LCE Products

Z580-D / Z593-D / Z595-D Diesel Z Master

Service Manual

ABOUT THIS MANUAL

This service manual was written expressly for Toro service technicians. The Toro Company has made every effort to make the information in this manual complete and correct.

Basic shop safety knowledge and mechanical/electrical skills are assumed. The Table of Contents lists the systems and the related topics covered in this manual.

The following service materials are available in addition to this service manual:

Hydrostatic Pumps:	Hydro-Gear P Series Pumps - Service and Repair Manual Form #BLN 52503
Wheel Motors:	Hydro-Gear HGM-E Wheel Motor Service Manual Form #492-9139
Diesel Engine:	Kubota D722/D902 3 Cylinder Liquid-Cooled Engine Repair Manual Form #492-4796
Hydraulic Troubleshooting:	Interactive hydraulic troubleshooting and failure analysis on DVD Form #492-4777
Electrical Troubleshooting:	Interactive electrical troubleshooting and wiring diagrams on DVD Form # 492-9171

The Z Master 593/595/580 model years 2006 to 2008 are covered in this manual. The manual may also be specified for use on later model products.

The hydrostatic drive system is precision machinery. Maintain strict cleanliness control during all stages of service and repair. Cover or cap all hose ends and fittings whenever they are exposed. Even a small amount of dirt or other contamination can severely damage the system.

We are hopeful that you will find this manual a valuable addition to your service shop. If you have any questions or comments regarding this manual, please contact us at the following address:

The Toro Company
LCE Service Training Department
8111 Lyndale Avenue South
Bloomington, MN 55420

The Toro Company reserves the right to change product specifications or this manual without notice.

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TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

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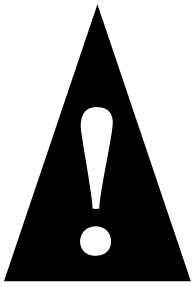
General Information



This symbol means WARNING or PERSONAL SAFETY INSTRUCTION - read the instruction because it has to do with your safety. Failure to comply with the instruction may result in personal injury or even death.

This manual is intended as a service and repair manual only. The safety instructions provided herein are for troubleshooting, service, and repair of the Z Master Z580-D, Z593-D and Z595-D.

The riding mower and attachment operator's manual contain safety information and operating tips for safe operating practices. Operator's manuals are available online at www.toro.com, through your Toro parts source or:

The Toro Company
Publications Department
8111 Lyndale Avenue South
Bloomington, MN 55420

Think Safety First

Avoid unexpected starting of engine...

Always turn off the engine and disconnect the spark plug wire(s) before cleaning, adjusting, or repair.

Avoid lacerations and amputations...

Stay clear of all moving parts whenever the engine is running. Treat all normally moving parts as if they were moving whenever the engine is running or has the potential to start.

Avoid burns...

Do not touch the engine, muffler, or other components which may increase in temperature during operation, while the unit is running or shortly after it has been running.

Avoid fires and explosions...

Avoid spilling fuel and never smoke while working with any type of fuel or lubricant. Wipe up any spilled fuel or oil immediately. Never remove the fuel cap or add fuel when the engine is running. Always use approved labeled containers for storing or transporting fuel and lubricants.

Avoid asphyxiation...

Never operate an engine in a confined area without proper ventilation.

Avoid injury from batteries...

Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes, and clothing. Battery gases can explode. Keep cigarettes, sparks, and flames away from the battery.

Avoid injury due to inferior parts...

Use only original equipment parts to ensure that important safety criteria are met.

Avoid injury to bystanders...

Always clear the area of bystanders before starting or testing powered equipment.

Avoid injury due to projectiles...

Always clear the area of sticks, rocks, or any other debris that could be picked up and thrown by the powered equipment.

Avoid modifications...

Never alter or modify any part unless it is a factory approved procedure.

Avoid unsafe operation...

Always test the safety interlock system after making adjustments or repairs on the machine. Refer to the Electrical section in this manual for more information.

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Specifications Z593-D & Z595-D

Configurations

	Z593-D Pro Performance	Z595-D Pro Performance
23 hp Kubota® 3 Cyl Diesel	52”/60” Turbo Force	
25 hp Kubota® 3 Cyl Diesel		52”/60”/72” Turbo Force

Power System

	Z593-D Pro Performance	Z595-D Pro Performance
Heavy Duty Canister Air Cleaner	Standard	Standard
Clutch	200 ft-lbs. (271 Nm) Electromagnetic	200 ft-lbs. (271 Nm) Electromagnetic
Hydraulic Pumps	Tandem Hydro-Gear® 16cc, w/shock valves	Hydro-Gear® 16cc, w/system relief
Wheel Motors(2)	Hydro-Gear® 18E, 1-1/4” (3.175cm) Tapered Shaft	Hydro-Gear® 18E, 1-1/4” (3.175cm) Tapered Shaft
Maximum Ground Speed (f/r)	11 mph (17.7 km/hr) / 6.3 mph (10 km/hr)	11.2 mph (18 km/hr) / 6.3 mph (10 km/hr)
Hour Meter	Standard	Standard
Rear Drive Tires	23 x 9.5 - 12 (52”) 24 x 12 - 12 (60”)	23 x 9.5 -12 (52”) 24 x 12 - 12 (60” & 72”)
Front Caster Tires	13 x 6.50 - 6	13 x 6.50 - 6 Flat-free Semi-pneumatic
Fuel / Capacity	Diesel #2 / 12 gallons (45.4L)	Diesel #2 / 12 gallons (45.4L)

SPECIFICATIONS

Specifications Z593-D & Z595-D cont.

Mowing Deck

	Z593-D Pro Performance	Z595-D Pro Performance
Type	TURBO FORCE™	TURBO FORCE™
Deck Construction	Fabricated, 7-ga Steel w/Bull-Nose bumper	Fabricated, 7-ga Steel w/Bull-Nose bumper
Deck Material	High-Strength Steel	High-Strength Steel
Deck Depth	5-1/2” (13.97cm)	5-1/2” (13.97cm)
Adjustable Discharge Baffle	Standard	Standard
Spindle Housings	9-3/8” (23.8cm) Diameter Cast Iron	9-3/8” (23.8cm) Diameter Cast Iron
Spindle Shaft / Bearings	1” (2.54cm) Steel Shaft/Tapered Roller	1” (2.54cm) Steel Shaft/Tapered Roller
Blades (3)	1/4” (.635cm) Heat Treated Steel	1/4” (.635cm) Heat Treated Steel
Blade Tip Speed	18,500 ft/min (5,638.8 meters/min)	18,500 ft/min (5,638.8 meters/min)
Belt Construction	Aramid Fiber V-Belt	Aramid Fiber V-Belt
Enhanced Belt Wrap	Minimizes Belt Slip	Minimizes Belt Slip
Discharge Chute	5/16” (.79cm) Rubber	5/16” (.79cm) Rubber
Cutting Height	1-1/2” - 5” in .25” increments (3.81 - 12.7cm in .635cm increments)	1-1/2” - 5” in .25” increments (3.81 - 12.7cm in .635cm increments)
Anti-Scalp Rollers - 52” Anti-Scalp Rollers - 60” / 72”	6 Standard 6 Standard	5 Standard 6 Standard
Carrier Frame Construction	2” x 2” x 3/16” (5.08 x 5.08 x .48cm)	2” x 2” x 3/16” (5.08 x 5.08 x .48cm)

Specifications Z593-D & Z595-D cont.

Operator Zone

	Z593-D Pro Performance	Z595-D Pro Performance
Steering Controls	1-5/8” (1.625cm) Diameter Grips, Adjustable, Dampened	1-5/8” (1.625cm) Diameter Grips, Adjustable, Dampened
Floor Pan	Pierced, extruded tread No-tools deck access	Pierced, extruded tread No-tools deck access
Seat	Non-suspension	Elastomeric
Seat Belt	Retractable	Retractable
Arm Rests	Standard	Standard
Seat Suspension System	Optional	Optional
Beverage Holder	Standard	Standard
Folding ROPS	Standard	Standard
Z Stand	Optional	Optional
Deck Lift Assist Pedal	Standard	Standard

Dimensions

	Z593-D Pro Performance	Z595-D Pro Performance
Weight	(52”/60”) 1426 / 1470 lbs. (646.8 / 666.8kg)	(60”/72”) 1443 / 1484 lbs. (654.5 / 673.1kg)
ROPS Height	72” (182.9cm)	72” (182.9cm)
ROPS Height Folded	53” (134.6cm)	53” (134.6cm)
Width w/ Deflector	54.0” / 62.0” (137.1 / 157.5cm)	(52”) 68” (173cm) (60”) 76” (193cm) (72”) 88” (224cm)
Length	79.5” / 81.6” (201.9 / 207.3cm)	(52”) 82.4” (209.3cm) (60”) 84.2” (213.9cm) (72”) 87.4” (221.9cm)

SPECIFICATIONS

Specifications Z580-D

Configurations

	Z580-D
25 hp Kubota Liquid-Cooled Diesel	52”/60”/72” Turbo Force

2

Power System

	Z580-D
Heavy Duty Canister Air Cleaner	Standard
Clutch	Adjustable .015” - .021” (0.35mm - 0.65mm) Ogura 150 ft-lbs. (203.37 Nm)
Hydraulic Pump	Tandem Hydro-Gear® variable displacement 16cc, w/shock valves
Hydraulic Oil System Capacity	4.2 quarts (4.0 liters)
Wheel Motors(2)	Twin Hydro-Gear® 18E, positive displacement 1.25” (3.2cm) Tapered Shaft
Maximum Ground Speed (f/r)	11 mph / 6.3 mph (17.7km/hr / 10km/hr)
Hour Meter	Standard
Rear Drive Tires	24 x 12.0 - 12 (52”) 23 x 9.5 - 12 (60” & 72”)
Front Caster Tires	Semi-Pneumatic 13 x 6.50 - 6
Fuel / Capacity	Diesel # 2 or 20% Bio-Diesel / 12 gallons (45 liters)

Specifications Z580-D cont.

Mowing Deck

	Z580-D
Type	TURBO FORCE™
Deck Construction	Fabricated, 7-ga Steel w/Bull-Nose bumper
Deck Material	High-Strength Steel
Deck Depth	5-1/2” (13.97cm)
Adjustable Discharge Baffle	Standard
Spindle Housings	9-3/8” (23.8cm) Diameter Cast Iron
Spindle Shaft / Bearings	1” (2.54cm) Steel Shaft/Tapered Roller
Blades (3)	1/4” (.635cm) Heat Treated Steel
Blade Tip Speed	18,500 ft/min (5,638.8 meters/min)
Belt Construction	Single Kevlar cord V-Belt
Cutting Height	1-1/2” - 5” in .25” increments (3.81 - 12.7cm in .635cm increments)
Anti-Scalp Rollers - 52” Anti-Scalp Rollers - 60” / 72”	5 Standard 6 Standard
Carrier Frame Construction	2” x 2” x 3/16” (5.08 x 5.08 x .48cm)

Operator Zone

	Z580-D
Steering Controls	1.5” (3.81cm) Diameter Grips, Adjustable, Dampened
Seat	Non-suspension - vinyl
Seat Belt	Retractable
Arm Rests	Standard
Seat Suspension System	Optional
Beverage Holder	Standard
Folding ROPS	Standard
Z Stand	Optional
Deck Lift Assist Pedal	Standard

Specifications Z580-D cont.

Dimensions

	Z580-D		
Model	74266	74267	74274
Wheel Base	54.3” / 137.9cm	56.1” / 142.5cm	59.3” / 150.6cm
Overall Length	82.4” / 209.3cm	84.2” / 213.9cm	87.4” / 221.9cm
Width Outside Tires	49.5” / 126cm	53.2” / 135cm	57.2” / 145cm
Overall Width (outside deck)	68” / 173cm	76” / 193cm	88” / 224cm
Gate Width	54” / 137cm	62” / 157.5cm	74” / 188cm
Overall Height ROPS up	72” / 183cm	72” / 183cm	72” / 183cm
Overall Height ROPS folded	53” / 135cm	53” / 135cm	53” / 135cm
Weight	1429 lbs. / 648kg	1470 lbs. / 667kg	1543 lbs. / 700kg

Torque Specifications

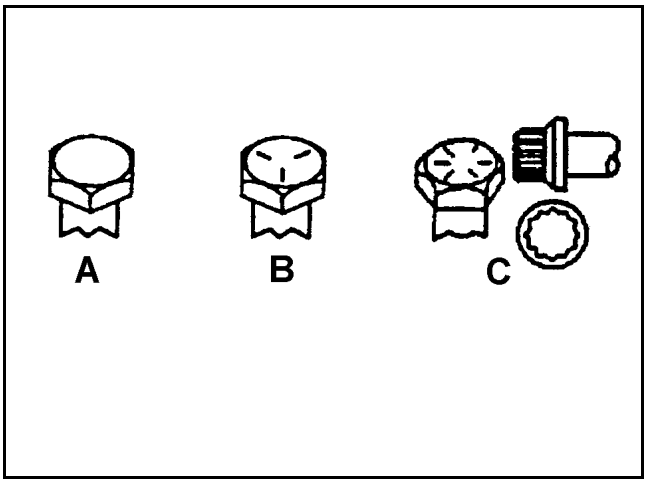
Recommended fastener torque values are listed in the following tables. For critical applications, as determined by Toro, either the recommended torque or a torque that is unique to the application is clearly identified and specified in the service manual.

These torque specifications for the installation and tightening of fasteners shall apply to all fasteners which do not have a specific requirement identified in the service manual. The following factors shall be considered when applying torque: cleanliness of the fastener, use of a thread sealant (Loctite), degree of lubrication on the fastener, presence of a prevailing torque feature, hardness of the surface underneath of the fastener's head, or similar condition which affects the installation.

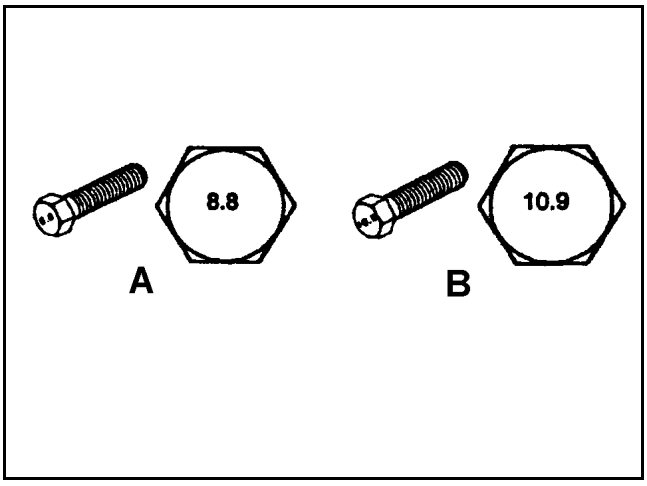
As noted in the following tables, torque values should be **reduced by 25% for lubricated fasteners** to achieve the similar stress as a dry fastener. Torque values may also have to be reduced when the fastener is threaded into aluminum or brass. The specific torque value should be determined based on the aluminum or brass material strength, fastener size, length of thread engagement, etc.

The standard method of verifying torque shall be performed by marking a line on the fastener (head or nut) and mating part, then back off fastener 1/4 of a turn. Measure the torque required to tighten the fastener until the lines match up.

Fastener Identification



Inch Series Bolts and Screws	
(A) Grade 1 (B) Grade 5	(C) Grade 8



Metric Bolts and Screws	
(A) Class 8.8	(B) Class 10.9

SPECIFICATIONS

Standard Torque for Dry, Zinc Plated, and Steel Fasteners (Inch Series)

Thread Size	Grade 1, 5, & 8 with Thin Height Nuts	SAE Grade 1 Bolts, Screws, Studs, & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)		SAE Grade 5 Bolts, Screws, Studs, & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)		SAE Grade 8 Bolts, Screws, Studs, & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)	
	In-lb	In-lb	N-cm	In-lb	N-cm	In-lb	N-cm
# 6 - 32 UNC	10 ± 2	13 ± 2	147 ± 23	15 ± 2	170 ± 20	23 ± 2	260 ± 20
# 6 - 40 UNF				17 ± 2	190 ± 20	25 ± 2	280 ± 20
# 8 - 32 UNC	13 ± 2	25 ± 5	282 ± 30	29 ± 3	330 ± 30	41 ± 4	460 ± 45
# 8 - 36 UNF				31 ± 3	350 ± 30	43 ± 4	31 ± 3
# 10 - 24 UNC	18 ± 2	30 ± 5	339 ± 56	42 ± 4	475 ± 45	60 ± 6	674 ± 70
#10 - 32 UNF				48 ± 4	540 ± 45	68 ± 6	765 ± 70
1/4 - 20 UNC	48 ± 7	53 ± 7	599 ± 79	100 ± 10	1125 ± 100	140 ± 15	1580 ± 170
1/4 - 28 UNF	53 ± 7	65 ± 10	734 ± 113	115 ± 10	1300 ± 100	160 ± 15	1800 ± 170
5/16 - 18 UNC	115 ± 15	105 ± 17	1186 ± 169	200 ± 25	2250 ± 280	300 ± 30	3390 ± 340
5/16 - 24 UNF	138 ± 17	128 ± 17	1446 ± 192	225 ± 25	2540 ± 280	325 ± 30	3670 ± 340
	ft-lb	ft-lb	N-m	ft-lb	N-m	ft-lb	N-m
3/8 - 16 UNC	16 ± 2	16 ± 2	22 ± 3	30 ± 3	41 ± 4	43 ± 4	58 ± 5
3/8 - 24 UNF	17 ± 2	18 ± 2	24 ± 3	35 ± 3	47 ± 4	50 ± 4	68 ± 5
7/16 - 14 UNC	27 ± 3	27 ± 3	37 ± 4	50 ± 5	68 ± 7	70 ± 7	68 ± 9
7/16 - 20 UNF	29 ± 3	29 ± 3	39 ± 4	55 ± 5	75 ± 7	77 ± 7	104 ± 9
1/2 - 13 UNC	30 ± 3	48 ± 7	65 ± 9	75 ± 8	102 ± 11	105 ± 10	142 ± 14
1/2 - 20 UNF	32 ± 3	53 ± 7	72 ± 9	85 ± 8	115 ± 11	120 ± 10	163 ± 14
5/8 - 11 UNC	65 ± 10	88 ± 12	119 ± 16	150 ± 15	203 ± 20	210 ± 20	285 ± 27
5/8 - 18 UNF	75 ± 10	95 ± 15	129 ± 20	170 ± 15	230 ± 20	240 ± 20	325 ± 27
3/4 - 10 UNC	93 ± 12	140 ± 20	190 ± 27	265 ± 25	359 ± 34	374 ± 35	508 ± 47
3/4 - 16 UNF	115 ± 15	165 ± 25	224 ± 34	300 ± 25	407 ± 34	420 ± 35	569 ± 47
7/8 - 9 UNC	140 ± 20	225 ± 25	305 ± 34	430 ± 45	583 ± 61	600 ± 60	813 ± 81
7/8 - 14 UNF	155 ± 25	260 ± 30	353 ± 41	475 ± 45	644 ± 61	660 ± 60	895 ± 81

Note: Reduce torque values listed in the table above by 25% for lubricated fasteners. Lubricated fasteners are defined as threads coated with a lubricant such as oil, graphite, or thread sealant such as Loctite.

Note: Torque values may have to be reduced when installing fasteners into threaded aluminum or brass. The specific torque value should be determined based on the fastener size, the aluminum or base material strength, length of thread engagement, etc.

Note: The nominal torque values listed above for Grade 5 and 8 fasteners are based on 75% of the minimum proof load specified in SAE J429. The tolerance is approximately ± 10% of the nominal torque value. Thin height nuts include jam nuts.

Standard Torque for Dry, Zinc, and Steel Fasteners (Metric Fasteners)

Thread Size	Class 8.8 Bolts, Screws, and Studs with Regular Height Nuts (Class 8 or Strong Nuts)		Class 10.9 Bolts, Screws, and Studs with Regular Height Nuts (Class 10 or Strong Nuts)	
M5 X 0.8	57 ± 5 in-lb	640 ± 60 N-cm	78 ± 7 in-lb	885 ± 80 N-cm
M6 X 1.0	96 ± 9 in-lb	1018 ± 100 N-cm	133 ± 13 in-lb	1500 ± 150 N-cm
M8 X 1.25	19 ± 2 ft-lb	26 ± 3 N-m	27 ± 2 ft-lb	36 ± 3 N-m
M10 X 1.5	38 ± 4 ft-lb	52 ± 5 N-m	53 ± 5 ft-lb	72 ± 7 N-m
M12 X 1.75	66 ± 7 ft-lb	90 ± 10 N-m	92 ± 9 ft-lb	125 ± 12 N-m
M16 X 2.0	166 ± 15 ft-lb	225 ± 20 N-m	229 ± 22 ft-lb	310 ± 30 N-m
M20 X 2.5	325 ± 33 ft-lb	440 ± 45 N-m	450 ± 37 ft-lb	610 ± 50 N-m

Note: Reduce torque values listed in the table above by 25% for lubricated fasteners. Lubricated fasteners are defined as threads coated with a lubricant such as oil, graphite, or thread sealant such as Loctite.

Note: Torque values may have to be reduced when installing fasteners into threaded aluminum or brass. The specific torque value should be determined based on the fastener size, the aluminum or base material strength, length of thread engagement, etc.

Note: The nominal torque values listed above are based on 75% of the minimum proof load specified in SAE J1199. The tolerance is approximately ± 10% of the nominal torque value. Thin height nuts include jam nuts.

Other Torque Specifications

SAE Grade 8 Steel Set Screws

Thread Size	Recommended Torque	
	Square Head	Hex Socket
1/4 - 20 UNC	140 ± 20 in-lb	73 ± 12 in-lb
5/16 - 18 UNC	215 ± 35 in-lb	145 ± 20 in-lb
3/8 - 16 UNC	35 ± 10 ft-lb	18 ± 3 ft-lb
1/2 - 13 UNC	75 ± 15 ft-lb	50 ± 10 ft-lb

Wheel Bolts and Lug Nuts

Thread Size	Recommended Torque**	
7/16 - 20 UNF Grade 5	65 ± 10 ft-lb	88 ± 14 N-m
1/2 - 20 UNF Grade 5	80 ± 10 ft-lb	108 ± 14 N-m
M12 X 1.25 Class 8.8	80 ± 10 ft-lb	108 ± 14 N-m
M12 X 1.5 Class 8.8	80 ± 10 ft-lb	108 ± 14 N-m

** For steel wheels and non-lubricated fasteners.

Thread Cutting Screws (Zinc Plated Steel)

Type 1, Type 23, or Type F	
Thread Size	**Baseline Torque***
No. 6 - 32 UNC	20 ± 5 in-lb
No. 8 - 32 UNC	30 ± 5 in-lb
No.10 - 24 UNC	38 ± 7 in-lb
1/4 - 20 UNC	85 ± 15 in-lb
5/16 - 18 UNC	110 ± 20 in-lb
3/8 - 16 UNC	200 ± 100 in-lb

Thread Cutting Screws (Zinc Plated Steel)

Thread Size	Threads per Inch		Baseline Torque*
	Type A	Type B	
No. 6	18	20	20 ± 5 in-lb
No. 8	15	18	30 ± 5 in-lb
No. 10	12	16	38 ± 7 in-lb
No. 12	11	14	85 ± 15 in-lb

* Hole size, material strength, material thickness and finish must be considered when determining specific torque values. All torque values are based on non-lubricated fasteners.

Conversion Factors

in-lb X 11.2985 - N-cm
ft-lb X 1.3558 = N-m

N-cm X - 0.08851 = in-lb
N-cm X 0.73776 - ft-lb

Equivalents and Conversions

Decimal and Millimeter Equivalents

Fractions	Decimals	mm	Fractions	Decimals	mm
1/64	0.015625	0.397	33/64	0.515625	13.097
1/32	0.03125	0.794	16/32	0.53125	13.484
3/64	0.046875	1.191	35/64	0.546875	13.891
1/16	0.0625	1.588	9/16	0.5625	14.288
5/64	0.078125	1.984	37/64	0.578125	14.684
3/32	0.9375	2.381	19/32	0.59375	15.081
1/8	0.1250	3.175	5/8	0.6250	15.875
9/64	0.140625	3.572	41/64	0.640625	16.272
5/32	0.15625	3.969	21/32	0.65625	16.669
11/64	0.171875	4.366	43/64	0.671875	17.066
3/16	0.1875	4.762	11/16	0.6875	17.462
13/64	0.203125	5.159	45/64	0.703125	17.859
7/32	0.21875	5.556	23/32	0.71875	18.256
15/64	0.234375	5.953	47/64	0.734375	18.653
1/4	0.2500	6.350	3/4	0.7500	19.050
17/64	0.265625	6.747	49/64	0.765625	19.447
9/32	0.28125	7.144	25/32	0.78125	19.844
19/64	0.296875	7.541	51/64	0.796875	20.241
5/16	0.3125	7.541	13/16	0.8125	20.638
21/64	0.328125	8.334	53/64	0.828125	21.034
11/32	0.34375	8.731	27/32	0.84375	21.431
23/64	0.359375	9.128	55/64	0.859375	21.828
3/8	0.3750	9.525	7/8	0.8750	22.225
25/64	0.390625	9.922	57/64	0.890625	22.622
13/32	0.40625	10.319	29/32	0.90625	23.019
27/64	0.421875	10.716	59/64	0.921875	23.416
7/16	0.4375	11.112	15/16	0.9375	23.812
29/64	0.453125	11.509	61/64	0.953125	24.209
15/32	0.46875	11.906	31/32	0.96875	24.606
31/64	0.484375	12.303	63/64	0.984375	25.003
1/2	0.5000	12.700	1	1.000	25.400
1 mm = 0.03937 in.			0.001 in. = 0.0254 mm		

U.S. to Metric Conversions

	To Convert	Into	Multiply By
Linear Measurement	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
Area	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
Volume	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
Weight	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces	Grams	28.3495
Pressure	Pounds/Sq. In.	Kilopascal	6.895
Work	Foot-pounds	Newton-Meters	1.356
	Foot-pounds	Kilogram-Meters	0.1383
	Inch-pounds	Kilogram-Centimeters	1.152144
Liquid Volume	Quarts	Liters	0.9463
	Gallons	Liters	3.785
Liquid Flows	Gallons/Minute	Liters/Minute	3.785
Temperature	Fahrenheit	Celsius	1. Subtract 32° 2. Multiply by 5/9

Castor Fork Assembly Replacement

Castor Fork Assembly Removal

1. Raise the front of the machine off the ground leaving enough clearance to remove the castor fork from the carrier frame.

2. Remove the grease cap from the frame (Fig. 001).

Fig 001 IMG_7694a

3. Remove the locknut (Fig. 002).

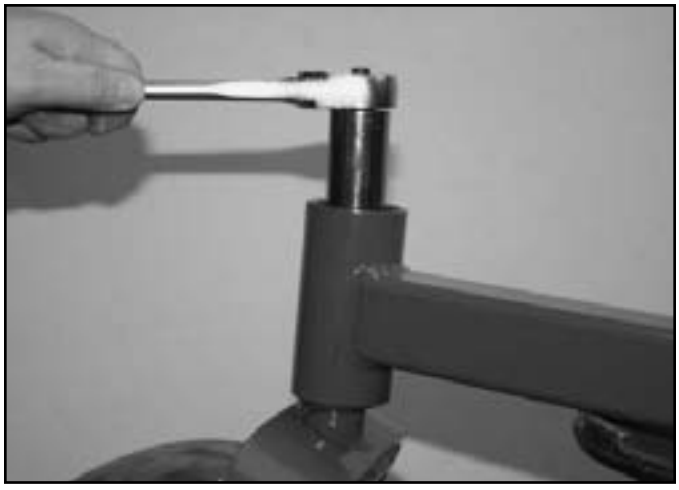


Fig 002 IMG_7874a

4. Slide the castor fork assembly out of the frame (Fig. 003).

Fig 003 IMG_7700

Castor Bearing Replacement

1. Remove the 3 Belleville washers (Fig. 004).

Fig 004 IMG_7703

2. Remove the top tapered bearing (Fig. 005).

Fig 005 IMG_7706

3. Remove the bottom grease seal (Fig. 006).

Fig 006 IMG_7709a

4. Remove the bottom tapered bearing (Fig. 007).

Fig 007 IMG_7711a

5. Drive the top and bottom tapered bearing cups out of the caster fork hub (Fig. 008).

Fig 008 IMG_7714

6. Install new tapered bearing cups by pressing each bearing cup into the caster fork hub so that the thicker part of the taper is pressed in first. The bearing cups should seat against the shoulder inside the frame.

Section view of caster fork hub (Fig. 009):

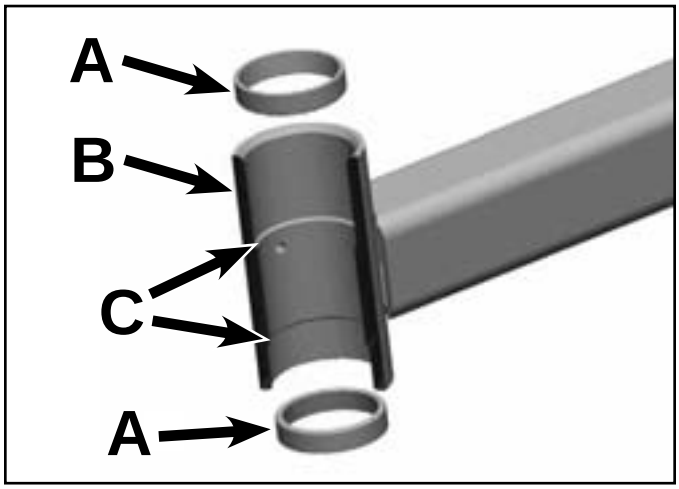


Fig 009 tapered bearing cup install

A. Tapered Bearing Cup (2)
B. Caster fork hub (sectioned)
C. Machined shoulder inside caster fork hub (2)

7. Pack the upper and lower tapered bearings with grease (No. 2 general purpose lithium base or molybdenum grease) (Fig. 010).

Fig 010 IMG_7719a

8. Install the lower bearing into the caster fork hub (Fig. 011).

Fig 011 IMG_7722

9. Install the grease seal into the caster fork hub (Fig. 012).

Fig 012 IMG_7725a

10. Install the upper bearing into the caster fork hub (Fig. 013).

Fig 013 IMG_7731

Castor Fork Assembly Installation

1. Install 3 Bellville washers as shown (Fig. 014):

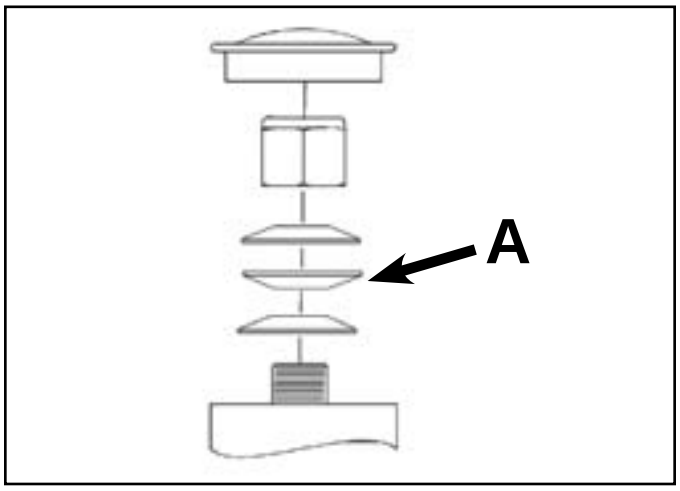


Fig 014 fig. 49 G001297

A. Belleville washers

2. Slide the castor fork assembly into the hub (Fig. 015).

Fig 015 IMG_7700

3. Install the locknut. Tighten the locknut until the Belleville washers are flat, then back the nut off 1/4 turn to properly set the preload on the bearings (Fig. 016).

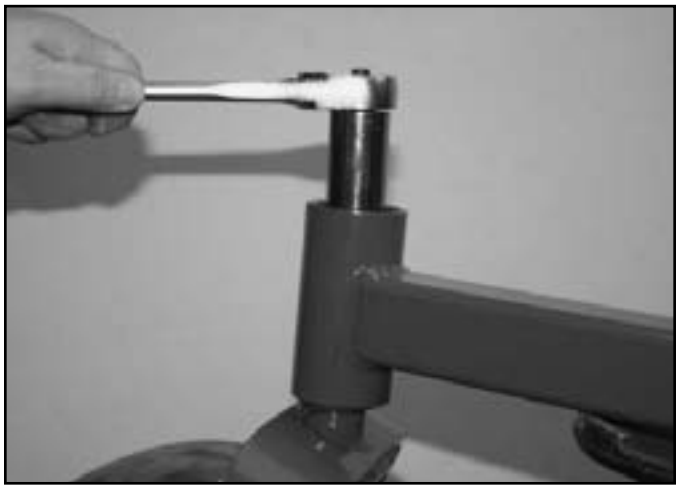


Fig 016 IMG_7874a

4. Remove the plug located on the side of the castor hub. Install a grease fitting. Apply grease (No. 2 general purpose lithium base or molybdenum grease) into the hub until it passes through the upper bearing. Fill the top cavity with grease (Fig. 017).

Fig 017 PICT-2897

5. Remove the grease fitting and install the grease plug.

6. Install the dust cap onto the frame (Fig. 018).

Fig 018 IMG_7734

Front Wheel Removal & Bearing Replacement

1. Raise the front of the machine off the ground.

2. Remove the wheel axle bolt and nut (Fig. 019).

Fig 019 IMG_7736

3. Remove the wheel assembly from the fork (Fig. 020).

Fig 020 IMG_7878

4. Remove the castor spacer from the wheel assembly (Fig. 021).

Fig 021 IMG_7742a

5. Remove both bearing spacers (one on each side) from the wheel assembly (Fig. 022).

Fig 022 IMG_7744a

6. Drive the bearing cup, bearing and bearing seal out of the wheel assembly. Repeat on the opposite side (Fig. 023).

Fig 023 IMG_7748a

Wheel Assembly (Fig. 024).

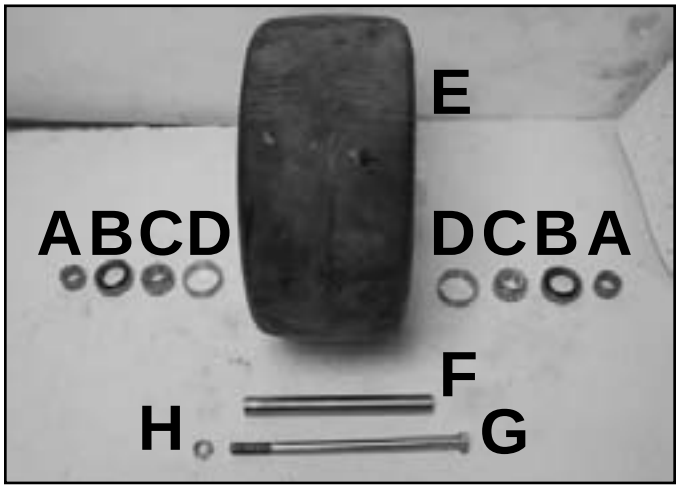


Fig 024 IMG_7880a

A. Bearing spacer (2)
B. Grease seal (2)
C. Tapered bearing (2)
D. Tapered bearing cup (2)
E. Wheel and tire assembly
F. Caster spacer
G. Wheel assembly axle bolt
H. Nut

7. Install a new tapered bearing cup into the wheel assembly by pressing each bearing cup into the wheel hub so that the thicker part of the taper is pressed into the wheel hub first. The bearing cups should seat against the shoulder divots inside the wheel hub (Fig. 025).

Fig 025 IMG_7881a

8. Pack both tapered bearings with grease (No. 2 general purpose lithium base or molybdenum grease) (Fig. 026).

Fig 026 IMG_7718a

9. Install the tapered bearings into each side of the wheel hub (Fig. 027).

Fig 027 IMG_7882a

10. Install the grease seals into each side of the wheel hub (Fig. 028).

Fig 028 IMG_7883a

11. Install a bearing spacer into each side of the wheel hub (Fig. 029).

Fig 029 IMG_7884a

12. Install the castor spacer into the wheel hub (Fig. 030).

Fig 030 IMG_7885a

13. Position the wheel assembly into the caster fork (Fig. 031).

Fig 031 IMG_7878

14. Install the axle bolt and nut securing the wheel assembly to the fork (Fig. 032).

Fig 032 IMG_7736

15. Apply grease (No. 2 general purpose lithium base or molybdenum grease) to the wheel assembly grease fitting (Fig. 033).

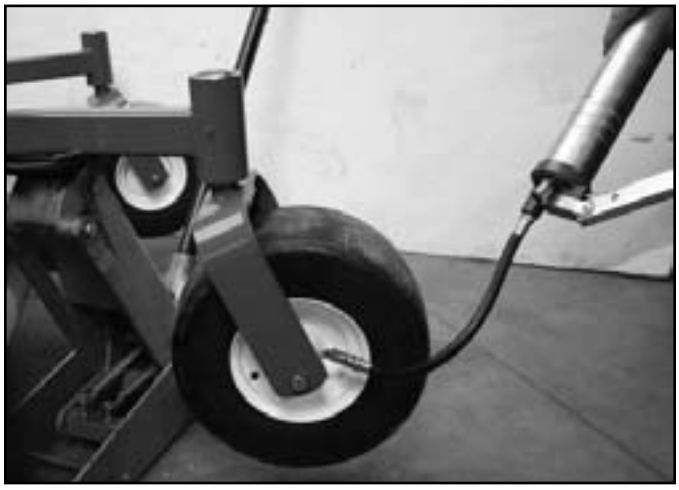


Fig 033 IMG_7886

Fuel Tank Replacement

Right Side Fuel Tank Removal

1. Raise the seat and remove the front engine shield (Fig. 034).

Fig 034 IMG_7751

2. Turn the fuel shut-off valve to the OFF position (Fig. 035).

Fig 035 IMG_7896

3. Disconnect the negative battery cable.

4. Remove the right rear wheel assembly (Fig. 036).

Fig 036 IMG_7753a

5. Remove the clamp securing the fuel line to the fitting on the bottom of the fuel tank. Slide the fuel hose off the fitting and drain the fuel from the fuel tank (Fig. 037).

Fig 037 IMG_7754

6. Remove the clamp securing the return fuel line to the fitting on the operator's side of the fuel tank. Slide the fuel hose off the fitting and drain the fuel from the fuel line (Fig. 038).

Fig 038 IMG_7759

7. Remove the nuts, springs and washers from the 3 studs on the underside of the fuel tank (Fig. 039).

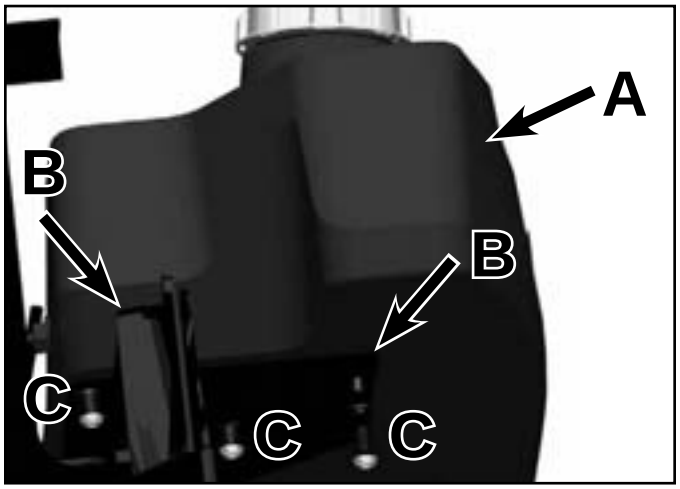


Fig 039 rh fuel tank fasteners a

A. Fuel tank
B. Frame
C. Mounting stud fastener assembly (3)

8. Remove the bolt and washers securing the left front corner of the fuel tank to the frame (Fig. 040).

Fig 040 IMG_7764

9. Lift the fuel tank off the frame (Fig. 041).

Fig 041 IMG_7768

Right Side Fuel Tank Installation

1. Position the fuel tank onto the frame (Fig. 042).

Fig 042 IMG_7768

2. Slide a hose clamp onto the return fuel line. Slide the return fuel line onto the fitting located on the operator's side of the fuel tank (Fig. 043).

Fig 043 IMG_7782

3. Position the hose clamp and tighten (Fig. 044).

Fig 044 IMG_7783

4. Slide a hose clamp onto the intake fuel line. Slide the intake fuel line onto the fitting located on the bottom of the fuel tank. Position the hose clamp and tighten (Fig. 045).

Fig 045 IMG_7787a

5. Loosely install a bolt, lock-washer, and washer through the frame and into the front left corner of the fuel tank (Fig. 046).

Fig 046 IMG_7788

6. Loosely install a washer, spring and nut onto each of the three studs on the underside of the fuel tank (Fig. 047).

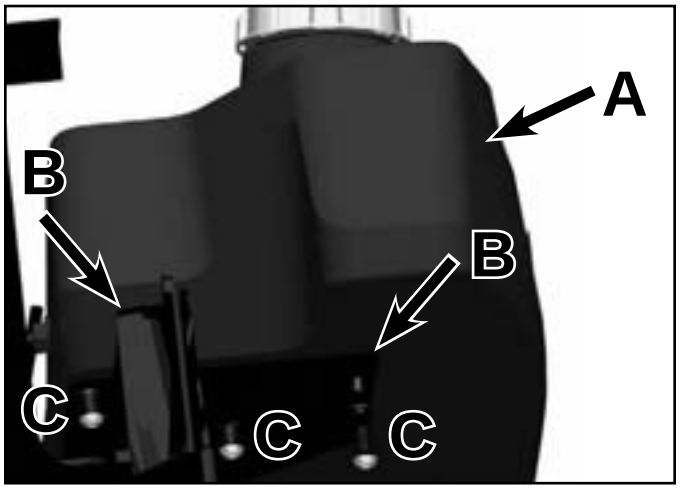


Fig 047 rh fuel tank fasteners

A. Fuel tank
B. Frame
C. Mounting stud fastener assembly (3)

7. Tighten the 3 nuts until three threads protrude past the nut. Do not over-tighten (Fig. 048).

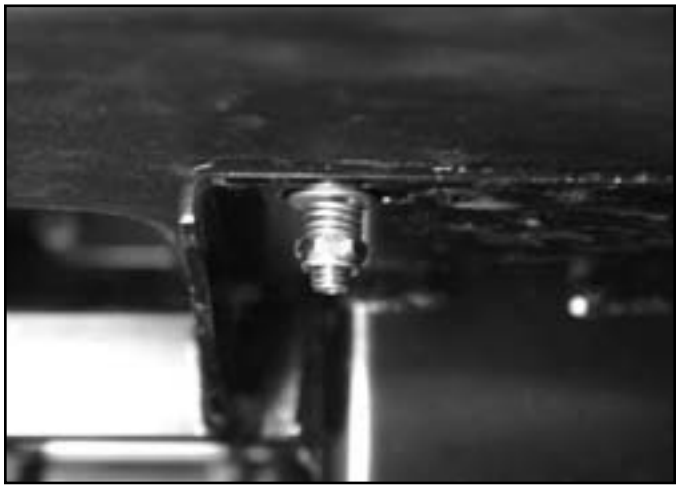


Fig 048 PICT-3290

8. Tighten the bolt located in the front left corner of the tank to the frame (Fig. 049).

Fig 049 IMG_7764

9. Install the right rear wheel assembly (Fig. 050).

Fig 050 IMG_7753a

10. Install the negative battery cable.

11. Install the front engine shield (Fig. 051).

Fig 051 IMG_7751

12. Lower the seat.

Left Side Fuel Tank Removal

1. Raise the seat and remove the front engine shield (Fig. 052).

Fig 052 IMG_7751

2. Turn the fuel shut-off valve to the OFF position (Fig. 053).

Fig 053 IMG_7896

3. Disconnect the negative battery cable.

4. Remove the left rear wheel assembly (Fig. 054).

Fig 054 IMG_7794

5. Remove the 4 screws and washers securing the control panel to the fuel tank (Fig. 055).

Fig 055 IMG_7797

6. Remove the cable tie securing the throttle cable to the fuel fitting (Fig. 056).

Fig 056 IMG_7799

7. Move the control panel assembly away from the fuel tank (Fig. 057).

Fig 057 IMG_7802a

8. Remove the hose clamp from the fuel return line and fitting located on the operator's side of the fuel tank (Fig. 058).

Fig 058 IMG_7805

10. Remove the return fuel line from the fuel fitting (Fig. 059).

Fig 059 IMG_7825

11. Remove the hose clamp from the fuel intake line and fitting located on the underside of the fuel tank (Fig. 060).

Fig 060 IMG_7809a

9. Remove the fuel line from the fuel fitting and drain the fuel from the fuel tank (Fig. 061).

Fig 061 IMG_7811a

10. Remove the nuts, springs and washers from the 3 fuel tank mounting studs located on the underside of the fuel tank (Fig. 062).

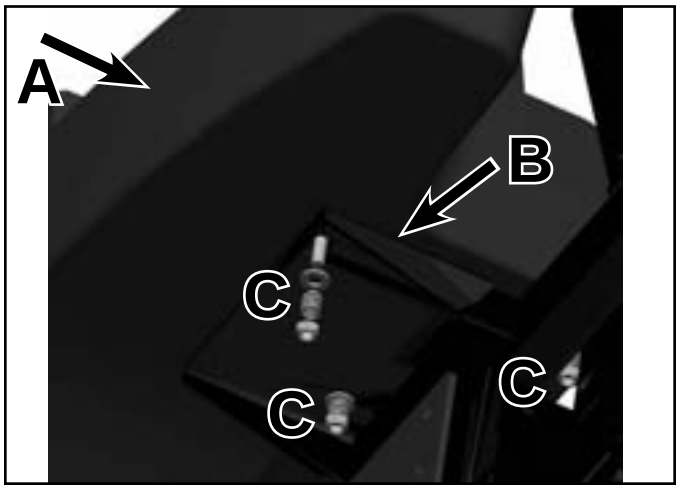


Fig 062 lh fuel tank fasteners a

A. Fuel tank
B. Frame
C. Mounting stud fastener assembly (3)

11. Remove the bolt and washers securing the right front corner of the fuel tank to the frame (Fig. 063).

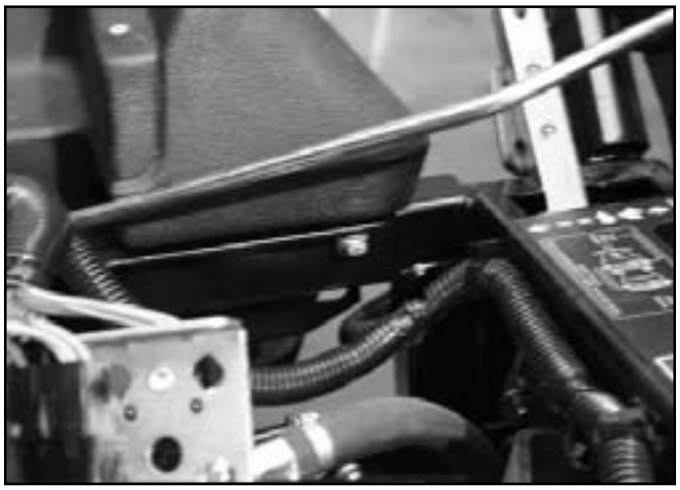


Fig 063 IMG_7824

12. Remove the fuel tank from the frame (Fig. 064).

Fig 064 IMG_7823

Left Side Fuel Tank Installation

1. Position the fuel tank onto the frame (Fig. 065).

Fig 065 IMG_7827

2. Slide a hose clamp onto the return fuel hose. Install the fuel return hose onto the fuel fitting barb located on the operator's side of the fuel tank. Slide the hose clamp into position and tighten (Fig. 066).

Fig 066 IMG_7828

3. Slide a hose clamp onto the fuel intake hose. Install the fuel intake hose onto the fuel fitting barb located on the underside of the fuel tank. Slide the hose clamp into position and tighten (Fig. 067).

Fig 067 IMG_7833

4. Loosely install a bolt, lockwasher, and washer into the right front corner of the fuel tank securing it to the frame (Fig. 068).

Fig 068 IMG_7863

5. Loosely install a washer, spring and nut onto each of the three studs on the underside of the fuel tank (Fig. 069).

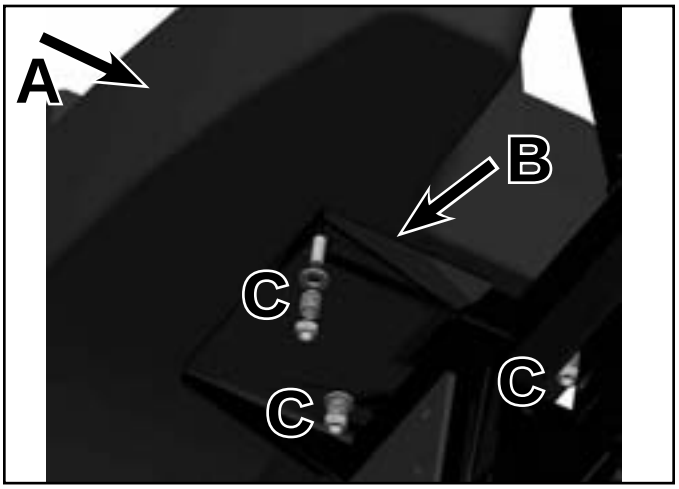


Fig 069 lh fuel tank fasteners

A. Fuel tank
B. Frame
C. Mounting stud fastener assembly (3)

6. Tighten the 3 nuts until three threads protrude past the nut. Do not over-tighten the nuts (Fig. 070).

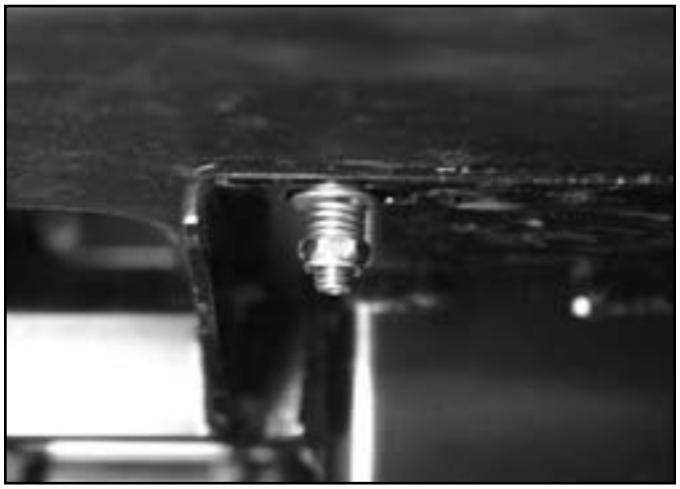


Fig 070 PICT-3290

7. Tighten the bolt, located on the right front corner of the fuel tank (Fig. 071).

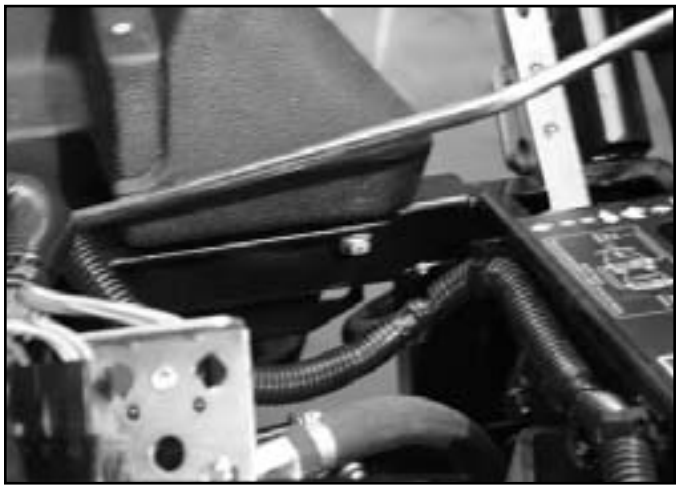


Fig 071 IMG_7824

8. Install 4 screws and washers securing the control panel to the fuel tank (Fig. 072).

Fig 072 IMG_7797

9. Install a cable tie securing the throttle cable to the fuel tank fitting located on the operator's side of the fuel tank (Fig. 073).

Fig 073 IMG_7835

10. Install the left rear tire assembly and lower the machine to the ground.

11. Install the negative battery cable.

12. Install the front engine shield (Fig. 074).

Fig 074 IMG_7751

13. Lower the seat.

Fuel Tank Fitting Replacement

There are 2 fuel fittings located on each of the fuel tanks. The following procedure can be used to replace any of the fittings (Fig. 075).

Fig 075 IMG_7771

1. Remove the nut and washer securing the fitting to the fuel tank (Fig. 076).

Fig 076 IMG_7772

2. Using a magnet, remove the fitting from the inside of the fuel tank (Fig. 077).

Fig 077 IMG_7774a

3. Using a magnet, install a fuel tank fitting by inserting it through the fuel tank opening (Fig. 078).

Fig 078 IMG_7775

4. Loosely install a washer and nut to secure the fuel tank fitting to the fuel tank (Fig. 079).

Fig 079 IMG_7772

5. Position the fuel tank fittings as shown (Fig. 080, Fig. 081 and Fig. 082):

Right and left fuel tank bottom fitting

Fig 080 IMG_7781a

Right side fuel tank operator's side fitting

Fig 081 IMG_7779

Left side fuel tank operator's side fitting

Fig 082 PICT-2952

6. Tighten the fitting nut.

Hood Assembly Replacement

Hood Assembly Removal

1. Unhook the rubber latch that is located on the rear of the hood (Fig. 083).

Fig 083 IMG_7836

2. Remove the two hairpins, clevis pins, and washers located in the left and right hinges (Fig. 084).

Fig 084 IMG_7844

3. Lift the hood and remove it from the machine (Fig. 085).

Fig 085 IMG_7848

Hood Assembly Installation

1. Align the hood pivot brackets with holes in the pivot bracket on the frame (Fig. 086).

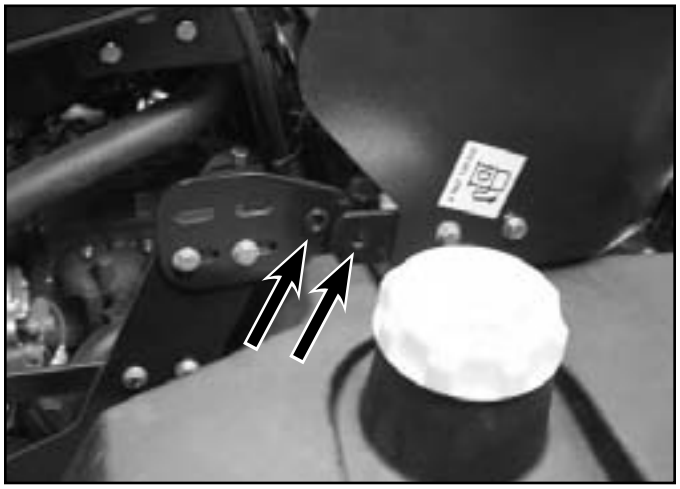


Fig 086 IMG_7854a

Note: Check the clearance between the hood screen and the radiator cap. If there is any interference, the hood can be adjusted using the slotted holes in the hood mounting brackets:

Hood Hinge Plate adjustment slots (Fig. 087).

Fig 087 PICT-4215

Hood Pivot Plate adjustment slots (Fig. 088).

Fig 088 PICT-4206

2. Install a clevis pin, washer and hairpin into each of the pivot brackets (Fig. 089).

Fig 089 IMG_7844

3. Lower the hood down and hook the rubber latch located at the rear of the hood (Fig. 090).

Fig 090 IMG_7836

Throttle Control Assembly Replacement

The hood assembly has been removed for photo purposes.

Throttle Control Assembly Removal

1. Raise the seat.
2. Disconnect the negative battery cable from the battery terminal.
3. Remove the 4 screws securing the control panel to the left hand fuel tank (Fig. 091).

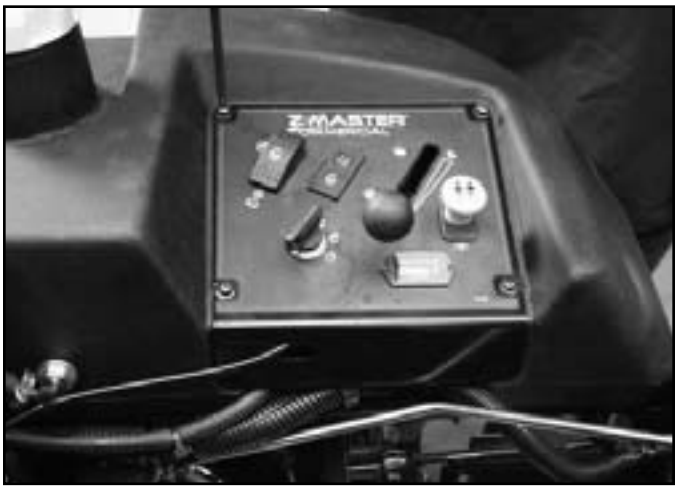


Fig 091 IMG_7887

4. Remove the knob from the throttle control assembly (Fig. 092).

Fig 092 IMG_7888

5. Remove the cable tie securing the throttle cable to the fuel tank fitting (Fig. 093).

Fig 093 IMG_7890

6. Remove the 2 locknuts and carriage bolts securing the throttle control to the control panel (Fig. 094).

Fig 094 IMG_7894

7. Remove the front engine shield assembly (Fig. 095).

Fig 095 IMG_7895

8. Loosen the swivel clamp at the end of the throttle cable located on the engine throttle linkage (Fig. 096).

Fig 096 IMG_7899

9. Remove the nut securing the throttle cable to the throttle bracket (Fig. 097).

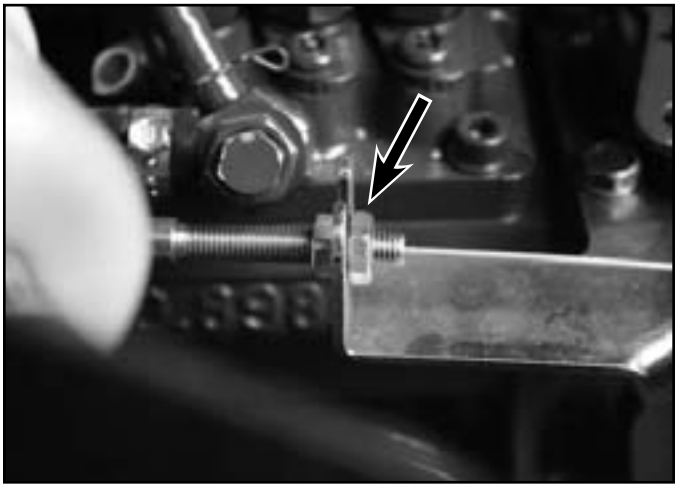


Fig 097 IMG_7901

10. Slide the throttle cable out of the throttle bracket and swivel clamp (Fig. 098).

Note: The loose nut will slide off the cable upon sliding it out of the throttle linkage bracket.

Fig 098 IMG_7906

11. Remove the throttle control assembly from the control panel (Fig. 099).

Fig 099 IMG_7909

12. Slide the cable out of the slot in the bottom of the control panel (Fig. 100).

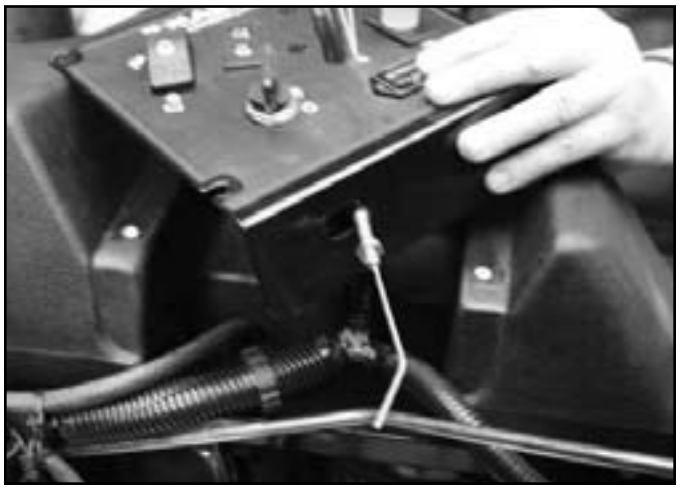


Fig 100 IMG_7911

Throttle Control Assembly Installation

1. Slide the throttle cable through the slot in the bottom of the control panel (Fig. 101).

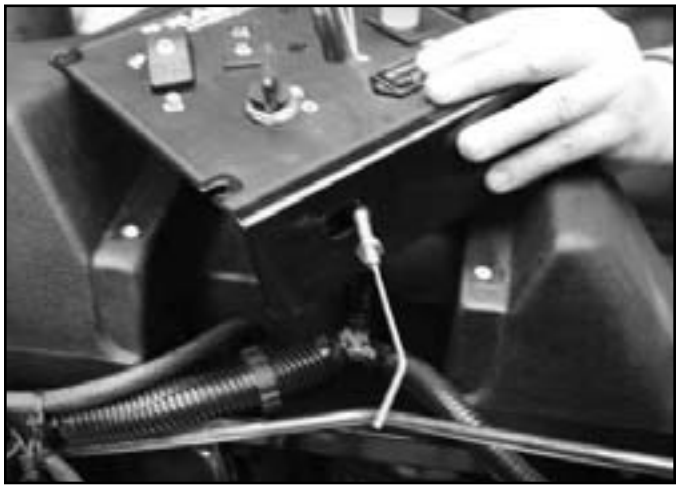


Fig 101 IMG_7911

2. Install the throttle control assembly into the slot in the control panel (Fig. 102).

Fig 102 IMG_7909

3. Install 2 carriage bolts and locknuts securing the throttle control to the control panel (Fig. 103).

Fig 103 IMG_7894

4. Route the throttle cable back toward the engine so that it is routed under the right hand fuel tank fuel lines where they connect to the fuel shut off valve, under the air cleaner intake hose, along side the fuel intake hose, up to the throttle linkage bracket.

5. Slide the throttle cable into the throttle linkage bracket. Slide the nut onto the cable. Slide the throttle cable into the swivel clamp (Fig. 104).

Fig 104 IMG_7906

6. Install the nut securing the throttle cable to the throttle bracket (Fig. 105).

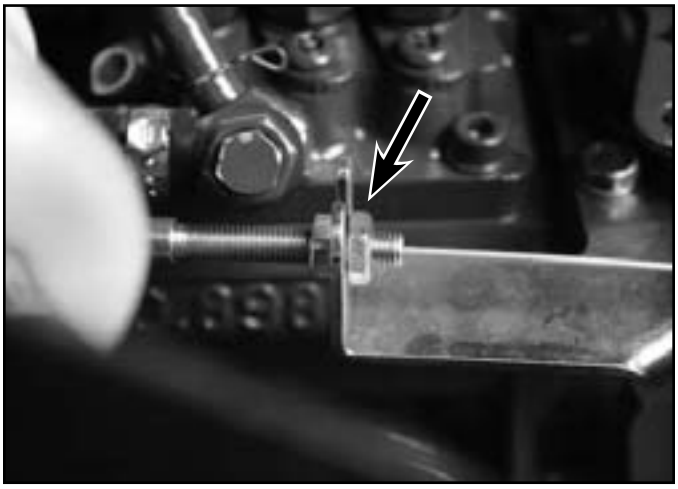


Fig 105 IMG_7901

7. Slide the end of the throttle cable into the swivel clamp (Fig. 106).

Fig 106 IMG_7899

8. Position the throttle control into the slow position (Fig. 107).

Fig 107 IMG_7913

9. Push the speed control lever toward the back of the engine (Fig. 108).

Fig 108 IMG_7914

10. Secure the throttle cable by tightening the swivel (Fig. 109).

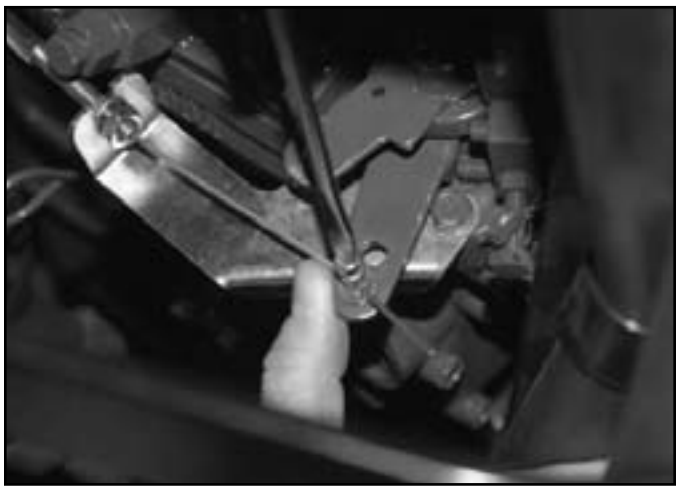


Fig 109 PICT-2918a

11. Install the front engine shield assembly (Fig. 110).

Fig 110 IMG_7895

12. Install a cable tie securing the throttle cable to the fuel tank inlet fitting. Trim the excess (Fig. 111).

Fig 111 IMG_7835

13. Install the knob onto the throttle control assembly (Fig. 112).

Fig 112 IMG_7888

14. Install 4 screws securing the control panel to the left hand fuel tank (Fig. 113).

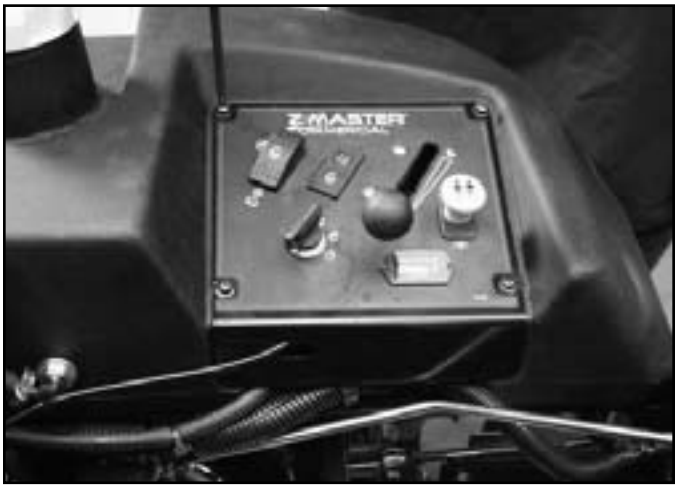


Fig 113 IMG_7887

15. Connect the negative battery cable to the battery terminal.

16. Lower the seat.

Brake Lever Replacement

The left fuel tank and hood have been removed for photo purposes.

Brake Lever Removal

1. Raise the seat.
2. Disconnect the negative battery cable from the battery terminal.
3. Lower the seat.
4. Release the parking brake (forward position).
5. Remove the cotter pin and clevis pin securing the brake linkage yoke to the brake lever assembly (Fig. 114).

Fig 114 PICT-2915

6. Lift the floor pan assembly.
7. Remove the brake lever pivot shaft cotter pin (Fig. 115).

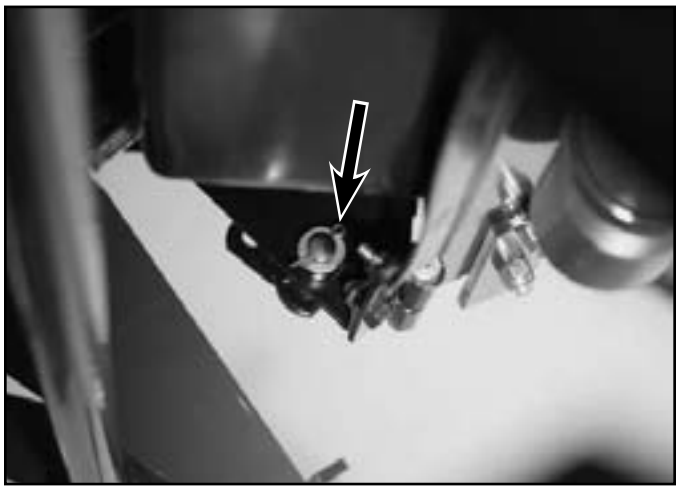


Fig 115 IMG_7922a

8. Slide the brake lever out of the pivot bushings (Fig. 116).

Fig 116 PICT-2913

9. With a hammer and punch tap out the two pivot bushings (Fig. 117).

Fig 117 PICT-2883

10. Inspect the brake shaft and bushings for excessive wear. Replace any worn or damaged components (Fig. 118).

Fig 118 PICT-2887

Brake Lever Installation

1. Raise the floor pan assembly.

2. Install the two bushings into the brake lever pivot mounting hole (Fig. 119).

Fig 119 PICT-2891

3. Slide the brake lever assembly pivot through the bushings (Fig. 120).

Fig 120 PICT-2892a

4. Install a cotter pin into the pivot shaft (Fig. 121).

Fig 121 IMG_7922a

5. Lower the floor pan assembly.

6. Move the parking brake lever into the released (forward) position.

7. Position the brake linkage yoke to the brake lever. Install a clevis and cotter pin to secure (Fig. 122).

Fig 122 PICT-2895

Brake Band Replacement

Note: The following procedures can be followed for both right and left brake band removal and installation.

