could result.

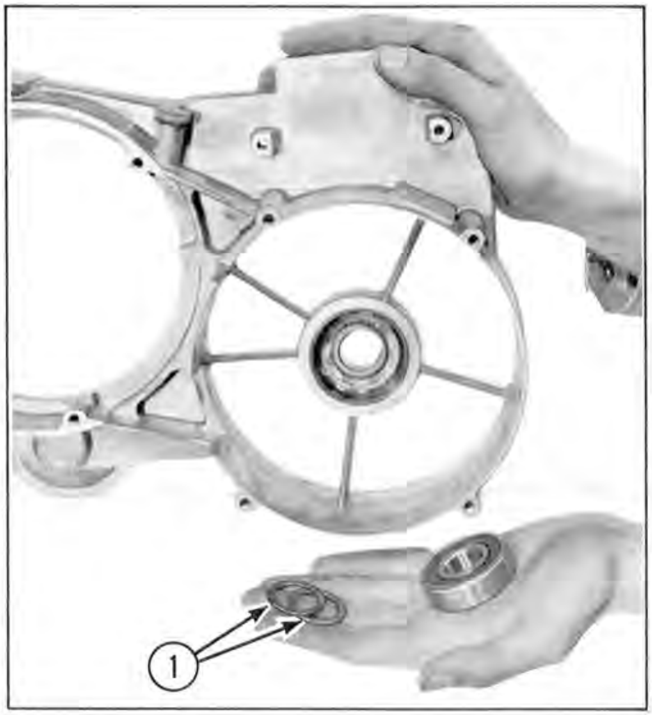
5. Using Tru-Arc or circlip pliers remove circlip and two spacers from fan housing. (See Figure 3-46.)

NOTE: Circlip is used to correctly position bearings. Spacers are installed between bearings to eliminate side loads when shaft nut is tightened.



1. Spacers (2)
2. Circlip
3. Bearings

Figure 3-46



1. Spacers

Figure 3-47

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 mouting studs for damage.

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 3-47.)

3. Attach pulley half to fan shaft. Assemble same number of pulley spacer washers to shaft as previously removed and attach remaining 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 to crankcase. Secure using four nuts and eight washers previously removed. Tighten nuts securely.

Carburetor Holders

Removal

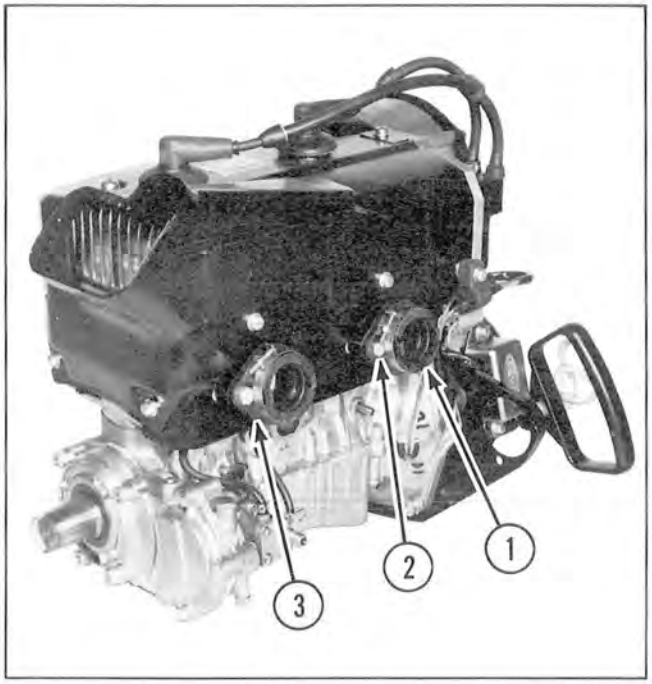
Remove the two bolts securing each carburetor holder to the cylinders. Remove the carburetor holders. (See Figure 3-48.)

Inspection

1. Inspect the carburetor holders for cracks or deterioration. Replace if necessary.

Installation

Position the carburetor holder onto the air intake shroud. Secure with the two bolts and washers removed above. Be sure the air silencer spring retaining tabs are located on the outside bolt of each carburetor holder. (See Figure 3-48.)



1. Carburetor Holder
2. Bolt
3. Gasket Between Air Shrcud and Cylinder

Figure 3-48

Cylinder Heads, Cylinders And Pistons

Cylinder Heads

Removal

1. Remove air shrouds.

2. Remove eight nuts, lockwashers and washers securing cylinder heads to cylinders, using a 13 mm socket and 3 in. extension. Carefully remove cylinder heads and gaskets. Discard gaskets. (See Figure 3-49.)

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: Dying the gasket surface before you begin will indicate high spots after some sanding.

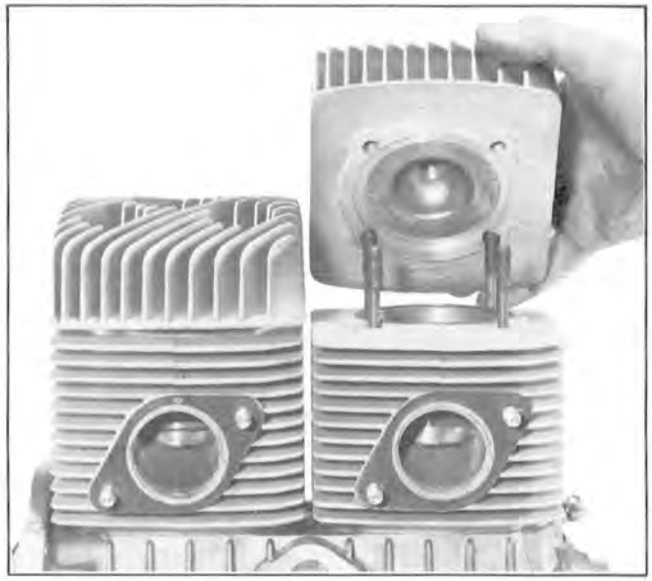


Figure 3-49

Cylinders

Removal

1. Remove the cylinders as shown in Figure 3-50. 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.

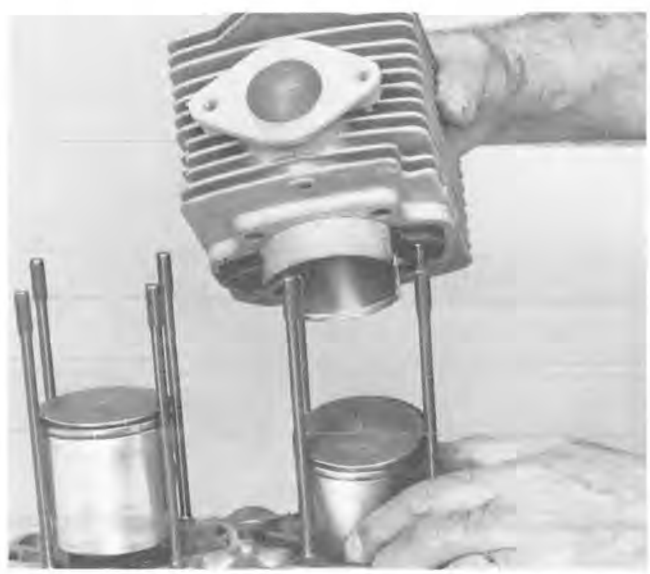


Figure 3-50

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.

2. Carefully remove cylinders from crankcase studs. Hold piston during cylinder removal to prevent piston from suddenly contacting studs or crankcase. (See Figure 3-51.)

3. Remove and discard cylinder base gaskets.

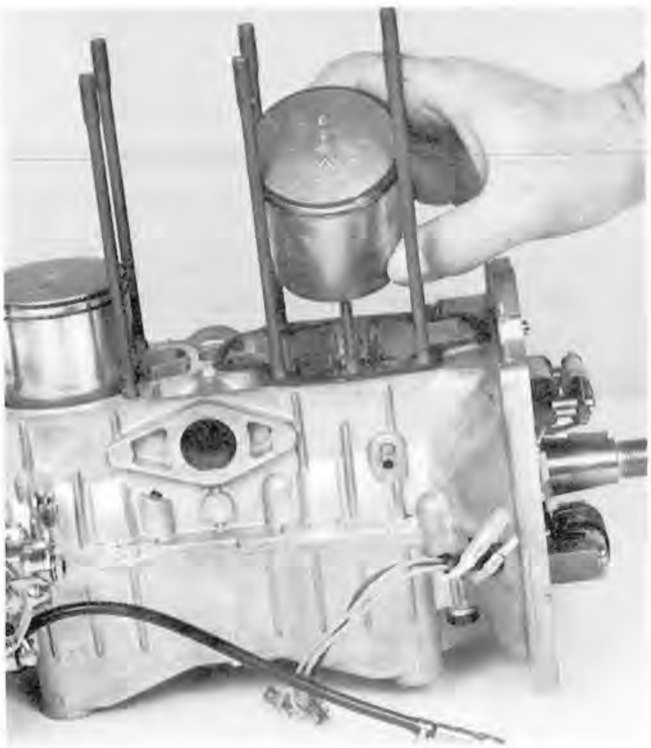


Figure 3-51

Inspection

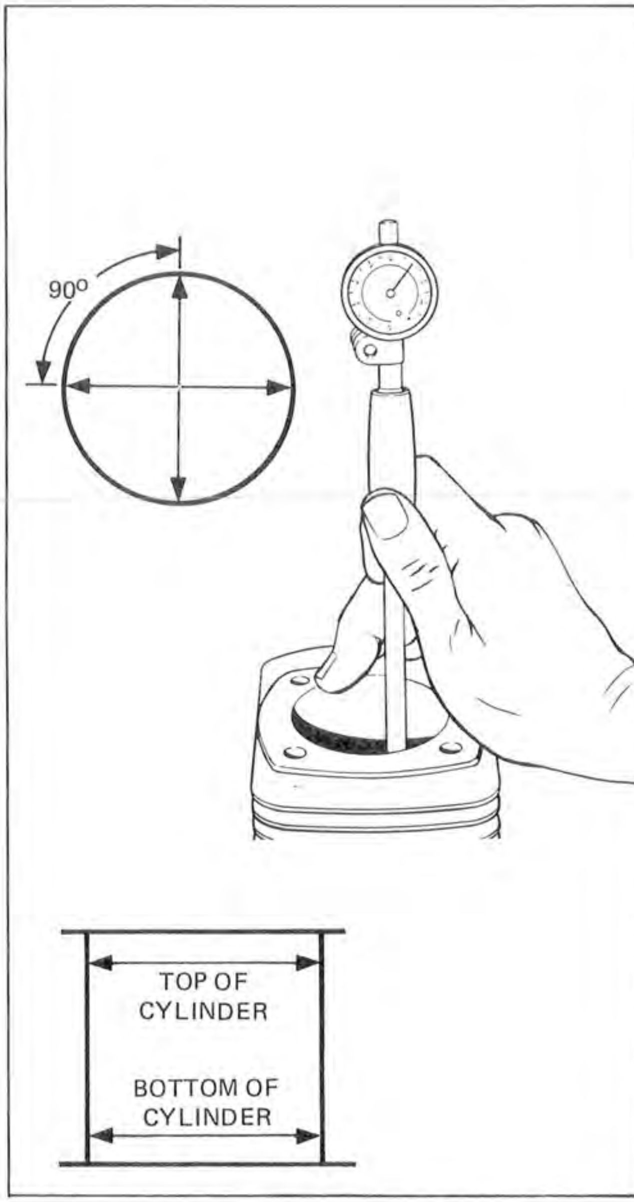
1. Check all cooling fins and remove any obstruction.

2. Thoroughly clean all carbon deposits from the exhaust ports and cylinder walls.

3. Check the cylinder wall for excessive scoring.

4. Using an dial bore gauge check the cylinder bore for wear. If the cylinder diameter exceeds the dimension shown under Service Limit in Figure 3-52, replace the cylinder.

NOTE: The cylinders in this engine are aluminum with chrome plated bores. They cannot be honed or rebored. Cylinders should be checked for size at top and bottom of bore with two measurements 90° apart.



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 3-52

Pistons

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.

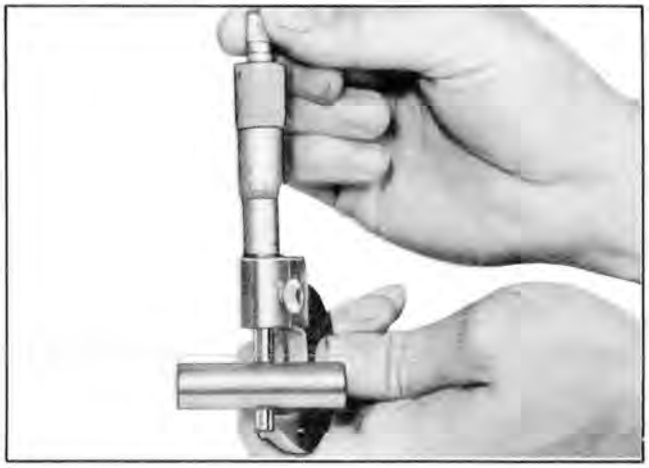
2. Check the piston-to-cylinder wall clearance. Measure the smallest inside diameter of the cylinder bore. Using a micrometer measure the largest outside diameter of the piston. Place micrometer 0.4 in. (10 mm) above the bottom of the piston skirt. (See Figure 3-53.) If the difference in the measurements 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 3-53 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 3-53

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 3-54 replace the piston pin.



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 3-54

4. Measure the piston pin bore diameter. If the dimension measured exceeds the Service Limit given in Figure 3-55, replace the piston.

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 3-55

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 3-56 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 3-56

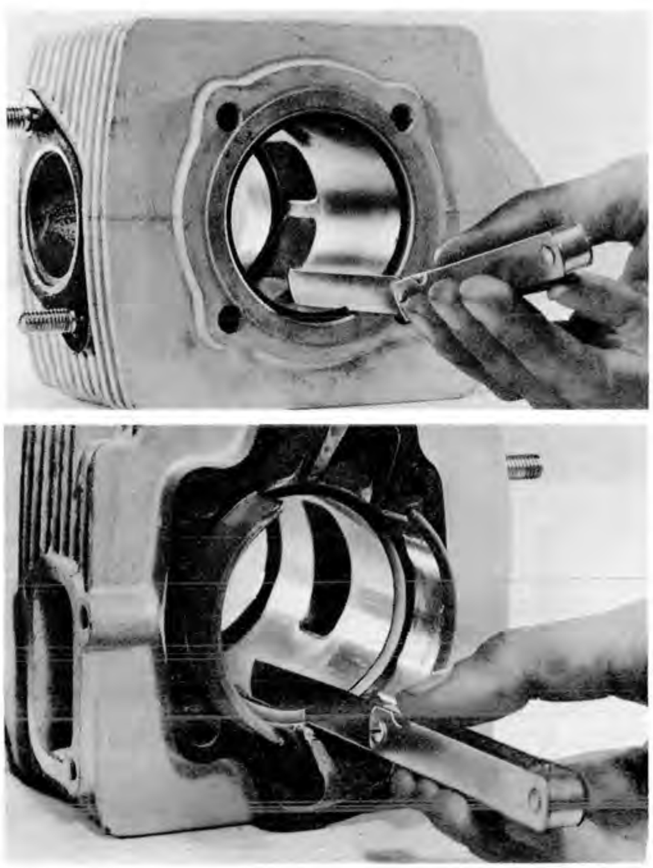


Figure 3-57

PISTON RING END CAP (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)

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 3-57.) If maximum ring gap exceeds the Service Limits when measured at the top and the bottom of the cylinder bore, replace the rings.

7. With the rings installed in their grooves, take several measurements with a feeler gauge to determine ring to groove clearance. If the clearance exceeds the Service Limit in Figure 3-58, replace the rings and remeasure ring to groove clearance. If the dimension still exceeds the Service Limit, replace the piston.

TOP RING/GROOVE CLEARANCE

Standard (New)	Service Limit (Used)
0.0020 - 0.0047 in. (0.05 - 0.12 mm)	0.009 in. (0.22 mm)

BOTTOM RING/GROOVE CLEARANCE

Standard (New)	Service Limit (Used)
0.0020 - 0.0035 in. (0.05 - 0.09 mm)	0.008 in. (0.19 mm)

Figure 3-58

REASSEMBLY

1. Install the piston rings onto the piston. The flat ring must be installed in the lower groove with the identification marks facing upward. The ring with the L shaped cross section must be installed in the top groove with the leg of the L up. The end gaps of these rings must be positioned over the alignment pins in the piston ring grooves.

NOTE: These rings are very fragile and should be handled accordingly.

2. Assemble bearings to upper connecting rod ends.

3. Attach piston and ring assemblies to connecting rods and insert piston pins. Secure piston pins with piston clips.

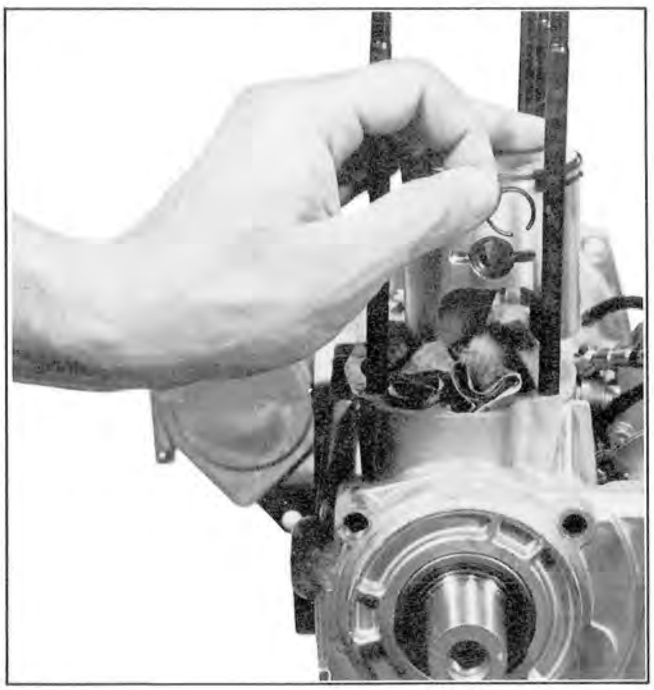


Figure 3-59

NOTE: Install the pistons with the letter E and the arrow mark to the exhaust side (front) of the engine. (See Figure 3-60.)

4. Install new cylinder base gaskets on the crankcase.

5. Lubricate the cylinder bores with KAWASAKI Snowmobile Oil.

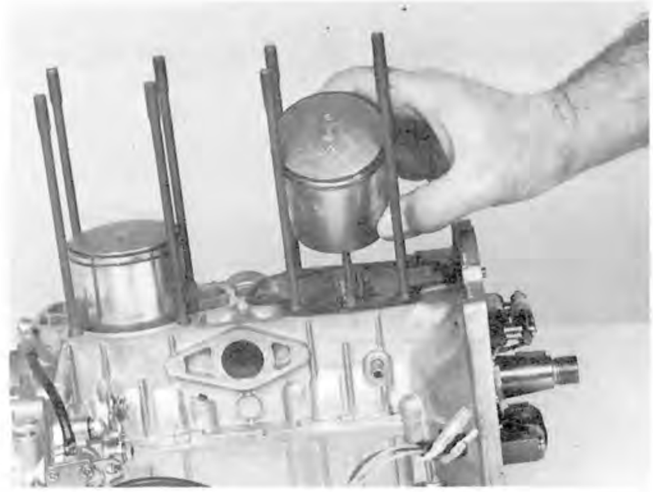
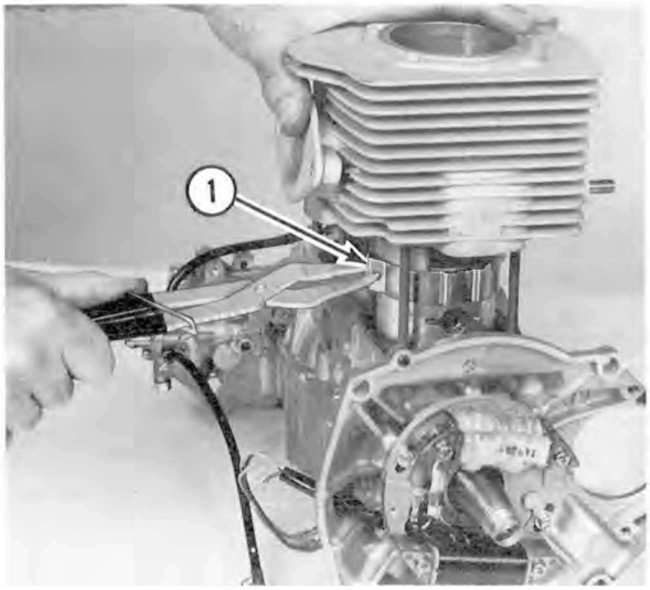


Figure 3-60

Figure 3-61

6. Lubricate the pistons and rings with KAWASAKI Snowmobile Oil. Match up the match marks scribed into the crankcase and cylinders before disassembly. (See Figure 3-61.) With the appropriate ring compressor install the cylinders. Be sure that the intake part of the cylinder is facing the rear of the crankcase. (See Figure 3-62.)

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 3-62

7. Install a new cylinder head gasket. (See Figure 3-63.)

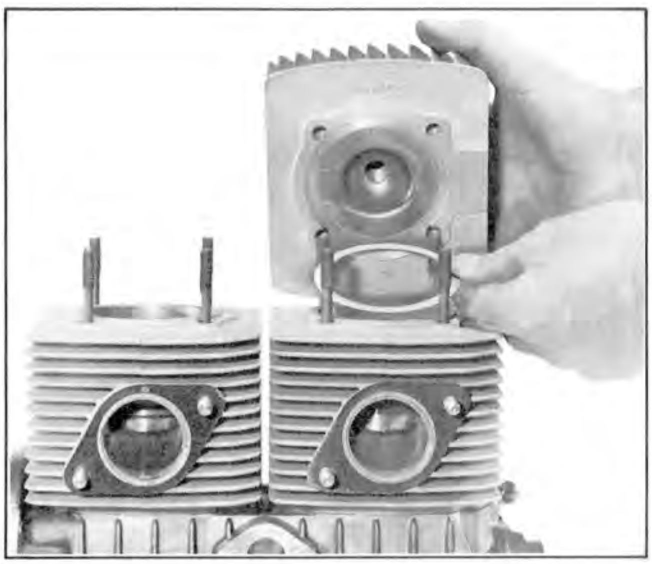


Figure 3-63

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 cross-cross pattern. (See Figure 3-64.)

10. Install the air shrouds and carburetor holders as described earlier in this section.

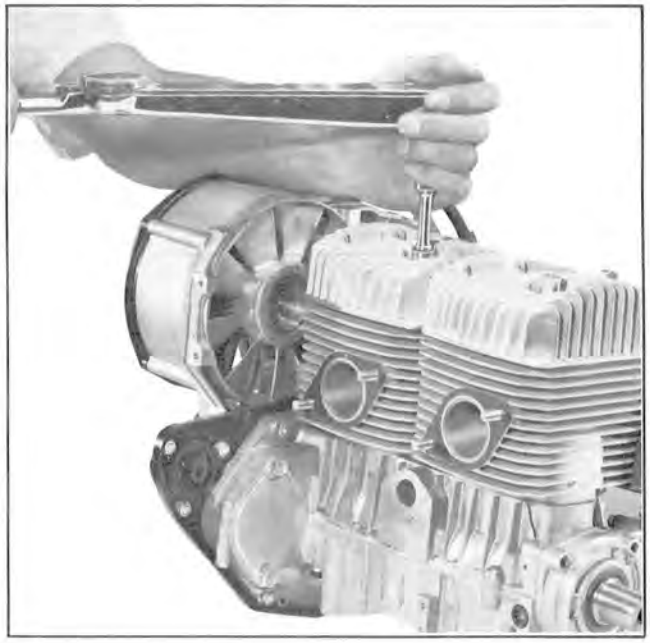


Figure 3-64

Oil Injection System

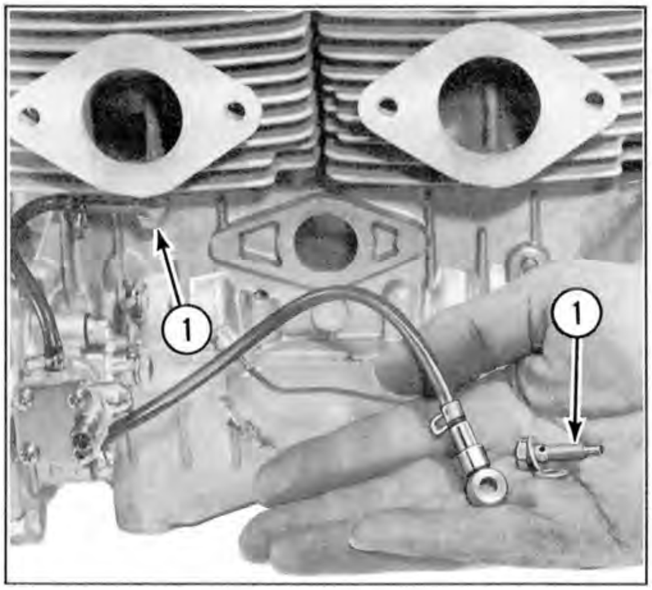
Oil Pump Output Test

For this test it is necessary to use premixed fuel (40 to 1). Use a one gallon can with a hose connected to the inlet of the fuel pump. Disconnect the oil pump output lines at oil pump. Install separate oil tubes to each outlet and place end of each in a separate container. Start engine and run at IDLE SPEED (3000 RPM) with OIL PUMP LEVER WIDE OPEN. Measure the output of each tube in a calibrated glass tube. The output from each tube to the cylinder fittings should be 3.35 to 4.06 cc per minute. Replace the oil pump if output is below these specifications.

