TENNANT

95

Operation, Maintenance, and Parts Manual

MM141
Rev. 08 (09–89)

This manual is furnished with each new TENNANT Model . It provides necessary operating and preventive maintenance instructions. Read this manual completely and understand the machine before operating or servicing it.

This manual covers all machine variations and standard accessories. The instruction portion of the manual consists of the Specification, Operation, Maintenance, and Appendix sections. The parts portion consists of the Low Dump Model Parts; LPG Parts; Diesel Parts, Continental ; Diesel Parts, Perkins; Diesel Parts, Kubota; Multi-Level Dump Model Parts; AA Model Parts; SE Model Parts; Accessories; Hydraulic Components; Engine Parts, Gasoline, LPG; ; Engine Parts, Diesel, Continental; Engine Parts, Diesel, Perkins; Engine Parts, Diesel, Kubota; and Cross Reference sections.

All right side and left side references to the machine are determined by facing the direction of forward travel. All hardware considered to be of a common nature or locally available has been omitted from the parts sections. Be aware that this machine may contain metric hardware. Make sure you use equivalent hardware when replacement becomes necessary.

This machine will provide excellent service. However, the best results will be obtained at minimum costs if:

- The machine is operated with reasonable care.
- The machine is maintained regularly – per the maintenance instructions provided.
- The machine is maintained with TENNANT supplied or equivalent parts.

Parts and supplies may be ordered by phone or mail from any TENNANT parts and service center, distributor, or from any of the TENNANT subsidiaries. Before ordering parts or supplies, be sure to have your machine model number and serial number handy. Fill out the data block below for future reference.

MACHINE DATA

Please fill out at time of installation.

Machine Serial Number – _____

Engine Serial Number – _____

Sales Representative – _____

Customer Number – _____

Date of Installation – _____

Manual Number – MM141

Revision: 08

Published: 9–89

03636

Acknowledgements: Technical information and/or illustrations supplied by Teledyne Continental Motors, Industrial Products Division, Inc.; Perkins Engines, Inc; Cessna Fluid Power Division; Eaton Corporation, Hydraulics Division.

ABOUT THIS MANUAL

The machine manual that you received with your TENNANT machine contains valuable information about the operation and maintenance, and numerous sections filled with TENNANT part numbers for the repair of the machine. Please read through this section titled *ABOUT THIS MANUAL* to become familiar with the contents of the machine manual, making the information you are looking for easier to find.

The machine manual consists of several sections of reference information, and the remainder contain part number information for ordering repair parts for the machine. Each section has a shaded bar at the top of the page with the name of that section. Just as this section has the title ABOUT THIS MANUAL on the top of each page. This way you can tell which section you are in at all times.

REFERENCE SECTIONS

The reference information sections of the manual are; General Information, Specifications, Operation, Maintenance, and Appendix.

GENERAL INFORMATION – The General Information section of the manual contains the safety precautions, the location of the safety labels on the machine, and a table of contents of the entire manual. The Safety Precautions are an overview of the safety measures to be observed when operating and maintaining your machine. The location of the safety labels show the mounting location of the safety labels for use in the replacement of the labels. The table of contents in this section is a list of all the table of contents that appear in the front of each section in the manual. This can be used for easy reference to locate information in a particular section of the manual.

SPECIFICATIONS – The Specifications section of the manual contains machine specification information useful in the operation and maintenance of the machine. This section gives you specification information on the engine, electric motors, brake system, hydraulics, fluid capacities, and machine weight to mention a few. The section also has a illustration of the top and side view of the machine with the height and width dimensions displayed.

OPERATION – The Operation section of the manual contains information needed to operate the machine. This section will list the controls and instruments on the machine, overview the machine operation, and tell you how to transport and store the machine.

MAINTENANCE – The Maintenance section contains information on the suggested maintenance procedures and adjustments to keep your machine in top operating condition. The section includes a Maintenance Chart listing the maintenance schedule and the areas of the machine to be addressed. Each subject of maintenance is covered in more detail in such areas as Lubrication, Hydraulics, Engine, and Electrical System.

APPENDIX – The Appendix contains hardware and hydraulic information. Standard hardware torques and identification information is included, plus hydraulic torques if your machine is hydraulically controlled.

PART SECTIONS

The remaining sections of the manual contain part number information for ordering repair parts for your machine. The manual contains part number information on every type of machine model available in the model size of your particular machine. Therefore there will be part number information in your manual you will not need to refer to when wanting to place an order.

The main thing you need to know about your machine is what type of model is it. Is the machine powered by an engine or batteries? If the machine has an engine, is it fueled from gasoline, LPG, or gasoline? If it is a mid-sized or larger sweeper, is it multi-level or low dump? For the scrubbers, is it SRS® or standard. Determining this information about your machine will help guide you through the separate parts sections to find the repair part you need.

The smaller line of sweeper and scrubbers have less complicated part section arrangement, and are easier to find your way through the parts sections. The larger machines can have quite a variety of model types which significantly increases the size to the machine manual. Because of this, on the larger machine we made the first part section, Section 5, a part section which contains parts common to all type of the machine. If the machine has an engine, this section contains parts information on a gasoline powered machine.

The remaining sections contain only parts information which is unique to that particular machine type, such as unique diesel parts on the machine, or unique SRS® parts. Knowing the machine model type you have is important when searching for that part information you need for ordering repair parts. Start in that unique section first when looking for a part, then go to the first parts section, Section 5, if the part can't be found in the unique section.

MACHINE SERIAL NUMBERS

When a design change takes place to a machine, the changes are indicated in the parts sections with machine serial numbers. Know the serial number of your machine which can be found on the machine data plate mounted on the machine. Record this number on the inside front cover of your manual along with your customer number.

Machine number usage is recorded in the *Machine Serial Number* column of the parts lists in the parts sections of the manual. If the machine serial number column lists zeros on the left side of the dash, then this part is used on all machines; such as (000000-).

If the column lists zeros on the left of the dash and a number on the right of the dash, then the part is used on machines up to and including that machine serial number; such as (00000-002345).

For parts that are used on machines beginning at and continuing on from a certain serial number, the column would list a serial number on the left of the dash and have blank spaces on the right side of the dash; such as (002346-). This part would be used on machines starting with that machine serial number and greater.

Finally, parts can be used on machines with serial numbers in a certain block of numbers. In this situation there is a serial number on the left and right side of the dash. The part is then used on a machine with a serial number starting at the number on the left and up to and including the number on the right; such as (002346-008900).

PARTS ASSEMBLIES

A part assembly has parts within the assembly, such as a parking brake consisting of other smaller parts. What parts are contained in a part assembly can be determined by an indentation arrangement in the description column of the parts lists.

Here is an example of a part assembly, in this case we will use the parking brake mentioned previously:

Machine Serial Number	**Description**	**Qty.**
(000000-)	Parking Brake	1
(000000-)	Pin, Roll	1
(000000-)	Link	1
(000000-)	Spring, Compression	1
(000000-)	Pin, Roll	1
(000000-)	Support	1
(000000-)	Lever, Release	1
(000000-)	Rod, Parking Brake	1
(000000-)	Washer, 0.50"	3

In this example, the parts whose descriptions are indented under the parking brake are all parts of the parking brake. When you order the parking brake you will receive all the parts listed under it. You also can order any of the individual parts listed under the parking brake if it is the only part you need.

SUPPLIER COMPONENT BREAKDOWNS

TENNANT purchases certain components of the machine from suppliers. Some of these components are engines, hydraulic pumps and motors, electric motors, and solution pumps.

For those purchased components that are repairable, lists of parts for them appear in the later part of the parts sections. These are the supplier breakdowns. The engine breakdown contains both supplier and TENNANT parts numbers for repair parts. Breakdowns for hydraulic and electrical components have TENNANT part numbers for the parts TENNANT supplies. The serial numbers listed in any of the parts lists in these sections is a serial number the manufacturer uses to identify design changes in their particular component.

ORDERING REPAIR PARTS

Once you have located a part to order, there are several things you need to have to place the order. At the beginning of each parts section is an Ordering Repair Parts page which lists the information you will need to place your order. Review this list before placing the order.

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 modified for use in those areas.**
   - **In areas with possible falling objects unless equipped with overhead guard.**

2. **Before starting machine:**
   - **Check for fuel leaks (gasoline, LPG, diesel).**
   - **Make sure all safety devices are in place and operate properly. See OPERATION section.**
   - **Check brakes and steering for proper operation.**

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

4. **When using machine:**
   - **Go slow on grades and slippery surfaces.**
   - **Use care when backing machine.**
   - **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 (if so equipped).**
   - **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.**
   - **Use Tennant Company 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: Hot engine coolant. Scalding can result. Do not open radiator cap or service cooling system until radiator and engine are cool to the touch.

WARNING: Leaking hydraulic fluid under pressure can penetrate skin. Severe infection or death can result. Do not use body to locate leak. Use cardboard to locate leak.

WARNING: Brush throws debris. Severe personal injury can result. Stop motor before lifting hopper.

WARNING: Machine can emit excessive noise. Consult with your regulatory agency for exposure limits. Hearing loss can result. Wear hearing protection.

WARNING: Machine hopper lifts to 108 in (2745 mm) when high dumping. Hopper can hit overhead wires or object. Electrical shock or falling debris can result. Be sure adequate clearance is available before raising hopper.

WARNING: Machine can have static electricity charge. When pouring fuel, spark can ignite fuel causing fire or explosion. Connect wire attached to fuel can to machine to discharge spark before pouring fuel.

WARNING: Machine moves when directional pedal linkage is out of adjustment. Severe personal injury or death can result. If machine creeps when the directional pedal is in neutral, adjust pedal linkage. Engage parking brake when stopped.

WARNING: Falling hopper. Engage hopper support bar before working under hopper.

WARNING: Fuel vapor is present when servicing fuel system. Fire or explosion can result. Keep flames and sparks away.

WARNING: Machine is unstable on jack. Block machine tires before jacking machine up.

WARNING: Machine is unstable on jack. Jack machine up at designated locations only. Block machine up with jack stands.

WARNING: Air or water under pressure. Severe eye or ear injury can result. Wear eye and ear protection.

WARNING: LPG fuel is very cold. Frostbite can result. Wear gloves when connecting or disconnecting LPG hoses.

WARNING: Diesel atomizer spray can penetrate skin. Severe personal injury or death can result. Keep away from atomisers when engine is in operation.

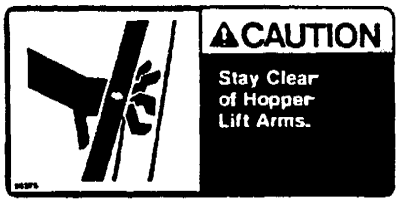
WARNING: Battery acid causes severe burns. Avoid contact. Wash immediately and get medical attention if contact occurs.

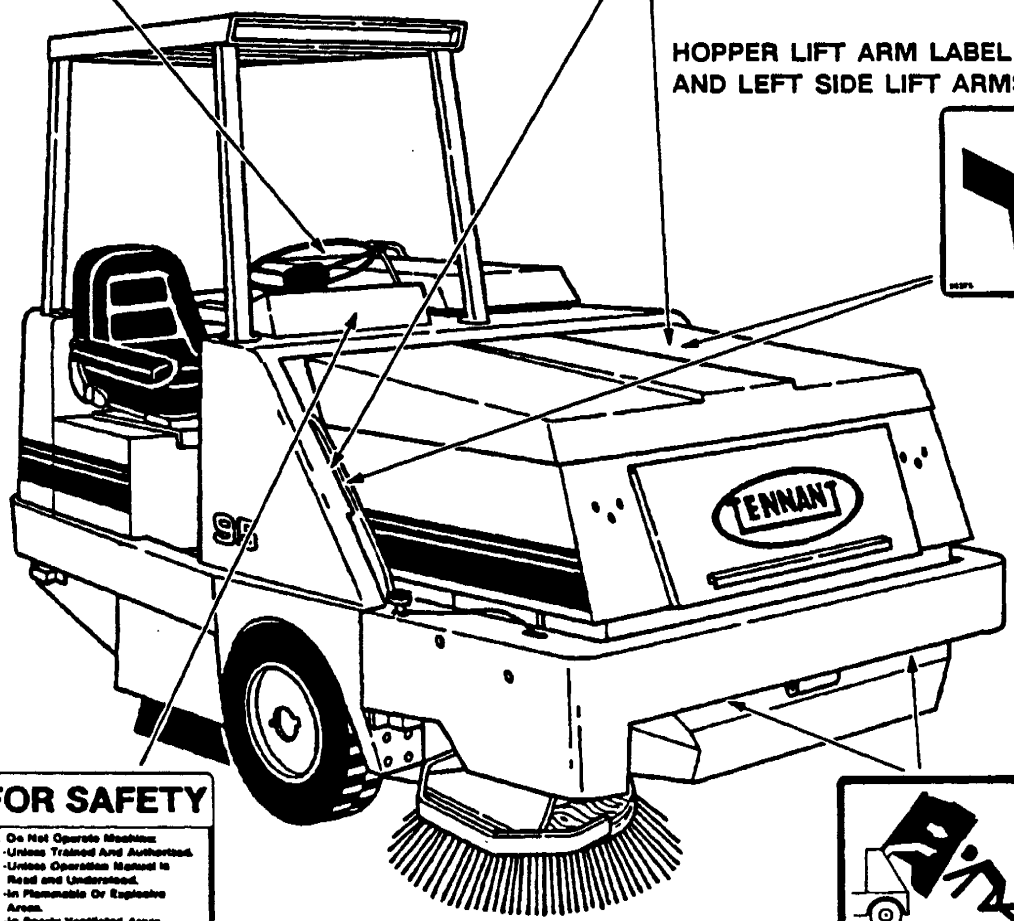
The following safety labels are mounted on the machine in the locations indicated. If these, or any, labels become damaged or illegible, install a new label in its place.