Brake Band Removal

1. Remove the rear tire (Fig. 123).

Fig 123 PICT-2919

2. Remove the 3 bolts, spacer and retainer from the brake band assembly (Fig. 124).

Fig 124 PICT-2920

3. Remove the 2 spacers from the brake band (Fig. 125).

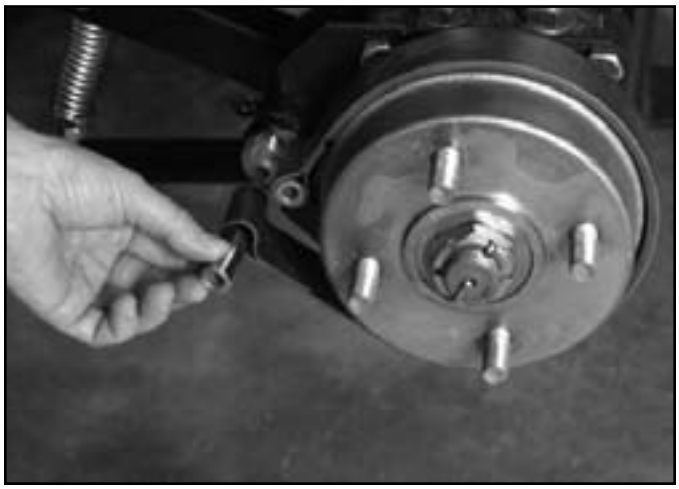


Fig 125 PICT-2935

4. Remove the brake band from the wheel and hub assembly (Fig. 126).

Fig 126 PICT-2933

5. Inspect the brake band. Replace if worn or damaged.

Brake Band Assembly (Fig. 127)

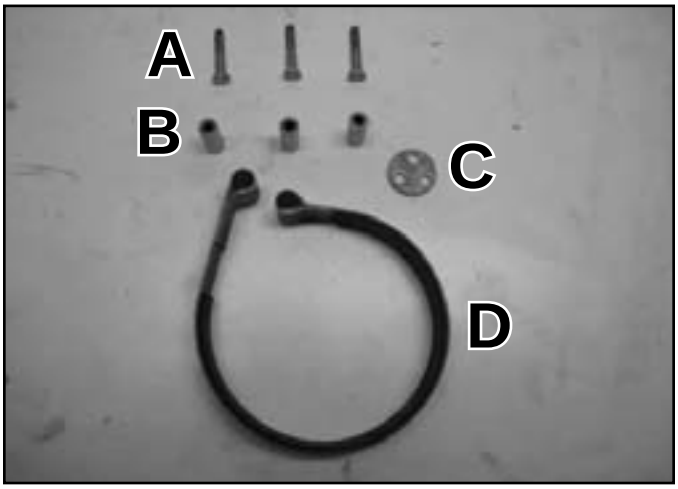


Fig 127 PICT-2926

A. Shoulder bolt (3)
B. Spacer (3)
C. Retainer
D. Brake band

Brake Band Installation

1. Slide the brake band onto the wheel hub assembly (Fig. 128).

Fig 128 PICT-2933

2. Slide a spacer into each end of the brake band (Fig. 129).

Fig 129 PICT-2935

3. Position the brake band retainer and loosely install 2 bolts through the retainer, brake band spacers and into the brake bracket (Fig. 130).

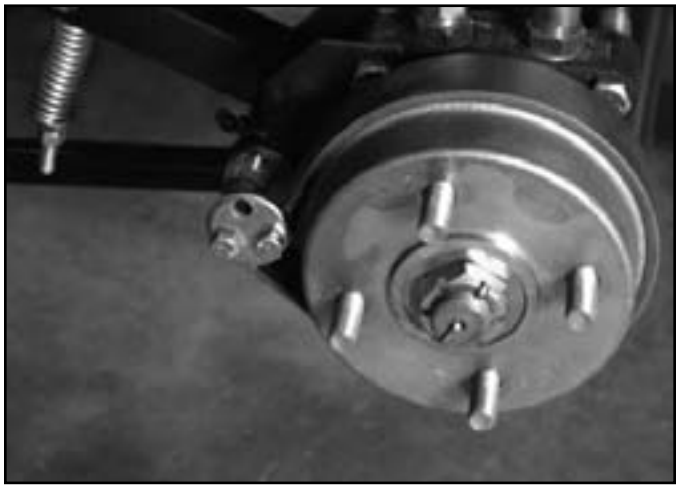


Fig 130 PICT-2941

4. Position the 3rd spacer between the retainer and the brake bracket. Loosely install the 3rd bolt through the retainer and spacer and into the brake bracket (Fig. 131).

Fig 131 PICT-2936

5. Tighten the 3 brake band retainer bolts (Fig. 132).

Fig 132 PICT-2942

6. Install the rear tire (Fig. 133).

Fig 133 PICT-2919

Brake Cross Shaft Replacement

Note: The front engine shield has been removed for photo purposes.

Brake Cross Shaft Removal

1. Raise the seat.
2. Remove the negative battery cable from the battery.
3. Raise the rear tires off the ground and remove the left and right tires (Fig. 134).

Note: To prevent the unit from rolling, block the front tires.

Fig 134 PICT-2919

4. Remove the clevis spring pins securing the brake rod linkage yokes to the left side of the brake cross shaft (Fig. 135).

Fig 135 PICT-2954

5. Remove the clevis spring pin securing the brake rod linkage yoke to the right side of the brake cross shaft (Fig. 136).

Fig 136 PICT-2956

6. Remove the 2 bolts and nuts securing the right side flange bearing to the frame. Remove the flange bearing from the cross shaft (Fig. 137).

Fig 137 PICT-2958a

7. Remove the 2 bolts and nuts securing the left side flange bearing to the frame. Remove the flange bearing from the cross shaft (Fig. 138).

Fig 138 PICT-2960

8. Remove brake cross shaft (Fig. 139).

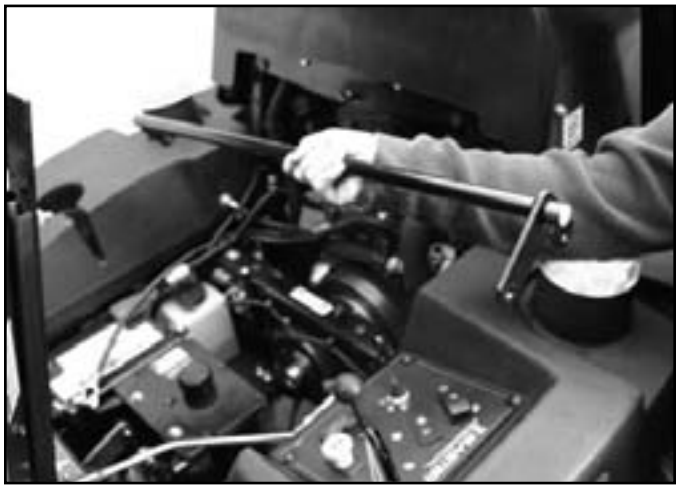


Fig 139 PICT-2964

9. Inspect brake cross shaft and bearings. Replace if worn or damaged (Fig. 140).

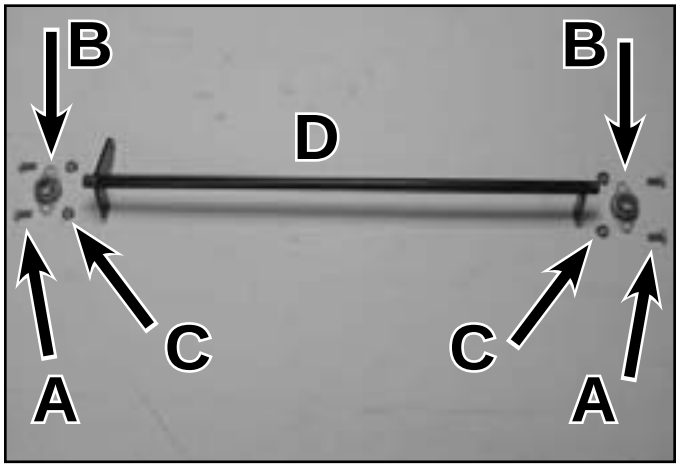


Fig 140 PICT-2968a

A. Bolt (4)
B. Side flange bearing (2)
C. Nuts (4)
D. Brake cross shaft

Brake Cross Shaft Installation

1. Slide the brake cross shaft into position (Fig. 141).

Note: The end of the cross shaft with two tabs is installed on the left side of the machine.

Fig 141 PICT-2964

2. Position a flange bearing onto each end of the cross shaft with the flange facing outward (Fig. 142).

Fig 142 PICT-2970a

3. Position the flange bearing on the right end of the cross shaft and install 2 bolts and nuts securing the flange bearing to the frame (Fig. 143).

Fig 143 PICT-2958a

4. Position the flange bearing up to the left side of the frame and install 2 bolts and nuts to secure the flange bearing to the frame (Fig. 144).

Fig 144 PICT-2960

5. Ensure the brake cross shaft rotates freely in the flange bearings.

6. Install the clevis spring pin securing the brake rod linkage yoke to the right side of the brake cross shaft (Fig. 145).

Fig 145 PICT-2956

7. Install the clevis spring pins securing the brake rod linkage yoke to the left side of the brake cross shaft (Fig. 146).

Fig 146 PICT-2954

8. Install the left and right rear tires and lower the machine to the ground (Fig. 147).

Fig 147 PICT-2919

9. Lower the seat.

10. Adjust the parking brake. Refer to “Adjusting the Parking Brake” on page 3-63.

Deck Lift Lever Replacement

Deck Lift Lever Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.

2. Raise the seat.

3. Remove the negative battery cable from the battery.

4. Place the mower deck in the transport position. Position wood blocks under each corner of the mower deck (Fig. 148).

Fig 148 PICT-2971

5. Lower the mower deck onto the blocks to remove tension from the deck lift chains (Fig. 149).

Fig 149 PICT-2973

6. Remove the lower stop bolt from the deck lift plate (Fig. 150).

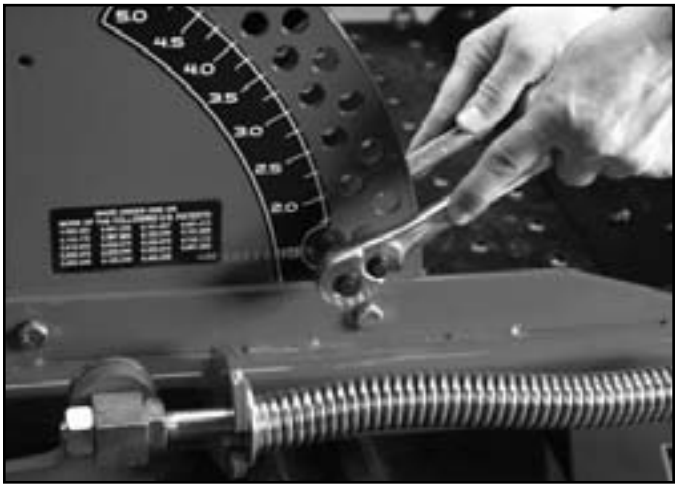


Fig 150 PICT-2978

7. Loosen the jam nut and hex nut on the right hand and left hand deck lift rods until the deck support springs are fully extended (Fig. 151).

Fig 151 PICT-2980

8. Remove the hex nut from the back end of the right and left deck lift assemblies (Fig. 152).

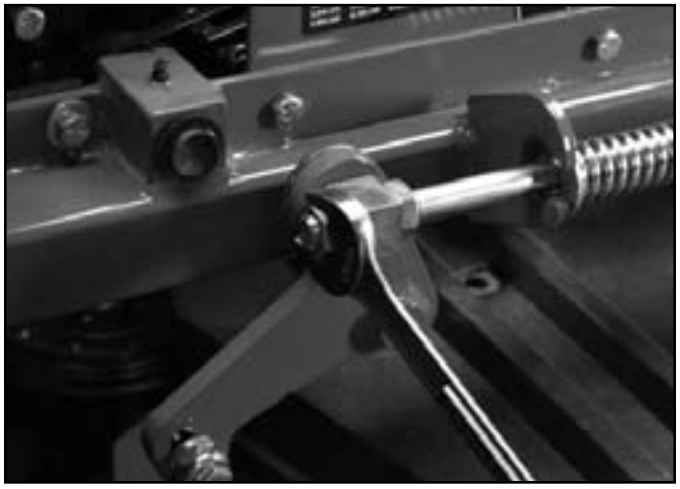


Fig 152 PICT-2982

9. Lower the deck lift lever to its lowest position. The rear deck swivel mounts should clear the deck lift rods on both sides. The mower deck lift linkage should now be fully unloaded (Fig. 153).

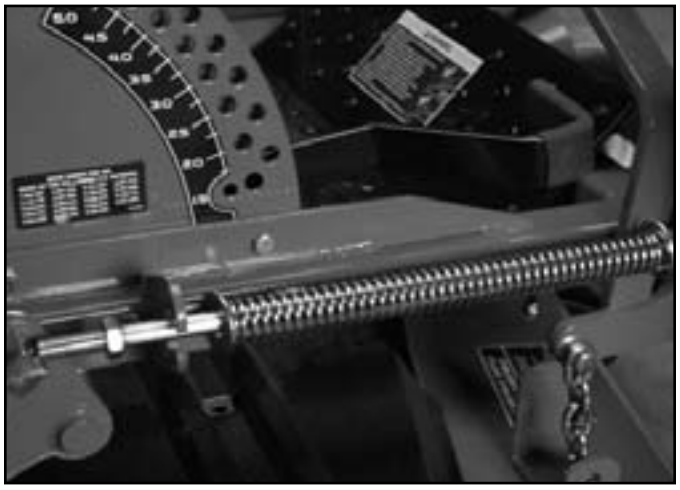


Fig 153 PICT-2984

10. Remove the bolt, nut and lift lever bushing that secures the inner deck lift plate to the frame (Fig. 154).

Fig 154 PICT-2987

11. Remove the outside hex head flange nut at the top of the inner deck lift plate. Remove the hitch pin assembly from the bolt (Fig. 155).

Fig 155 PICT-2988

12. Loosen the inner hex head flange nut. Pivot the inner deck lift plate up (Fig. 156).

Fig 156 PICT-2991a

13. Raise the floor pan.

14. Remove the front bolt and nut that secure the 2 deck lift arms to the deck lift cross shaft assembly. Pivot the deck lift arms away from the cross shaft assembly and remove the bushing from the hole in the cross shaft assembly tab (Fig. 157).

Fig 157 PICT-3000

15. Remove the E-clip from the deck lift arm pivot (Fig. 158).

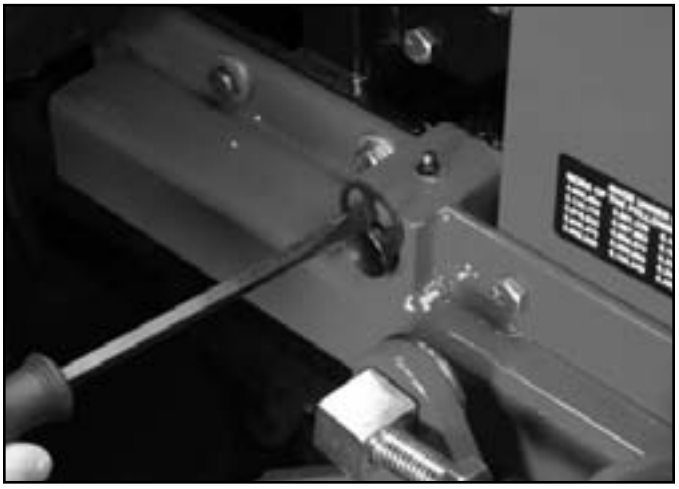


Fig 158 PICT-3002

16. Remove the deck lift lever assembly from the pivot (Fig. 159).

Fig 159 PICT-3014

Note: There may be interference between the lift lever assembly and the floor pan hinge when trying to remove the lift lever assembly (Fig. 160).

Fig 160 PICT-3005

17. If there is interference between the lift lever assembly and the floor pan hinge, loosen the right hand floor pan hinge mounting hardware, push the hinge upward and re-tighten the floor pan hinge mounting hardware (Fig. 161).

Fig 161 PICT-3008

Deck Lift Lever Assembly (Fig. 162)

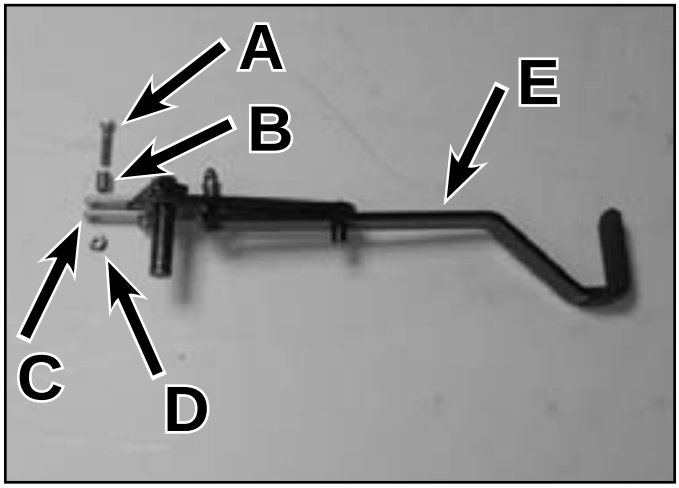


Fig 162 PICT-3015a

A. Bolt
B. Bushing
C. Deck lift arm (2)
D. Nut
E. Lift Lever Assembly

Deck Lift Lever Installation

1. Slide the deck lift lever assembly pivot into the pivot mount on the frame (Fig. 163).

Fig 163 PICT-3011a

2. Install an E-clip onto the deck lift lever pivot (Fig. 164).

Fig 164 PICT-3018

3. Slide the bushing into the hole in the cross shaft assembly tab (Fig. 165).

Fig 165 PICT-3019

4. Rotate the deck lift arms forward to align them with the bushing in the cross shaft assembly tab. Install a bolt and nut to secure (Fig. 166).

Fig 166 PICT-3000

5. Rotate the inner deck lift plate down to the mounting hole in the frame. Position a spacer in between the inner and outer plates. Install a bolt and nut to secure (Fig. 167).

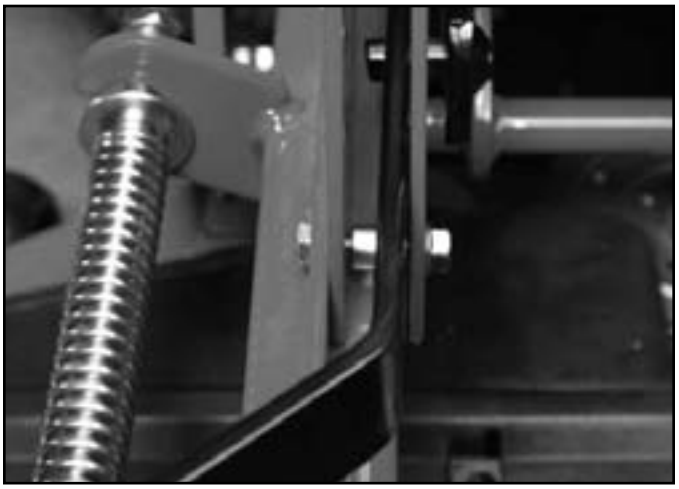


Fig 167 PICT-3022

6. Lower the floor pan assembly.

7. Tighten the nut on the bolt at the top of the inner deck lift plate (Fig. 168).

Fig 168 PICT-3023

8. Slide the hitch pin lanyard onto the bolt (Fig. 169).

Fig 169 PICT-3027

9. Install a second nut onto the bolt securing the hitch pin lanyard in place (Fig. 170).

Fig 170 PICT-3028

10. Lift up on the lift lever an install the lower stop bolt into the deck lift plate (Fig. 171).

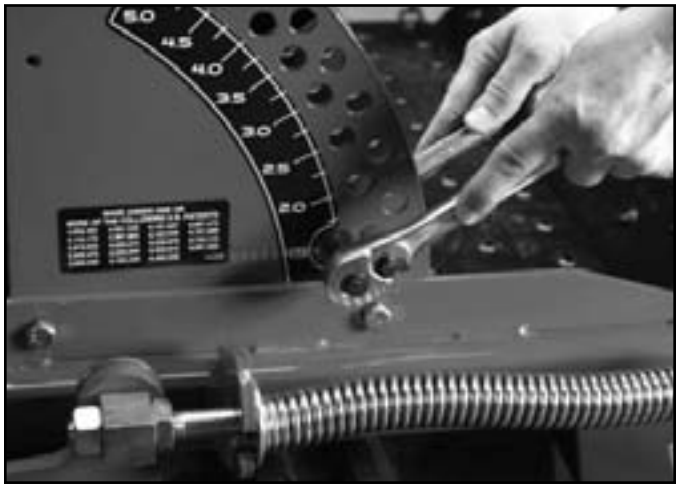


Fig 171 PICT-2978

11. Lower the lift lever. The deck lift lever rods should run through the rear swivels (Fig. 172).

Fig 172 PICT-3029a

12. Install a hex nut onto the back end of the right and left deck lift assemblies (Fig. 173).

Fig 173 PICT-2982a

13. Raise the mower deck to the transport position. Remove the wood blocks. Tighten the adjusting nut on the deck lift assemblies so that the following length is achieved between the two large washers (Fig. 174):

    A. 52” Mower Deck: 11.0” ± .25” (27.9 ± .6cm)
    B. 60” Mower Deck: 10.5” ± .25” (26.7 ± .6cm)
    C. 72” Mower Deck: 11.5” ± .25” (29.2 ± .6cm)

Fig 174 PICT-3034

14. Check the deck level adjustment. Refer to “Leveling the Mower” on page 7-82.

15. Apply grease to the grease fitting on the deck lift lever pivot (Fig. 175).

Fig 175 PICT-3035

16. Install the negative battery cable from the battery.

17. Lower the seat.

Motion Control Assembly Replacement

Motion Control Assembly Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Remove both floor pan assembly hinge bolts and nuts (Fig. 176).

Fig 176 PICT-3052

5. Remove the floor pan assembly (Fig. 177).

Fig 177 PICT-3053

6. Remove the 2 top pocket mounting bolts, washer and nuts and the 2 bottom pocket mounting bolts and nuts (Fig. 178).

Note: Raise the seat to remove the top two bolts and nuts.

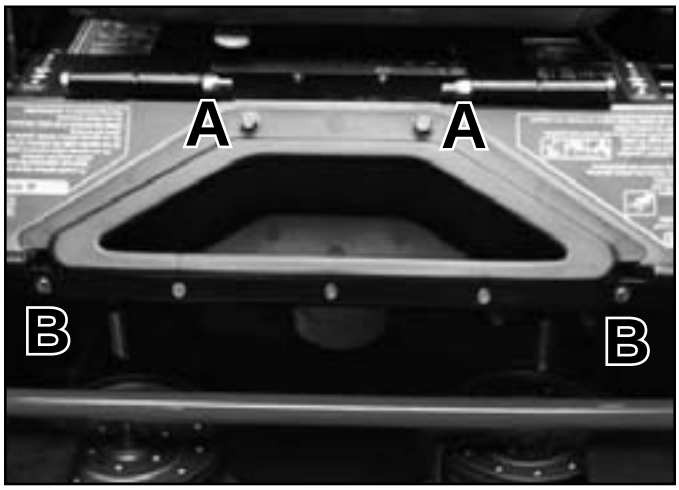


Fig 178 PICT-3055

A. Bolt, washer, nut B. Bolt, nut

7. Remove the pocket (Fig. 179).

Fig 179 PICT-3057

Right Hand Motion Control

8. Remove the 2 bolts and washers securing the right lever to the control shaft arm. Remove the right lever (Fig. 180).

Fig 180 PICT-3064

9. Remove the outside nut from the bolt that secures the motion control damper to the right hand motion control assembly (Fig. 181).

Fig 181 PICT-3066

10. Disconnect the harness from the neutral switch located under the right side of the traction frame assembly (Fig. 182).

Fig 182 PICT-3075

11. Remove the bolt, washer and nut that secure the right hand control rod assembly to the right hand motion control assembly (Fig. 183).

Fig 183 PICT-3079

12. Remove the cotter pin and clevis pin that secure the neutral return yoke to the right hand motion control assembly (Fig. 184).

Fig 184 PICT-3081

13. Loosen the jam nut on the right hand neutral return spring assembly. Remove the yoke from the neutral return bolt (Fig. 185).

Fig 185 PICT-3087

14. Remove the 2 bolts and nuts securing the side flange bearing to the inside of the traction frame (Fig. 186).

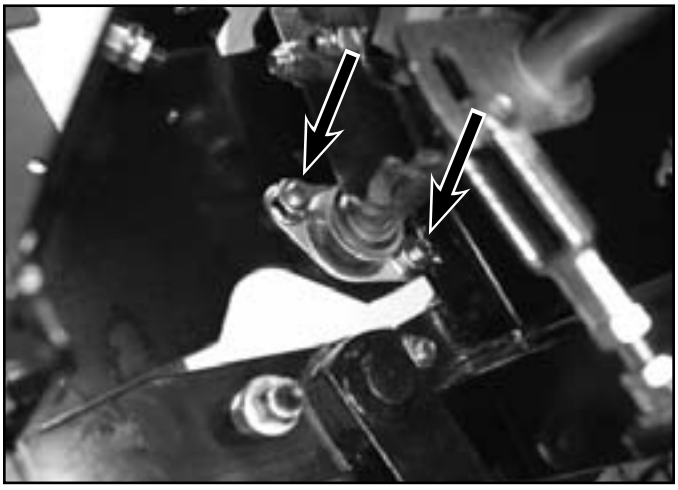


Fig 186 PICT-3084a

15. Remove the 2 bolts and nuts securing the side flange bearing to the left hand motion control assembly (Fig. 187).

Fig 187 PICT-3086

16. Remove the right hand motion control assembly and right hand control shaft arm assembly (Fig. 188).

Fig 188 PICT-3088

17. Inspect the side flange bearings. Replace if worn or damaged (Fig. 189).

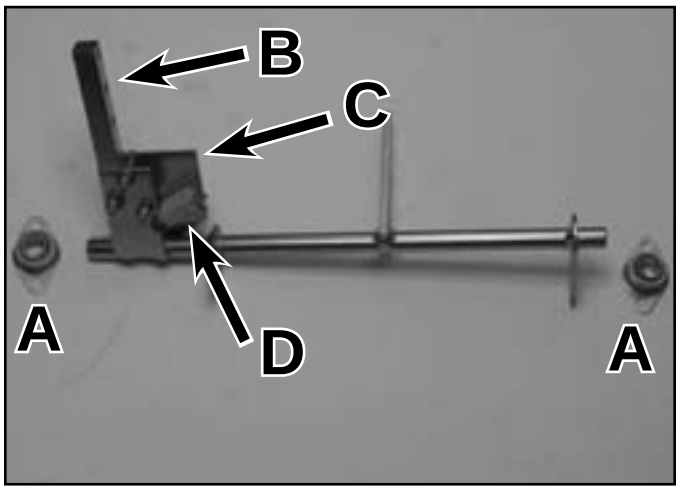


Fig 189 PICT-3091a

A. Side flange bearing (2)
B. Control shaft arm
C. Right hand motion control assembly
D. Neutral switch

Left Hand Motion Control

18. Remove the 2 bolts, and washers securing the left lever to the control shaft arm. Remove the left lever (Fig. 190).

Fig 190 PICT-3098

19. Raise the seat and remove the outside nut from the bolt that secures the motion control damper to the left hand motion control assembly (Fig. 191).

Fig 191 PICT-3102

20. Disconnect the harness from the neutral switch located under the traction frame assembly.

Note: Unplug the switch by accessing it from under the seat area.

21. Remove the bolt, washer and nut that secure the left hand control rod assembly to the left hand motion control assembly (Fig. 192).

Fig 192 PICT-3109

22. Remove the cotter pin and clevis pin that secure the neutral return yoke to the left hand motion control assembly (Fig. 193).

Fig 193 PICT-3124

23. Loosen the left hand neutral return assembly jam nut. Remove the yoke from the neutral return bolt (Fig. 194).

Fig 194 PICT-3126

24. Remove the nut, bolt and washer securing the left hand control rod ball joint to the hydrostatic pump control arm (Fig. 195).

Fig 195 PICT-3131

25. Remove the left hand control rod assembly (Fig. 196).

Fig 196 PICT-3133

26. Remove the 2 bolts and nuts securing the side flange bearing to the inside of the traction frame (Fig. 197).

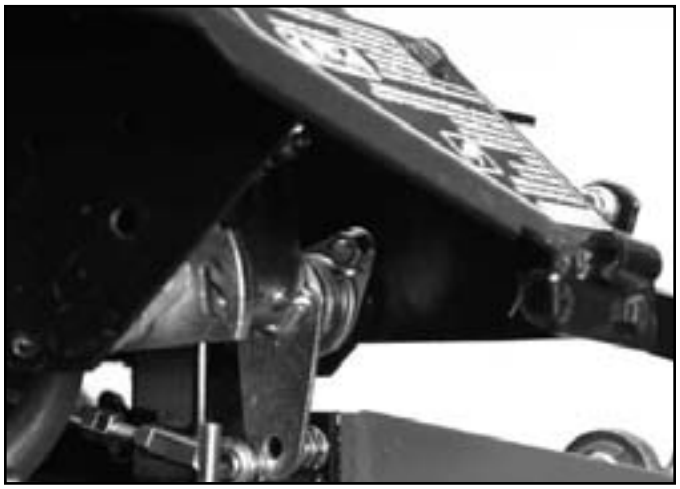


Fig 197 PICT-3128

27. Remove the left hand motion control assembly and left hand control shaft arm assembly (Fig. 198).

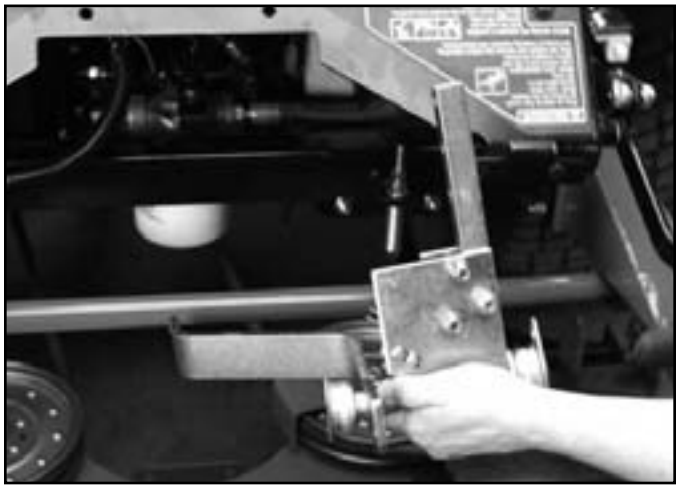


Fig 198 PICT-3135

28. Inspect the side flange bearings. Replace if worn or damaged (Fig. 199).

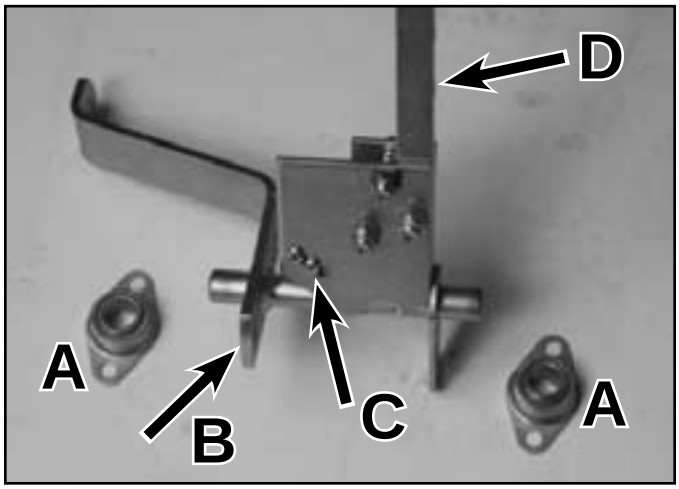


Fig 199 PICT-3137a

A. Side flange bearing (2)
B. Left hand motion control assembly
C. Neutral switch (reverse side of motion control assembly)
D. Control shift arm

Motion Control Assembly Installation

Left Hand Motion Control

1. Slide a side flange bearing onto each end of the left hand motion control assembly (Fig. 200).

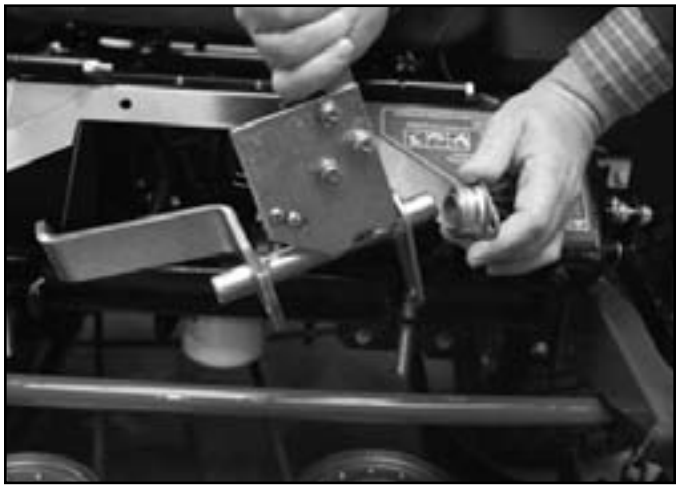


Fig 200 PICT-3138a

2. Position the left hand motion control assembly and control shaft arm assembly into the traction frame (Fig. 201).

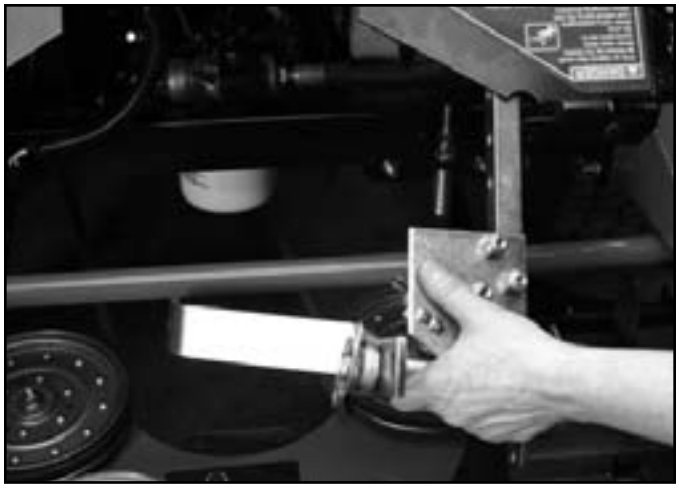


Fig 201 PICT-3134

3. Install 2 bolts and nuts securing the side flange bearing to the inside of the traction frame (Fig. 202).

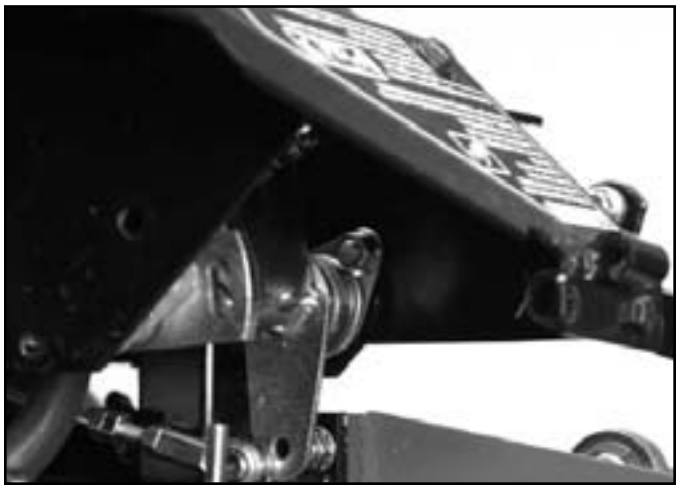


Fig 202 PICT-3128

4. Position the left hand control rod assembly into the traction frame (Fig. 203).

Fig 203 PICT-3133

5. Install a bolt, washer and nut securing the left hand control rod ball joint to the hydrostatic pump control arm (Fig. 204).

Note: The washer is installed between the ball joint and the control arm.

Fig 204 PICT-3131

6. Install the neutral return yoke onto the neutral return bolt (Fig. 205).

Fig 205 PICT-3126

7. Position the left hand neutral return yoke to the left hand motion control tab and install a clevis pin and cotter pin (Fig. 206).

Fig 206 PICT-3124

8. Tighten the jam nut to secure the neutral adjustment yoke (Fig. 207).

Fig 207 PICT-3142

Right Hand Motion Control

9. Slide a side flange bearing onto each end of the right motion control assembly (Fig. 208).

Fig 208 PICT-3092a

10. Position the right hand motion control assembly and control shaft arm assembly into position under the traction frame (Fig. 209).

Fig 209 PICT-3088

11. Position the side flange bearing to the left hand motion control assembly and loosely install 2 bolts and nuts to secure the side flange bearing (Fig. 210).

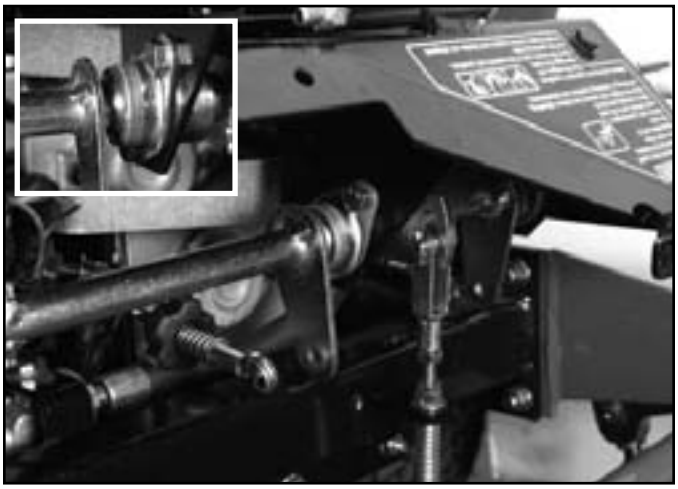


Fig 210 PICT-3144

12. Position the side flange bearing to the inside of the traction control frame and loosely install 2 bolts and nuts securing the side flange bearing (Fig. 211).

Fig 211 PICT-3084a

13. Thread the yoke onto the neutral return bolt (Fig. 212).

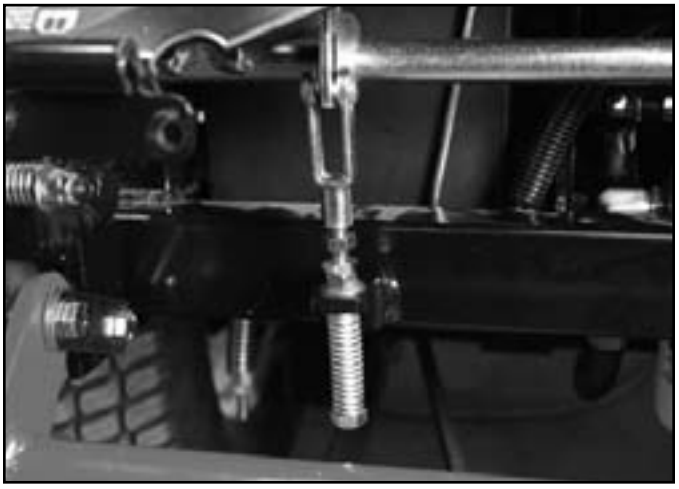


Fig 212 PICT-3145

14. Position the neutral return yoke to the right hand motion control tab and install a clevis pin. Install a cotter pin into the clevis pin to secure (Fig. 213).

Fig 213 PICT-3081

15. Tighten the jam nut to secure the yoke (Fig. 214).

Fig 214 PICT-3149

16. Install the bolt, washer and nut securing the right hand control rod assembly to the right hand motion control assembly (Fig. 215).

Note: The washer is installed between the ball joint and motion control assembly tab.

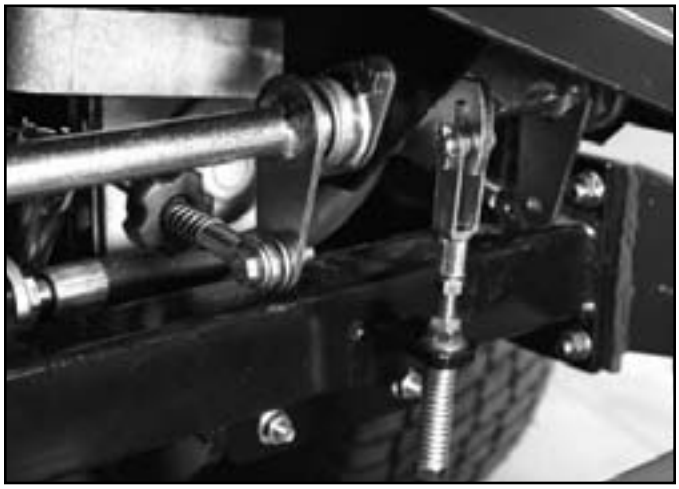


Fig 215 PICT-3151

17. Install a bolt, washer and nut securing the left hand control rod assembly to the left hand motion control assembly (Fig. 216).

Note: The washer is installed between the ball joint and motion control assembly tab.

Fig 216 PICT-3109

18. Raise the seat and insert the right and left damper bolts into the right and left motion control assembly tabs. Install a nut onto each of the damper bolts to secure the motion control dampers to the motion control assemblies (Fig. 217).

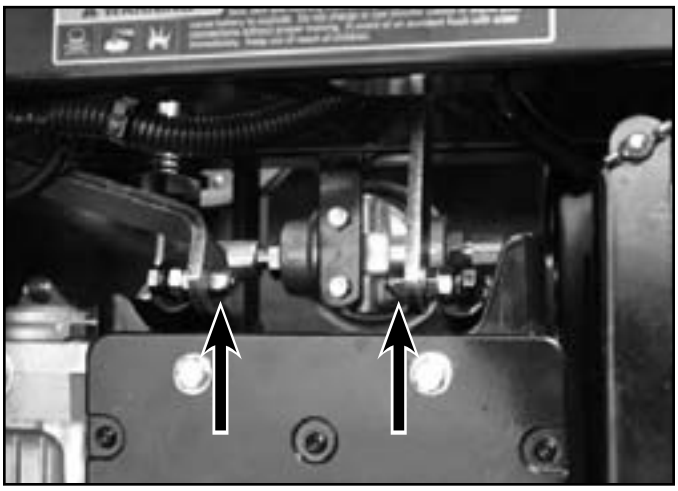


Fig 217 PICT-3156

19. Connect the harness to the 2 neutral switches located under the seat, behind the left hand and right and sides of the traction control frame under the traction frame assembly (Fig. 218 and 219).

Right hand neutral switch

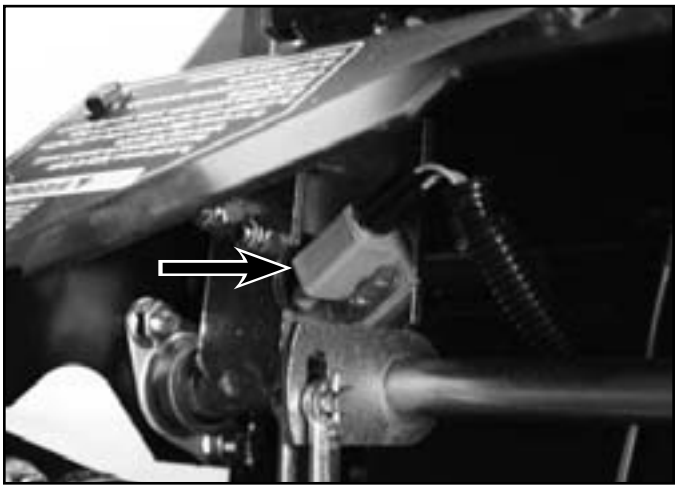


Fig 218 PICT-3075

Left hand neutral switch - access by raising seat.

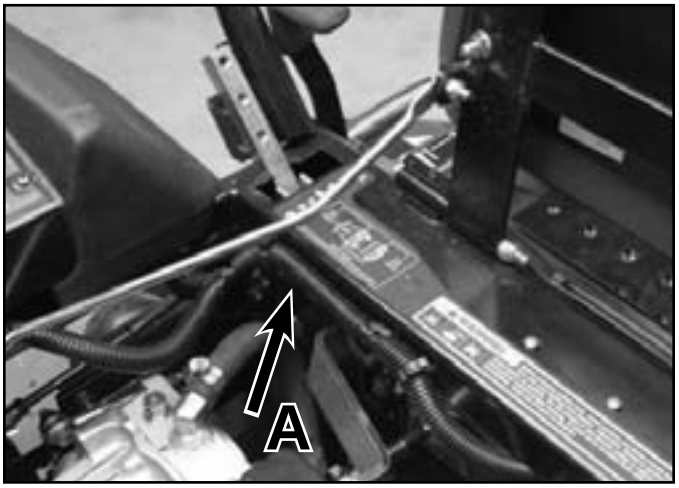


Fig 219 PICT-4221a

A. Left hand neutral switch located under the traction frame front console.

20. Tighten all 6 bolts and nuts securing the 4 side flange bearings:

A. Flange bearing mounted to the inside (right) of the traction control frame (Fig. 220).

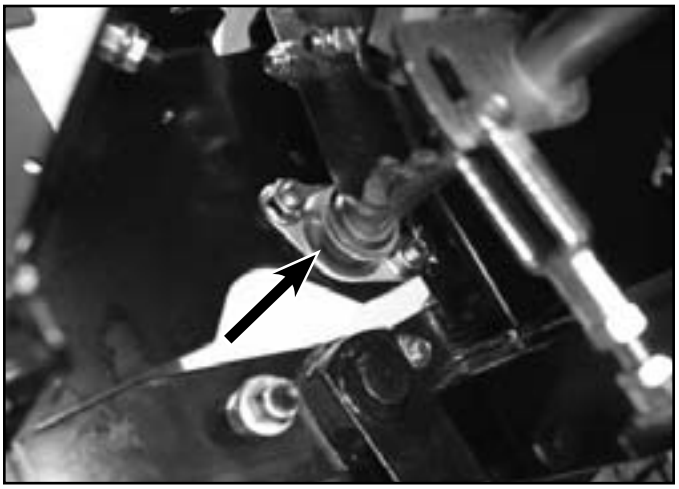


Fig 220 PICT-3084a

B. Flange bearings mounted to the left hand motion control assembly (Fig. 221).

Fig 221 PICT-3086

C. Flange bearing mounted to the inside (left) of the traction frame (Fig. 222).

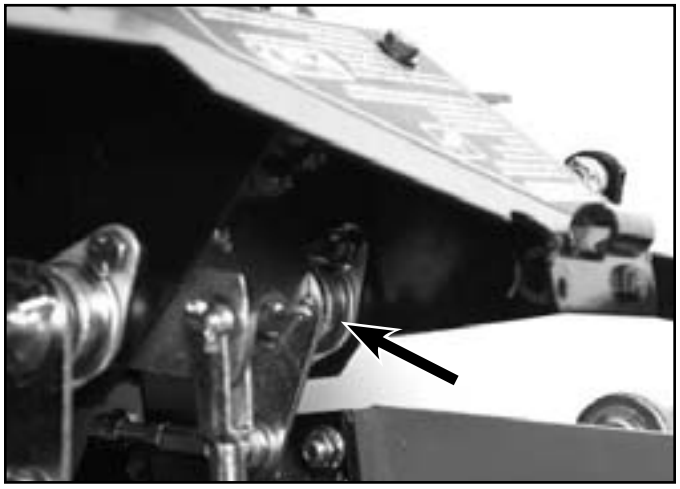


Fig 222 PICT-3161

21. Position the left hand control lever to the left hand control shaft arm. Install 2 bolts, and washers securing the left lever to the control shaft arm (Fig. 223).

Fig 223 PICT-3098

22. Position the right hand control lever to the right hand control shaft arm. Install 2 bolts, and washers securing the right hand lever to the control shaft arm (Fig. 224).

Fig 224 PICT-3064a

23. Adjust the control handle neutral position. Refer to “Adjusting the Control Handle Neutral Position” on page 4-25.

24. Adjust the hydrostatic pump neutral. Refer to “Setting the Hydrostatic Pump Neutral” on page 4-27.

25. Insert the pocket into the traction frame (Fig. 225).

Fig 225 PICT-3057

26. Install 2 top pocket mounting bolts, washers and nuts and 2 bottom pocket mounting bolts and nuts (Fig. 226).

Note: Raise the seat to install the top 2 bolts washer and nuts.

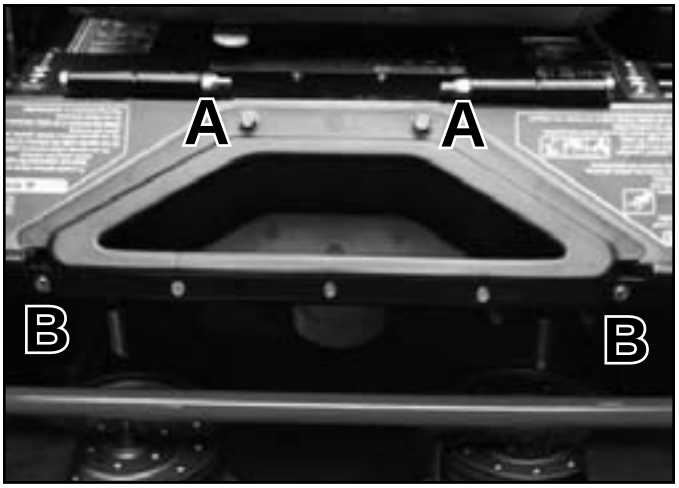


Fig 226 PICT-3055

A. Bolt, washer, nut B. Bolt, nut

27. Position the floor pan assembly (Fig. 227).

Fig 227 PICT-3053

28. Install both floor pan assembly hinge bolts and nuts (Fig. 228).

Fig 228 PICT-3052

29. Install the negative battery cable from the battery.

30. Lower the seat.

Motion Control Damper Replacment

There is a right and a left motion control damper. The following removal and installation procedures are done on the right damper. The procedures are the same for the left damper.

Motion Control Damper Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Remove the outer nut from the bolt on the lower end of the damper (Fig. 229).

Fig 229 PICT-3171

5. Remove the outer nut from the bolt on the upper end of the damper (Fig. 230).

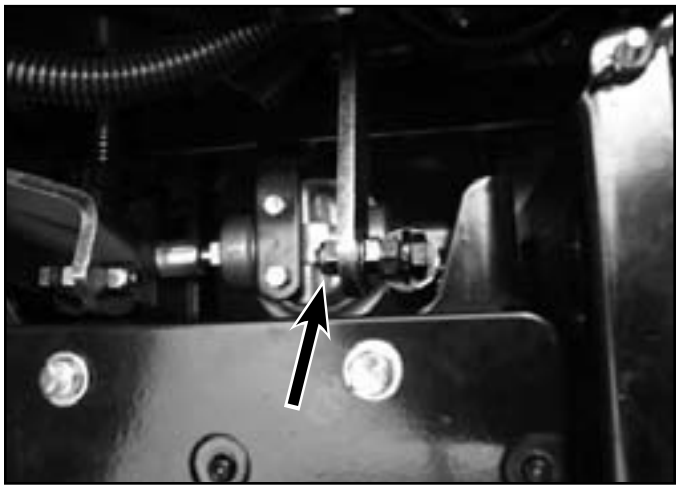


Fig 230 PICT-3173

6. Remove the damper assembly (Fig. 231).

Fig 231 PICT-3178

Damper Assembly (Fig. 232)

Fig 232 PICT-3181a

Motion Control Damper Installation

1. Raise the seat.
2. Position the damper assembly with the rod end down (Fig. 233).

Fig 233 PICT-3178

3. Insert the upper damper bolt into the motion control assembly arm. Install a nut to secure the upper end of the damper (Fig. 234).

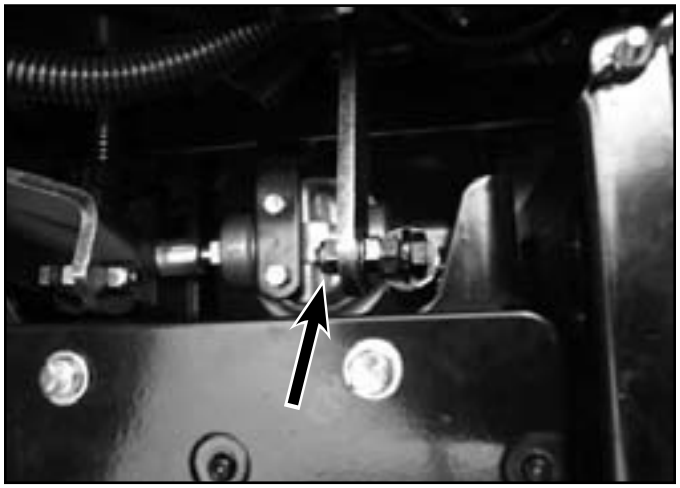


Fig 234 PICT-3173

4. Insert the lower damper bolt into the frame and install a nut to secure the lower end of the damper (Fig. 235).

Fig 235 PICT-3171

5. Install the negative battery cable to the battery.
6. Lower the seat.

Adjusting the Parking Brake

1. Engage the parking brake, lever up.

2. Measure the length of the spring. Measurement should be 2-1/2” (64mm) between the washers (Fig. 236).

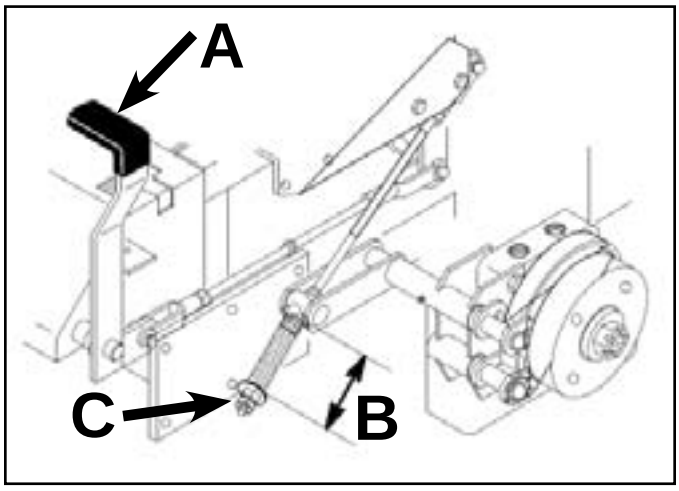


Fig 236 fig. 57 G001294

A. Brake lever in engaged position
B. Spring 2-1/2” (64mm)
C. Adjusting nut & jam nut

3. If adjustment is necessary, release the parking brake, loosen the jam nut below the spring and adjust the nut directly below the spring (Fig. 057). Turn the nut until the correct measurement is obtained. Turn the nut clockwise to shorten spring length and turn counterclockwise to lengthen the spring.

4. Tighten the two nuts together.

5. Engage the parking brake, lever up. Check the measurement of the spring again.

6. If adjustment is necessary, repeat the procedures above.

7. Repeat on the opposite side of machine.

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Hydrostatic Tandem Pump Replacement

Note: Cleanliness is a key factor in a successful repair of any hydrostatic system. Thoroughly clean all exposed surfaces prior to any type of maintenance. Cleaning all parts with a solvent wash and air drying is usually adequate. As with any precision equipment, all parts must be kept free of foreign material and chemicals. Protect all exposed sealing areas and open cavities from damage and foreign material.

Upon removal, all seals, o-rings, and gaskets should be replaced. Lightly lubricate all seals, o-rings and gaskets with clean petroleum jelly prior to installation.

Hydrostatic Tandem Pump Removal

1. Park the machine on a level surface, disengage the PTO, set the parking brake, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Remove the front engine shield (Fig. 237).

Fig 237 IMG_7862

5. Using a spring removal tool (Toro part no. 92-5771), remove the pump idler arm spring (Fig. 238).

Fig 238 PICT-3185

6. Remove the belt from the pump pulley (Fig. 239).

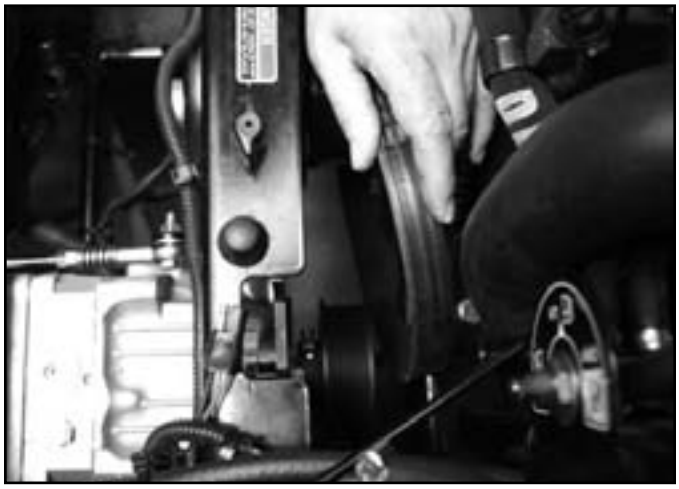

Fig 239 PICT-3187

7. Remove the 2 pump pulley set screws (Fig. 240).

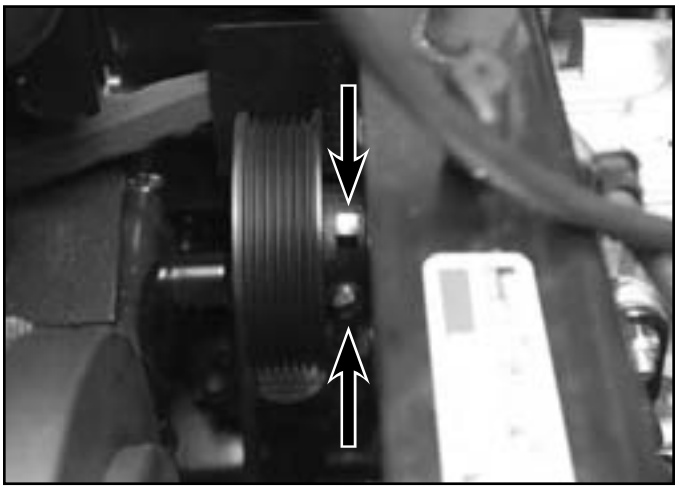

Fig 240 PICT-3188a

8. Remove the pump pulley (Fig. 241).

Fig 241 PICT-3190a

9. Remove the key from the keyway (Fig. 242).

Fig 242 PICT-3192a

10. Remove the bolt, nut and washer securing the right hand control rod assembly to the pump control arm (Fig. 243).

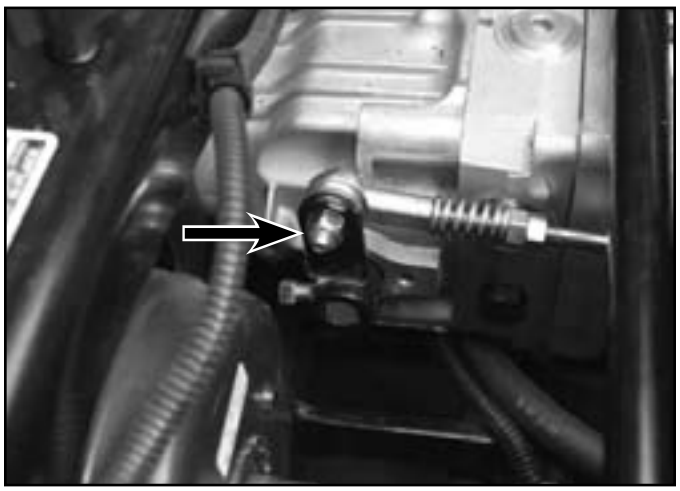

Fig 243 PICT-3195a

11. Remove the bolt, nut and washer securing the left hand control rod assembly to the pump control arm (Fig. 244).

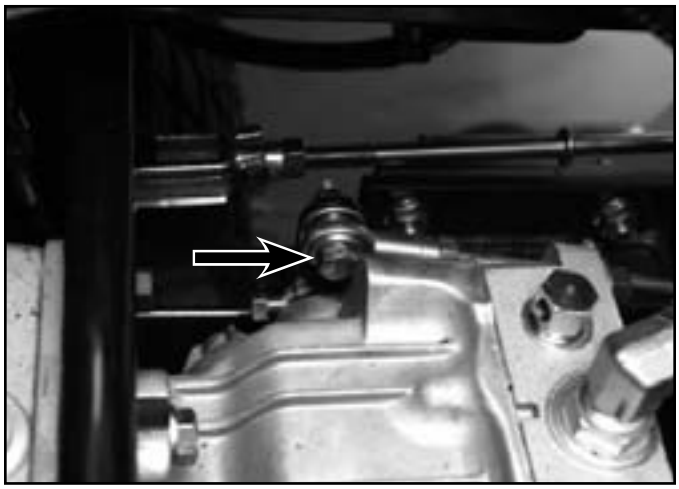

Fig 244 PICT-3196

12. Remove the cable tie securing the 2 right wheel motor hydraulic hoses to the frame (Fig. 245).

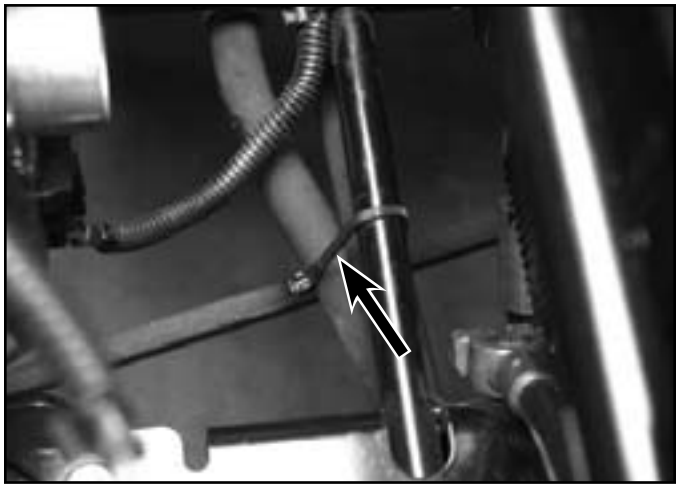

Fig 245 PICT-3197

13. Unplug the harness from the PTO clutch connector (Fig. 246).

Fig 246 PICT-3198

14. Remove the cable tie securing the PTO clutch wire to the frame (Fig. 247).

Fig 247 PICT-3200a

15. Remove the hose clamp located on the hydraulic suction hose coming from the oil filter (Fig. 248).

Fig 248 PICT-3202

16. Remove the hydraulic suction hose from the fitting on top of the hydrostatic pump (Fig. 249).

Note: When removing hydraulic hoses from the pump, cap the hose end and the fitting on the hydrostatic pump to ensure dirt and debris does not enter the system.

Fig 249 PICT-3203a

17. Raise the rear of the unit and remove both right and left rear tires.

18. Mark or tag the wheel motor hydraulic hoses and fittings to ensure they are reconnected correctly.

19. Remove the two hydraulic hoses from the right wheel motor (Fig. 250).

Fig 250 PICT-3217

20. Cap the hydraulic hoses and fittings (Fig. 251).

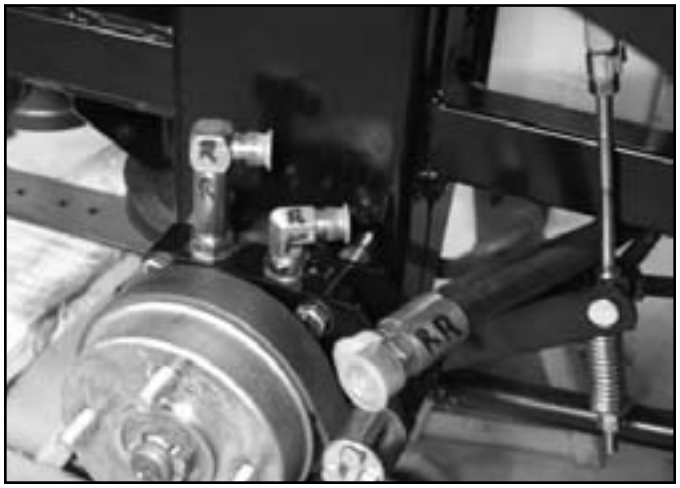

Fig 251 PICT-3207

21. Remove the two hydraulic hoses from the left wheel motor (Fig. 252).

Fig 252 PICT-3208

22. Cap the hydraulic hoses and fittings (Fig. 253).

Fig 253 PICT-3215

23. Remove the hose clamp located on the hydraulic hose routed from the oil cooler to the left side of the hydrostatic pump (Fig. 254).

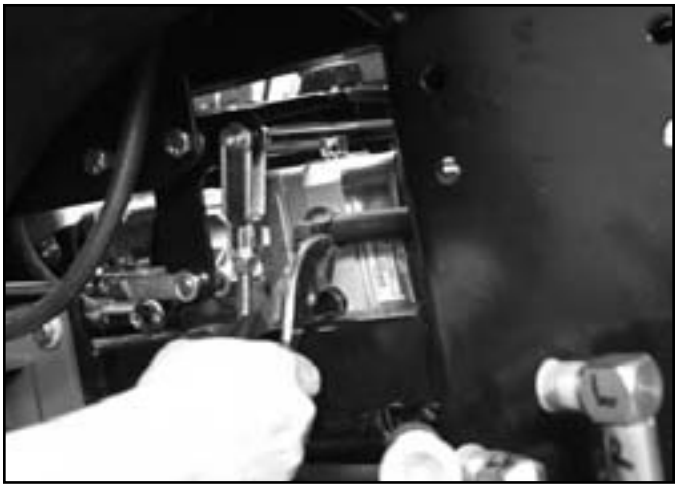

Fig 254 PICT-3211

24. Remove the hydraulic hose from the fitting barb (Fig. 255).

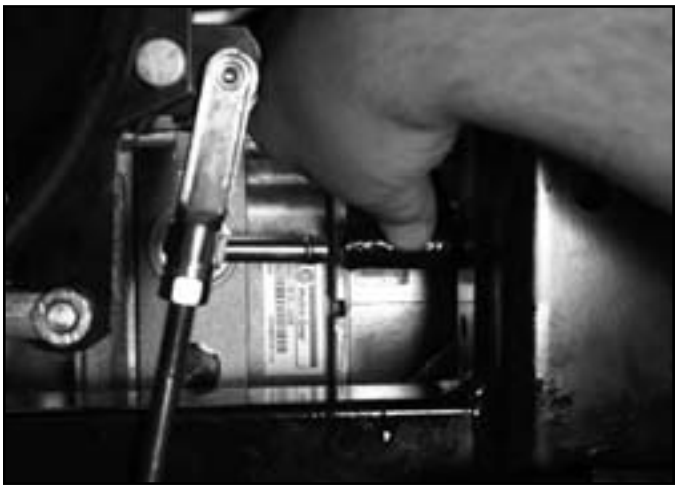

Fig 255 PICT-3331

25. Remove the two bolts, washers and nuts securing the front of the hydrostatic pump (by the input shaft) to the frame (Fig. 256).

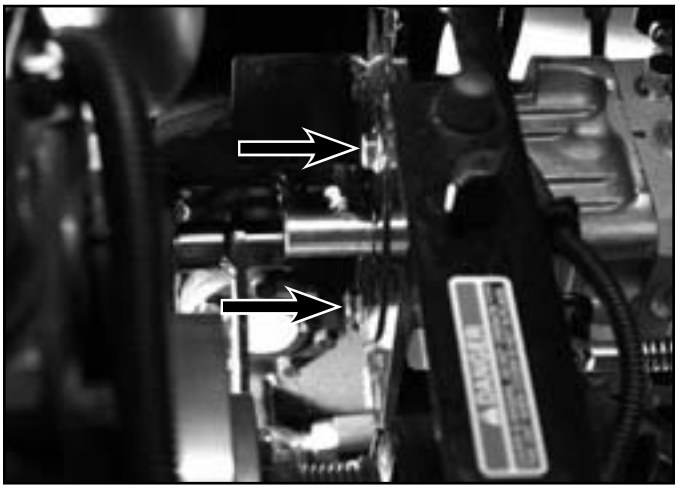

Fig 256 PICT-3257

26. Remove the pump shield plate from the hydrostatic pump input shaft (Fig. 257).

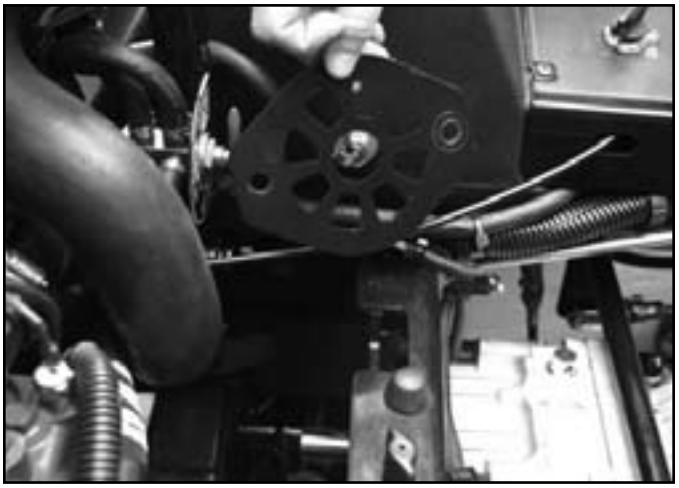

Fig 257 PICT-3269

27. Remove the two bolts, washers, and nuts holding the pump bracket to the frame of the unit (Fig. 258).

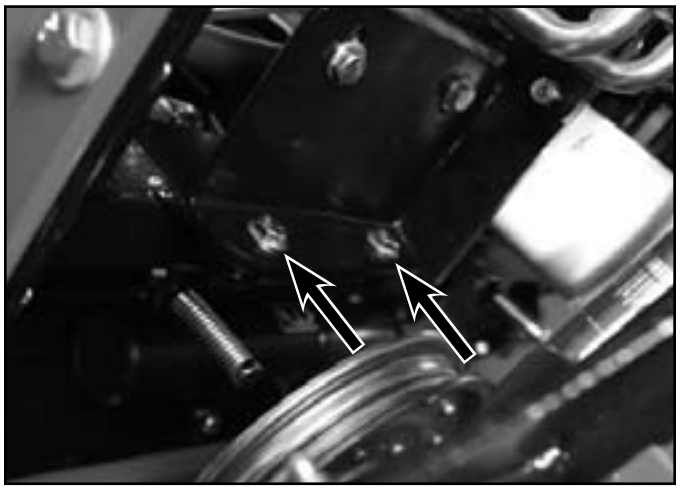

Fig 258 PICT-3265

28. Position the mower deck in the lowest height-of-cut position (Fig. 259).

Fig 259 PICT-4179

29. Carefully lower the hydrostatic pump from the frame (Fig. 260).

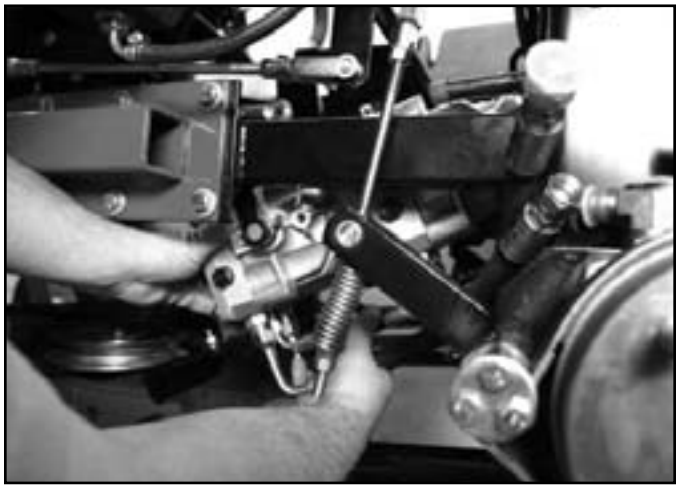

Fig 260 PICT-3271

30. Mark the wheel motor hose and pump fitting locations (Fig. 261).

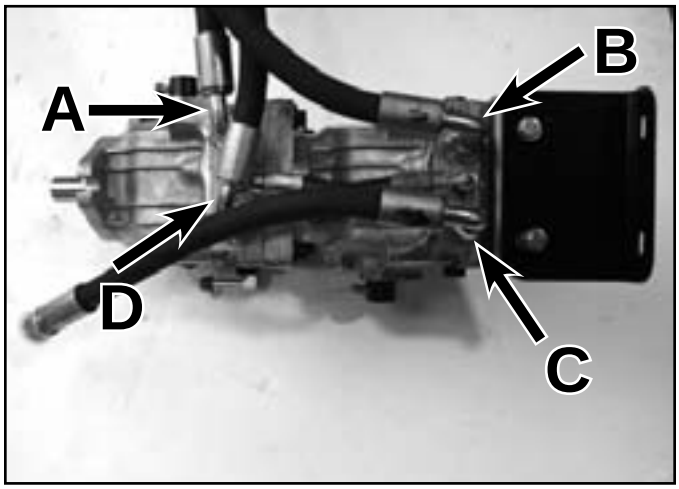

Fig 261 PICT-3298

A. Right wheel motor, front hose fitting
B. Left wheel motor, rear hose fitting
C. Left wheel motor, front hose fitting
D. Right wheel motor, rear hose fitting

31. Remove all 4 wheel motor hoses from the pump fittings (Fig. 262).

Fig 262 PICT-3300

32. Remove the 2 bolts, washers and nuts securing the pump mounting bracket to the pump. Remove the mounting bracket (Fig. 263).

