

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

	SECTION
Specifications	1
Maintenance and Theory	2
Repair	3
Appendix	4

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

Specifications

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General Specifications

GENERAL	MODEL	
	SA340-A3	SB440-A3
Overall Length	101 in. (2565 mm)	101 in. (2565 mm)
Overall Width	35.5 in. (902 mm)	35.5 in. (902 mm)
Overall Height (With Windshield)	39.5 in. (1003 mm)	39.5 in. (1003 mm)
Dry Weight (Approximate)	365 lb (166 kg)	375 lb (170 kg)

ENGINE

Model	Type TA 340 A	Type TA 440 B
Displacement	20.7 c.i. (338 cc)	26.6 c.i. (436 cc)
Bore x Stroke	2.362 x 2.362 in. (60 x 60 mm)	2.677 x 2.362 in. (68 x 60 mm)
Number of Cylinders	2	2
Engine RPM at Full Throttle	6300 to 6500 RPM	6600 to 6800 RPM
Engine RPM at Idle Speed	2000 RPM	2500 RPM
Starter	Manual rewind (Electric option)	Manual rewind

IGNITION

Ignition System	Magneto - Breaker Point	Capacitor Discharge
Spark Plug	NKG BR-8ESA	NGK BR-9EV

CARBURETOR

Carburetor Make	Mikuni	Mikuni
Carburetor Model	VM 32 Econo Jet	VM 32 Econo Jet
Identification Marking	32/143	32/142
Type of Carburetor	Open Vent	Open Vent
Main Jet	230	260
Air Jet	None	None
Jet Needle	6FL14-3	6DP10-3
Needle Jet	P-4	P-8
Throttle Valve (Cut Away)	0.079 in. (2.0 mm)	0.098 in. (2.5 mm)
Pilot Jet	25	25
By Pass	0.055 in. (1.4 mm)	0.055 in. (1.4 mm)
Pilot Outlet	0.031 in. (0.8 mm)	0.031 in. (0.8 mm)
Air Screw	1.5 Turns	1.5 Turns
Float Valve Seat	0.059 in. (1.5 mm)	0.059 in. (1.5 mm)
Starter Jet	0.059 in. (1.5 mm)	0.059 in. (1.5 mm)
Type of Float Chamber	Special	Special
Starter System	Cable, Dual Position	Cable, Dual Position
Econo Jet (Power Jet)	110 Round Reverse Type	120 Round Reverse Type

GEARING

Top Sprocket	17 teeth	21 teeth
Lower Sprocket	38 teeth	38 teeth
Sprocket Overall Ratio	2.24 to 1	1.81 to 1
Chain - (Silent Type)	90 pitch	92 pitch
Drive Chain Tension	Self Adjusting	Self Adjusting
Chain Tensioner Spring Color	Green	Green

	MODEL	
	SA340-A3	SB440-A3
DRIVE CONVERTER		
Engagement Speed (approximate RPM)	3500 RPM	3800 RPM
Drive Converter RPM	6300 to 6500 RPM	6600 to 6800 RPM
Spring Part Number and Color (Standard)	050760 (Yellow)	050786 (Green)
Spring Part Number and Color (Optional)	050786 (Green)	050760 (Yellow)
	050939 (Red)	050939 (Red)
Spring Length-New with no load*	4.35 in. (110.4 mm) Yellow	4.35 in. (110.4 mm) Green
	4.35 in. (110.4 mm) Green	4.35 in. (110.4 mm) Yellow
	4.0 in. (101.6 mm) Red	4.0 in. (101.6 mm) Red
Number of Spring Coils (All Colors)	5	5
Spring Wire Diameter	0.187±0.005 in. (4.7±0.1 mm)	0.192±0.005 in. (4.8±0.1 mm)
	Yellow	Green
	0.192±0.005 in. (4.8±0.1 mm)	0.187±0.005 in. (4.7±0.1 mm)
	Green	Yellow
	0.176±0.010 in. (4.4±0.2 mm)	0.176±0.010 in. (4.4±0.2 mm)
	Red	Red
Spring Rate	50 in. lb (0.89 kg-m) Yellow	64 in. lb (1.14 kg-m) Green
	64 in. lb (1.14 kg-m) Green	50 in. lb (0.89 kg-m) Yellow
	42 in. lb (0.75 kg-m) Red	42 in. lb (0.75 kg-m) Red
Spring Compression	155 lb @ 1.25 in.	198 lb @ 1.25 in.
	(70.3 kg @ 31.7 mm) Yellow	(89.8 kg @ 31.7 mm) Green
	198 lb @ 1.25 in.	155 lb @ 1.25 in.
	(89.8 kg @ 31.7 mm) Green	(70.3 kg @ 31.7 mm) Yellow
	116 lb @ 1.25 in.	116 lb @ 1.25 in.
	(52.6 kg @ 31.7 mm) Red	(52.6 kg @ 31.7 mm) Red
Spring Outside Diameter	2.375±0.125 in.	2.375±0.125 in.
	(60.32±3.17 mm) Yellow	(60.32±3.17 mm) Green
	2.375±0.125 in.	2.375±0.125 in.
	(60.32±3.17 mm) Green	(60.32±3.17 mm) Yellow
	2.375±0.250 in.	2.375±0.250 in.
	(60.32±6.3 mm) Red	(60.32±6.3 mm) Red
Weight Part Number (Standard)	050776	050934
Ramp Part Number	050933	050933
Weight-Total gram weight (Standard)	35.748 grams	47.148 grams
Weight Markings	0146-106	0146-105

Optional Weights			
Part Number	Color	Markings	Gram Weight
050968	Yellow	0146-108	3.058
050780	Red	0146-175	3.725
050779	Black	0146-135	4.479
050777	White	0146-107	4.958
050845	Black	0146-279	5.457
050776	Red	0146-106	5.958
050835	Black	0146-278	6.475
050778	Yellow	0146-123	6.992
050934	Black	0146-105	7.858
050836	Red	0146-286	8.800
050803	Green	0146-136	9.279
050841	White	0146-104	9.750

* After approximately 50 miles, the spring will take a set and lose 0.25 (1/4) of an in. of its total length. No significant loss of spring compression will occur because of the decreased spring length.

DRIVEN CONVERTER

Cam Angle	30°
Spring Part Number	050774
Spring Color	Black
Spring Length - New with no load	4.2 in. (107 mm)
Spring Diameter	2.880 in. (73.15 mm)
Spring Wire Diameter	0.155 in. (3.94 mm)
Spring Preload - Counterclockwise	2nd hole - 120°

BELT

Part Number	050655
Outside Circumference	43.5 ± 0.25 in. (1104.9 ± 6.4 mm)
Width - Top surface	1.25 + 0.06 - 0.00 in. (31.7 + 1.55 - 0.00 mm)
Thickness - Top of belt to bottom of lug	0.56 ± 0.03 in. (14.2 ± 0.8 mm)
Belt Taper Angle	30°

BRAKE

Brake Pad replacement required when threads protruding through adjusting nut exceed	7/16 in. (11.1 mm)
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TRACK AND SUSPENSION

Track Type	Rubber (Internal Drive Lug)
Track Width	15 in. (381 mm)
Track Length	116 in. (2946.4 mm)
Suspension	Slide rail

ELECTRICAL COMPONENTS

Type	12 VAC, 120 W
Headlight Part Number	040630 12 V. 60/60 W
Tail/Brake Light	G.E. 1157
Instrument Lights	GE 363 12 V - 3 W

FRAME

Frame	Aluminum alloy and HSLA steel construction
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FUEL/OIL

Gasoline	Premium or regular leaded (minimum pump posted octane number 89)
Oil	Kawasaki Snowmobile Oil (B.I.A. certified T.C.W.)
Gasoline/Oil Ratio	(40 to 1) 1 quart (0.946 liters) of oil to 6.25 gallons (23.6 liters) of gasoline
Fuel Tank Capacity	9 gallons (34 liters)

Service Specifications

ENGINE	MODEL	
	SA340-A3	SB440-A3
Effective Compression Ratio	6.9 to 1	7.3 to 1
Top Ring/Groove Clearance	0.008 in. (0.19 mm)	0.009 in. (0.22 mm)
Bottom Ring/Groove Clearance	0.008 in. (0.19 mm)	0.008 in. (0.19 mm)
Piston Ring End Gap (Top)	0.006 to 0.014 in. (0.15 to 0.35 mm)	0.008 to 0.016 in. (0.2 to 0.4 mm)
Piston Ring End Gap (Bottom)	0.006 to 0.014 in. (0.15 to 0.35 mm)	0.008 to 0.016 in. (0.2 to 0.4 mm)
Piston Skirt Clearance	0.001 to 0.003 in. (0.03 to 0.06 mm)	0.002 to 0.004 in. (0.05 to 0.10 mm)
Connecting Rod Radial Play	0.0008 to 0.0012 in. (0.021 to 0.031 mm)	0.0008 to 0.0012 in. (0.021 to 0.031 mm)
Connecting Rod Side Clearance	0.016 to 0.020 in. (0.4 to 0.5 mm)	0.016 to 0.020 in. (0.4 to 0.5 mm)
Connecting Rod Small End Diameter	0.787 to 0.789 in. (20.00 to 20.05 mm)	0.787 to 0.789 in. (20.00 to 20.05 mm)
Crankshaft End Play (Max)	0.030 in. (0.77 mm)	0.019 in. (0.48 mm)
Crankshaft Run Out (Max)	0.002 in. (TIR) (0.05 mm)	0.002 in. (TIR) (0.05 mm)

IGNITION

Spark Plug Gap	0.032 in. (0.8 mm)	0.024 in. (0.6 mm)
Ignition Timing (Dynamic)	25° @ 6500 RPM	18° @ 6500 RPM
Ignition Timing (BTDC)	0.006 in. (0.145 mm) Static 0.139 in. (3.145 mm) Full Advance	0.073 in. (1.86 mm) -----

MAGNETO RESISTANCE TESTS (SA340-A3)

Item	Ohmmeter Leads Connected Between	Resistance
Lighting Coil	Yellow-Yellow	0.14 ohm ± 20%
Exciter Coil	Red-Ground (Brown)	1.10 ohms ± 20%

IGNITION COIL RESISTANCE TESTS* (SA340-A3)

Item	Ohmmeter Leads Connected Between	Resistance
Primary winding	Red or white-Ground	1.61 ohms ± 20%
†Secondary winding	High Tension Lead to Ground	5,000 ohms ± 20%
†Spark Plug Cap	Terminals at each end of cap	1,000 ohms ± 20%

MAGNETO COIL RESISTANCE TESTS (SB440-A3)

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* (SB440-A3)

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%

†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.

CARBURETOR

Air Screw Setting	1.5 turns off seat
Idle Screw Setting	6 turns open from coil bound-initial (SA340-A3/2500 RPM-final) (SB440-A3/2500 RPM-final)

CHASSIS

Converter Offset Distance	0.454 in. (11.5 mm)
Converter Center Distance	10.3 in. (262 mm)
Drive Chain Tension	Self Adjusting
Brake Adjustment required when lever movement exceeds	3/4 in. (19 mm)
Track Tension	3/4 in. (19 mm) maximum deflection - 5 to 8 lbs (2.2 to 3.6 kg) pull
Steering Alignment	Skis parallel or 1/8 in. (3.1 mm) 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	15 ft lb (2.1 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)

Torque Chart and Loctite Table

Description	Quantity	Torque	Loctite
ENGINE MOUNT AND EXHAUST			
Engine rubber mount - nuts	4	30 ft lb (4.15 kg-m)	
Muffler mounting - nuts	4	10 ft lb (1.38 kg-m)	
Engine mounting - bolts	4	30 ft lb (4.15 kg-m)	
ELECTRICAL SYSTEM			
Key switch - nut	1	Hand tighten	
Voltage regulator mounting - nut	1	95 in. lb (1.09 kg-m)	
Brake and throttle lever - lock screw	1	25 in. lb (0.29 kg-m)	
Tail lamp lens mounting - screws	2	50 in. lb (0.57 kg-m)	
Head lamp housing mounting - bolts	4	11 ft lb (1.52 kg-m)	
Head lamp rim mounting - screw	1	50 in. lb (0.57 kg-m)	
DRIVE CONVERTER			
Spider assembly - roller bearing mounting - nuts	3	35 - 48 in. lb (0.40 - 0.55 kg-m)	
Spider assembly - set screws	3	35 - 48 in. lb (0.40 - 0.55 kg-m)	
Spider assembly - set screw - nuts	3	35 - 48 in. lb (0.40 - 0.55 kg-m)	
Ramp mounting - screws	3	24 - 30 in. lb (0.28 - 0.35 kg-m)	
Movable sheave to bearing housing mounting - socket screws	3	15 - 17 ft lb (2.07 - 2.35 kg-m)	
Drive converter assembly to crankshaft - bolt	1	55 - 60 ft lb (7.61 - 8.30 kg-m)	

Description	Quantity	Torque	Loctite
DRIVEN CONVERTER AND BRAKE			
Disc brake to stationary sheave mounting - screw	3	95 in. lb (1.09 kg-m)	
Clevis retainer to cam mounting - bolt	1	95 in. lb (1.09 kg-m)	
Securing brake support bracket - nut	2	120 in. lb (1.38 kg-m)	
Caliper to mounting bracket - nut	1	19 ft lb (2.63 kg-m)	
CHAINCASE			
Chaincase mounting - nuts	4	28 ft lb (3.87 kg-m)	
Chaincase cover mounting - bolts	2	95 in. lb (1.09 kg-m)	
Top sprocket mounting - bolt	1	28 ft lb (3.87 kg-m)	
Chaincase cover - plugs	2	20 in. lb (0.23 kg-m)	
Speedometer drive adapter	1	Hand Tighten	
Bearing support assembly to clevis mounting - nut	1	95 in. lb (1.09 kg-m)	
Tensioner to chaincase - nut	1	120 in. lb (1.38 kg-m)	
Bottom sprocket mounting - nut	1	55 ft lb (7.61 kg-m)	
Bearing support to shaft - bolt	1	19 ft lb (2.63 kg-m)	
SUSPENSION			
Track adjusting jam - nuts	2	20 ft lb (2.77 kg-m)	
Rear suspension bracket mounting - nuts	4	17 ft lb (2.35 kg-m)	
Mounting screws - washer to limiters	20	95 in. lb (1.09 kg-m)	
Rear axle support brackets mounting - bolts	8	95 in. lb (1.09 kg-m)	
Axle bracket mounting - bolts	8	95 in. lb (1.09 kg-m)	
Limiters to front suspension arm mounting - bolts	2	95 in. lb (1.09 kg-m)	
Shock absorber to rear suspension arm - nut	1	30 ft lb (4.15 kg-m)	
Eye bolts to suspension brackets - nuts	4	Adjust to obtain 1/4" exposed threads	
Support brackets - attaching nuts	18	95 in. lb (1.09 kg-m)	
Wear strip attaching screws	4	60 in. lb (0.69 kg-m)	
Upper idler shaft to chassis - mounting bolts	2	15 ft lb (2.07 kg-m)	
Suspension brackets - front and rear mounting - bolts	8	25 ft lb (3.46 kg-m)	
Rear axle assembly - bolts	2	30 ft lb (4.15 kg-m)	
DRIVESHAFT			
Bearing housing mounting - bolts	3	156 in. lb (1.8 kg-m)	
SKI AND SPINDLE			
Skeg (ski wear runner) to ski - attaching nut	6	180 in. lb (24.9 kg-m)	
Rear spring to ski - attaching nuts	2	31 ft lb (4.29 kg-m)	
Front spring to ski - attaching nuts	2	25 in. lb (0.29 kg-m)	
Shock absorber to ski and spindle - attaching nuts	4	31 ft lb (4.29 kg-m)	
Spindle to spring saddle - nut	2	35 ft lb (4.84 kg-m)	
Spring saddle to spring - nut	4	46 ft lb (6.36 kg-m)	

Description	Quantity	Torque	Loctite
STEERING			
LH tie rod to steering pole - nut	1	15 ft lb (2.07 kg-m)	242
Steering arms to tie rods - nut	2	35 ft lb (4.84 kg-m)	
Steering pole mounting - nuts, upper	2	17 ft lb (2.35 kg-m)	
Steering pole mounting - bolts, lower	2	28 ft lb (3.87 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 pole - nut	1	35 ft lb (4.84 kg-m)	
Handlebar to steering pole mounting - screws	4	15 ft lb (2.07 kg-m)	
Steering arm to spindle - nut	2	35 ft lb (4.84 kg-m)	
CHASSIS			
Hood guide and front bumper mounting - bolts	12	95 in. lb (1.09 kg-m)	
Hood guide, front bumper and hood hinge attaching - nuts	18	95 in. lb (1.09 kg-m)	
Rear bumper and snow flap attaching - nuts	8	95 in. lb (1.09 kg-m)	
Passenger handles attaching - nuts	4	60 in. lb (0.69 kg-m)	
Pan brace attaching - bolts	2	95 in. lb (1.09 kg-m)	
FUEL SYSTEM			
Primer pump - nut	1	30 in. lb (0.35 kg-m)	
Fuel pump assembly mounting - bolts	2	95 in. lb (1.09 kg-m)	
CABLES			
Throttle cable to carburetor - nut	1	72 in. lb (0.83 kg-m)	
Brake cable jam - nuts	2	12 ft lb (1.66 kg-m)	
Enrichener cable assembly	1	72 in. lb (0.83 kg-m)	
Enrichener cable - pal nut	1	Hand Tighten	
Speedometer cable	1	Hand Tighten	
CRANK AND PISTONS			
Flywheel - nut	1	60 ft lb (8.30 kg-m)	
CRANKCASE AND CYLINDER			
Cylinder head - nuts	8	16 ft lb (2.2 kg-m)	
Spark plug	2	20 ft lb (2.70 kg-m)	
Crankcase - bolts	14	16 ft lb (2.2 kg-m)	
INTAKE AND EXHAUST			
Carburetor holder mounting - bolt/washer assembly	2	40 in. lb (0.62 kg-m)	
Intake manifold - bolts	6	5 - 6 ft lb (0.69 - 0.83 kg-m)	
Exhaust manifold - nuts	4	12 ft lb (1.66 kg-m)	

Description	Quantity	Torque	Loctite
FAN CASE AND AIR SHROUD			
Fan shaft - nut	1	47 ft lb (6.5 kg-m)	222
Air shroud mounting - screws	10	Use impact driver	
Fan case mounting - screws	6	60 in. lb (0.69 kg-m)	
Starter plate mounting - bolts	2	16 - 18 ft lb (2.2 - 2.5 kg-m)	
Fan case to crankcase mounting - bolts	5	10 - 12 ft lb (1.4 - 1.7 kg-m)	
Duct to engine - screws	2	32 in. lb (0.37 kg-m)	
MAGNETO			
BREAKER POINTS (DRIFTER 340 MODEL)			
Breaker contact mounting - screws		Use impact driver	
Stator assembly mounting - screws		60 to 70 in. lb (0.69 to 0.82 kg-m)	
Exciter coil and lighting coil mounting - screws		Use impact driver	
Condenser mounting - screws		Use impact driver	
Ignition coil mounting - screws		60 to 70 in. lb (0.69 to 0.82 kg-m)	
CDI (DRIFTER 440 MODEL)			
Stator assembly mounting - screws		60 to 70 in. lb (0.69 to 0.82 kg-m)	
Wire clamps to stator assembly mounting - screws		Use impact driver	
Exciter coil and pulser coil mounting - screws		Use impact driver	
Lighting coil mounting - screw		Use impact driver	
Ignition coil mounting - screw		60 to 70 in. lb (0.69 to 0.82 kg-m)	
RECOIL STARTER			
Drive plate mounting - nut	1	8 - 10 ft lb (1.11 - 1.38 kg-m)	
Starter pulley mounting - bolts	3	60 in. lb (0.69 kg-m)	
Starter mounting - bolts	4	60 in. lb (0.69 kg-m)	
HOOD			
Hood hinge - nuts	8	25 in. lb (0.29 kg-m)	
Hood latch band - screws	4	25 in. lb (0.29 kg-m)	
Lanyard to engine - screw	1	120 in. lb (1.30 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.

Gear Ratio Chart

			Drive Sprocket - Number of Teeth					
			17	18	19	20	21	22
DRIVEN SPROCKET - NUMBER OF TEETH	36	Gear Ratio Speed Chain Pitch Tensioner Spring		2.00 *65 MPH 90 Red	1.89 *69 MPH 90 Pink			1.64 *79 MPH 92 Red
	37	Gear Ratio Speed Chain Pitch Tensioner Spring	2.18 *60 MPH 90 Red	2.06 *63 MPH 90 Green			1.76 *74 MPH 92 Red	1.68 *77 MPH 92 Green
	38	Gear Ratio Speed Chain Pitch Tensioner Spring	2.24 *58 MPH 90 Green STD SA340-A3			1.90 *68 MPH 92 Red	1.81 *72 MPH 92 Green STD SB440-A3	
	39	Gear Ratio Speed Chain Pitch Tensioner Spring			2.05 *63 MPH 92 Red	1.95 *67 MPH 92 Green		
	40	Gear Ratio Speed Chain Pitch Tensioner Spring		2.22 *58 MPH 92 Pink	2.11 *61 MPH 92 Green			

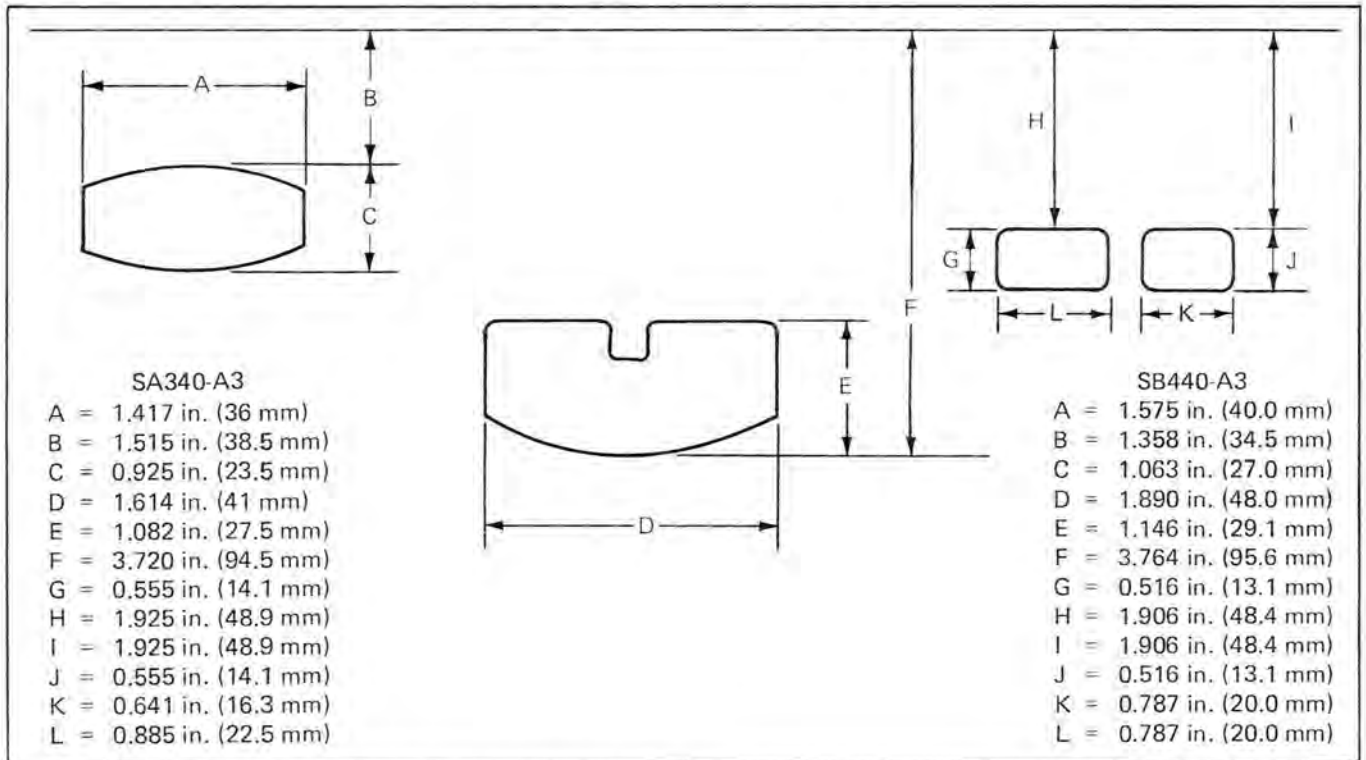
*Theoretical MPH at 6800 RPM

NOTE: All top speeds based on 1:1 converter ratio and engine RPM at 6800

CHAIN TENSIONER SPRINGS

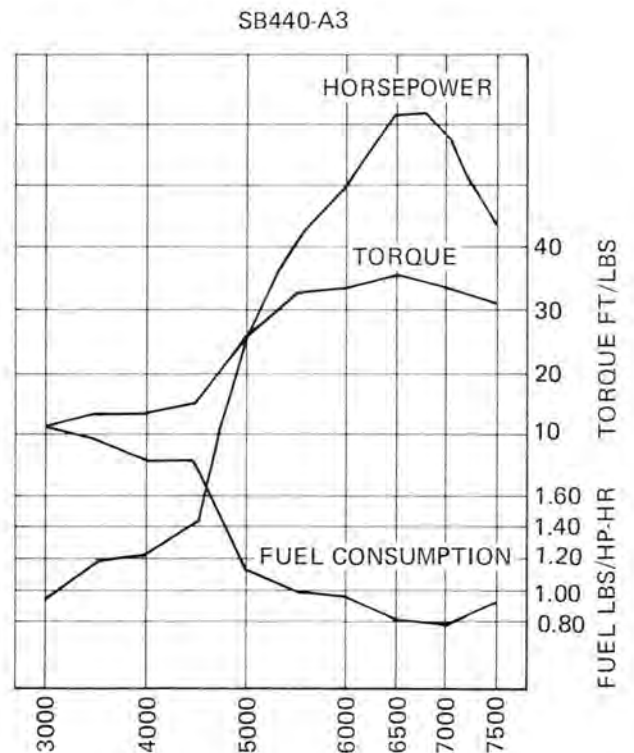
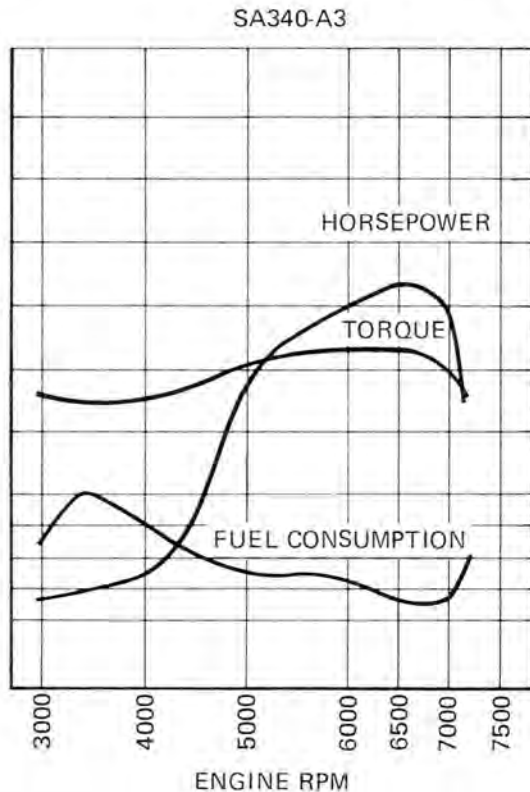
Color	Length	Wire Dia.
Red	3.00 in. (76.20 mm)	0.049 in. (1.245 mm)
Orange	3.00 in. (76.20 mm)	0.055 in. (1.397 mm)
Pink	3.38 in. (85.85 mm)	0.049 in. (1.245 mm)
Yellow	3.38 in. (85.85 mm)	0.049 in. (1.245 mm)
Green	3.75 in. (95.25 mm)	0.049 in. (1.245 mm)
Blue	3.75 in. (95.25 mm)	0.055 in. (1.397 mm)

Port Dimensions



NOTE: a. Port width is chordal and does not include the chamfer.
b. Port height and height location includes the chamfer.

Engine Performance Curves



Maintenance and Theory

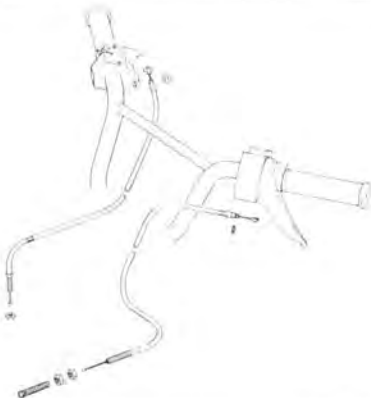
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Maintenance Chart

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 Refer- ence
Install new spark plugs	x			x			2-35
Check carburetor adjustment	x	x					2-29
Check throttle cable adjustment	x	x			x		2-31
Replace fuel filter					x		2-29
De-carbon engine and exhaust						x	3-58
Check axial fan belt	x	x			x		2-34
Check ignition timing		x					2-32
Replace drive belt (be sure converter sheaves are clean and dry)	x			x			2-40
Check drive converter and driven converter alignment	x				x	x	2-38
Check drive converter for wear					x		3-76
Clean and inspect drive and driven converters				x			2-41
Check drive chain tensioner guides	x				x		2-43
Adjust track tension and check alignment	x	x	x				2-47
Check ski alignment	x			x			2-45
Adjust brake		x	x				2-42
Check fasteners for security (use torque chart as a guide)	x			x			1-6
Inspect ski skegs for wear	x		x				2-46
Measure wear of slide rail wear strips	x		x				3-88
Adjust headlight	x						2-36

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.	
DRIVEN CONVERTER Ramp sliding surfaces	Low temperature grease.	Once a season and every 20 hours of operation.	
CHAINCASE HOUSING	Kawasaki Chain Lubricant.	Check level every 20 hours of operation.	

Engine Theory of Operation

Introduction to Two-Stroke Engines

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

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

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

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

1. Intake: On the upstroke of the piston a charge of fuel mixed with air is drawn into the engine through an open port in the cylinder.
2. Compression: Near the bottom of the downstroke, the intake port is closed, and the piston starts back up. This upstroke compresses the fuel/air mixture to a fraction of its former volume.

3. Combustion: When the mixture has been compressed, it is ignited and forces the piston down. This is called the power stroke.
4. Exhaust: After the power stroke, the burned gases exit through the now open exhaust port, and the cycle is ready to start again.

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

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

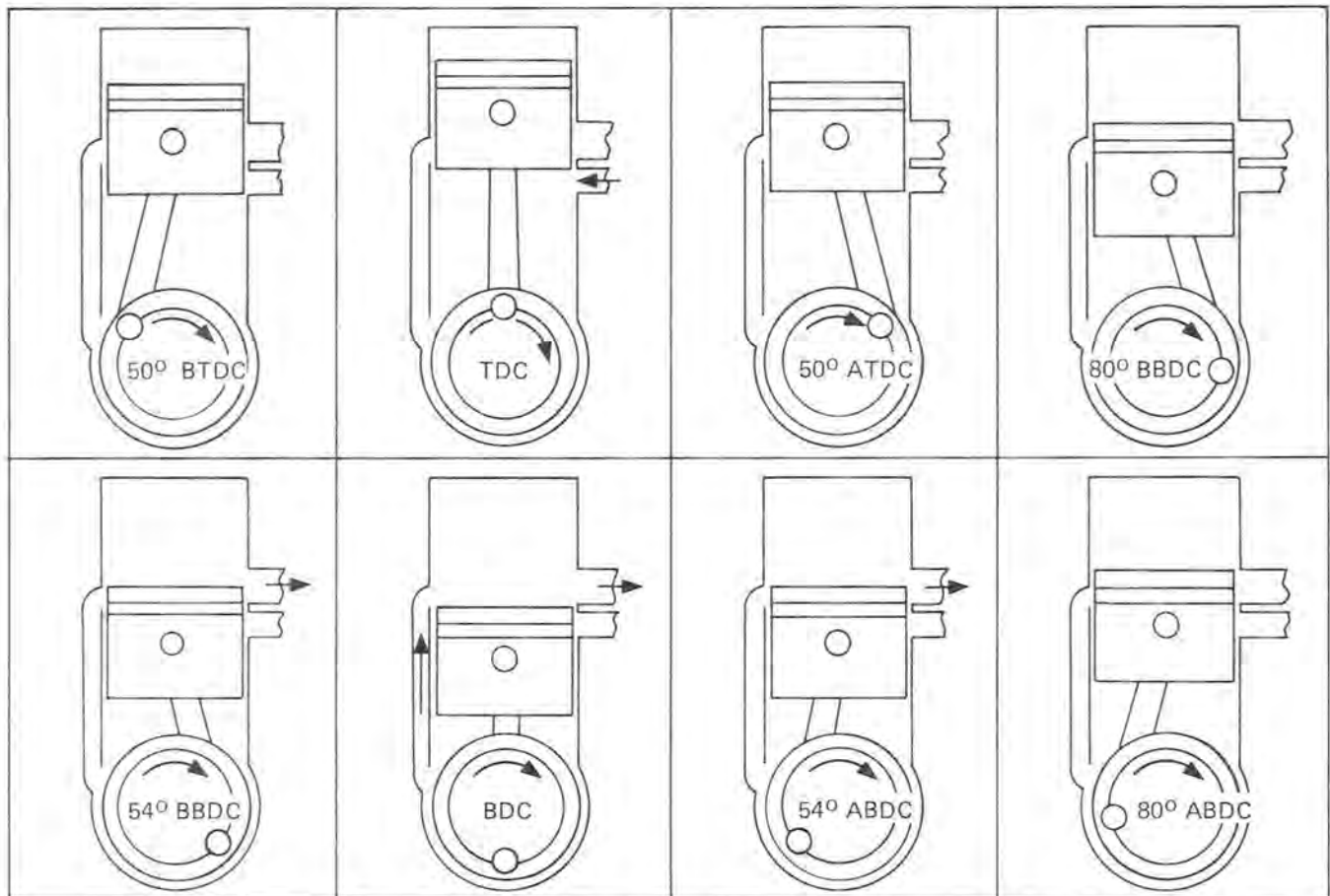


Figure 2-1

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

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.)

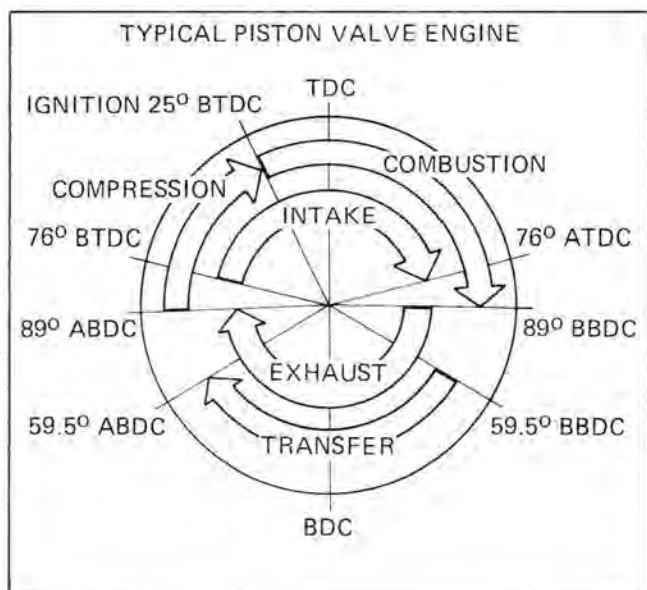


Figure 2-2

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

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 steel alloy 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 keystone 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. Keystone 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.

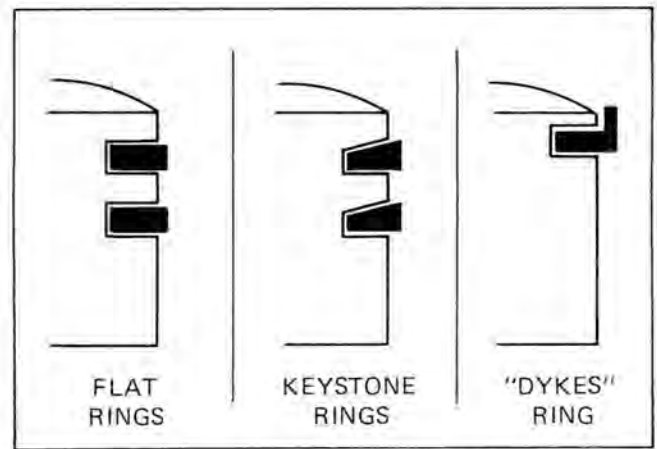


Figure 2-3

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.

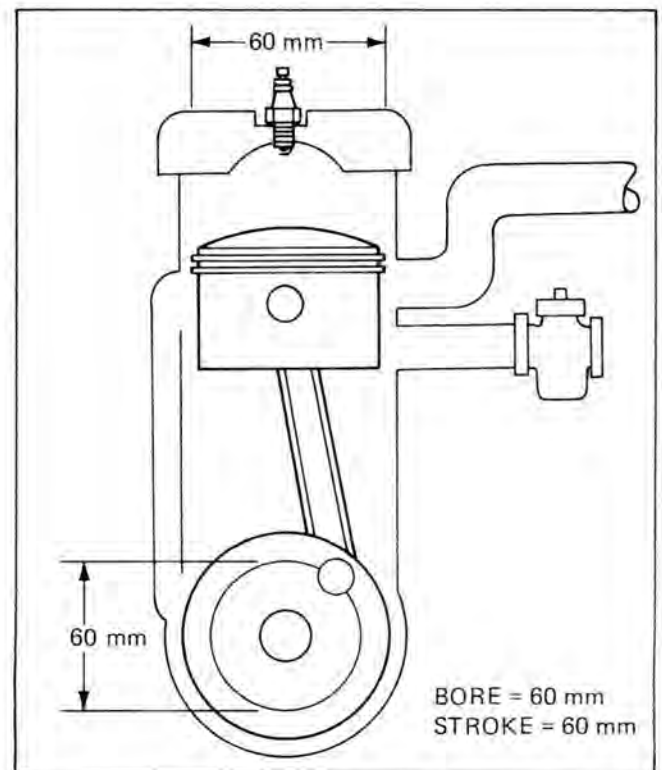


Figure 2-4

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

WHERE:

V = displacement volume

r = 1/2 bore = 30 mm or 3 cm

h = stroke = 60 mm or 6 cm

$\pi = 3.1416$

$$V = (3.1416) (9) (6)$$

$$V = 169.6 \text{ cc or approximately } 170 \text{ cc}$$

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

$\pi = 3.1416$

$$V = (3.1416) (3)^2 (4)$$

$$V = 113.1 \text{ cc or about } 113 \text{ cc}$$

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

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

$$R = 6.7$$

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

The 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 25° before top dead center. 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 pre-ignition. 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 pre-ignition 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.)

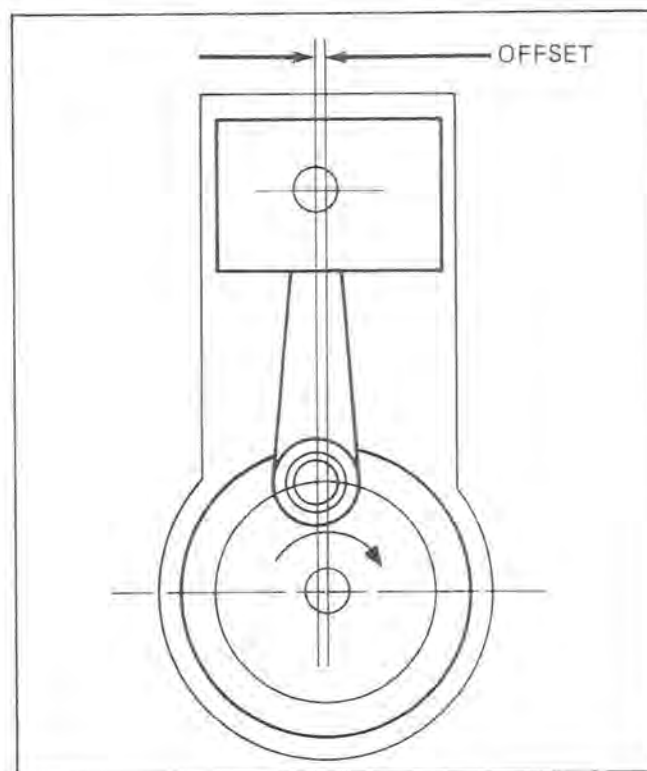


Figure 2-5

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.

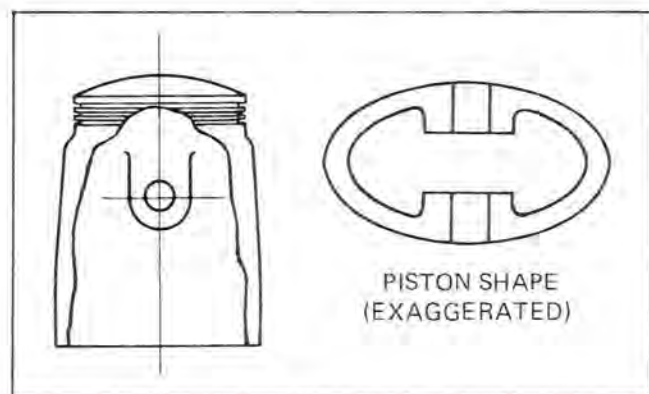


Figure 2-6

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 3/16 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.

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

Engine Crankcase Design

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

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

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

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

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

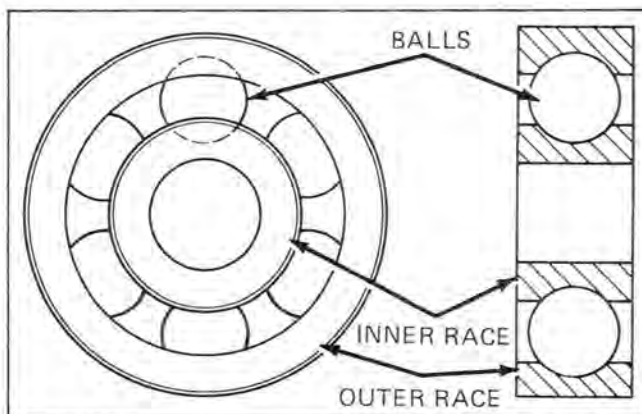


Figure 2-7

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.)

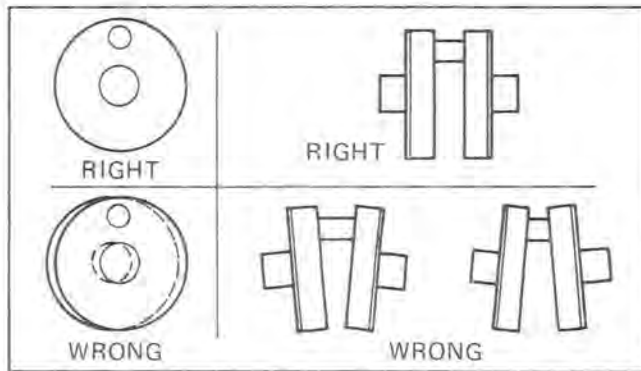


Figure 2-8

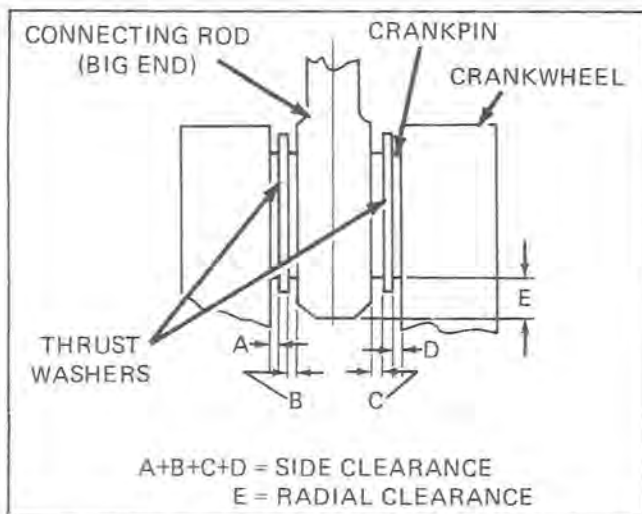


Figure 2-9

Engine Lubrication

The lubricating oil for most snowmobile engines is carried entirely in the fuel. Petroil is a mixture of gasoline and oil used as a fuel in these two-stroke engines. The term "petroil" was probably termed by the British from the two words "petrol" for gasoline, and "oil."

Depending upon the manufacturer's recommendations, the ratio of gasoline to oil in a petroil mix can vary from 16 to 1, all the way to 40 to 1 (and some may be even higher).

Engine Cooling

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

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

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

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

The engine is cooled by the air flowing over it. A fan blows cooling air across the cylinders and heads and draws the heat out of the engine. The engine will not be cooled as effectively at an idle,

and most snowmobile engines will gradually overheat if they are allowed to idle for an extended period of time.

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

Carburetor Theory of Operation

Introduction

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

A common method for referring to carburetors is the bore or venturi size. This method is used in snowmobiles. The measurement is the diameter of the smallest part of the venturi. (See Figure 2-10.)

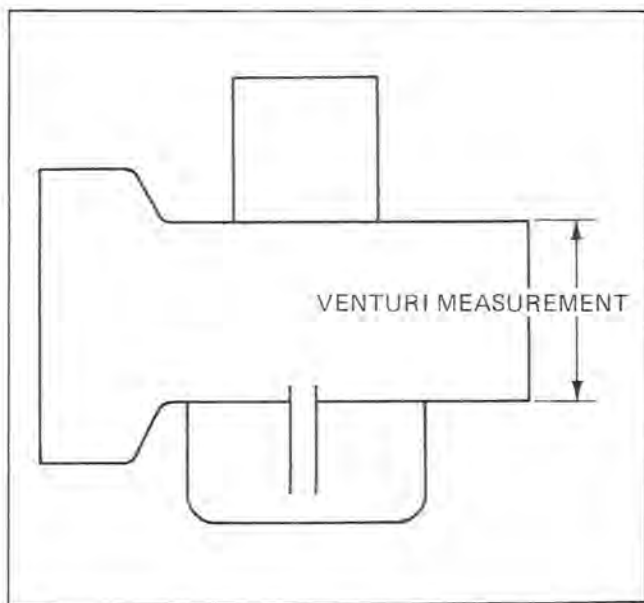


Figure 2-10

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.

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

The carburetor controls the amount of fuel/air mixture which reaches the engine. (See Figure 2-11.)

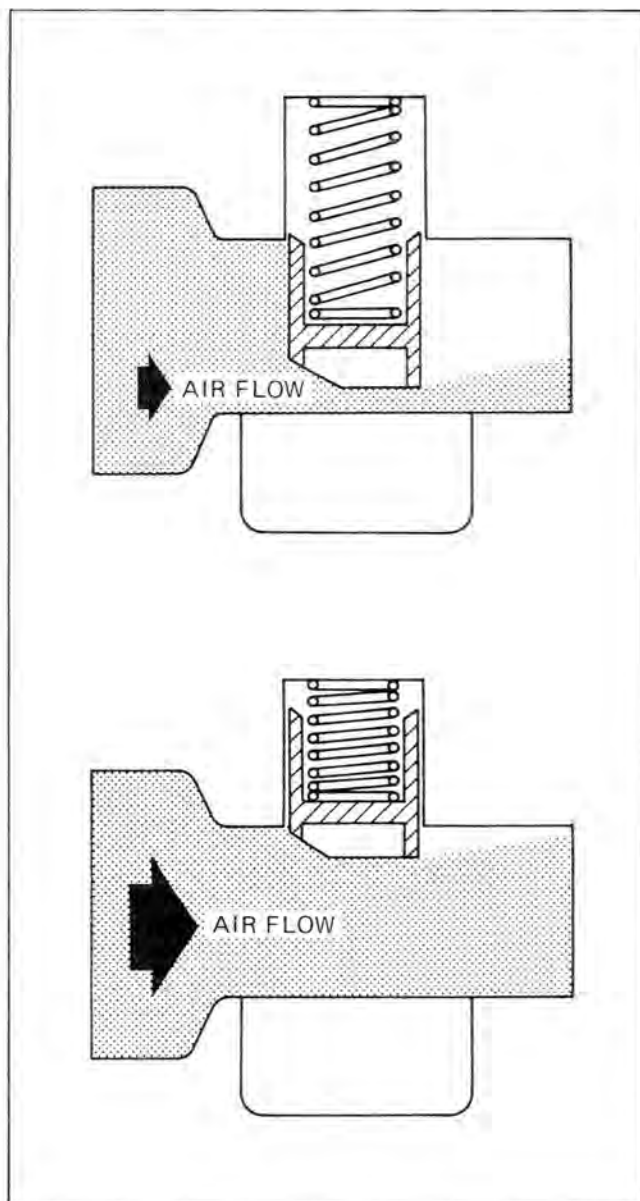


Figure 2-11

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.

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 2-12.) 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.

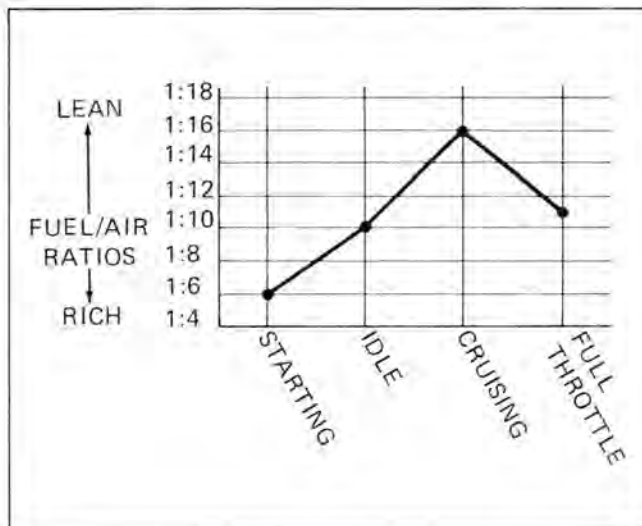


Figure 2-12

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 2-13.)

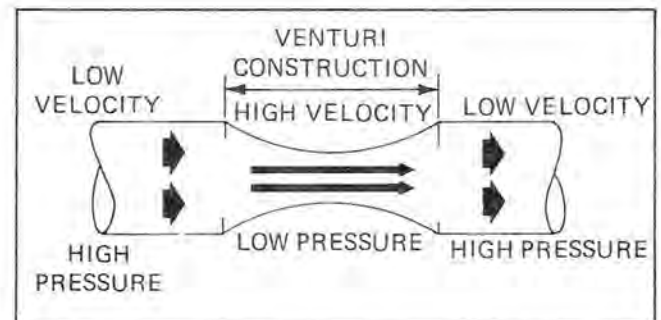


Figure 2-13

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 2-14 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.

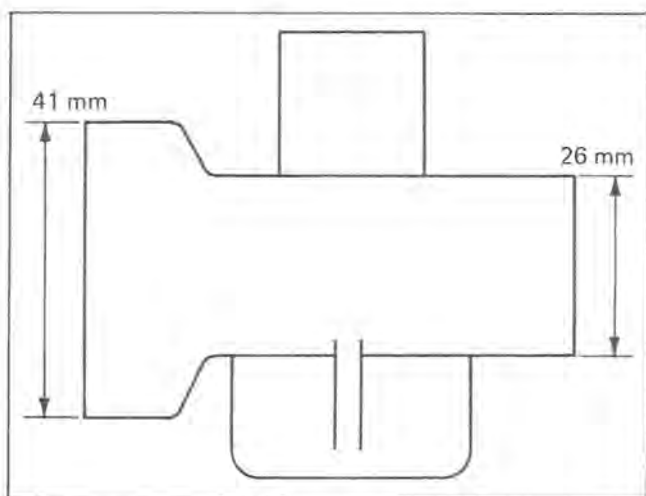


Figure 2-14

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

$$A_1 = \pi r_1^2$$

$$A_2 = \pi r_2^2$$

Where:

A_1 is the area of the entry

A_2 is the area of the venturi

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

r_2 is the radius of the venturi

π is a constant, 3.14

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

The cross-sectional area of the entry is:

$$A_1 = 3.14 \times 20.5^2$$

$$A_1 = 3.14 \times 420.25$$

$$A_1 = 1319.585 \text{ mm}^2$$

The cross-sectional area of the venturi is:

$$A_2 = 3.14 \times 13^2$$

$$A_2 = 3.14 \times 169$$

$$A_2 = 520.66 \text{ mm}^2$$

The ratio of A_1 to A_2 is:

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

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

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

Float Bowl

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

Fuel level in the float bowl is controlled by floats and a needle valve. The lower end of the needle valve rides on the float arm, and the upper end seals against the needle valve seat. When the level of fuel in the bowl drops, the floats drop slightly, and the needle valve moves down away from the seat. This allows fuel pumped from the tank by the fuel pump to flow into the bowl. As fuel enters the bowl, the floats rise, pushing the needle valve into contact with the valve seat, shutting off the flow of fuel. (See Figure 2-15.)

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 14.7 psi (1.03 kg/cm²) 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 2-16.)

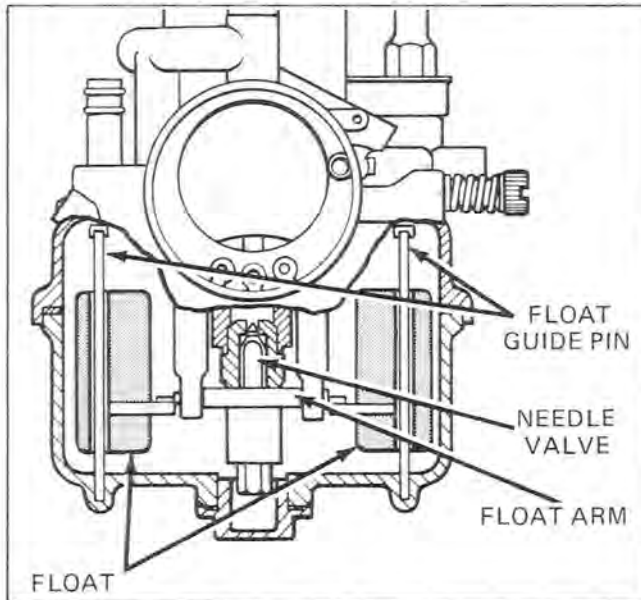


Figure 2-15

The float level is important at low speeds. If too low, the decreased pressure in the venturi would not be able to pull enough fuel up out of the bowl and into the air stream. This would cause hard starting and lean mixture ratios. If the fuel level is too high, too much fuel is pulled into the venturi and the engine would run too rich. The float level

is adjusted by bending the tab. Bending the tab towards the needle valve lowers the fuel level, and bending it away from the valve raises the level. Always set the fuel level at the correct level.

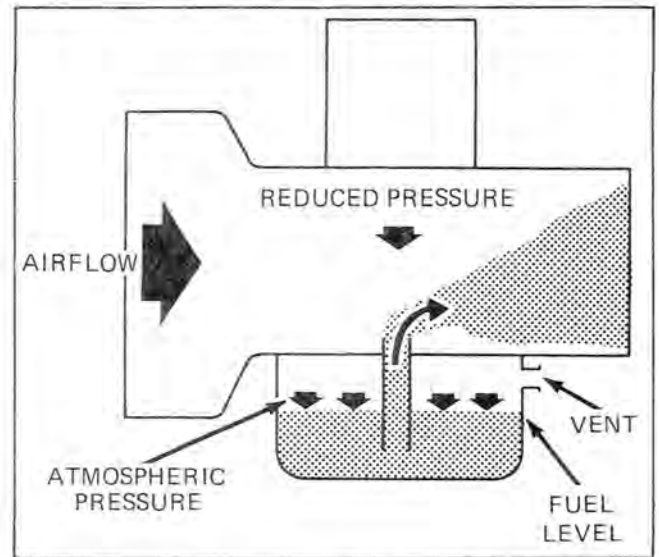


Figure 2-16

Metering System

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

Metering the fuel and air in the proper amounts is performed by a number of components. Each component has a range of throttle positions in which it is effective, but the division between where one takes up and another leaves off is gradual. This "overlap" insures the transition from

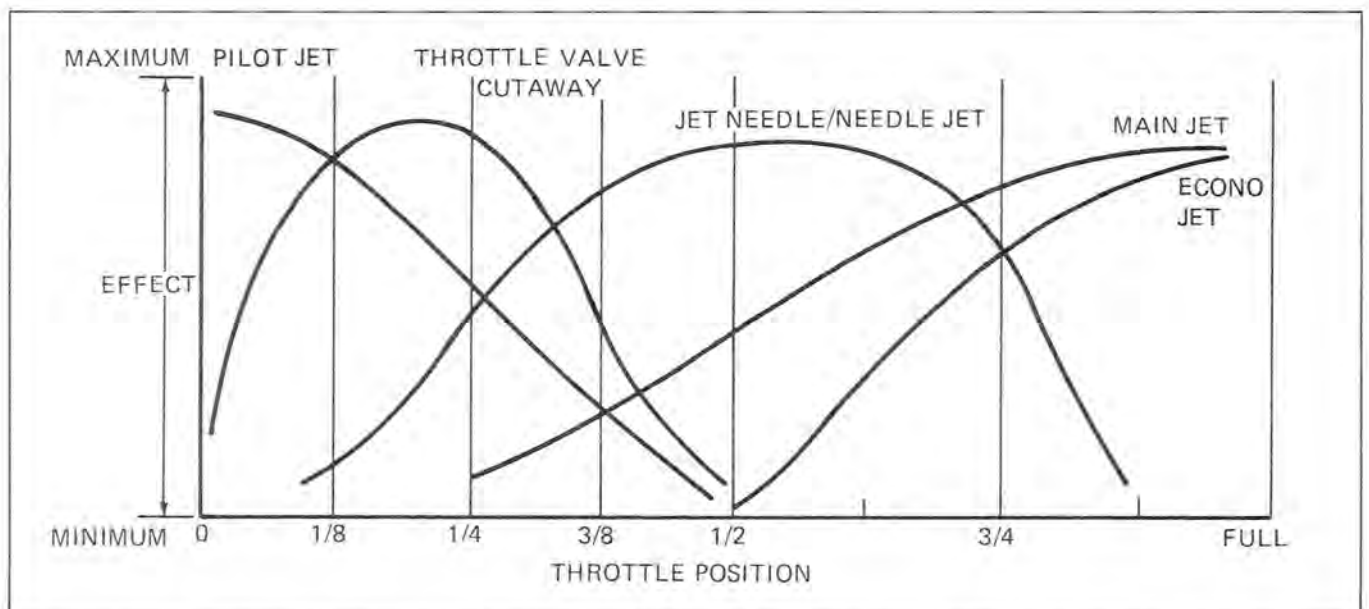


Figure 2-17

one range to another will be smooth. The metering components are: pilot jet, throttle valve cutaway, jet needle, needle jet, main jet, and econo jet. Figure 2-17 illustrates the overlap between the components.

Throttle Valve

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

At lower throttle positions, the cutaway of the throttle valve affects mixture ratios. The effect of the cutaway is felt most from about 1/8 to 1/3 throttle. The higher the cutaway, the leaner the mixture will be at a constant throttle position. The higher cutaway offers less resistance to the incoming air. The fuel supply remains relatively constant at any constant throttle position, and the additional air results in a leaner mixture. The lower the cutaway, the greater air flow resistance, and a richer mixture. The valve cutaway provides for adjustment of the fuel/air ratio as the transition is made from idle to the full venturi action of the carburetor. (See Figure 2-18.)

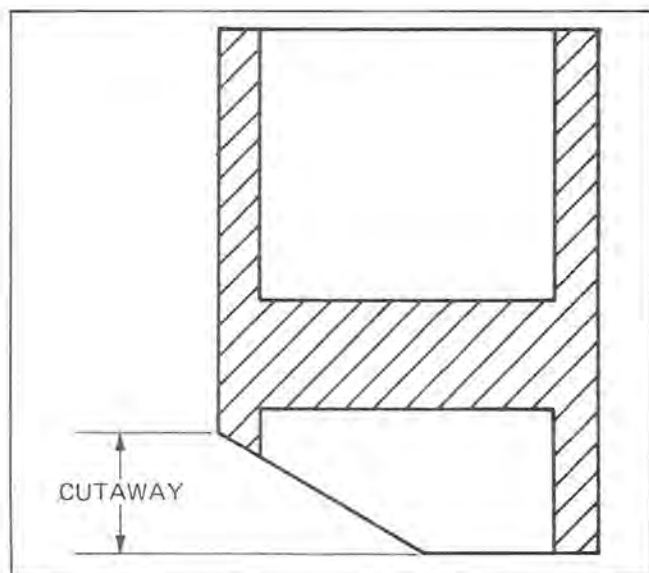


Figure 2-18

Main System

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

The jet needle rides in the throttle valve and moves up and down with the valve. The needle itself is tapered at its lower end and has grooves at its top end. Figure 2-19 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.

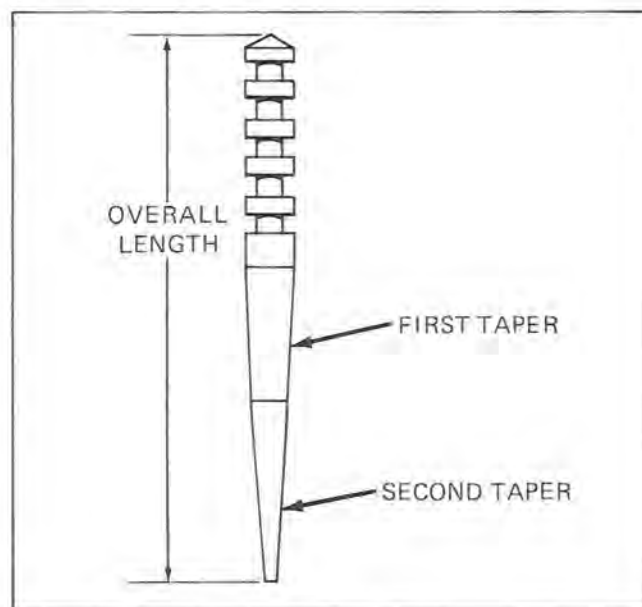


Figure 2-19

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.

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

The clearance is 0.168 mm. As shown in Figure 2-20, the needle blocks the jet when the throttle valve is closed. When the valve is lifted, the needle rises out of the jet until the tapered section arrives at the upper end of the jet. The effect of the taper is to increase the clearance between the jet and the needle as the needle is lifted.

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

Changing the position of the needle changes the amount of available fuel. The needle is moved by moving the clip up or down in the grooves on the needle. Moving the clip towards the top of the needle delays the fuel flow increase, leaning out the mixture. This is known as lowering the needle (because if the clip goes up, the needle sits lower). Raising the needle (lowering the clip) richens the mixture by advancing the fuel flow increase. (See Figure 2-21.)

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.

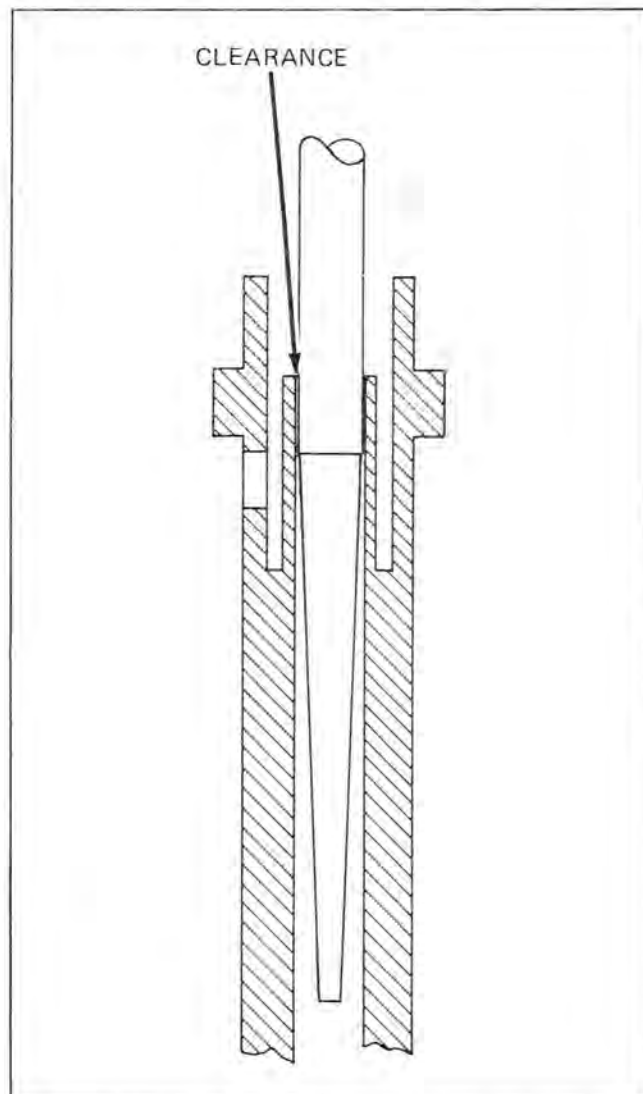


Figure 2-20

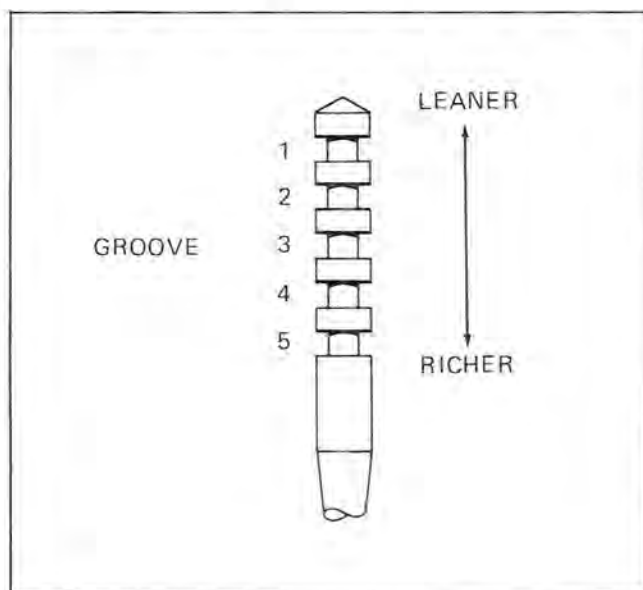


Figure 2-21

The needle jet pre-atomizes 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 2-22.)

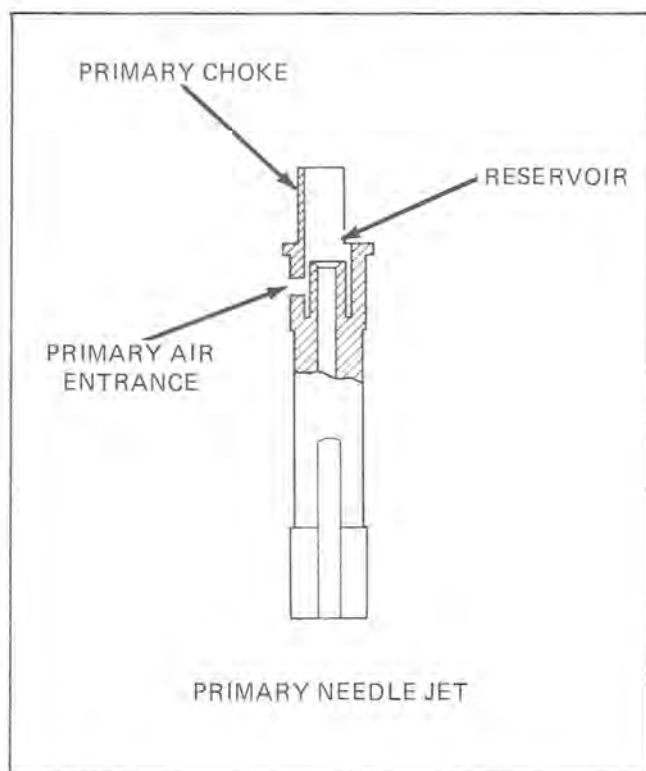


Figure 2-22

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 2-23.)

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.