Disassembly

1. Disconnect oil tube from the inlet fitting of the oil pump. Insert a bolt into the end of the tubing to prevent the oil from draining out.

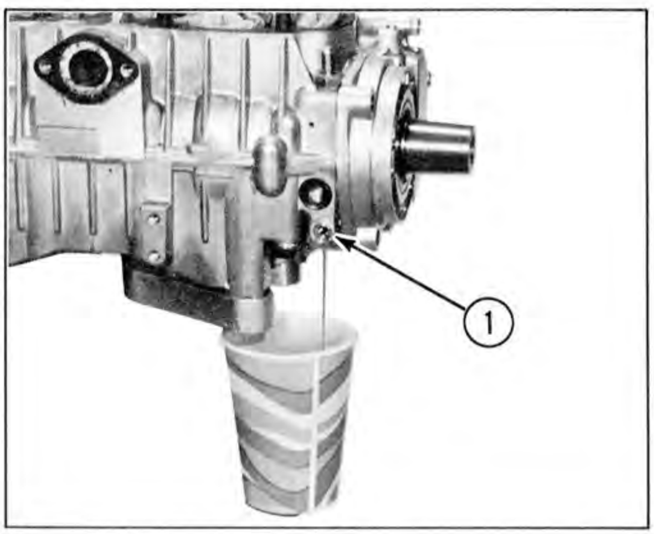
2. Remove the oil injection nozzles from the cylinders. (See Figure 3-65.)



1. Injection Nozzle

Figure 3-65

3. Remove the drain plug on the front of the gear case and drain the case. (See Figure 3-66.)



1. Drain

Figure 3-66

4. Remove the bolts securing the gear case cover to the crankcase and remove the gear case cover. (See Figure 3-67.) 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 3-67.)

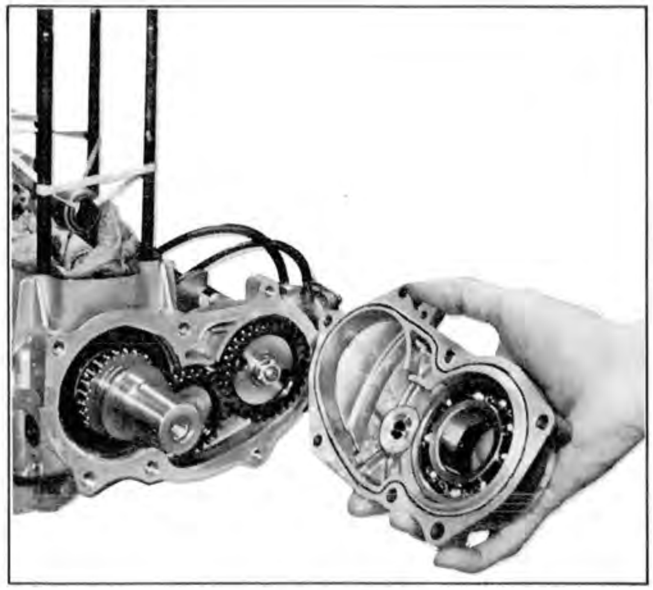
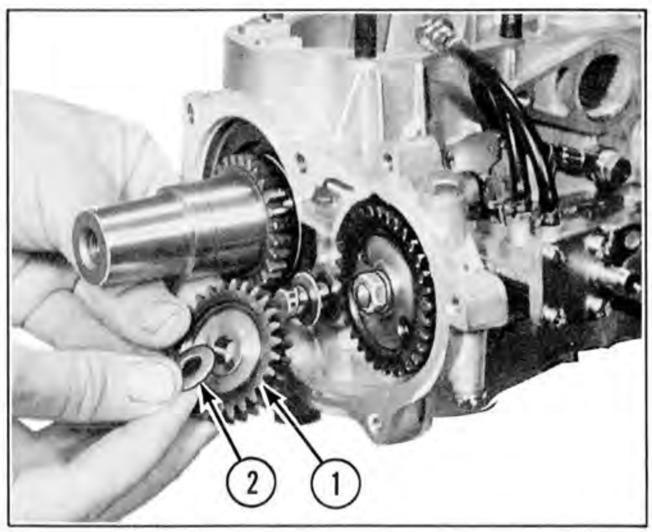


Figure 3-67

5. Remove the idler gear. Take care not to lose the spacer in back of the gear. (See Figure 3-68.)



1. Idler Gear
2. Spacer

Figure 3-68

6. 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.

7. Remove the two bolts securing the oil pump to the crankcase and remove the pump. (See Figures 3-69 and 3-70.)

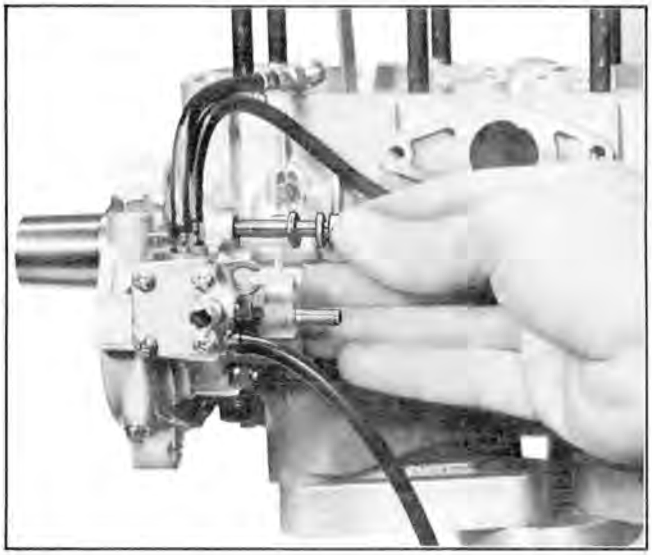
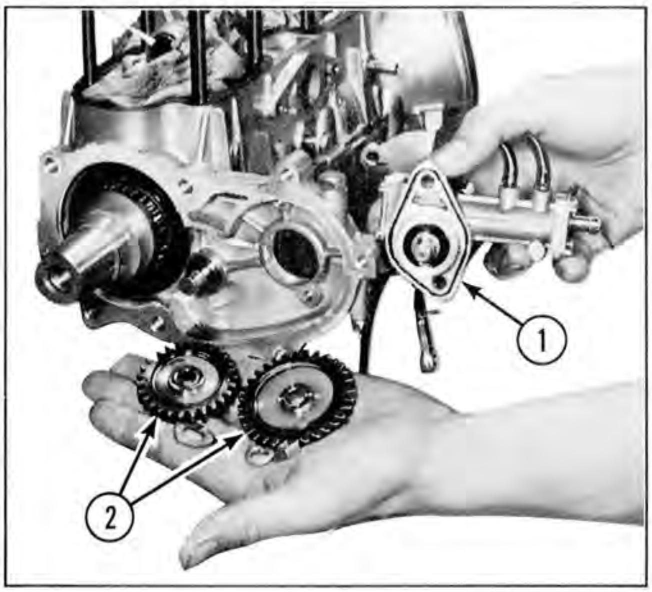


Figure 3-69



1. Oil Pump
2. Gears

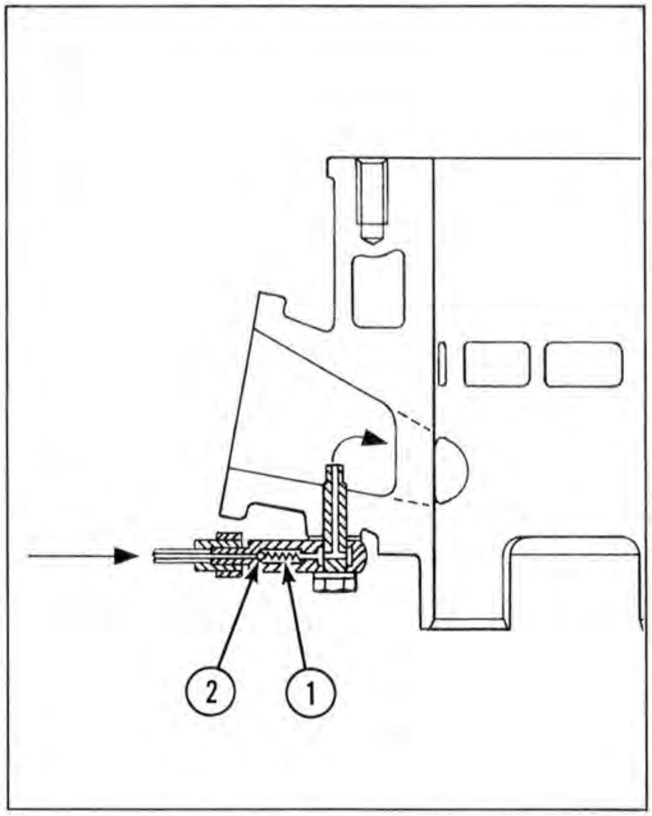
Figure 3-70

Inspection

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 3-71.)

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.



1. Spring
2. Steel Ball

Figure 3-71

Check the gears, bearings and seals for wear or damage and replace if necessary.

Figure 3-72 shows the oil flow through the crankcase to the center main bearings and to the big end of the connecting rod.

Check the gearcase vent hole directly above the sight glass to be sure it is free from obstruction to ensure proper seal operation. (See Figure 3-73.) If this hole is plugged, it could permit the gearcase oil to be sucked into the crankcase through the seal between the gearcase and crankcase. Loss of this oil would result in gear and bearing failure.

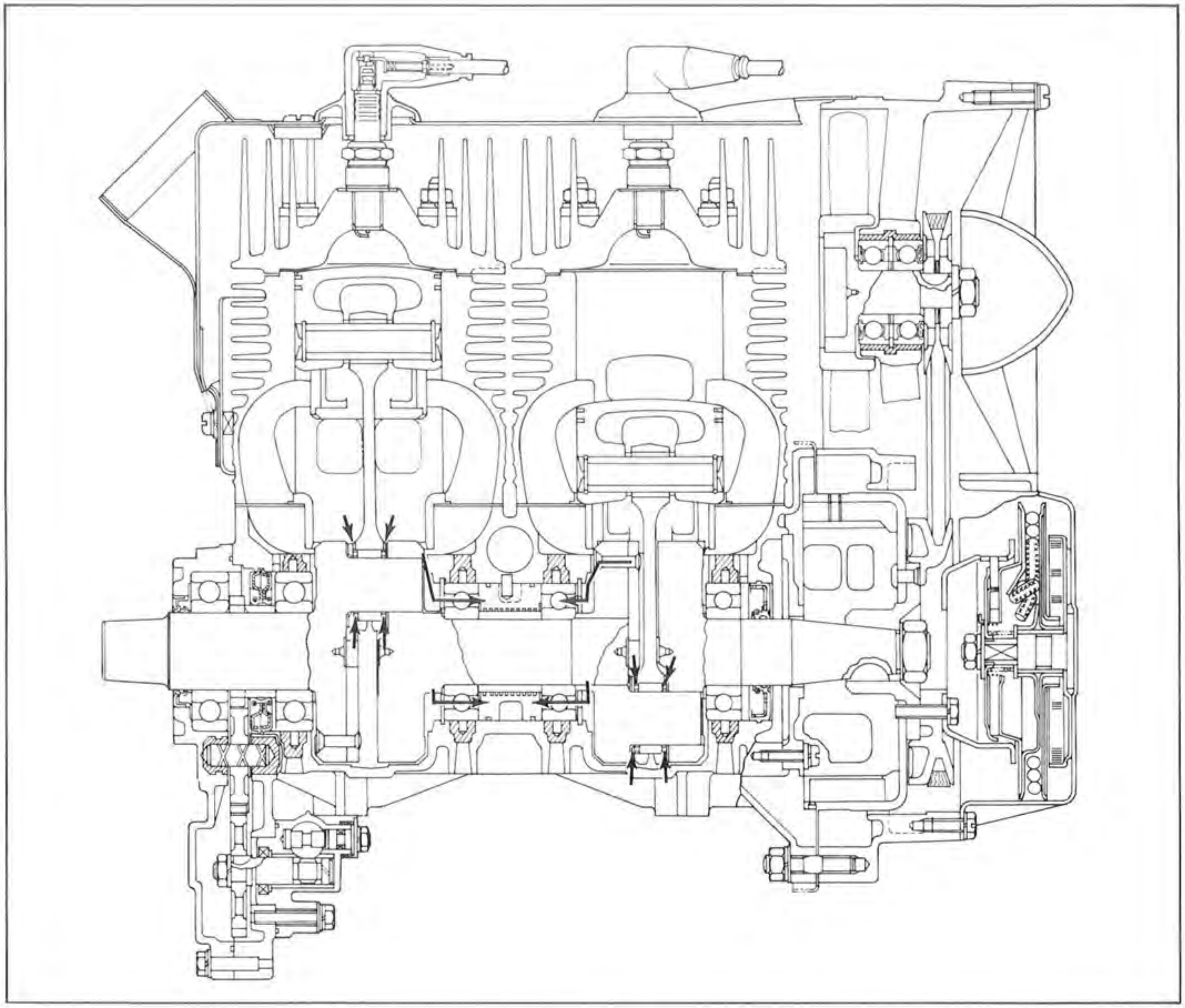
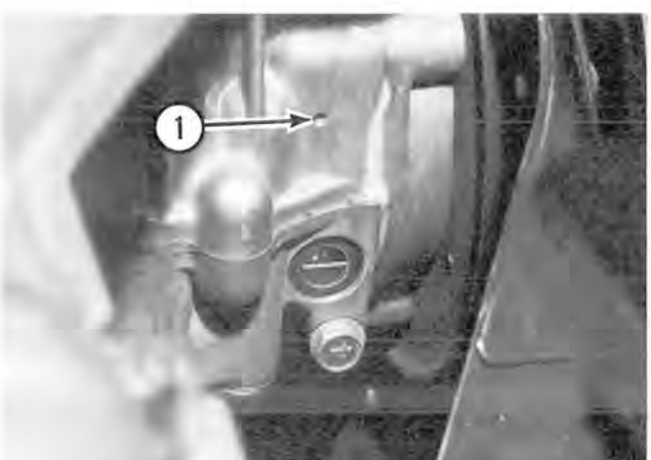


Figure 3-72



1. Vent Hole

Figure 3-73

Assembly

1. Install a new O-ring into oil pump flange and apply a thin coat of silicone sealer. Install oil pump into crankcase and secure with two bolts. Be sure to install new seal washers on the mounting bolts to prevent gearcase oil leakage.

CAUTION

Bleed oil pump by removing bleed bolt and holding control lever in full open position. Hold lever open until ALL air is bled from tube feeding the pump. To bleed air from the output tubes of the oil pump, idle the engine at 3000 RPM. Hold the control lever full open for one minute.

2. Install oil pump gear and secure with nut and washer.

3. Position one spacer, idler gear and second spacer onto idler shaft.

4. Install bearing into gearcase cover. Measure from the gasket surface of the gearcase cover to the face of the inner race of the bearing. (See B Figure 3-74.) Also measure from the gasket face of the crankcase to the face of the drive gear on the end of the crankshaft. (See A Figure 3-74.) Subtract dimension B from dimension A the results would be the clearance.

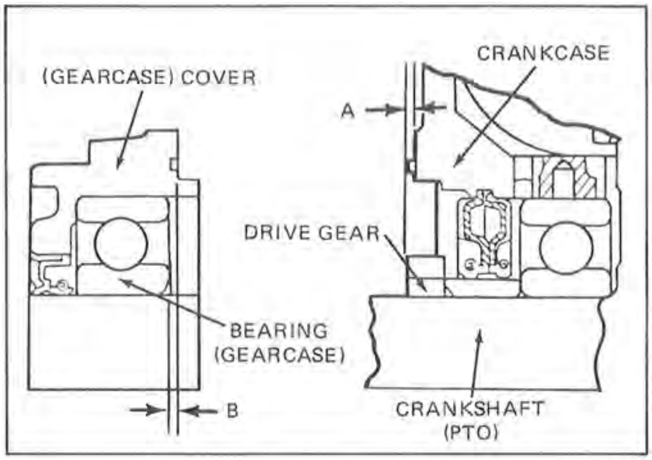


Figure 3-74

Clearance = Dimension B-A	Shim No. Required
.0052-.0156 inches (0.135-0.39 mm)	None
.0157-.0232 inches (0.4-0.59 mm)	(1)
.0236-.0312 inches (0.6-0.79 mm)	(1) + (1)
.0315-.0390 inches (0.8-0.99 mm)	(2)
.0394-.0469 inches (1.0-1.19 mm)	(1) + (2)
.0472-.0537 inches (1.2-1.39 mm)	(3)
.0551-.0626 inches (1.4-1.59 mm)	(2) + (2)
.0629-.0705 inches (1.6-1.79 mm)	(4)
.0709-.0783 inches (1.8-1.99 mm)	(2) + (3)
.0787-.0862 inches (2.0-2.19 mm)	(2) + (2) + (2)
.0866-.0931 inches (2.2-2.39 mm)	(3) + (3)
.0945-.1020 inches (2.4-2.59 mm)	(2) + (2) + (3)
.1024-.1076 inches (2.6-2.735 mm)	(3) + (4)

SHIM NUMBER DESCRIPTION

No.	Thickness	Part No.
(1)	.00787 inches (0.2 ± 0.015 mm)	92025-3007
(2)	.02362 inches (0.6 ± 0.030 mm)	92025-3008
(3)	.03937 inches (1.0 ± 0.040 mm)	92025-3009
(4)	.05512 inches (1.4 ± 0.050 mm)	92025-3010

With the correct shims there should be an axial clearance of 0.004-0.016 in. (0.15-0.39 mm).

5. Install a new O-ring into gearcase cover and coat gasket surface slightly with silicone sealer. (See Figure 3-75.) The outer seal in the gearcase cover is a double lip seal. Fill the area between the two lips with grease before installing the cover.

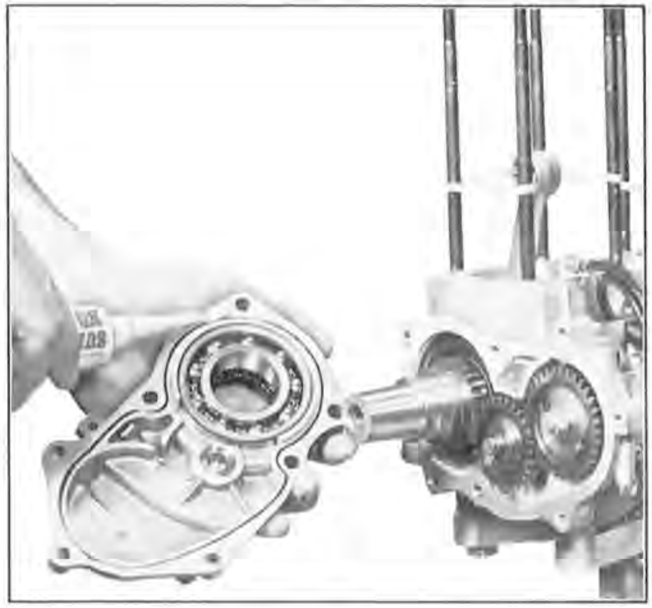


Figure 3-75

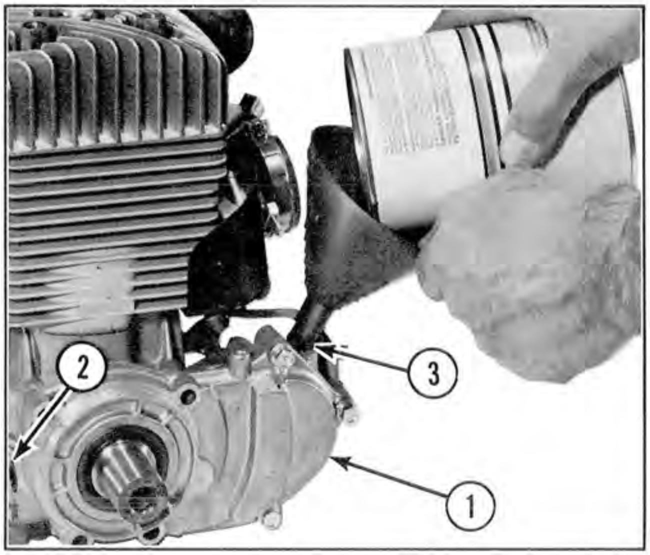
6. Install gearcase cover and secure with bolts removed previously.

7. Reinstall the oil pump nozzles to the cylinders.

CAUTION

Bleed oil pump by removing bleed boat and holding control lever in full open position. Hold lever open until ALL air is bled from tube feeding the pump. To bleed air from the output tubes of the oil pump, idle the engine at 3000 RPM. Hold the control lever full open for one minute.

8. Fill gearcase to just above center of sight glass but not higher than the top with SHELL XL100 10W-30 non-foaming engine oil. (See Figure 3-76.) The gearcase oil should be changed after the first 100 miles and thereafter at the end of each season.



1. Gearcase
2. Sight Glass
3. Fill Hole

Figure 3-76

Crankshaft Assembly

Removal

1. Remove the cylinder heads, cylinders, and pistons.

2. To remove the fan housing and engine mount plate disconnect the CDI wires and remove the lighting coil wires from the connector plug. Be sure to mark the connector so the wires for the lighting coil are reconnected correctly. Remove the nuts securing the fan housing and lift the entire assembly off of the crankcase. (See Figure 3-77.)

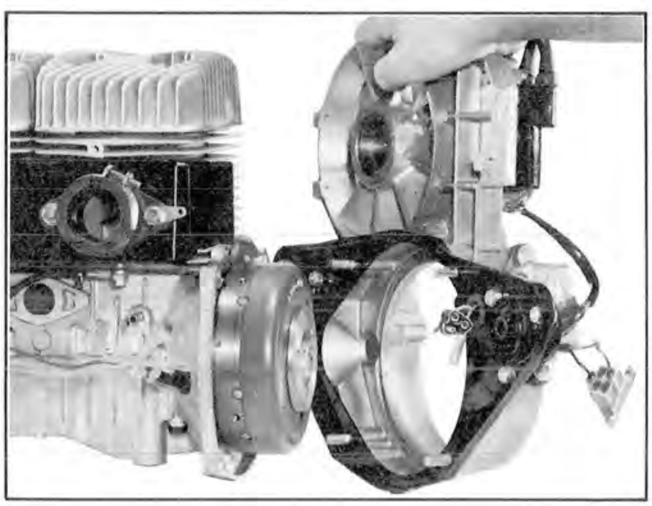
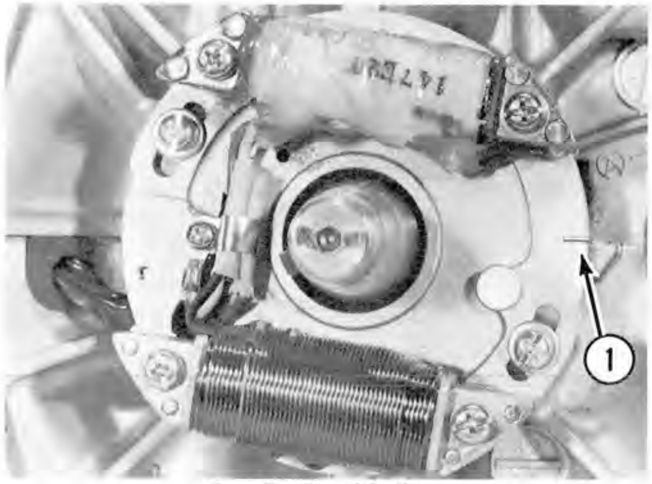


Figure 3-77

3. Scribe a mark on the stator plate and the crankcase boss to assure proper indexing during reassembly. (See Figure 3-78.)



1. Scribe Mark

Figure 3-78

4. Remove the screws securing stator plate to the crankcase and remove the stator plate.

5. Drain the gear case assembly. Remove the bolts securing the gear case cover to the crankcase and remove the cover. Remove the idler gear, spacers and idle shaft.

6. Remove the driven gear from the oil pump shaft and remove the oil pump.

7. Remove the bolts securing the crankcase halves together. Remove the lower crankcase from the upper crankcase.

8. Use a mallet or a soft hammer to break the crankcase seal and separate the two halves. (See Figure 3-79.)

9. Lift the crankshaft assembly straight up and out of the crankcase.

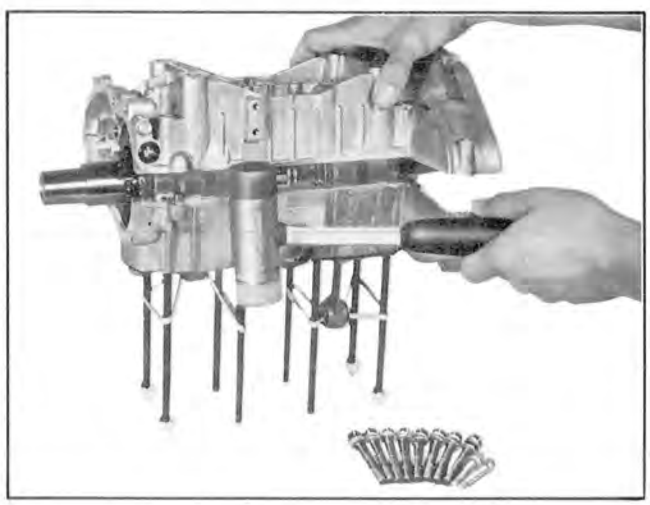


Figure 3-79

Inspection

1. With a feeler gauge check the side clearance of the connecting rods. (See Figure 3-80.) The correct tolerance is 0.016-0.020 in. (0.4-0.5 mm). If the clearance is greater than this replace the crankshaft assembly.

