TORO®

Sitework Systems Products

Dingo® TX 413

Compact Utility Loader

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.

For service information on drive systems, please refer to the Hydro-Gear BDP-10 pump service manual (492-4789) and Parker-Ross TF wheel motor service manual (492-4753). For information specific to the engines used on this unit, refer to the appropriate engine manufacturer's service and repair instructions.

2004 and 2005 TX 413 units are covered in this manual. The manual may also be specified for use on later model products.

The hydraulic power 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
LCB Technical Services
8111 Lyndale Avenue South
Bloomington, MN 55420

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

Rev. 001

REVISIONS

TX 413 SERVICE MANUAL

Revision 000 . . . . . 7/30/05
Revision 001 . . . . . 4/13/09

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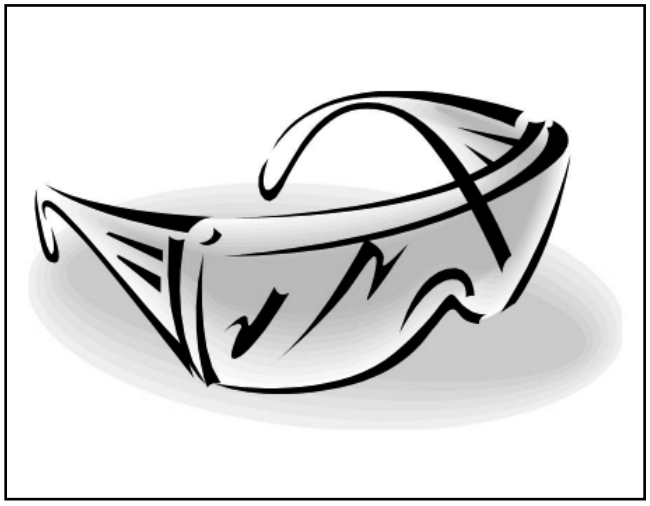
SAFETY INFORMATION



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 Sitework Systems TX 413 compact utility loader.

The TX 413 loader and attachment operator's manuals contain safety information and operating tips for safe operating practices. Operator's manuals are available 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.

Hydraulics Safety

• Inspect all hydraulic line connectors and fittings. Make sure all hydraulic hoses and lines are in good condition before applying pressure to the system.

• Keep body and hands away from pin hole leaks or nozzles that eject high pressure hydraulic fluid. Use cardboard or paper to find hydraulic leaks. Hydraulic fluid escaping under pressure can penetrate the skin and cause injury. Fluid accidentally injected into the skin must be surgically removed within a few hours by a doctor or gangrene may occur.

• Before disconnecting or performing any work on the hydraulic system, lower the loader arm/attachment to the ground and stop the engine so all pressure is relieved.

• Be sure you understand a service procedure before working on the machine.

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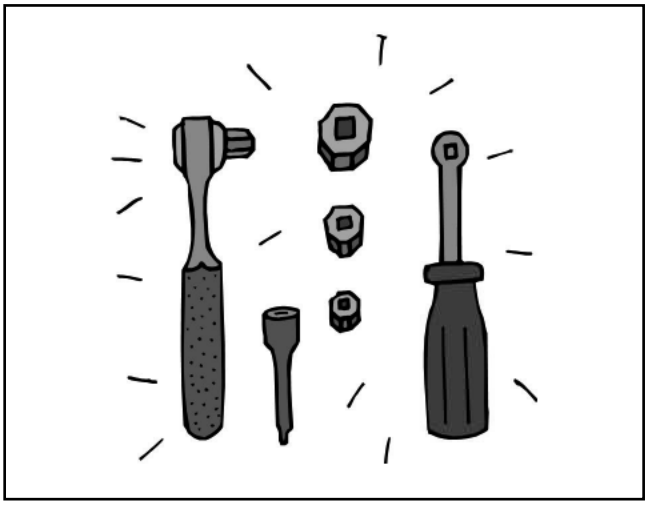
SPECIFICATIONS



SPECIFICATIONS

Special Tools

• Hydraulic Flow & Pressure Tester (Hydro-Gear BDP) Bi-directional Flow Test Kit (P/N 70661) or equivalent
• 15º/60º Offset Open End Wrench, 1/8" and 15/16"
• Torque Wrenches - nominal torque ranges, plus one capable of 300 ft-lbs. (407 Nm)
• Multimeter

General Specifications

Item	Specification
Engine	Honda Model GX390 13 horsepower, 4-cycle, air cooled, single cylinder, overhead valves, 12 VDC solenoid shift starter, 10 amp alternator, and low oil shut down.
RPM Setting	No-load Speed - 3600 rpm ± 150 rpm Low Idle Speed - 1450 rpm ± 150 rpm
Spark Plug	NGK BPR6ES, Denso W20EPR-U or equivalent. Air Gap: 0.030 inch (0.76mm).
Oil Capacity	1.16 Quarts (1.1 liter)
Fuel Tank	3 Gallons (11.4 liter)
Fuel shut off	Frame mounted electric fuel shut off

Dimensions:

Item	Specification
Overall Length (without Bucket)	**66.1" (167cm)**
Overall Length (with Bucket)	**86.7" (220cm)**
Overall Width (without Bucket)	**33.7" (85.6cm)**
Overall Width (with Bucket)	**34.5" (87.6cm)**
Overall Machine Height (Bucket Lowered)	**42.5" (107.9cm)**
Overall Operating Height (Fully Raised Bucket)	**76.4" (194cm)**
Wheel Base	**31.1" (78.9cm)**
Ground Clearance (Maximum)	**6.1" (15.5cm)**
Ground Clearance (Minimum)	**3.8" (9.7cm)**
Dump Angle	**45°**
Bucket Roll Back (Ground Position)	**25.2°**
Bucket Roll Back (Carry Position)	**25.2°**

Hydraulic System:

Item	Specification
Gear Pump	Single section 6.9 gpm (26.12 liter/min) gear pump powers the loader and auxiliary hydraulic systems.
Loader Valve	Two-spool mono-block valve controls loader functions via a single lever joystick. The valve has a power beyond circuit which feeds the auxiliary circuit. Main Relief Setting: 2650 psi (182.71 bar) Work Port Reliefs: 2030 psi (140 bar) for the bucket curl and loader lower circuit.
Auxiliary Valve	Single spool valve controls the auxiliary flow to the Dingo TX attachments. Flow is received via power beyond circuit in loader valve. The valve is actuated by a two-step-motion lever for forward and reverse flows. Relief is provided by loader valve at 2650 psi (182.7 bar).
Hydrostatic Pump	The traction circuit is powered by dual hydrostatic pumps in a closed loop system. The pumps have a service bypass valves for towing and have shock valves to limit circuit pressure spikes. The Hydro-Gear BDP-10A pumps are mechanically actuated by the patented Dingo TX traction control system. Pump Displacement: .61 in^3/rev (10cm^3/rev) Pump Speed: 3600 rpm Shock Valve Relief: 2320 psi (160 bar)
Wheel Motors	Two Parker-Ross TF hydraulic motors directly drive the track wheels. Displacement: 24.7 in^3/rev (40.4cm^3/rev) Mounting: 4-bolt through frame
Lift Cylinders	The lift circuit has a single hydraulic cylinder that control loader height. Working Pressure: 2650 psi (182.7 bar)
Dump Cylinders	The Quick-Attach angle is controlled by a single hydraulic cylinder. Working Pressure: 2650 psi (182.7 bar)
Tank	The hydraulic tank is a fabricated weldment integrated into the main frame. The tank has a cleanout access, stainless screen at the fill port, and a remote breather connected via hose. Capacity: 10 gallon (37.8 liter)
Filter	10 micron spin-on filter in gear return circuit

Electric System:

Item	Specification
Battery	12 volt, BCI group 55 battery with 585 CCA
Hour Meter	Frame mounted with Service Interval icon.
Fuel Shut Off	12 VDC ignition coil type
Ignition	Ignition switch is panel mounted with STOP-RUN-START positions.
Fuses	The machine has a fuse block with 3 separate fuses, 10 amp, 25 amp, and 30 amp circuits.

SPECIFICATIONS

Track System:

Item	Specification
Track	The tracks are Kevlar reinforced, endless rubber rings with 28 internal lugs. The outer tread on the tracks is a turf-friendly S-shaped pattern with pitched crosscuts. Track Width: 5.88 inches (14.9cm) Track Pitch: 3.45 inches (8.8cm)
Drive Wheel	The drive wheels are single-piece, austempered ductile iron, “squirrel cage” castings. Wheel Diameter: 11.63 inches (29.5cm)
Road Wheels	Constant track ground pressure is maintained by 20 ductile iron road wheels. The road wheels each have a sealed bearing that are protected by a secondary dirt seal on the inside and a gasketed steel cap on the outside.

Performance:

Item	Specification
Tip Capacity	1200 lbs. (544.3kg)
Operating Capacity	SAE J818 rating 35% tip capacity 420 lb (190.5kg) SAE J818 rating 50% tip capacity 600 lb (272.2kg)
Speed	Forward 0 - 3 mph (0 - 4.8km/hr) Reverse 0 - 1.5 mph (0 - 2.4km/hr)
Weight	1340 lbs. (607.8kg) (traction unit only) 1440 lbs. (653.2kg) (with Dingo TX bucket)

Periodic Maintenance Items:

Item	Specification	Maintenance Interval
Grease	Lithium Base NLGI2 (National Lubricating Grease Institute.)	Every 8 hrs. or after every washing
Hydraulic Oil	10w30 CH4 rating - 10 gal. (37.8 liters)	Check daily - change at 400 hrs.
Hydraulic Filter	Spin on	Initially, 8 hrs., then every 200 hrs.; more often when used in dusty, dirty conditions
Engine Oil	No filter, 10w30, SJ Rating, 1.16 qts (1.1 liters) / 5w-20 or 5w-30 below 32º F (0º C)	Check daily - change at 100 hrs.; more often when used in dusty, dirty conditions.
Engine Air Filter	Paper element with foam prefilter	Check every 50 hrs.; more often when used in dusty, dirty conditions

Note: Refer to Section 2 and the TX 413 and engine operator manuals for additional information.

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

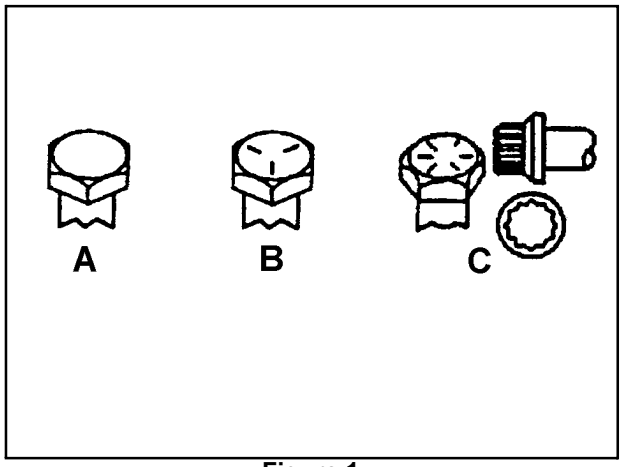


Figure 1

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

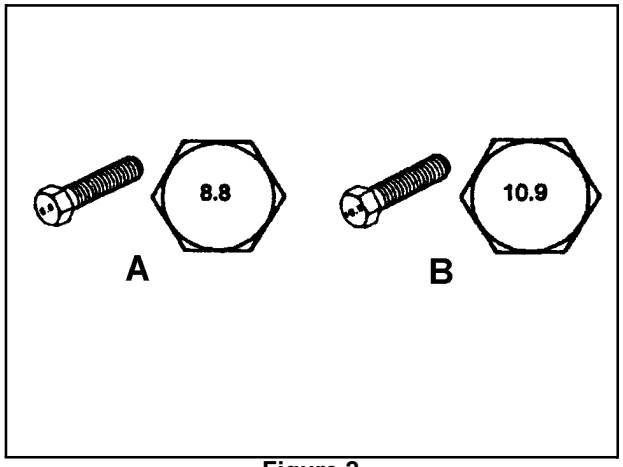


Figure 2

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

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

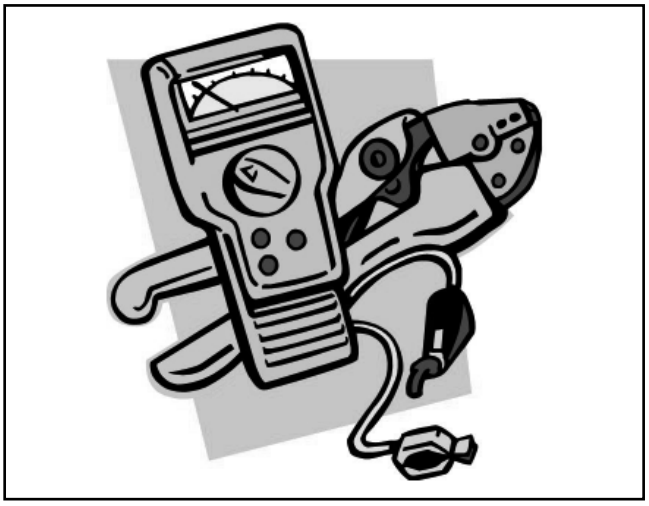
Decimal and Millimeter Equivalents

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

MAINTENANCE



Greasing the Traction Unit

Grease all pivot joints every 8 operating hours and immediately after every washing.

Grease Type: Lithium based NLGI2

1. Lower the loader arm and stop the engine. Remove the key from the ignition switch.
2. Clean the grease fittings with a rag.
3. Connect grease gun to each fitting and pump grease into the fittings until grease begins to ooze out of the bearings (approximately 3 pumps).
4. Wipe any excess grease.

There are 11 grease fittings on the TX413: (3) are located on the left side (Fig. 001).

Figure 001 DSC-0764

(1) is located under the hood for the loader arm assembly (Fig. 002).

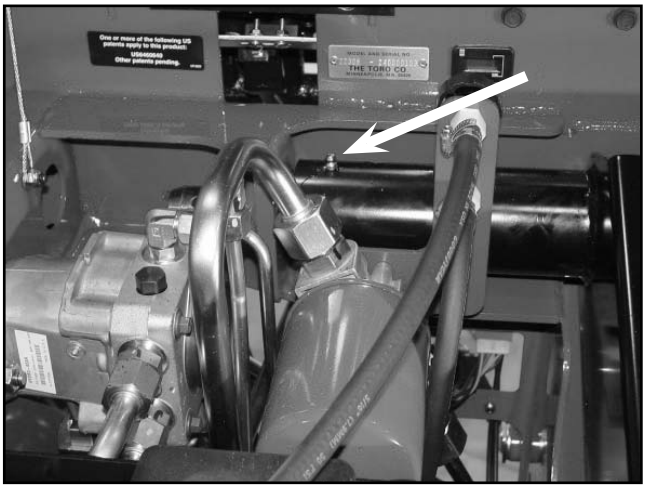


Figure 002 DSC-0766

(5) are located in the front on the quick attachment assembly and the front loader arm assembly (Fig. 003).

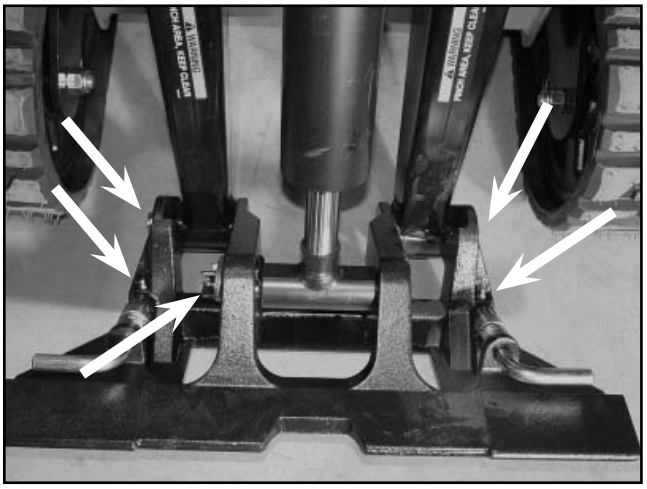


Figure 003 DSC-0767

(2) are located on the right side of the unit (Fig. 004).

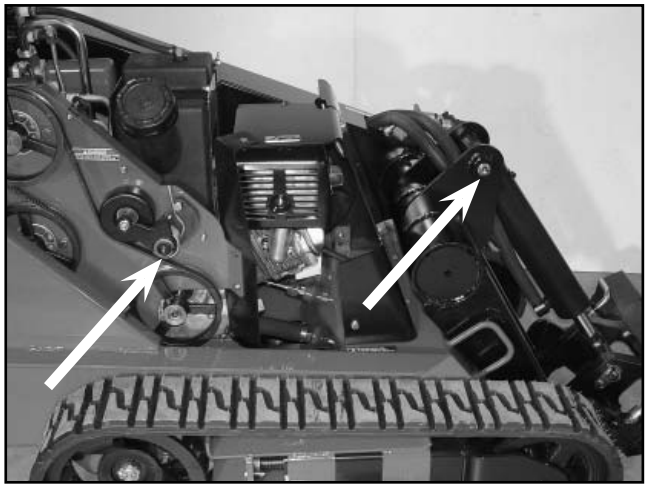


Figure 004 DSC-0769

Maintaining the Road Wheels

1. Remove the tracks; refer to Track Removal, page 8-4.

Note: Remove the tracks only when the inner wheels or the complete tray of wheels needs maintenance.

2. Remove the snap ring and cap from a road wheel (Fig. 005).

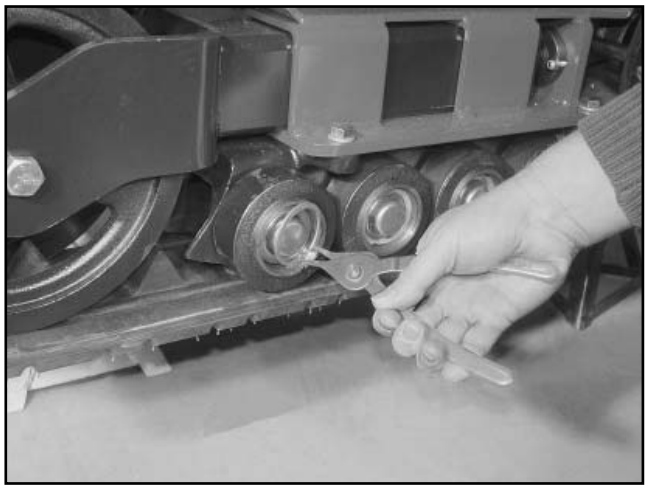


Figure 005 DSC-0821

3. Remove the wheel bearing cap with seal (Figure 006).

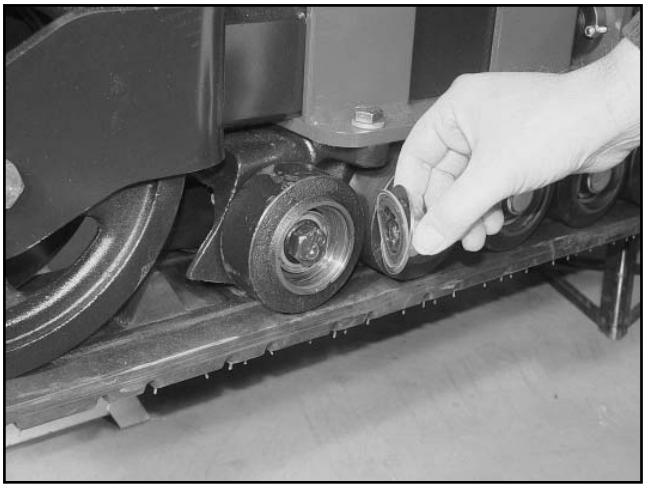


Figure 006 DSC-0822

4. Ensure that the road wheel turns smoothly on the bearing. If it does not turn smoothly or spin freely, replace the bearing; refer to Road Wheel Bearing Replacement, page 8-10.

5. Check the grease under the cap and around the gasket. If it is dirty, gritty, or depleted, clean out all of the grease, replace the gasket, and fill the head of the cap with new grease (Fig. 007).

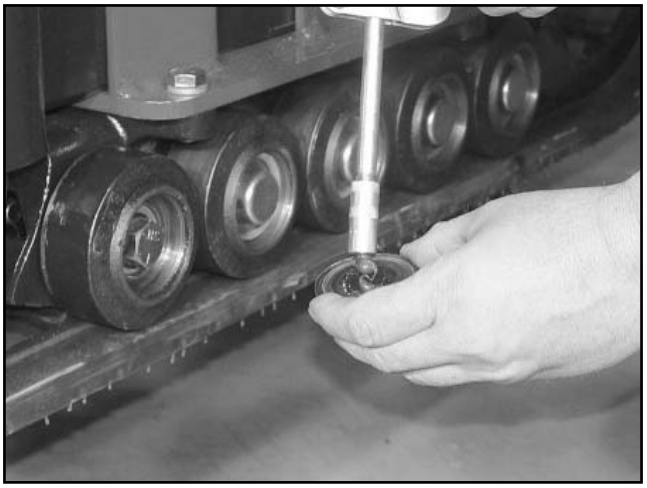


Figure 007 DSC-0835

6. Place the greased road wheel cap and seal over the bolt head.

7. Secure the road wheel cap with the snap ring (Fig. 008).

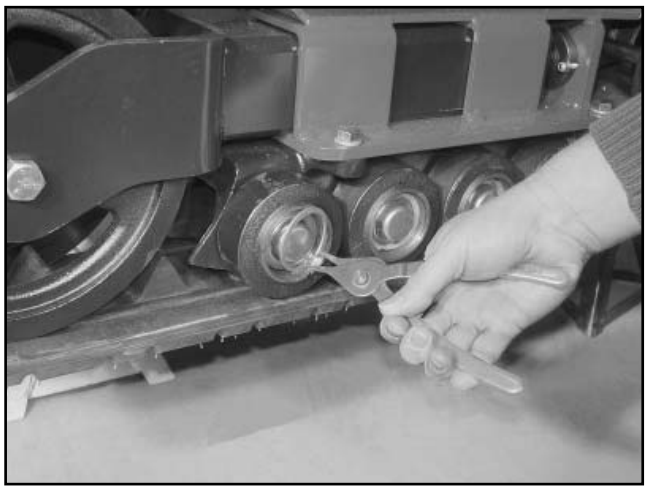


Figure 008 DSC-0821

Note: It is not always necessary to remove the track guide when replacing any of the road wheel bearings. They can also be removed by raising the unit off the ground. For safety reasons, make sure the frame of the unit is supported.

Hydraulic Reservoir Tank

Location

The hydraulic reservoir tank is located in the front of the TX 413 unit.

Hydraulic Tank Capacity: 10 gallons (37.85 liters)

Type of Oil to Use: 10W-30 detergent, diesel engine oil (API service CH-4 or higher)

Checking the Hydraulic Fluid

Check the hydraulic fluid level before the engine is first started and after every 25 operating hours.

1. Remove the attachment, if one is installed.
2. Park the traction unit on a level surface, lower the loader arm, and fully retract the tilt cylinder.
3. Stop the engine, remove the key, and and allow the engine to cool.
4. Clean the area around the filler neck of the hydraulic tank (Fig. 009).

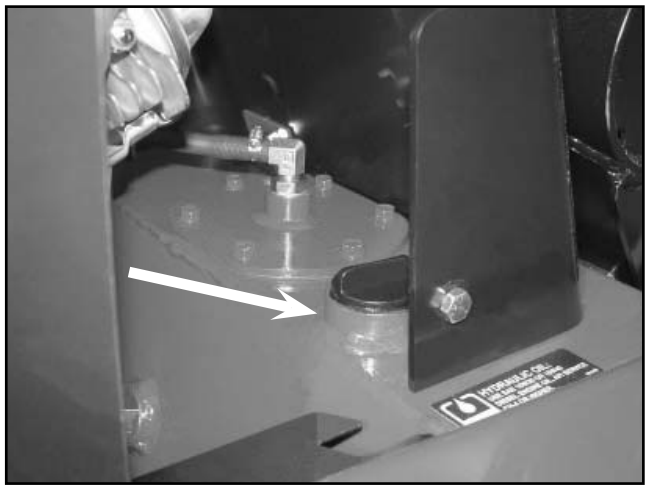


Figure 009 DSC-0771

5. Remove the cap from the filler neck (Fig. 010).

Figure 010 DSC-1368

6. Check the fluid level on the dipstick (Fig. 011).

Figure 011 DSC-1369

5. The fluid level should be between the marks on the dipstick. If the level is low, add enough fluid to raise it to the proper level.
8. Install the cap on the filler neck.

Replacing the Hydraulic Filter

Change the hydraulic filter:

- After the first 8 operating hours.
- After every 200 operating hours.

1. Position traction unit on level surface.
2. Lower the loader arm, stop the engine, and remove the key.
3. Open the hood.

IMPORTANT: Do not substitute an automotive oil filter or severe hydraulic system damage may result.

4. Remove the old filter (Fig. 012).

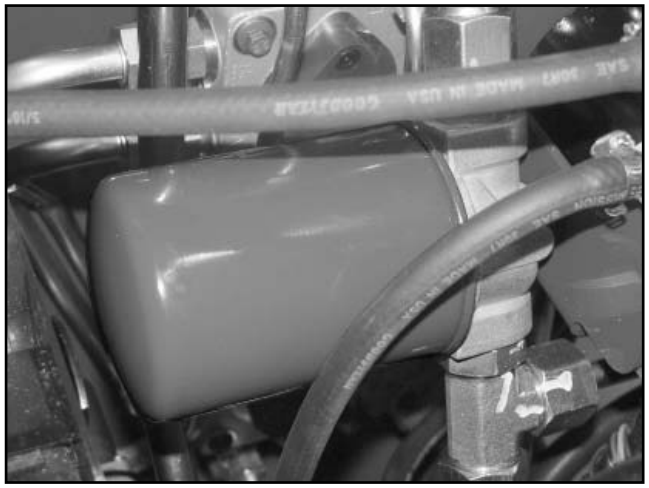


Figure 012 DSC-1370

5. Wipe the surface of the filter adapter gasket area clean.
6. Apply a thin coat of hydraulic fluid to the rubber gasket on the replacement filter.
7. Install the replacement hydraulic filter onto the filter adapter. Hand tighten it clockwise until the rubber gasket contacts the filter adapter, then tighten the filter an additional 3/4 turn.
8. Wipe up any spilled fluid.

9. Start the engine, raise and lower the loader arm, then drive the unit forward and backward to purge air from the system and check for leaks.
10. Stop the engine, check the fluid level in the hydraulic tank (refer to Checking the Hydraulic Fluid, page xx) and add fluid to raise the level to mark on dipstick. Do not over fill the tank.
11. Close the hood.

Note: Dispose of used oil and filters at a certified recycling center.

Changing the Hydraulic Fluid

Change the hydraulic fluid every 400 operating hours or yearly.

Note: The hydraulic filter should be replaced whenever the hydraulic oil is changed.

1. Position the traction unit on a level surface.
2. Raise the loader arm, install the cylinder lock, stop the engine, and remove the key.
3. Open the hood.
4. Allow the traction unit to cool completely.
5. Place a large drain pan (capable of holding a minimum of 10 gallons) under the drain plug on the front of the traction unit (Fig. 013).

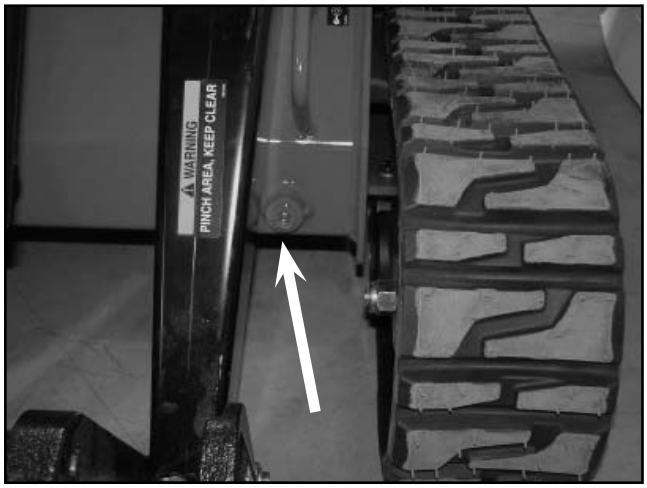


Figure 013 DSC-0772

6. Remove the hydraulic tank cap and dipstick (Figures 014 and 015).

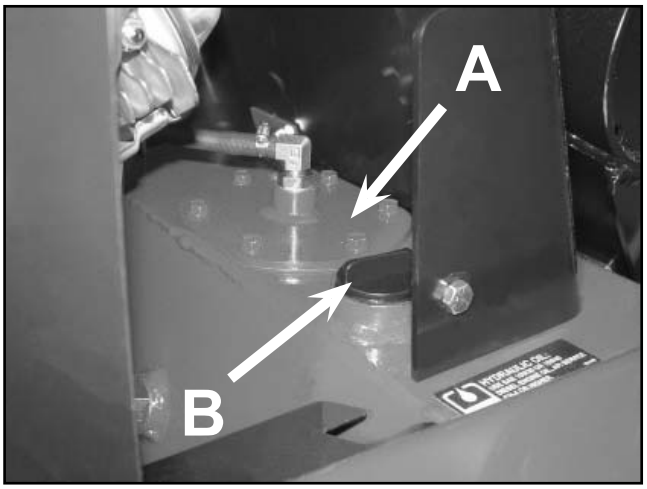


Figure 014 DSC-0771

A. Hydraulic Tank Cap B. Dipstick

Figure 015 DSC-1369

7. Remove the drain plug and allow the oil to drain into the pan.
8. When oil is finished draining, install and tighten the drain plug.

Note: Dispose of the used oil at a certified recycling center.

9. Fill the hydraulic tank with approximately 10 gallons (37.85 l) of 10w-30 or 15W-40 detergent, diesel engine oil (API service CH-4 or higher).

10. Replace the hydraulic oil filter.
11. Start the engine, remove the cylinder lock, raise and lower the loader arm, then drive the unit forward and backward to purge air from the system and check for leaks.
12. Stop the engine.
13. Check the hydraulic fluid level and top it off if necessary.

Checking the Hydraulic Lines

After every 100 operating hours, check the hydraulic lines and hoses for leaks, loose fittings, kinked lines, loose mounting supports, wear, weather, and chemical deterioration. Replace all moving hydraulic hoses every 1500 hours or 2 years, whichever comes first. Make necessary repairs before operating.

Vents - Fuel Tank and Hydraulic Tank

There are two vents located on the top of the unit. The top one is the fuel tank vent, A, and the bottom vent is for the hydraulic reservoir tank, B, (Fig. 016).

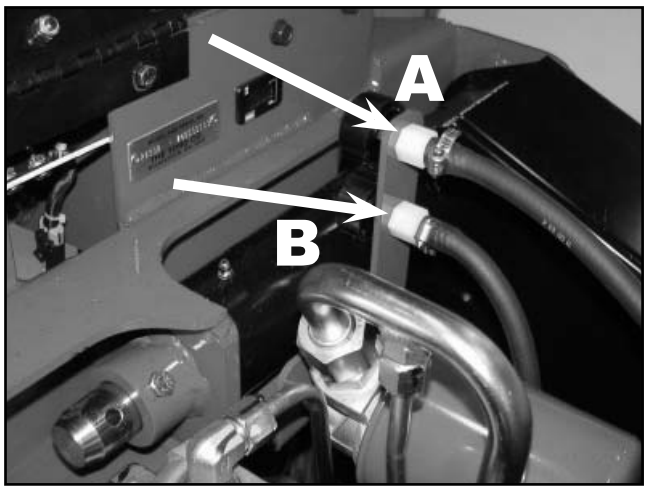


Figure 016 DSC-0773

Note: The only maintenance to perform on these is to make sure they are clean and free of any debris.

Servicing the Engine, Air Cleaner Replacement, and Spark Plug Servicing

See the Dingo TX 413 Operator's Manual. Or, for more details, see the Honda Engine Operator's or Service Manuals.

Fuse Block

The fuse block is located inside the rear cover. There are three fuses in the electrical system. One location for the fuse is blank, for optional head lights (Fig. 017).

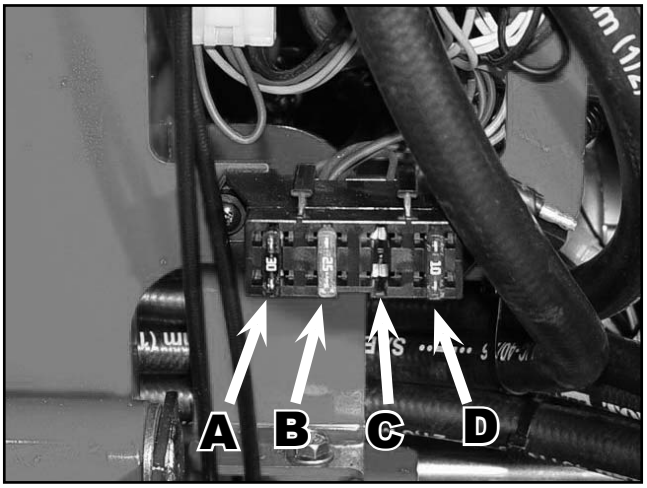


Figure 017 DSC-0753A

Fuses can be removed to check continuity. The test meter should read less than 1 ohm.

A. 30 amp - Main/Starter, Blade Type
B. 25 amp - Charging, Blade Type
C. Blank - Optional Headlights, 10 amp
D. 10 amp - Ignition Circuit, Blade Type

Recommended Maintenance Schedule

Maintenance Service Interval
- Maintenance Procedure

8 hrs
- Grease the traction unit
- Check engine oil level
- Check for loose fasteners
- Inspect the tracks for damage or wear
- Change hydraulic filter after the initial 8-10 operating hours

25 hrs
- Check hydraulic oil
- Inspect hydraulic lines for leaks

50 hrs
- Clean the foam pre-filter with liquid soap and warm water
- Clean the paper air filter by lightly tapping on flat surface

100 hrs
- Change engine oil
- Replace paper air filter
- Check battery electrolyte level
- Adjust track tension
- Check battery cable connections
- Check the spark plug

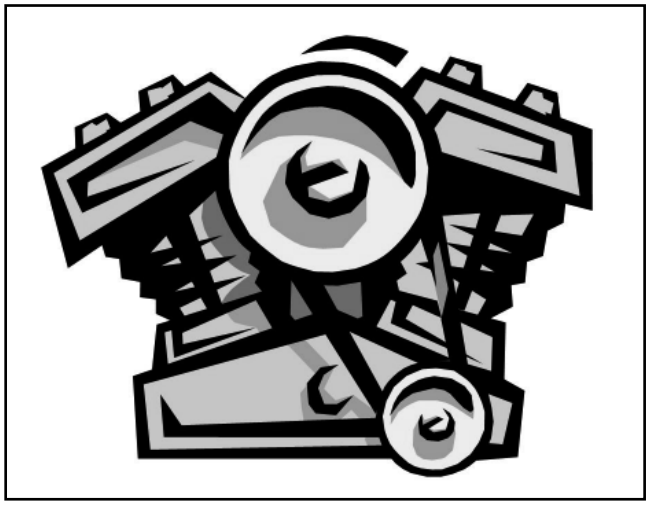
200 hrs
- Check hydraulic filter

300 hrs
- Replace the spark plug

400 hrs
- Inspect fuel lines for leaks
- Change hydraulic oil and filter

Yearly Storage
- Check for loose fasteners
- Touch up chipped paint
- Adjust track tension
- Check tracks and road wheels
- Complete all yearly maintenance procedures specified in the engine operator's manual
- Charge the battery and disconnect the cables (storage only)
- Drain the gasoline (storage only)

ENGINE



Introduction

The engine removal and installation procedure is provided in this manual. Refer to the engine manufacturer's owner's and service manuals for maintenance intervals and service procedures.

Engine Removal

1. Start the unit and raise the loader arm assembly to the fully raised position. Install the cylinder lock in the lift cylinder (Fig 018).

Figure 018 DSC-1041

2. Remove the belt cover and rear cover.
3. Disconnect the negative battery cable, then the positive cable. Remove the battery from the unit.
4. Remove the drive belt; refer to Drive Belt Removal and Replacement, page 8-2.
5. Loosen the two set screws on the engine drive pulley (Fig. 019).

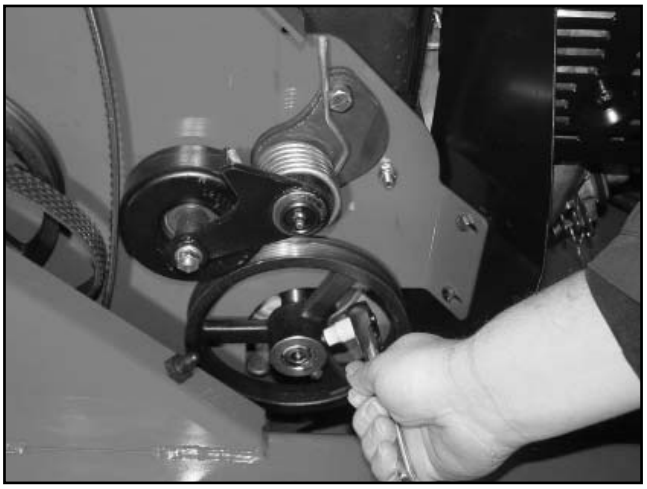


Figure 019 DSC-1088

6. Remove engine drive pulley after retracting the idler pulley assembly (Fig. 020).

Figure 020 DSC-1089

7. Remove the bolt and nut securing the exhaust deflector to the left hand frame (Fig. 021).

Figure 021 DSC-1090

8. Remove the two bolts and nuts on the backside of the exhaust deflector (Fig. 022).

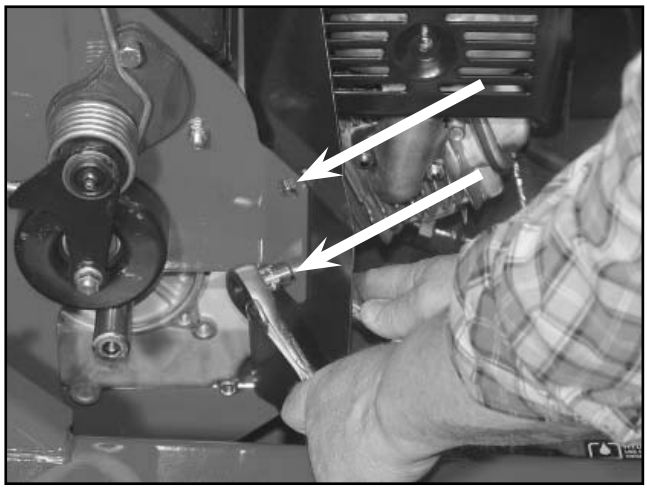


Figure 022 DSC-1091

9. Remove the four bolts and nuts at the base of the front grille (Fig. 023).

Figure 023 DSC-1092

10. Remove the front grille with the exhaust deflector attached (Fig. 024).

Figure 024 DSC-1093

11. Remove the gas tank vent hose on the hydraulic oil filter bracket (Fig. 025).

Figure 025 DSC-1095

12. At the base of the fuel tank bracket, left side, remove the two bolts and nuts holding the bracket to the frame (Fig. 026).

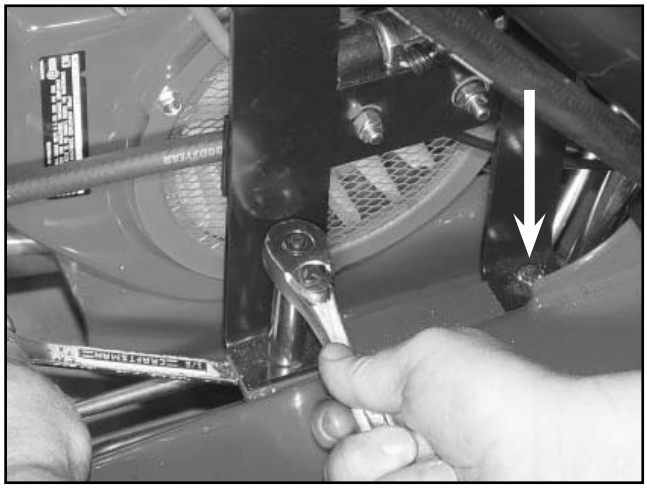


Figure 026 DSC-1096

13. Remove the bolt and nut retaining the hose clamp for the oil reservoir vent hose and the clamp holding the fuel shut off valve (Fig. 027).

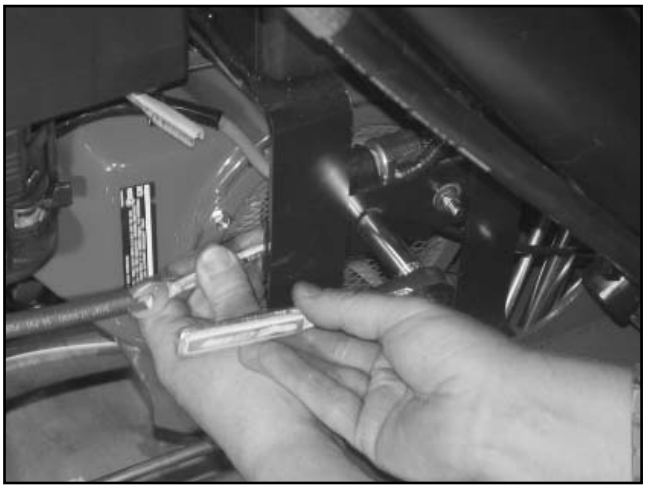


Figure 027 DSC-1098

NOTE: If there is fuel in the gas tank and the fuel line is removed between the gas tank and the fuel shut off valve, fuel spillage will occur. Drain fuel from the tank prior to removing any fuel lines.

14. Drain the fuel tank (Fig. 028).

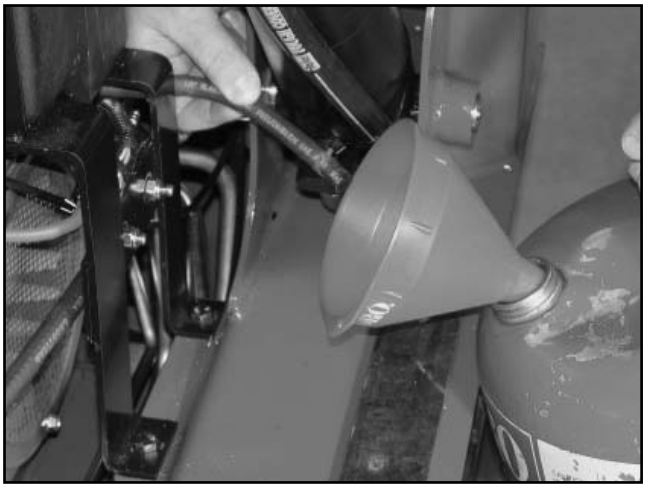


Figure 028 DSC-1134

15. Remove the fuel line clamp located at the electric fuel shut off valve (fuel line between shut off valve and carburetor (Fig. 029).

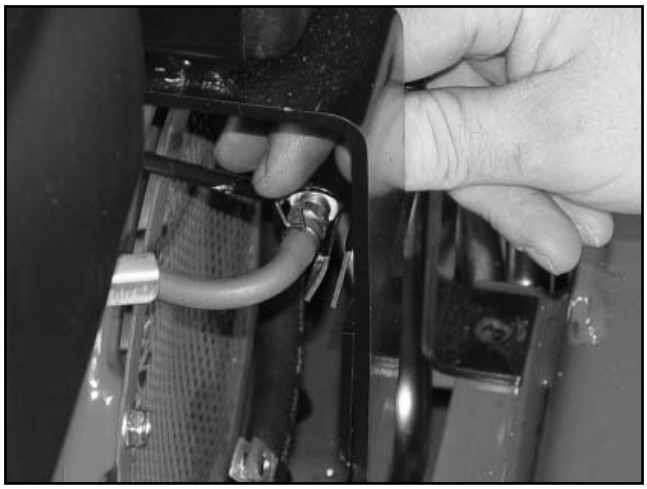


Figure 029 DSC-1099

16. Disconnect the wire terminals for the fuel shut off valve (Fig. 030).

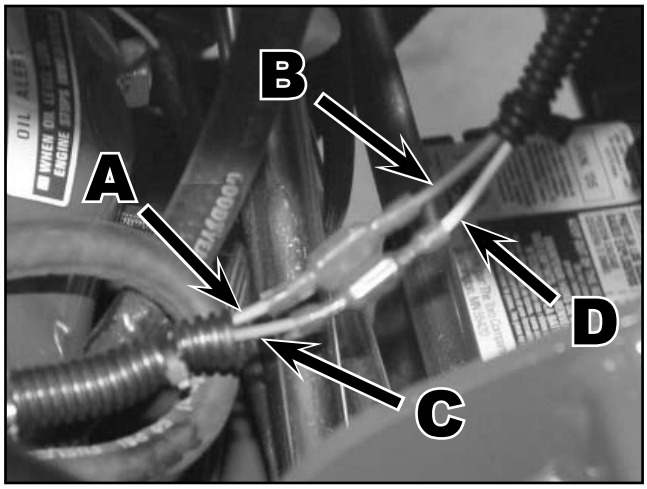


Figure 030 DSC-1100

A - Violet wire
B - Pink wire
C - Green wire
D - Yellow wire

17. Remove the two bolts and nuts to the tank bracket on the right side (Fig. 031).

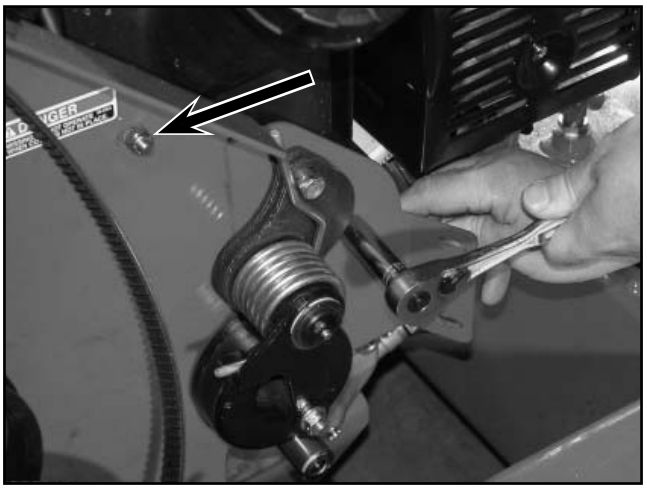


Figure 031 DSC-1101

18. Remove the fuel tank and tank bracket (Fig. 032).

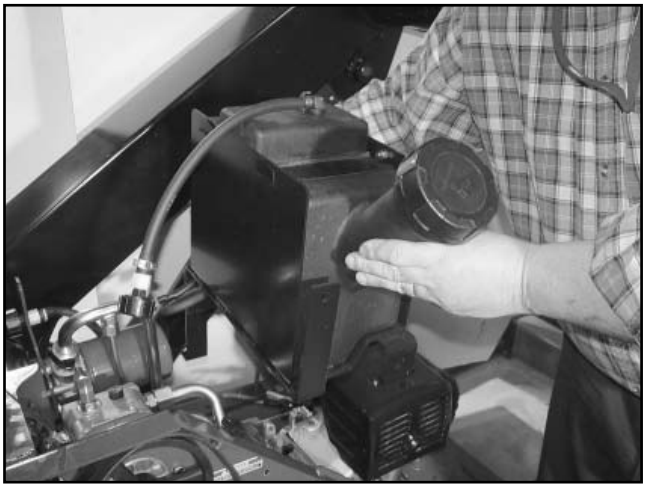


Figure 032 DSC-1102

19. Disconnect the charge coil wire, black to white (Fig. 033).

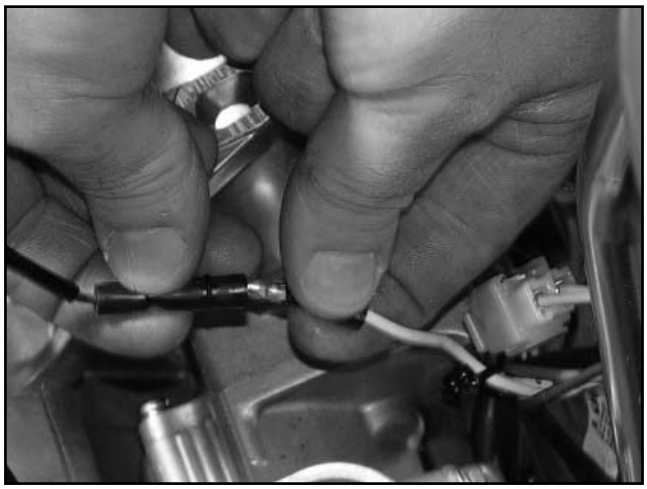


Figure 033 DSC-1103

20. Disconnect the plug and jack connection for the charge coil leads to the rectifier (Fig. 034).

Figure 034 DSC-1105

21. Disconnect the oil switch, black to white wire (Fig. 035).

Figure 035 DSC-1107

22. Disconnect the blue wire and two red wires on the starter assembly (Fig. 036).

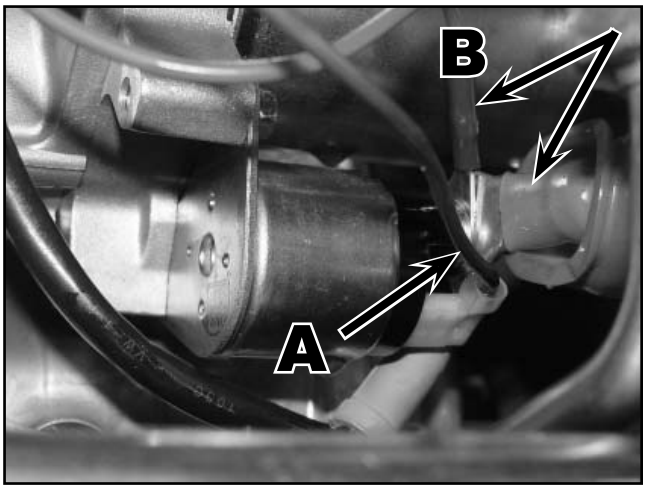


Figure 036 DSC-1111

A - Blue wire B - Red wires

23. Disconnect the throttle cable clamp and the throttle cable from the top of the engine (Fig. 037).

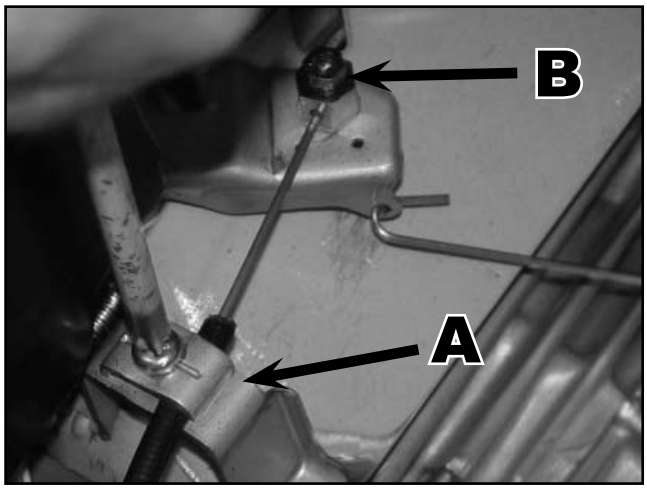


Figure 037 DSC-1112

A. Throttle Clamp B. Throttle Cable

24. Remove the engine air cleaner cover. Disconnect the choke cable clamp and choke cable from the front of the engine (Fig. 038).

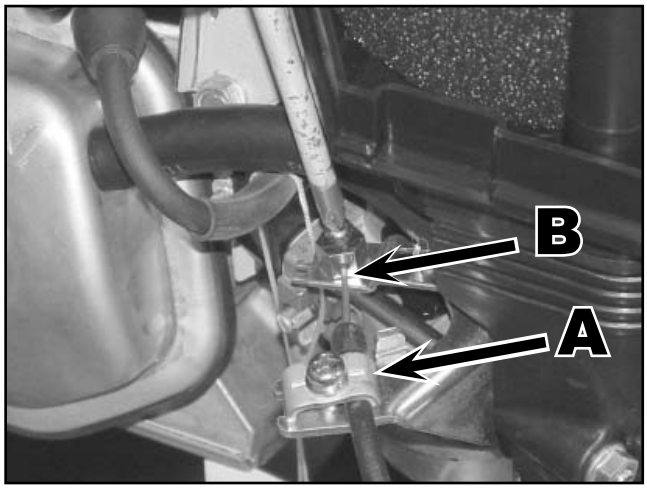


Figure 038 DSC-1113

A. Choke Cable Clamp B. Choke Cable

25. Remove the two front engine mounting bolts and nuts (Fig. 039).

Figure 039 DSC-1114

26. Remove the two rear engine mounting bolts and nuts.

Note: The left rear bolt and nut has two ground wires; a star washer is located between the ring terminals of the wires and the engine block (Fig. 040).

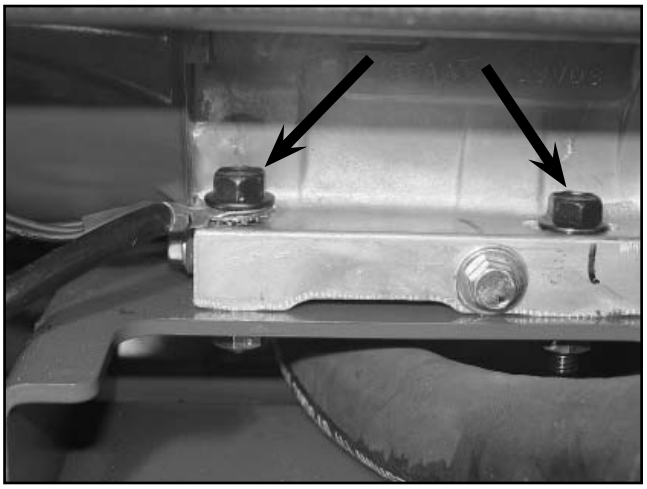


Figure 040 DSC-1115

27. With an overhead hoist, raise the engine slightly and slide the engine forward and then up and off the frame of the unit (Fig. 041).

Figure 041 DSC-1118

Engine Installation

1. Lower engine to the frame (Fig. 042).

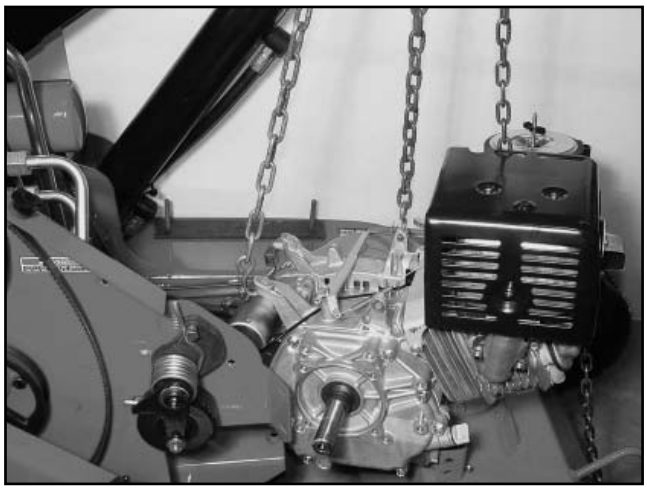


Figure 042 DSC-1118

2. Install the two rear engine mounting bolts and nuts.

Note: Make sure the two ground wires are installed on the left rear bolt, with the star washer installed first. DO NOT TIGHTEN THE BOLTS AND NUTS. (Fig. 043)

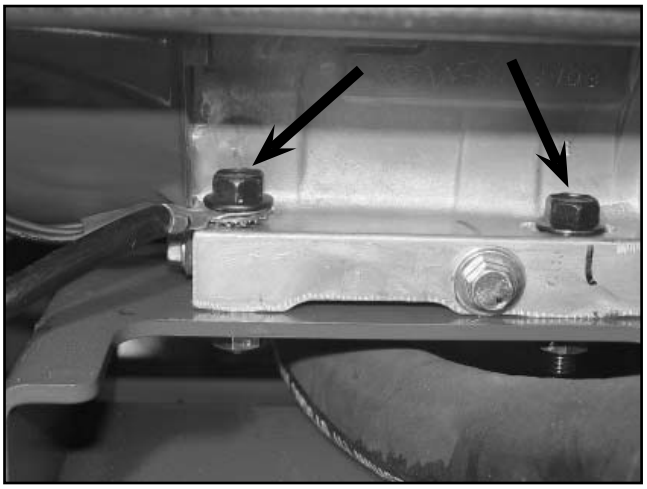


Figure 043 DSC-1115

3. Install the two front engine mounting bolts and nuts.

Note: DO NOT TIGHTEN THE BOLTS AND NUTS (Fig. 044).

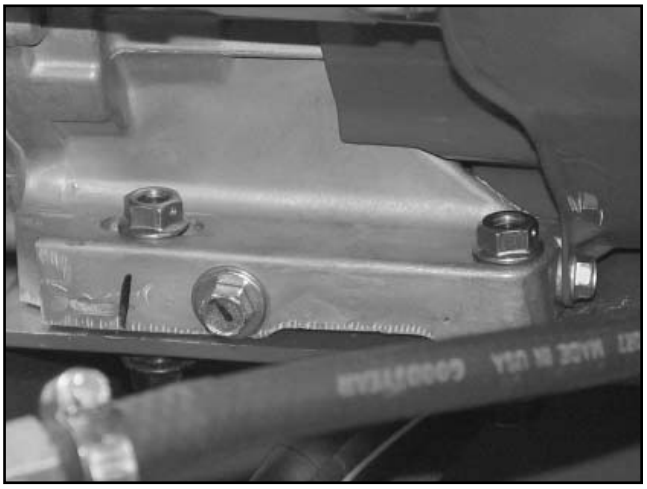


Figure 044 DSC-1120

9. Apply an anti-seize compound to the engine crankshaft and key. Apply a medium strength threadlocking material to the threads of the set screws and install the engine drive pulley. Using a straight edge, align the engine drive pulley to the lower hydrostatic pump pulley; with the engine bolts loose, you can move the engine to help align the pulley (Fig. 045).

Note: The belt idler pulley will need to be retracted while aligning the engine pulley with the hydrostatic pump pulley.

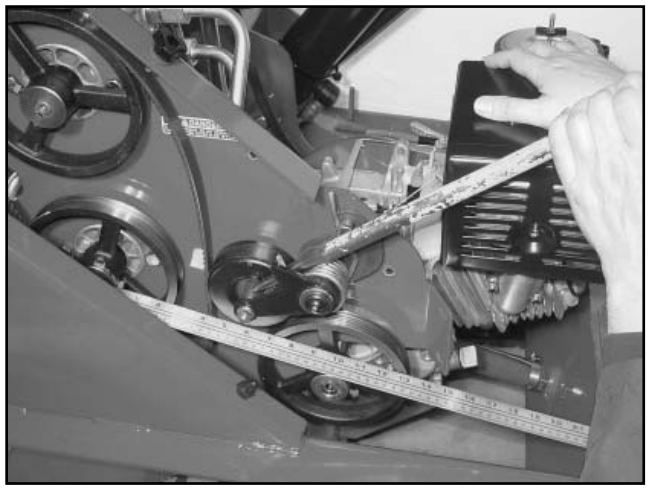


Figure 045 DSC-1119

10. Tighten all four engine mounting bolts and nuts and torque to 18 ft-lbs. (24.4 Nm) (Fig. 046).

Figure 046 DSC-1114

11. Recheck the alignment of the engine drive pulley, then tighten the set screws on the engine drive pulley.

Choke Cable Installation

1. Move the choke control on the dash to full position, then back the choke control so it is approximately 1/16" (1.6mm) away from the front edge of the slot (Fig. 047).

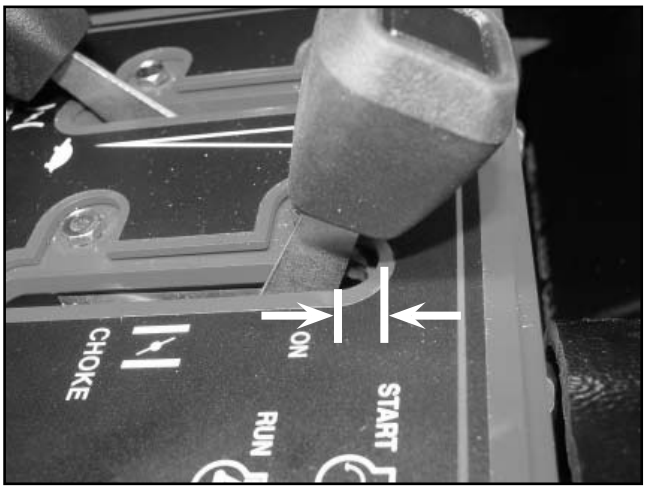


Figure 047 DSC-1123

2. At the carburetor linkage, insert the cable through the cable clamp and into the hole in the choke lever. Pull the choke lever to the full choke position and hold; tighten the screw on the choke lever (Fig. 048).

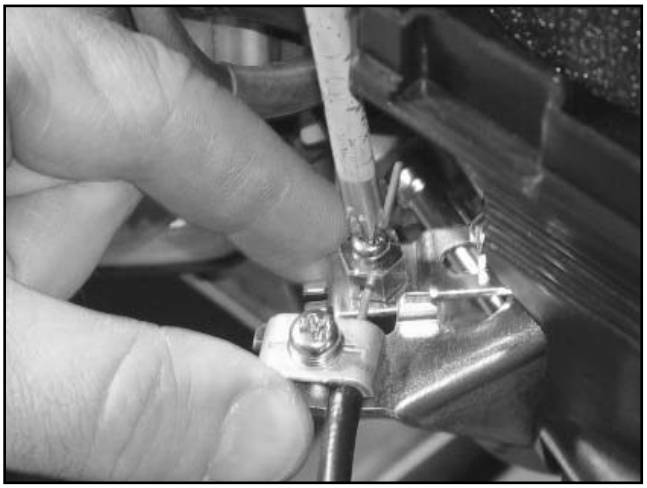


Figure 048 DSC-1124

3. While holding the choke lever, tighten the screw/clamp for the cable. Test for proper choke operation. Install the engine air cleaner cover.

Throttle Cable Installation

1. Move the throttle control on the dash to full position, then back the throttle control so it is approximately 1/16" (1.6mm) away from the front edge of the slot (Fig. 049).

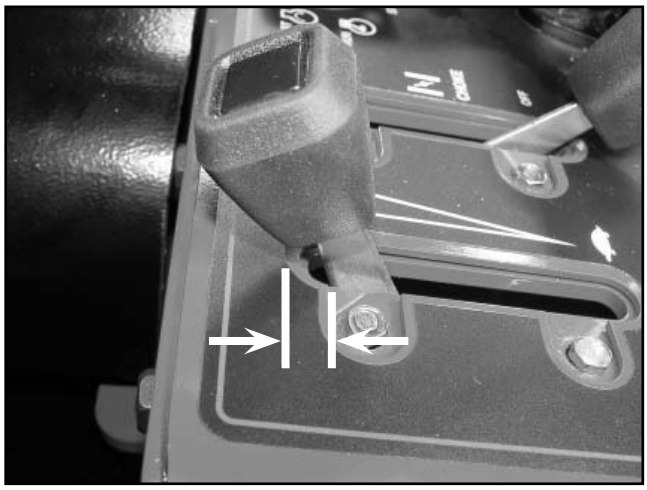


Figure 049 DSC-1126

2. On the engine, insert the cable under the clamp; move the engine throttle lever to the full open position and hold; tighten the screw on the throttle lever (Fig. 050).

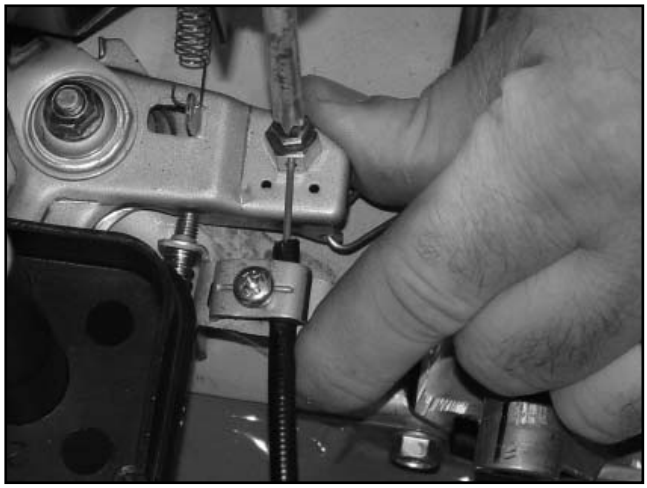


Figure 050 DSC-1127

3. While holding the throttle lever, tighten the screw/clamp for the cable. Test for proper throttle control operation.

4. Connect the blue wire onto the spade terminal and the two red wires to the post on the starter assembly (Fig. 051).

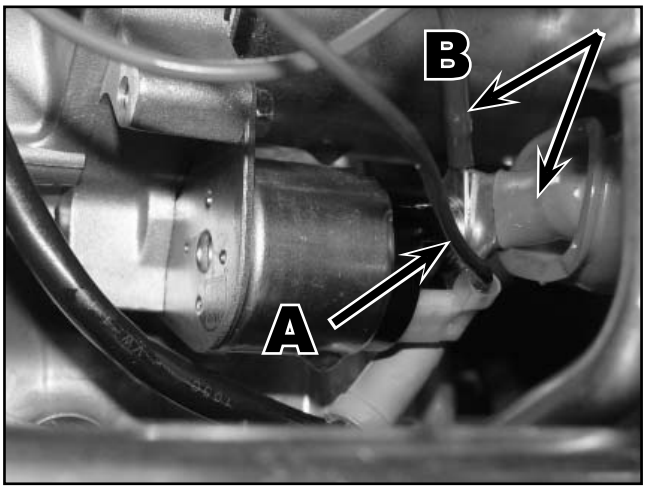


Figure 051 DSC-1111

A - Blue wire B - Red wires

5. Connect the oil switch, black to white wire (Fig. 052).

Figure 052 DSC-1107

6. Connect the plug and jack connection to the alternator wires to the rectifier (Fig. 053).

Figure 053 DSC-1105

7. Connect the magneto wire, black to white wire (Fig. 054).

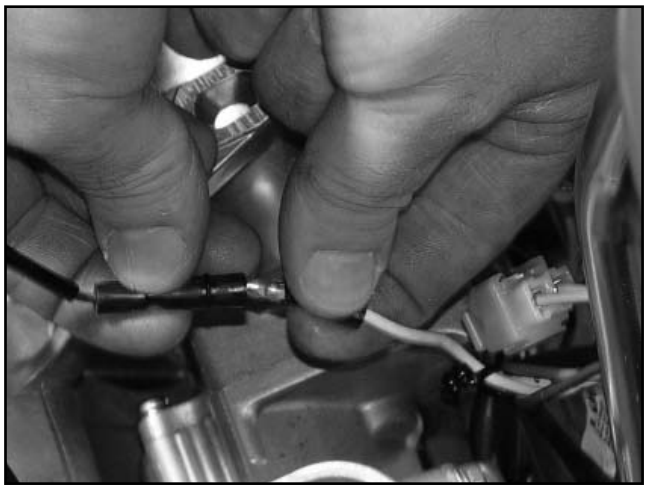


Figure 054 DSC-1103

8. Install the fuel tank and tank bracket on the frame (Fig. 055).

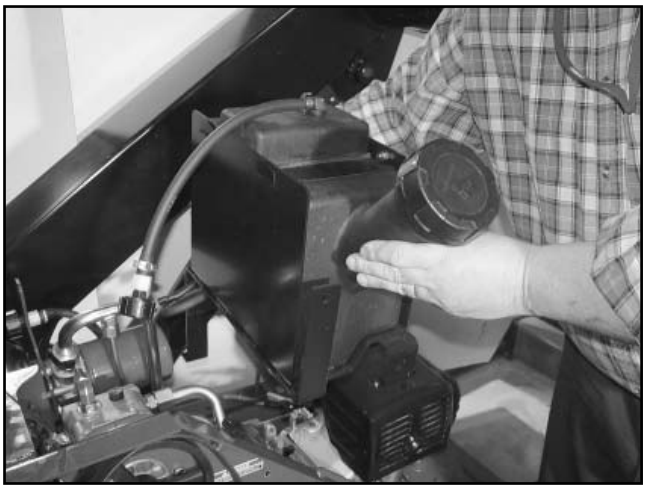


Figure 055 DSC-1102

9. Install two bolts and nuts located on the right side of the tank bracket and leave loose (Fig. 056).

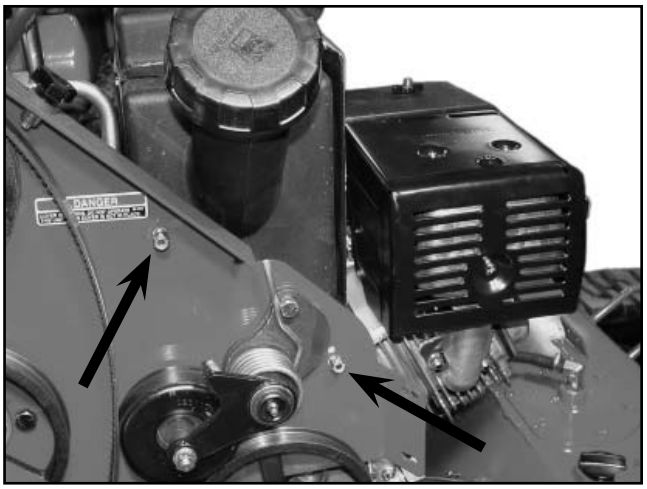


Figure 056 DSC-1128

10. Connect the wire terminals for the fuel shut off valve (Fig. 057).

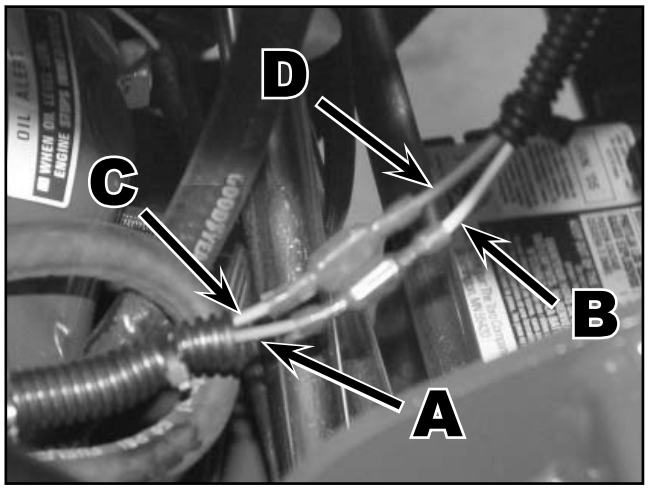


Figure 057 DSC-1100

A - Green wire
B - Yellow wire
C - Violet wire
D - Pink wire

11. Connect fuel line and install the fuel line clamp located at the fuel shut off valve (Fig. 058).

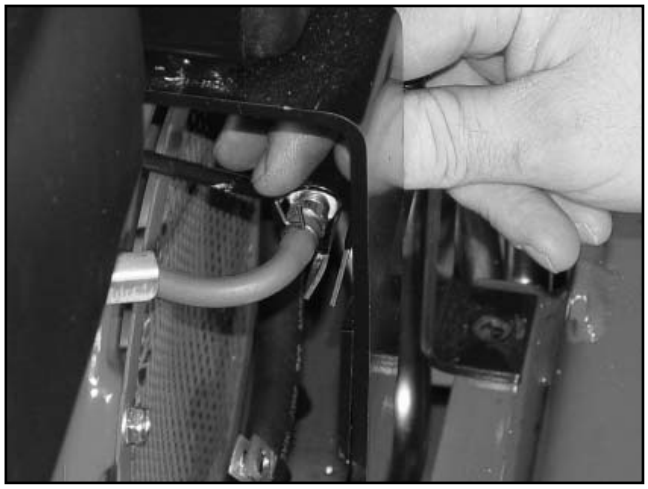


Figure 058 DSC-1099

12. Install the bolt and nut retaining the hose clamp for the oil reservoir vent hose and the clamp holding the fuel shut off valve and tighten (Fig. 059).

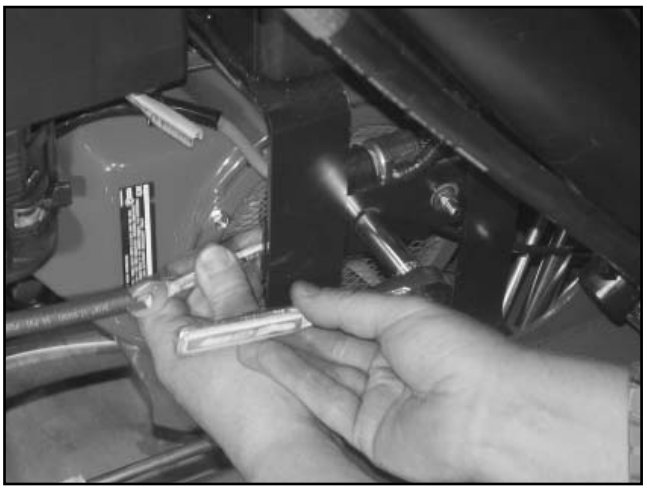


Figure 059 DSC-1098

13. Install the two bolts and nuts, left side, holding the fuel tank bracket to the frame and tighten (Fig. 060).

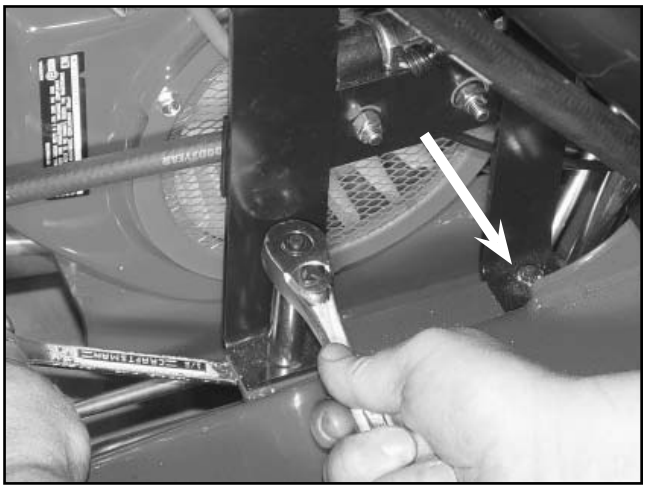


Figure 060 DSC-1096

14. Tighten the right side fuel tank bracket nuts and bolts.

15. Install the fuel tank vent hose on the oil filter bracket (Fig. 061).

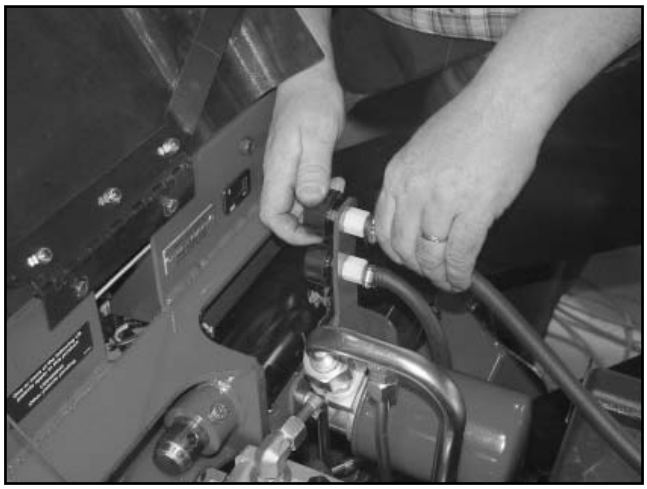


Figure 061 DSC-1095

16. Install the front grille with the exhaust deflector attached (Fig. 062).

Figure 062 DSC-1093

17. Install four bolts and washers located at the base of the front grille (Fig. 063).

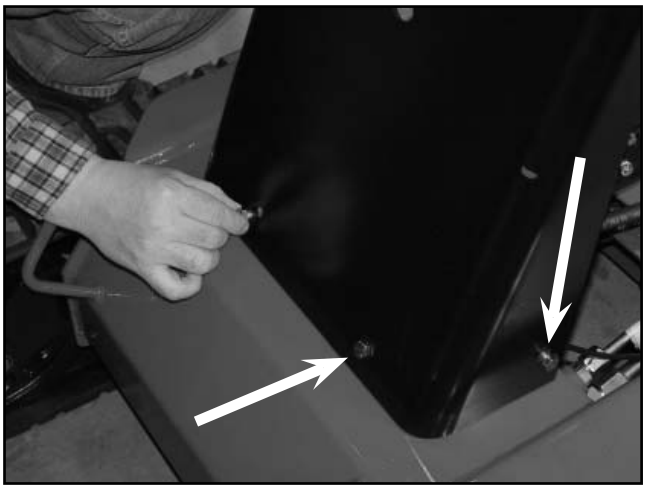


Figure 063 DSC-1129

18. Install the two bolts and nuts on the backside of the exhaust deflector (Fig. 064).

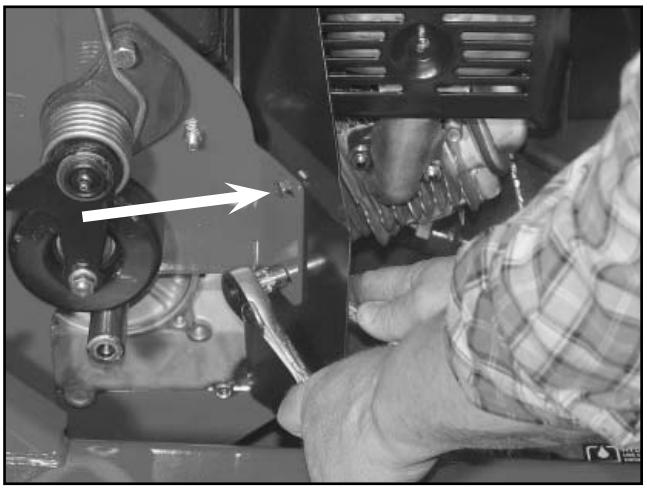


Figure 064 DSC-1091

19. Install bolt and nut located at the bottom of the exhaust deflector and tighten the bolt (Fig. 065). Then tighten the rest of the bolts in the front grille, the right side tank bracket, and on the exhaust deflector.

Figure 065 DSC-1090

20. Install the drive belt; refer to Drive Belt Removal and Installation, pages 8-2 and 8-3.
21. Install the battery. Connect the positive cable, then the negative cable.
22. Install the belt cover and rear cover.
23. Remove the hydraulic cylinder lock in the lift cylinder.
24. Start the unit and lower the lift arm. Check the engine high engine RPM. The engine RPM should be at 3600 ± 150 RPM.

Fuel Tank Removal

1. Start the unit, raise the lift arm to the fully raised position and install the hydraulic cylinder lock in the lift cylinder. Shut engine off.
2. Remove the rear cover and remove the negative battery cable.
3. Remove the fuel tank vent hose from the oil filter bracket (Fig. 066).

Figure 066 DSC-1095

4. Remove the two bolts and nuts retaining the tank straps located at the top of the fuel tank (Fig. 067).

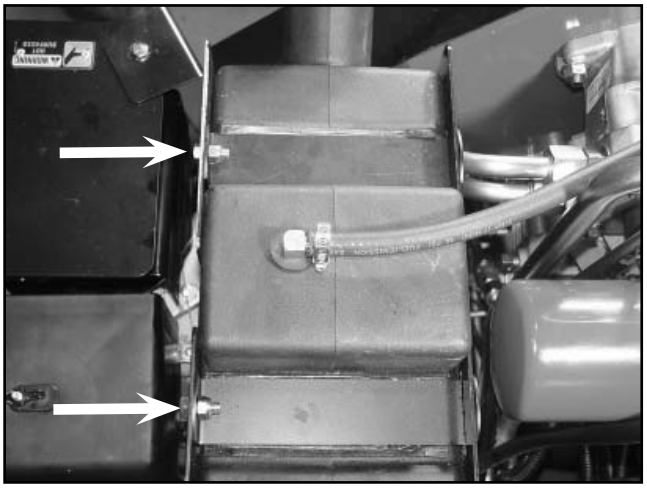


Figure 067 DSC-1131

5. Disconnect the fuel line located on fuel shut off valve that goes to the fuel tank (Fig. 068).

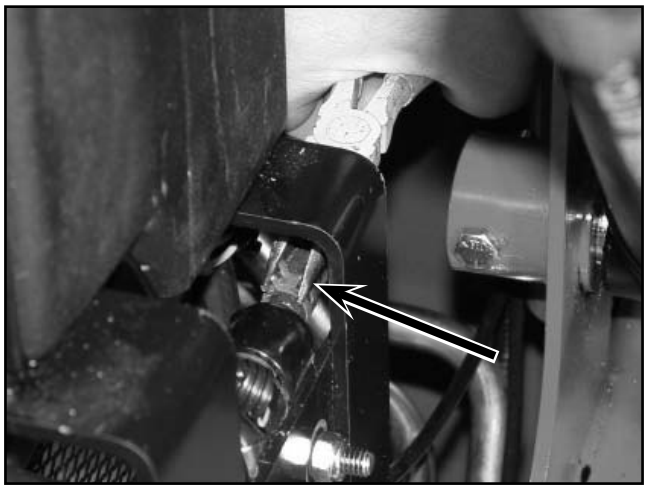


Figure 068 DSC-1133

6. Drain the fuel tank (Fig. 069).

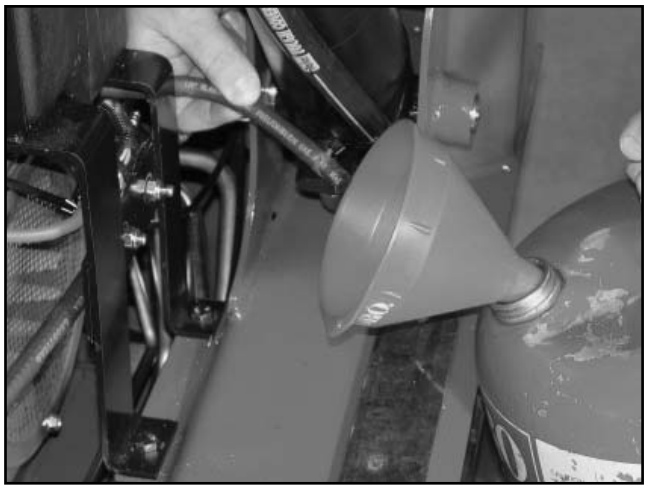


Figure 069 DSC-1134

7. Remove the fuel line from the fuel tank fitting. With a wrench, turn the fuel tank fitting so it is pointing out toward the left side of the unit (Fig. 070).