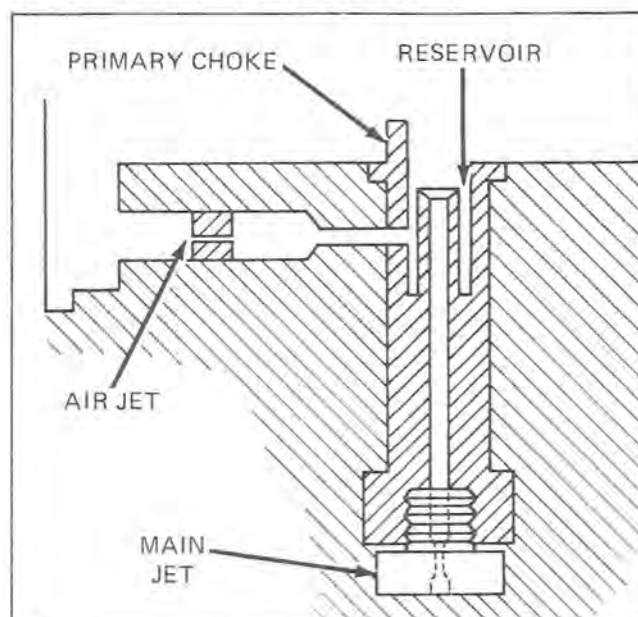


Figure 2-23

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 2-24

The needle jet is identified by its diameter. Figure 2-24 is a chart for identifying the size of needle jets of the primary type.

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

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

Main jet size is indicated by the number stamped on the jet. There are different types of main jets, each with a different numbering system. Figure 2-25 shows each type of jet and Figure 2-26 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.

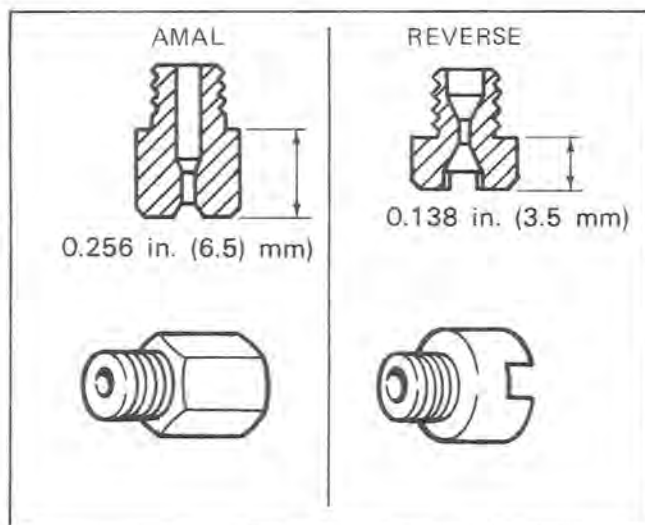


Figure 2-25

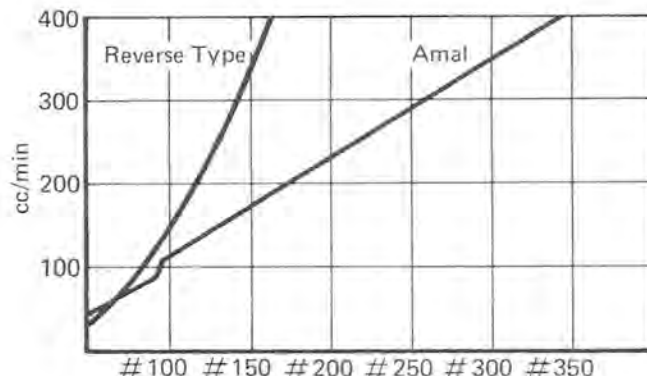


Figure 2-26

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 2-27.)

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 2-28.)

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

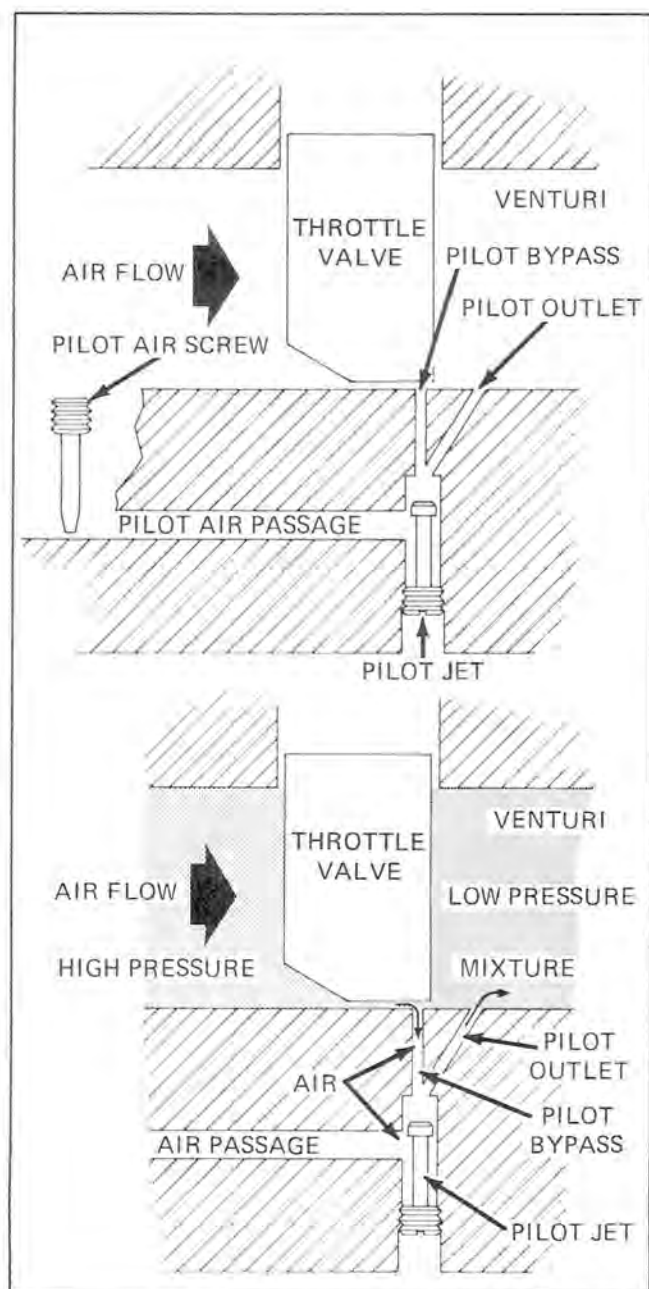


Figure 2-27

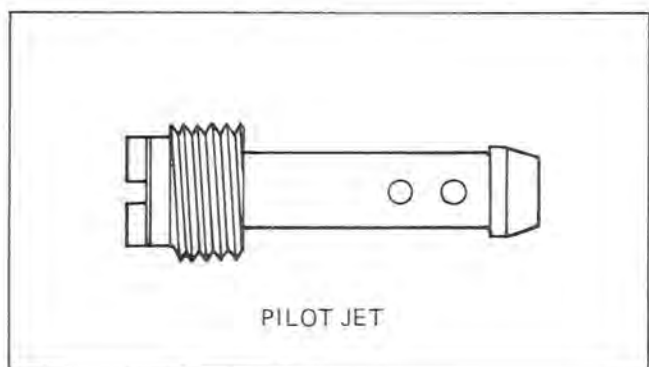


Figure 2-28

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.

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

Enrichener System

Starting a cold engine presents problems of low air flow and poor atomization that require a rich mixture. In a cold engine the engine parts are not hot enough to vaporize the droplets of fuel. To overcome these difficulties requires an even richer mixture than that provided by the pilot system. To provide these richer mixtures, an enrichener system is added to the carburetor. This system consists of a jet to meter the fuel, and a plunger which opens air passages from the front of the carburetor and into the venturi. The plunger is lifted by a cable. Lifting the plunger uncovers the air inlet passage and outlet to the venturi. If the throttle valve is closed, the air that goes to the engine must come through the enrichener passageways. This creates enough suction to draw fuel from the bowl into the chamber below the plunger. Here it is mixed with air from the front of the carburetor and drawn into the venturi and the engine. Atomization of fuel for enrichener mixture is aided by an emulsion tube, a long tube which protrudes into the fuel and through which the fuel is drawn. This tube has holes drilled in it, similar to the pilot jet and air bleed needle jet. These holes allow a small amount of air from the float chamber to be mixed with the fuel before it enters the chamber below the enrichener plunger. The atomization of the fuel allows it to flow more easily through small passages. (See Figure 2-29.)

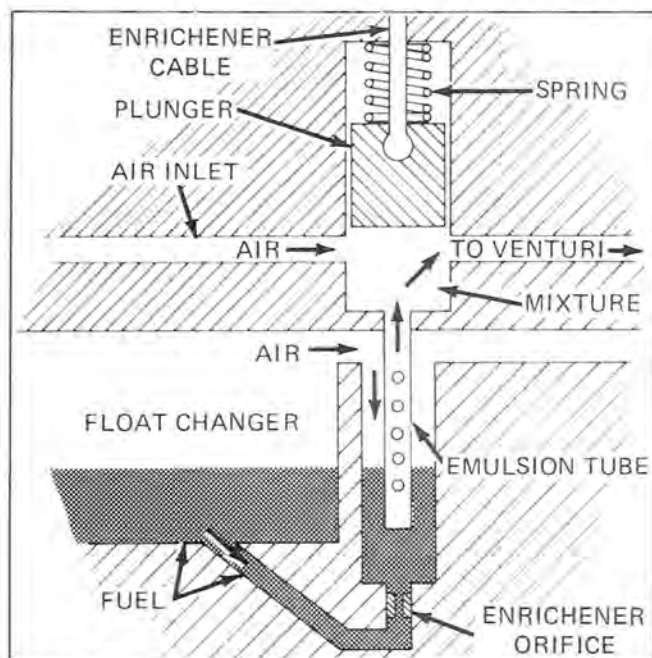


Figure 2-29

Primer System

The primer pump is located in the dash panel next to the key switch. This pump is used along with the enricher for cold starts. It injects a measured amount of fuel into the carburetor venturi at a point just beyond the throttle valve.

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

Should the engine tend to hesitate or die after starting, additional single strokes of the hand pump will be necessary until the motor has attained sufficient operating temperature.

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

SA340-A3

The breaker point ignition system consists of a condenser (capacitor), breaker points, coils and spark plugs. (See Figure 2-30.)

The rotor, also called the flywheel, has four magnets evenly spaced about the circumference. As the crankshaft turns, the flywheel rotates around the coil, inducing an alternating current in the low tension coil. (See Figure 2-31.)

The points and condenser act together to turn off the low tension coil voltage. The ignition points act as a switch to open and close the circuit to the ignition coil primary winding. The condenser prevents voltage from jumping the gap between the points as the points separate. Discharging the low tension coil induces a high voltage in the high tension coil which causes the spark plug to fire.

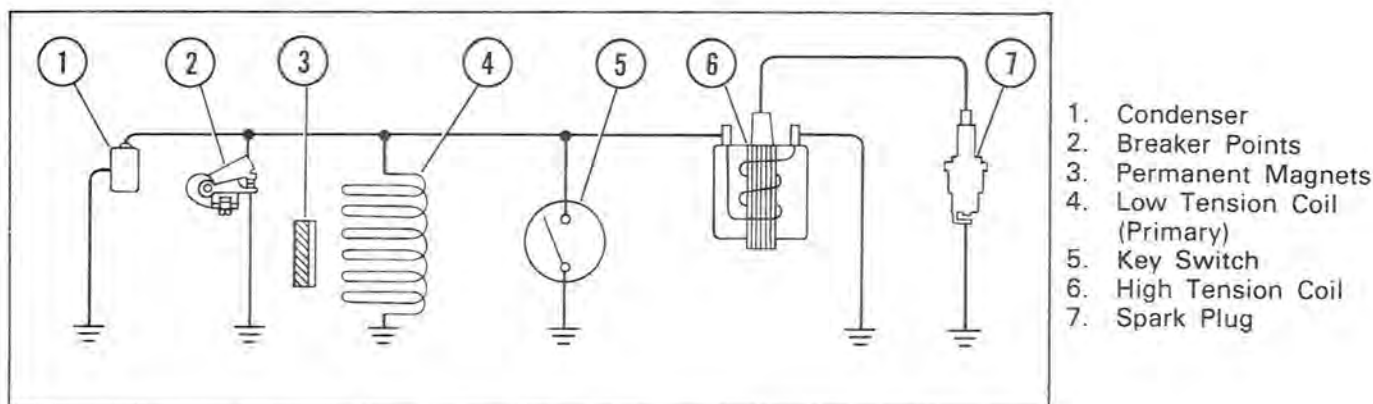
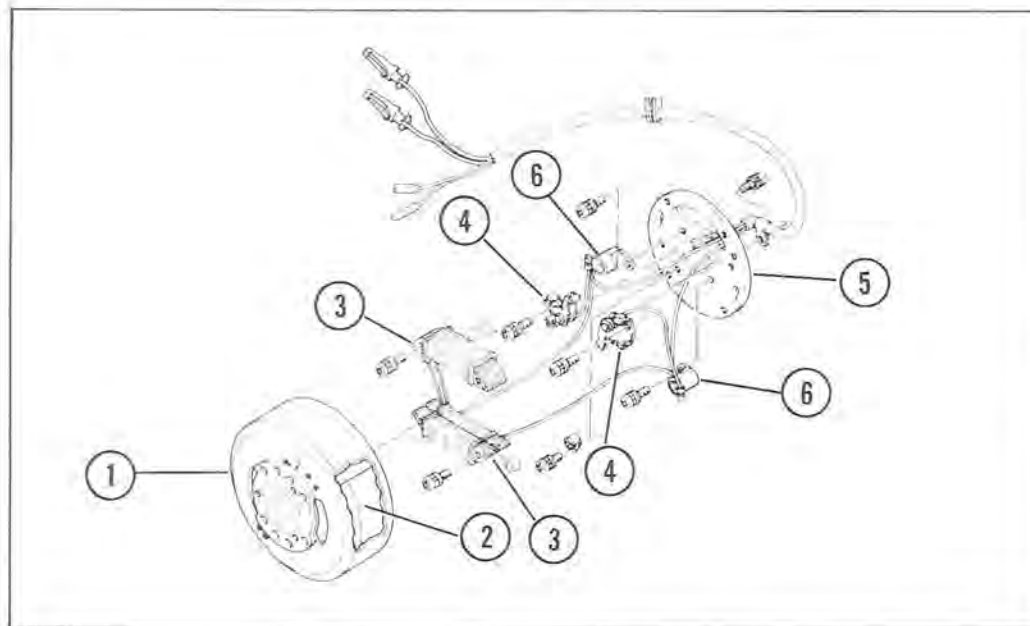


Figure 2-30



1. Rotor
2. Magnet
3. Coils
4. Breaker Points
5. Stator Plate
6. Condenser

Figure 2-31

SB440-A3

The CDI ignition system consists of the spark plugs, ignition coil, a capacitor discharge ignition (CDI) igniter, exciter coil, and a pulser coil. (See Figure 2-32.)

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 2-33.)

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

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

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

This sequence occurs twice every rotation of the flywheel.

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

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

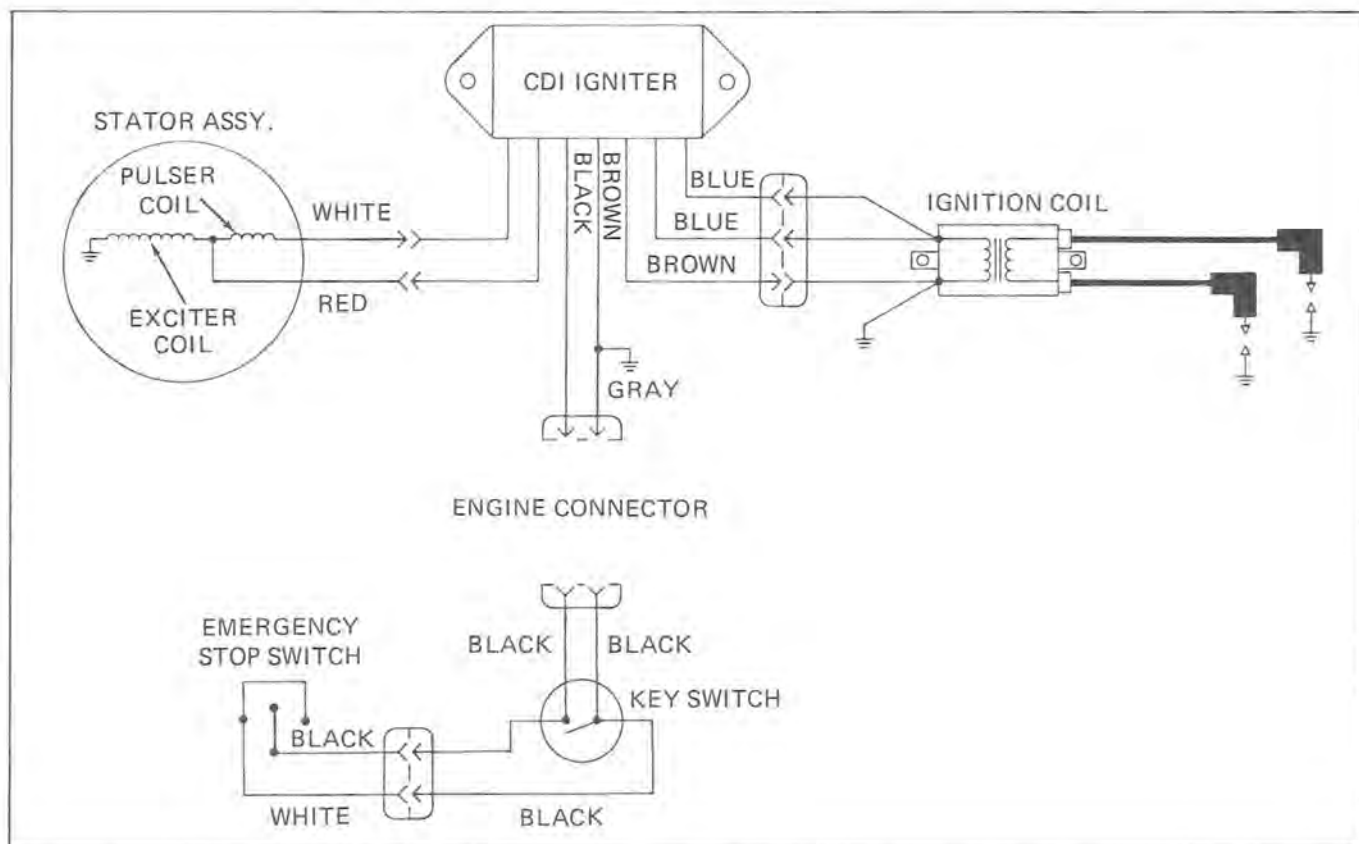


Figure 2-32

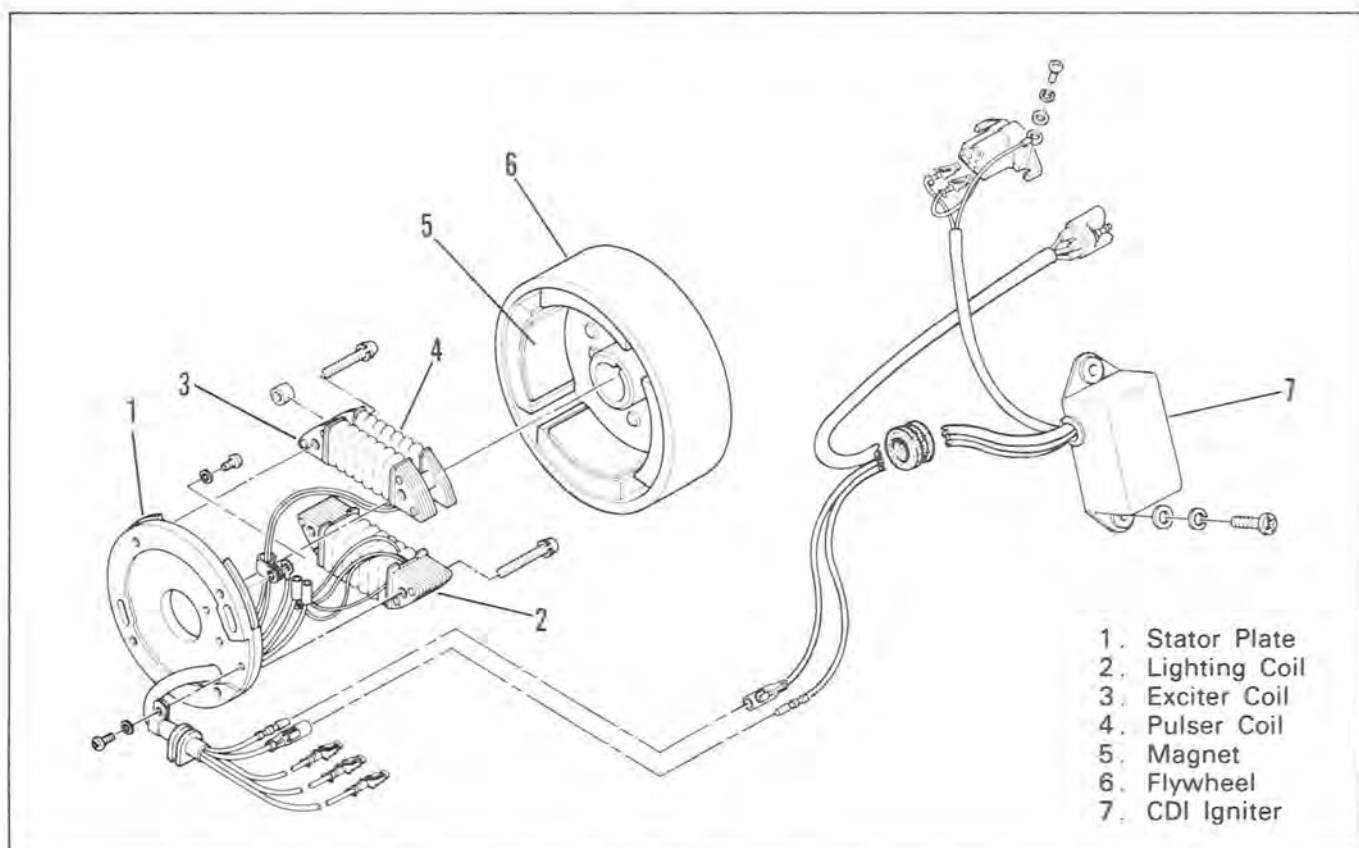


Figure 2-33

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, Wiring Diagram.

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

The schematic shown in Figure 2-34 shows all of the components in the lighting system.

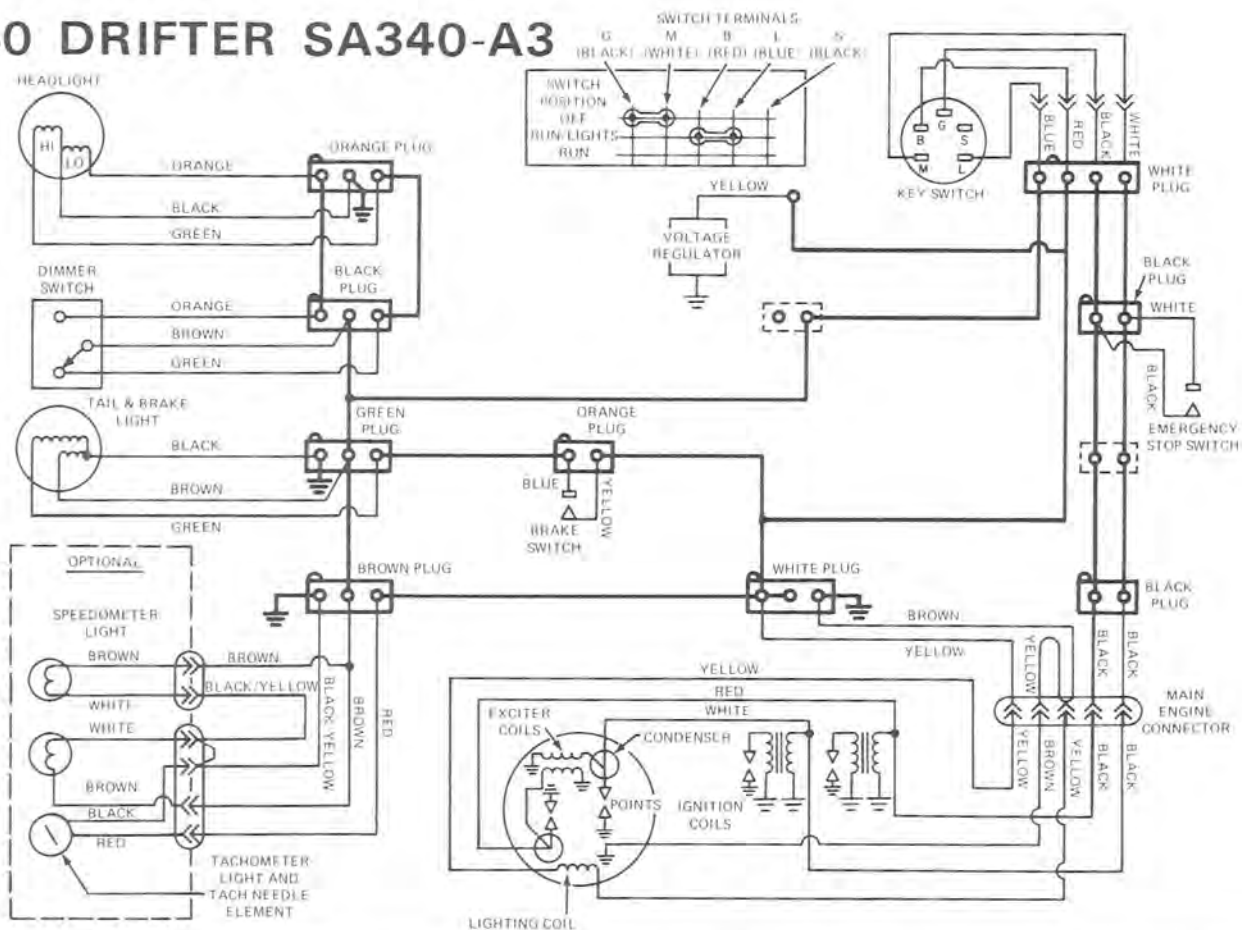
The AC current from the lighting coil is routed to the voltage regulator which adjusts the flow of current according to the demands of the system. Regulator operation is continuous, whenever the engine is running, and is necessary to protect the light bulbs and tachometer from extensive damage which could result from uncontrolled high output potential of the lighting coil.

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

In the RUN/LIGHTS position, current is routed from the key switch to the instrument lights, tail light, and dimmer switch.

The dimmer switch directs current to the appropriate head light beam or filament.

340 DRIFTER SA340-A3



440 DRIFTER SB440-A3

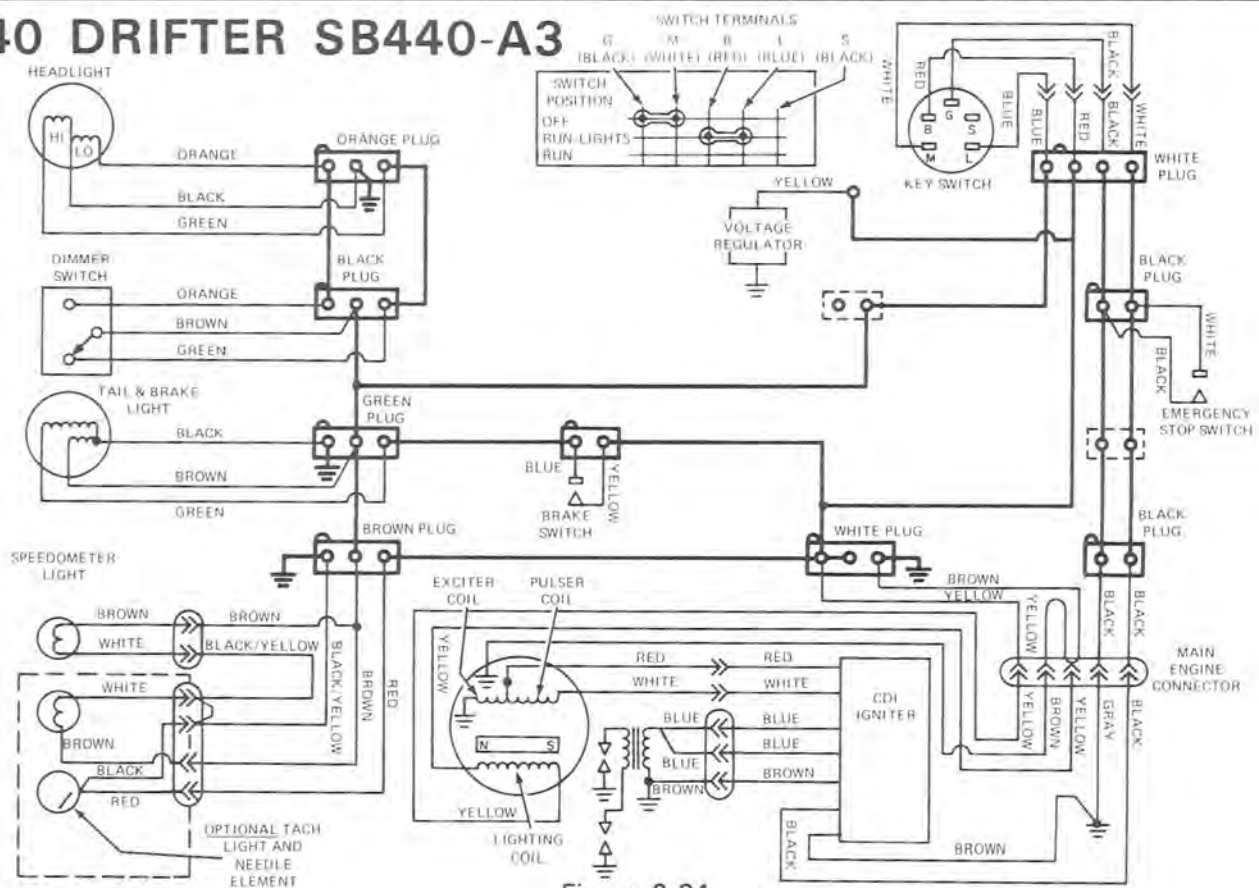


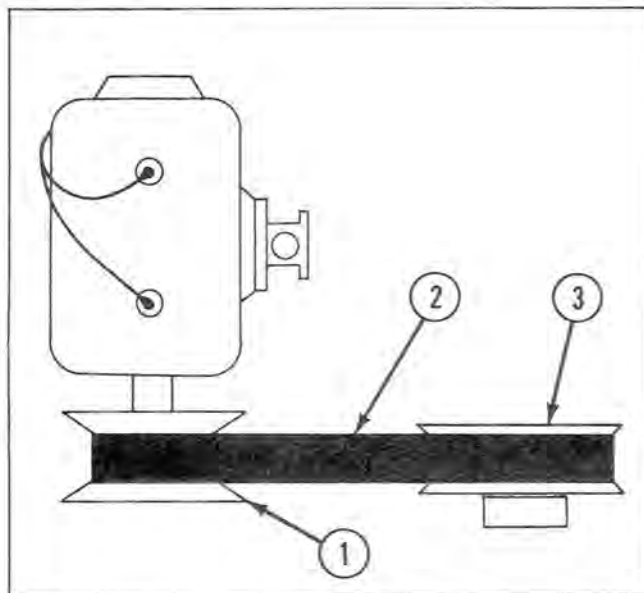
Figure 2-34

NOTE: Heavy black lines indicate Printed Circuit Board internal connections

Converter Theory of Operation

A torque sensing, variable ratio, sheave-type torque converter is used to drive the snowmobile. This converter consists basically of a drive converter mounted to the power take-off of the engine, a driven converter which drives the track through the chaincase and gearing, and a V-belt which transmits rotary motion from the drive converter to the driven converter. (See Figure 2-35.)

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



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

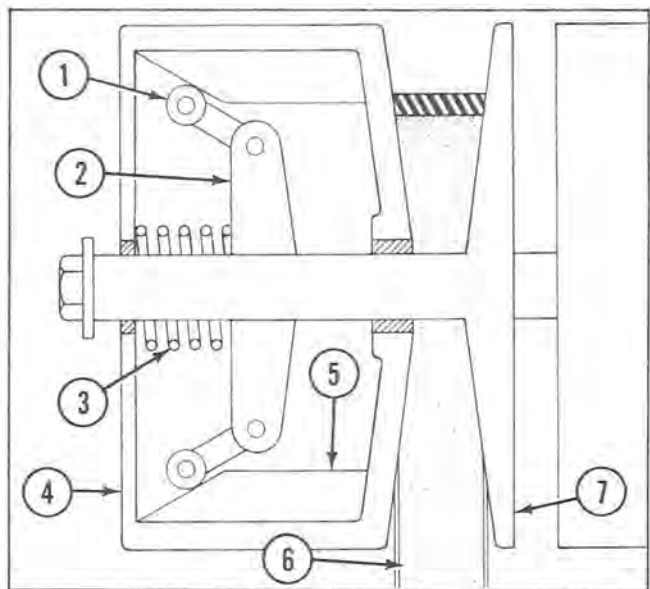
Figure 2-35

Drive Converter

The drive converter on the snowmobile is designed to provide maximum performance under all types of snow and load conditions. (See Figure 2-36.)

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/Weights
2. Spider Assembly
3. Spring
4. Movable Sheave
5. Ramp
6. Drive Belt
7. Stationary Sheave

Figure 2-36

The primary function of the spring is to control the initial engagement between the movable drive sheave and drive 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.

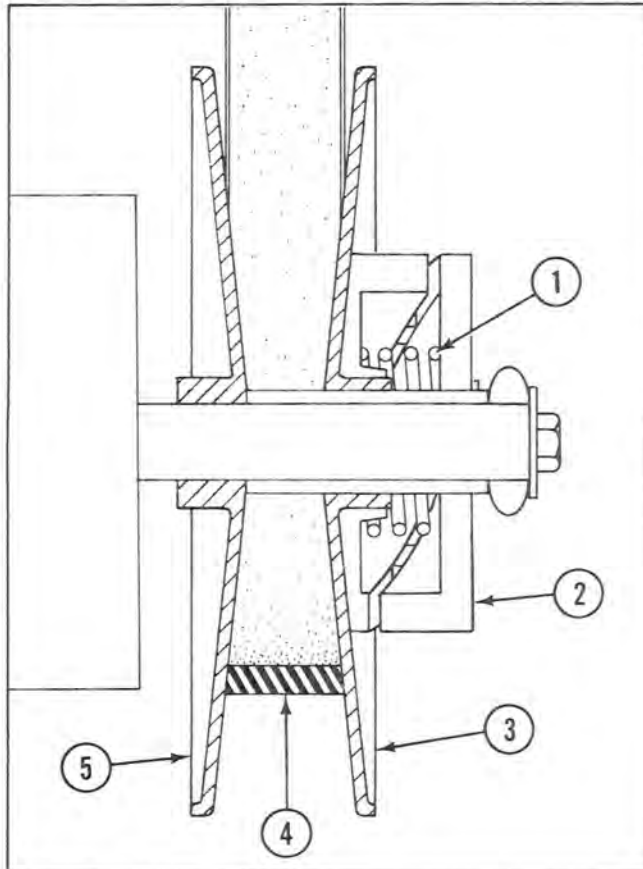
A heavy or strong spring will increase engagement speed and maximum engine RPM, but slows down the shift pattern. The drive spring will take a "set" after approximately 50 miles (80.47 km), and lose 0.25 in. (6.35 mm) of its total length. However, no significant loss of spring tension will occur due to the decreased spring length.

The drive converter contains six weights that control engine RPM. A lighter 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, a heavy weight will decrease engagement RPM, and also lower engine RPM throughout the shift pattern. However, the main function of the weights is to control the engine RPM through the shift pattern.

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

Driven Converter

The power that drives the track is transmitted from the drive converter through the drive 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.



1. Spring
2. Torque Bracket Assembly
3. Movable Sheave
4. Drive Belt
5. Stationary Sheave

Figure 2-37

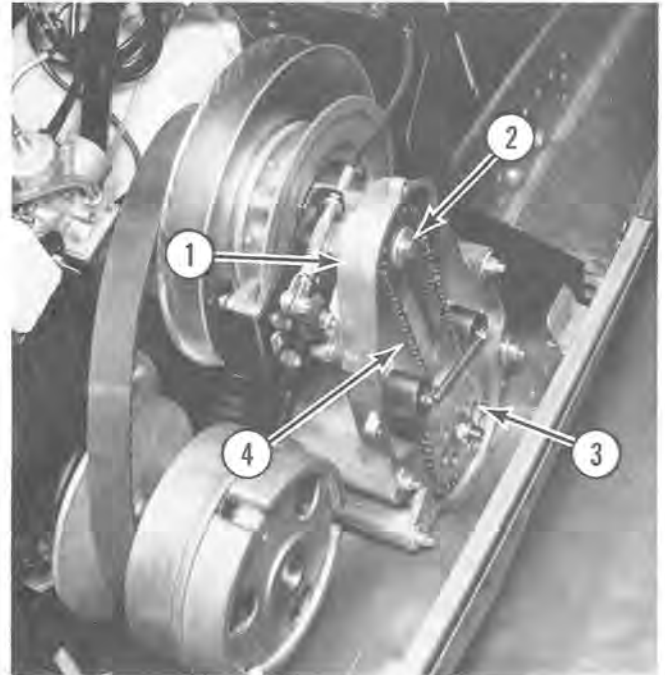
As the engine speed increases the driven flanges are spread apart allowing the belt to ride on a smaller diameter of the flanges. This change of flange diameter varies the drive ratio, automatically providing the most favorable ratio between the drive and driven converter for the speed and load at which the machine is operating. (See Figure 2-37.)

Chaincase and Gearing

The chaincase provides a mounting for the driven converter shaft and the front drive shaft. The drive

sprocket, drive chain and driven sprocket are housed within the chaincase. The chaincase is a sealed housing which contains lubricant for the drive chain. (See Figure 2-38.)

The top (drive) sprocket in the chaincase is attached by splines to the driven converter. The bottom (driven) sprocket is attached to the track drive shaft 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 2-38

Track, Suspension, and Steering System Operation

The suspension system consists of the track and slider and the skis. (See Figure 2-39.)

The track provides flotation and propels the snowmobile. Support for the track and suspension is provided by the sliders. Adjustable spring-loaded arms attached to the sliders allow suspension adjustment for the weight of the rider(s). Suspension can also be adjusted for snow conditions and steering control.

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 2-39

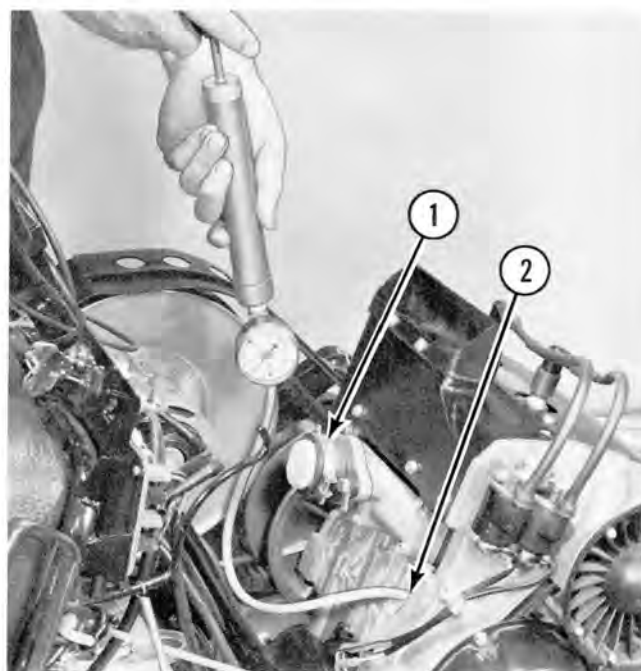
Engine Inspection

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

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

Crankcase Pressure Test

1. Remove muffler assembly, exhaust manifold, main upper shroud and exhaust side shroud. Discard the exhaust gaskets.
2. Seal exhaust and intake passages of each cylinder to trap air inside engine assembly during test.
 - a. Position rubber gasket (cut from old inner tube) on cylinder in place of exhaust gasket, and reinstall manifold.
 - b. With carburetor removed, install 1-1/2 in. (38.1 mm) wooden plug (cut out of 2 x 4) into rubber carburetor holder and secure in position by tightening clamp screw.
3. Connect pressure tester and gauge to fuel pump pulse tube nipple on crankcase. (See Figure 2-40.)



1. Carburetor Holder
2. Fuel Pump Pulse Tube Nipple

Figure 2-40

4. Apply 7 to 10 psi (0.5 to 0.7 kg-cm²) pressure to crankcase and observe gauge. If pressure is maintained for minimum of two minutes,

crankcase is okay. Any pressure drop observed within two minutes indicates leakage and must be eliminated.

Spray soapy water mixture along all sealing surfaces of engine to pinpoint leaking gasket or seal and repair as required.

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

Compression Check

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

Use a compression gauge for accurate measurement. A compression reading of 90 to 95 psi (6.33 to 6.68 kg-cm²) pressure per cylinder is minimum. There should be no more than 10 percent difference between the two cylinders.

Fuel System

Carburetor Adjustments

The 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 air screw should be adjusted for best idle within the correct adjustment range. (See Figure 2-41.)

Turn in idle stop screw on the carburetor until spring is coil bound. Next, back off screw to obtain initial adjustment of 6 turns open.

Final adjustment is performed with the engine running; turn screw out until idle speed is:

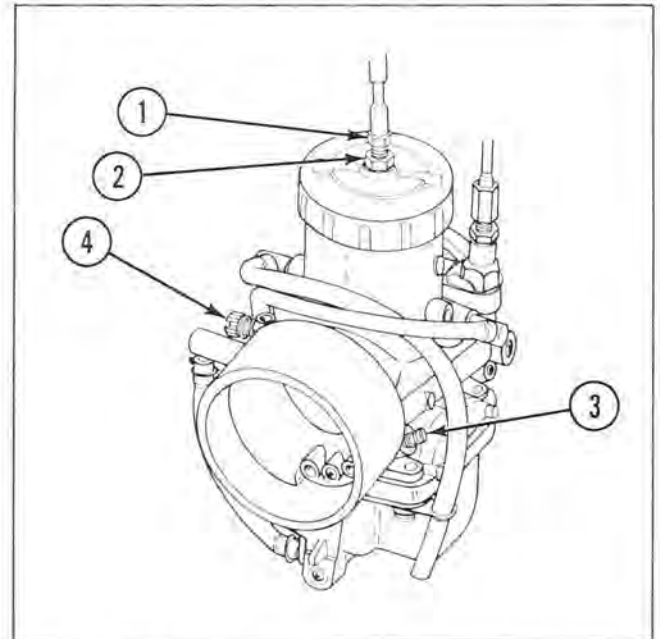
- 2,500 on DRIFTER 340 MODEL
- 3,000 on DRIFTER 440 MODEL

Fuel Pump

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

Fuel Filter

Inspect the fuel filter. If it is dirty or leaking, replace it.



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

Figure 2-41

Fuel Pump Pressure Test

1. Disconnect fuel pump output (fuel supply) tube from carburetor.
2. Connect output tube to pressure gauge. (See Figure 2-42.)
3. Start engine and run at idle speed for approximately 15 seconds, then stop engine and observe pressure gauge.
4. Gauge should maintain 4 to 7 psi (0.3 to 0.5 kg-cm²) pressure for minimum of one minute. Any pressure drop observed within one minute after test indicates internal fuel pump leakage. Repair fuel pump as required to eliminate leakage.

Fuel Pump Output Test

1. Perform Fuel Pressure Test to determine condition of internal components.
2. Disconnect fuel pump output (fuel supply) tube from carburetor and place end of tube into 1 quart (1 liter) container.

WARNING

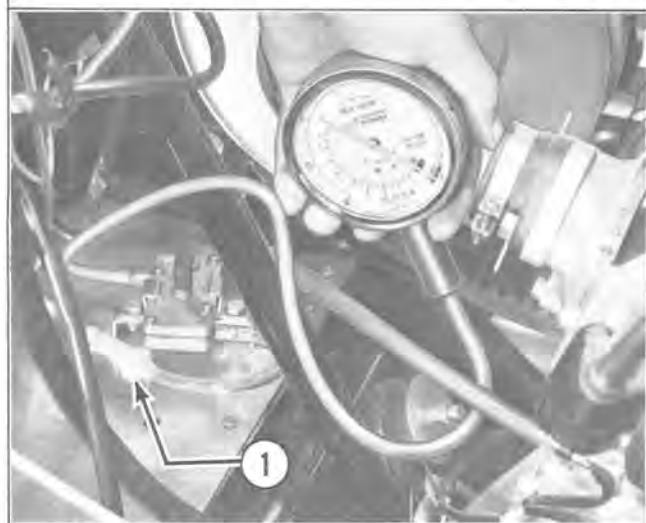
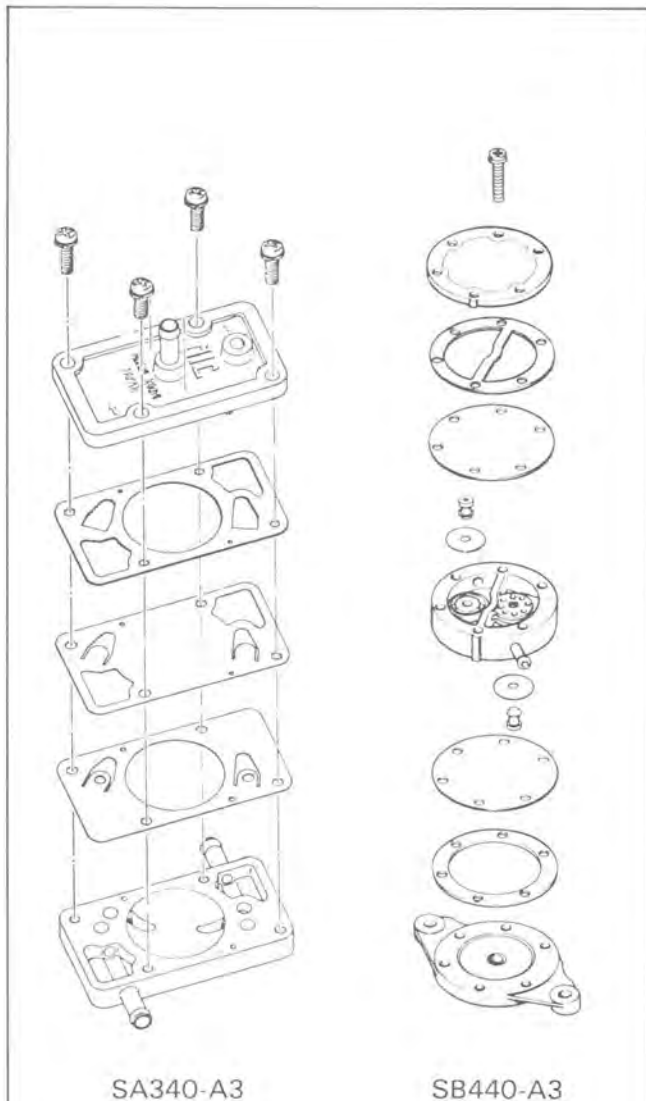
Gasoline fumes are heavier than air and can become explosive if exposed to a pilot light from a furnace, hot water heater, clothes dryer, etc. Perform maintenance only in an area that is well ventilated and free from pilot lights and sparks.

3. Start engine and run at idle speed for approximately 30 seconds, then stop engine and measure fuel in container.
4. Fuel pump output is okay if volume measured is:
 - 6.5 oz. (192 cc) on DRIFTER 340 MODEL
 - 9.0 oz. (266 cc) on DRIFTER 440 MODEL

If amount measured is less, inspect fuel pump, fuel filter, fuel tank fittings and tubes for obstructions.

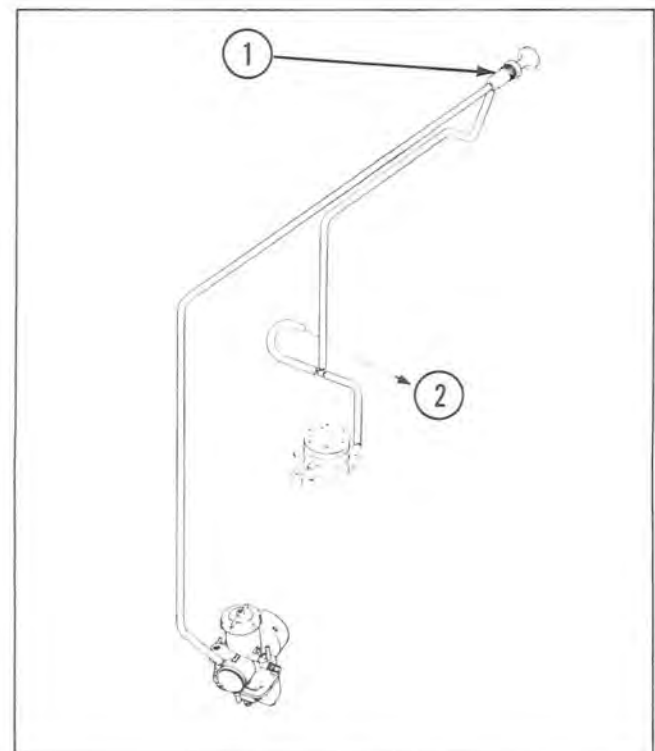
Primer Pump

Check all the tube connections in the primer system for loose fits and leaks. Correct as necessary. (See Figure 2-43.)



1. Fuel Filter

Figure 2-42



1. Primer Pump
2. To Fuel Tank

Figure 2-43

Fuel Tank and Lines

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

Throttle Cable Adjustment

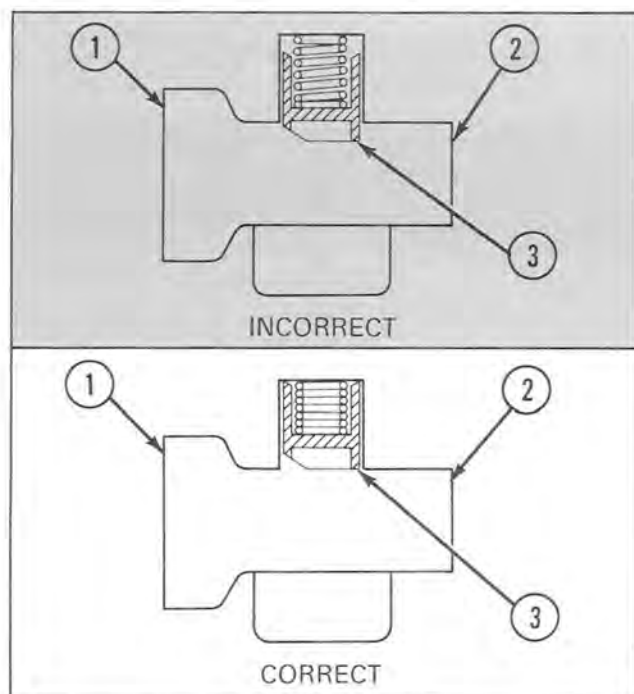
WARNING

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

1. Remove air silencer assembly, hold throttle lever at full throttle position and check that:
 - a. Throttle valve inside the carburetor bore opens fully. Be sure rear section of valve does not protrude into carburetor bore to restrict air flow at full throttle. (See Figure 2-44.)
 - b. With the throttle lever at idle, there should be approximately 1/16 in. (1.5 mm) free play between the lever and housing.

CAUTION

An excessive gap may cause the inner throttle cable to disconnect from the throttle lever. Too little or no gap can lead to incorrect idle adjustment.



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

Figure 2-44

2. To adjust the throttle cable, loosen the adjusting screw locknut at the carburetor top. Turn the adjusting screw to obtain the proper free play and retighten the lock nut. (See Figure 2-41.)

CAUTION

While installing air intake silencer, check that rubber seal between silencer and carburetor is properly positioned and fits securely. Failure to comply with this step will cause engine failure.

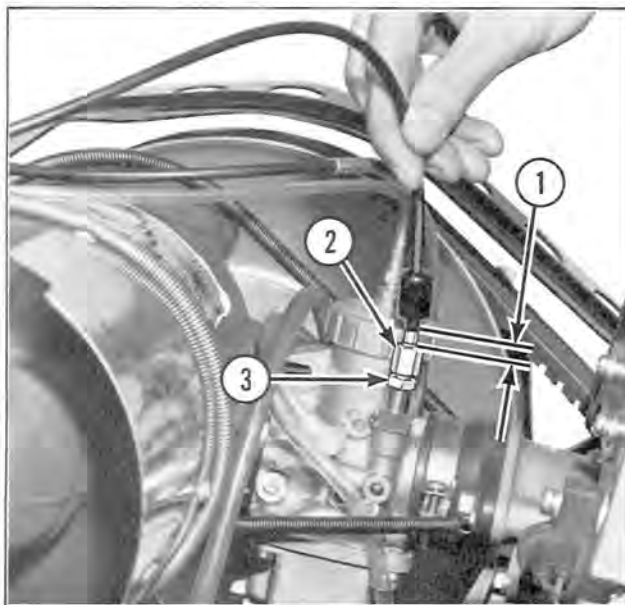
3. Secure air silencer into position with springs.

Enrichener Cable Adjustment

With the enrichener lever down, and boot slid up the casing, the Enrichener Cable should have 1/16 in. (1.5 mm) free movement when raised as shown. (See Figure 2-45.)

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

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



1. 1/16 In. (1.5 mm)
2. Adjusting Screw
3. Lock Nut

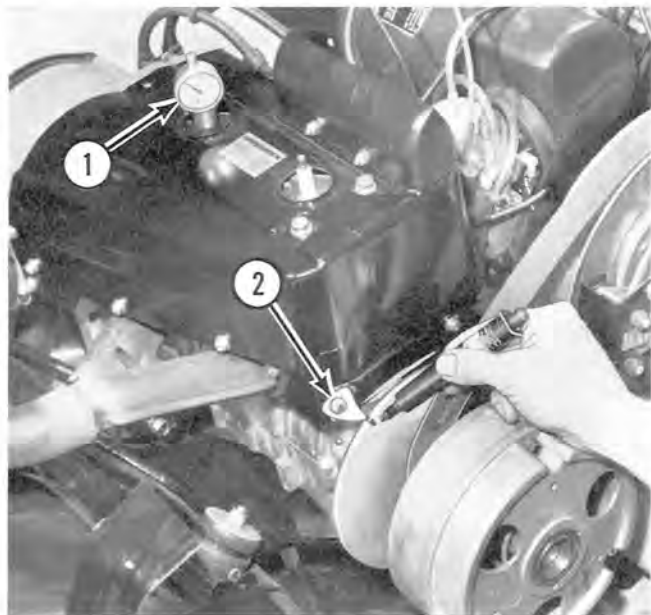
Figure 2-45

Ignition System

Ignition Timing Check

Remove the drive belt prior to performing the following procedure.

1. Install a fabricated timing pointer onto the engine. For accuracy it is important to attach the pointer to the engine rather than to the chassis, so the pointer can move with the engine. (See Figure 2-46.)



1. Dial Indicator
2. Timing Pointer

Figure 2-46

2. Remove both spark plugs 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 (top dead center).
4. Turn the drive converter clockwise to:
 - 0.139 in. (3.5 mm) BTDC (before top dead center) on DRIFTER 340 MODEL
 - 0.073 in. (1.85 mm) BTDC (before top dead center) on DRIFTER 440 MODEL

Make a mark on the drive converter fixed sheave corresponding to the timing pointer. (See Figure 2-46.)



Figure 2-47

5. Remove the dial indicator. Before installing the spark plugs, check that:
 - a. Plug gap is properly adjusted to:
 - 0.032 in. (0.8 mm) on DRIFTER 340 MODEL
 - 0.024 in. (0.6 mm) on DRIFTER 440 MODEL
 - b. The washer is installed on the plug and the cylinder head seat is clear.

Install spark plugs and torque 18 to 20 ft lbs (2.5 to 2.7 kg-m).

WARNING

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

6. With the drive belt removed and the converter guard secured in place, run the engine at:
 - 3,000 RPM on DRIFTER 340 MODEL
 - 6,500 RPM on DRIFTER 440 MODEL

Aim the timing light directly at the pointer and when the mark on the converter aligns with the pointer as the light flashes the timing is correct. (See Figure 2-47.)

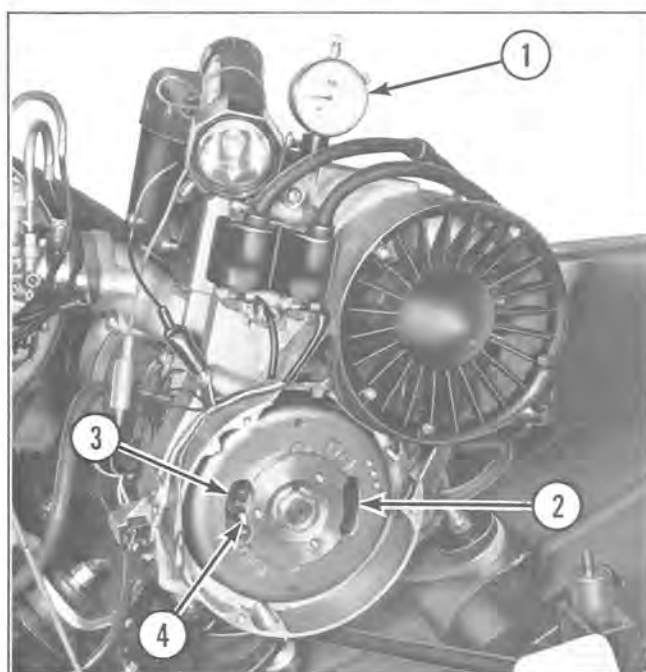
NOTE: On DRIFTER 340 MODEL both cylinders must be checked. Reinstall dial indicator into LH cylinder and repeat Timing Check Procedure.

If the timing is incorrect, perform Ignition Timing Adjustment.

Ignition Timing Adjustment Drifter 340 Model

1. Remove the muffler assembly, the manual starter assembly, the fan belt pulley and twist the belt out of the way.

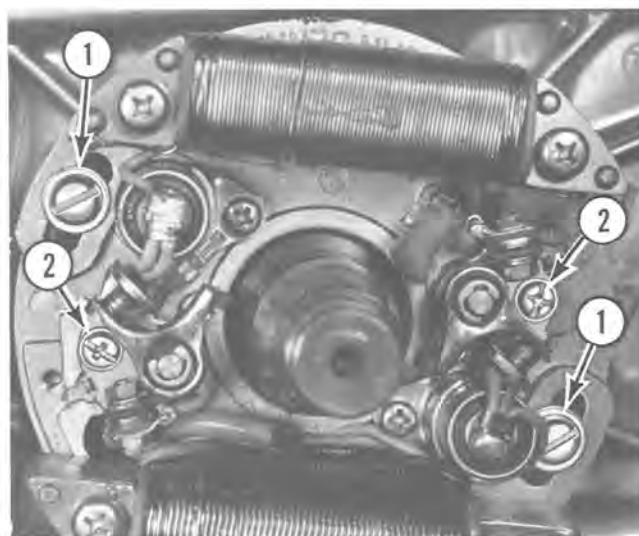
NOTE: Left hand cylinder points can be adjusted through the left hand cutout on the flywheel and right hand cylinder points are adjusted through the right hand cutout. Match the colored wire from the ignition coils to the colored wire at the points (red to red, white to white) to be sure you adjust the correct set of points. (See Figure 2-48.)



1. Dial Indicator
2. Right Hand Cutout
3. Left Hand Cutout
4. Advance Lever

Figure 2-48

2. Rotate the engine to position the breaker point cam for maximum point opening. Loosen the breaker point mounting screw for left hand cylinder points. Adjust the gap to 0.014 in. (0.35 mm) and tighten the breaker point mounting screw. (See Figure 2-49.)



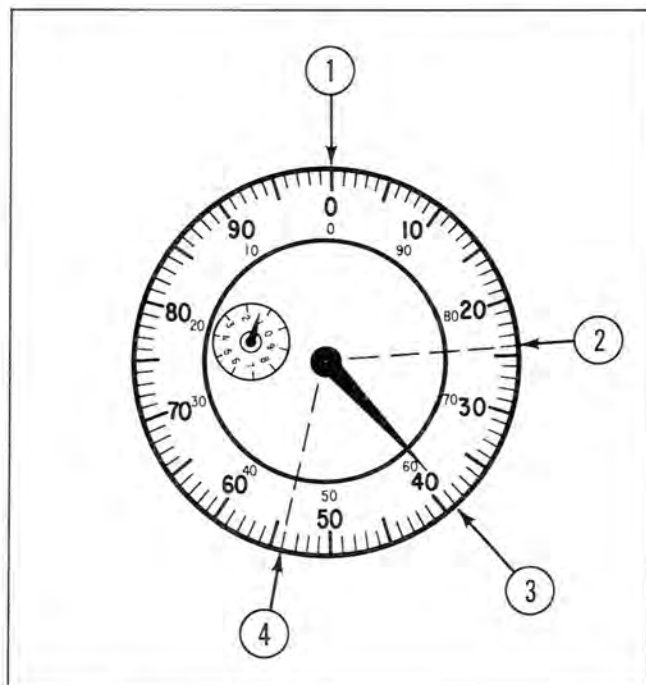
1. Stator Assembly Mounting Screws
2. Breaker Point Mounting Screws

Figure 2-49

3. Remove the spark plugs and install a dial indicator into the left hand cylinder. Rotate the engine to TDC and adjust the dial indicator to zero. (See Figure 2-48.)
4. Disconnect the red and white wires going to the ignition coil primary windings and connect one test lead of a timing buzzer or continuity tester to the magneto end of the white wire connector. Connect the other tester lead to a clean engine ground. (See Figure 2-48.)
5. Turn the engine approximately 1/2 revolution in the normal direction of rotation. Hold the advance levers at full advance (levers against the stop pins when rotated toward the outside diameter of the flywheel) and continue rotating the engine in the normal direction of rotation until the buzzer changes tone or the light dims.

NOTE: Check the dial indicator reading to see how far the timing is off and in what direction (retarded or advanced) from the correct 0.139 in. (3.5 mm) BTDC reading. (See Figure 2-50.)

6. Slowly rotate the flywheel from the incorrect timing position to 0.139 in. (3.5 mm) BTDC and take special note of the distance and direction the flywheel rotates.
7. Loosen the stator assembly mounting screws and using the distance and direction noted, rotate the stator assembly to correct the timing (counterclockwise to advance the timing or clockwise to retard the timing). Tighten the mounting screws and repeat step 5 to be sure the timing is correct.



1. Top Dead Center
2. Incorrect Timing (Retarded)
3. Correct Timing 0.139 in. (3.5 mm) BTDC
4. Incorrect Timing (Advanced)

Figure 2-50

8. Install the dial indicator into the right hand spark plug hole and connect the timing buzzer or continuity light to the magneto end of the red wire connector. Adjust the dial indicator to read zero at TDC.
9. With the advance levers at full advance, rotate the engine in normal direction until the buzzer changes tone or light dims and check the dial indicator reading to see how far and in what direction the timing is off from the correct 0.139 in. (3.5 mm) BTDC reading. (See Figure 2-50.)
10. Adjust the gap so that the right hand cylinder points will break at 0.139 in. (3.5 mm) BTDC. Advance the timing by increasing the point gap and retard the timing by decreasing the gap. Tighten the breaker point mounting screw and repeat step 9 to be sure the timing is correct.
11. Install the spark plugs, fan belt pulley and belt, recoil starter assembly and the muffler assembly. Use the timing light to recheck the timing as explained in the Ignition Timing Check procedure. When the timing is correct install the drive belt and converter guard.

Ignition Timing Adjustment Drifter 440 Model

1. Remove the muffler assembly, the manual starter assembly, the fan belt pulley and twist the belt out of the way.

CAUTION

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

2. Loosen the stator assembly mounting screws through the holes in the flywheel. To correct the timing, rotate the stator assembly as required (clockwise to retard the timing; counterclockwise to advance the timing). (See Figure 2-51.)

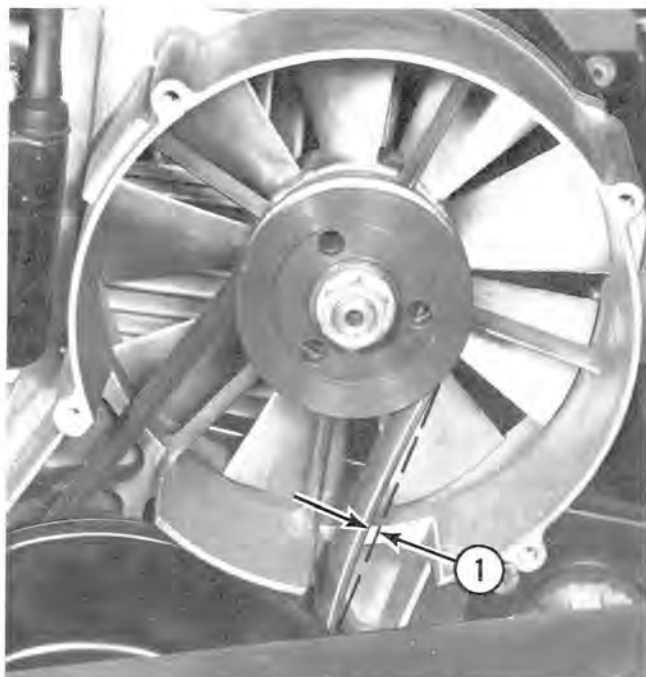


Figure 2-51

3. Tighten the stator assembly mounting screws and replace the fan belt pulley and the fan belt. Install the recoil starter assembly and the muffler.
4. Recheck the timing using the Ignition Timing Check procedure to be sure it is correct.
5. Install the drive belt and secure the converter guard into proper position with clip pins.

Fan Belt Tension

Test fan belt tension with a 11 lb (5 kg) force applied to the belt, the belt deflection should be 5/32 in. (3.5 to 4.5 mm). (See Figure 2-52.)



1. 5/32 In. (3.5 to 4.5 mm) Deflection

Figure 2-52

CAUTION

To prevent fan belt damage remove spark plugs and rotate engine crankshaft while torquing outer pulley mounting nut.

If adjustment of the fan belt tension is required, remove fan guard and the outer pulley from the fan shaft. To reduce belt deflection, remove a spacer from between the pulley halves, or add a spacer to increase the belt deflection. Re-install the fan guard.

Cleaning, Inspecting, and Gapping the Spark Plug

Normal plugs have brown to grayish-tan deposits and slight electrode wear. This indicates the correct spark plug heat range. (See Figure 2-53.)



Figure 2-53



Figure 2-54

Carbon fouled plugs show dry, fluffy black deposits which may be caused by over-rich carburetion, overchoking, weak coil, or worn cables. (See Figure 2-54.)

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 2-55.)

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 worn breaker points. These plugs can usually be degreased and reinstalled. (See Figure 2-56.)



Figure 2-55



Figure 2-56

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 2-57.)



Figure 2-57

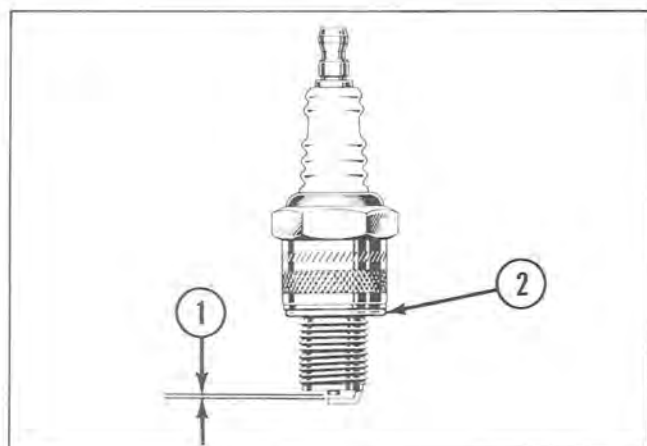
CAUTION

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

Inspect spark plugs for cracked porcelain and worn electrodes. Clean the electrodes with a point file. Adjust the gap to:

- 0.032 in. (0.8 mm) on DRIFTER 340 MODEL
- 0.024 in. (0.6 mm) on DRIFTER 440 MODEL

In regapping, adjust only the ground side electrode. Do not attempt to bend the center electrode; the insulation will crack. (See Figure 2-58.)



1. Gap
2. Washer

Figure 2-58

Electrical System

Key Switch

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

NOTE: Do not use an excessive amount of lubricant.

