GLOBAL M3/ MX3

Service Manual

Mechanical Sweeper
January 2015

Manual GS248199
Revision A

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Mechanical Sweeper
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ENVIRONMENTAL PRODUCTS

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Record of Changes
MX3 Series Operator's Manual

Revision Letter	Date	Description	Change Page

Note: Use log sheet to keep a current record of revision pages inserted in manual.

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Introduction

The information contained in this manual will help you better understand the operation of the GLOBAL Mechanical sweeper. The Global MX3 Series sweeper represents the highest grade of craftsmanship and reliability that makes Global a world leader in sweeper technology. Careful attention to proper operating procedures will ensure efficient operation, maximum performance and total customer satisfaction.

How to Use This Manual

- ❑ Keep this manual in the cab buddy seat compartment as a permanent and convenient reference.
- ❑ Throughout this manual, you will find **WARNINGS**, **CAUTIONS**, and **NOTES**.
  - The **WARNING**s reminds you to be especially careful to avoid possible personal injury.
  - The **CAUTION**s are given to prevent you from making an error that could damage the sweeper or cause personal injury.
  - The **NOTE**s are suggestions that will help you make full use of the sweeper.
- ❑ A thumb tabbed quick reference guide is located on the title page of manual to assist you in locating a desired function.
- ❑ Procedure titles and chapters are positioned in margins for easy reference while flipping through the manual.

Important Information

All information in this manual is based on the latest product information available at the time of printing. Due to improvements in design, performance and reliability, there may be minor discrepancies between actual vehicle and the contents of this manual. GlobalEnvironmental Products reserves the right to make changes at any time without notice and without incurring any obligation to make such changes to products manufactured previously. No liability can be accepted for any inaccuracies or omissions in this publication, although every endeavor is made to ensure that information contained in this manual is correct.

-Global Environmental Products Technical Publications

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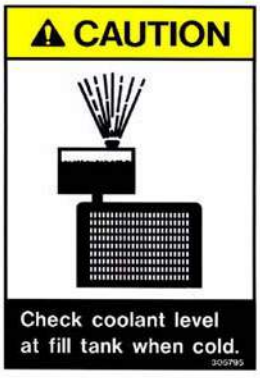
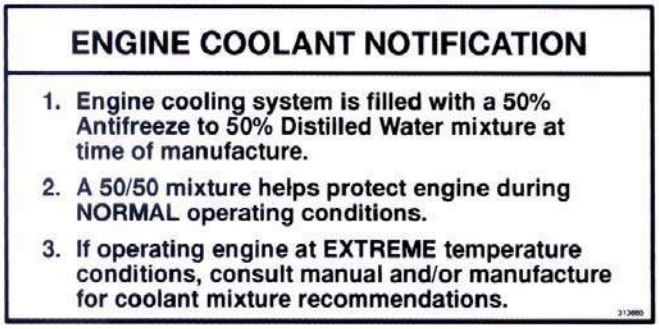
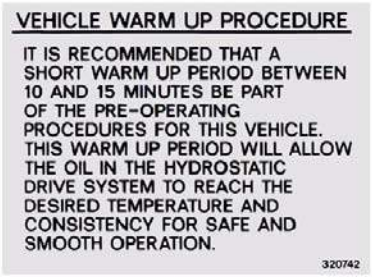
Safety Decals

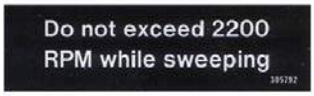
Safety must always be the operator's utmost concern and responsibility. The operator must read and understand this manual and all safety decals on the sweeper before operating the vehicle. Failure to follow these safety precautions could result in damage to the equipment and/or personal injury or death. Decals are designed and installed on the sweeper for your protection. They are placed at appropriate areas on the sweeper to be constant reminders of the ever – present dangers. KNOW and ADHERE to the information they provide.

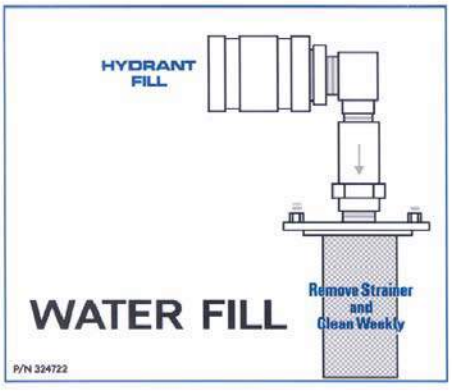


PLEASE REFER TO ENGINE MAINTENANCE MANUAL FOR PROPER COOLANT AND OIL REQUIREMENTS









Safety Precautions

The safety precautions listed in this manual and on the sweeper are not all–inclusive. Anyone using service procedures, methods, or tools, whether or not recommended by Global Environmental Productcs, Inc. must satisfy himself thoroughly that neither personal safety nor vehicle safety will be jeopardized by the service methods or tools selected. Remember, your ability as a professional operator is critical to ensuring your safety and that of others around you.

Always follow local and state traffic laws. Drive defensively–the other driver may be wrong, but it is better to avoid collisions of any kind. Carefully study the following safety related operating suggestions.

1. **Always** fasten seat belts.
2. Always drive at a safe speed. **Slow down** for curves and downgrades.
3. Be extremely **careful** when maneuvering around parked cars.
4. **Never** make sudden starts, stops or turns.
5. Be very **careful** when backing up sweeper.
6. **Do not** use sweeper for towing.
7. **Never** operate sweeper with a known hydraulic leak. Repair leak immediately.
8. Check sweeper daily for hydraulic leaks.
9. **Avoid** sweeping near bystanders or in congested areas eliminating possible injury caused from sweeper brooms throwing debris.
10. If elevator becomes jammed, turn **off** elevator drive motor and **stop** engine before proceeding to clear debris.
11. **Do not** overload sweeper.
12. Whenever a mechanic, operator, inspector or any other person needs to perform work under a raised hopper, **stop** engine and **install both safety props**. **Do not** stand under raised hopper with engine running.
13. **Never** use a hydraulic cylinder or hydraulic mechanical mechanism to lift another object or part.
14. **Never** leave sweeper unattended with engine running and/or ignition key in vehicle.
15. Be certain sweeper is parked in a position allowing hopper to **clear** container before dumping hopper.
16. Be sure sweeper is parked on **level ground** and bystanders are **clear** before dumping hopper.
17. Stay **clear** of electrical power lines and other overhead obstructions to prevent injury or property damage when dumping hopper.
18. **Always** cover battery terminals during maintenance to prevent electrical short.
19. When operating at slow speed or whenever sweeper may cause traffic problems, operate beacon and rear flashers lights.
20. **Never** step on either gutter broom for any reason. Serious injury may result. Use provided step plates located on right front bumper and handle to enter cab.

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Safety Summary

The following safety measures are essential and must be observed when servicing, repairing, or maintaining the Global MX3 Series sweeper.

- ❑ **JACK STANDS & CHOCKS –** Before jacking the vehicle, or releasing or adjusting the parking brake on a stationary sweeper, **always** chock the wheels. **Always** use safety (jack) stands when using hydraulic jacks or hoists to raise the vehicle. **Do not** rely on either the jack or the hoist to hold the load.

- ❑ **SAFETY GLASSES –** Safety glasses **must** be worn when using tools such as hammers, chisels, pullers and punches. Always wear safety glasses when working on the hydraulic system.

- ❑ **WELDING –** Wear welding gloves and goggles when welding or using an acetylene torch. Make sure that a metal shield separates the acetylene and oxygen bottles, both of which must be chained to a cart. **Do not** weld or heat areas near fuel tanks or fuel lines. Utilize proper shielding around hydraulic lines. **CAUTION: Disconnect battery terminals prior to welding**.

- ❑ **WORK AREA –** Organize your work area and keep it clean. To prevent slips and falls, promptly wipe clean any oil spills. Keep all tools and parts off the floor. After servicing the sweeper, reinstall all safety devices, guards and shields. Before starting the engine or moving the sweeper, check to make sure that all tools and servicing equipment are removed from the engine area.

- ❑ **CLOTHING & JEWELRY–** Wear close fitting clothing appropriate for the job. Use sturdy work shoes and rough–soled. Bare feet, sandals, or sneakers are **not** acceptable foot wear when adjusting and/or servicing the sweeper. **Do not** wear rings, wrist watches, neck chains, or loose–fitting clothing when working on the engine. Any of these items could catch on moving parts, causing serious injury.

- ❑ **COMPRESSED AIR –** To avoid serious injury or death, **do not** apply compressed air to any part of the body or clothing. Use only approved air guns that do not exceed 30 psi *(207 kPa).* Always wear safety glasses or goggles. Use proper shield to protect everyone in the work area.

- ❑ **PRESSURIZED FLUIDS –** Be extremely careful when dealing with fluids under pressure. Fluids under pressure can have enough pressure to penetrate the skin. These fluids can infect a minor cut or opening in the skin. If injured by escaping pressurized fluids, see a doctor at once. Serious infection or reaction can result without immediate medical treatment.

  When opening the radiator cap, always remove the coolant pressure control cap slowly, and only when the coolant is at room temperature. A sudden release of pressure from a heated cooling system can result in possible personal injury from the expulsion of hot coolant.

  Always use extreme caution while inspecting or working on the pressurized hydraulic systems. **Do not** attempt to look for hydraulic leaks without hand and eye protection. Oil can shoot from a pinhole in a fine jet at a velocity that can penetrate the skin and cause severe injury. **Never** attempt to block the oil flow with your hands or fingers.

Safety Summary

- **DIESEL FUEL –** Diesel fuel is highly flammable. Take extra precautions to avoid personal injury. **Do not** smoke when fueling the vehicle, or when servicing the engine or the fuel system. Store diesel fuel and other flammable fluids away from fire hazards.

- **HOT EXHAUST –** Engine produces extremely hot exhaust gases *(over 1200 degrees F).* To prevent the possibility of serious burns, always allow the engine and exhaust system to cool to ambient temperature before working on or servicing the engine or exhaust system. Engine exhaust fumes can cause sickness or death. **Do not** run engine in an enclosed area without exhaust pipe extension.

- **BATTERIES –** Electrical batteries give off highly explosive and flammable hydrogen gas when charging, and continue to do so for some time after receiving a steady charge. **Do not** smoke or allow an open flame or spark near the batteries – an explosion may result. Prevent battery explosions. Do not charge a frozen battery; it may explode. Warm battery to 16 degrees C *(60 degrees F).* Prevent acid burns. Avoid contact with sulfuric acid in battery electrolyte. Wear proper eye protection and wear rubber gloves when handling battery. Use voltmeter or hydrometer to check battery charge. To avoid the possibility of electrical shock, always remove the battery ground cable before working on the electrical system.

- **FIRE EXTINGUISHER –** Always keep a charged fire extinguisher within reach while working on or servicing the vehicle. Make sure the extinguisher is the correct type for the situation: a Type A extinguisher is for wood, paper, textiles and rubbish *(as might be found in the sweeper hopper)*; a Type B extinguisher is for flammable liquids such as solvents; and a Type C extinguisher is for electrical equipment.

- **HOPPER & ELEVATOR SAFETY –** A combination of a hydraulic system and an elevatable, heavy hopper present several safety concerns. The following cautions must be taken to avoid personal injury or damage to equipment:

  1. **Do not** raise the hopper unless the sweeper is parked on firm, level ground.
  2. Before raising the hopper, make sure that the vehicle is clear of overhead electrical power lines or other obstructions such as trees.
  3. Make sure that bystanders are well clear of the sweeper before dumping.
  4. Before working beneath a raised hopper, **always** install the safety props on both hopper cylinder rods. The safety props rest on the top edge of the cylinder body, positioned around the cylinder rod to keep the hopper from falling in the event of a hydraulic failure. **Never** position yourself beneath the hopper while installing or removing the safety props.
  5. **Always** stay clear of the running elevator while making adjustments. The moving equipment can easily grab clothing and cause personal injury.

DETAILED **T**

Table of Contents

Definition of Abbreviations

acc	accumulator
adh	adhesive
altntr	alternator
amp	ampere
appx	appendix
a/r	as required
assy	assembly
auto.	automatic
aux	auxiliary
bat.	battery
°C	Celsius
CB	circuit breaker
cc	cubic centimeter
cu ft	cubic foot
cu in.	cubic inch
cu m	cubic meter
cyl	cylinder
dB	decibel
DGB	double gutter broom
dia	diameter
diff	differential
elec	electric
°F	Fahrenheit
FS	Full Suspension
ga	gauge
gal.	gallon
GB	gutter broom
hd	head
hp	horse power
ht	heat treated
ID	inside diameter
ign	ignition
LH	left hand
max	maximum
min	minimum
NC	normally closed
neg	negative
NO	normally opened
No.	number
NPT	national pipe threads
NS	not serviced
NSS	not serviced separately
opt	optional
OD	outside diameter
pg	page
pl	parts list
pn	part number
pos	positive
rd	round
ref	reference
reqd	required
res	resistor
rev	revision
RH	right hand
SGB	single gutter broom
SN	serial number
soc	socket
svce	service
swp	sweeper
sym	symbol
temp	temperature
tol	tolerance
trans	transmission
vac	vacuum
vol	volume
w/	with
w/o	without
warr	warranty

T

Table of Contents

Subject **Page**

1 General Information

Sweeper Functions

Tables

Figures

Table of Contents

Subject **Page**

1 General Information (continued)

Figures

2 Operation

Start-up Checklist

Starting Engine

Driving the Sweeper

Sweeping

Dumping

Elevator

Table of Contents

Subject **Page**

2 Operation (continued)

3 Adjustments

Table of Contents

Subject **Page**

3 Adjustments (continued)

Table of Contents

Subject **Page**

3 Adjustments (continued)

Figures

4 Service and Lubrication

General Information

General Information

Table of Contents

Table of Contents

Table of Contents

5 Maintenance/Overhaul (Continued)

Table of Contents

Table of Contents

5 Maintenance/Overhaul (Continued)

Tables

Figures

6 Troubleshooting

General Information

Fault Diagnostic

Table of Contents

Table of Contents

6 Troubleshooting (Continued)

A Appendix

I Index

Table of Contents

CHAPTER 1

1

General Information

Table of Contents

1

CHAPTER 1

SWEEPER FUNCTIONS

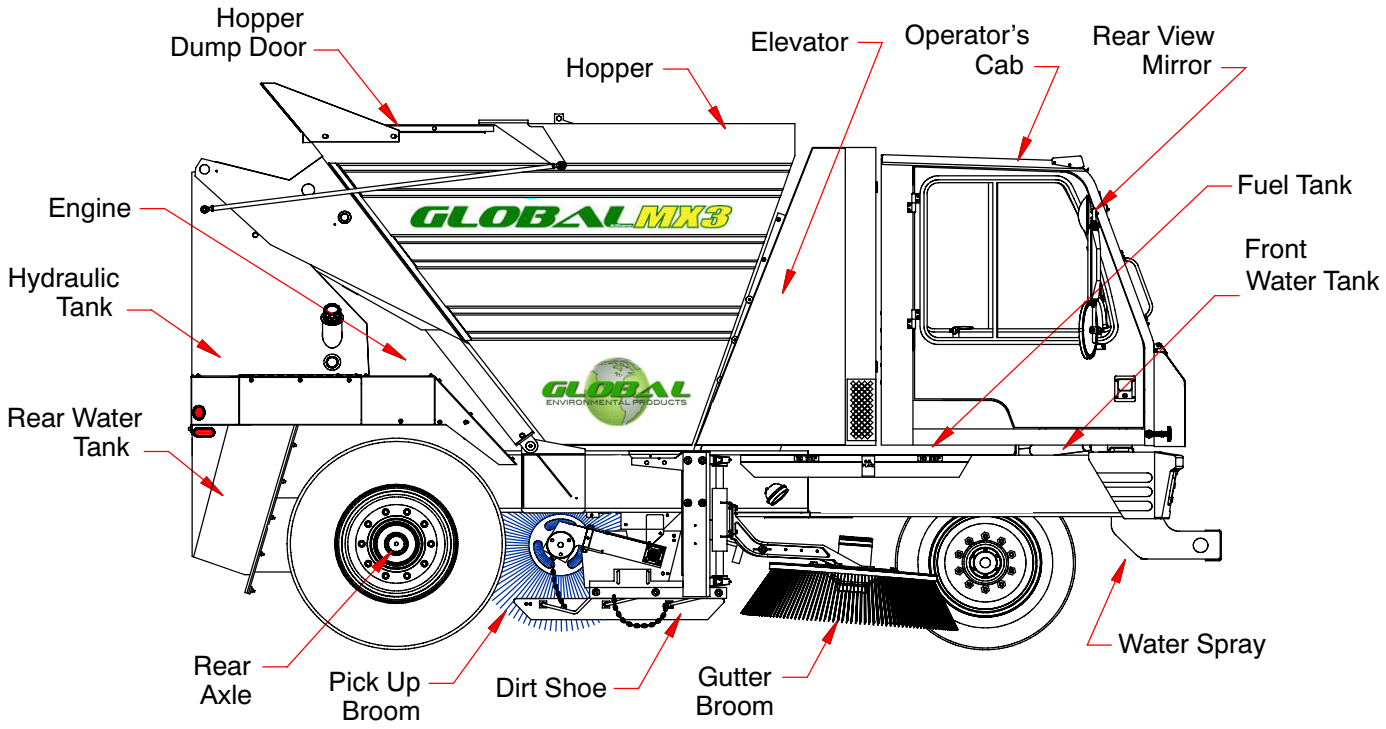
The Global MX3 sweeper ia a unique specially designed and manufactured mechanical type street sweeper. The operation of the sweeper encompasses the use of mechanical, hydraulic and electrical systems employing related components for the specific purpose of removal of debris from streets, highways, parking areas and other large paved locations. The sweeper is ruggedly constructed and durably designed to withstand the everyday operation as well as enabling the unit to sweep and pickup the heaviest of debris within its' published ratings and specifications.

Engine - The MX3 Series Sweeper is powered by a John Deere 4.5 liter (276 cu. in.), four cylinder injected diesel, turbocharged, and intrecooled engine. The engine delivers 115 (82kW) horsepower at 2400 rpm with a compression ratio of 17.0:1. The tourque is rated at 291 ft–lbs (395 N●m) at 1600 RPM. The radiator has a capacity of 42 Qts (40 L) using a swing away design.

(Refer to John Deere Engine Owners Manual, Troubleshooting & Repair Manual, and Parts Catalog for service information)

Hydrostatic Traction — A hydrostatic traction system is used on the unit to meet the mobility requirements of the sweeper. The engine RPM is separate from the mile–per–hour speed to allow engine speed to be set at a high RPM to run sweeping operations while vehicle travel is kept at slow sweeping speed.

Three major components make up the traction system: the traction pump, the hydraulic motors, and the torque hubs. The traction pump consist of a single, engine driven, variable displacement hydrostatic pump. The torque hubs are the last link in the drive system. Each rear wheel is mounted to its own torque hub which is mounted to the frame.



(MX3 Series sweeper major component locations) **Fig: 1.3 A**

Auxiliary Hydraulic Drive — The auxiliary hydraulic drive provides power and control to operate the sweep gear and other related systems. The auxiliary hydraulic system consists of a tandem or triple pump mounted on the rear of the hydrostatic pump that is driven by the engine. Hydraulic motors are used to drive the gutter brooms, pickup broom and elevator. Various hydraulic cylinders are used for lifting and lowering functions of the brooms and the hopper.

Operatror's Cab — The cab is designed for operators comfort inside a dust and weather protected interior. The operators driving position at the center of the sweeper provides excellent visibility while observing the sweeping path.

Cab Mounted Controls and Indicators — Operator controls and performance indicators are mounted in cab within easy reach and view of operator. A front console panel allows operator to monitor gauges and switches dedicated for driving operation. A set of side instrument panels allows operator to monitor gauges and switches dedicated for sweeping operation.

The engine RPM adjustment is controlled electronically using a rocker switch next to the shifter. A sweep/travel mode switch allows the engine RPM to be controlled independently during sweeping operations. The go–pedal *(similar to a gas pedal in a conventional truck)* controls sweeper speed and RPM speed simultaneously in travel mode. A built–hydrostatic braking system activates when go–pedal is fully released. In addition, a standard mechanical brake pedal activates wheel brakes and brake lights. The parking brake automatically engages when shifter is placed in park.

Water Tank — The storage of water for the spray system consists of a water tank designed to be filled from a fire hydrant through a single filler hole and water fill strainer. A fire hydrant hose needed to fill water tanks is stored in the right hand fender.

Water Pumps — The pressure and flow requirements for the water system is met by the use of two 12–volt electric motor driven diaphragm pump units. The electric motor is a permanent magnet, fan cooled with an amperage draw of 10 amps. The electric power source is taken from the chassis battery. The self–priming pumps are designed to produce a flow rate of 3.5 gpm (per pump) at 0 head pressure. The pumps have a maximum pressure of **45** psi.

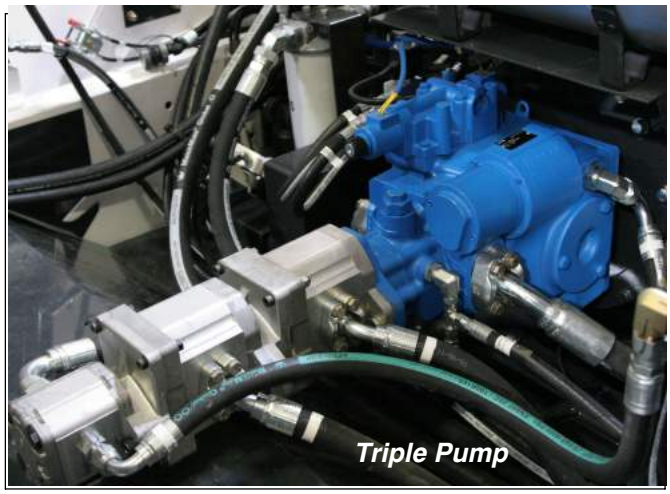


Fig: 1.4 A

Fig: 1.4 B

Fig: 1.4 C

Water Spray System — The water spray system is intended to control dust created when sweeping. Water nozzles spray in front of each gutter broom. A series of water nozzles mounted under the front bumper sprays water on debris being picked up by the sweeper. The water pump pressurizes the water spray system of the sweeper. The water control valves located behind the companion seat backrest are adjustable ball valves used to control the amount of water flow to the spray nozzles.

Hopper — The sweeper utilizes a hopper for storage of collected debris that has been swept. It is located basically at the center behind the cab. The hopper is designed and constructed from carbon steel *(a stainless steel option is also avalaible)* and is powder coated to reduce corrosion *(a Rhino lining option is also avalaible)*.

Elevator — The elevator assembly is used to transfer the swept debris from the pickup broom disposing of it into the hopper. This conveyor type component is located in a near vertical position between the front of the hopper and the rear of the cab. The elevator has squeegee type design consisting of 7 or 11 flights of squeegees with replaceable corded rubber tips. The squeegees carry the debris up the backplate of the elevator and throws the debris into the hopper. The elevator consists of the squeegee bars, large rubber belts, sprocket pulleys and drive shafts. The elevator is powered by a hydraulic motor that works in conjunction with the pickup broom operation. When the switch in cab is actuated, both the broom and elevator operation is simultaneously activated. Because of close clearances of the squeegees the possibility exists that the elevator could stall or stop operating. This is usually caused by an obstruction of a larger than normal piece of debris that is wedged at some point on the elevator. When this condition occurs, an **optional** alarm buzzer sounds alerting the operator of the condition. The obstruction must be cleared before proceeding to sweep.

Gutter Brooms— The gutter broom is located on each side of the sweeper just behind the cab. The gutter broom
measures 47 inches in diameter and is equipped with 12 brush segments of the Tuf–grip type with 26" wire bristles attached to the broom drive plate. A four brush segment is also avalaible. Each gutter broom is independently lowered and raised hydraulically and controlled from the cab. The direct connected hydraulic motor accomplishes the rotation motion of the brooms.The speed is based on the engine RPM. The broom down pressure can be selected to suit the specific type of sweeping being done. It is selected by the control in the cab that consists of a gauge which indicates a HEAVY–LIGHT or UP range. The adjustment is made with the broom raised and by setting the needle below the gauge. Once set, this range remains until reset even if broom is raised and again lowered.

The MX3 Series sweeper has the In-Cab Broom Tilt capability which allows the operator to easily adjust the broom to sweep various different road cambers without exiting the cab. The tilt option is a complete arm assembly.

Shock absorbers are installed on the horizontal movement of the gutter brooms. These are used as a protective device when the gutter broom is forced inward by hitting a curb or another type of obstacle. The shock absorbers also return the broom back to its' preset outward position.

Pickup Broom— The pickup broom is located underneath the unit just to the rear of the gutter brooms. The broom is a two broom type, polypropylene filled and it is 32 inches in diameter by 58 inches in length. The purpose of the pickup broom is to sweep up the debris in the center portion of the path including the debris directed to the center by the gutter brooms and deposit it on the elevator. The broom rotates in the opposite direction of travel. The rotation is accomplished by use of a hydraulic motor and is controlled by the switch in the cab. The rotational speed is based on the engine RPM. The broom is raised and lowered hydraulically.

Dirt Shoes and Dust Flaps— A fabricated structure referred to as a dirt shoe is located on both sides of the pick
up broom with the purpose of funnelling or containing the debris in front of the pickup broom and elevator. Without this component the debris would be thrown out from under the machine and left behind while sweeping. The dirt shoe is set to slightly drag and ride parallel to the sweeping surface. It is safety chained to the pickup broom and is lowered and raised as the broom is lowered and raised.

In an effort to control the dust and contain the debris being swept into the center of the sweep path by the gutter brooms, a rubberized flap deflector is located under the chassis and just to the rear of the front wheels. A dust flap is also located to the rear of the pickup broom to keep the debris and dust from escaping to the rear of the sweeper. In addition, a chain curtain is installed to reduce debris "cow plops" behind the sweeper.

Electrical System—A centralized, weatherproof system, equipped with a system schematic allows accessibility to electrical components. Power source consists of al battery 900 CCA @ 0 degrees Fahrenheit. A system voltage of 12 volt is circuit breaker protected. Electrical control unit is a sealed system locker with sealed sub compartments for high and low amperage components.

WARNING

Always shield eyes and face from batteries.

PM 10 Option — The Global MX3 Series sweeper has been tested and certified as being in compliance with the South Coast Air Quality Management District's *Rule #1186* regulating collection and containment of PM10 *(Particle Matter 10 Microns).* The PM10 is a unique feature of dust suppression system using an array of water spray mist. The use of water spray mist in appropriate areas is important for the efficiency of the PM10. It allows for dust particle as small as 10 microns to be swept.

In order to ensure compliance with *Rule #1186* requirements, the sweeper must be operated and maintained in accordance with sweeper's PM10 specifications.

CAUTION

Do Not attempt to sweep with the water spray system inoperative.

(Refer to the PM10 maintenance and specifications section in the service and lubrication chapter in this manual.)

Autolube System Option—The autolube system is electrically operated gear pump which is actuated by an electronic control unit. The pump delivers grease through the lubrication points on the sweeper. The autolube system injects a small, metered volume of fresh lubricant into specific lube point at predetermined intervals. The system ensures that each lube point will receive the right lubricant, the right amount, at the right time.

(Refer to the AC3 Lubrication System Owners Manual for operation, maintenance instructions and other autolube service information)

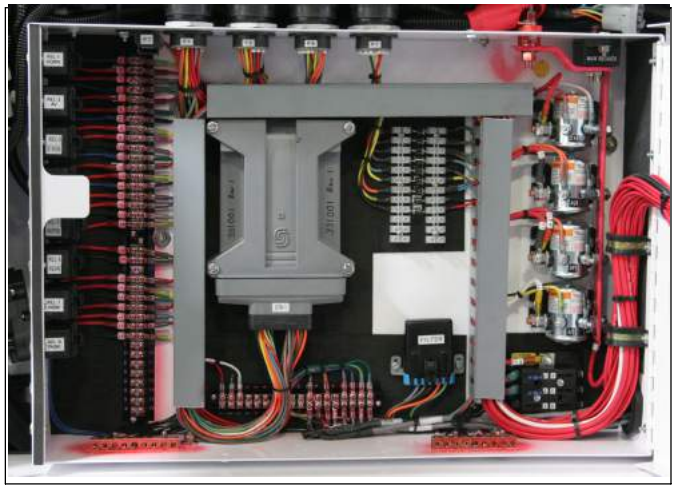


Fig: 1.6 A

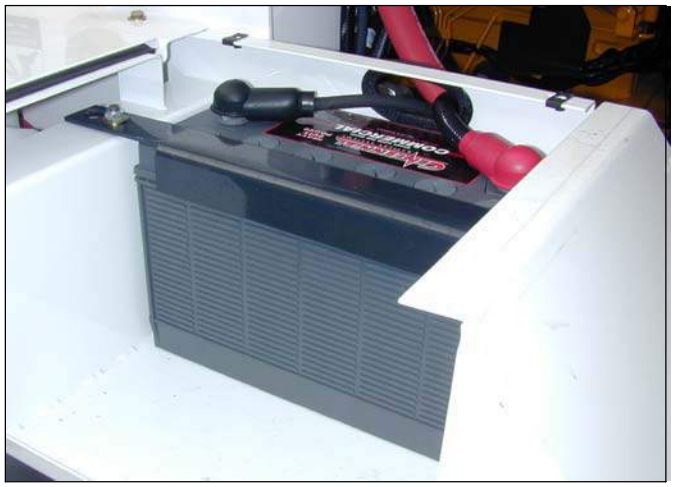


Fig: 1.6 B

Fig: 1.6 C

Table 1.1
Cab Mounted Controls and Indicators

Index No.	Description	Function/Indication
1.	**Shifter**	Allows selection of two forward speeds, reverse, and park *(similar to an automatic transmission shifter in a conventional truck).*
	❑ **HI** Position	Selects high ratio of hydrostatic system. Sweeper travels forward at speeds up to 25 mph.
	❑ **LO** Position	Selects low ratio of hydrostatic system to provide greater torque to rear wheels. Sweeper travels forward at speeds up to 8 mph.
	❑ **P** Position	Place shifter in park position to start engine. **Emergency brake is automatically activated when shifter is in park position.**
	❑ **R** Position	Allows sweeper to move in reverse direction.
	CAUTION	**DO NOT shift into REVERSE while sweeper is moving. Damage to the hydrostatic traction may result.**
2	**Side Instrument Panels**	Allows operator to adjust and monitor sweeping operations.
3.	**Steering Wheel/Column**	Besides performing standard turning applications, steering wheel tilts and telescope for operator comfort and easy access in and out of cab. Refer to Table 1.5 for detailed explanation of steering wheel/column functions.
4.	**Front Console Panel**	Allows operator to monitor driving and engine performance. Refer to Table 1.2 for detailed explanation of front instrument panel.
5.	**Foot Brake Pedal**	Foot brake pedal applies wheel brakes and activates brake lights simultaneously.
6.	**Go-Pedal**	Controls sweeper speed and engine rpm simultaneously *(similar to a gas pedal in a conventional truck)* when vehicle is in travel mode. Hydrostatic braking occurs when go-pedal is released.
7.	**Engine Throttle Switch**	Used to adjust engine rpm. The Throttle switch functions separate from go-pedal. Engine throttle switch is only used when sweeping. **Recommended sweeping RPM is between 1800 to 2100 RPM.**
8.	**Water Valves**	Valves control overall water flow to spray nozzles.
9.	**Hydraulic Temp Gauge (Opt.)**	Hydraulic temperature gauges allows the operator to monitor the oil temperatures of both left hand and right hand hydraulic tanks.
10.	**Mirror Controls (Option)**	Allows the operator to heat and defrost mirrors, and adjust left hand and right hand mirrors electronically.

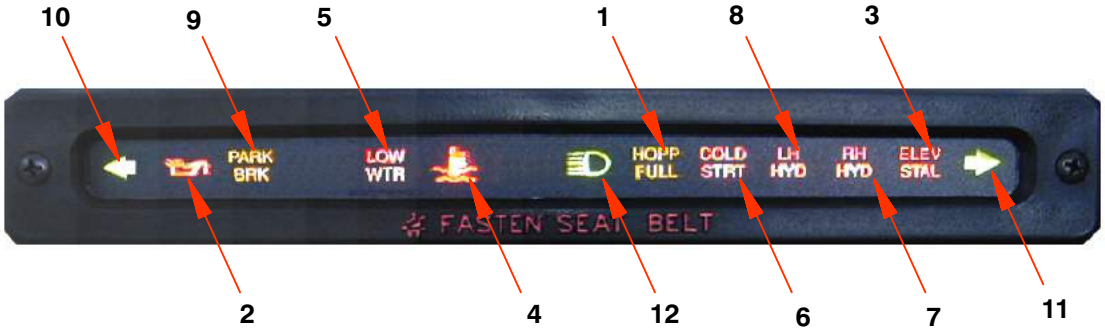
Note: Some switches and gauges may be optional, and may not apply to your vehicle.

Table 1.8A
Front Console Controls and Indicator Panel

1- Temperature Gauge
2- Engine Oil Gauge
3- Optional Hyd Filter Restriction Ind.
4- Tachometer
5- Gutter Broom Tilt RH (Option)
6- Fuel Gauge
7- Power Source (Option)
8- Ignition Key Switch
9- Voltmeter Gauge
10- Wiper / Washer Switch
11- Headlight Switch
12- Gutter Broom Tilt LH (Option)
13- Speedometer
14- Leaf Sweep Gate Switch (Option)
15- Kysor AV-1000 System
16- Engine Diagnostic Info Panel

Table 1.2

Index No.	Description	Function / Indication
1.	**Temperature Gauge** 	Indicates the engine water temperature. Normal temperature reads between 180º and 210º Fahrenheit (82ºC and 99ºC). **If the engine water temperature gauge rises above 238º F (114º C), the engine will shut down automatically.**
2.	**Engine Oil Gauge** 	Indicates the engine oil pressure when the engine is running. Normal oil pressure is between 20 and 50 psi (138 and 345 kPa. **If the engine oil pressure gauge goes below 8 psi (55 kPa), the engine will shut down automatically.**
3.	**Optional Hydraulic Restriction Indicator**	Indicates hydraulic traction filter restriction. The filter needs to be replaced
4.	**Tachometer**	Indicates the engine speed in hundreds of revolutions per minute (rpm x 100). The engine should run at arround 2100 rpm when sweeping.
5.	**Gutter Broom Tilt, Right Hand Side (Option)**	This switch is used to adjust the broom angle of the right hand side gutter broom.
6.	**Fuel Gauge**	Indicates the approximate amount of fuel remaining in the tank.
7.	**Power Source (Option)**	Used for the 12 volt accessories.
8.	**Ignition Key Switch**	Used to activate the solenoid to crank the engine starter, the normal engine ignition operation and powering the accessories.
9.	**Voltmeter Gauge**	Indicates the electrical system voltage. Troubleshoot the electrical system if the voltmeter constantly indicates an over or under charge.
10.	**Wiper / Washer Switch**	The two speed switch controls the windshield wiper motor and the windshield washer.
11.	**Headlight Switch**	The first extended position activates the panel lights, running lights, clearance lights, and tail lights. The full extended position turns on the headlights. All lights are OFF with the switch pushed in. Rotate the switch clockwise to brighten or counterwise to darken the indicator panel.
12.	**Gutter Broom Tilt, Left Hand Side (Option)**	This switch is used to adjust the broom angle of the left hand side gutter broom.
13.	**Speedometer**	Indicates the sweeper forward speed in miles-per-hour (mph). Odometer measures the total distance traveled.
14.	**Leaf Sweep Gate Switch (Option)**	This switch activates the function for collecting leaves. Activate only when the gutter brooms are lowered.
15.	**Kysor AV-1000 System**	This is a series of warning lights that monitor the condition of the sweeper (see table 5.4).
16.	**Engine Diagnostics Info Center**	Monitors Engine Operation



1. Hopper Full Indicator Light (Option)
2. Engine Oil Pressure Light
3. Elevator Stall Alarm Light
4. Engine Water Temperature Light
5. Low Engine Water Level Light
6. Cold Start Warning Light (Option)
7. Right Hydraulic Tank Level Light
8. Left Hydraulic Tank Level Light
9. Parking Brake Light
10. Left Turn Signal Light
11. Right Turn Signal Light
12. High Beam Light

(Controls and indicators on front console panel) **Fig: 1.10 A**

Table 1.3
Kysor AV-1000 Front Console Panel

Index No.	Description	Function/Indication
1.	**Hopper Full Indicator (Opt.)**	Light Indicates hopper reached full capacity.
2.	**Engine Oil Pressure**	Light indicates low engine oil pressure. The minimum engine oil pressure is 15 psi *(103 kPa)* @ idle.
	CAUTION	**If ENGINE OIL PRESSURE goes below 8 psi (55 kPa), the engine will shut down automatically.**
3.	**Elevator Stall Alarm**	Light Indicates the elevator stalled and an alarm will sound. *(Immediately bring sweeper to a full stop. Repair the elevator stall problem before proceeding to sweep).*
4.	**Engine Water Temperature**	Light indicates engine overheating due to high coolant temperature, 228° Fahrenheit or above. Check engine cooling system for failure.
	CAUTION	**If ENGINE COOLANT TEMPERATURE gauge rises above 238° Fahrenheit (114° Celsius), the engine will shut down automatically.**

(continued)

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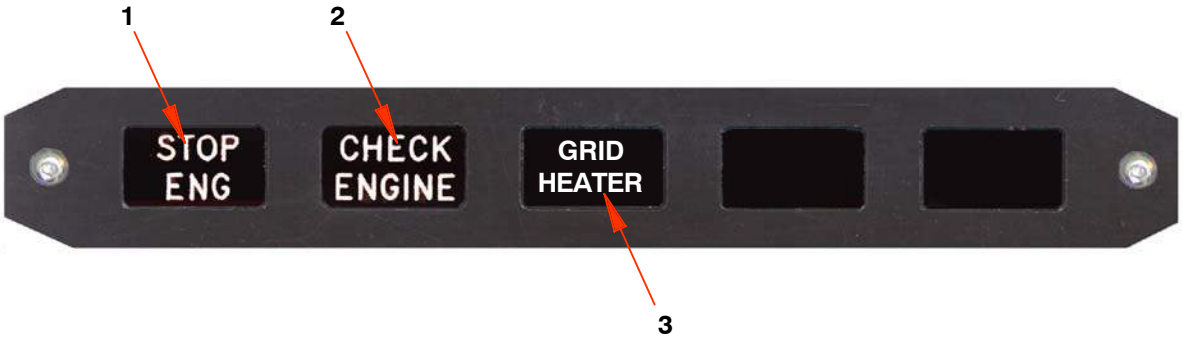


1. Stop Engine Warning Light
2. Check Engine Warning Light
3. Grid Heater Warning Light

(Controls and indicators on front console panel) **Fig: 1.12 A**

Table 1.4 Diagnostic Warning Lights Panel

Index No.	Description	Function/Indication
1.	**Stop Engine Warning Light**	Light indicates engine stopped. Light will stay ON momentarily until ignition switch is turned ON to start engine.
2.	**Check Engine Warning Light**	Light indicates engine problem. The engine requires diagnostics by a qualified technician with proper software.
	CAUTION	**If STOP ENGINE warning light illuminates, you have approximately 30 seconds to pull over to a safe place before the engine shuts down.** **Notify a qualified technician to troubleshoot any malfunction.**
3.	**Grid Heater Warning Light**	Light indicated that the intake heater is on. **Do not start the engine until the light is extinguished.**
4.	**(Not Used)**	
5.	**(Not Used)**	

Table 1.5 *(continued)*
Kysor AV-1000 Front Console Panel

Index No.	Description	Function/Indication
5.	**Low Engine Water Level**	Light indicates low engine coolant level. Check engine coolant level at deaeration tank.
	CAUTION	**If ENGINE COOLANT is low, stop engine and add necessary coolant at deaeration tank.**
6.	**Cold Start Warning Lt. (Opt.)**	Light indicates cold engine. Wait until light turns OFF before stating engine.
7.	**Right Hydraulic Tank Level**	Light indicates low traction hydraulic oil level. Check right hand hydraulic tank.
8.	**Left Hydraulic Tank Level**	Light indicates low auxiliary hydraulic oil level. Check left hand hydraulic tank.
	CAUTION	**If equiped with hydraulic temperature gauge & indicator panel (see Table 1.10 on page 1.19), and the inicator shows that the HYDRAULIC AUXILIARY or TRACTION oil is overheating, shut the engine OFF as soon as it is safe to prevent any damage to the sweeper hydraulic system.**
9.	**Parking Brake**	Light indicates parking brake is ON.
10.	**Left Turn Signal**	When flashing, left front and left rear turn signals operate. All turn signals flash when hazard warning flasher switch is ON.
11.	**Right Turn Signal**	When flashing, right front and right rear turn signals operate. All turn signals flash when hazard warning flasher switch is ON.
12.	**High Beam Light**	Blue light indicates high beam headlights are ON.

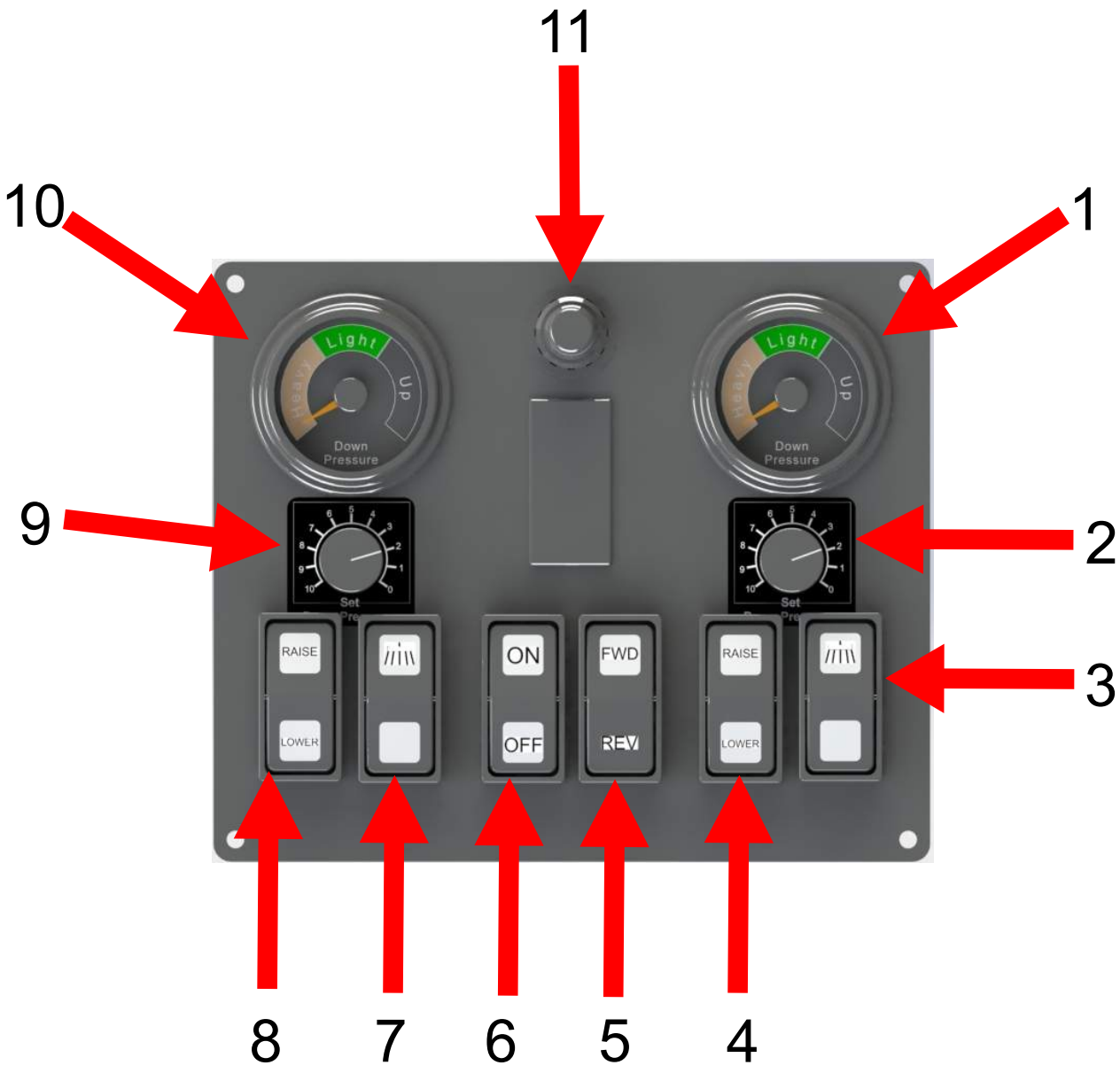
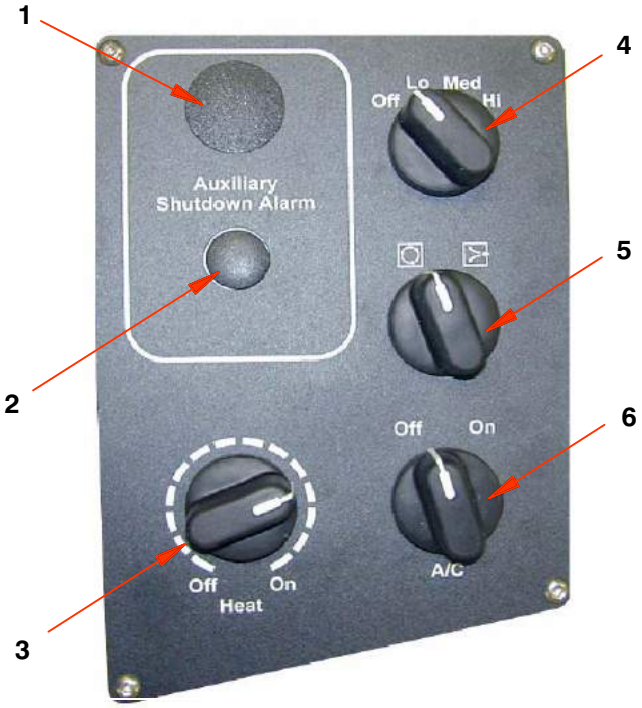


Table 1.6 Elevator/ Broom Control Panel

1- RH Gutter Broom Pressure Guage.
2- RH Gutter Broom Pressure Adjustment.
3- RH Gutter Broom Drive Switch.
4- RH Gutter Broom Raise/ Lower Switch
5- Elevator/ Pickup Drive Broom Low/Raise Switch
6-Ergo On/Off Switch
7-LH Gutter Broom Drive Switch
8- LH Gutter Broom Raise/ Lower Switch
9- LH Gutter Broom Pressure Adjustment
10- LH Gutter Broom Pressure Gauge
11- Gutter Broom Lights

Elevator/Broom Control Panel

Index No.	Description	Function / Indication
1.	**RH Gutter Broom Pressure Gauge**	Indicates the down pressure of the right hand side gutter broom.
		**DO NOT use the gutter broom as a step to climb onto the sweeper. Personal injury may occur.**
2.	**RH Gutter Broom Pressure Adjustment**	Increases or decreases the right hand side gutter broom pressure.
3.	**RH Gutter Broom Raise/Lower Switch**	Raises or lower the right hand gutter broom to the desired adjustment.
4.	**RH Gutter Broom Drive Switch**	Drives the right hand gutter broom and turns on the flood-light.
		**Stay clear of a rotating gutter broom. Personal injury may occur.**
5.	**ERGO SWITCH On/Off Switch**	Raises or lowers all selected present functions such as gutterbrooms. Will activate water pumps when selected.
6.	**Elevator/Pickup Drive Broom Switch**	First lowers, then Drives the elevator and the pickup broom. Reversing the selection momentary runs the elevator backward to un-clog and clean the elevator).
7.	**Gutter Broom Lights**	

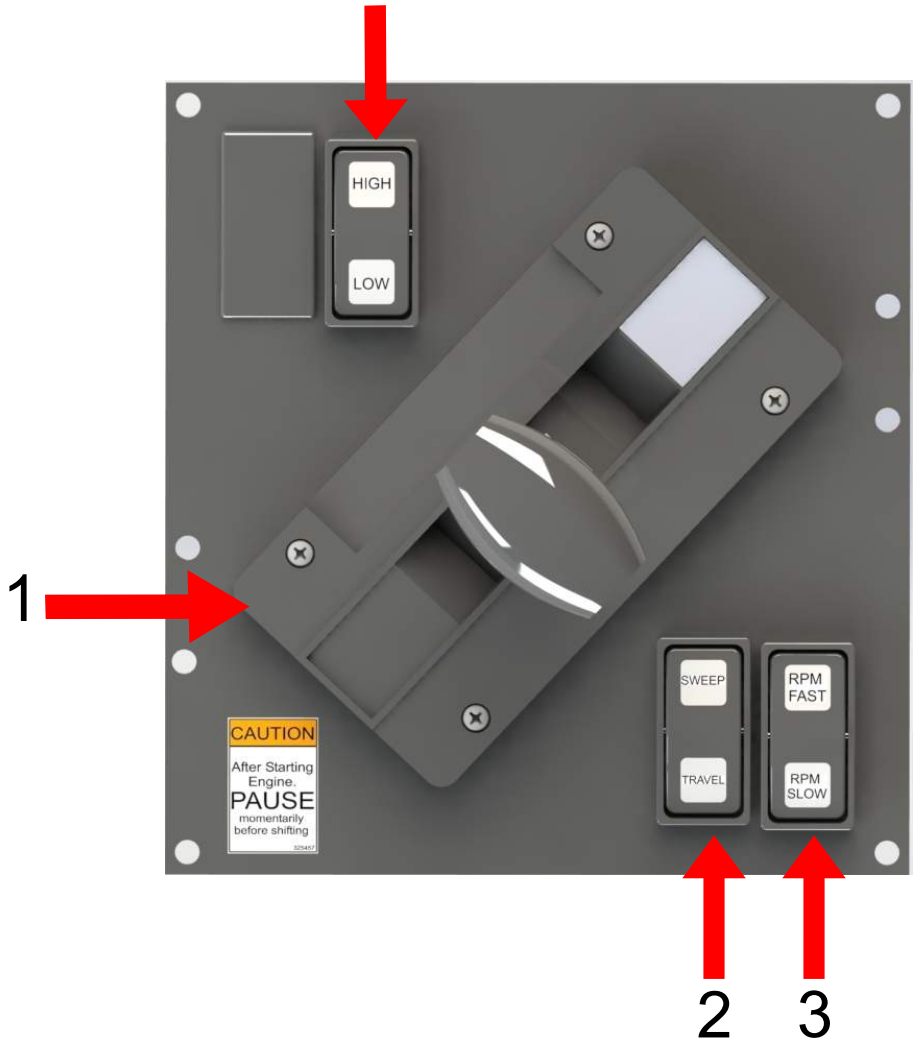


1. Auxiliary Shutdown Alarm (Option)
2. Not Used
3. Heat Temperature Control
4. Fan Switch
5. Air Circulation Control
6. AC ON/OFF Switch

(Controls and indicators on side instrument panel) **Fig: 1.15 A**

Table 1.8
Auxiliary Shutdown Alarm Option & Air Conditioner Control Panel

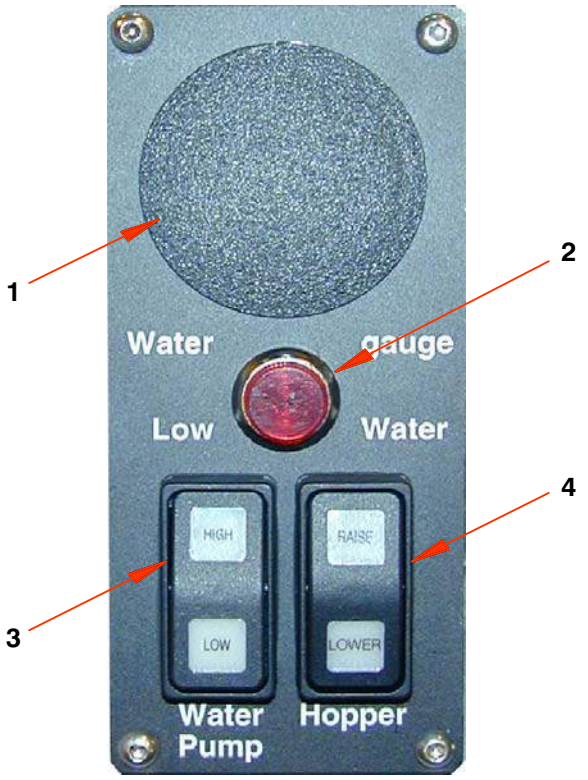
Index No.	Description	Function/Indication
1.	**Aux. Shutdown Alarm (Opt.)**	Audible alarm sounds when either the engine oil pressure is below 8 Psi, or the coolant temperature is above 238° F.
	CAUTION	**If the ENGINE OIL PRESSURE goes below 8 Psi (55 kPa) or the ENGINE COOLANT TEMPERATURE rises above 238° F (114° C), the engine will shut down automatically.**
2.	**Not Used**	N/A
3.	**Heat Temperature Control**	Selects desired hot temperature of cab air by directing hot water through heater.
4.	**Fan Switch**	Turns heater/air conditioner fan On or Off and selects desired fan speed *(Low, Medium, High).*
5.	**Air Circulation Control**	Selection controls fresh air or recirculating air.
6.	**AC On/Off Switch**	Turns On/Off Air Conditioner.



1. Shifter
2. Sweep Travel Switch
3. RPM Switch
4. Axle Drive Switch

Table 1.8
Shifter Control Panel

Index No.	Description	Function/Indication
1.	**Shifter**	Allows selection of two forward speeds, reverse, and park *(similar to an automatic transmission shifter in a conventional truck).* High and low forward speeds vary the displacement of the hydraulic traction pump *(refer to Table 1.1)*.
2.	**Sweep Travel Switch**	In Sweep mode selection, engine RPM is independent from traction drive. In Travel mode, engine RPM is linked to the Go-Pedal.
3.	**RPM Switch**	Adjusts engine RPM in sweep mode.
4.	**Axle Drive Switch**	Selects rear axle gear ratio. When in High mode, sweeper will travel up to 65 mph. High/Low axle drive switch works independent from High/Low gear Shifter.

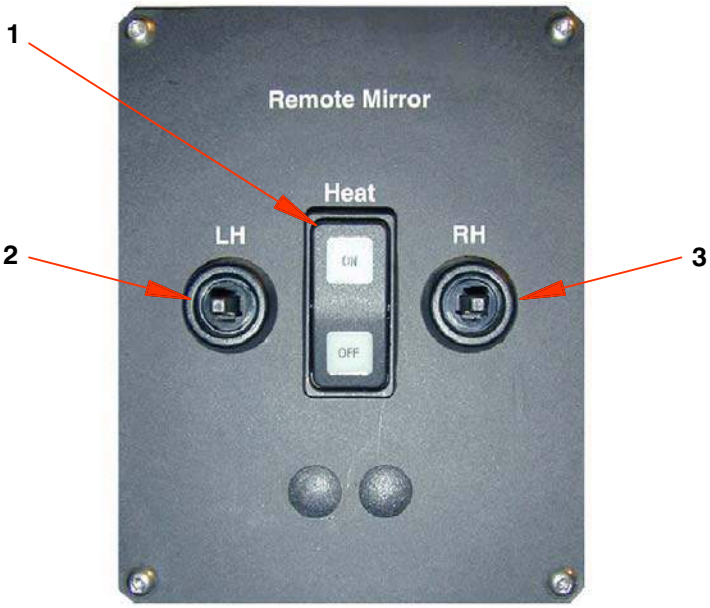


1. Water Level Gauge (Option)
2. Low Water Level Light
3. Water Pump Switch
4. Hopper Switch

(Controls and indicators on side instrument panel) **Fig: 1.17A**

Table 2.0
Water Level Gauge & Hopper Switch Panel

Index No.	Description	Function/Indication
1.	**Water Level Gauge (Option)**	Indicates water level in the water tank.
2.	**Water Level Indicator Light**	Light indicates low water level in the tank.
3.	**Water Pump Switch**	3-Position switch, Position 1 **(HIGH)** - Both water pump ON Position 2 **(MIDDLE)** - OFF Position 3 **(LOW)** - One water pump ON
4.	**Hopper Switch**	Raises hopper to dump position. Lower switch selection lowers hopper to sweeping and driving position.
	CAUTION	**Hopper will only raise or lower in Park position. Sweeper will not move forward or in reverse with a raised hopper.**

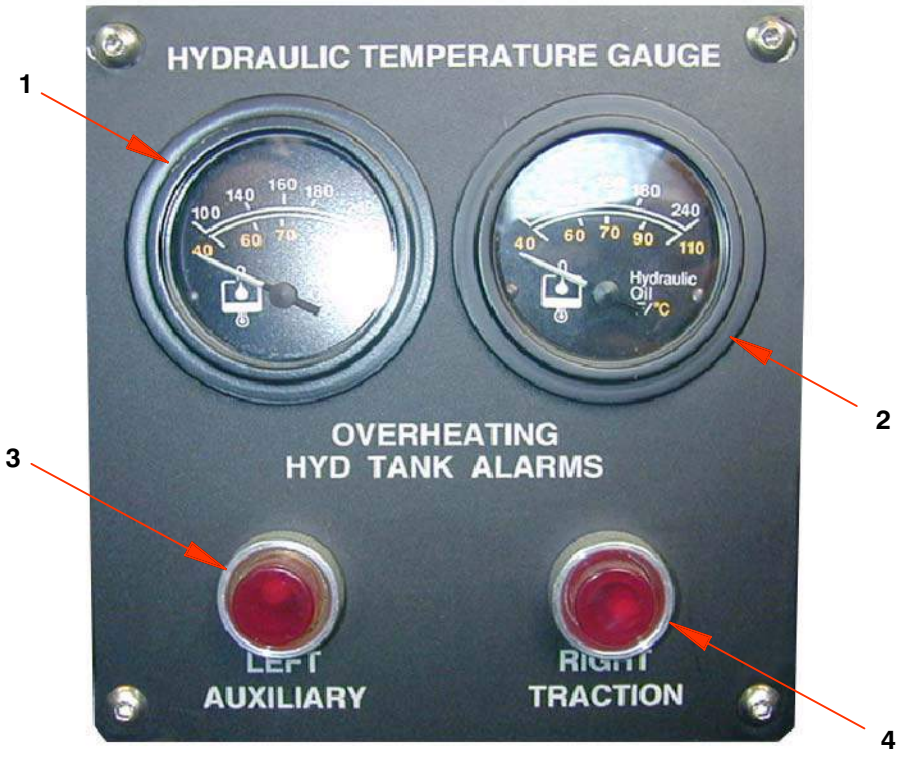


1. Mirror Heater Switch
2. Mirror Adjustment, LH
3. Mirror Adjustment, RH

(Controls and indicators on the wall below side instrument panel) **Fig: 1.18 A**

Table 2.1
Remote Mirror Option Control Panel

Index No.	Description	Function/Indication
1.	**Mirror Heater Switch**	Heats and Defrosts both left and right mirrors.
2.	**Mirror Adjustment, LH**	Adjust Left Hand mirror in-and-out.
3.	**Mirror Adjustment, RH**	Adjust Right Hand mirror in-and-out.
	CAUTION	**DO NOT adjust the side view mirror while sweeper is in motion.**
	CAUTION	**Make sure you can see clearly through the side view mirror at all times. DO NOT allow anything to block your vision.**

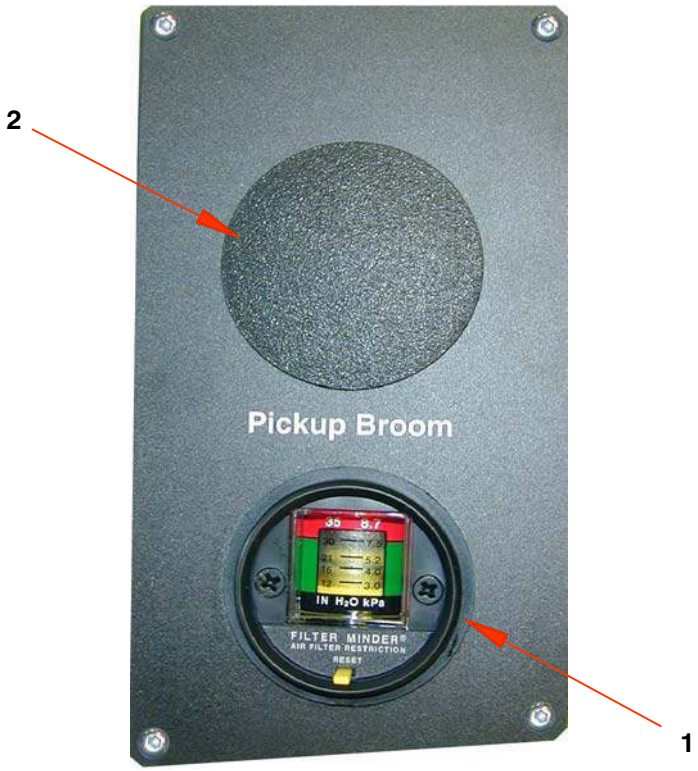


1. Auxiliary Hydraulic Oil Gauge, LH Tank (Option)
2. Traction Hydraulic Oil Gauge, RH Tank (Option)
3. Auxiliary Hydraulic Oil Indicator Light (Option)
4. Hydraulic Traction Indicator Light (Option)

(Gaugess and indicators on side instrument panel) **Fig: 1.19 A**

Table 2.2
Hydraulic Oil Temperature Gauge & Indicator Option Panel

Index No.	Description	Function/Indication
1.	**Aux Hyd Oil Gauge/LH Tank**	Measures Auxiliary Hydraulic Oil temperature in left tank. Normal oil temperature is below 200° Fahrenheit.
2.	**Trac Hyd Oil Gauge/RH Tank**	Measures Hydraulic Traction Oil temperature in right tank. Normal oil temperature is below 200° Fahrenheit.
3.	**Aux Hyd Oil Indicator**	Indicates overheating Auxiliary Hydraulic Oil system at temperatures above 200° Fahrenheit *(does not shut-down system).*
4.	**Hyd Traction Oil Indicator**	Indicates overheating Hydraulic Traction Oil system at temperatures above 200° Fahrenheit *(does not shut-down system).*



1. Air Cleaner Restriction Gauge
2. Pickup Broom Odometer (Option)

(Gaugess and indicators on side instrument panel) **Fig: 1.20 A**

Table 2.3
Air Restriction Gauge Indicator & Pickup Broom Odometer (Option)

Index No.	Description	Function/Indication
1.	**Air Restriction Gauge**	Indicates the restriction of the air flow from the air filter to the engine, caused by the accumulation of dirt on the air filter. If the gauge indicator is in the red (above 30 In or 7.5 kPa) replace the air filter.
2.	**Pickup Broom Odometer (Option)**	Indicates miles swept by the Pickup Broom. ***NOTE:*** *The odometer does not indicate the miles when the sweeper is not sweeping (Pickup Broom running in place).*

Fig: 1.21 A

Fig: 1.21 B

STEERING COLUMN CONTROLS

The Global MX3 Series sweeper has power steering to help you steer the sweeper easily. Never hold the steering wheel in the extreme left or right position for more than five seconds if the engine is running.

