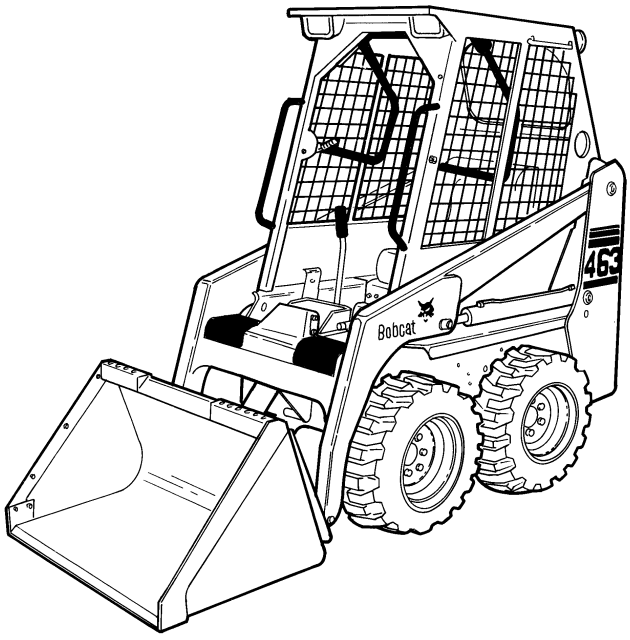
463

Bobcat®

Service Manual

S/N 522211001 & Above
S/N 522111001 & Above

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EQUIPPED WITH BOBCAT INTERLOCK CONTROL SYSTEM (BICS™)

Ingersoll Rand
Compact Vehicle Technologies

6901812 (3-06)

Printed in U.S.A.

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MAINTENANCE SAFETY

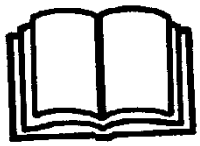
WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-0903

Safety Alert Symbol: This symbol with a warning statement, means: "Warning, be alert! Your safety is involved!" Carefully read the message that follows.

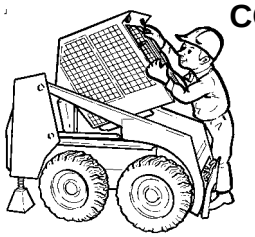
CORRECT



B-10731a

Never service the Bobcat Skid-Steer Loader without instructions.

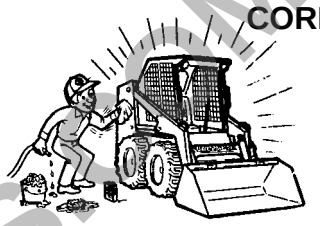
CORRECT



B-12365

Use the correct procedure to lift or lower operator cab.

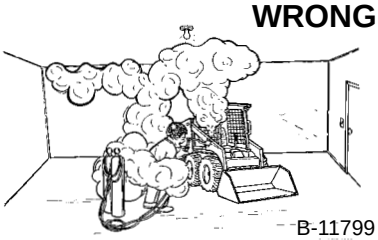
CORRECT



B-7469

Cleaning and maintenance are required daily.

WRONG



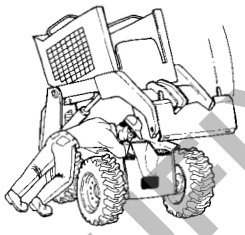
B-11799

Have good ventilation when welding or grinding painted parts.

Wear dust mask when grinding painted parts. Toxic dust and gas can be produced.

Avoid exhaust fume leaks which can kill without warning. Exhaust system must be tightly sealed.

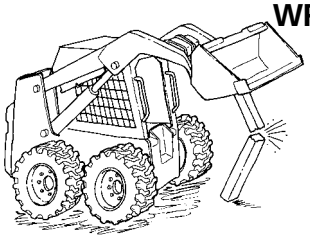
WRONG



B-15231

Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop. Do not go under lift arms when raised unless supported by an approved lift arm support device. Replace it if damaged.

WRONG

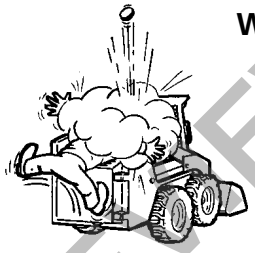


B-15280

Never work on loader with lift arms up unless lift arms are held by an approved lift arm support device. Replace if damaged.

Never modify equipment or add attachments not approved by Bobcat Company.

WRONG



B-6590

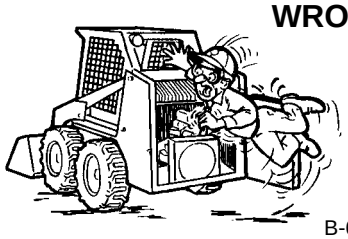
Stop, cool and clean engine of flammable materials before checking fluids.

Never service or adjust loader with the engine running unless instructed to do so in the manual.

Avoid contact with leaking hydraulic fluid or diesel fuel under pressure. It can penetrate the skin or eyes.

Never fill fuel tank with engine running, while smoking or when near open flame.

WRONG



B-6580

Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.

Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for type of welding.

Keep rear door closed except for service. Close and latch door before operating the loader.

WRONG



B-6589

Lead-acid batteries produce flammable and explosive gases.

Keep arcs, sparks, flames and lighted tobacco away from batteries.

Batteries contain acid which burns eyes or skin on contact. Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention.

Maintenance procedures which are given in the Operation & Maintenance Manual can be performed by the owner/operator without any specific technical training. Maintenance procedures which are **not** in the Operation & Maintenance Manual must be performed **ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL. Always use genuine Bobcat replacement parts.** The Service Safety Training Course is available from your Bobcat dealer.

MSW01-0805

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463 WIRING SCHEMATIC

S/N 522111001 - 522111908
S/N 522211001 - 522212646
(PRINTED JANUARY 2005)
V-0203

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WIRES CONNECT BY LETTER ACROSS CONNECTORS

SOME CONNECTOR BODIES NOT SHOWN FOR DRAWING CLARITY

BATTERY FEED 1000-1999 RED, RED/WHT, RNG
GROUND 2000-2999 BLK
MONITORING 3000-3999 LBL
HYDRAULIC 4000-4999 LGN
ATTACHMENT CONTROLS 5000-5999 YEL
LIGHTS 6000-6999 PNK
ACCESSORIES 7000-7999 WHT
ENGINE 8000-8999 TAN
COMMUNICATION 9000-9999 PUR

RED = RED
RNG = ORANGE
BLK = BLACK
LBL = LIGHT BLUE
DBL = DARK BLUE
LGN = LIGHT GREEN
DGN = DARK GREEN
YEL = YELLOW
PNK = PINK
WHT = WHITE
BRN = BROWN
TAN = TAN
PUR = PURPLE
GRY = GRAY