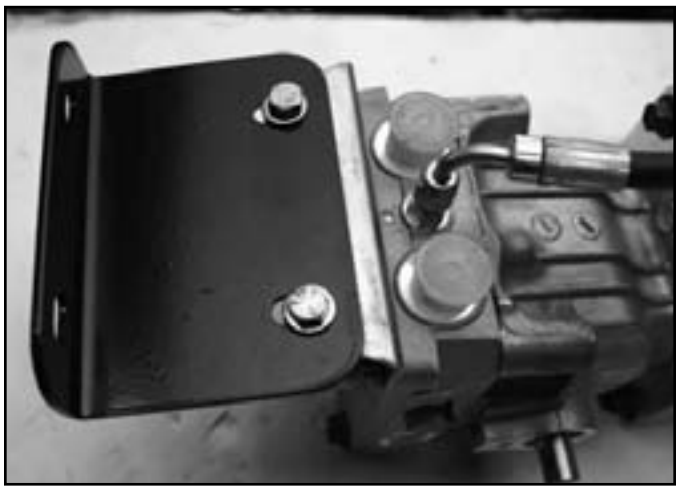

Fig 263 PICT-4204

33. Remove the set screw securing the control arm to the pump control shaft. Remove the control arm from the pump control shaft (Fig. 264).

Fig 264 PICT-3302

34. Repeat steps 29 and 30 to remove the opposite control arm from the pump.

35. For tandem pump service, refer to the Hydro-Gear P Series Pumps Service and Repair Manual (form BLN-52503)

36. Transfer all fittings and markings to the new hydrostatic tandem pump (Fig. 265).

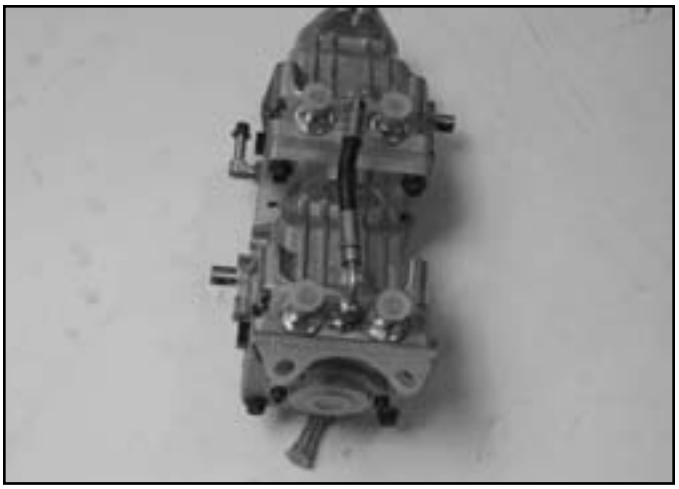

Fig 265 PICT-3305a

Hydrostatic Tandem Pump Installation

1. Apply thread locking compound to the pump control arm set screw (Fig. 266).

Fig 266 PICT-3307a

2. Thread the set screw into the control arm. Slide a control arm onto the pump control shaft and tighten the set screw (Fig. 267).

Fig 267 PICT-3302

3. Repeat steps 1 and 2 to install the other control arm to the opposite pump control shaft.

4. Position the pump mounting bracket to the pump. Loosely install 2 bolts, washers and nuts securing the pump mounting bracket to the pump (Fig. 268).

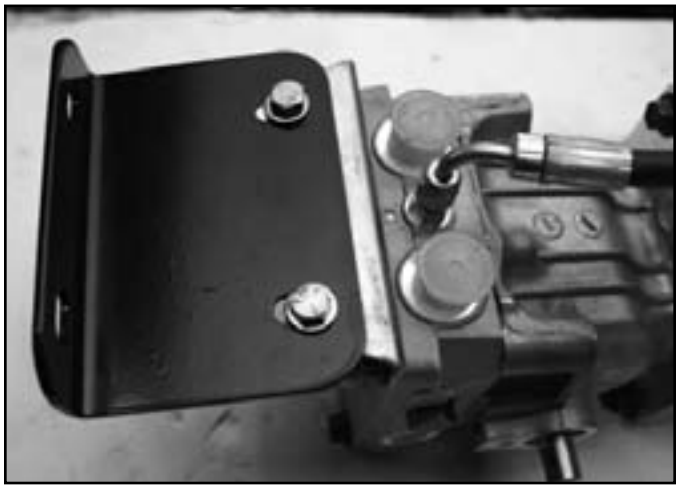

Fig 268 PICT-4204

5. Lower the mower deck to the lowest height-of-cut position.

6. From under the machine, position the pump input shaft through the hole in the frame (Fig. 269).

Fig 269 PICT-3309

7. Align the pump mounting bracket to the frame and loosely install 2 bolts, washers and nuts (Fig. 270).

Fig 270 PICT-3312

8. Position the pump shield plate over the pump shaft, against the frame. Install 2 two bolts, washers and nuts securing the pump shield plate and pump to the frame (Fig. 271).

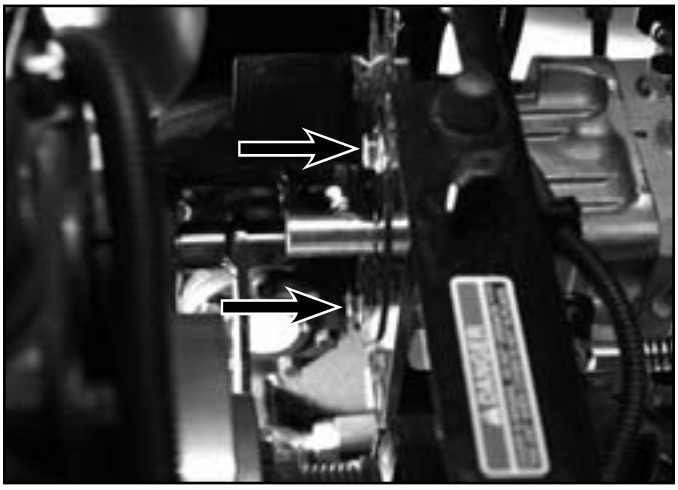

Fig 271 PICT-3257

9. Tighten the 2 bolts securing the pump mounting bracket to the bracket on the frame. Tighten the 2 bolts securing the mounting bracket to the pump (Fig. 272).

Fig 272 PICT-3259

10. Loosely install the 4 wheel motor hoses to the bottom of the pump. Note the location of each hose by the markings on the hose fittings and the pump (Fig. 273).

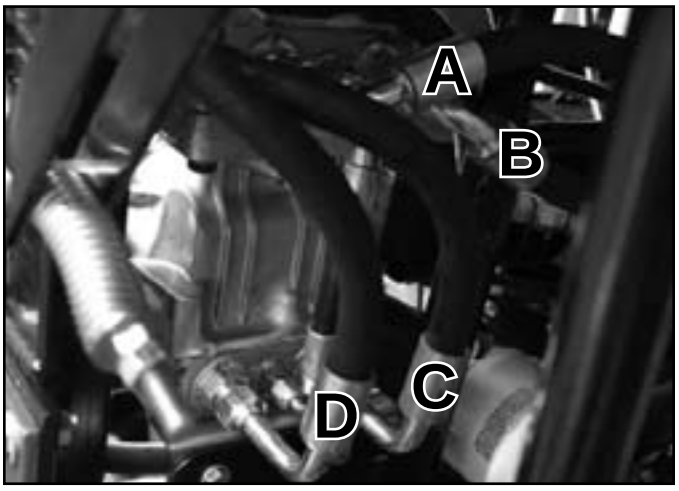

Fig 273 PICT-3322

A. Right wheel motor, rear hose fitting
B. Right wheel motor, front hose fitting
C. Left wheel motor, rear hose fitting
D. Left wheel motor, front hose fitting

11. Install the left wheel motor hoses. Note the location of each of the hoses by the markings on the hoses and wheel motor fittings (Fig. 274).

Fig 274 PICT-3324

12. Tighten the left hand wheel motor hose fittings at the pump and at the wheel motor.

13. Install the right wheel motor hoses. Note the location of each of the hoses by the markings on the hoses and the wheel motor fittings (Fig. 275).

Fig 275 PICT-3327

14. Tighten the right hand wheel motor hose fittings at the pump and at the wheel motor.

15. With the hose clamp on the oil cooler hose, slide the hose onto the pump fitting (Fig. 276).

Fig 276 PICT-3331a

16. Position the hose clamp over the hose and fitting barb (Fig. 277).

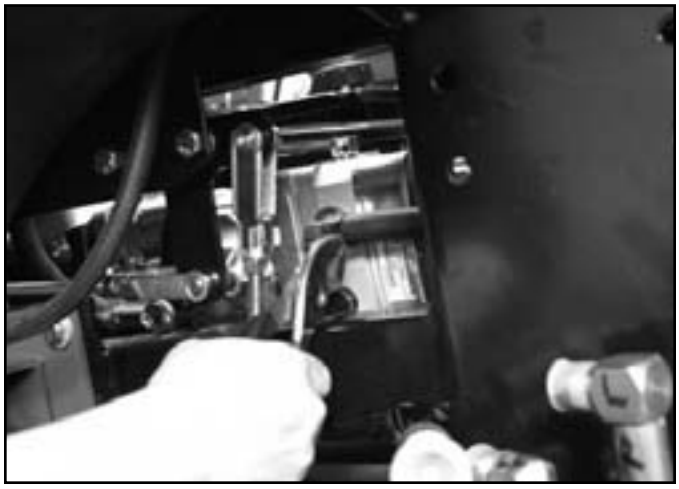

Fig 277 PICT-3211

17. Slide a hose clamp over the hydraulic suction hose (Fig. 278).

Fig 278 PICT-3333a

18. Slide the hydraulic suction hose onto the pump fitting on top of the hydrostatic pump (Fig. 279).

Fig 279 PICT-3203a

19. Position the hose clamp and tighten (Fig. 280).

Fig 280 PICT-3337

20. Plug the harness plug into the PTO clutch connector (Fig. 281).

Fig 281 PICT-3198

21. Install a cable tie securing the PTO clutch wire to the frame (Fig. 282).

Fig 282 PICT-3200a

22. Install a cable tie securing the 2 right wheel motor hydraulic hoses to the frame (Fig. 283).

Fig 283 PICT-3197

23. Position the left hand control rod ball joint to the pump control arm. Install a bolt, washer and nut securing the left hand control rod assembly to the pump control arm (Fig. 284).

Note: The washer is installed between the ball joint and the control arm.

Fig 284 PICT-3196

24. Position the right hand control rod ball joint to the pump control arm. Install a bolt, washer and nut securing the right hand control rod assembly to the pump control arm (Fig. 285).

Note: The washer is installed between the ball joint and the control arm.

Fig 285 PICT-3195a

25. Apply anti-seize compound onto the pump input shaft (Fig. 286).

Fig 286 PICT-3340a

26. Install the key into the pump shaft keyway (Fig. 287).

Fig 287 PICT-3341

27. Apply thread locking compound to the 2 pump pulley set screws (Fig. 288).

Fig 288 PICT-3307a

28. Loosely install the 2 set screws into the pump pulley (Fig. 289).

Fig 289 PICT-3342a

29. Slide the pump pulley onto the pump shaft (Fig. 290).

Fig 290 PICT-3345a

Belt Alignment Tool (Toro p/n: 110-0876) (Fig. 291):

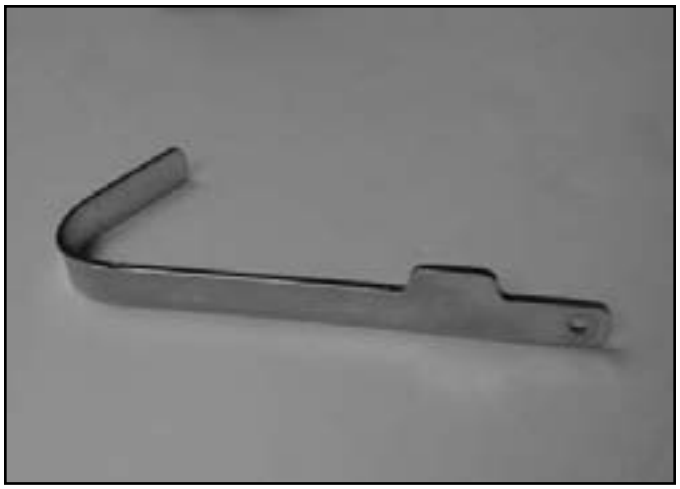

Fig 291 alignment tool

30. Hook the belt alignmentn tool (Toro p/n 110-0876) onto the engine drive sheave. Align the hydro pump drive pulley so that the tool lies squarely within the outer sheaves (Fig. 292).

Fig 292 hydro belt alignment

31. Rotate the too so that it faces to the right side of the machine. Hook the end into the hydro pump drive pulley on the front of the engine. There is a raised contact area on the tool. Loosen the gearbox input pulley and locate it so the outside of the pulley just makes contact with the raised contact area of the tool (Fig. 293). Since the distance between the clutch sheaves and the hydro pump drive sheave on the engine is fixed, the tool uses the hydro drive sheave for reference for doing both belt alighnment procedures.

Fig 293 deck drive alignment

32. Tighten the 2 pump pulley set screws. Torque to 12.1 ± 1.6 in-lbs. (1.37 ± 0.18 Nm) (Fig. 294).

Fig 294 PICT-3349a

33. Install the pump drive belt (Fig. 295).

Fig 295 PICT-3187

34. Using a spring removal tool (Toro part no. 92-5771), install the pump idler arm spring (Fig. 296).

Fig 296 PICT-3185

35. Install the right and left rear wheels.

36. Install the front engine shield (Fig. 297).

Fig 297 IMG_7862

37. Install the negative battery cable.

38. Lower the seat.

39. Purge the hydraulic system. Refer to “Purging the Hydraulic System” on page 4-24.

40. Adjust the control handle neutral position. Refer to “Adjusting the Control Handle Neutral Position” on page 4-25.

41. Adjust the hydrostatic pump neutral. Refer to “Setting the Hydrostatic Pump Neutral” on page 4-27.

Wheel Motor Replacement

The following procedures are the same for the left and right wheel motors.

Wheel Motor Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.

2. Raise the seat.

3. Remove the negative battery cable from the battery.

4. Support the unit on jack stands and remove the rear wheel.

5. Apply the parking brake. Remove the cotter pin from the wheel motor shaft (Fig. 298).

Fig 298 PICT-3350

6. Remove the castle nut securing the wheel hub to the wheel motor (Fig. 299).

Fig 299 PICT-3351

7. Using a Wheel Hub Puller (Toro p/n: TOR4097), remove the wheel hub from the wheel motor shaft (Fig. 300).

Fig 300 PICT-3353

8. Release the parking brake.

9. Remove the 3 bolts, spacers and the retainer from the brake band assembly and remove the brake band (Fig. 301).

Fig 301 PICT-3358

10. Mark or tag the wheel motor hoses and fittings to ensure they are reconnected correctly (Fig. 302).

Fig 302 PICT-3365

11. Disconnect the wheel motor hoses from the wheel motor fittings (Fig. 303).

Note: Cap the hoses and fittings to prevent debris from entering the system.

Fig 303 PICT-3366a

12. Remove the wheel motor fittings from the wheel motor (Fig. 304).

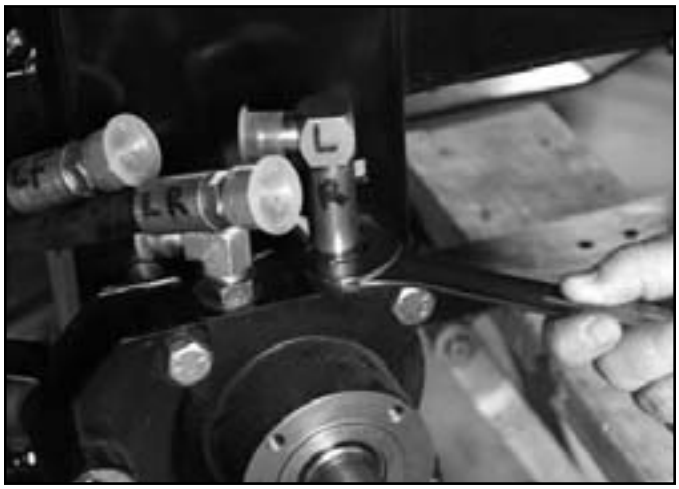

Fig 304 PICT-3367

13. Loosen all 4 wheel motor mounting bolts (Fig. 305).

Fig 305 PICT-3370

14. Remove the front 2 wheel motor mounting bolts, spacers and nuts (Fig. 306).

Fig 306 PICT-3376

15. Swing the brake linkage forward away from the wheel motor (Fig. 307).

Fig 307 PICT-3374

16. Remove the 2 rear wheel motor mounting bolts, spacers and nuts (Fig. 308).

Fig 308 PICT-3377

17. Remove the wheel motor (Fig. 309).

Fig 309 PICT-3378

18. For wheel motor service, refer to Parker/Ross Wheel Motor Service Manual (form no. 492-4753).

Wheel Motor Installation

Note: As a reminder, prior to connecting the hydraulic lines, the o-rings should be replaced with new ones and lightly lubricated with petroleum jelly.

Note: There are two different spacers used on the wheel motors (Fig. 310). The short spacers are used in the front of the wheel motor (with the brake linkage) and the long spacers are used to retain the back of the wheel motor.

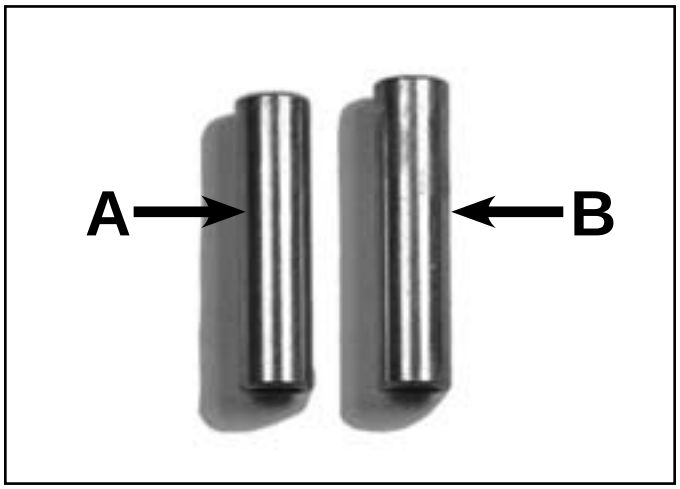

Fig 310 CLR DSC-2117

A. Short spacer B. Long spacer

1. Insert the wheel motor into the frame. Loosely install the 2 rear wheel motor mounting bolts, long spacers and nuts (Fig. 311).

Fig 311 PICT-3377

2. Swing the brake linkage into position (Fig. 312).

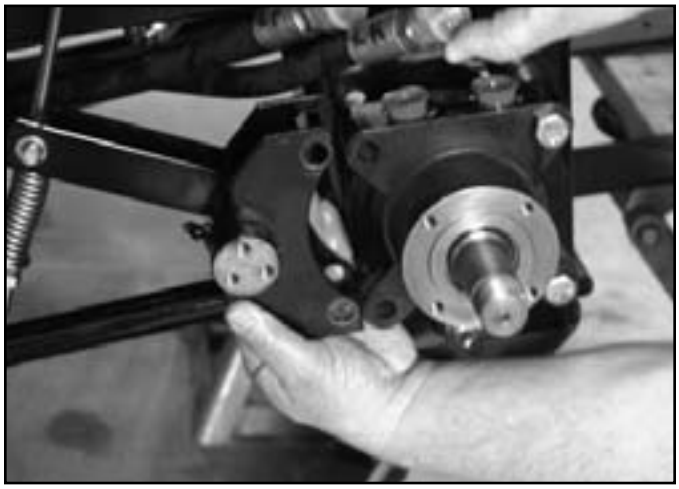

Fig 312 PICT-3374

3. Loosely install the 2 front wheel motor mounting bolts, short spacers and nuts (Fig. 313).

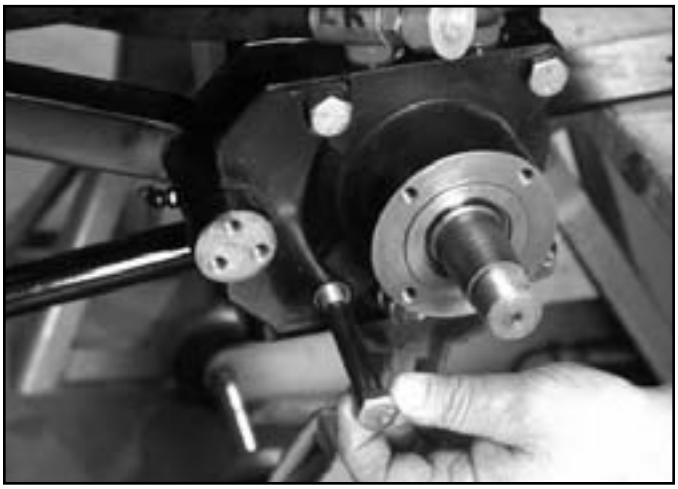

Fig 313 PICT-3376

4. Torque the 4 wheel motor mounting bolts to 100 ± 8 ft-lbs. (136 ± 11 Nm) (Fig. 314).

Fig 314 PICT-3382

5. Install the wheel motor fittings. Note the location markings (Fig. 315).

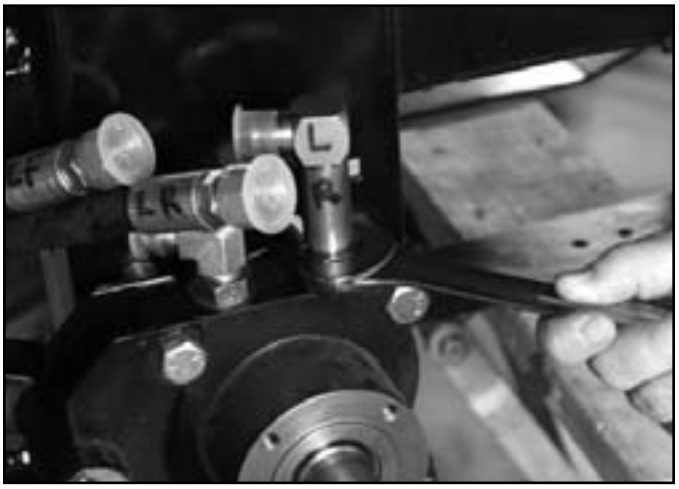

Fig 315 PICT-3367

6. Install the wheel motor hoses onto the wheel motor fittings. Note the location markings (Fig. 316).

Fig 316 PICT-3366a

7. Slide the brake band assembly over the wheel motor hub. Install the 3 spacers, the retainer and 3 brake band bolts into brake bracket (Fig. 317).

Fig 317 PICT-3358

8. Make sure the parking brake is released.

9. Make sure the woodruff key is in place in the motor shaft. Clean the shaft and wheel hub bore with solvent to remove any trace of grease or oil. Slide the wheel hub onto the wheel motor shaft and into the brake band (Fig. 318).

Fig 318 PICT-3384

10. Apply the parking brake.

11. Install a castle nut onto the wheel motor shaft. Torque the castle nut to 125 ft-lbs (170 Nm) (Fig. 319).

Fig 319 PICT-3385

12. Check the distance from bottom of the slot in the nut to the inside edge of the hole. Two threads or less should be showing (Fig. 320).

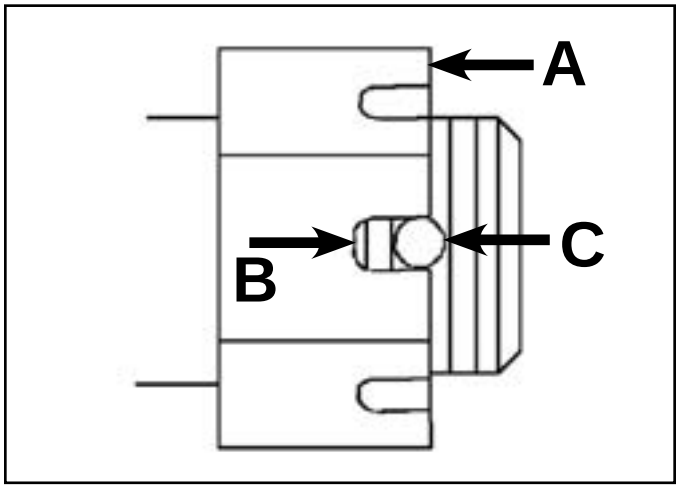

Fig 320 fig. 48 G001051 b

A. Slotted nut
B. Two threads or less showing
C. Hole in threaded shaft

Note: If more than two threads are showing remove nut and install washer between hub and nut and then:

a. Torque the slotted nut to 125 ft-lbs. (170 Nm) (Fig. 321).

b. If necessary, tighten the nut until the next set of slots line up with the hole in the shaft (Fig. 321).

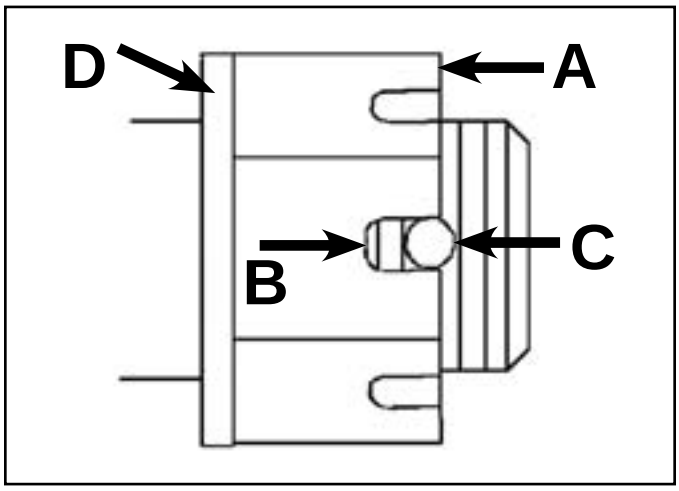

Fig 321 fig. 48 G001051 a

A. Slotted nut
B. Two threads or less showing
C. Hole in threaded shaft
D. Washer (if needed)

4

13. Install a cotter pin into the wheel motor shaft (Fig. 322).

Fig 322 PICT-3350

14. Install the rear wheel.

15. Install the negative battery cable.

16. Lower the seat.

Purging the Hydraulic System

The hydraulic system is normally self-bleeding however; it may be necessary to bleed the system if fluid is changed, or after work is performed on the system.

1. Raise rear of the machine so the wheels are off the ground and support it with jack stands (Fig. 323).

Fig 323 PICT-3464

2. Start the engine and run it at low idle speed. Engage the motion control lever on one side and spin the wheel by hand (Fig. 324).

Fig 324 PICT-3465a

3. When the wheel begins to spin on its own, keep it engaged until the wheel drives smoothly (minimum 2 minutes).

4. Check the hydraulic fluid level in the reservoir and add as required to maintain proper level.

5. Repeat this procedure on the opposite wheel.

Adjusting the Control Handle Neutral Position

If the motion control levers do not align or do not move easily into the console notch, adjustment is required. Adjust each lever, spring and rod separately.

1. Disengage the PTO, move the motion control levers to the neutral locked position and set the parking brake.

2. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.

3. Raise the seat (Fig. 325).

Fig 325 PICT-3469

4. Begin with either the left or right motion control lever.

5. Move the lever to the neutral position but not locked (Fig. 326).

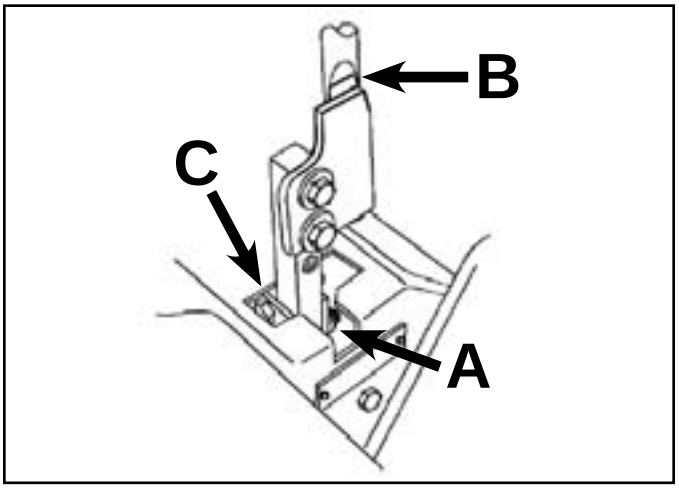

Fig 326 fig. 62 G001046

A. Neutral locked position
B. Control lever
C. Neutral position

6. Pull the lever back until the clevis pin (on arm below pivot shaft) contacts the end of the slot (just beginning to put pressure on the spring) (Fig. 326).

7. Check where the control lever is relative to the notch in console (Fig. 326). It should be centered with the neutral lock notch, to allow lever to pivot outward to the neutral lock position.

8. If adjustment is needed, loosen the nut and jam nut against the yoke (Fig. 327).

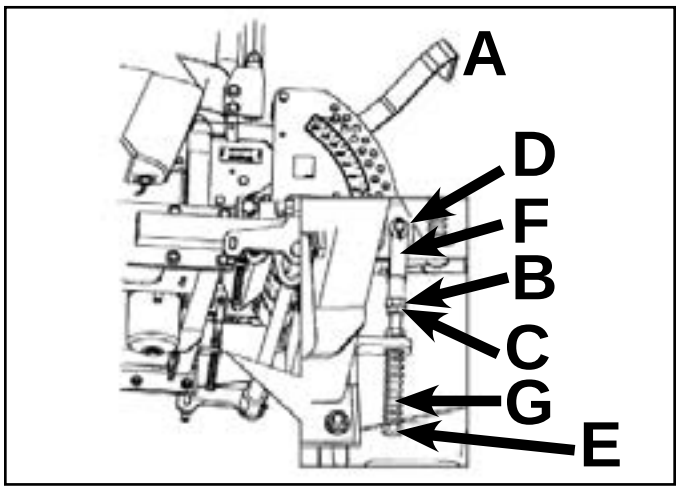

Fig 327 fig. 63 G001155

A. Height-of-cut lever
B. Nut against yoke
C. Jam nut
D. Clevis pin in slot
E. Adjustment bolt
F. Yoke
G. Spring

9. Apply slight rearward pressure on the motion control lever, turn the head of the adjustment bolt in the appropriate direction until the control lever is centered in the neutral lock position (Fig. 327).

Note: Keeping rearward pressure on the lever will keep the pin at the end of the slot and allow the adjustment bolt to move the lever to the appropriate position.

10. Tighten the nut and jam nut (Fig. 327).

11. Repeat procedure for the opposite control handle.

Setting the Hydrostatic Pump Neutral

1. Raise the machine and support with jack stands so that the rear tires are off the ground (Fig. 328).

Fig 328 PICT-3464

2. Raise the seat (Fig. 329).

Fig 329 PICT-3469

3. Remove the bolt and nut securing the seat rod to the seat. Rotate the seat rod up and out of the way of the hydrostatic pump (Fig. 330).

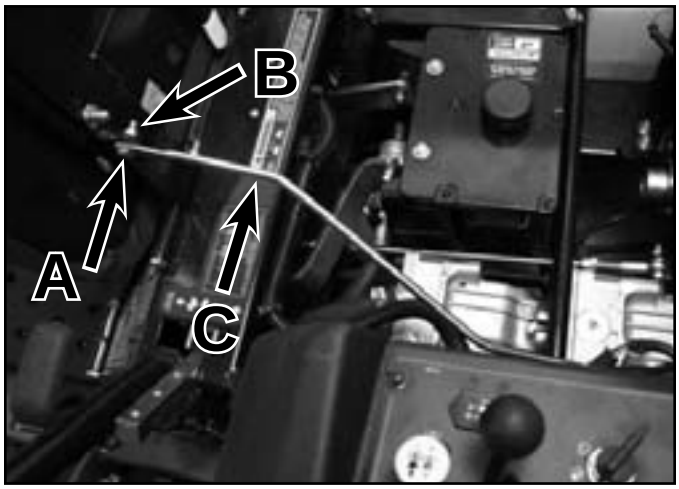

Fig 330 PICT-5324

A. Bolt
B. Nut
C. Seat rod

4. Disconnect the wire harness terminals from the seat switch. Install a jumper wire into the harness terminals (Fig. 331).

Fig 331 PICT-3474a

Setting the Right Hydraulic Pump Neutral Position

5. Place the motion control levers in the neutral position.

6. Start the engine, open the throttle 1/2 way and release parking brake.

7. Adjust the pump rod length by rotating the knob, in the appropriate direction, until the right wheel is still or slightly creeping in reverse (Fig. 332).

Fig 332 PICT-3477a

8. Move the motion control lever forward and reverse, then back to neutral. The wheel must stop turning; it is acceptable to have a slight creep in reverse.

9. Open the throttle to Fast. Make sure the wheel remains stopped or slightly creeps in reverse; adjust if necessary.

Setting the Left Hydraulic Pump Neutral Position

10. Place the motion control levers in the neutral position.

11. Loosen the jam nuts at the ball joints on the pump control rod (Fig. 333).

Fig 333 PICT-3486a

12. Start the engine, open the throttle 1/2 way and release the parking brake.

13. Adjust the pump rod length by rotating double nuts on rod, in the appropriate direction, until wheel is still or slightly creeps in reverse (Fig. 334).

Note: The front nut on the pump rod has left-hand threads.

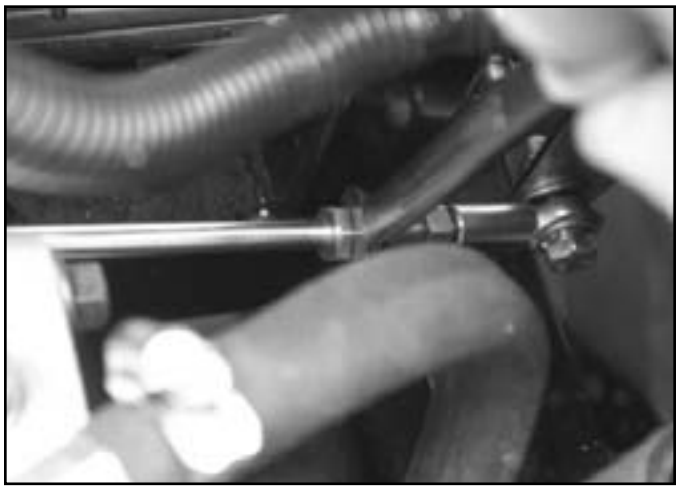

Fig 334 PICT-3489a

14. Move the motion control lever forward and reverse, then back to neutral. The wheel must stop turning; it is acceptable to have a slight creep in reverse.

15. Open the throttle to Fast. Make sure the wheel remains stopped or slightly creeps in reverse; adjust if necessary.

16. Tighten the jam nuts at the ball joints (Fig. 335).

Fig 335 PICT-3486a

17. After both pump neutrals are set, shut off the machine.

18. Remove the jumper wire from the wire harness terminals and plug the terminals into the seat switch (Fig. 336).

Fig 336 PICT-3491a

19. Install the seat rod and lower the seat into position.

20. Lower the machine.

Adjusting the Tracking

The machine has a knob located under the seat to adjust the tracking.

Important: Adjust the handle neutral and hydraulic pump neutral before adjusting the tracking. Refer to “Adjusting the Control Handle Neutral Position” on page 4-25 and “Setting the Hydrostatic Pump Neutral” on page 4-27.

1. Start the engine.
2. Push both control levers forward the same distance.
3. Check if the machine pulls to one side. If it does, stop the machine and set the parking brake.
4. Unlatch the seat and tilt the seat forward to access the tracking knob.

Note: Determine the left and right sides of the machine from the normal operating position.

5. To make the machine go right, turn the knob towards the right side of the machine (Fig. 337).

Fig 337 PICT-3475a

6. To make the machine go left, turn the knob towards the left side of the machine (Fig. 338).

Fig 338 PICT-3475a

7. Repeat adjustment until the tracking is correct.

Hydraulic Flow Testing

The following procedure was performed on the right hand wheel motor hoses. It can be performed on either the right or left side of the machine.

Note: Cleanliness is a key factor in successful flow testing of the hydraulic system. Thoroughly clean all exposed surfaces prior to any type of maintenance. Cleaning all parts with a solvent wash and air drying is usually adequate. As with any precision equipment, all parts must be kept free of foreign material and chemicals. Protect all exposed sealing areas and open cavities from damage and foreign material.

Hydraulic Flow Testing Procedure

1. Lift the back of the unit so the side being tested is off the ground. Place jack stands under the rear frame to support the unit. Remove the rear tire (Fig. 339).

Note: Be careful not to place jack stands near any moving parts or areas not capable of supporting the weight of the machine.

Fig 339 PICT-3494

2. Clean any dirt or debris away from the hydraulic line fittings. Mark each of the hoses and fittings so they will be properly re-installed after testing. Remove the hydraulic lines.

Note: Cap the fittings to prevent dirt from entering the hydraulic system (Fig. 340).

Fig 340 PICT-3496

3. Connect the hydraulic hose fittings to the hydraulic flow tester (Fig. 341).

Note: The flow tester shown is bidirectional so it does not matter which order the hoses are connected to the flow tester. If using a directional flow tester, be sure to correctly connect hoses.

Fig 341 PICT-3507

4. Check the hydraulic reservoir. Fill as needed with Mobil 1, 15w-50 oil.

5. Unplug the wire harness clutch wire from the electric PTO clutch to prevent accidental engagement of the mower deck (Fig. 342).

Fig 342 PICT-3513

6. Lift the seat and unplug the harness terminals from the seat switch. Temporarily install a jumper wire across the harness terminals (Fig. 343).

Fig 343 PICT-3471

7. Verify the restrictor valve on the hydraulic flow tester is in the fully “Opened” position (Fig. 344).

Fig 344 PICT-3497

8. Start the machine. Run it for approximately 5 minutes to warm the oil in the hydrostatic system.

9. Release the parking brake and bring both levers to the inside neutral position. Set the engine throttle to full RPM.

10. Stroke the left hand hydrostatic lever fully forward. Very slowly, rotate the “T” handle of the adjustable flow tester restrictor valve until the pressure gauge reaches 500 PSI (3447 kPa). The measured flow should be 13 to 15 gpm (49 to 56.8 lpm) (Fig. 345).

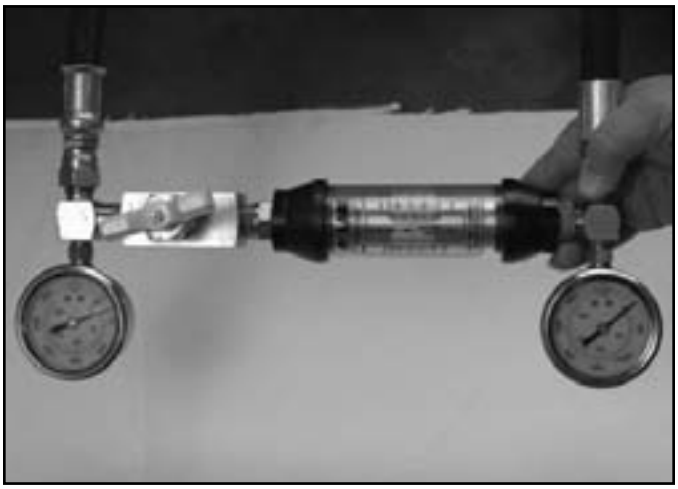

Fig 345 PICT-3509a

11. With the unit at full engine throttle speed, slowly rotate the “T” handle of the flow tester restrictor valve clockwise until the pressure gauge reads approximately 1000 to 1200 psi (6895 to 8274 kPa) (Fig. 346).

Caution: DO NOT operate the machine for an extended period of time at the 1200 psi (8274 kPa) rate.

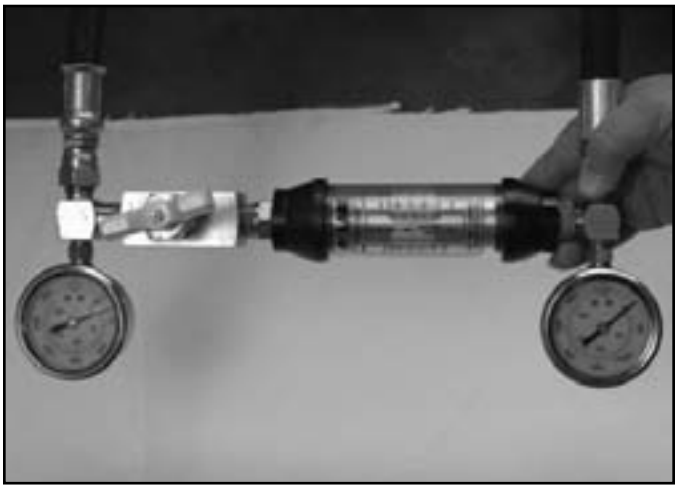

Fig 346 PICT-3509a

12. Record the difference or “flow droop” of the pump. For the Hydro-Gear PR Series pump, maximum allowable “flow droop” is 2.5 gpm (9.46lpm). Any droop greater than 2.5 gpm (9.46lpm) is considered unacceptable and the pump should be repaired/ replaced barring any other potential causes.

13. Return the motion control lever to the neutral position and return both levers to the neutral locked position. Engage the parking brake. Slow the engine speed to idle and turn the ignition switch to the OFF position.

14. Remove the hydraulic flow tester from the hydraulic lines.

15. Install the hydraulic lines to the wheel motor. Note the previously marked hose and fitting positions.

16. Check the hydraulic reservoir. Fill as necessary to the “Hot” level mark (Fig. 347).

Note: Cold oil level has been lowered by 1/4” (.635cm) from that shown in 2006-2008 Operator Manuals.

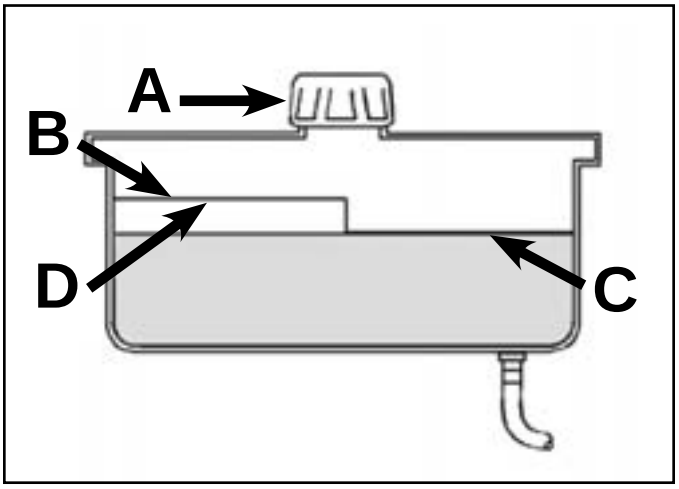

Fig 347 fig. 55 line art

A. Cap
B. Baffle
C. Cold fluid level - full
D. Hot fluid level - full

17. Reinstall the rear tire and lower the unit to the ground.

18. Remove the temporary jumper cable from the wire harness seat switch terminals. Plug the wire harness terminals into the seat switch (Fig. 348).

Fig 348 PICT-3471

19. Plug the wire harness electric clutch wire into the electric PTO clutch (Fig. 349).

Fig 349 PICT-3513

20. Lower the seat.

Traction Pump Drive Belt Replacement

Traction Pump Drive Belt Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Remove the front engine panel (Fig. 350).

Fig 350 IMG_7862

5. Unplug the harness connector from the electric PTO clutch (Fig. 351).

Fig 351 PICT-3513

6. Remove the 2 carriage bolts and nuts securing the clutch stop bracket to the frame (Fig. 352).

Fig 352 PICT-3514

7. Remove the clutch stop bracket (Fig. 353).

Fig 353 PICT-3515

8. Release tension from the gearbox idler arm pulley (Fig. 354).

Fig 354 PICT-3517a

9. With tension released from the gearbox idler, remove the PTO clutch belt from the clutch and gearbox pulleys (Fig. 355).

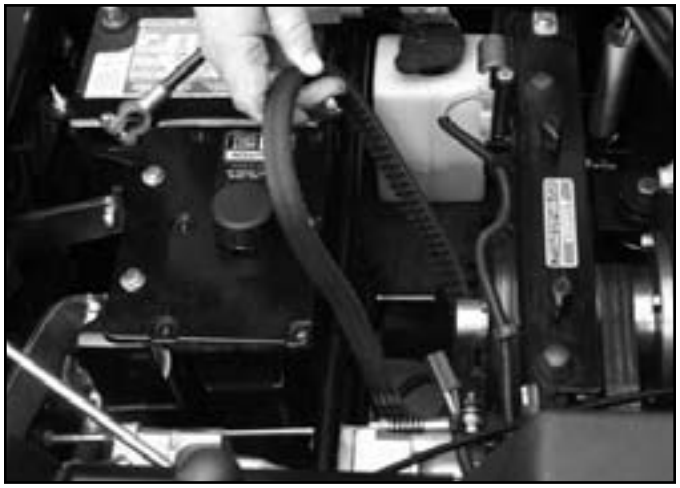

Fig 355 PICT-3519

10. Using a spring removal tool (Toro p/n: 92-5771), remove the pump idler assembly spring (Fig. 356).

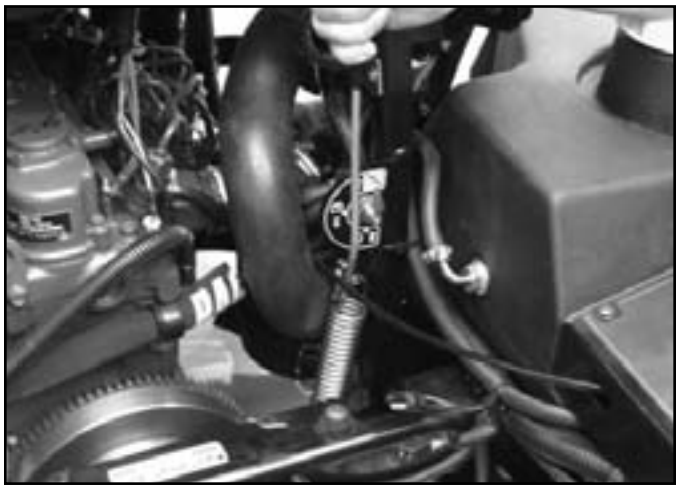

Fig 356 PICT-3522

11. Remove the traction pump drive belt from the pump pulley. Lift up on the gearbox idler pulley and remove the belt by sliding it out around the electric PTO clutch (Fig. 357).

Fig 357 PICT-3523

Traction Pump Drive Belt Installation

1. Slide the traction pump drive belt over the electric PTO clutch (Fig. 358).

Fig 358 PICT-3523

2. While lifting up on the gearbox idler pulley, route the traction pump drive belt around the pump pulley and the engine pulley as shown (Fig. 359):

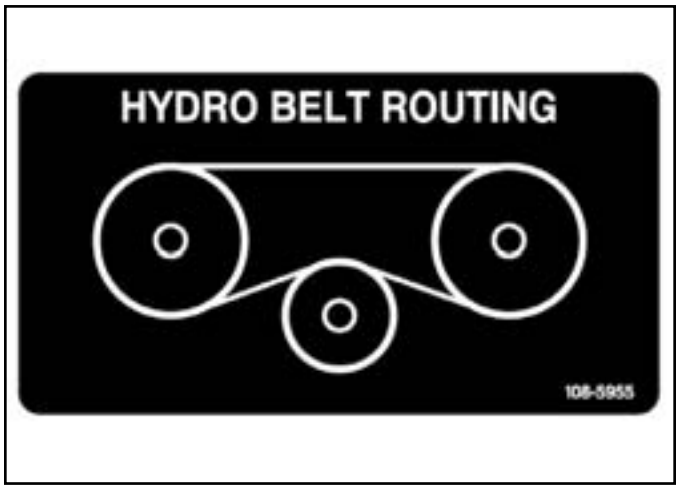

Fig 359 fig. 108-5955

3. Using a spring removal tool (Toro p/n: 92-5771), install the pump idler assembly spring (Fig. 360).

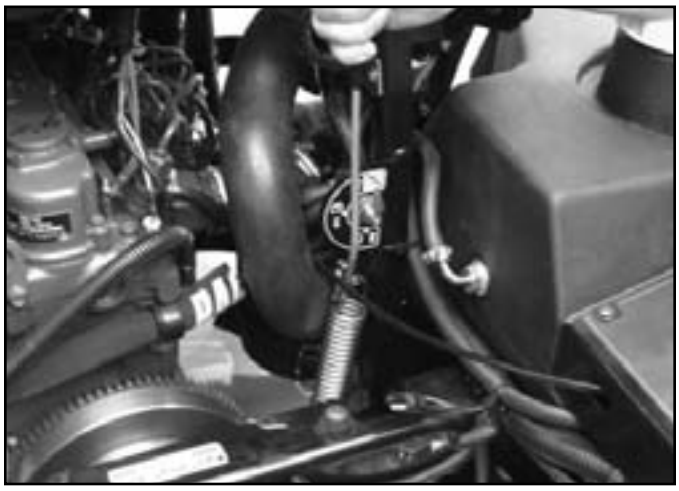

Fig 360 PICT-3522

4. With tension released from the gearbox idler, install the PTO clutch belt around the electric PTO clutch and gearbox pulleys as shown (Fig. 361):

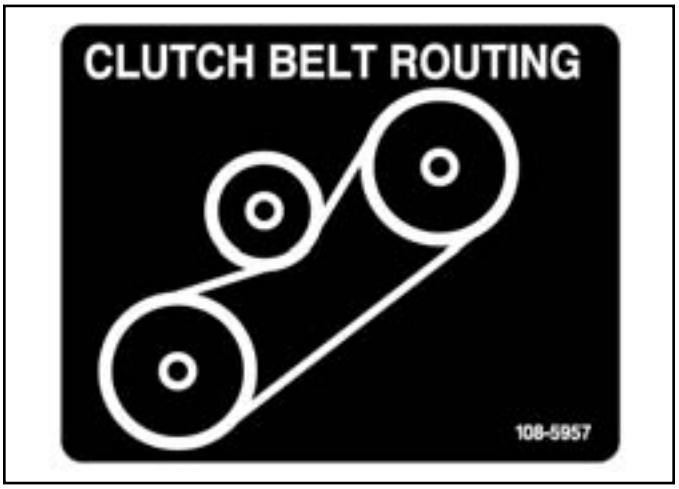

Fig 361 fig. 108-5957

5. Position the clutch stop bracket (Fig. 362).

Fig 362 PICT-3515

6. Install 2 carriage bolts and nuts to secure the clutch stop bracket to the frame (Fig. 363).

Fig 363 PICT-3514

7. Plug the harness connector into the electric PTO clutch (Fig. 364).

Fig 364 PICT-3513

8. Install the front engine panel (Fig. 365).

Fig 365 IMG_7862

9. Install the negative battery cable from the battery.

10. Lower the seat.

Hydraulic Oil Cooler Replacement

Machines built prior to 2008: Under certain conditions higher than desired case drain pressure or hydraulic pressure “spikes” can force oil past the tandem pump trunnion shaft seal. To correct this, there is an oil cooler kit (115-3565). With trunnion shaft seals, a larger capacity oil cooler and increased diameter (from 3/8” to 1/2”) case drain hoses and fittings. Refer to Z Master Zero Radius Tractors Service Bulletin #93 Issued: March 7, 2008.

Hydraulic Oil Cooler Removal

1. Park the machine on a level surface, disengage the PTO, engage the parking brake, turn the ignition off and remove the key.

2. Raise the seat.

3. Remove the negative battery cable from the battery.

4. Raise the hood assembly.

5. Remove the 3 bolts, washers and nuts securing right side top frame brace. Remove the top brace (Fig. 366).

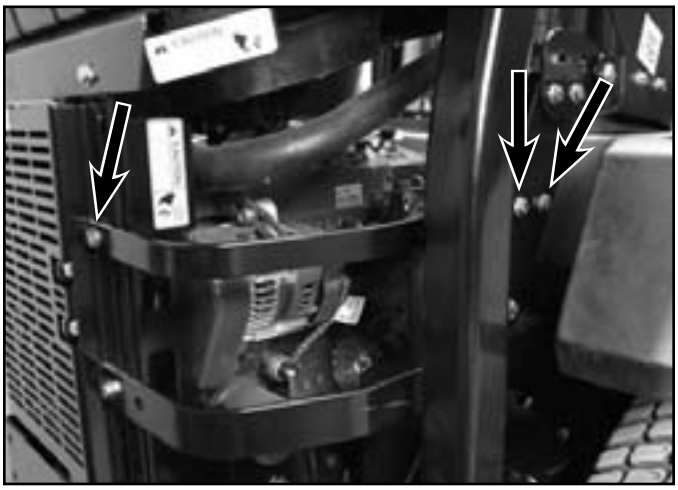

Fig 366 PICT-3421

6. Remove the nut securing the right side guard strap to the frame and radiator support. Remove the right hand fan guard (Fig. 367).

Fig 367 PICT-3432

7. Remove the 2 bolts, washers and nut securing right side guard strap to the frame and radiator support. Remove the guard strap (Fig. 368).

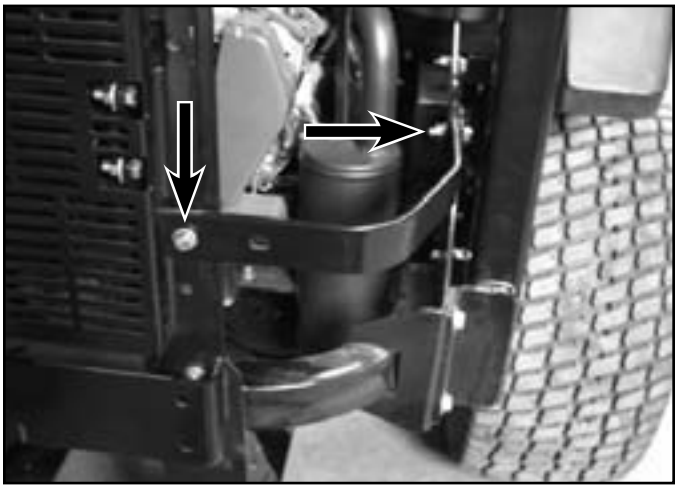

Fig 368 PICT-3462

8. Remove the 2 bolts, washers and nuts securing the left hand top brace and guard strap to the radiator support (Fig. 369).

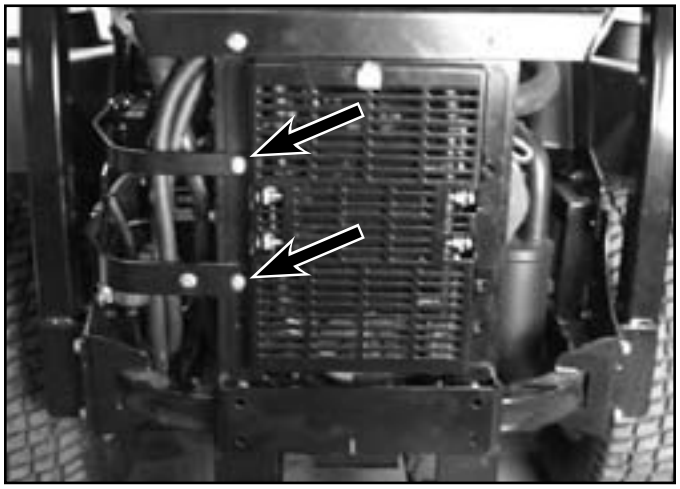

Fig 369 PICT-3437

9. Remove the radiator support (Fig. 370).

Fig 370 PICT-3442

10. Remove the 4 bolts and nuts securing the oil cooler to the frame (Fig. 371).

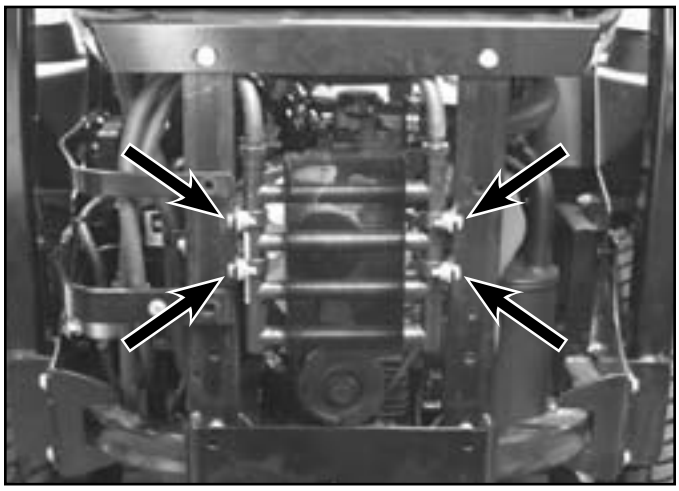

Fig 371 PICT-3447

11. Slide the 2 hose clamps off the oil cooler hoses (Fig. 372).

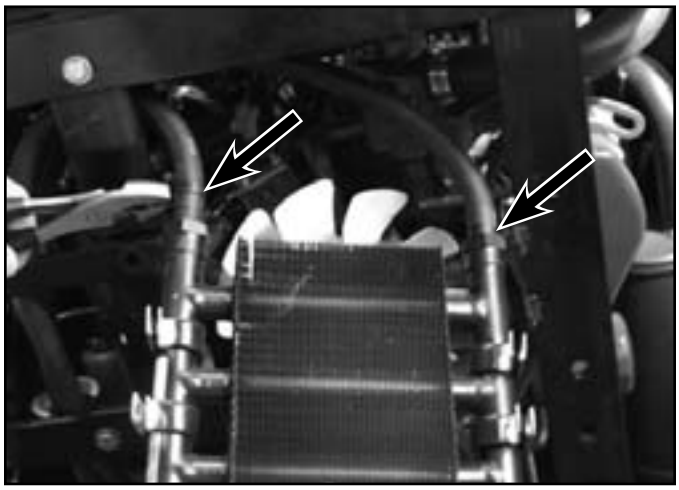

Fig 372 PICT-3452

12. Remove the 2 hoses from the oil cooler (Fig. 373).

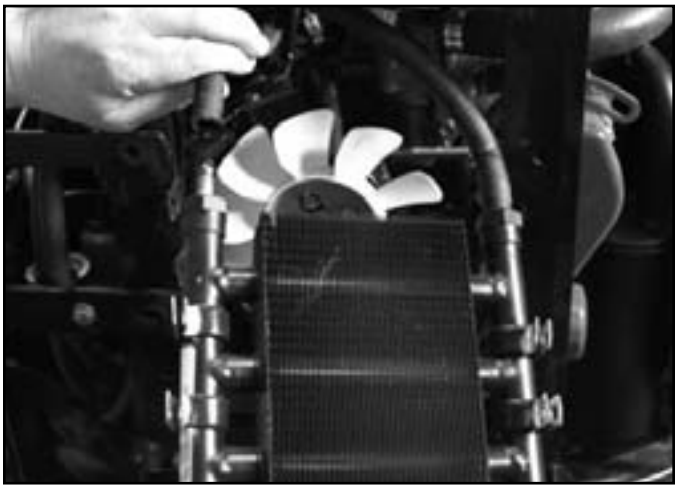

Fig 373 PICT-3454

13. Remove the 4 r-clamps and transfer them to the new oil cooler (Fig. 374).

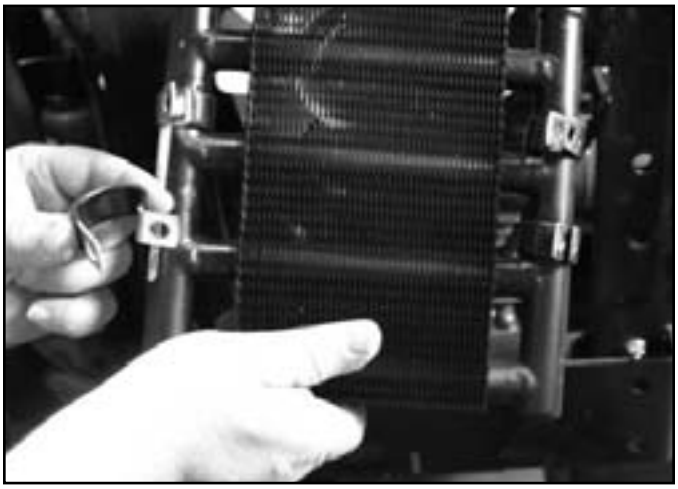

Fig 383 PICT-3458

Hydraulic Oil Cooler Installation

1. Install the 2 hoses onto the oil cooler (Fig. 375).

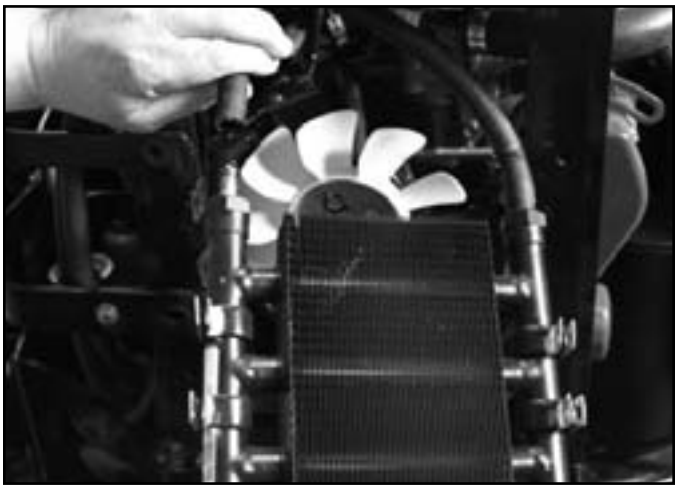

Fig 375 PICT-3454

2. Slide the 2 hose clamps into position (Fig. 376).

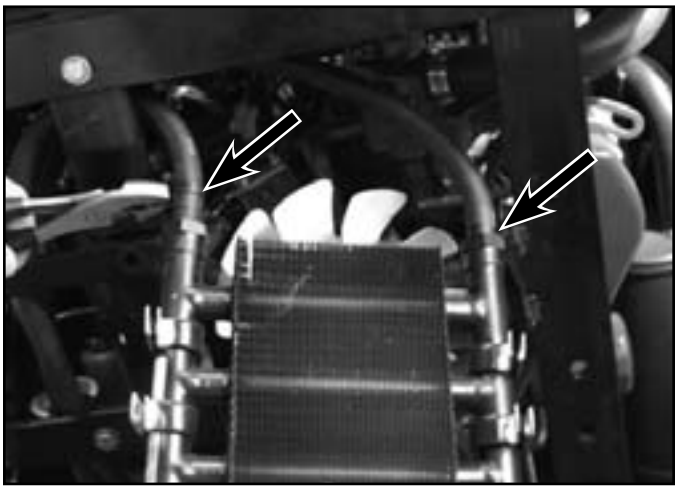

Fig 376 PICT-3452

3. Position the oil cooler and install 4 bolts and nuts securing the oil cooler to the frame (Fig. 377).

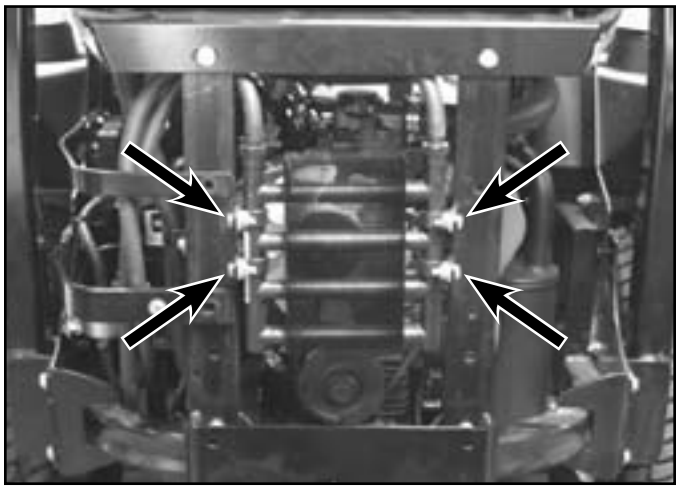

Fig 377 PICT-3447

4. Position the radiator support between the left hand top guard strap and frame (Fig. 378).

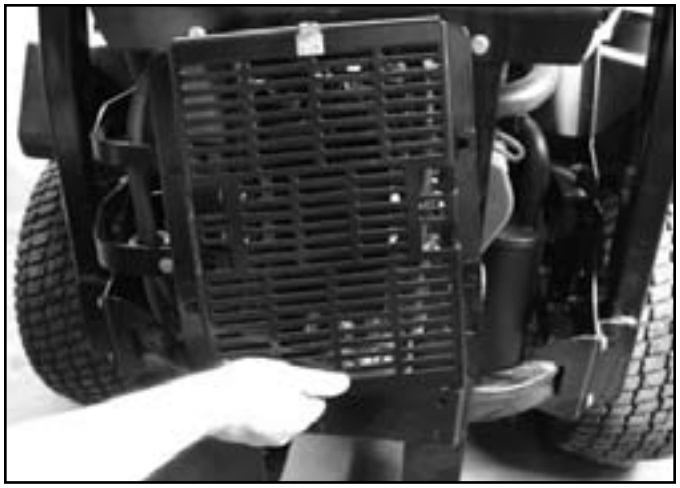

Fig 378 PICT-3442

5. Install 2 bolts, washers and nuts securing the left hand top brace and guard strap to the radiator support and frame (Fig. 379).

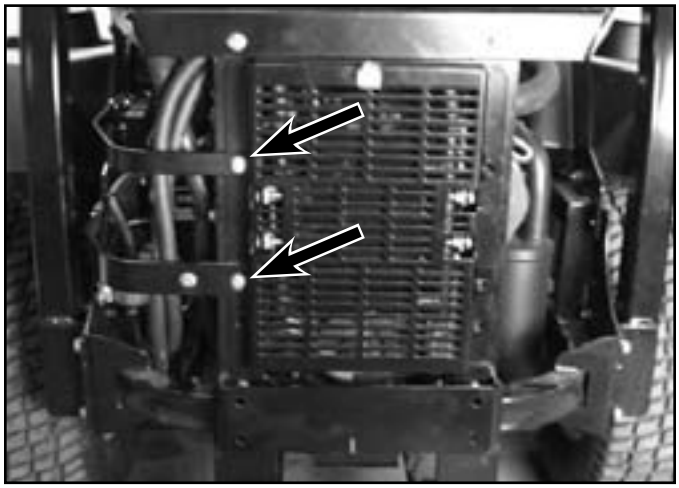

Fig 379 PICT-3437

6. Position the right side guard strap. Install a bolt, washer and nut to secure the end of the guard strap (closest to the operator) to the frame. Position the right hand fan guard. Install a bolt, washer and nut securing the guard strap, fan guard and radiator support to the frame (Fig. 380).

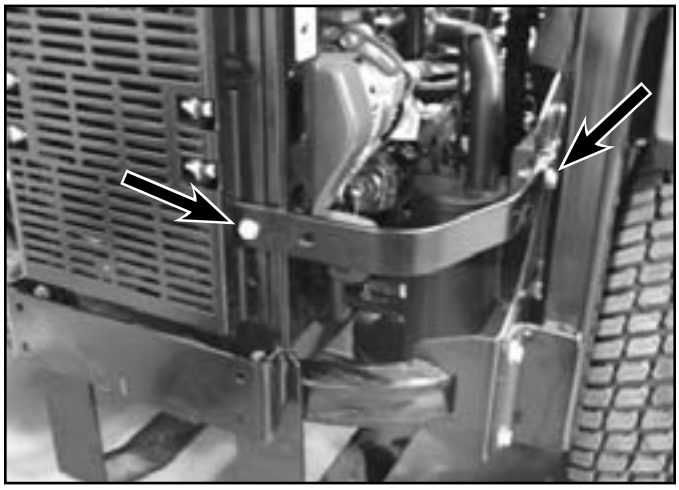

Fig 380 PICT-3424

7. Position the right side top brace. Install 3 bolts, washers and nuts securing the top brace, frame and radiator support (Fig. 381).