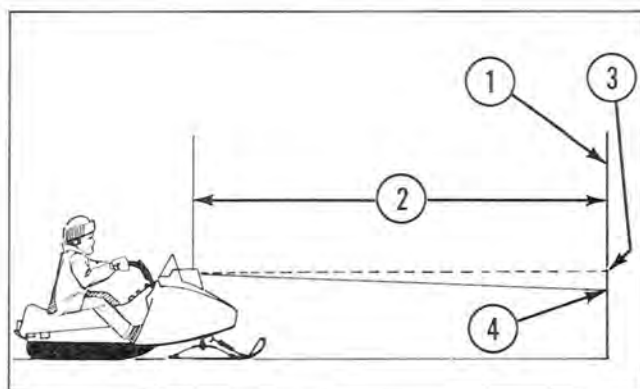
Headlight Adjustment

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

1. Position the snowmobile as shown. (See Figure 2-59.)
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.

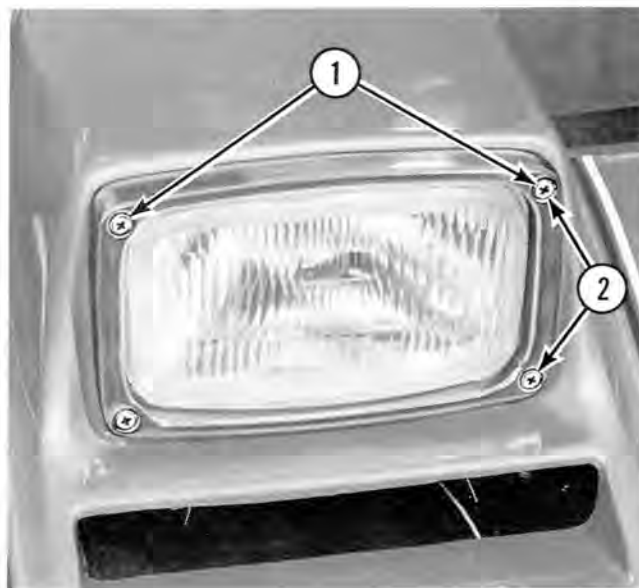


1. Wall
2. 25 ft (7,620 mm)
3. Reference Mark (Center of Headlight to Floor)
4. 2 In. (51 mm) Below Reference Mark

Figure 2-59

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 the adjusting screws as shown. (See Figure 2-60.)



1. Vertical Adjusting Screws
2. Horizontal Adjusting Screws

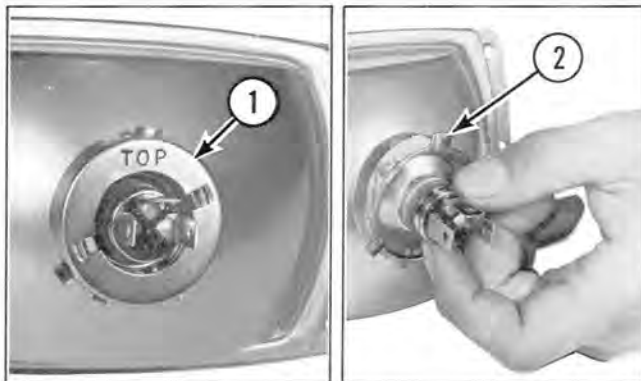
Figure 2-60

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 2-61.)
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 2-61.)

Install the headlight bulb in the reverse order of removal.



1. Retaining Ring
2. Wide Tab on Socket

Figure 2-61

Tail/Brake Light

Replace tail and brake light bulb by removing the lens, secured by 2 screws, and then removing the lamp from the socket. (See Figure 2-62.)



Figure 2-62

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

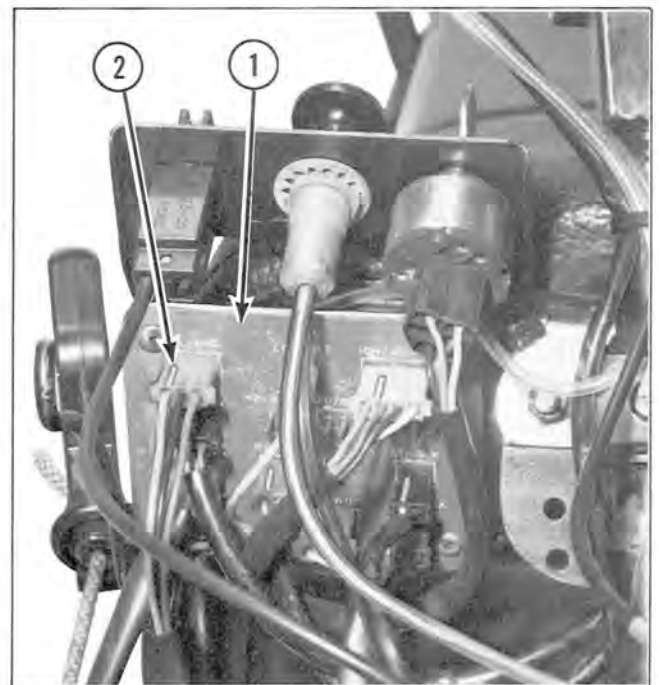
Check the connection on the circuit board from the voltage regulator. Make sure the connection is clean and tight.

Printed Circuit Board

Check the connectors on the wiring printed circuit board to be sure they are properly located and secure. The connectors must fit over the terminals completely contacting the board to prevent loosening from vibration. The circuit board identifies clearly which wire harness and connector color that should be attached to the terminals. (See Figure 2-63.)

WARNING

Indexing tab on connector must face upward for proper electrical polarity. Improper indexing may damage wiring harness or cause electrical sparks in engine compartment.



1. Printed Circuit Board
2. Indexing Tab

Figure 2-63

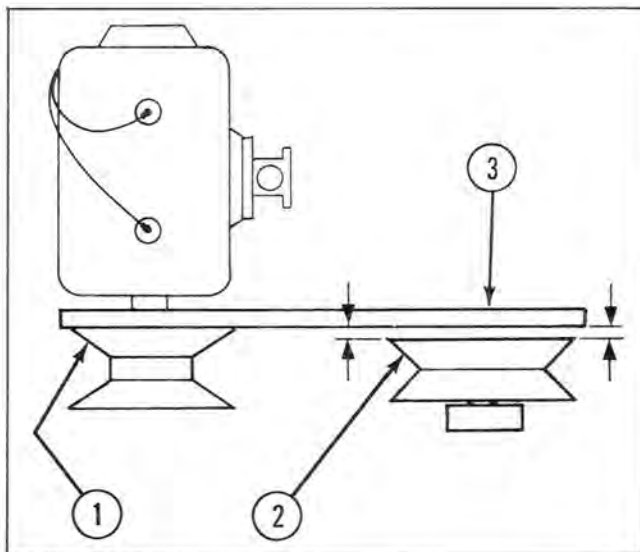
Converter Alignment

Converter Offset Alignment Without Special Tool P/N 205207

The converter alignment (offset) should be 0.454 in. (11.5 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 2-64.)

If adjustment of the converter alignment is required:

1. Loosen bolts that secure the engine mount plate to the chassis.
2. Slide engine left or right as necessary to obtain the 0.454 in. (11.5 mm) offset. (See Figure 2-64.)
3. Torque engine mount bolts 30 ft lb (5.15 kg-m).
4. Perform Converter Center Distance procedure.



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

Figure 2-64

Converter Center Distance Without Special Tool P/N 205207

The converter center distance should be 10.3 in. (262 mm). (See Figure 2-65.)



Figure 2-65

If adjustment of the converter center distance is required:

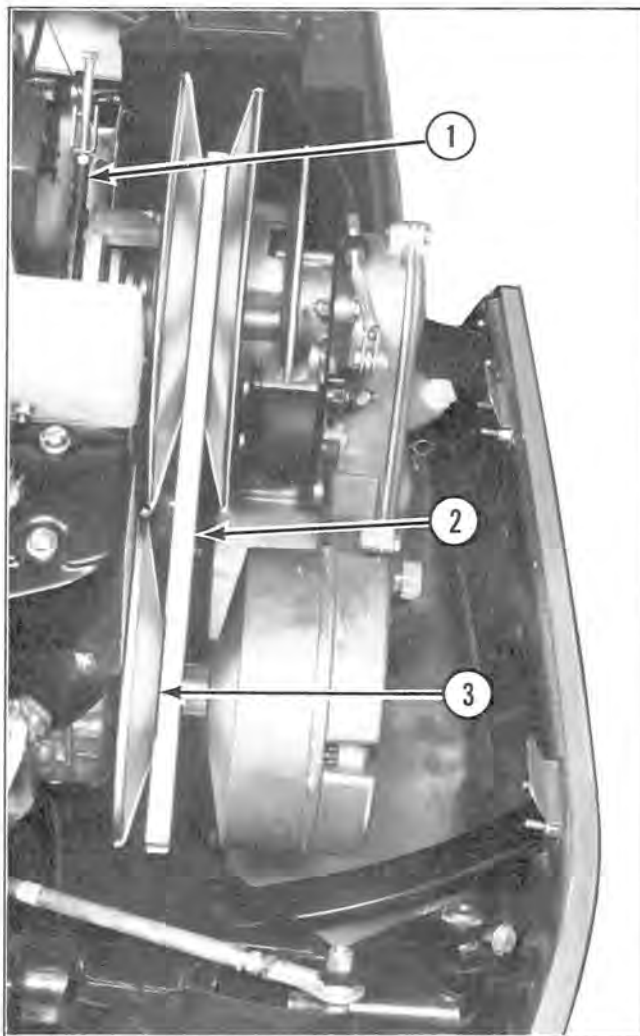
1. Loosen four mounting nuts on chaincase.
2. Disconnect driven converter bearing support assembly by removing clevis pin from yoke.
3. Move chaincase to obtain 10.3 in. (262 mm) center distance. (See Figure 2-65.)
4. Torque chaincase mounting nuts 28 ft lb (3.87 kg-m) and install driven converter bearing support assembly.
5. Perform Converter Parallelism procedure.

Converter Alignment Using Special Tool P/N 205207

Correct converter center-to-center distance of 10.3 in. (262 mm), and converter offset distance 0.454 in. (11.5 mm) is obtained when alignment gauge P/N 205207 is correctly installed between drive and driven converter sheaves. (See Figure 2-66.)

Converter Center Distance Using Special Tool P/N 205207

1. Remove converter guard and drive belt.
2. Rotate driven converter movable sheave assembly clockwise, and insert alignment gauge between sheaves. Carefully release movable sheave assembly allowing spring tension to retain gauge in position between stationary and movable sheave assemblies.
3. Rotate drive converter assembly until hex shaft is correctly positioned in the alignment gauge.



1. Bearing Support Assembly
2. Alignment Tool P/N 205207
3. Recess of Alignment Gauge

Figure 2-66

If adjustment of the converter center distance is required:

1. Loosen four chaincase mounting nuts and disconnect driven converter support bearing arm from the chassis by removing clevis pin from yoke.
2. Position chaincase as required and torque chaincase mounting nuts 28 ft lb (3.87 kg-m).
3. Adjust bearing support arm to proper length, lock the jam nut, and connect to chassis with clevis pin.
4. Perform Converter Offset Alignment procedure.

Converter Offset Alignment Using Special Tool P/N 205207

Correct offset distance is obtained when surface of the shallow notch on alignment gauge touches base of fixed sheave on the drive converter. (See Figure 2-67.)

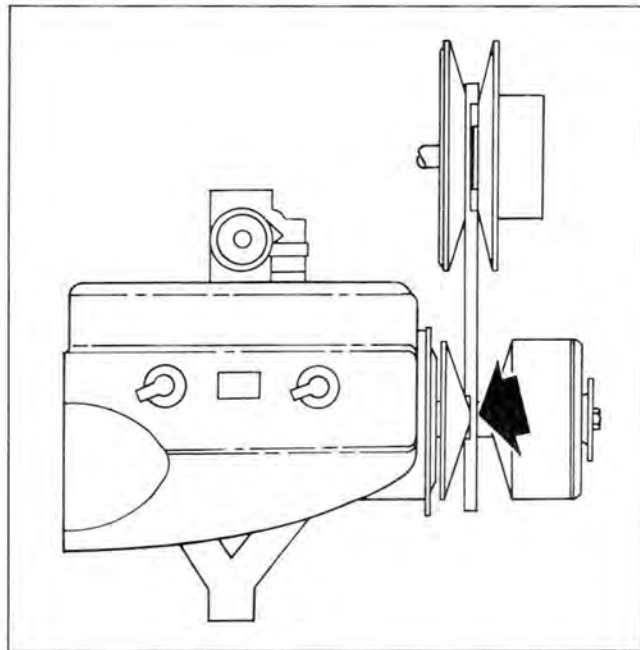


Figure 2-67

If adjustment of the offset distance is required:

1. Loosen four engine mounting nuts.
2. Slide engine back and forth until stationary sheave fits into recess in alignment gauge.
3. Torque mounting nuts 30 ft lb (4.15 kg-m).
4. Perform Converter Parallelism procedure.

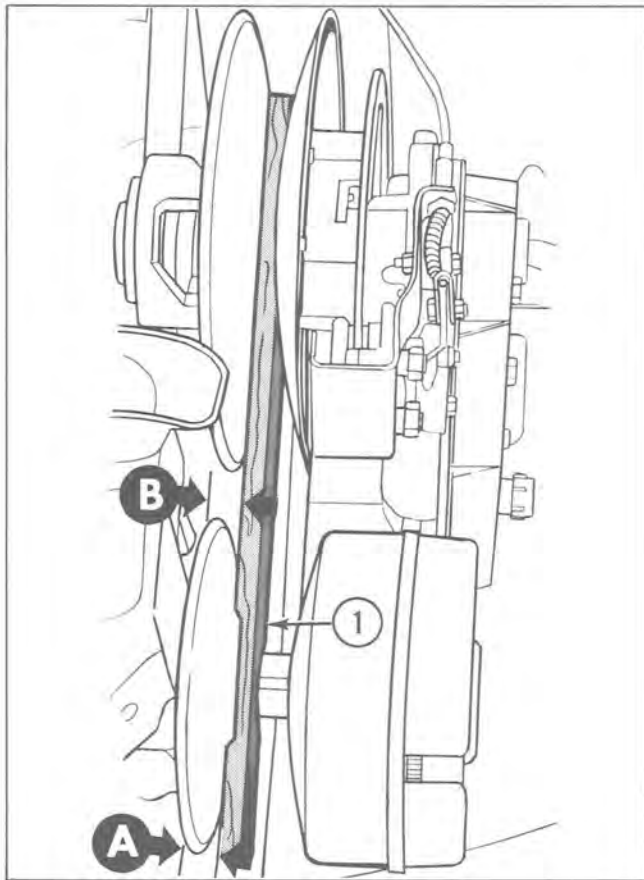
Converter Parallelism

When checking and adjusting center-to-center and offset distance, parallelism must be checked:

1. Measure dimensions A and B as illustrated. (See Figure 2-68.)
2. Compare dimensions A and B against Notes I and II.

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

NOTE II: Dimension A must never exceed dimension B by more than 1/16 in. (1.6 mm).

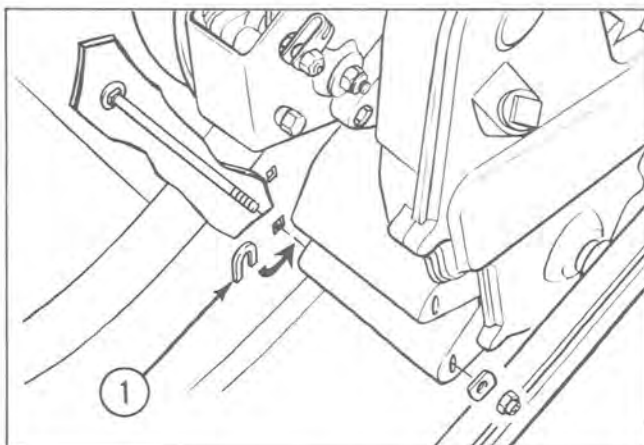


1. Alignment Gauge P/N 205207

Figure 2-68

3. If dimension A is less than dimension B, parallelism between drive and driven converter is not correct. Parallelism must be adjusted as follows:

Loosen engine and muffler mounting bolts and rotate the engine into the correct position.



1. U Washer P/N 917101

Figure 2-69

NOTE: If parallelism cannot be attained with the preceding method, loosen the chaincase mounting bolts. Install alignment U washers P/N 917101, as required between the chassis and chaincase to obtain correct offset. (See Figure 2-69.)

NOTE: Never use more than 2 alignment U washers per bolt.

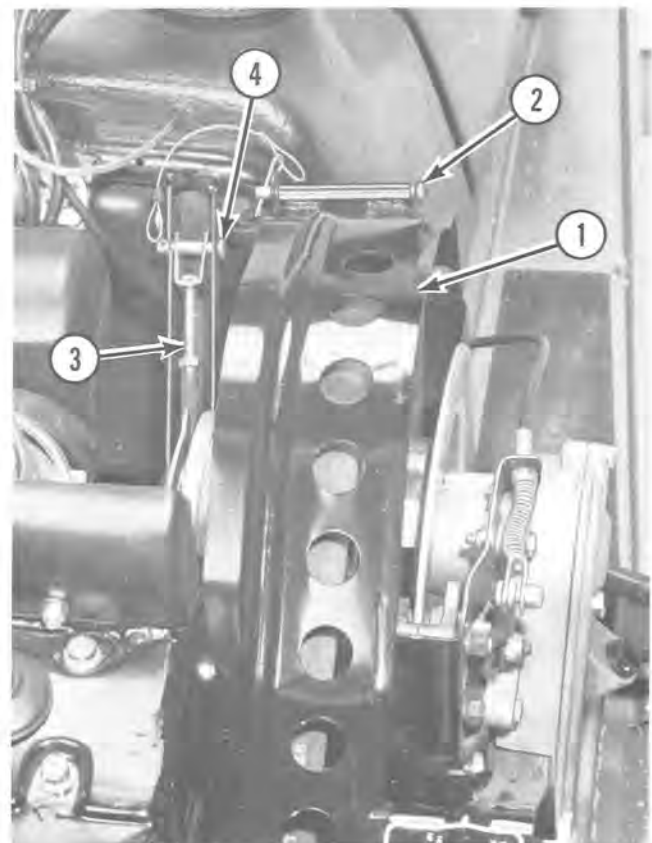
Belt

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

Remove the drive belt as follows:

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

1. Remove the safety pin which secures the belt guard at the top, and swing the belt guard forward. (See Figure 2-70.)



1. Belt Guard
2. Belt Guard Pin
3. Driven Converter Support Arm
4. Clevis Pin

Figure 2-70

2. Disconnect the driven converter support arm from the chassis by removing the clevis pin from the yoke.
3. Rotate the movable half of the driven sheave towards the rear of the vehicle while pushing it towards the steering post. Assistance may be required to apply the brake while rotating sheave. (See Figure 2-71.)



Figure 2-71

WARNING

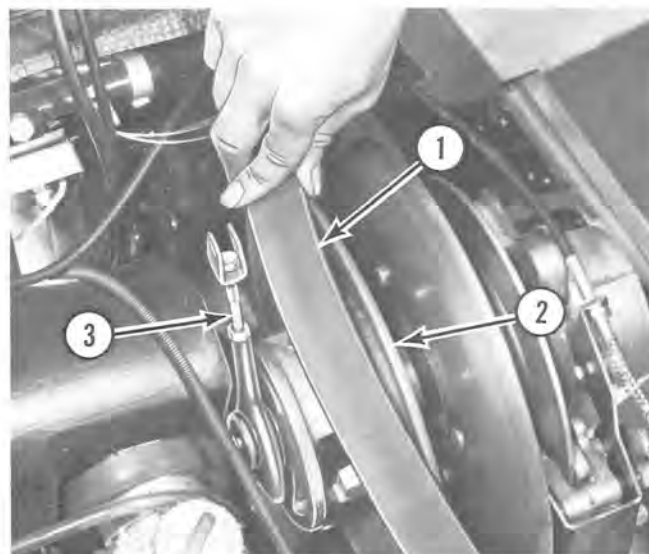
Use caution when removing the drive belt from the driven converter sheave since it is under a heavy spring load. Keep fingers and hands clear when releasing sheave.

4. Roll the drive belt up and off the driven converter. Then release the movable sheave. (See Figure 2-72.)
5. Work the drive belt past the carburetor and air silencer, then remove it from the drive converter.

To install the new belt:

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

1. With the drive belt in position around the drive converter, work the belt past the carburetor and around the driven converter support arm.
2. Open the driven converter movable sheave to ease installation of the drive belt.



1. Drive Belt
2. Driven Converter Movable Sheave
3. Driven Converter Support Arm

Figure 2-72

3. Roll the drive belt over the top of the movable sheave, being careful not to pinch your fingers. Position the belt into "low gear ratio" by working the belt around the converters until it is flush with the outside diameter of the driven converter. This will prevent excessive wear to the belt sides during initial converter engagement.
4. Install the driven converter support arm to the chassis, and secure the clevis pin with safety clip.
5. Position the belt guard and secure it with the safety clip.
6. Close the hood and lock it into position with the hood latches.

Converter Lubrication

CAUTION

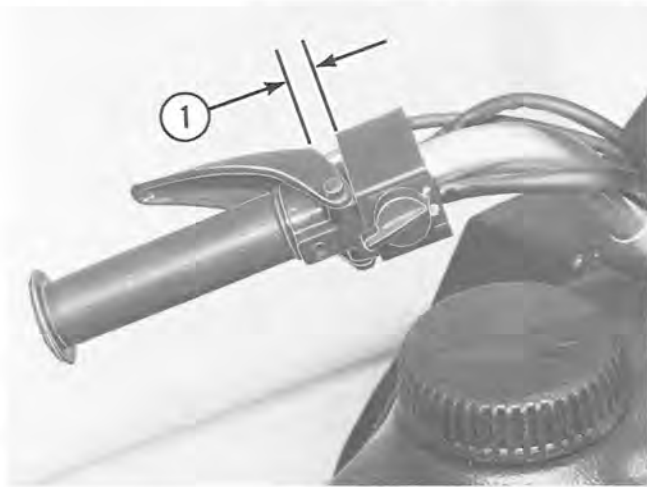
DO NOT LUBRICATE THE DRIVE CONVERTER. Any lubricant applied to the drive converter will drastically change the shifting characteristics, resulting in converter failure and reduced drive belt life.

Clean the drive 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.

Lubricate all driven converter ramp sliding surfaces with low temperature grease. Lubricate the movable sheave sliding surface with a graphite lubricant. Use solvent to remove grease and rubber from the belt contact surfaces.

Brake

Check the brake adjustment to be sure the driven converter can be moved back and forth with just a 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 2-73.)



1. 3/4 In. (19 mm)

Figure 2-73

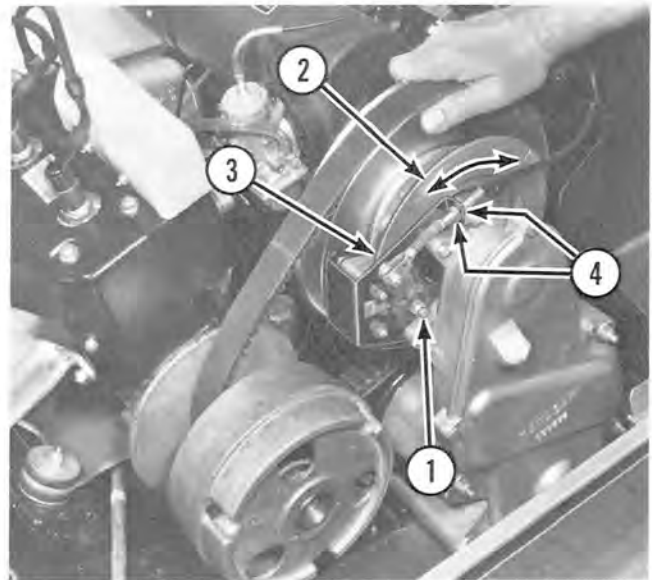
WARNING

DO NOT OVERTIGHTEN the brake. Component damage or personal injury could result.

If brake adjustment is required, turn the adjusting nut while simultaneously moving the driven converter back and forth until the brake pads just begin to move with the disc. (See Figure 2-74.)

NOTE: Do not disturb brake cable adjusting nuts. The cam (arm) must be centered on the pins in the off position. Improper adjustment will result in incorrect brake function and premature wear.

After adjustment is complete, perform Brake Pad Wear Inspection.

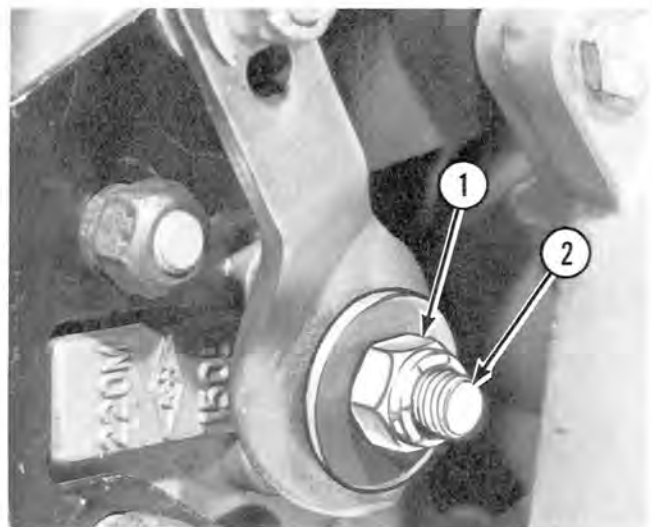


1. Brake Adjusting Nut
2. Brake Disc
3. Brake Pads
4. Cable Adjusting Nuts

Figure 2-74

Brake Pad Wear Inspection

After adjusting brake, measure amount of threads protruding through the brake adjusting nut. (See Figure 2-75.) Replacement of brake pads is recommended when the amount of exposed threads measures 7/16 in. (11.1 mm) or more. Remember, excessively worn or excessively tight brake pads will reduce braking action due to overheating, and could damage the brake disc.

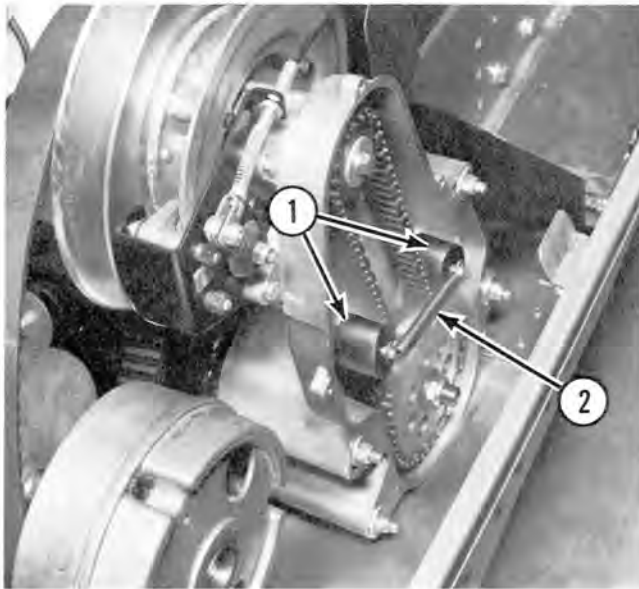


1. Brake Adjusting Nut
2. Protruding Threads

Figure 2-75

Chain Tension

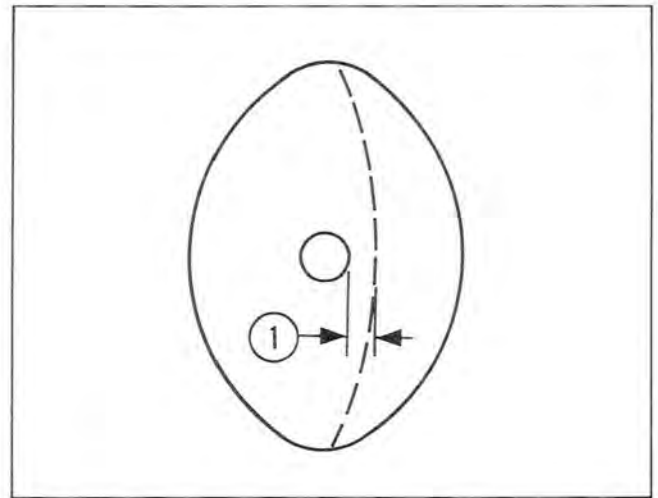
The drive chain is self-adjusting for tension but the plastic chain guides should be inspected for wear. Turn or replace if necessary. (See Figure 2-76.)



- 1. Chain Guides
- 2. Tensioner Spring

Figure 2-76

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 2-77.)



1. 0.12 in. (3.0 mm)

Figure 2-77

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. Pour Kawasaki Chain Lubricant into the chaincase through the top hole until it is level with the bottom hole lower edge.

Install the upper and lower plugs into the chaincase cover.

Gear Ratio Chart

			Drive Sprocket - Number of Teeth					
			17	18	19	20	21	22
DRIVEN SPROCKET - NUMBER OF TEETH	36	Gear Ratio Speed Chain Pitch Tensioner Spring		2.00 *65 MPH 90 Red	1.89 *69 MPH 90 Pink			1.64 *79 MPH 92 Red
	37	Gear Ratio Speed Chain Pitch Tensioner Spring	2.18 *60 MPH 90 Red	2.06 *63 MPH 90 Green			1.76 *74 MPH 92 Red	1.68 *77 MPH 92 Green
	38	Gear Ratio Speed Chain Pitch Tensioner Spring	2.24 *58 MPH 90 Green STD SA340-A3			1.90 *68 MPH 92 Red	1.81 *72 MPH 92 Green STD SB440-A3	
	39	Gear Ratio Speed Chain Pitch Tensioner Spring			2.05 *63 MPH 92 Red	1.95 *67 MPH 92 Green		
	40	Gear Ratio Speed Chain Pitch Tensioner Spring		2.22 *58 MPH 92 Pink	2.11 *61 MPH 92 Green			

*Theoretical MPH at 6800 RPM

NOTE: All top speeds based on 1:1 converter ratio and engine RPM at 6800

CHAIN TENSIONER SPRINGS

Color	Length	Wire Dia.
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)

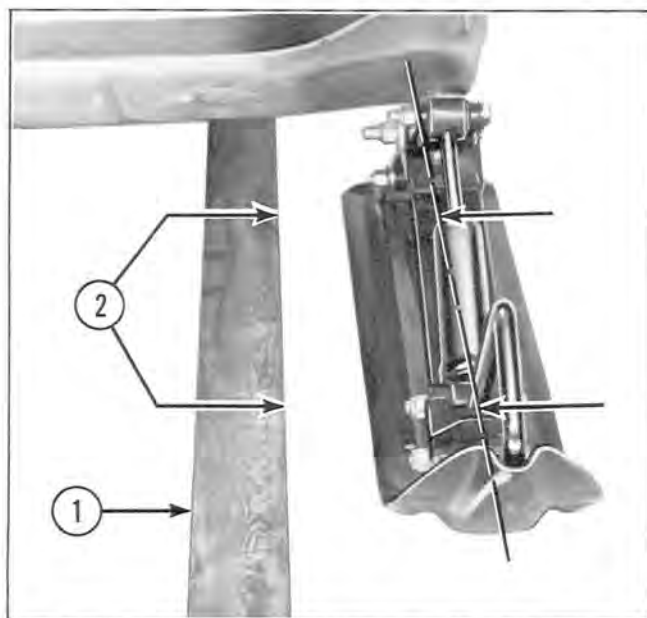
Steering System

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

Ski Alignment

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

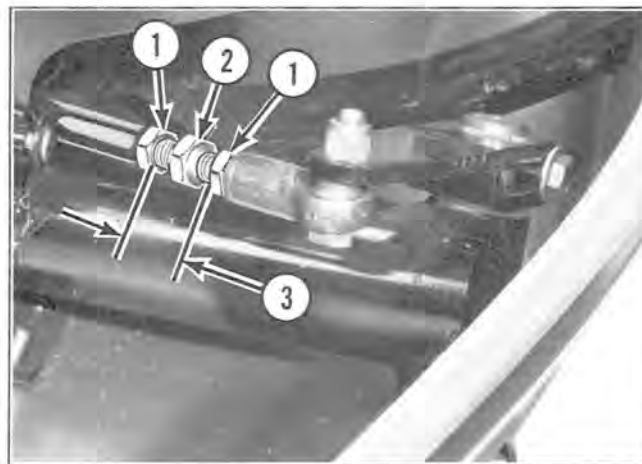
1. Place a long board (or suitable straightedge) against the left edge of the track, and measure the distance between the board and center line of the ski. Position the ski so that the distance measured between the ski center line and edge of the board is the same at the front and rear of the ski. (See Figure 2-78.)



1. Straightedge Against Track
2. Measure Distance Here

Figure 2-78

2. When the ski center line is parallel to the outside edge of the track, check the steering handlebar for centering.
3. If the handlebar requires centering, loosen the left tie rod locknuts and turn the tie rod length adjusting stud in the direction necessary to center the handlebar. (See Figure 2-79.)



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

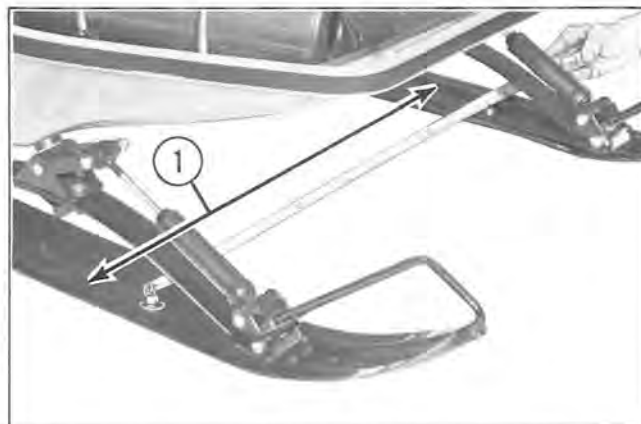
Figure 2-79

WARNING

The dimension shown in Figure 2-79 must not exceed 1-1/4 in. (32 mm) and the adjusting stud must remain centered between the two lock nuts, to prevent possible steering linkage failure.

NOTE: Be sure left hand ski remains parallel to the straightedge while turning the tie rod adjusting stud, by placing a support under the bumper to slightly raise right hand ski off ground.

4. To align the other ski, move both ski tips towards the center of the snowmobile to remove the steering linkage play. Turn the tie rod length adjusting stud (located below the muffler) to obtain an equal distance from ski center to ski center when measured at the front and rear of the skis. (See Figure 2-80.)



1. Equal Distance Between Ski Center Lines Front And Rear

Figure 2-80

5. Torque the adjusting stud locknuts 100 to 120 in. lb (1.15 to 1.38 kg-m). Refer to the torque chart and tighten all the hardware (nuts, bolts, etc.) in steering system.

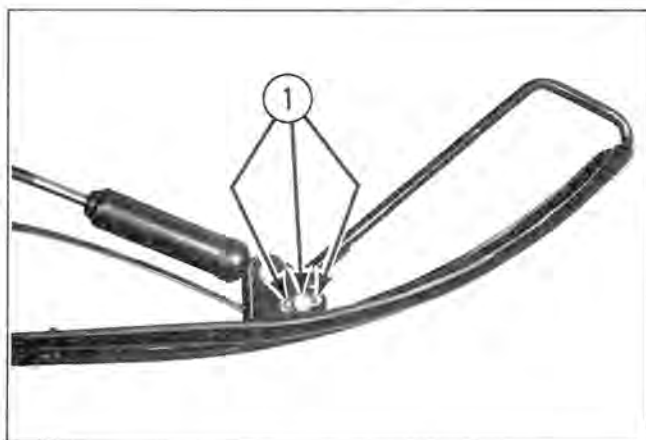
Ski Skeg

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

Ski Spring Preload

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

Center Hole Position - During factory assembly, bolt was installed in center hole in the ski and normally no change is required for general snowmobiling. (See Figure 2-81.)



1. Ski Spring Mounting Positions

Figure 2-81

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

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

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

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

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

Suspension Adjustment

The slider suspension is fully adjustable for rider comfort.

The adjustments consist of changing the tension of the suspension springs on each side of the front and rear suspension arms.

Ride Adjustment

As assembled, rear springs which control ride characteristics are mounted in lowest or softest of three positions available. Ride adjustments can be made by changing position of these springs to increase their tension; this will stiffen the ride and increase load capacity.

CAUTION

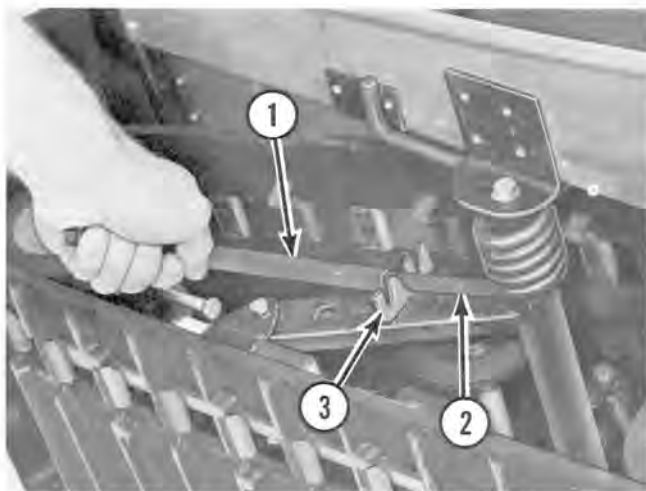
The tension pre-load (tension) of the springs on each side of the suspension arm must be equal. Excessive tension of one spring can cause spring breakage or excessive wear to one side of the slide wear strips.

To change spring tension:

1. Install spring adjusting tool, P/N 57001-3507 onto end of the spring arm as shown. (See Figure 2-82.)

WARNING

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



1. Spring Adjusting Tool P/N 57001-3507
2. Spring Arm
3. Spring Retainer

Figure 2-82

2. Apply a firm grip on spring adjusting tool with both hands and carefully lift spring arm out of the detent in spring retainer. Be prepared for heavy spring load to be transferred to spring adjusting tool as the spring arm is lifted out of retainer detent.
3. Install spring arm into a higher retainer detent to increase spring tension for the desired ride characteristics.

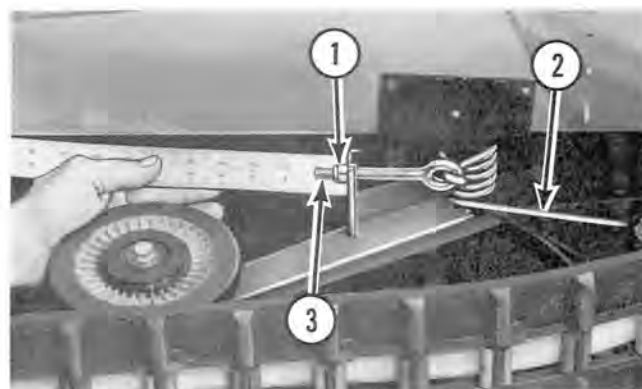
Handling Adjustment

Handling characteristics of the snowmobile are controlled by tension of the front suspension springs. Increasing spring tension will reduce ski pressure on the ground, resulting in less steering effort and slower response. Less spring tension allows more ski pressure, causing quicker response and increased steering effort.

CAUTION

The tension (pre-load) of the front springs on each side of the suspension arm must be equal. Excessive tension of one spring can cause spring breakage or excessive wear to one side of the slide wear strips.

To adjust or change handling characteristics of the snowmobile: tighten adjusting nuts on each side of the suspension equally to increase front spring tension or loosen nuts equally to decrease spring tension. (See Figure 2-83.)



1. Adjusting Nut
2. Front Suspension Spring
3. Exposed Threads

Figure 2-83

Track Adjustments

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

WARNING

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

Track Tension

WARNING

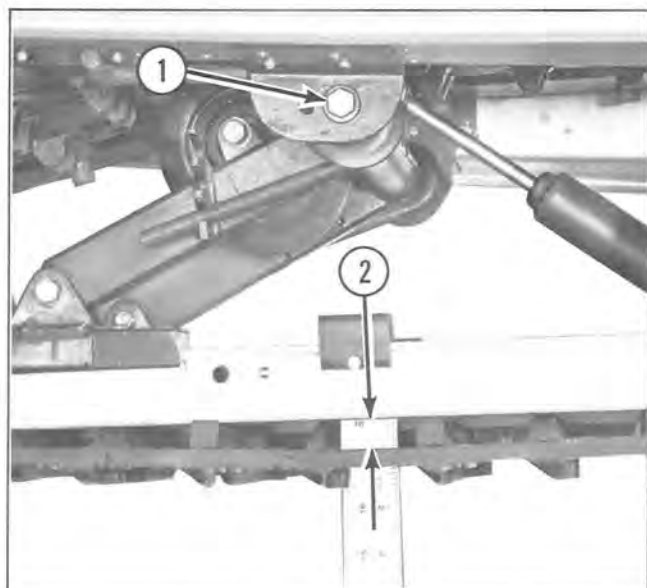
To prevent personal injury, never adjust track tension with the engine running.

1. Raise rear of the snowmobile so track is off the ground, and secure the snowmobile so it cannot fall; then hang a 5 to 8 lb (2.2 to 3.6 kg) weight from the mid point of the track.

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

2. With 5 to 8 lb (2.2 to 3.6 kg) weight hanging from track, clearance from the bottom of the wear strip to the top edge of the track should be 3/4 in. (19 mm). Measure this clearance directly below rear suspension pivot arm bolt. (See Figure 2-84.)

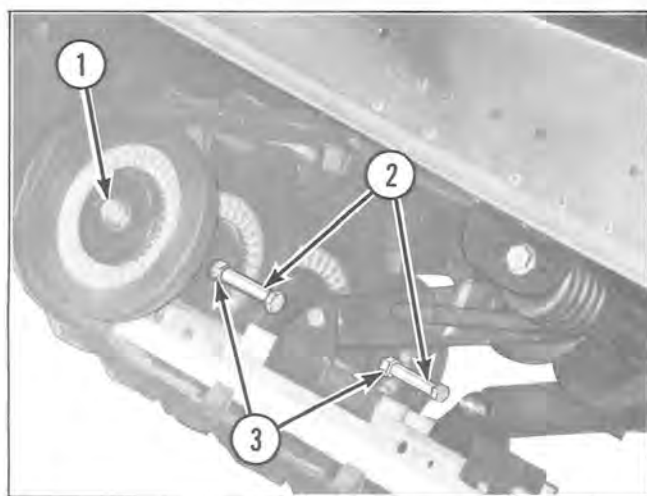
3. If adjustment is necessary, loosen rear axle locking bolts, turn the rear axle adjusting bolts as required to obtain the specified wear-strip to track clearance. (See Figure 2-84.)



1. Rear Suspension Pivot Arm Bolt
2. 3/4 In. (19 mm)

Figure 2-84

4. When proper tension is attained, be sure both adjusting bolts are same length when measured from bolt head to rear axle bracket. (See Figure 2-85.) This is a good starting point for track alignment.



1. Rear Axle Locking Bolt
2. Rear Axle Adjusting Bolts
3. Lock (Jam) Nuts

Figure 2-85

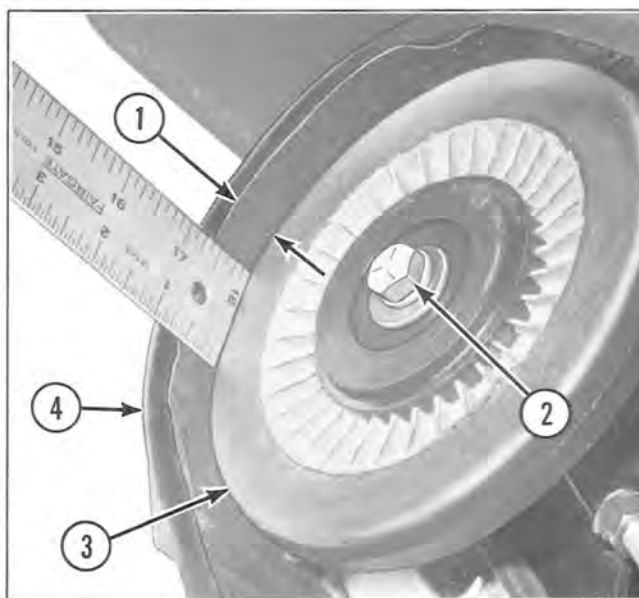
WARNING

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

5. Remove the weight from track and start engine. Push throttle lever only enough to turn the track slowly a few revolutions.
6. Stop engine and perform Track Alignment Check.

Track Alignment

The track is aligned when the distance between rear idler wheel and edge of track is equal on both sides. (See Figure 2-86.)



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

Figure 2-86

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

CAUTION

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

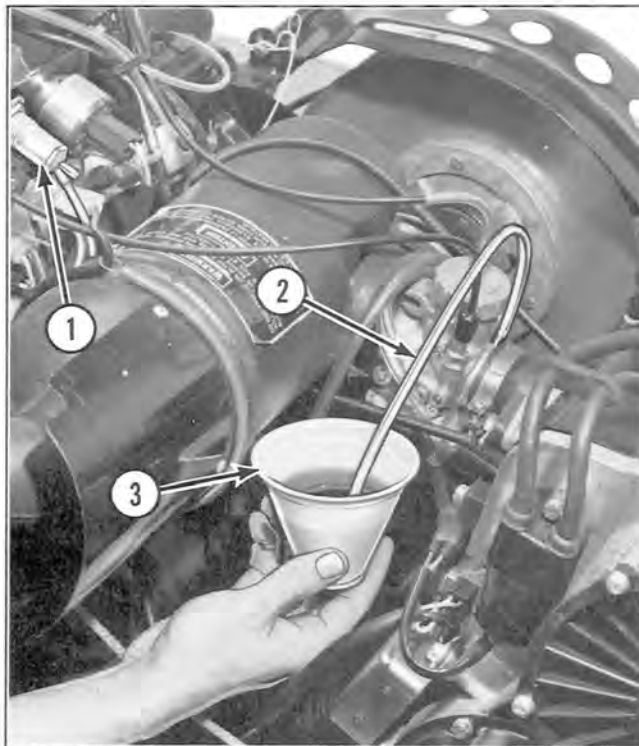
When track alignment is correct, tighten lock nut on both rear axle adjusting bolts and rear axle locking bolts.

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

Storage

Preparation for Storage

1. Thoroughly clean the snowmobile by hosing off all dirt and grime from the suspension and the engine compartment.
2. Remove the drive belt.
3. Siphon the fuel from the fuel tank.
4. Remove the primer to carburetor tube from the fitting on the primer pump. Submerge the open end of this tube into a container filled with Kawasaki Snowmobile Oil. (See Figure 2-87.)



1. Primer Pump
2. Primer to Carburetor Tube
3. Container of Kawasaki Snowmobile Oil

Figure 2-87

WARNING

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

5. Start the engine and allow it to run at idle until it stops. This procedure lubricates the internal engine components of each cylinder to prevent rust.
6. Reinstall the tube onto the primer pump fitting.
7. Position the snowmobile on its side on a protective surface. Drain the fuel from the carburetor through the vent tube as shown. (See Figure 2-88.) Position the vent tube into the retainer on the carburetor properly after all the fuel has been drained.



1. Vent Tube

Figure 2-88

8. With a rag or masking tape, plug the openings of the air intake silencer and muffler.
9. Check the chaincase lubricant level.
10. Replace the fuel filter.

CAUTION

DO NOT LUBRICATE THE DRIVE CONVERTER.

11. The driven converter sheaves are steel. To prevent rusting, apply a light coat of oil to both driven converter sheaves.
12. Block the rear of the snowmobile off the ground to remove weight from the suspension.
13. Loosen the rear axle adjusting bolts to relieve track tension.
14. If paint is scratched, use touch-up paint to restore original finish, and wax the hood and chassis using an automotive type wax.
15. Cover the snowmobile to protect it from dirt and dust.

Removal From Storage

1. Fill fuel tank with a fresh fuel mixture (40 to 1 ratio).

2. Remove the plugs (masking tape or rags) from the air intake silencer and muffler outlet.
3. Using a suitable solvent, remove the oil from the driven converter sheaves. The converter sheaves must be clean and dry.
4. Install a new drive belt. Use the one removed last year as a spare.

WARNING

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

5. Adjust the track tension.
6. Start the engine and rotate the track several revolutions, at low speed only, then stop the engine and check the track alignment.
7. Lower the vehicle from blocks.
8. Operate your snowmobile with the old spark plugs for the first 1/2 hour of operation. This will allow the oil used while storing the snowmobile to collect on the old spark plugs. Install new spark plugs, refer to the SPECIFICATIONS page for the recommended heat range and gap adjustment.

Repair

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General Troubleshooting

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

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

3. Correct the problem

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

Problem Isolation Chart

Engine Problem	Condition	Remedy
Engine does not start - no spark.	1. Key switch not ON or malfunctioning. 2. Emergency stop switch in OFF position or malfunctioning. 3. Spark plug(s) fouled, oiled or damaged. 4. Plug cap(s) damaged, leaking or shorted. 5. High tension wire(s) loose, grounded or shorted. 6. Weak flywheel magnets. 7. Defective ignition coil. 8. Defective exciter coil. 9. Defective CD igniter. 10. Defective pulser coil. 11. Defective breaker points. 12. Defective condenser(s). 13. Improper breaker point gap.	1. Turn switch ON or replace. 2. Move switch to ON or replace stop switch. 3. Replace spark plug(s). 4. Replace plug cap(s). 5. Service high tension wire(s)/coil(s). 6. Replace the flywheel. 7. Replace ignition coil. 8. Replace exciting coil. 9. Replace CD igniter. 10. Replace pulser coil. 11. Replace breaker points. 12. Replace condenser(s). 13. Adjust breaker points.
440 MODEL ONLY		
340 MODEL ONLY		
Engine will not start - does not get fuel.	1. Fuel tank empty. 2. Cracked, broken or pinched fuel line. 3. Obstructed or damaged fuel pump filter. 4. Carburetor jets plugged or fuel pump malfunctioning.	1. Fill fuel tank with fuel. 2. Replace the fuel line. 3. Clean or replace fuel pump filter. 4. Service the carburetor or the fuel pump.

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

GENERAL TROUBLESHOOTING (Continued)

Engine Problem (Continued)	Condition	Remedy
Engine develops power loss or runs on one cylinder (Continued) 440 MODEL ONLY 340 MODEL ONLY	- In-line filter obstructed. - Excessive carbon buildup in exhaust port(s). - Damaged or worn rings. - Low crankcase pressure. - Damaged piston. - Damaged head gasket. - Broken (shorted) high tension leads. - Defective spark plug cap(s). - Defective CDI igniter. - Defective pulser coil. - Defective breaker points. - Defective condenser(s). - Improper breaker point gap.	- Replace in-line filter. - Clean exhaust port(s). - Replace the rings. - Check crankcase for leaks; replace oil seal or gasket. - Replace piston and related component(s). - Replace gasket. - Replace complete ignition coil. - Replace cap(s). - Replace CDI igniter. - Replace pulser coil. - Replace breaker points. - Replace condenser(s). - Adjust breaker points.
Engine overheats.	- Incorrect spark plug(s). - Cooling fins obstructed. - Air leak between carburetor, intake manifold or cylinders. - Carburetor adjusted incorrectly. - Excessive carbon deposits in combustion chamber, exhaust port or muffler. - Damaged rings caused by excessive carbon buildup.	- Install correct spark plug(s). - Clean cooling fins. - Replace gaskets, tighten mounting hardware. - Adjust carburetor. - Clean affected components. - Clean or replace rings.
Engine backfires; has irregular running condition. Note: Engine may eventually overheat.	- High tension lead wire shorting out. - Fouled or incorrect spark plug(s) (heat range too hot).	- Replace complete ignition coil. - Replace spark plug(s) or install spark plug(s) having colder heat range.

Engine Problem (Continued)	Condition	Remedy
Engine backfires; has irregular running condition. Note: Engine may eventually overheat.	3. Air leak between carburetor and intake manifold. 4. Air leak between intake manifold and cylinders.	3. Check carburetor holder to make sure it is not warped. 4. Install new intake manifold gaskets.
Engine four-cycles.	1. Carburetor incorrectly adjusted. 2. Dirt between needle valve and valve seat.	1. Adjust carburetor. 2. Service carburetor.
Engine stops (suddenly) after running.	1. Defective ignition coil. 2. Obstruction in fuel tank or fuel filter. 3. Fuel line obstructed or pinched. 4. Defective exciter coil. 5. Spark plug bridged. 6. Seized piston(s). 7. Seized crankshaft. 8. Defective CDI igniter. 9. Defective pulser coil.	1. Replace ignition coil. 2. Clean or replace filter. 3. Remove obstruction, remove pinched area from fuel line. 4. Replace exciter coil. 5. Replace spark plug. 6. Replace piston and any affected components. 7. Replace crankshaft and any affected components. 8. Replace CDI igniter. 9. Replace pulser coil
440 MODEL ONLY 		
Engine stops (gradually) after running.	1. Obstruction in fuel tank or fuel filter. 2. Fuel line obstructed or pinched. 3. Damaged head gasket(s). 4. Loose cylinder head. 5. Loose spark plug(s).	1. Clean or replace filter. 2. Remove obstruction, remove pinched area from fuel line. 3. Replace head gasket(s). 4. Tighten cylinder head nuts to correct torque. 5. Tighten spark plug(s) to correct torque.
Drive Converter Problem	Condition	Remedy
Drive converter engages before specified RPM.	1. Incorrect spring. 2. Weak or damaged spring. 3. Incorrect weights.	1. Install correct spring. 2. Replace spring. 3. Install correct weights.

GENERAL TROUBLESHOOTING (Continued)

Drive Converter Problem (Continued)	Condition	Remedy
Drive converter engages after specified RPM.	1. Incorrect spring. 2. Incorrect weights. 3. Dirty movable sheave. 4. Worn (flat spots) rollers and ramps. 5. Bushing in housing worn excessively on inside diameter.	1. Install correct spring. 2. Install correct weights. 3. Clean movable sheave. 4. Replace rollers and ramps. 5. Replace components as required.
Maximum drive converter RPM too high.	1. Incorrect weights. 2. Incorrect ramps (ramp angle too steep at top). 3. Short belt or incorrect center to center distance.	1. Install correct weights. 2. Install correct ramps. 3. Install new belt and establish correct offset and center to center distance.
Maximum drive converter RPM too low.	1. Incorrect weights (too heavy). 2. Incorrect ramps (ramp angle too flat at top). 3. Long belt or incorrect center to center distance.	1. Install correct weights. 2. Install correct ramps. 3. Install new belt and establish correct offset and center to center distance.
Shifting too quickly.	1. Incorrect weights (too heavy). 2. Incorrect ramps (ramp angle too flat). 3. Weak drive spring. 4. Driven spring preload incorrect (too loose).	1. Install correct weights. 2. Install correct ramps. 3. Replace spring. 4. Correct spring preload.
Shifting too slowly.	1. Incorrect weights (too light). 2. Incorrect ramps (ramp angle too steep). 3. Spring too strong. 4. Driven spring preload too tight.	1. Install correct weights. 2. Correct ramps. 3. Replace spring. 4. 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 Problem (Continued)	Condition	Remedy
Drive converter will not dis-engage at idle - engine starts hard and stalls because of belt drag.	1. Loose movable sheave bushing setscrews. 2. Drive belt outside circumference below specifications. 3. Thickness of belt on inside diameter exceeds specifications.	1. Stake movable sheave set screws. 2. Replace drive belt. 3. 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. 5. Improper drive converter operation (sticking, etc.). 6. Drive converter and driven converter offset/center to center is incorrect. 7. Oil or grease on drive converter or driven converter sheave surface.	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. 5. Remove and repair drive converter; install new belt if one is needed. 6. Check and adjust, install new belt if one is needed. 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). 2. Center to center distance too far apart or belt too short.	1. Remove and repair drive converter; install new belt, if one is needed. 2. Alter center to center distance or install longer belt.
Belt worn in one spot.	1. Track frozen to suspension, front drive or ground. 2. Incorrect track tension. 3. Idle speed too high. 4. Improper operation of drive converter.	1. Free track and install new belt. 2. Adjust track tension and install new belt. 3. Reduce idle RPM and install new belt. 4. Repair or replace drive converter and install new belt.

GENERAL TROUBLESHOOTING (Continued)

Drive Belt Problem (Continued)	Condition	Remedy
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. 2. Chain stretched beyond adjustable limit.	1. Check tensioner guides and spring. 2. Install new chain and sprockets.
Chain slippage.	1. Incorrect chain tension. 2. Chain stretched beyond adjustable limit. 3. Sprocket teeth worn.	1. Check tensioner guides and spring. 2. Install new chain and sprockets. 3. Install new sprockets and chain.
Chain slips off sprockets.	1. Incorrect chain tension. 2. Sprocket teeth worn. 3. Sprockets misaligned.	1. Check tensioner guides and spring. 2. Install new sprockets and chain. 3. Align top sprocket with bottom sprocket.

Track Problem	Remedy	Condition
Edge of track is frayed.	1. Track is misaligned. 2. Track strikes rivets in tunnel, yet alignment is correct.	1. Set track tension and alignment. 2. Remove rivets and install correct type rivet.
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. Badly worn clip that contacts slide rail. 3. Track is misaligned.	1. Straighten slide rail(s) or install new rails. 2. Install new rail strip and/or clip. 3. Set track tension and alignment.

Driven Converter Problem	Condition	Remedy
Low engine RPM yet belt shifts completely through driven converter operating range.	1. Weak spring or broken spring.	1. Rotate end of spring clockwise on driven converter to increase spring tension or install new spring.
High engine RPM yet belt takes too long to shift through driven converter range.	1. Incorrect spring - too heavy. 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.

Ignition Troubleshooting

340 Model Only

Preliminary Procedures

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

Spark Test

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

1. Connect test spark plug to each spark plug cap. (See Figure 3-1.)

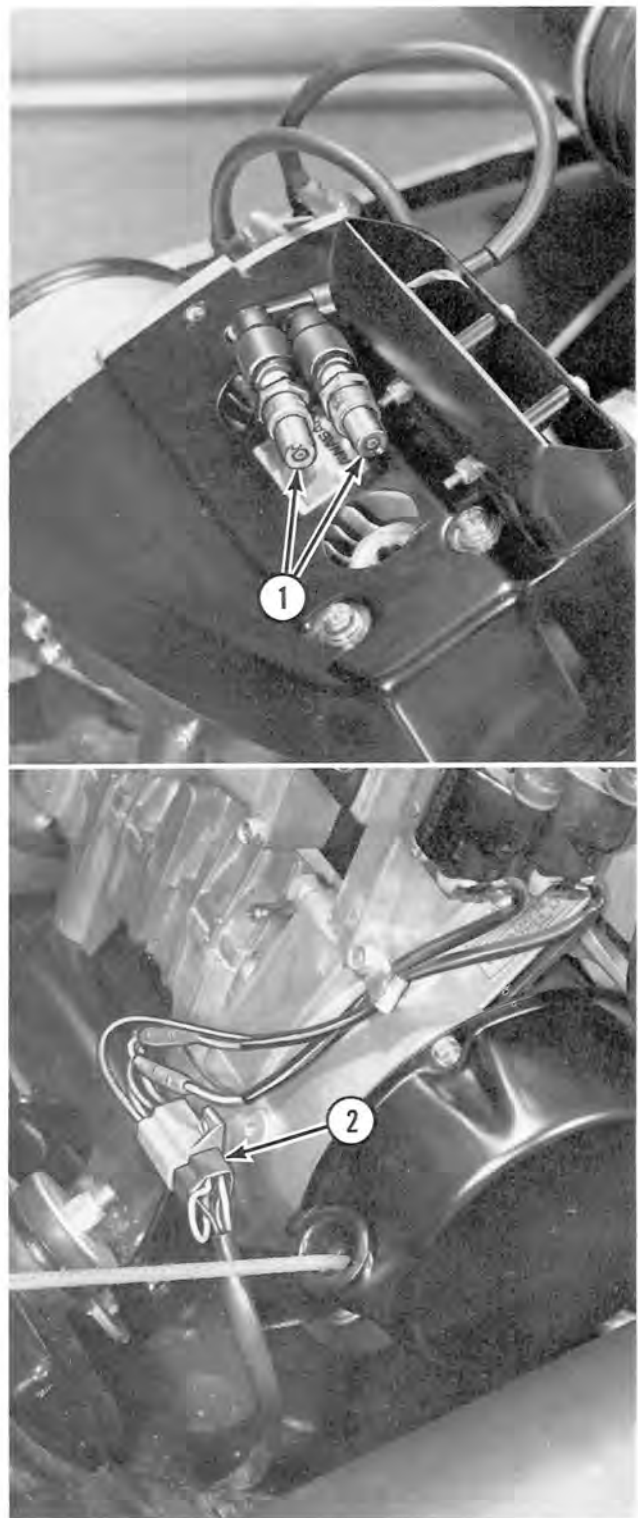
NOTE: Fabricate test spark plug by removing ground electrode. This increases distance spark must jump from center electrode to ground, working the ignition system harder than jumping standard spark plug gap.

2. Crank engine and observe spark.
 - a. Blue colored spark jumps gap of test spark plug indicates ignition system should start and run engine if timing is correct.
 - b. No spark observed, continue troubleshooting procedure.

Stop Circuit Elimination Test

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

1. Crank engine. If spark occurs with the connector separated, ignition components on the engine are okay, defective component must be key switch, emergency stop switch or the wiring. Refer to Key Switch and Emergency Stop Switch Tests.
2. If no spark is observed, test ignition components mounted on engine.



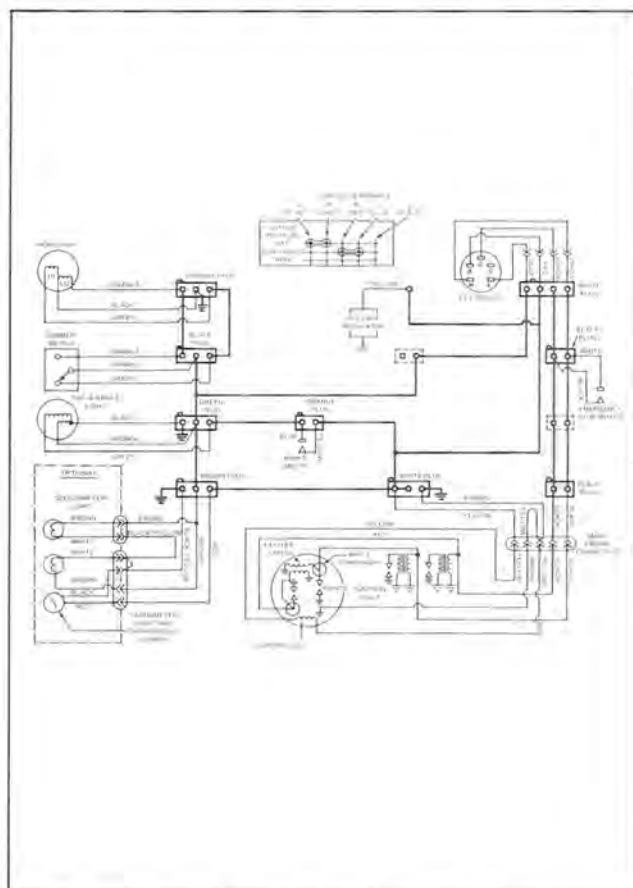
1. Test Spark Plugs
2. Wiring Harness Connector

Figure 3-1

Troubleshooting Using an Ohmmeter

The following test procedures are designed for locating ignition system malfunctions using an ohmmeter.

1. CHECKING WIRING CONNECTIONS - Check all wiring connectors to insure connections are clean, secure, and correct. (See Figure 3-2.)



WIRING CONNECTIONS

Figure 3-2

CAUTION

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

NOTE: Disconnect red and white exciter coil wires from ignition coil connectors prior to performing tests.

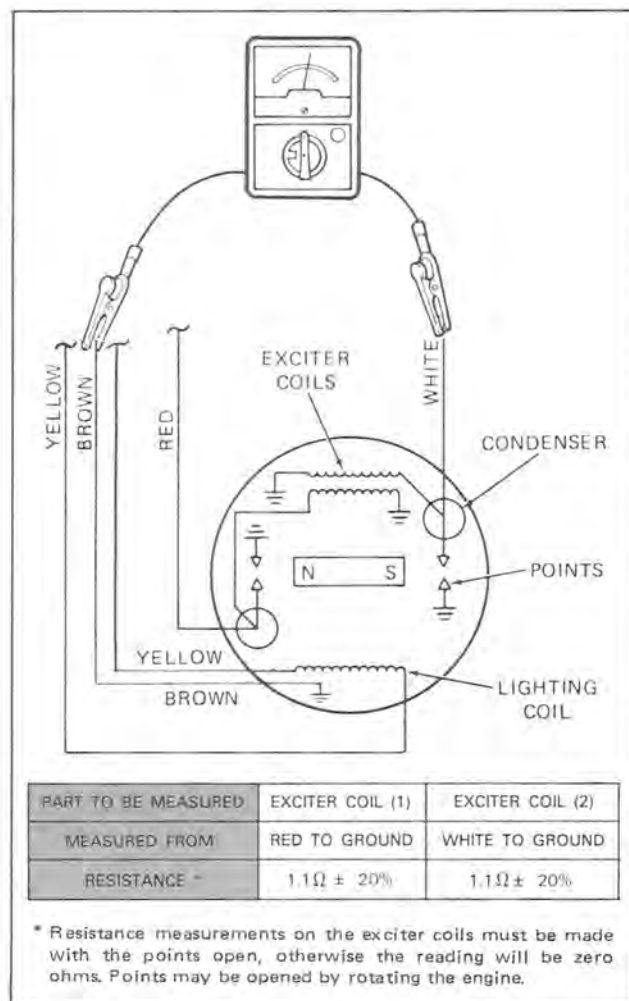


Figure 3-3

2. EXCITER COIL TEST - To locate the cause of trouble (broken wire, short circuit, etc.) measure the resistance of each coil winding as specified in the following illustration. Repair defective wire or replace coil not within specifications. (See Figure 3-3.)
3. IGNITION COIL - Measure resistance of ignition coil primary and secondary windings as specified in the following illustration. Repair defective wire or replace coil not within specifications. (See Figure 3-4.)

CAUTION

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

NOTE: Disconnect red and white exciter coil wires from ignition coil connectors prior to performing tests.

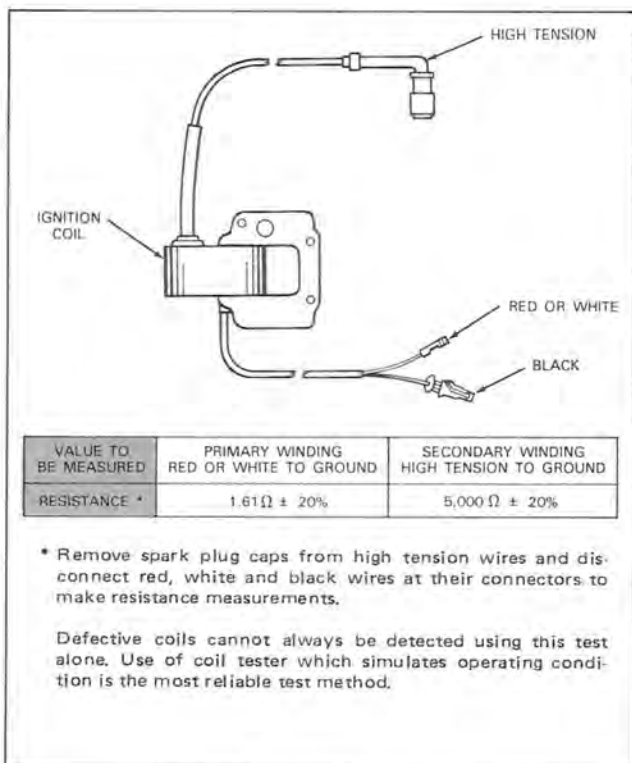


Figure 3-4

4. SPARK PLUG CAP - Unscrew the spark plug cap from the high tension wire and test for 1,000 Ω ± 20% resistance between the terminals at each end of the cap. (See Figure 3-5.)

5. BREAKER POINT TEST (See Figure 3-6.)

NOTE: Disconnect red and white exciter coil wires from ignition coil connectors prior to performing test.



Figure 3-5

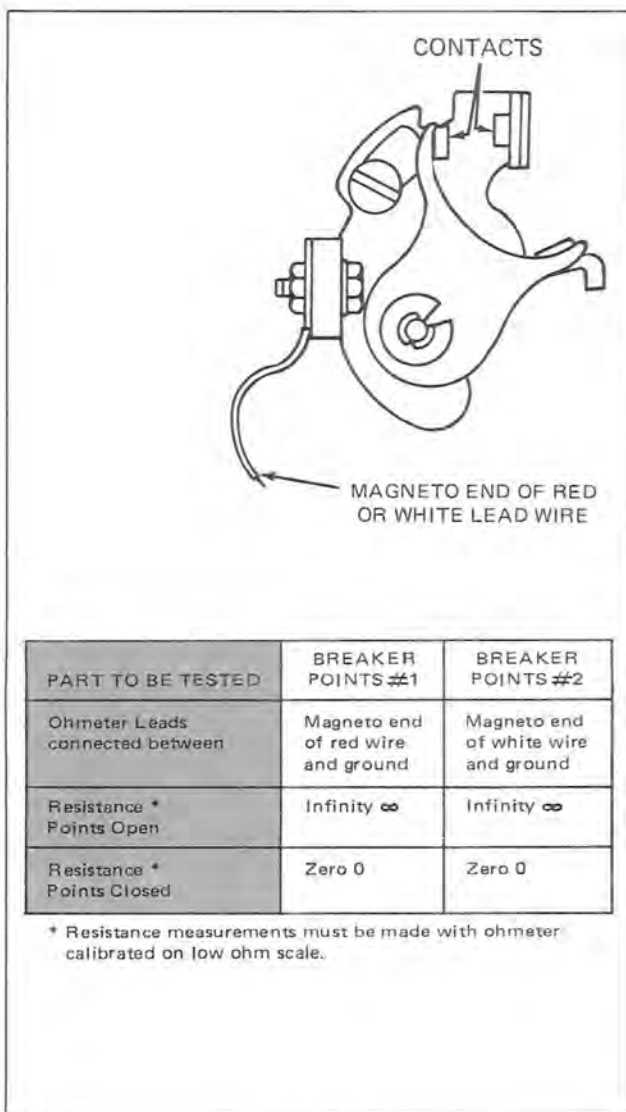


Figure 3-6

6. **CONDENSER TESTING** - A good condenser should indicate (∞) when checked with an ohmmeter calibrated on high ohm scale. A shorted condenser will not allow any spark to be produced. (See Figure 3-7.)