MAINFRAME HARNESS - 6732921 or 6735878

CAB HARNESS - 6732922

TO OPTIONS — C453
TO TAILGATE — C454
BUCKET POSITION VALVE (If Equipped) — C422
ACCESSORY — C452

BACKUP ALARM SWITCHES — 6733734 — C134
BACKUP ALARM — 6733735 — C127

TO HANDLE FOR HORN — C109

TRANS. OIL PRESSURE SWITCH — C110
TRANS. OIL TEMPERATURE SWITCH
ENGINE OIL PRESSURE SWITCH

BICS CONTROLLER — C448

REMOTE START CONNECTOR — C420
TRACTION LOCK SOLENOID — C425

DIODE

R - Terminal — C162
ALTERNATOR
STARTER
GROUNDS — T11, T12

Without Fan Jumper Harness

ENGINE TEMP SWITCH & SENDER (185°F) — C124

FUEL SHUTOFF TIMER — C117, C118
FUEL PULL SOLENOID — C101

COOLING FAN — C115, C116
GLOW PLUG — HR

(Accessory Fused and Switched) TO OPTIONS — C164
(Accessory Fused and Switched) TO OPTIONS — C105

BATTERY

FUSE / RELAY CENTER

FUSE 5 10A — FUSE 1 10A — SWITCH POWER
FUSE 6 20A — FUSE 2 25A — FUSE 10 25A
FUSE 7 40A — FUSE 3 10A — FUSE 11 15A
FUSE 8 — FUSE 4 25A — FUSE 12 25A
GLOW PLUG | FAN | TRACTION LOCK | STARTER

ACCESSORY — C216
EURO LIGHT CONNECTOR — C215
LIGHT SWITCH
LEFT TURN SIGNAL LIGHT INDICATOR (1A)
RIGHT TURN SIGNAL LIGHT INDICATOR (1A)
REAR WORK LAMP (2A)
REAR TAIL LAMP (1A)
LEFT FRONT HEADLIGHT (2A)
RIGHT FRONT HEADLIGHT (2A)
COOLANT TEMPERATURE GAUGE
VOLTMETER
HORN (If Equipped) 6695204
HOURMETER
ENGINE WARNING LIGHT
TRANSMISSION WARNING LIGHT
TRACTION LOCK OVERRIDE SWITCH — C305
SEAT BAR SENSOR
BRAKE SWITCH
GLOW PLUG SWITCH
IGNITION SWITCH — C123
AUXILIARY POWER SOCKET

C119
C114

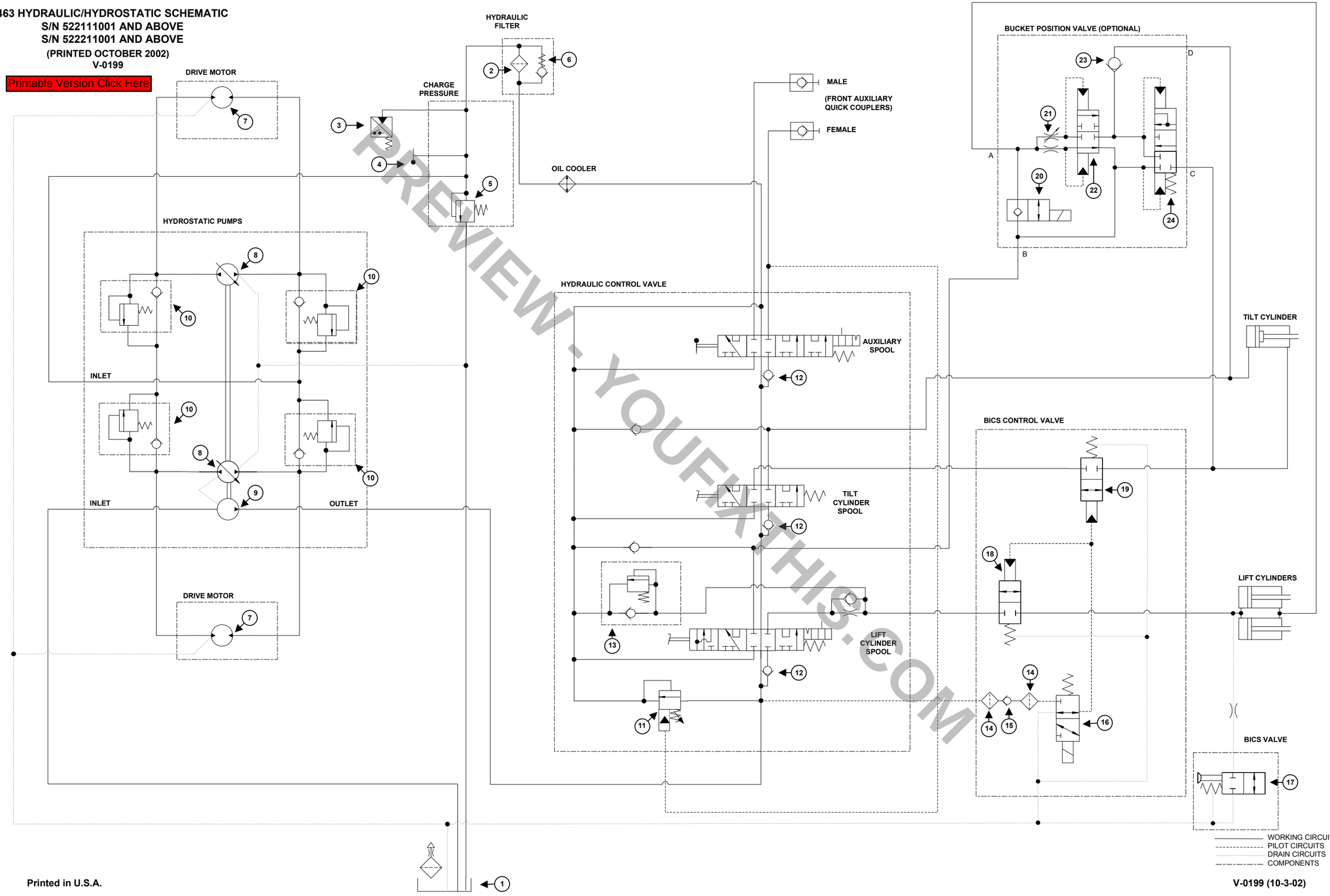
(Existing Wire)
STARTER
With Fan Jumper Harness P/N 7104468

V-0203 (1-10-05)

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463 HYDRAULIC/HYDROSTATIC SCHEMATIC
S/N 522111001 AND ABOVE
S/N 522211001 AND ABOVE
(PRINTED OCTOBER 2002)
V-0199