Figure 3-80

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 3-81 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 0.0008-0.001 in. (0.02-0.03 mm), if the radial clearance exceeds these dimensions replace the crankshaft assembly.

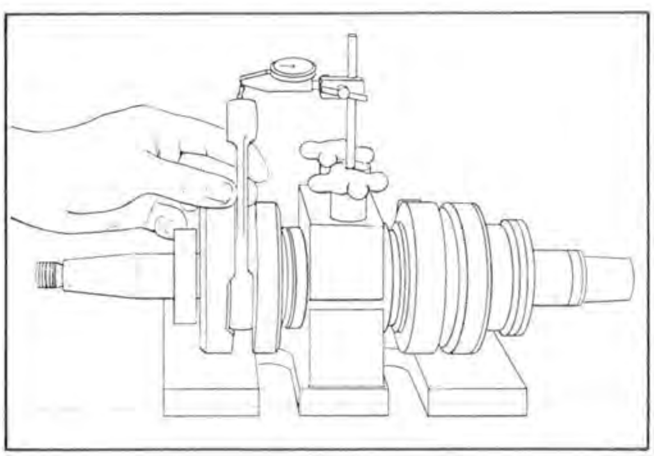


Figure 3-81

4. If the outer bearings, seals or oil pump drive gear require replacement, remove these parts with a bearing puller. (See Figure 3-82.) Never hammer on the bearings or crankshaft to remove these parts.

   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.

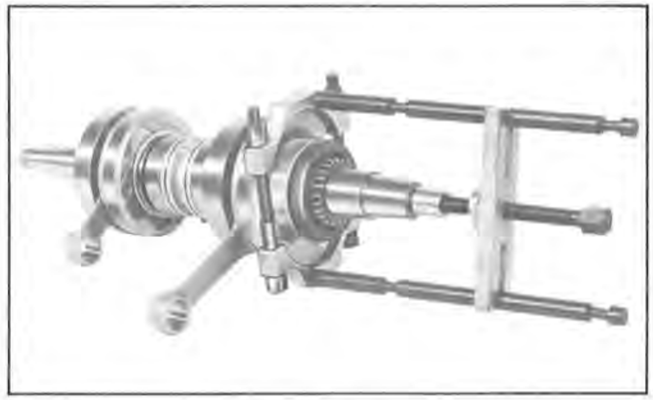


Figure 3-82

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 3-83 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.

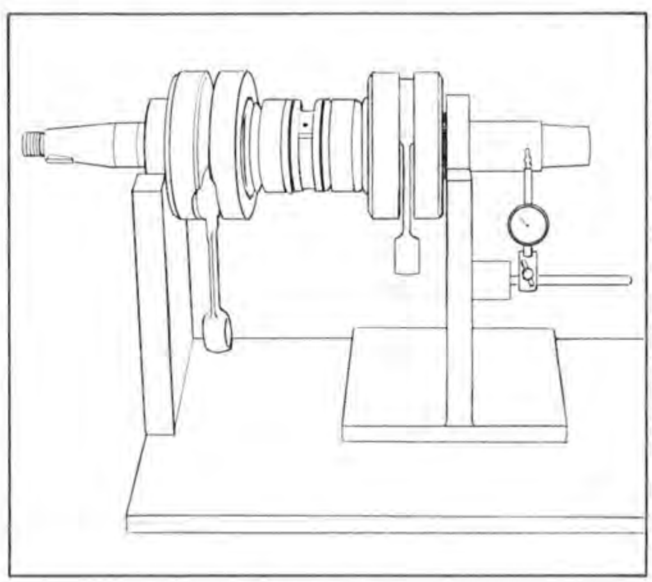
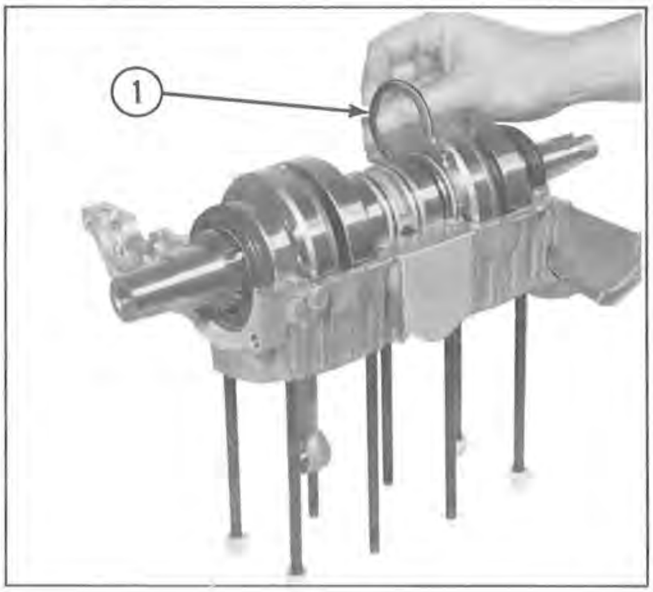


Figure 3-83

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 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 will be your end play. Select the correct shim from the chart below to permit 0.003-0.004 in. (0.076-0.1 mm) end play. Maximum allowable end play is 0.015 in. (0.38 mm).

   Install the shim between the thrust washer and the crankshaft center bearing on the magneto end. (See Figure 3-84.)

"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

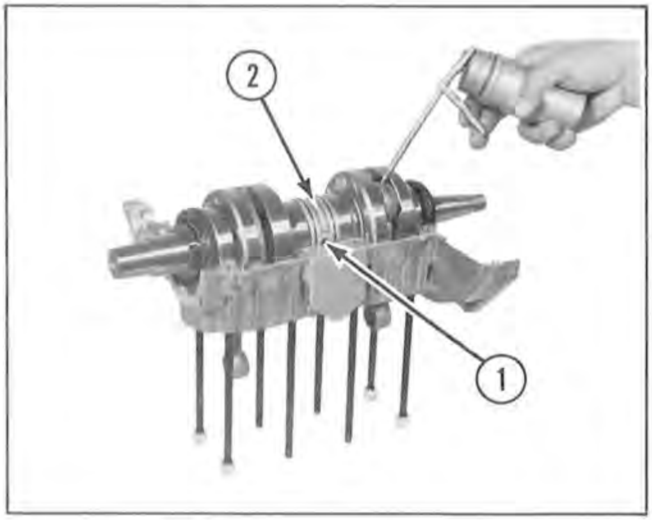


1. Shim

Figure 3-84

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 oil slingers near the center main bearings are properly seated in the grooves in the upper crankcase half. (See Figure 3-85.)



1. Dowel Pin
2. Labyrinth Seal

Figure 3-85

2. Apply a continuous thin bead of KAWASAKI SEALER to the upper crankcase half. (See Figure 3-86.)

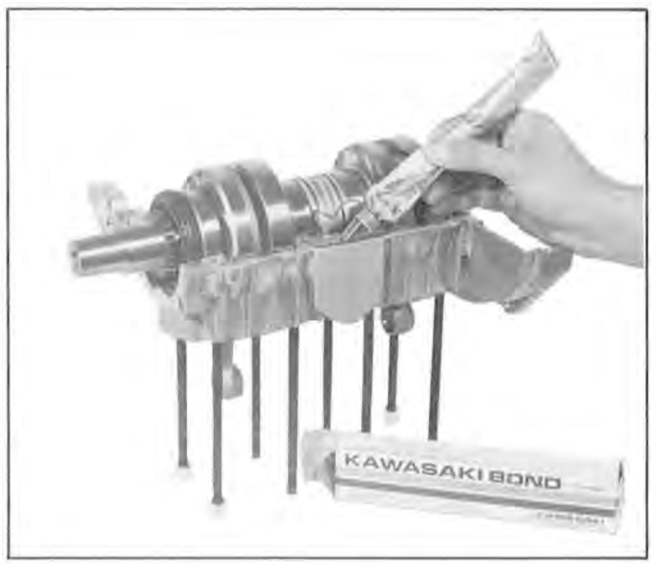


Figure 3-86

3. Install the lower half of the crankcase. Torque the bolts in a criss-cross pattern as shown in Figure 3-87. 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).

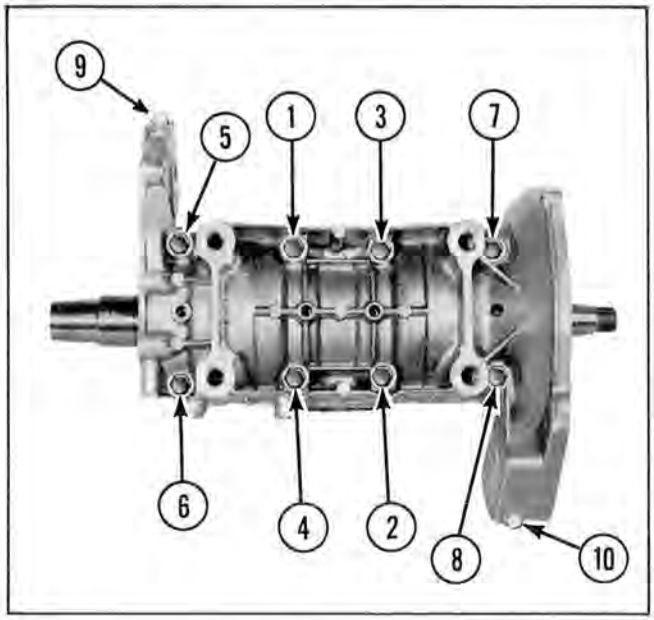
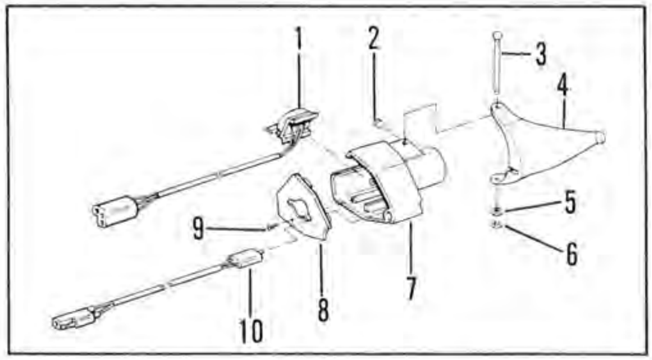


Figure 3-87



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 3-88

4. Reinstall fan housing and engine mount plate.
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 3-88.)
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.

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 lever adjustment as described in Section 2.

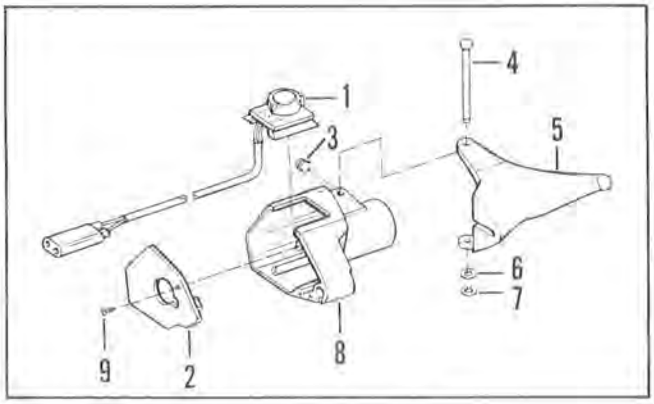
Emergency Stop Switch or Throttle Lever Assembly

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 handlegrip and handlebar to loosen the grip from the bar, and pull handlegrip from handlebar.
3. Disconnect the emergency switch connector from the main harness.

4. Loosen lock screw and slide throttle lever assembly from the handlebar. (See Figure 3-89.)



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 3-89

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 lever adjustment as described in Section 2.

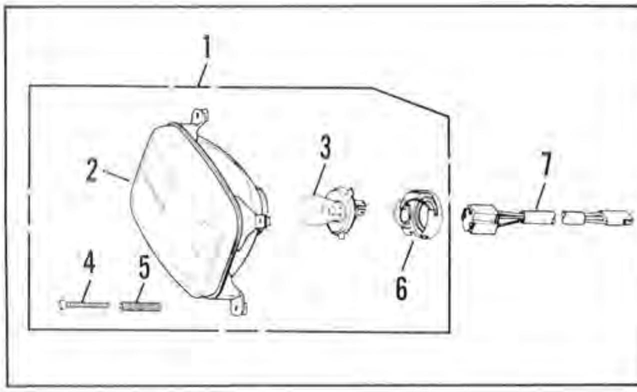
Headlamp

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 3-90.



1. Headlamp Assembly
2. Headlamp Lens
3. Headlamp Bulb
4. Upper Adjusting Screw
5. Adjustment Spring
6. Retainer
7. Headlamp Harness

Figure 3-90

Installation

1. Reassemble headlamp in reverse order of removal. (See Figure 3-90.)

2. Adjust headlamp in accordance with Section 2.

Key Switch

Removal

1. Remove the air silencer.

2. Remove the handlebars.

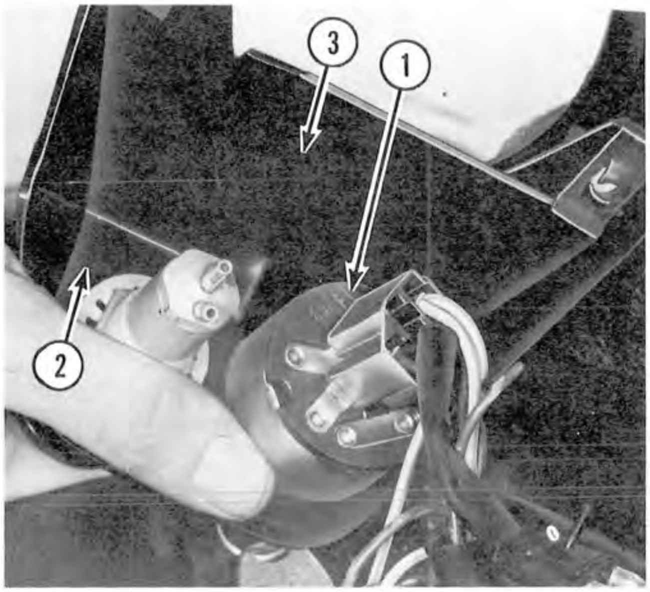
3. Remove the handlebar holder.

4. Remove the two upper steering mount bolts. Lift the key switch panel and bracket up. Disconnect the wiring harness from the key switch.

5. Remove the face nut from the key switch. Remove the switch from the panel. (See Figure 3-91.)

Installation

1. Install the key switch in the reverse order of removal. Hand tighten the face nut. Torque the upper steering mount bolts to 18 ft lb (2.5 kg-m). Torque the handlebar holder bolt to 35 ft lb (4.84 kg-m). Torque the four socket screws securing the handleholder to 105 in. lb (1.21 kg-m).



1. Key Switch
2. Panel
3. Bracket

Figure 3-91

Speedometer

Removal

1. Disconnect speedometer cable and remove the light bulb assembly from the speedometer.

2. Remove the speedometer bracket, and remove the speedometer from the panel. (See Figure 3-92.)

Figure 3-92

Installation

1. Install the speedometer to the panel and install the speedometer bracket.

2. Install the light bulb assembly. Connect the speedometer cable and hand-tighten. (See Figure 3-92.)

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. (See Figure 3-93.)

Figure 3-93

Tail Lamp

Removal

1. Disconnect tail lamp harness from the main harness.

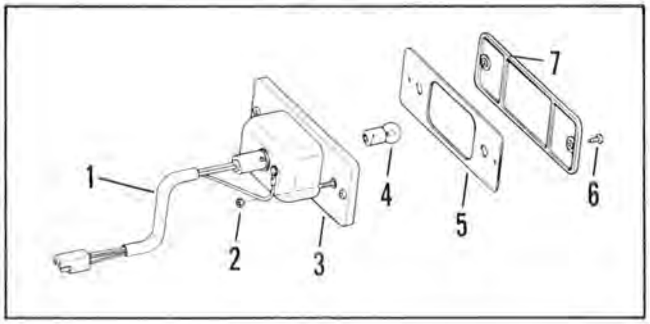
2. Remove the seat and fuel tank.

3. Remove the tail lamp lens and gasket. (See Figure 3-94.)

4. Remove the nuts securing the tail lamp assembly and remove the tail lamp assembly.

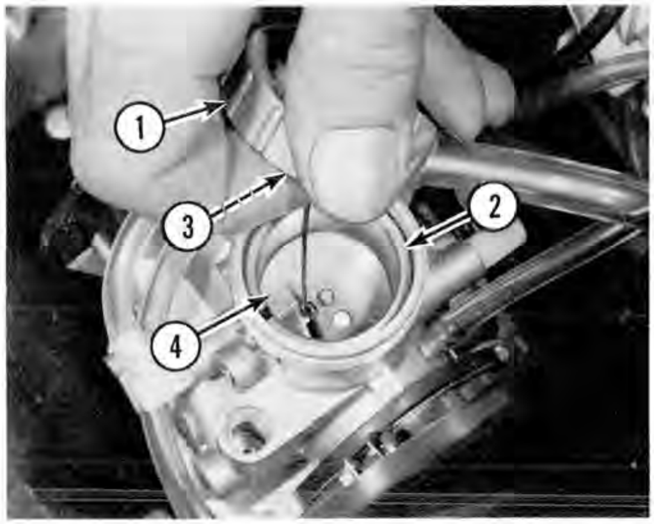
Installation

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.



1. Harness
2. Nut
3. Tail Lamp Body Assembly
4. Bulb
5. Gasket
6. Screw
7. Lens

Figure 3-94



1. Mixing Body Top Assembly
2. Throttle Slide Valve Assembly
3. Spring
4. Throttle Spring Seat Plate

Figure 3-95

Light Regulator Replacement

1. Disconnect the light regulator connector from the main harness.
2. Remove machine screw, lockwasher and locknut, and remove the light regulator.
3. Install light regulator in the reverse order of removal. Tighten machine screw to 95 in. lb (1.09 kg-m).

Throttle Cable and Oil Pump Cable

Removal

1. To remove the throttle cable from each carburetor, unscrew the mixing body top assembly and pull out the throttle slide valve assembly. (See Figure 3-95.)
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 slide valve and separate the throttle cable from the throttle slide valve.
4. Loosen the throttle cable locknut and unscrew the throttle cable from the mixing body top assembly. (See Figure 3-95.) Loosen clamp screw and remove LH carburetor from carburetor holder.
5. Loosen the locknut of the oil pump cable which is toward the engine.
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 3-96.)

Installation

1. Slide the throttle cable through the throttle lever assembly and install the snap ring. (See Figure 3-96.).
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 top assembly. (See Figure 3-95.)

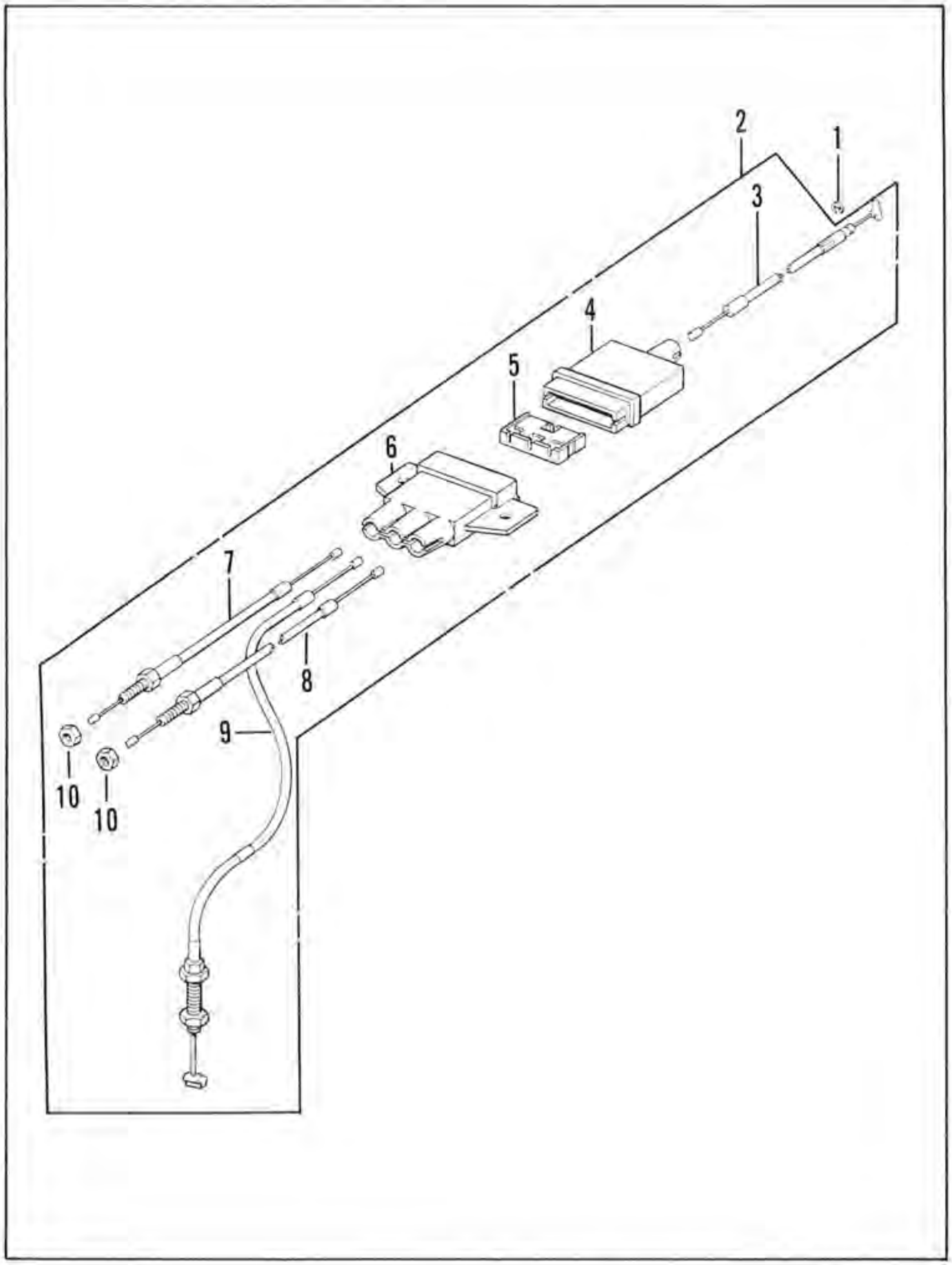
5. Hold the throttle cable and mixing body top assembly in one hand. Place the spring in the top and compress the spring so the throttle cable extends beyond the spring.

6. Guide the throttle slide valve over the throttle cable. Insert the end of the cable through the hole in the throttle slide 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 slide 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 top assembly and tighten finger tight.

9. Synchronize the throttle cables and the oil pump cable in accordance with Section 2. Tighten the throttle cable locknuts.



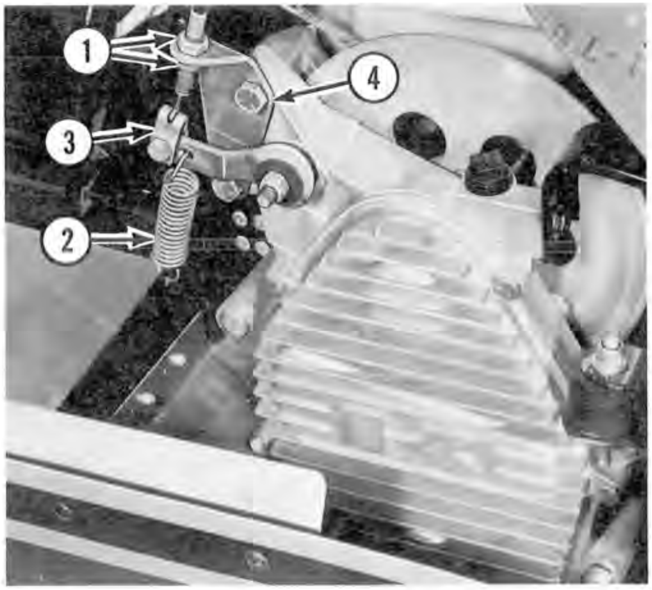
1. Snap Ring
2. Throttle Cable Assembly
3. Upper Throttle Cable
4. Upper Cable Housing
5. Connector 1-3 Cable
6. Lower Cable Housing
7. RH Carb Throttle Cable
8. LH Carb Throttle Cable
9. Oil Pump Cable
10. Locknut

Figure 3-96

Brake Cable

Removal

1. Remove the return spring and disconnect the brake cable tip from the retainer. (See Figure 3-97.)

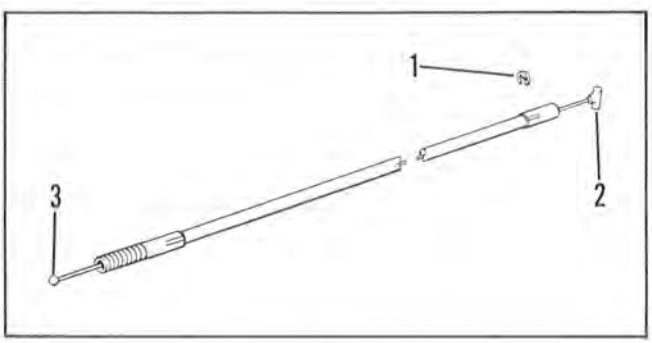


1. Locknuts
2. Return Spring
3. Retainer
4. Brake Cable Bracket

Figure 3-97

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 3-98.)



1. Snap Ring
2. Brake Cable End
3. Brake Cable Tip

Figure 3-98

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.

