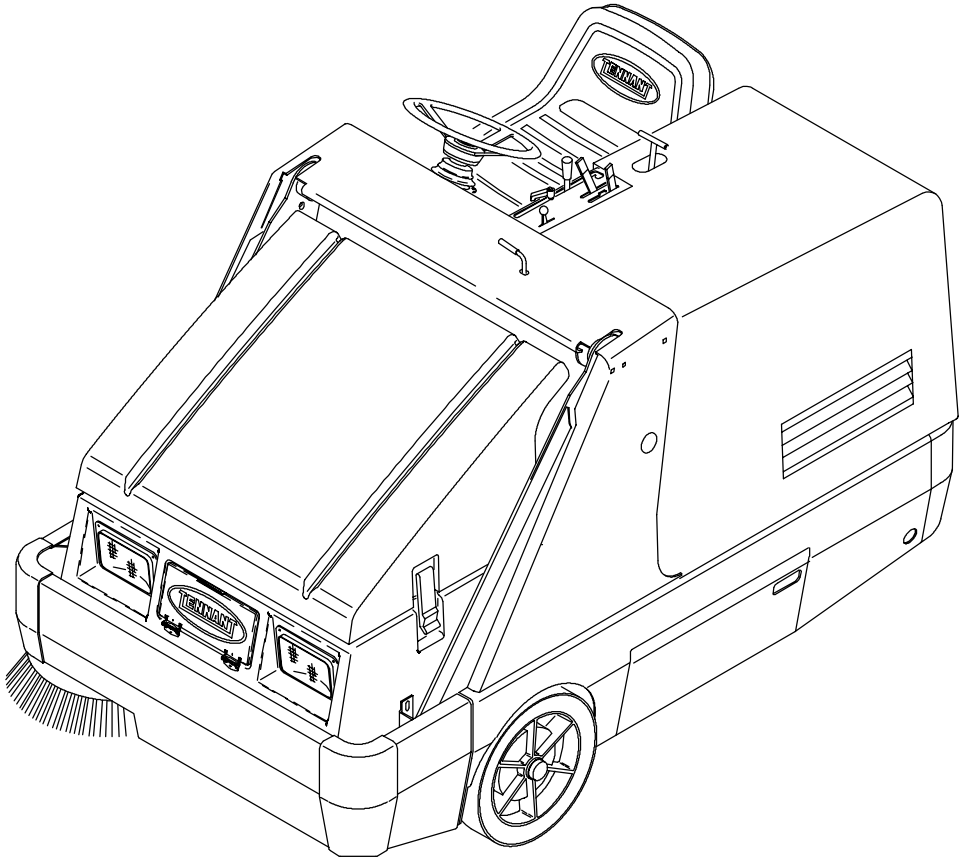
6400E

Service Manual



MM434
Rev. 02 (11-01)

This service manual is intended to be used as an aid in the detailed service, repair, and troubleshooting of your TENNANT Model 6400E.

The set is organized into five major groups: General Information, Chassis, Sweeping, Electrical, and Hydraulics.

General Information: Safety precautions, machine specifications, machine maintenance chart, machine tieing, machine jacking, machine storing, machine pushing or towing, and hardware information.

Chassis: Tire/wheel replacement, brake adjustment and replacement, seat removal and installation, chassis lubrication, and steering adjustment and replacement.

Sweeping: Hopper repair/replacement, brush repair/replacement, skirt/seal repair/replacement, and sweeping troubleshooting.

Electrical: Battery maintenance and replacement, instrument panel replacement, and electrical troubleshooting.

Hydraulics: Valve replacement/repair, motor replacement/repair, cylinder replacement/repair, pump replacement/repair, filter replacement, and hydraulics troubleshooting.

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SAFETY PRECAUTIONS

The following symbols are used throughout this manual as indicated in their description:

WARNING: To warn of hazards or unsafe practices that could result in severe personal injury or death.

FOR SAFETY: To identify actions that must be followed for safe operation of equipment.

The following information signals potentially dangerous conditions to the operator or equipment. Read this manual carefully. Know when these conditions can exist. Locate all safety devices on the machine. Then, take necessary steps to train machine operating personnel. Report machine damage or faulty operation immediately. Do not use the machine if it is not in proper operating condition.

FOR SAFETY:

1. **Do not operate machine:**
   - **Unless trained and authorized.**
   - **Unless operation manual is read and understood.**
   - **In flammable or explosive areas unless designed for use in those areas.**
   - **In areas with possible falling objects unless equipped with overhead guard.**

2. **Before starting machine:**
   - **Make sure all safety devices are in place and operate properly.**
   - **Check brakes and steering for proper operation.**

3. **When starting machine:**
   - **Keep foot on brake and directional pedal in neutral.**

4. **When using machine:**
   - **Use brakes to stop machine.**
   - **Go slowly on inclines and slippery surfaces.**
   - **Use care when reversing machine.**
   - **Move machine with care if hopper is raised.**
   - **Make sure adequate clearance is available before raising hopper.**
   - **Do not carry riders on machine.**
   - **Always follow safety and traffic rules.**
   - **Report machine damage or faulty operation immediately.**

5. **Before leaving or servicing machine:**
   - **Stop on level surface.**
   - **Set parking brake.**
   - **Turn off machine and remove key.**

6. **When servicing machine:**
   - **Avoid moving parts. Do not wear loose jackets, shirts, or sleeves when working on machine.**
   - **Block machine tires before jacking up machine.**
   - **Jack up machine at designated locations only. Block machine up with jack stands.**
   - **Use hoist or jack that will support the weight of the machine.**
   - **Wear eye and ear protection if using pressurized air or water.**
   - **Disconnect battery connections before working on machine.**
   - **Avoid contact with battery acid.**
   - **Use cardboard to locate leaking hydraulic fluid under pressure.**
   - **Use Tennant supplied or equivalent replacement parts.**

7. **When loading/unloading machine onto/off truck or trailer:**
   - **Turn off machine.**
   - **Use truck or trailer that will support the weight of the machine.**
   - **Use winch. Do not drive the machine onto/off the truck or trailer unless the load height is 380 mm (15 in) or less from the ground.**
   - **Set parking brake after machine is loaded.**
   - **Block machine tires.**
   - **Tie machine down to truck or trailer.**

WARNING: Batteries emit hydrogen gas. Explosion or fire can result. Keep sparks and open flame away. Keep covers open when charging.

WARNING: Lift arm pinch point. Stay clear of hopper lift arms.

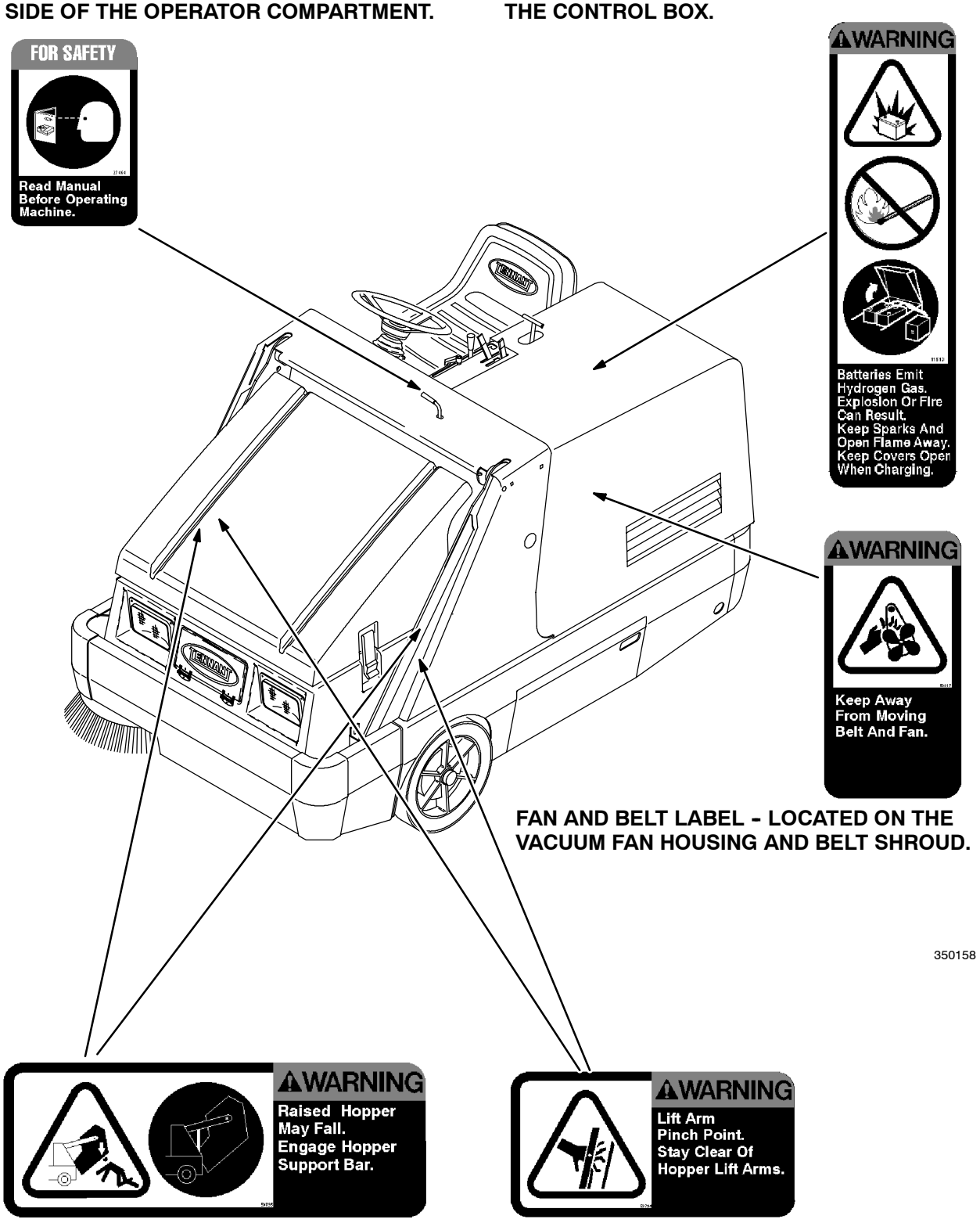
WARNING: Raised hopper may fall. Engage hopper support bar.

WARNING: Moving belt and fan. Keep away.

The following safety labels are mounted on the machine in the locations indicated. If these or any labels become damaged or illegible, install a new label in its place.

FOR SAFETY LABEL - LOCATED ON THE SIDE OF THE OPERATOR COMPARTMENT.

BATTERY CHARGING LABEL - LOCATED ON THE CONTROL BOX.



FAN AND BELT LABEL - LOCATED ON THE VACUUM FAN HOUSING AND BELT SHROUD.

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HOPPER SUPPORT LABEL - LOCATED ON BOTH LIFT ARMS AND THE HOPPER SUPPORT BAR.

HOPPER LIFT ARMS LABEL - LOCATED ON BOTH LIFT ARMS.

SPECIFICATIONS

GENERAL MACHINE DIMENSIONS/CAPACITIES

Item	Dimension/capacity	
Length	2085 mm	(82 in)
Length with side brush	2260 mm	(89 in)
Width	1230 mm	(48.4 in)
Width with side brush	1395 mm	(55 in)
Height	1435 mm	(56.5 in)
Height with overhead guard	2085 mm	(82 in)
Track	1135 mm	(44.7 in)
Wheelbase	1135 mm	(44.7 in)
Main sweeping brush diameter	355 mm	(14 in)
Main sweeping brush length	915 mm	(36 in)
Side brush diameter	585 mm	(23 in)
Sweeping path width	915 mm	(36 in)
Sweeping path width with side brush	1270 mm	(50 in)
Main sweeping brush pattern width	50 to 75 mm	(2 to 3 in)
Hopper weight capacity	315 kg	(700 lb)
Hopper volume capacity	315 L	(11.25 ft^3)
Dust filter area	6.9 m^2	(74 ft^2)
GVWR	2041 kg	(4500 lb)
Ceiling height minimum dumping clearance	2340 mm	(92 in)

GENERAL MACHINE PERFORMANCE

Item	Measure	
Maximum forward speed	8 km/h	(5 mph)
Maximum reverse speed	4.8 km/h	(3 mph)
Minimum aisle turn width, left	2360 mm	(93 in)
Minimum turning radius, right	1490 mm	(58.7 in)
Minimum turning radius, left	1135 mm	(44.7 in)
Maximum rated incline with empty hopper	10° / 17.6%	
Maximum rated incline with full hopper	8° / 14.1%	

POWER TYPE

Type	Quantity	Volts	Ah Rating	Weight
Batteries	6	6	315 @ hr rate	58 kg (127 lb)
	2	18	340 @ hr rate	254 kg (560 lb)
	2	18	440 @ hr rate	299 kg (660 lb)

Type	Use	VDC	Kw (hp)
Electric Motors	Propelling	36	1.6 (2.1)
	Accessory	36	3 (4)

Type	VDC	A	Hz	Phase	VAC
Chargers	36	50	60	1	240
	36	75	60	1	variable
	36	75	60	3	variable
	36	50	50	1	230
	36	75	50	3	variable
	36	45	50/60	1	variable

STEERING

Type	Power source	Emergency steering
Rear wheel, hydraulic cylinder and rotary valve controlled	Hydraulic accessory pump	Manual

HYDRAULIC SYSTEM

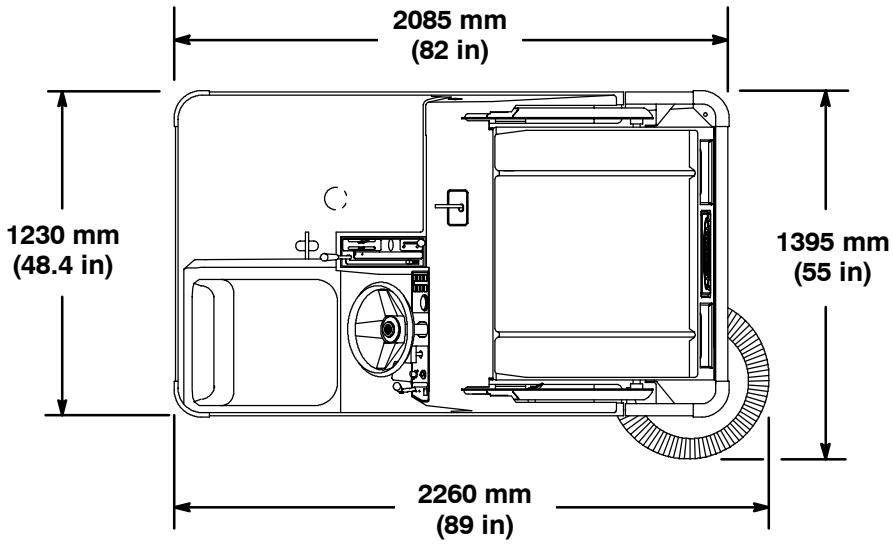
System	Capacity	Fluid Type
Hydraulic reservoir	10.6 L (2.8 gal)	TENNANT part no. 65870
Hydraulic total	12.1 L (3.2 gal)	
Propelling gearbox	2.6 L (2.7 qt)	SAE 90 Gear weight lubricant

BRAKING SYSTEM

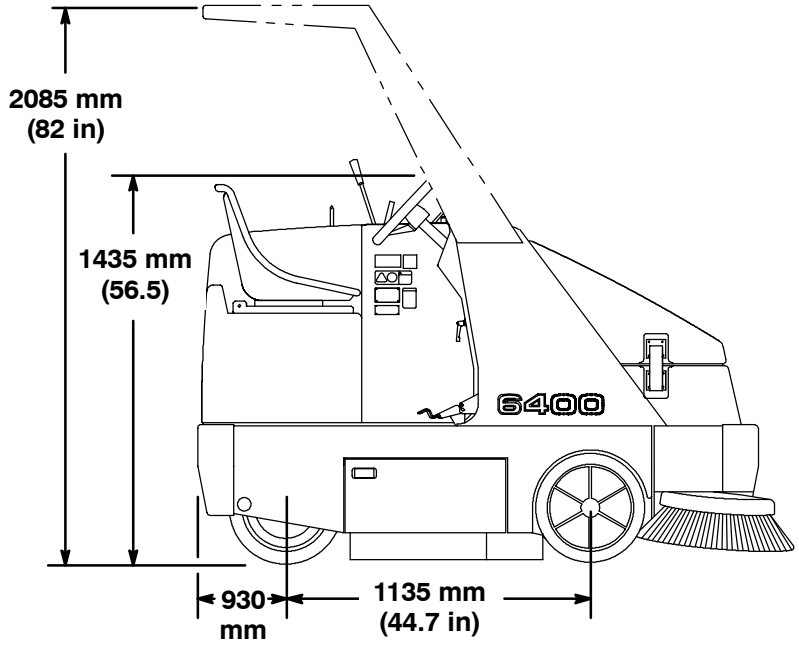
Type	Operation
Service brakes	Mechanical drum brakes (2), one per front wheel, cable actuated
Parking brake	Utilizes service brakes, cable actuated

TIRES

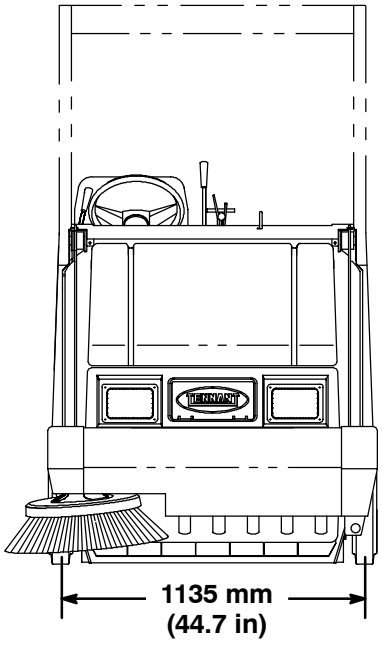
Location	Type	Size
Front (2)	Solid	406 x 89 x 308 (16 x 3 1/2 x 12 1/8)
Rear (1)	Solid	406 x 102 x 308 (16 x 4 x 12 1/8)



TOP VIEW



SIDE VIEW



FRONT VIEW

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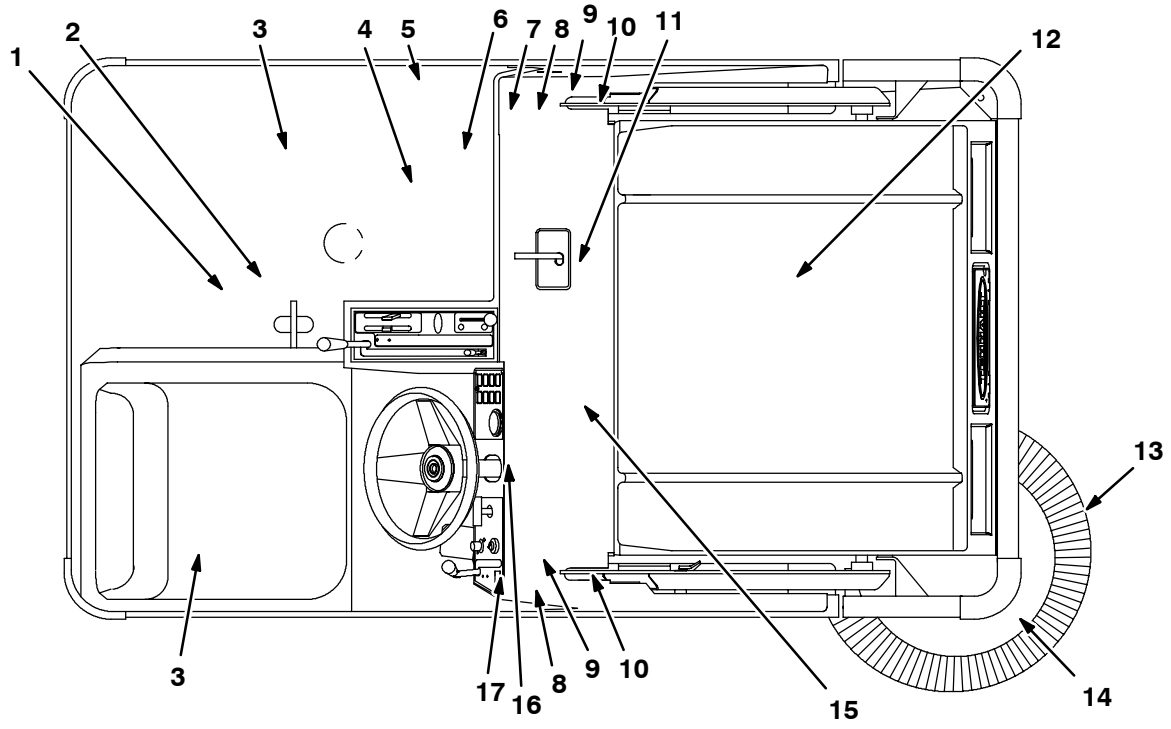
MACHINE DIMENSIONS

MAINTENANCE



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MAINTENANCE CHART

Interval	Key	Description	Procedure	Lubricant/ Fluid	No. of Service Points
Daily	8	Brush compartment skirts	Check for damage, wear, and adjustment	–	5
	15	Hopper lip skirts	Check for damage, wear, and adjustment	–	3
	11	Main brush	Check for damage or wear	–	1
			Check brush pattern	–	1
	13	Side brush	Check for damage or wear	–	1
			Check brush pattern	–	1
	12	Hopper dust filter	Shake	–	1
50 Hours	11	Main brush	Rotate end-for-end	–	1
	3	Batteries	Check electrolyte level	DW	6 (2)

Interval	Key	Description	Procedure	Lubricant/ Fluid	No. of Service Points
100 Hours	12	Hopper dust filter	Check for damage, clean or replace	–	1
	4	Hydraulic fluid reservoir	Check fluid level	HYDO	1
	9	Tires	Check for damage	–	3
	1	Propelling gearbox	Check lubricant level	–	1
	8	Main brush and hopper seals	Check for damage or wear	–	8
200 Hours	1	Rear wheel support bearings	Lubricate	SPL	1
	16	Brakes	Check and adjust travel	–	1
	2	Steering link	Lubricate	SPL	1
	10	Hopper lift arm pivots	Lubricate	SPL	2
	14	Side brush pivot	Check adjustment	–	1
	14	Side brush guard	Rotate 90°	–	1
	5	Vacuum fan belt	Check tension and wear	–	1
	5	Hydraulic pump belt	Check tension and wear	–	1
	5	Main brush intermediate belt	Check tension and wear	–	1
	5	Main brush belt	Check for wear	–	1
400 Hours	9	Front wheel bearings	Check for seal damage	–	2
800 Hours	4	Hydraulic fluid reservoir	Replace filler cap	–	1
			Replace suction strainer	–	1
			Change hydraulic fluid	HYDO	1
	6	Hydraulic fluid filter	Change filter element	–	1
	–	Hydraulic hoses	Check for wear and damage	–	All
	1	Propelling gearbox	■Change gear lubricant	GL	1
			■Change fill-level plug seals	–	1
	1	Rear wheel	■Torque wheel nuts	–	1
	1, 7	Electric motors	Check carbon brushes	–	2

LUBRICANT/FLUID
DW . . . . Distilled water
GL . . . . SAE 90 Gear lubricant
HYDO . Tennant or approved hydraulic fluid
SPL . . . Special lubricant, Lubriplate EMB grease (TENNANT part no. 01433-1)

NOTE: Also check procedures indicated (■) after the first 50 hours of operation.

NOTE: More frequent intervals may be required in extremely dusty conditions.

PUSHING, TOWING, AND TRANSPORTING THE MACHINE

PUSHING OR TOWING THE MACHINE

If the machine becomes disabled, it can be pushed from the front or rear, but tow it only from the rear.

Only push or tow the machine for a *very short distance* and do not exceed 3.2 kp/h (2 mph). It is NOT intended to be pushed or towed for a long distance or at a high speed.

ATTENTION! Do not push or tow machine for a long distance or damage may occur to the propelling system.

TRANSPORTING THE MACHINE

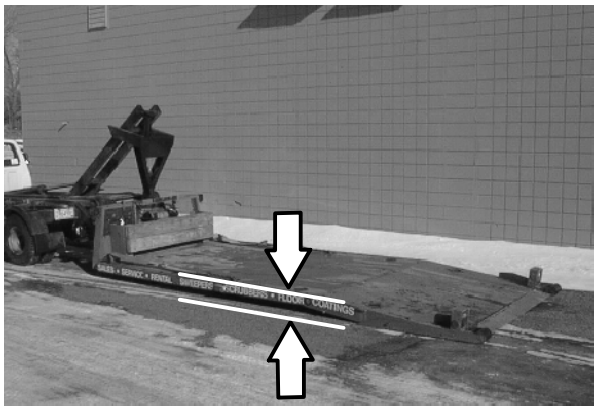
1. Position the rear of the machine at the loading edge of the truck or trailer.

   FOR SAFETY: Use truck or trailer that will support the weight of the machine.

NOTE: Empty the hopper before transporting the machine.

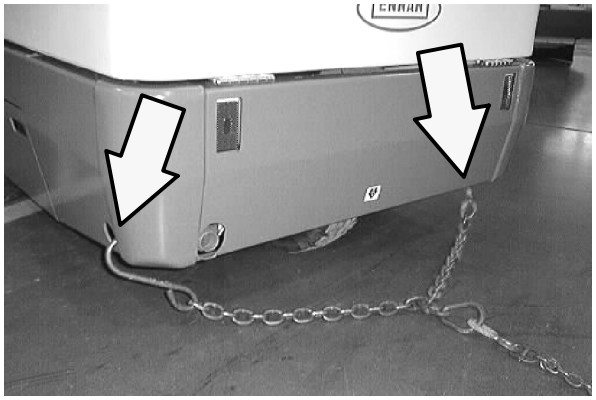
2. If the loading surface is not horizontal or is higher than 380 mm (15 in) from the ground, use a winch to load machine.

   If the loading surface is horizontal AND is 380 mm (15 in) or less from the ground, the machine may be driven onto the truck or trailer.



3. To winch the machine onto the truck or trailer, attach the winching chains to the rear tie down locations. The rear tie-down locations are the holes in the sides of the machine frame near the rear bumper.

   FOR SAFETY: When loading machine onto truck or trailer, use winch. Do not drive the machine onto the truck or trailer unless the loading surface is horizontal AND is 380 mm (15 in) or less from the ground.

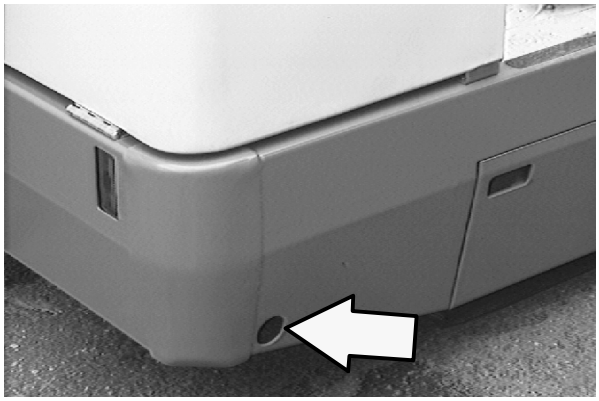


4. Position the machine onto the truck or trailer as far as possible. If the machine starts to veer off the centerline of the truck or trailer, stop and turn the steering wheel to center the machine.

5. Set the parking brake and block the machine tires. Tie down the machine to the truck or trailer before transporting.

   The front tie-down locations are the holes in the wheel pockets at the front of the machine frame.

   The rear tie-down locations are the holes in the sides of the machine frame near the rear bumper.



6. If the loading surface is not horizontal or is higher than 380 mm (15 in) from the ground, use a winch to unload machine.

   If the loading surface is horizontal AND is 380 mm (15 in) or less from the ground, the machine may be driven off the truck or trailer.

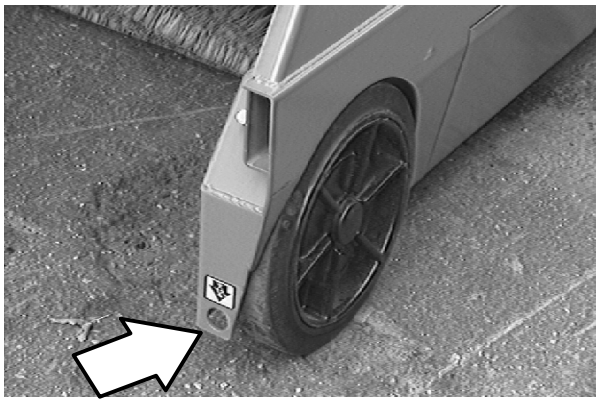
   FOR SAFETY: When unloading machine off truck or trailer, use winch. Do not drive the machine off the truck or trailer unless the loading surface is horizontal AND 380 mm (15 in) or less from the ground.

MACHINE JACKING

Empty the hopper before jacking the machine. You can jack up the machine for service at the designated locations. Use a hoist or jack that will support the weight of the machine. Always stop the machine on a flat, level surface and block the tires before jacking up the machine.

FOR SAFETY: Before leaving or servicing machine, stop on level surface, set parking brake, turn off machine, and remove key.

The front jacking locations are on the flat bottom edge of the front of the machine frame next to the front tires.



The rear jacking location is the center of the rear bumper.

FOR SAFETY: When servicing machine, block machine tires before jacking up machine.

FOR SAFETY: When servicing machine, jack up machine at designated locations only. Block machine up with jack stands.

STORING MACHINE

Before storing the machine for an extended period of time, the machine needs to be prepped to lessen the chance of rust, sludge, and other undesirable deposits from forming. Contact TENNANT service personnel.

HARDWARE INFORMATION

The following charts state standard plated hardware tightening ranges for normal assembly applications. Decrease the specified torque by 20% when using a thread lubricant. Do not substitute lower grade hardware for higher grade hardware. If higher grade hardware than specified is substituted, tighten only to the specified hardware torque value to avoid damaging the threads of the part being threaded into, as when threading into speed nuts or weldments.

STANDARD BOLT TORQUE CHART

Thread Size	SAE Grade 5 Torque ft lb (Nm)	SAE Grade 8 Torque ft lb (Nm)
0.25 in	7–10 (9–14)	10–13 (14–38)
0.31 in	15–20 (20–27)	20–26 (27–35)
0.38 in	27–35 (37–47)	36–47 (49–64)
0.44 in	43–56 (58–76)	53–76 (72–103)
0.50 in	65–85 (88–115)	89–116 (121–157)
0.62 in	130–170 (176–231)	117–265 (159–359)
0.75 in	215–280 (291–380)	313–407 (424–552)
1.00 in	500–650 (678–881)	757–984 (1026–1334)

NOTE: Decrease torque by 20% when using a thread lubricant.

METRIC BOLT TORQUE CHART

Thread Size	Class 8.8 Torque ft lb _Nm)	Class 10.9 Torque ft lb (Nm)
M4	2 (3)	3 (4)
M5	4 (5)	6 (8)
M6	7 (9)	10 (14)
M8	18 (24)	25 (34)
M10	32 (43)	47 (64)
M12	58 (79)	83 (112)
M14	94 (127)	133 (180)
M16	144 (195)	196 (265)
M20	260 (352)	336 (455)
M24	470 (637)	664 (900)

NOTE: Decrease torque by 20% when using a thread lubricant.

Exceptions to the above chart:

Check the machine for exceptions!

BOLT IDENTIFICATION

Identification Grade Marking	Specification and Grade
	SAE–Grade 5
	SAE–Grade 8
	ISO–Grade 8.8
	ISO–Grade 10.9

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THREAD SEALANT AND LOCKING COMPOUNDS

Thread sealants and locking compounds may be used on this machine. They include the following:

Locktite 515 sealant – gasket forming material. TENNANT Part No. 75567,15 oz (440 ml) cartridge.

Locktite 242 blue – medium strength thread locking compound. TENNANT Part No. 32676, 0.5 ml tube.

Locktite 271 red – high strength thread locking compound. TENNANT Part No. 19857, 0.5 ml tube.

HYDRAULIC FITTING INFORMATION

HYDRAULIC TAPERED PIPE FITTING (NPT) TORQUE CHART

NOTE: Ratings listed are when using teflon thread seal.

Size	Minimum Torque	Maximum Torque
1/4 NPT	10 ft lb (14 Nm)	30 ft lb (41 Nm)
1/2 NPT	25 ft lb (34 Nm)	50 ft lb (68 Nm)
3/4 NPT	50 ft lb (68 Nm)	100 ft lb (136 Nm)

HYDRAULIC TAPERED SEAT FITTING (JIC) TORQUE CHART

Tube O.D. (in)	Thread Size	Maximum Torque
0.25	0.44-20	9 ft lb (12 Nm)
0.38	0.56-18	20 ft lb (27 Nm)
0.50	0.75-16	30 ft lb (41 Nm)
0.62	0.88-14	40 ft lb (54 Nm)
0.75	1.12-12	70 ft lb (95 Nm)
1.0	1.31-12	90 ft lb (122 Nm)

HYDRAULIC O-RING FITTING TORQUE CHART

Tube O.D. (in)	Thread Size	Minimum Torque	Maximum Torque
0.25	0.44-20	6 ft lb (8 Nm)	9 ft lb (12 Nm)
0.38	0.56-18	13 ft lb (18 Nm)	20 ft lb (27 Nm)
		*10 ft lb (14 Nm)	12 ft lb (16 Nm)
0.50	0.75-16	20 ft lb (27 Nm)	30 ft lb (41 Nm)
		*21 ft lb (28 Nm)	24 ft lb (33 Nm)
0.62	0.88-14	25 ft lb (34 Nm)	40 ft lb (54 Nm)
0.75	1.12-12	45 ft lb (61 Nm)	70 ft lb (95 Nm)
1.0	1.31-12	60 ft lb (81 Nm)	90 ft lb (122 Nm)

NOTE: Do not use sealant on o-ring threads.

*Aluminum bodied components

MACHINE TROUBLESHOOTING

Problem	Cause	Remedy
Excessive dusting	Vacuum fan off	Move vacuum and filter shaker lever to **Vacuum fan on** position
	Brush skirts and dust seals worn, damaged, out of adjustment	Replace or adjust brush skirts or dust seals
	Hopper dust filter clogged	Shake and/or clean or replace dust filter
	Vacuum hose damaged	Replace vacuum hose
	Vacuum fan failure	Contact Tennant service personnel
	Thermo Sentry™ tripped	Reset Thermo Sentry™
	Hopper door partially or completely closed	Open hopper door
Poor sweeping performance	Brush bristles worn	Replace brushes
	Main and side brushes not adjusted properly	Adjust main and side brushes
	Debris caught in main brush drive mechanism	Remove debris from drive mechanism
	Main brush drive failure	Contact Tennant service personnel
	Side brush drive failure	Contact Tennant service personnel
	Hopper full	Empty hopper
	Hopper lip skirts worn or damaged	Replace lip skirts
	Hopper door partially or completely closed	Open the hopper door
	Wrong sweeping brush	Contact Tennant representative for recommendations
	Recirculation flap damaged	Replace flap

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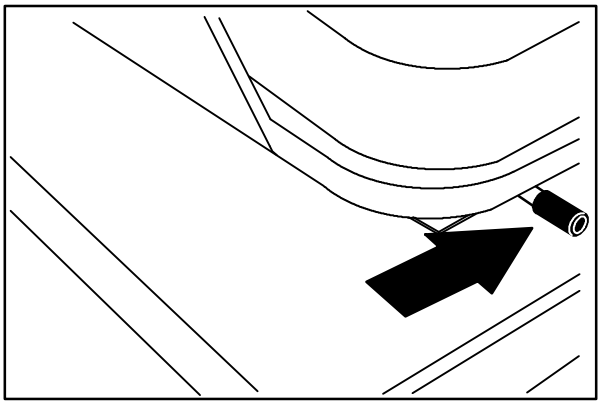
INTRODUCTION

This section includes information on the main chassis related components for example the seat, steering, brakes and tires.

SEAT

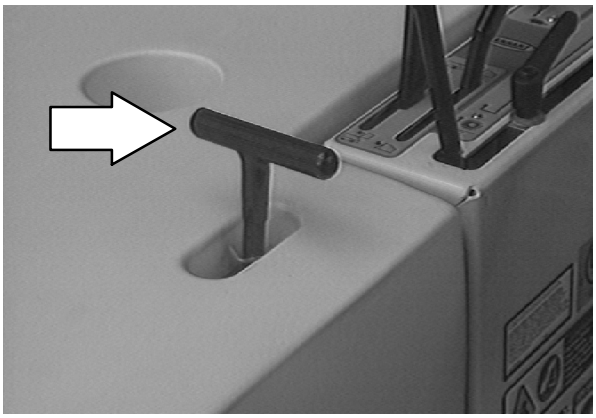
The seat assembly is removable on the model 6400. The seat can also be adjusted forward and backward using the handle on the front of the right hand seat bracket.



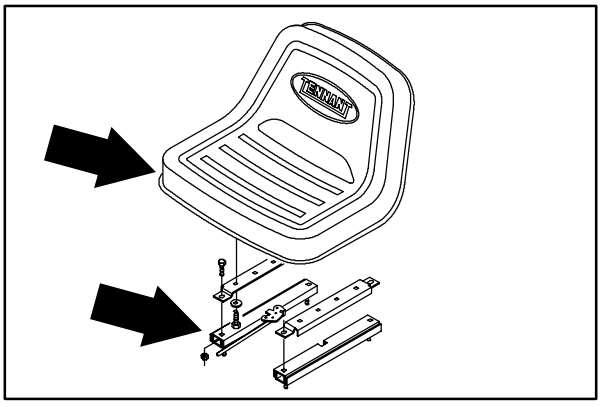
TO REPLACE OPERATOR SEAT

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Tilt the seat shroud back against the support cable.

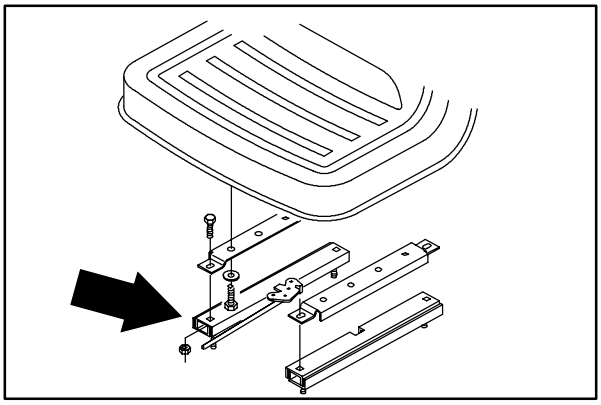


2. Remove the four hex nuts holding the seat brackets to the seat shroud.



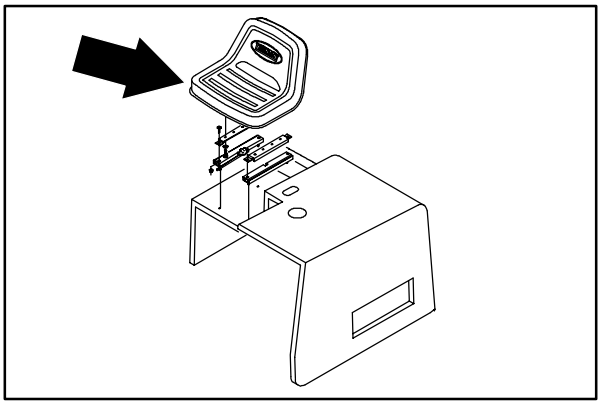
3. Remove the seat assembly from the seat shroud.

4. Remove the two seat brackets from the bottom of the old seat. Note the orientation of the brackets.



5. Install the two seat brackets on the bottom of the new seat.

6. Position the new seat and brackets on the seat shroud. Line up the holes and install the hardware. Tighten the hex screws to 18.5 – 24Nm (15 – 20 ft lb).

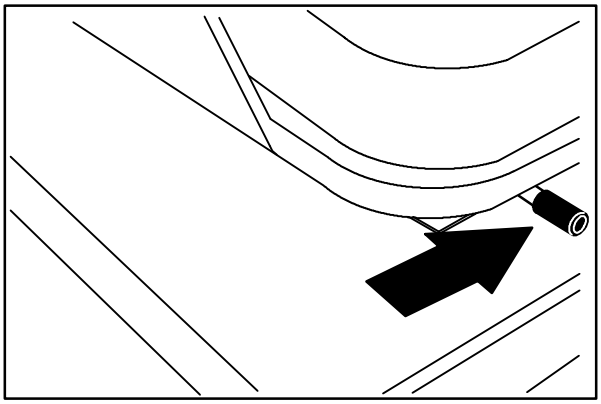


7. Close the seat shroud and adjust the seat to a comfortable position.

TO ADJUST SEAT POSITION

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

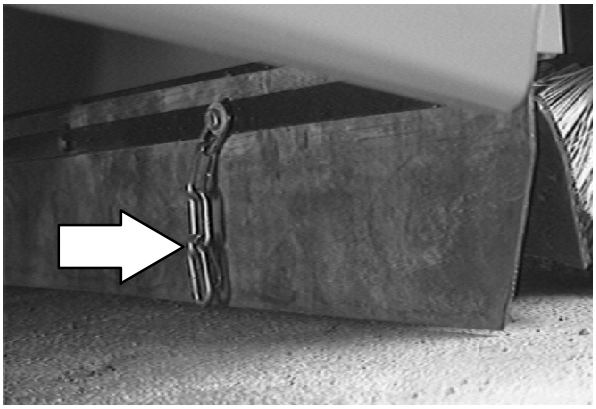
1. While sitting on the seat, reach under the front right corner and grasp the lock lever.
2. Move the lock lever to the left until the seat moves freely.
3. Slide the seat forward or backward to a comfortable position. Release the lock lever.
4. The seat is now locked in the chosen position.



STATIC DRAG CHAIN

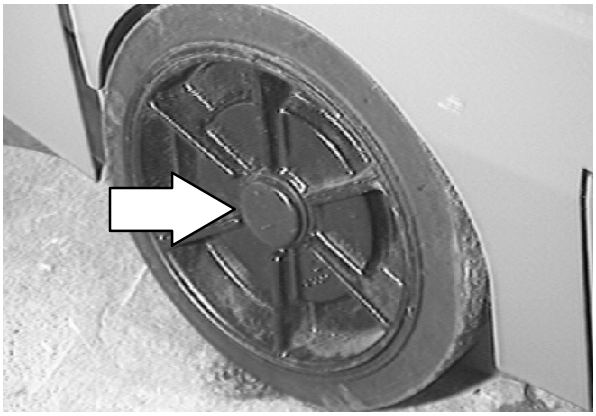
The static drag chain prevents build up of static electricity in the machine. The chain is attached near the rear of the brush compartment skirts.

The chain should be in contact with the floor at all times.



FRONT TIRES AND WHEELS

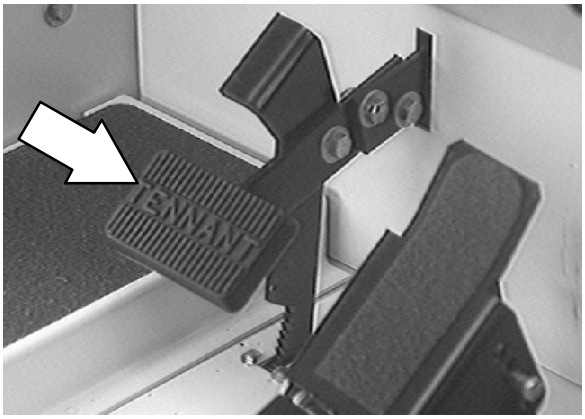
The machine front tires are solid. Inspect the front wheel bearings for seal damage.



TO REPLACE FRONT WHEEL BEARINGS

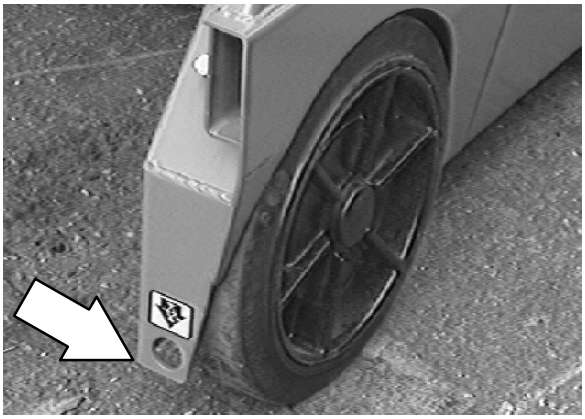
FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Disengage the parking brake if activated.

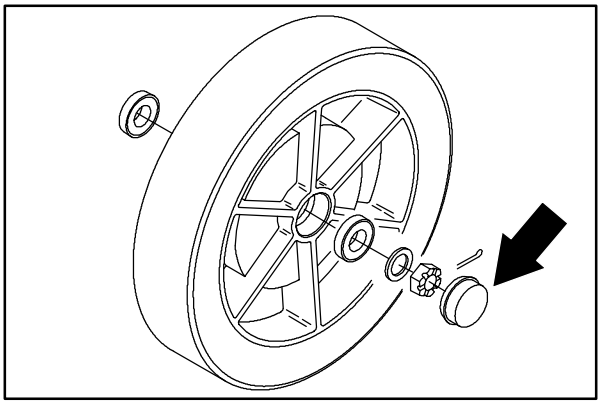


2. Jack up one front corner of the machine. Place jack stands under machine frame.

FOR SAFETY: Block machine tires before jacking machine up. Jack machine up at designated locations only. Block machine up with jack stands.

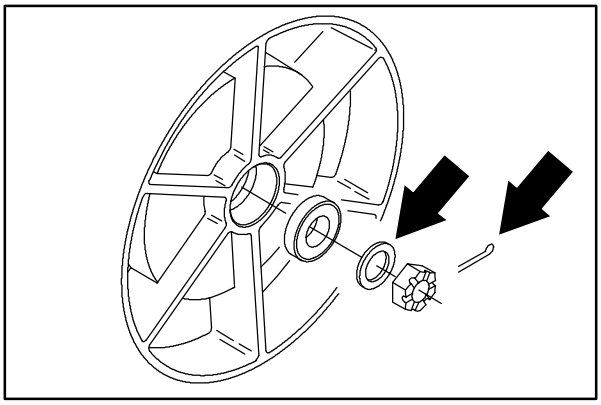


3. Remove the hub cap in the center of front wheel.



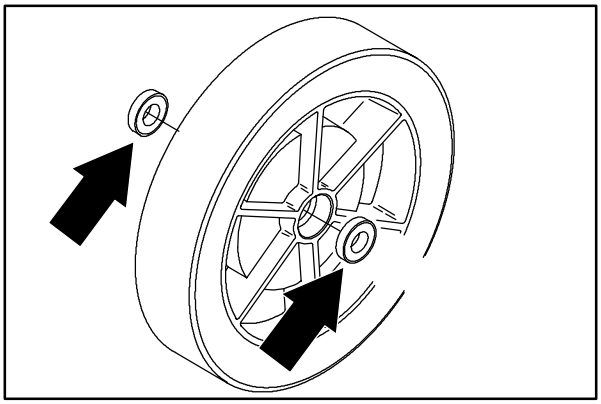
4. Remove the cotter pin, slotted nut, and flat washer.

5. Slide the wheel off the axle.



6. Press the old bearings out. Press the new bearings in the wheel in the same orientation.

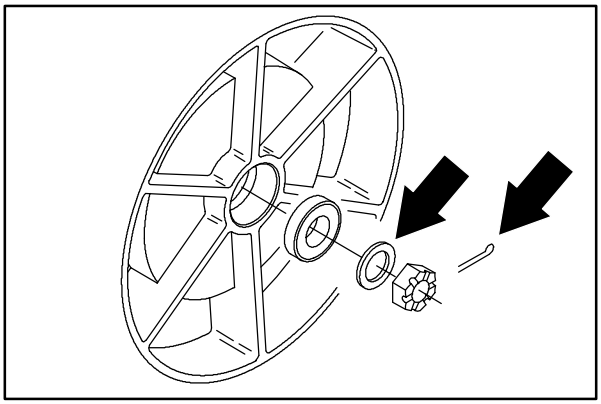
7. Slide the wheel back on the axle.



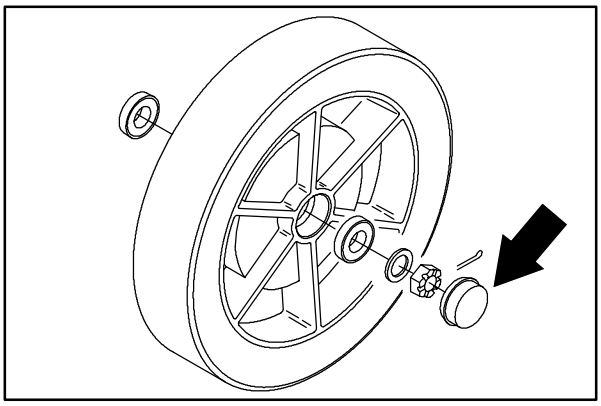
8. Slide the flat washer and nut on the shaft.

9. Tighten the nut with a hand wrench until the wheel binds, then back the nut off to nearest cotter pin hole.

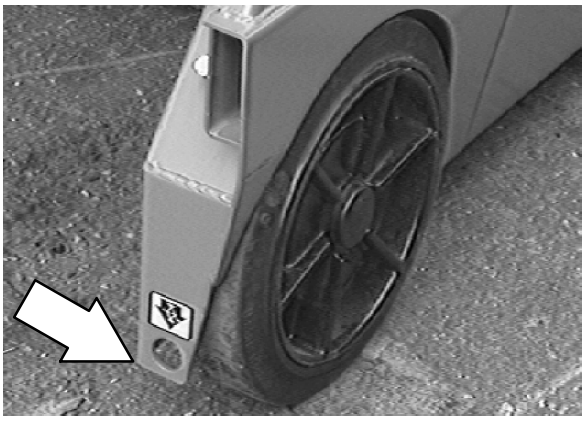
10. Insert a new cotter pin through nut and hole.



11. After making sure the wheel spins freely, carefully reinstall the hub cap.



12. Remove the jackstands and lower the machine.

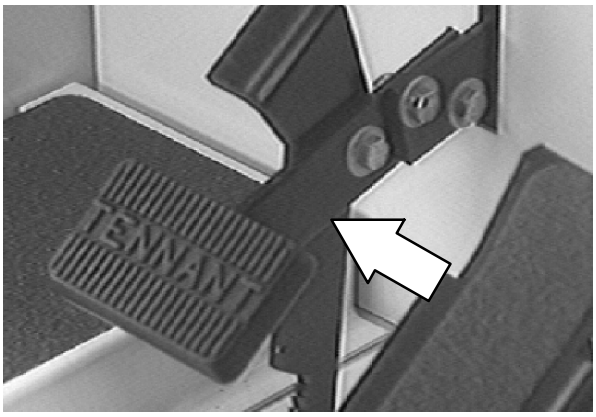


13. Repeat the procedure on the other wheel.

BRAKES AND TIRES

SERVICE BRAKES

The mechanical service brakes are located on the front wheels. The brakes are operated by the foot brake pedal and connecting rods.

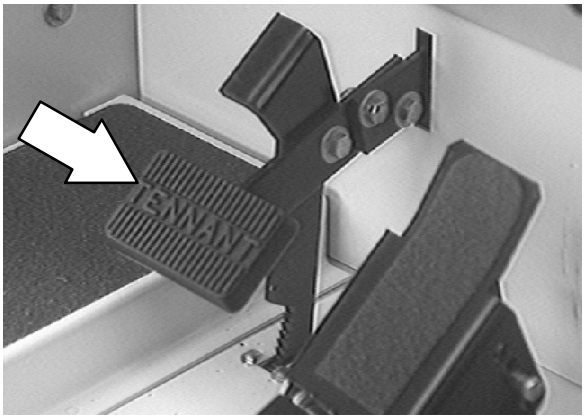


Check the brake adjustment every 200 hours of operation. The brake pedal should not travel more than 2 inches to fully engage the brakes.

TO REPLACE BRAKE SHOES

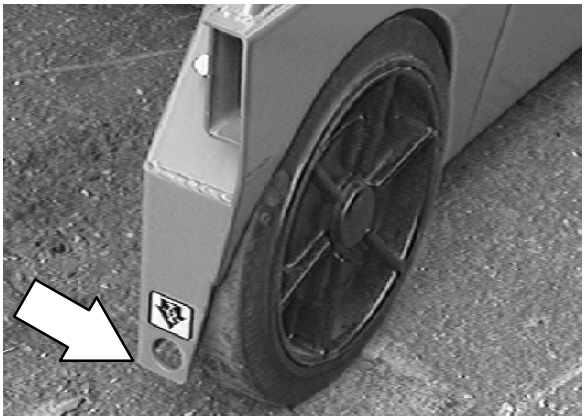
FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Disengage the parking brake if activated.

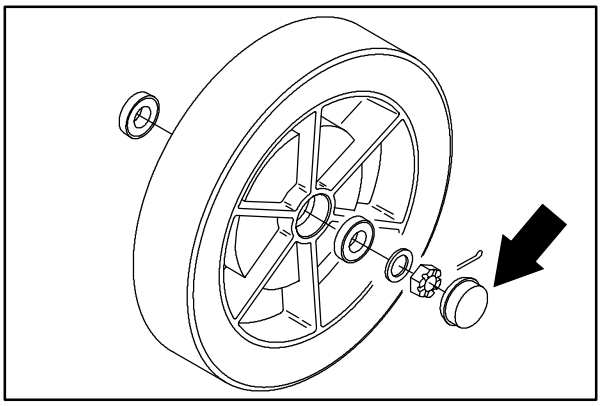


2. Jack up one front corner of the machine. Place jack stands under machine frame.

FOR SAFETY: Block machine tires before jacking machine up. Jack machine up at designated locations only. Block machine up with jack stands.

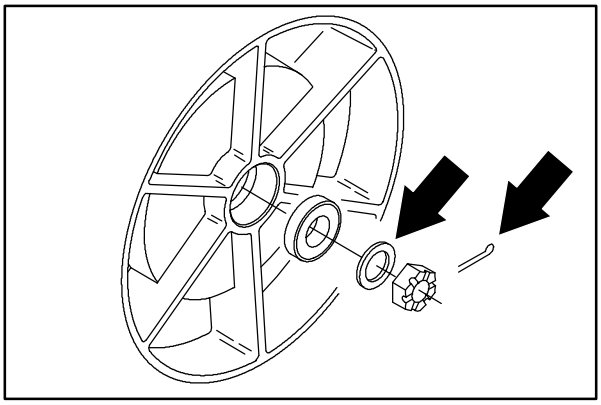


3. Remove the hub cap in the center of front wheel.



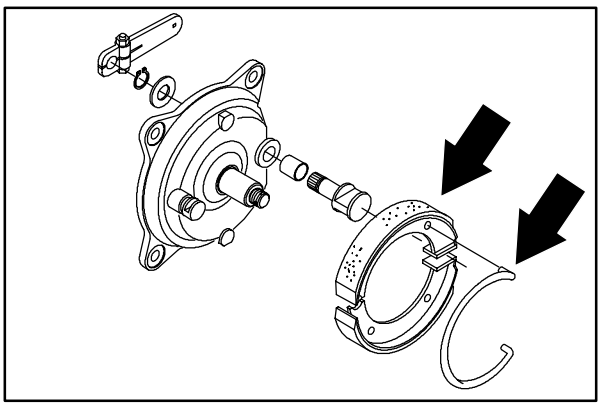
4. Remove the cotter pin, slotted nut, and flat washer.

5. Slide the wheel off the axle.



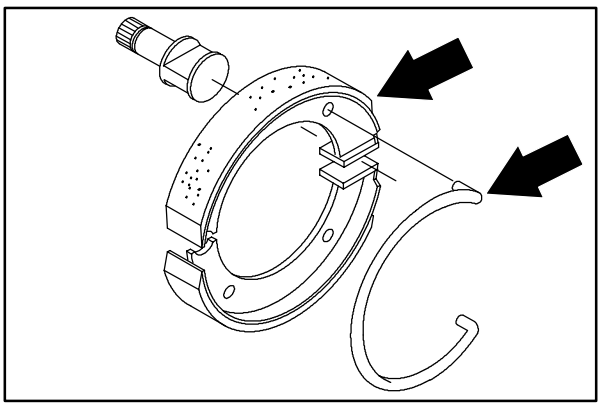
6. Remove the one large ”C” shaped tension spring holding the old brake shoes together. Remove the old brake shoes.

7. Replace the old brake shoes with new brake shoes.

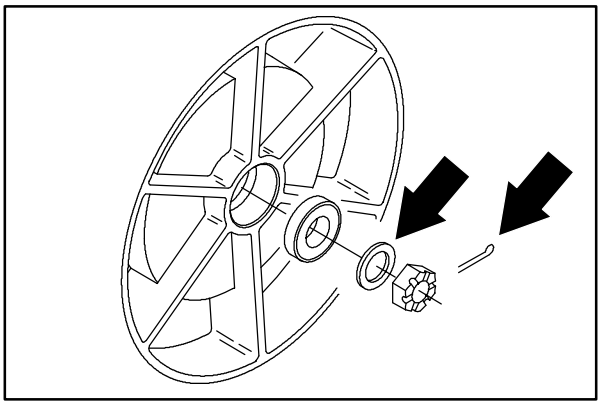


8. Reinstall the one large ”C” shaped brake tension spring on the new brake shoes.

9. Slide the wheel back on the axle.



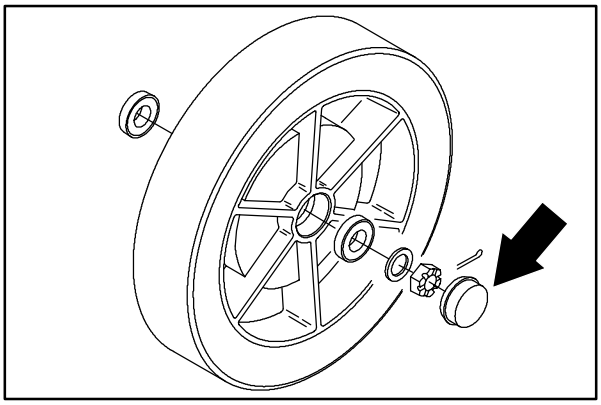
10. Reinstall the flat washer and nut on the axle shaft.



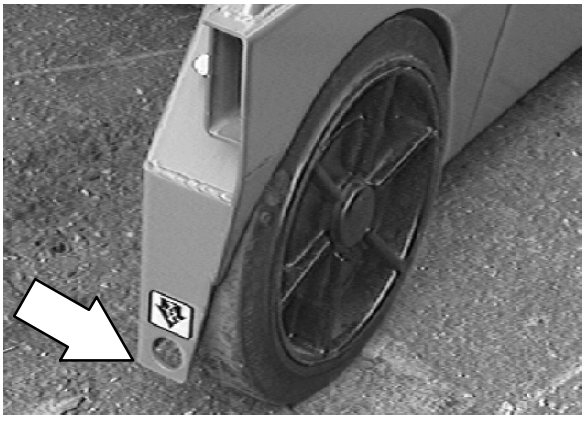
11. Tighten the nut with a hand wrench until the wheel binds, then back the nut off to nearest cotter pin hole.

12. Insert a new cotter pin through nut and hole.

13. After making sure the wheel spins freely, carefully reinstall the hub cap.



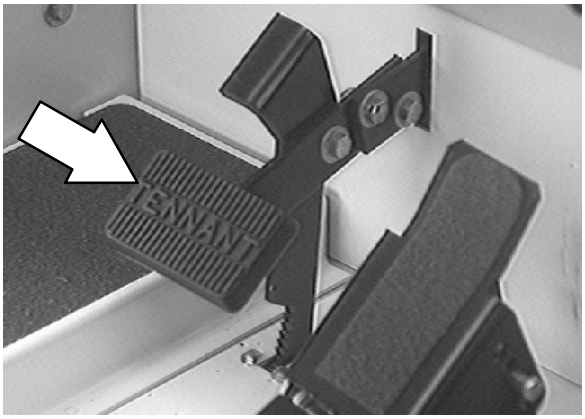
14. Remove the jackstands and lower the machine.



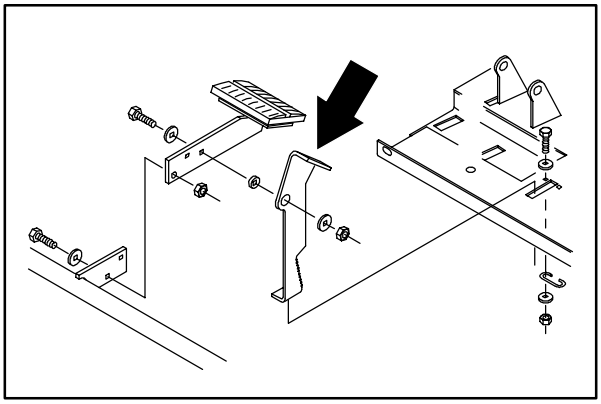
15. Repeat the procedure on the other wheel.

PARKING BRAKE

The parking brake is set with the parking brake lever that activates the service brakes.



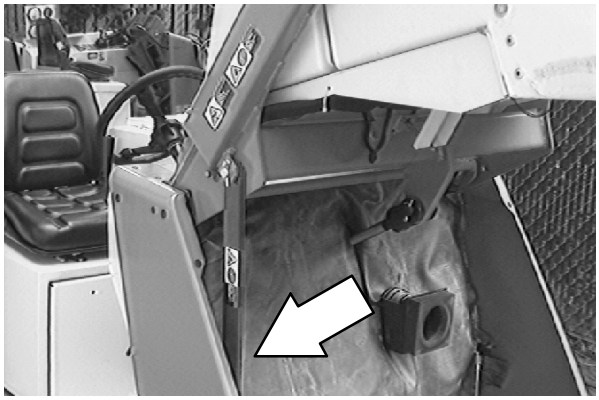
Adjust the parking brake whenever it becomes very easy to set, when the machine rolls after setting the parking brake, and after every 200 hours of operation. The parking brake may be tightened by adjusting the brake rod clevis on the ends of the brake cross shaft. See TO ADJUST BRAKES instructions. Adjust the parking brake so it will hold the Machine on a smooth 8 degree incline. The brake pedal should not travel more than 2 inches to fully engage the brakes.



TO ADJUST BRAKES

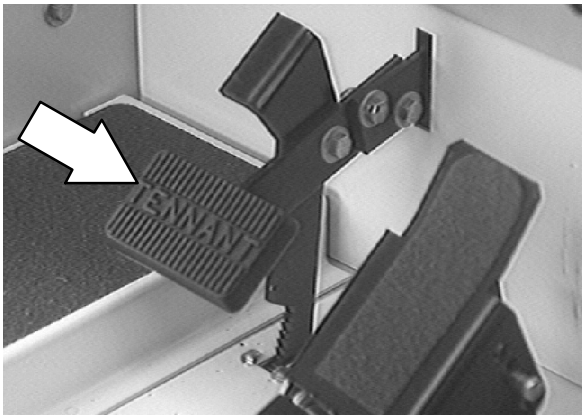
FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Raise the hopper and engage the support bar.

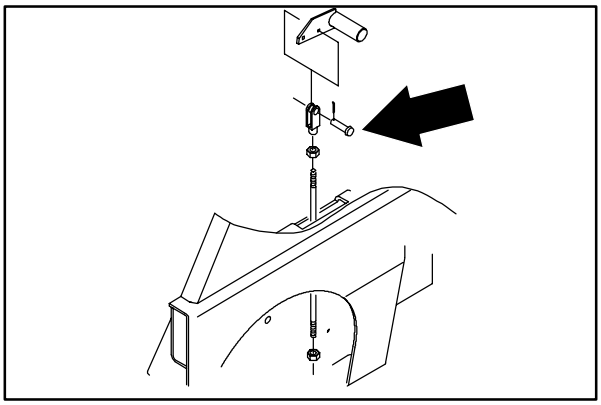


2. Disengage the parking brake if activated.

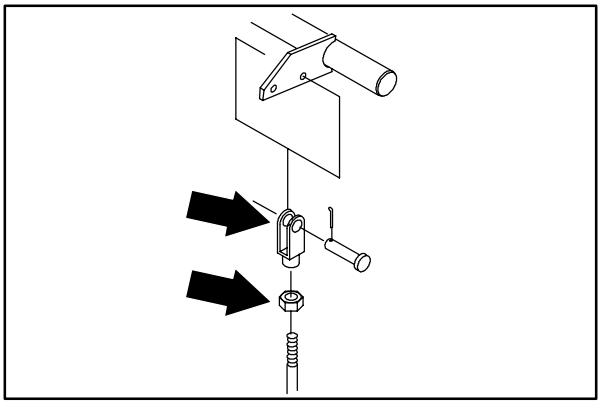
FOR SAFETY: Block machine tires before jacking machine up. Jack machine up at designated locations only. Block machine up with jack stands.



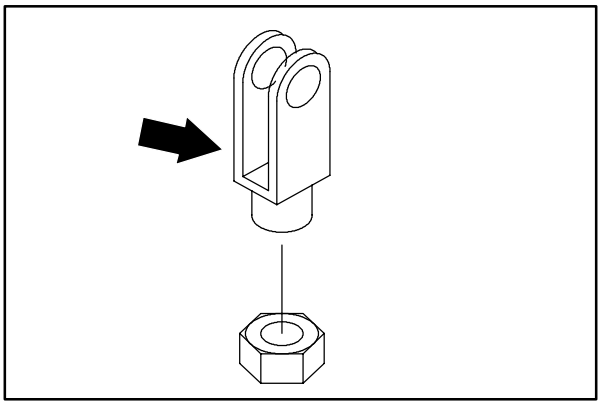
3. Remove the cotter pin and the clevis pin holding the brake rod clevis to the brake assembly lever.



4. Loosen the jam nut on the brake rod.

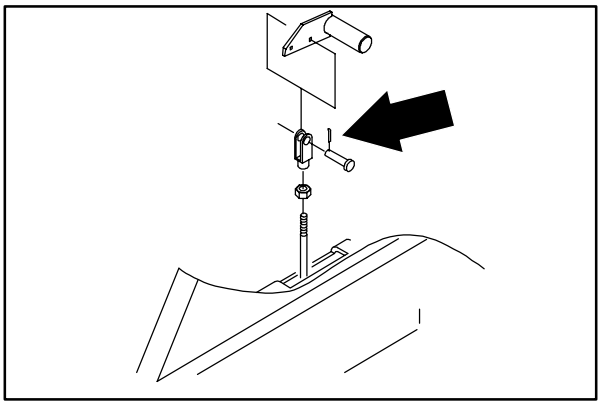


5. Turn the clevis in or out to achieve proper adjustment and pedal travel. The pedal should move no more than 1” before engaging the brakes.

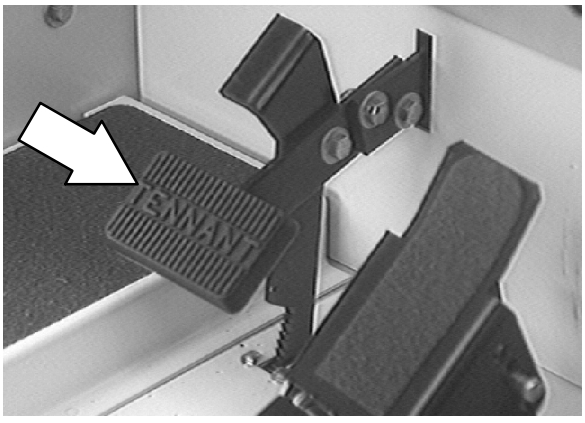


6. Reinstall the cotter pin and the clevis pin in the brake rod clevis and the brake assembly lever.

7. Repeat the procedure on both sides.

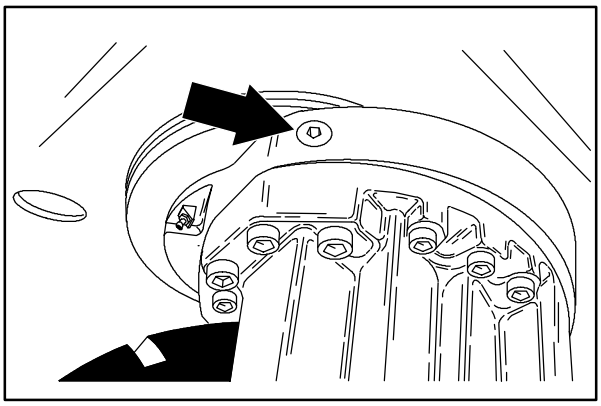


8. Drive the machine and operate the brakes. Check for equal engagement of the brakes on both wheels.



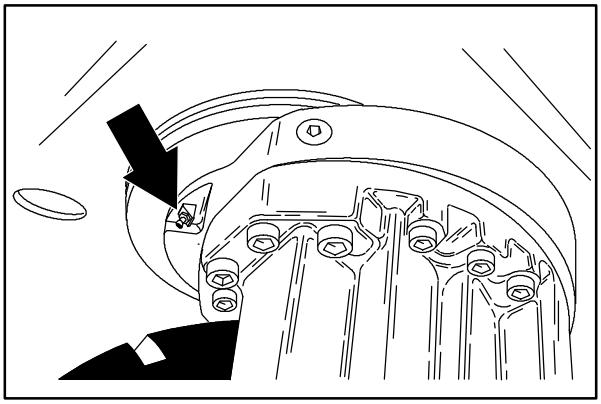
PROPELLING GEARBOX

Check the lubricant level in the propelling gearbox after every 100 hours of operation. Change the gear lubricant, and the drain and fill-level plug seals after the first 50 hours of operation, and then after every 800 hours of operation. Use SAE 90 weight gear lubricant.



REAR WHEEL SUPPORT

The rear wheel support pivots the rear wheel. The support has two grease fittings for the bearings. Raise the machine so the rear wheel support assembly is off the floor. Fill one of the grease fittings while rotating the gearbox from stop to stop. Fill the second grease fitting while rotating the gearbox back to the original position. The bearing cavity is full when grease comes out of the top seal.



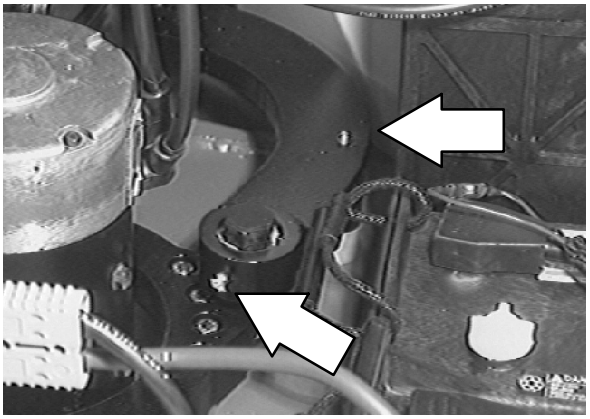
Lubricate with Lubriplate EMB grease (Tennant part number 01433–1) after every 200 hours of machine operation, or after steam cleaning the gearbox area.

FOR SAFETY: When servicing machine, block machine tires before jacking up machine.

FOR SAFETY: When servicing machine, jack up machine at designated locations only. Block machine up with jack stands.

STEERING LINK

The steering link has one grease fitting located on the end of the link. Lubricate with Lubriplate EMB grease (Tennant part number 01433–1) after every 200 hours of machine operation.

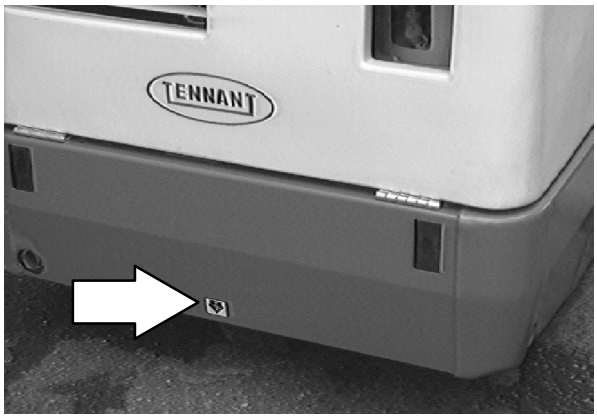


TO REMOVE PROPELLING GEARBOX

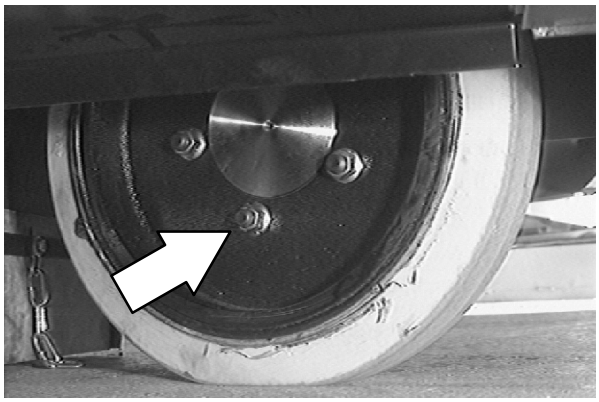
FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Raise the rear of the machine and place jack stands under the machine frame.

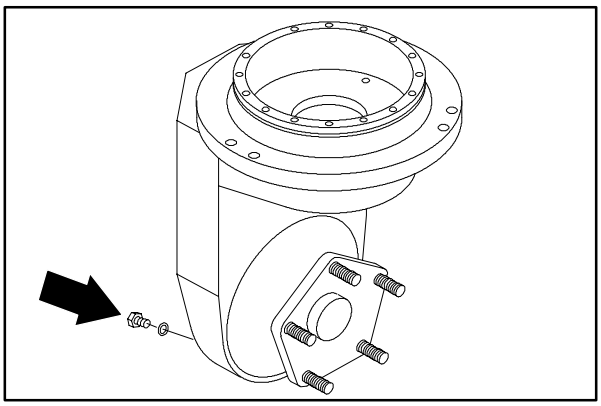
   FOR SAFETY: When servicing machine, jack up machine at designated locations only. Block machine up with jack stands.



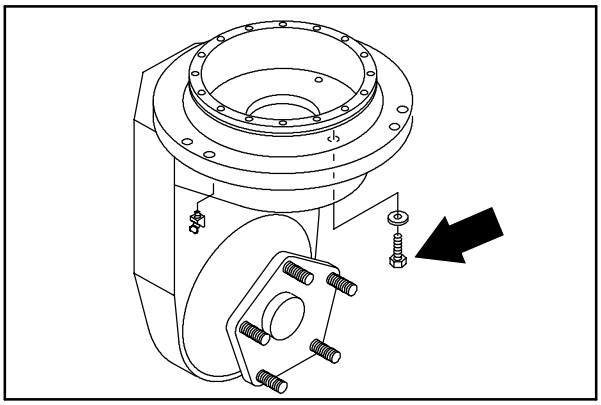
2. Remove the rear tire and wheel assembly.



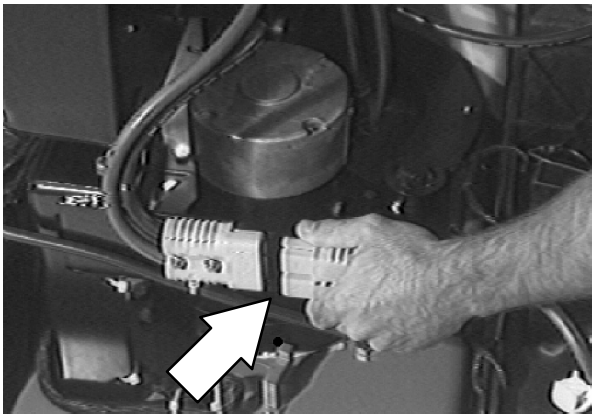
3. Remove the drain plug from the bottom of the gear box to drain the gear lube. Reinstall the plug after all the lube has been drained.



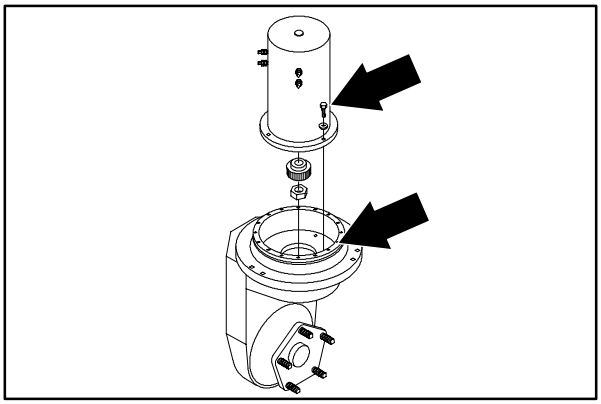
4. Remove the three hex screws holding the drive motor to the gearbox.



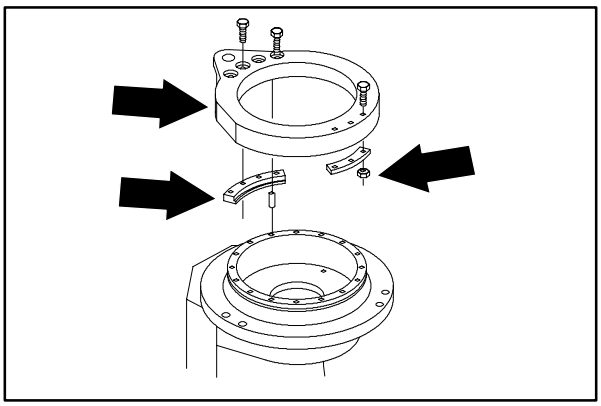
5. Open the seat support and disconnect the batteries.



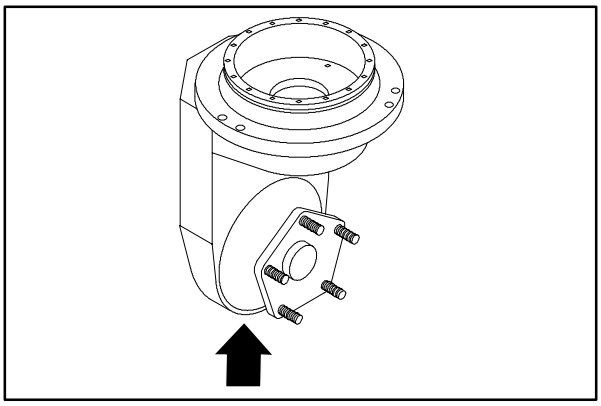
6. Mark the location of the drive motor in relation to the gearbox. Lift the drive motor up and out of the gearbox. Place the motor out of the way for now.



7. Mark the location of the steering cylinder mount ring in relation to the gearbox. Remove the seven hex screws holding the steering cylinder mount ring to the top of the propelling gearbox.



8. Place a floor jack or some other lifting device under the propelling gearbox to assist in the removal.

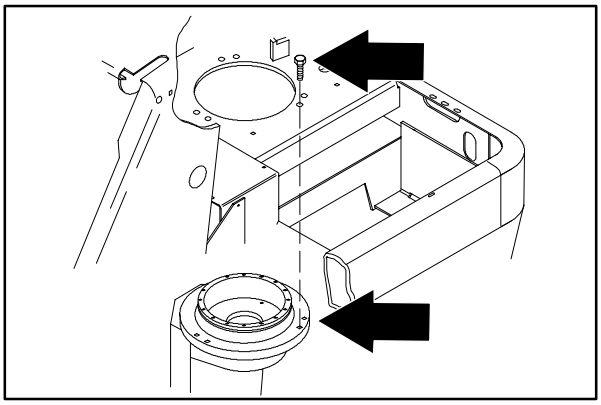


NOTE: The floor jack is needed to support the gearbox when the hardware is removed. The propelling gearbox is top heavy and tippy during the removal operation.

9. Mark the location of the gearbox in relation to the machine frame.

10. Remove the six hex screws holding the propelling gearbox to the machine frame.

11. Drop the gearbox down and out of the machine.

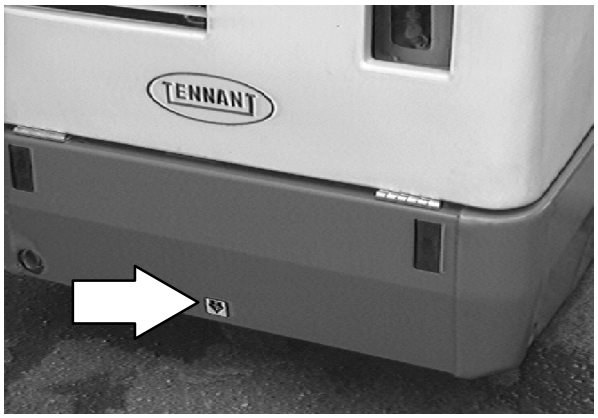


NOTE: Make sure to support the top of the propelling gear box when removing it from the machine to keep it from tipping over.

TO INSTALL PROPELLING GEARBOX

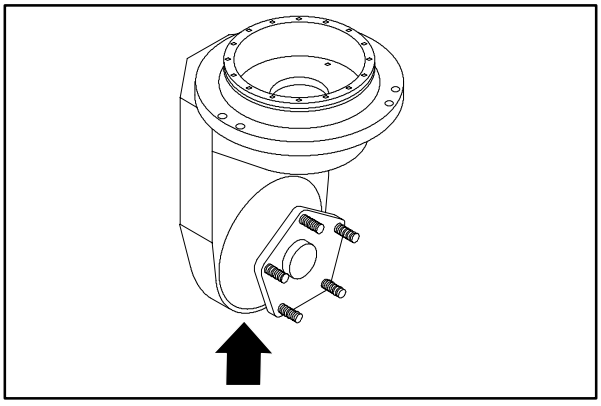
FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Raise the rear of the machine and place jack stands under the machine frame.



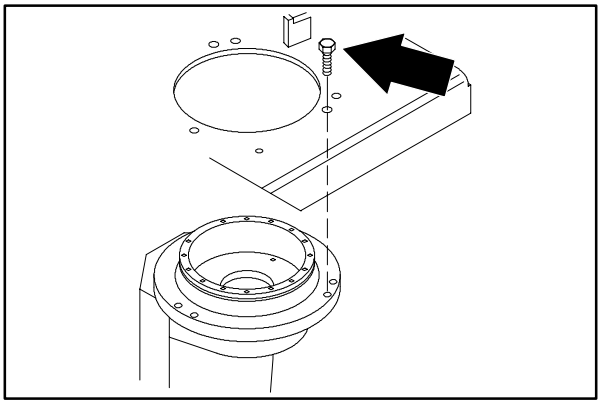
FOR SAFETY: When servicing machine, jack up machine at designated locations only. Block machine up with jack stands.

2. Position the gearbox under the rear of the machine. The gearbox must be stood straight up and jacked into position.



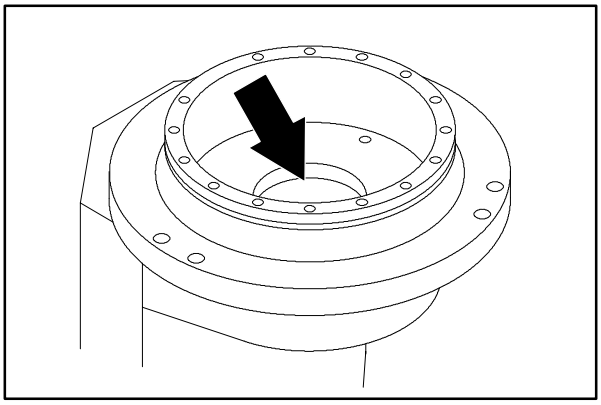
NOTE: Place a jack under the gearbox and use it to lift the gearbox into place.

3. Line up the threaded mount holes in the top of the gearbox with the mount holes in the machine frame. Reinstall the six hex screws using 242 blue loctite and tighten to 64 – 83 Nm (50 – 60 ft lb).



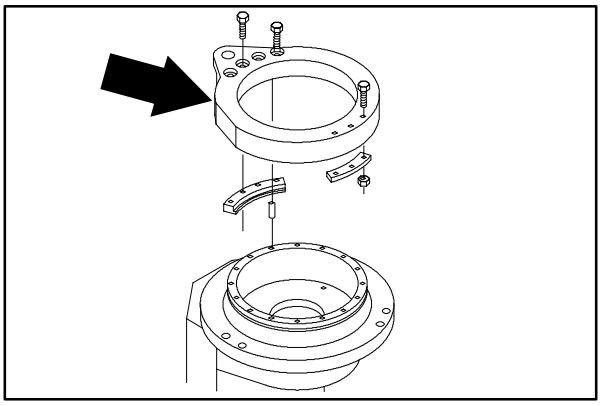
NOTE: Make sure the gearbox is installed in the machine frame in the same orientation as it was removed.

4. Fill the gearbox case, using the large hole on top, with .75 gallon of 90 weight gear lube.



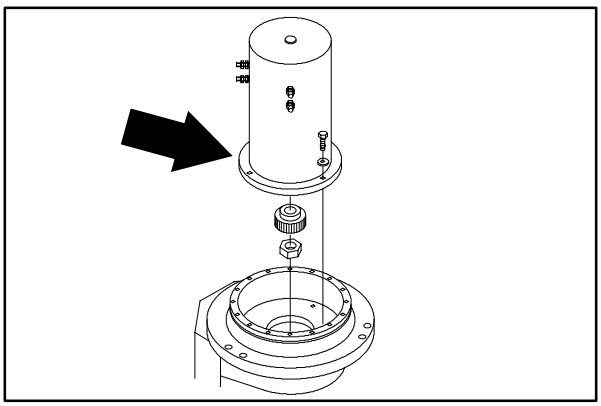
5. Reinstall the steering cylinder mount ring on top of the gearbox. Reinstall the seven hex screws and tighten to 18 – 24 Nm (15 – 20 ft lb).

NOTE: Make sure the steering cylinder mount ring is installed on top of the gearbox in the same orientation as it was removed.

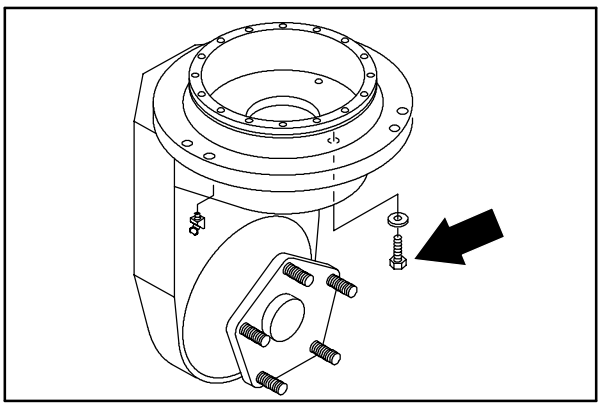


6. Position the drive motor in the top of the gearbox. Line up the three mount holes in the motor with the holes in the gear box.

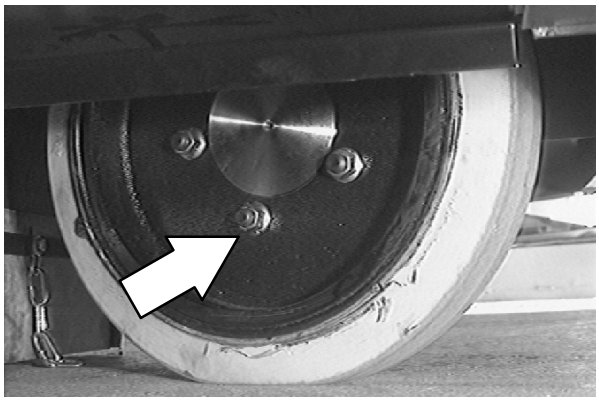
NOTE: Make sure the drive motor is installed in the same orientation on the gearbox as it was removed.



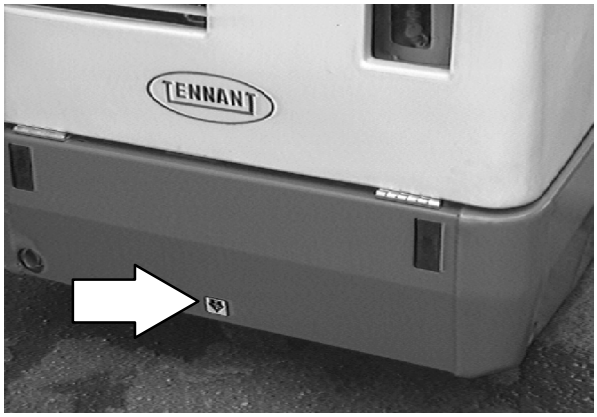
7. Go under the rear of the machine in back and reinstall the three hex screws that hold the drive motor to the gearbox. Tighten to 18 – 24 Nm (15 – 20 ft lb).



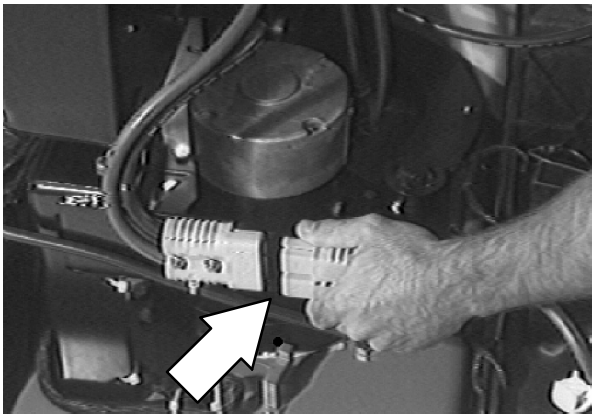
8. Reinstall the rear tire and wheel assembly. Tighten the wheel nuts to 122 – 150 Nm (90 – 110 ft lb).



9. Remove the jack stands and lower the machine.



10. Reconnect the batteries. Start the machine and operate the propel circuit. Check for proper operation.



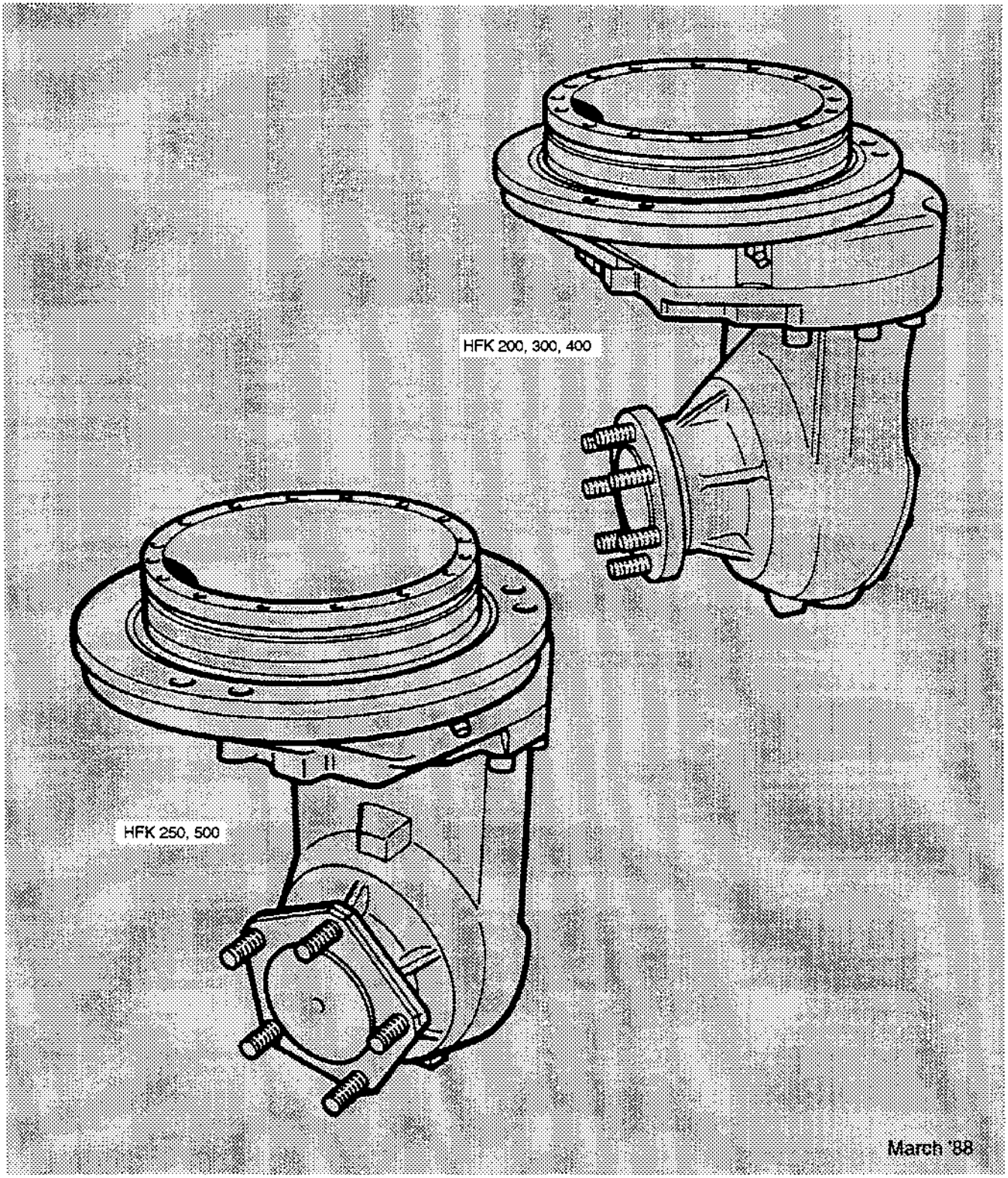
HURTH GETRIEBE UND ZAHNRÄDER

Repair Manual

HFK 200, 250, 500

HFK 300 to serial no. 5999

HFK 400 to serial no. 815



March '88

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4. Instructions for repair

General

Repair of drive assembly accessories will not be covered here since they may differ by quantity and design. Attention is drawn to section Z.

The following remarks refer to the disassembly/assembly of the gear unit and the dismounting/mounting of the accessories which are directly connected to the gear unit.

4.1 Dismantling the drive assembly

Before disassembling the gear unit, drain the transmission oil and dismount the drive wheel.

Drive wheel

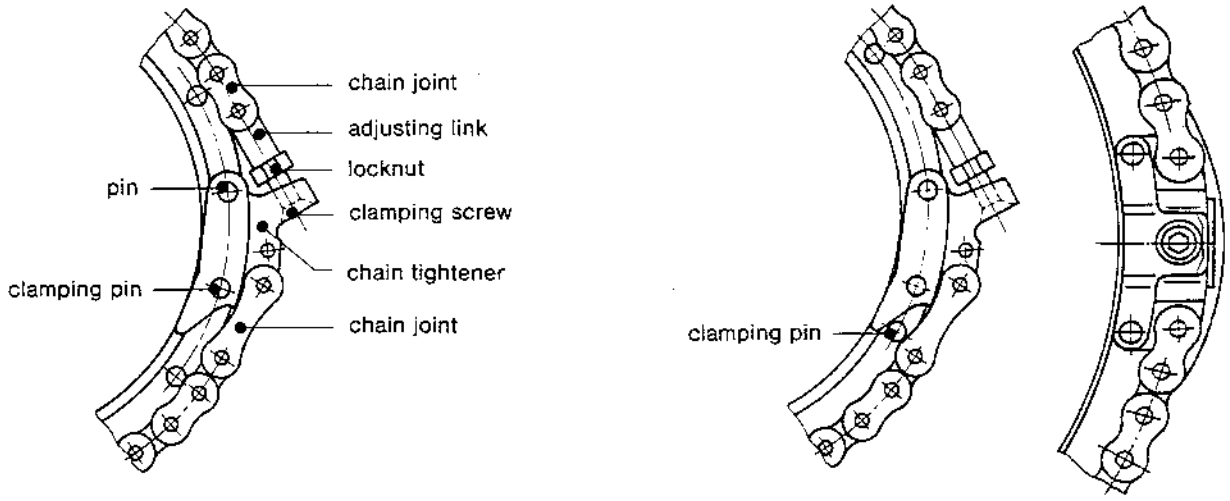
Remove wheel nuts and take off drive wheel.

Steering chain

Open lock nut and slacken the steering chain by screwing out the clamping screw.

a) Chain tightener
   Open the chain joint at the chain tightener and remove the steering chain.

Version S/B **Chain connection** Version SF/SU/BF/BU



b) Chain support
   Open the chain joint at the chain support and remove the steering chain.

Dismantling the drive assembly

Remove screws fastening the trunnion bearing to the vehicle frame.

Electric motor

The electric motor can be dismantled without dismounting the complete drive assembly. Remove the screws and lift the motor out of the assembly.

If only the electric motor is dismantled, the opening to the gear unit must be closed to prevent dirt from entering the gear unit.

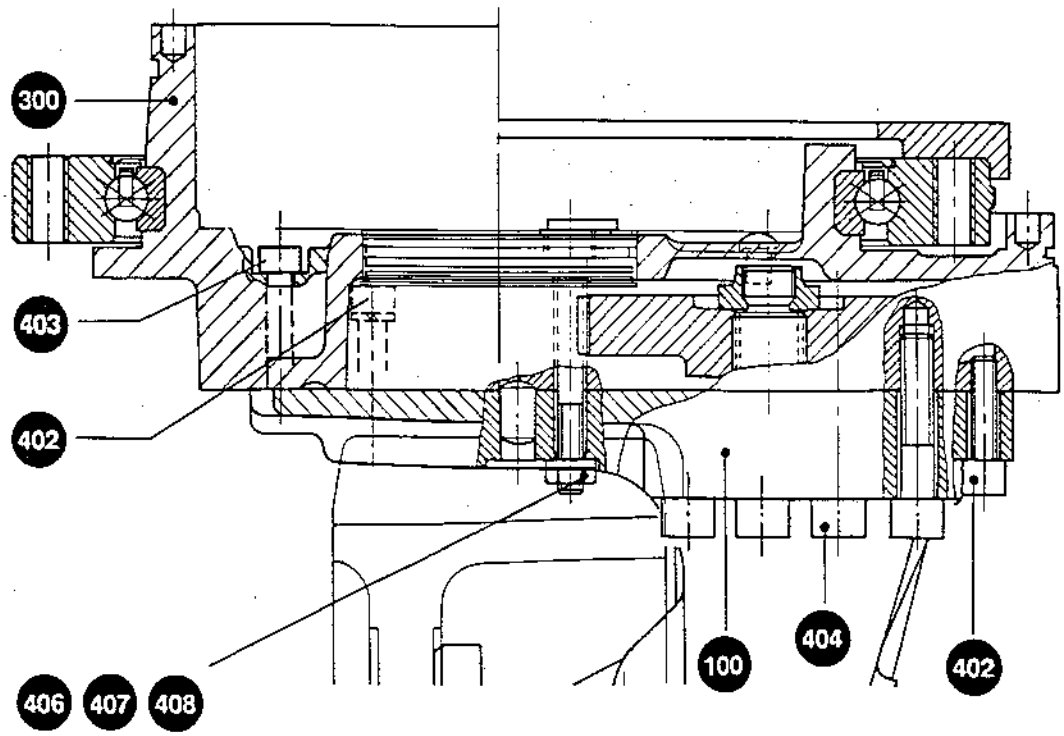
Dismantling the drive pinion (202)

Hold the motor shaft tight and loosen the shaft nut, then extract the drive pinion using the extractor. Remove the O-ring from the motor centering recess.

4.2 Dismantling the gear unit

4.2.1 Removing the top of the gear unit (300) from the basic gear unit (100)

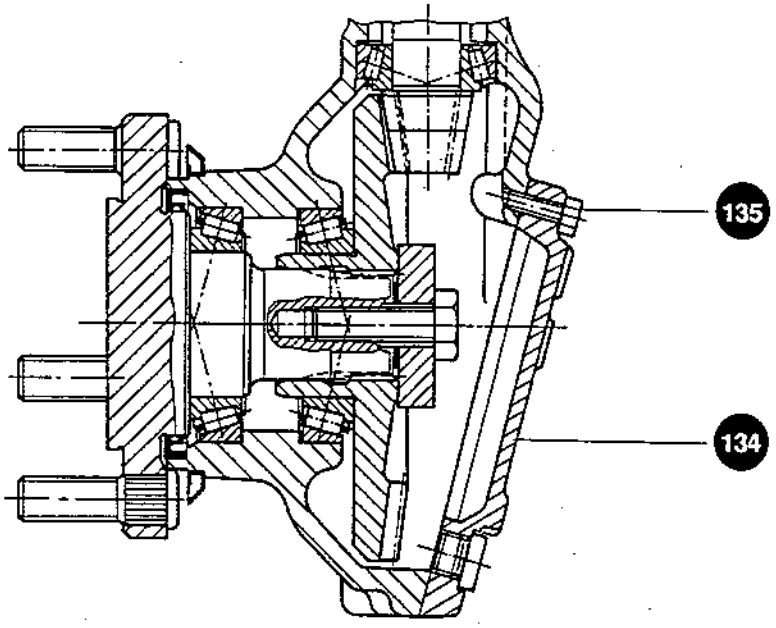
Remove the screws (402/404/406). Loosen the top of the gear unit by knocking lightly (e.g., with a plastic hammer) and lift it off.



4.2.2 Dismantling the basic gear unit (100)

4.2.2.1 Disassembling the housing lid (134)

Remove the screws (135), loosen the lid by knocking lightly, and lift off.



4.2.2.2 Dismantling the crown gear (104) and wheel shaft (119)

Fasten auxiliary unit "A" with screws (135) to housing. If the conical pinion shaft (104) is dismantled as well, it is recommended to loosen the hexagon nut (118) on the conical pinion shaft at the same time (refer to 4.2.2.5).

Hold the wheel shaft tight and remove the screw (129). Remove washer (128) with shims (130-133) and bind them together with a wire or the like.

Attention: The plane surface X of the wheel shaft is required for setting the wheel shaft bearing and must not be damaged.

Insert the 9-mm dia. striking pin into the threaded borehole of the wheel shaft and knock to dismantle the wheel shaft.

The wheel bolts (120) can be dismounted by pushing them out when the wheel shaft is dismantled.

Take the crown gear out of the gear unit.

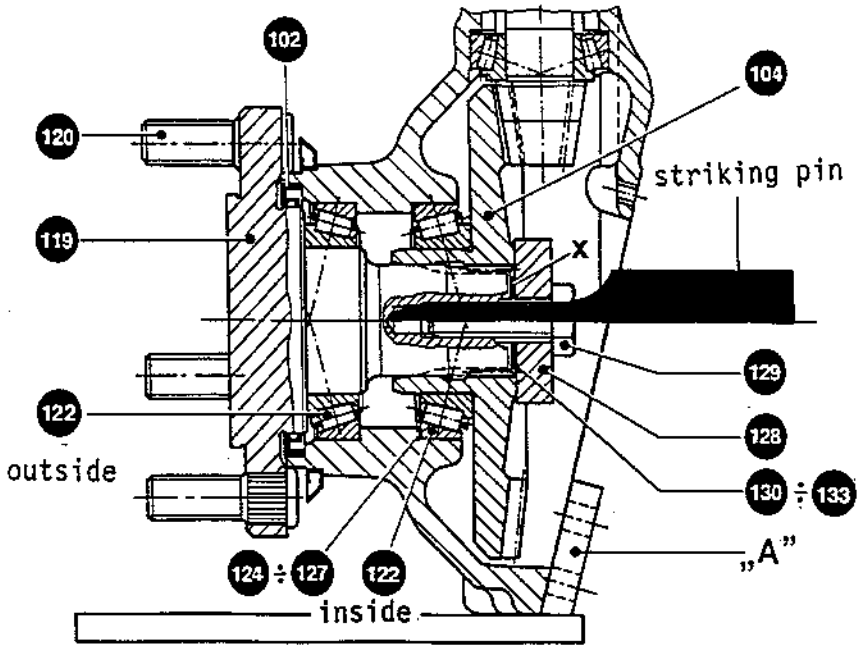
4.2.2.3 Dismounting the outer race (122), shims (124-127), radial sealing ring (102)

Dismount the outer race (122 inside) by lightly knocking with a copper pin or the like. Make sure not to damage the shims. Bind the outer race and the shims together with a wire or the like and place them with the crown gear.
Lever out the sealing ring, dismount the outer race (122 outside) by lightly knocking with a copper pin or the like, and place the outer race with the wheel shaft.

4.2.2.4 Dismantling the inner race

The inner race should be dismantled only if the bearings are damaged and have to be replaced. If a new wheel shaft or a new set of bevel gears is mounted, new bearings must be fitted.

To dismantle the inner race, cut open the bearing cage and extract the inner race via the small bearing collar using the extractor.