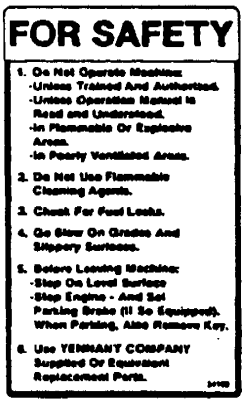
ENGINE FAN LABEL - LOCATED ON THE TOP AND SIDE OF THE RADIATOR FAN SHROUD.

FALLING HOPPER LABEL - LOCATED ON RIGHT AND LEFT SIDE LIFT ARMS. LOW DUMP MODEL ONLY.

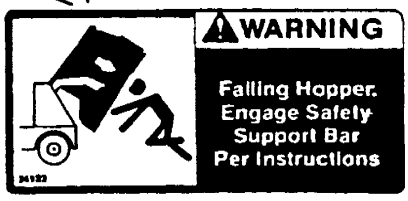
HOPPER LIFT ARM LABEL - LOCATED ON RIGHT AND LEFT SIDE LIFT ARMS.







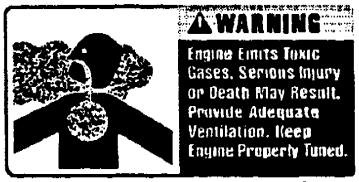
SAFETY LABEL - LOCATED ON THE DRIVER COMPARTMENT PANEL.



FALLING HOPPER LABEL - LOCATED ON UNDER-SIDE OF FRONT BUMPER. LOW DUMP MODEL ONLY.

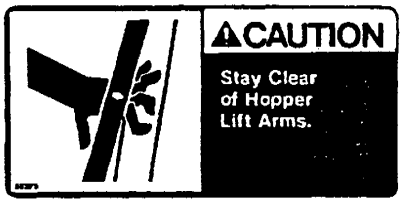
01430

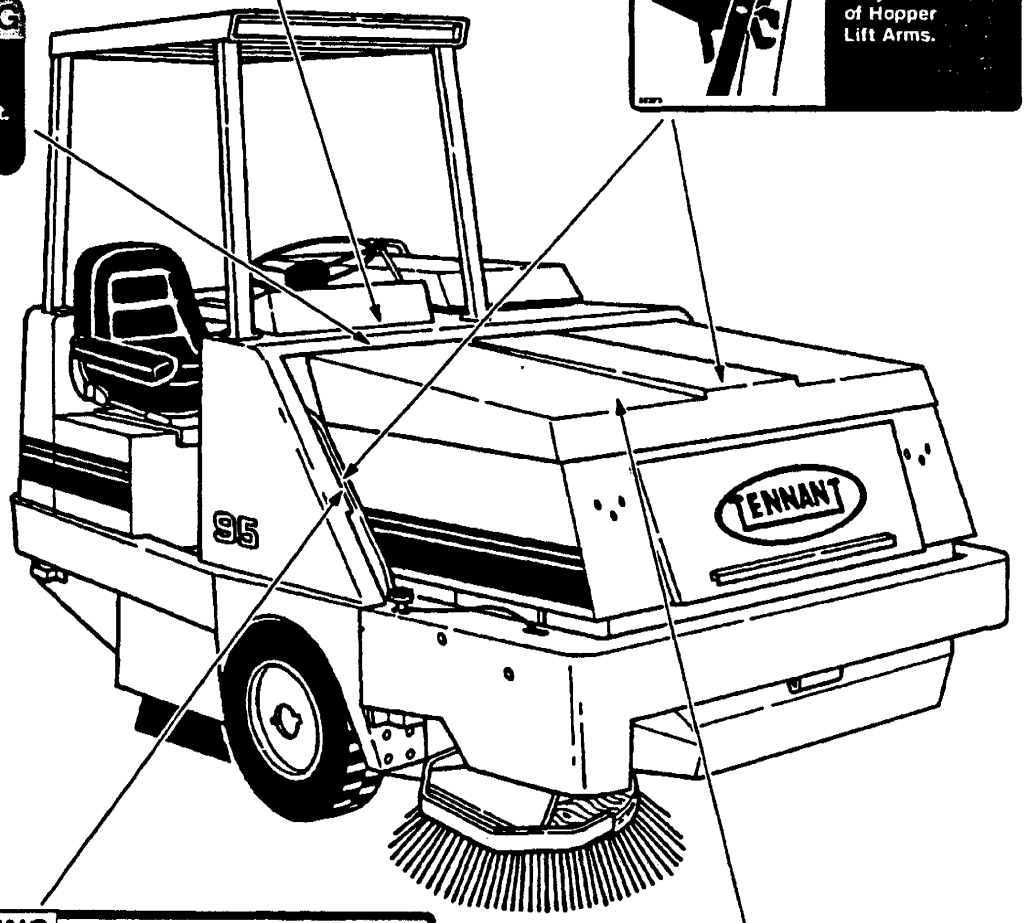
EMISSIONS LABEL - LOCATED ON THE DRIVER COMPARTMENT PANEL.



NOISE LABEL - LOCATED ON THE DRIVER COMPARTMENT PANEL.

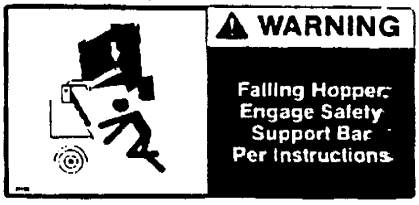
HOPPER LIFT ARM LABEL - LOCATED ON RIGHT AND LEFT SIDE LIFT ARMS.





FALLING HOPPER LABEL - LOCATED ON LEFT SIDE LIFT ARM AND ON HOPPER SAFETY SUPPORT BAR. MULTI-LEVEL DUMP, AA, SE MODELS ONLY.

01430



FALLING HOPPER LABEL - LOCATED ON LINTEL/PUMP BAFFLE. MULTI-LEVEL DUMP, AA, SE MODELS ONLY.

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MACHINE SPECIFICATIONS

POWER TYPE

Engine Manufacturer/model – Continental TM27
Engine type – piston
Ignition – breakerless-type spark
Cycle – 4
Aspiration – natural
Cylinders – 4
Bore – 3.58 in (91 mm)
Stroke – 4.06 in (103 mm)
Displacement – 164 cu in (2680 cc)
Net power – 58 hp (43 kw) @ 2200 rpm governed
70 hp (52 kw) @ 3000 rpm maximum
Fuels – gasoline, 85 octane minimum, unleaded, or LPG
Cooling system – water
Electrical system – 12 V nominal, 37 A alternator, low dump, multi-level dump, AA models, 30 A totally enclosed alternator, SE model

Engine Manufacturer/model – Continental TMD27
Engine type – piston
Ignition – diesel
Cycle – 4
Aspiration – natural
Cylinders – 4
Bore – 3.58 in (91 mm)
Stroke – 4.06 in (103 mm)
Displacement – 164 cu in (2680 cc)
Net power – 51 hp (38 kw) @ 2200 rpm governed
66 hp (49 kw) @ 3000 rpm maximum
Fuels – #1 or #2 diesel fuel, 45 cetane minimum
Cooling system – water
Electrical system – 12 V nominal, 37 A alternator, low dump, multi-level dump, AA models, 30 A totally enclosed alternator, SE model

Engine Manufacturer/model – Perkins 4.108
Engine type – piston
Ignition – diesel
Cycle – 4
Aspiration – natural
Cylinders – 4
Bore – 3.125 in (79.4 mm)
Stroke – 3.5 in (88.9 mm)
Displacement – 108 cu in (1770 cc)
Net power – 35 hp (26 kw) @ 2200 rpm governed
43 hp (32 kw) @ 3000 rpm maximum
Fuels – #1 or #2 diesel fuel
Cooling system – water
Electrical system – 12 V nominal, 37 A alternator, low dump, multi-level dump, AA models, 30 A totally enclosed alternator, SE model

Engine Manufacturer/model – Kubota V1902
Engine type – piston
Ignition – diesel
Cycle – 4
Aspiration – natural
Cylinders – 4
Bore – 3.35 in (85 mm)
Stroke – 3.23 in (82 mm)
Displacement – 113.57 cu in (1861 cc)
Net power – 34 hp (25.4 kw) @ 2200 rpm
governed 38.5 hp (28.7 kw) @ 2800 rpm maximum
Fuels – #2 diesel fuel
Cooling system – water
Electrical system – 12 V nominal, 37 A alternator, low dump, multi-level dump, AA models, 30 A totally enclosed alternator, SE model

POWER TRAIN

Propelling – hydraulic drive motor, rear wheel
Main brush – hydraulic drive motor
Side brush – hydraulic drive motor
Vacuum fan – hydraulic drive motor

STEERING

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

HYDRAULIC SYSTEM

Function – operates propelling, hopper lift, hopper dump, main brush drive, side brush drive, and vacuum fan drive.

Control valve, hopper dump, main brush drive, low dump model – open center, single spool.

Control valve, hopper lift, hopper dump, main brush drive, multi-level dump, AA, SE models – open center, two spool.

Control valve, side brush drive – open center, one spool.

Control valve, air assist drive, AA model – open center, one spool.

Propelling pump – variable displacement piston pump, 23.6 gpm (89 L/min) @ 2200 rpm

Propelling system rated pressure - 4500 psi (31,030 kPa)

Accessories pump - gear pump, 8 gpm (30 L/min) @ 2200 rpm.

Accessories system rated pressure - 2000 psi (13,790 kPa)

Air assist pump, AA model - gear pump, 8 gpm (30 L/min) @ 2200 rpm.

Dump cylinder system rated pressure - 500 psi (3450 kPa).

Propelling motor - internal gear motor, 29.9 cu in (490 cc) displacement per revolution. 4500 psi (31,030 kPa) maximum rated pressure.

Main brush motor - internal gear motor, 4.5 cu in (80 cc) displacement per revolution. 2500 psi (17,240 kPa) maximum rated pressure.

Side brush motor - internal gear motor, 17.9 cu in (295 cc) displacement per revolution. 2500 psi (17,240 kPa) maximum rated pressure.

Vacuum fan motor - external gear motor, 0.26 cu in (4 cc) displacement per revolution. 3000 psi (20,685 kPa) maximum rated pressure

Air assist fan motor - external gear motor, 0.40 cu in (7 cc) displacement per revolution, 2000 psi (13,790 kPa) maximum rated pressure.

Hopper lift cylinder, low dump model - double action, 3 in (75 mm) bore x 11.8 in (300 mm) stroke, 1.37 in (35 mm) diameter rod, 2500 psi (17,240 kPa) maximum rated pressure.

Hopper lift cylinder, multi-level dump, AA, SE models - double action, 3.5 in (90 mm) bore x 20.7 in (525 mm) stroke, 1.5 in (40 mm) diameter rod, 2500 psi (17,240 kPa) maximum rated pressure.