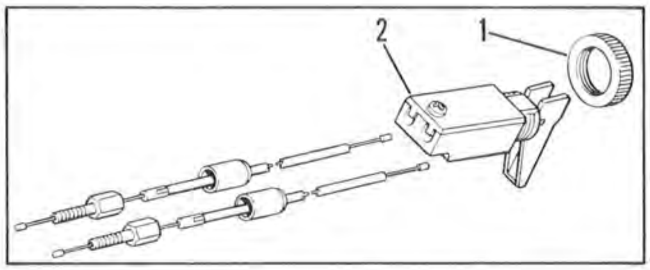
3. Install one locknut on the end of the brake cable and place it through the brake cable bracket. (See Figure 3-98.)

4. Install the second locknut on the end of the brake cable. Install the brake cable tip to the retainer and connect the return spring. For brake cable adjustment see Section 2.

Enrichener Cable

Removal

1. Unscrew the enrichener switch nut. (See Figure 3-99.) Separate the enrichener switch from the panel.



1. Enrichener Switch Nut
2. Enrichener Switch

Figure 3-99

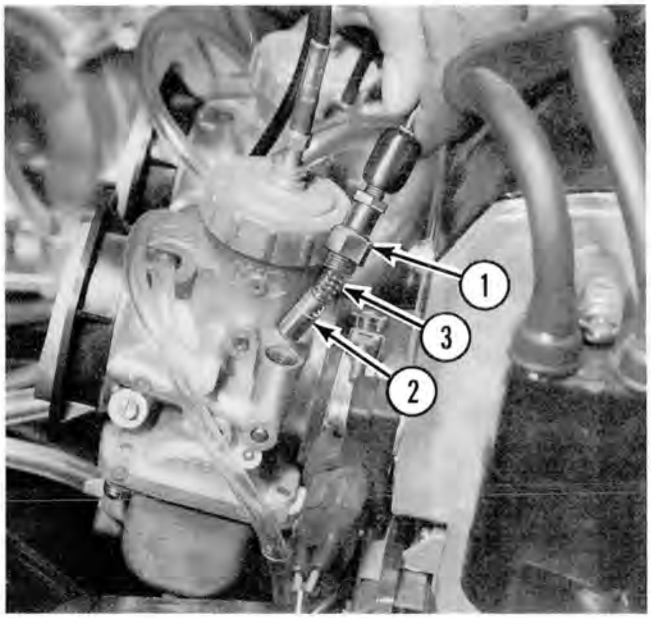
2. Lift the plastic cap up from the enrichener cable and unscrew the starter plunger cap. (See Figure 3-100.) Remove the enrichener plunger assembly from the carburetor.

3. Unscrew the fitting, compress the enrichener plunger spring and disconnect the enrichener cable from the plunger.

Installation

1. Slide the enrichener switch through the hole in the panel and install the enrichener switch nut. (See Figure 3-99.)

2. Slide the enrichener plunger cap, washer and spring over the end of the enrichener cable. (See Figure 3-100.)



1. Enrichener Plunger Cap
2. Enrichener Plunger
3. Spring

Figure 3-100

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.

Drive Converter

Removal

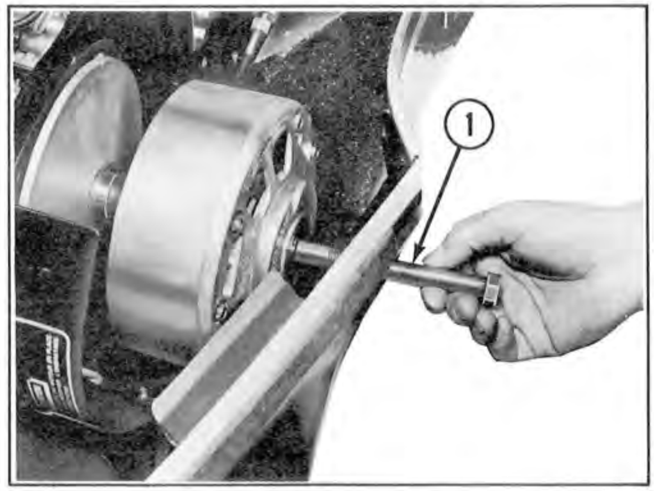
1. Remove the drive belt.
2. Remove the drive converter mounting bolt and conical washers.
3. Install the drive converter puller bolt (tool No. 57001-3502) and screw in to remove the drive converter. (See Figures 3-101 and 3-102.)

Disassembly and Inspection

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.



1. Drive Converter Puller Bolt

Figure 3-101

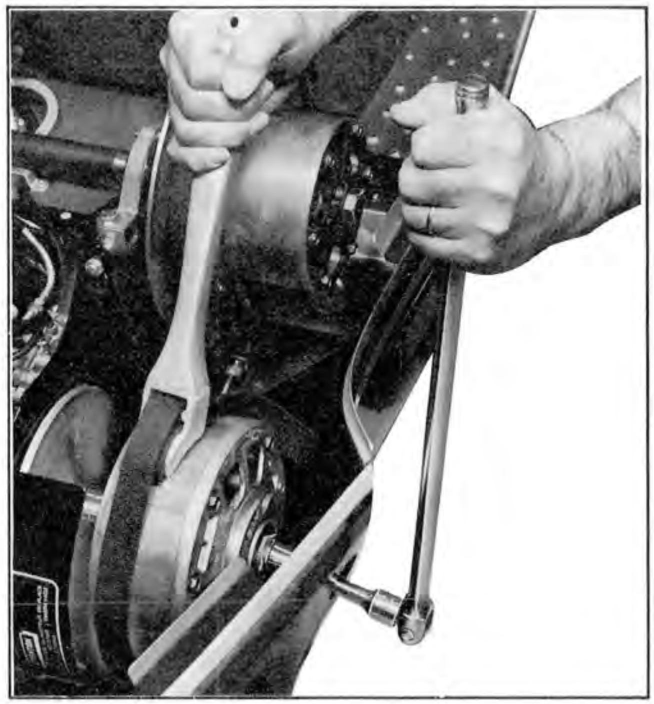


Figure 3-102

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 3-103 for bushing removal. See Figure 3-104 for bushing installation.

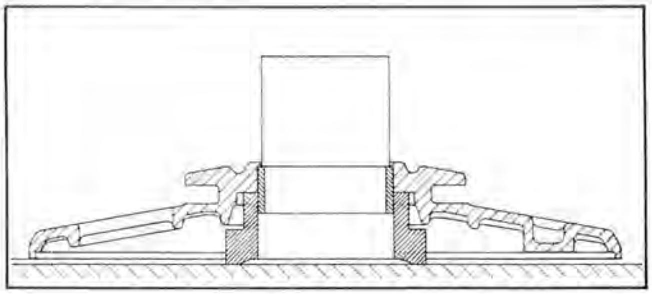


Figure 3-103

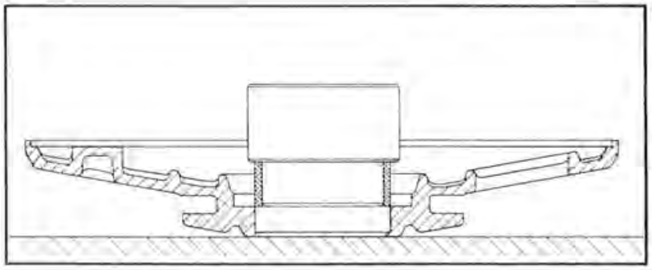


Figure 3-104

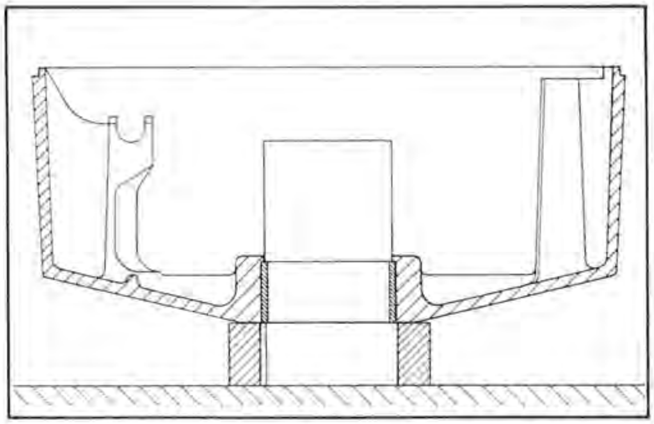


Figure 3-105

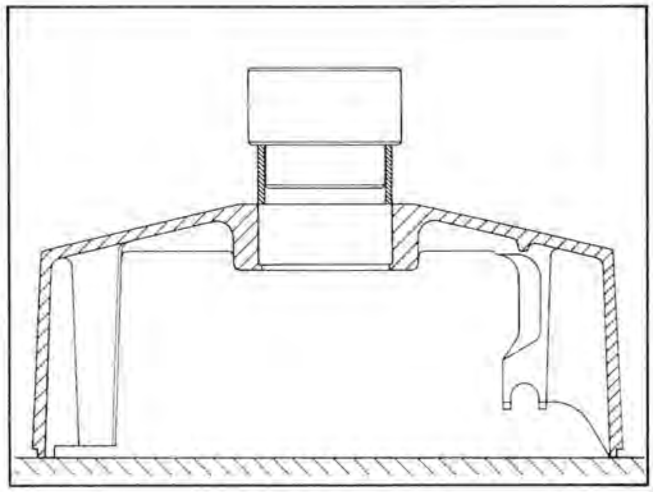


Figure 3-106

4. Lift the sleeve out of the converter. Remove the wear guides and check for excessive wear, replace if worn excessively.

5. Remove the spider assembly.

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 3-105 for bushing removal. See Figure 3-106 for bushing installation.

7. Remove the spacer, pin and roller assembly from the movable sheave and replace any part which shows signs of wear. Measure the thickness of the spacers with a micrometer they should be 0.032 - 0.004 in. (0.8 - 0.1 mm) if they measure 0.016 in. (0.4 mm) or less replace them.

8. Remove the weight ramps, spacers, pins and bushings. Replace any parts showing excessive wear. Check the spacers with the same procedure as in Step 7 above.

Cleaning

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. Remove rust and drive belt accumulations from the steel shaft of the stationary sheave with cleaning solvent or a fine grade of steel wool.

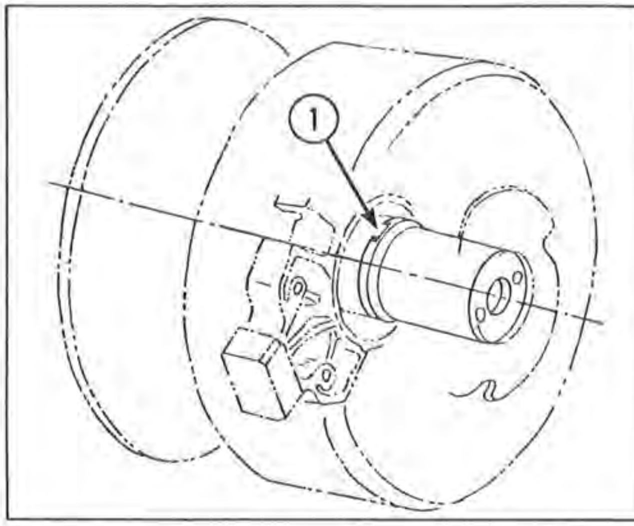
Reassembly

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 (1.1-1.4 kg-m). (See Figure 3-109.)
2. After torquing the bolts, check that the roller can rotate freely.
3. Assemble the weights to each weight ram. Torque the bolts to 4 to 5 ft lb (0.5-0.7 kg-m). Install the pin and spacers and 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 (0.8-1.1 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 and place the movable sheave over the shaft of the fixed sheave. 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. Apply NEVER-SEEZ to the bottom portion of the spider which contacts the split washer. Hold the three weight ramps up align the arrows and install the spider.

NOTE: Due to the indexing of the splines the arrows may not align perfect. Align as close as possible.

7. Apply NEVER-SEEZ to the oil groove area filling the grooves and the bottom surface of the sleeve. Install the sleeve. Be sure the notches in the bottom surface of the sleeve fit over the projections on the spider.
8. Install the spring into the groove in the spider.
9. Install the plastic guides into the movable sheave.
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 (1.1-1.4 kg-m). After assembly check the difference between the cover end surface and the sleeve end surface this should be 0.098 in. (2.5 mm). If this dimension is less, check to be sure the notches in the sleeve are engaged onto the projections on the spider.
11. Place the converter with the cover up on the workbench with pressure of approximately 110 pounds (50 kg) on the cover check the shifting action.



1. Notch in Sleeve and Projection on Spider

Figure 3-107

Installation

CAUTION

In order to maintain proper torque on bolt and to prevent possible bolt failure, install the THREE conical washers on converter mounting bolt as shown in Figure 3-108.

Install the drive converter on the crankshaft and secure with bolt and three, properly installed conical washers. Torque the bolt 60 to 65 ft lb (8.30-8.99 kg-m). Install the drive belt.

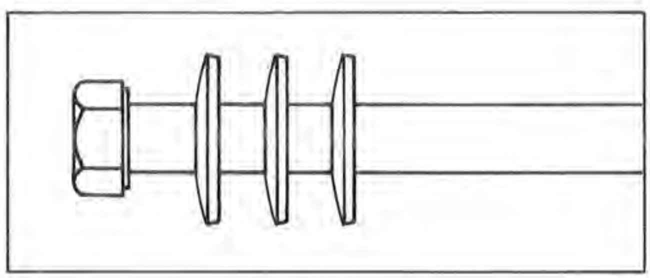
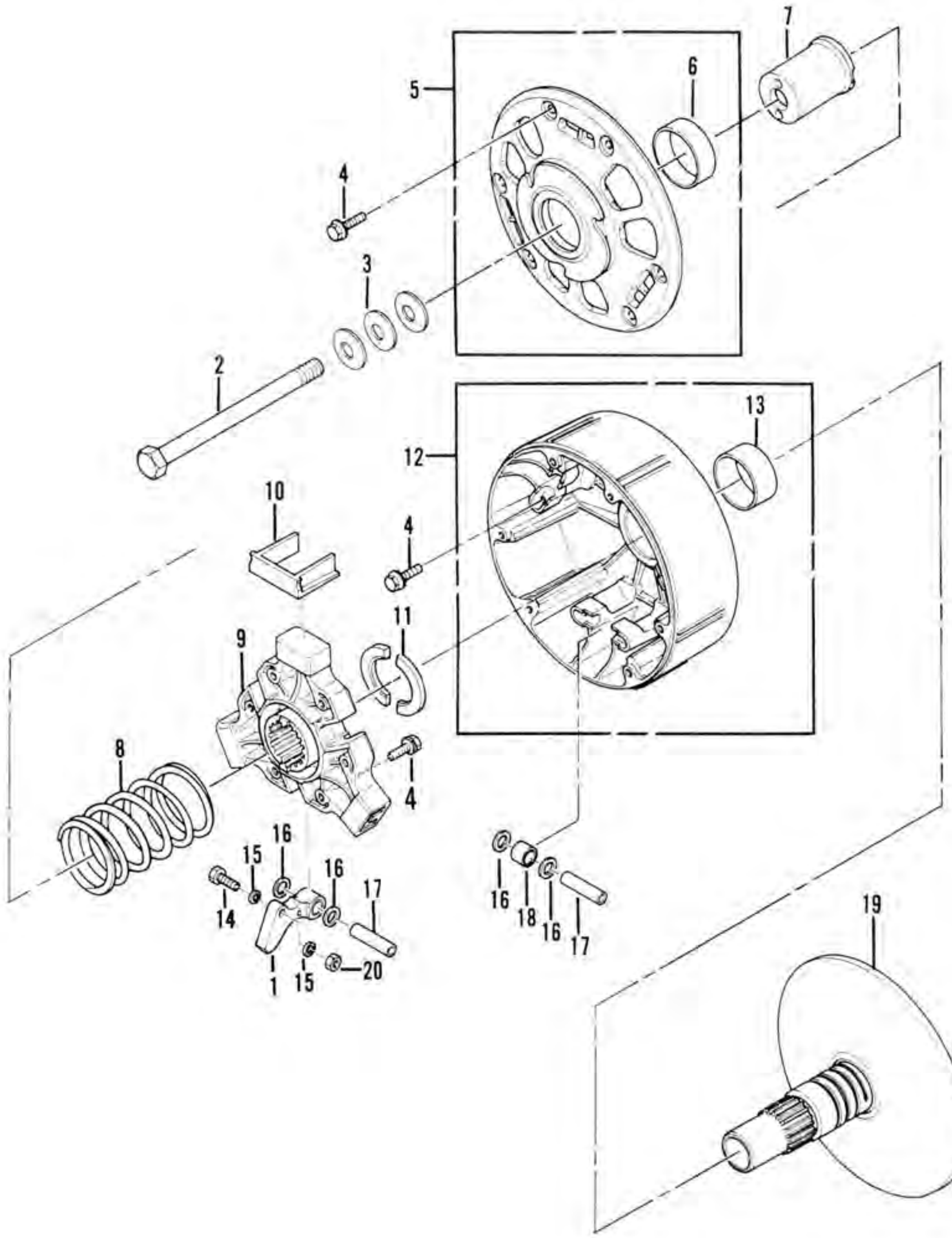


Figure 3-108



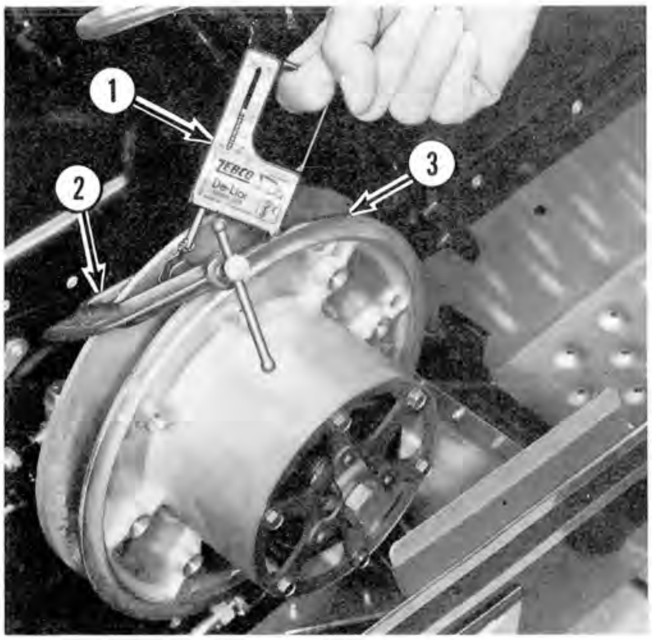
1. Ramp Weight Assembly
2. Bolt
3. Special Washer
4. Flanged Bolt
5. Cover Assembly
6. Bushing
7. Sleeve
8. Yellow Spring
9. Spider
10. Wear Guide
11. Split Washer
12. Movable Sheave Assembly
13. Bushing
14. Aluminum Bolt
15. Washer
16. Spacer
17. Pin
18. Roller Assembly
19. Fixed Sheave
20. Special Lock Nut

Figure 3-109

Driven Converter

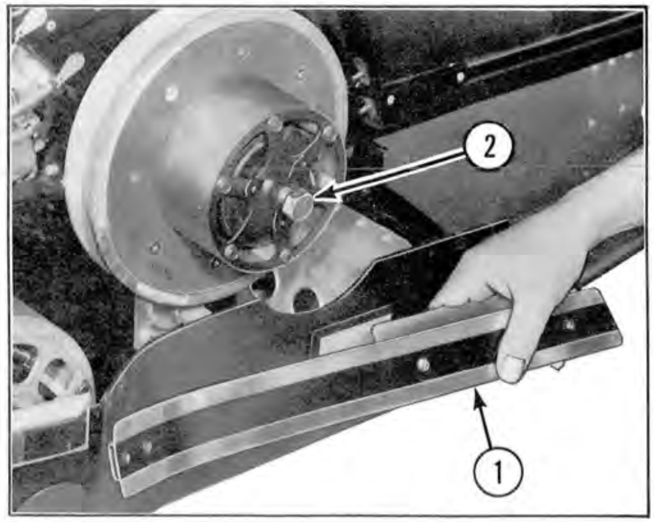
NOTE: Driven converter spring test is based on production setting for movable sheave twist (preload). Standard twist setting is 150° (spring tabs positioned in holes identified as B-2 or C1).

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. (3.175 mm) in from the edge. Pull in a clockwise direction with the scale. It should take 10 ± 0.5 lb (4.536 kg) to begin to move the sheave. If it takes less replace the spring. (See Figure 3-110.)



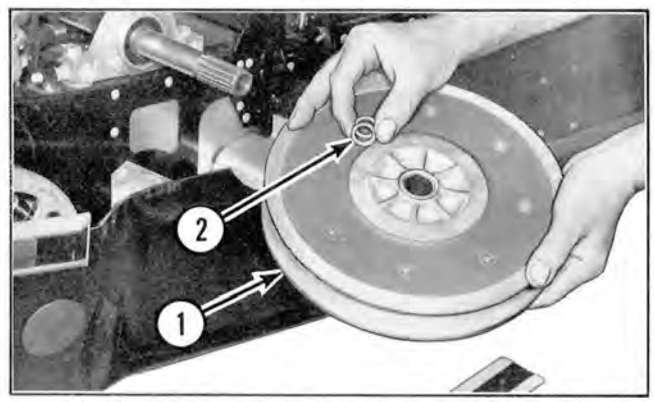
1. Scale
2. C Clamp
3. Movable Sheave

Figure 3-110



1. Aluminum Trim
2. Retaining Bolt

Figure 3-111



1. Driven Torque Converter
2. Shims

Figure 3-112

Removal

To remove the driven converter, remove left side aluminum trim from lower pan by removing mounting hardware. (See Figure 3-111.) 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 3-111 and 3-112.) Be careful not to lose the shims inside the driven converter. (See Figure 3-112.)

Disassembly

1. Remove the six bolts securing the coupling and remove the coupling.

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. 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 3-113 and 3-114.)

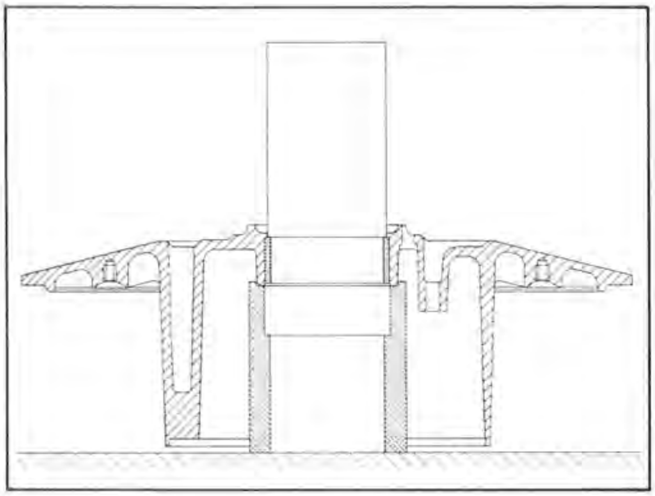


Figure 3-113

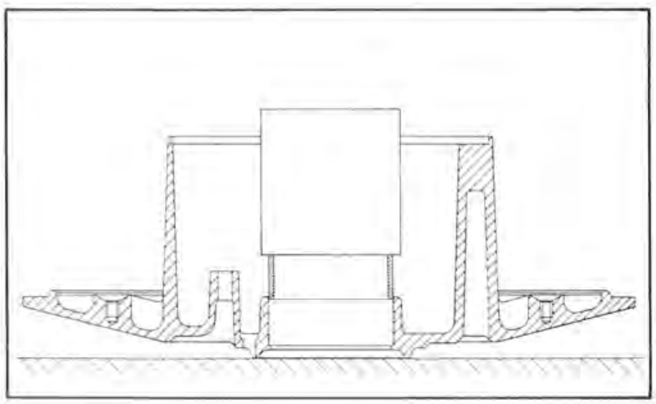


Figure 3-114

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 3-115 and 3-116.)

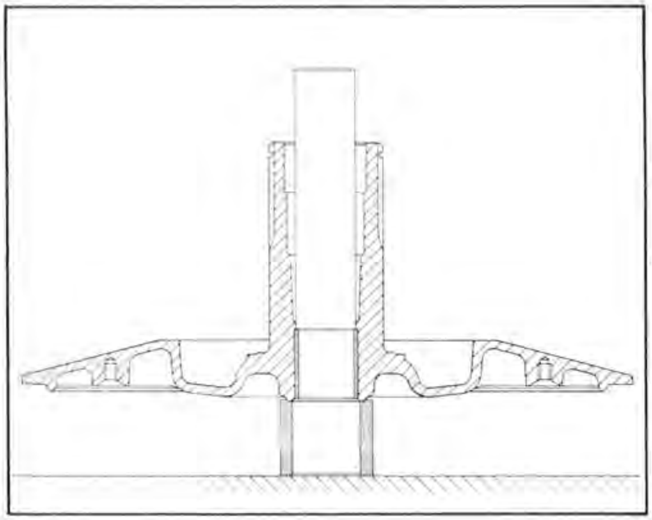


Figure 3-115

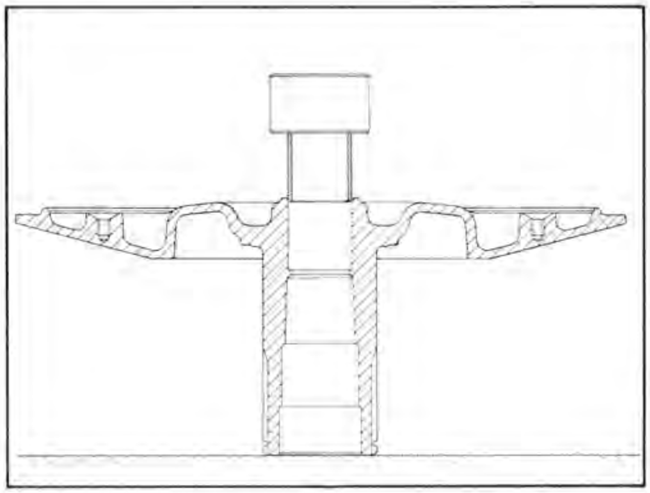


Figure 3-116

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 3-117 and 3-118.)

