TENNANT

215

Operator and Parts Manual

(Operator Manual)

MM157

This manual is furnished with each new TENNANT Model 215

This manual consists of Specifications; Operation; Maintenance; the How To Use This Manual; Low Dump Model Parts; Multi–Level Dump Model Parts; Options; Hydraulic Components; Engine Breakdown; and Cross Reference sections.

MACHINE DATA

Please fill out at time of installation for future reference.

Machine Model Number –215

Machine Serial Number – _____

Machine Options – _____

TENNANT Representative/phone no. – _____

Customer ID Number – _____

Date of Installation – _____

Manual Number –MM157

Revision: 10

Published: 2–98

CALIFORNIA PROPOSITION 65 WARNING:

Engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

SAFETY PRECAUTIONS

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

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

FOR SAFETY: To identify actions which 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:**
   - **Check For Fuel Leaks.**
   - **Keep Sparks And Open Flame Away From Refueling Area.**
   - **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 Slow On Grades And Slippery Surfaces.**
   - **Use Care When Backing Machine.**
   - **Move Machine With Care When Hopper Is Raised.**
   - **Make Sure Adequate Clearance Is Available Before Raising Hopper.**
   - **Do Not Carry Riders On Machine.**
   - **Always Follow Safety And Traffic Rules.**

5. **Before Leaving Or Servicing Machine:**
   - **Stop On Level Surface.**
   - **Set Parking Brake.**
   - **Turn Off Machine And Remove Key.**

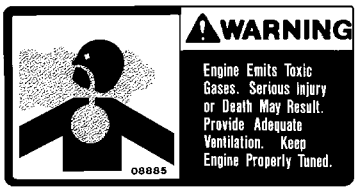
6. **When Servicing Machine:**
   - **Avoid Moving Parts. Do Not Wear Loose Jackets, Shirts, Or Sleeves When Working On Machine.**
   - **Block Machine Tires Before Jacking Machine Up.**
   - **Jack Machine Up At Designated Locations Only. Block Machine Up With Jack Stands.**
   - **Use Hoist Or Jack Of Adequate Capacity To Lift Machine.**
   - **Wear Eye And Ear Protection When Using Pressurized Air Or Water.**
   - **Disconnect Battery Connections Before Working On Machine.**
   - **Avoid Contact With Battery Acid.**
   - **Avoid Contact With Hot Engine Coolant.**
   - **Allow Engine To Cool.**
   - **Keep Flames And Sparks Away From Fuel System Service Area. Keep Area Well Ventilated.**
   - **Use Cardboard To Locate Leaking Hydraulic Fluid Under Pressure.**
   - **Use TENNANT Supplied Or Equivalent Replacement Parts.**

   WARNING: Engine Emits Toxic Gases. Severe Respiratory Damage Or Asphyxiation Can Result. Provide Adequate Ventilation. Consult With Your Regulatory Agency For Exposure Limits. Keep Engine Properly Tuned.

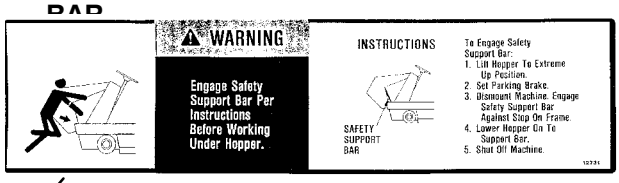
   WARNING: Raised Hopper May Fall. Engage Hopper Support Bar.

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

EMISSIONS WARNING LABEL - LOCATED THE SEAT SHROUD.



HOPPER SUPPORT BAR WARNING LABEL - LOCATED ON THE HOPPER SUPPORT BAR



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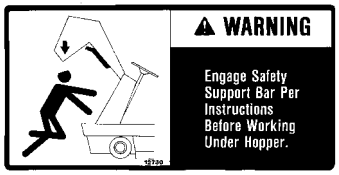
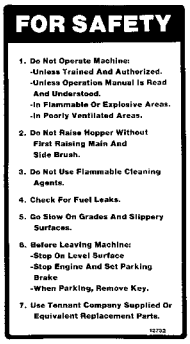
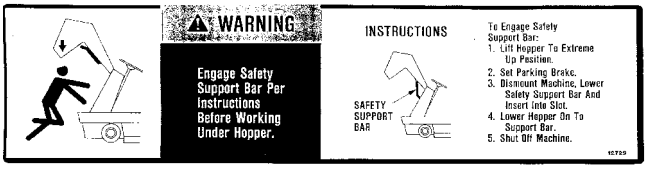


OPPER WARNING LABEL - LOCATED ON HE HOPPER SIDE OF THE FRONT UPPORT PARTITION.



FOR SAFETY LABEL - LOCATED ON THE SEAT SHROUD.



HOPPER SUPPORT BAR WARNING LABEL - LOCATED ON THE OPERATOR SIDE OF THE HOPPER.

SECTION 1

CONTENTS

MACHINE SPECIFICATIONS

POWER TYPE

Engine type – piston
Ignition – breakerless type spark
Cycle – 4
Aspiration – natural
Cylinders – 1
Bore – 2.94 in (75 mm)
Stroke – 2.75 in (70 mm)
Displacement – 18.6 cu in (305 cc)
Net power – 6.2 hp (4.6 kw) @ 2350 rpm, governed
Net power – 8 hp (6 kw) @ 3600 rpm maximum
Fuel – gasoline, unleaded, 87 octane or LPG
Cooling system – air
Electrical system – 12 V nominal, 15 A alternator

POWER TRAIN

Propelling – hydrostatic transmission, belt driven
Differential – chain driven
Drive axle (2) – chain driven
Main brush – belt driven
Side brush – belt driven
Vacuum fan – belt driven
Hydraulic pump – electric motor direct driven

STEERING

Type – rear wheel controlled, automotive cam and lever
Power source – manual

HYDRAULIC SYSTEM

Function – operates hopper lift on multi–level dump model and LPG powered machines
Control valve – solenoid operated, pump mounted
Pump – gear type, 0.065 cu in (1 cc) displacement per revolution, 1250 psi (8620 kPa) @ 1.0 gpm (4 L/min) relief setting
Cylinder – single action type, 2 in (50 mm) bore x 11 in (280 mm) stroke, 1 in (25 mm) diameter rod, 2500 psi (17,240 kPa) maximum rated pressure.
Cylinder (LPG) – single action type, 2 in (50 mm) bore x 5.7 in (145 mm) stroke, 1 in (25 mm) diameter rod,2500 psi (17,240 kPa) maximum rated pressure.

BRAKING SYSTEM

Service brakes – mechanical disc brakes (2) – 1 per front wheel, cable actuated
Parking brakes – utilizes service brakes, cable actuated

SUSPENSION SYSTEM

Front – 12 x 3.00 zero pressure tires (2)
Rear – 12 x 3.00 zero pressure tire (1)

SYSTEM FLUID CAPACITIES

Engine lubricating oil – 1 qt (0.95 L)
Fuel tank – 1.25 gal (4.75 L)
Fuel tank, LPG – 20 lb (9.1 kg)
Hydrostatic transmission – 1.6 pt (0.75 L)
Hydraulic system – reservoir 2 qt (1.8 L)
Hydraulic system – total 2.5 qt (2.4 L)

GENERAL MACHINE DIMENSIONS – CAPACITIES

Length – 63.75 in (1620 mm)
Width – 46.75 in (1190 mm) with side brush
Height – 53.75 in (1365 mm) less overhead guard
Height – 79 in (2005 mm) with overhead guard
Track – front 42 in (1065 mm)
Wheel base – 35.5 in (900 mm)
Main brush – width 36 in (915 mm)
Main brush – outside diameter 10 in (255 mm)
Side brush – rotary diameter 17 in (430 mm)
Sweeping path width (total) – 46 in (1170 mm)
Hopper capacity – 6 cu ft (0.17 m^3) 320 lb (145 kg)
Dust filter – 42 sq ft (3.9 m^2), pleated panel filter element

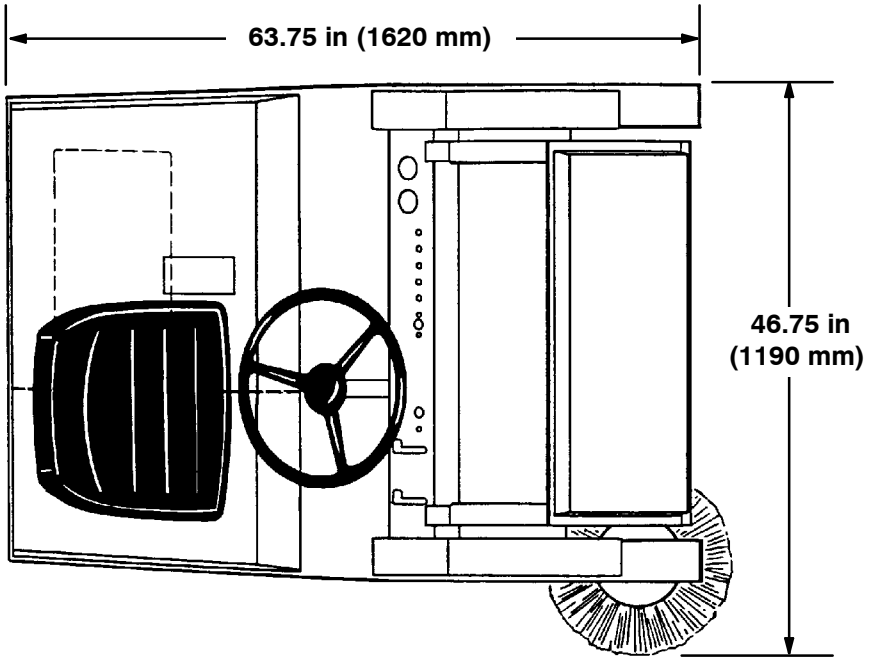
MACHINE WEIGHTS

Net weight, dry – 1375 lb (625 kg)
GVWR – 1935 lb (875 kg)

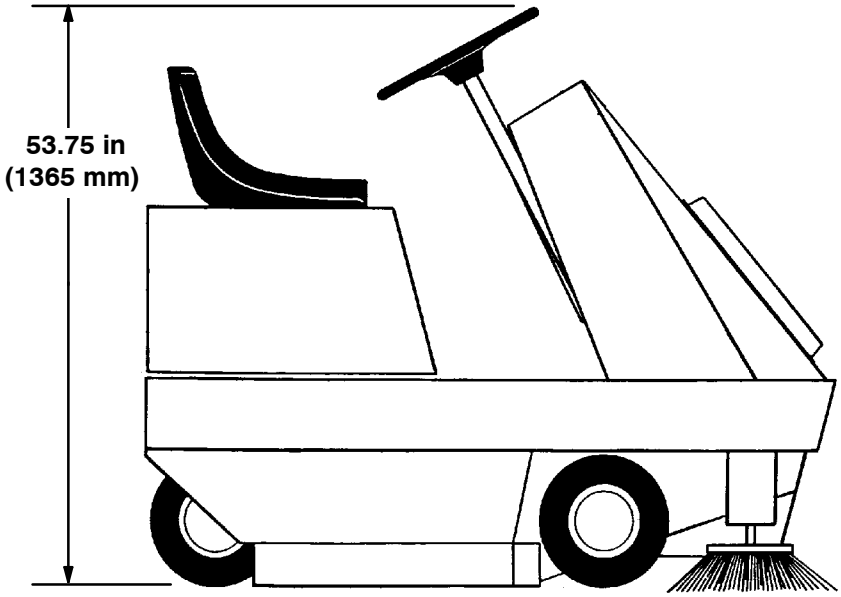
GENERAL MACHINE PERFORMANCE

Maximum forward speed – 4.5 mph (7 km/h)
Maximum reverse speed – 2 mph (3 km/h)
Turning radius – 67 in (1700 mm)

MACHINE DIMENSIONS



TOP VIEW



SIDE VIEW

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SECTION 2

CONTENTS

PREPARATION FOR OPERATION

AFTER UNLOADING AND BEFORE OPERATING THE MACHINE:

1. Check the machine for shipping damage.

2. Read this manual carefully before operating or servicing the machine.

   FOR SAFETY: Do Not Operate The Machine Unless Operation Manual Is Read And Understood.

3. Multi-level dump model machines: Check the hydraulic fluid level in the hydraulic fluid reservoir. See *HYDRAULICS* in the *MAINTENANCE* section.

4. Check the transmission fluid level. See *HYDRAULICS* in the *MAINTENANCE* section.

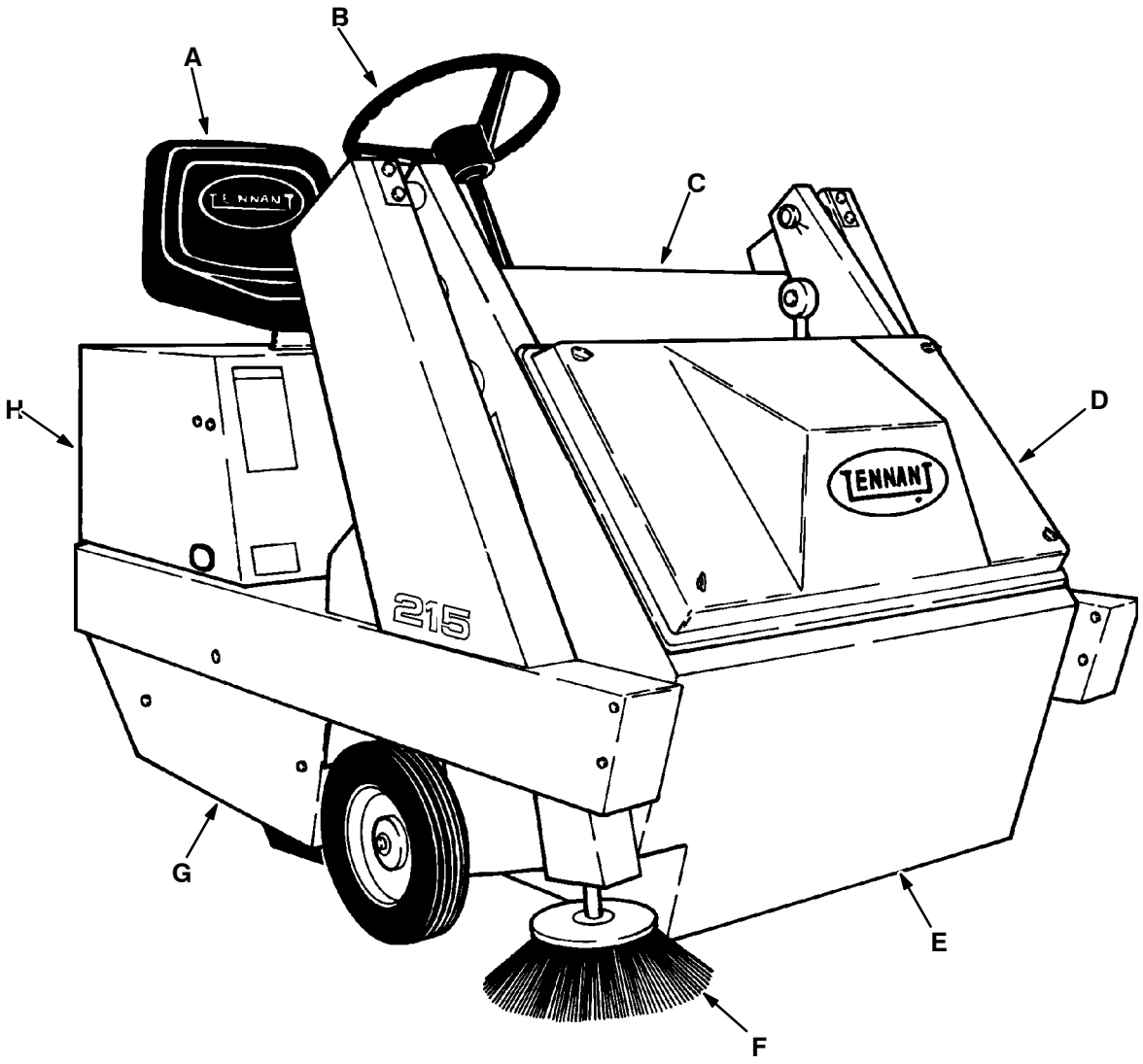
5. Check the engine oil level. See *ENGINE* in the *MAINTENANCE* section.

6. Check the main brush adjustment. See *BRUSHES* in the *MAINTENANCE* section.

7. Fill the fuel tank, or install an LPG fuel tank on the machine.

   FOR SAFETY: When Servicing Machine, Keep Flames And Sparks Away From Fuel System Service Area. Keep Area Well Ventilated.