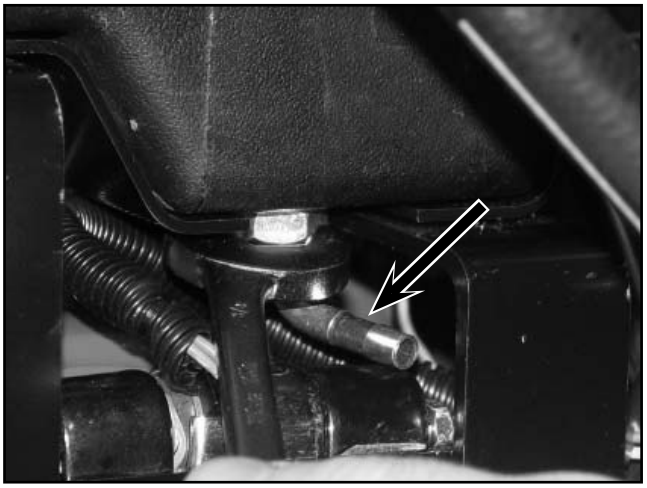


Figure 070 DSC-1137

8. Remove the fuel tank from the unit (Fig. 071).

Figure 071 DSC-1139

Bulkhead Fuel Fitting Replacement

1. Remove the nut and washer from the fuel fitting (Fig. 072).

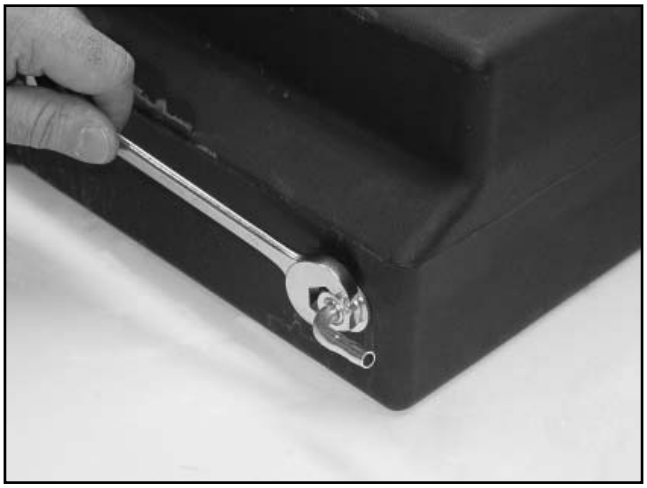


Figure 072 DSC-1140

2. Tape a piece of steel wire approximately 30" long to the fitting , then push the fitting into the tank, tilt the tank and feed the fuel fitting out the fill neck of the fuel tank (Fig. 073).

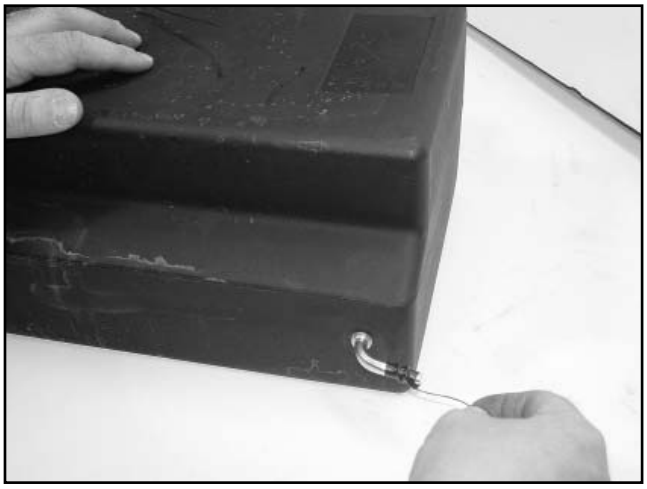


Figure 073 DSC-1141

3. Remove the fuel fitting from the steel wire. Tape a new fuel fitting to the steel wire and pull the fitting through the fuel tank and out the bottom of the tank (Fig. 074).

Figure 074 DSC-1142

4. Remove the wire and install the washer and nut on the fitting, then finger tighten the nut. Orient the fitting as shown (Fig. 075).

Figure 075 DSC-1143

Fuel Tank Installation

1. Install the fuel tank on the unit taking care not to damage the fuel fitting (Fig. 076).

Figure 076 DSC-1139

2. Turn the fuel fitting toward the rear of the unit and tighten the fitting nut, then install the fuel line and clamp (Fig. 077).

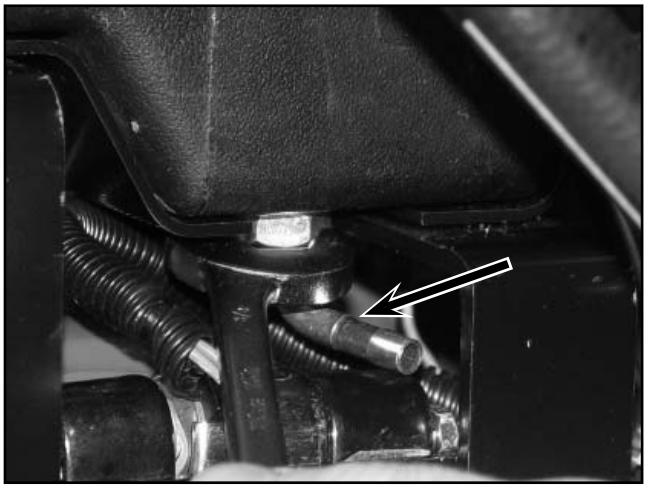


Figure 077 DSC-1137

3. Install the fuel line on the fuel shut off valve and install the clamp (Fig. 078).

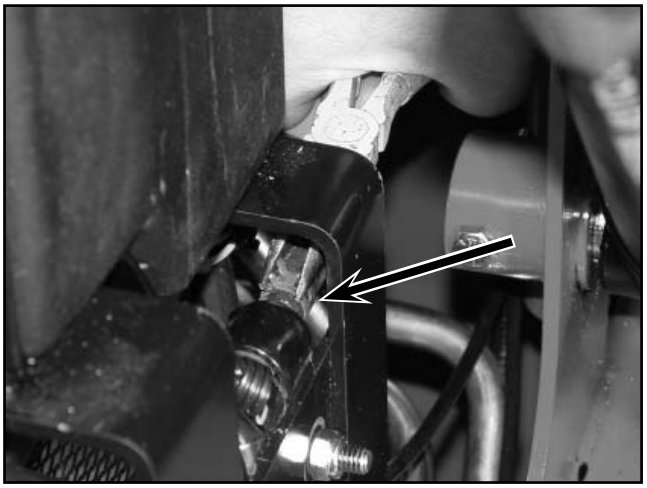


Figure 078 DSC-1133

4. Install the two fuel tank straps located on the top of the fuel tank and install the nuts and bolts and tighten (Fig. 079).

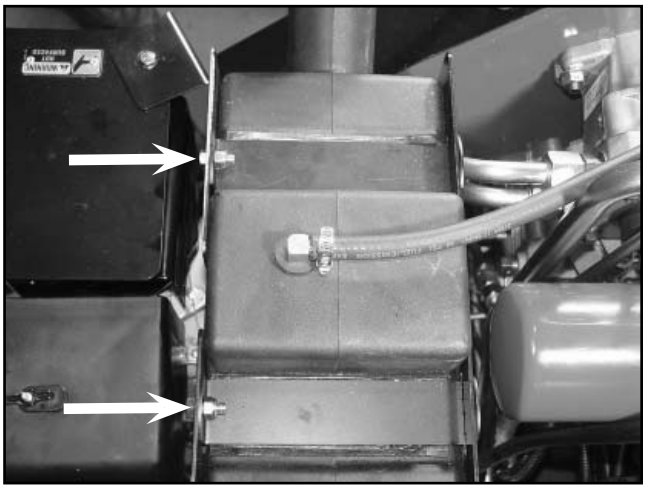


Figure 079 DSC-1131

5. Install the vent hose on the oil filter bracket (Fig. 080).

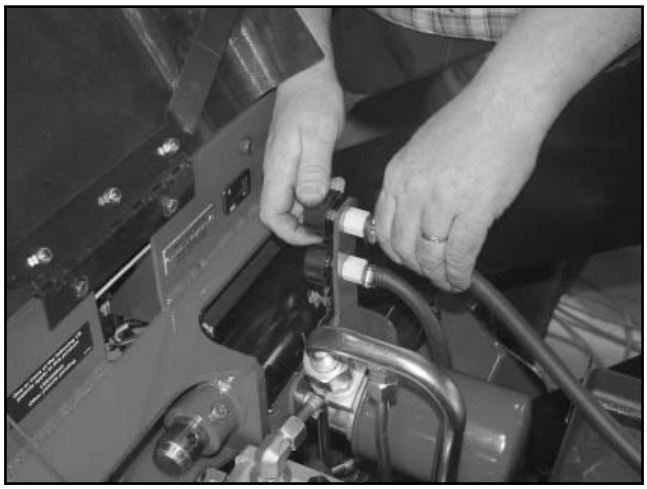


Figure 080 DSC-1095

6. Install the positive battery cable, then the negative cable.

7. Install the rear cover.

8. Start the unit and check for any fuel leaks. Remove the hydraulic cylinder lock on the lift cylinder and lower the lift arm.

Starter Service

Serial numbers 200000200 and higher have an opening for easier access to the starter (Fig. 081).

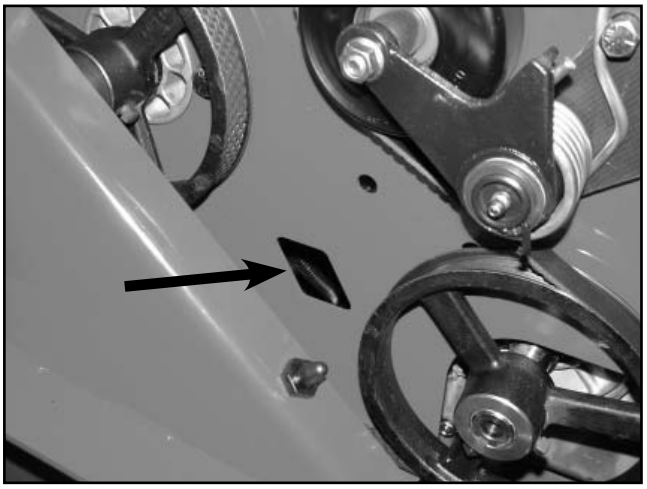


Figure 081 DSC-0583

Manual Shutoff

This engine also has the manual fuel shut off on the carburetor (Fig. 082).

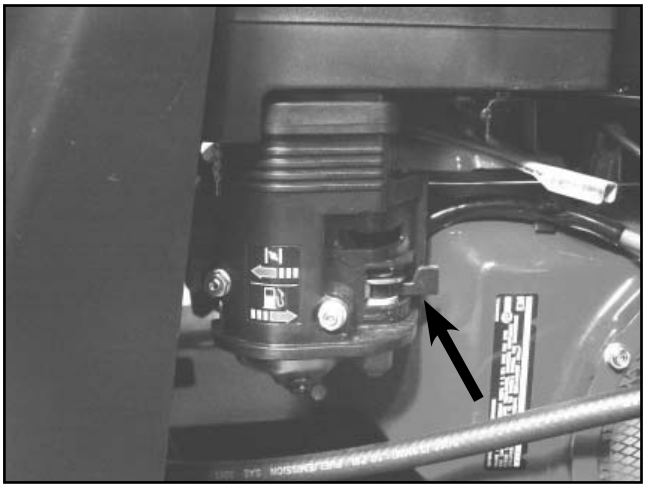
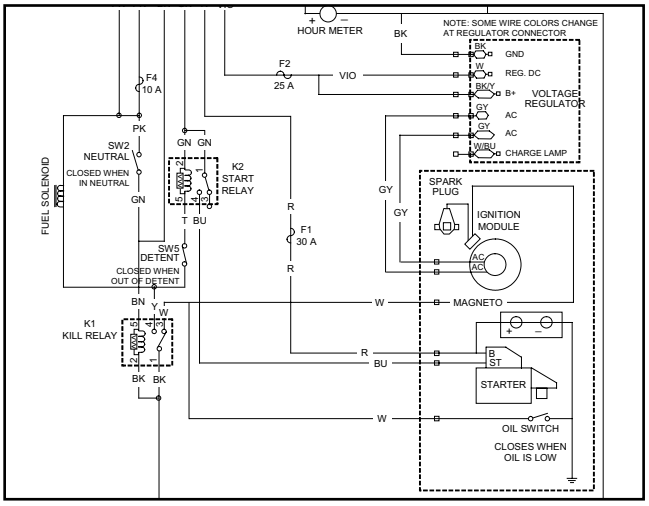


Figure 082 manual shutoff

ELECTRICAL SYSTEM



There are two primary current paths when the ignition switch is in the "START" position. (1) Current flows from the ignition switch to both the coil and contact terminals of the start relay. From the coil terminal of the start relay, current flows to the neutral detent (located on the Auxiliary Power Valve) to the contact terminal of the kill relay. Also, current flows to the engine starter. (2) At the same time, current flows to a neutral switch, (located on the control handle assembly) and to the engine fuel solenoid. From the neutral switch current flows to the coil terminal of the kill relay, which activates and takes the electronic ignition wire off of ground to allow the engine to have spark.

The following electrical section covers most of the electrical components used on the TX 413. It covers each electrical component's purpose, how it works, testing procedures and location on the unit.

Relay

Purpose

The TX 413 uses two relays to direct current flow to different areas of the unit. The two relays are the kill relay and the start relay. Electrically, they both operate the same.

Location

The relays are located behind the rear cover, in back of the hoses (Fig. 083).

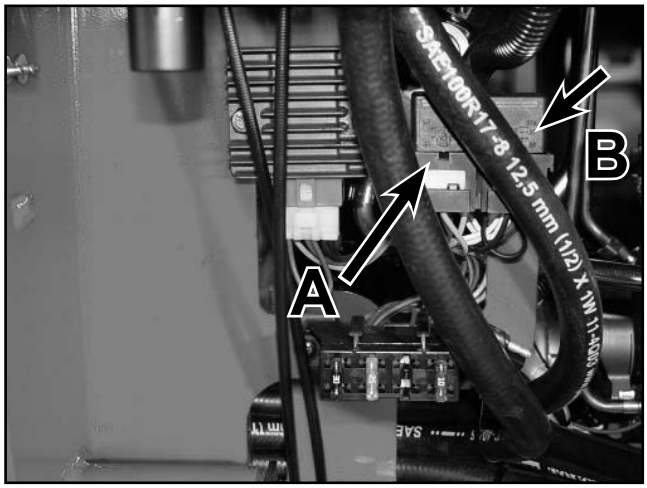


Figure 083 DSC-0753

A. Start relay B. Kill relay

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 connect when the coil is not energized. When the coil is energized, the switch is "thrown" and 30 and 87 are connected (Fig. 084).

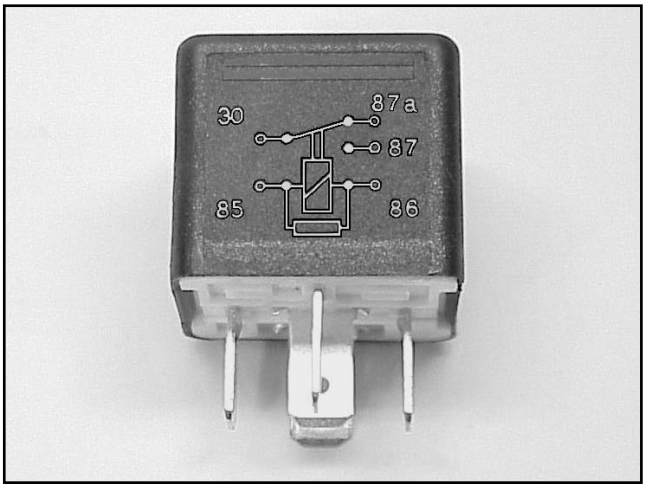


Figure 084 MVC-0671X

Testing

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 (Fig. 108).

3. Connect the multimeter (ohms setting) leads to relay terminals 30 and 87. Ground terminal 86 and apply +12 VDC to terminal 85. The relay should make and break continuity terminals 30 and 87 as 12 VDC is applied and removed from terminal 85 (Fig. 108).

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 the terminal (Fig. 085).

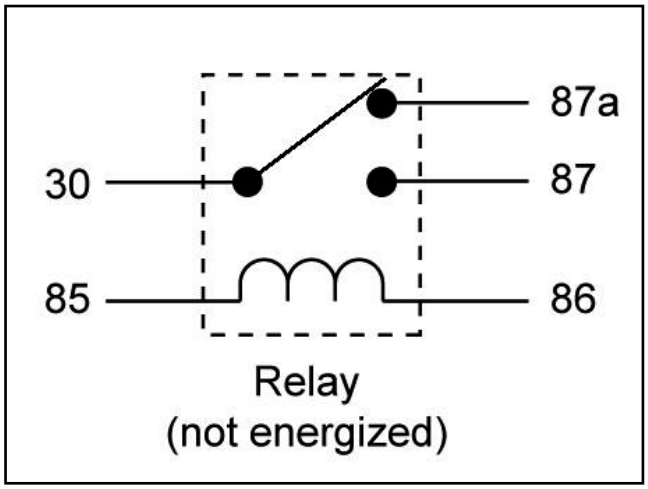


Figure 085 xl relay

5. Disconnect voltage and multimeter leads from relay terminals.

Ignition Switch

Purpose

This component provides the proper switching for the starter, ignition, accessories, and safety circuits (Fig. 086).

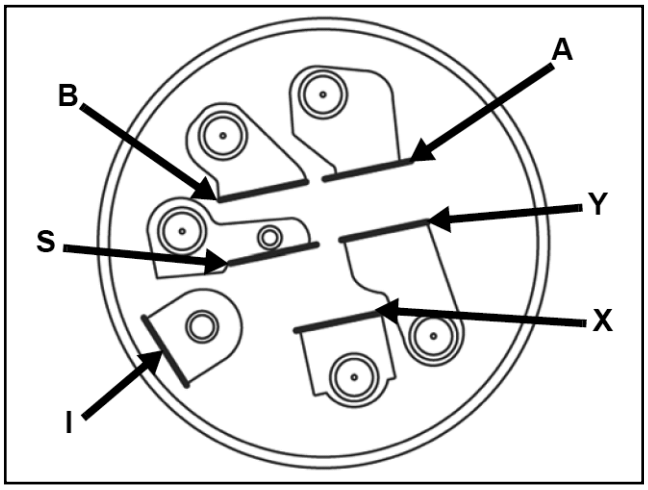


Figure 086 mvc-166 art

Location

The ignition switch is located on the top control panel (Fig. 087).

Figure 087 DSC-0750

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.

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 (Figure 086).

Position	Condition
Off	No continuity
Start	B + I + S
Run	B + I + A and X + Y

Auxiliary Power Neutral Switch

Purpose

3. The normally closed ball type switch is used on the auxiliary power valve. This is a safety type switch to make sure the auxiliary power valve is in the neutral detent (Fig. 088).

Figure 088 MVC-0866X

Location

The auxiliary power neutral switch is located behind the rear cover, on the left side of the unit, on the auxiliary power valve (Fig. 089).

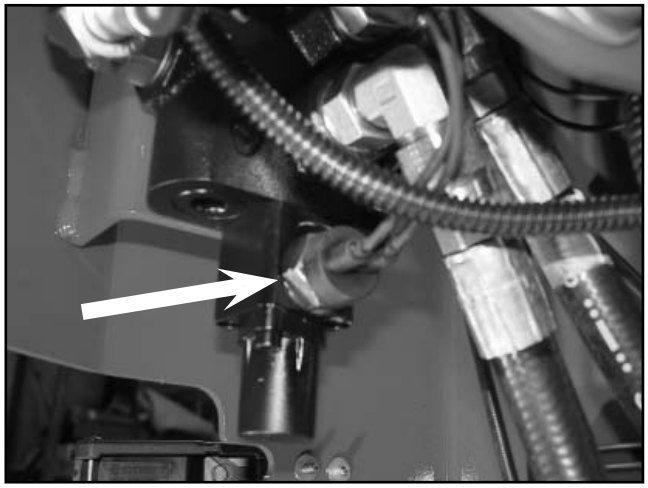


Figure 089 DSC-0758

Testing

1. Disconnect the switch from the wiring harness. Leave the switch in the Auxiliary Power Valve.
2. Using a VOM multimeter (ohms setting) there should be continuity between the two wire terminals.
3. Leave the Multimeter (ohms setting) leads connected to the two wire terminals. Move the auxiliary power valve handle to either the reverse flow or forward flow position. There should be NO continuity.

Regulator-Rectifier

Purpose

The regulator-rectifier changes AC stator to DC and regulates the charging current, to prevent overcharging the battery (Fig. 090).

Figure 090 MVC-0870X

Location

The regulator-rectifier is located behind the rear cover, in back of the hoses (Fig. 091).

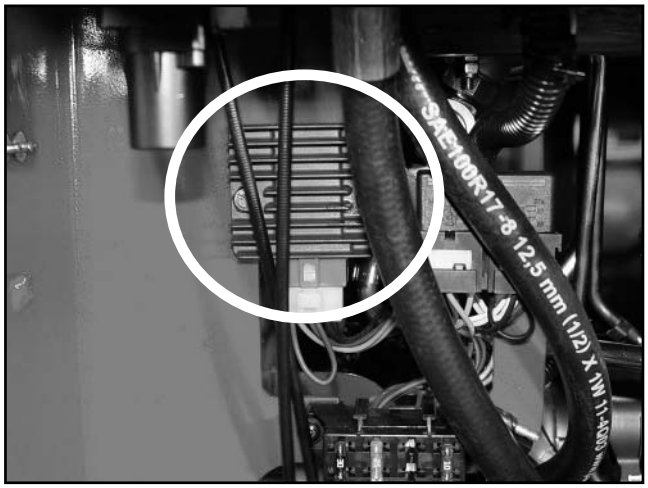


Figure 091 DSC-0753

How It Works

This regulator-rectifier, like many others, must be connected to the battery to function. Once the voltage level of the battery exceeds approximately 14 volts, the regulator-rectifier stops sending current to the battery and no charging takes place. When the voltage again drops below the specified level, the regulator-rectifier sends the current back to the battery.

Testing

1. Check the battery before checking the voltage regulator. The battery must be fully charged and in good condition for the voltage regulator to operate properly. (The voltage across the the battery terminals should be 13.6 volts or more.)

2. Using a multimeter set to DC volts, insert the positive probe of the meter into either A or B terminal violet wire. The negative probe should go to ground (C) or to the negative battery cable. Check the reading on the meter. Start the unit and operate the engine at full throttle. You should see an increase in DC voltage and should read 13.6 to 14 DC voltage or more. System is OK.

3. If not, check stator output. Using a multimeter set to AC volts, connect a probe to D and E terminal (grey wire). Start the unit and operate at full throttle. The AC voltage should be 27 volts or more. If not, the stator is bad. Stator resistance can also be checked - it should be 0.16 - 0.24 Ohms. If OK, proceed to step 4.

4. Shut the engine OFF. Disconnect the electrical connector from the regulator-rectifier. Set the multimeter to read Ohms. The resistance measurements are:

D and A, C, E	infinity
E and A, C	infinity
A and D, E	1 - 200 KΩ
A and C	0.1 - 100 KΩ
C and D, E	0.1 - 50 KΩ

(Fig. 092).

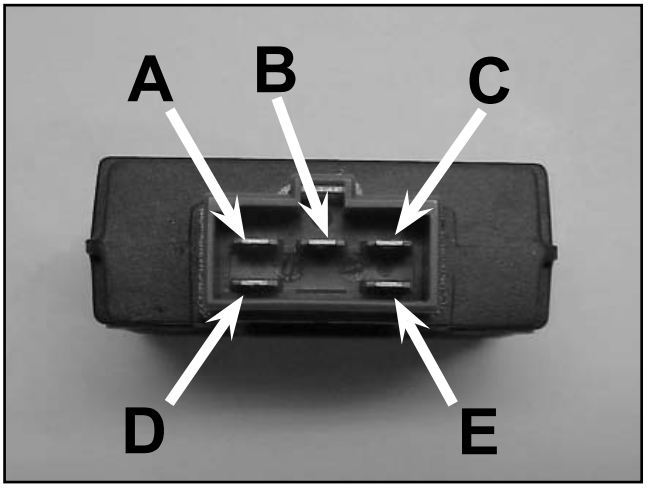


Figure 092 MVC-0872X

A. Violet Wire (B+ to fuse 25A)
B. Violet Wire (B+ to fuse 25A)
C. Black Wire (Ground)
D. Grey Wire (AC from Charge Coil Engine)
E. Grey Wire (AC from Charge Coil Engine)

Hour Meter

Purpose

The hour meter keeps track of how long the key has been in the "RUN" position. Also, the hour meter has a Maintenance Reminder Program. Icons will flash 3 hours before the service interval through 3 hours after the service interval. The service icon (looks like an hourglass) is set-up to flash at 8 hours (Break-in Period) and then every 99 hours.

At every 399 hour interval a second icon will flash. The "SVC" icon is a reminder to change the hydraulic oil and filter.

Location

The hour meter is located under the hood, toward the dash assembly (Fig. 093).

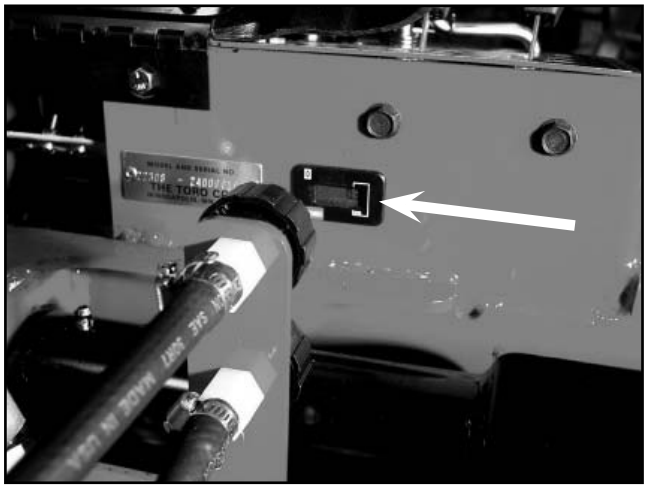


Figure 093 DSC-0755

How It Works

The hour meter is an electronic digital clock. It has its own internal battery to keep memory of the hours, when the engine is not running. It is not repairable or resettable.

Testing

1. Verify that 12 volts is present across the two terminals when the key is in the "RUN" position. Since the meter is polarized, it is important the positive wire is connected to the correct terminal (Fig. 118).

2. When the meter is operating properly, the hourglass icon will be flashing on and off. If the hourglass icon is not showing and the meter is hooked up properly, replace the meter (Fig. 094).

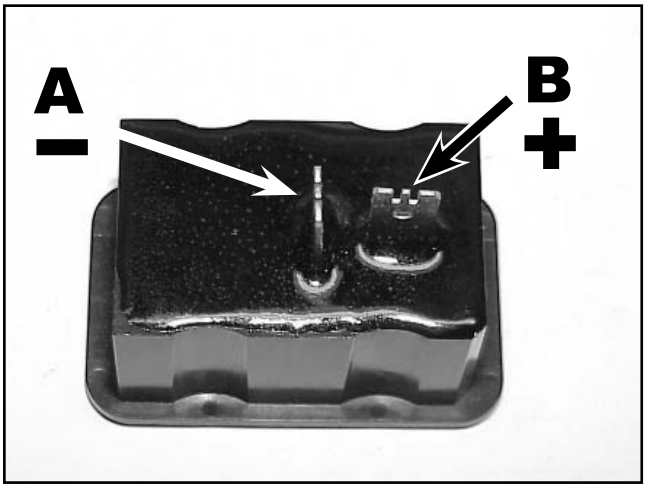


Figure 094 MVC-0877X

Neutral Proximity Switch

Purpose

Used to ensure the traction control lever is in the neutral/stop position when starting the unit. It is a magnetic type switch and it must be in proximity with the traction control lever bolt to close the contacts (Fig. 095).

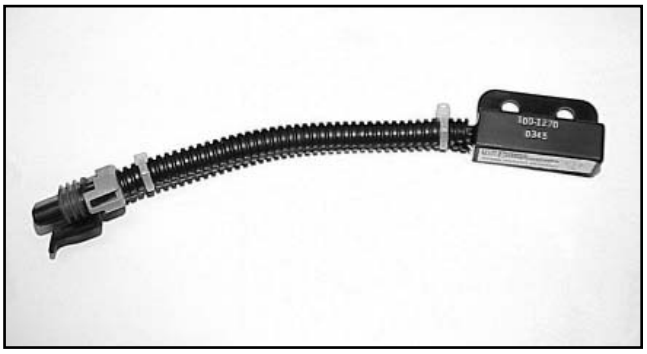


Figure 095 MVC-0878X

Location

The neutral proximity switch is located behind the rear cover, under the dash, in front of the traction control lever (Fig. 096), and can be viewed and adjusted from under the hood.

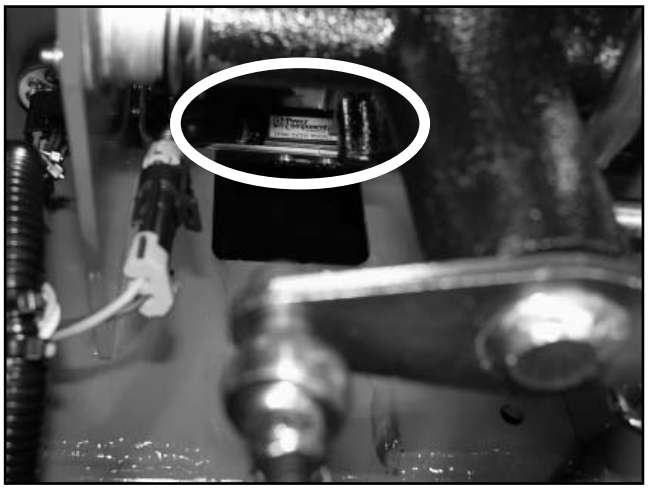


Figure 096 DSC-0756

How It Works

The neutral proximity switch has a sense zone which is the magnetic portion on the switch (Fig. 097). A bolt located on the traction control lever aligns with the sense zone in the neutral/stop position to magnetically close the contacts in the switch.

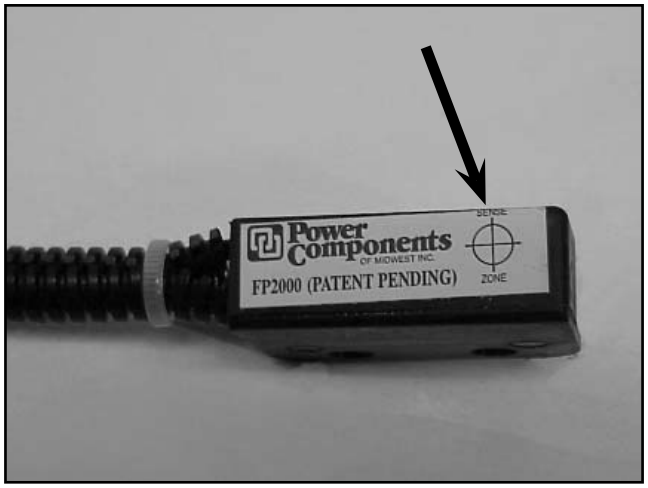


Figure 097 MVC-0885X

Testing

1. Before electrically testing the switch, check the location of the switch and bolt, to make sure they are meeting in the sense zone on the switch. Both the switch and the bolt are adjustable and the air gap between them should be 1/8” to 1/4" (3.2 to 6.4mm).

2. Disconnect the switch from the wiring harness and remove from the unit.

3. Using a multimeter (ohms setting), check the continuity of the switch at the wire terminals. There should be NO continuity (switch open).

4. Using the steel blade of a screw driver or similar, touch the blade of the screw driver up against the sense zone of the switch and check the continuity, there should be continuity (switch closed) (Fig. 098).

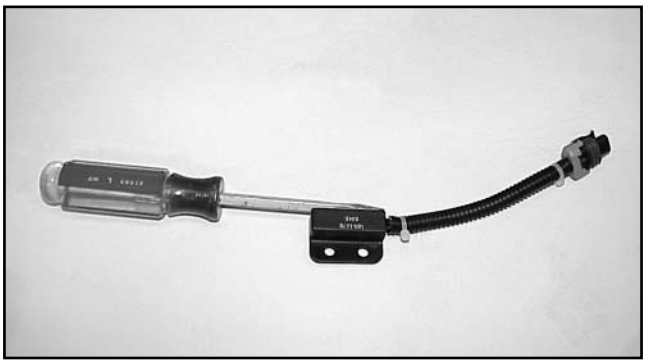


Figure 098 MVC-0879X

Fuel Solenoid or Shutoff Valve

Purpose

The fuel shutoff valve is located in-line between the gas tank and the engine carburetor. When the ignition switch is in the "OFF" position, fuel will not flow to the engine carburetor. When the ignition switch is in the "START" and "RUN" positions, the shutoff valve is open.

Location

The fuel shutoff valve is located on the left side of the unit, next to the engine (Fig. 099).

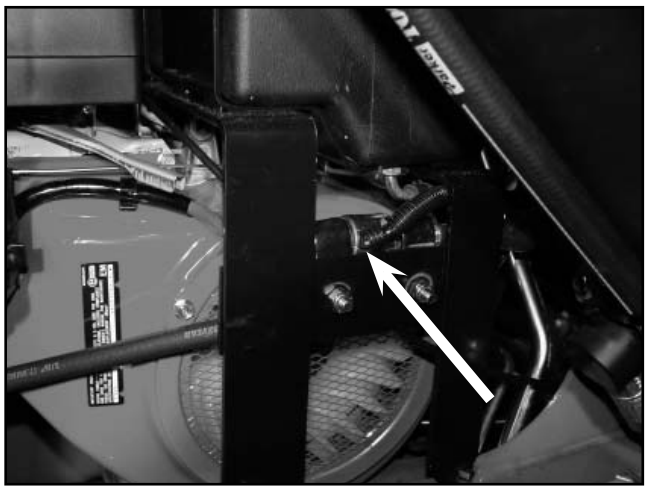


Figure 099 DSC-0762

How It Works

The fuel solenoid/shutoff valve is an electrically actuated valve. When 12 VDC is supplied to the valve, the valve opens and fuel will flow to the carburetor.

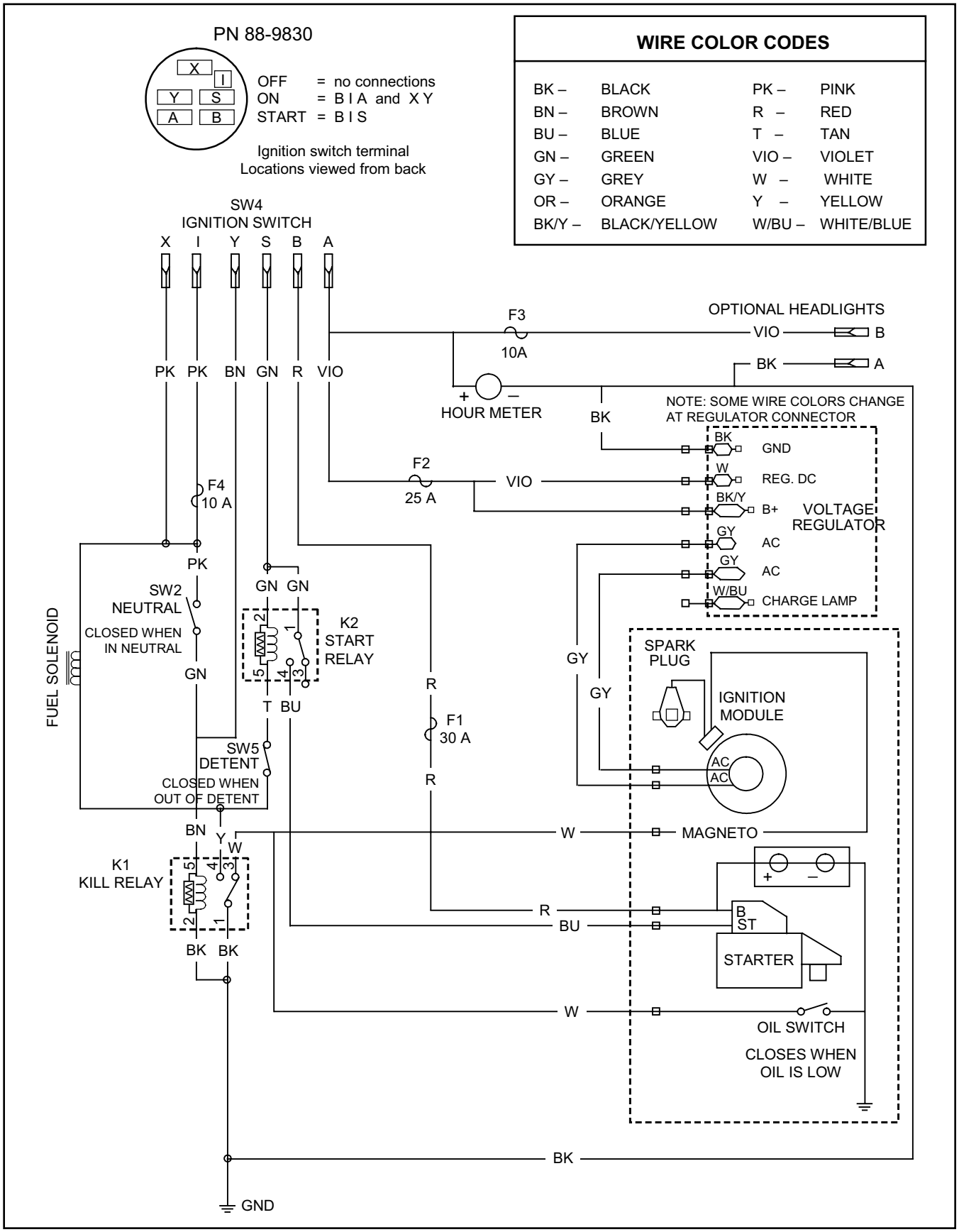
Testing

1. With the fuel solenoid connected to the wire harness, turn the ignition key to the "RUN" position. Verify there is 12 VDC at the connector with the pink wire.

2. If 12 VDC is present, carefully disconnect the fuel line from the fuel shutoff valve. You will need a container handy to catch any fuel. Turn the ignition key to the "RUN" position. Fuel should flow out of the fuel shutoff valve. If not, replace the valve (Fig. 100).

Figure 100 DSC-1729

Electrical Schematic Wiring Diagram



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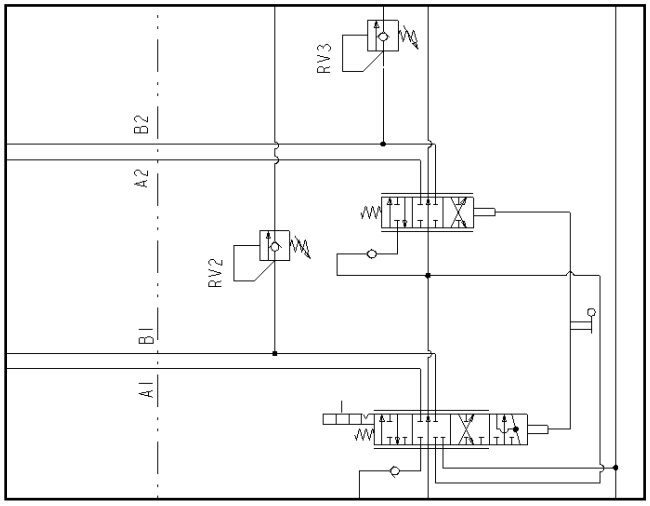
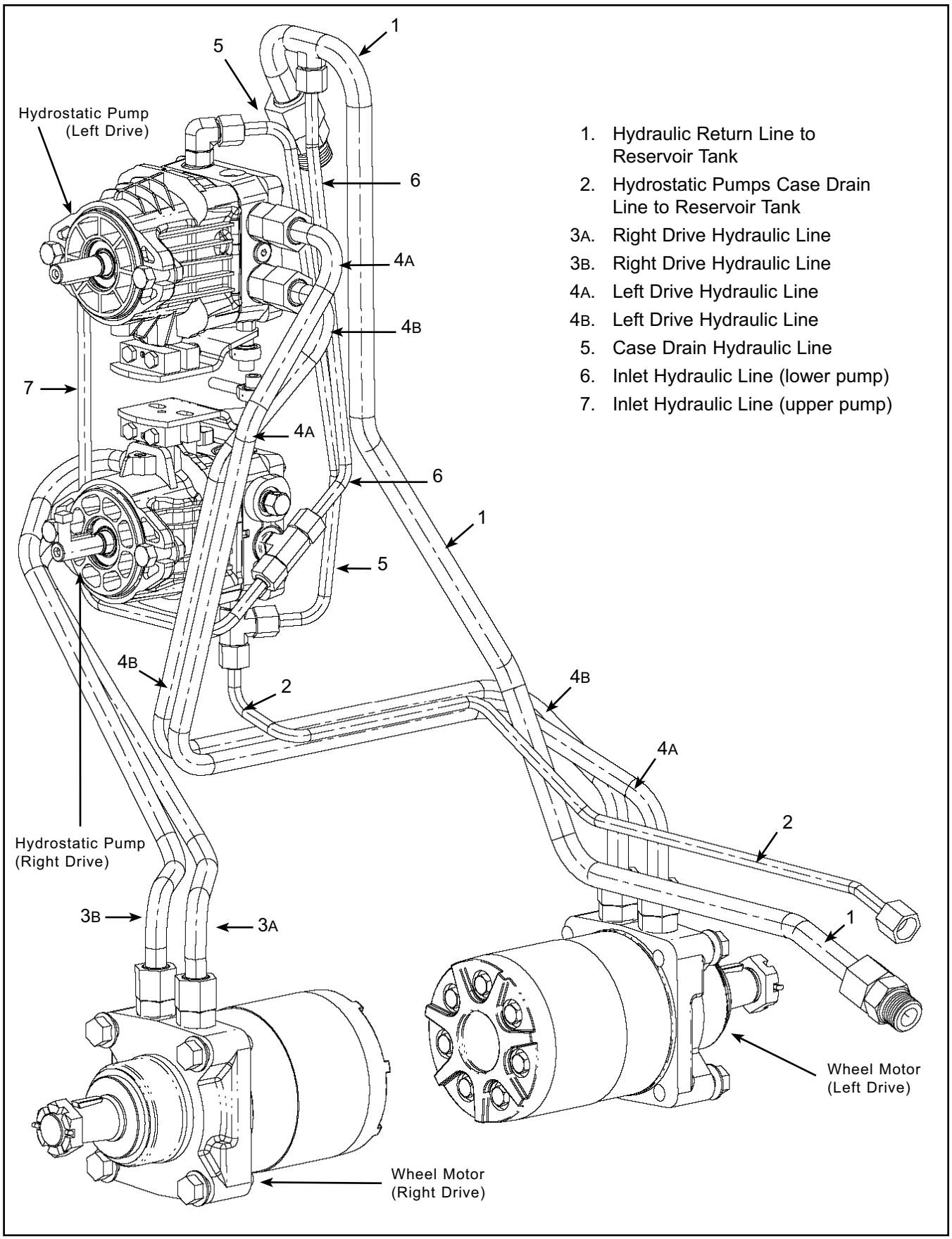
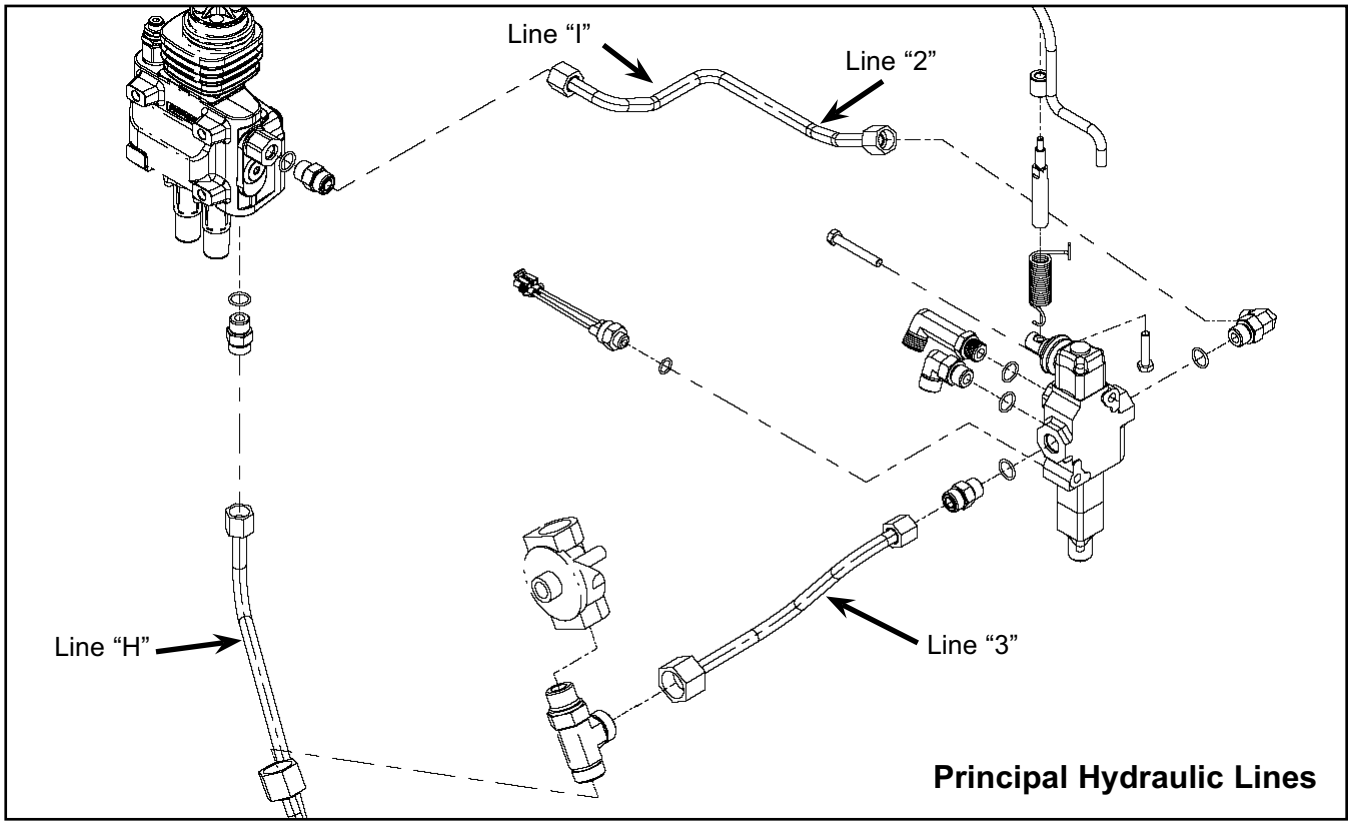
HYDRAULIC SYSTEM



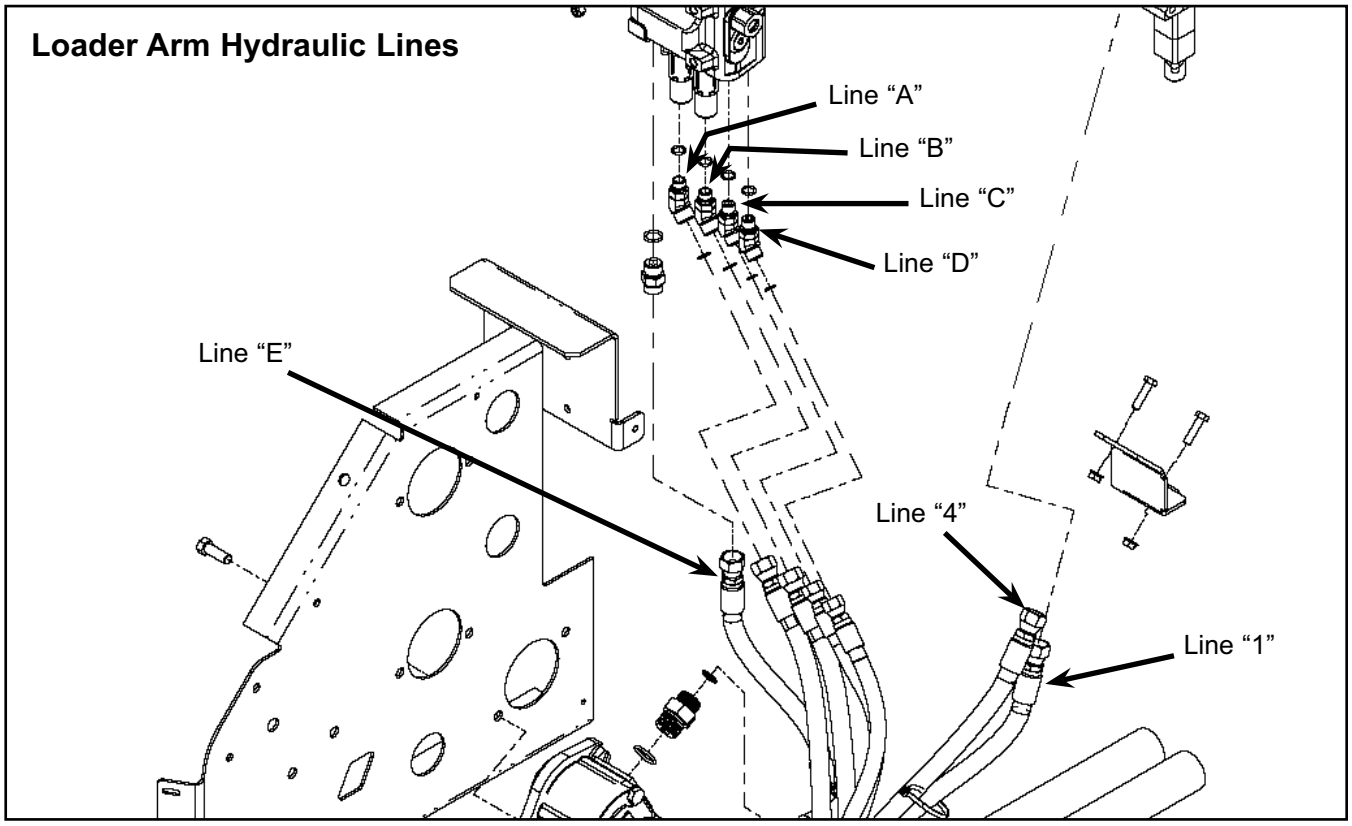
Hydrostatic Pump Reference Drawing



Valve Reference Drawings



Principal Hydraulic Lines



Purging Air Procedures

Due to the effects air has on efficiency in hydrostatic drive applications, it is critical that air is purged from the system.

These purge procedures should be implemented anytime a hydrostatic system or hydraulic lines has been opened to facilitate maintenance or any additional oil has been added to the system.

Air creates inefficiency because it has compression and expansion rates that are higher than that of oil.

Trapped air in the oil may cause the following symptoms:

1. Noisy operation.
2. Lack of power or drive after short-term operation.
3. High oil temperature and excessive expansion of oil.

Before starting, make sure the reservoir is at the proper oil level. If it is not, fill to the vehicle specifications, refer to the Hydraulic Reservoir Tank, Checking the Hydraulic Fluid section on page 3-4.

The following procedures should be performed with the vehicle drive tracks off the ground, then repeated under normal operating conditions.

1. Lift/support the unit so that both tracks are off the ground and free to rotate.
2. Start the engine and run it at slow idle engine speed for about 20 seconds.
3. Push the traction control to full forward position and hold. The tracks should begin to slowly turn. Once the tracks begin to turn smoothly, allow to run for 20 seconds. Pull the traction control to full reverse position and hold. Again, the tracks should begin to slowly turn in reverse. Once the tracks begin to turn smoothly, allow to run for 30 seconds.
4. Raise and lower the loader arm for 4 complete cycles. Raise loader arm and put into the float position, loader arm should drop.
5. Cycle the dump cylinder for 4 complete cycles.
6. Stop the engine and check the oil level in the reservoir and add if necessary.
7. It may be necessary to repeat Steps 2 through 6, until all the air is completely purged from the system.

Adjusting the Tracking of the Traction Control, Full Forward Position

If the traction unit does not drive straight when you hold the traction control against the reference bar, complete the following procedure:

Note: Whenever an adjustment is made, check to make sure the set screws contact stops in the full forward motion.

1. Drive the traction unit with the traction control against the reference bar, noting which direction the traction unit veers.
2. Release the traction control.

Note: When the traction control is stroked fully forward and the unit has severe pull to the left or right, a problem with the pump control linkage or a hydraulic component is indicated.

Note: When the traction control is stroked fully and a gradual pull happens, the tracking adjustment can be made. A very slight tracking error is considered normal.

3. If the traction unit veers **left**, loosen the **right** jam nut and adjust the tracking set screw on the rear of traction control (Fig. 101).

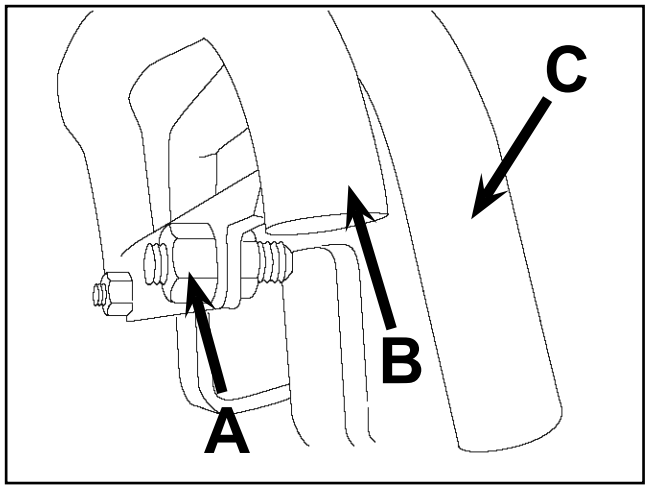


Figure 101 fig 38.bmp

A. Right jam nut
B. Operator Handle
C. Reference Bar

4. If the traction unit veers **right**, loosen the **left** jam nut and adjust the tracking set screw on front of the traction control (Fig. 102).

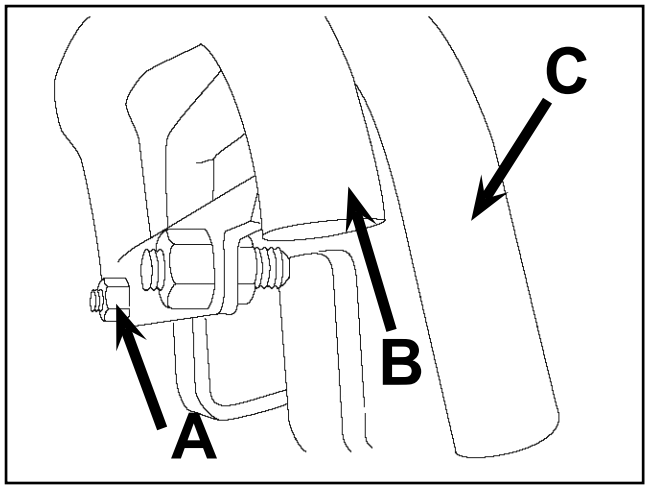


Figure 102 fig 38.bmp

A. Left jam nut
B. Operator Handle
C. Reference Bar

5. Repeat steps 1 through 4 until the traction unit drives straight in the full forward position.

Adjusting the Traction Control Neutral Position

If the traction unit creeps forward or backward when the traction control is in neutral (and the unit is fully warmed up), immediately complete the following procedure:

1. Park the traction unit on a flat surface and lower the loader arm.
2. Stop the engine and remove the key.
3. Lift/support the traction unit so that both tracks are off of the ground.
4. Open the rear access cover (Fig. 103).

Figure 103 DSC-0778

Note: Slight creeping of tracks in the forward or reverse drive with tracks off the ground can be a normal condition.

5. Loosen the jam nuts on the traction rods, under the control panel (Fig. 104).

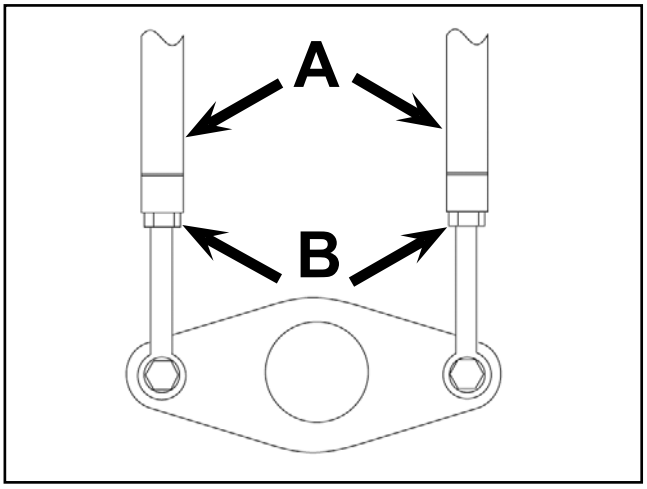


Figure 104 fig. 37.bmp

A. Traction rods
B. Jam nuts

6. Start the traction unit and set the engine throttle to 1/3 engine throttle speed.
7. If the **left** track moves, lengthen or shorten the **right** traction rod until the track stops moving.
8. If the **right** track moves, lengthen or shorten the **left** traction rod until the track stops moving.
9. Tighten the jam nuts.
10. Close the rear access cover.
11. Stop the engine and lower the traction unit to the ground.
12. Test for proper operation.

Hydrostatic Pump (Right Drive) Removal

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 by using 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. During installation, lightly lubricate all seals, O-rings and gaskets with clean petroleum jelly prior to assembly.

1. Lift/support the unit so the tracks are off the ground.
2. Raise the hood and remove the belt cover. Remove the rear cover and disconnect the battery cables and remove the battery.
3. Remove drive belt, refer to the Drive Belt Removal section of this manual page 8-2.
4. Loosen the two set screws located on the hydrostatic pump pulley and remove the pulley (Fig. 105).

Figure 105 DSC-0859

5. With an offset open end wrench remove the inlet hydraulic line, (page 6-2, Ref. 6), that runs to the lower hydrostatic pump, (Fig. 106).

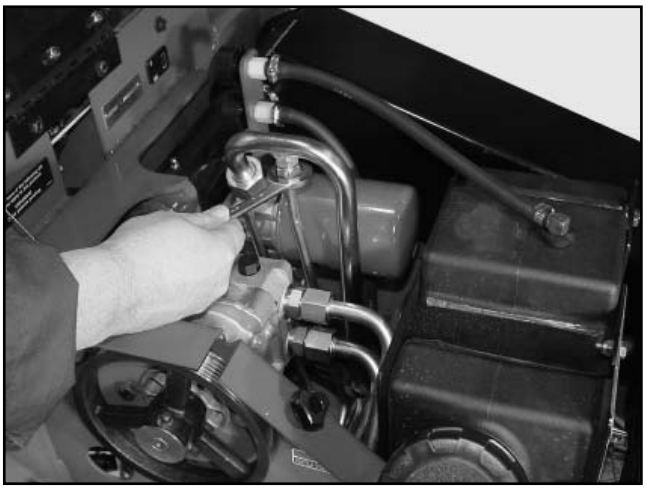


Figure 106 DSC-0860

6. Remove the upper end of the inlet hydraulic line at the T-fitting adapter, (page 6-2, Ref. 6), located on the lower hydrostatic pump (Fig. 107, top view).

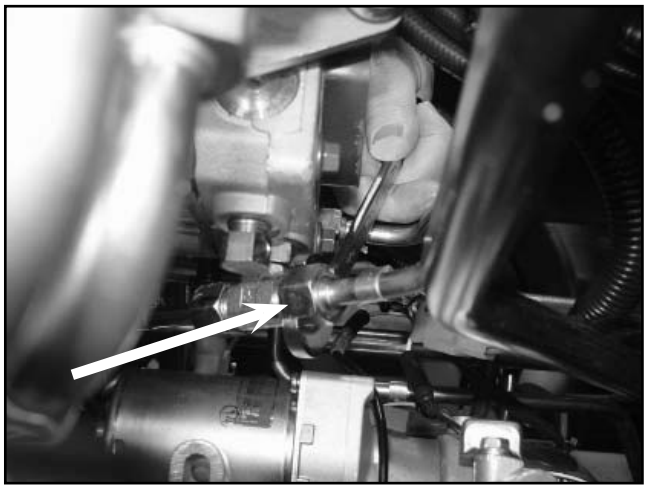


Figure 107 DSC-0861

7. On the lower side of the T-fitting adapter, remove the hydraulic inlet line, (page 6-2, Ref. 7), from the lower hydrostatic pump that runs to the upper hydrostatic pump (Fig. 108, top view).

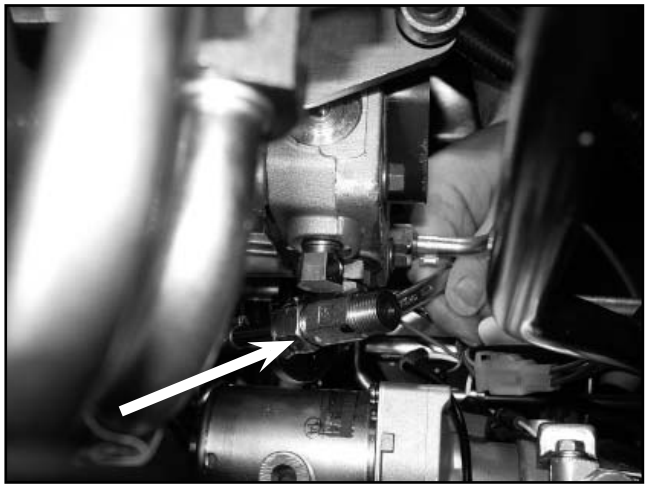


Figure 108 DSC-0863

8. Loosen and remove the hydraulic inlet line, (page 6-2, ref 7), located on the back side of the upper hydrostatic pump (Fig. 109).

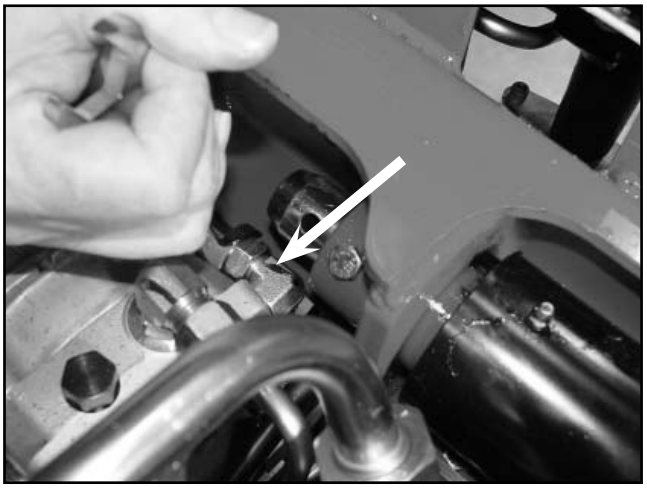


Figure 109 DSC-0864

9. Disconnect the hydrostatic case drain line from the T-fitting adapter, (page 6-2, Ref. 5), at the lower hydrostatic pump (Fig. 110, rear view).

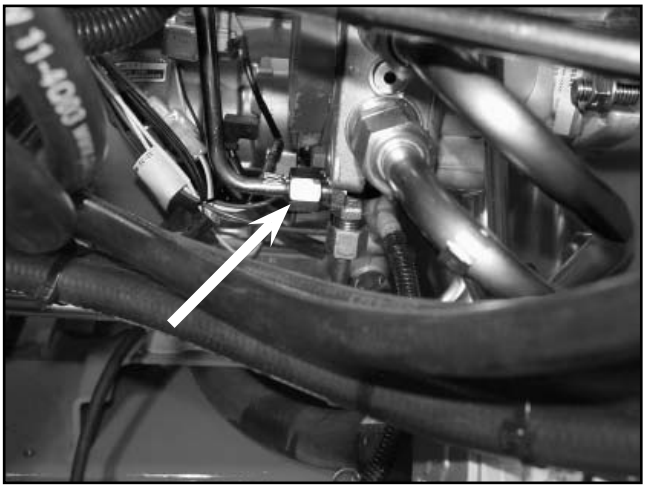


Figure 110 DSC-0869

10. Disconnect the hydraulic case drain line, (page 6-2, Ref. 2), from the bottom of the right drive hydrostatic pump, at the T-fitting that is connected to the reservoir tank (Fig. 111, rear view).

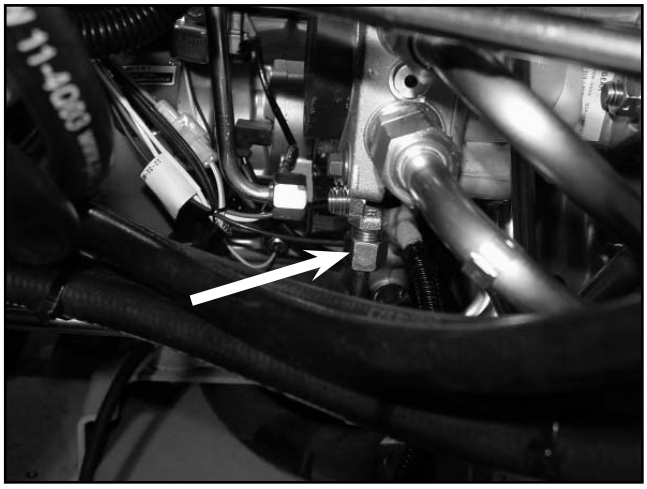


Figure 111 DSC-0869a

11. Disconnect the hydraulic case drain line from the upper hydrostatic pump, (page 6-2, Ref. 5), and remove the line (Fig. 112).

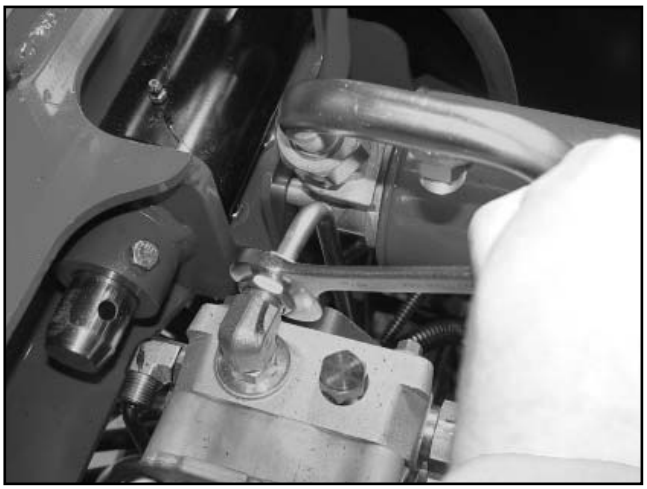


Figure 112 DSC-0870

12. Disconnect the two hydraulic lines to the wheel motor, (page 6-2, Ref. 3A and 3B), (Fig. 113).

Note: It may be necessary to loosen the hydraulic lines at the wheel motors.

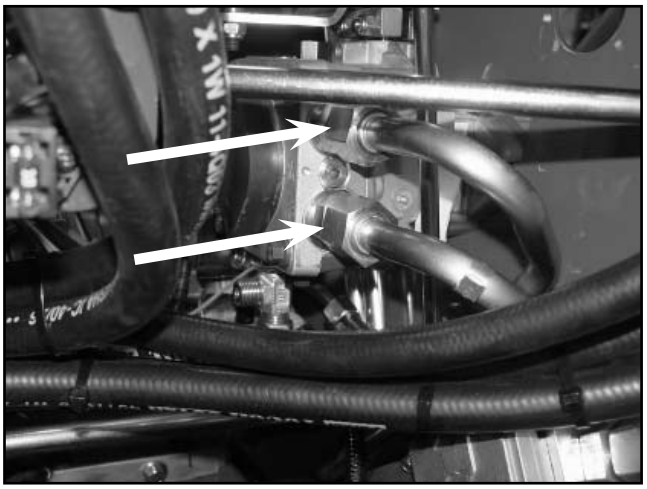


Figure 113 DSC-0871

13. Position the control handle so you can install a 1/4" Allen wrench into the Allen head bolt retaining the rod linkage to the pump lever assembly, (Fig. 114).

Figure 114 DSC-0874

14. Remove the Allen bolt, spacer, and nut from the pump lever assembly (Fig. 115).

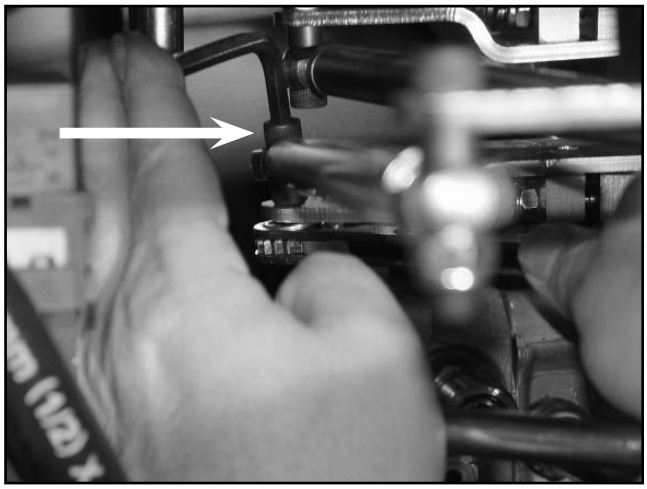


Figure 115 DSC-0876

15. Remove the two bolts and nuts holding the hydrostatic pump to the frame (Fig. 116).

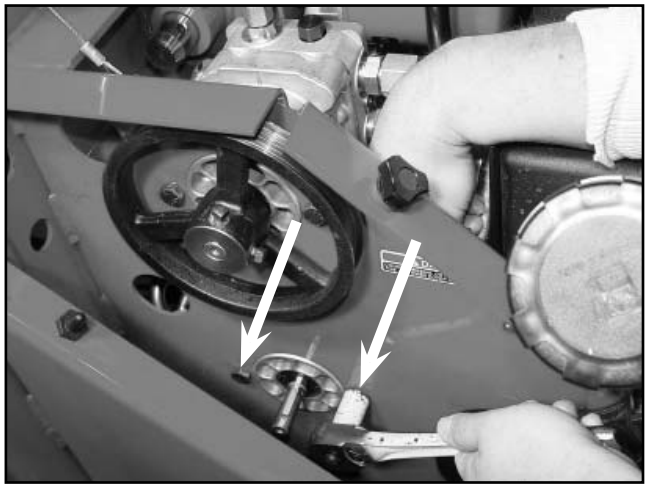


Figure 116 DSC-0877

16. Carefully lower the hydrostatic pump down and maneuver under the hydraulic hoses and out of the backside of the unit (Fig. 117).

Figure 117 DSC-0878

Hydrostatic Pump Service

For hydrostatic pump service, refer to Hydro-Gear BDP-10 service manual (Toro P/N 492-4789).

Hydrostatic Pump (Right Drive) 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.

1. When installing a new hydrostatic pump, make sure all the hydraulic fittings are installed properly; refer to the Hydrostatic Pump (Right Drive) Fittings and Pump Lever Assembly on pages 6-17.

2. Maneuver the right drive hydrostatic pump under the hydraulic hoses and up to the opening in the frame. Secure the frame with two bolts and nuts. DO NOT tighten the bolts at this time (Fig. 118).

Figure 118 DSC-0884

3. Connect the two hydraulic lines that run to the right wheel motor, (page 6-2, Ref. 3A and 3B), and hand tighten (Fig. 119).

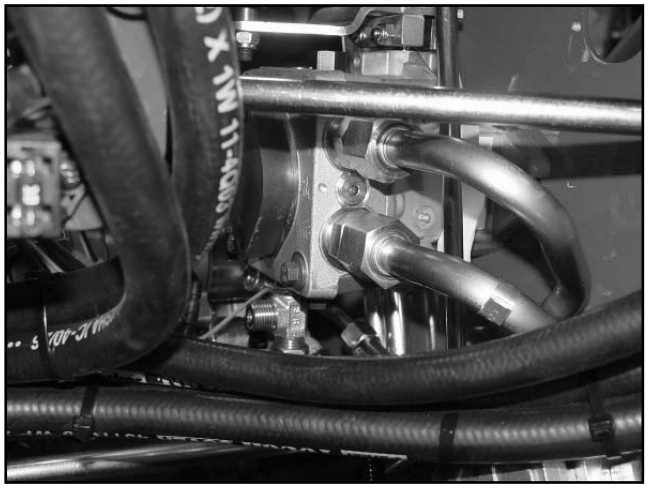


Figure 119 DSC-0871

4. Connect and hand tighten the inlet hydraulic line from the T-fitting adapter (page 6-2, Ref. 7) from the right drive hydrostatic pump to the left drive hydrostatic pump (Fig. 120, top view and Fig 121).

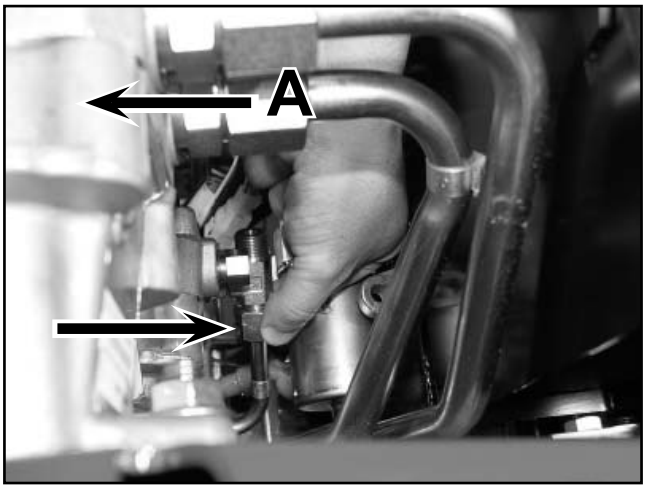


Figure 120 DSC-0885

A. Left Hand Drive Pump

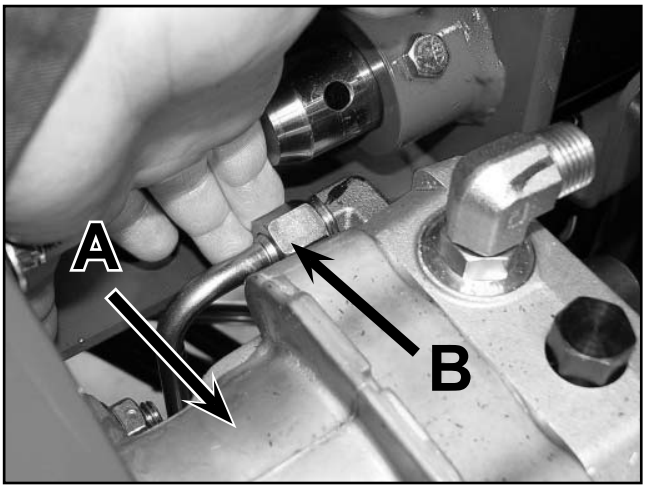


Figure 121 DSC-0886

A. Left Hand Drive Pump
B. Inlet Hydraulic Line from T-fitting Adapter

5. Connect and hand tighten the case drain hydraulic line (page 6-2, Ref. 2) to the bottom of the T-fitting adapter, located on the bottom of the right drive hydrostatic pump (Fig. 122, rear view).

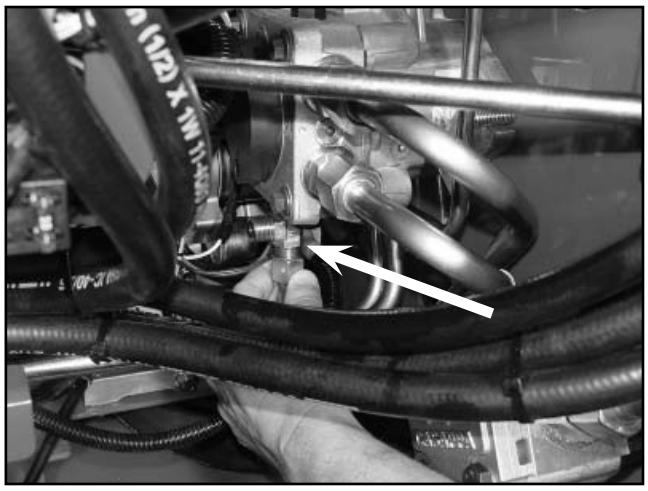


Figure 122 DSC-0887

6. Connect and hand tighten the case drain hydraulic line (page 6-2, Ref. 5) from the T-fitting located at the bottom of the right drive hydrostatic pump to the top 90° fitting located on the top of left drive hydrostatic pump (Fig. 123, rear view).

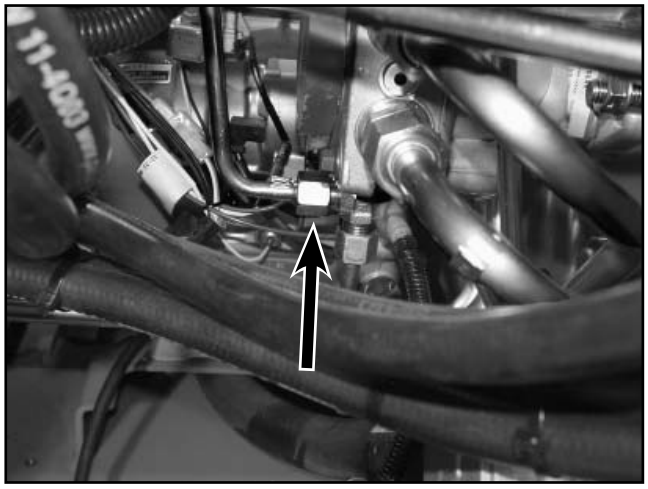


Figure 123 DSC-0869

7. Connect and hand tighten the case drain hydraulic line (page 6-2, Ref. 6), to the 90° fitting located on the top of the left drive hydrostatic pump (page 6-2, Ref. 1) (Fig. 124).

Figure 124 DSC-0903

8. Recheck all the fitting connections and tighten.
9. Tighten the two right drive hydrostatic pump mounting bolts and torque to 50 ± 5 ft-lbs. (70 ± 7 Nm) (Fig. 125).

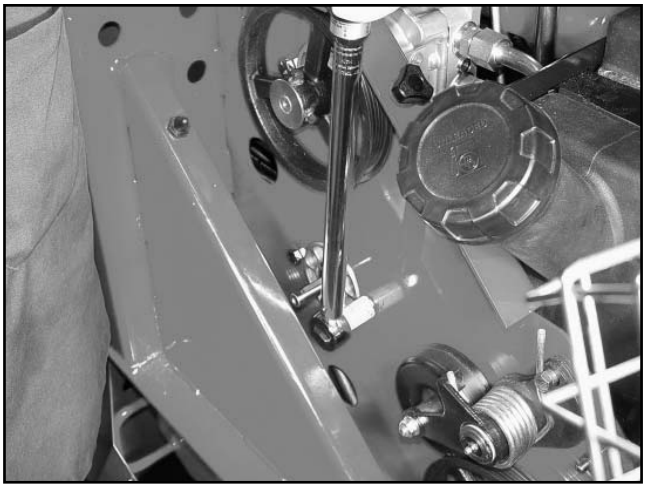


Figure 125 DSC-0888

10. Position the control handle so the Allen head bolt can be installed through the rod, linkage spacer, pump lever assembly, and a nut. Tighten the assembly and make sure the control handle is moving freely (Fig. 126).

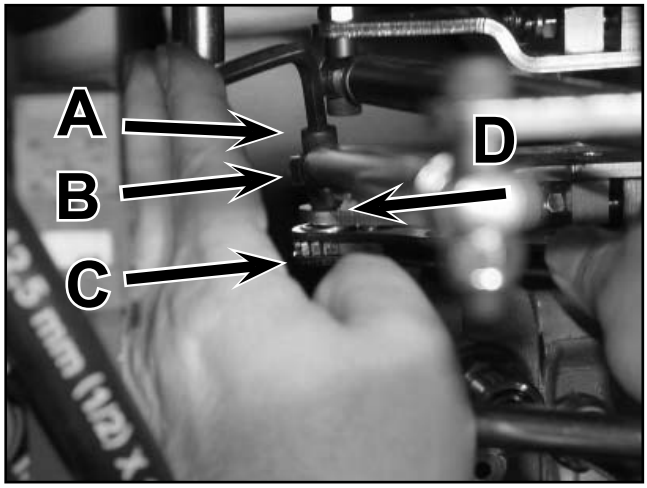


Figure 126 DSC-0876

A. Allen head bolt
B. Linkage spacer
C. Pump lever assembly
D. Nut

11. Apply anti-sieze compound on the right drive hydrostatic pump shaft. Also, apply a medium strength threadlocking material to the pulley set screws. Install the hydrostatic pump pulley on the shaft and key, making sure the set screws are facing outward and the pulley is flush with the end of the pump shaft (Fig. 127). Then tighten the set screws to 215 ± 35 in-lbs. (24 ± 4 Nm).

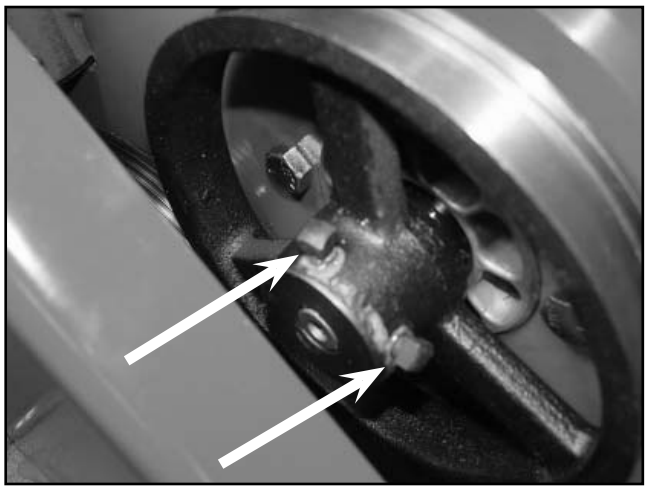


Figure 127 DSC-0889

12. Install drive belt; refer to the Drive Belt Installation section on page 8-3.
13. Install battery and battery cables.
14. Follow the Purging Air Procedures; refer to the Purging Air Procedures on page 6-4.
15. Check all of the hydraulic line connections for any leaks.
16. Check the traction control for neutral, refer to the Traction Control Neutral Position section on page 6-5.
17. Check the traction unit for tracking. If adjustment is needed; refer to the Adjusting the Tracking of the Traction Control, Full Forward Position section on page 6-4.
18. Install drive belt cover and rear cover. Lower the traction unit to the ground. Operate unit to make sure everything is operating properly.

Hydrostatic Pump (Left Drive) Removal

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 by using 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. During installation, lightly lubricate all seals, O-rings and gaskets with clean petroleum jelly prior to assembly.

1. Lift/support the unit so the tracks are off the ground.
2. Raise the hood and remove the belt cover. Remove the rear cover and disconnect the battery cables and remove the battery.
3. Remove drive belt; refer to the Drive Belt Removal section, page 8-2.