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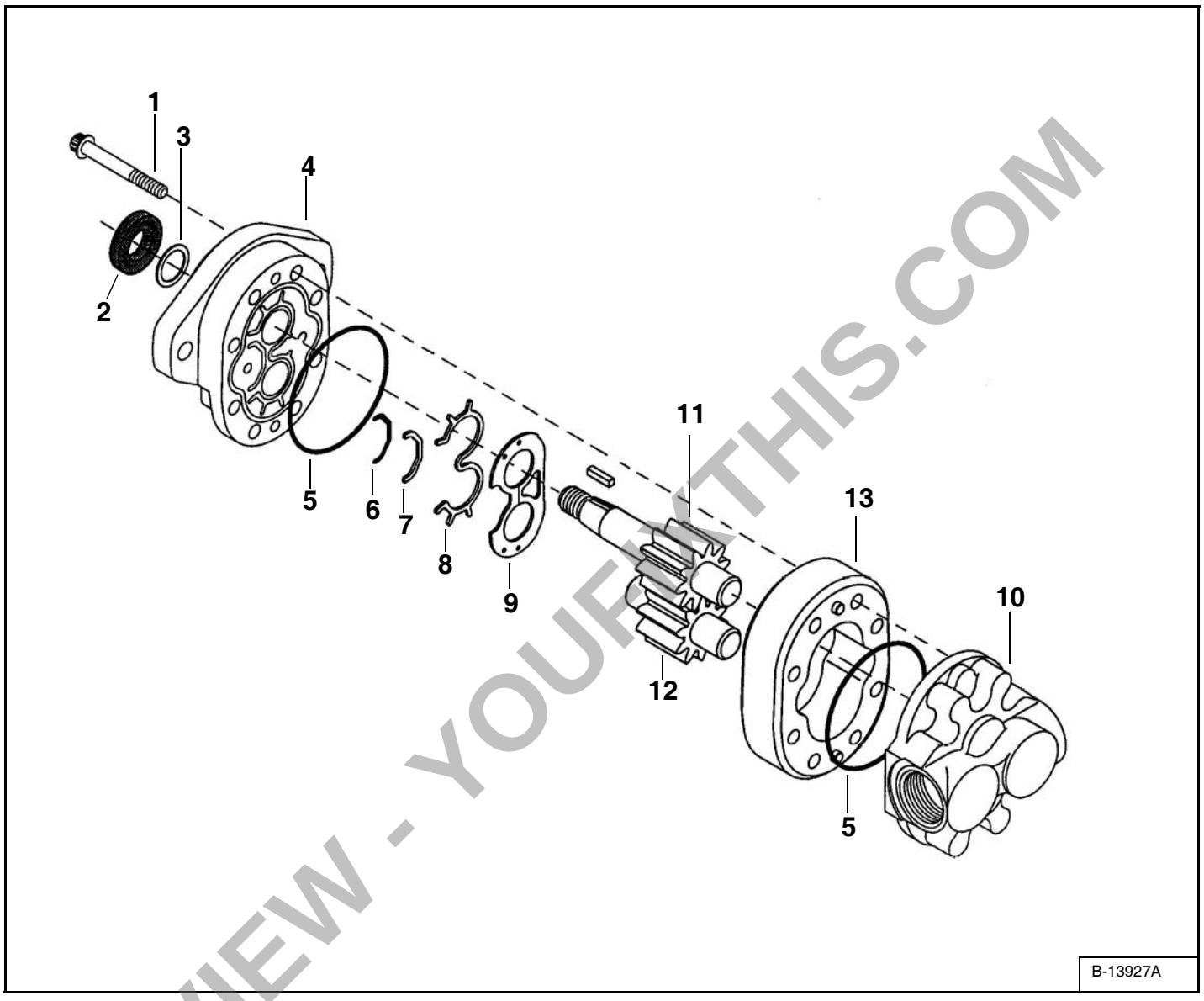
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V-0199 (10-3-02)

Parts Identification



Ref.	Description
1	BOLT
2	SEAL
3	WASHER
4	COVER
5	O-RING
6	BACK-UP RING
7	WASHER
8	SEAL
9	PLATE
10	COVER
11	GEAR
12	GEAR
13	BODY

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TORQUE SPECIFICATIONS FOR BOLTS

Torque For General SAE Bolts

The following table shows standard torque specifications for bolts with zinc phosphate coating. Bolts purchased from Bobcat that have zinc phosphate coating are specified by the letter “H” following the part number.

THREAD SIZE		SAE GRADE 5	SAE GRADE 8
INCH LBS. (N•m)	.250	80-90 (9-10)	110-120 (13-14)
	.3125	180-200 (21-23)	215-240 (24-27)
FOOT LBS. (N•m)	.375	25-28 (34-38)	35-40 (48-54)
	.4375	40-45 (54-61)	60-65 (82-88)
	.500	65-70 (88-95)	90-100 (125-135)
	.5625	90-100 (125-135)	125-140 (170-190)
	.625	125-140 (170-190)	175-190 (240-260)
	.750	220-245 (300-330)	300-330 (410-450)
	.875	330-360 (450-490)	475-525 (645-710)
	1.000	475-525 (645-710)	725-800 (985-1085)
	1.125	650-720 (880-975)	1050-1175 (1425-1600)
	1.250	900-1000 (1200-1360)	1475-1625 (2000-2200)
	1.375	1200-1350 (1630-1830)	2000-2200 (2720-2980)
	1.500	1500-1650 (2040-2240)	2600-2850 (3530-3870)
	1.625	2000-2800 (2720-2980)	3450-3800 (4680-5150)
	1.750	2500-2750 (3390-3730)	4300-4800 (5830-6500)
	1.875	3150-3500 (4270-4750)	5500-6100 (7450-8300)
	2.000	3800-4200 (5150-5700)	6500-7200 (8800-9800)

Torque For General Metric Bolts

Thread Size	Material		
(Dia. x Pitch)	Head Mark 4	Head Mark 7	Head Mark 10
M 5 x 0.8		3-4 ft.-lb. (4-5 N•m)	
M 6 x 1.0		6-7 ft.-lb. (8-9 N•m)	6-9 ft.-lbs (8-12 N•m)
M 8 x 1.25	6-9 ft.-lb. (8-12 N•m)	11-16 ft.-lb. (15-22 N•m)	18-25 ft.-lb. (24-34 N•m)
M 10 x 1.25	13-18 ft.-lb. (18-24 N•m)	22-30 ft.-lb. (30-41 N•m)	36-50 ft.-lb. (49-68 N•m)
M 12 x 1.25	22-30 ft.-lb. (30-41 N•m)	40-54 ft.-lb. (54-73 N•m)	69-87 ft.-lb. (94-118 N•m)
M 14 x 1.5	36-50 ft.-lb. (49-68 N•m)	58-80 ft.-lb. (79-108 N•m)	116-137 ft.-lb. (157-186 N•m)

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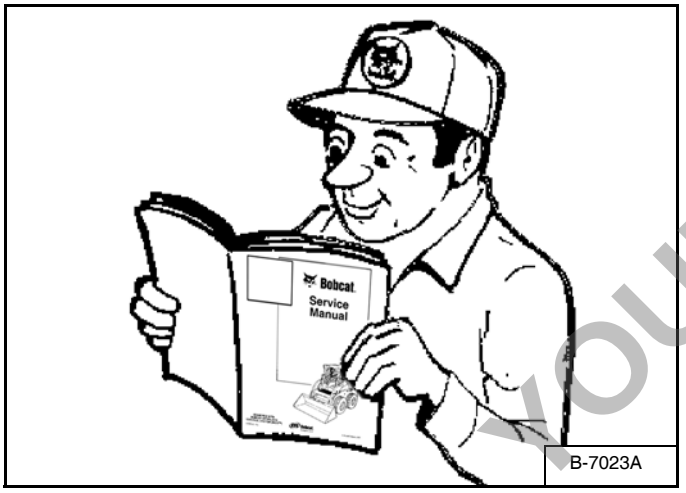
LIFTING AND BLOCKING THE LOADER

⚠ WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death [Figure 10-10-1].