NOTE: Disconnect the condenser from its mounting base by removing the screw attaching it before measuring resistance or capacitance.

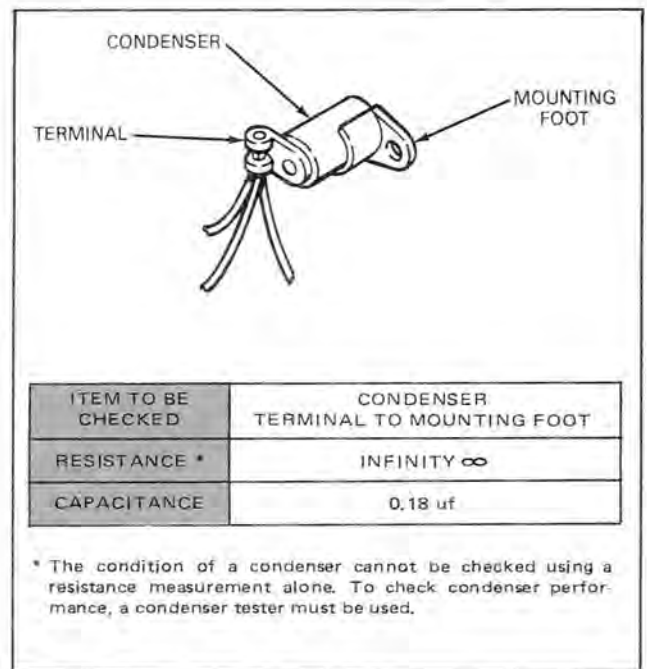


Figure 3-7

Ignition Troubleshooting Table 340 Model Only

The troubleshooting table lists ignition problems and possible conditions which would cause them.

To determine whether the exciter or ignition coils are defective, check the resistance readings values listed on the previous page. If the resistance readings obtained are not within the range given in the previous tables, the component is defective and must be replaced.

ELECTRICAL TROUBLESHOOTING

Ignition Problem	Condition	Remedy
No spark is produced.	1. Defective magneto exciter coil (1). 2. Defective magneto exciter coil (2). 3. Defective ignition coil primary winding. 4. Defective ignition coil secondary winding. 5. Shorted points. 6. Spark plug is shorted - resistance between electrodes should be 1 M Ω or more. 7. Wrong wire connections. 8. Shorted condenser.	1. Replace coil (1). 2. Replace coil (2). 3. Replace ignition coil. 4. Replace ignition coil. 5. Replace points. 6. Replace spark plug. 7. Connect wires correctly. 8. Replace condenser.
The engine starts but will not pick up speed.	1. Defective magneto exciter coil (1). 2. Defective magneto exciter coil (2). 3. Improper timing. 4. Wrong point gap. 5. Shorted spark plugs. Resistance between electrodes should read 1 M Ω or more. 6. Worn points.	1. Replace coil (1). 2. Replace coil (2). 3. Check and adjust timing. 4. Adjust point gap. 5. Replace spark plugs. 6. Replace points.
The engine is cranked again but will not start.	1. Defective magneto exciter coil (1). 2. Defective magneto exciter coil (2).	1. Replace coil (1). 2. Replace coil (2).
The engine tends to kick back.	1. Improper timing.	1. Adjust ignition timing.

Ignition Troubleshooting

440 Model Only

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

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

Preliminary Procedures

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

Spark Test

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

1. Connect test spark plug to each spark plug cap. (See Figure 3-8.)

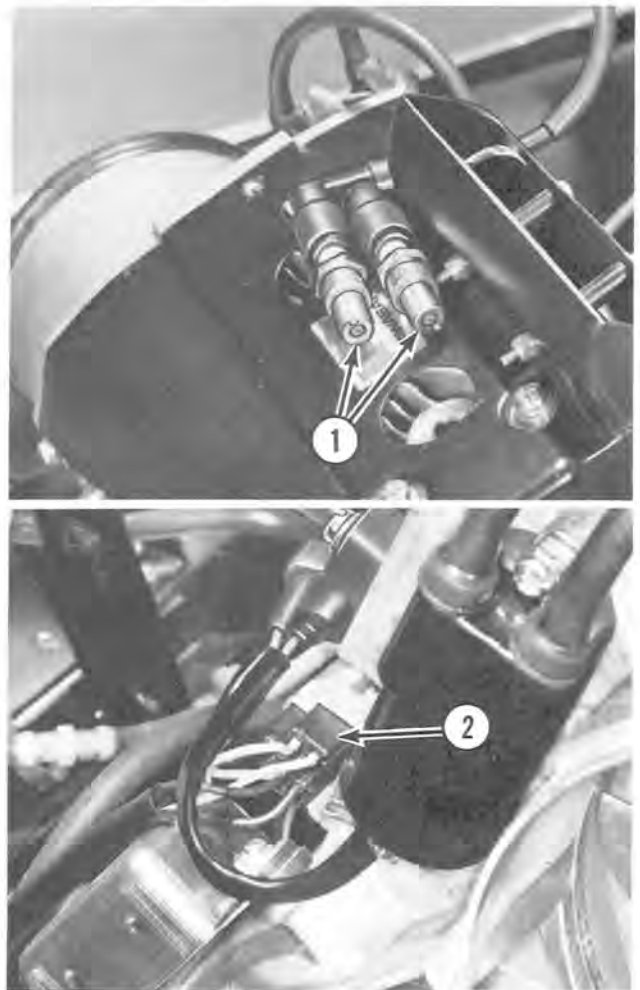
NOTE: Fabricate test spark plug by removing ground electrode. This increases distance spark must jump from center electrode to ground, working the ignition system harder than jumping standard spark plug gap.

2. Crank engine and observe spark.
 - a. Blue colored spark jumps gap of test spark plug indicates ignition system should start and run engine if timing is correct.
 - b. No spark observed, continue troubleshooting procedure.

Stop Circuit Elimination Test

Remove key switch and emergency stop switch circuits from the system. Separate wiring harness connector on the engine. (See Figure 3-8.)

1. Crank engine. If spark occurs with the connector separated, ignition components on the engine are okay, defective component must be key switch, emergency stop switch or the wiring. Refer to Key Switch and Emergency Stop Switch Tests.
2. If no spark is observed, test ignition components mounted on engine.



1. Test Spark Plugs
2. Wiring Harness Connector

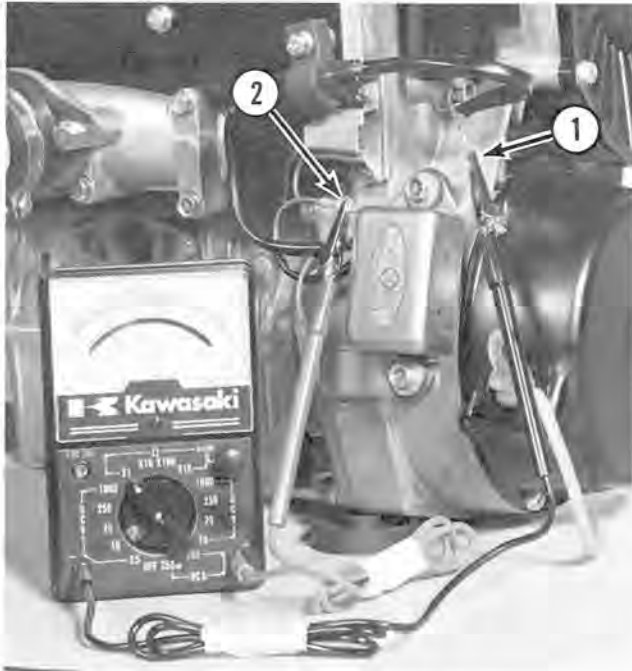
Figure 3-8

Ground Wire Test

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

1. Remove screw securing each ring terminal to ground.
2. Set meter to low ohms scale (X1). Connect one ohmmeter lead to the ring terminal removed from the ground at the ignition coil. Connect the other ohmmeter lead to the ring terminal removed from the ground at the engine connector. (See Figure 3-9.)
3. If ohmmeter indicates closed circuit (0), BROWN ground wire between the engine connector and the ignition coil is okay.

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



1. Ignition Coil Primary Wire
2. CDI Igniter to Engine Connector

Figure 3-9

Ignition Troubleshooting Using CD Ignition Tester PN T56019-201

GENERAL DESCRIPTION

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

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

The Kawasaki Ignition Tester P/N T56019-201 performs as a comparator. The energy output values for all CD Ignition components were derived from tests conducted by Kawasaki. Using this

tester, it can be determined if each ignition component is functioning properly. The test results can be compared with the standard values given.

Tester Controls and Accessories

1. High-Low Range Switch

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

High Scale Test:

- a. Plug the test simulator into a 115 VAC electric outlet for ten seconds.
- b. Place toggle switch of the tester in the High position.
- c. Remove the simulator from the outlet, and connect the P and N leads from the tester to the simulator as indicated on the bottom of the simulator.
- d. Set the tester dial to 50, or below. Depress the button on the simulator. The indicator lamp on the tester should light.

Low Scale Test:

- a. Place switch in Low position.
- b. Set tester dial to 50, or below.
- c. Connect yellow lead to negative terminal of 12 volt battery. Connect red lead to positive terminal. Indicator lamp should light.

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

2. Indicator Dial and Light

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

Indicator Dial Alignment:

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

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

3. Test Simulator

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

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

4. Load Coil

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

5. MM-1 Clip

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

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

GENERAL TEST INSTRUCTIONS

Engine Accessory Circuits

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

Cranking Engine

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

Analysis of Test Results

Indicator Lamp Lights at Specified Setting:

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

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

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

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

Indicator Lamp Does Not Light:

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

Multiple or Intermittent Ignition Problems

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

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

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

WARNING

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

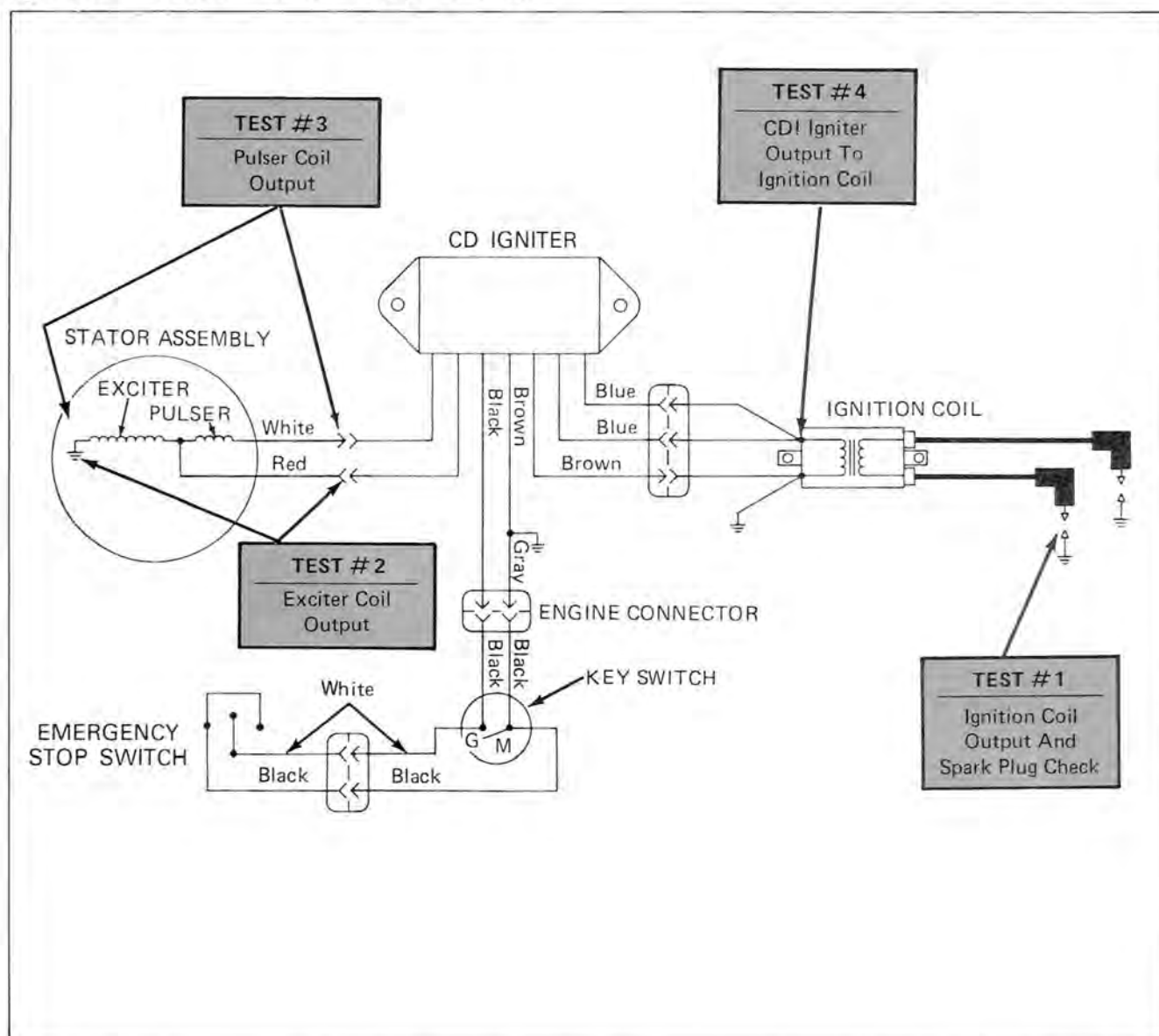
CAUTION

Never 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.

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

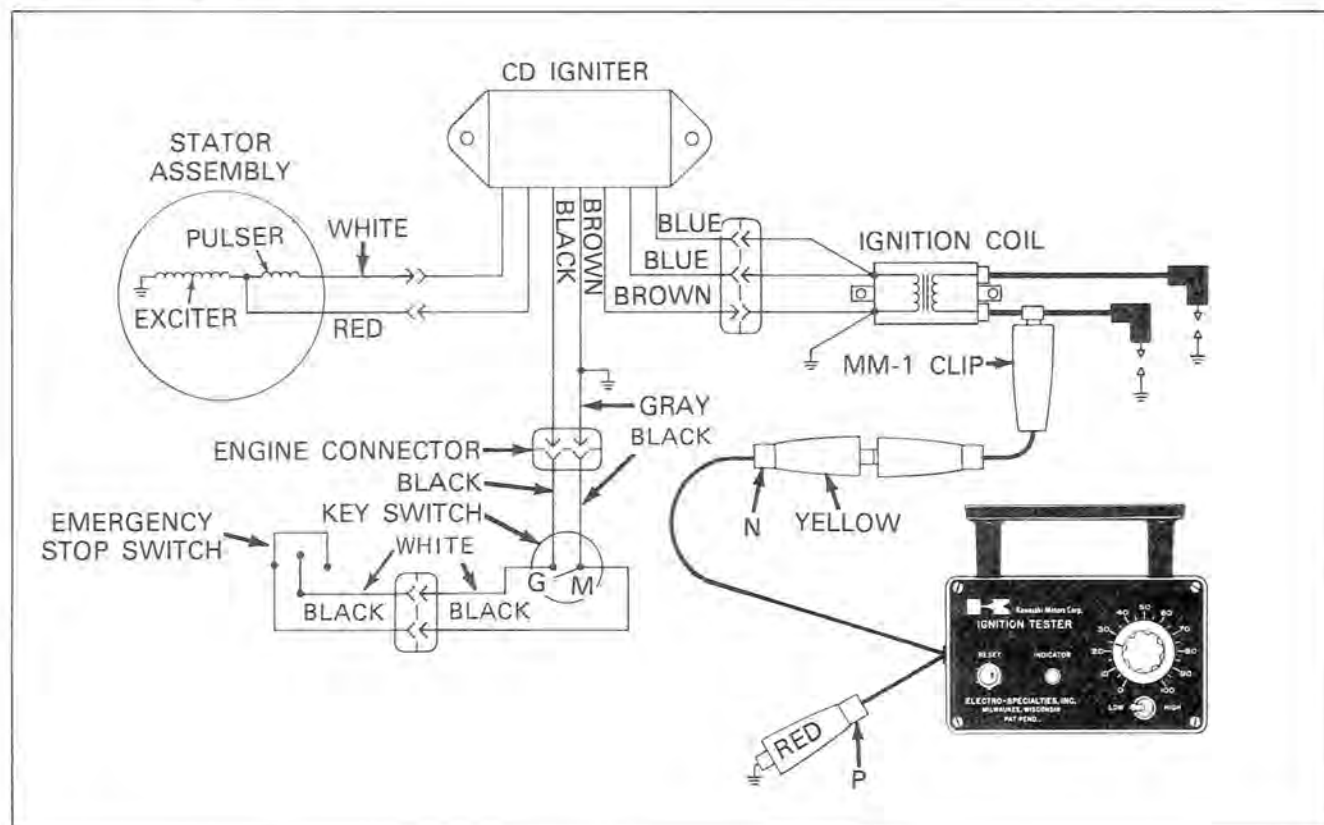


TEST #1		TEST #2		TEST #3		TEST #4	
RANGE	DIAL SETTING	RANGE	DIAL SETTING	RANGE	DIAL SETTING	RANGE	DIAL SETTING
Low	25	High	50	Low	90	High	55

NOTE: Refer to following pages for detailed testing procedures.

Test No. 1

Ignition Coil Output and Spark Plug Check



TEST CONNECTIONS

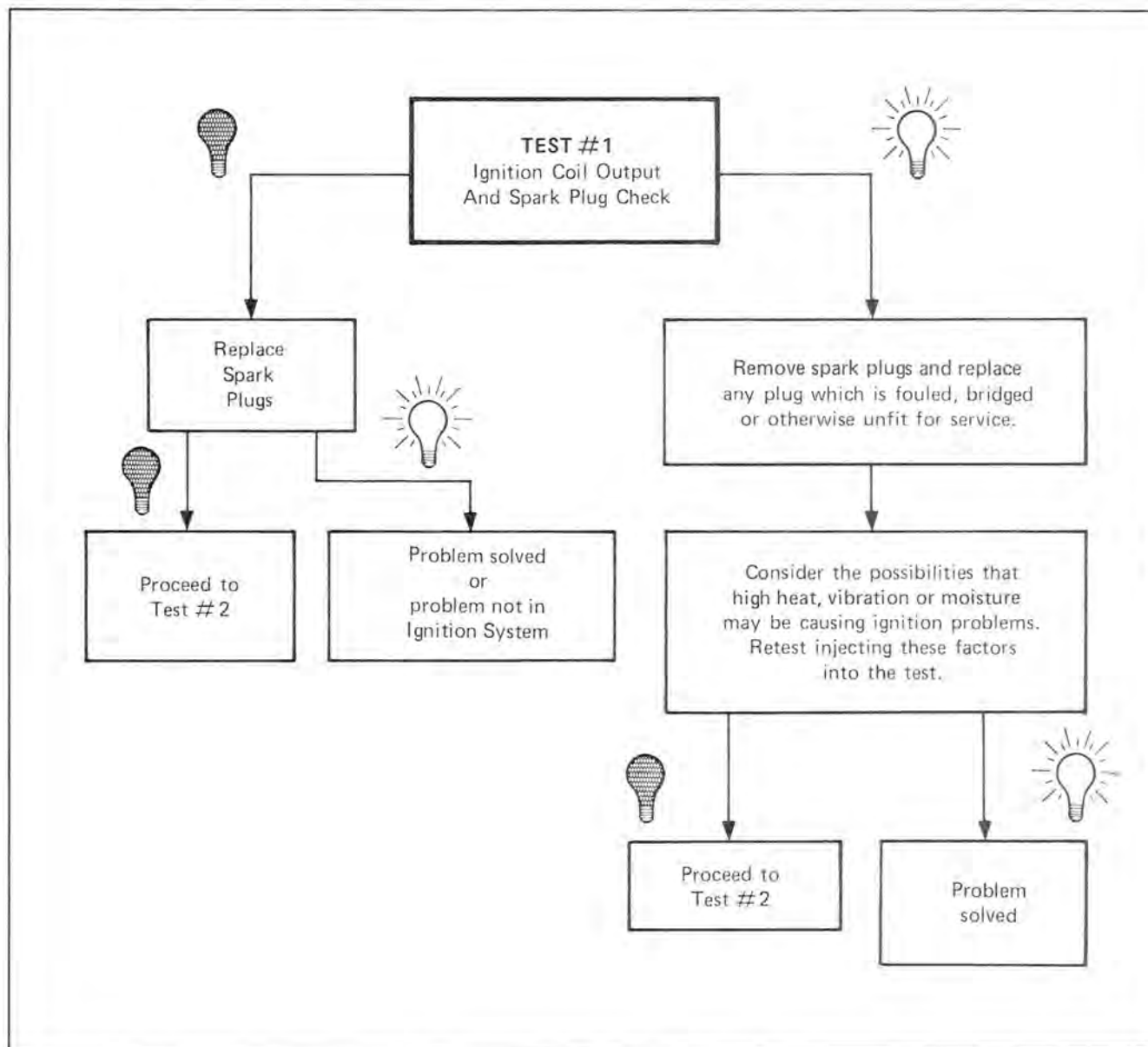
1. Connect the MM-1 adaptor to the tester N (yellow) lead wire.
 2. Connect the tester P (red) lead wire to a good ground on the engine.
 3. Clamp the MM-1 adaptor around either spark plug wire as close to the spark plug as possible. If insulation sleeving is over the spark plug wire, push the sleeving 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.
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.

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.

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.

TEST NO. 1 PROCEDURE (CONT)



No Lamp or Low/Inconsistent Reading



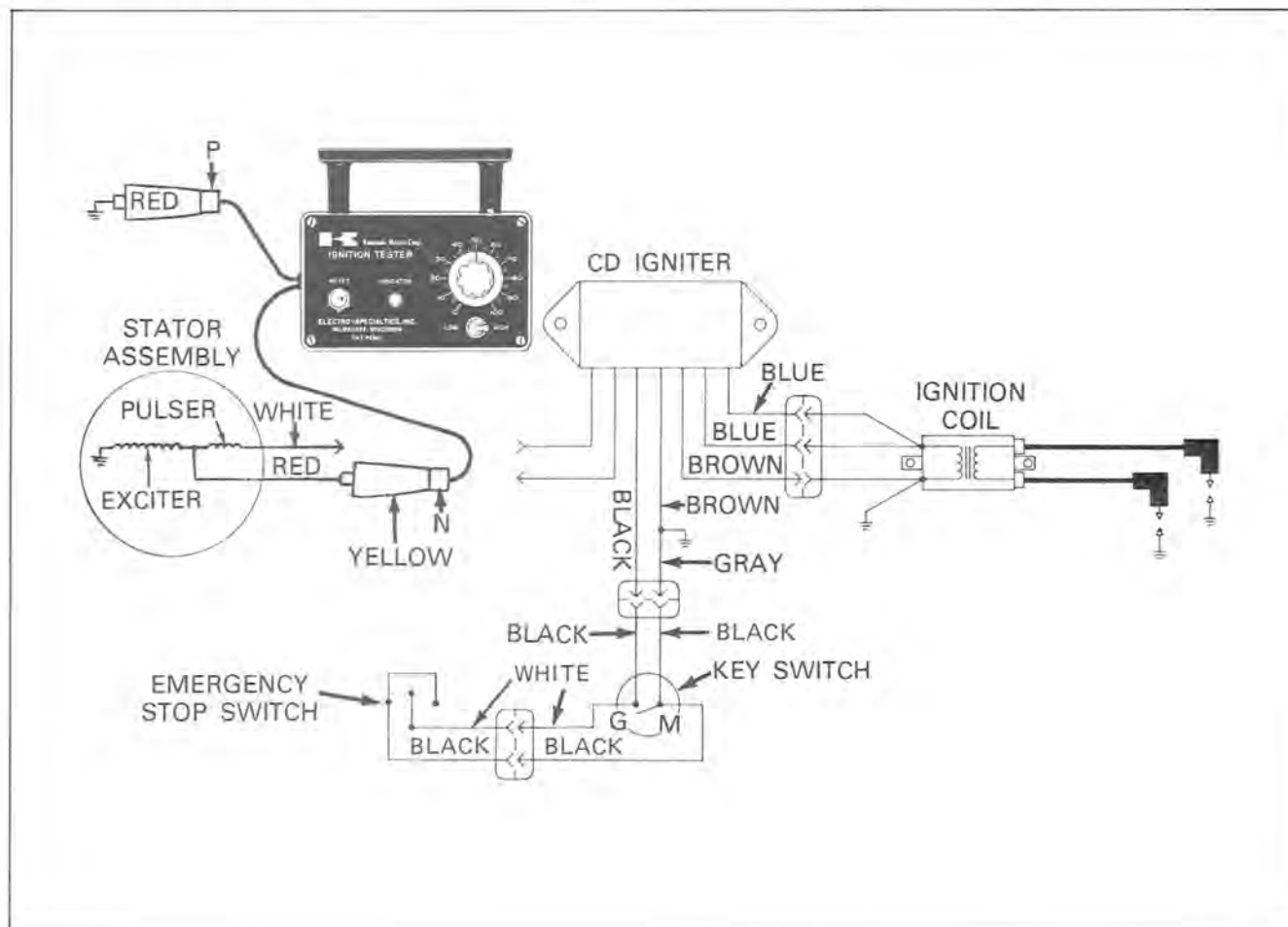
Lamp Lights at Specified Value

STANDARD VALUE TEST #1

RANGE	VALUE
Low	25

Test No. 2

Exciter Coil Output



CAUTION

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

TEST CONNECTIONS

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

TEST PROCEDURE

1. Set the toggle switch to the High range. Set the tester dial to 50.

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

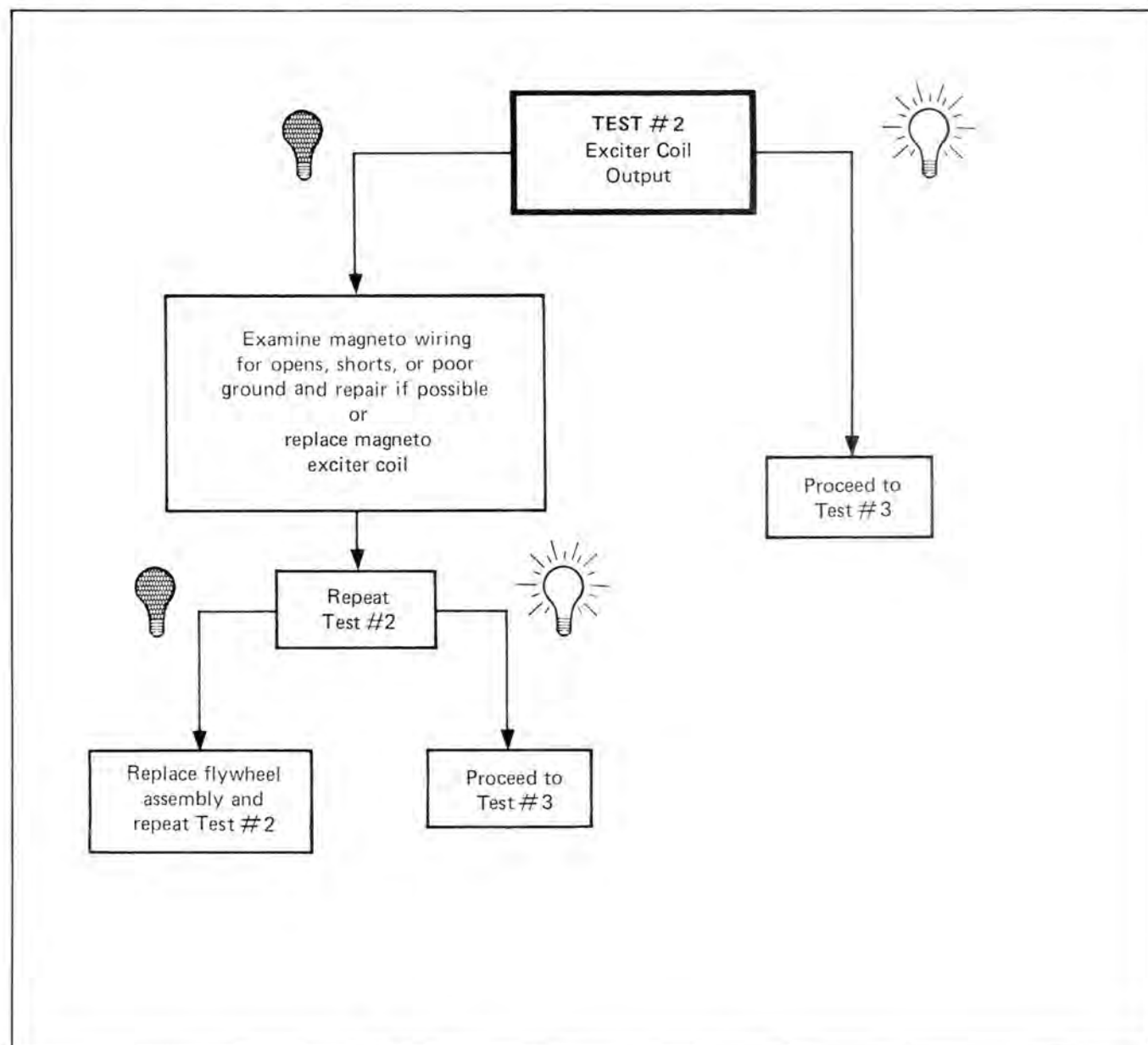
a. If the lamp lights, push the Reset button to turn the lamp off and repeat Test No. 2 three times. If the lamp lights consistently at 50, magneto exciter coil is good, proceed to Test No. 3.

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.

TEST NO. 2 PROCEDURE (CONT)



No Lamp or Low/Inconsistent Reading

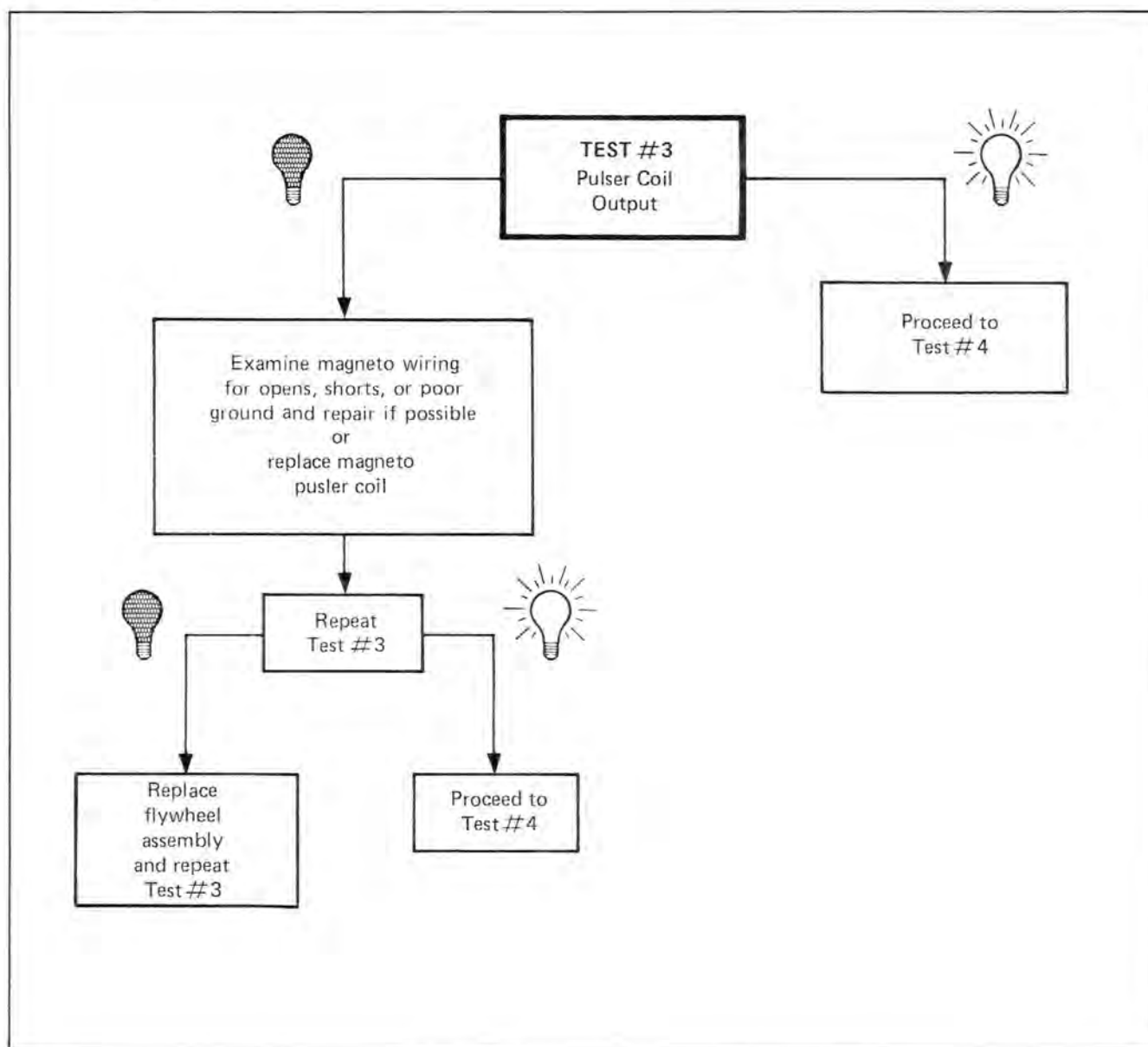


Lamp Lights at Specified Value

STANDARD VALUE TEST #2

RANGE	VALUE
High	50

TEST NO. 3 PROCEDURE (CONT)



No Lamp or Low/Inconsistent Reading



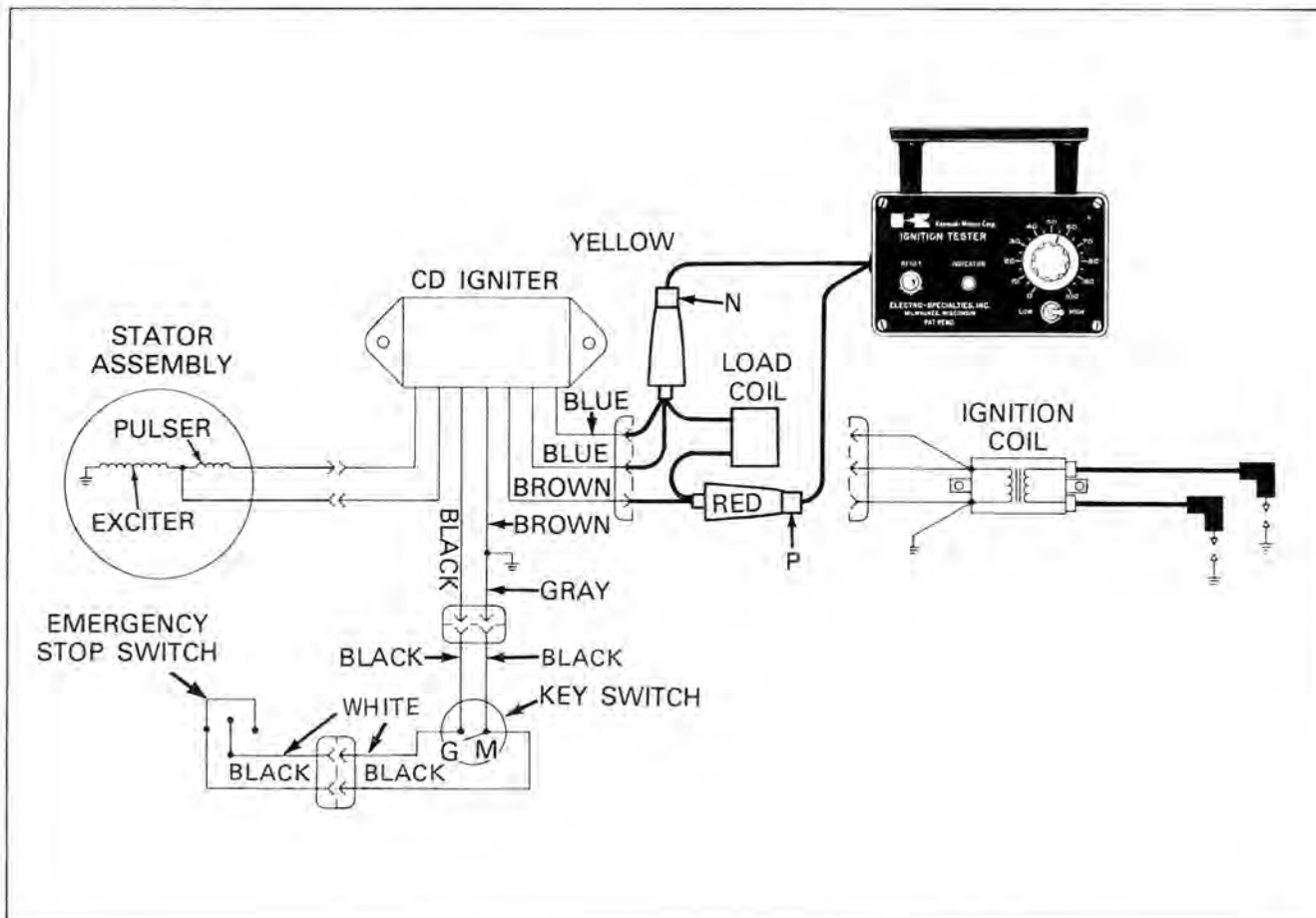
Lamp Lights at Specified Value

STANDARD VALUE TEST #3

RANGE	VALUE
Low	90

Test No. 4

CDI Igniter Output To Ignition Coil



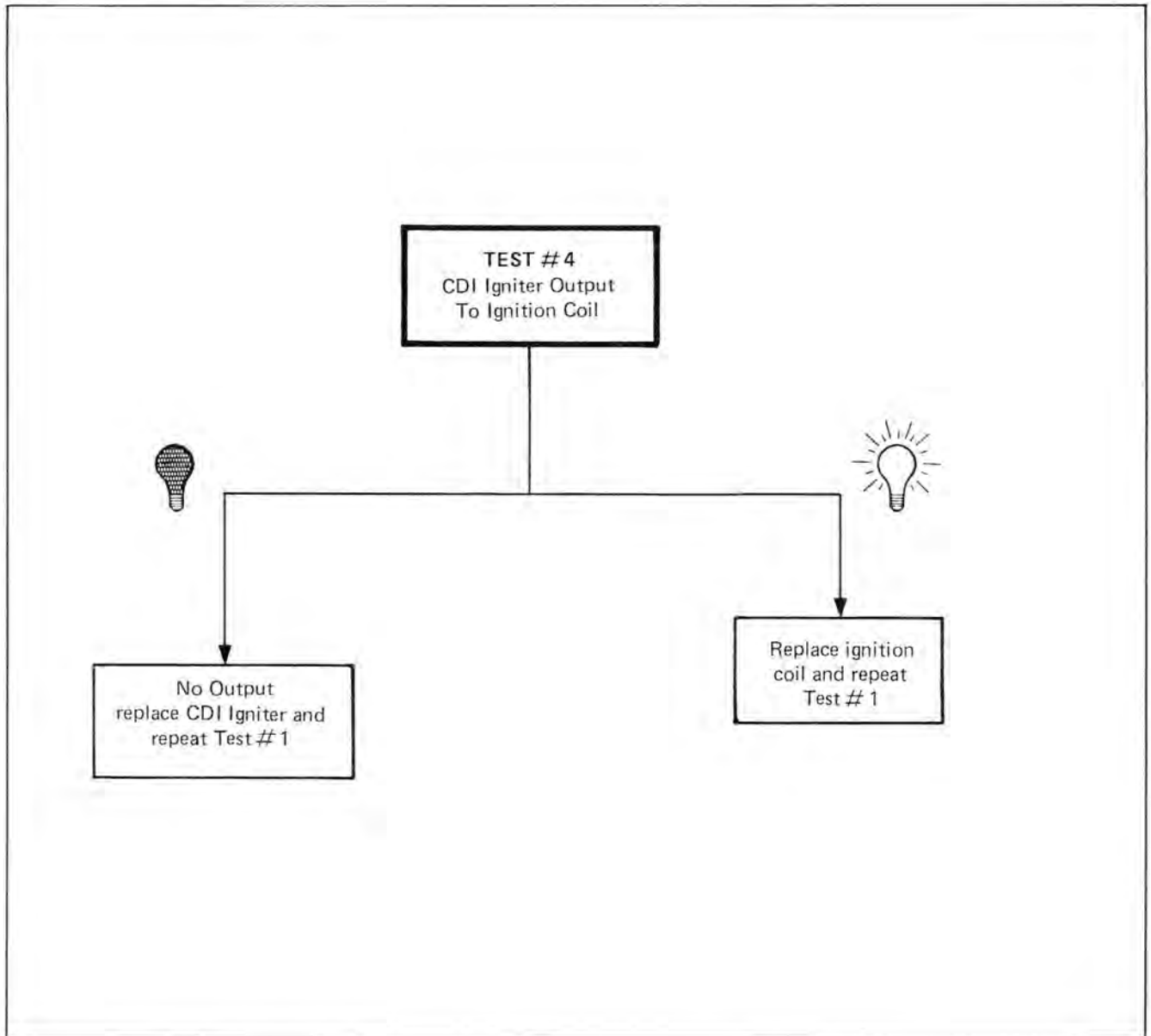
TEST CONNECTIONS

1. Disconnect the three-wire connector between the CD igniter and the ignition coil.
2. Connect the tester N (yellow) lead to both blue wire terminals in the CD 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 CD 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 CD 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 CD igniter.

TEST NO. 4 PROCEDURE (CONT)



No Lamp or Low/Inconsistent Reading



Lamp Lights at Specified Value

STANDARD VALUE TEST #4

RANGE	VALUE
High	55

Ignition Troubleshooting Using an Ohmmeter

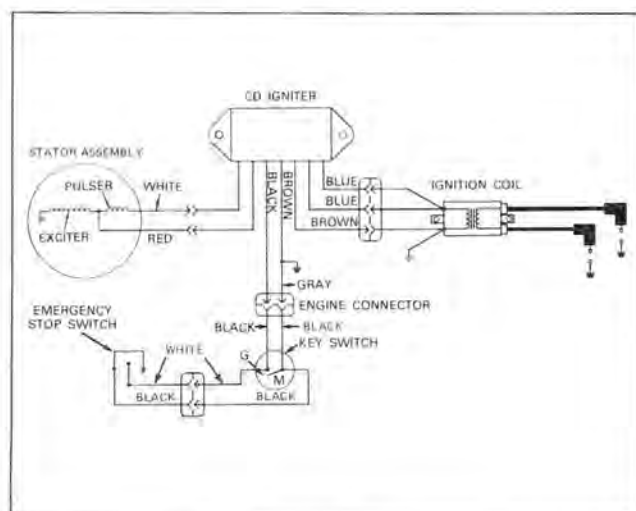
General Description

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

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

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

1. **WIRING CONNECTIONS** - Check all wiring connectors to insure connections are clean, secure, and correct. (See Figure 3-10.)



WIRING CONNECTIONS
Figure 3-10

2. **EXCITER AND PULSER COILS** - To locate the cause of trouble (broken wire, short circuit, etc.) measure the resistance of each coil winding and check AC voltage output as specified in the following illustration. Repair defective wire or replace coil not within specifications. (See Figure 3-11.)

CAUTION

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

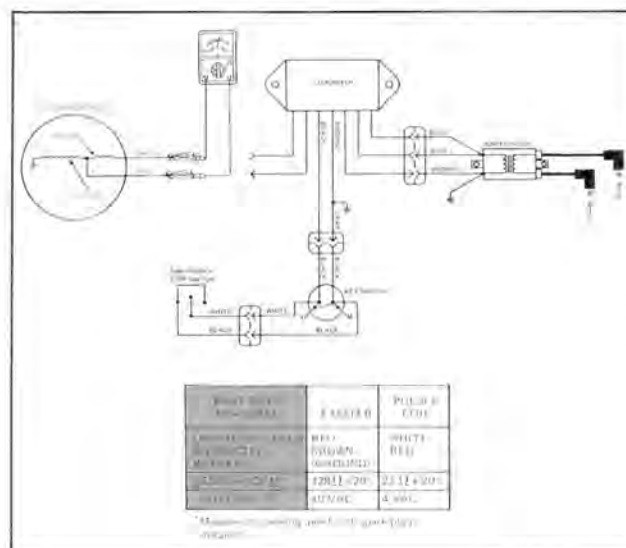


Figure 3-11

3. **IGNITION COIL** - Measure resistance of ignition coil primary and secondary windings as specified in the following illustration. Repair defective wire or replace coil not within specifications. (See Figure 3-12.)

CAUTION

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

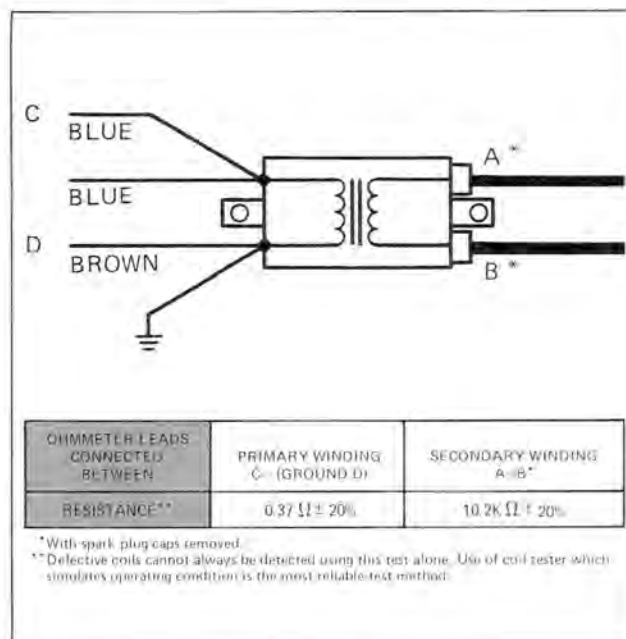


Figure 3-12

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 3-13.)

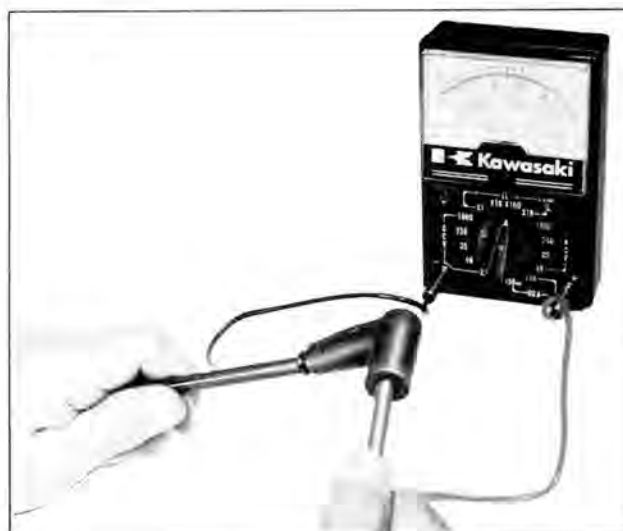


Figure 3-13

Ignition Troubleshooting Table 440 Model Only

Problem	Condition	Remedy
No spark is produced	1. Defective exciter coil 2. Defective pulser coil 3. Defective ignition coil primary winding 4. Defective ignition coil secondary winding 5. Defective CD igniter 6. Spark plug is shorted - resistance between electrodes should be $1\text{ M}\ \Omega$ or more 7. Wrong wire connections	1. Replace exciter coil 2. Replace pulser coil 3. Replace ignition coil 4. Replace ignition coil 5. Replace CD igniter 6. Replace spark plug 7. Connect wires correctly
The engine starts but will not pick up speed	1. Defective exciter coil 2. Defective pulser coil 3. Improper timing 4. Defective CD igniter 5. Shorted spark plugs. Resistance between electrodes should read $1\text{ M}\ \Omega$ or more	1. Replace exciter coil. 2. Replace pulser coil 3. Adjust timing 4. Replace CD igniter 5. Replace spark plugs
The engine is cranked again but will not start	1. Defective exciter coil 2. Defective pulser coil	1. Replace exciter coil 2. Replace pulser coil
The engine tends to kick back	1. Defective CD igniter	1. Replace CD igniter

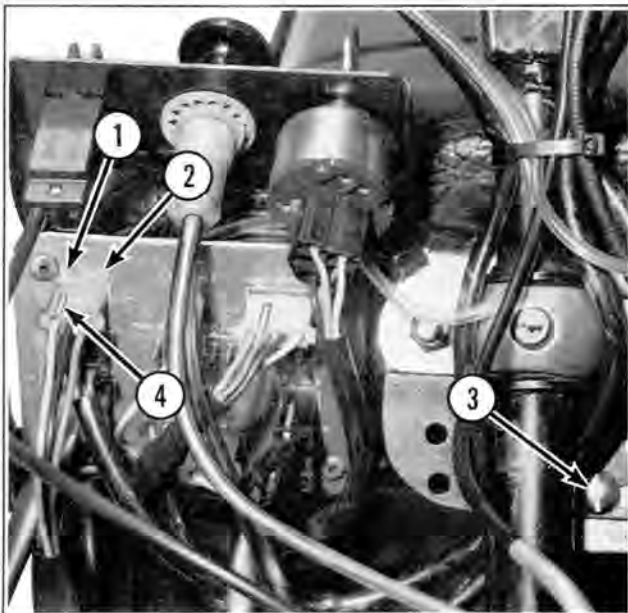
Electrical System Checks

Printed Circuit Board

Check connectors on printed circuit board to be sure they are properly located and secure. Connectors must fit over terminals completely, contacting the board to prevent loosening from vibration. The circuit board identifies clearly which wire harness and connector color that should be attached to the terminals. (See Figure 3-14.)

WARNING

The indexing tab molded on the connectors must face upward as indicated on the printed circuit board for proper electrical polarity. Incorrect indexing can damage the wiring harness or cause electrical sparks in the engine compartment.



1. Wire Harness Identification
2. Connector Color
3. Voltage Regulator
4. Indexing Tab

Figure 3-14

Key Switch and Emergency Stop Switch Test, Including Associated Circuits

1. Disconnect the black plug from engine to P.C. board.
2. Turn the key and emergency stop switches on.
3. Connect ohmmeter leads to the two pins on P.C. board that engine connector was plugged into (ohms X 100 scale).
4. If the ohmmeter registers infinity, there is an open circuit and the switches should be good. (To verify, activate key switch, meter should read 0. Turn on key switch and activate emergency stop switch, meter should read 0.)

Be sure to turn both switches on before proceeding.
5. If the reading is 0 or very low, keep ohmmeter connected to P.C. board and proceed to steps 6 and 7 below.
6. Disconnect emergency stop switch connector from P.C. board. If ohmmeter reads infinity, replace emergency stop switch, if not plug connector back into P.C. board and proceed to step 7.
7. Disconnect key switch connector (white) from P.C. board. If ohmmeter reads 0, replace P.C. board. If ohmmeter reads infinity, plug connector back into P.C. board and disconnect black connector from back of key switch. If ohmmeter reads infinity, replace key switch. If ohmmeter reads 0, replace wiring from P.C. board to key switch.

Voltage Regulator Tests

These tests should be conducted if bulbs burn out consistently or all the lights are extremely dim. (Filaments barely light.) Bulbs which fail due to overvoltage 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 ski tips against a stationary object, and be sure the vehicle is properly secured, to prevent personal injury.

2. Connect multimeter leads at engine (white) connector on PC board. DO NOT DISCONNECT FROM PC BOARD. Hook one lead to the yellow wire and the other to the brown wire.
3. Set multimeter at 25 VAC.
4. Set ignition switch in ON position (lights off). Do not activate brake light during test.

CAUTION

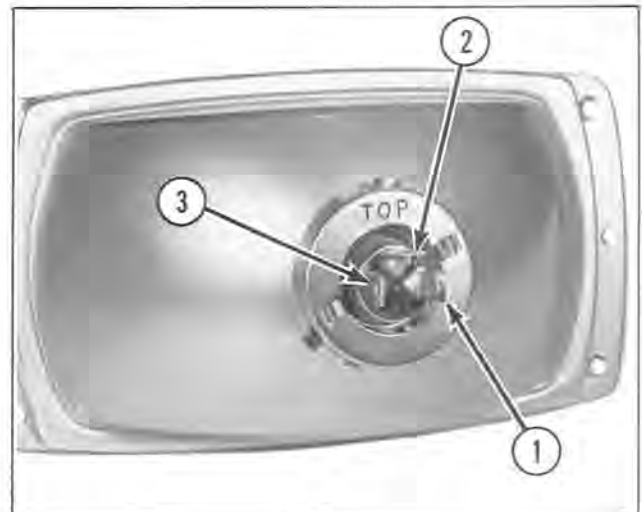
Excessive voltage may exist during test 4 and 5 which may burn out bulbs if lights are turned on.

5. Start the engine. DO NOT RUN OVER 2000 RPM. The voltmeter should read 8 to 11 VAC. If the voltage reads 8 to 11 V, the lighting coil and voltage regulator are probably okay. If it reads less than 8 to 11 V, proceed to No. 6. If it reads higher, the voltage regulator is probably open and is not working. To be sure, increase RPM slowly. DO NOT EXCEED 3000 RPM. If the voltage reading did not stabilize or exceeded 22 V, the regulator should be replaced. (Before replacing make sure connector on regulator is in good condition and case is properly grounded to chassis.)
6. With engine still running disconnect voltage regulator from PC board (single yellow wire). When voltage regulator is disconnected the voltage reading should increase to 14 to 20 V. DO NOT RUN OVER 2000 RPM. If it does not, the problem is in the lighting coil or wiring to lighting coil from PC board. Refer to Section 1 (Magneto Resistance Tests) for lighting coil specifications. If voltage does increase the regulator is most likely shorted and should be replaced.

Headlight and Headlight Harness Test

Before proceeding with these tests, be sure lighting coil and voltage regulator are working properly.

1. Check to see if headlight bulb filaments are good.
 - a. Disconnect headlight connector.
 - b. Connect one lead of the ohmmeter to the ground terminal of the headlight. (See Figure 3-15.)
 - c. Connect the other ohmmeter lead to the high beam terminal.
 - d. Set ohmmeter scale to ohms X 1.
 - e. If ohmmeter reads infinity or more than 2 ohms the filament is faulty.
 - f. Test the low beam in the same way by moving the ohmmeter lead from the high beam filament to the low beam.



1. High Beam
2. Low Beam
3. Ground

Figure 3-15

- g. If headlight malfunction still exists, proceed.
2. Check to see if voltage is present at 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 ski tips against a stationary object, and be sure the vehicle is properly secured, to prevent personal injury.

- b. Run engine at 2000 RPM.
- c. Set voltmeter to 25 Volts AC.
- d. Check for voltage between black and orange wire (low beam) and black and green wire (high beam). Be sure light switch is turned on and beam switch is set to proper beam, either high or low.
- e. If voltage is not present at either high or low beam, check headlight harness for good connection to P.C. board, and check for burned or shorted wires in headlight harness. If harness is good, proceed to tests for the dimmer switch and light switch. If taillights, etc. work proceed to the dimmer switch test before the light switch test.

Lighting Circuit Test

1. Disconnect light switch harness from P.C. board.
2. Connect ohmmeter between red and blue leads using ohms X 1 scale.
3. Turn key switch on.
4. Ohmmeter should read 0. If it reads infinity key switch or wiring from P.C. board to key switch could be faulty.
5. Disconnect wiring from key switch.
6. Connect ohmmeter between B and L terminals.
7. Turn key switch on.
8. Ohmmeter should read 0. If it does not key switch is faulty. If it reads 0 and the reading in step 4 was infinity, the problem is in the wiring from the P.C. board to the key switch.
9. If 0 was obtained in steps 4 and 8 above and the output from the lighting coil and voltage regulator is okay, and there are no lights, (headlights, tail, brake, etc) the problem is in the P.C. board circuitry. The board should be removed and inspected or replaced.

Dimmer Switch Test

1. Disconnect black dimmer switch from P.C. board.
2. Connect ohmmeter to brown and orange wires to dimmer switch (ohms X 1).
3. Turn dimmer switch to low, meter should read 0.
4. Turn dimmer switch to high, meter should read infinity.
5. Connect ohmmeter to brown and green wires to dimmer switch.
6. Turn dimmer switch to high, meter should read 0.
7. Turn dimmer switch to low, meter should read infinity.
8. If any of the tests in steps 3, 4, 6, or 7 were faulty, replace the dimmer switch.
9. If all above tests were okay and there is no headlight power, and the headlight circuit, lighting coil, voltage regulator, and key switch

tests were okay the problem is in the P.C. board. The board 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 socket housing.
2. Disconnect tail lamp (green) connector from P.C. board.
3. To check wiring to tail light connect ohmmeter between the brown lead and black lead (ohms X 1). Ohmmeter should read 2 - 3 ohms.
4. To check wiring to stop light, connect ohmmeter between the green and black wires in the connector (ohms X 1 scale). Ohmmeter should read 1 - 2 ohms.
5. If the readings in steps 3 and 4 read higher than specified or read infinity the problem is in the wiring to the tail stop light. Remove seat and inspect wiring to tail light. (Check bulb contacts again.)
6. If reading in step 3 was okay and the tail light, headlight, and instrument lights do not function proceed to the tests for the lighting coil, voltage regulator and key switch tests. If only the tail light does not function the problem is in the P.C. board. Remove and inspect or replace P.C. board.
7. If 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 P.C. board. Remove and inspect P.C board or replace..

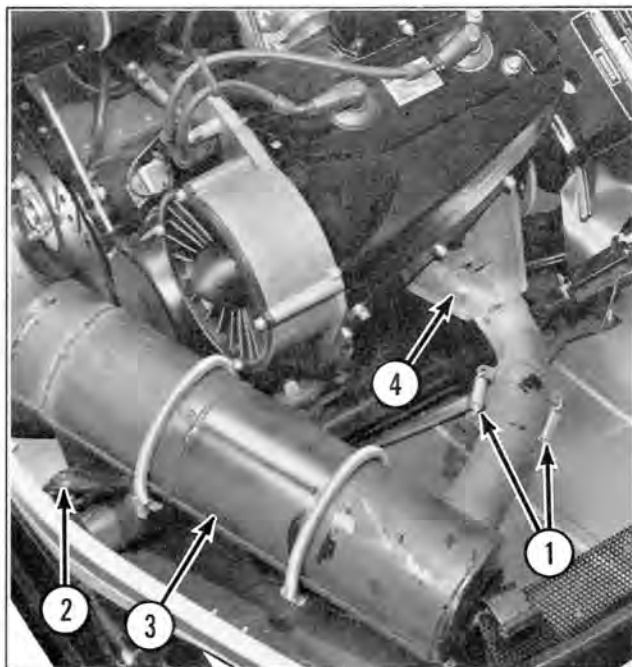
Brake Switch Test

Before proceeding with this test make sure brake lever makes good contact with brake switch.

1. Disconnect brake switch from the P.C. board.
2. Connect ohmmeter between the yellow and blue wires to the brake light switch (ohms X 1 scale).
3. The ohmmeter should read infinity (open).
4. Squeeze the brake lever. The ohmmeter should read 0.
5. If the readings in steps 3 and 4 are not obtained, replace the brake light switch.

Muffler Removal

1. Disconnect springs which secure muffler to the exhaust manifold and mounting bracket.
2. Remove the muffler from the snowmobile, carefully separating from the exhaust manifold. (See Figure 3-16.)



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

Figure 3-16.

Inspection

1. Visually check muffler assembly along welds and seams for signs of leakage. Repair any leakage by welding as required.
2. Lightly tap muffler on floor and listen for rattling or ringing inside muffler, indicating loose internal components. Replace muffler if loose internal components are suspected.
3. Inspect outlet pipe for restrictions and repair as necessary.

Installation

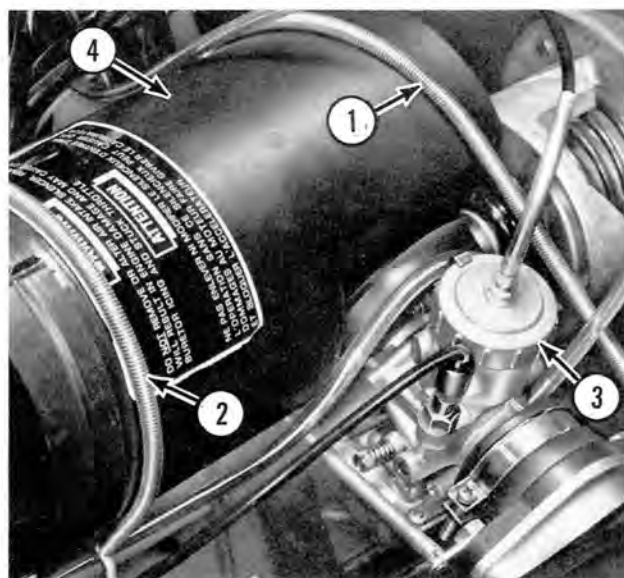
Install muffler by reversing removal procedure. Make sure muffler outlet pipe passes through exhaust boot in nose pan.

Silencer Removal

Disconnect the springs then remove air intake silencer by pulling silencer and seal from carburetor. (See Figure 3-17.)

CAUTION

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

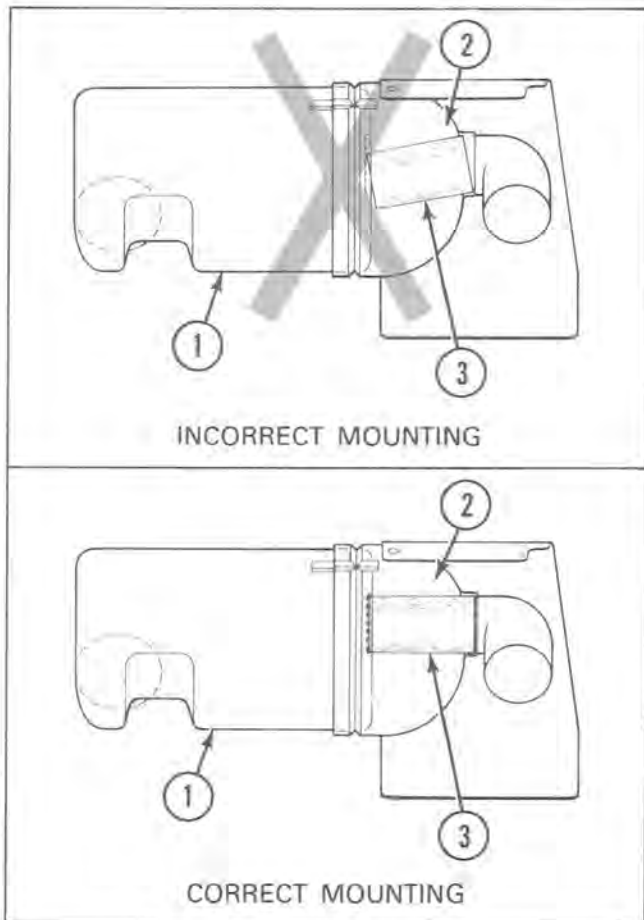


1. Spring
2. Spring
3. Carburetor
4. Air Intake Silencer

Figure 3-17

Inspection

Look through opening in elbow of intake housing to insure intake pipe is properly positioned. (See Figure 3-18.) If the pipe is not correctly positioned, it changes air flow through the air silencer assembly and carburetor, which affects fuel distribution to each cylinder. It is possible for the right hand cylinder to operate too rich while the left hand cylinder runs too lean, resulting in poor engine acceleration and possible internal engine damage.



1. Intake Silencer
2. Intake Housing
3. Intake Pipe

Figure 3-18

If required, reposition intake pipe as follows:

1. Remove intake pipe by placing seam of silencer against edge of work bench and push on both ends of housing to separate. (See Figure 3-19.)
2. Hold intake pipe correctly positioned on intake silencer housing by inserting rolled piece of paper through inside diameter of pipe and housing. (See Figure 3-20.)
3. Apply thin continuous bead of silicone sealer on intake housing. (See Figure 3-20.)

Index intake housing to intake silencer (elbow on intake housing in opposite direction from carburetor opening in intake silencer) and snap the two halves together. Be sure the raised bosses on the intake housing fall into the detents in the intake silencer. Rolled paper previously installed will properly guide pipe into intake housing during assembly. After assembly, remove rolled paper from inside intake silencer through carburetor opening.

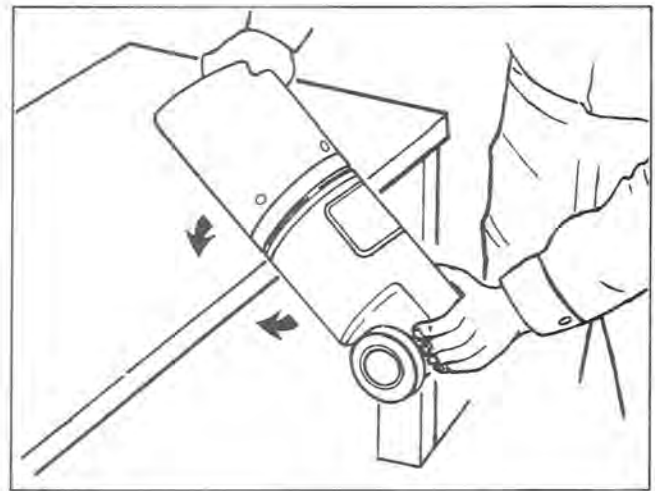
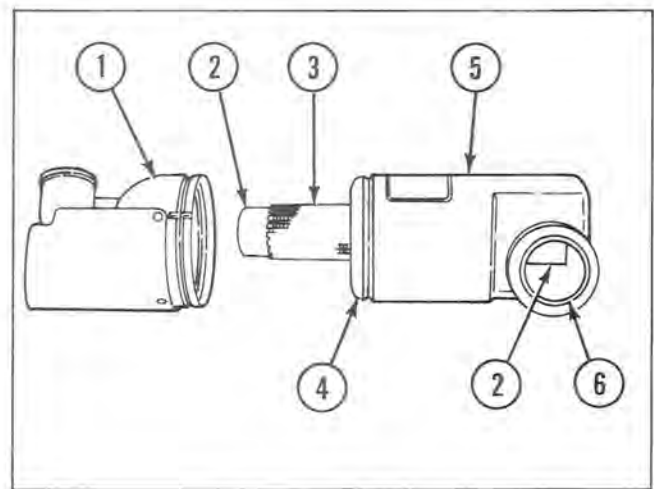


Figure 3-19



1. Intake Housing
2. Rolled Paper
3. Intake Pipe
4. Apply Sealer Here
5. Intake Silencer
6. Carburetor Opening

Figure 3-20

Installation

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

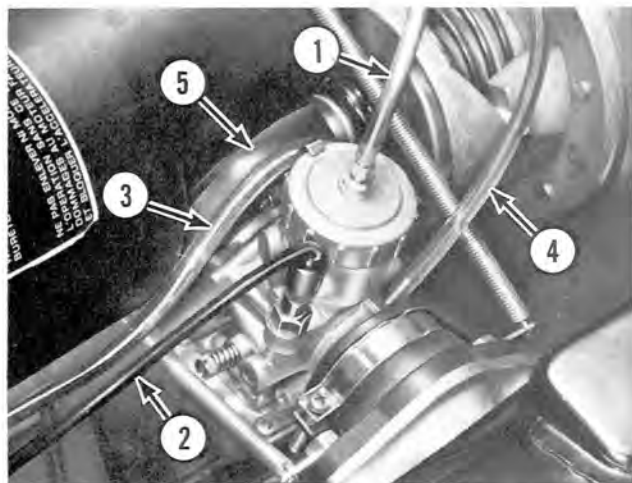
CAUTION

While installing the air intake silencer, check that rubber seal between intake silencer and carburetor is properly positioned and secure.