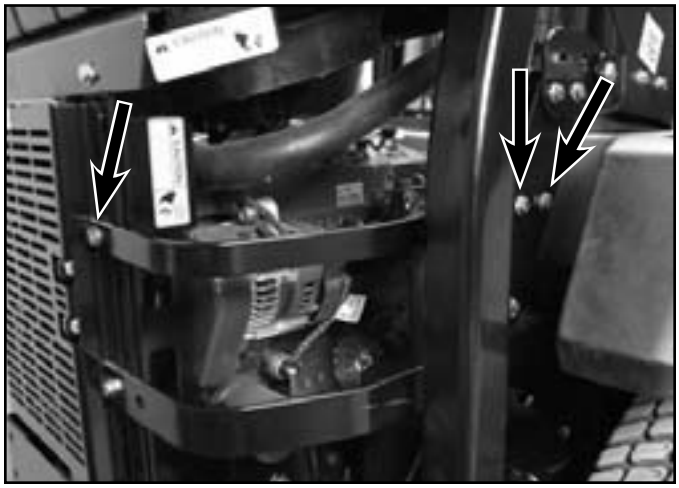

Fig 381 PICT-3421

8. Lower the hood.
9. Install the negative battery cable.
10. Lower the seat.

Hydraulic Reservoir Tank Replacement

Hydraulic Reservoir Tank Removal

1. Park the machine on a level surface, disengage the PTO, engage the parking brake, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Raise the floor pan assembly (Fig. 382).

Fig 382 PICT-3388

5. Remove the left hand mower deck belt cover (Fig. 383).

Fig 383 PICT-3389

6. Unhook the idler spring from the mower deck idler arm and spring post (Fig. 384).

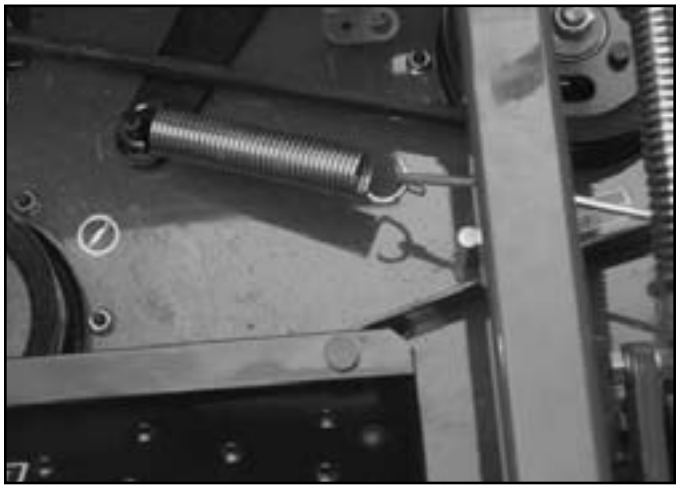

Fig 384 PICT-3391a

7. Remove the mower deck belt from the PTO drive pulley (Fig. 385).

Fig 385 PICT-3393

8. Place a drain pan under the hydraulic reservoir tank.

9. Remove the hydraulic filter hose from the fitting on the bottom of the hydraulic reservoir (Fig. 386).

Fig 386 PICT-3401a

10. Slide the hose clamp down the oil cooler hose, off the tank fitting barb (Fig. 387).

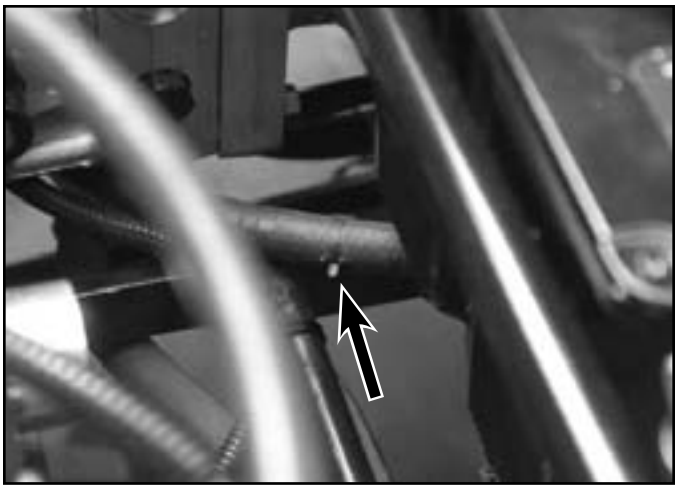

Fig 387 PICT-3396a

11. Remove the oil cooler hose from the tank fitting. Allow the hydraulic fluid to drain into the drain pan (Fig. 388).

Fig 388 PICT-3397a

12. Remove the 2 bolts, washers and nuts securing the reservoir to the hydraulic tank bracket (Fig. 389).

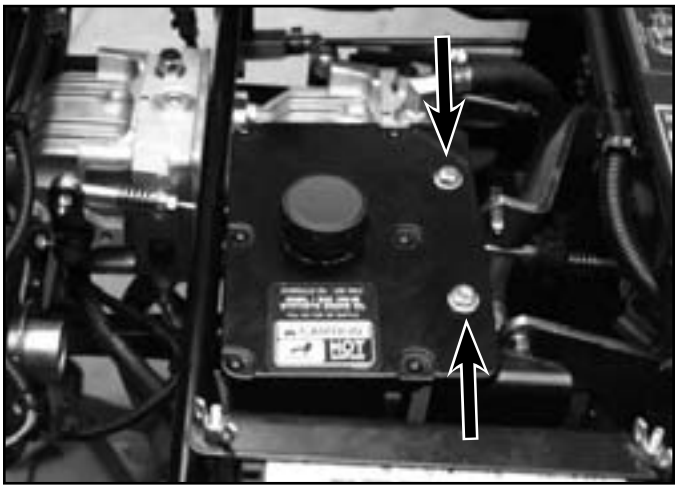

Fig 389 PICT-3409

13. Remove the hydraulic reservoir (Fig. 390).

Fig 390 PICT-3411a

Hydraulic Reservoir Tank Installation

1. Transfer the 2 hydraulic tank fittings to the new hydraulic reservoir tank (Fig. 391).

Fig 391 PICT-3416

2. Position the hydraulic reservoir onto the tank bracket (Fig. 392).

Fig 392 PICT-3411a

3. Install 2 bolts, washers and nuts to secure the reservoir to the hydraulic tank bracket (Fig. 393).

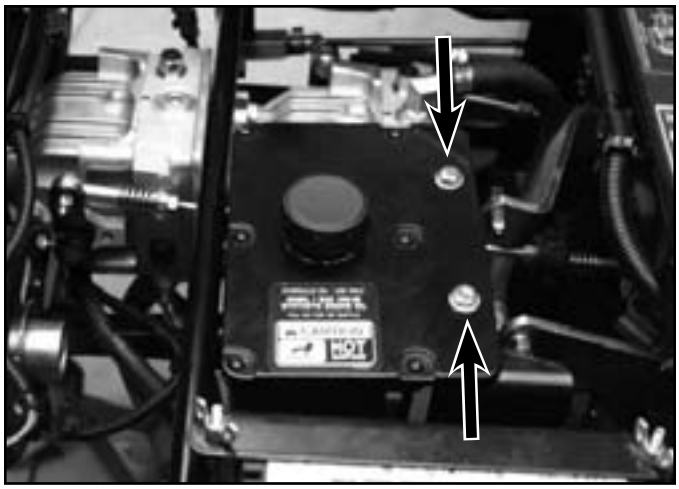

Fig 393 PICT-3409

4. Install the oil cooler hose onto the tank fitting on the bottom of the hydraulic reservoir (Fig. 394).

Fig 394 PICT-3397a

5. Position the hose clamp to secure the oil cooler hose to the tank fitting barb (Fig. 395).

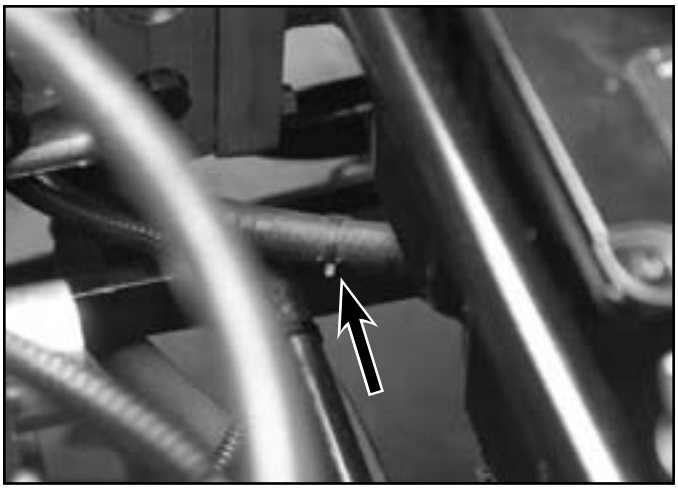

Fig 395 PICT-3396a

6. Install the hydraulic filter hose to the fitting on the bottom of the hydraulic reservoir (Fig. 396).

Fig 396 PICT-3401a

7. Route the mower deck belt around the PTO drive pulley (Fig. 397).

Fig 397 PICT-3393

8. Hook the idler spring from the mower deck idler arm to the spring post (Fig. 398).

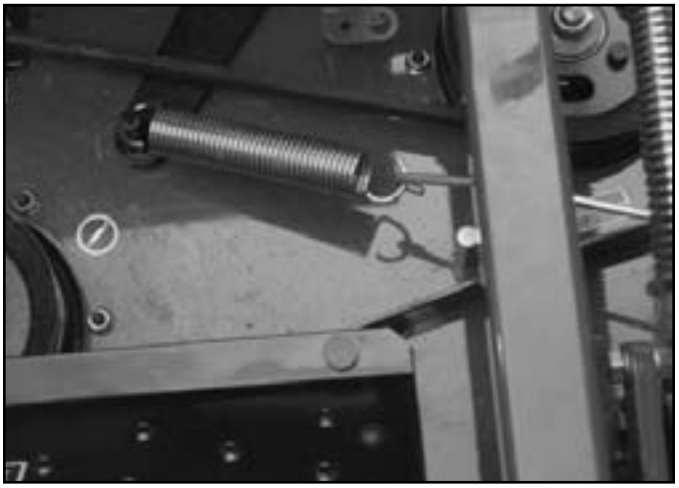

Fig 398 PICT-3391a

9. Install the left hand mower deck belt cover (Fig. 399).

Fig 399 PICT-3389

10. Lower the floor pan assembly (Fig. 400).

Fig 400 PICT-3388

11. Install the negative battery cable.

12. Lower the seat.

13. Fill the reservoir to the cold oil level (Fig. 401).

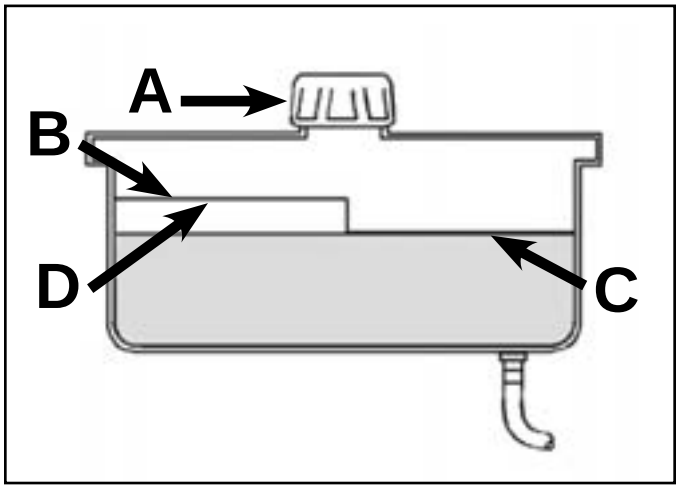

Fig 401 fig 55 line art

A. Cap
B. Baffle
C. Cold fluid level - full
D. Hot fluid level - full

14. Purge the hydraulic system. Refer to “Purging the Hydraulic System” on page 4-24.

Pushing the Machine by Hand

1. Disengage the power take off (PTO) and turn the ignition key to off. Move the levers to neutral locked position and apply parking brake. Remove the key.

2. Raise the seat.

3. Rotate the by-pass valves counterclockwise 1 turn. This allows hydraulic fluid to by-pass the pump enabling the wheels to turn (Fig. 402).

Important: Do not rotate by-pass valves more than 1 turn. This prevents valves from coming out of the body and causing fluid to run out.

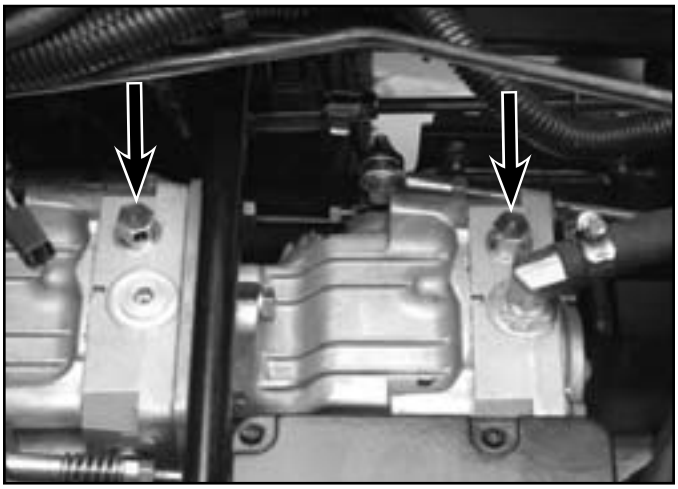

Fig 402 PICT-3524a

4. Lower the seat.

5. Disengage parking brake before pushing.

Switching from Pushing the Machine Back to Machine Operation

1. Engage the parking brake.
2. Raise the seat.
3. Rotate the by-pass valves clockwise 1 turn to operate machine (Fig. 403).

Note: Do not over-tighten the by-pass valves.

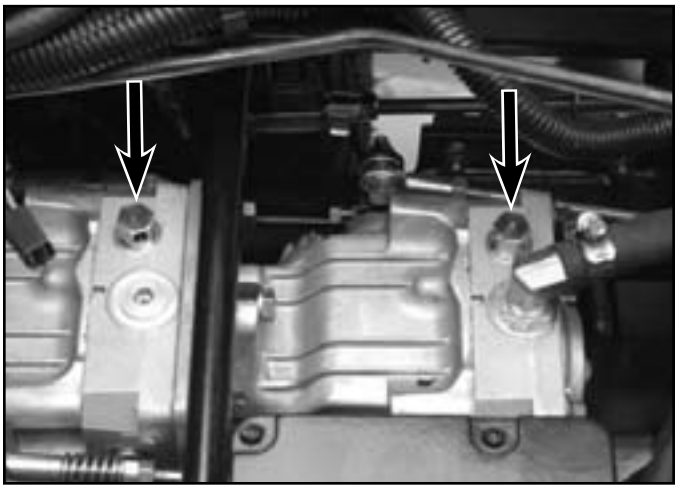

Fig 403 PICT-3524a

4. Lower the seat.

Engine Replacement

Engine Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Remove the front engine panel (Fig. 404).

Fig 404 IMG_7862

5. Remove the Hood Assembly. Refer to “Hood Assembly Removal” on page 3-22.
6. Remove the bolt, washer and nut securing the hose clamp to the left hand guard strap (Fig. 405).

Fig 405 PICT-3527a

7. Remove the bolt, washer and nut securing the hose clamp to the left hand fan guard (Fig. 406).

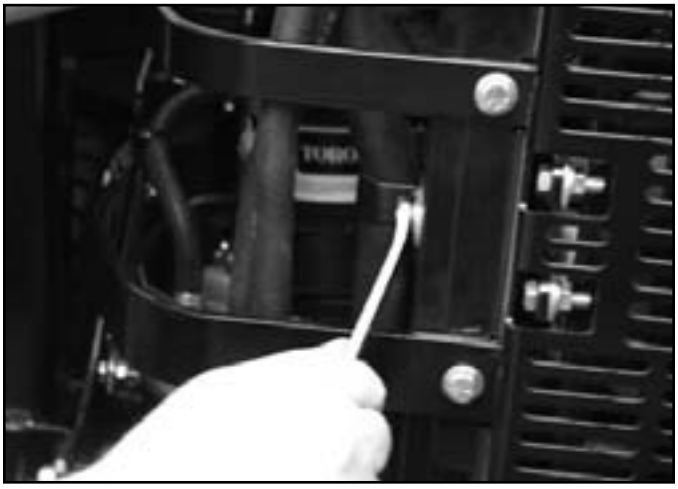

Fig 406 PICT-3528

8. Remove the 3 bolts, washers and nuts securing right side top brace frame and radiator support. Remove the right side top brace (Fig. 407).

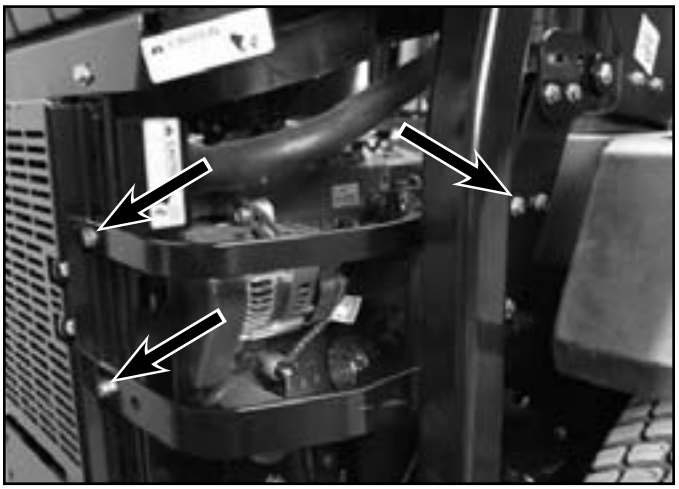

Fig 407 PICT-3421

9. Repeat previous step to remove the left side top brace.

10. Remove the nuts from the bolts securing the right and left guard straps to the frame and radiator support. Remove the right and left fan guards (Fig. 408).

Fig 408 PICT-3432a

11. Remove the 2 bolts, washers and nut securing right side guard strap to the frame and radiator support. Remove the guard strap (Fig. 409).

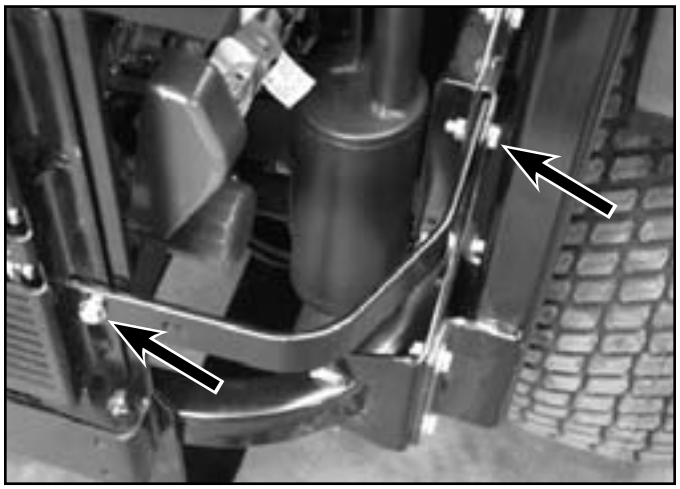

Fig 409 PICT-3775

12. Remove the oil cooler shield (Fig. 410).

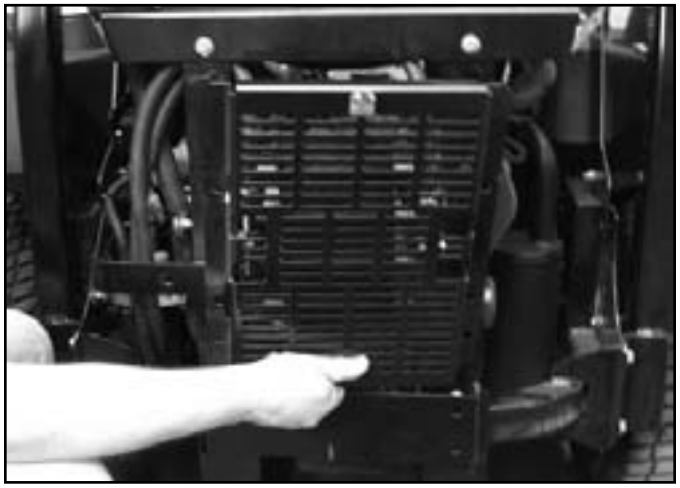

Fig 410 PICT-3531

13. Remove the bolt, washer and nut securing the left hand guard strap to the frame. Remove the left hand guard strap (Fig. 411).

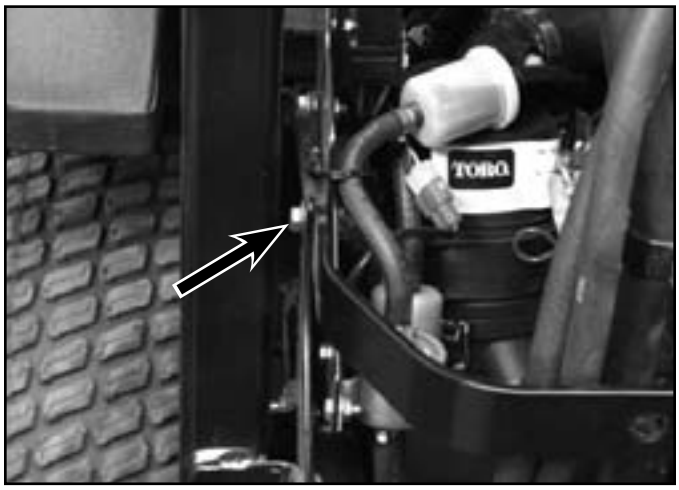

Fig 411 PICT-3533

15. Remove the radiator cap. Place a funnel below the radiator drain plug located on the lower right hand corner of the radiator. Remove the plug (Fig. 412).

Fig 412 PICT-3534

DANGER! Discharge of hot pressurized coolant or touching hot radiator and surrounding parts can cause severe burns.

- **Do not** remove radiator cap or open drain petcock when the engine is hot. Always allow the engine to cool at least 15 minutes or until the radiator cap is cool enough to touch without burning your hand before removing the radiator cap or opening drain petcock.
- **Do not** touch radiator and surrounding parts that are hot.

14. Place a drain pan under the lower right hand corner of the radiator.

16. Allow the coolant to drain from the radiator.

17. Re-install the drain plug.

18. Loosen the hose clamp securing the left hand radiator hose to the lower left hand corner of the radiator (Fig. 413).

Fig 413 PICT-3539a

19. Place a drain pan under the left hand rear corner of the radiator.

20. Remove the left hand radiator hose from the lower left hand corner of the radiator. Drain the coolant into the drain pan (Fig. 414).

Fig 414 PICT-3540

21. Remove the cable tie securing the overflow hose to the radiator cap barb (Fig. 415).

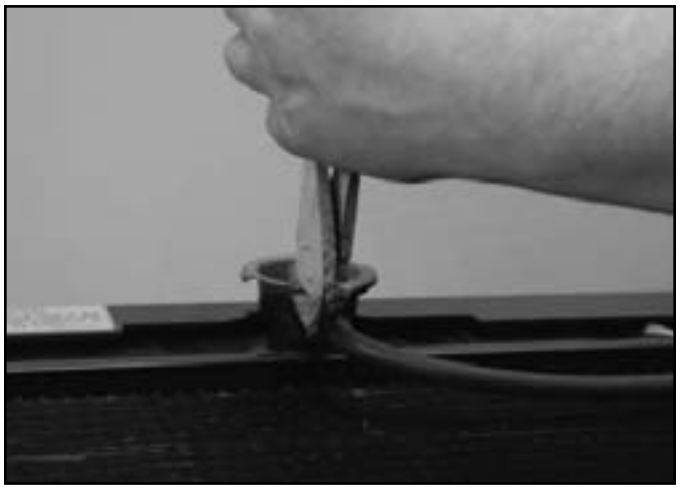

Fig 415 PICT-3542a

22. Slide the overflow hose from the barb on the radiator cap flange (Fig. 416).

Fig 416 PICT-3690

23. Pull the over flow hose out and away from the radiator (Fig. 417).

Fig 417 PICT-3544

24. Disconnect the harness from the fan connector (Fig. 418).

Fig 418 PICT-3547

25. Remove the 2 R-clamps located on the inside of the front panel of the bottom radiator plate assembly (Fig. 419).

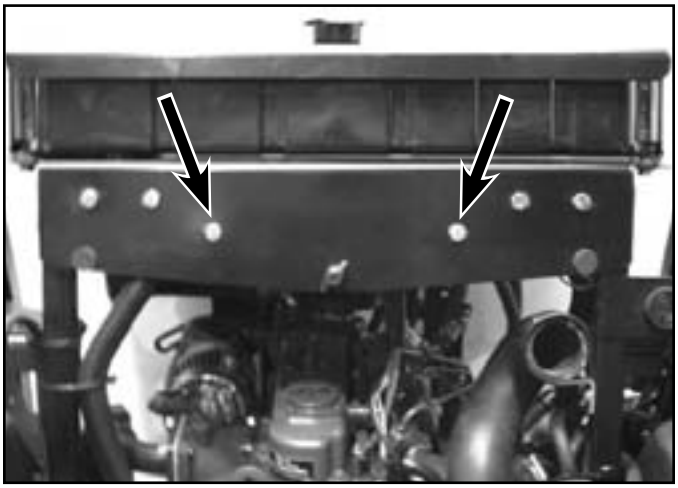

Fig 419 PICT-3549

26. Loosen the hose clamp securing the right hand radiator hose to the water pump (Fig. 420).

Fig 420 PICT-3686

27. Slide the right hand radiator hose off the water pump (Fig. 421).

Fig 421 PICT-3685

28. Remove the 10 bolts, nuts and 2 washers securing the radiator assembly to the frame (Fig. 422).

Note: There are 8 bolts and nuts securing the front end of the radiator and 2 bolts, washers and nuts securing the rear end of the radiator.

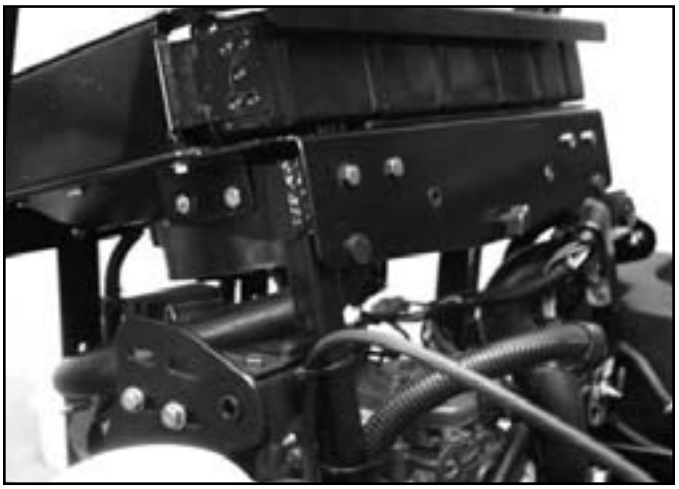

Fig 422 PICT-3553

29. Remove the radiator assembly from the frame (Fig. 423).

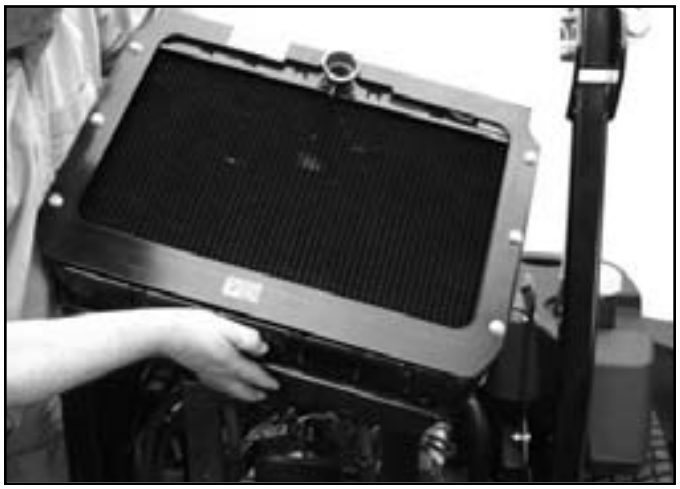

Fig 423 PICT-3554

30. Remove the 2 bolts and flange nuts securing the rear radiator support to the frame (Fig. 424).

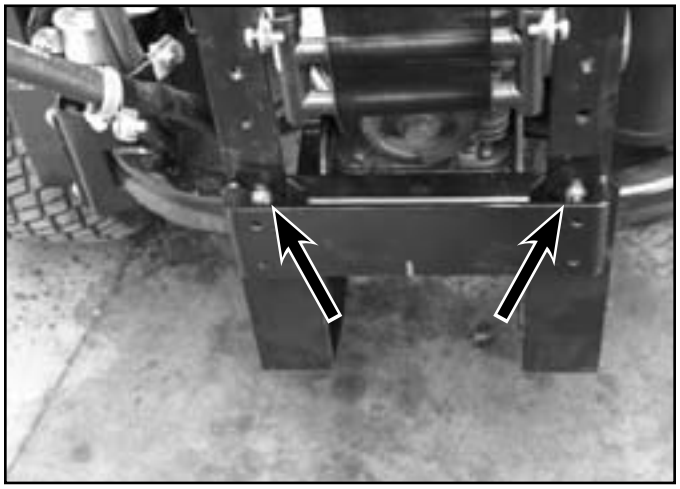

Fig 424 PICT-3562

31. Move the oil cooler assembly away from the engine area of the machine to prevent damage to oil cooler and hoses.

32. Remove the 2 bolts securing the fan and retainer plate to the engine (Fig. 425).

Fig 425 PICT-3563a

33. Remove the fan and retainer plate (Fig. 426).

Fig 426 PICT-3564a

34. Loosen the hose clamp on the lower end of the left hand radiator hose (Fig. 427).

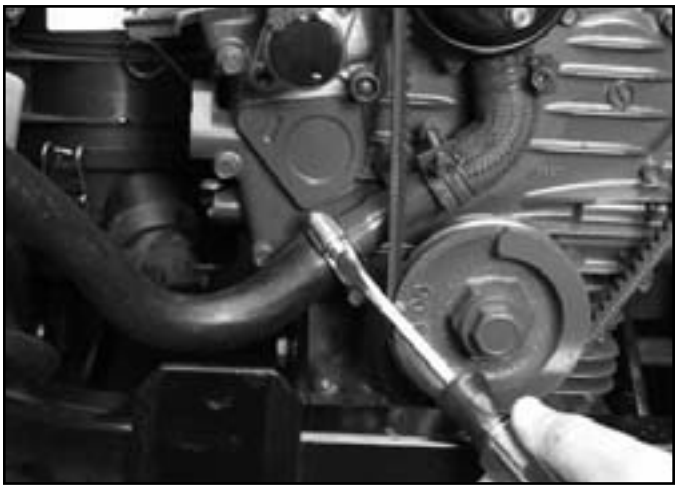

Fig 427 PICT-3565

35. Slide the left hand radiator hose off the flange on the engine (Fig. 428).

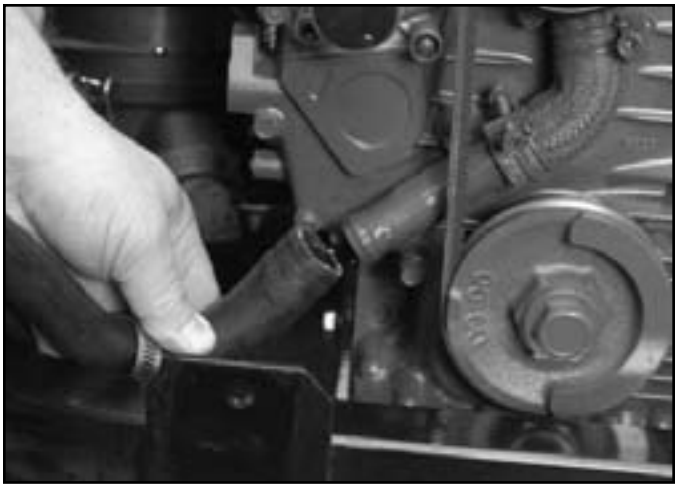

Fig 428 PICT-3566a

36. Remove the nut and bolt securing the wire harness R-clamp to the muffler bracket (Fig. 429).

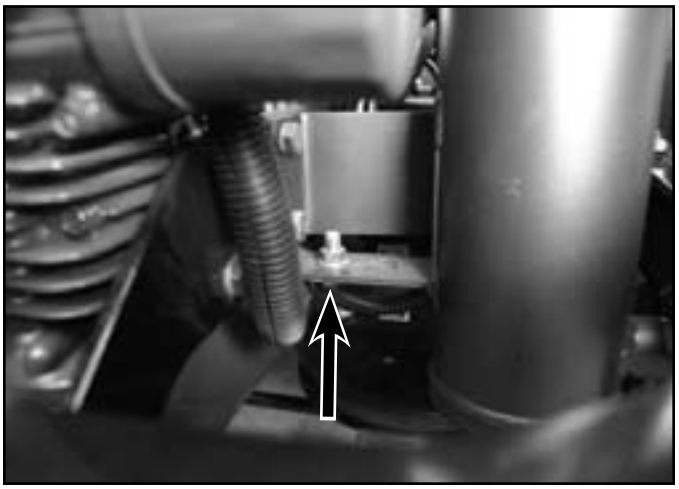

Fig 429 PICT-3567

37. Remove the 2 muffler mounting bolts and lock washers (Fig. 430).

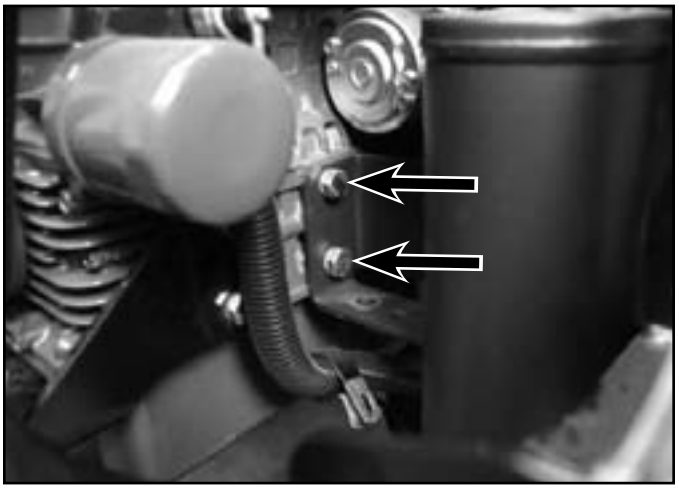

Fig 430 PICT-3570

38. Remove the 4 muffler manifold mounting bolts and lock washers (Fig. 431).

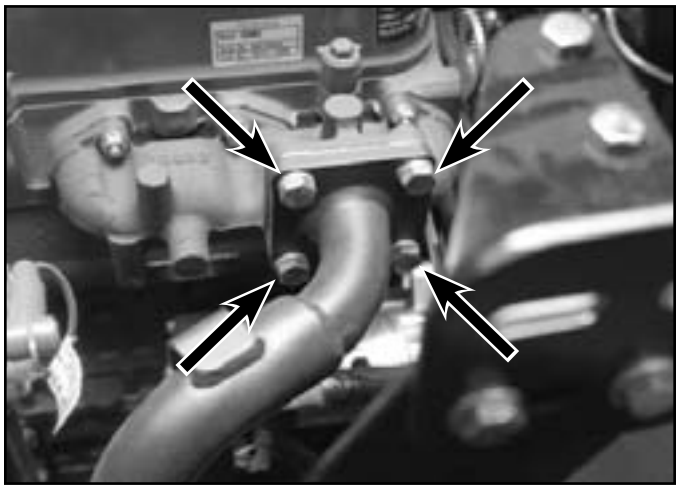

Fig 431 PICT-3573a

39. Remove the muffler and manifold gasket (Fig. 432).

Fig 432 PICT-3574

40. Remove the cable tie securing the harness to the oil switch located under the oil filter (Fig. 433).

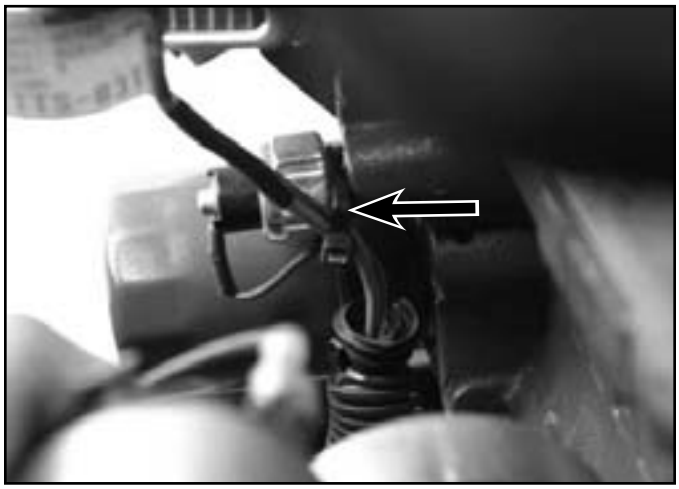

Fig 433 PICT-3578

41. Remove the cable tie securing the harness to the solenoid wires (Fig. 434).

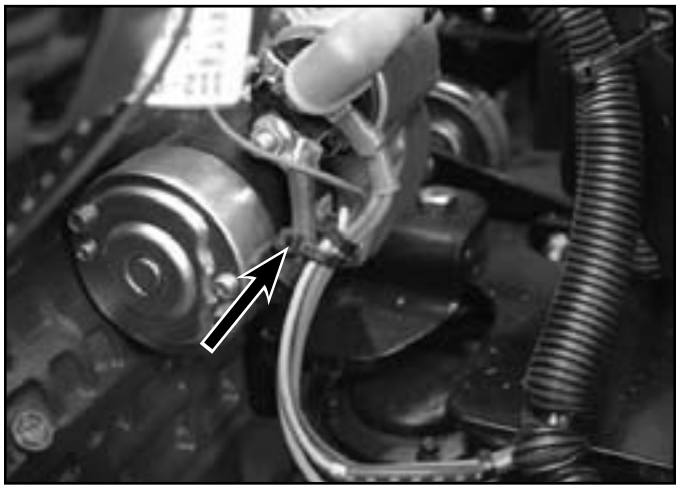

Fig 434 PICT-3576a

42. Remove the screw and lock washer securing the harness terminal to the oil switch (Fig. 435).

Fig 435 PICT-3581

43. Unplug the harness connector from the alternator (Fig. 436).

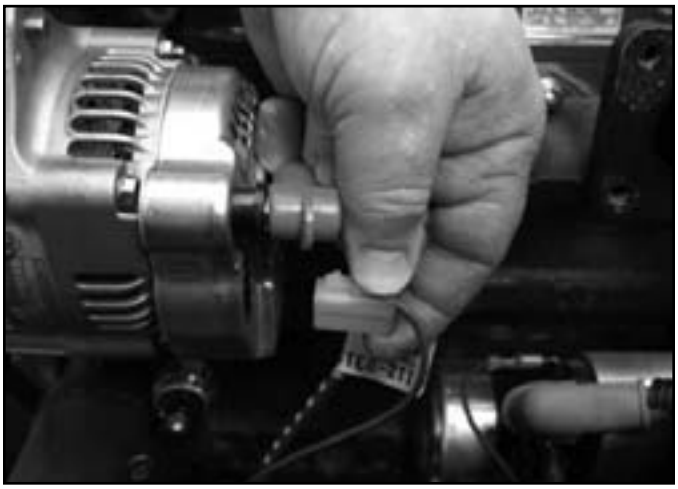

Fig 436 PICT-3585

44. Slide the rubber boot off the alternator connection and remove the nut securing the harness terminal to the alternator. Remove the harness terminal (Fig. 437).

Fig 437 PICT-3587

45. Remove the following connections from the starter solenoid (Fig. 438):

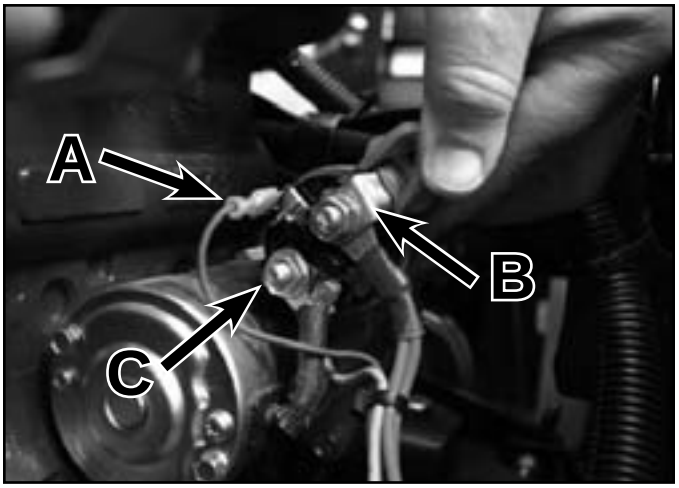

Fig 438 PICT-3589

A. Harness Spade terminal
B. Battery cable
C. Starter and harness terminal

46. Remove the bolts and washers securing 2 R-clamps to the engine block (Fig. 439).

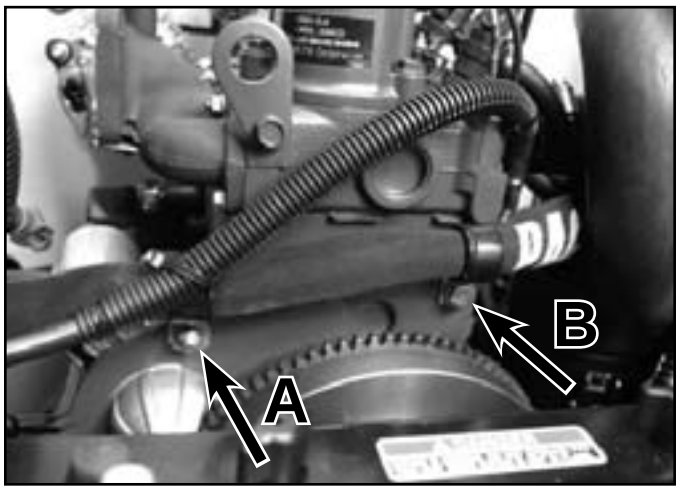

Fig 439 PICT-3590

A. Bolt, nut and washer securing the negative battery cable and fuel lines
B. Bolt and 2 washers securing fuel lines

47. Remove the bolt and washer securing the negative battery cable and ground wire to the engine block (Fig. 440).

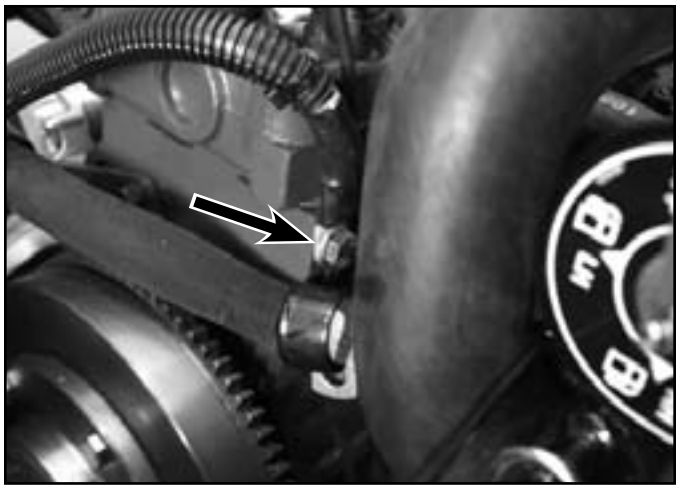

Fig 440 PICT-3593

48. Unplug the harness terminal from the engine thermoswitch (Fig. 441).

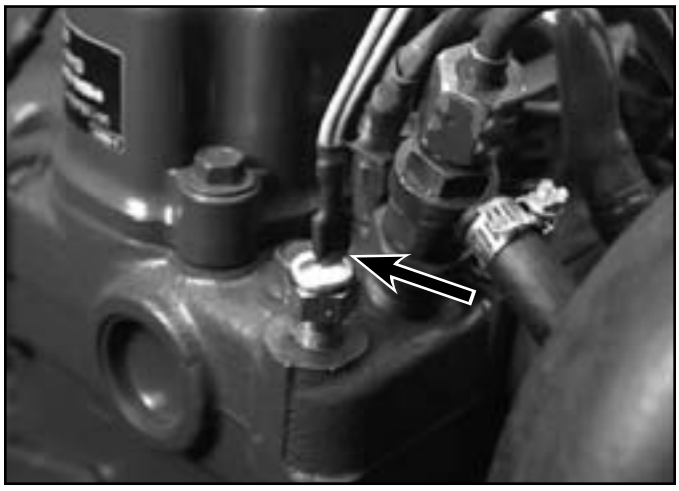

Fig 441 PICT-3595

49. Remove the nut securing the harness terminal to the front glow plug cord terminal (Fig. 442).

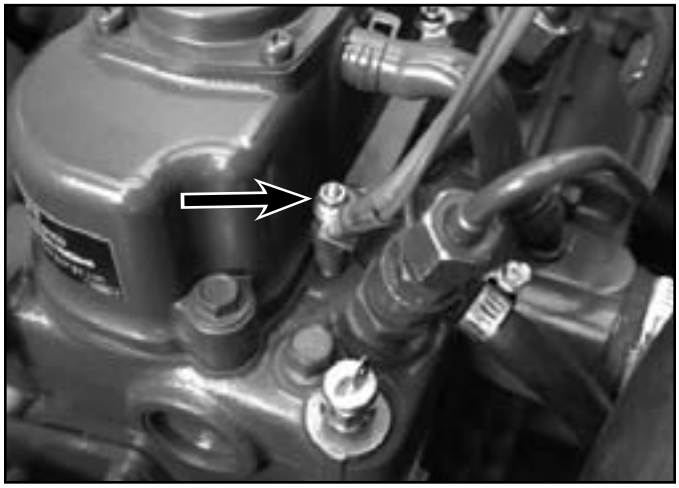

Fig 442 PICT-3596

50. Remove the cable tie securing the harness to the engine stop solenoid wire (Fig. 443).

Fig 443 PICT-3598

51. Unplug the harness from the stop solenoid connector (Fig. 444).

Fig 444 PICT-3599

52. Loosen the swivel clamp and rearmost nut holding the throttle cable into the throttle support bracket (Fig. 445).

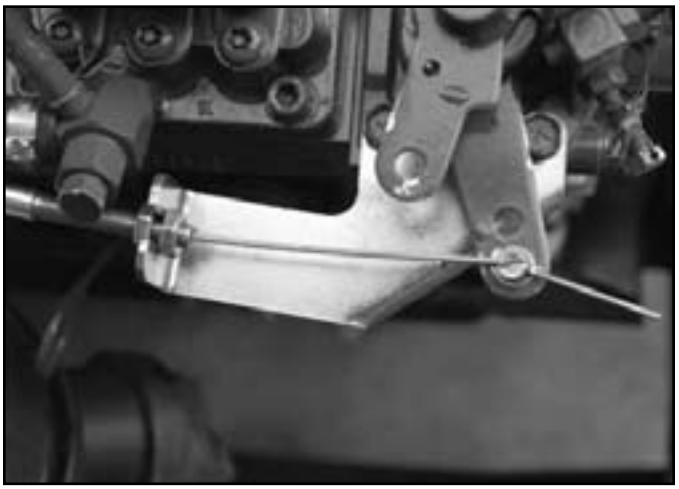

Fig 445 PICT-3601a

53. Remove the throttle cable from the throttle support bracket (Fig. 446).

Fig 446 PICT-3602

54. Remove the 2 hose clamps securing the fuel lines to the fuel injection pump and fuel return (Fig. 447).

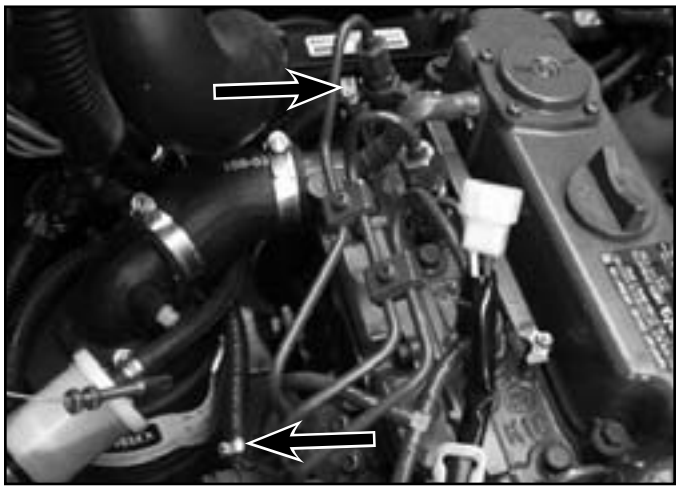

Fig 447 PICT-3606

55. Slide the fuel line off the fuel injection pump (Fig. 448).

Fig 448 PICT-3608a

56. Slide the fuel line off the fuel return (Fig. 449).

Fig 449 PICT-3611

57. Loosen the hose clamp securing the air cleaner hose to the engine (Fig. 450).

Fig 450 PICT-3612

58. Remove the traction pump drive belt. Refer to “Traction Pump Drive Belt Removal” on page 4-35.

Machines with a Warner clutch:

a. Unplug the harness connector from the electric PTO clutch (Fig. 451).

Fig 451 PICT-3933

b. Unhook the spring from the gearbox idler arm assembly (Fig. 452).

Fig 452 PICT-3872

c. Remove the gearbox drive belt from around the electric PTO clutch pulley (Fig. 453).

Fig 453 PICT-3934a

d. Remove the center clutch bolt, 2 cupped washers and clutch retainer securing the electric PTO clutch to the stub shaft (Fig. 454).

Fig 454 PICT-3613

e. Remove the electric PTO clutch from the stub shaft (Fig. 455).

Fig 455 PICT-3615

Machines with an Ogura Clutch:

a. Remove the tie strap holding the electric PTO clutch wire to the frame crossbar (Fig. 456).

Fig 456 PICT-3990

b. Unplug the harness connector from the electric PTO clutch (Fig. 457).

Fig 457 PICT-3979a

c. Remove the carriage bolts, washers and nuts holding the clutch stop to the frame. Remove the clutch-stop (Fig. 458).

Fig 458 PICT-3993

d. Loosen the bolt holding the electric PTO clutch to the stub shaft (Fig. 459).

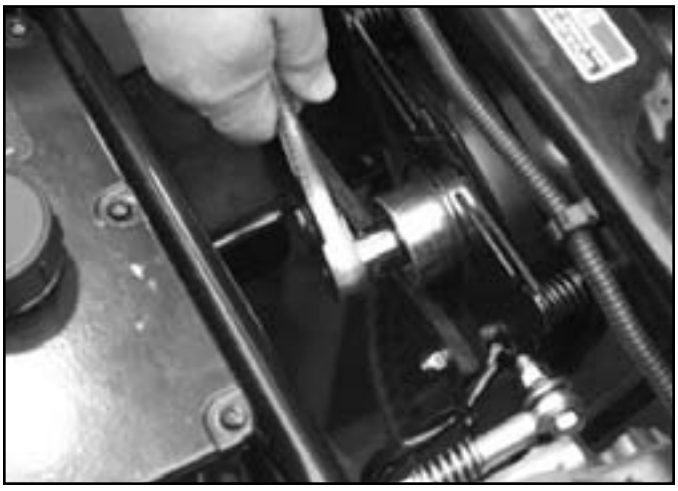

Fig 459 PICT-3995a

e. Remove the bolt, 2 curved washers, flat washer and retainer (Fig. 460).

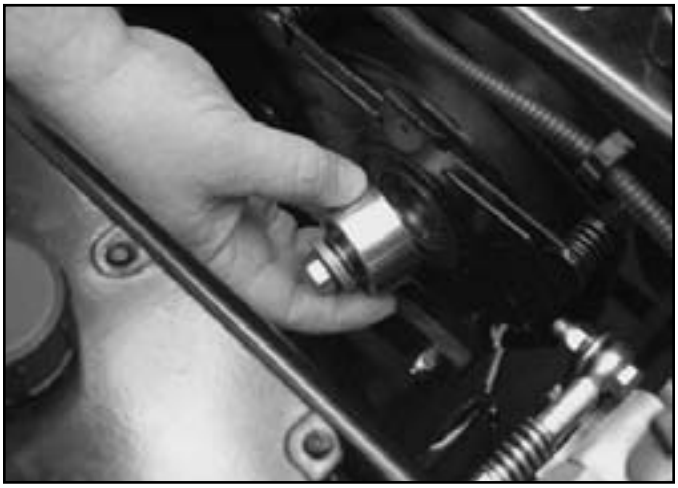

Fig 460 PICT-3997a

f. Remove the electric PTO clutch from the stub shaft (Fig. 461).

Fig 461 PICT-3998

g. Remove the key from the stub shaft (Fig. 462).

Fig 462 PICT-3955

h. Remove the clutch adapter from the stub shaft (Fig. 463).

Fig 463 PICT-3954a

59. Remove the 3 engine mounting bolts, washers and nuts (Fig. 464 and Fig. 465):

    Rear engine mounting bolt.

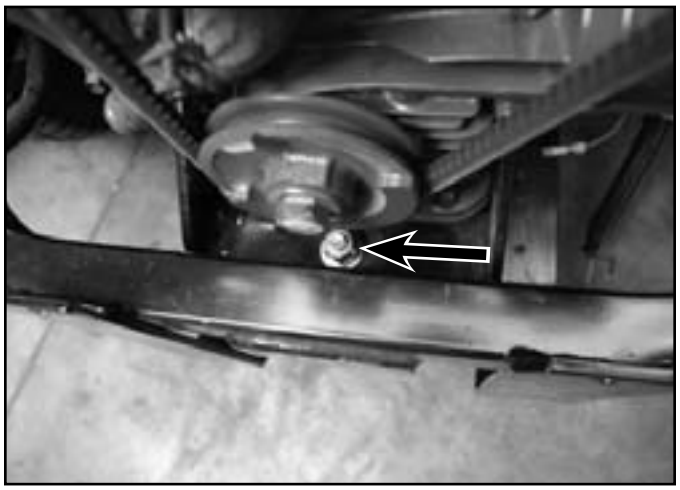

Fig 464 PICT-3617

Front right and front left engine mounting bolts.

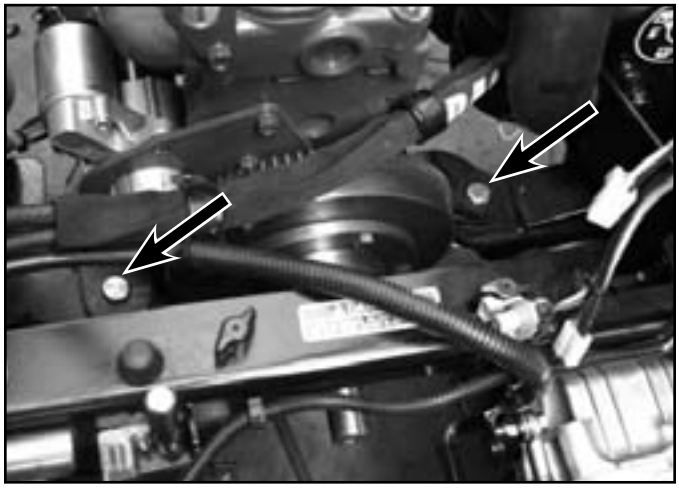

Fig 465 PICT-3621

60. Attach a properly rated hoist to the 2 engine hooks. Lift the engine out of the frame (Fig. 466).

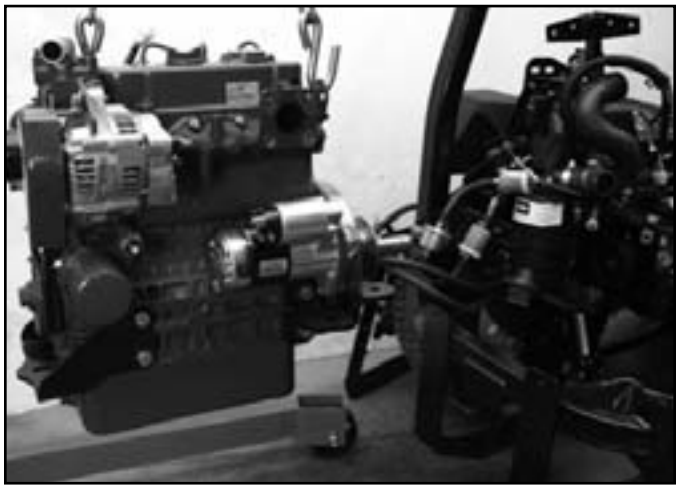

Fig 466 PICT-3626

61. Remove the large washer off the top of the rear engine mount (Fig. 467).

Fig 467 PICT-3629a

62. Remove the 3 sets of engine isolation mounts and the 3 isolation mount spacers (Fig. 468).

Fig 468 PICT-3628

63. Inspect the 3 sets of engine isolation mounts and spacers. Replace if damaged or worn (Fig. 469).

Note: The engine isolation mounts come in pairs. If one half of the pair is damaged, the whole mount should be replaced.

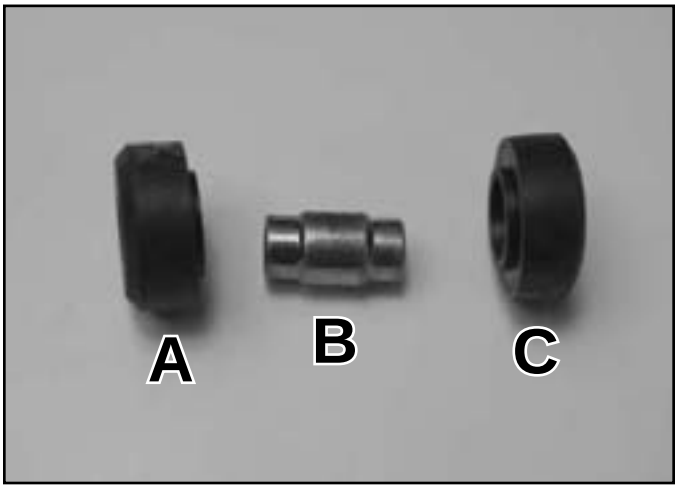

Fig 469 PICT-3631a

A. Half of the engine isolation mount
B. Spacer
C. Half of the engine isolation mount

64. Remove the 5 stub shaft mounting bolts (Fig. 470).

Fig 470 PICT-3640

65. Remove the stub shaft from the flywheel (Fig. 471).

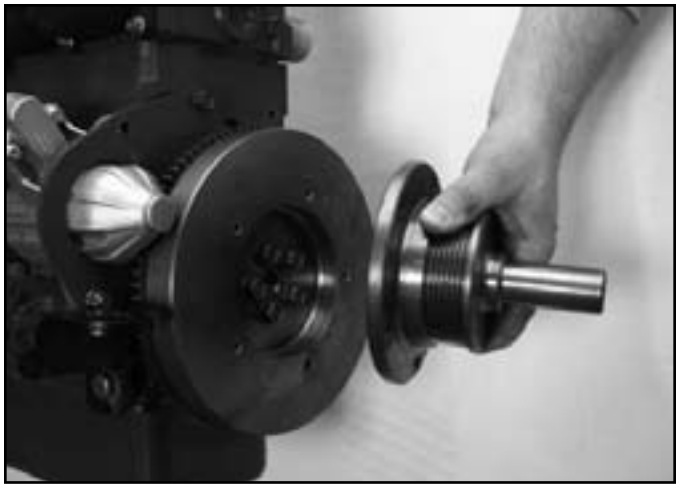

Fig 471 PICT-3642

66. Remove the rear engine mount bracket from the engine by removing the 4 bolts and lock washers securing it to the engine (Fig. 472).

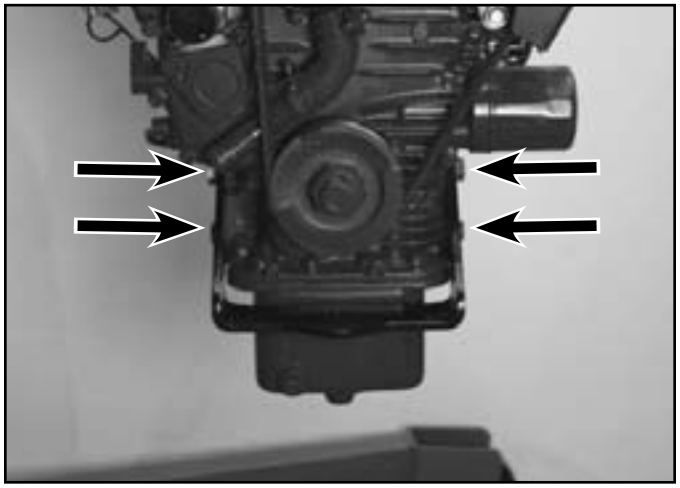

Fig 472 PICT-3635

67. Remove the right side engine mount by removing the 2 bolts and lock washers securing it to the engine (Fig. 473).

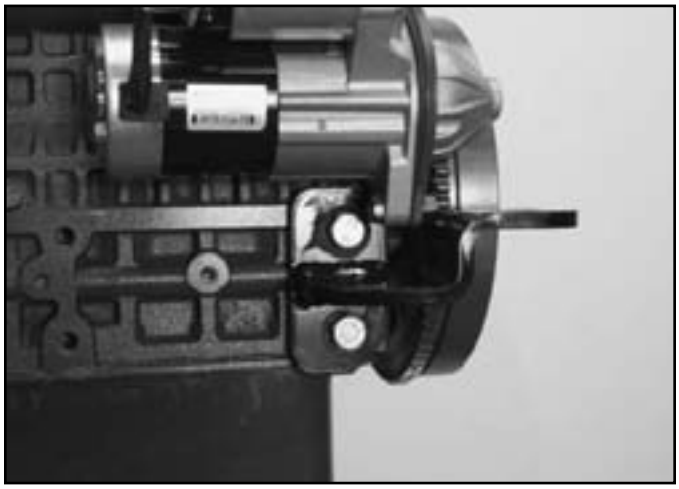

Fig 473 PICT-3643a

68. Remove the left side engine mount by removing the 2 bolts and lock washers securing it to the engine (Fig. 474).

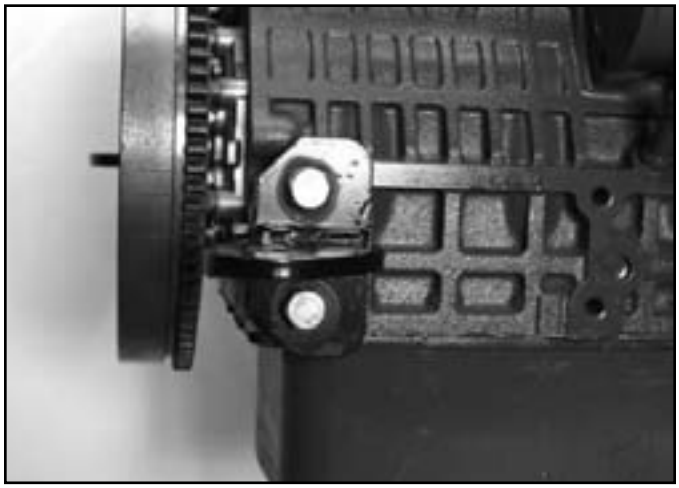

Fig 474 PICT-3644

Engine Installation

1. Apply thread locking compound to the 8 engine mounting bracket bolts (Fig. 475).

Fig 475 PICT-3648a

2. Install the rear engine mount bracket to the engine with 4 mounting bolts and lock washers (Fig. 476).

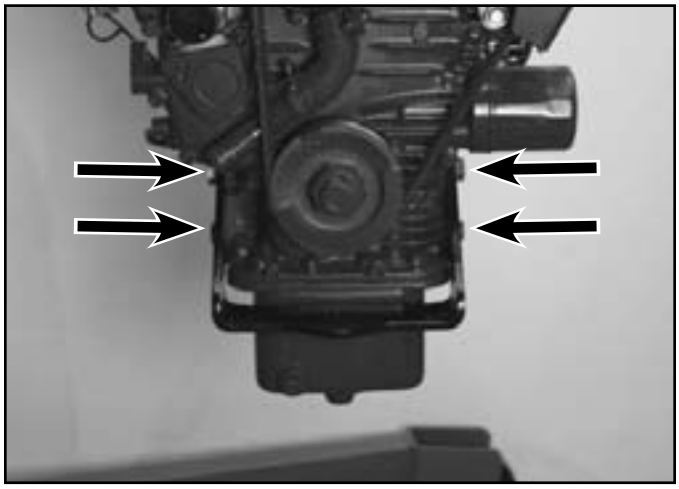

Fig 476 PICT-3635

3. Install the right side engine mount bracket to the engine with 2 mounting bolts and lock washers (Fig. 477).

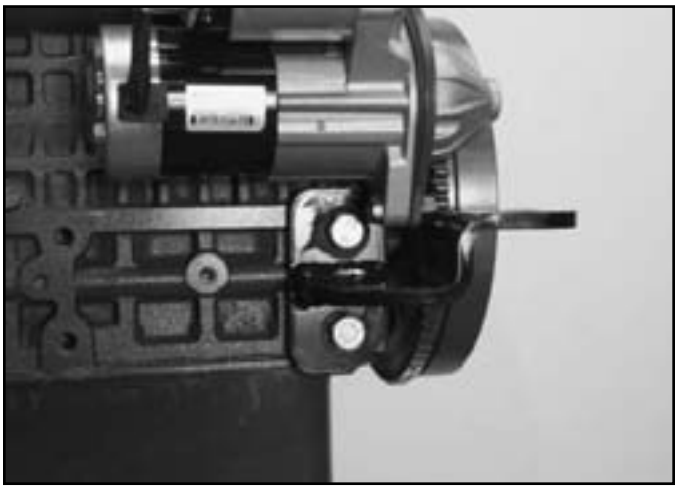

Fig 477 PICT-3643a

4. Install the left side engine mount bracket to the engine with 2 mounting bolts and lock washers (Fig. 478).

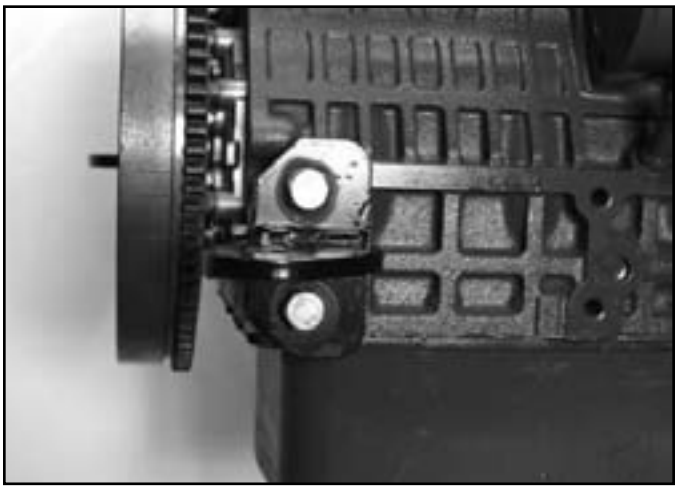

Fig 478 PICT-3644

5. Torque all 8 engine mount bracket mounting bolts to 29 ft-lbs. (39 Nm) (Fig. 479).

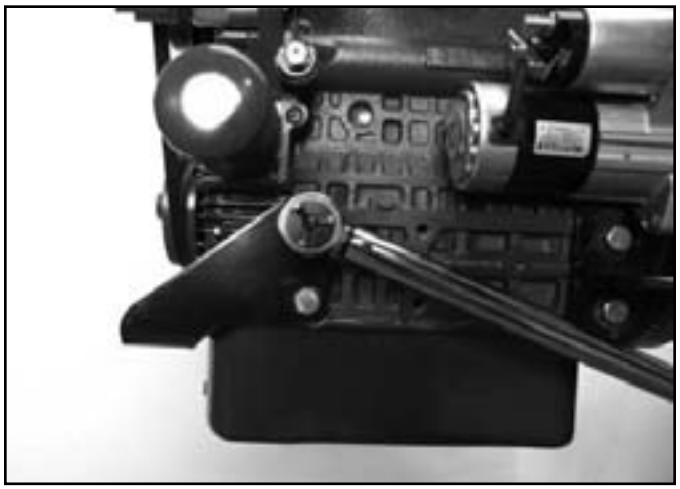

Fig 479 PICT-3650

6. Apply thread locking compound to the 5 stub shaft mounting bolts (Fig. 480).

Fig 480 PICT-3645a

7. Position the stub shaft to the flywheel (Fig. 481).

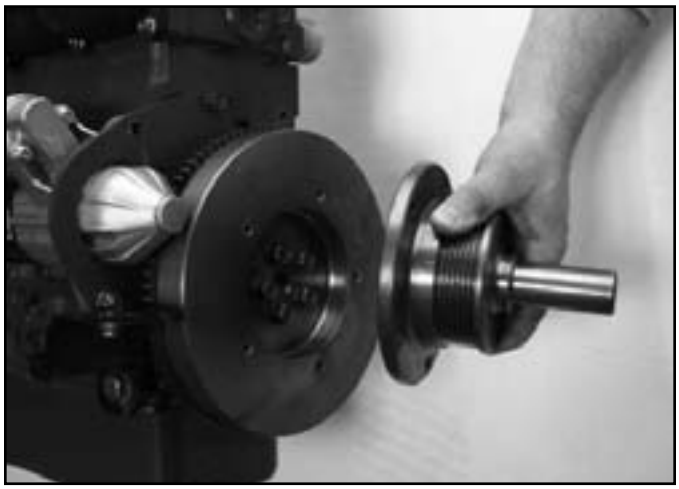

Fig 481 PICT-3642

8. Install the 5 mounting bolts securing the stub shaft to the flywheel. Torque the mounting bolts to 145 ± 20 in-lbs. (196 ± 27 Nm) (Fig. 482).