OPERATION OF CONTROLS



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MACHINE COMPONENTS

A. Operator Seat
B. Steering Wheel
C. Instrument Panel
D. Filter Cover
E. Hopper
F. Side Brush
G. Access Door
H. Seat Support

INSTRUMENT PANEL SYMBOLS

These symbols are used to identify controls and displays on the machine:

 Side Brush Down

 Side Brush Up

 Main Brush Down

 Main Brush Up

 Main Brush Extra Down Pressure

 Hopper Door Close

 Hopper Door Open

 Hopper Up

 Hopper Down

 Filter Shaker

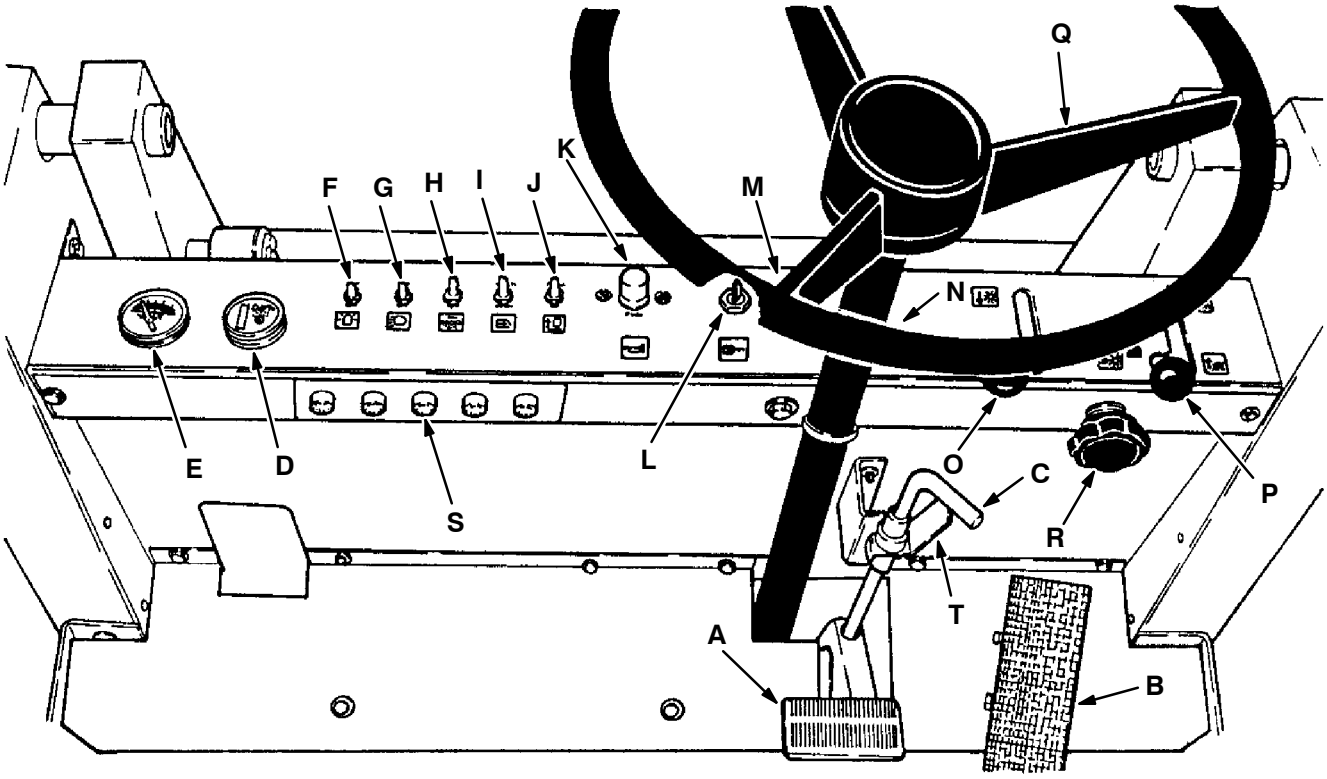
 Start

 Hazard Light

 Operational Lights

 Key Switch

 Horn



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CONTROLS AND INSTRUMENTS

A. Brake Pedal
B. Directional Pedal
C. Parking Brake Lever
D. Hour Meter
E. Voltmeter
F. Hazard Light Switch
G. Lights Switch
H. Filter Shaker Switch
I. Hopper Door Switch
J. Hopper Switch
K. Horn Button
L. Key-Operated Ignition Switch
M. Start Switch
N. Engine Choke Knob
O. Main Brush Lever
P. Side Brush Lever
Q. Steering Wheel
R. Main Brush Adjustment Knob
S. Circuit Breakers
T. Parking Brake Release Lever

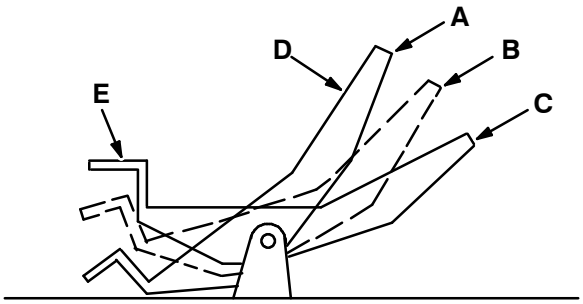
BRAKE PEDAL

The brake pedal operates the mechanical disc brakes on the two front wheels.

To stop the machine, return the direction control pedal to neutral, then apply pressure to the brake pedal.

DIRECTIONAL PEDAL

The directional pedal controls the propelling drive. It is used to select the direction of travel and the speed of the machine.



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DIRECTIONAL PEDAL

A. “Reverse” Position
B. “Neutral” Position
C. “Forward” Position
D. “Toe” Portion
E. “Heel” Portion

Gradually press the “toe” portion of the pedal for forward travel or the “heel” portion for reverse travel. Regulate the machine speed by varying the pressure on the control pedal.

If the machine creeps when the pedal is in the “neutral” position, adjust the directional control pedal.

NOTE: Always use the brake pedal for normal stopping and controlling speed on down grades.

PARKING BRAKE LEVER

The parking brake lever operates the front wheel disc brakes. To set the parking brake, pull the handle up. To release the parking brake, pull the release lever. Always park on a level surface, stop the engine, and set the parking brake before leaving the machine unattended and before working on the machine.

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

HOUR METER

The hour meter records the number of hours the machine has operated. This information is useful in determining when to service the machine.

VOLTMETER

The voltmeter registers the charging current which is being passed to the battery by the alternator. It also registers a discharge of current being used by the machine when the alternator is not charging.

HAZARD LIGHT SWITCH

The hazard light switch is present on machines with the flashing or revolving light accessory. To operate the hazard light, move the switch to the top position. To stop the light, move the switch to the bottom position.

LIGHT SWITCH

The light switch is present on machines with the headlight and taillight accessory. To operate the lights, move the switch to the top position. To stop the lights, move the switch to the bottom position.

FILTER SHAKER SWITCH

The filter shaker switch operates the dust filter shaker motor. The shaker motor shakes the dust out of the dust filter. To shake the filter, move the switch to the top position for 15 seconds; then move the switch to the bottom position to stop the filter shaker.

HOPPER DOOR SWITCH

The hopper door switch controls the hopper door position. The hopper door should always be open except when high dumping the hopper. To high dump the hopper, move the hopper door switch to the top position to close the hopper door, raise the hopper with the hopper switch, then move the hopper door switch to the bottom (Hopper Door Open) position to open the hopper door to empty the hopper. After the hopper has emptied, move the hopper switch to the top (Hopper Down) position until the hopper has lowered.

HOPPER SWITCH

The hopper switch controls the hopper position. To dump the hopper, move the switch to the bottom (Hopper Up) position. After the hopper has emptied, move the switch to the top (Hopper Down) position until the hopper has lowered.

HORN BUTTON

The horn button operates the machine horn. It is located on the instrument panel.

IGNITION SWITCH

The key-operated ignition switch has two positions. To start the engine, turn the key to the right. To turn the engine off, turn the key to the left.

START SWITCH

The start switch controls the engine starter motor. To start the engine, turn the key-operated ignition switch clockwise and push the start switch.

NOTE: Do not engage the starter for more than ten seconds at a time, or after the engine has started, as the starter may be damaged.

ENGINE CHOKE KNOB

The engine choke knob controls the engine choke which helps start cold engines. To engage the choke, pull the knob out. To disengage the choke, push the knob in. Do not choke a warm engine.

MAIN BRUSH POSITION LEVER

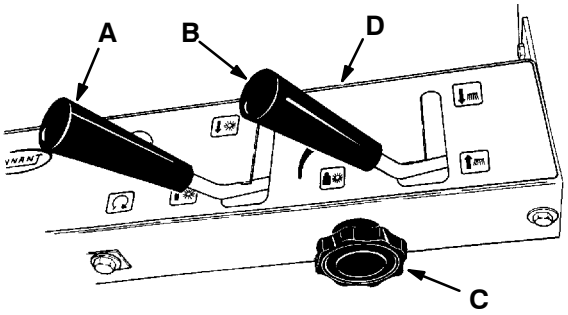
The main brush position lever controls the position of the main brush. To raise the main brush, pull the lever back into the (Main Brush Up) position. To lower the main brush, pull the lever back and release it into the (Main Brush Down) position.

When parking the machine, always raise the brush to prevent the bristles from taking a set.

SIDE BRUSH POSITION LEVER

The side brush position lever controls the position and the drive of the side brush. To raise the side brush, pull the lift lever back into the (Side Brush Up) position. To lower the brush, pull the lever back and release it into the (Side Brush Down) position.

When parking the machine, always raise the brush to prevent the bristles from taking a set.



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BRUSH CONTROLS

A. Main Brush Lever
B. Side Brush Lever
C. Main Brush Height Adjustment Knob
D. Instrument Panel

STEERING WHEEL

The steering wheel controls the rear caster wheel. The machine is very responsive to the movement of the steering wheel. The operator should use care until he or she becomes experienced in guiding the machine.

MAIN BRUSH HEIGHT ADJUSTMENT KNOB

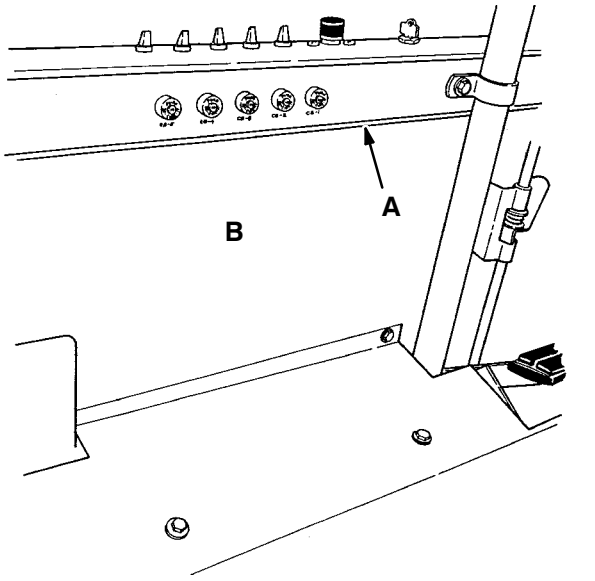
The main brush height adjustment knob (Main Brush Extra Down Pressure) adjusts the main brush contact with the floor. To increase main brush contact with the floor, turn the knob to the right. To decrease main brush contact with the floor, turn the knob to the left.

CIRCUIT BREAKERS AND FUSES

Circuit breakers are resetable circuit protection devices designed to stop the flow of current in the event of a circuit overload. Once tripped, circuit breakers must be manually reset. If the overload which caused the circuit breaker to trip is still present in the circuit, the circuit breaker will continue to stop current flow until the overload is corrected.

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

The circuit breakers are located on the instrument panel. The fuse is located on the fan support bracket.



CIRCUIT BREAKERS

A. Instrument Panel
B. Circuit Breakers

The following chart shows the various circuit breakers and fuses, and the electrical components they protect.

PROTECTIVE-DEVICE	RATING	CIRCUIT PROTECTED
CB–2	15 A	Starter, Hopper Lift, Hourmeter
CB–3	15 A	Horn, Filter Shaker, Voltmeter
CB–4	15 A	Hopper Dump Door
CB–5	15 A	Lights
FU–1	120 A	Hydraulic Pump Motor – Multi-Level Dump Model

HOPPER SUPPORT BAR

The hopper support bar is located on the left side of the hopper. It holds the hopper in a “raised” position to allow work to be done under the hopper. Do not rely on the machine hydraulic system to keep the hopper raised.

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

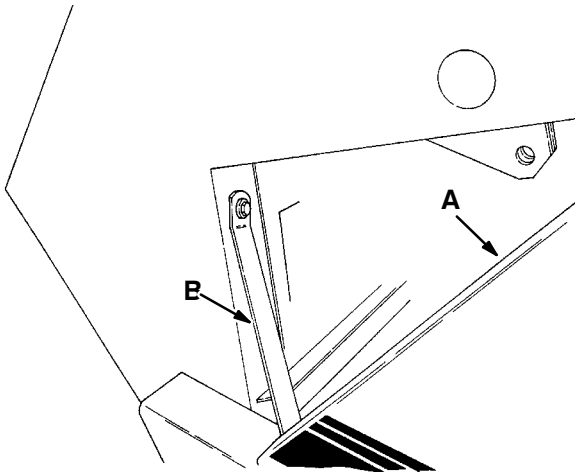
TO ENGAGE HOPPER SUPPORT BAR

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

   FOR SAFETY: Before Leaving Or Servicing The Machine; Stop On Level Surface, Set Parking Brake.

2. Raise the hopper to the “fully raised” position.

3. Position the hopper support bar on the lintel.



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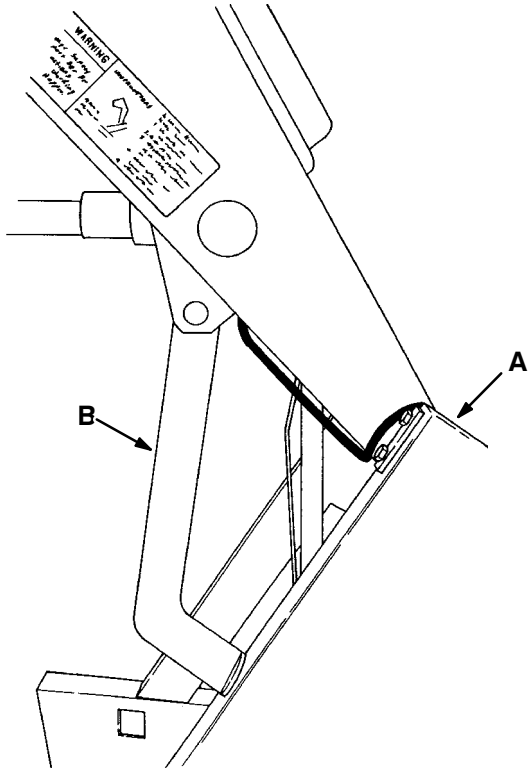
ENGAGED HOPPER SUPPORT BAR - LOW DUMP MODEL

A. Lintel
B. Support Bar



03069

ENGAGED HOPPER SUPPORT BAR - MULTI-LEVEL DUMP MODEL

A. Lintel
B. Support Bar

4. Slowly lower the hopper so the bar rests on the lintel.

TO DISENGAGE HOPPER SUPPORT BAR

1. Raise the hopper.

2. Place the support bar in its storage position.

3. Lower the hopper.

MACHINE OPERATION

NORMAL SWEEPING OPERATION

A normal sweeping operation consists of seven typical operations: pre-start checklist, starting machine, sweeping, dumping hopper, post operation checklist – engine operating, stopping machine, and post operation checklist – engine stopped.

PRE-START CHECKLIST lists things to check before starting the machine.

TO START MACHINE lists the steps required to start the machine.

TO SWEEP lists things to keep in mind before and during the sweeping operation.

TO DUMP HOPPER lists the steps required to dump the hopper.

POST OPERATION CHECKLIST – ENGINE OPERATING lists things to check before stopping the machine engine.

T*O STOP MACHINE* lists the steps required to stop the machine.

POST OPERATION CHECKLIST – ENGINE STOPPED lists things to check after stopping the machine engine.

PRE-START CHECKLIST

Check under machine for leak spots.

Check engine lubricating oil level.

Check fuel level.

Check for LPG odor or frosting on hoses or components indicating a leak.

Check brakes and controls for proper operation.

Check service records to determine service requirements.

TO START MACHINE

NOTE: Before starting machine, perform the pre-start checks.

1. LPG machines: Slowly open the liquid service valve.

NOTE: Opening the service valve too quickly may cause the service valve check valve to stop the flow of LPG fuel. If the check valve stops the flow of fuel, close the valve, wait a few seconds, and slowly open the valve once again.

2. The machine operator must be in the operator's seat with the directional control pedal in the "neutral" position and with a foot on the brake pedal or with the parking brake set.

   FOR SAFETY: Before Starting Machine, Make Sure All Safety Devices Are In Place And Operate Properly.

3. Gasoline powered machines: When the engine is cold, pull out the choke knob about three-fourths of the way. Push choke in after the engine has started and is running smoothly.

   LPG powered machines: When the engine is cold and exposed to cold temperatures, open the seat support, press the primer button on the LPG regulator, and close the seat support.

4. Turn the ignition switch key clockwise.

5. Push the start switch until the engine starts. Do not operate the starter for more than 10 seconds at a time or after the engine has started.