W-2003-0199

Figure 10-10-1



Procedure

⚠ WARNING

Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

Figure 10-10-2

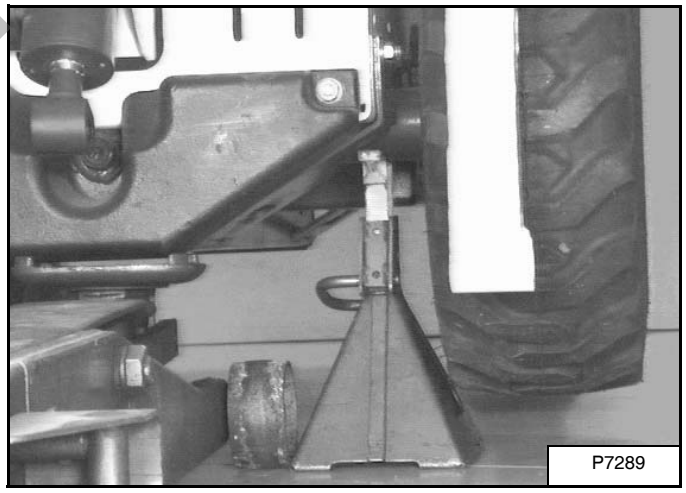


Always park the loader on a level surface.

Put a floor jack under the rear of the loader **[Figure 10-10-2]**.

Lift the rear of the loader and install jackstands **[Figure 10-10-2]**.

Figure 10-10-3



Put the floor jack under the front of the loader **[Figure 10-10-3]**.

Lift the front of the loader and put jackstands under the loader frame.

NOTE: Make sure the jackstands do not touch the tires.

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Troubleshooting Chart

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.

⚠ WARNING

Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

PROBLEM	CAUSE
The hydraulic system will not operate.	1, 2, 3, 5, 8
The transmission warning light comes ON when hydraulics are operating.	1, 3
Slow hydraulic system action.	1, 3, 4, 6, 8
Hydraulic action is not smooth.	1, 4, 5, 6, 7
Lift arms go up slowly at full engine RPM.	1, 3, 4, 6, 7, 8, 9
The lift arms or Bob-Tach will move when the pedal is in neutral position.	4
The lift arms come down with the pedal in the neutral position	4, 9, 10, 11

KEY TO CORRECT THE CAUSE
1. The fluid level is not correct.
2. The pedal linkage is disconnected.
3. The hydraulic pump has damage.
4. The pedal linkage is not adjusted correctly.
5. Relief valve is not at the correct pressure.
6. Suction leak on the inlet side of the hydraulic pump.
7. Fluid is cold. Wrong viscosity fluid. (See Specifications on Page SPEC-50-1.)
8. Using the loader for more than its rated capacity.
9. Internal leak in the lift cylinder(s).
10. External leak from the lift cylinder(s).
11. Damaged lift spool.

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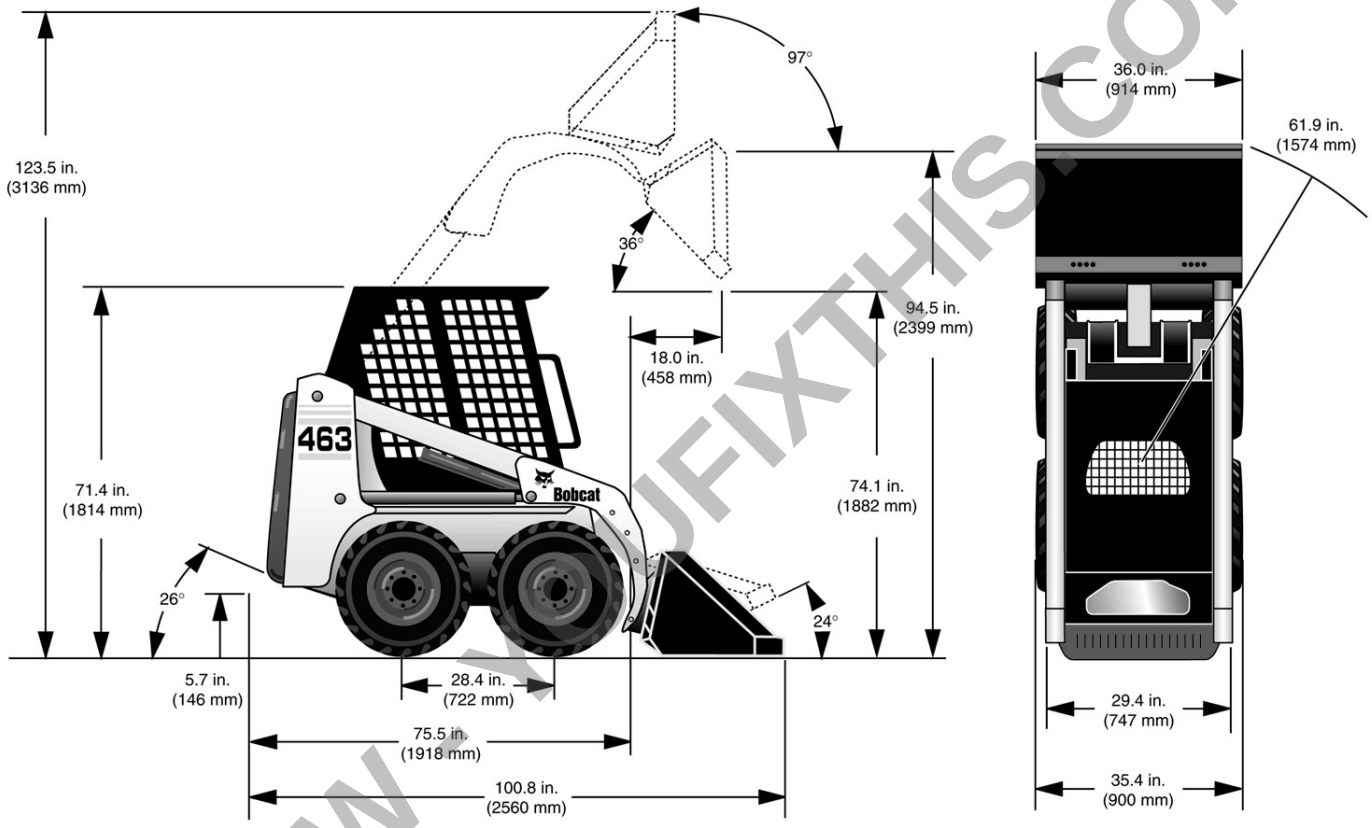
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LOADER SPECIFICATIONS

Machine Specifications

- Dimensions are given for loader equipped with standard tires and dirt bucket and may vary with other bucket types. All dimensions are shown in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

- Where applicable, specifications conform to SAE or ISO standards and are subject to change without notice.



B-16360

Changes of structure or weight distribution of the loader can cause changes in control and steering response and can cause failure of the loader parts.

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SERVICE SCHEDULE

Chart

Maintenance work must be done at regular intervals. Failure to do so will result in excessive wear and early failures. The service schedule is a guide for correct maintenance of the Bobcat loader.