Install the air intake silencer by reversing the removal procedure.

Carburetor Removal

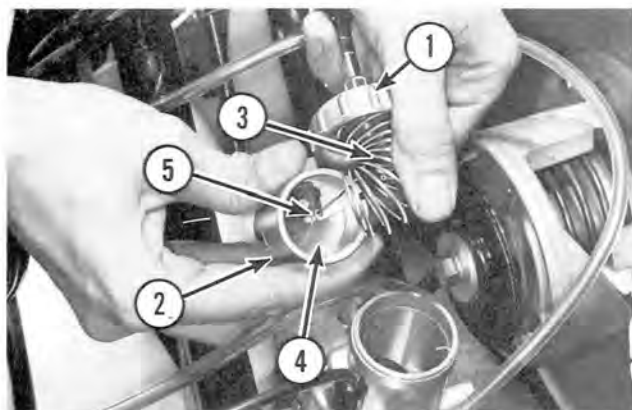
1. Remove air intake silencer.
2. Remove the carburetor fuel supply and primer tubes. Plug the fuel tube opening. (See Figure 3-21.)



1. Throttle Cable
2. Enricher Cable
3. Fuel Supply Line
4. Primer Line
5. Silencer/Carburetor Seal

Figure 3-21

3. Unscrew the mixing body top assembly and pull out the throttle valve. (See Figure 3-22.)



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

Figure 3-22

4. Compress the throttle spring and pull the spring from its seat. Slip the throttle cable through the slot in the valve. Remove the spring, spring seat plate, and jet needle from the throttle valve.
5. Unscrew the enricher plunger cap and remove the enricher plunger to release the enricher cable. Unscrew the fitting and disconnect the enricher cable. (See Figure 3-23.)
6. Loosen the screw on the carburetor holder clamp and remove the carburetor from the engine.



1. Enricher Plunger Cap
2. Enricher Cable
3. Enricher Plunger

Figure 3-23

Carburetor Disassembly (See Figure 3-24)

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 screws and separate float chamber body from the upper carburetor body. Disconnect 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.

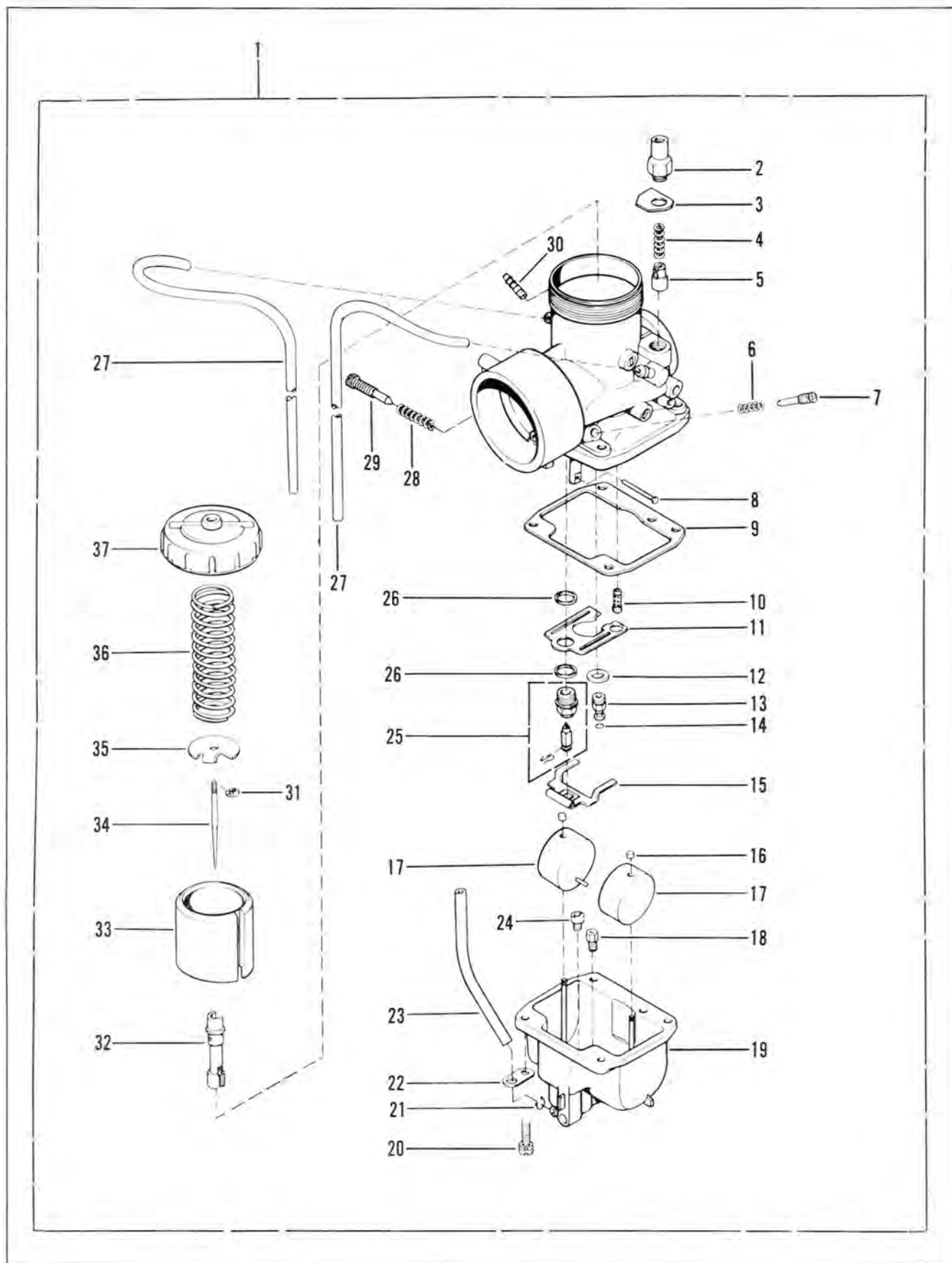


Figure 3-24

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. Econo 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. Throttle Valve
34. Needle
35. Spring Seat
36. Throttle Valve Spring
37. Mixing Chamber Cap

Figure 3-24

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 stop screw, spring, pilot air screw, spring, econo jet and main jet.

Carburetor Cleaning

Thoroughly clean all parts with a mild solvent or fuel/oil mixture. Inspect all drilled holes, openings and fuel passages in the body. Blow compressed air through the passages. Remove any sediment from the fuel bowl.

Use of carburetor cleaners may be necessary to remove gum and varnish build-up from the jets and float chamber. DO NOT USE DRILLS OR WIRES to clean the jets or damage to the jets will result.

Carburetor Reassembly (See Figure 3-24)

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

	340 MODEL	440 MODEL
a. Throttle Valve	CA 2.0	CA 2.5
b. Needle	6FL14-3	6DP10-3
c. Needle Jet	P4	P8
d. Pilot Jet	No. 25	No. 25
e. Main Jet	No. 230	No. 260
f. Econo (Power) Jet	No. 110	No. 120
g. Carburetor Body	32/143	32/142

1. Place the spring on the throttle stop screw and install in the carburetor body. Turn in the screw about 10 turns.
2. Insert the spring and pilot air adjusting screw in the carburetor body. Turn the screw all the way in then turn out 1-1/2 turns for initial adjustment.
3. Install pilot jet, econo jet, and main jet.
4. Position a new gasket, washers and baffle plate on the upper carburetor body. Install the float valve assembly. Tighten 25 to 30 in. lb (0.29 to 0.35 kg-m).

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 3-25.)



1. Adjusting Tab
2. Float Arm

Figure 3-25

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 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 econo jet tube to upper carburetor body. Secure econo jet tube to float bowl and carburetor body with clamps.

Installation Of Carburetor

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.
3. Insert the jet needle into the throttle 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 valve over the throttle cable. Insert the end of the cable through the hole in the throttle valve slot.
6. While keeping the spring compressed, release the throttle valve and install the spring seat plate. Then release the spring.
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 3-23.)
9. Place the hole in the enrichener plunger over the cable end and spring. Insert the plunger into the carburetor body and tighten the enrichener plunger cap. Bend washer plate against cap. Adjust Enrichener Cable as specified in Section 2.
10. Connect the fuel supply and primer tubes onto the proper carburetor fittings. (See Figure 3-21.)

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

CAUTION

While installing the air intake silencer, check that rubber seal between intake silencer and carburetor is properly positioned and secure.

11. Secure air silencer into position with springs.

WARNING

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

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

Troubleshooting

Carburetor related malfunctions can be identified as too rich or too lean a fuel mixture. Symptoms are as follows:

When the fuel/air mixture is too rich:

1. Engine noise is dull and intermittent.
2. The condition grows worse when the engine is hot.
3. The condition grows worse when the enrichener (choke) 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 enrichener is opened or the primer pump is operated.
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

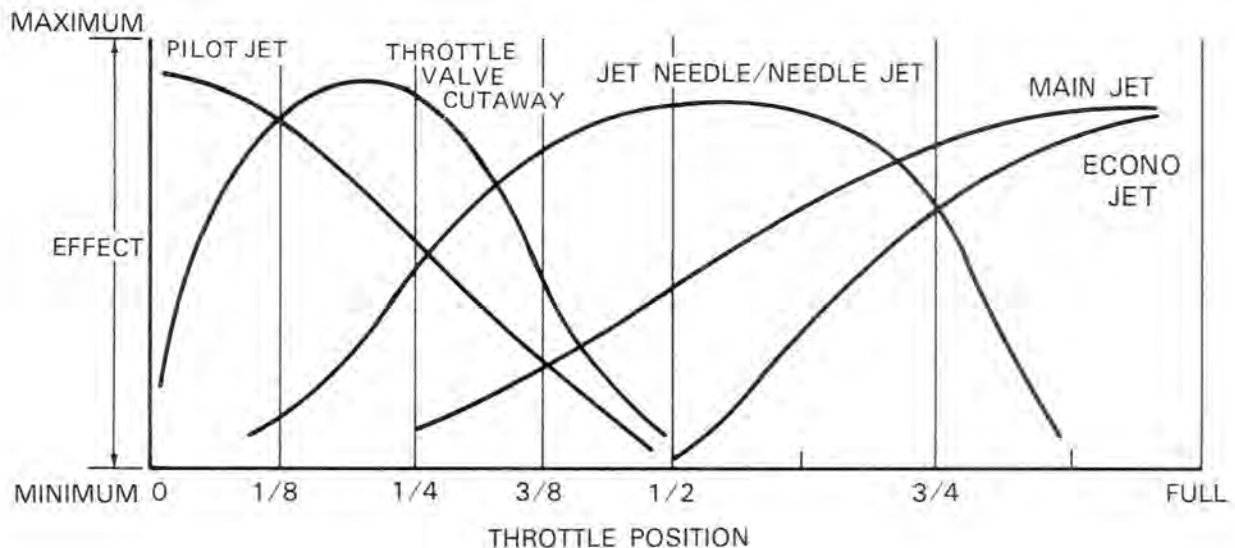


Figure 3-26

Different fuel metering components function according to the throttle setting. (See Figure 3-26.)

1. Pilot Jet - from closed throttle to one half ($1/2$) throttle opening.
2. Throttle Valve Cutaway - from closed throttle to one half ($1/2$) throttle opening.
3. Jet Needle and Needle Jet - one eighth ($1/8$) to seven eighths ($7/8$) throttle opening.
4. Main Jet - one quarter ($1/4$) to full throttle opening.
5. Econo jet - one half ($1/2$) to full throttle opening.

Tuning enables adjustment of the fuel/air mixture at any throttle setting by replacing the standard fuel metering devices with parts designed to meter more or less fuel than standard. Because a change in one fuel metering system can affect the performance of other systems, all systems should be checked whenever a change is made to one fuel metering system.

THE 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.

THE 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.

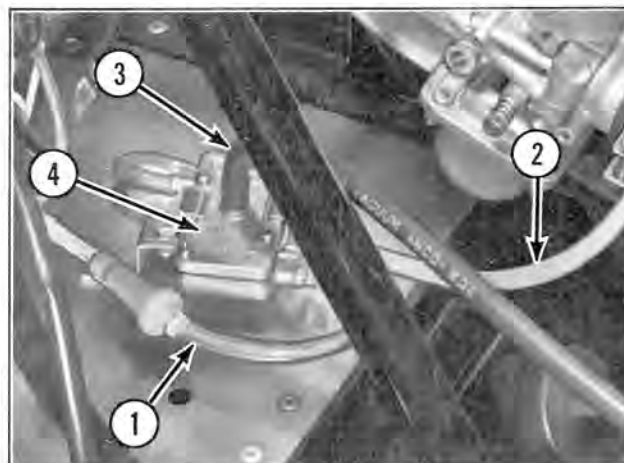
MAIN JET SYSTEM - the main jet meters all of the fuel to the main system. The main fuel system components meter fuel from 1/8 throttle to full throttle.

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.

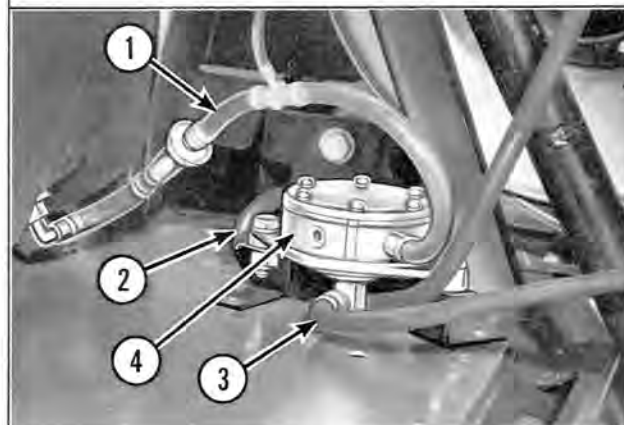
Fuel Pump Removal

1. Remove air intake silencer from carburetor.
2. Remove fuel tube from inlet of fuel pump and plug end of tube. (See Figure 3-27.)
3. Remove fuel outlet and impulse tubes from fuel pump.

4. Remove two fuel pump mounting bolts.



340 MODEL



440 MODEL

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

Figure 3-27

Disassembly

1. Remove cover retainer screws. (See Figure 3-28.)
2. Lift off body cover gasket and diaphragm. Note the position of gasket in relation to body cover.

NOTE: 440 MODEL ONLY - Once removed, grommets cannot be reinstalled. Be sure to have replacements before removing them. Remove grommets, and check valves from main body only if damaged or required for thorough cleaning.

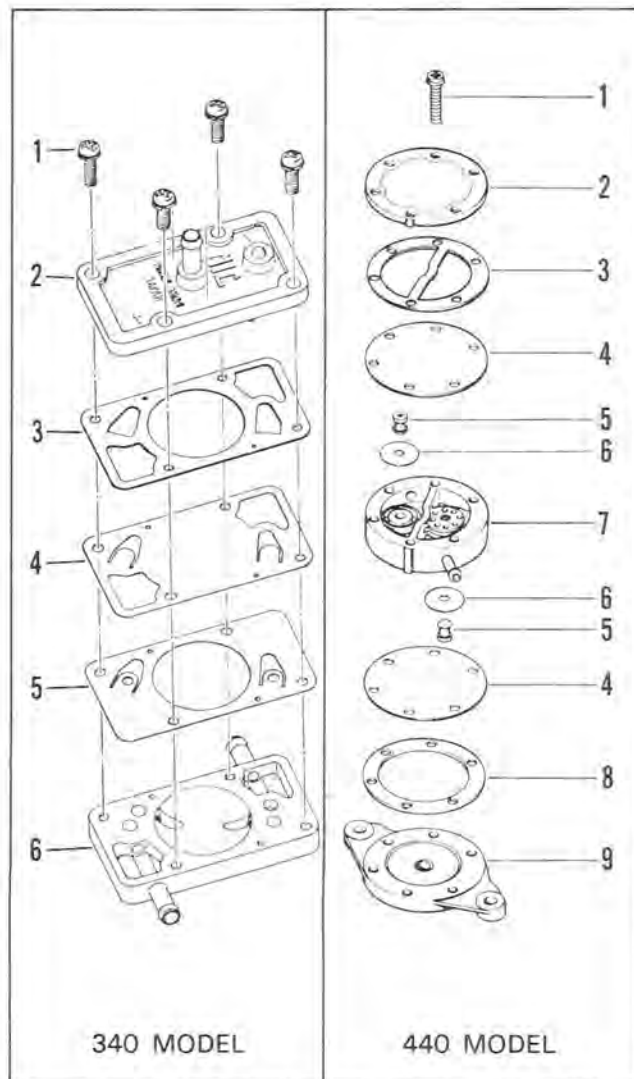
Cleaning

Clean body castings with a mild solvent.

CAUTION

Do not clean rubber diaphragms with solvent. Damage to diaphragms will occur.

Be sure fuel line and impulse tubes are clear of any obstructions and fit securely.



1. Screw/Washer
2. Body Cover
3. Gasket
4. Diaphragm
5. Membrane
6. Main Body

1. Screw
2. Body Cover
3. Gasket
4. Diaphragm
5. Grommet
6. Valve
7. Main Body
8. Gasket
9. Pump Casting

Figure 3-28

Reassembly

Reassemble fuel pump in sequence shown. (See Figure 3-28.)

NOTE: 440 MODEL ONLY - Align tabs on bodies, diaphragms, and gaskets during assembly.

Installation

1. Connect impulse tube to fitting.
2. Install fuel inlet line and outlet tubes. Arrows on top of body cover indicate direction of fuel flow.
3. Position fuel pump as shown and install two mounting bolts. (See Figure 3-27.)

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

CAUTION

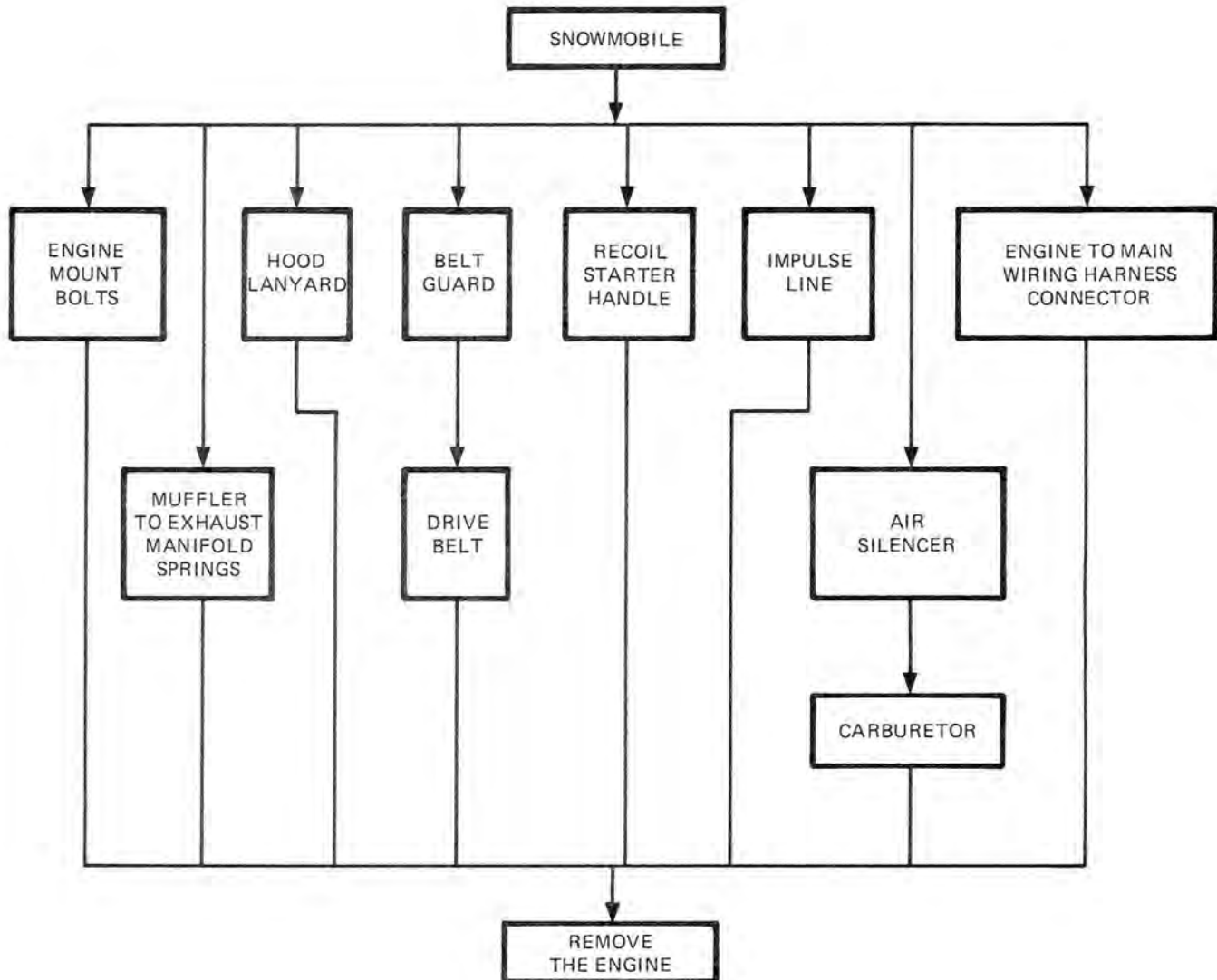
While installing the air intake silencer, check that rubber seal between intake silencer and carburetor is properly positioned and secure.

4. Secure air intake silencer to carburetor.

Engine Removal

1. Remove the hood.
2. Remove the retainer pins, drive belt guard and drive belt.
3. Disconnect the wiring harness from the engine or circuit board as required.
4. Remove starter handle from rope guide on steering mount.
5. Disconnect the fuel impulse tube from the engine as shown in Figure 3-27.
6. Remove the carburetor from the carburetor holder by loosening clamp screw and pulling from the engine. If carburetor is to be removed, refer to the Carburetor Repair instructions.
7. Using a spring puller tool, locking pliers, or a long wire hook, disconnect the two muffler mounting springs.
8. Remove the four engine mounting bolts, nuts and spacers.
9. Remove the engine from the snowmobile.

Flow Chart - Engine Removal 340 and 440 Models

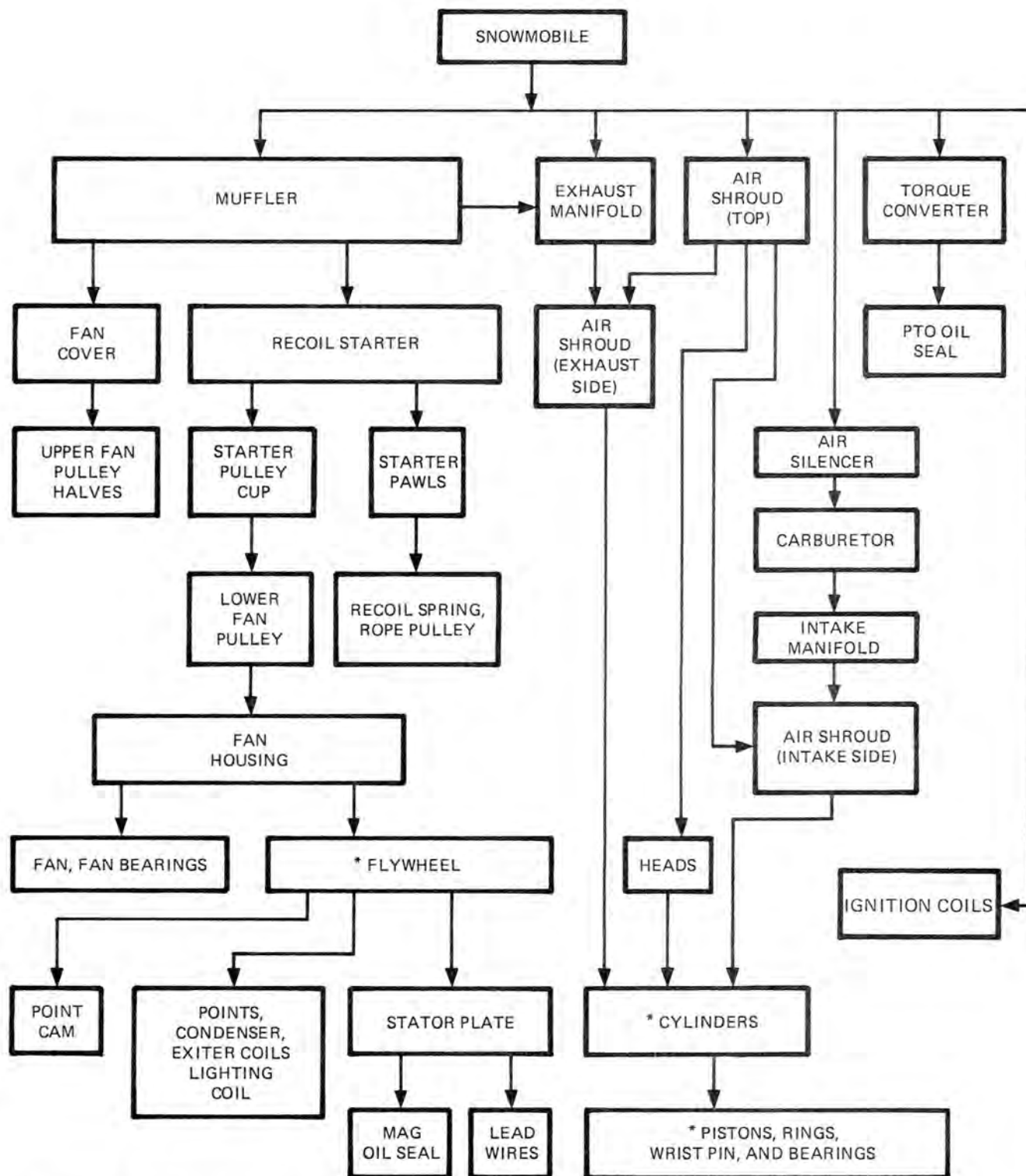


* Removal, installation, disassembly, or assembly requires use of special tool(s).

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 Installed 340 Model Only

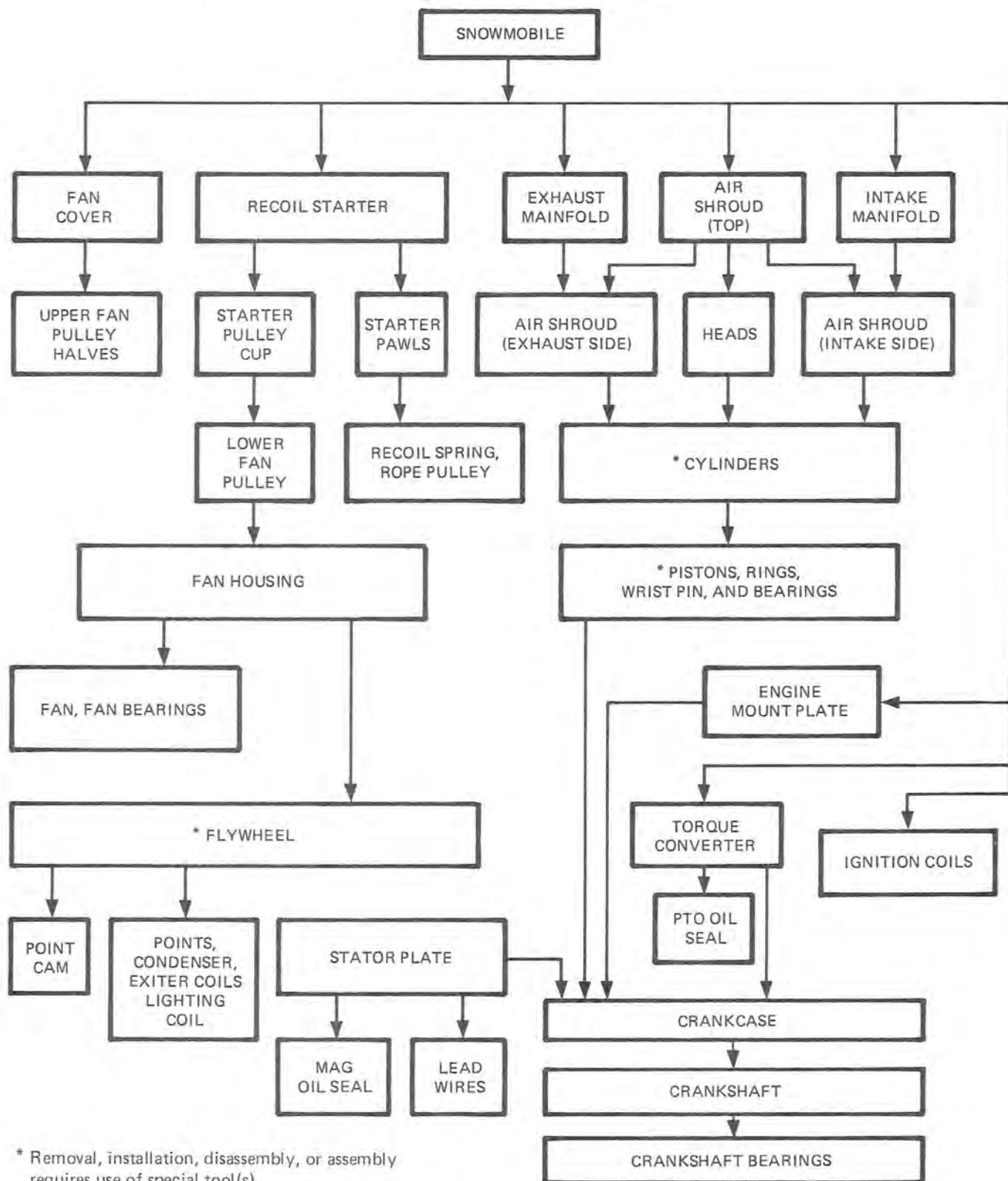


* Removal, installation, disassembly, or assembly requires use of special tool(s).

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.

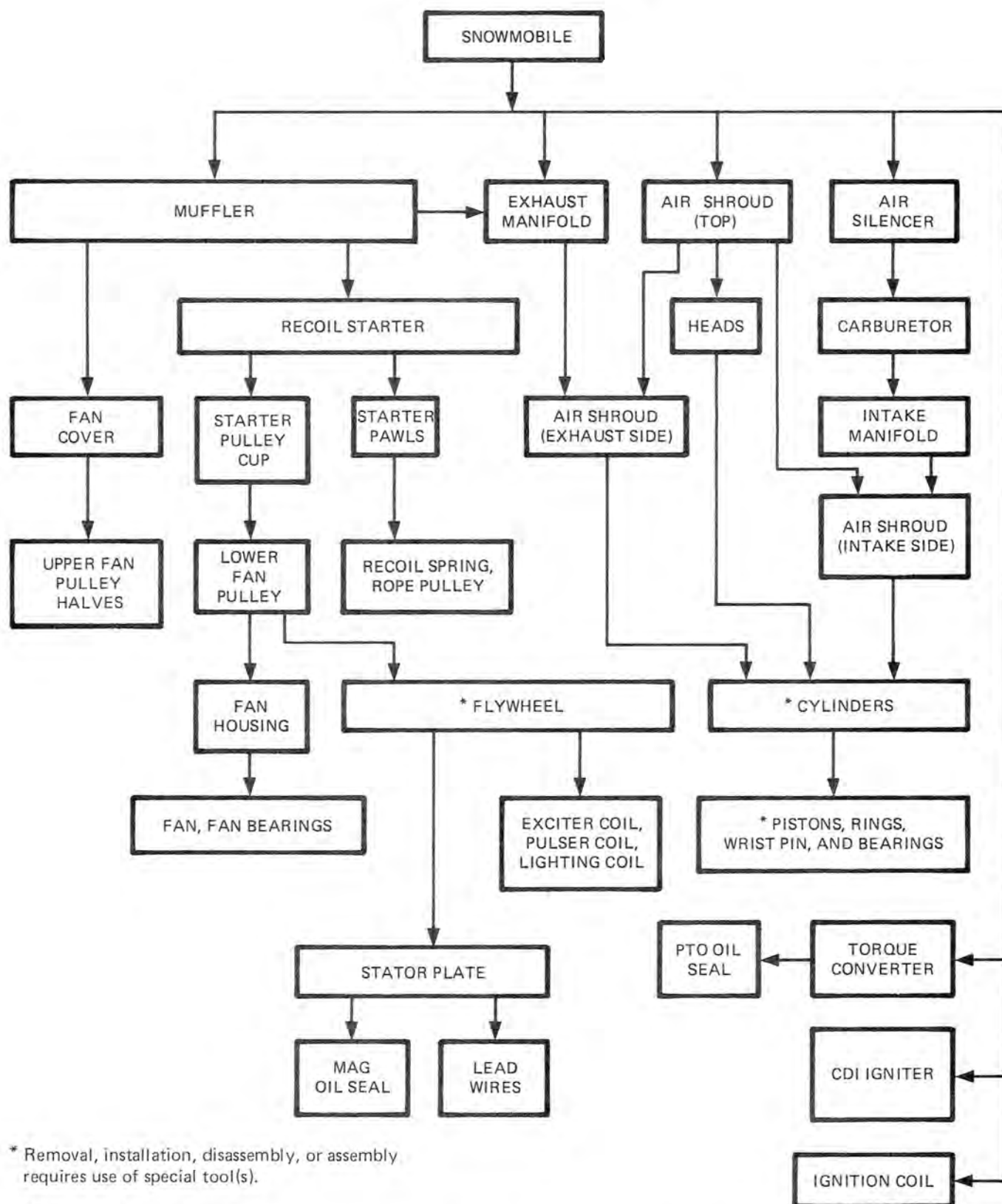
Flow Chart - Disassembly - Engine Removed 340 Model Only



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.

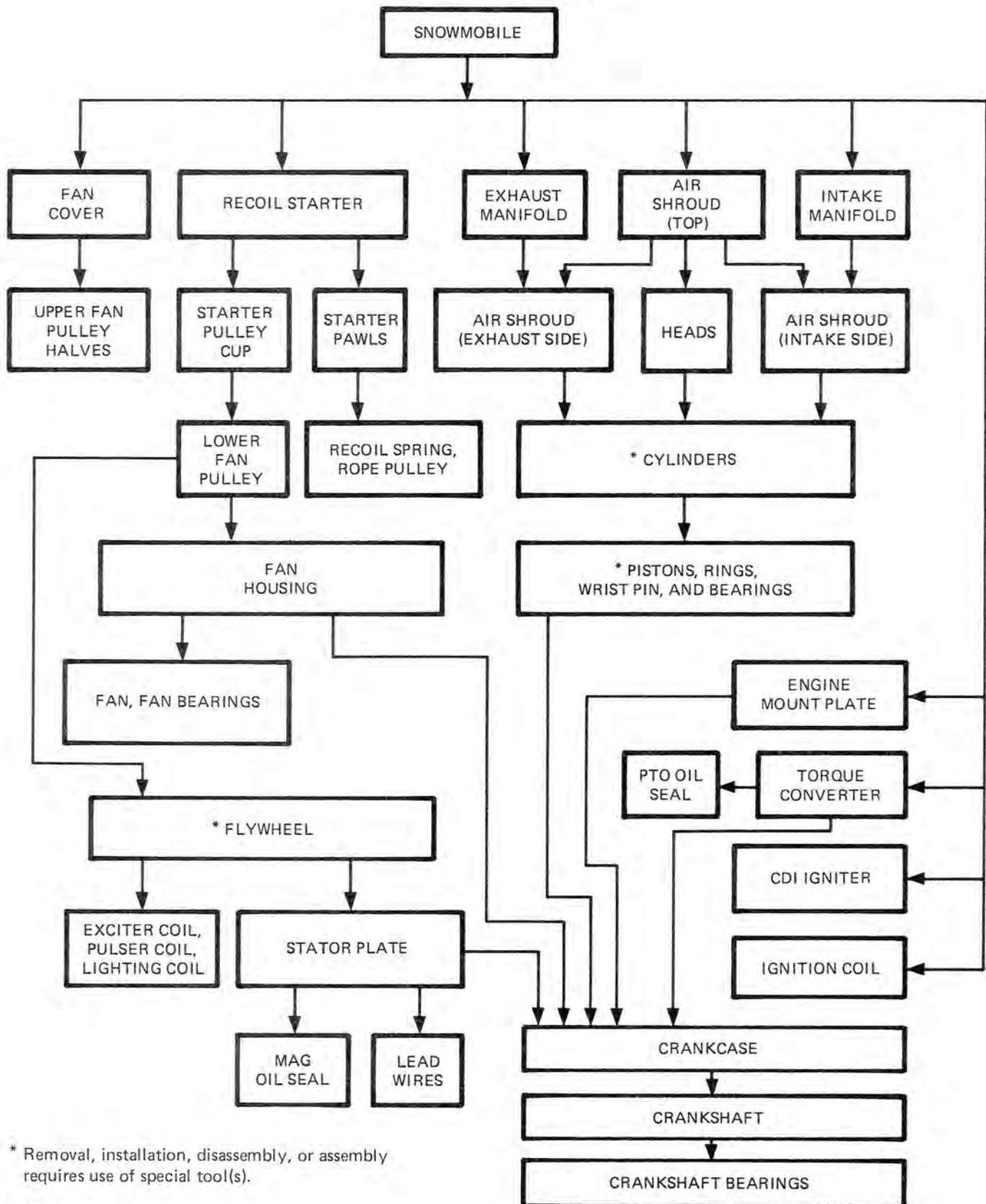
Flow Chart - Disassembly - Engine Installed 440 Model Only



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 440 Model Only



* 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.

Engine Installation

NOTE: Prior to installing engine assembly, perform Crankcase Pressure Test (refer to Section 2) to insure no air leaks are present.

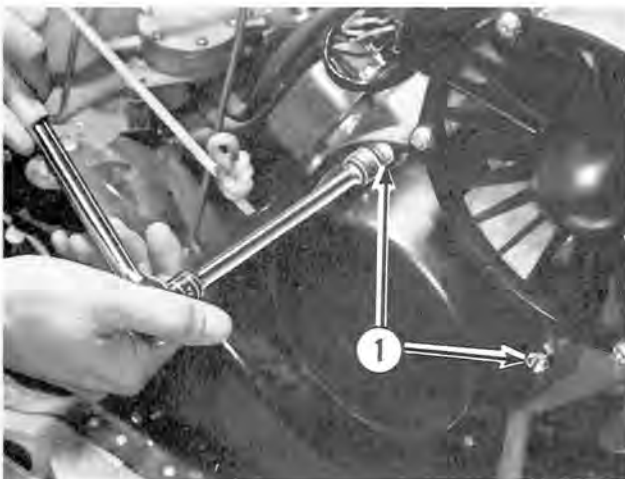
Install engine by reversing removal procedures along with the following:

- ☐ After step 8, perform Converter Alignment procedure. Refer to Section 2.
- ☐ After step 6, perform Carburetor Adjustments and Throttle Cable Adjustment. Refer to Section 2.
- ☐ After step 4, secure main wiring harness connector to engine connector. Be sure connector is clean and secure.
- ☐ After step 1, start the engine and adjust idle speed, then check all light bulbs for operation.

Starter Assembly

Removal

1. Remove muffler, then unscrew three slotted hex head bolts securing starter assembly to engine and remove starter assembly. (See Figure 3-29.)
2. Remove starter handle and tie knot in starter rope to prevent rope from suddenly retracting into the recoil case.

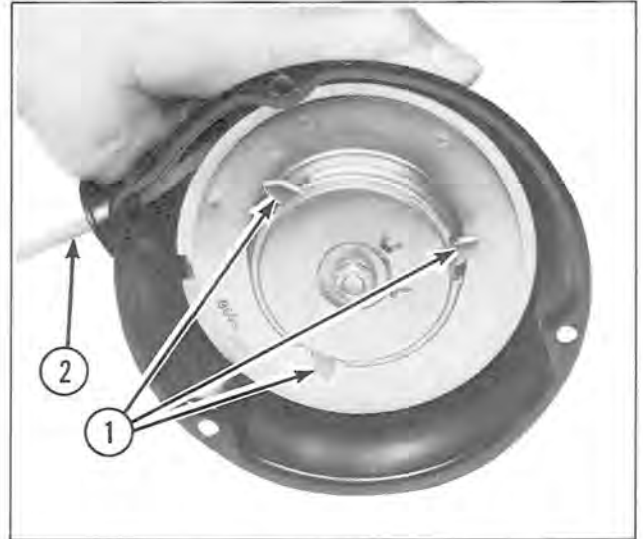


1. Slotted Hex Head Bolts

Figure 3-29

Inspection

1. Pull the starter rope out 3 to 5 in. (76.2 to 127.0 mm) and examine the starter pawls for chips or excessive wear. (See Figure 3-30.) Listen for any grinding noise which might indicate a broken or worn starter spring. Examine the starter rope for excessive wear or frayed condition.



1. Starter Pawls
2. Starter Rope

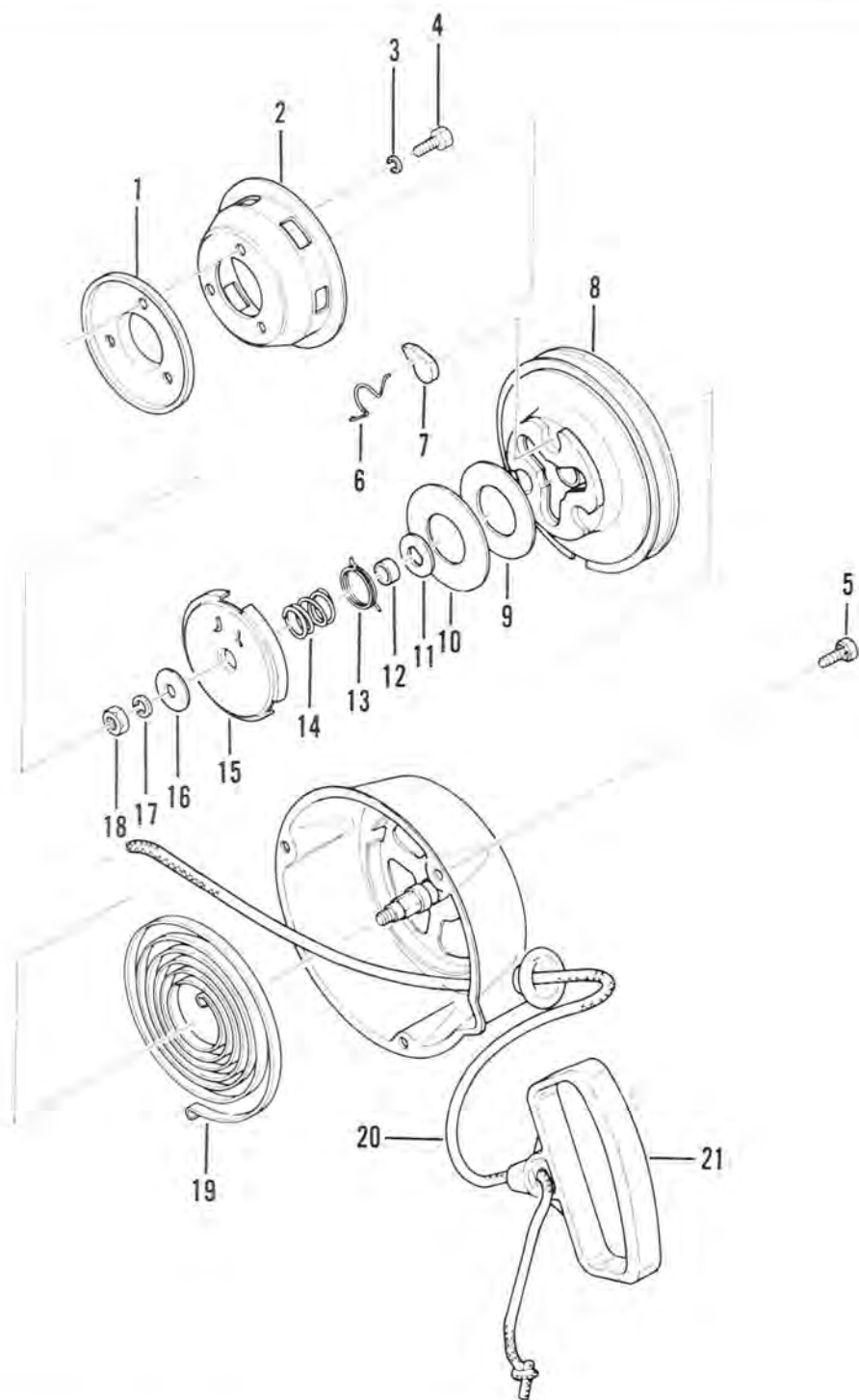
Figure 3-30

Disassembly

1. Release return spring tension by removing handle from starter rope and allow rope to retract slowly.
2. Exert slight downward pressure on friction plate, then remove securing nut and washers while slowly removing cover.
3. Remove the plate return spring, friction spring, pawl springs, pawls and thrust washer from starter assembly. (See Figure 3-31.) Check the return spring and pressure spring for breaks, rust, distorted or weakened condition.

WARNING

Exercise care when removing recoil reel from starter assembly. All spring tension should be released to prevent spring from accidentally disengaging and causing injury. Wear safety glasses when repairing starter assembly components.



- 1. Spacer Flange
- 2. Starter Pulley
- 3. Spring Washer
- 4. Bolt
- 5. Bolt
- 6. Pawl Return Spring
- 7. Pawl

- 8. Recoil Reel
- *9. Slide Plate, Small OD
- *10. Slide Plate, Large OD
- 11. Thrust Washer
- *12. Nylon Bushing
- 13. Plate Return Spring
- 14. Friction Spring

- 15. Friction Plate
- 16. Thrust Washer
- 17. Spring Washer
- 18. Nut
- 19. Return Spring
- 20. Rope
- 21. Rope Handle

*ON 440 MODEL ONLY

Figure 3-31

4. To replace starter rope, remove recoil reel from starter assembly. Untie knot and remove starter rope. Install new starter rope and tie a securing knot.
5. With recoil reel removed, examine recoil spring for cracks, crystallization or abnormal bends. Exercise care when handling recoil case to prevent recoil spring from accidentally disengaging. Spring should remain in the recoil case.
6. To remove return spring, hold starter housing approximately 2 in. (50.8 mm) above work bench with flat surface of housing towards palm of hand. Slap mounting surface of housing against bench to release spring from housing.

Reassembly

1. Thoroughly clean all parts removed prior to re-assembling starter. Reassemble components in sequence shown in Figure 3-31.
2. To install spring, insert outside spring hook into housing slot, and carefully wind spring in direction shown, while applying pressure with fingers to prevent spring from jumping out of housing. (See Figure 3-32.)

3. Apply light coat of grease to spring and housing.

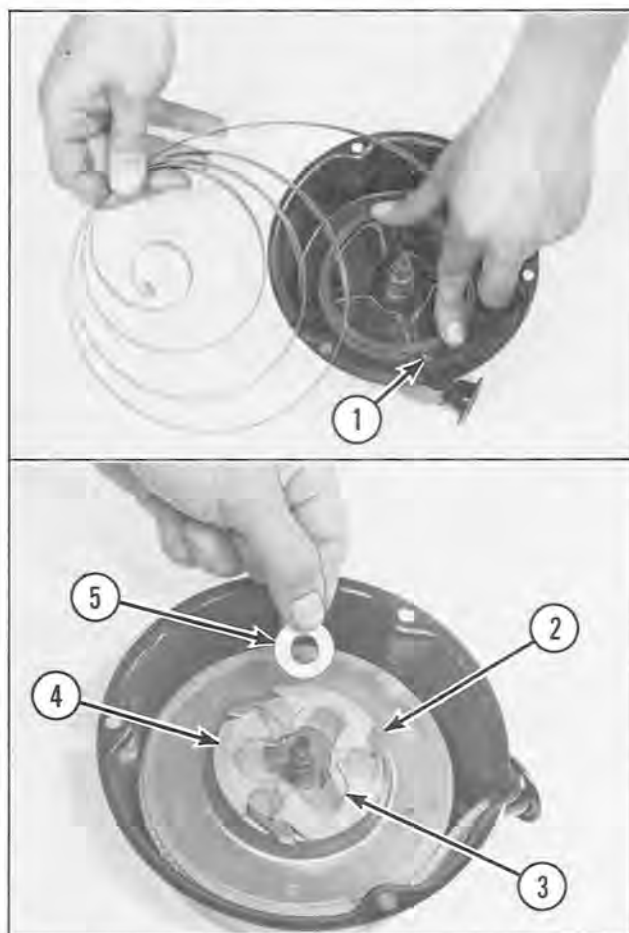
NOTE: Use extreme pressure (EP) type grease diluted 50% with Kawasaki Snowmobile oil to ensure proper operation in cold temperature.

4. With the rope installed on reel, insert reel assembly into housing. Be sure to engage reel with spring hook near center of housing.
5. Assemble starter pawls, small OD slide plate, pawl return springs and thrust washer. (See Figure 3-32.)
6. Next, position plate return spring onto large OD slide plate. (See Figure 3-33.)

7. Insert straight end of plate return spring into hole of reel. See Figure 3-33.)

NOTE: Apply grease to dimples in friction plate side of thrust washer prior to performing next step.

8. Install nylon bushing and friction spring onto stub in recoil housing, then carefully position friction plate onto reel assembly as follows:
 - a. lower friction plate only until bent end of plate return spring enters slot shown in Figure 3-33.



1. Spring Hook in Slot
2. Pawl
3. Pawl Return Spring
- *4. Small OD Slide Plate
5. Thrust Washer

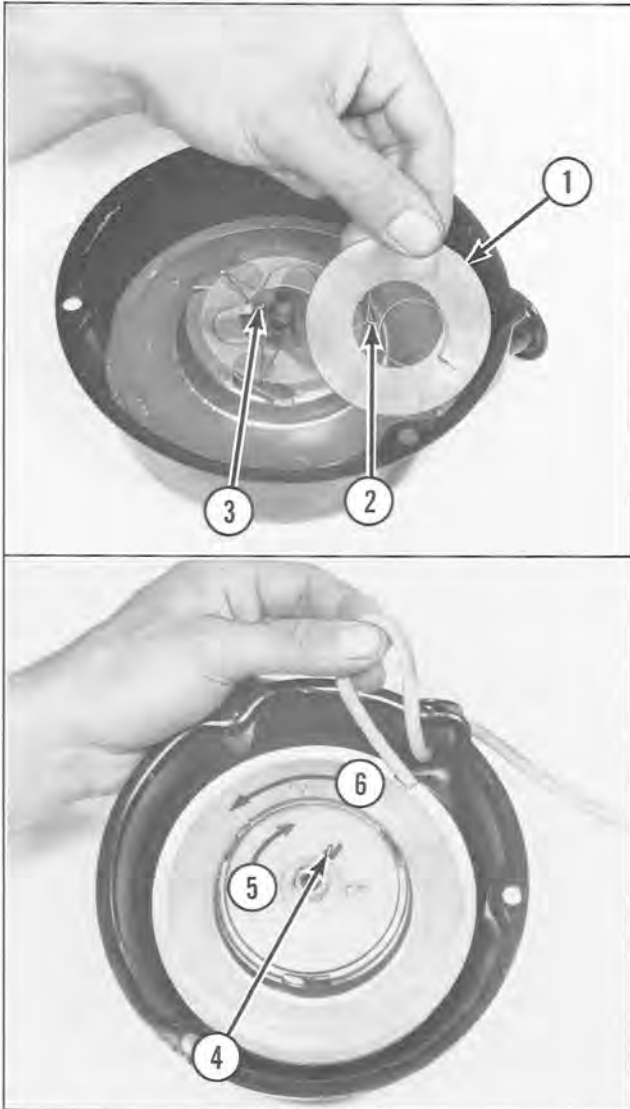
*ON 440 MODEL ONLY

Figure 3-32

- b. preload friction plate by turning plate 1/3 turn clockwise. (See Figure 3-33.)
- c. with preload applied to friction plate, lower plate completely into position (guide cut-outs in plate over end of pawls) and secure.

NOTE: After assembly check to be sure pawl return springs remained properly positioned by moving tip of pawl outward and release. If pawl does not return to disengaged position remove friction plate and repeat steps 5 thru 8.

9. Fasten handle to rope with knot, then apply preload to return spring by placing rope in notch of recoil reel and rotate reel counter-clockwise until handle retracts into housing. (See Figure 3-33.)
10. Pull starter handle and check starter assembly for proper operation.



- *1. Large OD Slide Plate
- 2. Straight End of Spring
- 3. Hole in Reel
- 4. End of Spring Through Slot
- 5. Rotate 1/3 Turn
- 6. Rotate Until Handle Meets Housing

*ON 440 MODEL ONLY

Figure 3-33

Installation

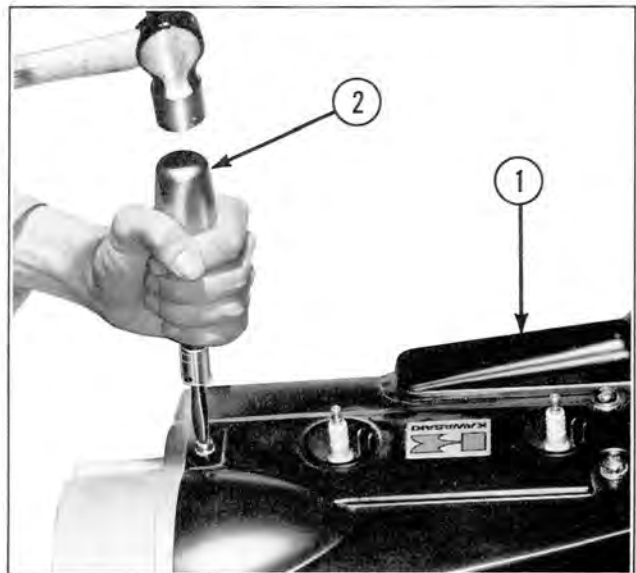
NOTE: Before bolts are tightened pull slightly on starter rope to engage pawls, then tighten bolts securely.

1. Secure starter assembly to engine using three hex head bolts.
2. Insert starter rope through guide in chassis. Pull starter a few times and observe starter operation.
3. Install muffler. Refer to Muffler Installation.

Air Shrouds

Removal

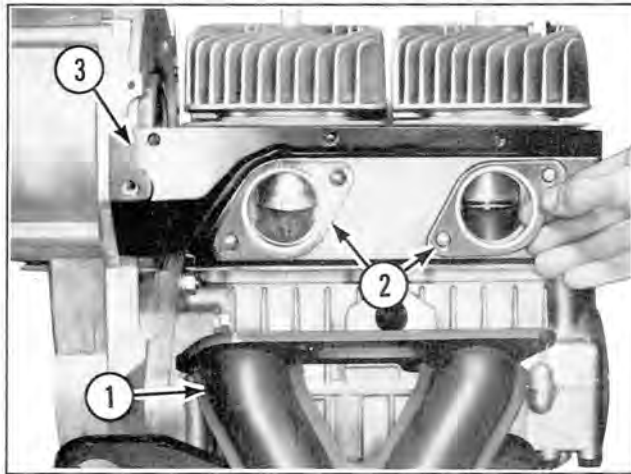
1. Using an impact driver, remove screws, and washers securing main shroud to engine. Impact driver should be used to prevent stripping the screw heads because Loctite was applied to screws during assembly. (See Figure 3-34.)



- 1. Main Engine Shroud
- 2. Impact Driver

Figure 3-34

2. Remove nuts and lockwashers securing exhaust manifold, gaskets and exhaust air shroud to engine. Discard gaskets. (See Figure 3-35.)
3. Remove bolts, and washers securing intake manifold, gaskets and intake air shroud to engine. Discard gaskets.



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

Figure 3-35

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 intake and exhaust manifolds for cracks. Check gasket surfaces and clean using a scraper.

Reassembly

1. Reassemble air shrouds, intake and exhaust manifolds to engine. Using new gaskets, assemble (2 each per cylinder) one on each side of exhaust and intake air shrouds. Secure using hardware previously removed. Torque exhaust manifold mounting nuts to 10 ft lb (1.38 kg-m) and intake manifold bolts 4 to 5 ft lb (0.55 to 0.69 kg-m).

CAUTION

If cylinders or cylinder heads have been removed intake manifold bolts must be secured before torquing nuts securing heads and cylinders.

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

2. Always use new gaskets during reassembly to ensure proper connections.

Fan Housing Removal

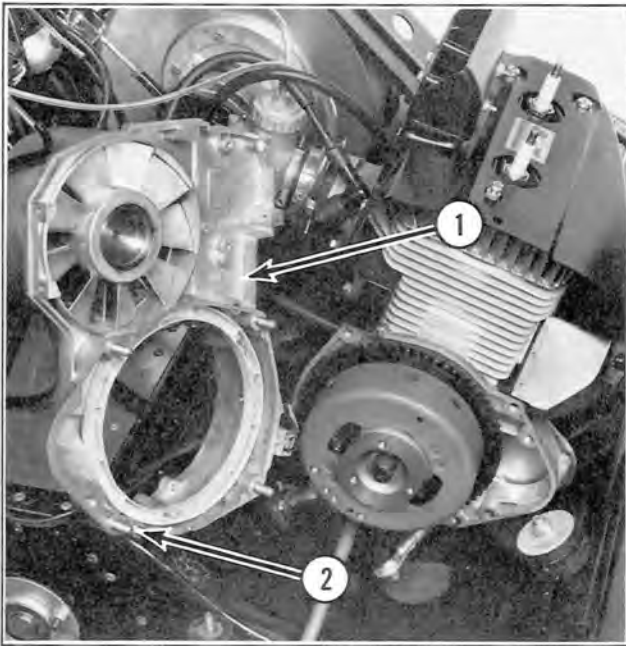
1. Disconnect springs securing muffler to exhaust manifold and mounting bracket, then remove muffler.
2. Remove manual starter. Refer to Starter Assembly Removal procedure in Section 3.
3. Unscrew bolts securing starter pulley cup and lower fan pulley to flywheel, then remove fan belt with pulley. (See Figure 3-36.)



Figure 3-36

4. Remove screws securing fan housing to intake, top, and exhaust air shrouds.
5. Disconnect stator assembly wires (lighting coil and ignition system) from connectors on fan housing.
6. Unscrew four nuts from studs securing fan housing to crankcase and slide fan housing from engine assembly. (See Figure 3-37.)

NOTE: When removing nut from stud on the lower front of the fan housing. Disconnect right side tie rod from the steering arm. Turn handlebars to the left. Insert a short (5-1/4 to 5-1/2 in. long) 13 mm twelve point box wrench, under engine from the flywheel end, and remove nut.

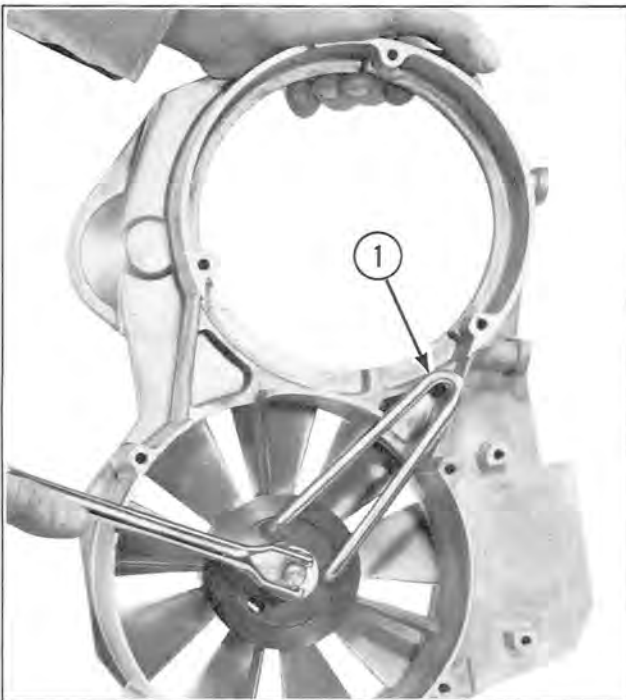


1. Fan Housing
2. Lower Front Stud

Figure 3-37

Disassembly

1. Using fan pulley holder tool No. 205208 remove nut and washer securing fan assembly to fan housing. (See Figure 3-38.)



1. Fan Pulley Holder Tool No. 205208

Figure 3-38

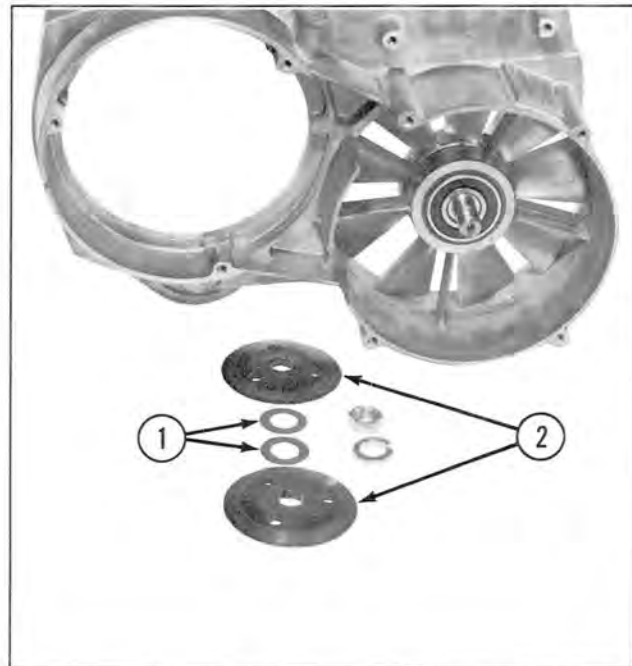
2. Remove fan pulley halves and spacers from fan shaft. (See Figure 3-39.)

NOTE: Spacers are used between the fan pulley halves to adjust fan belt tension. Using fewer spacers increases fan belt tension.

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

WARNING

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



1. Spacers
2. Pulley Halves

Figure 3-39

4. Using Tru-Arc or circlip pliers remove circlip and two spacers from fan housing. (See Figure 3-40.)

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 3-40

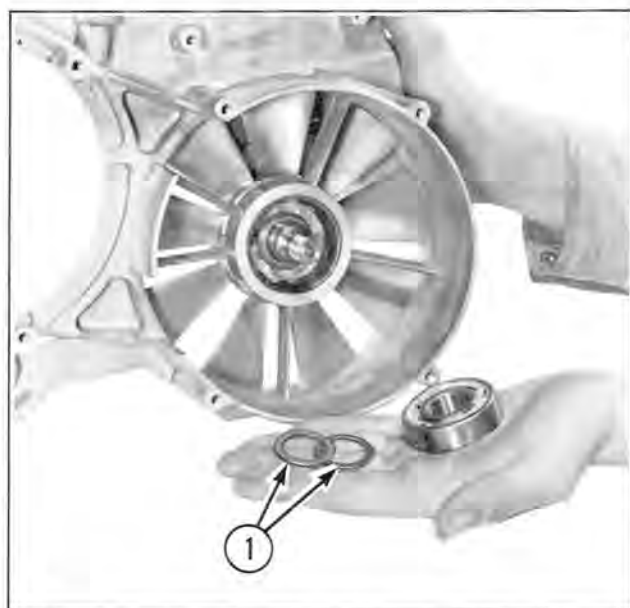
Inspection

1. Check woodruff key and keyway for damage.
2. Inspect fan housing for cracks or distortion.
3. Check bearings for discoloration and wear.
4. Check fan belt for excessive wear.
5. Check cooling fan assembly for missing or damaged blades.
6. Check threads on all mounting studs for damage.

Reassembly

1. Install Circlip in fan housing.
2. Using a heat gun or propane torch heat the aluminum fan housing and insert fan-side bearing. Insert fan shaft through bearing to serve as a pilot for spacers. (See Figure 3-41.)

NOTE: Insert two spacer washers between bearings to eliminate side loads when shaft nut is tightened.



1. Spacers

Figure 3-41

3. Insert pulley-side bearing in case. Attach pulley half to 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, turning nut only hand tight to ease removal when making any necessary adjustments to fan belt tension.

Installation

1. Install fan housing to crankcase. Secure using nuts and washers previously removed. Tighten nuts securely. (See Figure 3-37.)

NOTE: If removed for removing fan housing, reconnect tie rod end. Be sure the rod end spacer is properly positioned between the tie rod end and steering arm. Torque the nut to 35 ft lb (4,84 kg-m).

2. Connect stator assembly wire to connectors on fan housing. Be sure connections are clean, secure, and wire colors match on each half of connector. (See Figure 3-42.)

WARNING

When reconnecting the wiring harness, be sure the main wiring harness connector is fully engaged to the engine wiring harness connector to prevent separation during engine operation.

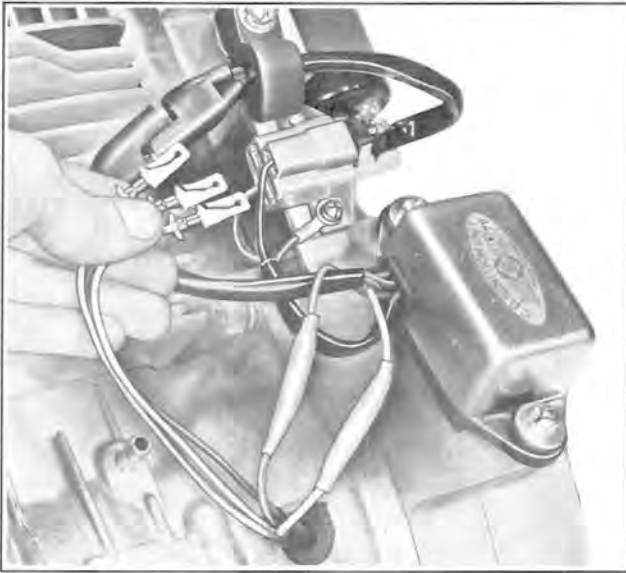


Figure 3-42

3. Install screws to secure fan housing to intake, top, and exhaust air shrouds.

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

4. Install fan belt, fan drive pulley and starter cup to flywheel. Secure using three bolts and lock washers. Tighten bolts evenly to prevent distortion of pulleys. (See Figure 3-36.)

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

5. Check fan belt tension. Refer to Fan Belt Tension procedure in Section 2.
6. After fan belt tension is correct, install manual starter and muffler.

Stator Assembly

Removal

1. Disconnect springs securing muffler to exhaust manifold and mounting bracket, then remove muffler.
2. Remove manual starter. Refer to Starter Assembly Removal procedure in Section 3.
3. Unscrew flywheel retaining nut from the crankshaft. Use a long rod or a large screwdriver in the starter pulley to hold the crankshaft from turning. (See Figure 3-43.)
4. Unscrew bolts securing starter pulley cup and lower fan pulley to flywheel, then remove fan belt with pulley. (See Figure 3-36.)

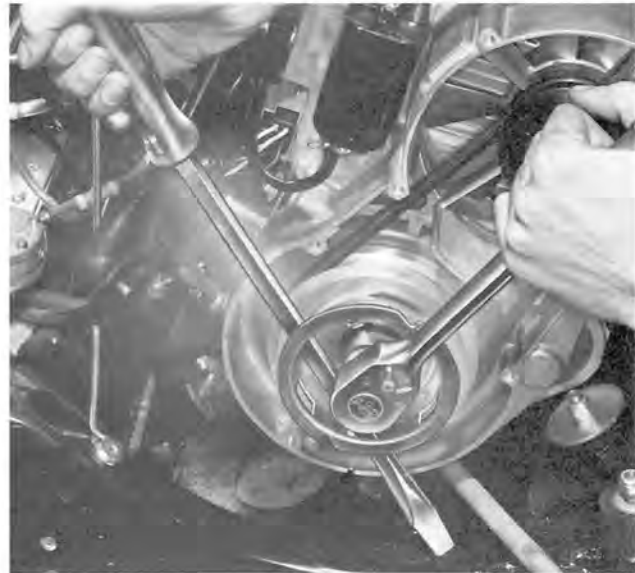


Figure 3-43

NOTE: On 340 model only - fan housing must be removed to permit flywheel removal. Refer to Fan Housing Removal procedure, Section 3. Flywheel ring gear is not used on 440 model, therefore flywheel can be removed with fan housing installed on engine. (See Figure 3-44.)