The following controls are located on the steering column:

❑ **Turn Signal Lever** — You can use the turn signal lever on the left side of the steering column to operate turn signals, turn the headlights to high beam or flash headlights.

- Usually, the turn signals turn off automatically after you turn the sweeper. If the turn signal continues to flash after you have made the turn, pull lever back to the neutral position.
- To indicate a lane change to the right, push the turn signal lever up slightly *(without latching)* and hold it in position. To indicate a lane change to the left, push the turn signal lever down slightly *(without latching)* and hold it in position. The lever will return to the Off position when you release it.

❑ **High Beams** — To turn on the high beams, turn the headlights on and push the turn signal lever away from you until it latches. When the high beams are on, the blue high beam indicator lights on the instrument panel is illuminated.

❑ **Tilt Steering Wheel** — Pull lever up to adjust steering wheel to desired position then release lever to lock steering wheel in place.

CAUTION

Do not adjust steering wheel while the sweeper is in motion.

❑ **Telescope Steering Wheel** — This is the same lever used for tilt steering wheel. To telescope steering push lever down and adjust steering height to comfortable position.

❑ **Horn Pad** — To sound the horn, press the center pad on the steering wheel firmly. Check the horn regularly to make sure it operates properly.

❑ **Hazard Flasher Switch** — The hazard flasher is used to alert other drivers to hazardous situations.

- The hazard flasher switch operates the same lights as the turn signal lever. When the hazard flasher is activated, and the G O Pedal is pressed the hazard light flash on and off. The turn signal indicators cannot be used when the hazard lights are flashing. When the G O Pedal is released, the hazard lights stop flashing and brake lights will automaticaly activate. *Please note that when G O Pedal is released, brake lights will always activate.*
- To use the hazard flasher, pull the HAZARD switch; you'll see the turn signal arrows flash.
- To stop the hazard flasher, push the HAZARD switch.

Fig: 1.22 A

SEAT ADJUSTMENTS

Perform backrest, armrest, height, fore and aft seat adjustments **prior** to driving the sweeper.

❑ **Height Adjustment**—Height of seat is adjustable to different levels. To raise, pull lever on left side and lift seat until it automatically engages. To lower seat, pull lever and let weight of operator push seat down to a different level.

NOTE: *Adjust Tether Belt after changing seat height.*

❑ **Fore and Aft Adjustment**—Pull up on left side fore/aft adjustment lever and slide seat to desired position. The operator must be able to comfortably reach all cab controls.

❑ **Backrest Adjustment**—With no weight on the backrest, set desired adjustment. On the right side of the backrest, turn knob clockwise to tilt forward and counterclockwise to tilt backward.

❑ **Arm Rests**—Armrests may be positioned up or down. In up setting, arm rests are flush with seat backing.

SAFETY RESTRAINTS

Using safety belt will help to restrain you and your companion in case of rough ride or collision. In most states, the law requires their use.

❑ **Seat Belt Adjustment** — Seat belt is a common lift type release with a shoulder harness. Insert the tongue into the buckle until it snaps and locks into place. Adjust belt by pulling extra strap material through buckle.

❑ **Tether Belt Adjustment** — Tether belt is a safety device that allows seat to travel up to a maximum distance. Insert the tongue into the buckle until it snaps and locks into place. Adjust belt by pulling extra strap material through buckle.

NOTE: *Adjust tether strap tight enough to eliminate chance of operator from hitting roof of cab during a rough ride.*

SIDE VIEW MIRRORS

Close your door and adjust the driver's seat to the most comfortable position before you adjust the side view mirrors.

If you have manually adjusting side view mirrors, you can adjust them in any direction by moving the mirror heads.

CAUTION

Make sure you can see clearly through the side view mirror at all times. Do not allow anything to block your vision.

CAUTION

Be careful. The convex side view mirrors makes objects appear smaller and farther away than they actually are.

CAUTION

Do not adjust the side view mirror while th e sweeper is in motion.

CHAPTER 2

Sweeper Operation

2

Table of Contents

2

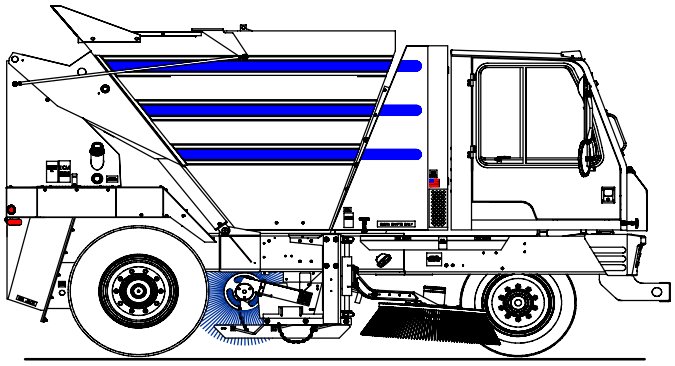


Fig: 2.3 A

START–UP CHECKLIST

The condition of the sweeper prior to start–up is a very important factor as it directly affects the operator's safety as well as those around him. It should be a common practice to the operator to perform preliminary inspection on a daily basis. The purpose of the inspection is to keep the equipment in proper working condition and to detect any signs of malfunction. These inspections aid in trouble–free operation reducing wear and mechanical failure.

Daily Check List

1.	**Lights**	✓
2.	**Tires**	✓
3.	**Water Spray Level**	✓
4.	**Fuel Level**	✓
5.	**Air Cleaner Service Indicator**	✓
6.	**Radiator and Oil Cooler**	✓
7.	**Belts**	✓
8.	**Hydraulic Oil**	✓
9.	**Engine Oil**	✓
10.	**Engine Coolant**	✓
11.	**Coolant and Oil Leaks**	✓
12.	**Brake Fluid**	✓
13.	**Service and Lubrication**	✓

1. **Lights** — It is a good idea to check the operation of the following lights frequently:

   - ❑ Headlights
   - ❑ Tail Lights
   - ❑ Brake Lights
   - ❑ Hazard Flasher
   - ❑ Turn Signal
   - ❑ Flood Lights
   - ❑ Beacon Lights

2. **Tires** — Visually check tires for correct inflation daily. Front=Manufacturer Specifications *(10R17.5)*, Rear= Manufacturer specifications *(11R 22.5)*. If one tire looks lower than the others, check the pressure in all of them. Perform inflation checks when tires are cool.

   - ❑ Keep your tires inflated to the recommended pressures.
   - ❑ Stay within the recommended load limit.
   - ❑ Drive sweeper at safe speeds

NOTE: *If you don't take these precautions, your tires may fail or go flat.*

3. **Water Level** — Check water spray level. Add water as required. *(ref–Filling Water Tank procedure in this chapter).*

4. **Fuel Level** — Turn ignition key to driving position and observe fuel gauge. Add fuel as required.

5. **Air Cleaner Service Indicator** — Check air cleaner service indicator daily. Clean or replace air cleaner filter element before yellow indicator spool reaches red line. Reset indicator after servicing air cleaner.

NOTE: *Frequent air cleaner cleaning is necessary when sweeping under severe dusty conditions.*

6. **Radiator, Oil Cooler, Charge Air Cooler**—

   Check radiator, charge air cool and oil cooler for leaks. Inspect all for damage, leaking weldments, and clogged fins. Repair all leaks and clean clogged fins. Visually check mounting screws for proper tightness. *Clean all radiator and all coolers daily.*

NOTE: *Visually check and clean radiator daily.*

7. **Belts**—Check all engine driven belts *(commonly referred to as fan belts)* for wear, tension and their condition. Adjust belt tension as required. Replace worn or damaged belts.

Fig. 2.4 A

8. **Hydraulic Oil**—Check oil level in each of the hydraulic tank sight gauges located outside of hopper towers. Sweeper must be on a level ground when checking oil level. With engine OFF add hydraulic oil *(ISO 46)* as required.

CAUTION

Do not attempt to check for HYDRAULIC OIL LEAKS without hand and eye protection. Hydraulic oil under pressure can penetrate skin and cause severe injury.

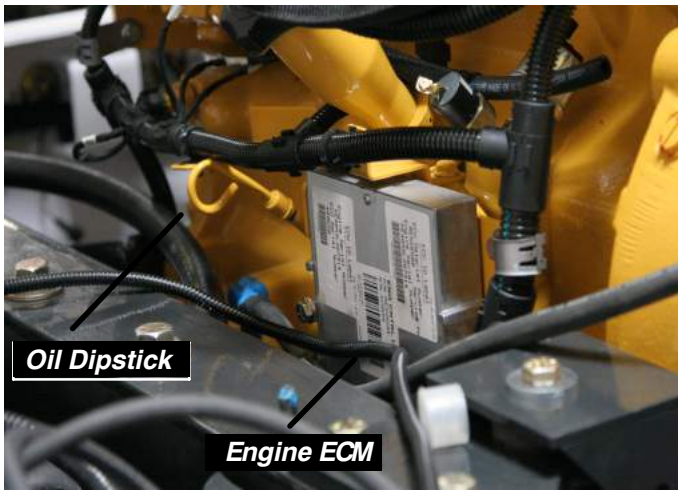


Fig: 2.4 B

9. **Engine Oil** — Stop engine before checking engine oil level. Remove dipstick, wipe clean and re–insert into engine. Then remove dipstick and check oil level by observing gradient lines. Oil level should indicate between *Add* and *Full* marks. If necessary, add oil by removing oil filler cap. **Never over fill engine with oil** *(Fig 2.4B).* **Engine ECM- do not spay high pressure water at or around the ECMUnit.**

NOTE: *When inserting, ensure that dipstick is fully seated to get a proper oil level reading and prevent contamination from entering engine.*

10. **Engine Coolant** — Check engine coolant level at deaeration tank. If coolant is not visible in between maximum and minimum fill lines, wait for radiator to cool, remove filler cap and add coolant as required.

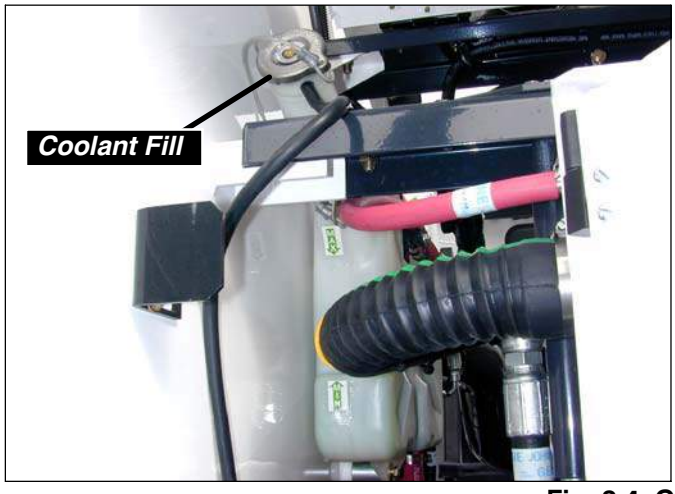


Fig: 2.4 C

WARNING

Never remove deaeration tank cap or any radiator hose when ENGINE COOLANT is hot.

11. **Coolant and Oil Leaks** — Check fluid leaks by inspecting the surface beneath the sweeper for oil, coolant and other fluid drips.

12. **Brake Fluid** — Check brake fluid level in master cylinder. Fluid level should indicate between *Add* and *Full* marks. If necessary, add fluid *(Brake Fluid DOT 3 or equivalent)*.

13. **Service and Lubrication** — Perform all daily service and lubrication functions.

(Master Cylinder Reservoir) **Fig: 2.5 A**

STARTING ENGINE

As previously indicated, it is important from a safe operational standpoint that you the operator know your sweeper before starting the engine. This means knowing the function of each control as to what happens when it is activated, how it might interact with other functions and any limitations that might exist. A good understanding of the controls and capabilities will enhance operation and assure maximum operating efficiency and safety.

Fig: 2.5 B

Ignition Positions

The sweeper's ignition has four positions:

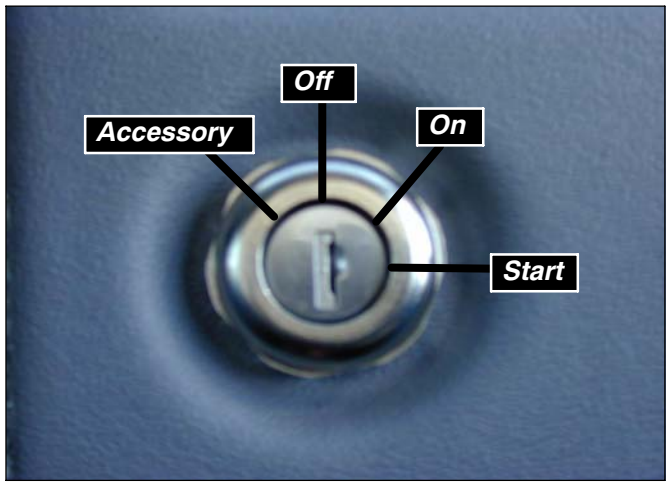


Fig: 2.5 C

❑ **OFF** position allows you to shut off the engine and all accessories.

NOTE: *The* ***OFF*** *position is the only position that allows you to insert and remove the key from the ignition.*

❑ **ON** position allow you to test the sweeper's warning lights to make sure they work before you start the engine. The key returns to the ON position once the engine is started and remains in this position while the engine runs.

CAUTION

Release the key once the engine starts so that you do not damage the starter.

❑ **START** position allows you to crank the engine. Release the key once the engine starts so that you don't damage the starter.

❑ **ACCESSORY** position allows you to operate some of the sweeper's electrical accessories while the engine is not running.

Before starting the Engine

Before you start the sweeper, always:

1. Make sure you close and lock door.
2. Make sure you fasten your safety belts.
3. Make sure you adjust rearview mirrors.
4. Make sure sweep gear, headlights and other accessories are turned OFF when starting.
5. Make sure that the shifter is in *Park (P)* position before you turn ON the ignition key.

Starting the Engine

Normal starting procedure will fire up engine in most conditions. To start the engine:

1. Make sure shifter is in *Park (P)* position. Engine will not start with shifter in any other position.
2. Insert key and turn Ignition Key Switch to ON position. Wait for engine warning lights to extinguish.
3. Proceed to turn Ignition Switch to far right to engage starter. As soon as engine has started, release ignition key switch allowing it to automatically return to ON Position. Check Dash controls and monitor instruments.

CAUTION

Do not engage STARTER MOTOR for more than 30 seconds at a time. Allow starter motor to cool at least 3 minutes between starting attempts to avoid heat damage to starter motor.

5. Engine oil pressure gauge should read 20 PSI minimum within 30 seconds. If oil pressure is low, immediately turn Ignition Key to OFF position. Notify a qualified mechanic to determine and correct cause of low oil pressure.

6. Allow engine and hydraulic pumps to warm up for a few minutes before driving sweeper or performing any hydraulic operations.

Vehicle Warm-up Procedure

It is recommended that a short warm–up period between 10 to 15 minutes be part of the pre–operating procedures for the sweeper. This warm–up period will allow the oil in the hydrostatic drive system to reach the desired temperature and consistency for safe and smooth operation.

Stopping the Engine

1. Turn OFF all sweeping functions and all accessories.
2. Allow the engine to idle 3 to 5 minutes before shutting it off after a full–load operation. This allows adequate cool down of pistons, cylinders, bearings, and turbo–charger components.
3. Turn the ignition keyswitch to the OFF position.

CHAPTER 2

DRIVING THE SWEEPER

Always operate the sweeper within reasonable limits. Abrupt changes in acceleration, deceleration, turning, or combinations of both of these maneuvers can cause the sweeper to behave differently than anticipated, especially when road conditions vary.

Use greater care until you become accustomed to its features and characteristics.

There are two distinct methods of driving sweeper. One is the normal street or highway travel mode *(shifter is placed in **High**)* and the other is the sweep–driving mode *(shifter is placed in **Low**)*. Sweep–driving mode is simply driving the unit with the sweep gear lowered and operating.

***NOTE:** In a safe area designed specifically for training, first time operators should practice driving, turning, accelerating, stopping and familiarizing themselves with the Global MX3 seriers sweeper.*

WARNING

Observe all safety precautions while operating the sweeper.

Driving in Normal Conditions

1. Position yourself in the driver's seat and make adjustment to your comfort. Buckle your seat belt.
2. If necessary make adjustment to the steering wheel height *(telescope)* and tilt.
3. If necessary adjust your side view mirrors.
4. With the engine running, check that all sweep gear is in the OFF position. Press hopper switch to lower to make sure it is completely down or the sweeper will not move forward or in reverse.

CAUTION

Do not shift to PARK while sweeper is in motion.

CAUTION

Do not adjust the RPM throttle switch when driving the sweeper.

5. Place shifter to Hi **(H)** or Lo **(L)** position.
   - ❑ Shifter Position Hi **(H)** – Used for traveling, the maximum speed is 25 MPH.
   - ❑ Shifter Position Low **(L)** – Used for sweeping or driving up steep hills, the maximum speed is 8 MPH.
6. Activate go–pedal to regulate travel speed. Hold foot on accelerator pedal to stabilize speed.
7. When reducing sweeper speed, slowly remove pressure from the go–pedal.

CAUTION

When go-pedal is fully released, hydraulic drive system automatically applies hydrostatic braking. Wheel brake is applied with the foot brake pedal.

CAUTION

Do not drive sweeper with your foot resting on the brake pedal.

8. To drive in reverse, position shifter in *Reverse (R)* and step on the go–pedal. When backing up sweeper, warning alarms sounds and back up light illuminates cautioning bystanders to stay clear.

***NOTE:** Make sure the sweeper is completely stopped before shifting into Reverse (R).*

CAUTION

Whenever sweeper is traveling at slow speed, Turn ON beacon flasher as a safety precaution.

Fig: 2.8 A

Driving in Hazardous Conditions

Adjust your driving to the weather and road conditions. When hazardous driving conditions are encountered, drive cautiously.

- ❑ Fog: If fog becomes so thick that you can barely see, pull completely off the road.
- ❑ Heavy rain or Snow: Slow down at the first sign of rain, drizzle, or snow on the road. This is when many road pavement surfaces are most slippery.
- ❑ Hills and Curves: When you encounter a steep hill or sharp curve, slow down enough to be able to stop.

CAUTION

If the sweeper breaks down on the road, pull over and turn ON your emergency flasher lights.

SWEEPING

The efficiency of a good sweeping operation is moving at a travel speed consistent with the type of debris and area to be swept. Too fast of a travel speed will only stir up the debris and result in a hit and miss operation. It is for this reason that rate of speed be minimized as dictated by your experience and sweeping conditions.

Filling the Water Tank

1. Check that water tank drain plugs and the water spray system control valves inside the cab are closed.
2. Remove cap from hydrant and using hydrant tool, open valve and allow water to run to flush out dirt and other foreign objects. Turn off hydrant.
3. Connect filler hose to hydrant and slowly open hydrant valve. Fill water tank.

WARNING

Stand clear from the fire hydrant hose when filling tanks.

4. After filling slowly close hydrant valve, disconnect filler hose and drain water in hose. Replace hydrant cap and return hose and tools to compartment.

CAUTION

Do not fill water tanks with CONTAMINATED water. Take extra care as high pressure exists in hydrant system.

Preliminary Sweeping Procedure

1. Check pickup broom pattern daily. An out–of–adjustment pickup broom will result in poor sweeping performance.

NOTE: *Pickup broom adjustments should only be made by experienced mechanics (see Chapter 3 for pickup broom adjustments).*

2. Adjust gutter broom pressure using the broom pressure gauge in the cab.

NOTE: *Careful attention to gutter broom pattern and arm angle will aid in maximum sweeping efficiency.*

3. Check water spray level. Fill the water tank if required.
4. Check water spray nozzle jets for obstruction.
5. Put the water pump switch on **HIGH** or **LOW.**

CHAPTER 2

Driving in Sweep Mode

For most conditions, the MX3 Sweeper sweeps the best when the engine RPM is between 1800 and 2100. The gear shift is in Low **(L)** with a maximum sweeper speed of 8 mph. Always follow the safety related operating suggestions discussed throughout the manual.

1. Determine the best travel speed to enable an efficient and satisfactory sweep operation.

   ❑ RPM throttle knob – Adjust engine **RPM** speed until TACHOMETER read out is between 1800 & 2100 RPM.

   ❑ Shifter – Move shifter to Low **(L)** position.

2. Turn **ON** Emergency Flashers, Rotating Beacon and other warning lights.

3. Lower gutter brooms to pavement by actuating the GB RIGHT and GB LEFT switches to **LOWER.** Hold down switch and check DOWN PRESSURE gauge for setting.

4. Actuate **GB DRIVE** switches to start rotation operation of brooms. One or both brooms may be used depending on the sweep application.

5. Lower the PICKUP broom by actuating the switch to **LOWER.**

6. Start operation of pickup broom and elevator by actuating DRIVE switch to **FORWARD** position. Both operate from same switch.

7. Activate water spray system by placing water pump switch on **LOW** or **HIGH** position.

8. Turn **ON** and adjust water volume to each spray bar of the gutter broom and front nozzle bar by controls located behind buddy seat.

9. Step on the go–pedal to start sweeping.

10. Continuously monitor all instruments and gauges while sweeping.

11. Using the rear view mirrors, observe the swept path to ensure it is clean. If not, stop and determine the cause of the problem.

Observe all local and state traffic laws and regulations.

Avoid sweeping near bystanders and take extra precautions in and around congested areas.

DUMPING

During the sweep operation or at the end of shift, it may be necessary to empty collected debris from the hopper. The hopper is designed to dump from the rear of the sweeper. The large hopper discharge door allows unloading of debris into a trash bin at the sweep site or at the dump site.

Before Unloading the Sweeper

Before you unload the sweeper, always:

1. Make sure sweeper is parked firmly on level ground.

2. Check overhead area above and to the rear of the sweeper for any obstructions such as trees, power lines, street lighting or street signs.

3. Make sure bystanders are clear from the sweeper.

Unloading Procedure

1. Place shifter in *Park (P)* position to engage parking brake.

2. Actuate hopper switch to *Raise* and continue to hold switch until hopper is fully elevated.

WARNING

Unloading a full hopper changes the sweeper's center of gravity and can tip the sweeper resulting in severe injury or property damage. DO NOT raise hopper unless sweeper is parked firmly on level ground.

CAUTION

Stay clear of electrical power lines and other overhead obstructions. A clearance of approximately 20 feet is required.

WARNING

As the hopper is being unloaded, debris in the hopper will be discharged. Be sure bystanders are clear from sweeper until hopper is emptied.

3. Once the hopper is empty and cleaned out, actuate the hopper switch to *Lower* position and hold until hopper is fully lowered.

NOTE: *Sweeper will not move forward or in reverse with a raised hopper.*

Raising the Hopper

Sometimes it is necessary to raise hopper in order to clean inside the hopper, check the engine, or check the elevator. When raising hopper other than unloading, install safety props on the both hopper cylinder rods.

CAUTION

Do not raise hopper unless sweeper is parked on firm, level ground.

1. Always use safety props when working on, around, or under raised hopper.

2. Always install safety props on both hopper cylinders.

3. Never position yourself under hopper while installing or removing safety props.

4. Be sure to clear any obstructions under the hopper and remove safety props before lowering the hopper.

WARNING

Serious injury or death may result if hopper cylinders fail.

Emergency Hopper Lift (Option)

If engine is inoperable, the hopper can still be lifted using the auxiliary dumping ports and a portable hydraulic pump.

1. Connect suction port *(Fig. 2.11 A)* from hydraulic tank to an external portable hydraulic pump *(5 to 10 GPM @ 2500 PSI)*.

2. To raise the hopper, connect a pressure line from the pump to the lower port located on the hydraulic cylinder *(Fig. 2.11 A)*.

WARNING

Always install safety props when working under a raised hopper.

3. To lower the hopper, connect pressure line from the pump to the upper port located on the inside upper part of the hydraulic cylinder *(not shown)*.

WARNING

Stay clear off the hopper while it is being lowered.

CAUTION

Make sure that the hopper does not come down on the pump pressure line while it is being lowered.

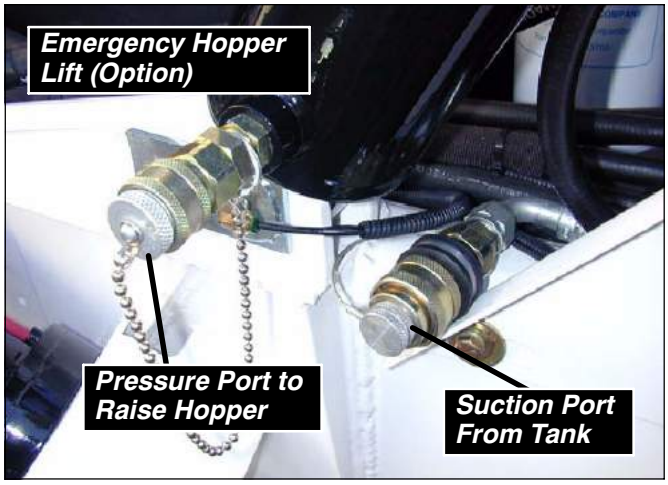


Fig: 2.11 A

Fig: 2.11 B

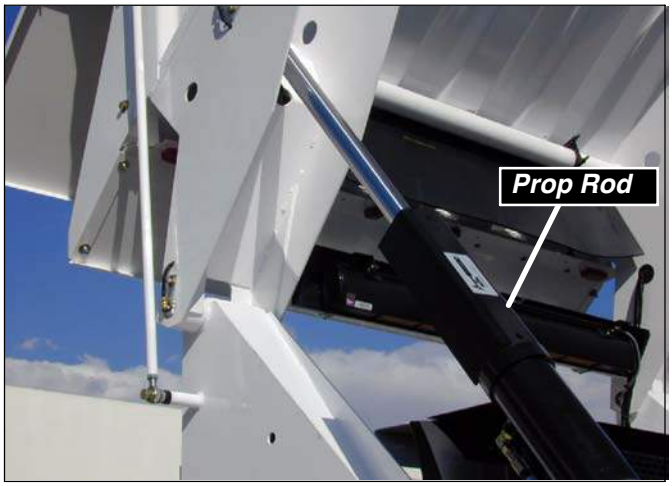


Fig: 2.11 C

ELEVATOR STALL

The MX3 Series sweeper is equipped with an Optional Elevator Stall Alarm. When the elevator is running, a sensor continuously detects the target point on the sprocket and sends an impulse signal to the stall alarm system. Once the signal is interrupted, after a five second delay, an alarm will sound indicating the elevator has stalled. An elevator stall condition is usually caused by an obstruction in the elevator. Clear obstruction from elevator area before proceeding to sweep.

Clearing Obstruction from the Elevator

To clear obstruction from the elevator:

1. Bring sweeper to a complete stop.
2. Place shifter in *Park (P)* position.
3. Adjust engine speed to approximately 1500 RPM.
4. Jog elevator/pickup broom switch to *Reverse*, *Off*, then *Forward* every few seconds until obstruction is cleared.

NOTE: *If stall condition continues after several attempts to remove obstruction, the hopper has ma have reached its capacity and should be emptied.*

With the hopper raised:

1. Turn the Elevator switch to OFF.
2. Stop the engine.
3. Install hopper safetly props.
4. Remove obstruction from the elevator.

WARNING

Stay clear of running elevator. Personal injury may occur.

NOTE: *With hopper raised, install safety prop on hopper cylinder rod. Safety prop rests on top edge of cylinder body. Install safety props on both hopper cylinders.*

PARKING THE SWEEPER

Abide to all local and state highway parking rules and regulations.

Always come to a complete stop before you place the shifter to *Park (P)* position. This position automatically engages the parking brake and prevents the wheels from turning.

Parking procedures

1. Bring sweeper to a complete stop.

2. Place shifter to *Park (P)* automatically activating parking brake.

3. Raise sweep gear and turn off elevator.

CAUTION

Damage may occur to bristles if sweeper is parked with brooms down.

4. Turn Off all switches including headlights, floodlights, beacon lights and rear flashers.

5. Turn off water pump switch and shut-off water spray valves

6. Allow the engine to idle for 3 to 5 minutes before turning off the ignition.

WARNING

Turn off the ignition whenever you leave the sweeper. Do not leave the sweeper unattended while the engine is running.

NOTE: *When parking the sweeper always make sure to raise the pickup broom and the gutter brooms to their up position.*

Fig: 2.12 A

Fig: 2.12 B

Fig: 2.12 C

CHAPTER 2

TOWING THE SWEEPER

If towing is necessary, Global Environmental Products, Inc. recommends having it done by a commercial tow–truck service. Proper lifting and towing procedures are necessary to prevent damage to the sweeper. State and local laws applicable to vehicle in tow must be followed. **Do not** tow sweeper without strict adherence to instructions in this manual. Strict procedures must be performed before towing to alleviate further damage to inoperable sweeper.

Emergency Towing

CAUTION

DO NOT tow sweeper more than 100 feet using the emergency towing procedure. Serious damage may occur.

NOTE: *The rear wheels will not turn during the emergency towing procedure due to parking brake engagement. Rear tires will skid as the sweeper is being dragged.*

1. Hitch the front end of sweeper *(Fig 2.13 A)* to the towing vehicle *(use rigid tow hitch).*

2. Tow the vehicle out of emergency situation.

NOTE: *An alternative to towing is to transport the sweeper on a flat bed truck or trailer.*

Special Towing Instructions

1. Follow all state and local laws that apply to vehicle in tow including warning signals, night illumination, speed, etc.

2. Always use safety chains.

3. Sweeper should not be towed at speeds in excess of 20 mph.

4. Remove any loose or protruding parts of sweeper prior to moving.

5. A safety chain system completely independent of the primary lifting and towing attachment must be used.

Fig: 2.13 A

Fig: 2.13 B

Fig: 2.13 C

6. Use only equipment designed for this purpose.

7. No towing operation should be attempted that for any reason jeopardizes the safety of the operator or any bystanders or other motorists.

Rear End Towing Procedure

CAUTION

DO NOT tow the sweeper from the rear.

NOTE: *An alternative to towing is to transport the sweeper on a flat bed truck or trailer.*

Front End Towing Procedure

WARNING

Chock the wheels before preparing sweeper for towing.

Before towing the sweeper, disengage the rear wheel torque hubs and then release the parking brake.

1. Chock rear wheels.

2. Disengage left and right rear wheel torque hubs, as follows:

   ❑ Remove the two bolts securing the tow plates to the center of the torque hub *(Fig 2.13 C)*.

NOTE: *Tow plate is a 3" long by 1/2" wide, with a dimple protruding from the center on one side.*

   ❑ Turn tow plate over and reinstall on to the torque hub with round dimple facing toward the middle of sweeper.

   ❑ Install and tighten two bolts securing tow plate to torque hub. Dimple will force torque hub to disengage when bolts are tightened *(Fig 2.13 C)*.

NOTE: *Rear wheel may need to be slightly rotated to properly engage the torque hub plate.*

3. Hitch front end of sweeper to towing vehicle *(use rigid tow hitch).*

4. Remove the parking brake release hairpin from linkage screw. Remove gutter broom angle adjustment tool from storage chain. Store the hair pin so that it ca be reused upon re-installation.

5. Disengage parking brake by mechanically screwing parking brake turnbuckle counterclockwise *(relative to brake canister)* until spring is compressed. Screw turnbuckle clockwise to engage parking brake.

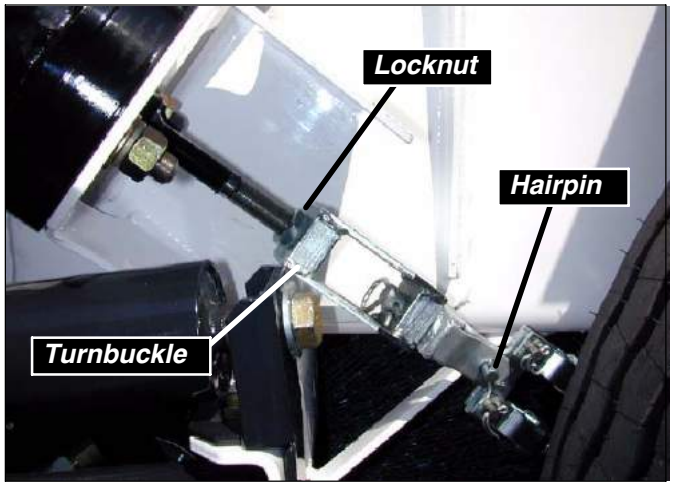


Fig 2.14 A

6. With front end of sweeper hitched to towing vehicle, raise front wheels off ground.

7. Ensure rear wheels spin freely with torque hubs and parking brake disengaged.

8. Remove wheel chocks.

CAUTION

DO NOT tow sweeper over 20 mph. Use proper tow-vehicle lighting. Observe local towing regulations.

Unhitch Sweeper From Towing Vehicle (Front End Towing)

1. Install wheel chocks after towing is complete.

WARNING

Chock the wheels before unhitching sweeper from tow vehicle.

WARNING

First engage parking brake, then re-engage the wheel torque hubs.

2. Remove parking brake hairpin *(Fig. 2.14 A)* from linkage screw. Engage parking brake by mechanically screwing parking brake turnbuckle clockwise *(relative to brake canister)* until spring is decompressed.

3. Replace parking brake release hairpin in linkage screw.

4. Lower sweeper to ground and unhitch from towing vehicle.

5. Check parking brakes for proper operation.

6. Disengage left and right rear wheel torque hubs, as follows:

   ❑ Remove the two bolts securing the tow plates to the center of the torque hub *(Fig 2.13 C)*.

   ❑ Turn tow plate over (the original position) and reinstall on to the torque hub with round dimple facing out (away from the middle of sweeper).

   ❑ Install and tighten two bolts securing tow plate to torque hub *(Fig 2.13 C)*.

7. Remove wheel chocks.

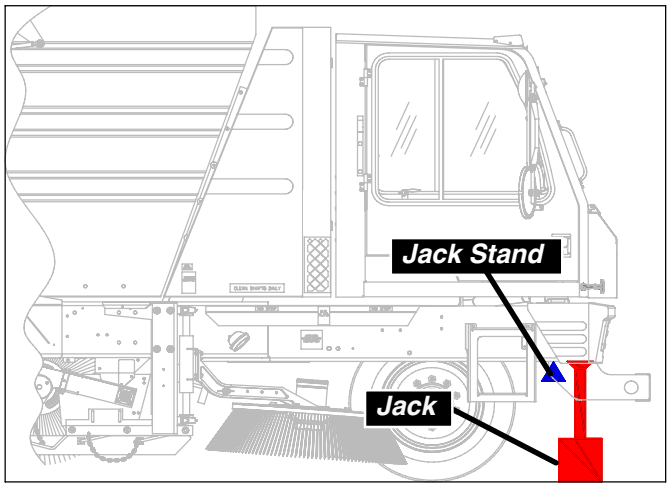


Fig: 2.15 A

Fig: 2.15 B

JACKING THE SWEEPER

If jacking the sweeper is necessary, the operator must strictly adhere to the instructions in this manual.

Jacking the Front of the Sweeper

1. Position the sweeper on a level surface.

CAUTION

If you can not find a nearly level work area, DO NOT attempt to jack the sweeper up!

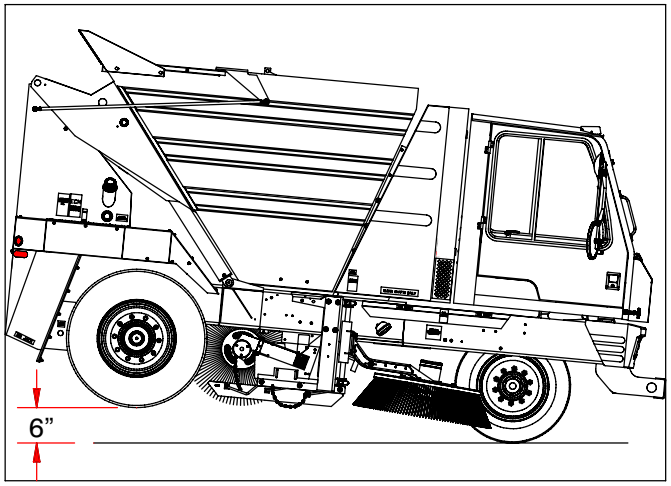


Fig: 2.15 C

CAUTION

Safety is everyone's responsibility. DO NOT take any chances to compromise personal safety and/or others around you.

2. Place the shifter in "P", setting the parking brake.
3. Stop the engine.
4. Chock the rear wheels.
5. Jack the front of the sweeper under the front frame *(Fig 2.15 A)*.

WARNING

Do NOT trust a hydraulic jack to hold the sweeper up by itself.

6. Install a 10,000 lbs jack stand (with a maximum adjustable stroke of 9 inches) under the frame *(Fig 2.15 A)*.

Jacking the Side of the Sweeper

1. Position the sweeper on a level surface.

CAUTION

If you can not find a nearly level work area, DO NOT attempt to jack the sweeper up!

CAUTION

Safety is everyone's responsibilit y. DO NOT take any chances to compromise personal safety and/or others around you.

2. Place the shifter in "P", setting the parking brake.
3. Stop the engine.
4. Chock the front wheels.
5. Jack the side of the sweeper under the frame rail, behind the rear wheel *(Fig 2.15 B)*.

CAUTION

DO NOT jack the side of the sweeper more than 6 inches off the ground *(Fig. 2.15 C)*.

WARNING

Do NOT trust a hydraulic jack to hold the sweeper up by itself.

6. Install a 10,000 lbs jack stand (with a maximum adjustable stroke of 9 inches) under the frame *(Fig 2.15 A)*.

CHAPTER 3

Sweeper Adjustment

Table of Contents

3

CHAPTER 3

PICKUP BROOM ADJUSTMENTS

There are several adjustments that must be checked in order to maintain satisfactory sweeping. Learn the procedures carefully to obtain the best results.

Pressure adjustment and Coning adjustment to the pickup broom must be checked daily to ensure sweeping efficiency and achieve maximum broom life. Pressure adjustment needs to be performed daily. Coning adjustments on the other hand, *(also referred as leveling)* rarely requires adjustment but it should also be checked regularly.

The broom pattern is the width and length of the polished area made on the ground by the pickup broom when the broom is turning while the sweeper is standing still.

Pickup Broom — Pressure Adjustment

Check tire pressure prior to testing pickup broom pattern to ensure proper adjustment. Recommended pickup broom pressure patterns are 3 to 5 inches for light sweeping and 5 to 7 inches for heavy sweeping *(Fig:3.3 A&B)*. Too much broom pressure produces a wide pattern causing broom life to be significantly cut down. If pattern is too narrow, broom will not sweep cleanly. To test broom pattern, proceed as follows:

1. On level ground, select a test area to run a broom pattern test. With all brooms off and raised, drive sweeper onto test site. Stop machine and place shifter in *Park (P)*.

2. Turn *ON* the Ergo Switch and Engage the Elevator *FWD.* Lower and Engage Gutterbrooms. **When Engaging the sweeping functions the engine speed should remain at idle.** Never engage any sweeping functions with the engine speed above 1000 RPM

3. Run engine to maximum 2100 rpm. Gutter brooms should be already turned *ON*.Run for approximately 30 seconds.

4. Lower tthe engine speed to idle. Turn *OFF* ergo switch. The elevator, pick up broom and gutterbrooms will raise auotmatically. Drive sweeper clear from pattern test area.

5. Place shifter in *Park*, shut down sweeper and exit cab to examine pattern.

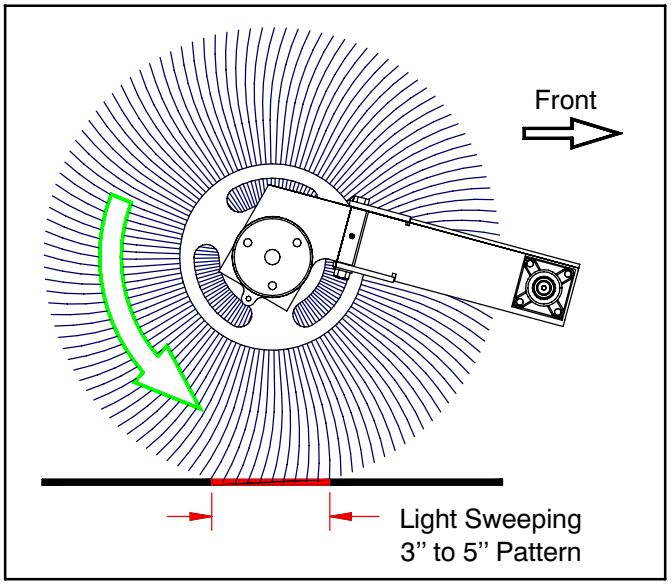


Fig: 3.3 A

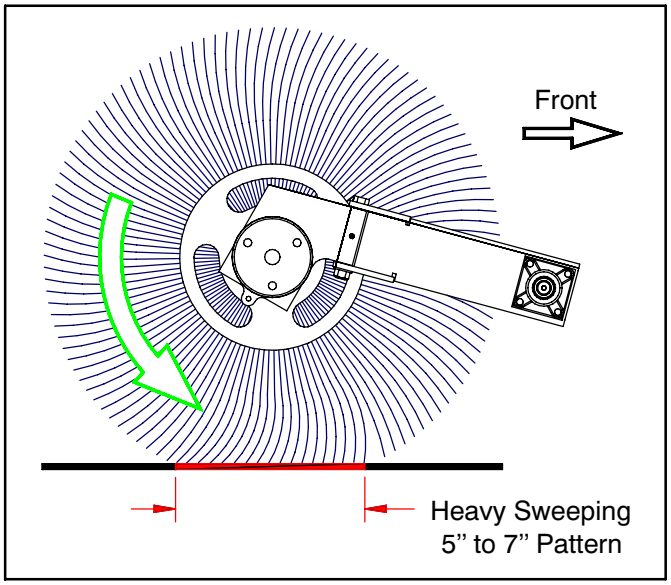


Fig: 3.3 B

6. Measure pattern *(Fig: 3.3 A&B)*.

   a. If not enough pressure exists, measurement is narrow and broom does not sweep clean.

   b. If too much pressure exists, measurement is wide and excessive broom wear results.

   c. If pattern measurement is not equal on both sides, repeat steps 1–5 with sweeper facing opposite direction and broom under the same test

site. If pattern is unequal on the opposite side, pickup broom coning exists *(ref – Coning Adjustment)*. If the pattern is unequal on the same side, test surface is not level.

7. Adjust pickup broom pressure from left side of sweeper by changing position of float spring linkage on threaded adjustment bolt *(Fig: 3.4B)*.

8. If narrow pattern exists, increase pickup broom pressure.

   a. Turn pickup broom spring linkage adjustment bolt clockwise to increase broom pressure *(Fig: 3.4B)*.

9. If wide pattern exists, decrease pickup broom pressure.

   a. Turn pickup broom spring linkage adjustment bolt counterclockwise to decrease broompressure *(Fig: 3.4B)*.

CAUTION

Do not over-adjust bolt counterclockwise. If pin shears, adjustment rod will pull out from bottom of bracket.

10. Repeat steps 7, 8 and 9 until desired pickup broom pressure pattern is achieved.

***NOTE**: Adjust pickup broom pressure by raising or lowering spring linkage adjustment bolt on left side of sweeper. Turn clockwise to increase broom pressure and counterclockwise to decrease broom pressure.*

Pickup Broom — Snubber Adjustment

Snubber adjustment *(broom free play)* controls side to side pickup broom movement. Properly adjusted free-play helps eliminate broom bounce while sweeping as well as reduce wear on pickup broom bristles by allowing it to spin concentric. The adjustable pickup broom shaft collar is on the right side of sweeper opposite of the hydraulic drive motor.

1. Follow standard procedures for lowering the pickup broom. Turn *Off* engine.

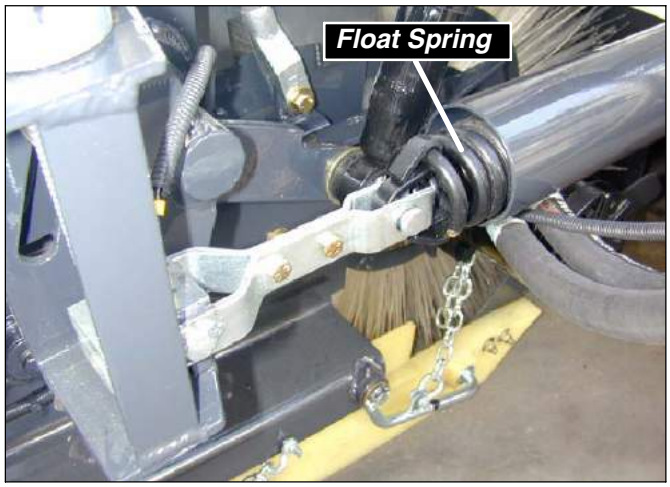


Fig: 3.4 A

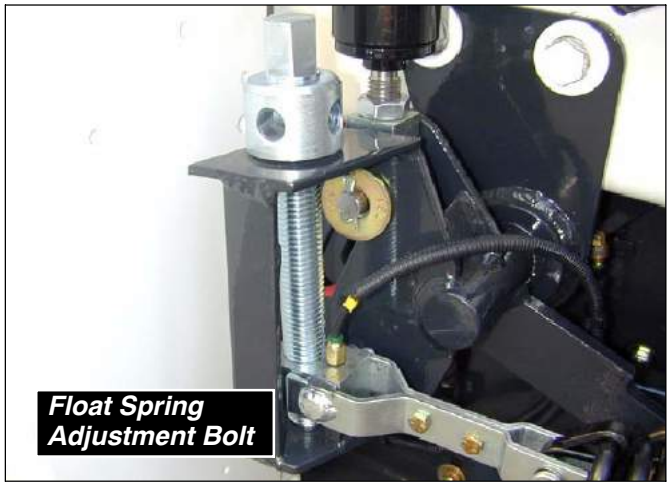


Fig: 3.4 B

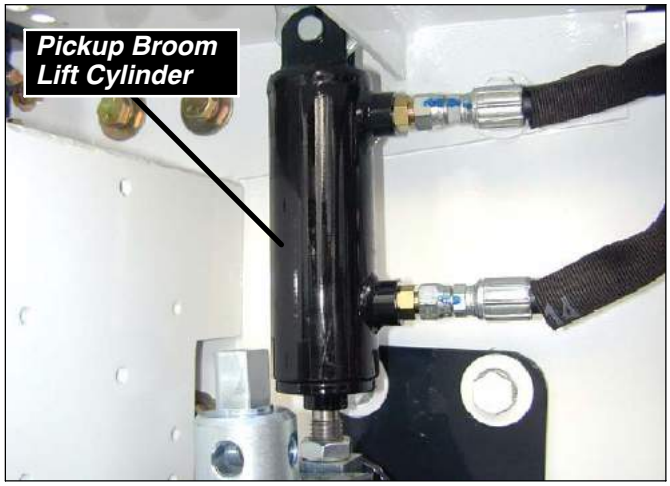


Fig: 3.4 C

2. On the four (4) bolt flange bearing an adjustment collar *(snubber)* is located inward from the shaft. Loosen two set of grub screws on adjustment collar behind shaft nut *(Fig: 3.5B)*.

3. Remove cotter pin from pickup broom shaft nut and adjust assembly free play by turning shaft nut. Tighten to reduce free play and loosen to increase free play. Correct free play adjustment is set at 1/32 of an inch *(or slight drag)*.

4. Check pickup broom snubber for proper clearance. The broom should slightly drag when spun.

5. Replace broom shaft cotter pin.

6. Tighten two grub screws on collar.

NOTE: *Pickup broom shaft has several cotter pin holes located at various thread depths to allow proper snubber adjustment.*

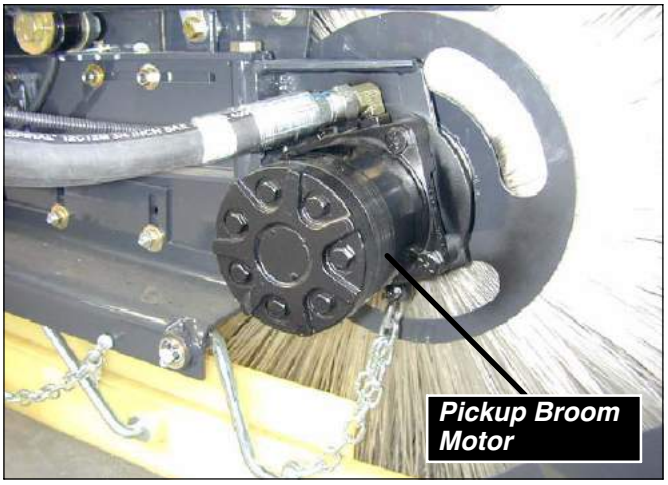


Fig: 3.5 A

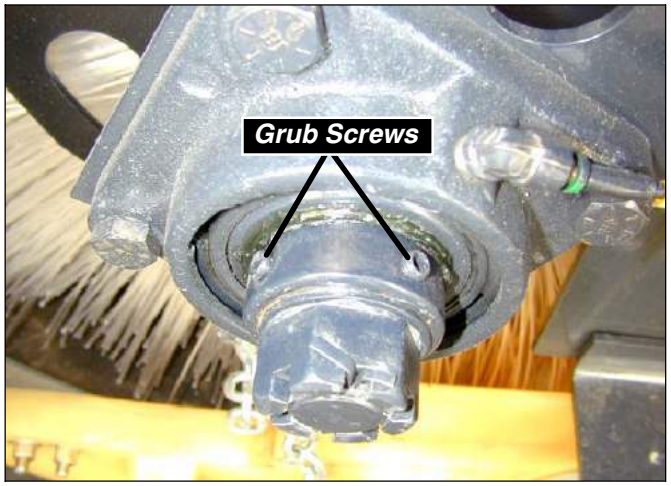


Fig: 3.5 B

Pickup Broom — Coning Adjustment

A level pickup broom will increase broom life as well as improve sweeper performance. The pickup broom requires coning adjustment if either of the following conditions exist:

- ❑ Broom pattern measures wider on one side.
- ❑ Broom bristles are wearing quicker on one end.

Measure the length of bristles on each end of broom. If bristles vary slightly, an immediate adjustment will correct problem and extend broom life. However, if bristles on each end of pickup broom vary more than a 1/2 inch, it may be difficult adjusting the broom to wear evenly again.

Pickup broom arms are connected to a shaft and adjustable clevis assemblies. The clevis assemblies are separate from the float spring linkage on left side of the sweeper. Although both left and right clevis assemblies are adjustable, it is common to only adjust the right side when leveling the pickup broom *(Fig: 3.6A)*.

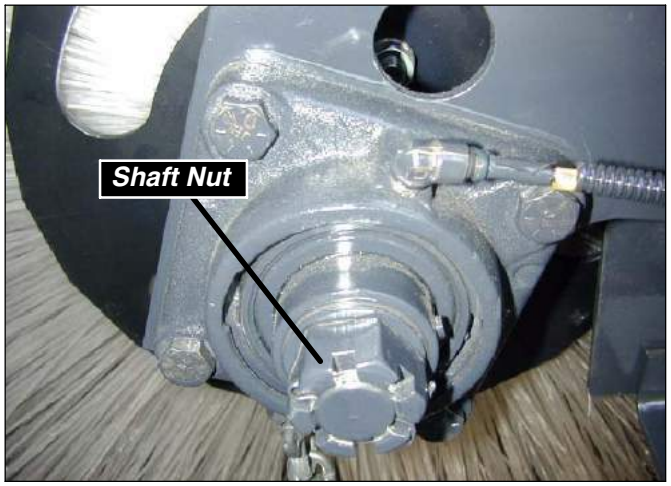


Fig: 3.5 C

Proceed as follows to make adjustments:

1. Park sweeper on a clean, level surface and raise pickup broom.

NOTE: *Pickup broom arm measurement is dependent on a flat level surface.*

2. Measure distance from left pickup broom arm to level surface. Then measure distance from right pickup broom arm to level surface.

3. If right and left measurements are not equal, adjust the right clevis assembly that connects right pickup broom arm to lift assembly.

   a. Lower Broom, turn off the engine.
   b. Remove the Pick UP Broom lift Bolt.

   c. Loosen lock nut and turn clevis to adjust length of clevis assembly until left and right *"arm to ground"* measurements are equal.

   d. Reinstall Pick Up Broom arm lift bolt. ***(Do not over tighten the bolt)***

   e. Tighten lock nut against clevis.

NOTE: *Adjust pickup broom coning by raising or lowering right side of broom assembly. Turn adjustable clevis clockwise to lower and counterclockwise to raise right side of broom.*

CAUTION

Stay clear from running pickup broom. Personal injury may occur.

Fig: 3.6 A

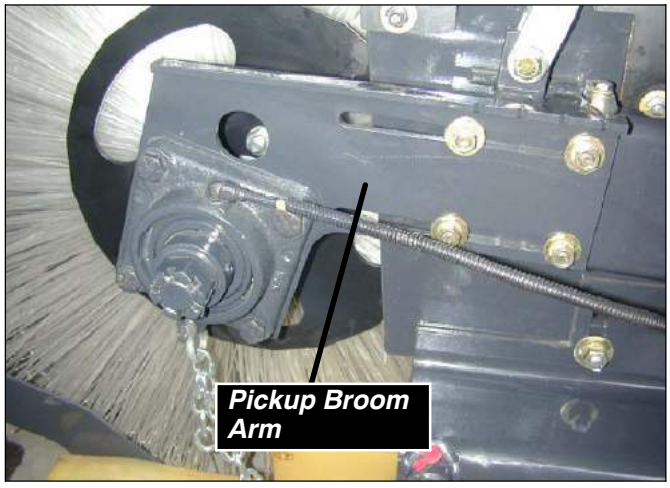


Fig: 3.6 B

Fig: 3.6 C

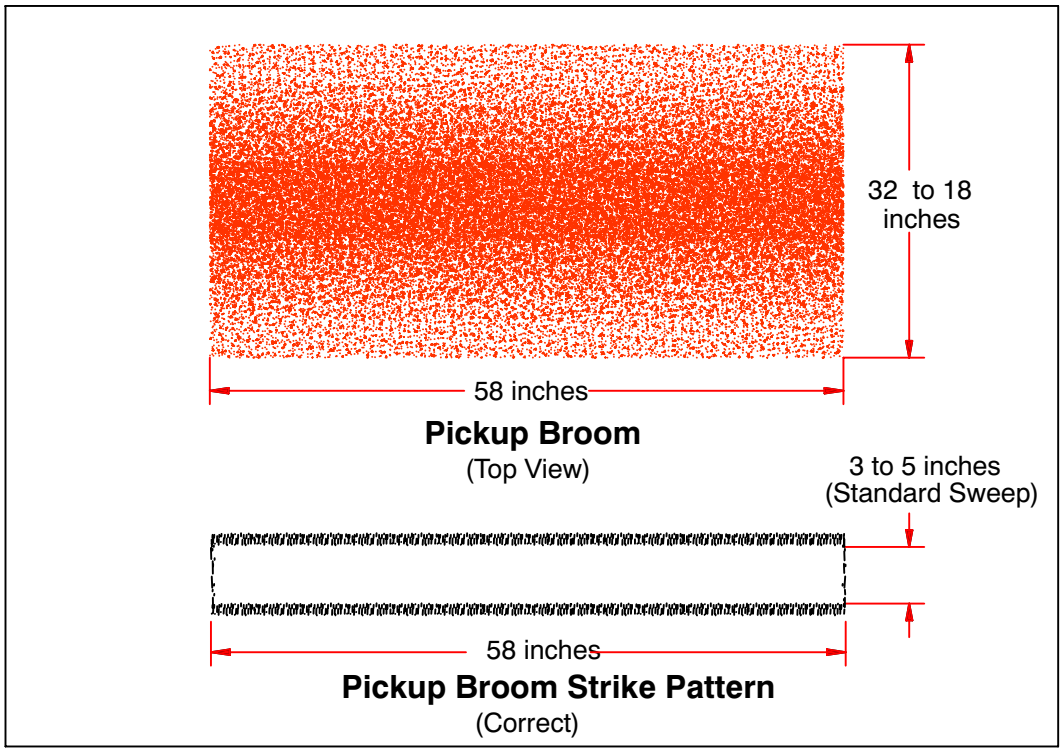


Fig: 3.7 A

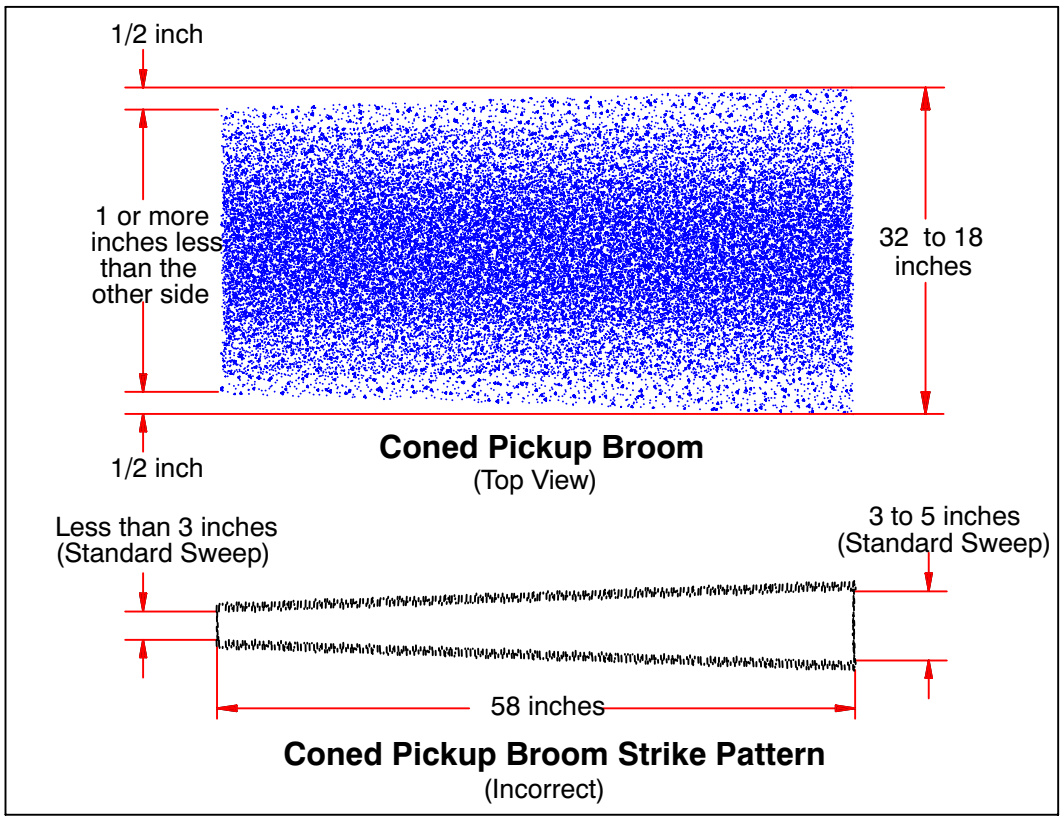


Fig: 3.7 B

Pickup Broom — Dirt Shoe Lift Adjustment

Dirt shoes funnel debris in front of elevator and pickup broom. An *"out of adjustment"* dirt shoe causes debris to be thrown out from under machine and left behind while sweeping.