⚠ WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-1285

SERVICE SCHEDULE		HOURS					
ITEM	**SERVICE REQUIRED**	**8-10**	**50**	**100**	**250**	**500**	**■1000**
Engine Air Cleaner	Empty the dust cup & replace the filter as needed.						
Engine Oil	Check the engine oil level and add oil as needed.						
Engine Cooling System	Clean debris from oil cooler, radiator and grill. Check coolant level in recovery tank. Add coolant as needed.						
Tires	Check for damaged tires and correct air pressure.						
Indicators, Gauges, & Lights (Opt.)	Check for correct operation of all indicators, gauges & lights (Opt.).						
Seat Belt, Seat Bar	Check the condition of the seat belt. Check the seat bar & pedal interlocks for correct operation. Clean dirt and debris from moving parts.						
Safety Signs (Decals) and Safety Tread	Check for damaged sign (decals) and safety treads. Replace any signs or safety treads that are damaged or worn.						
Lift Arms and Bob-Tach Pivot Pins and Wedges	Lubricate with multi-purpose lithium based grease.						
Engine Fuel Filter	Remove the water from the filter.						
Hydraulic Fluid, Hoses and Tubelines	Check fluid level and add as needed. Check for damage and leaks. Repair or replace as needed.						
Bobcat Interlock Control System (BICS™)	Check BICS™ System Controller functions. Clean dirt, debris or objects from under or behind seat as required.						
Battery	Check cables, connections and electrolyte level. Add distilled water as needed.						
Control Pedals & Steering	Check for correct operation. Repair or adjust as needed.						
Bob-Tach	Check locking levers & wedges for condition & operation.						
Wheel Nuts	❑Check for loose wheel nuts & tighten to 40-45 ft.-lb. (54-61 N•m) torque.						
Parking Brake	Check operation.						
Alternator Belt	Check belt tension and adjust as needed.						
Engine Oil and Filter	Replace oil and filter. (See Oil Chart on Page 10-110-1.)						
Hydraulic Filter Element	Replace Filter Element.						
Spark Arrestor Muffler	Clean the spark chamber.						
Drive Belt	Clean the spark chamber.						
Steering Lever Pivots	Lubricate grease fittings and oil hole in the steering shaft.						
Engine Fuel Filter	Replace the filter element.						
Hydraulic Reservoir Breather	Replace the breather cap.						
Final Drive Trans (Chain-case)	Replace the fluid.						
Hydraulic/Hydrostatic Reservoir	•Replace the fluid.						

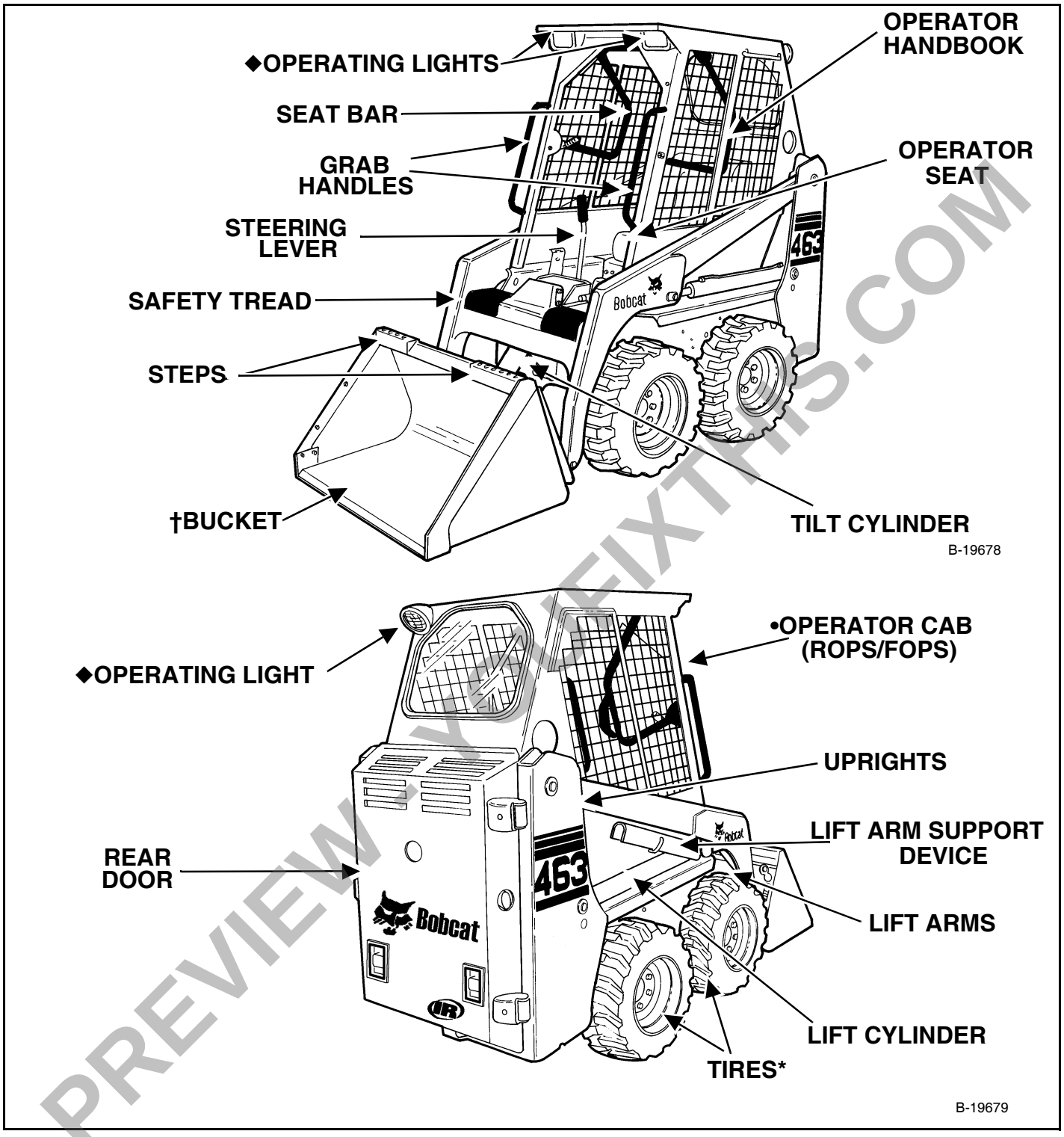
❑ **Check wheel nut torque every 8 hours for the first 24 hours.**

• **Also replace hydraulic/hydrostatic filter element when the transmission warning light stays on for five minutes after the hydraulic fluid is at operating temperature.**

■ **Or every 12 months.**

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◆ FACTORY OPTIONAL OR FIELD ACCESSORY (Not Standard Equipment)

* TIRES - Flotation tires (Optional) are shown. bobcats are base-equipped with standard tires.

† BUCKET - Several different buckets and other attachments are available for the Bobcat loader.

● ROPS, FOPS - Roll Over Protective Structure, per SAE J1040 and ISO 3471, and Falling Object Protective Structure per SAEJ1043 and ISO 3449, Level I. Level II is available. The Bobcat loader is base-equipped with a standard operator cab as shown. Extra insulated cab is available as an option (Reduced noise level).