Hopper dump cylinder, multi-level dump, AA, SE models (2) - double action, 2 in (51 mm) bore x 12 in (305 mm) stroke, 1 in (25 mm) diameter rod, 2500 psi (17,240 kPa) maximum rated pressure.

BRAKING SYSTEM

Service brakes - hydraulic drum brakes (2), one per front wheel, foot brake master cylinder actuated

Parking brakes - utilizes service brakes, cable actuated

SUSPENSION SYSTEM

Front - two 21 x 5 x 12 solid tires
Rear, low dump model - one 6.90/6.00 x 9 pneumatic tire
Rear, multi-level dump, AA, and SE models - one 6.90/6.00 x 9 solid tire

SYSTEM FLUID CAPACITIES

Engine cooling system, gasoline, LPG - radiator 7.4 qt (7 L)
Engine cooling system, gasoline, LPG - total system 11.2 qt (10.6 L)

Engine cooling system, Continental diesel - radiator 7.4 qt (7 L)
Engine cooling system, Continental diesel - total system 11.2 qt (10.6 L)

Engine cooling system, Perkins diesel - radiator 7.4 qt (7 L)
Engine cooling system, Perkins diesel - total system 11 qt (10.4 L)

Engine cooling system, Kubota diesel - radiator 7.4 qt (7 L)
Engine cooling system, Kubota diesel - total system 14.6 qt (13.8 L)

Engine lubricating oil, gasoline, LPG - 7 qt (6.6 L) without filter
Engine lubricating oil, Continental diesel - 7 qt (6.6 L) with filter
Engine lubricating oil, Perkins diesel - 5 qt (4.7 L) with filter
Engine lubricating oil, Kubota diesel - 8.38 qt (9 L) with filter

Fuel tank, gasoline, diesel - 12.9 gal (50 L)
Fuel tank, LPG - 33 lb (15 kg)

Hydraulic system - reservoir 5 gal (19 L) total system 7 gal (26 L)

GENERAL MACHINE DIMENSIONS - CAPACITIES

Length - 111.5 in (2830 mm)

Width - 71 in (1805 mm)

Height, without overhead guard - 59 in (1500 mm)
Height, with overhead guard - 81.5 in (2070 mm)
Height, with overhead guard and hazard light - 90.5 in (2300 mm)

Track - front, 60.5 in (1535 mm)
Wheel base - 48.9 in (1240 mm)

Main brush, tubular diameter - 16 in (405 mm)
tubular length - 50 in (1270 mm)
Side brush, rotary diameter - 26 in (660 mm)

Sweeping path width, without side brush - 50 in (1270 mm)
Sweeping path width, with side brush - 66 in (1676 mm)

Hopper capacity - 1800 lb (815 kg) 26.7 cu ft (0.76 m^3)

Dust filter area - 162 sq ft (15 m^2)

MACHINE WEIGHTS

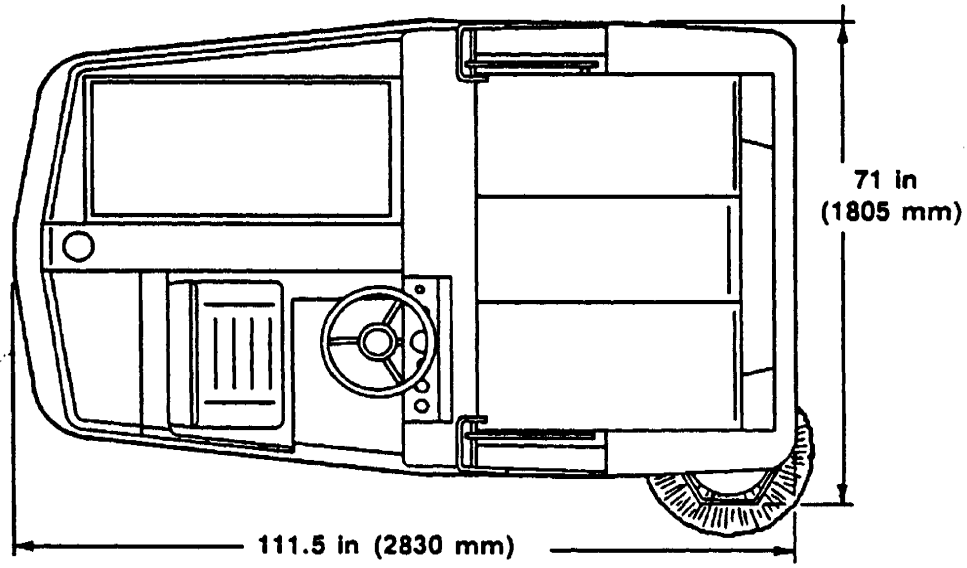
Net weight, dry, low and multi-level dump models - 4628 lb (2100 kg)
Net weight, dry, AA model - 4850 lb (2200 kg)
Net weight, dry, SE model - 4831 lb (2190 kg)

Net GVWR, low and multi-level dump models - 6628 lb (3005 kg)
Net GVWR, AA model - 6850 lb (3105 kg)
Net GVWR, SE model - 6831 lb (3100 kg)

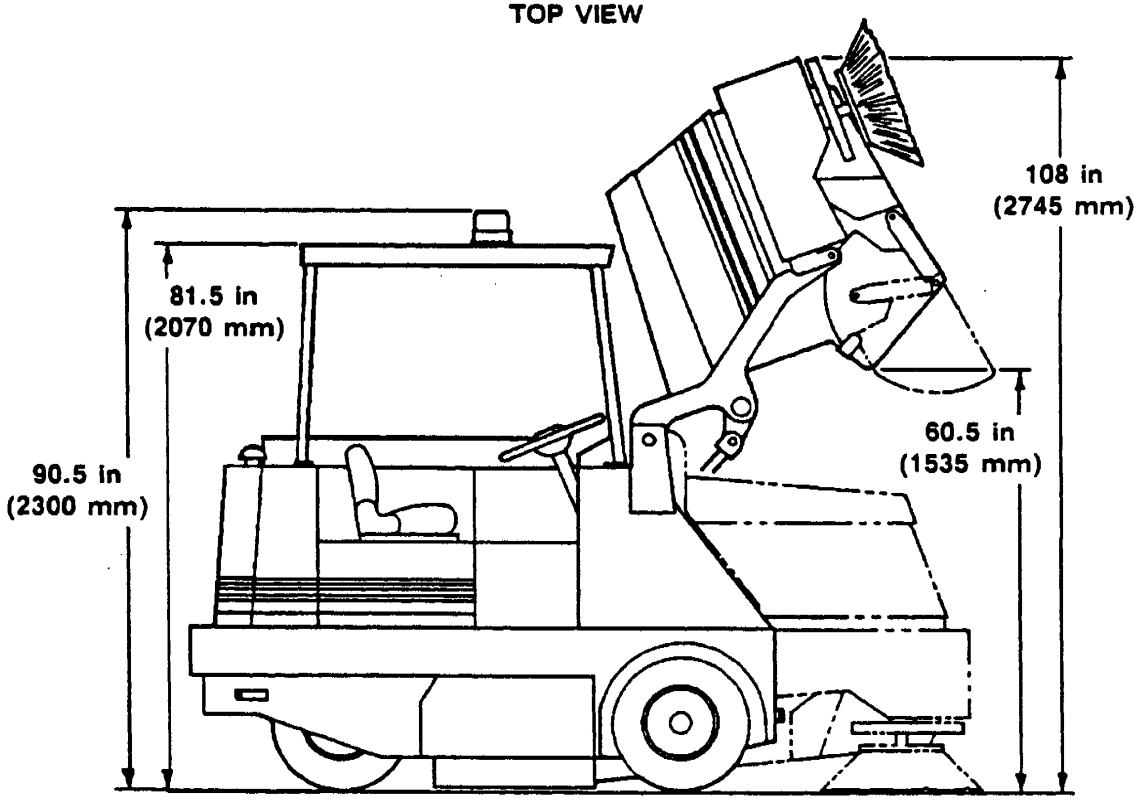
GENERAL MACHINE PERFORMANCE

Maximum forward speed - 10.7 mph (17 km/h)
Maximum reverse speed - 6 mph (10 km/h)
Turning radius, right - 91.5 in (2325 mm)
Turning radius, left - 70.75 in (1795 mm)

MACHINE DIMENSIONS



TOP VIEW



SIDE VIEW

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PREPARATION FOR OPERATION

AFTER UNCRATING 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. Check the hydraulic fluid level in the hydraulic fluid reservoir using the sight gauge provided. TENNANT® hydraulic fluid is recommended. If TENNANT® hydraulic fluid is not available, use only new-approved hydraulic fluid. See *HYDRAULICS* in the *MAINTENANCE* section.

4. Check the engine oil level.

5. Check the radiator coolant level.

WARNING: Hot engine coolant. Scalding can result. Do not open radiator cap or service cooling system until radiator and engine is cool to the touch.

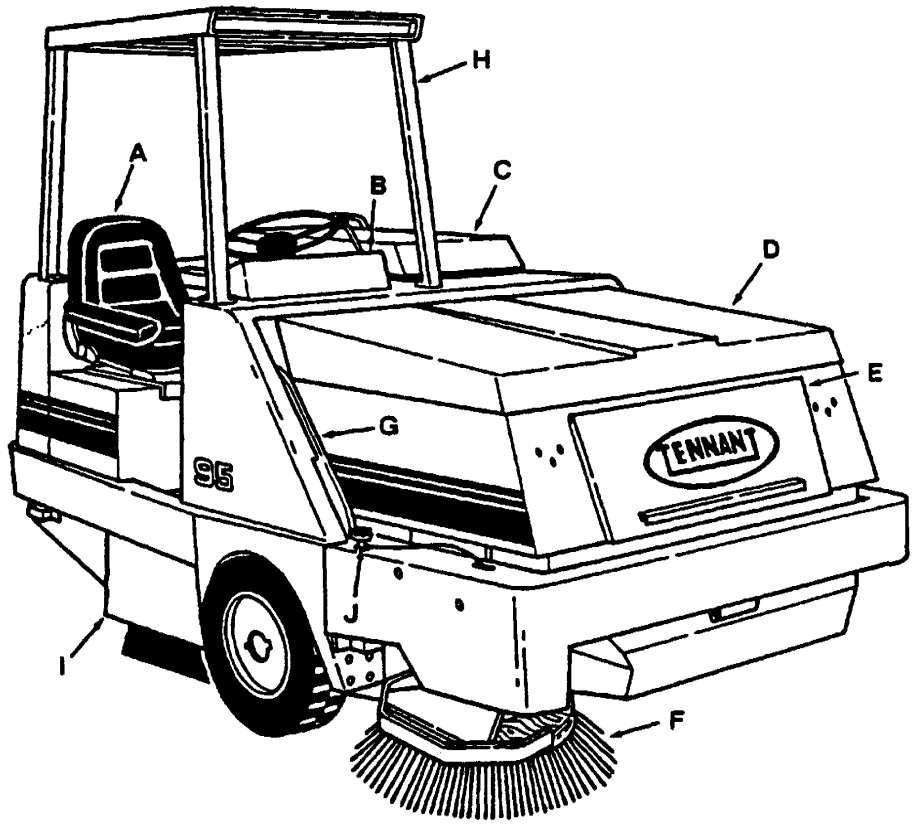
6. Check the brush adjustment, as described in *MAINTENANCE* section.

7. Check the air pressure of the rear tire, low dump model only.

8. Fill the fuel tank, or install an LPG fuel tank on the machine per the instructions in this manual.

WARNING: Machine can have static electricity charge. When pouring fuel, spark can ignite fuel causing fire or explosion. Connect wire attached to fuel can to machine to discharge spark before pouring fuel.