4. Loosen the two set screws located on the hydrostatic pump pulley and remove pulley (Fig. 128).

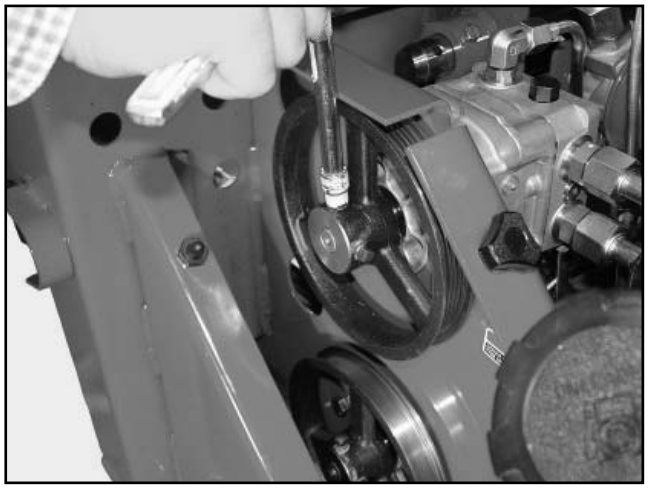


Figure 128 DSC-0891

5. With a 1-1/8" offset open end wrench, remove both the left drive hydraulic motor lines (page 6-2, Ref. 4A and 4B), (Fig. 129).

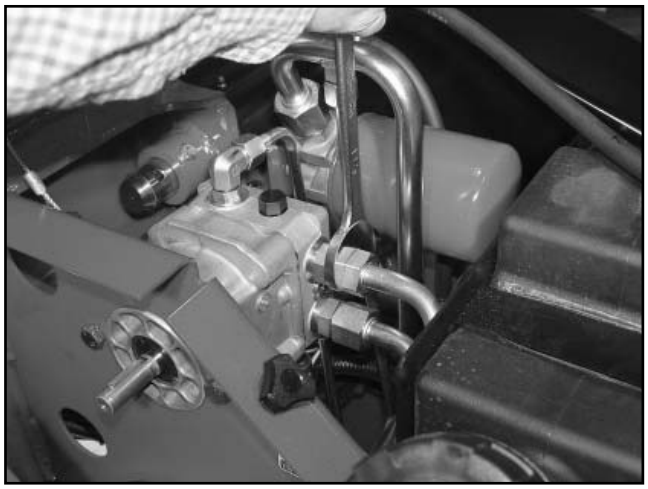


Figure 129 DSC-0892

6. Disconnect the case drain hydraulic line (page 6-2, Ref 5), from the top of the left drive hydrostatic pump (Fig. 130).

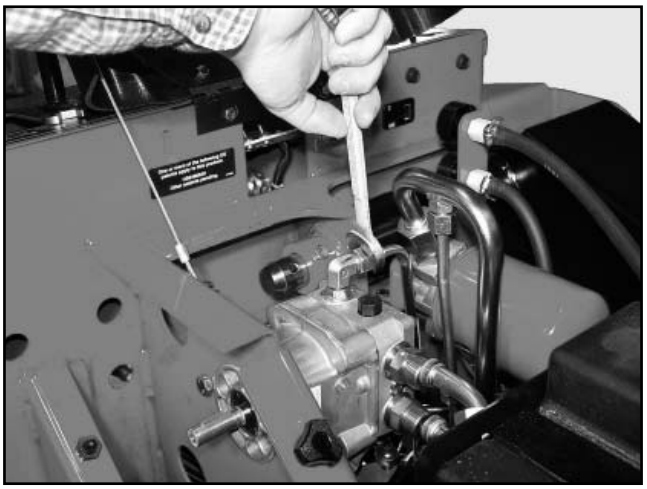


Figure 130 DSC-0893

7. Remove the inlet hydraulic line, (page 6-2, Ref. 7) from the side of the left drive hydrostatic pump (Fig. 131).

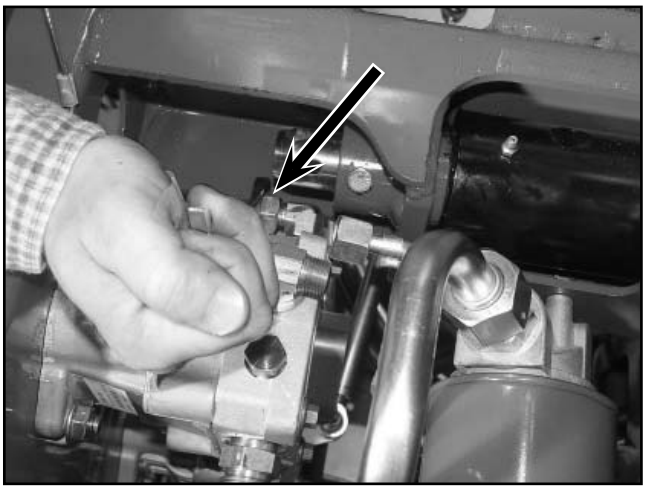


Figure 131 DSC-0894

8. Position the control handle so you can install a 1/4" Allen wrench into the Allen head bolt retaining the rod linkage spacer to the pump lever assembly (Fig. 132).

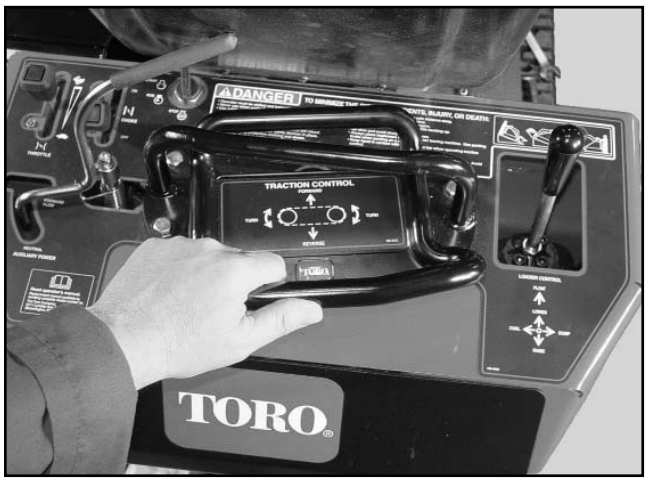


Figure 132 DSC-0874

9. Remove the Allen bolt, spacer, and nut from the pump lever assembly (Fig. 133).

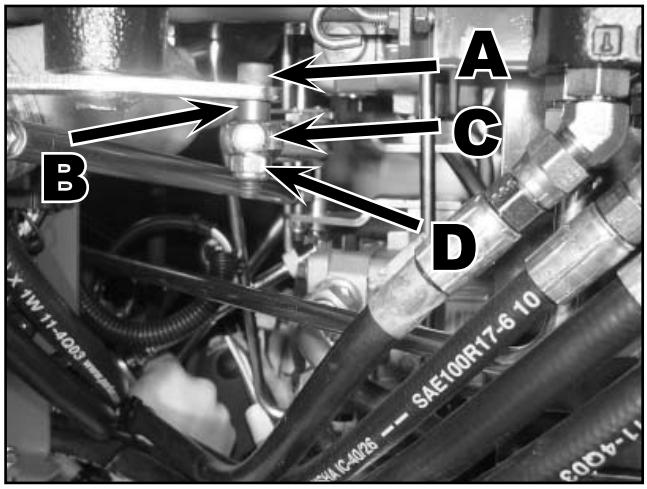


Figure 133 DSC-0896

A. Allen head bolt
B. Linkage spacer
C. Pump lever assembly
D. Nut

10. Remove the two mounting bolts and nuts holding the left drive hydrostatic pump to the frame (Fig. 134).

Figure 134 DSC-0897

11. Lift the hydrostatic pump up and out of the unit (Fig. 135).

Figure 135 DSC-0898

Hydrostatic Pump Service

For hydrostatic pump service, refer to Hydro-Gear BDP-10 service manual (Toro P/N 492-4789).

Hydrostatic Pump (Left Drive) 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.

1. When installing a new hydraulic pump, make sure all the hydraulic fittings are installed properly; refer to the Hydrostatic Pump (Left Drive) Fittings and Pump Lever Assembly section on pages 6-17.
2. Install the left drive hydrostatic pump with the two bolts and nuts that retain the pump to the frame. DO NOT tighten the bolts at this time (Fig. 136).

Figure 136 DSC-0901

3. Connect the inlet hydraulic line to the side of the pump and hand tighten (page 6-2, Ref. 7) (Fig. 137).

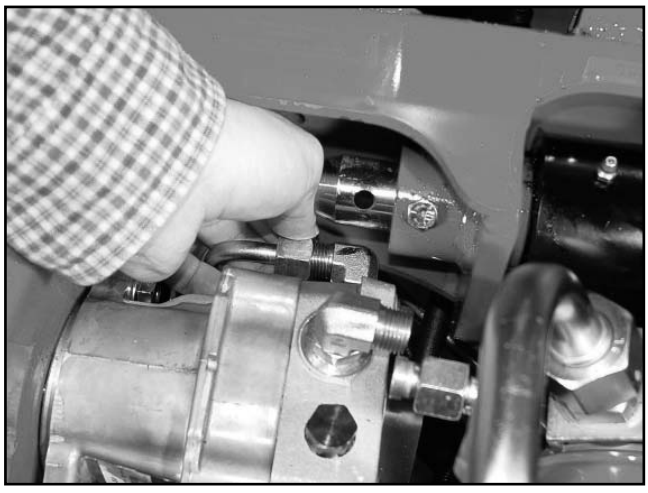


Figure 137 DSC-0902

4. Connect the case drain hydraulic line to the top of the pump and hand tighten (page 6-2, Ref. 5) (Fig. 138).

Figure 138 DSC-0903

5. Connect and tighten the bottom hydraulic line (page 6-2, ref 4B) to the wheel motor (Fig. 139).

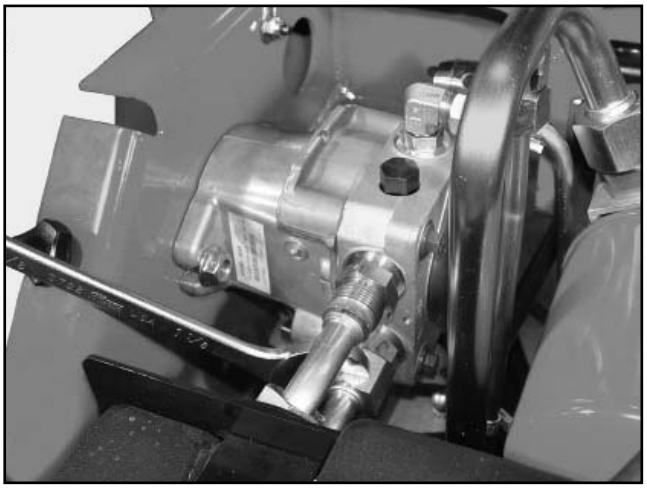


Figure 139 DSC-0905

6. Connect and tighten the top hydraulic line (page 6-2, Ref. 4A) to the wheel motor (Fig. 140).

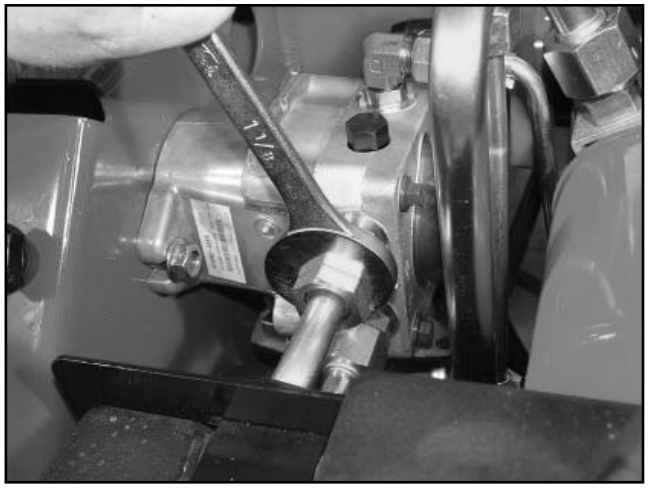


Figure 140 DSC-0906

7. Recheck all of the fitting connections and tighten.
8. Tighten the two left drive hydrostatic pump mounting bolts and torque to 50 ± 5 ft-lbs. (70 ± 7 Nm) (Fig. 141).

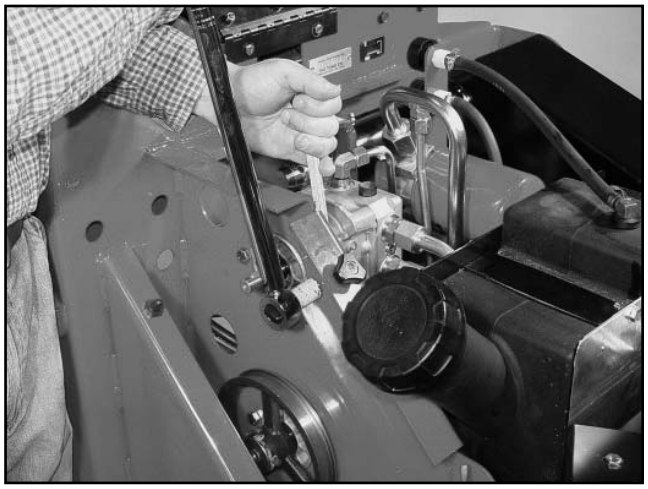


Figure 141 DSC-0907

9. Position the control handle so you can install the Allen head bolt through the rod end bearing, spacer, pump lever assembly, and a nut. Tighten the assembly and make sure the control handle is moving freely (Fig. 142).

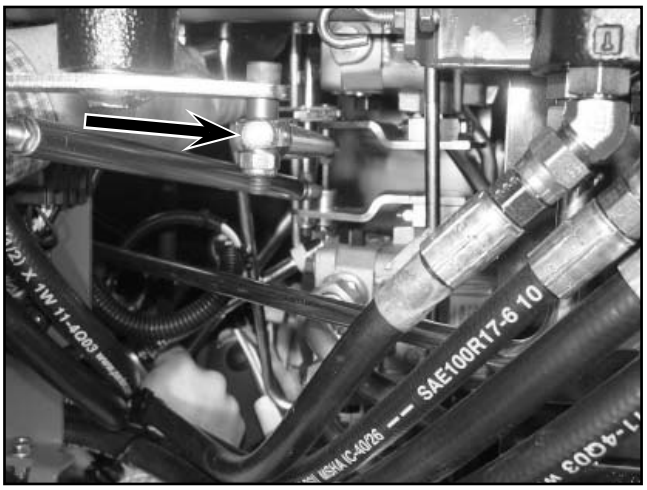


Figure 142 DSC-0896

10. Apply anti-seize compound on the left drive hydrostatic pump shaft. Also, apply a medium strength threadlocking material to the pulley set screws. Install the hydrostatic pulley (grooved-pulley) on the shaft and key, making sure the set screws are facing outward and the pulley is flush with the end of the pump shaft (Fig. 143), then tighten the set screws 215 ± 35 in-lbs. (24 ± 4 Nm).

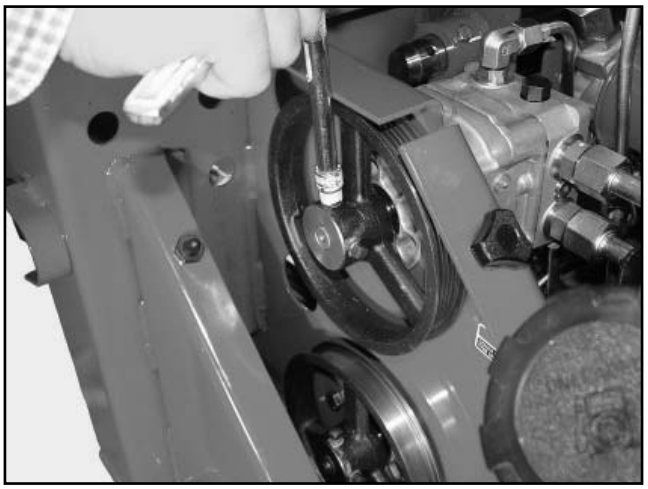


Figure 143 DSC-0891

11. Install drive belt; refer to Drive Belt Installation section on page 8-3.
12. Install battery and battery cables.
13. Follow the Purging Air Procedures; refer to the Purging Air Procedures section on page 6-4.
14. Check all the hydraulic line connections for any leaks.
15. Check the traction control for neutral; refer to Traction Control Neutral Position section on page 6-5.
16. Check the traction unit for tracking. If adjustment is needed, refer to the Adjusting the Tracking of the Traction Control, Full Forward Position section on page 6-4.
17. Install the drive belt cover and rear cover. Lower the traction unit to the ground. Operate the unit to make sure everything is operating properly.

Hydrostatic Pump (Right Drive) Hydraulic Fitting Orientation

A. Linkage Bracket
B. Wheel Motor
C. Case Drain
D. Inlet
E. Bypass

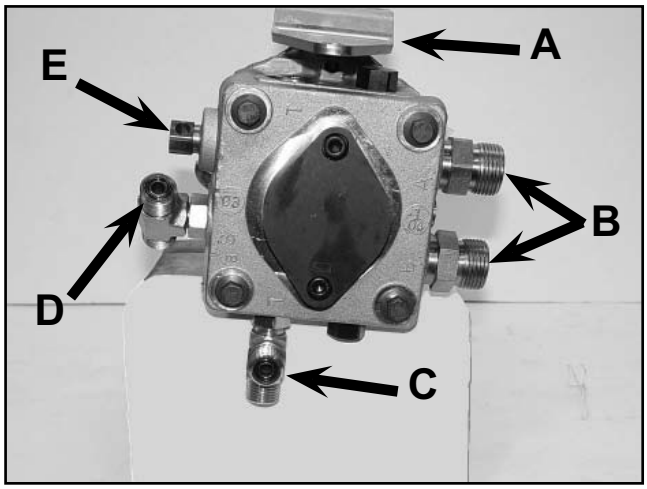


Figure 144 DSC-0880

Hydrostatic Pump (Left Drive) Hydraulic Fitting Orientation

A. Case Drain
B. Inlet
C. Bypass
D. Linkage Bracket
E. Wheel Motor

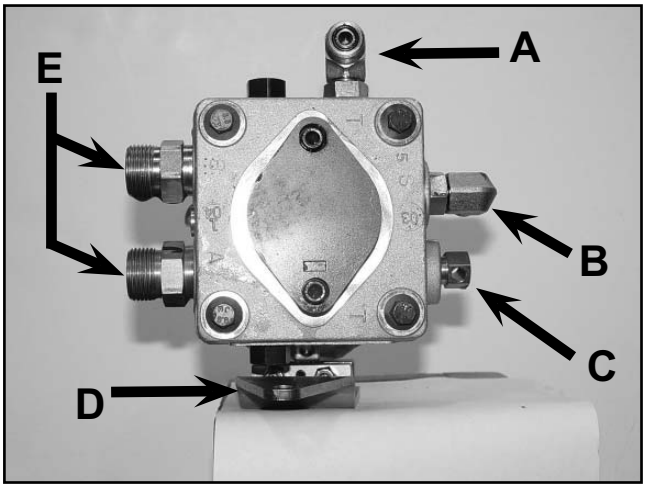


Figure 145 DSC-0899

Hydrostatic Pump Lever Assembly Removal and Installation

1. Remove the two retention bolts and nuts holding the pump lever assembly and the traction clamp to the trunnion arm of the hydrostatic pump (Fig. 146).

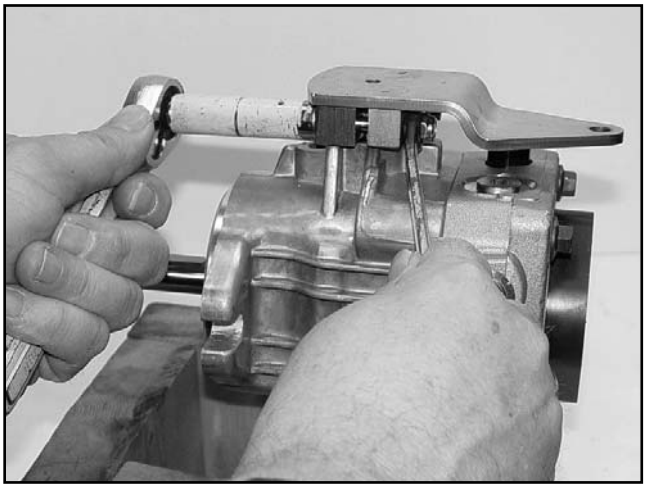


Figure 146 DSC-0881

2. Remove the pump lever assembly and traction clamp (Fig. 147).

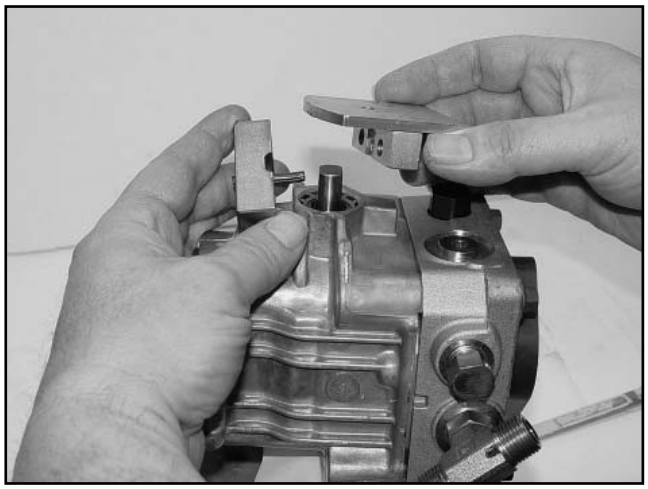


Figure 147 DSC-0882

For installation, reverse the order of removal (refer to Figures 146 and 147 shown above).

Note: Do not interchange pump lever assemblies between hydrostatic pumps.

Hydraulic Gear Pump Removal

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 by using 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. During installation, lightly lubricate all seals, O-rings and gaskets with clean petroleum jelly prior to assembly.

1. Remove the rear cover, belt cover, and pulley cover. Disconnect the battery cables. Place an oil drain pan under the hydraulic gear pump.

2. Remove the drive belt; refer to the Drive Belt Removal section on page 8-2, step 4 (Fig. 148).

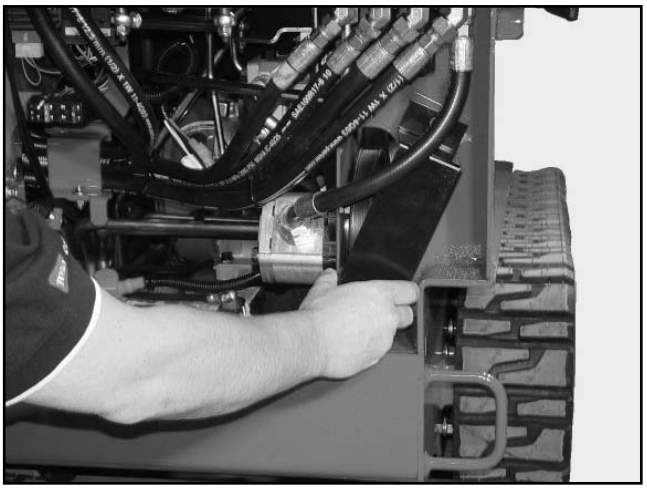


Figure 148 DSC-0779

3. Loosen the two set screws on the gear pump pulley (Fig. 149).

Figure 149 DSC-0910

4. Disconnect and remove the hydraulic line going to the loader arm valve (Fig. 150).

Figure 150 DSC-0911

5. Loosen the hose clamp and remove the hydraulic suction hose from the front of the gear pump and slide the hose off the fitting (Fig. 151).

Figure 151 DSC-0912

6. Loosen and remove the two mounting bolts and nuts that retain the gear pump to the frame. Once the pump mounting bolts are loosened and removed, the pump can be pulled away from the frame and the pulley can be removed from the shaft (Fig. 152).

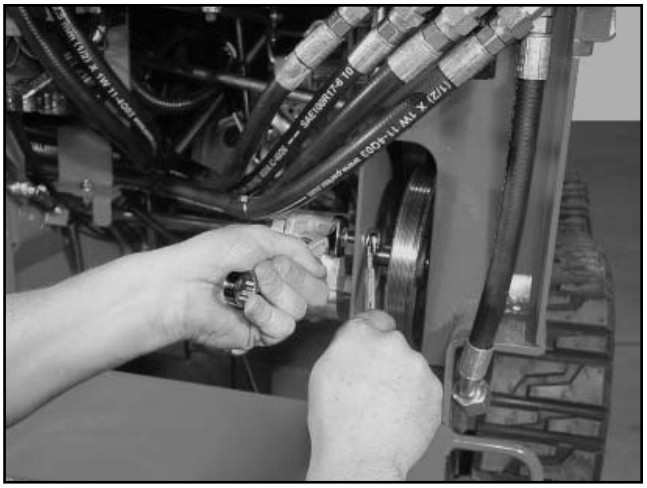


Figure 152 DSC-0913

7. Remove the gear pump from the frame (Fig. 153).

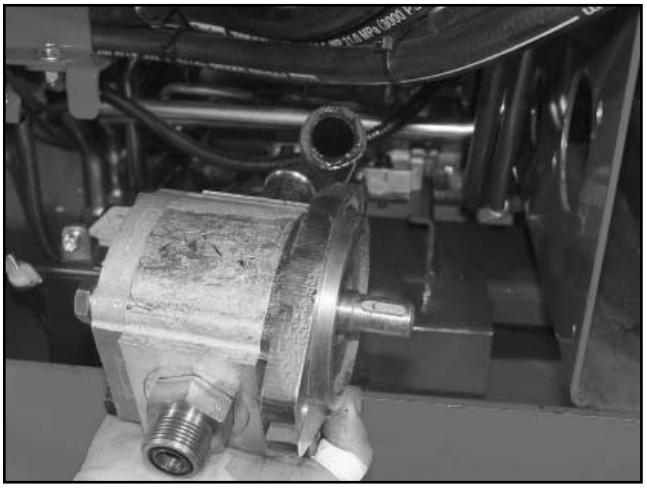


Figure 153 DSC-0916

8. For information on repairing the gear pump refer to the Gear Pump Repair section on page 6-21.

Hydraulic Gear Pump 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.

1. When installing a new gear pump, make sure the hydraulic fittings are installed properly; refer to the Gear Pump Fittings section on page 6-21.

2. Apply anti-seize compound on the gear pump shaft. Slide the hydraulic suction line on the fitting onto the front of the gear pump hose (Fig. 154).

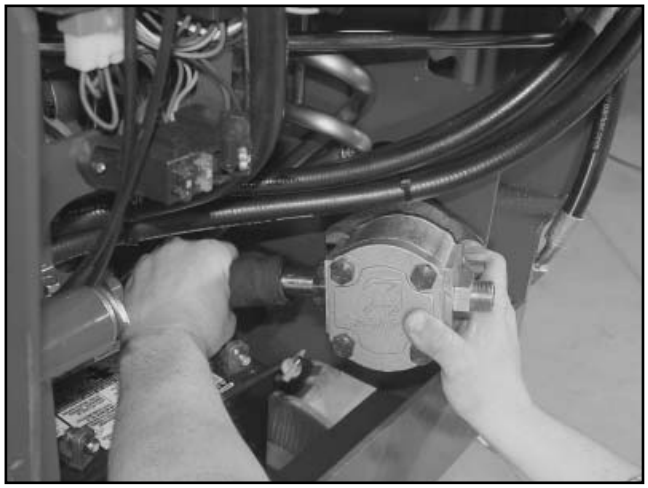


Figure 154 DSC-0920

3. Install the gear pump with two mounting screws and nuts into the frame, leaving the bolts and nuts loose (Fig. 155).

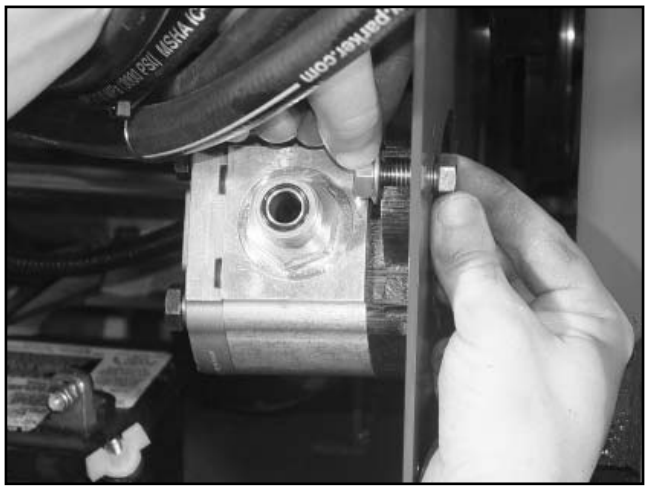


Figure 155 DSC-0921

4. Apply a medium strength threadlocking material to the set screws and install in the gear pump pulley. Slide the gear pump pulley, with the set screws facing toward the gear pump and leave the pulley loose, on the pump gear shaft. Tighten the pump mounting screws to 18 ± 3 ft-lbs. (24 ± 4 Nm) (Fig. 156).

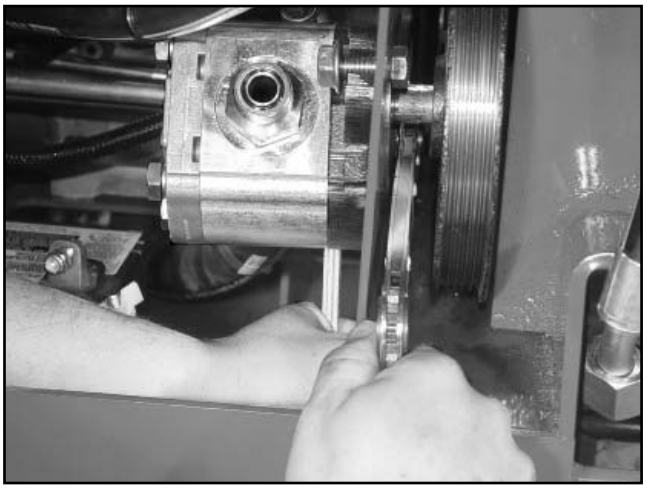


Figure 156 DSC-0922

5. Install gear pump pulley. Position the pulley all the way back, up against the shaft shoulder, and tighten the set-screws to 215 ± 35 in-lbs. (24 ± 4 Nm) (Fig. 157).

Figure 157 DSC-0910

6. Install the hose clamp on the hydraulic suction hose and tighten the clamp (Fig. 158).

Figure 158 DSC-0912

7. Install the loader arm valve line and tighten (Fig. 159).

Figure 159 DSC-0911

8. Install the drive belt; refer to the Drive Belt Installation section on page 8-3.
9. Connect the battery cables. Start the unit and check the hydraulic fittings for any leaks. Operate the loader valve, up, down, and tilt to purge any air out of the system.
10. Install belt cover, pulley cover and rear cover.

Gear Pump Hydraulic Fitting Orientation

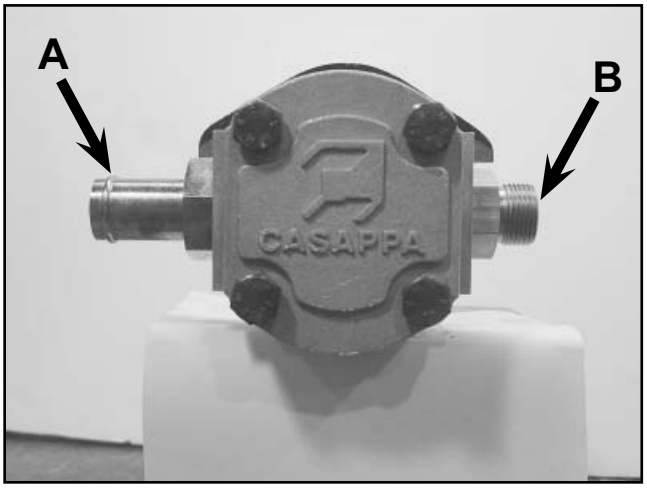


Figure 160 DSC-0919

A. Inlet B. Outlet

Gear Pump Disassembly and Assembly

NOTE: Cleanliness is a primary means of assuring satisfactory life on repaired pumps. Thoroughly clean all exposed surfaces prior to any type of maintenance. Cleaning of all parts by using 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 surfaces and open cavities from damage and foreign material. The external surfaces should be cleaned before beginning any repairs.

Gear Pump Disassembly

1. Seal Kit for gear pump assembly (Fig. 161).

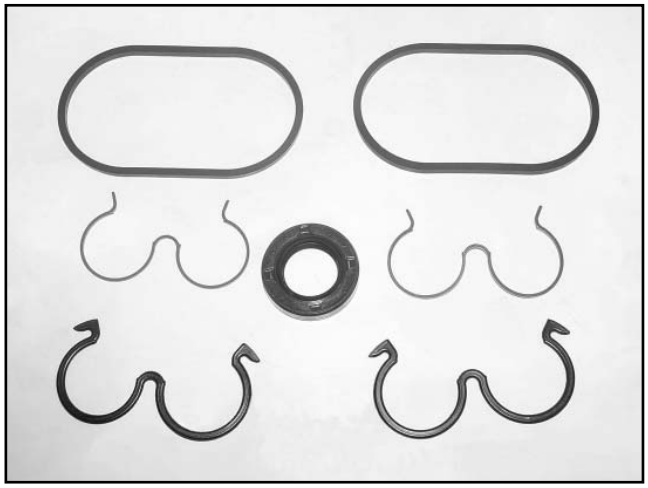


Figure 161 DSC-1461

2. Remove the snap ring and woodruff key from the input shaft (Fig. 162).

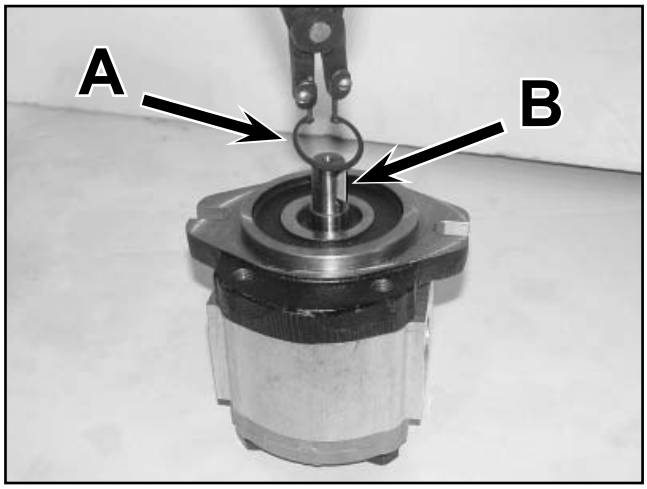


Figure 162 DSC-1471 with key

A. Snap ring B. Woodruff key

3. Mark the outside gear pump, body, front cover, and rear cover, to make sure they assemble together the same way they were disassembled (Fig. 163).

Figure 163 DSC-1462

4. Remove the four retaining bolts and washers (Fig. 164).

Figure 164 DSC-1463

5. Remove the rear cover (Fig. 165).

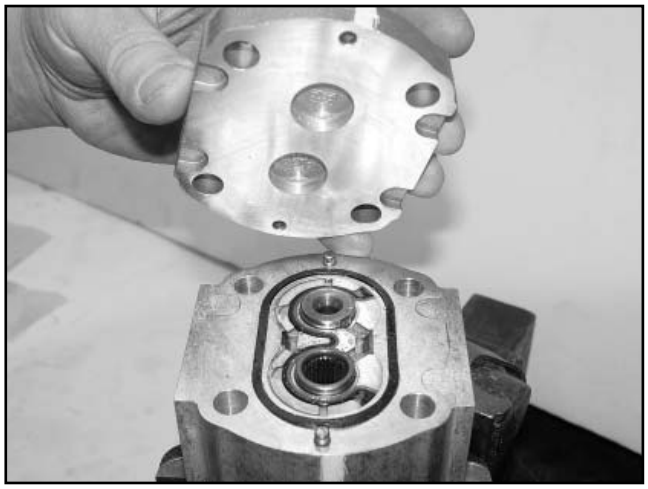


Figure 165 DSC-1465

6. Remove seals from the body and thrust plate. With a marker, mark the thrust plate in relation to the pump body (Fig. 166).

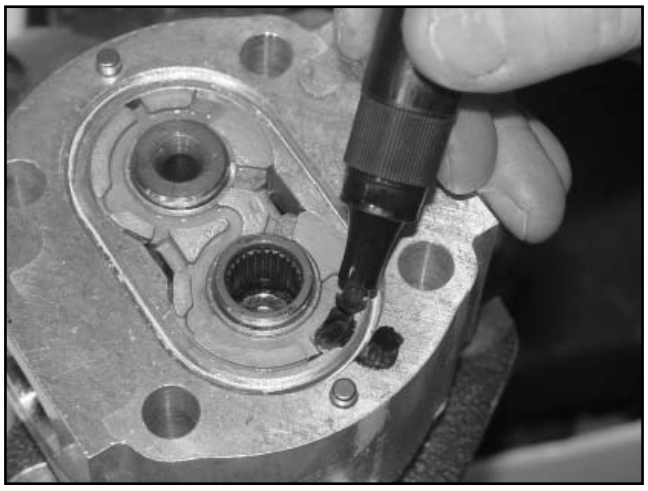


Figure 166 DSC-1467

7. Lift the body from the thrust plate (Fig. 167).

Figure 167 DSC-1468

8. Remove and separate the rear thrust plate from drive shaft and driven gear (Fig. 168).

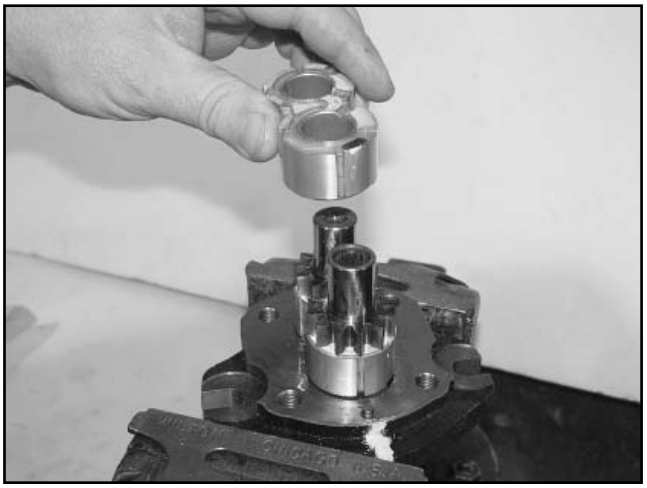


Figure 168 DSC-1469

9. Remove the input shaft and gear (Fig. 169).

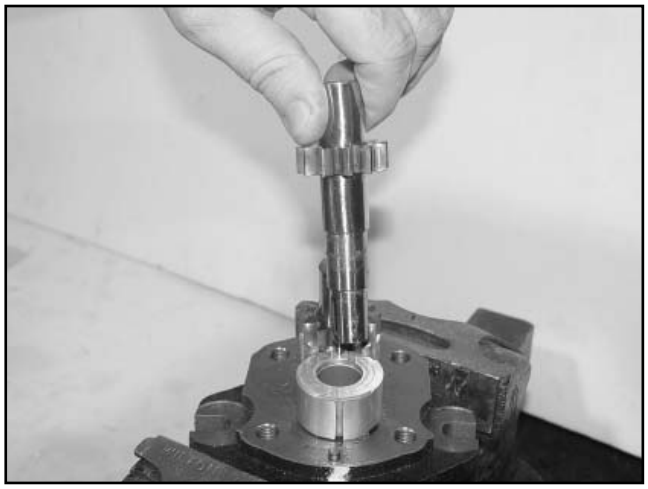


Figure 169 DSC-1472

10. Remove the driven gear (Fig. 170).

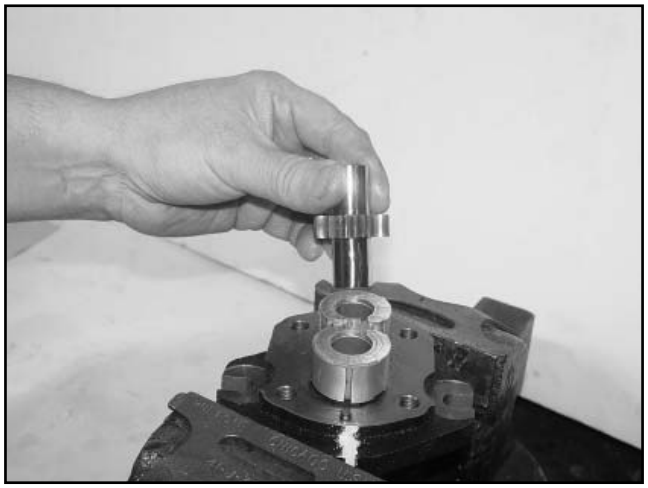


Figure 170 DSC-1473

11. With a marker, mark the thrust plate in relation to the front cover (Fig. 171).

Figure 171 DSC-1474

12. Remove the thrust plate from the front cover (Fig. 172).

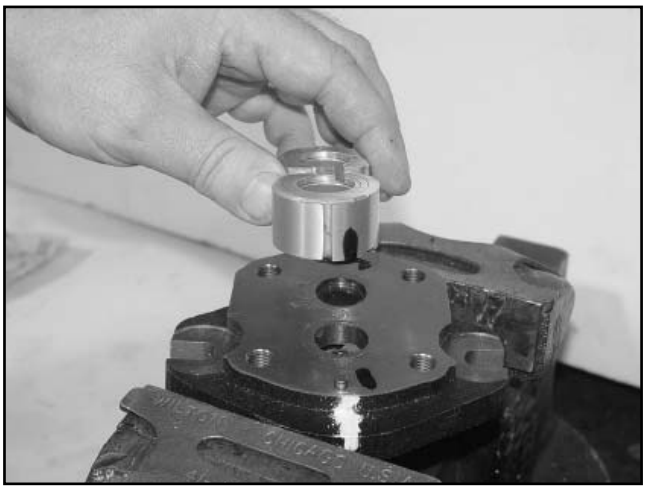


Figure 172 DSC-1475

13 With a hammer and drift punch, remove the shaft seal from the front cover (Fig. 173).

Figure 173 DSC-1477

Inspection: There should be no scratches or pits deep enough to catch the fingernail with any internal component. Scratches or pits that catch the fingernail are unacceptable and the gear pump must be replaced.

Gear Pump Assembly

1. Grease and press a new shaft seal in the front cover (Fig. 174).

Figure 174 DSC-1478

2. Install the snap ring on to hold the seal in place (Fig. 175).

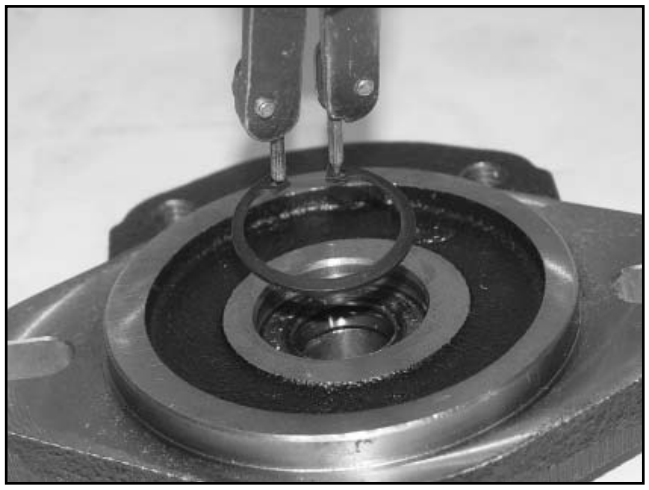


Figure 175 DSC-1480

3. Lubricate and install a new seal with the groove of the seal facing up (Fig. 176).

Figure 176 DSC-1481

4. Lubricate and install the back-up ring in the groove of the seal (Fig. 177).

Figure 177 DSC-1482

5. Install the thrust plate to the front cover (seals facing the front cover).

NOTE: Match up the alignment marks on the front cover and thrust plate (Fig. 178).

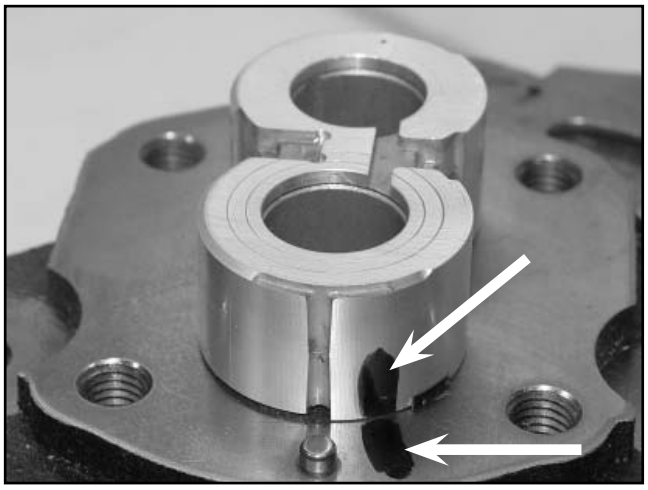


Figure 178 DSC-1483

6. Lubricate and install the drive shaft and gear (Fig. 179).

Figure 179 DSC-1484

7. Lubricate and install the driven gear (Fig. 180).

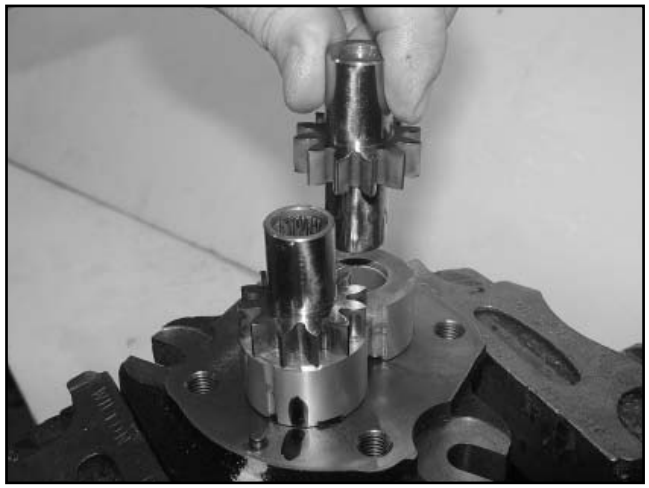


Figure 180 DSC-1486

8. Install the seal and the back-up ring following steps 3 and 4.
9. Lubricate and install the thrust plate with the seals facing the rear cover and the alignment mark facing you (Fig. 181).

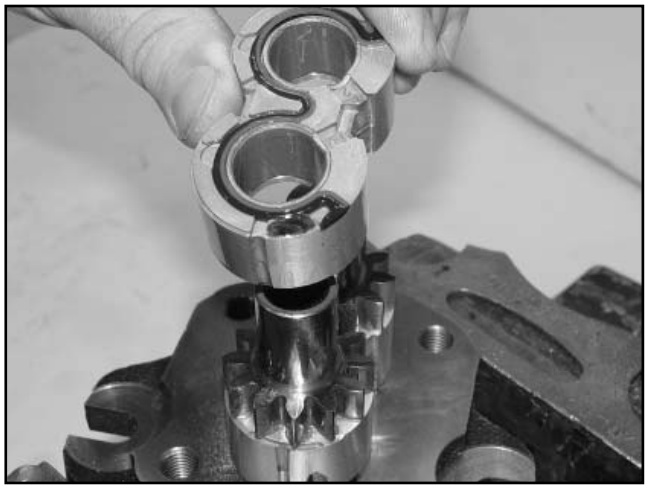


Figure 181 DSC-1489

10. Lubricate and install new seals on the both ends of the body (Fig. 182).

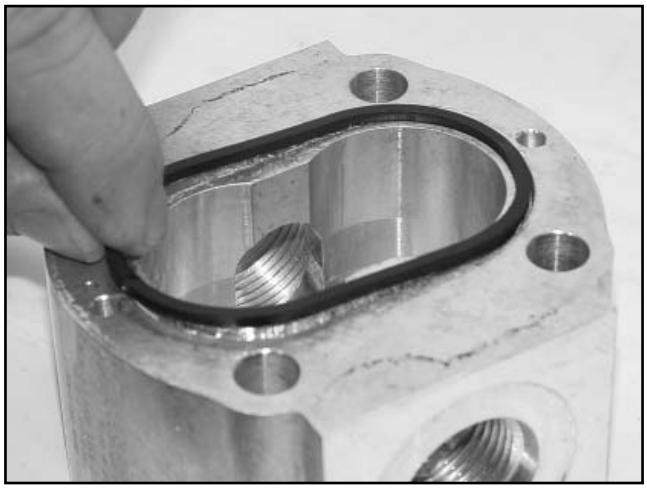


Figure 182 DSC-1490

11. Install the body on the front cover, making sure the marks are aligned (Fig. 183).

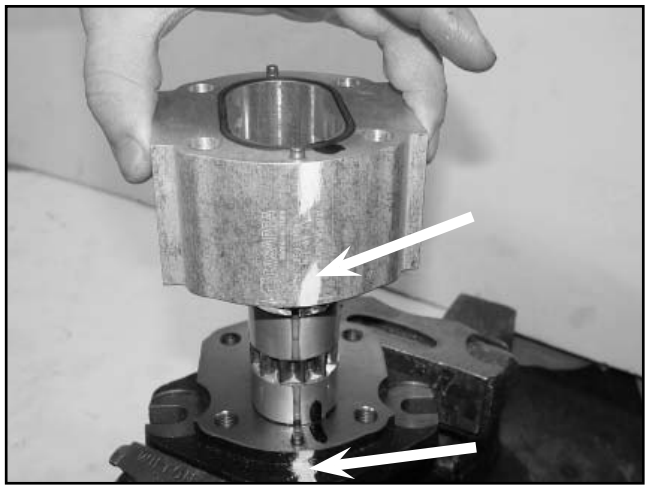


Figure 183 DSC-1491

12. Install the rear cover on the body; again, make sure the marks are aligned (Fig. 184).

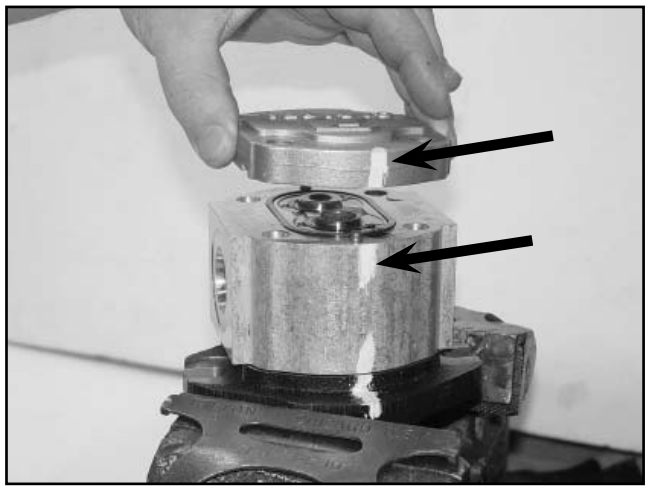


Figure 184 DSC-1492

13. Install the four bolts and washers. Tighten the bolts on a criss-cross pattern; torque to 33 ft-lbs. (45 Nm) (Fig. 185).

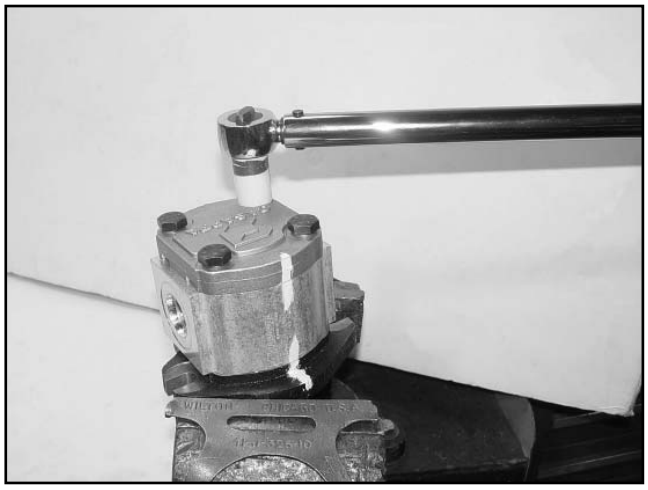


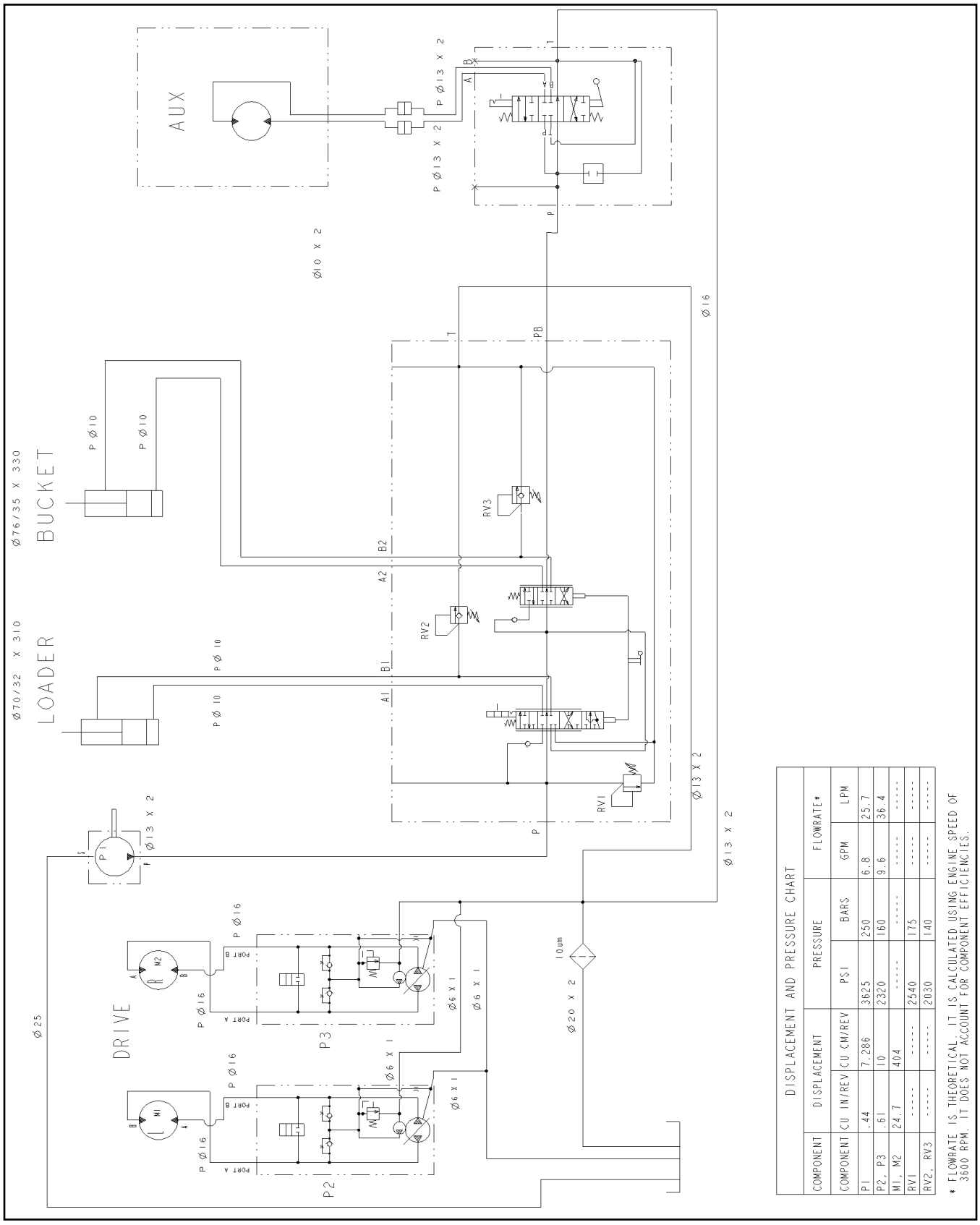
Figure 185 DSC-1493

Wheel Motors

Wheel motor removal and replacement is covered in the Drive System section of this manual, page 8-16.

For wheel motor service, refer to the Parker-Ross TF wheel motor service manual (Toro P/N 492-4753).

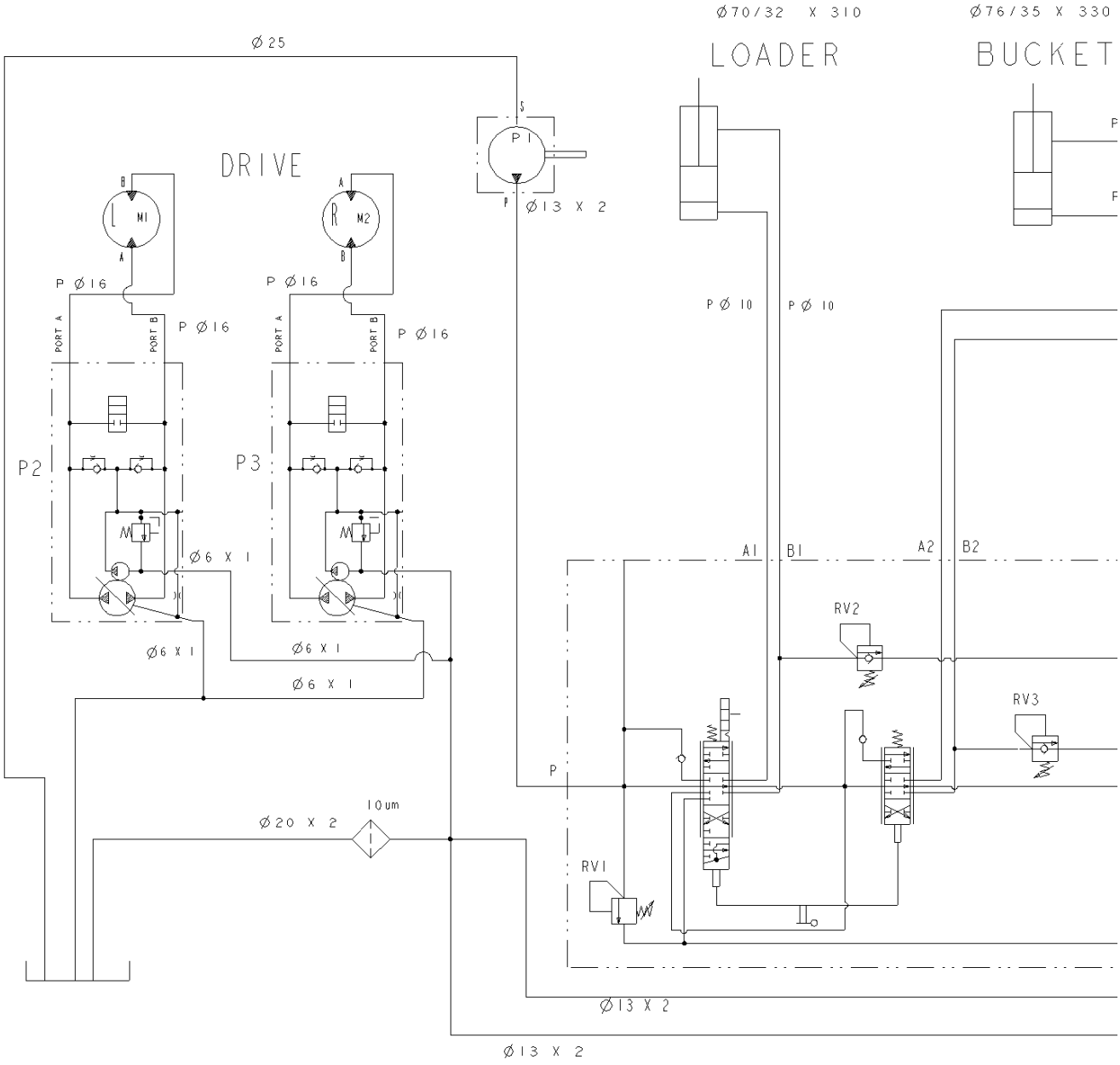
Hydraulic Schematic Diagram



DISPLACEMENT AND PRESSURE CHART						
COMPONENT	DISPLACEMENT		PRESSURE		FLOWRATE*	
COMPONENT	CU IN/REV	CU CM/REV	PSI	BARS	GPM	LPM
P1	.44	7.286	3625	250	6.8	25.7
P2, P3	.61	10	2320	160	9.6	36.4
M1, M2	24.7	404	-----	-----	-----	-----
RV1	-----	-----	2540	175	-----	-----
RV2, RV3	-----	-----	2030	140	-----	-----

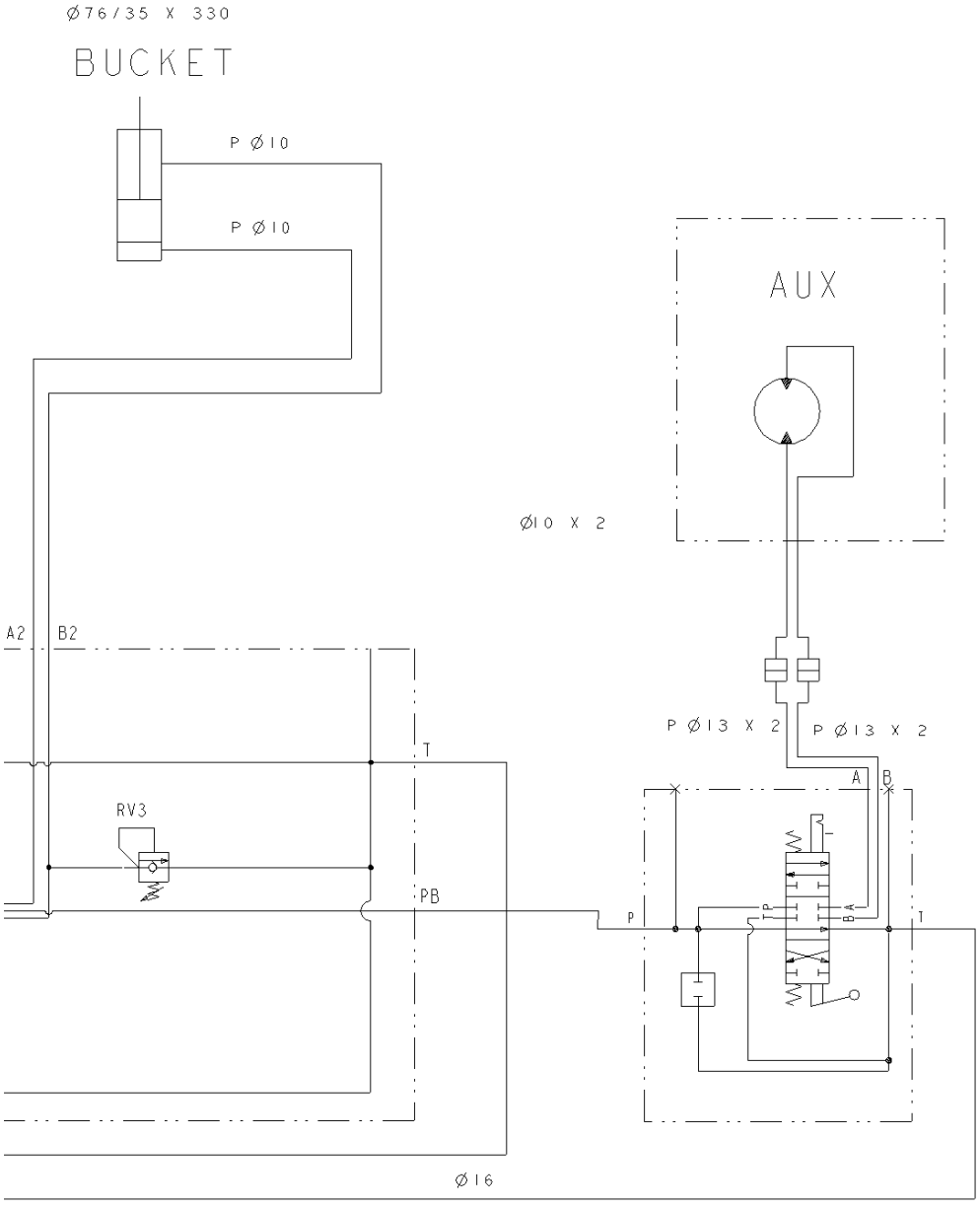
* FLOWRATE IS THEORETICAL. IT IS CALCULATED USING ENGINE SPEED OF 3600 RPM. IT DOES NOT ACCOUNT FOR COMPONENT EFFICIENCIES.

Hydraulic Schematic Diagram



DISPLACEMENT AND PRESSURE CHART						
COMPONENT	DISPLACEMENT		PRESSURE		FLOWRATE*	
COMPONENT	CU IN/REV	CU CM/REV	PSI	BARS	GPM	LPM
P1	.44	7.286	3625	250	6.8	25.7
P2, P3	.61	10	2320	160	9.6	36.4
M1, M2	24.7	404	-----	-----	-----	-----
RV1	-----	-----	2540	175	-----	-----
RV2, RV3	-----	-----	2030	140	-----	-----

* FLOWRATE IS THEORETICAL. IT IS CALCULATED USING ENGINE SPEED OF 3600 RPM. IT DOES NOT ACCOUNT FOR COMPONENT EFFICIENCIES.


Ø76/35 X 330
BUCKET
P Ø10
P Ø10
AUX
Ø10 X 2
A2
B2
T
RV3
PB
P Ø13 X 2
P Ø13 X 2
A
B
P
T
Ø16

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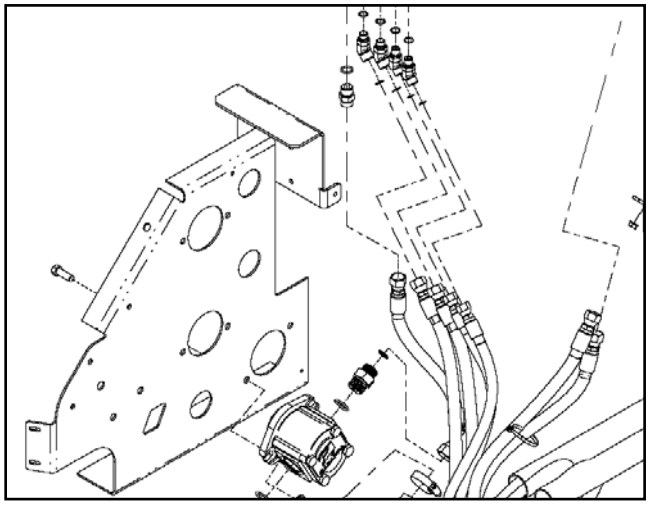
HYDRAULIC LIFT ASSEMBLY



Loader Valve Removal

Note: Cleanliness is a key factor in the successful repair of the hydraulic lift assemblies. Thoroughly clean all exposed surfaces prior to any type of maintenance. Cleaning of all parts by using 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.

All seals, O-rings, and gaskets should be replaced. During installation, lightly lubricate all seals, O-rings, and gaskets with clean petroleum jelly prior to reassembly.

Protect the inner diameter of seals and O-rings from damage during assembly by covering the shaft machined features with plastic wrap or equivalent.

1. The Loader Arm must be in the down position. Stop the engine, set park brake and allow the unit to cool down before any removal. Remove the rear cover and the belt cover. Place a drain pan under the control valve.

2. (Fig. 186, Ref. A) Working from right to left, from the operator position, disconnect the hydraulic lift cylinder hose from the fitting at the lift valve.

Note: It will be helpful to tag the hydraulic hoses to ease reassembly.

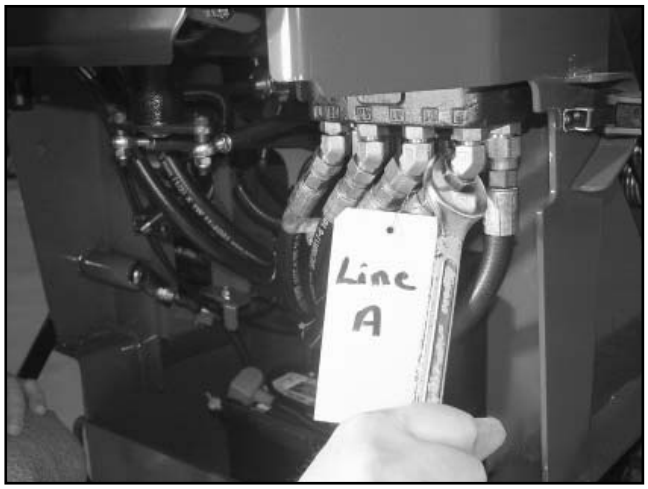


Figure 186 DSC-0925

3. (Fig. 187, Ref. B) Remove the second hydraulic lift cylinder hose from the fitting at the hydraulic lift valve.

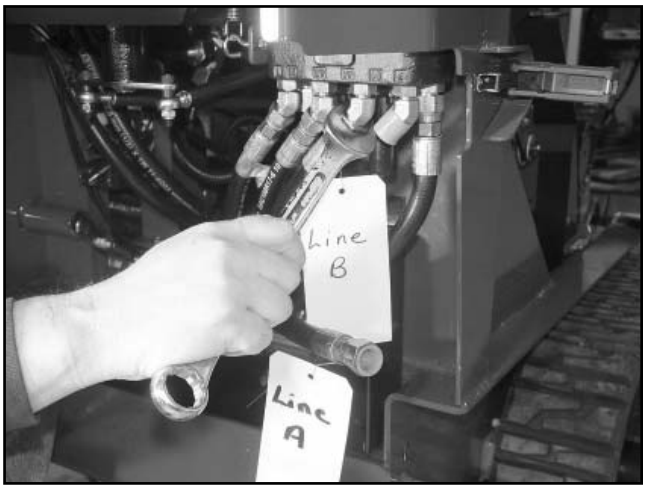


Figure 187 DSC-927

4. (Fig. 188, Ref. C) Remove the hydraulic tilt cylinder hose from the fitting at the hydraulic lift valve.

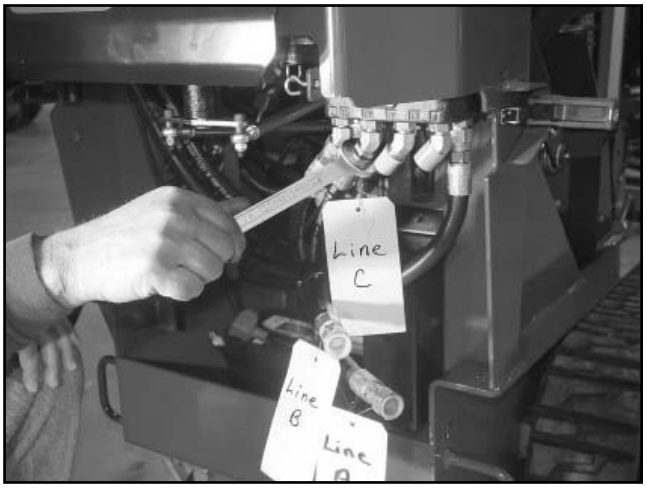


Figure 188 DSC-0928

5. (Fig. 189, Ref. D) Remove the second hydraulic tilt cylinder hose from the fitting at the hydraulic lift valve.

Figure 189 DSC-0929

6. (Fig. 190 Ref. E) With an offset wrench, remove the hydraulic gear pump hose from the fitting on the hydraulic lift valve.

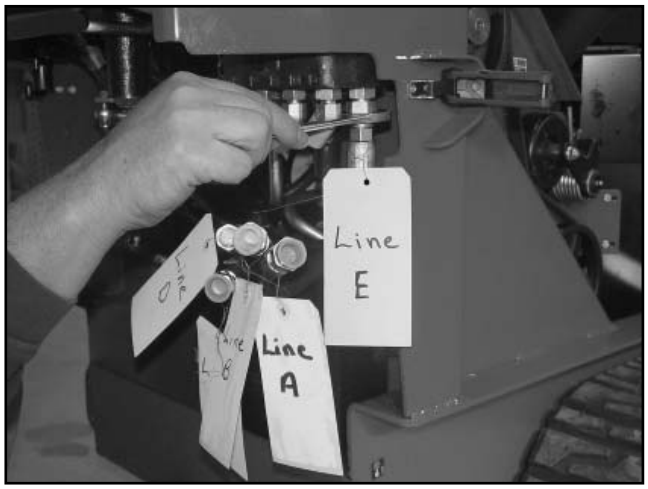


Figure 190 DSC-0932

7. (Fig. 191, Ref. H) Remove the hydraulic drain line from the hydraulic lift valve that goes to the T fitting on the oil filter base.

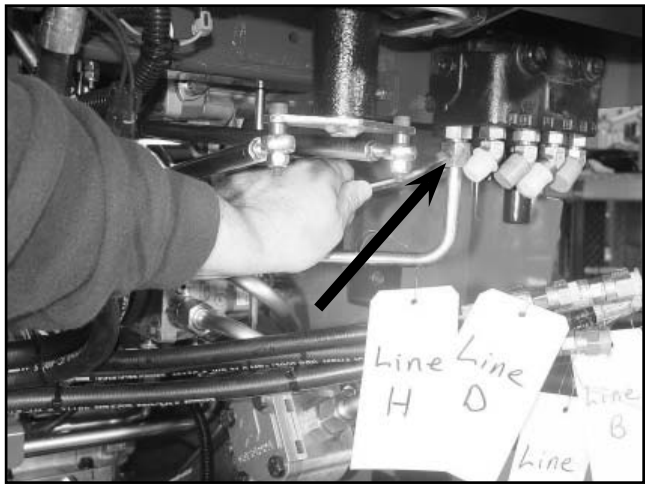


Figure 191 DSC-0933

8. (Fig. 192, Ref. I) Remove the hydraulic line from the hydraulic lift valve that goes to the auxiliary valve.

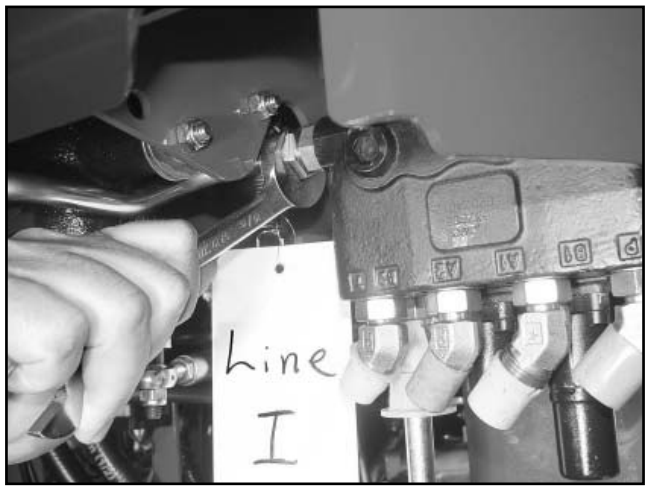


Figure 192 DSC-0935

9. Remove two of the three retaining bolts that mount the hydraulic lift valve to the frame. There are three access holes located in the frame (Fig. 193).

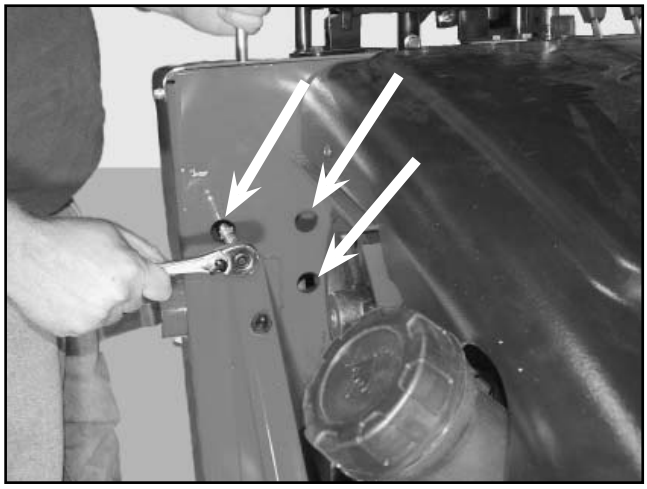


Figure 193 DSC-0936

10. While removing the last bolt holding the hydraulic lift valve, support the valve and lower the valve out of the tower assembly (Fig. 194).

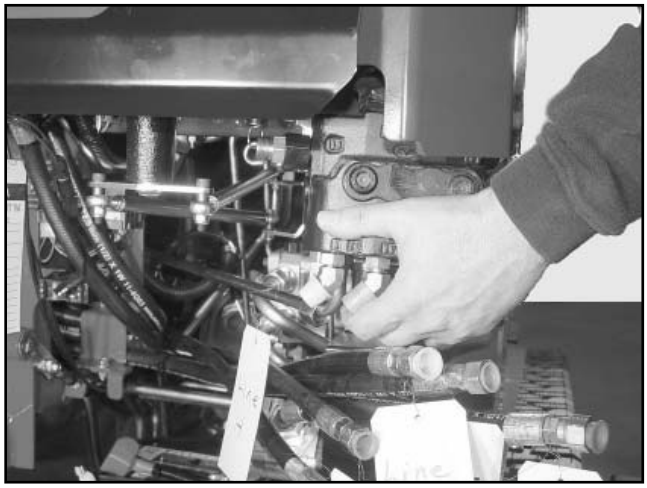


Figure 194 DSC-0937

11. For information on repairing the lift valve, refer to Lift Valve Repair, page 7-47 of this manual.

Loader Valve 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.

1. Install the valve and align the mounting holes. Install the three bolts and tighten (Fig. 195).

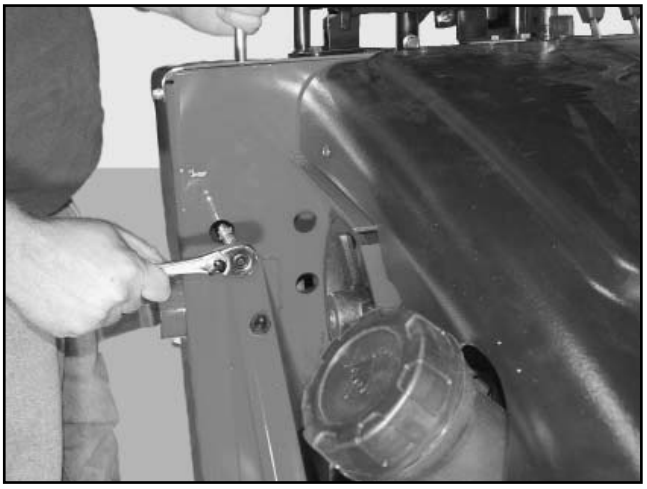


Figure 195 DSC-0936

2. (Fig. 196, Ref. I) Install the hydraulic hose from auxiliary valve to the hydraulic lift valve and tighten.

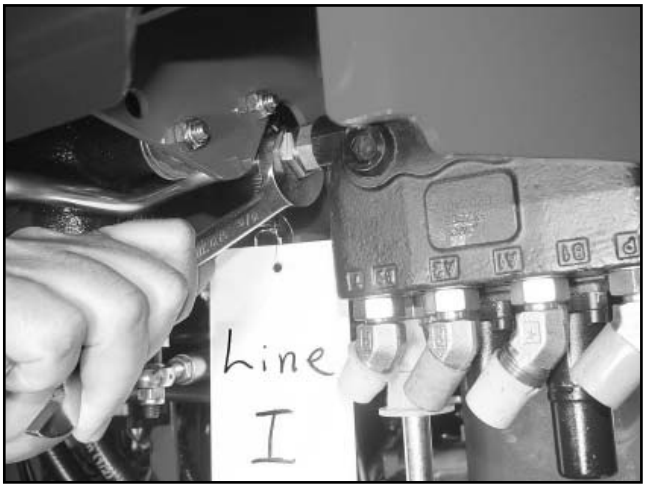


Figure 196 DSC-0935

3. (Fig. 197, Ref. H) Install the hydraulic drain line from the T-fitting on the oil filter base to the hydraulic lift valve and tighten.

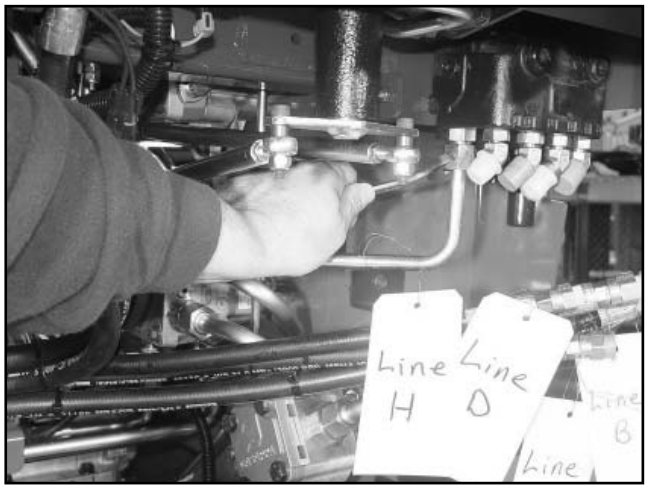


Figure 197 DSC-0933

4. (Fig. 198, Ref. E) Install the hydraulic hose from the gear pump to the hydraulic lift valve and tighten.

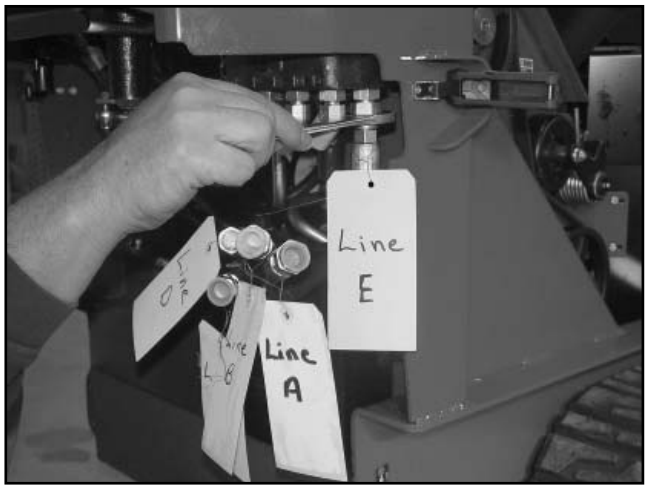


Figure 198 DSC-0932

5. (Fig. 199, Ref. D) Install the hydraulic hose to the fitting on the hydraulic lift valve and tighten.

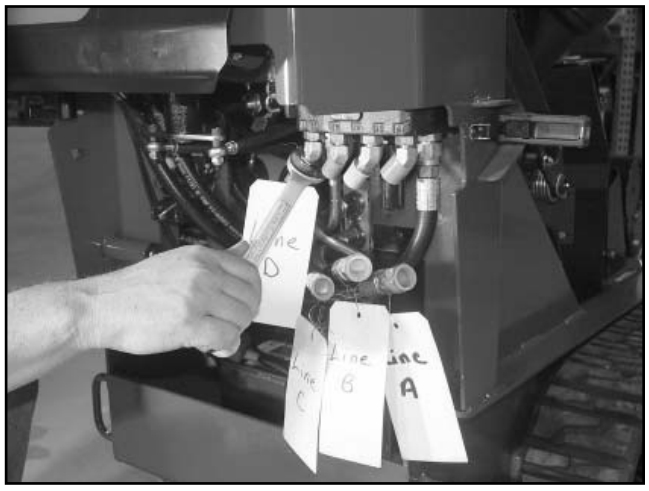


Figure 199 DSC-0929

6. (Fig. 200, Ref. C) Install the hydraulic hose to the fitting on the hydraulic lift valve and tighten.