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TRANSPORTING THE LOADER

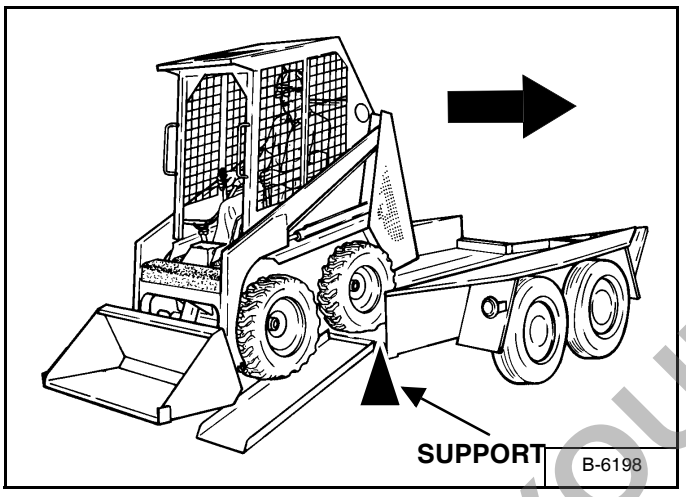
Procedure

⚠ WARNING

Adequately designed ramps of sufficient strength are needed to support the weight of the machine when loading onto a transport vehicle. Wood ramps can break and cause personal injury.

W-2058-0494

Figure 10-40-1



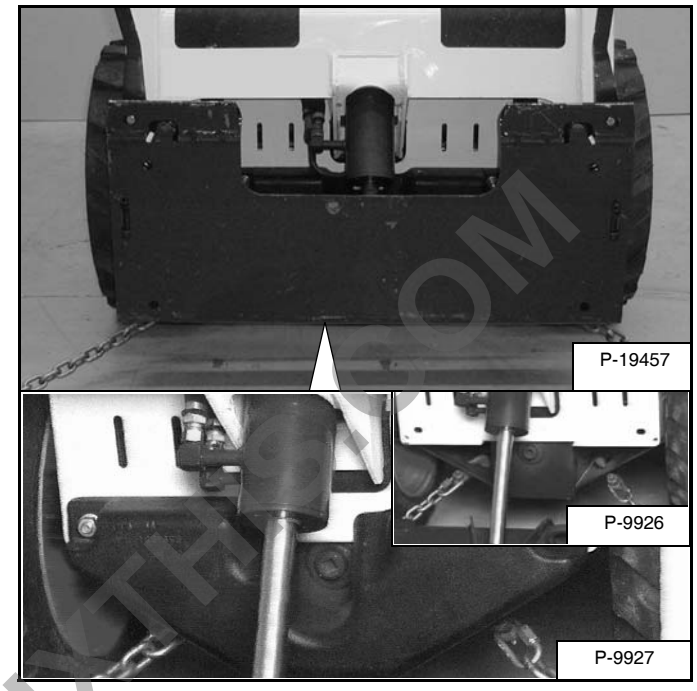
Be sure the transport and towing vehicles are of adequate size and capacity.

A loader with an empty bucket or no attachment must be loaded backward onto the transport vehicle **[Figure 10-40-1]**.

The rear of the trailer must be locked or supported **[Figure 10-40-1]** when loading or unloading the loader to prevent the front end of the trailer from raising up.

Adjusting The Bumper

Figure 10-40-2

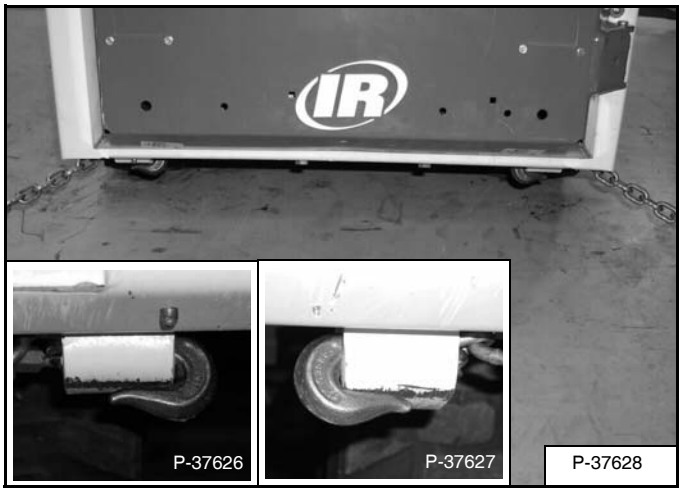


Use the following procedure to fasten the Bobcat loader to the transport vehicle to prevent the loader from moving during sudden stops or when going up or down slopes **[Figure 10-40-2]**.

Fully lower any bucket or attachment. Stop the engine. Engage the parking brake.

Fasten chains at the front using the slots in the axle gussets **[Figure 10-40-2]**. The counterweight is removed (Inset) to show clarity. DO NOT operate the loader with counterweight removed.

Figure 10-40-3



Fasten the rear of the loader as shown **[Figure 10-40-3]**.

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463 HYDRAULIC/HYDROSTATIC SCHEMATIC
S/N 522111001 AND ABOVE
S/N 522211001 AND ABOVE
(PRINTED OCTOBER 2002)
V-0199legend

LEGEND

1. RESERVOIR:
   Capacity . . . . . 5.3 Qts. (5,0 L)
2. FILTER - HYDRAULIC/HYDROSTATIC
3. CHARGE PRESSURE SWITCH:
   17-21 PSI (118-144 kPa)
4. TEMPERATURE SWITCH
   225-232 degrees F.
   (108-111 degrees C.)
5. RELIEF VALVE - CHARGE:
   85 PSI (586 kPa)
6. SPRING LOADED FILTER BY PASS VALVE: 46 PSI (317 kPa)
7. FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDRAULIC/ HYDROSTATIC MOTOR
8. VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDRAULIC/ HYDROSTATIC PUMP
9. HYDRAULIC PUMP:
   Gear Type . . . 9.8 GPM (37,09 L/min.)
   at 3000 RPM
10. RELIEF VALVE - HIGH PRESSURE:
    3000 PSI (20682 kPa)
11. RELIEF VALVE - MAIN - DUAL PRESSURE:
    System Pressure: 2000 PSI (13788 kPa)

    Auxiliary Pressure: 3000 PSI (20682 kPa)
    at Front Quick Couplers
12. LOAD CHECK VALVE
13. RELIEF/ANTICAVITATION VALVE - PORT . . . . . 3500 PSI (24129 kPa)
    at Full Speed
14. FILTER - BICS CONTROL VALVE
15. CHECK VALVE - BICS CONTROL VALVE
16. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BICS CONTROL
17. PULL BUTTON ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT ARM BY PASS
18. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - LIFT CONTROL
19. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - TILT CONTROL
20. SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE - BUCKET POSITION VALVE (ON/OFF)
21. FLOW DIVIDER ADJUSTMENT VALVE
22. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - FLOW CONTROL SPOOL
23. CHECK VALVE - BUCKET POSITION VALVE
24. PILOTED ACTIVATED DIRECTIONAL CONTROL VALVE - UNLOADING SPOOL

NOTE: Unless otherwise specified springs have NO significant pressure value.