NOTE: Do not operate the starter motor for more than 10 seconds at a time or after the engine has started. Allow the starter to cool between starting attempts. The starter motor may be damaged if it is operated incorrectly.

6. Release the machine parking brake.

7. Drive the machine to the area to be swept.

TO SWEEP

Plan the sweeping in advance. Try to arrange long runs with minimum stopping and starting. Sweep debris from very narrow aisles into main aisles ahead of time. Do an entire floor or section at one time.

Pick up oversize debris before sweeping. Flatten or remove bulky cartons from aisles before sweeping. Pick up pieces of wire, twine, string, etc., which could become entangled in brush or brush plugs. Overlap brush paths.

Avoid turning the steering wheel too sharply when the machine is in motion. The machine is very responsive to the movement of the steering wheel. Avoid sudden turns, except in emergencies.

Sweep as straight a path as possible. Avoid bumping into posts or scraping the sides of the sweeper.

1. Move the main brush position lever into the (Main Brush Down) position.
2. Move the side brush position lever into the (Side Brush Down) position.
3. Sweep as required.

TO DUMP HOPPER

1. Pull the main brush position lever into the (Main Brush Up) position.
2. Pull the side brush position lever into the (Side Brush Up) position.
3. Move the (filter shaker) switch to the top position for 10 to 15 seconds to shake the dust filter.
4. Slowly drive the machine up to the dump site or dumpster.
5. Low dump model machines: Move the hopper dump switch to the bottom (Hopper Up) position to dump the hopper.

   Multi-level dump model machines: Move the hopper door switch to the top (Hopper Door Close) position; move the hopper dump switch to the bottom (Hopper Up) position; then move the hopper door switch to the bottom (Hopper Door Open) position to dump the hopper.
6. Move the hopper switch to the top (Hopper Down) position to lower the hopper.
7. Slowly back the machine away from the dump site or dumpster.

POST OPERATION CHECKLIST – ENGINE OPERATING

Check brush patterns for width and evenness.

NOTE: Before leaving the machine, perform the post operation checks.

TO STOP MACHINE

1. Return the directional control pedal to the “neutral” position. Apply the brake.
2. Pull the main brush position lever into the (Main Brush Up) position.
3. Pull the side brush lever into the (Side Brush Up) position.
4. Set the machine parking brake.
5. Turn the ignition switch key counterclockwise. Remove the key from the ignition switch.

   FOR SAFETY: Before Leaving Or Servicing The Machine; Stop On Level Surface, Set Parking Brake.
6. LPG machines: Close the LPG tank liquid service valve.

POST OPERATION CHECKLIST – ENGINE STOPPED

Check skirts for damage, wear, and adjustment.

Check for wire or string tangled on brushes.

Check to make sure LPG tank service valve is closed.

Check for LPG odor or frost on LPG hoses and components, indicating a leak.

Check for leaks.

OPERATION ON GRADES

Drive the machine slowly on grades. Use the brake pedal to control machine speed.

FOR SAFETY: When Using Machine, Go Slow On Grades And Slippery Surfaces.

The maximum rated climb and descent angle is 8°.

MACHINE TROUBLESHOOTING

Problem	Cause	Remedy
Excessive dusting	Dust skirts and seals worn, damaged, not adjusted properly	Replace or adjust skirts or seals
	Dust filter clogged	Shake and/or clean or replace filter
	Vacuum hose damaged	Replace vacuum hose
	Vacuum fan failure	Belt broken or off sheave
Poor sweeping performance	Brush bristles worn	Replace brushes
	Brushes not adjusted properly	Adjust brushes
	Debris caught in brush drive mechanism	Free mechanism of debris
	Main brush drive failure	Belt broken or off sheave
	Side brush drive failure	Belt broken or off sheave
	Hopper not adjusted properly	Adjust hopper floor clearance
	Hopper full	Empty hopper
	Hopper floor skirts worn, damaged	Replace skirts
Machine will not travel	Directional control pedal linkage out of adjustment or broken	Check adjustment or damage
	Transmission drive belt slipping or broken	Check and adjust or replace
	Transmission malfunction	Repair or replace Transmission
	Wheel drive chains or sprockets broken	Check and replace
	Jackshaft belt broken or slipping	Check and adjust or replace

TRANSPORTING MACHINE

PUSHING OR TOWING MACHINE

The machine may be slowly pushed only from the rear, pushing on the machine frame.

The machine may be slowly towed from the front. Use care when attaching towing cables or chains to avoid damaging the machine.

MACHINE JACKING

The machine may be jacked up for service at the designated locations. Use a jack of adequate capacity and good working condition. Always stop the machine on a flat, level surface and block the tires before jacking the machine up. The front jacking locations are on the flat bottom edge of the machine frame next to the front tires.

The rear jacking location is the middle flat bottom edge of the rear bumper.

TO JACK UP MACHINE

1. Empty the debris hopper.

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

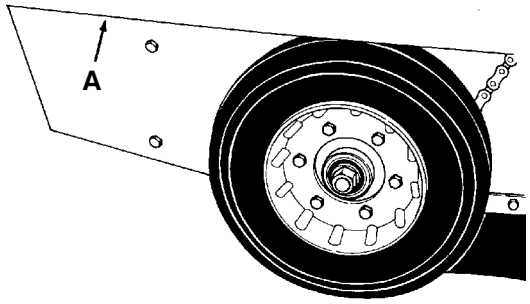
   FOR SAFETY: Before leaving or servicing the machine; stop on level surface, set parking brake.

3. Block the tires, which are not being jacked up, in order to secure the machine position.

   FOR SAFETY: When Servicing Machine, Block Machine Tires Before Jacking Machine Up.

4. Use a jack of adequate capacity to raise the machine. Jack up the machine only at the designated locations.

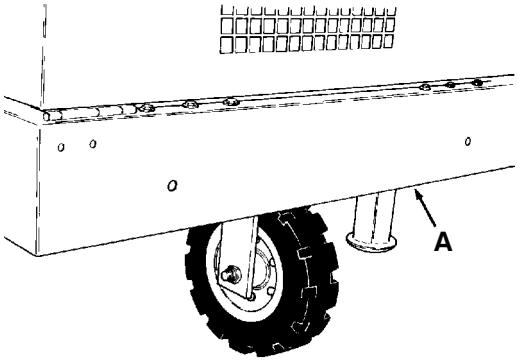
FOR SAFETY: When Servicing Machine, Jack Machine Up At Designated Locations Only. Block Machine Up With Jack Stands.



03070

FRONT JACKING LOCATION

A. Jacking Location



03071

REAR JACKING LOCATION

A. Jacking Location

5. Block machine up with jack stands or similar devices in the designated locations to secure the machine.

6. Lower the machine onto the jack stands.

7. Check to make sure the machine is secure.

8. Service the machine as required.

9. When finished servicing the machine, raise the machine off the jack stands.

10. Remove the jack stands from under the machine.

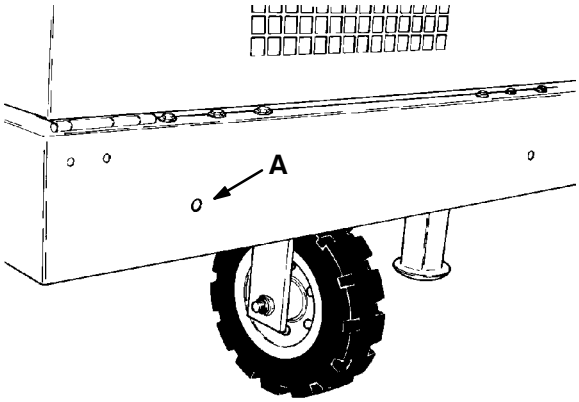
11. Lower the machine.

12. Remove the blocks from the tires.

MACHINE TIE-DOWNS

The machine may be tied down at each of the corners of the main frame at the locations specified.

To tie the machine down, use the holes on the front and the lower rear machine frame.



03071

REAR TIE-DOWN LOCATION

A. Tie-Down Hole

When transporting the machine on a trailer or in a truck, be sure to engage the machine parking brake and block the machine tires to prevent the machine from rolling.

MACHINE STORAGE

STORING MACHINE

When storing the machine for extended periods of time, the following procedures must be followed to lessen the chance of rust, sludge, or other undesirable deposits from forming.

1. Empty debris hopper.
2. Change engine oil.
3. Place the main brush and side brush levers in the raised position.
4. Park the machine in a cool, dry area.
5. Stop the engine.
6. Drain the fuel tank.
7. Start the engine and let it run out of fuel.
8. Remove the spark plug and pour 1 oz (30 cc) of new engine oil into the cylinder.
9. Crank the engine to distribute the oil, then replace the spark plug.
10. Clean the engine cooling fins.

SECTION 3

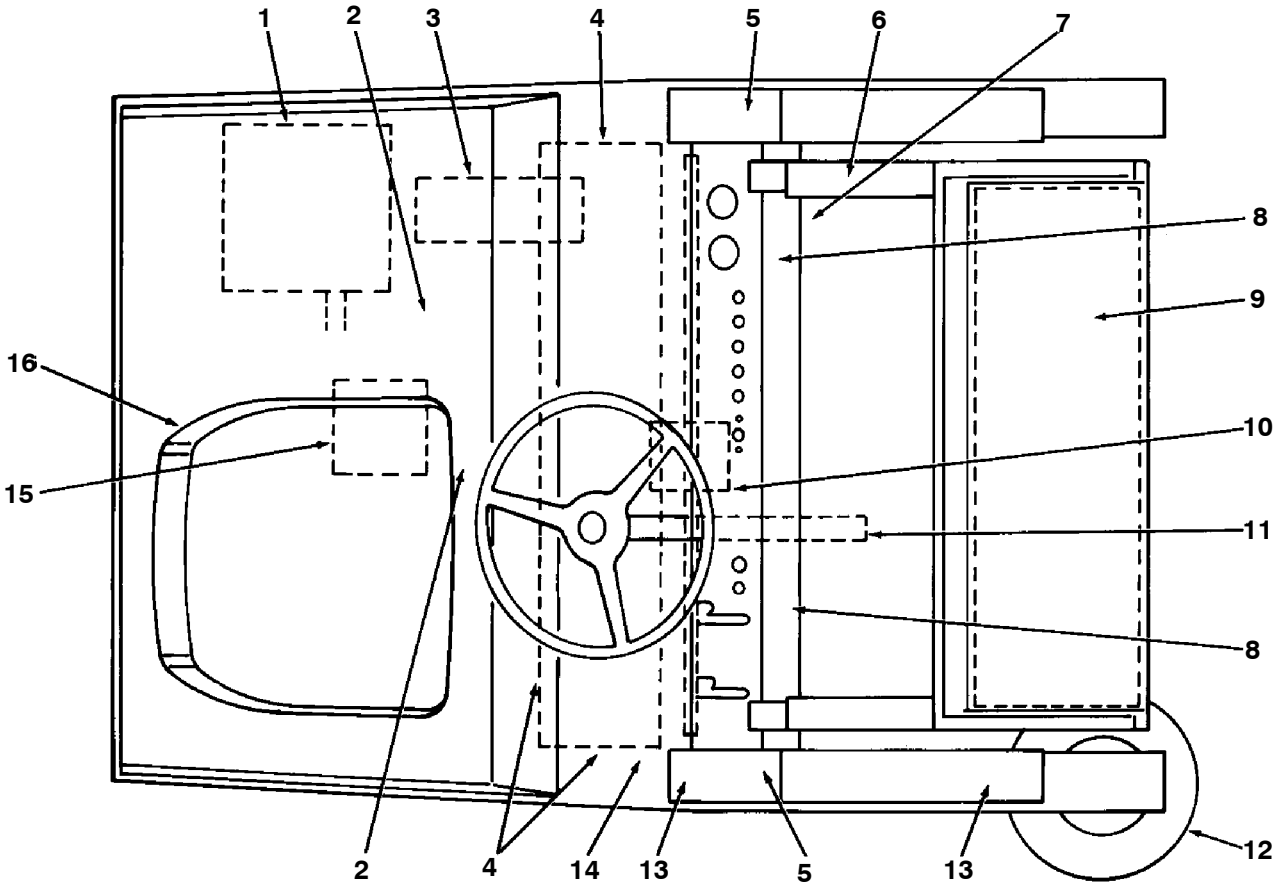
CONTENTS

RECOMMENDED FIRST 20-HOUR MACHINE INSPECTION

After the first 20 hours of operation, the following procedures are recommended:

1. Check the brush pattern for correct brush adjustment.
2. Check the floor skirts to floor clearance.
3. Check the side brush and main brush patterns.

MAINTENANCE CHART



03072

Interval	Key	Description	Procedure	Lubricant/ Fluid	No. of Service Points
Daily	1	Engine	Check oil level	EO	1
	9	Dust filter	Shake	–	1
	4	Brush skirts	Check for damage and wear	–	3
	14	Main brush	Check for damage and wear	–	1
			Check floor pattern	–	1
	12	Side brush	Check for damage and wear	–	1
			Check floor pattern	–	1
	6	Hopper	Check hopper door seal		
			for damage and wear	–	3
25 Hours	1	Engine	Change oil	EO	1
			Clean air filter precleaner element	–	1
			Clean cooling fins	–	1
	15	Transmission	Check oil level	EO	1
	3	Hydraulic reservoir	Check fluid level	HYDO	1
50 Hours	13	Intermediate side brush belt	Check tension and wear	–	1
	2	Engine belt	Check tension and wear	–	1

Interval	Key	Description	Procedure	Lubricant/ Fluid	No. of Service Points
50 Hours	15	Transmission belt	Check tension and wear	–	1
	16	Vacuum fan belt	Check tension and wear	–	1
	4	Main brush belt	Check tension and wear	–	1
	13	Side brush belt	Check for wear	–	2
	2	Jackshaft belt	Check for wear	–	2
	14	Main brush	Rotate end-for-end	–	1
	9	Dust filter	Clean or replace	–	1
100 Hours	1	Engine	Clean or replace spark plug	–	1
			Clean or replace filter element	–	1
	5	Drive chains	Check and adjust tension	–	3
			Lubricate	EO	3
	8	Brakes	Adjust	–	2
	10	Differential	Apply grease to fittings	SPL	2
	11	Steering gear	Apply grease to fitting	SPL	1
	6	Hopper	Clean inside	–	1
			Check floor clearance	–	1
	7	Lift cylinder	Apply grease to fitting	SPL	1
400 Hours	1	Engine	Check valve clearance	–	1
			Check breather reed valve and gaskets	–	1
			Clean cylinder head carbon deposits	–	1
			Check starter motor brushes	–	1

EO – Engine oil
HYDO – Tennant Company or approved hydraulic fluid
SPL – Special lubricant, Lubriplate EMB grease (TENNANT part No. 01433–1)

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

LUBRICATION

ENGINE

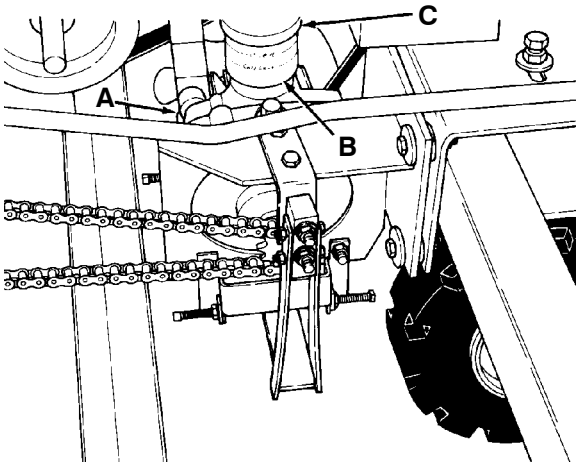
Check the engine oil level daily. Change the engine oil after every 25 hours of operation. Use a straight SAE 30-weight, API class SF engine oil. If multiviscosity oil is used, oil consumption and combustion deposits will increase.

Using other than API class SF oil or extending oil change intervals could cause engine damage not covered by the engine warranty.

The engine oil capacity is 1 qt (0.95 L).

TRANSMISSION

The transmission drives the two front wheels. Check the oil level after every 25 hours of operation by looking at the reservoir mounted on top of the transmission. The cold oil level should be 0 to 0.25 in (0 to 5 mm) above the cold mark. Use straight SAE 20-weight, API class SF engine oil.



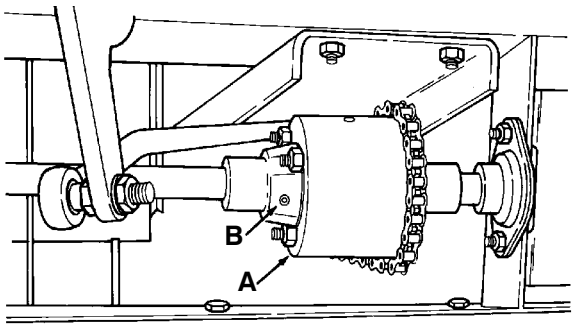
01784

TRANSMISSION

A. Transmission
B. Oil Reservoir
C. Fill Cap

DIFFERENTIAL

The differential drives the two front wheels. Two grease fittings are located on the differential housing for lubrication. The differential should be lubricated by applying Lubriplate EMB grease TENNANT Part No. 01433-1 to the grease fittings after every 100 hours of operation.