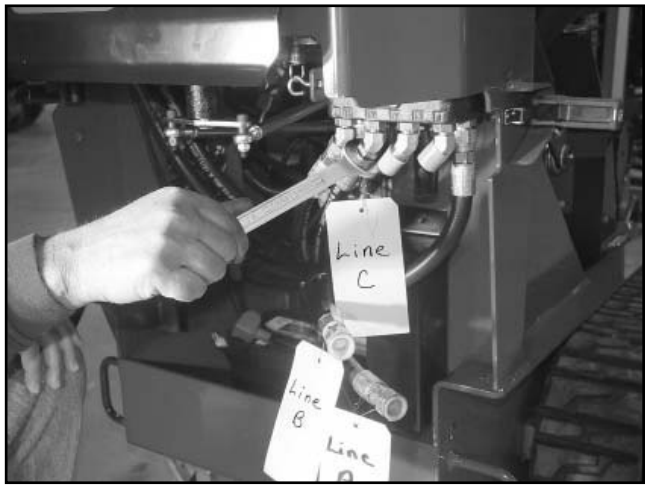


Figure 200 DSC-0928

7. (Fig. 201, Ref. B) Install the hydraulic hose to the fitting on the hydraulic lift valve and tighten.

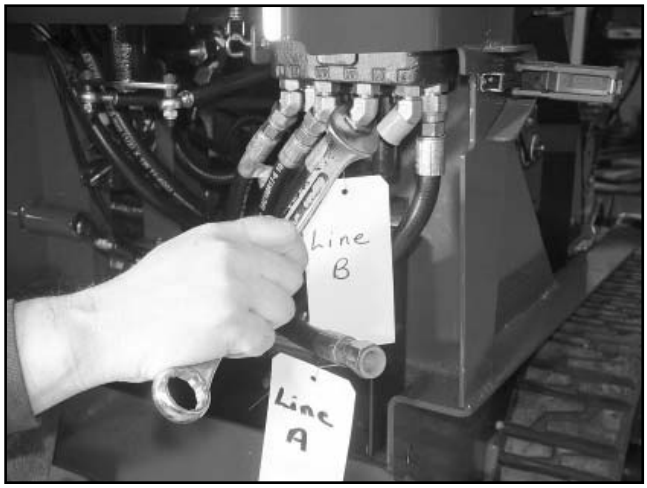


Figure 201 DSC-0927

8. (Fig. 202, Ref. A) Install the hydraulic hose to the fitting on the hydraulic lift valve and tighten.

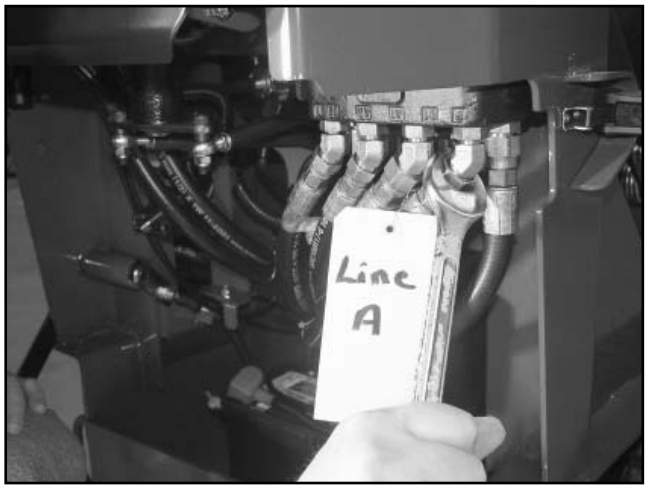


Figure 202 DSC-0925

9. Start the unit and check the hydraulic fittings for any leaks. Operate the loader valve up, down, and tilt to purge any air out of the system. Install the belt cover and the rear cover.

Auxiliary Valve Removal

The hose connections at the auxiliary valve on units with serial numbers 240000100 - 240000200 are close to each other. To obtain enough room to remove the upper hose, the lower hose and fitting needs to be removed (Fig. 203).

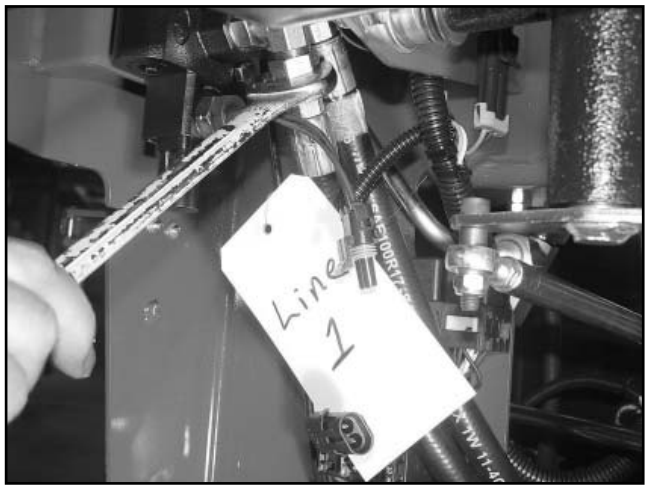


Figure 203 DSC-0944

Upper hose fitting on the auxiliary valve on units with serial numbers from 240000201 and higher is longer. This will give additional space to remove the upper hose without removing the lower fitting (Fig. 204).

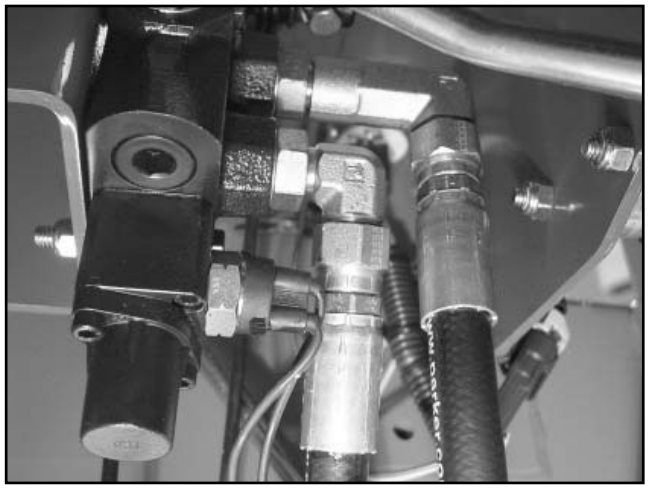


Figure 204 DSC-1039

Note: Cleanliness is a key factor in a successful repair of any valve system. Thoroughly clean all exposed surfaces prior to any type of maintenance. Cleaning all parts by using 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. During installation, lightly lubricate all seals, O-rings, and gaskets with clean petroleum jelly prior to assembly.

1. Allow the unit to cool down prior to removal. Remove the rear cover.

2. Remove the auxiliary lever assembly by removing the retention nut and washer located at the top of the lever (Fig. 205).

Figure 205 DSC-0939

3. After removing the nut and washer, apply tension on the torsion spring and then slide the auxiliary lever assembly up and off the auxiliary valve. Remove the torsion spring (Fig. 206).

Figure 206 DSC-0941

4. Disconnect the neutral ball switch at the harness connector (Fig. 207).

Figure 207 DSC-0942

5. (Fig. 208, Ref. 1) Remove the rear hydraulic hose from the fitting on the auxiliary valve

Note: It will be helpful to tag the hydraulic hoses to ease reassembly.

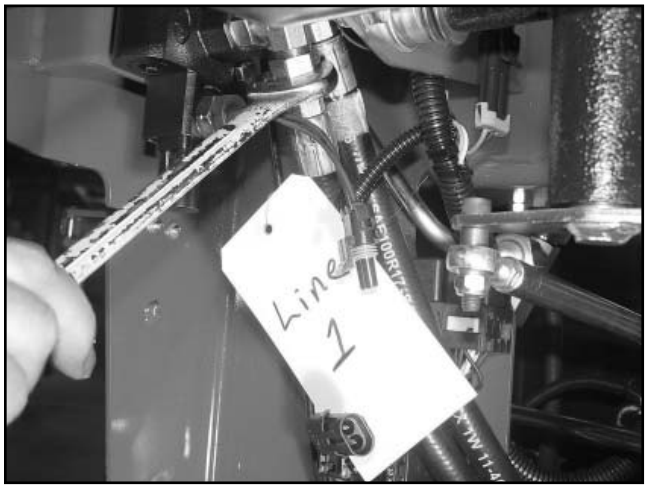


Figure 208 DSC-0944

6. (Fig. 209, Ref. 2) Remove the hydraulic line coming from the loader arm valve.

Figure 209 DSC-0945

7. (Fig. 210, Ref. 3) Remove the hydraulic return line from the front of the auxiliary valve.

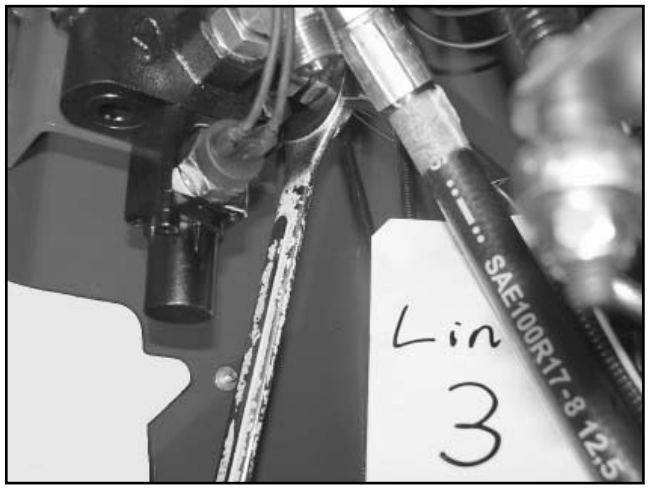


Figure 210 DSC-0946

Note: Lines 1 and 4 can be removed prior to removing the valve retaining bolts on units with serial numbers 240000201 and higher (Fig. 211).

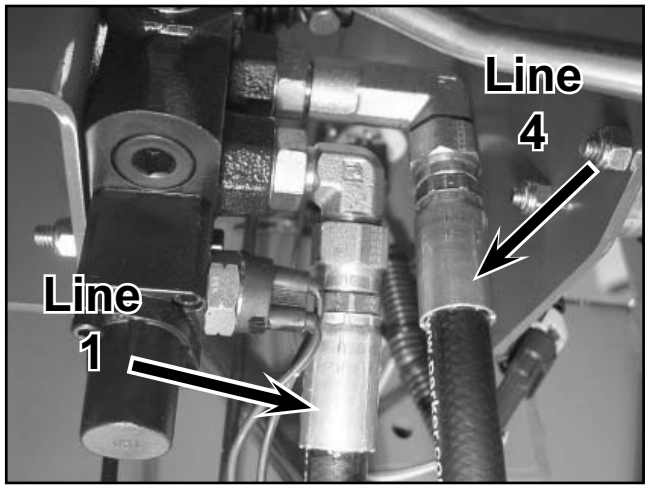


Figure 211 DSC-1039

8. Remove the two retaining bolts and nuts holding the auxiliary valve to the frame and lower the valve (Fig. 212).

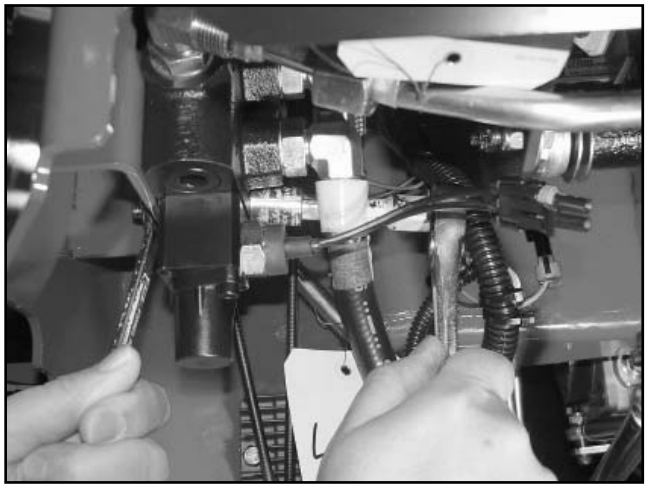


Figure 212 DSC-0948

9. (Fig. 213, Ref. 4) Remove the upper hydraulic hose from the fitting on the auxiliary valve on units with serial numbers 240000200 and lower.

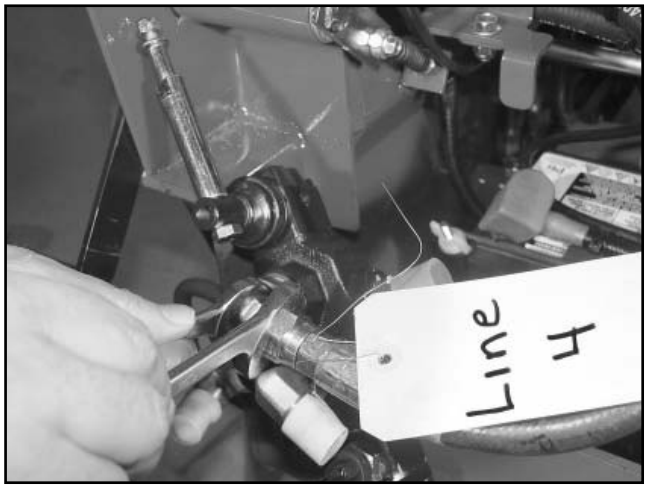


Figure 213 DSC-0951

10. For information on repairing the auxiliary valve, refer to the Auxiliary Valve Service section of this manual, page 7-60.

Auxiliary Valve 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.

1. Serial number range from 240000100 through 240000200, (Fig. 214, Ref. 4) Install the upper hydraulic hose to the fitting on the auxiliary valve.

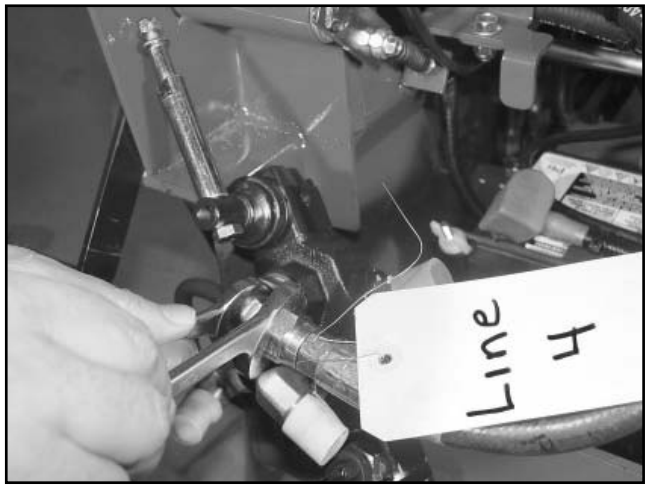


Figure 214 DSC-0951

Serial number range from 240000201 and higher, (Fig. 215) Lines 1 and 4 can be installed when the valve is installed.

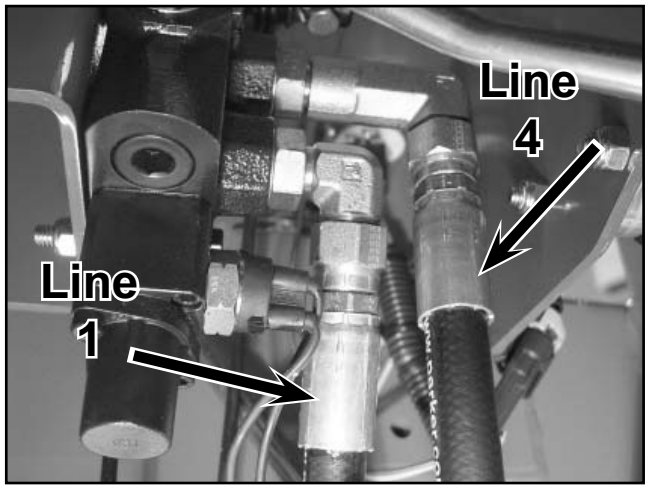


Figure 215 DSC-1039

2. Install the two retaining bolts and nuts holding the auxiliary valve to the frame (Fig. 216).

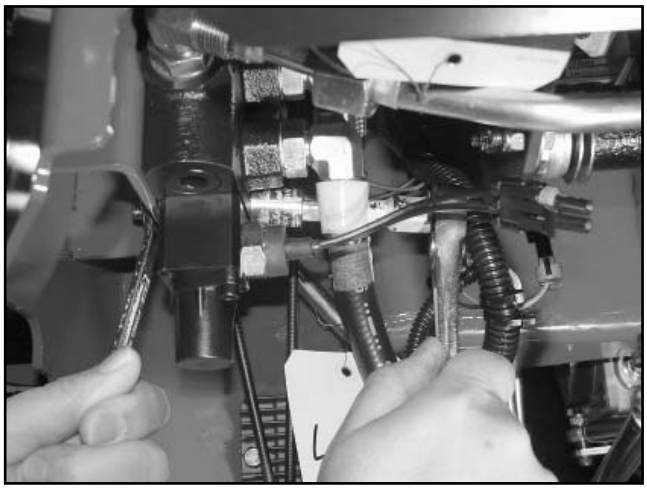


Figure 216 DSC-0948

3. (Fig. 217, Ref. 3) Install the hydraulic return line to the auxiliary valve.

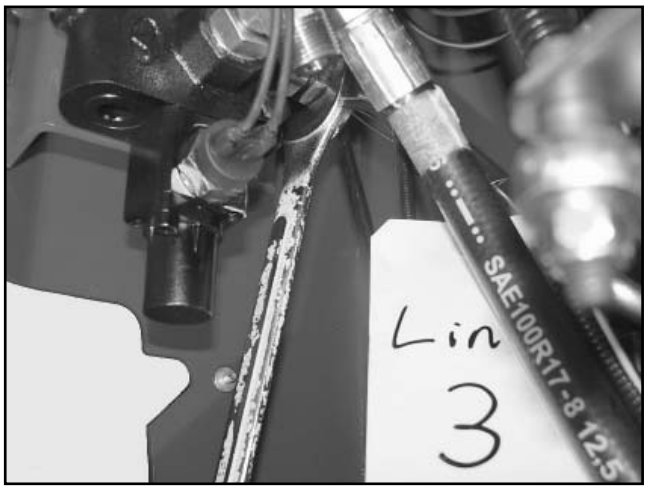


Figure 217 DSC-0946

4. (Fig. 218, Ref. 2) Install the hydraulic line from the loader valve to the auxiliary valve.

Figure 218 DSC-0945

5. (Fig. 219, Ref. 1) Install the lower hydraulic hose to the fitting on the auxiliary valve.

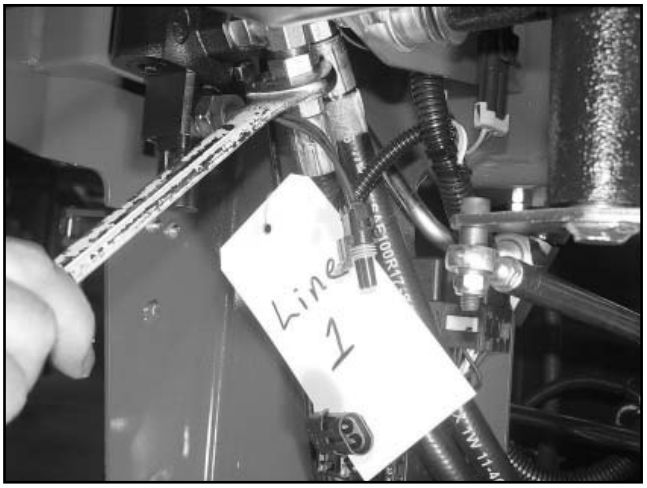


Figure 219 DSC-0944

6. Connect the neutral ball switch at the harness connector (Fig. 220).

Figure 220 DSC-0942

7. Slide the torsion spring over the control shaft, with the large hook end of the spring facing down (Fig. 221).

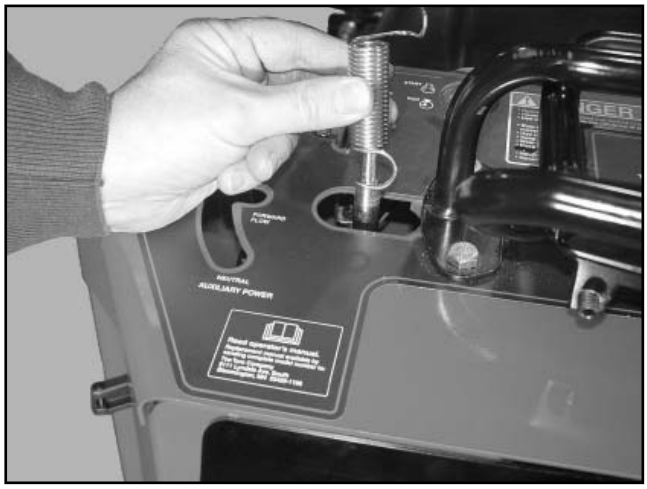


Figure 221 DSC-0954

8. Turn the torsion spring clockwise and hold. Slide the auxiliary lever over the control shaft and hook the spring end over the auxiliary lever (Fig. 222).

Figure 222 DSC-0941

9. Install the washer and retention nut on the top of the lever and tighten the nut (Fig. 223).

Figure 223 DSC-0939

10. Start the unit and check the hydraulic fittings for any leaks. Install a hydraulic attachment and operate the auxiliary valve in both the forward and reverse flow to purge any air out of the system. Also, operate the loader arm valve up, down, and tilt to help purge the system of any air. Recheck for leaks.

11. Install the rear cover.

Hydraulic Tilt Cylinder Removal

Units with serial numbers from 240000100 through 240000200 have a fixed, non-swivel fitting (Fig. 224).

Figure 224 DSC-1029

Units with serial numbers from 240000201 and higher have a swivel fitting (Fig. 225).

Figure 225 DSC-1030

Note: Cleanliness is a key factor in a successful repair of any hydraulic cylinder. Thoroughly clean all exposed surfaces prior to any type of maintenance. Cleaning all parts by using 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.

1. Start the unit and raise loader arm assembly to the full raised position. Install the cylinder lock assembly onto the hydraulic lift cylinder. Shut the engine off (Fig. 226).

Figure 226 DSC-0965

2. Remove the two hose clamps located under the loader arm assembly (Fig. 227).

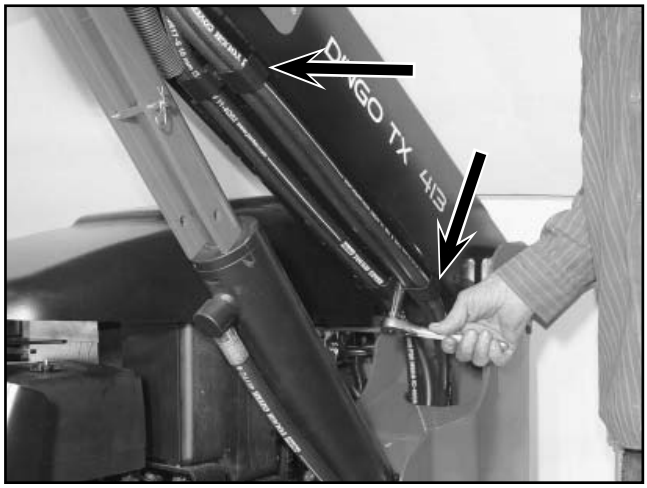


Figure 227 DSC-0968

3. Remove the cylinder lock, install a 4 x 4 block of wood under the front lift cylinder pin and lower the loader arm assembly so it rests on the block of wood and frame (Fig. 228).

Figure 228 DSC-0976

4. Place a jack stand under the quick attachment assembly. Extend cylinder to ease the removal of ram end pivot pin (Fig. 229).

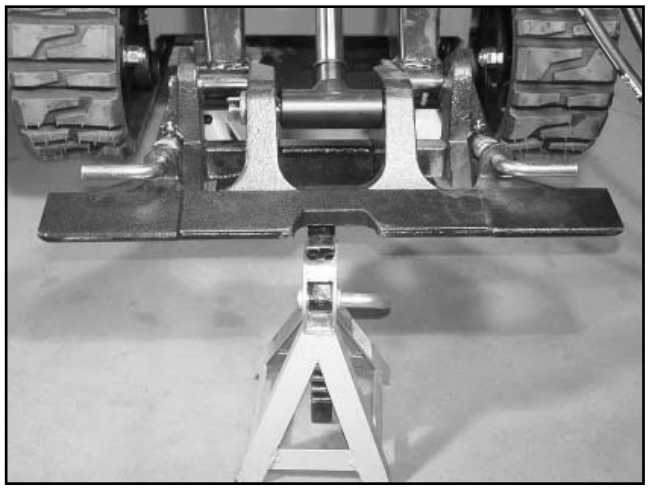


Figure 229 DSC-0978

5. Remove the rear cover. Remove the hose clamp, located in the back, on the lower left corner, and cut the plastic tie cable strap holding the two hydraulic hoses together (Fig. 230).

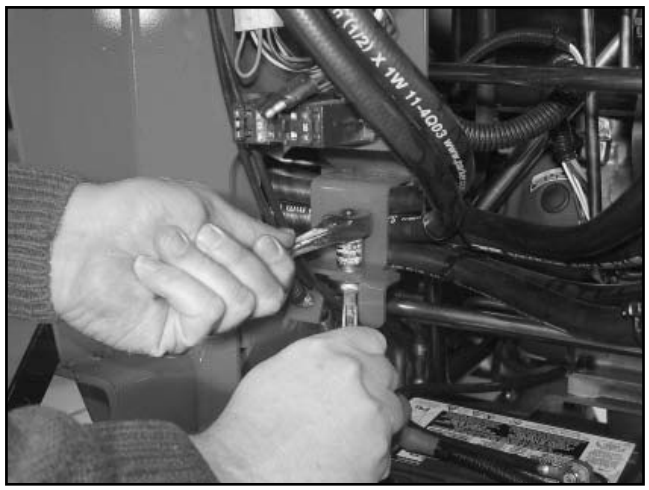


Figure 230 DSC-0969

6. Place an oil drain pan under the control valve hoses (Fig. 231, Ref. D). Remove the hydraulic hose from the fitting on the lift valve.

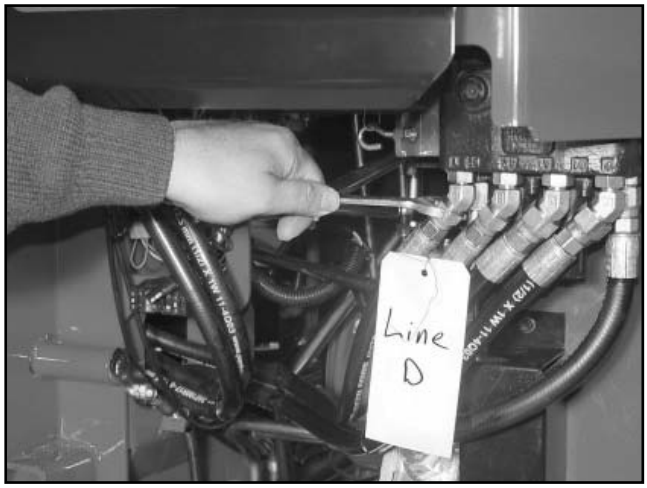


Figure 231 DSC-0970

Note: Use paint or other marking method to mark both ends of one hose and its valve and cylinder fitting (Fig. 232 and Fig. 233).

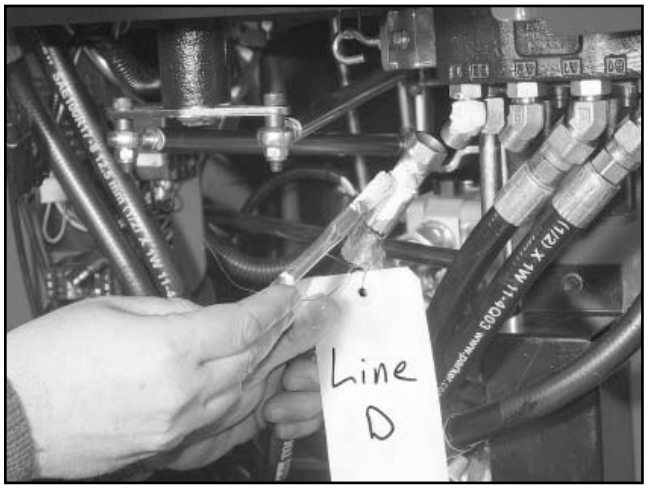


Figure 232 DSC-0972

Figure 233 DSC-0973

Note: It may help to remove the "Line D" hydraulic valve fitting before attempting to remove the next hydraulic hose.

7. (Fig. 234, Ref. C) Remove the hydraulic hose from the hydraulic fitting on the lift valve.

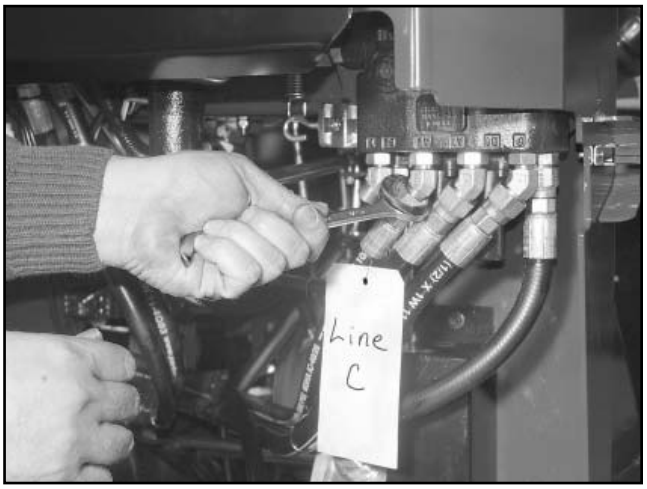


Figure 234 DSC-0971

8. Pull the two hydraulic hoses from the rear of the unit out the side, under the loader arm (Fig. 235).

Figure 235 DSC-0975

9. Pull the two hydraulic hoses through the front opening of the loader arm (Fig. 236).

Figure 236 DSC-0977

10. Remove the shoulder bolt that holds the pivot pin on the ram end of the hydraulic cylinder (Fig. 237).

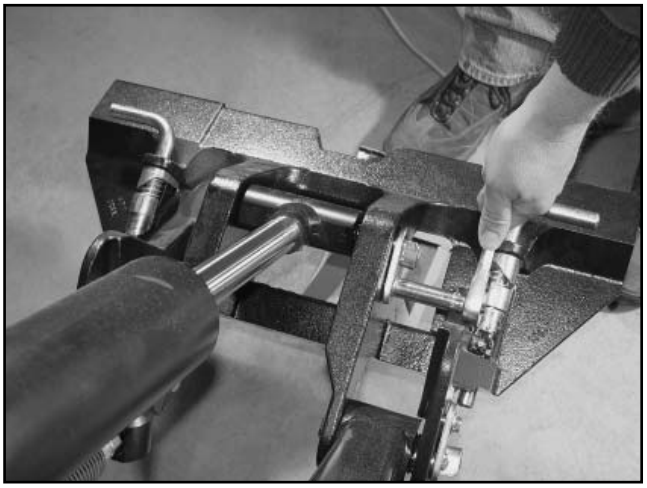


Figure 237 DSC-0979

11. Using a drift punch and a hammer, drive the pivot pin out of the ram end of the hydraulic tilt cylinder (Fig. 238).

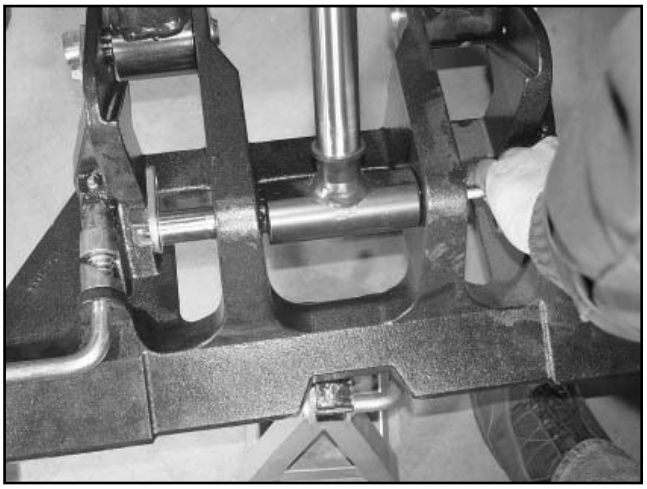


Figure 238 DSC-0980

12. Remove the bolt and nut on the pivot pin located on the barrel end of the hydraulic tilt cylinder (Fig. 239).

Figure 239 DSC-0983

13. Using a drift punch and hammer, drive the pivot pin out of the barrel end of the hydraulic tilt cylinder and remove the cylinder (Fig. 240).

Figure 240 DSC-0985

14. Remove the hydraulic hoses from the tilt cylinder (Fig. 241).

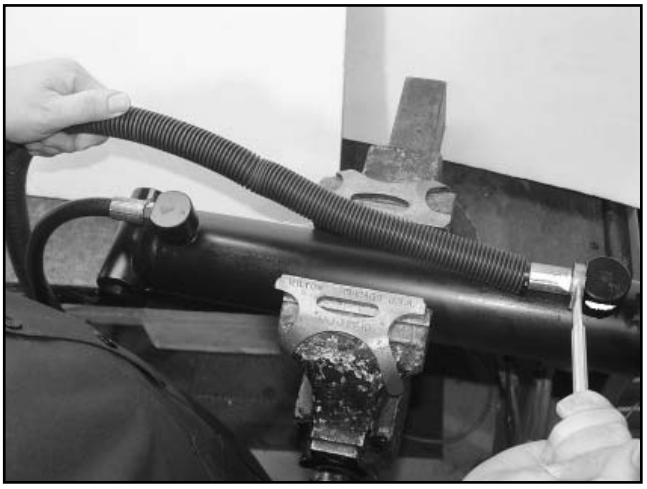


Figure 241 DSC-0986

15. For information on repairing the Tilt Hydraulic Cylinder, refer to the Hydraulic Cylinder Service section of this manual, page 7-40.

Hydraulic Tilt Cylinder Installation

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

1. Install hydraulic hoses to the tilt cylinder and tighten the hoses, making sure to connect marked hose to marked fitting. For reference purposes, hose “D” in Fig. 231 connects to the ram end of the tilt cylinder (Fig. 242).

Figure 242 DSC-1017A

2. Apply a small amount of grease to the end of the pivot pin on the barrel end of the cylinder and slide the pin through until the holes align up for the bolt and nut (Fig. 243).

Figure 243 DSC-0987

3. Install the bolt and nut and torque to 16 ± 2 ft-lbs. (21.7 ± 2.7 Nm) (Fig. 244).

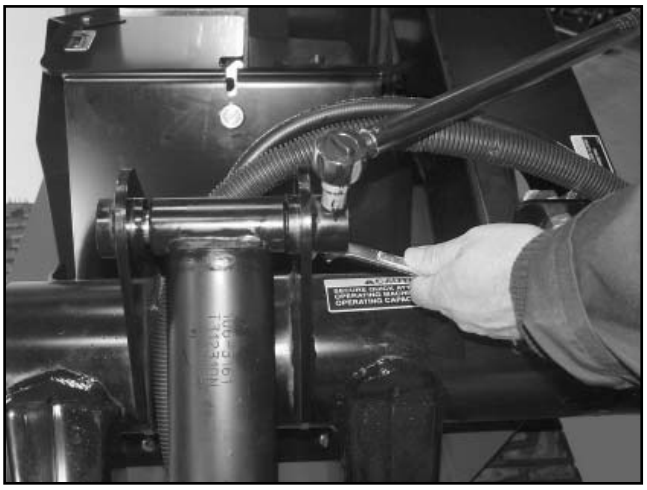


Figure 244 DSC-0988

4. Apply a small amount of grease to the pivot pin on the ram end of the cylinder and slide the pin through and align the locking shoulder bolt hole (Fig. 245).

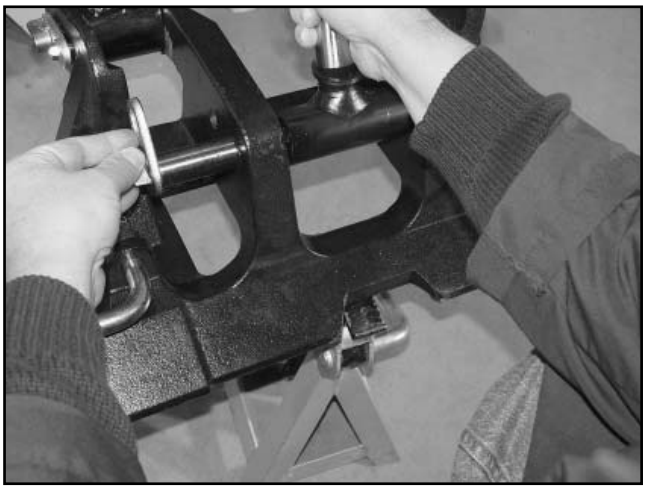


Figure 245 DSC-0989

5. Install shoulder bolt and torque to 16 ± 2 ft-lbs. (21.7 ± 2.7 Nm) (Fig. 246). Apply grease to the grease fitting with a grease gun.

Figure 246 DSC-0990

6. Route the two hydraulic hoses from the tilt cylinder into the front opening of the loader arm, behind the auxiliary quick couplers. Make sure the hydraulic hose (Fig. 247, Ref. D) is routed to the outside (Fig. 247, Ref. C) of the hydraulic hose. Both hydraulic hoses should be routed to the inside of the auxiliary hoses.

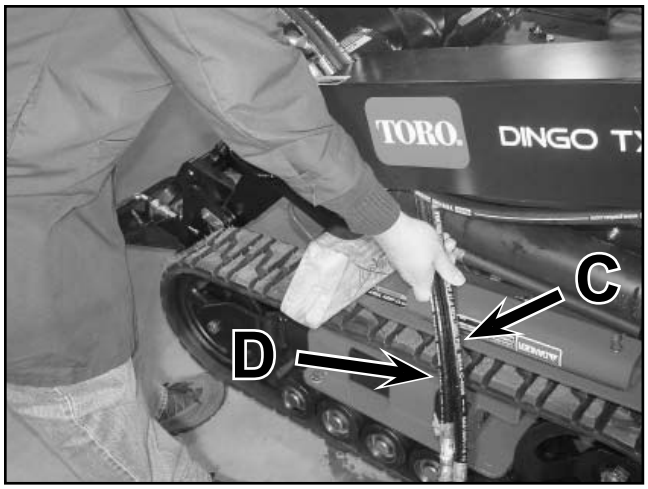


Figure 247 DSC-0992

7. Feed the hydraulic hoses toward the back of the loader arm. Make sure the hoses are routed to the inside of the auxiliary hoses that go to the quick couplers.

8. Route the two hydraulic hoses up from the tilt cylinder through the upper frame hole (Fig. 248).

Figure 248 DSC-0993

9. The hydraulic hoses are then pulled through the back of the frame. Make sure the hose (Fig. 249, Ref. D) is on top of the hydraulic hose (Fig 249, Ref. C).

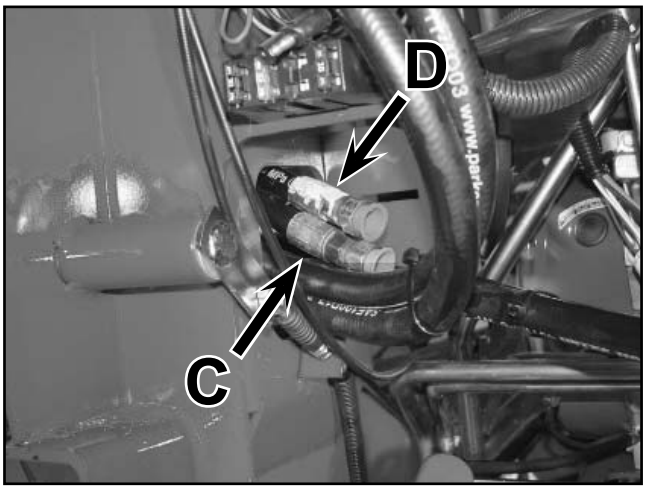


Figure 249 DSC-0994

10. Connect hydraulic hose (Fig. 250, Ref. C) to the hydraulic lift valve fitting and tighten.

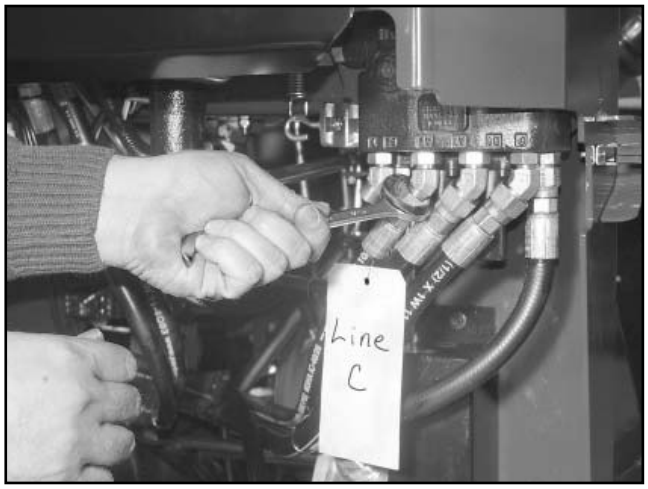


Figure 250 DSC-0971

11. Connect the hydraulic hose, Ref. D, to the hydraulic lift valve fitting and tighten (Fig. 251).

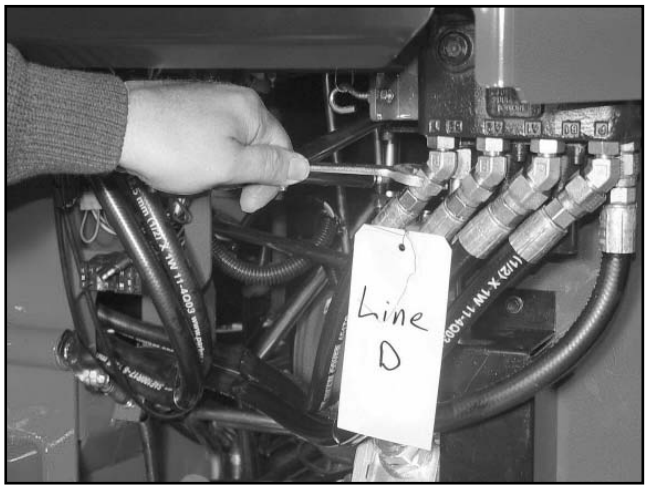


Figure 251 DSC-0970

12. Using a cable tie, tie the two hydraulic tilt hoses, 3" (7.62cm) from the barrel end fitting (Fig. 252).

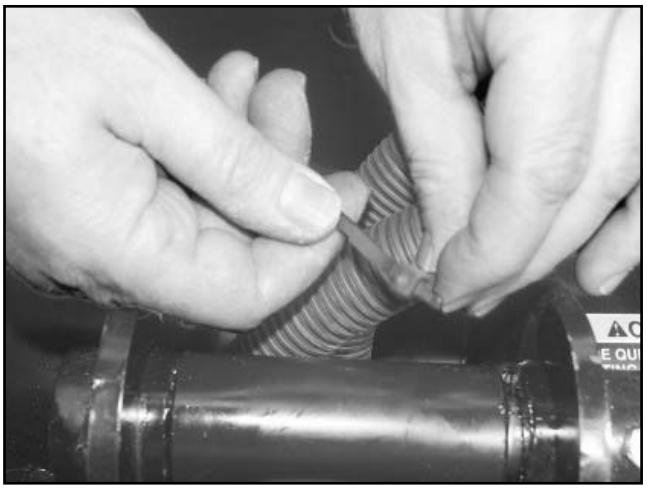


Figure 252 DSC-0995

13. Start the unit and raise the loader arm assembly to the full raised position. Install the cylinder lock assembly on the hydraulic lift cylinder. Shut the engine off (Fig. 253).

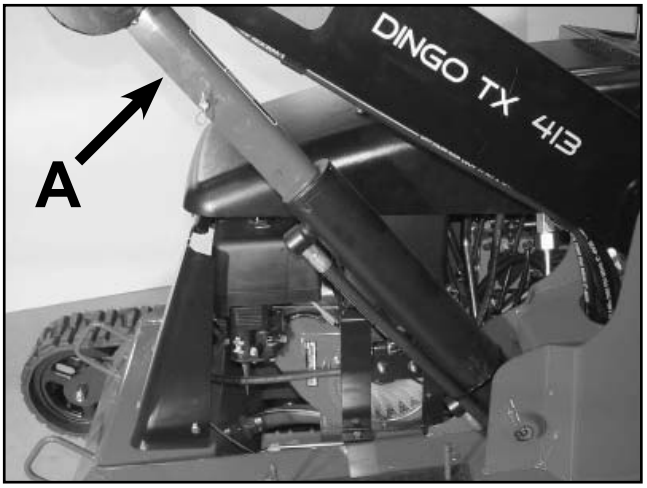


Figure 253 DSC-0965

A. Cylinder lock

14. Install the two hose clamps located under the loader arm assembly.

Note: The clamps have wide and narrow channels.

Make sure the wide channel goes to the outside of the loader arm, retaining the two hydraulic hoses for the auxiliary quick couplers (Fig. 254).

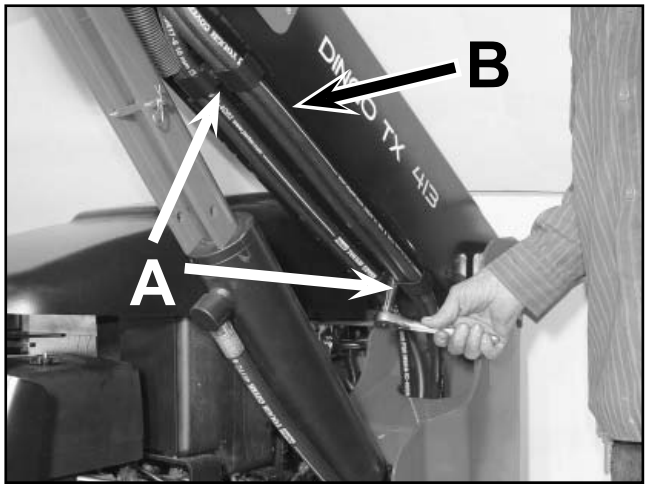


Figure 254 DSC-0968

A. Hose clamps B. Auxiliary hoses

Note: Units with a serial number of 240000100 through 240000200 have the clamp shown in Fig. 255.

Figure 255 DSC-1072

Note: Units with a serial number of 240000201 and higher have a revised hydraulic hose clamp. It is easier to install this clamp by using a crescent wrench to pry down on the bracket to install the bolt and nut (Fig. 256).

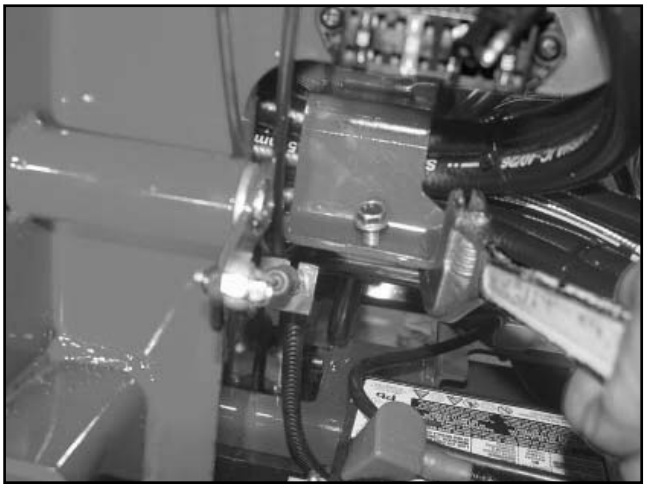


Figure 256 DSC-1073

Proper hose placement through the clamp (Fig. 257).

A. Auxiliary Hose (female coupler)
B. Auxiliary Hose (male coupler)
C. Lift Cylinder Hose (ram end)
D. Tilt Cylinder Hose (ram end)
E. Tilt Cylinder Hose (barrel end)
F. Lift Cylinder Hose (barrel end)

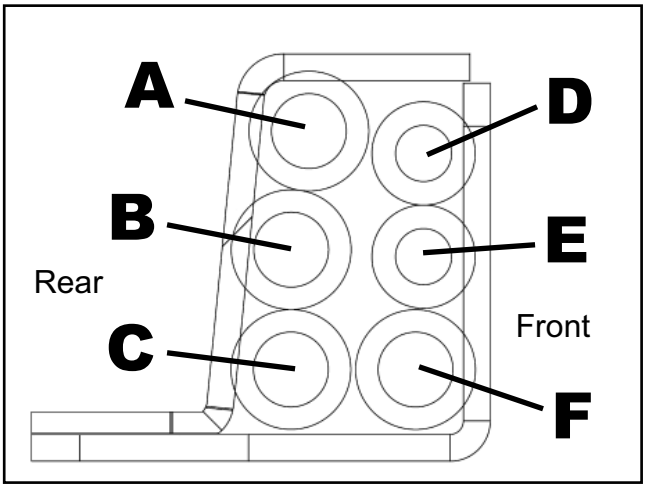


Figure 257 105-9000 clamp

15. Install cable tie strap around all four hydraulic hoses, approximately 8" (20.32cm) to the right of the rear clamp (Fig. 258).

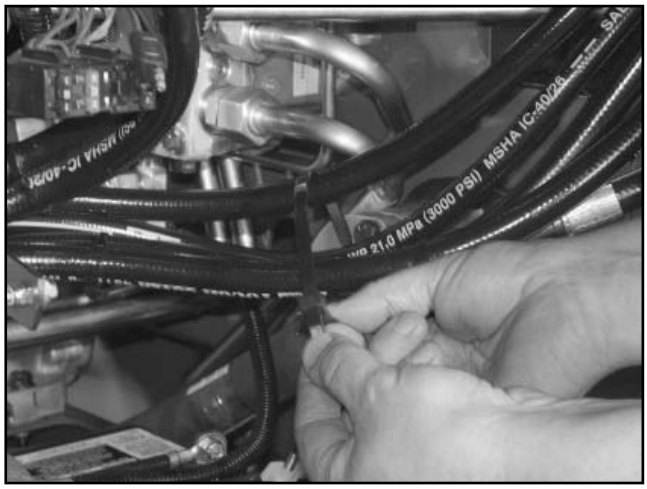


Figure 258 DSC-1075

16. Install a cable tie around all four hydraulic hoses, about 3” (7.62cm) from the back hose clamp in the Loader Arm Assembly (Fig. 259).

Figure 259 DSC-1071

17. Start the unit and remove the cylinder lock assembly. Operate the loader valve up, down, and tilt to purge the system of any air. Check for any oil leaks at the hydraulic hose connectors. After running the hydraulics recheck the oil reservoir; see the Maintenance Section, Checking the Hydraulic Reservoir, page 3-4. Shut engine off.

18. Install the rear cover.

Hydraulic Lift Cylinder Removal

Note: Units with serial numbers from 240000100 through 240000200 have a fixed fitting at the mounting end of the lift cylinder. You will need to hold the hydraulic line with a wrench and turn the cylinder until the hydraulic line is disconnected from the cylinder (Fig. 260).

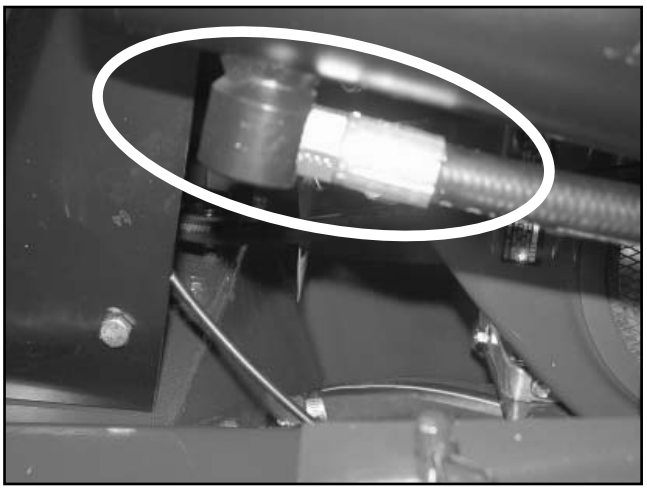


Figure 260 DSC-1031

Note: Units with serial numbers from 240000201 and higher have a swivel fitting at the ram end of cylinder (Fig. 261).

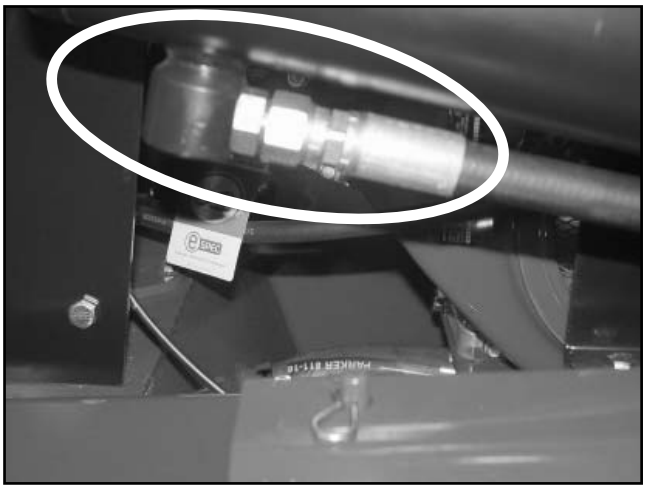


Figure 261 DSC-1032

Note: Cleanliness is a key factor in a successful repair of any hydraulic cylinder. Thoroughly clean all exposed surfaces prior to any type of maintenance. Cleaning all parts by using 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.

1. Remove the rear cover (Fig. 262).

Figure 262 DSC-0778

2. Start the unit and raise the loader arm. Place a jack stand under the quick attachment assembly and lower the loader arm so it is supported by the jack stand. The pivot pin on the ram end of the hydraulic lift cylinder should be approximately 10" (25.4cm) from the frame (Fig. 263).

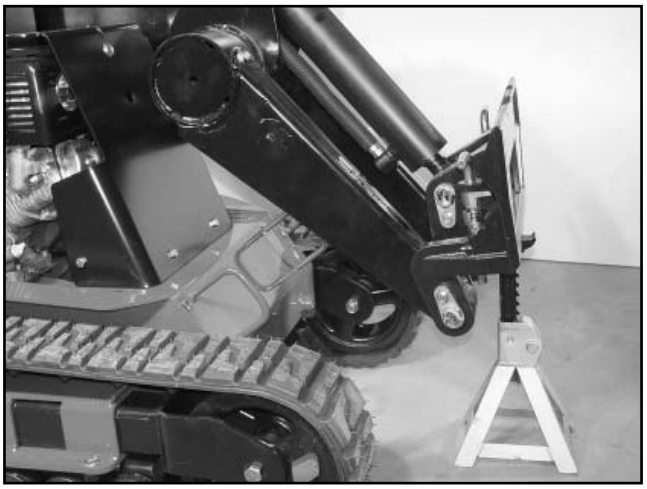


Figure 263 DSC-0998

3. Place an oil drain pan under the control valve. Mark the hydraulic hose and fitting with a marker or paint (Fig. 264).

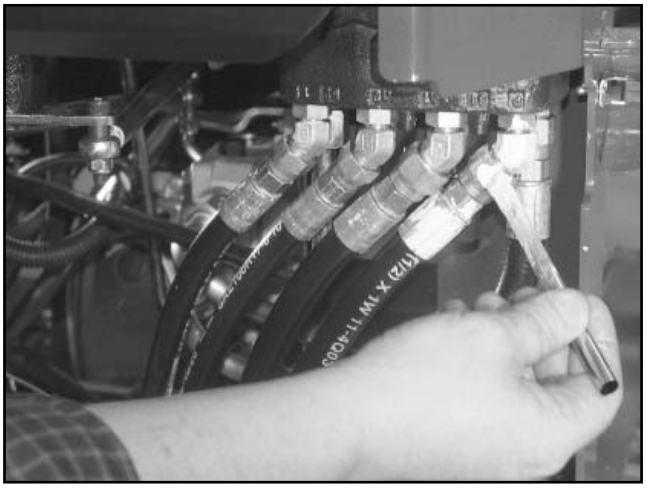


Figure 264 DSC-1026

4. Remove the hydraulic hose from the fitting on the hydraulic lift valve (Fig. 265).

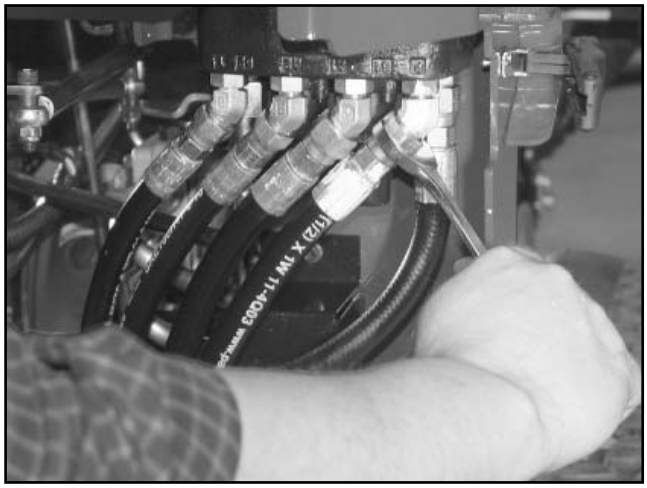


Figure 265 DSC-1025

5. Remove the bolt and nut on the pivot pin located at the ram end of the hydraulic lift cylinder (Fig. 266).

Figure 266 DSC-0996

6. Remove the bolt and nut on the pivot pin located at the barrel end of the hydraulic cylinder (Fig. 267).

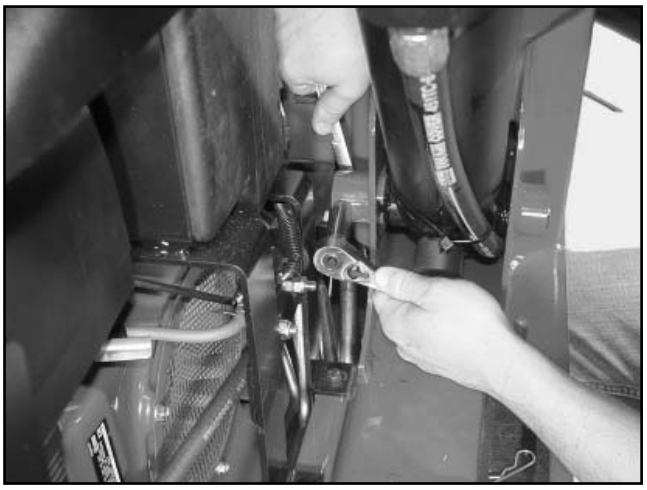


Figure 267 DSC-0997

7. Remove the hydraulic hose from the fitting on the hydraulic lift valve (Fig. 268).

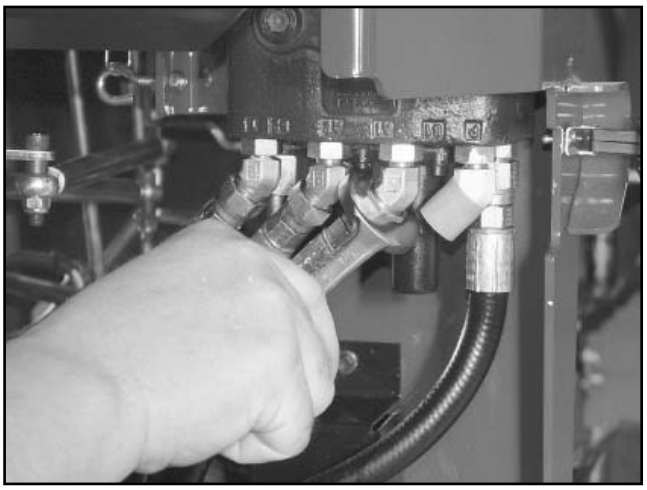


Figure 268 DSC-1024

8. Mark the hydraulic hose and fitting at the ram end of the hydraulic lift cylinder (Fig. 269).

Figure 269 DSC-1005

9. Remove the hose clamp located in the back at the lower left corner and cut the tie cable strap holding the hydraulic hoses together (Fig. 270).

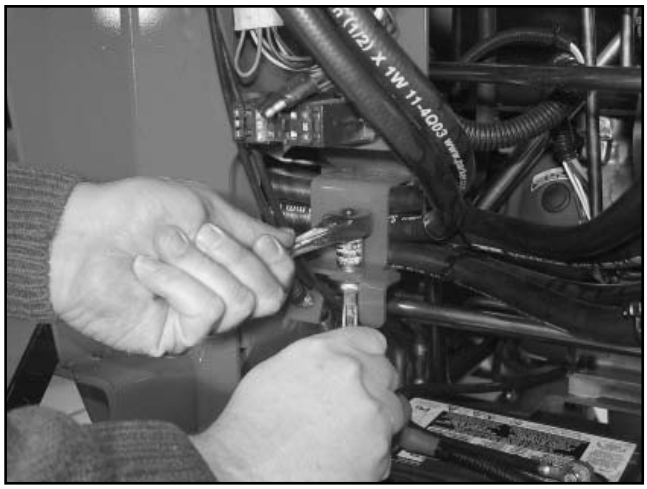


Figure 270 DSC-0969

10. Remove the pivot pin on the barrel end of the hydraulic cylinder by using a drift punch and hammer, tapping the pin out from the inside of the frame, toward the outside *(this is a top view of the barrel end of the pivot pin)* (Fig. 271).

Note: It may be necessary to remove the hydraulic return line to the reservoir to get more clearance to remove the pivot pin.

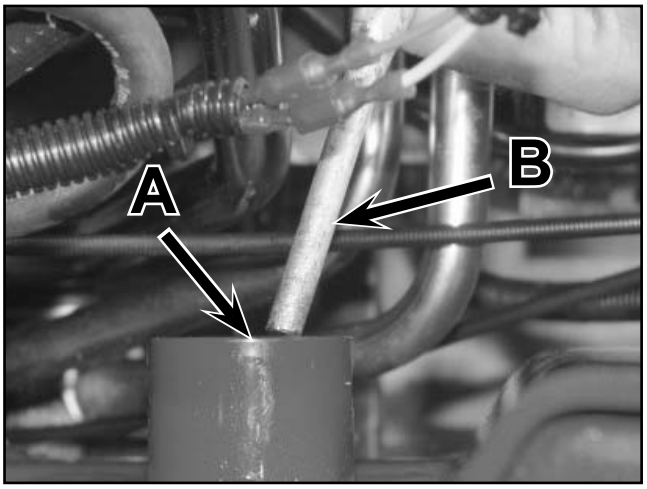


Figure 271 DSC-1014

A. Pin B. Punch

11. Support the hydraulic cylinder prior to removing the pivot pin at the ram end of the hydraulic lift cylinder. Using a drift punch and hammer, tap the pin out from the inside of the loader arm assembly, toward the outside (Fig. 272).

Figure 272 DSC-1015

12. Remove the hydraulic lift cylinder from the frame of the unit (Fig. 273).

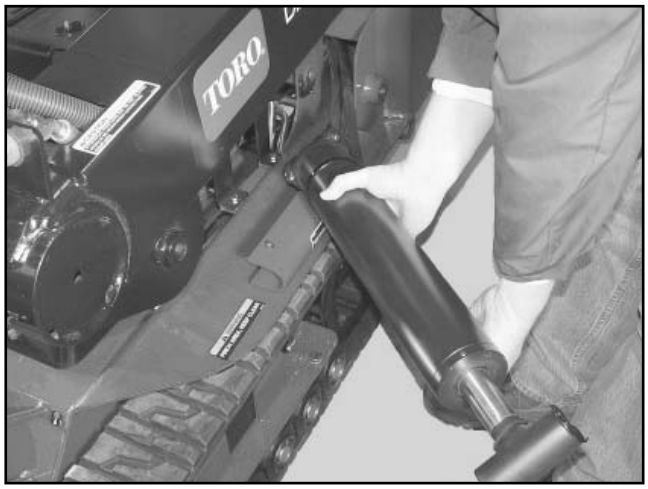


Figure 273 DSC-1016

13. Remove the three cable ties (Note the location of the cable ties) from the hydraulic hoses and remove the hoses from the lift cylinder (Fig. 274).

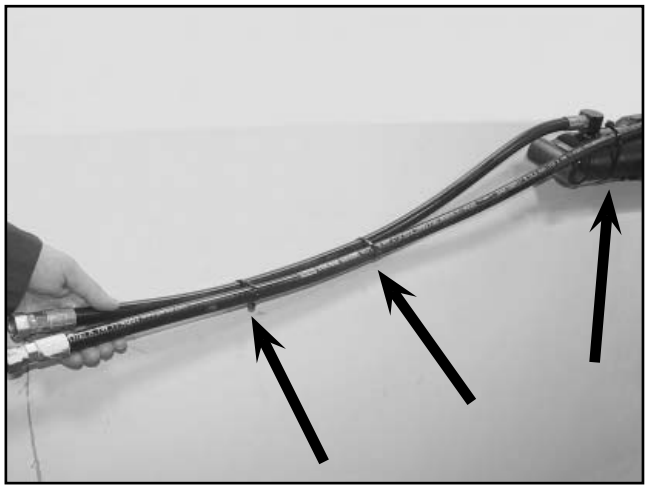


Figure 274 DSC-1018

14. For information on repairing the Hydraulic Lift Cylinder, refer to Hydraulic Lift Repair, page 7-40.

Hydraulic Lift Cylinder Installation

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

1. Install the hydraulic hoses to the lift cylinder. Replace the cable ties to the hydraulic hose and hydraulic lift cylinder and tighten the hoses (Fig. 275).

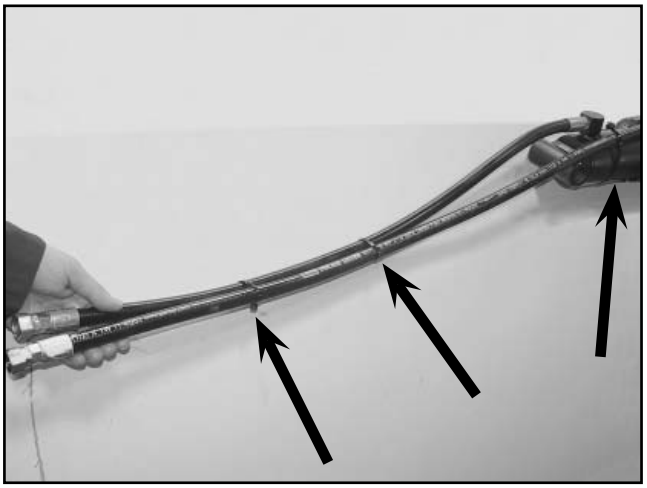


Figure 275 DSC-1018

2. Route the two hydraulic hoses from the hydraulic lift cylinder through the frame opening to the rear of the barrel end of the lift cylinder (Fig. 276).

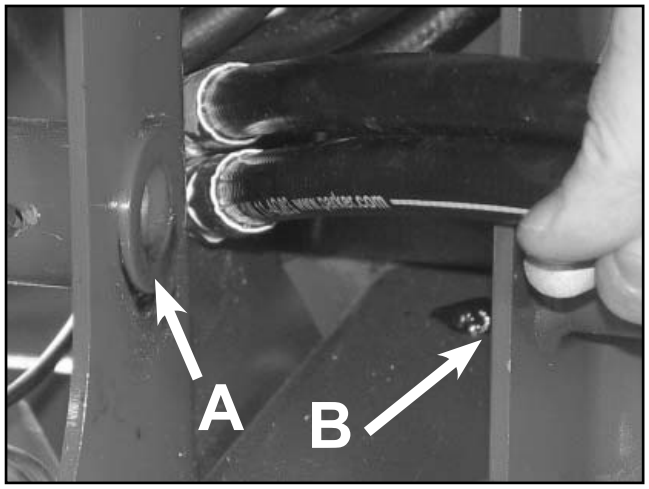


Figure 276 DSC-1020

A. Lift cylinder barrel end
B. Pivot pin mounting

3. Make sure the two hydraulic lift hoses are routed under the other four hydraulic hoses; 2 hydraulic hoses for the auxiliary couplers and two for the hydraulic tilt cylinder (Fig. 277).

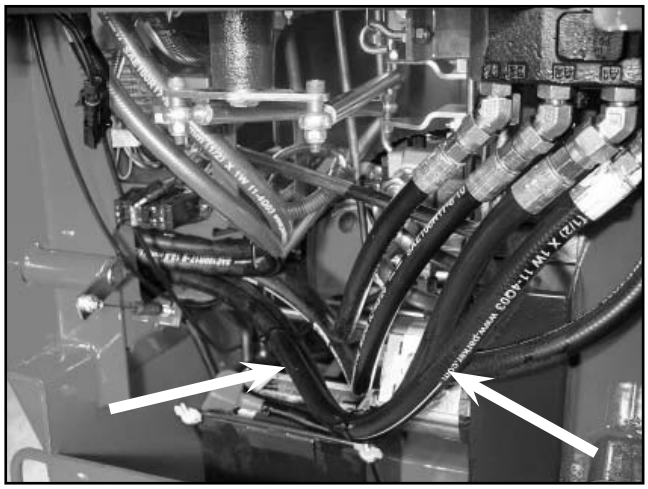


Figure 277 DSC-1028

4. Apply a small amount of grease to the pivot pin on the ram end of lift cylinder and slide the pin through, then align the bolt hole. Use a socket or pipe to tap the pivot pin in, so damage to the grease fitting does not occur (Fig. 278).

   Install bolt and nut, then tighten. With a grease gun, apply grease to the grease fitting.

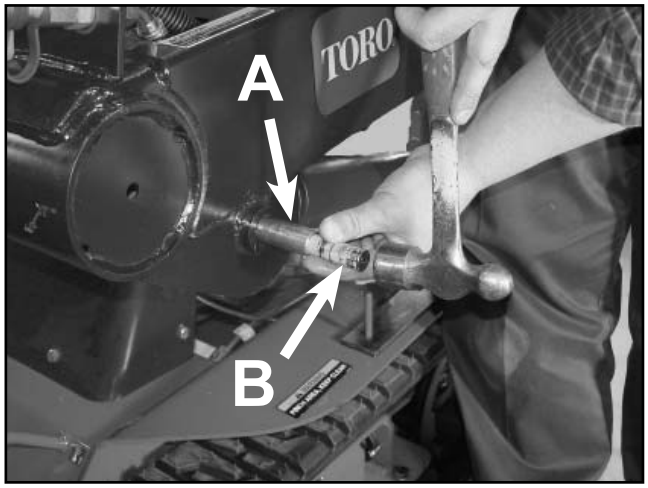


Figure 278 DSC-1022

A. Pin B. Socket or pipe

5. Apply a small amount of grease to the pivot pin on the barrel end of the lift cylinder and slide the pin through, then align the bolt hole. Use a socket or pipe to tap the pivot pin in, so damage to the grease fitting does not occur (Fig. 279).

   Install bolt and nut, then tighten. With a grease gun, apply grease to the grease fitting.

Figure 279 DSC-1023

6. Connect the hydraulic hose to the hydraulic fitting on the lift valve and tighten (Fig. 280).

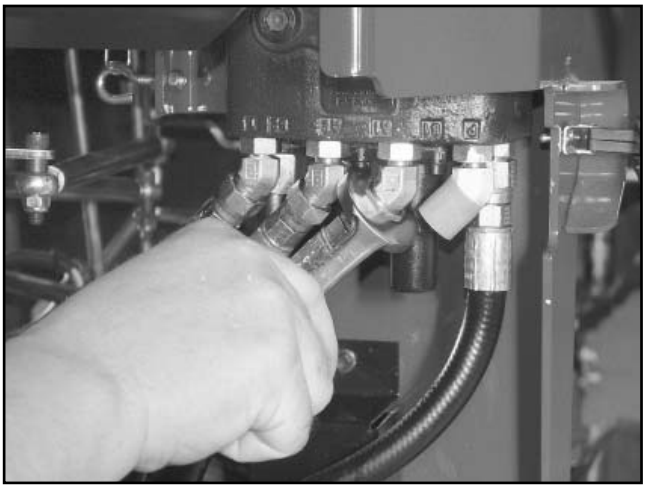


Figure 280 DSC-1024

7. Connect the next hydraulic hose to the hydraulic fitting on the lift valve and tighten (Fig. 281).

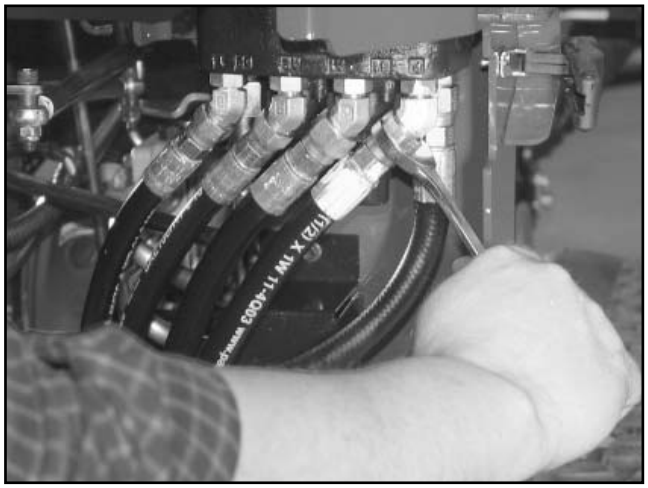


Figure 281 DSC-1025

8. Units, with serial numbers 240000100 through 240000200 will have a clamp and hoses routed as shown in Fig. 282.

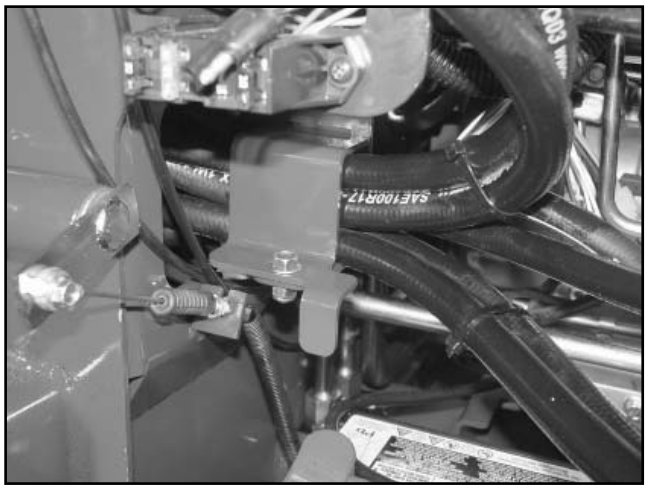


Figure 282 DSC-1072

Units, with serial numbers 240000201 and higher will have a clamp and hoses routed as shown in Fig. 283.

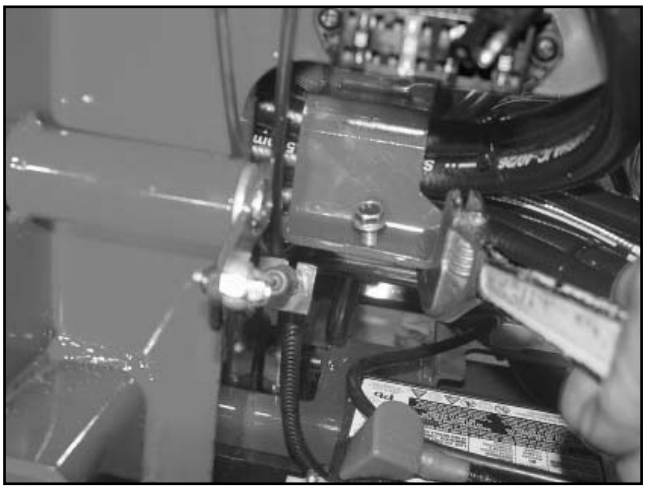


Figure 283 DSC-1073

Proper hose placement through the clamp (Fig. 284).

A. Auxiliary Hose (female coupler)
B. Auxiliary Hose (male coupler)
C. Lift Cylinder Hose (ram end)
D. Tilt Cylinder Hose (ram end)
E. Tilt Cylinder Hose (barrel end)
F. Lift Cylinder Hose (barrel end)

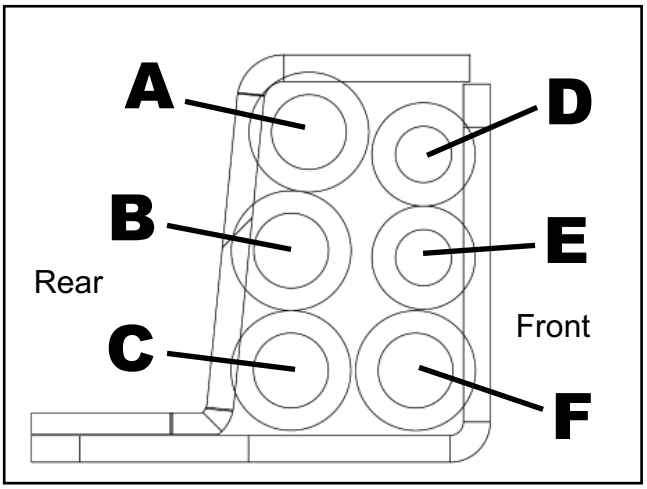


Figure 284 105-9000 clamp

9. Install cable tie strap around all four hydraulic hoses, approximately 8" (20.32cm) to the right of the rear clamp (Fig. 285).

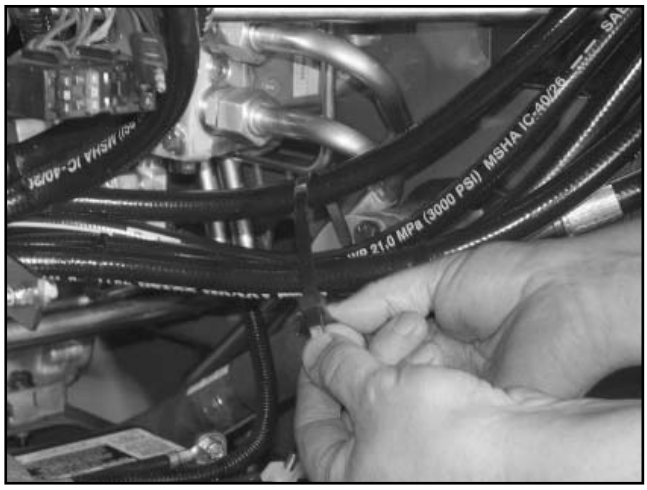


Figure 285 DSC-1075

10. Start the unit and raise the loader arm. Remove the jack stand. Continue operating the loader arm up, down, and tilt to help purge the system of any air. Check for any oil leaks at the hydraulic hose connectors. After running the hydraulics, recheck the oil reservoir; see the Maintenance Section, Checking the Hydraulic Reservoir, page 3-4. Shut the engine off.

11. Install the rear cover.

Loader Arm Assembly Removal

1. Remove the rear cover and belt cover.

2. Raise the loader arm assembly to the highest position and install the cyclinder lock in the hydraulic lift cylinder (Fig. 286).

Figure 286 DSC-1041

3. Remove the two hose clamps, located under the loader arm assembly (Fig. 287).

Figure 287 DSC-1042

4. Remove the bolt and nut retaining the pivot pin on the ram end of the lift cylinder (Fig. 288).

Figure 288 DSC-1043

5. Remove the cylinder lock and lower lift arm. Support the loader arm assembly with an overhead lift (Fig. 289).

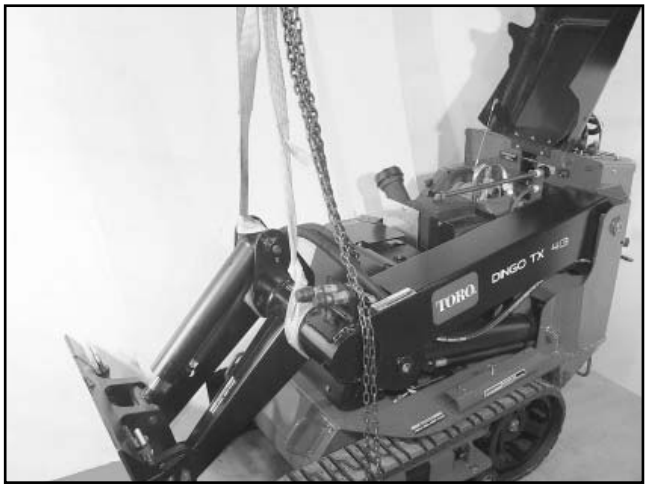


Figure 289 DSC-1069

Note: Units with serial numbers from 240000100 through 240000200 have a fixed fitting (Fig. 290).

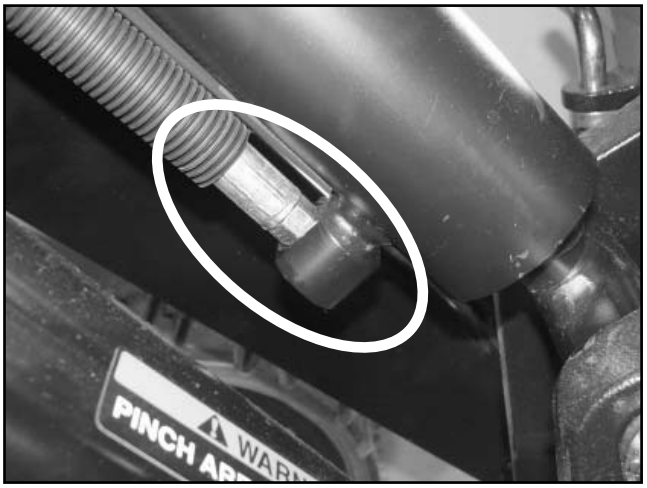


Figure 290 DSC-1029

Note: Units with serial numbers from 240000201 and higher have a swivel fitting (Fig. 291).

Figure 291 DSC-1030

6. At the loader arm valve, mark the tilt cylinder hydraulic hose and fitting with paint or marker. Remove the hydraulic hose from the fitting (Fig. 292).

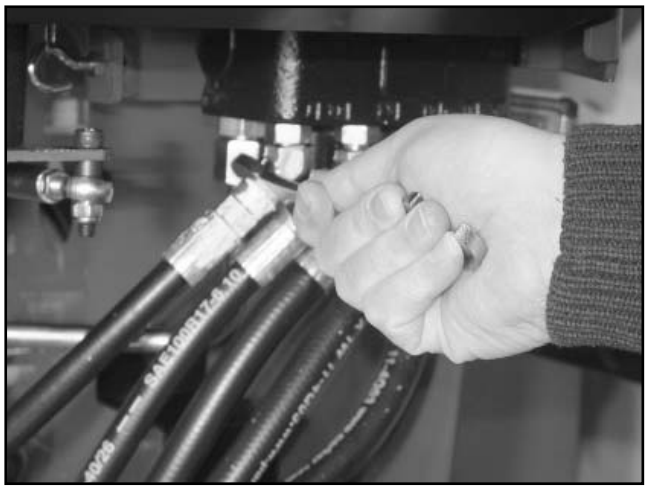


Figure 292 DSC-1045

7. Remove the hydraulic hose that goes to the tilt hydraulic cylinder and remove from the fitting at the hydraulic loader valve (Fig 293).