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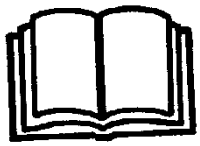
MAINTENANCE SAFETY

⚠ WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death. W-2003-0903

⚠ **Safety Alert Symbol: This symbol with a warning statement, means: "Warning, be alert! Your safety is involved!" Carefully read the message that follows.**

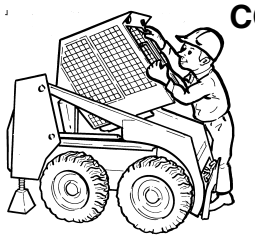
CORRECT



B-10731a

⚠ **Never service the Bobcat Skid-Steer Loader without instructions.**

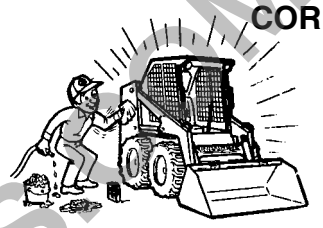
CORRECT



B-12365

⚠ **Use the correct procedure to lift or lower operator cab.**

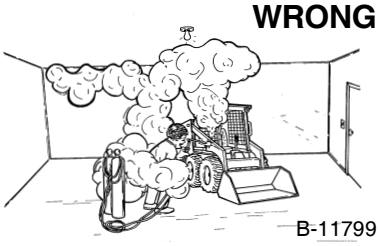
CORRECT



B-7469

⚠ **Cleaning and maintenance are required daily.**

WRONG



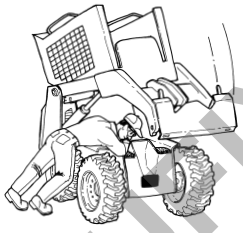
B-11799

⚠ **Have good ventilation when welding or grinding painted parts.**

⚠ **Wear dust mask when grinding painted parts. Toxic dust and gas can be produced.**

⚠ **Avoid exhaust fume leaks which can kill without warning. Exhaust system must be tightly sealed.**

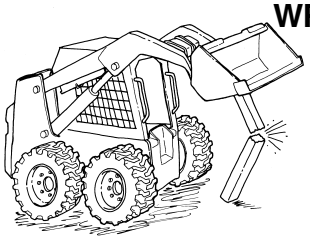
WRONG



B-15231

⚠ **Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop. Do not go under lift arms when raised unless supported by an approved lift arm support device. Replace it if damaged.**

WRONG

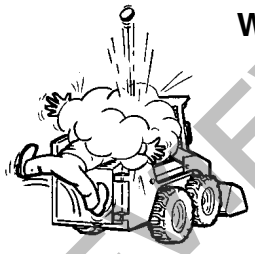


B-15280

⚠ **Never work on loader with lift arms up unless lift arms are held by an approved lift arm support device. Replace if damaged.**

⚠ **Never modify equipment or add attachments not approved by Bobcat Company.**

WRONG



B-6590

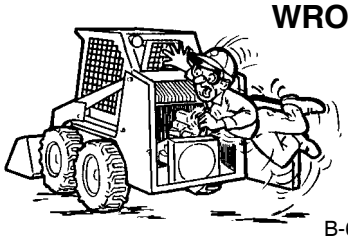
⚠ **Stop, cool and clean engine of flammable materials before checking fluids.**

⚠ **Never service or adjust loader with the engine running unless instructed to do so in the manual.**

⚠ **Avoid contact with leaking hydraulic fluid or diesel fuel under pressure. It can penetrate the skin or eyes.**

⚠ **Never fill fuel tank with engine running, while smoking or when near open flame.**

WRONG



B-6580

⚠ **Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.**

⚠ **Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for type of welding.**

⚠ **Keep rear door closed except for service. Close and latch door before operating the loader.**

WRONG



B-6589

⚠ **Lead-acid batteries produce flammable and explosive gases.**

⚠ **Keep arcs, sparks, flames and lighted tobacco away from batteries.**

⚠ **Batteries contain acid which burns eyes or skin on contact. Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention.**

Maintenance procedures which are given in the Operation & Maintenance Manual can be performed by the owner/operator without any specific technical training. Maintenance procedures which are **not** in the Operation & Maintenance Manual must be performed **ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL. Always use genuine Bobcat replacement parts.** The Service Safety Training Course is available from your Bobcat dealer.

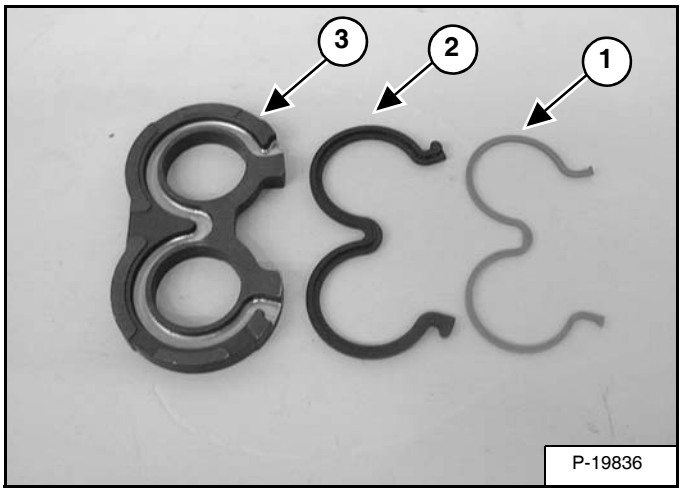
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Disassembly And Assembly (Cont'd)

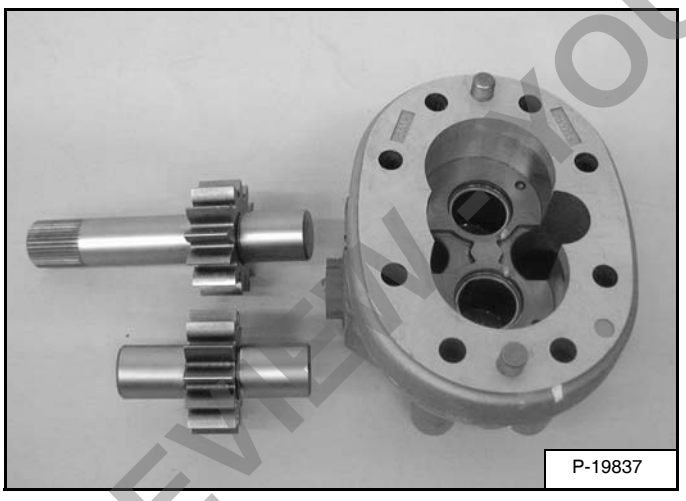
Figure 20-60-13



Remove the back-up ring (Item 1) **[Figure 20-60-13]** and seal (Item 2) **[Figure 20-60-13]** from the pressure plate (Item 3) **[Figure 20-60-13]**.

Check the pressure plate for wear.

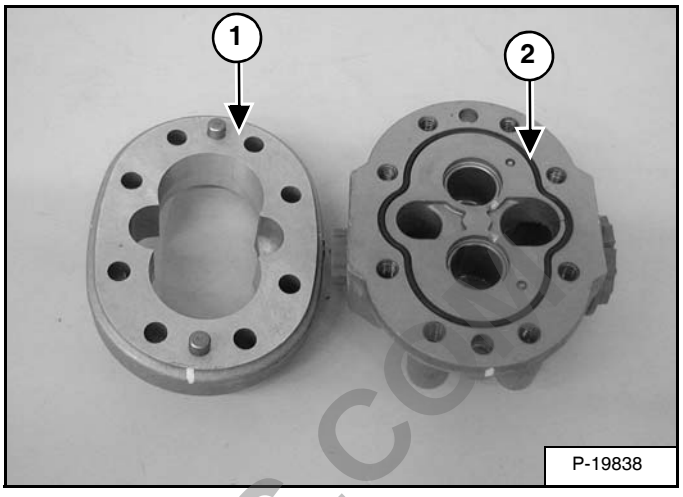
Figure 20-60-14



Remove the pump gears **[Figure 20-60-14]**.