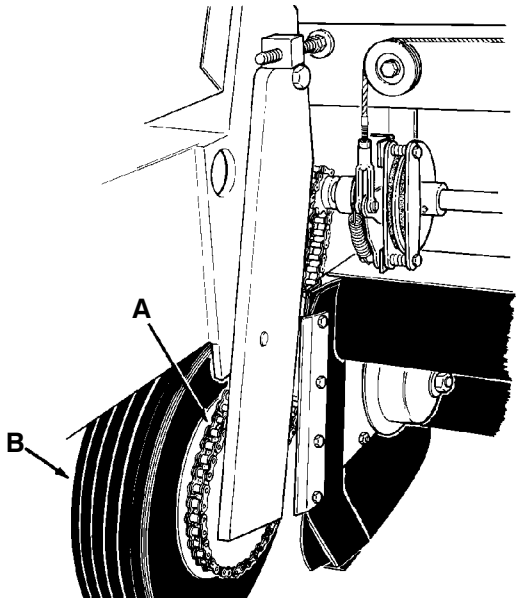
01783

DIFFERENTIAL

A. Differential
B. Grease Fitting

DRIVE CHAINS

The two wheel drive chains and the transmission drive chain propel the machine. They should be lubricated with SAE 30-weight engine oil after every 100 hours of operation.



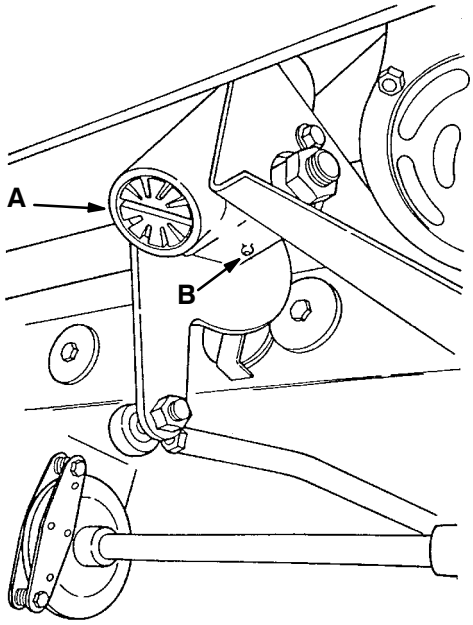
03073

WHEEL DRIVE CHAIN

A. Drive Chain
B. Right Tire

STEERING GEAR

The steering gear controls machine steering. A grease fitting is located on the differential housing for lubrication. The steering gear should be lubricated by applying Lubriplate EMB grease TENNANT Part No. 01433-1 to the grease fitting after every 100 hours of operation.



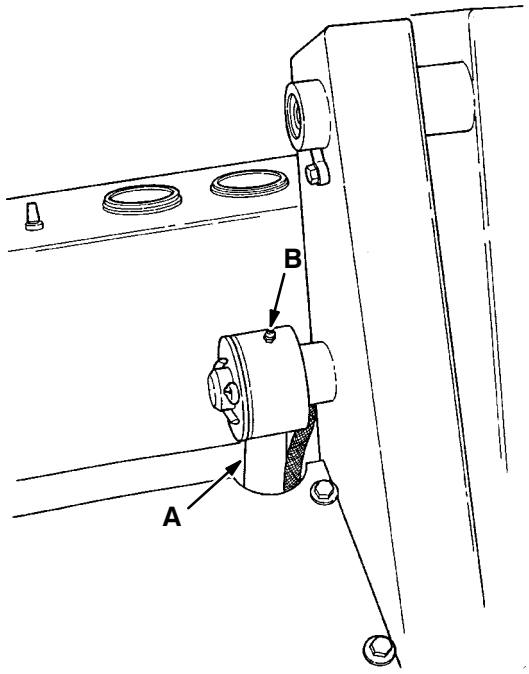
01786

STEERING GEAR

A. Steering Gear
B. Grease Fitting

LIFT CYLINDER

The lift cylinder is present on multi-level dump model machines. It raises the hopper to dump it. The top lift cylinder bearing should be lubricated by applying Lubriplate EMB grease TENNANT Part No. 01433-1 to the grease fitting after every 100 hours of operation.



03091

LIFT CYLINDER

A. Lift Cylinder
B. Grease Fitting

HYDRAULICS

HYDRAULIC FLUID

Hydraulic fluid is used in some components of multi-level dump model and LPG powered machines. The quality and condition of the hydraulic fluid plays a very important role in how well they operate. Tennant Company has developed its own hydraulic fluid to meet the special needs of its machines.

TENNANT Hydraulic Fluid is a specially compounded oil with the following features not found in many hydraulic fluids:

1. Flat viscosity curve.
2. Additives to prevent corrosion.
3. Additives to prevent oxidation.
4. Rust inhibitors.
5. Foam suppressers.

These features restrict foaming of the hydraulic fluid and provide a high standard of lubrication to the components.

TENNANT HYDRAULIC FLUID VISCOSITY SPECIFICATIONS

	TENNANT Hyd. Fluid No. 65870 (HP0520)
SUS @ 100° F (38° C)	150–200
SUS @ 210° F (99° C)	46 Min.

TENNANT Hydraulic Fluids have a very flat viscosity curve (synonymous with “high viscosity index”). The flat viscosity curve means that the thickness of the fluid is very constant over wide temperature ranges.

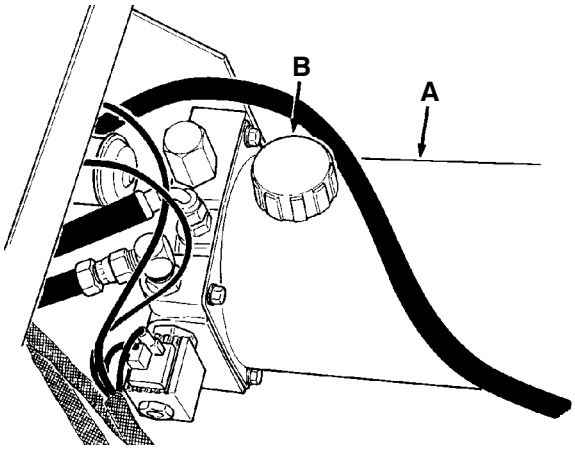
If a locally-available hydraulic fluid is preferred, or if products of only one oil company are used, the hydraulic fluid used must match closely the viscosity specifications given in the chart for TENNANT Hydraulic Fluid, as well as the other features described. Do not substitute automatic transmission fluid for hydraulic fluid.

ATTENTION! Hydraulic components depend on system hydraulic fluid for internal lubrication. If dirt or other contaminants are allowed to enter the hydraulic system, malfunctions, accelerated wear, and damage will result.

HYDRAULIC FLUID RESERVOIR

Hydraulic fluid is stored in the hydraulic fluid reservoir. It holds 2 qt (1.8 L) of hydraulic fluid. The reservoir is mounted on the back of the hydraulic pump.

A breather-filler cap is mounted on top of the reservoir.

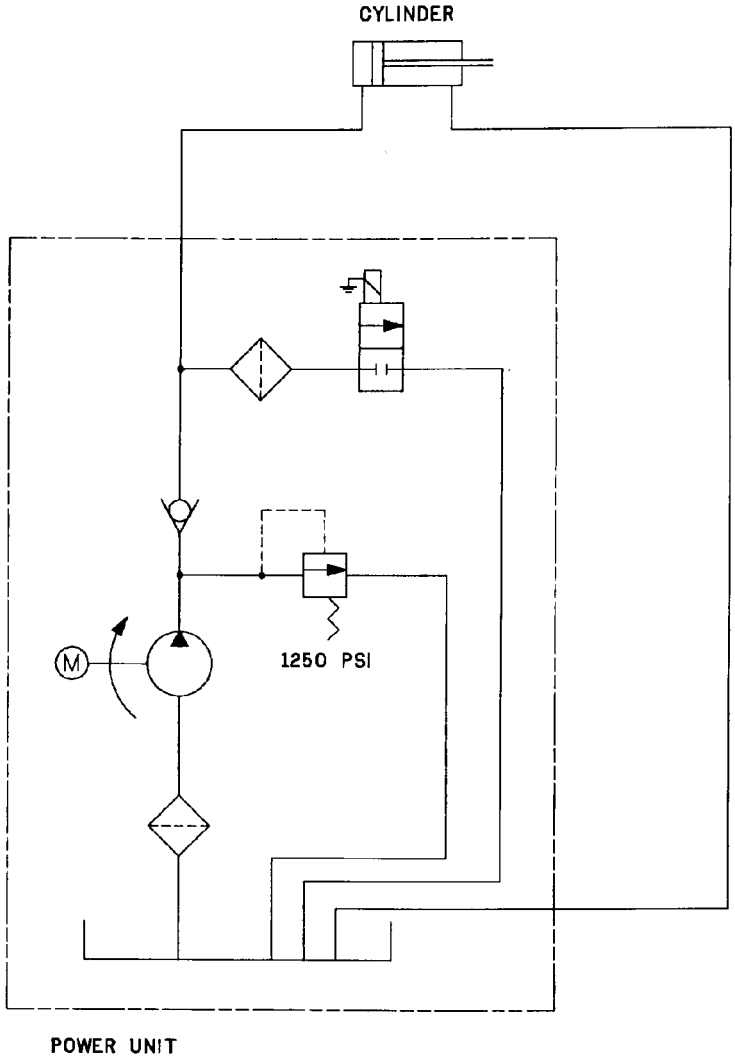


03092

HYDRAULIC PUMP

A. Pump
B. Breather-Filler Cap

Check the hydraulic fluid level after every 25 hours of operation with the hopper in the (Hopper Down) position. Do not overfill the hydraulic fluid reservoir. Hydraulic fluid expands as it heats to its normal operating temperature. Always allow for expansion when filling the reservoir.



03078

HYDRAULIC SCHEMATIC

ENGINE

ENGINE LUBRICATION

Check the engine oil level daily. Change the engine oil after every 25 hours of operation. Use a straight SAE 30-weight, API class SF engine oil. If multiviscosity oil is used, oil consumption and combustion deposits will increase.

Using other than API class SF oil or extending oil change intervals could cause engine damage not covered by the engine warranty.

The engine oil capacity is 1 qt (0.95 L).

COOLING SYSTEM

Maintaining cooling system efficiency is important. Engine temperatures must be brought up to and maintained within the satisfactory range for efficient operation. However, the engine must be kept from overheating in order to prevent damage to the valves, pistons, and bearings.

Clean the engine cooling fins after every 25 hours of operation.

FOR SAFETY: When Servicing Machine, Wear Eye And Ear Protection When Using Pressurized Air Or Water.

AIR INTAKE SYSTEM

The importance of maintaining an air filter in proper condition cannot be overemphasized. Dirt induced through improperly installed, improperly serviced, or inadequate air filter elements wears out more engines than long hours of operation. Even a small amount of dirt will wear out a set of piston rings in just a few hours. Operating with a clogged air filter element also causes the fuel mixture to be richer, which can lead to formation of harmful sludge deposits in the engine. Always cover the air intake when the air cleaner is removed for servicing. Do not neglect servicing the air cleaner. Use only correct parts for replacement. Keep all other air intake components such as hoses, clamps, etc., secure and in good condition to prevent entrance of unfiltered air.

AIR FILTER

The engine air filter is made up of two parts, a foam precleaner and a dry cartridge-type filter. The foam precleaner must be cleaned and re-oiled after every 25 hours of operation. The dry cartridge-type filter should be cleaned or replaced after every 100 hours of operation. The filter element must be replaced if it is damaged or has been cleaned three times.

TO CLEAN OR REPLACE AIR FILTER ELEMENT

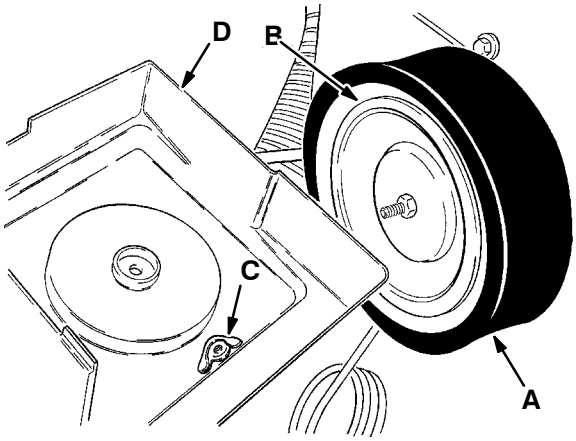
1. Stop the engine and engage the machine parking brake.

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

2. Open the seat support shroud to gain access to the engine.

3. Remove the air filter cover wing nut.

4. Remove the air filter cover.



03074

ENGINE AIR FILTER

A. Foam Precleaner
B. Dry Cartridge-Type Air Filter
C. Wing Nut
D. Filter Cover

5. Remove the foam precleaner.

6. Wash the foam precleaner in liquid detergent and water.

7. Squeeze it dry in a cloth.

8. Remove the dry cartridge-type filter nut and cup.

9. Gently remove the dry cartridge-type air filter.

10. Clean or discard the dry cartridge-type air filter.

11. Clean the interior of the air cleaner housing with a damp cloth. Clean the element sealing surfaces.

12. Position the cleaned or new, dry cartridge-type air filter on the engine.

13. Slide the air filter cup over the air filter stud.

14. Thread and tighten the nut onto the air filter stud.

15. Oil the foam precleaner with 1 oz (30 cc) of clean engine oil. Squeeze the precleaner to distribute the oil evenly throughout the foam.

16. Slide the foam precleaner over the dry cartridge type filter.

17. Position the air filter cover over the air filter assembly. Tighten the wing nut on the air filter stud.

18. Close seat support.

FUEL SYSTEM - GASOLINE

FUEL FILTER

An in-line fuel sediment bowl has been provided to filter the fuel. It is located under the fuel tank and is equipped with a fuel shutoff valve.

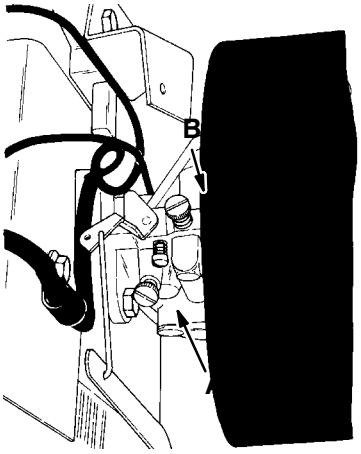
Clean the sediment bowl as necessary.

CARBURETOR

The carburetor needs no regular maintenance. It is set so there is no idle speed--only the normal operating speed. The initial setting of the idle and main fuel needle valves is made by turning them all the way in, then turning them out one and one-quarter turns. Final adjustment is made with the engine running and warm.

The carburetor should be adjusted with the fuel tank approximately one-half full and with the engine running at approximately 2350 RPM. Turn the main fuel adjusting needle valve out until the engine begins to lose speed (rich). Note the position of the needle. Then turn the needle in. The engine speed may increase, then it will decrease as the needle is turned in (lean). Note the position of the needle. Set the needle half way between the rich and lean positions.

FOR SAFETY: When Servicing Machine, Keep Flames And Sparks Away From Fuel System Service Area. Keep Area Well Ventilated.



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CARBURETOR ADJUSTMENTS

A. Idle Needle Valve
B. Main Fuel Needle Valve

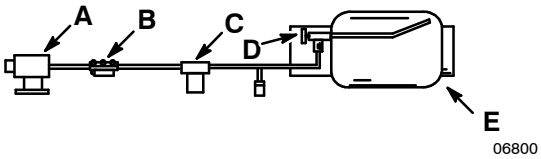
FUEL SYSTEM - LPG

LPG FUEL SYSTEM

The vapor withdrawal LPG fuel system is made up of four components which are: the LPG fuel tank, fuel filter lock, the regulator, and the carburetor.

Vapor LPG fuel flows from the LPG tank, under its own pressure, to the fuel filter lock. The fuel filter lock filters unwanted tank scale and deposits out of the LPG fuel. The fuel filter lock also stops the flow of LPG fuel when the engine is not operating. The LPG module controls the fuel filter lock. When the charging system produces sufficient energy, it permits an electrical current to open the fuel filter lock which allows LPG fuel to flow on to the regulator.

The regulator reduces the pressure of the LPG fuel to the level required by the carburetor. From the regulator, the LPG fuel is sent to the carburetor where it is finally metered into the combustion chamber air flow.



LPG FUEL SYSTEM

A. Carburetor
B. Regulator
C. Fuel Filter Lock
D. Tank Service Valve
E. LPG Fuel Tank

Never operate an LPG powered machine if the LPG fuel system is leaking, or if any component in the fuel system is malfunctioning. Operating the machine under either of these conditions may cause a fire or explosion.