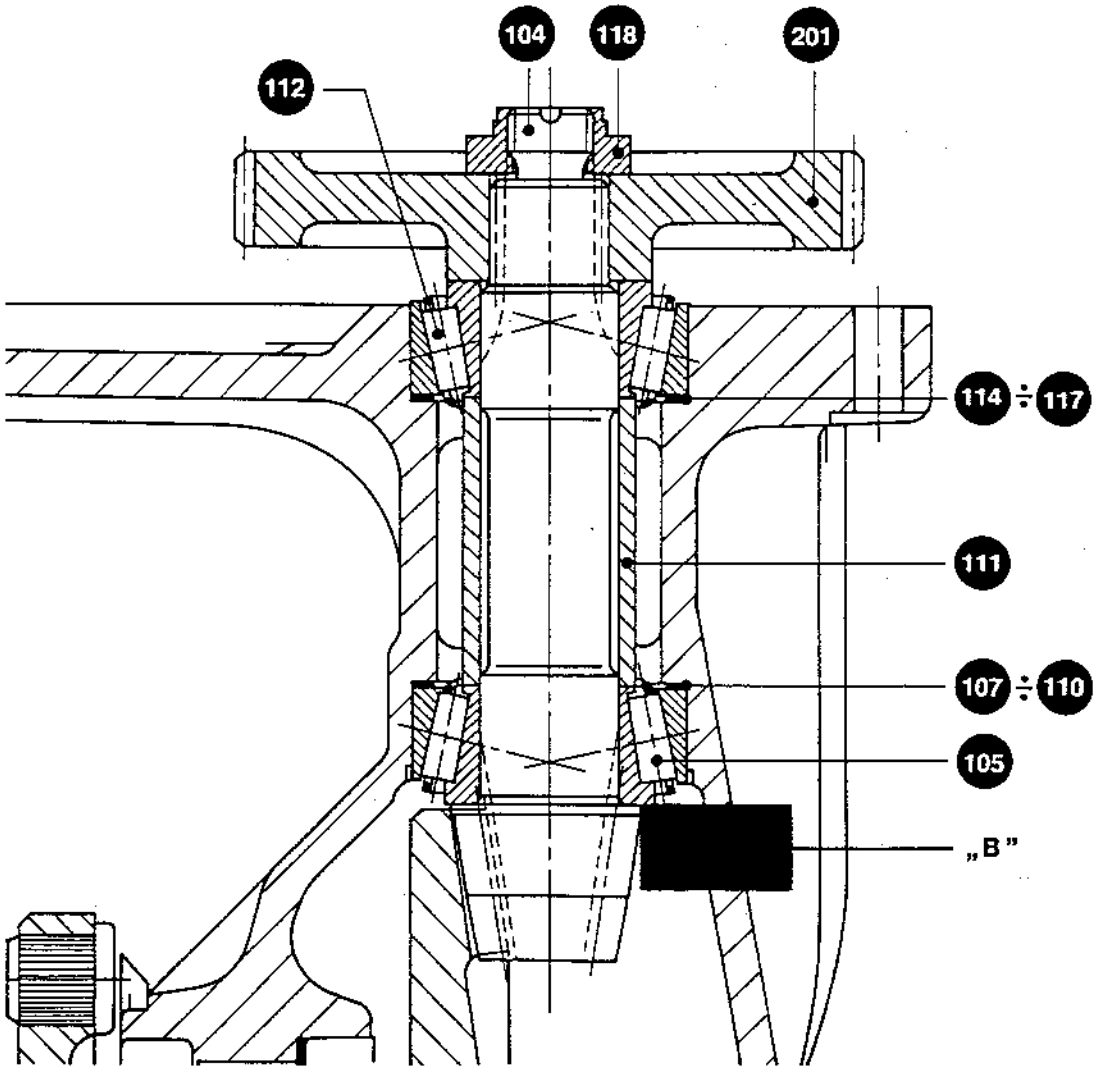


4.2.2.5 Dismounting the helical spur gear (201) and the conical pinion shaft (104)

Unscrew the hexagon nut, dismount the helical spur gear using the extractor, and knock out the conical pinion shaft (e.g., using a copper pin).
Remove the top inner race (112) and place it with the helical spur gear.
Push the lower inner race (105) with spacer bushing (111) off the conical pinion shaft using the auxiliary unit "B" and place them with the conical pinion shaft.

Dismount the top outer race (112) by lightly knocking with a copper pin or the like. Make sure not to damage the shims (114-117). Bind the outer race and the shims together with a wire or the like and place them with the inner race or the helical spur gear.
Dismount the bottom outer race (105) by lightly knocking with a copper pin or the like. Again make sure not to damage the shims (107-110). Bind the outer race and the shims together and place them with the inner race or the conical pinion shaft and the spacer bushing.

With the HFK 400 there is no spacer bushing (111) as from gear unit No. 816; it is replaced by a conical pinion shaft with a different form.



4.3 Mounting the gear unit

4.3.1 General remarks

Before mounting the gear unit, the following points should be noted:

- Clean all parts carefully and remove all traces of sealing compound.
- Check all parts for wear, damage and fissures and replace them if necessary.
- Hone the sealing surfaces with an oil stone or a smooth-cut file.
- Wheel set components such as helical spur gears **should** be replaced in pairs, helical gears **must** be replaced in pairs.
- It is recommended to always replace seals and radial seal rings whenever repairs are made.
- Cleaned anti-friction bearings should be lubricated before being mounted.
- For sealing, use only elastic non-hardening sealing compound (e.g., Loctite 574).

4.3.2 Mounting the basic gear unit (100)

4.3.2.1 Measuring the assembly dimension of the conical pinion shaft (104)

Insert measuring bush "D" into the bearing borehole of the housing and measure dimension F.

The housing dimension E is determined according to the following formula:

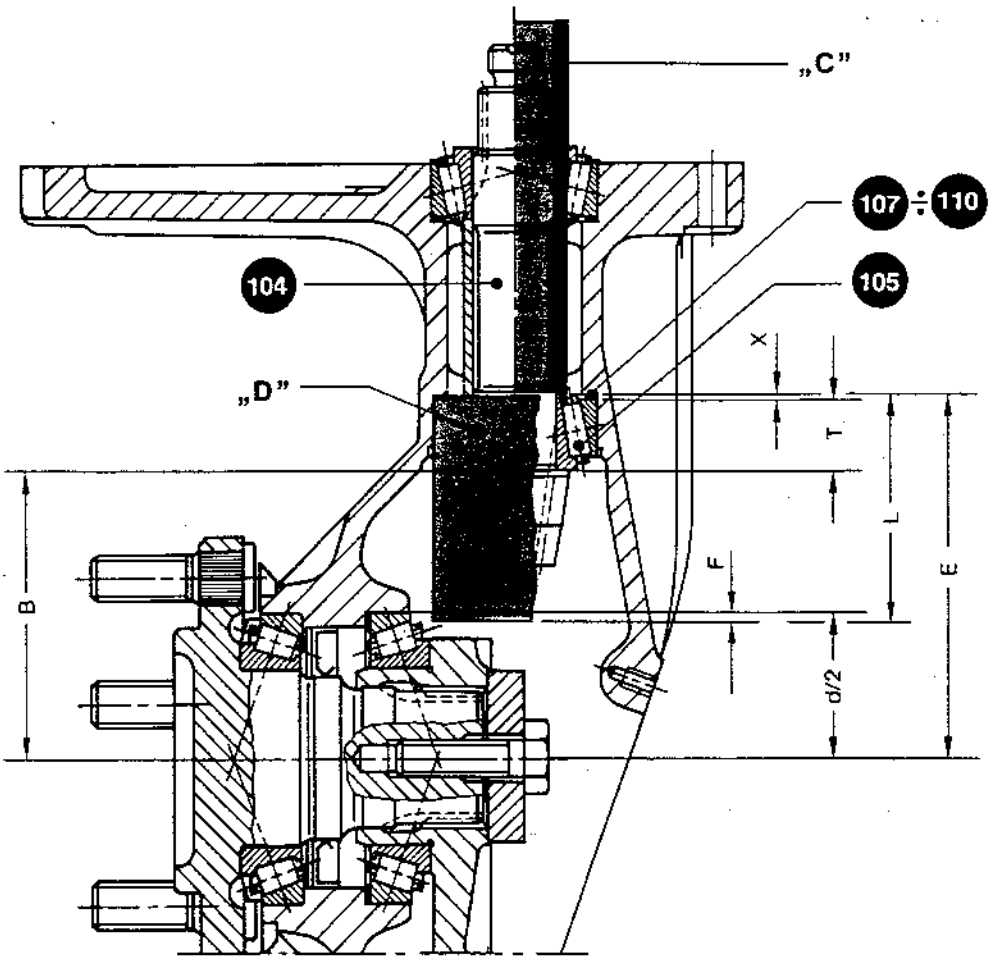
$$E = L - F + d/2$$

Type	Housing of borehole d/2
HFK 200	37.50
HFK 250/300	44.45
HFK 400/500	45.00

The thickness X of the shims (107-110) is calculated according to the following formula:

$$X = E - B - T$$

E = housing dimension
B = assembly dimension of conical pinion shaft (marked)
T = bearing width (105)



4.3.2.2 Pre-assembly of the conical pinion shaft (104)

Press the inner race (105) carefully with auxiliary unit "C" up to the limit stop.

4.3.2.3 Mounting the conical pinion shaft (104), helical gear (201) and setting the bearing clearance

Position the shims (107-110) according to instructions of section 4.3.2.1 and insert the outer race (105) into the housing (101).

Insert the previously mounted conical pinion shaft and mount the bushing (111).

With the HFK 400 there is no longer a bushing as from gear unit No. 816.

Using auxiliary unit "F", apply a light pre-stress to the conical pinion shaft via the housing towards the top.

Adjustment of bearing clearance

The thickness of the top shims (114-117) to be fitted can now be determined on the basis of the following dimensions:

C = distance between spacer bushing/conical pinion shaft (HFK 400) and contact of outer race.
S = distance between plane surface of outer race and plane surface of inner race.

Attention! If the outer race is higher than the inner race (dimension S as shown in detail "Z"), dimension X is determined as follows:

Shim thickness X = C - S - 0.02

If the outer race is lower than the inner race, dimension X is determined as follows:

Shim thickness X = C + S - 0.02

Insert the shims and the top outer race. Fit the inner race by knocking onto the pinion shaft using auxiliary unit "G". Place the helical spur gear (201) onto the conical pinion shaft and screw on the hex nut (118). Hold the helical spur gear tight using the auxiliary unit (see fig. 1) and tighten the nut with 60 +/- 5 Nm (44 +/- 3.7 ft-lb.). After checking the tooth pattern (refer to item 4.3.2.6), the shaft nut is locked by caulking.

Checking the bearing clearance of the pinion shaft

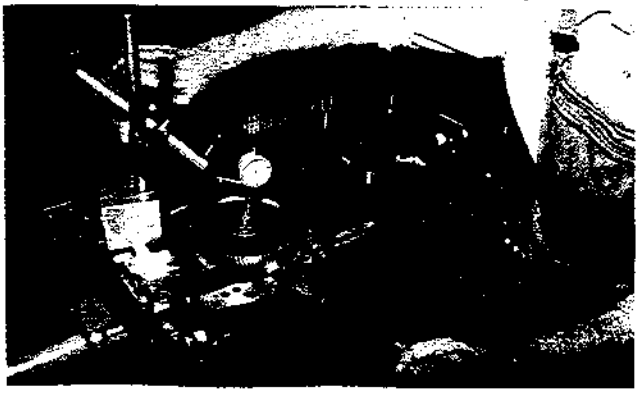
For the arrangement of the dial gauge refer to figure 2. Mark the measuring point on the helical spur gear (e.g., with a tallow pencil).

Press the conical pinion shaft downwards by hand, simultaneously turning it several times through approx. 180°. Adjust the dial gauge to zero at the measuring point.

Pull the conical pinion shaft upwards via the helical spur gear, turning it as described above, and hold it steady at the measuring point.

Read the bearing clearance off the dial gauge (admissible: 0-0.05 mm) (0-0.002").

Attention: When taking this measurement it is vital to turn the shaft several times so as to align the rollers in the taper roller bearing.



'82 7.87 1

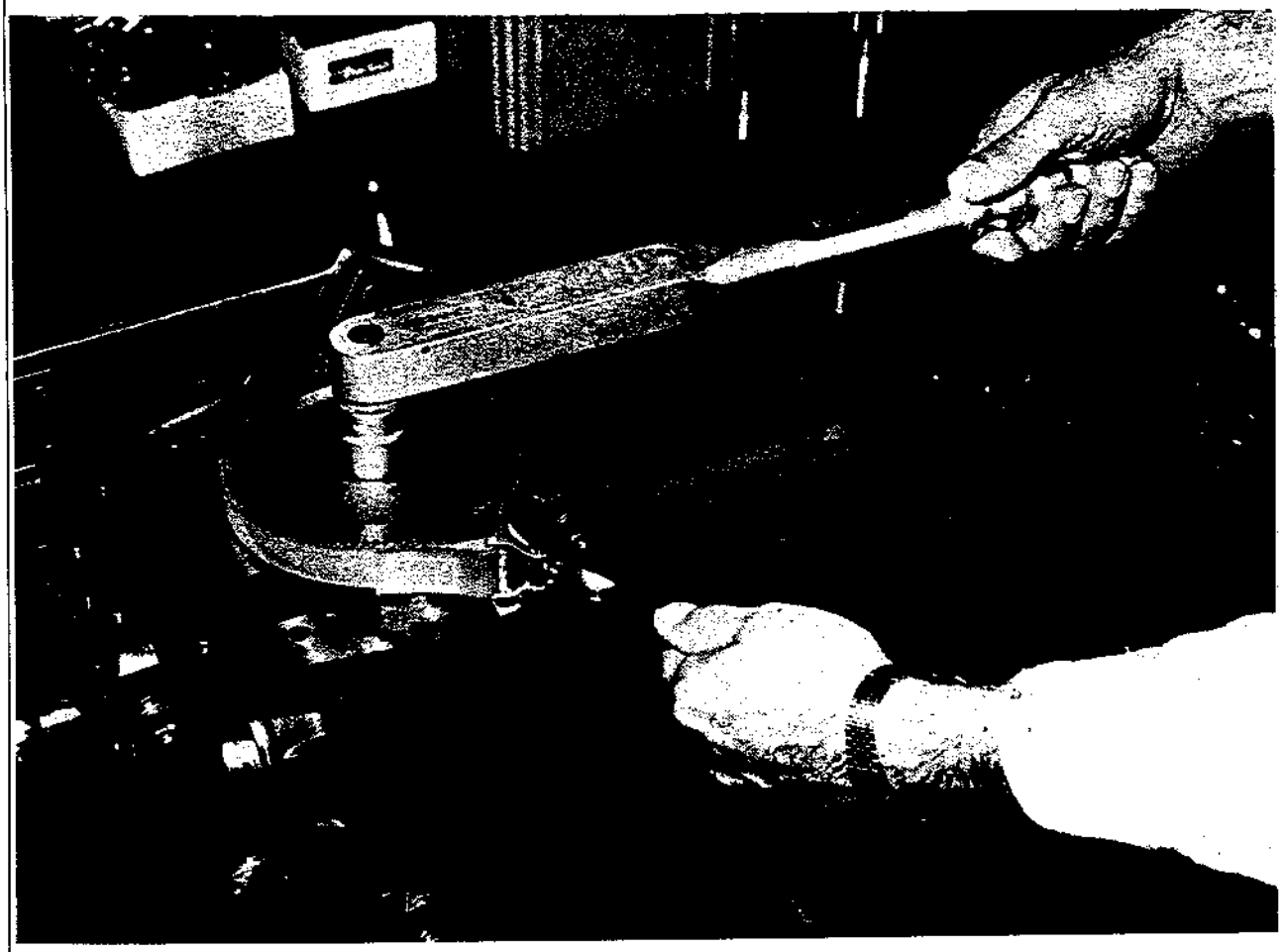
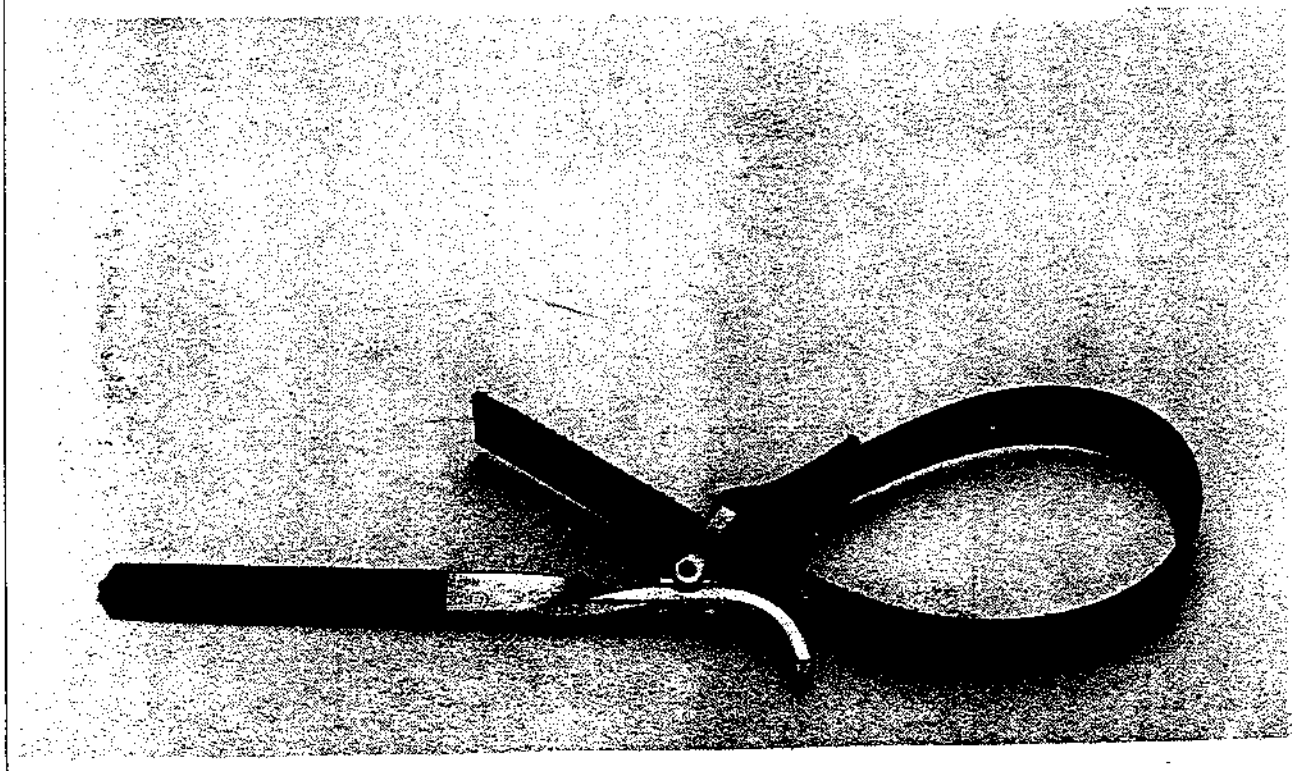
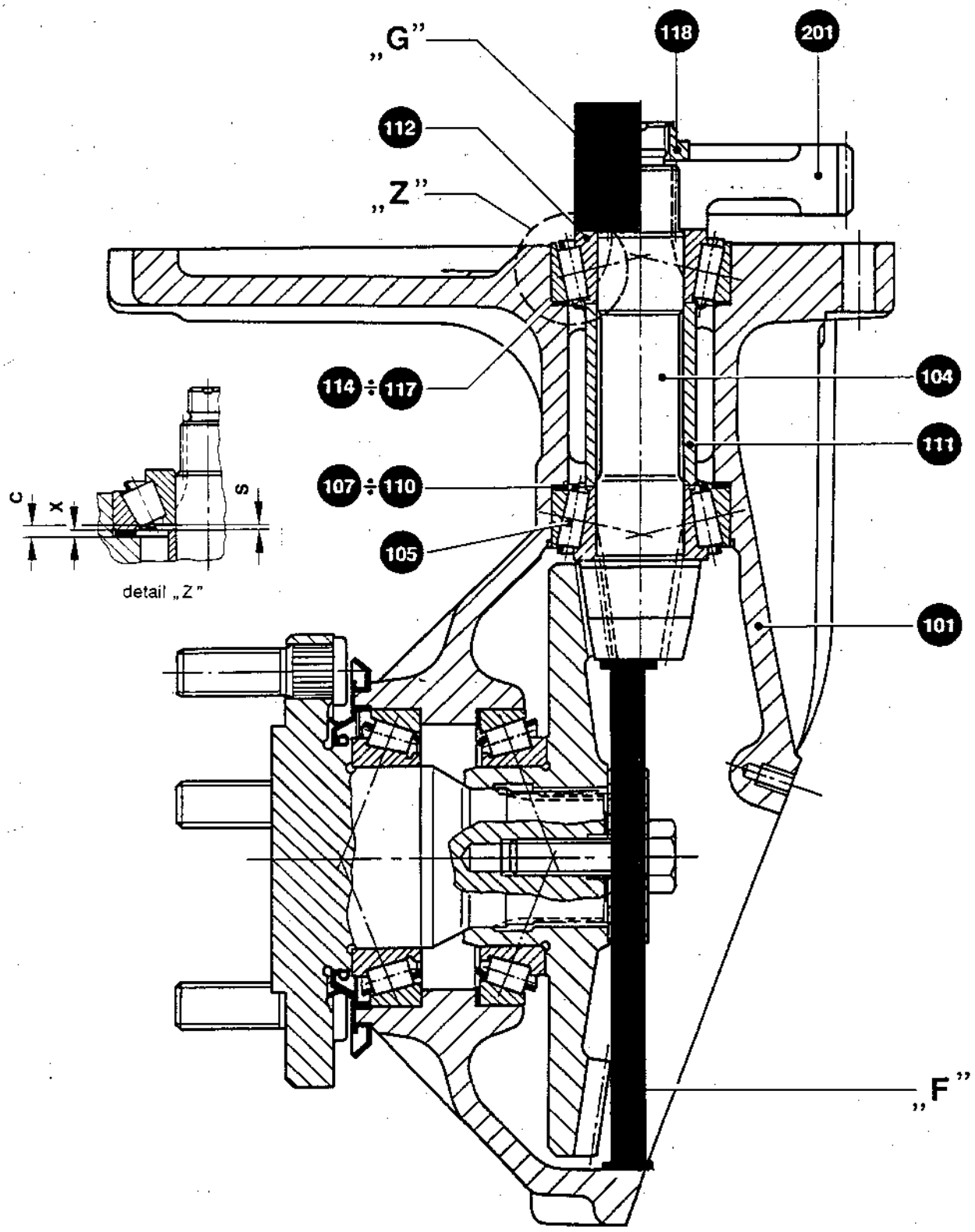


Fig. 1

Tools available on the market, such as, Gedore special tool 36/2



Mounting of wheel shaft



4.3.2.4 Pre-assembly of the wheel shaft (119)

Wet the wheel bolt (120) at its knurling with Loctite 242 and press into the boreholes provided on the flange of the wheel shaft.

Push the Nilos ring (121) onto the wheel shaft up to its stop at the flange.

Using auxiliary unit "H", press inner race (122) onto the wheel shaft up to the stop.

Grease the inner race of the taper roller bearing on the wheel shaft (cavities between rollers and cage and between cage and Nilos ring; use Shell Alvania R3 or a grease of identical composition and specification).

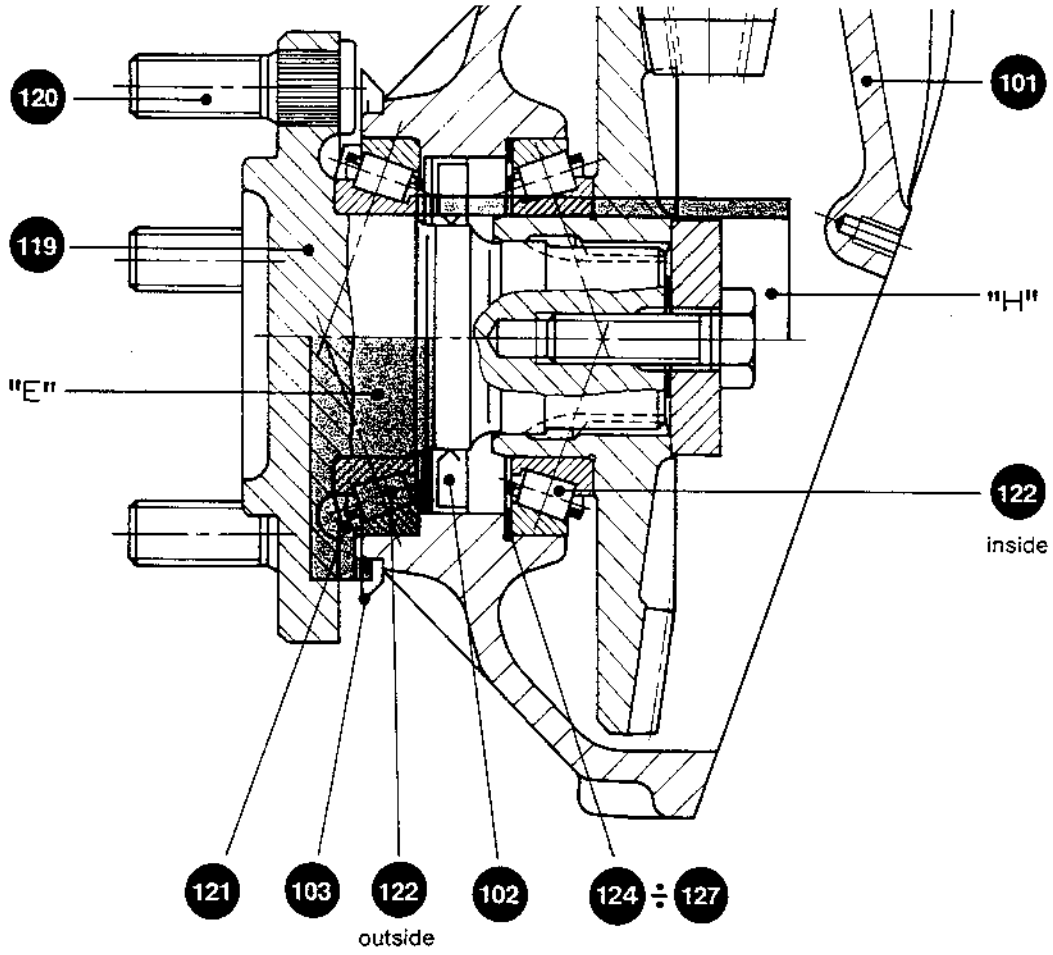
4.3.2.5 Pre-assembly of wheel shaft bearing in the housing (101)

Wet the sealing ring (102) at its outside diameter with Loctite 574 and mount it using auxiliary unit "E"; the open side of the ring must point to the inside of the gear unit.

Wet the Gamma ring (103) with Loctite 242 and press it onto the housing using auxiliary unit "E".

Insert the outer race (122 outside) into the housing.

As for dismantling, insert the outer race (122 inside) with shims (124-127) for the preliminary setting.



4.3.2.4 Pre-assembly of the wheel shaft (119)

Wet the wheel bolt (120) at its knurling with Loctite 242 and press into the boreholes provided on the flange of the wheel shaft.

Grease radial shaft seal (102) between dust and sealing lip and mount in such a way that the dust lip rests against the wheel shaft flange.

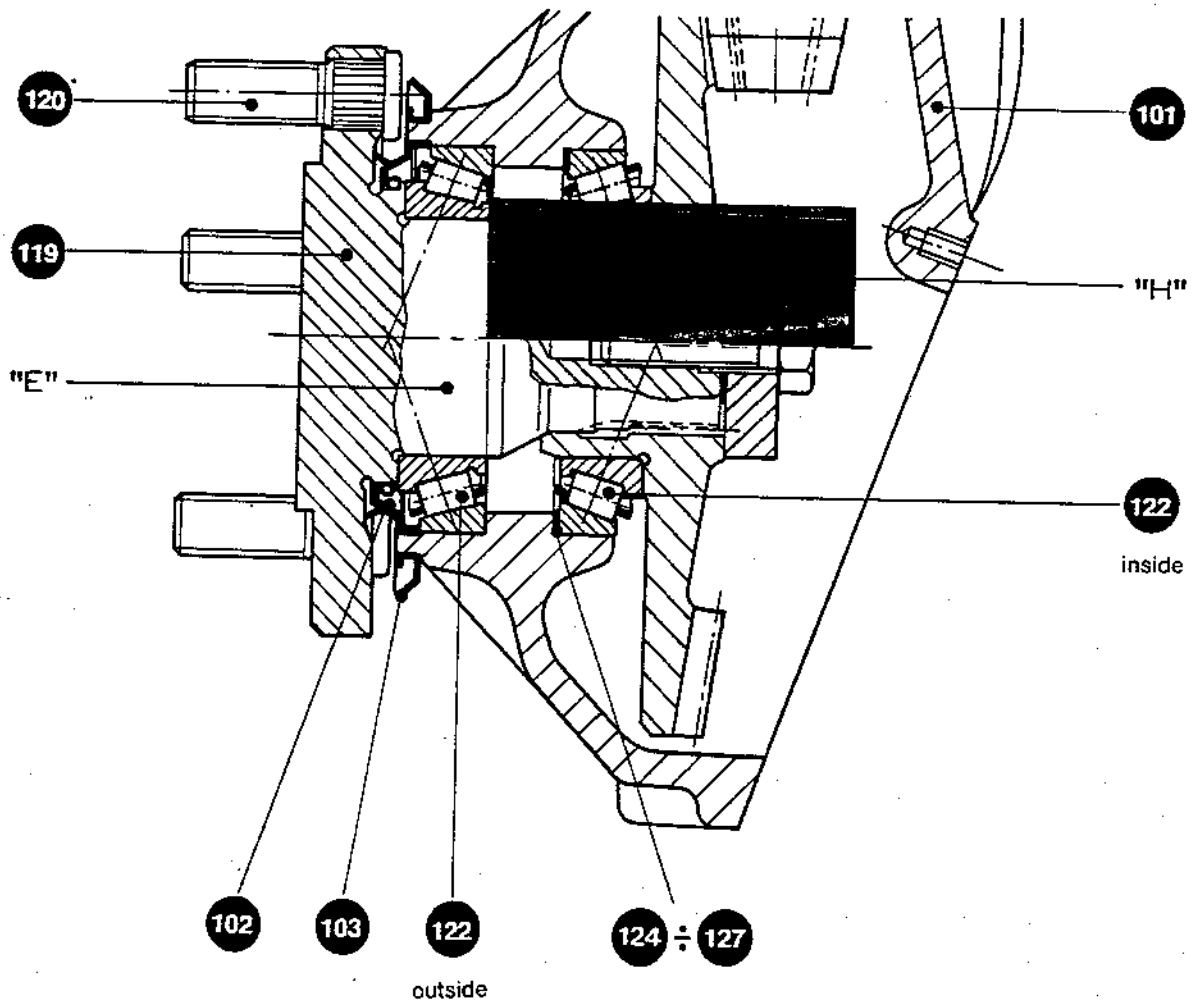
Using auxiliary unit "H", press inner race (122) onto the wheel shaft up to the stop.

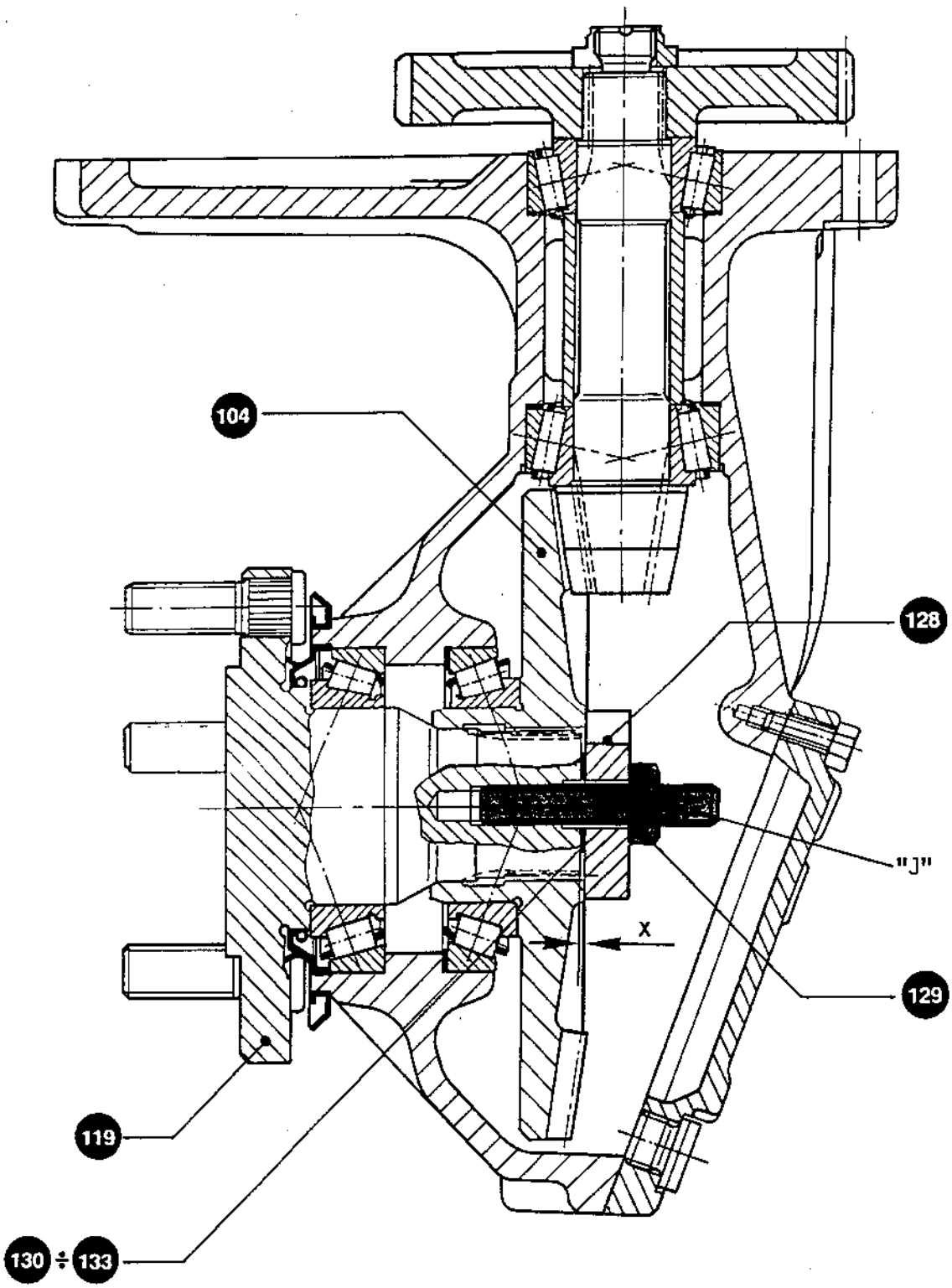
4.3.2.5 Pre-assembly of wheel shaft bearing in the housing (101)

Wet the Gamma ring (103) with Loctite 242 and press it onto the housing using auxiliary unit "E".

Insert the outer race (122 outside) into the housing.

As for dismantling, insert the outer race (122 inside) with shims (124-127) for the preliminary setting.




104
128
"J"
X
129
119
130 ÷ 133

4.3.2.6 Setting the circumferential backlash on the crown gear (104) and checking the tooth pattern

Press the inner race (122) onto the crown gear using the auxiliary unit "H".

Insert the crown gear (101) into the housing.

Push in the pre-assembled wheel shaft (used here simply as an auxiliary unit) and use auxiliary unit "J" to pull together the crown gear and the washer (128) until the bearing clearance is approx. zero.

For measuring the circumferential backlash at the crown gear, secure the conical pinion shaft against turning, e.g., with a wooden wedge.

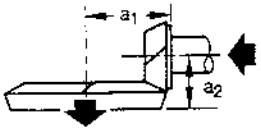
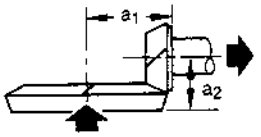
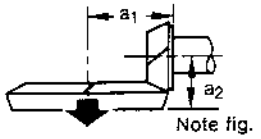
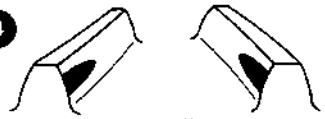
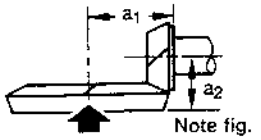
The circumferential backlash is corrected by adjusting with shims (124-127).

Admissible circumferential backlash 0.1-0.15 mm (0.004 - 0.006").

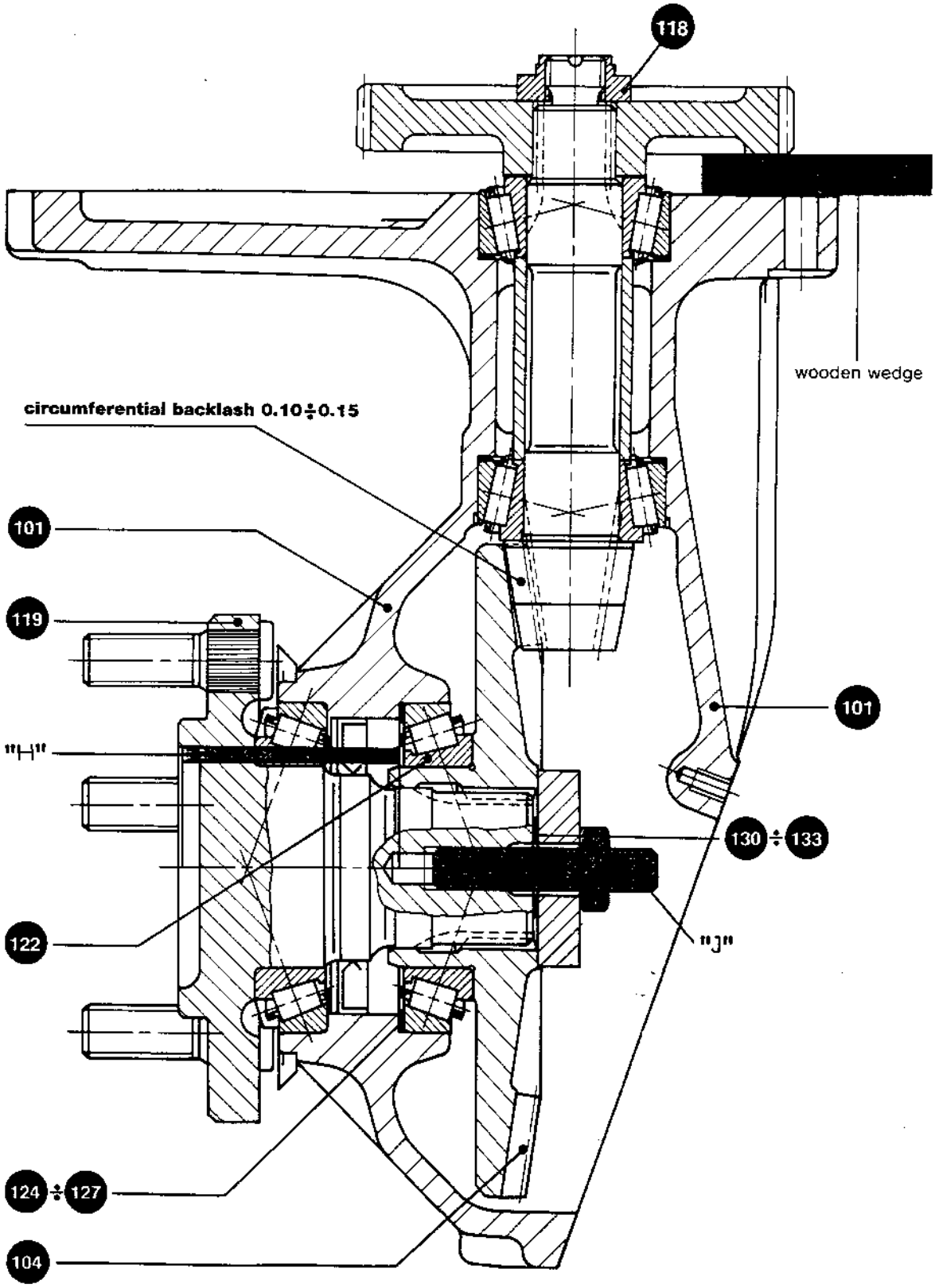
Checking the tooth pattern

For checking the tooth pattern it is necessary to apply a thin coat of marking ink to 3-4 tooth flanks of the crown gear.
Mesh the coated tooth flanks several times with the conical pinion. The pattern will show better if the conical pinion is slightly braked while in mesh. Compare the pattern obtained with the "Mounting guideline" below.
If a correction is necessary, its direction is indicated by the "Mounting guideline".
Secure the hex nut (118) by caulking.

Table of tooth patterns

Tooth pattern on the ring gear Defective patterns Concave flank | Convex flank	Correct pattern adjustment by changing the mounting dimensions in direction of arrow	Setting instructions
1  Pattern at tip		Mount every wheel set on principle according to the marked mounting dimensions a_1 and a_2 or the backlash S_d) or to deviations from the mounting dimensions $\pm\Delta$ a_1 and ($\pm\Delta_a$ or backlash S_d). The mounting dimensions may only be changed for incorrect patterns. The size of the change depends on the position of the patterns on the teeth.
2  Pattern at root		
3  Toe pattern	 Note fig. 1 & 2	
4  Heel pattern	 Note fig. 1 & 2	

Setting the circumferential backlash



4.3.2.7 Mounting the wheel shaft (119), crown gear (104), and setting the bearing clearance

Use auxiliary unit "J" to pull together the mounted wheel shaft and crown via washer (128):

- HFK 200 with M_A = 7 Nm (5.2 ft-lb.) = approx. 3500 N bearing pre-stress
- HFK 250-500 with M_A = 10 Nm (7.4 ft-lb.) = approx. 5000 N bearing pre-stress

When doing so, turn the wheel shaft several times in both directions to enable the bearing rollers to align themselves.

Measure dimension "Y" via the borehole of auxiliary unit "J".

Shim thickness "X" = Y - washer thickness of auxiliary unit.

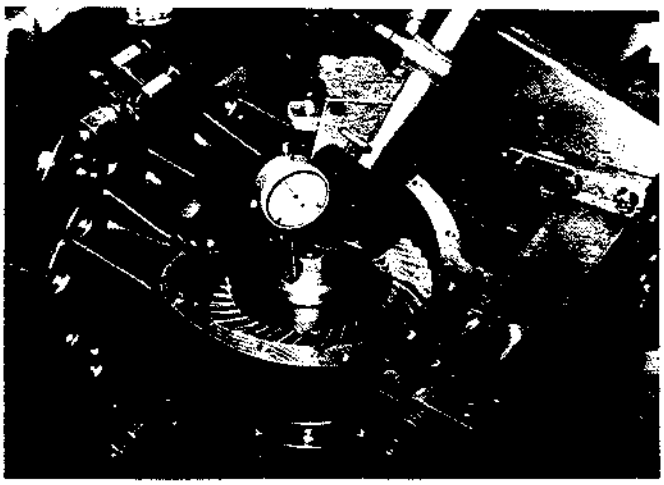
Unscrew auxiliary unit "J" and remove.

Insert shims (2, see fig. 4.5) in accordance with dimension "X".

Wet screw (129) with Loctite 242 and pull together the previously mounted wheel shaft and crown gear via the washer (128).

Tightening torque M_A = 110 Nm (81 ft-lb.) +/- 10 %

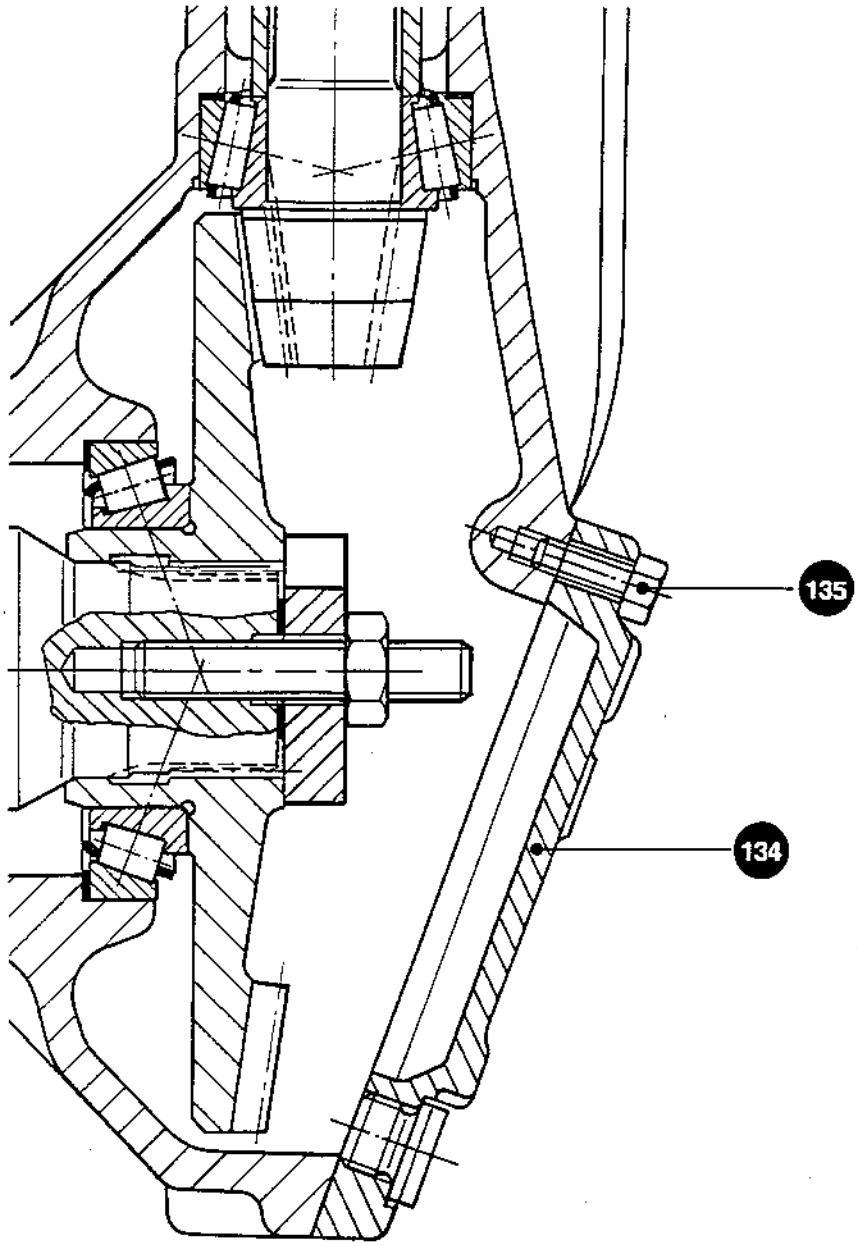
Remarks: A direct check of the bearing pre-stress as now set is hardly possible. When checking according to the measuring method described above, there should be no measurable bearing clearance. Nevertheless, it should still be possible to rotate the wheel shaft easily by hand.



4.3.2.8 Mounting the housing lid (134)

Coat the housing lid with Loctite 574 and fit in position. Wet screws (135) with Loctite 242 and fasten.

Tightening torque M_A = 9.5 Nm (7 ft-lb.)



Remarks

If the basic gear unit is stored as an assembly group, e.g., for standby purposes, it should be suitably protected against corrosion and be packaged accordingly.

Conservation can be carried out, e.g., by filling the unit with oil and draining it afterwards.

A closed plastic cover is sufficient to package the unit for storage.

4.3.3 Mounting the top of the gear unit (300)

4.3.3.1 Fitting the top of the gear unit to the basic gear unit (100)

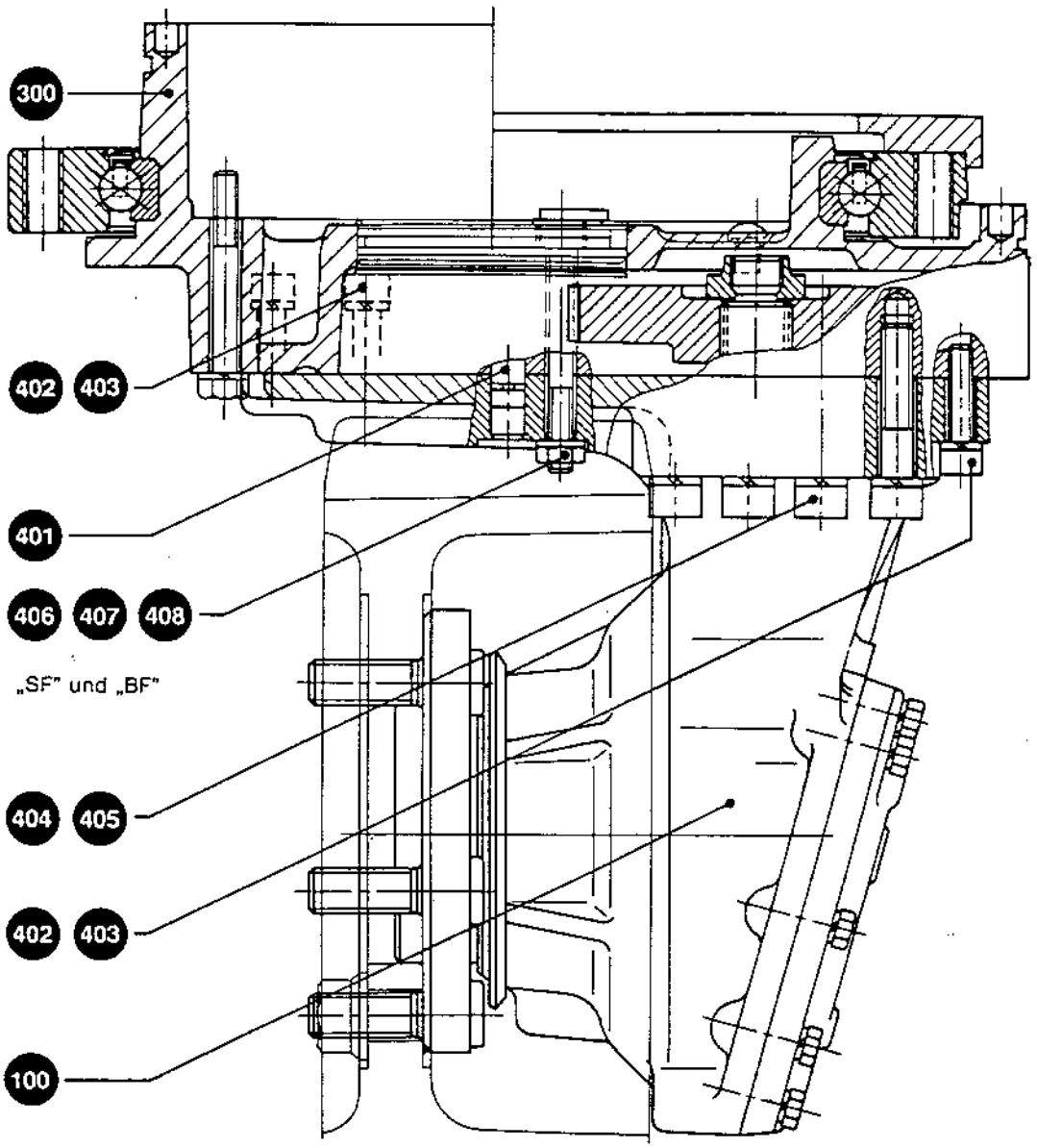
Insert dowel pins (401) into the basic gear unit in such a way (internal thread pointing downward) that they still project by approx. 1 mm (0.04") over the sealing surface.

Coat the sealing surface of the top of the gear unit with Loctite 574 and place it onto the basic gear unit.

Screw in bolts (402 and 404) with spring washers (403 and 405) and knock the dowel pin (401) with a 9 mm (11/32") dia. drift punch into the top of the gear unit up to the stop.

Tighten bolts (402/406) with tightening torque of M_A = 23 Nm (17 ft-lb.).

Tighten bolts (404) with tightening torque of M_A = 46 Nm (34 ft-lb.).



4.3.3 Mounting the top of the gear unit (300)

4.3.3.1 Fitting the top of the gear unit to the basic gear unit (100)

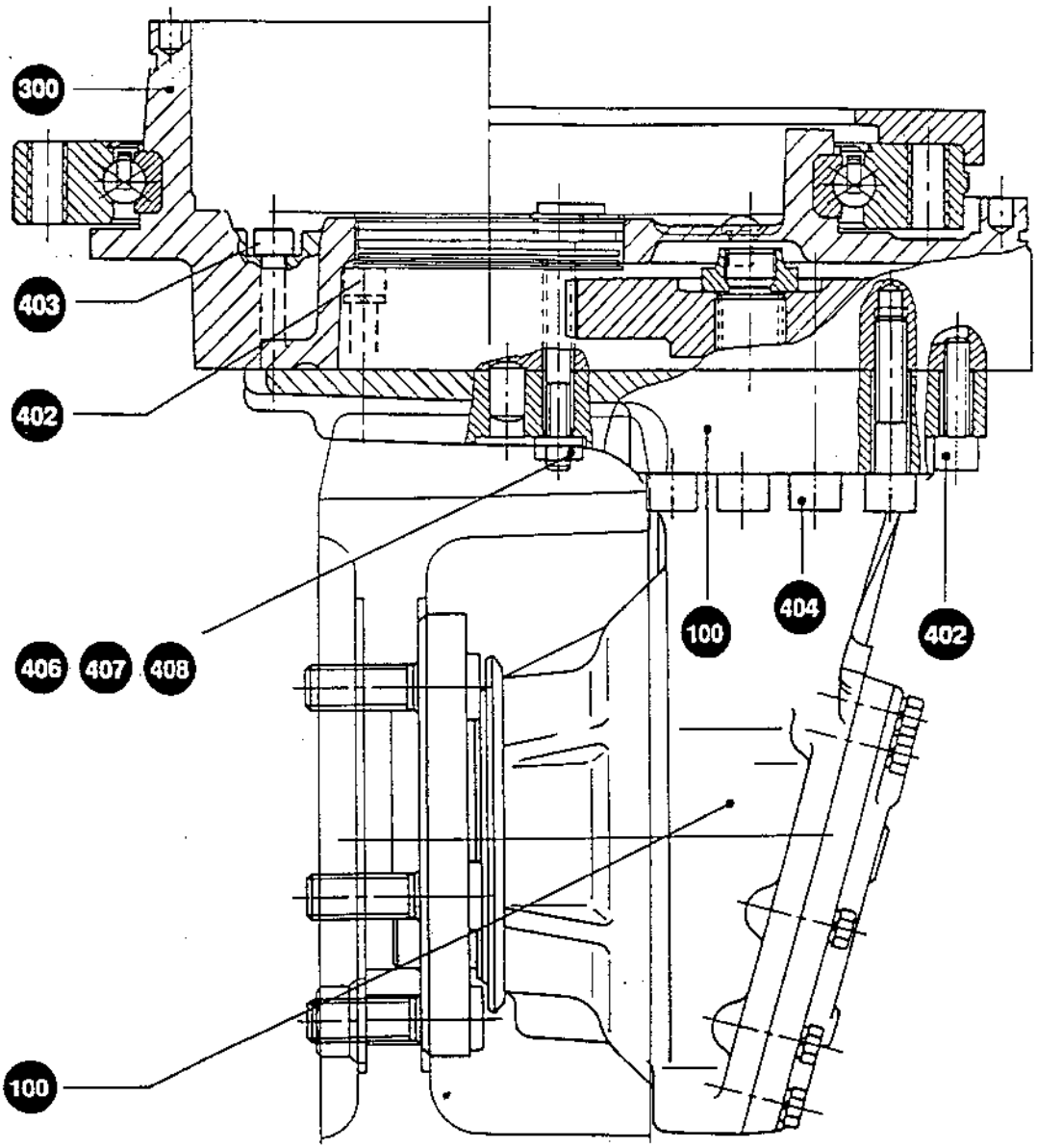
Dowel pins (401) to be driven up to the stop into the basic gear unit. (Dowel pins should then jut out of the sealing surface by abt. 3 mm - 1/8").

Coat the sealing surface of the top of the gear unit with Loctite 574 and place it onto the basic gear unit.

Screw in bolts (402 and 404).

Tighten bolts (402/406) with tightening torque of M_A = 23 Nm (17 ft-lb.).

Tighten bolts (404) with tightening torque of M_A = 46 Nm (34 ft-lb.).



4.3.3.2 General remarks

If the gear unit is stored, e.g., for standby purposes, it should be suitably protected against corrosion and packaged accordingly. Close the opening of the gear unit (for taking up the motor).

Protection against corrosion is possible, e.g., by filling the unit with oil and draining it afterwards. A closed plastic cover is sufficient to package the unit for storage.

4.4 Mounting the drive assembly

The part dealing with "Mounting the drive assembly" is included in the "Mounting Instructions", items 2.3 through 2.6 (refer also to item 1.2.6).

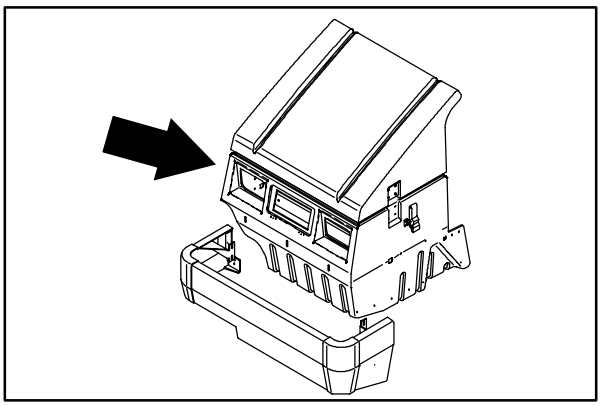
CONTENTS

INTRODUCTION

The side brush sweeps debris into the path of the main brush. The main brush sweeps debris from the floor into the hopper. The vacuum system pulls dust and air through the hopper and the hopper dust filter.

DEBRIS HOPPER

The debris hopper collects the debris swept up by the machine. The hopper includes the following main components: hopper dust filter, Thermo Sentry™, hopper dump door, and dust skirts. All adjustments have been made at the factory and require no regular maintenance. If hopper components are repaired or replaced, some components may need to be readjusted for best performance. The hopper may need to be removed from the machine for some repair or service work.



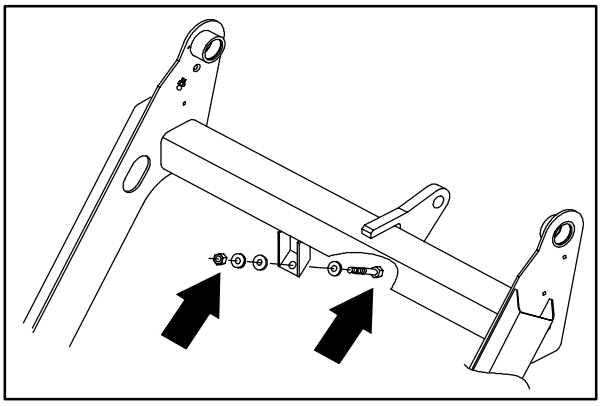
TO REMOVE HOPPER

1. Start the machine and raise the hopper. Engage the support bar.

2. Remove the hopper level adjustment bolt, nut, and washers.

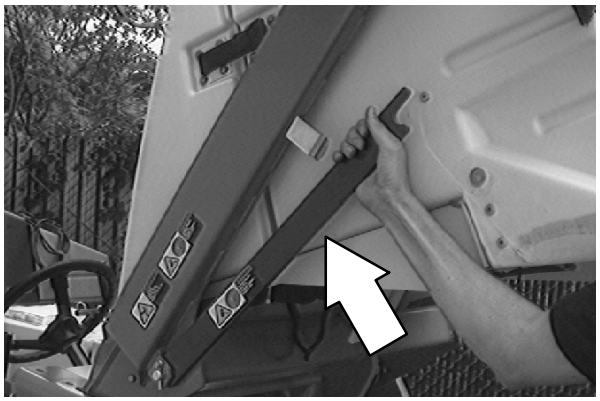
3. Cut the plastic ties holding the hopper harness to the main harness.

4. Unplug the hopper harness connectors from the main harness.



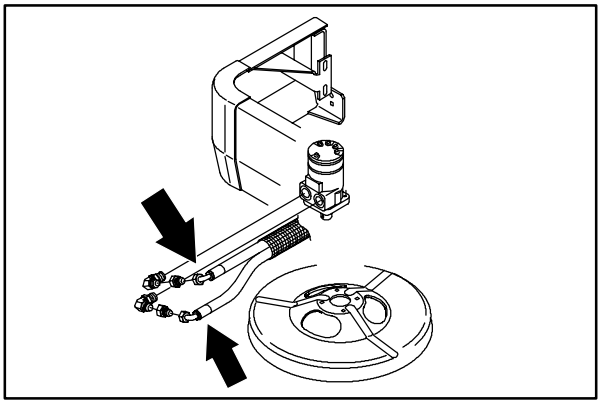
5. Disengage the hopper support bar and lower the hopper. Place (two) 2-3/4 ” blocks under the hopper.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

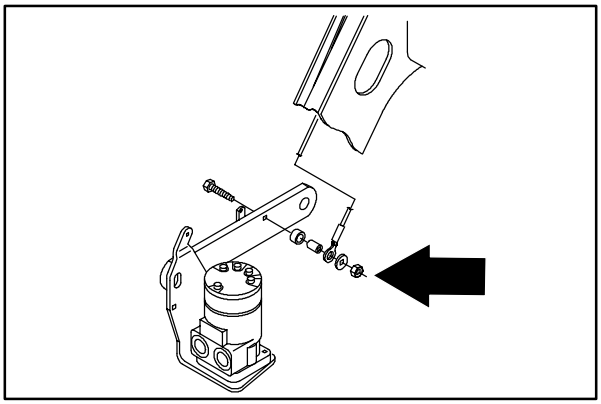


6. Disconnect the hydraulic hoses leading to the side brush motor.

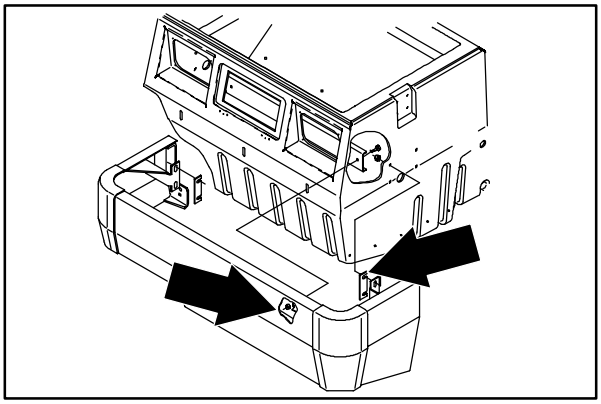
NOTE: *Observe hydraulic cleanliness requirements when opening hydraulic lines.*



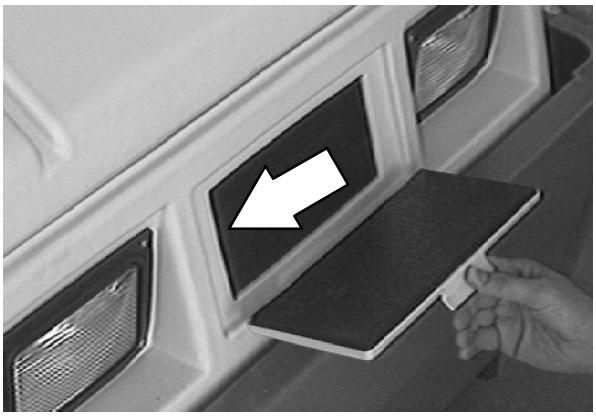
7. Disconnect the side brush lift cable at the hydraulic motor.



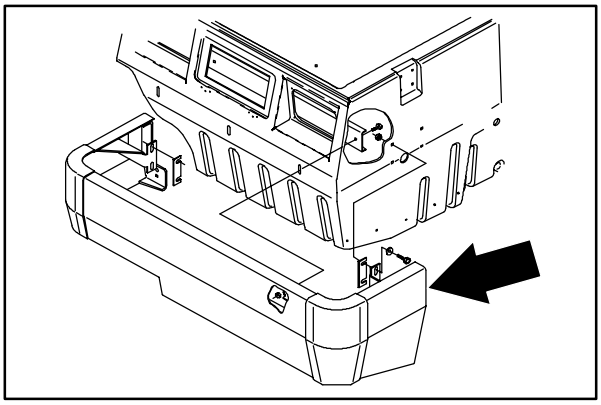
8. Remove the four hex screws holding the hopper bumper to the sides of the hopper.



9. Reach in through the access door in the front of the hopper and remove the three hex screws holding the bumper to the front of the hopper.

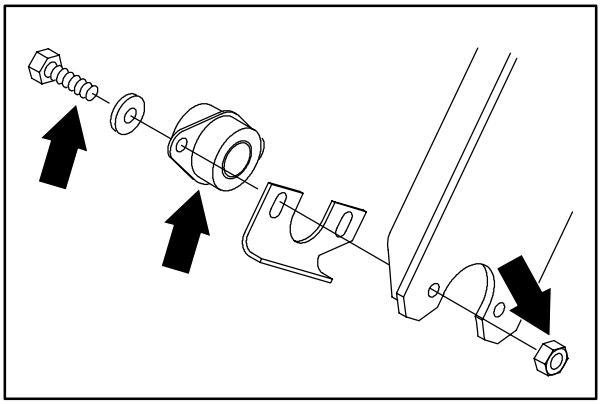


10. Remove the bumper and side brush assembly from the machine.



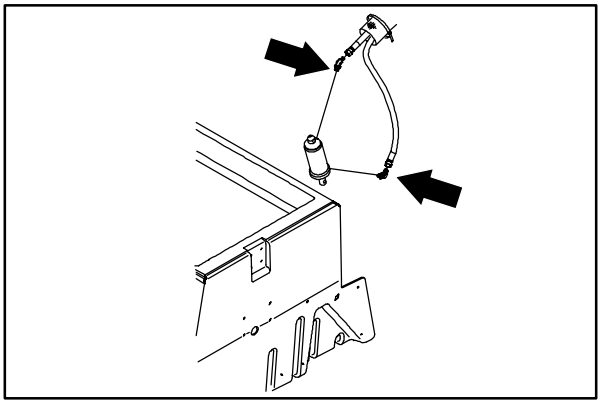
11. Remove the two hex screws and nyloc nuts holding the pivot bearings to each side of the hopper lift arm.

12. The hopper can now be pulled away from the machine.



13. Disconnect and plug the hydraulic hoses leading to the hopper dump door cylinder.

14. The hopper can now be removed from the machine.

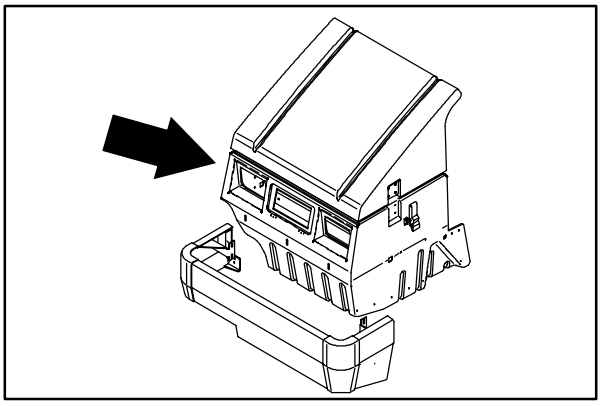


TO INSTALL HOPPER

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

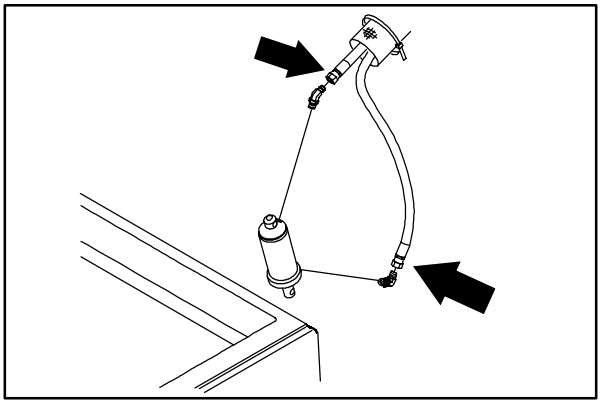
1. Position the hopper in front of machine. Make sure the hopper is sitting on (two) 2–3/4 ” blocks.

NOTE: Be careful not to pinch hydraulic hoses or electrical wires during this procedure.

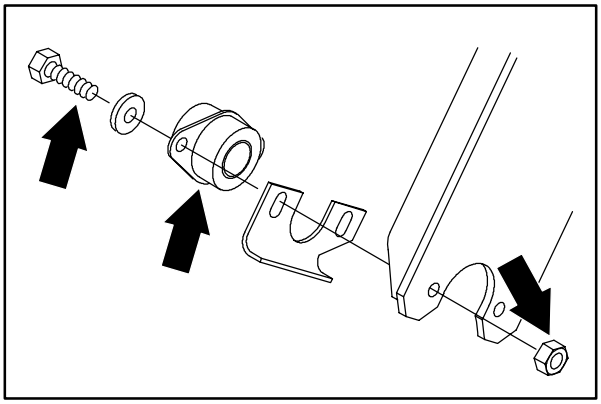


2. Reconnect the hydraulic hoses to the dump door cylinder. See the schematic in the HYDRAULICS section of this manual for proper hose connections.

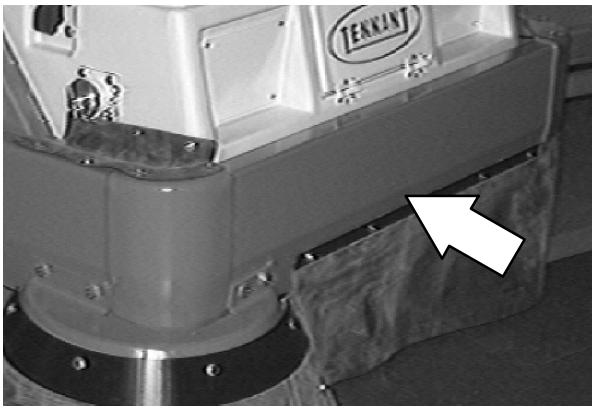
NOTE: *Observe hydraulic cleanliness requirements when opening hydraulic lines.*



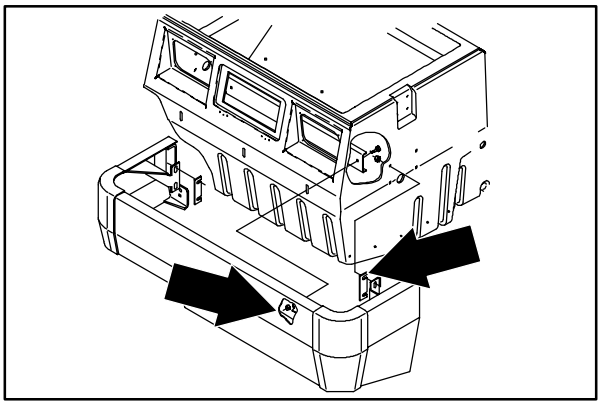
3. Line up the holes in the hopper pivot bearing flanges with the holes in the hopper lift arms. Install the four hex screws and nyloc nuts. Tighten to 18 – 24 Nm (15 – 20 ft lb).



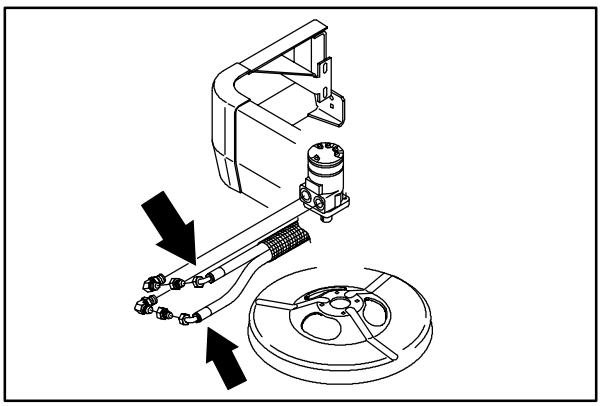
4. Position the side brush and front bumper assembly on the front of the hopper.



5. Line up the holes in the front and on the side of the hopper with the holes in the bumper assembly. Install the seven hex screws and tighten to 18 – 24 Nm (15 – 20 ft lb).



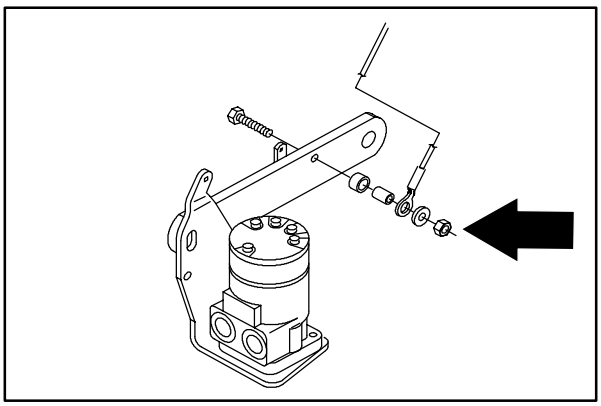
6. Reconnect the hydraulic hoses to the side brush motor. See the schematic in the HYDRAULICS section of this manual for proper hose connections.



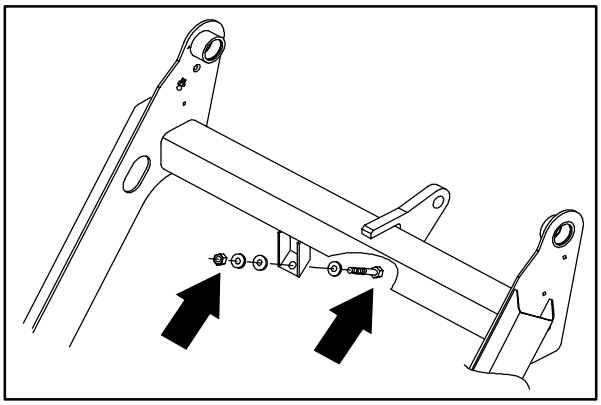
7. Reconnect the side brush lift cable at the side brush assembly.

8. Reconnect the hopper harness to the main harness.

9. See the schematic in the ELECTRICAL section of this manual for proper harness connections.



10. Reinstall the lip height adjustment bolt on the back of the hopper.

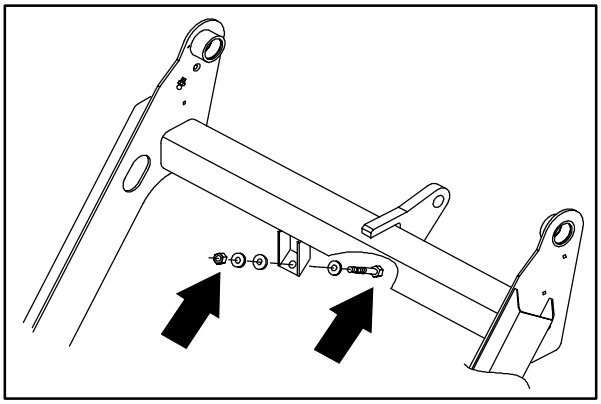


11. Start the machine and check for proper operation of hopper vacuum fan, dump door, side brush rotation and side brush up and down.

TO ADJUST HOPPER LIP HEIGHT

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. The hopper lip height adjustment should be 2–3/4” from the floor to the hopper bottom.

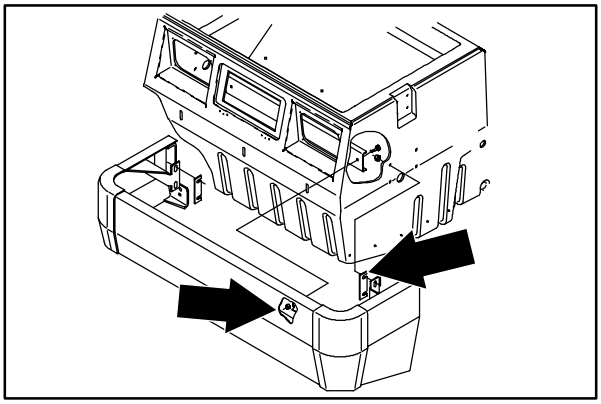


2. To achieve this measurement, adjust the length of the adjustment bolt on the back of the hopper.

TO ADJUST HOPPER BUMPER

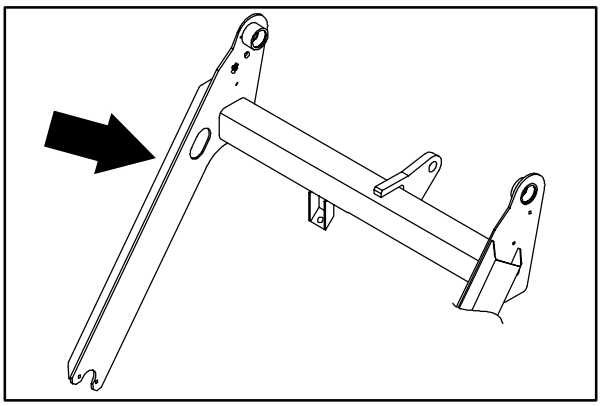
FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Loosen the four hex screws and nyloc nuts holding the hopper bumper to the sides of the hopper.
2. Loosen the three hex screws holding the hopper bumper to the front of the hopper.
3. Adjust the hopper bumper so it is level with the machine frame.
4. Firmly tighten all of the hardware.



HOPPER LIFT ARM

The hopper lift arm assembly and hopper lift cylinder raises and lowers the debris hopper. The lift arm is held in place by two pivot pins.



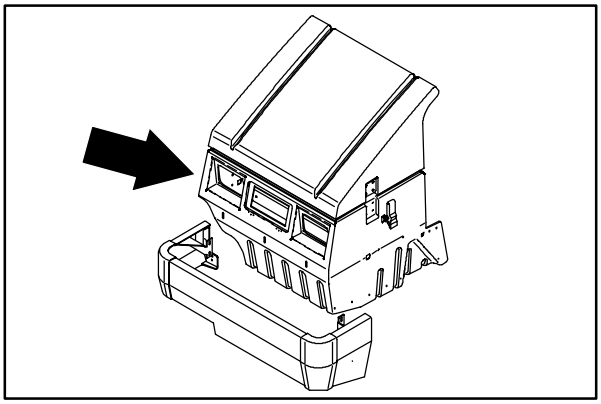
TO REMOVE HOPPER LIFT ARM

1. Park the machine on a smooth, level surface.

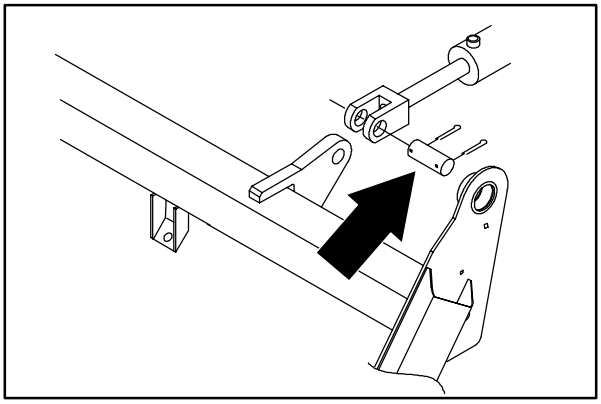
2. Stop the machine and set the machine parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

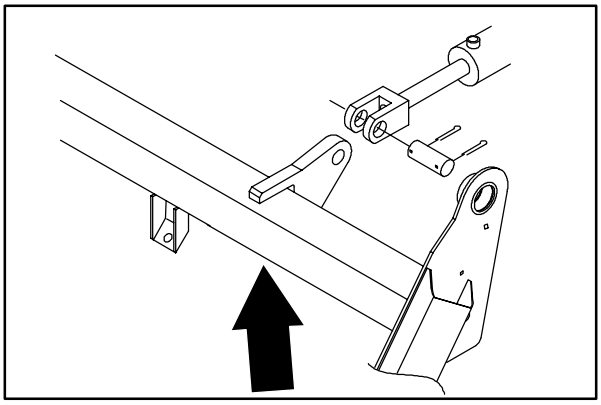
3. Remove the debris hopper. See TO REMOVE HOPPER FROM MACHINE instructions.



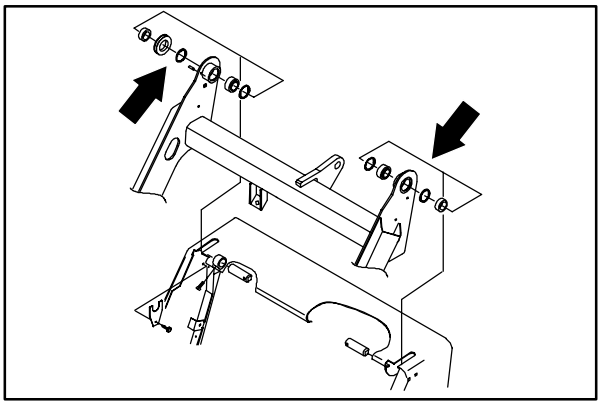
4. Remove the cotter pins from the upper, hopper lift cylinder pin.



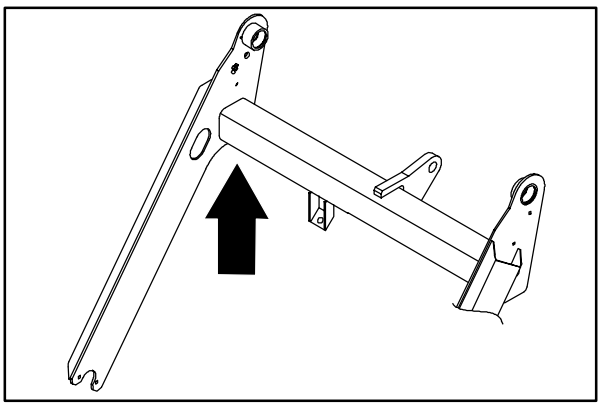
5. Raise up slightly on the lift arm to take pressure off the cylinder pin. Remove the pin.



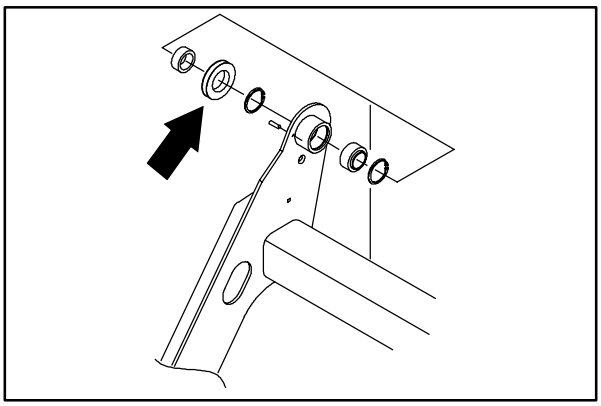
6. Remove the hex hardware holding the hopper pivot pins to the frame towers.



7. Raise up slightly on the lift arm to take pressure off the pins. Remove the pins and washers and remove the lift arm from the machine.



8. If the large self aligning bearing needs to be changed, remove retaining rings and press the old bearing out of the lift arm.



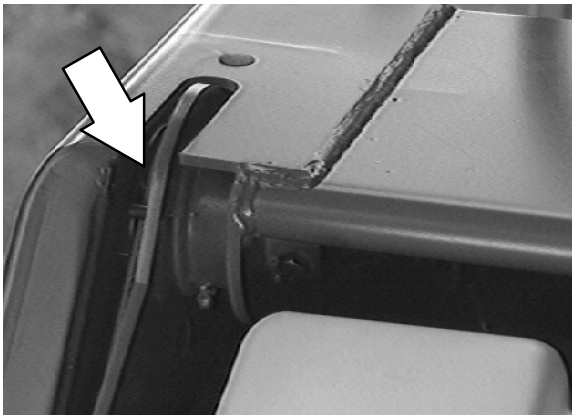
TO INSTALL HOPPER LIFT ARM

1. Park the machine on a smooth, level surface.

2. Stop the machine and set the machine parking brake.

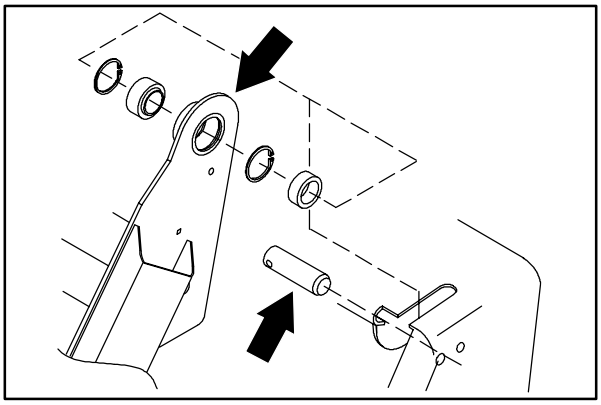
   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Position lift arm in the machine, aligning the upper bearings in the lift arm with the holes in the towers of the machine.

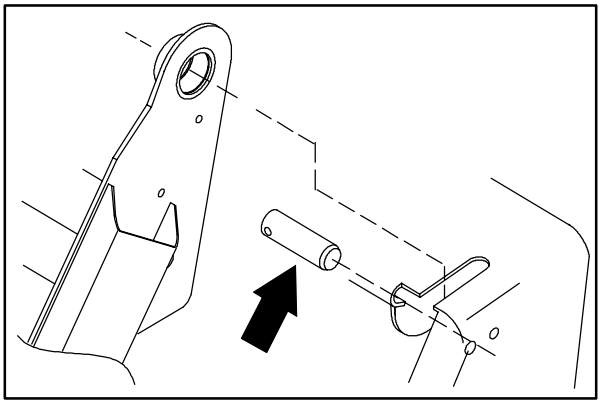


NOTE: Make sure the side brush lift cable is looped over the plastic pulley on the right hand lift arm pin.

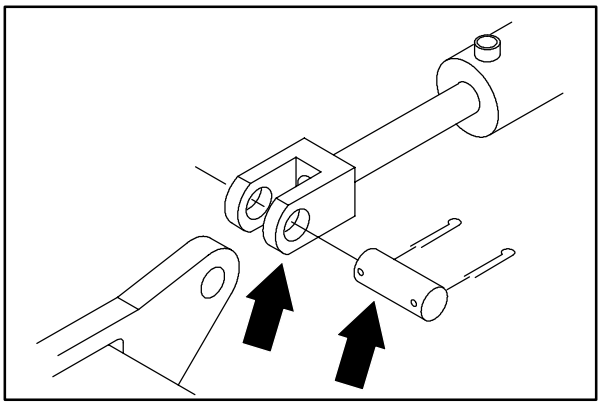
4. Install the lift arm pins in the bearings from the inside of the machine. Make sure to reinstall the spacer washers that were removed when the pins were removed.



5. Align the hole in lift arm pin with the hole in the pin boss on the tower. Install the hex screws and tighten to 18 – 24 Nm (13 – 18 ft lb).



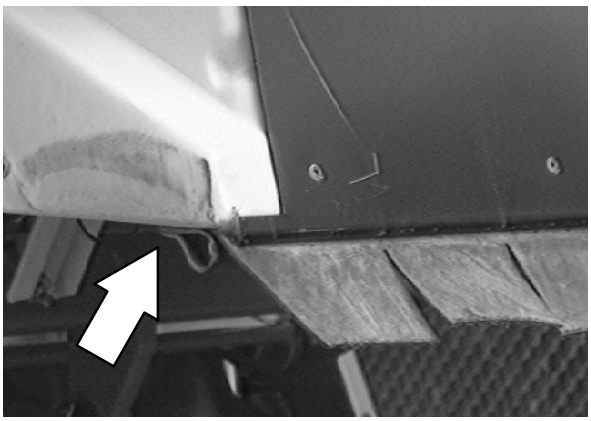
6. Align the small fiberglide bearing in the lift arm cylinder lug with the hole in the clevis on the hopper lift cylinder. Reinstall the cylinder pin and cotter pins.



7. Reinstall the hopper assembly. See TO INSTALL HOPPER instructions.

HOPPER DUMP DOOR

The hopper dump door is used to control debris when dumping. It also seals the hopper to the main brush compartment. The dump door is open and closed with a hydraulic cylinder.



TO REMOVE HOPPER DUMP DOOR

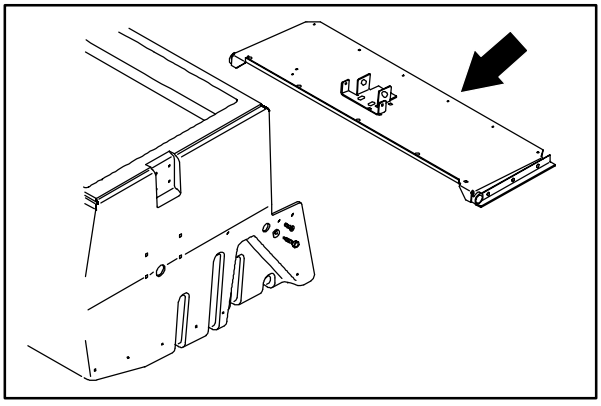
1. Make sure the hopper is emptied of all debris. Engage the parking brake.

2. Raise the hopper and engage the prop rod.

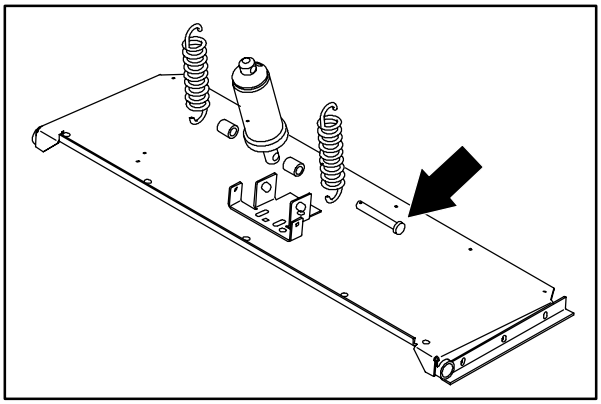
WARNING: Raised Hopper May Fall. Engage Hopper Support Bar.

3. Open the dump door. Shut off the machine.

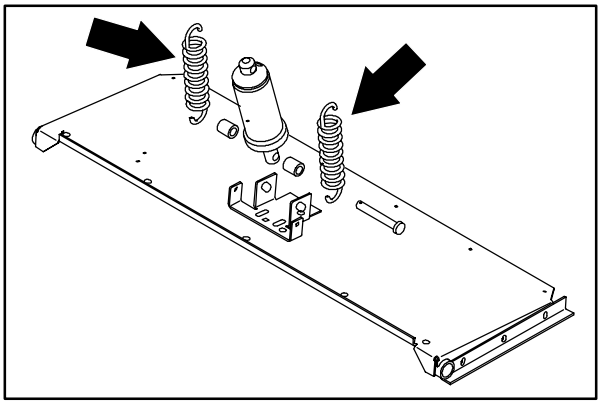
   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.



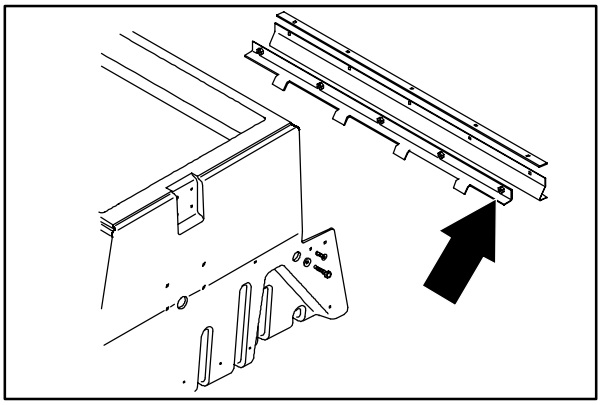
4. Disconnect the rod end of dump door cylinder from the bracket on the center of the dump door.



5. Remove the two tension springs from the dump door and the back off the hopper.

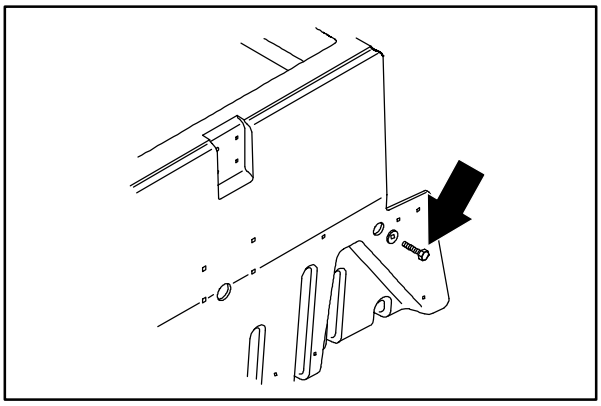


6. Remove the five hex screws holding the seal on the front of the dump door to the back of the hopper.



7. Use a razer knife to remove the RTV from the two dump door pivot bolts on each side of the hopper. Remove the two hex screws.

8. Drop the dump door down and out of the hopper.



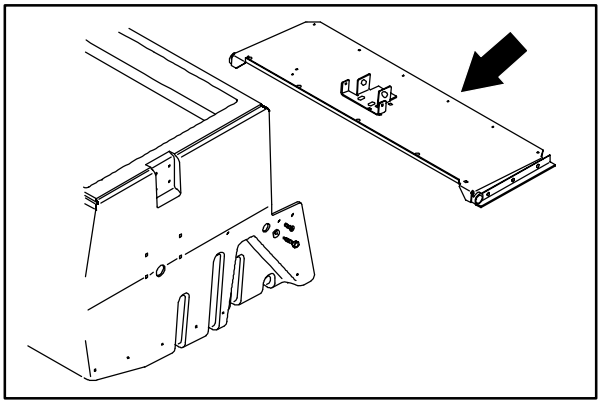
TO INSTALL HOPPER DUMP DOOR

1. Make sure the hopper is emptied of all debris. Engage the parking brake.

2. Raise the hopper and engage the prop rod. Shut off the machine.

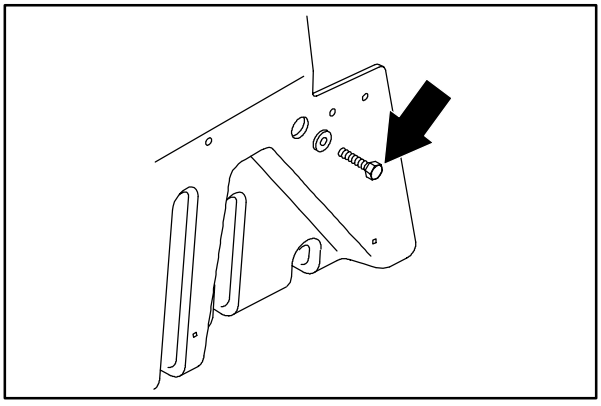
   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Position the dump door in the hopper. Line up the pivot holes in the dump door with the mount holes in each side of the hopper.

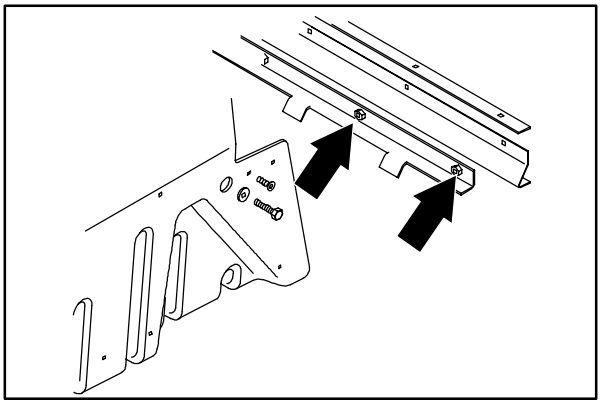


4. Install the two hex screws and nuts. Hand tighten tight.

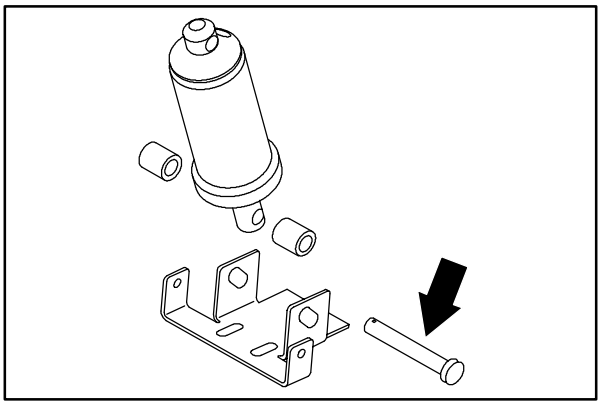
5. Put a small amount of RTV around the two hex screws.



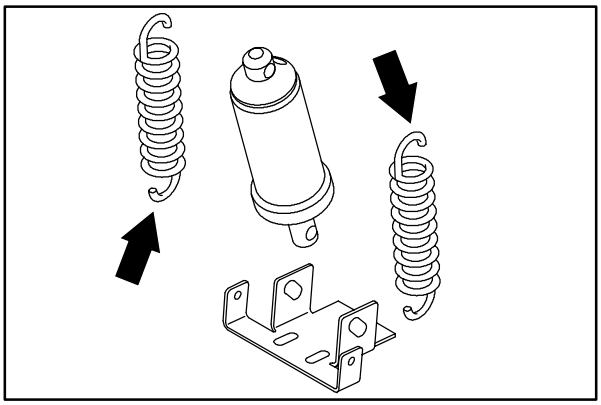
6. Reinstall the seal on the front of the dump door. Hand tighten the five hex screws tight.



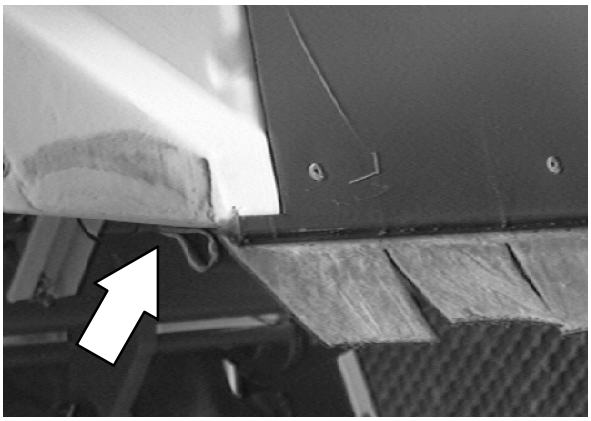
7. Reconnect the rod end of dump door cylinder to the mount bracket on the center of the dump door.



8. Reconnect the two tension springs to the mount bracket.



9. Start the machine and open and close hopper door a few times. Check for proper operation.



NOTE: Make sure the seals on the dump door are adjusted so they contact the inside wall of the hopper.

HOPPER DUST FILTER

The dust filter filters the air pulled up from the hopper. The dust filter is equipped with a shaker to remove the accumulated dust particles. The dust filter shaker is operated by the vacuum and filter shaker lever.

Shake the dust filter before emptying the hopper and at the end of every work shift. Check and clean or replace the dust filter after every 100 hours of operation.

To clean the dust filter, use one of the following methods:

- SHAKING – Move the vacuum and filter shaker lever to the **Filter shaker** position.
- TAPPING – Tap the filter gently on a flat surface with the dirty side down. Do not damage the edges of the filter element and seals, or the filter will not seat properly in the filter frame.
- AIR – Blow air through the dust filter, opposite the direction of the arrows. This may be done with the dust filter in the machine. Always wear eye protection when using compressed air.

  FOR SAFETY: When servicing machine, wear eye and ear protection if using pressurized air or water.

- WATER – Soak the dust filter in a water and mild detergent solution. Rinse the dust filter until it is clean. Air dry the wet dust filter; do not use compressed air.

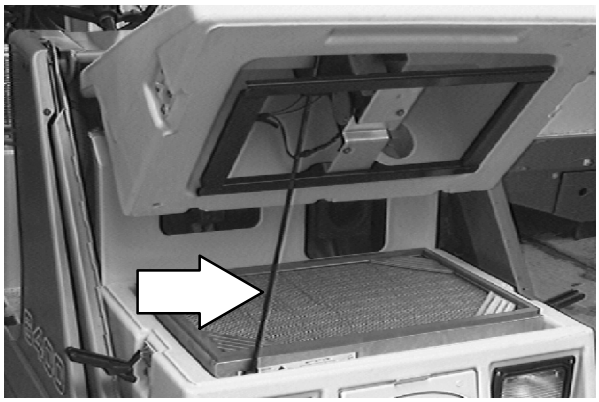
NOTE: Be sure the dust filter is completely dry before reinstalling it in the machine.

TO REPLACE HOPPER DUST FILTER

1. Stop the machine, set the parking brake and turn the machine power off.

   FOR SAFETY: Before leaving or servicing machine, stop on level surface, set parking brake, turn off machine, and remove key.

2. Unlatch and open the hopper cover. Support the hopper with the hopper cover prop rod.



3. Lift the dust filter element out of the hopper insert.

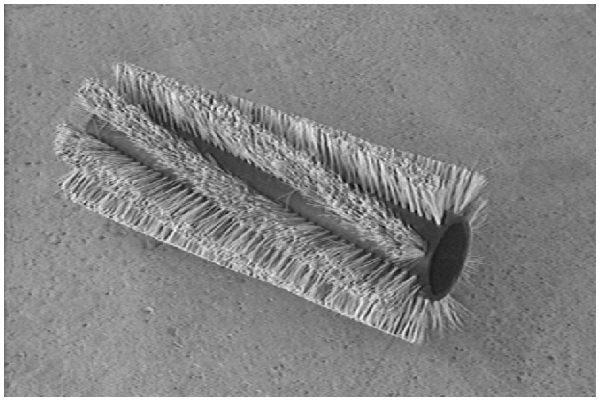
4. Clean or discard the dust filter as required.

5. Clean and inspect the filter sealing surfaces. Make sure the foam element centering strips attached to the hopper and intact. Put the cleaned or new dust filter in the hopper insert with the arrows pointing up.

6. Lower the hopper cover support and close the hopper cover. Latch the hopper cover.

MAIN BRUSH

The main brush is cylindrical and spans the width of the machine, sweeping debris into the hopper.



Check the brush daily for wear or damage. Remove any string or wire tangled on the main brush, main brush drive hub, or main brush idler hub.

Check the main brush pattern daily. The pattern should be 50 to 75 mm (2 to 3 in) wide with the main brush in the lowered position. Adjust the main brush pattern by turning the main brush down pressure knob and moving the brush stop.

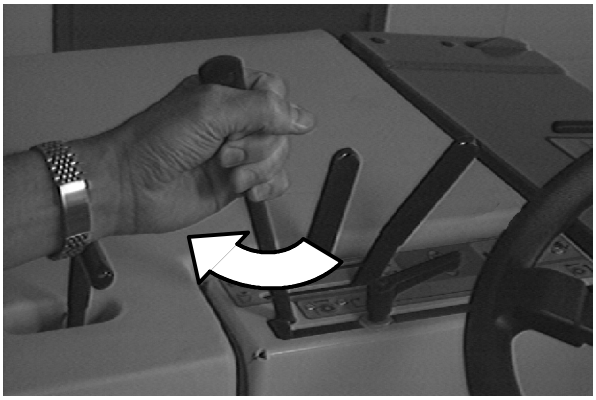
Rotate the main brush end-for-end after every 50 hours of operation for maximum brush life and best sweeping performance. Replace the main brush when the remaining bristles measure 25 mm (1 in) in length.