OPERATION OF CONTROLS



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MACHINE COMPONENTS

A. Operator Seat
B. Instrument Panel
C. Engine Cover
D. Hopper
E. Hopper Inspection Door
F. Side Brush
G. Hopper Support Arm
H. Overhead Guard
I. Main Brush Access Door
J. Side Brush Height Adjustment Knob

INSTRUMENT PANEL SYMBOLS

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


Idle


Fast


Side Brush


Main Brush On


Hopper Up


Hopper Hold


Hopper Door Open


Hopper Door Close


Main Brush Free-float


Main Brush Down


Main Brush Up


Filter Clogged


Filter Shaker


Operational Lights

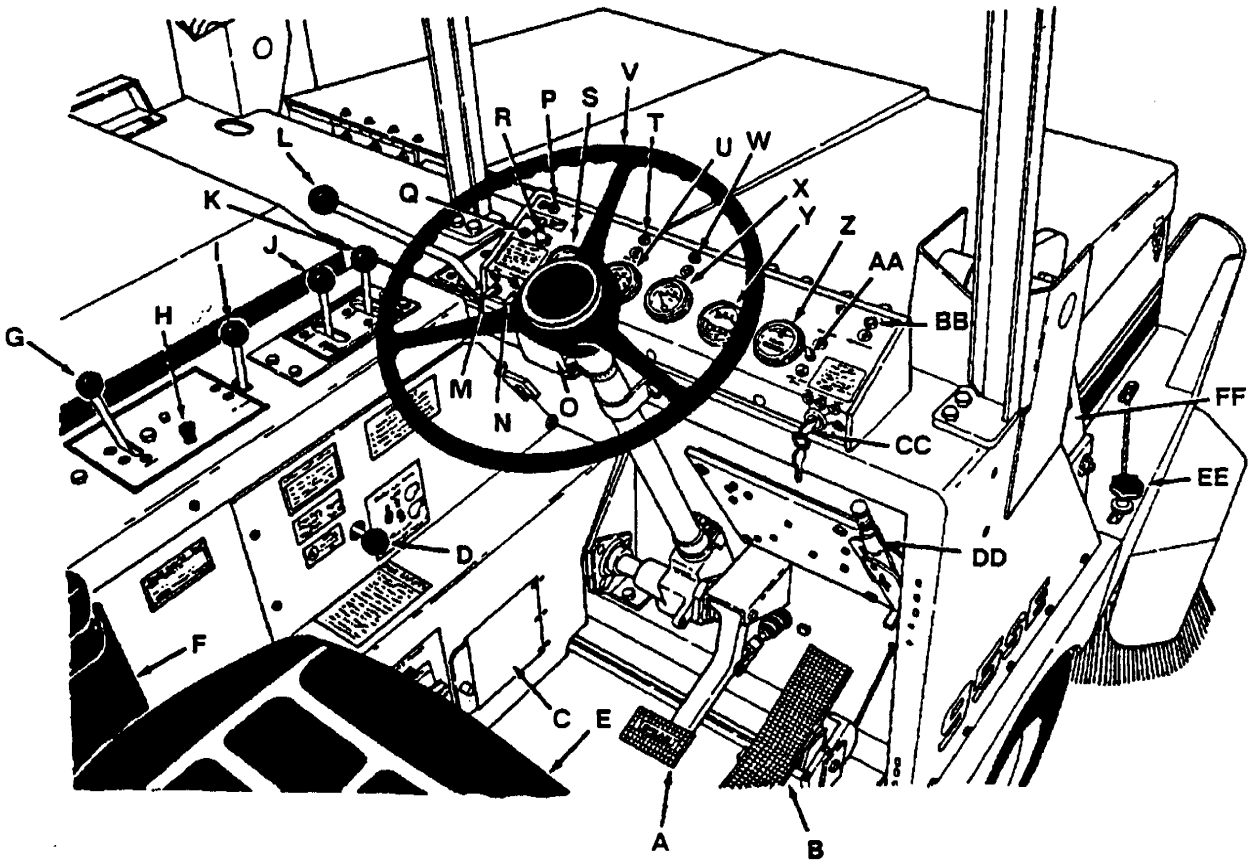

Hazard Light


Engine Water Temperature


Engine Oil Pressure


Diesel Preheat


Key Switch



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CONTROLS AND INSTRUMENTS

A. Brake Pedal
B. Directional Pedal
C. Main Brush Height Adjustment Knob
D. Air Assist Knob - AA Model
E. Operator Seat
F. Manual Pouch
G. Throttle Lever
H. Engine Choke Knob
I. Side Brush Lever
J. Main Brush and Hopper Lift Lever
K. Hopper Door Lever - Multi-Level Dump, AA, SE Models
L. Main Brush Position Lever
M. Operating Lamps Switch
N. Hazard Lamp Switch
O. Turn Signal Switch
P. Dump Door Indicating Lamp - Multi-Level Dump, AA, SE Models
Q. Clogged Dust Filter Indicating Lamp
R. Dust Filter Shaker Pushbutton Switch
S. Fuel Level Gauge
T. High Engine Coolant Temperature Indicating Lamp - SE Model
U. Engine Coolant Temperature Gauge
V. Steering Wheel
W. Low Engine Oil Pressure Indicating Lamp - SE Model
X. Oil Pressure Gauge
Y. Battery Condition Gauge
Z. Engine Hour Meter
AA. Side Brush Position Switch
BB. Diesel Pre-Heat Indicating Lamp - Perkins Continental and Diesel
BB. Diesel Pre-Heat Switch - Kubota Diesel
CC. Key-Operated Ignition Switch
DD. Parking Brake
EE. Side Brush Height Adjustment Knob
FF. Hopper Support Bar

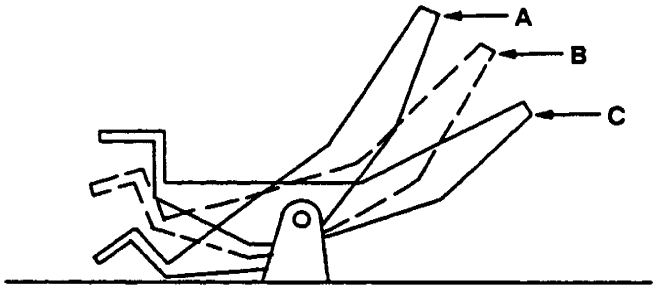
BRAKE PEDAL

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

To stop the machine, return the directional pedal to neutral; then apply pressure to the brake pedal.

DIRECTIONAL PEDAL

A single foot pedal controls the hydraulic propelling drive. The foot pedal is used to select the direction of travel and the propelling speed of the machine.



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DIRECTIONAL PEDAL

A. "Reverse" Position
B. "Neutral" Position
C. "Forward" Position

Gradually press the "toe" position of the pedal for forward travel or the "heel" portion of the pedal for reverse travel. The propelling speed of the machine is regulated by varying the pressure on the pedal.

WARNING: Machine free-wheels when machine is moving and directional pedal is reversed. Severe personal injury or death can result. Use brakes to control machine speed.

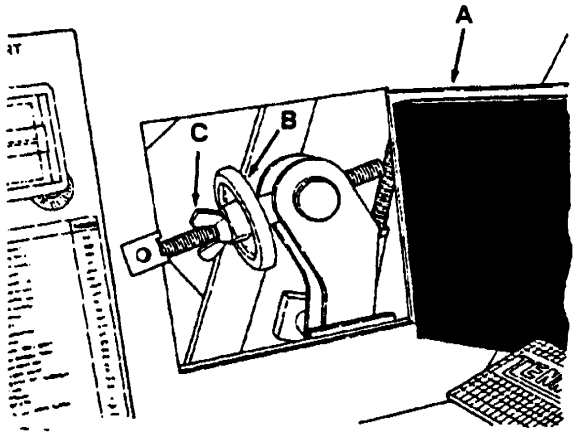
If the machine creeps when the pedal is in the neutral position, adjust the pedal as directed in *DIRECTIONAL PEDAL "NEUTRAL" POSITION ADJUSTMENT* in the *MAINTENANCE* section.

WARNING: Machine moves when directional pedal linkage is out of adjustment. Severe personal injury or death can result. If machine creeps when the directional pedal is in neutral, adjust pedal linkage. Engage parking brake when stopped.

MAIN BRUSH HEIGHT ADJUSTMENT KNOB

The main brush height adjustment knob is located behind an access door next to the operator's left foot. It limits the main brush lift linkage travel. The greater the linkage travel, the greater the amount of floor contact the main brush will have.

Threading the knob clockwise raises the main brush, reducing the main brush floor contact. Threading the knob counterclockwise lowers the main brush, increasing main brush floor contact.



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MAIN BRUSH HEIGHT ADJUSTMENT KNOB

A. Access Door
B. Adjustment Knob
C. Wing Nut

AIR ASSIST KNOB - AA MODEL

The air assist knob is present only on the AA model. The air assist knob controls the air assist motor. Pulling the knob out starts the air assist fan. Pushing the knob in stops the air assist fan. The air assist enhances the loading of light litter. The air assist fan should not be used when picking up heavy debris such as gravel or sand.

OPERATOR SEAT

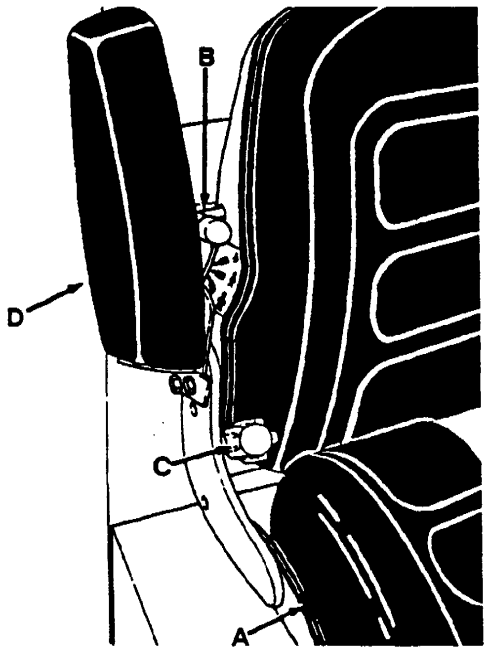
The operator seat is a three-way adjustable seat with armrests. It has adjustments to compensate for operator weight, to vary the backrest angle, and to vary the front to rear seat position.

The weight adjustment lever has three positions. One for light operators, one for medium weight operators, and one for heavy operators. Pull the lever up for light operators, position the lever horizontally for medium weight operators, and down for heavy operators.

The backrest angle is adjusted by rotating the knob clockwise to decrease the backrest angle or counterclockwise to increase the backrest angle.

The seat position is adjusted by pulling the seat position lever out to the left, sliding the seat forward or backward to a comfortable position, and releasing the lever.

The right side armrest may be rotated up and back to enter or exit from the operator seat.



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OPERATOR SEAT

A. Seat
B. Weight Adjustment Lever
C. Backrest Angle Knob
D. Armrest

THROTTLE LEVER

The throttle lever operates a rod which controls the engine governed speed. To slow the engine to idle speed, push the lever into the top (Idle) position. To speed the engine to the maximum governed speed, pull the lever back into the bottom (Fast) position.

ENGINE CHOKE KNOB

The engine choke knob is present on gasoline powered machines. It operates a cable which controls the engine choke. Pulling out on the knob closes the choke, aiding in the cold starting of the engine. Pushing in the knob opens the choke, allowing the engine to run normally at its operating temperature and speed. It is not necessary to choke a warm engine.

SIDE BRUSH LEVER

The side brush lever controls the side brush motor. Pushing the lever into the top position starts the side brush rotating, provided that the main brush is also operating. Pulling the lever into the bottom position stops the side brush rotation.

MAIN BRUSH AND HOPPER LIFT LEVER

The main brush and hopper lift lever controls main brush rotation and the hopper height position.

To start the main brush, side brush, and vacuum fan, push the lever into the top (Main Brush On) position. To raise the debris hopper, pull the lever back into the (Hopper Up) position. To stop and hold the hopper in a raised position, pull the lever into the bottom (Hopper Hold) position. The lever position between Main Brush On and Hopper Up turns off the main brush, side brush, and vacuum and allows the hopper to lower.

WARNING: Falling hopper. Engage hopper support bar before working under hopper.

HOPPER DOOR LEVER

The hopper door lever is present on multi-level dump, AA, and SE model machines. The lever controls the hopper door position. To open the hopper door into the operating position, push the lever into the top (Hopper Door Open) position. To close the hopper door so the hopper may be raised without allowing debris to spill out, pull the lever back into the bottom (Hopper Door Close) position.

Always sweep with the hopper door open in the operating position.

MAIN BRUSH POSITION LEVER

The main brush position lever controls the position of the main brush. There are two positions in which the main brush may be operated. The positions are normal and free-float. The normal sweeping position is used for most sweeping conditions. Operating in the normal position will extend main brush life. The free-float position is used when sweeping extremely uneven areas. The free-float position allows the main brush to follow the uneven surfaces more closely.

To lower the main brush for normal sweeping, pull the lever back and to the right into the (Main Brush Down) position.