1. Lower pickup broom and check dirt shoe to ground clearance at front and back of dirt shoe.

2. Start with the first hole at the bottom of the dirt shoe pivot mounting holes.

3. Push down back end of the dirt shoe bracket to make even contact with the road surface. Adjust front of dirt shoe to no more than 1/8 of an inch from the ground.

4. Dirt shoe level adjustment is accomplished by lifting or lowering the two adjustment slots.

5. Lift and lower pickup broom several times and re–check adjustment with broom in down position. Properly adjusted dirt shoes slightly drag and ride parallel to sweeping surface.

6. Repeat steps 2, 3, & 4 to adjust dirt shoe on opposite side of sweeper.

NOTE: *Dirt shoe safety chain helps eliminate damage to dirt shoe assembly caused while driving sweeper in reverse. Safety chain seldom requires adjustment.*

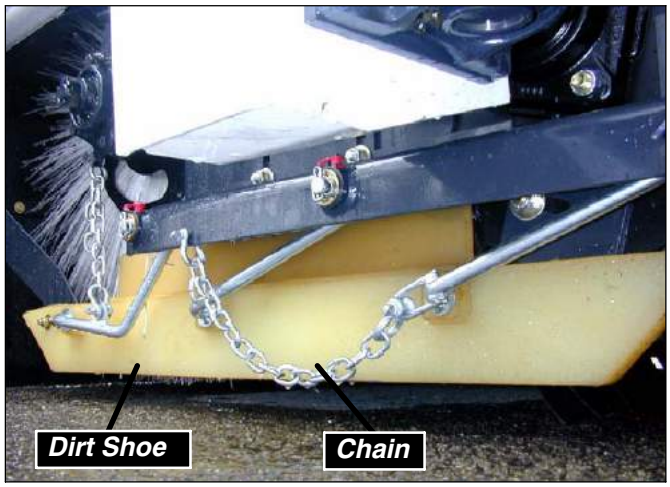


Fig: 3.8 A

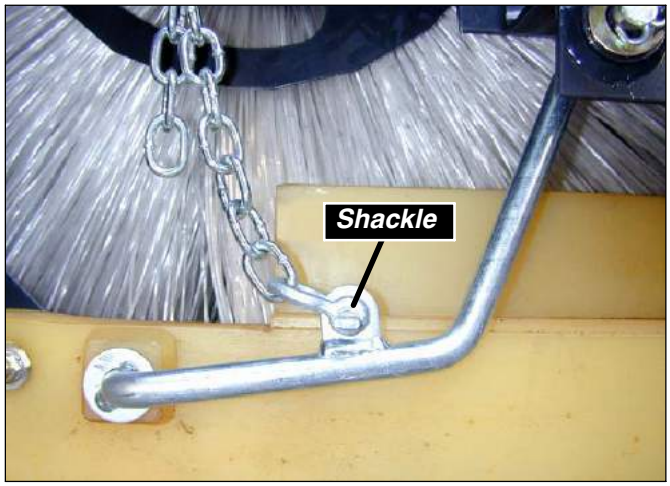


Fig: 3.8 B

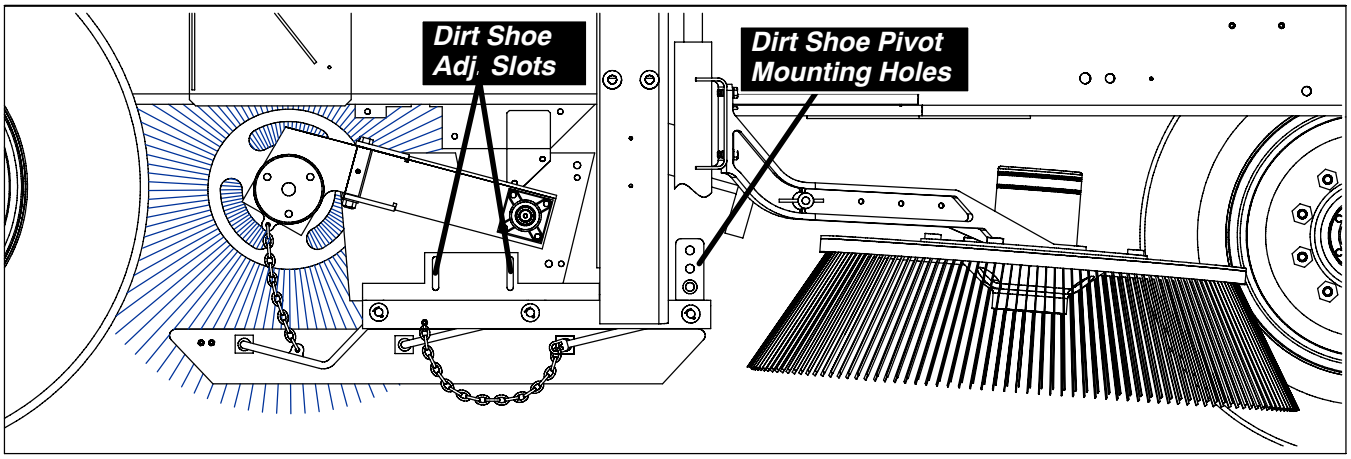


Fig: 3.8 C

CHAPTER 3

GUTTER BROOM ADJUSTMENTS

Properly adjusted gutter brooms are essential in sweeper performance. Each gutter broom requires three adjustments: broom angle in relation to street and curb and broom pressure. Broom angle and pressure require frequent readjusting caused by broom wear and sweeping conditions. Forward tilt adjustment is factory set and should remain correct indefinitely under normal sweeping conditions. All gutter broom adjustment procedures apply to both right and left sides.

Gutter Broom — Wear Adjustment

The gutter broom wear adjustment is automatically compensted for the wear of the broom wire. Maintaining proper adjustment will insure effective sweeping thoughout the life of the broom. When a proper adjustment has been maintained, it not only gives more effective sweeping job but also extends broom life by distributing the weight over a greater number of broom wires. It is recommended that a 12" long broom wire can be used until worn down to approximately 4" long.

Gutter Broom — Tilt Adjustment

The MX3 Series sweeper has the In-Cab Broom Tilt capability which allows the operator to easily adjust the broom *(see page 1.8, Fig: 1.8 A)* to sweep various different road cambers without exiting the cab . The in–cab tilt function is electrically actuated.

NOTE: *When sweeping conditions are severe such as a heavy overlay of asphalt on gutter or a high crown on street, increase gutter broom angle to transfer debris away from curb.*

Gutter Broom — Ground Pressure

The pressure by which the broom contacts or rides against the ground is called *ground pressure*. The amount of pressure is adjustable and how much or how little will vary depending on the type of sweeping to be performed. The gauge is located in the cab panels and has a readout of **Heavy – Light – Up** and is controlled by the knob below the gauge.

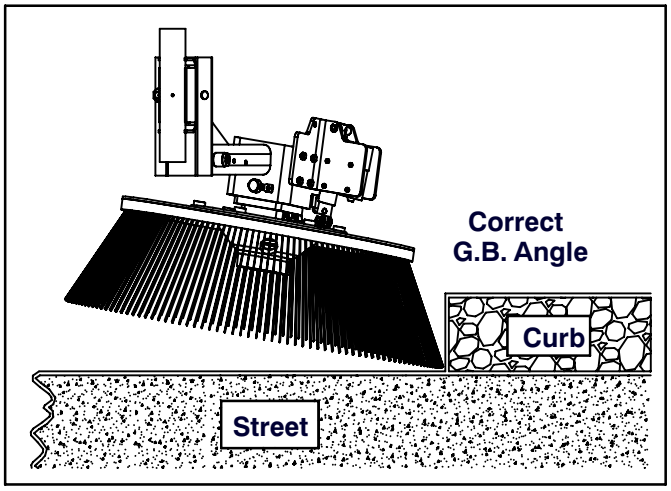


Fig: 3.9 A

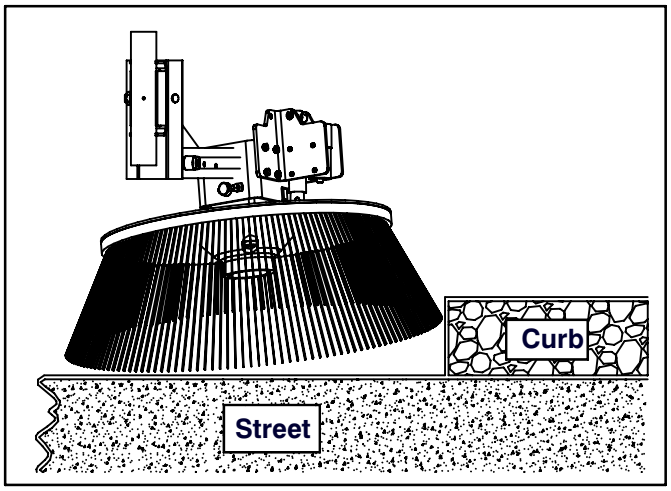


Fig: 3.9 B

Fig: 3.9 C

An accumulator is installed in the system to establish and maintain the amount of pressure being applied to the broom. It balances out the pressure in the cylinder rod side. The gauge is equipped with an electrical contact switch that will enable the broom to be lowered to the same pressure as previously preset. This electric signal opens or closes the lowering valve unless the set knb is in Up position.

Gutter Broom — Pressure Adjustment

Gutter broom pressure is altered using left and right gutter broom pressure adjustment switches in cab *(Fig: 3.9C)*. Use the following procedures to test gutter broom pressure.

1. On level ground, select a test area to run broom pressure test. With all brooms off and raised, drive sweeper onto test site. Stop machine and place shifter in *Park*.

2. Before increasing the engine speed to 2100 rpm perform the following procedures *(a thru f)*:

   a. Lower gutter brooms. Pickup broom should be off.

   b. Turn *On* gutter broom drive switches and turn *On* the Ergo Switch. **Do not turn on the elevator *FWD* switch at this time** Increase the engine speed to 2100 rpm accordingly. Run for approximately for 30 seconds.

   c. *Decrease* the engine speed to idle. Turn *Off* and raise gutter brooms. Drive sweeper forward a few feet.

   d. Turn *On* the Ergo Switch. Gutter brooms should be off.

   e. Turn *On* elevator FWD PUB broom drive switch and run for approximately 30 seconds.

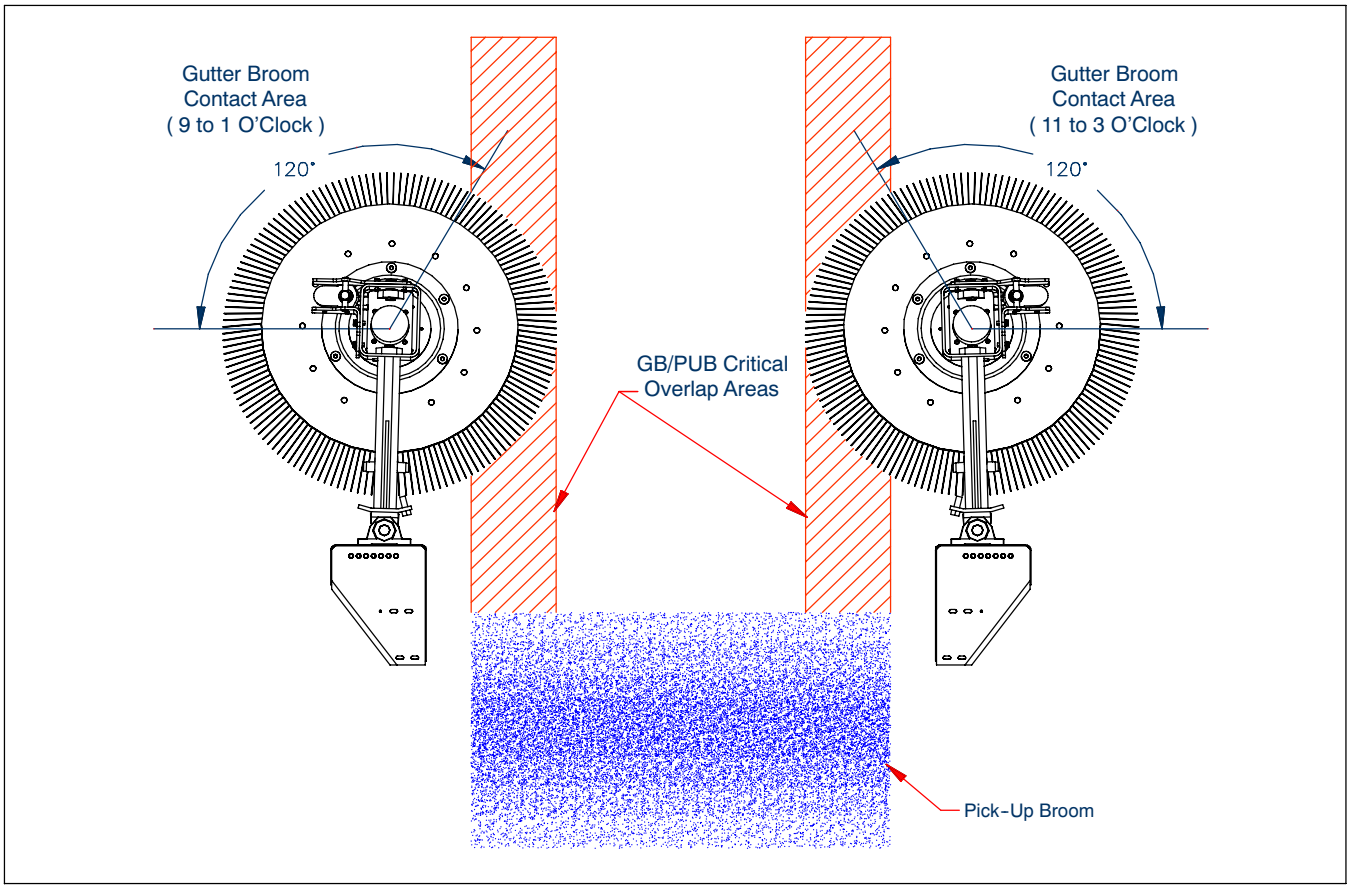


Fig: 3.10 A

f. Decrease the engine speed to Idle. Turn *Off* the Ergo Swich. Drive sweeper forward, clear of test site.

3. Place shifter in *Park*, shut down sweeper and exit cab to examine patterns. Each gutter broom pattern is 120 degrees when properly adjusted. The critical area is where the gutter broom pattern overlaps the pickup broom pattern *(Fig: 3.10A)*.

NOTE: *Insufficient gutter broom/pickup broom overlap results in streaking and poor sweeping performance.*

4. Adjust gutter brooms using the pressure gauge adjustment knobs in operators cab panel *(Fig: 3.9C)*.

a. If broom pattern is too light: broom is not scrubbing ground hard enough causing broom bouncing and streaking.

b. If broom pattern is too heavy: broom is scrubbing ground too hard causing excessive wear.

NOTE: *Gutter broom pressure adjustment is designed to return to pre-selected setting each time lowered.*

5. Repeat test procedures 1, 2, & 3 after re-adjustments.

ERGO SWITCH - STANDARD

1. Engaging the Ergo Swith to ***ON*** position:

Please Note: The sweeper will not start unless all the sweeping functions are in the ***OFF*** position, including the ERGO Switch.

❑ Lowers the Main Broom Automatically.

❑ Allows for the left and right gutterbroom raise/lower functions to engage. Allows for Gutterbroom Drive Switches to engage.

❑ Allows for Elevator and Main Pick up Broom to Engage.

❑ Turns *ON* the water spray ***(Only if Water Spray button is in the ON Position)***

NOTE: *When selectiong the ERGO switch and gutterbroom functions to ON position the engine must be running at idle speed.*

Fig: 3.11 A

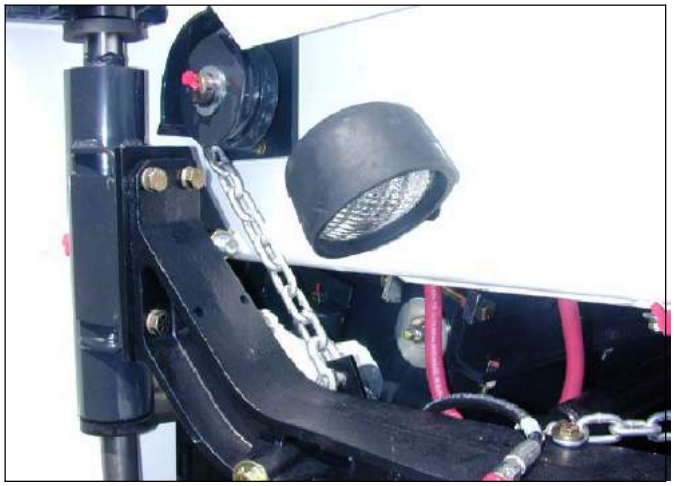


Fig: 3.11 B

Fig: 3.11 C

2. Engaging the ERGO SWITCH to *OFF* Position:

   ❑ Turns the water spray *OFF*.

   ❑ Turns the elevator *OFF*.

   ❑ Disengages the gutter brooms and the pickup broom.

   ❑ Raises all sweeping functions to a stow position.

WARNING

When engaging the ergo switch to *ON*, stay clear from rotating gutter broom. Personal injury may occur.

NOTE: *Ergo switch will resume previous sweep gear setting, ensure bystander are clear from rotating brooms when you restart engine.*

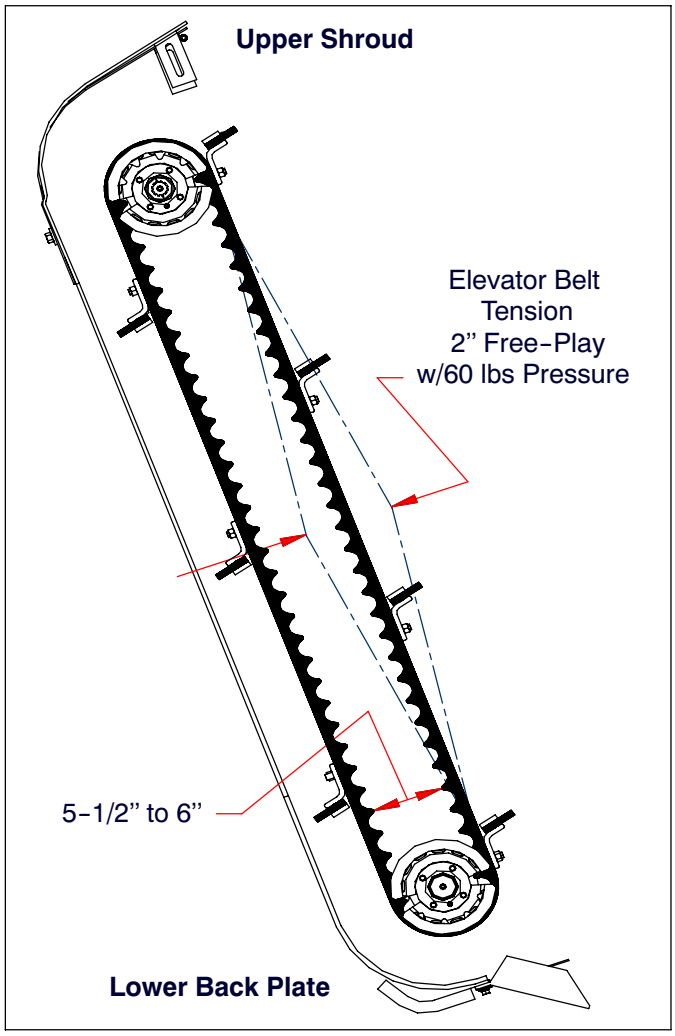


Fig: 3.12 A

ELEVATOR ADJUSTMENTS

The elevator assembly transfers dirt and debris from pickup broom into the hopper. The channel type chute is positioned almost vertically between the front of hopper and rear of operators cab.

Squeegee bars, large rubber belts, sprocket pulleys, split drive shafts and a hydraulic drive motor are all internally part of the elevator assembly. Sprocket pulley shields aid in preventing debris from building up between belt teeth and sprocket pulley teeth.

Preventing structural damage, the elevator automatically raises if large obstructions on the street are swept.

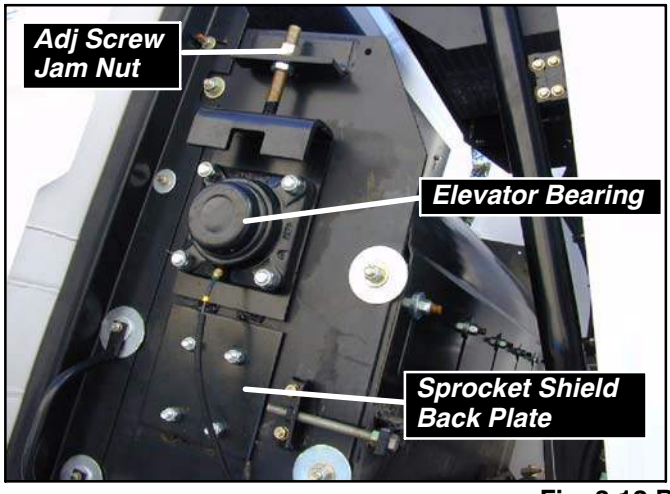


Fig: 3.12 B

CHAPTER 3

Elevator — Belt Tension Adjustment

Both elevator belts work together; therefore, tension adjustment on each belt must be equal. If one belt is misaligned, the entire elevator assembly will run off center toward the belt with the least amount of tension. As a result of unequal belt tension, sweeper performance and belt life will be greatly reduced.

NOTE: *Due to the crown in the street, elevator belts run slightly away from the curb side of sweeper. However, adjust elevator belt tension on a level surface. Adjust each elevator belt separately.*

1. Check elevator belt tension by applying 60 lbs of push/pull pressure to center of belt assembly. A properly adjusted belt will give about 2 inches in either direction *(Fig: 3.11A)*. Inside measurement of the belt is between 5 1/2 and 6 inches. If belt is properly adjusted, go to step 10.

2. On side of elevator, loosen four nuts securing upper elevator bearing bracket to side plate.

3. On side of elevator, loosen four nuts securing upper elevator sprocket shield to side plate.

4. Loosen jam nuts on elevator bracket adjusting screw. To adjust belt tension, raise *(or lower)* bearing bracket by changing position of jam nuts on top of bearing bracket.

5. Tighten jam nuts on elevator bracket adjusting screw.

6. Tighten nuts securing upper elevator bearing bracket to side plate.

7. Adjust sprocket shield to allow the cleaning finger to be positioned inside sprocket without rubbing.

8. Tighten nuts securing upper sprocket shield to side plate.

9. Adjust opposite elevator belt by repeating steps 1 – 8.

10. Run Elevator for several minutes. Check elevator belt tension on both sides. Repeat steps 2 – 9 if readjustment is necessary.

WARNING

Stay clear from running elevato r.
Personal injury may occur.

11. Adjust elevator upper arch *(ref – Upper Arch Adj)*.

Elevator — Belt Timing Adjustment

As a general rule, belt timing only requires adjustment if an object lodges between a belt tooth and the sprocket causing the belt to jump ahead.

Visually check timing by observing that each squeegee bar remains parallel to elevator lip as it runs over sprocket pulleys. Adjust belt timing as required.

1. On each side of elevator assembly, loosen four bolts securing upper elevator bearing brackets to side plates.

2. Loosen jam nuts on elevator bracket adjusting screw. Relieve belt tension by either loosening or tightening of jam nuts, and lowering the bearing bracket.

3. Actual belt timing is accomplished from within elevator. Place a 1/2 inch thick by 3 inch wide by 12 inch long *(approximately)* piece of solid rubber between one belt and sprocket pulley.

4. Rotate sprocket pulley slowly and jump belt ahead or behind one tooth.

NOTE: *Properly tracking belts ride on sprocket with 1/4 inch clearance between side of belt and sprocket flange.*

5. Repeat procedure until squeegee bars are parallel to lip of elevator.

6. Adjust elevator belt tension *(ref – Elevator Belt Tension Adjustment procedure)*.

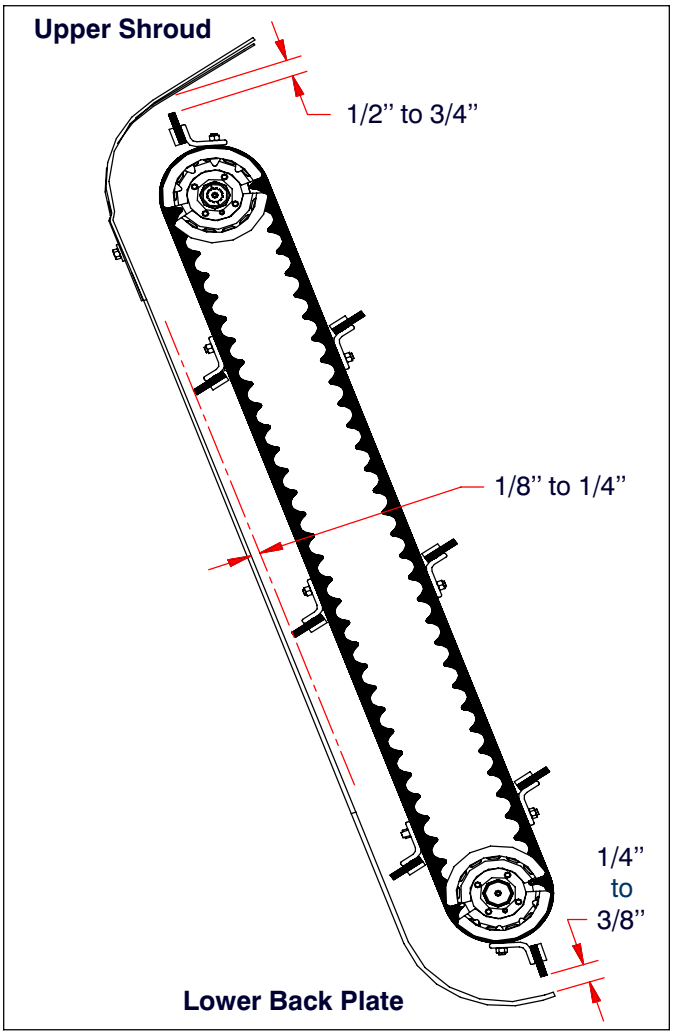


Fig: 3.14 A

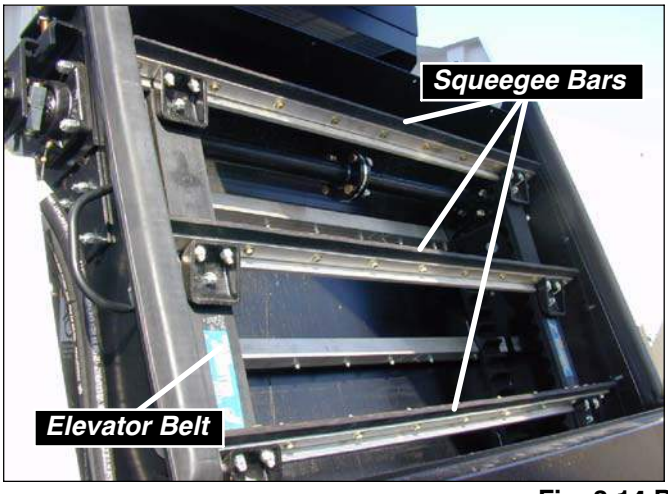


Fig: 3.14 B

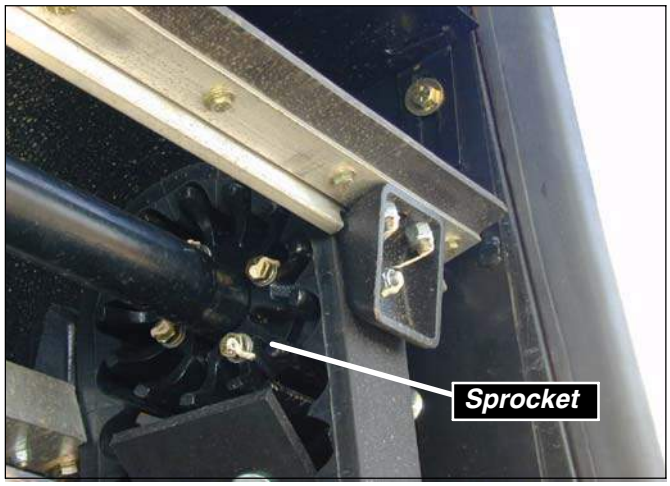


Fig: 3.14 C

Elevator — Upper Arch Adjustment

Elevator upper arch usually needs adjustments after elevator belts and/or squeegee bars have been replaced or altered. Rubber squeegee bars should maintain **1/2** to **3/4 inch** clearance around entire inside of upper elevator shroud.

1. From the back side of elevator, loosen five slotted adjuster nuts securing elevator upper arch to elevator back plate.

2. On upper inside of elevator plate, loosen two slotted adjuster nuts.

NOTE: *There are a total of 7 upper arch adjuster nuts.*

3. Adjust both sides of elevator upper arch to achieve a **1/2** to **3/4 inch** clearance from squeegee bar to shroud. Position upper arch to be parallel to squeegee bar. Top measuring point is on upper elevator shroud perpendicular to the elevator shaft axis and where the back plate connects to the upper arch.

4. From back side of elevator assembly, tighten five nuts securing elevator upper arch to elevator back plate.

5. Tighten two slotted adjuster nuts inside each upper corner of elevator upper arch.

6. Double check squeegee clearance.

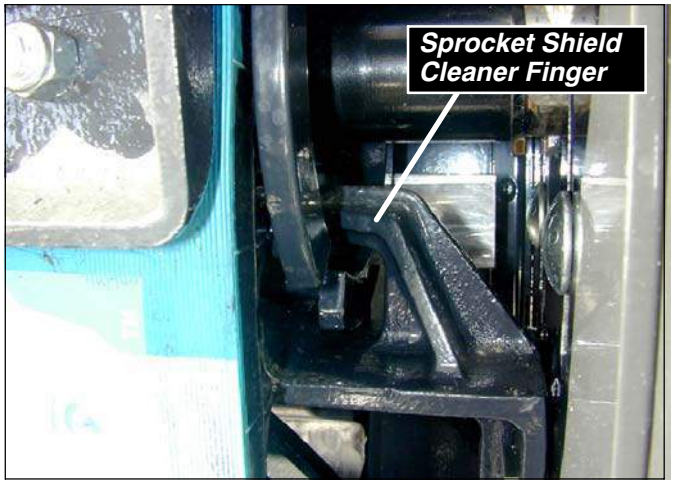


Fig: 3.15 A

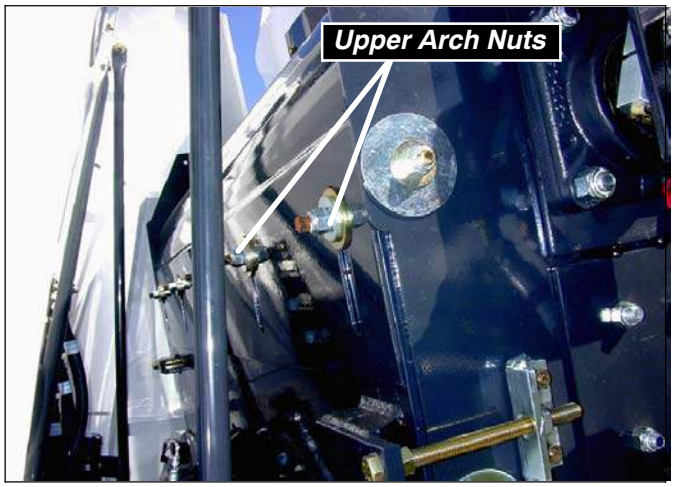


Fig: 3.15 D

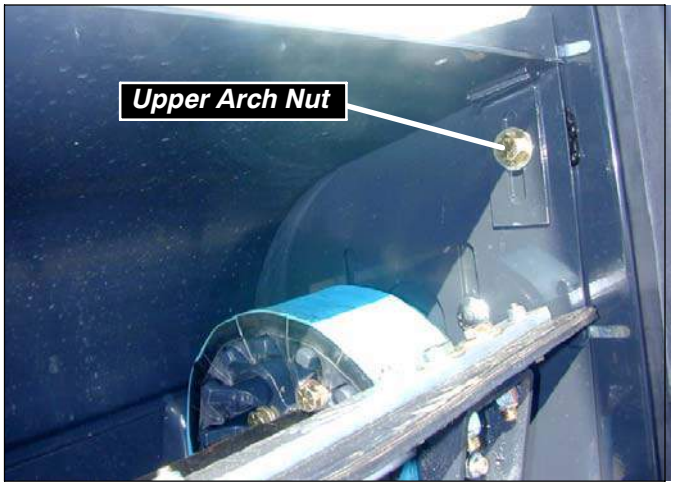


Fig: 3.15 B

Fig: 3.15 C

Elevator — Back Plate Adjustment

This back plate panel reaches from the lower part of the elevator and connects to the upper arch panel. Properly adjusted squeegee bars have **1/4 inch** clearance around entire inside of lower elevator back plate. Check squeegee bar clearance adjustment on a regular basis because of wear on elevator squeegees, back plate, and upper arch.

1. On each side of elevator assembly, loosen 12 (6 on each side) slotted back plate nuts *(Fig. 3.16 A & B)* securing elevator back plate to elevator side plate.

3. Using the 6 (3 on each side) jack screws *(Fig. 3.16 B & C)*, adjust both sides of elevator back plate to achieve a **1/4 inch** clearance from squeegee bar to shroud.

4. On each side of elevator assembly, tighten 12 sloted back plate nuts securing elevator back plate to the upper arch.

6. Double check squeegee clearance.

WARNING

Stay clear from running elevato r.
Personal injury may occur.

NOTE: *Run elevator for several minutes, turn elevator and engine off. Re-check squeegee bar adjustment.*

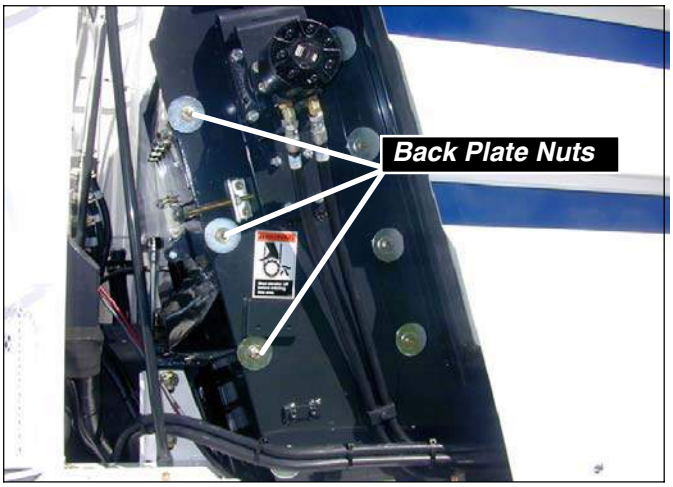


Fig: 3.16A

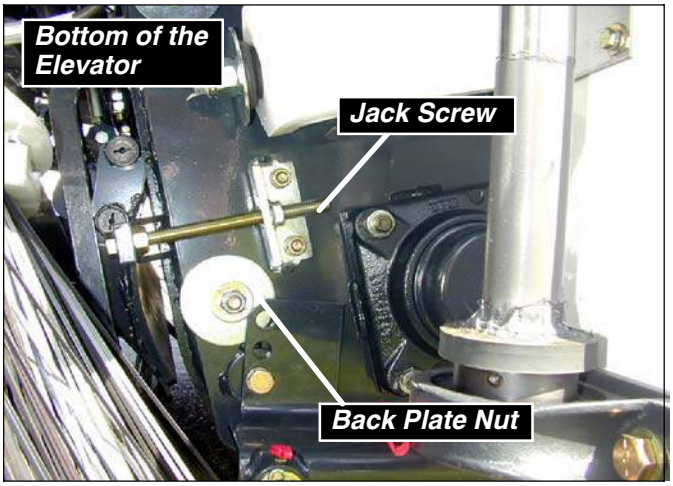


Fig: 3.16 B

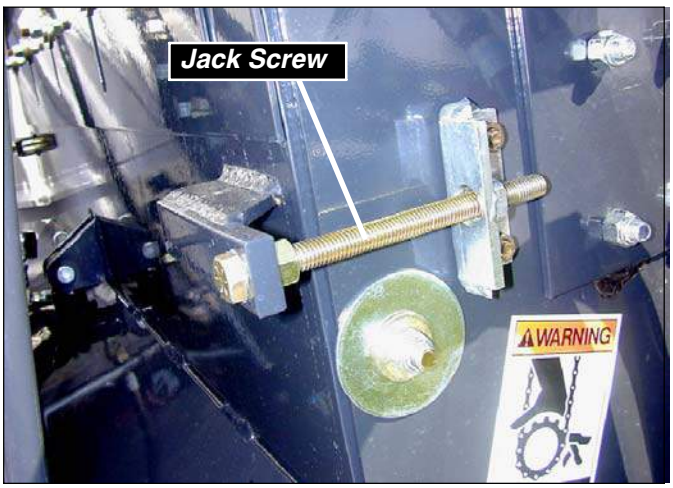


Fig: 3.16 C

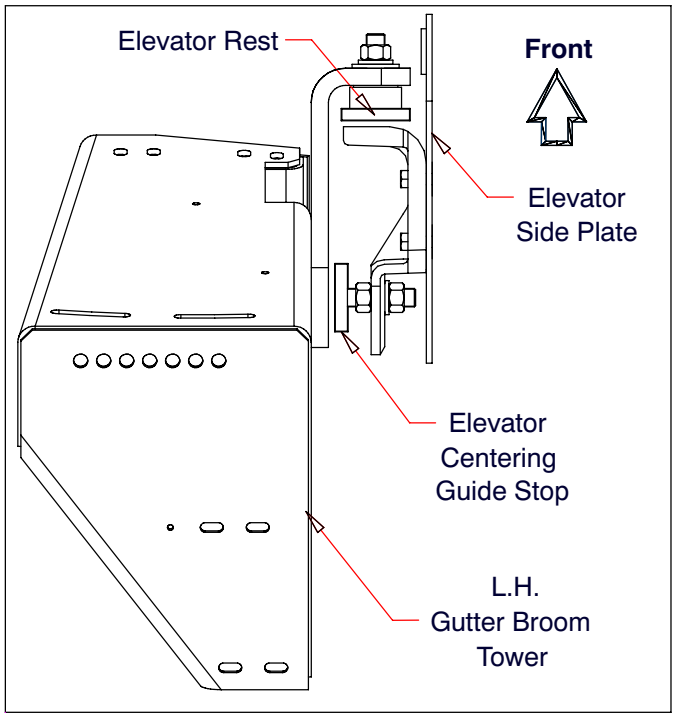


Fig: 3.16 D

Elevator — Centering & Side Adjustment

Elevator centering and side adjustments control the position of the elevator between frame rails and the side to side free play. Centering adjustment guides are mounted on elevator side plates and rub against an inside bracket attached to the gutter broom mounting tower *(Fig: 3.16D)*.

1. Measure the distance from the right side of elevator to the sweeper frame. Measure the distance from the left side of elevator to the sweeper frame.

2. Compare the two measurements and prepare to adjust centering guide bolts accordingly.

3. Loosen lock nuts on left and right guide bolts *(Fig: 3.16D)*. Adjust round guides to center elevator between frame rails.

4. Repeat steps 1, 2, & 3 until elevator is centered and guide bolts slightly touch gutter broom towers.

5. Tighten lock nuts on guide bolts

CHAPTER 3

BRAKE SYSTEM

The Global MX3 Series sweeper is equipped with automatically adjustable, hydraulic drum rear brakes. The sweeper does not have front brakes.

The Drum Brakes

Rear brakes are the self–energizing shoe and drum type. The shoes are lined with a friction material and designed to expand against the inner–machined surface of the drums to slow down or stop the vehicle each time pressure is applied to the foot pedal.

Brake Adjustment

Since the brakes on the sweeper are automatically adjustable, there is no need for periodic re–adjusting. However, the brakes do need to be initially adjusted after the brake shoes have been replaced.

WARNING

To prevent death or accidental injury, allways place jack stands to support a raised vehicle.

NOTE: *Adjust the brakes only after the brake shoes have been replaced.*

1. The brakes are adjusted through the brake adjustment slots *(Fig. 3.17 B)* located on the rear of the torque hub.

2. While rotating the drum, adjust the brakes using a brake tool *(brake spoon)* until a very slight resistance is felt. **DO NOT TIGHTEN ANY FURTHER.**

Master Cylinder/Brake Booster

The hydraulically powered booster in conjuction with the master cylinder, provides a power assist for applying hydraulic brakes. The brake system is composed of the following:

- ❑ A hydraulically *(ISO 46)* powered Booster
- ❑ A Hydraulic *(DOT 3)* master cylinder

Fig: 3.17 A

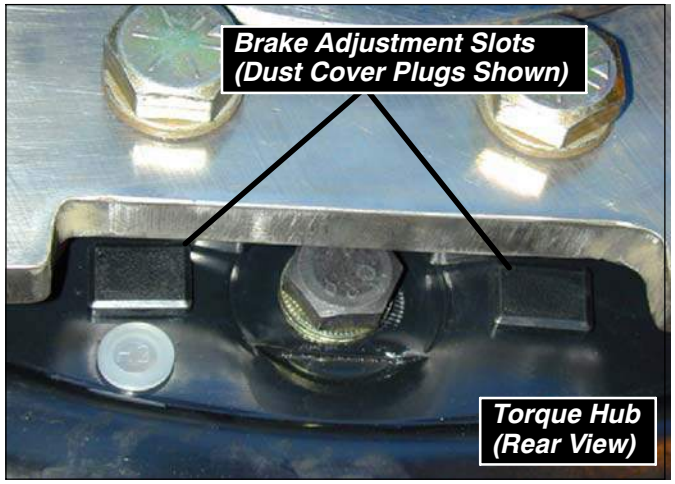


Fig: 3.17 B

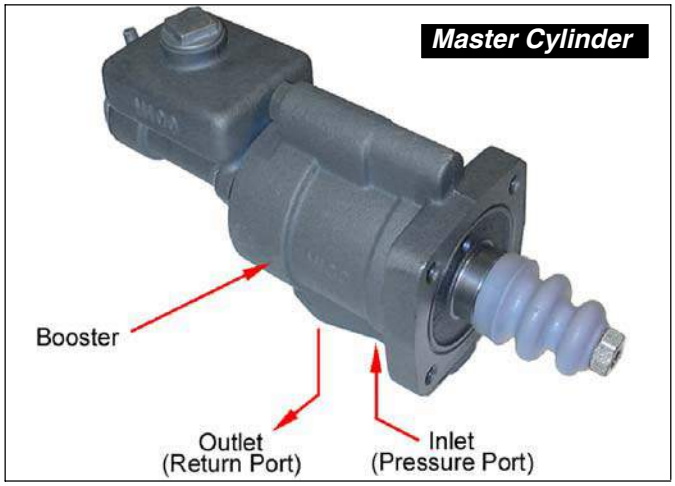


Fig: 3.17 C

Brake Pedal Adjustment

The pedal stop must be adjusted such that, when brake pedal is fully released, there is no load on the linkage that connects the pedal to the master cylinder/brake booster. When the brake pedal is fully released, the spring load must not be greater than that required to support the pedal weight.

1. Position the Sweeper on a clean, level surface.

2. Place the shifter in *Park (P)* position, setting the parking brake.

3. Stop the engine..

4. Chock the rear wheels.

5. Measure the free play on the brake pedal inside the operators cab.

   ❑ If the free play is **1/8 inch**, the brake pedal does not require adjusting.

   ❑ If the free play is more than **1/8 inch**, go to step 6.

6. Take care not to damage any linkage parts while loosening the lock nut *(Fig. 3.18 B)* between the pedal and the master cylinder *(Fig. 3.18 A)* located underneath the cab.

7. Turn the pedal adjusting nut *(Fig. 3.18 B)* to achieve 1/8" free play in the brake pedal.

8. Tighten the lock nut.

8. Remove chocks.

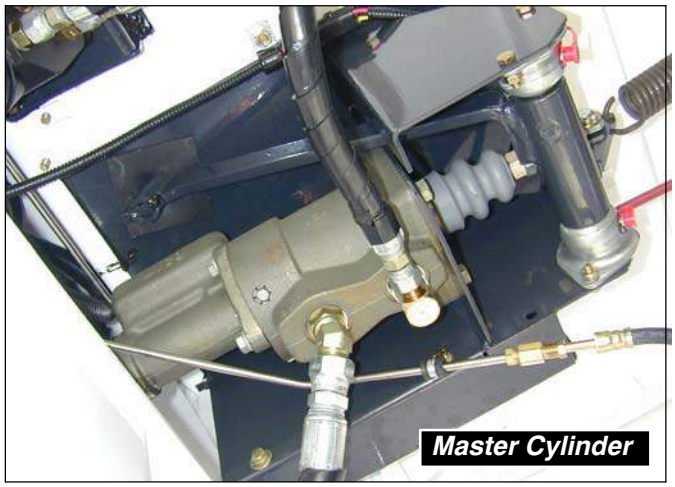


Fig: 3.18 A

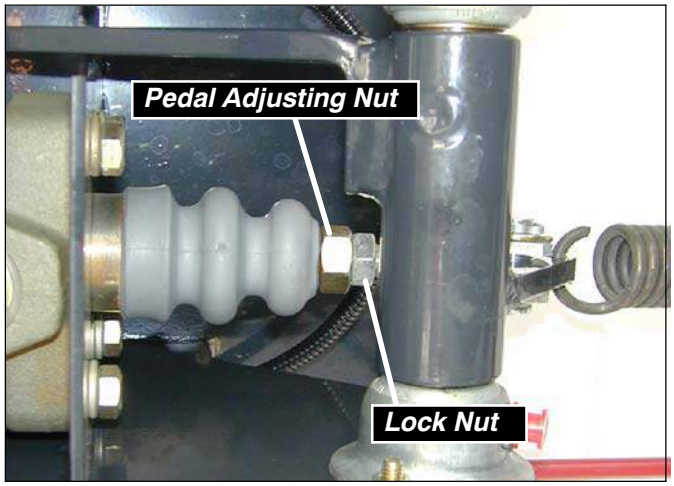


Fig: 3.18 B

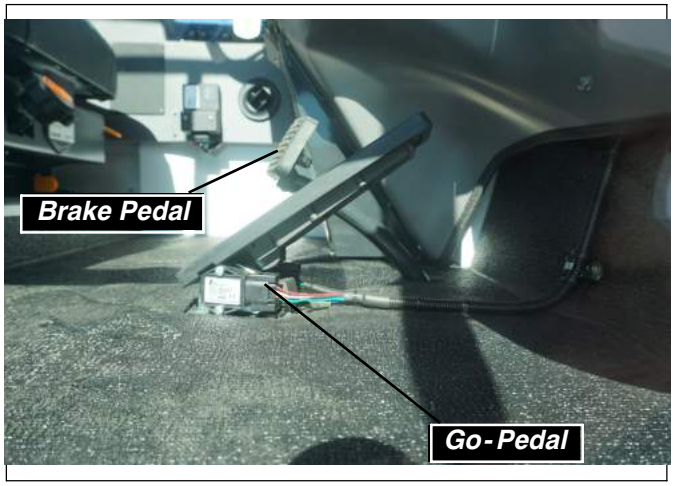


Fig: 3.18 C

CHAPTER 3

Parking Brake Adjustment

The parking brake is used to hold the brakes continuously in applied position. The parking brake employs the spring applied hydraulic release actuator to engage parking brakes when shifter is placed in *Park (P)* position.

WARNING

Chock wheels before releasing parking brake.

1. Position sweeper on clean, level surface. Place shift lever in *Park,* stop engine and chock wheels.

2. Start engine and place shifter into a forward gear.

WARNING

Parking brake actuator is under internal compressed spring loaded. DO NOT disassemble or service. Serious injury or fatality may result.

3. At parking brake canister, measure free play in cable assembly where it connects to hydraulic parking brake actuator. If free play is **1/8 inch**, go to step 6.

4. Remove parking brake release hair pin from linkage screw. Loosen Jam nut & screw parking brake turnbuckle achieving **1/8 inch** free play. Relative to brake canister, counterclockwise achieves more free play and clockwise achieves less free play.

5. Replace parking brake release hair pin in linkage screw. Tighten the jam nut.

6. Place gear shifter in *Park* and turn off engine.

7. Check parking brake engagement and adjustment for proper operation.

8. Remove wheel chocks.

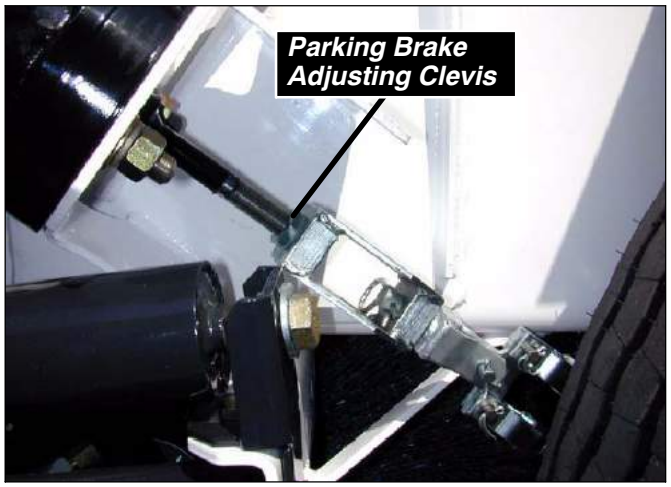


Fig: 3.19 A

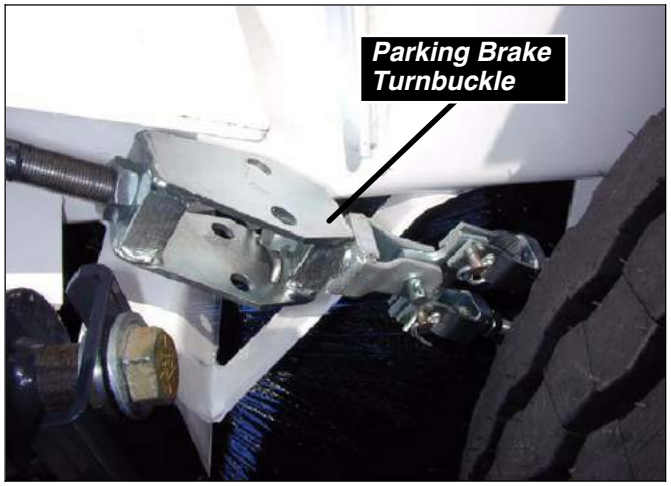


Fig: 3.19 B

Fig: 3.19 C

Electronic Displacement Control

The transmission on the Global MX3 is electronically controlled by an SX Controller. The Controller receives a Forward, Low or Reverse signal from the electronic gear shifter which directs the EATON Drive Pump (Fig. 3.20 A) in the selected direction.

The Go-Pedal sends a signal to the SX Controller tellitng it how much to stroke the pump for the required movement.

The computer is mounted inside the cab on the LH side. It is called the SX Controller (Fig: 3.20 B).

Caution: The SX Controller is an electrostatic discharge (ESD) sensitive device. Do not touch the pins in the connector, doing so can damage the controller. Use the metal case only when handling the SX Controller

The electrical connector on the SX Controller is identified as **ET3**

Caution: Never connect or disconnect the ET3 Connector when the ignition switch in on (ACCES,. IGN., START). Prior to disconnecting or connecting, wait a minimum of Two (2) minutes after turning the ignition into OFF position.

On the SX Controller there are two Green LED's, one is yellow LED, and one is RED LED.

For normal conditions: Both Green LEDs are ON and yellow LED flashes every 1/2 seconds.

TROUBLE SHOOTING: Either of the two Green LEDs are in the *OFF*'

*Check fuse F7: 4 amp fuse located in the electrical box on the left hand side of the cab

Fig: 3.20 A

Fig: 3.20 B

WHEN THE RED LIGHT IS FLASHING, PLEASE REFER TO DIAGNOSTICS FAU LT CODE CHART ON THE NEXT PAGE

PLEASE REFER TO THE CHART BELOW FOR SX CONTROLLER DIAGNOSTIC FAULT CODES

6.2.2 Blink Code Translation

Fault Code	Flash Bit Sequence	Device at Fault	Cause of Fault	Machine Response
1	•–••	Bi-directional Command Input	Voltage signal is out of range or input is uncalibrated.	Machine will decelerate to stop, no current will be driven until fault is cleared.
2	––••	Unidirectional Command Input	Voltage signal is out of range or input is uncalibrated.	Machine will decelerate to stop. Machine can be moved in automotive mode.
3	••–•	Engine RPM	RPM below 100, or no RPM at all.	Machine will decelerate to stop. Machine can be moved in displacement mode with 50% antistall.
4	–•–•	Inch input	Voltage signal is out of range or input is uncalibrated.	Machine will decelerate to stop in automotive mode. Machine will operate in displacement mode.
5	•––•	FNR switch	Both switches are on.	Machine will decelerate to stop, no current will be driven until fault is cleared.
6	–––•	Valve Drivers	Uncalibrated or open circuit.	Machine will decelerate to stop. New calibration is necessary.

"•" = short flash

"–" = long flash

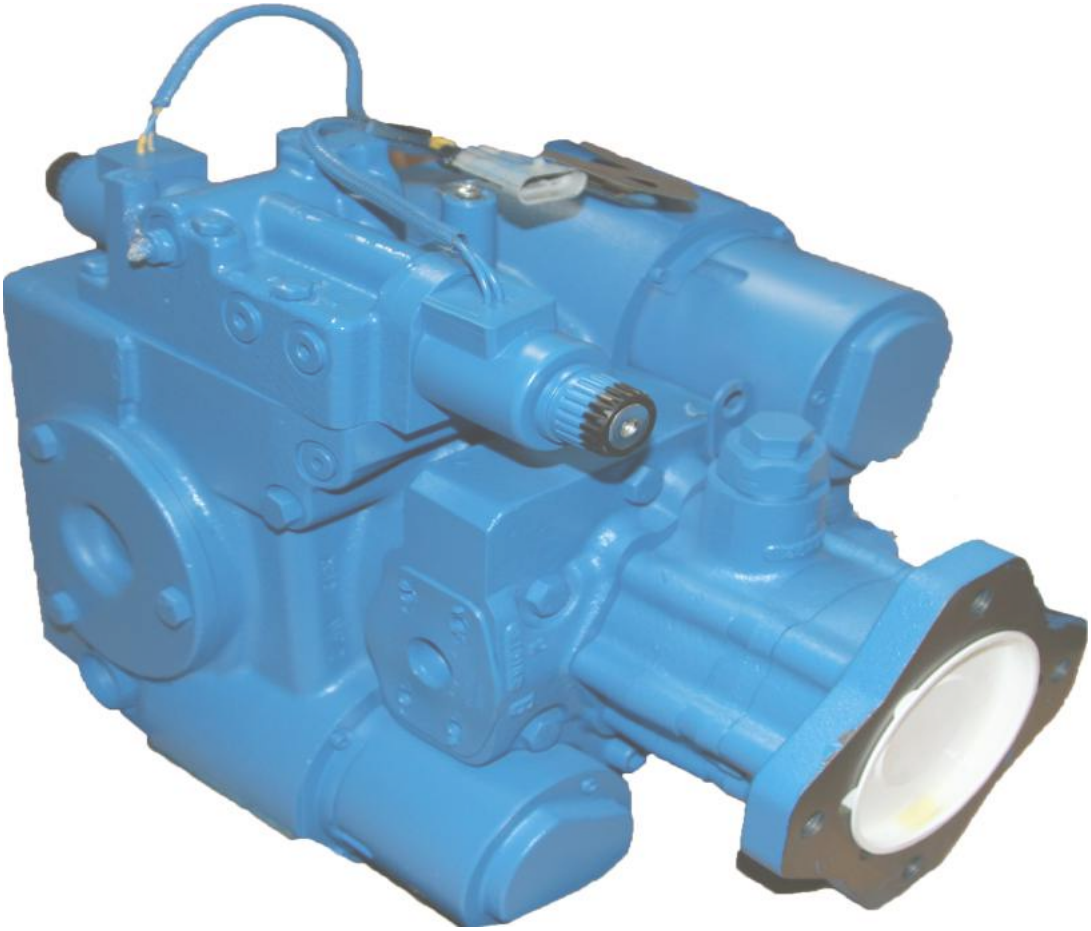


Fig: 3.22 Drive pump

** Please contact Global Environmental Products for adjustment and maintenance questions regarding the Drive pump and internall components.*

Technical Assitance: (909) 713-1600

CHAPTER 4

Sweeper Service & Lubrication

Table of Contents

4

CHAPTER 4

SERVICE & LUBRICATION

How good is any of the equipment you own? It is only as good as it is maintained. Even the finest equipment manufactured requires attention and care. The Global MX3 Series sweeper is no different. A good well planned preventive maintenance program will enhance a properly operating sweeper as well as providing safety to those operating the equipment.

It is very important to establish a good maintenance program. Costly repairs can often be avoided by planning ahead, setting a regular schedule, and excercising good preventive maintenance techniques.

Lubrication

Strict adherence to a detailed lubrication schedule is as important as timely preventive maintenance. The recommended lubrication schedule in the following charts, figures and tables is based on average sweeper use under normal sweeping and whether conditions.

Abnormal use such as sweeping in dusty, dirty conditions, or in extremely hot or cold climates, requires lubricants to be checked and changed more frequently than suggested in lubrication schedule. Also, short–haul driving may cause acids to form in engine and hydraulic oil. These acids are injurious to moving parts and may cause abnormal wear similar to that caused by dirty lubricants.

Lack of lubrication on bearings and cables make control operation difficult in addition to causing premature wear. However, lubricants should be used sparingly with excess oil and grease wiped away to prevent the attraction of additional dirt.

Engine Oil and Viscosity

The engine oil viscosity specification depends on the temperature of the engine oil at the time of starting the engine. Viscosity recommendations for various starting temperature are shown in the *"Engine Oil Viscosity Chart."*

When choosing an oil, consider the range of temperature your sweeper will operate in before the next oil change. Then select the recommended oil viscosity from the chart. *(Refer to Chart 4.1).*

NOTE: *Using oil other than API Service classified SE or CD, or not changing the oil and filter often enough could reduce engine life.*

Break-In Engine Oil

Special *"break–in"* engine lubricating oils are NOT recommended for new or rebuilt Cummins engines. Use the same type oil during the *"break–in"* as that which is used in normal condition. *(Refer to John Deere Engine Owners Manual)*

Damage to engines due to improper maintenance or use of incorrect oil quality and/or viscosity is not covered by the warranty.

Maintenance

Listed below are sweeper routine checks which should be made periodically by a qualified mechanic to ensure proper performance and safety of the sweeper.

For your safety and that of others, any of the safety-related components that are damaged should be checked and necessary repairs performed before operating the sweeper.

At a minimum, these routine checks should be made every six months or every 500 hours whichever comes first. Whenever repairs are necessary, have them completed before operating the sweeper.

❑ **Parking Brake –** Park on a fairly steep hill and put shifter in *"P" Park* position. This checks holding ability. Parking brake automatically engages when shifter is put on *"P" Park.* Before checking Parking Brake be sure to have enough room around the sweeper.

❑ **Parking Brake Actuator –** Check free play in cable assembly where it connects to hydraulic actuator. If free play is more than 1/8 inch see chapter 3 for adjustment. Check every 250 hours.

❑ **Brakes –** Be alert on changes to braking action, unusual sounds when braking or increased brake pedal travel. Any of these conditions could indicate the need for brake system inspection and/or service.

❑ **Brake Linings –** Check Drum brake linings for wear and cracks every 250 hours. Replace cracked and worn out brake linings. Failure to do so can result in expensive damage to the brake system or a serious accident.

❑ **Brake Drum –** Check brake drums for wear or damage every 250 hours of service.

❑ **Brake Lines and Hoses –** Check brake lines and hoses for leaks, cracks, chafing etc. every 500 hours. When rubbing or wear is noted on brake lines and hoses, correct the problem at once.

❑ **Steering –** Be alert for any changes in steering action. An inspection or service is required when the steering wheel is harder to turn or has too much free play or when there are strange sounds when turning.

❑ **Tires –** Check tires for abnormal wear or damage. Check tire pressure for correct inflation. Perform inflation checks when tires are *"Cold".*

❑ **Wheel Nut Torque –** Be sure wheels are not bent or cracked and that wheel nuts have been tightened to specified torque every 500 hours.

Specified Tightening Torque:

- Torque Front Lug Nuts to 400–420 ft lbs.
- Torque Rear Lug Nuts to 450–500 ft lbs.

❑ **Cab –** Check interior and exterior of the cab. Keep interior of the cab clean at all times. Check daily.

❑ **Safety Restraints –** Check seat belts system *(including buckles, latch plates, and anchors)* for proper operation.

❑ **Seat Adjuster –** Check seat adjustment prior to driving the sweeper. Do not attempt to adjust the seat when the sweeper is in motion.

❑ **Horn –** Sound horn periodically to be sure it works.

❑ **Mirrors –** Check mirrors to make sure you can see clearly through the side mirror at all times. Look for broken, scratched, dirty or damaged mirrors that could reduced the view or visibility. Replace, clean or repair promptly.