TO REPLACE MAIN BRUSH

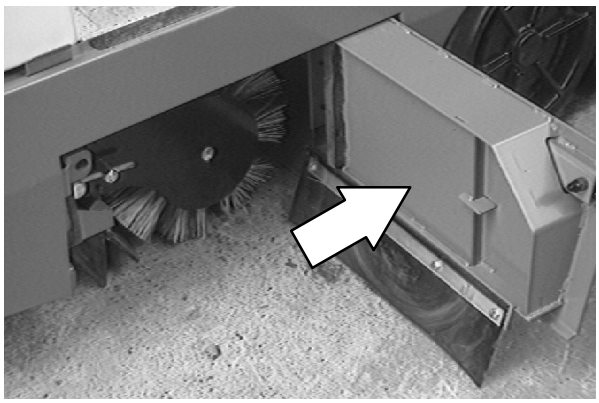
1. Stop the machine and set the parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

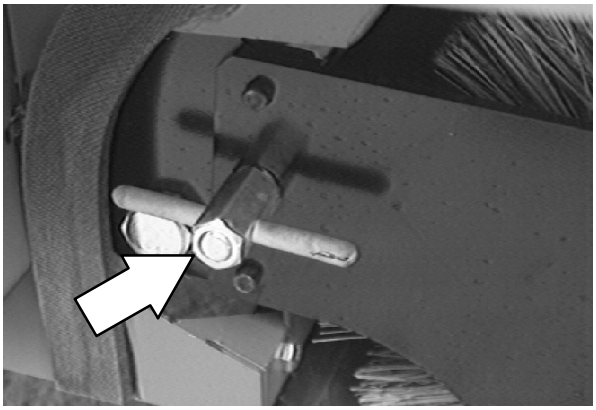
2. Raise the main brush.



3. Open the right side main brush access door.



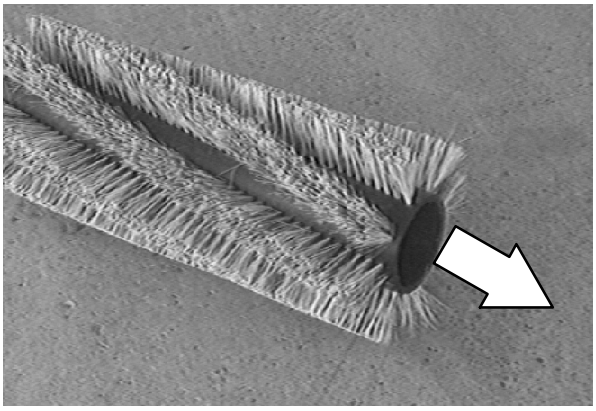
4. Unscrew the attachment bolt and remove the brush idler plate.



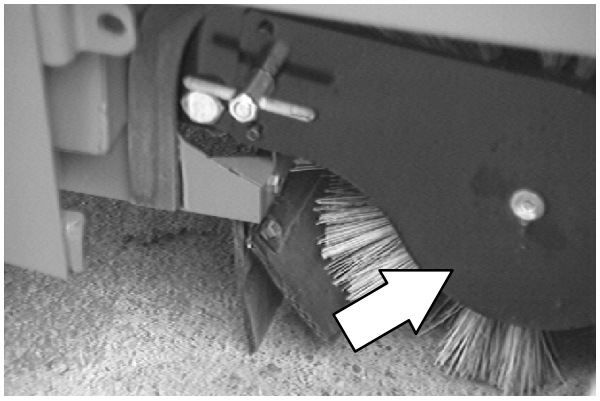
5. Grasp the main brush; pull it off the brush drive plug and out of the main brush compartment.

6. Put the new or rotated end-for-end main brush on the floor next to the access door.

7. Slide the main brush onto the drive plug. Rotate the brush until it engages the drive plug, and push it all the way onto the plug.

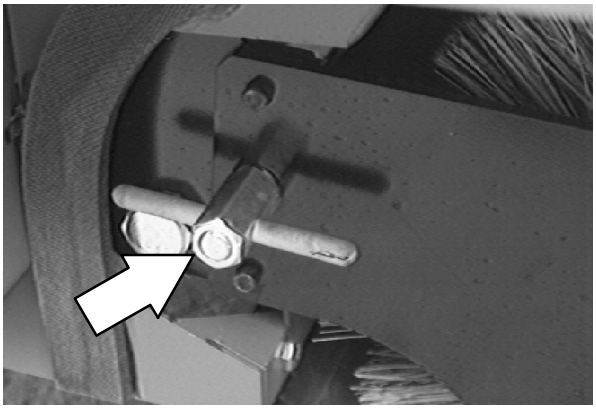


8. Slide the main brush idler plate plug in the main brush.



9. Reinstall the attachment bolt.

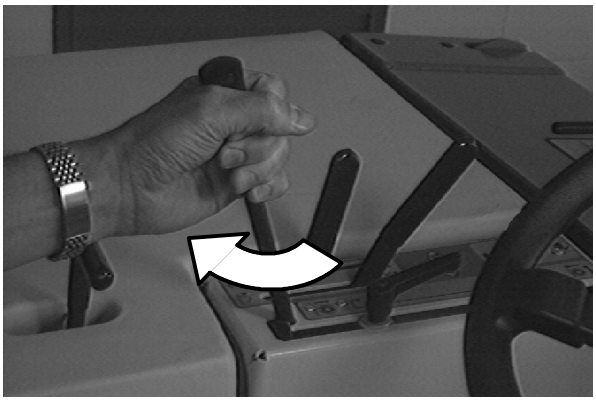
10. Close the right side main brush access door. Check the main brush pattern.



TO CHECK AND ADJUST MAIN BRUSH PATTERN

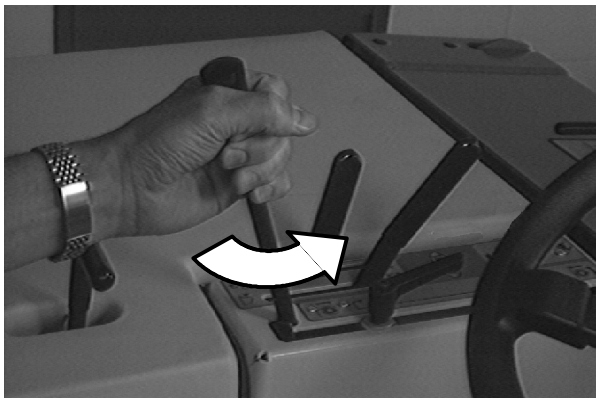
1. Apply chalk, or some other material that will not blow away easily, to a smooth, level floor.

2. Raise the side brush and main brush and position the main brush over the chalked area.

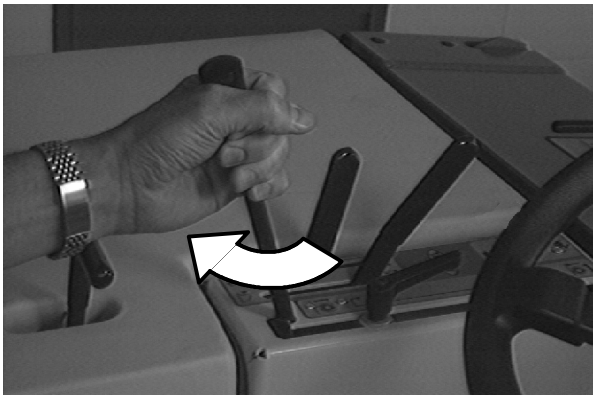


3. Lower and start the main brush for 15 to 20 seconds while keeping a foot on the brakes to keep the machine from moving. This will lower the rotating main brush.

NOTE: If chalk or other material is not available, allow the brushes to spin on the floor for two minutes. A polish mark will remain on the floor.

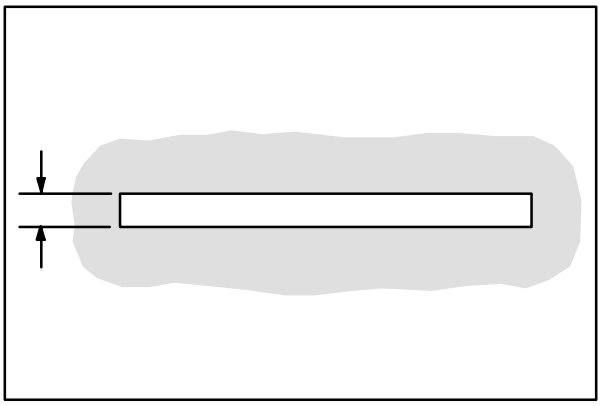


4. Raise and stop the main brush.



5. Drive the machine off the test area.

6. Observe the width of the brush pattern. The proper brush pattern width is 50 to 75 mm (2 to 3 in).

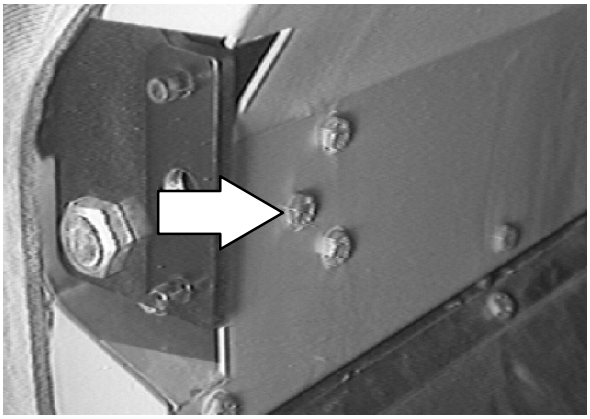


7. To increase the width of the main brush pattern, loosen the main brush pattern adjustment handle and slide forward in the slot.

NOTE: To decrease the width of the main brush pattern, loosen the main brush pattern adjustment handle and slide backward in the slot.

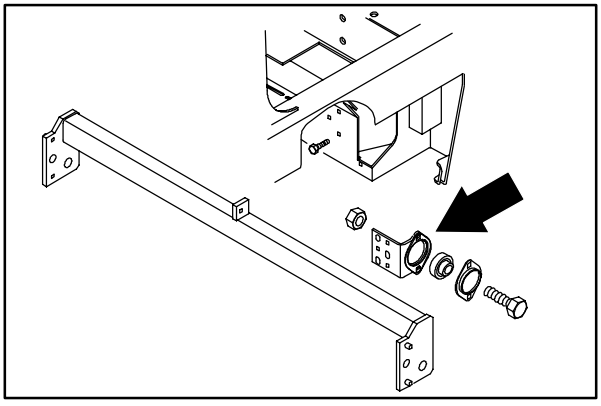
NOTE: If the main brush pattern is tapered, more than 15 mm (0.5 in) on one end than the other, adjust taper.

1. Loosen the brush shaft bearing bracket mounting bolts.



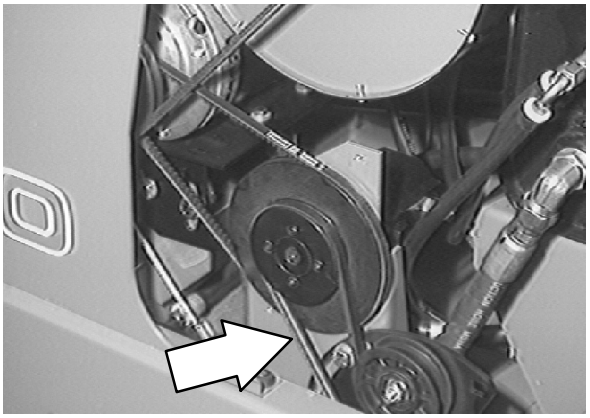
A. Move the brush shaft bearing bracket up or down in the slots.

B. Re-check the main brush pattern and readjust as necessary. Then adjust the width of the main brush pattern.



MAIN BRUSH BELTS

Check the main brush belts for wear after every 200 hours of operation. The primary belt is manually tensioned, and the secondary belt uses a spring idler for tension.



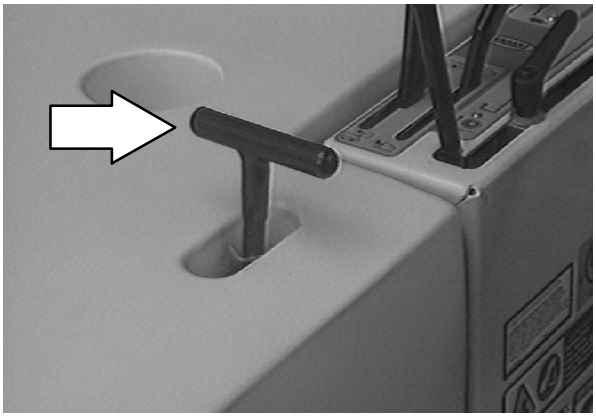
WARNING: Moving belt and fan. Keep away.

TO REPLACE MAIN BRUSH PRIMARY BELT

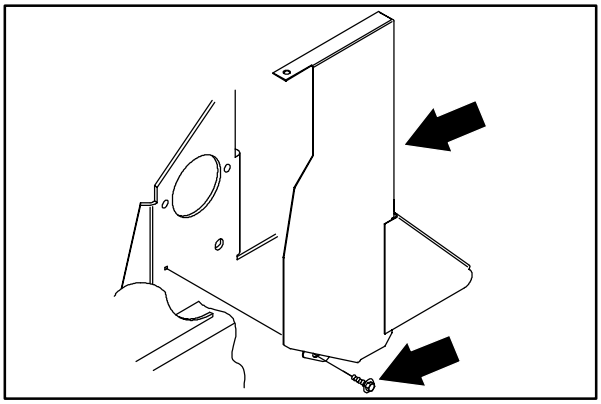
1. Park the machine on a smooth, level surface.
2. Stop the machine and set the parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

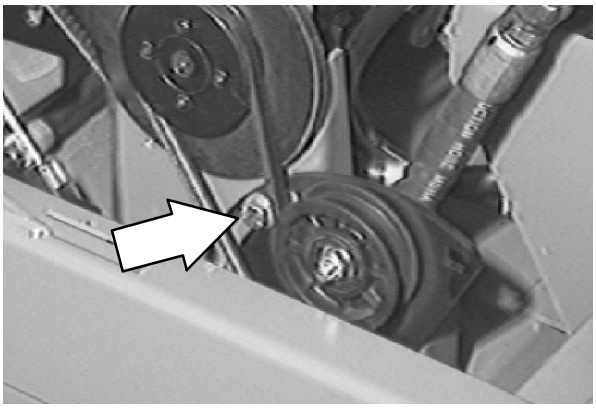
3. Open the seat shroud.



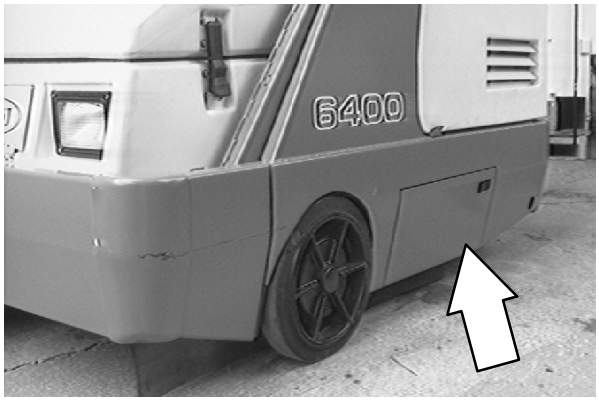
4. Remove the belt guard.



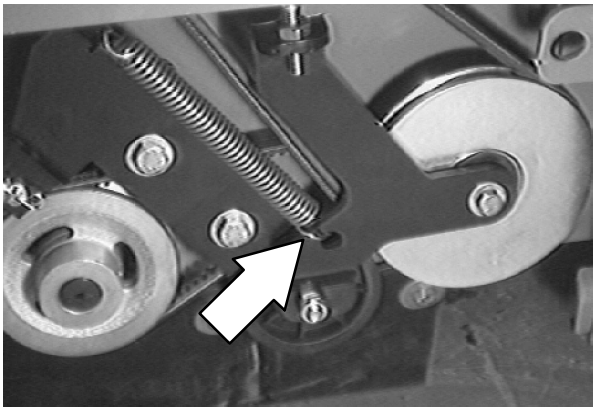
5. Loosen the hex screws holding the upper idler plate to the machine frame. Pull the idler plate back to remove tension on the primary belt. Remove the primary belt from the pump sheave groove.



6. Open the LH brush door.

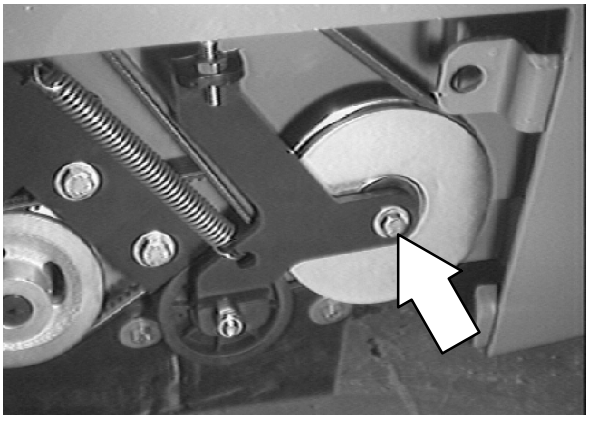


7. Remove the tension spring from the lower idler plate.

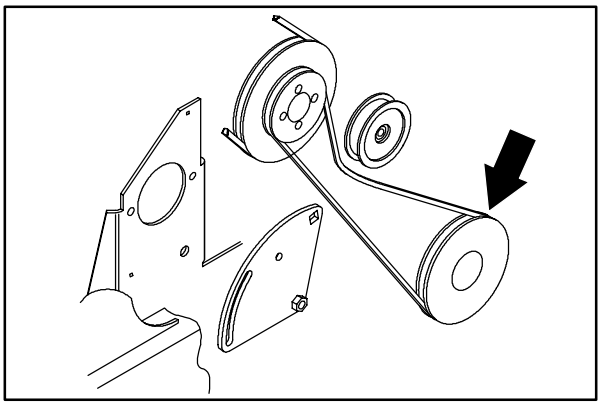


8. Remove the hex screw holding the lower idler plate to the brush shaft.

9. Remove the lower idler plate from the machine.



10. Remove the primary belt from the lower sheave groove.

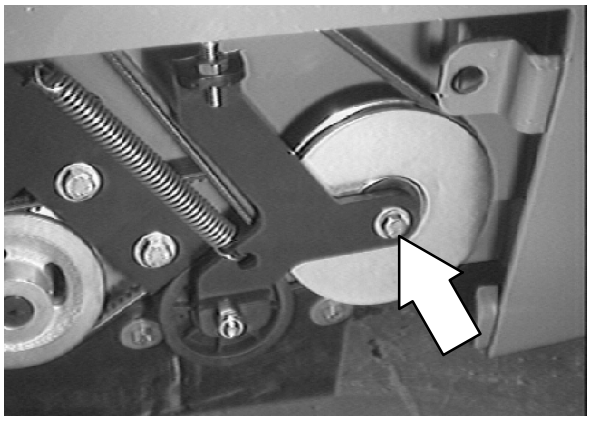


11. Remove the primary belt from the machine.

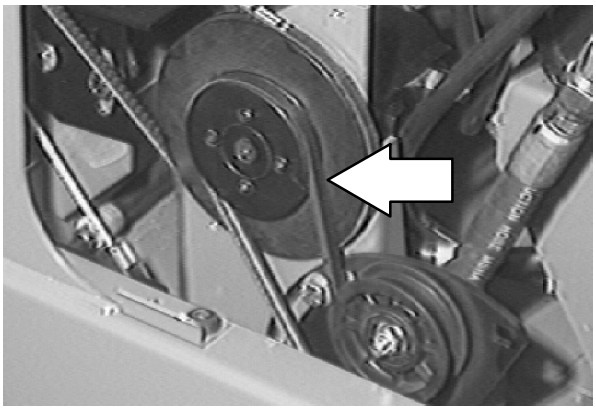
12. Position the new belt on the lower sheave.

13. Route the new belt up toward the hydraulic pump sheave.

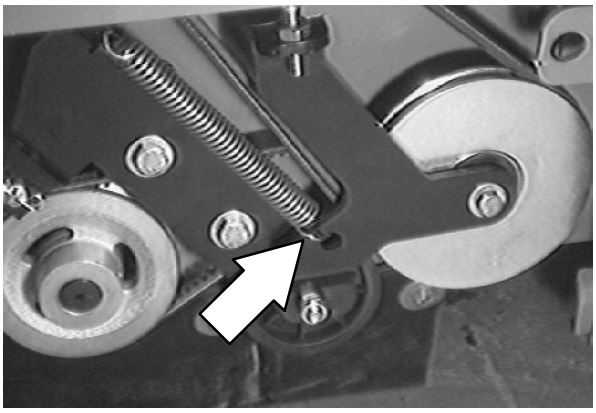
14. Reinstall the lower idler plate on the brush shaft. Tighten the hex screw to 18 – 24 Nm (15 – 20 ft lb).



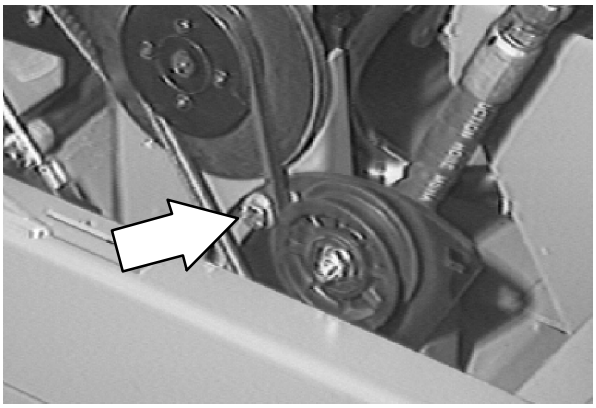
15. Position the new belt on the hydraulic pump sheave.



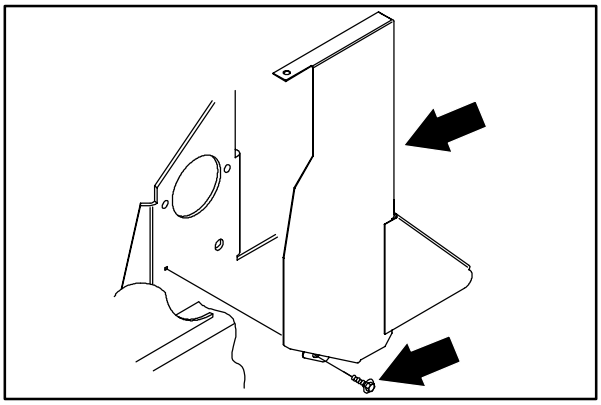
16. Reinstall the tension spring on the lower idler plate.



17. Use a 1/2 in. square drive breaker bar or ratchet wrench to move the upper idler plate forward to tension to primary belt. The correct tension is when the belt deflects 8 mm (0.3 in) from a force of 2.3 kg (5 lb) at belt midpoint. Tighten the hex screws to 37 – 48 Nm (26 – 34 ft lb).



18. Reinstall the belt guard.



19. Start the machine and check the main brush for proper operation.

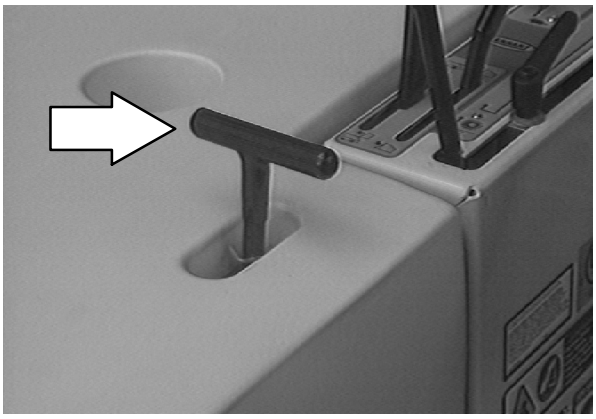
TO REPLACE MAIN BRUSH SECONDARY BELT

1. Park the machine on a smooth, level surface.

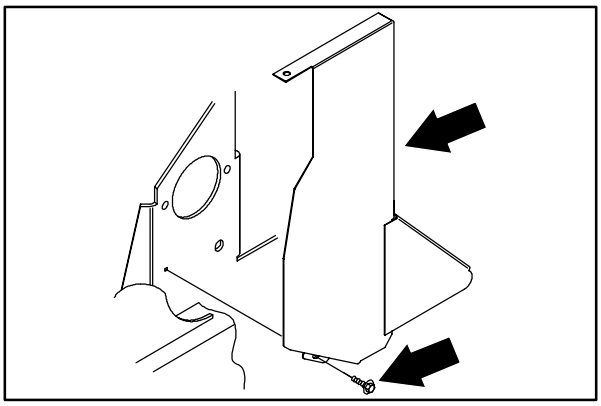
2. Stop the machine and set the parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

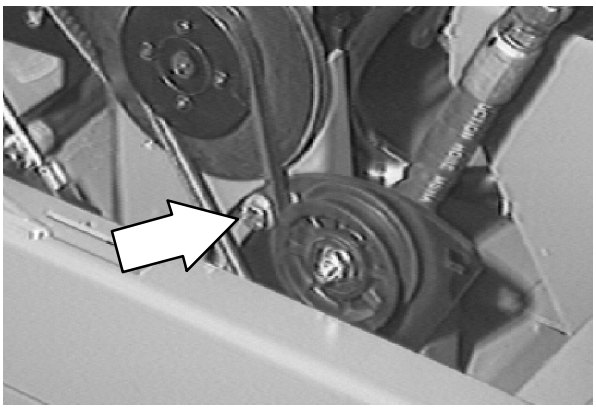
3. Open the seat shroud.



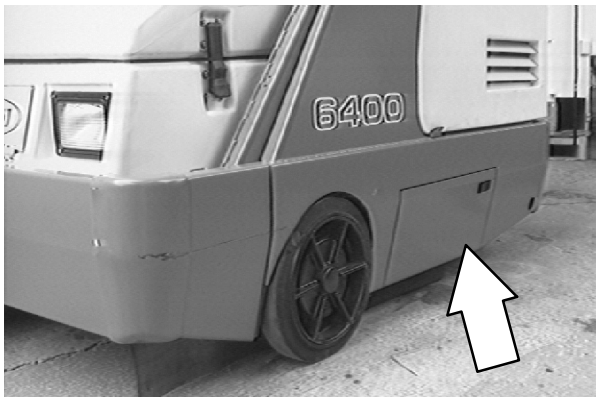
4. Remove the belt guard.



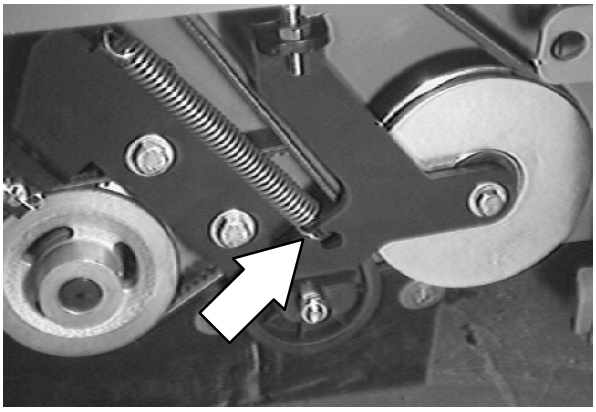
5. Loosen the hex screws holding the upper idler plate to the machine frame. Pull the idler plate back to remove tension on the primary belt. Remove the primary belt from the pump sheave groove.



6. Open the LH brush door.

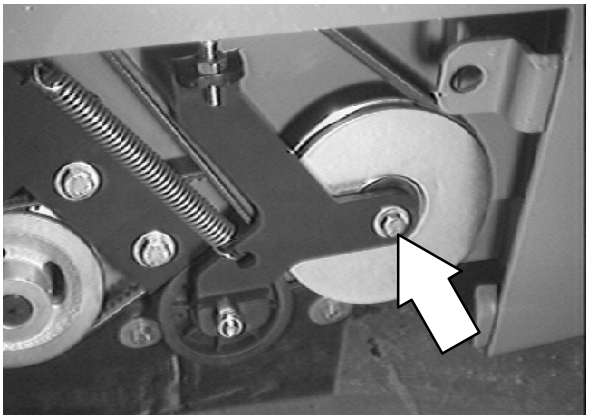


7. Remove the tension spring from the lower idler plate.

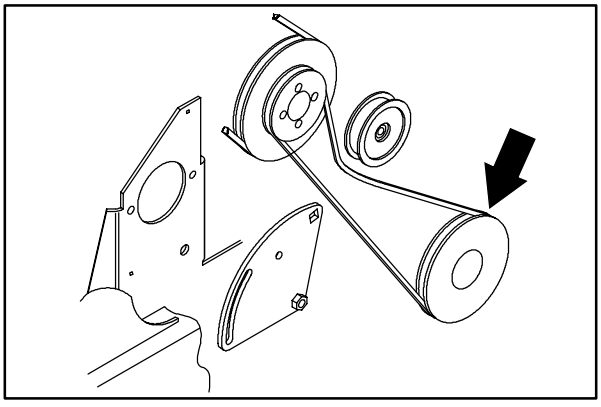


8. Remove the hex screw holding the lower idler plate to the brush shaft.

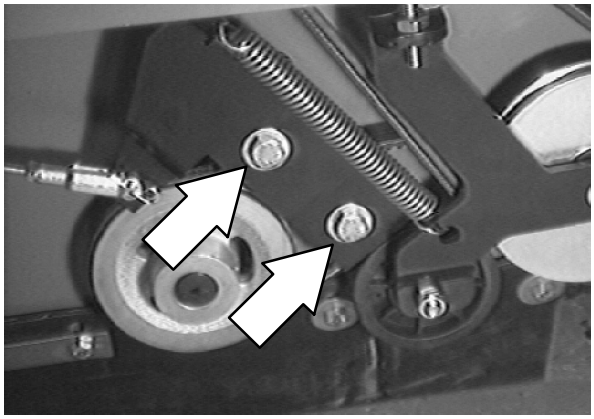
9. Remove the lower idler plate from the machine.



10. Remove the primary belt from the lower sheave groove.

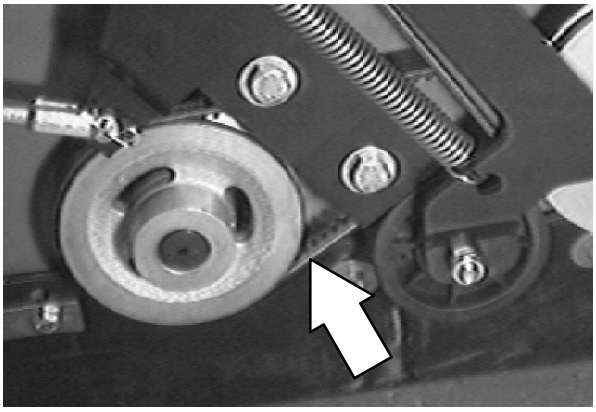


11. Remove the two hex screws holding the (hopper up) brush lift cable bracket to the brush arm. Remove the cable bracket.

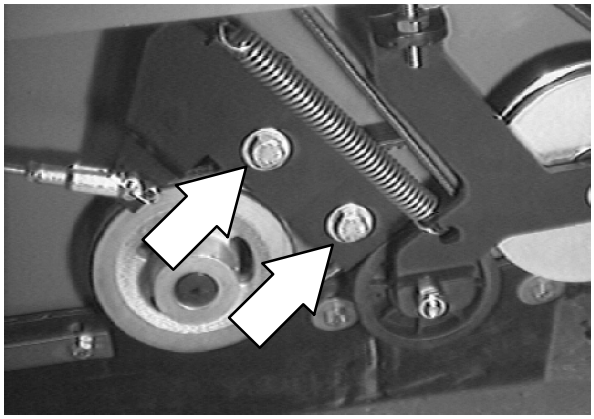


12. Remove the secondary belt from the brush sheave and idler shaft sheave. Remove the belt.

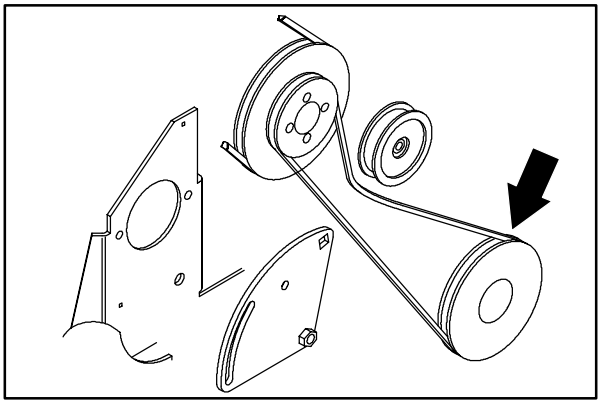
13. Position the new belt on the brush sheave and idler shaft sheave.



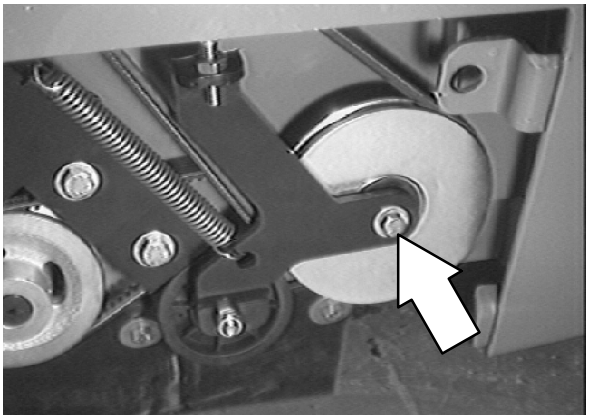
14. Reinstall the (hopper up) brush lift cable bracket to the brush arm. Tighten the two hex screws to 37 – 48 Nm (26 – 34 ft lb).



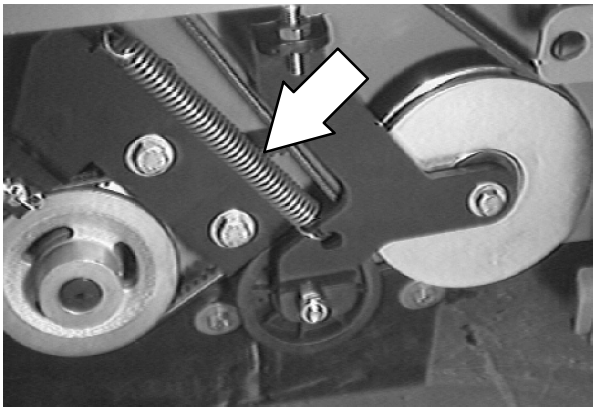
15. Position the primary belt on the lower idler shaft sheave.



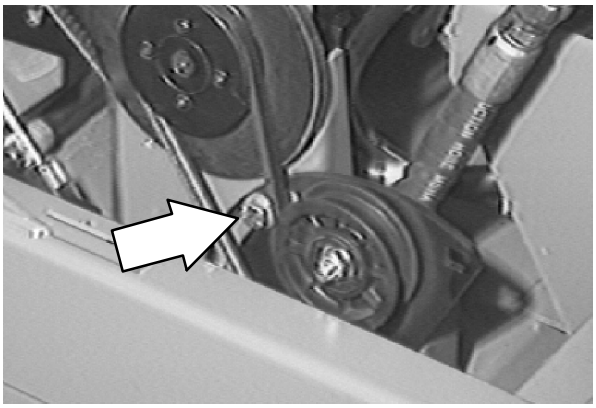
16. Reinstall the lower idler plate on the brush shaft. Tighten the hex screw to 18 – 24 Nm (15 – 20 ft lb).



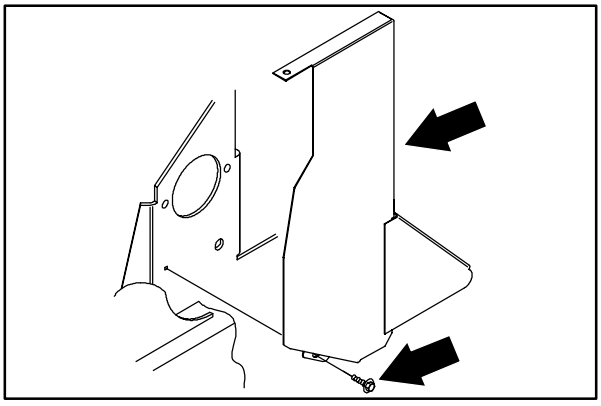
17. Reinstall the tension spring on the lower idler plate.



18. Push the upper idler plate forward to tension to primary belt. The correct tension is when the belt deflects 8 mm (0.3 in) from a force of 2.3 kg (5 lb) at belt midpoint. Tighten the hex screw to 18 – 24 Nm (15 – 20 ft lb).



19. Reinstall the belt guard.



20. Start the machine and check the main brush for proper operation.

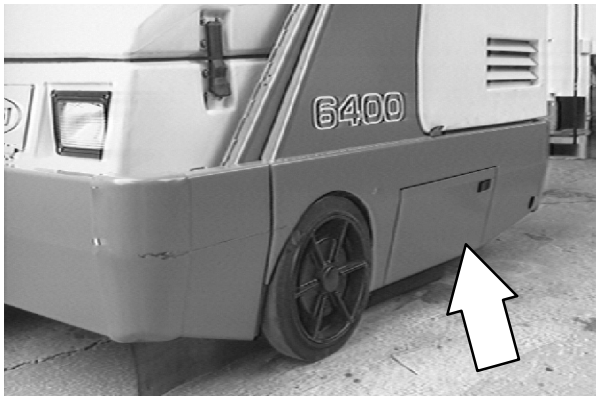
TO ADJUST MAIN BRUSH HOPPER UP SHUT-OFF CABLE

The main brush will shut off automatically when the hopper is raised. This feature is useful when approaching a container to dump the debris hopper.

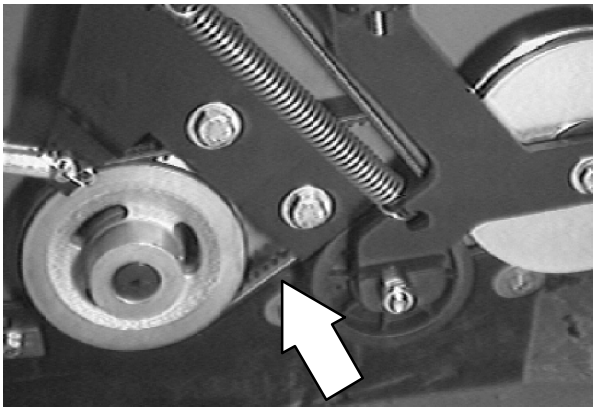
1. Raise the hopper and engage the prop rod.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

2. Open the left hand brush door.

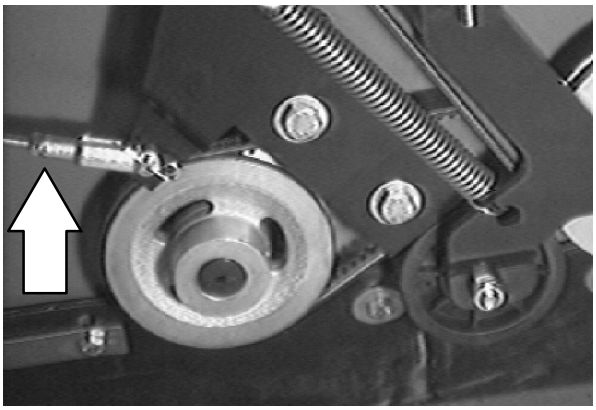


3. Check to see if the V-belt leading to the main brush drive pulley is disengaged. If the V-belt is loose the cable is adjusted properly. If the V-belt is tight the cable needs to be adjusted.



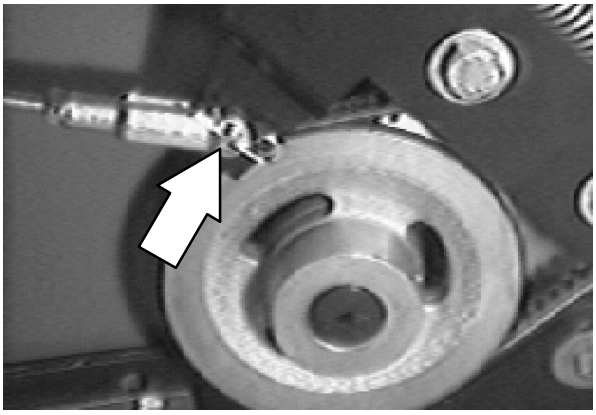
4. Locate the hopper up shut-off cable end and clevis. The starting adjustment should be 1 inch of threads showing above the cable clevis.

5. Loosen the jam nut that is against the cable clevis.



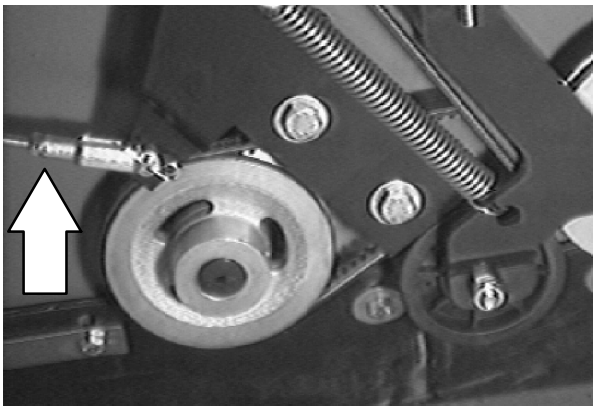
6. Remove the clevis pin holding the cable clevis to the lift bracket.

7. Turn the cable clevis clockwise a few turns.



8. Reconnect the lift cable to the bracket. Check to see if the V-belt is now disengaged (loose).

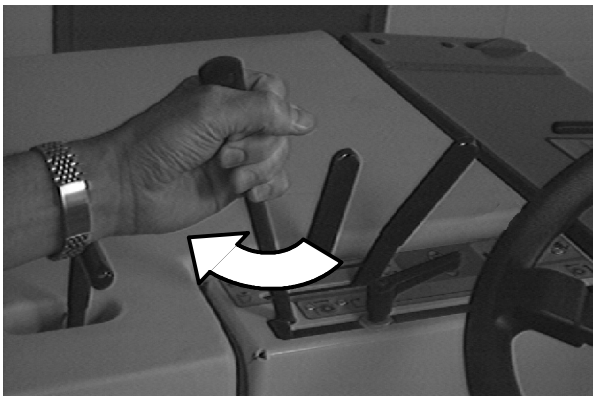
NOTE: Repeat steps 5 thru 7 if necessary.



TO ADJUST MAIN BRUSH RAISED POSITION SHUT OFF BOLT

When the main brush lift lever is place in the raised position the main brush will stop turning.

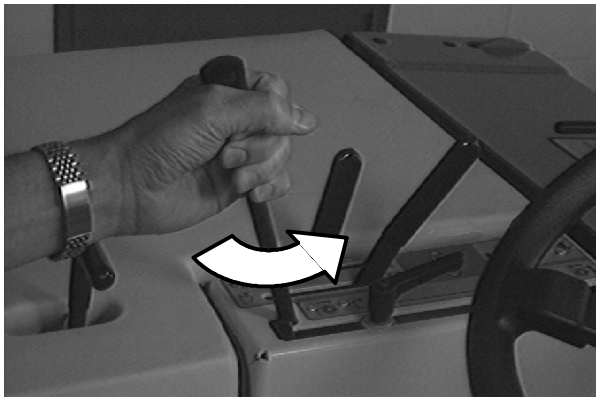
1. With the key on and the machine running, place the main brush lift lever in the raised position.



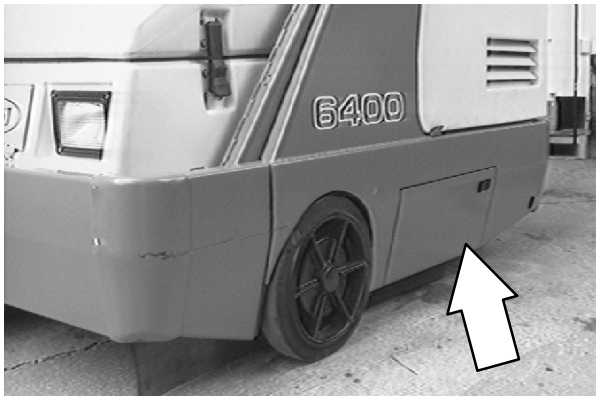
NOTE: Check to make sure the main brush stops turning. If the brush stops--no adjustment is necessary. If the brush continues to turn--go to the next step.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

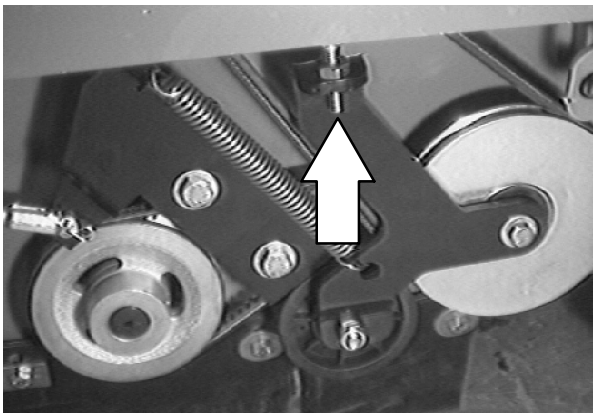
2. Shut off the machine and lower the main brush.



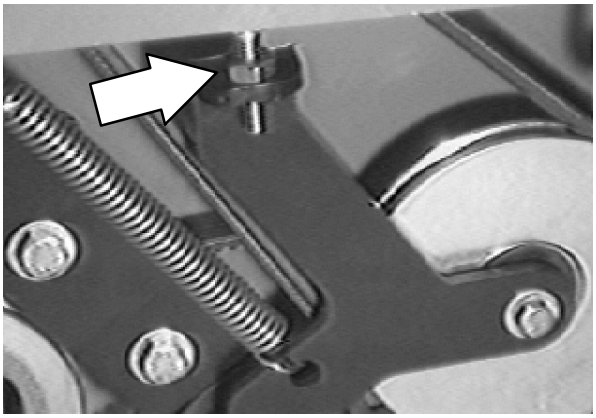
3. Open the left hand brush door.



4. The starting adjustment should be 1 inch of threads showing above the jam nut on the adjustment bolt.



5. Loosen the jam nut on the adjustment bolt. Turn the bolt counter–clockwise a few turns to lengthen it. Tighten the jam nut.



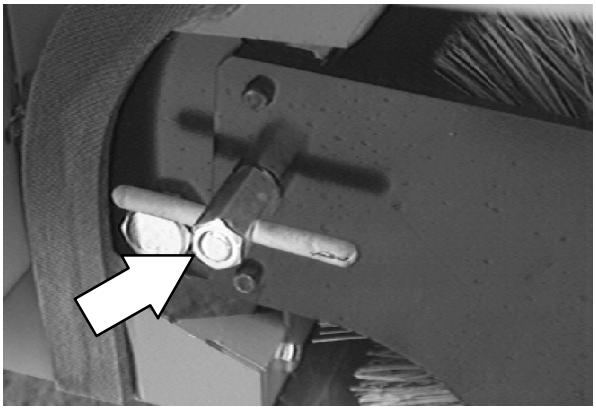
6. Start the machine and raise the main brush. Check the brush for rotation.

NOTE: If the main brush stops turning in the raised position--the adjustment procedure is complete. If the main brush still turns after the lift lever is placed in the raised position--repeat steps 5 and 6.

TO REPLACE MAIN BRUSH IDLER PLUG BEARING

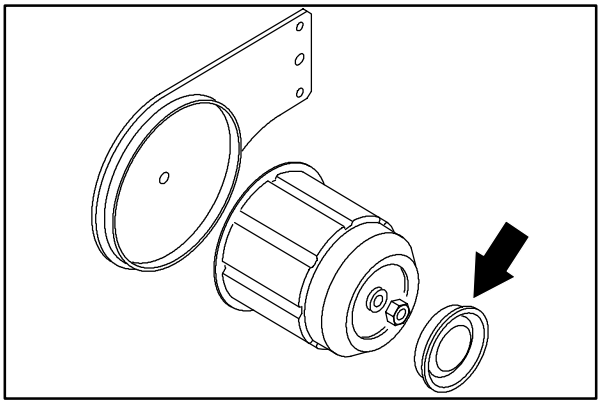
FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Remove the main brush idler arm from the machine.

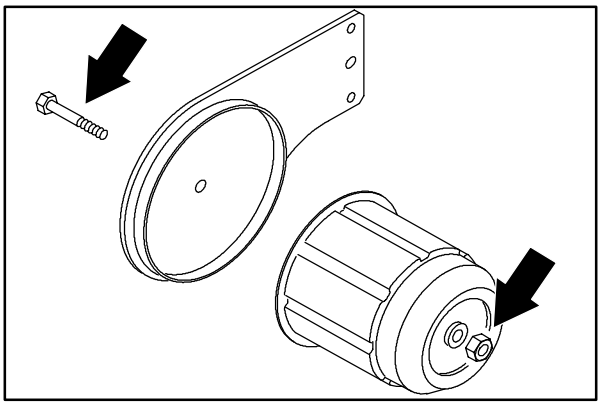


2. Remove the plastic cap from the idler plug.

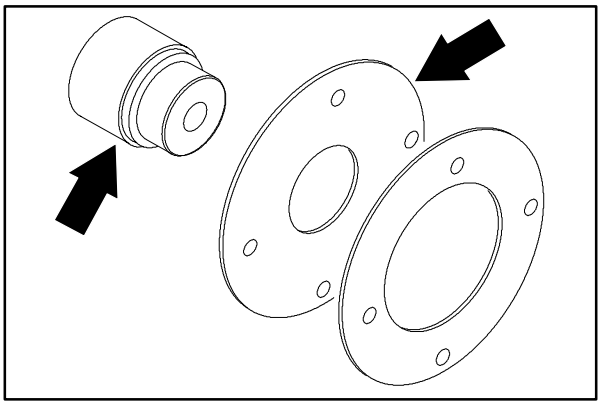
3. Clean the area around where the cap was mounted in the idler plug.



4. Remove the M12 flat screw, nyloc hex nut, and washer holding the idler plug to the idler arm.



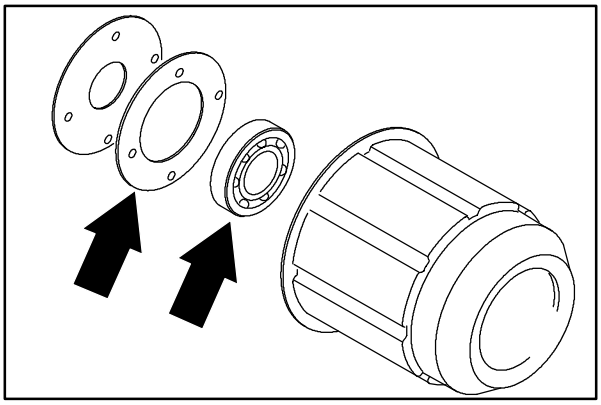
5. Remove the four M6 hex screws holding the idler shaft in the idler plug. Remove the shaft and cover.



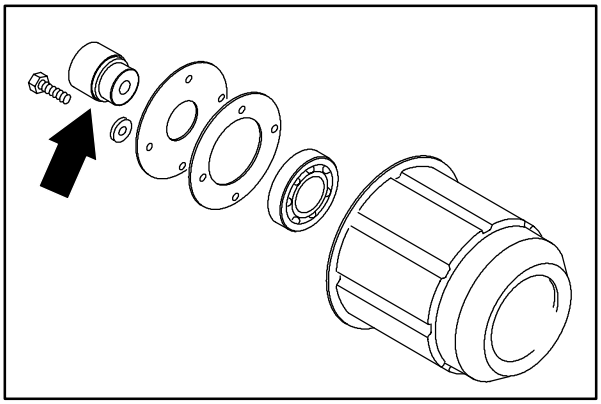
6. Remove the bearing seal plate, retainer and bearing.

7. Place a new bearing, the old seal plate, and the retainer on the idler.

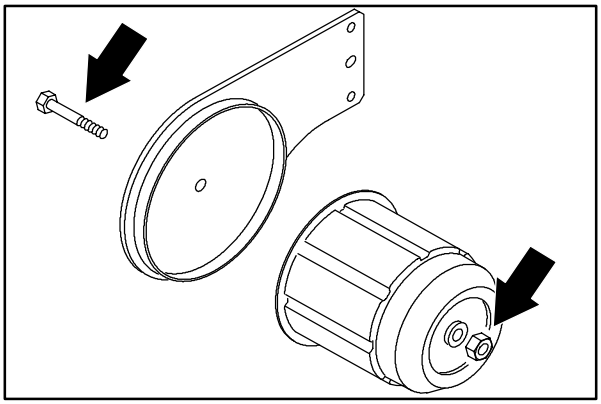
8. Reinstall the four hex screws that hold the bearing seal plate and retainer in place. Leave screws loose for now.



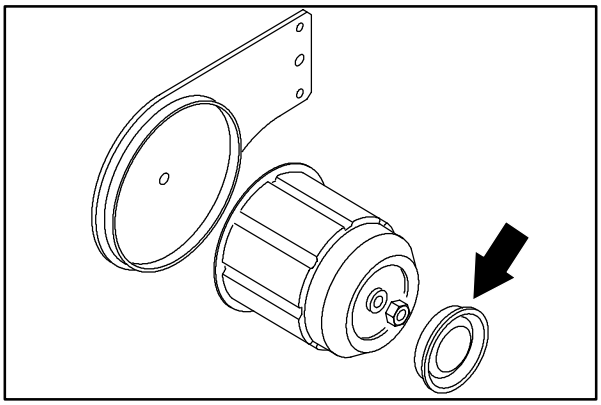
9. Install the idler shaft in the new bearing. Tighten the four hex screws to 8–10 Nm (6–8 ft lb).



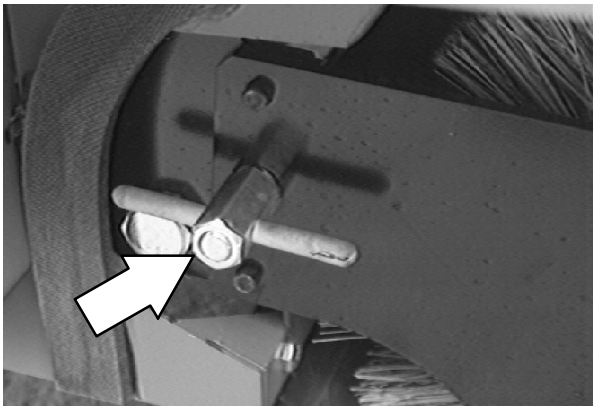
10. Position the idler plug on the idler arm shaft. Reinstall the long flat screw. Tighten to 68–81 Nm (50–60 ft lb).



11. Put a small amount of RTV on the lip of the plastic cap and install in the end of the idler plug.



12. Reinstall the idler arm on the machine.

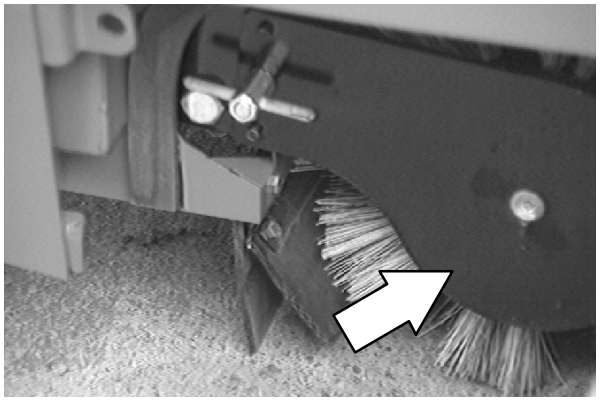


13. Operate the machine and check for proper operation.

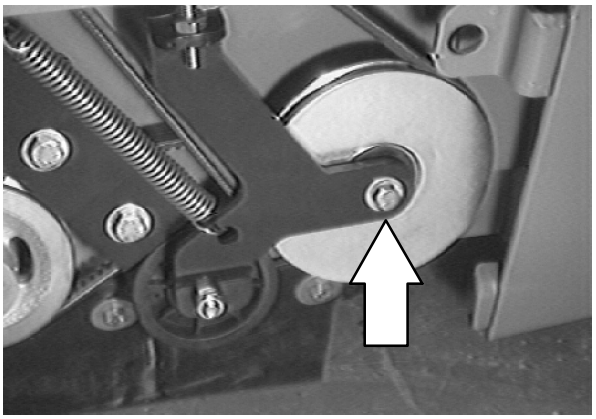
TO REPLACE MAIN BRUSH SHAFT BEARINGS

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Remove the main brush idler arm and brush from the right side of the machine.

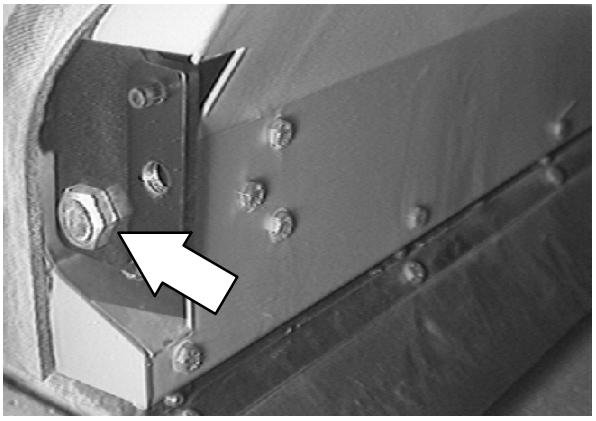


2. Remove the main brush motor arm assembly from the left side of the machine.

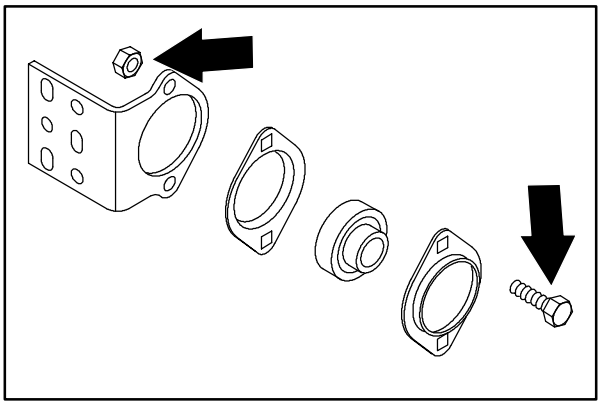


3. Remove the large hex screw and nyloc nut holding the brush arm to the pivot bearings.

4. Let the brush arm drop down and out of the way.

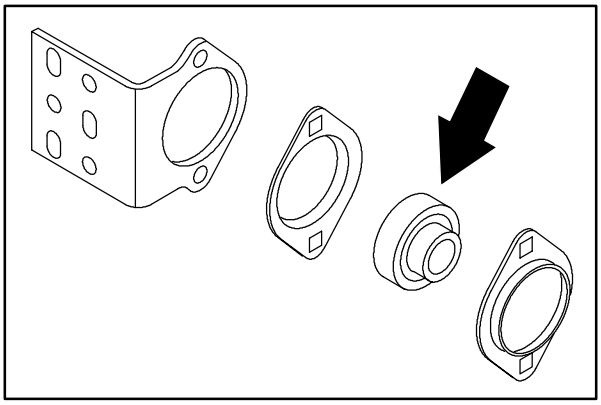


5. Remove the two bolts holding each of the two brush shaft bearings and retainers to the bearing brackets.

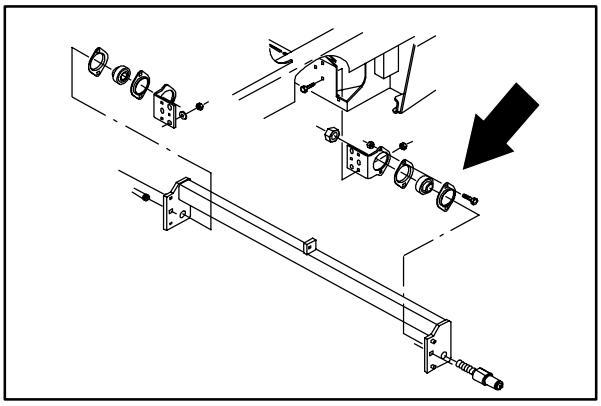


6. Remove the old brush shaft bearings.

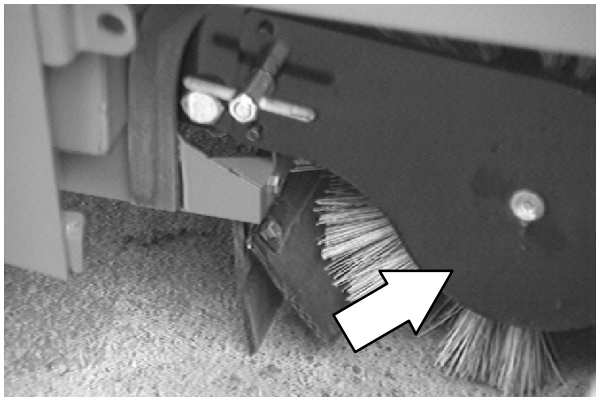
7. Position the new brush shaft bearings on the mount brackets. Make sure to have the lock collars pointing to the outside of the machine.



8. Reinstall the two bolts holding each of the two brush shaft bearings and retainers to the bearing brackets. Tighten to 18 – 24 Nm (15 – 20 ft lb).

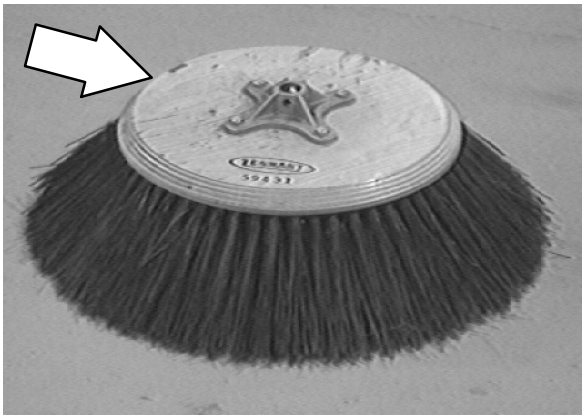


9. Reinstall the main brush motor plate and idler plate.



10. Check main brush pattern for taper and width. Adjust as necessary. See “TO CHECK AND ADJUST MAIN BRUSH PATTERN”.

SIDE BRUSH



The side brush sweeps debris along edges into the path of the main brush.

Check the brush daily for wear or damage. Remove any string or wire found tangled on the side brush or side brush drive hub.

Check the side brush pattern daily. The side brush bristles should contact the floor in a 10 o'clock to 3 o'clock pattern when the brush is in motion. Adjust the side brush pattern with the side brush down pressure lever. Turn the lever counter-clockwise to increase the brush contact with the sweeping surface, and clockwise to decrease the brush contact with the sweeping surface.

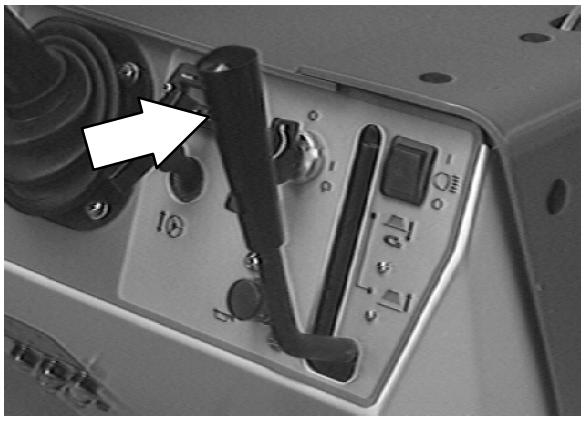
The side brush should be replaced when it no longer sweeps effectively for your application. A guideline length is when the remaining bristles measure 50 mm (2 in) in length. You may change the side brush sooner if you are sweeping light litter, or wear the bristles shorter if you are sweeping heavy debris.

TO REPLACE SIDE BRUSH

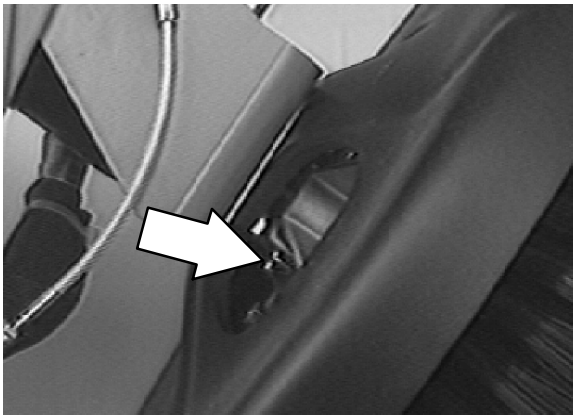
1. Empty the debris hopper.
2. Set the machine parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Raise the side brush.

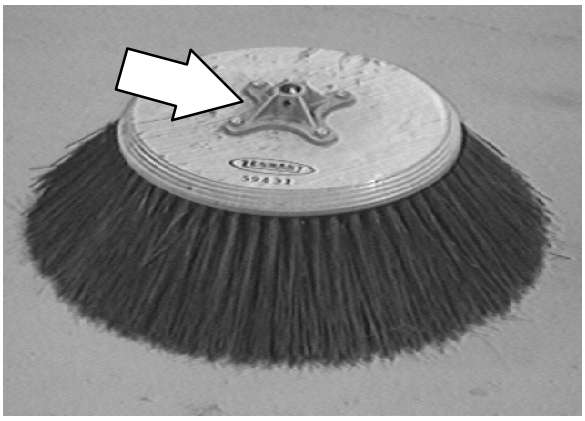


4. Remove the side brush retaining pin from the side brush drive shaft by pulling the pin keeper off and over the end of the pin. Remove the pin.

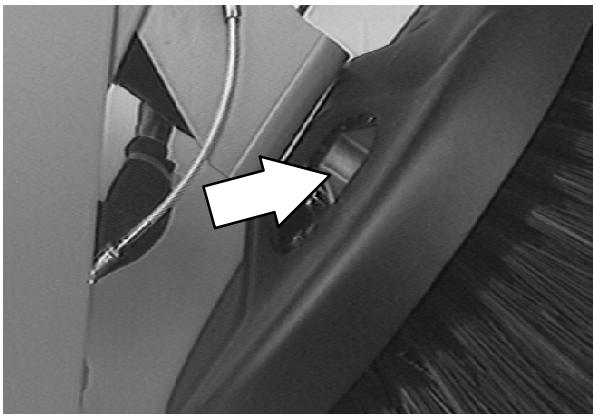


5. Slide the side brush off the side brush motor shaft.

NOTE: Remove the drive hub and put it on the new brush if one is not installed.

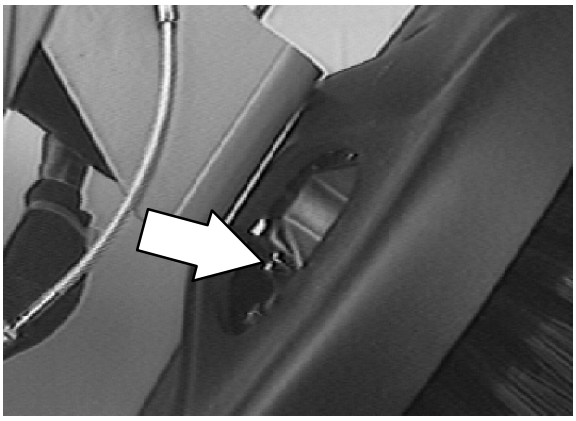


6. Slide the new side brush on the side brush motor shaft.

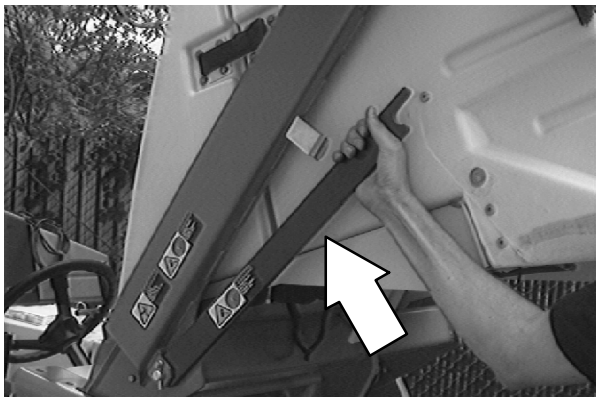


7. Reinstall the side brush retaining pin through the side brush hub and shaft.

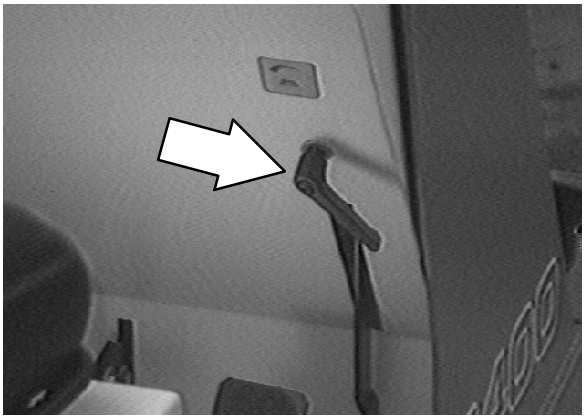
8. Secure the pin by clipping the pin keeper over the end of the pin.



9. Disengage the hopper support bar and lower the hopper.



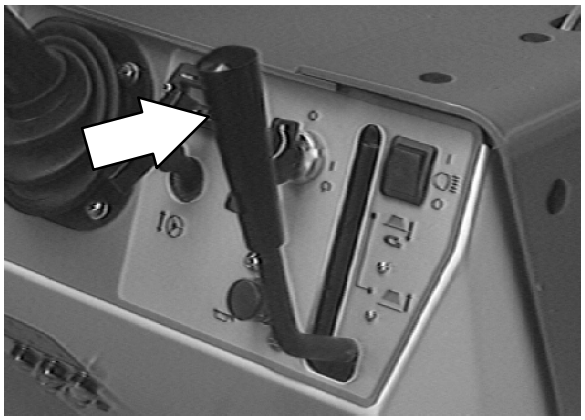
10. Adjust the side brush pattern with the side brush down pressure lever.



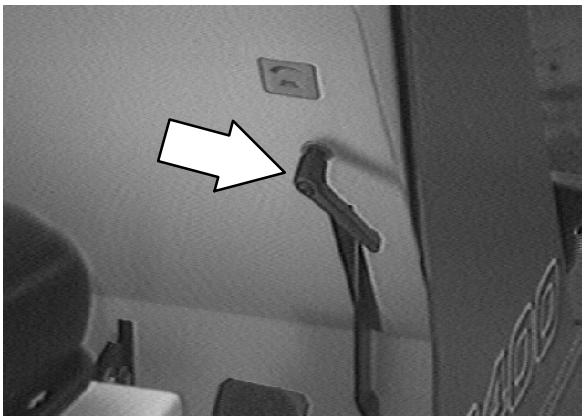
TO ADJUST SIDE BRUSH PATTERN

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

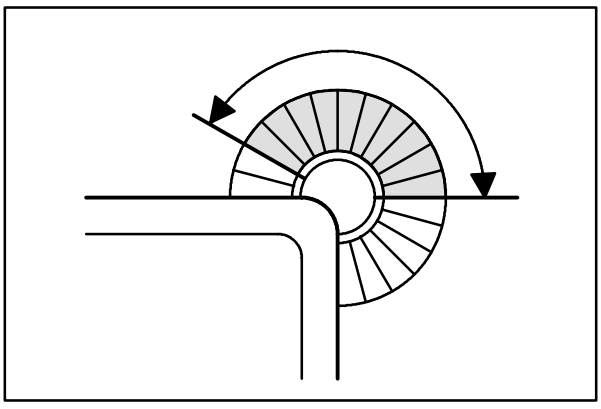
1. Lower the side brush.



2. Turn the side brush lever clockwise to decrease side brush pattern. Turn the side brush lever counter-clockwise to increase side brush pattern.



NOTE: One-half of the bristles should normally contact the floor.

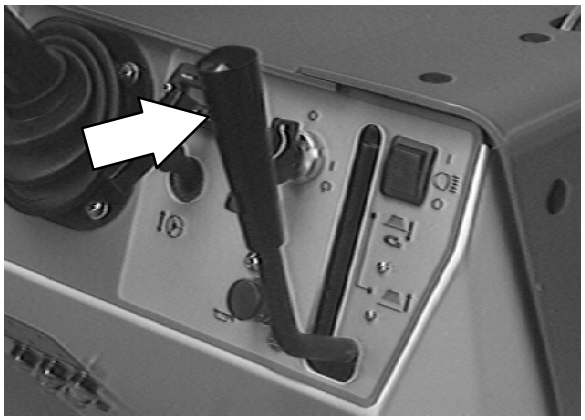


3. Raise the side brush.

TO ADJUST SIDE BRUSH TILT PATTERN

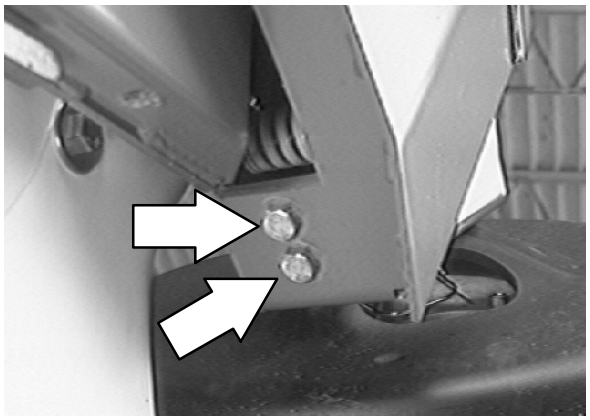
FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Lower the side brush.

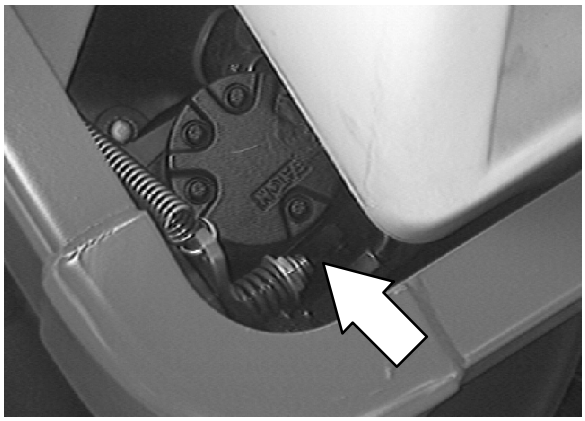


2. Raise the hopper slightly and shut off the machine.

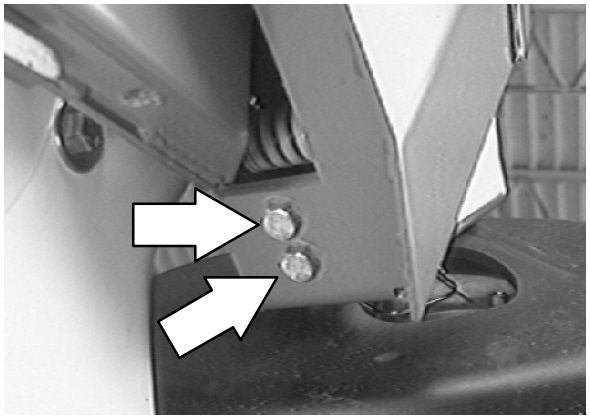
3. Loosen the two hex screws on the back of the hopper bumper near the side brush assembly.



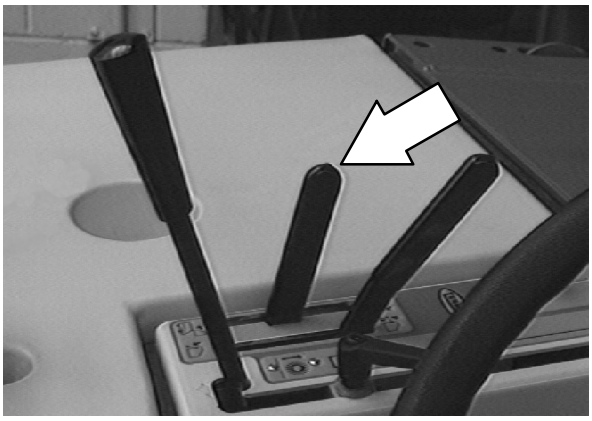
4. Tilt the side brush in either direction.



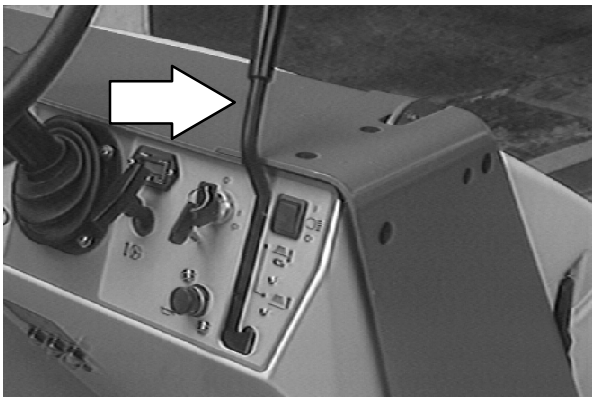
5. Tighten the hardware firmly.



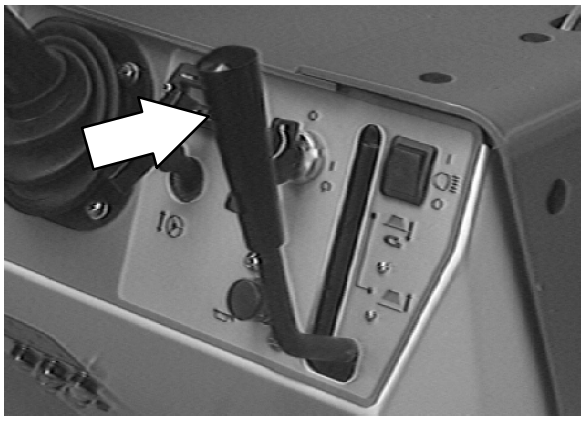
6. Lower the hopper.



7. Start the machine and turn on the side brush. Check the side brush pattern.



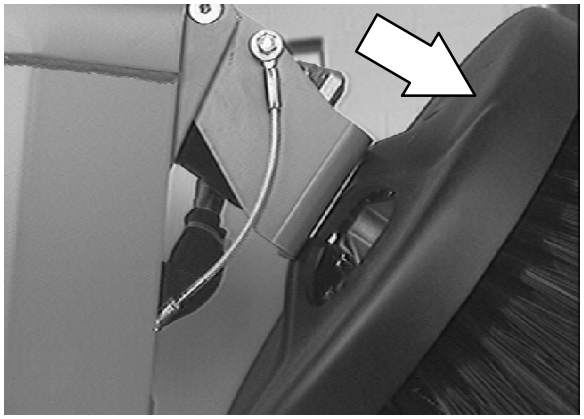
8. Raise the side brush.



SIDE BRUSH GUARD

The side brush guard protects the side brush from objects along path of the machine. It deflects the side brush out of harms way.

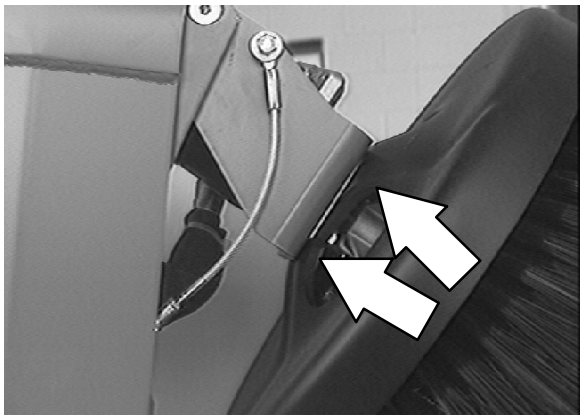
Rotate the side brush guard 90° every 200 hours of operation. Replace the brush guard after all four sides have been used.



TO ROTATE OR REPLACE SIDE BRUSH GUARD

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

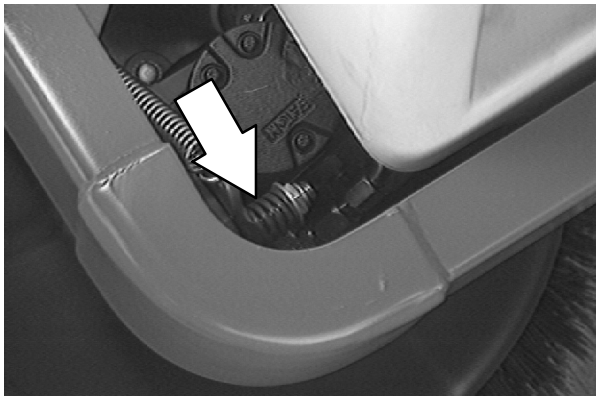
1. Remove the side brush.
2. Remove the four bolts holding the side brush guard to the side brush motor.



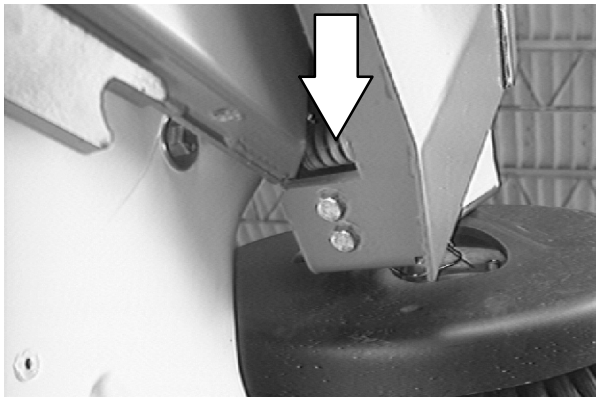
3. Rotate or replace the side brush guard.
4. Reinstall the four bolts in the side brush motor and tighten to 22–27 Nm (16–20 ft lb).

SIDE BRUSH PIVOT

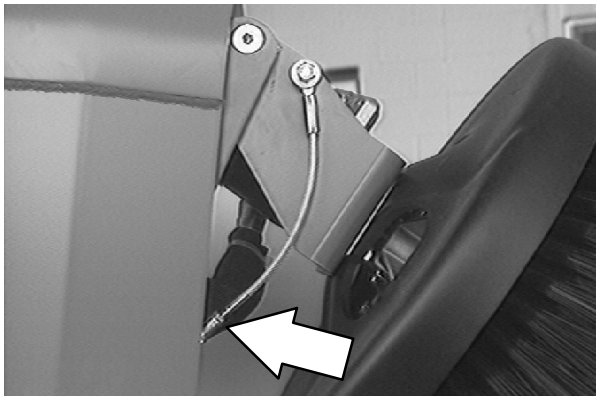
The side brush pivot should be checked for excessive movement after every 200 hours of operation.



Torque the front and rear compression springs to reduce excessive movement.



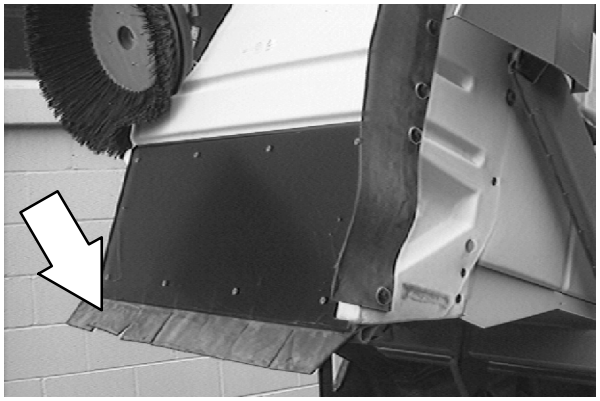
The side brush tilt is adjusted with the side brush cable. Turn the clevis on the cable to get the desired side brush pattern.



SKIRTS AND SEALS

HOPPER LIP SKIRTS

The hopper lip skirts are located on the bottom rear of the hopper. The skirts float over debris and help deflect that debris into the hopper. The hopper lip skirts consist of five bottom lip segments and two additional side lip segments.



Check the hopper lip skirts for wear or damage daily.

Replace the hopper lip skirts when they no longer touch the floor.

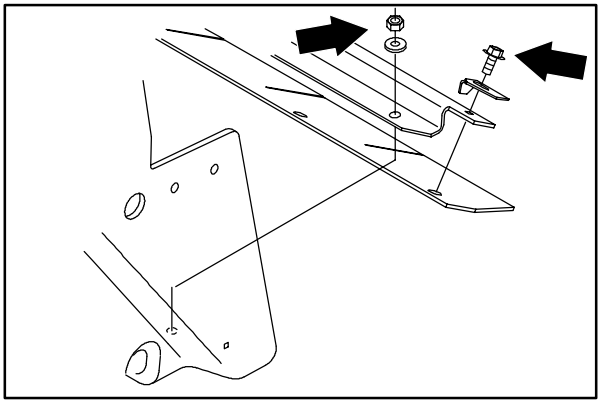
TO REPLACE HOPPER LIP SKIRTS

1. Dump the machine debris hopper.
2. Set the machine parking brake.
3. Raise the hopper, engage the hopper support bar. Shut off the machine.

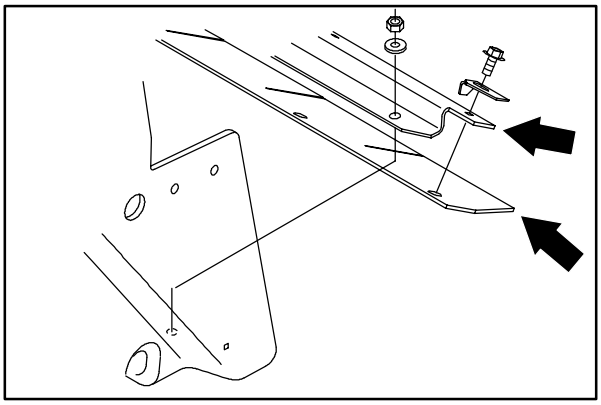
WARNING: Raised Hopper May Fall. Engage Hopper Support Bar.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

4. Remove the hopper lip retaining strip mounting hardware.

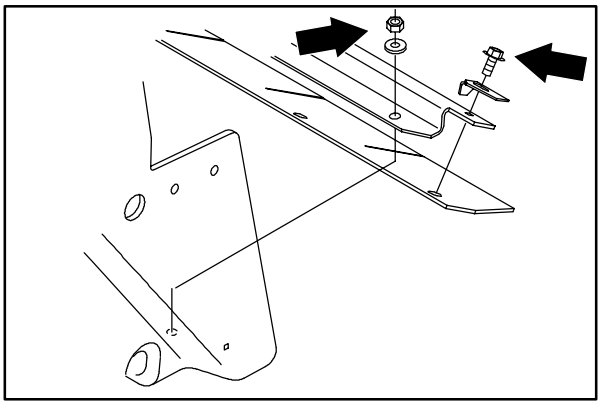


5. Remove the hopper lip retaining strip, hopper lip, and the back-up strip. Discard the hopper lip.

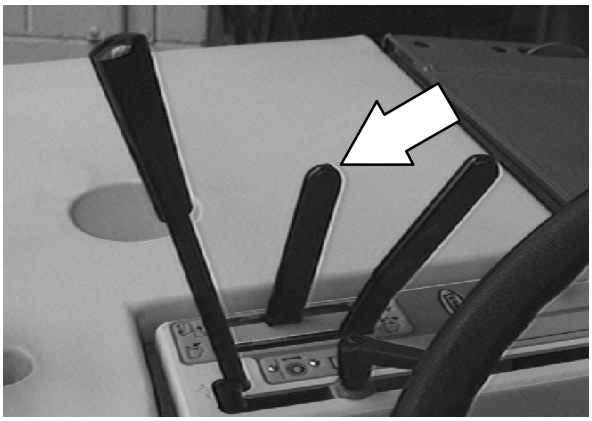


6. Thread the retaining strip mounting bolts through the retaining strip, the new hopper lip, and the back-up strip.

7. Tighten the mounting hardware to 8–14 Nm (6–10 ft lb).

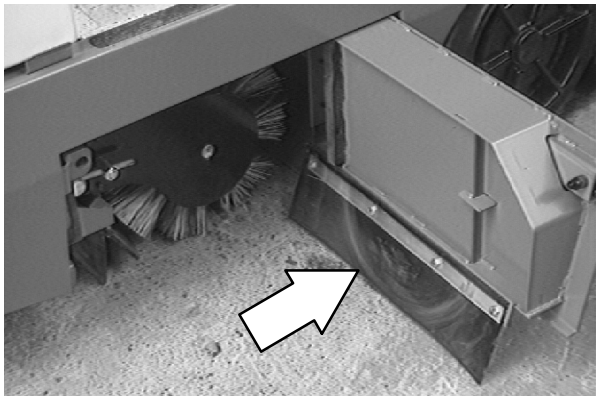


8. Start the machine and lower the hopper.



BRUSH DOOR SKIRTS

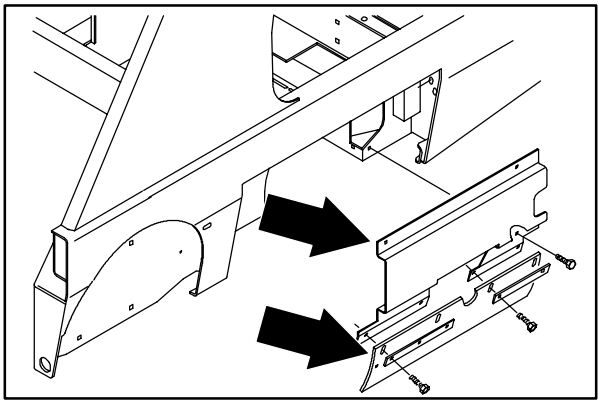
The right hand brush door skirt is located on the bottom of the main brush door.



The left hand skirt is located on a skirt mount plate behind the left brush door. Both skirts should clear the floor up to 5 mm (0.25 in) in dusty conditions, and touch the floor otherwise.

Check the skirts for wear or damage and adjustment daily.

NOTE: The brush door skirts have slotted holes to allow for a ground clearance adjustment. The door must be closed for proper adjustment.



TO REPLACE AND ADJUST RIGHT HAND BRUSH DOOR SKIRT

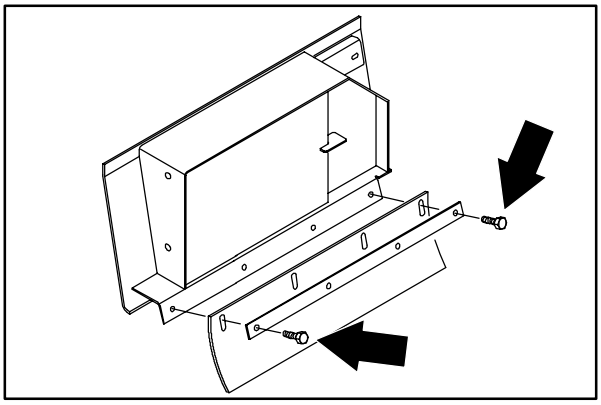
1. Park the machine on a smooth, level surface.

2. Stop the machine and set the machine parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Open the right hand brush door.

4. Remove the brush door skirt retaining bolts.



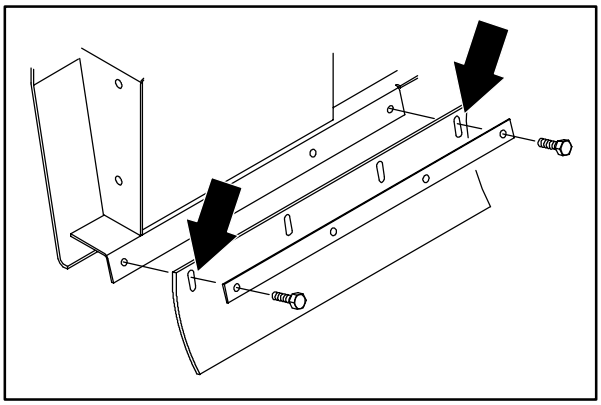
5. Remove the skirt retaining strip and door skirt.

6. Position the new brush door skirt on the brush door.

7. Position the retainer over the new skirt.

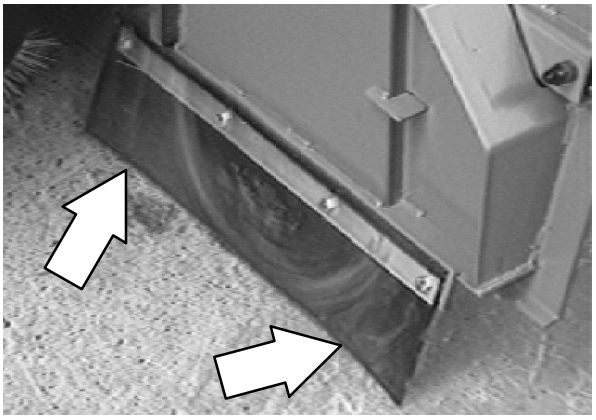
8. Thread the skirt retaining bolts through the brush door, the door skirt, and in the skirt retaining strip.

NOTE: The brush door skirts have slotted holes to allow for a ground clearance adjustment. The door must be closed for proper adjustment.



9. Slide the brush door skirt up or down so it will clear the floor by 3–5 mm (0.12 to 0.25 in). Hand tighten the hex screws firmly.

10. Operate the machine and check the new skirt for proper operation.



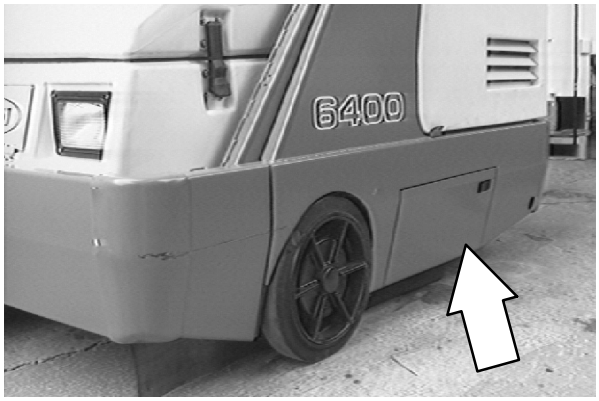
TO REPLACE AND ADJUST LEFT HAND BRUSH DOOR SKIRT

1. Park the machine on a smooth, level surface.

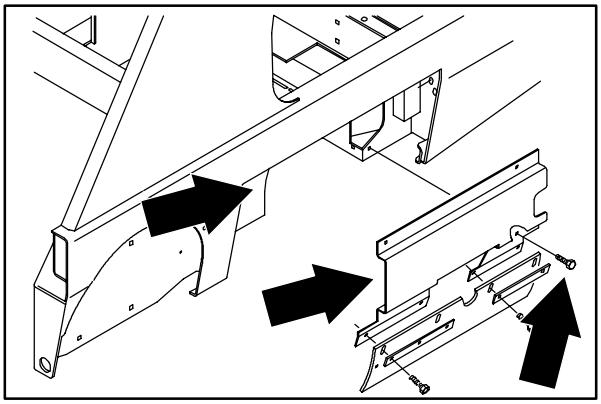
2. Stop the machine and set the machine parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

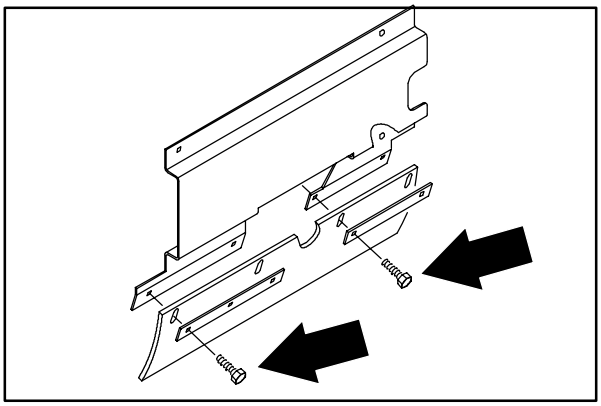
3. Open the left hand brush door.



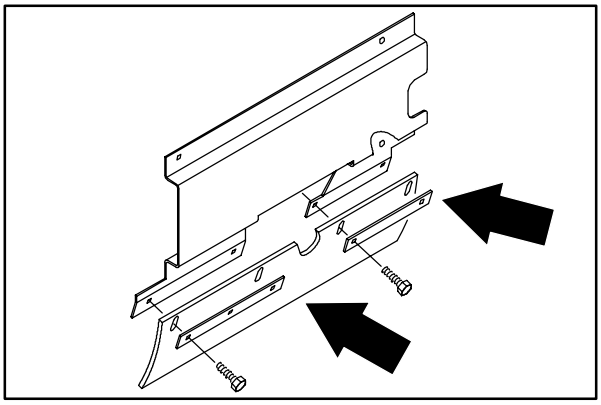
4. Remove the four hex screws holding the skirt mount plate to the machine.



5. Remove the brush skirt retaining bolts.



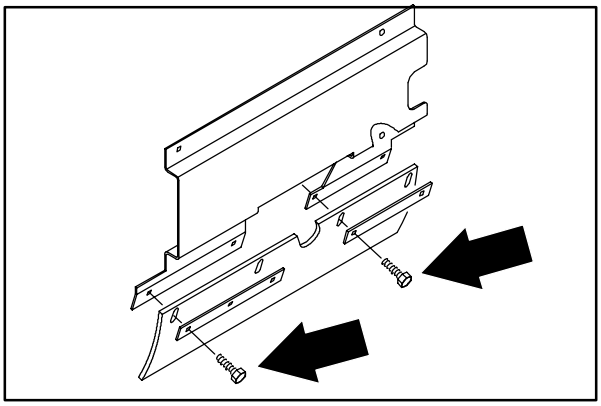
6. Remove the skirt retaining strips and brush skirt.



7. Position the new brush skirt on the mount plate.

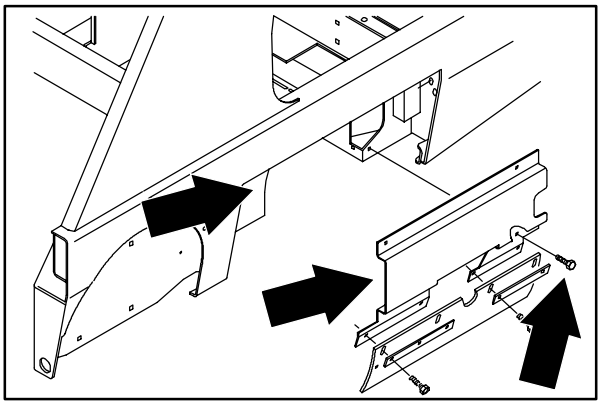
8. Position the retainer over the new skirt.

9. Thread the skirt retaining bolts through the mount plate, the door skirt, and in the skirt retaining strip.

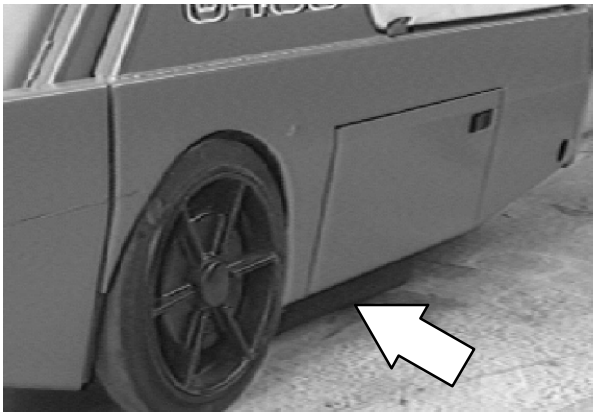


NOTE: The brush skirts have slotted holes to allow for a ground clearance adjustment. The skirt plate must be mounted on the machine for proper adjustment.

10. Reinstall the skirt mount plate on the machine. Tighten the hex screws to 18 – 24 Nm (15 – 20 ft lb).



11. Slide the brush door skirt up or down so it will clear the floor by 3–5 mm (0.12 to 0.25 in). Hand tighten the hex screws firmly.

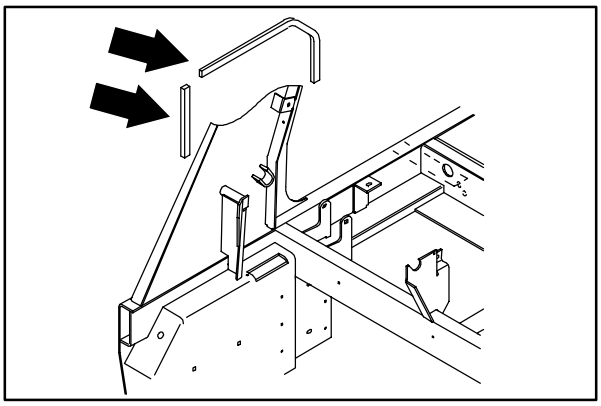


12. Operate the machine and check the new skirts for proper operation.

RIGHT BRUSH DOOR SEAL

The brush door seal is located on the right brush door and on corresponding portions of the main frame. They seal the right side of the main brush compartment.

Inspect the seal for wear or damage every 100 hours of operation.

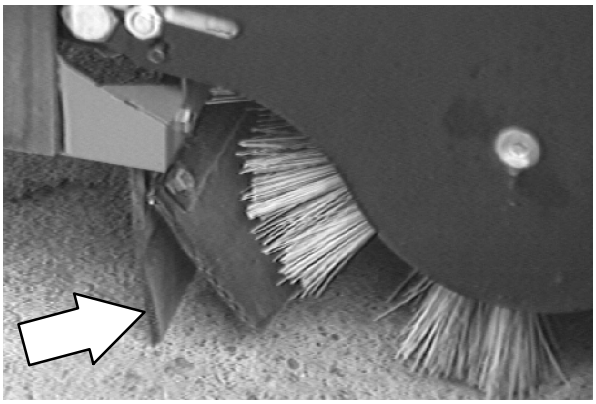


REAR SKIRT AND DEFLECTOR BLADE

The rear skirt and the deflector blade are located on the bottom rear of the main brush compartment. The rear skirt should clear the floor up to 5 mm (0.25 in) in dusty conditions, and touch the floor otherwise. The deflector blade is spring loaded.

Check the skirt and blade for wear or damage and adjustment daily.

NOTE: Rear tire pressure will affect skirt clearances.



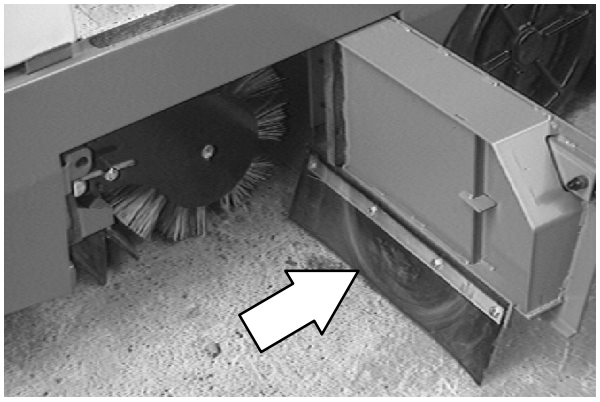
TO REPLACE AND ADJUST THE REAR SKIRT AND DEFLECTOR BLADE

1. Park the machine on a smooth, level surface.

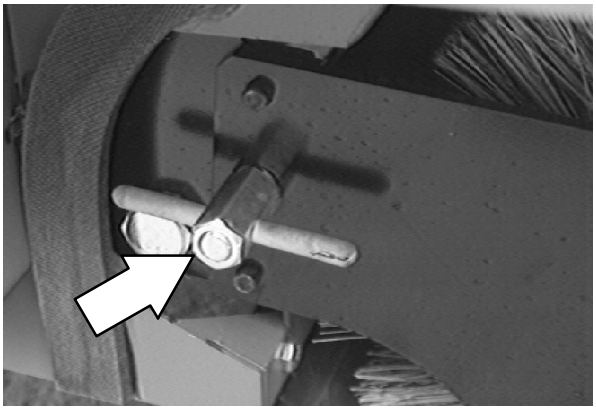
2. Stop the machine and set the parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

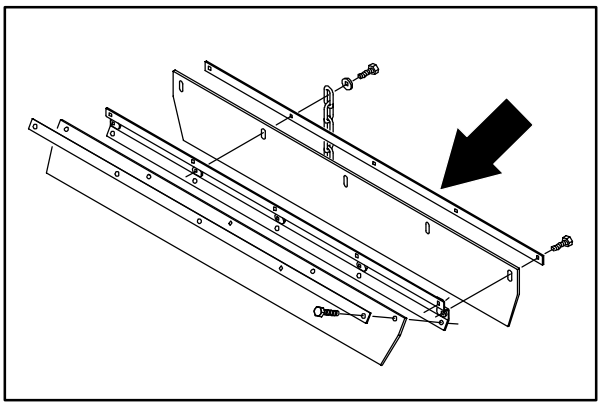
3. Open the main brush doors.



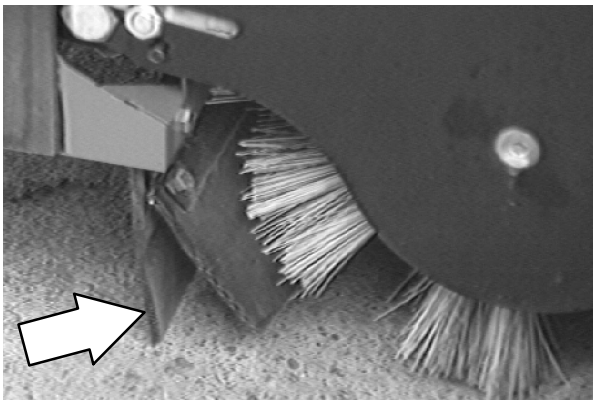
4. Remove the main brush.