Figure 293 DSC-1047

8. Cut the cable ties around the hydraulic hoses. Remove the hydraulic hose clamp located in the back at the lower left corner and cut the cable tie holding the two hoses together (Fig. 294).

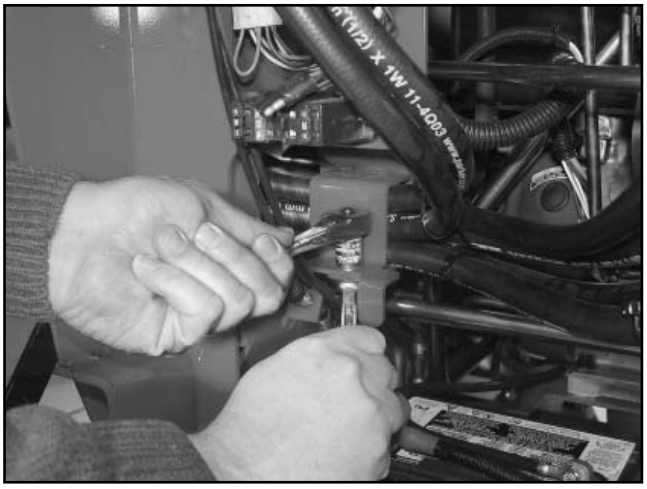


Figure 294 DSC-0969

Proper hose placement through the clamp (Fig. 295).

A. Auxiliary Hose (female coupler)
B. Auxiliary Hose (male coupler)
C. Lift Cylinder Hose (ram end)
D. Tilt Cylinder Hose (ram end)
E. Tilt Cylinder Hose (barrel end)
F. Lift Cylinder Hose (barrel end)

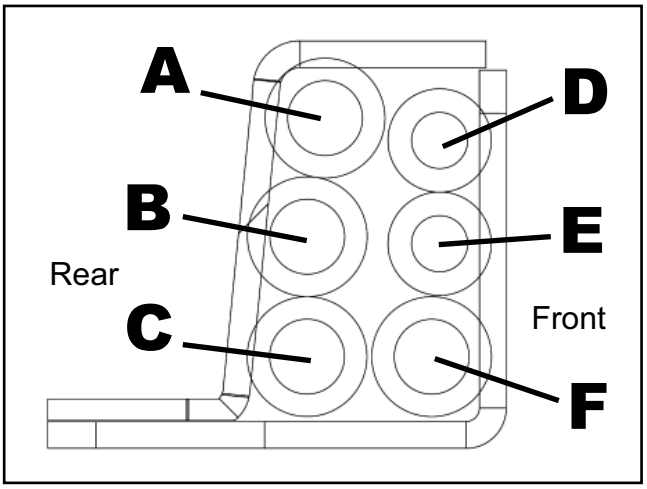


Figure 295 105-9000 clamp

9. Pull the two tilt cylinder hydraulic hoses from the rear of the unit out the side under the loader arm (Fig. 296).

Figure 296 DSC-0975

10. Mark, (with paint or marker) the hydraulic hose and hydraulic fitting on the male quick coupler located on the outside of the loader arm assembly (Fig. 297).

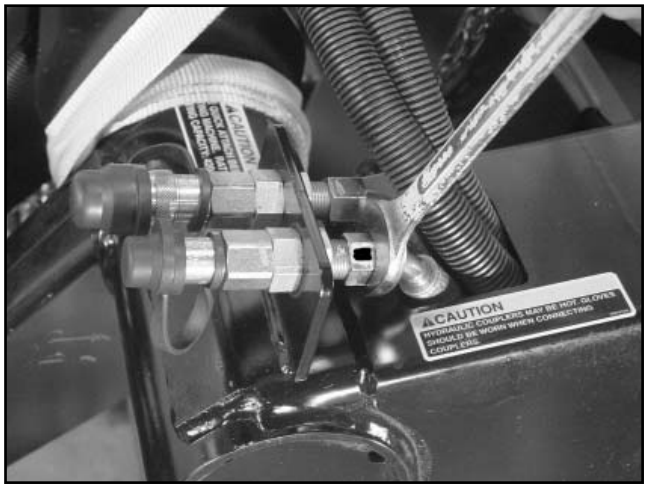


Figure 297 DSC-1053

11. Remove the hydraulic hose from the male quick coupler fitting. Pull the hydraulic hose down and out of the loader arm assembly.

12. Remove the hydraulic hose from the female quick coupler fitting (Fig. 298). Pull the hydraulic hose down and out of the loader arm assembly.

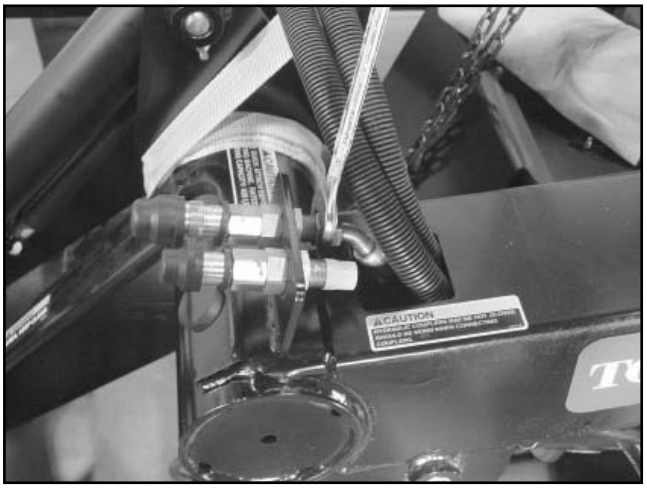


Figure 298 DSC-1054

13. Support the hydraulic lift cylinder prior to removing the pivot pin on the ram end of the hydraulic cylinder. Using a drift punch and hammer, tap the pin out from the inside of the loader arm assembly, toward the outside (Fig. 299).

Figure 299 DSC-1015

14. Remove the two vent hoses, located above the oil filter bracket. The top vent is for the fuel tank (A) and the bottom vent is for the hydraulic reservoir tank (B) (Fig. 300).

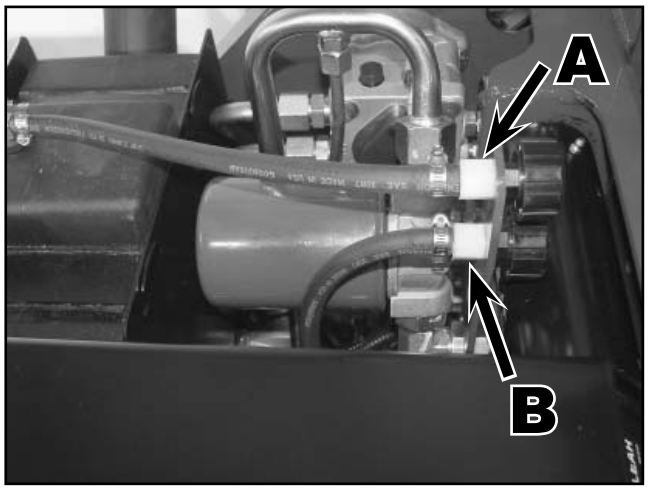


Figure 300 DSC-1064

15. Remove the bolt and nut at pivot pin for the loader arm assembly (Fig. 301).

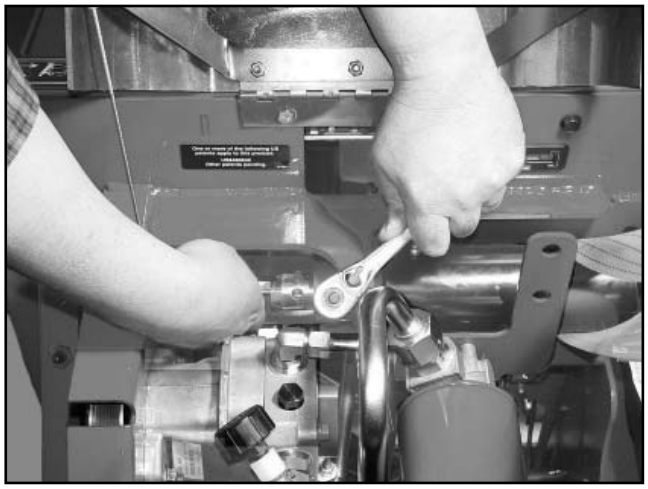


Figure 301 DSC-1057

16. With a hammer and a long pipe, tap the pivot pin out of the loader arm assembly (Fig. 302).

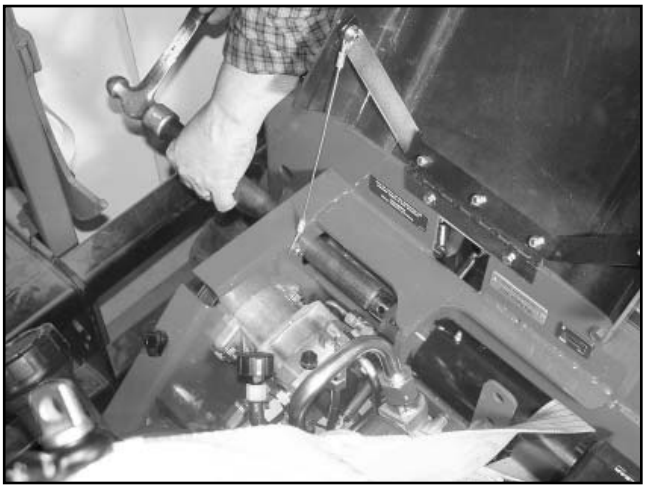


Figure 302 DSC-1058

17. Lift the loader arm assembly from the unit (Fig. 303).

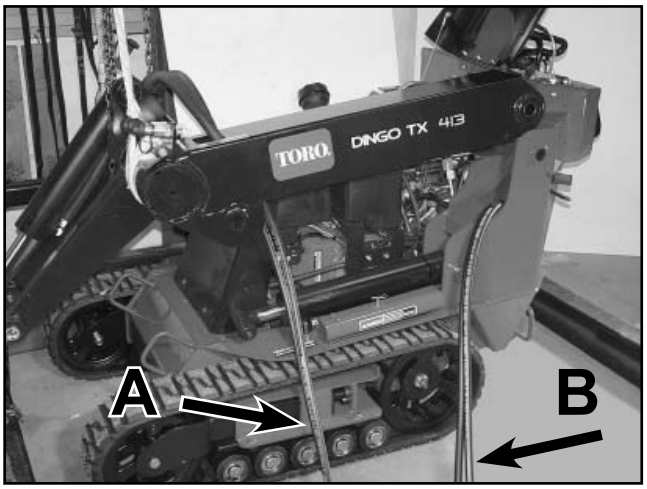


Figure 303 DSC-1060

A. Tilt cylinder hoses B. Auxiliary hoses

Loader Arm Assembly Installation

1. Route the tilt cylinder hoses through the opening of the frame (Fig. 304).

Note: Make sure the hoses are routed to the inside of the auxiliary hoses that go to the quick coupler.

Figure 304 DSC-1061

2. Lower the loader arm down into the frame. Apply a thin layer of grease to the pivot pin and push the pivot pin through the loader arm assembly (Fig. 305).

Figure 305 DSC-1062

3. Use a drift punch in the first hole to align the hole for the bolt. Install bolt and nut and tighten to 16 ± 2 ft-lbs. (21.7 ± 2.7 Nm) (Figure 306).

Figure 306 DSC-1063

4. Install the two vent hoses, located above the oil filter bracket. The top vent is for the fuel tank (A) and the bottom vent is for the hydraulic reservoir (B) (Fig. 307).

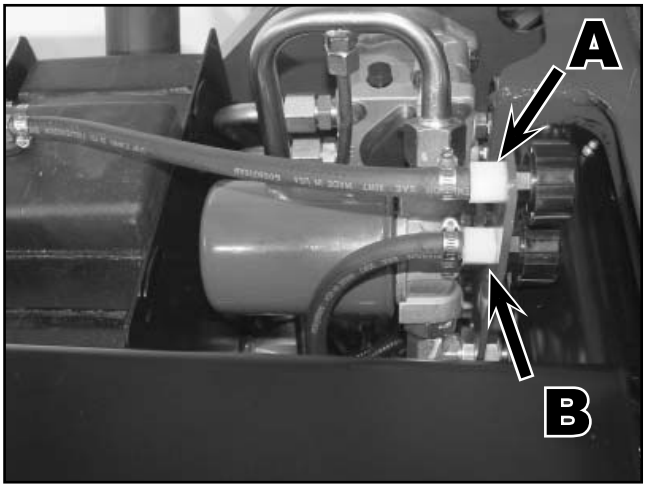


Figure 307 DSC-1064

Note: Prior to connecting the hydraulic lines, the o-rings and seals should be replaced with new ones and lightly lubricated with petroleum jelly.

5. Route the auxiliary hose through the loader arm assembly and connect it to the female quick coupler fitting and tighten (Fig. 308).

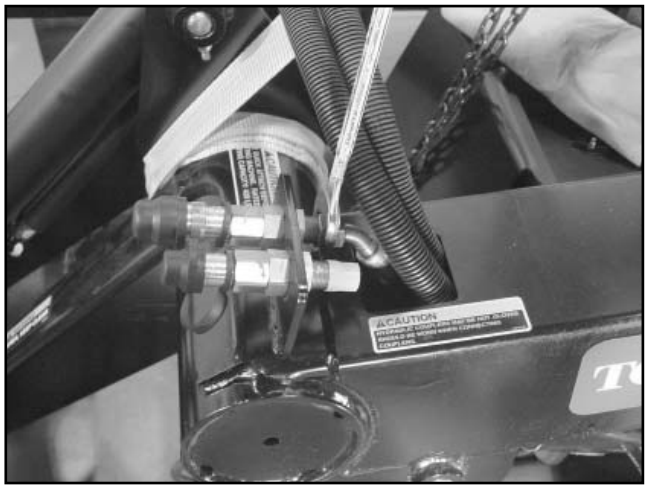


Figure 308 DSC-1054

6. Route the other auxiliary hydraulic hose, (the one that is marked when removed), and connect it to the male quick coupler fitting and tighten (Fig. 309).

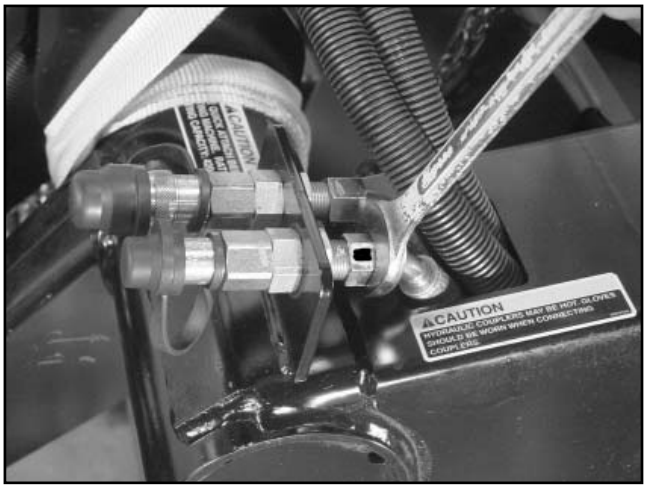


Figure 309 DSC-1053

7. Grease the pivot pin for ram end of the hydraulic lift cylinder and install on the loader arm (Fig. 310).

Figure 310 DSC-1066

8. Align the hole for the bolt that retains the pivot pin for the hydraulic lift cylinder. Install the bolt and nut and tighten to 16 $\pm$ 2 ft-lbs. (21.7 + 2.7 Nm) (Fig. 311).

Figure 311 DSC-1043

9. Using a grease gun, apply grease to the grease fitting for the pivot pin.

Note: Prior to connecting the hydraulic lines, the o-rings and seals should be replaced with new ones and lightly lubricated with petroleum jelly.

10. Connect hydraulic hose to the hydraulic lift valve fitting and tighten (Fig. 312).

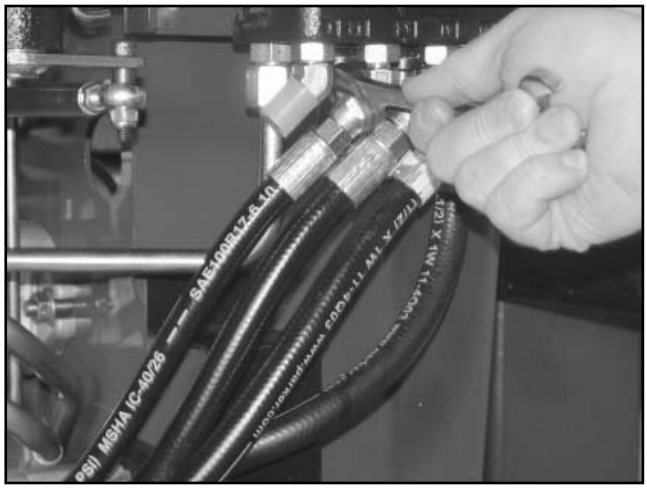


Figure 312 DSC-1047

11. Connect the next hydraulic hose (which should be marked) to the hydraulic lift valve fitting and tighten (Fig. 313).

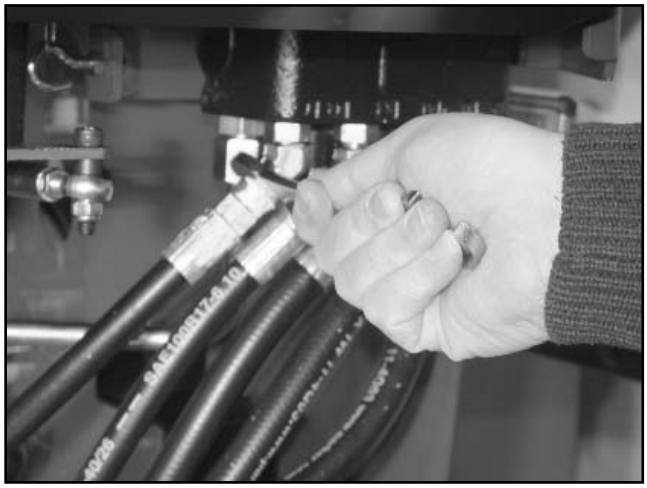


Figure 313 DSC-1045

12. Start engine and raise the loader arm assembly to the fully raised position. Install the cylinder lock in the hydraulic lift cylinder and shut engine off (Fig. 314).

Figure 314 DSC-1041

13. Install the two hose clamps, located under the loader arm assembly (Fig. 315).

Note: Make sure the two auxiliary hydraulic hoses are routed to the outside of the arm. The wider portion of the hose clamp goes over the auxiliary hydraulic hoses.

Figure 315 DSC-1042

14. Install a cable tie around all four hydraulic hoses, about 3" (7.6cm) from the rear hose clamp in the loader arm assembly (Fig. 316).

Figure 316 DSC-1071

15. Start engine and raise the loader arm assembly to the fully raised position. Remove locking arm assembly from the hydraulic lift cylinder and lower the loader arm assembly. Shut off engine.

Proper hose placement through the clamp (Fig. 317).

A. Auxiliary Hose (female coupler)
B. Auxiliary Hose (male coupler)
C. Lift Cylinder Hose (ram end)
D. Tilt Cylinder Hose (ram end)
E. Tilt Cylinder Hose (barrel end)
F. Lift Cylinder Hose (barrel end)

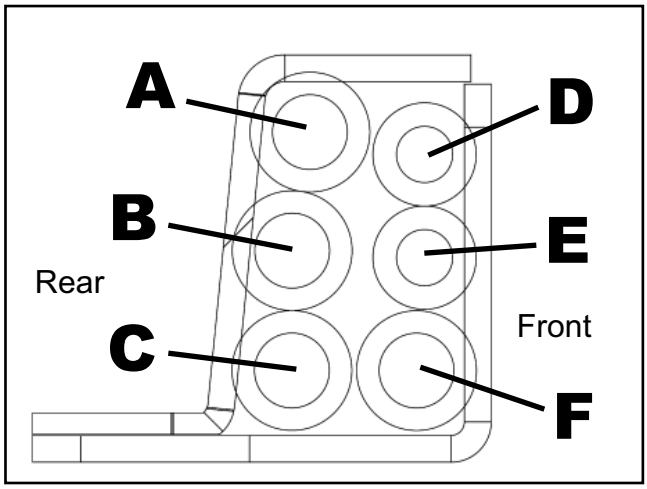


Figure 317 105-9000 clamp

16. Before installing the clamp, route the hoses through the clamp, refer to Fig. 317. Install the hose clamp, located on the lower left corner.

Note: Units with a serial number of 240000001 through 240000200 will have the clamp shown in Fig. 318.

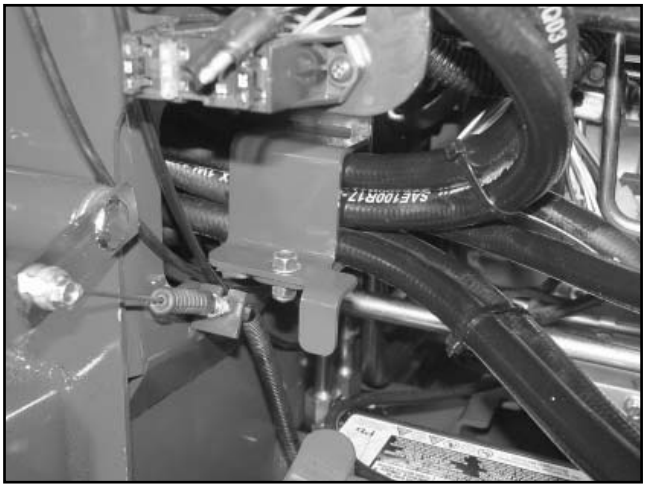


Figure 318 DSC-1072

Note: Units with a serial number of 240000201 and higher have a revised hydraulic hose clamp. It is easier to install this clamp by using a crescent wrench to pry down on the bracket to install the bolt and nut (Fig. 319).

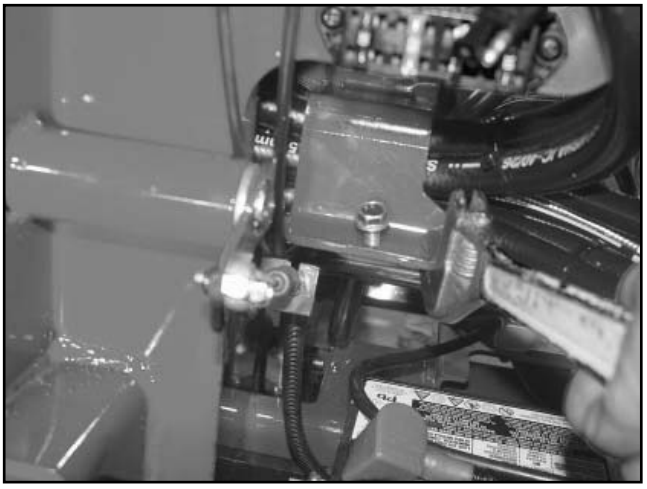


Figure 319 DSC-1073

17. Install a cable tie around the four hydraulic hoses that go to the hydraulic lift valve. The cable tie should be approximately 8" (20.3cm) away from the hose clamp (Fig. 320).

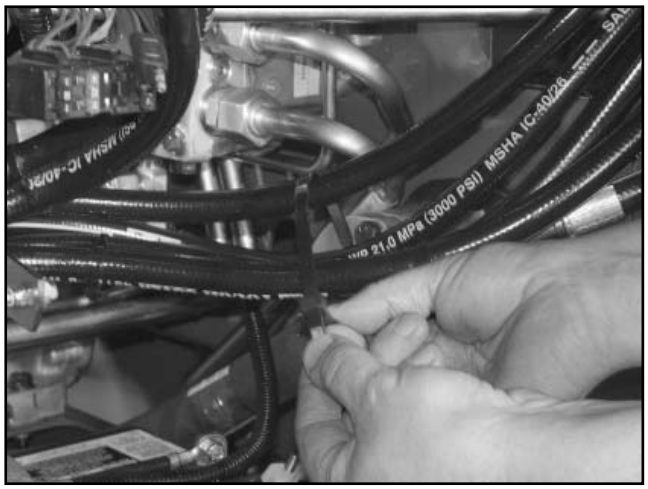


Figure 320 DSC-1075

18. Start the unit and remove the cylinder lock assembly. Operate the loader valve up, down, and tilt to help purge the system of any air. Check for any oil leaks at the hydraulic hose connectors. After running the hydraulics recheck the oil reservoir; see the Maintenance Section, Checking the Hydraulic Reservoir, page 3-4. Shut engine off.

19. Install the belt cover and the rear cover.

Quick Attachment Assembly Removal

1. Start engine and tilt the cylinder to lower the quick attachment assembly so it is laying flat on the ground (Fig. 321).

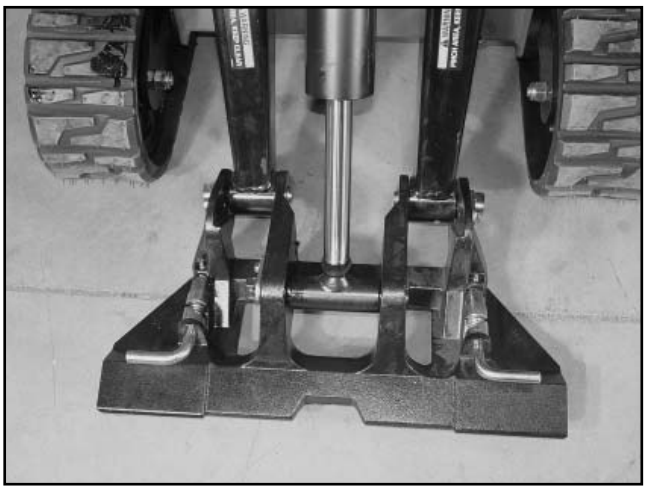


Figure 321 DSC-1076

2. Remove the shoulder bolt retaining the pivot pin for the ram end of the tilt cylinder (Fig. 322).

Figure 322 DSC-1077

3. Tap the pivot pin out of the ram end of the tilt cylinder using a hammer and drift punch (Fig. 323).

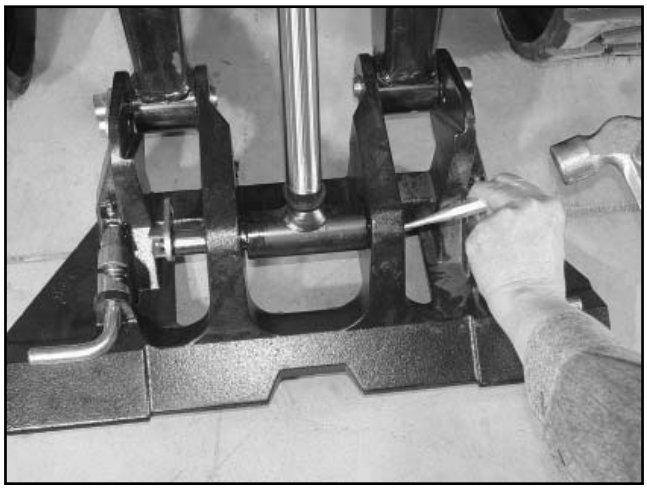


Figure 323 DSC-1079

4. Support the tilt cylinder and remove the pivot pin (Fig. 324).

Figure 324 DSC-1080

5. Remove the right and left shoulder bolt retaining the pivot pins located on both sides of the quick attachment assembly. Remove both pivot pins (Fig. 325).

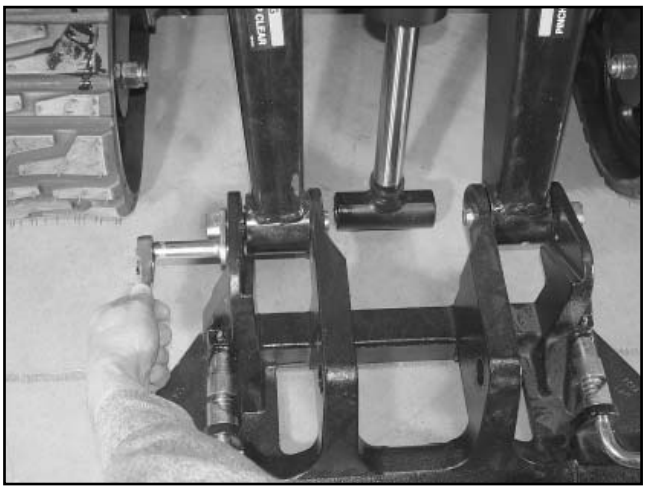


Figure 325 DSC-1081

6. Slide the quick attachment assembly away from the loader arms (Fig. 326).

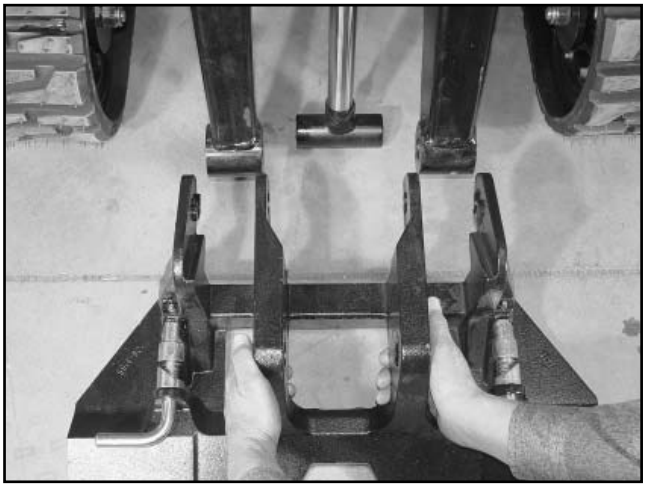


Figure 326 DSC-1083

Loader Arm Bushing Replacement

1. With attach plate removed, raise the loader arm assembly up to the highest position and install the cylinder lock in the hydraulic lift cylinder. Shut the engine off.
2. With a drift punch and hammer, tap the bushing out of the loader arm assembly; there are two bushings per pivot pin (Fig. 327).

Figure 327 DSC-1084

3. Replace the bushings with a driver and drive the bushings into the loader arm assembly until they are flush with the outside of loader arm (Fig. 328).

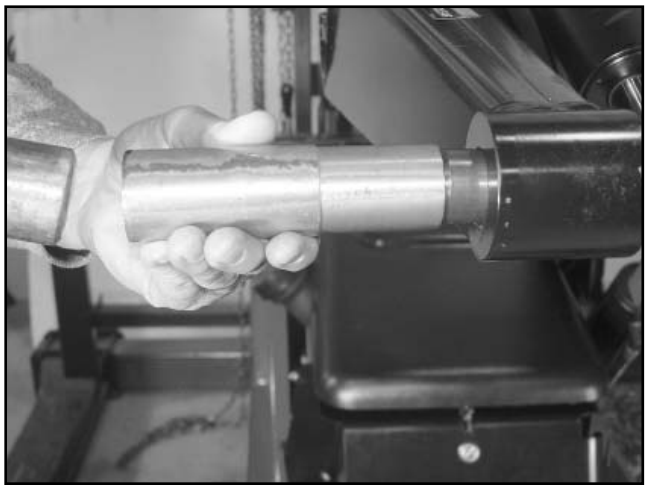


Figure 328 DSC-1085

4. Start the engine and raise the loader arm assembly to the fully raised position. Remove the locking arm assembly from the hydraulic lift cylinder and lower the loader arm assembly to the floor. Shut the engine off.

Quick Attachment Assembly Installation

1. Align the quick attachment assembly with the pivot pin holes.
2. Lightly grease pins and install the right and left pivot pins into the loader arm assembly (Fig. 329).

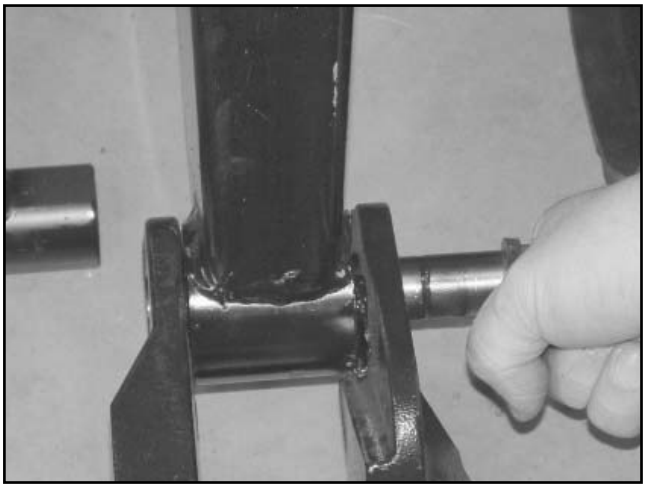


Figure 329 DSC-1086

3. Install the shoulder bolts in both the right and left pivot pins and torque the bolts to 16 ± 2 ft-lbs.(21.7 ± 2.7 Nm) (Fig. 330).

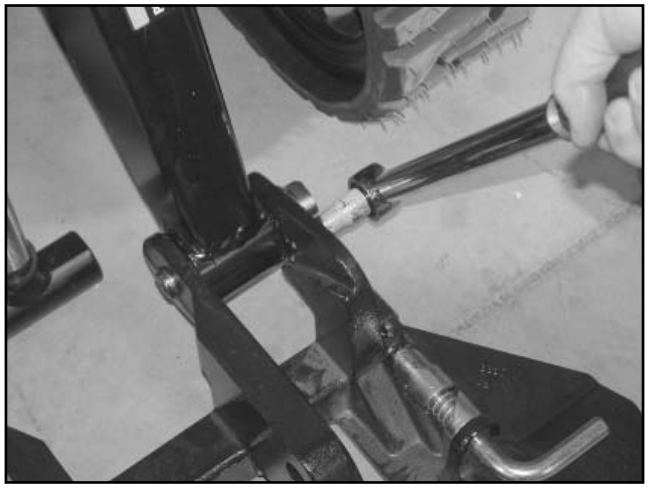


Figure 330 DSC-1087

4. Grease the pivot pin for the ram end of the cylinder and install the pivot pin. Torque the shoulder bolt to 16 ± 2 ft-lbs. (21.7 ± 2.7 Nm) (Fig. 331).

Figure 331 DSC-1080

Hydraulic Cylinder Service

WARNING!

Hydraulic cylinders are designed to hold hydraulic fluid under pressure. In addition, cylinders may contain holding valves and other means that could cause pressure to remain locked in the cylinder. As such, incorrect handling or process steps can create an unsafe situation. Be sure all appropriate measures are taken to relieve any residual pressure in the cylinder and further ensure that the cylinder is restrained in such a way that it cannot fall or move during the disassembly and assembly processes.

Hydraulic Cylinder, Lift and Tilt, Disassembly

This section covers the disassembly and assembly on both the Hydraulic Lift Cylinder and the Hydraulic Tilt Cylinder. Both cylinders are similar in design; however, the removal of the heads of the cylinder are different and will require different spanner wrenches (Fig. 332).

Figure 332 DSC-1375

1. Follow appropriate procedures for either Hydraulic Lift Cylinder Removal, page 7-21; or Hydraulic Tilt Cylinder Removal, page 7-12 for cylinder being serviced.
2. Clean away all dirt or other foreign substance from openings, particularly at the head of the hydraulic cylinder.

Note: If excessive wear due to side-loads or binding is a possibility, mark or note the piston and head relationship to the rod and tube. This condition will usually show up as a highly polished surface on the piston and head 90° to the pin rotation axis (Fig. 333).

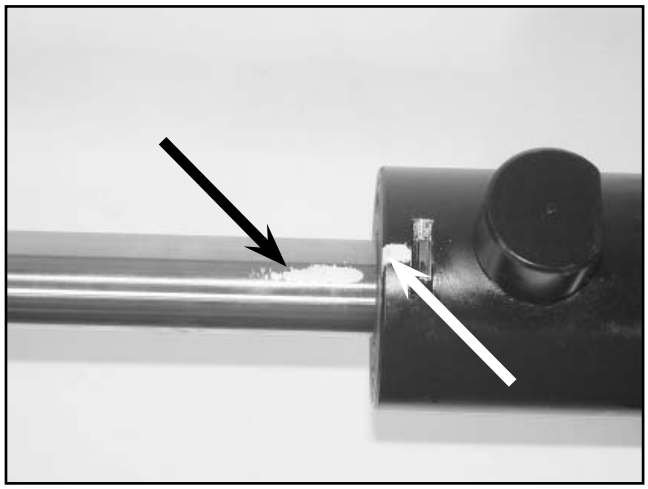


Figure 333 DSC-1329

3. Using a spanner wrench, install in the holes provided. Rotate the head clockwise until the edge of the retaining ring appears in the milled opening of the tube. Insert a flat blade screwdriver between the beveled edge of the retaining ring and the cylinder barrel to start the retaining ring through the opening.

4. Rotate counter-clockwise until the retaining ring is completely removed (Fig. 334).

Figure 334 DSC-1335

5. Pull out on the rod to remove the piston and head assembly from barrel (Fig. 335).

Figure 335 DSC-1338

Inspection

INSPECT ROD: There should be no scratches or pits deep enough to catch the fingernail. Pits that go to the base metal are unacceptable. Scratches that catch the fingernail but are not to the base metal, less than 0.5 inch long (1.27cm) and primarily in the circumferential direction are acceptable provided they cannot cut the rod seal. Chrome should be present over the entire surface of the rod and the lack thereof is unaccept-able. In the event that an unacceptable condition occurs, the cylinder should be replaced.

INSPECT HEAD: Visually inspect the inside bore for scratches or polishing. Deep scratches are unaccept-able. Polishing indicates uneven loading and when this occurs, the bore should be checked for out-of-roundness. If out-of-roundness exceeds 0.007" (.18mm), this is unacceptable. Check the condition of the dynamic seals, looking particularly for metallic particles em-bedded in the piston seal surface. Remove the seals. Damage to the seal grooves, particularly on the sealing surfaces, is unacceptable. In the event that an unacceptable condition occurs, the cylinder should be replaced.

INSPECT TUBE ASSEMBLY: Visually inspect the inside bore for scratches and pits. There should be no scratches or pits deep enough to catch the fingernail. Scratches that catch the fingernail but are less the 0.5 inch long (1.27cm) and primarily in the circumferential direction are acceptable provided they cannot cut the piston seal. In the event that an unacceptable condition occurs, the cylinder should be replaced (Fig. 336).

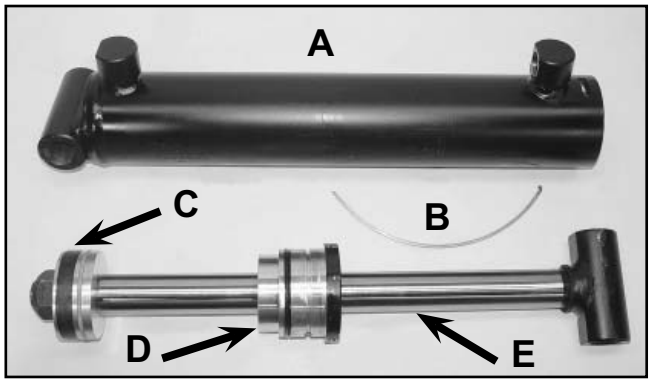


Figure 336 DSC-1345

A. Tube
B. Retaining Ring
C. Piston
D. Head
E. Ram

Rebuild

Thoroughly rinse the inside of the tube with a clean solvent. Remove all seals and o-ring and rinse and clean all internal components of any foreign material with a lint-free rag.

1. Visually inspect for material defects and contamination. All seals and O-rings must be replaced with new parts (Head Assembly, Fig. 337, and Piston Assembly, Fig. 338).

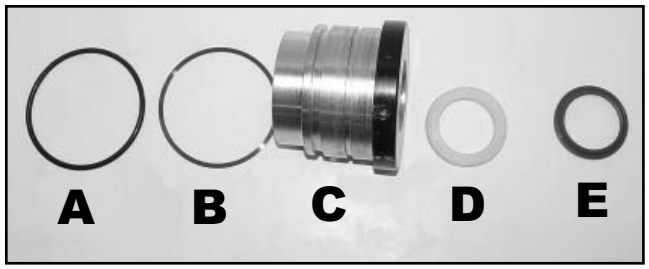


Figure 337 DSC-1348

A. Wiper
B. U-Cup
C. Head
D. Static Back-up
E. Static O-Ring

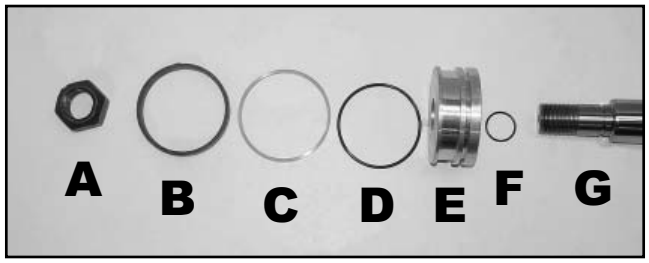


Figure 338 DSC-1350

A. Locknut
B. PRS Static O-ring
C. Piston
D. O-ring Loader
E. Bi-directional Piston Seal
F. Wear Ring
G. Rod

2. Lubricate the head and all seals with 10W-30 oil prior to installation. Using round-nose pliers, twist the dual lip u-cup seal into a "C" shape and allow it to snap into the groove (Fig. 339).

Figure 339 DSC-1351

3. Install one edge of the wiper seal and work it around inner lip in the head (Fig. 340).

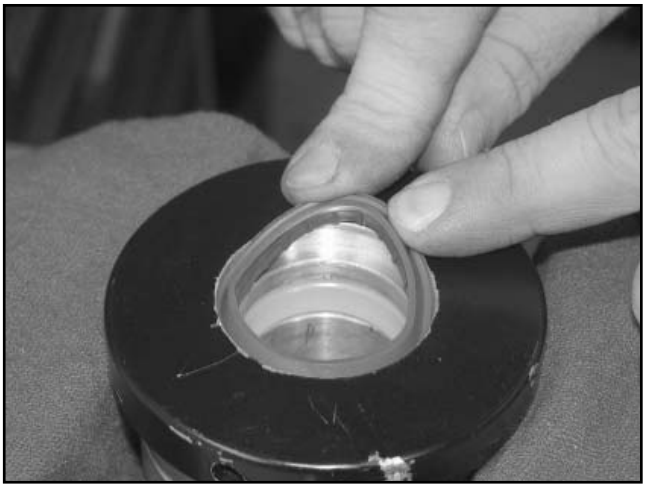


Figure 340 DSC-1352

4. Install the Static Back-Up ring around the groove in the head (Fig. 341).

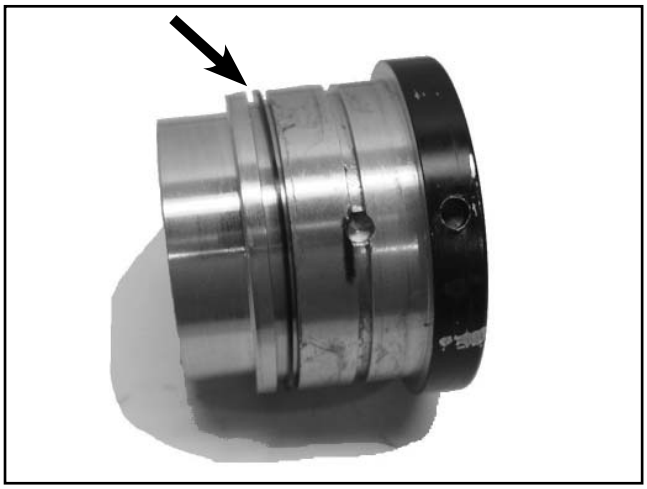


Figure 341 DSC-1355

5. Next, install the O-ring around the groove, next to the Static Back-up Ring (Fig. 342).

Note: If possible, the head/seal assembly should sit for at least one hour to allow the seals to normalize.

Figure 342 DSC-1356

6. For easiest installation, warm Bi-directional Piston Seal (Teflon seal) in 120° to 150° F (48.9° to 65.6°C) 10W-30 oil. Lubricate the piston and all components with oil. Stretch the 0-ring Loader Seal into the groove in the piston.

7. Verify that the o-ring is not pinched or twisted.

8. Remove the bi-directional piston seal from the warm fluid and install it around the end of the piston, then push it into the piston groove over the o-ring loader seal (Fig. 343).

   Be careful not to cut the OD of this seal.

Figure 343 DSC-1359

9. Spread the Wear Ring into a "C" shape only enough to fit over the outside of the piston and snap it into its groove (Fig. 344).

Figure 344 DSC-1360

10. Install tape around the threads on the rod and install the PRS Static O-ring onto the rod and remove tape (Fig. 345).

Figure 345 DSC-1361

11. Lubricate the ID of the head and install on the rod (Fig. 346).

Figure 346 DSC-1362

12. Lubricate the ID of the piston and install on the rod (Fig. 347).

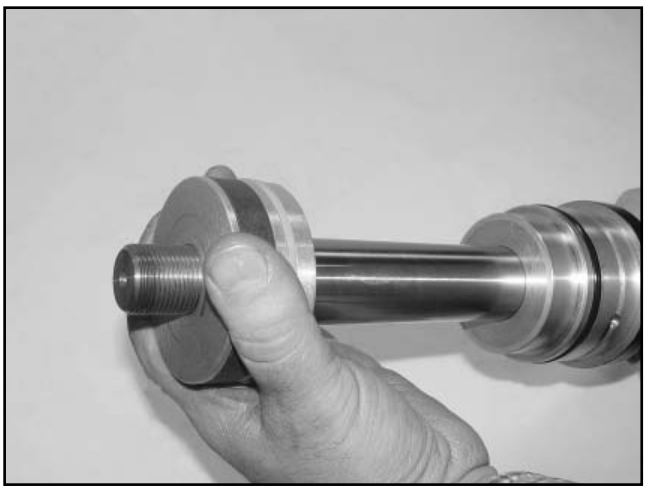


Figure 347 DSC-1363

13. Install the lock nut on the rod (Fig. 348) and torque to:
    - tilt cylinder lock nut 175 - 200 ft-lbs. (237.3 - 271.2 Nm)
    - lift cylinder lock nut 250 - 300 ft lbs. (339 - 406.7 Nm)

Figure 348 DSC-1364

14. Lubricate inside the tube, outside piston, and head. Insert the piston into tube until the head meets the end of the tube (Fig. 349).

Figure 349 DSC-1367

15. Turn head into tube until the retaining ring hole is aligned with the milled slot opening. Install the hook end of the retaining ring into retaining ring hole in the head (Fig. 350).

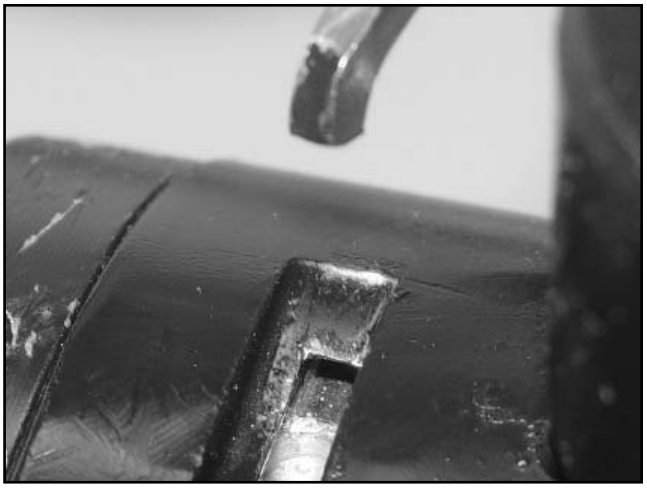


Figure 350 DSC-1373

16. With a spanner wrench, rotate the head clockwise. Continue turning the head until the retaining ring edge does not appear in the milled slot opening (Fig. 351).

Figure 351 DSC-1374

Loader Valve Disassembly and Assembly

1. Before disassembly of any hydraulic component, use a clean, dirt-free work surface and clean solvent to prevent system contamination (Fig. 352).

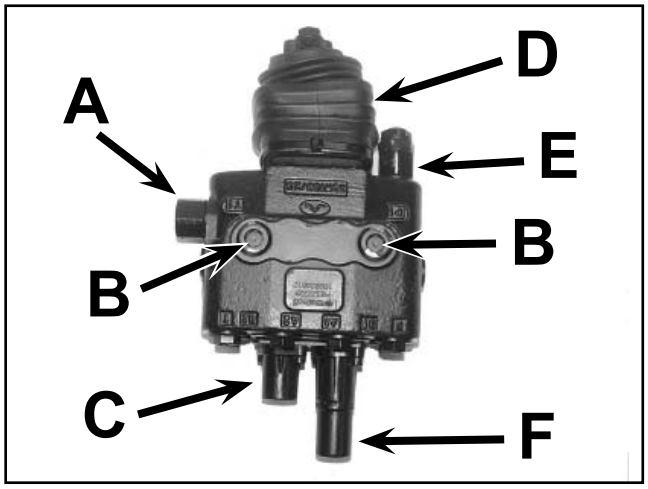


Figure 352 DSC-1377

A. Power beyond valve
B. Work port relief
C. Spring Cap
D. Rubber Bellows
E. System relief
F. Detent spring cap

Joystick Assembly Removal

1. Remove handle (Fig. 353).

Figure 353 DSC-1436

1. Remove tie cable around the rubber bellows and remove the joystick assembly (Fig. 354). Wipe excess grease from the joystick.

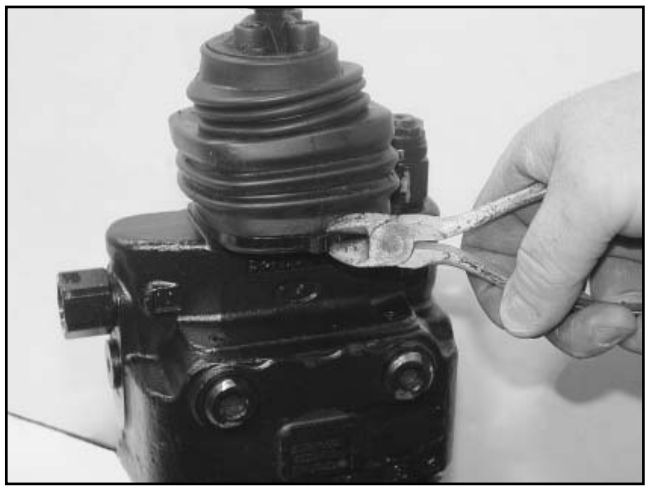


Figure 354 DSC-1381

2. Remove the 3 hex head screws and spring lock washers, and remove the articulated holder (Fig. 355).

Figure 355 DSC-1382

3. Pictured below (Fig. 356) are the joystick joints:
   A. Tilt Cylinder operation
   B. Loader Lift Cylinder operation
   C. Pivot for Lift and Tilt operation

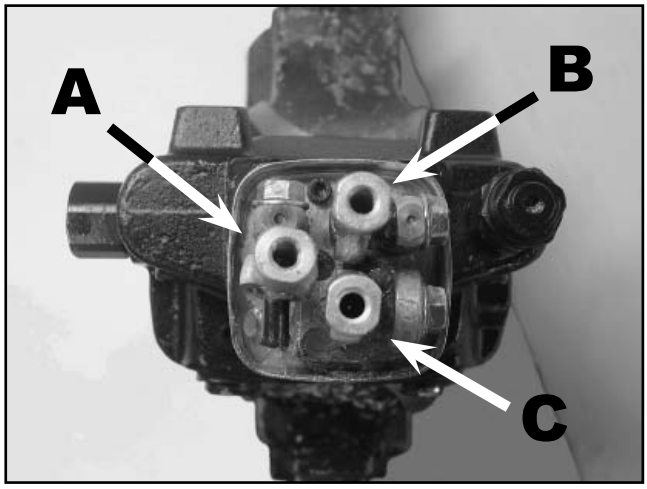


Figure 356 DSC-1391

4. Slide the end rod off the joystick pin of the joystick joint for the Tilt Cylinder (Fig. 357).

Figure 357 DSC-1726

5. Remove the pivot for the lift and tilt operation. Remove the nut holding the joystick joint (Fig. 358).

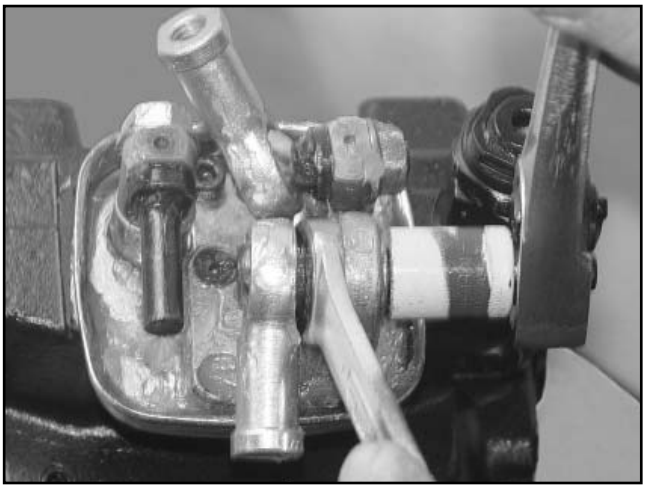


Figure 358 DSC-1395

6. Turn the loader lift joystick joint and remove two hex head screws, then remove the joystick pivot (Fig. 359).

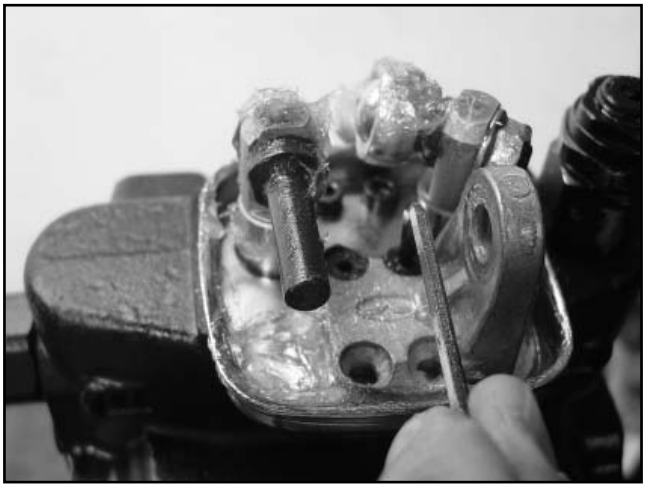


Figure 359 DSC-1728

Joystick Assembly Installation

1. Install the joystick pivot with two hex head screws (Fig. 360).

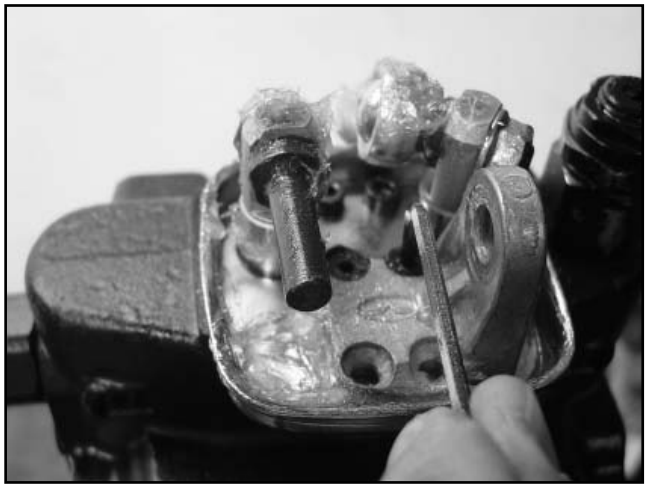


Figure 360 DSC-1728

2. Install the nut holding the joystick joint to the pivot for the lift and tilt operation (Fig. 361).

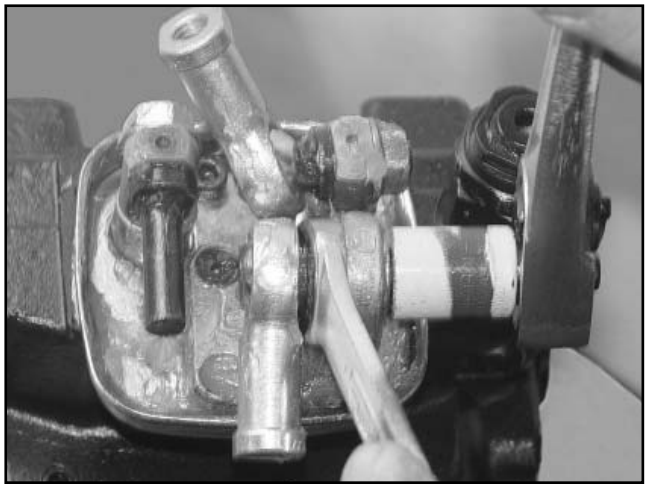


Figure 361 DSC-1395

3. Slide the end on the joystick joint onto the joystick pin for the tilt cylinder (Fig. 362).

Figure 362 DSC-1726

4. Install the articulated holder with 3 hex head screws and lock washers torque to 17.7 ft.-lbs. (24 Nm) (Fig. 363).

Figure 363 DSC-1382

5. Lubricate all of the articulated parts inside the mechanical joystick area with synthetic base grease grade NLGI2 (Fig. 364).

Figure 364 DSC-1434

6. Install the rubber bellows over the base plate and install the tie strap in the groove of the rubber bellows (Fig. 365).

Figure 365 DSC-1435

7. Install the lift/tilt handle (Fig. 366).

Figure 366 DSC-1436

Spool Removal

Note: To disassemble and assemble the valve, it is best to hold the valve in a bench vise.

1. Remove tie cable around the rubber bellows and remove (Fig. 367).

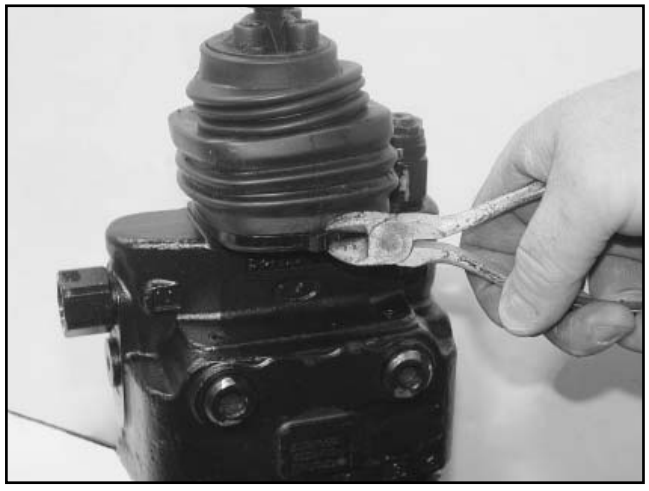


Figure 367 DSC-1381

2. Remove the 3 hex head screws and spring lock washers and remove the articulated holder (Fig. 368).

Figure 368 DSC-1382

3. Slide the rod end off the joystick pin and remove the pin (Fig. 369).

Figure 369 DSC-1726

4. Turn the loader lift joystick joint and remove the nut retaining it to the lift spool (Fig. 370).

Figure 370 DSC-1397

5. Remove the two hex head retaining screws that retain the joystick pivot (Fig. 371).

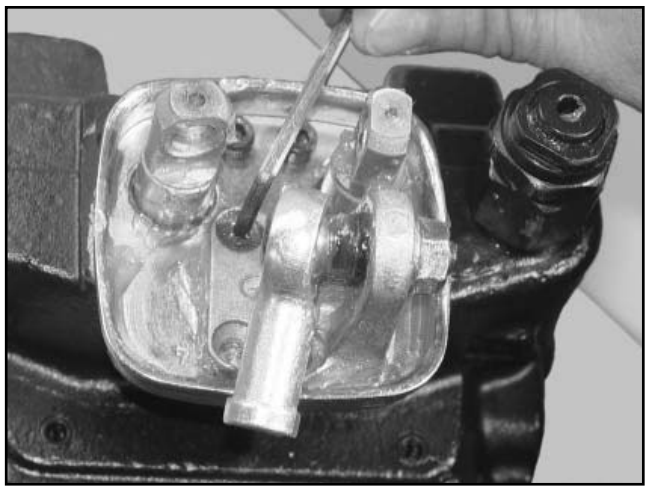


Figure 371 DSC-1398

6. Remove two hex head retaining screws that retain the joystick base plate (Fig. 372).

Figure 372 DSC-1399

7. Turn the valve assembly over. Remove the two hex head retaining screws securing each spring cap and remove (Fig. 373).

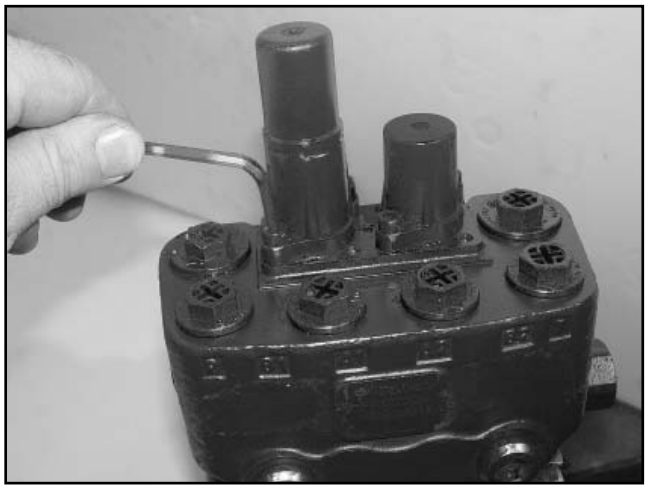


Figure 373 DSC-1400

8. Using a drift punch to hold the top end of the spool, remove the detent spring assembly from the bottom of the spool (Fig. 374).

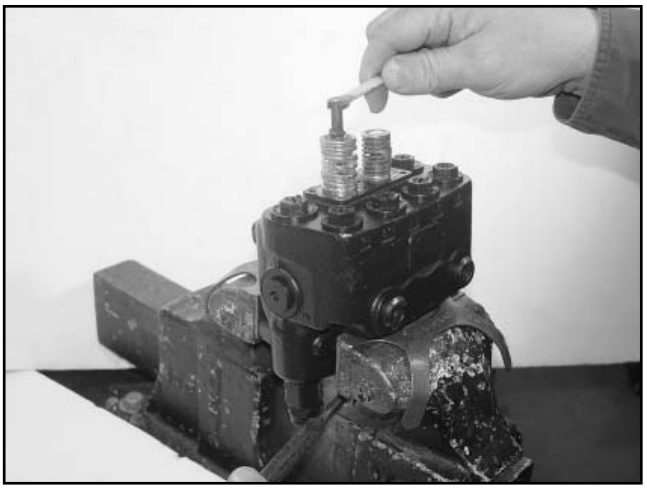


Figure 374 DSC-1404

9. Using a drift punch to hold the top end of the spool, remove the spring valve assembly with a hex wrench (Fig. 375).

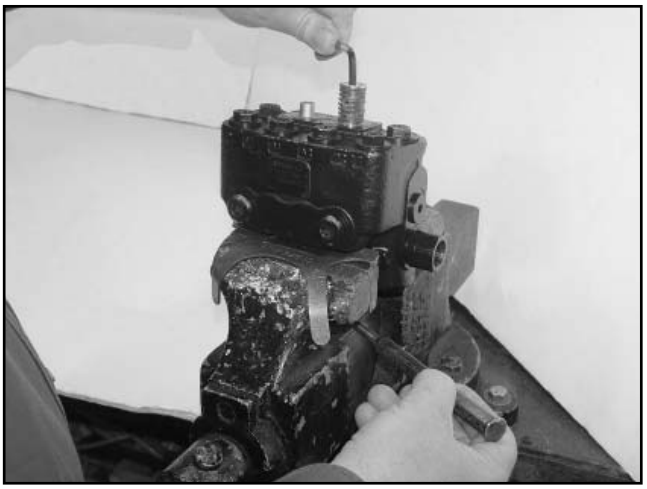


Figure 375 DSC-1406

10. Turn the valve in the vise sideways. Remove the tilt spool by twisting and pulling the spool out the top of the valve (Fig. 376).

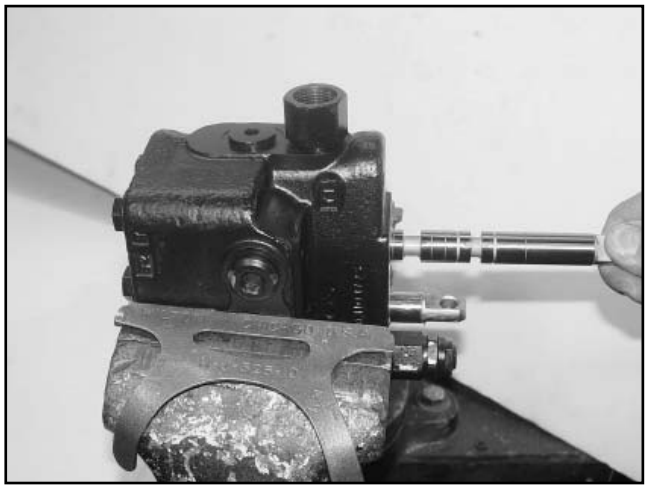


Figure 376 DSC-1407

11. Remove the lift spool by twisting and pulling the spool out of the valve (Fig. 377).

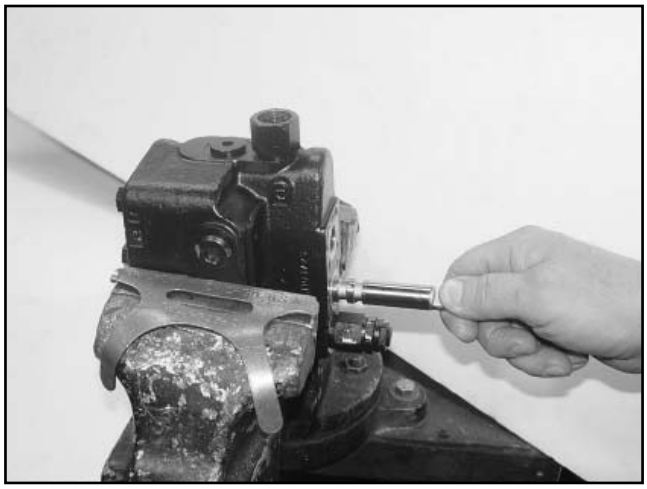


Figure 377 DSC-1408

Note: Visually inspect spool outside surfaces for scratches. Deep scratches are unacceptable and the spool needs to be replaced. Scratches that are deep enough to catch the fingernail are also unacceptable, and the spool needs to be replaced.

Before replacing the spool, clean and inspect the inner bore for damage. Check the condition of the o-rings, particularly for metallic particles embedded in the o-ring surface. Damage to o-ring grooves, particularly on the sealing surface, is unacceptable. In the event that an unacceptable condition occurs, the valve needs to be replaced (Fig. 378).

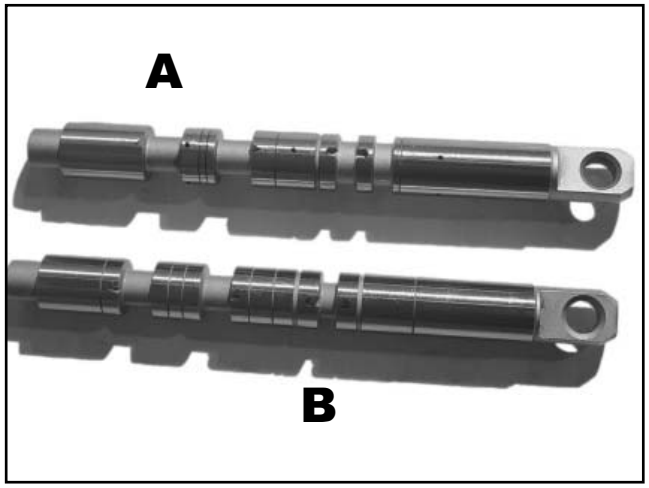


Figure 378 DSC-1410

A. Lift Spool with small relief holes
B. Tilt Spool

12. Using a tool with a 90° angle, (for example, a snap ring pliers with 90° tips) remove both the spool valve seals located at the top of the valve (Fig. 379).

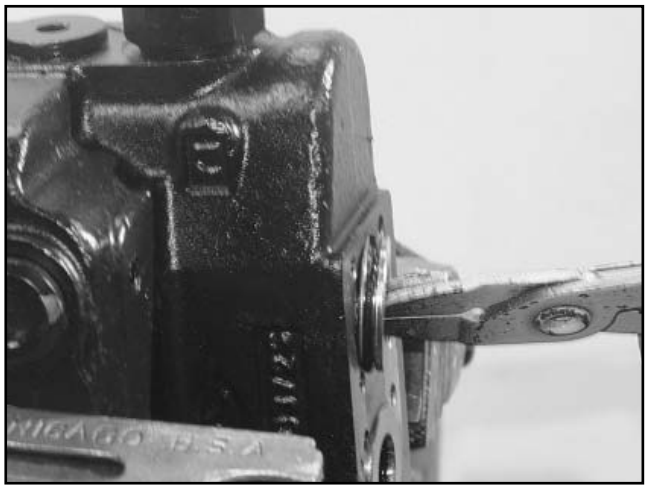


Figure 379 DSC-1411

13. Remove the two o-rings located at the bottom of the valve; a small dental pick works to help remove the o-rings (Fig. 380).

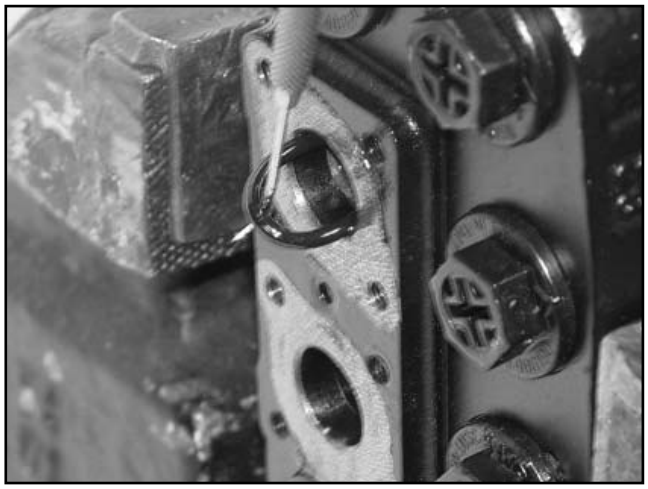


Figure 380 DSC-1413

Spool Assembly

Replace all seals and o-rings with new parts. Lubricate the valve, o-rings, and spool with 10W-30 oil prior to installation (Fig. 381).

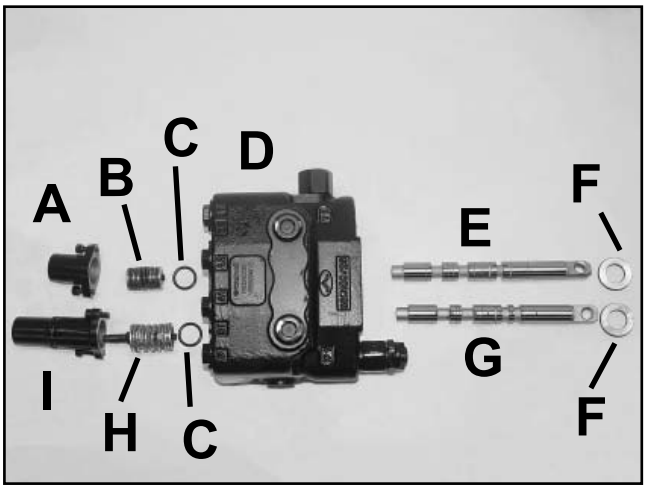


Figure 381 DSC-1414

A. Spring Cap
B. Tilt Spring
C. O-Ring
D. Valve Body
E. Tilt Spool
F. Spool Valve Seal
G. Lift Spool
H. Detent Spring
I. Detent Cap

1. Lubricate the two o-rings located at the bottom of the valve and install (Fig. 382).

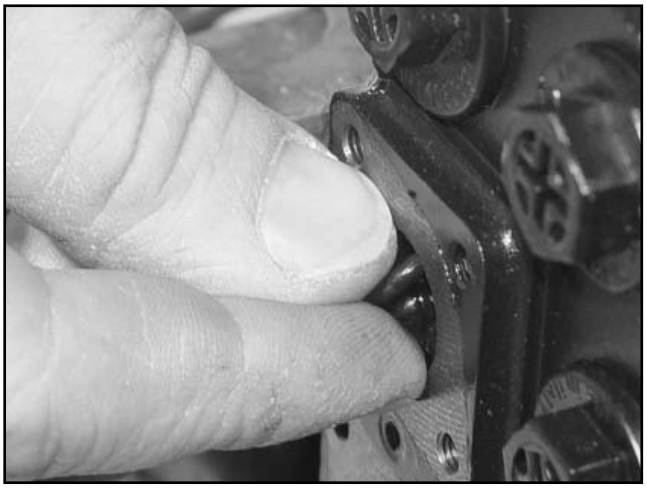


Figure 382 DSC-1415

2. Lubricate and install the spool valve seals in the top of the valve (Fig. 383).

Note: The thin wall of the seal goes into the valve body first.

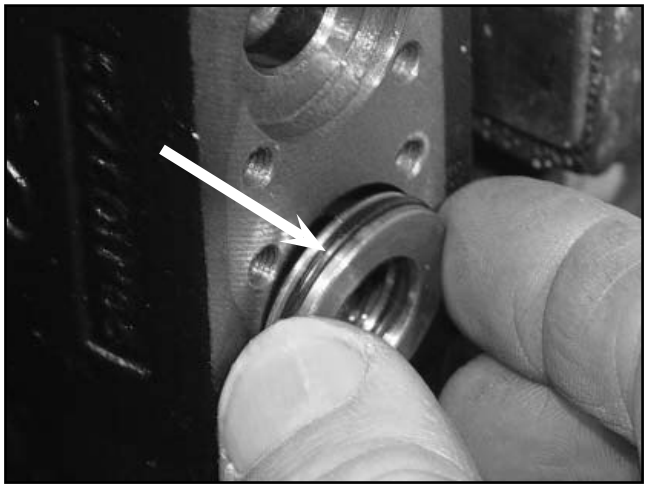


Figure 383 DSC-1416

3. Lubricate the tilt spool. Install the spool in the left port of the valve; twist and push gently, so you do not damage the o-ring (Fig. 384).

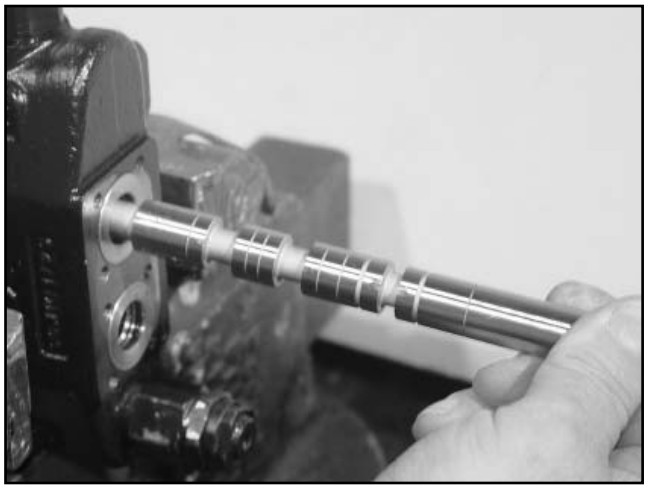


Figure 384 DSC-1417

4. Lubricate and install the lift spool in the right port of the valve, twist and push gently, so you do not damage the o-ring (Fig. 385).

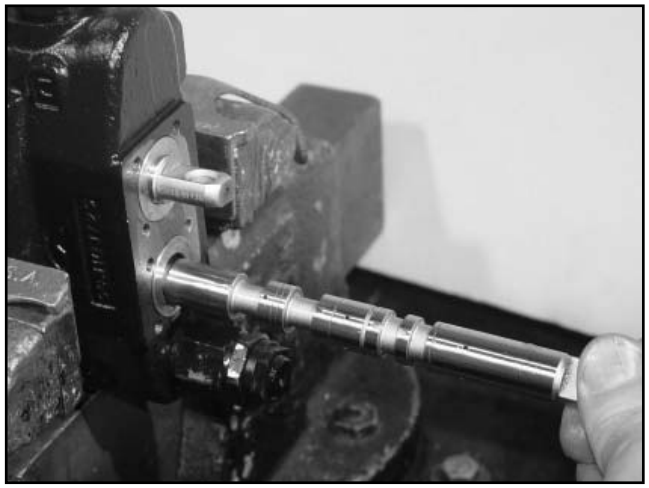


Figure 385 DSC-1418

5. Install the spring valve assembly with a hex wrench and torque to 5 ft-lbs. (6.8 Nm). Lubricate the spring with synthetic base grease grade NLGI2 (Fig. 386).

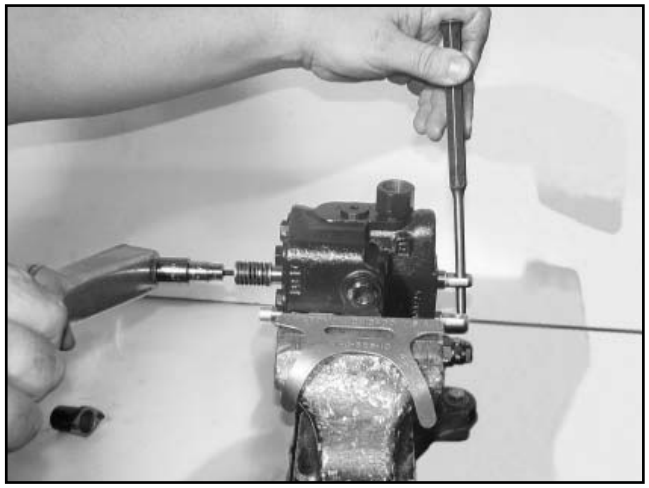


Figure 386 DSC-1419

6. Install the detent spring assembly and torque to 5 ft-lbs. (6.8 Nm). Lubricate the spring with synthetic base grease grade NLGI2 (Fig. 387).

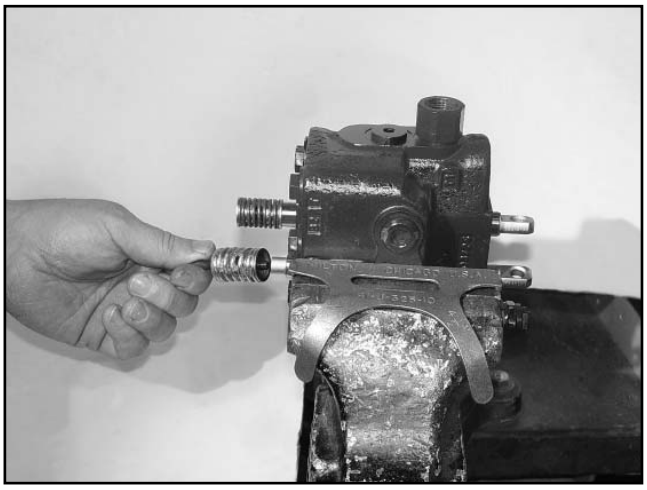


Figure 387 DSC-1420

7. Install spool caps over the detent and spring valve. Torque the cap screws to 5 ft. lbs. (6.8 Nm) (Fig. 388).

Figure 388 DSC-1421

8. Rotate the valve in the bench vise. Install gasket and joystick base plate with two cap screws, torque to 7 ft.lbs. (9.5 Nm) (Fig. 389).

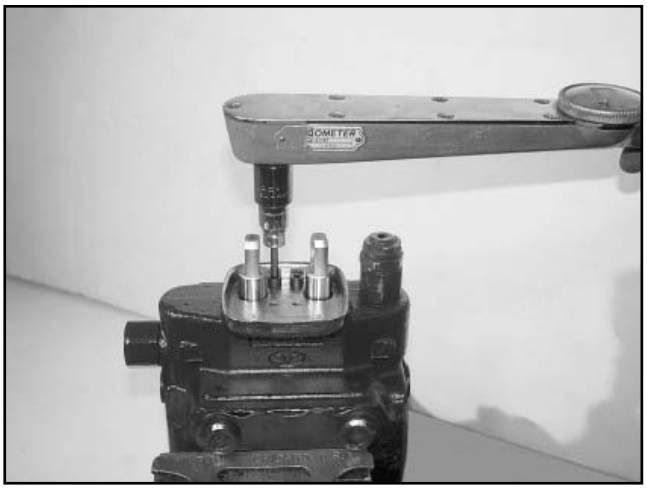


Figure 389 DSC-1423

9. Install the joystick pivot with two cap screws and torque to 7 ft.lbs (9.5 Nm) (Fig. 390).

Figure 390 DSC-1425

10. Apply a medium strength threadlocking material to the threads of the loader lift joystick joint, and install the retaining nut to the lift spool. Torque the nut to 31 ft-lbs. (42 Nm) (Fig. 391).

Figure 391 DSC-1428

11. Apply a medium strength threadlocking material to the threads of the joystick pin and torque the nut to 31 ft-lbs. (42 Nm) (Fig. 392).

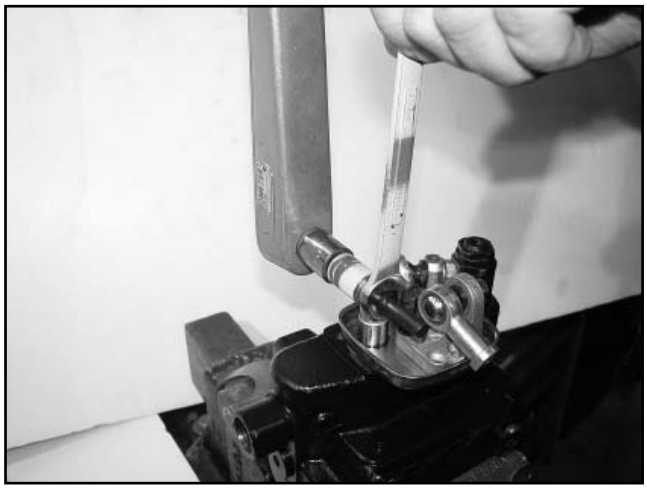


Figure 392 DSC-1429

12. Install the end rod on the joystick pin (Fig. 393).

Figure 393 DSC-1430

13. Install the articulated holder with 3 cap screws and torque to 18 ft-lbs. (24.4 Nm) (Fig. 394).

Figure 394 DSC-1431

14. Lubricate all articulated parts inside the mechanical joystick area with synthetic base grease grade NLGI2 (Fig. 395).

Figure 395 DSC-1434

15. Install the rubber bellows over the base plate and install the tie strap in the groove of the rubber bellows (Fig. 396).

Figure 396 DSC-1435

16. Install the lift/tilt handle (Fig. 397).

Figure 397 DSC-1436

Power Beyond Sleeve-Port

This sleeve seals off the return oil port and directs the hydraulic oil to the auxiliary valve (Fig. 398).