To lower the main brush for sweeping extremely uneven surfaces, pull the lever back and to the right into the (Main Brush Free Float) position.

To raise the main brush, pull the lever all the way back then to the left into the (Main Brush Up) position.

NOTE: Always raise the main brush when the machine is not being operated for a period of time to prevent the main brush from taking a set.

OPERATING LAMPS SWITCH

The operating lamps switch is present on machines with the operating lamps accessory. It controls the headlights, taillights, and the brush spot lamp. Flip the switch toggle upward to turn the lamps on. Flip the switch toggle down to turn the lamps off.

HAZARD LAMP SWITCH

The hazard lamp switch is present on machines with the hazard lamp accessory. Flip the switch toggle up to turn the lamp on. Flip the switch toggle down to turn the lamp off.

TURN SIGNAL SWITCH

The turn signal switch is present on machines with the operating lamps accessory. It controls the turn signal lamps. Pushing the turn signal switch arm forward signals a right turn. Pulling the signal switch arm back signals a left turn.

DUMP DOOR INDICATING LAMP

The dump door indicating lamp is present on multi-level dump, AA, and SE model machines. The lamp lights when the hopper dump door is not fully open. The dump door should be fully open and indicating lamp off whenever debris is being picked up. It should be closed when raising the hopper to dump the debris.

Do not sweep with the dump door indicating lamp lighted.

CLOGGED DUST FILTER INDICATING LAMP

The clogged dust filter indicating lamp lights when the dust filters become clogged and excessively restrict vacuum air flow. Lower the hopper, shut off the main brush and vacuum fan, and push the dust filter shaker pushbutton switch to shake the dust filter. Shake the dust filters when necessary to remove the air restriction. It may be necessary to clean or replace the dust filters to remove the air restriction. Do not continue to sweep with the clogged dust filter indicating lamp lighted as dust pickup will be reduced.

DUST FILTER SHAKER PUSHBUTTON SWITCH

The dust filter shaker pushbutton switch operates the shaker motors which are mounted on top of the hopper dust filters.

To operate the shaker motors, the hopper must be in the operating position. Turn the main brush and side brush off. Push the pushbutton switch in to shake the dust filters. The filter shakers will operate for 30 seconds and shut off automatically.

FUEL LEVEL GAUGE

The fuel level gauge is present on all gasoline and diesel powered machines. The gauge indicates how much fuel is left in the fuel tank.

ENGINE COOLANT TEMPERATURE GAUGE

The engine coolant temperature gauge registers the engine coolant temperature. Normal engine coolant temperatures range up to 200° F (93° C). Temperatures above this level indicate an over-heating engine. This condition may arise due to a low coolant level, a clogged radiator, a loose fan belt, a defective thermostat, or other engine malfunctions. Engine overheating will always cause a coolant loss. If coolant loss does not occur, check for malfunction of the temperature sending unit.

HIGH ENGINE COOLANT TEMPERATURE INDICATING LAMP - SE MODEL

The high engine coolant temperature indicating lamp is present only on the SE model. The lamp lights when the engine coolant temperature exceeds 225° F (107° C).

STEERING WHEEL

The automotive-type steering wheel operates the rear caster wheel through an arm and tie rod. The machine is very responsive to the movement of the steering wheel. Use care until you become more experienced in guiding the machine.

ENGINE OIL PRESSURE GAUGE

This gauge registers the engine oil pressure. Normal engine oil pressure ranges from 7 psi (48 kPa) at idle, to 35 psi (241 kPa) at full engine throttle. If the gauge registers an oil pressure reading below 7 psi (48 kPa), stop the engine immediately and determine the cause. Failure to stop the engine will result in severe engine damage.

LOW ENGINE OIL PRESSURE INDICATING LAMP - SE MODEL

The low engine oil pressure indicating lamp is present only on the SE model. The lamp lights when the engine oil pressure drops below 7 psi (50 kPa).

BATTERY CONDITION GAUGE

The battery condition gauge indicates the present voltage potential of the battery. Normal battery voltage is 10 to 14 volts. If the battery voltage exceeds 14 volts, it may be overcharging. If the battery voltage falls below 10 volts, it may not be accepting or getting a charge from the alternator. Overcharging and undercharging are indications that one or more electrical components is in need of repair.

HOUR METER

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

SIDE BRUSH POSITION SWITCH

The side brush position switch controls the side brush position. Flip the switch toggle up to raise the side brush on. Flip the switch toggle down to lower the side brush.

DIESEL PRE-HEAT INDICATING LAMP

The diesel pre-heat indicating lamp is present on Continental and Perkins diesel powered machines. The lamp lights when the diesel pre-heater is in operation.

DIESEL PRE-HEAT SWITCH

The diesel pre-heat switch is present on Kubota diesel powered machines. To operate the pre-heat, depress and hold the switch in for one minute.

KEY-OPERATED IGNITION SWITCH

The key-operated ignition switch starts the engine.

Gasoline and LPG powered machines: To start the engine, turn the key fully clockwise. Release the key as soon as the engine starts.

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.

Continental and Perkins diesel powered machines: To start the engine, turn the key clockwise. The diesel pre-heat indicating lamp may light. Wait until the lamp goes off and then turn the key fully clockwise to start the engine. Release the key as soon as the engine starts.

NOTE: The diesel pre-heater stops when the ignition key is advanced past the on position. To reactivate the diesel pre-heater, the key must be turned back to the off position to reset the pre-heat solenoid.

Kubota diesel powered machines: If the pre-heat switch is needed, depress and hold the switch for one minute. Release the pre-heat switch. To start the engine, turn the key fully clockwise. Release the key as soon as the engine starts.

PARKING BRAKE

The parking brake operates the two front wheel brakes. Pulling the brake handle up sets the parking brake. Pushing the brake handle to the left and down releases the parking brake. Always set the parking brake before leaving the machine unattended and before working on the machine.

HOPPER SUPPORT BAR

The hopper support bar is present on the operator's side of the hopper to hold the hopper in a raised position for a length of time to allow work to be done under the hopper. Do not rely on the machine hydraulic system to keep the hopper raised.

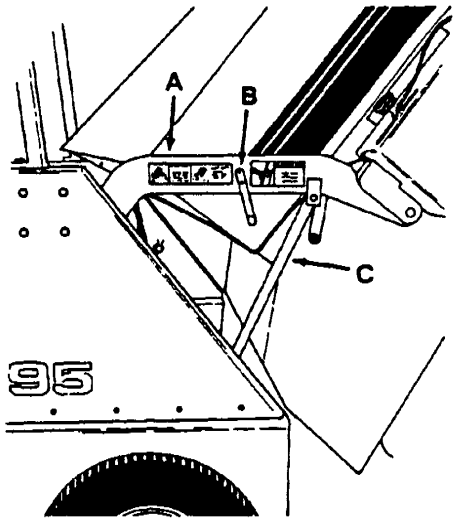
WARNING: Falling hopper. Engage hopper support bar before working under hopper.

TO ENGAGE LOW DUMP MODEL HOPPER SUPPORT BAR

1. Set the machine parking brake and start the engine.

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

2. Raise the hopper to the fully raised position.
3. Dislodge the hopper support bar from its storage clip.



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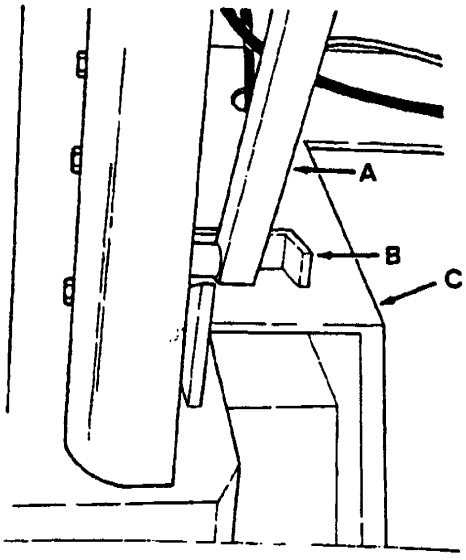
ENGAGED HOPPER SUPPORT BAR

A. Lift Arm
B. Storage Clip
C. Support Bar

4. Position the end of the support bar on the support bar stop on the machine frame.



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SUPPORT BAR STOP

A. Support Bar Hopper
B. Bar Stop
C. Machine Frame

5. Slowly lower the hopper so the support bar rests securely against the support bar stop.

6. Turn the engine off.

7. Check the support bar to make sure it is securely engaged.

TO DISENGAGE LOW DUMP MODEL HOPPER SUPPORT BAR

1. Start the engine.

2. Place the engine throttle lever into the bottom (Fast) position.

3. Raise the hopper to the fully raised position.

4. Raise the support bar into its storage position. Make sure the storage clip is holding the support bar in place.

5. Lower the hopper.

6. Turn the engine off.

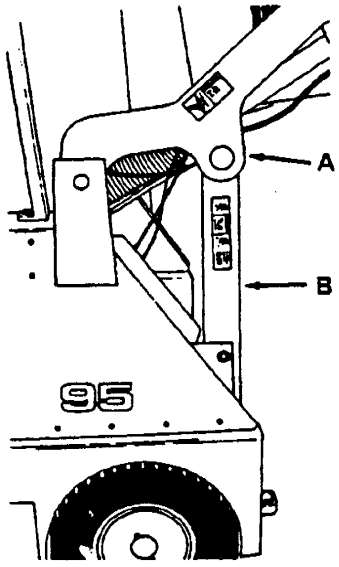
TO ENGAGE MULTI-LEVEL DUMP, AA, SE MODELS HOPPER SUPPORT BAR

1. Set the machine parking brake and start the engine.

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

2. Raise the hopper to the fully raised position.

3. Position the hopper support bar under the hopper lift arm cam.



01438

ENGAGED HOPPER BAR

A. Lift Arm
B. Hopper Support Bar

4. Slowly lower the hopper so the lift arm cam seats itself on top of the hopper support bar.

5. Turn the engine off.

6. Check the hopper support bar to make sure it is securely engaged.

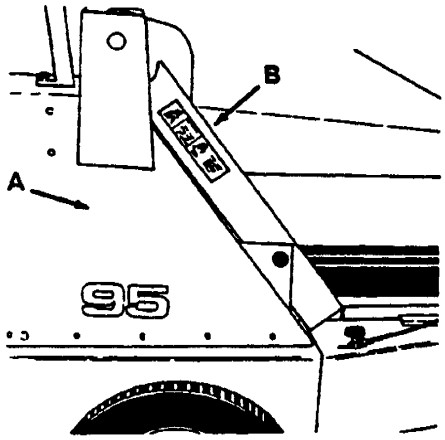
TO DISENGAGE MULTI-LEVEL DUMP, AA, SE MODELS HOPPER SUPPORT BAR

1. Start the engine.

2. Place the engine throttle lever into the bottom (Fast) position.

3. Raise the hopper to the fully raised position.

4. Lower the hopper support bar to its storage location.



01439

DISENGAGED HOPPER SUPPORT BAR

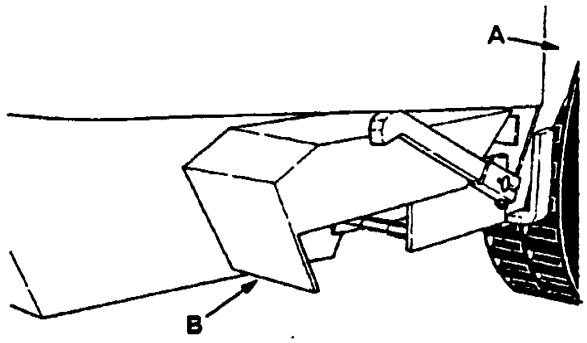
A. Machine Frame
B. Hopper Support Bar

5. Lower the hopper.

STABILIZER LEG

The machine stabilizer leg is present on multi-level dump, AA, and SE models.

The stabilizer leg is a safety device which, when the machine is being multi-level dumped, projects forward to act as an anti-tipping device. Check the stabilizer leg to be sure it is projecting forward when the machine is being multi-level dumped and is fully retracted when the hopper is in the "operating" position.