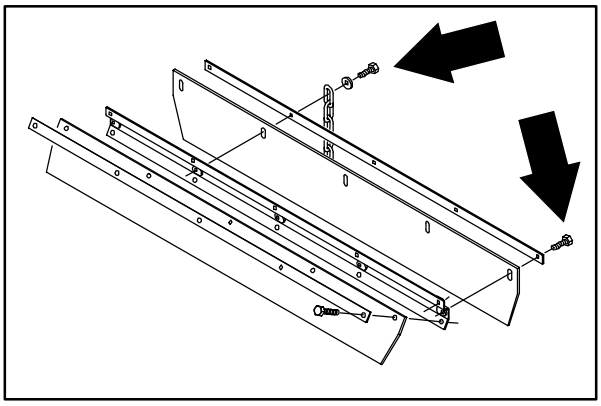
5. Remove the retaining strip and floor skirt. Discard the old skirt.



6. Position the new skirt on the machine.

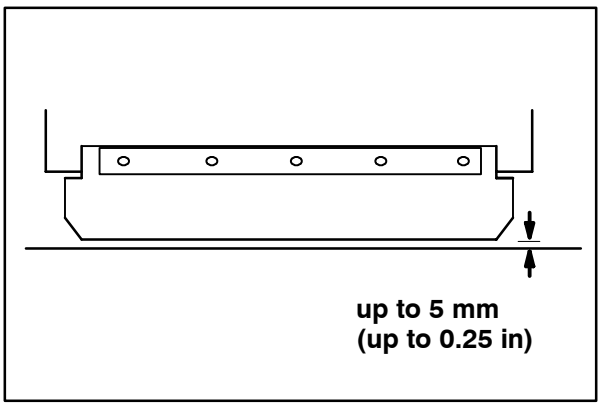


7. Thread the mounting bolts through the machine frame, the rear floor skirt, and the retaining strip toward the rear wheel.

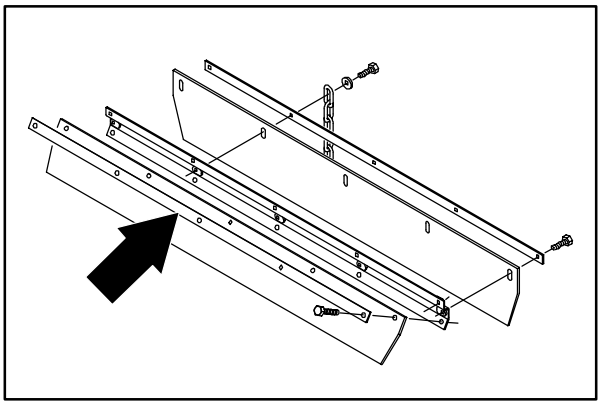


8. Slide the rear floor skirt up or down so that the skirt clears the floor up to a maximum of 5 mm (0.25 in).

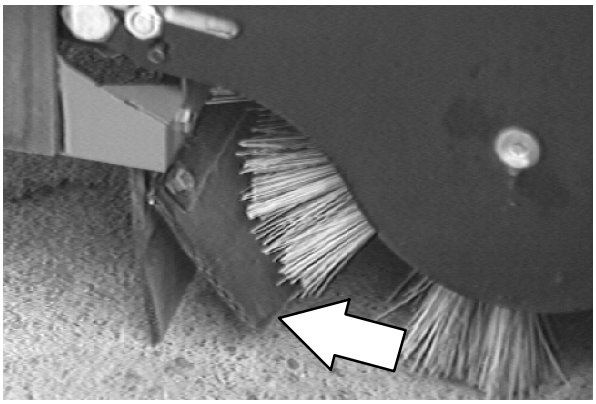
9. Tighten the rear floor skirt mounting bolts to 8–14 Nm (6–10 ft lb).



10. Remove the brush contact blade retaining strip and the brush contact blade. Discard the old blade.

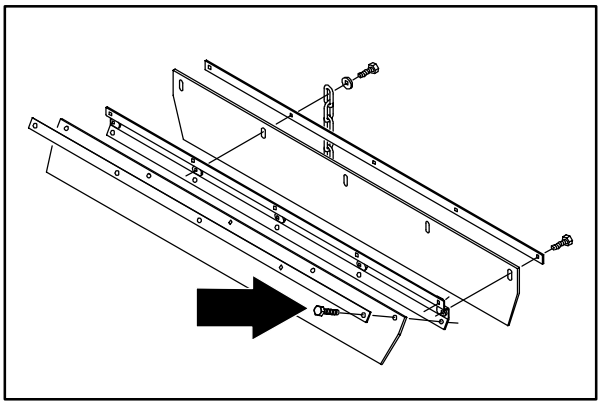


11. Position the new blade on the machine.

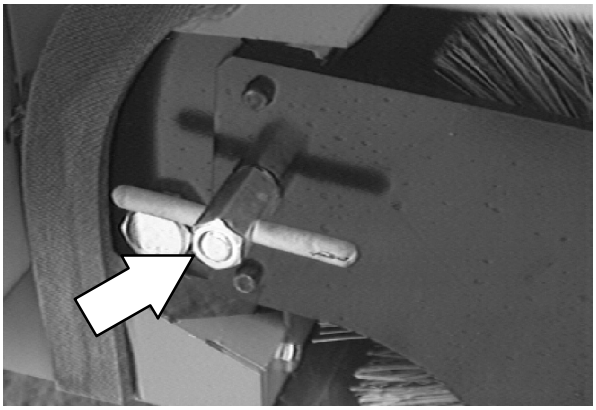


12. Thread the mounting bolts through the mounting bracket, the brush contact blade, and the retaining strip.

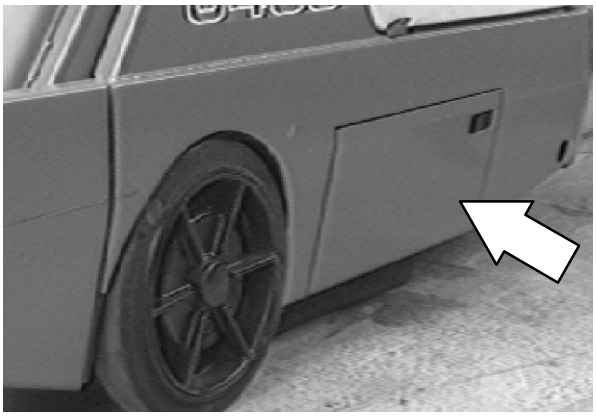
13. Tighten the brush contact blade mounting bolts to 8–14 Nm (6–10 ft lb).



14. Reinstall the main brush.



15. Close the main brush doors.

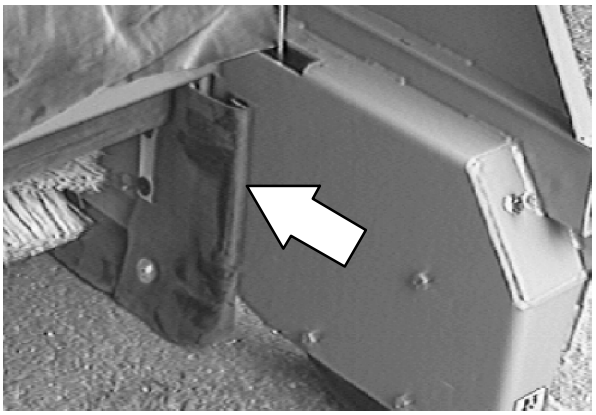


16. Operate the machine and check for proper operation.

HOPPER SIDE SEALS

The hopper seals are located on the side portions of the machine frame that contact the hopper. They seal the main brush compartment. tighten the seal hardware to 4–5 Nm (3–4 ft lb).

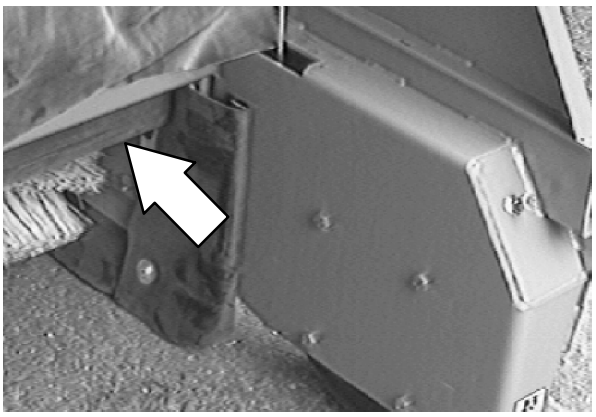
Inspect the seals for wear or damage every 100 hours of operation.



HOPPER TOP SEAL

The hopper dust seal is located under the front of the machine frame in the area of the machine that is contacted when the hopper is in the down position.

Check the seal for wear or damage every 100 hours of operation. You can reach the seal by lifting the hopper and engaging the prop arm.



TO REPLACE HOPPER SIDE SEALS

1. Park the machine on a smooth, level surface.

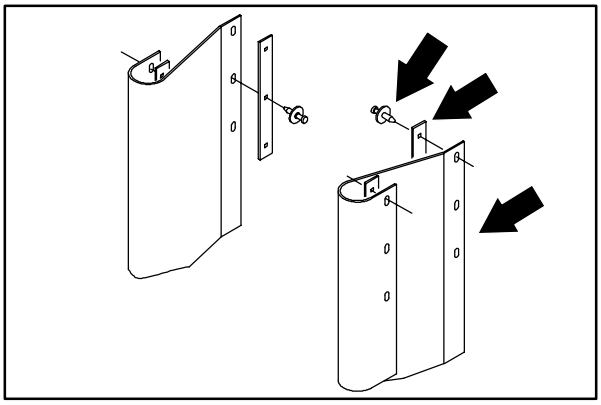
2. Stop the machine and set the parking brake.

3. Raise hopper and engage hopper support bar.

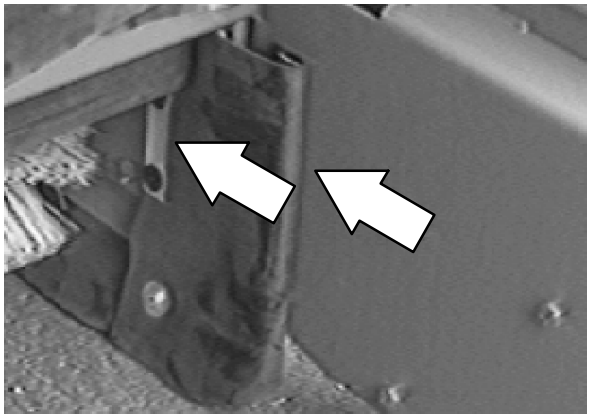
WARNING: Raised Hopper May Fall. Engage Hopper Support Bar.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

4. Remove the skirt retainer and skirt from each side of the machine. Remove the plastic hardware by prying under the head.



5. Position the new skirt and existing retainer on the front of the machine frame. Secure with plastic push-in hardware.

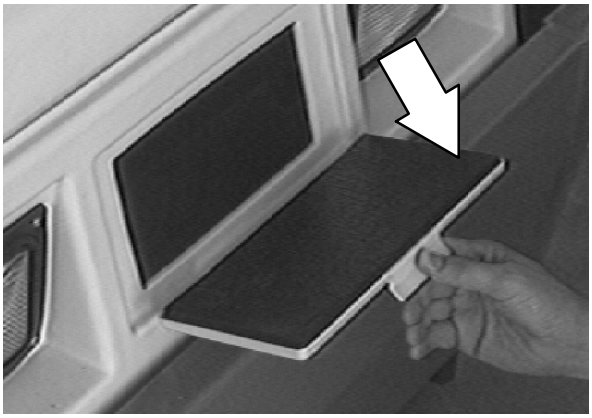


6. Repeat on the other side of the main frame.

HOPPER INSPECTION DOOR SEAL

The hopper inspection door seal is located on the hopper and seals the front of the debris hopper.

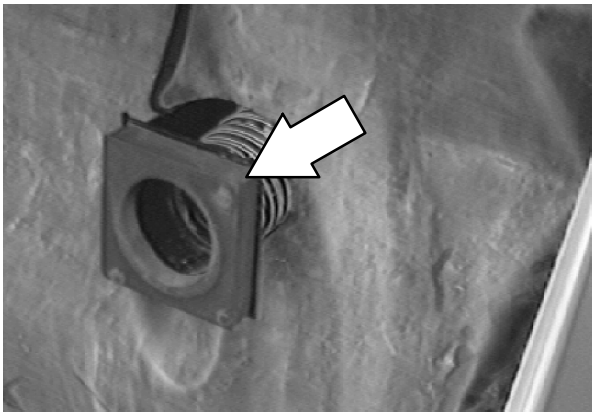
Check the seal for wear or damage every 100 hours of operation.



HOPPER VACUUM FAN SEAL

The hopper vacuum fan seal is mounted on the front the vacuum fan inlet assembly.

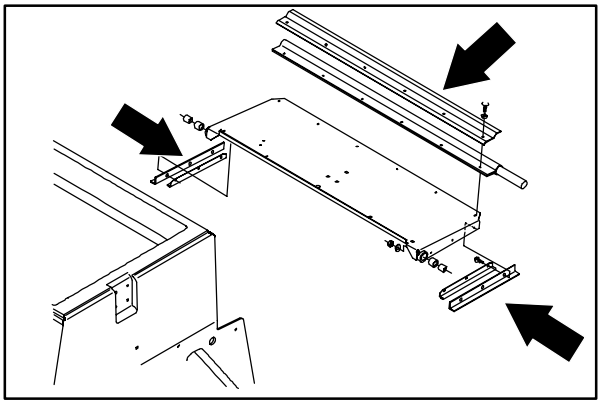
Check the seal for wear or damage every 100 hours of operation. You can reach the seal by removing the hopper insert.



HOPPER DUMP DOOR SEALS

The hopper door seals are located on the hopper door. They seal the hopper when the hopper door is closed. Tighten hardware to 3–4 Nm (2.5–3.5 ft lb).

Check the seals for wear or damage every 100 hours of operation.



TO REPLACE HOPPER DUMP DOOR SEALS

1. Park the machine on a smooth, level surface and open the hopper dump door.

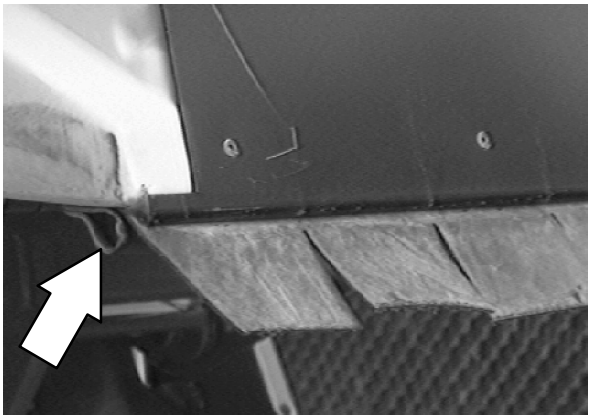
2. Stop the machine and set the parking brake.

3. Raise hopper and engage hopper support bar.

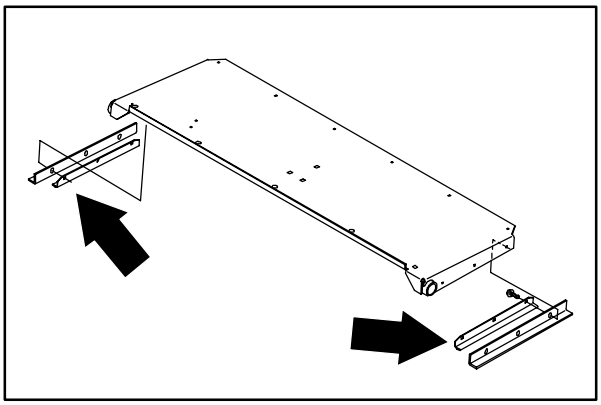
WARNING: Raised Hopper May Fall. Engage Hopper Support Bar.

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

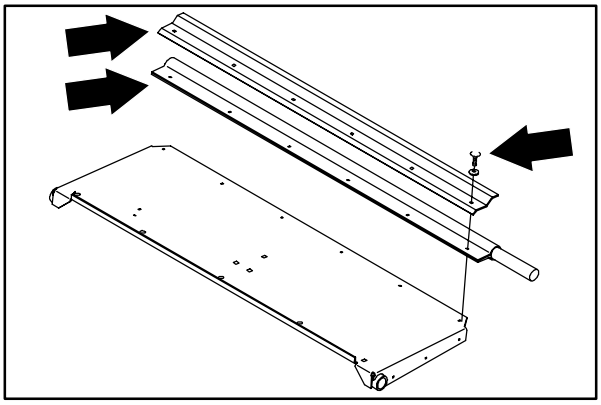
4. Remove the six hex screws holding the dump door seal, retainer, and sponge cord to dump door. Discard the old seal.



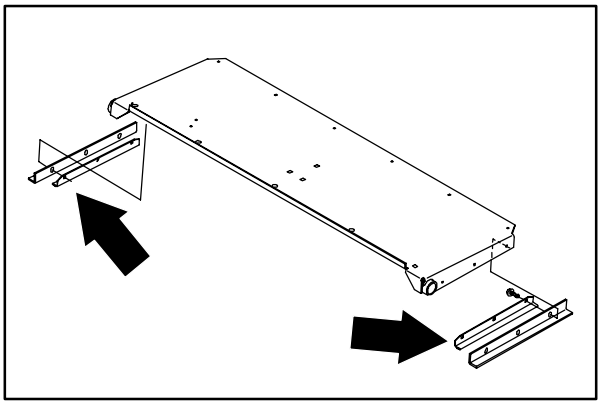
5. Remove the three hex screws holding each side seal to the dump door. Discard the old seals.



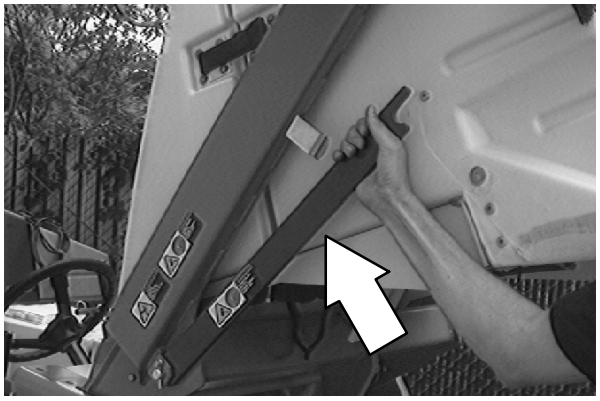
6. Align the holes in the new seal with holes on the rear of the dump door and retainer. Reinstall the six hex screws. Tighten to 3.3 – 4.4 Nm (30 – 39 In lb).



7. Align the holes in the new side seal with holes on the edge of the dump door and retainer. Reinstall the three hex screws. Tighten to 3.3 – 4.4 Nm (30 – 39 In lb). *Make sure the seals are lined up with edge of hopper when tightening.*



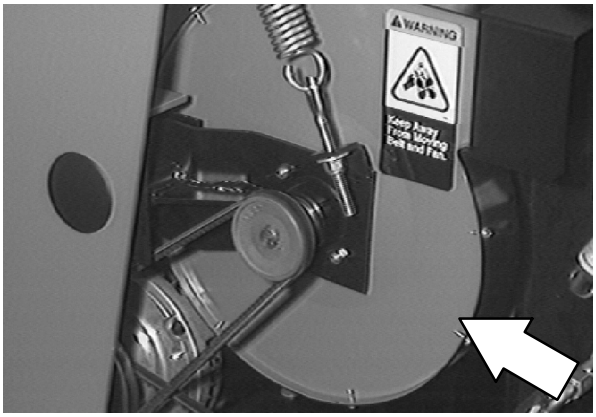
8. Start machine and lower hopper.



9. Operate the machine and check the dump door for proper operation.

VACUUM FAN

The vacuum fan is located in the battery compartment of the machine on the left hand side. The vacuum fan is used during sweeping to control dusting by pulling air from the main brush area through the hopper to the dust filters.

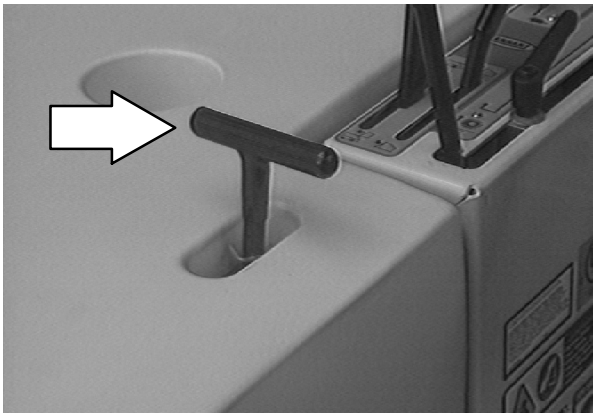


TO REMOVE VACUUM FAN ASSEMBLY

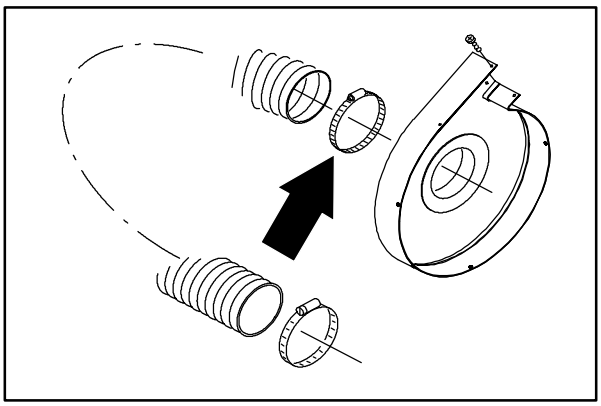
1. Park the machine on a smooth, level surface.
2. Stop the machine and set the parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

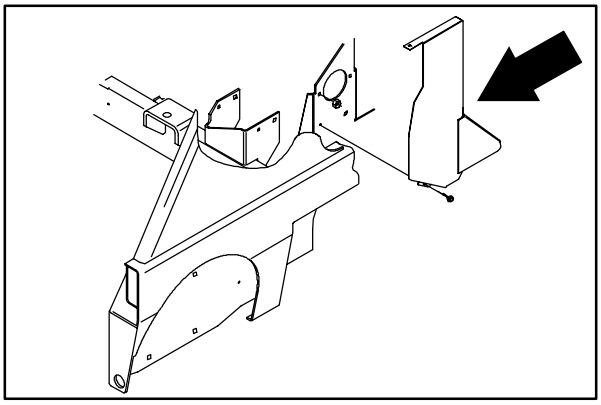
3. Open the seat shroud.



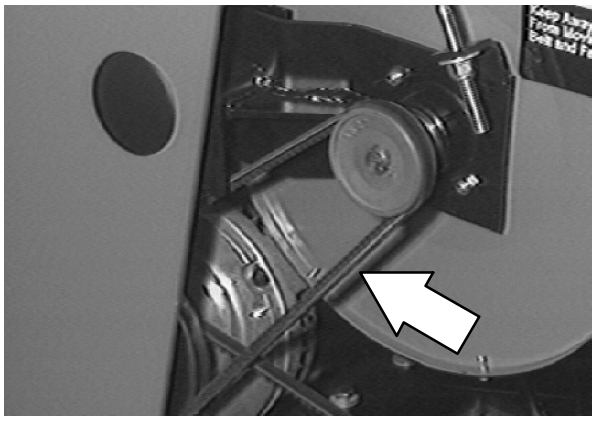
4. Remove the vacuum hose connected to the vacuum fan assembly.



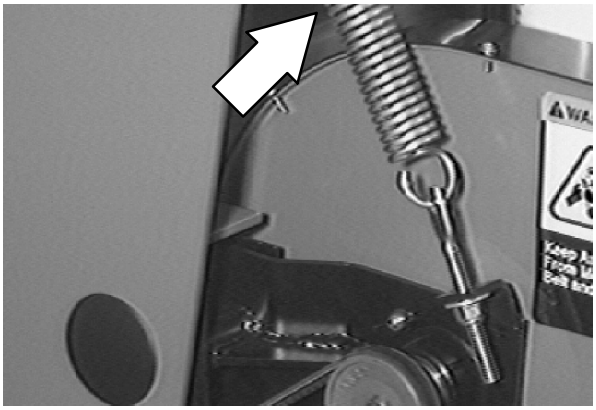
5. Remove the belt guard.



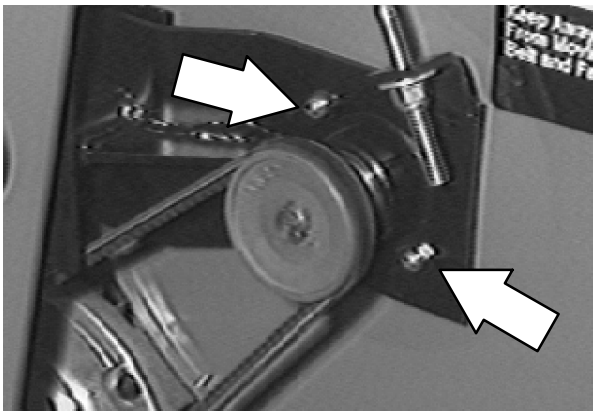
6. Push down on the vacuum fan assembly and remove the V-belt from the vacuum fan sheave.



7. Remove the tension spring from the frame bracket.



8. Remove the two hex screws holding the vacuum fan assembly to the frame mount bracket.



9. Remove the vacuum fan assembly from the machine.

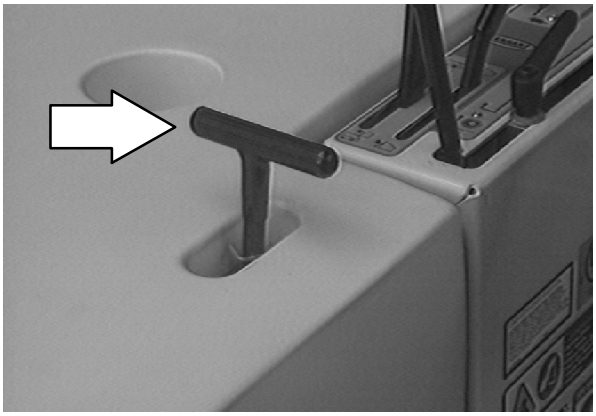
TO INSTALL VACUUM FAN ASSEMBLY

1. Park the machine on a smooth, level surface.

2. Stop the machine and set the parking brake.

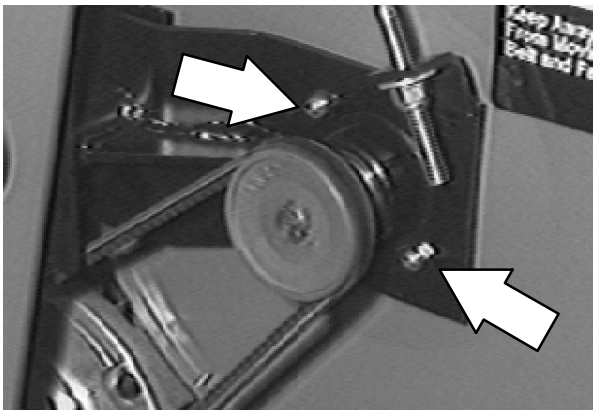
   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

3. Open the seat shroud.

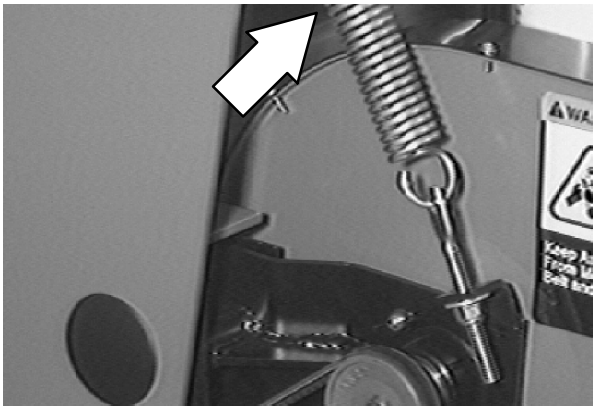


4. Position the vacuum fan assembly in the machine.

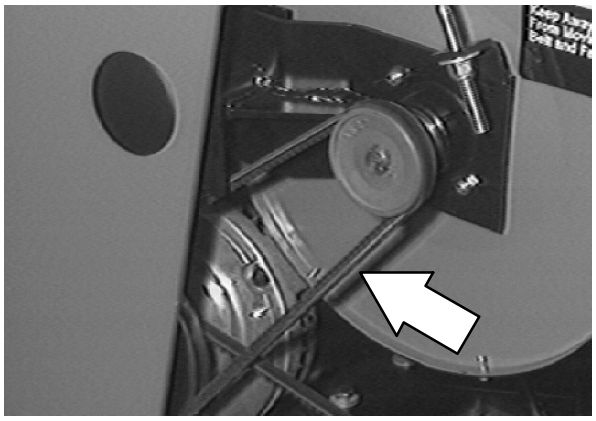
5. Align the holes in vacuum fan mount bracket with the bracket on the machine. Reinstall the two hex screws and nuts. Tighten to 37 – 48 Nm (27 – 35 ft lb).



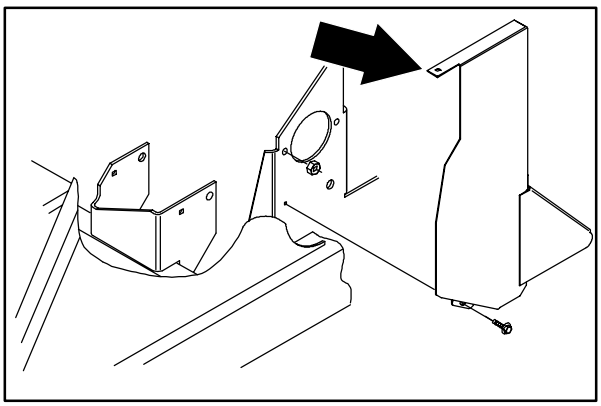
6. Reconnect the tension spring to the mount bracket.



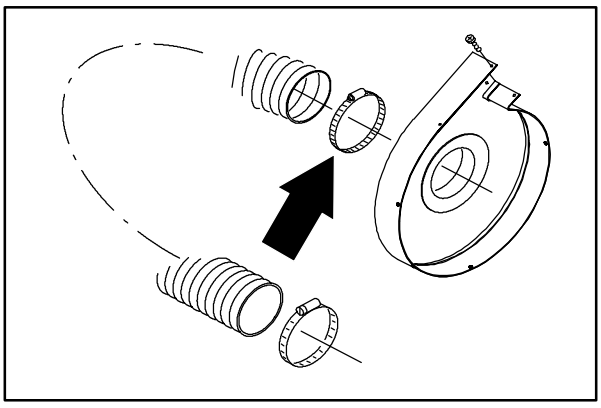
7. Push down on the vacuum fan assembly. Reinstall the V-belt on the vacuum fan sheave.



8. Reinstall the belt guard. Tighten the hardware to 18 - 24 Nm (15 - 20 ft lb).



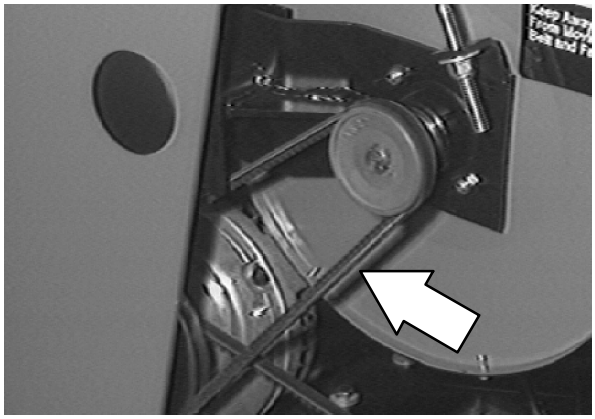
9. Reconnect the hose to the vacuum fan housing.



10. Start the machine and operate the vacuum fan. Check for proper operation.

VACUUM FAN BELT

Check the vacuum fan belt tension and wear after every 200 hours of operation. The correct tension is when the belt at midpoint deflects 5 mm (0.19 in) from a force of 1.4 kg (3.0 lb).



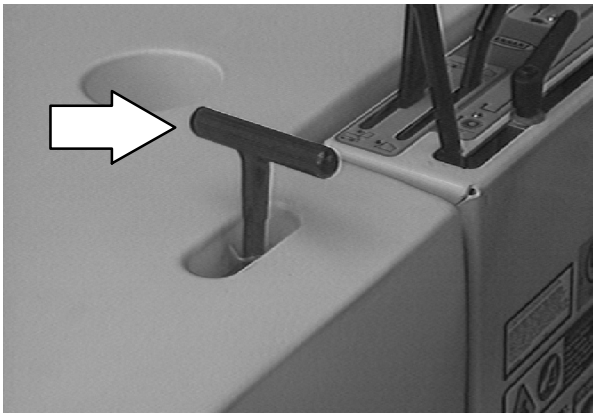
WARNING: Moving belt and fan. Keep away.

TO REPLACE VACUUM FAN BELT

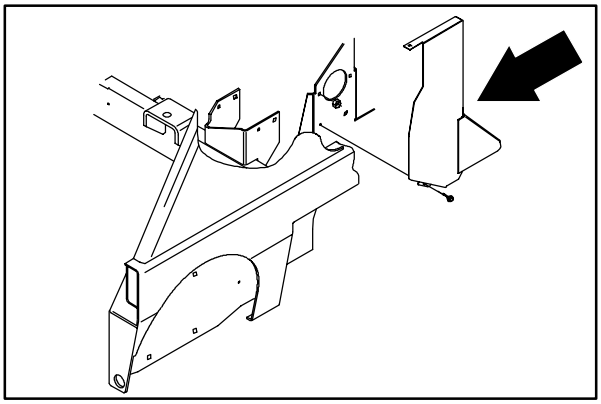
1. Park the machine on a smooth, level surface.
2. Stop the machine and set the parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

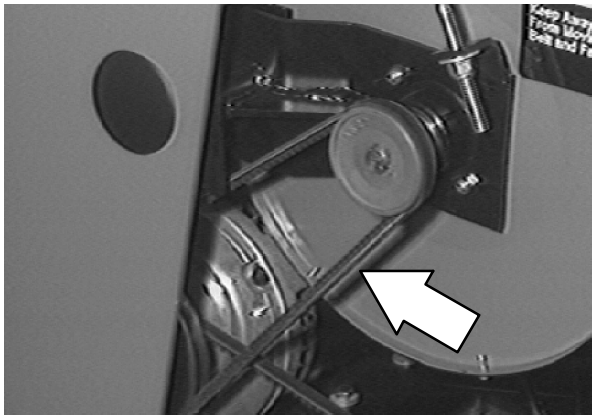
3. Open the seat shroud.



4. Remove the vacuum fan belt guard.

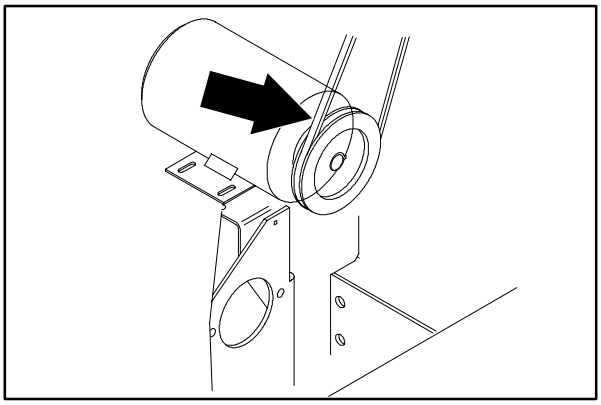


5. Push down on the vacuum fan assembly and remove the V-belt from the vacuum fan sheave. Allow the tension spring to pull the vacuum fan assembly back up.

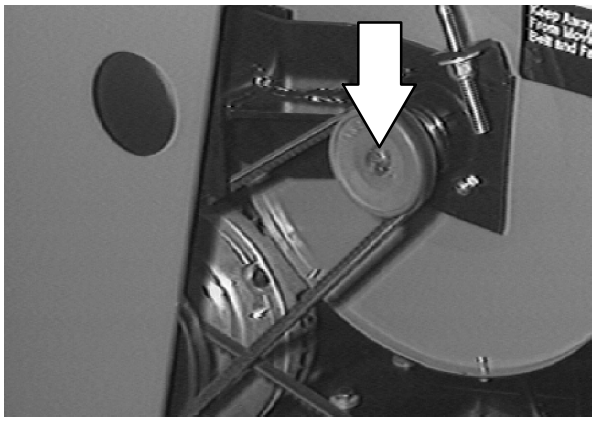


6. Remove the V-belt from the main electric motor sheave. Remove the V-belt from the machine.

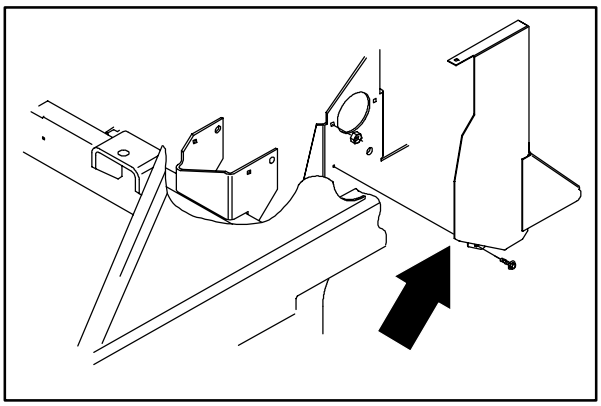
7. Place the new V-belt over the main electric motor sheave.



8. Push down on the vacuum fan assembly and place the new V-belt over the sheave on the vacuum fan. Allow the tension spring to pull the vacuum fan assembly back up and tension the V-belt.



9. Reinstall the belt guard.



10. Start the machine and check the vacuum fan for proper operation.

TO REPLACE VACUUM FAN IMPELLER

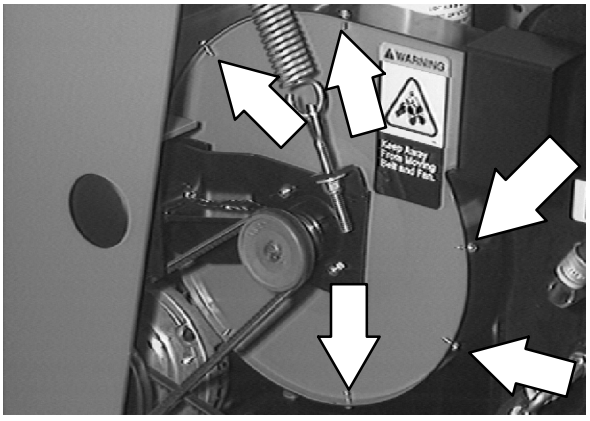
1. Park the machine on a smooth, level surface.

2. Stop the machine and set the parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

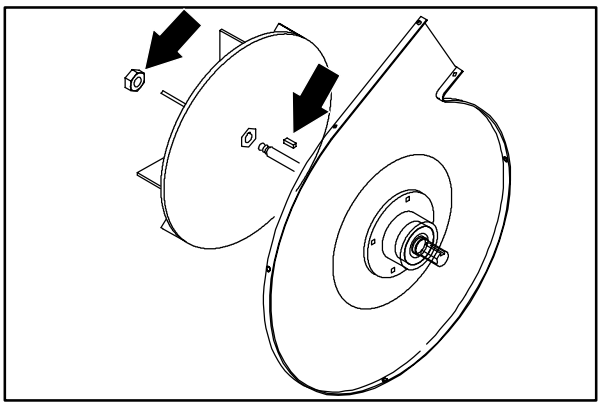
3. Remove the vacuum fan assembly from the machine. See TO REMOVE VACUUM FAN ASSEMBLY instructions in this section.

4. Remove the nine thread cutting screws holding the fan housing to the fan assembly. Remove the housing.



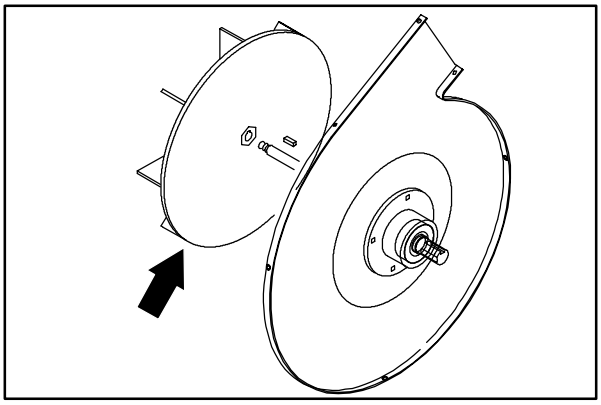
5. Hold the impeller from turning and remove the hex nut from the end of the fan impeller shaft. Pull the impeller straight off the shaft.

NOTE: Make sure to retain the shaft key and spacer.



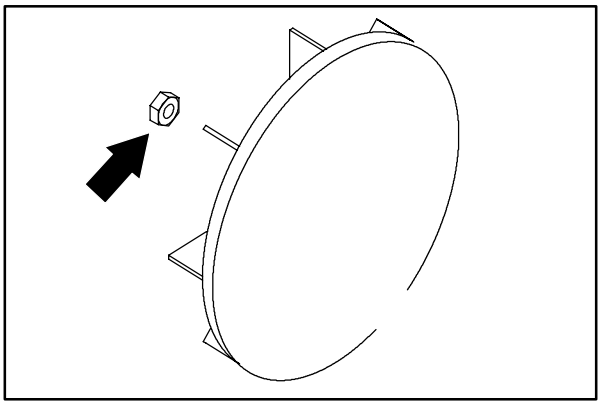
6. Put a small amount of grease on the impeller shaft before installing the new impeller. Slide the new impeller on the shaft.

NOTE: Make sure the impeller spacer and square key are in place on the impeller shaft.

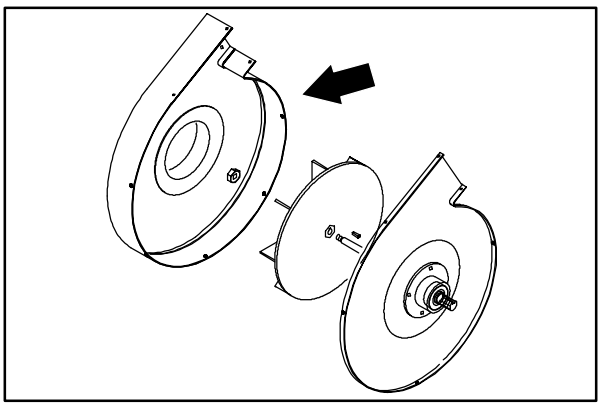


7. Reinstall the hex nut on the end of the impeller shaft.

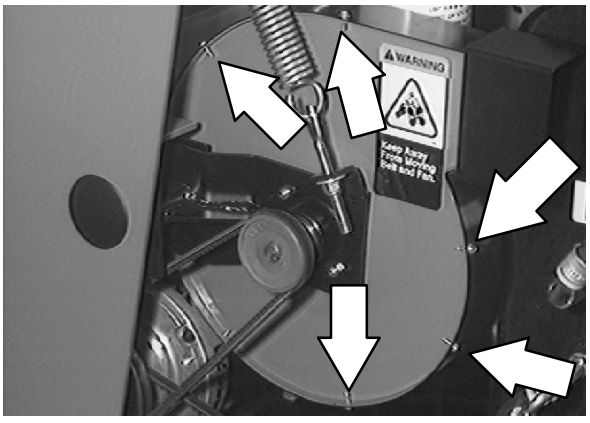
8. Hold the new impeller from turning and firmly tighten the flex lock nut.



9. Reinstall the fan housing on the fan assembly.



10. Reinstall the nine thread cutting screws in the fan housing. Hand tighten.



11. Reinstall the vacuum fan assembly in the machine. See TO INSTALL VACUUM FAN ASSEMBLY instructions in this section.

TO REPLACE VACUUM FAN IMPELLER BEARINGS

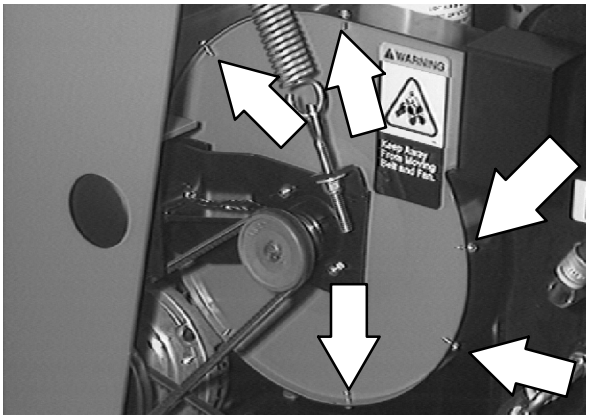
1. Park the machine on a smooth, level surface.

2. Stop the machine and set the parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

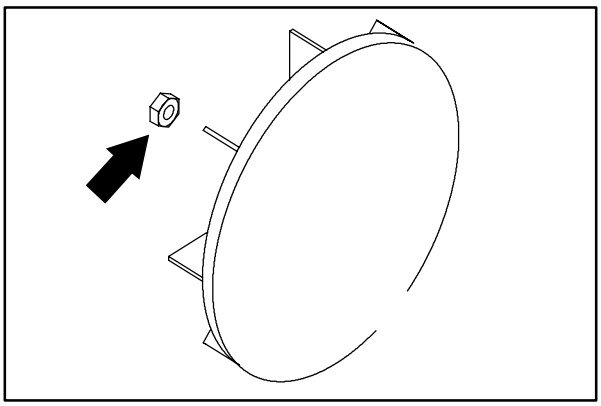
3. Remove the vacuum fan assembly from the machine. See TO REMOVE VACUUM FAN ASSEMBLY instructions in this section.

4. Remove the nine thread cutting screws holding the fan housing to the fan assembly. Remove the housing.



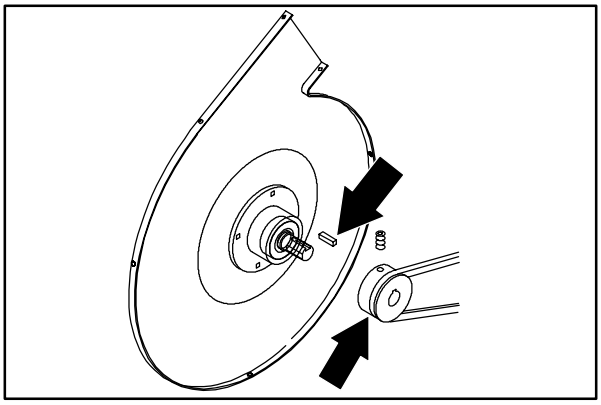
5. Hold the impeller from turning and remove the hex nut from the end of the fan impeller shaft. Pull the impeller straight off the shaft.

NOTE: Make sure to retain the shaft key and spacer.

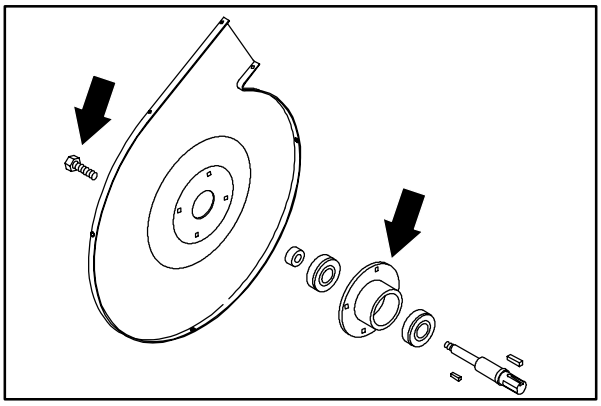


6. Loosen the two set screws holding the belt sheave to the impeller shaft. Remove the sheave.

NOTE: Make sure to retain the shaft key.

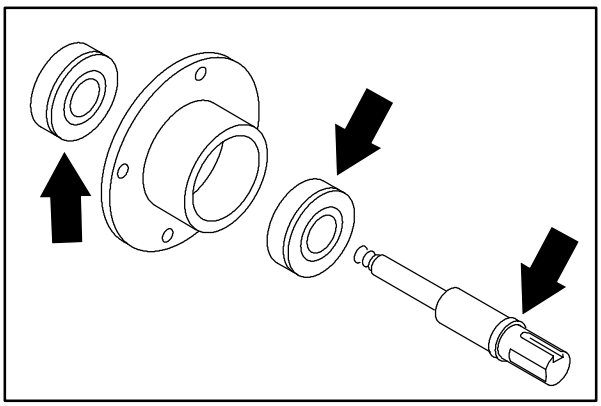


7. Remove the four hex screws holding the bearing assembly to the fan mount bracket and fan assembly back plate. Remove the bearing assembly.

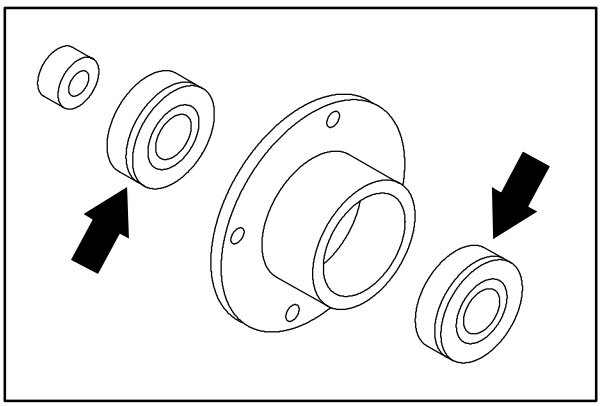


8. Use a small press to remove the impeller shaft and two bearings from the bearing housing.

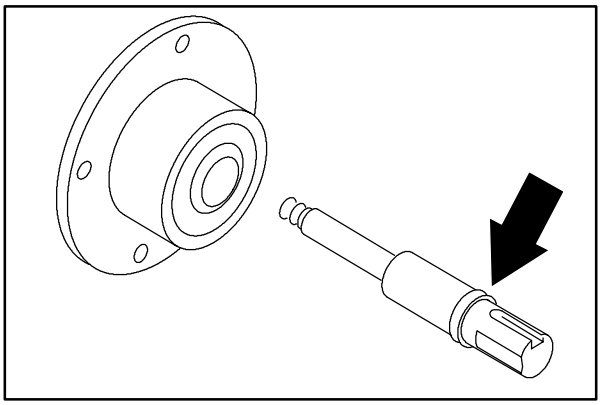
NOTE: Make sure to note the orientation of the bearings and impeller shaft in relation to the bearing housing.



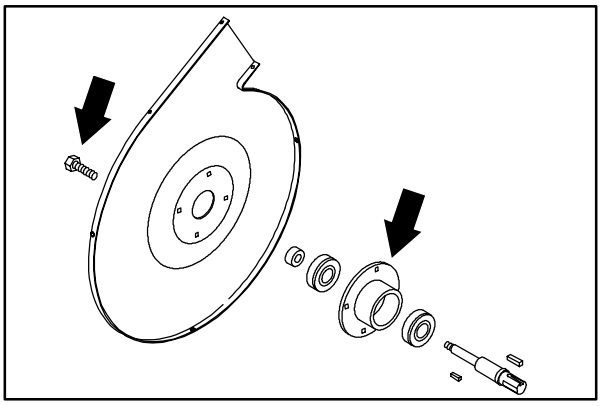
9. Press two new bearings in the bearing housing.



10. Press the impeller shaft in the new bearings.

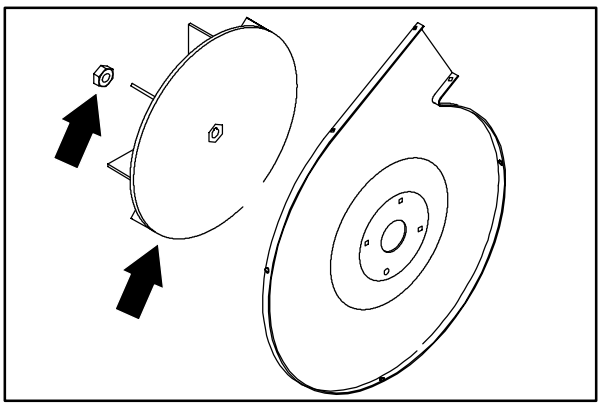


11. Reinstall the bearing housing and fan assembly back plate on the fan mount plate. Tighten the four M6 hex screws and nyloc nuts to 7.6 – 9.9 Nm (5 – 6 ft lb).

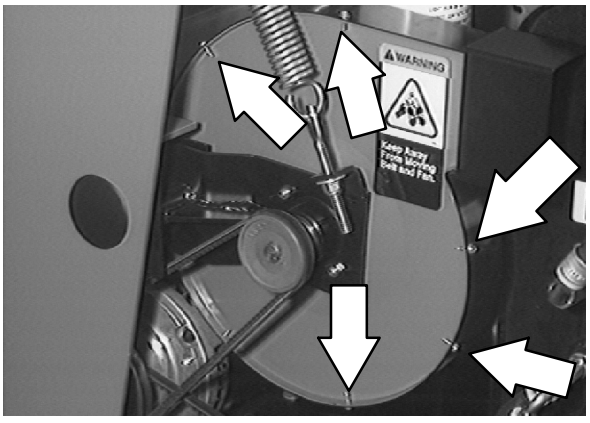


12. Reinstall the spacer, key, and impeller on the shaft.

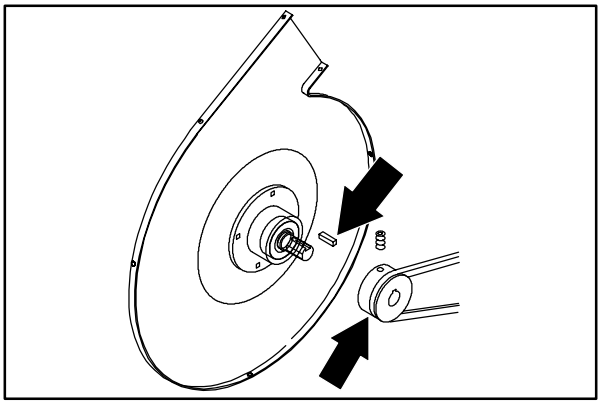
NOTE: Place a small amount of grease on the impeller shaft to ease installation.



13. Reinstall the fan impeller housing using the nine thread cutting screws. Tighten to 223 – 290 Ncm (20 – 25 in lb).



14. Go to the other side and reinstall the square key and sheave. Push the sheave all the way on and hand tighten the two set screws tight.

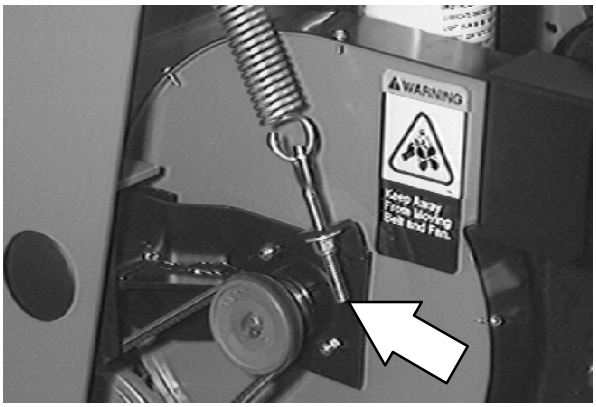


15. Reinstall the vacuum fan assembly in the machine. See TO INSTALL VACUUM FAN ASSEMBLY instructions in this section.

TO TENSION VACUUM FAN BELT

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Use a static 40lbs (+ or – 3lbs) to tension the V–belt. The correct tension is when the belt at midpoint deflects 5 mm (0.19 in) from a force of 1.4 kg (3.0 lb).



2. Tighten or loosen the hex nut on the eye bolt that attaches the tension spring to the vacuum fan assembly. This will raise or lower the vacuum fan belt tension.

MACHINE TROUBLESHOOTING

Problem	Cause	Remedy
Excessive dusting	Brush skirts and dust seals worn, damaged, out of adjustment	Replace or adjust brush skirts or dust seals
	Hopper dust filter clogged	Shake and/or clean or replace dust filter
	Vacuum hose damaged	Replace vacuum hose
	Vacuum fan failure	Contact TENNANT service personnel
	Hopper door partially or completely closed	Open the hopper door
	Thermo Sentry™ tripped	Reset Thermo Sentry™
Poor sweeping performance	Brush bristles worn	Replace brushes
	Main and side brushes not adjusted properly	Adjust main and side brushes
	Debris caught in main brush drive mechanism	Free drive mechanism of debris
	Main brush drive failure	Contact TENNANT service personnel
	Side brush drive failure	Contact TENNANT service personnel
	Hopper full	Empty hopper
	Hopper lip skirts worn or damaged	Replace lip skirts
	Hopper door partially or completely closed	Open the hopper door
	Wrong sweeping brush	Contact TENNANT representative for recommendations

CONTENTS

INTRODUCTION

The machines electrical system consists of the batteries, instrument panel, drive motor, actuators, switches, relays, and circuit breakers.

ELECTRICAL SYSTEM

The machine electrical system consists of the battery and related components. This section includes information on these components and their troubleshooting.

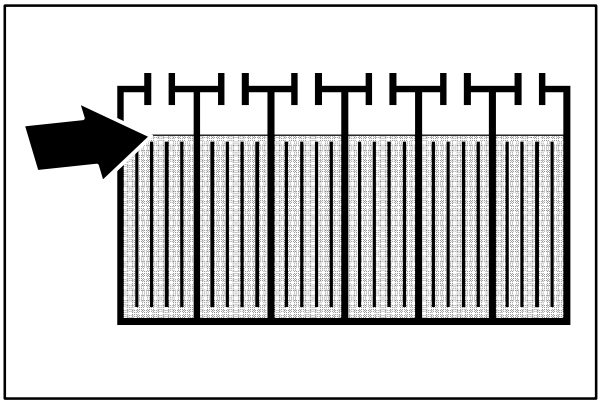
BATTERIES

The batteries are unique in that they hold their power for long periods of time. The lifetime of the batteries is limited by the number of charges the batteries receive. To get the most life from the batteries, charge them when the last battery discharge indicator segment flashes (20% charge left). Use an automatic charger with the proper rating for the batteries.

Periodically clean the top surface of the batteries and the terminals, and check for loose connections. Use a strong solution of baking soda and water. Brush the solution sparingly over the battery tops, terminals, and cable clamps. Do not allow any baking soda solution to enter the batteries. Use a wire brush to clean the terminal posts and the cable connectors. After cleaning, apply a coating of clear battery post protectant to the terminals and the cable connectors. Keep the tops of the batteries clean and dry.

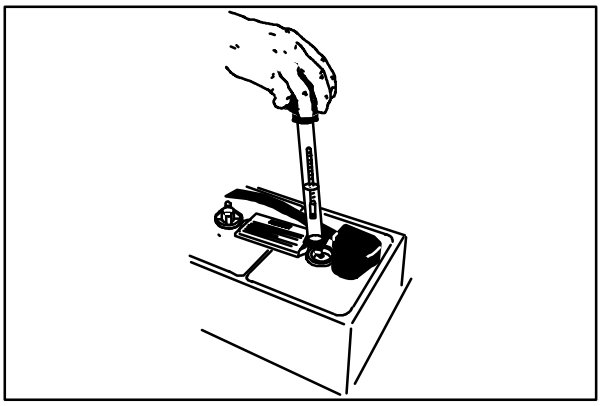
Keep all metallic objects off the top of the batteries, which may cause a short circuit. Replace any worn or damaged wires.

Check the electrolyte level in each battery cell before and after charging, and after every 50 hours of operation. Do not charge the batteries unless the fluid is slightly above the battery plates. If needed, add just enough distilled water to cover the plates. Never add acid to the batteries. Do not overfill. Always keep the battery caps on, except when adding water or taking hydrometer readings.



Measuring the specific gravity, using a hydrometer, is a way to determine the charge level and condition of the batteries. If one or more of the battery cells test lower than the other battery cells (0.050 or more), the cell is damaged, shorted, or is about to fail.

NOTE: Do not take readings immediately after adding distilled water. If the water and acid are not thoroughly mixed, the readings may not be accurate. Check the hydrometer readings against the following chart to determine the remaining battery charge level:



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SPECIFIC GRAVITY at 25° C (77° F)			
Charge Level	315A/hr Battery	340A/hr Battery	440A/hr Battery
100%	1.290	1.300	1.315
20%	1.250	1.155	1.155
0%	1.140	1.120	1.115

NOTE: If the readings are taken when the battery electrolyte is any temperature other than shown, the reading must be temperature corrected. Add or subtract to the specific gravity reading 0.004, 4 points, for each 6° C (10° F) above or below 25°C.

CHARGING THE BATTERIES

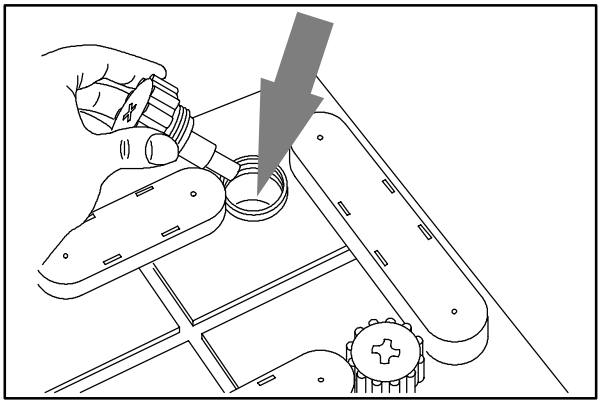
1. Drive the machine to a flat, dry surface in a well-ventilated area.

2. Stop the machine, set the parking brake and turn the machine power off.

   FOR SAFETY: Before leaving or servicing machine, stop on level surface, set parking brake, turn off machine, and remove key.

3. Open the seat support.

4. Check the electrolyte level in all the battery cells.



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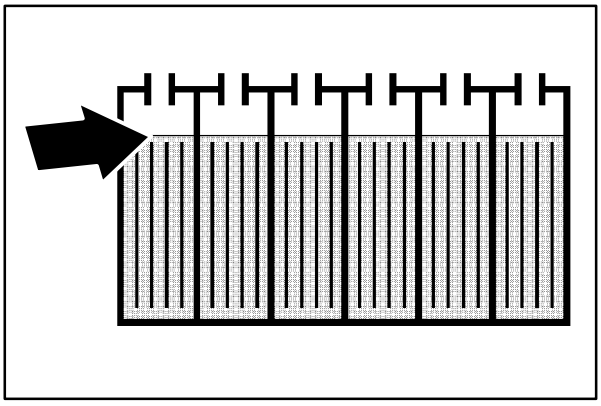
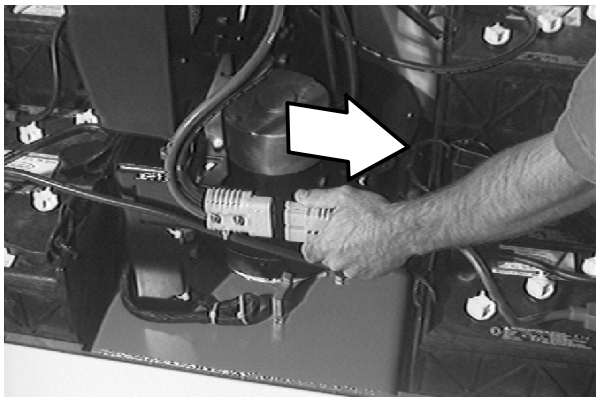
5. If the level is low, add just enough distilled water to cover the battery plates. DO NOT OVERFILL. The batteries can overflow during charging due to expansion.

NOTE: Make sure the battery caps are in place while charging.

FOR SAFETY: When maintaining or servicing machine, avoid contact with battery acid.



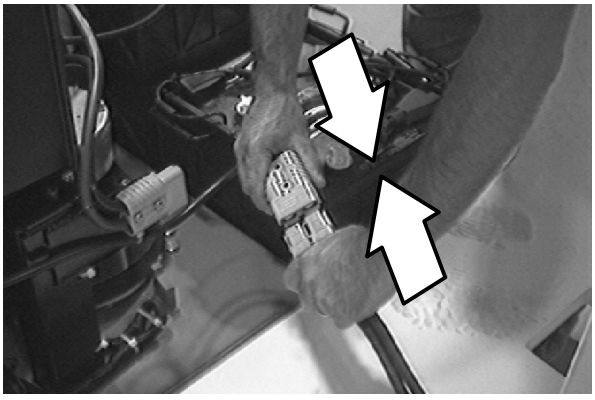
6. Unplug the battery connector from the machine connector.



7. Plug the charger connector into the battery connector.

WARNING: Batteries emit hydrogen gas. Explosion or fire can result. Keep sparks and open flame away. Keep covers open when charging.

NOTE: If the red "ABNORMAL CYCLE" lamp lights when the batteries are plugged into the TENNANT charger, this indicates that something is wrong with the battery. The charger can not charge the battery when this happens.

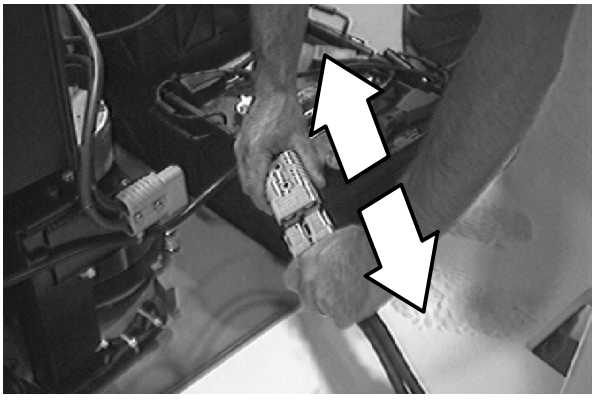


8. The Tennant charger will start automatically. When the batteries are fully charged, the Tennant charger will automatically turn off.

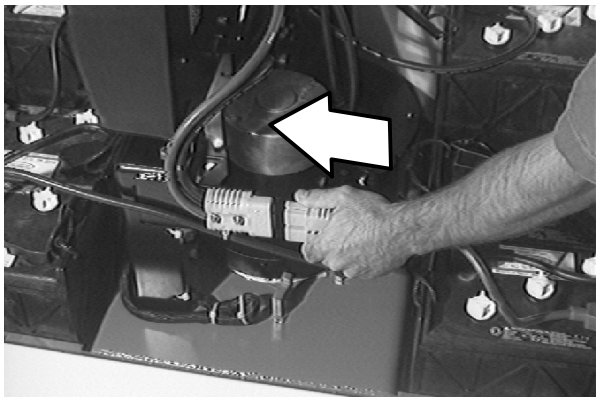
NOTE: Use a charger with the proper rating for the batteries to prevent damage to the batteries or reduce the battery life.

NOTE: If the charger needs to be disconnected from the machine before the batteries are fully charged and the charger has not automatically shut off, turn off the charger before disconnecting it.

9. After the charger has turned off, unplug the charger connector from the battery connector on the machine.



10. Reconnect the battery connector to the machine connector.



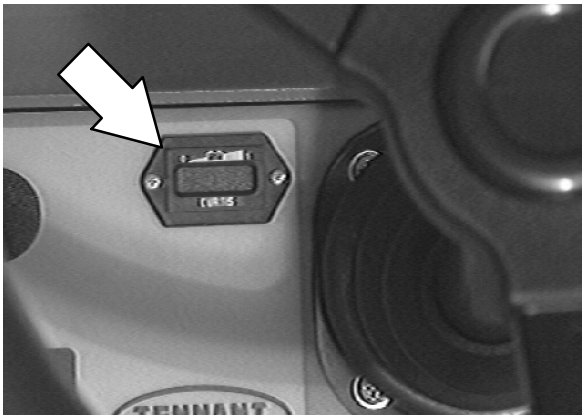
11. Check the electrolyte level in each battery cell after charging. If needed, add distilled water to raise the electrolyte level to about 12 mm (0.4 in) below the bottom of the sight tubes.

    FOR SAFETY: When maintaining or servicing machine, avoid contact with battery acid.

12. Close the seat support.

BATTERY DISCHARGE INDICATOR

The battery discharge indicator shows the charge level of the batteries. It displays the charge level when the machine is operating.



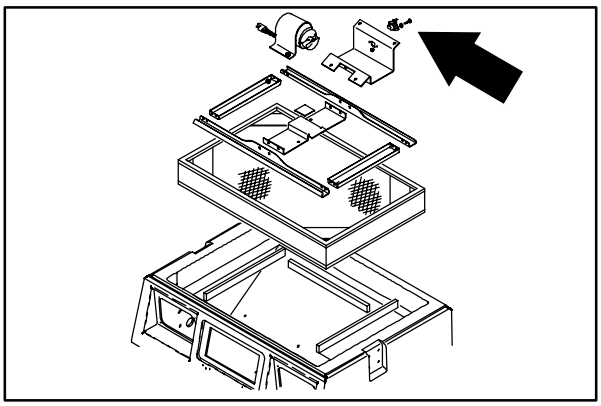
When the batteries are fully charged, the indicator on the far right is lit. As the batteries discharge, the indicator will move along the display to the left. Recharge the batteries when the indicator flashes.

NOTE: The reading on the battery discharge indicator is not accurate when the machine is first powered on. Operate the machine a few minutes before reading the charge level of the batteries.

NOTE: The battery discharge indicator will not reset from the flashing indicator unless the batteries have been fully charged.

THERMO SENTRY™

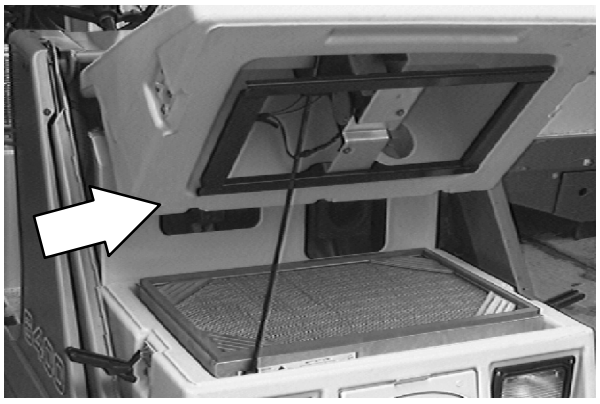
The Thermo Sentry™ senses the temperature of the air pulled up from the hopper. If there is a fire in the hopper, the Thermo Sentry™ stops the vacuum fan and cuts off the air flow.



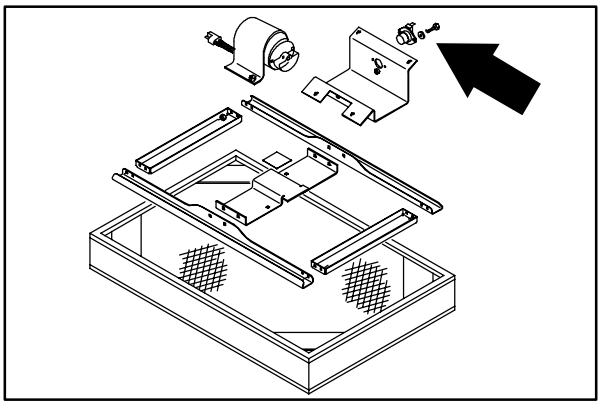
TO REPLACE THERMO SENTRY™

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

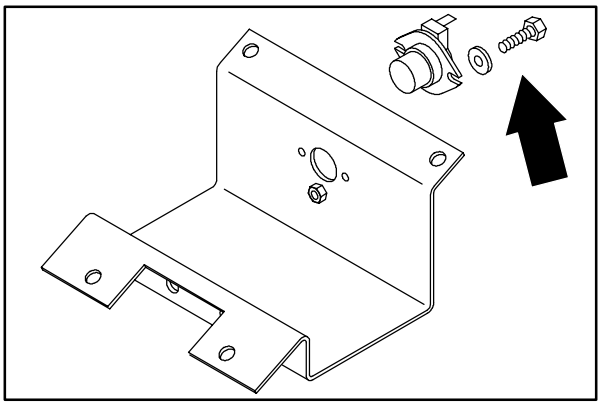
1. Open the hopper cover and engage prop rod.



2. Locate the Thermo Sentry™ on the back of the filter shaker motor bracket. Unplug the two wires leading to the Thermo Sentry™.

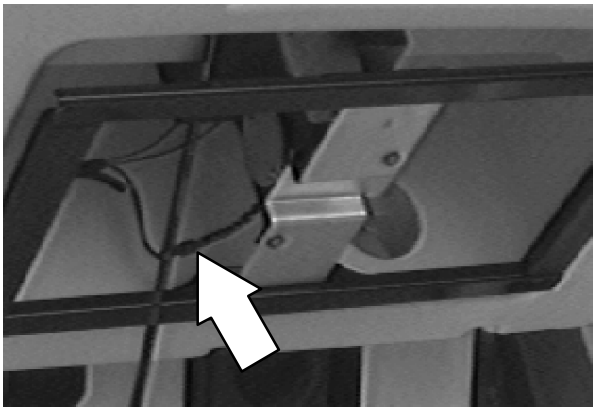


3. Remove the hex screws holding the Thermo Sentry™ to the bracket. Remove from the hopper.



4. Install the new Thermo Sentry™ on the bracket. Reinstall the hardware and tighten,

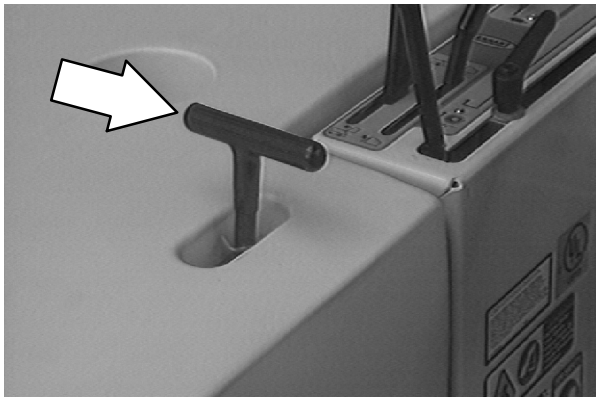
5. Reconnect the wires and close the hopper cover.



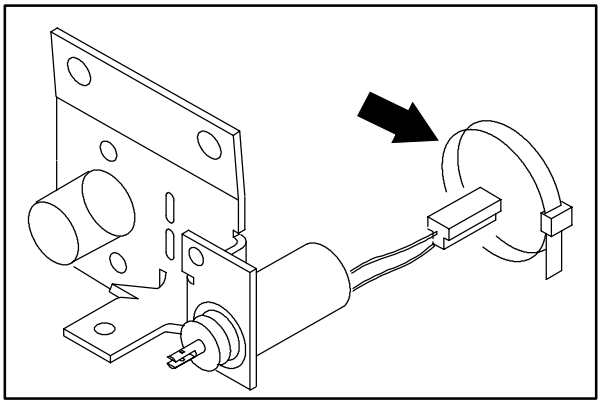
TO REPLACE THERMO SENTRY™ SHUT OFF SOLENOID

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

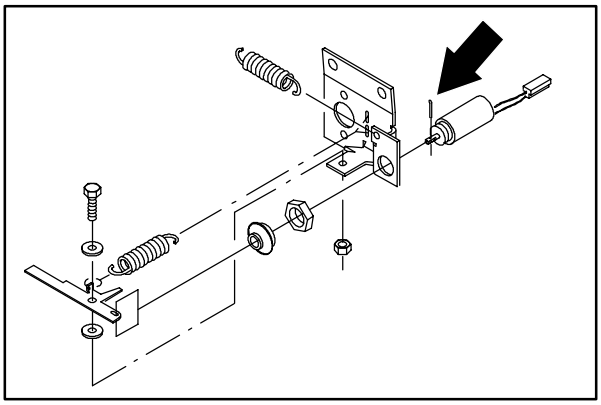
1. Open the seat support.



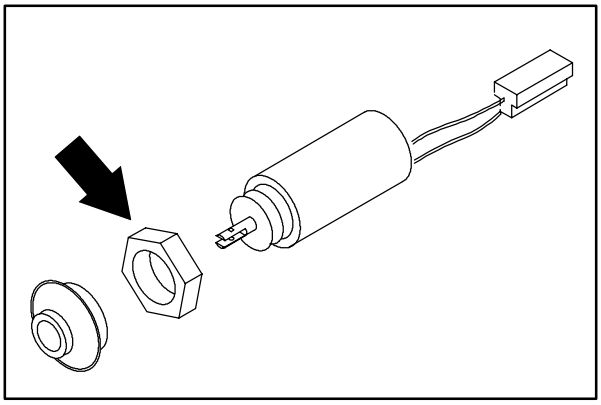
2. Cut the plastic wire tie holding the Thermo Sentry™ solenoid wire to the machine. Disconnect the Thermo Sentry™ solenoid wire harness from hopper harness.



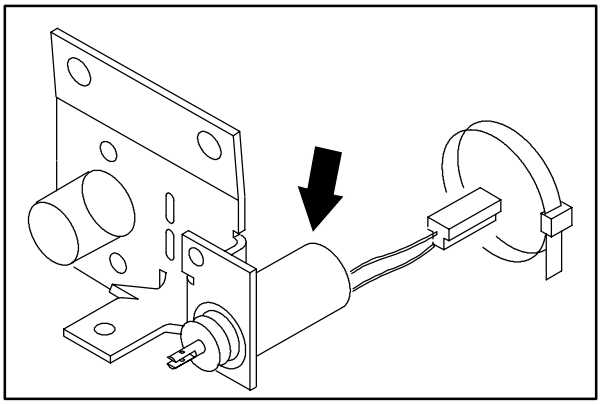
3. Remove the pin connecting the rod of the Thermo Sentry™ solenoid to the lever.



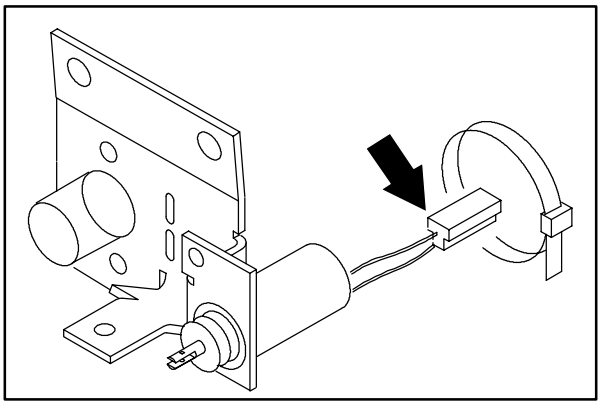
4. Remove the large nut holding Thermo Sentry™ solenoid to the bracket. Remove the Thermo Sentry™ solenoid from the machine.



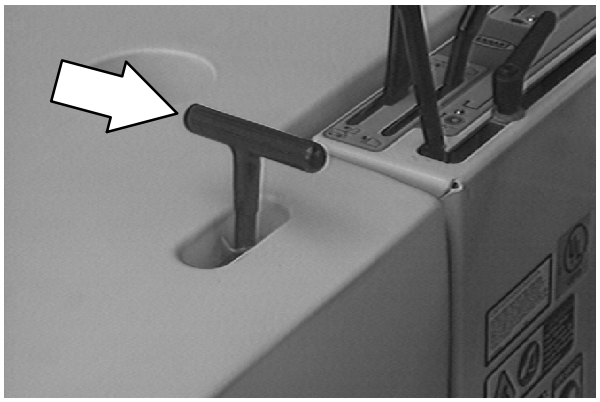
5. Mount the new Thermo Sentry™ solenoid on the bracket with existing hardware.



6. Reconnect the wires to the Thermo Sentry™ solenoid.



7. Close the seat support.



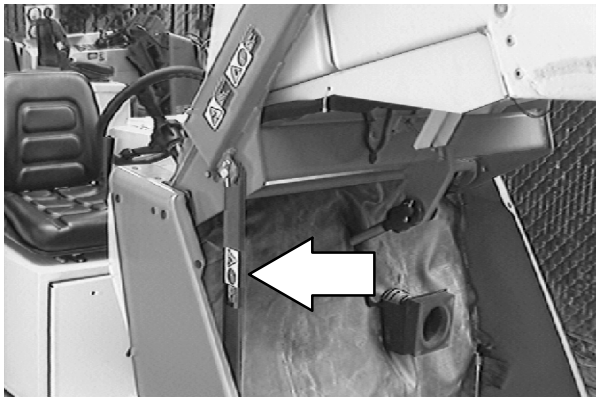
INSTRUMENT PANEL

The instrument panel consists of a key switch, light switch, hour meter, fuel gauge, horn button, circuit breakers, and indicator light panel.

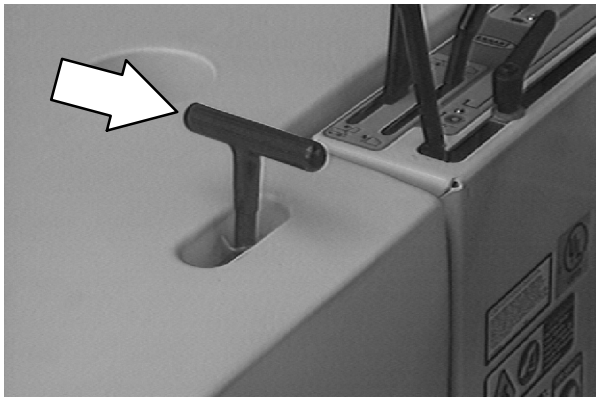
TO REPLACE INDICATOR LIGHT

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

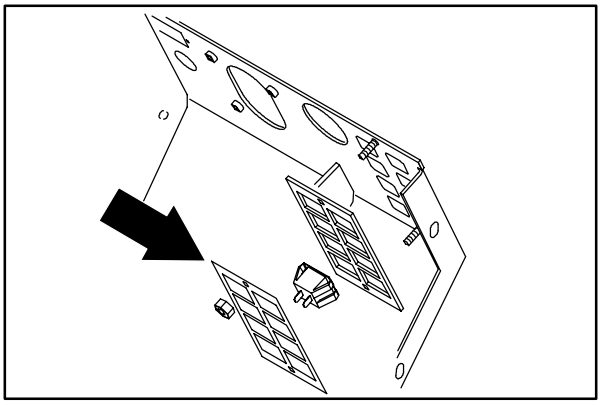
1. Raise the hopper and engage the support bar.



2. Open the seat support and disconnect the battery.

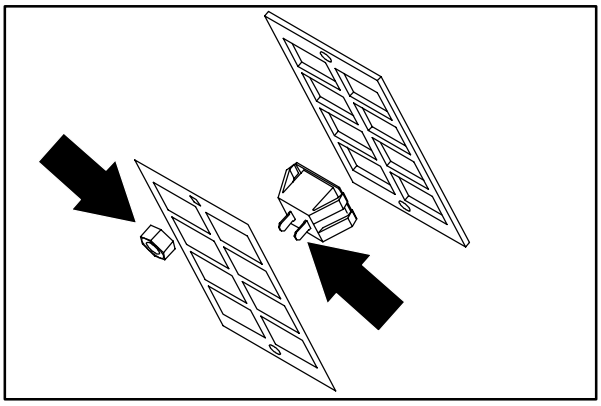


3. Locate the indicator light panel mount plate next to the power steering orbital control.



4. Remove the two nyloc nuts holding the mount plate to the instrument panel. Pull the mount plate back away from the instrument panel.

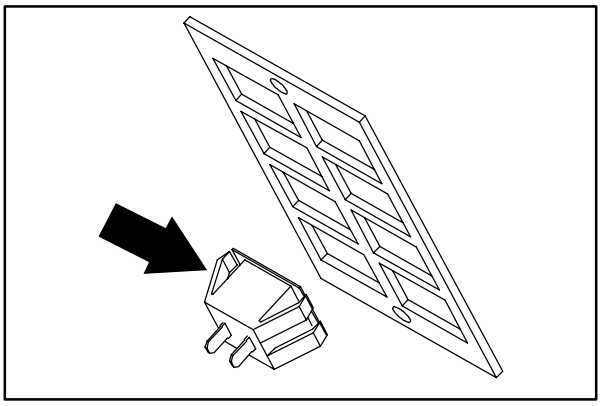
5. Unplug the two wires leading to the light that needs to be changed.



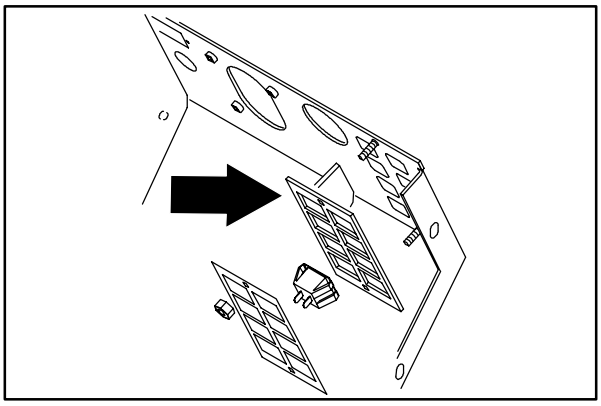
6. Squeeze the sides of the light and push the light out of the mount plate.

7. Install the new light in the mount plate. Snap in place.

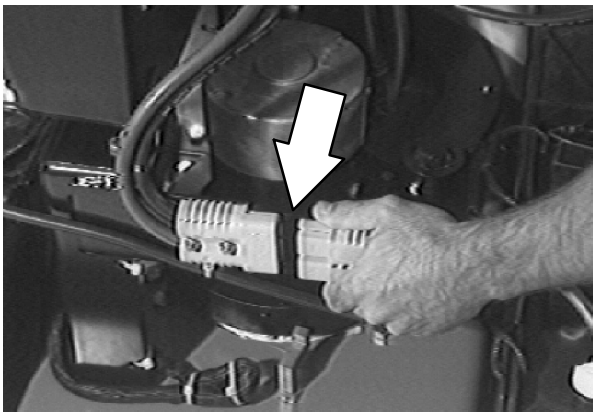
8. Reconnect the wires to the new light. See schematic in this section.



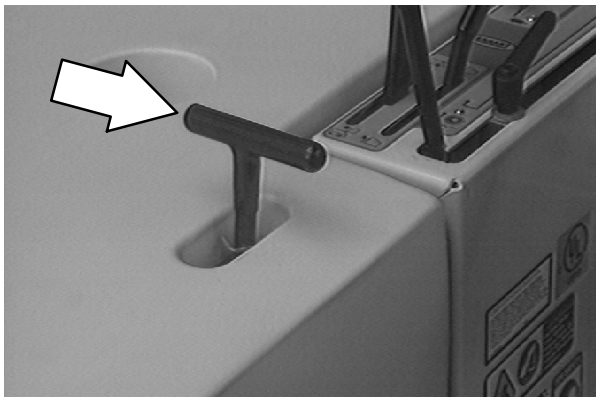
9. Position the mount plate back on the instrument panel. Reinstall the two nyloc nuts and tighten.



10. Reconnect the battery cables.

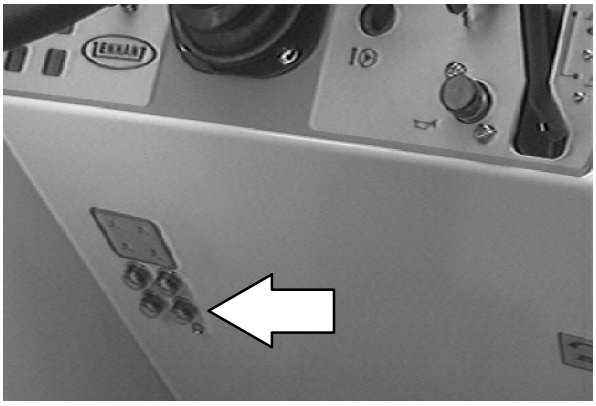


11. Close the seat support.



12. Start the machine and lower the hopper. Check the indicator lights for proper operation.

CIRCUIT BREAKERS



The circuit breakers are resetable electrical circuit protection devices. Their design stops the flow of current in the event of a circuit overload. Once a circuit breaker is tripped, it must be reset manually. Press the reset button after the breaker has cooled down.

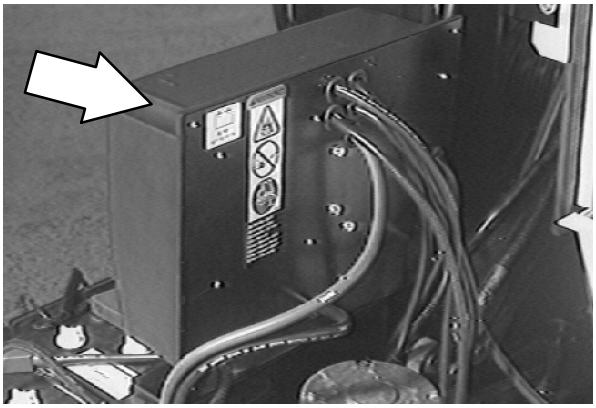
If the overload that caused the circuit breaker to trip is still there, the circuit breaker will continue to stop current flow until the problem is corrected.

The circuit breakers are located in the operator compartment.

This chart lists the circuit breakers and the electrical components they protect.

Circuit Breaker	Rating	Circuit Protected
CB-1	15 A	Thermo Sentry™
CB-2	15 A	Instrument panel, seat switch
CB-3	15 A	Operating lights
CB-4	15 A	Horn

FUSES



Fuses are one-time protection devices designed to stop the flow of current in the event of a circuit overload. Never substitute higher value fuses than specified.

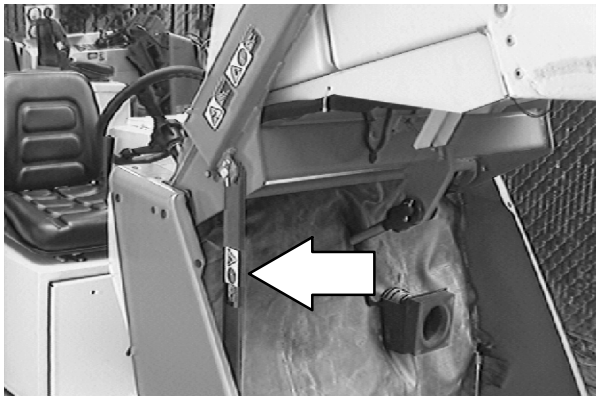
The fuses are located in the control box.

Fuse	Rating	Circuit Protected
FU-1	100 A	Hydraulic pump motor
FU-2	80 A	Propelling

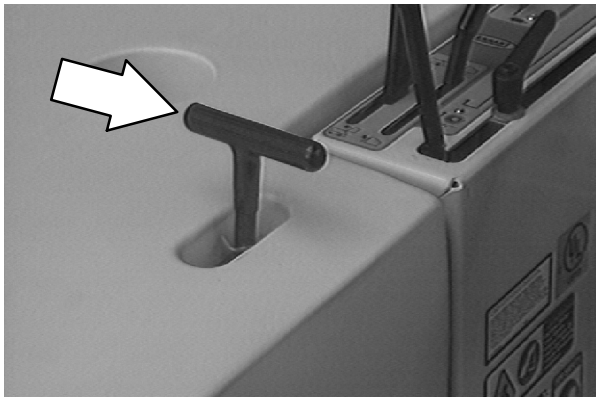
TO REPLACE MACHINE CIRCUIT BREAKER

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Raise the hopper and engage the support bar.



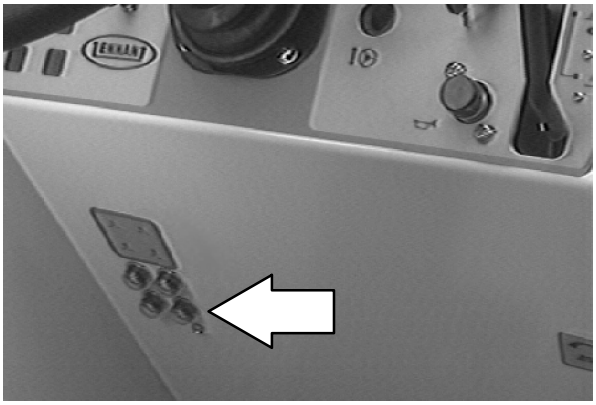
2. Open the seat support and disconnect the battery.



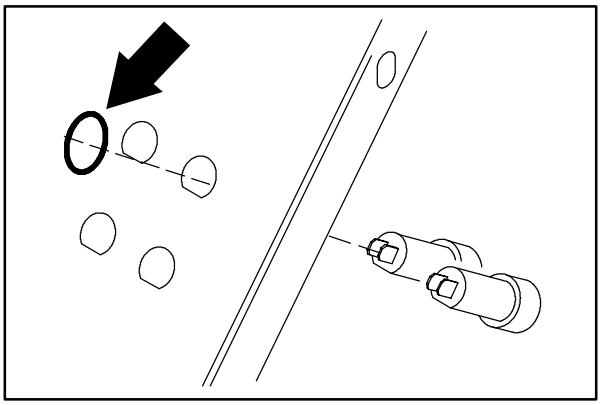
3. Locate the circuit breakers below the indicator light panel.

4. Use the electrical schematic in this section to locate the circuit breaker that needs to be replaced.

5. Disconnect the wires leading to the faulty circuit breaker.



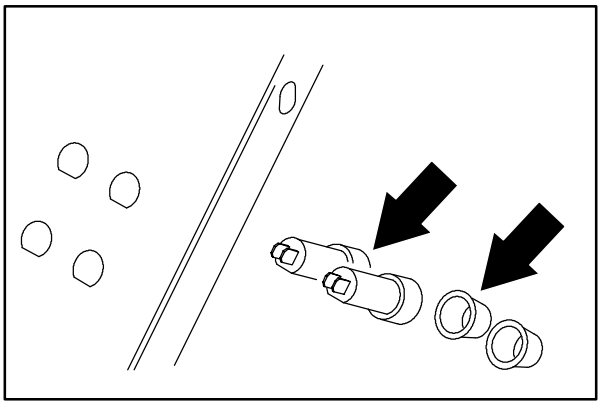
6. The metal ring must be removed in order to remove the old circuit breaker. *It may need to be cut off.*



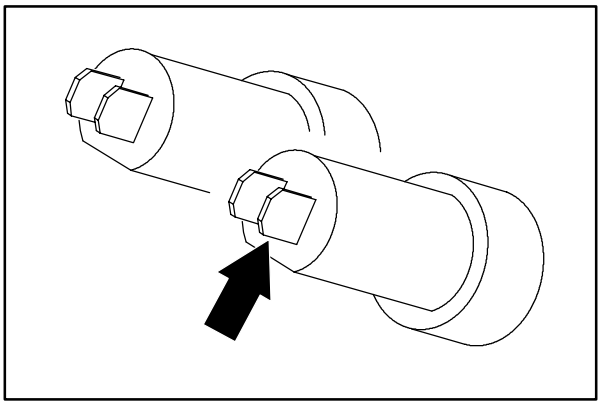
7. Remove the old circuit breaker and discard.

8. Position the new circuit breaker in the hole in the panel. Install the metal lock ring.

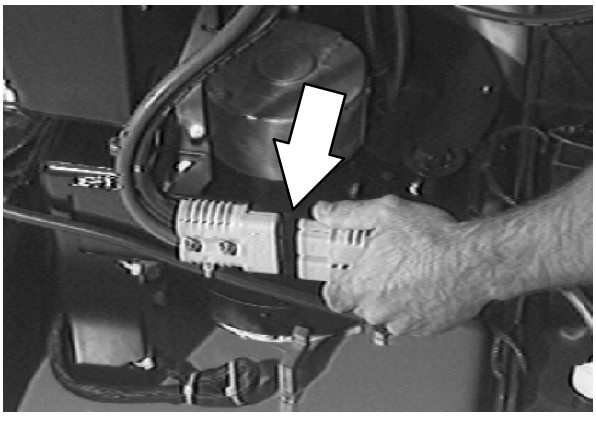
NOTE: The circuit breaker will only fit in the hole in one direction.



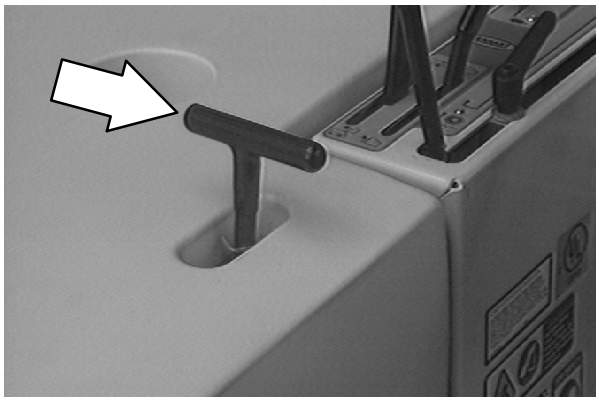
9. Plug the main harness wires into the new circuit breaker. *See the schematic in this section.*



10. Reconnect the battery cables.



11. Close the seat support.

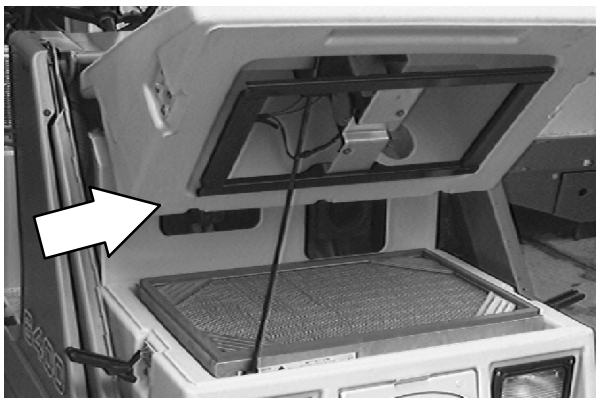


12. Start the machine and lower the hopper. Check the new circuit breaker for proper operation.

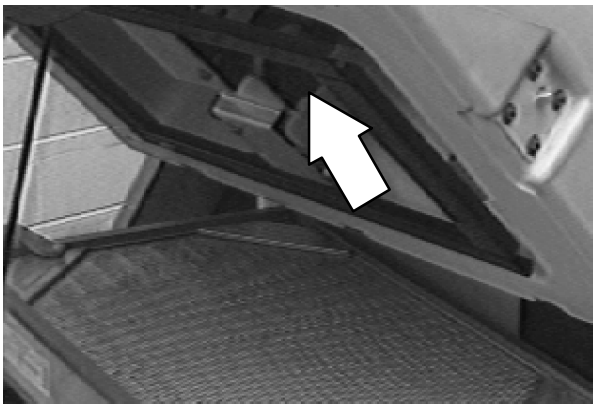
TO REPLACE FILTER SHAKER MOTOR

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

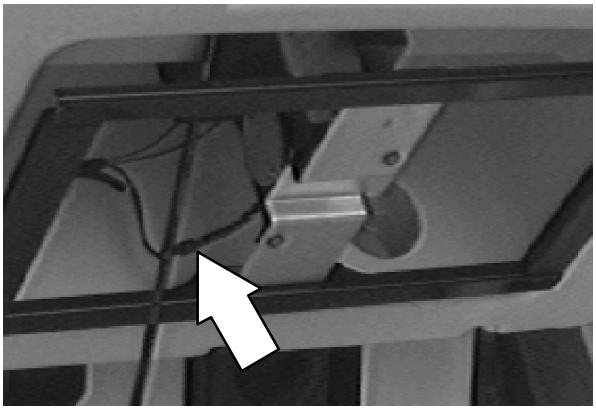
1. Open the hopper cover and engage the prop rod.



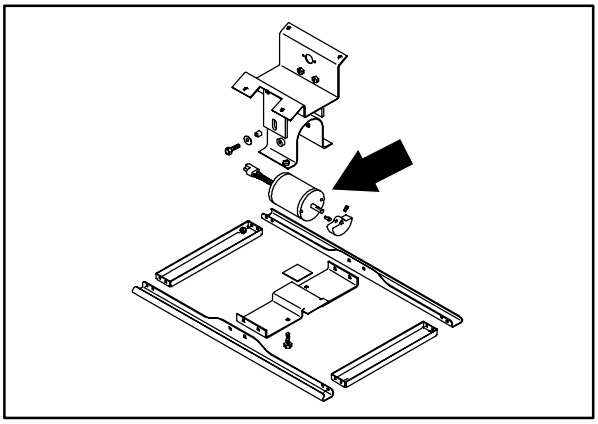
2. Locate the filter shaker motor on the top side of the filter shaker assembly.



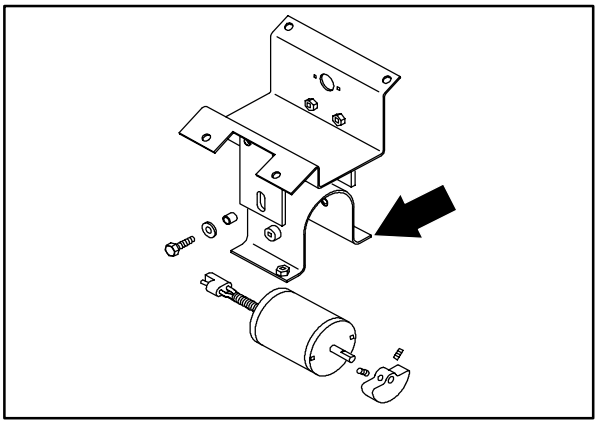
3. Unplug the filter shaker motor from the hopper harness.



4. Remove the two hex screws and sleeves holding the shaker motor assembly to the shaker support bracket. Remove the shaker motor assembly from the hopper.

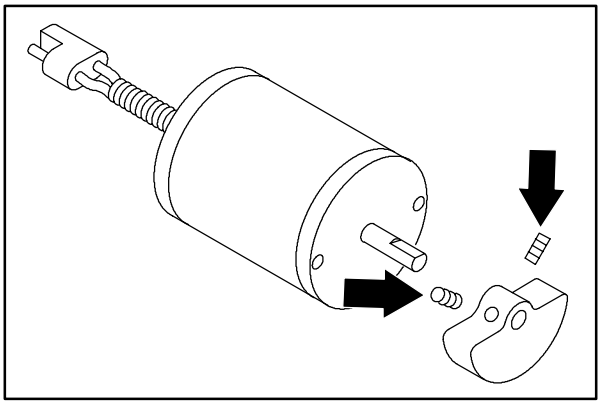


5. Remove the two hex screws holding the shaker motor bracket to the motor assembly. Remove the motor from the assembly.

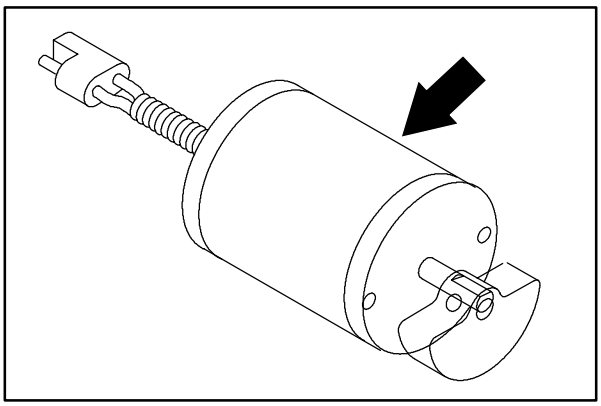


6. Loosen the two set screws on the eccentric weight. Pull the weight off the motor shaft.

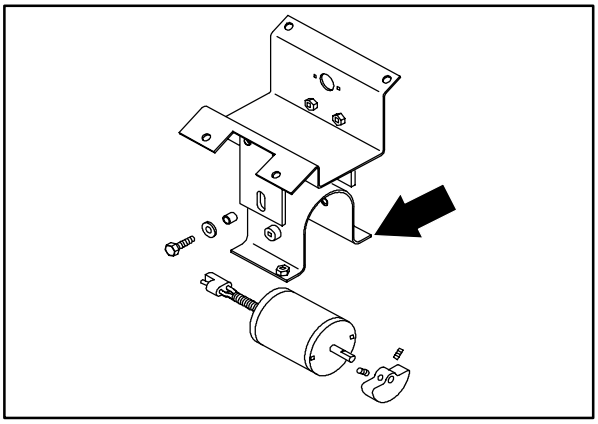
7. Install the eccentric weight on the new shaker motor. Position the weight flush with the guard plate.