Check for frosting. If frosting occurs on or near any LPG component, there is a possibility of an LPG fuel leak or a malfunctioning component. To locate the leak, apply a soapy water solution to the suspected area. Watch for bubbles forming in a confined area indicating an LPG fuel leak. Repair or replace the part. Use Loctite brand Stainless Steel PST thread sealant when reassembling. This epoxy-type sealant is not affected by aging or high humidity. Be sure to follow application directions and apply proper torque when reconnecting fittings. Never bypass safety components except to test. If they are defective, replace them before operating the machine.

Check routings of all LPG hoses. Keep them away from sharp edges, exhaust manifolds, or other hot surfaces. Check for signs of abrasion or deterioration. Replace hoses found to be worn or damaged.

FUEL TANKS

The LPG fuel tanks should be inspected for sharp dents, gouges, leaks, and broken protecting rings whenever the tanks are refilled. All tank valves must be inspected for leaks using a soap solution. Valves must also be checked for dirt, paint, or other debris in the valve openings. The following specific checks must also be made:

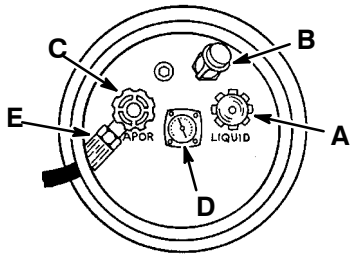
Filler Valve – Check for proper functioning and the presence of the handwheel. Valve must be closed except during filling.

Vapor and Liquid Service Valves – Check for proper functioning and presence of the handwheel. The valve must be closed except when in service.

Tank Service Valve Coupling – Check for proper functioning, thread condition, and damaged or missing washers or o-rings.

Safety Relief Valve – Check for damage. Check for the presence of the relief valve elbow and the proper direction of the elbow. If the rain cap is missing, check for foreign matter and replace cap. Do not tamper with the relief valve setting.

Magnetic Liquid Level Gauge – Check operation against the maximum filling point as determined by weight.



TYPICAL LPG VAPOR WITHDRAWAL FUEL TANK

A. Filler Valve
B. Safety Relief Valve
C. Vapor Service Valve
D. Magnetic Liquid Level Gauge
E. Tank Service Valve Coupling

An LPG fuel tank with any of the stated defects must be removed from service and be repaired or destroyed accordingly.

If an LPG fuel tank is damaged or leaking, it should be removed to a designated safe area, and the proper personnel should be notified. Do not attempt to make repairs to the tank, regardless of condition. Repairs or disposal must only be made by qualified personnel.

The care an LPG fuel tank receives has a direct bearing on how long that tank can be used safely. LPG fuel tanks must not be dropped or dragged across any surface. To move LPG fuel tanks, use a hand truck or roll the tank on its foot ring while it is being held in a position slightly off vertical.

Whether the storage is inside or outside, fuel tanks should not be stored in the vicinity of combustible materials or high temperature sources such as ovens and furnaces, since the heat may raise the pressure of the fuel to a point where the safety relief valves would function. Care should be taken to insure that the tanks are stored in such a manner that if the safety relief valves do function, they will relieve vapor, ratherthan liquid.

Valves on empty tanks must be closed during storage and transportation.

Similar precautions should be taken in storing machines fitted with LPG fuel tanks. They may be stored or serviced inside buildings, provided there are no leaks in the fuel system and the tanks are not overfilled. While machines are being repaired inside a building, the shut-off valve on the tank must be closed, except when the engine must be operated.

The tank changing operation presents an opportunity for the machine operator to carefully observe the tank, fittings, and the fuel lines and fittings for his own satisfaction. If abnormal wear is detected, the operator should report the findings to the appropriate personal for action.

TO CHANGE AN LPG FUEL TANK

1. Park the machine in a designated safe area.

   FOR SAFETY: When Servicing Machine, Keep Flames And Sparks Away From Fuel System Service Area. Keep Area Well Ventilated.

2. Close the tank service valve.

3. Operate the engine until it stops from lack of fuel, then engage the machine parking brake.

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

4. Put on gloves and remove the quick-disconnect tank coupling.

5. Inspect the LPG fuel lines for wear or damage.

6. Remove the empty LPG fuel tank from the machine.

7. Check the tank for damage or wear.

8. Store the tank in a designated safe area.

9. Select a filled LPG fuel tank and inspect it for damage or leaks.

NOTE: Make sure the LPG fuel tank matches the fuel system (vapor tank with vapor system).

10. Carefully place the LPG tank in the machine so that the tank centering pin enters the aligning hole in the tank collar.

NOTE: If the pin cannot be engaged, make sure you have the correct LPG fuel tank and then adjust the pin locator in or out.

11. Fasten the tank hold-down clamp to lock the tank in position.

12. Connect the LPG fuel line to the tank service coupling. Make sure the service coupling is clean and free of damage. Also make sure it matches the machine service coupling.

13. Open the tank service valve slowly and check for leaks. If an LPG leak is found, close the service valve immediately and notify the appropriate personnel.

14. If no leaks are found, the engine is ready to start.

FUEL FILTER LOCK

The fuel filter lock filters the LPG fuel. It also stops the flow of LPG fuel to the engine when the engine is not operating.

Replace the filter pack with the filter pack replacement kit if diminished gas flow indicates the filter is clogged. A drain plug is provided for purging the filter bowl on older style machines. Clean out the bowl when replacing the filter pack.

REGULATOR

The regulator regulates the flow of LPG fuel to the carburetor. If any malfunction is noted, completely disassemble the regulator. Clean all of the parts in alcohol. Inspect all of the parts and replace where needed. Carefully reassemble the regulator with the seal repair kit. Check for proper operation.

CARBURETOR

The carburetor meters fuel to the engine. If any malfunction is noted, completely disassemble the carburetor. Clean all of the parts in alcohol.

Inspect all of the parts and replace when needed. Carefully reassemble the carburetor with the seal repair kit.

LPG FUEL TROUBLESHOOTING

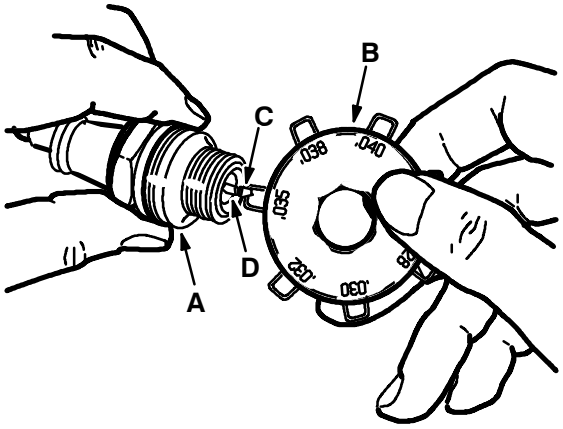
Problem	Cause	Remedy
Engine will not start	Out of fuel	Replace fuel tank with full one
	Service valve opened too quickly – engaging safety valve	Close valve and reopen slowly
	Plugged fuel filter	Replace filter
	Kinked or restricted fuel line	Straighten or replace fuel line
	Engine out of tune	Tune-up engine
	Fuel lock valve failure	Repair or replace fuel filter lock
	Regulator failure	Repair or replace regulator
Engine runs unevenly lacks power	Wrong type of fuel tank – vapor withdrawal tank	Replace liquid tank with vapor withdrawal tank
	Plugged fuel filter	Replace filter
	Kinked or restricted fuel line	Straighten or replace fuel line
	Engine out of tune	Tune-up engine
	Restricted air filter	Clean or replace air filter element
	Regulator maladjusted	Adjust regulator

ELECTRICAL SYSTEM

SPARK PLUG

Spark plug gaps are best checked with a wire gauge unless the points are dressed to obtain a correct reading with a flat gauge. The adjustment should always be made on the side electrode and never on the center electrode, which may cause the porcelain to be broken.

"Gapping" the electrode tip is more easily done with the proper tools.



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GAPPING THE SPARK PLUG

A. Spark Plug
B. Gapping Tool
C. Side Electrode
D. Center Electrode

Clean or replace and gap the spark plug after every 100 hours of operation.

The proper spark plug gap is 0.016 to 0.020 in (0.41 to 0.51 mm) for LPG engines, 0.023 to 0.028 in (0.58 to 0.71 mm) for gasoline engines.

IGNITION SYSTEM

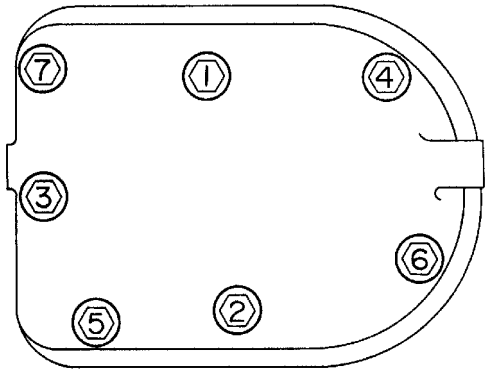
The engine ignition system is the breakerless type. The ignition system needs no regular maintenance. The magnet-to-ignition module gap is 0.012 to 0.016 in (0.3 to 0.4 mm). When adjusting, tighten module screws to 32 in lb (3.5 Nm).

STARTER

The starter motor brushes must be inspected after every 400 hours of operation.

CYLINDER HEAD

The cylinder head may develop carbon deposits. After every 400 hours of operation, remove the cylinder head and clean it of any accumulated deposits. Replace the cylinder head, making sure the cylinder head screws are lubricated with graphite grease and are returned to the same hole. Alternately snug the screws; tighten them to one-half of the specified value, then torque the screws to 15 to 20 ft lb (20 to 25 Nm).



03076

CYLINDER HEAD SCREW TIGHTENING SEQUENCE

VALVE TAPPET CLEARANCE

The valve tappet clearance requires no regularly scheduled adjustment. The intake valve clearance should be 0.006 to 0.008 in (0.15 to 0.20 mm) cold. The exhaust valve clearance should be 0.017 to 0.019 in (0.43 to 0.48 mm) cold. Grind off the end of the valve stem to obtain the proper clearance.

PCV SYSTEM

The PCV system including the reed valve and gaskets must be inspected after every 400 hours of operation.

TUNE-UP CHART		
Maximum governed	speed:	2350rpm
Spark plug gap:	gasoline	0.023 to 0.028 in (.6 to .7 mm)
	LPG	0.016 to 0.020 in (.4 to .5 mm)
Valve clearances,	cold: intake	0.006 to 0.008 in (0.15 to 0.20mm)
	exhaust	0.017 to 0.019 in (0.43 to 0.48mm)

ELECTRICAL SYSTEM

BATTERY

The battery used in the machine is a low maintenance battery. It has been constructed with special materials and has extra electrolyte to reduce or eliminate maintenance. Its design reduces electrolyte loss and contamination. Do not add water, remove the battery vent plugs, or check the battery specific gravity. For specific instructions, see the battery label.

The battery is a 12 V, 40 A/h at a 20-hour rate. It is located under the operator foot plate. When removing battery cables, remove the negative (–) cable before the positive (+) cable.

Do not allow the battery to remain in discharged condition for any length of time. Do not operate the machine if the battery is in poor condition or below 25% of the charge.

Clean the top surface and the terminals of the battery periodically. Use a strong solution of baking soda and water. Brush the solution sparingly over the battery top, terminals, and cable clamps. Do not allow any baking soda solution to enter the battery. Use a wire brush to clean the terminal posts and the cable connectors. After cleaning, apply a coating of clear petroleum jelly to the terminals and the cable connectors. Keep the top of the battery clean and dry.

Keep all metallic objects off the top of the battery, as they may cause a short circuit. Replace worn or damaged wires.

The electrolyte level in regular nonsealed batteries can be checked. It must always be above the battery plates. Add distilled water to maintain solution at the correct level above the plates, but do not overfill. Never add acid to batteries, only water. Keep vent plugs firmly in place at all times, except when adding water or taking hydrometer readings.

FOR SAFETY: When Servicing Machine, Avoid Contact With Battery Acid.

If when checking battery specific gravity, one or more battery cells tests 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 water– –if the water and acid are not thoroughly mixed, the readings may not be accurate. Check the hydrometer readings against this chart:

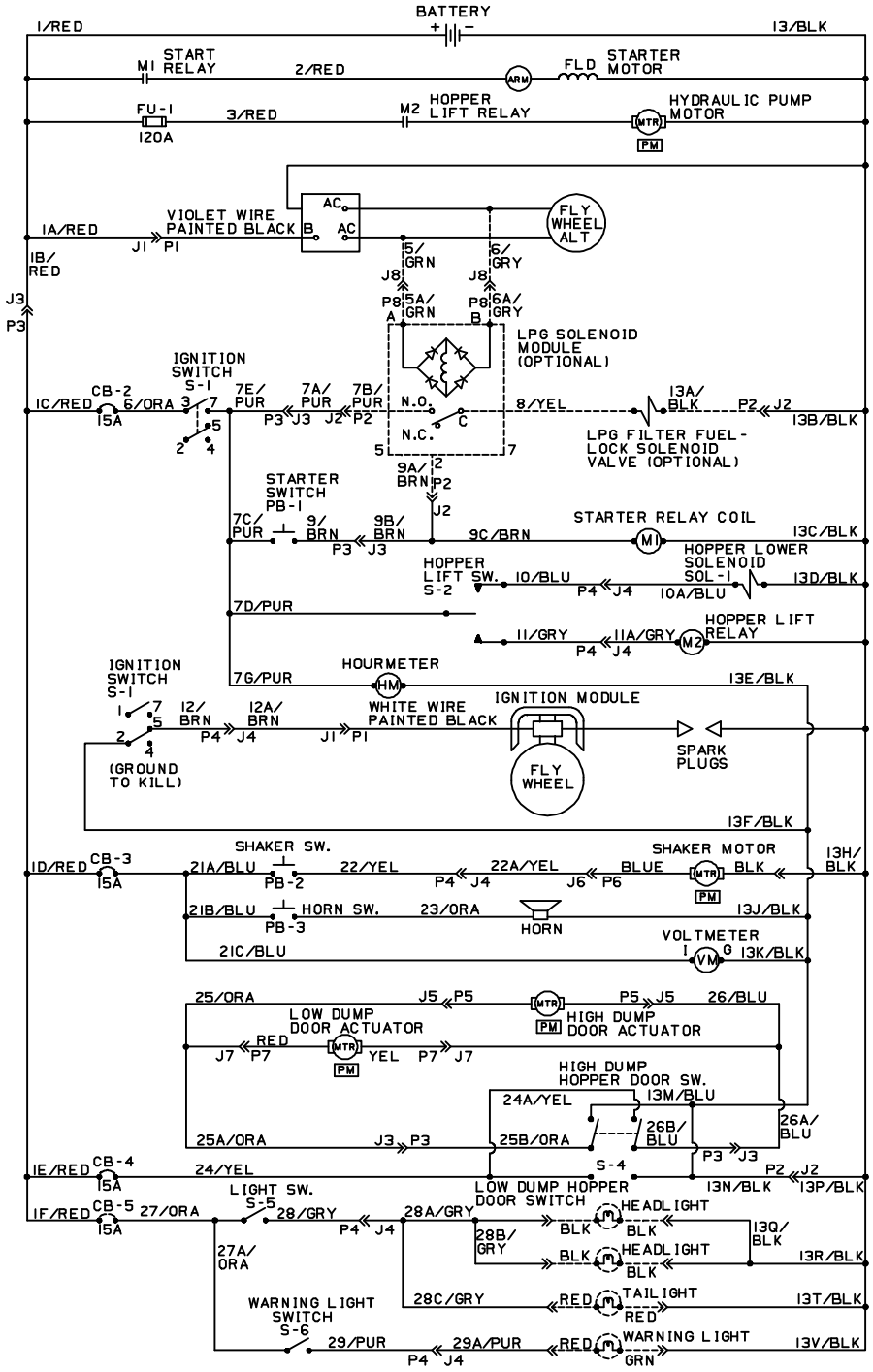
SPECIFIC GRAVITY at 80° F (27° C)	BATTERY CONDITION
1.265	100% charged
1.225	75% charged
1.190	50% charged
1.155	25% charged
1.120	Discharged

NOTE: If the readings are taken when the battery electrolyte is any temperature other than 80° F (27° C), the reading must be temperature corrected.

To determine the corrected specific gravity reading when the temperature of the battery electrolyte is other than 80° F (27° C):

Add to the specific gravity reading 0.004 (4 points) for each 10° F (6° C) above 80° F (27° C).

Subtract from the specific gravity reading 0.004 (4 points) for each 10° F (6° C) below 80° F (27° C).



LEGEND			
M	POWER RELAY	HM	HOURMETER
MTR	MOTOR	SV	SOLENOID VALVE
CB	CIRCUIT BREAKER	S	SWITCH
PM	PERMANENT MAGNET	ACC	ACCESSORY
J	JACK-FEM. SOCKET	GND	GROUND CHASSIS
P	PLUG-MALE PIN	C	COMMON
PB	PUSHBUTTON	N.O.	NORMALLY OPEN
VM	VOLTMETER	N.C.	NORMALLY CLOSED
FU	FUSE		

03077

ELECTRICAL SCHEMATIC

BELTS AND CHAINS

ENGINE BELT

The engine belt transfers power from the engine sheave to the engine jackshaft. Check the belt condition and tension after every 50 hours of operation as described in *DRIVE CHAIN AND BELT ALIGNMENT AND TENSIONING*.