6. Check the wear shoes if they are excessively worn replace them. Push the wear shoes out from the back of the fixed sheave with a hammer and punch.

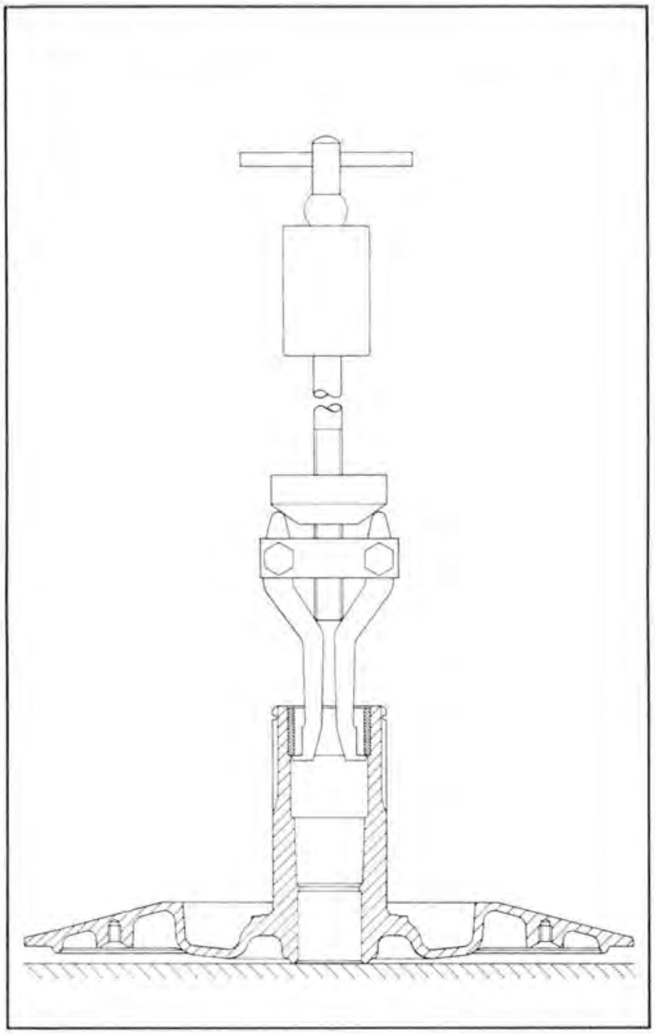


Figure 3-117

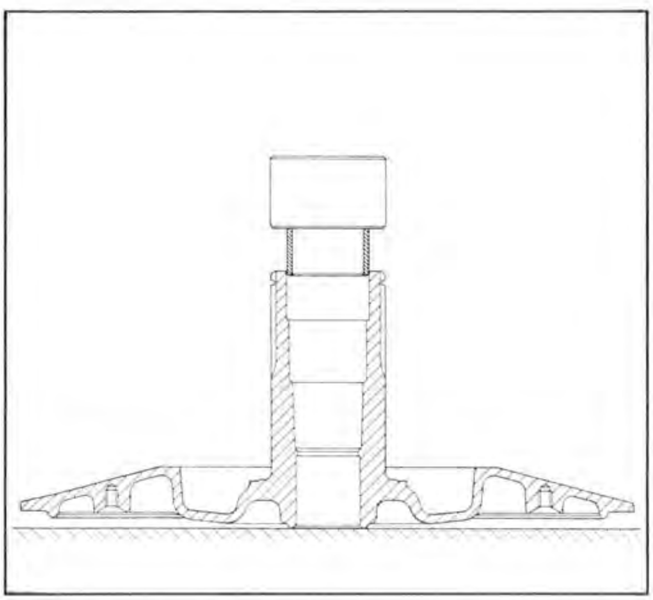


Figure 3-118

Reassembly

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.

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 3-119.)

Figure 3-119

3. Place the fixed sheave onto the movable sheave. Position the arrow on the fixed sheave 150° clockwise from the oval protrusion, 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 3-120.) 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 3-120.) 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°

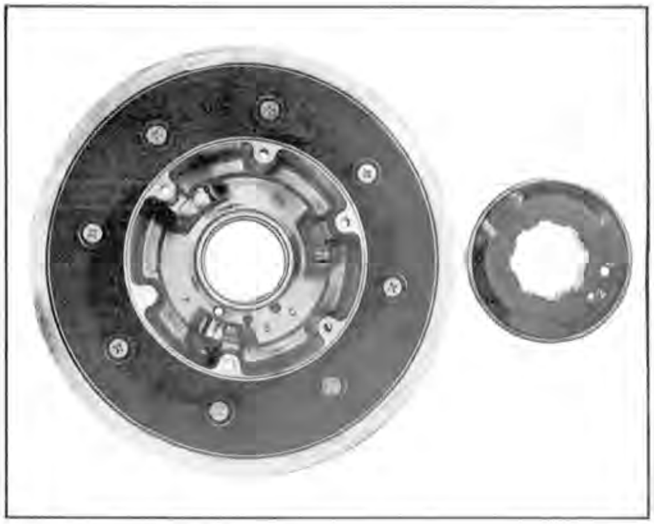


Figure 3-120

5. Align the arrow on the ramp cap with the oval protrusion on the movable sheave. Match the splines nearest this position and lower the ramp cap 0.394 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 of the movable sheave and the arrow of the fixed sheave. Push the ramp all the way down and install the retainer ring. 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. Install the six bolts and torque 8 to 10 ft lb (1.1-1.4 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.

Follow Figure 3-121 for assembly procedure.

Figure 3-121

1. Movable Sheave Assembly
2. Bushing
3. Bushing
4. Fixed Sheave Assembly
5. Wear Shoe
6. Bushing
7. Ramp Cap
8. Circlip
9. Coupling
10. Flanged Bolt
11. Driven Converter Spring

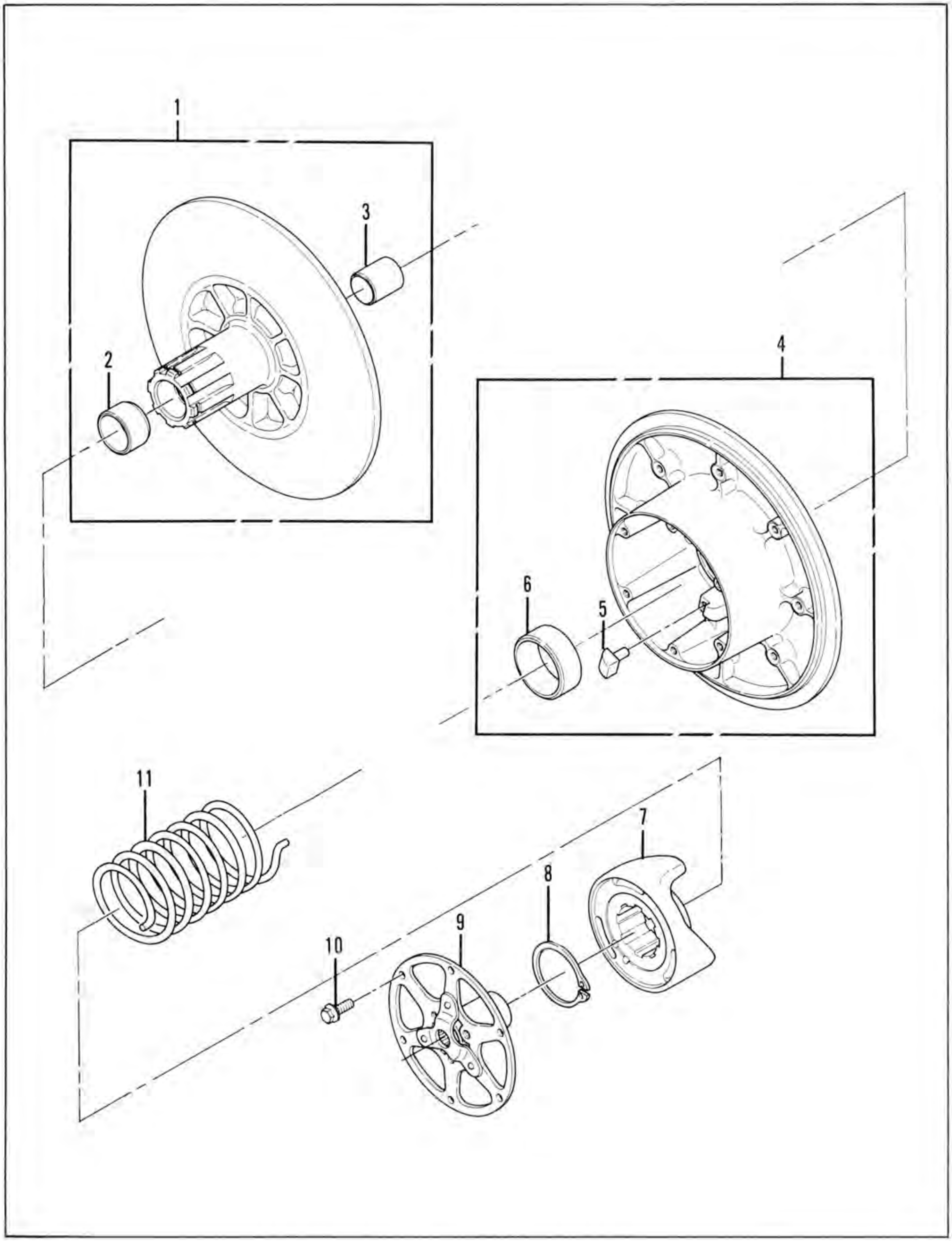


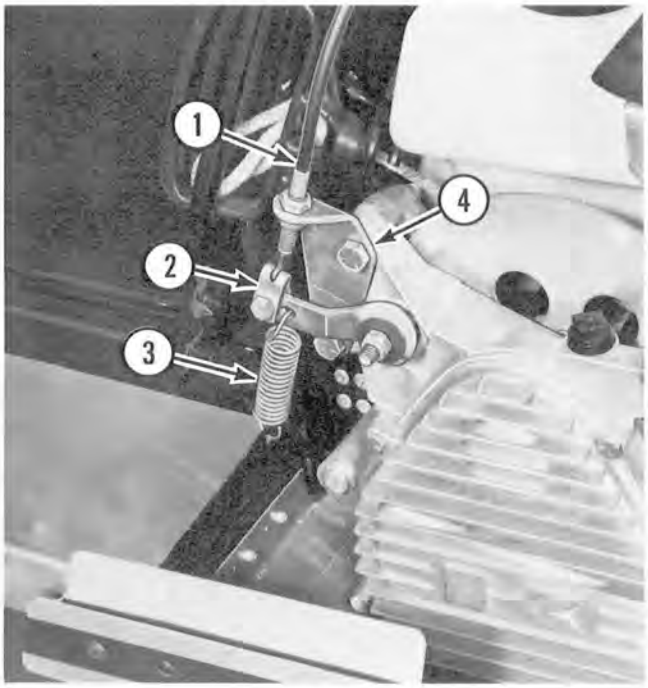
Figure 3-121

Chaincase

Removal

1. Remove the muffler.

2. Remove brake return spring. Remove brake cable from clevis retainer. Remove brake cable from brake cable bracket. (See Figure 3-122.)



1. Brake Cable
2. Clevis Retainer
3. Return Spring
4. Brake Cable Bracket

Figure 3-122

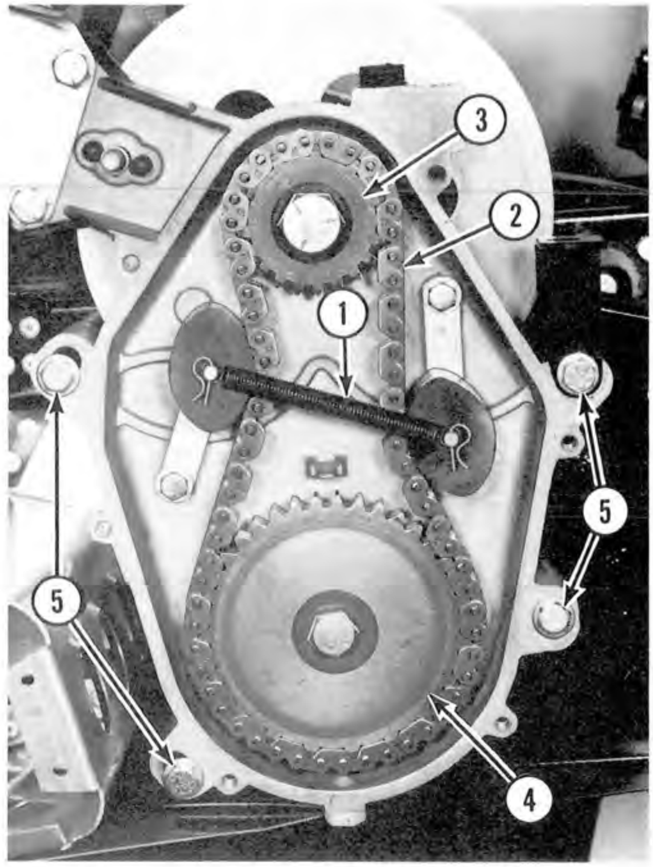
3. Remove the cover to drain the oil from the chaincase.

4. Remove all tension from the track. Refer to TRACK ADJUSTMENT.

5. Remove tensioner spring, chain, top and bottom sprockets. (See Figure 3-123.)

6. Remove the four bolts holding the chaincase to the frame.

7. Pull chaincase away from frame and remove from the snowmobile. The brake disc will slide off of jackshaft along with chaincase. Do not lose the woodruff key that fastens the brake hub to the jackshaft.



1. Tensioner Spring
2. Chain
3. Top Sprocket
4. Bottom Sprocket
5. Chaincase Mounting Bolts

Figure 3-123

Disassembly

1. Remove brake lever, spring and pins.

2. Remove brake caliper, movable pad and back-up plate.

3. Remove tensioner arms with chain guides.

4. 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 shafts for chipped, broken or missing teeth or splines.

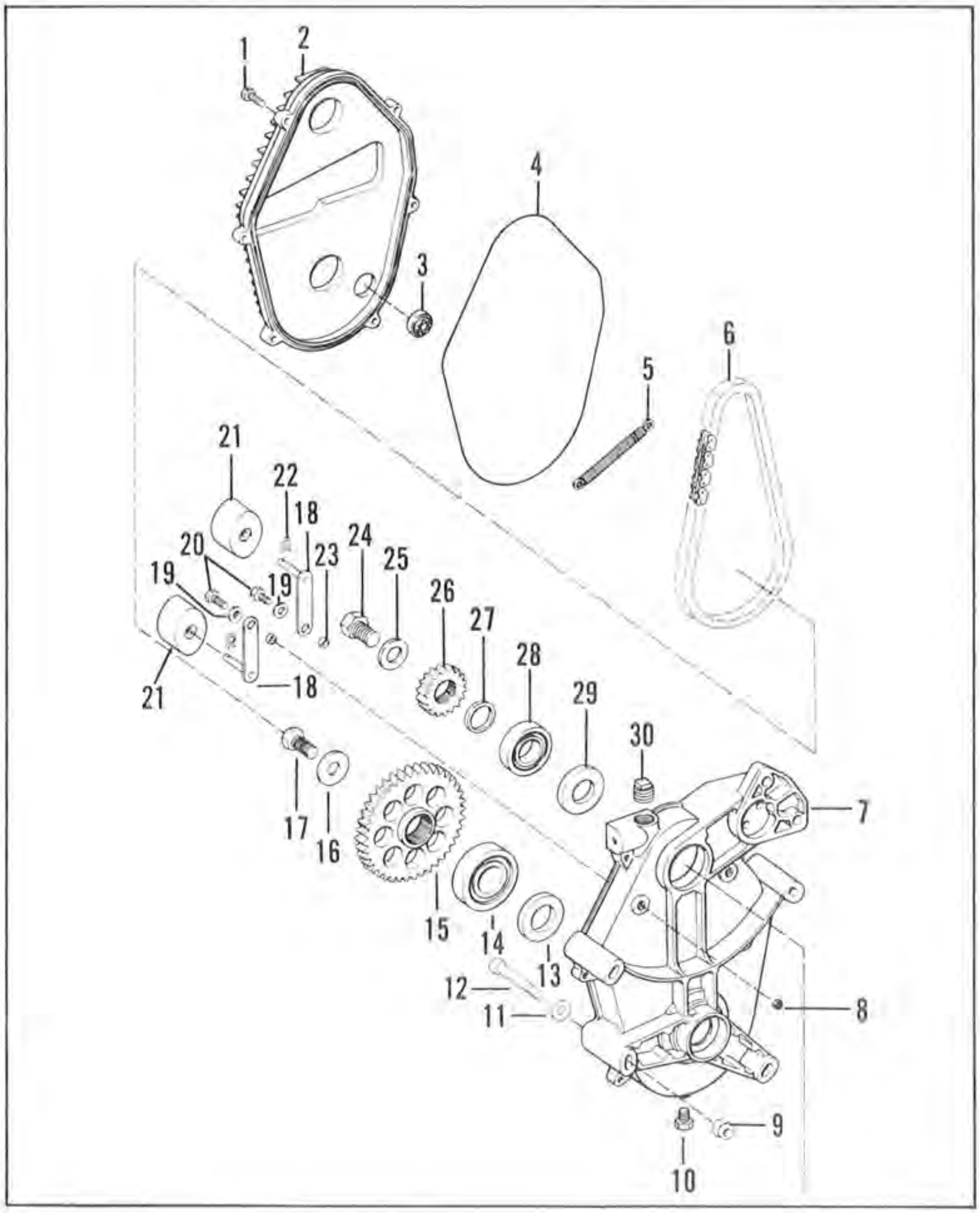
Reassembly (See Figure 3-124.)

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.

2. Install tensioner arms with bolt, washer, sleeve and nut. Do not over tighten. The arm must swing freely.

3. Install brake pad back-up plate and movable brake pad into chaincase and install fixed caliper and brake cable bracket with bolts and nuts.

4. Insert push pins into brake housing and install spring, guide, brake lever, washer and nut. NOTE: Lubricate pins and underside of brake lever with NEVER-SEEZ lubricant.



1. Bolt
2. Chaincase Cover
3. Oil Level Gauge
4. O-Ring Seal
5. Pink Tensioner Spring
6. Chain
7. Chaincase
8. Nut
9. Insert Nut
10. Drain Plug
11. Special Washer
12. Bolt
13. Lower Oil Seal
14. Lower Ball Bearing
15. Sprocket
16. Washer
17. Bolt
18. Tensioner Arm
19. Plain Washer
20. Bolt
21. Chain Guide
22. Hair Pin
23. Tensioner Arm Sleeve
24. Bolt
25. Special Washer
26. Sprocket
27. Sprocket Spacer
28. Upper Ball Bearing
29. Upper Oil Seal
30. Fill Plug

Figure 3-124

Installation (See Figure 3-124.)

1. Install the chaincase and brake disc onto the jackshaft as an assembly. Be sure to properly align the woodruff key between the jackshaft and the brake hub prior to installation. Torque the nuts 18 ft lb (2.5 kg-m).
2. Install the upper sprocket spacer.
3. 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 (5.53-6.92 kg-m).
4. Install the chain guides, tensioner spring and hair pin retainers.
5. Install brake cable and return spring.
6. Attach radiator bracket and reinstall the muffler.
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. Adjust track tension. Refer to Section 2.

Brake Caliper

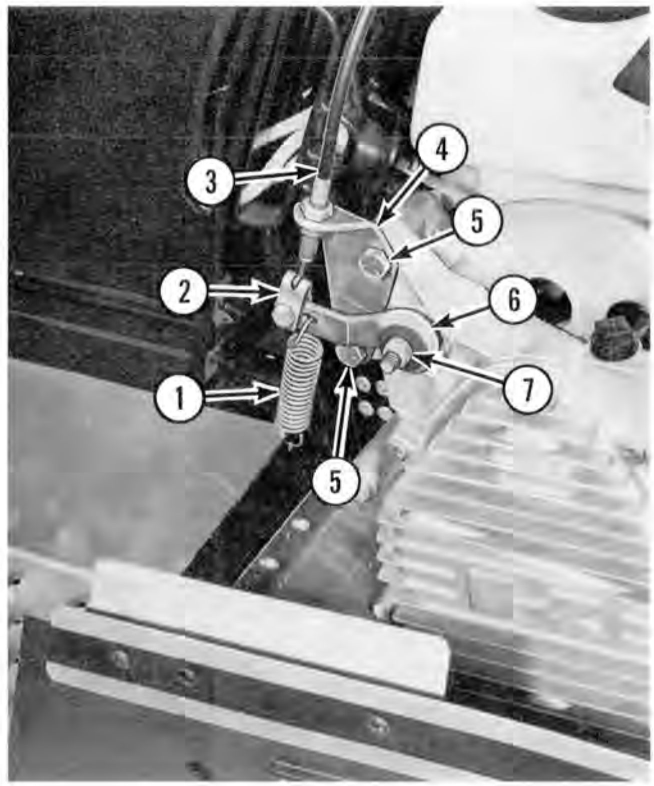
Removal (See Figure 3-125.)

1. Remove brake return spring. Remove brake cable from clevis retainer. Remove brake cable from brake cable bracket.
2. Remove nut, washer, brake lever, spring and guide, and push pins from casting.
3. Remove the two bolts and nuts securing the brake caliper and bracket to the chaincase casting.
4. Slide brake disc towards center of chassis and remove the movable brake pad and back-up plate.

Repair

Inspect the brake pads for wear. If pad A is worn so only 1/32 in. (0.79 mm) protrudes from the caliper, replace pad A. Use contact cement to secure the new pad. If pad B is worn to 1/4 in. (6.3 mm), replace pad B. (See Figure 3-126.)

Clean all parts in solvent. Be sure to keep oil and grease from the pads. Braking action will be impaired by oily or greasy pads.

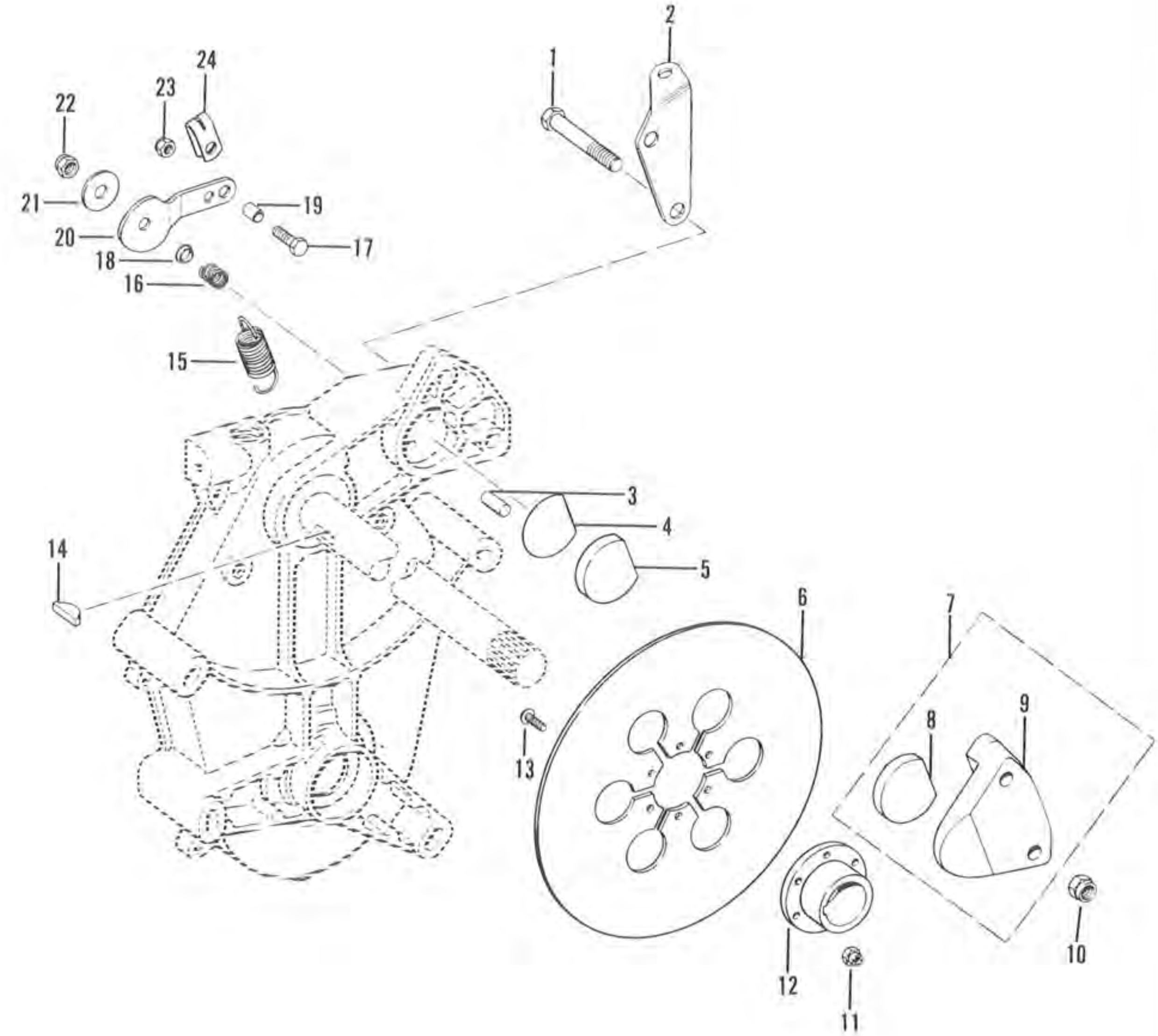


1. Return Spring
2. Clevis Retainer
3. Brake Cable
4. Brake Cable Bracket
5. Bolts and Nuts
6. Brake Lever
7. Nut

Figure 3-125

Assembly

Apply coating of NEVER-SEEZ to push pins. Assemble and install brake caliper in the reverse order of removal and disassembly. Then adjust brake as instructed in Section 2.