8. Install the new shaker motor on the assembly mount plate. Tighten the two hex screws to 18 – 24 Nm (15 – 20 ft lb).

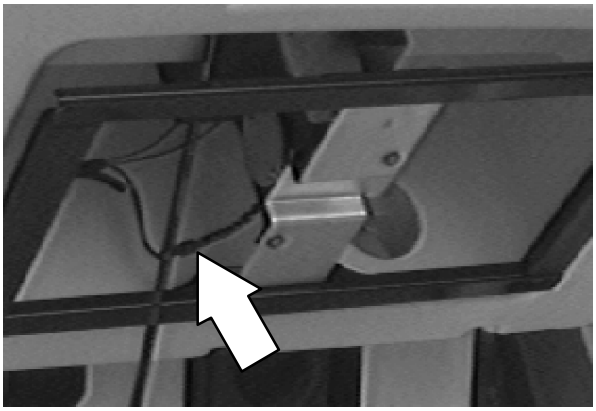


9. Reinstall the motor assembly on the shaker motor support bracket. Make sure the sleeves are in place on the two hex screws. tighten to 18 – 24 Nm (15 – 20 ft lb).

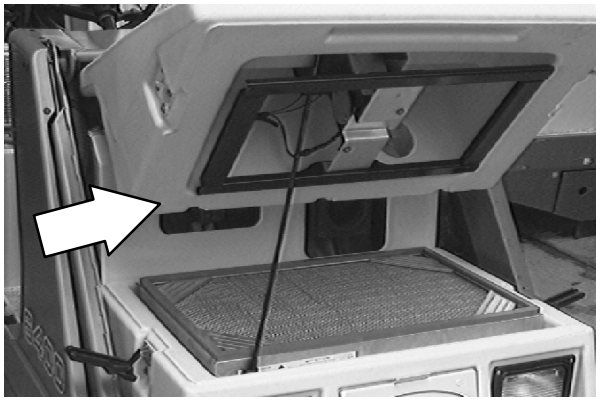


10. Plug the shaker motor into the hopper harness.

11. Test the shaker motor for proper operation.



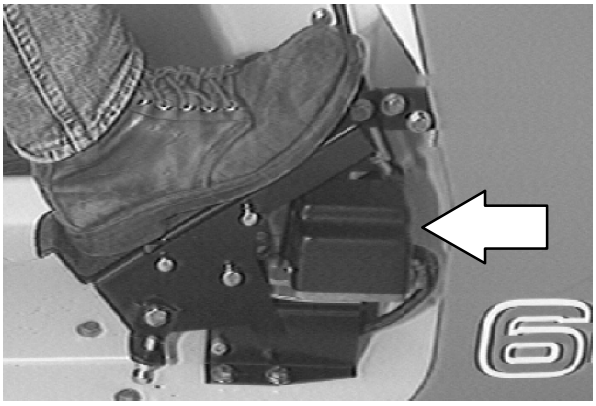
12. Disengage the hopper cover prop rod and lower the cover.



DIRECTIONAL PEDAL

The directional pedal controls the direction of travel and the propelling speed of the machine. You change the speed of the machine with the pressure of your foot on the pedal; the harder you press the faster the machine travels.

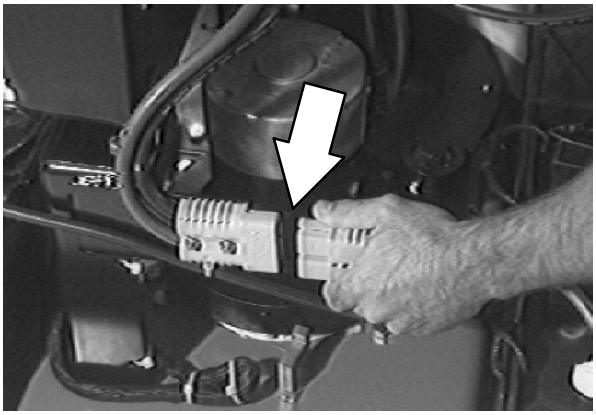
The machine will coast for a short distance before changing direction when the directional pedal is reversed. Use the brake pedal to stop the machine.



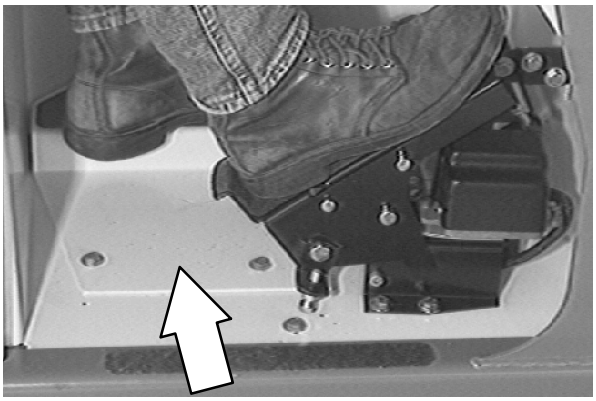
TO REPLACE DIRECTIONAL CONTROLLER

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

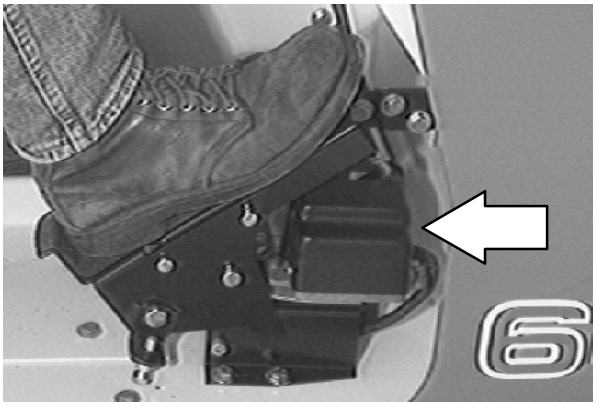
1. Open the seat support and disconnect the batteries.



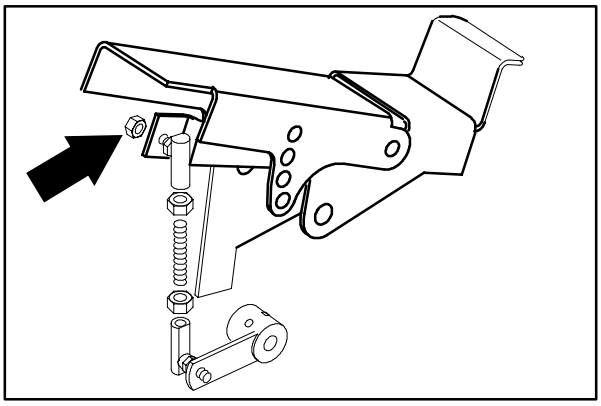
2. Remove the floor plate in the operators compartment.



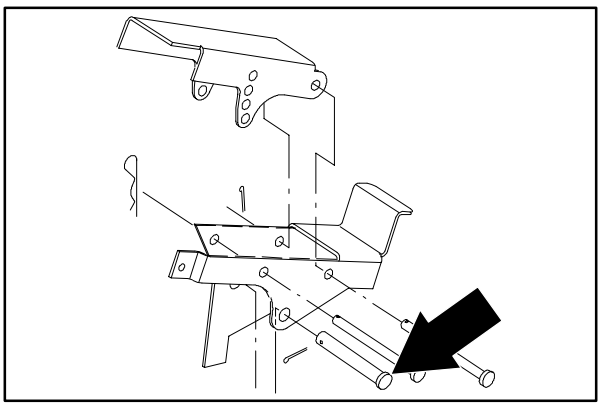
3. Disconnect the directional controller from the main harness.



4. Remove the nut holding the upper balljoint to the front of the directional pedal.

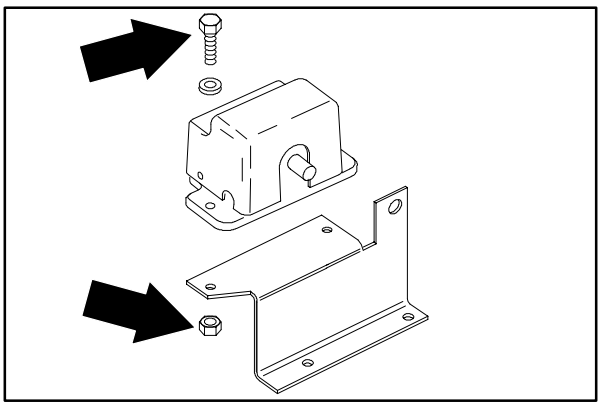


5. Remove the cotter pin and clevis pin holding the directional pedal to the directional assembly. Remove the pedal from the machine.

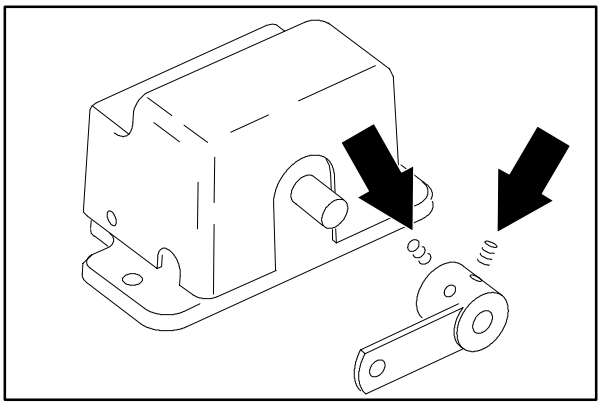


6. Remove the two hex screws holding the directional controller to the two mount brackets. Remove the directional controller from the machine.

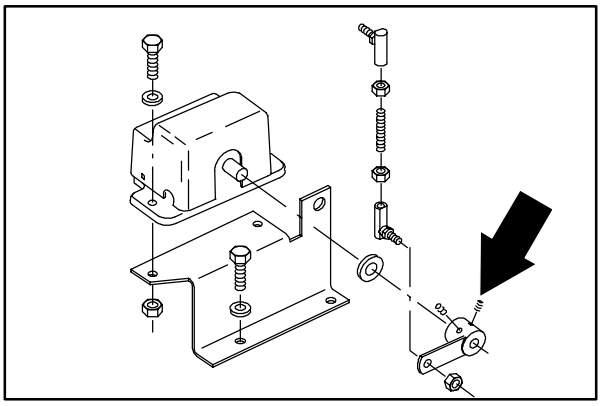
NOTE: Mark the orientation of the arm to the controller for proper re-assembly.



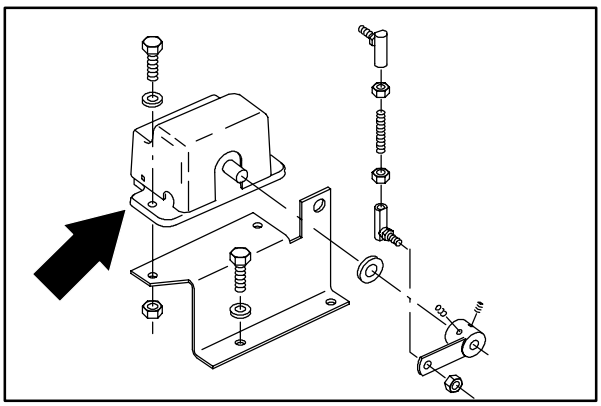
7. Loosen the two set screws holding the arm to the controller. Pull the arm and balljoint assembly off the controller shaft.



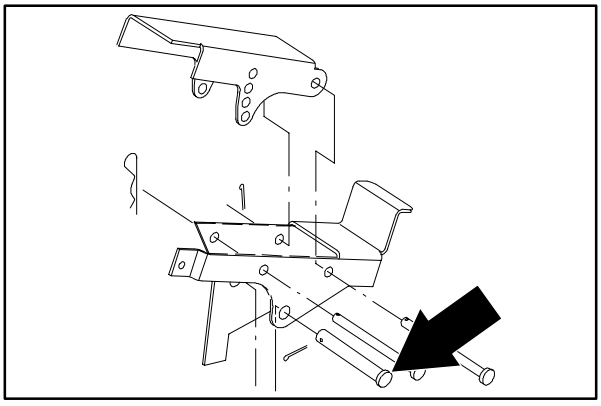
8. Install the arm and balljoint assembly on the shaft of the new controller in the same orientation as it was removed. Hand tighten the two set screws firmly.



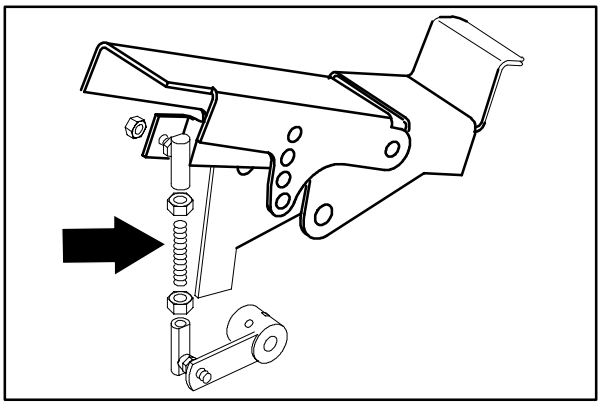
9. Position the new controller on the left hand mount bracket. Reinstall the two hex screws and nuts. Tighten to 8 – 10 Nm (5 – 6 ft lb).



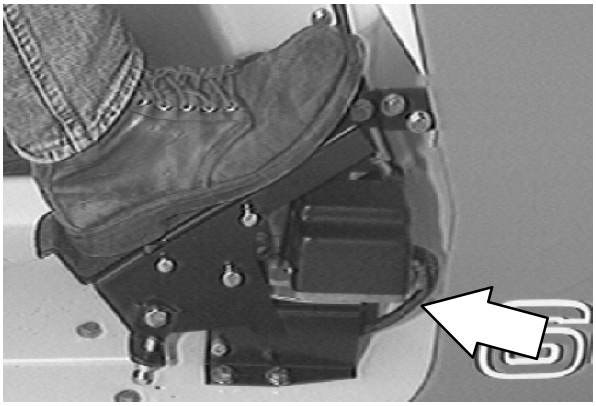
10. Position the pedal, clevis pin, and cotter pin back on the mount brackets.



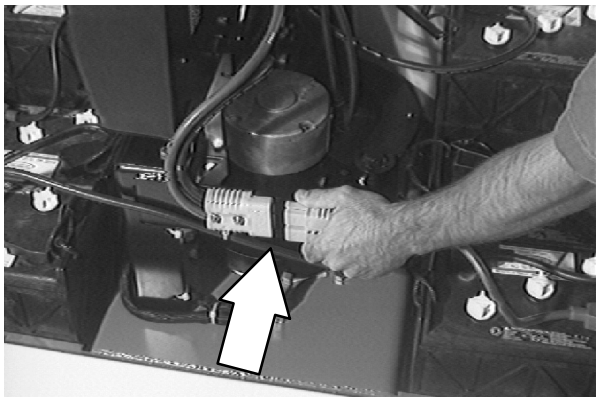
11. The pedal and controller should now be in a neutral position. Adjusted the threaded rod and balljoint so it lines up with the hole in the accelerator arm. Reinstall the nut on the balljoint and tighten to 8 – 10 Nm (5 – 6 ft lb).



12. Feed the controller wire harness back down under the floor plate and reconnect to the main harness.



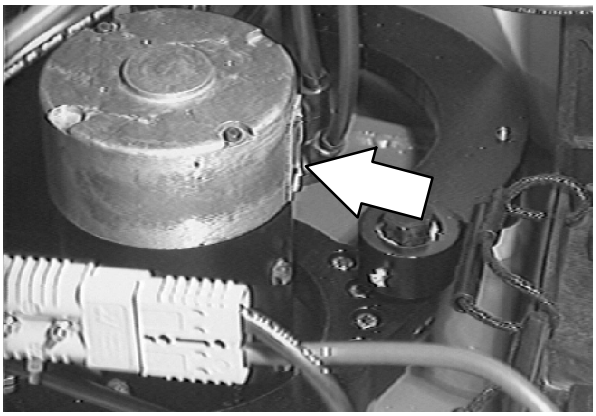
13. Reconnect the batteries and operate the machine. Check the controller for proper operation.



REAR DRIVE MOTOR

The rear drive motor is assembled to the rear drive gear box. It is controlled by the foot pedal in the operators compartment.

The carbon brushes on the rear drive motor should be inspected after every 800 hours of machine operation.

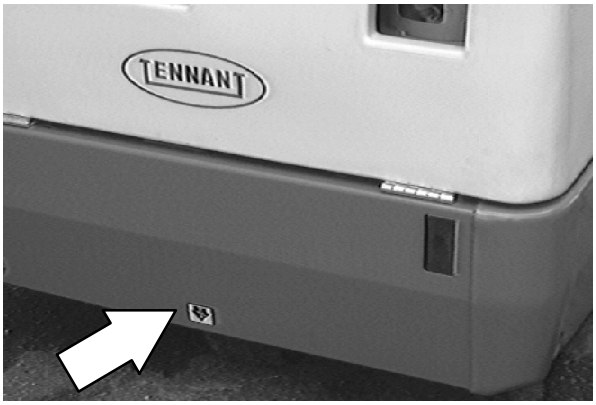


TO REPLACE REAR DRIVE MOTOR

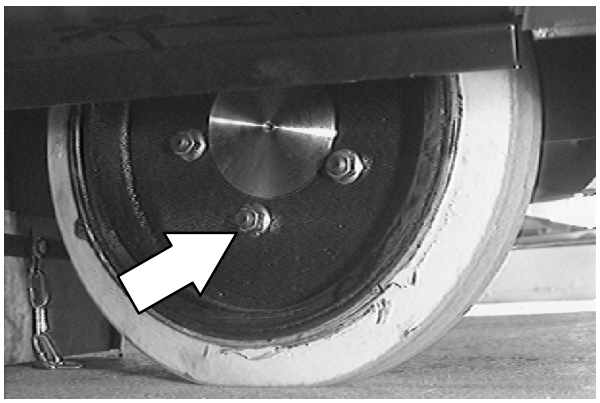
FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Raise the rear of the machine and place jack stands under the machine frame.

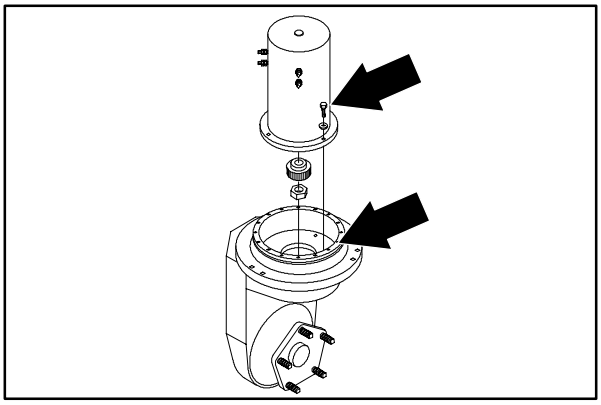
   FOR SAFETY: When servicing machine, jack up machine at designated locations only. Block machine up with jack stands.



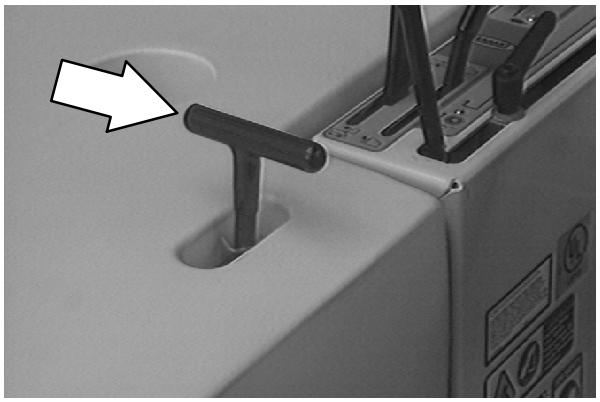
2. Remove the rear tire and wheel assembly.



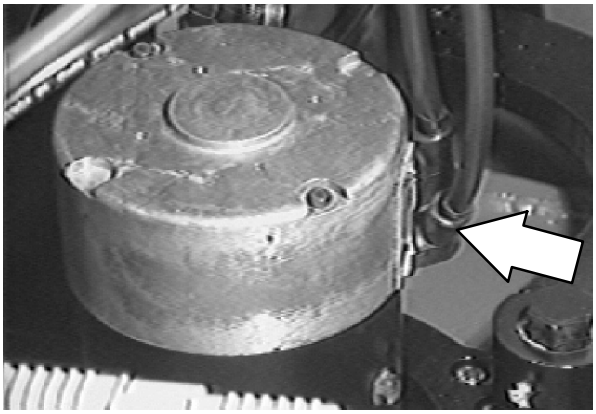
3. Remove the three hex screws holding the drive motor to the gearbox.



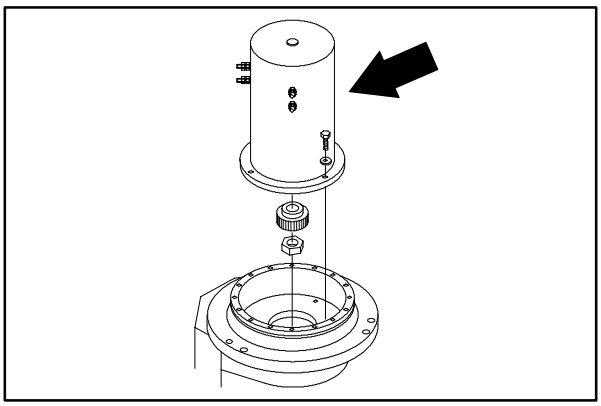
4. Open the seat support and disconnect the batteries.



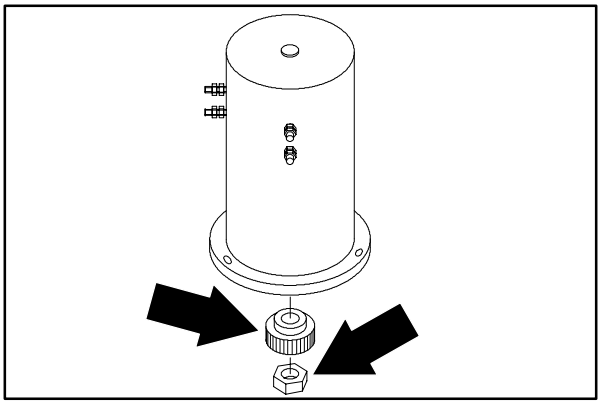
5. Remove the four power cables leading to the rear drive motor.



6. Mark the location of the drive motor in relation to the gearbox. Lift the drive motor up and out of the gearbox. Remove the drive motor from the machine.

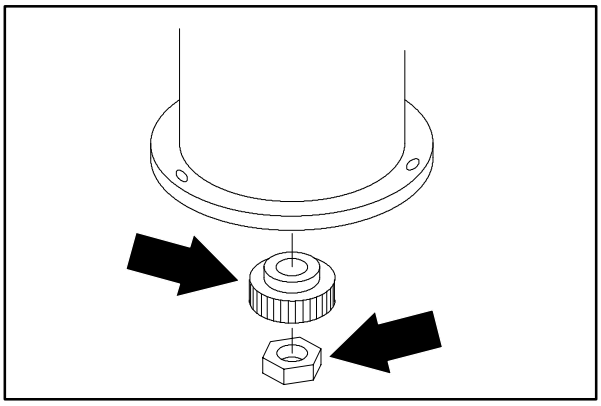


7. Remove the nut holding the drive gear to the tapered shaft on the bottom of the drive motor.



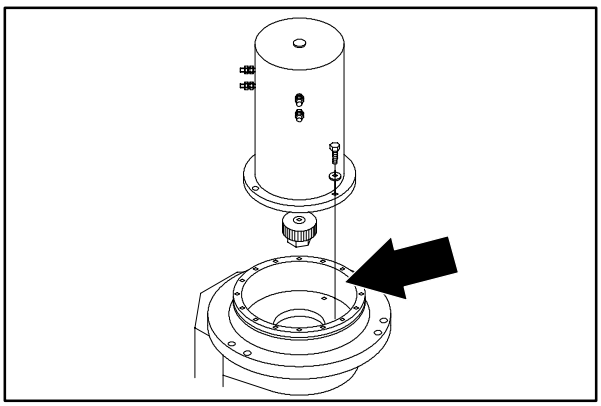
8. Use a puller to remove the gear from the drive motor shaft.

9. Install the gear on the new motor. Make sure the key is installed on the tapered shaft. Tighten the hex nut to 14 – 18 Nm (10 – 13 ft lb).

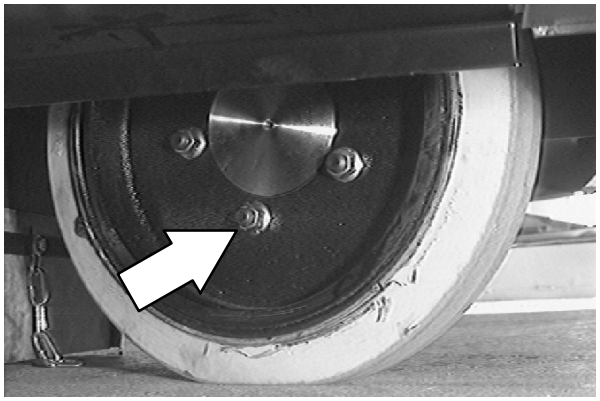


10. Position the new motor on the propelling gearbox in the same orientation as the old one. Line up the holes in the motor with the holes in the propelling gearbox.

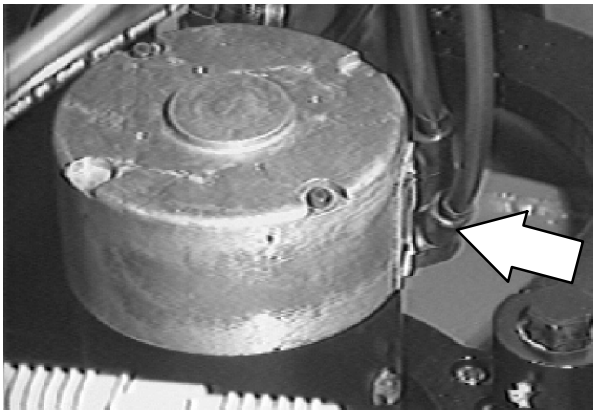
11. Reinstall the three hex screws and tighten to 18 – 24 Nm (15 – 20 ft lb).



12. Reinstall the rear tire and wheel assembly. Tighten the wheel nuts to 122 – 150 Nm (90 – 110 ft lb).

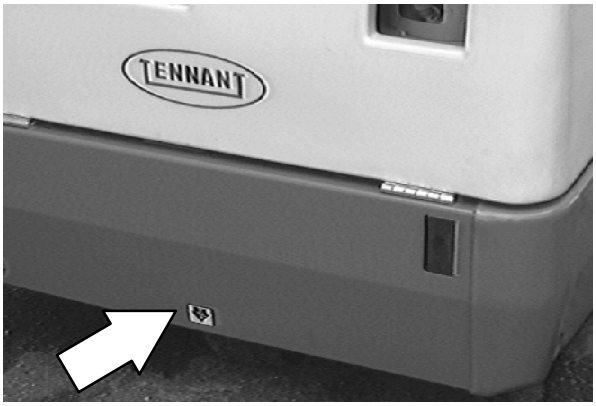


13. Reconnect the four power cables to the drive motor. See Power Cable drawing in this section.



14. Reconnect the batteries and close the seat support.

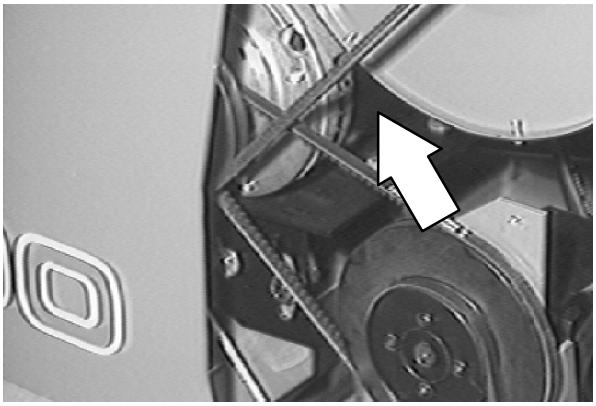
15. Lower the machine to the floor and operate the propelling. Check for proper operation.



MAIN ACCESSORIES MOTOR

The main electric motor is assembled to the mount bracket on the left side of the machine, near the vacuum fan assembly. The main electric motor operates the vacuum fan, hydraulic pump, and the main sweep brush.

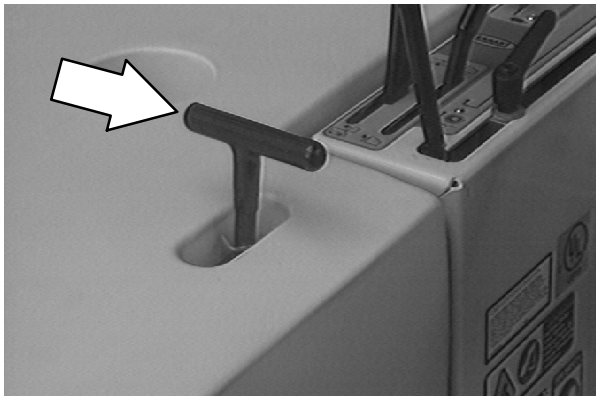
The carbon brushes on the accessories motor should be inspected after every 800 hours of machine operation.



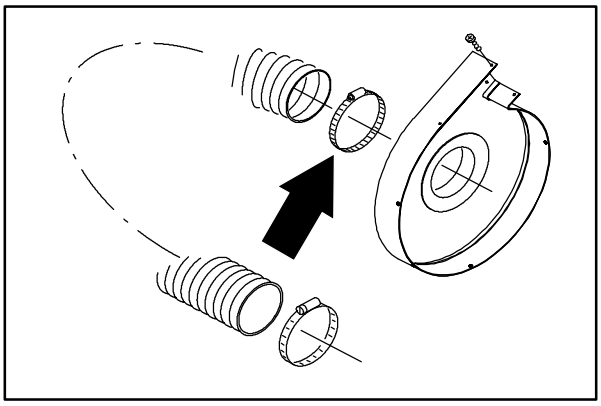
TO REPLACE MAIN ACCESSORIES MOTOR

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

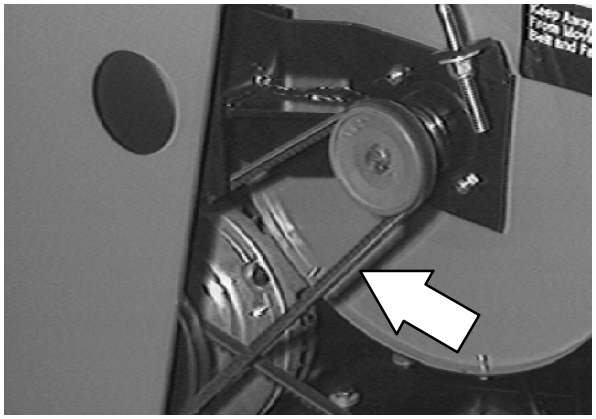
1. Open the seat support and disconnect the batteries.



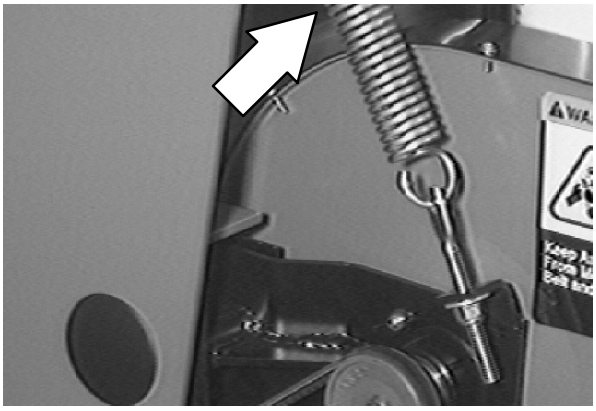
2. Remove the hose leading to the vacuum fan assembly.



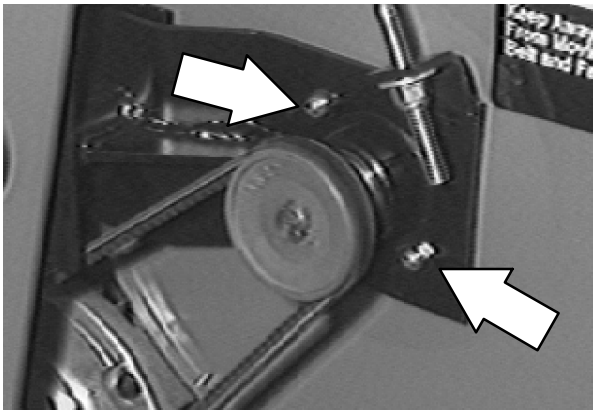
3. Push down on the vacuum fan assembly and remove the V-belt from the fan sheave and motor sheave.



4. Remove the vacuum fan belt tensioning spring.

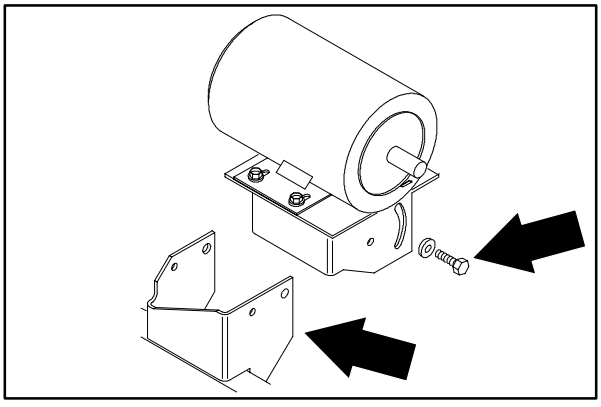


5. Remove the two hex screws holding the vacuum fan mount bracket to the machine frame. Remove the vacuum fan assembly from the machine.

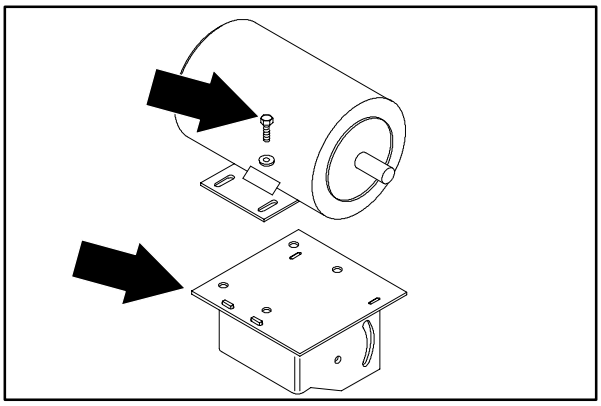


6. Loosen the two hex screws in the adjustment slots on the motor mount pivot. Let the pivot drop down and remove the V-belt from the motor sheave.

7. Disconnect the two electrical cables leading to the accessories motor.

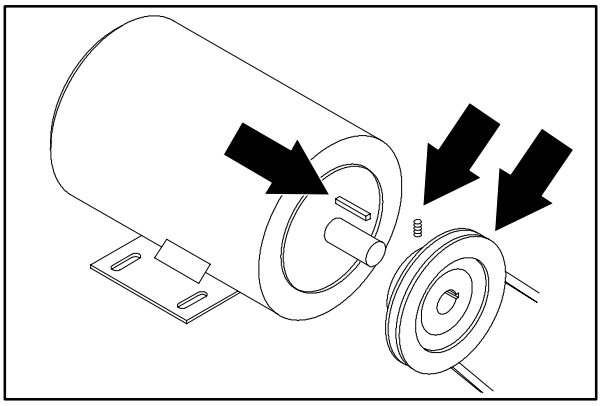


8. Remove the four hex screws holding the motor to the mount pivot. Remove the motor from the machine.

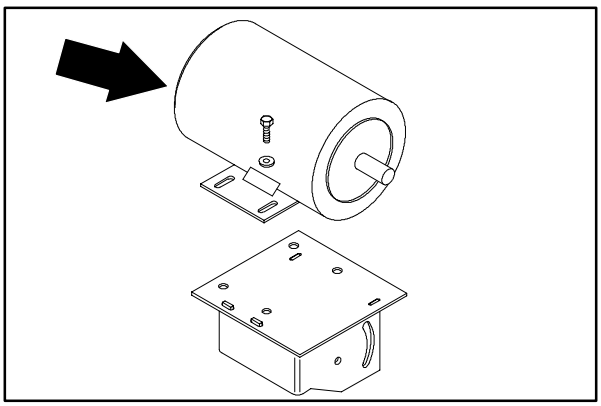


9. Loosen the two set screws holding the V-belt sheave to the accessories motor. Remove the sheave and install it on the new motor in the same orientation. Snug, but do not tighten the set screws at this time.

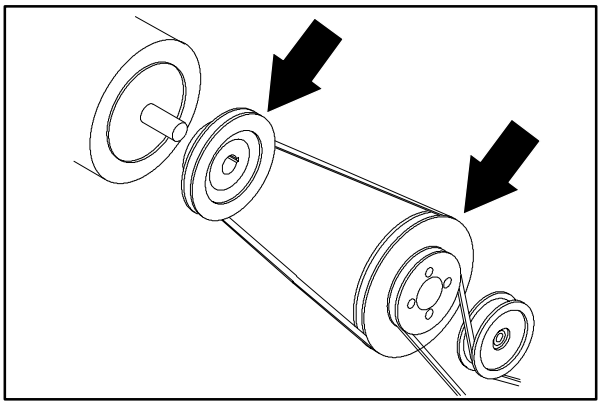
NOTE: Make sure the key is installed on the shaft of the new motor before installing sheave.



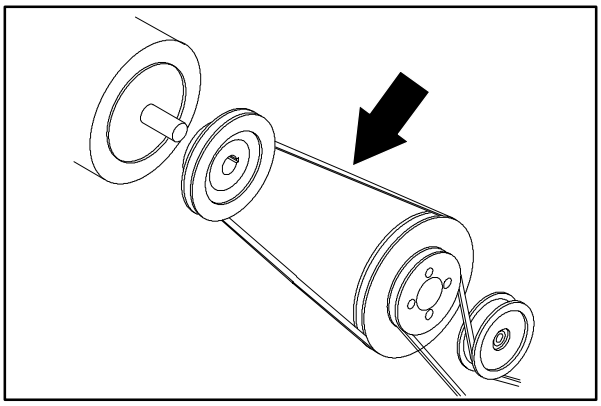
10. Install the new motor assembly on the mount pivot. Reinstall the four hex screws and slide the motor towards the hopper until the motor base contacts the stops on the bracket. Tighten the four hex screws to 18 – 24 Nm (15 – 20 ft lb).



11. Use a straight edge to line up the sheave on the motor assembly with the sheave on the hydraulic pump. Tighten the two set screws firmly.

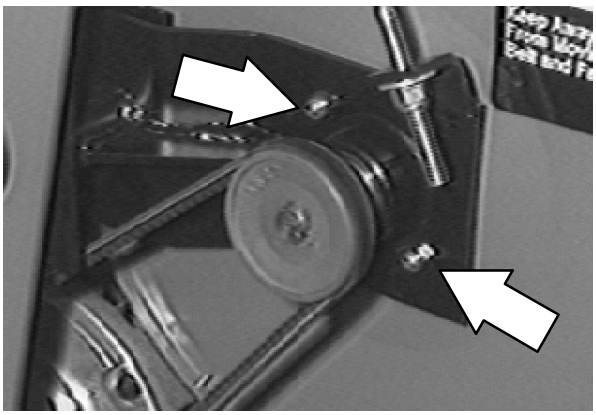


12. Place the pump/accessories motor V-belt on the small diameter sheave on the accessories motor. Pull up on the motor mount pivot until the V-belt is tight. Tighten the two hex screws tight. The proper tension is when the belt deflects 4mm (.15in) from a force of 2.5 Kg (5.5 lb) at belt midpoint.

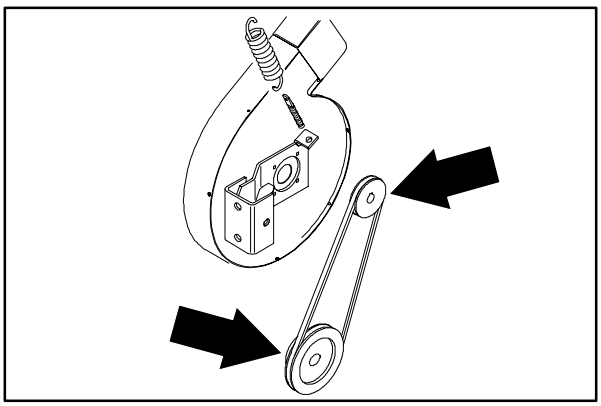


13. Reconnect the two electric cables to the new motor. See electrical diagram in this section.

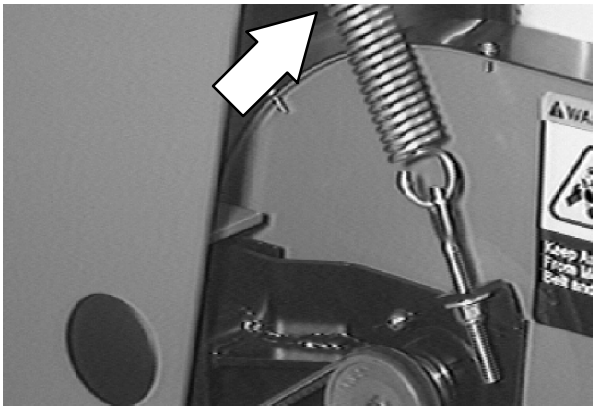
14. Reinstall the vacuum fan assembly in the machine. Line up the two mount holes in the vacuum fan assembly with the mount holes in the machine frame. Reinstall the two hex screws. Leave loose for now.



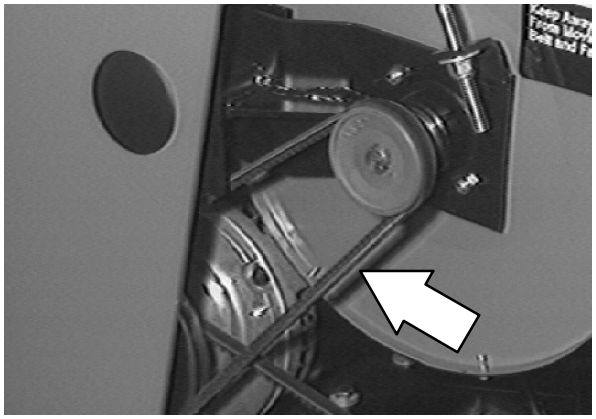
15. Use a straight edge to line up the sheave on the vacuum fan assembly with the sheave on the accessories motor. Tighten the two hex screws to 18 - 24 Nm (15 - 20 ft lb).



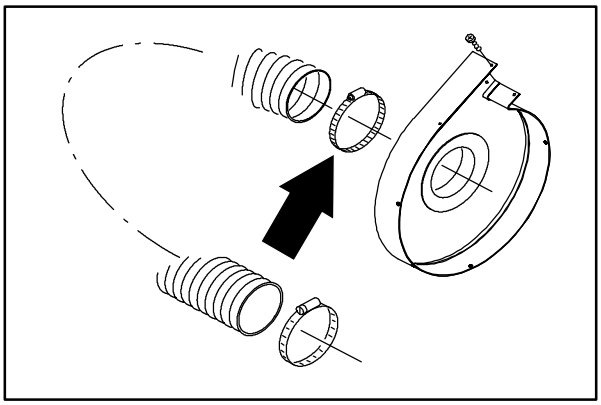
16. Reinstall the vacuum fan V-belt tension spring to the vacuum fan and machine frame.



17. Push down on the vacuum fan and reinstall the V-belt on the vacuum fan sheave and large diameter accessories motor sheave. Let up on the vacuum fan. Check vacuum fan belt tension. See TO TENSION VACUUM FAN BELT in the sweeping section.

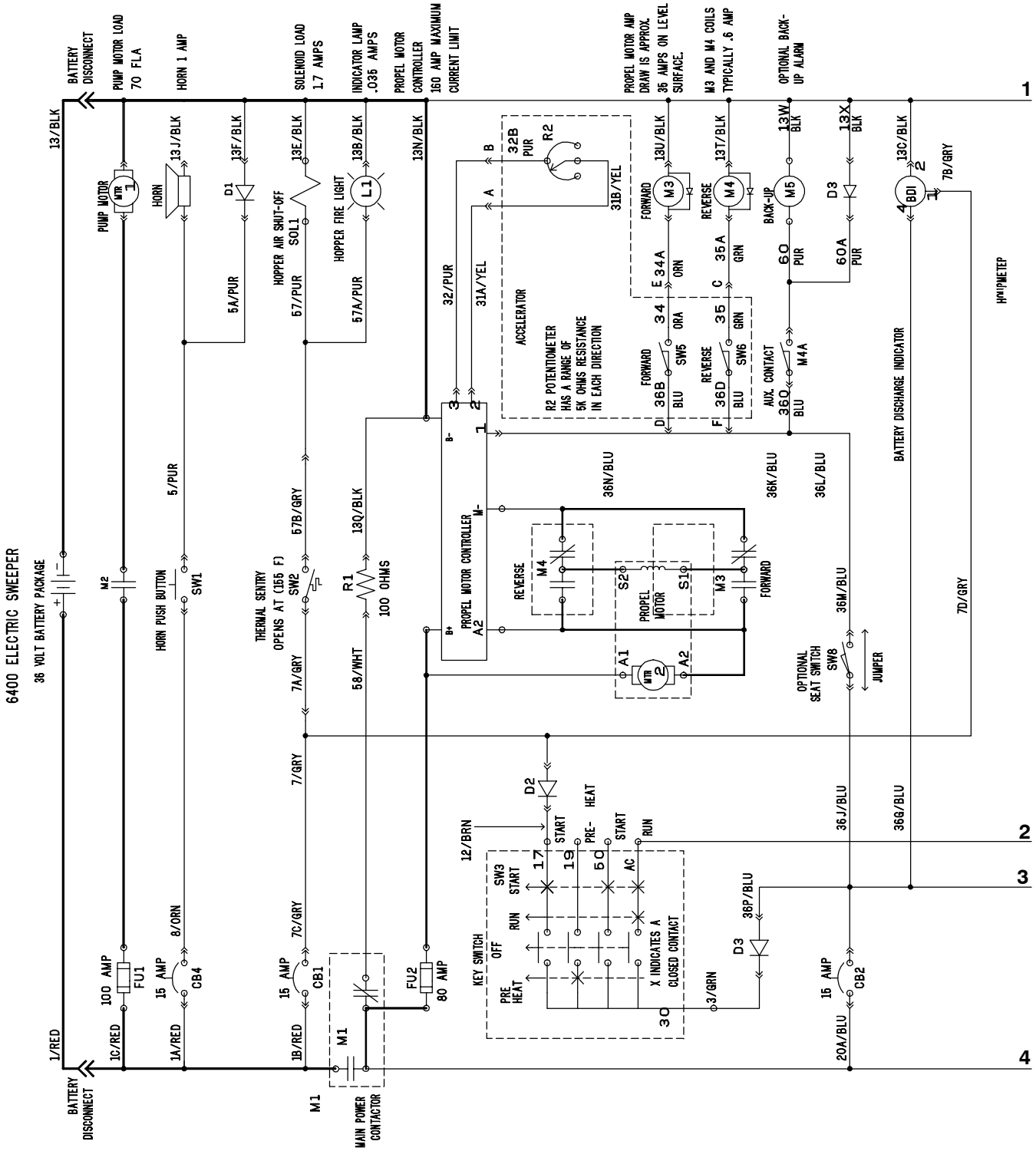


18. Reinstall the hose on the vacuum fan assembly.

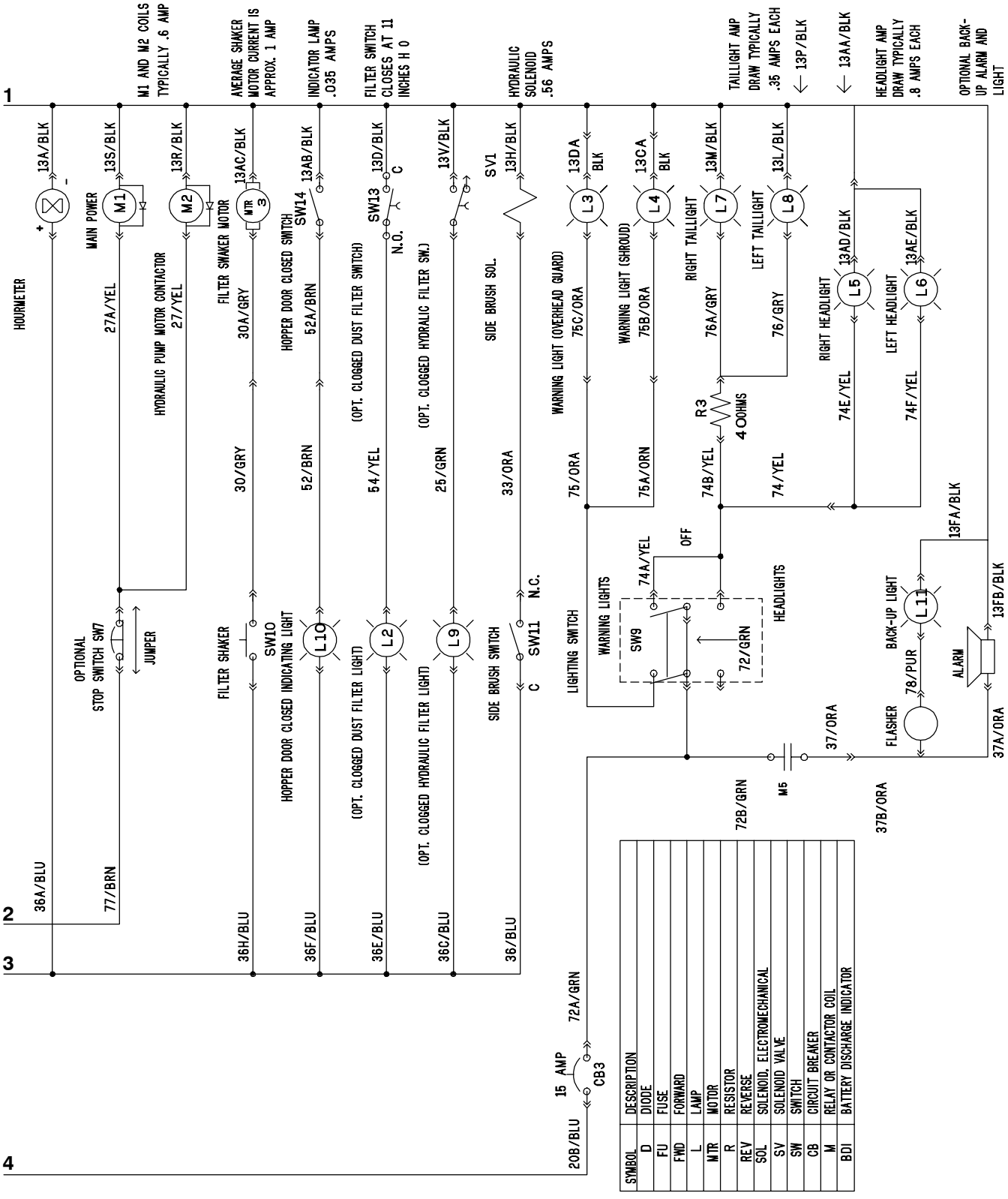


19. Reconnect the batteries. Start the machine and check the new motor for proper operation.

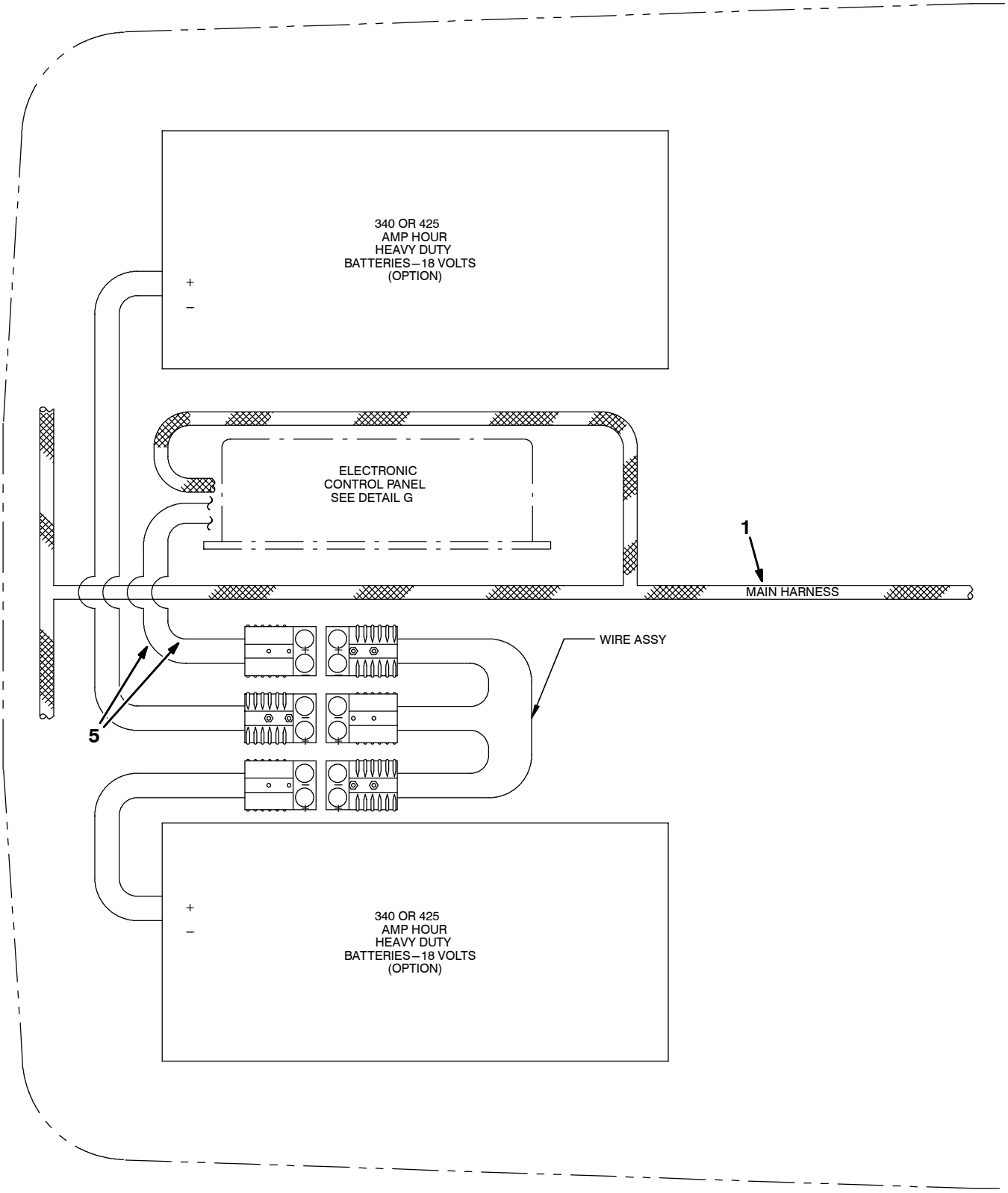
ELECTRICAL SCHEMATIC



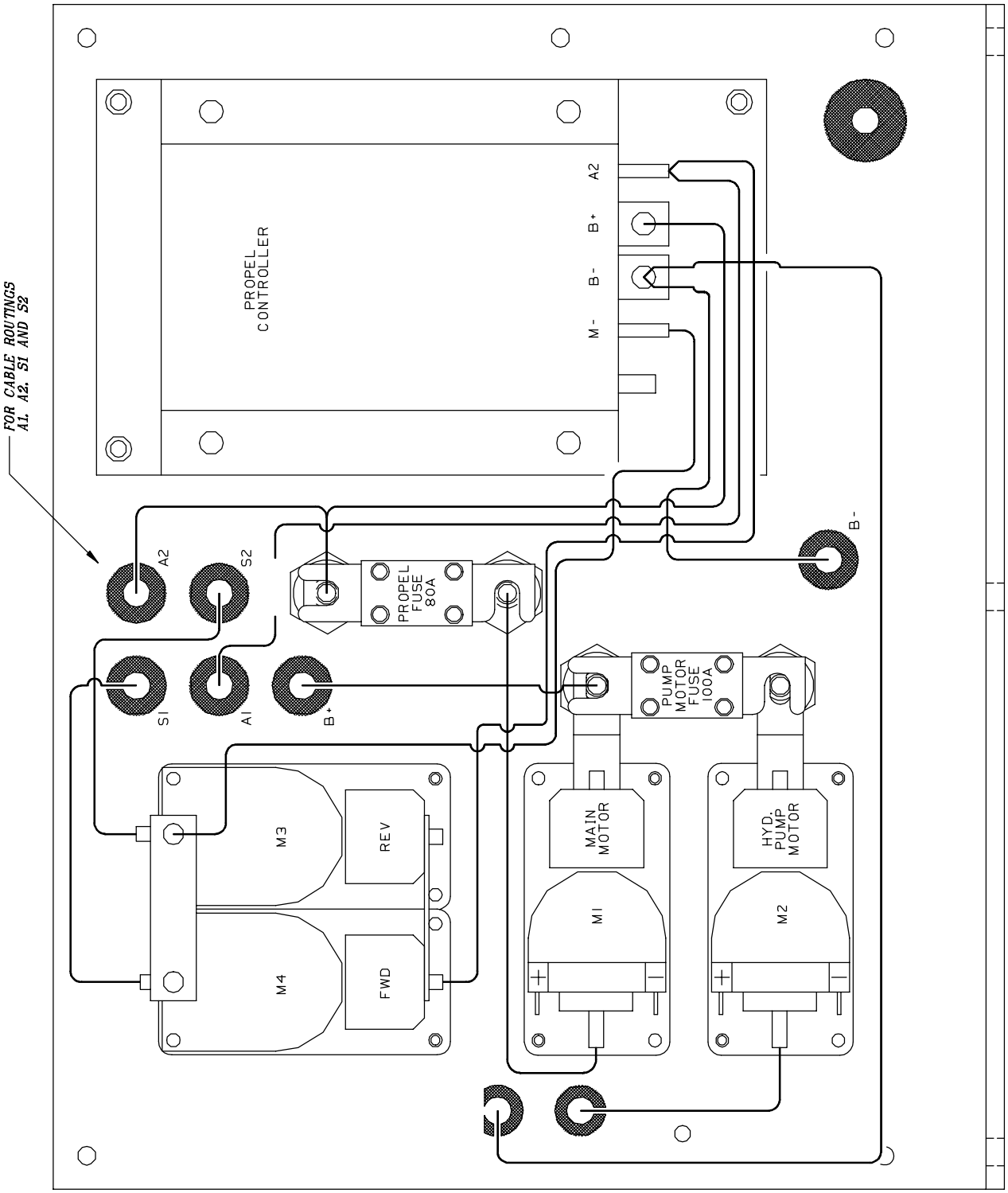
ELECTRICAL SCHEMATIC



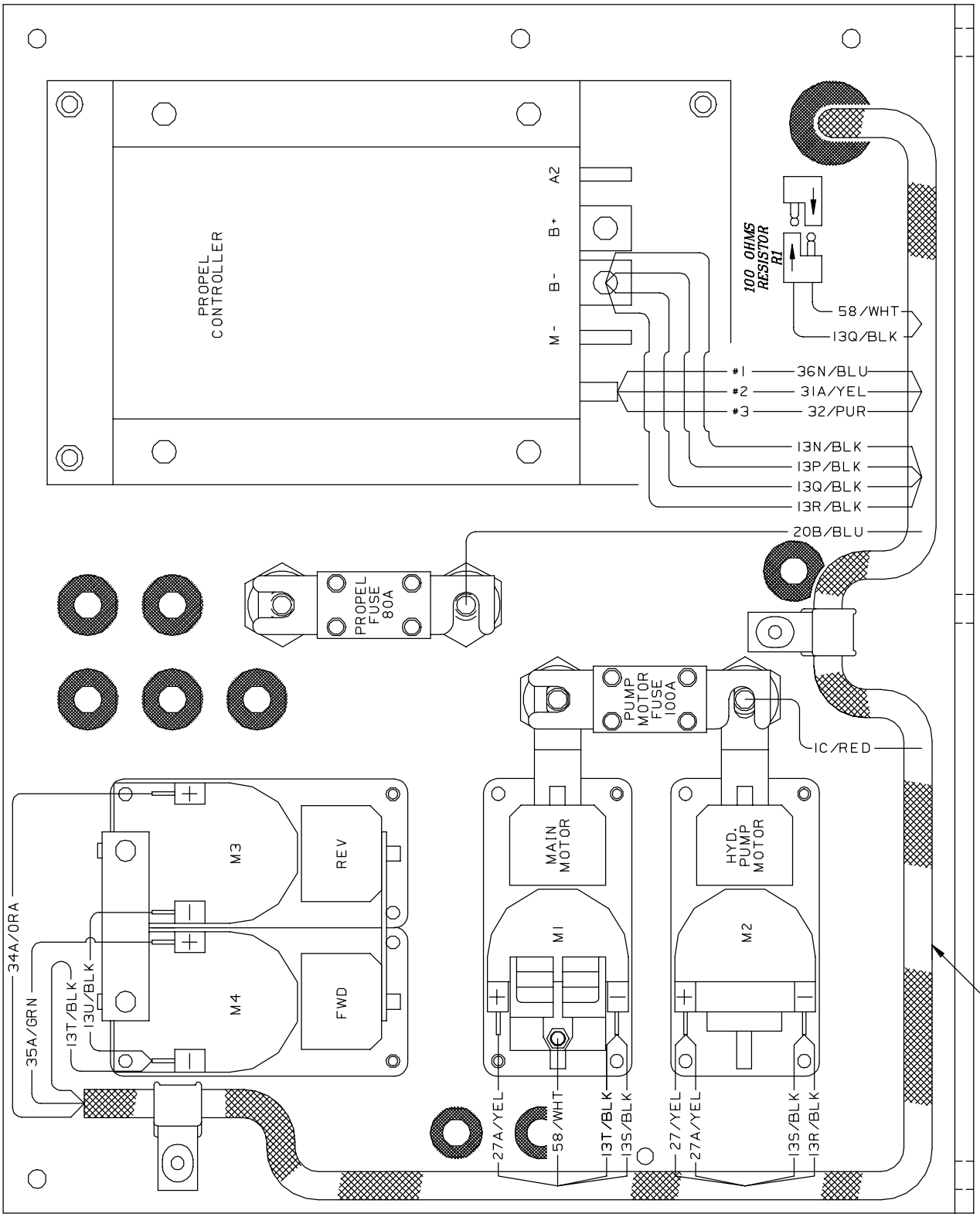
WIRE HARNESS GROUP



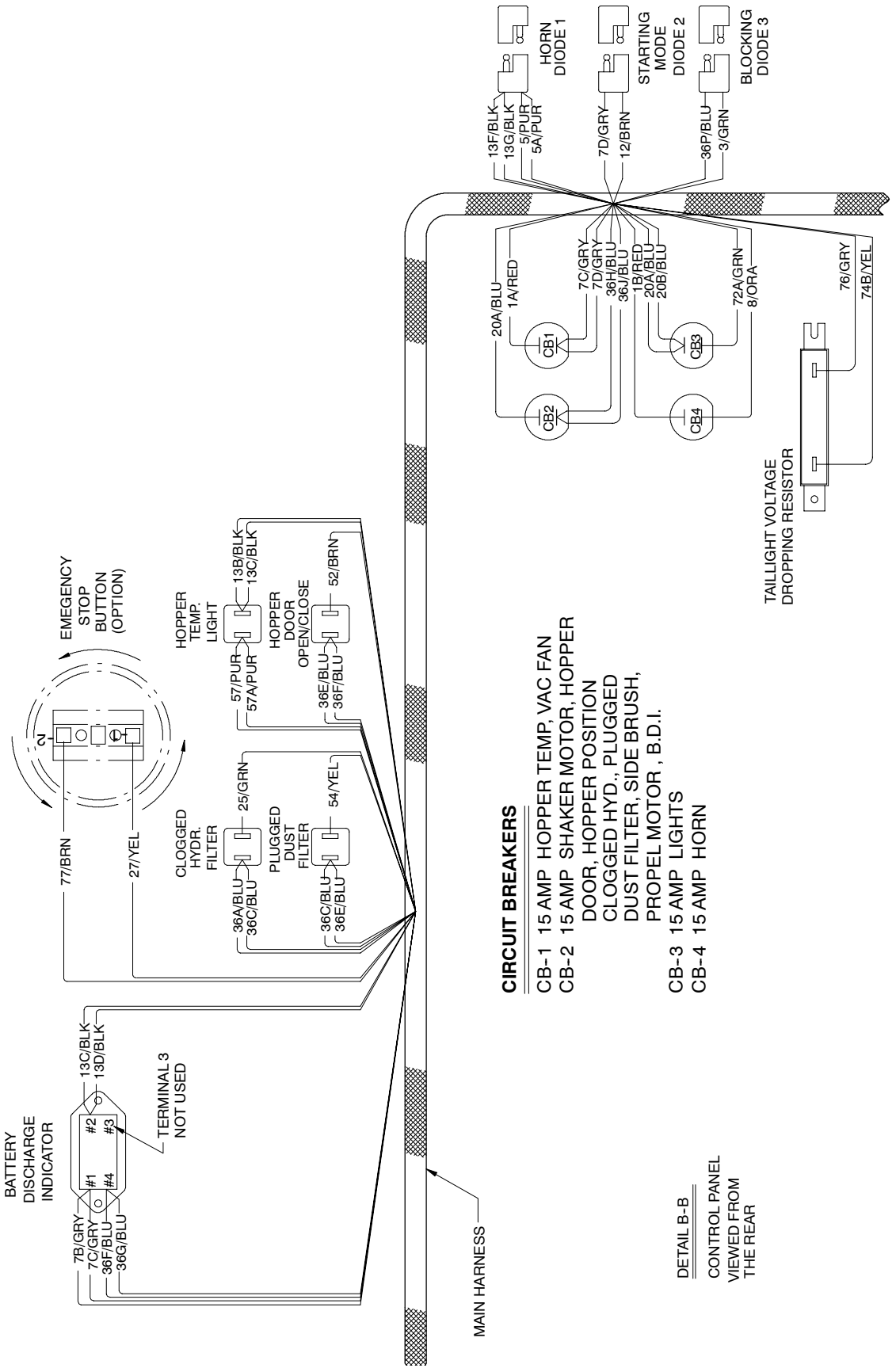
CONTROL PANEL CABLE GROUP



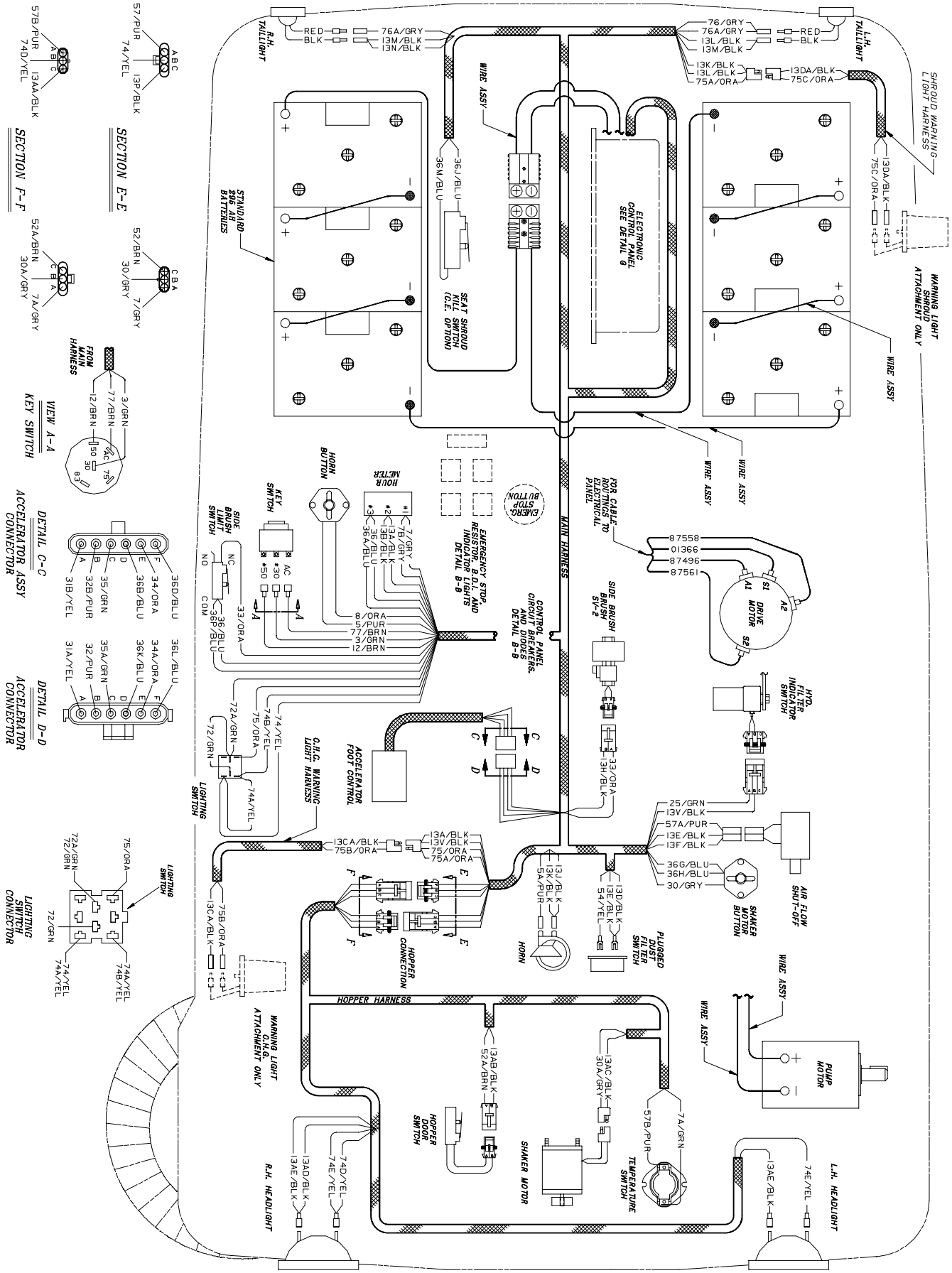
CONTROL PANEL WIRE GROUP



WIRE HARNESS GROUP



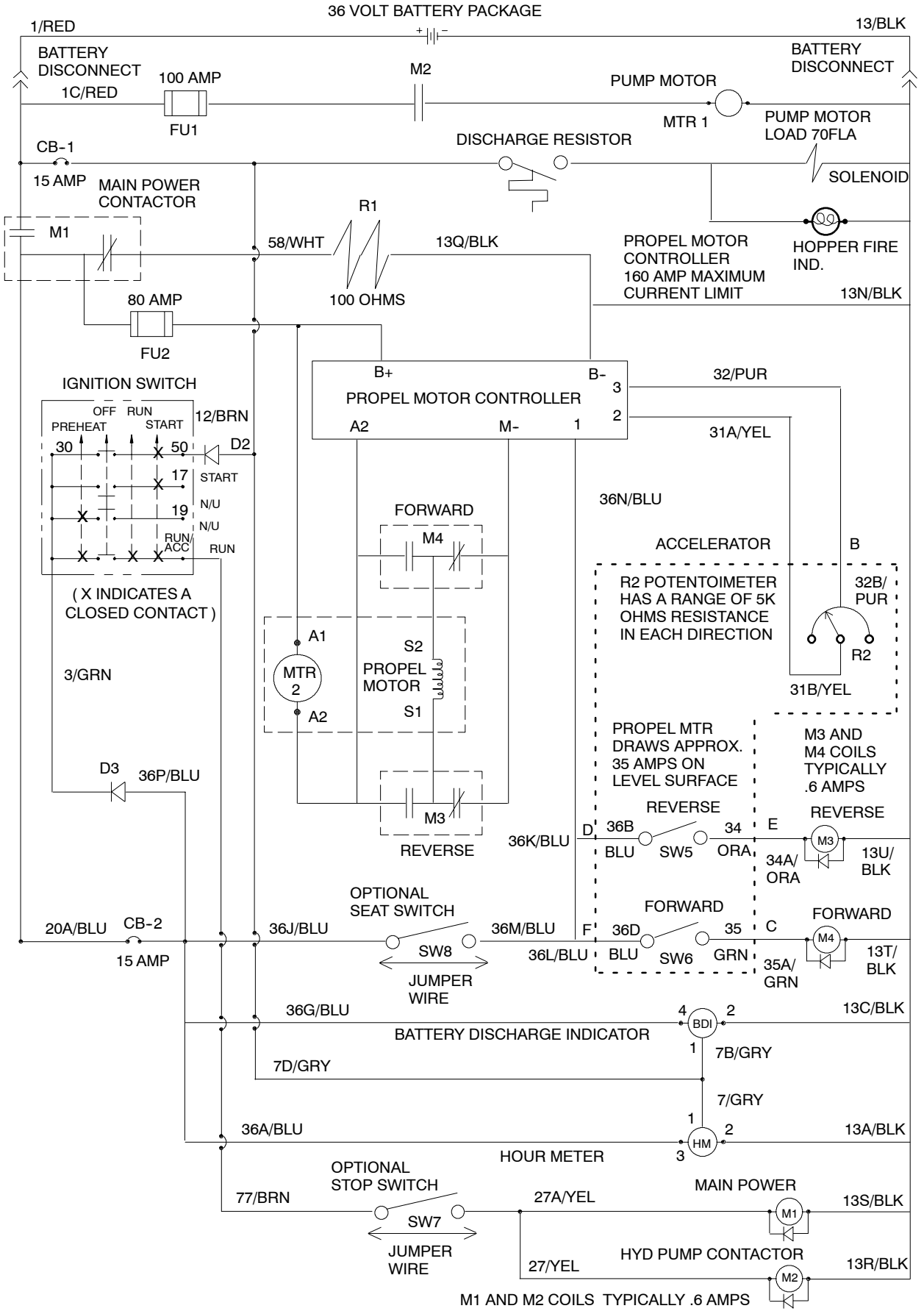
WIRE HARNESS GROUP



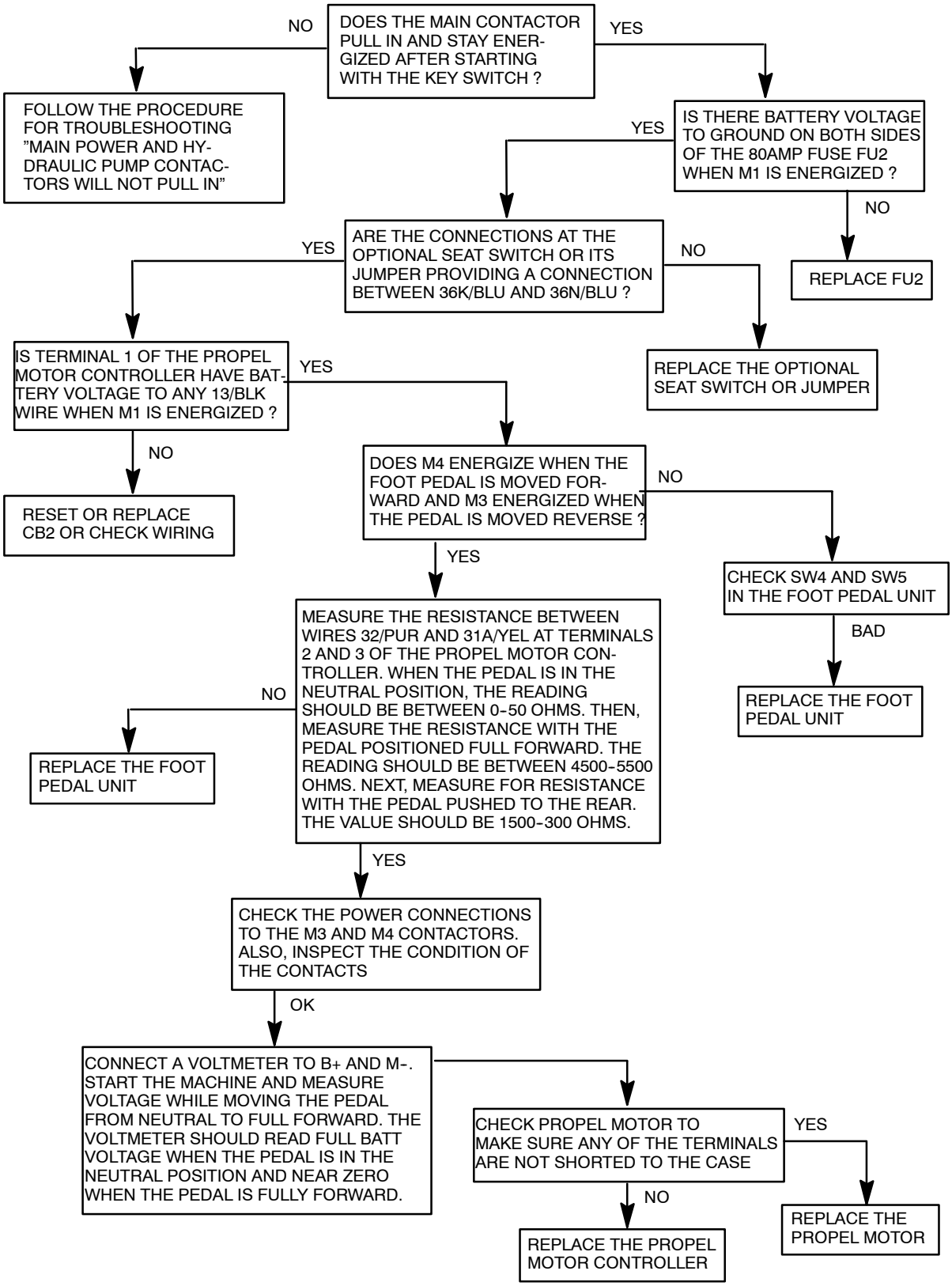
TROUBLESHOOTING

The troubleshooting charts that follow are organized so they lead you through the circuits. They include flow charts and instructions for you as to where to insert your test instruments.

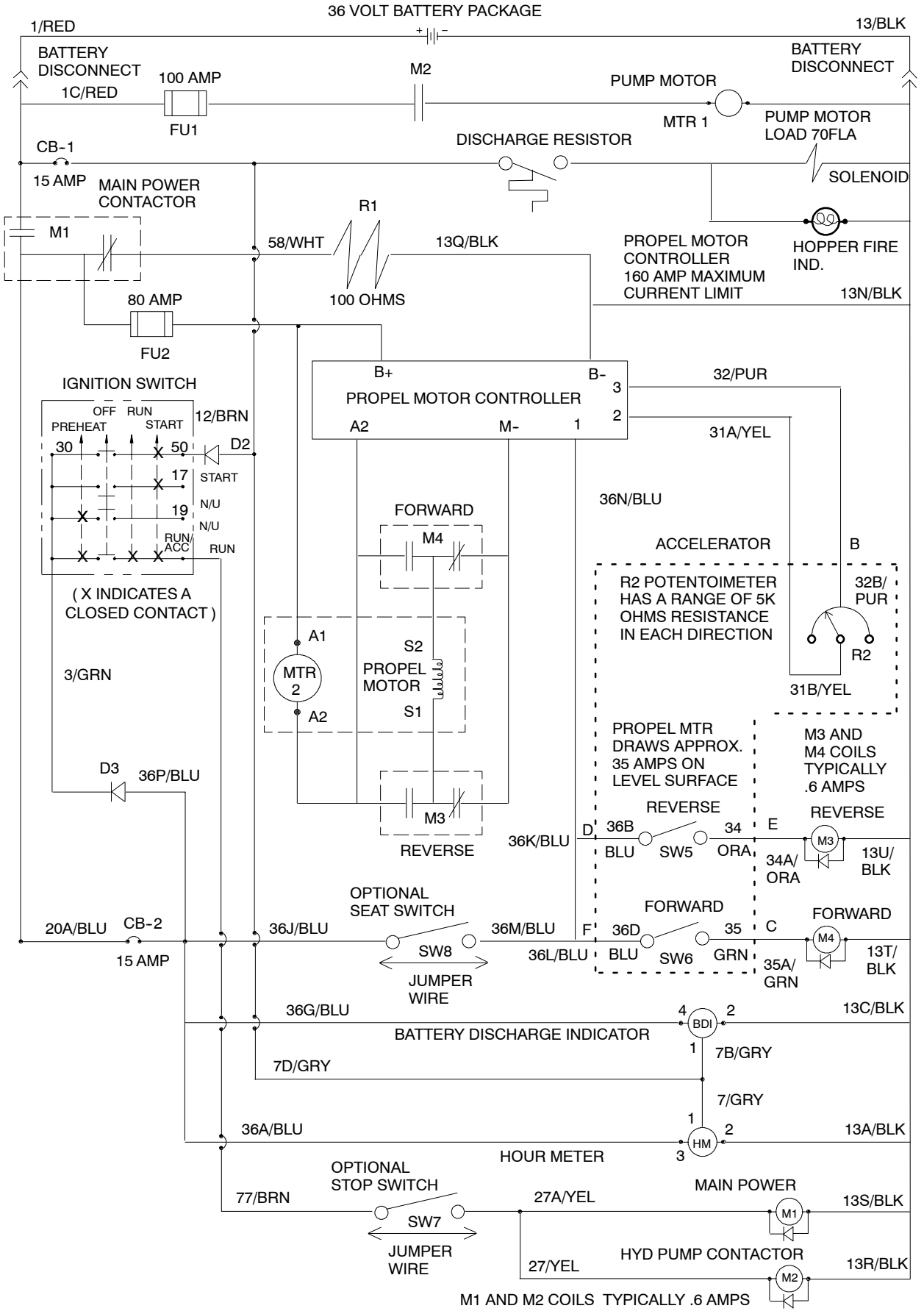
6400E ELECTRICAL SCHEMATIC (POWER-ON / PROPEL CIRCUITS)



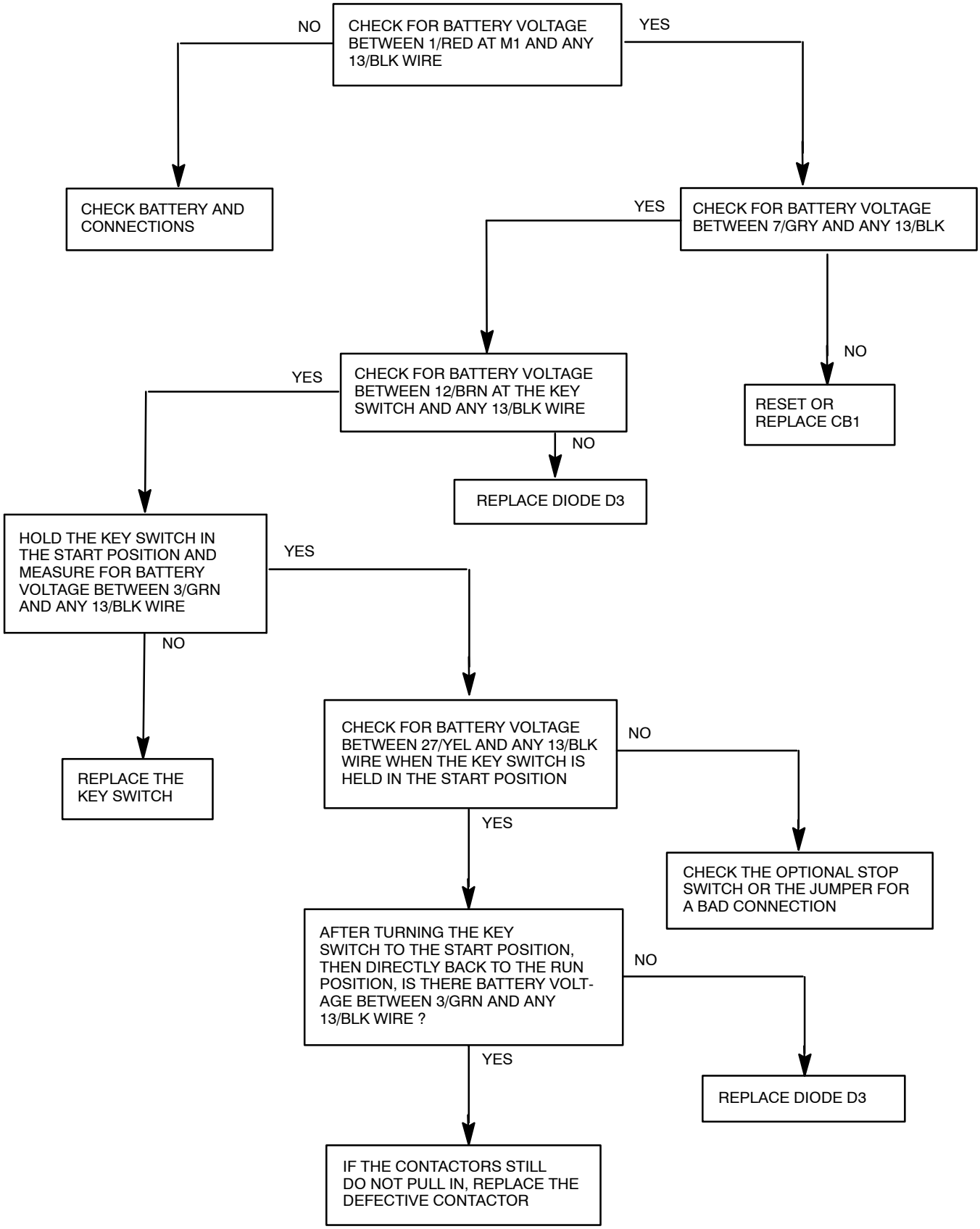
MACHINE WILL NOT PROPEL



6400E ELECTRICAL SCHEMATIC (POWER-ON / PROPEL CIRCUITS)



MAIN POWER AND HYDRAULIC PUMP CONTACTORS WILL NOT PULL IN



CONTENTS

INTRODUCTION

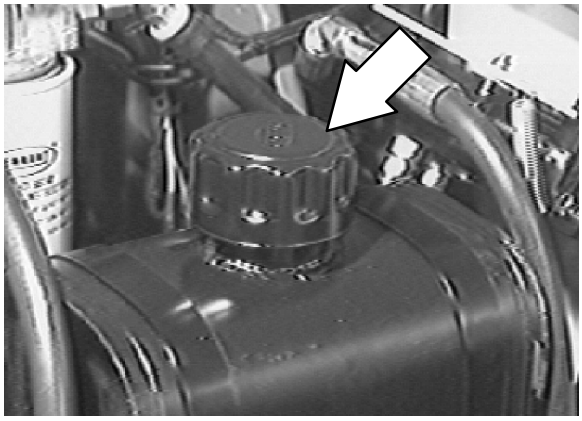
The hydraulic system consists of the propel pump, accessory pump, control valve, drive motors, and vacuum fan motor.

HYDRAULICS

HYDRAULIC FLUID RESERVOIR

The reservoir is located in front of the batteries next to the vacuum fan.

Mounted on top of the reservoir is a filler cap with a built-in breather and fluid level dipstick. Replace the cap after every 800 hours of operation.



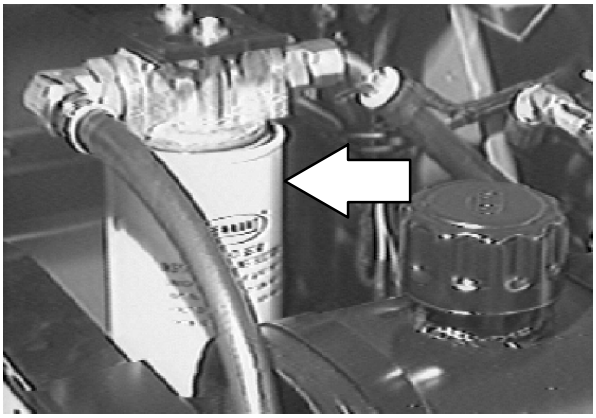
Check the hydraulic fluid level at operating temperature after every 100 hours of operation. Make sure the hopper is down when checking hydraulic fluid level. The end of the dipstick is marked with FULL and ADD levels to indicate the level of hydraulic fluid in the reservoir.

Lubricate the filler cap gasket with a film of hydraulic fluid before putting the cap back on the reservoir.

> **ATTENTION! Do not overfill the hydraulic fluid reservoir or operate the machine with a low level of hydraulic fluid in the reservoir. Damage to the machine hydraulic system may result.**

Drain and refill the hydraulic fluid reservoir with new hydraulic fluid after every 800 hours of operation.

The hydraulic fluid filter is located at the left rear of the machine. Replace the filter element after every 800 hours of operation.



NOTE: If the machine is equipped with the hydraulic filter bypass light option, and the light comes on, replace the filter as soon as possible.

The reservoir has a built-in strainer outlet that filters hydraulic fluid before it enters the system. Replace the strainer after every 800 hours of operation.

HYDRAULIC FLUID

The quality and condition of the hydraulic fluid play a very important role in how well the machine operates. Tennant's hydraulic fluid is specially selected to meet the needs of Tennant machines.

Tennant's hydraulic fluids provide a longer life for the hydraulic components. There is one recommended fluid.

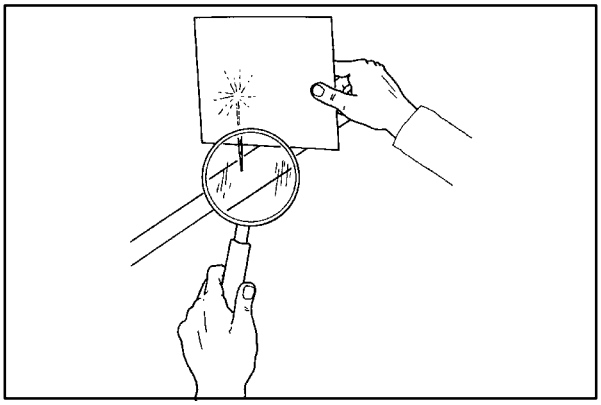
Tennant hydraulic fluid	
Part number	Fluid weight
65870	SHP 5/20

If a locally available hydraulic fluid is used, make sure the specifications match Tennant hydraulic fluid specifications. Using substitute fluids can cause premature failure of hydraulic components.

ATTENTION! Hydraulic components depend on system hydraulic fluid for internal lubrication. Malfunctions, accelerated wear, and damage will result if dirt or other contaminants enter the hydraulic system.

HYDRAULIC HOSES

Check the hydraulic hoses after every 800 hours of operation for wear or damage.



Fluid escaping at high pressure from a very small hole can be almost invisible, and can cause serious injuries.

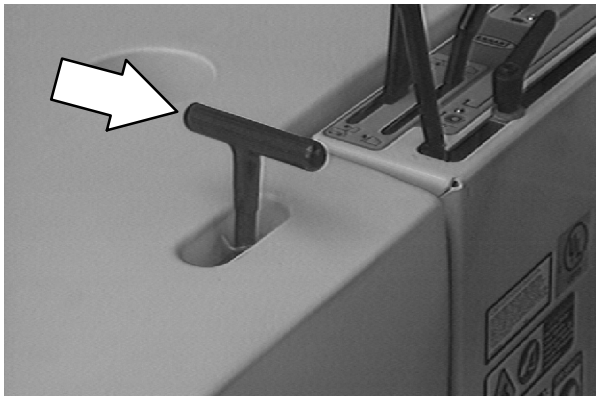
See a doctor at once if injury results from escaping hydraulic fluid. Serious infection or reaction can develop if proper medical treatment is not given immediately.

FOR SAFETY: When servicing machine, use cardboard to locate leaking hydraulic fluid under pressure.

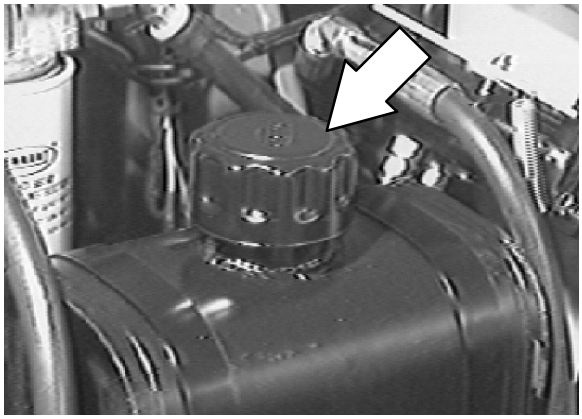
If you discover a fluid leak, contact your mechanic or supervisor.

TO FILL HYDRAULIC FLUID RESERVOIR

1. Open the seat support.



2. Remove the reservoir breather-filler cap.

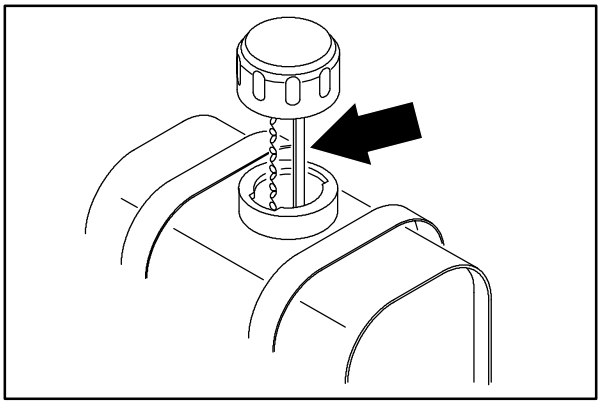


NOTE: Make sure the hydraulic reservoir drain plug is installed in the bottom of the tank before refilling.

3. Pour new, approved hydraulic fluid through a 200 mesh screened funnel and into the reservoir.

   ATTENTION! Use only new, approved hydraulic fluid to fill the hydraulic fluid reservoir. Do not overfill.

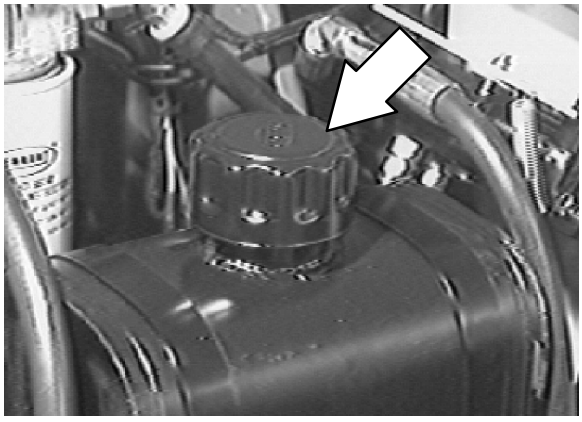
4. Check the hydraulic fluid level in the reservoir with the fluid level dipstick.



5. Add hydraulic fluid until the level in the reservoir is between the ADD and the FULL range. Do not overfill.

NOTE: Do not overfill the hydraulic fluid reservoir. Hydraulic fluid expands as it reaches its normal operating temperature. Always allow for expansion when filling the reservoir.

6. Put the reservoir breather-filler cap on the reservoir.



7. Start machine and operate all the hydraulic components.

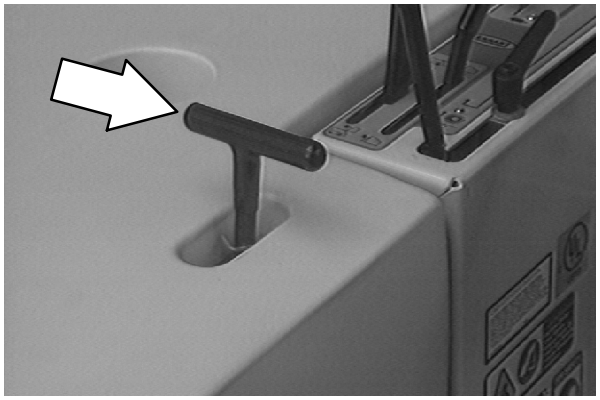
8. Recheck the hydraulic fluid level.

9. Check for any leaks.

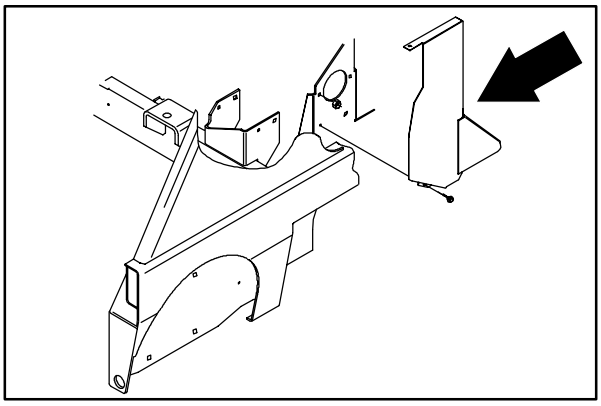
TO REPLACE HYDRAULIC PUMP

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

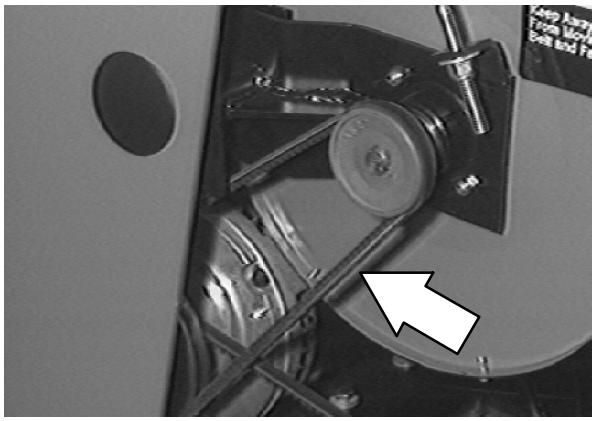
1. Open the seat support and disconnect the batteries.



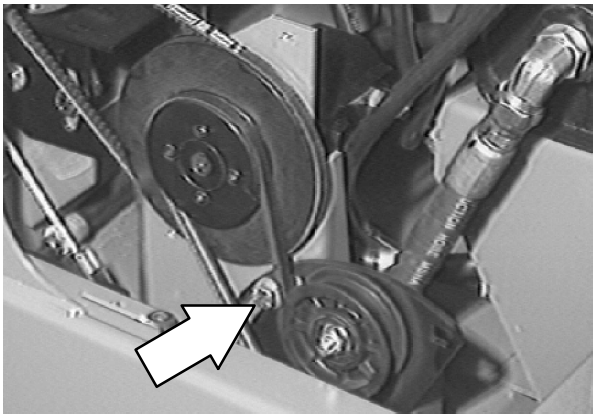
2. Remove the pump/vacuum fan belt guard.



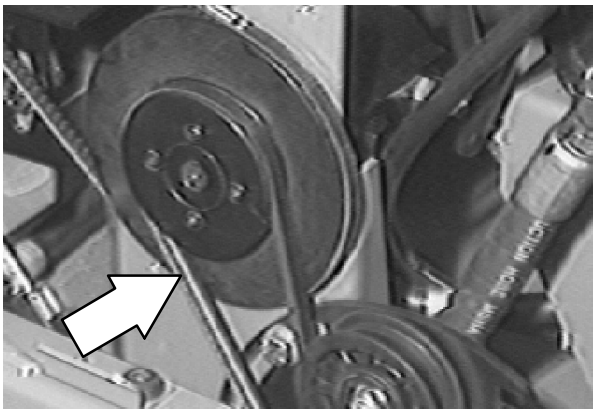
3. Push down on the vacuum fan assembly to release tension on the belt. Remove the V-belt from the large diameter sheave on the accessories motor.



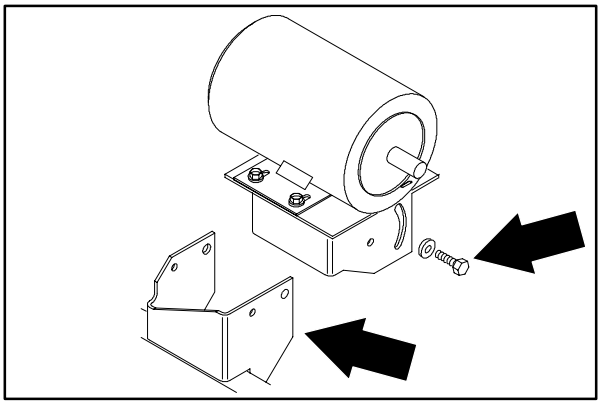
4. Loosen the two hex screws holding the main brush V-belt idler pivot to the machine frame. Pull the main brush idler back far enough to remove the tension on the V-belt leading down to the main brush.



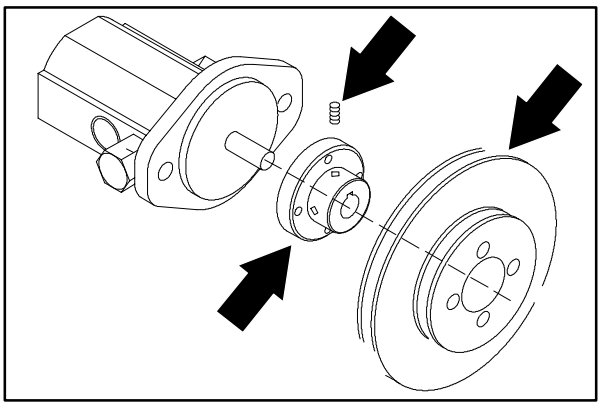
5. Remove the main brush V-belt from the small diameter sheave on the hydraulic pump.



6. Loosen the two hex screws in the adjustment slots on the accessories motor mount pivot. Let the pivot drop down and remove the V-belt from the large diameter sheave on the hydraulic pump.

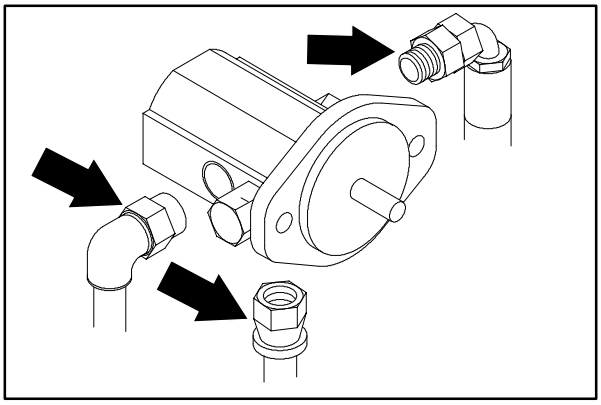


7. Remove the four allen screws from the sheave on the hydraulic pump. Remove the sheave.

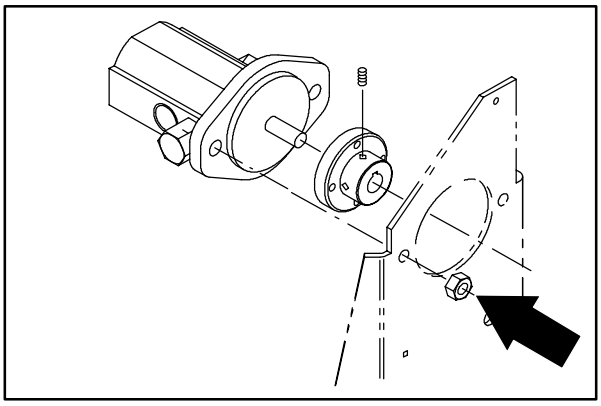


8. Mark, remove, and plug the three hydraulic hoses leading to the hydraulic pump.

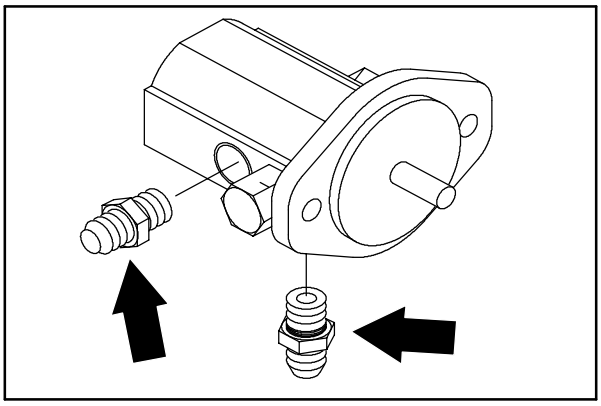
NOTE: Always observe hydraulic cleanliness requirements when opening hydraulic lines.



9. Remove the two hex screws and nyloc nuts holding the hydraulic pump to the machine frame. Remove the pump from the machine.