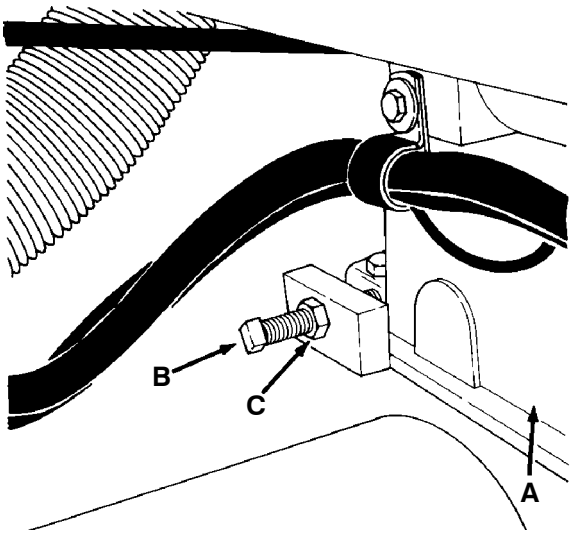
TO REPLACE ENGINE BELT

1. Stop the engine and set the parking brake.

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

2. Open the seat support.

3. Loosen the engine mounting bolts and belt tension bolts and jam nuts to relieve belt tension.

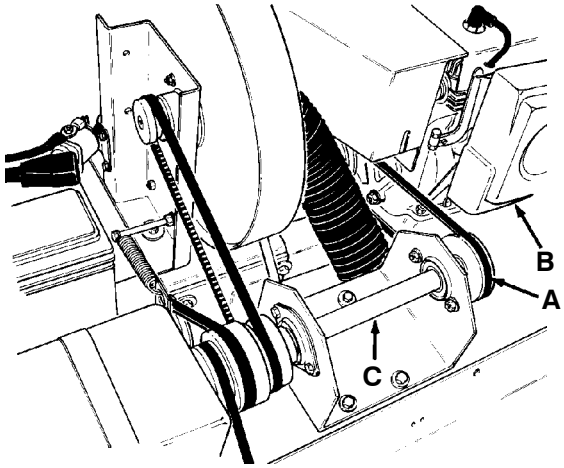


03551

FRONT ENGINE BELT TENSION BOLT

A. Engine
B. Tension Bolt
C. Jam Nut

4. Remove the existing belt.



03080

ENGINE BELT

A. Engine Belt
B. Engine
C. Engine Jackshaft

5. Position a new belt on the sheaves.

6. Adjust the belt tension bolts to tension the belt. Tighten the engine mounting bolts.

7. Check the belt condition and tension as described in *DRIVE CHAIN AND BELT ALIGNMENT AND TENSIONING*.

8. Close the seat support.

VACUUM FAN BELT

The vacuum fan belt transfers power from the engine jackshaft to the vacuum fan. Check the belt condition and tension after every 50 hours of operation as described in *DRIVE CHAIN AND BELT ALIGNMENT AND TENSIONING*.

TO REPLACE VACUUM FAN BELT

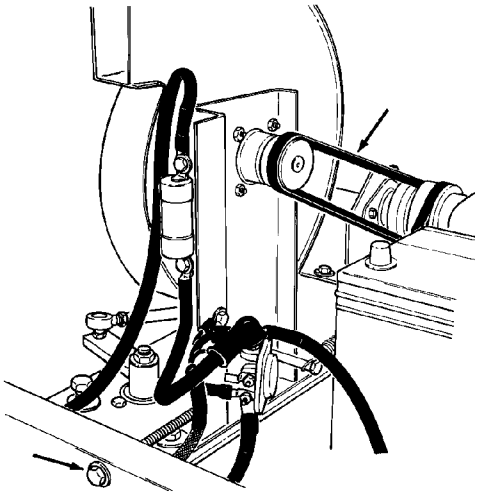
1. Stop the engine and set the parking brake.

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

2. Open the seat support.

3. Remove the transmission belt and the jackshaft belt.

4. Loosen the fan bracket mounting screws, unthread the adjustment bolt, and slide the bracket forward.



03079

VACUUM FAN BELT

A. Vacuum Fan Belt
B. Adjustment Bolt

5. Remove the existing belt.

6. Position the new belt on the sheaves.

7. Pull the fan bracket backward, snug the belt, and tighten the bracket mounting bolts.

8. Replace the transmission belt and the jackshaft belt.

9. Check the alignment and tension of the belt as described in *DRIVE CHAIN AND BELT ALIGNMENT AND TENSIONING*.

10. Close the seat support.

TRANSMISSION BELT

The transmission belt transfers power from the engine jackshaft to the transmission. Check the belt condition and tension after every 50 hours of operation as described in *DRIVE CHAIN AND BELT ALIGNMENT AND TENSIONING*.

TO REPLACE TRANSMISSION BELT

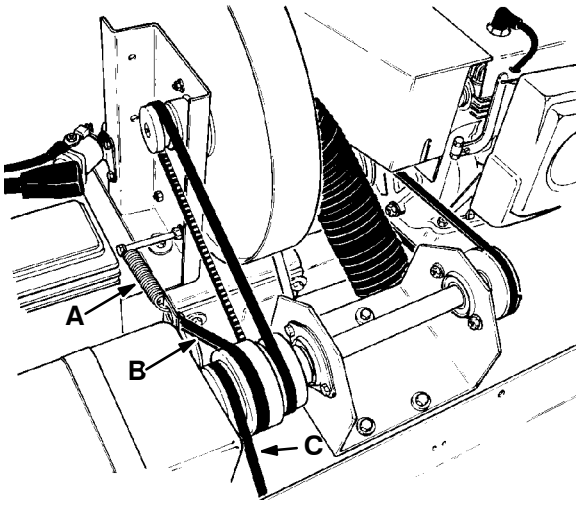
1. Stop the engine and engage the parking brake.

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

2. Open the seat support.

3. Remove the jackshaft belt.

4. Unhook the transmission belt tension spring.



03080

TRANSMISSION BELT

A. Belt Tension Spring
B. Transmission Belt
C. Jackshaft Belt

5. Remove the transmission belt.

6. Position a new transmission belt on the sheaves.

7. Rehook the belt tension spring.

8. Replace the jackshaft belt.

9. Check the alignment as described in *DRIVE CHAIN AND BELT ALIGNMENT AND TENSIONING*.

10. Close the seat support.

JACKSHAFT BELT

The jackshaft belt transfers power from the engine jackshaft to the side brush jackshaft. Check the belt condition and tension after every 50 hours of operation as describe in *DRIVE CHAIN AND BELT ALIGNMENT AND TENSIONING*.

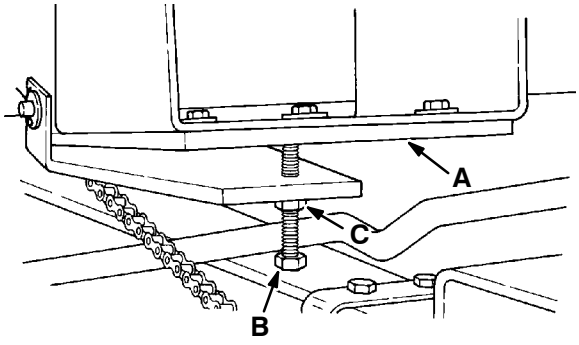
TO REPLACE JACKSHAFT BELT

1. Stop the engine and set the parking brake.

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

2. Open the seat support.

3. Loosen the jam nut and adjustment bolt under the jackshaft bracket to relieve belt tension.

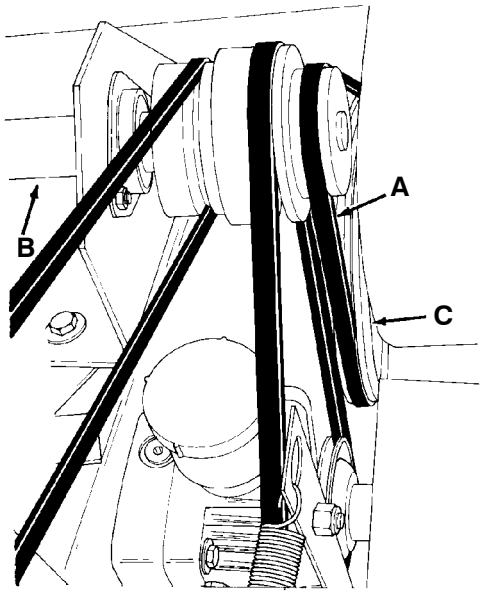


03552

BELT ADJUSTMENT BOLT

A. Jackshaft Bracket
B. Adjustment Bolt
C. Jam Nut

4. Remove the belt.



03081

JACKSHAFT BELT

A. Jackshaft Belt
B. Engine Jackshaft
C. Side Brush Jackshaft

5. Position the new belt on the sheaves.

6. Tighten the adjustment bolt until the belt snugs.

7. Check the alignment and tension the belt as described in *DRIVE CHAIN AND BELT ALIGNMENT AND TENSIONING*.

8. Close the seat support.

INTERMEDIATE SIDE BRUSH BELT

The intermediate side brush belt transfers power from the side brush jackshaft to the side brush belt. Check the belt condition and tension after every 50 hours of operation.

TO REPLACE INTERMEDIATE SIDE BRUSH BELT

1. Stop the engine and set the parking brake.

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

2. Open the seat support.
3. Remove the right side access door.
4. Remove the plug button from the right side of the machine frame.
5. Disconnect the main brush belt idler spring.
6. Remove the allen head socket cap screw from the end of the jackshaft. Remove the small sheave from the end of the jackshaft.
7. Remove the intermediate belt guide and belt.
8. Position the new belt on the large intermediate belt sheave. Secure the belt guide to the bracket.
9. Position the intermediate belt over the small intermediate belt sheave. Be sure the main brush belt is on its sheave.
10. Secure the sheaves to the jackshaft with the allen head socket cap screw. Check sheave alignment.
11. Reconnect the main brush belt idler spring.
12. Reinstall the right side access door and machine frame plugbutton.
13. Close the seat support.

SIDE BRUSH BELT

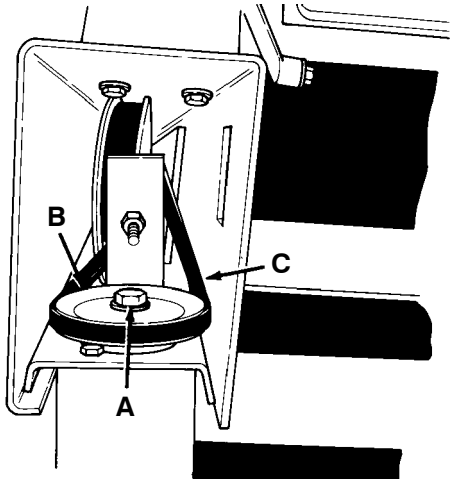
The side brush belt transfers power from the intermediate side brush belt to the side brush. Check the belt condition after every 50 hours of operation.

TO REPLACE SIDE BRUSH BELT

1. Stop the engine and set the parking brake.

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

2. Place the side brush position lever in the (Side Brush up) position.
3. Open the seat support.
4. Remove the front right machine frame end cap.
5. Remove the front side brush sheave retaining bolt.



01794

SIDE BRUSH BELT

A. Sheave Retaining Bolt
B. Front Sheave
C. Side Brush Belt

6. Remove the existing belt.
7. Position the rear of the new belt over the rear sheave.

8. Position the front of the new belt over the loose sheave. Be sure that the top of the belt on the rear sheave goes to the left side of the front sheave. If this is reversed, the side brush will rotate the wrong direction.

9. Secure the front sheave to the side brush shaft.

10. Replace the front machine frame end cap.

11. Close the seat support.

MAIN BRUSH BELT

The main brush belt transfers power from the side brush jackshaft to the main brush. Check the belt condition after every 50 hours of operation.

TO REPLACE MAIN BRUSH BELT

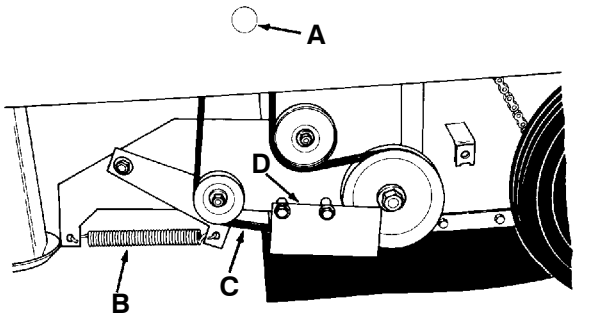
1. Stop the engine and set the parking brake.

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

2. Open the seat support.

3. Remove the right side access door.

4. Remove the plugbutton from the right side of the machine frame.



01795

MAIN BRUSH BELT

A. Plugbutton
B. Belt Idler Spring
C. Main Brush Belt
D. Belt Guard

5. Disconnect the main brush belt idler spring.

6. Remove the allen head socket cap screw from the end of the jackshaft. Remove the sheaves from the jackshaft. Remove the main brush belt.

7. Position the new belt on the sheaves.

8. Position the main brush belt on the large end sheave and the intermediate side brush belt on the small end sheave. Secure the sheaves to the end of the jackshaft with the allen head socket cap screw.

9. Check the sheave alignment.

10. Reconnect the main brush drive belt idler spring.

11. Replace the machine frame plugbutton and right side access door.

12. Close the seat support.

DRIVE CHAIN AND BELT ALIGNMENT AND TENSIONING

The chains and belts used on this machine must be properly aligned and tensioned in order for the machine to operate properly. Belts out of alignment do not stay on sheaves and wear or break more frequently. Sheave alignment can be checked as describe by placing a straightedge across the sheave faces. Be sure to align and tension the belts in the order given.

TO ALIGN AND TENSION DRIVE CHAINS AND BELTS

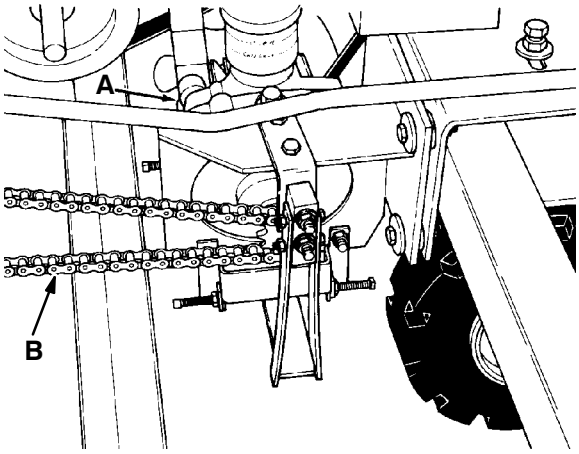
1. Stop the engine and set the parking brake.

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

2. Open the seat support.

3. Check the differential sprocket to transmission sprocket alignment. If they are not lined up, loosen the differential bearing locking collars, align the sprockets, and tighten the locking collars.

4. Check the transmission to differential chain tension. There should be 0.5 in (15 mm) slack measured midway between the sprockets. To adjust the tension, loosen the transmission mounting bolts, slide the transmission forward to increase slack or backward to decrease slack, and tighten the transmission bolts.



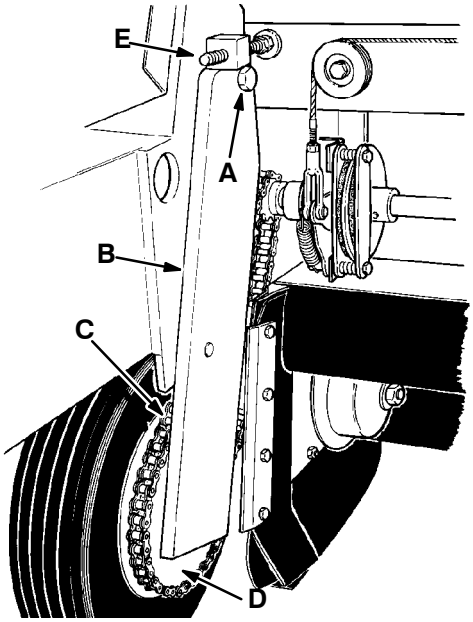
01784

TRANSMISSION CHAIN

A. Transmission
B. Chain

5. Check the alignment of the differential to wheel chain sprockets. If they are not lined up, loosen the differential sprocket set screws, align the sprockets, and tighten the set screws.

6. Check the differential to wheel chain tension. There should be 0.5 in (15 mm) slack measured midway between the sprockets. To adjust tension, loosen the two wheel pivot plate bolts, turn the adjustment bolts forward to tighten the chain or backward to loosen the chain, and tighten the two wheel pivot plate bolts and jam nuts.