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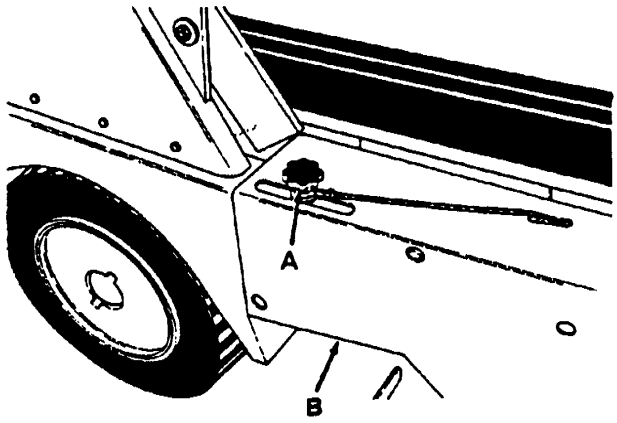
RETRACTED STABILIZER LEG

A. Machine Frame
B. Stabilizer Leg

SIDE BRUSH HEIGHT ADJUSTMENT KNOB

The side brush height adjustment knob is located just above the side brush on the front bumper. Loosening the knob and sliding it forward lowers the side brush, sliding it backward raises the side brush. Tighten the knob after setting the side brush height. The side brush should be raised before making an adjustment.



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SIDE BRUSH HEIGHT ADJUSTMENT KNOB

A. Adjustment Knob
B. Side Bumper

FUSES AND CIRCUIT BREAKERS

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.

Circuit breakers are reusable circuit protection devices designed to stop the flow of current in the event of a circuit overload. Once tripped, circuit breakers must cool before they automatically 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. The chart below shows the various fuses and circuit breakers, the electrical components they protect, and their locations in the machine.

PROTECTIVE DEVICE	RATING	CIRCUIT PROTECTED
FU-1	50 A	Diesel Glow Plug
CB-1	25 A	Dust Shaker Motors
CB-2	15 A	Operating Lamps
CB-3	15 A	Gauges
CB-4	15 A	Actuator
CB-5	15 A	Turn Signal Lamps
CB-6	15 A	Heater, Defroster, Fan
CB-7	15 A	Back-up Alarm

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.

The *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.

TO 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 powered machines: Slowly open the liquid service valve.

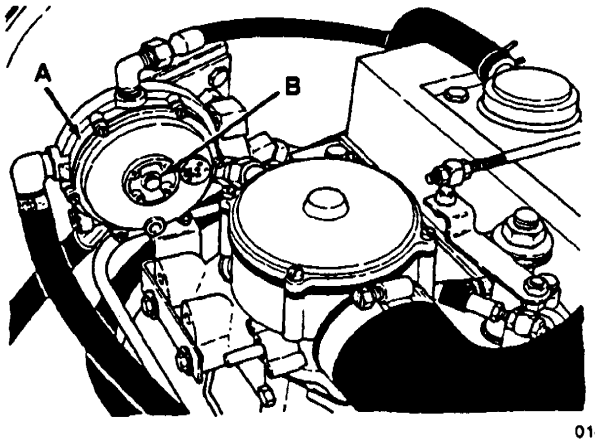
NOTE: Opening the service valve too quickly may cause the service valve check valve to stop the flow of LPG fuel. If the check valve stops the flow of fuel, close the valve, wait a few seconds, and slowly open the valve once again.

2. The machine operator must be in the operator's seat with the directional 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 engine cover, press the primer button on the LPG vaporizer, close the engine cover.



01442

LPG VAPORIZER PRIMER BUTTON

A. Vaporizer
B. Primer Button

Kubota diesel powered machines: When the engine is cold and exposed to cold temperatures, depress and hold in the pre-heat switch for one minute.

4. Move the throttle lever into the top (Idle) position.

5. Turn the ignition switch key clockwise until the engine starts. Do not operate the starter for more than a few seconds at a time or after the engine has started.

   Continental and Perkins diesel powered machines: To start the engine, turn the key clockwise. The diesel pre-heat indicating lamp may light. Wait until the lamp goes off and then turn the key fully clockwise to start the engine. Release the key as soon as the engine starts.

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. Allow the engine and hydraulic system to warm up three to five minutes.

7. Release the machine parking brake.

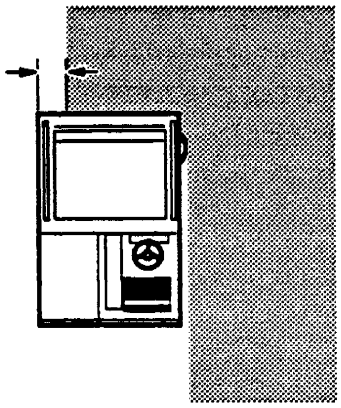
8. Move the throttle lever into the bottom (Fast) position, and drive the machine to the area to be swept.

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.



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OVERLAPPING PATHS

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

1. Place the main brush and hopper lift lever into the top (Main Brush On) position and push side brush lever forward.

2. Move the main brush position lever back and to the right into the (Main Brush Down) position and flip the side brush position switch down to lower the side brush.

3. Sweep as required.

   AA model machines: Sweep wet debris with the air assist control turned off.

TO DUMP HOPPER

1. Pull the main brush position lever all the way back and to the left into the (Main Brush Up) position.

2. Flip the side brush position switch up to raise the side brush.

3. Press the filter shaker switch to shake the dust filters.

4. Slowly drive the machine up to the dump site or dumpster.

5. Low dump model machines: Pull the main brush and hopper lift lever back into the (Hopper Up) position to dump the hopper. Pull the lever into the bottom (Hopper Hold) position to keep the hopper in the dump position.

   Multi-level dump, AA, and SE model machines: Pull the hopper door lever into the bottom (Hopper Door Closed) position to close the hopper door so the hopper can be raised without debris spilling out. Pull the main brush and hopper lift lever back into the (Hopper Up) position to lift the hopper to the desired height. Be aware: The minimum hopper clearance needed to multi-level dump the hopper is 108 in (2745 mm).

WARNING: Falling hopper. Engage hopper support bar before working under hopper.

   Multi-level dump, AA, and SE model machines: Pull the main brush and hopper lift lever back into the bottom (Hopper Hold) position to keep the hopper at the desired height; then push the hopper door lever into the top (Hopper Door Open) position to dump the debris from the hopper.

NOTE: Lowering the hopper into the dumpster may help to control flying dust.

   Multi-level dump, AA, and SE model machines: Pull the hopper door lever back into the bottom (Hopper Closed) position to close the hopper door.

6. Slowly back the machine away from the dump site or dumpster.

7. Push the main brush and hopper lift lever into the position between the Main Brush On and Hopper Up to lower the hopper to its operating position.

   Multi-level dump, AA, and SE model machines: Push the hopper door lever into the top (Hopper Door Open) to open the hopper door.

POST OPERATION CHECKLIST - ENGINE OPERATING

Check brush patterns for width and evenness.

TO STOP MACHINE

1. Return the directional pedal to the "neutral" position. Apply the brake.

2. Pull the main brush position lever all the way back and to the left into the (Main Brush Up) position.

3. Flip the side brush position switch up to raise the side brush.

4. Pull the side brush lever back to stop the side brush rotation. Push the main brush and hopper lift lever into the position between the Main Brush On and Hopper Up.

5. Turn the operating lamps off if used.

6. Place the throttle lever into the top (Idle) position.

7. Set the machine parking brake.

8. Turn the ignition switch key counter-clockwise. Remove the key from the ignition switch.

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

9. LPG powered 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 service brakes to control machine speed.

FOR SAFETY: When using machine, go slow on grades and slippery surfaces.

The maximum rated ramp climb and descent angle is 15° with an empty hopper, and 13° with a full hopper.

ACCESSORIES OPERATION

VACUUM WAND ACCESSORY

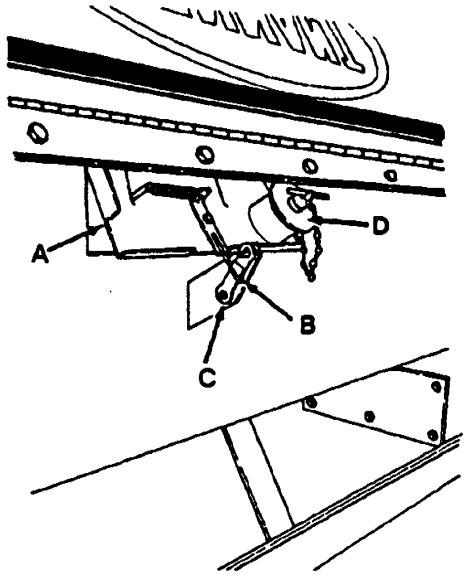
The vacuum wand accessory gives the machine the added flexibility of picking up debris not accessible by the machine. A 120 in (3050 mm) hose utilizes the machine vacuum system. The vacuum wand accessory is not available on the AA model.

TO OPERATE VACUUM WAND

1. Stop the machine close to the area to be cleaned.
2. Raise the main brush and side brush.
3. 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 and remove key.

4. Open the hopper access door.
5. Disconnect the fire door hook from the fusible link and allow the fire door to close.

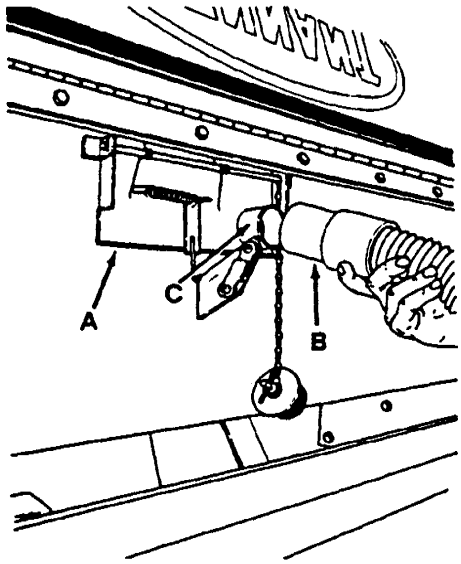


01443

OPEN FIRE DOOR

A. Fire Door
B. Fire Door Hook
C. Fusible Link
D. Wand Hose Connection Plug

6. Remove the wand hose connection plug from the fire door.
7. Remove the vacuum wand and wand hose from their storage clips.
8. Push the wand hose onto the wand hose connection on the fire door.



01444

CONNECTING WAND HOSE

A. Fire Door
B. Wand Hose
C. Wand Hose Connection

9. Push the loose end of the wand hose onto the vacuum wand.
10. Start the engine.
11. Pull the throttle lever into the bottom (Fast) position.
12. Push the main brush and hopper lift lever into the top (Main Brush On) position to start the vacuum fan.
13. Vacuum the area as required.
14. When finished, push the main brush and hopper lift lever into the position between the Main Brush On and Hopper Up to stop the vacuum fan.
15. Push the throttle lever into the top (Idle) position.

16. Stop the engine.

17. Pull the vacuum hose out of the vacuum hose connection.

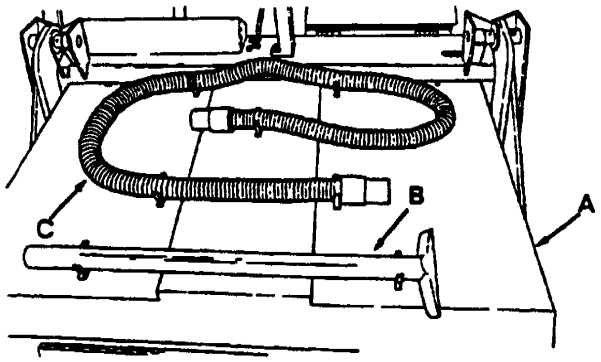
18. Disconnect the wand hose from the vacuum wand.

19. Push the wand hose connection plug into the wand hose connection.

20. Open the fire door and reposition the fire door hook over the middle of the fusible link.

21. Close the hopper access door.

22. Return the vacuum wand and wand hose to their storage clips.



01445

VACUUM WAND STORAGE LOCATIONS

A. Hopper Cover
B. Vacuum Wand
C. Wand Hose

HOPPER DOLLY ACCESSORY

The hopper dolly accessory makes the job of removing the debris hopper easy. The machine must be equipped with the snow blade hydraulic kit to allow the hydraulic connections to be disconnected in a timely manner.