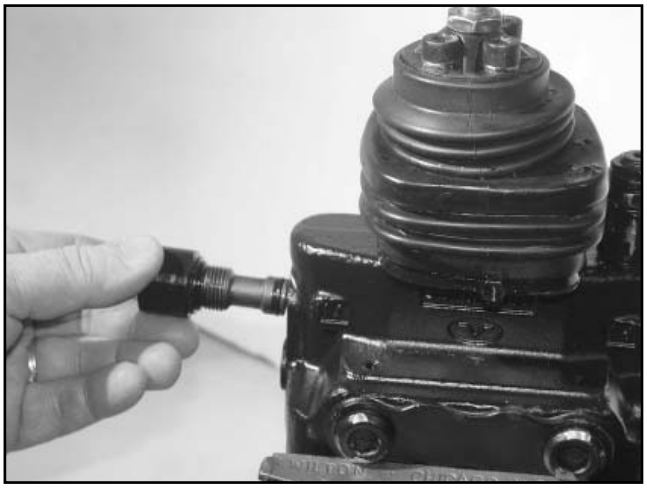


Figure 398 DSC-1437

Main Relief Valve

Pressure relief is designed to prevent internal fluid pressure from rising above a pre-determined maximum pressure (Fig. 399).

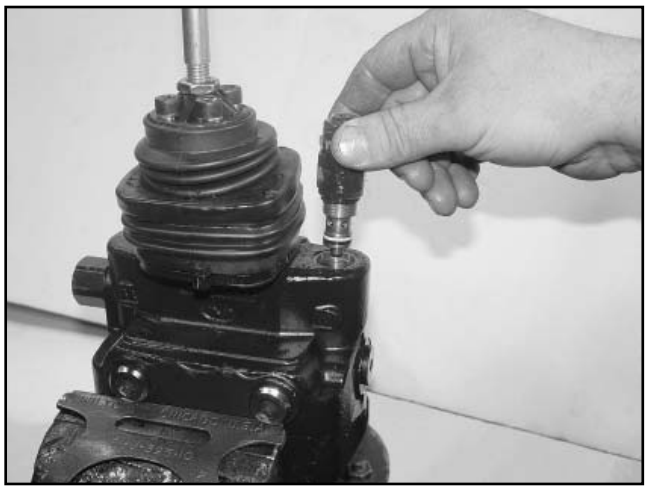


Figure 399 DSC-1438

The relief valve is used to adjust to the specified system pressure (2650 psi or 182.71 bar) by increasing or decreasing the load on the spring against the disc. Loosen the lock nut turn screw inward to increase the pressure or outward to decrease the pressure (Fig. 400).

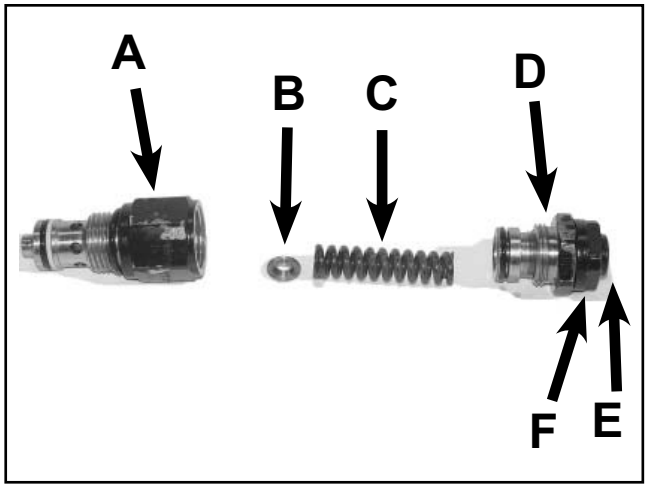


Figure 400 DSC-1439

A. Bonnet
B. Disc
C. Spring
D. Body
E. Set screw
F. Set screw lock nut

Work Port Relief

The work relief ports relieve the fluid spikes when the Lift and Tilt Cylinders are being actuated (Fig 401 and Fig. 402). These ports are non-adjustable. Port relief setting is 2030 psi (140 bar).

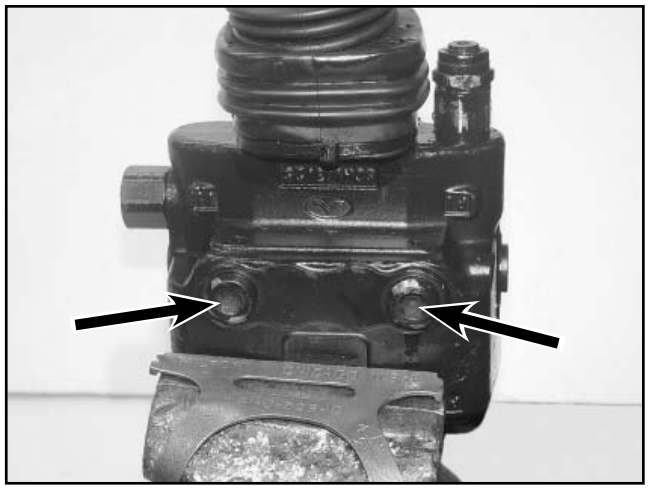


Figure 401 DSC-1440

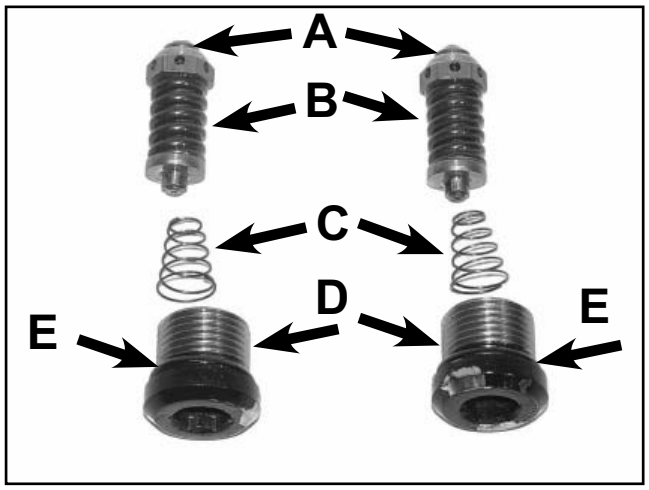


Figure 402 DSC-1442

A. Seat
B. Relief
C. Spring
D. Plug
E. O-ring

Auxiliary Valve Disassembly and Assembly

Before disassembly of any hydraulic component, use a clean, dirt-free work surface and clean solvent to prevent system contamination (Fig. 403).

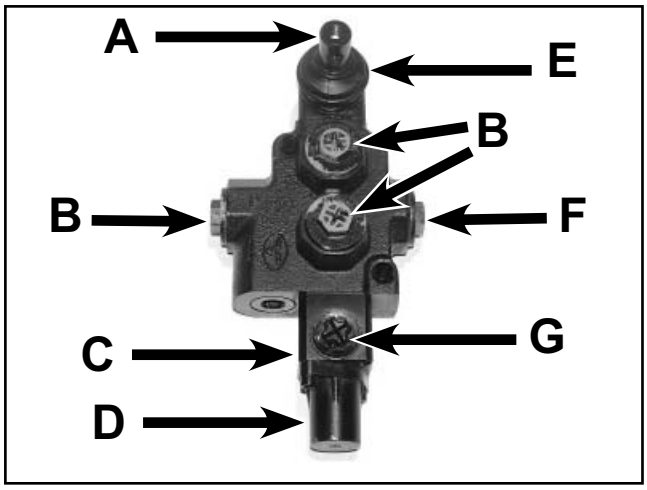


Figure 403 DSC-1443

A. Operator lever
B. Inlet
C. Detent
D. Return spring cap
E. Rubber bellows
F. Return
G. Safety switch port

Disassembly

1. Remove the top lever assembly by removing the two hex head screws (Fig. 404).

Figure 404 DSC-1444

2. Remove the spring cap by removing the two hex head cap screws (Fig. 405).

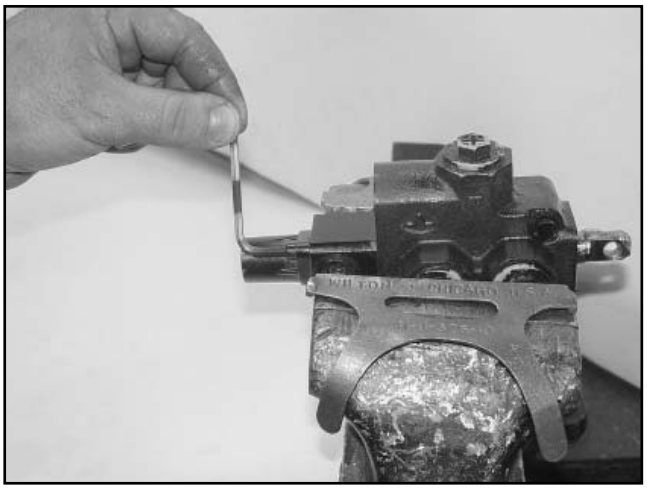


Figure 405 DSC-1445

3. Remove the spool spring by removing the hex cap screw. Use a drift punch to hold the top of the spool (Fig. 406).

Figure 406 DSC-1446

4. Remove the bottom neutral switch block by removing the two hex cap screws (Fig. 407).

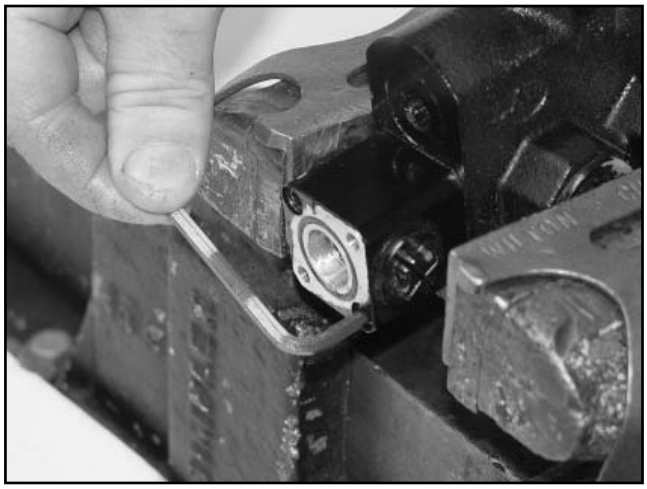


Figure 407 DSC-1448

5. Remove the spool from the bottom of valve (Fig. 408).

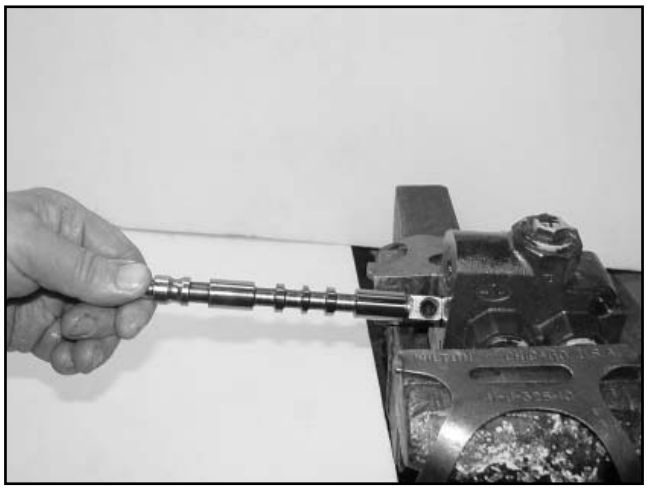


Figure 408 DSC-1450

Note: Visually inspect spool outside surfaces for scratches. Deep scratches are unacceptable and the spool needs to be replaced. Scratches deep enough to catch the fingernail are also unacceptable and the spool needs to be replaced. Before replacing the spool, clean and inspect the inner bore for damage. Check the condition of the o-rings particularly for metallic particles embedded in the o-ring surface. Damage to o-ring grooves, particularly on the sealing surface, is unacceptable. In the event that an unacceptable condition occurs, the valve needs to be replaced.

6. Remove the two o-rings located at each end of the valve. A small dental pick works to remove the o-ring (Fig. 409).

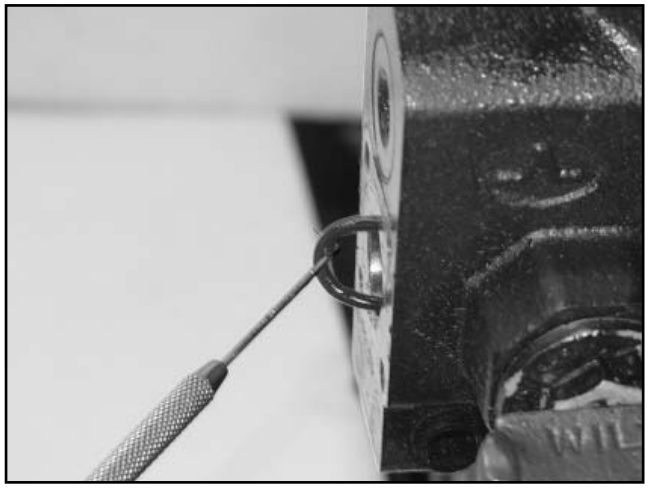


Figure 409 DSC-1451

7. Remove relief plug cavity (Fig. 410).

Figure 410 DSC-1452

8. Remove the two o-rings located at each end of the neutral switch block (Fig. 411).

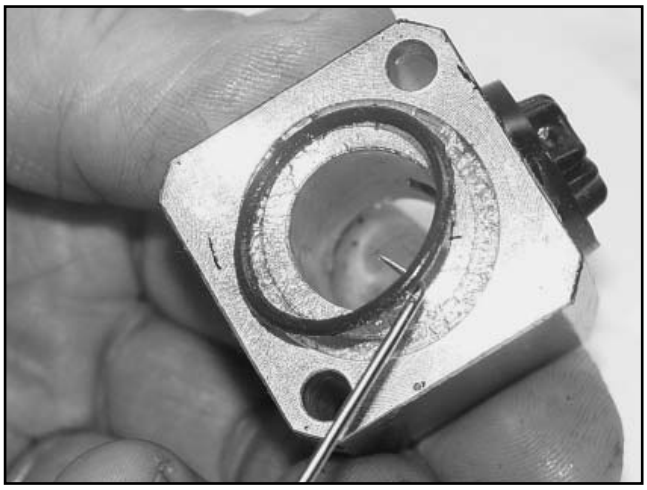


Figure 411 DSC-1453

Assembly

Note: Replace all seals and o-rings with new parts. Lubricate the valve, o-rings, and spool with 10W-30 oil prior to installation.

1. Lubricate and install the two o-rings located at the top and bottom of the valve (Fig. 412).

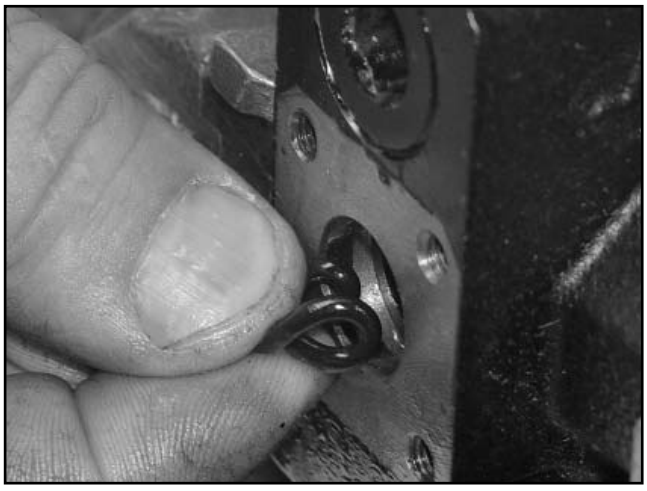


Figure 412 DSC-1454

2. Lubricate and carefully install the spool, from the bottom of the valve (Fig. 413).

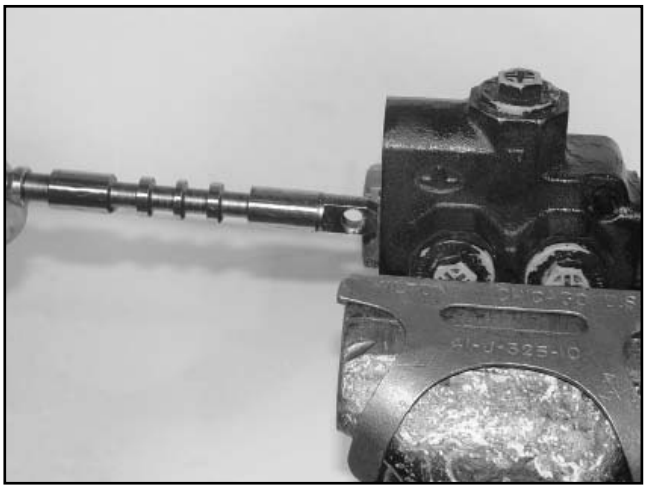


Figure 413 DSC-1455

3. Install the neutral switch block with two hex head screws, torque to 5 ft-lbs. (6.8 Nm) (Fig. 414).

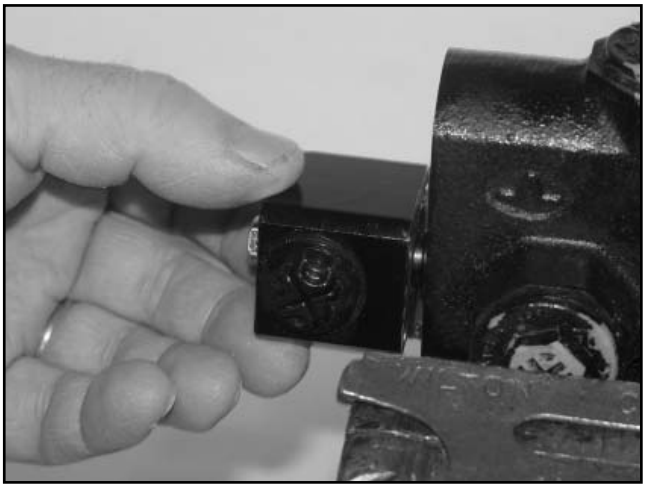


Figure 414 DSC-1456

4. Install the spool spring with a hex head screw, torque to 5 ft-lbs. (6.8 Nm) (Fig. 415).

Note: Lubricate the spring with synthetic base grease grade NLGI2.

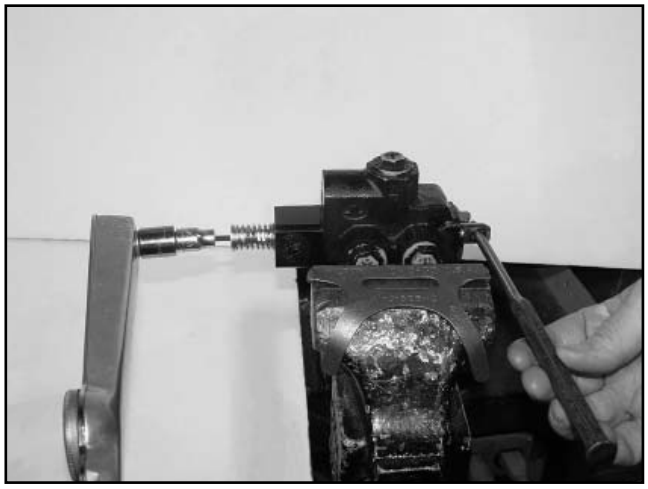


Figure 415 DSC-1457

5. Install the spring cap and torque the hex head screws to 5 ft-lbs. (6.8 Nm) (Fig. 416).

Figure 416 DSC-1458

6. Lubricate the cavity of the top lever assembly with a synthetic base grease grade NLGI2. Install the lever assembly and gasket. Torque the hex head screws to 5 ft-lbs. (6.8 Nm) (Fig. 417).

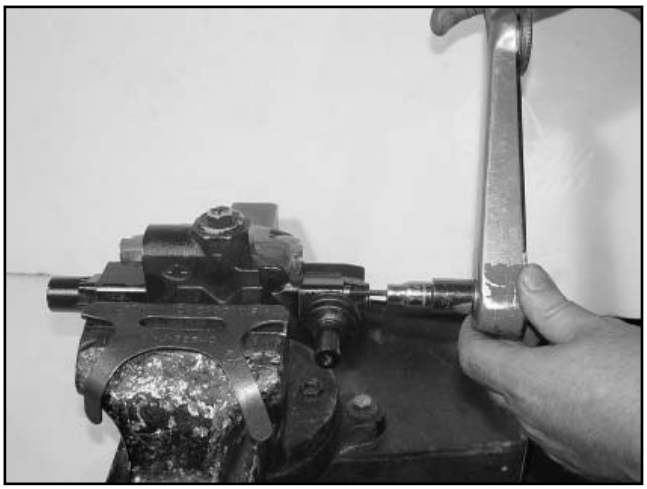


Figure 417 DSC-1460

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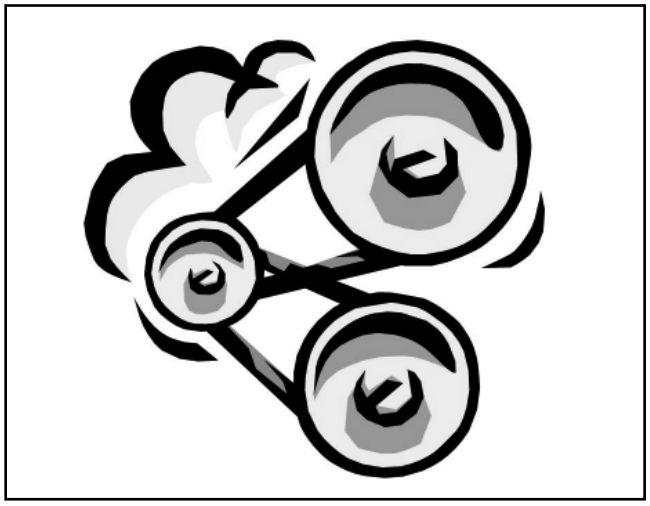
DRIVE SYSTEM



Drive Belt Removal

1. Shut engine "OFF", apply parking brake, and remove ignition key.
2. Remove belt cover knob and remove the belt cover (Fig. 418).

Figure 418 DSC-0777

3. Disconnect the two rear latches and remove the rear cover (Fig. 419).

Figure 419 DSC-0778

4. Remove the two fasteners holding the pulley cover and remove cover (Fig. 420).

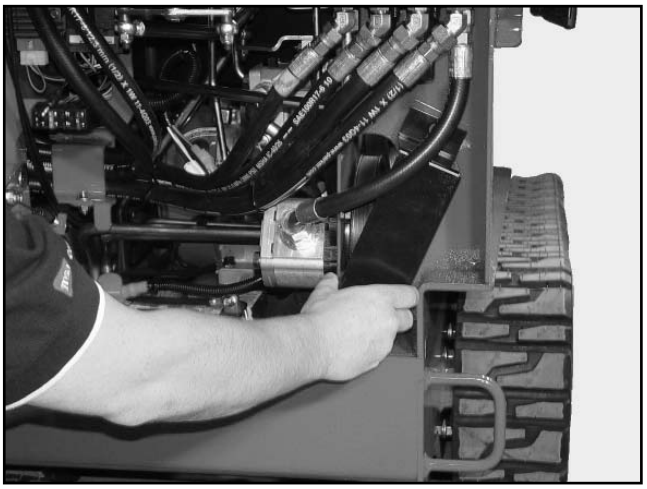


Figure 420 DSC-0779

5. Using a 12” (30.5cm) crow foot pry bar, insert the end of the crow foot between the idler bracket tab and the idler pivot shaft (Fig. 421).

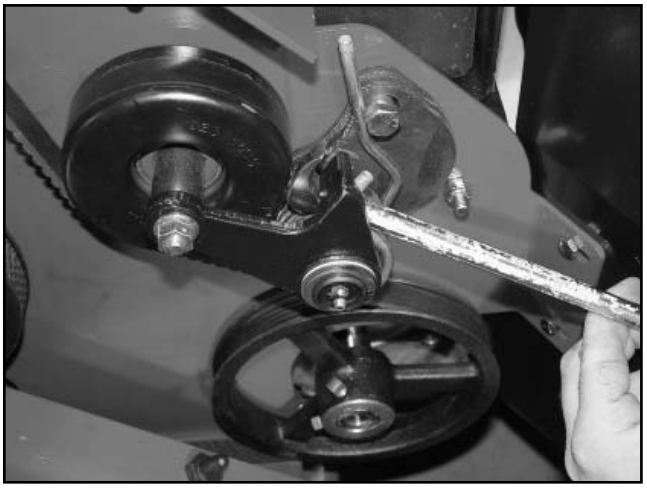


Figure 421 DSC-0785

6. Pry down with the pry bar to remove tension and remove the belt from the engine drive pulley (Fig. 422).

Figure 422 DSC-0788

7. Remove the belt around the upper and lower hydraulic pump pulleys, and around the gear pump pulley. Slide the belt out the rear of the unit (Fig. 423).

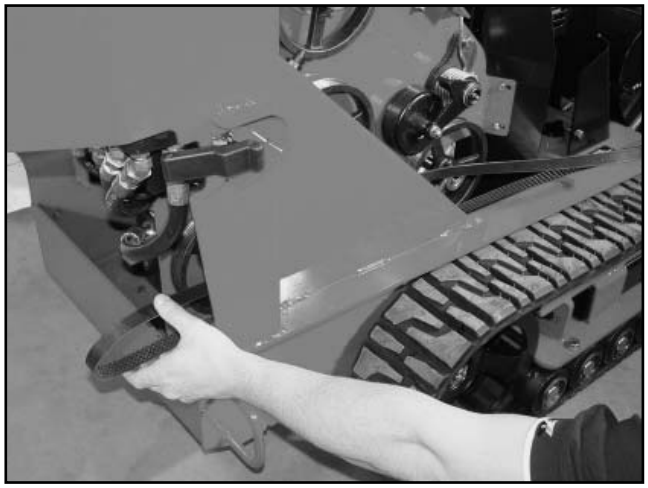


Figure 423 DSC-0782

Drive Belt Installation

1. Start by taking the belt and feeding it through the rear of the unit, around the gear pump pulley and then around both the lower and upper hydraulic pump pulleys (Fig. 424).

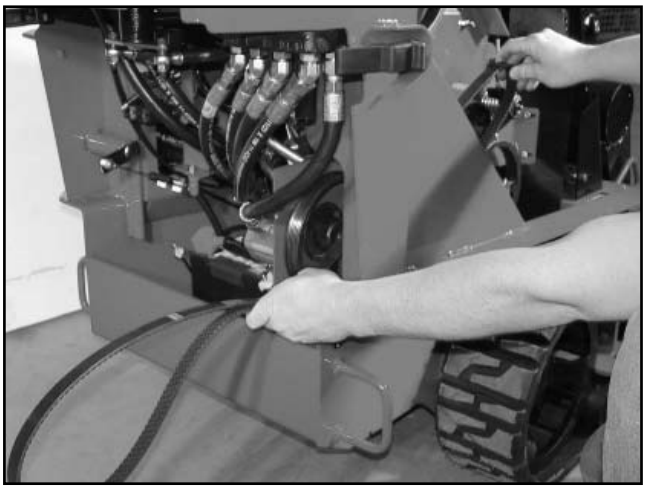


Figure 424 DSC-0783

2. Using a 12" (30.5cm) crow foot pry bar, insert the crow foot end of the pry bar between the idler pivot shaft and the pivot arm tab. Pry down (clockwise) on the pry bar and install the belt around the engine drive pulley (Fig. 425).

Figure 425 DSC-0790

3. Check belt routing, (Fig. 426). Start unit to make sure the belt is operating properly.

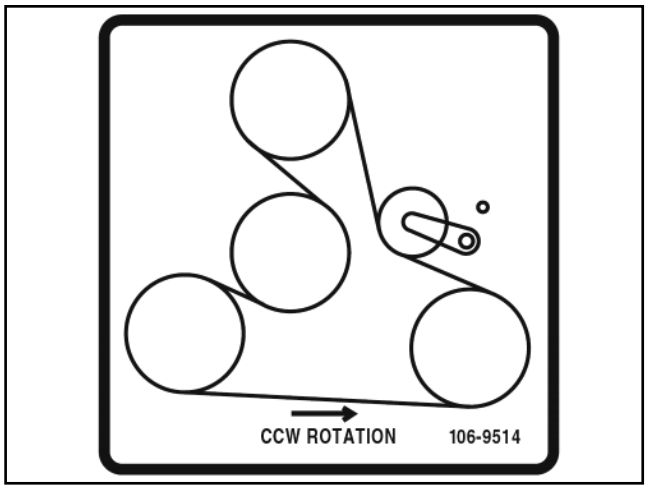


Figure 426 106-9514 decal

4. Install drive belt cover with retaining knob, the pulley cover with two bolts, and the rear cover.

Track Removal

1. Raise and securely support the side of the unit to be worked on so that the track is 3 to 4” (7.6 to 10cm.) off the ground (Fig. 427).

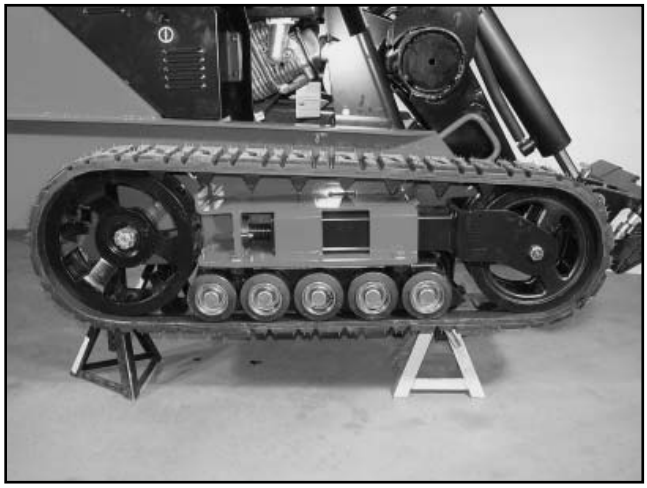


Figure 427 DSC-0791

2. Remove the bolt and nut securing the tensioner bolt (Fig. 428).

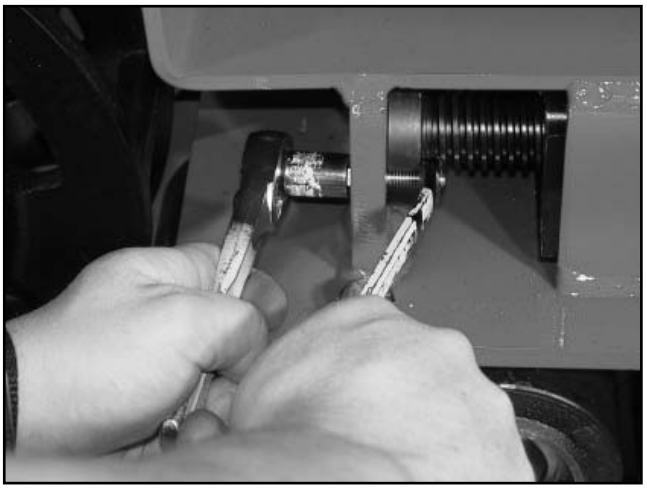


Figure 428 DSC-0793

3. Using a 1/2” drive socket ratchet, release the drive tension by turning the tensioner bolt clockwise until the tensioning nut contacts the tensioner bolt head. Push the tension wheel toward the rear of the unit (Fig. 429 and Fig 430).

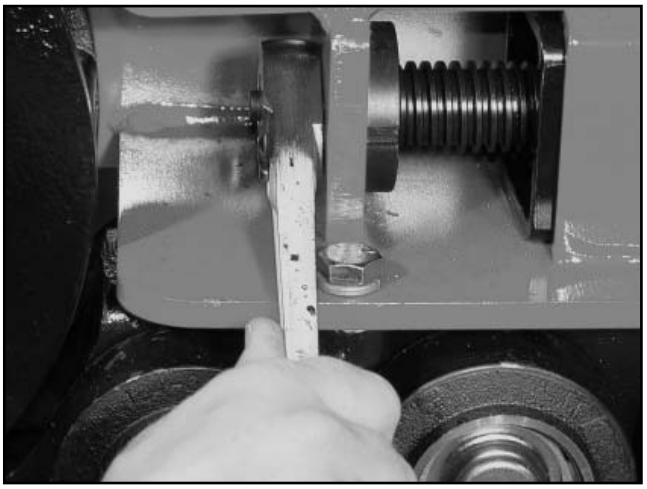


Figure 429 DSC-0794

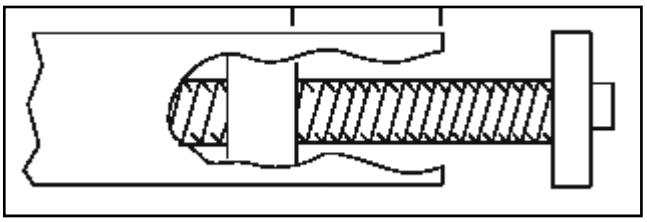


Figure 430 track install #3

4. Begin removing the track at the top of the tension wheel, lifting up on the the track removing any slack from the bottom (Fig. 431).

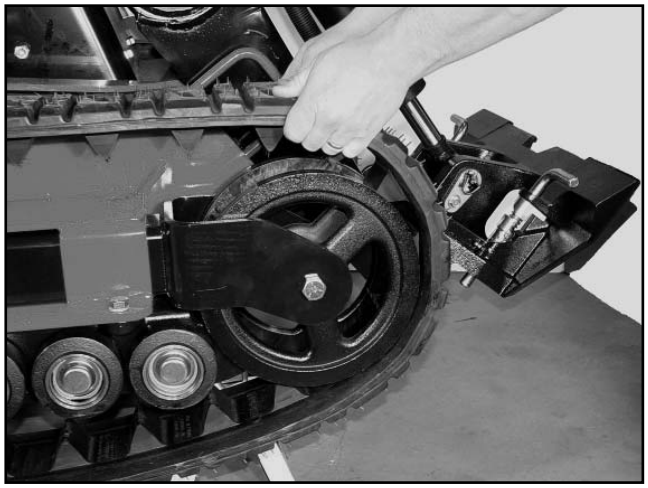


Figure 431 DSC-0795

5. Start working the track off the front tension wheel while rotating the track forward (Fig. 432).

Figure 432 DSC-0796

6. Use a pry bar to help assist in removal of the track (Fig. 433).

Figure 433 DSC-0798

7. Remove the track off the rear drive wheel (Fig. 434).

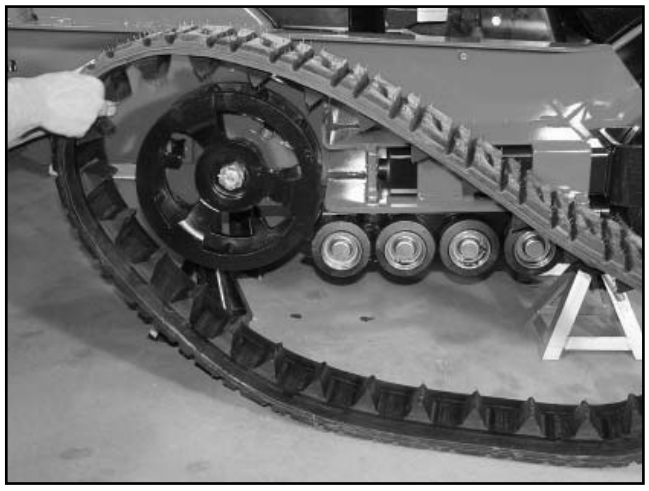


Figure 434 DSC-0801

Tensioner Wheel Bearing Replacement

1. Remove tensioner arm assembly out of the frame (Fig. 435).

Figure 435 DSC-1724

2. Remove the bolt and nut holding the tensioner wheel to the tensioner arm (Fig. 436).

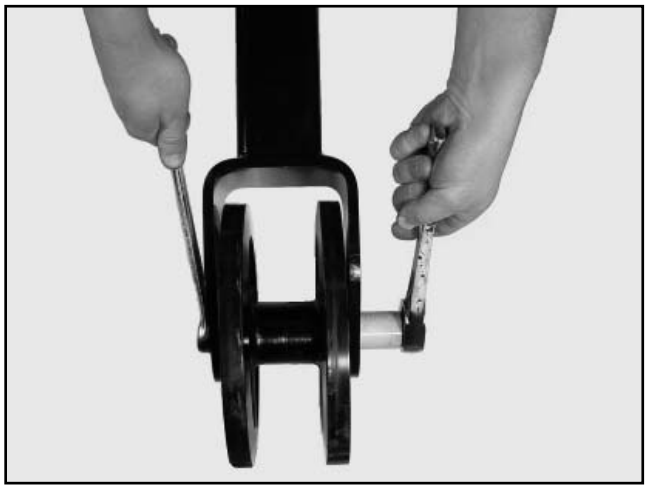


Figure 436 DSC-0804

3. Support the tensioner wheel so there is a space under it for bearing removal. Using a hammer, drive the upper bearing down to create a gap between spacer and bearing, then use a drift punch to hammer the lower bearing out. The spacer will fall out when bearing is removed. Turn the tensioner wheel over and drive out the other bearing. Inspect the tensioner wheel housing and spacer (Fig. 437).

Figure 437 DSC-0808

Bearing Installation

Note: The raised inner race of the bearing should be facing outward on both bearings on the tensioner wheel (Fig. 438).

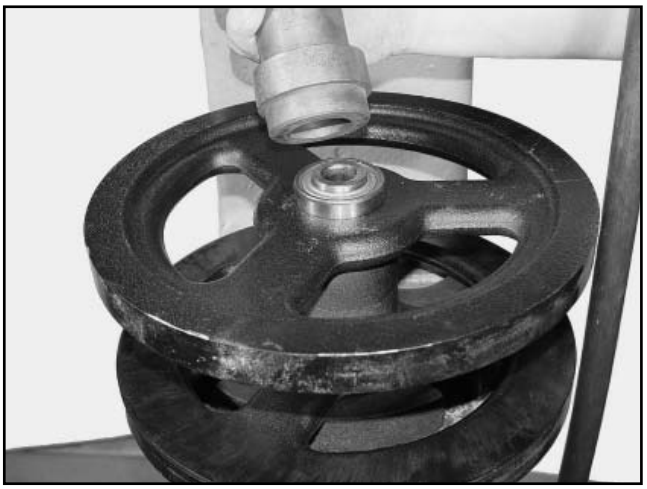


Figure 438 DSC-0810

1. Press the first bearing in so far that the outer bearing race is flush with the center hub. Turn the tensioner wheel over and install the spacer centered on the inner race (tensioner wheel bolt can be used to keep the spacer centered to the bearing inner race) and press the second bearing in until the spacer is held in tight between the bearings.

Important: Press on outer bearing race only, otherwise bearing damage could occur.

Note: The outer race of the bearing is flush with the center hub of the tensioner wheel (Fig. 439).

Figure 439 DSC-0811

2. Reassemble the tensioner wheel to the tensioner arm.

Note: Make sure that grease is applied to the flat washers on both sides and the washers are installed between the tensioner arm and tensioner wheel on both sides (Fig. 440).

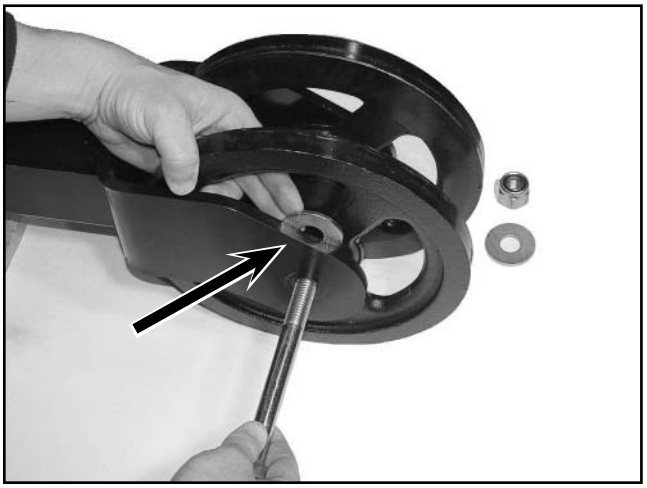


Figure 440 DSC-0813

3. Torque the bolt and nut holding the tensioner wheel to the frame to 150 ± 15 ft-lbs. (203 ± 20 Nm) (Fig. 441).

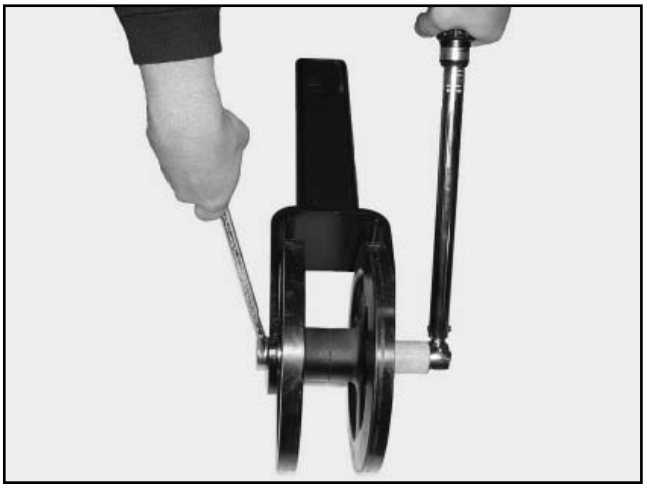


Figure 441 DSC-0814

4. Install compression spring and the bolt tensioner with tensioning nut.

Note: Make sure the tensioning nut is contacting the bolt tensioner (Fig. 442).

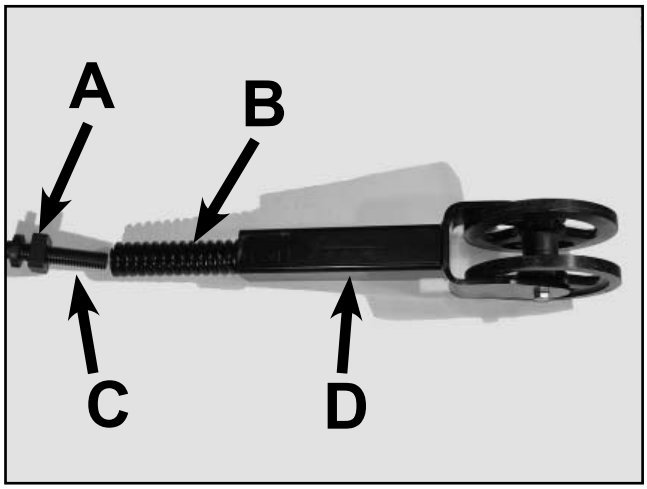


Figure 442 DSC-0815

A. Tensioning nut
B. Compression spring
C. Tensioning bolt
D. Tension Arm

5. Install the tensioner assembly into the frame (Fig. 443).

Figure 443 DSC-1724

Track Guide Alignment

Alignment Tool – P/N 110-0069 (Fig. 444)

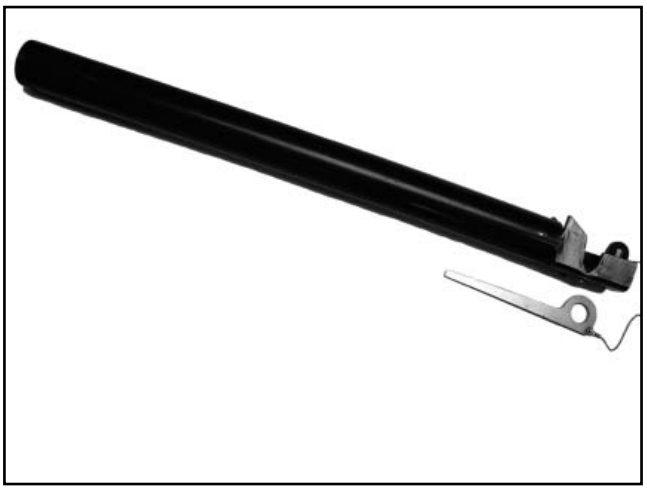


Figure 444 DSC-0624

1. Insert the notched end of the alignment tool into the drive wheel spacer (Fig. 445).

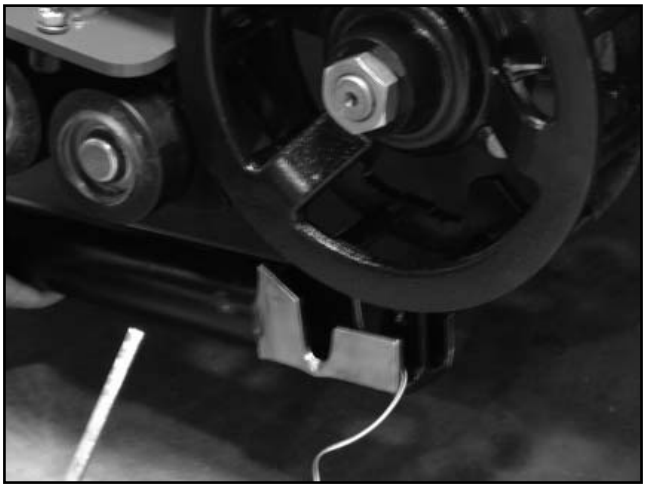


Figure 445 DSC-0625

2. Secure the end with the pin (Fig. 446).

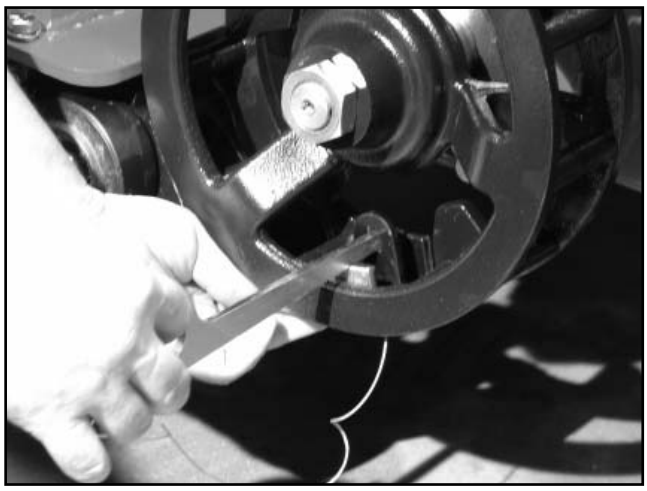


Figure 446 DSC-0628

3. Rotate the tool and move the track guide as necessary until the tool fits into the track guide channel. Secure the end of the tool with a strap (Fig. 447).

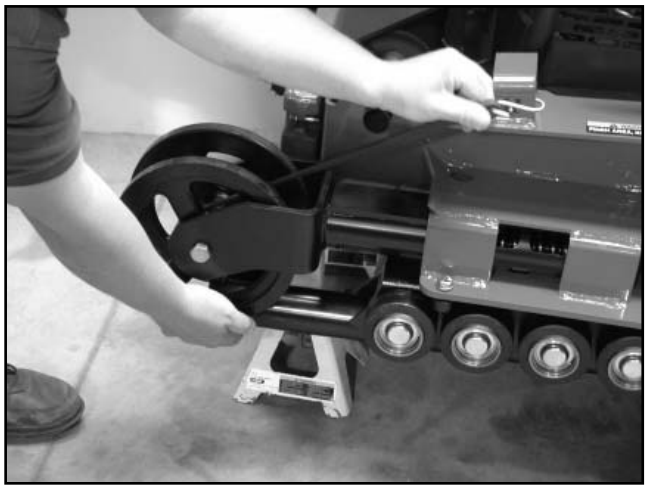


Figure 447 DSC-0629

4. Tighten and torque the 4 track guide mounting bolts to 75 ft lbs (102 Nm) (Fig. 448).

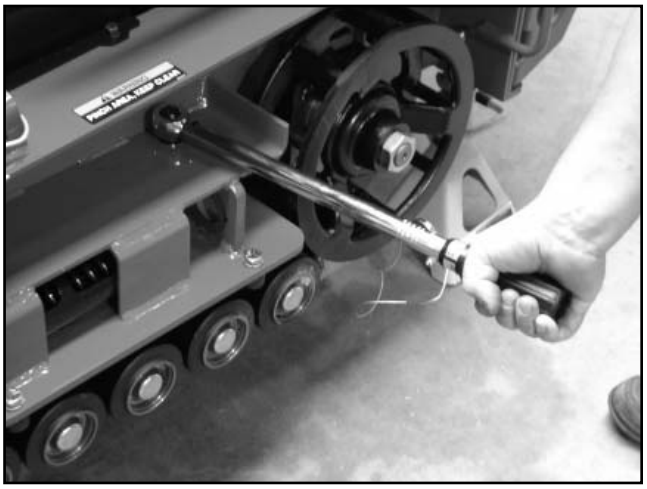


Figure 448 DSC-0631

5. Remove the alignment tool.

Track Installation

1. Engage the lugs on the track between the spacers on the drive sprocket (Fig. 449).

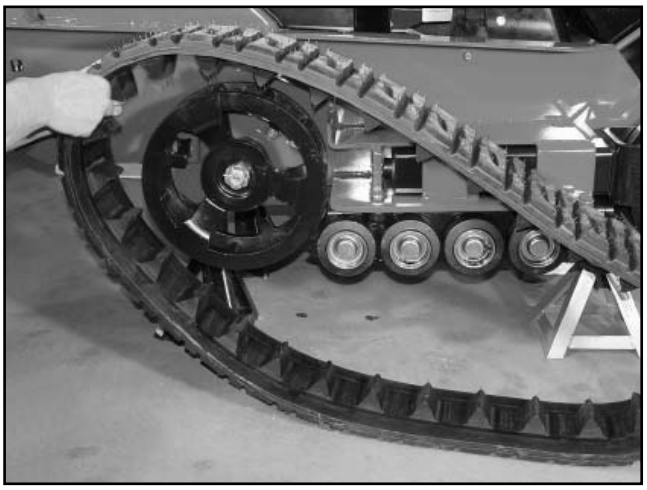


Figure 449 DSC-0801

2. Push the track under and between the road wheels. Starting at the bottom of the tension wheel, install the track around the wheel by rotating the track rearward while pushing the lugs into the wheel (Fig. 450).

Figure 450 DSC-0796

3. Turn the tensioning screw counter-clockwise, (Fig. 451), until the distance between the tension nut and the back of the tensioner arm is 2-1/2 inches (6.35cm) (Fig. 452).

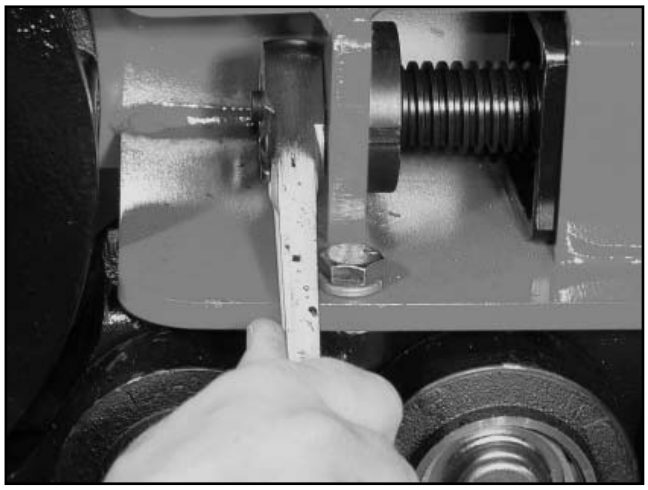


Figure 451 DSC-0794

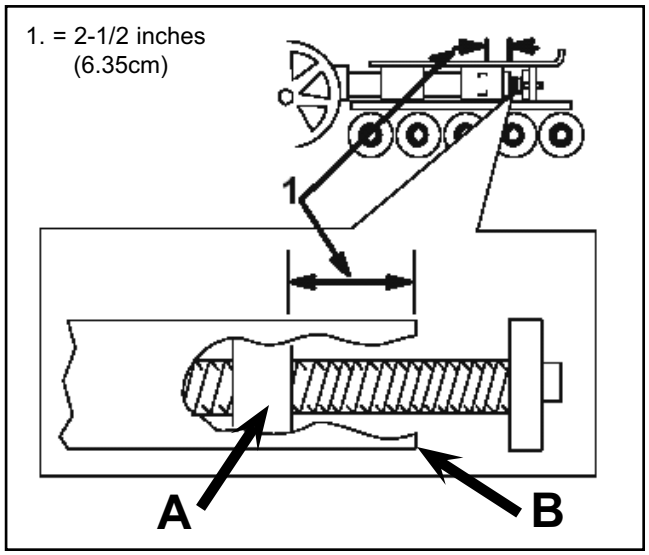


Figure 452 track install #3

A. Tension nut B. Tensioner Arm

4. Align the closest notch in the tension screw to the locking bolt hole and secure the screw with the locking bolt and nut (Fig. 453).

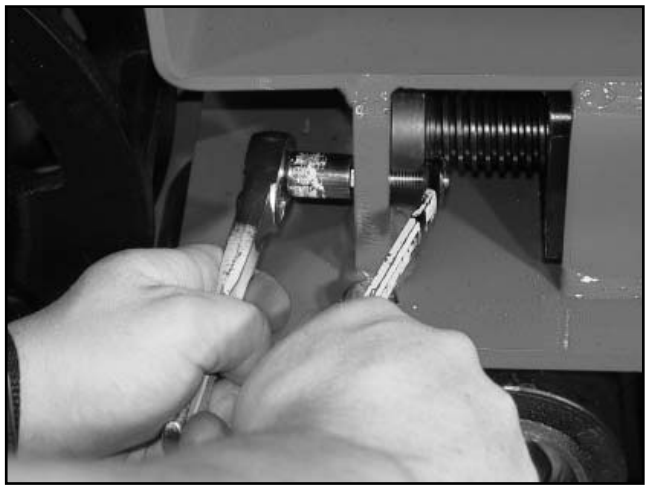


Figure 453 DSC-0793

Track Guide Removal

1. Raise and securely support the side of the unit to be worked on so that the track guide is far enough off the ground to remove from the unit.
2. Remove the track, refer to "Track Removal" on page 8-4.
3. Install a hydraulic floor jack and 6" (15.24cm) wide board long enough to fit under the track guide (Fig. 454).

Figure 454 DSC-0817

4. Remove the four bolts holding the track guide to the frame (Figure 455).

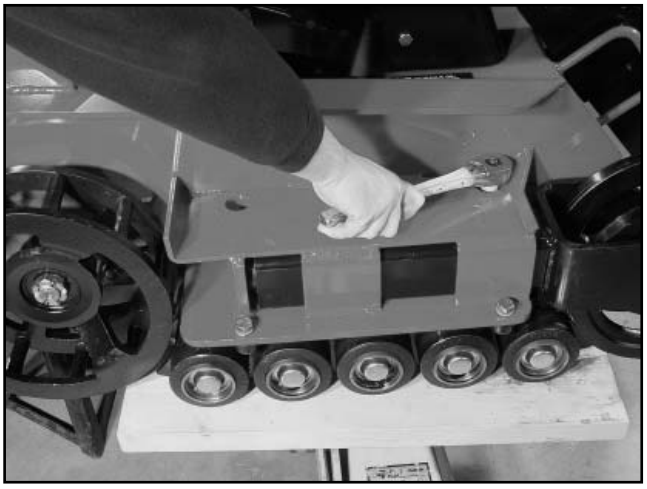


Figure 455 DSC-0819

5. Lower the track guide from the frame (Fig. 456).

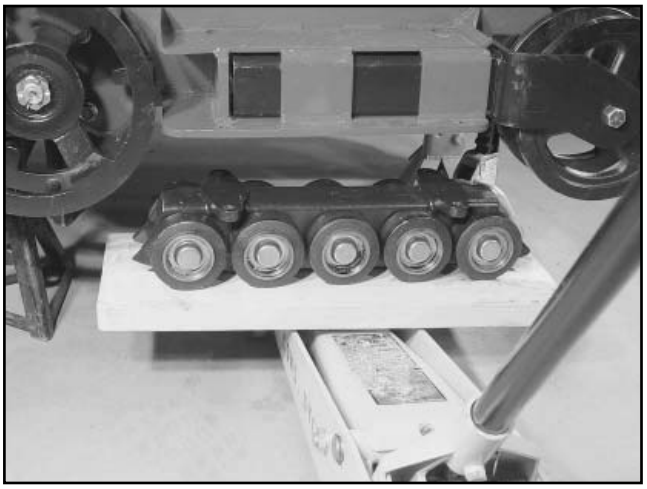


Figure 456 DSC-0820

Road Wheel Bearing Replacement

Check and grease the road wheels every 250 operating hours, or yearly.

Note: It is usually not necessary to remove the track guide when replacing any of the road wheel bearings. They can also be removed by raising the unit off the ground. For safety reasons, make sure the frame of the unit is securely supported.

1. Remove the snap ring from the inner hub of the road wheel (Fig. 457).

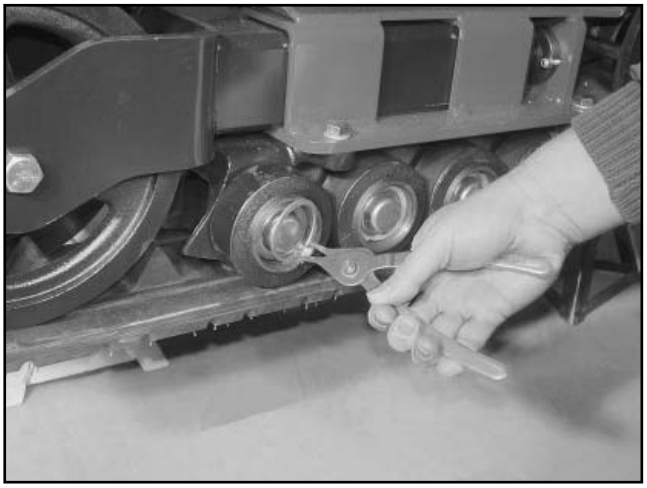


Figure 457 DSC-0821

2. Remove wheel bearing cap with seal (Fig. 458).

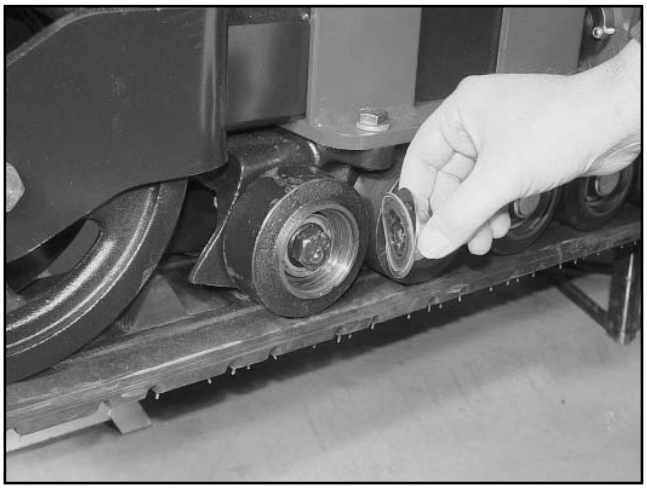


Figure 458 DSC-0822

3. With a ratchet and socket, remove bolt retaining the road wheel (Fig. 459).

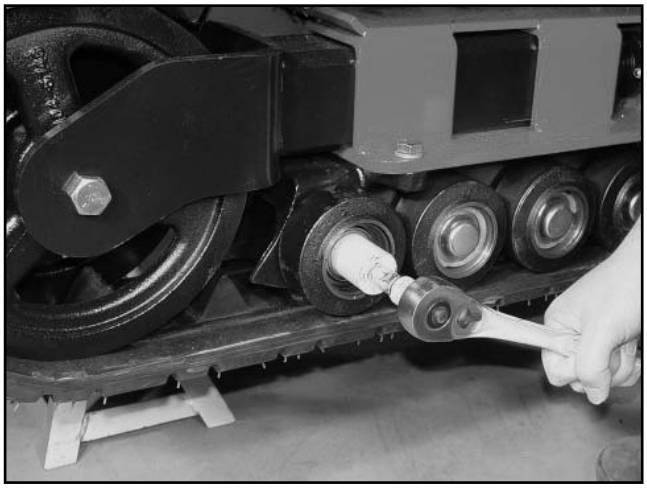


Figure 459 DSC-0823

4. Remove the road wheel from the track guide (Fig. 460).

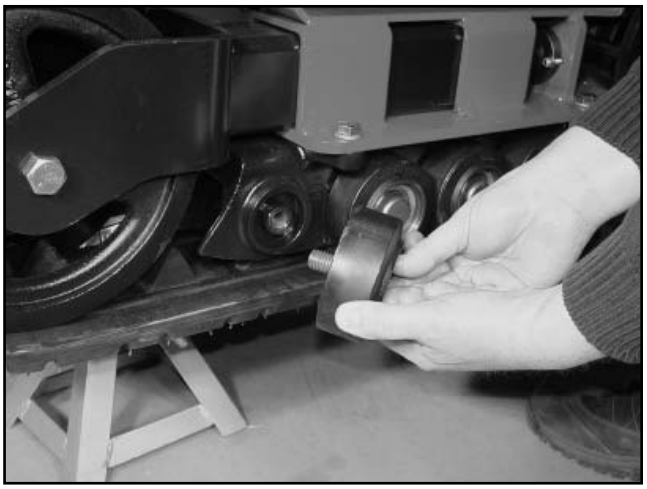


Figure 460 DSC-0824

5. Press bearing out from the seal side, pressing on the inner race of the bearing (Fig. 461).

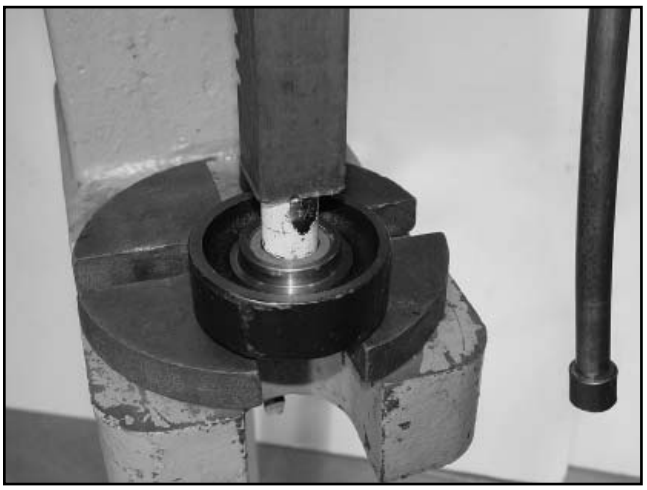


Figure 461 DSC-0827

6. Using a drift punch and hammer, tap out the seal (Fig. 462).

Figure 462 DSC-0828

Installation of Road Wheel Bearing and Road Wheel Assembly

1. The raised portion of the bearing should be installed toward the seal side (Fig. 463).

Figure 463 DSC-0829

2. Pressing on the outer race, press bearing in until it seats against the inner shoulder of the road wheel (Fig. 464).

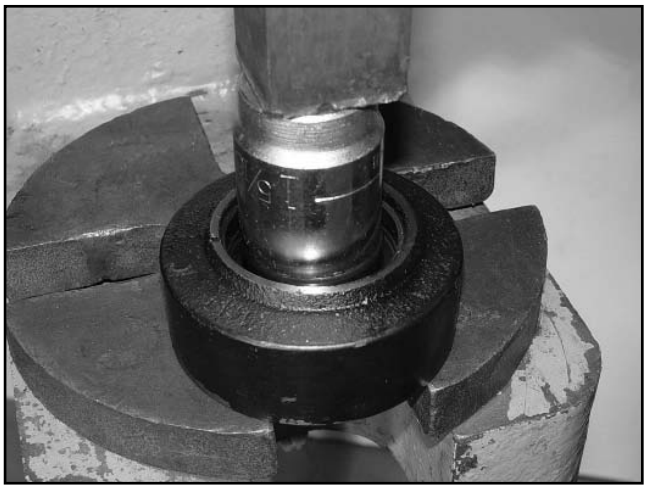


Figure 464 DSC-0830

3. Apply grease around the bearing before installing the seal (Fig. 465).

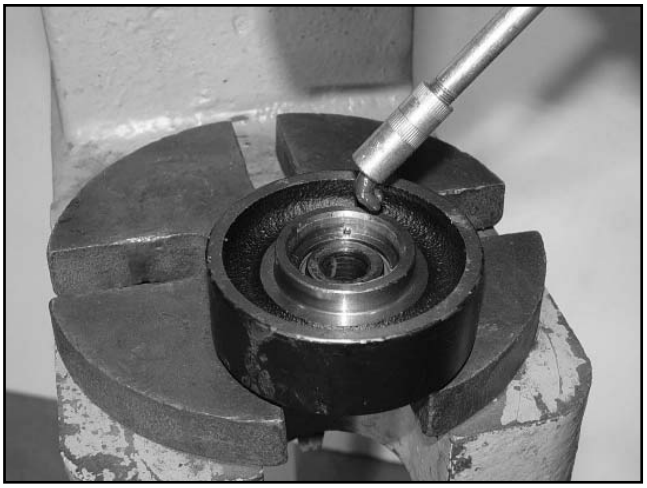


Figure 465 DSC-0831

4. Align seal so the lip is facing the bearing (Fig. 466).

Figure 466 DSC-0832

5. Press seal in until it is flush with the inner hub of the road wheel (Fig. 467).

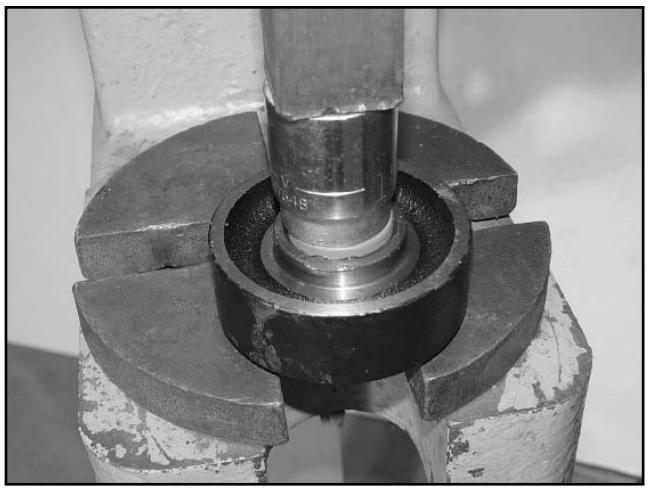


Figure 467 DSC-0833

6. Install the road wheel on the track guide and torque bolt to 150 ft-lbs. (203 Nm) (Fig. 468).

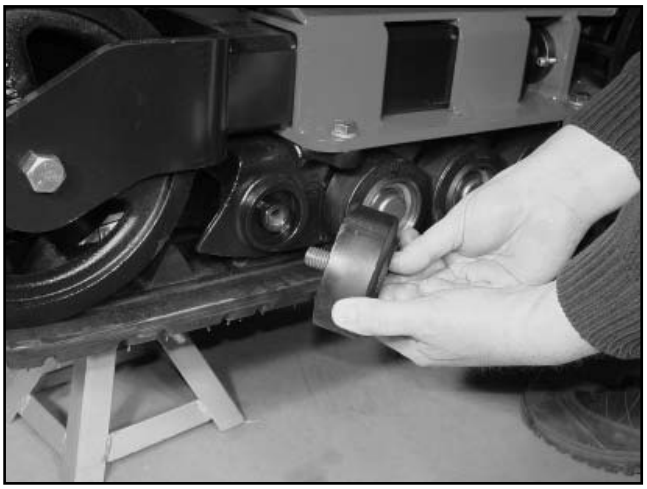


Figure 468 DSC-0824

7. Fill the cap with grease and install the wheel gasket (Fig. 469).

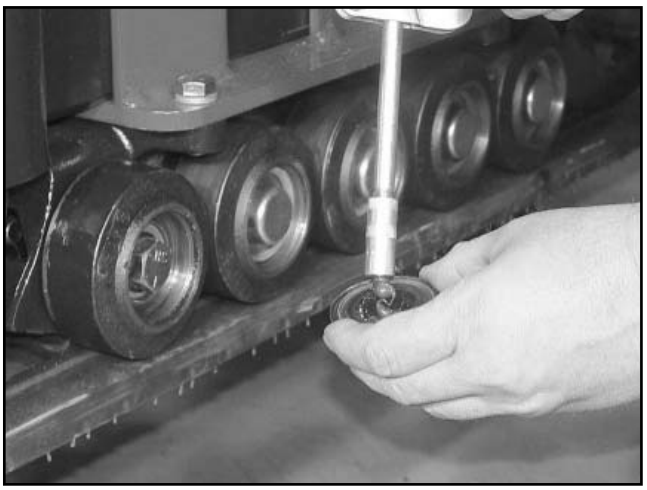


Figure 469 DSC-0835

8. Secure the road wheel cap with the snap ring (Fig. 470).

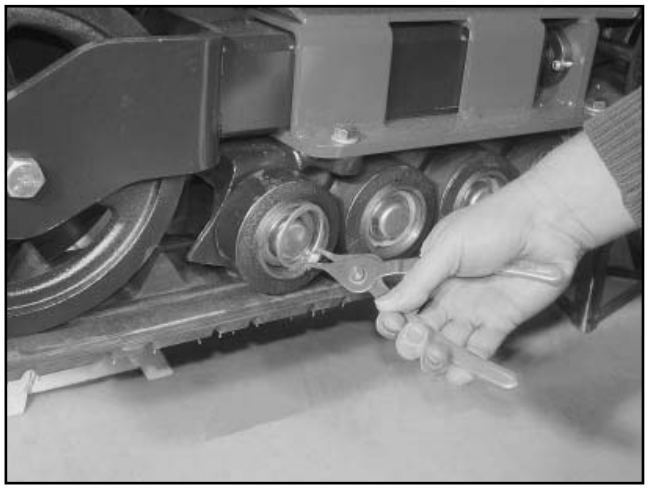


Figure 470 DSC-0821

Track Guide Installation

1. With a hydraulic floor jack and a board to support the track guide, raise the track guide up to the frame (Fig. 471).

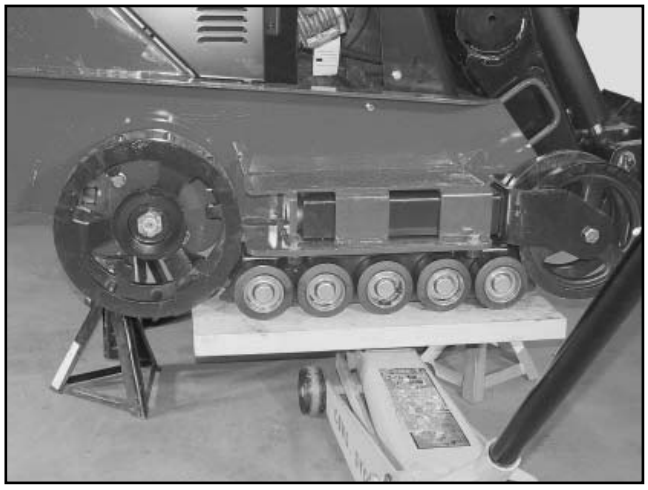


Figure 471 DSC-0817

Note: The track guide end with a step is mounted toward the drive wheel (Fig. 472).

Figure 472 DSC-0619

2. Install the four bolts that hold the track guide to the frame. Torque the bolts to 75 ± 8 ft-lbs. (102 ± 11 Nm) (Fig. 473).

Note: For ease of installation of the inside bolt, it maybe necessary to remove the tensioner arm.

Figure 473 DSC-1725

3. Install the tracks; refer to Track Installation, page 8-8.

Wheel Motor Removal

Note: This procedure can be used for the Left or Right Wheel Motor

1. Lift and securely support the unit so that the track is far enough off the ground to remove the wheel motor.

2. Remove rear cover.

3. Disconnect the negative battery cable and then the positive cable; remove the battery. Slide an oil drain pan under the wheel motor (Fig. 474).

Figure 474 DSC-0856

4. Remove the track; refer to the Track Removal section, page 8-4.

5. Remove cotter key from the motor shaft (Fig. 475).

Figure 475 DSC-0837

6. Remove castle nut on the motor shaft (Fig. 476).

Note: A self-locking nut with thread-locking material may be used. This self-locking nut needs to be replaced whenever it is removed from the wheel motor shaft.

Figure 476 DSC-0838

7. Using a wheel puller, remove the drive wheel (Fig. 477).

Figure 477 DSC-0839

8. Loosen the hydraulic line nuts located at the hydrostatic pump (Fig. 478).

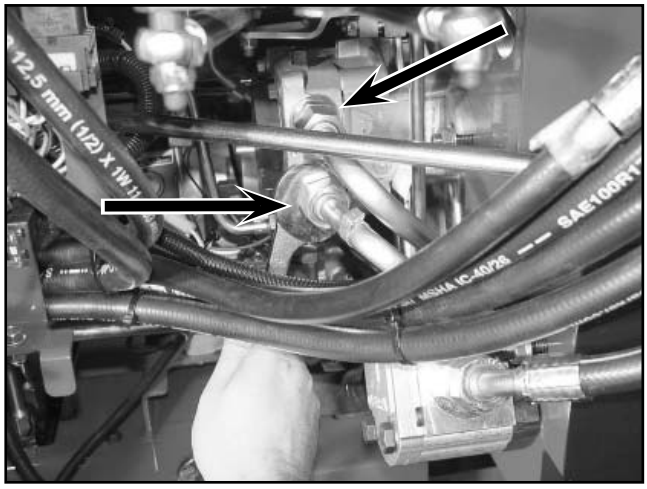


Figure 478 DSC-0845

9. Using an off-set open-end wrench, remove both hydraulic line nuts from the fittings located on the top of the wheel motor (Fig. 479).

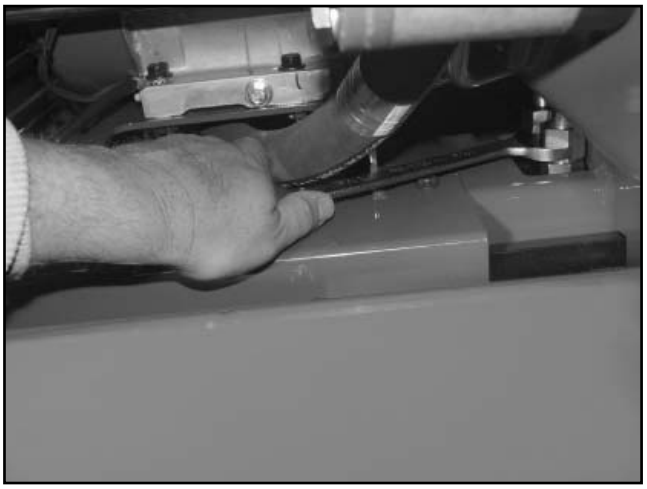


Figure 479 DSC-0842

10. Remove both hydraulic fittings located at the top of the wheel motor (Fig. 480).

NOTE: Remove the belt cover for easier access to the right hand hydraulic fitting.

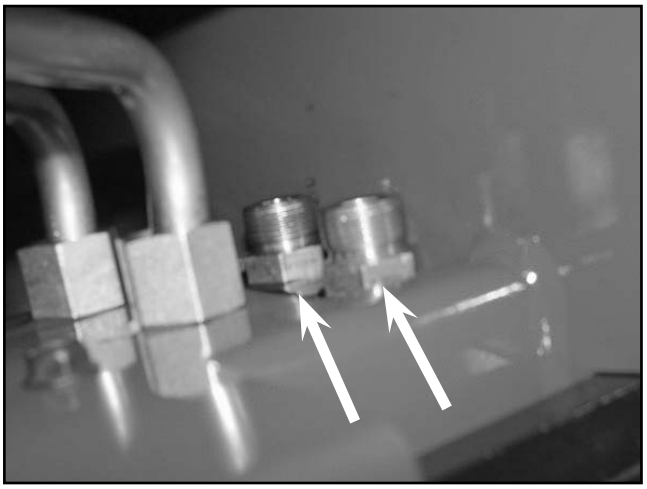


Figure 480 DSC-0846

11. Install a hydraulic floor jack under the wheel motor. Remove the 4 wheel motor mounting bolts (Fig. 481).

Figure 481 DSC-0843

12. Before removing the wheel motor, install a protective cap in the two open ports. Slide the wheel motor inward from the frame until the wheel motor shaft clears the frame and lower the motor (Fig. 482).

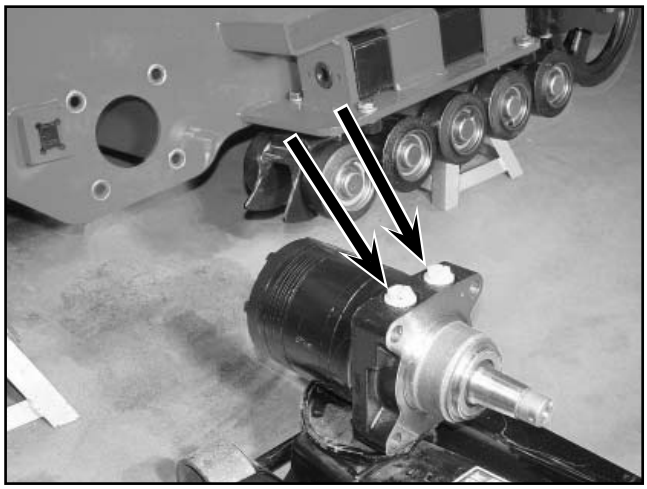


Figure 482 DSC-0847

Wheel Motors

For wheel motor service, refer to the Parker-Ross TF wheel motor service manual (Toro P/N 492-4753).

Wheel Motor Installation

1. Position the wheel motor on a hydraulic floor jack with the hydraulic line ports facing up. Slide the wheel motor under the frame and raise into the frame opening. Apply medium strength threadlocking material to the mounting bolts and torque the bolts to 75 ± 8 ft-lbs. (102 ± 11 Nm) (Fig. 483).

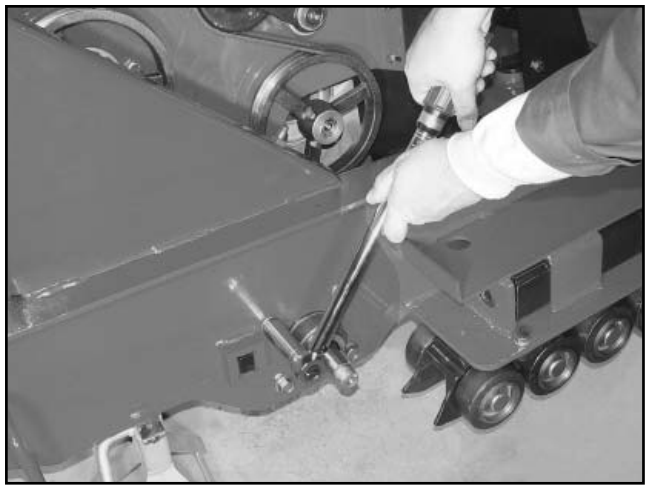


Figure 483 DSC-0848

2. Remove the protective caps from the two open ports.

Note: Before installing the hydraulic fittings, replace the O-rings.

Install the two hydraulic fittings (Fig. 484).

Figure 484 DSC-0846

3. Install the hydraulic lines to the hydraulic fittings on top of the wheel motors and tighten (Fig. 485).

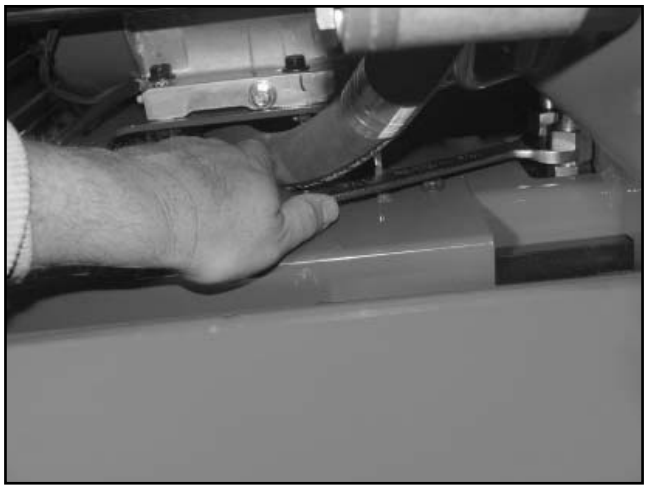


Figure 485 DSC-0842

4. Tighten the hydraulic lines that connect to the hydrostatic pumps (Fig. 486).

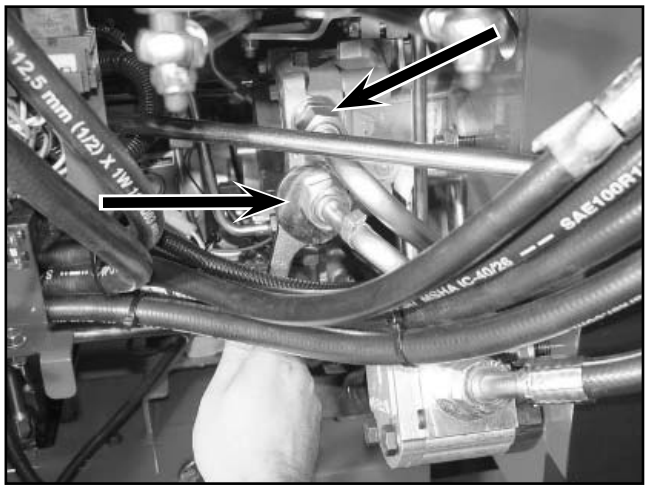


Figure 486 DSC-0845

5. Clean the motor shaft with a degreaser to make sure there is no grease or dirt.

Note: Do not use grease or anti-seize compound on the shaft.

Install the drive wheel on the shaft, aligning the keyway (Fig. 487).

Figure 487 DSC-0849

6. Install the nut on the shaft. Lock the drive wheel with a pry bar or similar tool installed in the spokes and torque the nut to 300 ± 50 ft-lbs. (407 ± 68 Nm).

Note: After achieving the specified torque, make sure the hole in the motor shaft is aligned with one of the slots on the castle nut to install the cotter pin, DO NOT loosen the nut to align the cotter pin hole.

Note: Self-locking nut with thread-locking material may be used with some model years. This self-locking nut needs to be replaced whenever it is removed from the wheel motor shaft (Fig. 488).

Figure 488 DSC-0852

7. Install track; refer the Track Installation, page 8-8.
8. Reinstall battery and battery cables; connect positive cable first.
9. Purge the unit of any air that may be trapped in the hydraulic system; refer to Purging Air Procedures, page 6-4. Check for any oil leaks.
10. Lower the unit to the ground and reinstall the rear cover and belt cover.

Traction Control Handle Assembly Removal

1. Remove the rear cover.
2. Remove the bolt and nut retaining the control handle assembly to the drive rod assembly (Fig. 489).