❑ **Lights –** Check panel lighting, warning lamps, indicator lamps and interior lamps. On the outside check: headlights, taillights, brakelights, turn signal, backup lights, hazard flasher, flood lights and beacon lights.

❑ **Sun Visor –** Check that friction joints hold sun visor in place.

❑ **Windshield Wipers and Washers –** Check operation and condition of the wiper blades. Replace worn out wiper blades. Check the flow and aim of the windshield washer spray.

❑ **Door Latches –** Check that doors close, latch, and lock tightly.

❑ **Fluid Leaks –** Check for fuel, water, oil, coolant, and other fluid drips by looking at the surface beneath the sweeper after it has been parked for a while.

❑ **Air Cleaner System –** Check air cleaner service indicator on the LH instrument panel inside the cab. Clean or replace air cleaner filter element.

❑ **Water Spray System –** Check water level. Add water as required. Check to make sure all nozzles spray cleanly.

❑ **Engine –** *(For engine information, refer to John Deere Engine Owners Manual, Troubleshooting & Repair Manual, and Parts Catalog)*

❑ **Belts –** Check all engine driven belts *(commonly referred to as fan belts)* for wear and tension. Replace worn belts.

❑ **Fuel Filter –** Replace filter every 500 hours or 12 months whichever occurs first, or more frequently if the filter is clogged.

❑ **Battery –** Keep battery securely mounted, top clean and dry. Keep terminals and connections clean and tight and coated with petroleum jelly. check batteries every 500 hours.

❑ **Electrical Control Unit (ECU) –** Check wirings and connections. Make sure door to ECU box is secured tightly

to prevent dust from accumulating. Check every 100 hours.

❑ **Exhaust System –** Check the complete exhaust system every 250 hours of operation. Look for broken, damaged, missing or out–of position parts. Check for holes, loose connections or other conditions which could cause fumes to leak. Be alert for any changes in the sound of the exhaust system or any smell of fumes. These are signs that system may be leaking. Have it checked and/or repaired immediately.

❑ **Radiator –** Every 500 hours drain the engine coolant by opening the drain cock at the bottom of the radiator core, flush and refill the engine cooling system with a new engine coolant. *(Clean Radiator Daily)*

❑ **Oil Cooler –** Inspect charge oil cooler for damage, leaks, and clogged fins. Repair all leaks and clean clogged fins. Check every 250 hours.

❑ **Deaeration Tank –** Visually check engine coolant at deaeration tank. Add coolant as required. Do not allow coolant to go below the minimum level. Check every 50 hours.

❑ **Air Conditioner –** Check compressor, condenser, evaporator, receiver/drier and control knobs to ensure its safe and reliable operation. Check every 250 hours.

❑ **Hopper –** Check hopper pivot points and hopper door hinges and lubricate as required.

❑ **Elevator –** Check squeegee bars, large rubber belts, sprocket pulleys, split drive shafts and hydraulic motors for any signs of damage. Elevator should be checked daily and needed repair should be made prior to sweeping. *(Refer to Chapter 3 for Elevator Adjustment)*

❑ **Elevator Belt Tension** – Measure 2" free play with 60 lbs. pressure.

❑ **Gutter Brooms –** Check gutter brooms daily. Broom wire should be replaced when the length is less than 4 inches long.*(Refer to Chapter 3 for Gutter Broom Adjustment)*

❑ **Pickup Broom –** Check pickup broom pattern daily prior to sweeping. *(Refer to Chapter 3 for Pickup Broom Adjustment)*

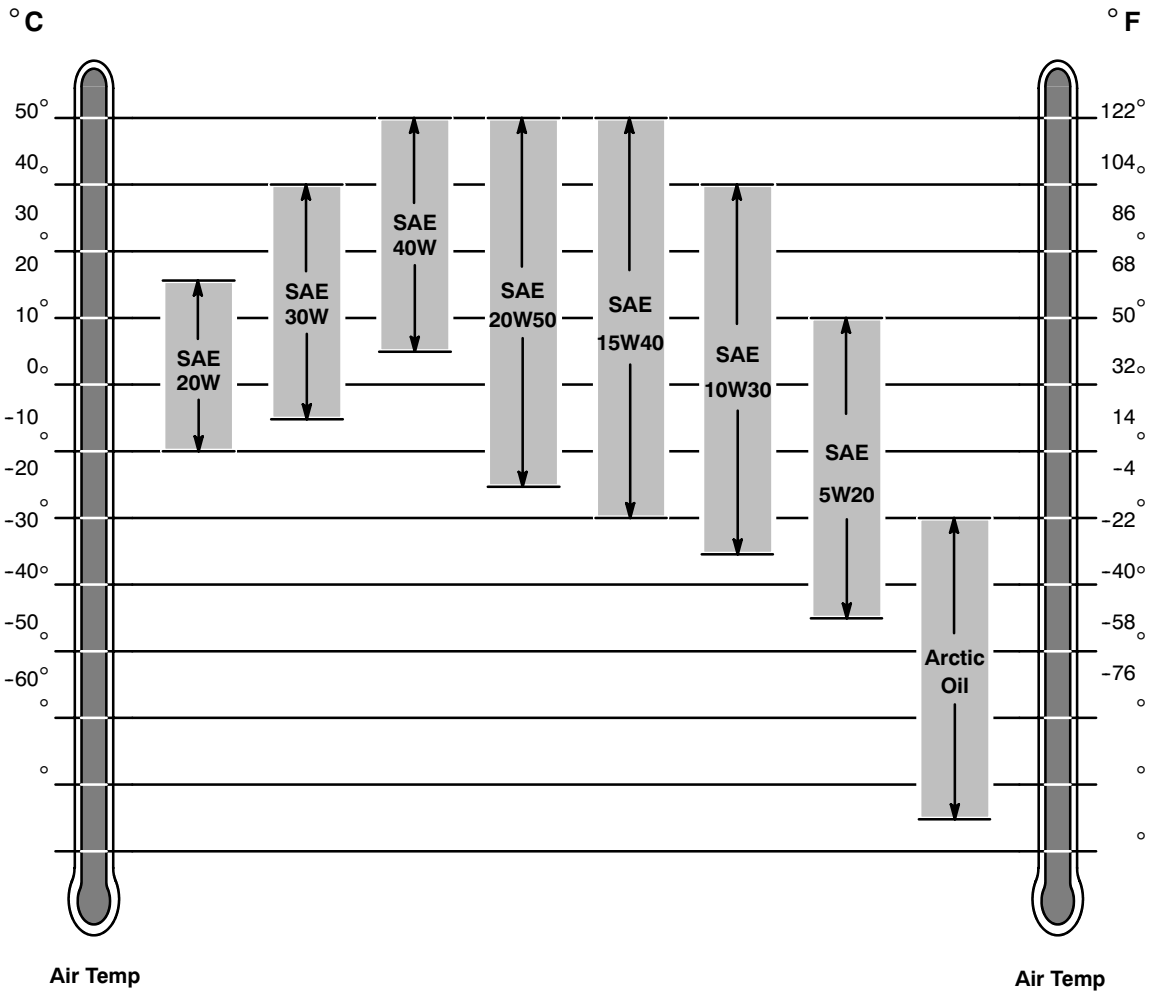
❑ **Dirt Shoes –** If sweeper is not equipped with an automatic lubricating system, lubricate dirt shoe bushings on the left and right pivots every 50 hours.

❑ **Autolube (Option)–** Visually check autolube system grease reservoir daily. Do not allow grease to go below the minimum level. Inspect grease lines, fittings, and connectors for damages and repair as required.

Recommended Fluids and Lubricants

Usage	Fluids/Lubricants
Engine Oil	15W-40
Hydraulic Oil	ISO 46
Steering Fluid	ISO 46
Brake Fluid	Dot 3 or equivalent
Engine Coolant	Ethylene Glycol/Water (50-50 Mixture)
Grease	NLGI 1 & NLGI 2
Windshield Washer	Washer Solvent
Cab-Door Hinges	General Purpose Grease
Battery Terminals	Petroleum Jelly
Diesel Fuel	Grade 1-D or 2-D
AC Refrigerant	R134a

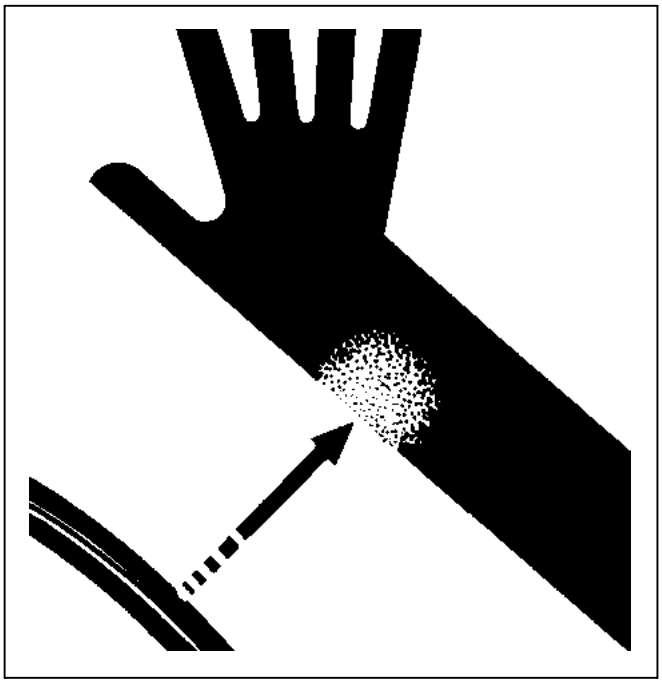
Fig: 4.5 A



Engine Oil Viscosity

Chart 4.1 – Choose the proper engine oil viscosity based on expected air temperature range during sweeper operation. All oils used must meet API Service Classification SE or CD. SAE 5W20 and arctic oil viscosity grades meeting API Service Classification CC may be used, but oil and filter must be changed twice as often. A slight increase in oil consumption is expected when low viscosity oils are used; therefore, check oil level more frequently. An oil engine heater is required when ambient air temperature is less than 14° F (–10° C).

NOTE: REFER TO ENGINE MANUFACTURER SPECIFICATIONS AND RECOMMENDATIONS WHEN REPLACING/INSPECTING ENGINE FLUIDS.



WARNING

Do not attempt to check for hydraulic oil leaks without hand and eye protection. Oil under pressure can penetrate skin and cause severe injury.

Do not attempt to block oil flow with hands or fingers.

Oil can shoot from a pinhole in a fine jet at a velocity sufficient to penetrate skin causing serious injury.

Use extreme caution when inspecting hydraulic system for oil leaks.

Always wear appropriate clothing and eye protection when working on or near hydraulic system.

Fig: 4.7 A

CAUTION

Keep all dirt, grime, dust and debris from contaminating hydraulic oil when working on hydraulic system.

SERVICE ROUTINE

Normal Sweeper Use

The sweeper service maintenance instructions are based on the assumption that the sweeper will be subjected to an average use. A sweeper that is extensively exposed to abusive conditions requires more frequent attention.
A MX3 Series sweeper that spends months non-operating also requires periodic maintenance. Rust, dirt and corrosion cause unnecessary damage if the sweeper is neglected. The following routine service maintenance suggestions will help avoid expensive repairs.

1. **Air Cleaner Filter –** Check and clean air cleaner filter daily. Replace the engine air cleaner filter under normal operations every 250 hours. Operation of sweeper in dusty areas will necessitate more frequent filter replacement.

2. **Air Intake System –** Check daily if air cleaner, filters, hoses and ducts are in good condition.

3. **Air Cleaner Service Indicator –** Check air cleaner service indicator daily.

4. **Air Cleaner & Safety Elements –** Clean air cleaner safety element when required or change at least every third time the primary elements is replaced.

5. **Brake Fluid Level –** Check the fluid in brake fluid reservoir every 50 hours and add fluid *(Use SAE Brake Fluid DOT 3 or equivalent)* as required.

6. **Engine Cooling System –** Check coolant level daily. Daily clean exterior of radiator, inspect hose clamps and inspect condition of all cooling and heater hoses. Replace hoses if cracked, swollen or deteriorated.

7. **Engine Coolant Leakage –** Visually check cooling system for leaks. Look at the surface beneath the sweeper after it has been parked for a while for any signs of leakage.

8. **Engine Oil and Filter –** Check engine oil level-daily. Refer to Engine Manufacturer required specifications for change oil intervals and oil specifications.

9. **Engine Oil Leakage –** Visually check engine for oil leaks and repair as required.

10. Belts – Check all engine driven belts for cracks, fraying, wear and tension every 50 hours. Replace worn belts.

11. Fuel System – Check Fuel level daily. Inspect the fuel tank, cap for proper sealing. and fuel lines for damage which could cause fuel leakage. Check every 250 hours intervals.

12. Fuel Filter, Pre–filter – Replace fuel filter element every 250 hours of operation.

13. Fuel Filter, Water Separator (Option) – Inspect Daily, Clean and drain fuel filter as necessary based upon the inspection.

14. Fuel Filter, Water Separator (Option) – Replace fuel filter element every 250 hours of operation.

❑ Water Level – Check water level indicator inside the cab for water spray system.

15. Water Spray System – Check water spray nozzle jets for obstruction. Clean, repair or replace clogged nozzles. Check for water leaks. Check the following daily:

❑ Water Tank – Check for leaks.

❑ Water Pumps – Check water pumps for operation.

❑ Strainers – Clean two Water Strainers: 1st–next to the engine (rear right hand side of the engine), 2nd–under elbow on top of water tank.

16. Hydraulic Oil – Check oil level daily in each hydraulic tank at sight glass located on outside of hopper towers. With engine turned off add hydraulic oil as required *(ISO 46)*. Sweeper must be warmed to operating temperature when checking oil level. Be sure sweeper is on a level ground when checking oil level.

17. Hydraulic Oil Leakage – Check hydraulic oil system for leaks daily and repair as required.

18. Hydraulic Oil Filter High Pressure – If sweeper is new or any components *(motors or pumps)* have been replaced, change filters after 50 hours of operation. Thereafter, replace hydraulic oil filters every 100 Hours. If the filter gauge indicator is in RED, replace the filter, regardless of the filter operational hours.

19. Hydraulic Oil Filter (Low Pressure) – If sweeper is new or any components *(motors or pumps)* have been replaced, change filter after 50 hours of operation. Thereafter, replace the low pressure hydraulic oil filter every 100 Hours. If the pop–up indicator on the filter shows RED, replace the filter.

20. Traction Pump Filter – If sweeper is new or any components *(motors or pumps)* have been replaced, change filters after 50 hours of operation. Thereafter, replace the traction pump filter every 100 Hours.

❑

The traction pump oil filter is equipped with an inlet pressure gauge and an outlet pressure gauge. If at 2500 RPM and 120° F, the PSI difference between the two gauges is 50 PSI or more, replace the filter.

21. Hydraulic Oil Composition – Run engine for 15 minutes while operating several hydraulic components such as brooms, elevator or hopper dump. Turn engine off. Clean a convenient hydraulic fitting and using a kit *(P/N GS381930)*, provided by Global Environmental Products, draw sample of hydraulic oil (required for analysis) into a sterile container. Send the container to Global Environmental Products for results. Perform the test every 500 hours of operation.

22. Front Wheel Bearing Grease – Check and replenish if necessary every 500 hours.

23. Tire Pressure – Check tires daily for excessive or abnormal wear, or damage. Also, check tire pressure and adjust to proper inflation based on manufacturer specifications.

❑ Front Tires – 10R17.5

❑ Rear Tires – 11R22.5

Inflate to tire pressure recommended by the tire manufacturer

24. Door Hinge & Latch – Check that door closes, latches, and locks tightly. Check broken, damaged, or missing parts that might prevent from tight latching. Lubricate hinges.

25. Elevator Bearings, Lower – Lubricate left and right lower bearings. *(Automatic lubrication if equipped with the Autolube option)*

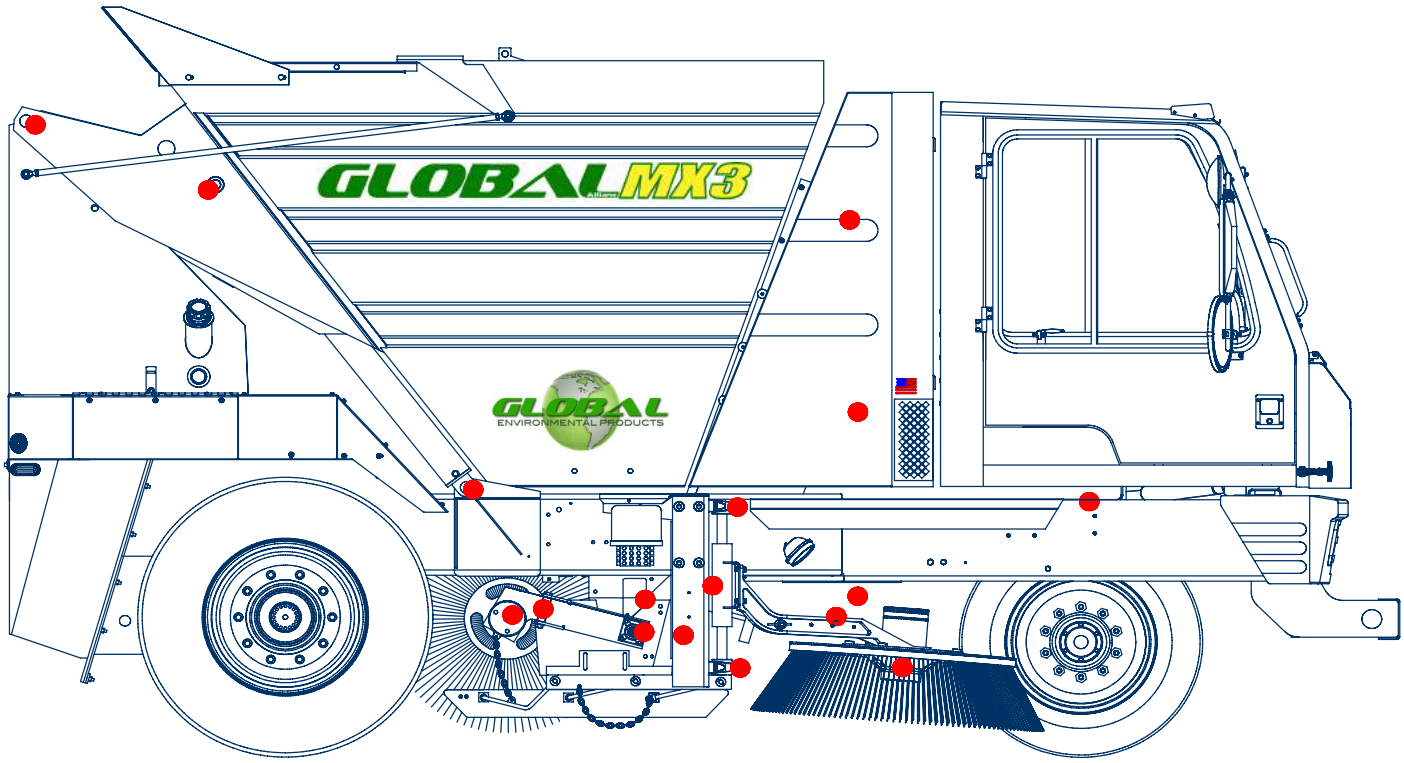


Fig: 4.9 A *Autolube Option Lubrication Points.*

26. Elevator Bearings, Upper – Lubricate left and right upper bearings. *(Automatic lubrication if equipped with the Autolube option)*

27. Elevator Pivot – Lubricate left and right pivot located between cab and elevator. *(Automatic lubrication if equipped with the Autolube option)*

28. Gutter Broom Lift Bearings – Lubricate left and right gutter broom arm and pulley. *(Automatic lubrication if equipped with the Autolube option)*

29. Gutter Broom Swing Bearings – Lubricate upper and lower pivot bearings. *(Automatic lubrication if equipped with the Autolube option)*

30. Gutter Broom Motor/Dish Cavity – Lubricate left and right motor/dish cavity. *(Automatic lubrication if equipped with the Autolube option)*

31. Hopper Pivot Bearings – Lubricate left and right pivot bearings. *(Automatic lubrication if equipped with the Autolube option)*

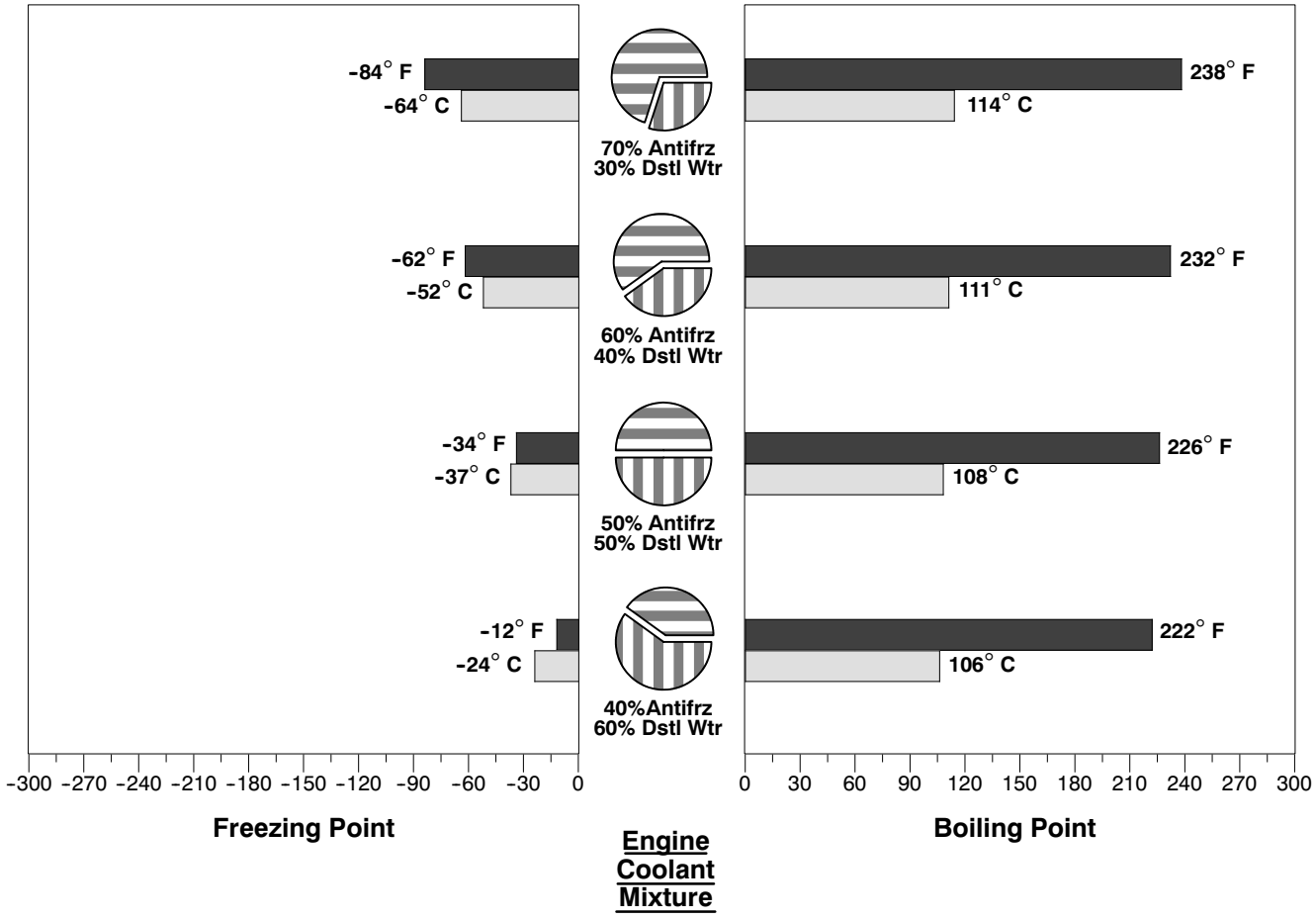
32. Hopper Ram Bearings – Lubricate upper and lower bearings. *(Automatic lubrication if equipped with the Autolube option)*

33. Pickup Broom Arms Linkage – Lubricate left and right arms and pivot linkage. *(Automatic lubrication if equipped with the Autolube option)*

34. Pickup Broom Bearings – Lubricate bearings. *(Automatic lubrication if equipped with the Autolube option)*

35. Pickup Broom Pivot Linkage – Lubricate left and right pivot linkage. *(Automatic lubrication if equipped with the Autolube option)*

36. Dirt Shoe Bushings – Lubricate left and right pivots.



CAUTION

Do not use methyl alcohol base antifreeze. Do not use methoxy propanol antifreeze. Damage may occur to rubber seals on cylinder liners which are in contact with coolant.

NOTE: *Some types of ethylene glycol antifreeze commonly available on the open market are intended for automotive use. These products are often labeled for use in aluminum engines and usually contain more than 0.1 percent anhydrous metasilicate. Use of this type of antifreeze can cause a gel-like deposit to form which reduces heat transfer and coolant flow. When wet, gel becomes the same color as coolant. When dry, gel is a white, powdery deposit. Check container label or consult with antifreeze supplier before using.*

Chart 4.2 - Engine coolant mixture consist of a ethylene glycol type antifreeze and distilled water. The ethylene glycol type antifreeze cannot contain more than 0.1 percent anhydrous metasilicate and must meet General Motors Performance Specification GM1899M or be formulated to GM6038M. Antifreeze to distilled water coolant mixture is determined by required boiling and freezing points.

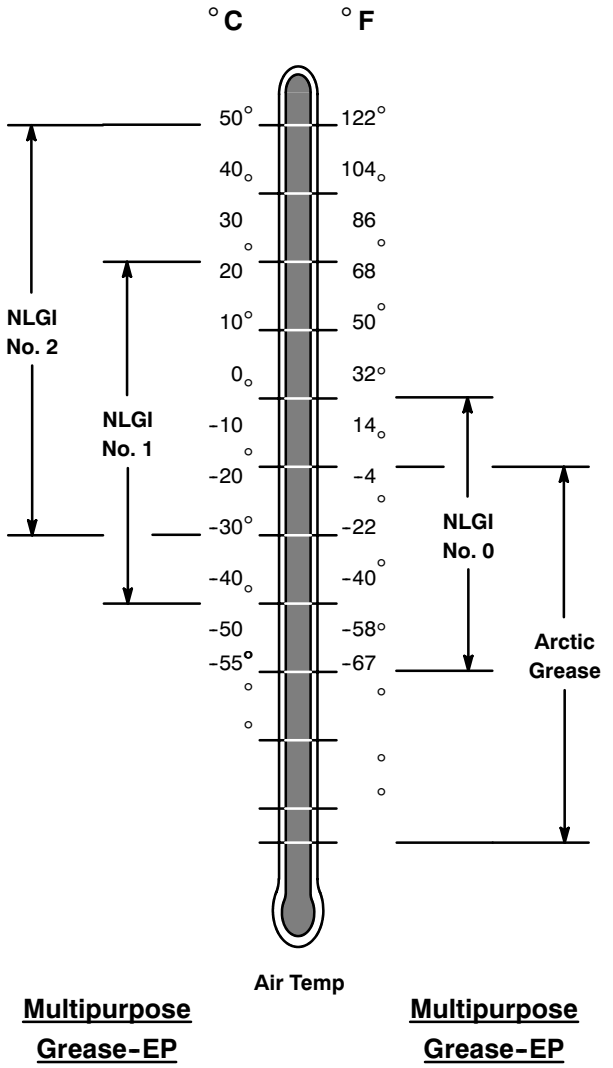


Chart 4.3 - Choose the proper Multipurpose Extreme Pressure (EP) grease based on expected air temperature range during sweeper operation. All grease used must meet SAE Multipurpose EP (MPG) service classification or SAE Multipurpose EP with Molybdenum Disulfide (MPGM) service classification. The consistency property of grease determines it's classification which is the measure of relative hardness expressed in terms of a National Lubricating Grease Institute (NLGI) consistency number.

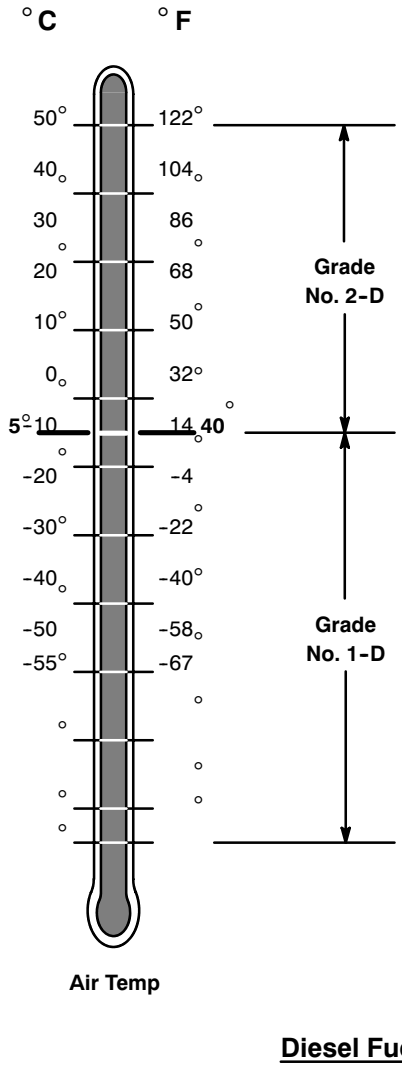
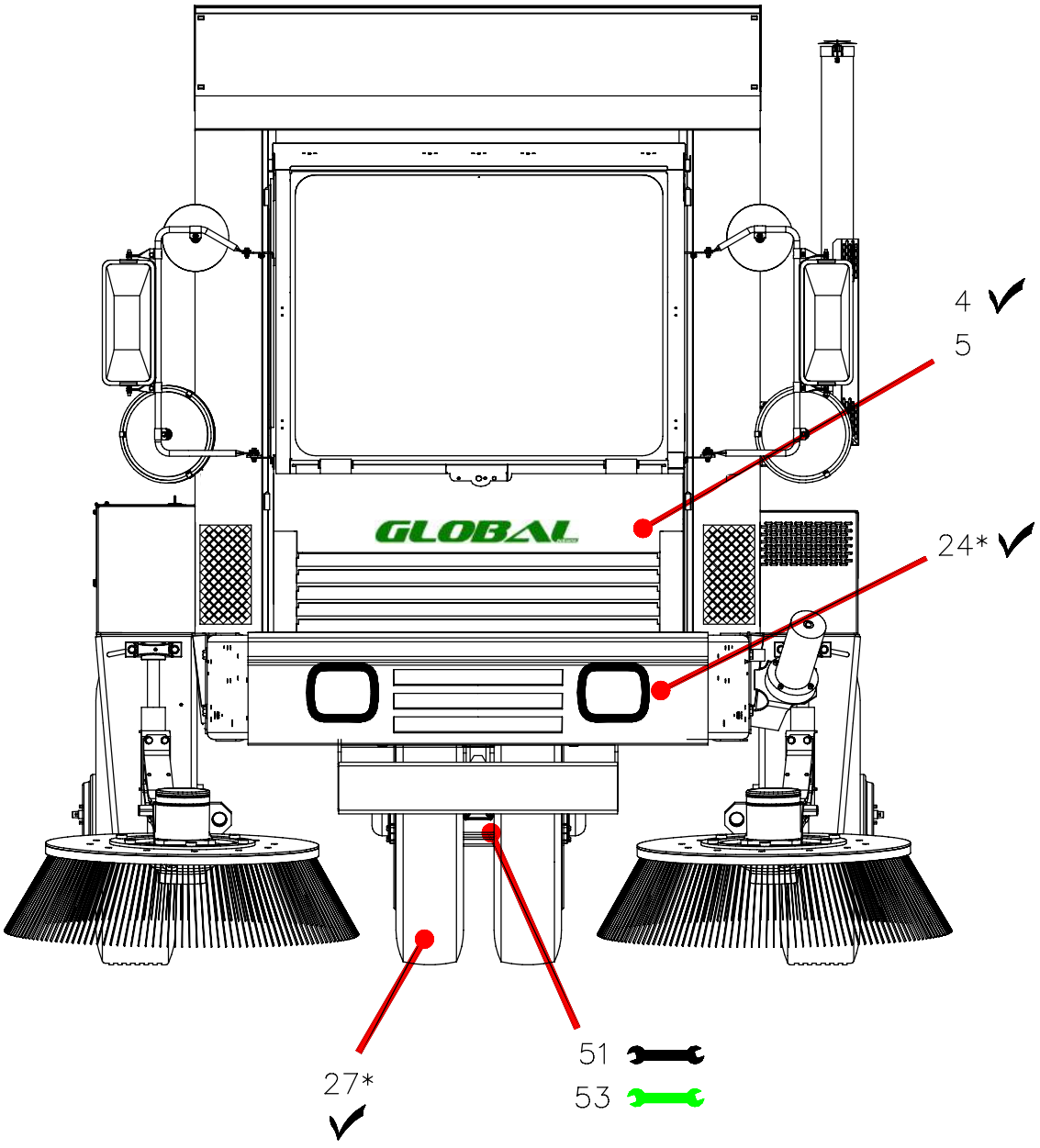


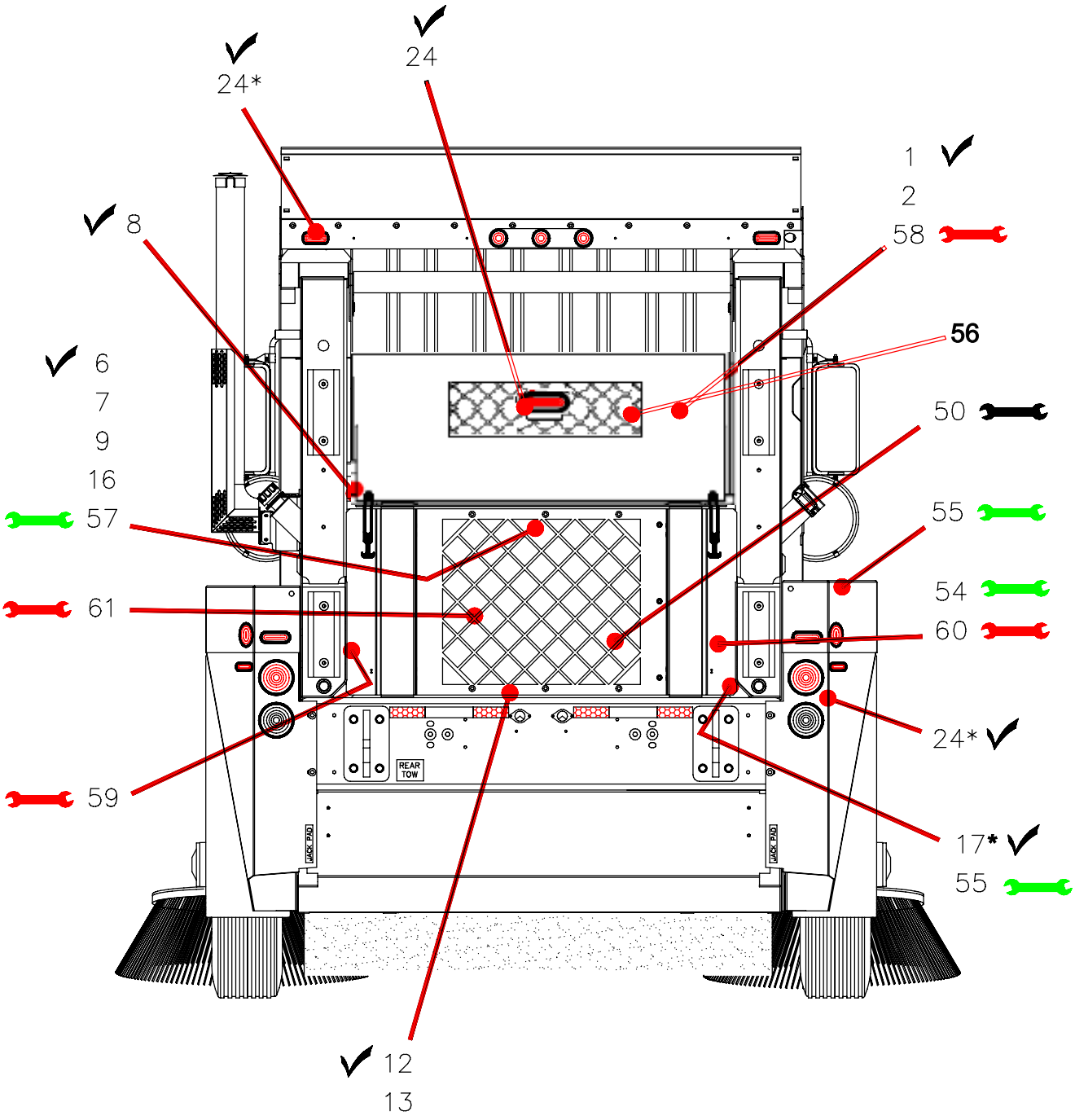
Chart 4.4 - Either Grade No. 1-D or Grade No. 2-D diesel fuel, as defined by ASTM designation D975, is required for diesel engines. Choose the correct EPA certified diesel fuel corresponding to air temperature at the time motor is started. When sweeper is operating at altitudes above 5000 ft (1500 m), use Grade No. 1-D for all temperatures. If sweeper is frequently being shutdown and restarted, use Grade No. 1-D for all temperatures.

SERVICE & LUBRICATION CHART

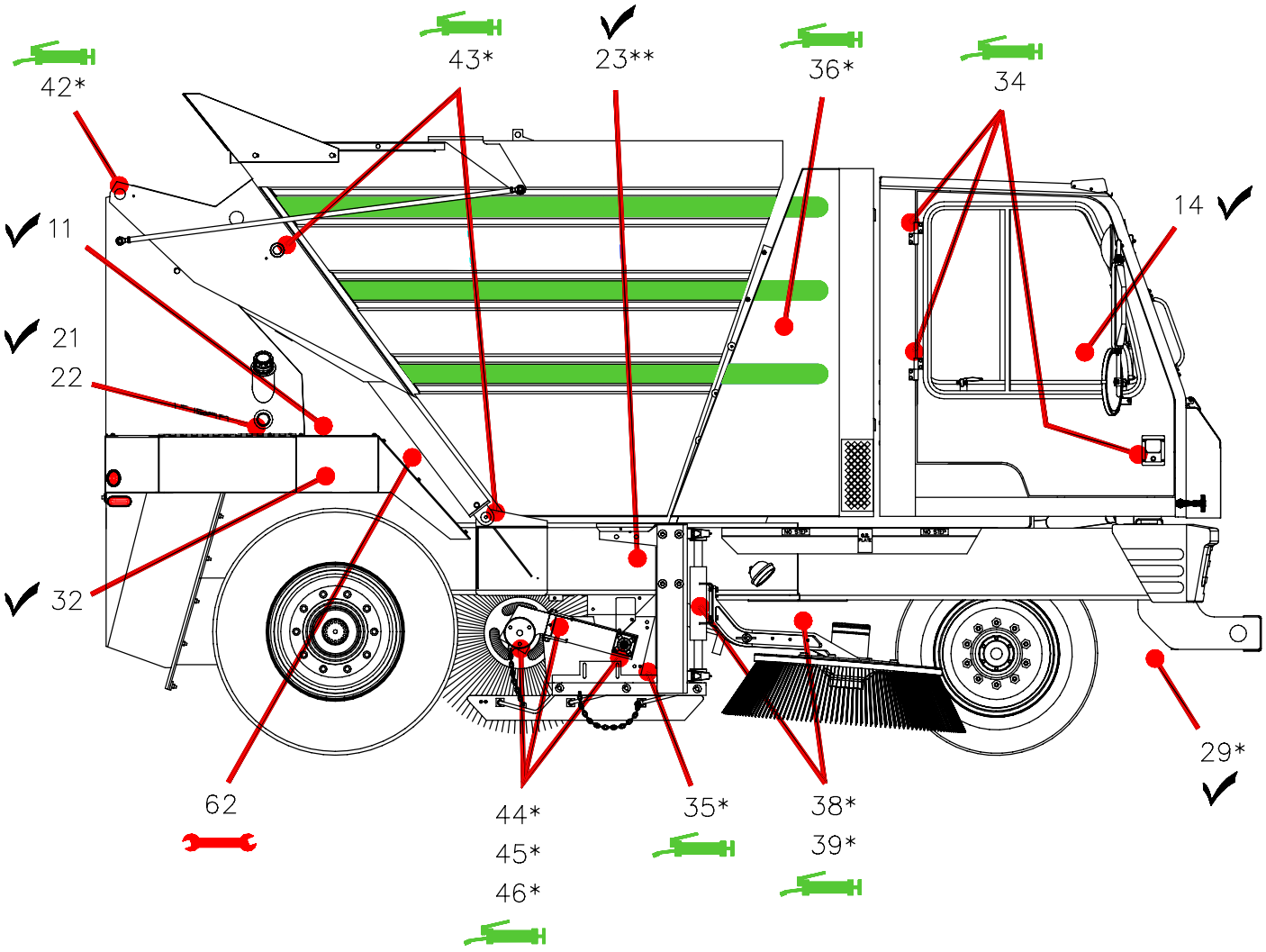
Note: *Perform daily maintenance before each work shift. If a problem is discovered, notify a qualified mechanic to repair machine.*



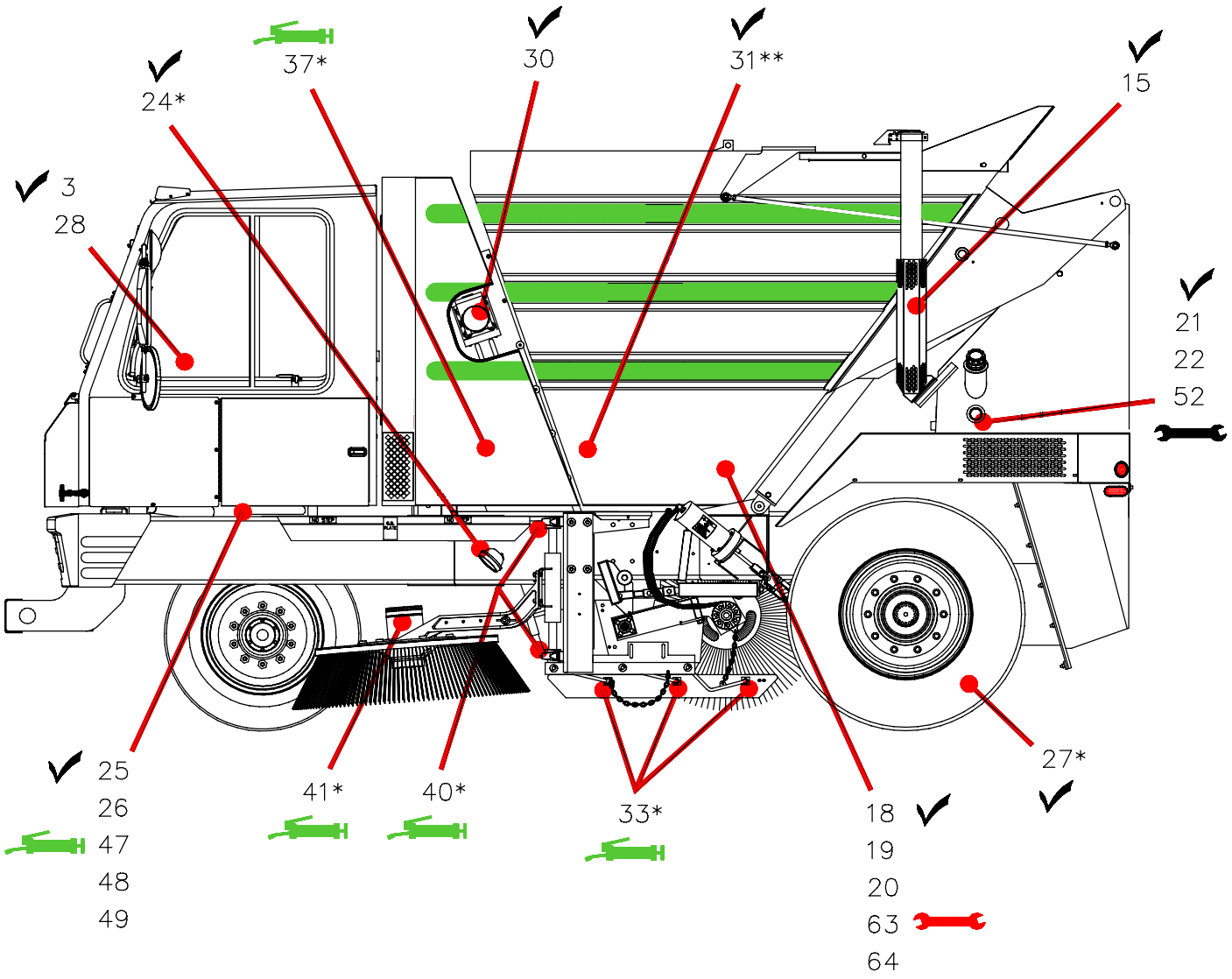
Note: The * denotes maintenance is required on both sides of the sweeper.



Note: The * denotes maintenance is required on both sides of the sweeper.



Note: The * denotes maintenance is required on both sides of the sweeper.
The ** denotes optional equipment on the sweeper.



Note: The * denotes maintenance is required on both sides of the sweeper.
The ** denotes optional equipment on the sweeper.

No.	Maintenance Operation	Service Interval				
		Daily	50 - Hour	100 - Hour	250 - Hour	500 - Hour
	Check: ✓					
1	Air Cleaner Filter	○				
2	Air Cleaner Hoses And Connections		○			
3	Air Cleaner Service Indicator	○				
4	Air Conditioner Filter		○			
5	Brake Fluid Level	○				
6	Radiator	○				
7	Coolant Level	○				
8	Cooling System – Deaeration Tank	○				
9	Coolant Leakage	○				
10	(Not Used)	N/A	N/A	N/A	N/A	N/A
11	Engine Oil Level	○				
12	Engine Oil Leakage	○				
13	Fan Belt Tension	○				
14	Fuel Level	○				
15	Exhaust System	○				
16	Oil Cooler (Inspect and Wash)	○				
17	Hydraulic Oil Composition					○
18	Hydraulic Oil Filter Gauge, Suction	○				
19	Hyd. Oil Filter Indicator, High Pressure	○				
20	Hydraulic Hoses – Visual Inspection	○				
21	Hydraulic Oil Level	○				
22	Hydraulic Oil Leakage	○				
23	Auto Lube (optional)	○				
24	Lights	○				
25	Steering Ball Joints		○			
26	Steering Spindle Bearing		○			
27	Tire Pressure	○				
28	Water Spray Level	○				
29	Water Spray Nozzles	○				
30	Elevator	○				
31	Elevator Washdown	○				
32	Battery Corrosion			○		

No.	Maintenance Operation	Service Interval				
		Daily	50 - Hour	100 - Hour	250 - Hour	500 - Hour
	Lubricate:					
33	Dirt Shoe Bushings	●				
34	Door Hinge & Latch			●		
35	Elevator Bearings, Lower	●				
36	Elevator Bearings, Upper	●				
37	Elevator Bearings, Pivot		●			
38	Gutter Broom Shock Absorber		●			
39	Gutter Broom Lift Bearings	●				
40	Gutter Broom Swing Bearings		●			
41	Gutter Broom Motor/Dish Cavity	●				
42	Hopper Pivot Bearings		●			
43	Hopper Ram Bearings, Lower & Upper		●			
44	Pickup Broom Arm Linkage		●			
45	Pickup Broom Bearings	●				
46	Pickup Broom Pivot Linkage		●			
47	Steering Ball Joints		●			
48	Steering Spindle Bearing		●			
49	Steering Spindle Input Shaft		●			
	Service - Change:					
50	Engine Oil *(Follow JD Engine Manufacturer Recommedations)*				●	
51	Front Wheel Bearing Grease					●
52	Hydraulic Oil *(Analyze and Change if required)*					●
	Service - Clean:					
53	Front Wheel Bearings					●
54	Fuel Filter, Primary, Water Separator				●	
55	Water Stariners (2 Places)	●				
56	Charge Air Cooler	●				
57	Radiator/Oil Cooler	●				
	Service - Replace:					
58	Air Cleaner, Primary & Safety Elements				●	
59	Engine Oil Filter *(Refer to JD Enginene Manual for recommendations)*				●	
60	Fuel Filter, Primary, Water Separator				●	
61	Fuel Filter, Secondary *(Refer to JD Enginene Manual for recommendations)*				●	
62	Hydralic Oil Filter, Suction				●	
63	Hydraulic Oil Filter, High Pressure				●	
64	Hydraulic Oil Filter, Water Separator				●	

PM10 OPTION

To maintain optimal PM 10 efficiency, hopper and elevator seals mus be inspected for proper sealing. Water spray system must also be in proper working condition. Check all PM 10 components on a daily basis. Prior to sweeping, the following functions must be set and checked:

a. Check water level, and if equipped with a water gauge, make sure water gauge indicates adequate water level.

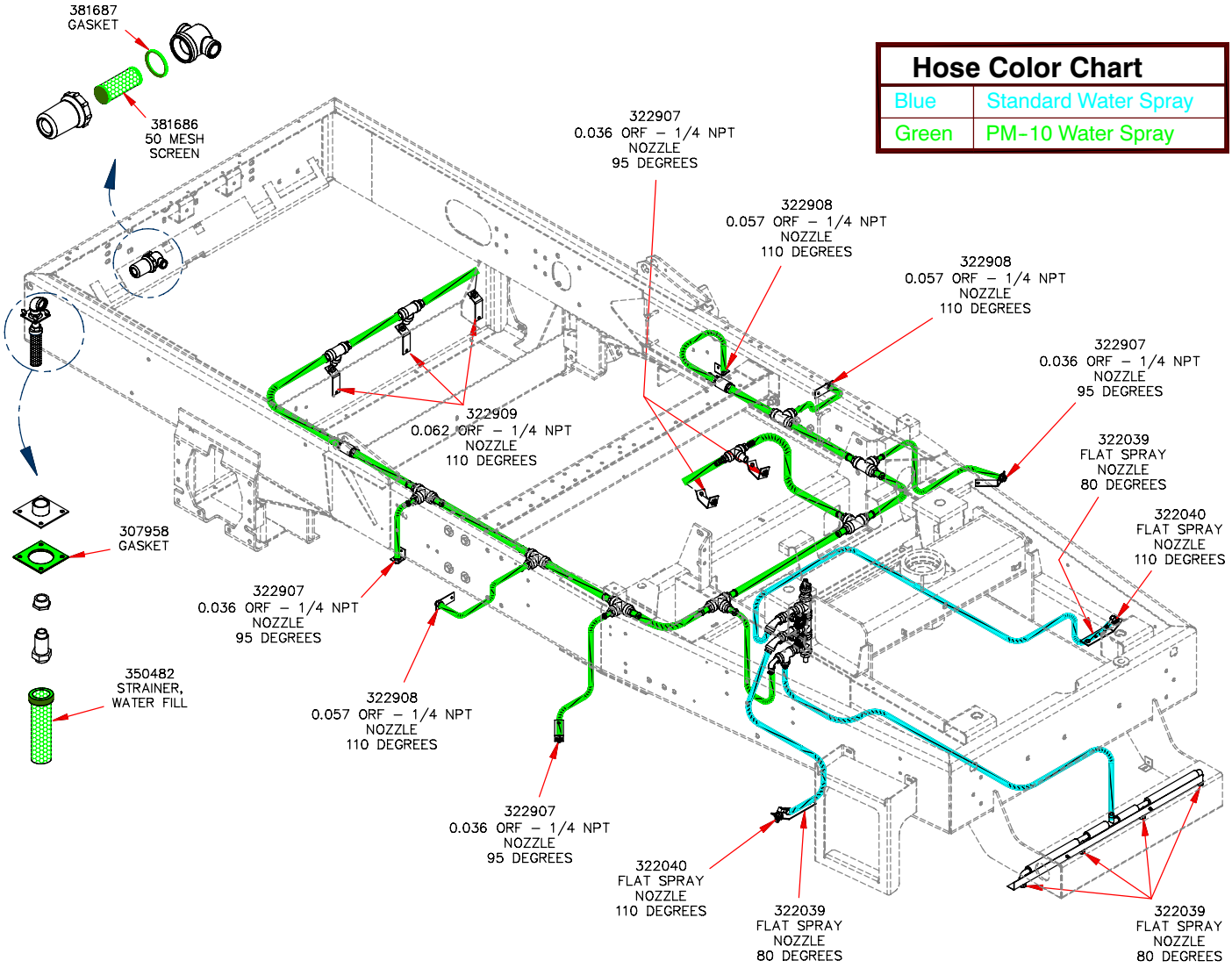
b. Water control valves behind the buddy seat must be turned ***ON***.

c. Water pump switch must be in either ***HIGH*** or ***LOW*** position, or the water spray system will not function.

d. With the unit stationary and the water spray operating, visually inspect to make sure that all the nozzles are spraying cleanly.

CAUTION

Do not attempt to sweep with the water spray system inoperative.



(PM 10 Water Plumbing Schematic) **Fig: 4.18 A**

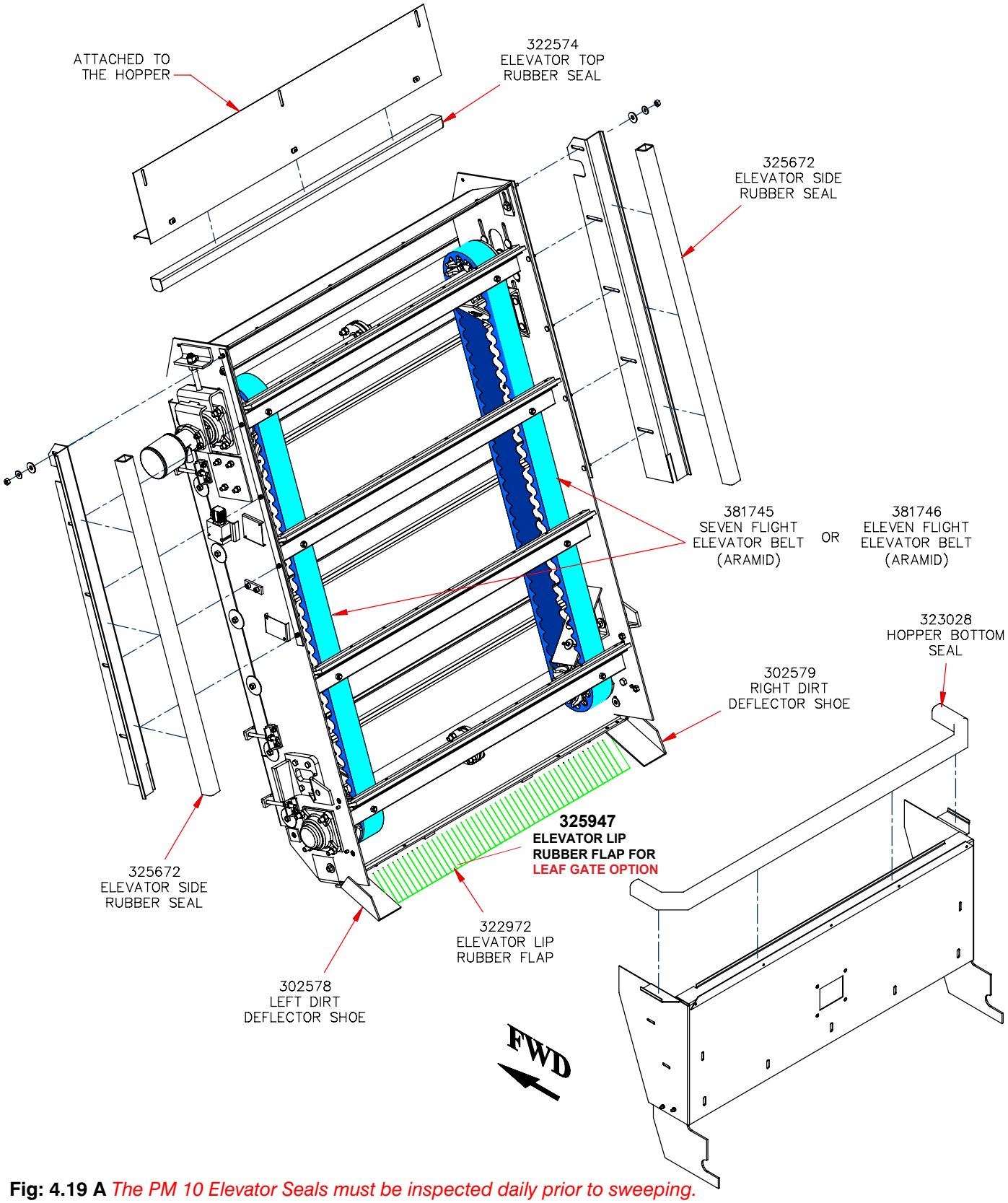


Fig: 4.19 A *The PM 10 Elevator Seals must be inspected daily prior to sweeping.*

WASHDOWN

Because your job and responsibility is to primarily operate the equipment does not prevent you from focusing some attention on the cleanliness of the unit. Keeping the machine in a clean condition will help prolong the life of some components. If the unit is exposed to high dust level, washdown the machine after use. Do not let dirt accumulate. Washdown sweeper after every sweeping shift.

Washdown Procedure

1. Park the sweeper on a level surface.

2. Raise hopper. Install prop rods.

WARNING

Falling hopper can cause severe injury or death. The prop rod must be in position before anyone goes under hopper.

3. Attach the fire hydrant hose located inside the right rear fender to a high volume water source *(such as a fire hydrant)*.

WARNING

Stand clear from the fire hydrant hose when filling tanks or attaching water hose. A high volume of water travels through hose under high pressure.

4. Turn ON the built–in elevator washdown water spray system (option).

5. Lower the PUB to sweeping position. Start rotation of the elevator.

6. With the elevator running, use a high pressure water hose *(connected to a high volume source)* to flush the elevator.

7. Flush out the hopper, all undercarriage parts, side broom(s), and dirt shoes.

8. Use a high pressure hose to dislodge material between the lower sprocket and the edge of the squeegee bar. Flush the lower sprocket from both sides of the sweeper.

CAUTION

An engine must never be washed or steam cleaned while it is running. Cold water on a hot manifold could crack the manifold.

CAUTION

A high pressure hose should never be used to clean a radiator or oil cooler. The high pressure water can damage cores.

CAUTION

A high pressure hose should never be aimed directly at solenoid valves, particularly when they are hot.

CAUTION

DO NOT spray high pressure water at or around ECM or fuse/relay box.

9. Before washing down the engine compartment, be certain that the engine is cool. Be sure to clean out the engine radiator, oil cooler and other engine external components.

10. After the washdown, visually inspect for damage or unusual signs of wear.

CHAPTER 5 Maintenance/Overhaul

Table of Contents

5

CHAPTER 5

GENERAL INFORMATION

This chapter contains procedures for the removal, repair, overhaul, and installation of component parts of the MX3 Series sweeper. Refer to the supplied John Deere Engine manual to perform service, maintenance, overhaul or troubleshooting procedures on the engine.

Throughout this chapter, Front and Rear refer to the front and rear of the vehicle. Left and Right sides of the vehicle refer to the orientation of a person sitting in the driver's cab facing forward.

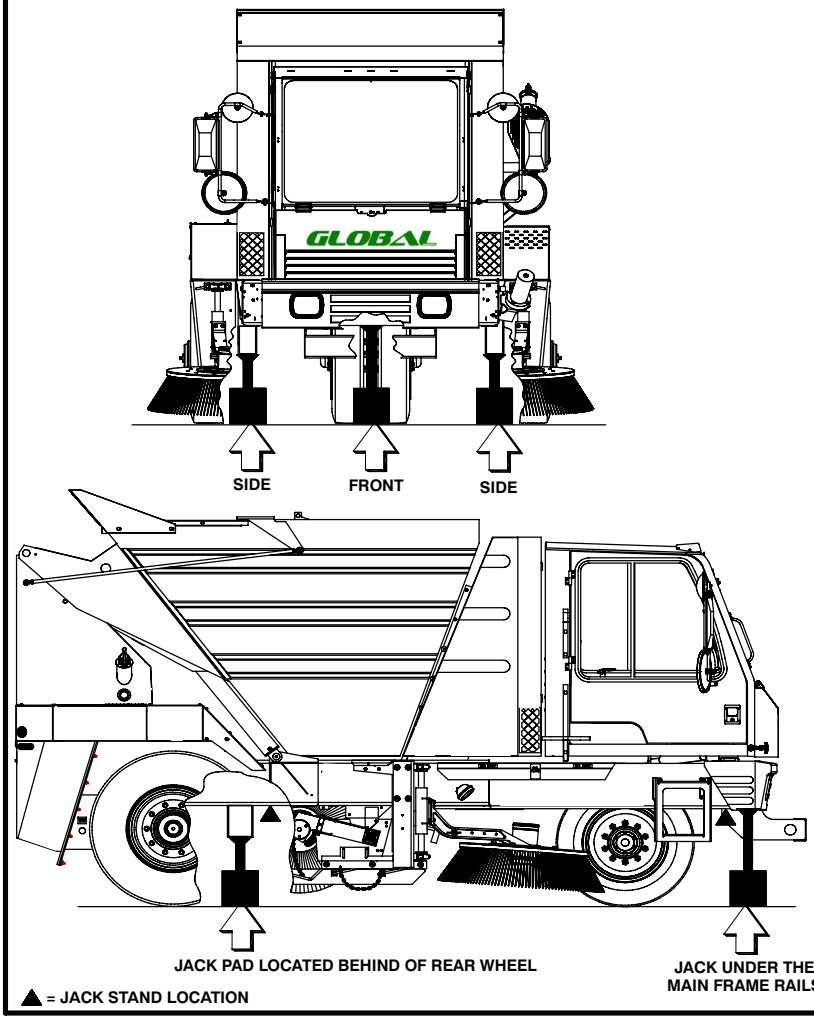
Be aware that the engine is actually situated in the sweeper frame backwards *(the flywheel is toward the front of the sweeper and the alternator, water pump and cooling fan are toward the rear of the sweeper).*

During disassembly and assembly, remember that force is rarely needed. If parts have a tight fit, such as a bearing in a case, there is usually a tool designed to do the job. Never use a screwdriver to pry apart any parts with machined surfaces. You will mar the surfaces and leaks will result after the parts are reassembled.