TO REMOVE HOPPER WITH DOLLY

1. Set the parking brake. Start the engine and raise the hopper.

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

2. Engage the hopper support bar. Lower the hopper onto the support bar. Stop the engine.

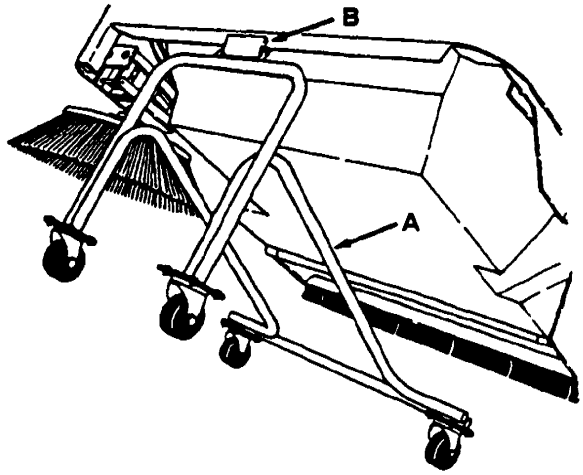
WARNING: Falling hopper. Engage hopper support bar before working under hopper.

3. Check the hopper support bar to make sure it is securely engaged.

4. Disconnect and plug all hoses and disconnect all wires between the hopper and the machine.

5. Start the engine, raise the hopper, place the hopper support bar in its storage location, and lower the hopper one-half of the way down.

6. Hook the hopper dolly on the hopper hook and lower the hopper. Stop the engine.

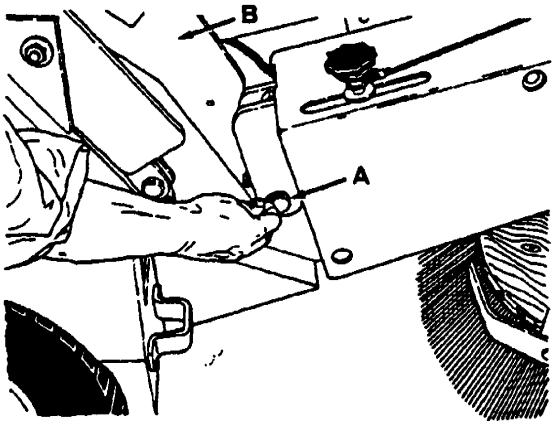


01446

HOPPER DOLLY HOOKED ON HOPPER

A. Hopper Dolly
B. Hopper Hook

7. Remove the two hopper lift arm release pins.



01447

LIFT ARM RELEASE PINS

A. Release Pin
B. Lift Arm

8. Push the lift arms down to release the hopper from the lift arms.

9. Roll the hopper and dolly away from the machine.

TO REINSTALL HOPPER WITH DOLLY

1. Position the hopper and dolly in the machine.

2. Raise the lift arms slightly to hook the lift arms onto the hopper brackets.

3. Install the two hopper lift arm release pins.

4. Raise the hopper, remove the hopper dolly, engage the hopper support bar, and lower the hopper onto the support bar.

5. Reconnect the hoses and wires between the hopper and the machine.

6. Raise the hopper, place the hopper support bar in its storage location, and lower the hopper.

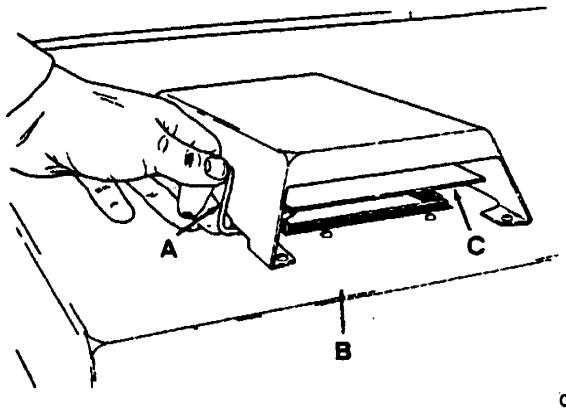
DUST FILTER BYPASS ACCESSORY

The dust filter bypass accessory is designed to enable the machine to operate when damp or wet conditions exist. Wet or damp conditions may clog the dust filters. When the accessory is in use, the air which is normally drawn through the dust filters is drawn in the air scoop located on the hopper cover. This eliminates excessive moisture from contacting the dust filters.

TO OPERATE FILTER BYPASS

1. Set the machine parking brake.

2. Place the filter bypass control lever in the "open" position.



00560

FILTER BYPASS CONTROL LEVER

A. Control Lever
B. Hopper Cover
C. Dust Filter Bypass "Open" Position

3. Release the parking brake.

4. Clean the area as required with the machine.

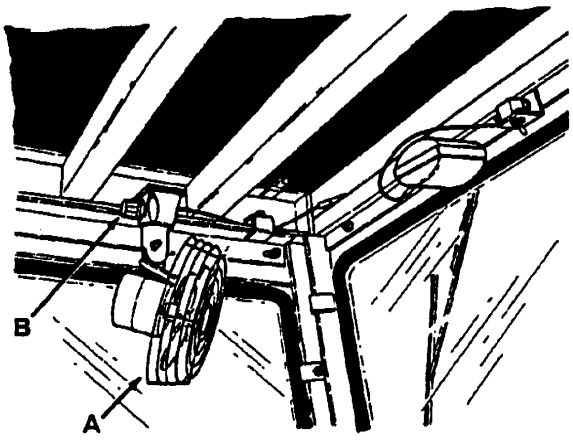
5. When finished cleaning the wet or damp area, set the machine parking brake.

6. Place the filter bypass control lever in the "closed" position.

7. Release the parking brake and continue operating the machine as required.

HEATER/DEFROSTER ACCESSORY

The heater/defroster accessory includes a fan powered heater and a defroster fan. A switch on the defroster fan base controls the defroster fan.



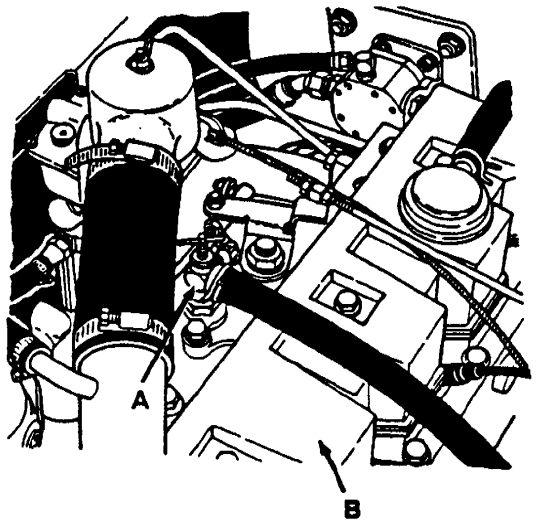
01448

DEFROSTER FAN

A. Fan
B. Switch

A switch on the front of the seat support controls the heater fan. A valve on the engine controls the hot coolant flow to the heater core. Turning the valve handle clockwise closes the valve and stops the hot coolant flow.

Turning the valve handle counterclockwise opens the valve and allows hot coolant to flow to the heater core.

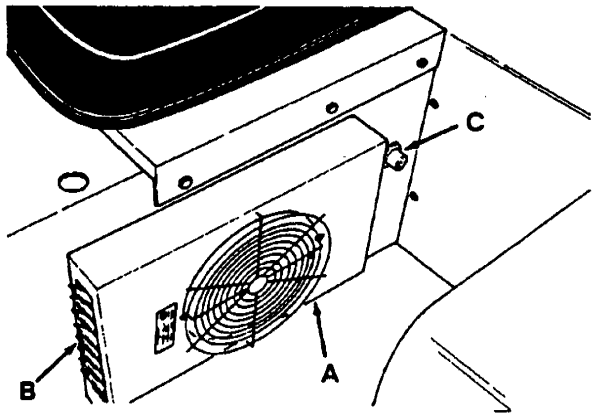


01449

HEATER VALVE

A. Valve
B. Engine

The air deflectors on the sides of the heater are repositionable to allow the air flow to be directed as desired.



01450

HEATER

A. Heater
B. Air Deflector
C. Heater Fan Switch

SNOW BLADE ACCESSORY

The snow blade accessory gives the machine the added flexibility to remove snow from walks and driveways.

TO INSTALL SNOW BLADE

1. Set the parking brake; start the engine, and raise the hopper.

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

2. Engage the hopper support bar. Lower the hopper onto the support bar. Stop the engine.

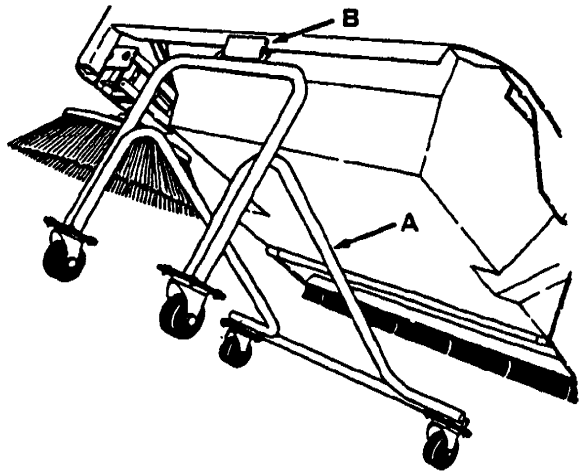
WARNING: Falling hopper. Engage hopper support bar before working under hopper.

3. Check the hopper support bar to make sure it is securely engaged.

4. Disconnect the hydraulic quick-disconnect fittings, large vacuum hose, and the wire connections. Label and remove the two small vacuum hoses.

5. Start the engine, raise the hopper, place the hopper support bar in its storage location, and lower the hopper one half of the way down.

6. Hook the hopper dolly on the hopper hook and lower the hopper. Stop the engine.

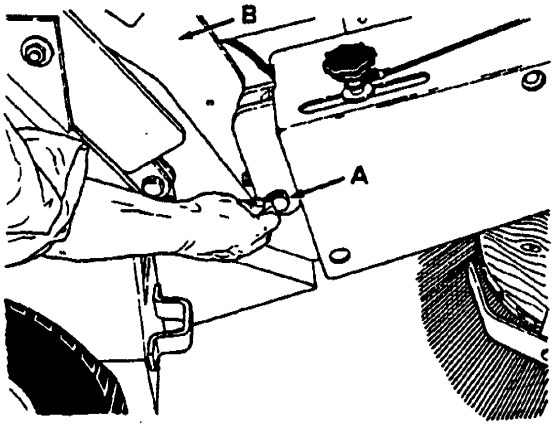


01446

HOPPER DOLLY HOOKED ON HOPPER

A. Hopper Dolly
B. Hopper Hook

7. Remove the two hopper lift arm release pins.



01447

LIFT ARM RELEASE PINS

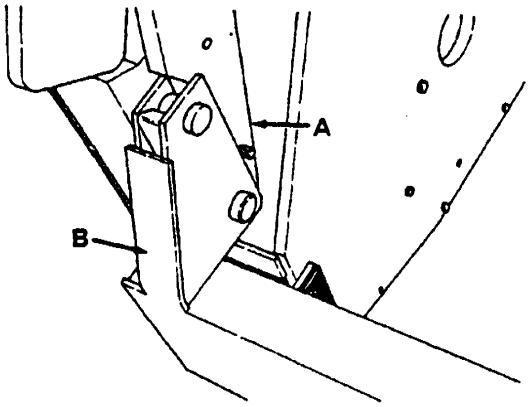
A. Release Pin
B. Lift Arm

8. Push the lift arms down to release the hopper from the lift arms.

9. Roll the hopper and dolly away from the machine.

10. Position the snow blade assembly so the upper cross bar pins engage the lift arm hooks.

11. Install clevis pins through the cross bar and the lift arms.



01451

LIFT ARM AND CROSS BAR

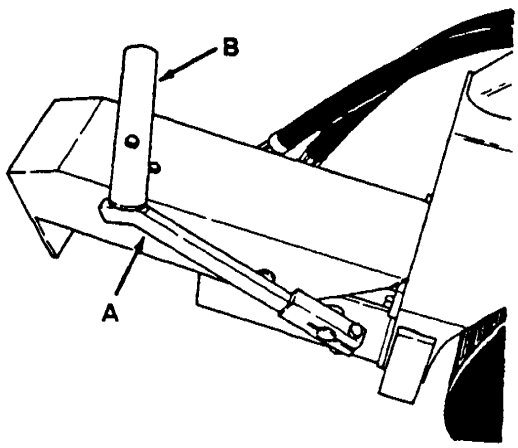
A. Lift Arm
B. Cross Bar

12. Loop the snow blade limiting chain over the lift arm tube and close the loop with the connecting link.

NOTE: Do not lift the snow blade without the limiting chain installed.

13. Install tire chains on the rear tire.

14. Position the stabilizer leg stop arm over the spring loaded stop lever to keep the leg raised on multi-level dump, AA, or SE models.