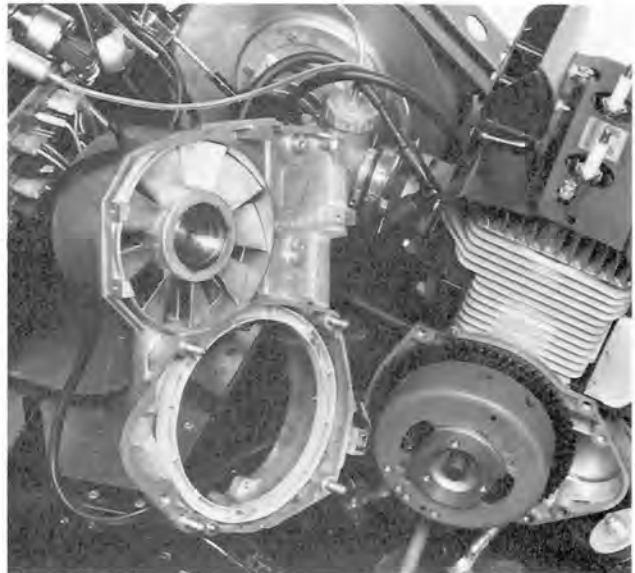


Figure 3-44

5. Bolt the flywheel puller (special tool P/N 57001-3509) to the flywheel with the three flywheel puller bolts (P/N 110P0620). Pull the flywheel and remove the puller, then examine flywheel keyway for damage. (See Figure 3-45.)

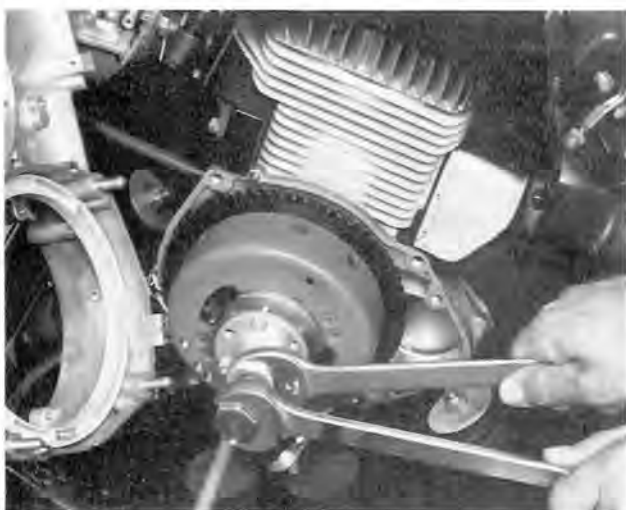
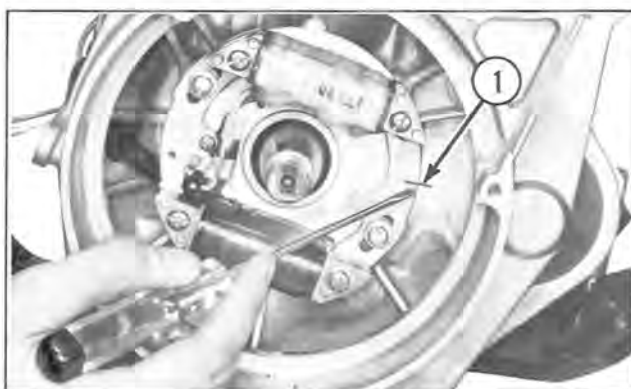


Figure 3-45

6. Prior to removing the stator assembly, scribe an aligning mark from the stator plate to the crankcase. (See Figure 3-46.) Upon reassembly, the stator plate may be installed with the scribe marks aligned and ignition timing returned to its original setting.
7. Disconnect stator assembly wires (lighting coil and ignition system) from connectors on fan housing.
8. Remove the two screws and washers securing the stator plate to the crankcase and remove the stator assembly. Remove the stator harness and wires from the rubber grommet.



1. Aligning Mark

Figure 3-46

Disassembly

Refer to Figure 3-47 for stator disassembly sequence.

Inspection

1. Inspect all lead wires for cracks or frayed condition.
2. Check magnets in flywheel assembly. Thoroughly clean magnet area to remove any metal filings or particles that magnets may have attracted.
3. Check woodruff key and keyway for damage.
4. Check breaker points for pitting or excessive wear. Clean point contacts using bias tape (ON 340 MODEL ONLY.)

Reassembly

1. Reassemble all components to stator assembly in sequence shown in Figure 3-47.
2. Be sure wires are properly routed to prevent pinched condition during installation, or rubbing during engine operation.

Installation

1. Insert electrical leads through grommet in crankcase and reinstall stator assembly to crankcase. Align mark made during disassembly. Secure stator assembly using two screws and washers previously removed. (See Figure 3-46.)
2. Install fan drive pulley and starter cup to flywheel. Secure using three bolts and lock-washers. Tighten bolts evenly to prevent distortion of pulleys.

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

3. Clean tapered surfaces of flywheel and crankshaft to remove oil and dirt. Surfaces must be clean and dry. Install flywheel on crankshaft and torque nut to 60 ft lb (8.3 kg-m).

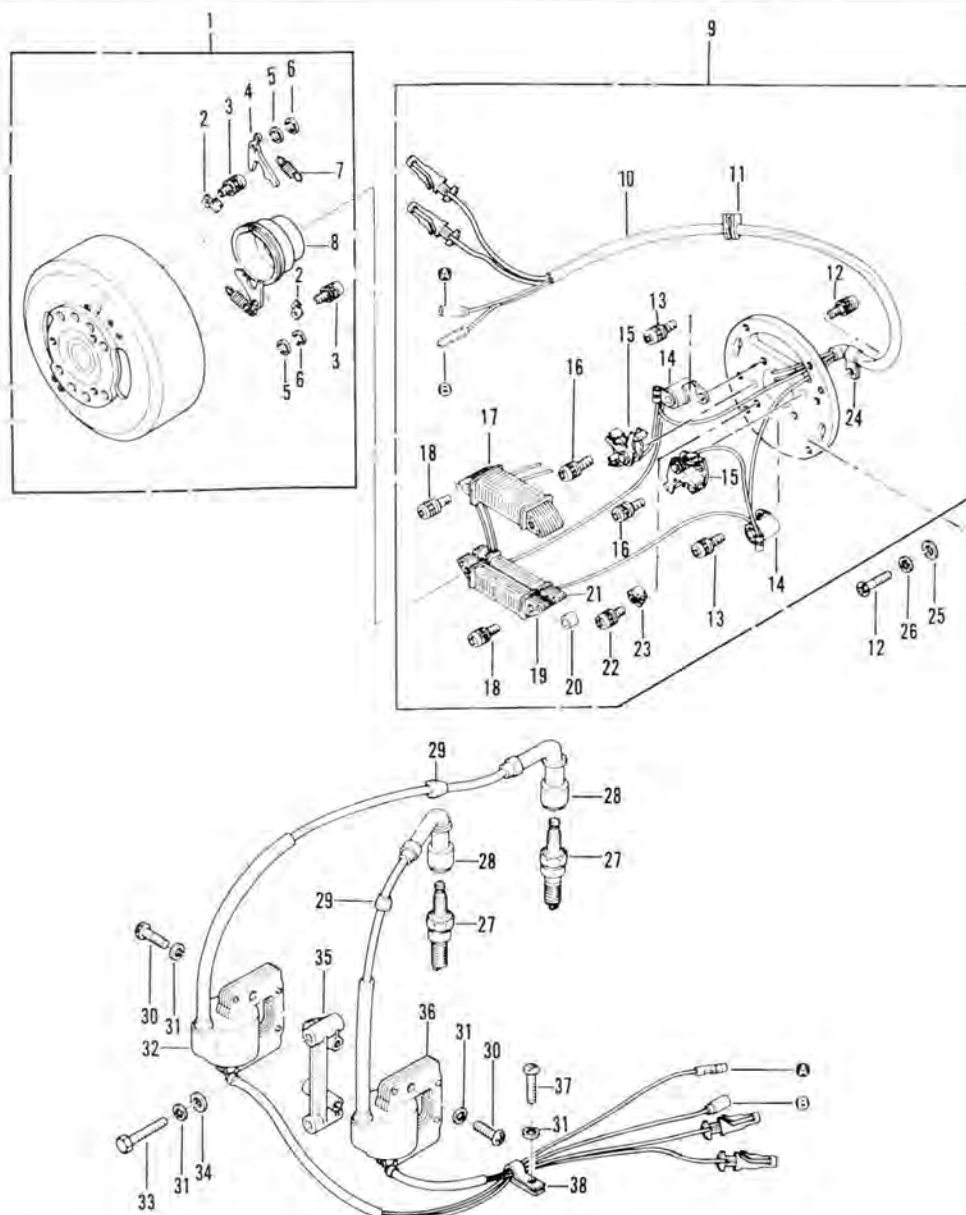
NOTE: ON 340 MODEL ONLY - install fan housing assembly. Refer to Fan Housing Installation procedure in Section 3.

4. Connect stator assembly wires to connectors on fan housing. Be sure connections are clean, secure, and wire colors match on each half of connector. (See Figure 3-42.)

WARNING

When reconnecting the wiring harness, be sure the main wiring harness connector is fully engaged to the engine wiring harness connector to prevent separation during engine operation.

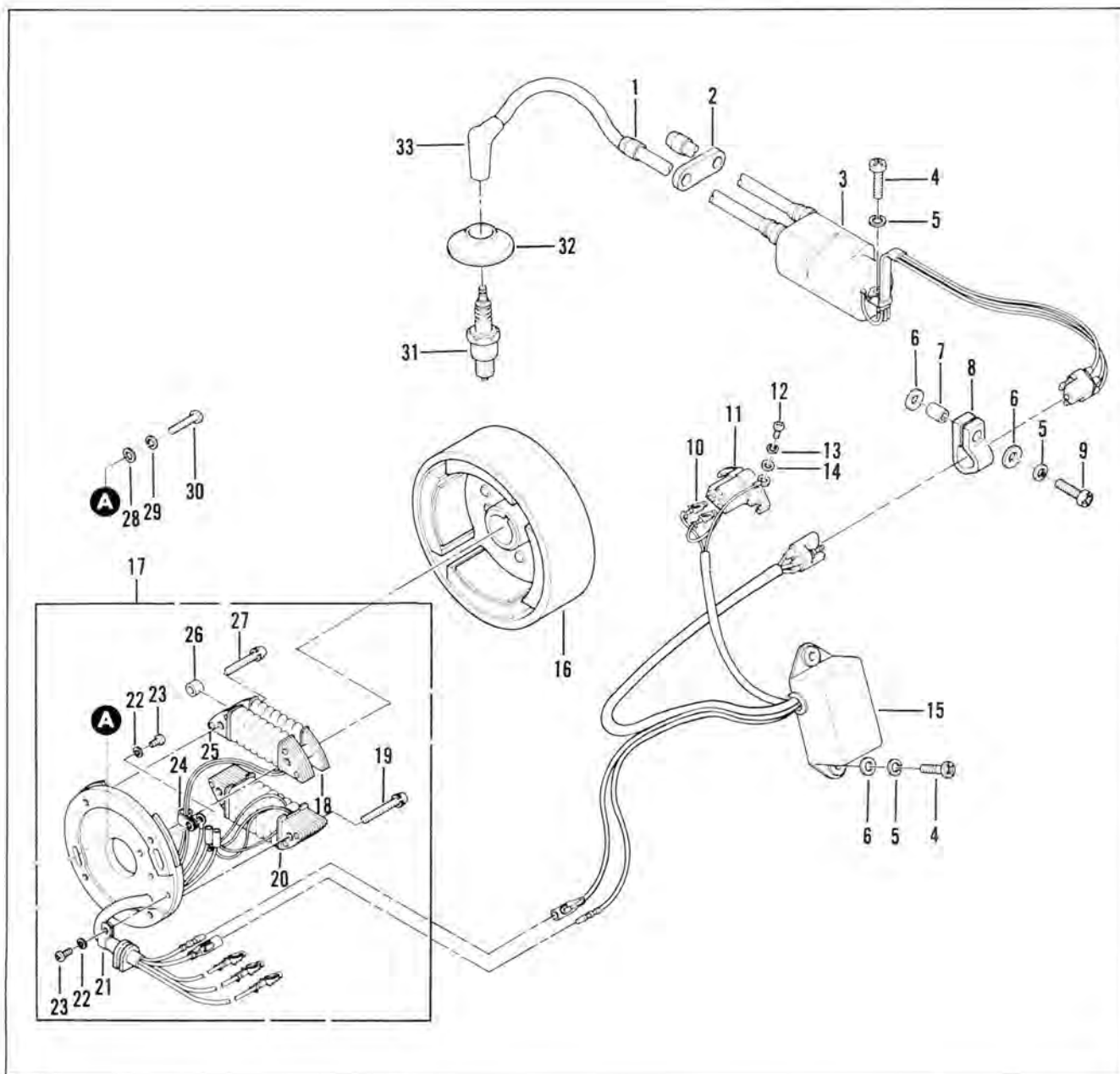
5. Install fan belt and check belt tension. Refer to Fan Belt Tension procedure in Section 2.
6. Perform Ignition Timing Check. Refer to Section 2. Start engine using emergency starter rope.
7. After ignition timing is correct, install manual starter and muffler.



- | | | |
|----------------------|--------------------------|---------------------------|
| 1. Flywheel Assembly | 14. Condenser | 27. Spark Plug |
| 2. Cam Holder | 15. Breaker Contact | 28. Cap |
| 3. Screw | 16. Screw | 29. Grommet |
| 4. Advance Weight | 17. Lighting Coil | 30. Screw |
| 5. Washer | 18. Screw | 31. Washer |
| 6. E Ring | 19. Exciter Coil (No. 1) | 32. Ignition Coil (No. 1) |
| 7. Advance Spring | 20. Collar | 33. Bolt |
| 8. Cam | 21. Exciter Coil (No. 2) | 34. Washer |
| 9. Stator Assembly | 22. Screw | 35. Bracket |
| 10. Wiring Harness | 23. Cam Felt | 36. Ignition Coil (No. 2) |
| 11. Grommet | 24. Clamp | 37. Screw |
| 12. Screw | 25. Washer | 38. Clamp |
| 13. Screw | 26. Washer | |

STATOR ASSEMBLY - 340 MODEL ONLY

Figure 3-47A



- | | | |
|------------------------|---------------------|--------------------|
| 1. Grommet | 12. Screw | 23. Screw |
| 2. Grommet Wire Spacer | 13. Washer | 24. Clamp |
| 3. Ignition Coil | 14. Washer | 25. Exciter Coil |
| 4. Screw | 15. CDI Igniter | 26. Collar |
| 5. Washer | 16. Flywheel | 27. Screw |
| 6. Washer | 17. Stator Assembly | 28. Washer |
| 7. Collar | 18. Pulser Coil | 29. Washer |
| 8. Clamp | 19. Screw | 30. Screw |
| 9. Screw | 20. Lighting Coil | 31. Spark Plug |
| 10. Terminal | 21. Clamp | 32. Plug Cap Boot |
| 11. Connector | 22. Washer | 33. Spark Plug Cap |

STATOR ASSEMBLY - 440 MODEL ONLY

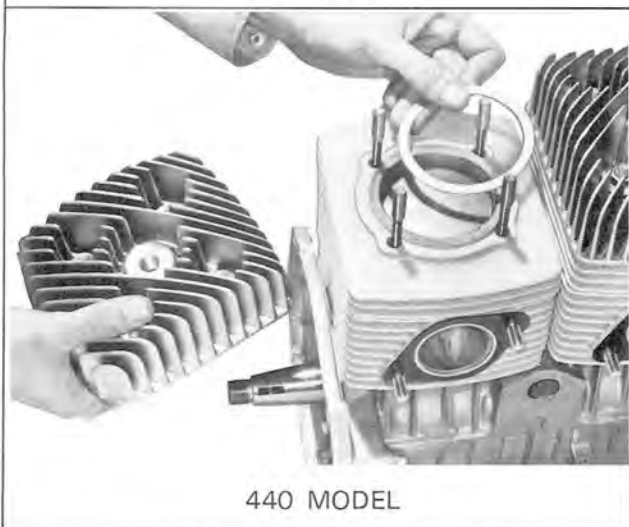
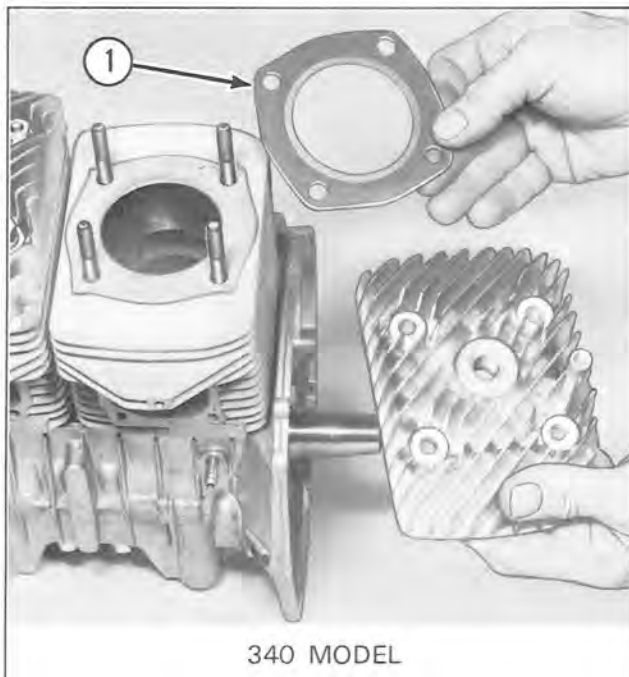
Figure 3-47B

Cylinder Heads, Cylinders And Pistons

Cylinder Heads

REMOVAL

1. Remove spark plugs. Mark heads, cylinders, and crankcase for reference in reassembly.
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 3-48.)



1. Head Gasket

Figure 3-48

INSPECTION

1. Remove excessive carbon from inside cylinder head using a nonferrous carbon scraper, or cylinder head brush.
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 placing No. 400 sandpaper on a surface plate and rubbing head in a circular motion on the sandpaper to remove high spots.

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

Cylinders

REMOVAL

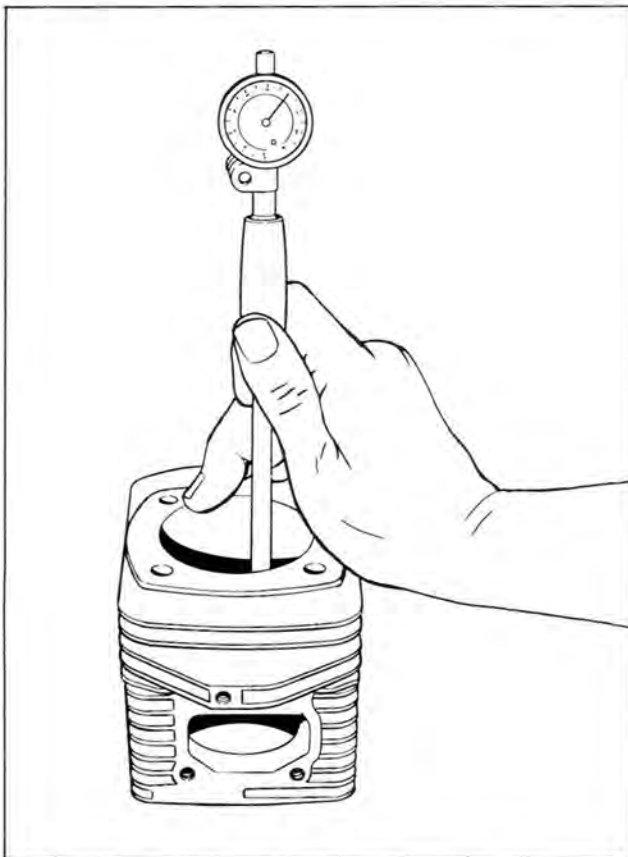
1. Gently tap cylinder with a soft mallet to release seal.
2. Carefully remove cylinders from crankcase studs. Hold piston during cylinder removal to prevent piston from suddenly contacting studs or crankcase. (See Figure 3-49.)
3. Remove and discard cylinder base gaskets.



Figure 3-49

INSPECTION

1. Check the cylinder for damaged or broken fins.
2. Thoroughly clean all carbon deposits from exhaust ports and cylinder walls.
3. Check cylinder wall for excessive scoring.
4. Using an inside micrometer check cylinder bore for out-of-round or taper condition. (See Figure 3-50.)
5. Using an inside micrometer check the cylinder bore for wear. If the cylinder diameter exceeds the dimension shown under Service limit in Figure 3-50, replace the cylinder.



CYLINDER BORE DIAMETER

MODEL	STANDARD (NEW)	SERVICE LIMIT (USED)
SB440	2.6774 - 2.6781 in. (68.005 - 68.023 mm)	2.681 in. (68.10 mm)
SA340	2.3624 - 2.3632 in. (60.005 - 60.025 mm)	2.366 in. (60.10 mm)

Figure 3-50

6. Examine the cylinder wall for excessive wear, scoring or deep lines, and replace cylinder if necessary. The cylinders in this engine are aluminum with chrome plated bores. They cannot be honed or rebored.

NOTE: To check for out of round of the cylinder bore move the micrometer in a circular direction, 90° at a time. The difference in measurements obtained should not exceed 0.002 in. (0.05 mm).

NOTE: To check for taper of the cylinder bore, move the micrometer from the top to the bottom of the cylinder. The difference in the measurements obtained (between top and bottom) should not exceed 0.002 in. (0.05 mm).

Pistons

REMOVAL

1. Seal crankcase with clean shop rag and using a sharp steel pointer remove piston circlips. Discard circlips. (See Figure 3-51.)

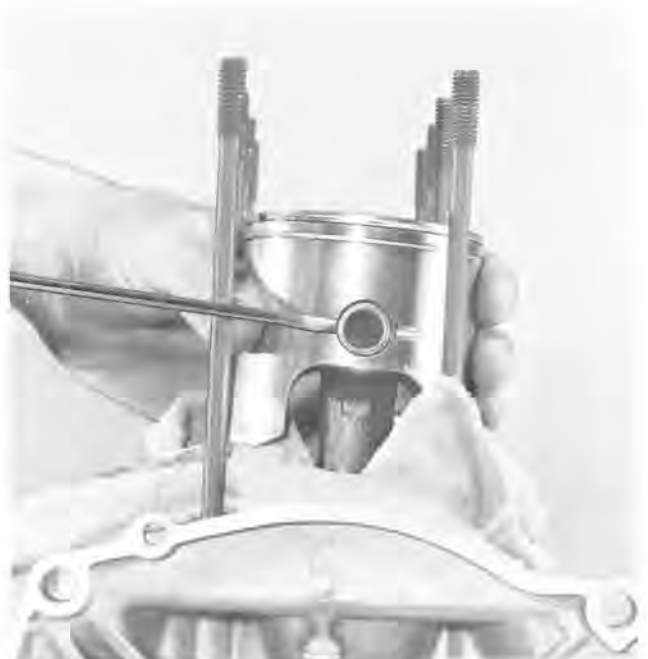
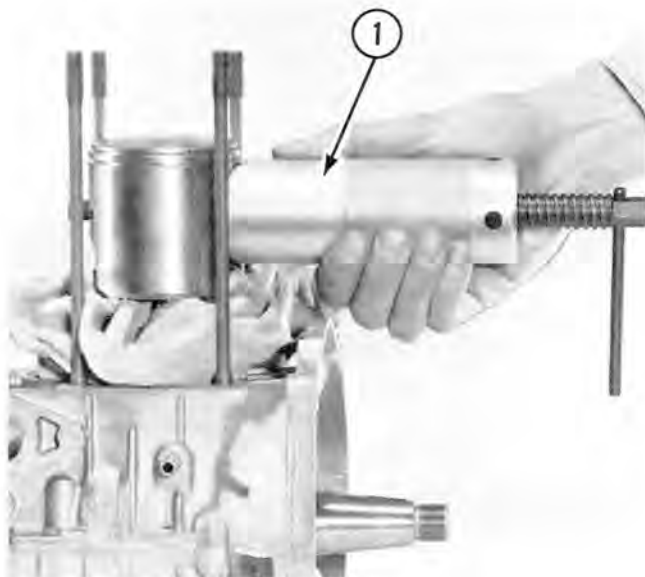


Figure 3-51

- Using piston pin puller tool No. T57001-910 remove piston pins from pistons and remove piston from connecting rod. (See Figure 3-52.)

NOTE: Keep piston pin bearings together as a set and mark pistons left and right to assure correct reassembly.



1. Piston Pin Puller Tool No. T57001-910

Figure 3-52



PISTON SKIRT DIAMETER

MODEL	STANDARD (NEW)	SERVICE LIMIT (USED)
SB440	2.6744 - 2.6752 in. (67.929 - 67.950 mm)	2.670 in. (67.82 mm)
SA340	2.3607 - 2.3614 in. (59.961 - 59.980 mm)	2.355 in. (59.82 mm)

Figure 3-53

- Using a ring expander tool remove rings from piston.

NOTE: Do not interchange rings between pistons.

INSPECTION

- Remove all carbon from piston dome, ring grooves and piston skirt.

NOTE: If piston dome or skirt is scored or pitted from overheating, replace piston and piston rings.

- Using a micrometer measure the outside diameter of each piston at right angle to piston pin hole and 3/16 in. (4.76 mm) from bottom. (See Figure 3-53.)

Should the measured piston skirt diameter be less than the service limit specified in the above table, replace the piston. Measure the skirt diameter of the new piston to be used, and subtract the figure obtained from the measured cylinder bore diameter. Piston skirt-to-cylinder wall clearance must be between:

SB440 MODEL - 0.002 to 0.004 in.
(0.050 to 0.101 mm)

SA340 MODEL - 0.001 to 0.003 in.
(0.0254 to 0.762 mm)

If this computed difference is greater than the specified tolerance, a new cylinder will also be needed.

- Check piston pin for wear or damage. Using a 1 in. outside micrometer measure piston pin diameter. (See Figure 3-54.)

Should piston pin diameter be less than specified service limit, pin and needle bearing must be replaced.



PISTON PIN DIAMETER

MODEL	STANDARD (NEW)	SERVICE LIMIT (USED)
ALL	0.6297 - 0.6299 in. (15.994 - 16.000 mm)	0.628 in. (15.98 mm)

Figure 3-54

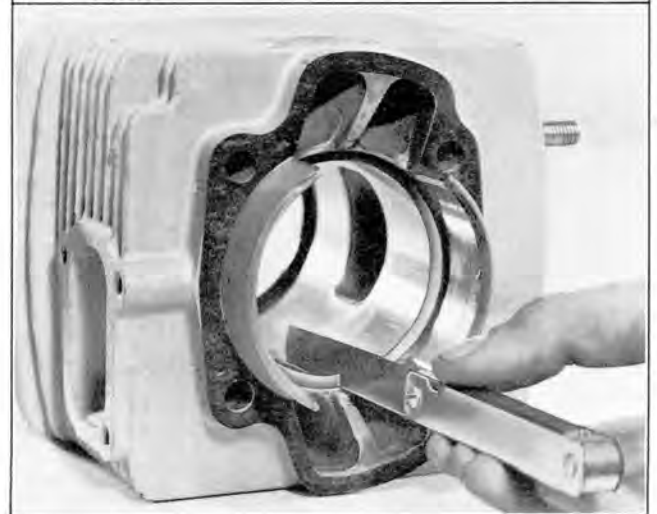


PISTON PIN BORE DIAMETER

MODEL	STANDARD (NEW)	SERVICE LIMIT (USED)
ALL	0.6299 - 0.6301 in. (15.999 - 16.005 mm)	0.633 in. (16.08 mm)

Figure 3-55

4. Measure piston pin bore diameter by inserting a snap gauge approximately 1/4 in. (6.35 mm) into piston pin bore. Remove snap gauge and measure it using a 1 in. outside micrometer. If measured diameter is greater than service limit given in Figure 3-55, replace piston.
5. Check needle bearings and needle bearing cage for wear or overheating.
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 3-56.) If maximum ring gap exceeds the Service Limits when measured at the top and the bottom of the cylinder bore, replace the rings.



PISTON RING END GAP

MODEL	STANDARD (NEW)	SERVICE LIMIT (USED)
SB440	0.008 - 0.016 in. (0.2 - 0.4 mm)	0.028 in. (0.7 mm)
SA340	0.006 - 0.014 in. (0.15 - 0.35 mm)	0.028 in. (0.7 mm)

Figure 3-56

- 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 3-57, replace the rings and remeasure ring to groove clearance. If the dimension still exceeds the Service Limit, replace the piston.



TOP RING/GROOVE CLEARANCE

MODEL	STANDARD (NEW)	SERVICE LIMIT (USED)
SB440	0.0020 - 0.0047 in. (0.05 - 0.12 mm)	0.009 in. (0.22 mm)
SA340	0.0010 - 0.0036 in. (0.03 - 0.09 mm)	0.008 in. (0.19 mm)

BOTTOM RING/GROOVE CLEARANCE

MODEL	STANDARD (NEW)	SERVICE LIMIT (USED)
ALL	0.0020 - 0.0035 in. (0.05 - 0.09 mm)	0.008 in. (0.19 mm)

Figure 3-57

REASSEMBLY

- Install new cylinder base gaskets on crankcase.
- Apply light coat of oil to piston pin needle bearings and insert needle bearings into upper connecting rod.

- Install piston to connecting rod with arrow pointing toward exhaust side. Insert piston pin and secure piston pin using new circlips.

CAUTION

New circlips must be used to prevent serious engine damage.

- Apply a light coat of oil to bearing on each end of rod, inside of cylinders and outside of pistons. Align piston rings with locating pins on piston and using ring compressor tool No. T57001-130 compress the rings and install cylinders over pistons. (See Figure 3-58.)

CAUTION

Make sure piston rings are in correct position to prevent breakage.

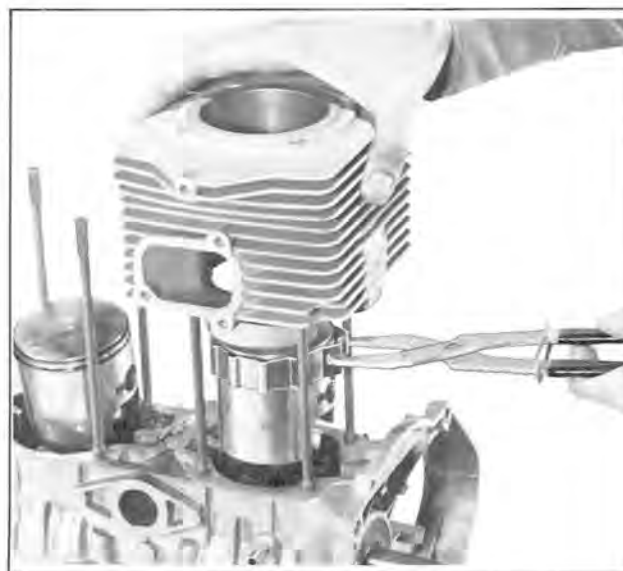


Figure 3-58

- Install new head gaskets to cylinders.

NOTE: ON 340 MODEL ONLY - Install head gaskets with wide metal section of gasket facing cylinders.

- Set cylinder heads in place on correct cylinders and loosely install the eight nuts, washers and lockwashers. Do not tighten cylinder nuts until intake manifold is installed. Refer to Section 2 for correct torque.

NOTE: The long nuts are installed on the outside studs of the PTO side cylinder head.

- Install spark plugs and torque to 20 ft lb (2.77 kg-m).

Crankcase Assembly

Disassembly

1. Remove eleven bolts, lockwashers and washers securing crankcase halves. (See Figure 3-59.)



Figure 3-59

2. With a plastic hammer tap on end of lower case half to break seal, and remove lower case. (See Figure 3-60.)

CAUTION

Never pry crankcase halves apart with screwdriver or similar tool. Sealing surfaces will be damaged making crankcase unusable.

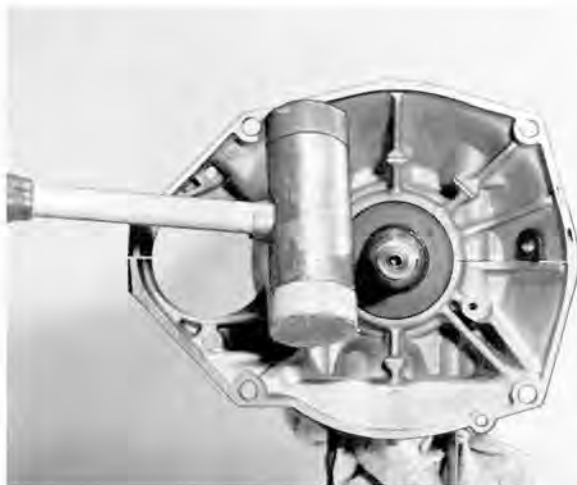
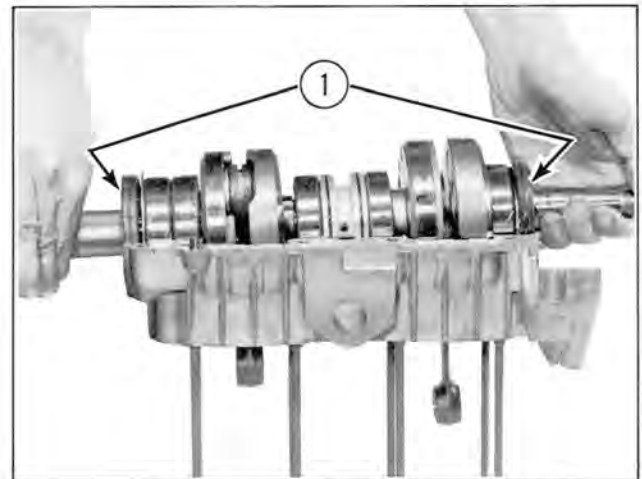


Figure 3-60

3. Carefully remove crankshaft by lifting the crankshaft assembly straight up and out of the crankcase. Remove oil seals and washers from crankshaft. (See Figure 3-61.)

CAUTION

To prevent internal crankcase damage lift the crankshaft equally at each end during removal process.



1. Oil Seals

Figure 3-61

Inspection

1. Wash crankcase halves in cleaning solvent, dry using compressed air.
2. Inspect crankcase halves for scoring, pitting, scuffing or any imperfection in the castings that may cause a crankcase leak.
3. Check oil seals for wear, cracks or deterioration. Replace seal if damage is suspected. Check washers for damage.
4. Clean crankshaft in cleaning solvent, dry using compressed air.
5. Check keyway for damage. Inspect magneto external threaded end for damaged threads. Check PTO internal threads for damage. Check taper on both ends of crankshaft for scratches, scoring or signs of excessive wear.
6. Check rubber O-rings on center seal for damage.

7. Check crankshaft main outer bearings for discoloration, wear, or skuffing. After oiling, bearings should rotate freely on crankshaft with no binding or grinding noise evident. No noticeable play in bearing should exist perpendicular to its axis. Replace bearings if damage is suspected.

If bearings require replacement, use puller tool No. 57001-158 to remove bearings. (See Figure 3-62).

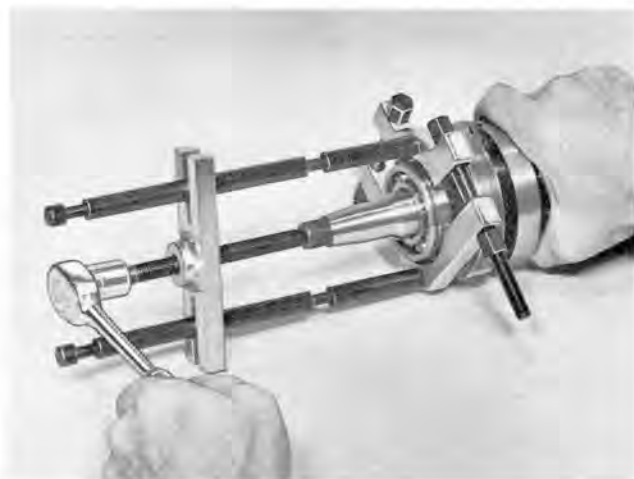


Figure 3-62

NOTE: Inner main bearings and labyrinth seal must also show no evidence of bluing, scoring, radial looseness due to wear, or grinding sound, and should turn freely on the shaft after oiling. Any defect found will indicate need for crankshaft replacement.

New outer main bearings are easily installed on crankshaft after heating inside bearing race with a heat gun or setting bearing on light bulb. After bearing is heated properly, slide bearing into correct position on crankshaft.



Figure 3-63

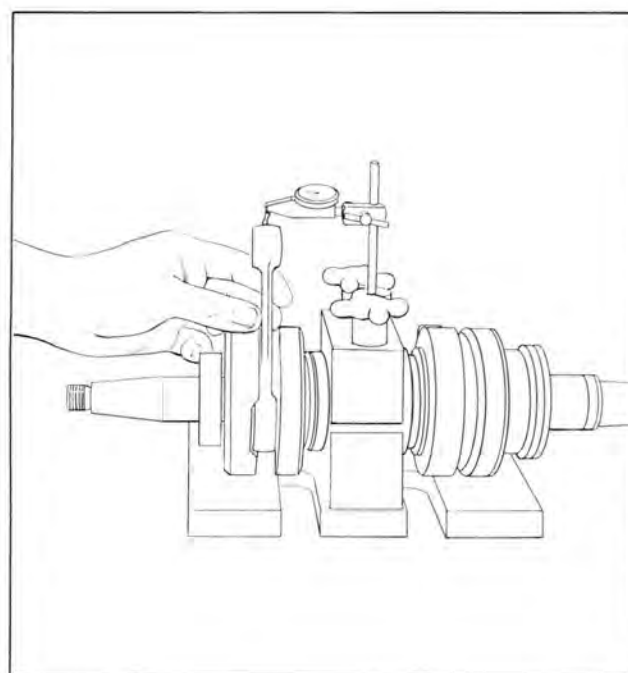


Figure 3-64

Connecting Rod Big End

1. Check connecting rod side play by inserting a feeler gauge between connecting rod big end and crankshaft flyweight. (See Figure 3-63.) Correct side clearance is 0.016 to 0.020 in. (0.41 to 0.51 mm).
2. Check for excessive radial clearance of connecting rod big end by measuring the distance the connecting rod big end is moved up and down. Radial play should not exceed 0.0008 to 0.0012 in. (0.020 to 0.030 mm). See Figure 3-64.)
3. Check that the connecting rod rotates freely on the crank pin through its entire 360° of movement. Any noticeable drag or grinding noise indicating the presence of foreign particles in the needle rollers or scoring of the rollers and crank pin will necessitate crankshaft assembly replacement.

Connecting Rod Small End



CONNECTING ROD SMALL END DIAMETER

MODEL	STANDARD (NEW)	SERVICE LIMIT (USED)
ALL	0.7875 - 0.7880 in. (20.003 - 20.015 mm)	0.789 in. (20.05 mm)

Figure 3-65

Check connecting rod small end diameter by inserting a snap gauge into the rod small end bore. (See Figure 3-65.) Remove snap gauge and measure it using a 1 in. outside micrometer. Should the measured dimension be greater than the service limit specified, the crankshaft must be replaced.

Crankshaft Runout

After new outer main bearings have been installed, crankshaft runout must be measured. Set the assembled crankshaft in V blocks with outer mains resting in blocks. Attach a dial indicator to read from the converter end of the crankshaft. (See Figure 3-66.) Slowly rotate the crankshaft noting the amount of indicator needle travel. Maximum runout should not exceed 0.002 in. (0.05 mm). Should runout exceed the specified maximum, the crankshaft must be replaced.

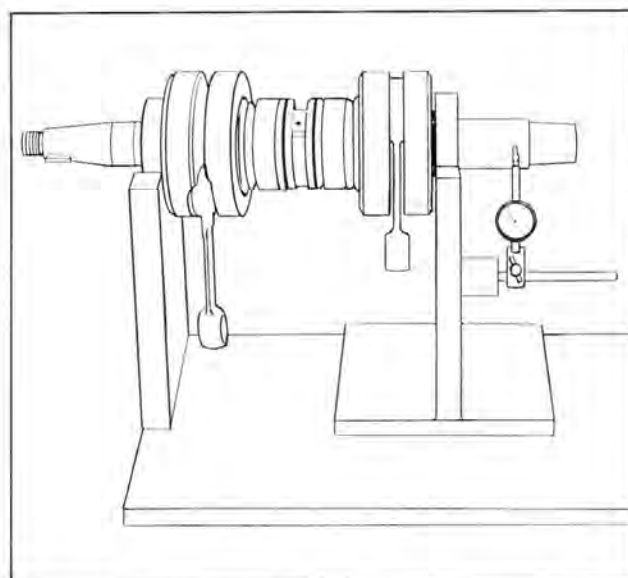


Figure 3-66

Crankshaft End Play Adjustment 440 Model Only

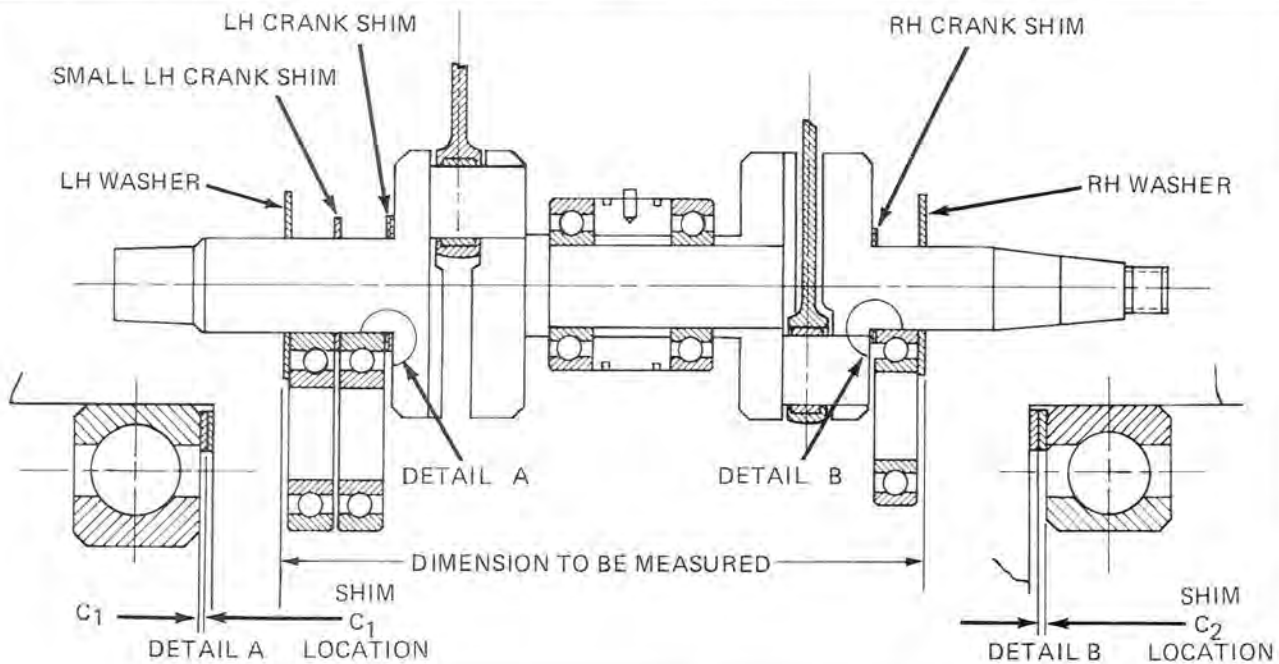
To check for proper crankshaft end play.

1. Position the RH crank shim, RH crankshaft bearing and RH washer onto crankshaft as shown in Figure 3-67.
2. Position the LH crank shim, LH crankshaft inner bearing, smaller LH crank shim, LH crankshaft outer bearing and LH washer onto crankshaft as shown in Figure 3-67.
3. Measure, where indicated in Figure 3-67, with a micrometer.
4. Refer to the tables for the correct shims and quantity to use.

Shims C1 are to be placed between the LH crank shim and the inner bearing. (See detail A Figure 3-67.)

Shims C2 are to be placed between the RH crank shim and the RH crankshaft bearing. (See detail B Figure 3-67.)

CRANKSHAFT END PLAY ADJUSTMENT 440 MODEL ONLY



Measured Dimension	Shim Location and Reference Number	
	C1 (Detail A)	C2 (Detail B)
9.3547 in. (237.61 mm)	0	0
9.3449 - 9.3543 in. (237.36 - 237.60 mm)	0	0
9.3390 - 9.3445 in. (237.21 - 237.35 mm)	(1)	0
9.3350 - 9.3386 in. (237.11 - 237.20 mm)	(2)	0
9.3311 - 9.3346 in. (237.01 - 237.10 mm)	(1)	(1)
9.3271 - 9.3307 in. (236.91 - 237.00 mm)	(2)	(1)
9.3232 - 9.3268 in. (236.81 - 236.90 mm)	(2)	(2)
9.3193 - 9.3228 in. (236.71 - 236.80 mm)	(3)	(1)
9.3153 - 9.3189 in. (236.61 - 236.70 mm)	(3)	(2)
9.3114 - 9.3149 in. (236.51 - 236.60 mm)	(3)	(1) + (1)
9.3075 - 9.3110 in. (236.41 - 236.50 mm)	(3)	(3)
9.3035 - 9.3071 in. (236.31 - 236.40 mm)	(2) + (2)	(3)
9.2996 - 9.3031 in. (236.21 - 236.30 mm)	(4)	(3)
9.2957 - 9.2992 in. (236.11 - 236.20 mm)	(2) + (3)	(3)
9.2917 - 9.2952 in. (236.01 - 236.10 mm)	(4)	(4)
9.2878 - 9.2913 in. (235.91 - 236.00 mm)	(2) + (3)	(4)
9.2838 - 9.2874 in. (235.81 - 235.90 mm)	(1) + (4)	(4)
9.2799 - 9.2834 in. (235.71 - 235.80 mm)	(5)	(4)
9.2760 - 9.2795 in. (235.61 - 235.70 mm)	(5)	(2) + (3)
9.2720 - 9.2756 in. (235.51 - 235.60 mm)	(5)	(1) + (4)
9.2689 - 9.2716 in. (235.43 - 235.50 mm)	(5)	(5)

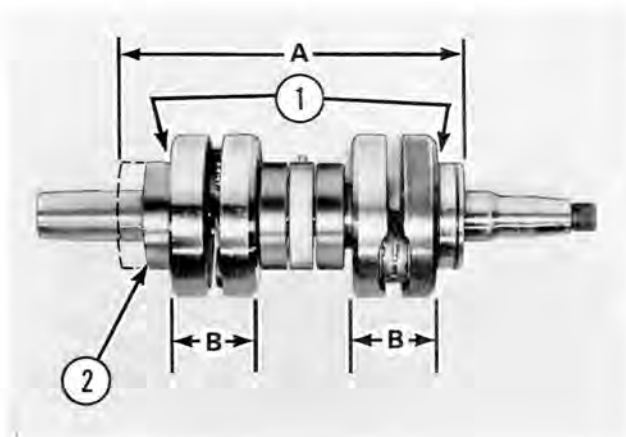
Shim Description Chart			
Shim C1 Location	Reference Number	Shim C2 Location	Thickness
92025-535	(1)	92025-515	0.0079 in. (0.2 mm)
92025-536	(2)	92025-521	0.0118 in. (0.3 mm)
92025-537	(3)	92025-525	0.0197 in. (0.5 mm)
92025-538	(4)	92025-528	0.0276 in. (0.7 mm)
92025-539	(5)	92025-532	0.0394 in. (1.0 mm)

Figure 3-67

Crankshaft End Play Adjustment 340 Model Only

If bearings are replaced you must measure crankshaft and shim as required to assure correct end play exists when crankshaft is installed in crankcase. Proper end play is to be established by the following procedure:

1. With a suitable micrometer, measure distance B. (The distance across the outer surfaces of each pair of crankshaft flyweights as shown in Figure 3-68.)



1. Shim B Location
2. Shim A Location

Figure 3-68

2. Refer to Shim Chart (Distance B) for the appropriate shim to be placed between the bearings and outer flyweights. (See Figure 3-57.)

SHIM(S) REQUIRED FOR DISTANCE B

DISTANCE B	REQUIRED SHIM REFERENCE NUMBER(S)
1.9551-1.9634 inch (49.66-49.87 mm)	None
1.9469-1.9547 inch (49.45-49.65 mm)	2
1.9378-1.9465 inch (49.22-49.44 mm)	4

3. After installing the first two bearings, and shims B, distance A is to be computed by measuring the total distance between the outer-most race surfaces of the two bearings already installed, and adding to that measure-

ment, the thickness dimension of the bearing yet to be installed. The arrived-at sum of these dimensions will constitute distance A. (See Figure 3-68.)

4. Refer to Shim Chart (Distance A) and select the appropriate shim(s) required between the two left-hand main bearings.

SHIM(S) REQUIRED FOR DISTANCE A

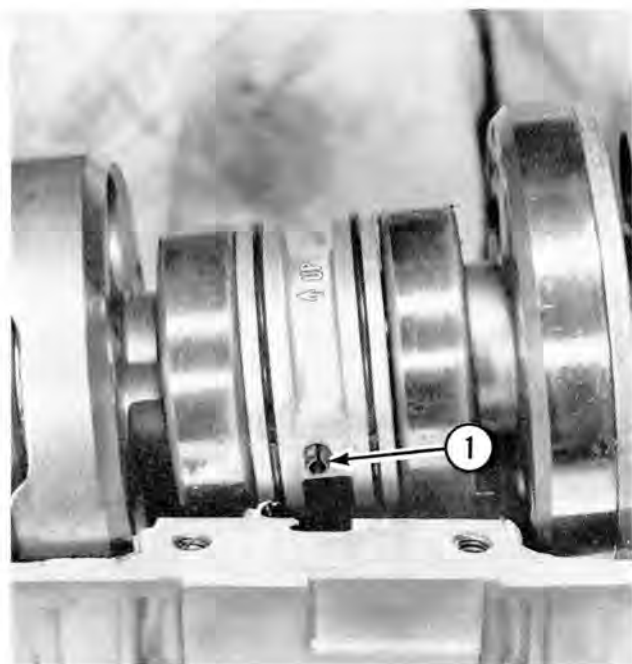
DISTANCE A	REQUIRED SHIM REFERENCE NUMBER(S)
8.0158-8.0256 inch (203.61-203.84 mm)	None
8.0119-8.0157 inch (203.51-203.60 mm)	1
8.0080-8.0118 inch (203.41-203.50 mm)	2
8.0040-8.0079 inch (203.31-203.40 mm)	3
8.0001-8.0039 inch (203.21-203.30 mm)	4
7.9962-8.0000 inch (203.11-203.20 mm)	5
7.9922-7.9961 inch (203.01-203.10 mm)	6
7.9898-7.9921 inch (202.93-203.00 mm)	6+1, or 5+2, or 4+4

SHIM DESCRIPTION CHART

SHIM REFERENCE NUMBER	PART NUMBER	THICKNESS
1	92025-513	0.0039 in. (0.1 mm)
2	92025-518	0.0078 in. (0.2 mm)
3	92025-523	0.0118 in. (0.3 mm)
4	92025-527	0.0157 in. (0.4 mm)
5	92025-530	0.0197 in. (0.5 mm)
6	92025-533	0.0236 in. (0.6 mm)

Reassembly

1. Oil all bearings.
2. Align crankshaft labyrinth seal aligning pin with recess in upper crankcase half and carefully insert crankshaft into crankcase. (See Figure 3-69.)



1. Aligning Pin

Figure 3-69

3. Install washers in crankcase grooves. Apply a coat of grease to inner section of oil seals and install oil seals to crankshaft.

CAUTION

When replacing bearings, crankshaft surface that oil seal contacts may be scratched which will cause excessive seal wear. Always remove any irregularities on the shaft surface using No. 400 emery cloth before installing new oil seals.

4. Apply crankcase sealer to lower crankcase half and carefully attach crankcase halves.
5. Secure crankcase halves using eleven bolts, lockwashers and washers. Tighten hardware evenly and in the sequence shown in Figure 3-70. Torque to 16 ft lb (2.21 kg-m).

NOTE: Apply torque in one third increments to prevent distortion of crankcase halves.

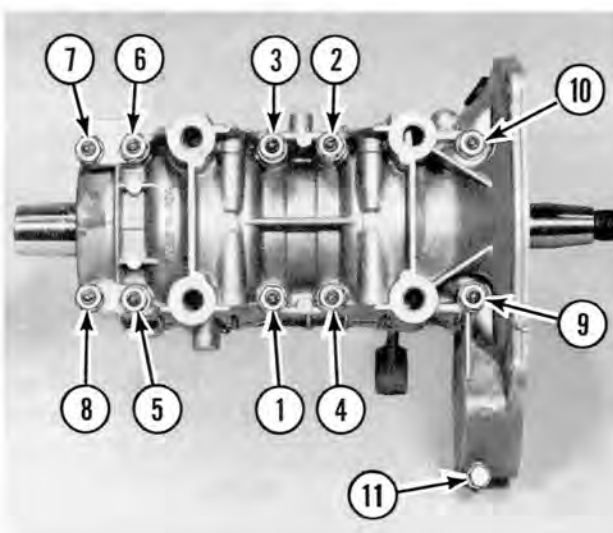


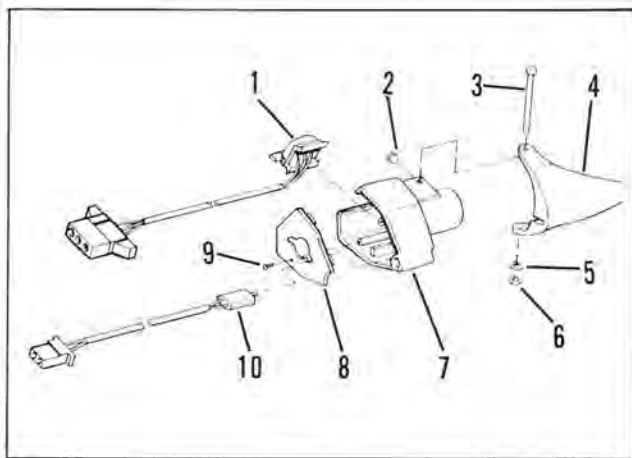
Figure 3-70

Brake Light Switch, Dimmer Switch, or Brake Lever Assembly

Removal

NOTE: Entire brake lever assembly must be removed to replace brake light switch or dimmer switch.

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, or grasp the handle grip to be removed and hold thumb over end hole. Induce compressed air through end hole of opposite grip, and by twisting grip to be removed, slide it from the handlebar.
3. Remove brake and dimmer switch harness connectors from printed circuit board, and cable ties from handlebar. Note positioning of cable ties to insure proper location during installation.
4. Loosen lock screw and slide brake lever assembly from handlebar. (See Figure 3-71.)



1. Dimmer Switch
2. Lock Screw
3. Pin
4. Lever
5. Washer
6. Retainer
7. Case
8. Plate
9. Screw
10. Brake Light Switch

Figure 3-71

5. Remove screw and plate from case; slide switches from case.
6. Brake lever may be removed by removing pin retainer and washer, and withdrawing pin.
7. Reassemble reversing order of disassembly.

Installation

1. Install brake lever assembly on the handlebar in reverse order of removal. Tighten lock screw to 25 in. lb (0.278 kg-m).
2. Check brake lever adjustment as described in Section 2.
3. Install connectors onto correct printed circuit board terminals and secure wiring harness with cable tie bands.

WARNING

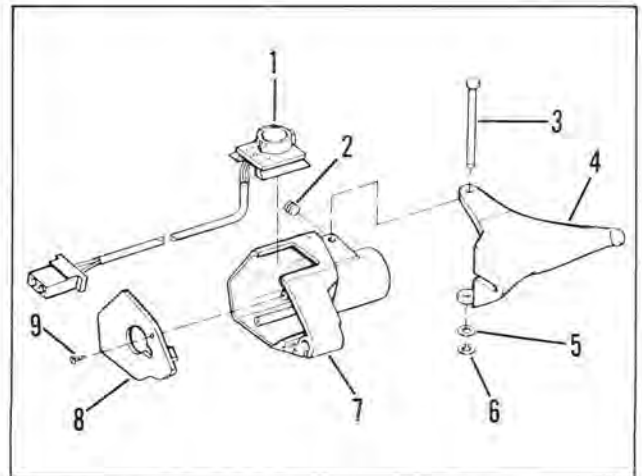
Indexing tab on connector must face upward for proper electrical polarity. Improper indexing may damage wiring harness or cause electrical sparks in the engine compartment.

Emergency Stop Switch or Throttle Lever Assembly

Removal

NOTE: Entire throttle lever assembly must be removed to replace the emergency stop switch.

1. Remove the throttle cable from throttle lever assembly.
2. Insert a screwdriver between handle grip and handlebar to loosen the grip from the bar, and pull handle grip from handlebar, or grasp the handle grip to be removed, and hold thumb over end hole. Induce compressed air through end hole of opposite grip, and by twisting grip to be removed, slide it from the handlebar.



1. Emergency Stop Switch
2. Lock Screw
3. Pin
4. Lever
5. Washer
6. Retainer
7. Case
8. Plate
9. Screw

Figure 3-72

3. Remove the emergency stop switch harness connector from the printed circuit board, and cable ties from handlebar. Note positioning of cable ties to insure proper location during installation.

- Loosen lock screw and slide throttle lever assembly from the handlebar. (See Figure 3-72.)
- Remove screw and plate from case; slide switch from case.
- Brake lever may be removed by removing pin retainer and washer, and withdrawing pin.
- Reassemble reversing order of disassembly.

Installation

- Install throttle lever assembly on the handlebar in the reverse order of removal. Tighten lock screw to 25 in. lb (0.278 kg-m).
- Check throttle lever adjustment as described in Section 2.
- Install connectors onto correct printed circuit board terminals and secure wiring harness with cable tie bands.

WARNING

Indexing tab on connector must face upward for proper electrical polarity. Improper indexing may damage wiring harness or cause electrical sparks in the engine compartment.

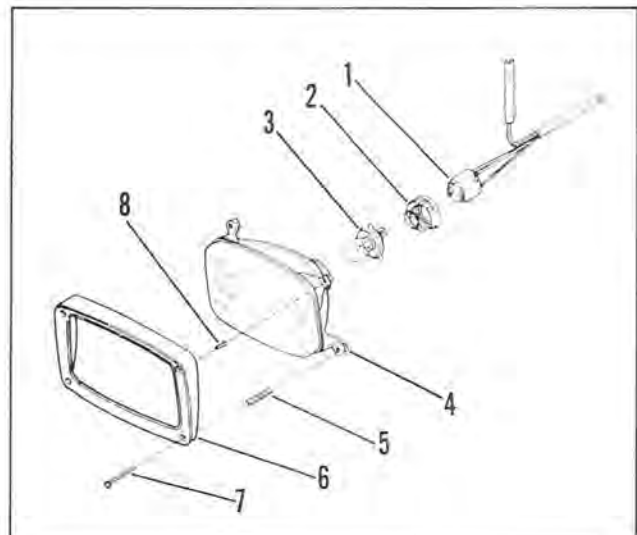
Headlamp Removal

- To remove just the headlamp assembly, disconnect the headlamp harness from the headlamp.
- Remove the four adjusting screws and springs. The headlamp assembly can now be removed from the hood. Note positioning of short and long adjusting springs for proper location during installation.

Disassemble headlamp as illustrated in Figure 3-73.

Installation

- Reassemble headlamp in reverse order of removal. (See Figure 3-73.)
- Adjust headlamp in accordance with Section 2.



- Headlamp Harness
- Bulb Retainer
- Bulb
- Lens Assembly
- Bottom Spring - Long
- Rim
- Adjustment Screw
- Top Spring - Short

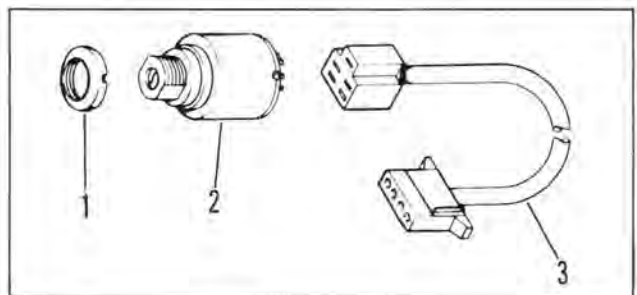
Figure 3-73

Key Switch Removal

- Remove the face nut and wiring harness from the key switch and remove key switch from the console. (See Figure 3-74.)

Installation

- Install key switch in the reverse order of removal. Hand-tighten the face nut.



- Face Nut
- Key Switch
- Wiring Harness

Figure 3-74

Speedometer

Removal

1. Open hood for access to the speedometer.
2. Disconnect speedometer cable and light bulb harness connector.
3. Remove the speedometer bracket, and remove the speedometer from the panel. (See Figure 3-75.)



Figure 3-75

Installation

1. With rubber mount positioned in mounting hole, insert speedometer and install the speedometer bracket. Tighten nuts to 11 in. lb (0.13 kg-m) torque.
2. Secure the light bulb connector. Connect the speedometer cable and hand-tighten.

Printed Circuit Board Replacement

1. Disconnect all socket housings from printed circuit board. Remove rivets securing printed circuit board to the chassis.
2. Remove the printed circuit board and plate.
3. Install printed circuit board and plate in reverse order of removal.
3. Remove rear fuel tank mounting bracket by drilling out the 3/16 in. rivets. (See Figure 3-76.)
4. Unscrew seat mounting bolts, and while raising fuel tank slightly, remove seat and tail lamp wiring harness from snowmobile.

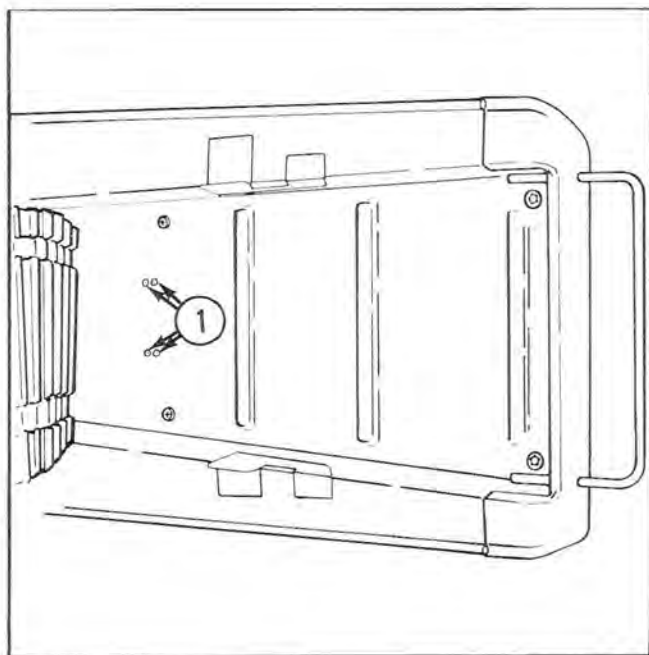
WARNING

Indexing tab on connector must face upward for proper electrical polarity. Improper indexing may damage wiring harness or cause electrical sparks in the engine compartment.

Tail Lamp

Removal

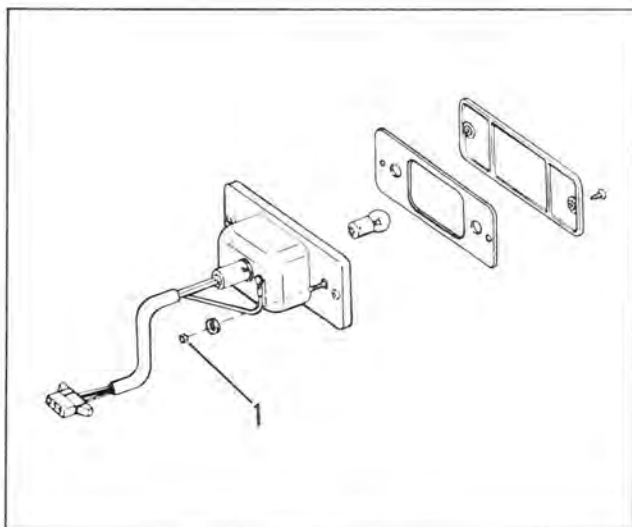
1. Disconnect tail lamp socket housing from printed circuit board. Note tie band positioning for proper location during installation.
2. Remove rear suspension mounting bolts, position snowmobile on its side, (be sure to provide a protective surface to prevent marring finish on snowmobile) then swing track and suspension out of tunnel. (See Figure 3-76.)



1. Rivets

Figure 3-76

5. Separate tail lamp from seat assembly by removing nuts located inside storage compartment. (See Figure 3-77.)



1. Nuts

Figure 3-77

Installation

1. Install tail lamp assembly in the reverse order of removal.

CAUTION

To prevent track damage, secure rear fuel tank mounting bracket with rivet heads positioned on underside (track side) of tunnel.

2. After installing rear suspension mounting bolts, adjust rear suspension springs. Refer to Suspension Ride Adjustment procedure in Section 2.
3. Install tail lamp connector onto correct printed circuit board terminals and secure wiring harness with cable tie band.

WARNING

Indexing tab on connector must face upward for proper electrical polarity. Improper indexing may damage wiring harness or cause electrical sparks in the engine compartment.

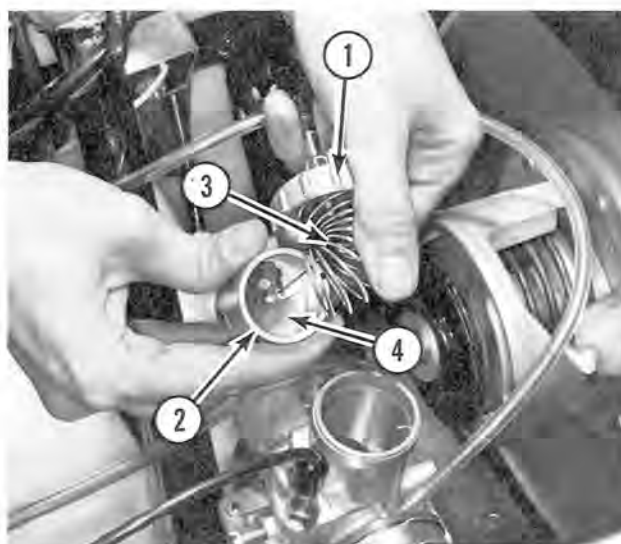
Voltage Regulator Replacement

1. Disconnect voltage regulator socket housing from the printed circuit board.
2. Remove machine screw, lockwasher and locknut, and remove the voltage regulator.
3. Install voltage regulator in the reverse order of removal. Tighten machine screw to 95 in. lb (1.09 kg-m).

Throttle Cable

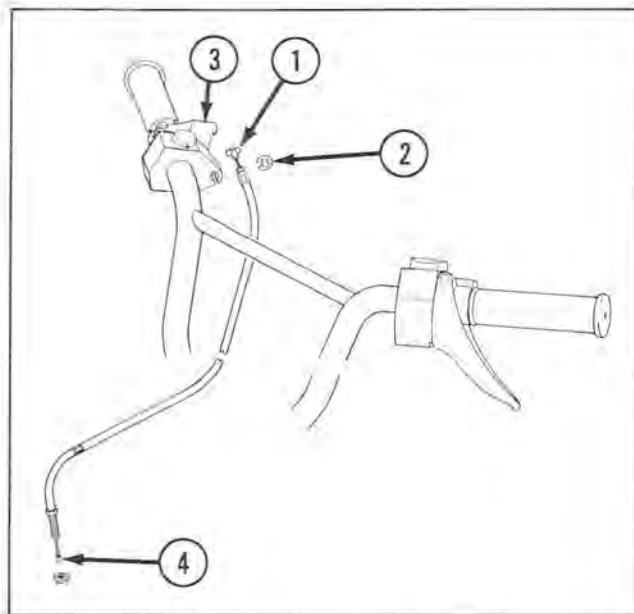
Removal

1. Unscrew the mixing body top assembly, and pull out the throttle valve assembly.
2. Compress the throttle spring and remove the spring seat plate.
3. Slide the throttle cable tip to the larger hole in the base of the throttle valve and separate the throttle cable from the throttle valve.
4. Loosen the throttle cable locknut and screw the throttle cable from the mixing body top assembly. (See Figure 3-78.)
5. Remove snap ring and disconnect the throttle cable end from the throttle lever. (See Figure 3-79.)