Most procedures are straightforward and are accompanied by illustrations and/or photographs. If a more detailed parts description or an assembly illustration is required, refer to the accompanying parts manual. Hydraulic and electrical schematics are located at the end of chapter 6.

Perform preventive maintenance and overhaul tasks when they are required, so as to avoid additional expensive repairs that will result from damage caused by operating a malfunctioning sweeper. It has been proven that a well–maintained sweeper has increased reliability and improved long term, overall performance.

Table 5.1
Jacking Procedures



Equipment Required

- 5–ton hydraulic jack with an adjustable stroke of 9 inches minimum to 19 inches maximum
- Wheel chocks
- Jackstands (10,000 lbs.)

Procedures

1. Position the sweeper on a level surface.
2. Place the shifter in *Park (P)* setting the parking brake.
3. Stop the engine.
4. **Jacking the front:**
   a. Chock rear wheels.
   b. Place the jack under the front axle.
5. **Jacking the side:**
   a. Chock the opposite rear and front wheels.
   b. Place the jack under the side jack pad. Do not jack more than 6 inches off the ground
6. Place jackstands under the vehicle. Do not trust a hydraulic jack to hold the sweeper up by itself.

CAUTION

If you can not find a level work area, DO NOT attempt to jack the sweeper up!

FRONT & REAR WHEELS

Front Wheel – *Removal/Installation*

1. Position the sweeper on a hard level surface.
2. Set the parking brake, stop the engine, and jack the vehicle in accordance with the Jacking Procedures in Table 5.1.

WARNING

To prevent death or accidental injury, always place jack – stands to support a raised vehicle.

3. Loosen the lug nuts.
4. With the front tire slightly off the ground, clean the area around the wheel and hub.
5. Remove the wheel lug nuts.
6. Remove the wheel assembly from the front hub.
7. Remove the tire from the wheel, and repair the tire as required, using standard procedures.
8. With the tire dismounted, inspect the wheel for signs of damage such as a rough area that might damage the mounted tire.
9. Using standard procedures, remount the tire to the wheel. Inflate the mounted tire to 115 psi.
10. Place the assembled wheel on the front hub, and install and hand tighten the lug nuts. Tighten the lug nuts in the numerical order shown in Fig: 5.4 A. Final torque specification of front wheel lug nuts is 400–420 ft lbs.
11. Remove the jack – stands and lower the sweeper to the ground.
12. Remove the jack and wheel chocks.

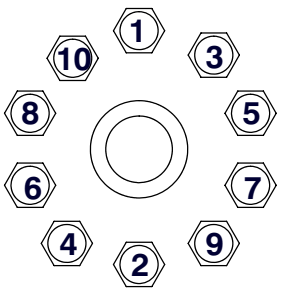
Rear Wheel – *Removal/Installation*

1. Position the sweeper on a hard level surface.
2. Set the parking brake, stop the engine, and jack the vehicle in accordance with the Jacking Procedures in Table 5.1.

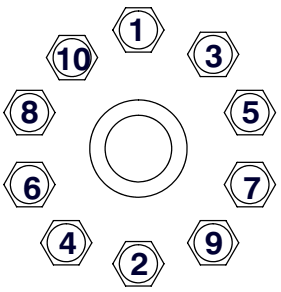
WARNING

To prevent death or accidental injury, always place jack – stands to support a raised vehicle.

3. With the rear tire slightly off the ground, clean the area around the wheel and hub.
4. Remove the wheel lug nuts.
5. Remove the wheel assembly from the rear hub.
6. Remove the tire from the wheel, and repair the tire as required, using standard procedures.
7. With the tire dismounted, inspect the wheel for signs of damage such as a rough area that might damage the mounted tire.
8. Using standard procedures, remount the tire to the wheel. Inflate the mounted tire to 120 psi.
9. Place the assembled wheel on the rear hub, and install and hand tighten the lug nuts. Tighten the lug nuts in the numerical order shown in Fig: 5.4 A. Final torque specification of rear wheel lug nuts is 450–500 ft lbs.
10. Remove the jack – stands and lower the sweeper to the ground.
11. Remove the jack and wheel chocks.



Front Lug Nut Torque Pattern (400-420 ft lbs)



Rear Lug Nut Torque Pattern (450-500 ft lbs)

Fig: 5.4 A *Lug nut tightening sequence for replacing the front and rear wheels. Torque the first and second lug nuts to properly seat in the wheel recess before tightening down other lug nuts. Tighten in the sequence order shown.*

CHAPTER 5

Front Suspension –*Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Stop the engine.
4. Chock the rear wheels.
5. Clean the area around the front suspension assembly.
6. Disconnect the hydraulic cylinder *(Fig: 5.5 A: item 9)* from the front suspension assembly.
7. Remove the driver seat inside the operators cab to gain access to the floor panel underneath the driver seat.
8. Remove the floor panel.
9. From inside the operators cab, remove the front suspension assembly dust cap *(2)* .
10. Remove the lock nut, lock washer and the bearing cone *(3, 4, 5)* from the front suspension assembly.

WARNING

To prevent death or accidental injury, secure the front suspension assembly before raising the vehicle.

11. Using an overhead hoist, lift the front of the sweeper by connecting the overhead hoist to the front tow bar eyelids. The front suspension should slide out as the front of the sweeper is being raised.

1. Front Suspension with Wheels
2. Dust Cap
3. Lock Nut
4. Lock Washer
5. Bearing Cone
6. Bearing Cone
7. Grease Seal
8. Castle Nut
9. Hydraulic Cylinder, 1” Rod
10. Elbow, MJ-MP90-4-2
11 Hose Assembly
12 Cotter Pin

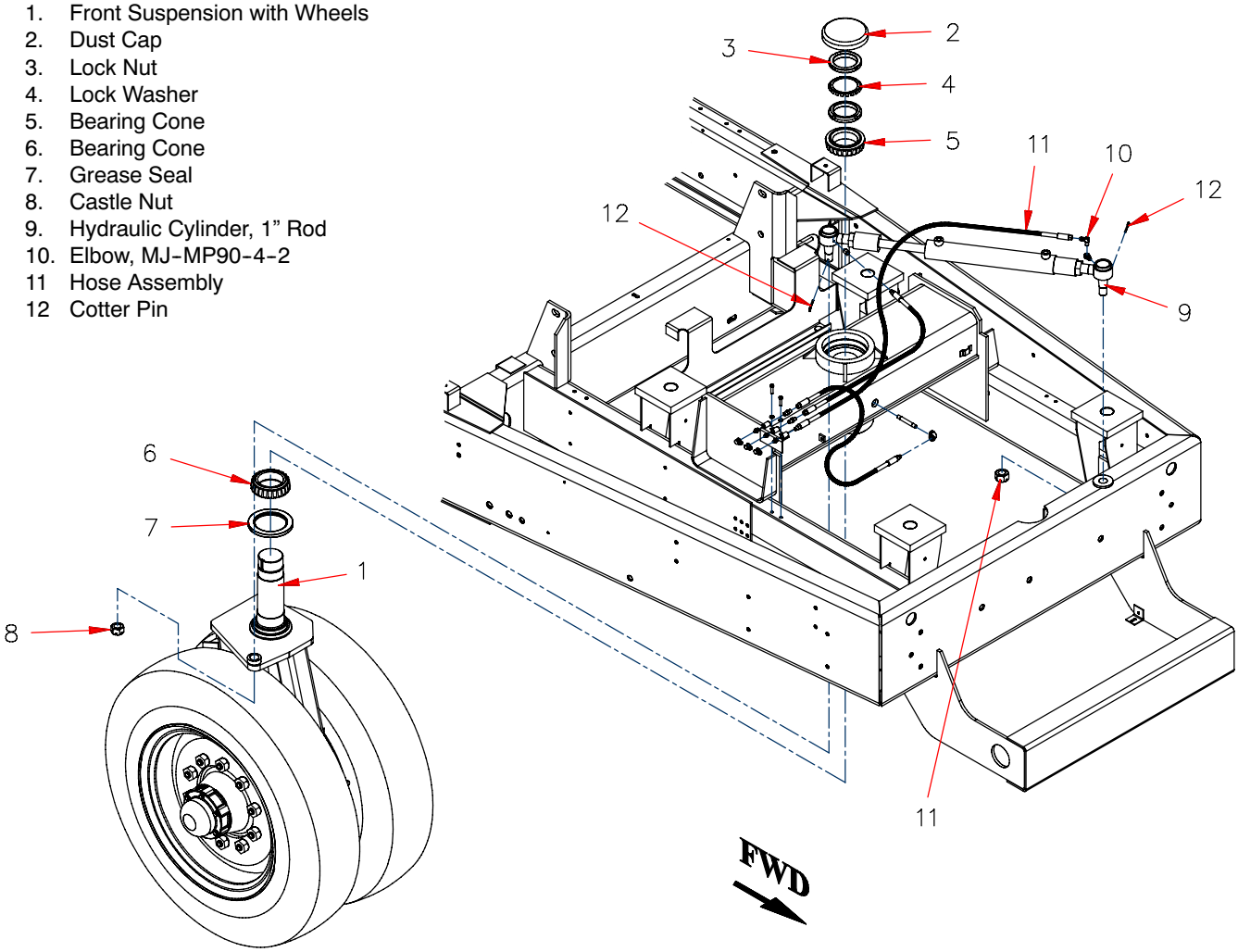
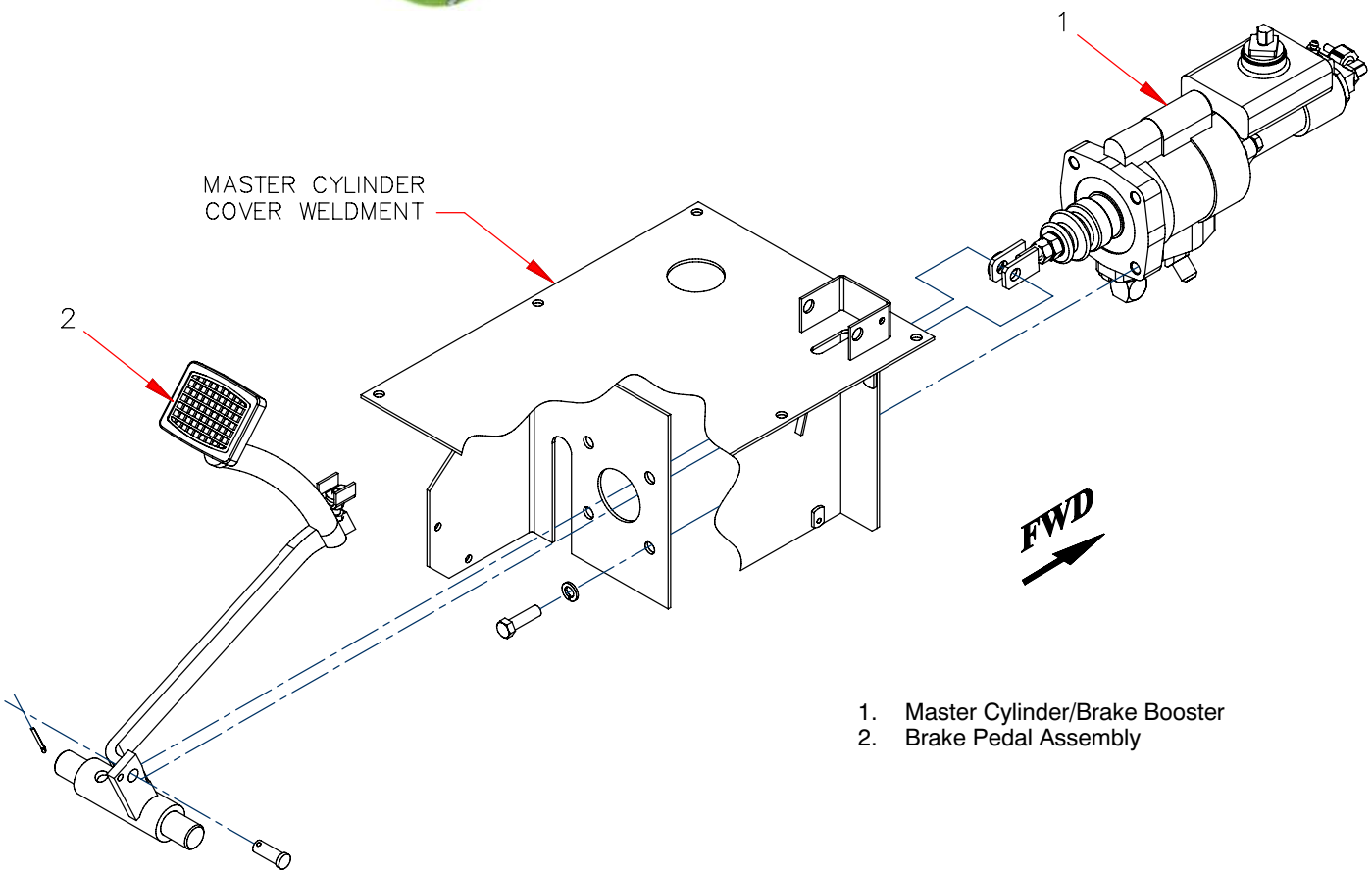


Fig: 5.5 A *Front Suspension Removal/Installation*



1. Master Cylinder/Brake Booster
2. Brake Pedal Assembly

Fig: 5.6 A *Master Cylinder/Brake Booster Removal/Installation*

WARNING

To prevent death or accidental injury, always place jack – stands to support a raised vehicle.

12. Remove the front suspension assembly.
13. Remove the bearing cone and the grease seal *(Fig: 5.5 A: items 6, 7)* from the front suspension assembly.
14. Install the front suspension assembly by reversing the steps.

Master Cylinder/Brake Booster – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Stop the engine.
4. Chock the rear wheels.
5. Clean the area around the master cylinder/brake booster and the brake pedal.
6. Identify the hydraulic hoses connected to the master cylinder/brake booster.

   NOTE: *Before removing the hoses, provide a container to catch the excess hydraulic fluid from the master cylinder/brake booster.*
7. Disconnect hydraulic hoses from the master cylinder.
8. Remove the cotter pin from the clevis pin which connects the master cylinder to the brake pedal assembly.
9. Disconnect the brake pedal assembly from the master cylinder.
10. Disconnect the master cylinder from the cover weldment by removing the four screws and washers which connect the master cylinder to the cover weldment.
11. Install the master cylinder/brake booster by reversing the steps.
12. Bleed the brakes.

    NOTE: *Before driving the sweeper, brake pedal adjustment should be done, refer to chapter 3 for the brake pedal adjustment procedure.*

1. Actuator- Parking Brake
2. Elbow- MB-MJX90-8
3. Nut- Jam, Plated, 5/8-18
4. Nut- Lock, Plated, 5/8-18
5. Washer- Lock, Split, Plated, 5/8
6. Washer- Flat, SAE, Plated, 5/8
7. Turn Buckle Weldment
8. Hairpin- 5/8 Dia.
9. Clevis Pin- 3/8 X 1 1/8
10. Cotter Pin- Plated, 1/8 X 1
11. Cleavis Weldment, LH Thread
12. Equalizer Plate
13. Clevis Weldment
14. Clevis Pin- 5/16/X 1
15. Brake Cable- RH Wheel
16. Brake Cable- LH Wheel

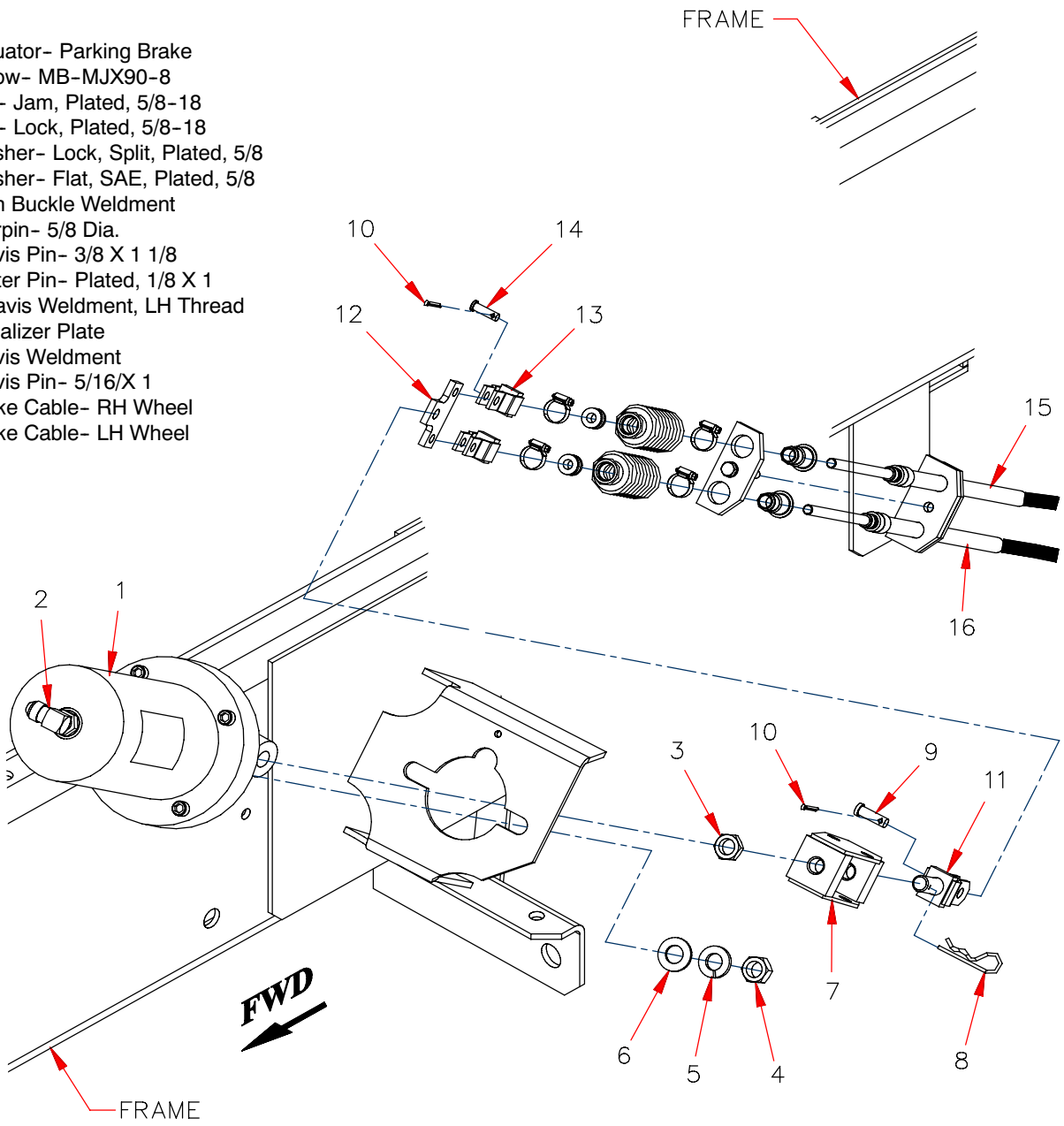


Fig: 5.7 A *The Parking Brake Actuator is located in front of the left rear fender. Do not cut into, disassemble or torch the canister. The spring is under compressed force. The actuator canister must be replaced if a failure occurs.*

Parking Brake Actuator
- *Removal/Installation*

1. Position sweeper on a level surface.
2. Chock the rear wheels.
3. Clean the area around the Parking Brake Actuator, cables and connecting hardware.
4. With an assistant in cab, have them start the sweeper, place shifter in the *Low (L)* position, releasing the parking brake, and engage the brake pedal.

WARNING

Do not cut into, disassemble, or torch the canister. The internal spring is under compressed force. The canister is not repairable. Obtain a new canister if failure occurs.

Fig: 5.8 A

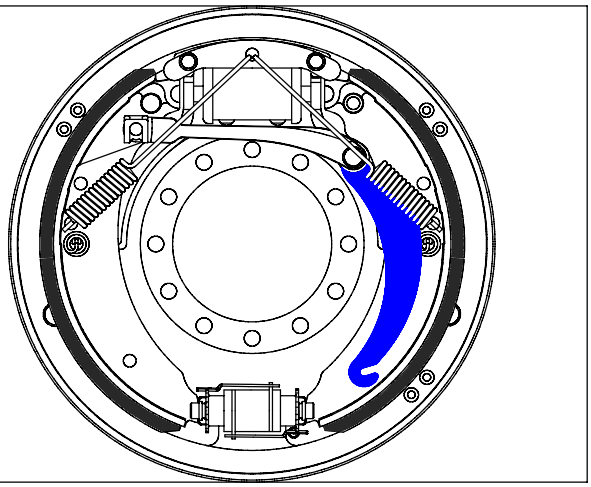


Fig: 5.8 B

5. Remove the parking brake release cotter pin and the clevis *(Fig: 5.7A: 9 & 10)* from the clevis weldment *(11)*.
6. Loosen the locking nut *(3)*. Using the gutter broom angle adjustment tool, mechanically unscrew the parking brake clevis weldment *(7) turnbuckle* and remove it from the actuator *(1)*.
7. Turn off engine.
8. Disconnect the hydraulic hose from the elbow *(2)* on the front of the actuator. Plug the hose.

***NOTE:** Before removing the hydraulic hose, provide a container to catch the excess hydraulic fluid from the parking brake actuator.*

9. Remove the nuts and flat washers securing the actuator to the frame. Remove the actuator *(1)*.
10. Install the parking brake actuator by reversing the steps.

CAUTION

Hydraulic pressure is present with parking brake de-activated. Do not remove hydraulic hoses with shaft protruding out of cannister.

Parking Brake Cable - *Removal/Installation*

1. Position sweeper on a level surface.
2. Chock the rear wheels.
3. Clean the area around the Parking Brake Actuator, cables and connecting hardware.
4. With an assistant in cab, have them start the sweeper, place shifter in the *Low (L)* position, releasing the parking brake, and engage the brake pedal.
5. Remove the parking brake release cotter pin and the clevis *(Fig: 5.7A: 9 & 10)* from the clevis weldment *(11)*.
6. Loosen the locking nut *(3)*. Using the gutter broom angle adjustment tool, mechanically unscrew the parking brake clevis weldment *(7) turnbuckle* and remove it from the actuator *(1)*.
7. Turn off engine.
8. Jack the vehicle in accordance with the Jacking Procedures in Table 5.1.

WARNING

To prevent death or accidental injury, always place jack – stands to support a raised vehicle.

9. Remove the rear wheel(s) *(Refer to page 5.4 for wheel removal procedure)*.
10. Remove the cotter pins and clevis pins from the parking brake cable clevises *(13)*.
11. Loosen the lock nuts on the cables. Unscrew the clevises from the cables.
12. Remove the nuts, lock washers, screws and clamps from the cable assemblies.
14. Remove the allen screws (3) which connect the drum to the torque hub assembly. Remove the drum.
15. Disconnect the parking brake cable from the brake arm *(Fig: 5.8B)*.
16. Remove the brake cables *(15 & 16)*.
17. Install the cables by reversing the steps.
18. Use the procedure in Chapter 3 to adjust the brake system.

CHAPTER 5

CAB GROUP

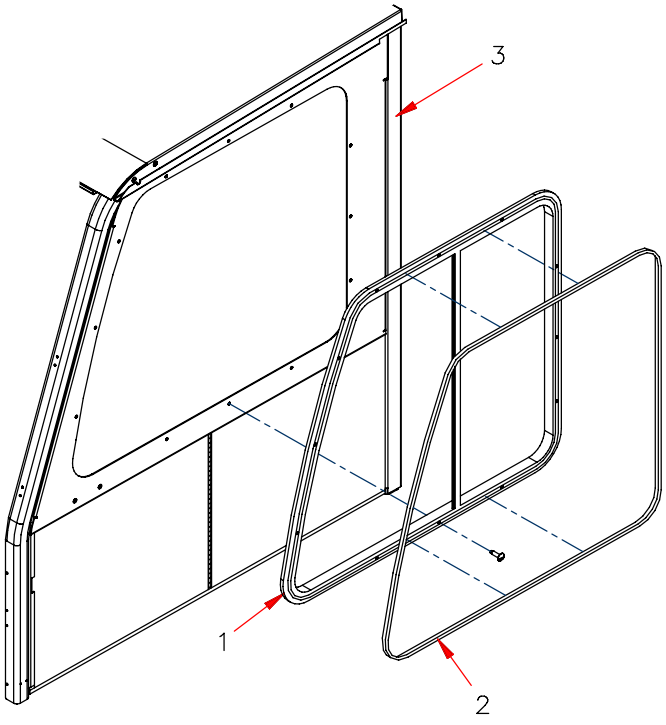
WINDOW & DOOR MECHANISM

Left Window
- *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Remove silicone sealant and rubber *(2)* to gain access to the self tapping screws securing the window frame to the cab.

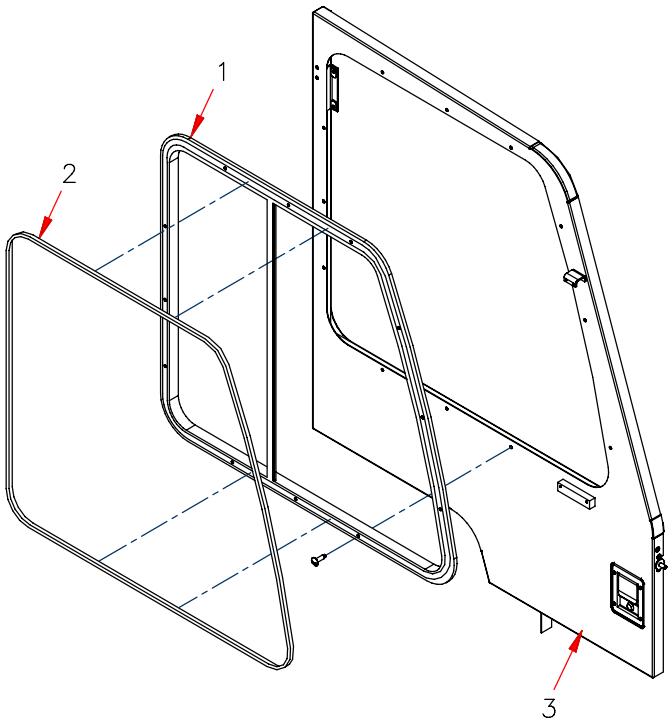
   NOTE: *Sealant may make it difficult to take out rubber seal around the window frame.*

4. Remove self tapping screws securing window *(Fig: 5.9A; 1).*
4. Slide window to left or right to remove from cab frame.
5. Install the left window by reversing the steps.



1. Window- Operator, LH
2. Rubber-.25 X .75,Closed Cell
3. Cab Frame
4. Silicone Black Sealant (Not Shown)

Fig: 5.9 A *Always take extra precaution when handling left cab glass window to avoid breaking.*



1. Window- Operator, RH
2. Rubber
3. Cab Door Weldment
4. Silicone Black Sealant (Not Shown)

Fig: 5.9 B *Right Cab Door is heavy. Removal may require two mechanics.*

Right Window
- *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Remove the screws securing the panel brackets to the top and front edges of the window frame inside the cab door.
4. Remove upholstery door trims from the operator's cab door.
5. Remove the pan head screws securing the window assembly to the door *(Fig: 5.9B; 3).*
7. Remove the window assembly *(1)*.
8. Install the right window by reversing the steps.

   NOTE: *Use a sealing compound on the window seal when installing left and right windows.*

1. Latch Rework
2. Scr– Pn Hd, Sltd, Pltd 8–32 X 1/2
3. Washer– Lock, Split, Pltd, #8
4. Clevis Pin– 3/16 X 19/32
5. Washer– Flat, SAE, Plated, #10
6. Spacer
7. Cotter Pin– 1/16 X 1/2
8. Clevis Pin– 1/4 X 1/2
9. Washer– Flat, SAE, Plated, 1/4
10. Angle
11. Latch Rework W/Key
12. Scr– Pn Hd, Sltd, Pltd 8–32 X 1/2
13. Washer– Lock, Split, Pltd, #8
14. Clevis Pin– 3/16 X 19/32
15. Washer– Flat, SAE, Plated, #10
16. Spacer
17. Cotter Pin– 1/16 X 1/2
18. Clevis Pin– 1/4 X 1/2
19. Washer– Flat, SAE, Plated, 1/4
20. Bent Angle

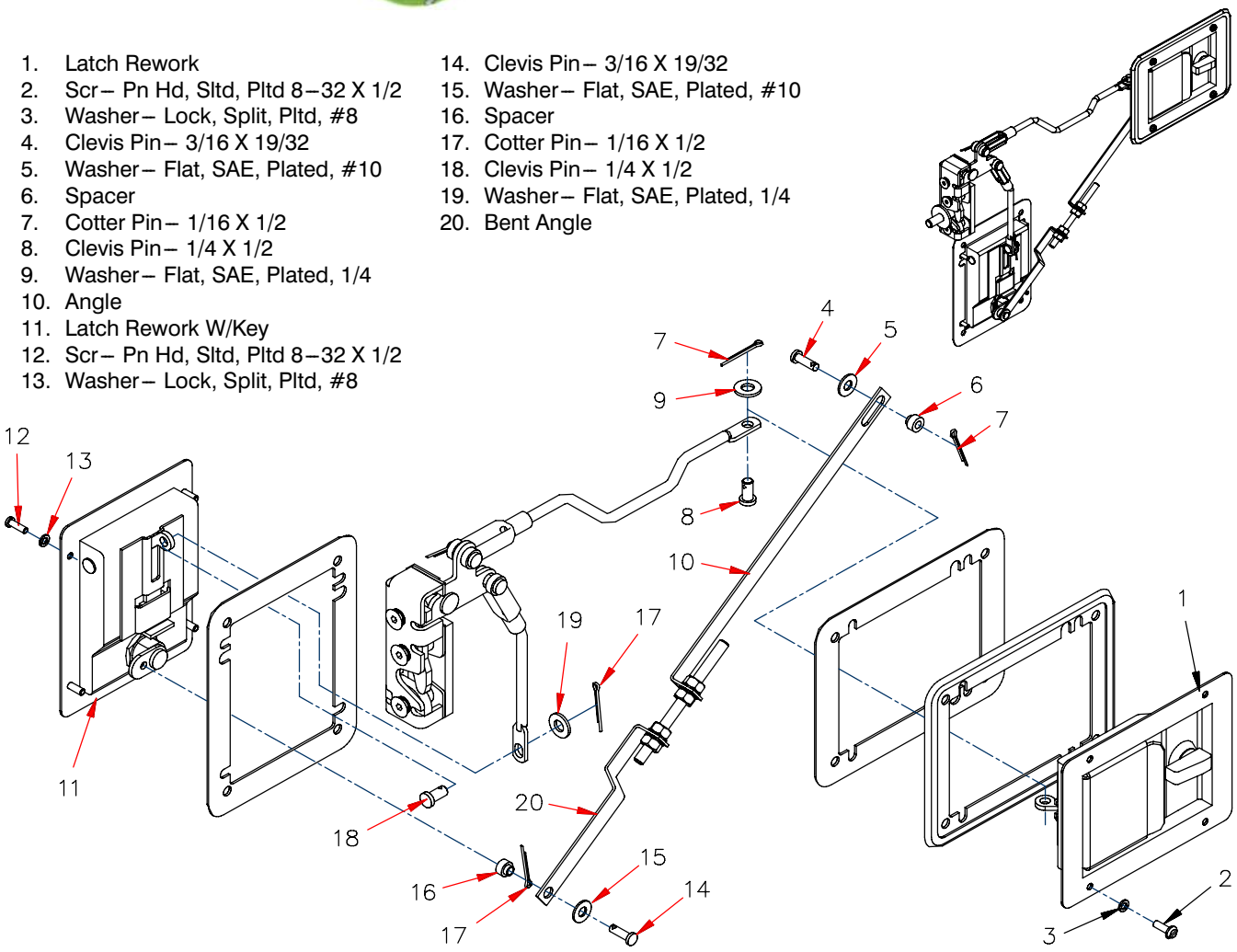


Fig: 5.10 A *Remove bottom upholstery and grip handle to gain access to the inside latch mechanism.*

DOOR ASSEMBLY LATCH MECHANISM

Inside Paddle Latch – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Remove screws and washers *(Fig: 5.11A; 2 & 3)* securing the door latch cover plate *(1)* inside the door.
4. Remove bottom upholstery clipped to the door.
5. Remove cotter pins and clevis pins securing inside door latch.
6. Remove flat socket head screws.
7. Remove the inside paddle latch mechanism.
8. Install the inside paddle latch assembly by reversing the steps.

Exterior Lock Latch – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Remove the four truss head screws securing the outside paddle lock *(11)* to the door.
4. Remove screws and washers *(Fig: 5.11A; 2 & 3)* securing the door latch cover plate *(1)* inside the door.
5. Remove bottom upholstery clipped to the door.
6. Remove cotter pins and clevis pins securing inside door latch.
7. Remove the outside latch *(11)*.
8. Install the outside latch with key assembly by reversing the steps.

Interior Door Latch – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Remove screws and washers *(Fig: 5.11A; 2 & 3)* securing the door latch cover plate *(1)* inside the door.
4. Remove door latch cover plate *(1).*
5. Remove bottom upholstery clipped to the door.
6. Remove cotter pins and clevis pins securing inside door latch.
7. Remove the outside latch with key *(11).*
8. Remove flat socket head screws.
9. Remove the inside paddle latch mechanism.
10. Install the interior door latch by reversing the steps.

NOTE: *If necessary, adjust the position of the two rod assemblies that attach to the latch mechanism assembly.*

HEATER/AIR CONDITIONER

NOTE: *Only the EPA certified technicians may work with refrigerants.*

The air conditioning system consists of a condenser, a compressor, an evaporator, a receiver/dryer and an AC control panel.

Use manifold gauges, charging hoses and other air conditioning service tools when checking the refrigerant system. Use Refrigerant Recovery System or equivalent before removing or replacing any air conditioning parts.

CAUTION

Improper service methods may cause injury. Air Conditioning System to be serviced by qualified personnel only. Consult AC service manual.

CAUTION

The maximum operating charge is 4.0 lbs. of R-134A refrigerant.

Air Conditioner – *Evacuation by Vacuum Pump*

WARNING

DO NOT allow air conditioner refrigerant to escape into atmosphere.

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Clean the area around the air conditioner and connecting hardware.

WARNING

Before connecting the manifold, close the gauge valves. Serious injury may occur if refrigerant touches your skin.

NOTE: *The following procedures requires the use of a Refrigerant Recovery System or a manifold with three charging hoses, a compound gauge and pressure gauge.*

4. Remove the compression valve port caps and stem covers.
5. Connect the compound gauge to the compressor suction port with the hose. Connect the pressure gauge to the compressor discharge port with the hose.
6. Hook the hose to the vacuum pump.
7. Back out both compressor valve port stems completely and turn the valve stems two turns to a slightly open position.
8. Open the gauge valves and turn on the vacuum pump.
9. Operate the vacuum pump for 30 minutes. Close the gauge valves, stop the pump, and disconnect the hose from the vacuum pump.
10. The reading on the compound gauge should remain constant at 28 inches of vacuum. Let the system remain idle for 15 minutes.

NOTE: *If the reading remains constant, the system is ready for charging. If the vacuum drops off, it is an indication of a leak. The leak must be located and sealed before charging.*

WARNING

Should Refrigerant-134A contact your eye(s), do not rub the affected eye(s). Instead, splash with fresh clean cold water. Consult a doctor immediately.

Fig: 5.12 A

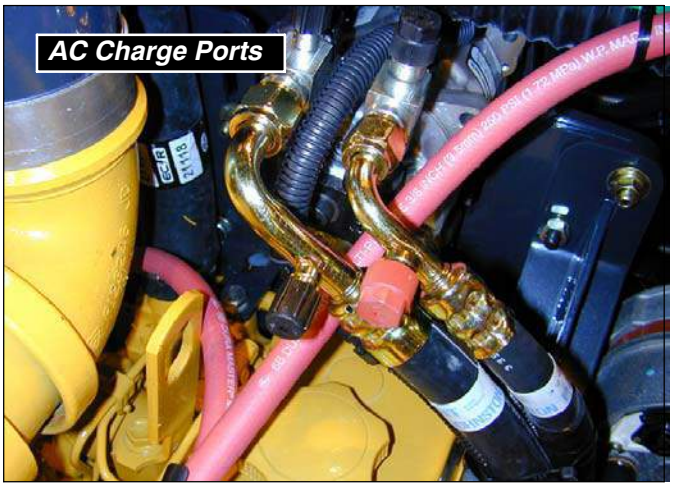


Fig: 5.12 B

Fig: 5.12 C

Air Conditioner

– *Charging or Adding Refrigerant*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Clean the area around the air conditioner and connecting hardware.

NOTE: *The following procedures requires the use of a Refrigerant Recovery System or a manifold with three charging hoses, a compound gauge and pressure gauge.*

WARNING

Before connecting the manifold, close the gauge valves. Serious injury may occur if escaping refrigerant touches your skin.

4. Remove the compression valve port caps and stem covers.
5. Connect the compound gauge to the compressor suction port with the hose. Connect the pressure gauge to the compressor discharge port with the hose.
6. Turn in the compressor discharge valve and suction valve port stems.
7. Bleed air from the hoses by slightly opening the shutoff valves slowly and individually for three seconds each. Then close each valve.
8. Install the valve on a refrigerant per the manufacturer's instructions and connect it to the center hose.
9. Open the valve at the refrigerant and bleed air from the center hose at the manifold. Retighten the center hose couplings.

CAUTION

The maximum operating charge is 4.0 lbs. of R-134A refrigerant.

10. Open both gauge valves. When the gauge readings are equal, close the pressure gauge valve. Check for leaks in the system.
11. When the refrigerant is empty, close the compound gauge valve. Close the refrigerant valve. Remove and discard the empty container. Attach another refrigerant. Open the refrigerant valve and the compound gauge valve.

CAUTION

The low pressure side suction gauge should not exceed 40 psi.

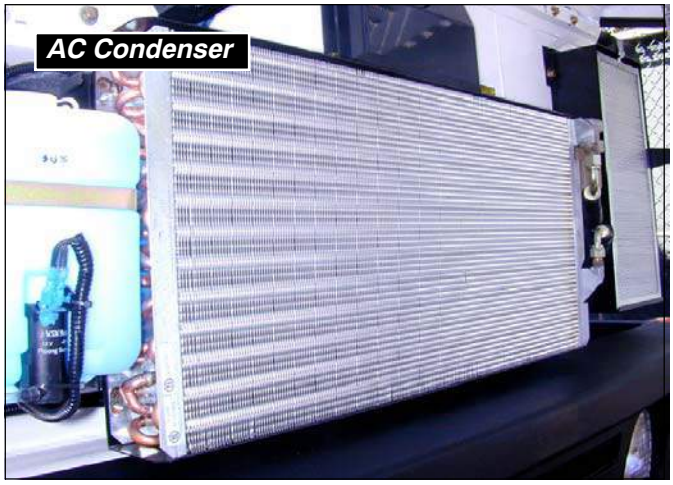


Fig: 5.13 A

Fig: 5.13 B

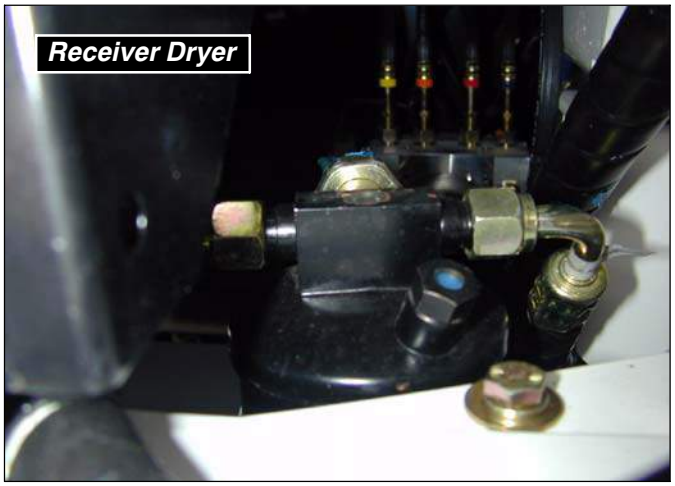


Fig: 5.13 C

12. Start the engine and set the throttle at fast idle. Position the fan switch to *On* and turn the cool switch to maximum.
13. Repeat step 8 until the sight glass on the receiver/dryer is clear and free of bubbles.
14. Close the compound gauge valve and the refrigerant valve. Slowly disconnect the center hose from the refrigerant.
15. Back out the compressor discharge valve port stem and open the pressure gauge shut off valve. Back out the compressor suction valve port stem.
16. Disconnect the hose from the refrigerant hose. Disconnect the hoses from the compressor valve port caps and stem covers.
17. In the A/C panel located in the operator's cab, position the fan switch to *Off* and stop the engine.

Air Conditioner
– *Leak Detection*

WARNING

Avoid breathing the refrigerant fumes. They are toxic and may cause death or severe injury.

1. Leaks of refrigerant can be detected and located by using an electronic leak detection device with a sniffing tube tip for drawing air samples. If a leak is detected, the device will beep rapidly.
2. Explore the refrigerant system by passing the open end of the sniffing tube tip close to every joint.
3. If a leak is detected at a connection, tighten the fitting carefully. Recheck for leaks. If any leak is still apparent, discharge system and replace damaged components.

Air Conditioner Condenser
– *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Raise the front grille.
4. Clean area around the air conditioner condenser and connecting hardware.
5. Discharge the air conditioner system *(refer to previous procedures).*

WARNING

Serious injury may occur if the escaping refrigerant touches the skin.

6. Remove hoses from the condenser.
7. Unscrew bolts and nuts securing air conditioner condenser. Remove the condenser.
8. Install the condenser by reversing steps.
9. Evacuate and charge the air condition system *(refer to previous procedures).*

Air Conditioner Receiver Dryer – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Raise the front grille.
4. Clean area around the air conditioner receiver dryer and connecting hardware.
5. Discharge air conditioner system prior to removing components for service.

WARNING

Serious injury may occur if the escaping refrigerant touches the skin.

6. Disconnect two hoses from the receiver/dryer.
7. Remove bolts, lock washers, and clamps securing the receiver dryer. Remove the receiver dryer.
8. Install receiver/dryer by reversing the steps.
9. Evacuate and charge the air condition system *(refer to previous procedures).*

Air Conditioner Evaporator – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Raise the left hand side cover.
4. Clean area around the air conditioner evaporator and connecting hardware.
5. Discharge air conditioner system prior to removing components for service.

WARNING

Serious injury may occur if the escaping refrigerant touches the skin.

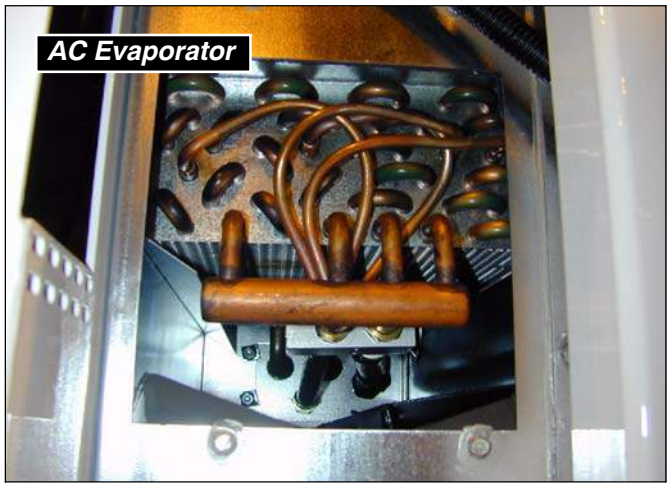


Fig: 5.14 A

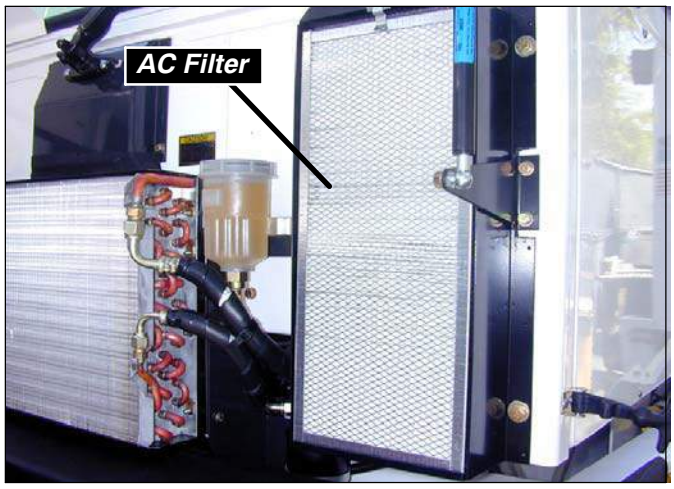


Fig: 5.14 B

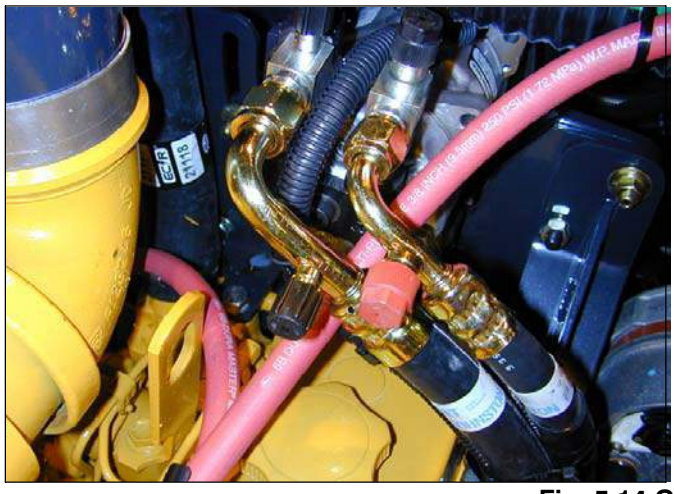


Fig: 5.14 C

6. Disconnect electrical leads and remove hose clamps- from the evaporator.
7. Remove bolts, lock washers, and clamps securing the evaporator. Remove the evaporator.
8. Install evaporator by reversing the steps.
9. Evacuate and charge the air condition system *(refer to previous procedures)*.

Air Conditioner Compressor –*Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Working from the rear of the sweeper, swing out and latch the radiator.
4. Clean the area around the air conditioner compressor and connecting hardware.
5. Have the air conditioning system discharged *(refer to previous procedure)*.

NOTE: *Before removing components for service or before recharging refrigerant, always discharge the air conditioner system.*

6. Disconnect the air conditioner hoses from the compressor.
7. Remove the electrical leads from the compressor.
8. Loosen the lock nut and turn the adjusting bolt to allow the compressor to slide toward the engine relieving V–belt tension.
10. Remove the V–belt from the compressor pulley.
11. Remove compressor bracket bolts & lock washers.
12. Remove the compressor.
13. Install the compressor by reversing the steps.
14. Use the following procedure to adjust the "V–belt" tension.

    a. Tighten the bolts securing the compressor to the engine bracket.

    b. With the lock nut loose, turn the adjusting bolt to move the compressor away from the engine in creasing the belt tension.

NOTE: *The properly–adjusted tension on the V–belts is a 1/2 inch deflection with a 12 pound force applied.*

    c. Tighten the lock nut.

    d. Tighten the bolt and nut securing compressor to the bracket.

    e. Have the air conditioning system evacuated and recharged *(refer to the previous procedures)*.

ELEVATOR GROUP

Elevator Hydraulic Motor - *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Clean the area around the hydraulic motor and connecting hardware.
4. Remove the hydraulic hoses from the elbows on the hydraulic motor *(Fig: 5.16A; 1)*. Drain the fluid into a clean container.

CAUTION

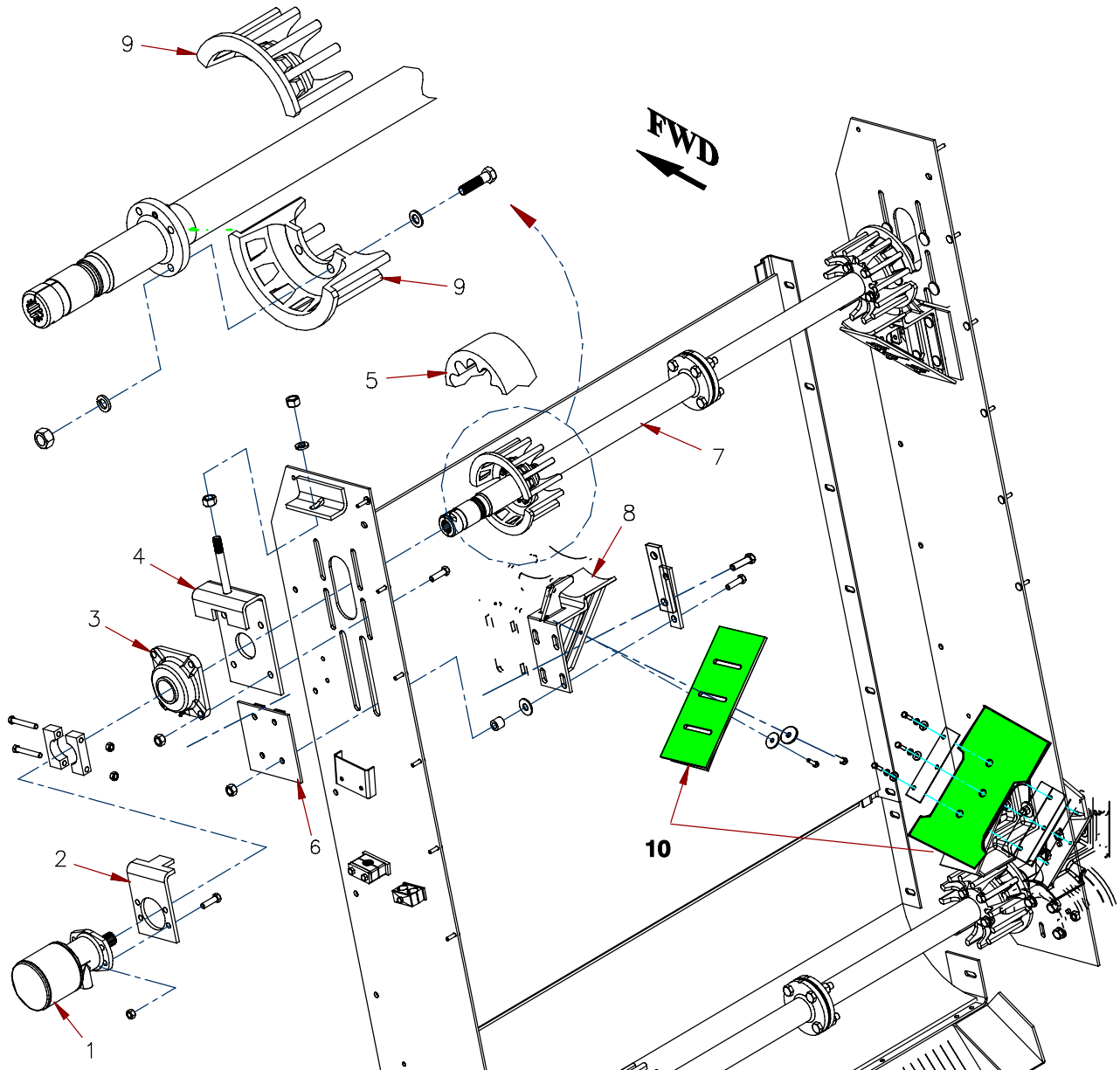
Plug all hoses and open ports to prevent foreign matter from entering the system.

NOTE: *Before removing the hoses, provide a container to catch the excess hydraulic fluid from the elevator motor.*

5. Remove the elbows from the hydraulic motor.
6. Remove the lock nuts and bolts securing the hydraulic motor to the mount plate.
7. Remove the collar to allow the motor shaft to slide out.
8. Remove the hydraulic motor.
9. Install the elevator motor by reversing the steps.

Elevator Self-Align Bearings - *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Raise the hopper and install the safety props.



1. Elevator Motor
2. Hydraulic Motor Angle Mounting
3. Flange Ball Bearing
4. Bearing Bracket Weldment
5. Elevator Belt
6. Elevator Side Plate
7. Elevator Half-Shaft Assembly
8. Sprocket Shield- Machined
9. Hardfaced Split Sprocket
10. Deflector Pad

Fig: 5.16 A *Elevator Assembly. This assembly is located behind the operator cab and extends to the ground in front of the pickup broom. Elevator removal/Installation requires two experienced mechanics and an overhead crane.*

WARNING

INSTALL safety props. DEATH or serious INJURY may result if the hopper cylinders fail.

4. Stop the engine.
5. Clean the area around the self–aligned bearings.
6. Remove the elevator hydraulic motor *(refer to the previous procedure).*
7. Release tension on the elevator rubber belt *(Fig: 5.16A; 5)* by loosening the nuts on the bearing bracket weldment *(4).*

   ***NOTE:** Only Loosen the nuts, because they are attached to the carriage bolts.*
8. Remove the nuts, washers and bolts securing the bearing *(3)* to the elevator side wall.

   ***NOTE:** Make a note where the elevator bearing grease fittings are located since the bearing needs to be remounted in the same position. The top bearings have grease fittings facing down and the bottom bearings have grease fittings facing to the back.*
9. Remove the self–align bearing *(3)*.
10. Install the elevator bearings by reversing the steps.

Elevator
– *Removal/Installation*

1. Position the sweeper on a level surface under an overhead crane or hoist capable of lifting the elevator assembly.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Raise the hopper and install the safety props

WARNING

INSTALL safety props. DEATH or serious INJURY may result if the hopper cylinders fail.

4. Stop the engine.
5. Clean the area around the elevator.
6. Remove the bolts securing the center body panels to the elevator.
7. Remove the center body panels from the elevator.
8. Remove the hydraulic hoses from the elbows on the hydraulic motor. Drain the fluid into a container.
9. Disconnect hose mounts from the elevator housing.

Fig: 5.17 A

WARNING

INSTALL safety props. DEATH or serious INJURY may result if the hopper cylinders fail.

INSTALL safety props when working on, around or under raised hopper.

NEVER position yourself under hopper while installing or removing safety props.

***NOTE:** With hopper raised, install safety prop on hopper cylinder rod. Safety prop rests on top edge of cylinder body. Install safety props on both hopper cylinders.*

CAUTION

Plug all hoses and open ports to prevent foreign matter from entering the system.

10. Remove the nuts and bolts securing the left and right dirt shoe bracket assembly to the lower sides of the elevator.
11. Remove the center deflector chain.
12. Attach the hoist securely to the elevator and place a slight tension on the hoist chain.

    ***NOTE:** The elevator assembly is only attached at two pivot points and rests on two rubber stops.*
13. Remove the bolts, lock washers and pivot block caps securing the elevator assembly to the elevator pivot weldments *(behind the operator's cab).*

    ***NOTE:** Check for removal of the elevator components that attach the assembly to the frame.*

14. Use the hoist to slowly raise the elevator from the sweeper. When the elevator clears the frame, move the assembly to a clean work area.
15. If required, remove the right and left elevator pivot weldments.
16. Remove the bolts, lock nuts and washers securing the pivot weldments to the cross frame.
17. Remove the bolts and nuts securing the pivot weldments to the main frame.
18. Remove the pivot weldments.

NOTE: *Replace all worn or defective parts on the elevator assembly. Refer to replacement procedures of squeegee bar, sprockets and belts in Chapter 3.*

19. Install the elevator by reversing the steps.

NOTE: *Coat each end of the upper and lower elevator shafts with anti–seize compounds before installing the self–aligned bearings.*

20. Adjust the elevator assembly *(refer to the adjustment procedure in chapter 3)*.

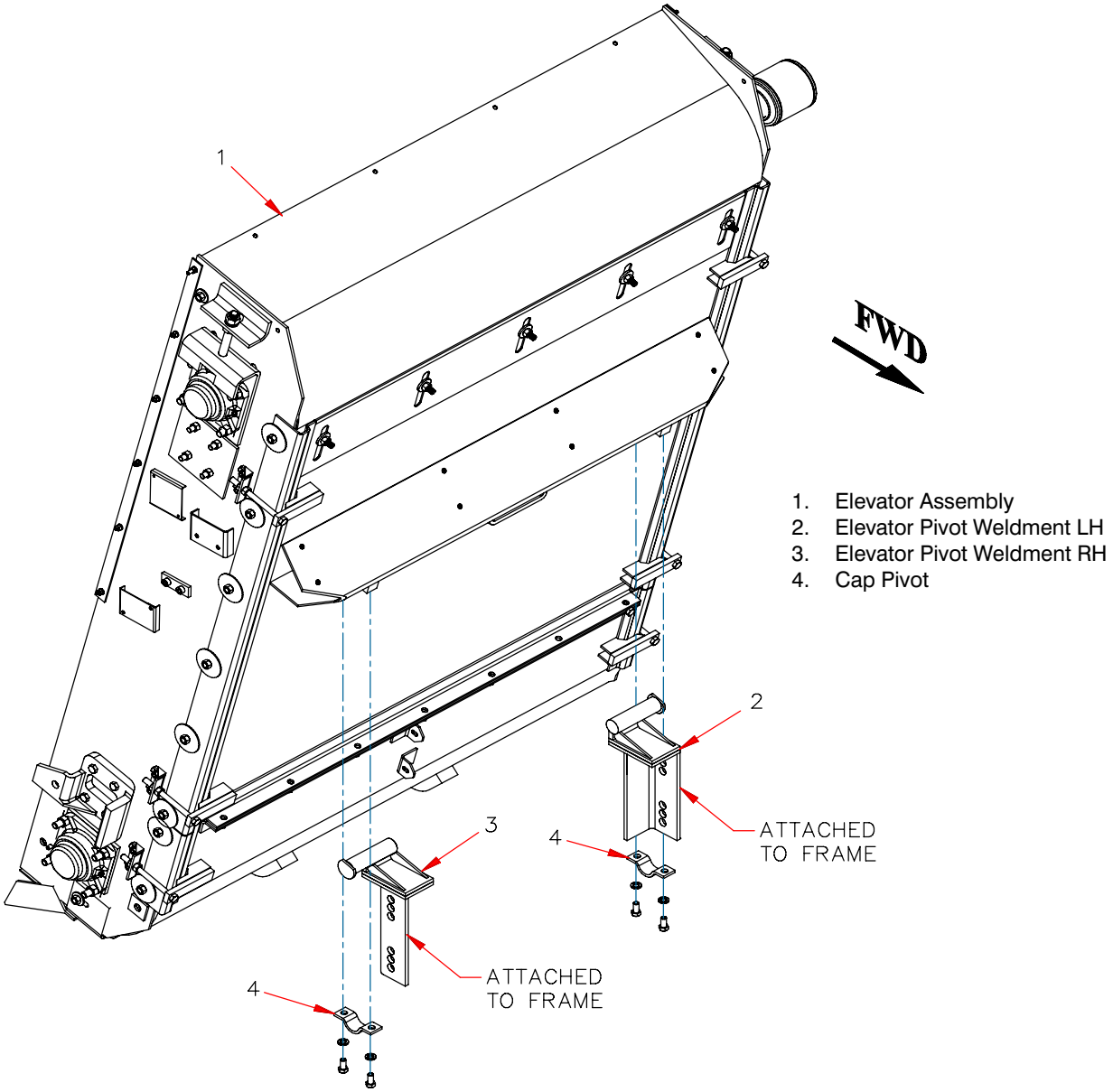


Fig: 5.18 A *Removal and installation of the Elevator Assembly requires an overhead crane and a sling to hoist.*

CHAPTER 5

Elevator–Sprocket Pulley – *Removal/Installation*

The elevator sprocket pulleys are split–type with each half secured to a mounting hub. Frequently check for sprocket pulley wear. Continued operation with a worn sprocket pulley shortens the life of the elevator belt.

1. On each side of the elevator assembly, loosen the eight bolts securing the upper elevator bearings and brackets to the side plates *(Fig: 5.16A; 3 & 4)*.
2. Loosen the jam nuts to bearing bracket weldment *(4)*. Lower the bearing bracket by loosening the adjustment nuts on the screw in the bearing bracket until the belt tension is relieved.
3. Rotate the elevator belt until the sprocket pulley and mounting bolts are accessible. Position the sprocket pulley split line horizontal with the ground. The belt teeth will be linked in only the top half sprocket pulley.
4. Remove the bolts and washers securing the bottom half sprocket pulley. Remove the half sprocket pulley.