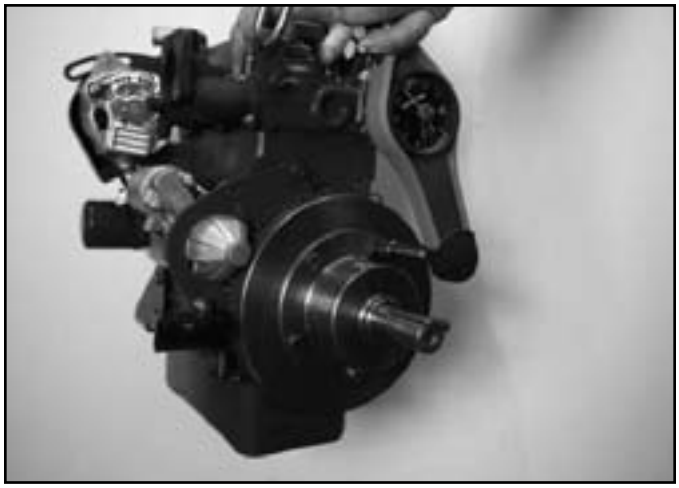

Fig 482 PICT-3647

9. Install the 3 sets of engine isolation mounts and the 3 isolation mount spacers (Fig. 483).

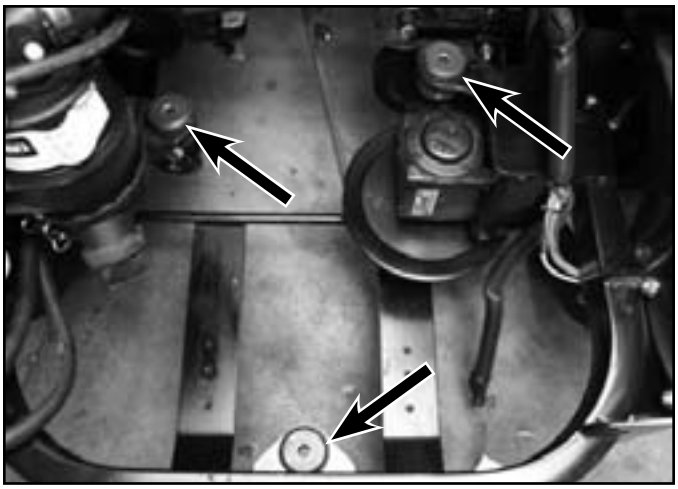

Fig 483 PICT-3652

Note: The frame bracket is sandwiched between the engine isolation mounts with the spacer running through the middle (Fig. 484).

Fig 484 PICT-3628a

5

10. Place a large washer on the top of the rear engine isolation mount (Fig. 485).

Fig 485 PICT-3629a

11. Attach a properly rated hoist to the 2 engine hooks. Position the engine into the frame aligning it with the engine isolation mounts (Fig. 486).

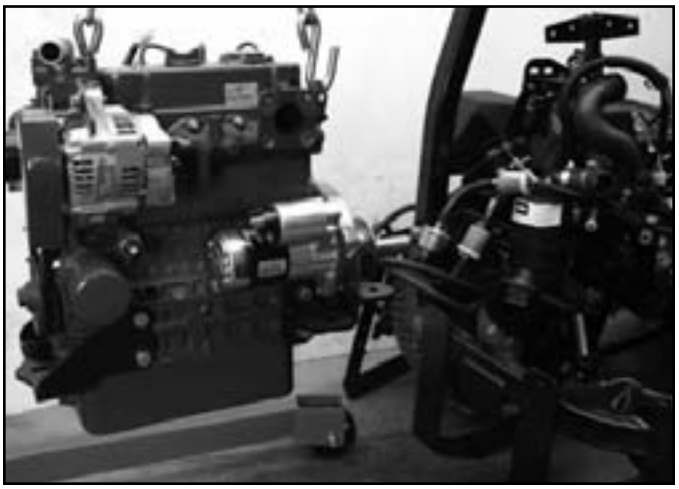

Fig 486 PICT-3626

12. Install 3 engine mounting bolts, washers and nuts (Fig. 487 and Fig. 488):

    Rear engine mounting bolt.

Fig 487 PICT-3617

    Front right and front left engine mounting bolts.

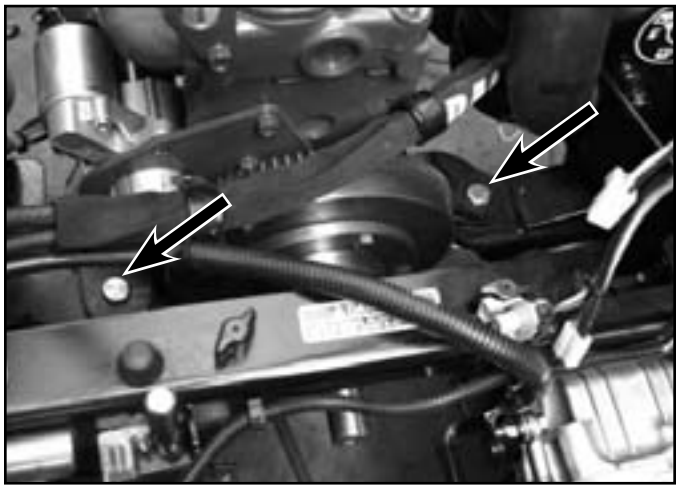

Fig 488 PICT-3621

Machines with a Warner clutch:

a. Apply anti-seize compound to the stub shaft (Fig. 489)

Fig 489 PICT-3656

b. Install the electric PTO clutch to the stub shaft (Fig. 490).

Fig 490 PICT-3615

c. Apply thread locking compound to the center clutch bolt (Fig. 491).

Fig 491 PICT-3957a

d. Install the center clutch bolt, two spring washers, and the clutch retainer (Fig. 492).

Note: The direction of the spring washers.

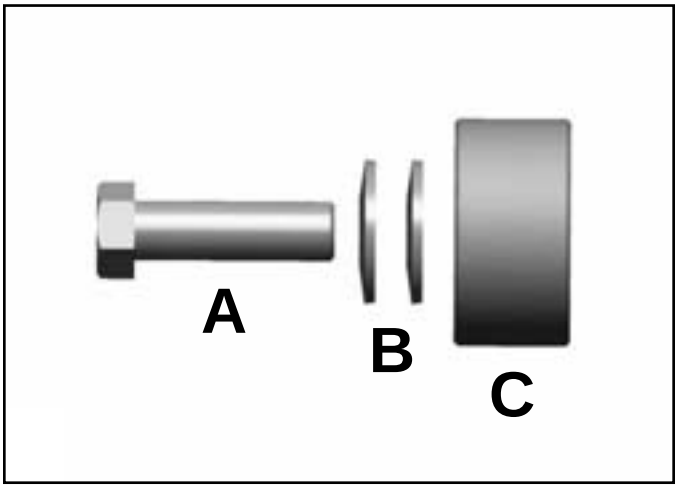

Fig 492 clutch bolt retainer asm

A. Clutch bolt
B. Spring washer (2)
C. Clutch retainer

e. Torque the center clutch bolt to 50 ft-lbs. (67.8 Nm) (Fig. 493).

Fig 493 PICT-4006

f. Install the gearbox belt around the electric PTO clutch pulley (Fig. 494).

Fig 494 PICT-3934a

g. Hook the spring up from the gearbox idler assembly to the frame (Fig. 495).

Fig 495 PICT-3872

h. Connect the harness connector to the electric PTO clutch (Fig. 496).

Fig 496 PICT-3933

Machines with an Ogura Clutch:

a. Apply anti-seize compound on the engine crankshaft (Fig. 497).

Fig 497 PICT-3656

b. Install the clutch adapter onto the stub shaft (Fig. 498).

Note: Ensure it is installed as shown.

Fig 498 PICT-3954a

c. Install the key onto the stub shaft (Fig. 499).

Fig 499 PICT-3955

d. Align the key with the clutch and slide the clutch onto the stub shaft (Fig. 500).

Fig 500 PICT-3956

e. Apply thread locking compound to the bolt (Fig. 501).

Fig 501 PICT-3957a

f. Secure the clutch to the stub shaft with retainer, flat washer, 2 curved washers (note the direction of the curved washers), and bolt (Fig. 502).

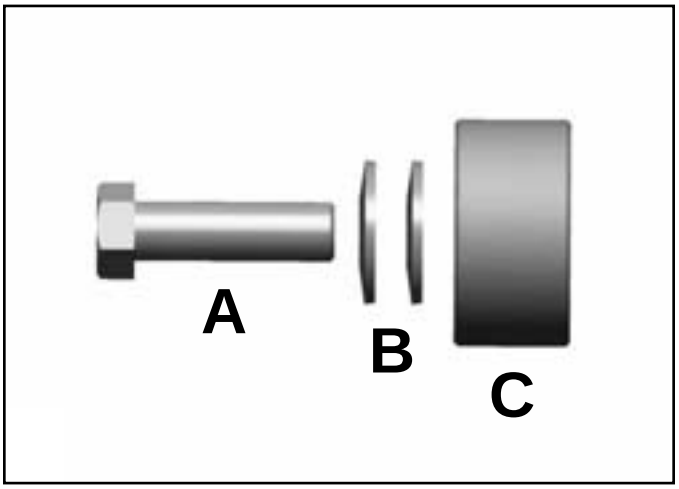

Fig 502 clutch bolt retainer asm

A. Clutch bolt
B. Spring washer (2)
C. Clutch retainer

g. Torque the bolt to 50 ft-lbs. (67.8 Nm) (Fig. 503).

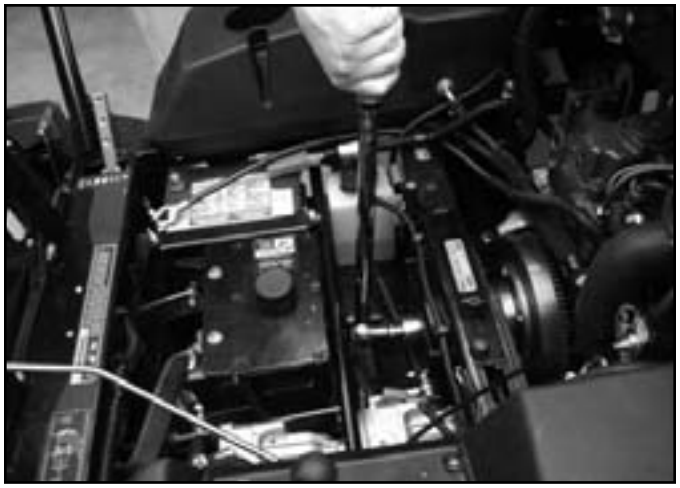

Fig 503 PICT-3967

h. Install the PTO drive belt onto the clutch. Install the spring for the idler arm (Fig. 504).

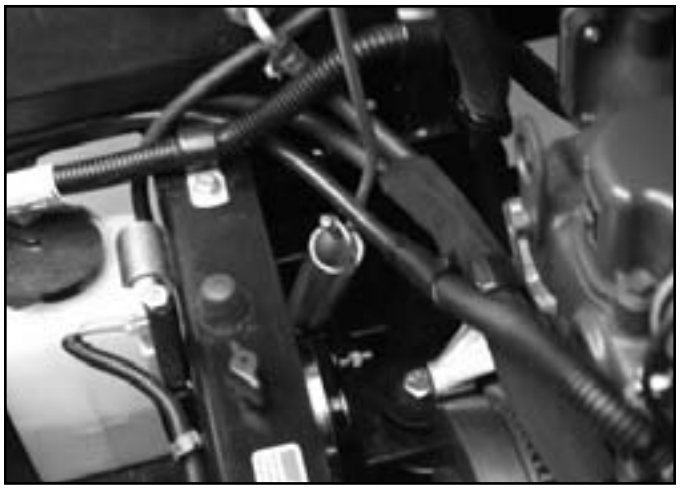

Fig 504 PICT-3972

i. Install the clutch stop on the machine with 2 carriage bolts, 2 flat washers, and 2 locknuts (Fig. 505).

Note: Make sure there is a twist in the clutch stop.

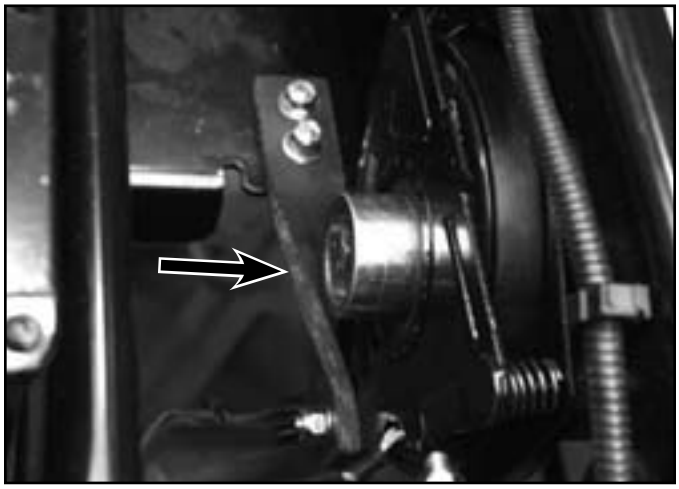

Fig 505 PICT-3974

j. Connect the harness connector to the electric PTO clutch (Fig. 506).

Fig 506 PICT-3979a

k. Install a tie strap around the wire on the electric PTO clutch (Fig. 507).

Fig 507 PICT-3988a

13. Install the traction pump drive belt. Refer to “Traction Pump Drive Belt Installation” on page 4-37.

14. Tighten the hose clamp securing the air cleaner hose to the engine (Fig. 508).

Fig 508 PICT-3612

15. Slide the fuel line onto the fuel return barb (Fig. 509).

Fig 509 PICT-3611

16. Slide the fuel line onto the fuel injection pump (Fig. 510).

Fig 510 PICT-3608a

17. Slide the 2 hose clamps up the fuel line, onto the fitting barbs and tighten (Fig. 511).

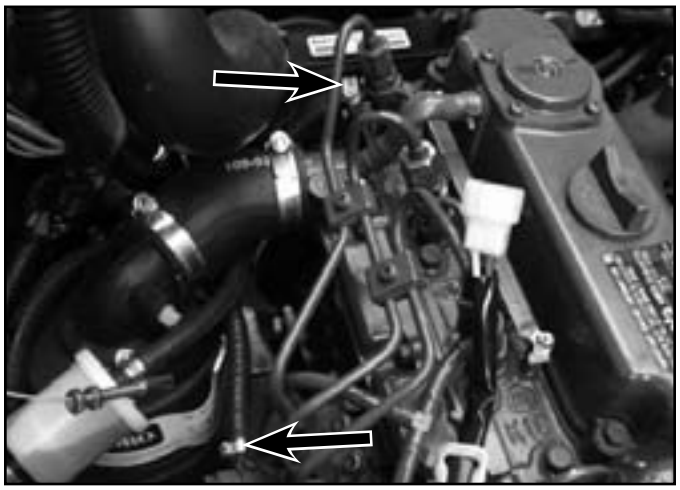

Fig 511 PICT-3606

18. Slide the throttle cable into the throttle support bracket and swivel clamp. Tighten the swivel clamp and rearmost nut securing the throttle cable into the throttle support bracket (Fig. 512).

Fig 512 PICT-3601a

19. Plug the harness into the stop solenoid connector (Fig. 513).

Fig 513 PICT-3599

20. Install the cable tie securing the harness to the engine stop solenoid wire (Fig. 514).

Fig 514 cabletie a

21. Slide the harness terminal onto the front glow plug cord terminal and install a nut to secure (Fig. 515).

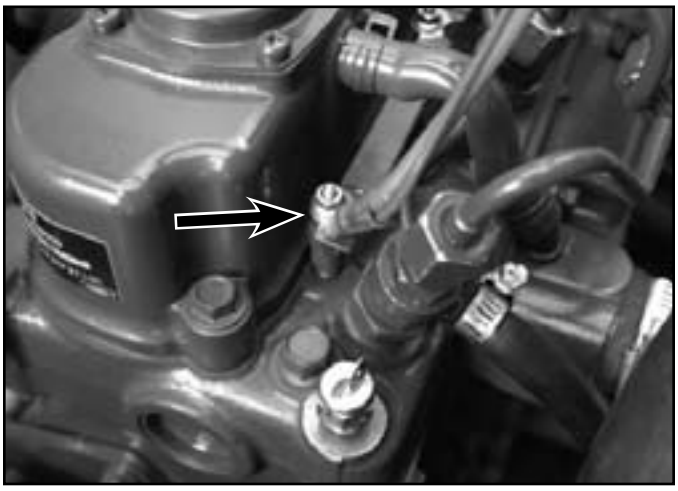

Fig 515 PICT-3596

22. Plug the harness terminal into the engine thermo-switch (Fig. 516).

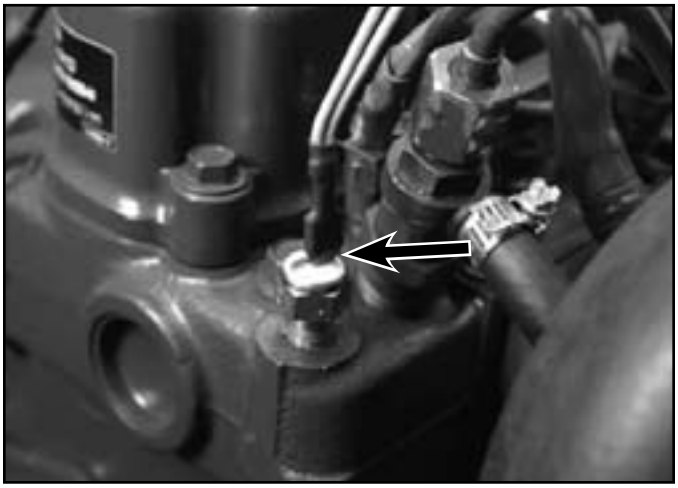

Fig 516 PICT-3595

23. Apply thread locking compound to the engine block grounding bolt (Fig. 517).

Fig 517 PICT-3669a

24. Position the ground wire and negative battery cable terminal to the engine block and install the engine block grounding bolt and washer (Fig. 518).

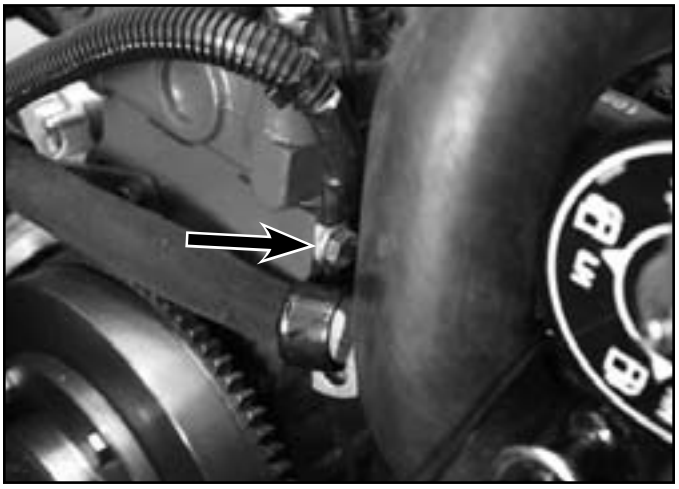

Fig 518 PICT-3593

25. Position the 2 harness R-clamps to the front of the engine and install the bolts and washers to secure (Fig. 519).

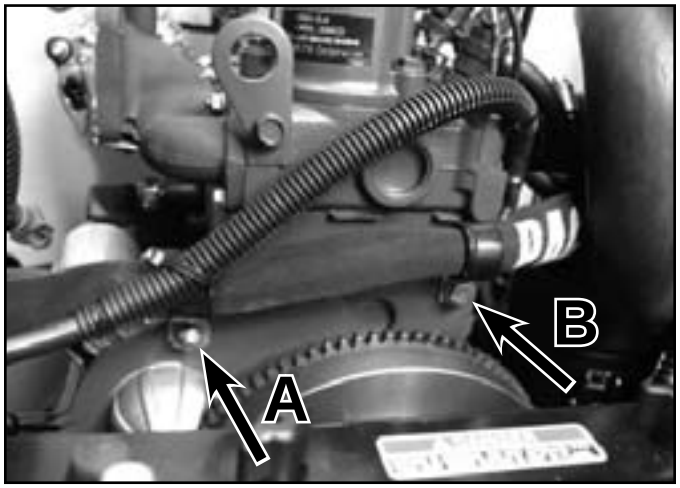

Fig 519 PICT-3590

A. Bolt, nut and washer securing the negative battery cable and fuel lines
B. Bolt and 2 washers securing fuel lines

26. Install the following to the starter solenoid (Fig. 520):

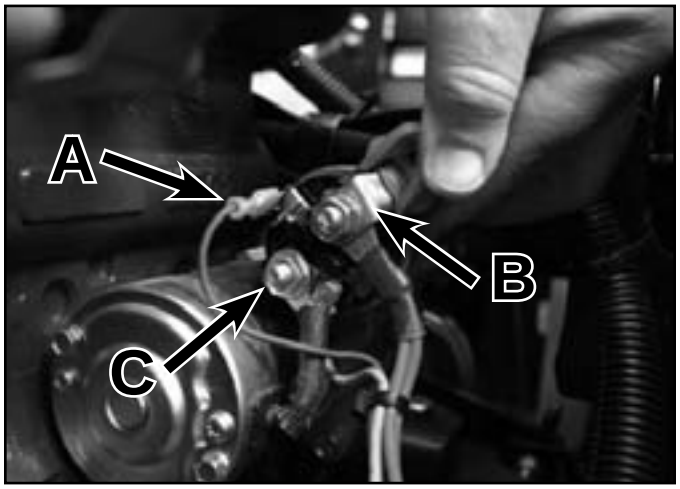

Fig 520 PICT-3589

A. Harness spade terminal
B. Battery cable
C. Starter and harness terminal

27. Slide the harness terminal onto the alternator terminal and install a nut. Slide the rubber boot up over the connection (Fig. 521).

Fig 521 PICT-3587

28. Plug the harness connector into the alternator (Fig. 522).

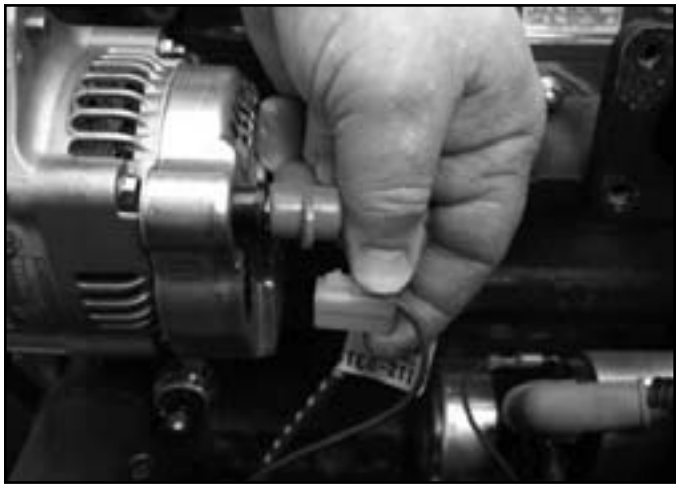

Fig 522 PICT-3585

29. Position the harness terminal to the oil switch and install a screw and lock washer to secure (Fig. 523).

Fig 523 PICT-3581

30. Install a cable tie securing the harness to the solenoid wires (Fig. 524).

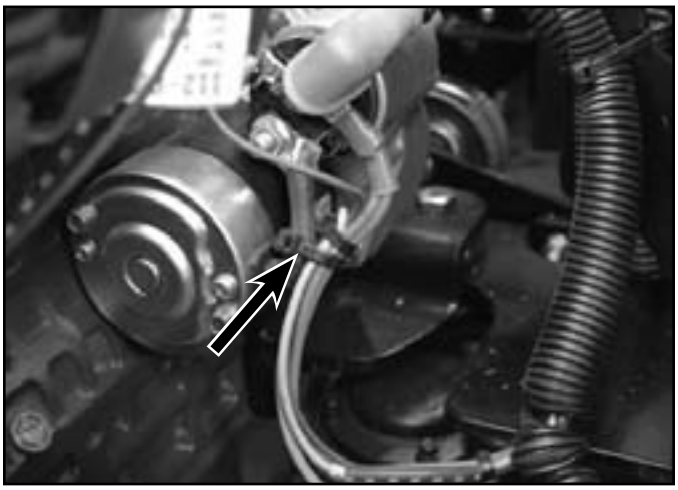

Fig 524 PICT-3576a

5

31. Install a cable tie securing the harness to the oil switch located under the oil filter (Fig. 525).

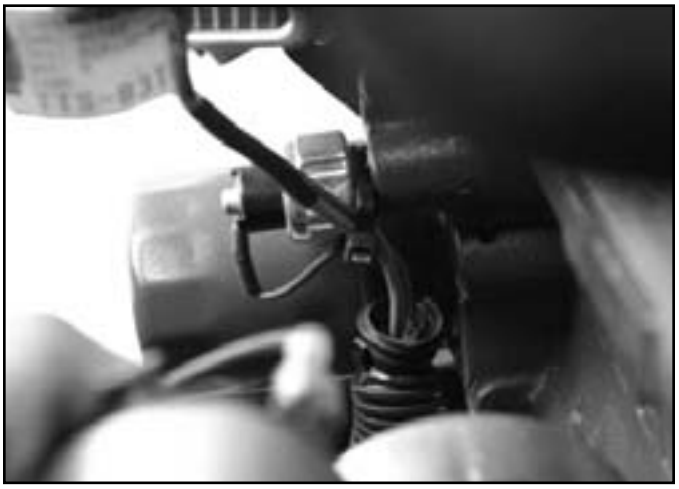

Fig 525 PICT-3578

32. Position the muffler to the engine with a new manifold gasket installed between the engine and exhaust manifold plates (Fig. 526).

Fig 526 PICT-3670

33. Apply thread locking compound to the 4 muffler manifold mounting bolts (Fig. 527).

Fig 527 PICT-3645a

34. Loosely install 4 muffler manifold mounting bolts and lock washers (Fig. 528).

Fig 528 PICT-3573a

35. Apply thread locking compound to the 2 lower muffler mounting bolts (Fig. 529).

Fig 529 PICT-3645a

36. Loosely install 2 muffler mounting bolts and lock washers on the lower muffler mounting bracket (Fig. 530).

Fig 530 PICT-3570

37. Tighten the top 4 muffler mounting bolts (Fig. 531).

Fig 531 PICT-3573a

38. Torque the 2 lower muffler mounting bolts to 29 ft-lbs. (39 Nm) (Fig. 532).

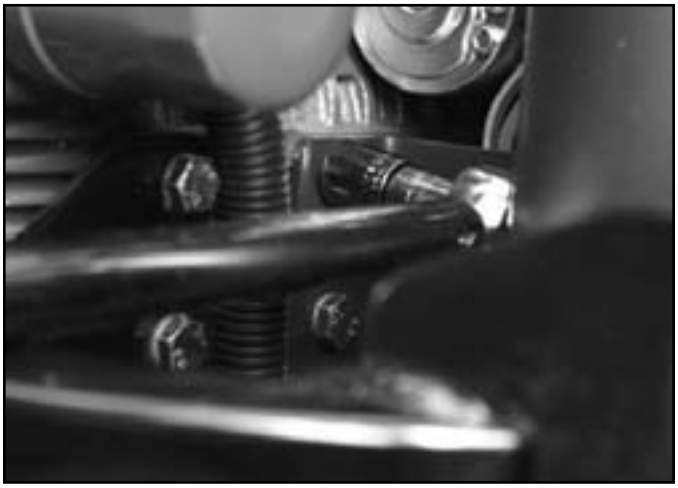

Fig 532 PICT-3674

39. Position the wire harness R-clamp to the underside of the muffler mounting bracket. Install a bolt and nut to secure (Fig. 533).

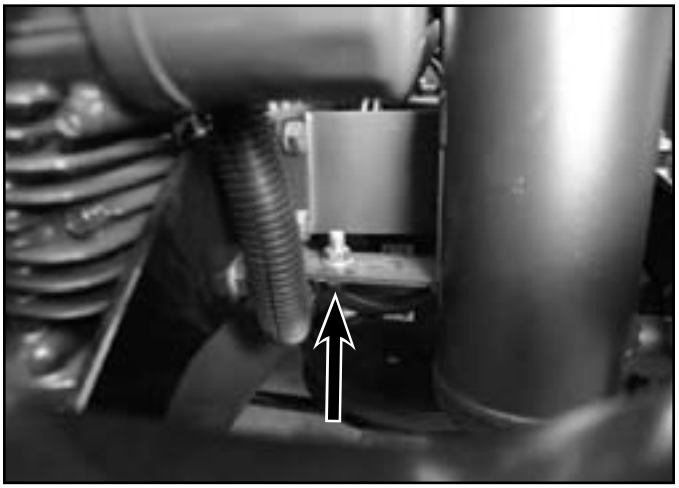

Fig 533 PICT-3567

40. Slide the lower end of the left hand radiator hose onto the flange on the engine (Fig. 534).

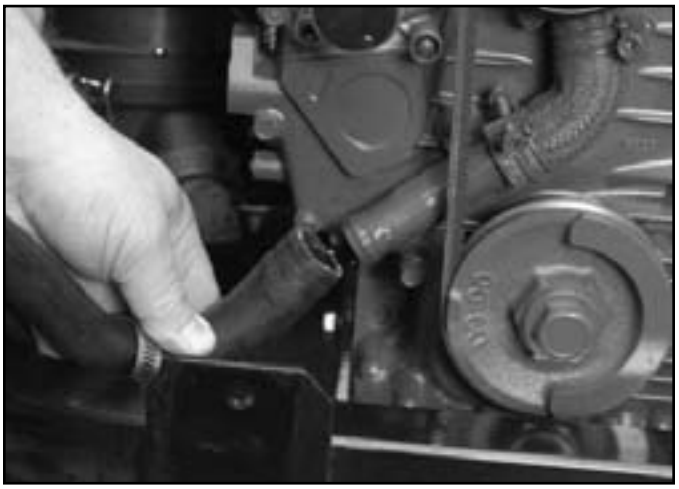

Fig 534 PICT-3566a

41. Slide the hose clamp into position and tighten (Fig. 535).

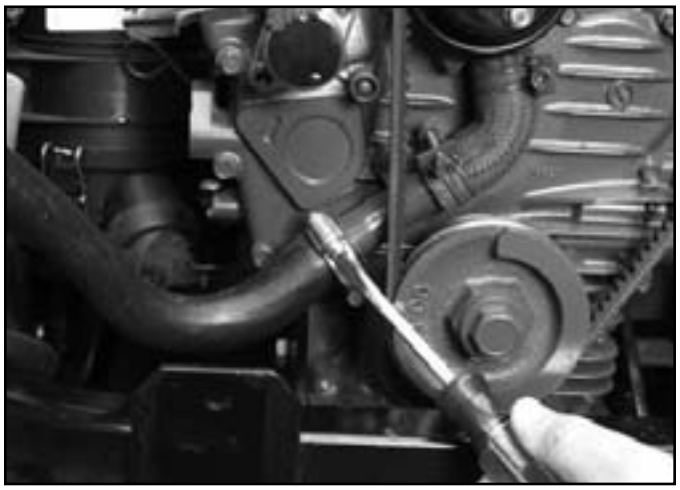

Fig 535 PICT-3565

42. Position the fan and retainer plate to the engine (Fig. 536).

Fig 536 PICT-3564a

43. Install 2 bolts securing the fan and retainer plate to the engine (Fig. 537).

Fig 537 PICT-3563a

44. Position the oil cooler assembly to the rear of the engine aligning the lower mounting bracket holes with the holes in the frame (Fig. 538).

Fig 538 PICT-3676

45. Loosely install 2 bolts and flange nuts securing the rear radiator support to the frame (Fig. 539).

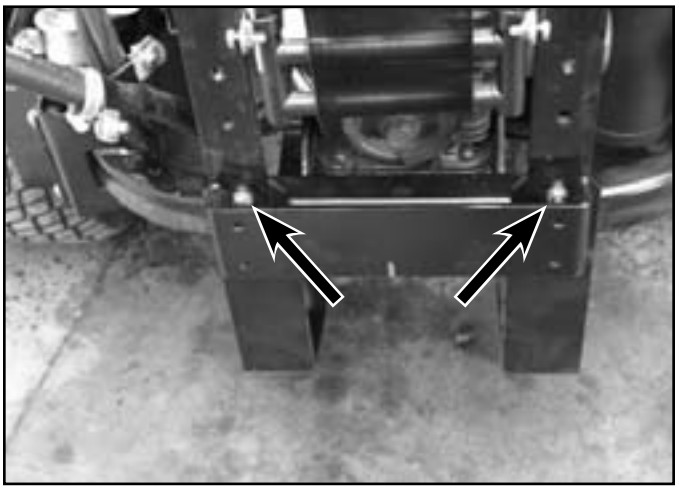

Fig 539 PICT-3562

46. Position the radiator assembly onto the frame (Fig. 540).

Fig 540 PICT-3683

47. Loosely install 10 bolts, nuts and 2 washers securing the radiator assembly to the frame (Fig. 541).

Note: There are 8 bolts and nuts securing the front end of the radiator and 2 bolts, washers and nuts securing the rear end of the radiator.

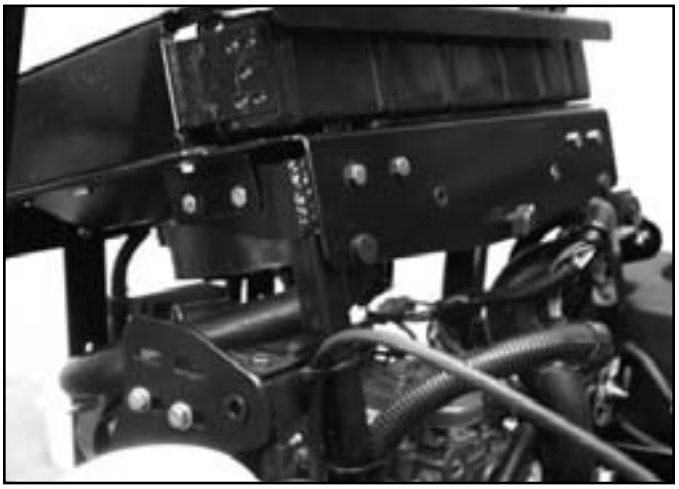

Fig 541 PICT-3553

48. Tighten (in the following order):

a. The 8 front radiator assembly mounting bolts and nuts.

b. The 2 rear radiator assembly mounting bolts, nuts and washers

c. The 2 lower bolts and nuts securing the rear radiator support to the frame.

49. Slide the right hand radiator hose onto the water pump (Fig. 542).

Fig 542 PICT-3685

50. Slide the hose clamp into position and tighten (Fig. 543).

Fig 543 PICT-3686

51. Position the 2 harness R-clamps to the inside of the front panel on the bottom radiator plate assembly. Install a bolt and nut securing each R-clamp (Fig. 544).

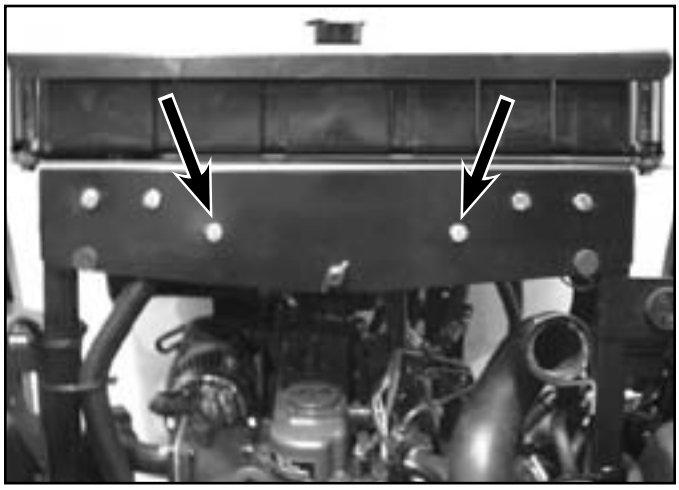

Fig 544 PICT-3549

52. Plug the harness into the fan connector (Fig. 545).

Fig 545 PICT-3547

53. Route the overflow hose up, through the front right hand corner of the radiator frame assembly, to the coolant fill overflow barb (Fig. 546).

Fig 546 PICT-3544a

54. Slide the overflow hose onto the barb on the radiator cap flange (Fig. 547).

Fig 547 PICT-3690

55. Install a cable tie securing the overflow hose to the barb (Fig. 548).

Fig 548 PICT-3692

56. Slide the left hand radiator hose onto the flange located on the lower left hand corner of the radiator (Fig. 549).

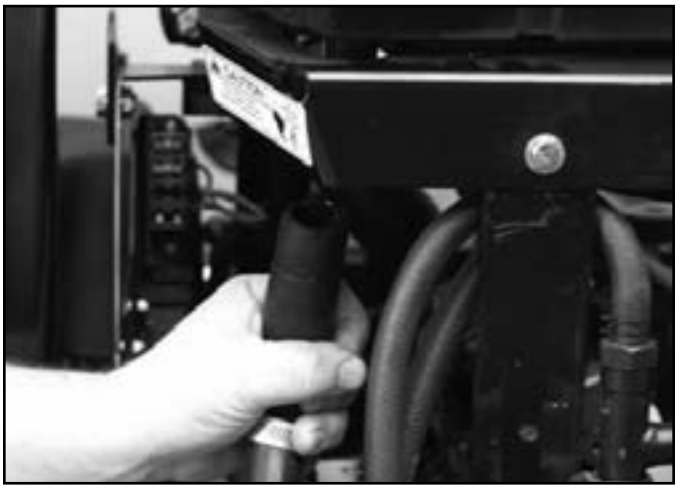

Fig 549 PICT-3540

57. Position the hose clamp and tighten (Fig. 550).

Fig 550 PICT-3539a

58. Slide the left hand guard strap between the frame and radiator support bracket. Insert a bolt (with a washer) and position the fuel pump bracket onto the bolt. Loosely install a nut securing the left hand guard strap to the frame (Fig. 551).

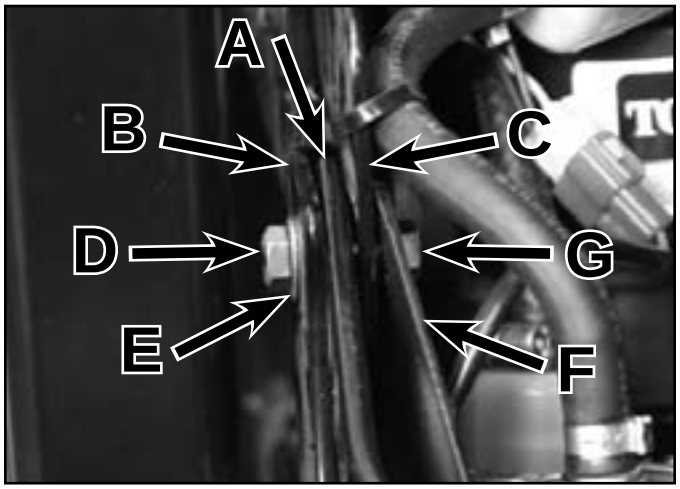

Fig 551 PICT-3695

A. Left hand guard strap
B. Frame
C. Radiator support
D. Bolt
E. Washer
F. Fuel pump bracket
G. Nut

59. Position the cooler shield to the rear radiator support (Fig. 552).

Note: The cooler shield is installed between the left hand guard strap and the rear radiator support.

Fig 552 PICT-3696

60. Position the left fan guard behind the rear radiator support. Insert a bolt (with a washer) through the left hand guard strap, cooler shield and rear radiator support. Loosely install a nut to secure (Fig. 553).

Fig 553 PICT-3700

61. Position the left hand radiator hose R-clamp to the left hand fan guard and install a bolt, washer and nut to secure (Fig. 554).

Fig 554 PICT-3703

62. Position the front end of the left hand top frame brace between the fuse block relay bracket and the frame. Loosely install 2 bolts, washers and nuts securing the front end of the left side top frame brace (Fig. 555).

Fig 555 PICT-3711

63. Align the left hand top frame brace, cooler shield and left fan guard with the rear radiator brace and loosely install a bolt, washer and nut to secure (Fig. 556).

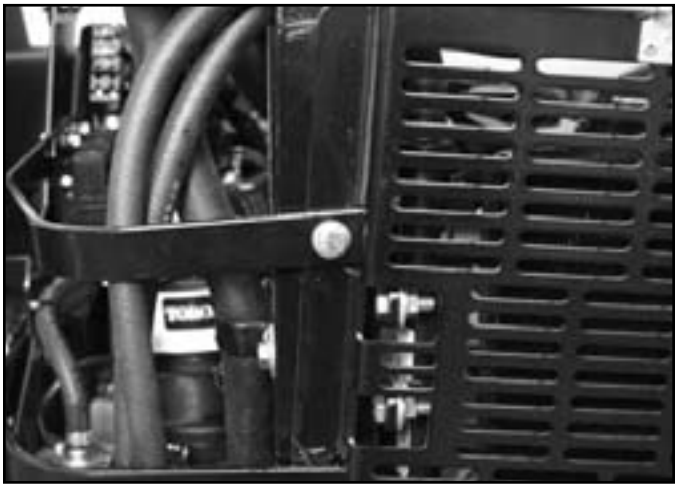

Fig 556 PICT-3717

64. Position the oil cooler hydraulic hose R-clamp to the inside of the left hand guard strap. Install a bolt, washer and nut to secure (Fig. 557).

Fig 557 PICT-3716

65. Slide the front end of the right hand guard strap between the right hand radiator brace and the frame. Loosely install a bolt and nut to secure (Fig. 558).

Fig 558 PICT-3719a

66. Position the right hand fan guard behind the rear radiator support. Install a bolt (with a washer) through the right hand guard strap, cooler shield, rear support and fan guard. Loosely install a nut to secure (Fig. 559).

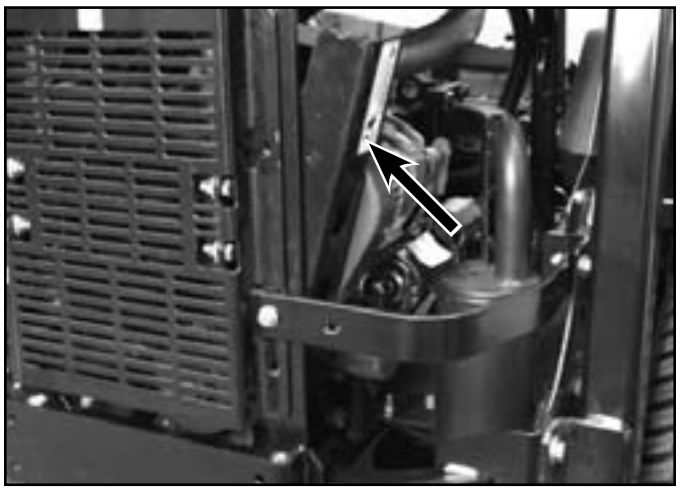

Fig 559 PICT-3723

67. Position the front end of the right hand top frame brace to the inside of the right hand radiator brace. Loosely install 2 bolts, washers and nuts to secure (Fig. 560).

Fig 560 PICT-3726

68. Align the right hand top frame brace, cooler shield, rear support and fan guard. Loosely install a bolt, washer and nut to secure (Fig. 561).

Fig 561 PICT-3727

69. Tighten all the fasteners securing the right and left guard straps and frame braces to the frame and rear support.

70. Install the Hood Assembly. Refer to “Hood Assembly Installation” on page 3-22.

71. Check and fill the engine oil per specifications.

72. Connect the negative battery cable to the battery.

73. Fill the fuel tanks with fuel per specifications.

74. Fill the radiator with 50/50 mix of extended life anti-freeze/Dex-Cool and water.

Note: Cooling system capacity:
87 oz. (2.6 liters) Z593 and Z580
148 oz. (4.4 liters) Z595

75. Install the radiator cap (Fig. 562).

Fig 562 PICT-3771a

76. Check the coolant level in the overflow bottle and add as necessary.

77. Install the front engine panel (Fig. 563).

Fig 563 IMG_7862

78. Lower the seat.

79. Start the unit up and operate for about 5 minutes. Observe all the cooling hoses for any leaks.

80. Turn the machine off.

81. Check the coolant level in the overflow bottle and add as necessary.

Radiator Replacement

Radiator Removal

DANGER! Discharge of hot pressurized coolant or touching hot radiator and surrounding parts can cause severe burns.

- **Do not** remove radiator cap or open drain petcock when the engine is hot. Always allow the engine to cool at least 15 minutes or until the radiator cap is cool enough to touch without burning your hand before removing the radiator cap or opening drain petcock.

- **Do not** touch radiator and surrounding parts that are hot.

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.

2. Raise the seat.

3. Remove the negative battery cable from the battery.

4. Raise the hood assembly (Fig. 564).

Fig 564 PICT-3728

5. Place a drain pan under the lower right hand corner of the radiator.

6. Remove the radiator cap. Place a funnel below the radiator drain plug located on the lower right hand corner of the radiator. Remove the plug located on the lower right hand corner of the radiator (Fig. 565).

Fig 565 PICT-3731

7. Allow the coolant to drain from the radiator.

8. Re-install the drain plug.

9. Loosen the hose clamp securing the left hand radiator hose to the lower left hand corner of the radiator (Fig. 566).

Fig 566 PICT-3539a

10. Place a drain pan under the left hand rear corner of the radiator.

11. Remove the left hand radiator hose from the lower left hand corner of the radiator. Drain the coolant into the drain pan (Fig. 567).

Fig 567 PICT-3734

12. Remove the cable tie securing the overflow hose to the radiator cap barb (Fig. 568).

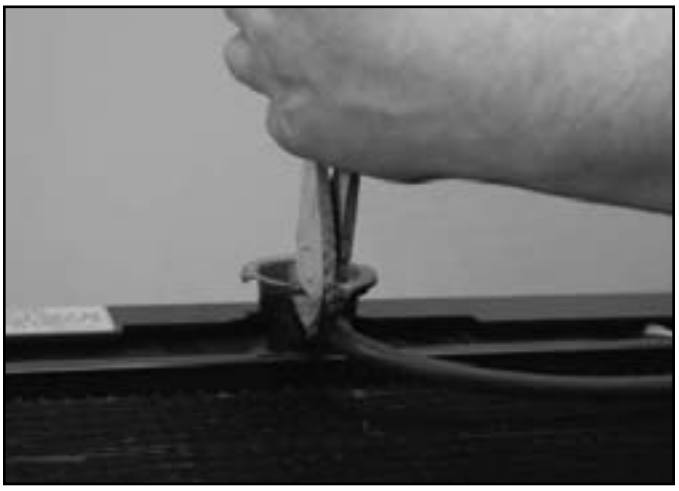

Fig 568 PICT-3542a

13. Slide the overflow hose from the barb on the radiator cap flange (Fig. 569).

Fig 569 PICT-3690

14. Pull the overflow hose out and away from the radiator (Fig. 570).

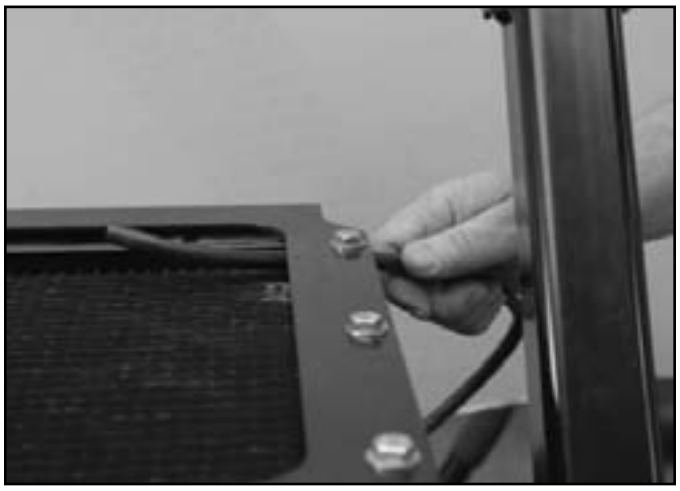

Fig 570 PICT-3544a

15. Remove the 6 bolts and washers securing the top radiator plate to the radiator (Fig. 571).

Fig 571 PICT-3745

16. Remove the top radiator plate (Fig. 572).

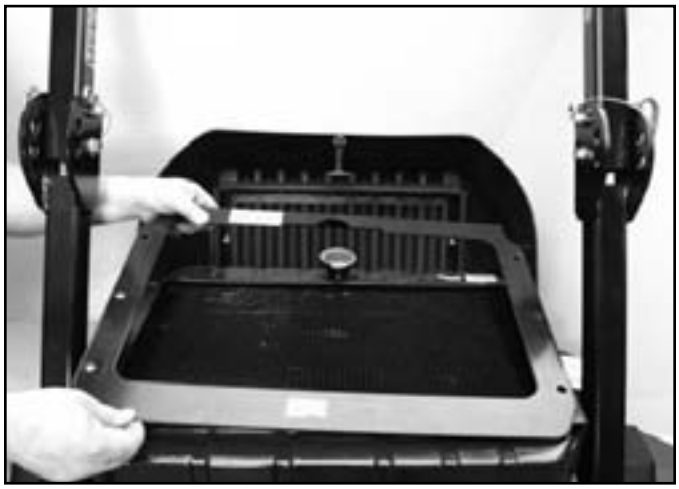

Fig 572 PICT-3747

17. Remove the 6 bolts and washers (3 on the left and 3 on the right) securing the radiator to the bottom radiator plate and cooling shroud (Fig. 573).

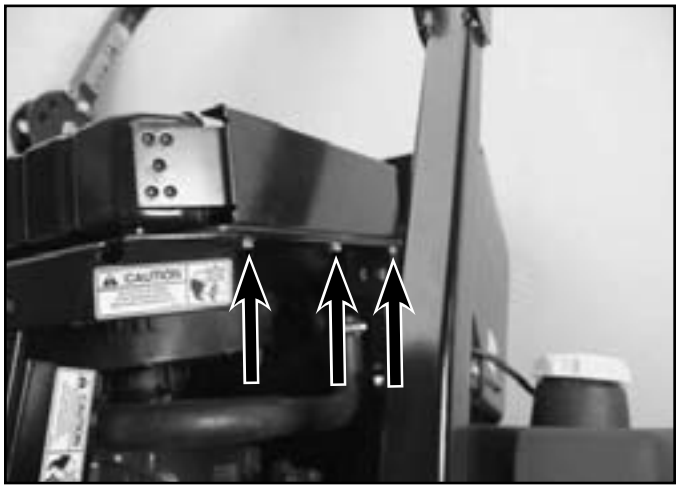

Fig 573 PICT-3752a

18. Raise the front end of the radiator and loosen the hose clamp securing the right hand radiator hose to the flange on the upper right hand corner of the radiator (Fig. 574).

Fig 574 PICT-3767

19. Slide the right hand radiator hose off the flange (Fig. 575).

Fig 575 PICT-3765a

20. Remove the radiator (Fig. 576).

Fig 576 PICT-3753

Radiator Installation

1. Position the radiator onto the bottom radiator plate and cooling shroud (Fig. 577).

Fig 577 PICT-3753

2. Lift up the front end of the radiator and slide the right hand radiator hose onto the radiator flange (Fig. 578).

Fig 578 PICT-3765a

3. Slide the hose clamp into position and tighten (Fig. 579).

Fig 579 PICT-3767

4. Install 6 bolts and washers (3 on the left and 3 on the right) securing the radiator to the bottom radiator plate and cooling shroud (Fig. 580).

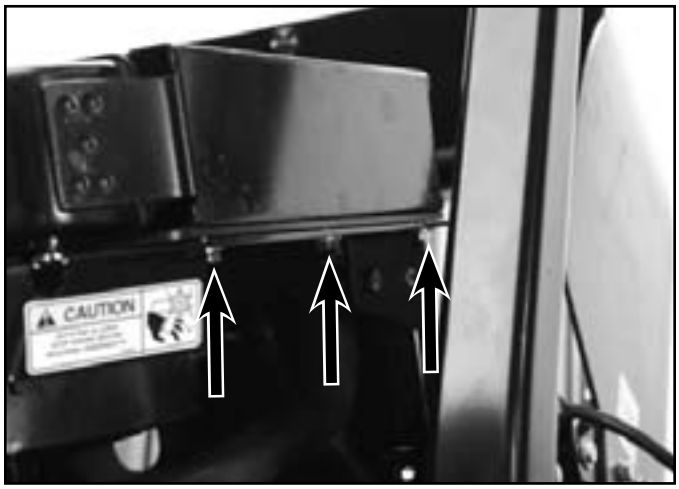

Fig 580 PICT-3769

5. Position the top radiator plate onto the radiator (Fig. 581).

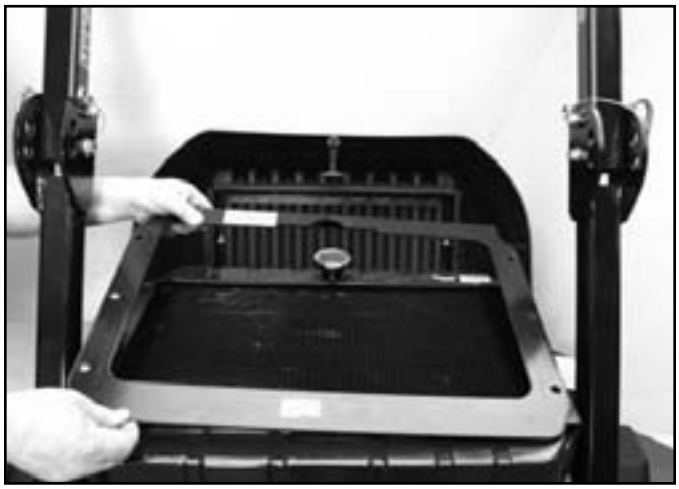

Fig 581 PICT-3747

6. Install 6 bolts and washers to secure the top radiator plate to the radiator (Fig. 582).

Fig 582 PICT-3745

7. Route the overflow hose through the upper right corner of the radiator over to the radiator filler neck (Fig. 583).

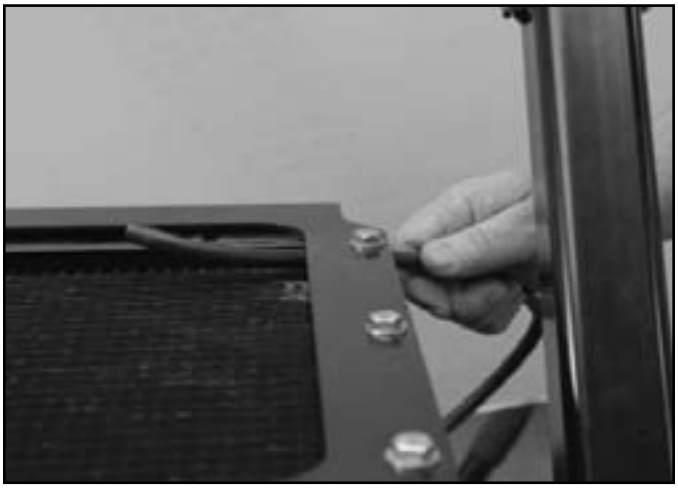

Fig 583 PICT-3544a

5

8. Slide the overflow hose onto the barb onto the radiator filler neck barb fitting (Fig. 584).

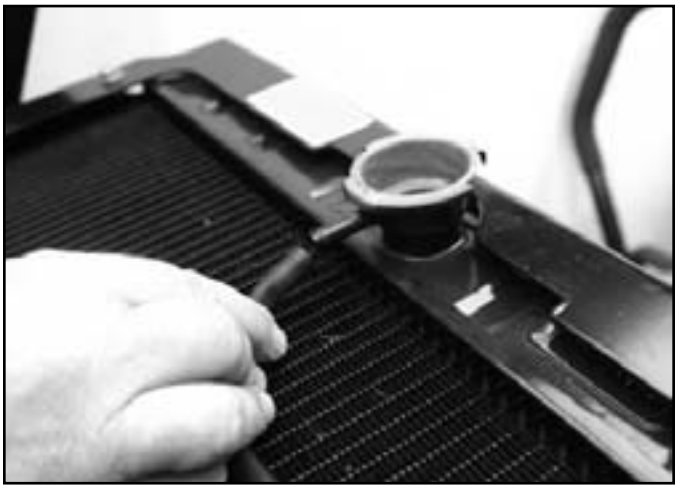

Fig 584 PICT-3690

9. Install a cable tie to secure the overflow hose to the radiator filler neck barb fitting (Fig. 585).

Fig 585 PICT-3692a

10. Slide the left hand radiator hose onto the lower left hand corner of the radiator (Fig. 586).

Fig 586 PICT-3734

11. Slide the hose clamp into position and tighten to secure (Fig. 587).

Fig 587 PICT-3539a

12. Ensure the drain plug is installed and tight.

13. Fill the radiator with a 50/50 mix of extended life antifreeze/Dex-Cool and water.

14. Install the radiator cap (Fig. 588).

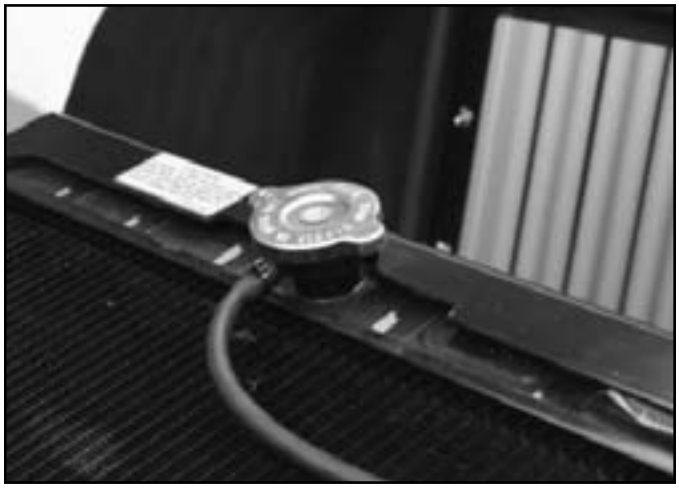

Fig 588 PICT-3771a

15. Check the antifreeze overflow bottle and make sure it is up to indicator line.

Note: Cooling system capacity:
87 oz. (2.6 liters) Z593 and Z580
148 oz. (4.4 liters) Z595

16. Connect the negative battery cable. Start the unit up and operate for about 5 minutes. Observe all the cooling hoses for any leaks.

17. Turn the machine off.

18. Check the coolant level in the overflow bottle and add as necessary.

Cooling Fan Replacement

Cooling Fan Removal

1. Remove the Radiator. Refer to “Radiator Removal” on page 5-42.

2. Unplug the cooling fan connector from the harness connector (Fig. 589).

Fig 589 PICT-3754

3. Lift the cooling fan and shroud assembly out of the bottom radiator plate (Fig. 590).

Fig 590 PICT-3755

4. Remove the 4 bolts, washers and nuts securing the cooling fan to the shroud (Fig. 591).

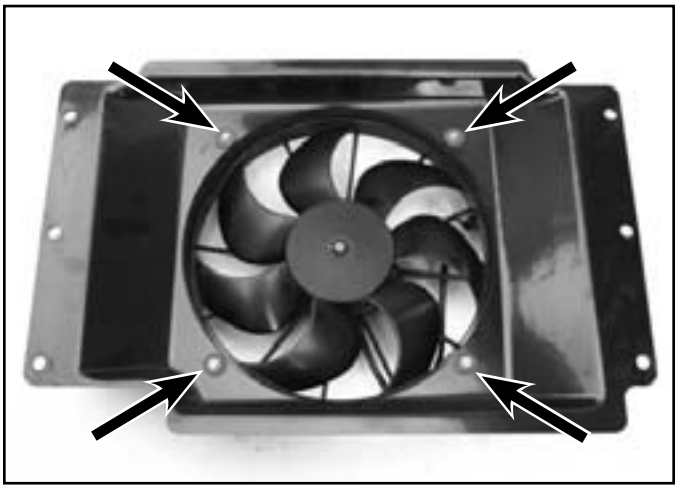

Fig 591 PICT-3756

5. Remove the cooling fan from the shroud (Fig. 592).

Fig 592 PICT-3758

Cooling Fan Installation

1. Position the cooling fan to the back side of the shroud. Position the fan onto the shroud as shown (Fig. 593).

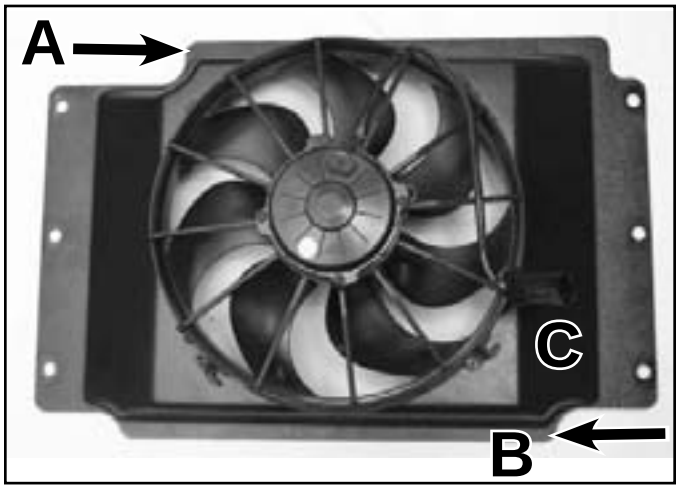

Fig 593 PICT-3760a

A. Front of the machine side with large flange and cut-out
B. Rear of the machine
C. Fan plug location

2. Install 4 bolts, washers and nuts securing the cooling fan to the shroud (Fig. 594).

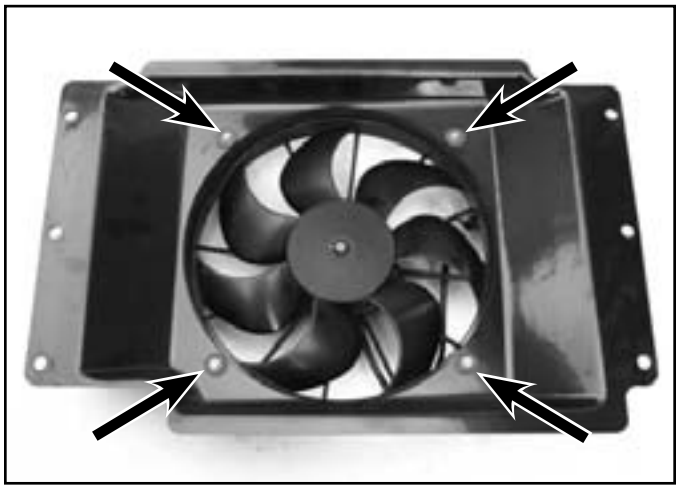

Fig 594 PICT-3756

3. Position the cooling fan and shroud assembly into the bottom radiator plate (Fig. 595).

Fig 595 PICT-3755

4. Plug the cooling fan connector into the harness connector (Fig. 596).

Fig 596 PICT-3754

5. Install the Radiator. Refer to “Radiator Installation” on page 5-46.

Air Cleaner Replacement

Air Cleaner Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Remove the front engine panel (Fig. 597).

Fig 597 IMG_7895

5. Raise the hood assembly (Fig. 598).

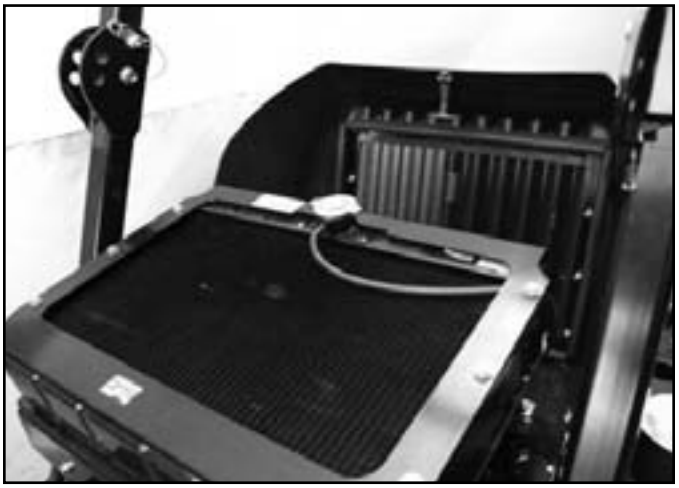

Fig 598 PICT-3729

6. Remove the bottom cover and air cleaner element from the air cleaner assembly (Fig. 599).

Fig 599 PICT-3866

7. Remove the 2 bolts, washers and nuts securing the air cleaner mounting bracket to the frame (Fig. 600).

Fig 600 PICT-3824

8. Loosen the hose clamp securing the engine intake hose to the air cleaner (Fig. 601).

Fig 601 PICT-3825

9. Push the air cleaner intake hose out of the R-clamp (Fig. 602).

Fig 602 PICT-3845

10. Remove the air cleaner/hose assembly (Fig. 603).

Fig 603 PICT-3852

11. Loosen the hose clamp securing the intake hose to the air cleaner (Fig. 604).

Fig 604 PICT-3867

12. Remove the air cleaner intake hose from the air cleaner (Fig. 605).

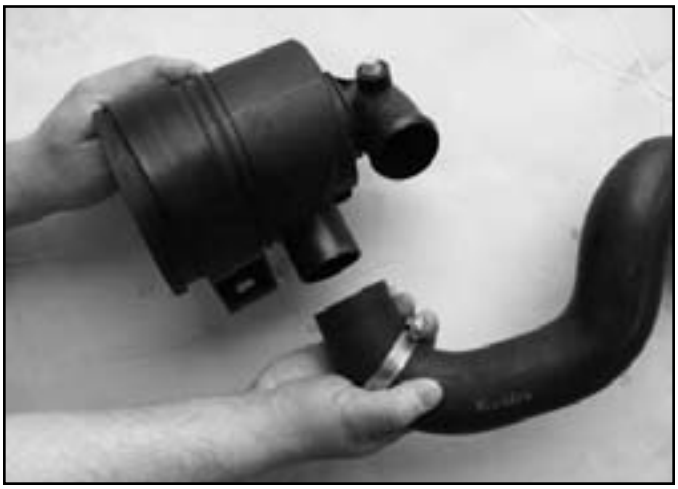

Fig 605 PICT-3868

Air Cleaner Installation

1. Slide the air cleaner intake hose onto the air cleaner (Fig. 606).

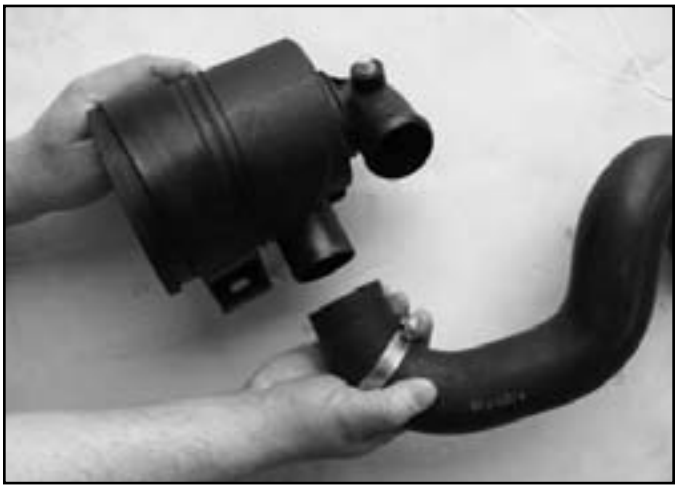

Fig 606 PICT-3868

2. Position the hose clamp and tighten (Fig. 607).

Fig 607 PICT-3867

3. Position the upper half of the air cleaner and hose assembly up to the left side of the engine (Fig. 608).

Fig 608 PICT-3848

4. Slide the air cleaner intake hose into the R-clamp located behind the seat (Fig. 609).

Fig 609 PICT-3845

5. Slide the engine intake hose onto the air cleaner. Position the hose clamp and tighten (Fig. 610).

Fig 610 PICT-3825

6. Install 2 bolts, washers and nuts securing the air cleaner mounting bracket to the frame (Fig. 611).

Note: There is a washer against the bolt head and one against the nut.

Fig 611 PICT-3824

7. Install the air cleaner element and bottom cover onto the air cleaner assembly (Fig. 612).

Fig 612 PICT-3866

8. Install the negative battery cable to the battery.
9. Install the front engine panel (Fig. 613).

Fig 613 IMG_7895

10. Lower the hood assembly.
11. Lower the seat.

Alternator Belt Replacement

Alternator Belt Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Remove the 3 bolts, washers and nuts securing right side top brace frame and radiator support. Remove the right side top brace (Fig. 614).

Fig 614 PICT-3421

5. Remove the nut from the bolt securing the right guard strap to the frame and radiator support. Remove the right fan guard (Fig. 615).

Fig 615 PICT-3432a

6. Remove the 2 bolts, washers and nuts securing the right side guard strap to the frame and radiator support. Remove the guard strap (Fig. 616).

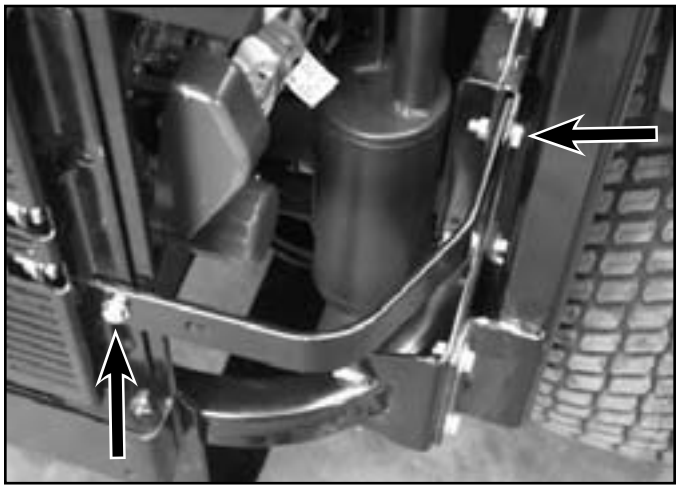

Fig 616 PICT-3775

7. Remove the 2 bolts, washers and nuts securing the left side of the cooler shield to the rear radiator support (Fig. 617).

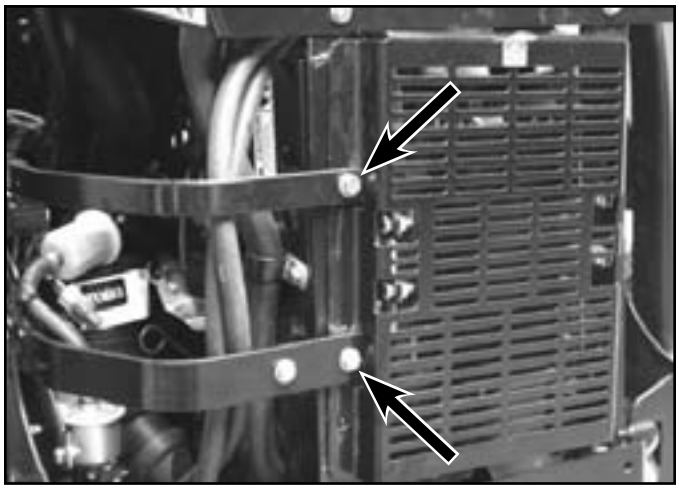

Fig 617 PICT-3808

8. Remove the cooler shield (Fig. 618).

Fig 618 PICT-3781

9. Remove the 4 bolts, washers and nuts securing the oil cooler to the rear radiator support. Lower the oil cooler out of the way of the alternator belt (Fig. 619).