Figure 489 DSC-1247

3. Mark or tag the right side linkage rod and remove the bolt, spacer, and nut in the rod end bearing (Fig. 490).

Figure 490 DSC-1264

4. Disconnect the left side linkage rod by removing the bolt, spacer, and nut from the rod end bearing (Fig. 491).

Figure 491 DSC-1263

5. Remove four bolts and nuts that retain the bushings, located on each side of the control support assembly (Fig. 492).

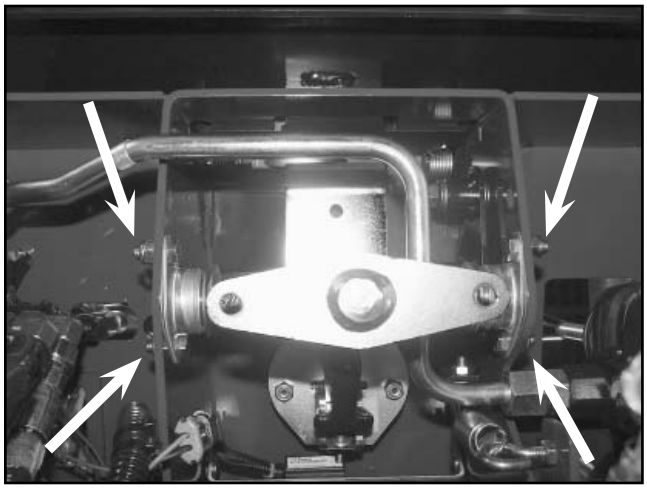


Figure 492 DSC-1252

6. Turn the traction control assembly clockwise and remove the bushings, flat washers, and spring washers from the control support assembly (Fig. 493).

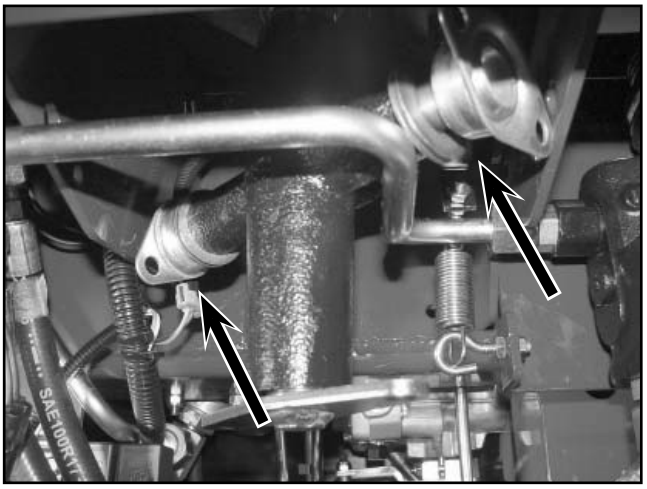


Figure 493 DSC-1253

7. Turn the traction control assembly counter-clockwise and maneuver the assembly until it clears the neutral return bracket (Fig. 494).

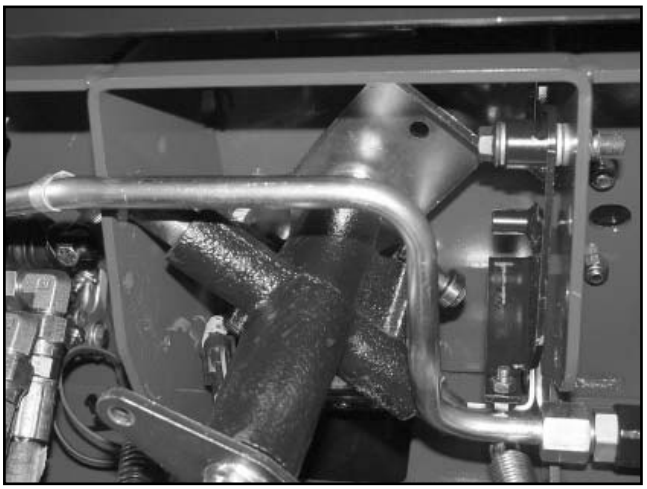


Figure 494 DSC-1254

8. Tilt the top of the control assembly forward and slide the assembly down and out of the control handle and then out of the unit (Fig. 495).

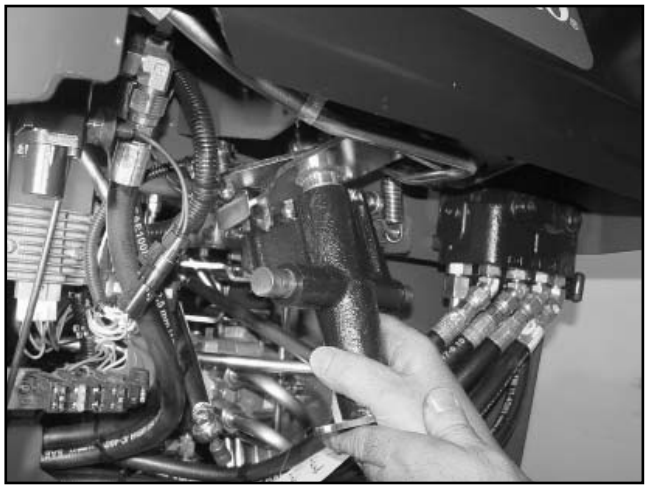


Figure 495 DSC-1255

9. Traction control assembly (Fig. 496).

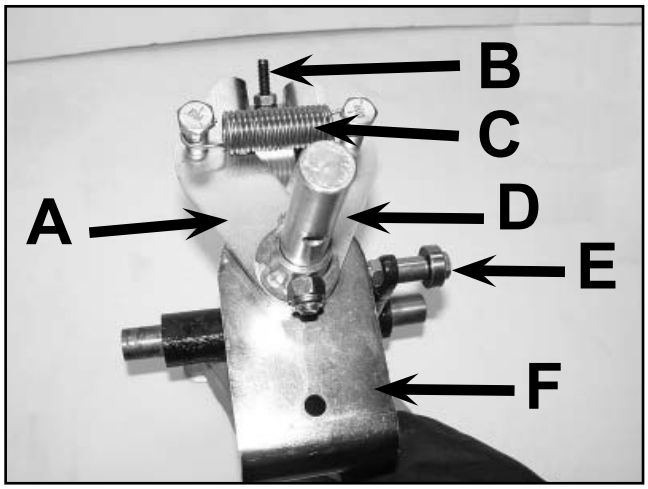


Figure 496 DSC-1256

A. RH Return Lever
B. Neutral Switch Stud
C. Neutral Return Spring
D. LH Return Lever
E. Neutral Centering Cam
F. Reverse Lever Asm.

Traction Control Handle Assembly Installation

1. Install traction control assembly, tilting the top of the control assembly forward so the control handle can be installed onto the drive rod assembly; do not install the bolt and nut.
2. Install flat washer, spring washer, washer, and then the bushing on each end of the control support assembly (Fig. 497).

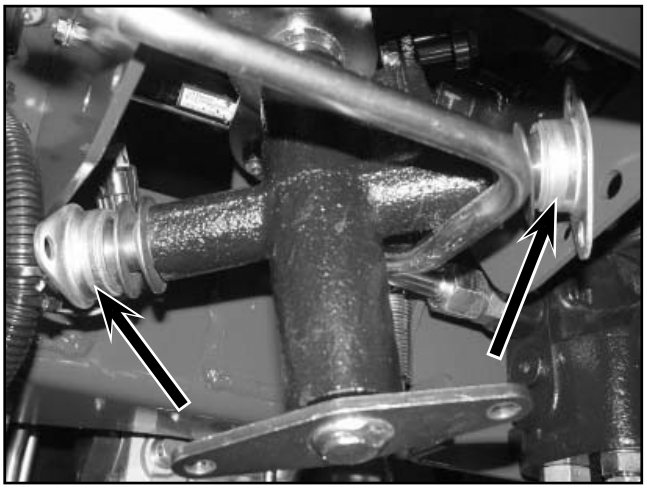


Figure 497 DSC-1262

3. Lift up slightly on the neutral centering lever and align the bushings to the bolt holes and install the four bolts and nuts and tighten (Fig. 498).

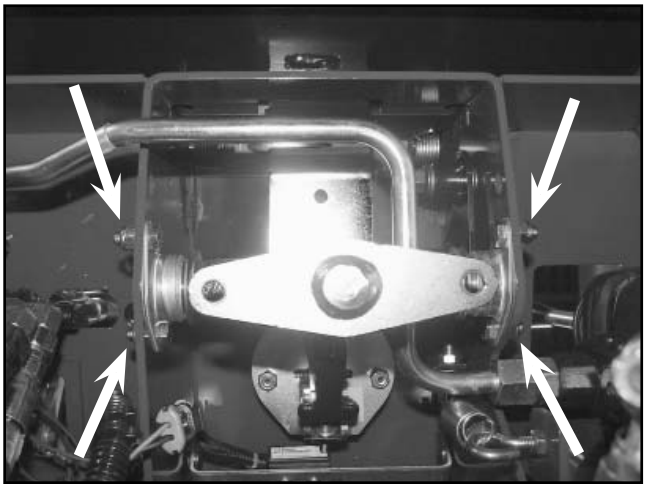


Figure 498 DSC-1252

4. Install the left side rod linkage with a bolt through the bearing rod end, spacer, through the drive rod assembly and install the nut and tighten (Fig. 499).

Figure 499 DSC-1263

5. Install the right side rod linkage with a bolt through the bearing rod end, spacer, through the drive rod assembly and install the nut and tighten (Fig. 500).

Figure 500 DSC-1264

6. Insert the bolt and nut into the traction control handle assembly and through the drive rod assembly.

Note: The control handle assembly is slotted, so you need to align the assembly before tightening the bolt and nut (Fig. 501).

Figure 501 DSC-1247

7. Install the rear cover.

Brake Assembly Removal

1. Remove the rear cover. Disconnect the battery negative cable and then the positive cable. Remove the battery. Remove the battery bracket.
2. Disconnect brake cable by removing the bolt and nut that holds the brake cable end to the brake shaft assembly (Fig. 502).

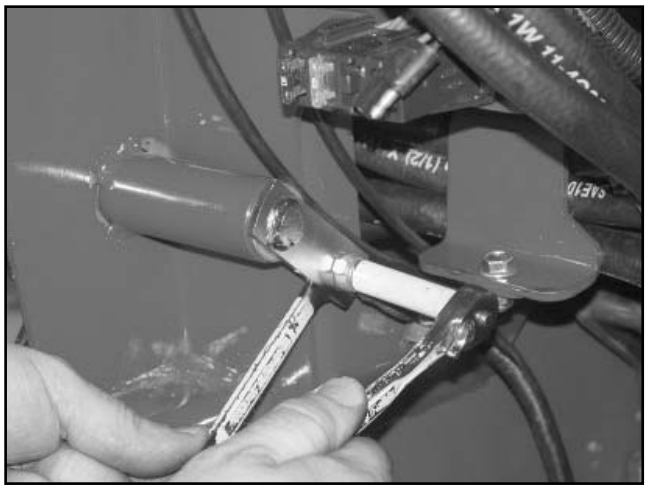


Figure 502 DSC-1265

3. Slide the boot up on the cable and remove the adjusting nut on the cable and remove the brake cable from the bracket on the frame (Fig. 503).

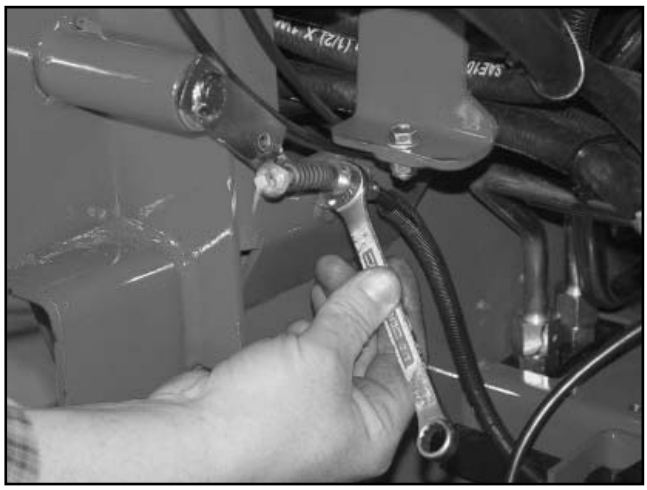


Figure 503 DSC-1266

4. Remove the two bolts and nuts that hold the cable brackets to the brake bars (Fig. 504).

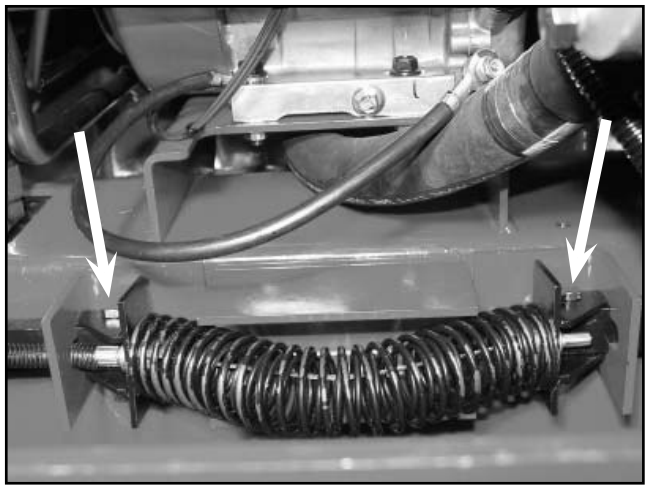


Figure 504 DSC-1268

5. Carefully slide the brake spring and cable brackets off the brake bar, sliding it off the right side first and then remove it off the left side (Fig. 505).

Figure 505 DSC-1269

6. Slide the left brake bar out of the frame (Fig. 506).

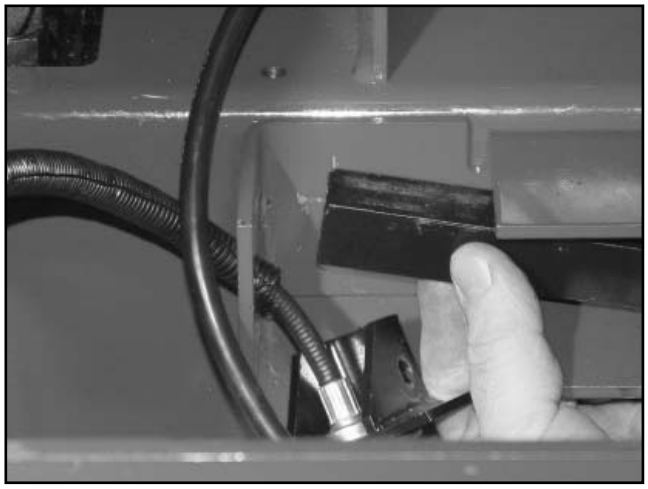


Figure 506 DSC-1271

7. Remove the spring assembly and cable (Fig. 507).

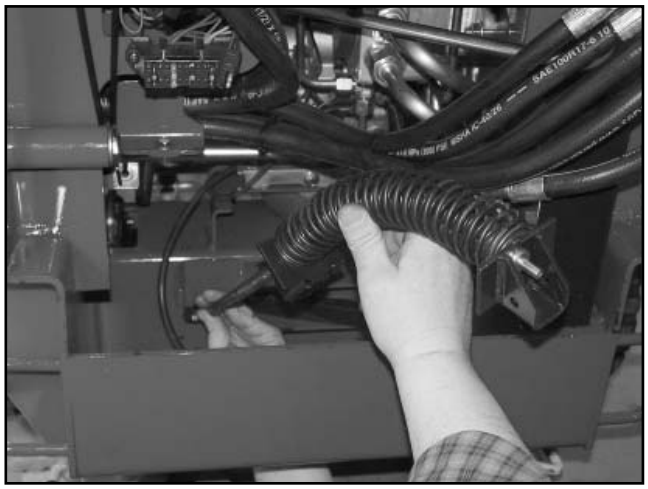


Figure 507 DSC-1273

8. Clamp the right side cable bracket in a vise. Using a tool to hook into the spring, pull back the spring enough to reach the set screw in the tube guide (Fig. 508).

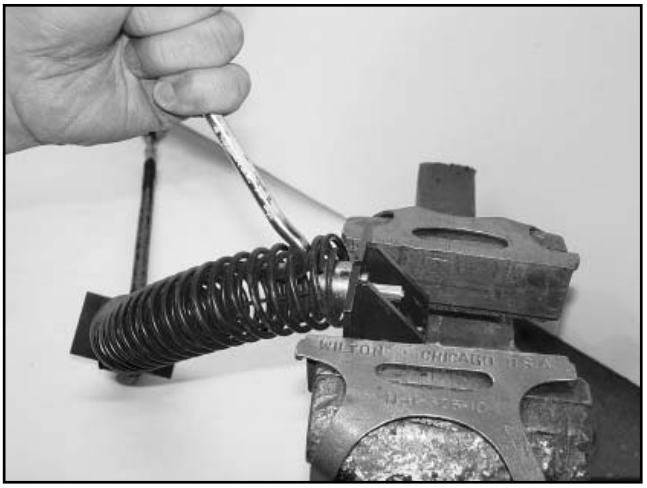


Figure 508 DSC-1274

9. Loosen the set screw on tube guide. Carefully compress the spring and slide the cable end from the slot in the cable bracket and remove (Fig. 509).

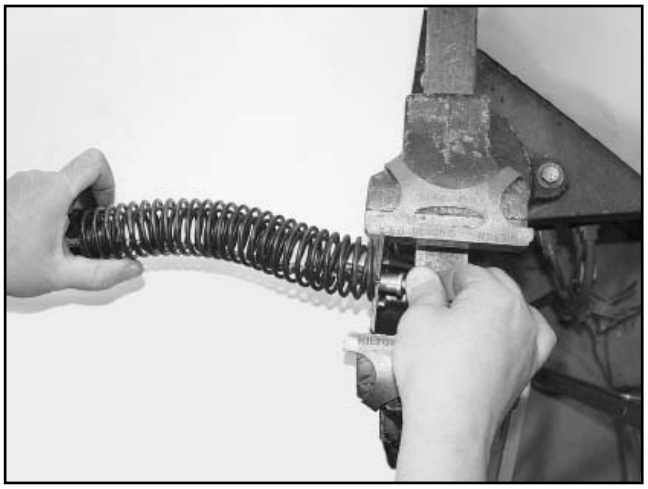


Figure 509 DSC-1276

10. Loosen the set screw on the tube guide on the left side and remove the brake cable from the cable bracket (Fig. 510).

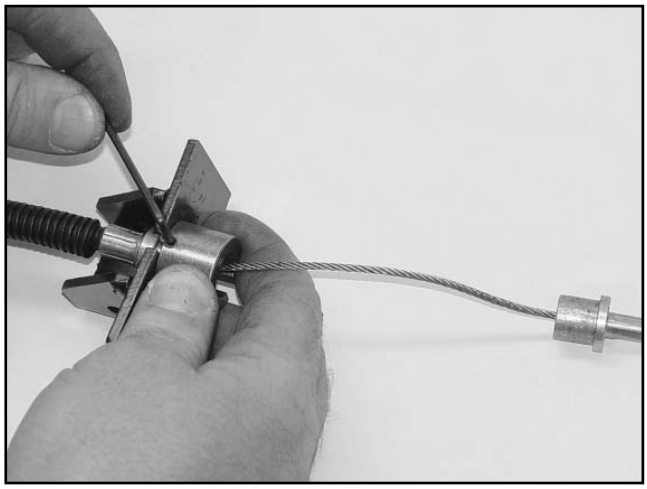


Figure 510 DSC-1277

11. To install a new brake cable, insert the left side of the cable in the cable bracket and tighten the set screw (Fig. 511).

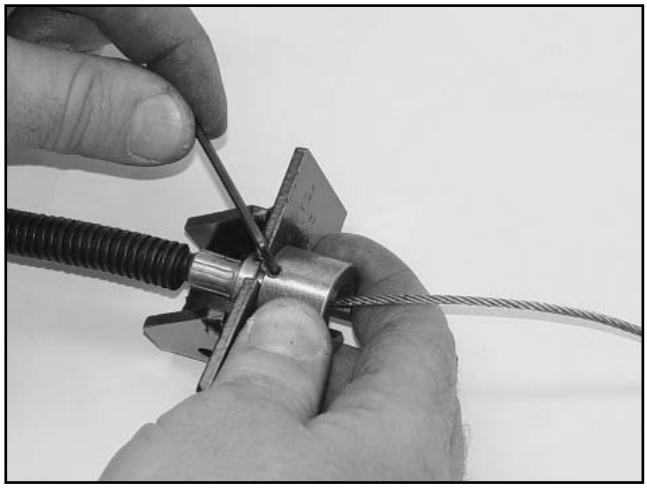


Figure 511 DSC-1277

12. Measure a piece of rope approximately 20" (50.8cm) long and equip it with a handle. Feed the rope through the two brake springs. Tie the rope to the end of the brake cable and pull the cable through the brake springs (Fig. 512).

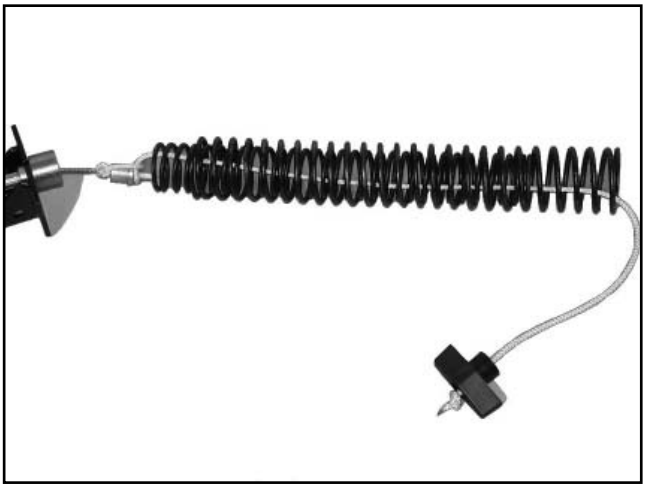


Figure 512 DSC-1283

13. With the right hand cable bracket in a vise, pull the brake cable through the brake springs and slip the cable into the cable bracket (Fig. 513).

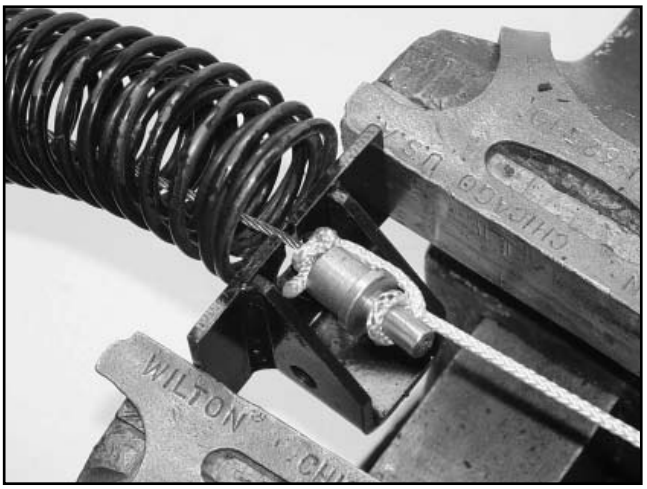


Figure 513 DSC-1284

14. Remove the end of the rope, by cutting it. Slide the brake springs back and install the tube guide and tighten the set screw (Fig. 514).

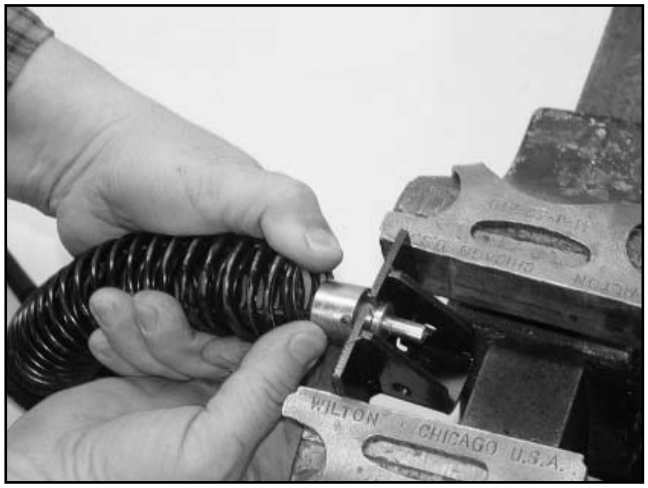


Figure 514 DSC-1285

Brake Assembly Installation

1. Slide the brake cable through the bracket on the frame (Fig. 515).

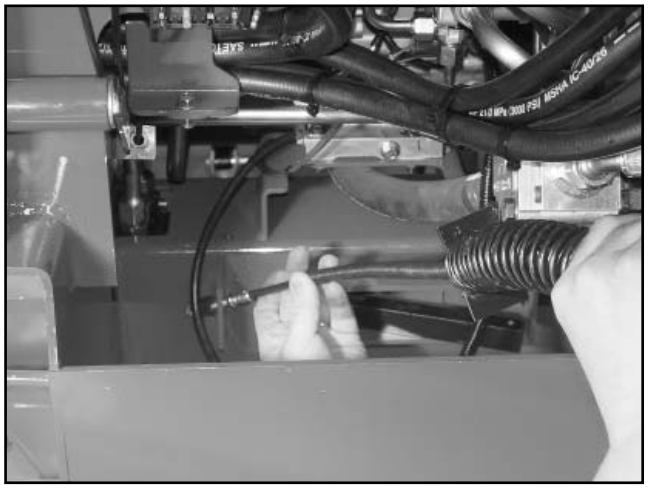


Figure 515 DSC-1286

2. Slide the brake bar through the bracket on the frame, with the brake cable pulled to the front of the bracket (Fig. 516).

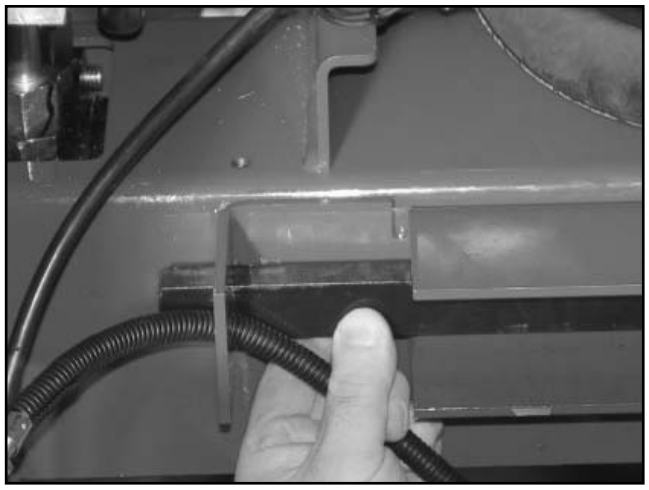


Figure 516 DSC-1287

Note: Serial #200000201 and higher will have an extra hole drilled to hold brake "OFF" manually.

3. Install bolt and nut through the cable bracket and the brake bar, left side (Fig. 517).

Figure 517 DSC-1288

4. Install bolt and nut through the right side cable bracket and the bar bracket (Fig. 518).

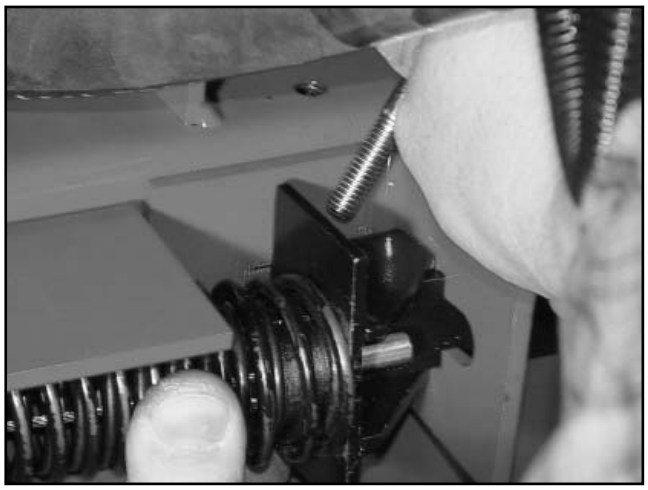


Figure 518 DSC-1289

5. Tighten the bolt and nut on the right and left cable brackets (Fig. 519).

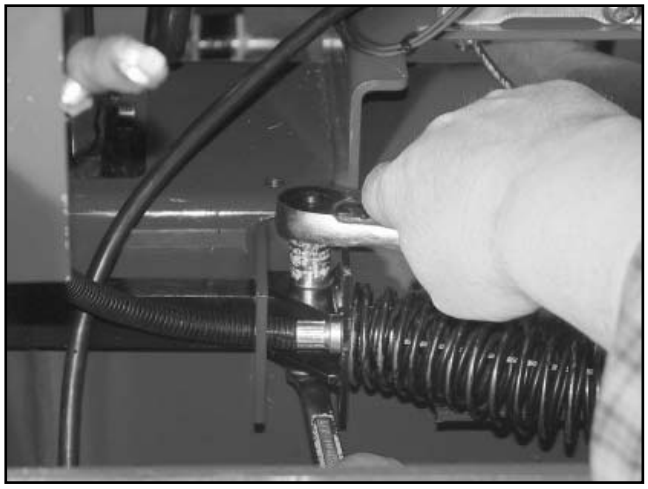


Figure 519 DSC-1290

6. Install the brake cable through the bracket on the left side of the frame (Fig. 520).

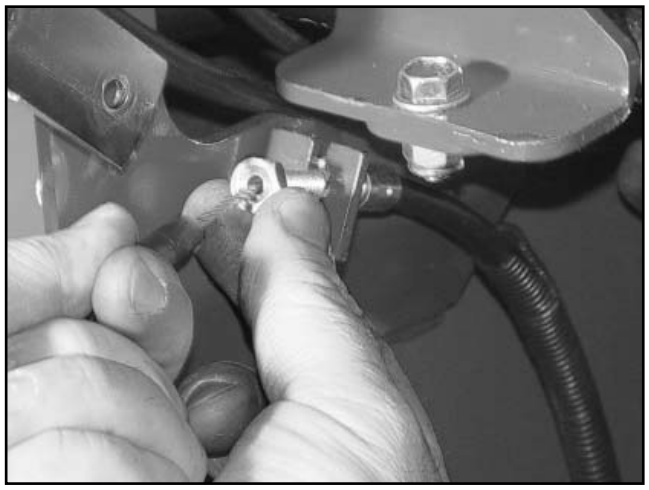


Figure 520 DSC-1291

7. Attach the brake cable with a bolt and nut to the brake shaft assembly (Fig. 521).

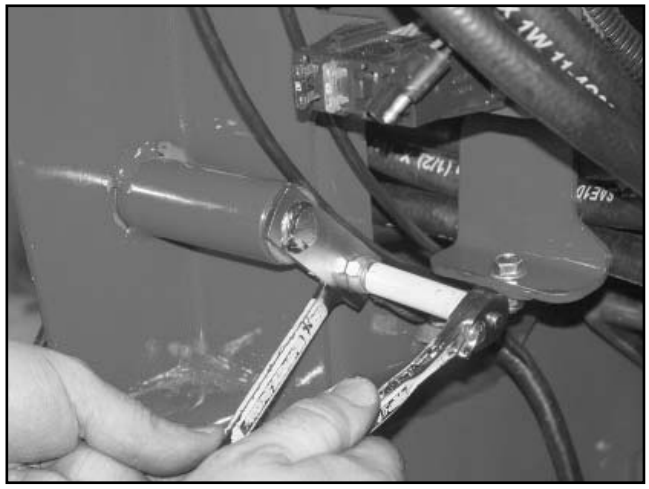


Figure 521 DSC-1265

8. Brake Adjustment - Ensure the brake engages and disengages freely. The brake bars should both move in and out of the frame. When disengaged, the brake bar should not protrude more than 1/2" (12.7mm) out of the frame (Fig. 522).

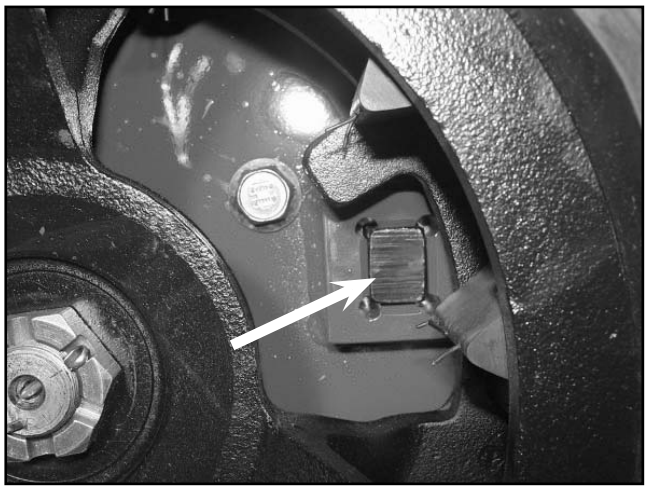


Figure 522 DSC-1292

If adjustment is needed, there are two jam nuts located on the brake cable, next to the cable bracket on the left inside of the frame (Fig. 523). Loosen the jam nuts to adjust the brake bars.

Figure 523 DSC-1291

9. Install the battery bracket. Install the battery and the positive battery cable, then the negative cable. Install the rear cover.

Idler Assembly Removal

1. Raise engine cover and remove the belt cover.

2. Use a pry bar to relieve idler tension and remove the drive belt (Fig. 524).

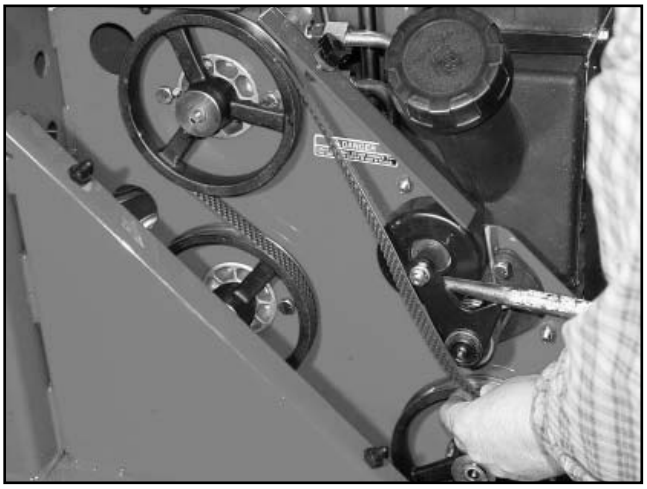


Figure 524 DSC-1293

3. Loosen the set screws on the engine drive pulley and remove the pulley (Fig. 525).

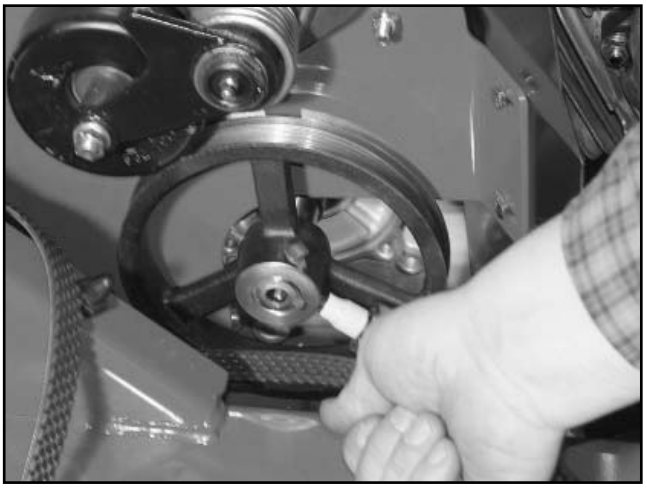


Figure 525 DSC-1294

4. Remove the retaining ring on the end of the idler arm (Fig. 526).

Figure 526 DSC-1295

5. Remove the idler arm and torsion spring (Fig. 527).

Figure 527 DSC-1297

6. Remove the idler pulley from the idler arm by removing the bolt and nut (Fig. 528).

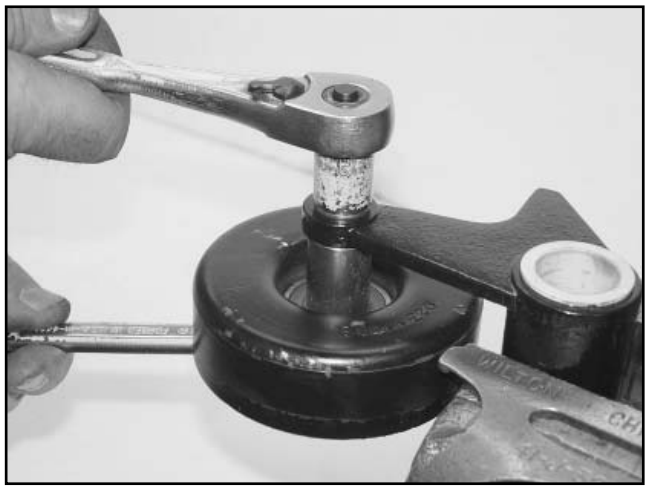


Figure 528 DSC-1298

Idler Assembly Installation

1. Install idler pulley by first installing the spacer between the idler arm and idler pulley, bolt, washer and nut. Tighten bolt and nut to 27 - 33 ft-lbs. (36.6 - 44.7 Nm) (Fig. 529).

Figure 529 DSC-1299

2. Install idler arm. First, install the torsion spring on the pivot shaft and then install the idler arm (Fig. 530).

Figure 530 DSC-1300

3. Place washer on the end of pivot shaft and install the retaining ring (Fig. 531).

Figure 531 DSC-1295

4. Apply medium strength threadlocking material to the threads of the set screws for the engine drive pulley. Apply anti-seize compound to the engine crankshaft and key. Install the engine drive pulley.
5. With a straight edge, align the engine drive pulley to the bottom hydrostatic pump pulley and tighten the engine set screws (Fig. 532).

Figure 532 DSC-1301

6. Install the drive belt. Start the unit and check the belt alignment.
7. Shut engine off. Install belt cover and lower the engine cover.

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TESTING

Introduction

Due to the many types and manufacturers of test equipment, the test hoses and fittings needed will vary. Refer to the connection information at each hydraulic test location.

Hoses being used for pressure and flow testing must exceed maximum system flow and pressure and must be compatible with the type of fluid in the hydraulic system (Fig. 533).

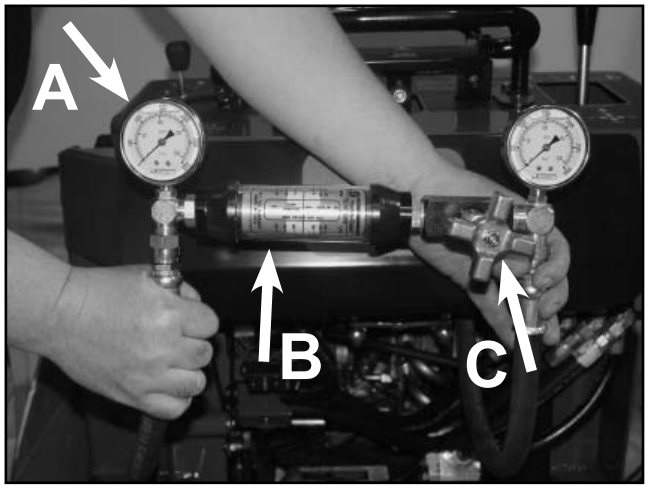

Figure 533 DSC-1516

A. Pressure gauge
B. Flow gauge
C. Restriction valve

Flow Testing Hoses

The three components listed A, B, and C are the primary testing locations for the TX models (Fig. 534).

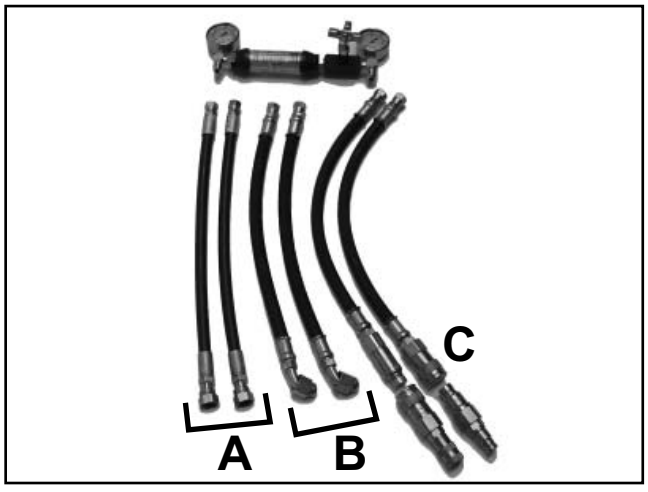

Figure 534 DSC-0573

Fitting sizes and test hose configurations are also shown (Fig. 535, 536, 537, 538 and 539).

A. RH Drive Hydrostat Pump
Pump Fitting – 1”-14 O-ring Face Seal - Straight Female (Fig. 535).

Figure 535 DSC-0579

B. LH Drive Hydrostat Pump
Pump Fitting – 1”-14 O-ring Face Seal – 90° Female (Fig. 536).

Figure 536 DSC-0576

C. Couplers
Coupler End – 7/8”-14 UNF-2B O-ring Seal (Fig. 537).

Figure 537 DSC-0580

Test Gauge – 3/4”-16 – 37° Female (Fig. 538).

Figure 538 DSC-0577

Coupler Adaptor Kit 106-7695. Converts the 3/4” coupler to the 3/8” coupler (Fig. 539).

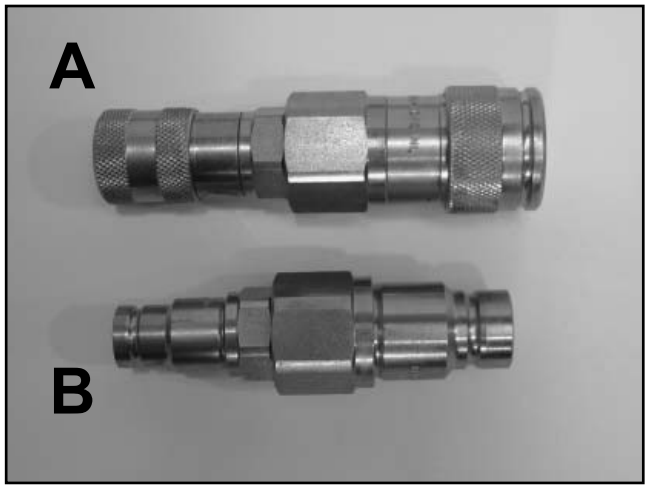

Figure 539 DSC-0585

A. P/N 100-4701 - Female coupler
B. P/N 104-6134 - Male coupler

Test hoses:

Diameter	Length	PSI Rated
- 8	3'	5000

TX 413 Hydraulic Testing

The TX 413 hydraulic system utilizes a single gear pump to flow oil for all hydraulic components of the unit. The TX 413 hydraulic system can be separated into three circuits; loader, auxiliary and drive systems. Each is an open circuit system which allows oil to be flowing when the valves and the hydrostatic pumps are in the neutral position.

The gear pump draws the oil from the hydraulic tank flows the oil through the hydraulic lines, hoses and valves. The pump creates the system working pressure and gallons per minute (gpm). Auxiliary and loader circuits are connected in series, so both circuits operate at the same pressure and flow.

The oil is drawn from the hydraulic tank by the gear pump and flows into the loader valve, then into the auxiliary valve. The loader valve relief valve regulates the system pressure (psi). When the loader valve handle is moved forward or back from neutral position it directs the hydraulic oil to the lift cylinder. When the loader valve handle is moved left and right it directs hydraulic oil to the tilt cylinder.

The auxiliary valve directs hydraulic oil to the attachment couplers. When the auxiliary lever is moved toward the drive handle the female coupler is pressurized and turns the attachment in the forward drive. When the auxiliary lever is moved away from drive handle the male coupler is pressurized and turns the attachment in the reverse drive.

The drive system includes the two hydrostatic pumps and wheel motors. The hydrostatic pumps are supplied with low pressure oil returned from the loader valve. This oil is filtered, then drawn into the hydrostatic pumps. When the drive handle is moved from neutral position, hydraulic oil is pumped to the wheel motors that drive the tracks.

The recommended flow (gpm) and pressure (psi) valves are located in the specification section of this manual for use in troubleshooting each circuit. The following tests need to be done at various locations to determine which component(s) may not be functioning correctly.

Hydraulic testing needs to be done in a systematic manner with a basic understanding of the hydraulic system and functions. It is recommended to have the hydraulic schematic for the model and serial number being tested. Schematics are contained in this manual or in the Toro Operator or Parts catalogs provided with the unit.

Make sure engine RPM is checked and set properly prior to any hydraulic testing.

Test 1 - System Pressure Testing

This test checks the system pressure for both the auxiliary and loader circuits. Components involved in this test are Gear Pump, Loader Valve, Power Beyond Valve at Loader Valve, Auxiliary Valve, auxiliary couplers and hoses. This test will verify that pressure is or is not the reason for the problem in the hydraulic circuit. Depending on test results, Test 5 may need to be performed to determine system problem.

Test 2 - System Flow Testing

This test checks the system flow for both the auxiliary and loader circuits. Components involved in this test are Gear Pump, Loader Valve, Power Beyond Valve at Loader Valve, Auxiliary Valve, auxiliary couplers and hoses. This test will verify that flow is or is not the reason for the problem in the hydraulic circuit. Depending on test results tests 3 & 4 may need to be performed to determine the system problem.

Test 1 - Testing Pressure at Flush Face Couplers

1. Warm hydraulic fluid to operating temperature
2. Set park brake.
3. Shut engine off.
4. Connect pressure/flow test gauge into couplers. Have restrictor valve fully open on flow meter (may have to cycle auxiliary valve to remove any pressure at couplers).
5. Start engine and run at full recommended RPM.
6. Stroke the auxiliary valve.
7. Take reading of the pressure at the gauge.
8. Adjust to recommended psi/bar at loader valve as necessary.
9. If pressure doesn't meet specification, then perform Test 5.
10. Disconnect pressure/flow gauge.
11. Check hydraulic fluid level; add as needed.
12. Start engine and check for leaks.
13. Release park brake.
14. Shut engine off.

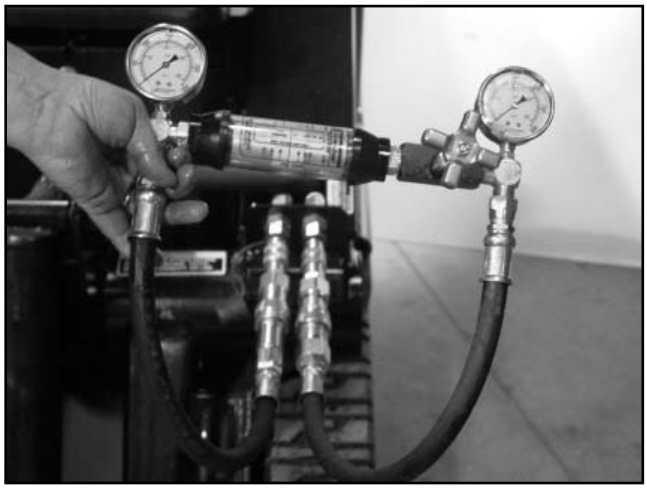

Figure 540 DSC-1528

Test 2 - Testing Flow at the Flush Face Couplers

1. Warm hydraulic fluid to operating temperature.
2. Set park brake.
3. Shut engine off.
4. Connect pressure/flow test gauge into couplers. Have restrictor valve fully open on flow meter (may have to cycle auxiliary valve to remove any pressure at couplers).
5. Start engine and run at full recommended RPM.
6. Stroke auxiliary valve.
7. Take reading of flow at the gauge.
8. Slowly turn restrictor valve in until 2650 psi (183 bar) is obtained.
9. Take reading at flow meter.
10. If flow does not meet specification, then perform Tests 3 and 4.
11. Disconnect pressure/meter gauge.
12. Check hydraulic fluid; add as needed.
13. Start unit and check for leaks.
14. Release park brake.
15. Shut engine off.

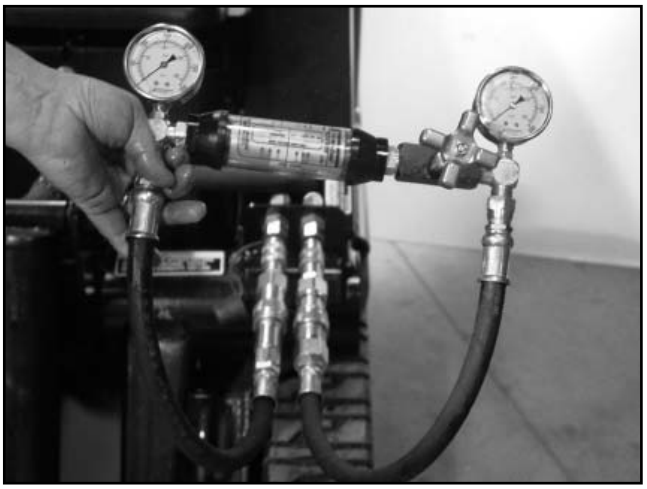

Figure 541 DSC-1528

Test 3 - Flow Test Gear Pump to Loader Valve

This test measures the flow output of the gear pump. Components involved are flow meter, suction hose and pump. This test will verify if the pump, pump pulley, or belt is at fault if flow does not meet specification.

If flow meets specification the loader valve, auxiliary valve, steel line, hose or couplers may be at fault. Perform test 4.

Test 3 - Flow Test at the Gear Pump to the Loader Valve

1. Warm hydraulic fluid to operating temperature.
2. Set park brake.
3. Shut engine off.
4. Use a drain pan under the gear pump.
5. Remove hydraulic line from pump outlet to loader valve inlet.
6. Connect pressure/flow gauge between pump outlet fitting and the loader valve inlet fitting (Fig. 542).
7. Start engine and run at full recommended RPM.
8. Take reading of flow at the gauge.
9. If pump does not meet flow specification, then check for suction hose restriction, pump pulley slippage and then repair or replace gear pump.
10. If pump does meet flow specification, then perform Test 4.
11. Disconnect pressure/flow gauge.
12. Replace o-rings and reinstall hydraulic line between pump outlet and loader valve inlet.
13. Check hydraulic fluid and add as needed.
14. Start unit and check for leaks.
15. Remove drain pans.
16. Release park brake.
17. Shut engine off.

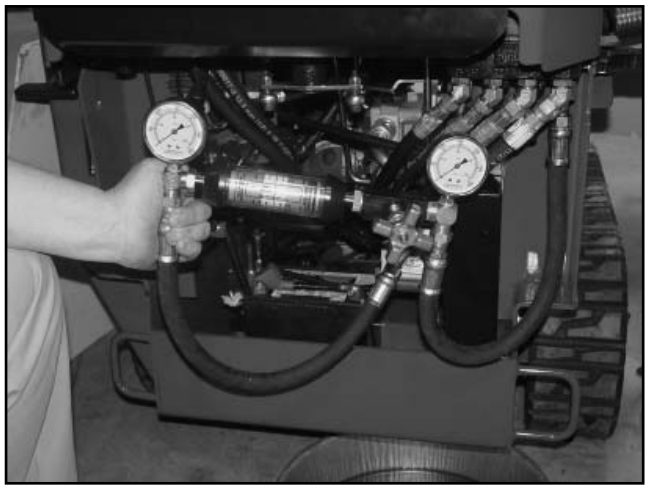

Figure 542 DSC-1525

Test 4 - Flow Test Loader Valve to Auxiliary Valve

Hydraulic flow output can be determined by turning restrictor valve on test gauge inward until specification is obtained. If the flow does not meet specification and test 3 has been performed, then loader valve or power beyond valve will need to be repaired or replaced. If flow tests to specification the loader valve is not the problem. The auxiliary valve, hoses, steel lines, or couplers could be at fault.

Test 4 - Flow Test from the Loader Valve to Auxiliary Valve

1. Warm hydraulic fluid to operating temperature.
2. Set park brake.
3. Shut engine off.
4. Use 2 drain pans. Place one under loader valve and one under auxiliary valve.
5. Disconnect hydraulic line from loader valve to the auxiliary valve.
6. Connect pressure/flow gauge from loader valve to the auxiliary valve (Fig. 543).
7. Start engine and run at full recommended RPM.
8. Take reading of flow at the gauge.
9. Slowly turn restrictor valve in until 2650 psi (183 bar) is obtained.
10. If flow does not meet specification, check for any hydraulic line restrictions, then repair or replace loader valve.

11. If flow does meet specification, look for restriction of a hydraulic line from outlet of loader valve to couplers. If no restrictions are found then repair or replace auxiliary valve and/or couplers. Repeat.
12. Replace o-rings and reinstall hydraulic line from loader valve to auxiliary valve and tighten.
13. Check hydraulic fluid and add as needed.
14. Start unit and check for leaks.
15. Remove drain pans.
16. Release park brake.
17. Shut engine off.

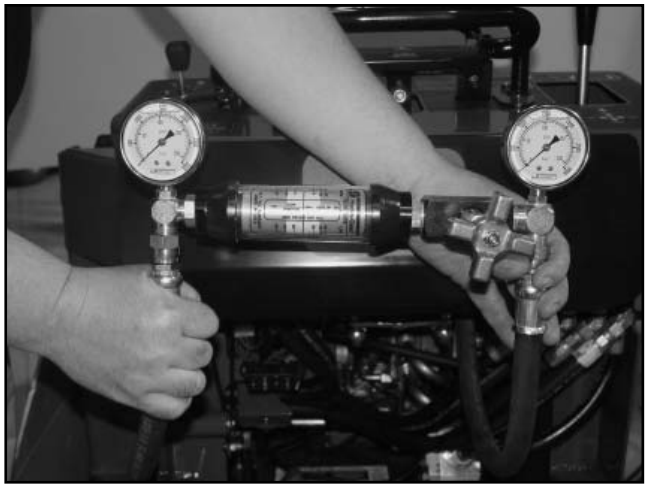

Figure 543 DSC-1516

Test 5 - Pressure Test Loader Valve to Auxiliary Valve

This test checks pressure output after the loader valve. Test gauge is connected the same as test 4.

Pressure will be determined with the flow restrictor open on the flow gauge and taking a reading on the pressure gauge. The pressure can be adjusted at the relief on the loader valve. If the pressure does not change by turning the relief screw and test 1 has been performed, then the relief valve or the loader valve needs to be repaired or replaced. If the pressure tests to specification, the loader valve is not the problem. The auxiliary valve, hoses, steel line, or couplers could be at fault.

Test 5 - Pressure Test from the Loader Valve to Auxiliary Valve

1. Warm hydraulic fluid to operating temperature.
2. Set park brake.
3. Shut engine off.
4. Use 2 drain pans. Place one under loader valve and one under auxiliary valve.
5. Disconnect hydraulic line from loader valve to the auxiliary valve.
6. Connect pressure/flow gauge from loader valve to the auxiliary valve.
7. Start engine and run at full recommended RPM.
8. Take pressure gauge reading.
9. If pressure does not meet specification check for any hydraulic line restrictions and relief valve on loader valve. Then repair or replace loader valve.
10. If pressure does meet specification check for restriction of a hydraulic line from outlet of loader valve to couplers. If no restrictions are found then repair or replace auxiliary valve and/or couplers. Repeat.
11. Replace o-rings and reinstall hydraulic line from loader valve to auxiliary valve and tighten.
12. Check hydraulic fluid and add as needed.
13. Start unit and check for leaks.
14. Remove drain pans.
15. Release park brake.
16. Shut engine off.

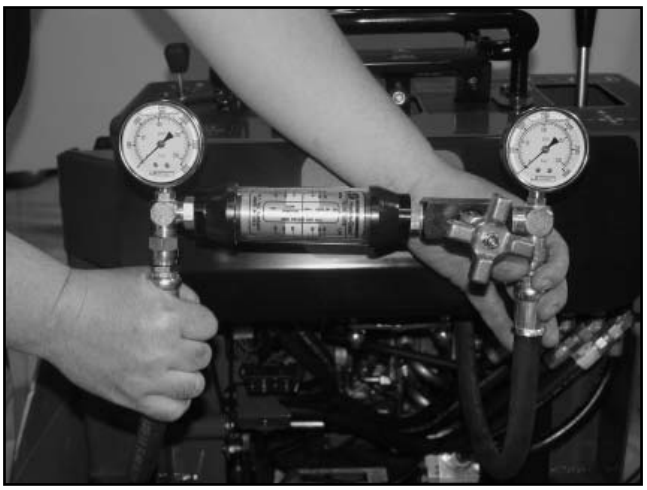

Figure 544 DSC-1516

Hydrostatic Testing Procedures

Hydrostatic Pump Flow Testing

WARNING

Certain procedures require the vehicle engine to be operated and the vehicle to be raised off the ground. To prevent possible injury to the servicing technician and/or bystanders, ensure the vehicle is properly secured.

WARNING

Do not attempt any adjustments with the engine running. Use extreme caution while working in or around all vehicle linkage! Follow all safety procedures outlined in the Operators Manual.

The purpose of the flow test is to isolate and determine if there is a problem with either the hydrostatic pump or the wheel motor.

CAUTION: Ensure all fittings and hoses are attached securely. This test is being completed on the vehicle's high pressure lines. Failure to perform this test properly could result in bodily injury.

Testing Procedures

Special care should be taken to prevent debris from entering pump or wheel motor ports.

Raise the unit and get both tracks off the ground. Use jack stands to support the unit (Fig. 545).

Figure 545 DSC-2922

Open the hood and remove the rear cover (Fig. 546).

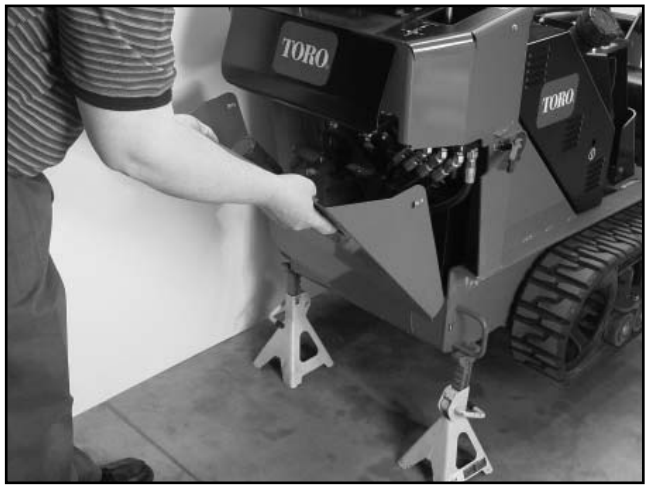

Figure 546 DSC-2924

Left Drive System Flow Test

1. Lift and support the unit so tracks are 3 to 4" (7.6 to 10.2cm) off the ground.

2. Disconnect the two output hydraulic lines to the wheel motor with a 1-1/8" offset wrench (Fig. 547).

Note: Before removing nuts from the hydraulic fittings, place a piece of tape around both hydraulic lines, so the nut will not slide down the hydraulic line.

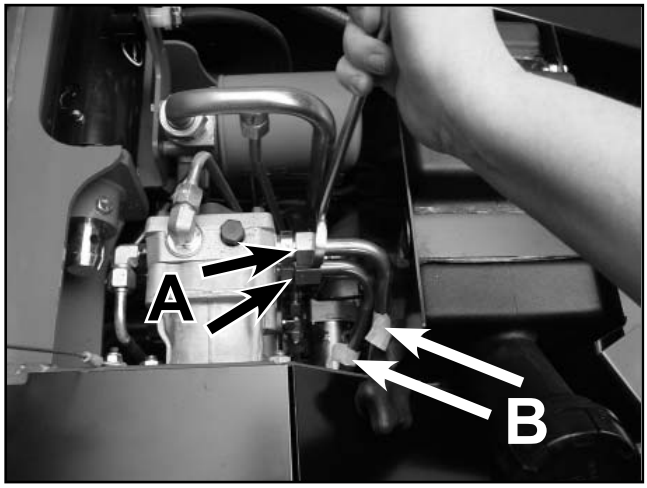

Figure 547 DSC-2926

A. Nuts B. Tape

2. Using tie straps, tie strap each hydraulic line away from the hydraulic fitting (Fig. 548).

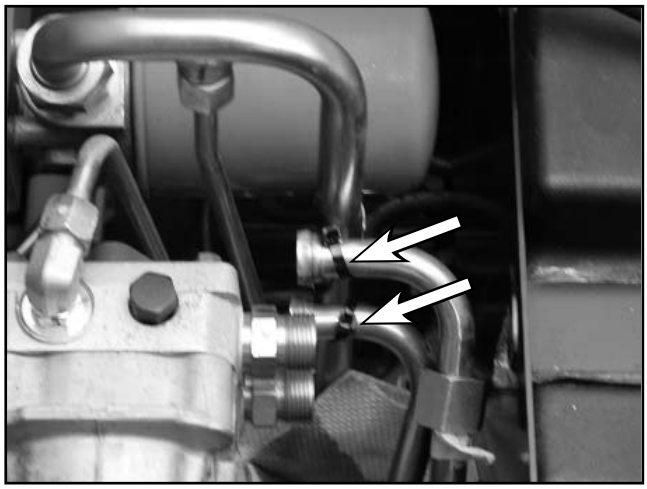

Figure 548 DSC-2928

3. Connect the flow tester to the two hydraulic fittings on the hydrostatic pump (Fig. 549).

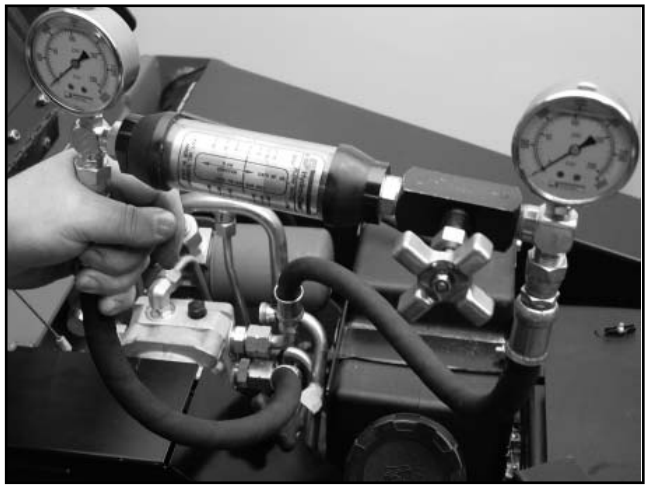

Figure 549 DSC-2930

Note: Before performing this test, make sure the bypass valve is closed on the pump located below the hydraulic inlet line (Fig. 550).

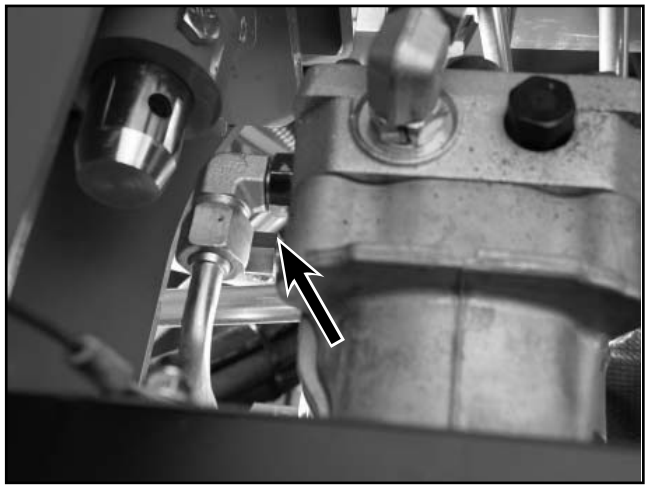

Figure 550 DSC-2932

4. Start the engine and bring the engine speed up to full throttle.

5. Move the traction control in the left direction, in full forward motion (Fig. 551). Operate without any load for approximately 2 minutes; this allows the system oil temperature to rise.

Figure 551 DSC-2933

Note: Raising the system oil temperature will make a difference in the readings you receive. To complete the test accurately, the oil temperature must be near system operating temperatures. Suggested temperature range 160° - 210° F (71.1° - 98.9° C).

6. Turn the restriction valve until you read 300 psi (21 bar) (Fig. 552).

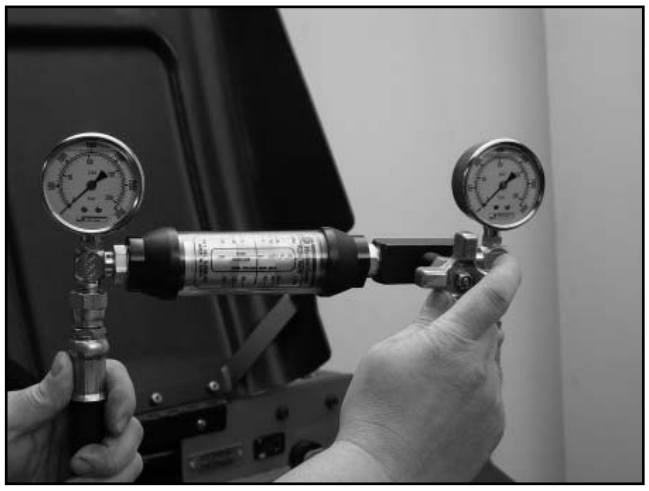

Figure 552 DSC-2934

7. At 300 psi (21 bar), note gpm reading (Fig. 553).

Note: The gpm reading can vary between left and right hydrostatic pumps.

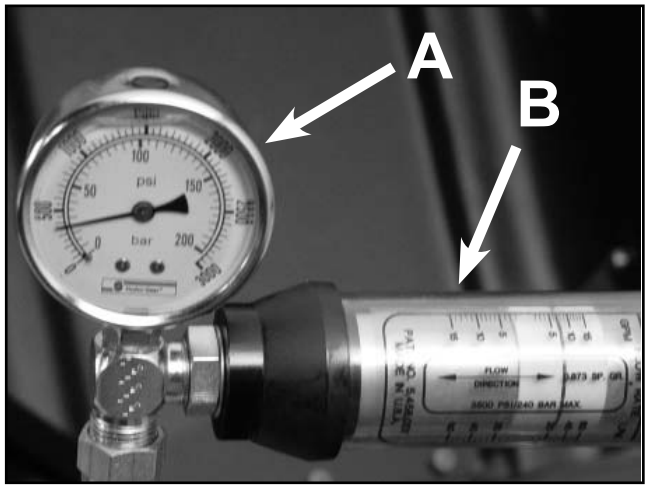

Figure 553 DSC-2937

A. PSI reading B. GPM reading

8. Then turn the restriction valve to 1100 psi (76 bar) (Fig. 554).

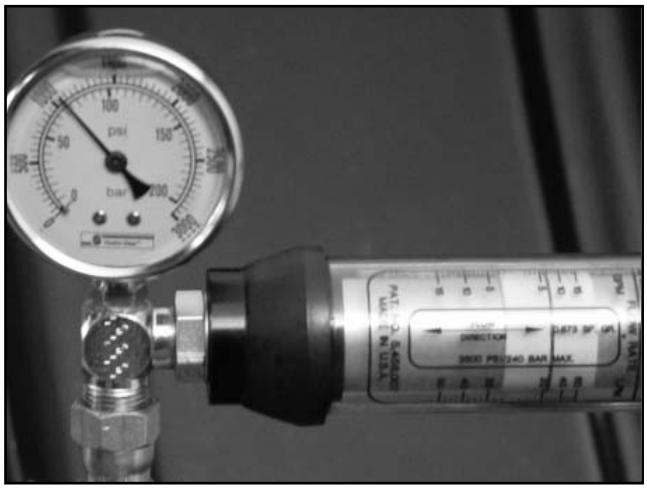

Figure 554 DSC-2942

9. At 1100 psi (76 bar) note gpm reading.

Example:

• 300 psi (21 bar) reading	8 gpm (30 l/min) 1st reading
• 1100 psi (76 bar) reading	6.5 gpm (24.6 l/min) 2nd reading
	1.5 gpm (5.6 l/min) (the difference)

Subtract the first gpm reading from the second gpm reading. This will determine your “flow droop”.

Note: The acceptable gpm “flow droop” or (difference) is: 1.5 gpm (5.6 l/min)

If the difference exceeds these values, the hydrostatic pump droop is not acceptable.

If the values have been met, the issue would be in the wheel motor. Refer to Wheel Motor Removal, page 8-16.

10. Disconnect the flow tester and reconnect the hydraulic lines when test is completed.

Note: Before reconnecting the hydraulic lines, install new O-rings in the fittings.

Right Drive System Flow Test

1. Lift and support the unit so tracks are 3 to 4" (7.6 to 10.2cm) off the ground.

2. Disconnect the two hydraulic output lines with a 1-1/8" offset wrench to the wheel motor (Fig. 555).

Figure 555 0871 rev

Note: It may be necessary to loosen the hydraulic lines at the wheel motor to obtain additional clearance to move the hydraulic lines at the hydrostatic pump.

3. Use tie straps to hold the hydraulic lines out of the way. Connect the flow gauge lines to the two hydraulic ports on the hydrostatic pump (Fig. 556, rear view).

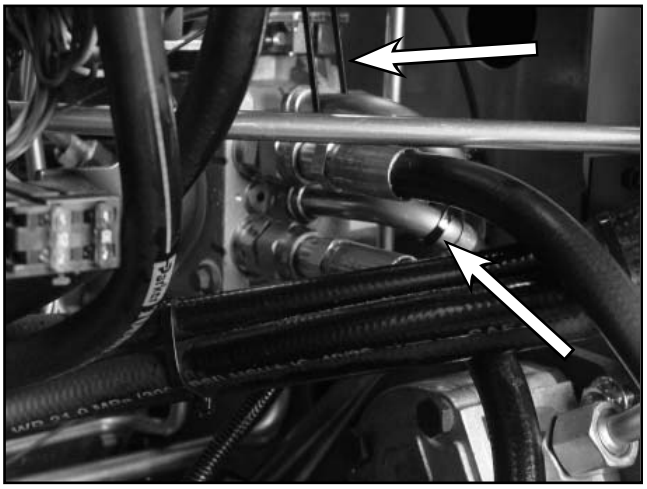

Figure 556 DSC-2946

Note: Before performing this test, make sure the bypass valve, located on the front side of the lower pump, is closed (Fig. 557, top view).

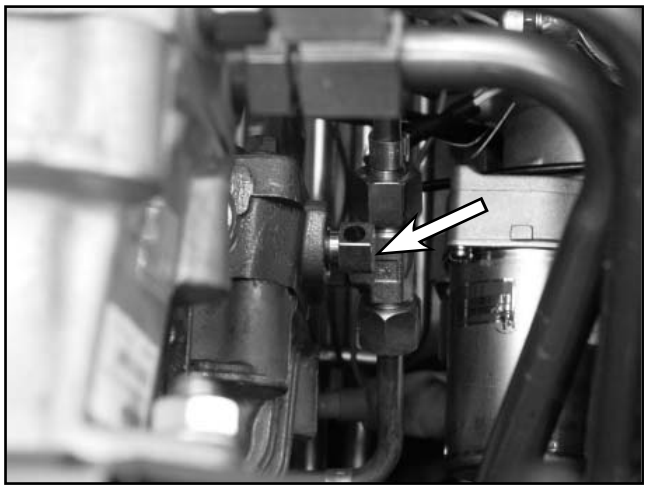

Figure 557 DSC-2943

4. Start the engine and bring the engine speed up to full throttle.

5. Move the traction control in the right direction, in full forward motion (Fig. 558). Operate without any load for approximately 2 minutes, this allows the system oil temperature to rise.

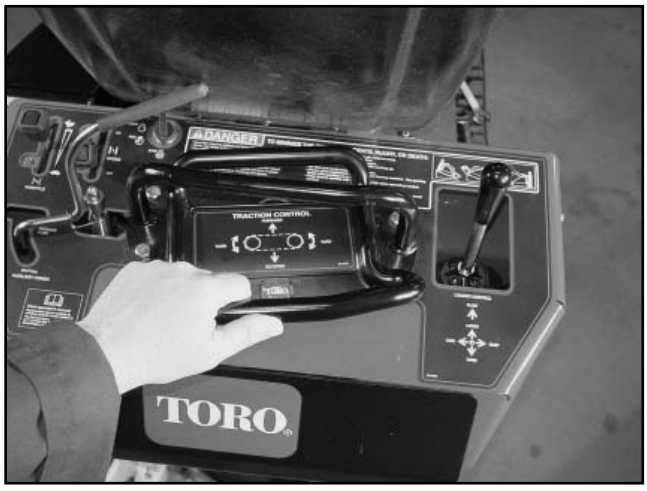

Figure 558 DSC-0874

Note: Raising the system oil temperature will make a difference in the readings you receive. To complete the test accurately, the oil temperature must be near system operating temperatures. Suggested temperature range 160° - 210° F (71.1° - 98.9° C).

6. Turn the restriction valve until you read 300 psi (21 bar) (Fig. 559).

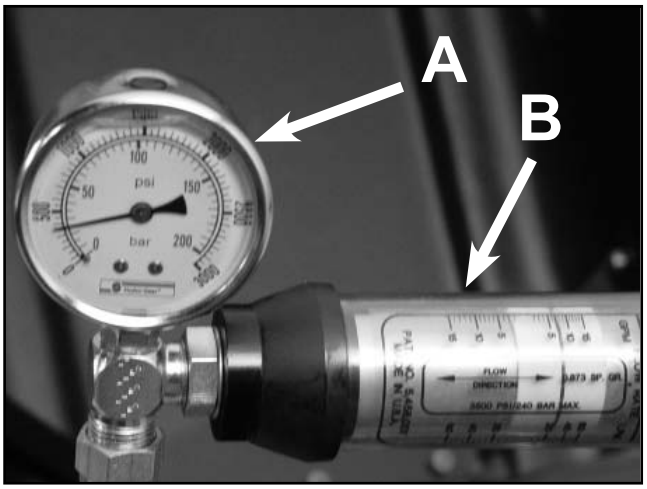

Figure 559 DSC-2937

A. PSI reading B. GPM reading

7. At 300 psi (21 bar), note the gpm reading.

Note: The gpm reading can vary between left and right hydrostatic pumps.

8. Then turn the restriction valve to 1100 psi (76 bar) (Fig. 560).

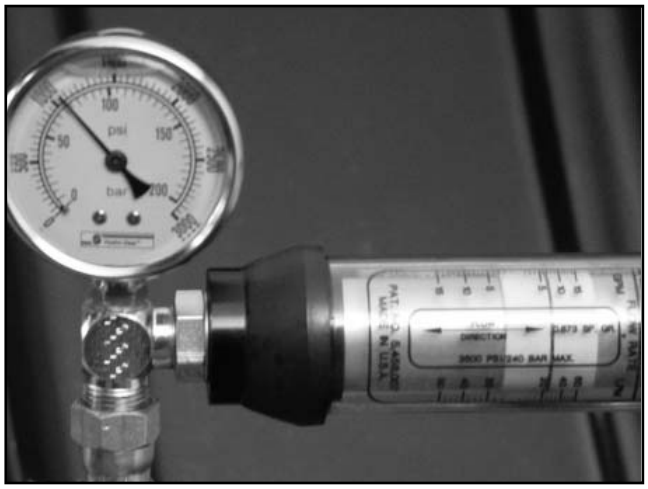

Figure 560 DSC-2942

9. At 1100 psi (76 bar), note the gpm reading.

Example:

• 300 psi (21 bar) reading	8 gpm (30 l/min) 1st reading
• 1100 psi (76 bar) reading	6.5 gpm (24.6 l/min) 2nd reading
	1.5 gpm (5.6 l/min) (the difference)

Subtract the first gpm reading from the second gpm reading. This will determine your "flow droop".

Note: The acceptable gpm "flow droop" or (difference) is 1.5 gpm (5.6 l/min).

If the difference exceeds these values, the hydrostatic pump droop is not acceptable.

If the values have been met, the issue would be in the wheel motor. Refer to Wheel Motor Removal, page 8-16.

10. Disconnect the flow tester and reconnect the hydraulic lines when test is completed.

Note: Before reconnecting the hydraulic lines, install new O-rings in the fittings.

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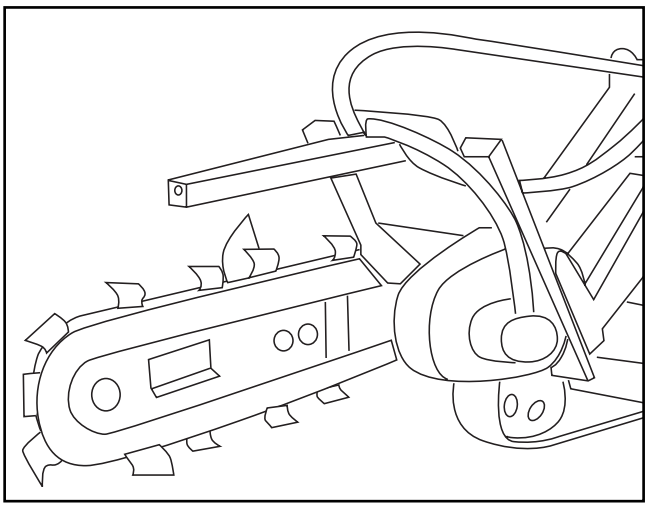
ATTACHMENTS



Auger Removal

1. To remove the auger bit from the auger shaft, set the assembly down in its storage location (Fig. 001).

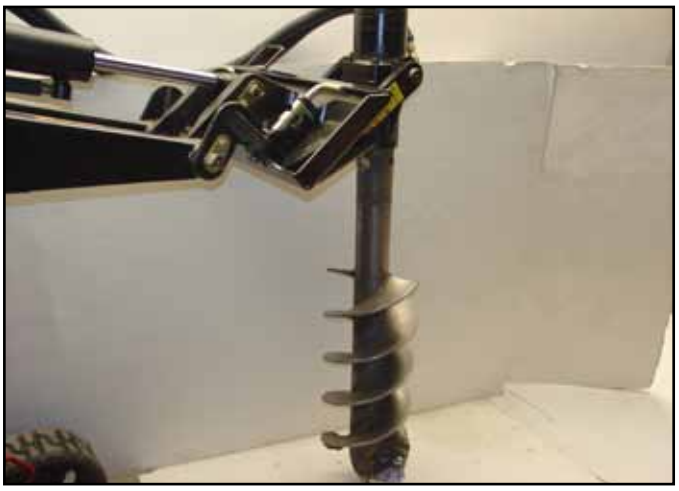


Fig 001 CLR DSC-0220

2. While lowering the arms, drive slowly backwards until the auger is horizontal (Fig. 002).

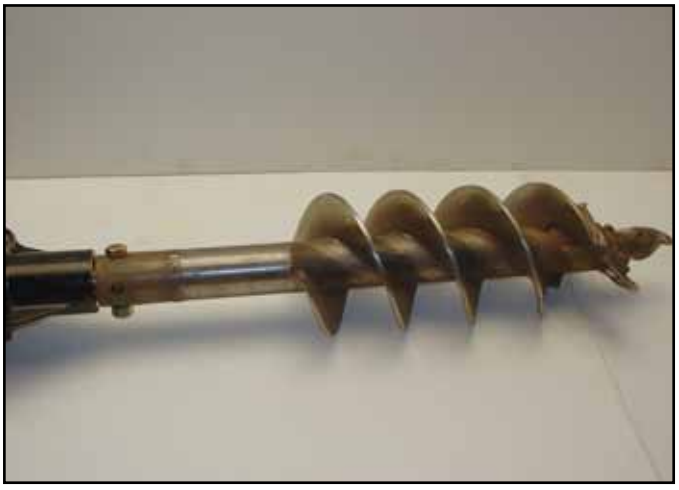


Fig 002 CLR DSC-0213

3. Stop the engine.

4. Remove the bolt and nut securing the auger bit or extension to the auger shaft (Fig. 003).

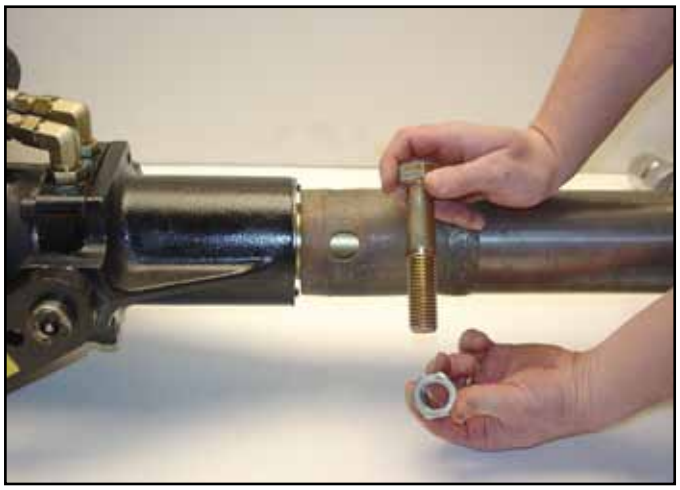


Fig 003 CLR DSC-0217

5. Start the engine and back the traction unit away from the auger bit (Fig. 004).

Note: If you used an extension, remove the bolt and nut securing it and pull it off the auger shaft.

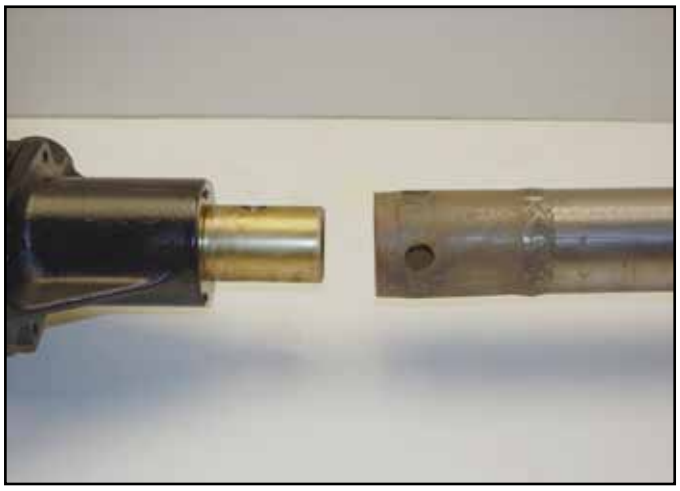


Fig 004 CLR DSC-0218

Auger Reassembly

Reassemble in reverse order.

Auger Tooth and Fishtail Shank Removal

1. While lowering the arms, drive slowly backwards until the auger assembly is horizontal (Fig. 005).

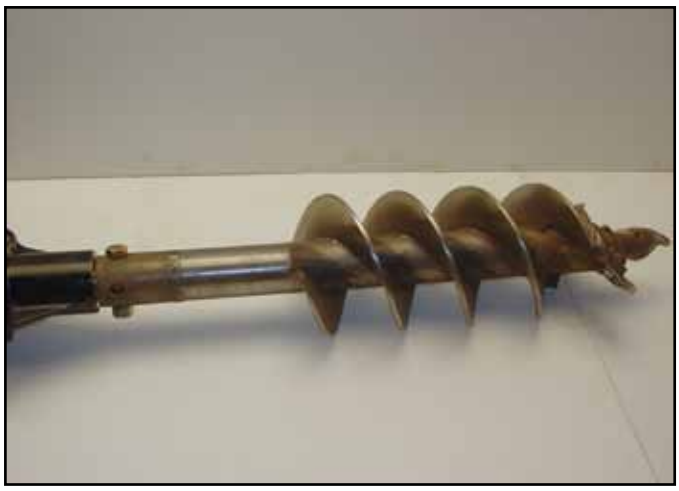


Fig 005 CLR DSC-0213

2. Stop the engine.

3. Remove teeth from auger bit by loosening nuts on the carriage bolts enough for the teeth to slide out (Fig. 006).

Fig 006 CLR DSC-0221

Repeat on other lock nuts that hold gauge and wisdom teeth (Fig. 007).