1. Bolt
2. Brake Cable Bracket
3. Push Pin
4. Pad Back-up Plate
5. Pad B
6. Brake Disc
7. Brake Caliper Assembly
8. Pad A
9. Fixed Side Caliper
10. Insert Nut
11. Special Nut
12. Brake Disc Hub
13. Special Screw
14. Special Woodruff Key
15. Brake Return Spring
16. Cam Spring
17. Bolt
18. Spring Guide
19. Retainer Bushing
20. Brake Cam
21. Special Washer
22. Insert Nut
23. Insert Nut
24. Clevis Retainer

Figure 3-126

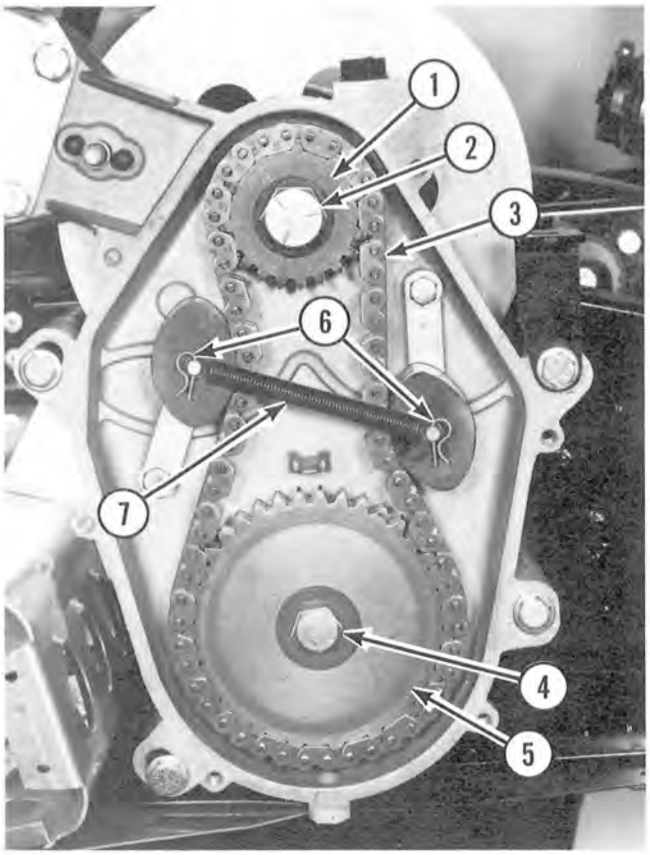
Drive Chain Replacement

Removal

1. Remove the six chaincase cover bolts and remove chaincase cover to drain the chain case.

2. Remove tensioner spring pins and spring.

3. Remove lower sprocket retaining bolt, upper sprocket retaining bolt and remove sprockets and chain. (See Figure 3-127.)



1. Upper Sprocket
2. Retaining Bolt
3. Chain
4. Retaining Bolt
5. Lower Sprocket
6. Hair Pin
7. Tensioner Spring

Figure 3-127

Installation

1. Install the upper sprocket spacer.

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 (5.53-6.92 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 glass.

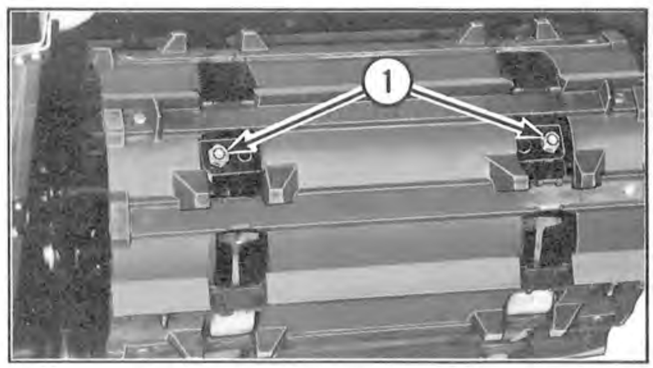
Slide Rail Suspension

Removal

1. Loosen track tension by:

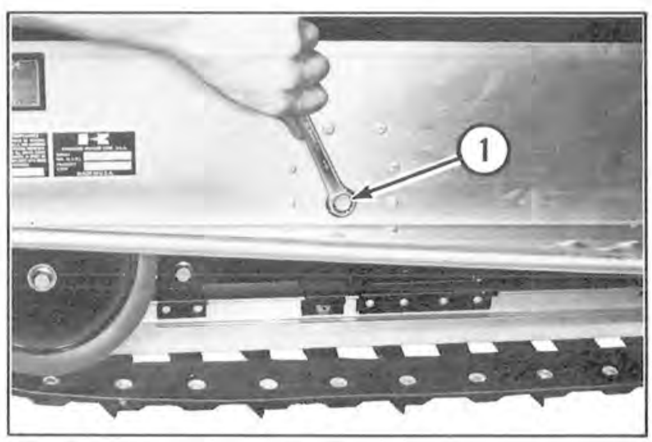
   a. Loosening the rear axle wheel assembly mounting bolt on either end of the rear axle. (See Figure 3-133.)

   b. Turn the rear axle adjusting nuts counter clockwise to reduce track tension. (See Figure 3-128.)



1. Rear Axle Adjusting Nuts

Figure 3-128

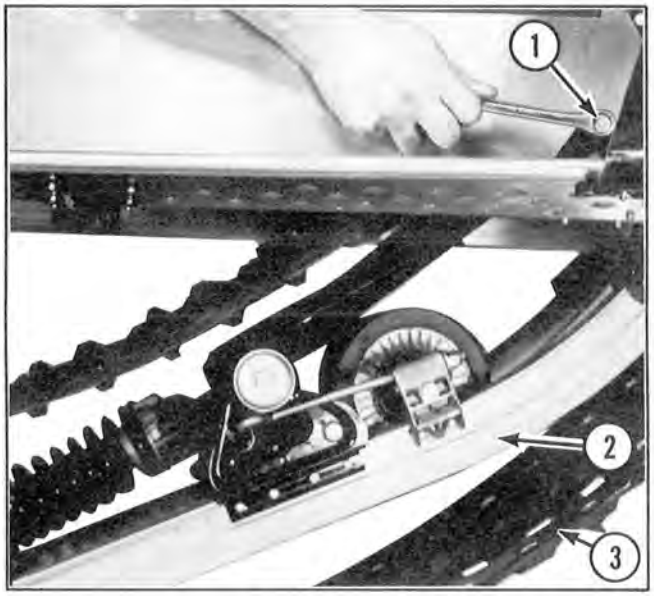


1. Bolt

Figure 3-129

2. Remove the bolts securing the rear suspension arm to the side of the tunnel. (See Figure 3-129.)

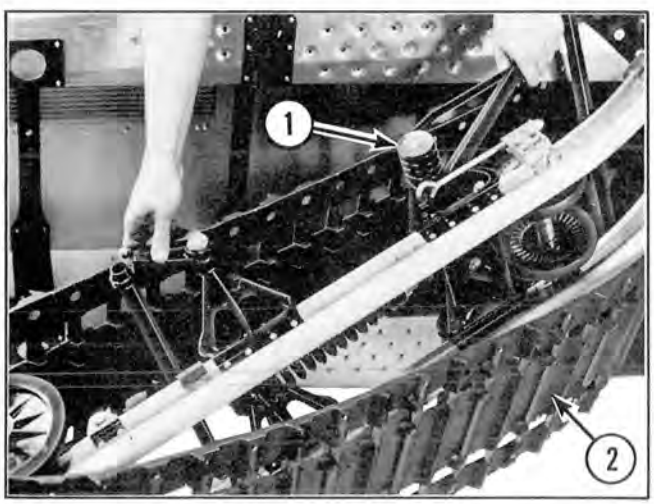
3. Remove the bolts securing the front suspension swing arm assembly to the side of the tunnel. (See Figure 3-130.)



1. Bolt
2. Suspension Assembly
3. Track

Figure 3-130

4. Remove the suspension assembly from the snowmobile. (See Figure 3-131.)



1. Suspension Assembly
2. Track

Figure 3-131

Figure 3-132 shows the complete suspension assembly after it has been removed from the snowmobile.

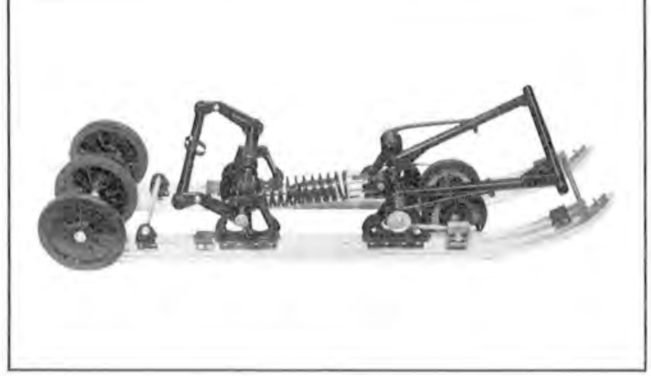


Figure 3-132

Inspection

Move slide rail suspension back and forth on a level surface to check for binding. (See Figure 3-132.)

If the suspension binds, locate the problem and refer to the appropriate repair procedure, below. Refer to Figure 3-133 for parts location and identification when repairing the suspension.

NOTE: The following repairs are performed with the slide rail suspension removed from the snowmobile.

Front Idler Shaft and Wheels

Inspection (See Figure 3-134.)

1. Replace front idler shaft wheel if rubber is excessively worn.

2. Spin wheels on the shaft and check for noise or binding. Replace bearings if necessary.

3. Inspect the shaft for damage.

1. Rear Axle
2. Rear Axle Wheels Spacer
3. Rear Axle Washer
4. Rear Axle Bracket
5. Insert Nut
6. Rivet
7. Special Bolt
8. Track Adjusting Bracket
9. Rear Axle Wheel Assembly
10. Inside Spacer
11. Rear Axle Wheel
12. Ball Bearing
13. Snap Ring
14. Outside Spacer
15. Plain Washer
16. Special Bolt
17. Special Nut
18. Suspension Arm Spacer
19. Bolt
20. Track Guard Pipe
21. Pivot Shaft
22. Pivot Arm Assembly
23. Bolt
24. Insert Nut
25. Pivot Arm Bushing
26. Rear Suspension Bracket
27. Rear Suspension Arm
28. Special Washer
29. Special Bolt
30. Suspension Rail Brace
31. Rear Brace Bracket
32. Suspension Rail
33. Rivet
34. Stopper Bumper
35. Back-up Washer
36. Special Bolt
37. Spring Lock Washer
38. Special Cupped Washer
39. Spring
40. Spring Spacer
41. Front Suspension Bracket
42. Eye Bott
43. Bolt
44. Snow Track
45. Track Rod Assembly
46. Special Rivet
47. Nut
48. Track Rod
49. Rail Wear Strip
50. Special Screw
51. Spring Adjusting Bracket
52. Insert Nut
53. Insert Nut
54. Outside Spacer
55. Brace Bracket
56. Front Idler Wheel Assembly
57. Inside Spacer
58. Idler Wheel
59. Ball Bearing
60. Snap Ring
61. Outside Spacer
62. Center Spacer
63. Shaft
64. Front Pivot Shaft
65. Limiter Shaft
66. Limiter Damper
67. Swing Arm Assembly
68. Suspension Shock Absorber
69. Shock Absorber Sleeve
70. Shock Absorber Bushing
71. Shock Absorber Cam
72. Shock Absorber Spring
73. Spring Retainer

Figure 3-133

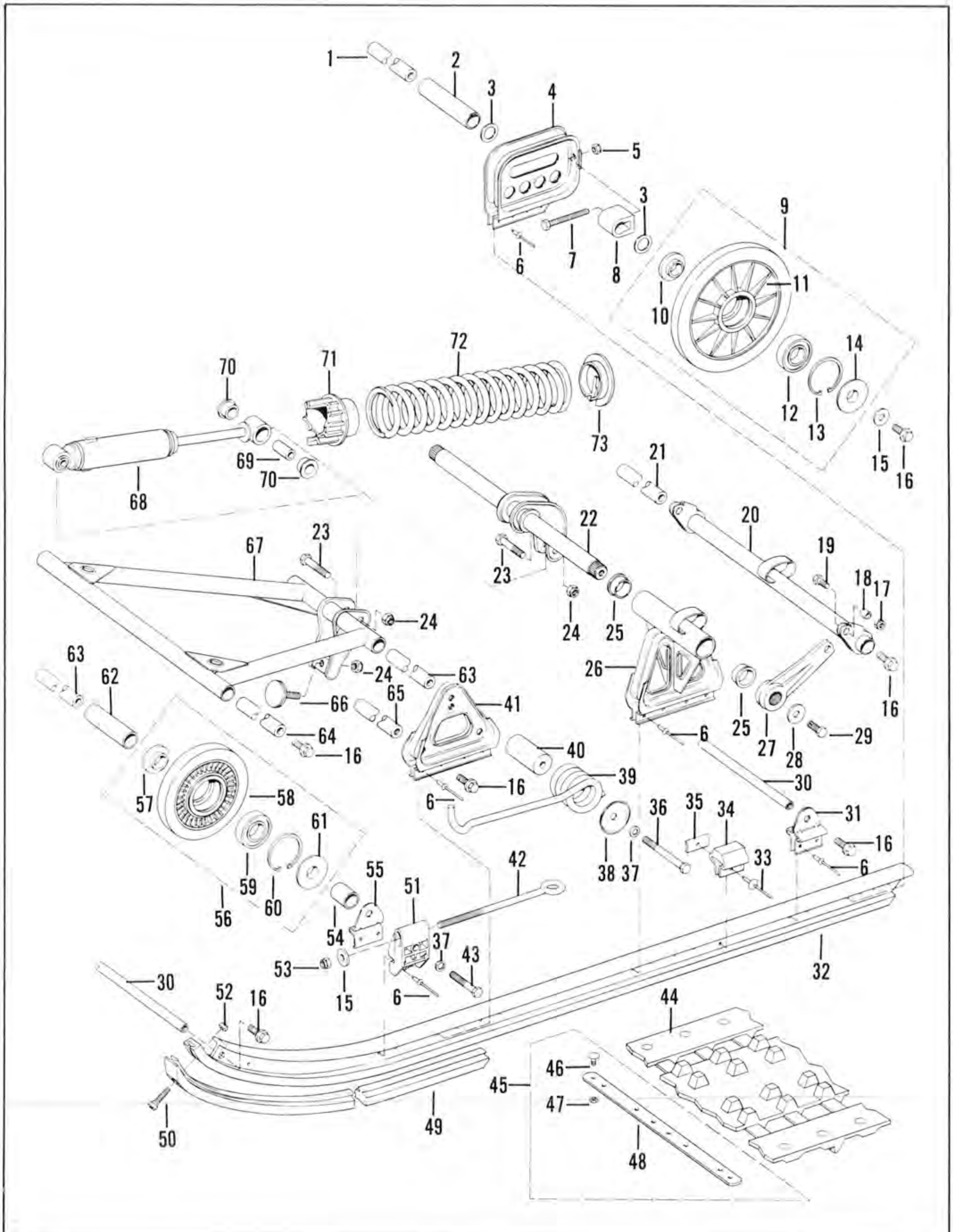

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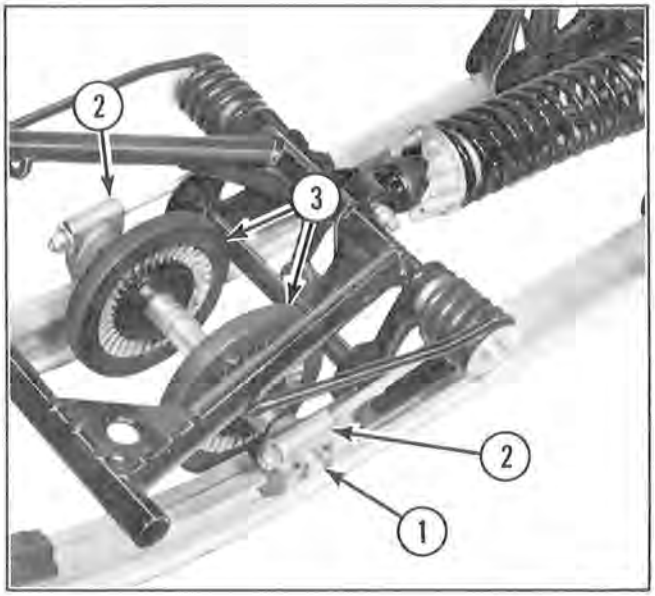
Figure 3-133

Removal

Remove front idler shaft and wheels from the suspension by removing bolts from shaft and spring adjusting bracket. (See Figure 3-134.)



1. Bolt
2. Spring Adjusting Bracket
3. Idler Wheels

Figure 3-134

Disassembly (See Figure 3-133.)

1. To remove idler wheel, remove spacers and slide idler wheel assembly off shaft.
2. To remove the bearing from the idler wheel, remove the outside and inside spacers, snap ring and press the bearing out of the wheel.

NOTE: To protect against wear, DO NOT allow dirt to enter bearings.

Reassembly and Installation

1. Reassemble bearings and wheels to idler shaft. Lubricate bearings and shaft before assembly. Be sure large diameter spacers face to outside of suspension.

NOTE: To prevent bearing damage, press bearings into the idler wheels - DO NOT tap them in.

2. Secure the idler shaft assembly to the front spring adjusting bracket. Torque the bolts to 25 ft lb (3.46 kg-m).

Limiters

Inspection

1. Inspect limiters for deterioration and damage. Replace as required.
2. Check the limiter cross shaft and bell crank for distortion.

Removal

1. To remove the limiter, remove the locknut securing limiter to the bracket on the swing arm assembly and remove the limiter.

WARNING

Front swing arm is under heavy spring load. Relieve spring load from both swing arm springs prior to removing limiter shaft.

2. To remove the limiter cross shaft, remove the bolts securing it to the front suspension bracket and remove the shaft.

Reassembly

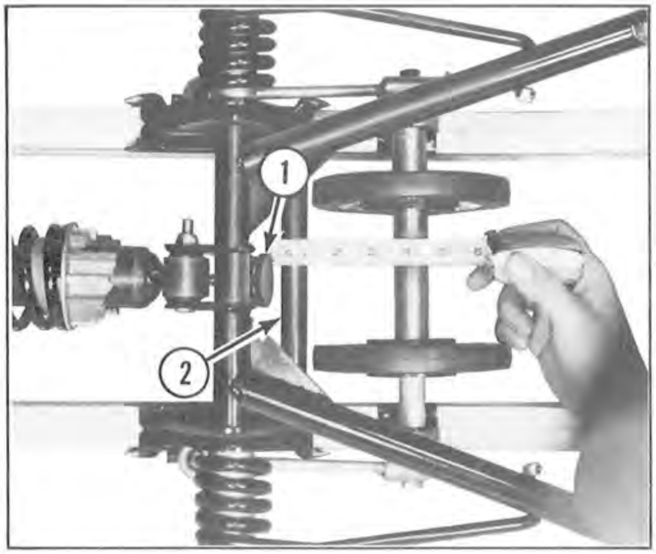
1. Reinstall limiter cross shaft and torque to 25 ft lb (3.46 kg-m).
2. Reinstall limiter into the bracket on the swing arm. (See Figure 3-133.)
3. For general riding adjust the limiter so there is a clearance of 1/4 in. (6.35 mm) or less between the rubber pad and the stop (cross shaft).

NOTE: Weight of snowmobile must be on suspension to obtain this adjustment.

When riding in powder snow this clearance can be increased to allow the skis to ride higher during acceleration of the snowmobile. (See Figure 3-135.) Torque the nut to 35 ft lb (4.84 kg-m).

CAUTION

Clearance between the rubber washer and the stop should never exceed 1/2 in. (12.7 mm), serious damage to the slide rails or track could occur.



1. Limiter Rubber Pad
2. Stop

Figure 3-135

Rail Wear Strips

Inspection

1. Check rail wear strips for cracks, distortion, and alignment with rail suspension.

2. Measure wear strip thickness. If rail strip is worn to 3/8 in. (9.5 mm) or less at any point, it must be replaced.

Removal

1. Turn slide rail suspension upside down, and brace it to prevent shifting.

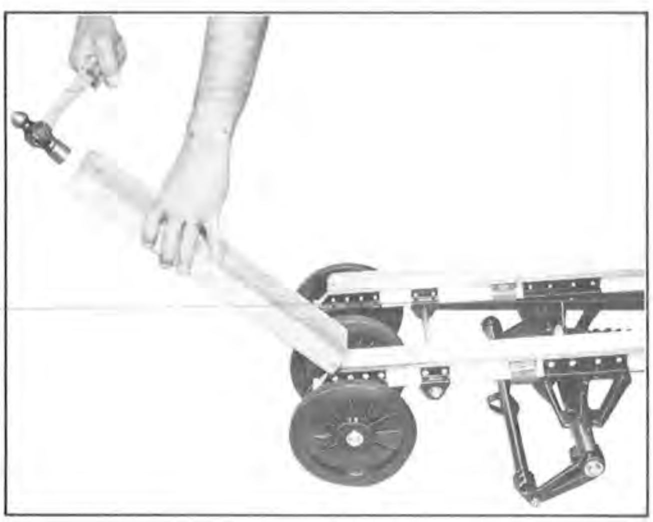


Figure 3-136

2. Remove the screw and nut from the rail wear strip.

3. Tap the back of the wear strip with a block of wood and hammer as illustrated in Figure 3-136 to remove it from the suspension rail.

Installation

Install new rail wear strip by sliding it into position on the suspension rail. Secure with a special screw and nut and tighten to 25 in. lb (0.29 kg-m).

Rear Axle and Wheels

Inspection

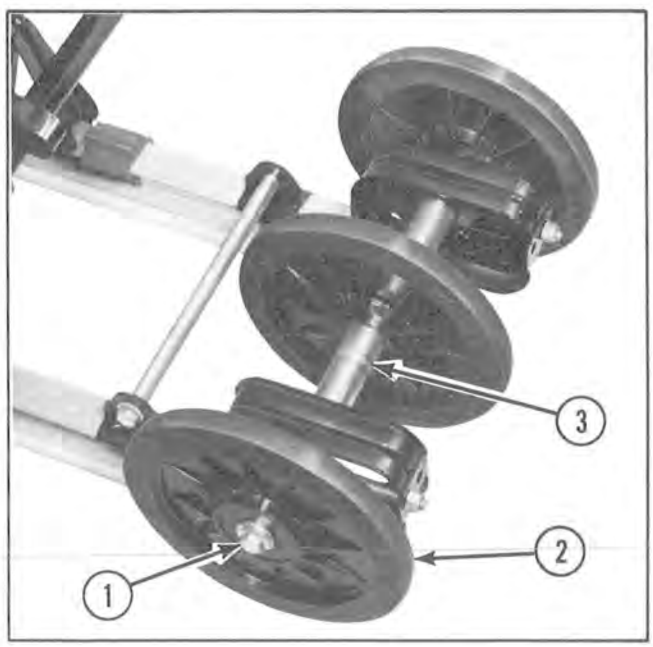
1. Replace rear idler wheel if rubber is excessively worn.

2. Spin rear idler wheels on the shaft, and check for noise or binding. Replace bearings if necessary.

3. Inspect the shaft for damage.

Removal and Disassembly

1. Remove the bolts from the end of the axle. (See Figures 3-133 and 3-137.)



1. Bolt
2. Idler Wheel
3. Spacer

Figure 3-137

2. Tap the rear axle out of the wheel assemblies. Remove the axle spacers, washers and snap ring from the wheels and press out the bearings.

NOTE: To protect against excessive wear, DO NOT allow dirt to enter bearings.

Reassembly and Installation

1. Press the new bearings into the wheels and secure with the snap ring.

NOTE: There are no lubrication fittings on the suspension system, therefore lubricate the shafts before installing.

2. Install the axle spacers and washers onto the rear axle. Position the track adjusting brackets and washers onto the rear axle as shown in Figure 3-133. Install the outer idler wheels onto the axle shaft. Be sure the large diameter spacer on the wheel assembly is installed toward the outside of the suspension. Secure with the bolts previously removed. Torque the bolts 25 ft lb (3.46 kg-m). (See Figure 3-133.)

Shock Absorber

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.

To remove the spring from the shock absorber:

1. Attach shock spring compressor No. 57001-3504 as shown in Figure 3-138.
2. Turn screw to compress the spring. Remove the spring retainer. Slowly release spring and remove the spring and adjusting cam.