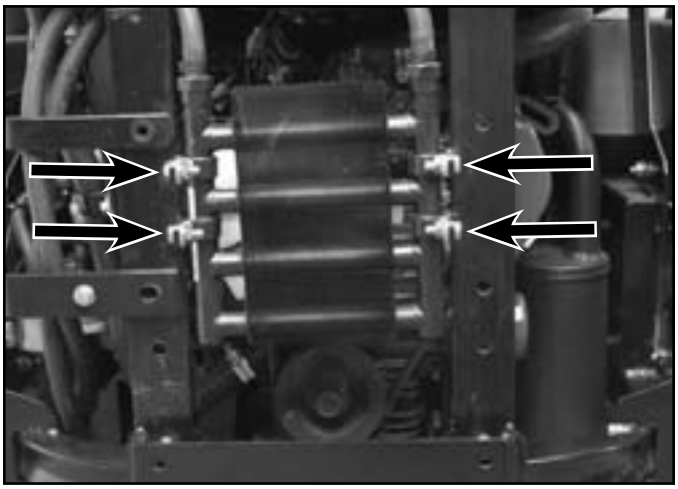

Fig 619 PICT-3792a

10. Remove the 2 bolts securing the fan and retainer plate to the engine (Fig. 620).

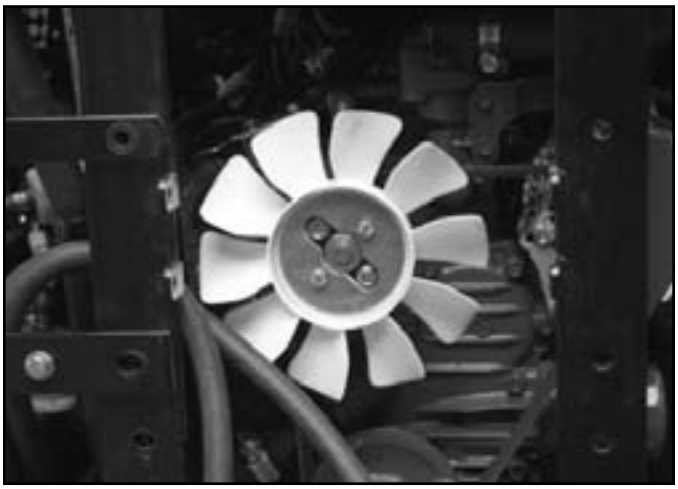

Fig 620 PICT-3794a

11. Remove the retainer and fan (Fig. 621).

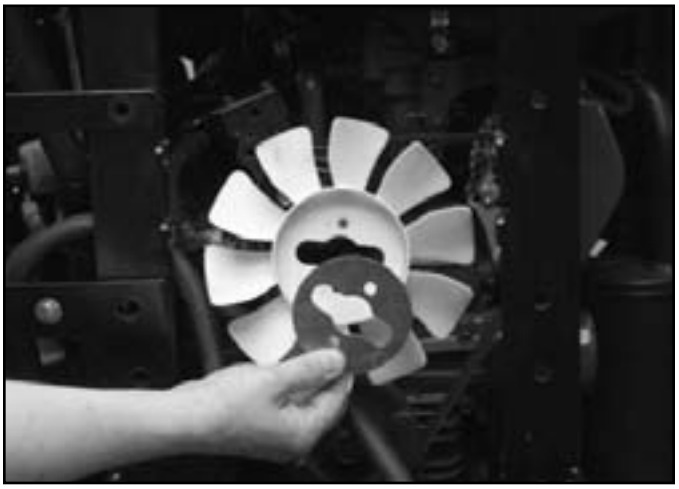

Fig 621 PICT-3795a

12. Loosen the bottom bolt and remove the upper bolt securing the alternator and belt cover (Fig. 622).

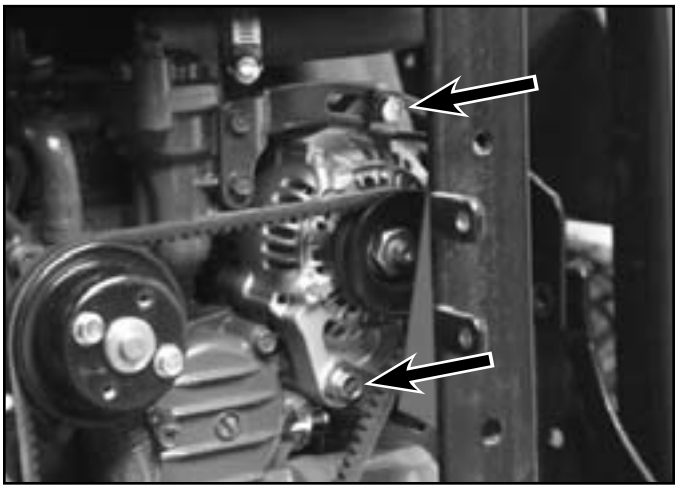

Fig 622 PICT-3797

13. Rotate the belt cover to the side and remove the belt from the pulleys and alternator (Fig. 623).

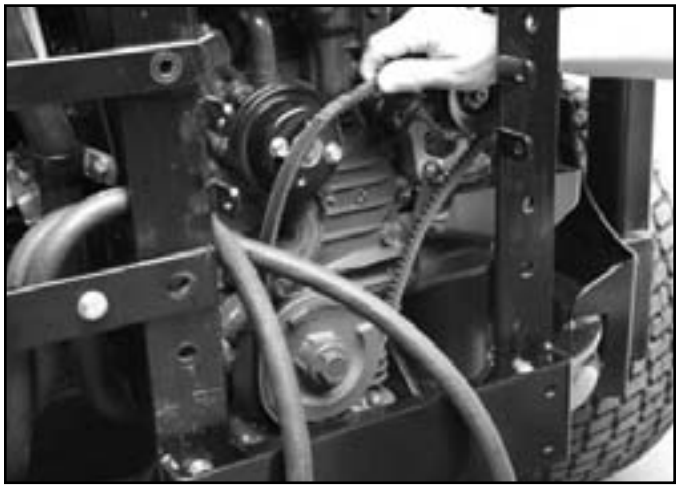

Fig 623 PICT-3799

Alternator Belt Installation

1. Route the alternator belt around the pulley and the alternator (Fig. 624).

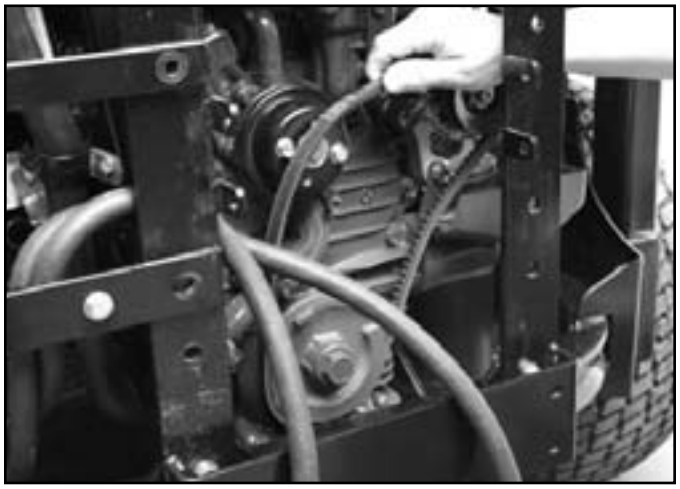

Fig 624 PICT-3799

2. Position the belt cover and install the upper bolt to secure. Tighten the bottom bolt (Fig. 625).

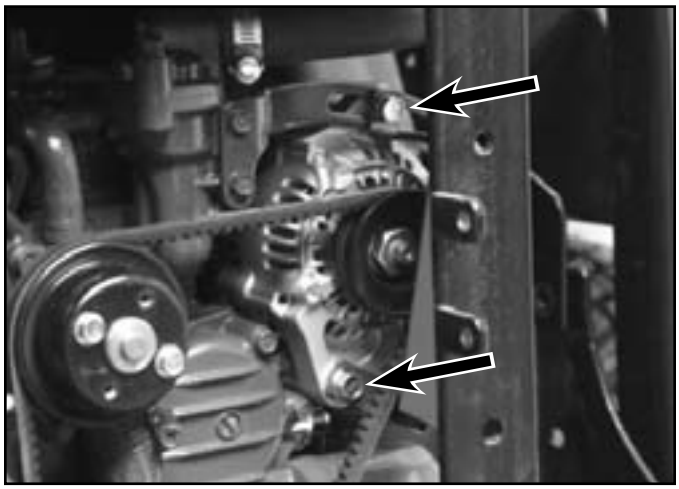

Fig 625 PICT-3797

3. Check the alternator belt tension. Refer to “Checking Alternator Belt Tension” on page 5-61.

4. Position the fan and retainer plate (Fig. 626).

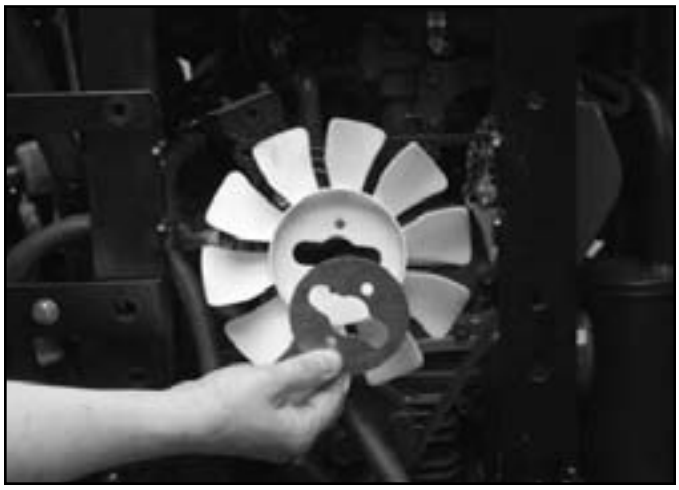

Fig 626 PICT-3795a

5. Install 2 bolts securing the fan and retainer plate to the engine (Fig. 627).

Fig 627 PICT-3794

6. Position the oil cooler assembly to the rear radiator support. Install 4 bolts, washers and nuts to secure oil cooler to the rear radiator support (Fig. 628).

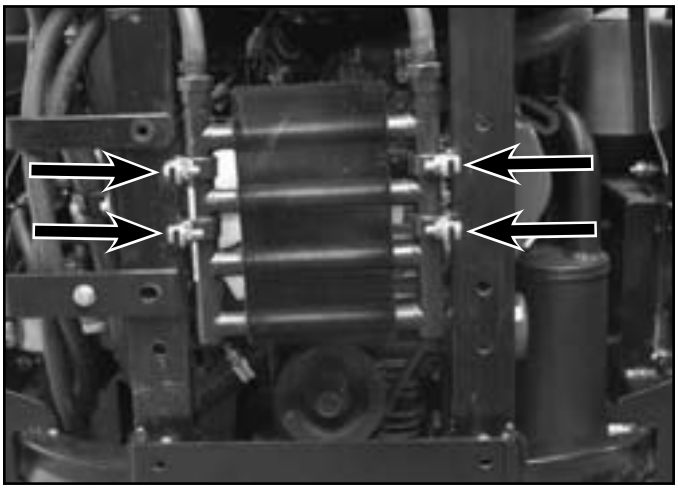

Fig 628 PICT-3792a

7. Position the cooler shield so the left flange is between the left hand straps and the rear radiator support (Fig. 629).

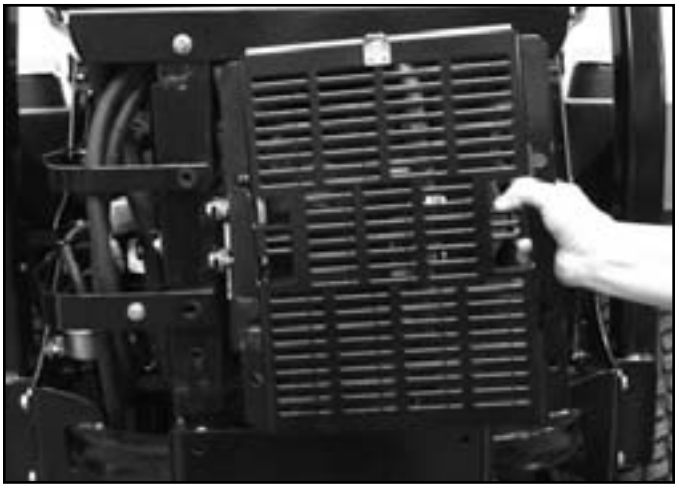

Fig 629 PICT-3781

9. Position the right hand guard strap. Install 2 bolts, washers and nuts securing right side guard strap to the frame and radiator support (Fig. 631).

Fig 631 PICT-3775

8. Install 2 bolts, washers and nuts securing the left side of the cooler shield and left fan guard to the rear radiator support (Fig. 630).

Fig 630 PICT-3808

10. Position the right hand fan guard and install the bolt washer and nut securing the right hand strap and fan guard to the rear radiator strap (Fig. 632).

Fig 632 PICT-3432a

11. Position the right hand top brace. Install 3 bolts, washers and nuts securing the right hand top brace to the frame and rear radiator support (Fig. 633).

Fig 633 PICT-3421

12. Install the negative battery cable to the battery.

13. Lower the seat.

Checking Alternator Belt Tension

1. Check the tension of the alternator belt. There should be 1/4” to 11/32” deflection in the belt between the engine and alternator pulleys with 22.1 lbs. of force (10kgf) (Fig. 634).

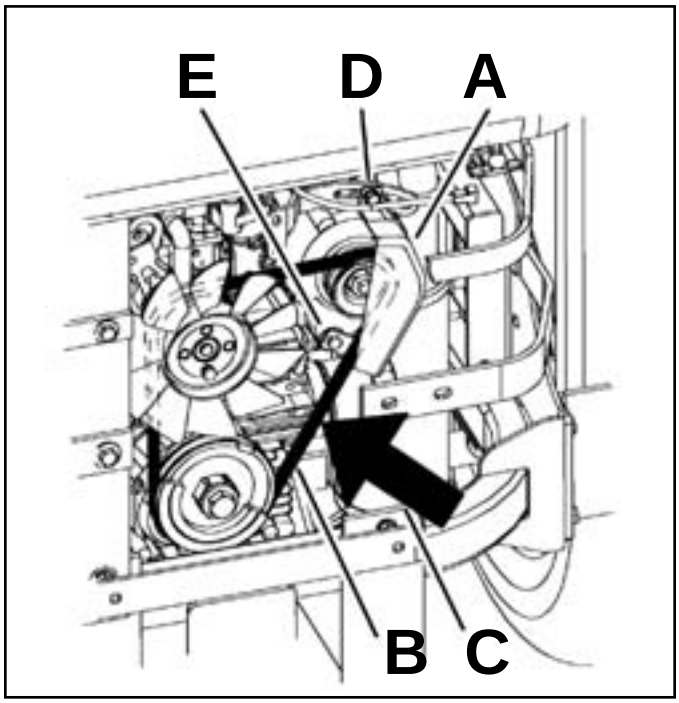

Fig 634 fig. 61 G000968

A. Alternator
B. Alternator belt
C. Deflection, 1/4” to 11/32” (7 to 9mm) with 22.1 lbs. of force (10kgf)
D. Top bolt
E. Bottom bolt

2. If the belt tension needs adjustment, refer to “Tensioning the Alternator Belt” on page 5-62.

Tensioning the Alternator Belt

1. Slightly loosen the bottom alternator bolt. Loosen the top alternator bolt (Fig. 635).

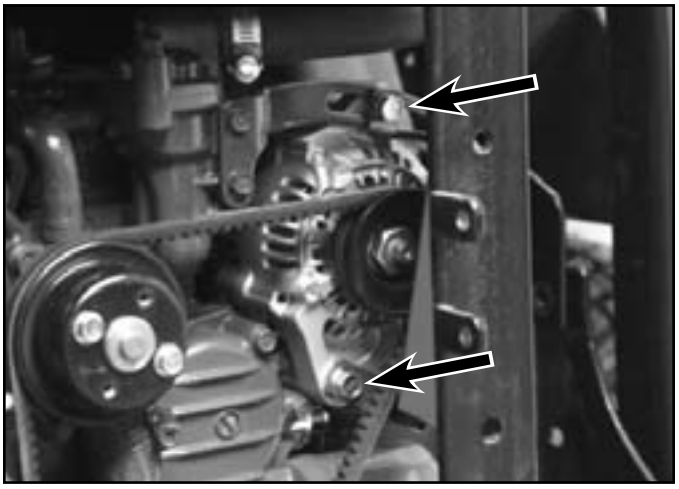

Fig 635 PICT-3797

2. Using a wooden handle or pry bar to pivot the alternator away, from the engine block, tension the drive belt until there is 1/4” to 11/32” (7 to 9mm) deflection in the belt between the engine and the alternator pulleys with 22.1 lbs. of force (10 kgf) (Fig. 636).

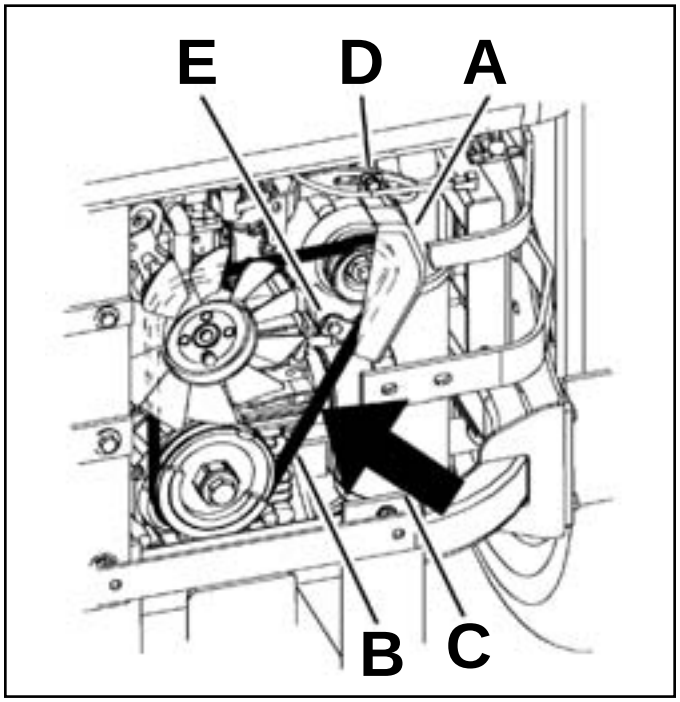

Fig 636 fig. 61 G000968

A. Alternator
B. Alternator belt
C. Deflection, 1/4” to 11/32” (7 to 9mm) with 22.1 lbs. of force (10kgf)
D. Top bolt
E. Bottom bolt

3. Tighten the top and bottom alternator bolt (Fig. 637).

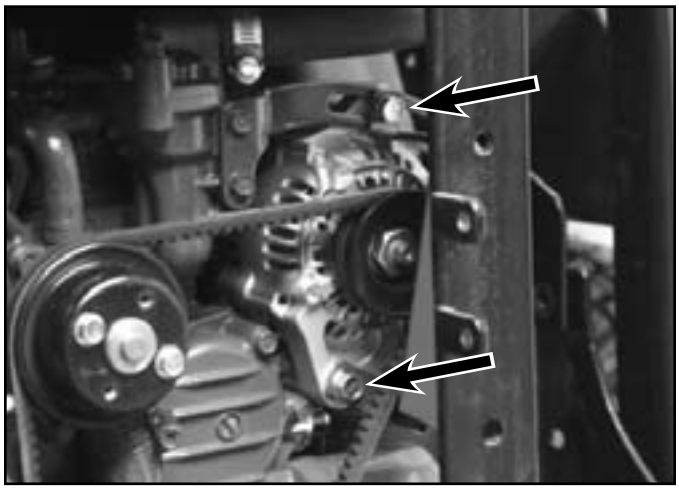

Fig 637 PICT-3797

4. Check the deflection in the belt again. Adjust the alternator as needed.

Fuel Filter Service

Models through 2007: the fuel system includes 2 replaceable, in-line fuel filters (15 micron). Both fuel filters should be replaced at the same time.

2008 and later Models: the fuel system includes 1 replaceable, in-line fuel filter and one fuel/water separator.

Models through 2007: 2 replaceable in-line fuel filters (Fig. 638).

Fig 638 PICT-3814

Note: Arrow on filter shows direction of fuel flow (Fig. 639).

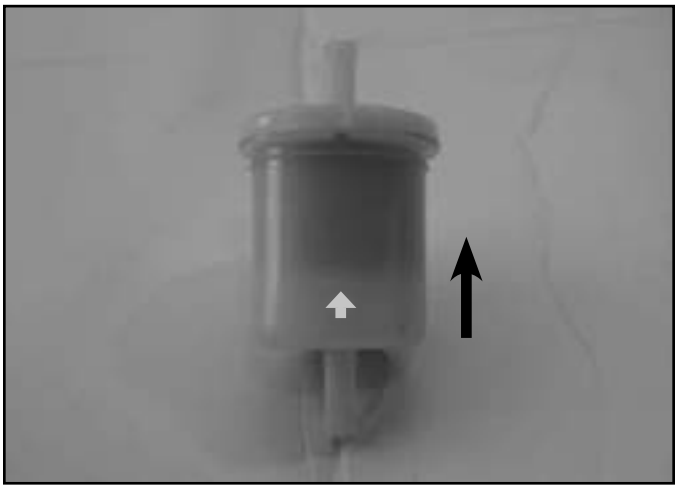

Fig 639 PICT-3819a

2008 and later Models: 1 replaceable in-line fuel filter and 1 fuel/water separator (Fig. 640).

Fig 640 IMG_8107

Fuel Filter Replacement

1. Disengage the PTO, move the motion control levers to the neutral locked position and set the parking brake.
2. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.
3. Allow the machine to cool down.
4. Close the fuel shut-off valve (Fig. 641).

Fig 641 PICT-3810

5. Loosen the two hose clamps and disconnect the fuel lines from the fuel filter (Fig. 642).

Fig 642 PICT-3812

6. Install a new filter. Note directional arrow embossed in the side of the filter (Fig. 643).

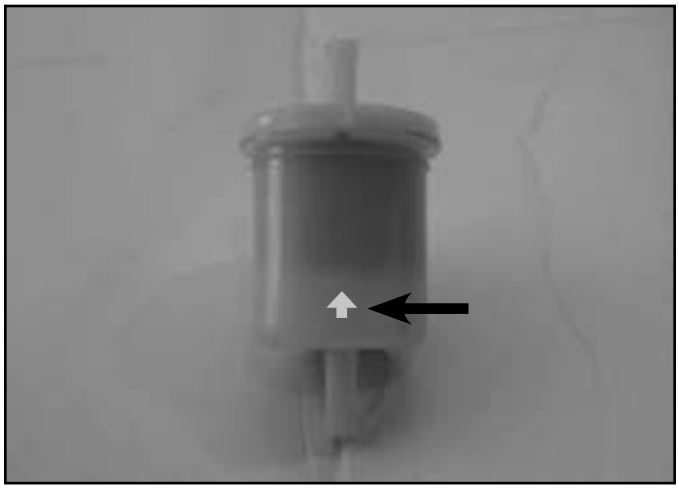

Fig 643 PICT-3819

7. Connect the fuel lines to the fuel filter so that the fuel flows through the filter in the direction of the arrow on the side of the filter housing. Slide the hose clamps into position and tighten (Fig. 644).

Fig 644 PICT-3812

8. Repeat process for second filter (2007 and prior models).

9. Open the fuel shut-off valve.

10. Start the engine and check for leaks.

Draining the Water Separator

1. Position the machine on a level surface.
2. Disengage the PTO, move the motion control levers to the neutral locked position and set the parking brake.
3. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.
4. Locate the water separator at the back left of the machine.
5. Place a drain pan below the water separator.
6. Open the drain valve on the water separator approximately one turn to allow water and other contaminates to drain (Fig. 645).
7. Close the drain valve when only diesel fuel comes out (Fig. 645).

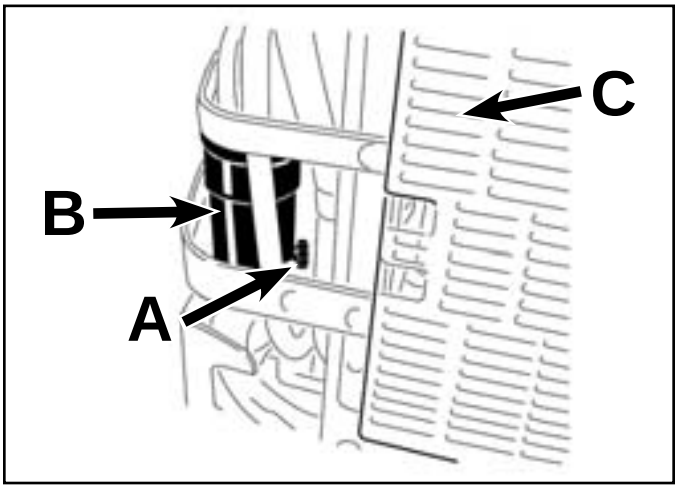

Fig 645 fig. 42 G007169

A. Drain valve
B. Water separator
C. Back of machine

Checking the Radiator Coolant

Note: Do not open the radiator cap. Doing this may introduce air into the cooling system.

1. Position the machine on a level surface, stop the engine, and set the parking brake.
2. Raise the seat.
3. With the engine cool, check the overflow bottle level. The fluid needs to be up to the indicator line (bump) on the outside of the overflow bottle (Fig. 646).
4. If the coolant level is low, add a 50/50 mix of extended life antifreeze/Dex-Cool® and water to the overflow bottle. Fill the overflow bottle to the indicator line on the bottle (Fig. 646).

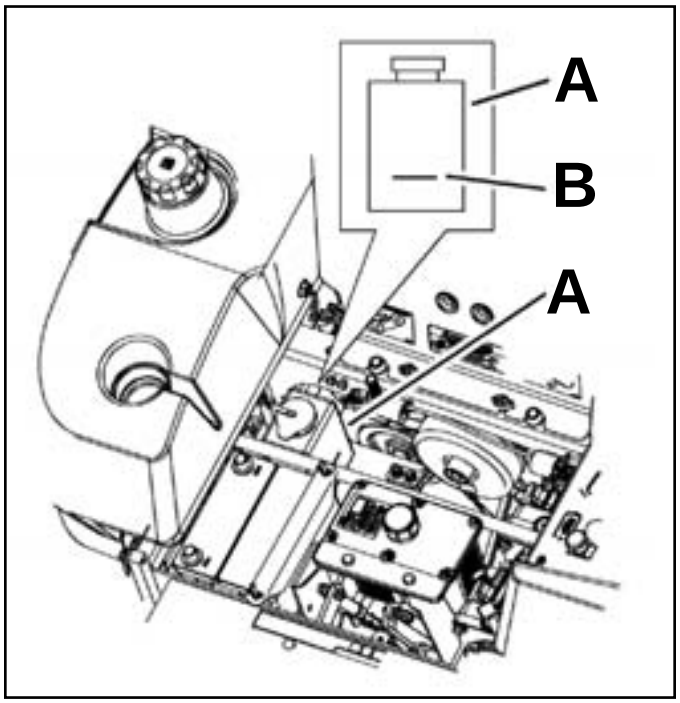

Fig 646 fig. 51 G001103

A. Antifreeze overflow bottle
B. Indicator line on side of overflow bottle

General

Note: Interactive Electrical Troubleshooting DVD, Form No. 492-9171 is also available.

Engine Starting

Turn the ignition switch to the RUN position, push the glow plug switch for 10 seconds. The light will turn on. Release the switch after 10 seconds. The light will turn off. Turn the key to the start position and the glow plug indicator light will come back on. When the engine starts, release the key.

Important: Use starting cycles of no more than 30 seconds per minute to avoid overheating the starter motor.

If the engine does not start immediately, move the throttle control to fast and turn the key to the start position.

Note: Additional starting cycles may be required when starting the engine for the first time after the fuel system has been completely without fuel.

Current flows from the ignition switch to the PTO switch. It moves on to the brake switch, the two neutral motion control switches, the fuel solenoid and finally to the engine starter. Current flow branches from the two neutral motion control switches and goes to the start relay and the glow plug relay, which activate the starter solenoid and glow plugs.

Relays

There are 3 relays:
1. Glow Relay (furthest forward)
2. Start Relay
3. Fan Relay

Purpose

Glow Relay: Once the safety connections are made, the relay will activate and provide current to the glow plugs and oil pressure relay.

Start Relay: Once the safety connections are made, the relay will activate completing the circuit to the starter solenoid.

Fan Relay: Once the engine has started the oil pressure switch closes and completes the grounding of the fan relay to allow current to operate the radiator fan.

Location

The 3 relays are located to the left of the engine attached to the top support strap (Fig. 647).

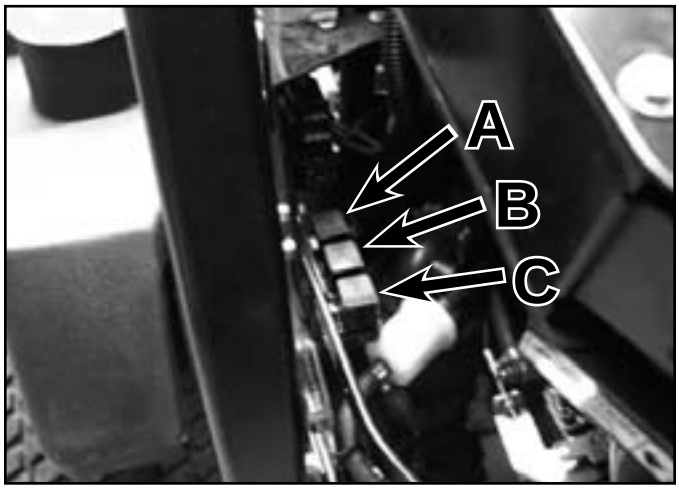

Fig 647 PICT-4130

A. Glow Relay (furthest away)
B. Start Relay (middle)
C. Fan Relay (closest)

How It Works

A relay is an electrically actuated switch.

1. **Coil:** Terminals 85 and 86 are connected to a coil. Applying 12 volts to these terminals energizes the coil turning it into an electromagnet.

2. **Switch:** Terminals 30, 87 and 87a are actually part of a single pole, double throw (SPDT) switch. Terminal 30 is the common lead. The switch is spring loaded so that 30 and 87a are connected when the coil is not energized. When the coil is energized, the switch is “thrown” and 30 and 87 are connected (Fig. 648).

Fig 648 CLR DSC-2517

Testing

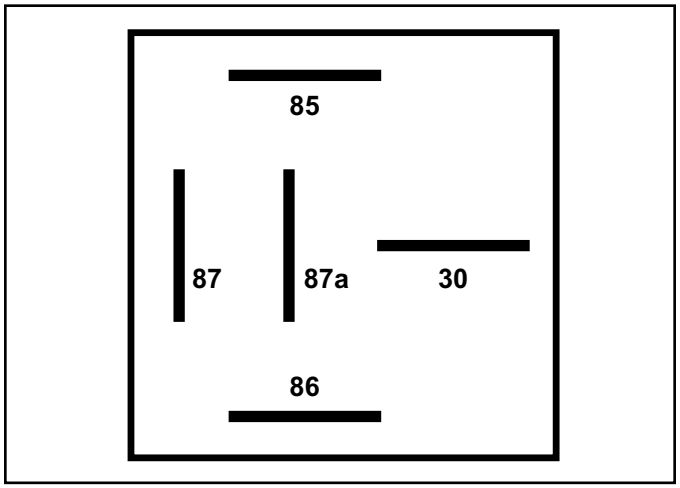

Fig 649 relay pin diagram

1. Disconnect the relay from the harness.

2. Verify the coil resistance between terminals 85 and 86 with a multimeter (ohms setting). Resistance should be from 70 to 90 ohms. There should be continuity between terminals 87a and 30.

3. Connect multimeter (ohms setting) leads to relay terminals 30 and 87. Ground terminal 86 and apply +12 VDC to 85. The relay should make and break continuity between terminals 30 and 87 when 12 VDC is applied and removed from terminal 85.

4. Connect multimeter (ohms setting) leads to relay terminals 30 and 87a. Apply +12 VDC to terminal 85. With terminal 86 still grounded, the relay should break and make continuity between terminals 30 and 87a as 12 VDC is applied and removed from terminal.

5. Disconnect voltage and multimeter leads from relay terminals (Fig. 650).

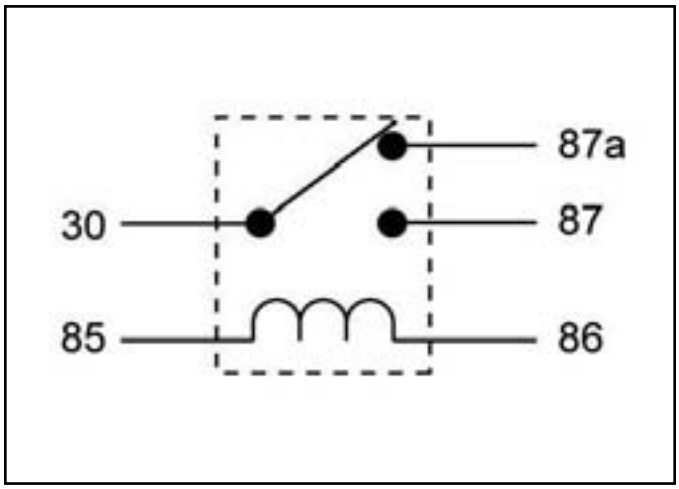

Fig 650 xl relay

PTO Switch

Purpose

The PTO (Power Take Off) switch is typically used to activate the Electric PTO Clutch and to function as part of the safety interlock system.

Location

The PTO switch is located on the control panel, on the left side of the operator (Fig. 651).

Fig 651 PICT-4133

How It Works

Contacts inside the switch electrically connect various terminals in both “On” and “Off” position. When the PTO is pulled out to the ON position, current flows to the electric clutch and it engages. When the switch is pushed in to OFF position, current flows through the PTO switch to the Park Brake switch as part of the circuit used to ensure safe starting.

Testing

1. Disengage the PTO, set the parking brake, and turn the ignition to OFF and remove the key.
2. Remove the 4 screws holding the control panel to the fuel tank.
3. Disconnect the wiring harness from the PTO switch.
4. Press in the locking tabs, on each side of the switch, and pull the switch out of the control panel.
5. Verify that there is continuity between the appropriate terminals in the ON and OFF positions (Fig. 652).

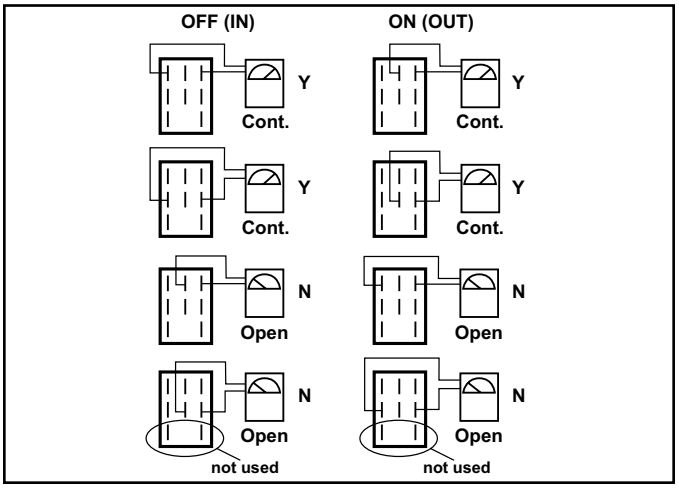

Fig 652 PTO switch test

6. Replace the switch if your test results do not correspond with those given in Fig. PTO switch test.
7. Mount the PTO switch back into the control panel and reinstall the wiring harness (Fig. 653).

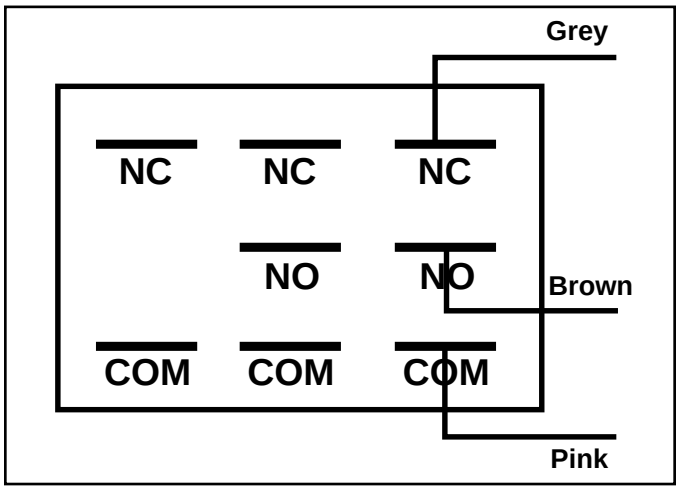

Fig 653 PTO Clutch switch a

Ignition Switch

Purpose

The ignition switch provides the proper switching for the starter, accessories, and safety circuits.

Location

The ignition switch is located on the control panel, to the left side of the operator (Fig. 654).

Fig 654 PICT-4133

How It Works

Detents inside the switch give it 3 positions: OFF, RUN and START. The START position is spring loaded so the cylinder automatically returns to RUN once the key is released (Fig. 655).

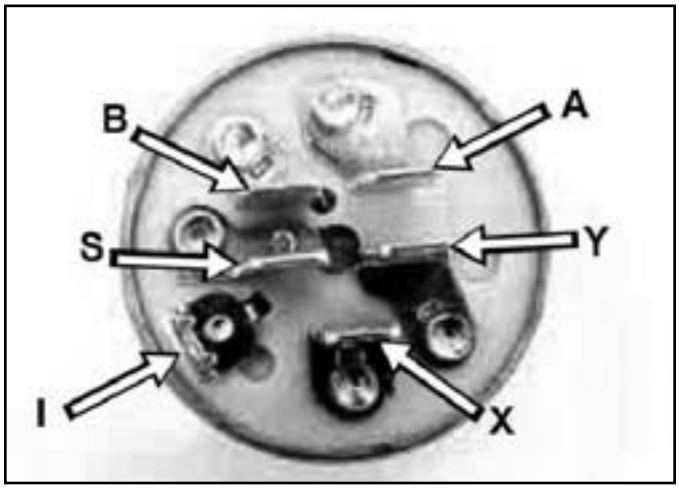

Fig 655 mvc-166

Ignition Switch Wiring Connections
B = Battery voltage “in”
S = Starting Circuit
I = Safety Circuit, Gauges, and Start Circuit
A = Alternator/Charge Circuit
Y = Safety and Start Circuit
X = Safety/Start/Delay Module

Testing

1. Disconnect the switch from the wiring harness.

2. Verify that continuity exists between the terminals listed for the switch position. Verify that there is NO continuity between terminals not listed for the switch position.

OFF	No continuity between terminals
RUN	Continuity - B I A X Y
START	Continuity - B I S

Neutral Safety Switch

Purpose

Used to ensure the motion control handles are in neutral to start the unit. It is actuated by moving the motion control handles to the neutral position (handles outward).

Location

To gain access to the neutral safety switches, remove the front storage pocket. There are 2 neutral switches. One for the right motion control handle and one for the left motion control handle (Fig. 656).

Fig 656 PICT-4139a

How It Works

This single pole plunger (normally open) type switch has two terminals. When the motion control handles are in the neutral position (handles in the out position), it pushes on the plunger, closing the contact and connecting the terminals (Fig. 657).

Fig 657 CLR DSC-2527

Testing

1. Disconnect the switch from the wiring harness.

2. Using a VOM or test light, check first to ensure there is no continuity between the terminals, plunger out.

3. With the plunger pushed in, there should be continuity between the terminals.

Parking Brake Switch

Purpose

The purpose of the parking brake switch is to ensure the machine is in neutral and the parking brake is applied before attempting to start the machine.

Location

The park brake switch is located on the left side, below the left motion control handle (Fig. 658).

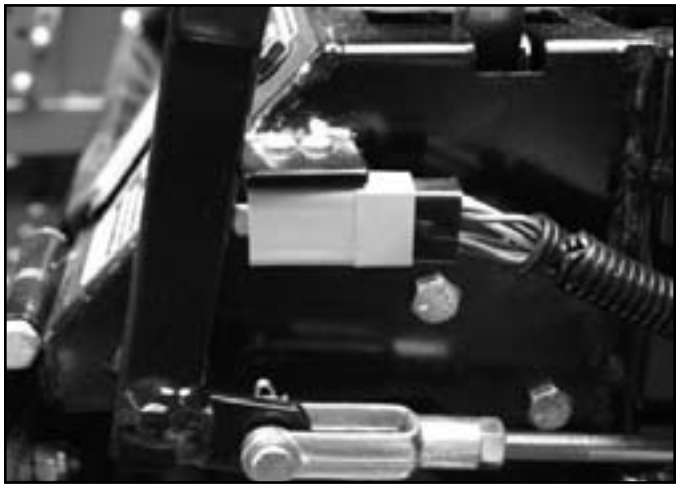

Fig 658 PICT-4141

How It Works

In the start position it is used to ensure the park brake is in the ON position. At the same time it allows current to flow through for safety circuit. When the park brake is released in the OFF position it bypasses both neutral switches, as long as the operator is in the seat to maintain current for the safety circuit (Fig. 659).

Fig 659 CLR DSC-2528

Testing

1. Disconnect the switch from the wiring harness.

The park brake switch is a double pole switch. When the park brake is in the ON position, a pair of closed terminals is part of the starting safety interlock circuit. When the brake is released after starting, the other pair of terminals closes, bypassing the neutral switches and applying power to the seat switch circuit.

2. Using a multimeter, follow the procudures listed below (Fig. 660).

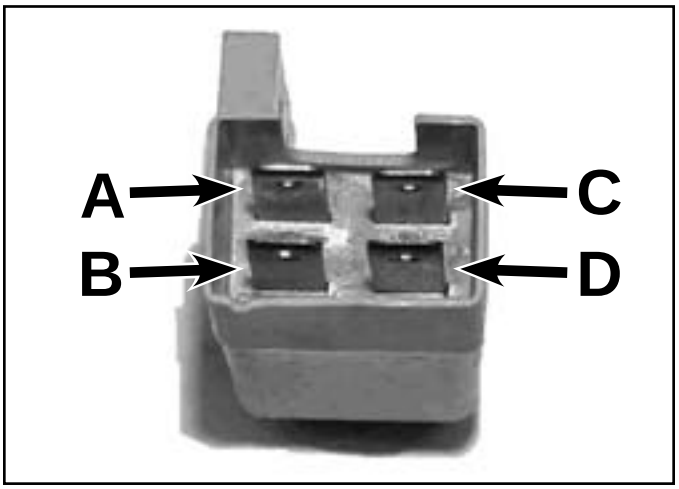

Fig 660 rev brake switch

Plunger Not Depressed	Plunger Depressed
A/B Terminals - Closed Circuit - Continuity	A/B Terminals - Open Circuit - No Continuity
C/D Terminals - Open Circuit - Not Continuity	C/D Terminals - Closed Circuit - Continuity

Seat Switch

Purpose

The seat switch is in the safety circuit. If the engine is running and the operator vacates the seat with either the PTO engaged or the parking brake disengaged, the engine will shut down.

Note: There is a delay module in the system; there will be a slight delay before the engine shuts down after the operator vacates the seat.

Location

The seat switch is located under the seat in the rear right hand corner of the compartment (Fig. 661).

Fig 661 PICT-4144a

How It Works

When the seat is vacated, the switch is open and there should be NO continuity between the two terminals. When the seat is occupied, the swtich closes and there should be continuity between the two terminals (Fig. 662).

Fig 662 PICT-4146a

Testing

1. Disconnect the switch from the wiring harness.
2. Using a VOM or test light, check first to ensure there is no continuity between either terminal, plunger out.
3. With the plunger pushed in, there should be continuity between the terminals.

Delay Module

Purpose

When operating the unit on rough terrain and the operator comes off the seat, the seat delay module will temporarily delay the engine shutting down, preventing erratic engine operation.

Location

The seat delay module is located under the seat assembly behind the storage pocket (Fig. 663).

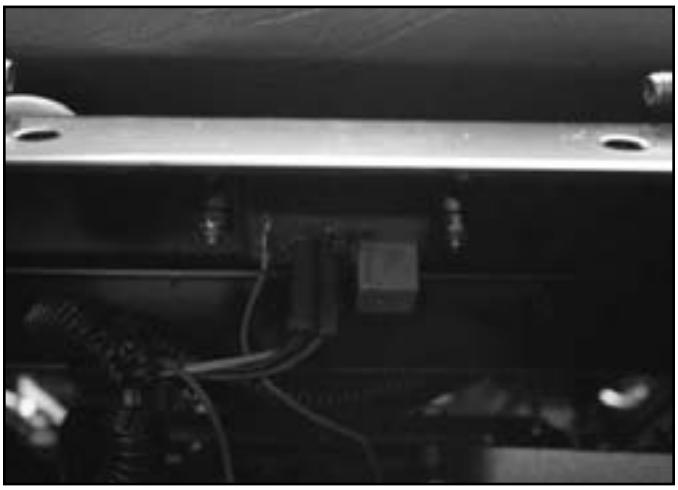

Fig 663 PICT-4150a

How It Works

The seat delay module circuit board is made up of several different electrical components, such as a transient voltage suppressor, capacitor, transistors, carbon film resistors, diodes and a relay. These all work together to supply seat switch temporary voltage to the circuit to keep the engine running in case of short term voltage interruption (Fig. 664).

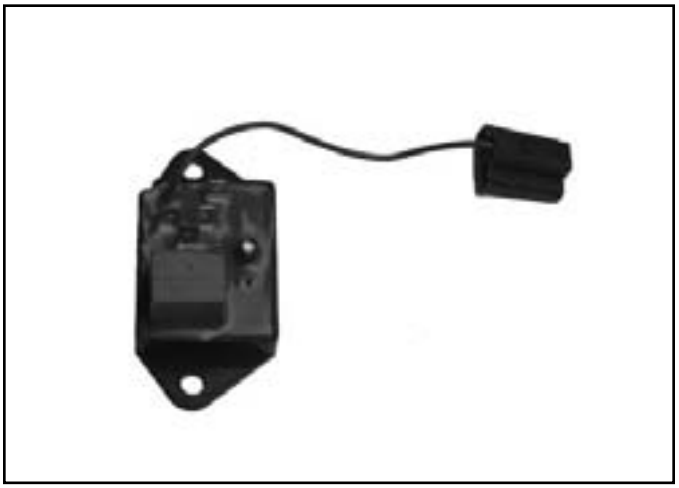

Fig 664 CLR DSC-2532

Testing

1. Raise the seat and disconnect the seat switch. Install a jumper wire in place of the seat switch (Fig. 665).

Fig 665 PICT-4156a

2. Remove the 4 bolts to the control panel and raise the panel.

3. Connect a VOM positive lead to the violet wire on the module (Fig. 666). Connect the negative lead to the battery negative terminal.

Fig 666 PICT-4153

Follow the procedure below to test the delay module function.

1. Disengage the parking brake.
2. Pull the right and left motion control levers out of the neutral position.
3. Turn the ignition key to the RUN position.
4. The meter should read approximately 12 volts DC.
5. Disconnect one of the jumper wire leads. The meter should hold around 12 volts and then read 0 volts DC after approximately 1 to 3 seconds.
6. If you do not get 12 volts DC at the violet wire when turning the ignition switch to the RUN position, verify the following:

   - 12 VDC at the orange wire terminal.
   - 12 VDC at the brown wire terminal.
   - 0 VDC at the black wire terminal.

If all these conditions are met, replace the seat delay module.

High Temperature Audible Alarm (Solid Tone)

Purpose

This machine has an audible alarm that alerts the user to turn off the engine or engine damage can occur from overheating.

Location

The audible alarm is located behind the seal to the left of the front engine access panel (Fig. 667).

Fig 667 PICT-4158

How It Works

A continuous tone will sound when the engine temperature switch connects to ground as the engine reaches a certain temperature (Fig. 668).

Fig 668 CLR DSC-2538

Testing

Connect a positive lead from a 12 volt battery to the + terminal on the back of the audible alarm. Connect the negative lead to the S terminal on the back of the audible alarm. The alarm should emit a continuous tone.

Temperature Sender

Purpose

The temperature sender is a temperature-dependent variable resistor. As the coolant temperature increases, the internal resistance decreases. This causes a change in voltage applied to the water temperature gauge, which indicates a higher temperature.

Location

The temperature sender is located on the top of the engine block on the front end of the engine (Fig. 669).

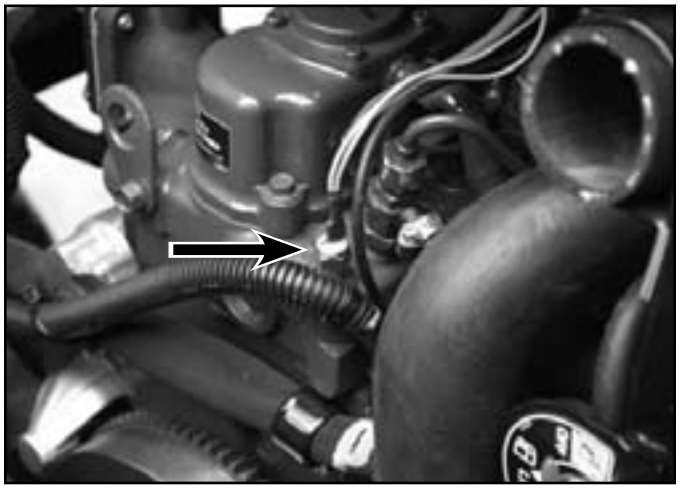

Fig 669 PICT-4163

How It Works

When the water temperature reaches an excessive operating temperature the switch will close internally and ground the high temperature audible alarm. This completes the alarm circuit and the alarm sounds (Fig. 670).

Fig 670 PICT-4161a

Testing

It is not practical to test the switch in a shop environment. The temperature switch closes at 230º F (110º C).

Oil Pressure Switch

Purpose

The oil pressure switch completes the circuit that activates the hour meter and the radiator fan relay.

Location

The oil pressure switch is located on the right side of the engine under the alternator (Fig. 671).

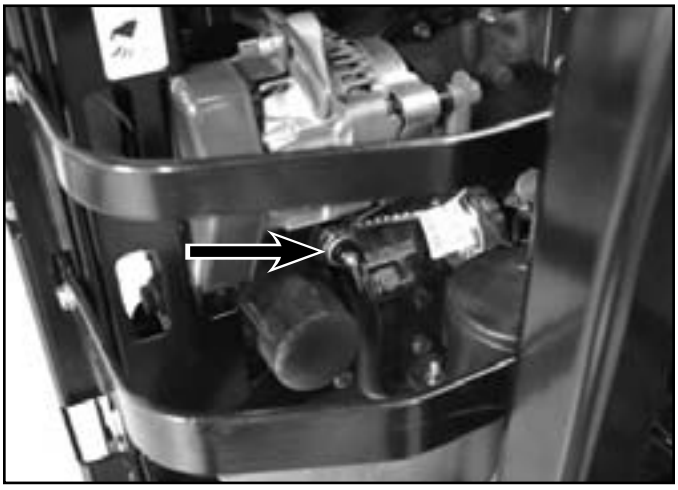

Fig 671 PICT-4164

6

How It Works

When the engine oil pressure builds the switch closes to complete the circuit for both the hour meter and the cooling fan relay (Fig. 672).

Fig 672 PICT-4165a

Testing

The switch can be tested with an ohmmeter. There should be no continuity between the wire terminal and ground with the engine not running. There should be continuity between the wire terminal and ground when the engine is running.

High Temperature & Glow Plug Light Cluster

Purpose

There are two purposes for this light cluster:

1. In addition to the high temperature audible alarm, there is an accompanying light for visual representation of high temperature. It is a red LED light.

2. The glow plug indicator light turns on when the glow plug switch is engaged. It is an amber light.

Location

The high temperature and glow plug light cluster is located on the control panel on the left side of the operator position (Fig. 673).

Fig 673 PICT-4133

How It Works

The high temperature light is connected in parallel with the high temperature audible alarm. The light gives a visual indicator that the engine has reached a high temperature.

The glow plug light comes on when the glow plug relay is activated by the glow plug switch (Fig. 674).

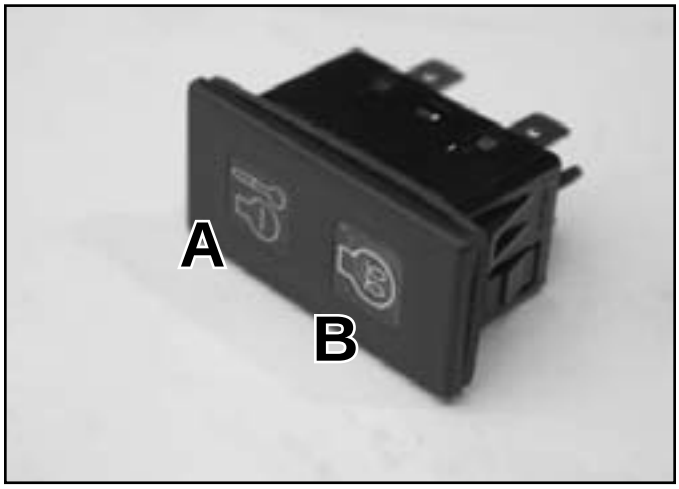

Fig 674 PICT-4167a

A. High temperature light B. Glow plug light

Testing

The indicator lights can be tested with the diode tester or a multi-meter. When testing the indicator lights, the diode tester will show a reading in only one direction when connected to the light terminals.

Glow Plug Switch

Purpose

The glow plug switch activates the glow plug relay in addition to turning the glow plug indicator light on.

Location

The glow plug switch is located on the control panel on the left side of the operator position (Fig. 675).

Fig 675 PICT-4133

How It Works

The glow pug switch is manually depressed and held in place for 10 seconds. This activates the relay that closes the circuit which sends current to the glow plugs.

Testing

Only terminals 1 and 2 are used in this application. The switch can be tested with an ohmmeter. There should be no continuity between terminals 1 and 2. When the switch is depressed, there is continuity between terminals 1 and 2 (Fig. 676).

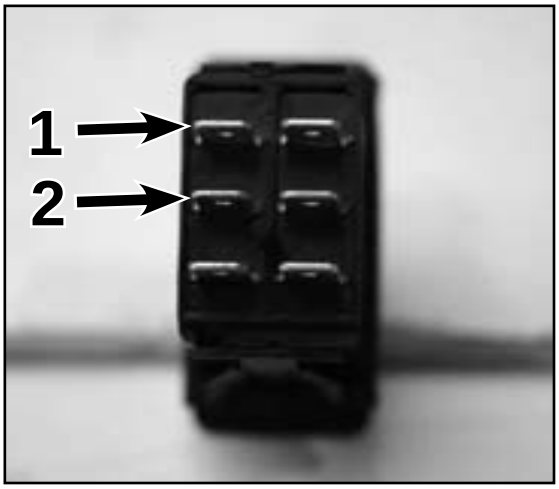

Fig 676 PICT-4176

Hour Meter

Purpose

The hour meter keeps track of the actual engine running hours.

Location

The hour meter is positioned on the control panel which is located on the left side of the operator position (Fig. 677).

Fig 677 PICT-4133

How It Works

The hour meter is made up of an electric “winder” and a mechanical clock movement. When power is applied, a coil is energized to wind the movement. The movement unwinds in about 2 seconds. As it finishes its rotation, it re-energizes the coil so that the cycle can start over (Fig. 678).

Fig 678 CLR DSC-2560

Testing

Verify that 12 volts DC is present across the two terminals when the engine is running. If there is no continuity, replace the hour meter. The meter is a permanently sealed unit and is not repairable.

Electric PTO Clutch

There are two different electric PTO clutches:

- 2007 and prior models have a Warner clutch.
- 2008 and later models have an Ogura clutch.

Purpose

The electric clutch controls the engagement and disengagement of the Power Take-off (PTO) pulley.

Location

The electric PTO clutch is located on the flywheel end of the crankshaft (Fig. 679).

Note: The photo shows a Warner clutch installed.

Fig 679 PICT-4187

How It Works

The PTO clutch is composed of three major components; the field, the clutch plate, and the friction plate. The clutch plate always turns with the engine. The field is a coil of wire wound around an iron core, which acts like an electromagnet when power is applied. The friction plate is the only piece that can slide inward and outward on the crankshaft axis. It is spring loaded away from contact with the clutch plate. When the clutch is not energized, the clutch plate rests against the brake material opposite the clutch plate. When energized the friction plate is drawn into the clutch plate magnetically and the two rotate as one component.

Testing

1. Disengage the PTO, set the parking brake, turn the ignition to the “off” position and remove the ignition key. Disconnect negative battery cable.
2. Disconnect the clutch harness from the main harness.
3. Set the multimeter or volt/ohm meter to check resistance (ohms).
4. Connect the meter lead wires to the clutch wires as shown (Fig. 680).

Fig 680 IMG_8116

5. The meter should read:
   Warner clutch: 1.0 – 2.7 ohms,
   Ogura clutch: 2.4 ohms

If the reading is above or below these readings, the field has failed and needs to be replaced. If the reading falls within the specified resistance, measure clutch coil continuity (see below).

Clutch Coil Continuity Test

This test can be performed the same way on both the Warner and Orgura clutches.

1. Disengage PTO.
2. Raise the seat and disconnect the negative battery cable from the battery.
3. Unplug the harness connector from the clutch (Fig. 681).

Fig 681 PICT-3933

4. Using a continuity tester, touch one tester lead to one of the clutch terminals and the other lead to the clutch housing.

5. If the tester shows a resistance reading, the field has failed and needs to be replaced.

Engine Stop Solenoid

Purpose

The engine stop solenoid stops fuel flow from the injector pump when the key is turned to the Off position.

Location

The engine stop solenoid is located on the lower left side of the engine (Fig. 682).

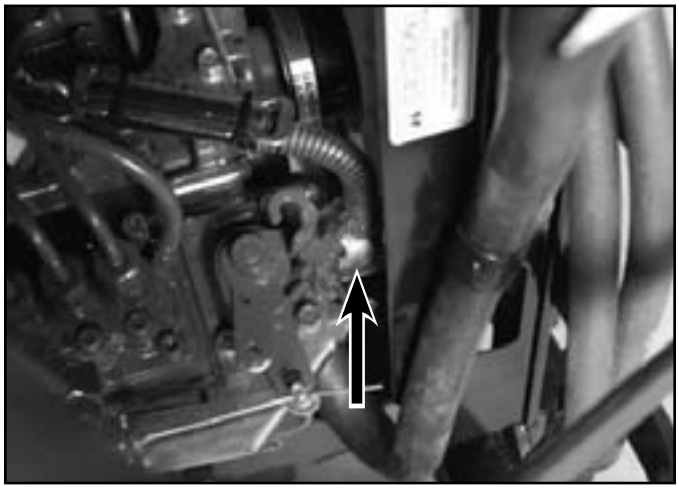

Fig 682 PICT-4194a

How It Works

The ignition switch removes power to the stop solenoid when the key is turned to the Off position, the plunger of the solenoid cuts off fuel flow to the fuel injectors and the engine stops.

Testing

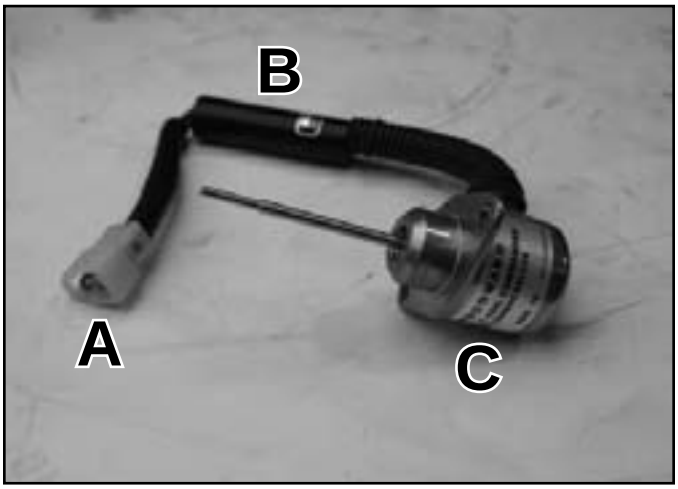

Fig 683 PICT-4182

A. Connector
B. Timer module
C. Stop solenoid

Pull Coil Terminal Test

This test checks both the pulling coil and pulling coil timer module (Fig. 684).

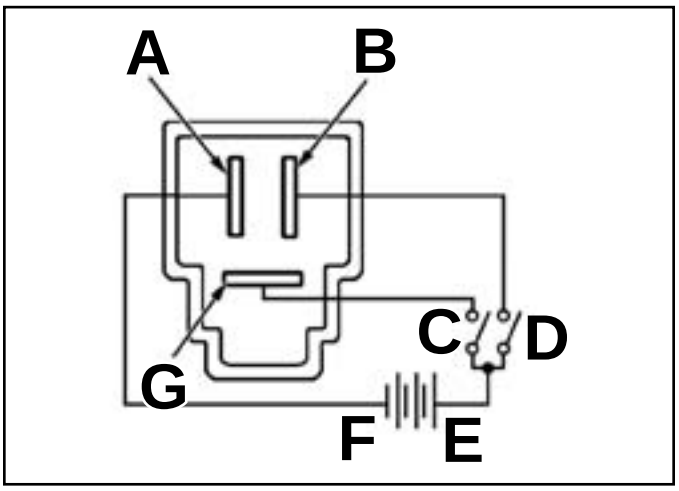

Fig 684 3EEACAB1P007A

A. Ground
B. Holding Coil Terminal
C. Switch for Pulling Coil
D. Switch for Holding Coil
E. Battery Positive
F. Battery Negative
G. Pulling Coil Terminal

6

1. Disconnect the 3 terminal connector from the engine stop solenoid wiring harness.
2. Remove the engine stop solenoid from the engine.
3. Connect a jumper lead from the pull coil (G) terminal to the positive battery terminal.
4. Connect a jumper lead from the ground (A) terminal to the negative battery terminal.

The plunger should retract into the solenoid body. With the jumpers still connected to the battery terminals, the plunger should extend out of the solenoid body in approximately 1.2 seconds. If the plunger does not retract and then extend, it is faulty.

Hold Coil Terminal Test

This test checks the holding coil.

1. Connect a jumper lead from the ground (A) terminal to the negative battery terminal.
2. Connect a jumper lead from the holding (B) terminal to the positive battery terminal.
3. Connect a jumper lead from the pull coil (G) terminal to the battery positive terminal.

The plunger should pull into the solenoid body. Remove the pull coil terminal (G) from the positive battery terminal. The plunger should remain pulled into the solenoid body. If the plunger does not remain pulled into the solenoid body, the engine stop solenoid is faulty.

Mower Belt Replacement

1. Disengage the PTO, move the motion control levers to the neutral locked position and set the parking brake.

2. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.

3. Raise the floor pan (Fig. 685).

Fig 685 PICT-4011

4. Remove the right hand and left hand belt covers (Fig. 686).

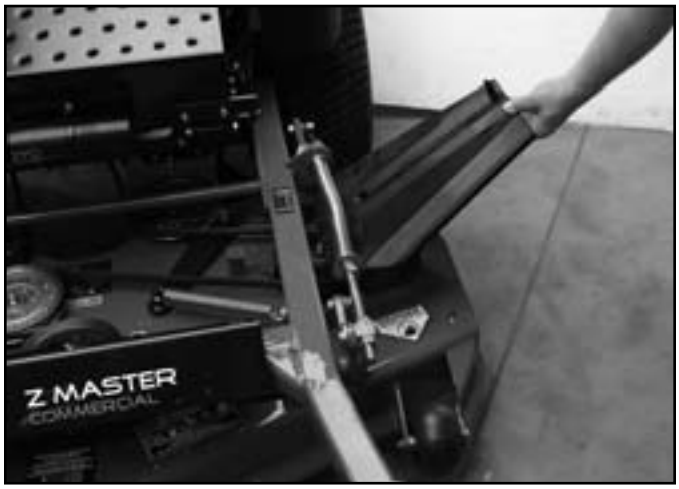

Fig 686 PICT-4012

5. Using a spring removal tool (Toro p/n: 92-5771), remove the mower deck belt idler spring (Fig. 687).

Fig 687 PICT-4013

6. Remove the belt guide from the idler arm pulley (Fig. 688).

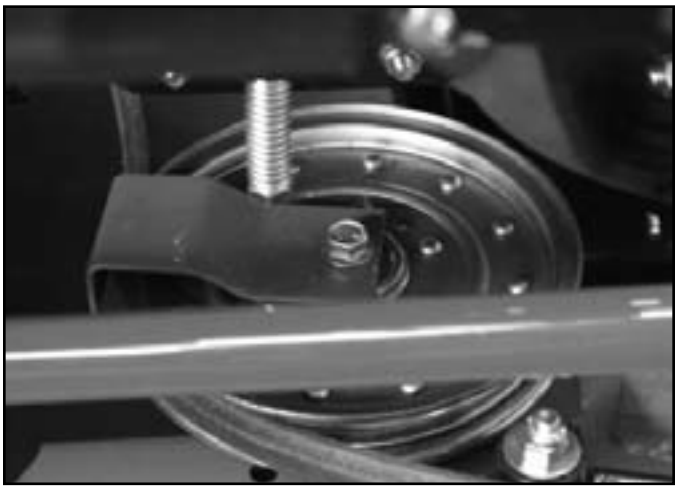

Fig 688 PICT-4060

7. Remove the existing belt if needed (Fig. 689).

Fig 689 PICT-4044

8. Install a new belt around the mower pulleys and the gearbox pulley under the engine. Refer to the belt routing decal (Fig. 690).

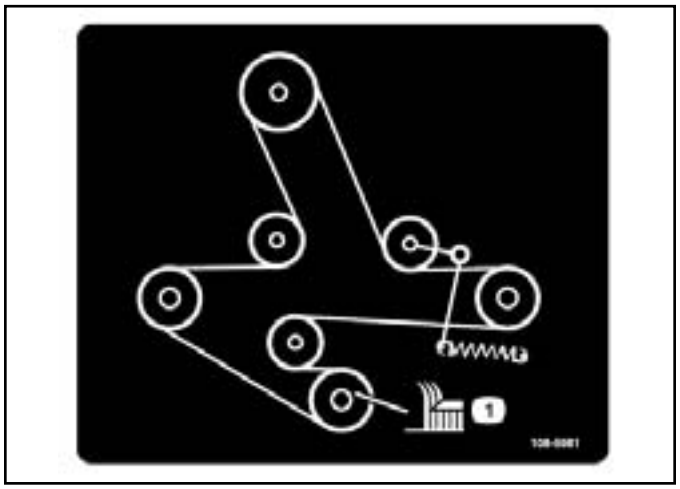

Fig 690 fig. 108-5981

9. Install the belt guide on the spring loaded idler at a 45 degree angle as shown (Fig. 691):

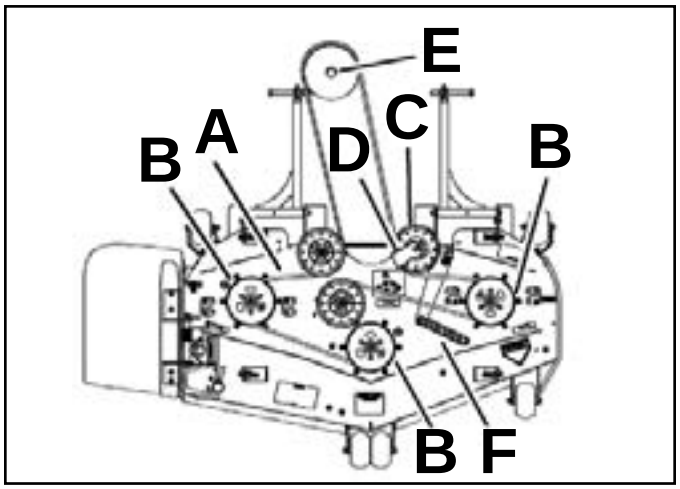

Fig 691 fig. 55 G001067

A. Mower belt
B. Mower spindle pulley
C. Mower idler pulley
D. Belt guide
E. Gearbox pulley
F. Spring

10. Install mower deck belt idler spring (Fig. 692).

Fig 692 PICT-4013

11. Install the right hand and left hand belt covers (Fig. 693).

Fig 693 PICT-4012

12. Lower the floor pan.

13. 72” mower decks only: Adjust Mower Deck Belt tension. Refer to “72” Mower Deck Mower Belt Tension Adjustment” on page X-XX.

Mower Deck Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Raise the floor pan assembly (Fig. 694).

Fig 694 PICT-4011

5. Remove the left and right mower deck belt covers (Fig. 695).

Fig 695 PICT-4012

6. Using a spring removal tool (Toro p/n: 92-5771), remove the mower deck idler spring (Fig. 696).

Fig 696 PICT-4013

7. Remove the mower deck belt from the gearbox deck drive pulley (Fig. 697).

Fig 697 PICT-4016

8. Place the mower deck in the transport position. Position wood blocks under each corner of the mower deck. Lower the mower deck onto the blocks to remove tension from the deck lift chains (Fig. 698).

Fig 698 PICT-4019

9. Push the deck lift handle to the lowest height-of-cut position to overcome the tension of the lift assist springs. Insert the hitch pin above the deck lift handle to lock the handle in the down position (Fig. 699).