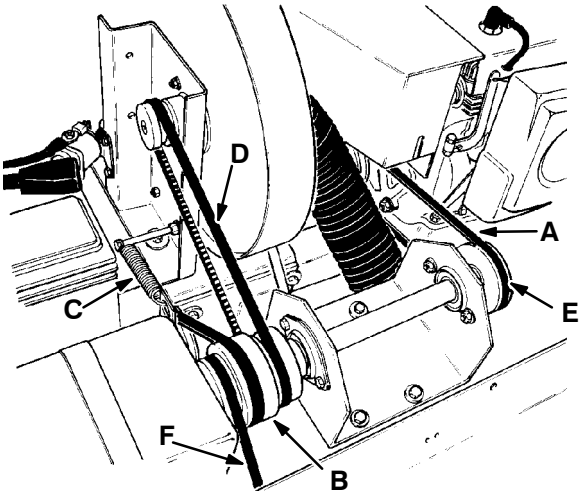


03073

WHEEL DRIVE CHAIN

A. Pivot Plate Bolts
B. Wheel Pivot Plate
C. Chain
D. Chain Sprocket
E. Adjustment Bolt

7. Check the alignment of the jackshaft sheave to the transmission sheave. If they are not lined up, loosen the sheave set screws, align the sheave, and retighten the set screws. The belt is automatically tensioned by an idler spring assembly.



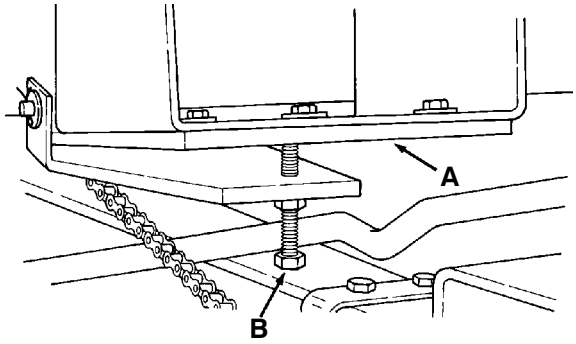
03080

DRIVE BELTS

A. Engine Belt
B. Transmission Sheave
C. Transmission Belt Spring
D. Vacuum Fan Belt
E. Engine Jackshaft Sheave
F. Jackshaft Belt

8. Check the alignment of the engine jackshaft sheave with the side brush jackshaft sheave. If they are not lined up, loosen the side brush jackshaft sheave set screws, align the sheaves, and retighten the set screws.

9. Check the jackshaft belt tension. There should be 0.08 in (2 mm) deflection from a force of 13 lb (6 kg) applied at belt span midpoint. To adjust tension, adjust the belt adjustment bolt under the jackshaft bracket. Tighten jam nut.



03552

ADJUSTMENT BOLT

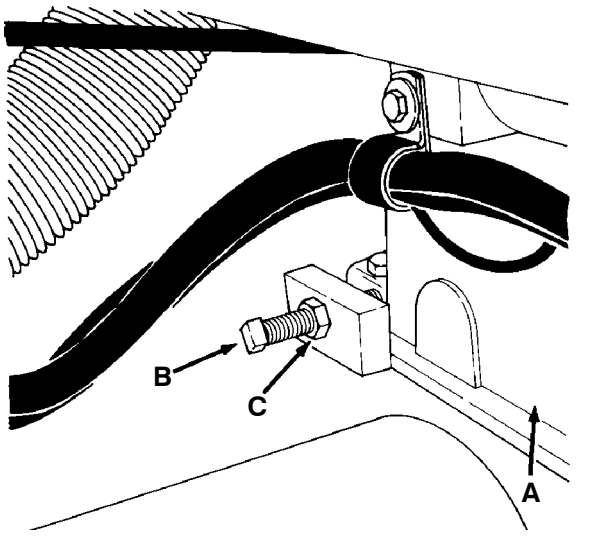
A. Jackshaft Bracket
B. Adjustment Bolt

10. Check the alignment of the vacuum fan sheave with the jackshaft sheave. If they are not lined up, loosen the fan bracket mounting bolts, align the sheaves, and retighten the mounting bolts.

11. Check the vacuum fan belt tension. There should be 0.18 in (5 mm) deflection from a force of 8 lb (4 kg) applied at belt span midpoint. To adjust tension, loosen the fan bracket mounting bolts, slide the fan bracket forward to loosen or backward to tighten the belt, and retighten the mounting bolts. Recheck the sheave alignment.

12. Check the alignment of the engine jackshaft sheave with the engine sheave. If they are not lined up, loosen the engine mounting bolts, align the sheaves, and retighten the bolts. The engine jackshaft sheave may also be moved by loosening the sheave clamp bushing.

13. Check the engine belt tension. There should be 0.16 in (4 mm) deflection from a force of 12 lb (5 kg) applied at belt span midpoint. To adjust tension, adjust the position of the engine by loosening the engine mounting bolts and the two engine belt tension jam nuts. Adjust the adjustment bolts and retighten the jam nuts and mounting bolts.

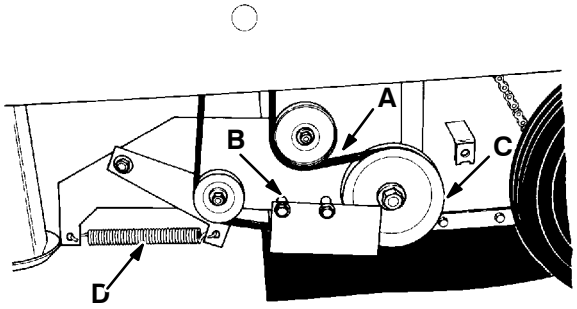


03551

FRONT ADJUSTMENT BOLT

A. Engine
B. Adjustment Bolt
C. Jam Nut

14. Make sure the main brush belt clears the belt guard.



01795

MAIN BRUSH BELT GUARD

A. Main Brush Belt
B. Belt Guard
C. Main Brush Sheave
D. Belt Idler Spring

15. Check the alignment of the small jackshaft sheave to the main brush sheave. If they are not lined up, loosen the jackshaft bearing locking collars, align the sheaves, and tighten the locking collars. The belt is automatically tensioned by an idler spring assembly.

16. Measure the length of the jackshaft belt tension spring. It should be 6.5 in (165 mm). To adjust the spring length, unhook the spring. Loosen the adjustable idler bolt and slide the idler forward to reduce spring length or backward to increase spring length. Tighten the adjustable idler bolt and rehook the belt tension spring. Repeat procedure as required.

17. Close the seat support.

STATIC DRAG CHAIN

The static drag chain prevents the buildup of static electricity in the machine. It is attached to the rear skirt retaining strip.

Make sure that the chain is making contact with the floor at all times.

DEBRIS HOPPER AND DUST FILTER

DEBRIS HOPPER

The debris hopper collects debris swept by the machine. It should be dumped after every work shift. It should also be flushed out after every 100 hours of operation. The hopper floor clearance should be checked and adjusted if necessary after every 100 hours of operation.

TO CHECK AND ADJUST HOPPER FLOOR CLEARANCE

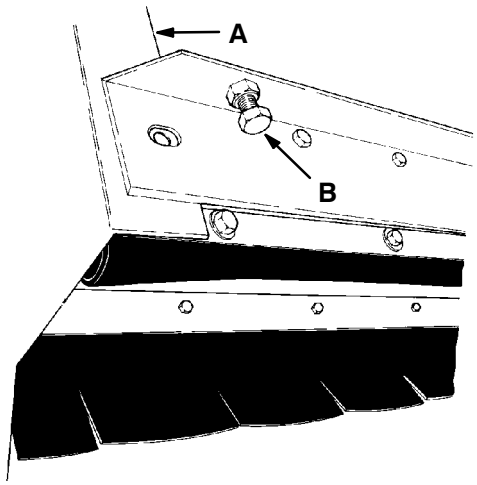
1. Empty the hopper and park the machine on a smooth, level surface.

2. Place the hopper in the “operating” position.

3. Stop the engine and set the parking brake.

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

4. Check the distance between the floor and the bottom edge of the hopper. It should be equal side to side. To adjust the hopper floor clearance, raise the hopper and adjust the hopper stop bolts. A good starting point is to adjust both bolts so they extend 1.25 in (30 mm) from their mounting position.



03084

HOPPER STOP BOLTS

A. Hopper
B. Stop Bolts

HOPPER DUST FILTER

The hopper dust filter filters the air which is drawn up from the main brush compartment by the vacuum fan. It is located inside the dust filter compartment. Shake the excess dust from the filter daily. Inspect and clean or replace the dust filter after every 50 hours of operation.

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

- TAPPING – Tap the filter gently on a flat surface with the dirty side down. Do not damage the edges of the filter element or the filter will not seat properly in the filter frame.

- AIR – Blow compressed air, 35 psi (240 kPa) maximum, through the dust filter opposite the direction of the arrows. This may be done with the filter in the machine. Always wear eye protection when using compressed air.

- WATER – Soak the dust filter in a water and mild detergent solution. Rinse the dust filter until it is clean. The maximum water pressure allowable is 40 psi (275 kPa). Air dry the wet filter; do not use compressed air.

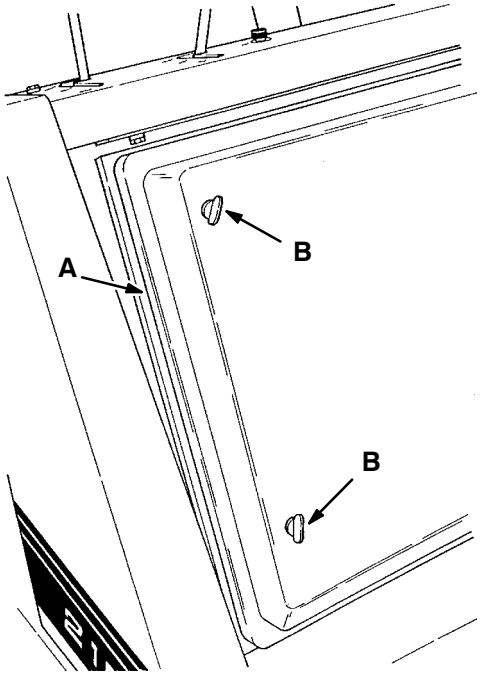
NOTE: Be sure the dust filter is dry before reinstalling it in the machine.

TO REMOVE AND REPLACE HOPPER DUST FILTER

1. Stop the engine and set the machine parking brake.

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

2. Unthread the four front filter cover screws and remove the front filter cover.

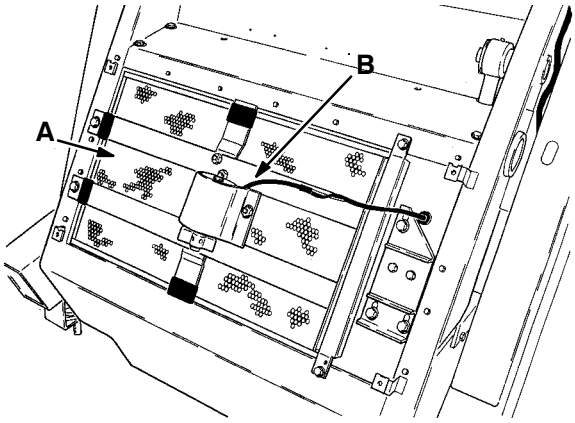


03082

FRONT FILTER COVER

A. Filter Cover
B. Filter Cover Screw

3. Unplug the shaker motor leads. Remove the shaker motor and springs assembly. Remove the dust filter.



03083

DUST FILTER

A. Dust Filter
B. Shaker Motor Assembly

4. Inspect and clean or replace the dust filter.

5. Position the dust filter in the filter frame with the arrows pointing toward the machine.

6. Secure the filter with the shaker motor and springs assembly. Plug the shaker motor leads together.

7. Secure the front filter cover on the filter frame with the four screws.

SKIRTS AND SEALS

BRUSH SKIRTS

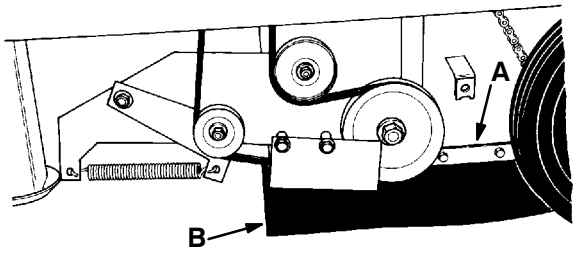
Brush skirts control main brush dusting. They are located on each of the side access doors. The skirts should be inspected for wear or damage daily. They should clear the floor by 0 to 0.12 in (0 to 5 mm) at all times.

TO ADJUST BRUSH SKIRTS

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

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

3. Unlatch and open the left side access door.
4. Loosen the skirt and retaining strip. Adjust the skirt height, retighten the retaining strip, and close and latch the door.
5. Check the skirt clearance.
6. Loosen the two right side access door screws and remove the right side access door.



01795

RIGHT SIDE SKIRT

A. Retaining Strip
B. Side Skirt

7. Loosen the skirt retaining strip, adjust the skirt height, and retighten the retaining strip.
8. Check the skirt clearance.
9. Reinstall the right side access door.

TO REPLACE BRUSH SKIRTS

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

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

3. Unlatch and open the left side access door.
4. Remove the skirt retaining strip and the brush skirt.
5. Loosely install the new dust skirt with the retaining strip.
6. Close the access door and check the floor clearance.
7. Adjust the skirt so that it clears the floor by 0 to 0.12 in (0 to 5 mm) and tighten the retaining strip screws.
8. Close and latch the left access door.
9. Loosen the two right side access door screws and remove the right side access door.
10. Remove the skirt retaining strips and the brush skirt.
11. Loosely install the new brush skirt with the retaining strips.
12. Adjust the skirt so that it clears the floor by 0 to 0.12 in (0 to 5 mm) and tighten the retaining strip screws.
13. Reinstall the right side access door.

HOPPER SEALS

Three seals control hopper dusting. They are the hopper top seal, and the left and right side hopper seals. They should be inspected daily for wear or damage.

TO REPLACE HOPPER SEALS

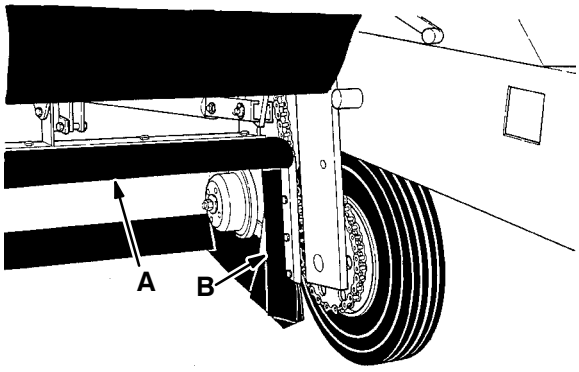
1. Empty the debris hopper.
2. Raise the hopper.
3. Engage the hopper support bar.

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

4. Stop the engine and set the parking brake.

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

5. Remove the retaining strip of the seal or skirt to be replaced.



03066

HOPPER SEALS AND SKIRT

A. Hopper Top Seal
B. Hopper Side Seal

6. Remove the existing seal or skirt.
7. Mount the new seal or skirt to the machine with the retaining strip removed earlier.
8. Raise the hopper, disengage the hopper support bar, and lower the hopper.

HOPPER DUMP DOOR SEAL

The hopper dump door seal is present on multi-level dump model machines. It allows the hopper to be high dumped without scattering debris. Check the seal for damage daily.

TO REPLACE HOPPER DUMP DOOR SEAL

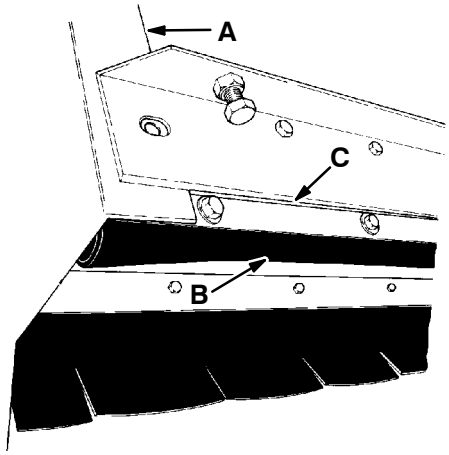
1. Empty the debris hopper.
2. Raise the hopper.
3. Engage the hopper support bar.

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

4. Stop the engine and set the parking brake.

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

5. Open the dump door.
6. Remove the seal retaining strip.



03084

HOPPER DUMP DOOR SEAL

A. Hopper
B. Dump Door Seal
C. Seal Retaining Strip

7. Remove the seal.

8. Mount the new seal to the door with the retaining strip removed earlier.

9. Raise the hopper, disengage the hopper support bar, and lower the hopper.

REAR SKIRTS

The rear skirts seal the brush compartment. They are located on the bottom rear of the brush compartment. The seals should be inspected for wear or damage daily.