Fig 007 CLR DSC-0222

4. Remove the screw and lock nut securing the fishtail shank to the auger bit (Fig. 008).

Fig 008 CLR DSC-0224

5. The fishtail shank can be difficult to remove because it is being held in by dirt and debris – you may need to pry the fishtail shank away from the auger bit (Fig. 009 and Fig. 010).

Fig 009 CLR DSC-0225

Fig 010 CLR DSC-0226

Fishtail Shank Reinstallation

1. Reinstall the fishtail shank and torque nut and bolt to 16 ± 2 ft-lbs. (22 ± 3 Nm) (Fig. 011).

Fig 011 CLR DSC-0381

Auger Tooth Replacement

1. Replace the new teeth in their correct location on the auger bit. Torque the lock nuts to 88 ± 12 ft-lbs. (119 ± 16 Nm) (Fig. 012).

Note: It is good practice when replacing teeth to also replace the carriage bolts and nuts.

Fig 012 CLR DSC-0222

2. Install the gauge teeth on the outside edges of the auger bit (Fig. 013).

Fig 013 CLR DSC-0383

3. The wisdom tooth is installed next to the gauge tooth on the inside edge closest to the auger shaft (Fig. 014).

Fig 014 CLR DSC-0382

4. Torque nuts to 150 ± 15 ft-lbs. (203 ± 20 Nm).

Disassemble Auger Power Head

1. Remove coupler and nipple connectors from the loader arm (Fig. 015).

Fig 015 CLR DSC-0101

Install dust caps over the ends (Fig. 016).

Fig 016 CLR DSC-0103

2. Mark the hydraulic hose fitting and motor fitting to identify their location when reinstalling (Fig. 017).

Note: The hose with the male nipple is on the right hand side of the power head from operator position and the hose with the female coupler is to the left side of the power head from the operator position.

Fig 017 CLR DSC-0377

3. Place a drain pan under hydraulic fittings to catch hydraulic oil in the lines. Then using a 15/16” wrench on the hydraulic line fitting and a 3/4” open end wrench to hold the motor fitting, disconnect hydraulic lines from the hydraulic motor (Fig. 018).

Fig 018 CLR DSC-0097

4. Cap the two 90º motor fittings, as well as the ends of the hydraulic lines, to prevent contamination (Fig. 019).

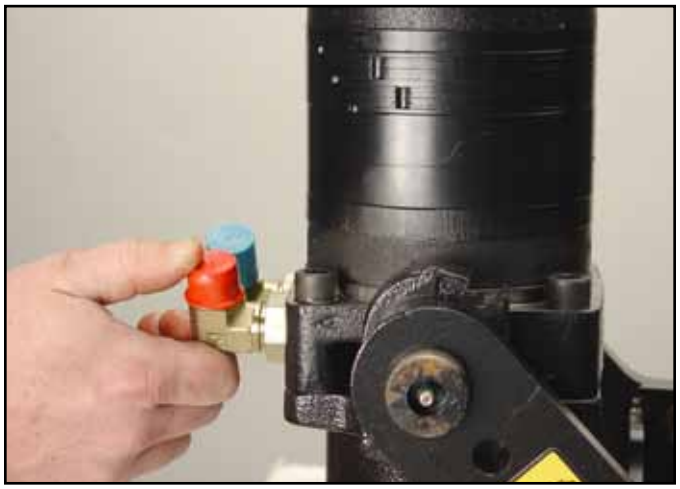


Fig 019 CLR DSC-0104

Removing the Hydraulic Motor

1. Using a 3/8” hex wrench remove the four hex head screws from the hydraulic motor (Fig. 020).

Fig 020 CLR DSC-0112

2. Using a pry bar, gently break the seal between the hydraulic motor and the auger housing (Fig. 021).

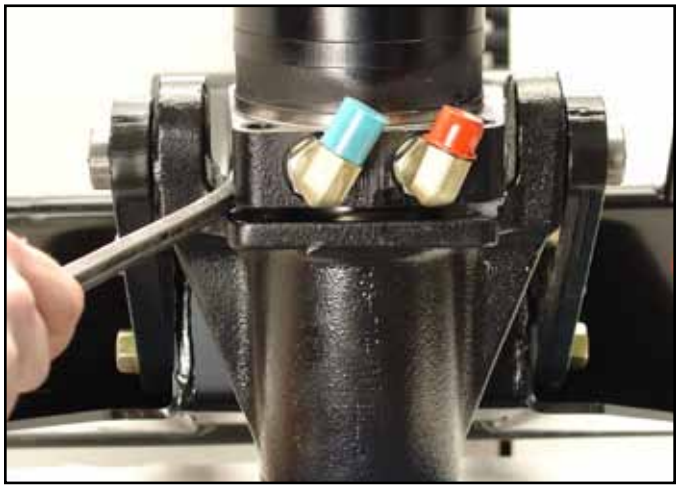


Fig 021 CLR DSC-0107

3. Lift the hydraulic motor from the auger housing (Fig. 022).

Fig 022 CLR DSC-0108

4. Discard the o-ring from the hydraulic motor and replace it with a new one (Fig. 023).

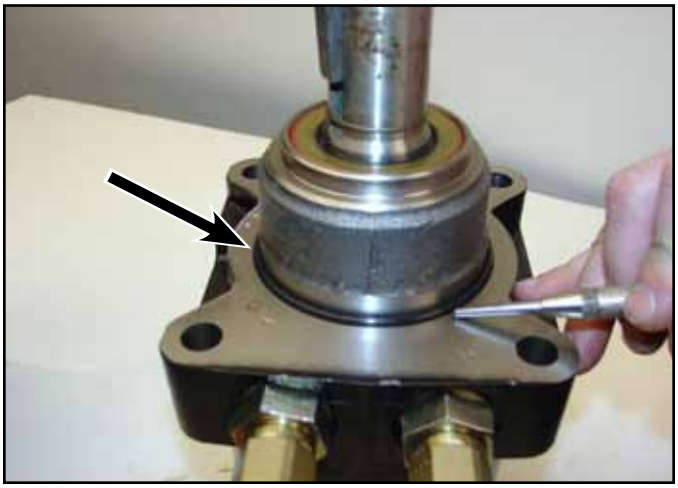


Fig 023 CLR DSC-0194

Note: Make sure you retain the motor shaft key (Fig. 024).

Fig 024 CLR DSC-0110

Shaft Removal

1. Using a flat screwdriver, pry the 2 bearing lock washer tangs out of the notches on the bearing nut.
2. Using the TOR 6002 spanner socket, align the tabs of the socket with the notches on the bearing nut (Fig. 025 and Fig. 026).

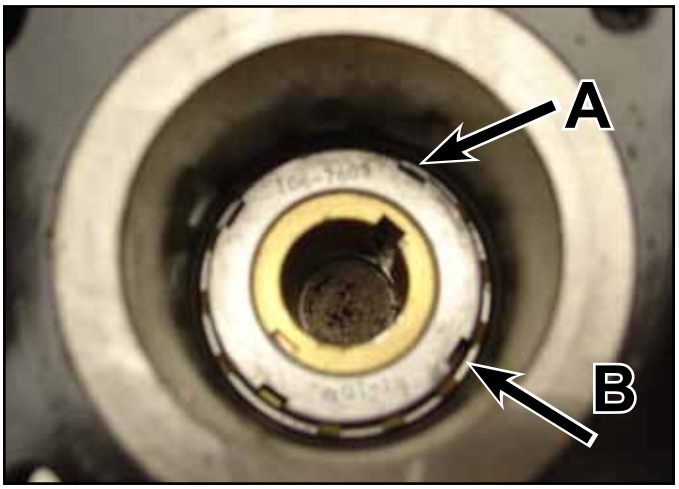


Fig 025 CLR DSC-0113

A. Lockwasher tang B. Bearing nut notch

Fig 026 CLR DSC-0115

3. Using 7/8” round stock to prevent the auger shaft from turning, remove the bearing nut using a breaker bar to loosen the nut (Fig. 027).

Fig 027 CLR DSC-0121

Nut removed (four notches) (Fig. 028).

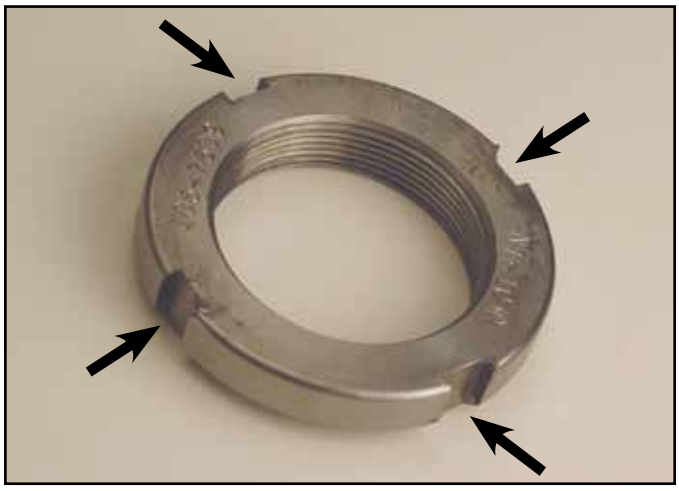


Fig 028 CLR DSC-0122

4. Using two pairs of needle nose pliers, remove the bearing lockwasher (Fig. 029).

Note: Do not reuse. Discard and replace with new lockwasher.

Fig 029 CLR DSC-0125

5. Raise the loader arms so the auger shaft clears the surface area it is resting on.

6. Rotate the auger housing up until you can slide a 1/2” x 2-3/4” bolt into the hole on the cradle arm to lock the auger housing in place (Fig. 030).

Fig 030 CLR DSC-0144

7. Slide auger shaft from auger housing (Fig. 031).

Fig 031 CLR DSC-0128

8. Using a 1/8” hex wrench, remove the three hex head screws from the bearing protector plate (Fig. 032). Remove the plate to access the 2 bearings and spacer.

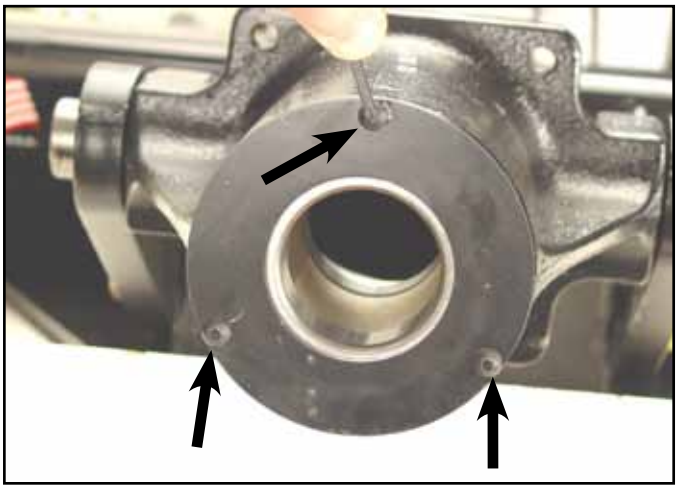


Fig 032 CLR DSC-0130

9. Remove the 1/2” x 2-3/4” bolt securing the auger housing to the cradle. Swing the auger housing so the shaft end is facing up (Fig. 033).

Fig 033 CLR DSC-0138

10. Using a hammer and punch, go around the circumference of the bearing to drive the first bearing out. With the bearing removed, the spacer will slide out (Fig. 034 and Fig. 035).

Fig 034 CLR DSC-0132

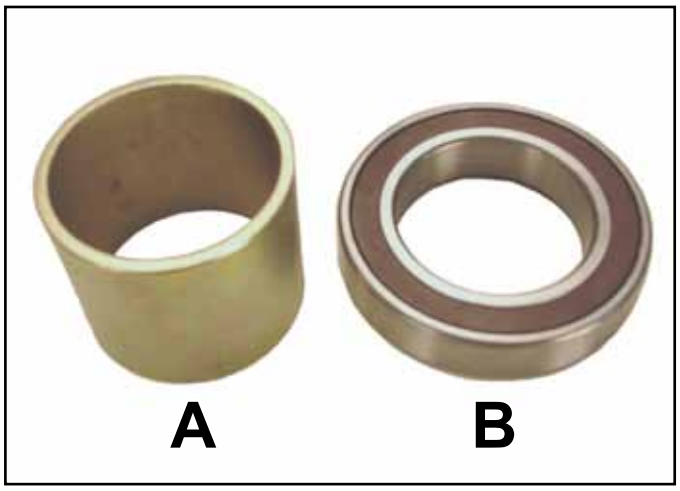


Fig 035 DSC-134

A. Spacer B. Bearing

11. Reposition the auger housing so the shaft end faces down. Use a bearing driver or a hammer and punch to remove the second bearing from the housing (Fig. 036).

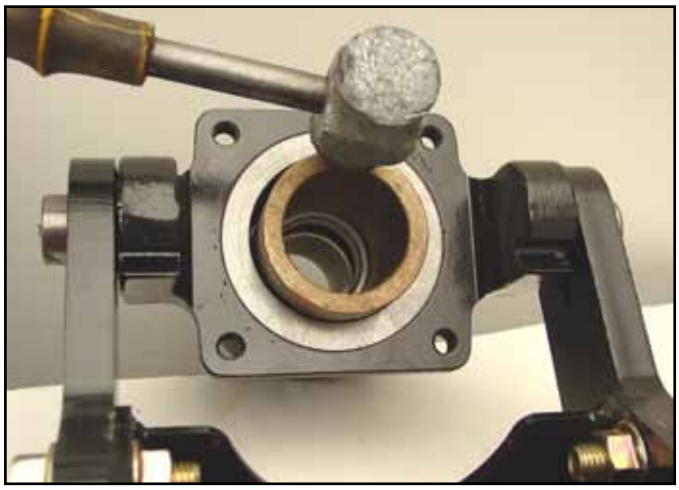


Fig 036 CLR DSC-0142

Note: Check the bearings for smooth rotation. If damaged by dirt or debris, replace bearing.

Remove Power Head from Frame Assembly

1. From the operator's position, mark the pivot plates with R for right and L for left before disassembly.

2. The auger housing has a right and left side and should be marked accordingly before disassembly.

3. Remove the three bolts and nuts securing one of the pivot plates to the frame assembly (Fig. 037).

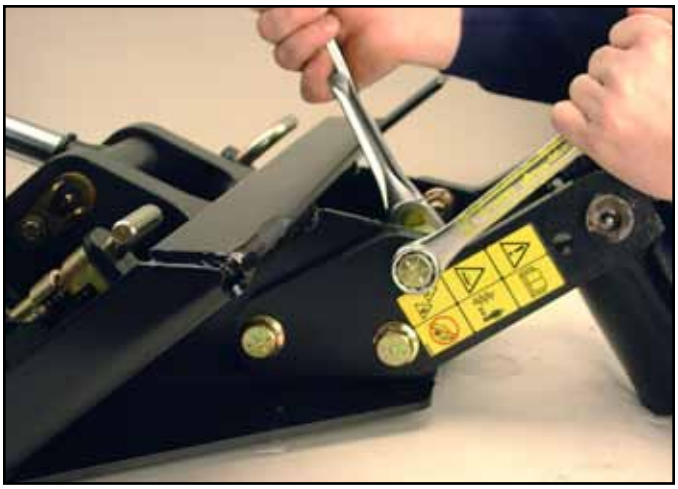


Fig 037 CLR DSC-0148

4. While supporting the auger housing, remove the pivot plate on one side from the frame assembly. The auger housing can now be set aside (Fig. 038).

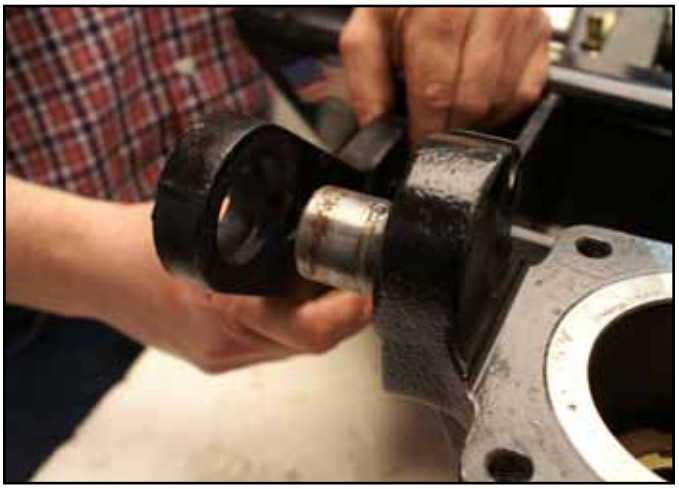


Fig 038 PICT-8710

5. Now remove the three pivot plate bolts from the other side and remove the pivot plate (Fig. 039).

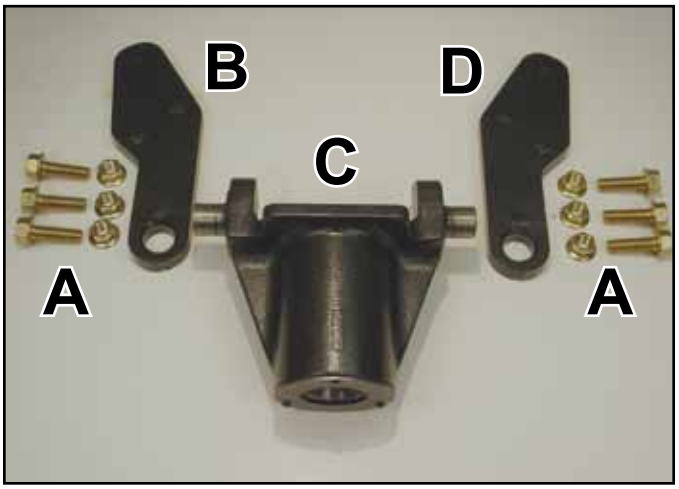


Fig 039 CLR DSC-0174

A. Nuts and bolts
B. RH pivot plate
C. Auger housing
D. LH pivot plate

6. Remove the stop pad from the frame assembly (Fig. 040).

Fig 040 CLR DSC-0155

Reassemble Power Head into Frame Assembly

1. Install the stop pad on the frame assembly (Fig. 041).

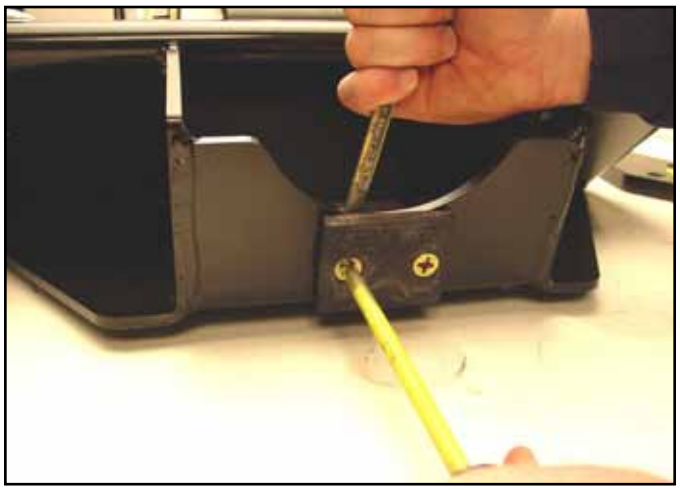


Fig 041 CLR DSC-0155

2. Install one of the pivot plates and 3 bolts and nuts to the frame assembly (Fig. 042 and Fig. 043).

Fig 042 PICT-8704

Fig 043 PICT-8703

3. Insert the auger housing into the previously installed pivot plate (Fig. 044).

Fig 044 PICT-8709

4. Insert the other pivot plate on the auger housing (Fig. 045).

Fig 045 PICT-8710

5. Install the 3 bolts and nuts to secure the pivot plate to the frame assembly (Fig. 046).

Fig 046 PICT-8712

6. Torque the six pivot plate bolts to 210 ± 21 ft-lbs. (284.7 + 28.5 Nm) (Fig. 047).

Fig 047 PICT-8717

Reassemble Auger Power Head

1. With the auger housing shaft facing up, use a bearing driver or press to install bearing. The bearing is seated when the surface is flush with the auger housing (Fig. 048 and Fig. 049).

Fig 048 CLR DSC-0136

Fig 049 CLR DSC-0138

2. Reposition the auger housing so the shaft end is facing down and install spacer (Fig. 050).

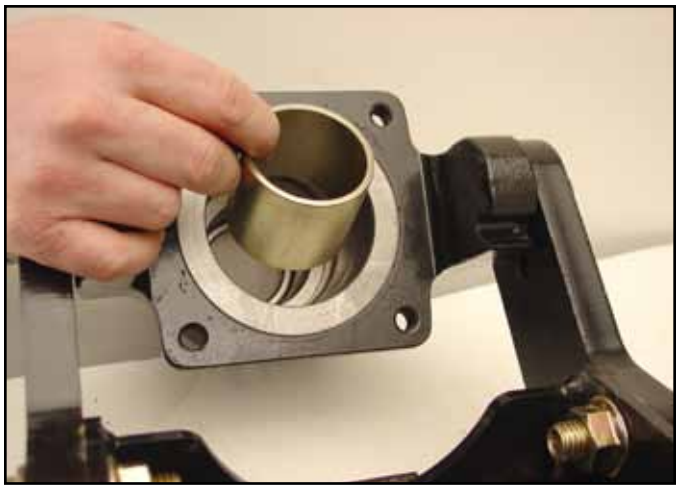


Fig 050 CLR DSC-0140

3. Keep the auger housing in its current position and install the second bearing with a press or bearing driver until it is fully seated.

Note: When the bearing is seated there should be minimal play in the spacer. The spacer should not be bound between the bearings (Fig. 051).

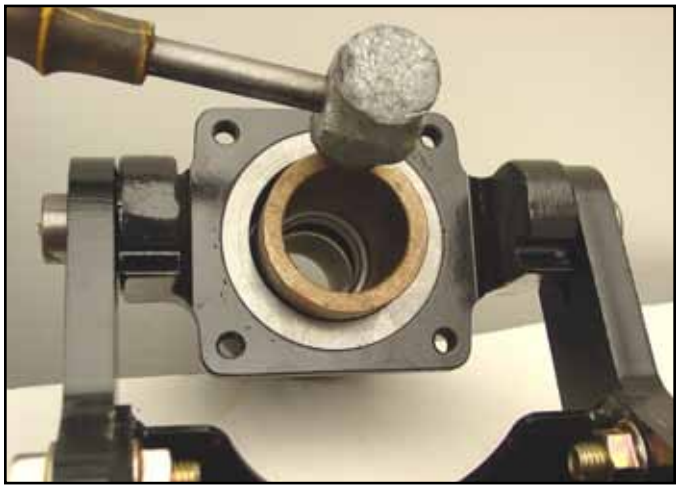


Fig 051 CLR DSC-0142

4. Replace the three hex head screws on the protector plate and torque to 38 ± 7 in-lbs. (4.3 ± .79 Nm) (Fig. 052).

Fig 052 CLR DSC-0160

5. Rotate the auger housing up until you can slide a 1/2” x 2-3/4” bolt into the hole in the cradle arm to lock the auger housing in place (Fig. 053).

Fig 053 CLR DSC-0144

6. Remove any dirt or debris from the auger shaft and slide it into the auger housing (Fig. 054).

Fig 054 CLR DSC-0161

7. Remove the 1/2” x 2-3/4” bolt securing the auger housing. Rotate the shaft down and lower arm. Insert the new bearing lockwasher onto the auger shaft. Make sure the tangs are facing out towards the bearing nut (Fig. 055).

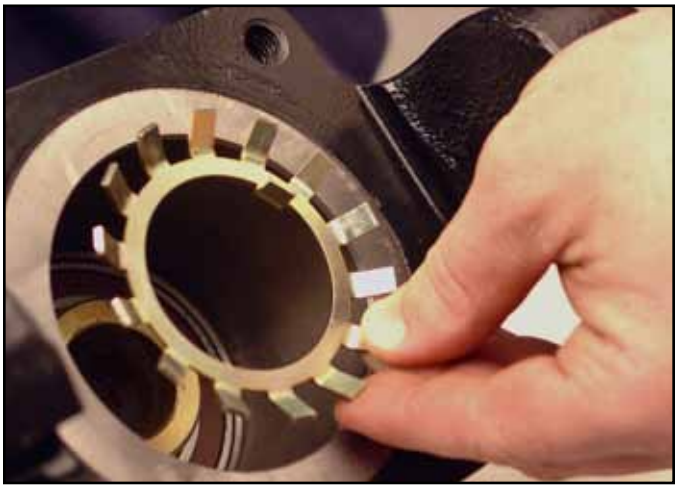


Fig 055 CLR DSC-0163

8. Align the inner tab of the lock washer with the slot on the auger shaft (Fig. 056).

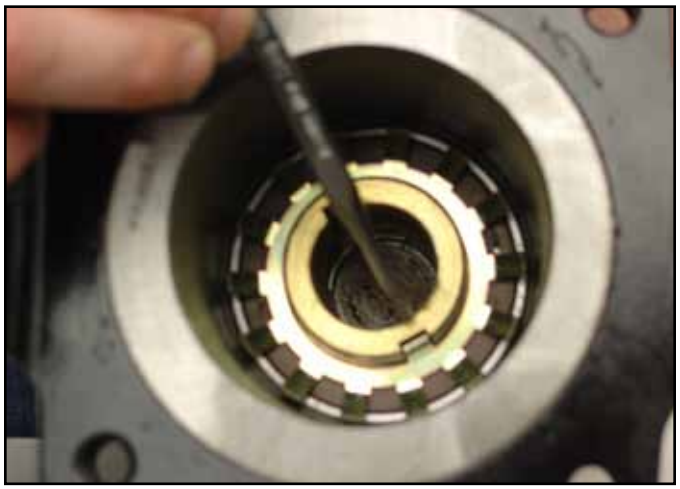


Fig 056 CLR DSC-0165

9. With the auger shaft pointing down on a secure surface, place a 7/8” round stock through the shaft to prevent it from turning when torquing the bearing nut (Fig. 057).

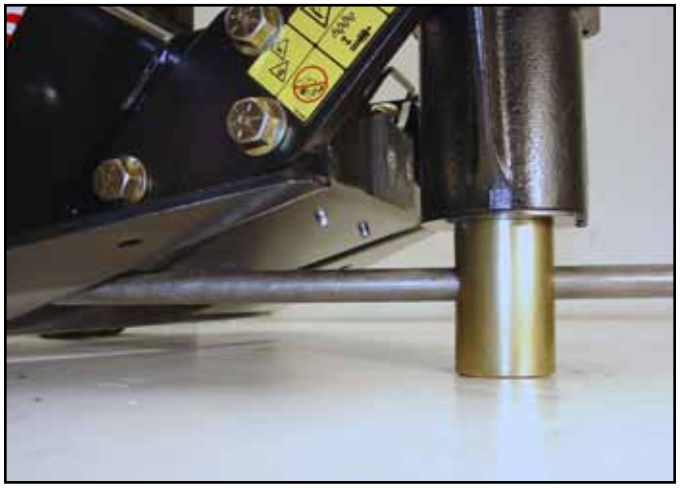


Fig 057 CLR DSC-0179

10. Install the bearing nut onto shaft with the chamfer side of the nut facing down towards the bearing lockwasher (Fig. 058).

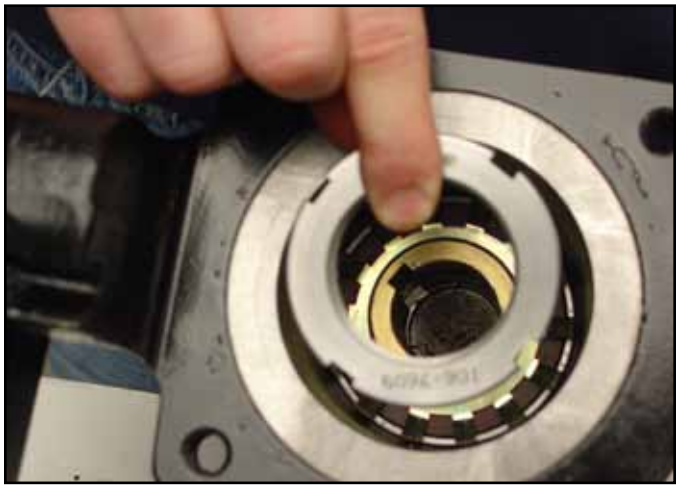


Fig 058 CLR DSC-0166

11. Torque the bearing nut to 150 ft-lbs. (203.37 Nm) (Fig. 059).

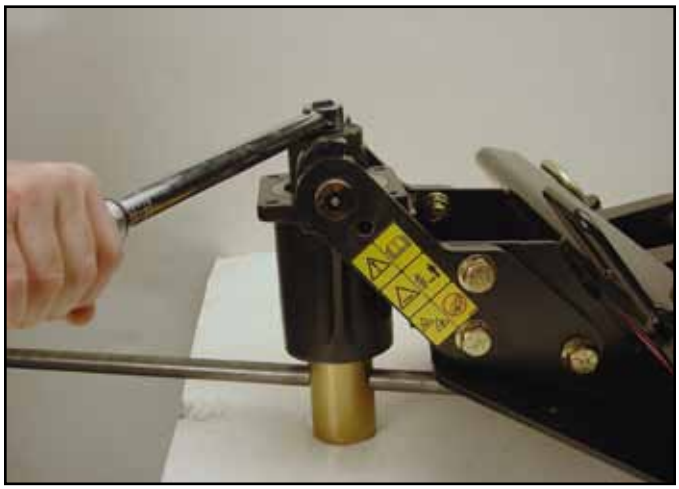


Fig 059 CLR DSC-0171

12. Once the torque value has been reached, if the lockwasher tangs do not line up with the notches on the bearing nut, continue to tighten the bearing nut until two tangs from the bearing lockwasher line up with the notches in the bearing nut (Fig. 060).

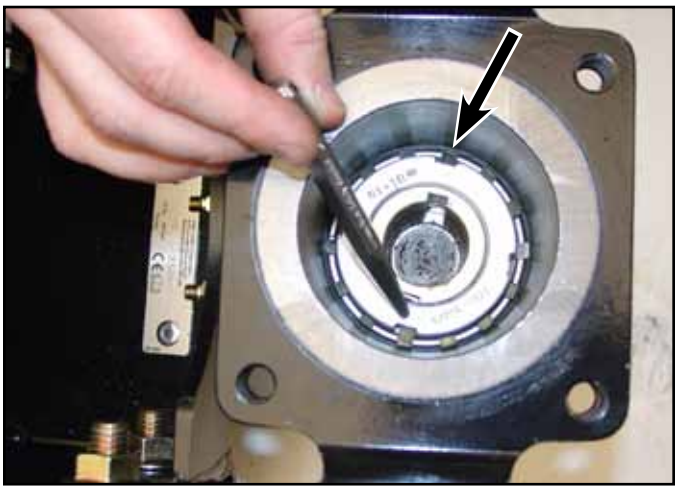


Fig 060 CLR DSC-0185

13. Bend the tabs from the bearing lockwasher into the notches of the bearing nut (Fig. 061).

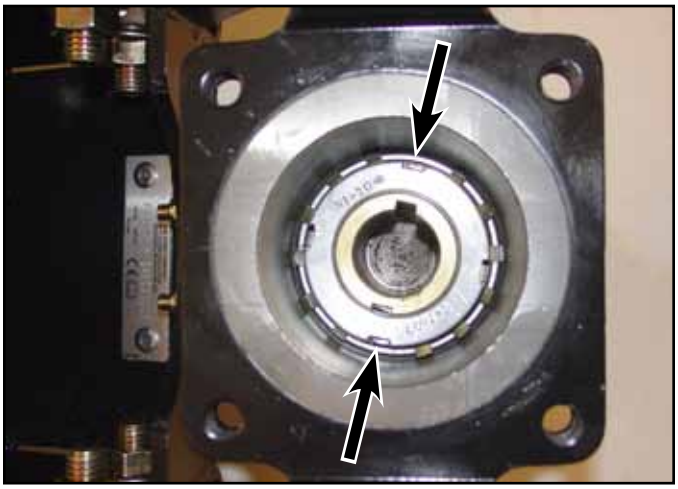


Fig 061 CLR DSC-0189

14. Place a new o-ring on the hydraulic motor (Fig. 062).

Fig 062 CLR DSC-0194

15. Place the key in the groove of the hydraulic motor shaft (Fig. 063).

Fig 063 CLR DSC-0198

16. Align the key of the hydraulic motor with the keyway of the auger shaft. Lower the hydraulic motor into the auger housing. Make sure the 90º hydraulic fittings face away from the traction unit (Fig. 064).

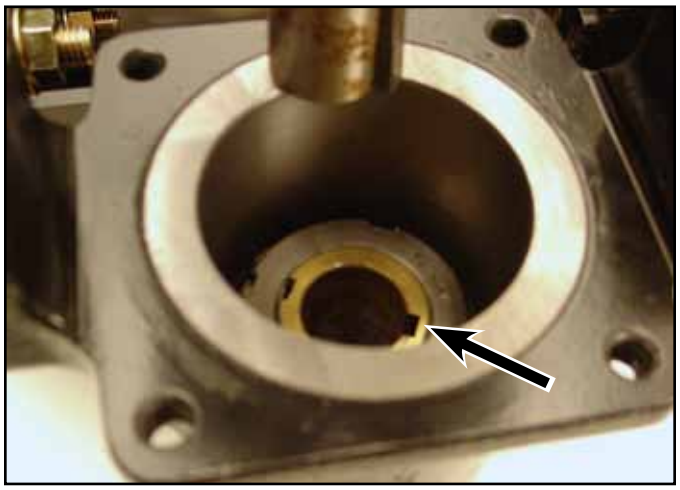


Fig 064 CLR DSC-0199

17. Install the four 3/8” hex head bolts into the hydraulic motor and fasten to the auger housing. Torque to 25 ft-lbs. (34 Nm) (Fig. 065).

Note: Using an extension can reduce torque by one or two pounds.

Fig 065 CLR DSC-0210

18. Install the hydraulic hoses to the hydraulic motor

Note: Replace the o-ring seals on the hydraulic fittings (Fig. 066).

Fig 066 CLR DSC-0203

19. Stabilize the auger head by sliding the 1/2” x 2-3/4” bolt into cradle arm (Fig. 067).

Fig 067 CLR DSC-0144

20. Torque the hydraulic fittings to 42 ± 5 ft-lbs. (56.9 ± 6.8 Nm) (Fig. 068).

Fig 068 CLR DSC-0206

21. Install the other end of the hydraulic hoses onto the flush face couplers (Fig. 069).

Fig 069 CLR DSC-0204

22. Grease the zerks on the auger housing with a high temperature Mobil grease (Fig. 070).

Fig 070 CLR DSC-0192

23. Start the traction unit and engage the auger to make sure the auger is operational in both directions.

Trencher

Chain wear cannot exceed more than 3% of its compressed length. To determine this, lay the chain on a flat surface. Push the ends in to remove all the slack. Measure its length. Next, stretch the chain by pulling the ends until all the slack is removed. Measure its length once more. If the stretch length is more than 3% longer then the compressed length, replace the chain (Fig. 071).

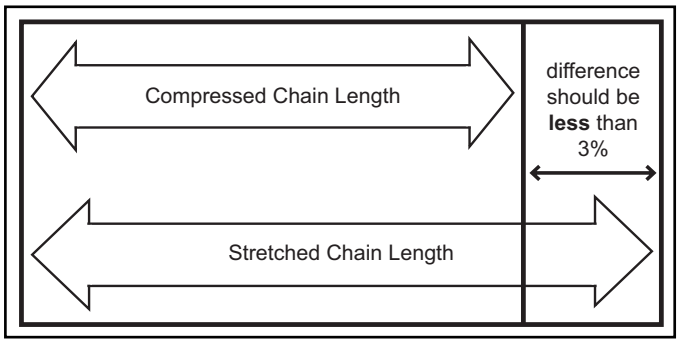


Fig 071 chain chart

1. Disconnect hydraulic lines at the flush face couplers (Fig. 072).

Fig 072 CLR DSC-0204

Cap the flush face couplers to prevent hydraulic contamination (Fig. 073).

Fig 073 CLR DSC-0103

2. Optional: Remove the three bolts washers and nuts that are securing the safety bar for better access (Fig. 074).

Fig 074 CLR DSC-0228

Trencher Chain and Boom Removal

1. Remove the bolt and nut securing the spoils auger to the trencher shaft (Fig. 075).

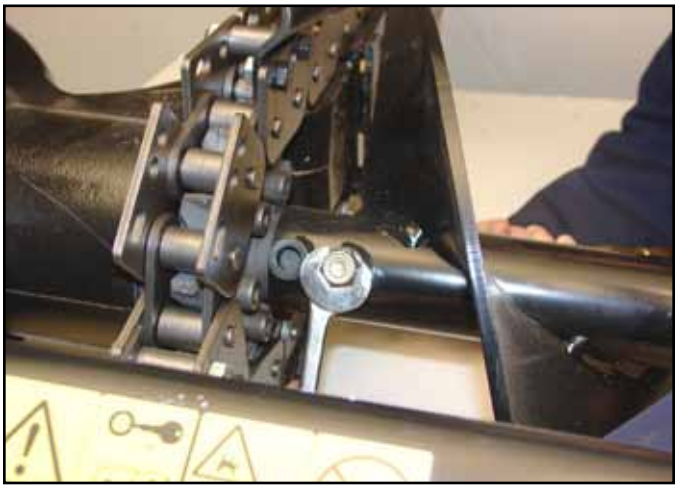


Fig 075 CLR DSC-0229

Slide the spoils auger off trencher shaft (Fig. 076).

Fig 076 CLR DSC-0230

2. Remove the two nuts and bolts from the support plates securing the boom to the trencher arm (Fig. 077).

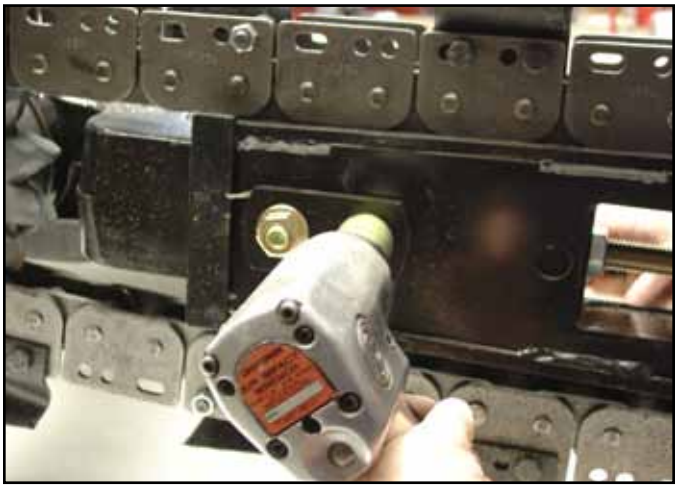


Fig 077 CLR DSC-0232

3. Loosen the jam nut (counter clockwise) on the adjustment bolt and turn the bolt out. Slide boom in towards motor to provide enough slack to remove chain from sprocket (Fig. 078).

Fig 078 CLR DSC-0231

4. First, remove the chain from the nose roller (Fig. 079).

Fig 079 CLR DSC-0234

Second, remove the chain from the trencher sprocket (Fig. 080).

Fig 080 CLR DSC-0235

5. Slide/remove the boom from the boom mount arm (Fig. 081).

Fig 081 CLR DSC-0236

Nose Roller Removal

1. Remove the screw, washer and pin assembly from the nose roller (Fig. 082).

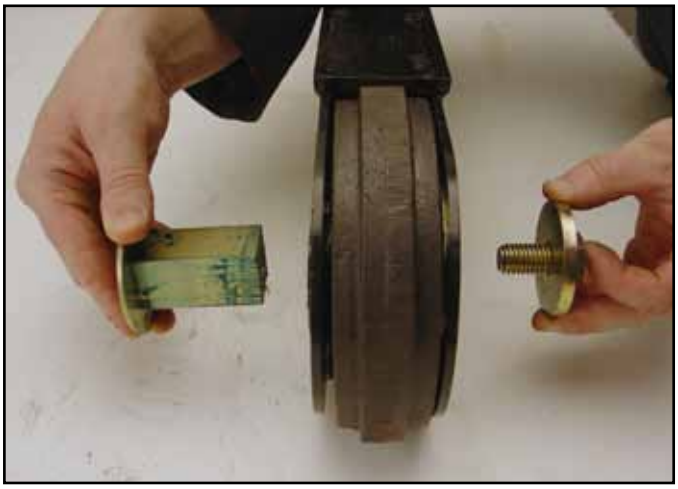


Fig 082 CLR DSC-0238

2. Slide the nose roller out of the boom. Remove the roller caps from each side of the roller. Remove the slotted spacers from each side of the nose roller (Fig. 083).

Fig 083 CLR DSC-0239

3. Clean grease from nose roller to expose the retaining ring. Remove with snap ring pliers (Fig. 084).

Fig 084 CLR DSC-0243

Note: The nose roller bearing is removed from the same side of the nose roller as the retaining ring. Make sure the bearing rotates freely. Replace if necessary. Press the bearing back into the nose roller from the retaining ring side until the bearing is seated (Fig. 085).

Fig 085 CLR DSC-0244

4. Block the nose roller up on a press so the bearing has room to come out. Press the bearing out of the nose roller (Fig. 086 and Fig. 087).

Fig 086 CLR DSC-0244

Fig 087 CLR DSC-0245

Reassemble the Nose Roller

1. Reassemble in reverse order. Place a roller spacer against each side of the bearing surface (Fig. 088).

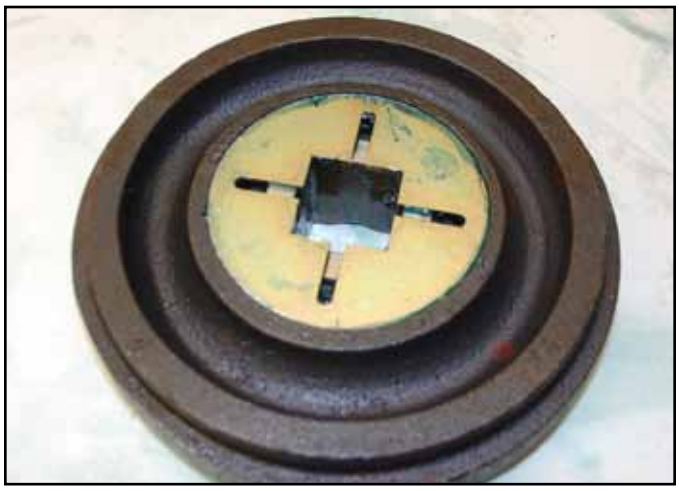


Fig 088 CLR DSC-0246

Install the roller caps next, aligning the square of the cap with the square of the bearing hub (Fig. 089).

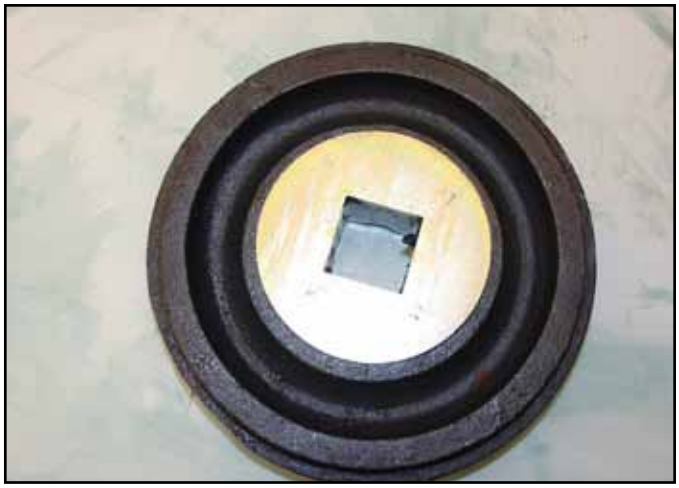


Fig 089 CLR DSC-0247

2. Slide the nose roller back into the boom. Install the screw, washer and pin assembly. Make sure the pin assembly lines up with roller caps and bearing hub (Fig. 090).

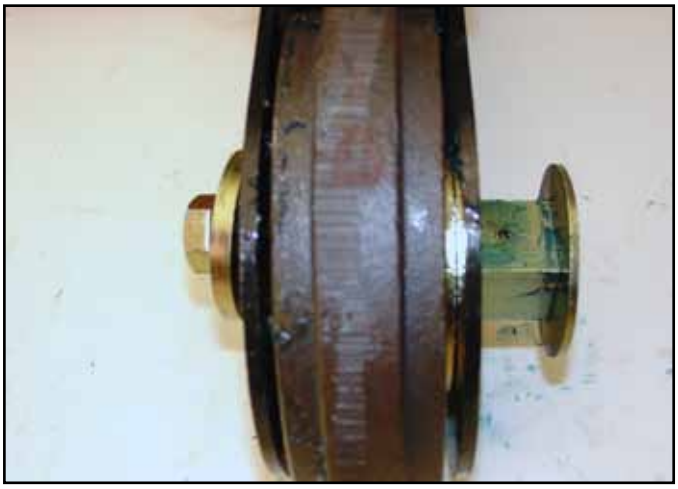


Fig 090 CLR DSC-0248

3. Torque the screw to 150 ft-lbs. ± 15 ft-lbs. (203 ± 20 Nm).

4. Grease the pin assembly with high temperature Mobil grease (Fig. 091).

Fig 091 CLR DSC-0250

Motor Removal

1. Place drain pan under hydraulic motor. Mark one fitting on the hose to one fitting on the motor. Remove hydraulic hoses and cap all motor and hose fittings to prevent contamination to hydraulic system (Fig. 092).

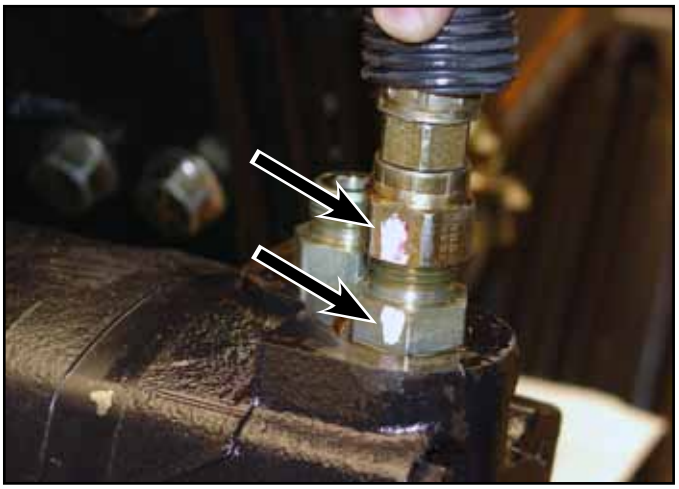


Fig 092 DSC-377

2. Support the hydraulic motor and remove the four screws securing the motor to the boom mount.

Note: When removing the hydraulic motor from the boom mount, hydraulic fluid will come out of the motor as well as the boom mount. Use an oil pan (Fig. 093).

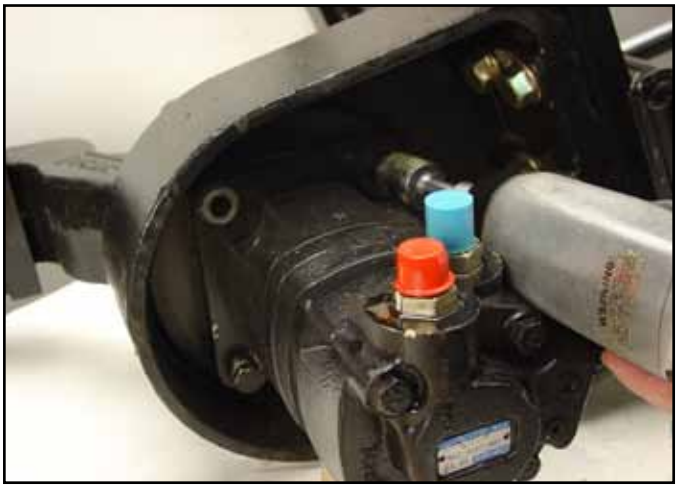


Fig 093 CLR DSC-0257

Trencher Shaft Removal

1. Remove the six hex head screws from the trencher sprocket (Fig. 094).

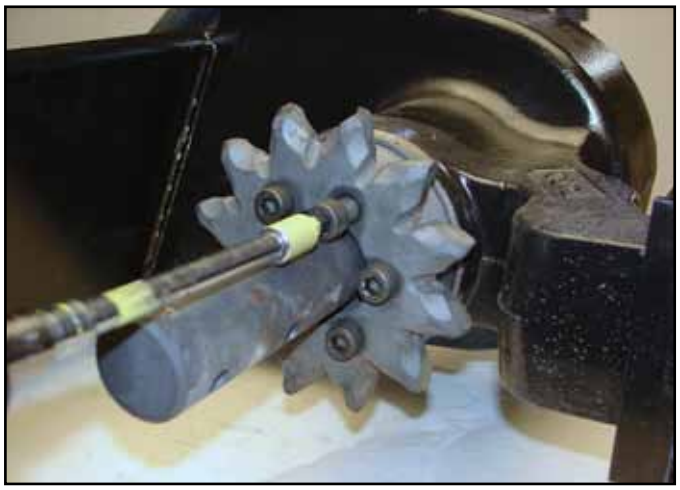


Fig 094 CLR DSC-0252

2. Bend the two tangs from the bearing lockwasher out of the bearing locknut (Fig. 095).

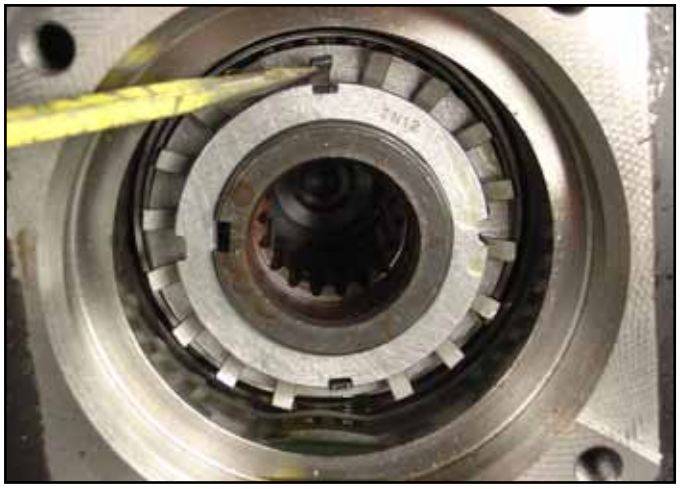


Fig 095 CLR DSC-0297

3. Use a large slotted screw driver to prevent the trencher shaft from spinning and remove the bearing locknut with a spanner wrench, p/n 999-9999 (Fig. 096 and Fig. 097).

Fig 096 CLR DSC-0299

Fig 097 CLR DSC-0300

4. Remove the bearing lockwasher from the trencher shaft (Fig. 098).

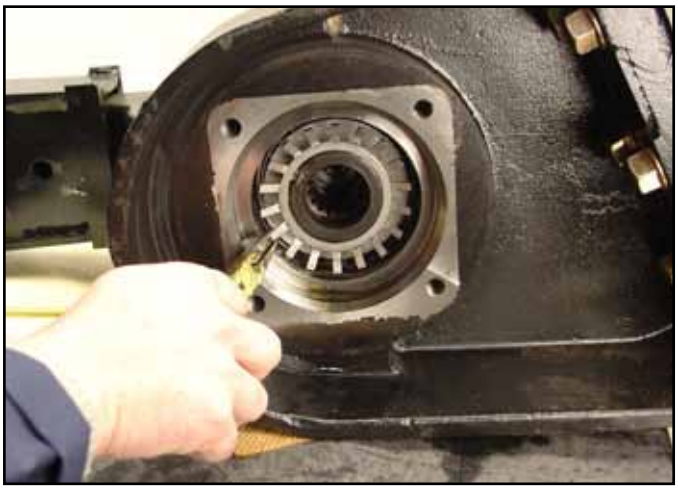


Fig 098 CLR DSC-0301

5. Remove the tongued washer from the trencher shaft (Fig. 099).

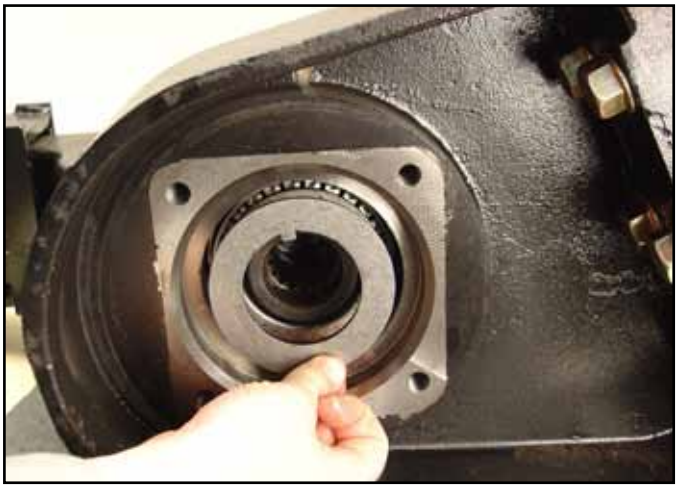


Fig 099 CLR DSC-0302

6. Remove the roller bearing from the trencher shaft (Fig. 100).

Fig 100 CLR DSC-0303

7. From the sprocket side of the trencher boom mount, remove the trencher shaft (Fig. 101).

Fig 101 CLR DSC-0305

8. If the motor side bearing needs replacement proceed as follows. Remove boom mount from mount assembly (Fig. 102).

Fig 102 CLR DSC-0353

9. Block the boom mount on a press so the spacer and shaft seal will press out freely (Fig. 103).

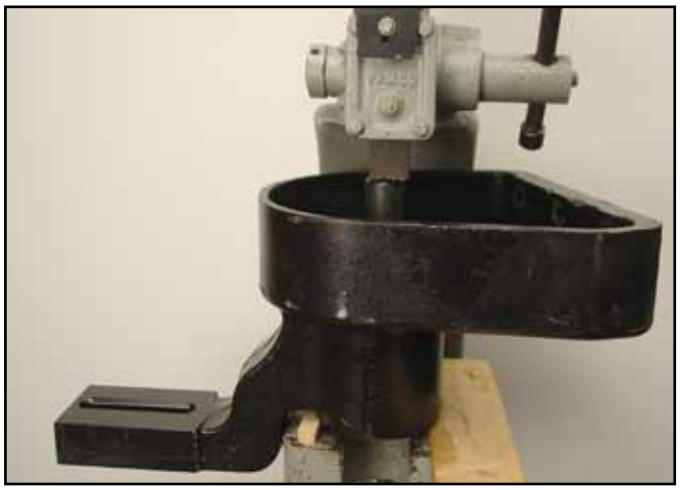


Fig 103 CLR DSC-0310

10. The roller bearing is only removed after the spacer and shaft seal have been pressed out. Inspect bearings for any damage or wear. Replace if damaged.

Note: If the spacer and shaft seal are driven out of the boom mount, replace them. Do not reuse (Fig. 104).

Fig 104 CLR DSC-0311

11. Drive or press out bearing cups from boom mount (Fig. 105).

Note: Do not reuse bearing cups if they are driven out of the boom mount.

Fig 105 CLR DSC-0314

Reassemble Trencher

1. Install new bearing cups with the taper end or the manufacture name stamp towards center. Press or drive both bearing cups until fully seated (Fig. 106).

Note: Assemble the remaining bearing components into the shaft side first.

Fig 106 CLR DSC-0314

2. On the shaft side of the boom mount, place a bearing into the cup with taper end facing down toward the center. The manufacturer name should face up (Fig. 107).

Fig 107 CLR DSC-0336

3. The shaft seal is installed with the step facing down toward the bearing. The green coating facing up. Press or drive the shaft seal until fully seated (Fig. 108).

Fig 108 CLR DSC-0337

4. Press or drive spacer.

Note: Spacer stepped side faces up (Fig. 109).

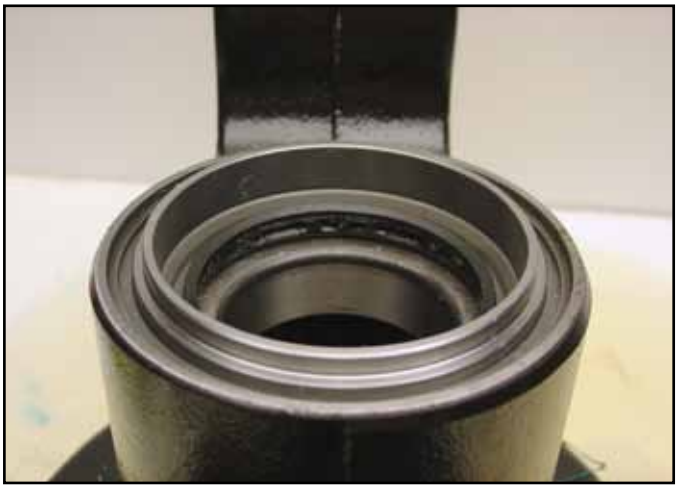


Fig 109 CLR DSC-0341

5. After the shaft side is assembled, turn the boom mount over onto its side and install bearing into the motor side (Fig. 110).

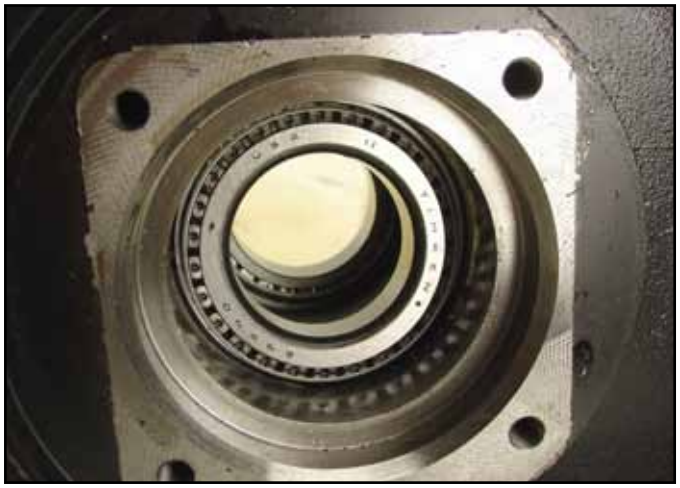


Fig 110 CLR DSC-0342

6. Holding the bearing into the bearing cup on the motor side, slide the trencher drive shaft into the boom mount. Make sure the shaft seats onto the boom mount housing (Fig. 111).

Fig 111 CLR DSC-0343

7. Line up the tab on the tongued washer with the trencher shaft keyway and install (Fig. 112).

Fig 112 CLR DSC-0347

8. Line up the inner tab of the bearing lockwasher with the trencher shaft keyway and install (Fig. 113).

Note: The angle of the bearing lockwasher tabs should face up.

Fig 113 CLR DSC-0348

9. Use a large slotted screwdriver to prevent the trencher shaft from spinning and install the bearing locknut. Torque to 45 ft-lbs. (61 Nm) (Fig. 114).

Fig 114 CLR DSC-0351

10. After the proper torque value has been reached, line up two of the lockwasher tangs and bend into the slots on the locknut (Fig. 115).

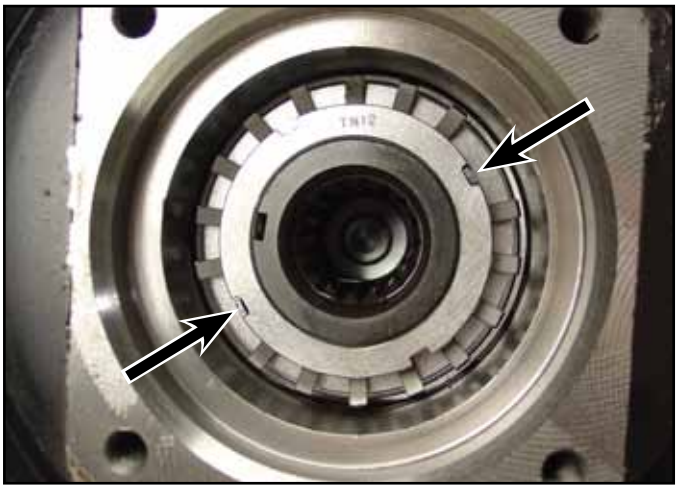


Fig 115 DSC-352

11. Rotate the shaft to ensure the bearings are properly seated.

12. Bolt the mount assembly to the boom and torque the six screws to 210 ± 20 ft-lbs. (285 ± 28 Nm) (Fig. 116).

Note: The three inside screws are difficult to torque with a standard profile socket and torque wrench combination. Torque the outer three screws and ensure the inside screws are securely tightened.

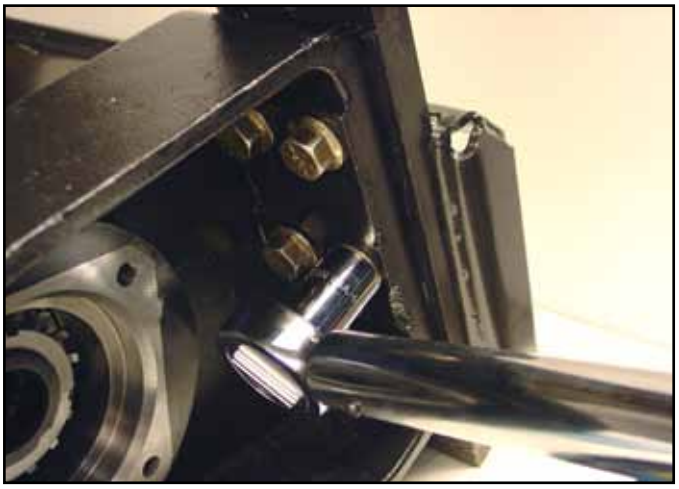


Fig 116 CLR DSC-0355

Note: Install sprocket before hydraulic motor.

13. The sprocket is installed with the recessed side facing the trencher arm. The arrow side faces out toward the spoils auger (Fig. 117).

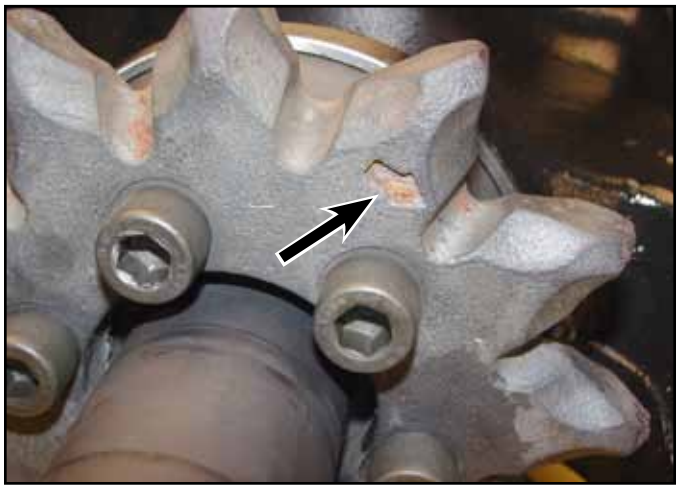


Fig 117 CLR DSC-0359

14. Secure the trencher drive shaft so it will not rotate. Torque the six hex head screws to 105 ± 11 ft-lbs. (142 ± 15 Nm) (Fig. 118).

Fig 118 CLR DSC-0360

15. Install new o-ring onto the hydraulic motor prior to mating it with the trencher shaft (Fig. 119).

Fig 119 CLR DSC-0362

16. Install the hydraulic motor onto the boom mount with the ports facing up. Torque the four screws to 75 ± 8 ft-lbs. (102 ± 11 Nm) (Fig. 120).

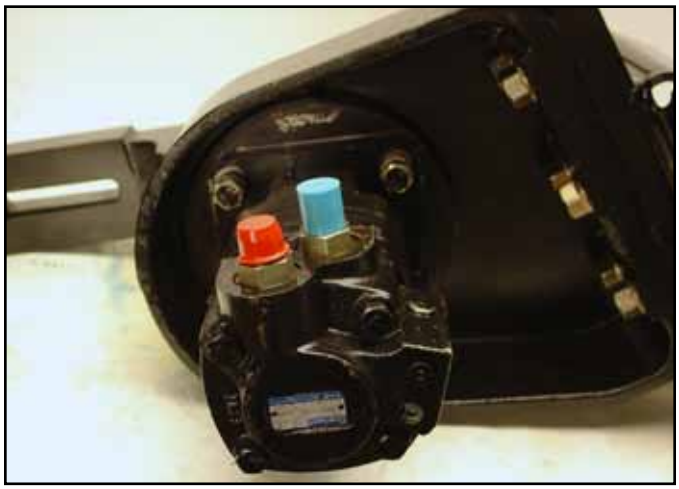


Fig 120 CLR DSC-0357

17. Level the trencher arm before servicing the bearing reservoir. Remove the fill plug. Fill with 16 oz. of SAE 90 - 140 AP 1 Service GL-4 or GL5 (Fig. 121).

Fig 121 CLR DSC-0364

18. Reinstall the fill plug and torque to 11 ± 2 inch-lbs. (1 ± .23 Nm).

19. Install boom onto trencher arm. Place the plate supports on either side of the boom (Fig. 122).

Fig 122 CLR DSC-0367

20. Loosely install bolts and nuts but DO NOT torque yet.

Note: Do not torque until the chain is on the boom and tension has been adjusted (Fig. 123).

Fig 123 CLR DSC-0368

21. Use a traction unit to lift the boom to aid in the install of the chain.

22. Install chain on the sprocket end first and then over the nose roller (Fig. 124).

Fig 124 CLR DSC-0370

23. Turn the adjuster bolt until 1-1/2” - 2-1/2” (3.8 - 6.35cm) droop between the bottom of the boom and the top of the bottom chain span (Fig. 125).

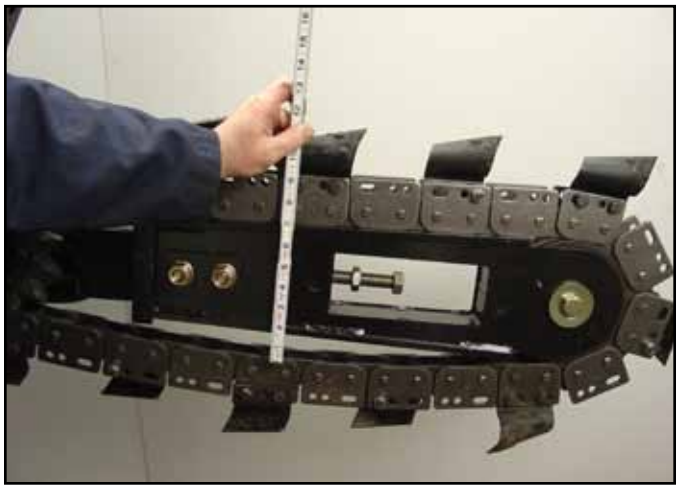


Fig 125 CLR DSC-0371

24. When proper chain tension is obtained, tighten the jam nut securely against the boom (Fig. 126).

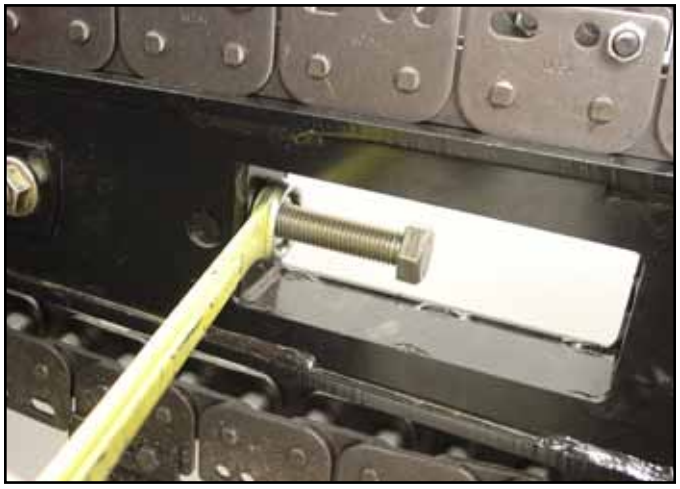


Fig 126 CLR DSC-0372

25. Hold the other side of the screw with a wrench and torque the support plate bolts to 150 ± 15 ft-lbs. (203 ± 20 Nm) (Fig. 127).

Fig 127 CLR DSC-0373

26. Slide the spoils auger onto the trencher shaft. Install screw and nut into one of the two holes according to chain width. Torque to 105 ± 11 ft-lbs. (142 ± 15 Nm) (Fig. 128).

Fig 128 CLR DSC-0374

27. If applicable, install safety bar and torque the three screws and nuts to 210 ± 20 ft-lbs. (284 ± 27 Nm) (Fig. 129).

Fig 129 CLR DSC-0376

28. Remove caps and install hydraulic hoses onto the hydraulic motor. Torque hose fitting to 59 ± 7 ft-lbs. (80 ± 9 Nm) (Fig. 130).

Fig 130 CLR DSC-0377

Note: If motor fittings are removed and replaced, torque to 85 ± 10 ft-lbs. (115 ± 13 Nm).

29. Start traction unit and test trencher in both directions. Check for leaks.

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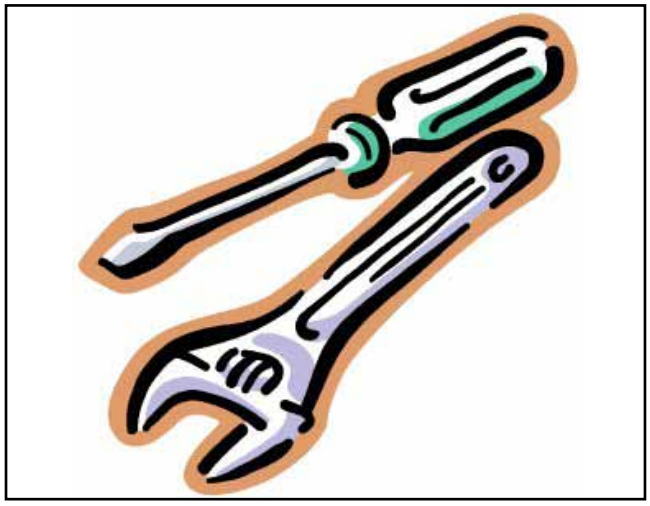
HYDRAULIC TROUBLESHOOTING



Fluids

Hydraulic Fluids

The reservoir acts as an expansion chamber and separates trapped air within the fluid.

When checking the reservoir level, examine the condition of the fluid. The presence of dirt and or metallic particles indicate a fluid and filter change along with further system troubleshooting is needed.

Viscosity

Viscosity is a measure of a fluid's resistance to flow. Fluids with high viscosity resist motion due to internal friction and low viscosity fluids flow easily when in motion.

Fluid too thin
- Creates leakage past seals
- Proper pressure not maintained

Fluid too thick
- Sluggish operation
- Increased pump loading to flow oil
- High cold fluid pressure can fail seals and gaskets

Excessive Fluid Temperature

Continuous Operation at Relief Pressure

Incorrect Fluid
- Drain, flush and replace with proper fluid

Low Fluid Level
- Fill reservoir to the full mark
- Check system for external leaks

Contaminated Fluid
- Drain, flush and fill with clean fluid
- Determine source of contamination

Excessive Engine Speed
- Adjust rpm’s to specification

Incorrect Relief Valve Pressure Setting
- Check and adjust pressure
- Clean or replace relief valve

Internal Component Fluid Leakage
- Inspect and test valves, cylinder, pumps and motors for internal leakage
- Locate and repair faulty component(s)

Pump Suction Line Restriction
- Clean and or replace suction hose(s)

Pinched, Dented and or Obstructed Hydraulic Lines
- Clean and or replace affected hydraulic lines

Control Valve Partially or Fully Open
- Free spools to allow them to return to neutral

Heat not Dissipating
- Clean dirt and debris from hydraulic lines, components, oil cooler and reservoir
- Excessive internal leakage

Foaming Fluid

Low Fluid Level
- Fill reservoir to the full mark
- Check system for external leaks

Water in the Fluid
- Drain, flush and replace fluid

Incorrect Fluid
- Drain, flush and replace with proper fluid

Air Leak Between Reservoir and Pump
- Tighten loose connection
- Replace damaged hose

Restricted Flow from Kinked/Dented Lines
- Replace affected lines

Worn Pump Seal
- Replace seal
- Check for contaminated fluid
- Ensure pump alignment

Hydraulic Fluid Dirty/Milky

Water in the fluid (Milky)
- Change fluid and filter and flush complete system

Failed Filter
- Replace filter
- Check system pressure and flow
- Restrictions

Metal Particles
- Change fluid and replace filter
- Determine damaged components and repair and replace
- Flush complete system

Discolored/Burned Fluid

Kinked Hydraulic lines
- Locate affected line(s) and replace

Incorrect Fluid/Contaminated Fluid
- Drain, flush and replace with proper fluid

Operational Troubleshooting

Loss of Hydraulic Function

No Fluid in the System
- Fill reservoir to the full mark
- Check system for external leaks
- Damaged components may result

Low Fluid Level
- Fill reservoir to the full mark
- Check system for external leaks
- Damaged components may result

Incorrect Fluid
- Drain, flush and replace with proper fluid
- Damaged components may result

Dirty/Plugged Filter
- Replace Filter
- Determine the source of contamination
- Flush complete system
- Clean hydraulic tank

System Restriction
- Collapsed hoses
- Kinked tubing

Suction Line Air Leaks
- Determine if connection is loose and tighten
- Replace damaged hose or fitting and o-ring

Pump Contaminants
- Clean pump
- Drain and flush the hydraulic system
- Clean hydraulic tank

Worn/Damaged Pump
- Repair or replace pump
- Check fluid
- Check for proper alignment
- Leak
- Hydraulic restriction

Worn/Damaged Components
- Check Valves, wheel motors and cylinders for damage/leaks
- Repair/Replace as necessary
- Belt or pulley (hydrostatic pump)

Operational Troubleshooting cont.

Loss of Hydraulic Function cont.

Pressure Line Leaks
- Tighten loose fittings/Replace damaged fittings
- Replace damaged seal(s)

Relief Valve
- Pressure test to ensure the valve is opening at the rated pressure
- Look for leaks, replace damaged seals
- Clean the valve and inspect for broken spring

Erratic Operation

Air in the System
- Inspect suction side for leaks
- Ensure Reservoir is at the full mark

Cold Fluid
- Fluid viscosity too thick
- Allow fluid to reach operating temperature prior to operating hydraulic functions

Components Sticking/Binding
- Inspect for dirt and other contaminants
- Check for worn or bent parts

Quick Coupler Worn
- Replace

Damaged Pump
- Check and replace broken or worn bearings
- Repair or replace pump
- Belt or pulley (hydrostatic pump)

Contaminants in the Relief Valve
- Clean and test

Filter/Suction Line Restriction
- Collapsed suction hoses or filter lines restricting flow

Slow Operation

Cold Fluid
- Fluid viscosity too high
- Allow fluid to reach operating temperature prior to operating hydraulic functions

Low Engine Speed
- Adjust to engine manufacturer specification

Low Fluid Level
- Fill reservoir to the full mark
- Check system for external leaks

Air in the System
- Inspect suction side for leaks
- Ensure Reservoir is at the full mark

Worn/Damaged Pump
- Replace pump
- Check fluid
- Check for proper alignment
- Belt or pulley (hydrostatic pump)

Filter/Suction Line Restriction
- Collapsed suction hoses or filter lines restricting flow

Relief Valve
- Pressure test to ensure the valve is opening at the rated pressure
- Look for leaks, replace damaged seals
- Clean the valve and inspect for broken spring

Worn/Damaged Components
- Check Valves, wheel motors and cylinders for damage/leaks
- Repair/Replace as necessary

Pressure Line Leaks
- Tighten loose fittings/Replace damaged fittings
- Replace damaged seal(s)

Pumps

Pump Troubleshooting

Hydraulic pumps transfer fluids by suction, pressure, or both. Pumps convert mechanical energy into hydraulic pressure and flow.

Inspect the plumbing for bent, kinked/flattened lines, leaks and dirt build up.

Inspect the pump housing for discolored surfaces. Ensure the linkage is assembled correctly and it is not bent or binding.

Look for evidence of recently installed parts and inquire with the owner/operator.

Pump not delivering oil
- Reservoir fluid level low
- Inlet line to the pump plugged
- Air drawn in through the inlet side of pump
- Insufficient pump speed
- Dirt/debris in the pump
- Worn or broken internal pump parts
- Pump belt or connection

No Pressure (Pump doesn't produce pressure. Relief valve relief regulates maximum pressure.)
- Oil recirculating back to the reservoir instead of downstream
- Broken hydrostatic pump piston, valve broken or stuck in the open position
- Relief valve damaged, stuck, adjusted/misadjusted, no flow
- Leak

Slow/Erratic Behavior
- Oil temperature too cold
- Incorrect oil viscosity
- Restriction or air leak at the pump inlet
- Insufficient pump speed
- Internal pump parts sticking
- Internal pump parts out of tolerance due to wear
- Contaminated oil
- Belt slippage (hydrostatic pump)

Noisy Pump
- Inlet line restricted or plugged
- Air drawn in through the inlet side of pump
- Reservoir level low
- Fluid viscosity (thick or thin)
- Pump speed too high
- Contaminated oil
- Broken or worn pump parts
- Belt or pulley (hydrostatic pump)

Excessive Wear
- Abrasives in the oil
- Oil viscosity too low or too high
- Continued high pressure operation (Above pump specification)
- Cavitation due to air leaks or restrictions
- Misaligned pump drive shaft

Excessive Oil Leakage
- Drive shaft seals damaged

Broken Internal Parts
- Maximum pressure limits for pump exceeded (hydrostatic pump)
- Lack of oil
- Abrasive contaminants in the oil

Pumps cont.

Noisy Pump

Low Fluid Level
- Fill reservoir with recommended fluid
- Check for system leaks

Fluid Viscosity Too Thick
- Flush system and change to recommended fluid

Suction Line Restricted
- Clean or replace the line between reservoir and pump

Dirty Pump
- Disassemble and clean the pump and suction line
- Determine the source

Plugged Reservoir Vent
- Remove breather cap and clean the vent line

Air in the Fluid
- Tighten loose suction line fittings
- Check for system leaks
- Replace pump seals

Worn/Damaged Pump Bearings or Shaft
- Replace worn parts
- Determine the cause
- Belt and pulley

Inlet Screen Plugged
- Remove and clean screens

Broken or Damaged Pump Parts
- Replace damaged parts
- Check for contamination
- System pressure set too high

Sticking/Binding Parts
- Eliminate cause of binding
- Clean parts
- Flush system and change the fluid

Leaky Pump

Damaged Shaft Seal
- Replace seal
- Check fluid for contamination
- Ensure shaft alignment

Damaged Pump Parts
- Tighten loose bolts and or fittings
- Inspect housing for cracks

Wheel Motors

Simply put, wheel motors are pumps used backwards. Wheel motors receive hydraulic pressure and flow from a pump and convert it back into rotary mechanical energy.

Leakage
- Loose, worn or damaged fittings
- Damaged seals
- Loose, worn or damaged bolts
- Internal shaft seal damaged
- Internal parts out of tolerance due to wear
- Hub not on properly or not torqued properly

Loss of Drive
- Lack of oil
- Excessive internal leakage
- Worn or damaged internal splines
- Excessive heat

Slow/Erratic Behavior
- Oil temperature too cold
- Incorrect oil viscosity
- Restriction or air leak at the pump
- Insufficient pump speed
- Internal parts sticking
- Internal parts out of tolerance due to wear

Valves

Valves are used to provide control of pressure, direction and volume in a hydraulic system.

Bypass Valve

Bypass valves are a type of flow control valve used to manually open a hydraulic circuit allowing oil to bypass from one side of a circuit to the other. Bypass valves allow units to be moved without starting the engine.

Relief Valve Troubleshooting

Relief valves are a type of pressure control valve. Relief valves are used both to regulate system pressure and to protect hydraulic circuits from pressures which are higher than its design.

Erratic/Low Pressure
- Incorrect pressure setting
- Valve held open by dirt/debris
- Poppet and or seat worn or damaged
- Weak or damaged spring
- Blocked orifice

No Pressure
- Blocked orifice
- Poppet not properly seating
- Weak or damaged spring
- Valve held open by dirt/debris
- Poppet and or seat worn or damaged
- Cracked housing

System pressure can not be adjusted or is excessive
- Broken or worn spring
- Incorrect spring
- Restricted drain line

Excessive Heat
- Continuous operation at relief pressure
- Oil viscosity too high
- Valve seat leakage
- Restriction hydraulic line

Spool Valve Troubleshooting

Spool valves are a type of directional control valve that allows oil flow to be diverted to a remote circuit when the spool is not centered.

Difficult Spool Shifting
- Control lever binding
- Lack of pressure
- Bad centering spring
- Spool out of adjustment
- Contamination

Cylinder Creep
- Spool not properly centered
- Spool worn or damaged
- Cylinder wear
- Cylinder seals

Control Valve Leaks

Worn/Damaged O-Rings
- Replace affected O-rings
- If damaged from contamination, locate the source

Valve Parts Broken/ Damaged
- Inspect to determine cause
- If cracked, check system pressure
- Confirm hydraulic lines are attached correctly

Cylinders/Loader Arms

Hydraulic Cylinders

Hydraulic cylinders convert hydraulic pressure and flow into linear mechanical energy. Cylinders consist of a sealed chamber, piston and piston rod.

External Leaks
- Loose fittings
- Bad seal

Internal Leaks
- Leaking piston seals
- Scored cylinder bore
- Burr on the piston

Loose cylinder
- Bent cylinder rod
- Overloading
- High system pressure or flow
- Impact

Cylinder Leaks

Damaged Cylinder Barrel
- Replace Cylinder Barrel
- Determine cause of the damage
- Inspect loader arm for straightness or loose, worn pivot pins

Rod Seal Leaks
- Replace damaged seal
- If damaged from contamination, locate the source
- Inspect piston for scratches and or nicks

Loose Parts
- Tighten loose parts/fittings

Piston Rod Damaged
- Inspect Piston for scratches and or nicks
- Replace affected part

Loader Arm Drops in Neutral

Broken or Leaky Hydraulic Lines between Control Valve and Cylinder
- Check for leaks
- Tighten or replace affected hydraulic line fittings

Fluid Leaking Past Cylinder O-Rings
- Replace worn parts
- Wear due to contamination requires system flushing
- Inspect cylinder barrel and piston

Fluid Leaking Past Control Valve
- Clean and inspect the valve
- Replace worn parts
- Wear due to contamination requires system flushing

Valve Control Lever not Returning to Neutral when Released
- Check linkage for binding
- Check valve adjustment
- Check valve return spring

Valve Control Lever Sticks
Misaligned/Stuck Control Linkage
- Realign linkage
- Lubricate linkage
- Return spring

Tie Bolts Over-tightened
- Loosen bolts and torque to specification
- Wrong bolts or hardware
- Assembled incorrectly

Broken/Damaged Internal Valve Parts
- Replace broken/damaged parts
- If damaged from contamination, locate the source

Dingo® TX413

Compact Utility Loader

Service Manual

Form no. 492-4797