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

Figure 3-78



1. Throttle Cable End
2. Snap Ring
3. Throttle Lever
4. Throttle Cable Tip

Figure 3-79

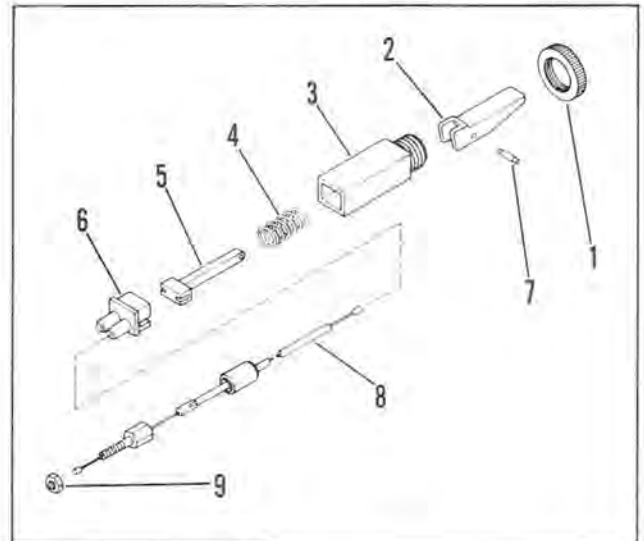
Installation

1. Slide the throttle cable through the throttle lever assembly and install the snap ring. (See Figure 3-79.)
2. Connect the throttle cable end to the throttle lever.
3. Screw the mixing body top assembly to the throttle cable.
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 valve over the throttle cable. Insert the end of the cable through the hole in the throttle valve slot.
6. While keeping the spring compressed, release the throttle valve and install the spring seat plate. Then release the spring.
7. Install the throttle valve into the carburetor so the slot in the throttle valve mates with the locating pin in the throttle valve bore. Install the mixing body top assembly and tighten finger tight. Tighten the throttle cable locknut. Perform Throttle Cable Adjustment Procedure. Refer to Section 2.

Enrichener Cable

Removal

1. Unscrew the enrichener mounting nut and separate the enrichener from control console. (See Figure 3-80.)



1. Mounting Nut
2. Lever
3. Housing
4. Spring
5. Plunger
6. Cap
7. Lever Pin
8. Cable Assembly
9. Nut

Figure 3-80

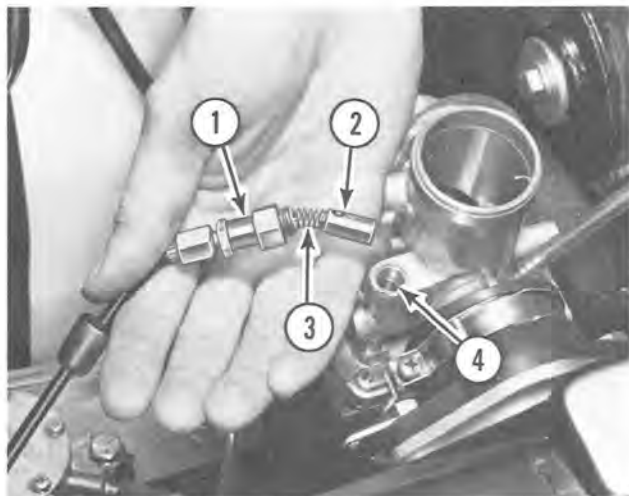
2. Unscrew the enrichener plunger cap. (See Figure 3-81.) Remove the enrichener plunger assembly from the carburetor.
3. Unscrew the fitting, compress the enrichener plunger spring and disconnect the enrichener cable from the enrichener plunger assembly.

NOTE: Individual components of enrichener cable assembly are available if replacement is required. Assemble replacement parts in sequence shown in Figure 3-80.

Installation

1. Slide enrichener through hole in control console, and install the enrichener mounting nut.
2. Slide the enrichener plunger cap, washer and spring over the end of the enrichener cable.

3. Place hole in the enricher plunger over the cable end and spring. Insert plunger into carburetor body and tighten the enricher plunger cap. Bend washer against cap. Perform Enricher Cable Adjustment Procedure. Refer to Section 2.

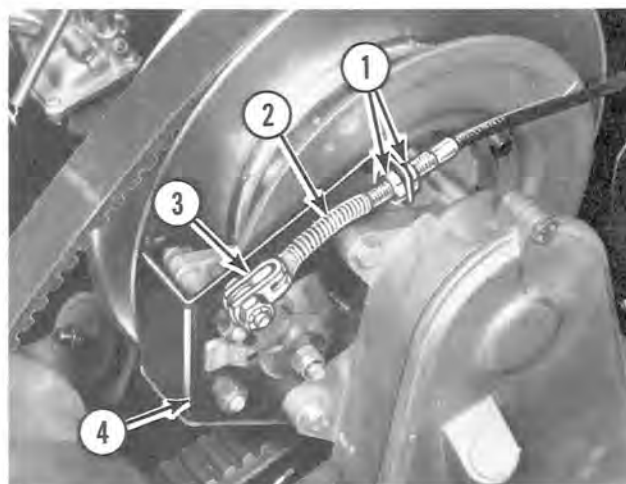


1. Enricher Plunger Cap
2. Enricher Plunger
3. Spring
4. Washer

Figure 3-81

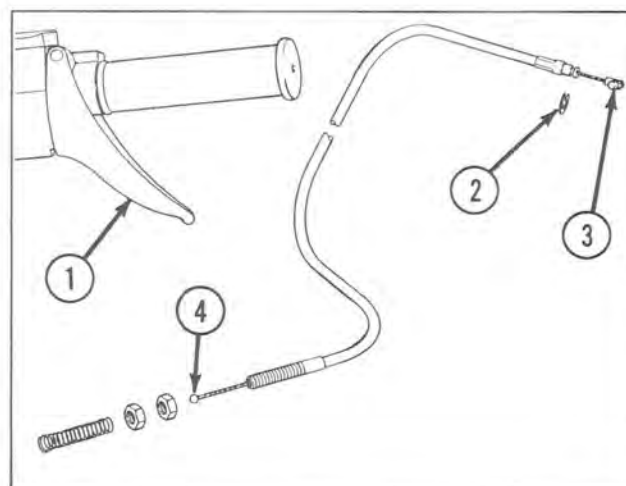
Brake Cable Removal

1. Compress the return spring and disconnect the brake cable tip from the retainer. (See Figure 3-82.)
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 3-83.)
4. Cut cable tie band and remove brake cable.



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

Figure 3-82

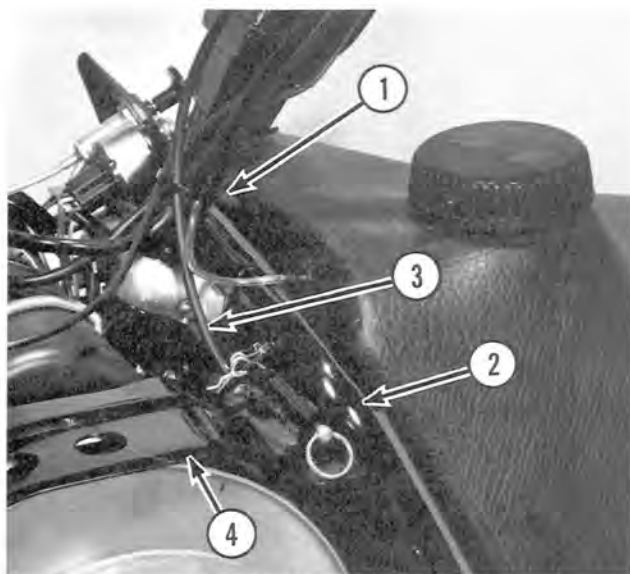


1. Brake Lever
2. Snap Ring
3. Brake Cable End
4. Brake Cable Tip

Figure 3-83

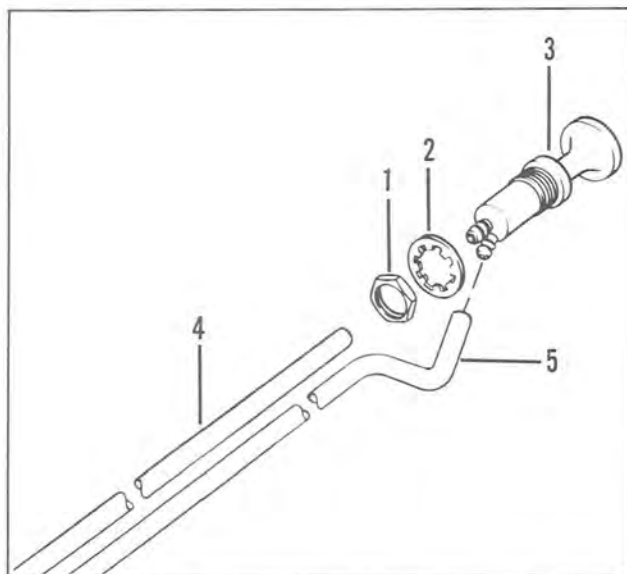
Installation

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. Route other end of cable behind belt guard on steering mount and install cable tie band. (See Figure 3-84.)
4. Install one locknut on the end of the brake cable and place it through the brake support bracket.
5. Install the second locknut and return spring on the end of the brake cable. Compress the spring and connect the brake cable tip to the retainer. Squeeze the retainer to prevent the cable end from slipping out of the retainer slot. Refer to Brake Adjustment in Section 2.



1. Cable Tie Band
2. Steering Mount
3. Brake Cable
4. Belt Guard

Figure 3-84



1. Nut
2. Washer
3. Pump
4. Line to Carburetor
5. Line From Fuel Tank T

Figure 3-85

Primer Removal

1. Raise hood and disconnect fuel lines from primer pump noting position of tank-to-pump and pump-to-carburetor lines. (See Figure 3-85.)
2. Remove nut and internal star washer, and withdraw pump assembly through top of console.

NOTE: The primer pump is a non-serviceable item, requiring replacement as an assembly if any defect or malfunction is noted.

Installation

1. Insert pump assembly in the console. Install internal star washer, and securing nut. Tighten to approximately 30 in. lb (3.0 kg-m).
2. Reconnect fuel tank T to primer line to off-center nipple; primer-to-carburetor line to center nipple.

Drive Converter Removal

1. Remove the drive belt.
2. Remove the drive converter mounting bolt and lockwasher.
3. Install the drive converter puller bolt (tool No. 205196) and screw in to remove the drive converter. (See Figure 3-86.)

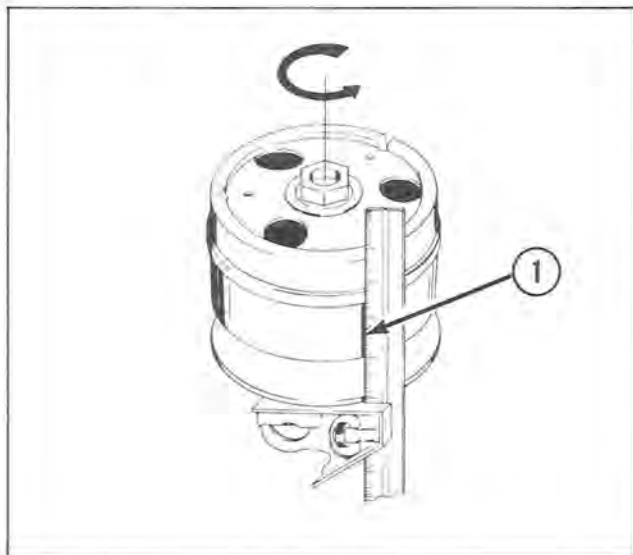


1. Drive Converter Puller Bolt

Figure 3-86

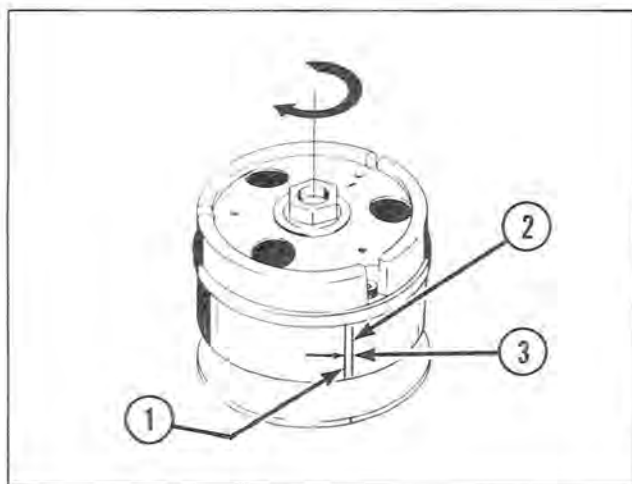
Drive Converter Wear Check

1. With the drive converter removed from the engine, remove the spring as described in steps 1 and 2 of the following disassembly procedure. Then reinstall the housing and bearing assembly.
2. Hold the stationary sheave securely and rotate the movable sheave counterclockwise as far as it will go. Scribe a line on the stationary and movable sheaves using a combination square as a guide as shown in Figure 3-87. Mark this line A.



1. Line A

Figure 3-87



1. Line A
2. Line B
3. Dimension X

Figure 3-88

3. Now rotate the movable sheave all the way clockwise. Scribe a second line on the movable sheave in line with line A on the stationary sheave. (See Figure 3-88.)
4. Measure the distance between the two lines on the movable sheave. If the difference is 0.156 in. (3.962 mm) or more, the drive converter is worn out of tolerance and must be replaced.

Disassembly

1. Loosen the three capscrews securing the housing and bearing assembly. Mark the housing and bearing assembly and the movable sheave for proper alignment. Carefully remove the capscrews while releasing spring tension on the housing and bearing assembly. Remove the housing and bearing assembly from the movable sheave.

CAUTION

Bearing and housing may be damaged if not carefully disassembled. Even minor damage to this bearing can make it unuseable.

2. Slide the spring and cup washer from the shaft.
3. Loosen three locknuts on the spider assembly. Back off the screws until the spider is free on the hex shaft.
4. Push the spider down against the movable sheave. If the spider does not slide easily, force down with a slight amount of pressure.
5. Remove the split ring from the hex shaft.
6. Mark the spider for correct alignment with the hex shaft and remove the spider.
7. Mark the movable sheave for correct alignment with the stationary sheave and remove the movable sheave.
8. To service the spider roller arm assembly, remove the capscrew and nut securing the roller arm weights and the roller. Remove the capscrew and ramp from the movable face.

Cleaning

1. Remove all grease and dirt by placing components in cleaning solvent. Dry parts with compressed air or a clean cloth.
2. Remove drive belt accumulations from the stationary sheave, movable sheave and hex bearing with cleaning solvent. Do not use steel wool or a wire brush on the hex bearing.
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

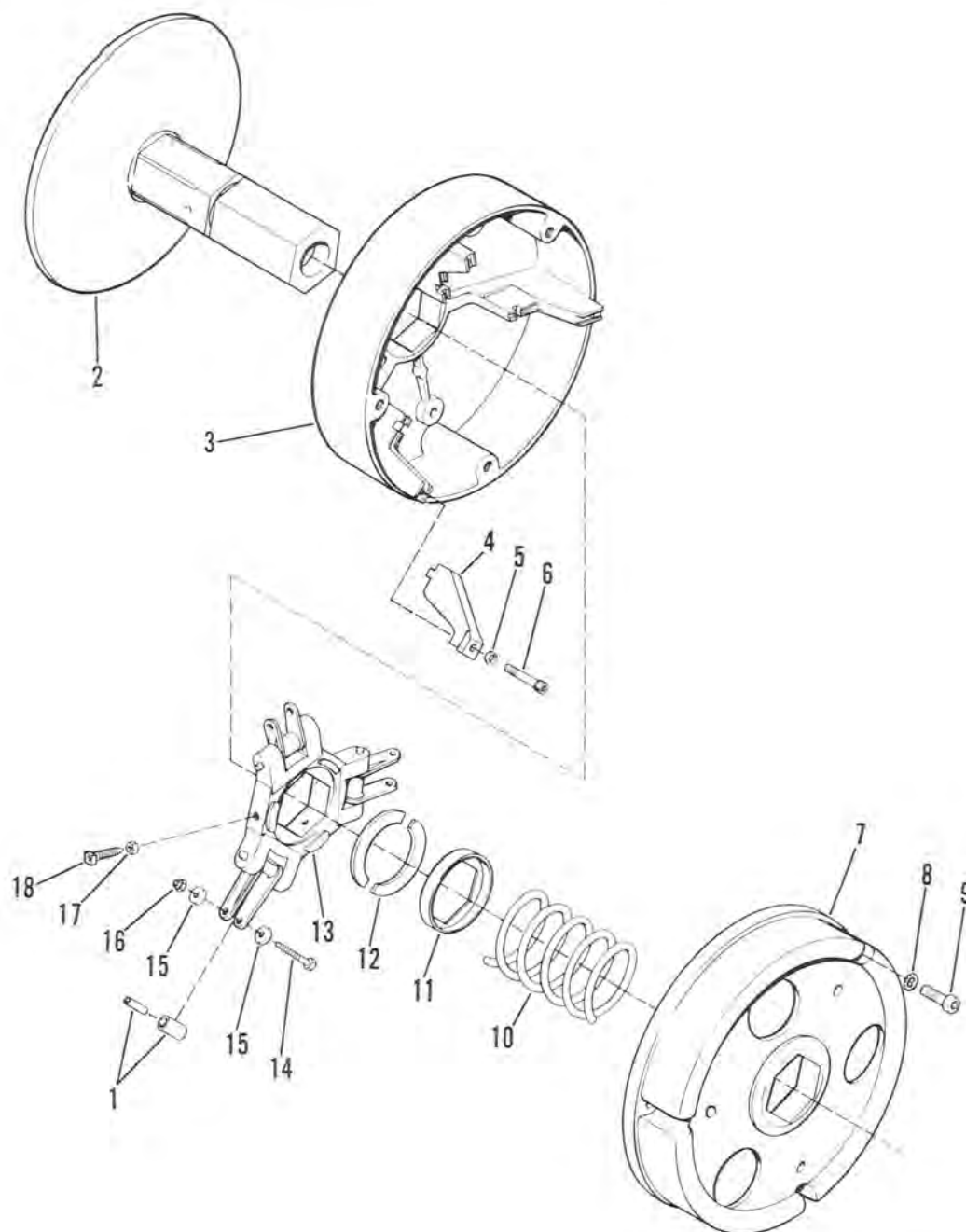
1. Position the ramp in the movable sheave. Secure with the capscrew and tighten capscrew to 24 to 30 in. lb (0.28 to 0.35 kg-m). (See Figure 3-89.)
2. Place the movable sheave on the hub of the stationary sheave, matching alignment marks on the movable sheave and stationary sheave.
3. If the spider roller arm assembly was serviced, align the slot in the bushing with the ears on the roller arm. Place the roller and bushing into the roller arm. Slide the weight onto the capscrew and start the capscrew into the roller arm. Slide the remaining roller arm weight on the capscrew and secure with the nut. Tighten the nut to 35 to 48 in. lb (0.40 to 0.55 kg-m).

4. Match the alignment marks on the spider assembly and hex shaft and slide the spider assembly onto the shaft.
5. Place split rings on the hex shaft.
6. Position the spider against the split rings. Tighten the three setscrews on the spider assembly to 36 to 48 in. lb (0.41 to 0.55 kg-m). Tighten the locknuts securely.
7. Place the cup washer and spring over the hex shaft.
8. Match alignment marks and place the housing and bearing assembly over the spring. Press down on the housing and bearing assembly to compress the spring. Hold in position while lifting up on the movable sheave. Secure the housing and bearing assembly to the movable sheave with three capscrews and tighten 15 to 17 ft lb (2.07 to 2.35 kg-m).

Installation

NOTE: Clean taper inside converter and on crankshaft to remove all oil, dust, etc. Tapers must be clean and dry.

Install the drive converter on the crankshaft and secure with a bolt and lockwasher. Tighten the bolt to 75 ft lb (10.37 kg-m). Install the drive belt.



- | | |
|--|---------------------|
| 1. Roller Bearing | 9. Screw |
| 2. Stationary Sheave | 10. Spring |
| 3. Movable Sheave and Bearing Assembly | 11. Washer |
| 4. Ramp | 12. Split Ring |
| 5. Washer | 13. Spider Assembly |
| 6. Screw | 14. Screw |
| 7. Housing and Bearing Assembly | 15. Weight |
| 8. Washer | 16. Nut |
| | 17. Nut |
| | 18. Screw |

Figure 3-89

Driven Converter

NOTE: When repair of the driven converter is required, remove the chaincase and driven converter from the snowmobile as an assembly. See Chaincase Removal. Then disassemble the driven converter as follows.

Disassembly

1. Remove the screw, lockwasher, and flat washer securing bearing support to converter shaft. (See Figure 3-90.)
2. Use a puller to remove the bearing support assembly. Remove the spacer.
3. Hold the stationary sheave and turn the movable sheave so the shoe ramps do not contact the cam or torque bracket.
4. Force the torque bracket down on the shaft until it bottoms.

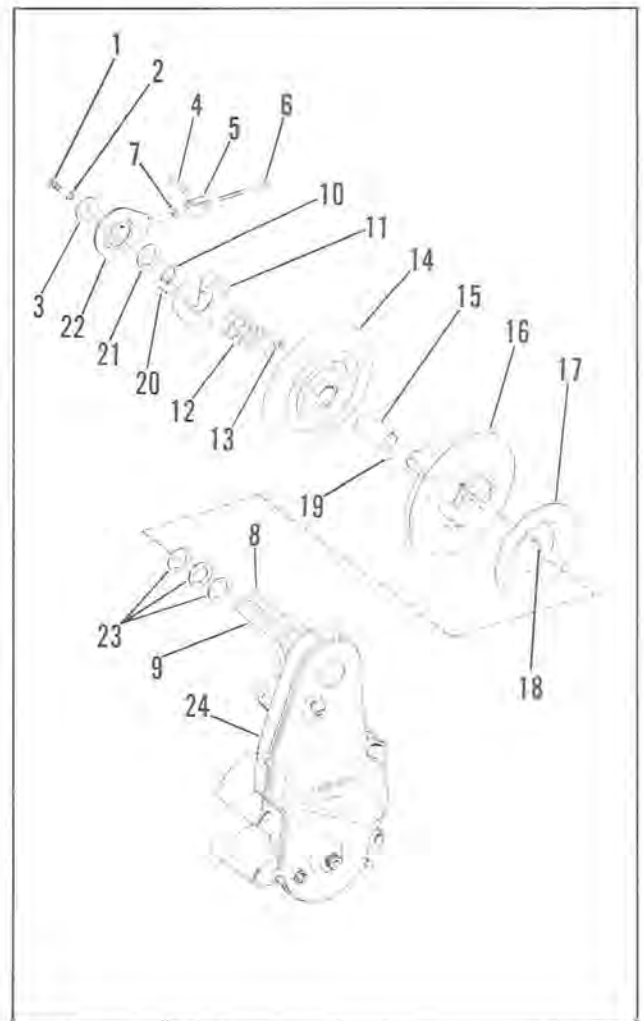
WARNING

Keep a downward pressure on the torque bracket and release spring tension slowly.

5. Remove the retaining ring, the torque bracket assembly, and driven spring.
6. Slide movable sheave from stationary sheave shaft. Remove the key and bushing.
7. Pull the shoe ramps from the hub of the movable sheave.
8. Remove three capscrews and separate the brake disc from the stationary sheave.

Cleaning and Inspection

1. Remove all foreign matter from the shoe ramps with a clean cloth and inspect for wear.
2. Place remaining components in cleaning solvent and remove all grease and dirt. Dry components with compressed air or a clean cloth.
3. Inspect sliding surfaces for wear and damage.
4. Inspect the fixed and movable faces for broken or loose rivets.
5. Check the torque bracket for cracks, wear and other damage.



1. Bolt
2. Washer
3. Washer
4. Pin
5. Clevis
6. Bolt
7. Nut
8. Key
9. Shaft
10. Retaining Ring
11. Torque Bracket Assembly
12. Spring
13. Shoe Ramp
14. Movable Sheave
15. Bearing
16. Stationary Sheave
17. Brake Disc
18. Capscrew
19. Key
20. Pin
21. Spacer
22. Bearing Support Assembly
23. Spacer
24. Chaincase Assembly

Figure 3-90

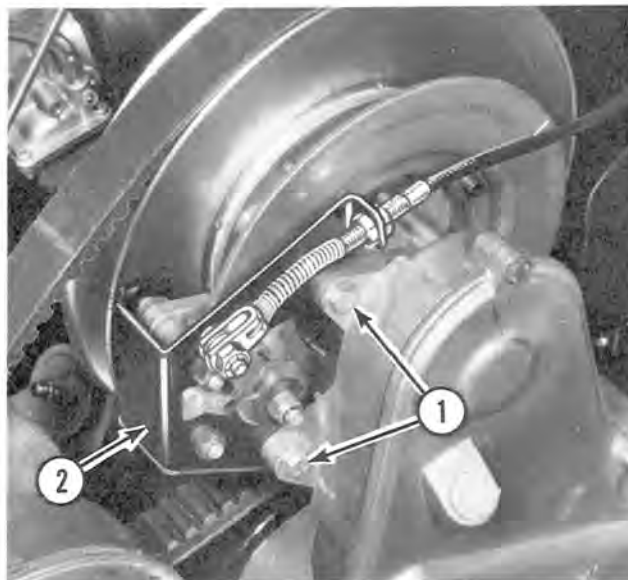
Reassembly (See Figure 3-90)

1. Position the shoe ramps on the movable face and tap into place using a rubber mallet.
2. Position bearing and movable sheave onto shaft of stationary sheave, then install key.
3. Position the driven spring over the stationary sheave and hook the turned down end into the hole in the movable face.
4. Position the torque bracket over the spring and hook the turned up end into the second hole of the torque bracket for standard spring tension.
5. Align the keyway in the torque bracket with the key. Push the torque bracket onto the shaft just far enough to contact the key. Hold the torque bracket in position. Turn the movable face counterclockwise until there is slight spring tension. Then turn the movable face an additional 120 degrees.
6. Push the torque bracket down on the shaft, while aligning pin in bracket with notch in bearing, until it bottoms. Hold the torque bracket in position and install the retaining ring.
7. Release the torque bracket against the retaining ring.
8. Install the brake disc and secure with three cap screws. Use Loctite on screws and torque to 95 in. lb (1.09 kg-m).
9. Position the spacers and key on the converter shaft. Install the assembled converter.
10. Position the spacer and press on the bearing support assembly.
11. Install flat washer, lockwasher and screw.
12. Install the chaincase in the snowmobile. Refer to Chaincase Installation.

Chaincase

Removal

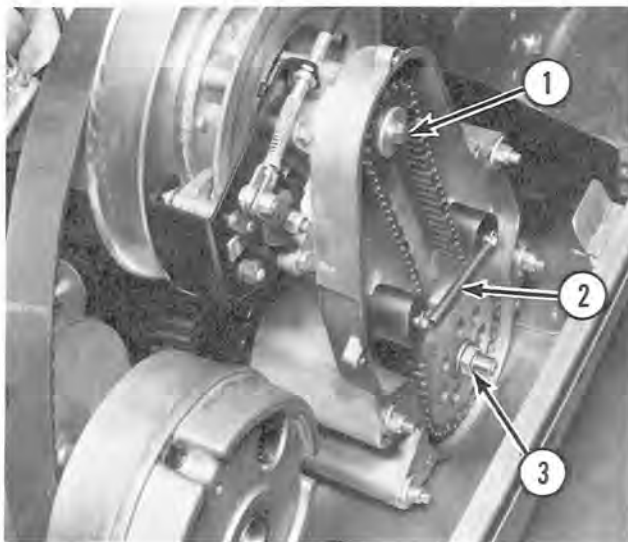
1. Remove retainer pin from bearing support clevis, and remove drive belt.
2. Remove bolts and nuts securing the brake caliper bracket to the chaincase, and lift the brake caliper assembly from the chaincase. (See Figure 3-91.)



1. Bolts
2. Support Bracket

Figure 3-91

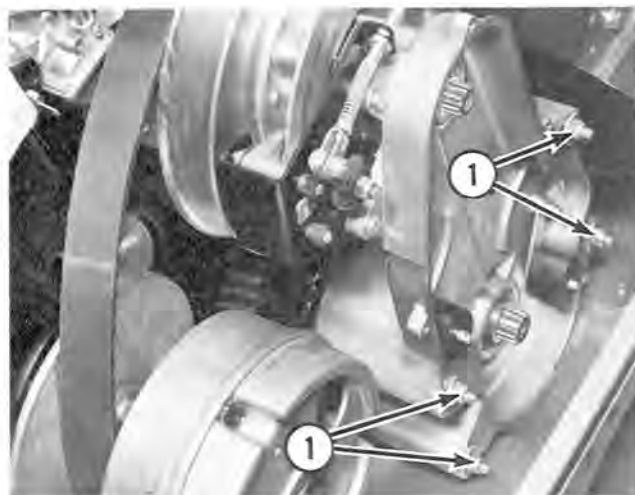
3. Remove chain cover and allow oil to drain into a clean container.
4. Remove chain tensioner spring from one of the tensioner arms, and the bolts securing sprockets. (See Figure 3-92.) Remove the chain and sprockets from the splines on their respective shafts.



1. Bolt
2. Spring
3. Bolt

Figure 3-92

5. Remove the four locking nuts and washers from the through-bolts securing chaincase to chassis. (See Figure 3-93.) Pull the assembled chaincase and driven converter outward, disengaging from the track driveshaft and remove the chaincase.



1. Nuts

Figure 3-93

Disassembly of the Chaincase (See Figure 3-94)

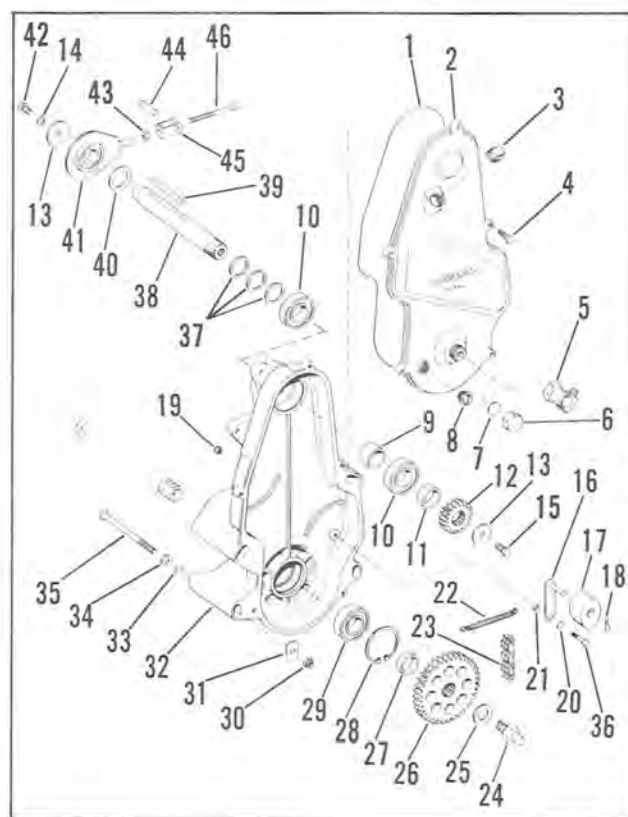
1. Remove driven converter and shaft from chaincase as an assembly by tapping shaft with a soft mallet. Use care not to damage splines.

NOTE: After converter and shaft assembly have been removed, check to see if spacers are stuck onto right hand bearing race. Install spacers onto driven converter shaft to insure proper positioning during reassembly and prevent loss during chaincase cleaning.

2. Clean metal parts in solvent, dry all components except bearings with compressed air. Allow bearings to air dry. Inspect bearings for scoring, binding during rotation, and radial play. Inspect sprockets and splined shafts for damaged teeth or splines. Replace damaged parts.
3. Should bearings require replacement, they may be removed by the following procedure. Heat the boss area of case with a propane torch, and remove right hand bearing by alternately tapping on opposite sides of the inner race. Remove the remaining spacer. The left bearing may now be removed by pressing it out or by placing an appropriately sized drift against the inner race and tapping the bearing from the

case with a hammer. Remove driveshaft bearing by first removing snap ring retainer, then pressing or tapping bearing from case.

4. Inspect chain and tensioner arm bushings for wear; replace if necessary.



- | | |
|-------------------------|------------------------------|
| 1. Gasket | 25. Washer |
| 2. Cover | 26. Sprocket |
| 3. Plug | 27. Spacer |
| 4. Bolt | 28. Ring |
| 5. Adapter | 29. Bearing |
| 6. Cap | 30. Lock Nut |
| 7. Gasket | 31. Washer |
| 8. Plug | 32. Chaincase Base |
| 9. Inner Bearing Spacer | 33. Washer |
| 10. Bearing Assembly | 34. Washer |
| 11. Spacer | 35. Bolt |
| 12. Sprocket | 36. Bolt |
| 13. Washer | 37. Driven Converter Spacers |
| 14. Washer | 38. Shaft |
| 15. Bolt | 39. Key |
| 16. Tensioner Arm | 40. Spacer |
| 17. Guide | 41. Bearing Support Assembly |
| 18. Pin | 42. Bolt |
| 19. Nut | 43. Nut |
| 20. Washer | 44. Pin |
| 21. Bushing | 45. Clevis |
| 22. Spring | 46. Bolt |
| 23. Chain | |
| 24. Jam Nut | |

Figure 3-94

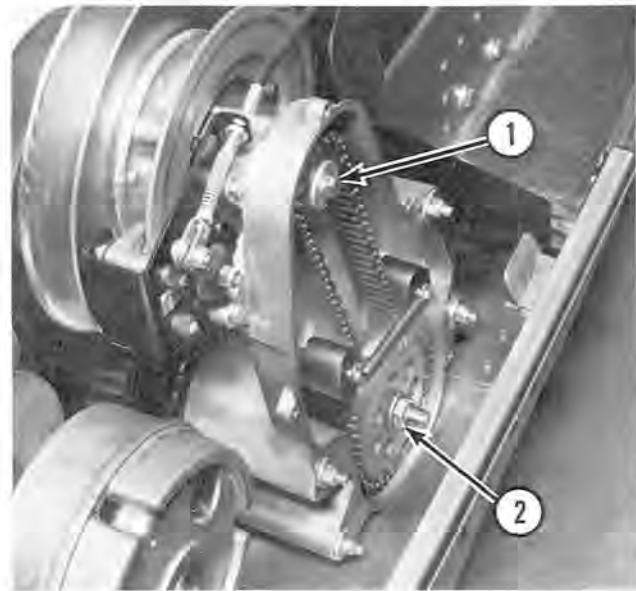
Reassembly (See Figure 3-94)

1. Install driveshaft bearing and left converter shaft bearings in case. Assemble snap ring retainer on driveshaft bearing making sure it is properly seated in groove.
2. Be sure driven converter spacers are installed on shaft, then assemble right hand bearing onto shaft until bearing contacts spacers.
3. Next, position inner bearing spacer onto driven converter shaft, then insert assembly through right side of chaincase.
4. Press shaft assembly through left bearing while right bearing enters chaincase boss.

NOTE: Be sure bearing inner races are seated against the inner bearing spacer.

Installation

1. Loosen track tension. Refer to Track Tension Procedure Section 2.
2. Install assembled case and converter in snowmobile, sliding driveshaft bearing over driveshaft, and secure case to chassis. Assemble four mounting nuts finger tight on through bolts.
3. Install assembled brake caliper and support bracket to chaincase. Tighten mounting nuts to 120 in. lb (1.383 kg-m). (See Figure 3-91.)
4. Install chain tensioner arms, and replace chain guides if necessary.
5. Slide bearing to sprocket spacers onto shafts. Set sprockets in chain, and slide sprockets simultaneously onto shafts, rotating sprockets until they align with shaft splines. Apply Loctite and thread bolts with proper washers to shafts. (See Figure 3-95.) Torque upper and lower sprockets to 28 ft lb (3.871 kg-m) and 55 ft lb (7.604 kg-m) respectively.
6. Install chain tensioner spring and retaining hair pin clips.
7. Place O-ring gasket properly in cover. Apply a thin coating of sealer to the gasket to hold it in place. Install chain cover. Add chain oil until fluid is level with lower edge of hole.
8. Align converters. Refer to Converter Alignment Procedure Section 2.
9. Install drive belt and adjust converter shaft bearing support assembly to install retainer pin through clevis and support brace.



1. Bolt
2. Bolt

Figure 3-95

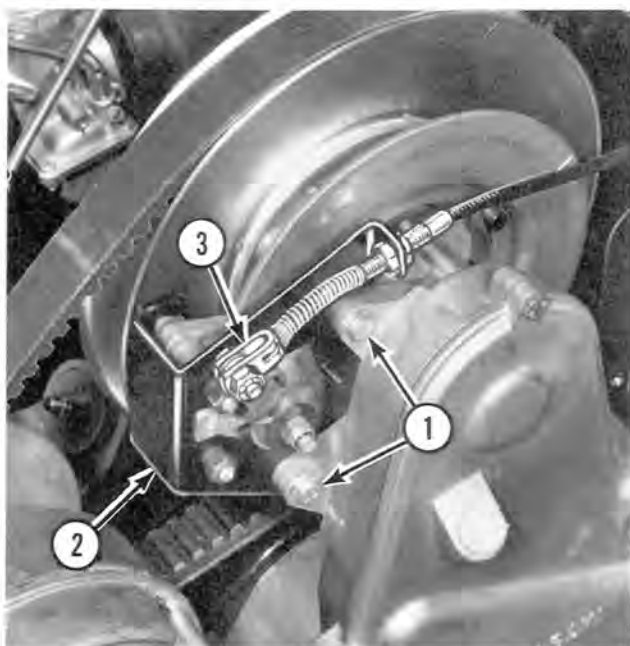
Brake Caliper

Removal

1. Disengage brake cable at the retainer by rotating the cam so the brake pads contact the disc, pull the spring back, and move cable end sideways from the retainer. Remove spring and forward-most locknut from the cable adjuster. Withdraw cable and adjuster from support bracket.
2. Remove the bolts and nuts securing the brake support bracket to the chaincase and lift brake assembly from chaincase. (See Figure 3-96.)

Disassembly

1. Remove the nut and washer and lift off the cam and spring. (See Figure 3-97.)
2. Remove two nuts, bolts, washers and bushings. Remove the brake support bracket.
3. Separate caliper B from caliper A and remove pad B and backup washer.



1. Bolts and Nuts
2. Brake Support Bracket
3. Brake Cable Retainer

Figure 3-96

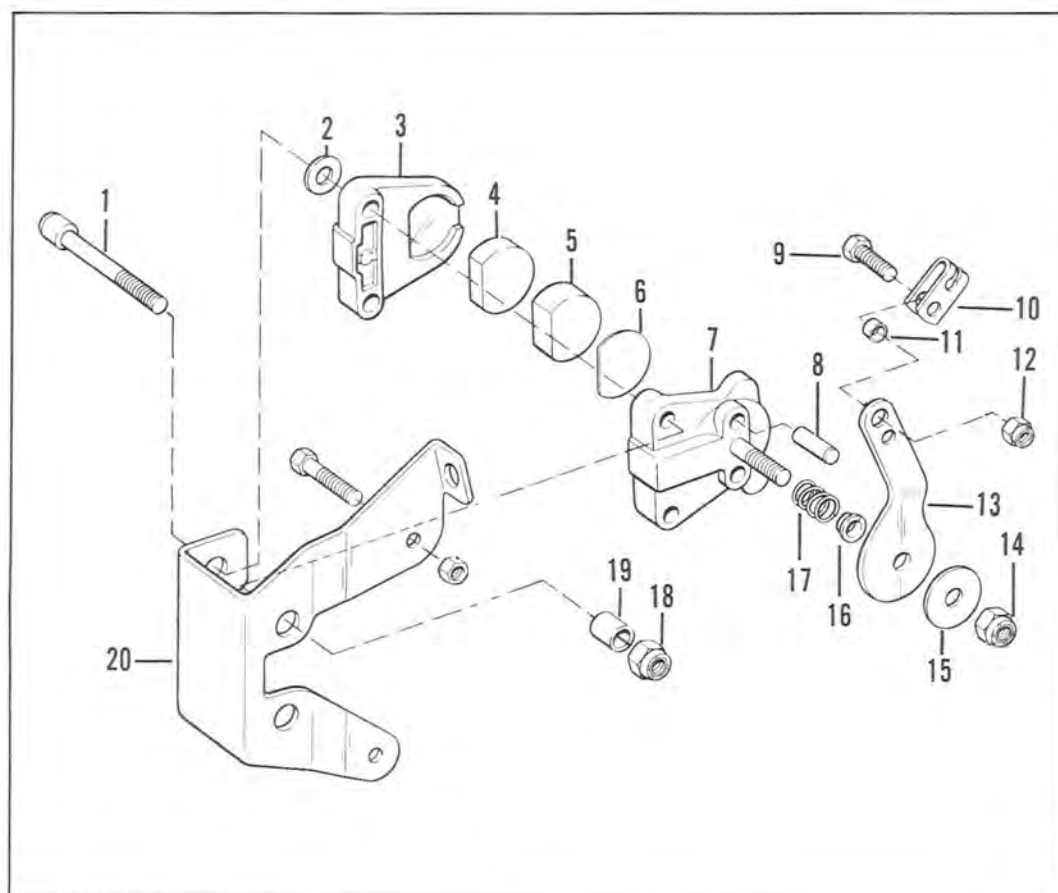
Repair

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 1/8 in. (3.18 mm), replace pad B.

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.

Assembly

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

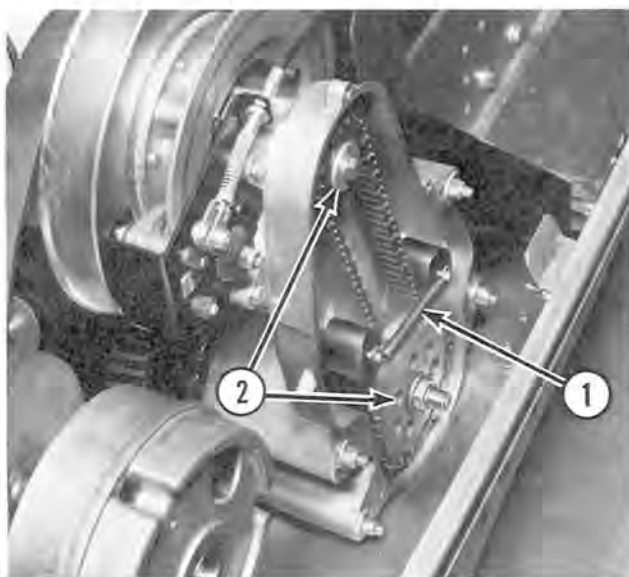


1. Bolt
2. Washer
3. Caliper A
4. Pad A
5. Pad B
6. Backup Washer
7. Caliper B
8. Push Pin
9. Bolt
10. Retainer
11. Bushing
12. Nut
13. Cam
14. Nut
15. Washer
16. Bushing
17. Spring
18. Nut
19. Bushing
20. Brake Support Bracket

Figure 3-97

Chain Replacement Removal

1. Remove the chaincase cover and drain oil from chaincase into a suitable container. Inspect the cover gasket, and discard if damaged.
2. Remove chain tensioner spring.
3. Remove upper and lower sprocket retaining bolts, then remove sprockets and chain. (See Figure 3-98.)



1. Chain Tensioner Spring
2. Sprockets

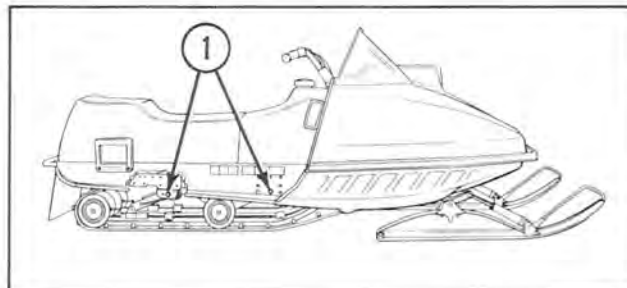
Figure 3-98

Installation

1. Install the upper sprocket, lower sprocket and the chain as a unit. Install the lower sprocket washer and retaining bolt. Torque bolt 55 ft lb (7.61 kg-m). Install washer and apply Loctite to upper sprocket retaining bolt. Torque sprocket retaining bolt to 19 ft lb (2.63 kg-m). Inspect chain guides, and service as described in Section 2.
2. Install chain tensioner spring and retaining pins.
3. Place O-ring gasket properly in cover, applying a light coating of sealer to hold it in place. Install cover to chaincase, and add chain oil until fluid is level with lower edge of hole.

Suspension Removal

1. Remove four bolts (two on each side of snowmobile) securing suspension to chassis. (See Figure 3-99.)



1. Suspension Mounting Bolts

Figure 3-99

2. Position snowmobile on its side on a protective surface and lift suspension out of chassis. Figure 3-100 shows the complete suspension assembly after it has been removed from the snowmobile.

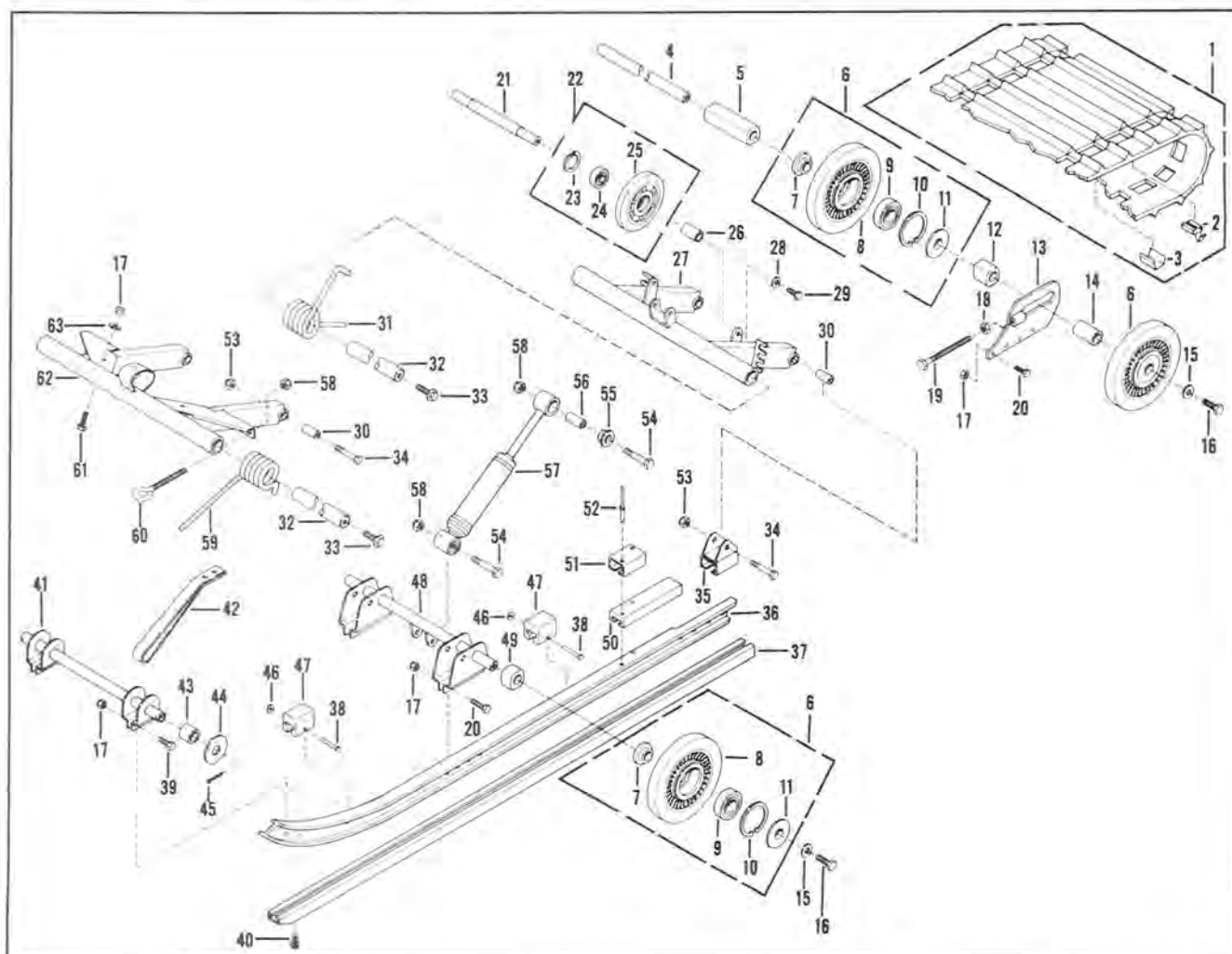


Figure 3-100

Inspection

Check wheel bearings, suspension arms and pivot shafts for binding. If the suspension binds, locate the problem and refer to the appropriate repair procedure. Refer to Figure 3-101 for parts location and identification when repairing the suspension.

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



- | | | |
|---|------------------------------------|---|
| 1. Track Assembly | 23. Snap Ring | 43. Front Suspension Spring Bushing |
| 2. Track Clip | 24. Bearing | 44. Limiter Bracket Assembly Washer |
| 3. Track Clip | 25. Wheel | 45. Cotter Pin |
| 4. Rear Axle | 26. Idler Wheel Spacer | 46. Bumper Pin Retainer |
| 5. Rear Axle Wheels Spacer | 27. Rear Suspension Arm | 47. Rubber Bumper |
| 6. Idler Wheel Assembly | 28. Washer | 48. Front Suspension Bracket Assembly |
| 7. Inside Wheel Spacer | 29. Bolt | 49. Front Idler Wheel Spacer,
0.935 in. (23.7 mm) long |
| 8. Idler Wheel | 30. Suspension Bushing | 50. Bracket Wear Strip |
| 9. Ball Bearing | 31. Rear Spring | 51. Rear Suspension Bracket Stopper |
| 10. Snap Ring | 32. Pivot Shaft | 52. Rivet |
| 11. Outside Wheel Spacer | 33. Bolt | 53. Nut |
| 12. Rear Axle Wheels Spacer
1.210 in. (30.7 mm) long | 34. Bolt | 54. Bolt |
| 13. Rear Axle Bracket Assembly | 35. Rear Suspension
Arm Bracket | 55. Shock Absorber Bushing |
| 14. Rear Axle Wheel Spacer | 36. Suspension Rail | 56. Shock Absorber Sleeve |
| 15. Washer | 37. Rail Wear Strip | 57. Shock Absorber |
| 16. Bolt | 38. Bumper Pin | 58. Nut |
| 17. Nut | 39. Screw | 59. Front Spring |
| 18. Nut | 40. Bolt | 60. Eye Bolt |
| 19. Bolt | 41. Limiter Bracket
Assembly | 61. Bolt |
| 20. Bolt | 42. Limiter | 62. Front Suspension Swing Arm |
| 21. Idler Wheel Shaft | | 63. Limiter Strap Washer |
| 22. Rear Suspension Idler
Wheel Assembly | | |

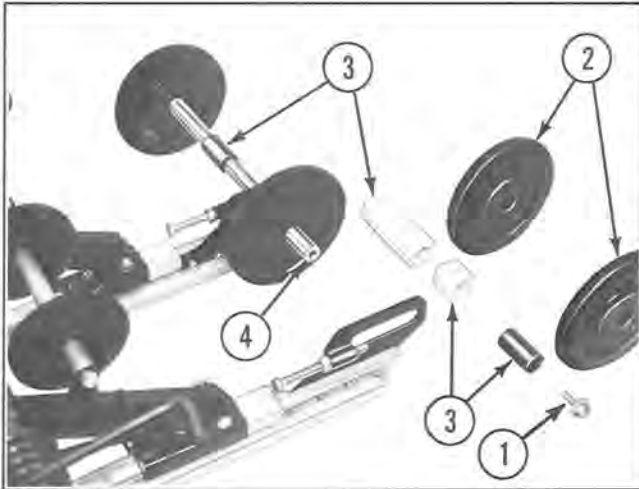
Figure 3-101

Rear Axle and Wheels

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

Removal and Disassembly

1. Remove bolts from end of the axle. (See Figure 3-102.)



1. Rear Axle Mounting Bolt
2. Wheel Assembly
3. Spacers
4. Rear Axle

Figure 3-102

2. Lightly tap rear axle out from wheel assemblies and remove axle spacers.
3. To remove bearing from wheel, remove outside and inside (large and small) wheel spacers, snap ring, then press the bearing out of the wheel. (See Figure 3-101.)

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

Inspection

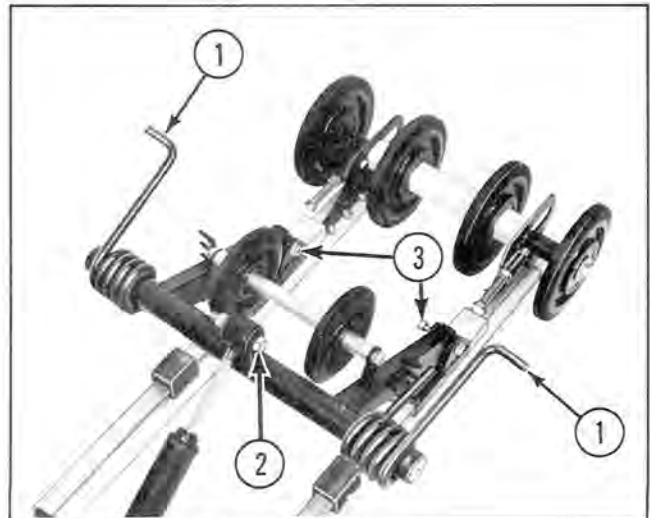
1. Replace rear idler wheel if rubber is excessively worn.
2. Spin rear idler wheels and check for noise, excessive slop between shaft and bearing, or binding. Replace bearings or spacers if necessary.
3. Inspect the shaft for damage.

Reassembly and Installation

1. Press the new bearings into the wheels and secure with snap ring, then install the outside and inside (large and small) wheel spacers.
2. Install idler wheels and spacers onto rear axle in sequence shown. (See Figure 3-102.) Be sure plastic spacer 1.210 in. (30.7 mm) long is positioned inside of rear axle bracket.
3. Secure wheels with bolts previously removed tightened to 30 ft lb (4.1 kg-m) torque.
4. Install suspension and check track adjustments. Refer to Suspension Installation procedure in Section 3.

Rear Suspension Arm (See Figure 3-103)

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



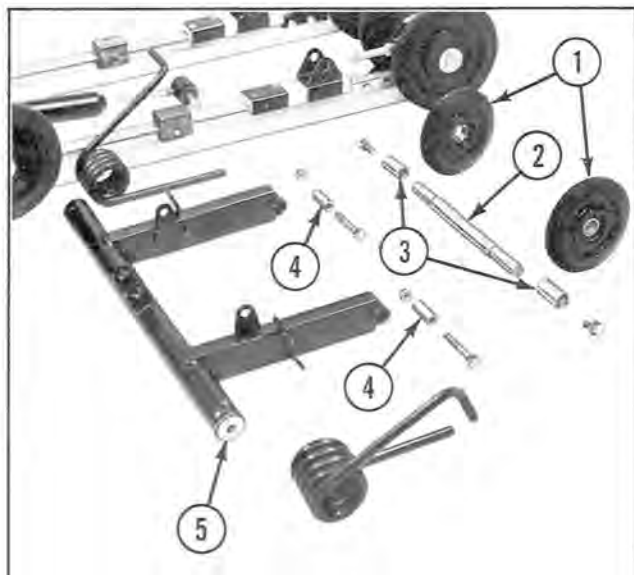
1. Springs
2. Upper Shock Absorber Mount Bolt
3. Rear Arm Mounting Bolts

Figure 3-103

Removal and Disassembly

1. Slide springs off of rear arm.
2. Unscrew upper shock absorber mounting bolt.

3. Unscrew bolts securing rear arm assembly to slide rail brackets and lift rear arm from slide rail assembly.
4. Disassemble rear suspension arm by removing pivot shaft, idler wheels with shaft, spacers and bushings. (See Figure 3-104.)



1. Idler Wheels
2. Idler Shaft
3. Spacers
4. Bushings
5. Pivot Shaft

Figure 3-104

Inspection (See Figure 3-105)

1. Measure swing arm as shown. If dimension "X" is different than dimension "Y" by 1/8 in. (3.2 mm) or more, replace swing arm. Examine swing arms for distortion, cracks or broken welds. Repair or replace if necessary.
2. Remove and examine bushings and shafts for wear or damage. Replace if necessary.
3. Examine suspension brackets for bends or cracks. Replace if necessary.
4. Inspect wheel bearings for noise, excessive play or binding. Replace defective or questionable bearings. (See Figure 3-101.)
5. Check springs for worn spots and cracks. Replace if any defects are observed.

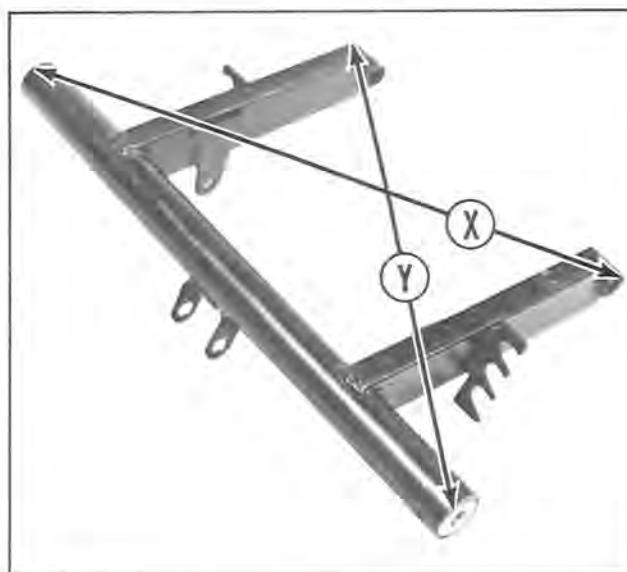


Figure 3-105

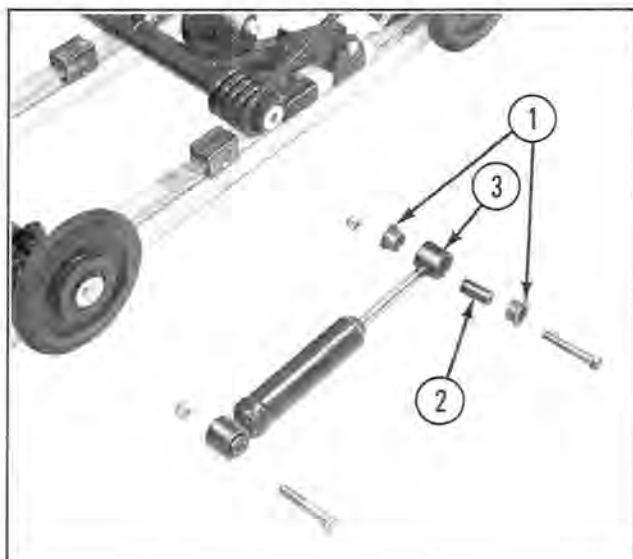
Reassembly and Installation (See Figures 3-103 and 3-104)

1. Assemble idler wheels onto shaft in sequence shown. (See Figure 3-104.)
2. Secure idler wheel and shaft assembly to rear suspension arm by tightening mounting bolts to 11 ft lb (1.5 kg-m) torque.
3. Grease and insert bushings into rear suspension arms, position arm assembly into slide rail brackets, then secure rear arm to rail brackets by tightening mounting bolts and nuts to 17 ft lb (2.4 kg-m) torque.
4. Secure shock absorber to rear arm bracket by tightening mounting bolt and nut to 15 ft lb (2.1 kg-m) torque.
5. Grease and insert pivot shaft into rear arm.
6. Slide springs onto rear arm as shown. (See Figure 3-103.)
7. Install suspension, and check track adjustments. Refer to Suspension Installation procedure in Section 3.

Shock Absorber

Removal (See Figure 3-106)

1. Unscrew bolts from each end of shock absorber and remove from suspension arms.
2. Remove bushings and sleeve from upper shock absorber mounting eye.



1. Bushings
2. Sleeve
3. Upper Mounting Eye

Figure 3-106

Inspection

1. Examine shock absorber shaft for warpage.
2. Inspect shock absorber for leakage and cracked or worn rubber mounts.
3. Check bushings and sleeve for wear and damage. Replace defective parts as required.

Installation (See Figure 3-106)

1. Install bushings and sleeve into upper shock mounting eye.
2. Position shock absorber upper mounting eye into rear suspension arm bracket, insert short mounting bolt and thin nut, then tighten bolt and nut to 15 ft lb (2.1 kg-m) torque.

CAUTION

Short bolt must be installed in upper shock absorber mount or damage to track drive lugs will result.

3. Secure lower shock absorber mount to front arm bracket assembly by tightening bolt and nut to 30 ft lb (4.1 kg-m) torque.

Wear Strips

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

Hi-Fax (Rail Wear Strip) Inspection

1. Check rail wear strips for cracks, and distortion.
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.
2. Remove self-tapping screw from bottom of the rail wear strip.
3. Tap the back of the wear strip with a block of wood and hammer as illustrated in Figure 3-107 to remove it from the suspension rail.

NOTE: To ease removal of wear strip apply silicone spray (or comparable lubricant) between wear strip and slide rail for entire length.

Installation

1. Lubricate slide rail with silicone spray (or comparable lubricant) then slide wear strip into position on rail assembly.
2. Install wear strip mounting screw and tighten to 60 in. lb (0.69 kg-m) torque.
3. Install suspension and check track adjustments. Refer to Suspension Installation procedure in Section 3.



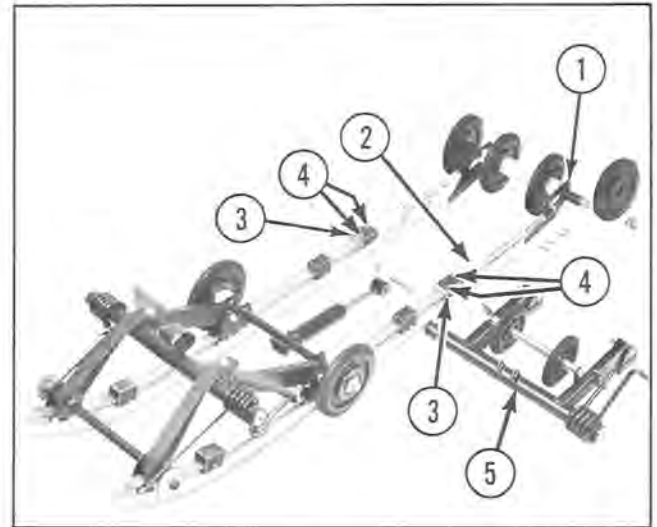
Figure 3-107

Wear Strip (Rear Suspension Arm) Inspection

Replace wear strip if damaged or excessive play exists between rear suspension arm and slide rail.

Removal (See Figure 3-108)

1. Unscrew bolts securing each rear axle bracket to suspension rails and remove rear axle assembly. Remove outside rear axle wheel for access to bracket mounting bolts.
2. Unscrew upper shock absorber mounting bolt from rear suspension arm.
3. Slide rear suspension arm assembly towards rear of rails and off from wear strips.
4. Remove rear suspension arm bracket stopper by drilling $3/16$ in. (4.7 mm) rivets securing stopper to rails. To simplify removal of rivet, drill off head of rivet, then use punch to push body of rivet downward and out of rail assembly.
5. Tap wear strip rearward until off of suspension rail.



1. Rear Axle Bracket
2. Rear Suspension Arm Wear Strip
3. Rear Suspension Arm Bracket Stopper
4. Rivets
5. Upper Shock Absorber Mount

Figure 3-108

Installation (See Figure 3-108)

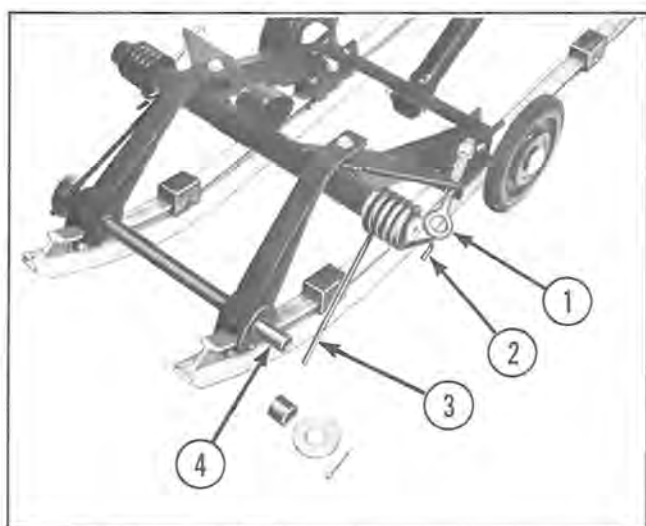
1. Slide wear strip into position on rails, install rear suspension arm bracket stopper, and secure components to suspension rails with rivets.
2. Position rear suspension arm brackets onto wear strips and push assembly forward until brackets contact stoppers.
3. Install upper shock absorber mounting bolt and tighten bolt and nut to 15 ft lb (2.1 kg-m) torque.
4. Install rear axle assembly onto suspension rails, then secure rear axle brackets to rails by tightening bolts and nuts to 95 in. lb (1.1 kg-m) torque.
5. Install suspension and check track adjustments. Refer to Suspension Installation procedure in Section 3.

Front Suspension Arm Springs

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

Removal (See Figure 3-109)

1. Disconnect front arm of spring from limiter bracket assembly.
2. Unhook rear arm of spring from eye bolt and slide spring off of front suspension arm.
3. Remove cotter pin, then slide front suspension spring bushing and washer from limiter bracket assembly.



1. Eye Bolt
2. Spring Rear Arm
3. Spring Front Arm
4. Limiter Bracket

Figure 3-109

Inspection

1. Check springs for worn spots and cracks. Replace springs if defects are noted.
2. Replace spring bushing if worn.
3. Inspect eye bolts for damage and replace if required.

NOTE: If eye bolt replacement is required, observe number of exposed threads protruding through nut, so that same spring tension will be applied during installation of nut and suspension handling adjustment will be unchanged.

Installation (See Figure 3-109)

1. Install front suspension spring bushing and washer onto limiter bracket assembly, then secure components using cotter pin.

2. Slide front springs onto suspension arm and hook rear arm of spring into eye bolt.

NOTE: Springs are different for left and right sides. When properly installed, rear arm of spring is positioned on outside of suspension assembly.

3. Raise front arm of spring over washer and into position on spring bushing.
4. Install suspension and check track adjustments. Refer to Suspension Installation procedure in Section 3.

Limiter Straps

Removal

(See Figures 3-109 and 3-110)

1. Disconnect front arm of spring from limiter bracket assembly.
2. Unscrew bolts and nuts securing limiter straps to front suspension arm, then remove limiters.



Figure 3-110

Inspection

1. Inspect limiters for deterioration and damage. Replace as required.
2. Check the limiter bracket for distortion.

Installation (See Figure 3-110)

1. Install limiter straps through guides on limiter bracket assembly as shown. Be sure washer is positioned on top of limiter strap, then tighten bolts and nuts to 95 in. lb (2.1 kg-m) torque.
2. Raise front arm of spring over washer and into position on spring bushing.

Idler Wheels Front Suspension Arm

Removal and Disassembly (See Figure 3-111)

1. Unscrew bolts securing front idler wheels, then remove wheel assembly and spacer from shaft.

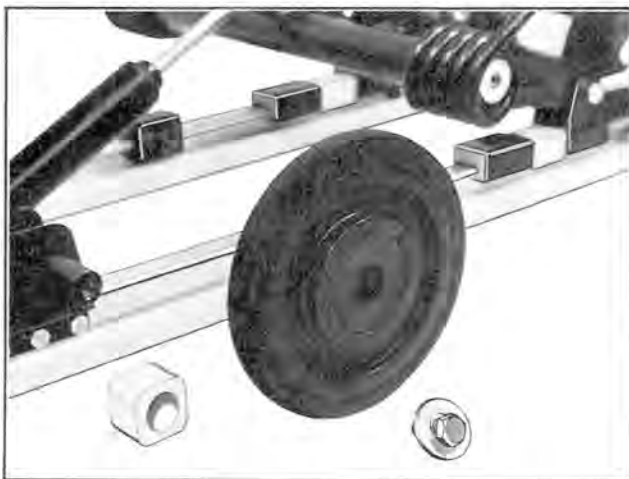


Figure 3-111

2. To remove bearing from wheel, remove outside and inside (large and small) wheel spacers, snap ring, then press the bearing out of the wheel. (See Figure 3-101.)

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

Inspection

1. Replace front idler shaft wheel if rubber is excessively worn.
2. Spin wheels on the shaft and check for noise, excessive slop between shaft and bearing, or binding. Replace bearings if necessary. (See Figure 3-101.)

3. Inspect shaft. If damaged, replace front suspension arm bracket assembly.

Reassembly and Installation (See Figure 3-111)

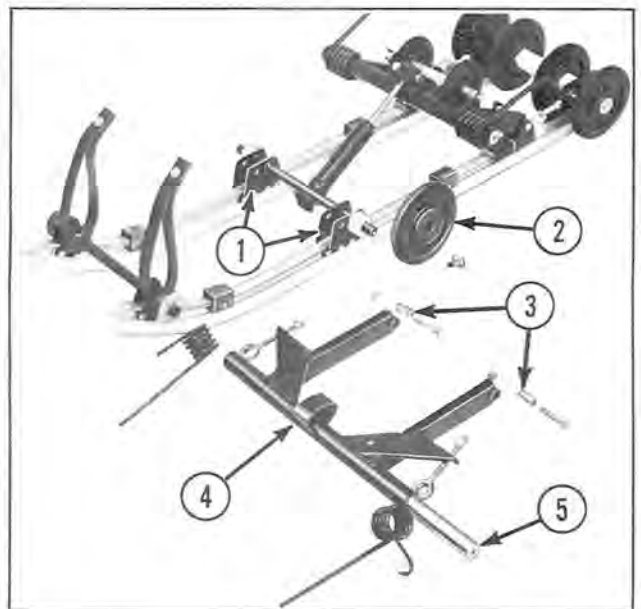
1. Press the new bearings into the wheels and secure with snap ring, then install the outside and inside (large and small) wheel spacers.
2. Install idler wheels and spacers onto shaft in sequence shown. Be sure plastic spacer 0.935 in. (23.7 mm) long is positioned on shaft prior to installing wheel assembly.
3. Secure wheels with bolts previously removed tightened to 30 ft lb (4.1 kg-m) torque.