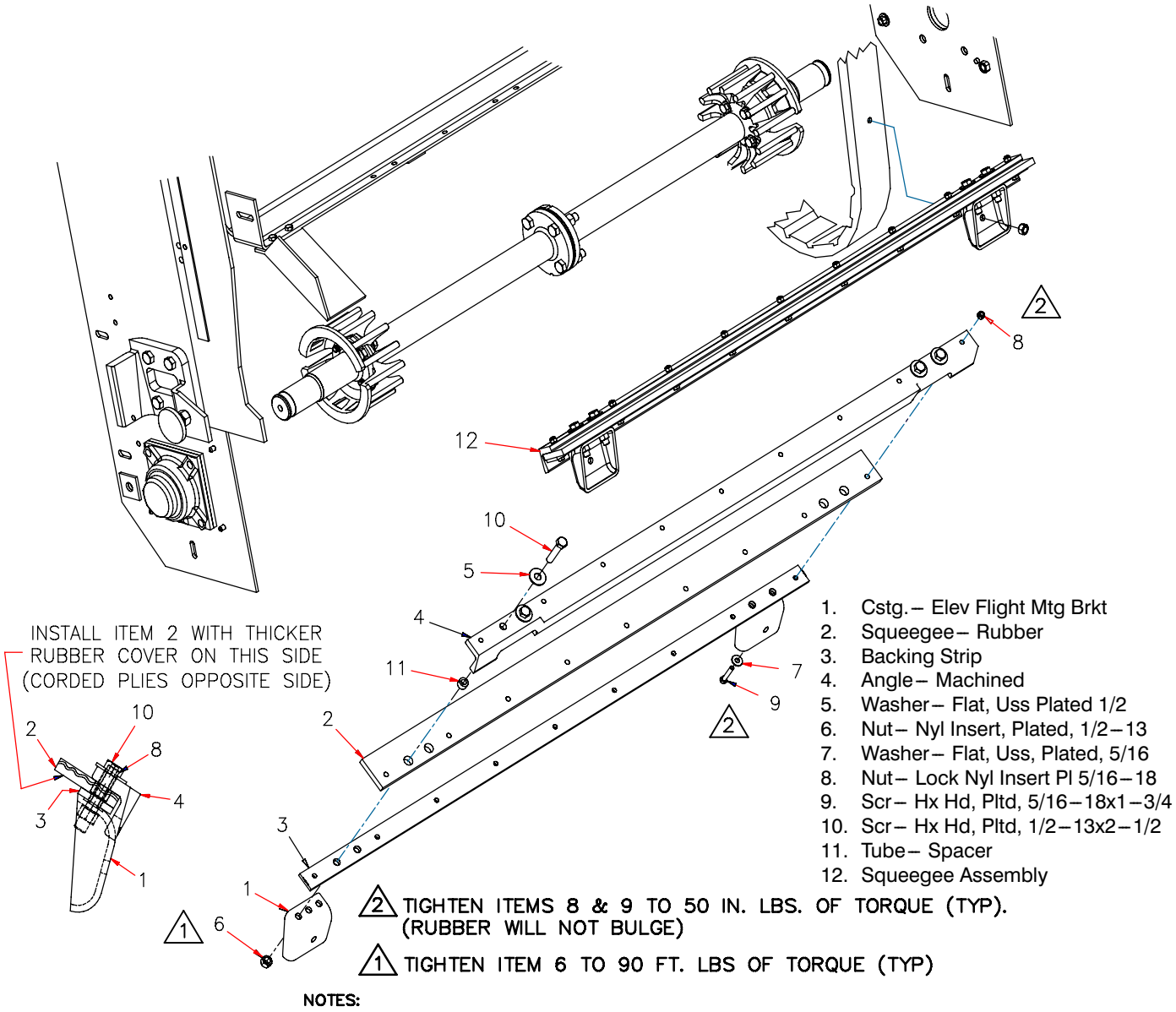


Fig: 5.19 A *Each Elevator Squeegee Bar Assembly is attached to the left and right elevator belts. It is not necessary to remove the elevator belt assembly from the elevator to replace squeegees.*

5. Thoroughly clean the tapped screw holes in the hub. Remove any accumulation of dirt and debris. The threads may need to be re–tapped.

   NOTE: *Make sure the new sprocket pulley half has the same number of teeth as the one being removed. A sprocket pulley with the different number of teeth will not work. Always use new cap screws when replacing the sprocket pulleys.*

6. Assemble the new half sprocket pulley on the hub and secure with new bolts. Torque the bolts to 105–110 foot–pounds *(142–149 Nm)*.
7. Rotate the elevator belt until the opposite half sprocket pulley and mounting bolts are accessible. Position the sprocket pulley split line perpendicular to the elevator shaft. The belt teeth will be linked in only the new top half sprocket pulley.
8. Replace the second half sprocket pulley repeating steps 4, 5 and 6.
9. Repeat replacement procedure steps 3 thru 8 for all worn sprocket pulleys.
10. After the worn sprocket pulleys have been replaced, adjust the elevator belt tension *(refer to the Elevator – Belt Tension Adjustment procedure in Chapter 3)*.

Elevator–Squeegee Bar – *Removal/Installation*

The squeegee bars are rubber strips mounted onto the brackets. Parallel to the elevator shafts, each bar assembly end connects to the elevator belts. When the squeegee bars require replacement, always replace nuts, screws and locking tabs.

1. Remove the nuts and washers attaching squeegee bar assembly to belts *(Fig: 5.19A; 12)*.
2. Inspect the angles and hardware that attach squeegee bar assembly to elevator belt. Replace all worn or damaged parts.
3. Remove the bolts, washers, nuts, the backing strip and the squeegee bar.
4. Replace squeegee bar *(2)* by installing rubber edge toward outside *(edge that scrapes on elevator back plate)*. **Inside edge has a cord exposed.**
5. Assemble in the reverse order of disassembly. Torque the bolts and nuts *(6)* to 90 foot–pounds. Torque bracket bolts and nuts *(8 & 9)* to 50 foot–pounds.
6. Adjust the elevator to squeegee bar clearance and elevator upper arch clearance *(refer to the Elevator–Squeegee Bar Clearance Adjustment and Elevator–Upper Arch Adjustment–Chapter 3)*.

PICKUP BROOM GROUP

Pickup Broom Hydraulic Motor – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Stop the engine.
4. Clean the area around the hydraulic motor and connecting hardware.
5. Remove the hydraulic hoses from the elbows on the hydraulic motor. Drain the fluid in a container.

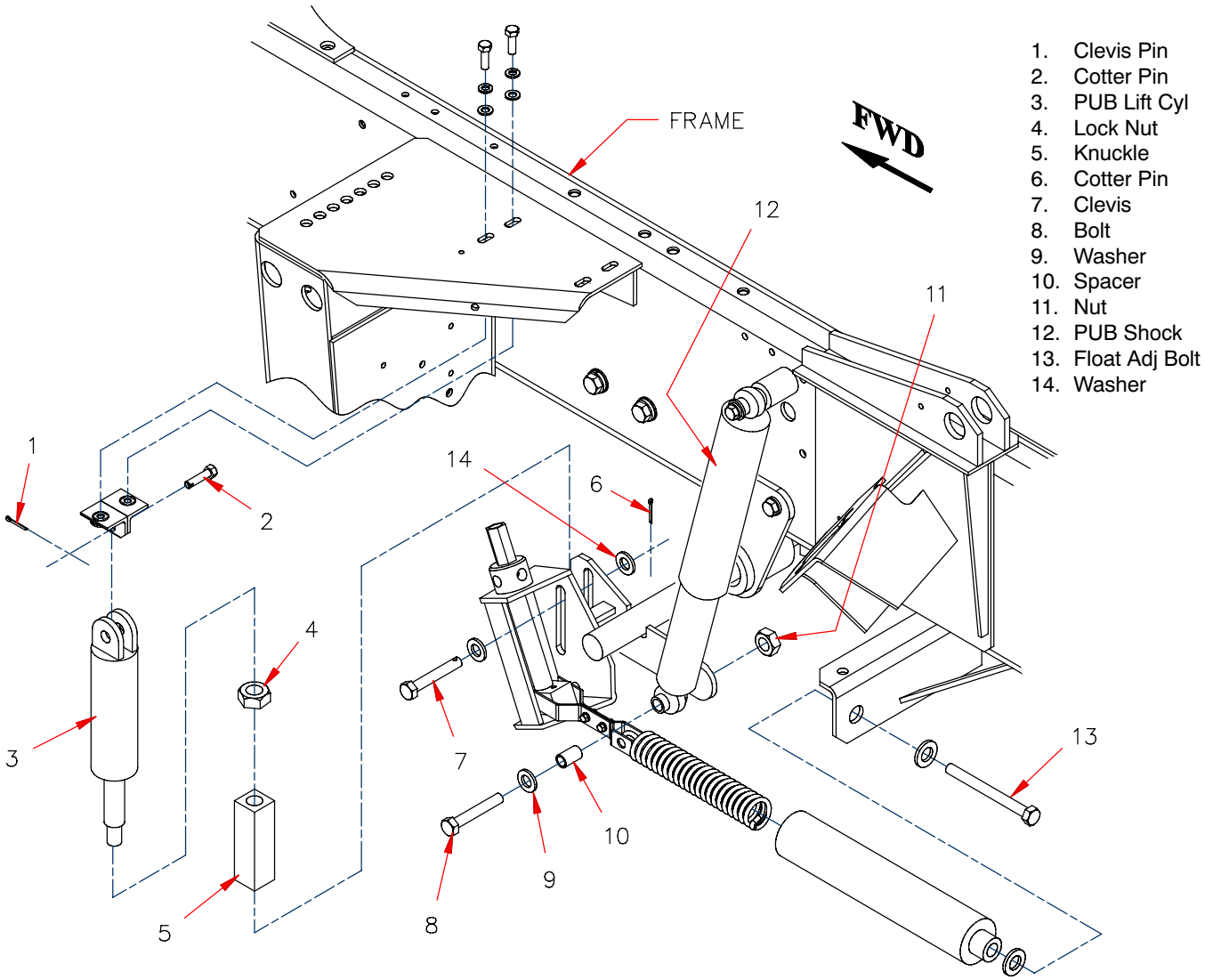
   NOTE: *Before removing the hoses, provide a container to catch the excess hydraulic fluid from the pickup broom motor.*

6. Remove the elbows from the hydraulic motor.
7. Unscrew the float adjusting bolt *(Fig: 5.21A; 13)* from the spring about 3 to 3 1/2 inches.
8. Remove the Pickup Broom *(refer to Pickup Broom Removal/Installation procedure on the following pages)*.
9. Remove the nut and washer securing the broom hub and the end plate of the pickup broom.
10. Remove the four bolts, nuts and lock washers securing the hydraulic motor to the left arm and bushing assembly.
11. Remove the hydraulic motor.
12. Install the pickup broom motor by reversing the steps.

    NOTE: *Be careful to align the holes in the end plate and pickup broom wheel hub prior to tightening the bolts. The broom core must align with the three holes in the end plate assembly. Torque the motor shaft hex nut from 300 to 310 foot–pounds.*

Pickup Broom Hydraulic Cylinder – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Stop the engine.
4. Clean the area around the hydraulic cylinder and connecting hardware.



1. Clevis Pin
2. Cotter Pin
3. PUB Lift Cyl
4. Lock Nut
5. Knuckle
6. Cotter Pin
7. Clevis
8. Bolt
9. Washer
10. Spacer
11. Nut
12. PUB Shock
13. Float Adj Bolt
14. Washer

Fig: 5.21 A *The pickup broom hydraulic cylinder and shock absorber are located on the left side of the sweeper. When working on or around the broom, be aware that spring tension exists.*

5. Remove the hydraulic hoses from the elbows on the hydraulic cylinder *(Fig: 5.21A; 3)*. Drain the fluid in a container.

   NOTE: *Before removing the hoses, provide a container to catch the excess hydraulic fluid from the hydraulic lift cylinder.*

   CAUTION

   Plug all hoses and open ports to prevent foreign matter from entering hydraulic system.

6. Remove the elbows from the hydraulic cylinder.
7. Remove the cotter pin and clevis pin *(1 & 2)* securing the top of the hydraulic cylinder to the frame bracket.

   WARNING

   To avoid personal injury, the float adjusting bolt must be turned out of the spring cover to release the tension on the broom.

8. Unscrew the adjusting rod from the floating spring connecting linkage to gain access to the cylinder clevis pin.
9. Remove the cotter pin, washers and clevis pin *(6, 7 & 14)* securing the bottom of the cylinder to the connecting linkage.

10. Remove the hydraulic cylinder *(3)* with the knuckle attached.
11. Loosen the lock nut holding the knuckle to the threaded shaft of the cylinder.
12. Remove the knuckle and lock nut *(4 & 5)* from the cylinder.
13. Install the pickup broom cylinder by reversing the steps.
14. Adjust the distance between the mounting holes of the hydraulic cylinder and the knuckle on the cylinder shaft to 11 inches.
15. Adjust the pickup broom floating position to the midpoint of travel measuring the knuckle in relation to the slots of the shaft and linkage assembly.

Pickup Broom Shock Absorber – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Lower the pickup broom to relieve tension on the shock absorber.
4. Stop the engine.
5. Clean the area around the shock absorber and connecting hardware.
6. Remove the lock nuts *(Fig: 5.21A; 11)* on each end of the shock absorber. Remove the bolts *(8)*, flat washers *(9)*, and spacers *(10)*.
7. Remove the shock absorber *(12)*.
8. Install the pickup broom shock absorber by reversing the steps.

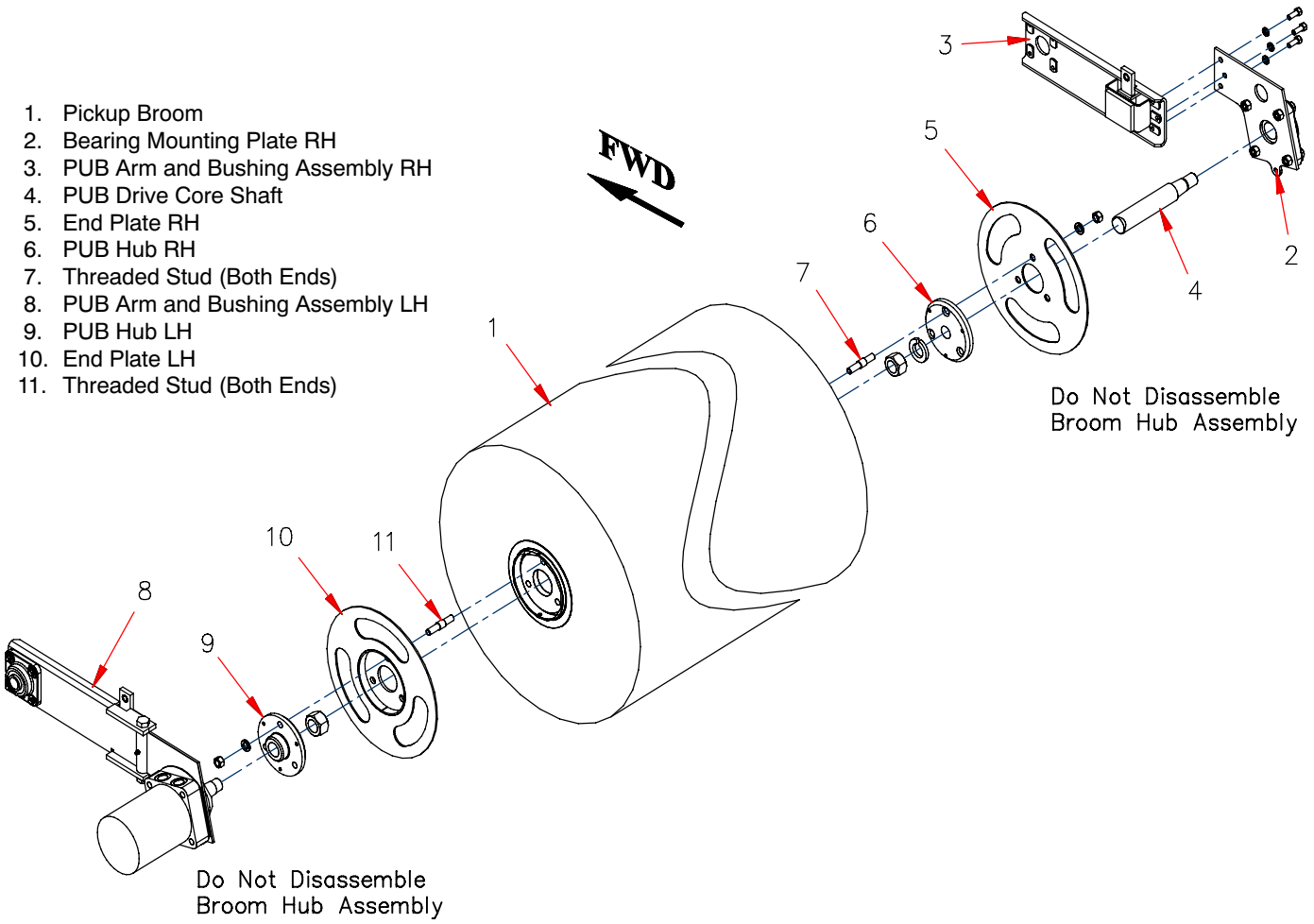


Fig: 5.22 A *Pickup Broom Assembly. The Pickup Broom is removed from the right side of the sweeper.*

Pickup Broom – *Replacement*

Park the sweeper on a clean, level surface and proceed as follows:

WARNING

To avoid personal injury, the float adjusting bolt must be turned out of the spring cover to release the tension on the broom.

1. Unscrew the float adjusting bolt *(Fig: 5.21A; 13)* about 3 to 3–1/2 inches from the spring.
2. Remove the three hex nuts and lock washers securing the broom hubs to the core of the broom *(Fig: 5.22A; 5,6,9 & 10).* **Do not** disassemble the broom hub and pivot bearing assemblies.
3. Remove the cotter pin securing the clevis pin. Remove the clevis pin from the adjustable connecting link and pickup broom arm.
4. Remove the two hex head screws and lock washers securing the side plate and one hex head screw and lock washer securing the support bracket on the pickup broom arm.
5. Remove the assembled side plate, pickup broom arm, support bracket and dirt shoe.
6. Remove the three hex nuts and lock washers securing the left end plate and wheel hub to the pickup broom. **DO NOT** disassemble the Pickup Broom motor assembly.
7. Pull out the pickup broom *(1)* from the right side of sweeper.
8. Slide in the new pickup broom from the right side of the sweeper. Position the broom so the core aligns with the assembled end plate and wheel hub. Attach the left end plate, wheel hub and core using the three hex nuts and lock washers. Tighten the hex nuts securely.
9. Replace the assembled side plate, pickup broom arm, support bracket and dirt shoe. The bearing, end plate and wheel hub must align with the three holes in the core of the pickup broom.
10. Attach the side plate with two hex head screws and lock washers. Attach the support bracket using a single screw and lock washer.
11. Attach the end plate and wheel hub to the core of the broom using three hex nuts and lock washers.
12. Connect the adjustable connecting rod to the pickup broom arm with the clevis pin. Secure the clevis pin with the cotter pin.
13. Test the broom pattern *(refer to Pattern Adjustment, Chapter 3)* and coning adjustment *(refer to Leveling Adjustment, Chapter 3).*

GUTTER BROOM GROUP

The right and left gutter brooms are similar in construction. Mounting each broom on its respective side of the sweeper requires minor changes. The following procedure cov ers only the right gutter broom.

Gutter Broom Hydraulic Motor – *Removal/Installation*

1, Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Stop the engine.
4. Clean the area around the hydraulic motor and connecting hardware.
5. Remove the hex nut *(Fig: 5.24A: 1)* securing the gutter broom plate assembly and dish assembly to the hydraulic motor. Lower the assembly to the floor.
6. Disconnect the hydraulic hoses from the elbows. Remove the elbows and connectors from the hydraulic motor.

NOTE: *Before removing the hoses, provide a container to catch the excess hydraulic fluid from the gutter broom motor.*

CAUTION

Plug all hoses and open ports to prevent foreign matter from entering hydraulic system.

WARNING

The GB Motor will separate from the collar once free. Take care so that the GB motor does not fall on you.

7. Place protective plugs in the ports of the hydraulic motor and on the hoses to prevent dirt from entering the system.

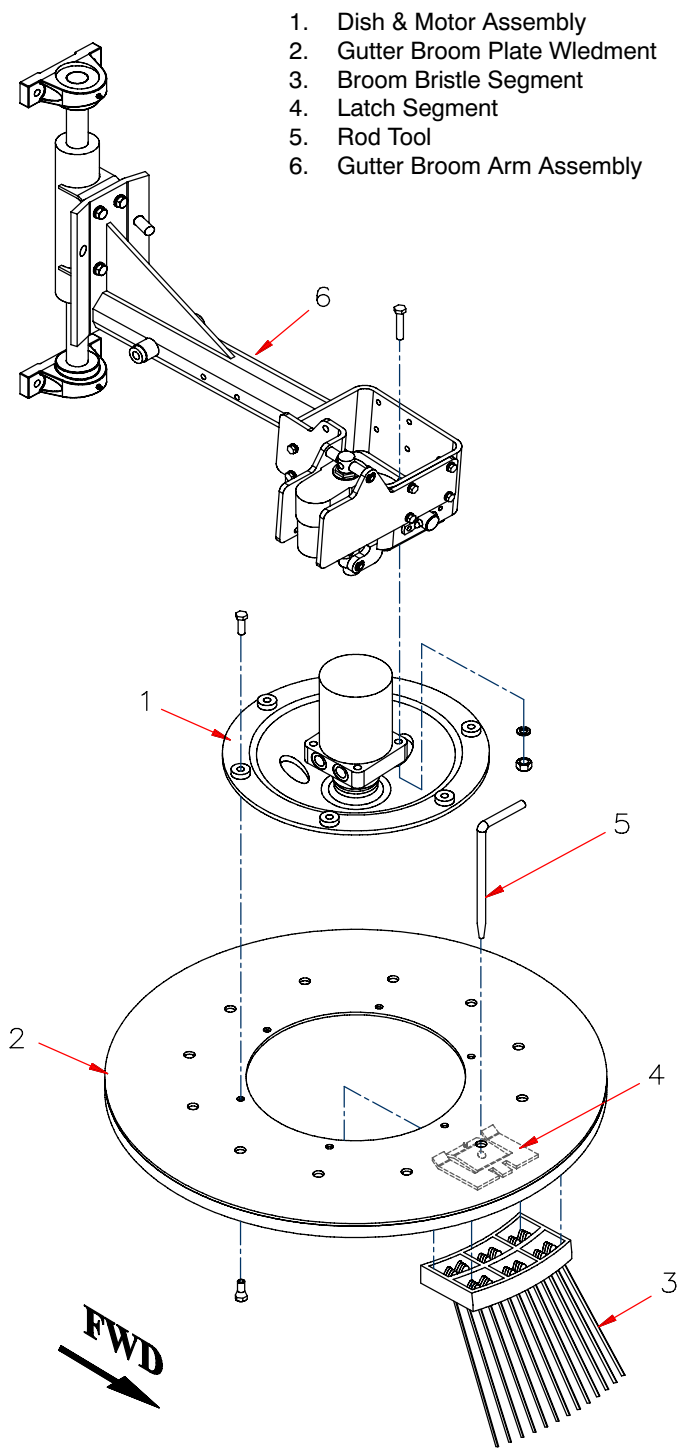


Fig: 5.24 A *Gutter Broom Plate/Brush Removal and Installation are basically the same on both sides.*

8. Remove the four hex nuts, lock washers, flat washers, and bolts securing the hydraulic motor to the gutter broom arm.
9. Remove the hydraulic motor and separate the dish assembly. Inspect the dish assembly for rust or damage. Replace the parts.
10. Install the gutter broom motor by reversing the steps.
11. Before installing the plate assembly and dish assembly, make sure the woodruff key is positioned in the gutter broom motor shaft. Install the motor shaft hex nut and torque from 300 to 310 foot–pounds.

Gutter Broom Plate & Brush Assembly – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Raise the gutter broom.
4. Stop the engine.
5. Clean the area around the gutter broom and connecting hardware.
6. Using the rod tool *(Fig: 5.24 A; 5)*, unlock the bristle segment *(3)* from the gutter broom plate.
7. Steam clean the gutter broom segment plate, removing all dirt and debris.
8. Remove the hex nut securing the gutter broom plate assembly, plate and mounting dish to the hydraulic motor. Lower the assembly to the floor making sure the shaft key stays in place.
9. Remove the six bolts securing the mounting dish to the plate.
10. Remove the mounting dish.

NOTE: *Inspect the mounting dish threads for damage. Replace the mounting dish if damaged. Inspect the threads on the bolts for damage, and re place as necessary.*

12. Install the gutter broom plate assembly by reversing the steps.

NOTE: *Be careful to position the woodruf key in the gutter broom motor shaft before installing the plate assembly and mounting dish. Torque the mo tor shaft hex nut from 300 to 310 foot–pounds.*

13. Re–adjust the gutter broom pressure.

CHAPTER 5

Gutter Broom Hydraulic Lift Cylinder – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Lower the gutter broom.
4. Stop the engine.
5. Remove the two bolts and lock washers securing the cover over the hydraulic lift cylinder. Remove the cover.
6. Clean the area around the hydraulic cylinder *(Fig: 5.25A: 1)* and the connecting hardware.
7. Disconnect the hydraulic hose assembly *(3)* from the elbow fitting *(4)*.

NOTE: *Before disconnecting the hydraulic hose, provide a container to catch the excess hydraulic fluid from the gutter broom hydraulic cylinder.*

1. Hydraulic cylinder
2. Cylinder Cover
3. Cylinder Hose Assembly
4. Elbow- MB-MJ90-6
5. Brather Filter
6. Elbow- MB-MP90-6-4
7. Clevis Assembly
8. Cylinder Support Weldment
9. Cotter Pin- Plated

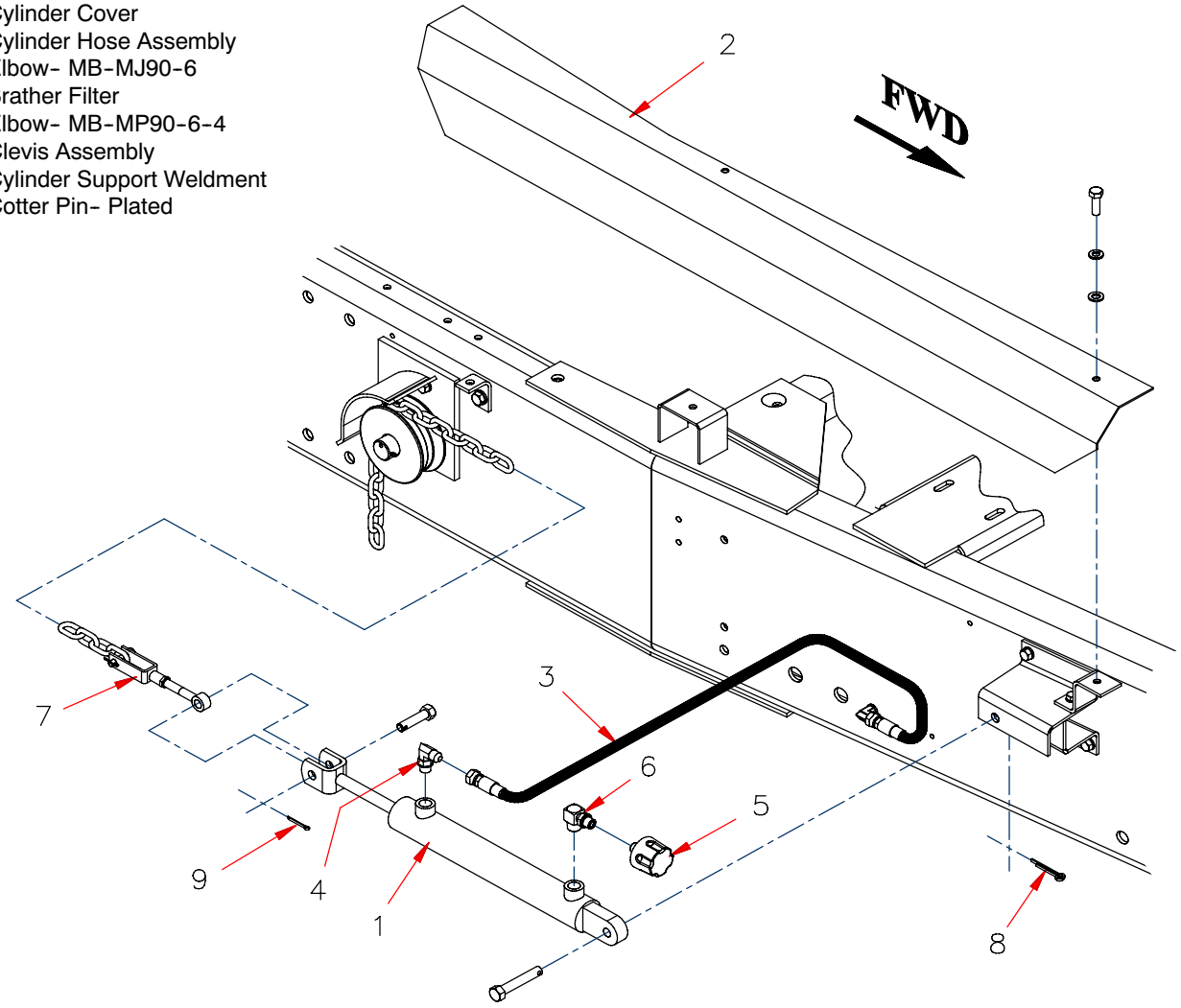


Fig: 5.25 A *The Gutter Broom Lift Cylinder is located outside of the frame rail. A cable chain is connected to the cylinder and runs through a pulley down to the gutter broom arm.*

CAUTION

Plug all hoses and open ports to prevent foreign matter from entering hydraulic system.

8. Remove the elbow fitting from the hydraulic cylinder.

9. Place protective plugs in the port of the hydraulic cylinder and on the hose to prevent dirt from entering the system.

10. Place a hydraulic jack under the gutter broom and raise just enough to release pressure off the cable.

11. Remove the cotter pin and clevis pin from the shaft end of the cylinder, freeing the cable and the shaft end of the lift cylinder.

12. Remove the cotter pin *(9)* and clevis pin from the body end of the cylinder securing it to the sweeper frame. Retain the two flat washers for re–installation.

13. Remove the hydraulic cylinder.

14. Remove the breather and elbow from the hydraulic cylinder.

15. Install the gutter broom lift cylinder by reversing these steps

Gutter Broom Arm Assembly – *Removal/Installation*

1. Position the sweeper on a level surface.

2. Place the shifter in the *Park (P)* position, setting the parking brake.

3. Stop the engine.

4. Clean the area around the gutter broom and connecting hardware.

5. Remove the gutter broom motor and plate assembly *(refer to previous procedures).*

6. Disconnect the shock absorber from the arm assembly by removing the nut, flat washer, bushing, and bolt from clevis weldment *(Fig: 5.28A; 5)*.

7. Remove the nut, flat washer and lower bearing from the clevis.

8. Remove the clevis and upper hardware.

9. Disconnect and remove tension spring *(3)*.

NOTE: *When performing installation procedure close the spring loops after connecting the spring to the chain and frame.*

10. Remove the lock nuts, cap screws and washers attaching the shock absorber bracket and chain to the gutter broom arm.

NOTE: *Inspect the spring, chain and cable for damage. Replace as necessary.*

11. Place a hydraulic jack under the gutter broom and raise just enough to release the pressure off the lift chain.

12. Remove the nut, washer and bolt securing the lift chain bracket to the gutter broom arm.

NOTE: *Record the number of top spacers between the pillow blocks and the bracket weldment. A correct installation requires the same spacing.*

NOTE: *In disassembly, remove only the top pillow block bearing (so that the arm assembly is still supported).*

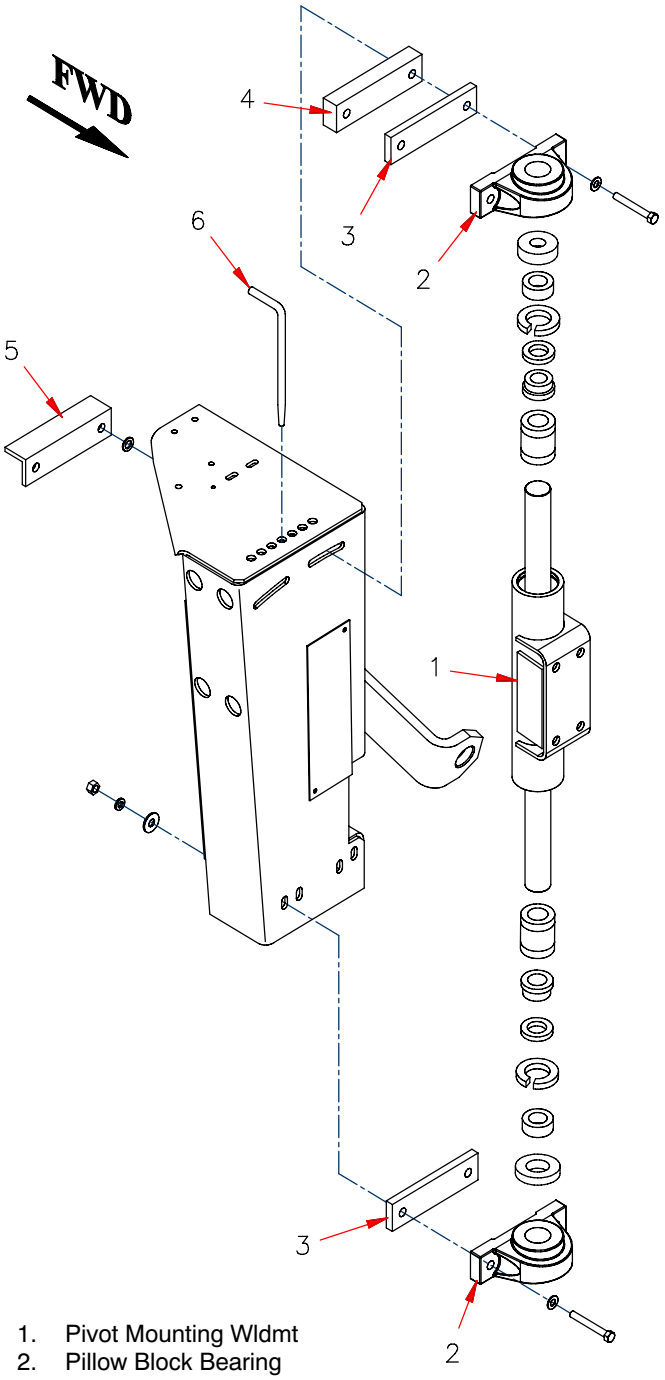
13. Remove the screws, washers and nuts securing the gutter broom arm to the lift shaft pivot assembly.

14. Remove the gutter broom arm assembly *(1)* from the the lift shaft pivot assembly.

NOTE: *Before installation of the arm assembly, check the fit of the shaft in the pillow block bearings. Inspect the shaft for scoring, rust, or other damage. Replace as necessary.*

WARNING

The GB Arm will separate from the GB bracket weldment once free. Take extra precautions so that the GB arm does not fall on your feet.



1. Pivot Mounting Wldmt
2. Pillow Block Bearing
3. Gutter Broom Arm Spacer
4. Spacer
5. Angle Wldmt
6. Chain Assembly

Fig: 5.27 A *Removal of the Gutter Broom Arm requires the use of a jack to hold up the assembly while the hydraulic cylinder tension is being released.*

NOTE: *During each overhaul, always replace the bumpers, housing wipers and wiper rings. Install the bumpers against the bearing collars.*

15. Install gutter broom arm assembly by reversing steps.
16. Grease pillow block bearing fittings after installation.

CAUTION

Plug all hoses and open ports to prevent foreign matter from entering hydraulic system.

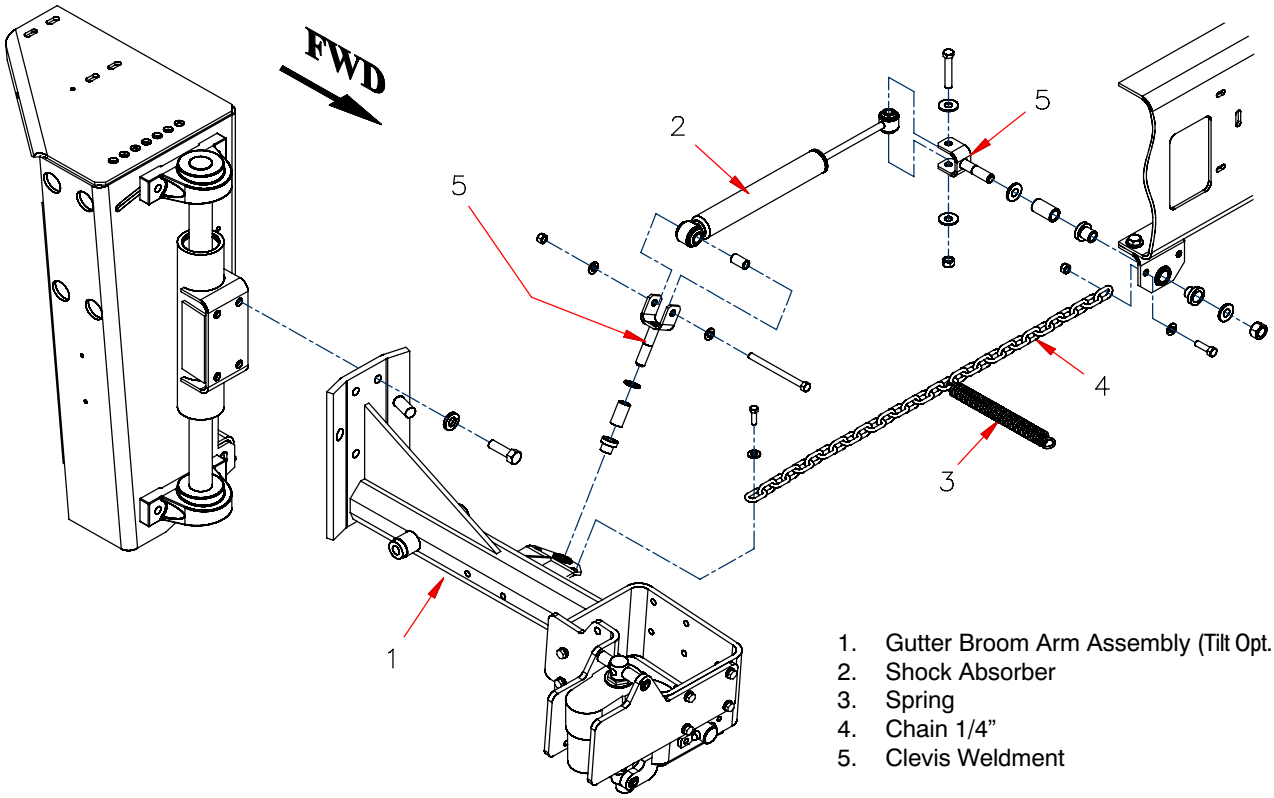
Gutter Broom Shock Absorber – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Lower the gutter broom.
4. Stop the engine.
5. Clean the area around the shock absorber and connecting hardware.
6. Remove the nut, flat washers, bushing, and bolt from both ends of the shock absorber, securing the absorber to the gutter broom arm and frame.
7. Remove the shock absorber .

NOTE: *If either clevis requires replacement, go to step 8. Otherwise go to step 10.*

8. Remove the nut, washer and lower bearing from the clevis.
9. Remove the clevis and separate the washer, sleeve, and upper bearing from the clevis shaft.
10. Before replacing the shock absorber, collapse the new shock and rotate it to the "R" setting until it clicks.
11. Partially extend the shock and rotate the ends until the eyes align with each clevis.
12. Proceed with shock absorber installation by reversing the above steps.

NOTE: Tighten the lock nuts securing the shock to each clevis just enough to allow free rotation.



1. Gutter Broom Arm Assembly (Tilt Opt. Shown)
2. Shock Absorber
3. Spring
4. Chain 1/4”
5. Clevis Weldment

Fig: 5.28 A *The gutter broom arm shock absorber mounts to the gutter broom arm and to the frame. A jack may be required when working on the gutter broom arm assembly to relieve the hydraulic cylinder tension.*

ENGINE GROUP

The engine group section in this chapter provides instructions on the removal and installation of the engine external components. Refer to the John Deere Engine Troubleshooting and Repair Manual to repair and overhaul the engine.

Fuel Filters/Water Separator – *Removal/Installation*

The purpose of the fuel filters are to keep fuel clean, to filter any dirt particles that can cause wear on the fuel system, and to separate any water from the fuel. The primary fuel filter is mounted on the right side of to the engine towards the front of the sweeper. The pre–filter is mounted on the wall inside RH hydraulic tower next to the engine.

CAUTION

The filter element should always be replaced with new one. Never try to clean the filter element.

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Raise the hopper and install the safety props.
4. Stop the engine.
5. Clean area at the right front of engine and fuel filter.

   NOTE: *Before removing the fuel filter element, provide a container to catch the excess fuel.*

6. Unscrew the fuel filter element from the filter head, located on the right hydraulic tower.
7. Remove fuel filter element and the gasket.

   NOTE: *Always replace the gasket when replacing a fuel filter element.*

   NOTE: *The engine fuel system may require priming the first time the engine is started after working on the fuel system.*

8. Replace fuel filter element and the gasket by reversing the steps.

1. Air Cleaner
2. Pre-Cleaner
3. Clamp
4. Restriction Air Gauge Hose
5. Elbow Tube
6. Elbow, 90 Deg.

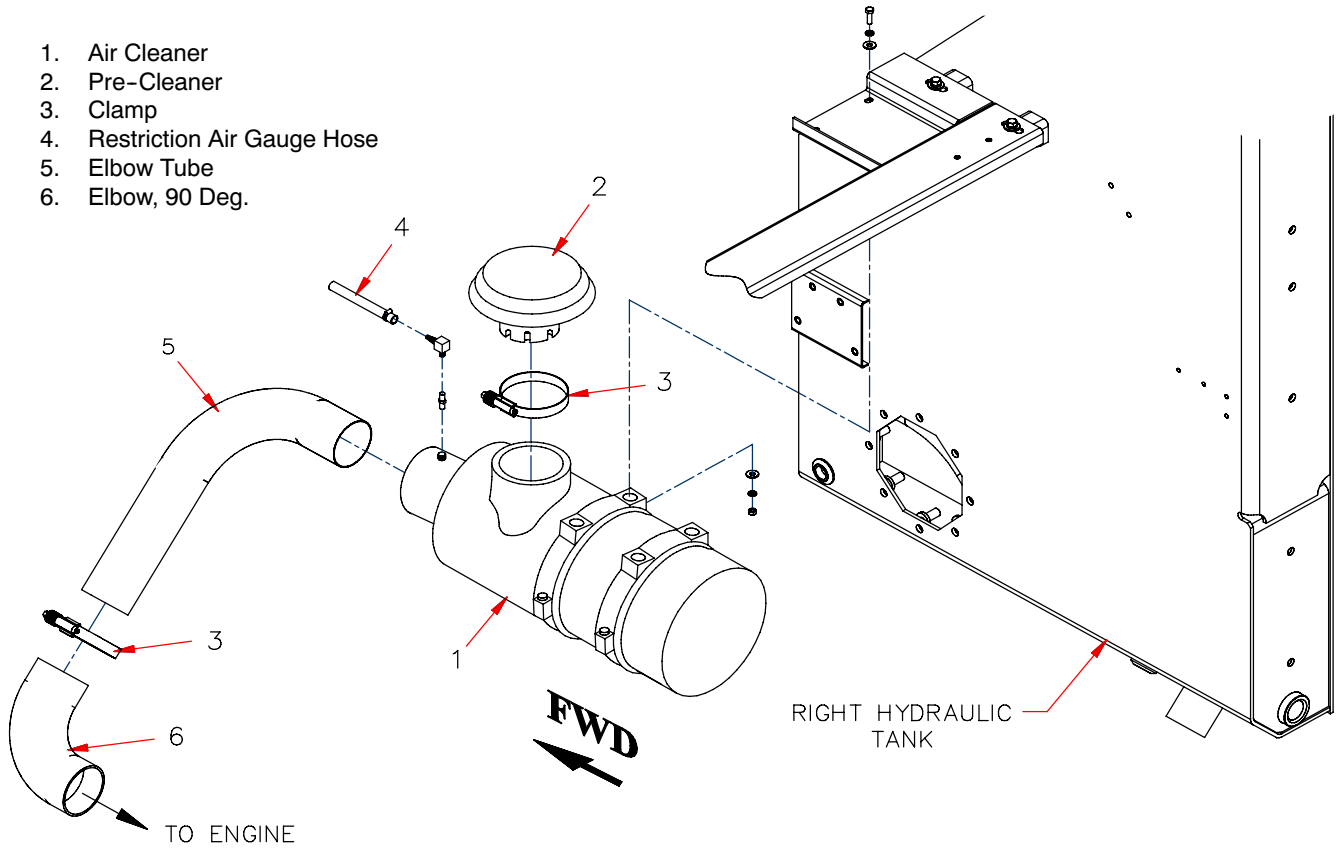


Fig: 5.29 A *The Air Cleaner Assembly is located above the engine.*

Air Cleaner – *Removal/Installation*

WARNING

Hot exhaust systems present burn and fire hazards. Do not work on or near the engine or muffler until all components are cool.

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Raise the hopper and install the safety props.

WARNING

INSTALL safety props. DEATH or serious INJURY may result if the hopper cylinders fail.

4. Stop the engine.
5. Unlatch and swing open the radiator.
6. Clean the area around the air cleaner.
7. Remove the wing nut securing the front cap of the air cleaner housing.
8. Remove the front cap and the air cleaner element from the housing.

   NOTE: *Replace the primary and safety filter elements if required. The following steps refer to replacement of the housing.*

9. Disconnect the restriction air gauge hose from the housing.
10. Loosen the hose clamp and disconnect the air intake elbow from the housing.

    NOTE: *Support the air cleaner housing before removing it from the mounting plate.*

11. From the top of the air cleaner housing, loosen the hose clamp and remove the pre–cleaner.
12. Remove the bolts and washers that secure the air cleaner housing clamps to the cross channel.
13. Remove the air cleaner housing assembly.
14. Install the air cleaner assembly by reversing the steps.

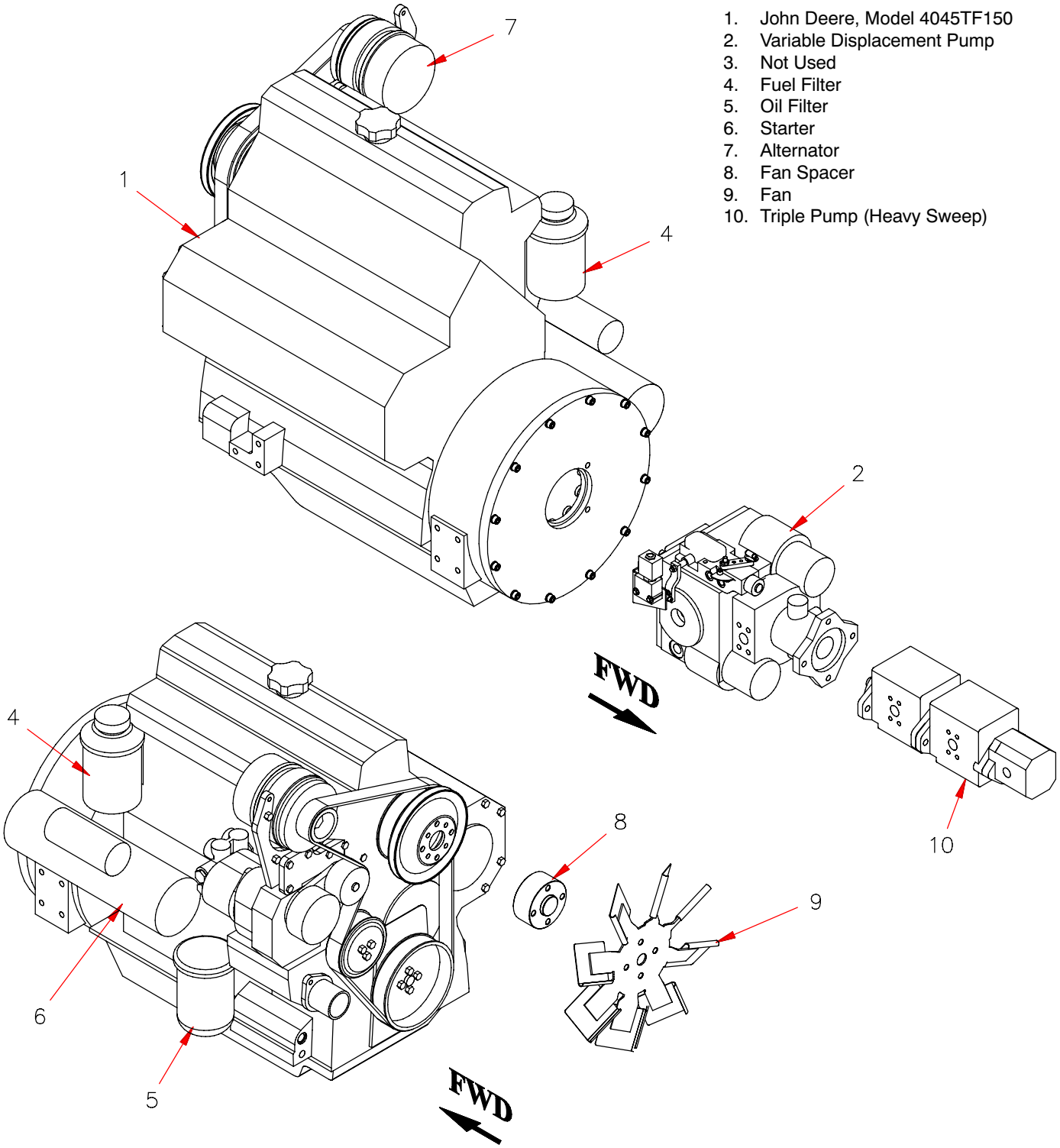


Fig: 5.30 A *The engine is situated in the sweeper frame backwards — that is the flywheel is toward the front of the sweeper and the radiator cooling fan is toward the rear of the sweeper.*

CHAPTER 5

Muffler
– *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.

WARNING

INSTALL safety props. DEATH or serious INJURY may result if the hopper cylinders fail.

3. Raise the hopper and install the safety props.
4. Stop the engine.
5. Clean the area around the muffler.
6. Remove the nuts securing the heat shield to the muffler.

WARNING

Do not work on the muffler assembly until the components completely cool down.

7. Remove the heat shield.
8. Loosen the clamp *(Fig:5.31 A; 9)* which connects the tail pipe to the to the muffler.
9. Disconnect the tail pipe from the muffler.
10. Loosen the lap joint clamp *(14)* which connects the exhaust tube to the muffler.
11. Disconnect the exhaust tube from the muffler.
12. Remove the nuts, washers and bolts clamping the muffler to the mufler mounting bracket.
13. Remove the muffler.
14. Install the muffler assembly by reversing the steps.

1. Muffler
2. Tail Pipe
3. Rain Cap
4. Heat Shield
5. Tail Pipe Bracket
6. Exhaust U-Clamp
7. Flex Hose, Metal
8. Bent Tube
9. Clamp, Accuseal 4.0” Dia.
10. Muffler Mounting Bracket
11. Tube, 4.0” Dia.
12. Flex Hose, Metal
13. Elbow, 90 Deg.
14. Lap Joint Exhaust Clamp
15. Engine, John Deere

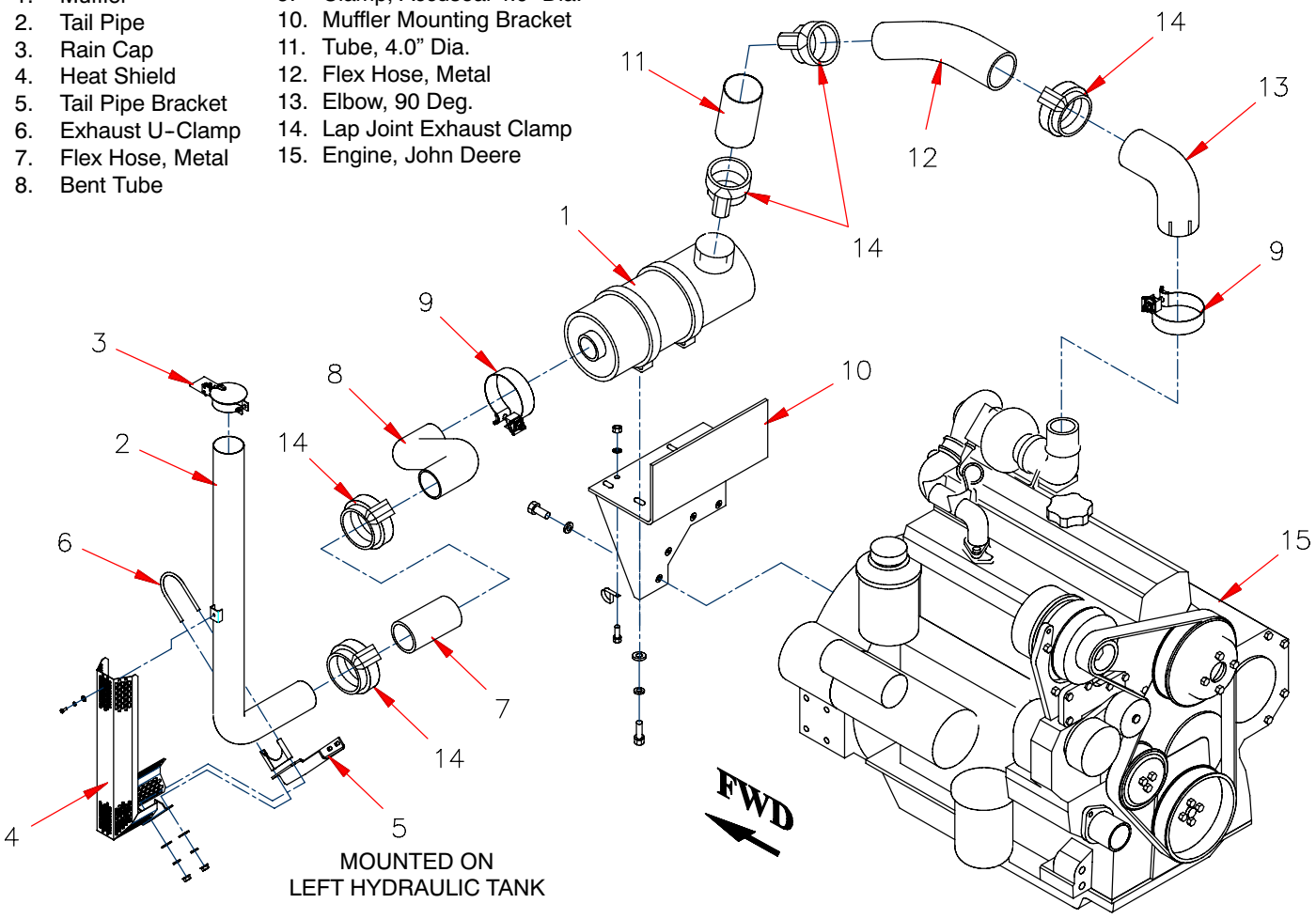


Fig: 5.31 A *The Muffler Assembly.*

Radiator Cooling Fan – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Stop the engine.
4. Working from the rear of the sweeper, swing out the radiator.
5. Remove the bolts securing the fan to the pulley assembly.
6. Remove the fan and spacer.
7. Install the fan and spacer by reversing the steps.

Deaeration Tank – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Stop the engine.

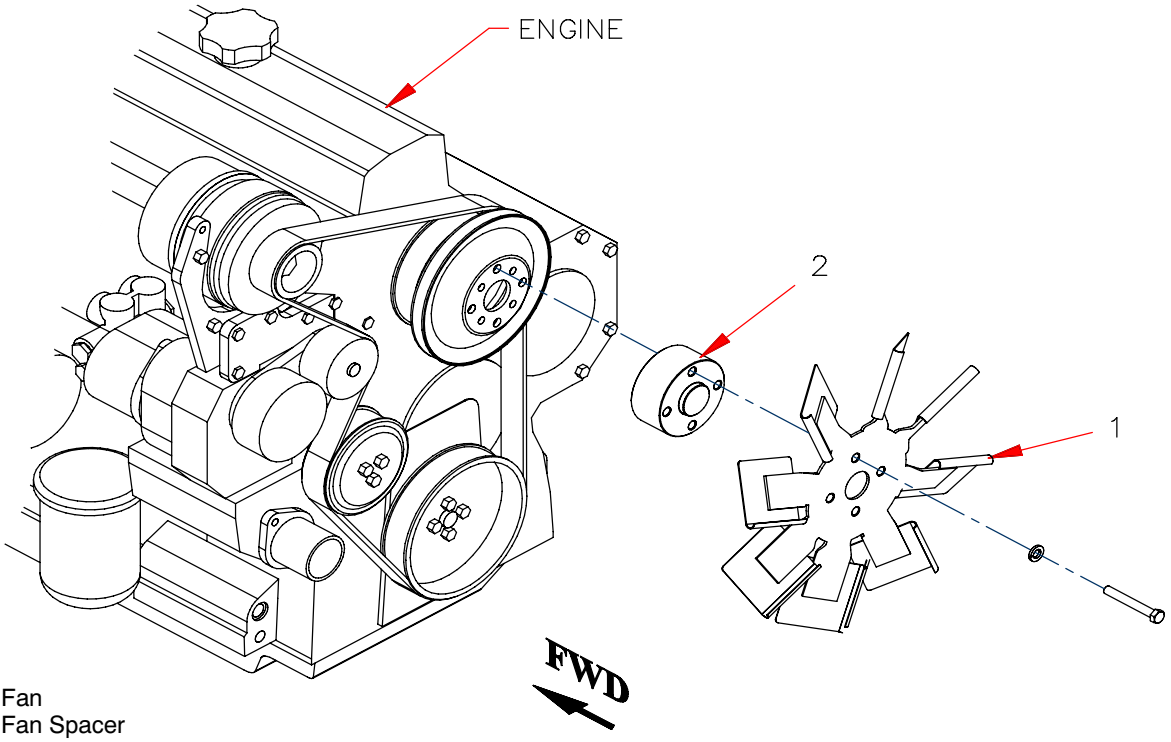
WARNING

To prevent burn injury, allow the engine to completely cool down before working on or around the Radiator.

4. Working from the rear of the sweeper, open rear grille and swing out the radiator.
5. Remove electrical wirings connected to deaeration tank.
6. Remove the deaeration tank cap.

   NOTE: *Provide a container to drain the coolant from the deaeration tank.*

7. Drain the coolant from the deaeration tank.
8. Remove the overflow hose from the overflow nipple on the deaeration tank.
9. At the bottom of the deaeration tank, loosen the hose clamp securing the engine water inlet hose.



1. Fan
2. Fan Spacer

Fig: 5.32 A *The Radiator Cooling Fan.*

9. Remove the inlet hose from the elbow. Plug the inlet hose to stop any excess coolant from draining.
10. On the side of the deaeration tank, loosen the hose clamp securing the engine water and radiator outlet hoses.
11. Remove the outlet hose from the tee. Plug the outlet hoses to stop any excess coolant from draining.
12. Remove the bolts and washers securing the deaeration tank to the hopper tower.
13. Remove the deaeration tank.

***NOTE:** If the deaeration tank requires replacement or repair, remove the elbow and tee fittings.*

14. Install the deaeration tank by reversing the steps.
15. Fill the engine with coolant *(refer to service/lubrication procedure).*

Radiator – *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Stop the engine.
4. Working from the rear of the sweeper, swing out the radiator.
5. When the engine is cool, remove the deaeration radiator cap.

WARNING

To prevent burn injury, allow the engine to completely cool down before working on or around the Radiator.