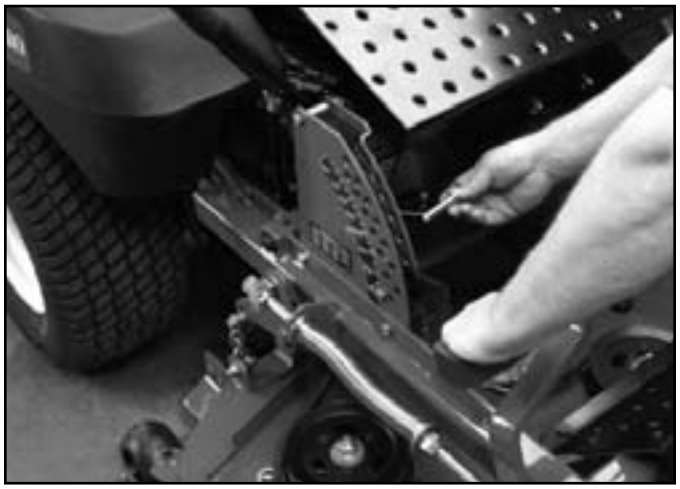

Fig 699 PICT-4021

10. Remove the outer nut from each of the 4 deck chain assemblies (Fig. 700).

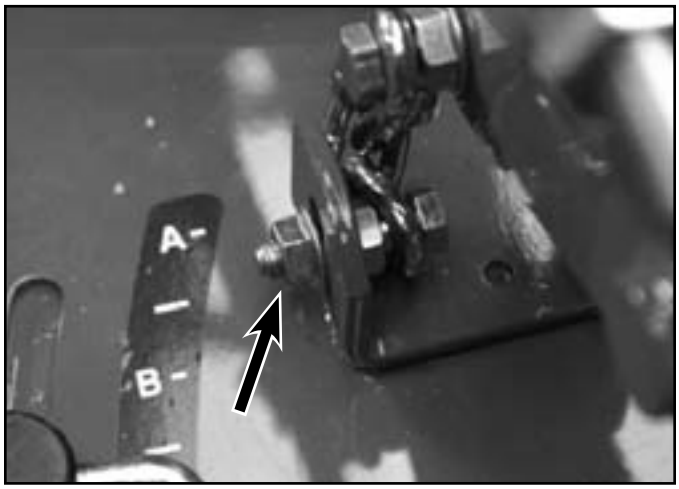

Fig 700 PICT-4023

11. Raise the deck lift lever to the transport position (Fig. 701).

Fig 701 PICT-4029

12. Remove the bolt and nut securing the strut to the mower deck (Fig. 702).

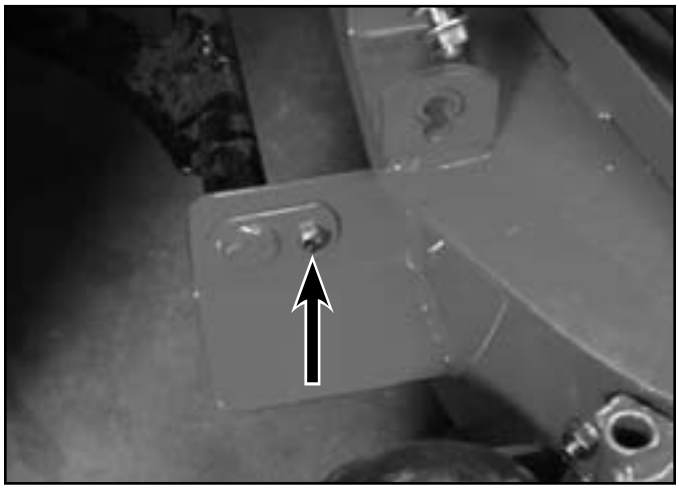

Fig 702 PICT-4036

13. Repeat the above step to remove the bolt and nut securing the opposite strut from the mower deck.

14. Pull both strut pins to free the mower deck from the pins (Fig. 703).

Fig 703 PICT-4038

15. Tie the struts up, out of the way of the mower deck being removed.

16. Remove the 4 wood blocks from each corner of the mower deck.

17. Turn the right front castor wheel so the castor fork is angled forward to allow more clearance for sliding the mower deck out (Fig. 704).

Fig 704 PICT-4041

18. Slide the mower deck out from under the right side of the frame (Fig. 705).

Fig 705 PICT-4042

Mower Deck Installation

1. Turn the right front wheel so the castor fork is angled forward to allow more clearance for sliding the mower under the frame (Fig. 706).

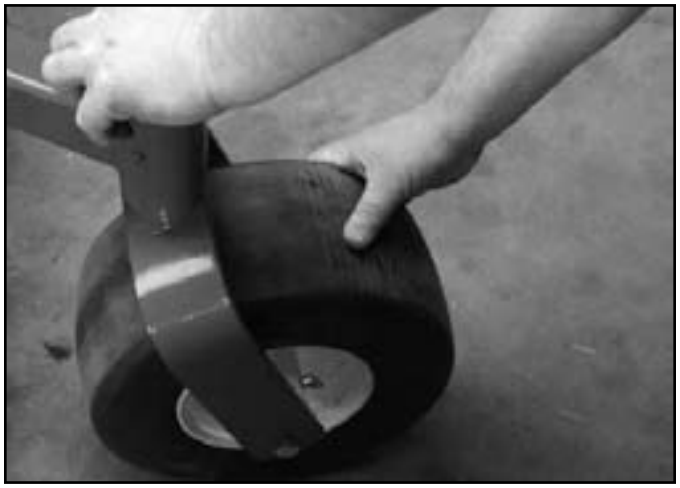

Fig 706 PICT-4041

2. Slide the mower deck under the right side of the frame (Fig. 707).

Fig 707 PICT-4043

3. Slide a wood block under each corner of the mower deck.

4. Push the deck lift handle to the lowest height-of-cut position to overcome the tension of the lift assist springs. Insert the hitch pin above the deck lift handle to lock the handle in the down position (Fig. 708).

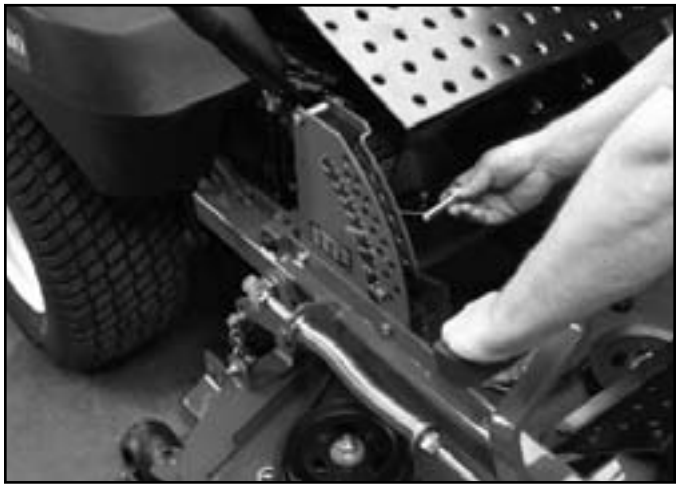

Fig 708 PICT-4021

5. Insert the deck chain assembly bolt into the chain brackets on the mower deck. The front chain bolts are installed in the bottom of the bracket slot and the rear chain bolts are installed in the top of the bracket slot. Install a nut onto each of the chain bolts (Fig. 709).

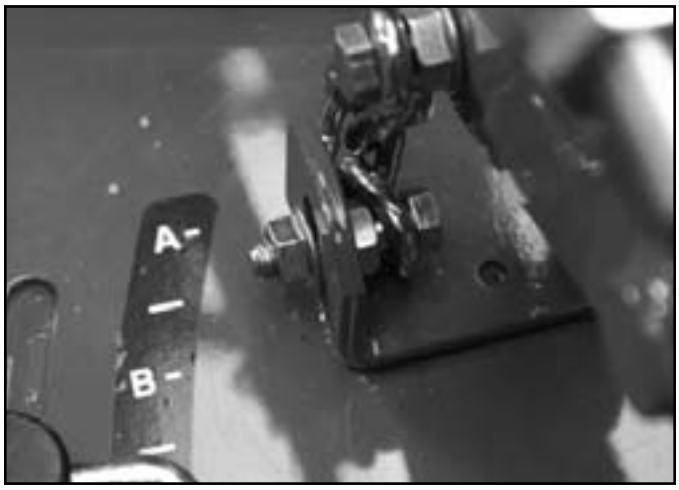

Fig 709 PICT-4023

6. Place the mower deck in the transport position. Remove the wood blocks from under each corner of the mower deck.

7. Align each strut with the mower deck strut brackets and install the strut pins (Fig. 710).

Fig 710 PICT-4038

8. Install a bolt and nut to secure each strut pin to the mower deck (Fig. 711).

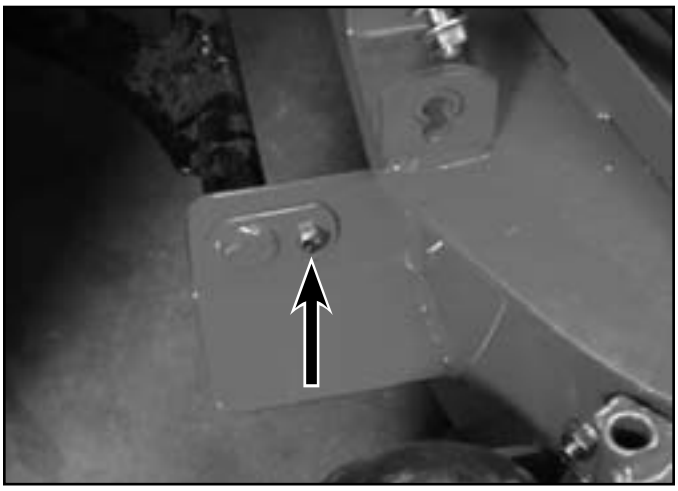

Fig 711 PICT-4036

9. Route the mower deck belt around the mower deck pulleys and gearbox deck drive pulley. Refer to the belt routing decal (Fig. 712).

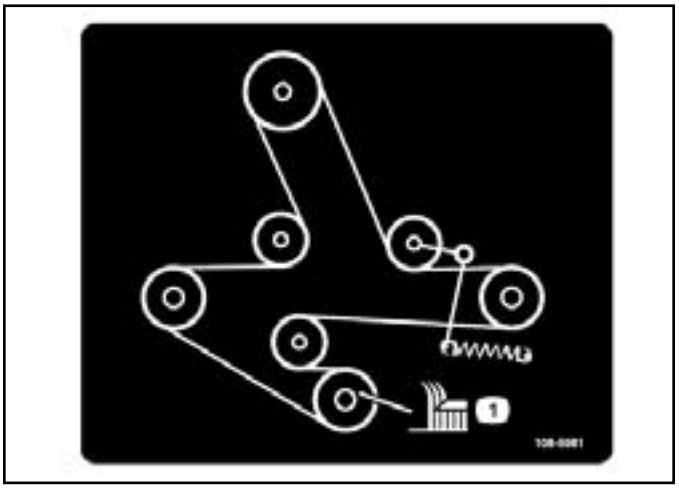

Fig 712 fig. 108-5981

10. Install the mower deck idler spring (Fig. 713).

Fig 713 PICT-4013

11. Install the left and right mower deck belt covers (Fig. 714).

Fig 714 PICT-4012

12. Lower the floor pan assembly (Fig. 715).

Fig 715 PICT-4011

13. Install the negative battery cable to the battery.

14. Lower the seat.

Mower Spindle Replacement

Mower Spindle Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Raise the floor pan assembly (Fig. 716).

Fig 716 PICT-4011

5. Remove the left and right mower deck belt covers (Fig. 717).

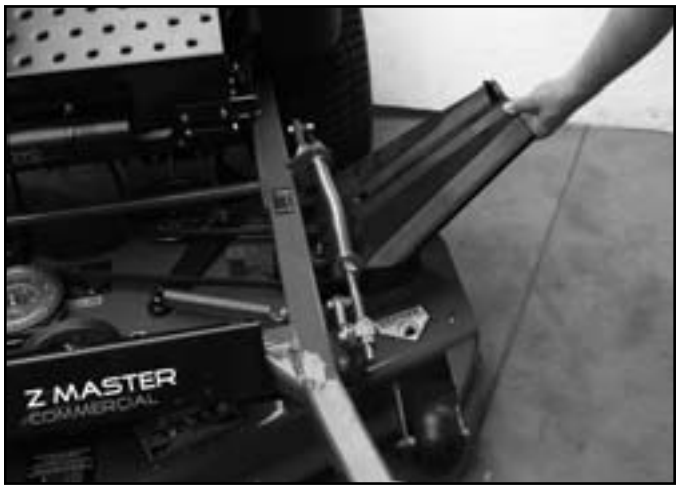

Fig 717 PICT-4012

6. Using a spring removal tool (Toro p/n: 92-5771), remove the mower deck idler spring (Fig. 718).

Fig 718 PICT-4013

7. Remove the mower deck belt from the spindle pulley (Fig. 719).

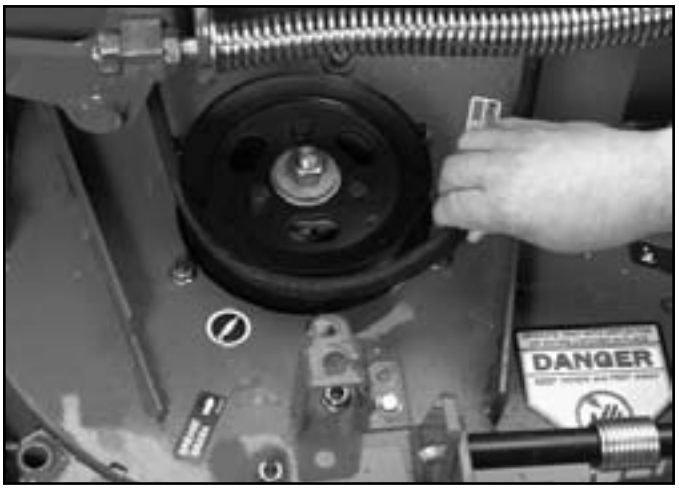

Fig 719 PICT-4044

8. Remove the nuts from the 6 spindle mounting bolts (Fig. 720).

Fig 720 PICT-4045

9. **72" mower decks:** Remove 3 bolts retaining the pulley to the pulley hub (Fig. 721).

Fig 721 CLR DSC-2662

10. **72" mower decks:** Raise the mower deck to the transport position.

11. **72" mower decks:** Remove the mower blade from the spindle assembly.

12. **72" mower decks:** Remove the 6 bolts and nuts from the spindle assembly. Remove the spindle assembly (Fig. 722).

Fig 722 CLR DSC-2666

13. **52" mower decks:** Remove the 6 spindle mounting bolts securing the spindle housing to the mower deck (Fig. 723).

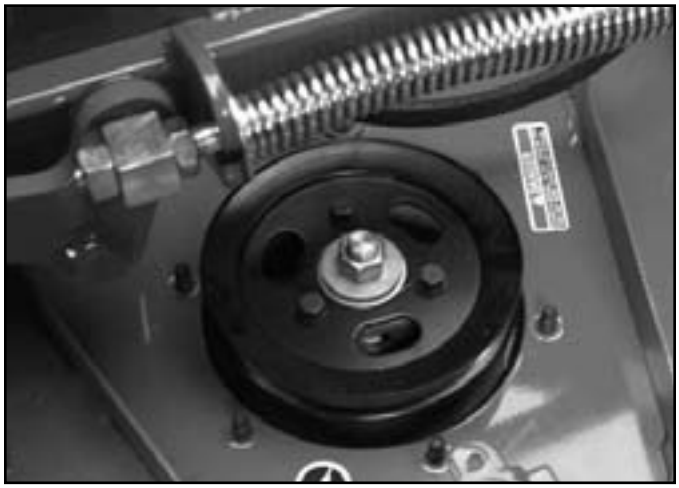

Fig 723 PICT-4046

14. **52" mower decks:** Carefully lower the spindle assembly out of the mower deck (Fig. 724).

Fig 724 PICT-4049

15. **52" mower decks:** Remove the spindle blade bolt and washer (Fig. 725).

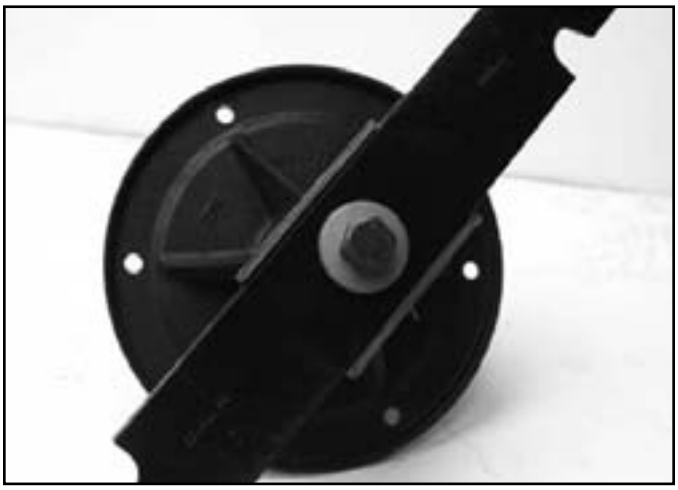

Fig 725 PICT-4050

16. **52" mower decks:** Remove the blade (Fig. 726).

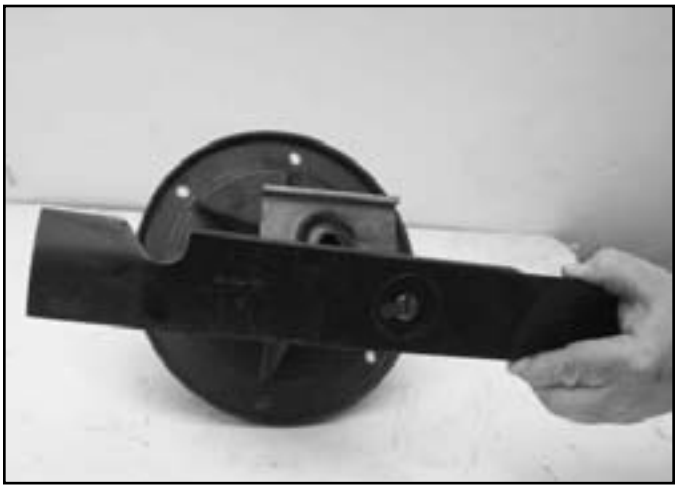

Fig 726 PICT-4053a

17. **52” mower decks:** Remove the 3 bolts securing the pulley to the spindle hub (Fig. 727).

Fig 727 PICT-4055

18. **52” mower decks:** Remove the pulley from the spindle assembly (Fig. 728).

Fig 728 PICT-4056

Mower Deck Spindle Rebuild

1. Remove the nut and washer (Fig. 729).

Fig 729 CLR DSC-2669

2. Remove the pulley hub and square key (Fig. 730).

Fig 730 CLR DSC-2670

3. Remove the bearing shield (Fig. 731).

Fig 731 CLR DSC-2671

4. Remove the spindle housing from the spindle shaft assembly (Fig. 732).

Fig 732 CLR DSC-2672

5. Remove the seal spacer from the top of the spindle housing (Fig. 733).

Fig 733 CLR DSC-2673

6. Remove the seal spacer from the bottom of the spindle housing (Fig. 734).

Fig 734 CLR DSC-2674

7. Remove the top oil seal from the spindle housing (Fig. 735).

Fig 735 CLR DSC-2675

8. Remove the tapered roller bearing from the top of the spindle housing (Fig. 736).

Fig 736 CLR DSC-2676

9. Remove the spacer (Fig. 737).

Fig 737 CLR DSC-2677

10. Turn the spindle housing over and remove the oil seal from the bottom of the spindle housing (Fig. 738). Note the orientation of the lower oil seal. The open end of the seal faces outwards to help relieve pressure from over-greasing the spindle assembly.

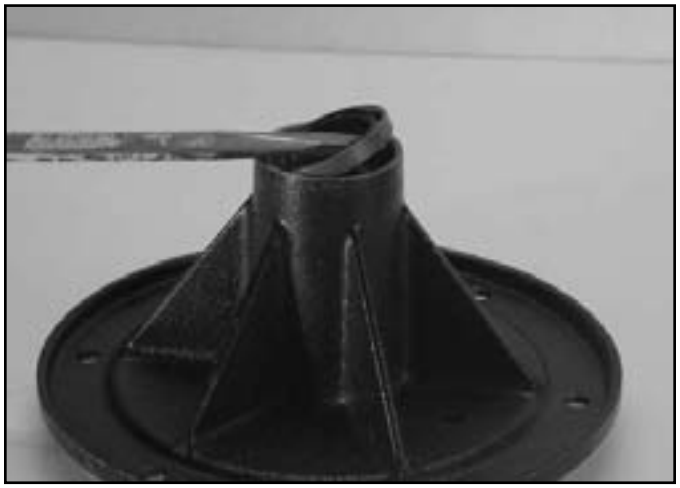

Fig 738 CLR DSC-2679

11. Remove the tapered roller bearing from the bottom of the spindle (Fig. 739).

Fig 739 CLR DSC-2680

12. Using a hammer and a driver with a square edge, drive both the top and bottom bearing races out of the spindle housing (Fig. 740).

Fig 740 CLR DSC-2681

13. Remove the large spacer in the spindle housing (Fig. 741).

Fig 741 CLR DSC-2682

14. This view shows the 2 bearing races and the large spacer in the spindle housing (Fig. 742). Note the internal snap ring in the housing; it is not necessary to remove it when installing new bearing races and the spacer.

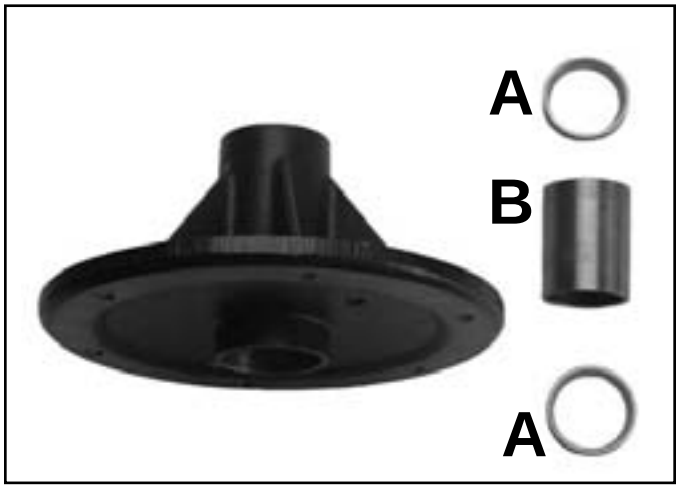

Fig 742 CLR DSC-2684

A. Bearing Race B. Spacer

15. Install the spacer through the top of the spindle housing (Fig. 743).

Fig 743 CLR DSC-2688

16. Using a press, install the upper bearing race into the spindle housing (Fig. 744).

Note: The wider inside diameter of the bearing race should be facing up to accept the tapered bearing.

Fig 744 CLR DSC-2689

17. Turn the spindle housing over and install the lower bearing race into the spindle housing (Fig. 745).

Note: The wider inside diameter of the bearing race should be facing up to accept the tapered bearing.

Fig 745 CLR DSC-2690

18. Pack the tapered bearing with #2 grease and install the tapered bearing (Fig. 746).

Fig 746 CLR DSC-2691

19. Install the lower seal (Fig. 747).

Note: The open lip of the seal should be facing outward.

Fig 747 CLR DSC-2692

20. Using a seal driver, drive or press the seal on the lower end of the spindle housing until the seal is flush with the outer edge of the housing (Fig. 748).

Fig 748 CLR DSC-2693

21. Install the inner spacer to the spindle assembly (Fig. 749).

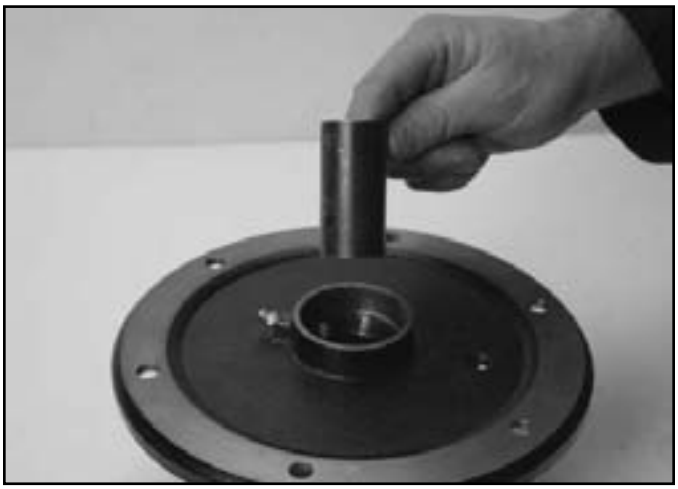

Fig 749 CLR DSC-2700

22. Pack the tapered bearing with #2 grease and install the tapered bearing (Fig. 750).

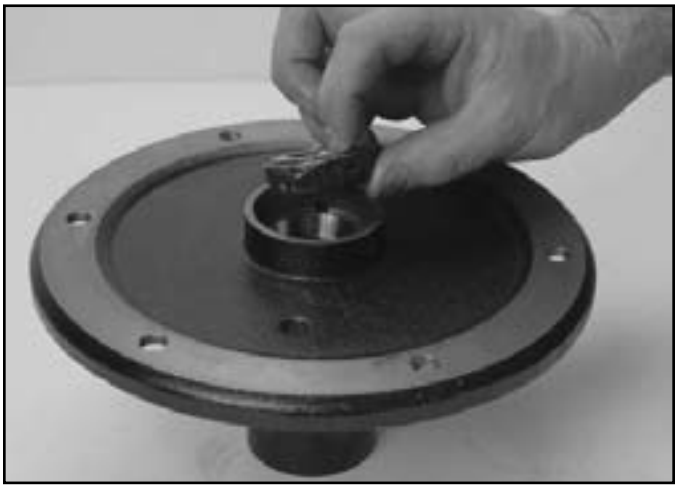

Fig 750 CLR DSC-2694

7

23. Install the seal. Press it flush with the top of the housing (Fig. 751).

Note: The open lip of the seal faces inward.

Fig 751 CLR DSC-2696

24. Install the bearing shield and the seal spacer onto the spindle shaft (Fig. 752).

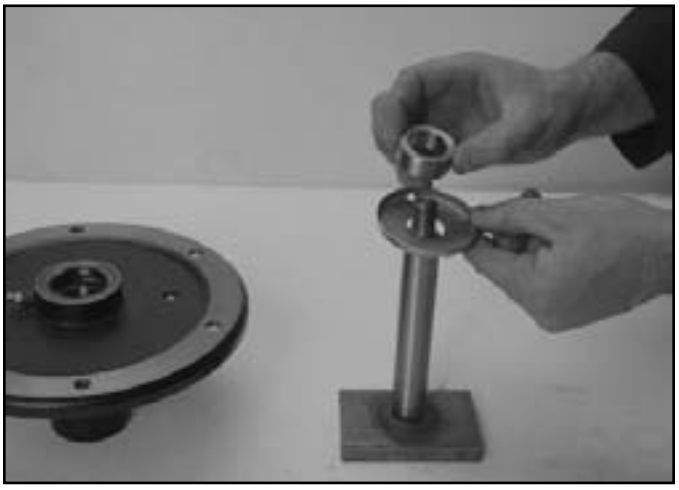

Fig 752 CLR DSC-2702

25. Lower the spindle housing over the spindle shaft (Fig. 753).

Fig 753 CLR DSC-2703

26. Install the seal spacer on the top of the spindle housing (Fig. 754).

Fig 754 CLR DSC-2704

27. Install bearing shield (Fig. 755).

Fig 755 CLR DSC-2705

28. Install the square key onto the spindle shaft (Fig. 756).

Fig 756 CLR DSC-2706

29. Install the pulley hub on the spindle shaft (Fig. 757).

Fig 757 CLR DSC-2707

30. Install the heavy washer and nut on the top of the spindle shaft (Fig. 758).

Note: The cup side of the washer should be facing down toward the pulley hub.

Fig 758 CLR DSC-2708

7

31. Torque the top nut to 100 to 120 ft-lbs. (135.58 to 162.7 Nm) (Fig. 759).

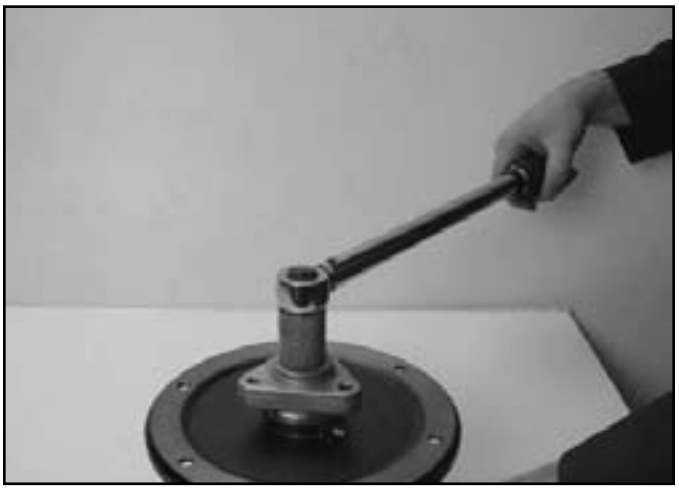

Fig 759 CLR DSC-2709

32. Grease the spindle assembly using a grease gun with #2 grease.

Mower Spindle Installation

1. **72" mower decks:** Position the spindle assembly into the mower deck. Install the 6 self-tapping bolts securing the spindle assembly to the mower deck (Fig. 760).

Fig 760 CLR DSC-2666

2. **72" mower decks:** Install the mower blade onto the spindle assembly.

3. **72" mower decks:** Install 3 bolts retaining the pulley to the spindle hub (Fig. 761).

Fig 761 CLR DSC-2662

4. **52” mower decks:** Position the pulley onto the spindle assembly (Fig. 762).

Fig 762 PICT-4056

5. **52” mower decks:** Install 3 bolts securing the pulley to the spindle hub. Torque bolts to 23 ft-lbs. (31 Nm) (Fig. 763).

Fig 763 PICT-4055

6. **52” mower decks:** Position the blade to the spindle shaft retainer (Fig. 764).

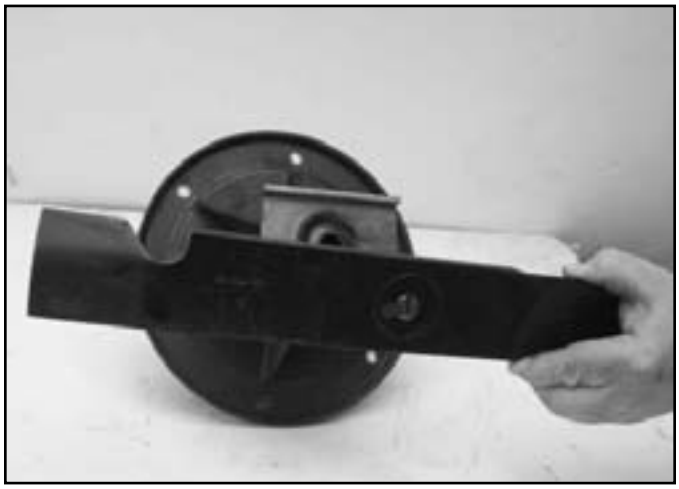

Fig 764 PICT-4053a

7. **52” mower decks:** Install the spindle blade bolt and washer. Torque to 85-110 ft-lbs. (115-149 Nm) (Fig. 765).

Fig 765 PICT-4058

8. **52” mower decks:** Carefully position the spindle assembly into the mower deck (Fig. 766).

Fig 766 PICT-4049

9. **52” mower decks:** Install 6 spindle mounting bolts securing the spindle housing to the mower deck (Fig. 767).

Fig 767 PICT-4046

10. Install a nut onto each of the 6 spindle mounting bolts (Fig. 768).

Fig 768 PICT-4045

11. Route the mower deck belt around the spindle pulley. Refer to the belt routing diagram (Fig. 769):

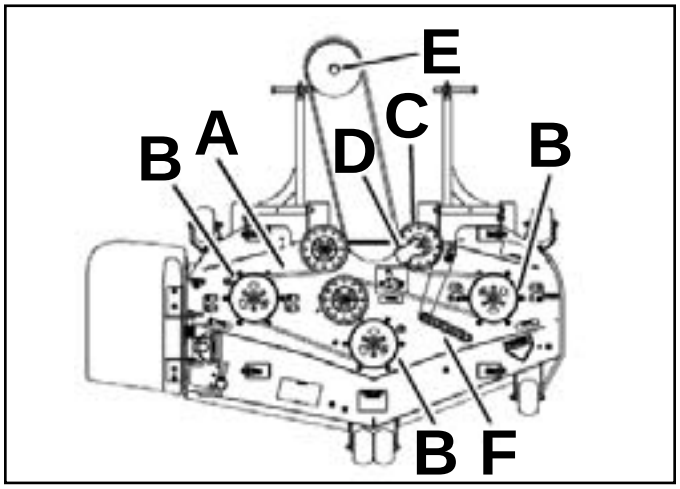

Fig 769 fig. 55 G001067

A. Mower belt
B. Mower spindle pulley
C. Mower idler pulley
D. Belt guide
E. Gearbox pulley
F. Spring

12. Install the mower deck idler spring (Fig. 770).

Fig 770 PICT-4013

13. Install the left and right mower deck belt covers (Fig. 771).

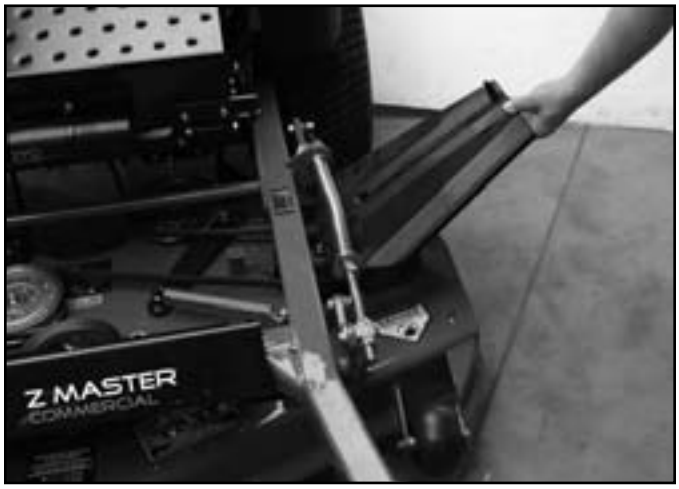

Fig 771 PICT-4012

14. Lower the floor pan assembly (Fig. 772).

Fig 772 PICT-4011

15. Install the negative battery cable to the battery.

16. Lower the seat.

7

Mower Deck Idler Assembly Replacement

Mower Deck Idler Assembly Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Raise the floor pan assembly (Fig. 773).

Fig 773 PICT-4011

5. Remove the left and right mower deck belt covers (Fig. 774).

Fig 774 PICT-4012

6. Using a spring removal tool (Toro p/n: 92-5771), remove the mower deck idler spring (Fig. 775).

Fig 775 PICT-4013

7. Remove the bolt, belt guide and 2 flat washers securing the idler pulley to the idler arm (Fig. 776).

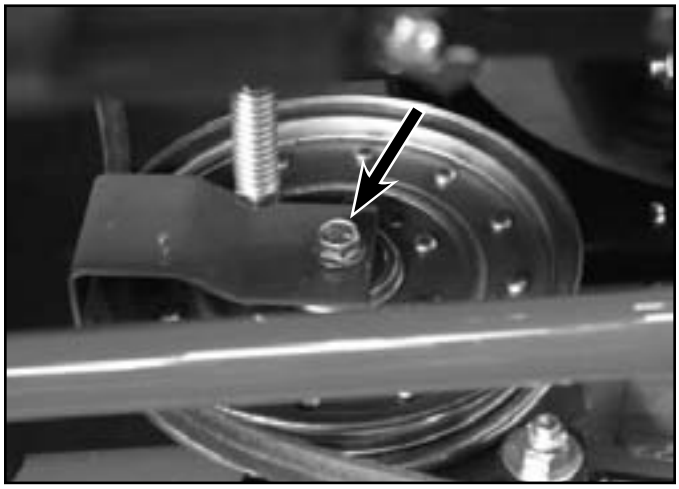

Fig 776 PICT-4061

8. Remove the pulley from the idler arm assembly (Fig. 777).

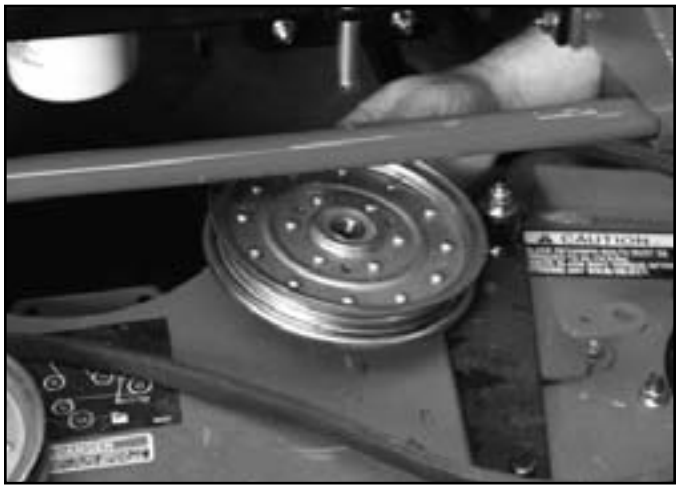

Fig 777 PICT-4063

9. Remove the bolt, nut and 2 washers securing the idler arm assembly to the mower deck (Fig. 778).

Note: One of the washers is between the idler arm and mower deck.

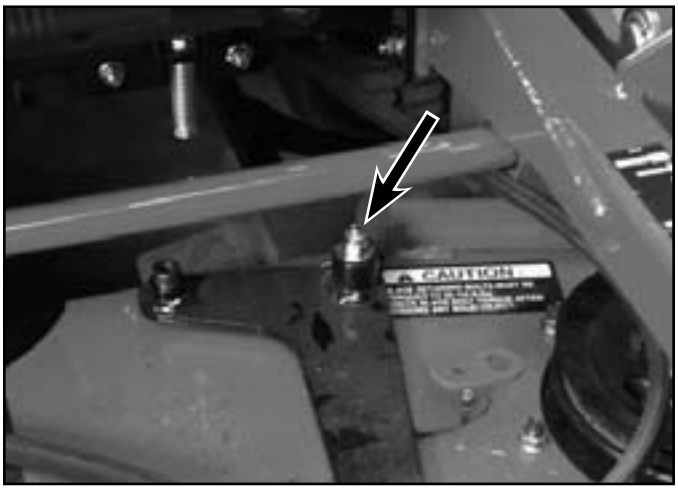

Fig 778 PICT-4065

10. Remove the idler arm assembly from the mower deck (Fig. 779).

Fig 779 PICT-4067

11. Remove the 2 bushings and 1 spacer from the idler arm (Fig. 780).

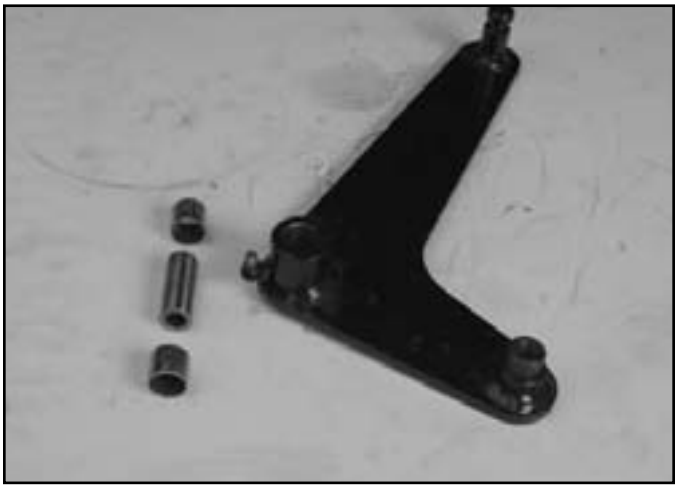

Fig 780 PICT-4073a

12. Remove the grease fitting from the idler arm pivot (Fig. 781).

Fig 781 PICT-4070a

Mower Deck Idler Assembly Installation

1. Install a grease fitting into the idler arm pivot (Fig. 782).

Fig 782 PICT-4070a

2. Press 2 bushings into the idler arm pivot (Fig. 783).

Fig 783 PICT-4077a

3. Slide a spacer into the idler arm pivot (Fig. 784).

Fig 784 PICT-4082a

4. Position a washer onto the mower deck in the idler arm pivot location (Fig. 785).

Fig 785 PICT-4083

5. Position the idler arm assembly onto the mower deck with the pivot placed over the washer (Fig. 786).

Fig 786 PICT-4084

6. Install a bolt, nut and washer to secure the idler arm assembly to the mower deck (Fig. 787).

Fig 787 PICT-4065

7. Position the pulley onto the idler arm assembly (Fig. 788).

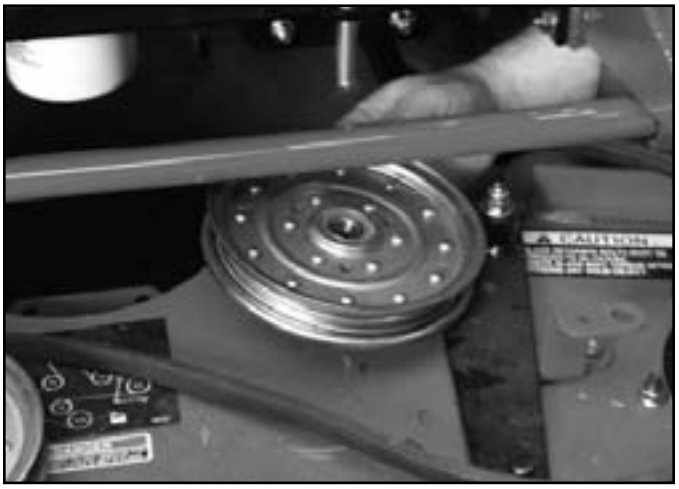

Fig 788 PICT-4063

8. Route the mower deck belt into the pulley and place 2 washers on top of the pulley (Fig. 789).

Fig 789 PICT-4086

9. Position the belt guide onto the 2 washers so that it is 45 degrees from the idler arm (Fig. 790).

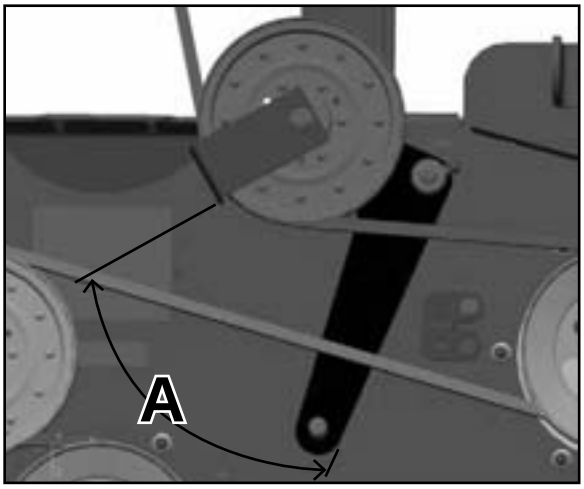

Fig 790 belt guide position

A. 45º

10. Install a bolt to secure the belt guide to the pulley (Fig. 791).

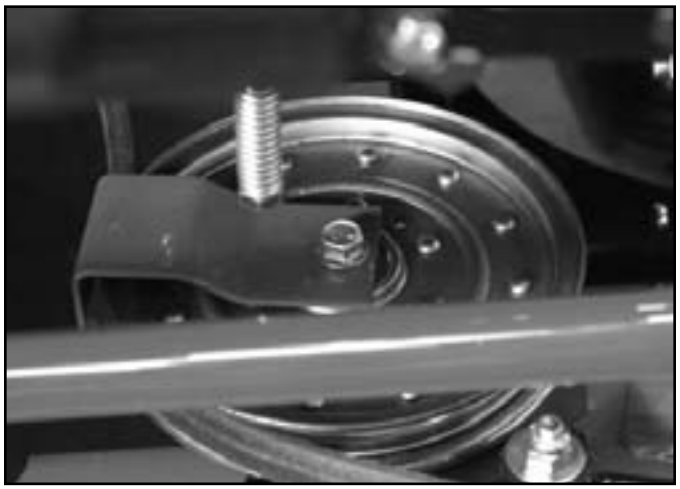

Fig 791 PICT-4061

11. Apply grease to the idler arm pivot grease fitting (Fig. 792).

Fig 792 PICT-4127

12. Ensure the mower deck belt is properly routed around the pulleys. Refer to the belt routing decal (Fig. 793).

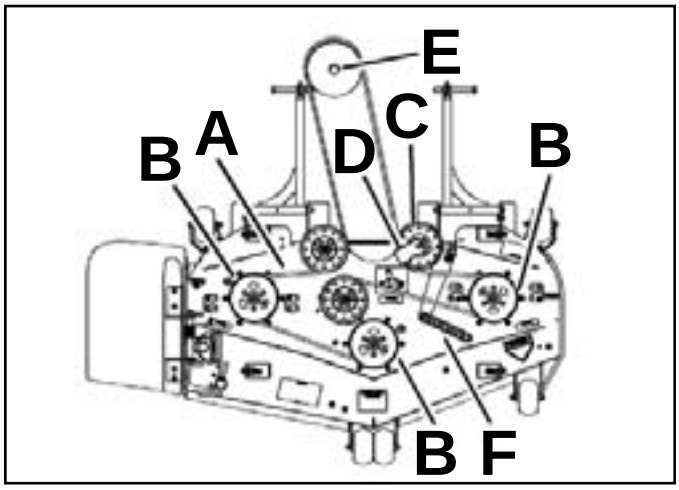

Fig 793 fig. 55 G001067

A. Mower belt
B. Mower spindle pulley
C. Mower idler pulley
D. Belt guide
E. Gearbox pulley
F. Spring

13. Install the mower deck idler spring (Fig. 794).

Fig 794 PICT-4013

14. Install the left and right mower deck belt covers (Fig. 795).

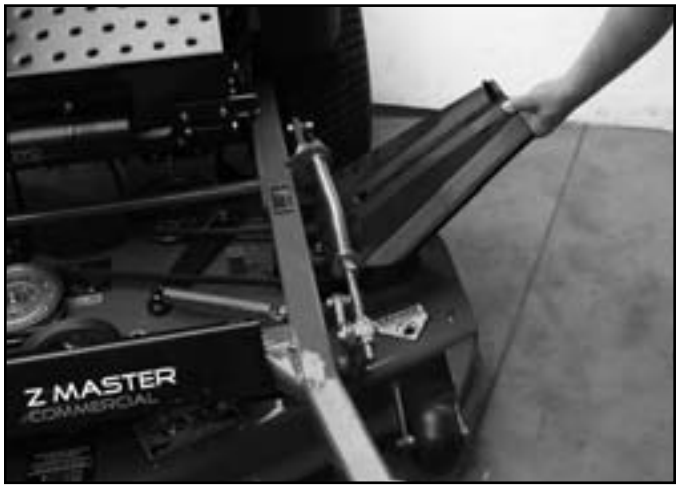

Fig 795 PICT-4012

15. Lower the floor pan assembly (Fig. 796).

Fig 796 PICT-4011

16. Install the negative battery cable to the battery.

17. Lower the seat.

Fixed Pulley Replacement

Fixed Pulley Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Raise the floor pan assembly (Fig. 797).

Fig 797 PICT-4011

5. Remove the left and right mower deck belt covers (Fig. 798).

Fig 798 PICT-4012

6. Using a spring removal tool (Toro p/n: 92-5771), remove the mower deck idler spring (Fig. 799).

Fig 799 PICT-4013

7. Remove the bolt, washer and nut securing the fixed pulley to the mower deck (Fig. 800).

Fig 800 PICT-4090a

8. Remove the pulley from the pulley mount (Fig. 801).

Fig 801 PICT-4093

9. Remove the pulley mount (Fig. 802).

Fig 802 PICT-4095

Fixed Pulley Installation

1. Position the pulley mount onto the mower deck (Fig. 803).

Fig 803 PICT-4095

2. Position the pulley onto the pulley mount (Fig. 804).

Fig 804 PICT-4093

3. Install a bolt, washer and nut securing the fixed pulley to the mower deck (Fig. 805).

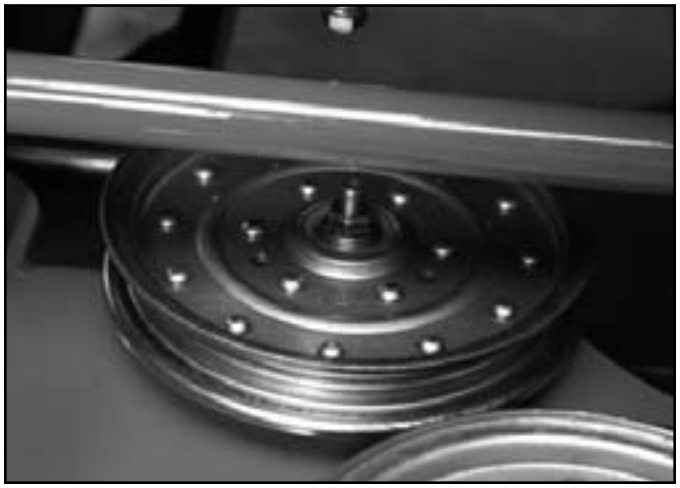

Fig 805 PICT-4100

4. Route the mower deck belt. Refer to the belt routing decal (Fig. 806).

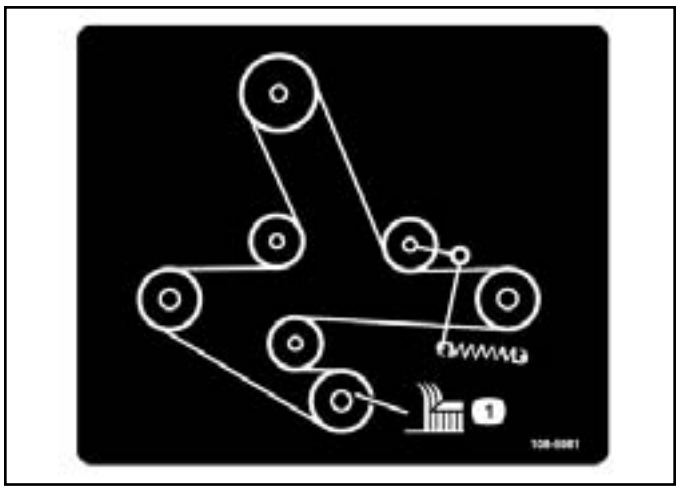

Fig 806 fig. 108-5981

5. Install the mower deck idler spring (Fig. 807).

Fig 807 PICT-4013

6. Install the left and right mower deck belt covers (Fig. 808).

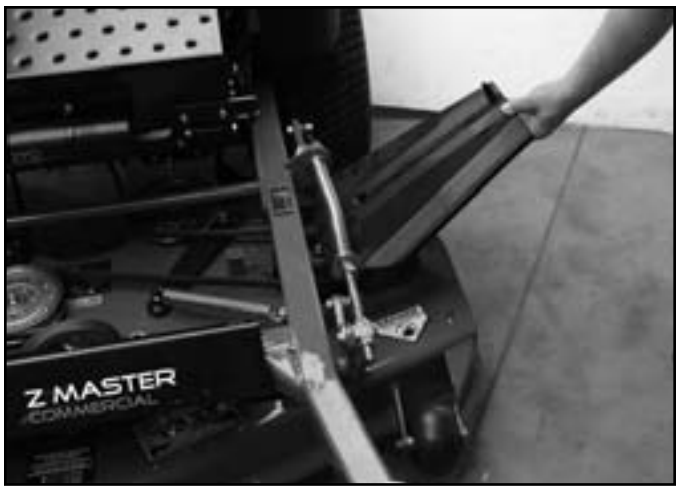

Fig 808 PICT-4012

7. Lower the floor pan assembly (Fig. 809).

Fig 809 PICT-4011

8. Install the negative battery cable to the battery.
9. Lower the seat.

Electric PTO Clutch Replacement

Electric PTO Clutch Removal Warner Clutch

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Remove the front engine panel (Fig. 810).

Fig 810 IMG_7862

5. Unplug the harness connector from the electric PTO clutch (Fig. 811).

Fig 811 PICT-3933

6. Using a spring removal tool (Toro p/n: 92-5771), unhook the spring from the gearbox idler arm assembly (Fig. 812).

Fig 812 PICT-3872

7. Remove the gearbox drive belt from around the electric PTO clutch pulley (Fig. 813).

Fig 813 PICT-3934a

8. Remove the center clutch bolt, 2 spring washers and clutch retainer securing the electric PTO clutch to the stub shaft (Fig. 814).

Fig 814 PICT-3613

9. Remove the electric PTO clutch from the stub shaft (Fig. 815).

Fig 815 PICT-3615

Electric PTO Clutch Installation Warner Clutch

1. Apply anti-seize compound to the PTO stub shaft (Fig. 816).

Fig 816 PICT-3655

2. Slide the electric PTO clutch onto the stub shaft (Fig. 817).

Note: Make sure the clutch stop bracket is in the slot on the clutch.

Fig 817 PICT-3615

3. Apply thread locking compound to the center clutch bolt threads (Fig. 818).

Fig 818 PICT-3957a

4. Install the center clutch bolt, two spring washers, and the clutch retainer (Fig. 819).

Note: The direction of the spring washers.

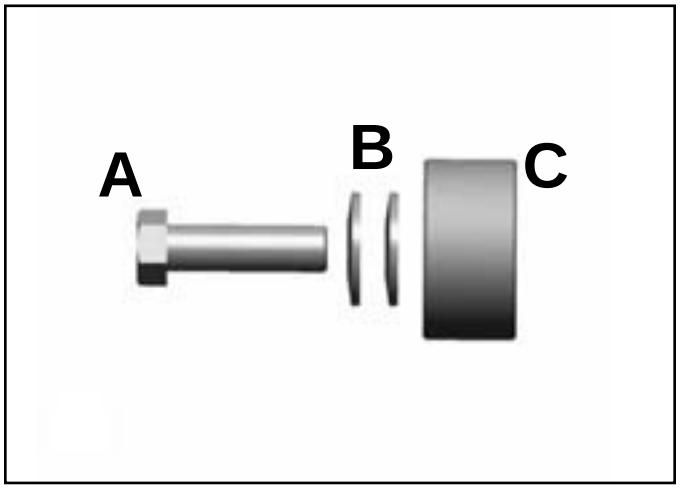

Fig 819 clutch bolt retainer asm

A. Clutch bolt
B. Spring washer (2)
C. Clutch retainer

5. Torque the center clutch bolt to 50 ft-lbs. (68 Nm) (Fig. 820).

Fig 820 PICT-4006

6. Route the gearbox belt around the electric PTO clutch pulley (Fig. 821).

Fig 821 PICT-4009

7. Hook the gearbox idler spring to the frame (Fig. 822).

Fig 822 PICT-3872

8. Plug the clutch harness into the electric PTO clutch plug (Fig. 823).

Fig 823 PICT-3933

9. Install the front engine panel (Fig. 824).

Fig 824 IMG_7862

10. Install the negative battery cable to the battery.

11. Lower the seat.

Electric PTO Clutch Removal
Ogura Clutch

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Remove the front engine panel (Fig. 825).

Fig 825 IMG_7862

5. Remove the tie strap holding the electric PTO clutch wire to the frame crossbar (Fig. 826).

Fig 826 PICT-3990

6. Unplug the harness connector from the electric PTO clutch (Fig. 827).

Fig 827 PICT-3979

7. Remove the carriage bolts, washers, and nut holding the clutch stop to the frame (Fig. 828).

Fig 828 PICT-3993

8. Using a spring removal tool (Toro p/n: 92-5771), unhook the idler pulley spring from the frame and remove the belt from around the electric PTO clutch (Fig. 829).

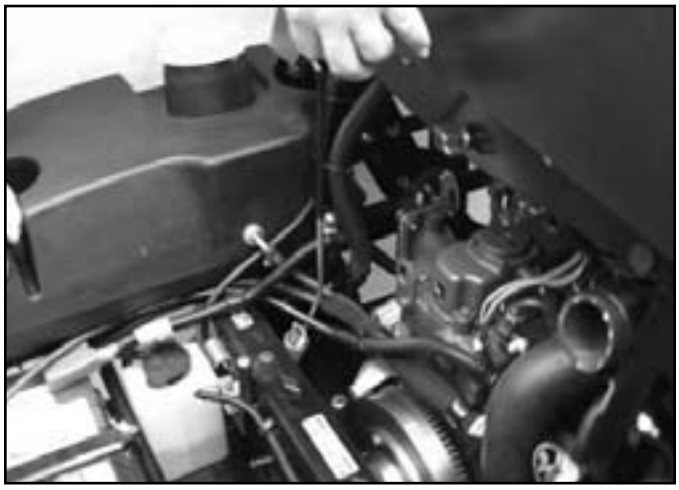

Fig 829 PICT-3971

9. Loosen the bolt holding the electric PTO clutch to the stub shaft (Fig. 830).

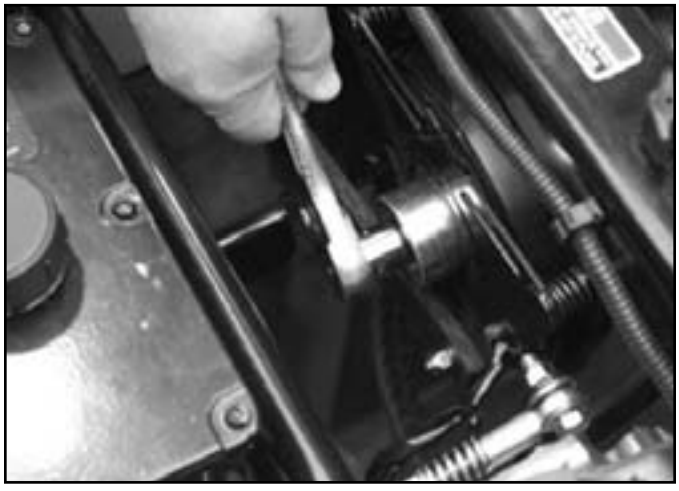

Fig 830 PICT-3995a

10. Remove the bolt, 2 curved washers, flat washer, and retainer (Fig. 831).

Fig 831 PICT-3997a

11. Remove the electric PTO clutch from the stub shaft (Fig. 832).

Fig 832 PICT-3998

12. Remove the key from the stub shaft (Fig. 833).

Fig 833 PICT-3955

13. Remove the clutch adapter from the stub shaft (Fig. 834).

Fig 834 PICT-3954a

Electric PTO Clutch Installation
Ogura Clutch

1. Insert a 0.015”–0.021” (0.381–0.533mm) feeler gauge through one inspection slot in the side of the electric PTO clutch. Make sure it is between the armature and the rotor friction surfaces (Fig. 54).

2. Tighten the lock nuts until there is slight binding on the feeler gauge but it can be moved easily within the air gap (Fig. 835).

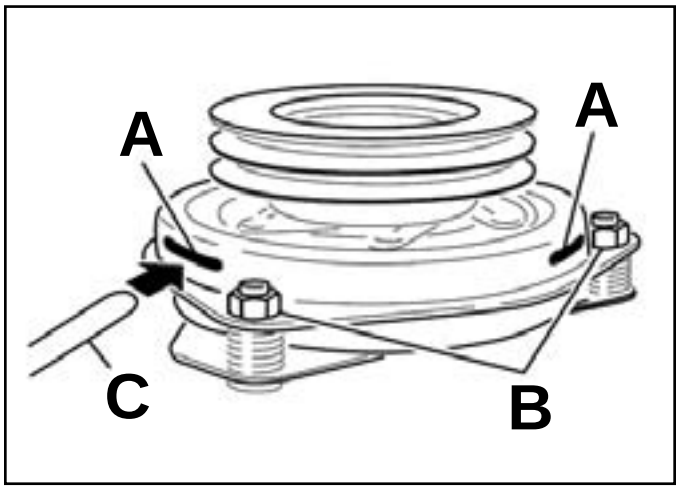

Fig 835 fig. 54 G007168

A. Slot
B. Adjusting nut
C. Feeler gauge

3. Repeat this for the remaining slots.

4. Check each slot again and make slight adjustments until the feeler gauge fits between the rotor and armature with very slight contact between them.

7

5. Install the clutch stop to the clutch (Fig. 836):

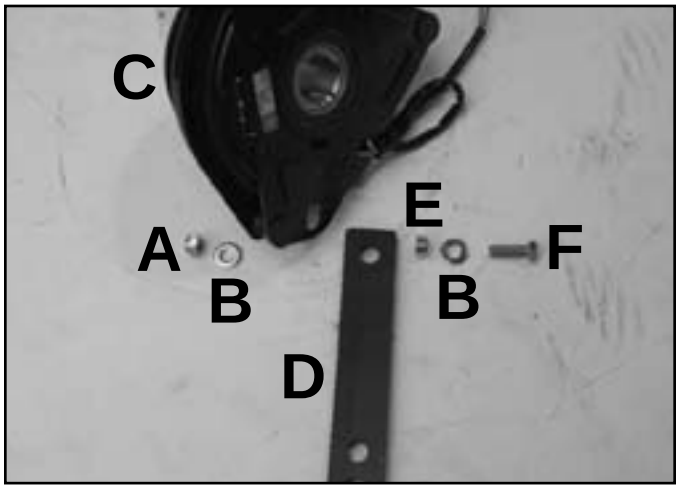

Fig 836 PICT-3944a

A. Nut
B. Washer (2)
C. Electric PTO clutch
D. Clutch stop
E. Spacer
F. Bolt

6. Slide the clutch adapter onto the stub shaft (Fig. 837).

Fig 837 PICT-3954a

7. Apply anti-seize compound to the stub shaft (Fig. 838).

Fig 838 PICT-3655

8. Install the key onto the stub shaft (Fig. 839).

Fig 839 PICT-3955

7

9. Slide the clutch onto the stub shaft (Fig. 840).

Fig 840 PICT-3956

10. Apply thread locking compound to the clutch bolt threads (Fig. 841).

Fig 841 PICT-3957a

11. Slide the 2 curved washers, a flat washer and a clutch retainer onto the clutch bolt (Fig. 842).

Note: Curved washers must be installed as shown.

Fig 842 PICT-3962

12. Torque the clutch bolt to 50 ft-lbs. (68 Nm) (Fig. 843).

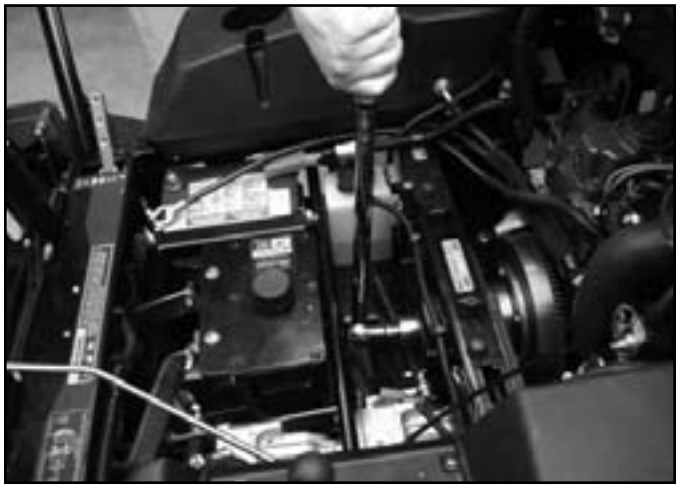

Fig 843 PICT-3967

13. Route the PTO drive belt onto the clutch pulley. Install the idler arm spring (Fig. 844).

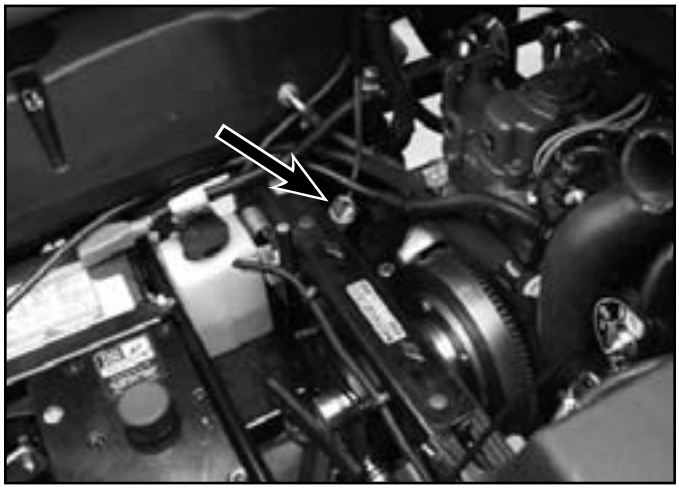

Fig 844 PICT-3969

14. Twist the clutch stop and install the end to the frame bracket with 2 carriage bolts, 2 flat washers, and 2 locknuts (Fig. 845).

Note: Make sure there is a twist in the clutch stop.

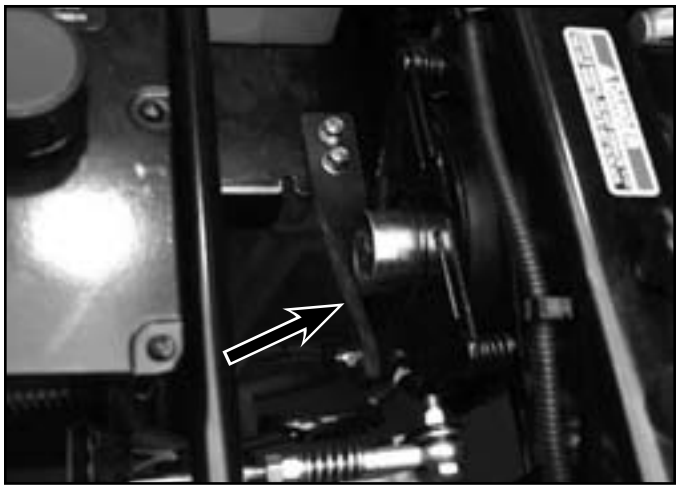

Fig 845 PICT-3973

15. Plug the clutch harness into the electric PTO clutch plug (Fig. 846).

Fig 846 PICT-3979

16. Secure the electric PTO clutch plug and wires to the frame crossbar with a cable tie (Fig. 847).

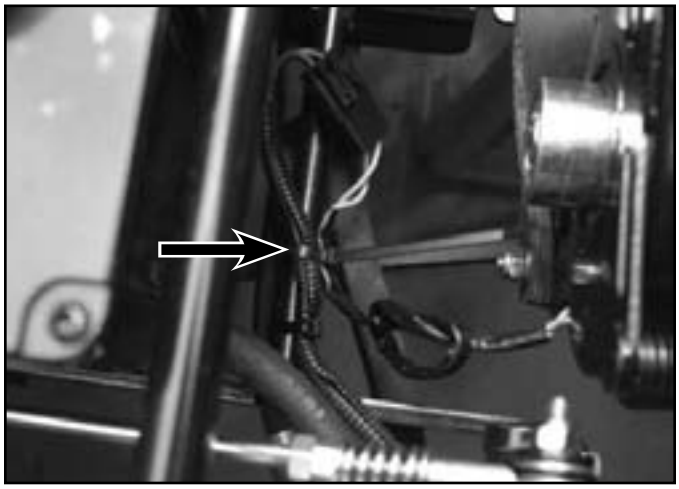

Fig 847 PICT-3988a

17. Install the front engine panel (Fig. 848).

Fig 848 IMG_7862

18. Install the negative battery cable to the battery.

19. Lower the seat.

Gearbox Assembly Replacement

Gearbox Assembly Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Remove the front engine panel (Fig. 849).