Front Suspension Arm

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

Removal (See Figure 3-112)

1. Remove front suspension arm idler wheels. Refer to Idler Wheel Removal procedure.



1. Front Suspension Arm Bracket Assembly
2. Idler Wheel
3. Bushings
4. Front Suspension Arm
5. Pivot Shaft

Figure 3-112

2. Remove front suspension arm springs. Refer to Front Suspension Arm Springs Removal procedure.
3. Disconnect limiter straps from front suspension arm assembly. Refer to Limiter Strap Removal procedure.
4. Separate front suspension arm from suspension arm brackets by removing mounting bolts. (See Figure 3-112.)
5. Disassemble front suspension arm by removing pivot shaft and bushings.

Inspection (See Figure 3-113)

1. Measure swing arm as shown. If dimension "X" is different than dimension "Y" by 1/8 in. (3.2 mm) or more, replace swing arm. Examine swing arms for distortion, cracks or broken welds. Repair or replace if necessary.

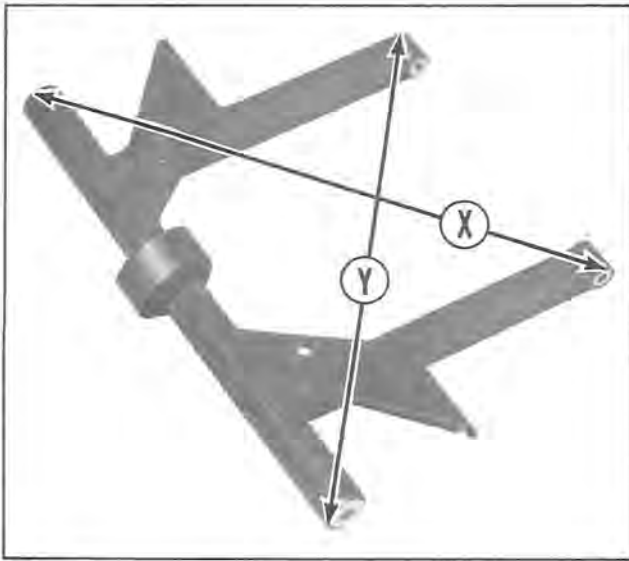


Figure 3-113

2. Remove and examine bushings and shafts for wear or damage. Replace if necessary.
3. Examine suspension brackets for bends or cracks. Replace if necessary.
4. Inspect wheel bearings for noise, excessive play or binding. Replace defective or questionable bearings. (See Figure 3-101.)
5. Check springs for worn spots and cracks. Replace if any defects are observed.

6. Inspect eye bolts for damage and replace if required.

NOTE: If eye bolt replacement is required, observe number of exposed threads protruding through nut, so that same spring tension will be applied during installation of nut and suspension handling adjustment will be unchanged.

Installation (See Figure 3-112)

1. Grease and insert bushings into front suspension arms, position arm assembly into slide rail brackets, then secure by tightening mounting bolts and nuts to 17 ft lb (2.4 kg-m) torque.
2. Install limiter straps. Refer to Limiter Strap Installation procedure.
3. Install front suspension springs. Refer to Front Suspension Arm Springs Installation procedure.
4. Secure idler wheels to front suspension arm bracket assembly. Refer to Front Suspension Arm Idler Wheel Installation procedure.
5. Grease and insert pivot shaft into front suspension arm.
6. Install suspension and check track adjustments. Refer to Suspension Installation procedure in Section 3.

Suspension Rails

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

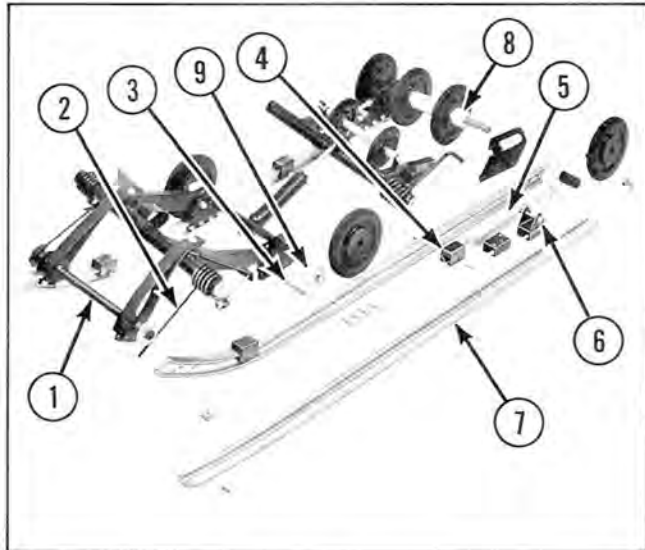
Inspection

Inspect suspension rails for distortion and damage. Rails should be parallel for entire length.

Removal (See Figure 3-114)

1. Remove rail wear strips. Refer to Hi-Fax (rail wear strip) Removal procedure.
2. Remove all bolts and nuts, which secure suspension rails to brackets.
3. Disconnect front suspension arm spring from limiter bracket assembly.

4. Remove front and rear suspension arm mounting bolts.
5. Remove rear bumper.
6. Remove rear suspension arm wear strip. Refer to Rear Suspension Arm Wear Strip Removal procedure.
7. Slide suspension rails from brackets.



1. Limiter Bracket Assembly
2. Front Suspension Spring
3. Front Suspension Arm Mount Bolt
4. Bumper
5. Rear Suspension Arm Wear Strip
6. Rear Suspension Arm Mount Bolt
7. Suspension Rail Wear Strip
8. Spacer 1.210 in. (30.7 mm) long
9. Spacer 0.935 in. (23.7 mm) long

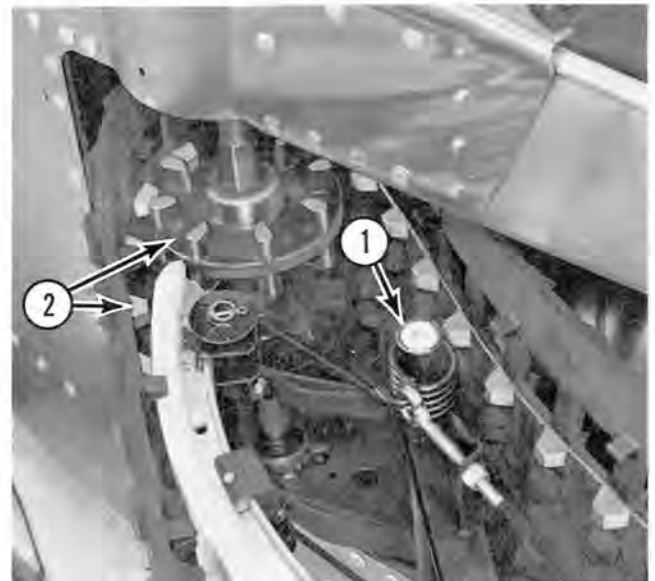
Figure 3-114

5. Measure distance between suspension rails several places along its length, to insure rails are parallel, after performing repairs.
6. Install suspension and check track adjustments. Refer to Suspension Installation procedure.

Suspension Installation

NOTE: Apply grease to front and rear suspension arm pivot shafts prior to installation.

1. Place the snowmobile on its right side and slide suspension between the track. Be sure lugs on track are properly mated with drive lugs on sprockets. (See Figure 3-115.)



1. Pivot Shaft
2. Drive Lugs

Figure 3-115

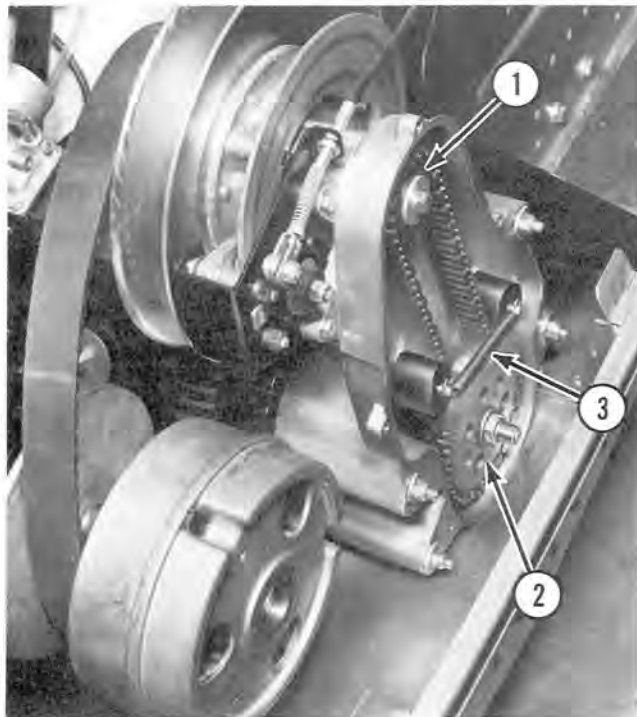
Installation

1. Reassemble suspension rails in the opposite order of removal. Tighten bolts and nuts which attach rails to the brackets and rear axle support brackets to 95 in. lb (1.09 kg-m).
2. Tighten front and rear suspension arm mounting bolts to 17 ft lb (2.4 kg-m) torque.
3. Be sure correct plastic spacer is installed behind front suspension arm idler wheel. (See Figure 3-114.)
4. Install rail wear strips. Tighten screw to 60 in. lb (0.69 kg-m).
2. Align front pivot shaft with forward holes in side of tunnel. Secure with whiz lock bolts. Torque to 25 ft lb (3.4 kg-m).
3. Align rear suspension arm pivot shaft with holes in rear suspension bracket. Install bolts and tighten to 25 ft lb (3.4 kg-m).
4. Adjust the track tension and suspension springs. Refer to Track Adjustments and Suspension Adjustment procedures in Section 2.

Driveshaft and Track

Removal

1. Remove suspension. Refer to Suspension Removal procedure in Section 3.
2. Remove the chaincase cover and drain lubricant into a clean container.
3. Remove the chain tensioner spring, upper and lower sprockets and spacers. (See Figure 3-116.)



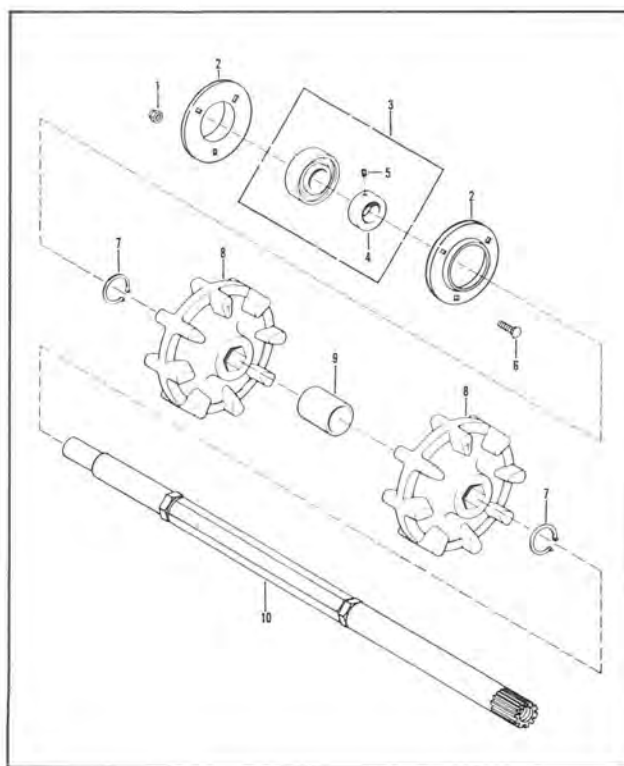
1. Upper Sprocket
2. Lower Sprocket
3. Tensioner Spring

Figure 3-116

Driveshaft Repair

1. Inspect the bearing. If bearing has signs of scoring, discoloration, binding, or excessive radial play, it must be replaced. (See Figure 3-117.)
2. Check drive sprockets for excessive wear. Should replacement be necessary, use snapping pliers to remove sprocket retaining rings. Support shaft vertically on a wood block and remove sprockets by lightly tapping with a plastic hammer.

NOTE: When replacing sprockets, index marks (T) must be aligned in same position on shaft as shown in Figure 3-117.



1. Nut
2. Bearing Flange
3. Bearing Assembly
4. Collar
5. Set Screw
6. Screw
7. Snap Ring
8. Drive Sprocket
9. Sprocket Spacer
10. Track Drive Shaft

Figure 3-117

Track Repair

1. Check track for cracks, tears and gouges.

4. Loosen set screw and collar on driveshaft bearing. To loosen the locking collar; rotate collar in opposite direction of drive shaft rotation, using hammer and punch.
5. Unscrew nuts and remove bearing with flanges from right hand end of drive shaft. (See Figure 3-117.)
6. Pull the driveshaft assembly to the right, until it disengages from the chaincase. Carefully lower, and remove driveshaft assembly.
7. Remove the track.

2. Check for broken, worn or missing clips. Remove old clips.
 - a. To remove clips from track, drill a series of indentations across top of clip, then use hammer and chisel to split clip along indentations.

NOTE: It is not necessary to drill completely through clip, small indentations are sufficient to permit the clip to split.

- b. To install new clip, position it on track and compress with track clip tool assembly (tool No. 205088) as shown in Figure 3-118.



1. Track Clip Tool Assembly

Figure 3-118

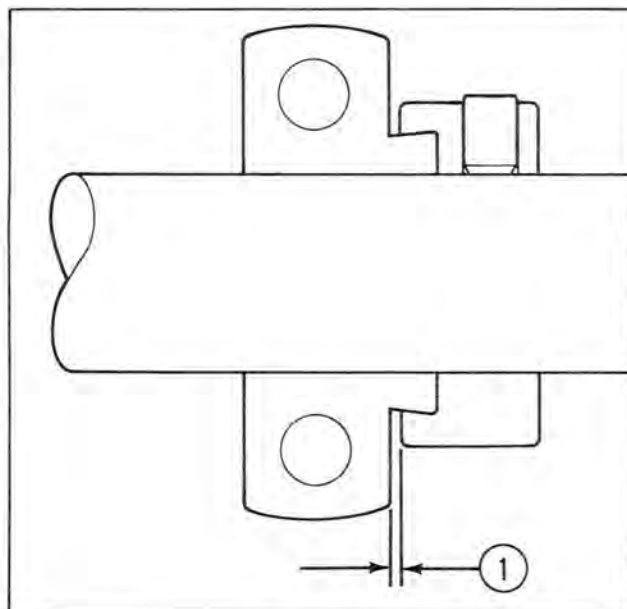
Driveshaft and Track Installation

1. Position track into tunnel with driveshaft between track.
2. Insert splined end of driveshaft through the chaincase.
3. Place the lock collar, bearing, and bearing flange on the driveshaft from outside of chassis.
4. Install bearing flange mount bolts with bolt heads inside tunnel, then install nuts and tighten to 17 ft lb (2.4 kg-m).
5. Place bearing-to-sprocket spacers on the shafts. Insert sprockets in chain, and install on shafts, rotate sprockets until they align with shaft splines.
6. Apply Loctite to bolts. Install washers and torque upper sprocket bolt to 20 ft lb (2.8 kg-m), and lower sprocket bolt to 55 ft lb (7.6 kg-m).
7. Install chain tensioner spring and pins.
8. Secure chaincase cover to the chaincase and torque bolts 70 in. lb (0.81 kg-m).

CAUTION

To prevent premature component failure, properly position locking collar onto bearing during installation. When properly installed, gap between bearing and locking collar is less than 1/8 in. (3.1 mm). (See Figure 3-119.)

9. Pull driveshaft to the right 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 same direction as shaft rotation. Tighten set screw to prevent the lock collar loosening.
10. Fill the chaincase as specified in Section 2.
11. Install suspension as specified in Section 3.
12. Adjust the track as described in Section 2.



1. Gap

Figure 3-119

Steering System

Handlebars and Steering Pole Removal (See Figure 3-120)

1. Disconnect electrical connectors from the circuit board so handlebars can be removed.
2. Disconnect the control cables from the handles.
3. Remove four mounting screws from the handle holder. (See Figure 3-120.) The handlebars can now be removed.

NOTE: Engine assembly should be removed for access to steering pole components.



- | | |
|---------------------------|----------------------------|
| 1. Handle Grip | 15. Nut |
| 2. Cable Tie Band | 16. Special Screw |
| 3. Lower Steering Bracket | 17. Nut |
| 4. Bolt | 18. Rod End Spacer |
| 5. Handle Pole Assembly | 19. Short Steering Arm |
| 6. Bolt | 20. Bolt |
| 7. Steering Tie Rod | 21. Bolt |
| 8. Nut | 22. Washer |
| 9. Adjusting Stud | 23. Upper Steering Bracket |
| 10. Nut | 24. Nut |
| 11. Washer | 25. Rubber Damper |
| 12. Long Steering Arm | 26. Bolt |
| 13. Bolt | 27. Handle Holder |
| 14. Tie Rod End | 28. Handlebar |

Figure 3-120

4. Disconnect tie rods from arms at base of steering pole.
5. Unscrew bolts and nuts from upper and lower steering pole mounts, then remove steering pole.

Installation (See Figure 3-120)

1. Lubricate the steering dampers inner surfaces with silicone grease. Slide the steering pole into position. Apply Loctite to bolts and secure the lower steering pole bracket with two bolts and washers. Torque bolts to 16 ft lb (2.2 kg-m). Bend tabs on washers to retain the bolts. Secure the upper steering pole bracket with two bolts, washers and nuts. Tighten bolts to 16 ft lb (2.2 kg-m).
2. Install the tie rods to the steering pole and secure with screws and nuts. Tighten nuts to correct torque value. Refer to Section 1.
3. Install handlebars and secure with four mounting bolts. Refer to Section 1 for proper torque value.
4. Attach electrical connectors to printed circuit board.

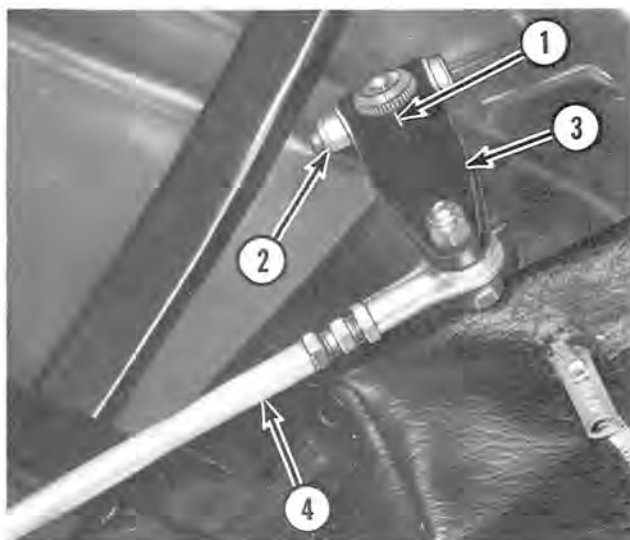
WARNING

Indexing tab on connector must face upward for proper electrical polarity. Improper indexing may damage wiring harness or cause electrical sparks in the engine compartment.

5. Align skis as described in Section 2.
6. Install engine assembly. Refer to Engine Installation procedure in Section 3.

Steering Arm and Spindle Removal

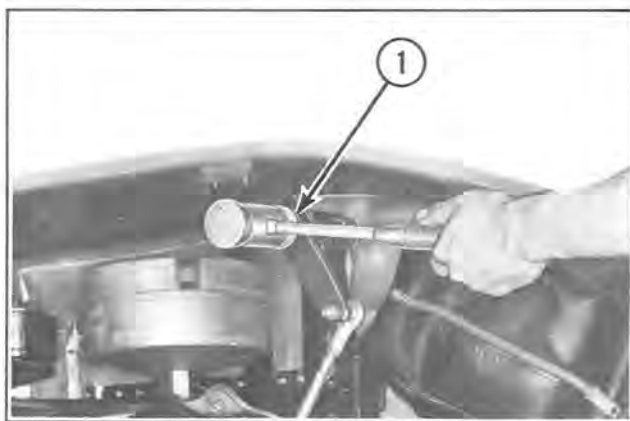
1. Scribe an alignment mark on the steering arm and spindle to aid in installation. (See Figure 3-121.)
2. Remove the nuts from the steering arm retaining bolts. Do not remove the bolts, until the tie rods are disconnected.
3. Remove the tie rod end mounting bolts from steering arms and note the numbers and positions of spacers. Rotate the spindle until the steering arm bolt can be removed.



1. Alignment Mark
2. Nut
3. Steering Arm
4. Tie Rod

Figure 3-121

4. Position the snowmobile on its side. Force the spindle from the steering arm by tapping with a soft mallet. (See Figure 3-122.)



1. Spindle

Figure 3-122

5. Remove one ski spindle bushing from top of snowmobile chassis and one bushing from underneath chassis.
6. Remove spindle from ski saddle assembly and upper shock absorber mount. (See Figure 3-123.)

Installation (See Figure 3-120)

NOTE: Prior to installing spindle, lubricate spindle shaft with low temperature (EP) extreme pressure grease.

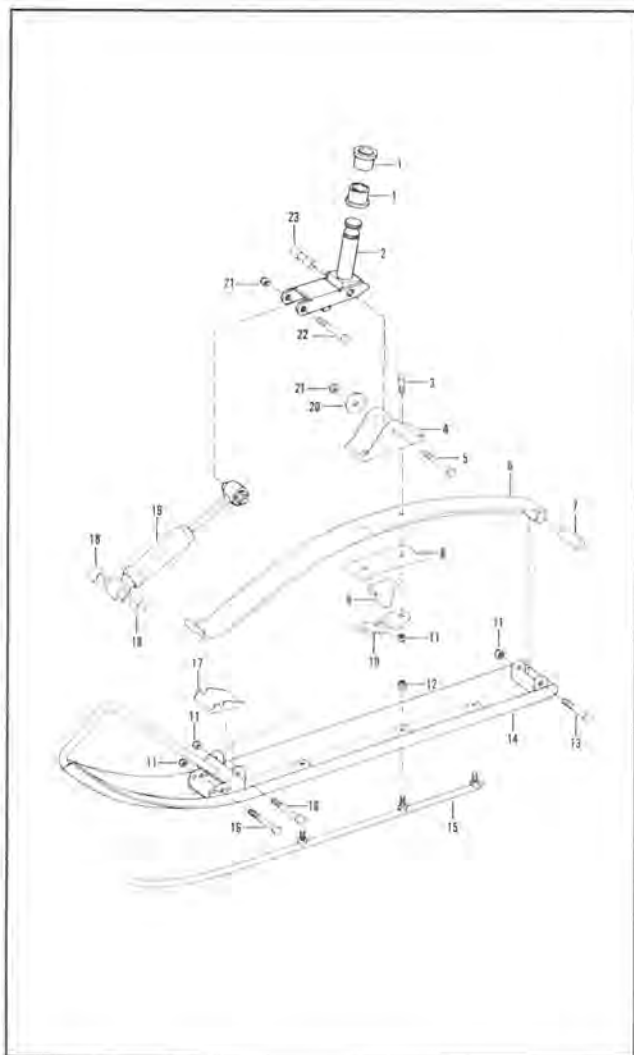
1. Slide one bushing onto ski spindle and insert into lower spindle boss of chassis. Slide upper bushing onto spindle from top of chassis.
2. Install steering arm to spindle, matching index marks made during removal, and tighten mounting bolt and nut to 30 ft lb (4.2 kg-m) torque.
3. Attach tie rod ends to steering arms. Install bolts and spacer in sequence shown in Figure 3-120. Refer to Section 1 for proper torque values.
4. Fill the grease groove or cut away area of the spindle sleeve with a low temperature extreme pressure (EP) grease, and insert sleeve into the spindle. (See Figure 3-123.)
5. Secure the ski assembly to the spindle. Be sure the nut and large flat washer are installed on the inboard side of the ski assembly, then torque the nut 45 to 47 ft lbs (6.2 to 6.5 kg-m). (See Figure 3-123.)
6. Secure upper shock absorber mount to spindle. Refer to Section 1 for proper torque value.
7. Align skis and center steering pole as described in Section 2.

Ski Removal (See Figure 3-123)

1. Remove bolts at each end of spring.
2. Unscrew bolt securing lower end of shock absorber to ski, and remove ski.

Installation (See Figure 3-123)

1. Position rub strip in ski and install front of ski over shock absorber and spring. Tighten shock absorber mounting bolt to 31 ft lb (4.3 kg-m) torque, but do not install front spring mount bolt at this time.
2. Install rear spring sleeve and mounting bolt then torque to 31 ft lb (4.3 kg-m) to secure spring to ski.
3. Adjust spring preload while installing front spring mounting bolt. Refer to Ski Spring Preload procedure in Section 2.

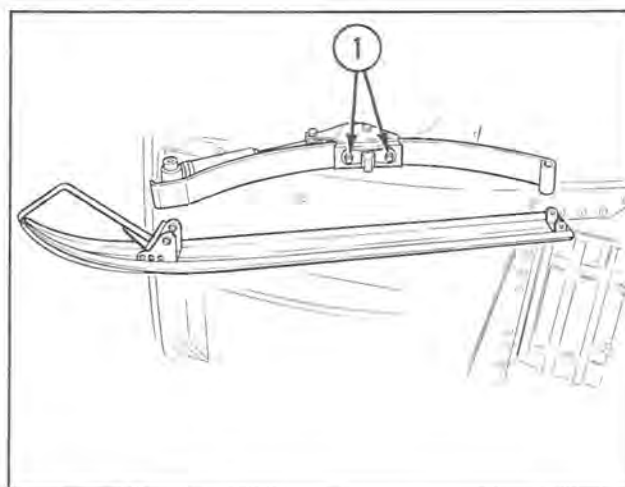


- | | |
|--------------|--------------------|
| 1. Bushing | 13. Bolt |
| 2. Spindle | 14. Ski |
| 3. Bolt | 15. Skag |
| 4. Saddle | 16. Bolt |
| 5. Bolt | 17. Strip |
| 6. Spring | 18. Spacer |
| 7. Sleeve | 19. Shock Absorber |
| 8. Plate | 20. Washer |
| 9. Bumper | 21. Nut |
| 10. Retainer | 22. Bolt |
| 11. Nut | 23. Sleeve |
| 12. Nut | |

Figure 3-123

Ski Spring Removal

1. Remove ski. Refer to Ski Removal procedure.
2. Unscrew spring mounting bolt nuts to separate spring from saddle. (See Figure 3-124.)



1. Spring Mounting Bolts

Figure 3-124

Installation (See Figure 3-123)

1. Install spring mounting bolts into saddle.
2. Next, position spring, back-up plate, bumper and bumper retainer under saddle and secure with nuts. Tighten nuts to 46 ft lb (6.3 kg-m) torque.
3. Install ski. Refer to Ski Installation procedure.

Skeg Removal (See Figure 3-123)

1. Remove nuts securing skeg to ski and remove skeg.

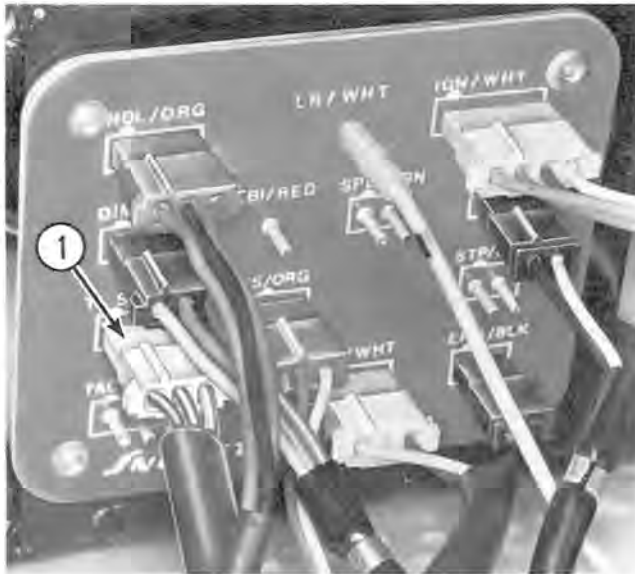
Installation (See Figure 3-123)

1. Insert front of skeg into hole near tip of ski.
2. Align studs on skeg with mounting holes in bottom of ski.
3. Install nuts and tighten to 18 ft lb (2.5 kg-m) torque.

Seat

Removal

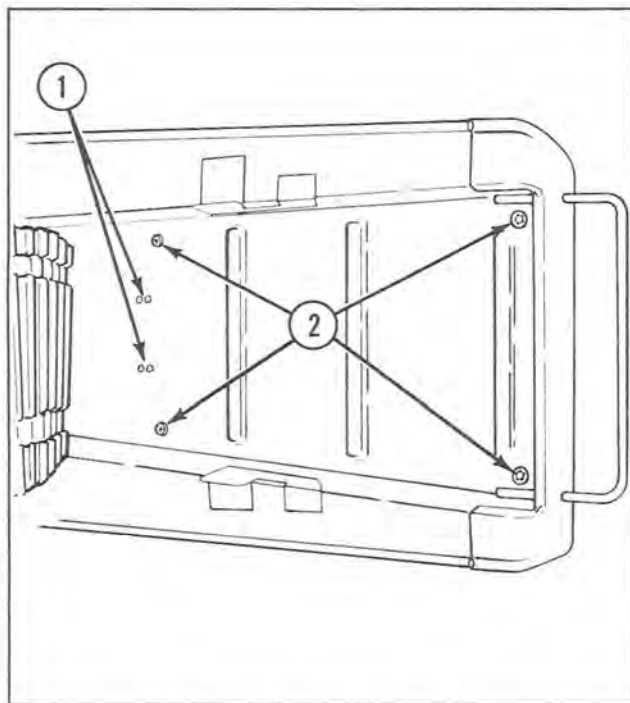
1. Disconnect tail lamp socket housing from printed circuit board. Note tie band positioning for proper location during installation. (See Figure 3-125.)



1. Tail and Brake Light Connector

Figure 3-125

2. Remove rear suspension mounting bolts, position snowmobile on its side, (be sure to provide a protective surface to prevent marring finish on snowmobile) then swing track and suspension out of tunnel. (See Figure 3-126.)



1. Fuel Tank Bracket Rivet Heads
2. Seat Mounting Bolts (Round Head in Front, Hex Head at Rear)

Figure 3-126

3. Remove rear fuel tank mounting bracket by drilling out the 3/16 in. (4.7 mm) rivets. (See Figure 3-126.)
4. Unscrew seat mounting bolts, and while raising fuel tank slightly, remove seat and tail lamp wiring harness from snowmobile.

Installation

NOTE: Check to be sure the rubber pads are properly positioned to protect fuel tank when mounted between tunnel and steering mount. (See Figure 3-127.)

1. Position fuel tank onto snowmobile, route tail light harness under fuel tank, then secure fuel tank to tunnel by installing rivets as shown in Figure 3-126.

CAUTION

To prevent track damage, secure rear fuel tank mounting bracket with rivet heads positioned on underside (track side) of tunnel.

2. Mount seat to tunnel. Round head screws should be installed at front of seat and hex head bolts at rear of seat.
3. After installing rear suspension mounting bolts, adjust rear suspension springs. Refer to Suspension Ride Adjustment procedure in Section 2.
4. Install tail lamp connector onto correct printed circuit board terminals and secure wiring harness with cable tie band.

WARNING

Indexing tab on connector must face upward for proper electrical polarity. Improper indexing may damage wiring harness or cause electrical sparks in the engine compartment.

Fuel Tank

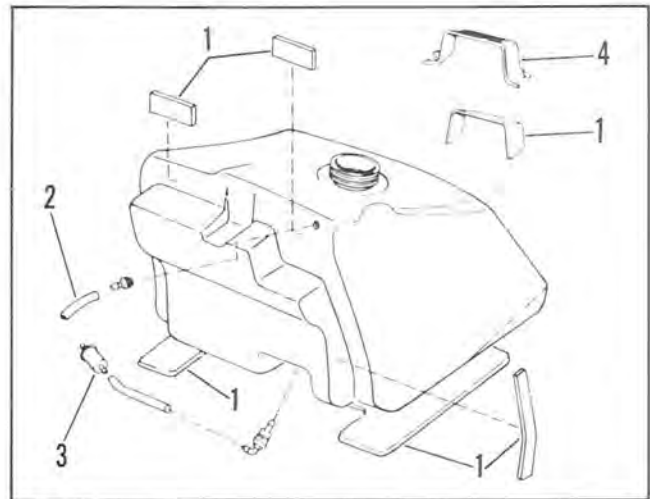
Removal

1. Remove seat assembly. Refer to Seat Removal procedure.
2. Disconnect fuel tank vent tube from fitting near top of fuel tank.

WARNING

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

3. Separate fuel tube from filter and plug end of tube to prevent leakage from tank.
4. Remove fuel tank assembly from snowmobile.



1. Fuel Tank Pads
2. Fuel Tank Vent Tube
3. Fuel Filter
4. Fuel Tank Mount Bracket

Figure 3-127

Installation

NOTE: Check to be sure the rubber pads are properly positioned to protect fuel tank when mounted between tunnel and steering mount. (See Figure 3-127.)

1. Position fuel tank onto snowmobile, route tail light harness under fuel tank, then secure fuel tank to tunnel by installing rivets as shown in Figure 3-126.

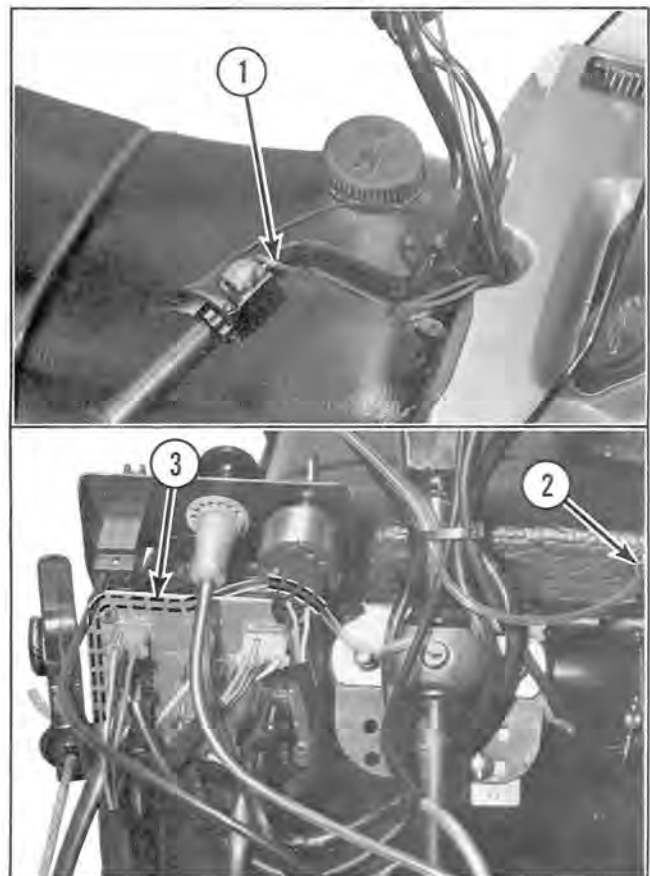
CAUTION

To prevent track damage, secure rear fuel tank mounting bracket with rivet heads positioned on underside (track side) of tunnel.

2. Connect tube between fuel tank and fuel filter.
3. Install fuel tank vent tube onto tank fitting.
4. Check vent tube for proper routing. (See Figure 3-128.)

CAUTION

Incorrect vent tube routing may result in fuel spillage within the engine compartment during deceleration or hard braking when the fuel tank is filled to capacity.



1. Vent Tube Near Throttle Case
2. Fuel Tank Vent Fitting
3. Vent Tube Behind Printed Circuit Board

Figure 3-128

5. Mount seat to tunnel. Round head screws should be installed at front of seat and hex head bolts at rear of seat.
6. After installing rear suspension mounting bolts, adjust rear suspension springs. Refer to Suspension Ride Adjustment procedure in Section 2.
7. Install tail lamp connector onto correct printed circuit board terminals and secure wiring harness with cable tie band.

WARNING

Indexing tab on connector must face upward for proper electrical polarity. Improper indexing may damage wiring harness or cause electrical sparks in the engine compartment.

Appendix

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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

In an emergency situation when Kawasaki Snowmobile Oil is not available, a B.I.A. certified TC-W oil may be substituted. All certified oils will indicate the TC-W rating on the container. If the B.I.A. certification does not appear on the container, THE OIL MUST NOT BE USED.

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

Fuel

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

Fuel/Oil Mixture (Ratio)

Always use a clean separate container to mix fuel. The recommended fuel mix ratio is 40 to 1. Add one pint (0.4732 liters) of KAWASAKI SNOWMOBILE OIL to 5.0 gallons (18.9 liters) of leaded gasoline, with a minimum pump posted octane number of 89, and thoroughly mix the fuel and oil by shaking the can from side to side. (See Figure 4-2.)

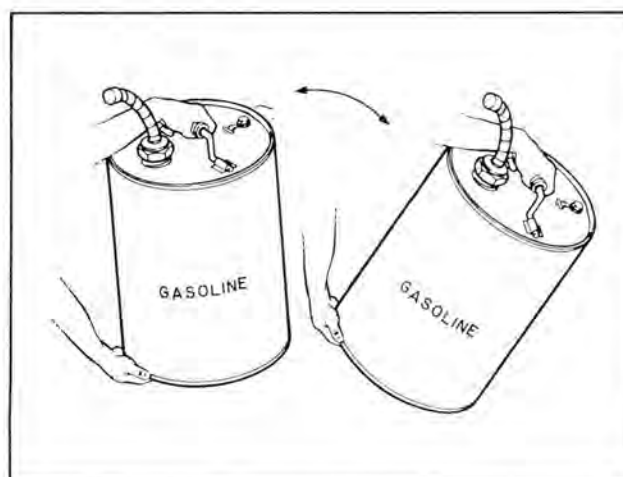


Figure 4-2

CAUTION

Fuel and oil MUST be PROPERLY MIXED or damage to the engine will result.

A major brand of Gasoline Antifreeze (such as Heet) should be added to the fuel and oil mix by following the manufacturer's recommendations on the container for proper mix ratio of gasoline with antifreeze. (See Figure 4-3.)

CAUTION

Each time the fuel tank is filled, gasoline antifreeze must be added to the fuel mix. Moisture contained in fuel system components (fuel tank, lines, fuel pump or carburetor) could freeze and may result in severe damage.



Figure 4-3

WARNING

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

Before removing filler cap from the fuel tank, remove any ice, snow, or water from around the fuel tank opening to prevent contamination of fresh fuel mixture.

Fill the fuel tank slowly and pour the fuel into the tank using a funnel with a fine mesh screen.

Engine Break-In

To insure adequate lubrication of internal engine components during early break-in, a 25-to-1 gasoline-to-oil ratio is required for the first 6.25 gallons of fuel. To obtain this ratio, thoroughly mix one quart (0.946 liters) of KAWASAKI SNOW-MOBILE OIL with 6.25 gallons (24.6 liters) of gasoline.

After the initial 6.25 gallons of the 25-to-1 gasoline-to-oil ratio have been consumed, the standard recommended 40-to-1 ratio should be used.

For proper engine break-in, run the machine on hard packed snow at approximately $\frac{3}{8}$ to $\frac{1}{2}$ throttle, with occasional bursts to full speed. Limit the full speed operation to 1-1/2 to 2 minutes, then return to cruising speed for 10 to 15 minute intervals. After 10 hours of operation or two tanks of gasoline are used, break-in is complete.

Conversion Chart / Fraction Inch to Decimal Inch to mm

Frac. Inch	Dec. Inch	mm.	Frac. Inch	Dec. Inch	mm.	Frac. Inch	Dec. Inch	mm.	Frac. Inch	Dec. Inch	mm.
	.000400	.0100	13/32	.406250	10.3187		.984259	25.0000		1.800000	45.7196
	.000800	.0200	27/64	.421875	10.7156	63/64	.984375	25.0031		1.811037	46.0000
	.001200	.0300		.433074	11.0000	1	1.000000	25.4001	1-13/16	1.812500	46.0376
	.001600	.0400	7/16	.437500	11.1125		1.023629	26.0000	1-27/32	1.843750	46.8313
	.002000	.0500		.450000	11.4300	1-1/32	1.031250	26.1938		1.850000	46.9896
	.002400	.0600	29/64	.453125	11.5094		1.050000	26.6699		1.850407	47.0000
	.002800	.0700	15/32	.468750	11.9062	1-1/16	1.062500	26.9876	1-7/8	1.875000	47.6251
	.003100	.0800		.472444	12.0000		1.062999	27.0000		1.889777	48.0000
	.003500	.0900	31/64	.484375	12.3031	1-3/32	1.093750	27.7813		1.900000	48.2596
	.003900	.1000	1/2	.500000	12.7000		1.100000	27.9397	1-29/32	1.906250	48.4188
1/128	.007900	.2000		.511814	13.0000		1.102369	28.0000		1.929147	49.0000
	.011800	.3000	33/64	.515625	13.0969	1-1/8	1.125000	28.5751	1-15/16	1.937500	49.2126
1/64	.015625	.3969	17/32	.531250	13.4937		1.141739	29.0000		1.950000	49.5296
	.015700	.4000	35/64	.546875	13.8906		1.150000	29.2097		1.968522	50.0000
	.019700	.5000		.550000	13.9700	1-5/32	1.156250	29.3688	1-31/32	1.968750	50.0063
	.023600	.6000		.551184	14.0000		1.181113	30.0000	2	2.000000	50.8001
	.027600	.7000	9/16	.562500	14.2875	1-3/16	1.187500	30.1626		2.007892	51.0000
1/32	.031250	.7937	37/64	.578125	14.6844		1.200000	30.4797	2-1/32	2.031250	51.5939
	.031500	.8000		.590554	15.0000	1-7/32	1.218750	30.9563		2.047262	52.0000
	.035400	.9000	19/32	.593750	15.0812		1.220483	31.0000		2.050000	52.0695
	.039370	1.0000		.600000	15.2400	1-1/4	1.250000	31.7501	2-1/16	2.062500	52.3876
3/64	.046875	1.1906	39/64	.609375	15.4781		1.259853	32.0000		2.086632	53.0000
	.050000	1.2700	5/8	.625000	15.8750	1-9/32	1.281250	32.5438	2-3/32	2.093750	53.1814
1/16	.062500	1.5875		.629924	16.0000		1.299223	33.0000		2.100000	53.3395
5/64	.078125	1.9844	41/64	.640625	16.2719		1.300000	33.0197	2-1/8	2.125000	53.9751
	.078740	2.0000		.650000	16.5100	1-5/16	1.312500	33.3376		2.126002	54.0000
3/32	.093750	2.3812	21/32	.656250	16.6687		1.338593	34.0000		2.150000	54.6095
	.100000	2.5400		.669294	17.0000	1-11/32	1.343750	34.1313	2-5/32	2.156250	54.7688
7/64	.109375	2.7781	43/64	.671875	17.0656		1.350000	39.2897		2.165372	55.0000
	.118110	3.0000	11/16	.687500	17.4625	1-3/8	1.375000	34.9251	2-3/16	2.187500	55.5626
1/8	.125000	3.1750		.700000	17.7800		1.377963	35.0000		2.200000	55.8795
9/64	.140625	3.5719	45/64	.703125	17.8594		1.400000	35.5597		2.204712	56.0000
	.150000	3.8100		.708664	18.0000	1-13/32	1.406250	35.7188	2-7/32	2.218750	56.3564
5/32	.156250	3.9687	23/32	.718750	18.2562		1.417333	36.0000		2.244112	57.0000
	.157418	4.0000	47/64	.734375	18.6531	1-7/16	1.437500	36.5126	2-1/4	2.250000	57.1501
11/64	.171875	4.3656		.748034	19.0000		1.450000	36.8297	2-9/32	2.281250	57.9439
3/16	.187500	4.7625	3/4	.750000	19.0500		1.456703	37.0000		2.283482	58.0000
	.196850	5.0000	49/64	.765625	19.4469	1-15/32	1.468750	37.3063		2.300000	58.4195
	.200000	5.0800	25/32	.781250	19.8437		1.496073	38.0000	2-5/16	2.312500	58.7376
13/64	.203125	5.1594		.787409	20.0000	1-1/2	1.500000	38.1001		2.322852	59.0000
7/32	.218750	5.5562	51/64	.796875	20.2406	1-17/32	1.531250	38.8938	2-11/32	2.343750	59.5314
15/64	.234375	5.9531		.800000	20.3200		1.535443	39.0000		2.350000	59.6895
	.236220	6.0000	13/16	.812500	20.6375		1.550000	39.3696		2.362226	60.0000
1/4	.250000	6.3500		.826779	21.0000	1-9/16	1.562500	39.6876	2-3/8	2.375000	60.3251
17/64	.265625	6.7469	53/64	.828125	21.0344		1.574817	40.0000		2.400000	60.9594
	.275590	7.0000	27/32	.843750	21.4312	1-19/32	1.593750	40.4813		2.401596	61.0000
9/32	.281250	7.1437		.850000	21.5900		1.600000	40.6396	2-13/32	2.406250	61.1189
19/64	.296875	7.5406	55/64	.859375	21.8281		1.614187	41.0000	2-7/16	2.437500	61.9126
	.300000	7.6200		.866149	22.0000	1-5/8	1.625000	41.2751		2.440966	62.0000
5/16	.312500	7.9375	7/8	.875000	22.2250		1.650000	41.9096		2.450000	62.2294
	.314960	8.0000	57/64	.890625	22.6219		1.653557	42.0000	2-15/32	2.468750	62.7064
21/64	.328125	8.3344		.900000	22.8600	1-21/32	1.656250	42.0688		2.480336	63.0000
11/32	.343750	8.7312		.905519	23.0000	1-11/16	1.687500	42.8626	2-1/2	2.500000	63.5001
	.350000	8.8900	29/32	.906250	23.0187		1.692927	43.0000		2.519706	64.0000
	.354330	9.0000	59/64	.921875	23.4156		1.700000	43.1796	2-17/32	2.531250	64.2939
23/64	.359375	9.1281	15/16	.937500	23.8125	1-23/32	1.718750	43.6563		2.550000	64.7694
3/8	.375000	9.5250		.944889	24.0000		1.732297	44.0000		2.559076	65.0000
25/64	.390625	9.9219		.950000	24.1300	1-3/4	1.750000	44.4501	2-9/16	2.562500	65.0876
	.393704	10.0000	61/64	.953125	24.2094		1.771667	45.0000	2-19/32	2.593750	65.8814
	.400000	10.1600	31/32	.968750	24.6062	1-25/32	1.781250	45.2438		2.598446	66.0000

Frac. Inch	Dec. Inch	mm.	Frac. Inch	Dec. Inch	mm.	Frac. Inch	Dec. Inch	mm.	Frac. Inch	Dec. Inch	mm.
2-5/8	2.600000	66.0394	2-31/32	2.952780	75.0000	3-5/16	3.312500	84.1377	3-11/16	3.661449	93.0000
	2.625000	66.6751		2.968750	75.4064		3.343750	84.9314		3.687500	93.6627
	2.637816	67.0000		2.992150	76.0000		3.346485	85.0000		3.700000	93.9792
2-21/32	2.650000	67.3094	3	3.000000	76.2002	3-3/8	3.350000	85.0892	3-23/32	3.700819	94.0000
	2.656250	67.4689		3.031250	76.9939		3.375000	85.7252		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	3-1/16	3.050000	77.4693	3-13/32	3.400000	86.3592	3-3/4	3.750000	95.2502
	2.700000	68.5794		3.062500	77.7877		3.406250	86.5189		3.779559	96.0000
	2.716556	69.0000		3.070890	78.0000		3.425225	87.0000		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	3-13/16	3.800000	96.5192
	2.750000	69.8501		3.100000	78.7393		3.450000	87.6292		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		3.500000	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		3.187500	80.9627		3.543339	90.0000		3.897669	99.0000
	2.843750	72.2314		3.189005	81.0000		3.550000	90.1691		3.900000	99.0591
2-27/32	2.850000	72.3893	3-7/32	3.200000	81.2793	3-9/16	3.562500	90.4877	3-29/32	3.906250	99.2189
	2.874040	73.0000		3.218750	81.7564		3.582709	91.0000		3.937043	100.0000
	2.875000	73.0251		3.228375	82.0000		3.593750	91.2814		3.937500	100.0130
2-7/8	2.900000	73.6593	3-1/4	3.250000	82.5502	3-19/32	3.600000	91.4392	3-15/16	3.950000	100.3291
	2.906250	73.8189		3.267745	83.0000		3.622079	92.0000		3.968750	100.8060
	2.913410	74.0000		3.281250	83.3439		3.625000	92.0752		3.976413	101.0000
2-15/16	2.937500	74.6126	3-9/32	3.300000	83.8192	3-5/8	3.650000	92.7092	4	4.000000	101.6000
	2.950000	74.9293		3.307115	84.0000		3.656250	92.8639			

Drill Sizes/Inch Decimal Equivalent

80 .0135	61 .039	42 .0935	23 .154	4 .209	
79 .0145	60 .040	41 .096	22 .157	3 .213	
78 .016	59 .041	40 .098	21 .159	2 .221	
77 .018	58 .042	39 .0995	20 .161	1 .228	O .316
76 .020	57 .043	38 .1015	19 .166		P .323
75 .021	56 .0465	37 .104	18 .1695	A .234	Q .332
74 .0225	55 .052	36 .1065	17 .173	B .238	R .339
73 .024	54 .055	35 .110	16 .177	C .242	S .348
72 .025	53 .0595	34 .111	15 .180	D .246	T .358
71 .026	52 .0635	33 .113	14 .182	E .250	U .368
70 .028	51 .067	32 .116	13 .185	F .257	V .377
69 .02925	50 .070	31 .120	12 .189	G .261	W .386
68 .031	49 .073	30 .1285	11 .191	H .266	X .397
67 .032	48 .076	29 .136	10 .1935	I .272	Y .404
66 .033	47 .0785	28 .1405	9 .196	J .277	Z .413
65 .035	46 .081	27 .144	8 .199	K .281	
64 .036	45 .082	26 .147	7 .201	L .290	
63 .037	44 .086	25 .1495	6 .204	M .295	
62 .038	43 .089	24 .152	5 .2055	N .302	

English to Metric Conversions

METRIC EQUIVALENTS

m indicates one meter
cm indicates one hundredth of a meter
mm indicates one thousandth of a meter
km indicates one thousand meters

LENGTH

1 mm. = 0.03937 In.
Cm. = 0.3937 In.
Meter = 3.28 Ft.
Meter = 1.094 Yd. (39.37 In.)
Kilom. = 0.621 Mile

In. = 2.54 Cm.
Ft. = 0.3048 Meter
Yd. = 0.9144 Meter
Mile = 1.61 Kilom.

AREA

Sq. Cm. = 0.1550 Sq. In.
Sq. M. = 10.76 Sq. Ft.

Sq. In. = 6.45 Sq. Cm.
Sq. Ft. = 0.0929 Sq. M.

VOLUME

Cu. Cm. = 0.061 Cu. In.
Cu. M. = 35.315 Cu. Ft.

Cu. In. = 16.38 Cu. Cm.
Cu. Ft. = 0.028 Cu. M.

CAPACITY

Liter = 0.0353 Cu. Ft.
Liter = 0.2642 Gallons (U.S.)
Liter = 61.023 Cu. In.
Liter = 2.202 lb. of fresh water at 62°F.
Liter = 1,000 CC
Liter = 35.19 Fl. Oz. (Imp.)
Liter = 33.82 Fl. Oz. (U.S.)

Gal. (U.S.) = 3.785 Liters
Gal. (Imp.) = 4.546 Liters
Cu. Ft. = 28.32 Liters
Cu. In. = 0.0164 Liter
Fl. Oz. (U.S.) = 29.57 CC
Fl. Oz. (Imp.) = 28.41 CC

WEIGHT

Gram = 15.432 Grains
Gram = 0.0353 Oz.

Kilogram = 2.2046 lbs.
Kilogram = 0.0011 Ton (Sht)
Met. Ton = 1.1025 Ton (Sht)
Grain = 0.0648 Gram

Oz. = 28.35 Gram
Lb. = 0.454 Kilgm.
Ton (Sht) = 907.18 Kilgm.
Ton (Sht) = 0.907 Metric Ton
Ton (Sht) = 2000 lb.

PRESSURE

1 Kilogram per Sq. Cm. = 14.2233 Lbs. per Sq. In.
1 Lb. per Sq. In. = 0.070307 Kilgms. per Sq. Cm.
1 Kilogram per Sq. Meter = 0.20482 Lbs. per Sq. Ft.
1 Lb. per Sq. Ft. = 4.8824 Kilgms. per Sq. Meter
1 Kilgm. per Sq. Cm. = 0.96784 Standard Atmosphere
1 Standard Atmosphere = 1.033228 Kilgm. per Sq. Cm.
1 Metric Atmosphere = 1.033228 Kilgm. per Sq. Cm.
1 Std. Atmosphere = 4.6959 Lbs. per Sq. In.

CONVERSION TABLES

	GALLON	QUART	PINT	LITER
U.S.	1	= 4	= 8	= 3.785
	1/4	= 1	= 2	= 0.946
	1/8	= 1/2	= 1	= 0.473
	0.264	= 1.056	= 2.113	= 1
IMP.	1	= 4	= 8	= 4.546
	1/4	= 1	= 2	= 1.136
	1/8	= 1/2	= 1	= 0.568
	0.220	= 0.880	= 1.760	= 1
U.S.				
1 Gallon = 128 oz. = 3,785.41 cc				
1 Quart = 32 oz. = 946.35 cc				
1 Pint = 16 oz. = 473.18 cc				
IMP.				
1 Gallon = 160 oz. = 4,546.09 cc				
1 Quart = 40 oz. = 1,136.52 cc				
1 Pint = 20 oz. = 568.26 cc				

CONVERSION FACTORS

Inches to centimeters (cm) Multiply by 2.54
Meters (m) to yards Multiply by 70 and divide by 64
Kilometers (km) to miles Multiply by 5 and divide by 8
Cubic inches to cubic centimeters Multiply by 16.39
Grams to ounces Multiply by 567 and divide by 20
Liters to U.S. pints Multiply by 95 and divide by 20
Degrees Centigrade to degrees Fahrenheit Multiply by 9, divide by 5 and add 32
Degrees Fahrenheit to degrees Centigrade Subtract 32, multiply by 5 and divide by 9

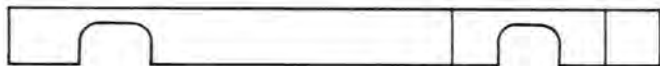
Unit Conversion Table

cc	x	.0610	=	cu.in.
cc	x	.03519	=	fl.oz. (imp.)
cc	x	.03381	=	fl.oz. (U.S.)
cu. in.	x	16.39	=	cc
fl. oz. (imp.)	x	28.41	=	cc
fl. oz. (U.S.)	x	29.57	=	cc
ft-lbs	x	12	=	in-lbs
ft-lbs	x	.1383	=	kg-m
gal. (imp.)	x	4.546	=	liters
gal. (imp.)	x	1.201	=	gal. (U.S.)
gal. (U.S.)	x	3.7853	=	liters
gal. (U.S.)	x	.8326	=	gal. (imp.)
grams	x	.03527	=	oz.
in.	x	25.40	=	mm
in-lbs	x	.0833	=	ft-lbs
in-lbs	x	.0115	=	kg-m
kg	x	2.2046	=	lb.
kg	x	35.274	=	oz.
kg-m	x	7.233	=	ft-lbs
kg-m	x	86.796	=	in-lbs
kg/cm ²	x	14.22	=	lbs/sq.in.
km	x	.6214	=	miles
lb.	x	.4536	=	kg
lb/sq. in.	x	.0703	=	kg/cm ²
liter	x	35.19	=	fl.oz. (imp.)
liter	x	33.81	=	fl.oz. (U.S.)
liter	x	.8799	=	qt. (imp.)
liter	x	1.0567	=	qt. (U.S.)
meter	x	3.281	=	ft.
mile	x	1.6093	=	km
mm	x	.03937	=	in.
oz.	x	28.35	=	grams
qt. (imp.)	x	1.1365	=	liters
qt. (imp.)	x	1.201	=	qt. (U.S.)
qt. (U.S.)	x	.9463	=	liters
qt. (U.S.)	x	.8326	=	qt. (imp.)
fl. oz. (U.S.)	x	1.04	=	fl. oz. (imp.)

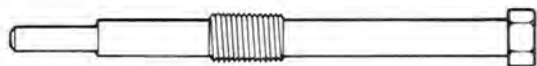
List of Abbreviations

ABDC.....	after bottom dead center
ATDC.....	after top dead center
BBDC.....	before bottom dead center
BDC	bottom dead center
BTDC.....	before top dead center
cc	cubic centimeters
cu. in.	cubic inches
fl. oz.	fluid ounces
ft.	foot, feet
ft-lbs	foot-pounds
gal.	gallon, gallons
hp	horsepower
in.	inch, inches
in-lbs	inch-pounds
kg.....	kilogram, kilograms
kg/cm ²	kilograms per square centimeter
kg-m.....	kilogram-meters
km	kilometer
kph	kilometers per hour
lb., lbs.	pound, pounds
lbs/sq.in.	pounds per square inch
ℓ	liter
m	meter, meters
mi.	mile, miles
mm	millimeters
mph	miles per hour
oz.	ounce, ounces
psi	pounds per square inch
qt.	quart, quarts
r.p.m.	revolutions per minute
sec.	second, seconds
SS	standing start
TDC	top dead center
"	inch, inches

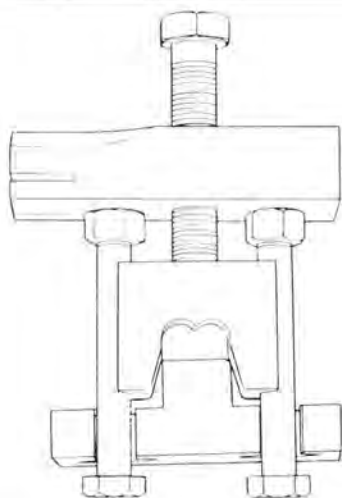
Special Service Tools



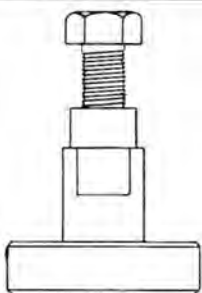
Part No. 205207 Converter Alignment Gauge



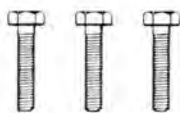
Part No. 205196 Drive Converter Puller



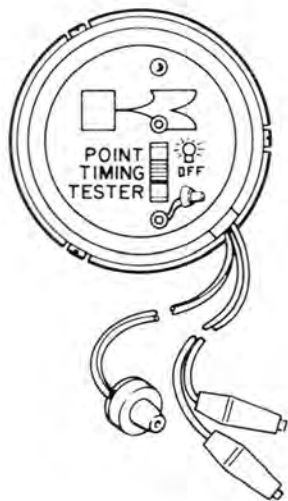
Part No. 205088 Track Clip Tool Assembly



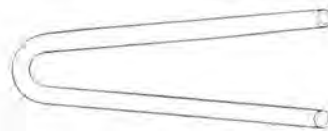
Part No. 57001-3509
Flywheel Puller



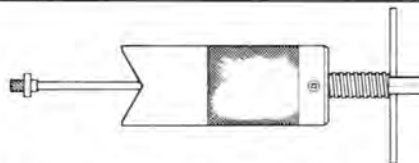
Part No.
110P0620
Flywheel Puller
Bolt



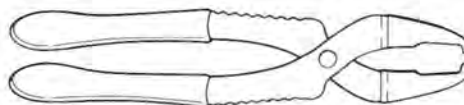
Part No. T57001-120
Static Ignition Timing Tester



Part No. 20508 Fan Pulley Holder



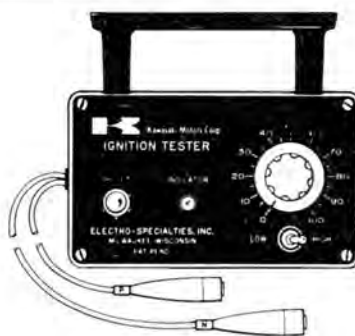
Part No. T57001-910 Piston Pin Puller



Part No. T57001-130
Piston Ring Compressor Set



Part No. 92104-002 Liquid Gasket Sealer

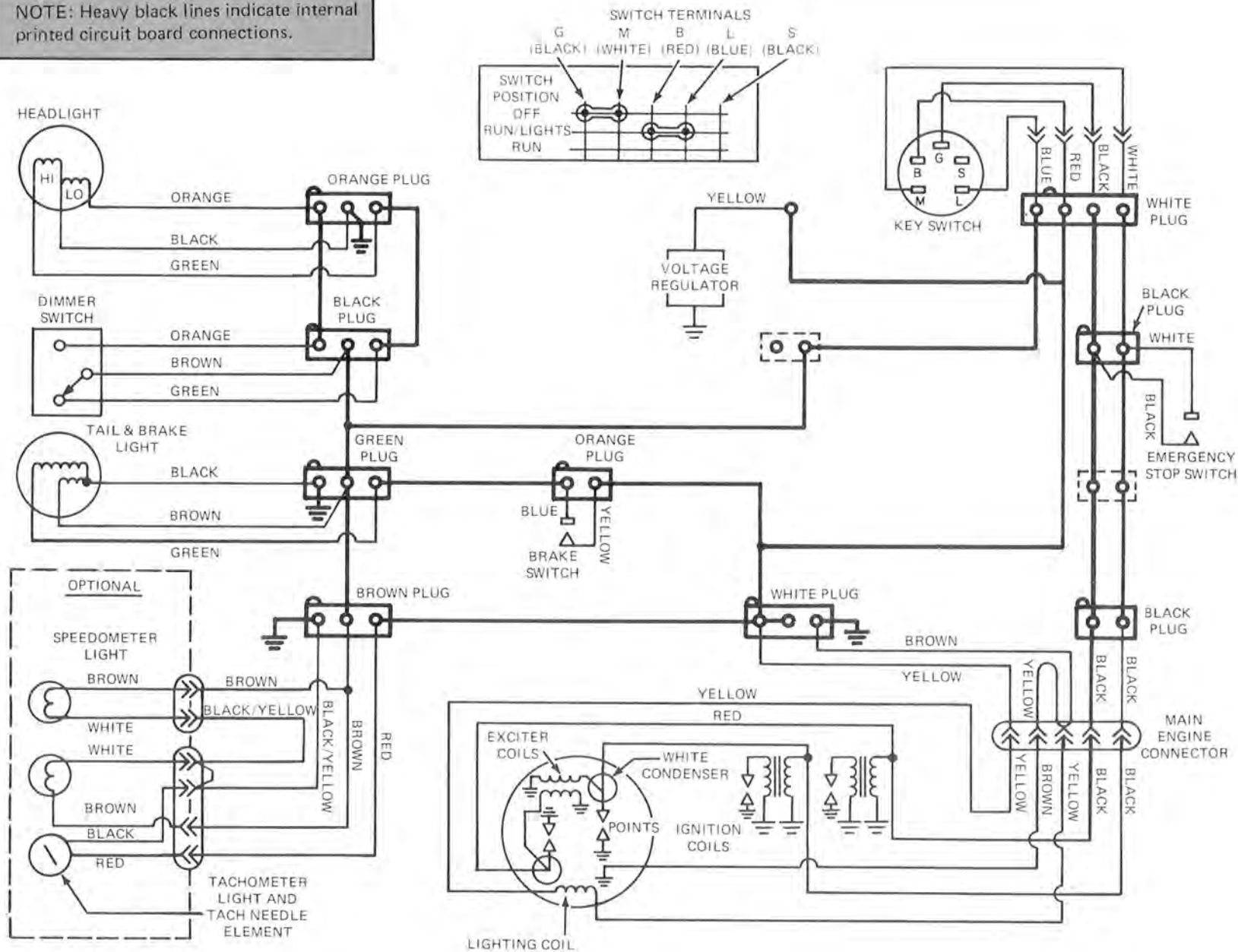


Part No. T56019-201 CD Ignition Tester

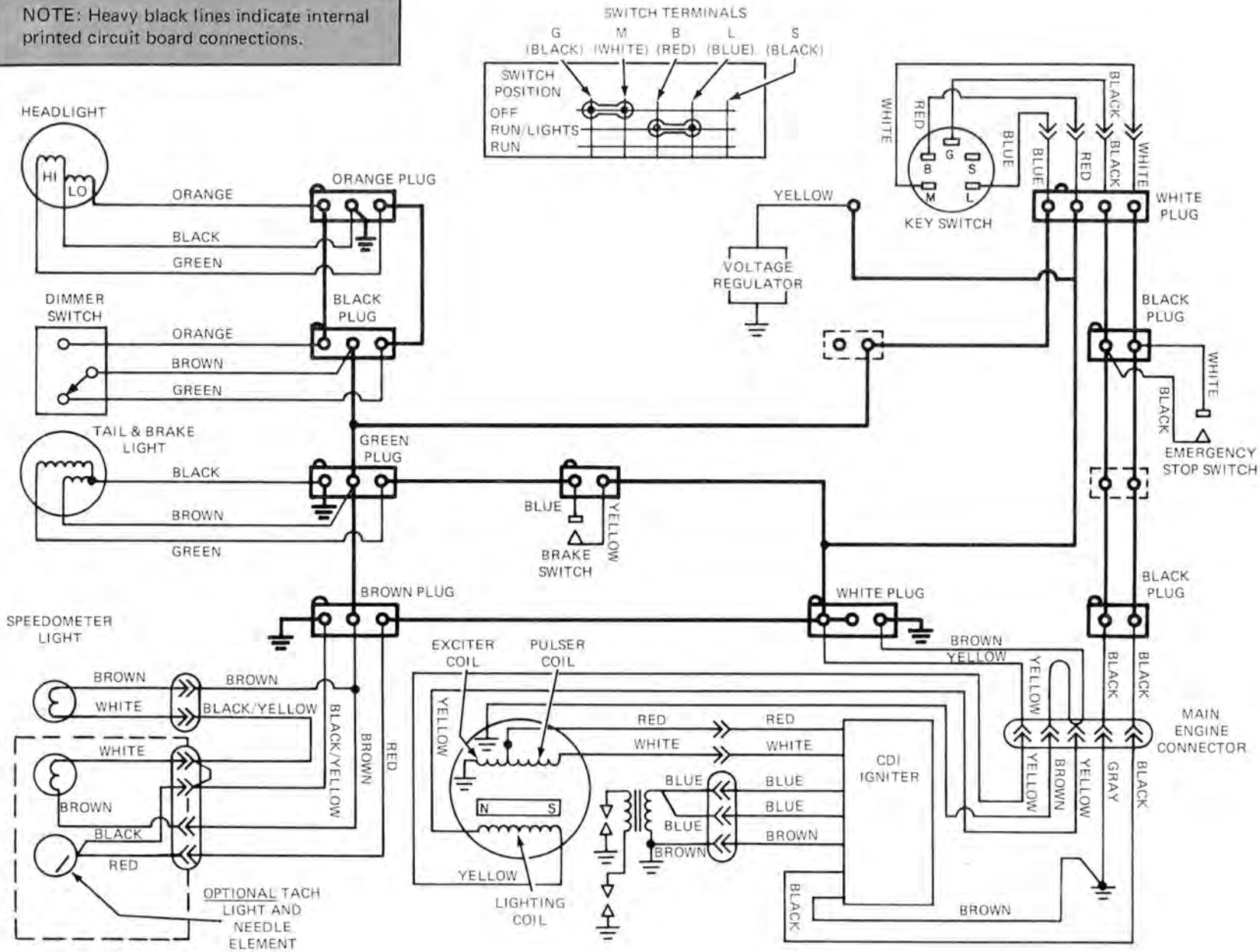


Part No. 57001-3507 Suspension Spring Adjuster

NOTE: Heavy black lines indicate internal printed circuit board connections.



NOTE: Heavy black lines indicate internal printed circuit board connections.



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