1. Deaeration Tank
2. Coolant Level Sensor
3. Engine Hose
4. Radiator Hose
5. Coolant Cross-over Hose
6. Excess Fluid Relief Hose

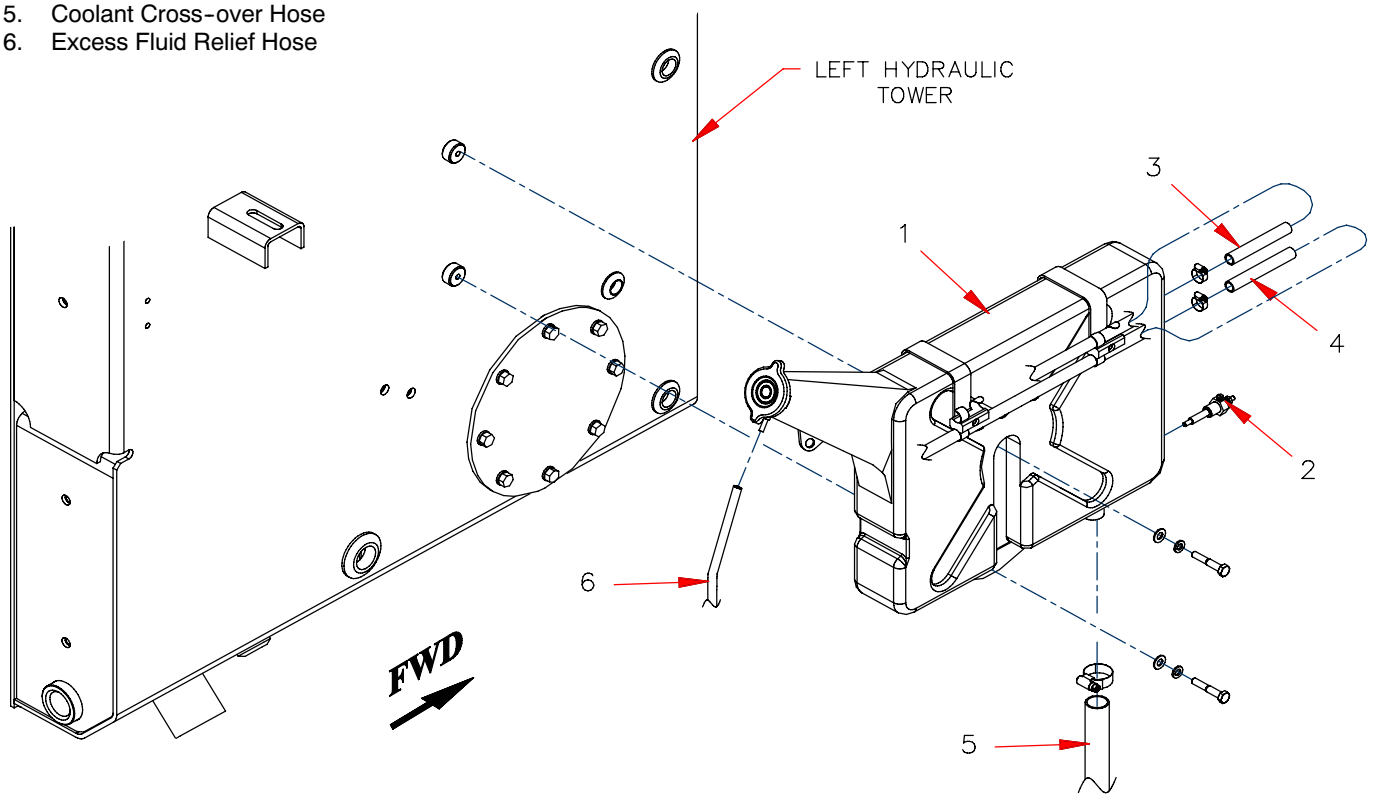


Fig: 5.33 A *The Deaeration Tank Assembly is mounted on the LH Hydraulic Tank.*

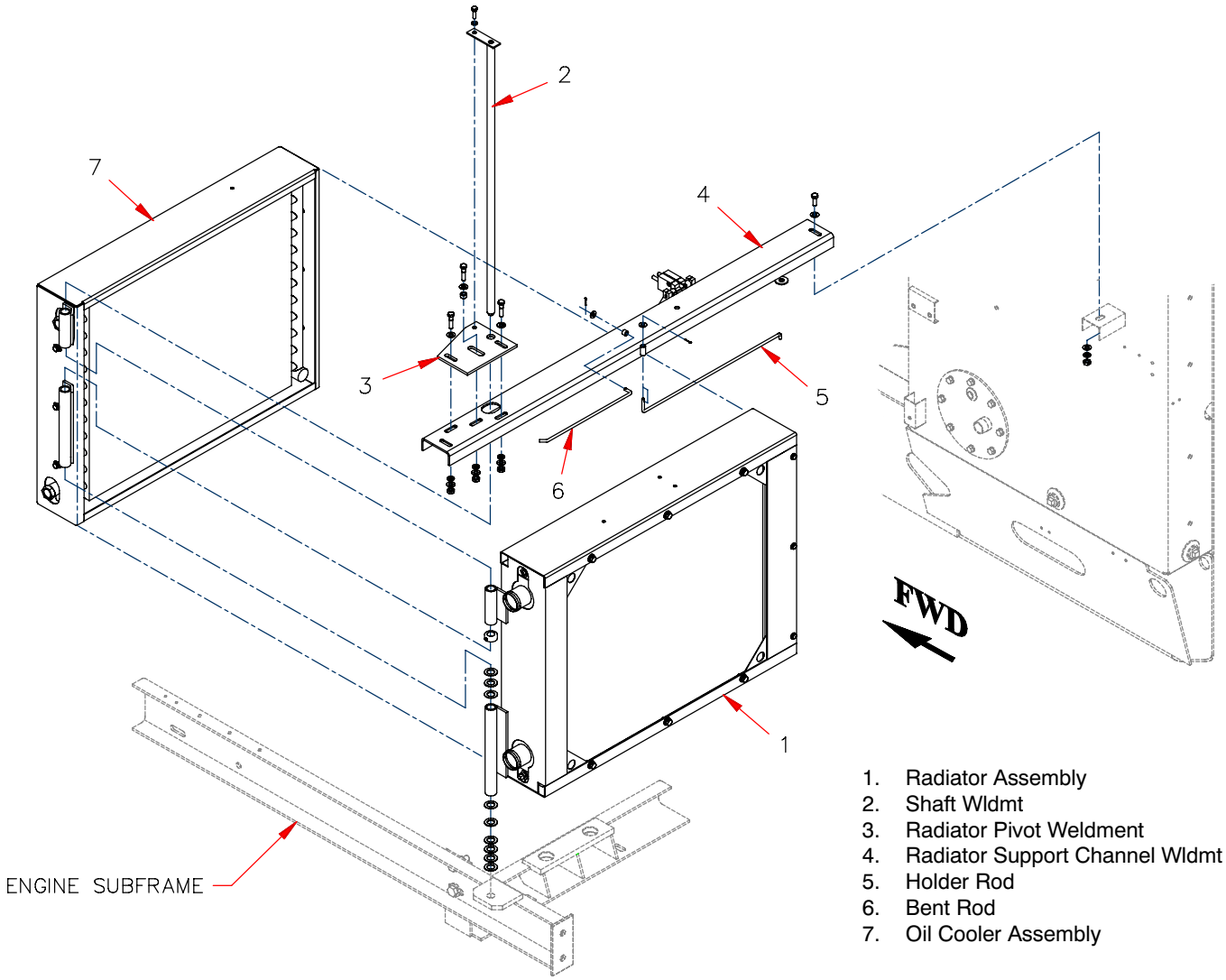
6. When the engine is cool, remove the drain cock to drain coolant.

   NOTE: *Provide a container to drain the coolant from the radiator.*

7. Unlatch and swing out the radiator to gain access to the radiator hoses.
8. On the left side of the radiator, loosen the upper hose clamp securing the small radiator coolant hose coming from the deaeration tank.
9. Loosen the upper hose clamp securing the large radiator hose coming from the engine outlet.
10. Remove the two upper hoses. Plug the hoses to stop excess coolant from draining.
11. Loosen the lower hose clamp securing the large radiator hose going to the engine water pump.
12. Remove the lower hoses. Plug the hoses to stop excess coolant from draining.
13. Remove radiator spring. Remove the nuts, bolts and washers securing the radiator shroud end cap to the radiator shroud. Remove the end cap.
14. Remove the bolts and washers securing the radiator to the radiator shroud.
15. Remove the radiator by sliding out the end of the shroud.
16. Install the radiator by reversing the steps.

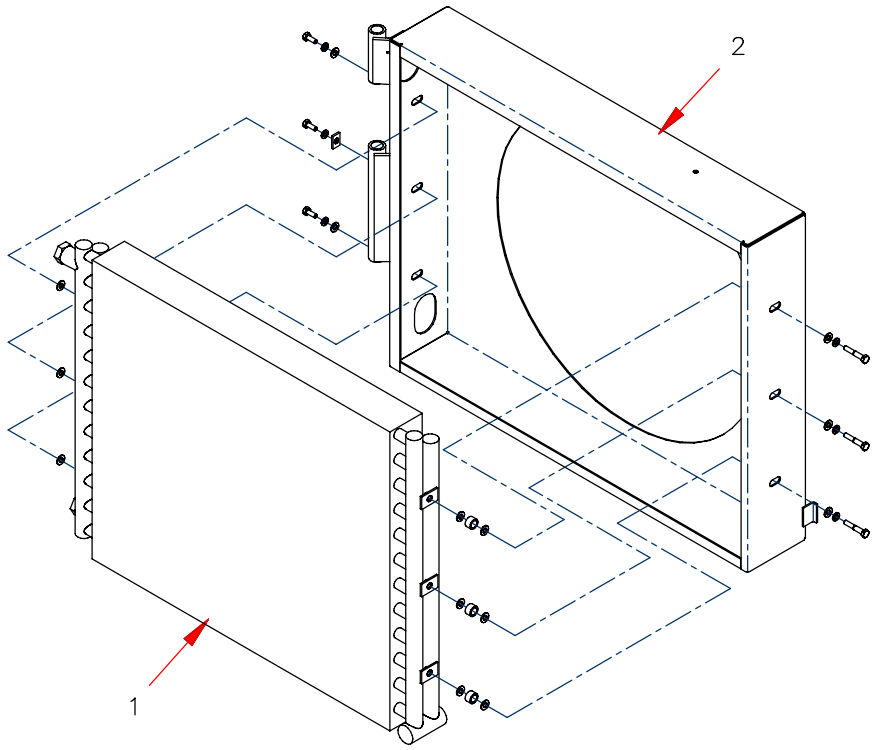
    NOTE: *The radiator is heavy. Always lift with your arm and leg muscles, not your back muscles.*

17. Fill the engine with coolant *(refer to the service/ lubrication procedure)*.



1. Radiator Assembly
2. Shaft Wldmt
3. Radiator Pivot Weldment
4. Radiator Support Channel Wldmt
5. Holder Rod
6. Bent Rod
7. Oil Cooler Assembly

Fig: 5.34 A *The Radiator & Oil Cooler Assemblies are located at the rear of the sweeper.*



1. Oil Cooler
2. Oil Cooler Shroud

Fig: 5.35 A *The Oil Cooler Assembly is located at the rear of the sweeper.*

Oil Cooler
– *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Stop the engine.

WARNING

To prevent burn injury, allow the engine to completely cool down before working on or around the Oil Cooler.

NOTE: *Before removing hydraulic hoses, provide a container to drain the hydraulic oil from the cooler and hoses.*

4. When the engine is cool, remove the upper and lower hydraulic hoses from the side of the oil cooler.
5. Drain the hydraulic oil from the cooler.
6. Remove the hydraulic elbows on the upper and lower side of the cooler.
7. Remove the bolts and washers securing the stone guard to the oil cooler. Remove the guard.

CAUTION

Before removing any mounting hard ware, support the oil cooler to prevent the assembly from dropping.

8. Remove the bolts and washers securing the oil cooler to the shroud.
9. Remove the oil cooler.

NOTE: *The oil cooler is heavy. Always lift with your arm and leg muscles, not your back muscles.*

10. Install the oil cooler by reversing the steps.
11. Fill the hydraulic oil tanks *(refer to service/lubrication procedure).*

BATTERY GROUP

The battery provides a source of energy for cranking the engine and acts a voltage stabilizer for the electrical system.

The battery is factory sealed. Water never needs to be added. A small amount of electrolyte may leak from the top of the battery if it is tipped at more than 45 degree angle. Evidence of electrolyte leakage on top of the battery does not necessarily mean that the battery is defective.

Battery - *Warning*

WARNING

EXPLOSIVE GASES. Always shield eyes and face when working on or around batteries. Cigarettes, flames or sparks could cause the battery to explode.

Batteries contain poisonous sulfuric acid which can cause severe burns. Avoid contact with skin, eyes and clothing. In the event of accident flush with water and call a physician immediately.

Antidote-External:
Flush thoroughly with water.

Antidote-Internal:
Drink large quantities of water or milk. Follow with milk of magnesia, a beaten egg or vegetable oil.

Antidote-Eyes:
Flush eyes with water for 15 minutes.Accidental shorting across the battery terminals may result in lead splatter which can cause bodily injury and/or fire.

CAUTION

Do not tip the battery more than 45 degree angle when carrying or installing it.

NOTE: *Keeping the batteries in a charged condition should protect it against freezing.*

Battery - *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Stop the engine.
4. Open RH fender cover to gain access to the battery.
5. Remove plastic terminal cover. Disconnect the negative battery cable *(black)* from the battery negative terminal. Move the cables away from the terminals.
6. Disconnect the positive battery cable *(red)* from the battery positive terminal. Move the cables away from the terminals.
7. Remove the nuts and washers from the hold down assemblies.
8. Remove the hold down assemblies
9. Remove the battery.

WARNING

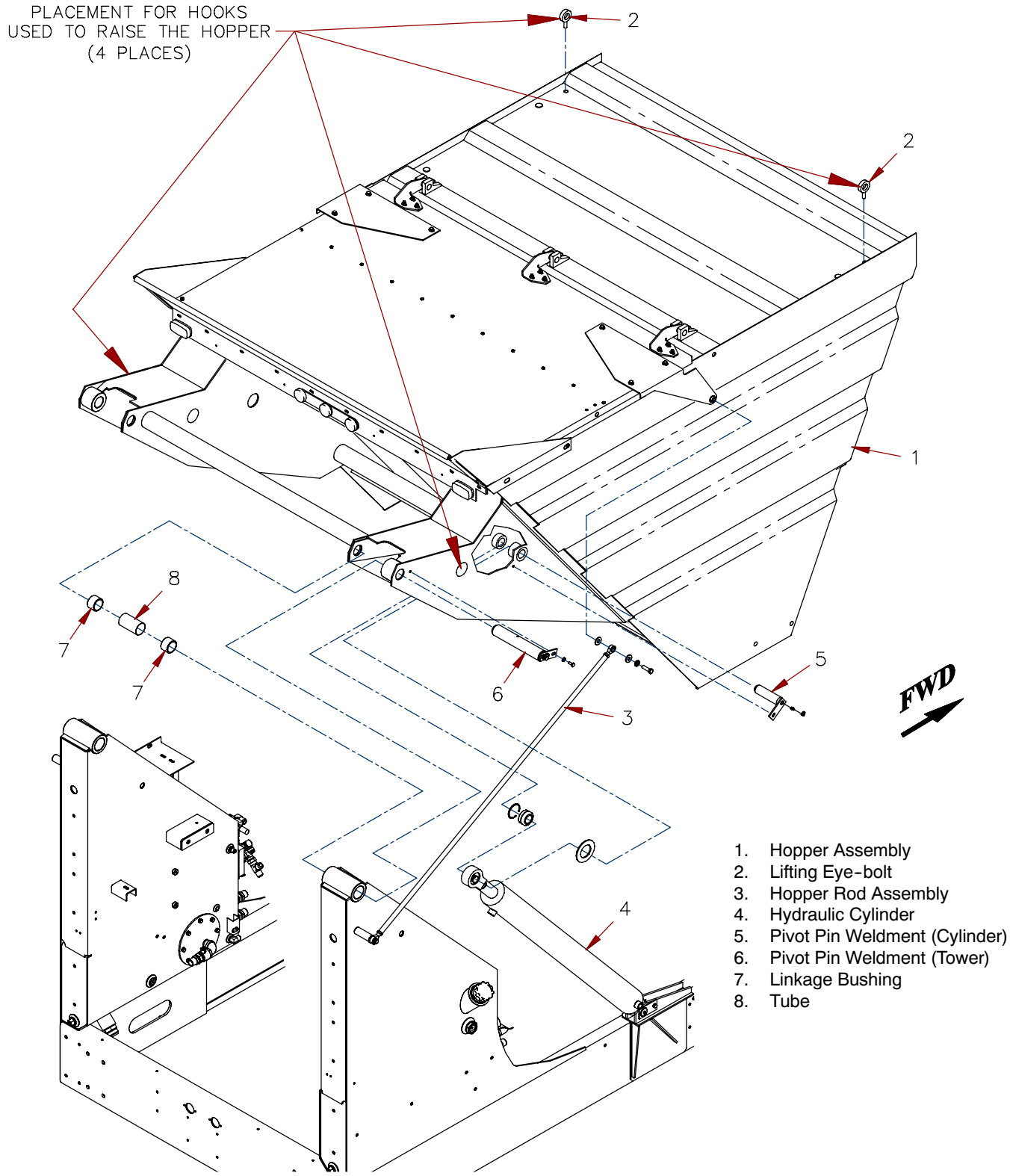
The battery is extremely heavy. To prevent injury, always lift with your leg and arm muscles, not your back.

10. Install the battery by reversing the steps.

Battery - *Replacement Precautions*

When handling a battery, the following precautions should be observed:

1. Hydrogen gas is produced by the battery. A flame or spark near the battery may cause the gas to ignite.
2. Inspect the battery for physical damage and replace as required.
3. Battery fluid is highly acidic. Avoid spilling on clothing or other fabric. Any spilled should be flushed with water immediately.
4. To disconnect, remove negative cable from the negative terminal and positive cable from the positive terminal.
5. To connect or install make sure positive cable is connected to the positive terminal and negative cable is connected to the negative terminal.



1. Hopper Assembly
2. Lifting Eye-bolt
3. Hopper Rod Assembly
4. Hydraulic Cylinder
5. Pivot Pin Weldment (Cylinder)
6. Pivot Pin Weldment (Tower)
7. Linkage Bushing
8. Tube

Fig: 5.37 A *To remove the hopper, attach an overhead crane sling to each of the attaching point.*

HOPPER GROUP

The removal and installation of the hopper requires a lifting equipment designed to lift the hopper safely as an assembly without causing personal injury or damage to the equipment.

Hopper
- *Removal/Installation*

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Stop the engine.

NOTE: *Before removing the hydraulic hoses, provide a container to catch the excess hydraulic fluid.*

4. Remove the hydraulic hoses connected to the hopper door lift cylinder.
5. Provide a chain sling and hoist capable of lifting the hopper. Attach the sling to the lifting eye (1/2" standard) at each corner of the hopper, with a center pull
crane (or hoist) configuration.
6. Remove the bolts, lock washers and hopper lift cylinder pins from each side of the hopper.

WARNING

Do Not remove the lower lift cylinder pins from the frame.

7. Remove the bolts and lock washers that secure the hopper hinge pivot pin on each side of the hopper.
8. Raise the crane (or hoist) to lift the hopper from the sweeper.
9. Remove the bushing and spacer from each side of the hopper pivots.
10. Install the hopper by reversing the steps.

Raising the Hopper Without Engine Power *(Option)*

In order to raise the hopper without engine power, a remote hydraulic pump is required to actuate pressure necessary to lift the cylinder.

1. Position the sweeper on a level surface.
2. Place the shifter in the *Park (P)* position, setting the parking brake.
3. Remove remote high pressure and low pressure caps from auxiliary hopper lift ports.
4. Attach remote hydraulic hoses and a remote hydraulic pump to the ports.

NOTE: *The **female port (pressure)** comes directly from the auxiliary pump. The **male port (return)** should dump into a hydraulic oil container or pump reservoir.*

5. Start the remote hydraulic pump and raise the hopper.

NOTE: *Pressure necesssary to lift the cylinder will depend on the amount of debris inside the hopper.*

WARNING

INSTALL safety props. DEATH or serious INJURY may result if the hopper cylinders fail.

6. Install the safety props.
7. Remove the remote pump and related connections.
8. Replace the auxiliary port caps.
9. Check the hydraulic fluid level.

CHAPTER 6

Troubleshooting

Table of Contents

6

TROUBLESHOOTING

The troubleshooting and fault diagnostic chapter is intended for use by qualified, trained, and experienced service technician. Attempting repairs or service sweeper without the appropriate training, tools, and equipment could cause injury to yourself or others and damage the sweeper.

The troubleshooting and fault diagnostic chapter will assist and provide information necessary to understand the problems encountered on the Global MX3 Series sweeper. The following pages will help to diagnose common problems that may occur, and offer direction on correcting these problems. When working with Chapter 6:

- First use the **Fault Diagnostic Table** to identify the problem.
- Then check each **Action Step Code List** for possible remedies.

As more pertinent information is compiled, the troubleshooting chapter will expand. Generally speaking, the following **"7-Steps"** apply to each and every troubleshooting problem addressed:

1. Know the System...
2. Ask the Operator...
3. Operate the Sweeper...
4. Inspect the Sweeper...
5. Determine the Causes...
6. Reach a Conclusion...
7. Test the Conclusion...

It is not possible to include all the solutions to the fault diagnostics on the sweeper; however, the action step code provides the basic solutions and corrections to the problems. The engine fault diagnostics can be

found in the John Deere Engine Troubleshooting Manual.

CHAPTER 6

FAULT DIAGNOSTIC

FAULT DIAGNOSTIC TABLE

SYMPTOM	*ACTION STEP CODE LIST*
TRACTION SYSTEM	*Please contact Global Environmental Products Service Technician at (909) 713-1600*
No drive–Forward or Reverse.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Machine move in only one direction.	10, 13, 18
Machine has no Low Range.	20, 22
Machine has no High Range	20
Machine creeps at idle or low rpm.	30
Sluggish performance or poor gradeability.	1, 2, 4, 10, 32, 33, 36, 37
AUXILIARY SYSTEM	
Gutter Brooms will not lift or lower.	38, 39, 40, 41, 42, 43, 44, 45, 47
Gutter Brooms turn slowly or will not turn.	38, 39, 45, 47, 48, 49, 50, 51, 52, 53, 54
Gutter Broom speed control does not change the broom speed.	163, 164
Pickup broom will not raise or lower.	38, 39, 45, 55, 56, 57, 58, 59, 60
Pickup broom and elevator will not turn.	38, 39, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71
Hopper will not raise or lower.	38, 39, 60, 72, 74, 75, 76, 77
Elevator turns in reverse when switch is in the forward position.	38, 39, 69, 162
Elevator Stall light/alarm ON when elevator is not stalled.	165, 166, 167
CAB CONTROLS & FUNCTIONS	
Horn inoperative.	79, 80
Hazard lights/turn signals inoperative.	81

(continued)

SYMPTOM	*ACTION STEP CODE LIST*
CAB CONTROLS & FUNCTIONS	*Please contact Global Environmental Products Service Technician at (909) 713-1600*
Speedometer inoperative.	83
Tachometer inoperative.	84
Windshield wiper inoperative.	85
Heater inoperative or insufficient heat.	86, 87, 88, 89, 90
Lights and turn signals will not work.	91, 92, 93, 94, 95
Brake lights not working.	95, 96, 97, 98, 99, 100
AIR CONDITIONER	
A/C blows warm air.	101, 102, 103, 104, 105, 106
A/C is not working.	101, 107, 108, 109, 110
WATER SYSTEM	
Poor water spray	111, 112, 113
No water spray	111, 112, 113, 114, 115, 116
ENGINE	*Please contact Global Environmental Products Service Technician at (909) 713-1600*
Engine shuts down and will not start.	117, 118, 119, 120, 121, 122, 123, 124
Engine will not crank.	119, 124, 125, 126
Engine overheats.	127, 128, 129, 130
STEERING	
Steering feels hard, pulls, or has no power.	132, 133, 134, 135, 136, 137
SHIFTING	*Please contact Global Environmental Products Service Technician at (909) 713-1600*
Problems with High, Low, or Reverse.	5, 13, 32, 33
ALTERNATOR	
Alternator is not charging.	84, 124, 138, 139, 140

(continued)

SYMPTOM	*ACTION STEP CODE LIST*
BRAKES	
Spongy, dragging, squealing, pedal low, or will not hold.	33, 141, 142, 143
Brakes lock up.	7, 8, 9, 10, 11, 12, 33, 37, 145
Parking brake will not release.	7, 8, 9, 10, 11, 145, 146
POOR SWEEPING PERFORMANCE	
Debris is thrown out on street.	147, 148, 149
Debris is left behind in washboard pattern.	150, 151
Streaking at gutter brooms or dirt shoes.	149, 152, 153, 154
Excessive dust emitted from machine.	155
Rear of hopper will not load properly.	156, 157, 158, 159, 160
Debris drops back into elevator and will not load.	156, 157, 158
Debris “cow plops” behind sweeper.	161

CHAPTER 6

ACTION STEP CODES

CODE LIST OF POSSIBLE CAUSES AND REMEDIES

1. **LOW OIL LEVEL IN THE HYDRAULIC TANKS**
   Fill up to the sight glass with ISO 46 hydraulic oil and check for leaks.

2. **VALVES ON HYDRAULIC TANKS ARE CLOSED**
   Open the valves.

3. **BROKEN TRACTION PUMP SHAFT OR STRIPPED SPLINE**
   Check by starting the engine and engaging auxiliary systems *(hopper, gutter brooms and pickup broom).* If the shaft is broken or has a stripped spline, the auxiliary systems will not operate.

4. **CONTAMINATED OR PLUGGED SUCTION OIL FILTER**
   Check by starting the engine and allowing the hydraulic oil to warm up. The gauge on the suction filter should read no more than 14" Hg. If the reading is higher replace the suction filter.

5. **(Not Applicable)**

6. **(Not Applicable)**

7. **HOPPER LIMIT SWITCH IS ENGAGED OR MALFUNCTIONING**
   Turn the ignition ON, select FORWARD range and check the switch for continuity. *(The Hopper must be in the DOWN position).* If no continuity reading is obtained, check the wiring and connections. If the wiring and connections are good, replace the switch.

8. **MALFUNCTIONING NEUTRAL SOLENOID ON THE TRACTION PUMP**
   Turn the ignition ON, select FORWARD range and check the solenoid for magnetism and continuity. If a continuity reading is not obtained, check the wiring and connections. If the wiring and connections are good, replace the solenoid.

9. **MALFUNCTIONING PARKING BRAKE RELAY**
   Turn the ignition ON, select any range except PARK and check the parking brake relay with a voltmeter or test light. The relay should be energized. If a reading is not obtained, check the wiring and connections. If the wiring and connections are good, replace the relay.

10. **CHARGE PUMP PRESSURE IS TOO LOW**
    With the front and rear wheels blocked and the engine OFF, a 500 psi gauge should be fitted into the charge pump outlet port. Ensure that the vehicle is in PARK. Start the engine and let it IDLE. The charge pressure should read approximately 340 psi. If the reading is less than 340 psi, remove and inspect the pressure relief cartridge for operation or damage. Repair/Replace as necessary.

11. **(Not Applicable)**

12. **(Not Applicable)**

13. **(Not Applicable)**

14. **(Not Applicable)**

15. **(Not Applicable)**

16. **(Not Applicable)**

17. **(Not Applicable)**

18. **STICKING SHUTTLE IN TRACTION MOTOR**
    Remove shuttle and check for damage or sticking. Repair or replace as necessary.

19. (Not Applicable)

20. (Not Applicable)

21. (Not Applicable)

22. FAULTY HIGH/LOW SOLENOID COIL

Select the FORWARD/LOW range and turn the ignition switch ON. First check the switches in the shift quadrant for power with a voltmeter or test light. When the switches and wiring have been checked out and found to be good, check the solenoid coil for power with a voltmeter or test light. If no power is evident, run a jumper wire from the battery to the coil. Check the coil for power again. If no reading is obtained this time, replace the solenoid coil.

NOTE: *This hydraulic system fails to LOW range if power is lost to HIGH/LOW solenoid.*

23. (Not Applicable)

24. (Not Applicable)

25. (Not Applicable)

16. (Not Applicable)

27. (Not Applicable)

28. (Not Applicable)

29. (Not Applicable)

30. (Not Applicable)

31. (Not Applicable)

32. (Not Applicable)

33. PARKING BRAKE SOLENOID PROBLEM

With the ignition ON and the shifter in either HIGH or LOW, or REVERSE, check the parking brake solenoid coil for power with a voltmeter or test light. If no power reading is obtained, remove the quadrant side cover and make sure the cams make contact with the switches when the shifter is moved. Ensure the switches are energized when the corresponding shift ranges are selected.

If problems are encountered, replace the appropriate switches. If it is necessary to replace the switches, after doing so, re-check the parking brake solenoid for power. If a power reading is not obtained, the parking brake relay should be checked. If the relay proves to be good, replace the parking brake solenoid.

NOTE: *See troubleshooting diagrams for coil and valve locations.*

34. (Not Applicable)

35. (Not Applicable)

36. BRAKE CANNISTER PROBLEM

Check the parking brake cannister for leakage of hydraulic oil. If a leak is detected, replace the cannister. Check the oil pressure to the cannister.

37. BRAKES DRAGGING

Block the front wheels and left rear wheel. Release the parking brake by removing the "hairpin" and turning the clevis until slack is felt. Jack up the right rear wheel and properly adjust the brakes. There should be no "drag." Repeat the process on the other side and reconnect the parking brake cables.

38. LOW OIL LEVEL

Check the oil level in the hydraulic tanks. If the oil is low, fill to the center of the sight glass. Check for leaks.

39. TANK VALVES CLOSED

Make sure that the shut off valves on both hydraulic oil tanks are open.

40. (Not Applicable)

41. DAMAGED GUTTER BROOM SHAFT OR SEIZED ARM

Inspect the shaft for damage. Repair or replace as required. Lubricate the arm at the provided grease fittings.

42. LIFT CYLINDER PROBLEM

With the broom fully lowered, disconnect the hydraulic fitting from the cylinder and remove the pin securing the lift cylinder cable. Check the cylinder rod for free movement. If sticking or binding is encountered, dismantle the cylinder and replace seals.

43. ELECTRICAL FAULT OR POOR WIRING CONNECTIONS

Check the wiring and connections at the gutter broom switches. If faulty, replace as necessary. Check the wiring and connections at the lift manifold UP and DOWN solenoids.

Turn the ignition ON and place both gutter broom switches in the UP position. Now, using a voltmeter or a test light, check both UP solenoids for power. If no reading is obtained and the wiring is good, replace the coils.

If the problem persists, place both gutter broom switches in the DOWN position and test the DOWN solenoids in a similar manner. Repair or replace the solenoids as necessary.

44. (Not Applicable)

45. CIRCUIT BREAKER PROBLEM

Inspect the circuit breakers in the left side panel outside the cab for poor/loose wiring connections. Repair as necessary.

46. (Not Applicable)

47. MAIN BYPASS PROBLEM

Switch the ignition ON and engage both gutter broom switches in the DOWN position. Check the coil for power with a voltmeter or test light. If no reading is obtained, check the wiring and connections. If the wiring and connections are good, replace the bypass coil.

48. GUTTER BROOM ON/OFF SOLENOID PROBLEM

With the ignition ON and the gutter broom switches engaged, check the ON/OFF solenoid for power with a voltmeter or test light. If a power reading is not obtained, check the wiring and connections. If the wiring and connections are good, replace the coil.

49. SWITCHES MALFUNCTIONING

With the ignition on and both gutter broom switches engaged, check the switches with a voltmeter or test light. If a power reading is not obtained, replace or repair the switches.

50. RELIEF VALVE MALFUNCTION

Remove the 2500 psi relief valve from the manifold. Check the O-rings for damage and make sure that the valve is not stuck in the OPEN position. Repair or replace as necessary.

51. FAULTY GUTTER BROOM SOLENOID COILS

With the ignition ON and both gutter broom drive switches engaged, check the RH and LH gutter broom solenoid coils with a voltmeter or test light. If no power reading is obtained, check the wiring and connections. If the wiring and connections are good, replace the coils.

NOTE: *See troubleshooting diagrams for coil and valve locations.*

52. (Not Applicable)

53. FAULTY GEAR PUMP

Remove one end of the hydraulic hose that connects the gutter broom pump to the high pressure filter. Install a flow-meter between the hose and the filter. Select PARK and start the engine. Increase the engine speed to 2300 rpm. Engage the gutter broom switches and read the flow. The flow should be from eight to nine gallons per minute. If the flow is less than this, replace the pump.

54. SEIZED GUTTER BROOM MOTOR

Check both right and left gutter broom motors for free rotation. If evidence of seizure is apparent, replace the motors.

55. FAULTY PICKUP BROOM UP AND DOWN SOLENOIDS

Switch the ignition ON and engage the pickup broom switch in the DOWN position. Check the DOWN solenoid for power with a voltmeter or a test light. If a power reading is not obtained, check all wiring and connections. If the wiring and connections are good, replace the solenoid coil.

NOTE: *See troubleshooting diagrams for coil and valve locations.*

Now check the UP solenoid coil in the same manner with the pickup broom switch in the UP position. If a problem is detected, replace the UP solenoid coil.

56. FAULTY SWITCH

With the ignition ON, check the pickup broom up/down switch for power with a voltmeter or test light. If the switch is faulty, replace as required.

57. CROSS SHAFT JAMMED OR SNUBBERS ADJUSTED INCORRECTLY

Check the pickup broom cross shaft for evidence of binding. Free off as necessary. Check the pickup broom snubbers for over tightening. The snubbers should just touch the broom side plate but should not restrict broom movement.

58. FLOW CONTROL VALVE PROBLEM

Remove the 7 gpm flow control valve *(hopper)* from the lift manifold and check O-ring for damage. Replace O-ring if necessary.

NOTE: *See troubleshooting diagrams for coil and valve locations.*

59. LIFT CYLINDER PROBLEM

With the pickup broom in either the UP or DOWN position, remove the non-pressurized hydraulic hose from the lift cylinder on the left side of the pickup broom. There should be no leakage. If a leakage is detected, replace the lift cylinder.

60. BYPASS VALVE PROBLEM

Check the main bypass solenoid coil *(hopper)* in the lift manifold for power with a voltmeter or test light. If no reading is obtained, physically depress the manual over-ride in the end of the solenoid tube. If the valve now functions normally, check the wiring, switch, connections and coil. If all checks prove good, then the likely cause of malfunction is a sticking or contaminated valve. Repair or replace the valve as necessary.

61. STICKING PILOT PISTON

Remove the check valve from the pickup broom/elevator manifold and check for a sticking pilot piston. Free up and clean piston as necessary.

62. MOTOR SHAFT OR BEARING PROBLEM

Check the elevator motor shaft and elevator shaft for spline damage. Check the bearings for seizure or damage. The motor also should be checked for internal bypassing of oil and repaired or replaced as necessary.

63. PICKUP BROOM MOTOR SHAFT OR BEARING DAMAGE

If the elevator turns but the pickup broom doesn't, check the broom shaft and motor shaft for damage. Repair as required. Inspect the bearings for seizure or damage. Repair as required.

Check the motor for internal bypassing of oil and repair or replace as necessary. With the broom in the UP position, check the snubber adjustment.

64. CHECK VALVE PROBLEM

Remove the check valve from the pickup broom/elevator drive manifold and check for O-ring damage or contamination. Repair as required.

65. ELECTRICAL PROBLEM

Turn the ignition switch ON and place the pickup broom/elevator switch in the FORWARD position. Check the cartridge valve solenoid coils on the manifold for power and magnetism. Both cartridge coils should be powered when the switch is set in the FORWARD position. The two way cartridge coil should be powered when the switch is set in the REVERSE position. The four way cartridge coil should have no power reading. Replace any coils found to be defective.

If the coils are good, check the wiring, grounds, connections and switch. Repair or replace wiring as necessary.

66. HYDRAULIC PROBLEM

Install a 5,000 psi gauge in port G2 of the pickup broom/elevator manifold. Select the PARK position with the shifter and start the engine. Raise the engine speed to 2100 rpm. Select the pickup broom/elevator switch to the forward position and check the pressure reading. If the reading is less than 2800 psi, shut the engine down and replace the relief valve. The pressure should now read 3500 psi. If the pressure reading is still low, and the broom and elevator still won't turn, remove the 5 psi check valve from the manifold and check for damage or sticking. Clean/repair/replace as necessary. Now, if the elevator turns only in reverse and the pickup broom refuses to turn, replace the four way cartridge.

NOTE: *See troubleshooting diagrams for coil and valve locations.*

67. FAULTY OR DAMAGED MOTOR

If the pickup broom motor and/or the elevator motor turns very slowly or won't turn at all, replace the failed motors.

68. WORN OR FAULTY HYDRAULIC GEAR PUMP

Remove the hydraulic hose that connects the gear pump and pickup broom/elevator manifold. Install a flow–meter between the hose and the manifold. With the shifter in PARK, start the engine and increase the speed to 2300 rpm. Place the pickup broom switch in FORWARD and read the flow. The flow reading should be 14 to 16 gallons per minute. If the reading is less than this, replace the pump.

69. ELECTRICAL PROBLEM

Turn the ignition switch ON and place the pickup broom elevator switch in the FORWARD position. Check both solenoid coils for power with a voltmeter or a test light. Both the coils should be energized in the FORWARD position. If no power reading is obtained, check the wiring and connections. If the wiring and connections are good, replace the coils.

70. SWITCH MALFUNCTION

Turn the ignition switch ON and engage the pickup broom/elevator switch. Check the switch with a voltmeter or a test light. If no power reading is obtained, check the wiring and connections. If the wiring and connections are good, replace the switch.

71. (Not Applicable)

72. ELECTRICAL PROBLEM

With the ignition switch ON, place the hopper switch in the DOWN position. Using a voltmeter or a test light, check the switch for power. If no power reading is obtained, check all wiring and connections. If the wiring and connections are good, replace the switch.

If no problems are detected with the wiring and switch, check the hopper lift manifold coils with a voltmeter or a test light. Check the coils with the hopper lift switch first in the UP position and then in the DOWN position. If a power reading is not obtained and the wiring and connections are good, replace the coils.

73. (Not Applicable)

74. RELIEF VALVE PROBLEM

Remove the hopper DOWN relief valve from the hopper manifold. Check for damaged O–rings or contamination. Repair or replace as necessary.

75. FLOW CONTROL VALVE PROBLEM

Remove the flow control valve from the hopper manifold *(Parts Manual, Ch. 7).* Check for damaged O–rings or contamination. Repair as required.

76. HYDRAULIC PROBLEM

With the engine shut down, remove the plug from the hopper lift cylinder and install a 3000 psi gauge. Start the engine and raise the speed to 2100 rpm. Engage the hopper UP switch and check the pressure gauge reading. The pressure should read 2500 psi. If the reading is low, check the flow control valve. Repair or replace as necessary.

If the problem persists, the gear pump is likely at fault and should be checked.

77. HYDRAULIC PROBLEM IN COUNTERBALANCE OR RELIEF

With the hopper body props installed, remove the hose fitting at the top of the cylinder and tee install a 3000 psi gauge. Place the shifter in PARK and start the engine. Increase the speed to 2100 rpm. Engage the hopper DOWN switch and observe the gauge reading. Pressure should read 900 psi. If a reading of 900 psi is obtained and the hopper still won't lower, replace the counterbalance valve in the hopper manifold. If the pressure reading is lower than 900 psi, replace the hopper DOWN relief valve.

78. (Not Applicable)

79. MALFUNCTION IN HORN

Ensure the horn physically works when powered from another source, *(place a jumper wire from battery and a good ground connection to the horn).* If the horn doesn't work when tested this way, replace horn.

80. ELECTRICAL PROBLEM

With the ignition ON, check the wiring and electrical connections at the base of the steering column. Check the relay at the front of cab for operation or signs of arcing or burning. Check the relay for power with the ignition ON. If problems are detected, repair as necessary. Check horn button, contacts and connections at steering column. Repair as necessary.

81. ELECTRICAL PROBLEM

With the ignition ON, check the wiring and electrical connections at the base of steering column. Check the bulbs. Check flasher unit in the front panel of cab.

82. (Not Applicable)

83. FAULTY SENSOR

Check the speedometer sensor on the right front wheel for damage or contamination. Repair as required.

Check the wiring from the sensor to the speedometer head for chafing or breakage. Repair as required.

If the problem is determined to be in the speedometer head, replacement of the head is recommended.

NOTE: *If a new head is installed, the dip switches on the back of the unit must be programmed the same as the original speedometer head.*

84. ELECTRICAL

Check the connection at the three prong plug on the alternator for secure connections. Check the wiring for signs of chafing or damage. Repair as required.

Check the voltage at "R" terminal on the alternator for a voltage reading of from 2 to 15 volts AC. Check the alternator belt for slippage. Adjust belt as required.

85. (Not Applicable)

86. THERMOSTAT SWITCH CLOSED

Ensure that the thermostat switch on the left side panel in the cab is fully opened to the left.

87. FAULTY FAN SWITCH

With the ignition ON, engage the fan switch and listen to ensure the fan is running. If the fan cannot be heard, check all wiring and connections. Check the switch with a voltmeter or test light. Repair or replace as necessary.

88. CLOSED VALVE

The valve on the heater under the left outside panel of the cab must be OPEN.

89. DAMAGED/LEAKING HEATER HOSE

Check the heater hoses for leaks or damage. Replace as required.

90. DAMAGED/DISLODGED AIR DUCT HOSES

Ensure the air duct hoses are undamaged and securely clamped in place.

91. ELECTRICAL PROBLEM

Check the electrical plug and the wiring at the base of the steering column for secure engagement and condition. If problems are detected, repair as necessary.

92. (Not Applicable)

93. FAULTY CIRCUIT BREAKER

Check the circuit breaker above the buss bar in left side panel outside of cab. If wiring or terminals are loose or burned, repair or replace as required.

94. POOR CONNECTIONS

Check the wiring connections and securing fasteners at buss bar in the left side panel outside of cab. Repair as necessary.

95. BURNED OUT BULBS

Inspect the bulbs and replace if burned out or damaged.

96. FAULTY SWITCH

With the ignition ON, and the brakes applied, check the brake light switch (in the master cylinder line under the cab floor) for power with a voltmeter or a test light.

If no reading is obtained, check the wiring and connections. If the wiring and connections are good, replace the brake light switch.

97. FAULTY BRAKE LIGHT PRESSURE SWITCH

The brake light pressure switch is located under the cab. Turn the ignition switch ON, DO NOT depress pedal, and check for power with a voltmeter or a test light. If no power reading is obtained, replace the pressure switch.

98. POOR GROUND CONNECTIONS

Check the ground wires at rear brake lights for poor or broken connections. Repair as necessary.

99. FAULTY CIRCUIT BREAKER

Check the circuit breaker CB1 for poor or loose connections. Repair or replace as necessary.

100. (Not Applicable)

101. LOOSE, WORN OR SLIPPING COMPRESSOR BELT

Check the air conditioner compressor belt for tension and condition. Tighten or replace belt as necessary.

102. FAULTY THERMOSTAT SWITCH

Turn the ignition ON. Check the thermostat switch on the AC unit with a voltmeter or a test light. If no reading is obtained, check the wiring and connections. If the wiring and connections are good, replace the switch.

103. LOW REFRIGERANT LEVEL

Check the sight gauge on the dryer for a low level or the presence of air bubbles. If the level is low or if bubbles are present, there is a leak in the system which should be checked, repaired and recharged by a qualified shop with proper air conditioner equipment.

104. RESTRICTED AIR FLOW

Examine the condenser for obstructions or bent/damaged fins. Remove the obstruction and comb the fins as required.

105. RESTRICTED AIR FILTER

Examine the outside air filter on the left side cab panel and replace if necessary. Examine the inside filter on the evaporator and replace if necessary. Check the condition of the foam seal on the filter door. If the seal is deteriorated, replace as necessary

106. HEATER VALVE IN ”ON” POSITION

Valve must be in the ”OFF” position for air conditioning.

107. FAULTY A/C & HEATER CONTROL SWITCHES

With the ignition ON and control switches engaged, check for power with a test light. If no reading is obtained, check wiring and connections. If the wiring and connections are good, replace switches.

108. (Not Applicable)

109. BLOWER MOTOR PROBLEM

With the ignition ON, engage the fan switch and check to see if the blower motor operates. If the motor does not run, check the switch, fan speed resistors, wiring and connections for continuity with a voltmeter or a test light. If the wiring, switch, resistors and connections are good, replace blower motor.

110. CLUTCH PROBLEM

Check to make sure the compressor clutch engages when the AC unit is switched ON.

If the clutch does not engage, the supply of electrical power to the unit must be checked; i.e., the switch, wiring, grounds, fuses or circuit breakers. If the supply checks out good and the clutch still won't engage, the clutch should be replaced.

111. PLUGGED STRAINER OR JETS

Remove the water strainer and check for contamination. Check the water nozzle jets for blockage. Clean or repair as necessary. Ensure the water strainer is tight to avoid water and air leaks.

112. ELECTRICAL PROBLEM

Ensure that there is power to the water pumps with ignition ON and water pump switch engaged. If power is lost, check all wiring and connections, check grounds, check the switch and fuses or circuit breakers. Check the water pump relay for malfunction. If the circuitry checks out good and the pump still doesn't work, replace pump.

113. PLUGGED OR DAMAGED VALVE/VALVES

Check the proportioning valve behind the cab. Clean or repair as necessary.

114. POOR GROUND CONNECTION

Check the ground connection in the water pump box and clean or repair as necessary.

115. FAULTY PRESSURE SWITCH

With ignition ON, check the pressure switch behind the cab on the right side for continuity with a voltmeter or test light. Replace the pressure switch if found to be defective.

116. (Not Applicable)

117. KYSOR ENGINE PROTECTION SWITCH ACTIVATED

If the warning buzzer/light came on before the engine stopped, check for a high temperature condition or low engine oil pressure.

If high temperature is the problem, the cooling system must be thoroughly checked and proved. First, the Kysor temperature switch should be checked for proper operation and replaced if found to be defective.

If the Kysor switch is good, all normal cooling system checks such as fan belt tension, system pressure cap, leaking hoses, loose clamps, clogged radiator core, failed water pump, bad thermostat etc., should be carried out.

If problem is not detected in the above checks, a more intensive examination should be carried out by repair personnel. These checks should include *(but not be limited to)* system pressure check, restriction in air induction system, fault in fuel atomizers, restriction in exhaust system, damaged cooling fan, blown cylinder head gasket, cracked cylinder head, damaged cylinder liner or seals, cracked engine block, incorrect timing, engine subjected to "lugging."

If low oil pressure is the problem, the Kysor switch must first be checked and proved. If the Kysor switch is good, the following items should be checked: there is not enough lubricating oil in the sump, there is a defective gauge or a dirty oil filter, the engine oil pump is worn, the oil pump relief valve is stuck open, the relief valve spring is broken, the crankshaft bearings are worn, there is an oil pump suction pipe problem, or there is a blocked suction strainer.

CHAPTER 6

118. NO FUEL OR LOW FUEL LEVEL

Replenish the fuel and bleed system as follows: Loosen the bleed screw on the engine fuel filter and prime the fuel system by means of the manual transfer pump until air is expelled from the filter. Tighten the bleed screw. "Crack" open the fuel injector lines at the fuel injectors and crank the engine until air is expelled and only raw fuel is being delivered from the fuel injection pump. Tighten down the fuel lines and start the engine.

119. SAFETY SWITCH OPEN

Ensure that the radiator and cooler at the rear of the machine are closed and latched and the safety switch is closed.

120. FUEL RELAY OPEN

Check the fuel relay on the engine. The relay should be energized with the ignition ON.

121. FUEL SOLENOID PROBLEM

With the ignition ON, check the fuel pump solenoid for power with a voltmeter or a test light. If no reading is obtained, check the wiring and connections. If the problem persists, replace solenoid.

122. PLUGGED FUEL FILTERS

Check the filters and replace if required.

123. (Not Applicable)

124. DEAD BATTERY

Determine what has caused this condition and rectify. Clean the battery posts and connections and then recharge or replace battery as required.

125. FAULT IN STARTER RELAY

Turn the ignition ON and check the starter relay for power. If power is not found, check the wiring and connections. If the wiring and connections are good, replace the starter relay.

126. FAULT IN STARTER SOLENOID COIL

With the ignition ON, check the starter solenoid coil for power with a voltmeter or test light. If power is not found, check the wiring and connections. If the wiring and connections are good, replace the starter solenoid coil. If the problem persists, replace the starter motor.

127. RESTRICTED AIR FLOW AT RADIATOR

Examine the front and rear of the radiator for obstructions *(leaves, dirt etc.)* and clean as necessary. Examine and clean the oil cooler fins if contaminated. Avoid using high pressure air or water sprays during cleaning as flattening of the fins is likely to result and this will exaggerate the problem.

128. LOW COOLANT LEVEL

Check the coolant level in the deaeration header tank and replenish as required with a 50/50 mix of water and antifreeze. If the level was found to be low, determine the cause and rectify.

129. FAN BELT LOOSE

Check the tensioner.

Check water pump for leaks. Check hoses and clamps. Repair as required.

130. MALFUNCTIONING TEMPERATURE GAUGE OR SENDER

Check the temperature gauge for operation. Check the wiring and connections. Repair or replace as necessary. Turn the ignition ON and OFF and observe the temperature gauge. The needle should move. If the needle doesn't move, replace the gauge.

131. (Not Applicable)

132. RELIEF VALVE PROBLEM

Check the power steering pump relief valve for relief pressure of 1500 psi. If the pressure is low, remove the relief valve and add a .003" shim.

If no pressure increase is obtained, the pump should be changed. If only a slight pressure increase is observed, add additional shims to obtain 1500 psi.

133. STEERING VALVE PROBLEM

Check the steering valve for alignment, binding or seizure. Check the flex joint components. Repair as necessary.

134. SEIZED OR DAMAGED BALL JOINTS

Inspect the ball joints for operation and lubrication. Replace or lubricate as required.

135. BEARING PROBLEM

Check the front suspension bearings and also the front wheel bearings for seizure or lack of lubrication. Replace or lubricate as necessary.

136. PRESSURE PROBLEM

Install a 3000 psi gauge in the outlet port of the power steering pump. Select PARK and start the engine. Increase the engine speed to 2100 rpm Turn the steering hard to the left or right and check the gauge reading. The pressure should read 1500 psi. If the pressure is low, check both the pump relief and the steering gear internal relief valves.

First check the steering pump relief valve. This can be accomplished in the following manner: Remove the valve and add a .003" shim. Reinstall the valve and test as above.

If the pressure does not increase, the pump should be replaced. If the pressure increases slightly but not quite to 1500 psi, add additional shims until the specified pressure is obtained. If the pump relief valve checks out good, the steering gear internal relief must now be checked.

First you must prevent operation of the gear's internal unloading (poppet) valves or relief valve. This will allow full pump pressure to develop. To prevent operation of the poppets, place an unhardened steel spacer block, about one inch thick and long enough to keep hands clear, between the axle and stop at one wheel. To prevent operation of the relief valve, remove the valve and install a suitable threaded pressure plug in it's place. With the steering fluid at it's working temperature, *(125/135 degrees Fahrenheit)* turn the steering until the axle stop bottoms on the spacer block. Maintain a force of 20 lbs pressure on the steering wheel and check the gauge reading. The gauge should now read the pump relief pressure.

CAUTION: Do not hold the steering wheel in a full turn position for more than 5 to 10 seconds at a time, or damage will be inflicted on the steering pump.

If the pump relief pressure reading is 1500psi, then the steering gear relief valve and/or poppet valves should be repaired or replaced as necessary.

137. ALIGNMENT PROBLEM

Check the alignment of the telescoping shaft and steering valve. Check for tightness of components. Check the tie rod ball joints, drag link, and pitman arm for damage or wear. Check the cross tube arms, check bushings and steering knuckle, and the knuckle pin for any signs of binding, damage, or wear. Repair or replace as necessary.

138. BROKEN, LOOSE OR WORN DRIVE BELT

Check the drive belt for wear, slippage or breakage. Tighten or replace belt as required.

139. POOR GROUND OR WIRING DAMAGE

Check the grounding of the alternator. Clean or repair as necessary. Check the wiring for chafing or short circuits, and repair as necessary.

140. NO OUTPUT

Remove the alternator and have a qualified auto electrical shop conduct an AVR *(alternator/voltage/regulator)* test on the unit. Repair or replace as required.

CHAPTER 6

141. LOW BRAKE FLUID

Check the master cylinder and wheel cylinders for leaks. Install new repair kits or new components as necessary. Bleed the brakes.

142. INTERNAL LEAK IN MASTER CYLINDER

After ensuring that all other brake components have been checked out and no problems found, the brake pedal should be pumped several times and held in the applied position. If the pedal fades, there is likely an internal leak within the master cylinder, hindering it's ability to hold and maintain sufficient hydraulic pressure. A leak to atmosphere would be evidenced by the presence of air bubbles in the fluid. An internal leak past the spool seals would not be so apparent. In either case, the master cylinder would have to be rebuilt or replaced.

143. HYDRAULIC BOOSTER PROBLEM

Check the brake booster for leaks. If leakage is present, replace the booster.

144. (Not Applicable)

145. CHECK VALVE PROBLEM

Remove the outlet line from port B of the parking brake manifold and tee install a 500 psi gauge. Start the engine and select any range except PARK. The pressure should read 220 psi. A check valve is incorporated in the manifold and it maintains a minimum pressure of 130 psi. This check valve prevents the parking brake from applying itself if the charge pump pressure is lost. If the charge pump is known to be good, the check valve must be inspected and replaced if found defective.

NOTE: *See troubleshooting diagrams for coil and valve locations.*

146. (Not Applicable)

147. WORN GUTTER BROOMS

Inspect the gutter broom tines for wear. If length is less than four inches, install new gutter broom segments.

148. DAMAGED, WORN OR NOT ADJUSTED DIRT SHOES OR LINKAGES

Visually inspect and repair or replace. Adjust as necessary.

149. MALADJUSTED GUTTER BROOM

Check the gutter broom mark or strike pattern on a flat surface. The broom should be angled slightly into the base of the curb and the road. The area of contact should be no more than 120 degrees of the broom diameter when sweeping.

150. WORN OR DAMAGED COMPONENTS

Check the pickup broom components and linkages for wear or damage. Check the broom shock absorber. Check the broom pressure adjustment and strike pattern. Adjust, repair or replace parts as necessary.

151. SNUBBERS OUT OF ADJUSTMENT

Adjust the snubbers to just touch the broom side plates, but not to restrict the broom's ability to "float."

152. MISSING OR DAMAGED DIRT DEFLECTORS

Check the dirt deflectors at the lower end of elevator for wear or damage. Repair or replace as necessary.

153. PROBLEM WITH DIRT SHOES/PIVOT RODS

Check the dirt shoes and pivot rods for wear, binding or damage. Lift and lower the shoes manually to ensure free movement. Properly adjusted dirt shoes should make contact with the edge bristles of the pickup broom with no gap.

154. INSUFFICIENT OVERLAP PATTERN

Check both gutter broom and pickup broom for correct overlap pattern. Adjust the overlap if necessary by lengthening or shortening the gutter broom chain.

NOTE: *The nominal adjustment should be 16 links of chain. Finer adjustment (a link or so either way) may be required to obtain an acceptable overlap pattern (See Ch. 3; Fig 3.10 A).*

155. INSUFFICIENT WATER FROM SPRAY NOZZLES

Ensure there is sufficient water in the water tank. Check the nozzle jets on the spray bars and clean out as necessary.

Check the water proportioning valves behind the cab for proper function and water delivery. Clean as necessary.

Remove and check the water strainer on the side at the right rear of the machine and clean or renew as necessary.

Check the water pumps for operation.

If the water pumps do not work, check the switch, wiring and ground connections. If the electrical system checks out OK and the pumps still don't work, replace the pumps.

156. IMPROPERLY ADJUSTED ELEVATOR BELTS

The adjustment is accomplished by loosening the bolts that secure the upper shaft bearing and also the bolts on the sprocket guard mounting. Now tighten the draw bolts to obtain the correct belt tension. Properly adjusted belts should deflect a total of four inches *(two inches on either side of center)* while applying approximately 65 lbs. of force in the center area of the belt.

When the adjustment has been completed, the belt should be checked for tracking. With the hopper UP and the safety props installed, start the machine and allow the elevator to run. Improperly adjusted belts will tend to track toward the loose side and rub up against the sprocket flange. If this condition is observed, the loose side must be readjusted until even tracking is obtained.

157. ELEVATOR ARCH OUT OF ADJUSTMENT

Check the elevator arch and adjust if necessary. After properly adjusting the belt tension, the arch can be adjusted as follows: First, loosen the bolts at the five adjustment slots at the back of the elevator, then adjust the entire arch to obtain a clearance of a quarter inch minimum clearance between the squeegee rubber and the radius of the arch. Re-tighten the arch adjustment bolts.

158. ELEVATOR SPEED TOO SLOW

Place the shifter in PARK and start the engine. Raise the hopper and install the safety props. Engage the elevator and increase the engine speed to 2300 rpm. Check the elevator shaft speed with a tachometer. The shaft speed should be approximately 210 rpm. If the shaft speed is too slow, refer to Possible Cause #159.

159. HYDRAULIC PROBLEM

Install a 5000 psi gauge in port G1 of the Pickup Broom/Elevator manifold. Manually "jam" the elevator to prevent it from rotating. This can be accomplished by inserting a special tool between the motor mounting bracket and the motor shaft clamp.

NOTE: *The special tool must be locked in position by inserting a pin through the mounting plate and the tool.*

NOTE: *See troubleshooting diagrams for coil and valve locations.*

Select PARK and start the engine. Engage the elevator switch in the FORWARD position. Increase the engine speed to 2100 rpm and check the pressure reading. If the pressure is below 2800 psi, shut the engine down and replace the relief valve. Recheck the pressure. It should be 3500 psi. If the pressure remains low, remove the check valve and examine it for operation and damage. Replace if necessary.

160. HYDRAULIC PUMP PROBLEM

Install a flow meter in the hydraulic line that runs from the gear pump to the pickup broom/elevator manifold. Select PARK and start the engine. Increase the engine speed to 2100 rpm. Engage the elevator switch in the FORWARD position and read the flow-meter. The flow should be from14 to 16 gallons per minute. If the flow reading is normal and the elevator still rotates too slowly, replace the elevator drive motor.

161. EXCESSIVE WATER BEING USED FOR CONDITIONS

Reduce the amount of water being sprayed by partially closing the water spray valves to the pickup broom and gutter broom spray bars. Do not close the valves entirely, merely adjust the amount of water being sprayed to obtain the best results. If desired, an optional front mounted spray bar may be fitted and this will assist in pre-wetting the debris before the pickup broom reaches it.

162. (Not Applicable)

163. RHEOSTAT PROBLEM

Turn the ignition switch ON and engage the gutter broom(s). Check the rheostat for power with a voltmeter or a test light. If no power is reading is obtained, check the wirings and connections. If the wirings and connections are good, replace the rheostat.

164. DEFECTIVE PROPORTIONAL VALVE OR COIL

Turn the ignition switch ON and engage the gutter broom(s). Check the coil for power with a voltmeter or a test light. If no power reading is obtained, check wirings and connections. If the wirings and connections are good, replace the defective proportional valve or coil.

165. (Not Applicable)

166. FAULTY GROUND

Turn the ignition switch ON and engage the pickup broom/elevator switch. If power is present at relay R5 and does not function, check ground wires at relay R5. If ground is good, replace relay R5.

167. PROXIMITY SWITCH PROBLEM

Check the adjustment of the proximity switch. The distance between the proximity switch and the pickup should be no more than .030".

TROUBLESHOOTING DIAGRAM

The troubleshooting diagram is designed to assist service technician in isolating hydraulic problems in regards to the systems function. Understanding the mechanics of the hydraulic system will enhance your ability to solve system malfunctions. The process of isolating system fault will help speed-up in correcting these problem.

When diagnosing hydraulic system malfunctions, check all obvious items related to oil pressure, such as hydraulic oil gauges, high or low oil level, clogged filters and excessive oil contamination.

In addition to the complete hydraulic and electrical schematics, the following hydraulic and electrical troubleshooting diagrams illustrates the basic hydraulic system flow: Please refer to the end of this sections for all electical schematics.

1. Hopper Raise
2. Hopper Lower
3. Gutter Broom Raise
4. Gutter Broom Lower
5. Gutter Broom Rotate
6. Pickup Broom Raise
7. Pickup Broom Lower
8. Pickup Broom Rotate
9. Elevator Forward Rotaion
10. Elevator Reverse Rotaion
11. Power Steering
12. Parking Brake

Manifolds and control valves are also shown in detail. Refer to the Parts manual for service parts numbers.