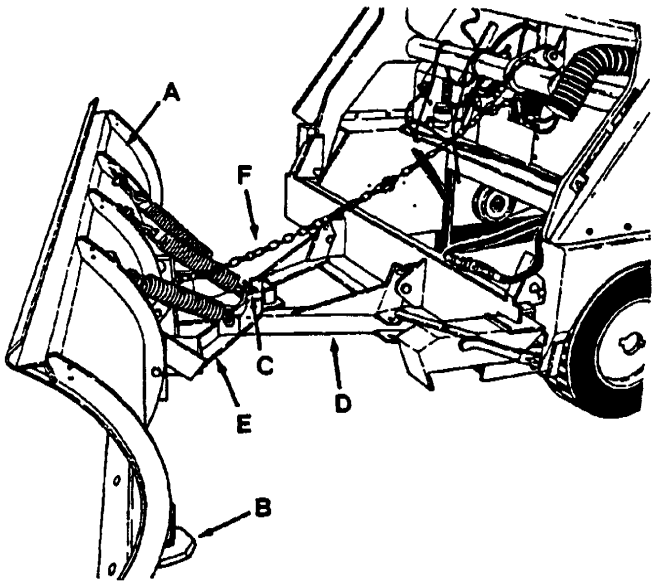


01453

STABILIZER LEG STOP ARM

A. Stop Lever
B. Stop Arm

15. Remove the sector pin from the A-frame, adjust the snow blade to the desired angle and replace the clevis pin.



01454

SNOW BLADE INSTALLATION

- **A. Snow Blade**
- **B. Runner Spindle**
- **C. Sector Pin**
- **D. A-Frame**
- **E. Quadrant**
- **F. Limiting Chain**

TO OPERATE SNOW BLADE

Operate the machine as normally done using the main brush and hopper lift lever to raise and lower the snow blade.

Begin plowing early when snow reaches 1 to 4 in (25 to 100 mm). Don't allow snow to accumulate. Heavy, wet snow can create hazards at even a 1 in (25 mm) accumulation. In heavier amounts, snow can be extremely difficult to handle. Do not allow snow to become packed and frozen. Crusted snow can hinder traction in future plowing. Choose the proper plowing speed. The heavier the snow, the slower the speed.

The plow blade should be set at the best angle for rolling the snow sideways and in the desired direction. Snow of any considerable depth cannot be pushed straight ahead for more than a short distance.

For best operation, the bottom edge of the snow blade should be slightly above the ground. If adjustments are needed, they can be made by adding flat washers to the runner spindles. Place additional washers under the runner bracket to raise the blade. Remove washers to lower the blade.

To change the angle of the blade, raise the blade as far as the limiting chain will permit. Pull out the sector pin and the blade can be moved to the desired position. Then replace the sector pin. The sector pin is designed to be a shear pin. If the plow strikes a solid, immovable object, the pin will shear, allowing the blade to swing away from the object before the equipment is damaged. The blade assembly is mounted on the hydraulic lift arms of the machine which are free to float upward if necessary.

Under some conditions, snow can be pushed to unused areas and stacked to a considerable height. To do this, place the blade in a straight-on position. Push the snow forward by raising the plow as you move into the pile.

Stack snow only with the blade in a straight-on position. Do not create a vertical wall, but slope the piles so that later snow may be pushed up the slope.

Clearing large open areas can be done best by using a combination of snow removal equipment, such as a snow blade and snow blower or loader of some type. The snow can be plowed into windrows or piles and then blown into or loaded onto trucks and carried away. However, if only a blade is available, the area can be cleared by using the proper technique and common sense.

As a guide to help determine how much snow the plow can handle, remember that with a 6 in (152 mm) snowfall, the plow can easily move that amount of snow in two passes. With more snow, it will handle less; with less snow, more.

A suggested method of plowing is as follows:

Make the first pass one blade width in from the outside edge.

Make the second pass around the outside edge, moving the snow to the edge of the area, then keep moving in. Double the blade width from edge of the snow covered area and move this amount to the outside edge.

TO REMOVE SNOW BLADE

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 and remove key.

2. Position the stabilizer leg stop arm so the stabilizer leg is free to lower on multi-level dump, AA, or SE models.

3. Remove the tire chains.

4. Remove the limiting chain from the lift arm tube.

5. Remove the cross bar clevis pins and disconnect the cross bar from the lift arms.

6. Start the engine, then release the parking brake.

7. Back the machine away from the snow blade, then engage the parking brake.

8. Position the hopper and dolly in the machine.

9. Raise the lift arms slightly to hook the lift arms onto the hopper brackets.

10. Install the two hopper lift arm release pins.

11. Raise the hopper, remove the hopper dolly, engage the hopper support bar, and lower the hopper onto the support bar.

12. Reconnect the hoses and wires between the hopper and the machine.

13. Raise the hopper, place the hopper support bar in its storage location, and lower the hopper.

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 wand door closed	Open vacuum wand door
	Vacuum hose damaged	Replace vacuum hose
	Vacuum fan failure	See *HYDRAULIC SYSTEM TROUBLESHOOTING*: Poor or no vacuum to brush compartment
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	See *HYDRAULIC SYSTEM TROUBLESHOOTING:* Main brush turns slowly or not at all
	Side brush drive failure	See *HYDRAULIC SYSTEM TROUBLESHOOTING*: Side brush turns slowly or not at all
	Hopper not adjusted properly	Adjust hopper floor clearance
	Hopper full	Empty hopper
	Hopper floor skirts worn, damaged	Replace skirts

NOTE: For more specific electro-hydraulic system troubleshooting information, see HYDRAULIC SYSTEM TROUBLESHOOTING *in the* MAINTENANCE *section.*

TRANSPORTING MACHINE

PUSHING OR TOWING MACHINE

The machine may be pushed from the front or the rear, using the bumpers provided, only after placing the rear wheel on a dolly.

The machine may be towed only from the rear. Do not pull on the front bumper.

MACHINE JACKING INSTRUCTIONS

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 and remove key.

2. Empty the debris hopper before attempting to jack the machine up.

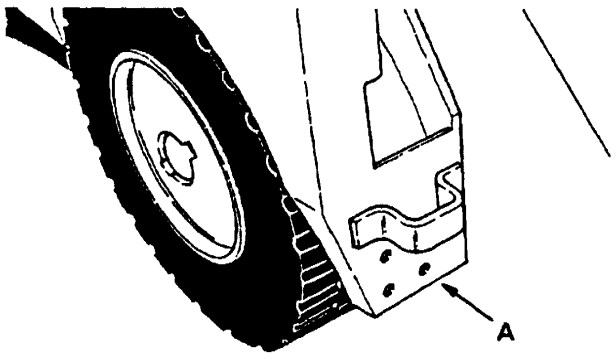
3. Block the tires which are not being jacked up to secure the machine's position.

WARNING: Machine is unstable on jack. Block machine tires before jacking machine up.

4. Use a scissors or hydraulic-type jack of adequate capacity to raise the machine. Jack up the machine only at the designated locations.

WARNING: Machine is unstable on jack. Jack machine up at designated locations only. Block machine up with jack stands.

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

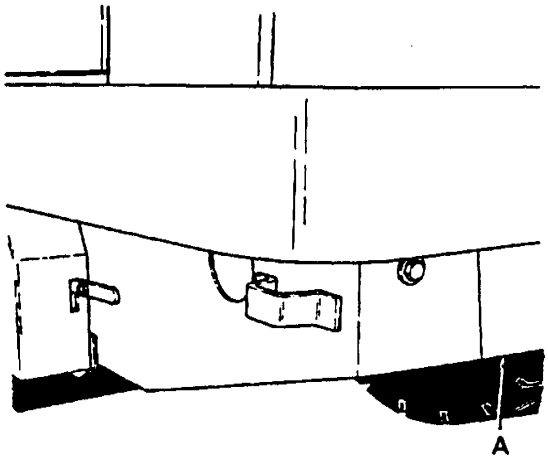


01455

FRONT JACKING LOCATION
(RIGHT SIDE SHOWN)

A. Jacking Location

The rear jacking location is the bottom of the rear edge of the machine frame.



01456

REAR JACKING LOCATION

A. Jacking Location

5. Block machine up with jack stands or similar devices to make sure machine is secure.

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 up off the jack stands.

10. Remove the jack stands from under the machine.

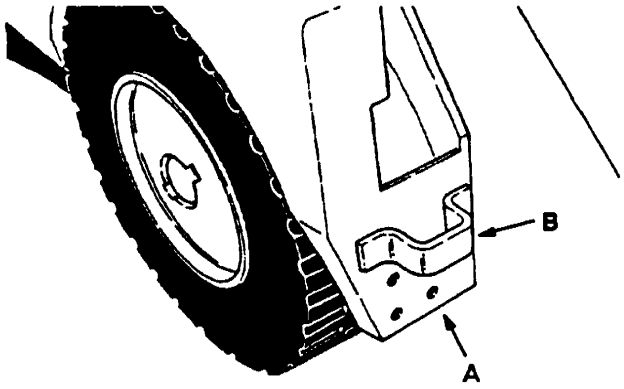
11. Lower the machine.

12. Remove the blocks from the tires.

MACHINE TIE-DOWN INSTRUCTIONS

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

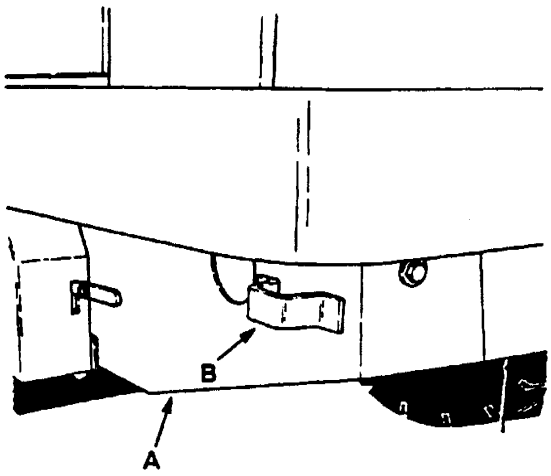
To tie the machine down, use the tie down lug provided.



01455

FRONT TIE-DOWN LUG
(RIGHT SIDE SHOWN)

A. Machine Frame
B. Tie-Down Lug



01456

REAR TIE-DOWN LUG
(LEFT SIDE SHOWN)

A. Machine Frame
B. Tie-Down Lug

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, and other undesirable deposits from forming.

1. Empty the debris hopper.
2. Change engine oil.
3. Raise the main and side brushes.
4. Park the machine in a cool and dry area.
5. Stop the engine.
6. Fill the hydraulic reservoir with hydraulic fluid to the full mark on the dipstick to prevent excessive condensation from forming in the reservoir.

7A. Gasoline and LPG powered machines: To store the machine 30 to 90 days:

1. Remove the spark plugs.
2. Pour 3 oz (90 cc) of clean engine oil into each spark plug hole.
3. Remove the ignition coil high tension wire. Operate the engine starter motor for at least a dozen revolutions. This distributes the oil over the cylinder walls.

NOTE: Before preparing the engine for storage, allow it to cool down to the surrounding temperature. Oil adheres to cold metal surfaces much better than hot surfaces.

4. Replace the high tension coil wire and spark plugs.
5. Drain the gasoline from the carburetor.

7B. Gasoline and LPG powered machines: To store the machine 90 days to 6 months:

1. Remove the spark plugs.
2. Pour 3 oz (90 cc) of clean engine oil into each of the spark plug holes.
3. Remove the ignition coil high tension wire. Operate the engine starter motor for at least a dozen revolutions. This distributes the oil over the cylinder walls.

NOTE: Before preparing the engine for storage, allow it to cool down to the surrounding temperature. Oil adheres to cold metal surfaces much better than hot surfaces.

4. Replace the high tension coil wire and spark plugs.
5. Drain the engine oil from the engine oil pan.
6. Drain coolant from the radiator and engine block.
7. Close the engine cooling system drain cocks.
8. Drain gasoline from the carburetor, fuel tank, and the fuel lines.
9. Seal the air cleaner inlet and the exhaust outlet with weatherproof masking tape.
10. Tighten the engine oil filler cap, the fuel tank cap, and the radiator cap to make certain they are securely in place.

7C. Diesel powered machines: To store machine:

1. Drain the coolant from the radiator and engine block.
2. Close the engine cooling system drain cocks.