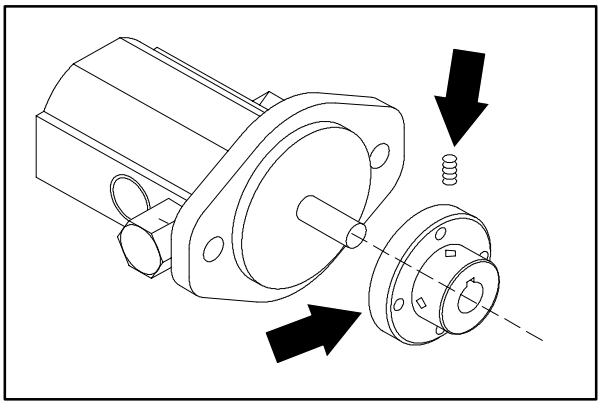


10. Remove the hydraulic fittings from the old pump and install in the new pump in the same orientation.

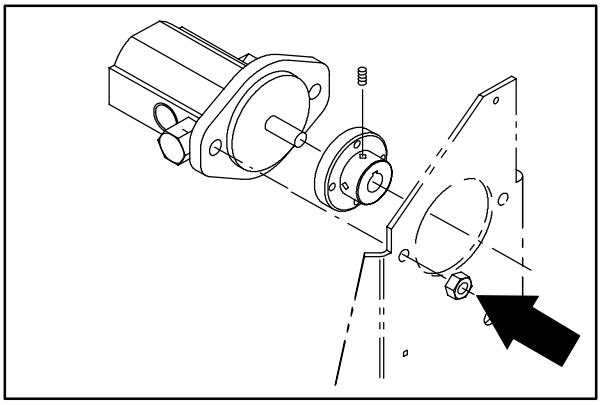


11. Loosen the two set screw holding the pump sheave hub to the pump shaft. Remove the pump hub and install it on the new pump in the same orientation. Hand tighten the set screws tight.

NOTE: Make sure the key is installed on the shaft of the new motor before installing sheave.

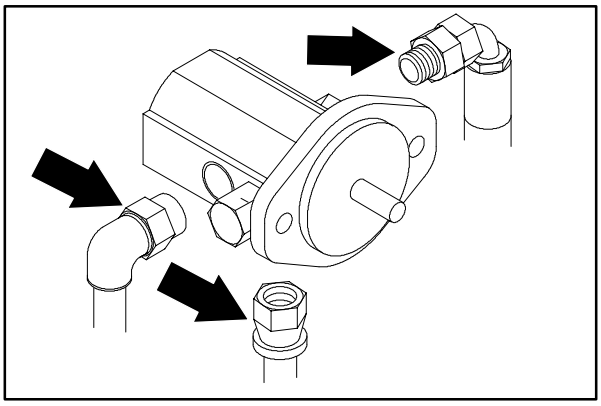


12. Install the new pump assembly on the frame mount bracket. Tighten the two hex screws to 37 – 48 Nm (26 – 34 ft lb).

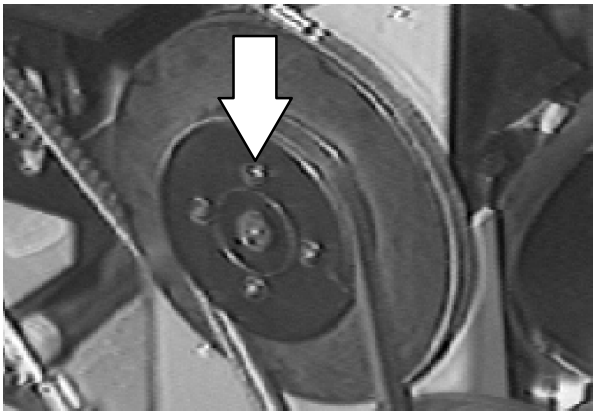


13. Reconnect the hydraulic hoses to the new pump. See schematic in this section.

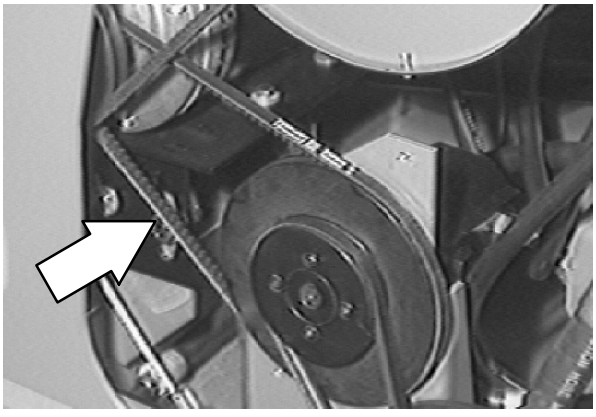
NOTE: Always observe hydraulic cleanliness requirements when opening hydraulic lines.



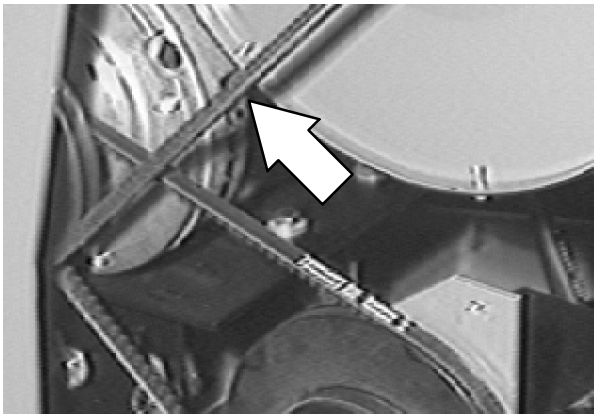
14. Reinstall the sheave on the hydraulic pump hub. Tighten the four allen screws to 11 – 14 Nm (7 – 10 ft lb).



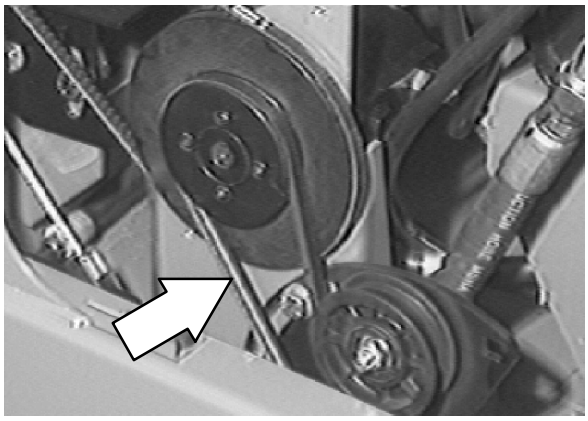
15. Reinstall the V-belt leading from the small diameter accessories motor sheave to the large diameter sheave on the hydraulic pump. Pull up on the motor mount pivot until the V-belt is tight. The proper tension is when the belt deflects 4mm (.15in) from a force of 2.5 Kg (5.5 lb) at belt midpoint. Tighten the two hex screws tight.



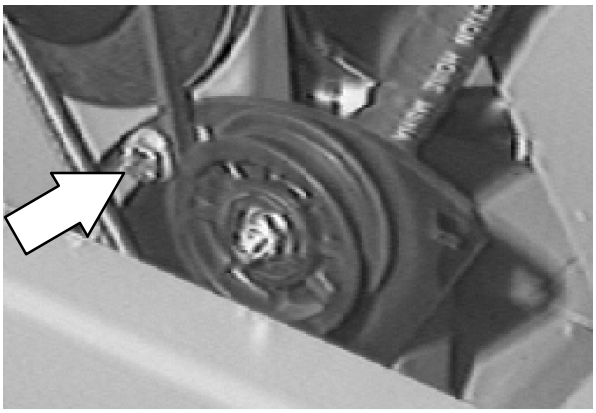
16. Push down on the vacuum fan and reinstall the V-belt on the large diameter accessories motor sheave. Let up on the vacuum fan.



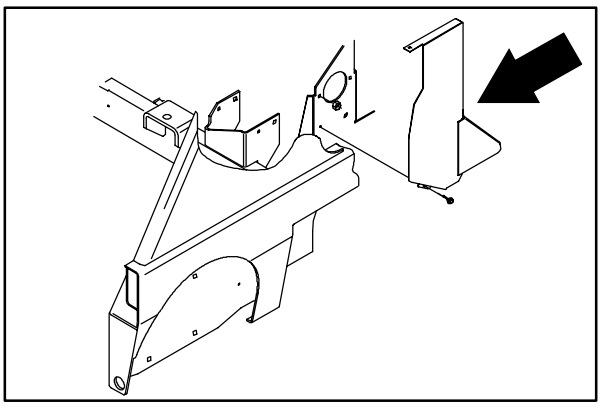
17. Reinstall the V-belt leading from the main brush idler to the small diameter sheave on the hydraulic pump.



18. Use a 1/2 in. square drive breaker bar or ratchet wrench to move the upper idler plate forward to tension to primary belt. The correct tension is when the belt deflects 8 mm (0.3 in) from a force of 2.3 kg (5 lb) at belt midpoint. Tighten the hex screws to 37 - 48 Nm (26 - 34 ft lb).



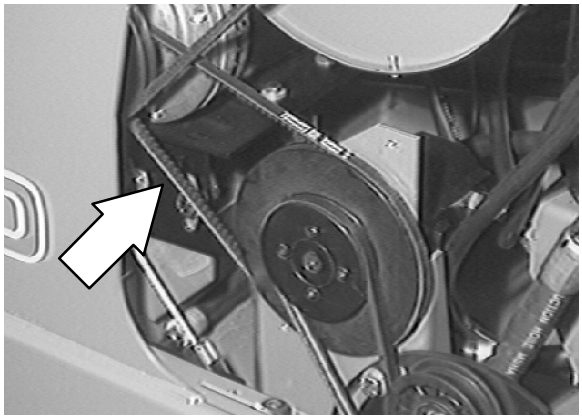
19. Reinstall the pump/vacuum fan belt guard.



20. Start the machine and check the new hydraulic pump for proper operation.

HYDRAULIC PUMP BELT

Check the hydraulic pump belt tension and wear after every 200 hours of operation. The correct tension is when the belt at midpoint deflects 4 mm (0.15 in) from a force of 2.5 kg (5.5 lb).

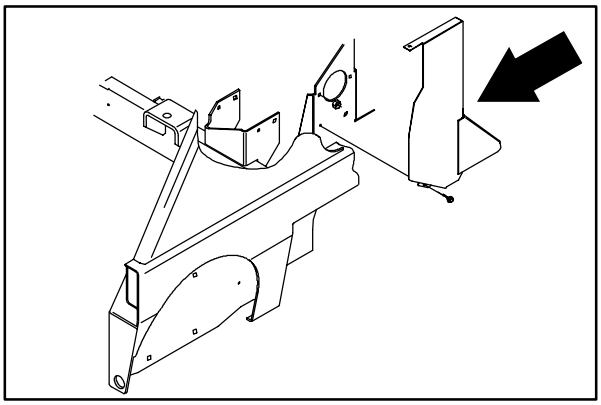


WARNING: Moving belt and fan. Keep away.

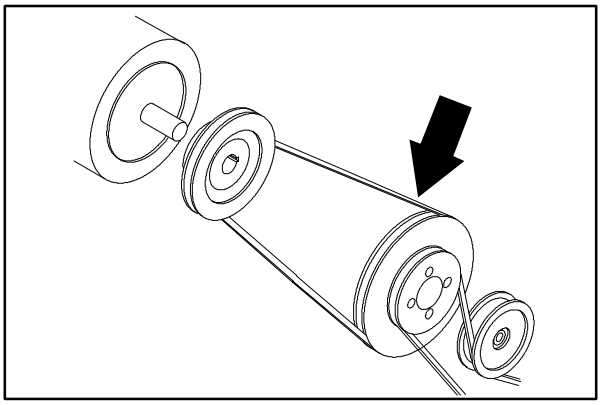
TO REPLACE HYDRAULIC PUMP BELT

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

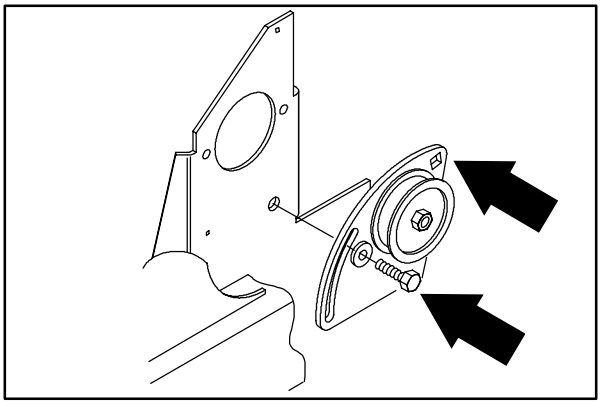
1. Open the seat support and disconnect the batteries. Remove the pump/vacuum fan belt guard.



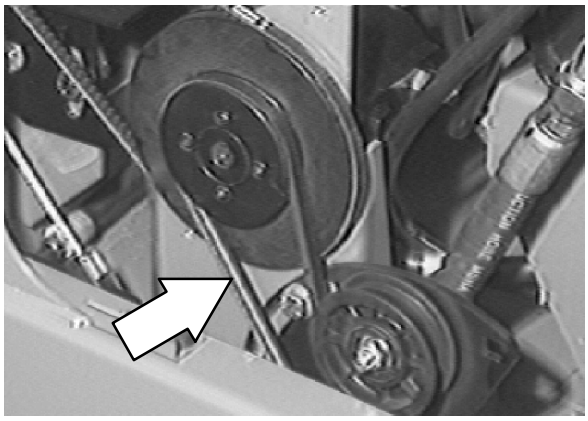
2. Push down on the vacuum fan assembly to release tension on the belt. Remove the V-belt from the large diameter sheave on the accessories motor.



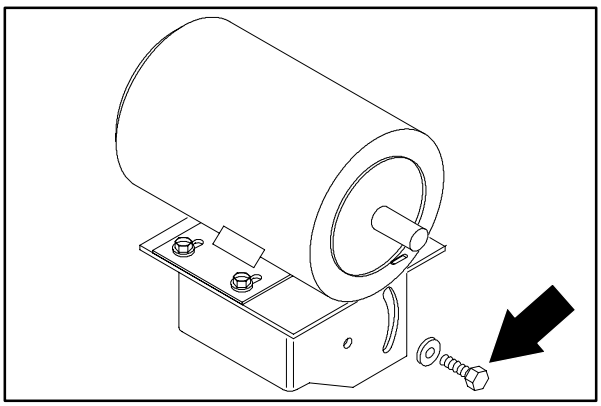
3. Loosen the two hex screws holding the main brush idler pivot to the machine frame. Pull the main brush idler back far enough to remove the tension on the V-belt leading down to the main brush.



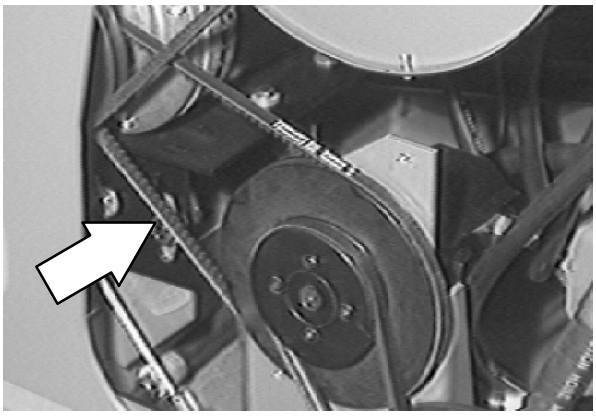
4. Remove the main brush V-belt from the small diameter sheave on the hydraulic pump.



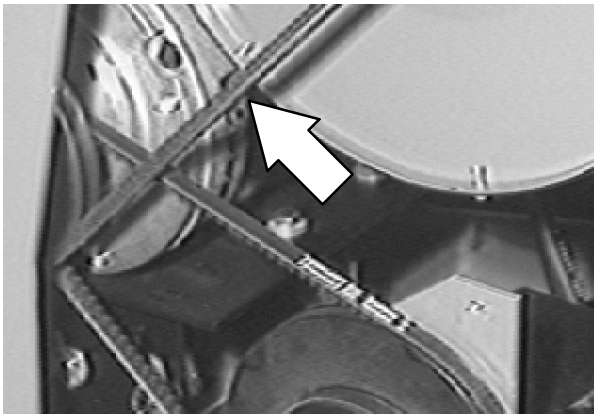
5. Loosen the two hex screws in the adjustment slots on the accessories motor mount pivot. Let the pivot drop down far enough to remove the V-belt from the large diameter sheave on the hydraulic pump. Remove the old hydraulic pump V-belt from the machine.



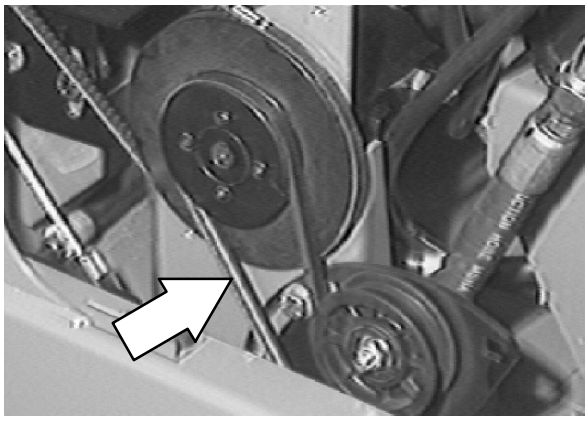
6. Install the new hydraulic pump belt on the small diameter accessories motor sheave and over to the large diameter sheave on the hydraulic pump. Pull up on the motor mount pivot until the V-belt is tight. The correct tension is when the belt at midpoint deflects 4 mm (0.15 in) from a force of 2.5 kg (5.5 lb). Tighten the two hex screws tight.



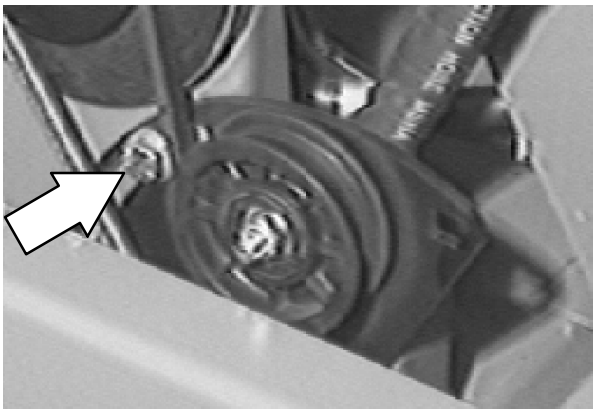
7. Push down on the vacuum fan and reinstall the V-belt on the large diameter accessories motor sheave. Let up on the vacuum fan.



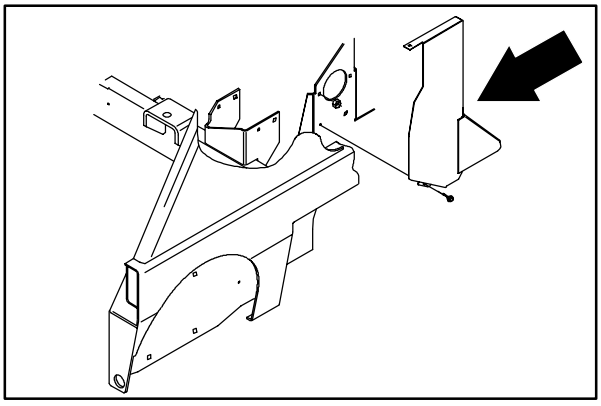
8. Reinstall the V-belt leading from the main brush idler to the small diameter sheave on the hydraulic pump.



9. Push the main brush idler in far enough to put tension on the V-belt leading down to the main brush. The correct tension is when the belt deflects 8 mm (0.3 in) from a force of 2.3 kg (5 lb) at belt midpoint. Tighten the hex screws to 37 – 48 Nm (26 – 34 ft lb).



10. Reinstall the pump/vacuum fan belt guard.



11. Start the machine and check the new hydraulic pump V-belt for proper operation.

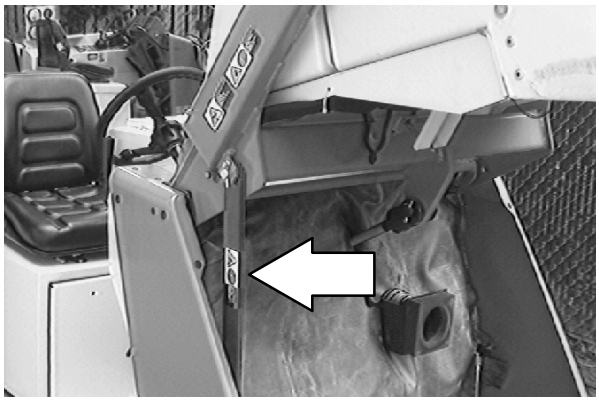
TO REPLACE HOPPER LIFT CYLINDER

1. Empty the debris hopper.

2. Set the machine parking brake.

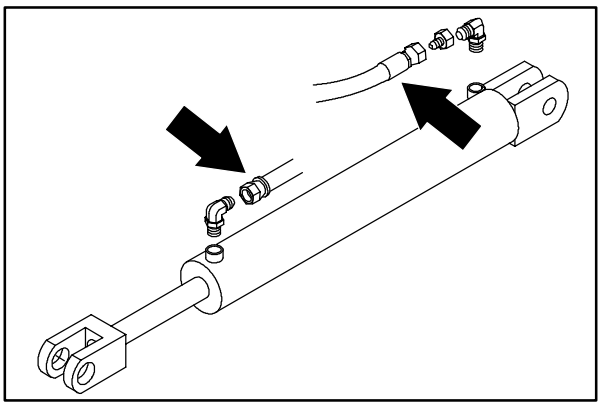
3. Raise the hopper and engage the prop arm. Shut off the machine. Move the hopper lift handle back and forth a few times.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

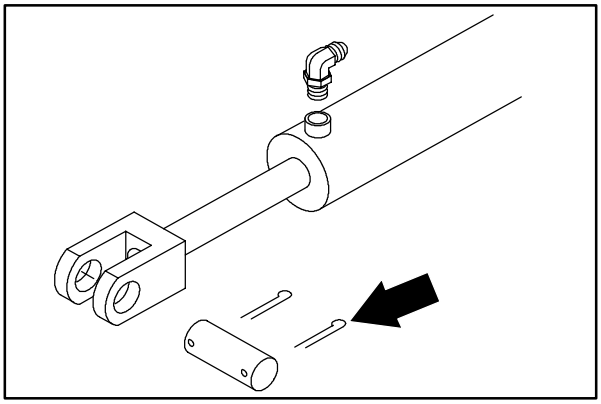


4. Disconnect and cap the two hydraulic hoses leading to the hopper lift cylinder.

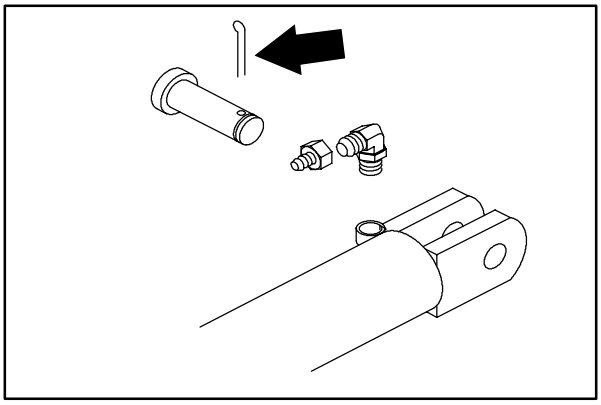
NOTE: Always observe hydraulic cleanliness requirements when opening hydraulic lines.



5. Remove the inside cotter pin from the upper clevis pin on the upper end of the hopper lift cylinder. Remove the clevis pin.

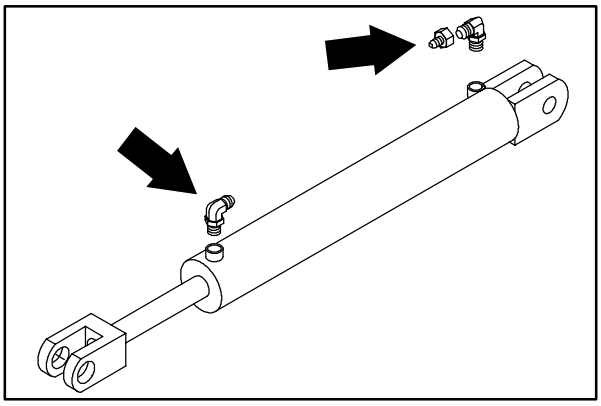


6. Remove the inside cotter pin from the lower clevis pin on the lower end of the hopper lift cylinder. Remove the clevis pin.

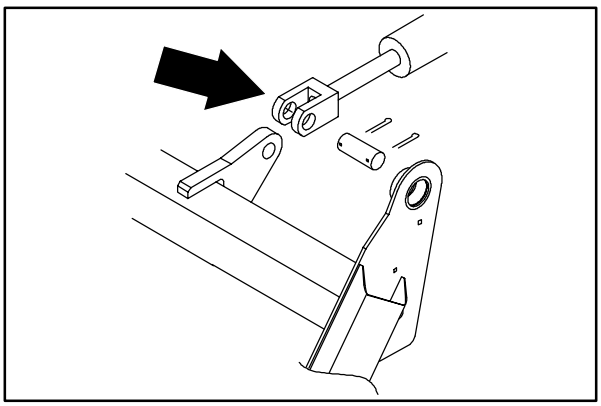


7. Remove the hopper lift cylinder from the machine.

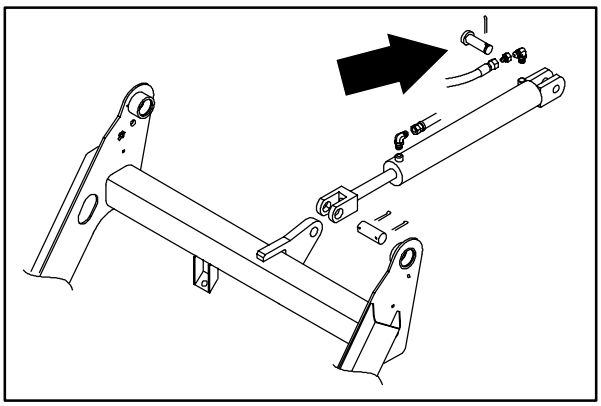
8. Remove the fittings from the old cylinder and install in the new cylinder in the same orientation.



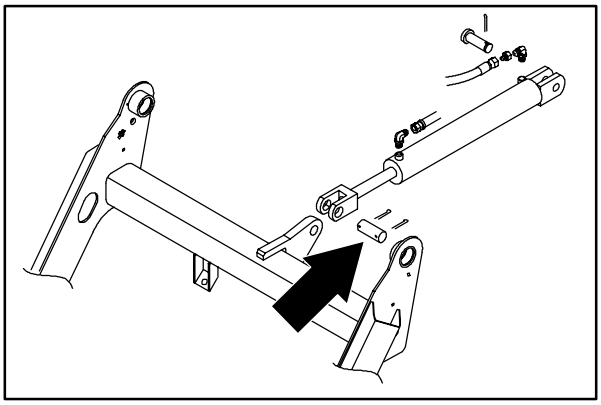
9. Position the new cylinder in the machine with the rod end pointing to the front of the machine.



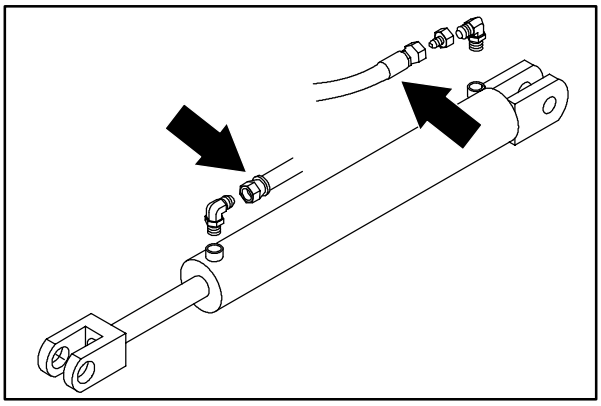
10. Align the bottom of the lift cylinder with the hole in the frame mount lug. Reinstall the clevis pin and cotter pin.



11. Align the top of the lift cylinder with the hole in the lift arm cylinder mount lug. Reinstall the clevis pin and cotter pin.



12. Reconnect the hydraulic hoses to the new cylinder. See schematic in this section.

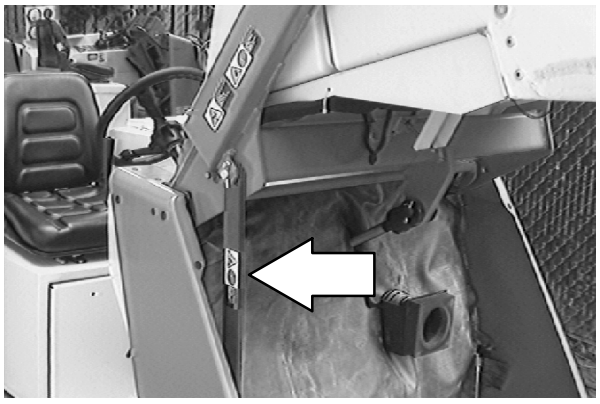


13. Start the machine and operate the hopper. Check for any leaks and proper operation.

TO REPLACE HOPPER DUMP DOOR CYLINDER

1. Dump the debris hopper.

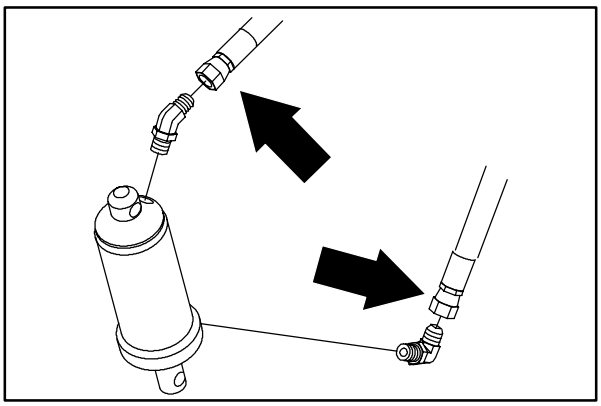
2. Raise the hopper and open the dump door. Engage the support bar.



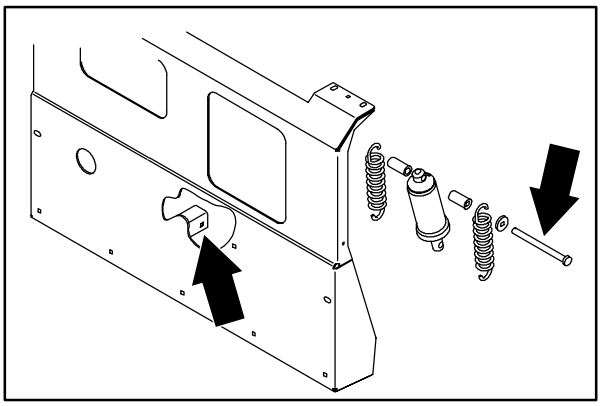
3. Set the machine parking brake.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

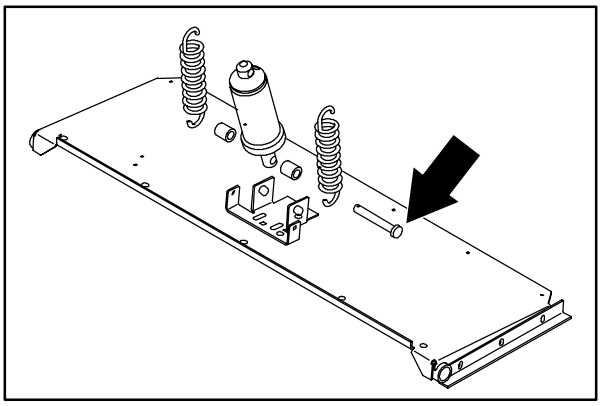
4. Disconnect and plug the two hoses leading to the hopper dump door cylinder.



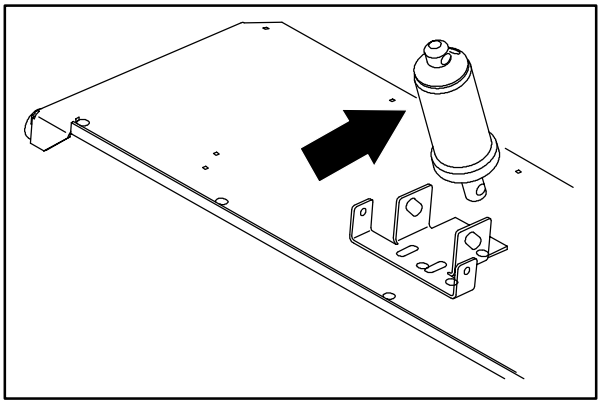
5. Remove the cotter pin and clevis pin from the top of the dump door cylinder were it attaches to the center/rear of the debris hopper.



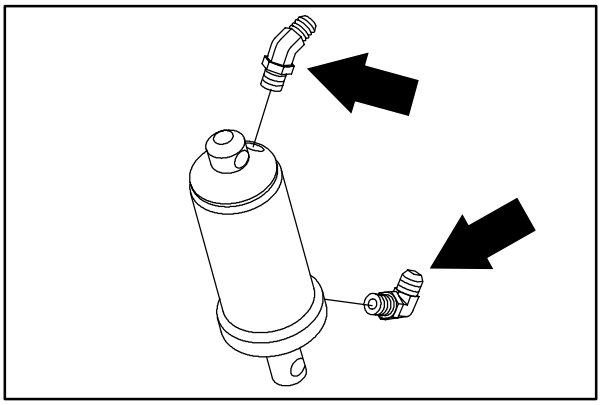
6. Remove the cotter pin and clevis pin from the bottom of the dump door cylinder were it attaches to the center of the dump door.



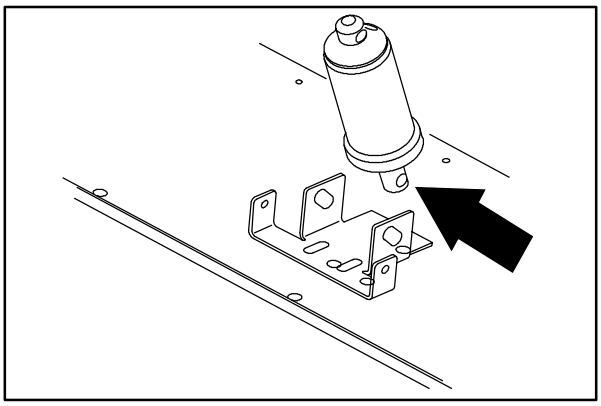
7. Remove the old cylinder from the hopper.



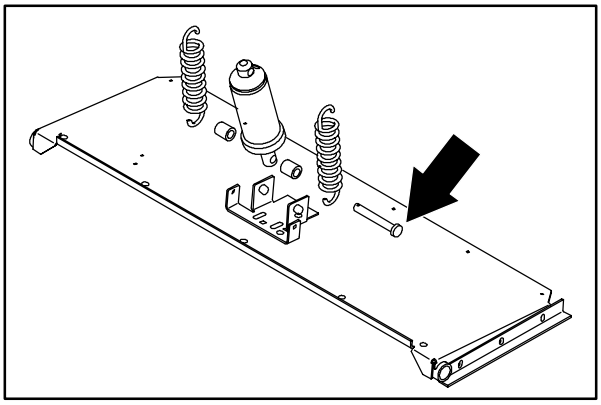
8. Remove the fittings from the old cylinder and install in the new cylinder in the same orientation.



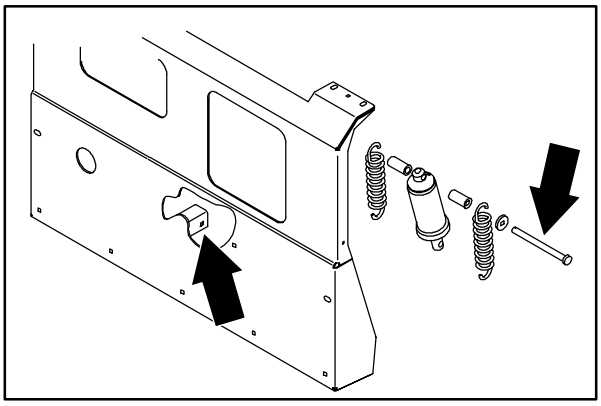
9. Position the new cylinder in the machine with the rod end pointing to the center of the dump door.



10. Reinstall the clevis pin and cotter pin in the lower end of the dump door cylinder.

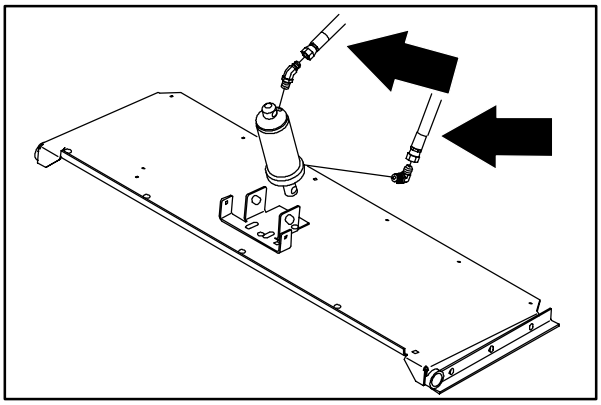


11. Reinstall the clevis pin and cotter pin in the upper end of the dump door cylinder.



12. Reconnect the hydraulic hoses to the dump door cylinder. See the schematic in this section.

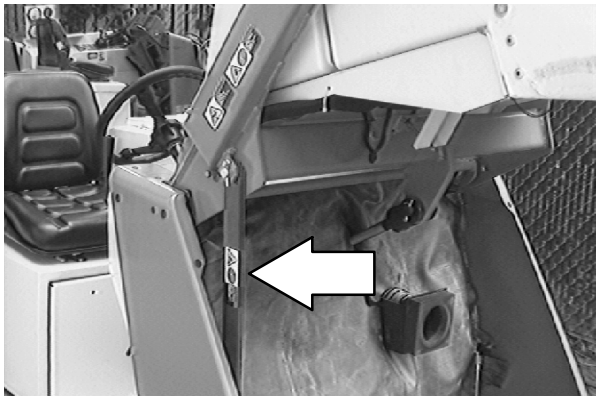
13. Start the machine and open and close the hopper dump door. Check for any leaks and proper operation.



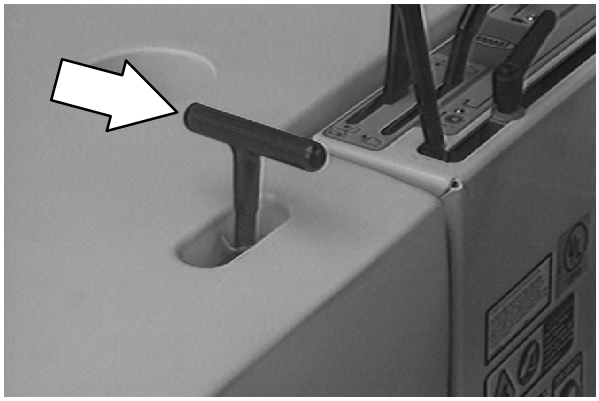
TO REPLACE STEERING CYLINDER

1. Raise the hopper and engage the support bar.

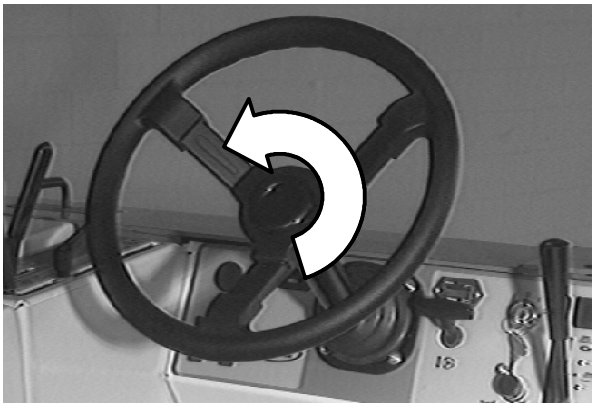
   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake., Turn Off Machine And Remove Key.



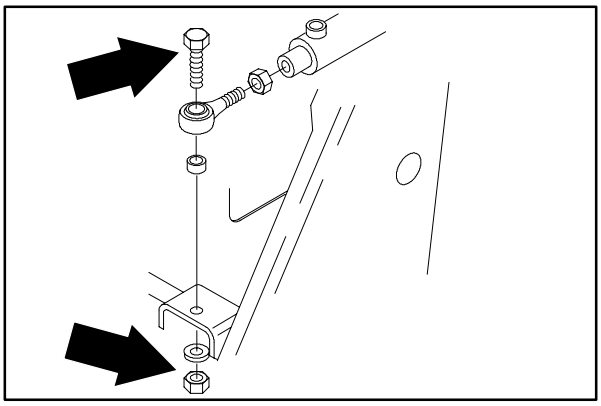
2. Open the seat support.



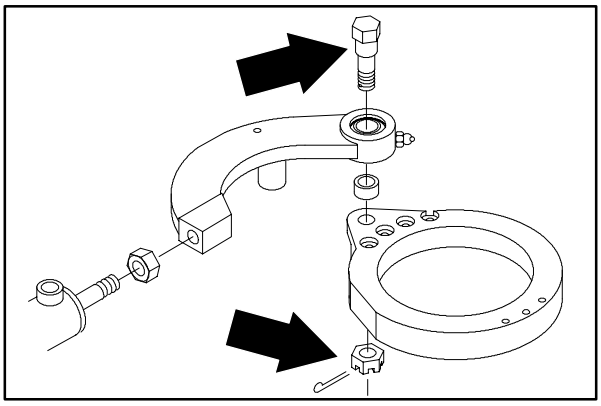
3. Turn the steering wheel all the way to the left.



4. Remove the hex screw, spacer, and nyloc nut holding the piston end of the steering cylinder rod end to the front of the machine frame.

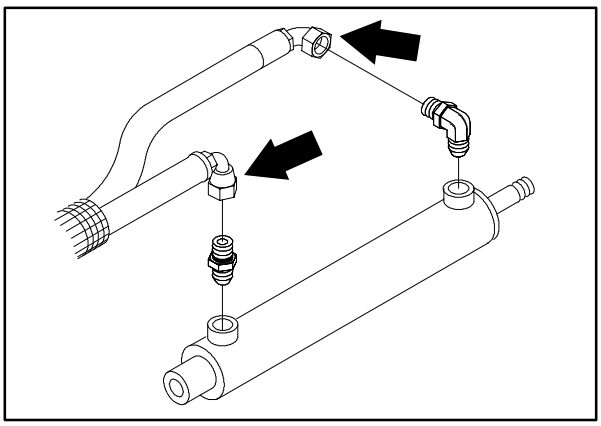


5. Remove the cotter pin, castle nut, spacer, and hex screw holding the steering drag link to the rear drive gear box.

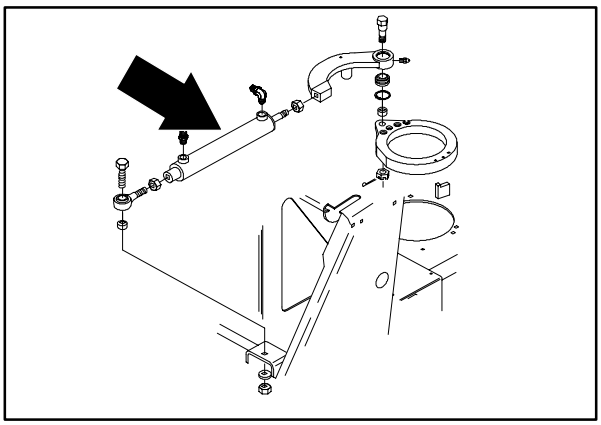


6. Disconnect and cap the two hydraulic hoses leading to the steering cylinder.

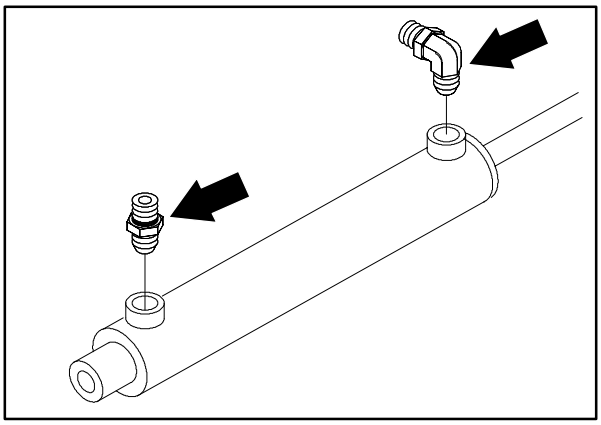
NOTE: Always observe hydraulic cleanliness requirements when opening hydraulic lines.



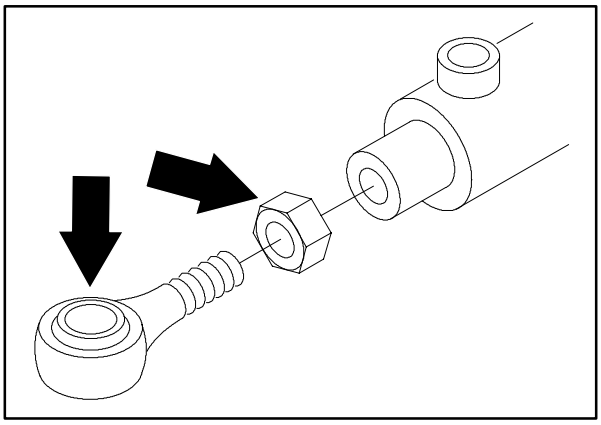
7. Remove the steering cylinder from the machine.



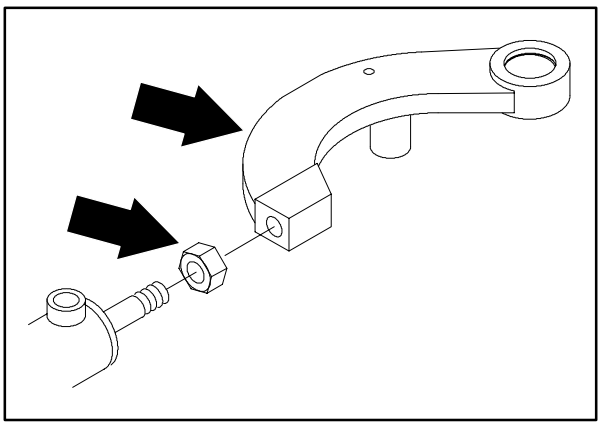
8. Remove the fittings from old cylinder. Install the fittings in the new cylinder in the same orientation.



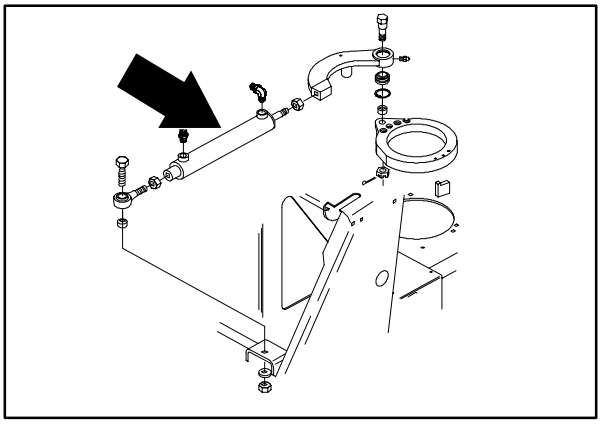
9. Remove the rod end from the piston end of the old cylinder and install in the new cylinder in the same orientation. Tighten the jam nut.



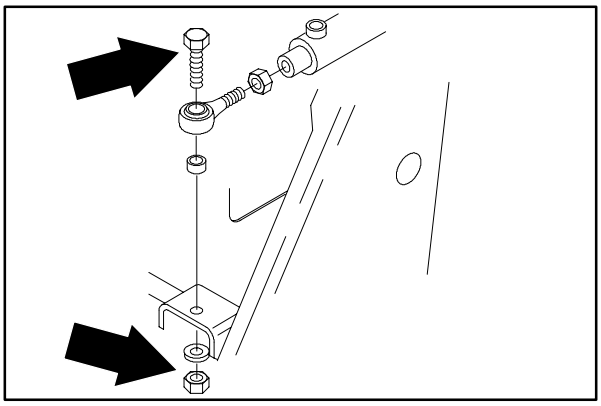
10. Loosen the jam nut on the rod end of the steering cylinder and remove the drag link. Install the drag link on the new cylinder in the same orientation. Tighten the jam nut.



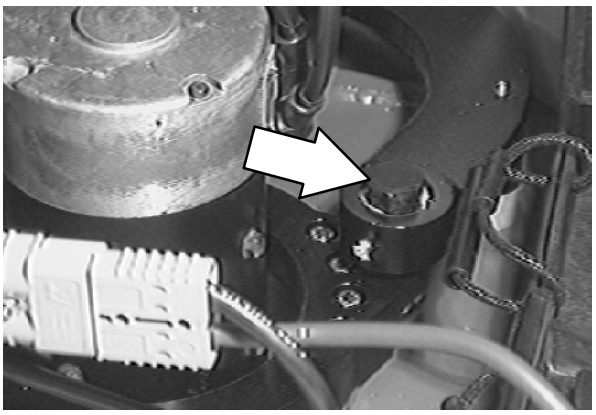
11. Position the new steering cylinder assembly in the machine with the drag link pointing toward the rear of the machine.



12. Reinstall the hex screw, spacer, and nyloc nut through the steering cylinder rod end and tighten to 52 – 67 Nm (26 – 34 ft lb).

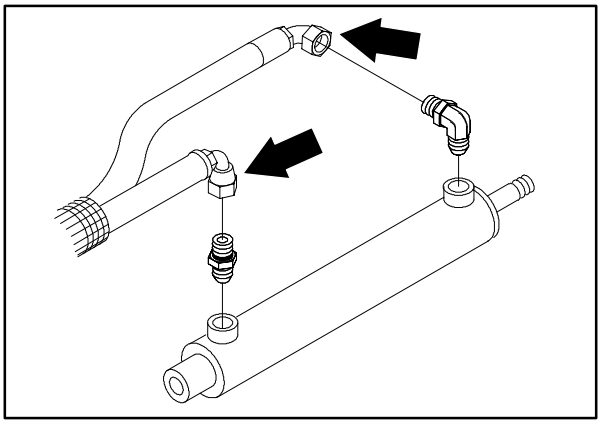


13. Reinstall the hex screw, spacer, and castle nut through the steering cylinder drag link. Tighten very firmly, then, line up the hole in the hex screw with the castle nut. Install the cotter pin.



14. Reconnect the hydraulic hoses to the steering cylinder. See schematic in this section.

NOTE: Always observe hydraulic cleanliness requirements when opening hydraulic lines.

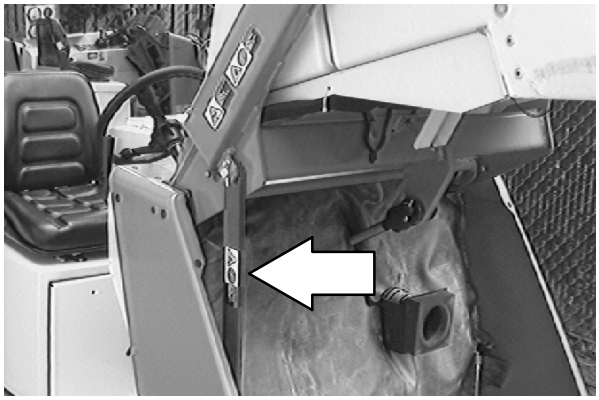


15. Start machine and turn steering wheel in both directions. Observe the steering cylinder for any leaks.

TO REPLACE STEERING VALVE

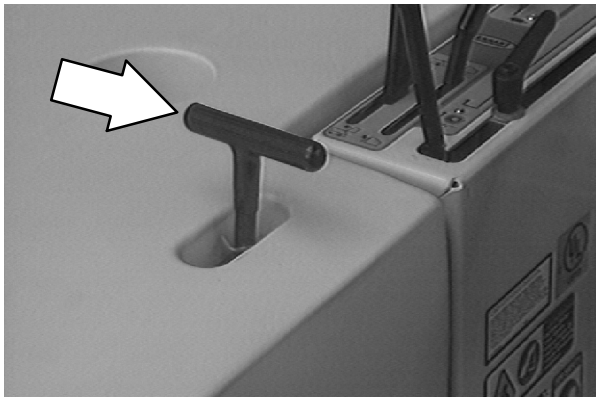
1. Raise the hopper and engage the support bar.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

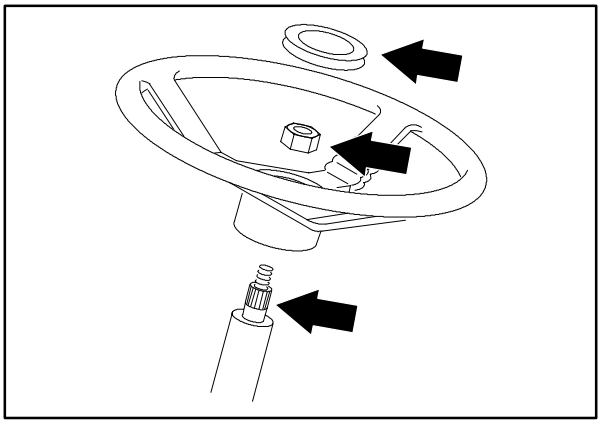


2. Turn off the machine and engage the parking brake. Open the seat support.

3. Disconnect the battery.

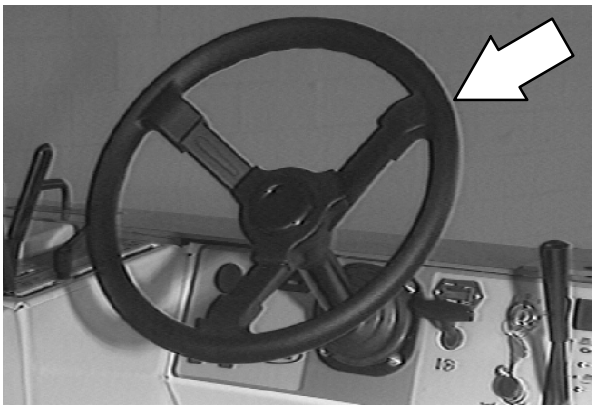


4. Remove the rubber cap in the center of the steering wheel. Remove the large nut.

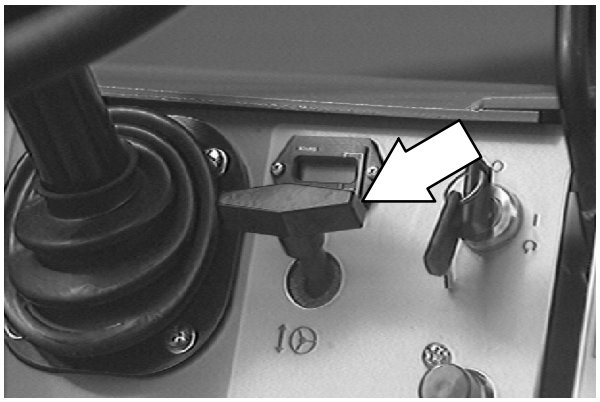


5. Remove the steering wheel.

NOTE: A puller may have to be used to remove the steering wheel from the steering valve shaft.

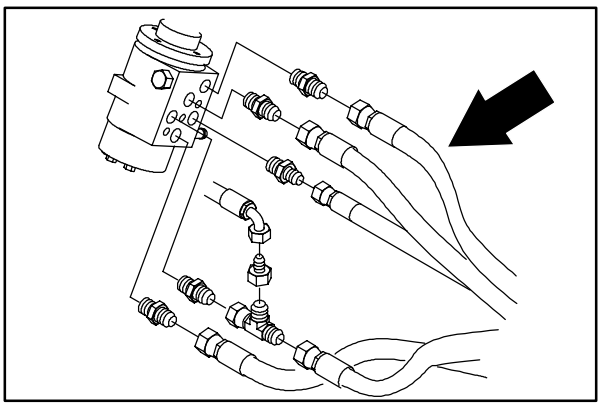


6. Tilt the steering wheel to the lowest position.



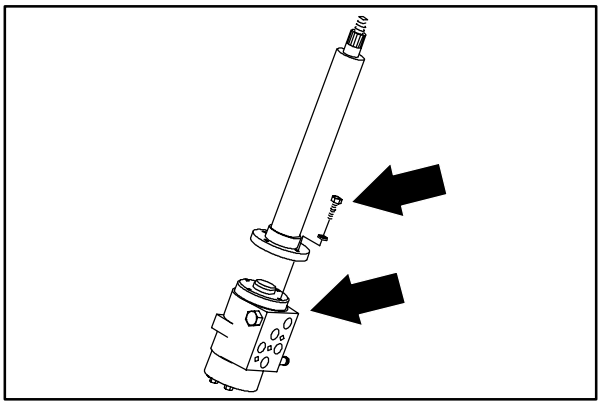
7. Remove and plug the five hydraulic hoses on the steering control motor.

NOTE: Observe hydraulic cleanliness requirements when opening hydraulic lines.

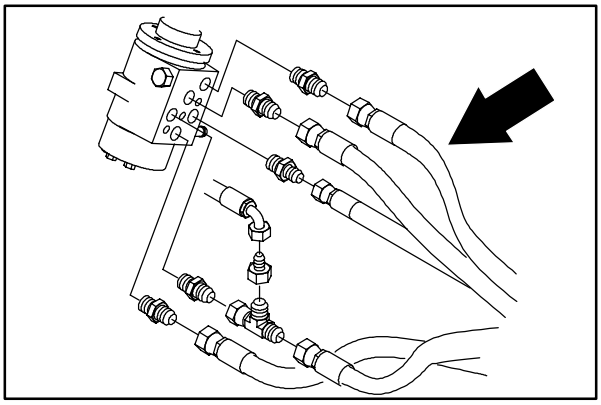


8. Remove the hex screws holding the hydraulic steering valve to the steering column.

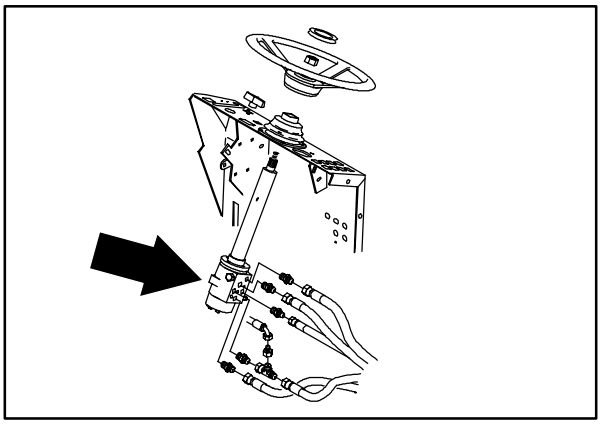
9. The hydraulic steering valve can now be removed from machine.



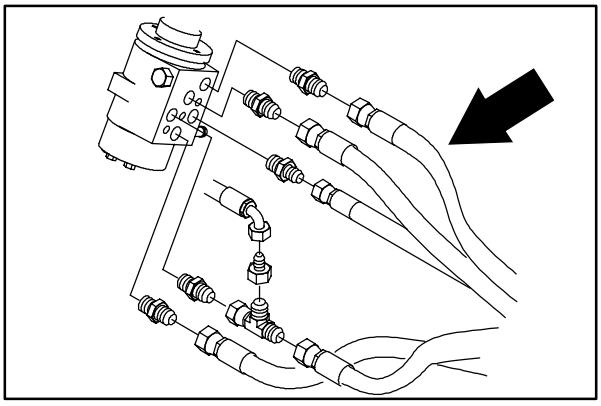
10. Remove hydraulic fittings from old control motor. Install the fittings in the new valve in the same orientation.



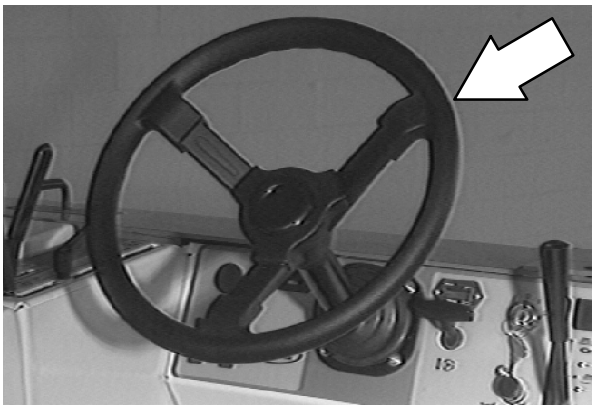
11. Install the new hydraulic steering valve in the machine. Position the ports in the same orientation as the old valve. Reinstall the hex screws and tighten to 31 – 40 Nm (27 – 35 ft lb).



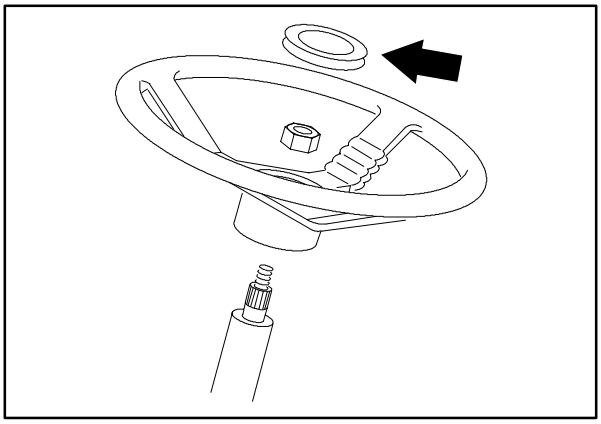
12. Reconnect the hydraulic hoses to hydraulic steering valve. See the schematic in this section.



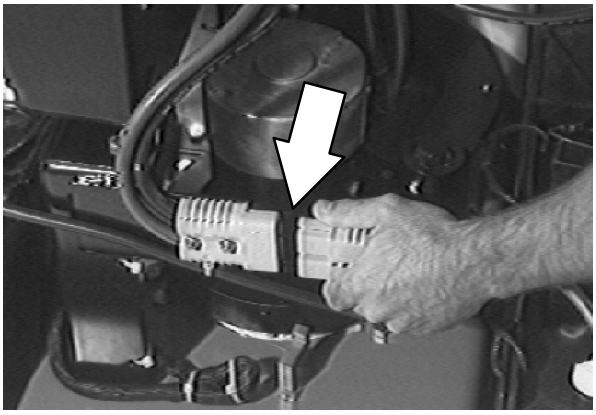
13. Reinstall the steering wheel on the steering column. Tighten the wheel nut to 18 – 24 Nm (15 – 20 ft lb).



14. Reinstall the rubber steering wheel cover.



15. Reconnect the battery cables and start the machine. Turn the steering wheel and check for any leaks and proper operation.



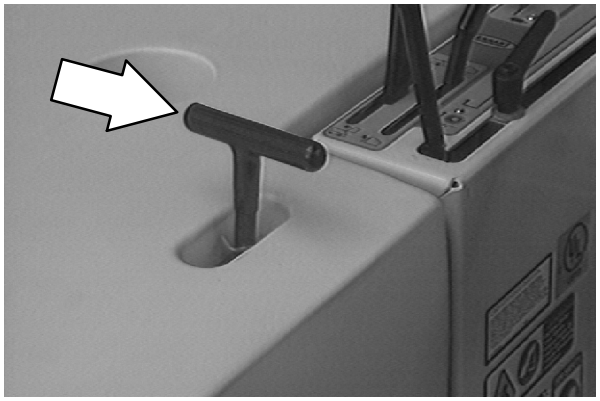
HYDRAULIC CONTROL VALVE

The main control valve is used to raise and lower the hopper, open and close the dump door, and provide hydraulic flow to the main and side brushes. The main and side brushes will only turn on when the handles are in the down position.

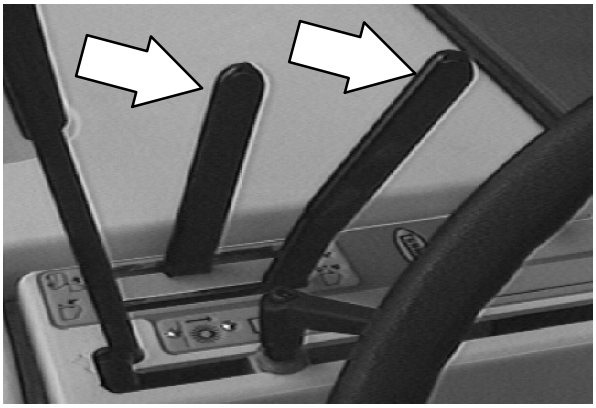
TO REPLACE CONTROL VALVE

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

1. Open the seat support.

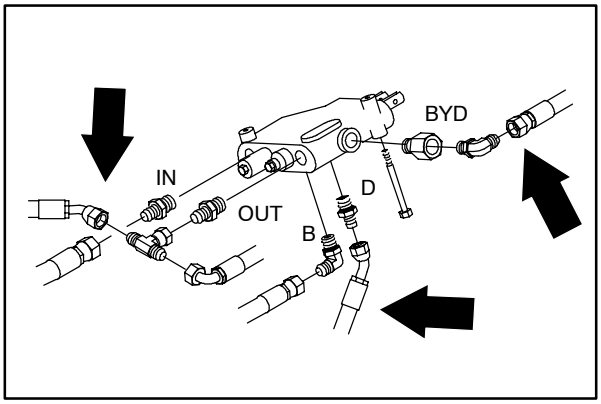


2. Remove the two valve handle boots.

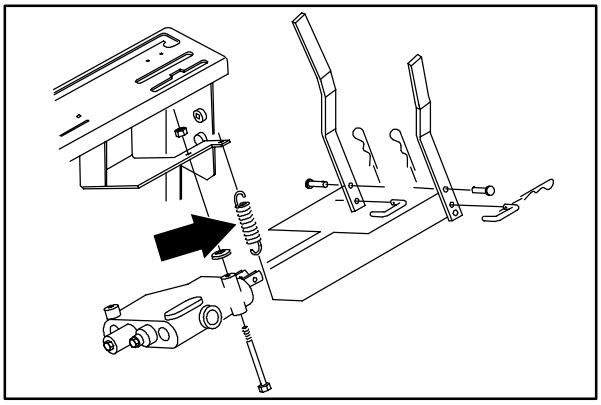


3. Mark, disconnect, and plug the hydraulic hoses leading to the control valve.

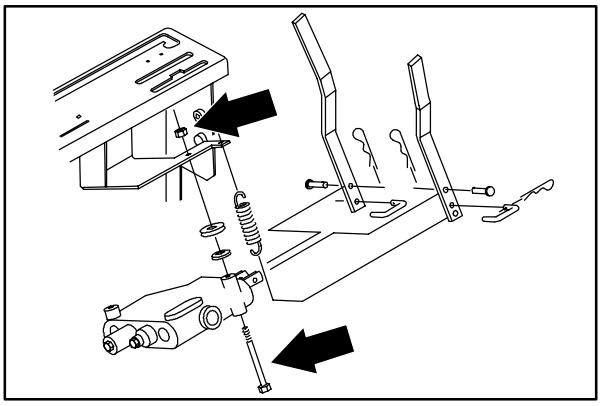
NOTE: Observe hydraulic cleanliness requirements when opening hydraulic lines.



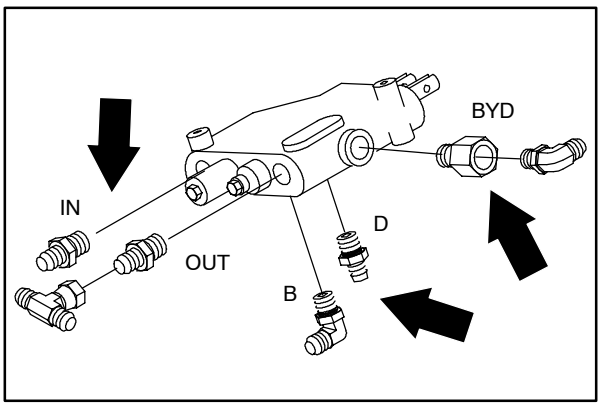
4. Remove the tension spring from the valve handle with the notched slot.



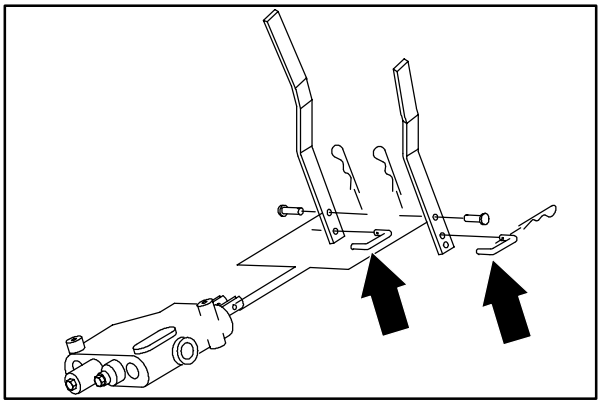
5. Remove the two M6 hex screws and nyloc nuts holding the control valve to the valve mount bracket. Remove the valve from the machine.



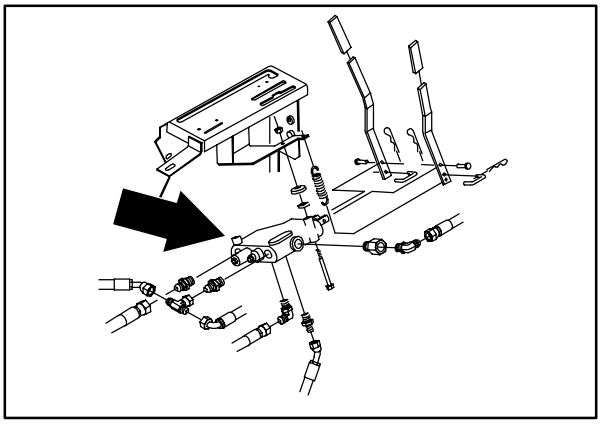
6. Remove the fittings from the old valve and install in the new valve in the same orientation.



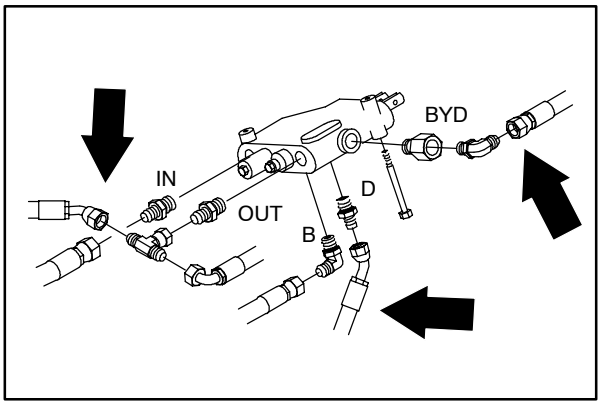
7. Remove the valve handles and **C** pins from the old valve and install on the new valve in the same orientation.



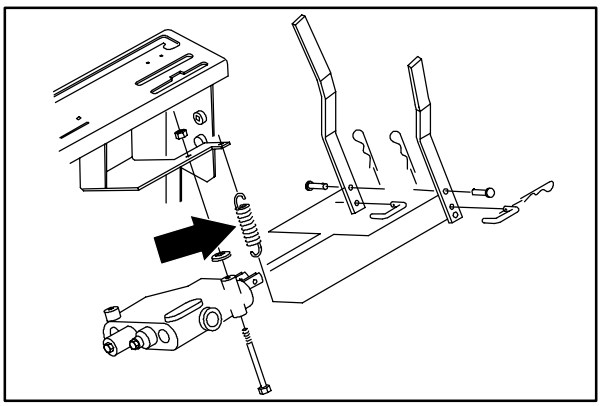
8. Install the new valve back on the valve mount bracket. Make sure the handles go through the handle slots in the machine center panel. Reinstall the two M6 hex screws and nyloc nuts. Tighten to 11 – 14 Nm (7 – 10 ft lb).



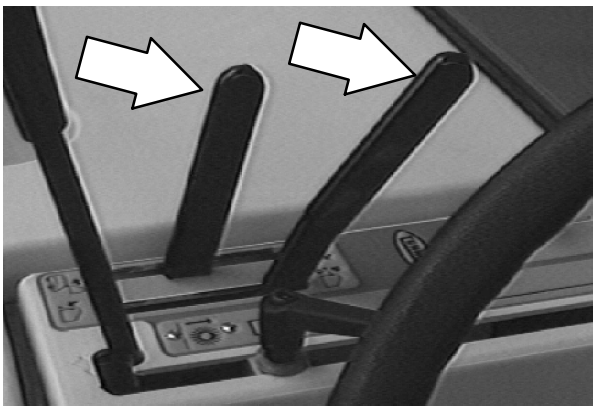
9. Reconnect the hydraulic hoses. See schematic in this section.



10. Reconnect the tension spring to the left handle.



12. Reinstall the valve handle boots.



13. Start the machine and check the control valve for proper operation.

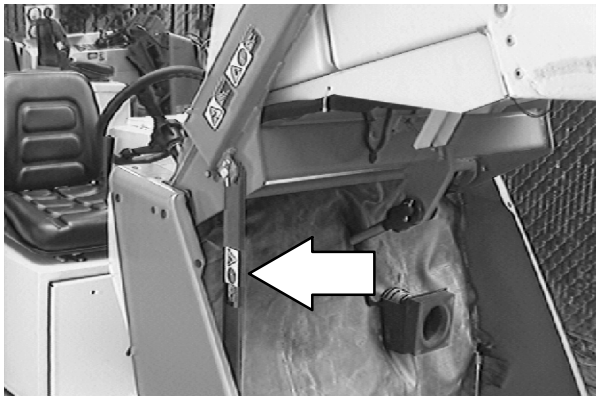
HYDRAULIC SOLENOID VALVE

The hydraulic solenoid valve controls the operation of the main and side brush. The solenoid valve coil is electrically activated when the side brush or main brush handles are placed in the down position. The solenoid valve also contains a relief valve to protect the hydraulic system from damage.

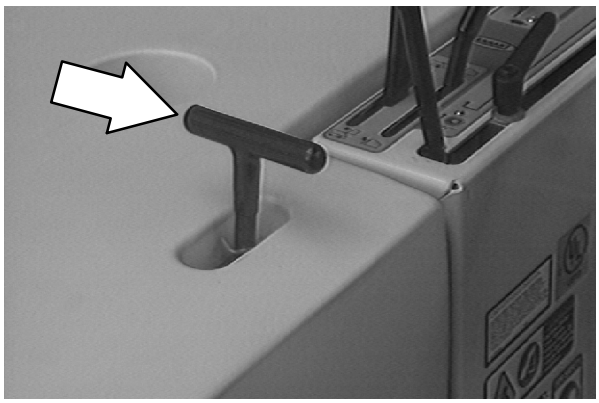
TO REPLACE SOLENOID VALVE

FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

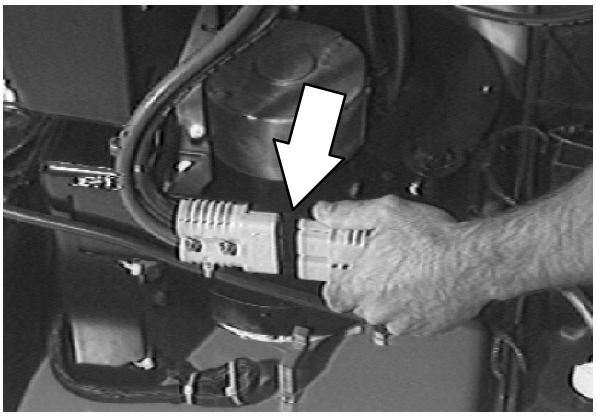
1. Raise the hopper and engage the support bar.



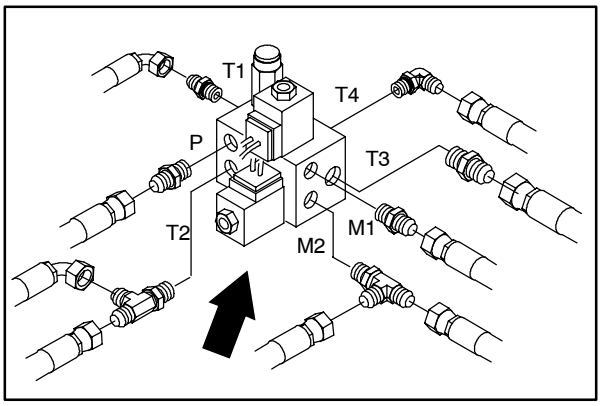
2. Open the seat support.



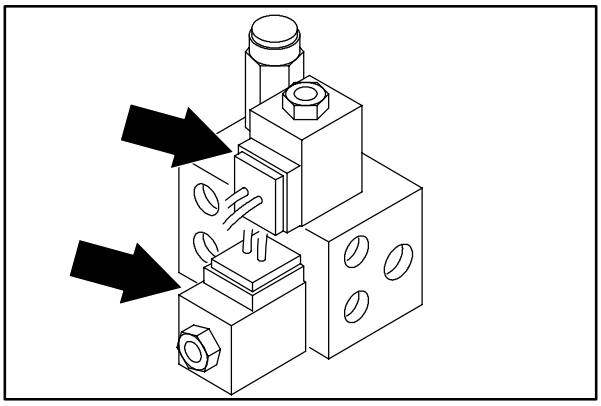
3. Disconnect the battery.



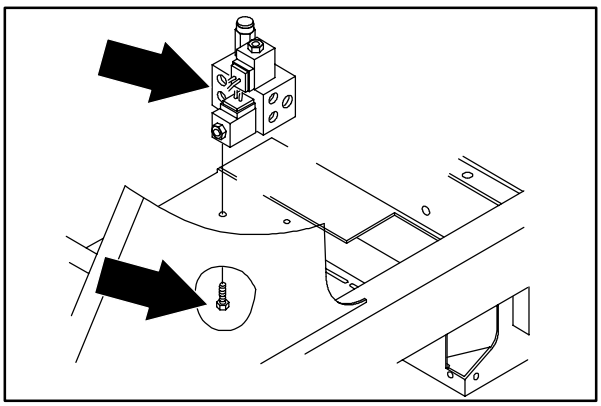
4. Mark, disconnect, and plug the hydraulic hoses leading to the solenoid valve.



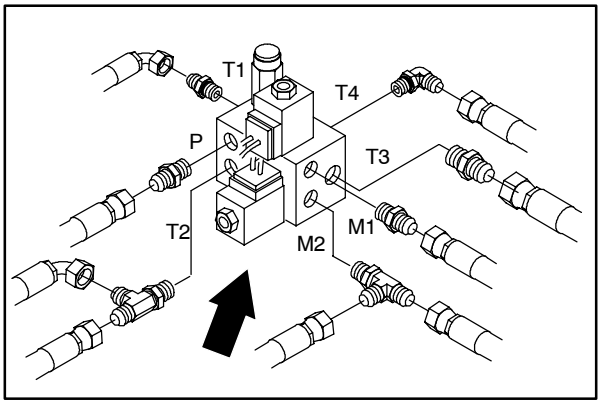
5. Un-plug the two electrical coils from the main harness.



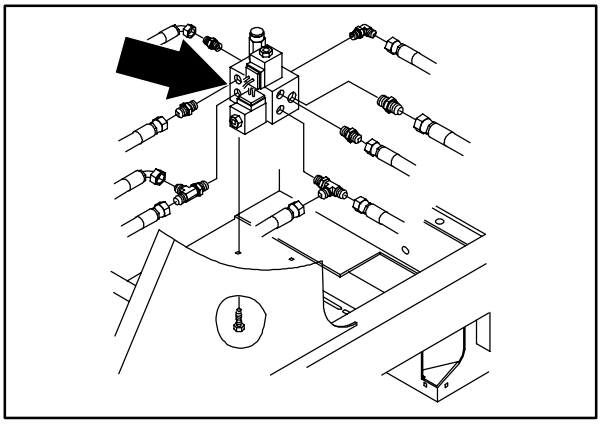
6. Go in front of the machine and down under the brush wrap. Locate the two hex screws holding the solenoid valve to the machine frame. Remove the valve from the machine.



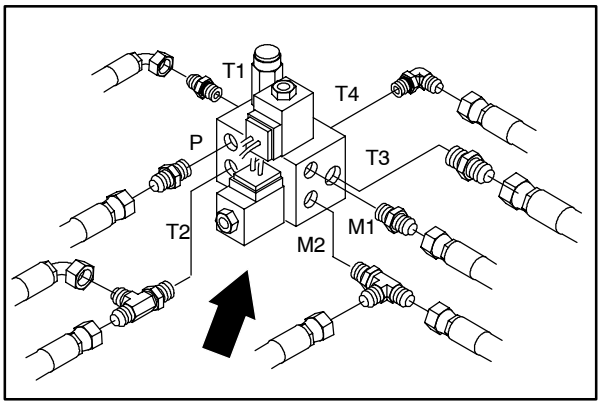
7. Remove the fittings from the old solenoid valve and install in the new valve in the same orientation.



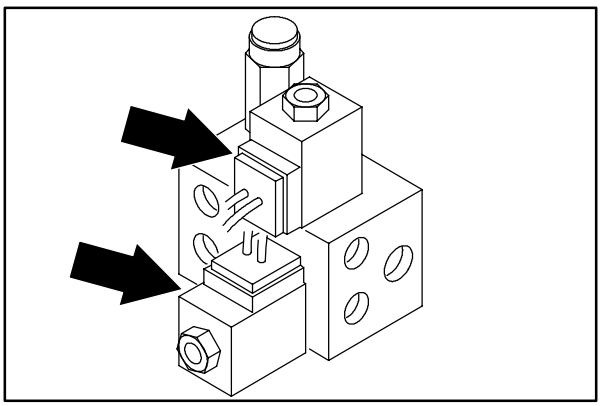
8. Position the new valve in the machine. Line up the holes in the frame with the two holes in the valve. Reinstall the two hex screws and tighten to 18 – 24 Nm (15 – 20 ft lb).



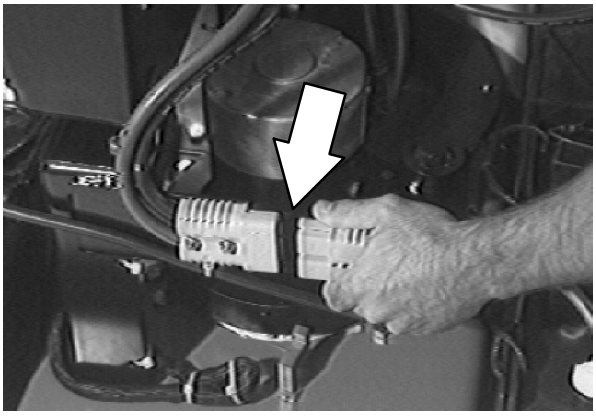
9. Reconnect the hydraulic hoses. See schematic in this section.



10. Reconnect the two electrical coils to the main harness.



11. Reconnect the battery.

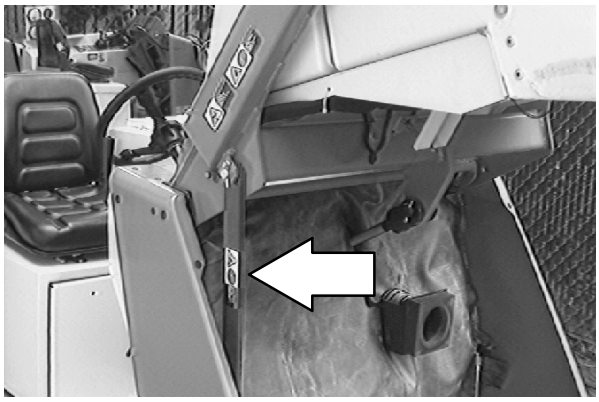


12. Start the machine and check the new valve for any leaks and proper operation.

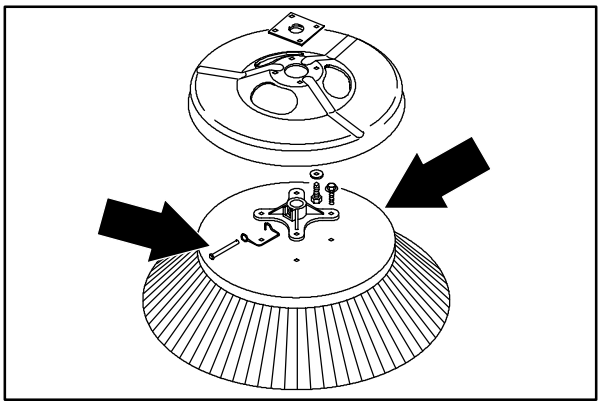
TO REPLACE SIDE BRUSH MOTOR

1. Empty the debris hopper.
2. Set the machine parking brake.
3. Raise the hopper and engage the support bar.

   FOR SAFETY: Before Leaving Or Servicing Machine; Stop On Level Surface, Set Parking Brake, Turn Off Machine And Remove Key.

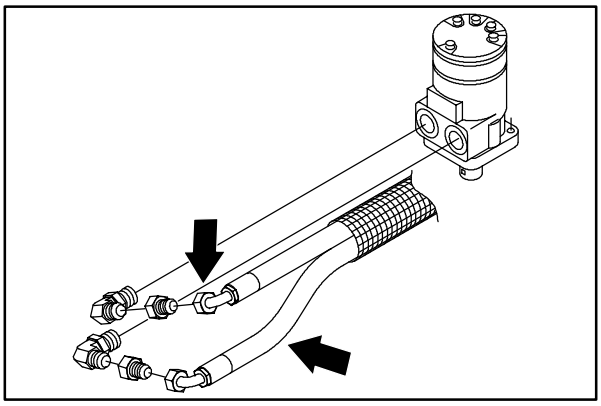


4. Remove the side brush retaining pin from the side brush drive shaft by pulling the pin keeper over the end of the pin.
5. Remove the side brush from the side brush motor.

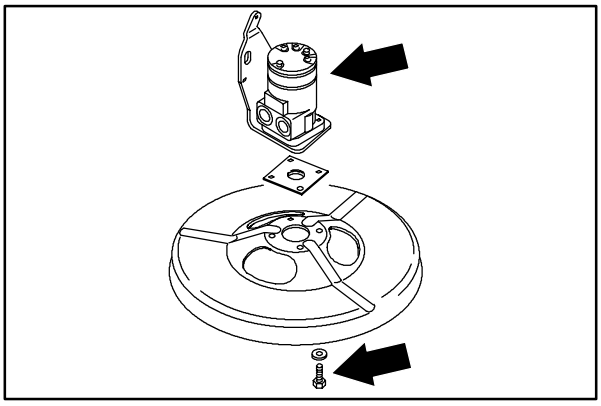


6. Remove and plug the hydraulic hoses leading to the side brush motor.

NOTE: Observe hydraulic cleanliness requirements when opening hydraulic lines.

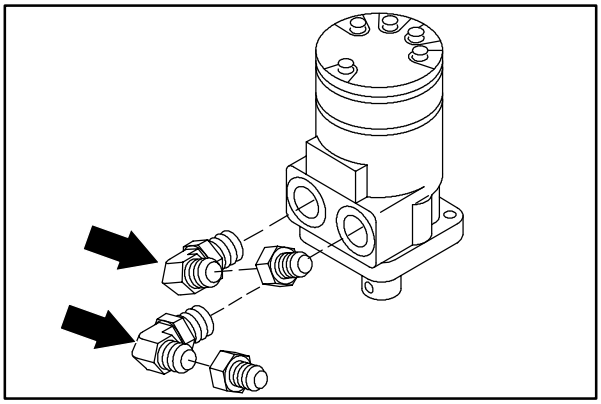


7. Remove the four hex screws holding the side brush motor to the mount bracket. Remove the side brush guard and side brush motor from machine.

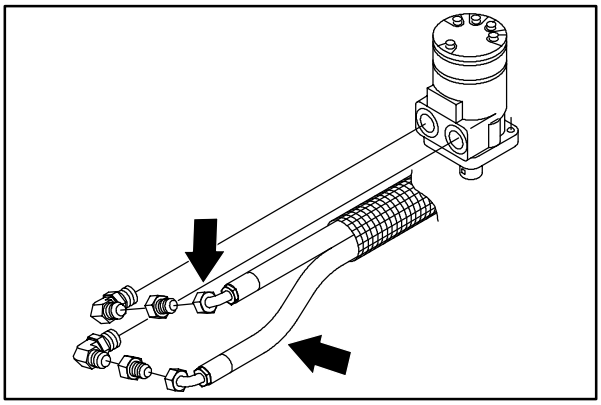


8. Remove the hydraulic fittings from the old motor and install in the new motor in the same orientation.

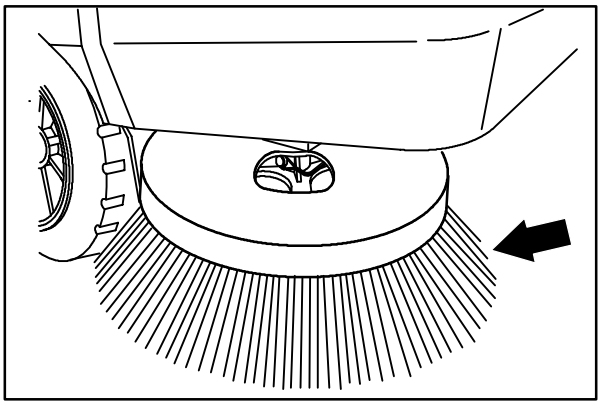
9. Install the new side brush motor and the side brush guard on the mount bracket. Tighten the four hex screws to (27 – 35 ft lb).



10. Reconnect the hydraulic hoses to the side brush motor. See schematic in this section.

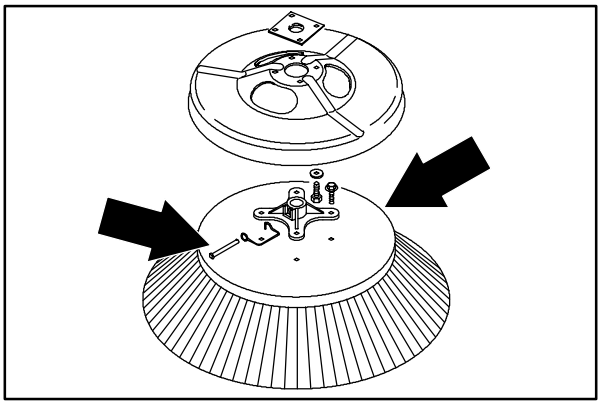


11. Reinstall the side brush on the side brush motor.

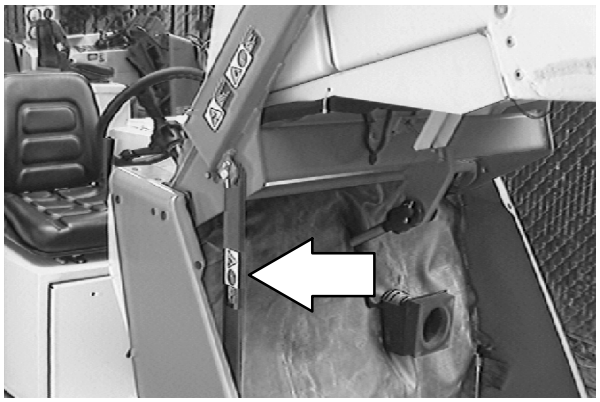


12. Reinstall the side brush retaining pin through the side brush hub and shaft.

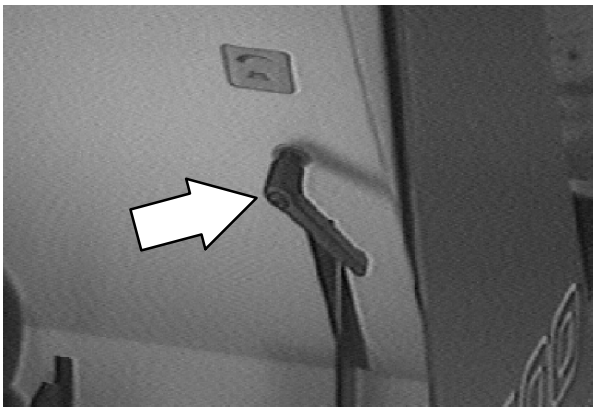
13. Secure the pin by clipping the pin keeper over the end of the pin.



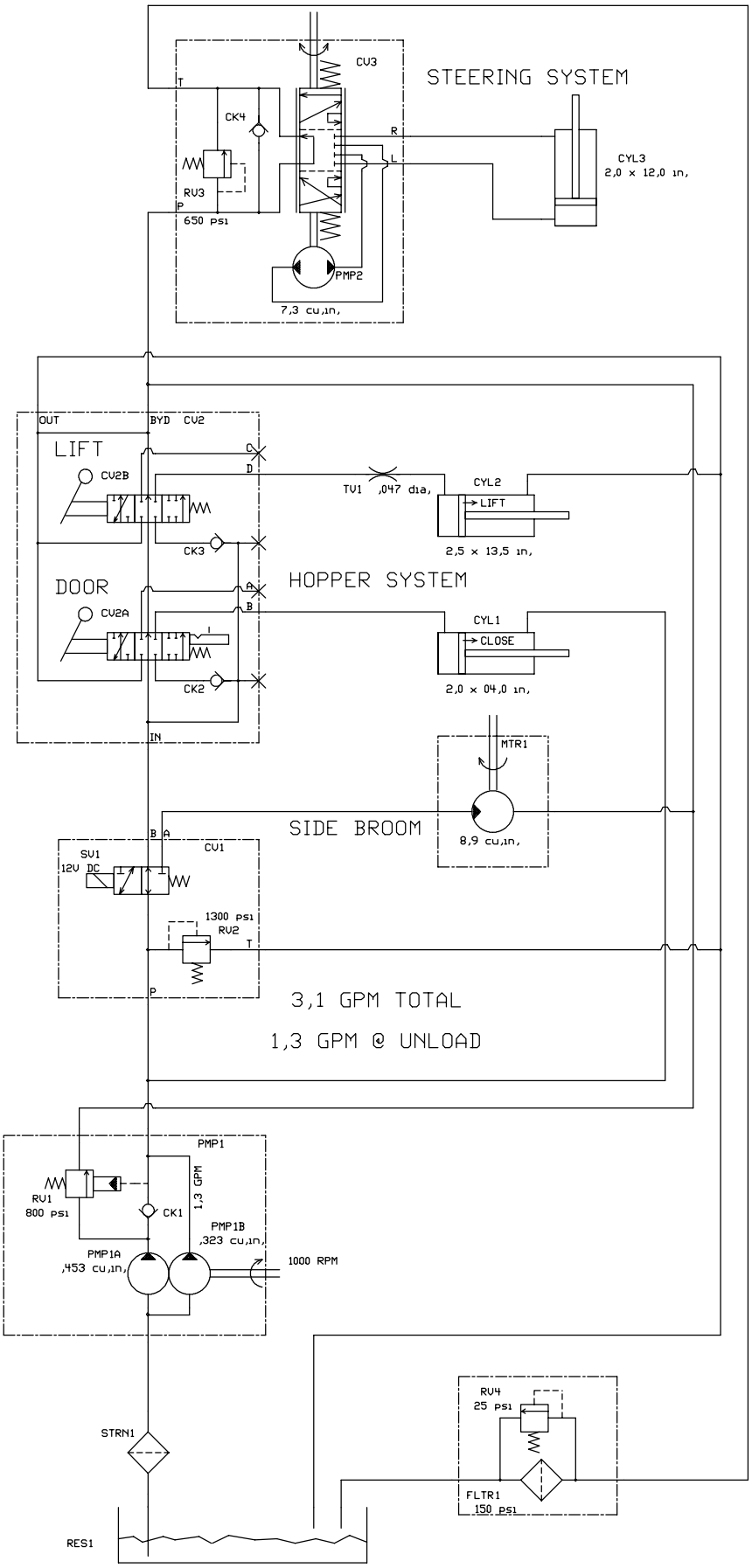
14. Disengage the hopper support bar and lower the hopper.



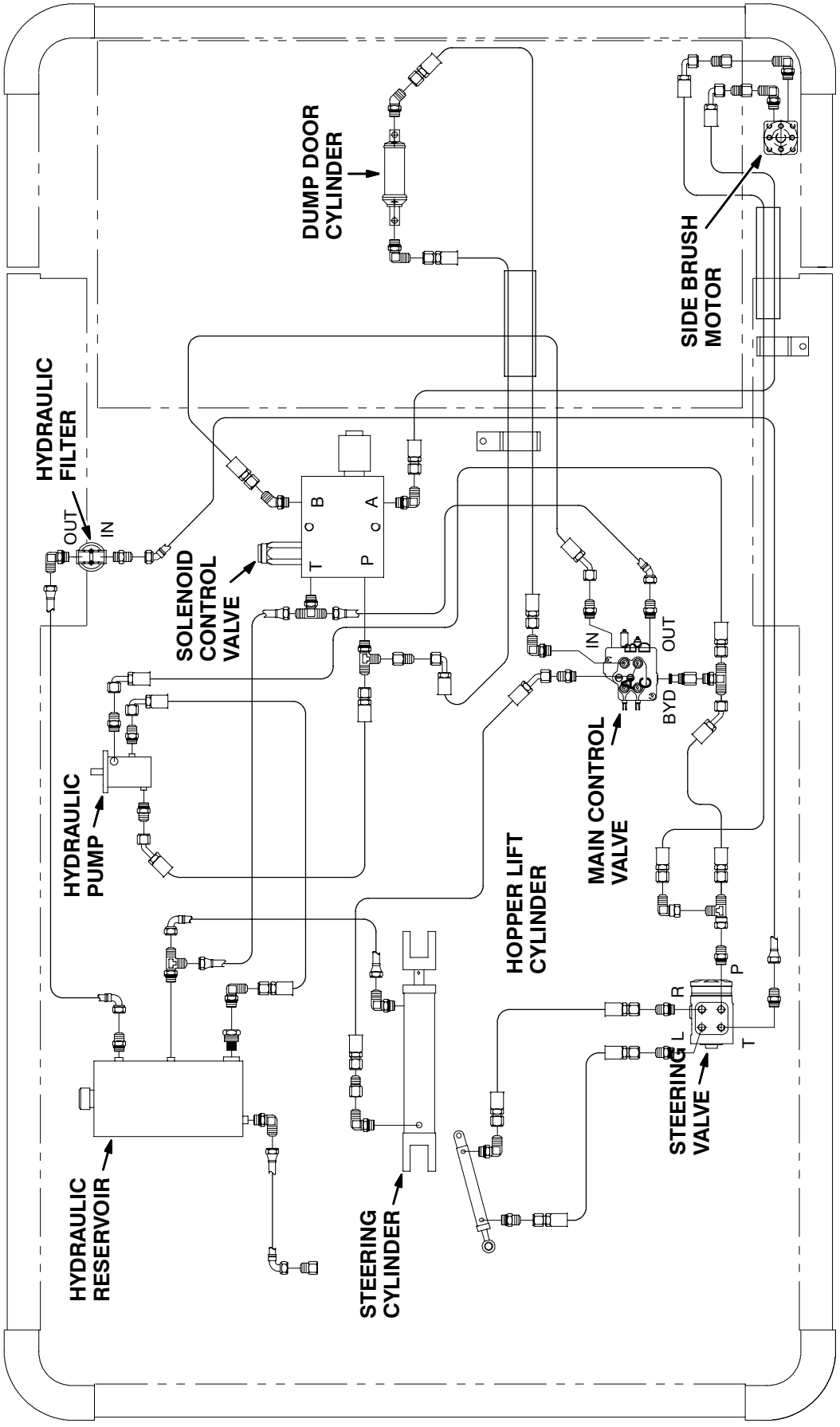
15. Adjust the side brush pattern with the side brush down pressure lever.



HYDRAULIC SCHEMATIC, ELECTRIC



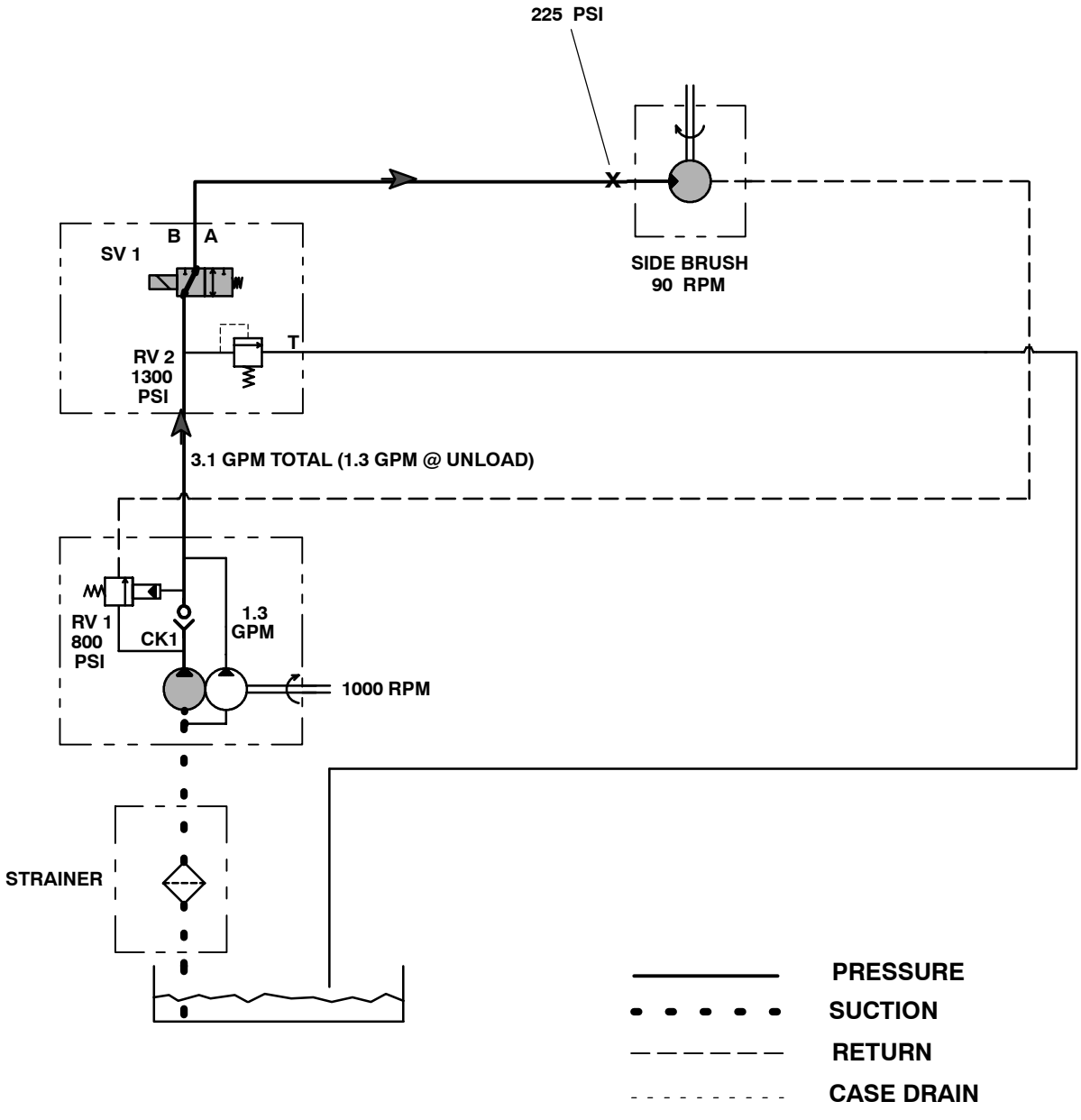
HYDRAULIC HOSE GROUP, ELECTRIC



TROUBLESHOOTING

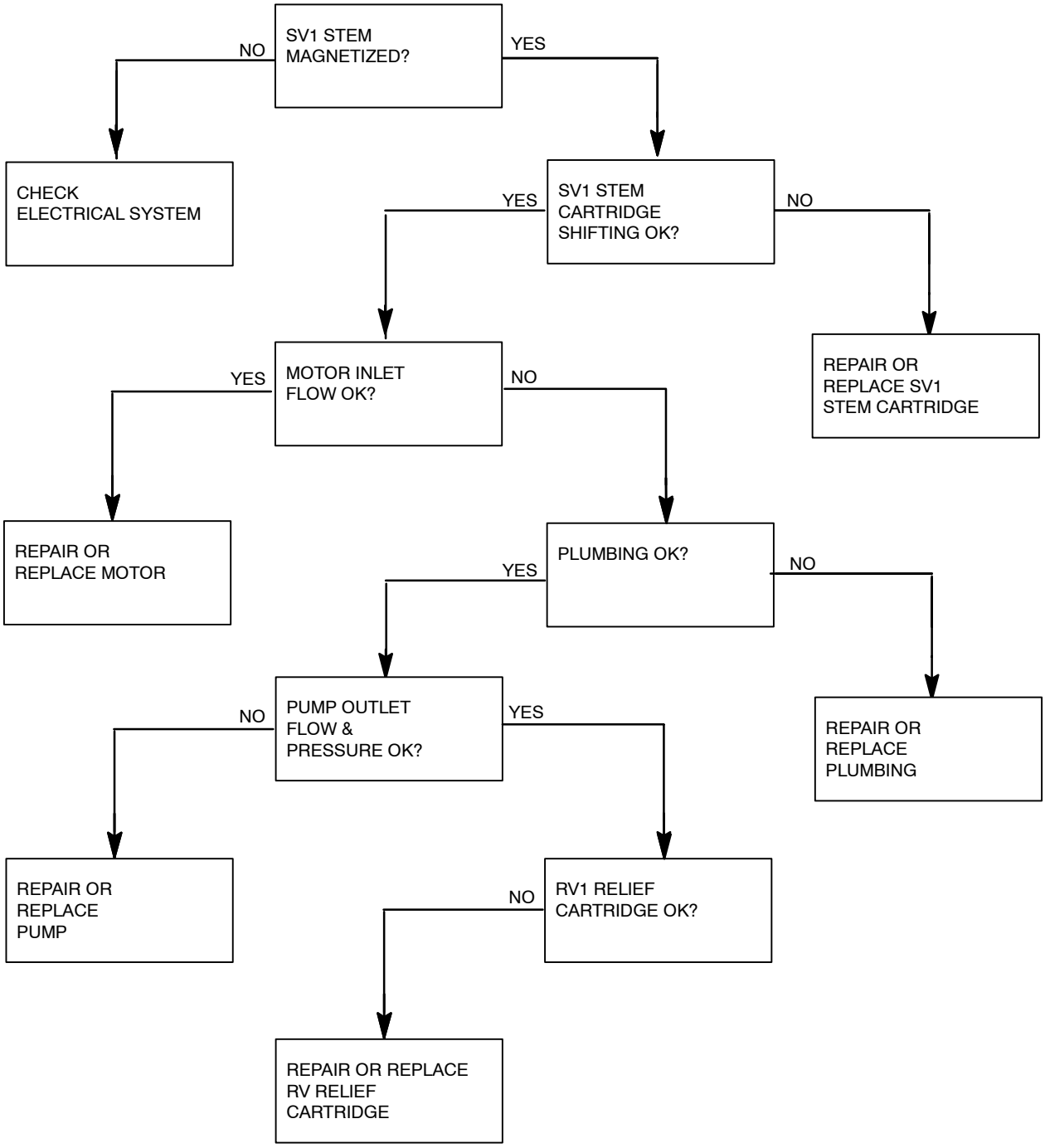
The troubleshooting charts that follow are organized so they lead you through the hydraulic circuits. They include flow charts and instructions for you as to where to insert your test instruments.