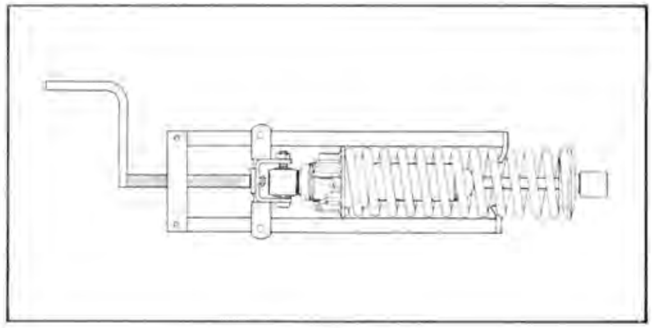
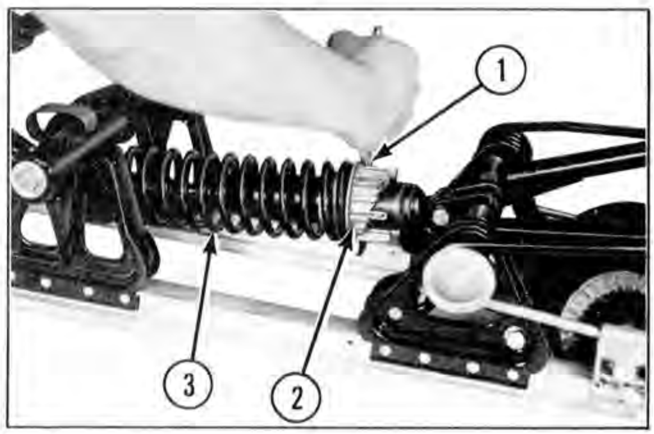


Figure 3-138

Reassembly and Installation

1. Reassemble shock absorber to the suspension in the reverse order of removal.
2. Torque the bolts to 35 ft lb (4.84 kg-m).
3. Adjust the spring tension with the cam. Install the spanner wrench with the handle straight up and move the cam into the second detent notch. (See Figure 3-139.)



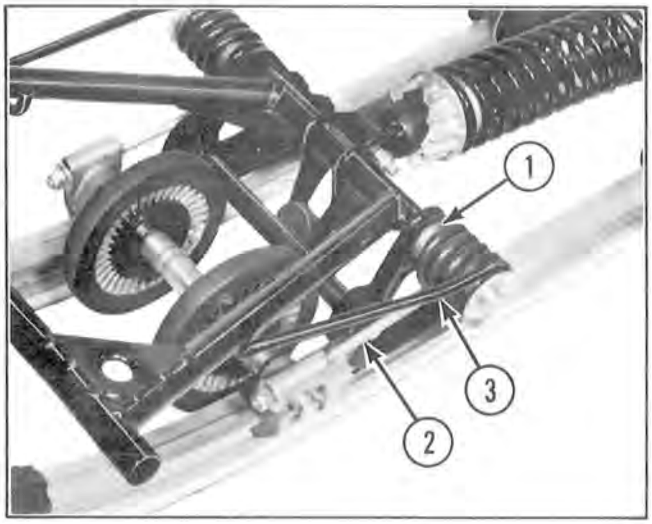
1. Spanner Wrench
2. Cam
3. Spring

Figure 3-139

Front Springs

Inspection

1. Check the eye bolts and spring spacers for distortion or wear. (See Figure 3-140.)
2. Replace a distorted spring, eye bolt or worn spacer.



1. Spacer
2. Eye Bolt
3. Spring

Figure 3-140

Removal

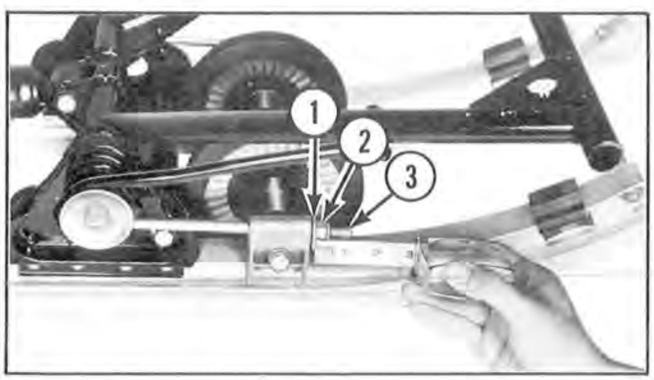
1. Relieve swing arm spring tension by turning the eye bolt nuts counterclockwise until the nuts are at the end of the eye bolt.

2. Release the spring from swing arm. Remove bolt and special cup washer securing spring and remove the spring and spacer.

3. Remove the locknut and washer from the eye bolt and remove the eye bolt.

Installation

1. Lubricate the spacer and reassemble in the reverse order of removal.



1. Washer
2. Locknut
3. End of Eye Bolt

Figure 3-141

2. Adjust the nuts on the eye bolts to one inch as measured from the washer face to the end of the eye bolt. (See Figure 3-141.)

Swing Arm

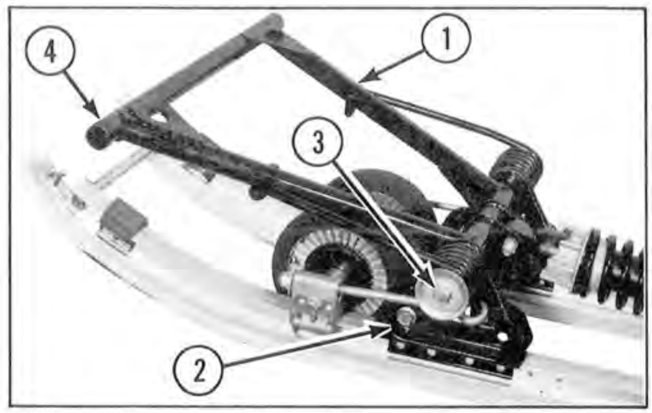
Inspection (See Figure 3-142.)

1. Examine swing arms for distortion, cracks or broken welds. Replace if necessary.

2. Remove spring and shock absorber.

3. Remove and examine the pivot shafts for wear or damage. Replace if necessary. NOTE: Lubricate the shafts before installation.

4. Examine the front suspension brackets for bends or cracks. Replace if necessary.



1. Swing Arm Assembly
2. Front Suspension Bracket
3. Shaft
4. Front Pivot Shaft

Figure 3-142

Removal

1. Relieve swing arm spring tension by turning the eye bolt nuts counterclockwise until nuts are at end of eye bolt.

2. Remove springs, eye bolts and spacers from swing arm and bolts securing swing arm.

3. Remove the swing arm.

Installation

1. Install the swing arm in the reverse order of removal.

2. Adjust swing arm spring tension as shown in Figure 3-141.

Pivot Arm and Track Guard

Inspection

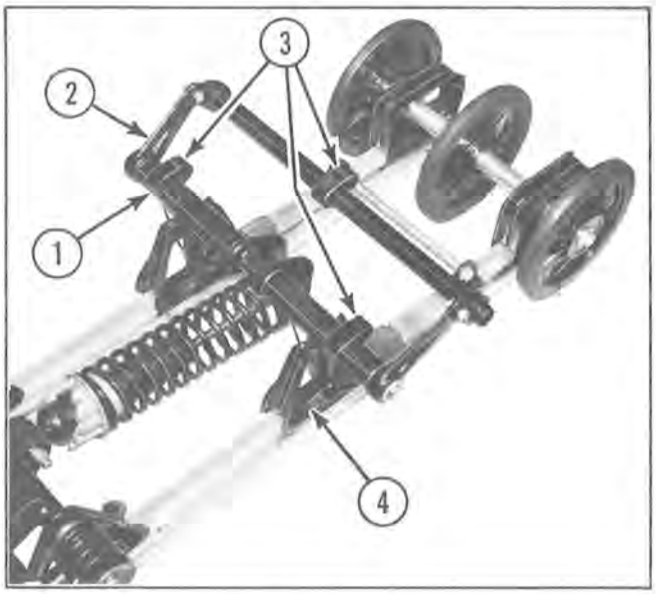
1. Examine pivot arm, track guards and rear suspension brackets for dents, bends and cracks. Replace if necessary.

Removal

1. Remove shock absorber and spring assembly.

2. Remove all bolts, nuts and washers which secure the pivot arm and track guard to the suspension rails.

3. Remove rear suspension arms, track guard and pivot arm.



1. Pivot Arm
2. Rear Suspension Arm
3. Track Guard
4. Rear Suspension Bracket

Figure 3-143

Installation

1. Install the pivot arm, track guard and rear suspension arm in the reverse order of removal. (See Figures 3-133 and 3-143.)

2. Reinstall shock absorber and spring.

Suspension Rails

Inspection

Inspect suspension rails for distortion and damage.

Removal

1. Relieve swing arm spring tension on both sides. Remove rail wear strips and rear axle outside wheel assemblies.

2. Remove all rivets and bolts which secure suspension rails to the suspension, and slide out the rails from the suspension.

Installation

1. Reassemble suspension rails in the opposite order of removal.

2. Install rail wear strips. Tighten bolt to 25 in. lb (0.29 kg-m).

3. Adjust spring tension for swing arm as shown in Figure 3-141.

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

1. Position bumper and special back up washer onto the rail and pop rivet into place.

Installation of Slide Rail Suspension

1. Place the snowmobile on its right side and slide suspension between the track.

2. Align front pivot shaft with holes in side of tunnel. Secure with whiz lock bolts. Torque to 25 ft lb (3.4 kg-m).

3. Align rear pivot shaft with holes inside of tunnel. Secure with whiz lock bolts. Torque to 30 ft lb (4.15 kg-m).

4. Adjust the track and suspension in accordance with Section 2.

Driveshaft and Track

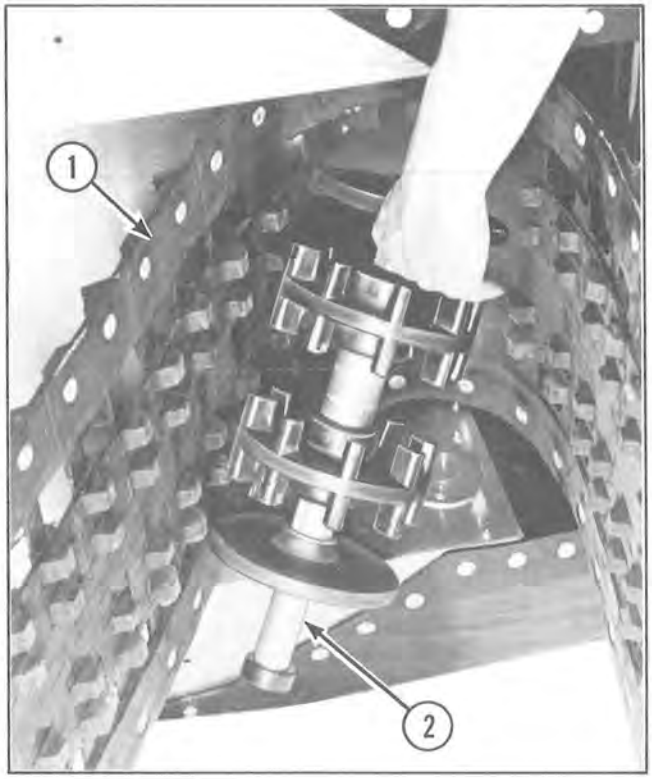
Removal

1. Remove slide rail suspension.
2. Remove chaincase cover, sprockets and chain.
3. Remove speedometer drive adapter from the bearing flange. Remove the speedometer key.
4. Loosen set screw and collar on driveshaft bearing. (See Figure 3-144.)

1. Punch
2. Set Collar

Figure 3-144

5. Remove three bolts, nuts and the bearing flange. Remove the bearing from the driveshaft assembly.
6. Reach between the track and slide the driveshaft from the chaincase and remove. (See Figure 3-145.)
7. Remove the track.



1. Track
2. Driveshaft

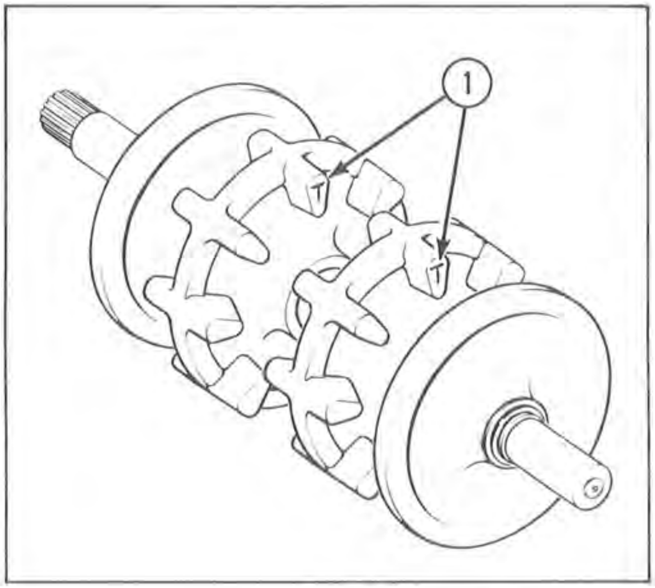
Figure 3-145

Repair of Driveshaft

1. Turn the bearing by hand. If the bearing binds, has excessive end play or is rough, it must be replaced.
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 snap rings and slide idler wheels and washers off the driveshaft.

NOTE: The snap rings used to retain the idler wheels are smaller ID than the rings used to retain the drive sprockets.

4. Check the drive sprockets for excessive wear. To remove drive sprockets, remove the snap rings, position the driveshaft vertically on a wood block to protect the driveshaft. Lightly tap off the sprockets and spacers with a rubber mallet. When reassembling the drive sprockets, make sure the index marks (T) are aligned as shown in Figure 3-146.

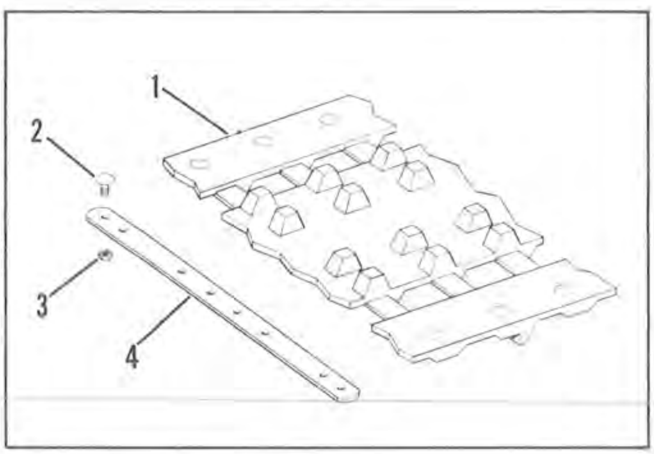


1. Alignment Marks (T)

Figure 3-146

Repair of Track

1. Check track for cracks, tears and gouges.
2. Check for broken, worn or missing track bars. Remove old track bars.
3. To install new bar, position it on the track and install the special rivet screws and nuts supplied with replacement track bar kit. Use the holes in replacement bar as a template to drill holes into track.



1. Track
2. Special Rivet Bolt
3. Nut
4. Track Bar

Figure 3-147

Installation

1. Insert track onto chassis tunnel and position the track as shown in Figure 3-148.

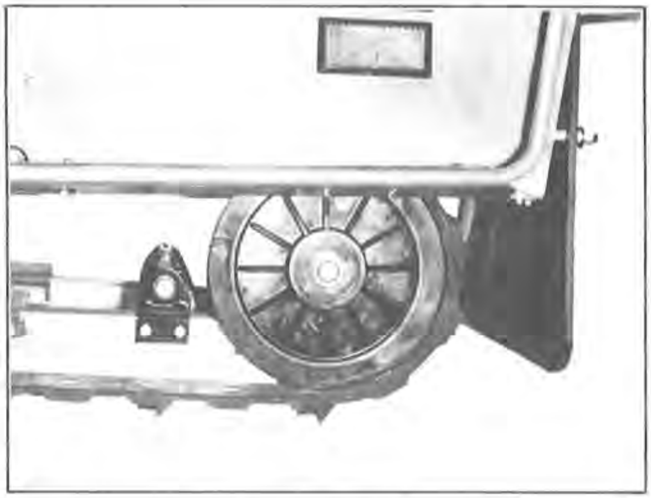
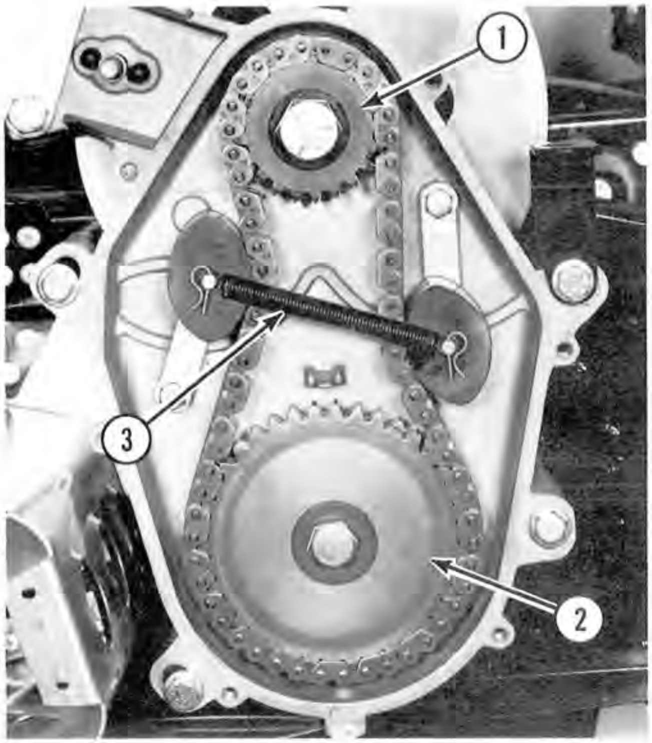


Figure 3-148

2. Insert splined end of driveshaft through the chaincase. Be careful not to damage seal.
3. Place the lock collar and bearing on the driveshaft from outside of chassis bearing flange.
4. Install upper sprocket spacer, upper and lower sprockets and chain. Install the tensioner spring and pins. (See Figure 3-149.)
5. Secure chaincase cover to the chaincase and torque bolts 70 in. lb (0.81 kg-m).
6. Pull driveshaft to the left side of the tunnel (this positions the lower sprocket lip tight against the bearing in the chaincase. With a hammer and punch, lock the bearing collar in the direction of rotation. Tighten set screw to prevent the lock collar loosening. Insert speedometer key into drivenhaft. Hand tighten speedometer drive adapter.
7. Fill the chaincase as specified in Section 2.
8. Adjust the track as described in Section 2.



1. Upper Sprocket
2. Lower Sprocket
3. Tensioner Spring

Figure 3-149

Jackshaft and Brake Disc

Removal

1. Remove belt guard and drive belt.
2. Remove left side trim from lower pan.
3. Remove driven converter.
4. Remove the chaincase cover to drain the chaincase.
5. Remove chain tensioner spring and upper chain sprocket and spacer.

NOTE: It may be necessary to remove the lower sprocket also.

6. Loosen brake lever adjusting nut so disc rotates freely. Remove the three bolts and nuts and bearing flange from bearing housing.
7. Turn jackshaft and disc so key is on top to prevent it from falling out and remove jack shaft from the chaincase. Remove the brake disc from between the calipers.

Cleaning and Inspection

1. Loosen the set screw and collar and remove the bearing from the jackshaft. Replace the bearing if damaged or it turns rough.
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.

Installation

1. Slide brake disc assembly between brake calipers.
2. Insert key into jackshaft and slide jackshaft through brake disc assembly into chaincase.
3. Slide lock collar and bearing onto jackshaft and into bearing housing. Do not lock collar at this time. Install bearing flange.
4. Install upper sprocket spacer, sprockets, chain and tensioner. Torque the upper sprocket mounting bolt 40 to 50 ft lb (5.53-6.92 kg-m). Torque the lower sprocket mounting bolt to 35 ft lb (4.84 kg-m).
5. Install chaincase cover and fill chaincase with fluid until fluid is one half way up in the window in the chaincase cover.
6. Pull the jackshaft toward the left side of the snowmobile to seat the top sprocket spacer against the bearing. With a hammer and punch lock the bearing collar in the direction of shaft rotation. Tighten set screw to prevent collar from loosening.
7. Install driven converter and check alignment as described in Section 2.
8. Install left side trim to lower pan.

Steering and Skis

Handlebars and Column Removal (See Figure 3-150.)

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. Removal of the steering column requires the prior removal of the intake silencer and engine as previously described in this section.

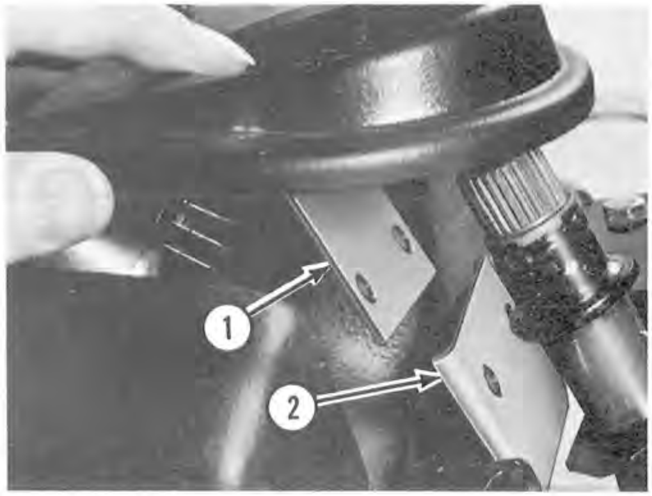
5. Remove the bolt and nut holding the primary tie rod to the steering column.

6. Remove the bolts and nuts from the upper mounting blocks and lower mounting brackets.

7. Remove upper split bushing and lower damper; withdraw steering column upward through the key switch panel.

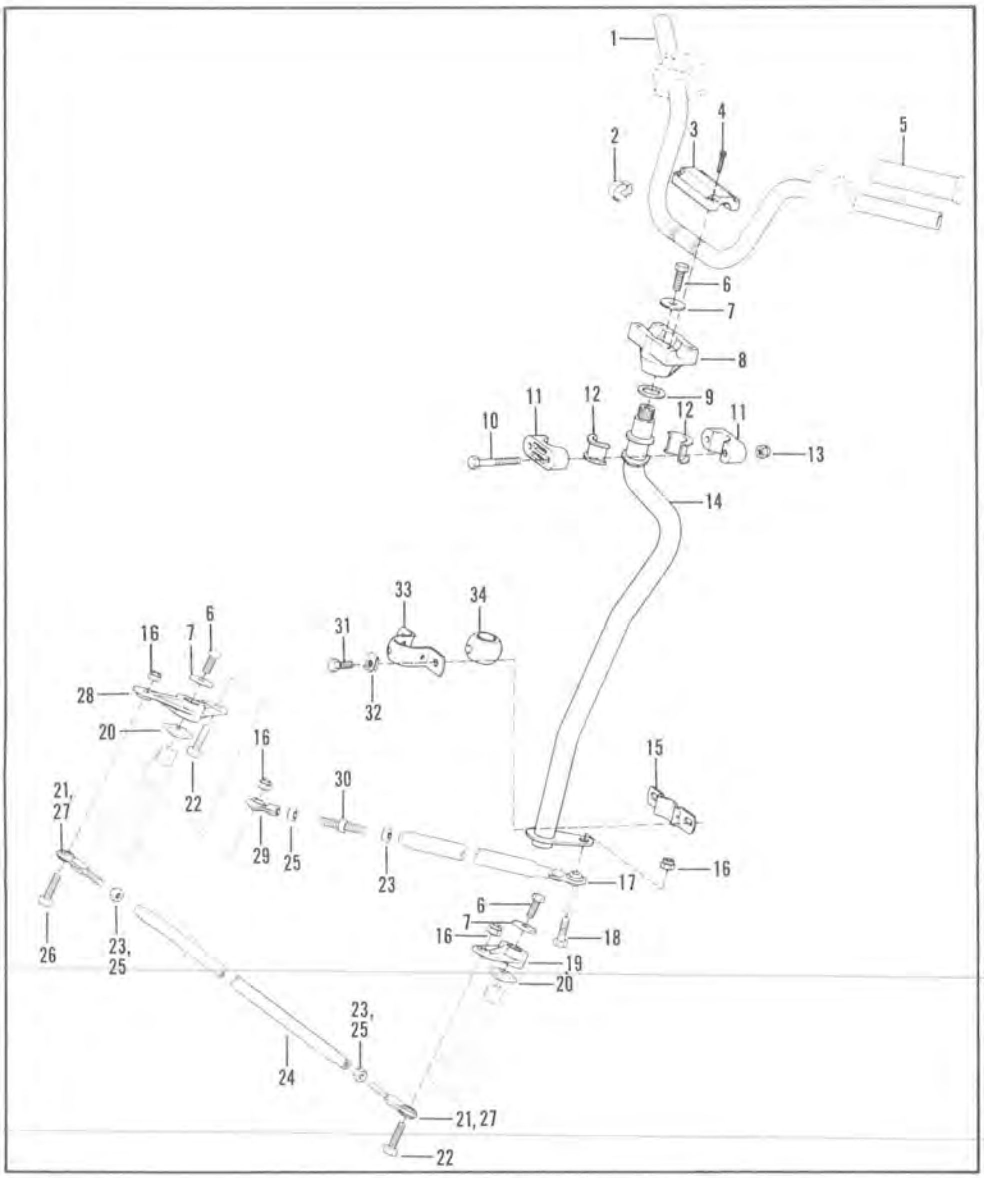
8. Remove bolt and washer securing lower handle bar holder to top of steering pole and lift off lower holder.

NOTE: During reassembly, front of key switch panel bracket must be mounted behind the bracket on the upper steering mount assembly to prevent the steering pole from turning over center during a full-lock turn. (See Figure 3-150.)