Fig 849 IMG_7862

5. Remove the right rear wheel and tire assembly (Fig. 850).

Fig 850 IMG_7753a

6. Using a spring removal tool (Toro p/n: 92-5771) unhook the spring from the gearbox idler assembly (Fig. 851).

Fig 851 PICT-3872

7. Remove the gearbox drive belt from the drive pulley (Fig. 852).

Fig 852 PICT-3876

8. Raise the floor pan assembly (Fig. 853).

Fig 853 PICT-3877

9. Remove the left hand mower deck belt cover (Fig. 854).

Fig 854 PICT-3879

10. Using a spring removal tool (Toro p/n: 92-5771), remove the mower deck idler spring (Fig. 855).

Fig 855 PICT-3880

11. Remove the deck drive belt from the gearbox pulley (Fig. 856).

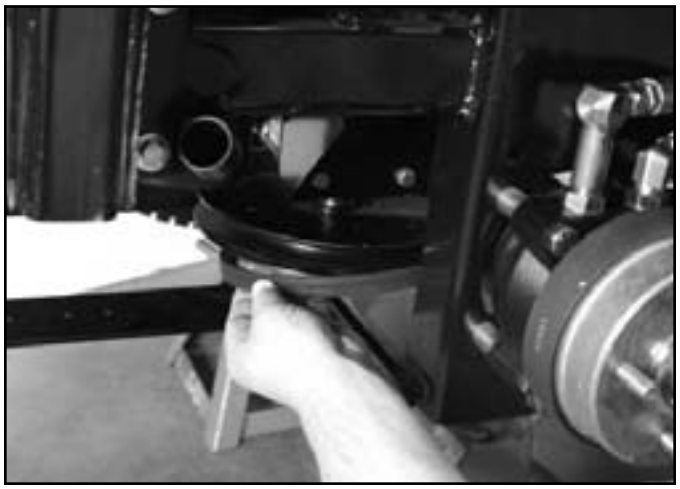

Fig 856 PICT-3881

12. Remove the 4 mounting bolts and lock washers securing the gearbox assembly to the frame (Fig. 857).

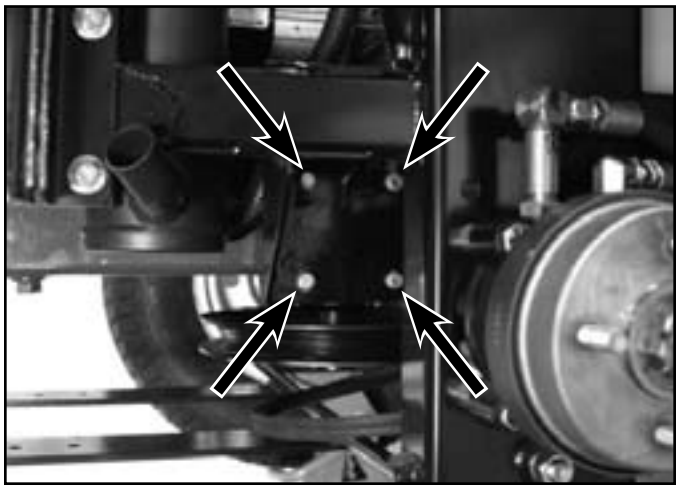

Fig 857 PICT-3892

13. Remove the gearbox assembly (Fig. 858).

Fig 858 PICT-3898

14. Remove the 2 set screws from the gearbox driven pulley (Fig. 859).

Fig 859 PICT-3907

15. Remove the pulley (Fig. 860).

Fig 860 PICT-3909a

16. Remove the key from the keyway (Fig. 861).

Fig 861 PICT-3910

17. Remove the 2 set screws from the gearbox drive pulley (Fig. 862).

Fig 862 PICT-3908

18. Remove the pulley (Fig. 863).

Fig 863 PICT-3918a

19. Remove the key from the keyway (Fig. 864).

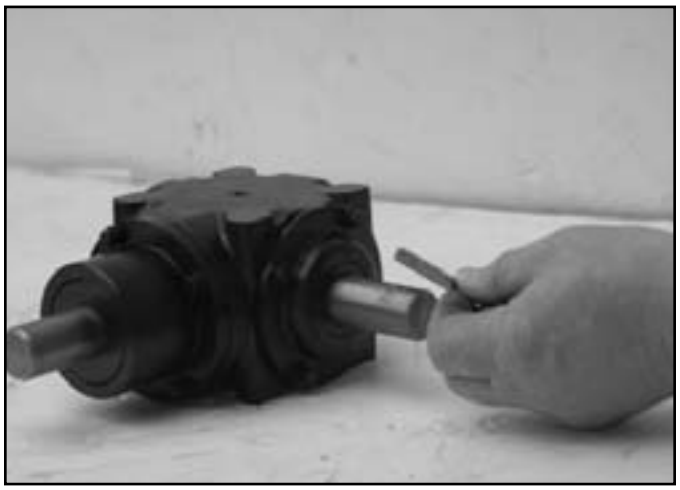

Fig 864 PICT-3912a

20. Inspect the keys, gearbox shafts and pulleys. Replace if worn or damaged.

21. Check the gearbox oil level. Refer to “Checking the Gearbox Oil Level” on page 7-54.

Gearbox Assembly Installation

1. Apply anti-seize compound to both gearbox assembly shafts (Fig. 865).

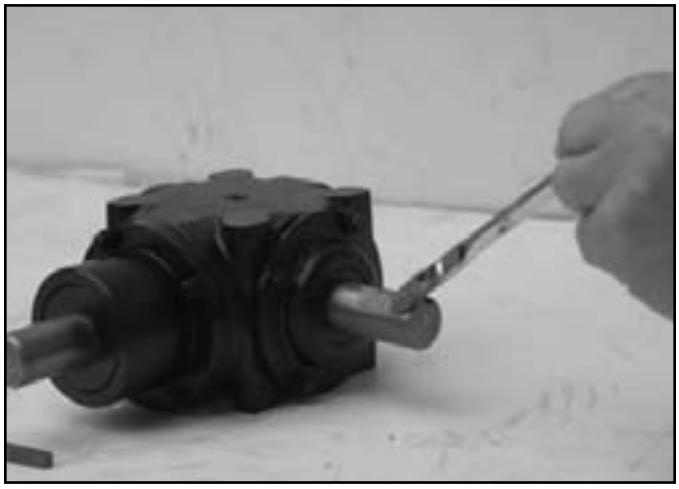

Fig 865 PICT-3913a

2. Install a key into the gearbox drive shaft keyway (Fig. 866).

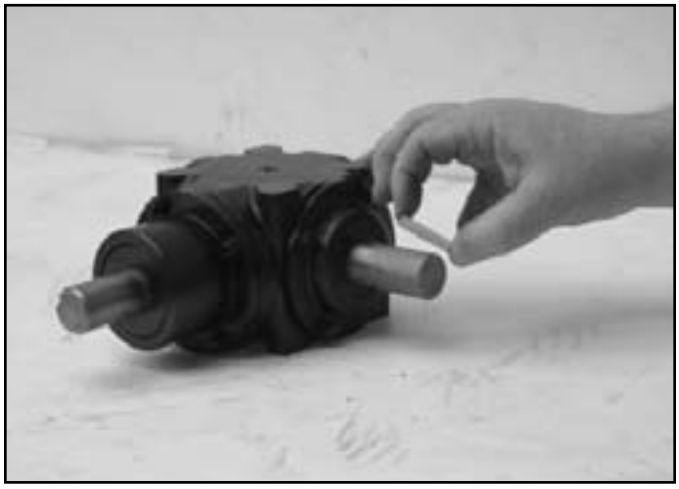

Fig 866 PICT-3915a

3. Apply thread locking compound to all 4 pulley set screws. Start the set screws into the pulley hubs (Fig. 867).

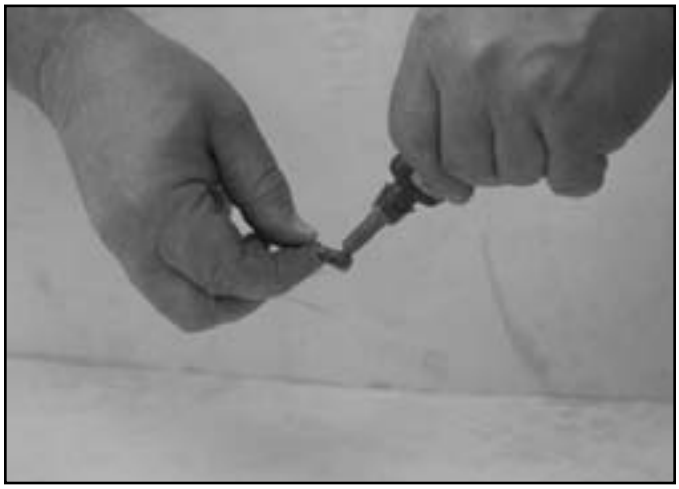

Fig 867 PICT-3917a

Slide the gearbox drive pulley onto the gearbox drive shaft (Fig. 868).

Note: Install the pulley so that the pulley hub is flush ± .03" (0.76mm) with the end of the gearbox shaft.

Fig 868 PICT-3918a

4. Tighten the set screws (Fig. 869).

Fig 869 PICT-3919a

5. Torque each set screw to 145 ± 20 in-lbs. (16 ± 2.25 Nm) (Fig. 870).

Fig 870 PICT-3921a

6. Install a key into the gearbox driven shaft keyway (Fig. 871).

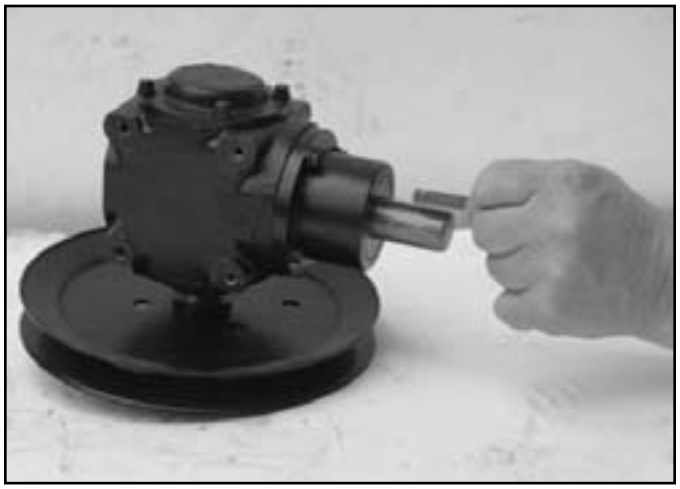

Fig 871 PICT-3924a

7. Slide the driven pulley onto the gearbox driven shaft (Fig. 872).

Fig 872 PICT-3909a

Note: Install the pulley so that the hub is .06" (1.5mm) from the end of the gearbox driven shaft. Tighten the set screws (Fig. 873).

Fig 873 PICT-3925

8. Torque each set screw to 145 ± 20 in-lbs. (16 ± 2.25 Nm) (Fig. 874).

Fig 874 PICT-3927a

9. Position the gearbox assembly to the frame (Fig. 875).

Fig 875 PICT-3898

10. Install 4 mounting bolts and lock washers securing the gearbox assembly to the frame. Torque the 4 mounting bolts to 145 ± 20 in-lbs. (16 ± 2.25 Nm) (Fig. 876).

Fig 876 PICT-3930

11. Install the deck drive belt around gearbox mower deck drive pulley (Fig. 877).

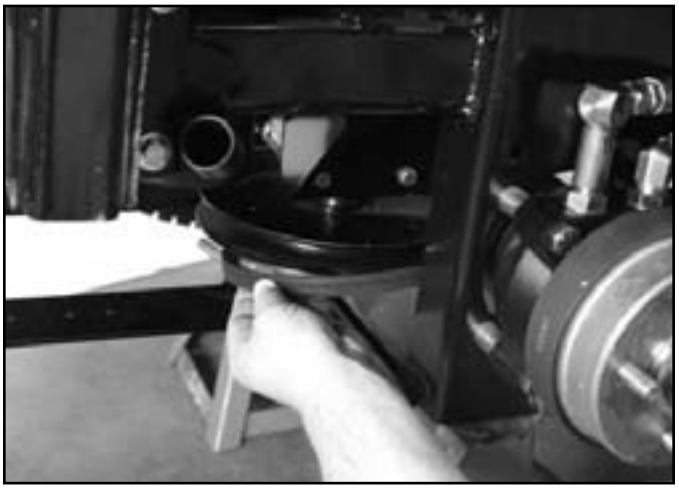

Fig 877 PICT-3881

12. Using a spring removal tool (Toro p/n: 92-5771), install the mower deck idler spring (Fig. 878).

Fig 878 PICT-3880

13. Install the left hand mower deck belt cover (Fig. 879).

Fig 879 PICT-3879

14. Lower the floor pan assembly (Fig. 880).

Fig 880 PICT-3877

15. Position the gearbox drive belt around the gearbox drive pulley (Fig. 881).

Fig 881 PICT-3876

16. Using a spring removal tool (Toro p/n: 92-5771), install the spring to the gearbox idler assembly (Fig. 882).

Fig 882 PICT-3872

17. Install the right rear wheel and tire assembly (Fig. 883).

Fig 883 IMG_7753a

18. Install the front engine panel (Fig. 884).

Fig 884 IMG_7862

19. Install the negative battery cable to the battery.

20. Lower the seat.

Checking the Gearbox Oil Level

1. Park the machine on a level surface.
2. Disengage the PTO, move the motion control levers to the neutral locked position and set the parking brake.
3. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.
4. Remove the side or rear plug on the gear box (Fig. 885).

Note: Gearbox removed from machine for photo clarity.

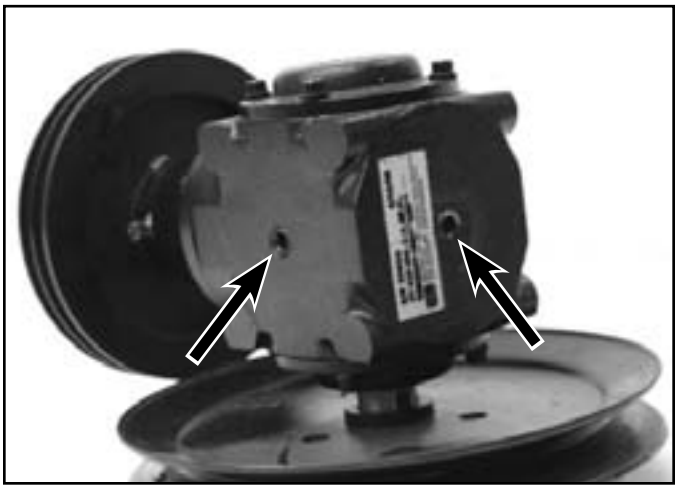

Fig 885 PICT-3899

5. The oil should be up to the opening of the gear box.
6. Add oil if needed to bring it to the correct level. Use SAE 75W–90 Synthetic Gear Lube.

Changing Gearbox Oil

Service Interval: Initial at 100 hours, then yearly.

1. Remove the gearbox assembly from the machine. Refer to “Gearbox Assembly Removal” on page 7-44.

Note: The pulleys do not have to be removed from the gearbox.

2. Remove the 2 plugs located on the side and rear of the gearbox assembly (Fig. 886).

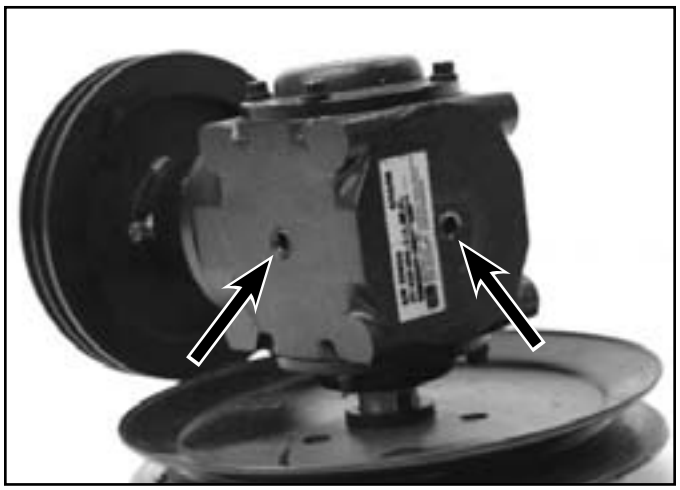

Fig 886 PICT-3899

3. Drain the oil from the gearbox into a drain pan.

4. Fill the gearbox assembly with 75W-90 Synthetic Gear Lube until the oil level reaches the plug openings (Fig. 887). Capacity 6 oz. (.177 liters).

Fig 887 PICT-3901a

5. Install the 2 plugs into the side and rear of the gearbox assembly (Fig. 888).

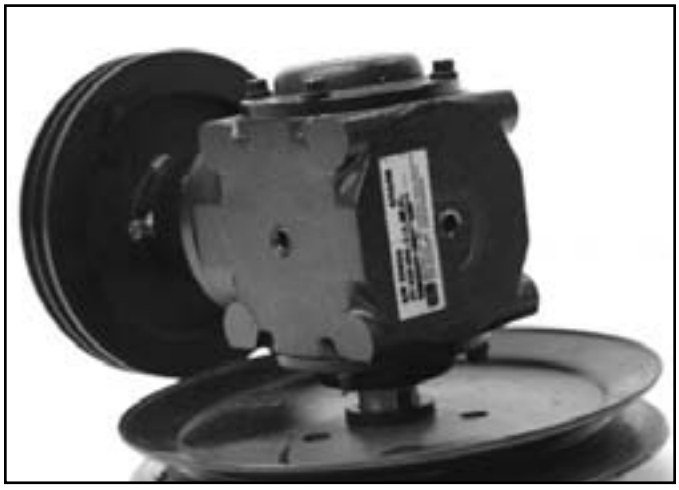

Fig 888 PICT-3899

6. Install the gearbox assembly. Refer to “Gearbox Assembly Installation” on page 7-49.

Strut Replacement

Note: The right rear wheel assembly has been removed for photo purposes.

Strut Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.

2. Raise the seat.

3. Remove the negative battery cable from the battery.

4. Raise the floor pan assembly (Fig. 889).

Fig 889 PICT-4011

7

5. Remove the left and right mower deck belt covers (Fig. 890).

Fig 890 PICT-4012

6. Using a spring removal tool (Toro p/n: 92-5771), remove the mower deck idler spring. Remove the mower deck belt from the gearbox deck drive pulley (Fig. 891).

Fig 891 PICT-4013

7. Remove the bolt and nut securing the strut pin to the mower deck strut bracket (Fig. 892).

Fig 892 PICT-4108

8. Remove the strut pin (Fig. 893).

Fig 893 PICT-4111

9. Remove the nut, lockwasher and bolt securing the strut balljoint to the frame (Fig. 894).

Fig 894 PICT-4105

10. Remove the strut assembly (Fig. 895).

Fig 895 PICT-4115

11. Remove the grease fittings from the strut (Fig. 896).

Fig 896 PICT-4116a

12. Loosen the balljoint jam nut (Fig. 897).

Fig 897 PICT-4119a

13. Remove the balljoint and jam nut from the strut (Fig. 898).

Fig 898 PICT-4121a

Strut Installation

1. Install the balljoint and jam nut into the strut. The length of the strut should be 17.31” (43.97cm) from the center of the balljoint to the center of the cross shaft of the strut (Fig. 899).

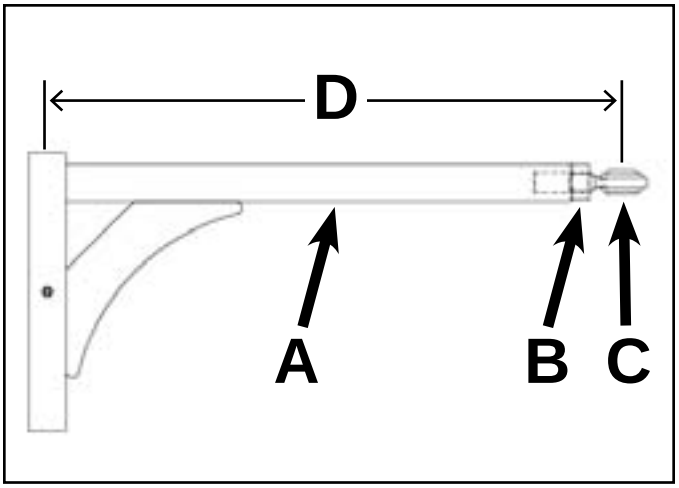

Fig 899 fig. 108-5969

A. Strut
B. Jam nut
C. Balljoint
D. 17.31” (43.97cm)

2. Tighten the jam nut to secure the balljoint position (Fig. 900).

Note: Balljoint to be positioned perpendicular to strut.

Fig 900 PICT-4119a

3. Install 2 grease fittings into the strut (Fig. 901).

Fig 901 PICT-4116a

4. Position the strut assembly balljoint up to the frame. Secure it to the frame with a bolt, lockwasher and nut (Fig. 902).

Fig 902 PICT-4105

5. Position the front end of the strut between the strut brackets on the rear of the mower deck and install the strut pin (Fig. 903).

Fig 903 PICT-4111

6. Install a bolt and nut securing the strut pin to the mower deck strut bracket (Fig. 904).

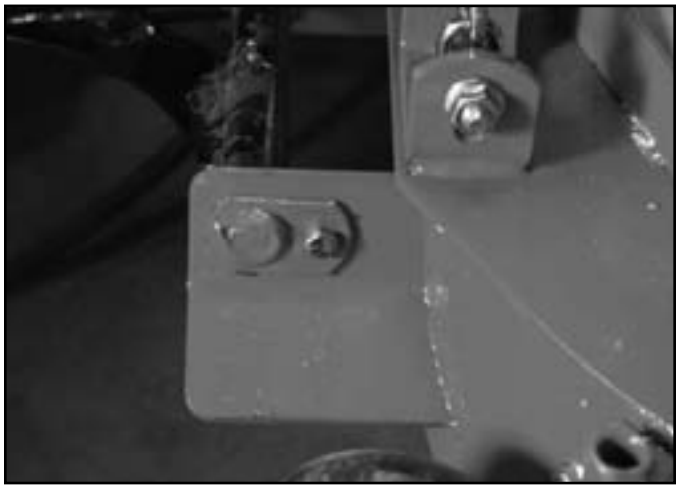

Fig 904 PICT-4108

7. Apply grease to the strut grease fitting (Fig. 905).

Fig 905 PICT-4128

7

8. Route the mower deck belt. Refer to the belt routing decal (Fig. 906).

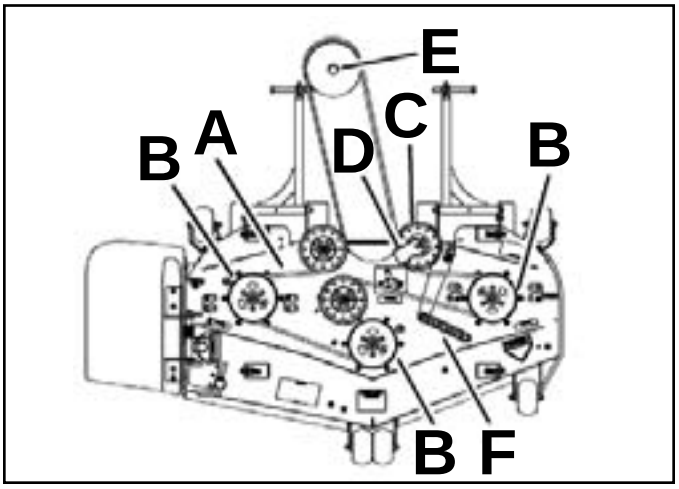

Fig 906 fig. 55 G001067

A. Mower belt
B. Mower spindle pulley
C. Mower idler pulley
D. Belt guide
E. Gearbox pulley
F. Spring

9. Install the mower deck idler spring (Fig. 907).

Fig 907 PICT-4013

10. Install the left and right mower deck belt covers (Fig. 908).

Fig 908 PICT-4012

11. Lower the floor pan assembly (Fig. 909).

Fig 909 PICT-4011

12. Install the negative battery cable to the battery.

13. Lower the seat.

7

72” Mower Deck Belt Tension Adjustment Plate Replacement

72” Mower Deck Belt Tension Adjustment Plate Removal

1. Park the machine on a level surface, disengage the PTO, turn the ignition off and remove the key.
2. Raise the seat.
3. Remove the negative battery cable from the battery.
4. Raise the floor pan assembly (Fig. 910).

Fig 910 PICT-4011

5. Remove the left and right mower deck belt covers (Fig. 911).

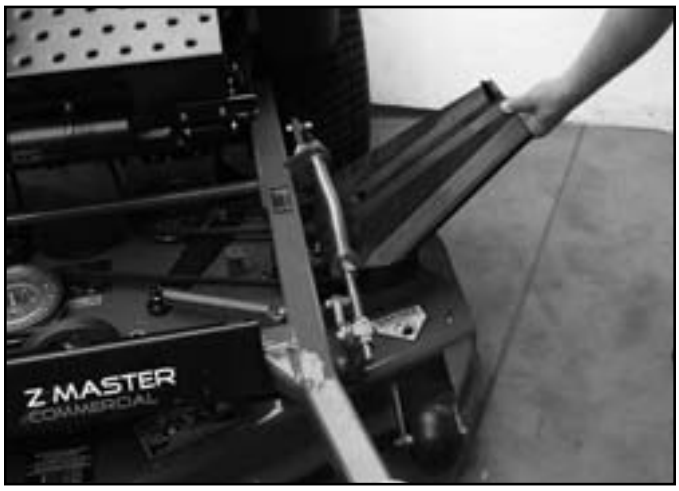

Fig 911 PICT-4012

6. Using a spring removal tool (Toro p/n: 92-5771), remove the mower deck idler spring (Fig. 912).

Fig 912 PICT-4013

7. Remove the belt from around the adjustment plate pulley.

8. Remove the nut from the pivot bolt (Fig. 913).

Note: The pivot bolt will fall through to the underside of the deck when the nut is removed.

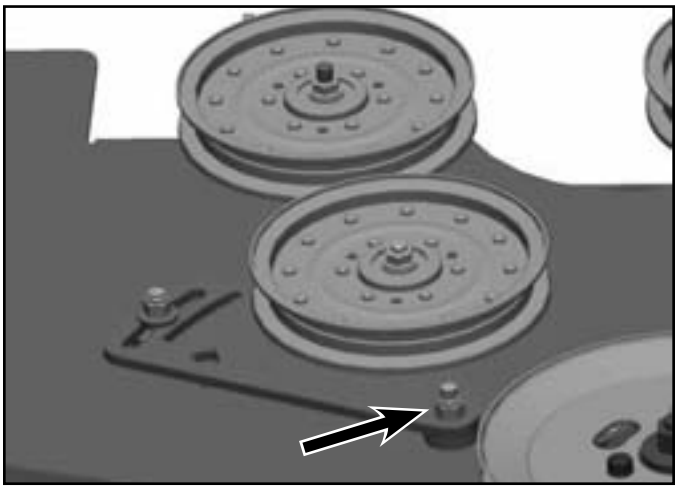

Fig 913 6666a

9. Remove the nut and washer from the adjustment plate slot bolt (Fig. 914).

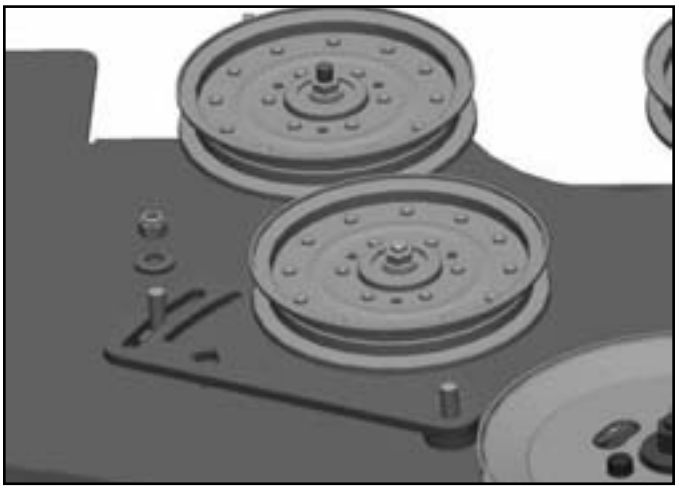

Fig 914 6667a

10. Remove the tension adjustment plate assembly (Fig. 915).

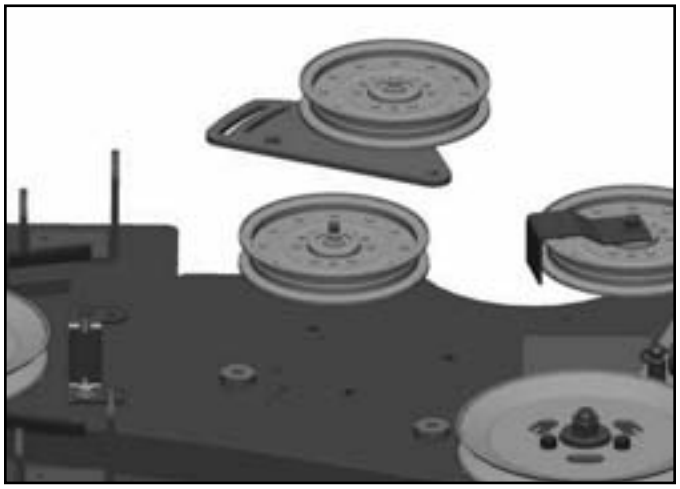

Fig 915 PICT-6668a

11. Remove the 2 spacers from the mower deck (Fig. 916).

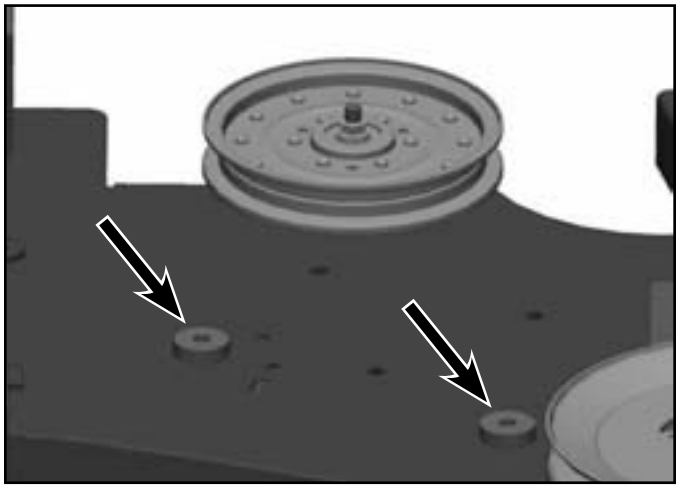

Fig 916 6669a

12. Remove the nut, washer and bolt securing the pulley to the adjustment plate (Fig. 917).

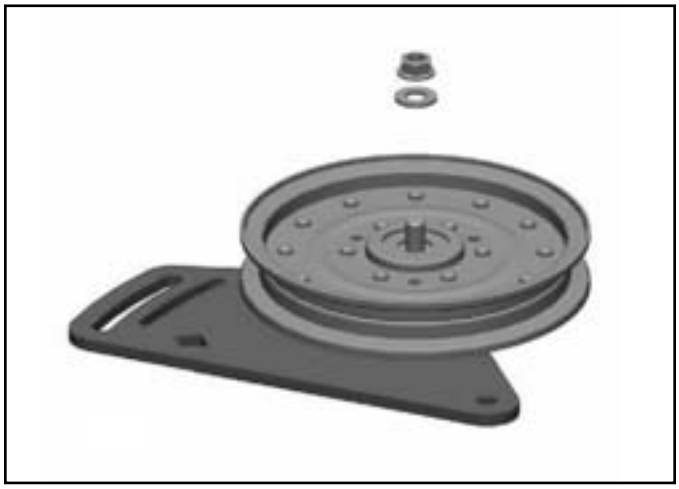

Fig 917 6670a

13. Remove the pulley from the idler bushing (Fig. 918).

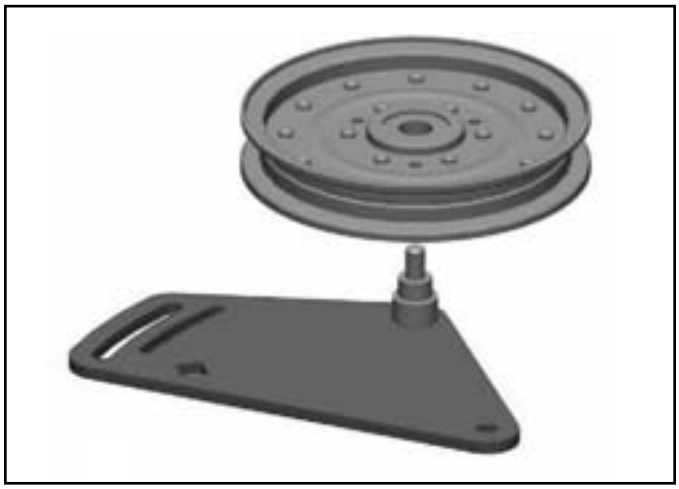

Fig 918 6671a

14. Remove the idler bushing (Fig. 919).

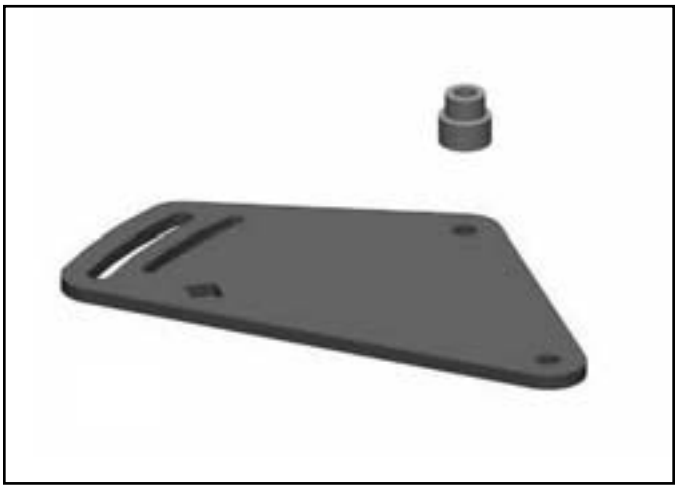

Fig 919 6672a

72” Mower Deck Belt Tension Adjustment Plate Removal

1. Position the idler bushing onto the tension adjustment plate (Fig. 920).

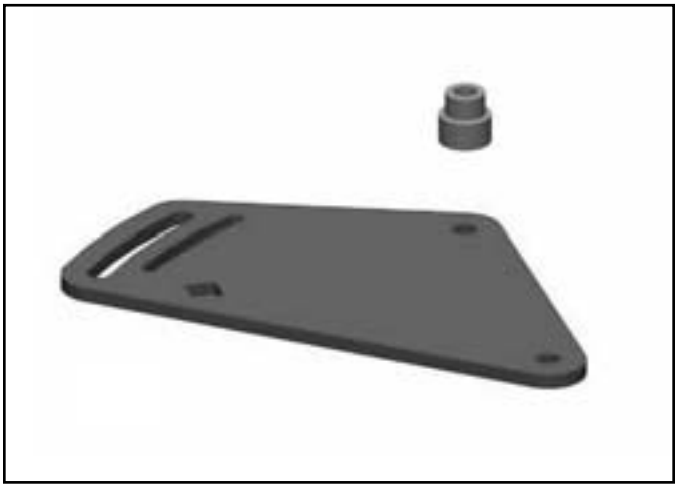

Fig 920 6672a

2. Insert the mounting bolt up through the idler bushing and place the pulley onto the bushing (Fig. 921).

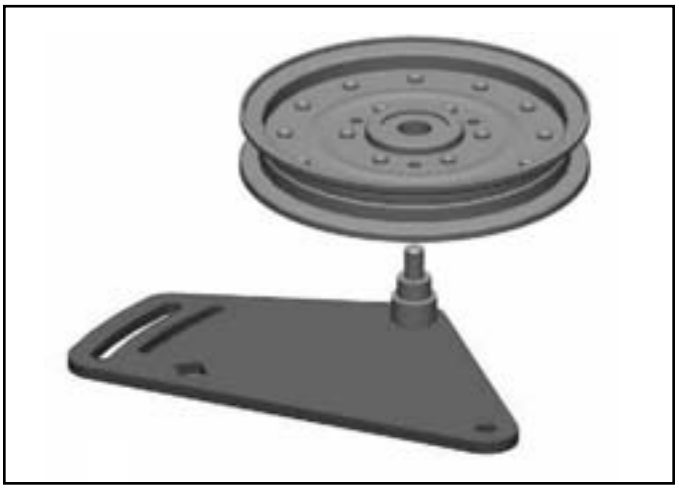

Fig 921 6671a

3. Install a washer and nut onto the pulley bolt securing the pulley to the adjustment plate (Fig. 922).

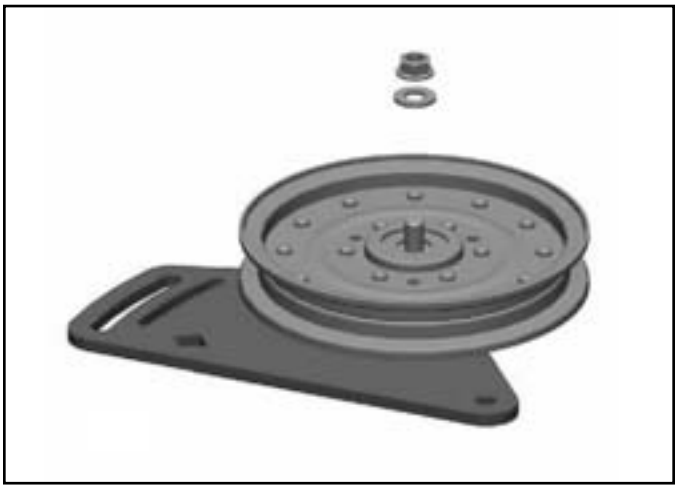

Fig 922 6670a

4. Position 2 spacers onto the mower deck (Fig. 923).

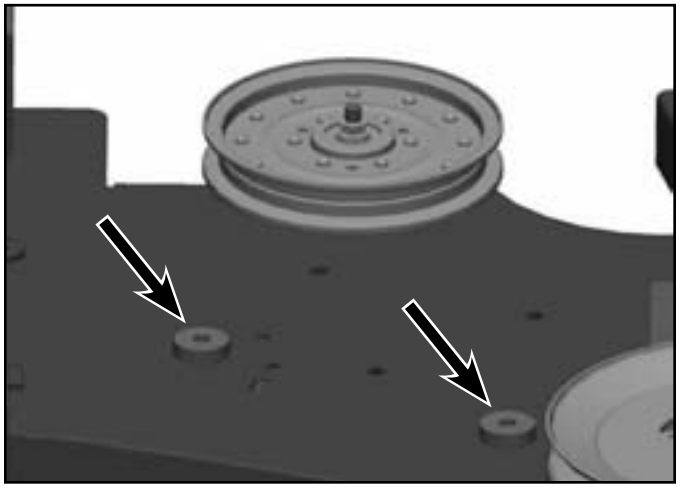

Fig 923 6669a

5. Position the tension adjustment plate assembly onto the mower deck making sure the spacers are in place (Fig. 924).

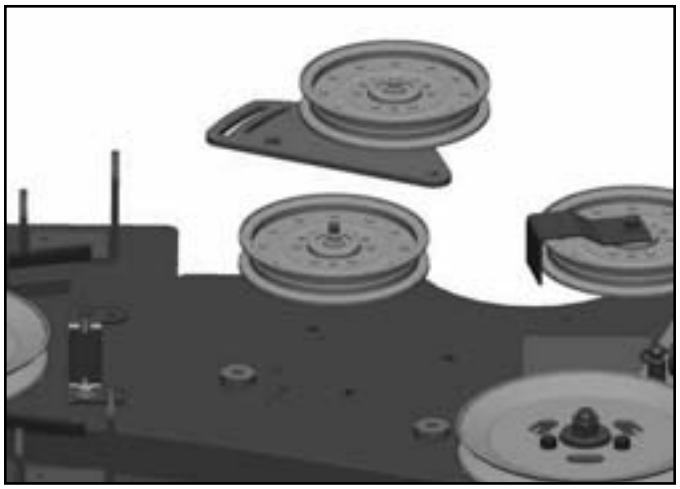

Fig 924 PICT-6668a

6. Insert 2 bolts up through the mower deck, spacers and tension adjustment plate. Install a washer and nut onto each bolt (Fig. 925).

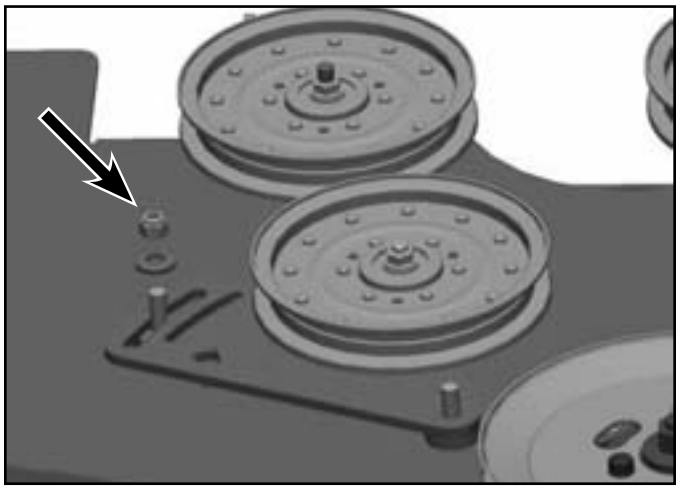

Fig 925 6667a

7. Route the belt around the adjustment plate pulley. Refer to the belt routing decal (Fig. 926).

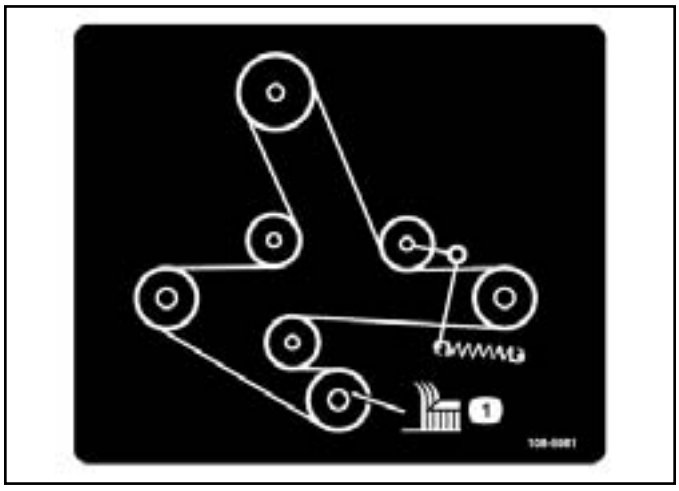

Fig 926 fig. 108-5981

8. Install the mower deck idler spring (Fig. 927).

Fig 927 PICT-4013

9. Adjust the mower belt tension. Refer to “72” Mower Deck Mower Belt Tension Adjustment” on page 7-66.

10. Install the left and right mower deck belt covers (Fig. 928).

Fig 928 PICT-4012

11. Lower the floor pan assembly (Fig. 929).

Fig 929 PICT-4011

12. Install the negative battery cable to the battery.

13. Lower the seat.

72” Mower Deck Belt Tension Adjustment

Important: To ensure proper mower belt tension, which will result in a longer belt life, check the mower belt tension after the first 8 hours of use and 8 hours after each belt change.

1. Disengage the PTO, move the motion control levers to the neutral locked position, and set the parking brake.

2. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.

3. Place the mower deck in the 3” (76mm) height-of-cut position.

4. Measure the mower deck idler spring length (Fig. 000). If the spring length is between 10” and 10-1/4” (25.4 and 26.0cm), from post to post, no adjustment is needed.

   If it is not between 10” and 10-1/4” (25.4 and 26.0cm), continue:

5. Loosen the bolts holding the idler plate (Fig. 930).

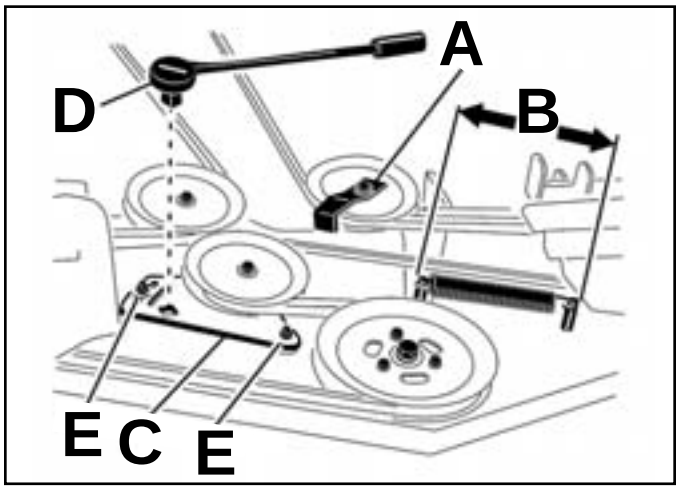

Fig 930 fig. 62 G006478

A. Belt guide install at a 45 degree angle
B. Idler spring length between 10 & 10-1/4” (25.4 & 26.0cm)
C. Idler plate
D. Ratchet or breaker bar
E. Idler plate bolt

6. Insert a ratchet or breaker bar into the square hole in the idler plate (Fig. 930).

7. Rotate the ratchet or breaker bar to move the idler plate until the idler spring is between 10” and 10-1/4” (25.4 and 26.0cm) from post to post (Fig. 930).

8. While holding the belt tension and spring length, tighten the idler plate bolts to secure the idler plate (Fig. 930).

Gearbox Rebuild

1. Remove the two gearbox drain plugs and drain the oil from the gearbox (Fig. 931).

Fig 931 PICT-5631

2. Remove the 4 bolts securing the pinion housing to the case (Fig. 932).

Note: The bolts securing the end caps to the gearbox housing are patch lock bolts and must be replaced with new patch lock bolts.

Fig 932 PICT-5636

3. Carefully remove the pinion assembly (Fig. 933).

Fig 933 PICT-5646

4. Remove the o-ring from the pinion pilot (Fig. 934).

Fig 934 PICT-5649

7

5. Remove the shim(s) (Fig. 935).

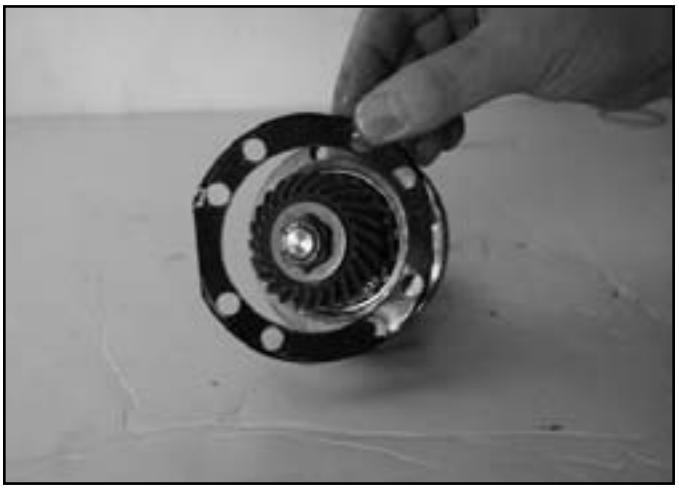

Fig 935 PICT-5650

6. Remove the 8 end cap screws (4 securing each end cap) (Fig. 936 and Fig. 937).

Note: The bolts securing the end caps to the gear-box housing are patch lock bolts and must be replaced with new patch lock bolts.

Fig 936 PICT-5651a

Fig 937 IMG-8490

7. Remove the closed end cap (Fig. 938).

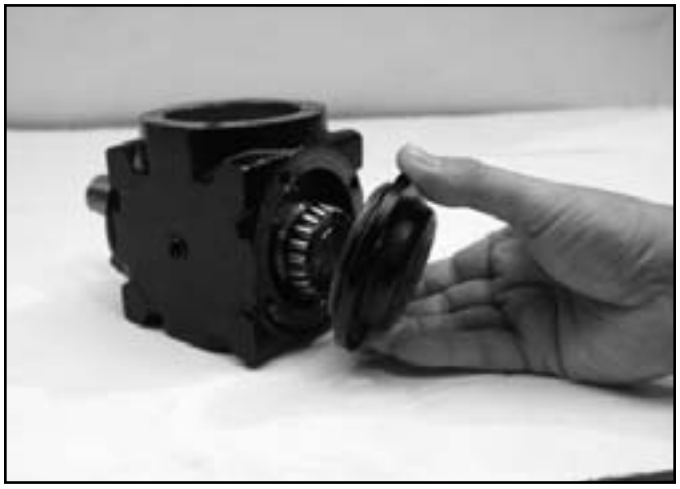

Fig 938 PICT-5657

8. Remove the o-ring from the closed end cap (Fig. 939).

Fig 939 IMG-8491

9. Remove the open end cap and cross shaft assembly (Fig. 940).

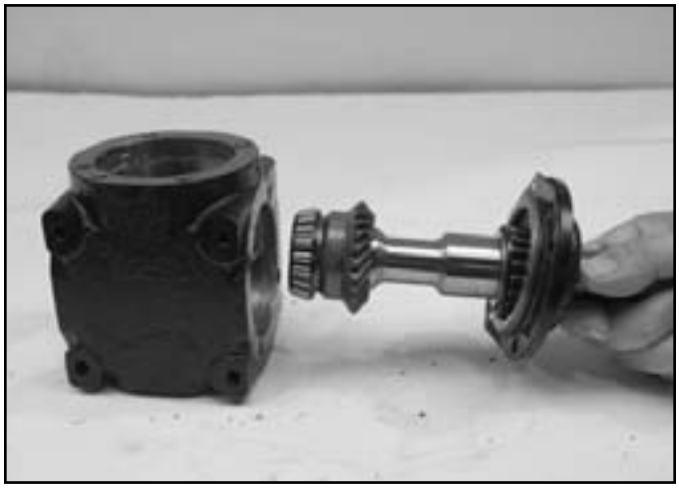

Fig 940 PICT-5658a

10. Remove the o-ring from the cross shaft pilot (Fig. 941).

Fig 941 PICT-5664

11. Remove the shim(s) (Fig. 942).

Fig 942 PICT-5666

12. Remove the cross shaft from the open end cap (Fig. 943).

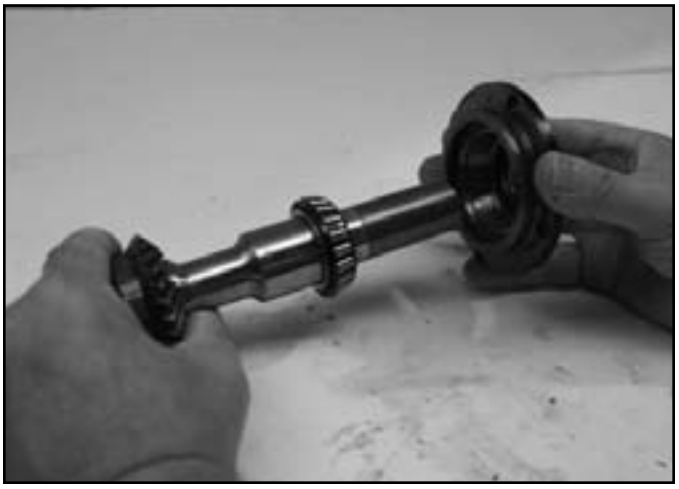

Fig 943 PICT-5667

Pinion Shaft Teardown

13. Secure the pinion shaft in a vise.

14. Remove the lock nut from the pinion shaft (Fig. 944).

Fig 944 IMG-8494a

15. Remove the washer from the pinion shaft (Fig. 945).

Fig 945 IMG-8495

16. Using a gear puller, remove the cross shaft gear from the pinion shaft (Fig. 946).

Fig 946 IMG-8499

17. Remove the key from the shaft keyway (Fig. 947).

Fig 947 IMG-8501

18. Place the pinion shaft assembly in a press, shaft side down. Press the pinion shaft assembly out of the pinion housing (Fig. 948).

Fig 948 IMG-8503

19. Remove the bearing and shaft assembly from the pinion housing (Fig. 949).

Fig 949 IMG-8504

20. Remove the grease seal from the shaft (Fig. 950).

Fig 950 IMG-8507a

21. Place the shaft assembly in a press and press the bearing off the shaft (Fig. 951).

Fig 951 IMG-8509

22. Place the pinion housing in a vise and remove the inner and outer bearing races from the housing (Fig. 952).

Note: The inner race and housing must be heated to remove the races.

Fig 952 IMG-8514

Cross Shaft Teardown

23. Place the cross shaft in a press with the pinion gear bearing facing up.

24. Press the pinion gear and bearing off the cross shaft (Fig. 953).

Fig 953 IMG-8517

25. Remove the key from the shaft keyway (Fig. 954).

Fig 954 IMG-8519

26. Position the cross shaft in the press so the opposite bearing is facing up. Press the bearing off the shaft (Fig. 955).

Fig 955 IMG-8520

Open End Cap Teardown

27. Remove the oil seal from the open end cap (Fig. 956).

Fig 956 IMG-8536

28. Remove the bearing race form the open end cap (Fig. 957).

Note: The inner race and housing must be heated to remove the race.

Fig 957 IMG-8537

Closed End Cap Teardown

29. Remove the bearing race from the closed end cap (Fig. 958).

Note: The inner race and housing must be heated to remove the race.

Fig 958 IMG-8537

Closed End Cap Rebuild

30. Press the bearing race into the open end cap (Fig. 959).

Fig 959 IMG-8537

Open End Cap Rebuild

31. Press the oil seal into the open end cap (Fig. 960).

Fig 960 IMG-8538a

32. Press the bearing race into the open end cap (Fig. 961).

Fig 961 IMG-8537

Cross Shaft Rebuild

33. Place the cross shaft in the press and press a new bearing onto the shaft (Fig. 962).

Fig 962 IMG-8525

34. Install the key into the shaft keyway (Fig. 963).

Fig 963 IMG-8519

35. Place the cross shaft in a press with the installed bearing down.

36. Align the keyway in the pinion gear with the key installed in the shaft. Press the pinion gear onto the shaft (Fig. 964).

Fig 964 IMG-8529

37. Press the bearing onto the shaft (Fig. 965).

Fig 965 IMG-8530

Pinion Shaft Rebuild

38. Press a new bearing race into the outer end of the pinion housing (Fig. 966).

Fig 966 IMG-8532

39. Press a new bearing race into the inner end of the pinion housing (Fig. 967).

Fig 967 IMG-8534

40. Place the pinion shaft assembly in a press and press the bearing onto the shaft (Fig. 968).

Fig 968 IMG-8540a

41. Slide the bearing and shaft assembly into the pinion housing (Fig. 969).

Fig 969 IMG-8541

42. Place the assembly into a press and press a new bearing into the pinion housing (Fig. 970).

Fig 970 IMG-8542a

43. Install the key into the pinion shaft keyway (Fig. 971).

Fig 971 IMG-8543

44. Align the keyway in the pinion gear with the key installed in the shaft. Press the pinion gear onto the shaft (Fig. 972).

Fig 972 IMG-8546a

45. Install a washer onto the pinion shaft (Fig. 973).

Fig 973 IMG-8547

46. Install the lock nut onto the pinion shaft (Fig. 974).

Note: Secure the assembly in a vise and tighten the lock nut enough to draw the gear and washer until the bearings bind slightly. Back off the nut approximately 1/8 of a turn.

Fig 974 IMG-8494a

47. Place a protective wrap around the shaft keyway to protect the grease seal on installation.

48. Press the grease seal into the pinion housing (Fig. 975).

Fig 975 IMG-8550

Gearbox Assembly

49. Assemble the closed end cap onto the gearbox (Fig. 976).

Note: The end cap is oriented onto the gearbox adjacent to the 2 drain plug holes.

Fig 976 IMG-8554

50. Install 4 new bolts securing the closed end cap to the gearbox housing. Torque the bolts to 280 – 325 in-lbs. (31.6 – 36.7 Nm) (Fig. 977).

Note: The bolts are to be tightened in a crisscross pattern.

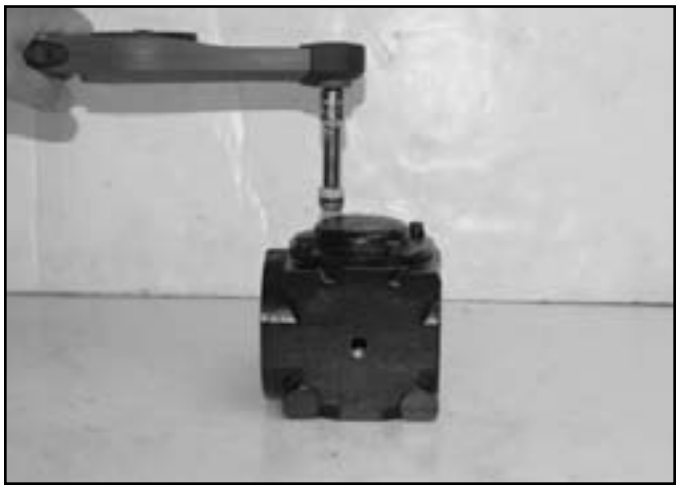

Fig 977 PICT-6429a

51. Insert the cross shaft into the gearbox. Seat the cross shaft bearing into the closed end cap (Fig. 978).

Fig 978 IMG-8558

52. Install .013” (.33mm) thickness of shims onto the open end cap (Fig. 979).

Note: The shim color corresponds to its thickness:
Blue: .005” (.127mm) thick
Green: .003” (.076mm) thick
Brown: .010” (.254mm) thick

Fig 979 IMG-8561

53. Install a new end cap o-ring (Fig. 980).

Fig 980 IMG-8562

54. Apply a protective film onto the shaft keyway.

55. Install the open end cap assembly over the cross shaft and onto the gearbox (Fig. 981).

Fig 981 IMG-8559

56. Install 4 new bolts securing the open end cap to the gearbox housing. Torque the bolts to 280 – 325 in-lbs. (31.6 – 36.7 Nm) (Fig. 982).

Note: Tighten the bolts in a crisscross pattern.

Fig 982 IMG-8582a

57. Check the cross shaft end play measurement, it should be between .004” and .012” (.101 and .305mm). Adjust the open end cap shims to adjust backlash (Fig. 983).

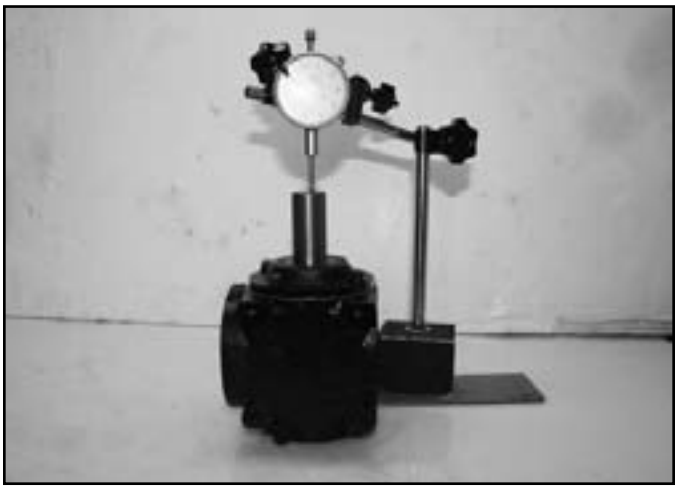

Fig 983 IMG-8564

58. Install .013” (.33mm) thickness of shims onto the pinion housing (Fig. 984).

Note: The shim color corresponds to its thickness:
Blue: .005” (.127mm) thick
Green: .003” (.076mm) thick
Brown: .010” (.254mm) thick

Fig 984 IMG-8567

59. Install a new o-ring on onto the pinion housing (Fig. 985).

Fig 985 IMG-8569

60. Insert the pinion shaft assembly into the gearbox assembly seating the pinion gear into the cross shaft gear (Fig. 986).

Fig 986 IMG-8570a

61. Install 4 new bolts securing the pinion assembly to the to the gearbox housing. Torque the bolts to 280 – 325 in-lbs. (31.6 – 36.7 Nm) (Fig. 987).

Note: The bolts are to be tightened in a crisscross pattern.

Fig 987 IMG-8580a

62. Check the pinion shaft end play measurement, it should be between .004” and .012” (.101 and .305mm). Adjust the pinion housing shims to adjust backlash (Fig. 988).

Note: Pinion housing shims and open end cap shims should not vary more than .005” (.127mm). If they vary more than that, adjust the cross shaft shimming until a better balance is achieved.

Fig 988 IMG-8572

63. Fill the gearbox with 6 oz. (.15 liters) of 75W-90 synthetic gear oil with anti-foaming agent until it starts to flow out of the oil plug hole (Fig. 989).

Fig 989 IMG-8574a

64. Install the fill and drain plugs so they are flush with or below the housing mounting surfaces (Fig. 990).

Fig 990 IMG-8578a

Leveling the Mower

Setting up the Machine

1. Position mower on a flat surface.
2. Disengage the PTO, move the motion control levers to the neutral locked position and set the parking brake.
3. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.
4. Check the tire pressure of all four tires. If needed, adjust to 13 psi (90 kPa).
5. Lower the mower to the 3” (76mm) height-of-cut position.
6. Inspect the four chains. The chains need to have tension.
   - If one rear chain is loose, lower (loosen) the front support arm on the same side. Refer to “Adjusting the Front-to-Rear Mower Pitch” on page 7-84.
   - If one front chain is loose, raise (tighten) the front support arm for that chain. Refer to “Adjusting the Front-to-Rear Mower Pitch” on page 7-84.

Leveling the Mower Side to Side

1. Position the right blade side-to-side (Fig. 991).

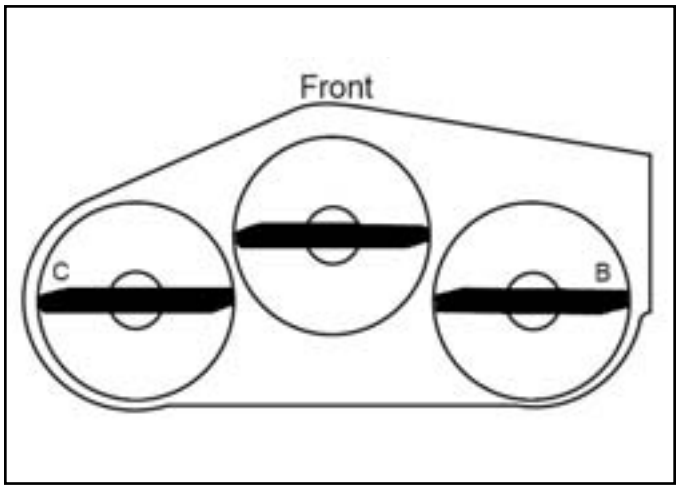

Fig 991 fig. 65 m-1078

2. Measure the right blade at the B location (Fig. 991), from a level surface to the cutting edge of the blade tip (Fig. 992).

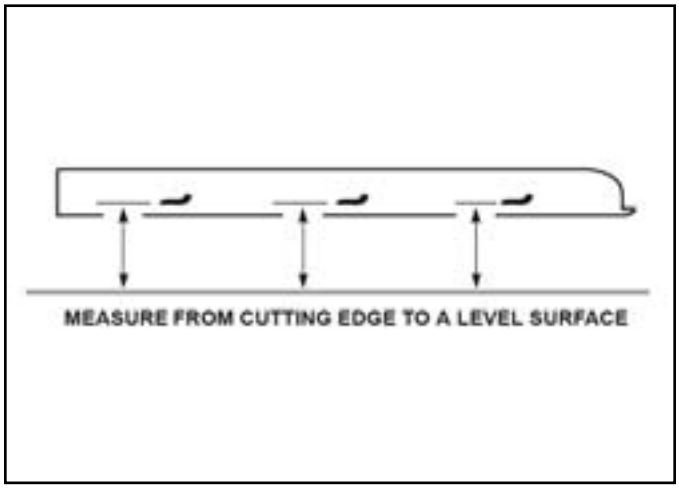

Fig 992 fig. 66 m-2539

3. Record this measurement. This measurement needs to be 3-1/8” to 3-1/4” (7.9 to 8.3cm).

4. Position the left blade side-to-side (Fig. 991).

5. Measure the left blade at the C location (Fig. 65 m1078) from level surface to cutting edge of the blade tips (Fig. 992).

6. Record this measurement. The measurement needs to be 3-1/8” to 3-1/4” (7.9 to 8.3cm).

7. If the measurement at positions B or C are not correct, loosen the bolt attaching the rear chain support arm (Fig. 993).

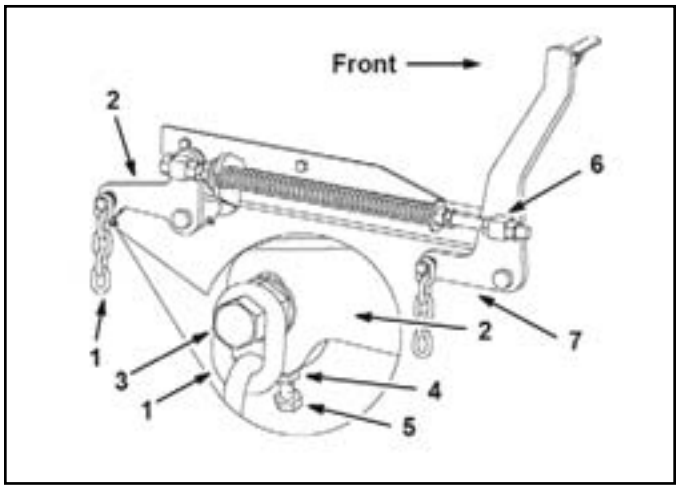

Fig 993 fig. 67 m-6830

1. Rear chain
2. Rear support arm
3. Bolt
4. Jam nut
5. Adjustment bolt
6. Front swivel
7. Front support arm

8. Loosen the jam nut under the rear support arm and use the adjustment bolt to get a measurement of 3-1/8” to 3-1/4” (7.9 to 8.3cm).

Note: Ideally both sides of the mower are set to the same distance.

9. Tighten the jam nut under the rear support arm and tighten the bolt securing the chain to the rear support arm.

Adjusting the Front to Rear Mower Pitch

1. Position the right blade front-to-rear (Fig. 994).

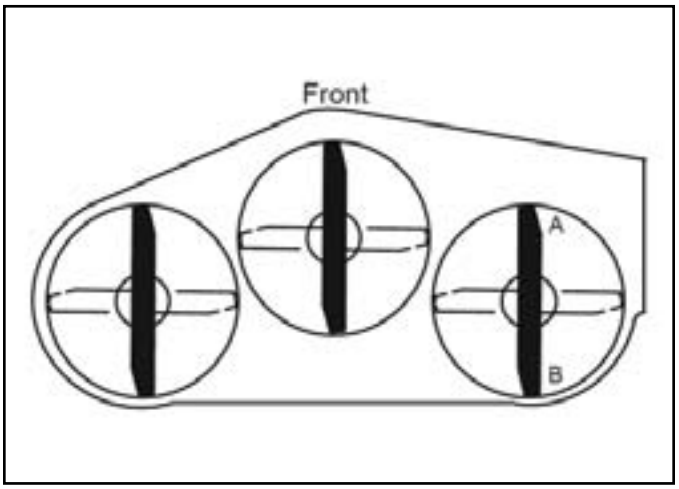

Fig 994 fig. 68 m-1078

2. Measure the right blade at the A location (Fig. 991), from a level surface to the cutting edge of the blade tip (Fig. 995).

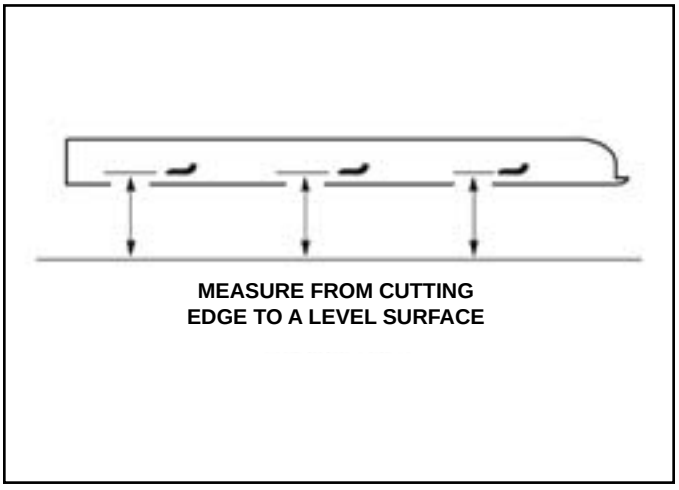

Fig 995 fig. 69 m-2539

3. Record the measurement.
4. Measure the right blade at the B location (Fig. 991) from a level surface to the cutting edge of the blade tip (Fig. 995).
5. Record this measurement.
6. The mower blade should be 1/4” to 3/8” (6 to 10mm) lower at position A than at position B (Fig. 994). If it is not correct, proceed to the following steps.

Note: Both of the front swivels need to be adjusted the same amount to maintain equal chain tension.

7. Loosen the front swivel jam nuts, at the front of the right and left swivels, approximately 1/2” (13mm) (996 and Fig. 997).

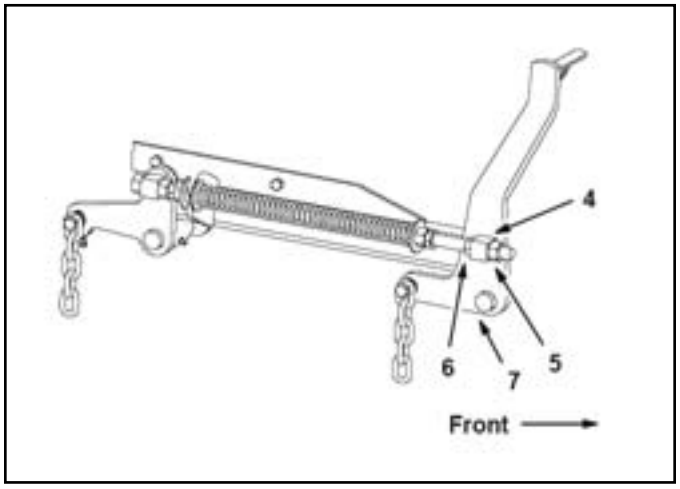

Fig 996 fig. 70 m-6831a

4. Front swivel
5. Swivel jam nut
6. Lift nut
7. Front support arm

8. Adjust the lift nuts on both the left and the right side of the machine (Fig. 996 and Fig. 997) to achieve 1/4” to 3/8” (6 to 10mm) lower in front A than in the rear at B (Fig. 994).

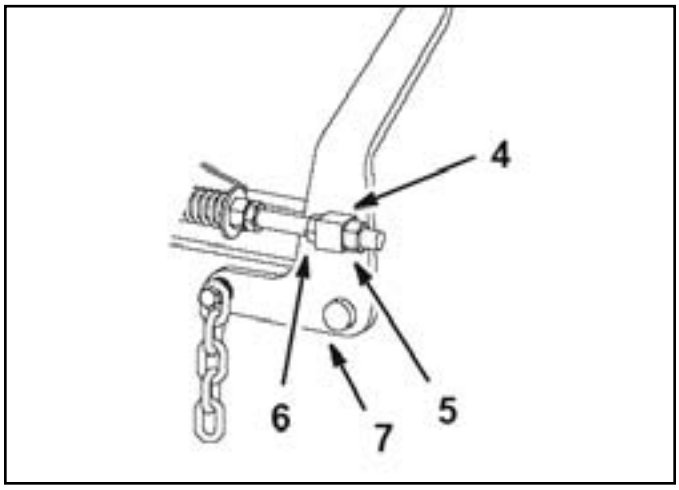

Fig 997 fig. 70 m-6831 rev

4. Front swivel
5. Swivel jam nut
6. Lift nut
7. Front support arm

9. Tighten both swivel jam nuts against the front swivel to lock the height.

10. Check to make sure there is equal tension on chains and adjust again if needed.

Adjusting the Compression Spring

1. Raise the mower lift lever to the transport position.

2. Check the distance between the two large washers, it needs to be 11-1/2” (29.2cm) (Fig. 998).

3. Adjust this distance, by loosening the spring jam nut and turning the nut in front of each spring (Fig. 998). Turning the nut clockwise will shorten the spring; counter-clockwise will lengthen the spring.

4. Lock the nut into position by tightening the spring jam nut (Fig. 998).

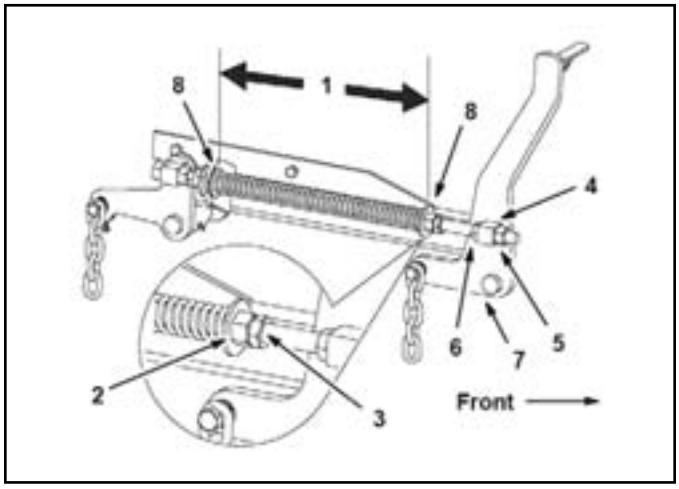

Fig 998 fig. 70 m-6831

1. 11-1/2” (29.2cm) between the large washers
2. Front nut
3. Spring jam nut
4. Front swivel
5. Swivel jam nut
6. Lift nut
7. Front support arm
8. Large washer

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Z580-D / Z593-D / Z595-D
Diesel Z Master

Service Manual

Form No. 492-9188