SIDE BRUSH ON CIRCUIT

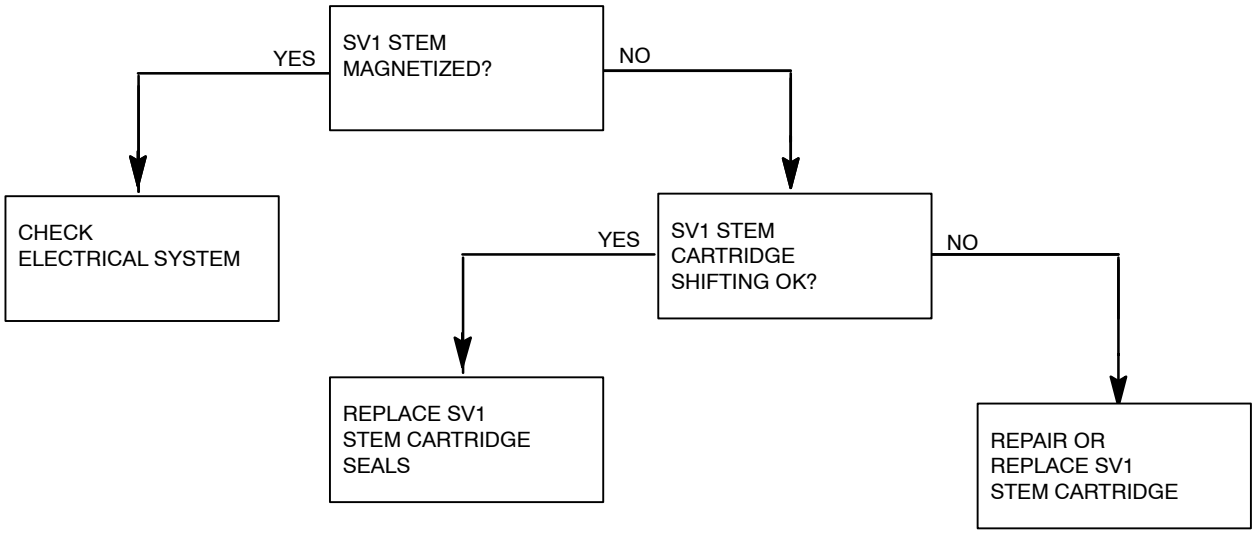


PRESSURE READINGS BASED ON 150 F°

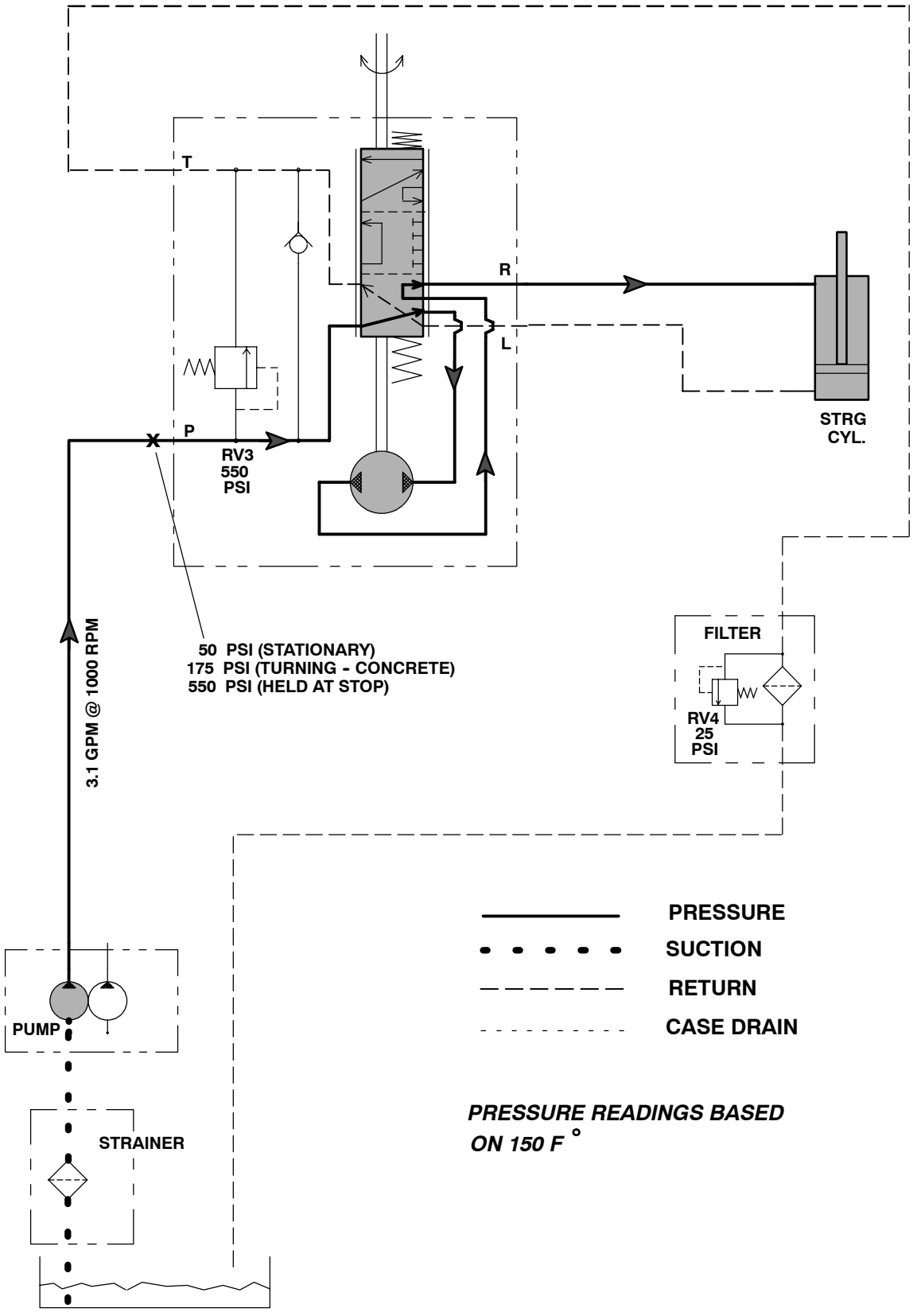
SIDE BRUSH DOES NOT TURN ON



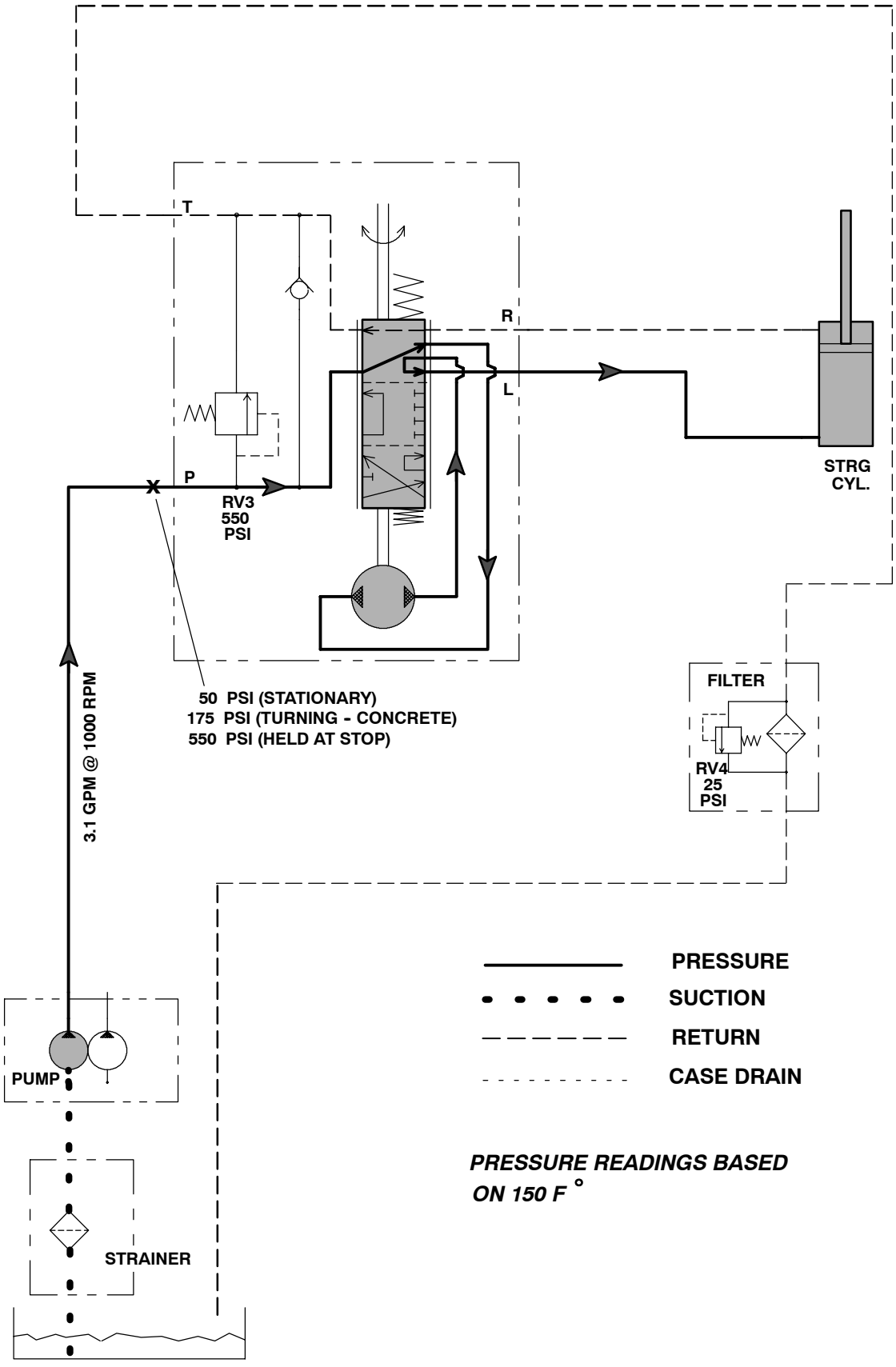
SIDE BRUSH DOES NOT TURN OFF



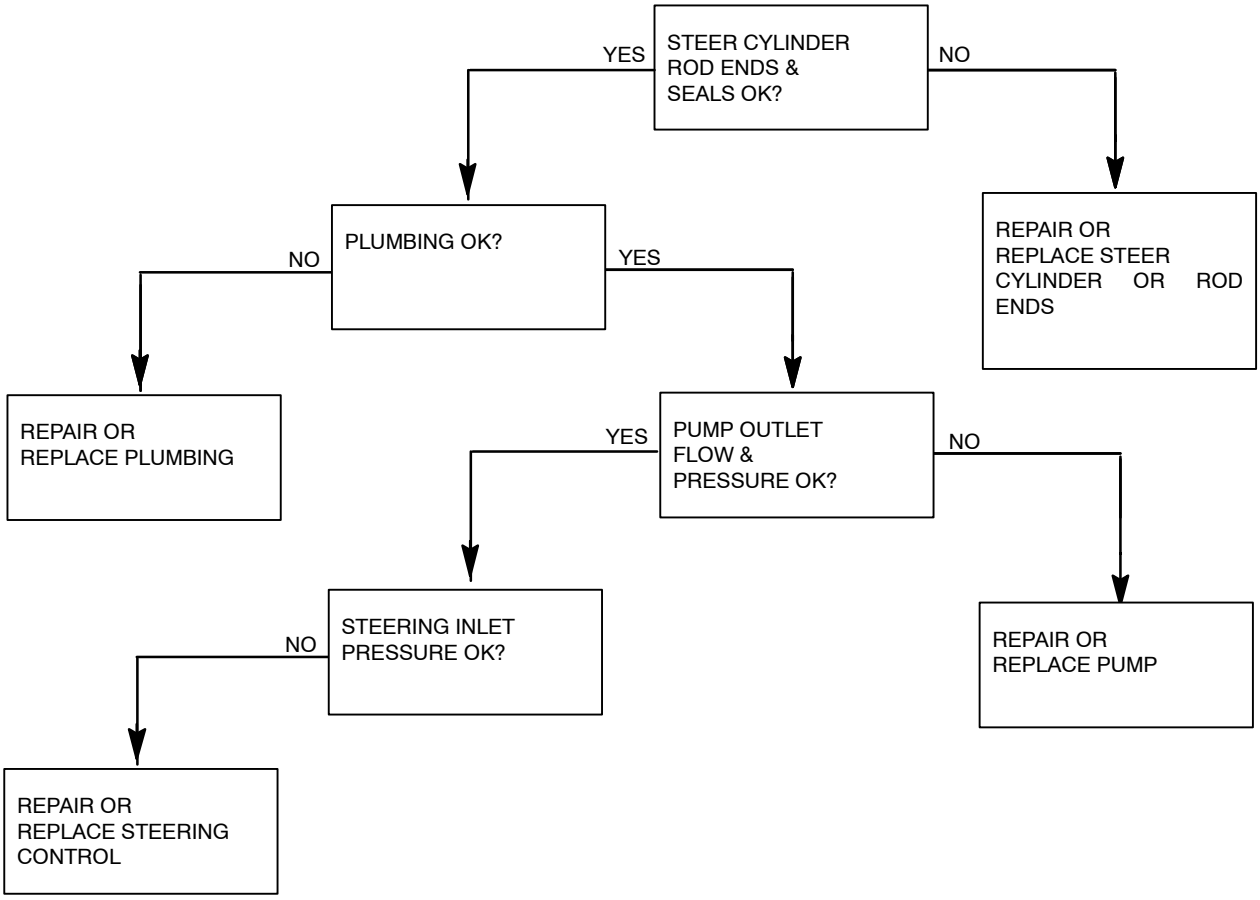
STEERING CIRCUIT
RIGHT TURN



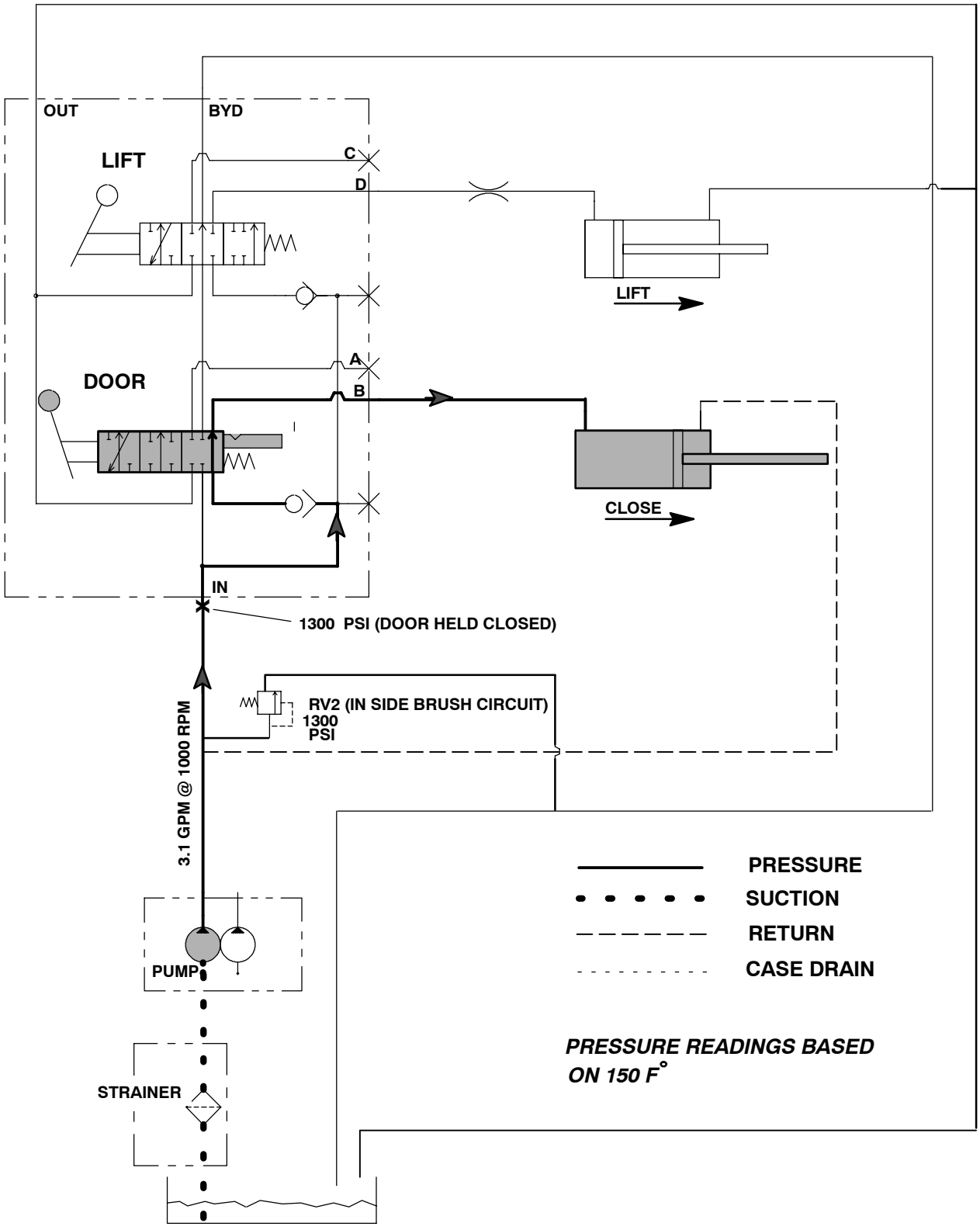
STEERING CIRCUIT
LEFT TURN



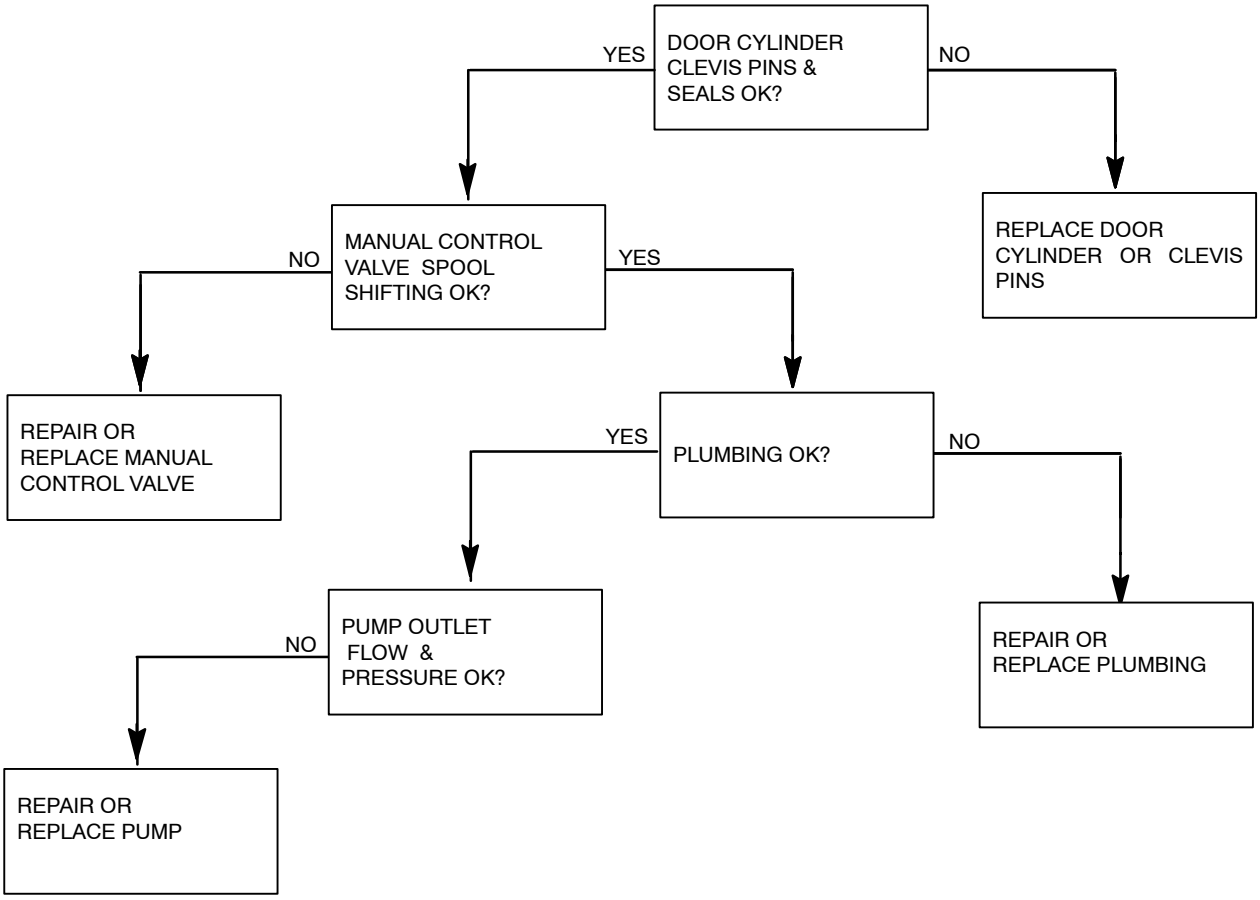
POWER STEERING IS NOT NORMAL



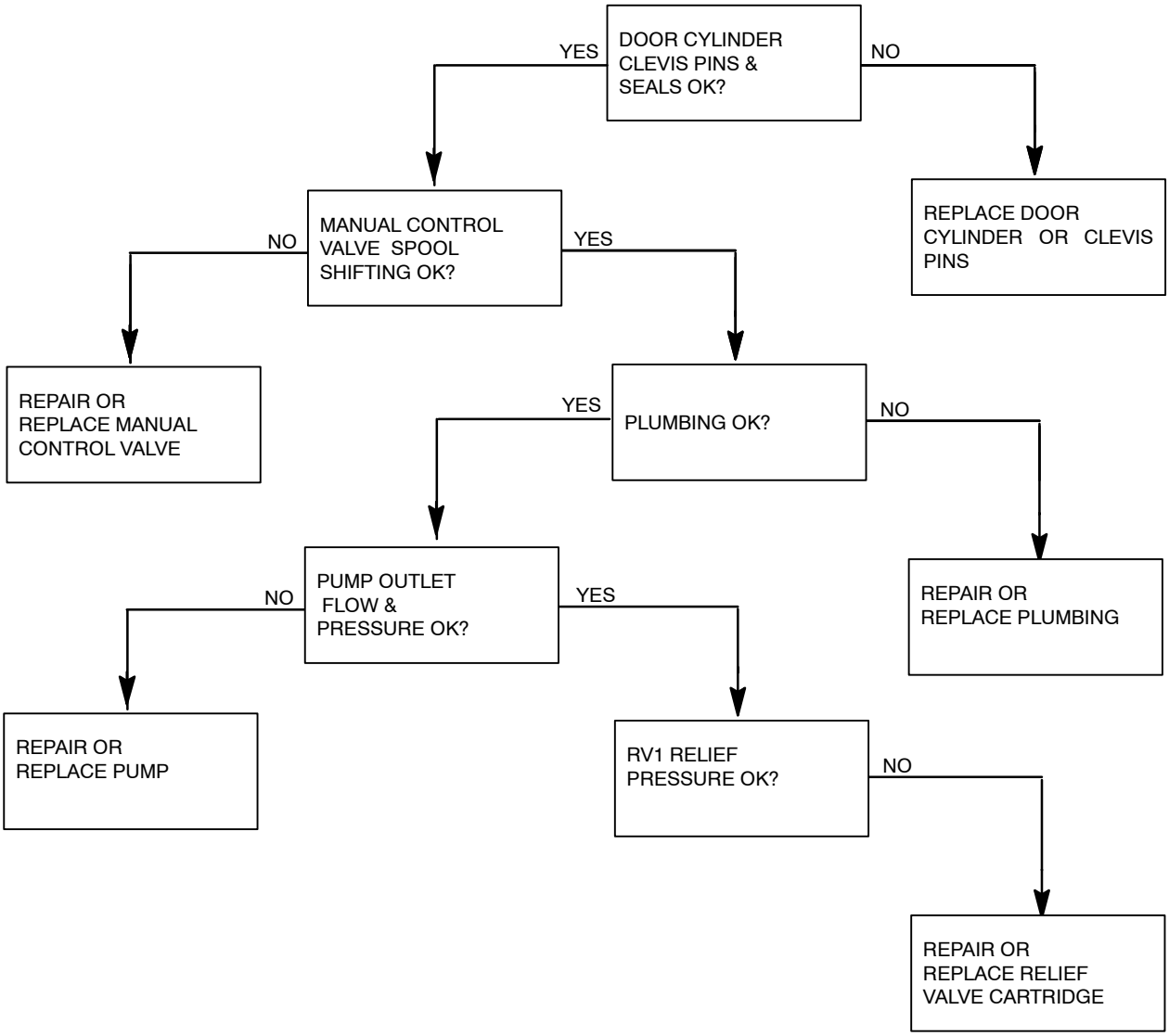
HOPPER DOOR CIRCUIT CLOSED



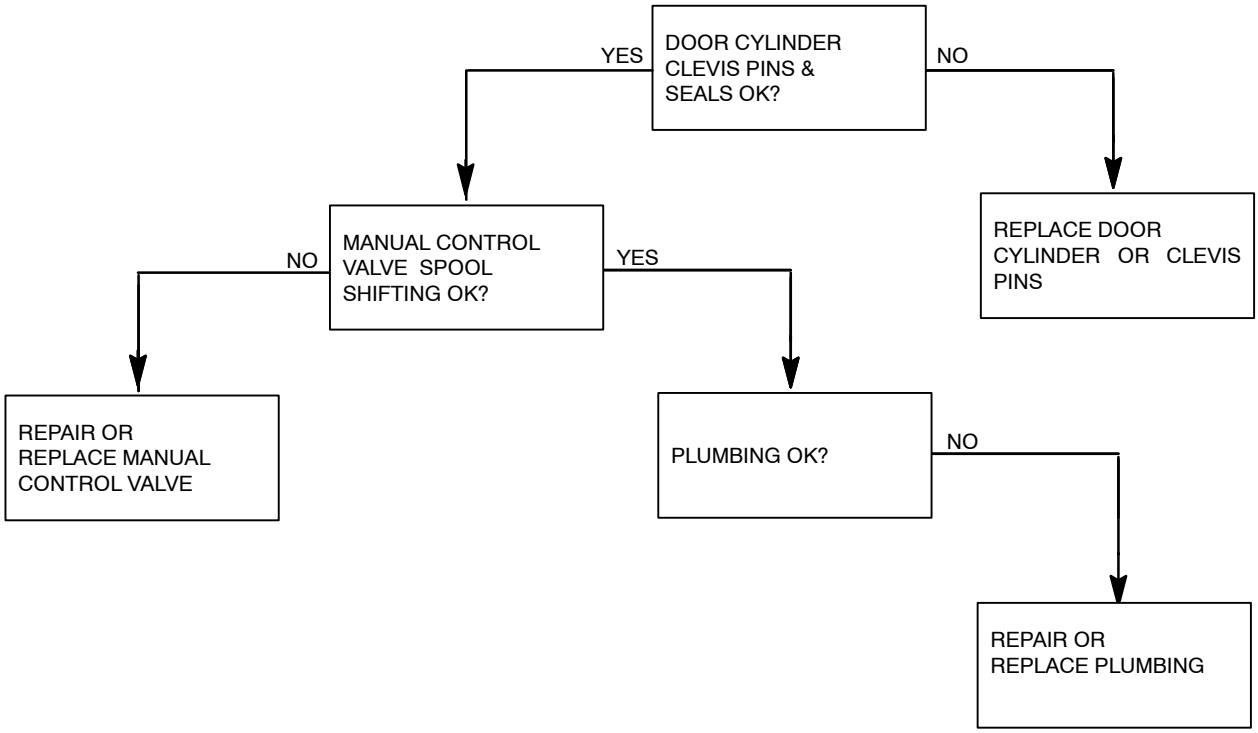
HOPPER DOOR DOES NOT OPEN



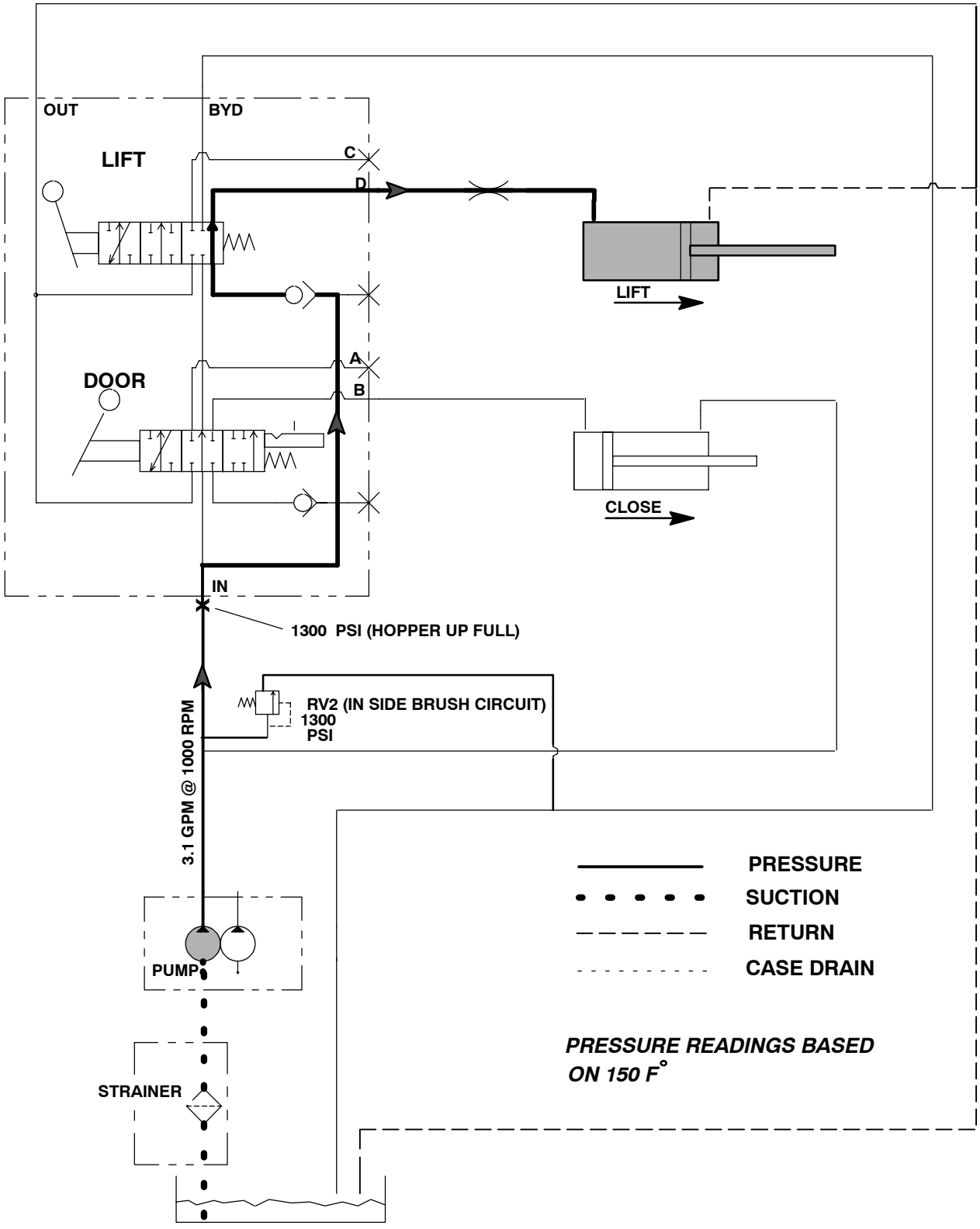
HOPPER DOOR DOES NOT CLOSE



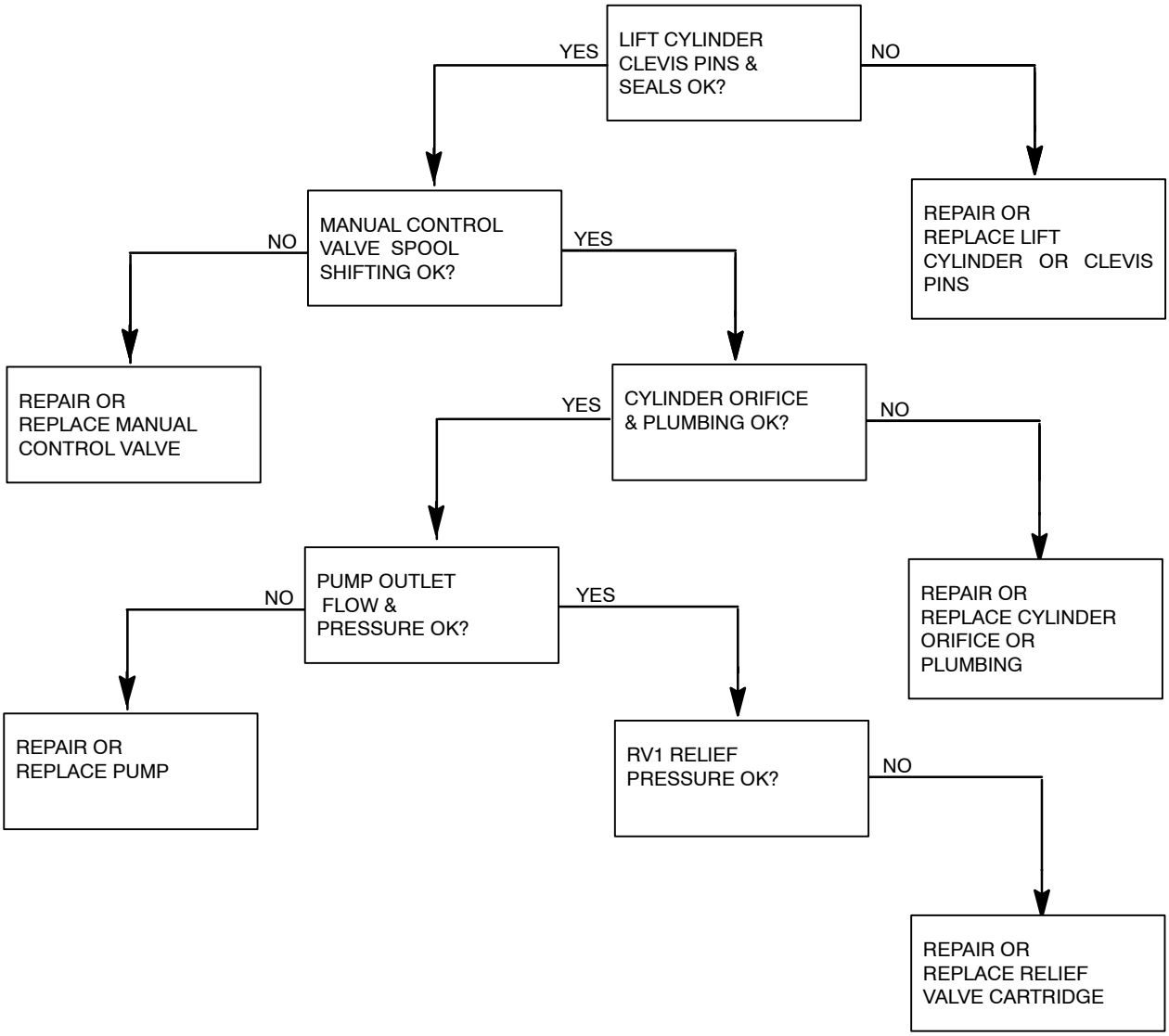
HOPPER DOOR DOES NOT STAY CLOSED



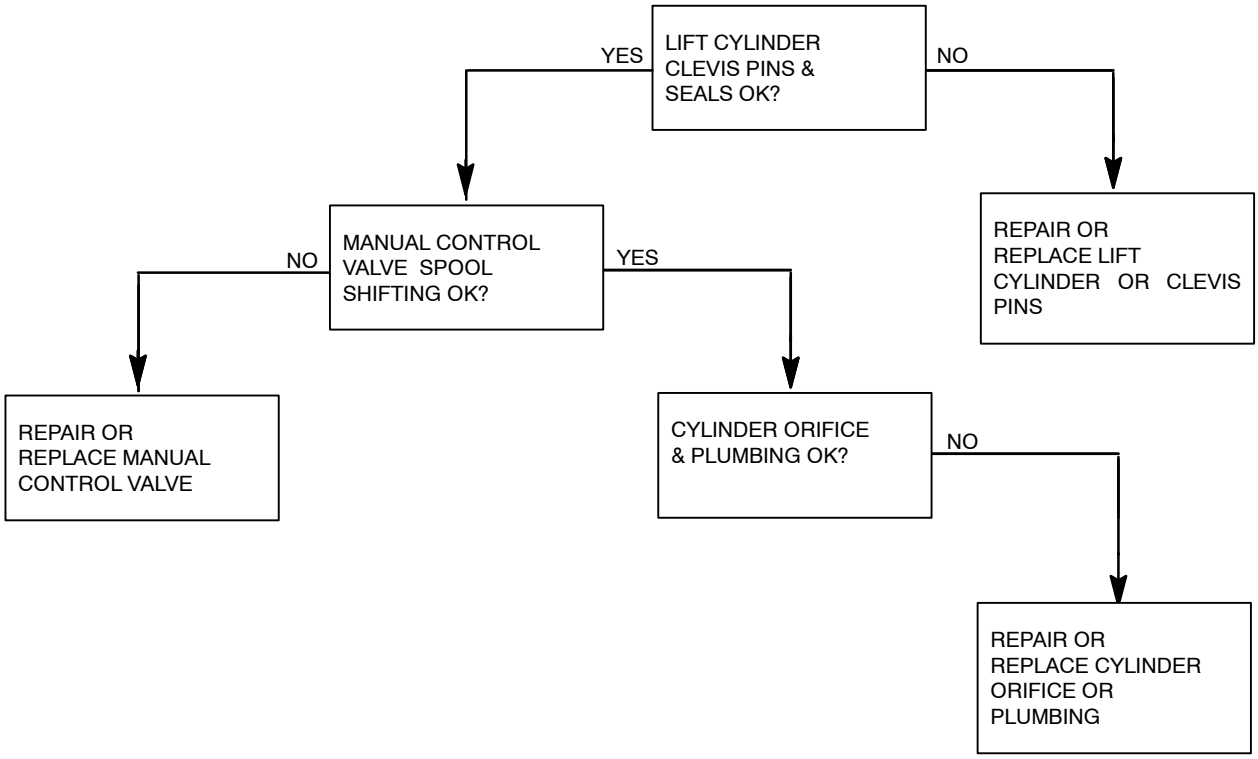
HOPPER LIFT CIRCUIT



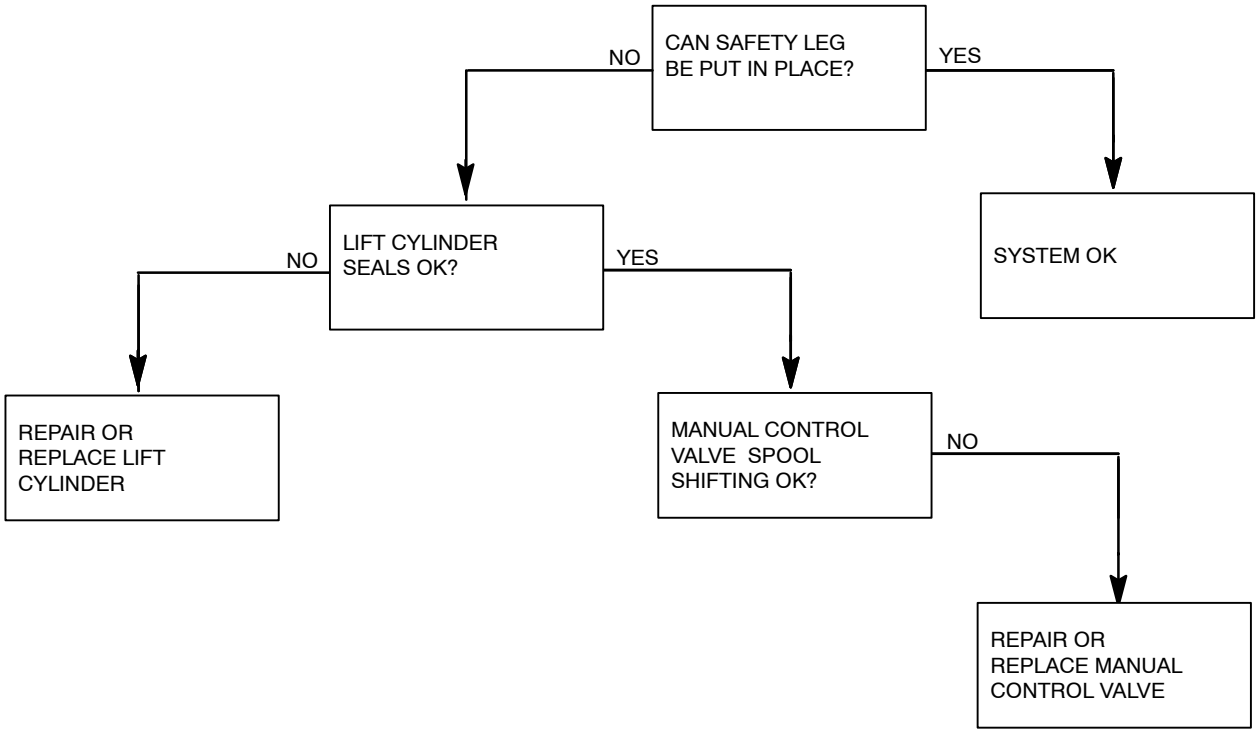
HOPPER DOES NOT RAISE



HOPPER DOES NOT LOWER



HOPPER DOES NOT HOLD UP POSITION

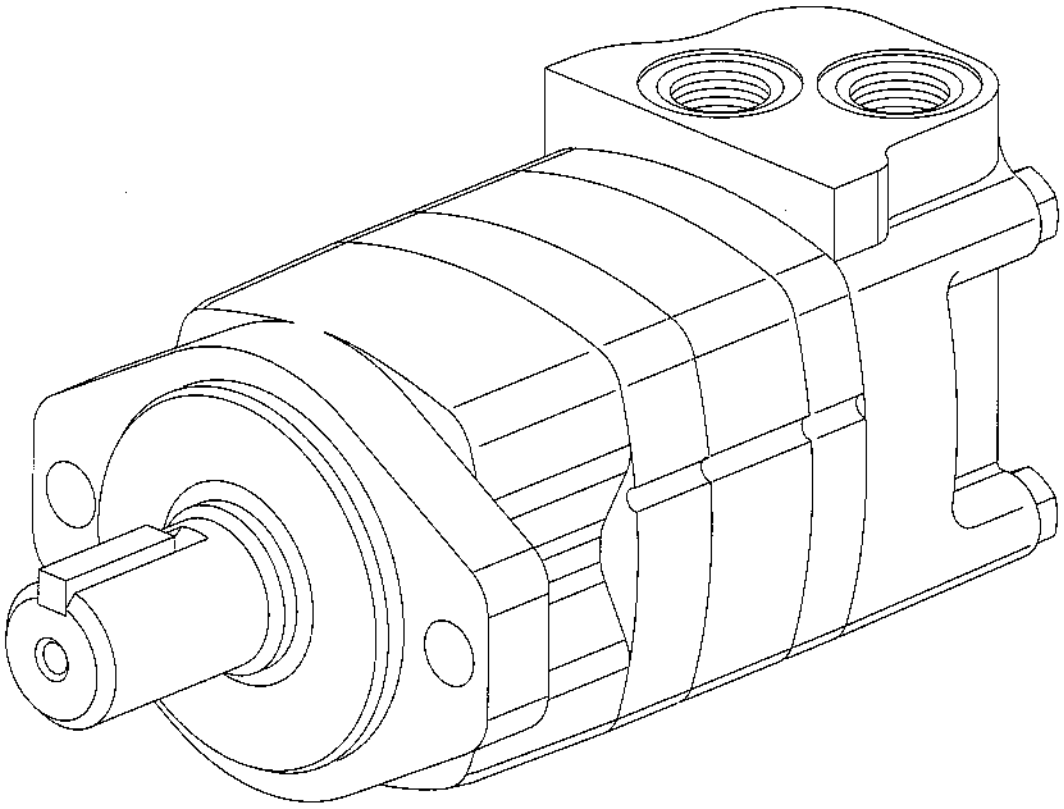


Char-Lynn®
Hydraulic Motor

No. 7-124
Revised December, 1994

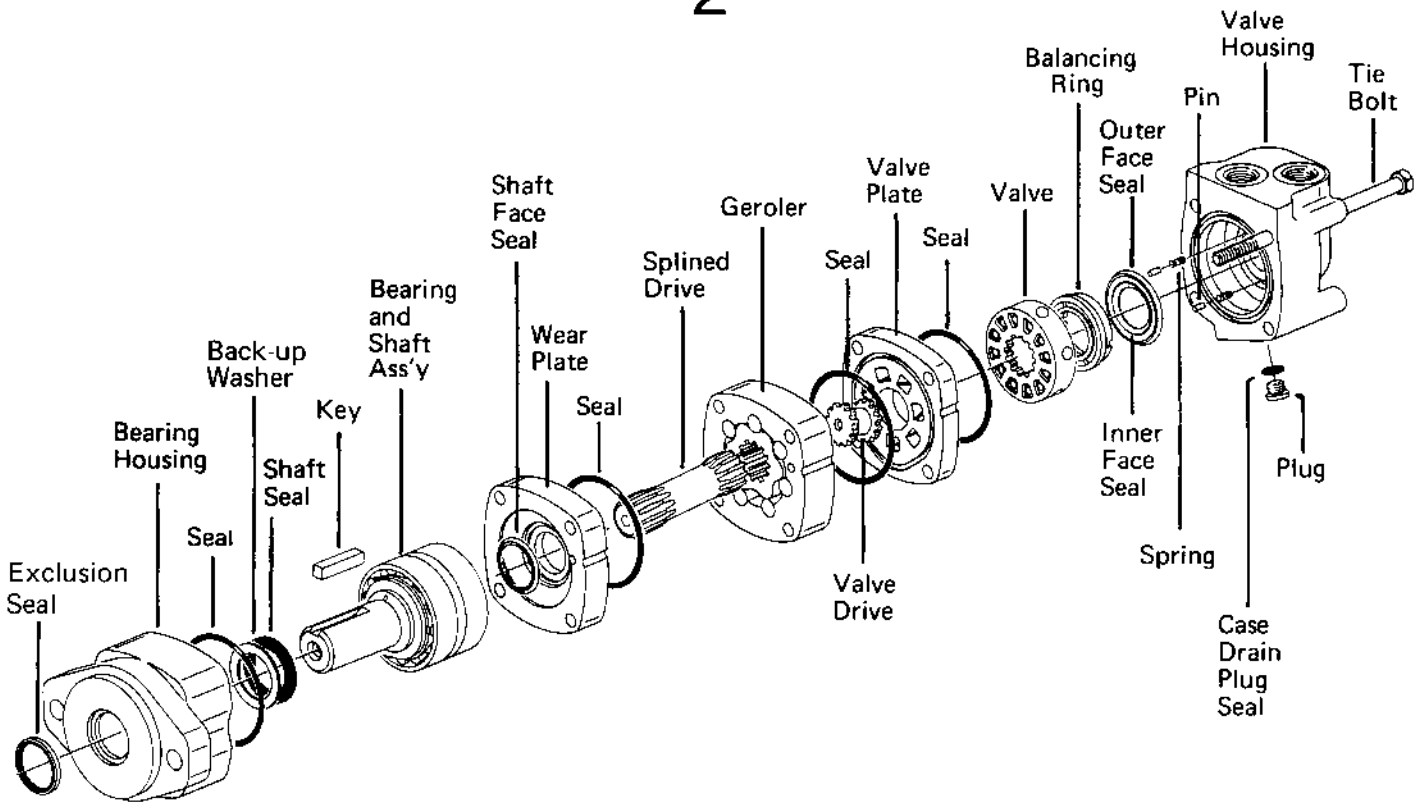
EATON

Repair Information



2000 Series
Disc Valve Geroler Motor

006



Tools required for disassembly and reassembly.

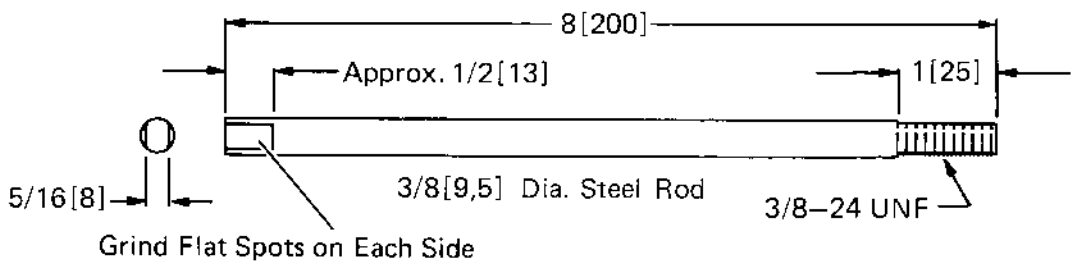
Torque wrench 500 lb-in[57Nm] capacity
12-16[300-450]* breaker bar
9/16 socket
Small screwdriver 6-8x1/4[150-200x6,5] blade
3/16 allen wrench
Press

*Unless indicated otherwise, measurements are given in inches[mm].

**Shaft seal installation tool (600496)
**Bullet (600465) for 1 diameter shafts

The following tools are not necessary for disassembly and reassembly, but are extremely helpful.

Alignment studs (2)



**Available--by special order

3 Disassembly

Cleanliness is extremely important when repairing a hydraulic motor. Work in a clean area. Before disconnecting the lines, clean the port area of the motor thoroughly. Use a wire brush to remove foreign material and debris from around the exterior joints of the motor. Check the shaft and keyslot, remove all nicks, burrs or sharp edges that might damage the bearing housing seals when installing the shaft and bearing assembly. Before starting the disassembly procedures, drain the oil from inside the motor.

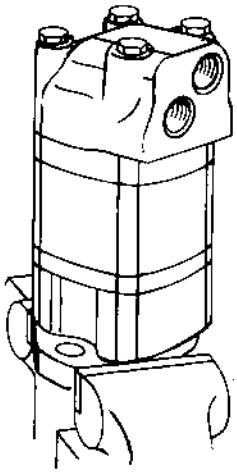


Figure 1

1 Place the motor in a vise with the output shaft down. Clamp across the mounting flange of the motor not the housing. Excessive clamping pressure will cause distortion. When clamping, use some protective device on the vise, such as special soft jaws, pieces of hard rubber or board.

> Although not all drawings show the motor in a vise, we recommend that you keep the motor in the vise during disassembly and reassembly. Follow the clamping procedures explained throughout the manual.

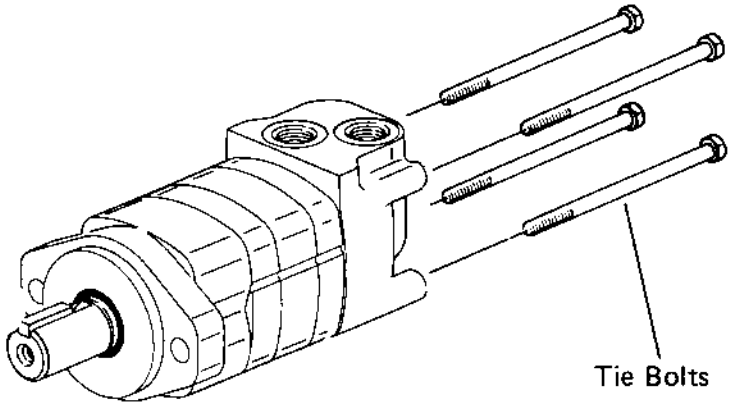


Figure 2

2 Remove 4 bolts from motor.

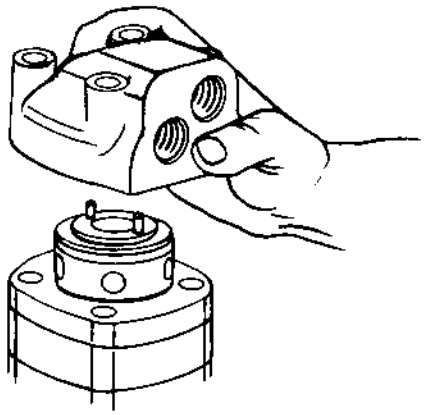


Figure 3

3 Lift valve housing straight up. If done carefully the pins, springs, balance ring assembly, and valve will remain on the valve plate.

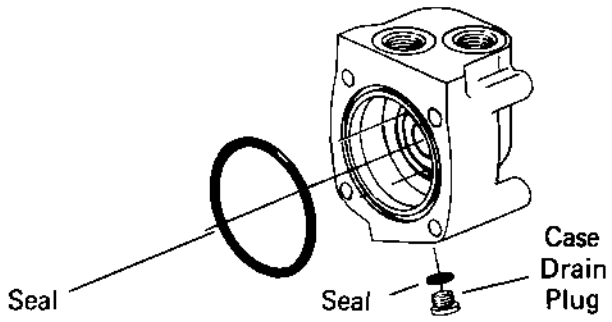


Figure 4

4 Carefully remove 3[76] diameter seal from valve housing.

5 Remove case drain plug—with seal, from valve housing.

6 Remove 2 pins and 2 springs from balance ring assembly, see Fig. 5.

Disassembly

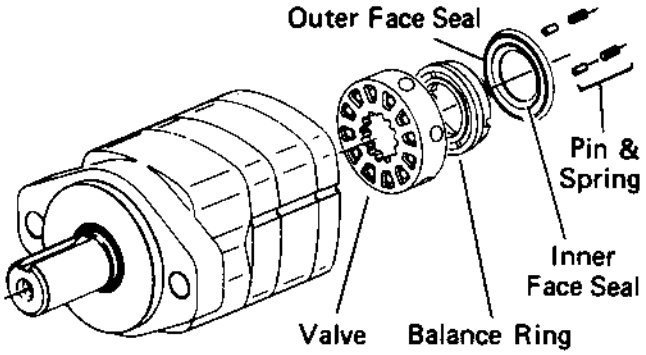


Figure 5

7 Remove balance ring assembly.

8 Remove inner and outer face seals from balance ring.

9 Remove the valve.

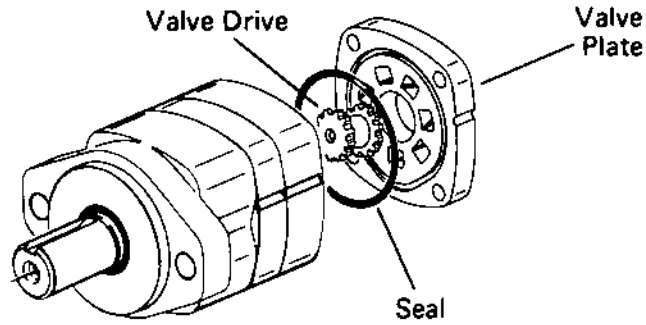


Figure 6

10 Remove the valve plate.

11 Remove the 3[76] diameter seal from valve plate.

12 Remove the valve drive.

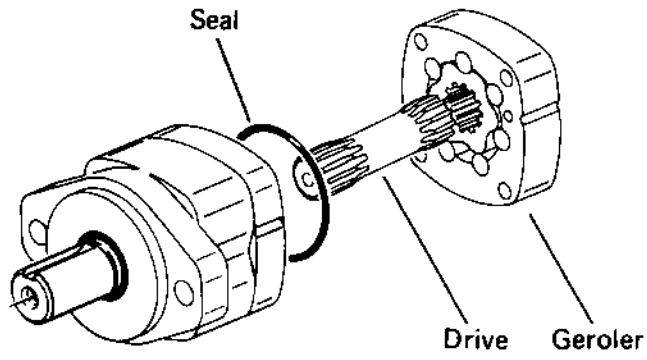


Figure 7

13 Remove the Geroler. Be sure to retain the rollers in the outer ring if they are loose.

14 Remove the drive.

15 Remove the 3[76] diameter seal from wear plate, see Fig. 7.

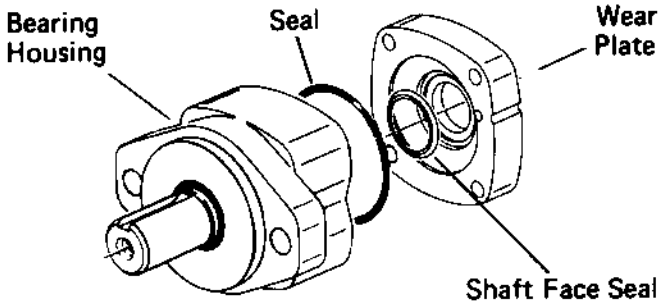


Figure 8

16 Remove the wear plate.

17 Remove the shaft face seal from the wear plate.

18 Remove the 3[76] diameter seal from bearing housing.

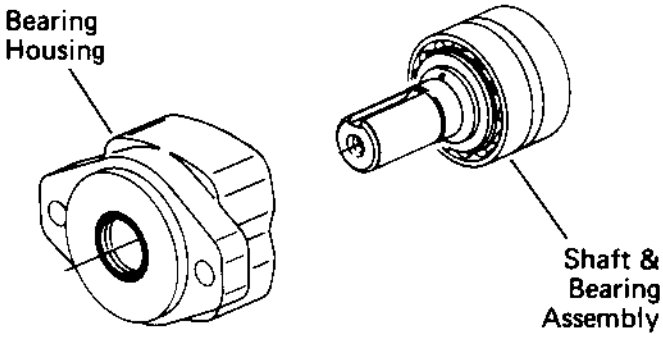


Figure 9

19 You may need a press to remove shaft and bearing assembly from bearing housing. (Key must be removed before removing shaft.)

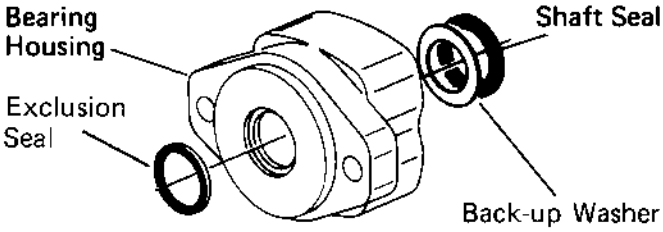


Figure 10

20 Use a small screwdriver to remove shaft seal, back-up washer and exclusion seal from bearing housing, see Fig. 10. Do not damage bore of housing.

Note: Individual parts of shaft and bearing assembly are not sold separately. Replace as a unit.

5 Reassembly

Check all mating surfaces. Replace any parts that have scratches or burrs that could cause leakage. Clean all metal parts in clean solvent. Blow dry with air. Do not wipe dry with cloth or paper towel because lint or other matter can get in the hydraulic system and cause damage. Do not use a coarse grit or try to file or grind these parts. Check around the keyway and chamfered area of the shaft for burrs, nicks or sharp edges that can damage the seals when reassembling the bearing housing.

Note: Lubricate all seals (prior to installation) with petroleum jelly such as Vaseline. Use new seals when reassembling this motor. Refer to parts list (6-129) for proper seal kit number.

21 Use a press to install exclusion seal in outer bore of bearing housing. Lip of seal must face outward. See Fig. 11. If a press is **not** available use a plastic or rubber hammer, being careful not to damage or cock seal in the bore.

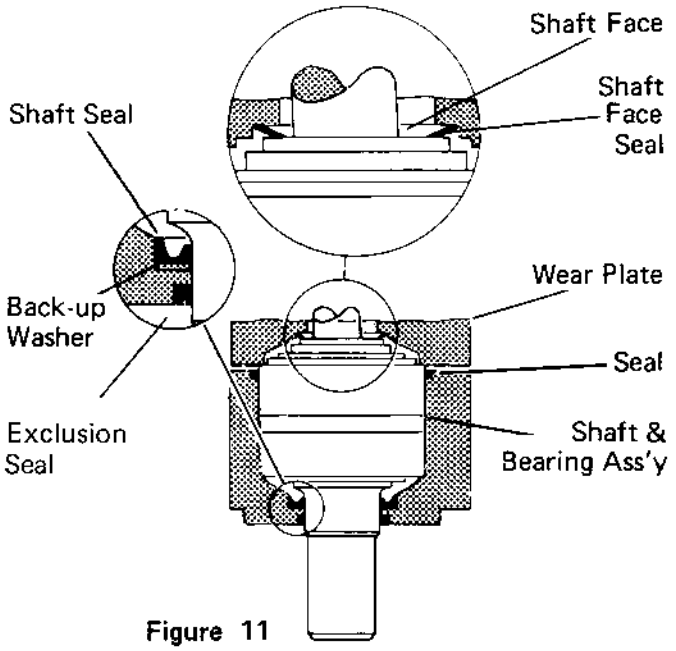


Figure 11

22 Place back-up washer into seal bore. Place shaft seal onto installation tool (600496) and press seal into seal bore of the housing.

23 Clamp housing in vise, see Fig. 1.

24 Place protective bullet (see note below) over shaft. Apply petroleum jelly to inside diameter of dust and shaft seal. You may need a press to install shaft and bearing assembly. Do not distort shaft seal. Damage to this seal will cause leakage.

Note: Bullet (600465), for 1" shafts, available--by special order. Use tape over other shafts to prevent cutting the seals.

25 Apply petroleum jelly to the 3[76] diameter seal. Install seal into the bearing housing.

26 Alignment studs can be very helpful in reassembly of the motor. See special tool listing page 2. If you use studs, install 2 studs diagonally opposed in the bearing housing.

27 Install the shaft face seal in the wear plate as shown in Fig. 11. Do not distort seal.

28 Install the wear plate, see Fig. 11.

29 Apply a light film of petroleum jelly to the 3[76] diameter seal and install seal in the wear plate.

30 Install the drive into the output shaft.

31 Align the notch on the outside of the Geroler with the notch on the wear plate. Install the Geroler against the wear plate. Be sure to retain the rollers in the outer ring if they are loose.

32 Install the valve drive in the Geroler.

Note: Installation at this time involves 3 steps in the timing of the motor. Timing determines the direction of rotation of the output shaft. Timing parts include:
1. Geroler
2. Valve Drive
3. Valve Plate
4. Valve

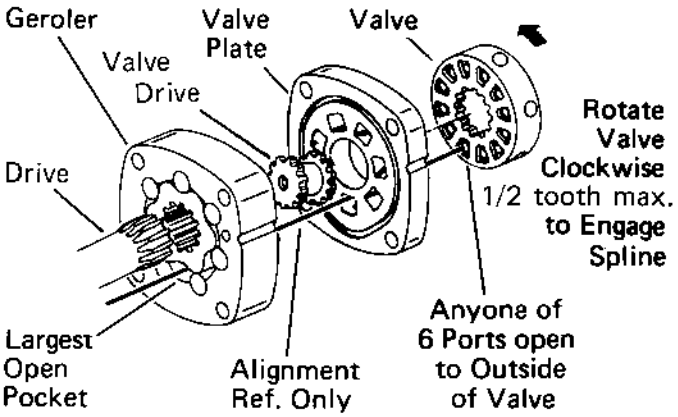


Figure 12 Timing Alignment

Timing Step # 1—Locate the largest open pocket in the Geroler and mark it on the outside edge of the Geroler.

33 Apply a light film of petroleum jelly to the 3[76] diameter seal. Install seal in groove of valve plate.

Reassembly 6

34 Align the notch on the outside of the valve plate with the notch on the Geroler as shown in Fig. 12.

Timing Step # 2— Locate the slot opening in the valve plate which is in line with the largest open pocket of the Geroler.
Timing Step # 3— Locate any one of the side openings of the valve and align this opening with the open slot of the valve plate that is in line with the largest open pocket of the Geroler. Install the valve by rotating it clockwise until the spline teeth engage (1/2 spline tooth max.). This will provide the proper rotation when pressurized as shown in Fig. 13.

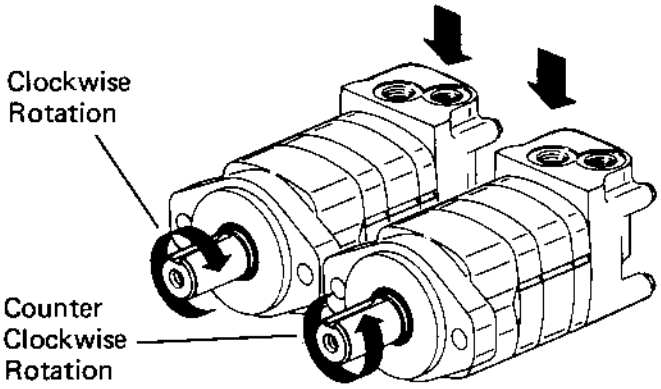


Figure 13

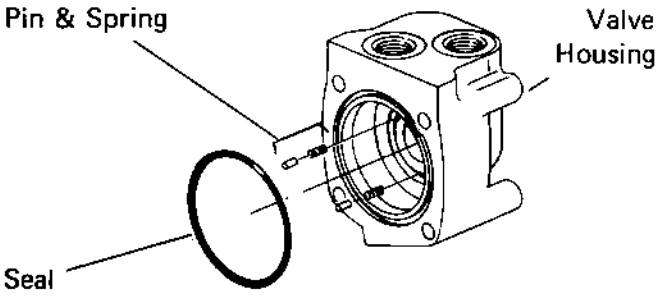


Figure 14

35 Install 2 springs and 2 pins in the holes located in the bore of the valve housing, as shown in Fig. 14.

36 Apply a light film of petroleum jelly to the 3[76] diameter seal. Install seal in the valve housing.

37 Apply petroleum jelly to inner and outer face seals. Install seals on balance ring as shown in Fig. 15.

Important: Install face seals in the positions shown in Fig. 15. or the motor will not operate properly. Do not force or bend the face seals. Any damage to these seals will affect the operation of the motor.

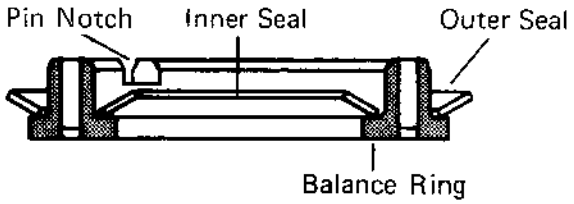


Figure 15

38 Align pin notches in balance ring with pins in bore of valve housing. Install balance ring assembly in valve housing.

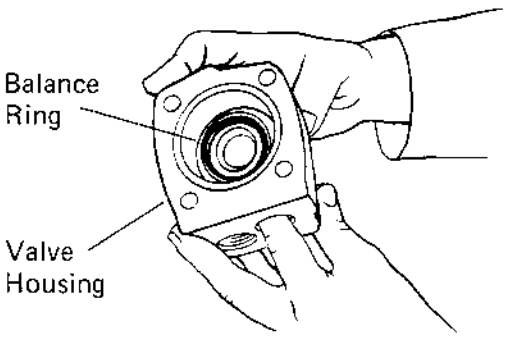


Figure 16

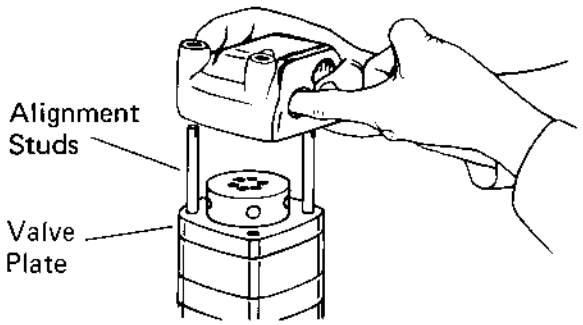


Figure 17

39 Insert your finger through port of valve housing. Apply pressure to side of balance ring as shown in Fig. 16. Hold ring in position until valve housing is in place against valve plate. See Fig. 17.

Note: After installing the valve housing on the valve plate check for proper placement. Push down on the valve housing. You should get a slight spring action.

40 Install tie bolts. If you use alignment Studs, install 2 bolts opposite the studs. Finger tighten the bolts. Remove the alignment studs and replace with the two remaining bolts. Torque all four bolts alternately to 50 Nm [450 lb-in].

41 Install seal on case drain plug then install in valve housing. torque to 6 Nm [50 lb-in.

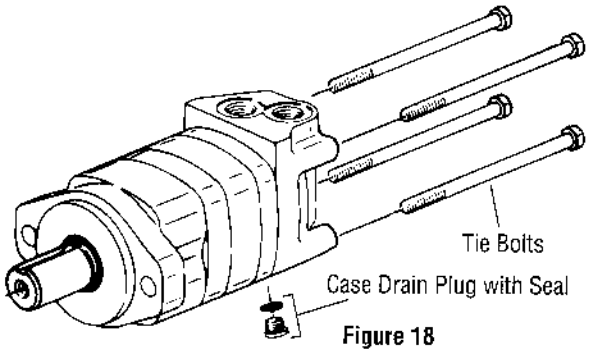


Figure 18

Wheel Motor

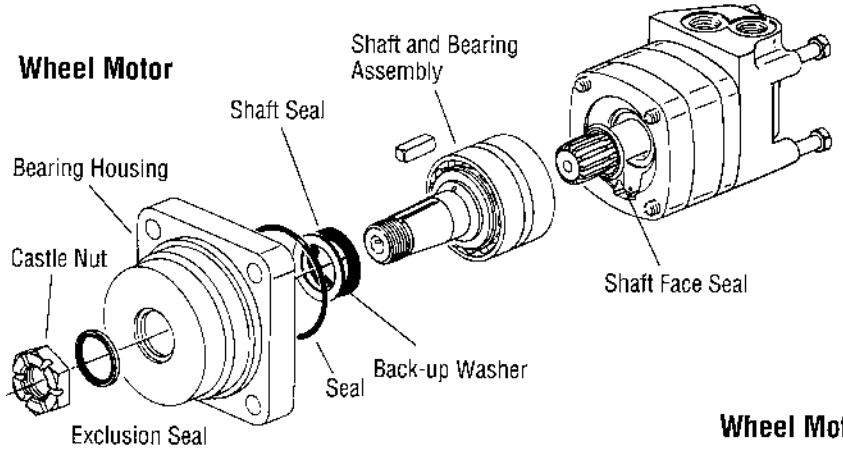
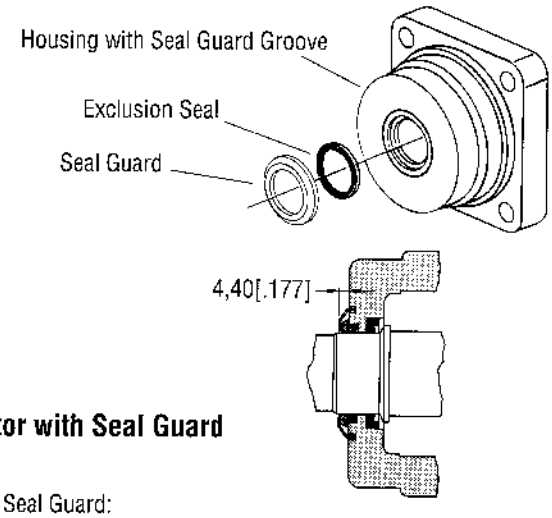


Figure 19

On wheel motors, a different bearing housing is used, see Fig. 19. Other than this the same parts are the same as the standard motor and the same disassembly and reassembly procedures apply.

Wheel Motor with Seal Guard



Installation of Seal Guard:
After completing assembly of the shaft and bearing assembly into the bearing housing, press the seal guard onto the shaft with a tool that will provide an even push over the seal. This tool must bottom out against the bearing housing and provide a 4,5 mm [.177 inch] stop for the seal guard.

Bearingless Motor

This motor is the same as the standard motor without the shaft/bearing assembly, and bearing housing. The mounting flange replaces the bearing housing, see Fig. 20 Follow same disassembly and reassembly procedures as rear section of standard motor.

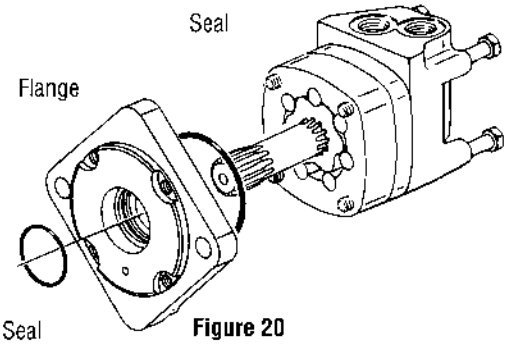
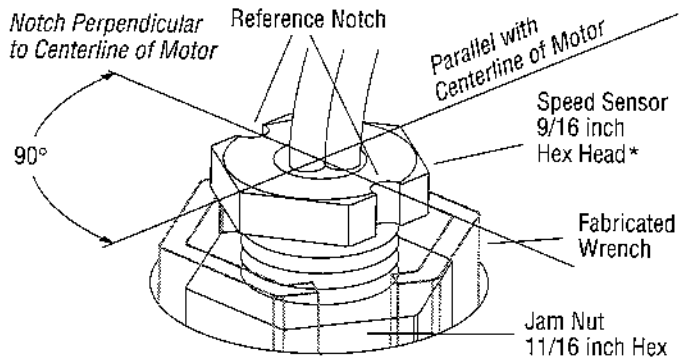


Figure 20

Speed Sensor Installation



*Turn Speed Sensor in to bottom (making sure jam nut is backed off sufficiently), back off 1/4 turn (CCW) and if reference notch(s) is not positioned as shown above continue turning (CCW) to align reference notch 90° off of centerline of motor or perpendicular to motor shaft. Hold speed sensor in this position and tighten jam nut to 8,5 — 14 Nm [75 — 125 lb-in].

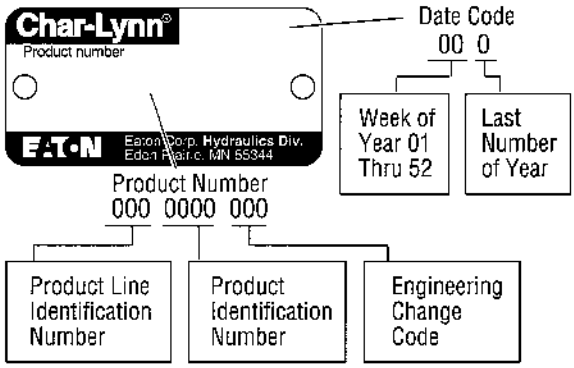
For Additional Literature Contact Eaton Corp. Hydraulics Division 15151 Highway 5 Eden Prairie, MN 55344.

- Specifications and performance Data, Catalog No. 11-878
- Replacement Part Numbers and Kit Information — Parts Information No. 6-129

How to Order Replacement Parts

Each Order Must Include the Following:

1. Product Number
2. Date Code
3. Part Name
4. Part Number
5. Quantity of Parts



Product Numbers—2000 Series

Use digit prefix **—104-**, **105-**, or **106-** plus four digit number from charts for complete product number—Example **106-**1043.

Mounting	Shaft	Ports	Displacement cm³/r [in³/r] and Product Number								
			80 [4.9]	100 [6.2]	130 [8.0]	160 [9.6]	195 [11.9]	245 [14.9]	305 [18.7]	395 [24.0]	490 [29.8]
2 Bolt SAE A Flange	1 inch Straight	7/8-14 O-ring Staggered	**104-**1001	-1002	-1003	-1004	-1005	-1006	-1007	-1143	—
		1-1/16—12 O-ring 180° Apart	**104-**1037	-1038	-1039	-1040	-1041	-1042	-1043	-1044	—
	1-1/4 Inch Straight	7/8-14 O-ring Staggered	**104-**1022	-1023	-1024	-1025	-1026	-1027	-1028	-1228	-1420
		1-1/16—12 O-ring 180° Apart	**104-**1061	-1062	-1063	-1064	-1065	-1066	-1067	-1068	-1421
	1-1/4 Inch 14 T Splined	7/8-14 O-ring Staggered	**104-**1029	-1030	-1031	-1032	-1033	-1034	-1035	-1229	-1422
		1-1/16—12 O-ring 180° Apart	**104-**1087	-1088	-1089	-1090	-1091	-1092	-1093	-1094	-1423
2 Bolt SAE B Flange	1-1/4 Inch Straight	7/8-14 O-ring Staggered	**104-**1200	-1201	-1202	-1203	-1204	-1205	-1206	-1207	—
	1-1/4 In. Involute SAE C Splined	7/8-14 O-ring Staggered	**104-**1208	-1209	-1210	-1211	-1212	-1213	-1214	-1215	—
	1 Inch SAE 6B Splined	7/8-14 O-ring Staggered	**104-**1193	-1194	-1195	-1196	-1197	-1198	-1199	—	—
	7/8 Inch SAE B Splined	7/8-14 O-ring Staggered	**104-**1216	-1217	-1218	-1219	-1220	—	—	—	—
Standard with 4 Bolt Square Flange	32 mm Straight	G 1/2 (BSP)	**104-**1384	-1385	-1386	-1387	-1388	-1389	-1390	-1391	—
	1-1/4 Inch 14 T Splined	G 1/2 (BSP)	**104-**1376	-1377	-1378	-1379	-1380	-1381	-1382	-1383	—
Wheel Motor	1-1/4 Inch Straight	7/8-14 O-ring Staggered	**105-** —	—	—	—	—	—	—	—	-1148
		1-1/16—12 O-ring 180° Apart	**105-** —	—	—	—	—	—	—	—	-1149
	32 mm Straight	G 1/2 (BSP)	**105-**1134	-1135	-1136	-1137	-1138	-1139	-1140	-1141	—
	1-1/4 Inch Tapered	7/8-14 O-ring Staggered	**105-**1001	-1002	-1003	-1004	-1005	-1006	-1007	-1060	-1152
		1-1/16—12 O-ring 180° Apart	**105-**1071	-1072	-1073	-1074	-1075	-1076	-1077	-1078	—
	1-1/4 Inch 14 T Splined	7/8-14 O-ring Staggered	**105-**1029	-1030	-1031	-1032	-1033	-1034	-1035	-1096	—
		1-1/16—12 O-ring 180° Apart	**105-**1079	-1080	-1081	-1082	-1083	-1084	-1085	-1086	—
Bearingless		7/8-14 O-ring Staggered	**106-**1008	-1009	-1010	-1011	-1012	-1013	-1014	-1015	-1047
		G 1/2 (BSP)	**106-**1038	-1039	-1040	-1041	-1042	-1043	-1044	-1045	—

105-1043

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Fax 44/1-592-773-184

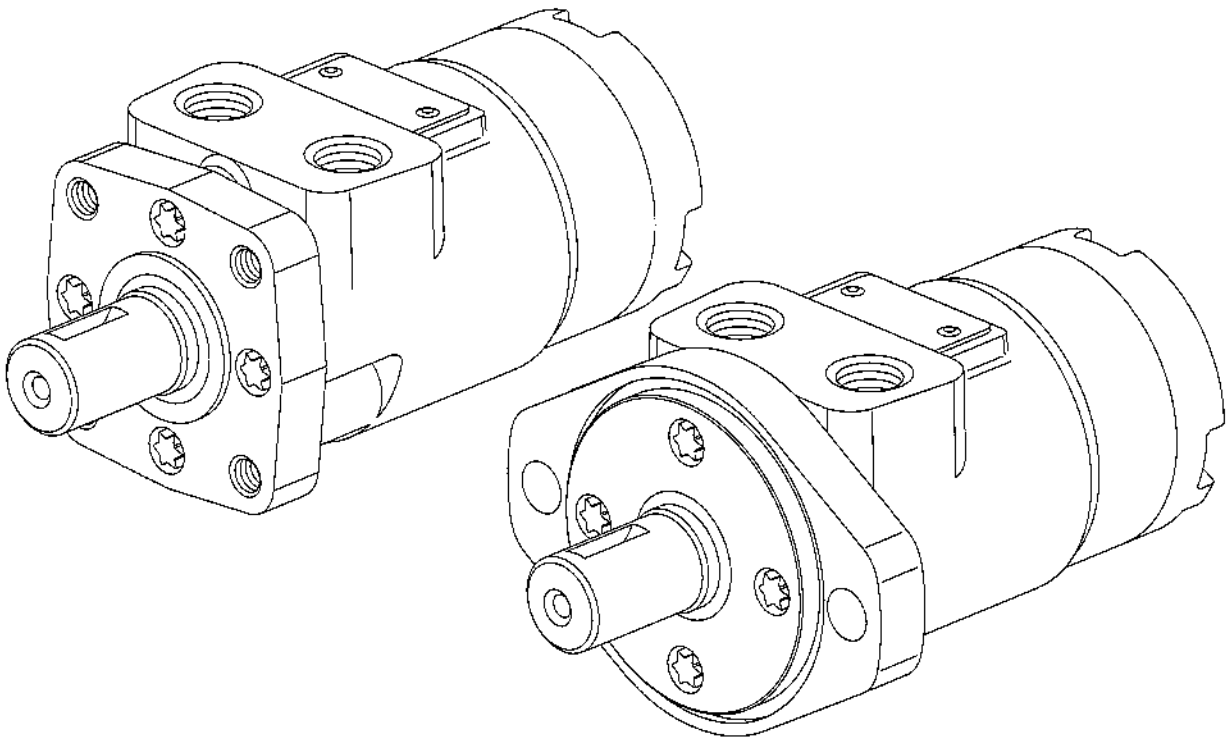
Form No. 7-124

Char-Lynn®
Hydraulic Motor

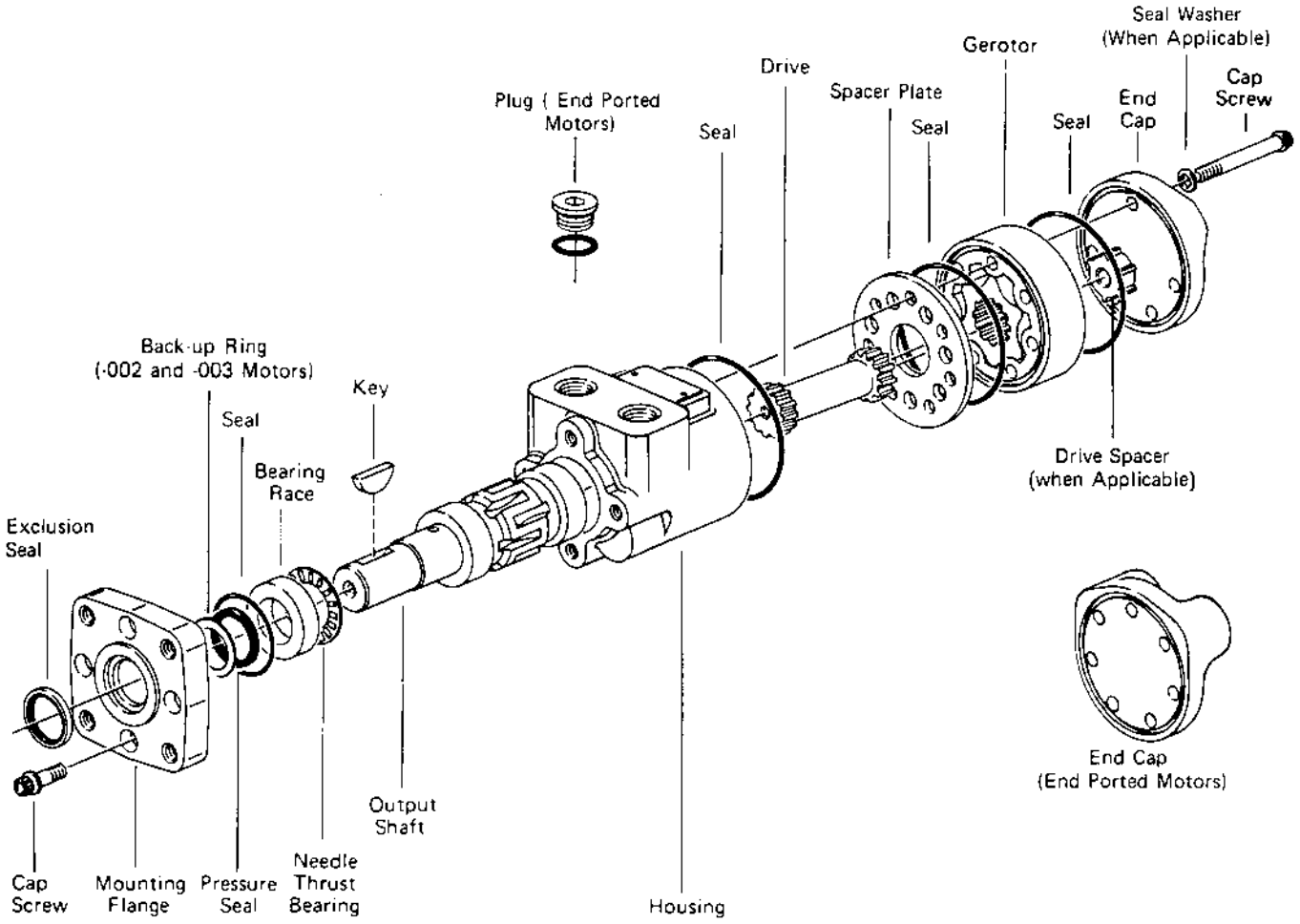
No. 7-125
January, 1995

EATON

Repair Information



A Series
General Purpose Geroler® Motor 001 002 003



Tools required for disassembly and reassembly.

- Torque wrench (300 lb-in [34Nm] capacity)
- 12-16 in. [300-400mm] breaker bar
- *• 5/16 –12 point socket no. 5422 (Heavy Duty 500 lb-in [56Nm] Capacity)
- Small screwdriver (6-8x1/4 in. [150-200x6mm] flat blade), see page 5 for tooling information.
- *• Shaft pressure seal installation tool for 001 motor P/N 600470, for 002 and 003 motors P/N 600523
- *• Seal sleeve or bullet P/N 600304 (1 in. dia. shaft), P/N 600466 (⅞ in. dia. shaft)

*Tools available–by special order–through our service department.

Repair Information

A Series Char-Lynn Motors

Disassembly

Instructions in this manual are for standard A Series Motors (130-XXXX-001, 002 and 003).

Cleanliness is extremely important when repairing these motors. Work in a clean area. Before disconnecting lines, clean port area of motor. Remove key when used. Check shaft and key slot. Remove burrs, nicks and sharp edges. Before disassembly, drain oil from motor. Then plug ports and thoroughly clean exterior of motor.

Although not all drawings show the motor in a vise, we recommend that you keep the motor in a vise during disassembly. Follow the clamping procedures explained throughout the manual.

Gerotor End

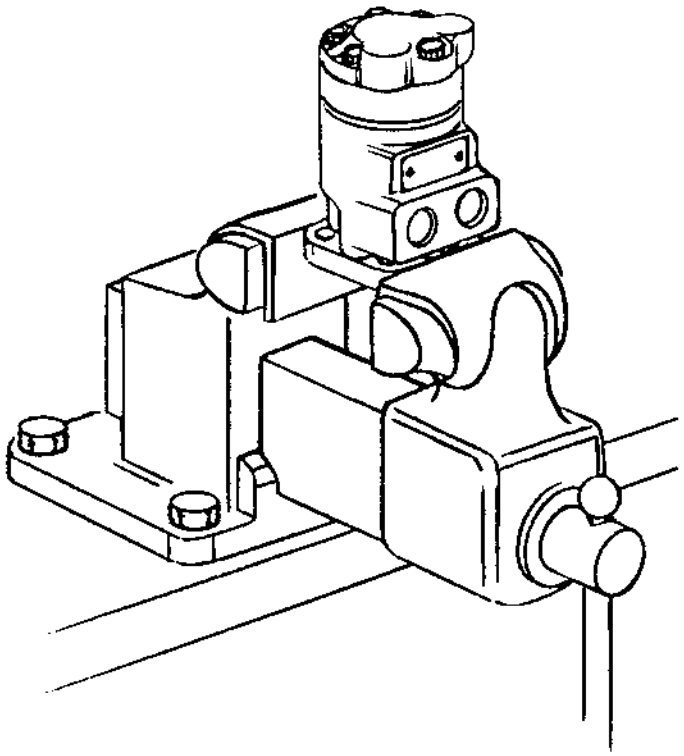


Figure 1

1 Place motor in vice and clamp across edge of flange with output shaft down. When clamping, use protective device on vise such as special soft jaws, pieces of hard rubber or board. See Figure 1.

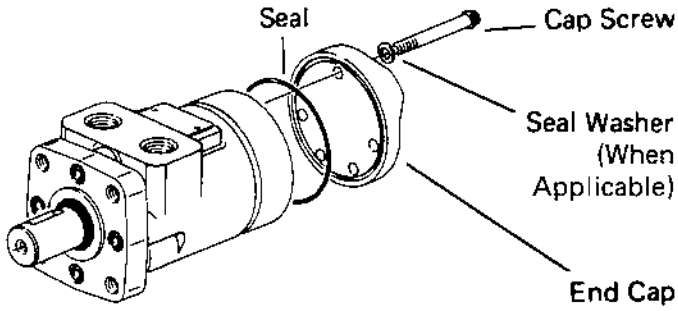


Figure 2

2 Remove cap screws and seal washers (when applicable). See Figure 2.

3 Remove end cap.

4 Remove seal from end cap.

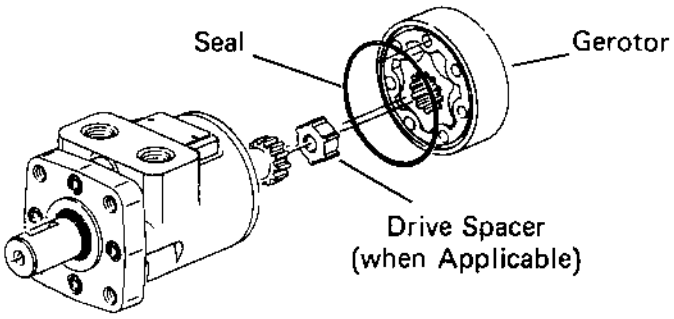


Figure 3

5 Remove gerotor.

6 Remove seal from gerotor (Figure 3).

7 Remove drive spacer if applicable.

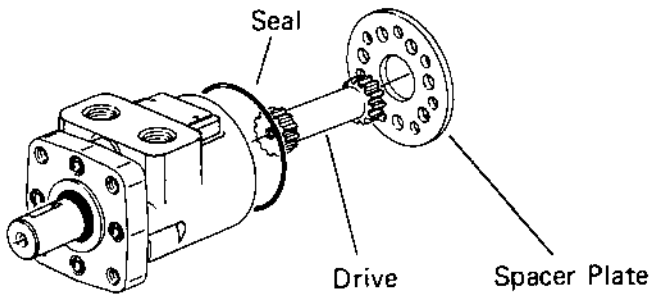


Figure 4

8 Remove drive. See Figure 4.

9 Remove spacer plate.

10 Remove seal from housing.

11 Remove output shaft from housing.

12 Remove needle thrust bearing from shaft or housing.

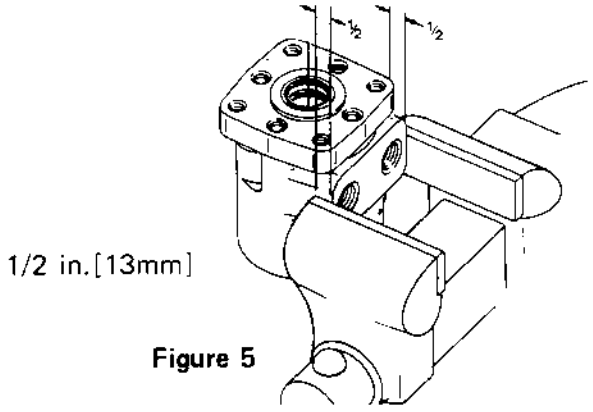


Figure 5

13 Reposition motor in vise. Clamp across ports as shown in Figure 5. Do not clamp on side of housing. Excessive clamping pressure on side of housing causes distortion.

14 Remove cap screws from mounting flange. These screws are assembled with Loctite to hold them in place.

The screws will require 300-400 lb-in [35-45 Nm] of torque to break loose and 100 lb-in [11 Nm] torque to remove. Do not use impact wrench on Loctited screws. This could result in rounded heads or broken sockets.

Note: If torque higher than given above is required to break screws loose, apply heat according to following instructions:

When heated, Loctite partially melts. This reduces torque required to remove screw. Use small flame propane torch to heat small area of housing where screw enters. See Figure 6. **Be careful not to overheat housing** and damage motor. Gradually apply torque to screw with **socket** wrench as heat is applied for 8 to 10 seconds. As soon as screw breaks loose, remove heat from housing. Continue turning screw until it is completely removed.

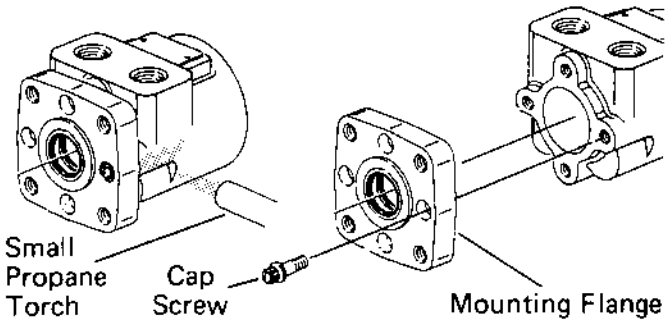


Figure 6

15 Remove motor from vise. Place motor on clean flat surface. Carefully remove flange from housing.

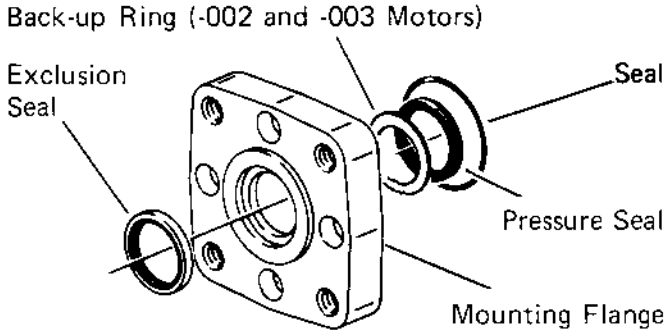


Figure 7

16 Exclusion seal, back-up ring, pressure seal and seal will come off with flange (Figure 7). Use seal removal tool, shown in Figures 8 and 9, to remove exclusion and pressure seals.

Important: Be careful not to scratch seal cavity O.D. This could create a leak path.

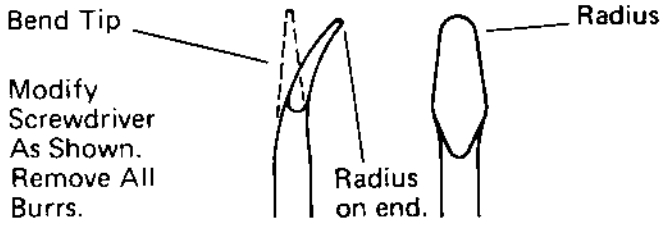


Figure 8

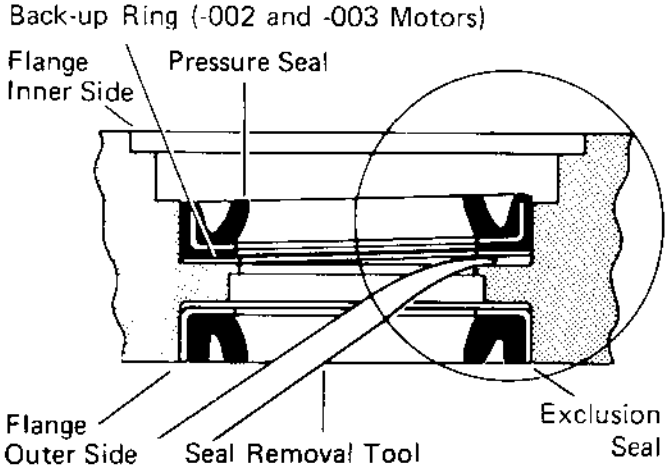


Figure 9

Reassembly

Shaft End

Check all mating surfaces. Replace any parts with scratches or burrs that could cause leakage or damage. Clean all metal parts in clean solvent. Blow dry with air. Do not wipe parts with cloth or paper towel because lint or other matter could get into the hydraulic system and cause damage.

Check around key slot and chamfered area of shaft for burrs, nicks or sharp edges that could damage seals during reassembly. Remove nicks or burrs with a hard smooth stone (such as an Arkansas stone). Do not file or grind motor parts.

Note: Lubricate all seals with petroleum jelly. Use new seals when reassembling motor. Refer to parts list 6-130 for proper seal kit numbers.

Important: Do not stretch seals before installing them.

Cleanliness is extremely important in the successful application of Loctite. Before Loctite can be applied, the parts should be cleaned as follows:

Note: Fully cured Loctite resists most solvents, oils, gasoline and kerosene and is not affected by cleaning operations. It is not necessary to remove cured Loctite that is securely bonded in tapped holes; however, any loose particles of cured Loctite should be removed.

a. Wash the housing with solvent to remove oil, grease and debris. Pay particular attention to four tapped holes on flange end.

b. Blow dry with compressed air. Clean and dry tapped holes.

c. Wire brush screw threads to remove cured Loctite and other debris. Discard any screws that have damaged threads or rounded heads.

d. Wash screws with non-petroleum base solvent. Blow dry with compressed air.

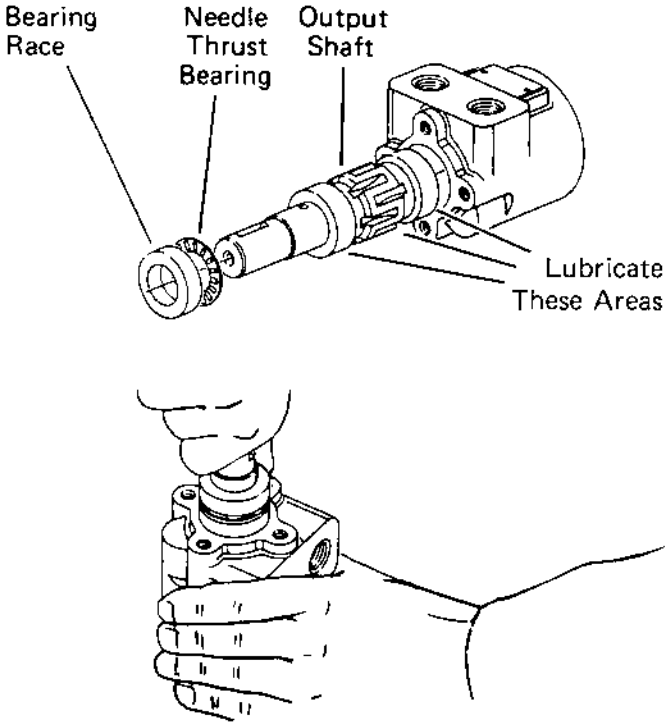
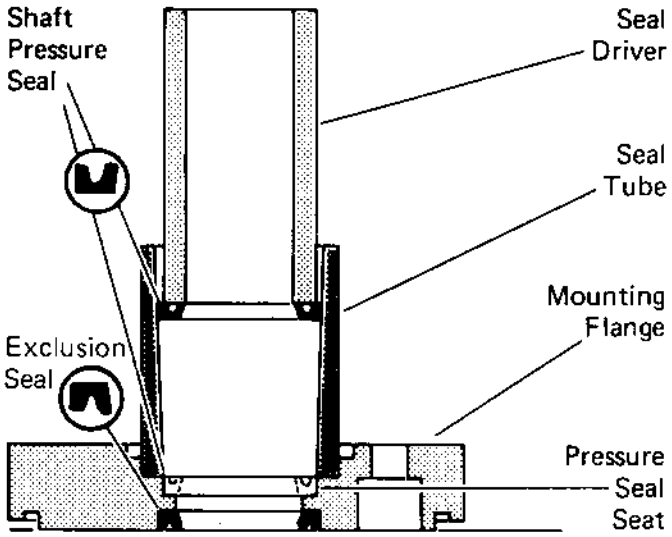


Figure 10

17 Lubricate output shaft with hydraulic oil, then install shaft in housing. See Figure 10.

Important: Do not permit oil to get into the four tapped holes.

18 Install needle thrust bearing, then bearing race on shaft. Pull shaft partially out of housing. Push all three parts in housing together. See Figure 10. The bearing race must rotate freely when in position.



Seal Installation Tool
No. 600470 –001 Motors
No. 600523 –002 and –003 Motors

Figure 11

19 Install exclusion seal in flange. See Figure 11. Carefully press exclusion seal into place.

20 Visually check seal seat in mounting flange for scratches or other marks that might damage the pressure seal. Check for cracks in flange that could cause leakage.

21 Lubricate I.D. of seal tube and O.D. of shaft pressure seal with light film of clean petroleum jelly. Align small I.D. end of seal tube with seal seat in mounting flange. Install back-up ring and pressure seal in tube with lips of seal face up. See Figure 11. Insert seal driver in tube and firmly push seal seat with a rotating action.

Important: After installing seal in flange, examine seal condition. If damaged or improperly installed, you must replace it before continuing with reassembly.

22 Install $1\frac{15}{16}$ in. [49 mm] I.D. seal in flange.

23 It is recommended to apply a light coat of Loctite Primer NF in tapped holes of housing. Allow primer to air dry for at least 1 minute. Do not force dry with air jet; the primer will blow away.

Use of primer is optional. With primer, Loctite curing time is approximately 15 minutes. Without primer, curing time is approximately 6 hours.