1. Panel Bracket
2. Bracket on Upper Steering Mount

Figure 3-150



1. Steering handle
2. Wire Clamp
3. Handle Holder
4. Screw
5. Handle Grip
6. Bolt
7. Special Washer
8. Handle Holder
9. Special Washer
10. Bolt
11. Upper Mount Block
12. Bushing
13. Insert Nut
14. Steering Pole Assembly
15. Base Bracket
16. Insert Nut
17. Tie Rod
18. Bolt
19. Left Steering Arm
20. Wave Washer
21. Tie Rod End
22. Bolt
23. Nut
24. Tie Rod
25. Nut Special
26. Bolt
27. Tie Rod End
28. Right Steering Arm
29. Tie Rod End
30. Adjusting Stud
31. Bolt
32. Tab Locking Washer
33. Upper Bracket
34. Damper

Figure 3-151

Steering Arm and Ski Removal

1. Remove the tie rods from the steering arms.
2. Loosen the bolts securing the steering arms to the spindles approximately 3 turns but do not remove.
3. Position the snowmobile on its side. Drive the spindle from the steering arm by tapping on the bolt head until the spindle loosens from the splines in the steering arm.
4. Remove bolts, washers, steering arms and assembled spindles.
5. Remove bushings from top and bottom of spindle bosses.

Repair

1. Clean all steering components thoroughly.
2. Inspect parts for wear and damage. Refer to Figure 3-151 for parts location and identification. Replace parts as required.

Installation

1. Reinstall steering pole reversing order of removal. Apply a liberal coating of silicone grease to lower damper/bushing. Torque mounting bolts to 16 ft lb (2.2 kg-m) and set lock tabs.
2. Install primary tie rod to steering pole.
3. Slide one bushing onto ski spindle and insert into spindle boss on chassis. Slide remaining bushing onto spindle.
4. 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).
5. Install secondary tie rod to steering arms.
6. Install handlebars reversing order of removal.
7. Align skis and center steering pole as described in Section 2. Check mounting bolts for proper torque.

Repair of the Skis

1. Clean the skis thoroughly to remove dirt and grease. Paint as required to prevent rust.
2. Inspect skis for wear and damage. See Figure 3-152 for parts location and identification.

Skeg Replacement

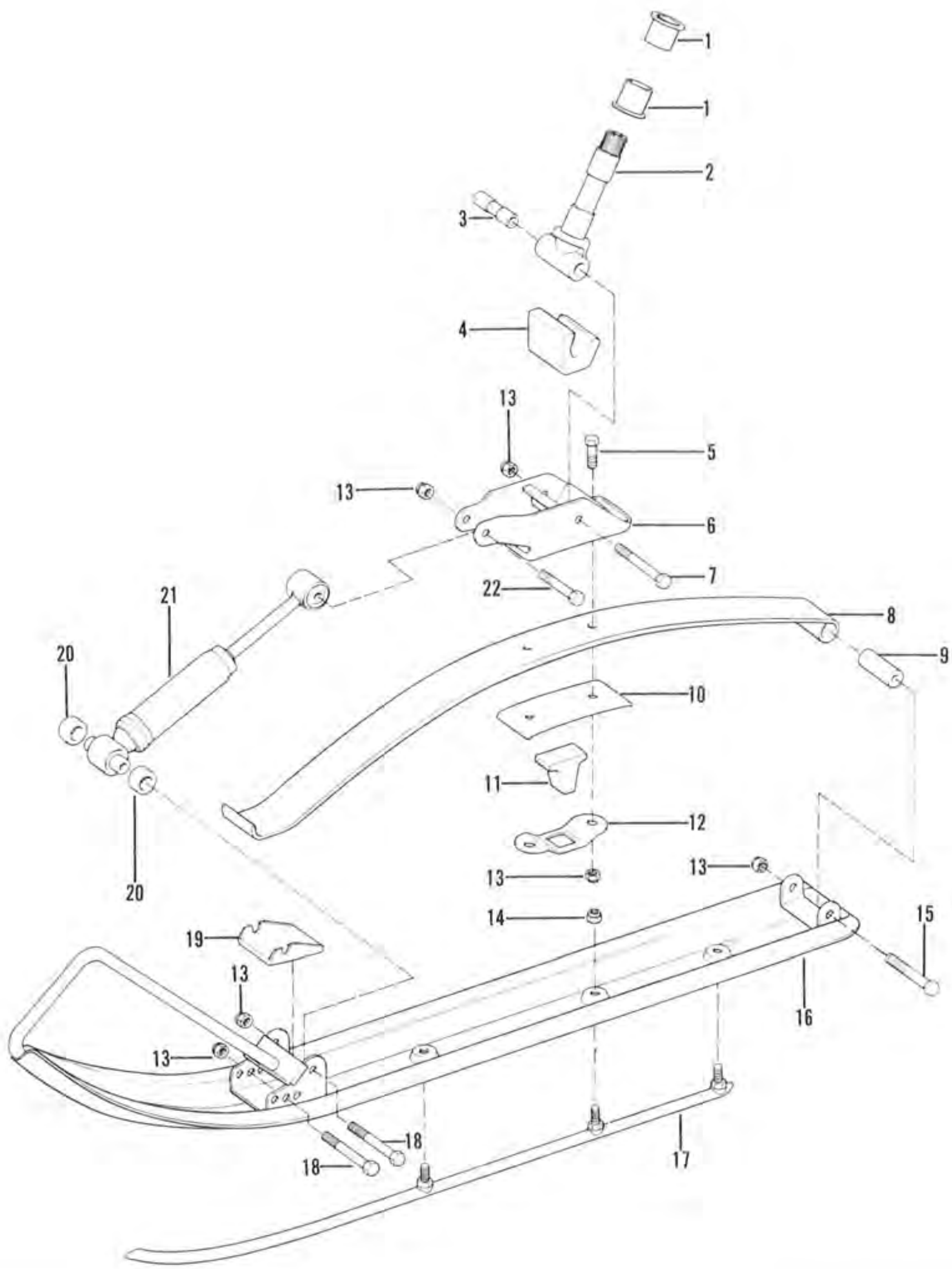
1. Remove nuts securing skeg to ski and remove skeg.
2. To install skeg, grasp ends of skeg and bend skeg until the three studs on skeg are aligned with holes in ski. Insert skeg studs through holes in ski, and secure skeg to ski using three nuts. Tighten nuts to 18 ft lb (2.5 kg-m).

Ski Spindle Replacement

1. Remove the nuts and bolts which secure the spindle to the ski saddle.
2. Lift the spindle from the ski saddle.
3. To install, apply low-temperature grease to the unthreaded portion of the bolt. Position the spindle on the ski saddle and secure with bolt. Tighten nut to 35 ft lb (4.84 kg-m).

Make sure the head of the bolt is on the outside of the machine.

NOTE: On some replacement spindles, the spindle may be too wide for the ski saddle. Grind the spindle if necessary for a proper fit.



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

Figure 3-152

Ski Spring Replacement

1. Remove the spindle from the ski saddle.
2. Remove the nuts and bolts which secure the shock absorbers to the mounting brackets.
3. Place the ski in a vise and compress spring about one inch. Remove the bolt and nut which secure the front of the spring. Slowly release vise pressure.

   WARNING

   When tightening the vise, be sure ski is securely positioned in vise. Spring pressure will tend to force ski to rotate resulting in possible damage.

4. Remove the rear bolt and nut, and remove the spring.
5. To install the spring, position the end of the spring in the rear ski mounting bracket. Secure with bolt and nut and tighten the nut to 31 ft lb (4.28 kg-m).

NOTE: Install nut on inside of ski.

6. Position the rub strip and front of spring on the front ski mounting bracket.
7. Place the ski in a vise and compress the spring until the bolt and nut can be installed. Tighten nut to 25 in. lb (0.29 kg-m). Remove from vise.

NOTE: Install nut on inside of ski.

8. Install shock absorber to the mounting bracket.
9. Install the spindle.

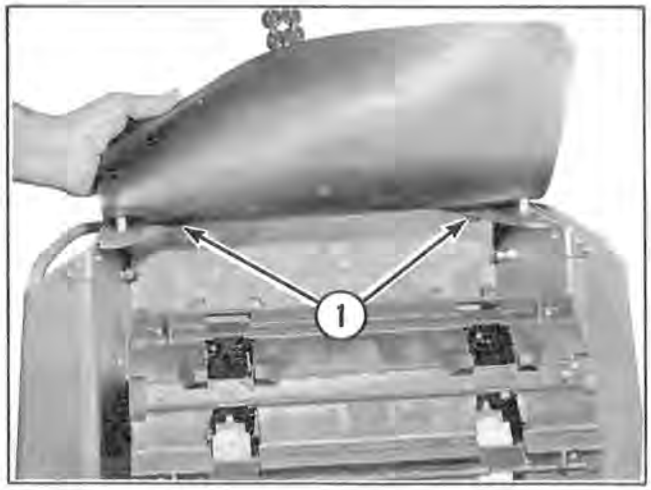
Seat

Removal

1. Remove the four seat mounting bolts. (See Figure 3-153.)
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, drill head of nut off and push stripped section of nut into seat. Push new nut into hole in seat.



1. Seat Mounting Bolts

Figure 3-153

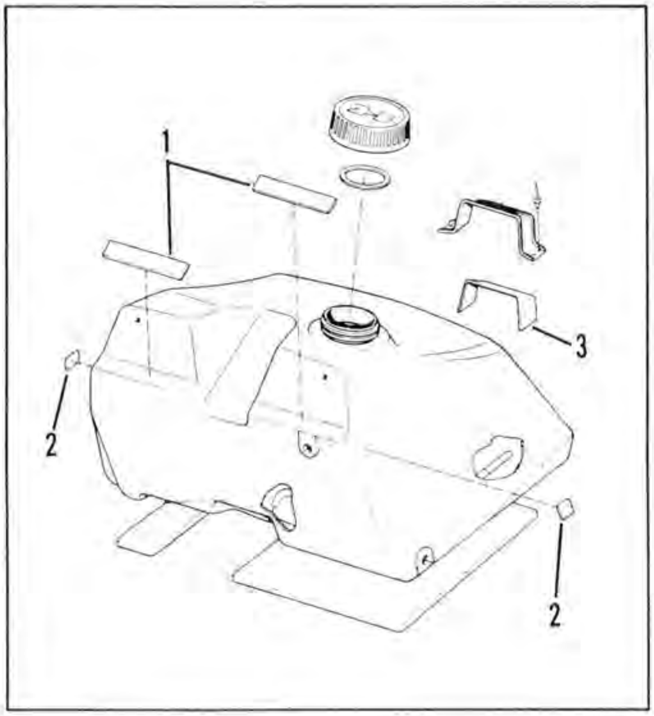
Fuel Tank

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 pump tube, and connect another suitable length of 1/4 in. tube and allow fuel to drain into a proper container.
4. Disconnect remaining fuel level sight tubes from fittings at left front corner of tank, and lift tank from snomobile.

Installation

1. Position tank on chassis, with tank slightly raised. Reconnect fuel pump tube to fitting at bottom front of tank, and sight level tube to fittings at left front of tank.
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 3-154.)
3. Remount the pad and bracket at the rear of the tank.



1. Front Pads
2. Side Pads
3. Rear Pad

Figure 3-154

Oil Tank

Removal

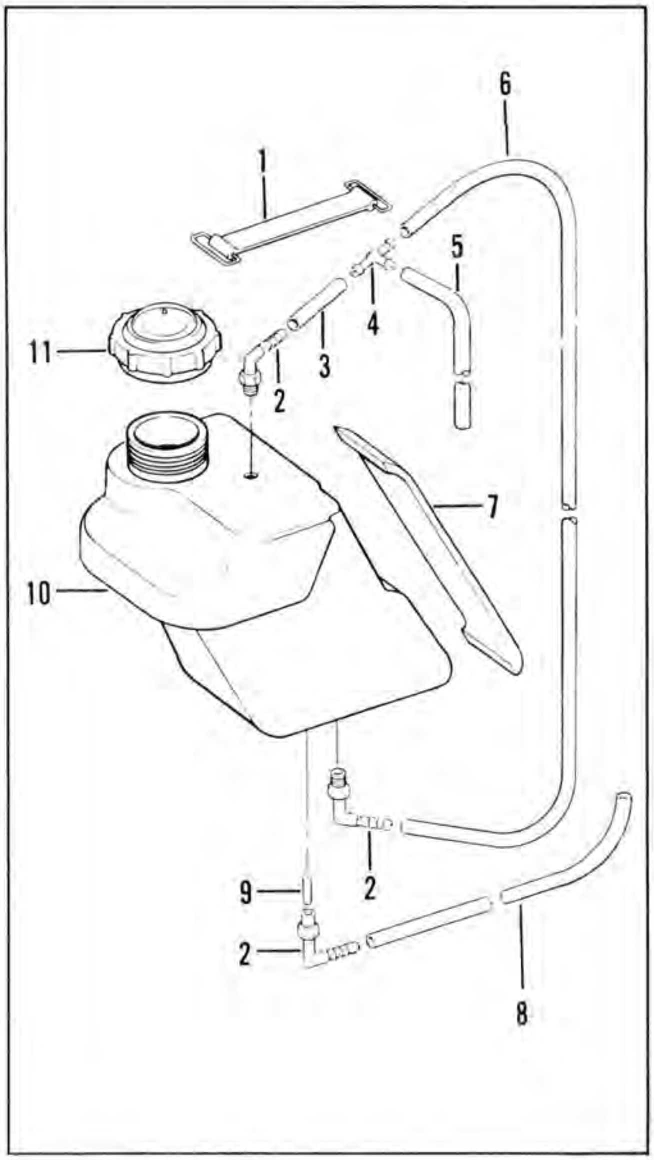
1. Remove oil tank retaining band, and lift tank to allow access to elbow fittings on bottom. (See Figure 3-155.)
2. Pull oil level tube from fitting at the top of tank and allow oil to drain into a container of sufficient capacity to hold the entire 2-1/2 quarts (2.37 liters) of oil tank capacity if necessary. (See Figure 3-155.)
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.

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. 1/4 x 150 in. (Tank to Tee) Tube
4. T Fitting
5. 1/8 x 15.00 in. (Vent) Tube
6. 1/4 x 14.50 in. (Oil Level) Tube
7. Oil Tank Pad
8. 1/4 x 20.00 in. (Oil Pump Supply) Tube
9. Pick Up Pipe
10. Oil Tank
11. Oil Tank Cap

Figure 3-155

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.

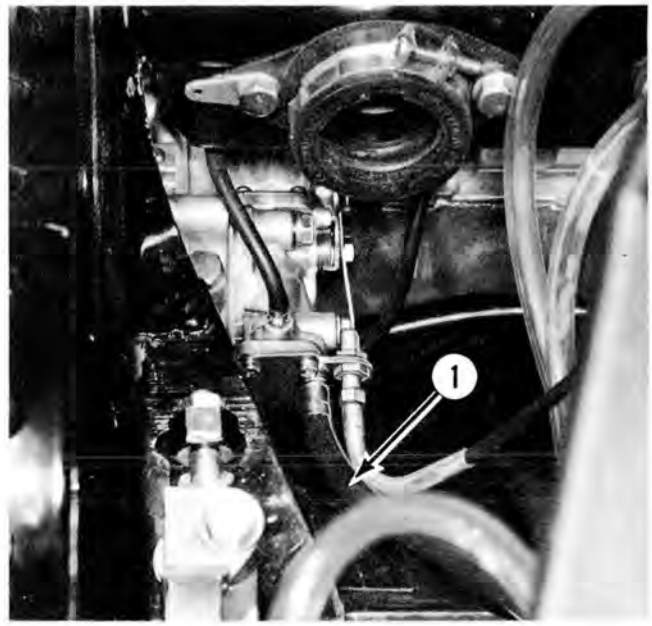
2. Resecure tank with band, and refill with KAWASAKI Snowmobile Oil.

3. Pull feed tube from rear of the oil pump, and bleed air from the line. Reconnect the line and secure with clamp. (See Figure 3-156.)

CAUTION

Bleed the oil pump by removing the bleed bolt from the oil pump. Hold control lever in the full open position until all air is deleted from the tube feeding the pump.

4. To purge trapped air from outlet tubes of oil pump, hold oil pump lever in full open position for one minute with engine idling at 3,000 RPM. Oil pump lever wide open for one minute generates maximum oil flow and completely purges oil pump outlet tubes of air.



1. Feed Line

Figure 3-156

Appendix

Table of Contents

4

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, in an emergency use a B.I.A. certified T.C.W. (Two Cycle) oil. These oils are specially formulated to give minimum piston ring varnish and combustion chamber deposits along with excellent lubrication qualities. (See Figure 4-1.)

Figure 4-1

The use of fuel additives such as tune-up tonics and super oils are NOT RECOMMENDED.

Fuel

Use regular leaded gasoline with a minimum PUMP POST OCTANE NUMBER of 89.

Fuel/Oil Mixture

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.

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.

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.

Break-in Procedure

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 1/2 to 3/4 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	11/64	.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

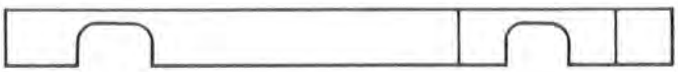
Unit Conversion Table

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/cm²	x	14.22	=	lbs/sq.in.
km	x	.6214	=	miles
lb.	x	.4536	=	kg
lb/sq. in.	x	.0703	=	kg/cm²
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.)

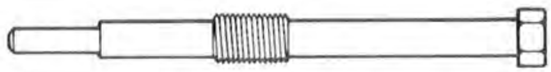
List of Abbreviations

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/cm².......... 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

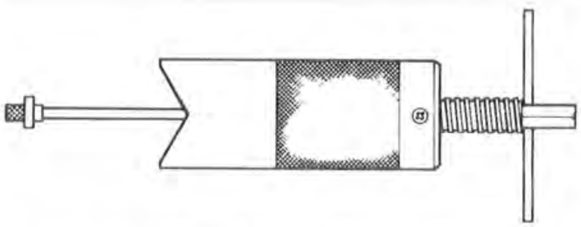
Special Service Tools



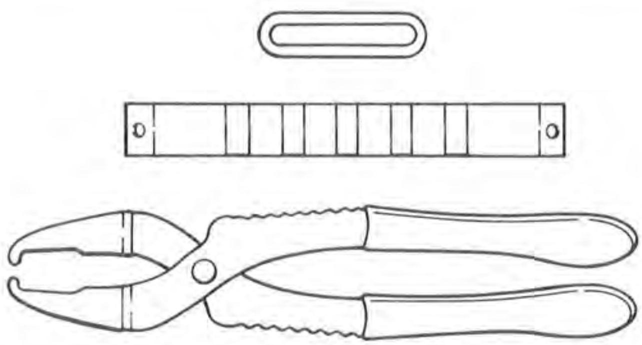
Part No. 57001-3503 Converter Alignment Gauge



Part No. 57001-3502 Drive Converter Puller

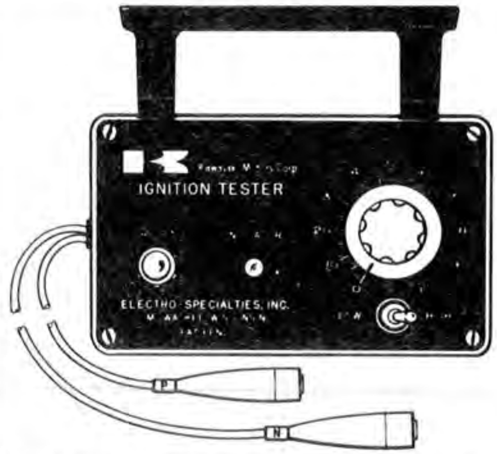


Part No. 57001-910 Piston Pin Puller

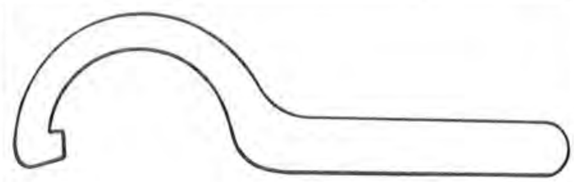


Part No. T57001-130 Piston Ring Compressor Set

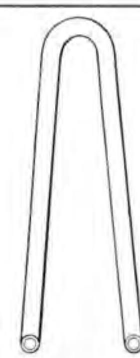
Part No. 92104-002 Liquid Gasket Sealer



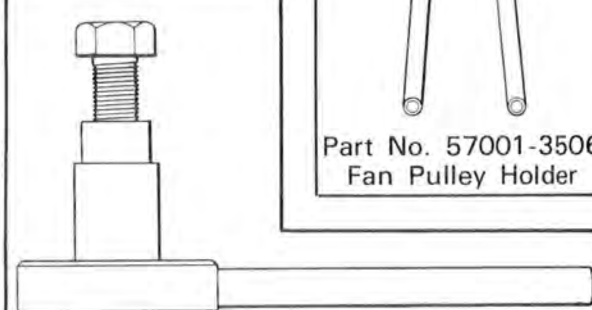
Part No. T56019-201 CD Ignition Tester



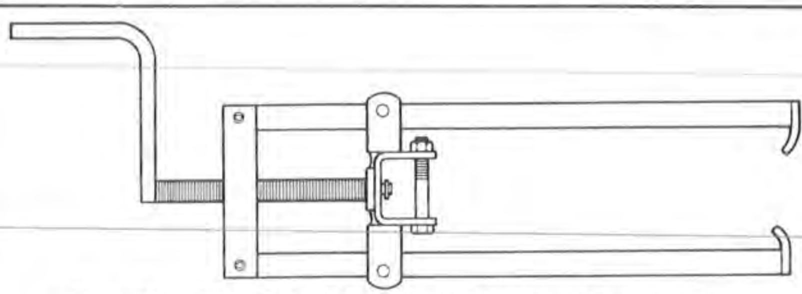
Part No.57001-3501
Shock Cam Adjuster



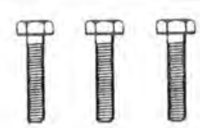
Part No. 57001-3506
Fan Pulley Holder



Part No. T56019-011 Flywheel Puller

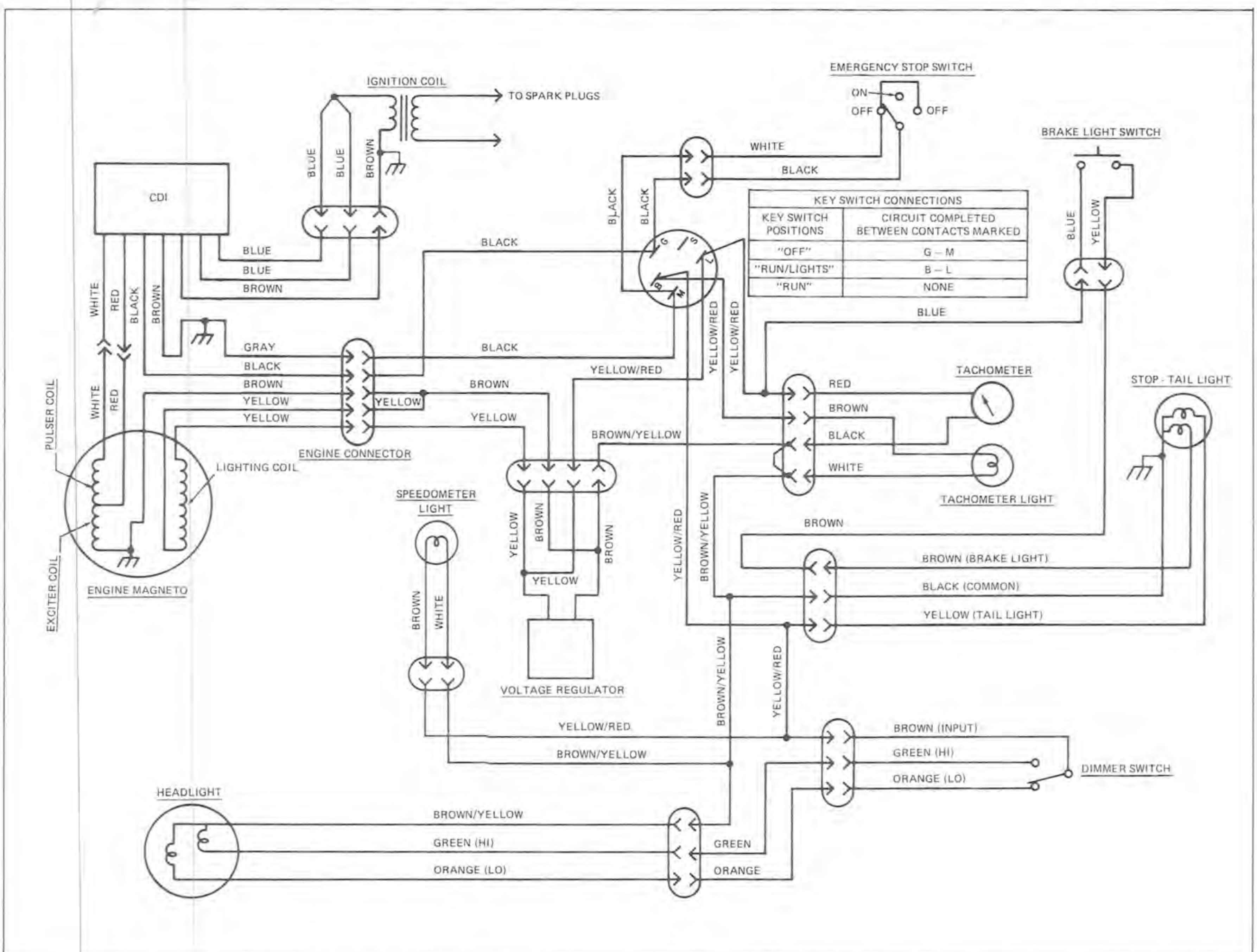


Part No. 57001-3504 Shock Spring Compressor



Part No. 110G0630
Flywheel Puller Bolt

Wiring Diagram



KEY SWITCH CONNECTIONS	
KEY SWITCH POSITIONS	CIRCUIT COMPLETED BETWEEN CONTACTS MARKED
"OFF"	G – M
"RUN/LIGHTS"	B – L
"RUN"	NONE

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