Check the gears for wear **[Figure 20-60-14]**.

Figure 20-60-15

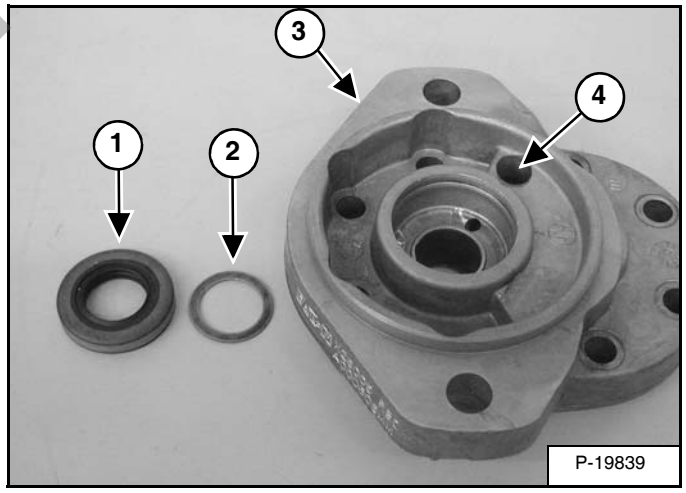


Remove the pump body (Item 1) **[Figure 20-60-15]** from the rear cover of the pump.

Remove the o-ring (Item 2) **[Figure 20-60-15]** from the rear cover.

Check the pump body and rear cover for wear.

Figure 20-60-16



Remove the seal (Item 1) **[Figure 20-60-16]** and washer (Item 2) **[Figure 20-60-16]** from the front cover (Item 3) **[Figure 20-60-16]**.

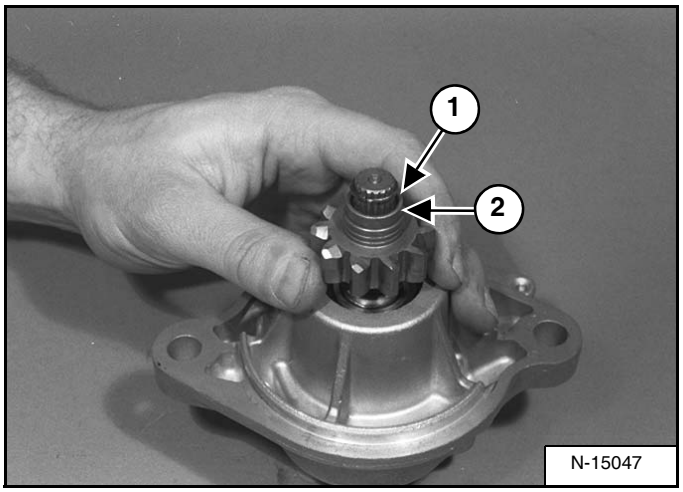
NOTE: If the front cover is equipped with a seal and washer they can be removed and discarded. The seal and washer are for factory testing purposes only. Current cover will also be equipped with a drain hole (Item 4) [Figure 20-60-16].

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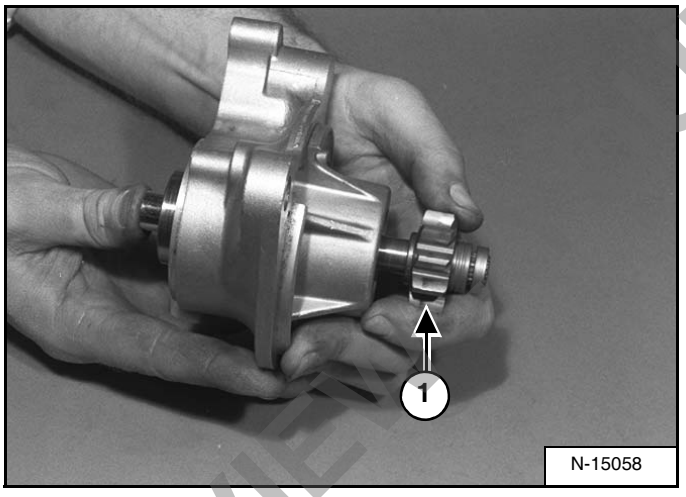
Assembly (Cont'd)

Figure 60-40-51



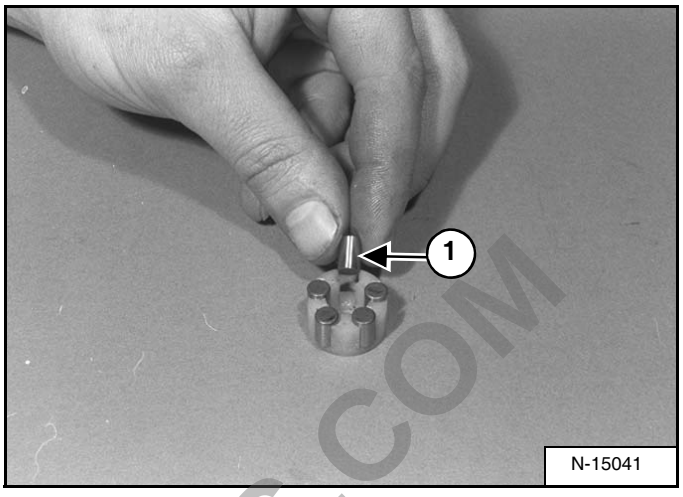
Install the snap ring (Item 1) **[Figure 60-40-51]**. Pull the collar (Item 2) **[Figure 60-40-51]** over the snap ring.

Figure 60-40-52



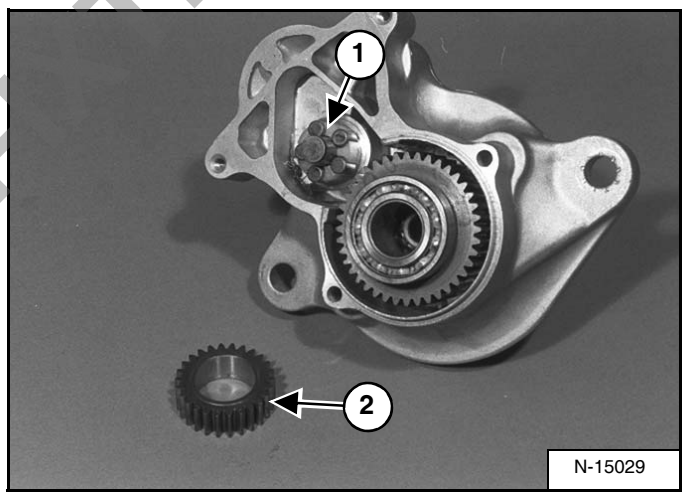
With the pinion shaft extended, extend and release the pinion (Item 1) **[Figure 60-40-52]**. The pinion must return to the fully retracted position.

Figure 60-40-53



Install the rollers (Item 1) **[Figure 60-40-53]** in the retainer.

Figure 60-40-54



Install the roller/retainer assembly (Item 1) **[Figure 60-40-54]** on the starter housing.

Install the idler gear (Item 2) **[Figure 60-40-54]** over the roller/retainer assembly.

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