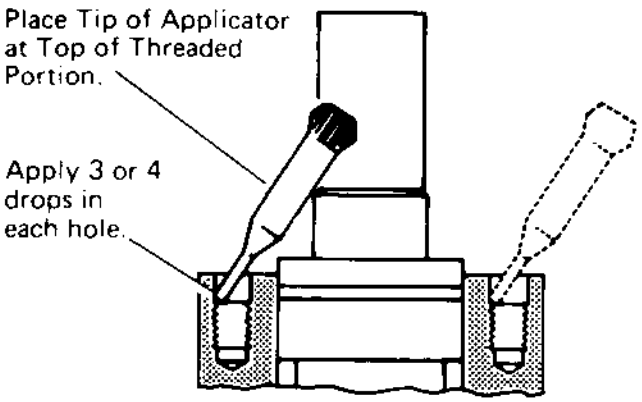


Figure 12

24 Apply 3 or 4 drops of Loctite sealant at top of thread for each of four holes in housing. See Figure 12. Do not allow parts with Loctite applied to come in contact with any metal parts other than those for assembly. Wipe off excess Loctite from housing face, using a non-petroleum base solvent.

Do not apply Loctite to threads more than 15 minutes before installing screws. If housing stands for more than 15 minutes, repeat application. No additional cleaning or removal of previously applied Loctite is necessary.

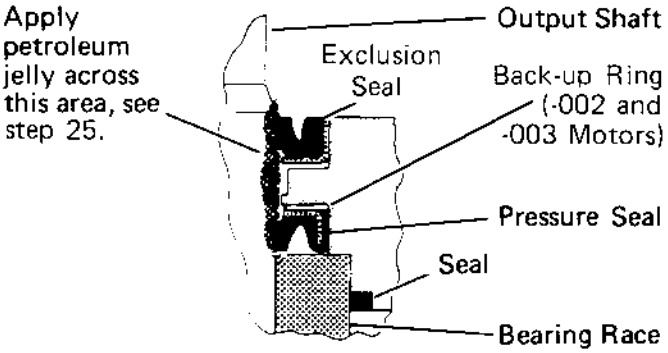


Figure 13

25 Before installing flange and seal assembly over shaft, place protective sleeve or bullet over shaft. Then lubricate space between exclusion seal and pressure seal, as well as lips of both seals. See Figure 13.

Install flange. Rotate flange slowly while pushing down over shaft. Be careful not to invert or damage seals.

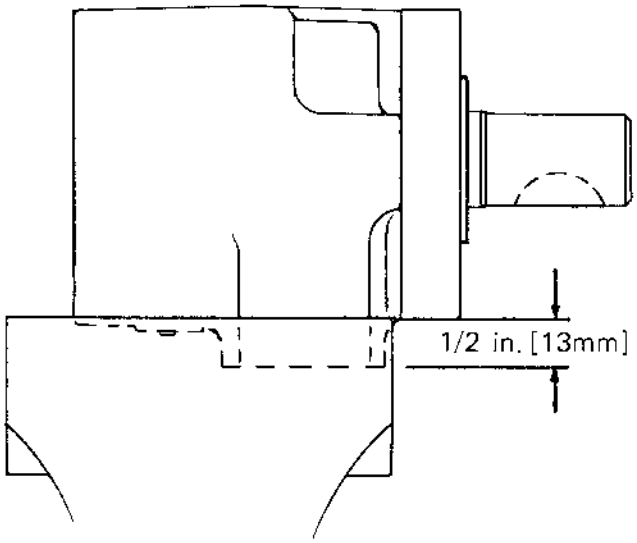


Figure 14

26 After removing bullet, clamp motor in vise as shown in Figure 14. Make sure shaft cannot fall out. Install **dry** screws and alternately torque them immediately to 250 lb-in [28 Nm]. If you use primer, allow to cure for **10 to 15 minutes.** Without primer, allow 6 hours curing time before subjecting motor to high torque reversals. On all other applications, you can run motor immediately.

If you use new screws, make sure they are the correct length: 7/8 in. [22 mm] under head length. See parts list for correct part number.

Gerotor End

27 Reposition motor with gerotor end up, then clamp across ports. Do not clamp on side of housing.

Important: To aid installation of seals, apply light coat of clean petroleum jelly to seals. Do not stretch seals before installing them in groove.

28 Pour approximately 35 cc of clean hydraulic oil in output shaft cavity.

29 Install 2 7/8 in. [73 mm] I.D. seal in housing seal groove. Avoid twisting seal.

Timing Procedure

a. Install drive. Use felt tip marker to mark one drive tooth. Align this tooth with timing dot on shaft.

Note: If drive is not symmetrical, install larger splined end into shaft.

b. Install spacer plate.

c. Install 2 7/8 in. [73 mm] I.D. seal in gerotor seal groove. Carefully place gerotor on spacer plate, seal side toward spacer plate.

Standard Rotation Align any star point with tooth marked on drive. See Figure 15.

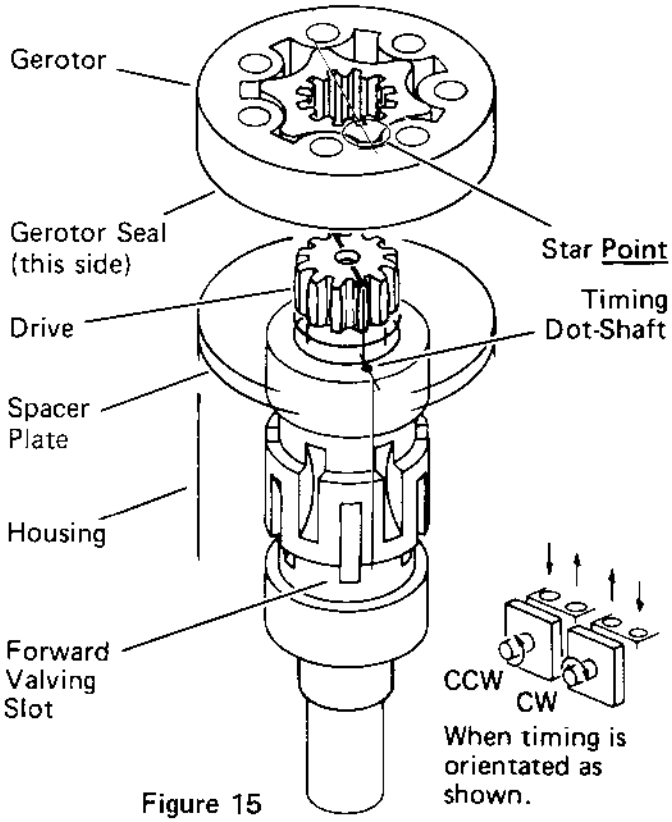


Figure 15

Reverse Rotation Align any star valley with marked tooth. See Figure 16.

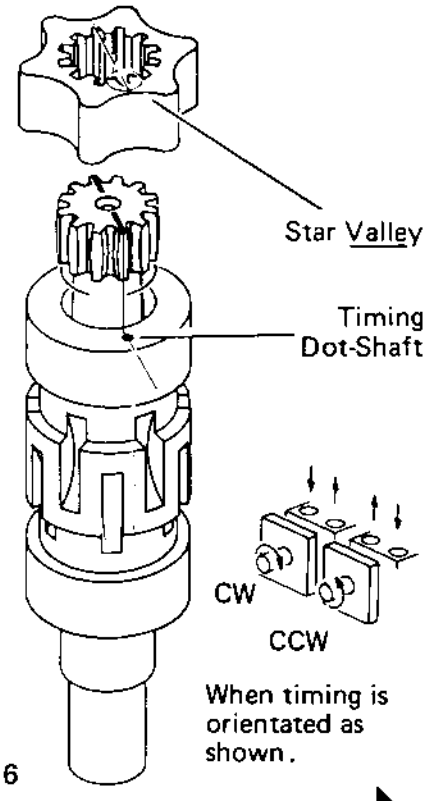


Figure 16

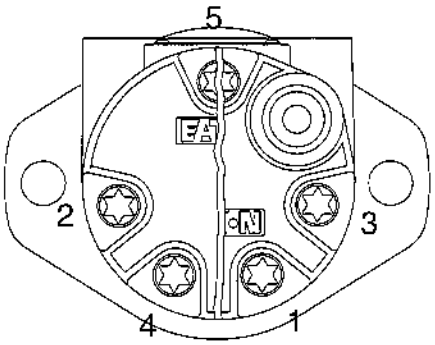
Reassembly Continued on Page 8

Reassembly Continued from Page 7

30 Rotate gerotor to line up with bolt holes. Be careful not to disengage star from drive or disturb gerotor seal.

31 Install drive spacer if applicable.

32 Install 2 7/8 in. [73 mm] seal in end cap. Carefully place end cap on gerotor.



Bolt Torquing Sequence

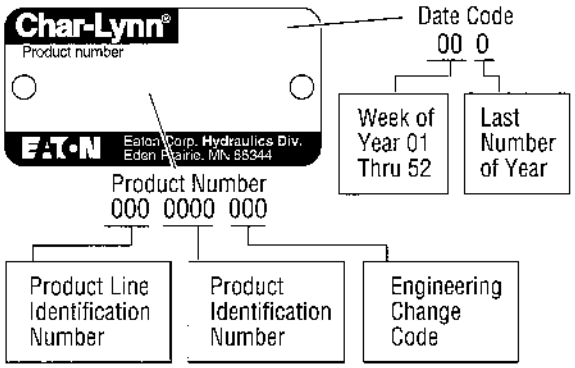
Figure 17

33 Install cap screws and seal washers (if applicable) in end cap. Pretighten screws to 40 lb-in [7,4 Nm]. Make sure seal are properly seated. Then torque screws 275-300 lb-in [30-40 Nm] in sequence, as shown in figure 17.

How to Order Replacement Parts

Each Order Must Include the Following:

1. Product Number
2. Date Code
3. Part Name
4. Part Number
5. Quantity of Parts



Eaton Corporation
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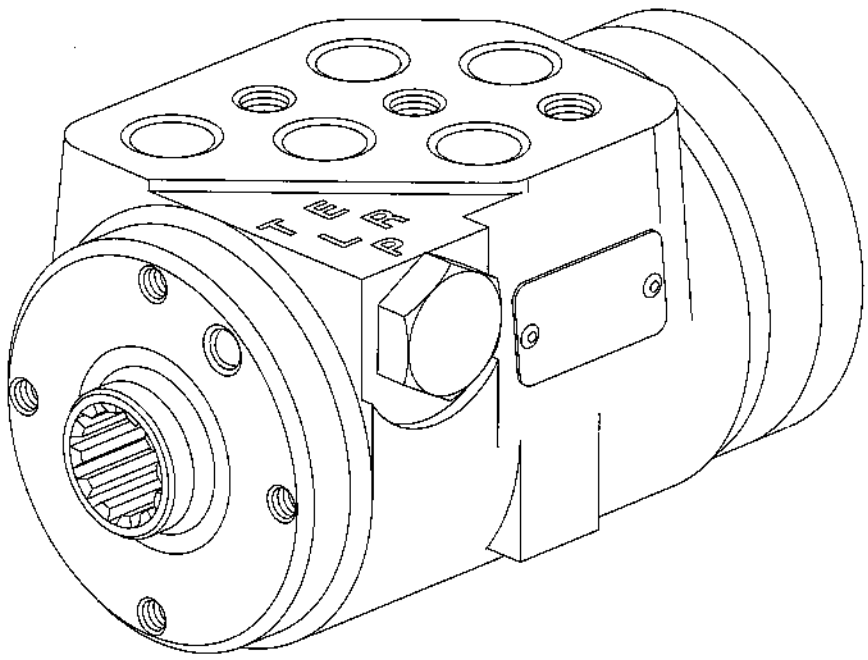
Form No. 7-125

Char-Lynn®
Power Steering

No. 7-310
January, 1995

EATON

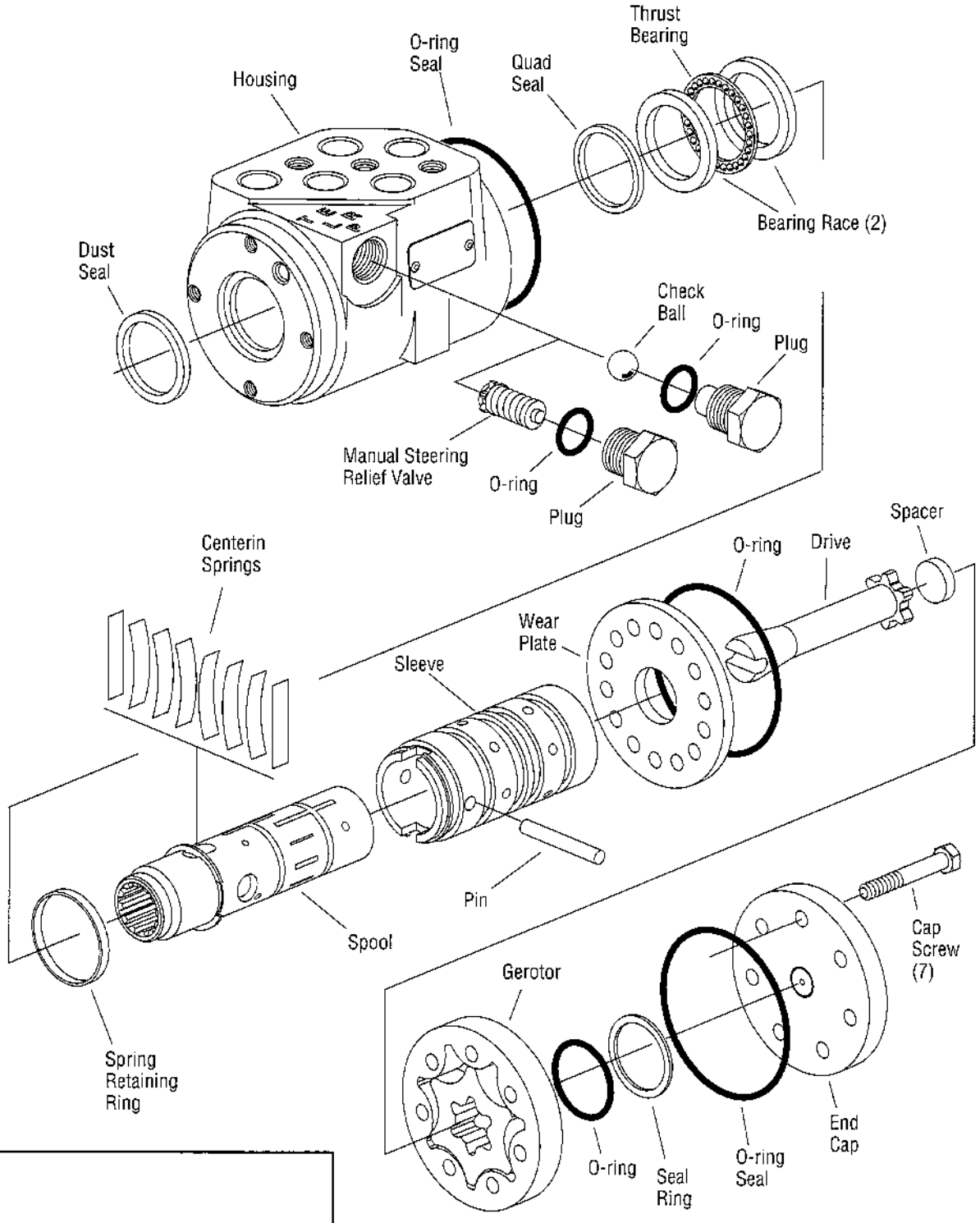
Repair Information



2 Series
Steering Control Unit

001

2 Series
Steering Control Units



Tool List

- 10 mm Socket
- 7/8 in. Socket
- Torque Wrench (18 Nm [160 lb-in] Capacity)
- Small Blade Screwdriver

2 Series
Steering Control Units

Disassembly

Cleanliness is extremely important when repairing hydraulic Steering Control Units (SCU). Work in a clean area. Before disconnecting the hydraulic lines, clean the port area of the SCU. Before disassembly, drain the oil, then plug the ports and thoroughly clean the exterior of the SCU. During repairs, always protect machined surfaces.

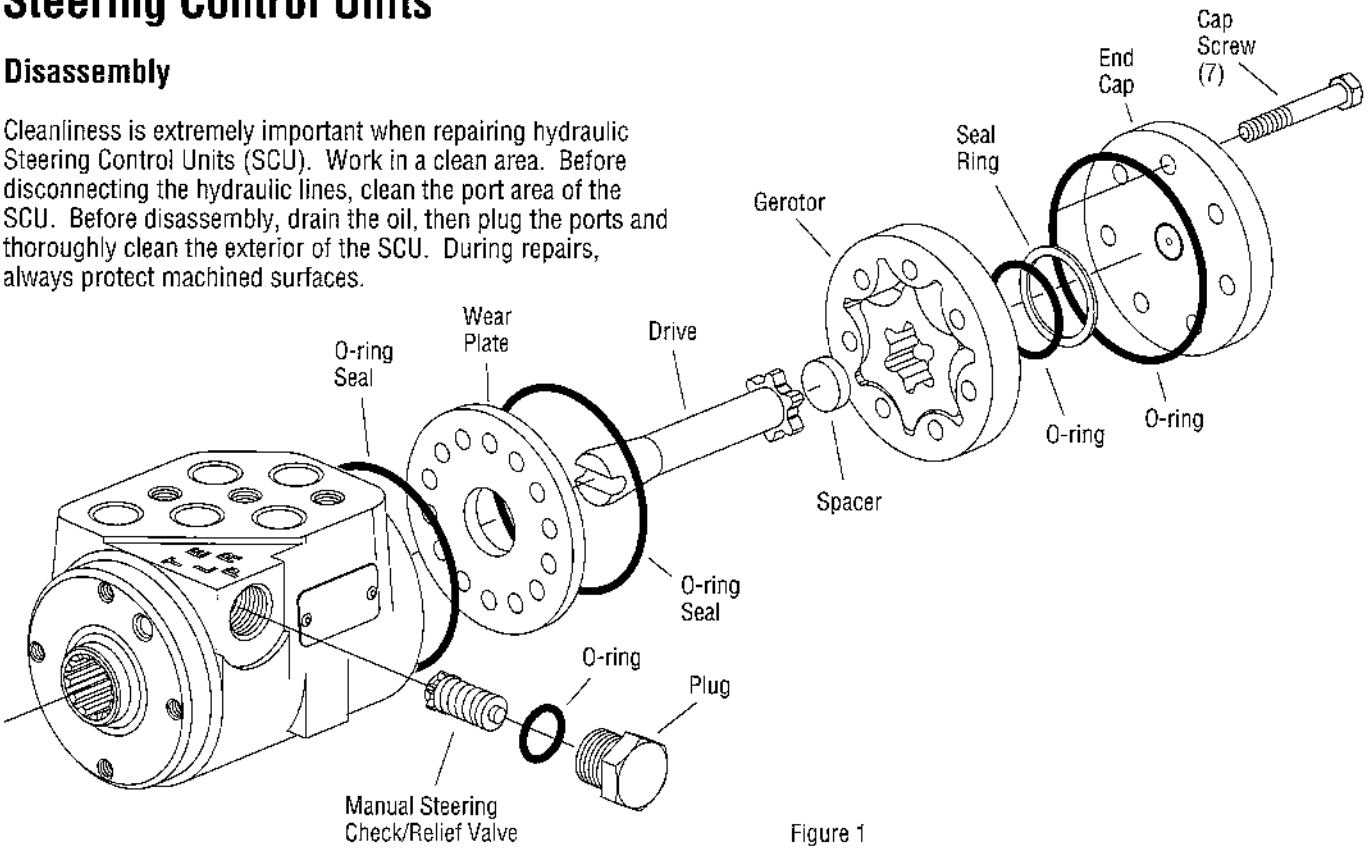


Figure 1

1 Remove the 7 cap screws and disassemble the SCU as shown in figure 1.

2 Remove the plug and manual steering check as shown in figure 1.

Note: The manual steering check may be a check ball or a check/relief valve.

3 Slide the spool and sleeve from the housing, see figure 2.

4 Remove the thrust bearing and bearing races.

5 Remove the quad seal.

6 Using a small blade screwdriver, carefully pry the dust seal from the housing.

Important: Do not damage the dust seal seat.

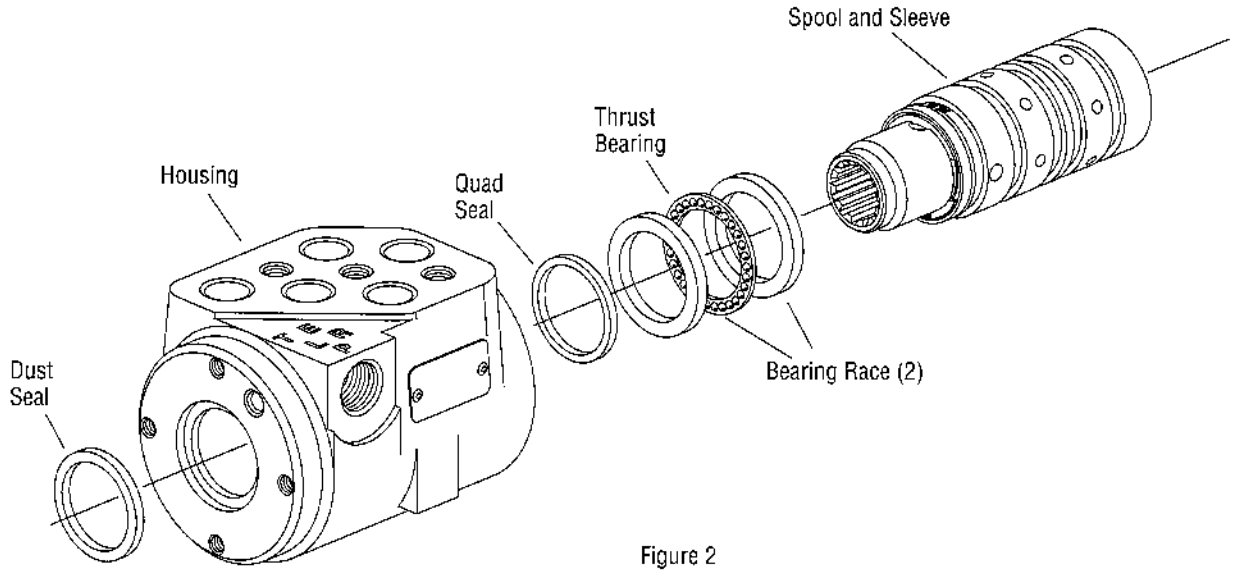


Figure 2

2 Series
Steering Control Units

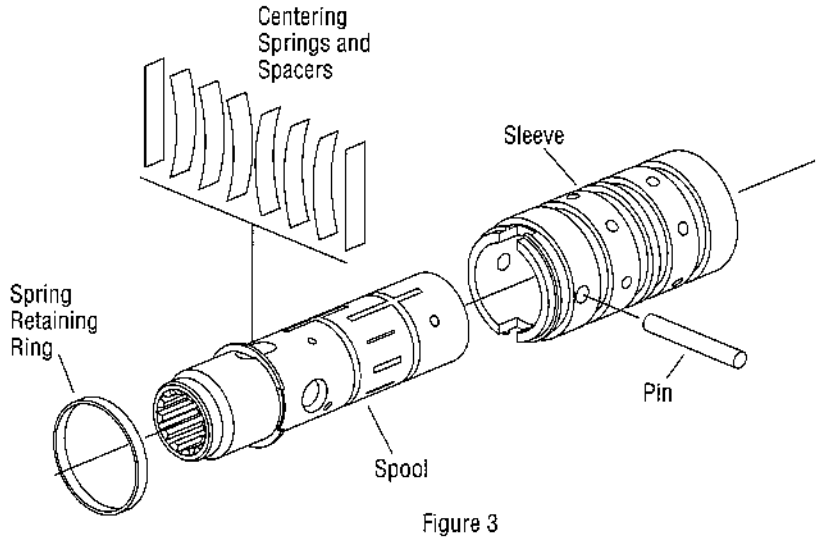


Figure 3

7 Remove the pin that holds the spool and sleeve together, see figure 3.

8 Carefully slide the spool out of the sleeve. The springs and retaining ring will stay with the spool as it's removed.

9 Remove the retaining ring and springs.

Caution: The centering springs are under tension; remove the retaining ring carefully.

Reassembly

Check all mating surfaces. Replace any parts with scratches or burrs that could cause leakage. Wash all metal parts in clean solvent. Blow them dry with pressurized air. Do not wipe parts dry with paper towels or cloth. Lint in a hydraulic system will cause damage.

Note: Always use new seals when reassembling hydraulic steering control units. Refer to parts list 6-323 for seal kit part numbers, replacement parts, and ordering information.

Important: During reassembly lubricate the new seals with a petroleum jelly like Vaseline. Also lubricate machined surfaces and bearings with clean hydraulic fluid.

10 Install the quad seal:

- Put one of the bearing races and sleeve into the housing.
- Together, the housing and bearing race create a groove into which the quad seal will be installed.
- Hold the bearing race tightly against the input end of the housing by pushing on the gerotor end of the sleeve.
- Fit the quad seal into its seat through the input end of the housing. Be sure the seal is not twisted.
- Remove the sleeve and bearing race.

2 Series
Steering Control Units

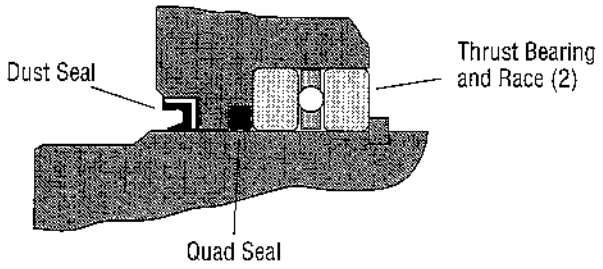


Figure 4

11 Lubricate and install the dust seal, see figure 4 for correct seal orientation.

12 Install the centering springs in the spool. It is best to install the two flat pieces first. Next, install the curved pieces, three at a time.

13 Fit the retaining ring over the centering springs.

14 Apply a light coating of clean hydraulic fluid to the spool and slide it into the sleeve. Be sure the centering springs fit into the notches in the sleeve.

15 Install the pin, see figure 3.

16 Apply a light coating of petroleum jelly to the inner edge of the dust and quad seals.

17 Put the thrust bearing and races into the housing. The thrust bearing goes between the two races, see figure 2.

18 Apply a light coating of clean hydraulic fluid to the spool and sleeve assembly and slide it into the housing.

Important: Do not damage the dust or quad seals.

19 Clamp the housing in a vise as shown in figure 5. Use just enough clamping force to hold the housing securely.

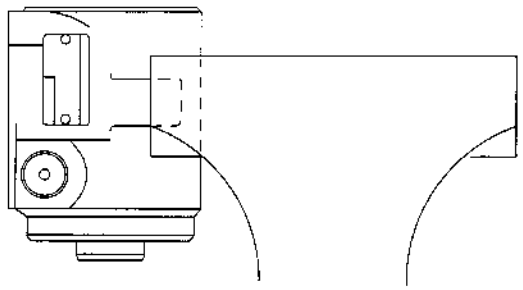


Figure 5

20 Lubricate and install a new o-ring seal in the groove in the housing.

21 Install the wear plate and align the holes in the wear plate with threaded holes in the housing.

Note: The holes in the wear plate are symmetrical.

22 Install the drive, be sure the slot in the drive engages the pin.

23 Lubricate and install a new o-ring seal in the groove in the wear plate.

24 Install the gerotor and align the screw holes.

25 Lubricate and install a new o-ring seal in the groove in the gerotor ring.

26 Lubricate and install a new o-ring and seal ring in the groove in the gerotor star.

27 Install the spacer.

28 Install the end cap and 7 cap screws. Tighten the cap screws, in a criss-cross pattern, to 16 -18 Nm [140 -160 lb-in].

29 Remove the SCU from the vise.

30 Install the relief valve/check or check ball and plug. Use a new o-ring and tighten the plug to 17 Nm [150 lb-in].

Product Numbers 2 Series (Standard — 69 Bar [1000 PSI])

System	Ports	Relief Valve Setting Bar [PSI]	Displacement cm³/r [in³/r] and Product Number					
			31 [1.9]	39 [2.4]	51 [3.1]	63 [3.8]	74 [4.5]	100 [6.1]
Open Center Non-Load Reaction	9/16 Inch Plug-O (4)	None	291-1001-001	291-1002-001	291-1003-001	291-1004-001	291-1005-001	291-1006-001
		40 [580]	291-1001-041	291-1002-041	291-1003-041	291-1004-041	291-1005-041	291-1006-041
		50 [725]	291-1001-051	291-1002-051	291-1003-051	291-1004-051	291-1005-051	291-1006-051
		63 [914]	291-1001-061	291-1002-061	291-1003-061	291-1004-061	291-1005-061	291-1006-061
		70 [1015]	291-1001-071	291-1002-071	291-1003-071	291-1004-071	291-1005-071	291-1006-071
	9/16 -18 Inch SAE (4)	None	291-1007-001	291-1008-001	291-1009-001	291-1010-001	291-1011-001	291-1012-001
		40 [580]	291-1007-041	291-1008-041	291-1009-041	291-1010-041	291-1011-041	291-1012-041
		50 [725]	291-1007-051	291-1008-051	291-1009-051	291-1010-051	291-1011-051	291-1012-051
		63 [914]	291-1007-061	291-1008-061	291-1009-061	291-1010-061	291-1011-061	291-1012-061
		70 [1015]	291-1007-071	291-1008-071	291-1009-071	291-1010-071	291-1011-071	291-1012-071
Power Beyond Non-Load Reaction	9/16 Inch Plug-O (5)	None	291-5001-001	291-5002-001	291-5003-001	291-5004-001	291-5005-001	291-5006-001
		40 [580]	291-5001-041	291-5002-041	291-5003-041	291-5004-041	291-5005-041	291-5006-041
		50 [725]	291-5001-051	291-5002-051	291-5003-051	291-5004-051	291-5005-051	291-5006-051
		63 [914]	291-5001-061	291-5002-061	291-5003-061	291-5004-061	291-5005-061	291-5006-061
		70 [1015]	291-5001-071	291-5002-071	291-5003-071	291-5004-071	291-5005-071	291-5006-071
	9/16 -18 Inch SAE (5)	None	291-5007-001	291-5008-001	291-5009-001	291-5010-001	291-5011-001	291-5012-001
		40 [580]	291-5007-041	291-5008-041	291-5009-041	291-5010-041	291-5011-041	291-5012-041
		50 [725]	291-5007-051	291-5008-051	291-5009-051	291-5010-051	291-5011-051	291-5012-051
		63 [914]	291-5007-061	291-5008-061	291-5009-061	291-5010-061	291-5011-061	291-5012-061
		70 [1015]	291-5007-071	291-5008-071	291-5009-071	291-5010-071	291-5011-071	291-5012-071
Dynamic Signal Load Sensing	9/16 Inch Plug-O (5)	None	293-4001-001	293-4002-001	293-4003-001	293-4004-001	293-4005-001	293-4006-001
	9/16 -18 Inch SAE (5)	None	293-4007-001	293-4008-001	293-4009-001	293-4010-001	293-4011-001	293-4012-001

Product Numbers 2 Series (High Pressure — 103 Bar [1500 PSI])

Open Center Non-Load Reaction	9/16 Inch Plug-O (4)	None	291-1001-121	291-1002-121	291-1003-121	291-1004-121	291-1005-121	291-1006-121
		80 [1160]	291-1001-081	291-1002-081	291-1003-081	291-1004-081	291-1005-081	291-1006-081
		90 [1305]	291-1001-091	291-1002-091	291-1003-091	291-1004-091	291-1005-091	291-1006-091
		100 [1450]	291-1001-101	291-1002-101	291-1003-101	291-1004-101	291-1005-101	291-1006-101
	9/16 -18 Inch SAE (4)	None	291-1007-121	291-1008-121	291-1009-121	291-1010-121	291-1011-121	291-1012-121
		80 [1160]	291-1007-081	291-1008-081	291-1009-081	291-1010-081	291-1011-081	291-1012-081
		90 [1305]	291-1007-091	291-1008-091	291-1009-091	291-1010-091	291-1011-091	291-1012-091
		100 [1450]	291-1007-101	291-1008-101	291-1009-101	291-1010-101	291-1011-101	291-1012-101
Power Beyond Non-Load Reaction	9/16 Inch Plug-O (5)	None	291-5001-121	291-5002-121	291-5003-121	291-5004-121	291-5005-121	291-5006-121
		80 [1160]	291-5001-081	291-5002-081	291-5003-081	291-5004-081	291-5005-081	291-5006-081
		90 [1305]	291-5001-091	291-5002-091	291-5003-091	291-5004-091	291-5005-091	291-5006-091
		100 [1450]	291-5001-101	291-5002-101	291-5003-101	291-5004-101	291-5005-101	291-5006-101
	9/16 -18 Inch SAE (5)	None	291-5007-121	291-5008-121	291-5009-121	291-5010-121	291-5011-121	291-5012-121
		80 [1160]	291-5007-081	291-5008-081	291-5009-081	291-5010-081	291-5011-081	291-5012-081
		90 [1305]	291-5007-091	291-5008-091	291-5009-091	291-5010-091	291-5011-091	291-5012-091
		100 [1450]	291-5007-101	291-5008-101	291-5009-101	291-5010-101	291-5011-101	291-5012-101
Dynamic Signal Load Sensing	9/16 Inch Plug-O (5)	None	293-4001-121	293-4002-121	293-4003-121	293-4004-121	293-4005-121	293-4006-121
	9/16 -18 Inch SAE (5)	None	293-4007-121	293-4008-121	293-4009-121	293-4010-121	293-4011-121	293-4012-121

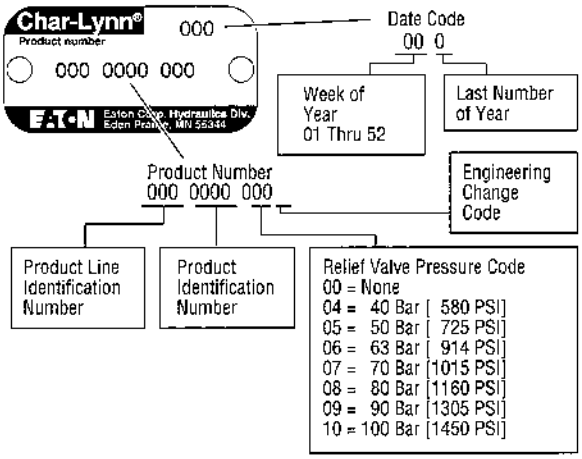
How to Order Replacement Parts

Each Order Must Include the Following:

1. Product Number
2. Date Code
3. Part Name
4. Part Number
5. Quantity of Parts

For More Detailed Information Contact Eaton Corp. Hydraulics Division 15151 Highway 5 Eden Prairie, MN 55344.

- Specifications and performance Data, Catalog No. 11-872
- Replacement Part Numbers and Kit Information — Parts Information No. 7-310.



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Form No. 7-310

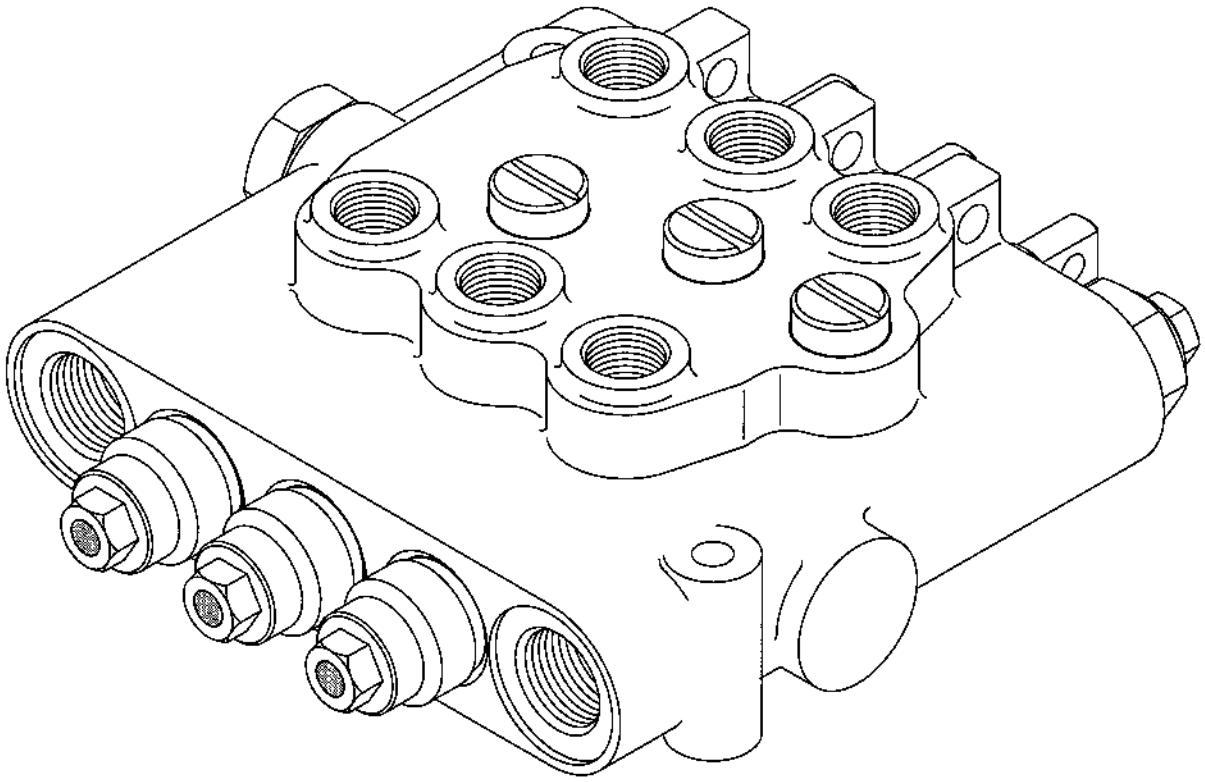
NO. 7-503

Revised June 1991

Eaton
Hydraulics
Division

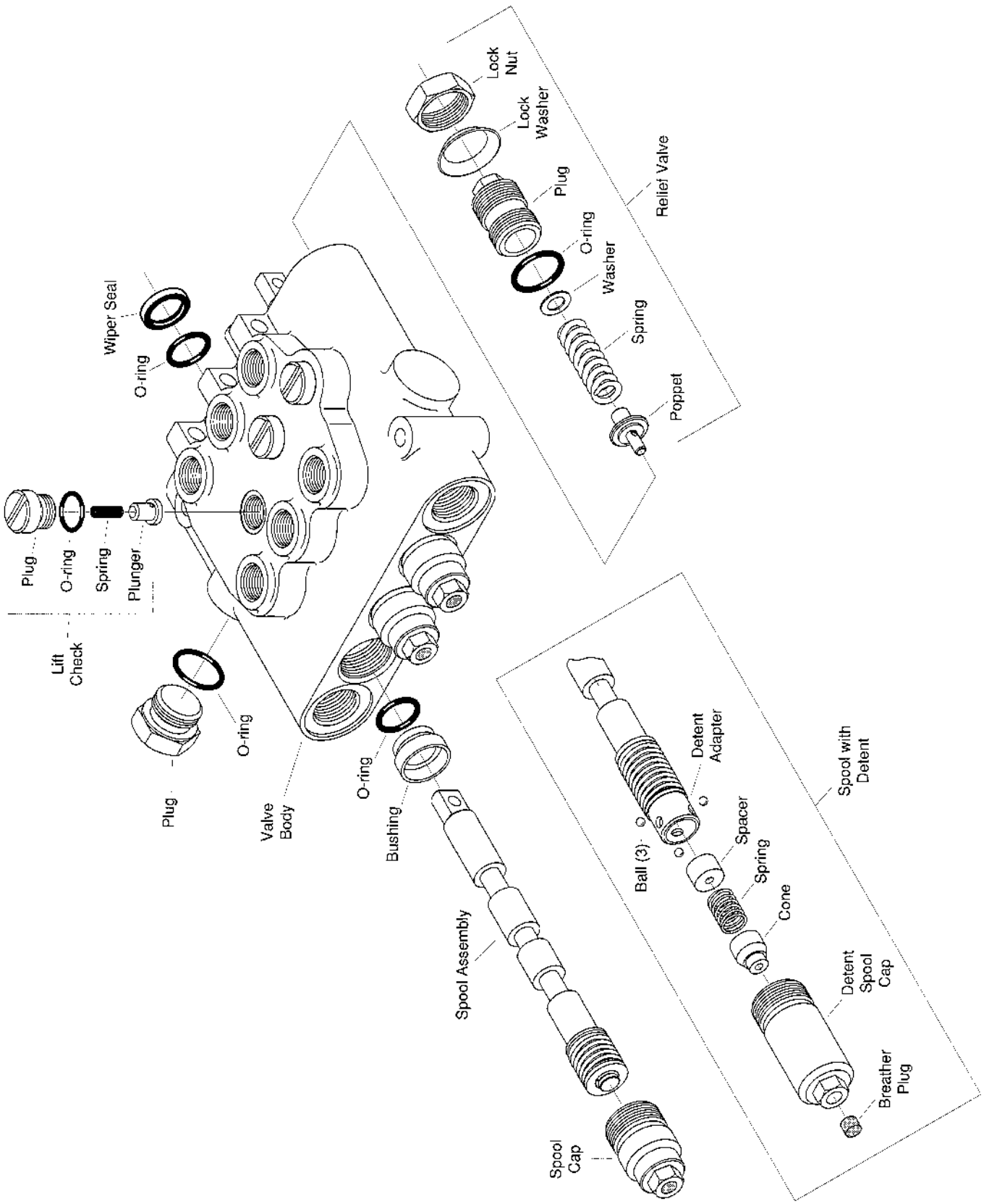
Repair Information

Model 30920 - 30930 Directional Control Valve



EATON

Parts Drawing



Disassembly

Refer to the Parts Drawing as you preform the repairs.

1. Plug all ports and clean the outside of the valve thoroughly.

2. Mark the spools and their specific bores. The spools are matched to the bores and must not be switched.

3. Remove the spool caps and slide the spool assemblies from their bores.

If spools are detented, take care not to lose the balls, spacer, detent spring, or cone.

4. Remove the o-rings and bushings from the spools.

5. Remove the wiper seals and o-rings from the valve body.

6. Disassemble the spool assemblies only if the retaining ring, spacer, spool spring, or washer need to be replaced see figure 1.

Note: Do not disassemble spool assemblies with detents.

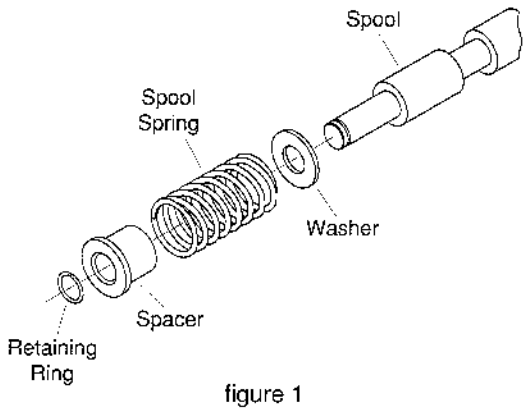


figure 1

7. Remove the lift check plugs, springs, and lift check plungers.

8. Remove the plug from the BYD port. This may be a solid plug, pressure beyond plug, or closed center plug.

9. Remove the relief valve lock nut, lock washer, plug, and o-ring .

10. Remove the washer, relief valve spring, and poppet.

11. Remove all o-rings and back-up rings from the plugs.

Inspection

1. Inspect the spools for wear. If wear is excessive, the valve becomes non-serviceable.

2. Inspect all of the springs and replace as necessary. Replace spool springs as shown in figure 1.

Note: The spool springs on detented spools are not serviceable.

3. Inspect the relief valve parts for wear and replace as necessary.

4. Inspect the lift check plungers and their seats in the valve body.

Reassembly

1. Wash all metal parts in clean solvent and blow them dry with compressed air. Do not wipe parts dry with paper towels or cloth. Lint in a hydraulic system will cause damage.

Note: Replace all o-rings, back-up rings and wiper seals as new.

2. Install new o-rings and wiper seals in the valve body.

3. Slide the bushings and new o-rings over the spools.

4. Liberally lubricate the spools with clean hydraulic fluid and install them in their proper bores.

5. Install the spool caps and tighten them to 20 - 25 lb-ft [27 - 34 Nm].

6. If spools are detented, install the spool caps as follows:

Remove the brass breather plug from the spool cap using a 3/16 inch drift punch.

Insert the punch through the hole in the spool cap.

Put the spacer, detent spring, cone, and balls into the detent adapter.

Hold the parts in place with the drift punch, while threading the spool cap into the valve body.

Tighten the cap to 20 - 25 lb-ft [27 - 34 Nm].

Install the breather plug.

7. Install the lift check plungers, springs, and lift check plugs. Use new o-rings and tighten the plugs to 20 - 25 lb-ft [27 - 34 Nm].

8. Install a new o-ring on the relief valve plug .

9. Insert the washer and relief valve spring into the plug .

10. Place the poppet on the spring and carefully install the relief valve into the valve body.

11. Install the lock washer and nut .

12. Adjust the relief valve setting and tighten the lock nut to 21 - 24 lb-ft [28 - 33 Nm].

Eaton Corporation **Hydraulics Division,** 15151 Highway 5, Eden Prairie, MN 55344 Telephone (612) 937-9800

Eaton G.m.b.H. **Hydraulics Division** ✉ 100 410 • D-5620 Velbert 1 West Germany ☎ 49-2051-2070

Printed in U.S.A.

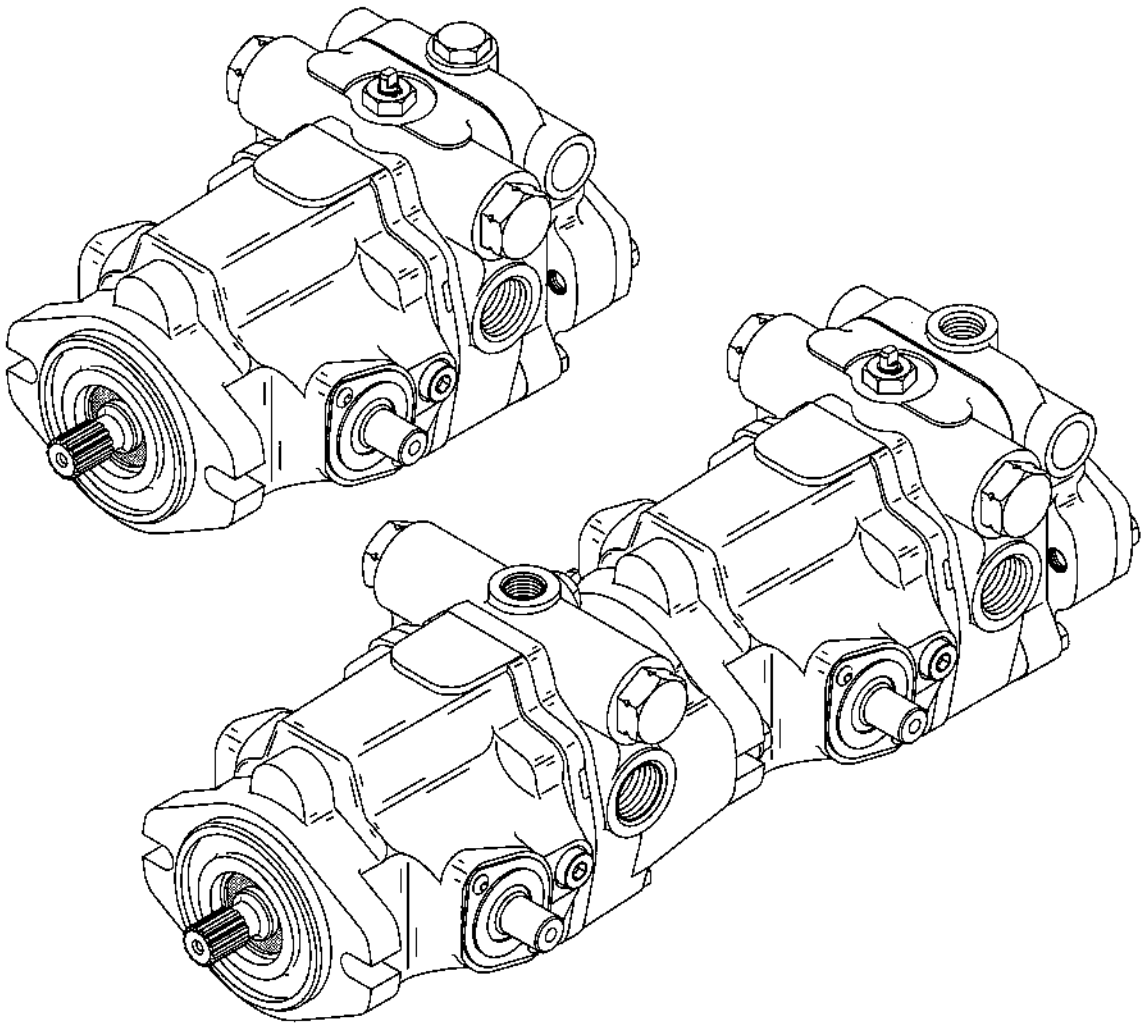
FORM NO. 7- 503
Issued June 1989

Eaton®
Medium Duty Piston Pump

No. 7-623
November, 1993

EATON

Repair Information



Model 70142 / 70144, 20.3 cm^3/r [1.24 in^3/r] Displacement
and 70145, 23.6 cm^3/r [1.44 in^3/r] Displacement
Variable Displacement Piston Pump **-01**

with **Valve Plate**

Introduction

Table of Contents

Introduction

This manual provides service information for the Eaton Models 70142 / 70144 and 70145 Variable Displacement Piston Pumps. Step by step instructions for the complete disassembly, inspection, and reassembly of the pump are given. The following recommendations should be followed to insure successful repairs.

- Remove the pump from the application.
- Cleanliness is extremely important.
- Clean the port areas thoroughly before disconnecting the hydraulic lines.
- Plug the pump ports and cover the open hydraulic lines immediately after they're disconnected.
- Drain the oil and clean the exterior of the pump before making repairs.
- Wash all metal parts in clean solvent.
- Use compressed air to dry the parts. Do not wipe them dry with paper towels or cloth.
- The compressed air should be filtered and moisture free.
- Always use new seals when reassembling hydraulic pumps.
- For replacement parts and ordering information refer to parts list 6-632.
- Lubricate the new rubber seals with a petroleum jelly (vaseline) before installation.
- Torque all bolts over gasketed joints, then repeat the torquing sequence to make-up for gasket compression.
- Verifying the accuracy of pump repairs on an authorized test stand is essential.

Identification and Tools Required

Identification Numbers

Stamped on each unit.

A - Product Number Discription
- 70142 = Piston Pump (20.3 cm^3/r [1.24 in^3/r]) with Gerotor
- 70144 = Piston Pump (20.3 cm^3/r [1.24 in^3/r]) without Gerotor
- 70145 = Piston Pump (23.6 cm^3/r [1.44 in^3/r]) with or without Gerotor
- 78113 = Tandem Piston Pumps (20.3 cm^3/r [1.24 in^3/r]) no Gear Pump
- 78114 = Tandem Piston Pumps (20.3 cm^3/r [1.24 in^3/r]) with Gear Pump
- 78115 = Tandem Piston Pumps (23.6 cm^3/r [1.44 in^3/r]) no Gear Pump
- 78116 = Tandem Piston Pumps (23.6 cm^3/r [1.44 in^3/r]) with Gear Pump

B - Rotation,
R = Righthand,
L = Lefthand

C - Sequential Letters

D - Design Code Number

Single Pump - Product Number

70142 - RAA-01

A B C D

Tandem Pumps - Product Number

78113 - RAB-01

A B C D

Serial Number Code:

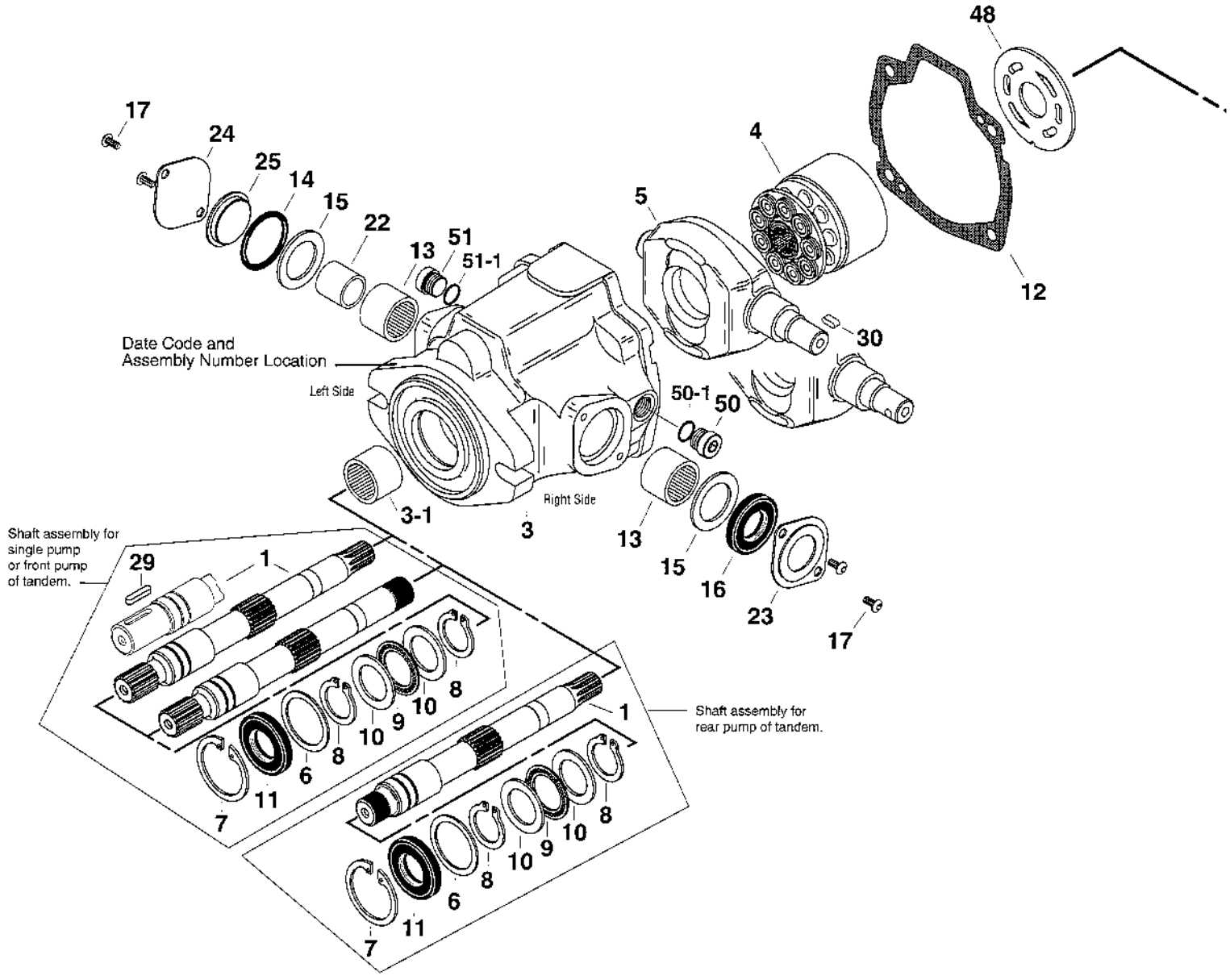
B 93 01 31 JB

- B — Revision level of parts list.
- 93 — Last two digits of year built. (93 for 1993 etc.)
- 01 — Month (two digits)
- 31 — Day of Month (two digits)
- JB — Testers Initials

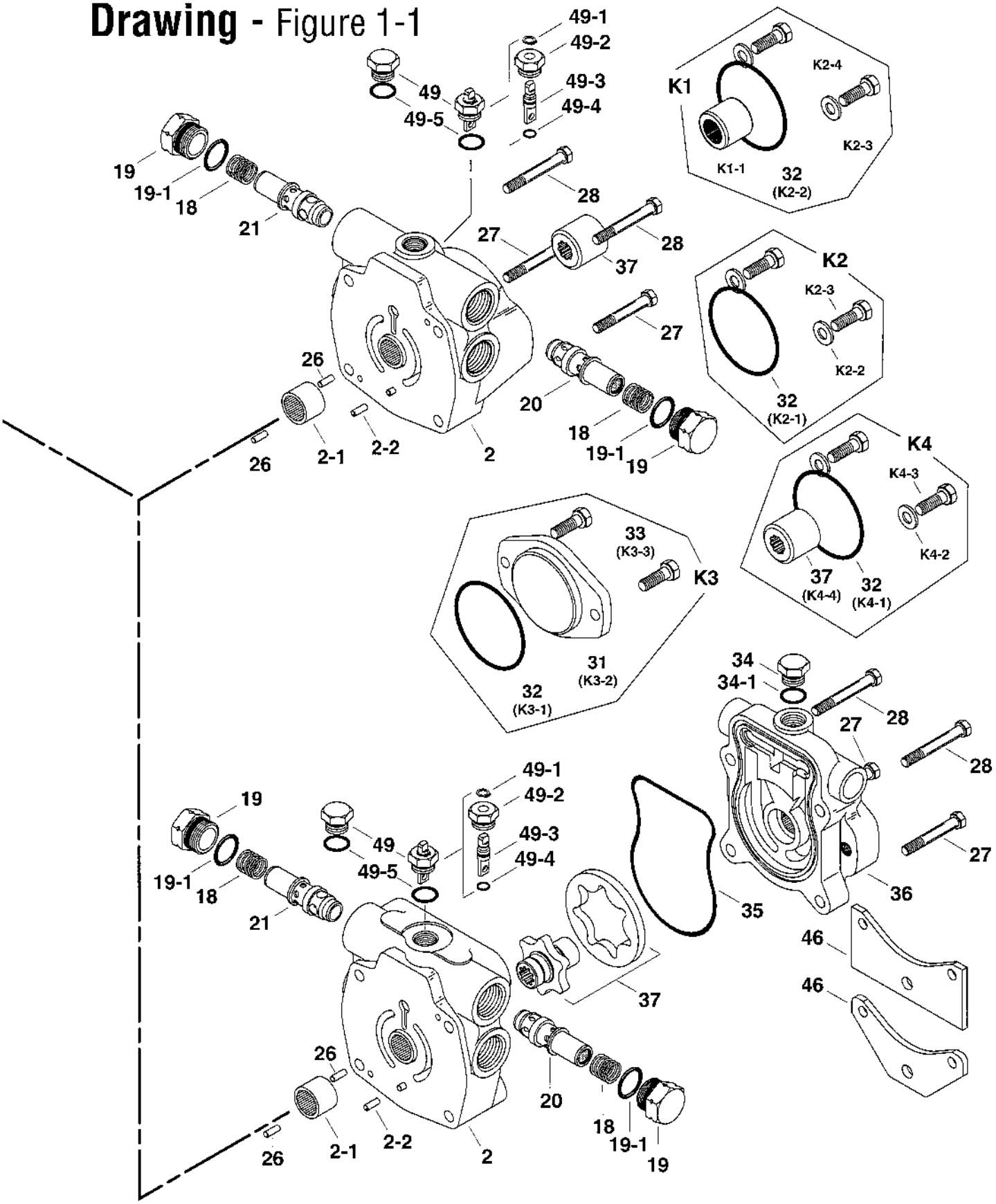
Required Tools

- 7/16 in. Hex Key (Allen)
- 9/16 in. End Wrench
- 1 in. End Wrench
- 9/16 in. Socket
- 1/2 in. Socket
- Internal Retaining Ring Pliers (straight .090 tip)
- External Retaining Ring Pliers (straight .070 tip)
- O-ring Pick
- Torque Wrench (135.6 N·m [100 lbf·ft] capacity)
- Hammer (soft face)
- Light Petroleum Jelly
- Seal Driver
- Arbor Press

Parts Drawing - Figure 1-1



Parts Drawing - Figure 1-1



Parts List

	Item	Qty.	Description
	1	1	Drive Shaft
	2	1	Backplate Assembly
	3	1	Housing Assembly
	4	1	Rotating Kit Assembly
	5	1	Camplate
	6	1	Washer
+	7	1	Retaining Ring
+	8	2	Retaining Ring
	9	1	Thrust Bearing
	10	2	Bearing Race
+	11	1	Shaft Seal, Drive
+	12	1	Housing Gasket
	13	2	Needle Bearing
+	14	1	O-ring, 3.175 mm Dia. x 31.75 mm ID. [.125 in. Dia. x 1.25 in. ID.]
	15	2	Washer
+	16	1	Shaft Seal, Trunnion
	17	4	Screw, Pan Head
	18	2	Spring
	19	2	Plug Assembly
+	19-1	2	O-ring, 2.38 mm Dia. x 22.23 mm ID. [.0937 in. Dia. x .875 in. ID.]
	20	1	Relief Valve for Port "C"
	21	1	Relief Valve for Port "D"
	22	1	Inner Race
	23	1	Seal Cover
	24	1	Trunnion Cover
	25	1	Cover, O-ring
	26	2	Dowel Pin
	27	2	Cap Screws, 5/16-18, 50.8 mm [2 in.] Long
	28	2	Cap Screws, 5/16-18, 63.5 mm [2.5 in.] Long
	29	1	Key, Drive Shaft
	30	1	Key, Camplate Trunnion
	31	1	Cover Plate (In K3 kit)
+	32	1	O-ring (In K1, K2, K3 & K4 kit)
	33	2	Cap Screws, Cover Plate (In K3 kit)
	34	1	Plug Assembly
+	34-1	1	O-ring, 2.21 mm Dia. x 16.36 mm ID. [.087 in. Dia. x .644 in. ID.]
+	35	1	Molded O-ring
	36	1	Charge Pump Adaptor
	37	1	Gerotor set and coupler sub-assembly 6.9 cm^3/r [.42 in^3/r] displacement, 6.35 mm [.25 in] width 13.8 cm^3/r [.84 in^3/r] displacement, 12.7 mm [.5 in] width
	37	1	9 tooth coupler (In K4 kit)
	46	1	Mounting Bracket, Square shaped
	46	1	Mounting Bracket, "V" shaped
	48	1	Valve Plate

Parts List

	Item	Qty.	Description
	49	1	Dump Valve sub-assembly
+	49-1	1	Retaining Ring
	49-2	1	Separator Plug
	49-3	1	Separator
+	49-4	1	O-ring, 1.59 mm Dia. x 9.53 mm I.D. [.0625 in. Dia. x .375 in. I.D.]
+	49-5	1	O-ring, 2.46 mm Dia. x 19.18 mm I.D. [.097 in. Dia. x .755 in. I.D.]
	49	1	Plug Assembly
	49-5	1	O-ring, 2.46 mm Dia. x 19.18 mm I.D. [.097 in. Dia. x .755 in. I.D.]
	50	1	Plug Assembly
+	50-1	1	O-ring, 1.98 mm Dia. x 11.89 mm ID. [.078 in. Dia. x .468 in. ID.]
	51	1	Plug Assembly
+	51-1	1	O-ring, 1.98 mm Dia. x 11.89 mm ID. [.078 in. Dia. x .468 in. ID.]

Mounting Kits

K1	1	Tandem Piston Pump Mounting Kit
K1-1	1	35T Coupler, 36.8 mm [1.45 in.] long
K1-2	1	O-ring, 1.59 mm Dia. x 101.6 mm ID. [.0625 in. Dia. x 4 in. ID.]
K1-3	2	Cap Screws
K1-4	2	Washer
K2	1	Gear Pump Mounting Kit
K2-1	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K2-2	2	Washer
K2-3	2	Cap Screws
K3	1	Cover Plate Kit
K3-1	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K3-2	1	Cover Plate
K3-3	2	Cap Screws
K4	1	Gear Pump Mounting Kit with Coupler
K4-1	1	9T Coupler
K4-2	1	O-ring, 1.59 mm Dia. x 101.6 mm ID. [.0625 in. Dia. x 4 in. ID.]
K4-3	2	Cap Screws
K4-4	2	Washer

Seal Repair Kit

70142-938	Seal Repair Kit for 70142, 70144 and 70145 piston pump.

Legend + Included in seal repair kit.

Disassembly

Disassembly

The following instructions apply to a variable displacement piston pump with or without a gerotor charge pump. A tandem pump assembly should be separated into individual pumps before disassembly.

1 Position the pump into a protected jaw vise, clamping onto the outer portion of the flange, with the input drive shaft down. Remove the four cap screws retaining charge pump adapter or backplate.

No gerotor charge pump skip to step 6.

2 Lift the charge pump adapter assembly straight up off backplate, shaft, and gerotor. Gerotor may stay in adapter or on backplate.

3 Remove o-ring from charge pump adapter.

4 Remove outer gerotor ring from either the charge pump adapter or the inner gerotor ring.

Refer to Appendix A for disassembly and inspection of charge pump adapter assembly.

5 Remove the inner gerotor ring and coupler assembly from shaft.

6 Lift backplate straight up off of shaft and housing. Remove valve plate from backplate or from rotating kit assembly, still in housing.

7 From backplate remove dump valve assembly or plug assembly, and relief valve assemblies. Note: Mark the relief valve in relationship to the cavity it was removed, for reassembly purposes.

Backplate Inspection:

• Check the bearing (press fit) in backplate. If needles remain in cage, move freely, and setting is at the dimension shown in figure 1-3, removal not required.

• Check roll pin in backplate. If tight and set to the dimension shown in figure 1-3, removal not required.

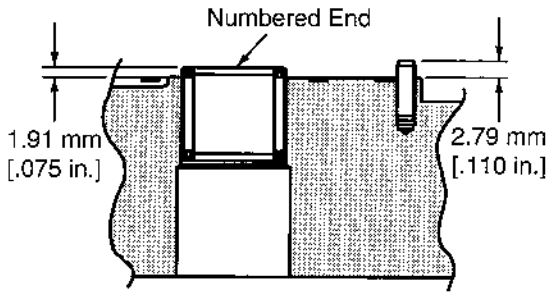


Figure 1-3

8 Remove housing gasket from housing or backplate.

9 To remove rotating kit assembly from housing, first remove pump from vise holding the rotating kit assembly in position. Lower pump so that the shaft end (flange end) is up. Set the rear of housing onto table with housing flat and rotating kit assembly at rest on table. Hole in table for protruding shaft is required. Remove by lifting the housing and shaft from rotating kit assembly.

Refer to Appendix B for disassembly and Inspection of rotating kit.

10 Remove retaining ring from the front of housing. Press the shaft, shaft seal or spacer, and washer from housing. Remove retaining ring, thrust washer, thrust bearing, second thrust washer, and second retaining ring from shaft.

11 To remove camplate from housing, remove the two screws from both sides of housing (four total) retaining seal cover and trunnion cover. Remove seal cover, shaft seal, washer, and bearing from housing. Remove trunnion cover, o-ring cover, o-ring, washer, inner race, and bearing from housing. Slide the camplate over to one side and remove thru the back side of housing.

Camplate Inspection:

• The finish on the piston shoe surfaces of the camplate should show no signs of scoring.

Housing Inspection:

• Check the bearing (press fit) in front of housing. If needles remain in cage, move freely, and setting at the dimension shown in figure 1-4, removal not required.

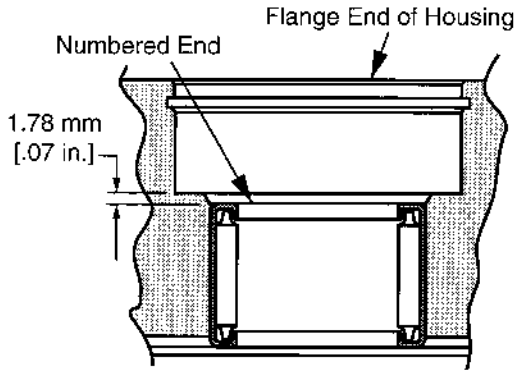


Figure 1-4

12 Discard the shaft seal, gaskets, and o-rings from all assemblies. Replace with new seals upon reassembly.

Reassembly

Reassembly

1 All parts should be cleaned and critical moving parts lubricated before reassembly.

2 If necessary, press new bearing in housing to dimension shown in figure 1-4 with the numbered end of bearing outward.

3 Starting with the camplate, insert camplate into the housing with the long trunnion side down and to the appropriate side of linkage on the machine.

4 On the short trunnion side of camplate install bearing (bearing with numbered side to the inside of pump), bearing race (race with chamfer toward inside of pump), washer, o-ring, o-ring cover, trunnion cover, and retain with two screws. Torque screws 4.1 to 5.4 N·m [36 to 48 lbf·ft].

5 On the long trunnion side of camplate install bearing (bearing with numbered side to the inside of pump), washer, trunnion shaft seal, seal cover, and retain with two screws. Torque screws 4.1 to 5.4 N·m [36 to 48 lbf·ft].

6 To install shaft, place exterior retaining ring, thrust race, thrust bearing, second thrust race, and second retaining ring onto shaft. Position washer and shaft seal or spacer onto shaft.

7 Install shaft assembly into front of housing: For units with spacer, retain with interior retaining ring and go on to step 8. For units with shaft seal, seat seal into position with seal driver and retain with interior retaining ring.

Refer to Appendix B for reassembly of rotating kit assembly.

8 With flange end of housing up, position rotating kit assembly onto shaft and into housing. Align the spline within the piston block with shaft internal spline. Make sure piston block is engaged fully to put piston shoes in contact with camplate. Check all parts for proper position before proceeding.

9 Clamp pump assembly in a protected jaw vise with the open end of the housing up. Install gasket and two dowel pins onto housing.

10 If necessary, press new bearing and roll pin in backplate to dimension shown in figure 1-3. Bearing installed with the numbered end outward. Roll pin installed with split oriented away from bearing.

11 Install new o-ring on relief valves. Install relief valve in its original cavity in backplate that it was removed. Torque 128 to 142 N·m [95 to 105 lbf·ft.]

12 Install new o-ring on dump valve or plug. Install dump valve or plug into backplate. Torque dump valve or plug to 36.6 to 40.7 N·m [27 to 30 lbf·ft]

13 Apply a small amount of petroleum jelly to the steel side of valve plate to hold in place for installation. Aligning the index pin, place the valve plate in position onto the backplate, with steel side against backplate.

14 Install backplate assembly onto housing assembly. Making sure valve plate and gasket stay in place.

No gerotor charge pump, skip to step 17.

15 Install inner gerotor and coupler assembly. The coupler has a "V" groove on one end and this end of coupler should enter backplate first. Lubricate inner gerotor.

Refer to Appendix A for reassembly of Charge relief valve in adapter plate.

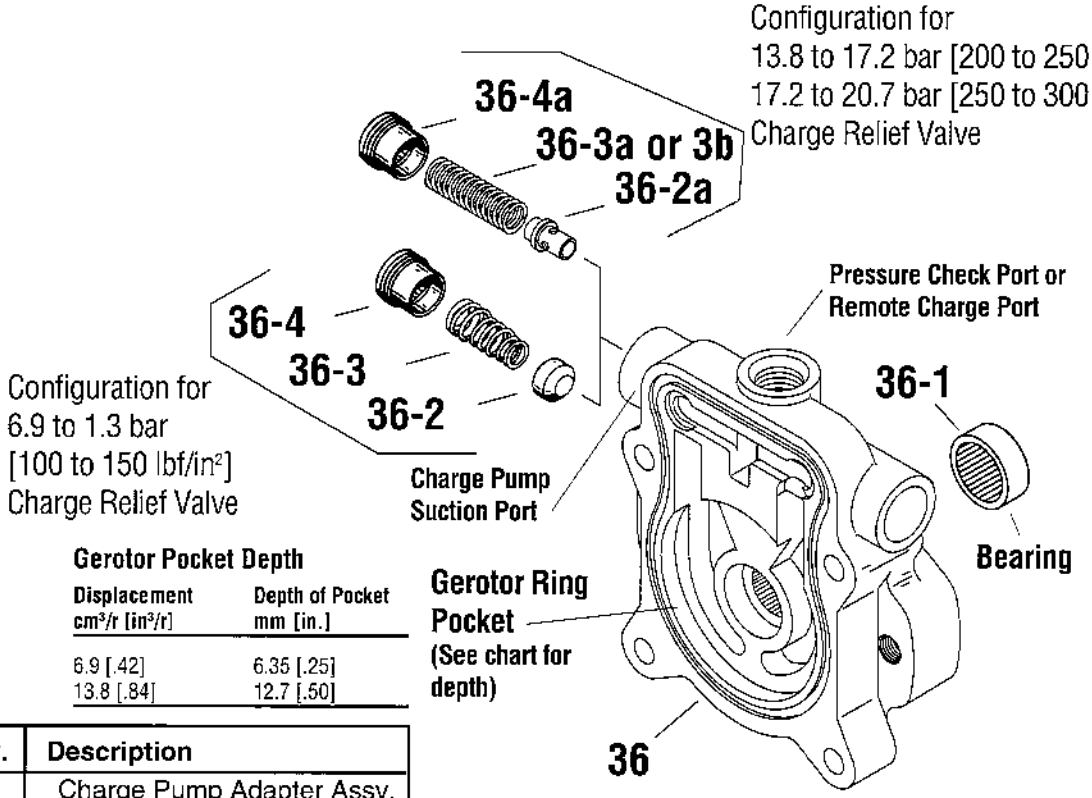
16 Install o-ring and outer gerotor ring onto adapter plate. Lubricate both o-ring and outer gerotor ring to hold in position during assembly of adapter plate. Install adapter plate onto backplate. Make sure o-ring and gerotor ring stay in place.

17 Retain backplate and adapter plate (when used) with four cap screws, Torque 23 to 27 N·m [17 to 20 lbf·ft].

18 Install new o-rings on all plugs. Install plugs into housing. Torque 9/16 in. - 18 plug 28 to 32 N·m [21 to 24 lbf·ft].

19 Refer to start-up procedures on page 17.

Appendix A - Charge Pump Adapter Assembly



Gerotor Pocket Depth

Displacement cm³/r [in³/r]	Depth of Pocket mm [in.]
6.9 [.42]	6.35 [.25]
13.8 [.84]	12.7 [.50]

Item	Qty.	Description
36	1	Charge Pump Adapter Assy.
36-**1**	1	Bearing (press fit)
36-**2**	1	Poppet, Cup
36-**2a**	1	Poppet, Pin
36-**3**	1	Spring, Tappered
36-**3a**	1	Spring, "Light Green" *
36-**3b**	1	Spring, "Pink" **
36-**4**	1	Spring Retainer
36-**4a**	1	Spring Retainer

*200 to 250 lbf/in²

**250 to 300 lbf/in²

Disassembly - Charge Pump Adapter Assembly

1 Remove spring retainer, spring, and poppet from adapter assembly.

Inspection:

- Inspect the charge pump relief valve seat inside the charge pump adapter. Check to insure that seat is smooth and free of burrs or other defects.
- Inspect the charge pump relief valve spring.
- Inspect the bearing inside the charge pump adapter. The bearing needles must remain in the bearing cage and bearing at dimension shown in figure 1-2.
- Inspect the gerotor pocket inside the charge pump adapter assembly. It should not be scored excessively.

Reassembly - Charge Pump Adapter Assembly

1 If necessary, press new bearing in adapter assembly. The bearing to dimension shown in figure 1-2 with the numbered end of bearing outward and closest to mounting flange.

2 Install cup poppet or pin poppet, spring, and spring retainer into charge pump adapter. Torque retainer 6.8 to 9.5 N·m [5 to 7 lbf·ft.]

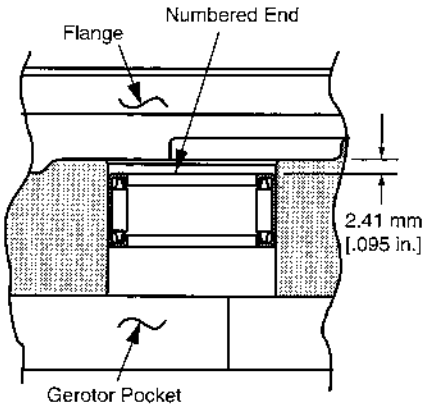
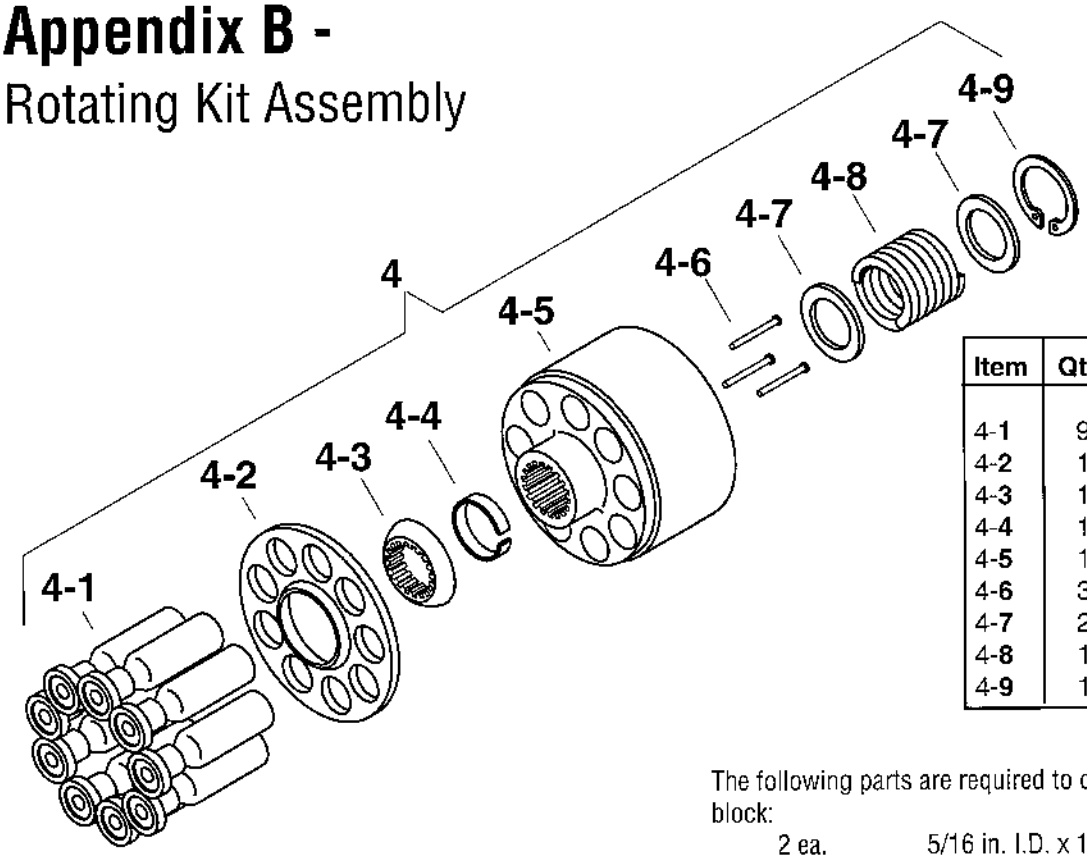


Figure 1-2

Appendix B -
Rotating Kit Assembly



Item	Qty.	Description
4-1	9	Piston assemblies
4-2	1	Spider
4-3	1	Spider Pivot
4-4	1	Retainer
4-5	1	Piston Block
4-6	3	Pins
4-7	2	Washer
4-8	1	Spring
4-9	1	Retaining Ring

Disassembly - Rotating Kit Assembly

Disassembly of rotating assembly is required for inspection only.

1 Remove the nine piston assemblies, spider, and spider pivot from piston block.

Inspection:

• Examine the O.D. of the pistons for finish condition. They should not show wear or deep scratches. Inspect the shoes for a snug fit on the ball end of the pistons and a flat smooth surface that comes in contact with the camplate. **Do not lap piston shoes**.

• Examine the spider for wear in the pivot area.

• Examine the pivot to insure smoothness and no signs of wear.

• Inspect the piston block surface that makes contact with valve plate. This surface should be smooth and free of deep scratches. **Do not lap piston block.**

• The pistons should move freely in the piston block bore. If not free moving, examine the bore for scoring or contamination.

2 To inspect pins and spring **Caution** should be taken in removing spring. The **spring is highly compressed** and the retaining ring should not be removed without compressing the spring safely.

The following parts are required to disassemble the piston block:

2 ea. 5/16 in. I.D. x 15/16 in. O.D. flat washers
1 ea. 5/16 in. x 2-7/8 in. N.C. cap screw, and
1 ea. 5/16 in. N.C. nut

To remove spring, place one of the flat washers over the 5/16 in. x 2-7/8 in. cap screw. Put cap screw through the center of the piston block and apply the second washer. Let washer rest on the three pins and retain with nut. Turning nut and compressing spring inside the block. Use a pair of retaining ring pliers and remove the internal retaining ring. Remove nut, bolt, and the two washers from block. Removing the washer, spring, second washer, three pins, and pin keeper at the same time.

Reassembly - Rotating Kit Assembly

1 To reassemble the rotating kit assembly complete the following: Compress the pin keeper and install in the spline of the piston block. Install the three pins with head end to the inside of the block and position in the special grooves of the piston block spline.

2 Install the washer, spring, and second washer into the piston block. Use the two 5/16 in. I.D. washers, nut, and 5/16 in. x 2-7/8 in. cap screw to compress the spring and retain with retaining ring. Remove the nut, cap screw, and the two washers.

3 Install the pivot onto the three pins, spider on the pivot, and piston assemblies thru the spider and into piston block, resting on spider.

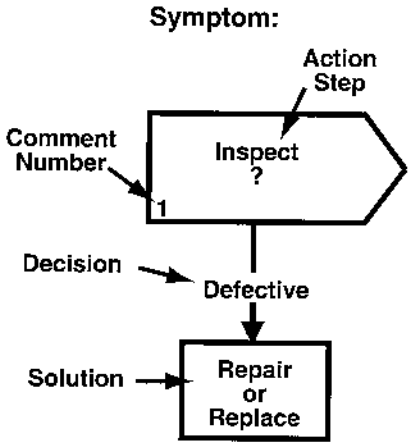
Fault - Logic Trouble Shooting

This fault - logic trouble shooting guide is a diagnostic aid in locating transmission problems.

Match the transmission symptoms with the problem statements and follow the action steps shown in the box diagrams. This will give expedient aid in correcting minor problems eliminating unnecessary machine down time.

Following the fault - logic diagrams are diagram action comments of the action steps shown in the diagrams. Where applicable, the comment number of the statement appears in the action block of the diagrams.

Explanatory Diagram



Recommended Gauge Locations

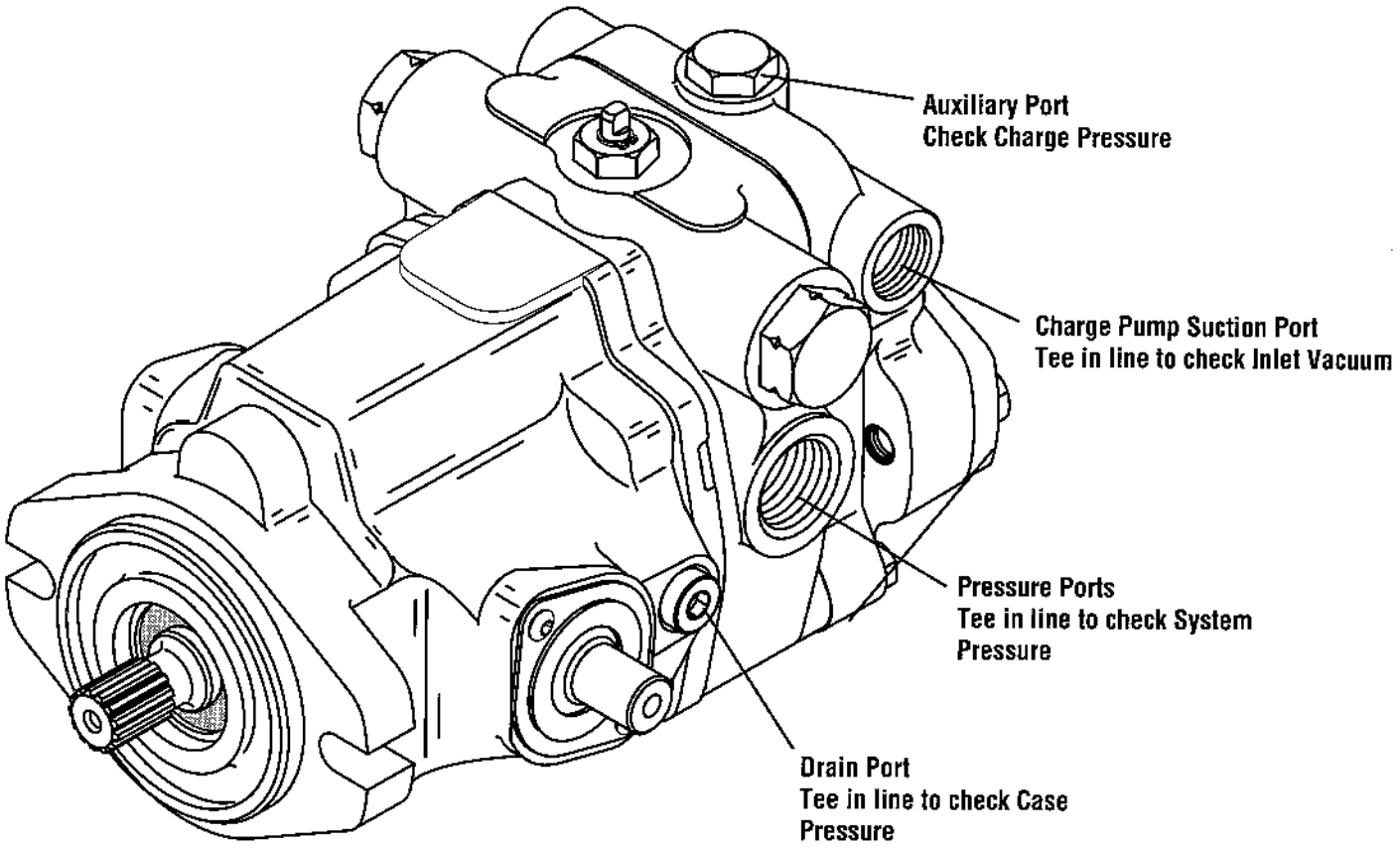


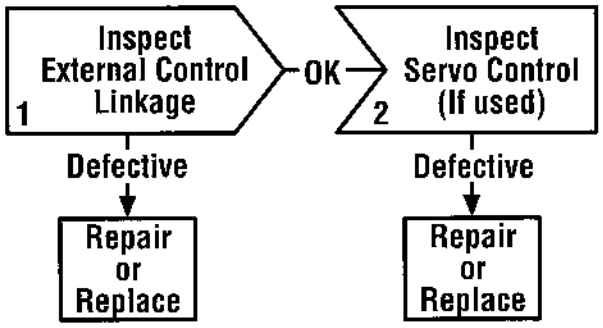
Figure 3-1

Gauges Recommended

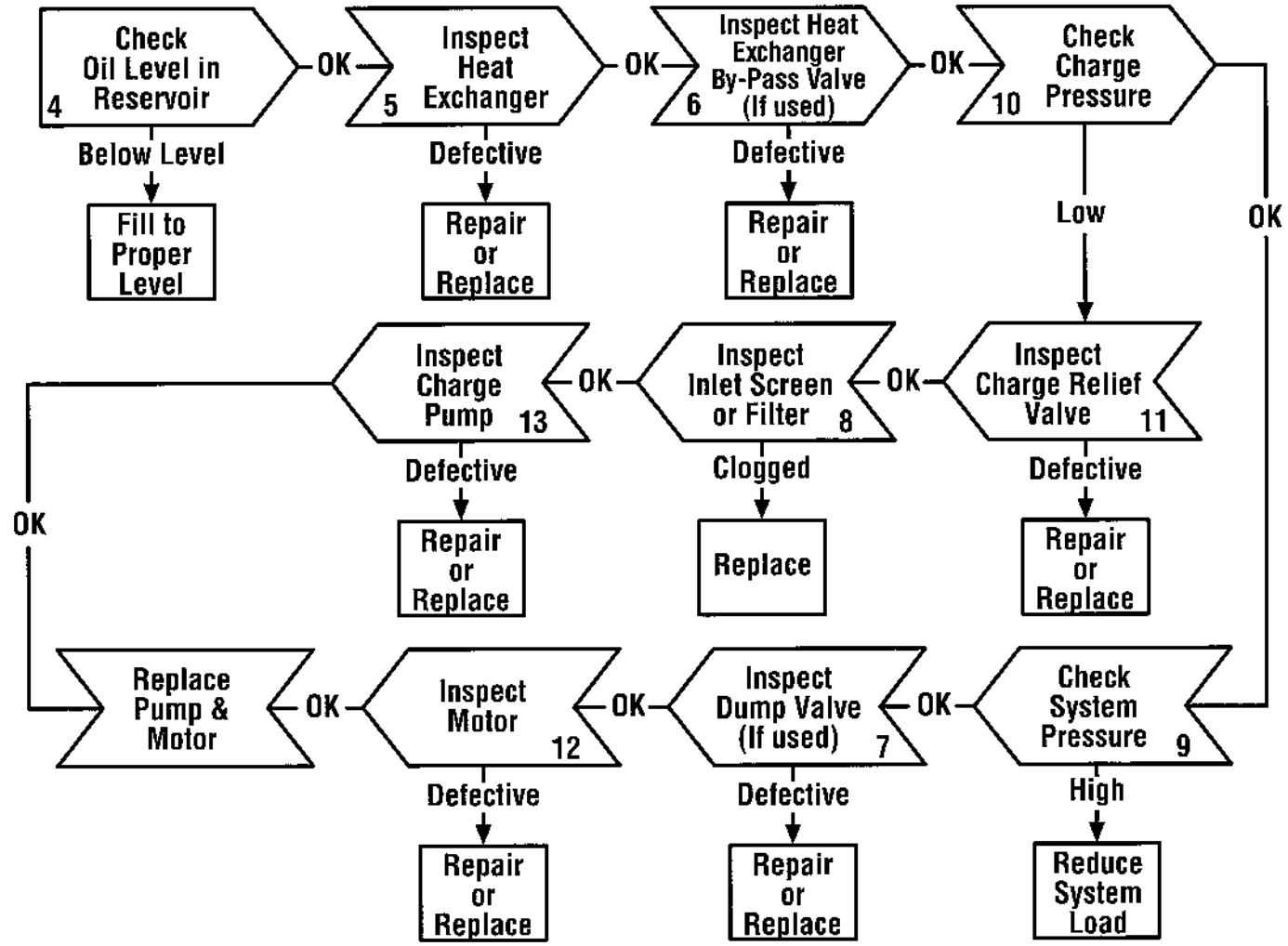
Inlet vacuum gauge: 207 bar to 0 bar [30 lbf/in² to 30 inHg]
System pressure gauge: 700 bar [10,000 lbf/in²]
Charge pressure gauge: 0 to 50 bar [0 to 600 lbf/in²]
Case pressure gauge: 0 to 25 bar [0 to 300 lbf/in²]

Fault - Logic Trouble Shooting

Symptom: Neutral Difficult or Impossible to Find

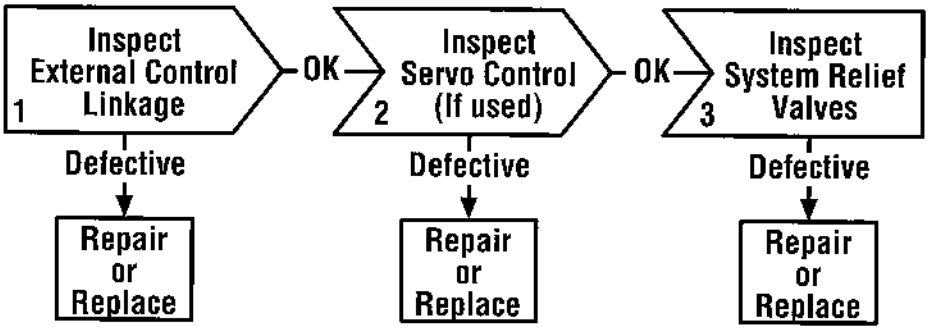


Symptom: System Operating Hot

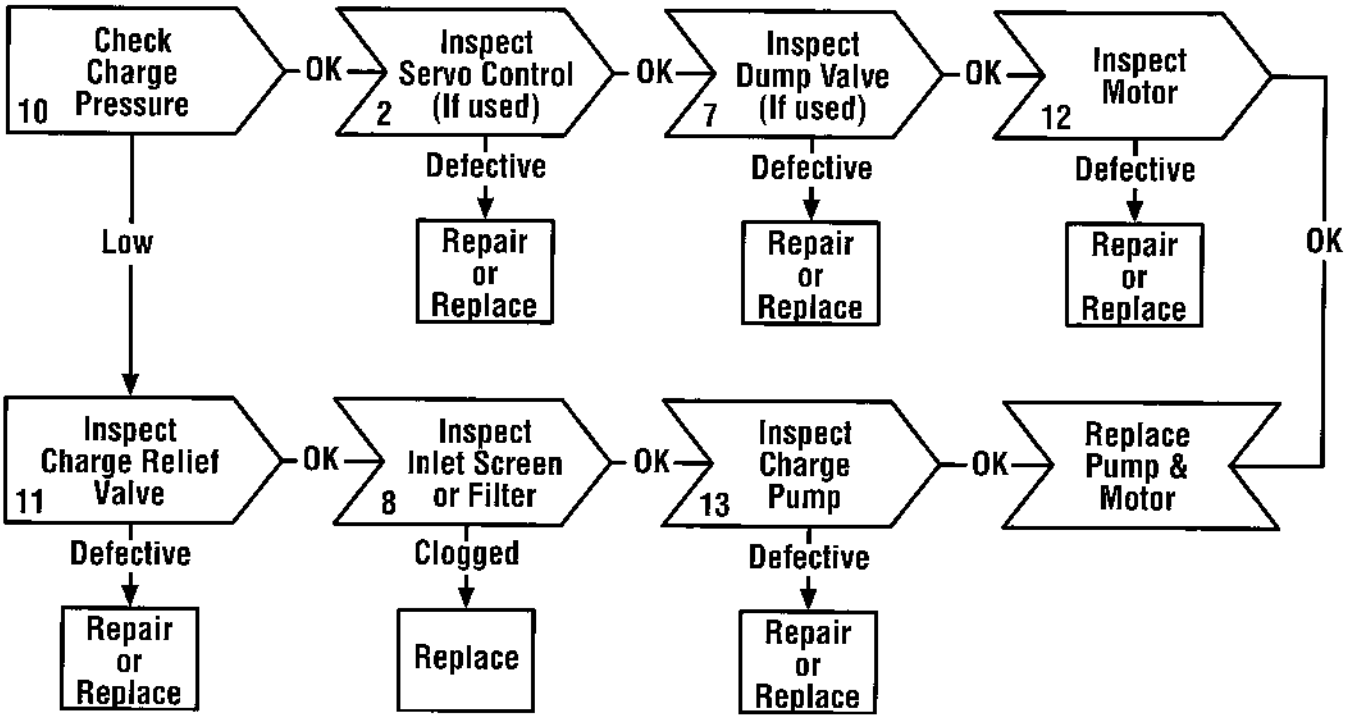


Fault - Logic Trouble Shooting

Symptom: Operates in One Diection Only

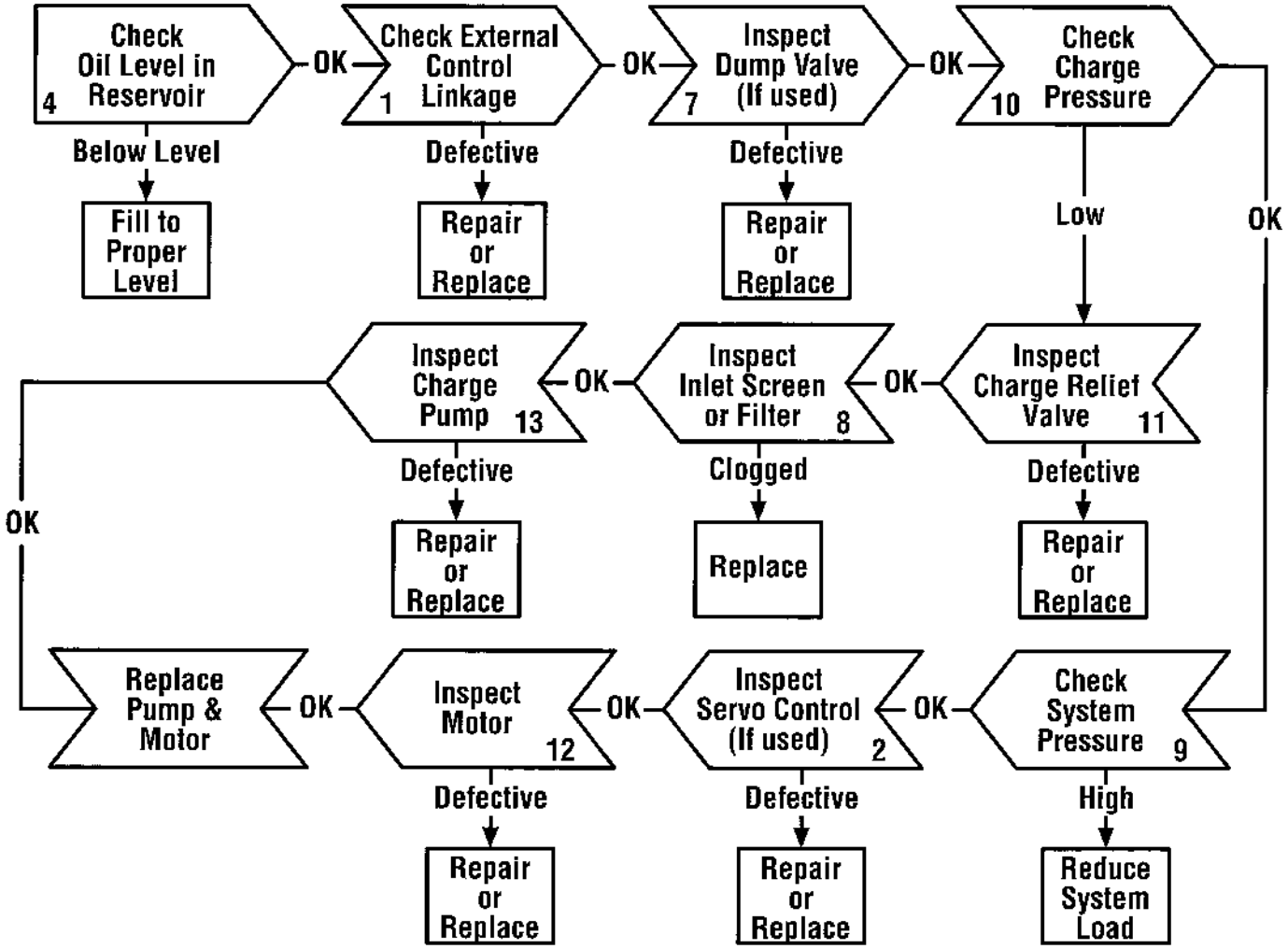


Symptom: System Response Sluggish



Fault - Logic Trouble Shooting

Symptom: System Will Not Operate In Either Direction



Fault - Logic Trouble Shooting

Diagram Action Step Comments

1 **Inspect External Control Linkage for:**
   a. misadjusted or disconnected
   b. binding, bent, or broken
   c. misadjusted, damaged or broken neutral return spring

2 **Inspect Servo Control Valve for: (if used)**
   a. proper inlet pressure
   b. misadjusted, damaged or broken neutral return spring
   c. galled or stuck control spool
   d. galled or stuck servo piston

3 **Inspect System Relief Valves * for:**
   a. improper pressure relief setting
   b. damaged or broken spring
   c. valve held off seat
   d. damaged valve seat

4 **Check Oil Level in Reservoir:**
   a. consult owner/operators manual for the proper type fluid and level

5 **Inspect Heat Exchanger for:**
   a. obstructed air flow (air cooled)
   b. obstructed water flow (water cooled)
   c. improper plumbing (inlet to outlet)
   d. obstructed fluid flow

6 **Inspect Heat Exchanger By-Pass Valve for: (if used)**
   a. improper pressure adjustment
   b. stuck or broken valve

7 **Inspect Dump Valve for: (if used)**
   a. held in a partial or full open position

8 **Inspect Inlet Screen or Filter for:**
   a. plugged or clogged screen or filter element
   b. obstructed inlet or outlet
   c. open inlet to charge pump

9 **Check System Pressure:**
   a. See figure 3-1 for location of pressure gauge installation.
   b. consult owner/operators manual for maximum system relief valve settings

10 **Check Charge Pressure:**
   a. See figure 3-1 for location of pressure gauge installation.
   b. consult owner/operators manual for maximum charge relief valve settings

11 **Inspect Charge Relief Valve for:**
   a. improper charge relief pressure setting *
   b. damaged or broken spring
   c. poppet valve held off seat

12 **Inspect Motor for:**
   a. disconnected coupling

13 **Inspect Charge Pump for:**
   a. broken or missing drive key
   b. damaged or missing o-ring
   c. excessive gerotor clearance
   d. galled or broken gerotor set

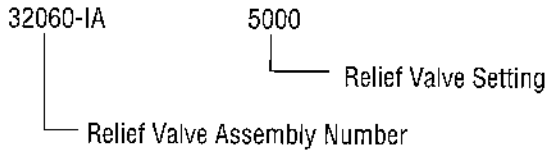
*** System/Charge Relief Valve Pressure Settings for Eaton's Variable Displacement Controlled Piston Pumps**

Inlet Vacuum	6 inHg max.
Case Pressure	25 lbf/in² maximum
Charge Pressure	100 to 150 lbf/in² Standard
	200 to 250 lbf/in² Optional
	250 to 300 lbf/in² Optional
System Pressure	5000 lbf/in² maximum
	3000 lbf/in² continuous

The high pressure relief valves are all factory preset and cannot be readjusted.

The pressure setting and assembly number is stamped on each high pressure relief valve cartridge.

Valve Identification Example:



Start-up Procedure

When initially starting a new or a rebuilt transmission system, it is extremely important that the start-up procedure be followed. It prevents the chance of damaging the unit which might occur if the system was not properly purged of air before start-up.

1 After the transmission components have been properly installed, fill the pump housing at least half full with filtered system oil. Connect all hydraulic lines and check to be sure they are tight.

2 Install and adjust all control linkage.

3 Fill the reservoir with an approved oil that has been filtered through a 10 micron filter. Refer to Eaton Hydraulics Technical Data sheet number 3-401 titled Hydraulic Fluid Recommendations.

4 Gasoline or L.P. engines: remove the coil wire and turn the engine over for 15 seconds. Diesel engines: shut off the fuel flow to the injectors and turn the engine over for 15 seconds.

5 Replace the coil wire or return the fuel flow to the injectors. Place the transmission unit in the neutral position, start the engine and run it at a low idle. The charge pump should immediately pick up oil and fill the system. If there is no indication of fill in 30 seconds, stop engine and determine the cause.

6 After the system starts to show signs of fill, slowly move pump camplate to a slight cam angle. Continue to operate system slowly with no load on motors until system responds fully.

7 Check fluid level in the reservoir and refill if necessary to the proper level with an approved filtered oil.

8 Check all line connections for leaks and tighten if necessary.

9 The machine is now ready to be put into operation.

10 Frequent filter changes are recommended for the first two changes after placing the machine back into operation. Change the first filter in 3-5 hours and the second at approximately 50 hours approx. hours. Routinely scheduled filter changes are recommended for maximum life of the hydraulic system.

Notes

Notes

Order parts from number 6-632 Parts Information booklet.
Each order must include the following information.

1. Product and/or Part Number
2. Serial Code Number
3. Part Name
4. Quantity

Eaton Corporation
Hydraulics Division
15151 Hwy. 5
Eden Prairie, MN 55344
Telephone 612/937-9800
Fax 612/937-7130

Eaton Ltd.
Hydraulics Division
Glenrothes, Fife
Scotland, KY7 4NW
Telephone 44/592-771-771
Fax 44/592-773-184

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November, 1993

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