TO REPLACE AND ADJUST REAR SKIRTS

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

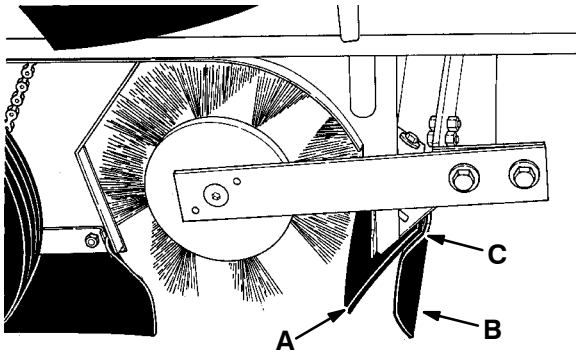
2. Stop the engine and set the machine parking brake.

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

3. Unlatch and open the left side access door.

4. Loosen the two right side access door screws and remove the right side access door.

5. Remove the rear skirt retaining strips and the rear skirts.



01802

REAR SKIRTS

A. Brush Skirt
B. Vertical Rear Skirt
C. Retaining Strip

6. Loosely install new skirts with the existing retaining strips.

7. Slide the vertical rear skirt up or down so it is 0 to 0.12 in (0 to 5 mm) above the floor.

8. Retighten the retaining strip bolts.

HOPPER LIP SKIRT

The hopper lip skirt floats over debris and helps deflect that debris into the hopper. It is located on the bottom rear of the hopper

The hopper lip skirt should be inspected for wear or damage daily.

TO REPLACE HOPPER LIP SKIRT

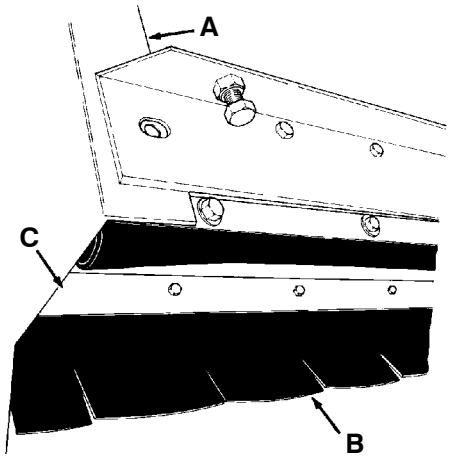
1. Empty the machine debris hopper.
2. Raise the hopper.
3. Engage the hopper support bar.

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

4. Stop the machine on a level surface, stop the engine, and set the machine parking brake.

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

5. Remove the skirt retaining strip and the skirt.



03084

HOPPER LIP SKIRT

A. Hopper
B. Lip Skirt
C. Retaining Strip

6. Position the new skirt on the hopper. Secure it in place with the retaining strip.
7. Raise the hopper, disengage the hopper support bar, and lower the hopper.

BRUSHES

MAIN BRUSH

The main brush is tubular and spans the width of the machine, sweeping debris into the debris hopper. It should be inspected daily for wear or damage. Remove any string or wire found tangled on the main brush, main brush drive hub, or main brush idler hub.

Rotate the main brush end-for-end after every 50 hours of operation for maximum brush life and best sweeping performance.

The main brush pattern should be checked daily. It should be 2 to 2.5 in (50 to 65 mm) wide with the main brush in the (Main Brush Down) position. Main brush pattern adjustments are made by turning the height adjustment knob on the instrument panel.

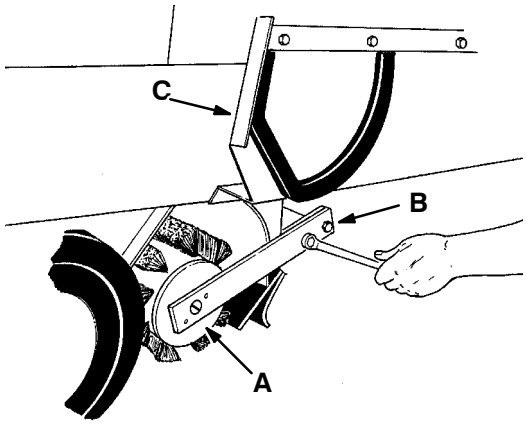
The main brush should be replaced when the remaining bristles measure 1.25 in (30 mm) or less in length.

TO REMOVE MAIN BRUSH

1. Stop engine and set the machine parking brake.

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

2. Place the main brush position lever in the (Main Brush Down) position.
3. Open the left side access door.
4. Remove the brush idler arm retaining bolts from the arm hub.



01128

REMOVING MAIN BRUSH IDLER ARM

A. Brush Idler Arm
B. Arm Retaining Bolt
C. Access Door

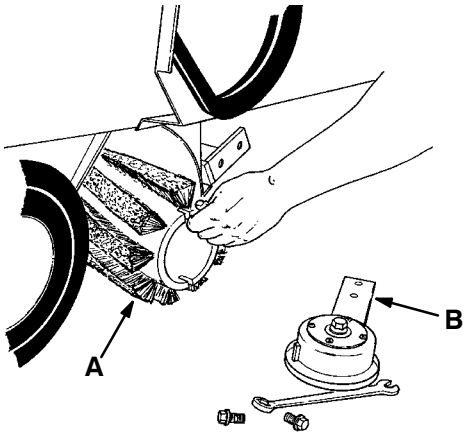
5. Pull the brush idler arm off the arm hub.
6. Grasp the main brush, pull it off the brush drive plug, and out of the main brush compartment.

TO INSTALL MAIN BRUSH

1. Place main brush on the floor next to the access door.

2. Align the main brush drive slots with the drive keys on the main brush drive plug.

3. Slide the main brush into the brush compartment and onto the drive plug. Make sure the drive slots and keys mate.



01129

INSTALLING MAIN BRUSH

A. Main Brush
B. Idler Arm

4. Align the main brush idler plug slots with the main brush keys.

5. Slide the main brush idler plug into the main brush tube.

6. Slide the brush idler arm onto the arm hub.

7. Thread the brush idler arm retaining bolts through the idler arm and into the arm hub.

8. Tighten the brush idler arm retaining bolts.

9. Close the left side access door.

10. Check and adjust the main brush pattern as describe in *TO CHECK AND ADJUST 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.

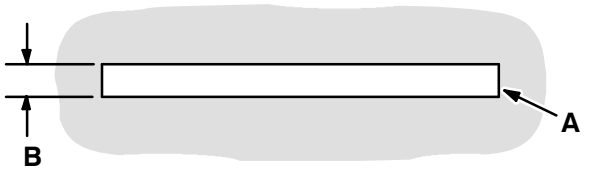
2. With the side brush and main brush raised, position the main brush over the chalked area.

3. Place the main brush position lever in the (Main Brush Down) position 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.

4. Place the main brush position lever in the (Main Brush Up) position.

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.

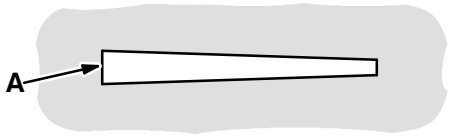
5. Drive the machine off the test area.



00582

NORMAL MAIN BRUSH PATTERN

A. Main Brush Pattern
B. Pattern Width



00601

TAPERED MAIN BRUSH PATTERN

A. Main Brush Pattern

The pattern should be of equal width across the length of the pattern. If the main brush pattern is tapered, wider on one side by 0.50 in (15 mm) or more than the other side, perform the following leveling procedure:

A. Park the sweeper on a level surface, raise the main brush, stop the engine, and set the parking brake.

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

B. Open the left side access door.

C. Remove the main brush.

D. Reinstall the idler arm. Let the front of the arm drop to take up the slack in the holes. Retighten the screws.

E. Place a block under the brush idler plug and release the brush lift handle.

F. Remove the right side access door.

G. Remove the brush drive belt from the spring idler sheave and allow the idler arm to hang down.

H. Loosen the two Hex head screws and move the drive assembly up or down to center it the same distance from the floor as the idler arm to obtain an even pattern. Retighten the screws.

I. Replace the drive belt and remove the block from under the brush idler arm.

J. Reinstall the main brush.

K. Recheck the main brush pattern to see if the main brush is level.

L. Replace the right side access door and close the left side access door.

The pattern should be 2 to 2.5 in (50 to 55 mm) wide. If the main brush pattern is too narrow, turn the main brush height adjustment knob clockwise. If the main brush pattern is too wide, turn the main brush height adjustment knob counterclockwise. Recheck the pattern width after making any adjustments.

SIDE BRUSH

The side brush sweeps debris from curbs or gutters into the path of the main brush. It should be inspected daily for wear or damage. Remove any string or wire found tangled on the side brush or side brush drive hub.

The side brush pattern should be checked daily. Between one-third and one-half of the side brush bristles should contact the floor when the brush is in motion. The side brush pattern adjustment is made by removing the side brush attaching hardware, repositioning the side brush assembly, and replacing the hardware.

The side brush should be replaced when the remaining brush bristle measures 2.5 in (65 mm) in length.

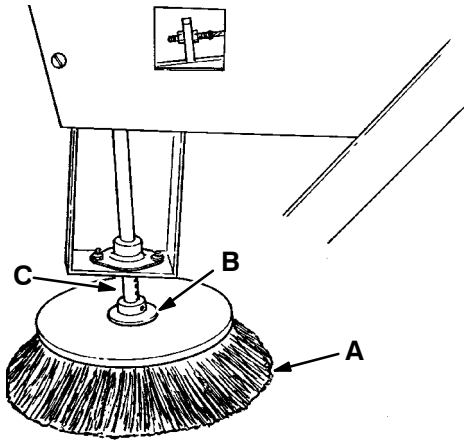
TO REMOVE SIDE BRUSH

1. Stop the engine and set the machine parking brake.

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

2. Place the side brush position lever in the (Side Brush Up) position.

3. Remove the side brush retaining bolt from the side brush hub and shaft.



01127

SIDE BRUSH

A. Side Brush
B. Retaining Bolt
C. Side Brush Drive Shaft

4. Slide the side brush off the side brush drive shaft.

TO INSTALL SIDE BRUSH

1. Slide the side brush onto the side brush drive shaft.

2. Insert the side brush retaining bolt through the side brush hub and shaft.

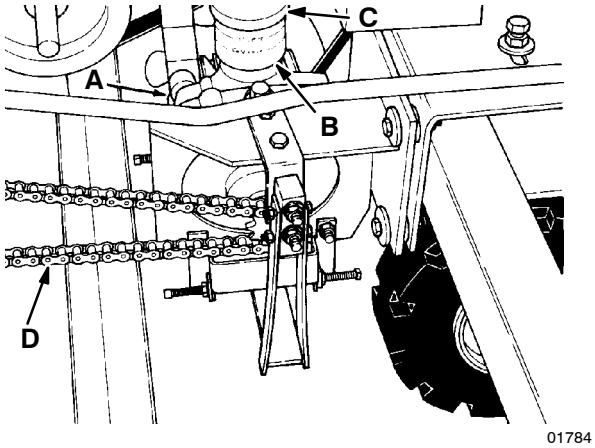
3. Thread a nut onto the threads of the bolt.

4. Tighten the nut and bolt to secure the side brush.

TRANSMISSION

TRANSMISSION

The transmission drives the two front wheels. Check the oil level after every 25 hours of operation by looking at the reservoir mounted on top of the transmission. The cold oil level should be 0 to 0.25 in (0 to 5 mm) above the cold mark. Use straight SAE 20-weight, API class SF engine oil.



TRANSMISSION

A. Transmission
B. Oil Reservoir
C. Fill Cap
D. Transmission Chain

Proper cooling is essential to both performance and life of the transmission. Keep the fan and cooling fins clean.

ATTENTION! Cleaning the transmission with high pressure water spray or live steam may allow water to enter the reservoir. A few drops of water in the system will result in loss of oil, and loss of power.

If contaminants are observed on the reservoir screen, remove, wash and clean it. If the reservoir screen has been pierced, internal failure may occur. The damaged reservoir should be replaced. If the transmission oil color has changed to black or milky, overheating and/or water contamination is indicated. The oil should be drained and replaced with new oil.

NOTE: The threads connecting the plastic reservoir to the aluminum cover are "left hand."

To drain transmission oil, first blow all dirt from the reservoir and vent plug. Remove the drain plug in the bottom of the transmission and the vent plug in the top. Allow the transmission to drain completely, replace the lower plug, and refill the transmission through reservoir with new SAE 20-weight engine oil. Rotate input and output shafts to purge any air trapped in the unit and fill until oil overflows the vent plug opening. Replace the vent plug and fill the reservoir to the "cold" mark.

TRANSMISSION LINKAGE

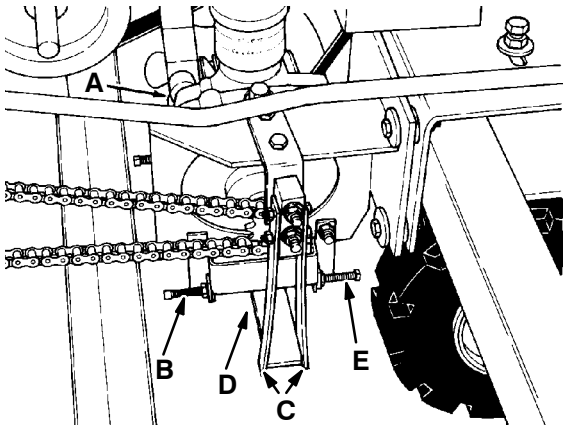
The transmission linkage controls the transmission. It has four adjustments. They are control rod length, forward stop, rear stop, and pintle arm centering. These adjustments need no regular checks. However, they should be checked if any of the linkage parts is replaced or if the transmission position is changed.

The control rod and ball joints between the directional control pedal and the pintle arm should be adjusted so that the full stroke of the transmission may be obtained without interference from anything other than the stop bolts.

The forward stop bolt should be adjusted so that the threaded end of the bolt is 0.06 to 0.12 in (2 to 5 mm) from the bracket.

The rear stop bolt should be adjusted so that the threaded end of the bolt is 1 in (25 mm) from the bracket.

The centering springs should be adjusted so that the pintle arm returns the transmission to the “neutral” position without machine creeping.



TRANSMISSION LINKAGES

A. Transmission
B. Forward Stop Bolt
C. Centering Spring
D. Pintle Arm
E. Rear Stop Bolt

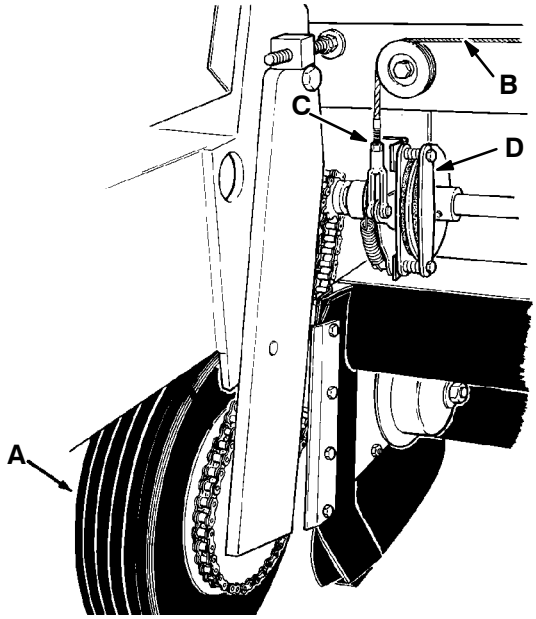
BRAKES AND TIRES

BRAKES

The parking brake and the foot brake operate the brake cable which controls two disc brakes.

The brakes should be adjusted after every 100 hours of operation. The brakes are properly adjusted when the parking brake lever will travel 0.50 in (15 mm) before engaging the brakes.

To adjust the brakes, remove the clevis pin from each brake assembly, turn the clevis ends an equal amount, reconnect the clevis pins, and recheck the parking brake lever travel.



BRAKE ASSEMBLY

A. Right Side Tire
B. Brake Cable
C. Clevis
D. Brake Assembly

TIRES

All of the machine tires are zero-pressure tires and need no regular maintenance.

SECTION 4

CONTENTS

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:

Main brush drive plug nut – 30 ft lb (40 Nm) then tighten to next slot.

Brake unit to hub socket head screw – 9 to 12 ft lb (12 to 16 Nm) with Locktite 242 blue.

Front wheel nut – 10 to 12 ft lb (14 to 16 Nm) while turning wheel, tighten to spec, then backoff, retighten by hand till snug, then turn to next slot.

Damper solenoid nut – 20 to 23 in lb (2.5 to 3 Nm).

Pitman arm to steering column nut – 160 ft lb (215 Nm).

Propelling motor shaft thin nylon lock nut – 7 to 10 ft lb (9 to 14 Nm).

Propelling motor adapter bolts – 16 to 21 ft lb (21 to 28 Nm) with Locktite 242 blue on threads. Use Locktitie 515 sealant on the pilot fillet of the motor and the adapter.

BOLT IDENTIFICATION

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

01395

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

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 Nm)	0.56–18	20 ft lb (27
0.50 Nm)	0.75–16	30 ft lb (41
0.62 Nm)	0.88–14	40 ft lb (54
0.75 Nm)	1.12–12	70 ft lb (95
1.0 Nm)	1.31–12	90 ft lb (122

HYDRAULIC O–RING FITTING TORQUE CHART

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

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

*Aluminum bodied components