NOTE: *1.Hydraulic valves shown in the hydraulic schematics are all in non-actuated position.*

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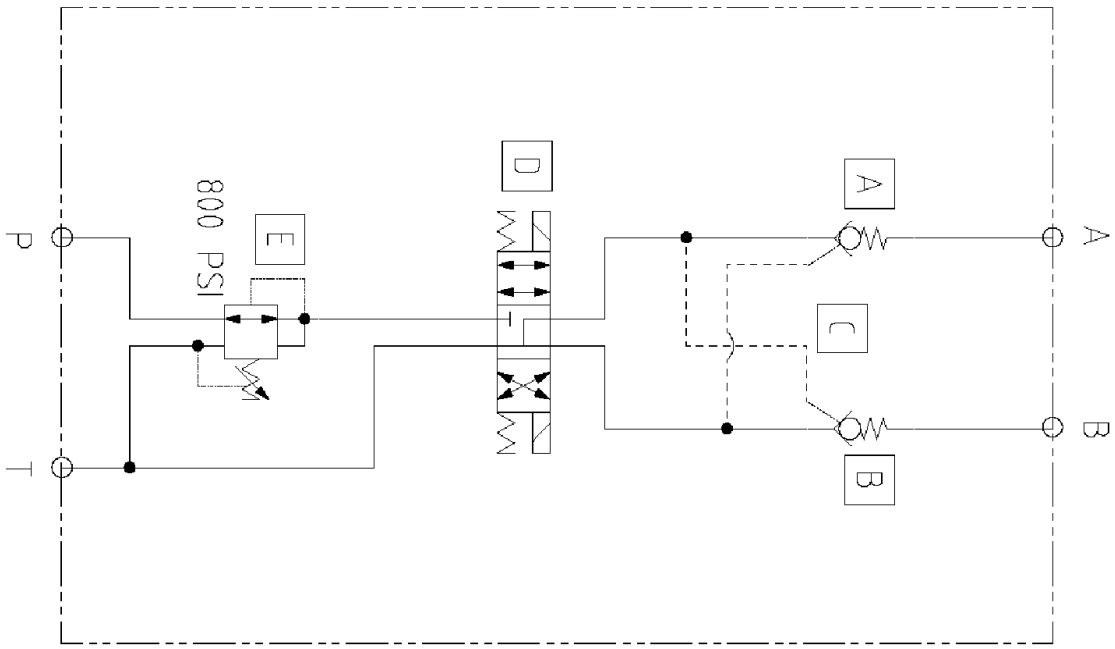
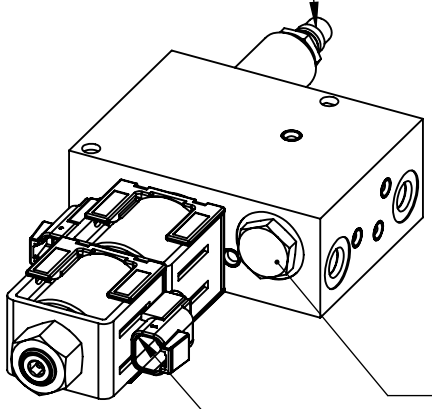


NOTE:
PART#331223 & 331224 ARE BUILT INSIDE AND ARE NOT SHOWN.

REDUCING/ RELIEVING CARTRIDGE (800PSI)
PART # (331227)

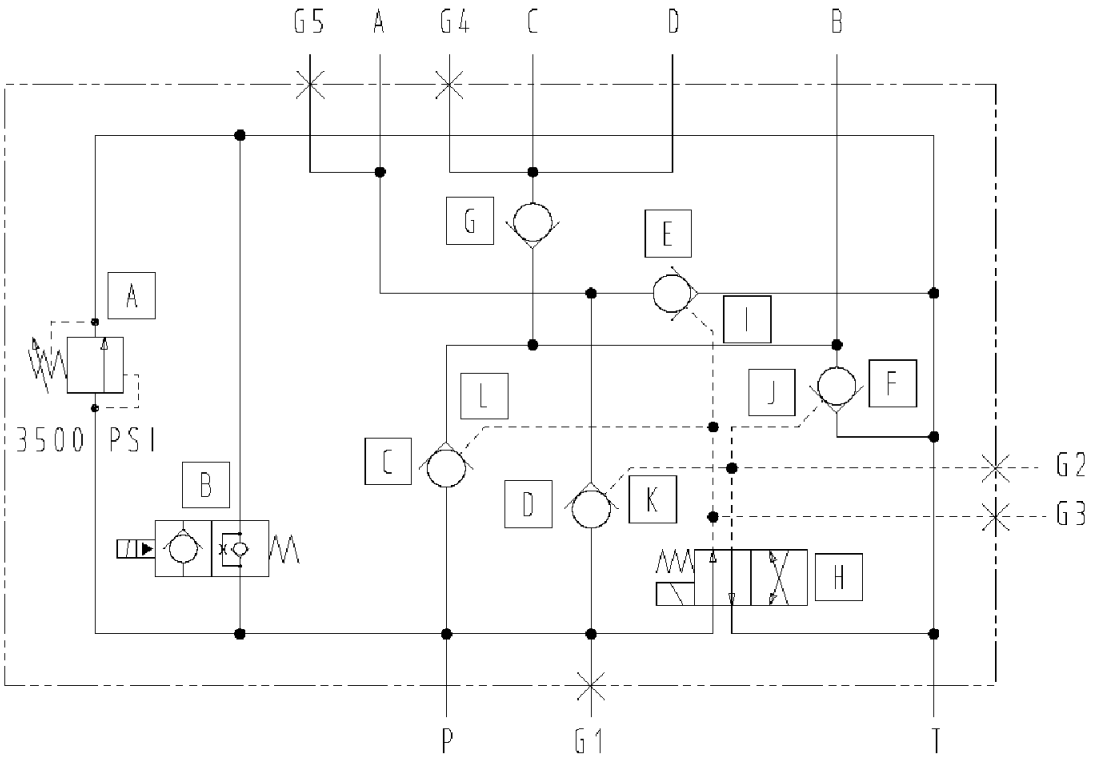


CHECK VALVE
PART# (331222)

SOLENOID VALVE & COIL
PART# (331225)

PART #	DESCRIPTION
248020	G.B EXTENDED
331227	REDUCING/ RELIEVING CARTRIDGE (800PSI).
331288	SEAL KIT
331225	SOLENOID VALVE & COIL
331289	CARTRIDGE ONLY
331214	COIL
331290	SEAL KIT
331222	CHECK VALVE
331291	SEAL KIT

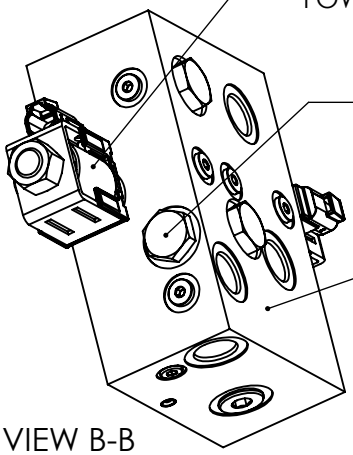
BLUE MANIFOLD- ELEV./ PICKUP BROOM
PART# (319872)



SOLENOID VALVE & COIL.
FOWARD/ REVERSE (4-WAY) VALVE.
PART# (307839)

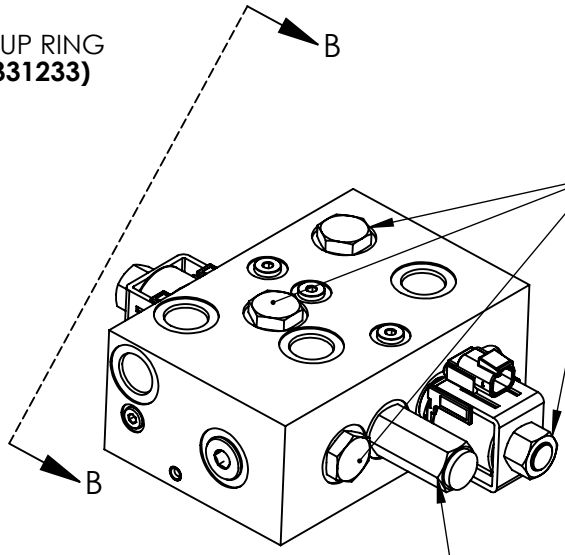
CHECK VALVE CARTRIDGE.
PART# (382709)

12X BACKUP RING
PART# (331233)



VIEW B-B

NOTE:
BACK UP RINGS AND PISTONS ARE BUILT INSIDE MANIFOLD AND ARE NOT SHOWN IN DRAWING.



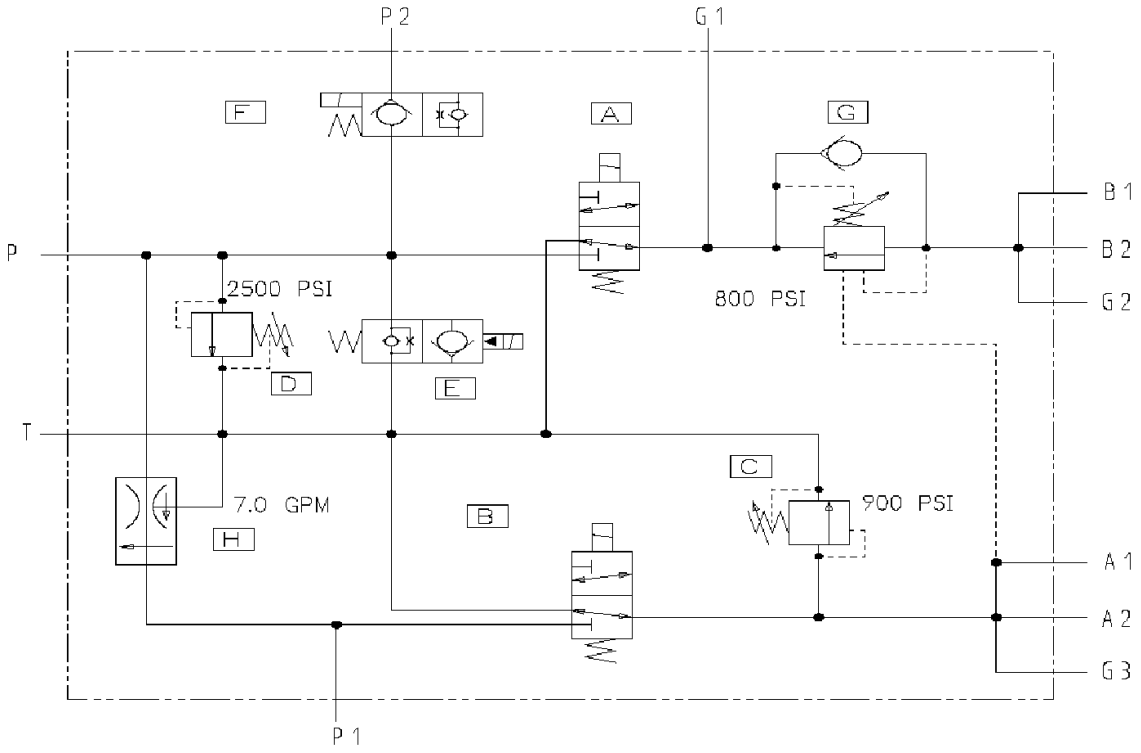
4X CHECK VALVE.
PART# (382708)
4X PISTON.
PART# (381212)

SOLENOID VALVE & COIL.
BY-PASS (2-WAY) VALVE.
(PART# 382707)

RELIEF VALVE CARTRIDGE, (3500 PSI).
PART# (381209)

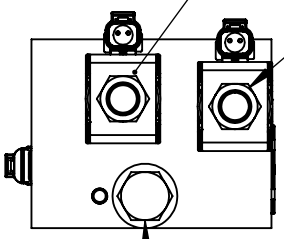
PART #	DESCRIPTION
319872	ELEV./ PICK UP BROOM
	382708 CHECK VALVE **381258** SEAL KIT
	382707 BY-PASS (2-WAY) VALVE **382723** CARTRIDGE **382724** COIL **331276** SEAL KIT
	307839 FORWARD/ REVERSE (4-WAY) VALVE **331280** CARTRIDGE **382724** COIL **331283** SEAL KIT
	331236 RELIEF VALVE (3500PSI). **381258** SEAL KIT
	382709 CHECK VALVE **381258** SEAL KIT
	331284 BACK UP RING FOR PILOT PISTON

BLUE MAINFOLD- HOPPER, UP/ DOWN
PART# (319870)



2X CARTRIDGE & COIL
HOPPER UP.
PART# (331247)

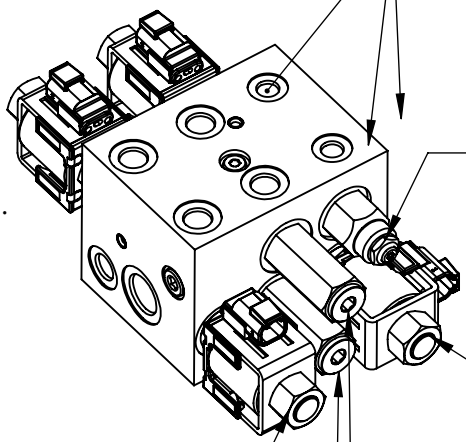
2X CARTRIDGE & COIL
HOPPER DOWN.
PART# (331247)



FLOW CONTROL CARTIDGE(7GPM).
PART# (381202)

NOTE:
PART NUMBER (381223) &
(381224) NOT SHOWN.

3X FITTING, DIAGNOSTIC, 7/16.
PART# (381223)
3X DUST CAP.
PART# (381224)



COUNTERBALANCE VALVE(800 PSI).
PART# (331238)

CARTRIDGE & COIL
BYPASS VALVE.
PART# (382707)

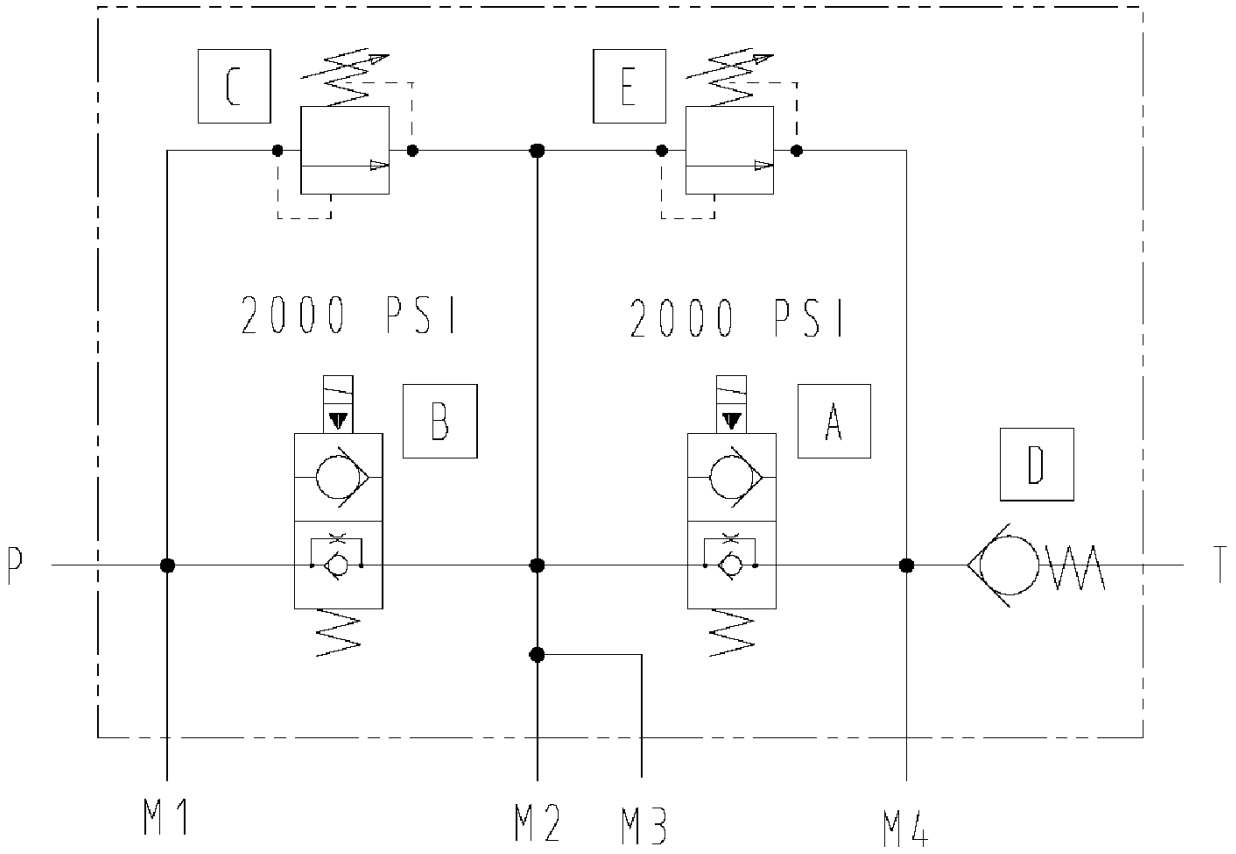
RELIEF VALVE CARTRIDGE (900 PSI).
PART# (331240)

CARTRIDGE & COIL
G.B. RUN VALVE.
PART# (382706)

RELIEF VALVE CARTRIDGE (2500 PSI).
PART# (331239)

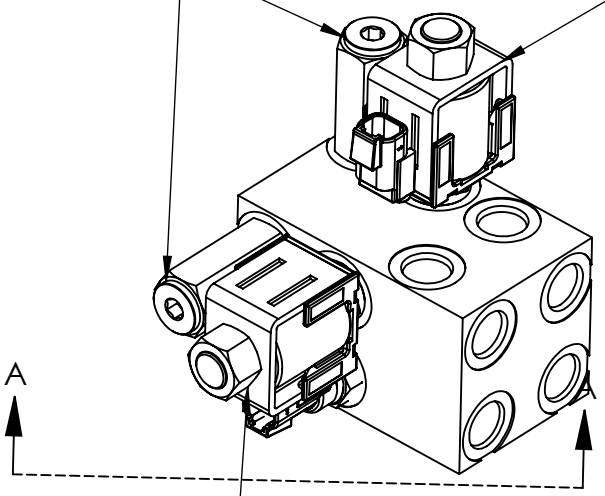
PART #	DESCRIPTION
319870	HOPPER, UP/DOWN
331238	COUNTERBALANCE VALVE (800 PSI)
331277	SEAL KIT
331239	RELIEF VALVE (2500 PSI)
381258	SEAL KIT
331240	RELIEF VALVE (900 PSI)
381258	SEAL KIT
381202	FLOW CONTROL (7GPM)
331278	SEAL KIT
382707	BYPASS VALVE
382723	CARTRIDGE
382724	COIL
331276	SEAL KIT
331247	HOPPER UP/DOWN VALVE
331280	CARTRIDGE
382724	COIL
331281	SEAL KIT
382706	G.B. RUN VALVE
331282	CARTRIDGE
382724	COIL
331276	SEAL KIT

BLUE MANIFOLD- GUTTERBROOM DRIVE.
PART# (319871)



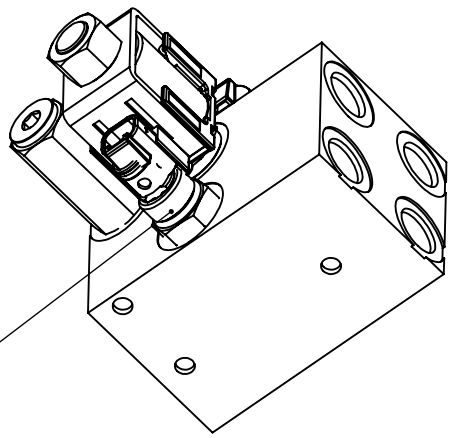
RELIEF VALVE CARTRIDGE (2000 PSI).
PART# (331256)

SOLENOID VALVE & COIL.
LH G/B RUN VALVE.
PART# (382707)



SOLENOID VALVE & COIL.
RH G/B VALVE.
PART# (382707)

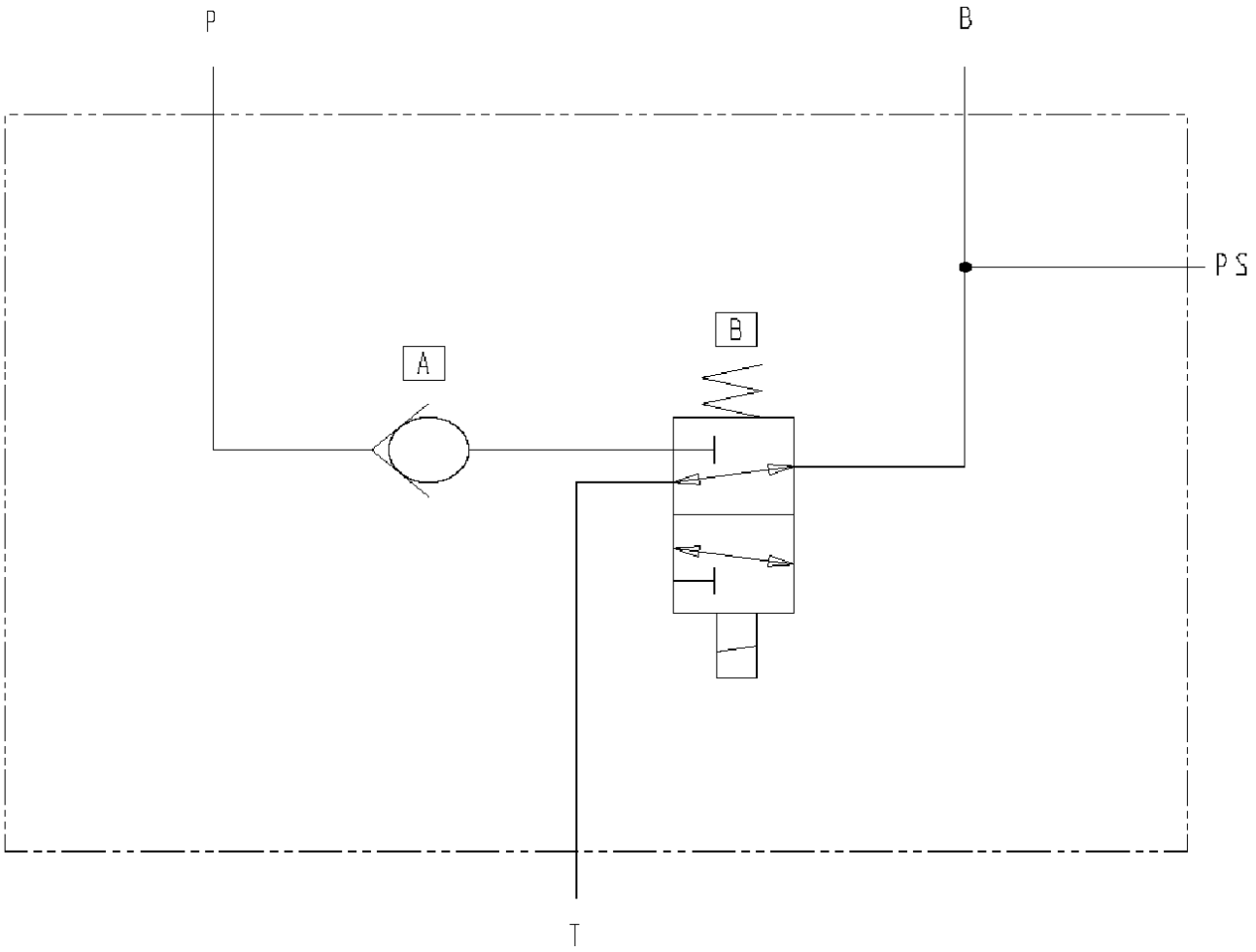
CHECK VALVE.
PART# (382709)

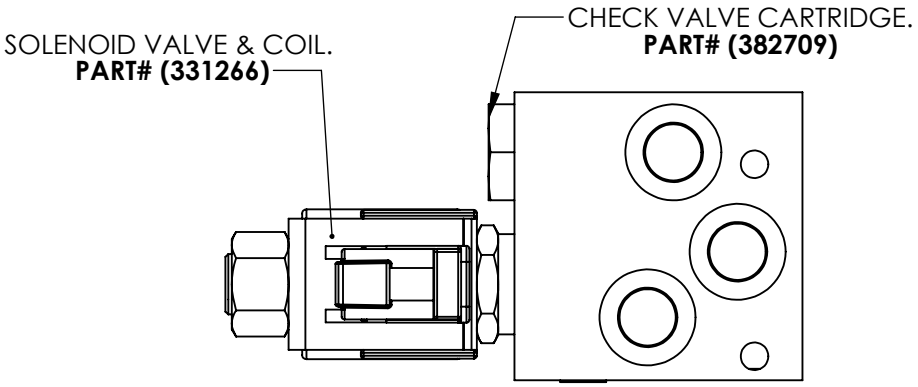


VIEW A-A
SCALE 1 : 3

PART #	DESCRIPTION
319871	GUTTER BROOM DRIVE
	331256 RELIEF VALVE (2000 PSI) **381258** SEAL KIT
	382707 SOLENOID VALVE & COIL **382723** CARTRIDGE **382724** COIL **331276** SEAL KIT
	382709 CHECK VALVE **381258** SEAL KIT

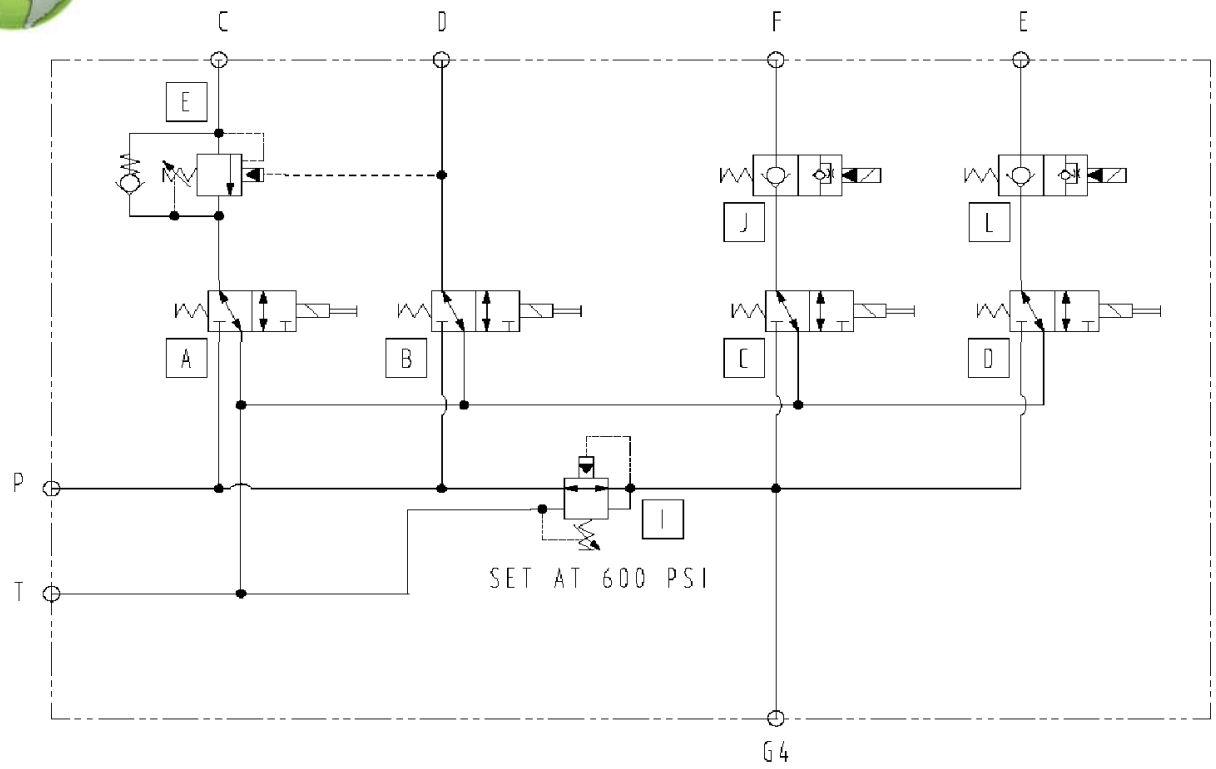
BLUE MANIFOLD-PARKING BRAKE
PART# (319874)





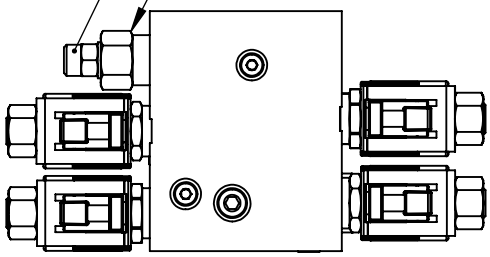
PART #	DESCRIPTION
319874	PARK BRAKE
331266	SOLENOID VALVE & COIL
331280	CARTRIDGE
382724	COIL
331281	SEAL KIT
382709	CHECK VALVE
381258	SEAL KIT

BLUE MANIFOLD-BROOM LIFT
PART# (319875)

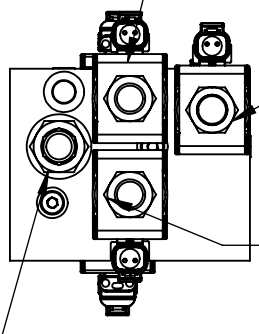


DUST CAP.
PART# (381224)

FITTING, DIAGNOSTIC, 7/16.
PART# (381223)



4X SOLENOID VALVE & COIL
P.U.B DOWN.
PART# (331266)



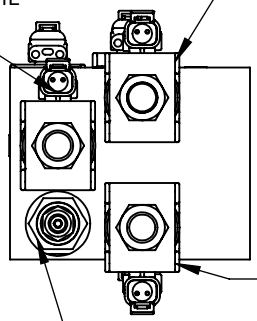
4X SOLENOID VALVE & COIL
LH G.B DOWN.
PART# (331266)

2X SOLENOID VALVE & COIL
P.U.B DOWN.
PART# (331270)

PRESSURE REDUCING/RELIEVING(600PSI).
PART# (382712)

4X SOLENOID VALVE & COIL
LH G.B UP
PART# (331266)

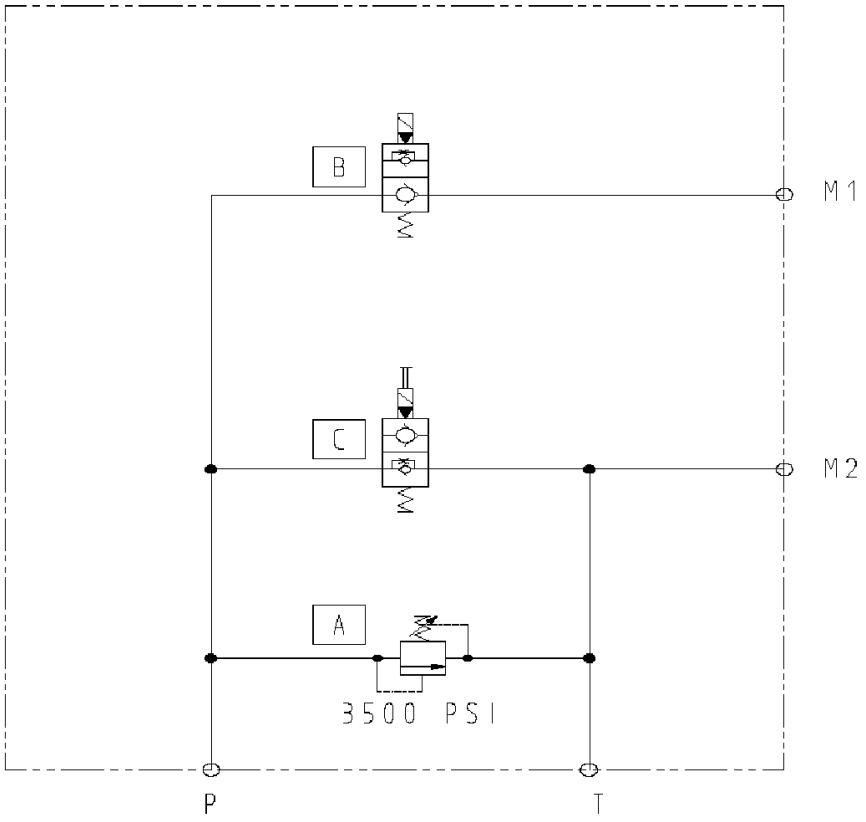
2X SOLENOID VALVE & COIL
P.U.B UP.
PART# (331270)

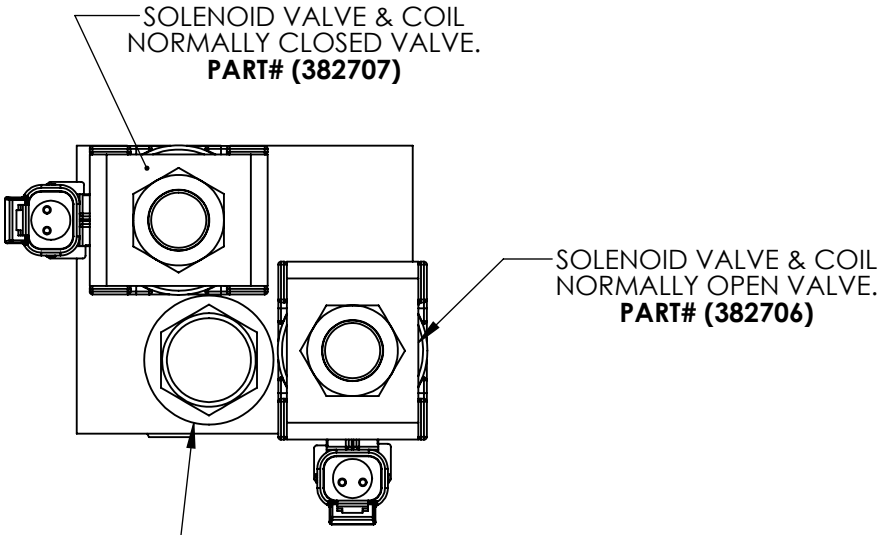


4X SOLENOID VALVE & COIL
RH G.B. DOWN.
PART# (331266)

COUNTERBALANCE CARTRIDGE (3045PSI).
PART# (331268)

PART #	DESCRIPTION
319875	BROOM LIFT
331268	COUNTERBALANCE VALVE (3045PSI)
331277	SEAL KIT
382712	PRESSURE REDUCER VALVE (600PSI)
331285	SEAL KIT
331266	P.U.B DOWN
331280	CARTRIDGE
382724	COIL
331281	SEAL KIT
331270	P.U.B UP
331282	CARTRIDGE
382724	COIL
331276	SEAL KIT


B
M1
C
M2
A
3500 PSI
P
T


SOLENOID VALVE & COIL
NORMALLY CLOSED VALVE.
PART# (382707)
SOLENOID VALVE & COIL
NORMALLY OPEN VALVE.
PART# (382706)
RELIEF VALVE CARTRIDGE (3500PSI).
PART# (381209)

PART #	DESCRIPTION
319876	P.U.B DRIVE
382707	NORMALLY CLOSED VALVE
382723	CARTRIDGE
382724	COIL
331276	SEAL KIT
382706	NORMALLY OPEN VALVE
331282	CARTRIDGE
382724	COIL
331276	SEAL KIT
381209	RELIEF VALVE (3500PSI)
381258	SEAL KIT

Sheet-1

NOTE : "CB" – CIRCUIT BREAKER
"C" – CONTACTOR
"R" – RELAY
– CONNECTOR (CAVITY)
– DIODE
– TRANSIENT VOLTAGE SUPPRESSOR
– GROUND TERMINAL
– GROUND CHASSIS

"CTR-1" – CONTROLLER 1
"CTR-2" – CONTROLLER 2
"F" – FUSE

PARK START SW
CLOSED IN PARK POSITION

CONDENSER COOLING FANS

KEY STARTER SWITCH

R3 STRDB

WASHER PUMP

WIPER MOTOR

WIPWR/WASHER SW

CAB BLOWER MOTOR SW

COMPRESSOR CYCLE TIMER

BLOWER MOTOR

TSTAT

DIODE (40HF40)

HEATER–AC BOX

RADIATOR DOOR SW–1
(CLOSE IF DOOR CLOSED)

STARTER COIL

C–1 START
C–2 AUX
C–3 OPT
C–4 A/C

AIR SEAT (OPTION)

2–WAY RADIO (OPT)

DISTRIBUTION BAR

F1(15A) LHGB TILT (OPTION)
F2(15A) RHGB TILT (OPTION)
F3(3A) DRL (OPTION)
F4(10A) DRL (OPTION)
F5(5A) 2–WAY RADIO (OPTION)
F6(3A) AUTOMATIC LUBRICATION UNIT (OPTION)

A/C CLUTCH

AIR DUCT ASSY. FRESH AIR/RECIRC.

MOTORISED VALVE ASSY.

FRESH AIR/ RECIRC SW

A/C SW

AC CONTROL PANEL LIGHTS

VALVE POT.

TO AV(D12) Sheet–6
TO AV(D1) Sheet–6
TO F7 Sheet–8
TO F12 (OPTION) Sheet–8
TO LEAF GATE SW Sheet–8
TO RADIO Sheet–8
TO HD LIGHT SW Sheet–2
BATT Sheet–8
TO LHGB UP/DN SW Sheet–4

UNLESS OTHERWISE SPECIFIED DIMENSION TOLERANCES ARE:

ENGLISH		METRIC	
.X	±.06	.X	±1.5
.XX	±.03	.XX	±.75
.XXX	±.01	.XXX	±.25

ANGULAR ±1°

DO NOT SCALE DRAWING

BY	DATE	REVISION DESCRIPTION	E/R NO	REV	NEXT ASSY	MODEL
–	–	–	–	–	–	M3JD

TITLE
ELECTRICAL_SCHEMATIC_M3JD

BA	09/23/14	SEE CURRENT ER FOR APPROVALS	–	–	PAGE 1 OF12	28651	3
DRAWN BY	DATE DRAWN		SCALE	SIMILAR P/N		CURRENT ER & REV	

SIZE C DWG NO. 330330

TO C-3 Sheet-1
43A
RED
F4 (10A) (OPTION)
FUR RED
CB2
71
RED
P1/2(5)
RED
71A
T
B
H
HD LITE SW
77
PINK
TO AC PANEL Sheet-1
78F
TRAN TMP GAUGE (OPTION)
DASH LT
ENG OIL PRE GAU
ENG COOL TEM GAU
FUEL LVL GAU
SPR WT LVL GAU (OPTION)
TACHOMETER
SPEEDOMETER
VOLT METER
LHGB GAUGE
RHGB GAUGE
LH FRONT MARK
RH FRONT MARK
LH HOPP MARK
CENT HOPP MARK
RH HOPP MARK
LH TAIL
LH REAR MARK
LH LICENCE
RH LICENCE
RH TAIL
RH REAR MARK
LT
76
BLU
T(C)
78
ORA
HD LITE DIMMER SW
B
HI
LO
T(D)
T(J)
DBLU
72
CTR-1 OUT 31
73
73A
73B
DGRN
P1/2(6)
T1(22)
T1(24)
86
30
85
87A
87
T1(23)
R7 HIBM
YEL
74
P1/2(7)
74A
74B
74C
P1/2(28)
FUR GRN#1
DAYTIME RUNNING LIGHTS (OPTION)
FUR BLK
FUR WHT
P1/2(21)
FUR BLU
FUR GRN#2
516
TO AV(C16) Sheet-6
75
BRN
75A
75B
75C
75D
HD LITE LEFT
HD LITE RIGHT
HI
LO
G
253
WHT
GLTR
BLK
TO AV(C15) Sheet-6
515
DPUR
165A
LT
RH FRONT TURN LT
165
S(J)
DPUR
DPUR
LPUR
164A
LH FRONT TURN LT
164
LPUR
LPUR
T(B)
505
TO AV(C5) Sheet-6
STEERING SW
2
5
9
12
13
44
15
511
3
6
385
S(D)
T(A)
S(C)
S(B)
DGRN
RH REAR TURN LT
167A
DGRN
DGRN
BK1/2(14)
167
LT
BLK
G137
LH REAR TURN LT
166A
YEL
YEL
BK1/2(13)
166
LT
BLK
G130
RH REAR STOP LT
171J
LT
BLK
G89B
STP3/4(B)
CENTER REAR STOP LT
171F
LT
BLK
G86
LH REAR STOP LT
171H
LT
BLK
G85B
STP1/2(B)
TO R8 Sheet-3
264D
LBLU
TO NEUTRAL SOL-9 Sheet-3
981
DBLU
171E
163C
TO AV(D11) Sheet-6
531
DGRN
163D
DGRN
163A
P1/2(15)
DGRN
163
YEL/RED
P5/6(15)
171D
YEL/RED
CB3
RED
161
T1(5)
86
30
85
87A
87
T1(4)
R2 AV
T1(6)
LGRN
162
P1/2(14)
LGRN
533
TO AV(D13) Sheet-6
CB15
RED
172
T1(12)
86
30
85
87A
87
R4 ACCP
T2(13)
DGRN
653B
T1(11)
TO CTR-1 (43) Sheet-4
173
YEL/BLK
RED
172A
TO T2(1) Sheet-4
D6
171J
YEL
DRBN
171F
D8
TAN
TAN
P1/2(17)
171G
DBRN
BRAKE SW
no
RED
180A
CB3
RED
180
P1/2(18)
975B
TAN
86
30
85
87A
87
R21 NEUT

GLOBAL

TITLE	SIZE	DWG NO.
ELECTRICAL_SCHEMATIC_M3JD	C	330330

BA	09/23/14		–	–	PAGE 2 OF12	28651	3
DRAWN BY	DATE DRAWN	ENGINEER	SCALE	SIMILAR P/N		CURRENT ER	& REV

TO FUEL HEATER (OPTION) Sheet-6

TO R-CAC Sheet-8

CB10

35A

35

RED

P1/2(31)

35E

35D

BK1/2(30)

TO AV(C13) Sheet-6

513

LBLU

BK1/2(5)

513A

HOPPER FULL SENSOR (OPTION)

SIG

NEG

POS

BLK

35L

35J

ENG OIL PRESSURE GAUGE

BRN/WHT

283A

BK1/2(16)

283

SENDER

ENG COOLANT TEMP GAUGE

YEL/RED

284A

BK1/2(17)

284

FUEL LEVEL GAUGE

ORA/BLK

285A

BK1/2(18)

285

SPRAY WATER LVL GAUGE (OPTION)

WHT/BLK

286A

BK1/2(19)

286

TRANS TEMP GAUGE (OPTION)

DPUR

288A

BK1/2(12)

288

VOLT METER

TACHOMETER

818

TO ENGINE 21 PIN CONNECTOR Sheet-11

SPEEDOMETER

G

S

GRN

YEL

SCHIELD

SCHIELDED CABLE P/N 322104

SPEEDO SENSOR (MAGNET PICK-UP)

SN1/2(A)

SN1/2(B)

WHT

BLK

SN3/4(A)

SN3/4(B)

SCHIELD

YEL

25 IN CTR-2

Sheet-3

T1(14)

T1(17)

T1(16)

T1(15)

85

86

87A

30

87

R5 HOPDB

226B

GRY

LPUR

265

265A

262B

262C

YEL/BLK

SH1/2(F)

P3/4(16)

LPUR

LBLU

643B

643A

643

ET1/2(E)

SH1/2(B)

TO SX CONTROLLER Sheet-9

262F

ORA/BLK

WH1/2(G)

265B

HOPPER UP/DN SW

981

DBLU

TO R21 Sheet-2

TO R21 Sheet-2

LBLU

264D

HI-SPD SW

LO-SPD SW

no

226F

226C

226E

P1/2(30)

SH1/2(A)

PARK SW

nc

P5/6(30)

262

HOPPER LIMIT SW

YEL/BLK

262A

262D

262E

P5/6(31)

P7/8(26)

T1(28)

T1(27)

T1(26)

T1(25)

CB11

271

R8 PKBK

220C

G79

PARK BRK SOL-20

264A

P5/6(5)

264

G82

NEUTRAL SOL-9

981A

DBLU

P5/6(6)

660A

660B

661C

661D

HP1/2(B)

HP1/2(E)

DGRN

LPUR

LGRN

TO D30 Sheet-7

AUX HOPPER LIFT SW (OPTION)

215A

215

HP1/2(D)

ORA

TO D7 Sheet-4

209D

209E

HP1/2(C)

BRN/WHT

211D

211E

HP1/2(A)

LPUR

211B

211A

209B

209A

WH1/2(E)

WH1/2(F)

P3/4(14)

P3/4(12)

211

209

333B

WH1/2(D)

DBRN

BRN/GRN

G75

HOPP UP SOL-3A

212A

212

YEL

210A

210

ORA

P5/6(3)

3BA(B)

IF NO OPTION: AUTO PROP WIRE ORA-210D CONNECTED TO THE HOPP DN SOL-3B VALVE

210D

P5/6(2)

GH7

HOPP DN SOL-3B

214A

340A

TO D4 Sheet-4

210E

LH HOPPER SENSOR

D1

D2

209B

211B

BRN/WHT

LPUR

BRN/GRN

210F

804

LGRN

GH4

BLK

BLU

BRN

LS

210G

205A

REL HL

214B

214

PINK

210H

REL HR

805

GH6

210C

HIGH-LOW SOL-21

OPTION: AUTO PROP

GH5

RH HOPPER SENSOR

201

201A

201B

201D

201E

P1/2(22)

SH1/2(G)

REVERSE SW

203B

203A

203C

203

P1/2(23)

SH1/2(H)

D3

204

TO REVERSE LITE AND ALARM Sheet-7

201F

203D

10 IN CTR-1

282E

282D

282B

P1/2(20)

SH1/2(B)

HI-SPEED SW

658A

658

658B

P7/8(27)

ET1/2(F)

TO CTR-1 (26) Sheet-4

T1(20)

T1(19)

T1(18)

R6 REVR

TO SX CONTR Sheet-9

TITLE	ELECTRICAL_SCHEMATIC_M3JD			SIZE	DWG NO.
				C	330330
DRAWN BY	BA	DATE DRAWN	09/23/14		
ENGINEER		SCALE	–	SIMILAR P/N	–
				PAGE	3 OF 12
				CURRENT ER & REV	28651 3

CAN J1939
TO CTR-2 Sheet-5 & 10

TO IGN LINE 351
Sheet-8

SPRAY WATER HI/LO SW
RHGB ROT SW
RHGB UP/DN SW
ELEV FWD/REV SW
ERGO SW
LHGB ROT SW
LHGB UP/DN SW

WHT 309 WH1/2(H) WHT 309A P3/4(23) WHT 309B
DBRN 305B WH1/2(B) DBRN 305A P3/4(3) DBRN 305

DGRN 328 P3/4(24) DGRN 328A
ORA 318 P3/4(8) ORA 318A
YEL 331 P3/4(26) YEL 331A
PINK 332 P3/4(27)
DBLU 303 P3/4(2)
GRY 325 P3/4(28)
LBLU 327 P3/4(11)
DBRN 314 P3/4(6) DBRN 314A
GRY 324 P3/4(25) GRY 324A
PINK 333 P3/4(10) PINK 333A TO R3 Sheet-1

TO HI-SPEED SW Sheet-3
282D ORA
P1/2(20
ORA 282E

RED 765
765K
BLK
BLK RED
VS2 (Voltage Suppressor)

1	POWER GND (-)		IN	26	
2	POWER SUPPLY (+)		IN	27	
3	CAN0 (+)	YEL	IN	28	
4	CAN0 (-)	GRN	IN	29	
5	AIN/CAN0 SHIELD		IN	30	
6	IN		OUT	31	FUR BLU → TO DRL (OPTION) Sheet-2
7	IN		OUT	32	DGRN 944 P1/2(26) DGRN 944A → POWER FOR RHGB ODOLETER/HOURMETER (OPTION)
8	5 VDC SENSOR PWR (+)	T2(14) T2(13) ORA 776	OUT	33	DPUR 307 P3/4(4) DPUR 307A WH1/2(C) DPUR 307B LT BLK → LOW WATER LEVEL LAMP
9	SENSOR PWR GND (-)	T2(12) T2(11) DBRN GCON	OUT	34	DBRN 534 P1/2(11) DBRN 534A → TO AV100(D14). RH HYD OIL LEVEL LAMP Seet-6
10	IN	ORA 282E	OUT	35	ORA 536 P1/2(12) ORA 536A → TO AV100(D16). LH HYD OIL LEVEL LAMP Seet-6
11	IN		OUT	36	TAN 946 P1/2(29) TAN 946A → POWER FOR PUB ODOMETER/HOURMETER (OPTION)
12	IN		OUT	37	POWER FOR LHGB ODOLETER/HOURMETER (OPTION) USE WIRES 946 AND 946A. DISCONNECT FROM (36) CONNECT TO THE (37)
13	IN		OUT	38	
14	IN	LBLU 327A	OUT	39	18-PINK-504 P7/8(4) 18-PINK-504A → TO AV100(C4) Sheet-7
15	IN		OUT	40	18-ORN-501 P7/8(3) 18-ORN-501A → TO AV100(C1) Sheet-7
16	IN	DBLU 303A	OUT	41	
17	IN	PINK 332A	OUT	42	
18	IN		OUT	43	18-DGRN-653B → TO R4 Sheet-2
19	IN		OUT	44	GRY 514 P1/2(4) GRY 514A → TO AV100(C14). ELEV STALL (OPTION) Seet-6 IF NO OPTION USED. PULL OUT WIRE GRY 514 FROM (44) AND CONNECT THIS WIRE TO THE GROUND.
20	CAN1 (+)		OUT	45	
21	CAN1 (-)		OUT	46	
22	AIN/CAN1 SHIELD		POWER SUPPLAY (+)	47	
23	IN	GRY 325A	POWER SUPPLAY (+)	48	LGRN 781 F FILTER E ORA 320 P3/4(9) ORA 320A → RHGB GROUND PRESSURE GAUGE
24	IN		POWER SUPPLAY (+)	49	LBLU 782 B D C DBRN 316 P3/4(7) DBRN 316A → LHGB GROUND PRESSURE GAUGE
25	IN		POWER SUPPLAY (+)	50	

CTR

686B PINK P3/4(15) 686 PINK → TO LEAF GATE SW Sheet-8

ES1/2
BLK B WHT WHT T2(3)
BRN A RED RED T2(1)
BLU C BLK BLK T2(2)
ELEVATOR STALL PROXIMITY SENSOR (OPTION)

WHT
RED 324 → TO R4 Sheet-2
BLK

351D RED

ORA 351G P3/4(5) → TO F7 Sheet-8

DBRN 340A P3/4(19) DBRN 340B D4 LBLU → TO HOPPER UP/DN SW Sheet-3

LBLU 321A P5/6(16) LBLU 321D → TO D26 Sheet-6

D7 (OPTION) ORA 215E

TO AUX HOPPER LIFT SW Sheet-3
HP1/2(D) 215A ORA P3/4(22) 215B ORA ORA 215C P5/6(28) ORA 215D

AUX HOPP LIFT PUMP Sheet-7

DBRN 658B → TO R6, REVERSE Sheet-3

LBLU 777 T2(11) T2(13) T2(15) SHL BLK RED WHT → BLK WHT RED CW → LHGB GROUND PRESS SET
DBLU 778 T2(11) T2(13) T2(16) SHL BLK RED WHT → BLK WHT RED CW → PRESS SET RHGB GROUND
LGRN 779 T2(12) T2(14) T2(17) SHL BLK RED WHT → BLK RED WHT 1 2 3 BLK RED WHT LST1/2 → TRANSDUCER LHGB PRESSURE
DGRN 780 T2(12) T2(14) T2(18) SHL BLK RED WHT → BLK RED WHT 1 2 3 BLK RED WHT RST1/2 → TRANSDUCER RHGB PRESSURE

GB PANEL ILLUMINATION LAMP BLK LT ORA 78M
ORA 78C HY1/2(B) ORA 78M → TO LINE 78 Sheet-2

ORA 78AC → RHGB GROUND PRESSURE GAUGE
RED 301AC → LHGB GROUND PRESSURE GAUGE

CB13 RED 301 P3/4(1) RED 301A
RED 301D
RED 301C
→ TO GB LIT SW Sheet-6

GLOBAL

TITLE	SIZE	DWG NO.
ELECTRICAL_SCHEMATIC_M3JD	C	330330

BA	09/23/14		–	–	PAGE 4 OF 12	28651	3
DRAWN BY	DATE DRAWN	ENGINEER	SCALE	SIMILAR P/N		CURRENT ER & REV	

CAN J1939
TO CTR-2 Sheet-4 & 10

120 OHM BR-2

CB14 — RED

RED
BLK
BLK — RED
VS25 (Voltage Suppressor)

1	POWER GND (-)	IN	26
2	POWER SUPPLY (+)	IN	27
3	CAN0 (+)	IN	28
4	CAN0 (-)	IN	29
5	AIN/CAN0 SHIELD	IN	30
6	IN	OUT	31
7	IN	OUT	32
8	5 VDC SENSOR PWR (+)	OUT	33
9	SENSOR PWR GND (-)	OUT	34
10	IN	OUT	35
11	IN	OUT	36
12	IN	OUT	37
13	IN	OUT	38
14	IN	OUT	39
15	IN	OUT	40
16	IN	OUT	41
17	IN	OUT	42
18	IN	OUT	43
19	IN	OUT	44
20	CAN1 (+)	OUT	45
21	CAN1 (-)	OUT	46
22	AIN/CAN1 SHIELD	POWER SUPPLAY (+)	47
23	IN	POWER SUPPLAY (+)	48
24	IN	POWER SUPPLAY (+)	49
25	IN	POWER SUPPLAY (+)	50

CTR-2

968 — DBRN — OPEN IF TANK EMPTY — LOW LVL WAT SW — BLK
969 — YEL — CLOSED IF TANK EMPTY — LH HYD OIL LEVEL SW — BLK
970 — ORA — CLOSED IF TANK EMPTY — RH HYD OIL LEVEL SW — BLK

18-GRY-972A

18-RED-35RC — SPRAY WATER RECIRCULATION SW (OPTION) — 18-GRY-972 — BK1/2(27)
TO LINE 35 Seet-3

SN3/4(B) / SN3/4(A) — YEL — SCHIELD
TO SPEED SENSOR Sheet-3

LBLU — 321D — TO D7 Sheet-4
D26
LBLU — 952B — MAIN BY-PASS SOL-10 — BLK

DBRN — 951 — DBRN — 951A — HI-SPEED SOL-8 — BLK — DBRN — VS11 — DBRN — 952A
LBLU — 952 — LBLU — LBLU — VS12 — LBLU
DPUR — 953 — DPUR — 953A — GB BY-PASS SOL-18 — BLK — DPUR — VS13 — DPUR
DBLU — 954 — DBLU — 954A — LHGB ROTATE SOL-13 — BLK — DBLU — VS14 — DBLU
DGRN — 955 — DGRN — 955A — RHGB ROTATE SOL-12 — BLK — DGRN — VS15 — DGRN
ORA — 956 — ORA — 956A — PUB UP SOL-4A — BLK — ORA — VS16 — ORA
DPUR — 958 — DPUR — 958A — PUB DN SOL-4B — BLK — DPUR — VS17 — DPUR
PINK — 959 — PINK — 959A — ELEV REV SOL-7B — BLK — PINK — VS18 — PINK

CB13

DBRN — 960 — 86 / 30 / 85 / 87A / 87 — R20 ELV FWD — YEL — 967
YEL — 967 — YEL — 967B — ELEV FWD SOL-7A — BLK
YEL — 967C — ELEV FWD SOL-7D — (OPTION) BLK
YEL — 967D — ELEV FWD SOL-7E — (OPTION) BLK

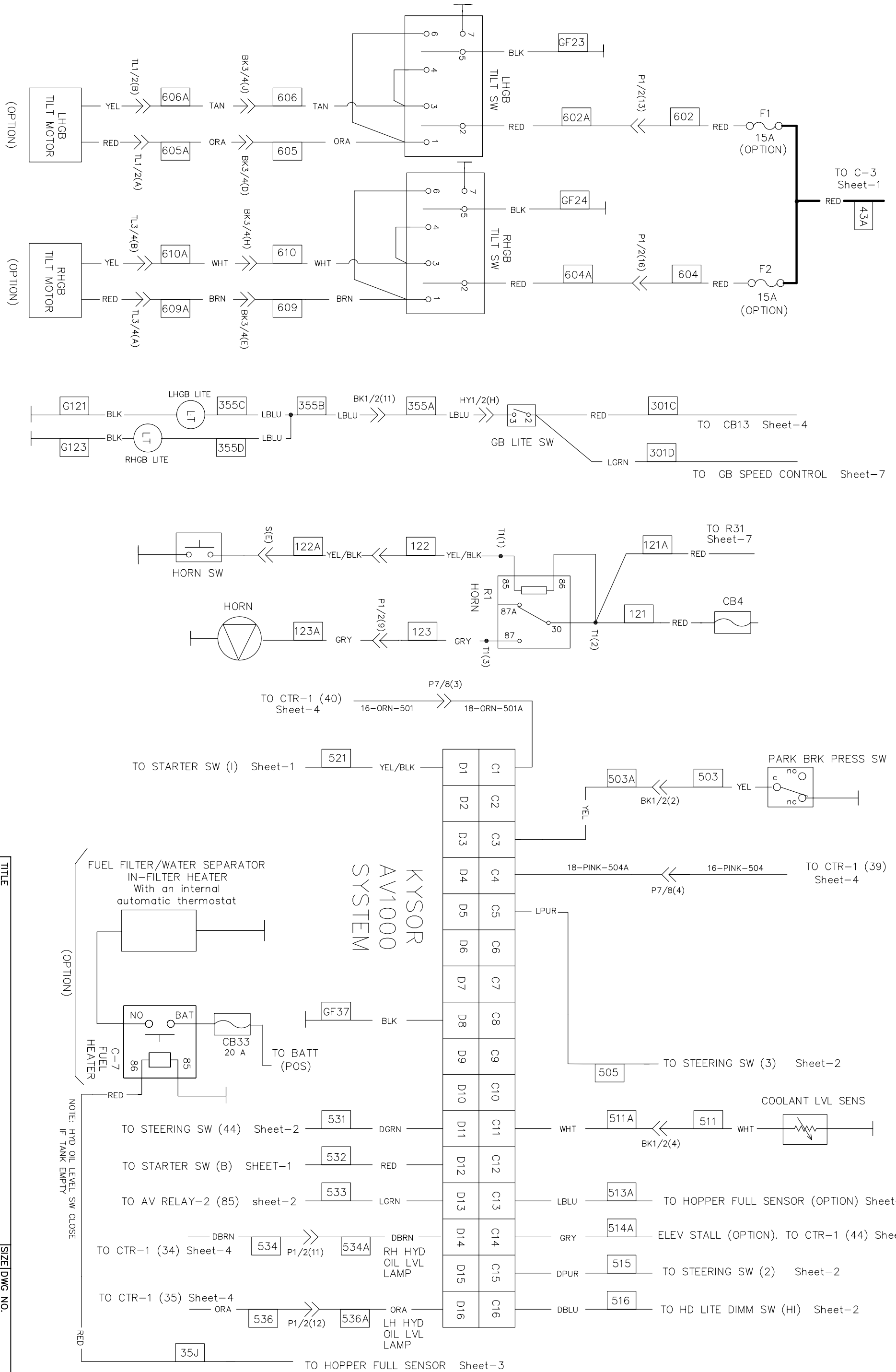
YEL — 961 — YEL — 961A — RHGB UP SOL-5A — BLK — YEL — VS19 — YEL
DBRN — 962 — DBRN — 962A — RHGB DN SOL-5B — BLK — DBRN — VS20 — DBRN
GRY — 963 — GRY — 963A — LHGB UP SOL-6A — BLK — GRY — VS21 — GRY
YEL — 964 — YEL — 964A — LHGB DN SOL-6B — BLK — YEL — VS22 — YEL
DPUR — 965 — DPUR — 965A — TO C-6 Sheet-9 — DPUR — VS23 — DPUR
WHT — 966 — WHT — 966A — TO C-8 Sheet-9 — WHT — VS24 — WHT

Sheet-5

GLOBAL

TITLE	SIZE	DWG NO.
ELECTRICAL_SCHEMATIC_M3JD	C	330330

DRAWN BY	DATE DRAWN	ENGINEER	SCALE	SIMILAR P/N	PAGE	CURRENT ER & REV
BA	09/23/14		–	–	PAGE 5 OF12	28651 3



Sheet-6

TITLE	ELECTRICAL_SCHEMATIC_M3JD
DRAWN BY	BA
DATE DRAWN	09/23/14
ENGINEER	
SCALE	–
SIMILAR P/N	–
PAGE	6 OF 12
CURRENT ER & REV	28651 3
SIZE	C
DWG NO.	330330

BLK GCAB GND DOME POS RED 197B CA1/2(B) 197A RED P3/4(17) 197 RED CB6

GND ARROW SIGN (OPTION) POS MEM

RED 241D 6" FAN CABINE WALL FAN WITH INTERN. ON/OFF SW (OPTION)

GND RADIO (OPTION) POS 241C RED 241B CA1/2(A) 241A RED P3/4(18) 241 RED CB9

G90 BLK LT RH REVERSE LITE 204D BRN/GRN

G88 BLK LT LH REVERSE LITE 204C BRN/GRN

G87 BLK REVERSE ALARM 204B BRN/GRN

BRN/GRN 204A P5/6(1) TO D3 Sheet-3

TO D7 Sheet-4 215D ORA

310A RED TO CB10 Sheet-3

T2(10) 85 86 87A 30 87 T2(9) T2(8) 121A RED TO CB4 Sheet-6

661 R31 AUXH (OPTION)

AUX HOPPER LIFT PUMP (OPTION) M RED 38 TO BATT (POS)

BLK TO GAUGES +12VDC RED 35W

WATER DETECTION KIT P/N: 324741 LED & BUZZER IGN GND SIG G-UNT G-SEN BLK YEL 368 (OPTION)

WATER SENSOR PROBE P/N: 324740

FUEL/WATER SEPARATOR (OPTION)

LGRN 661A LGRN D30 (OPTION) DGRN 660 P3/4(30) DGRN 660A

LGRN 661B P3/4(31) LGRN 661C

TO AUX HOPPER LIFT SW (OPTION) Sheet-3

LIGHTER (OPTION) 231B RED

Sheet-7

231A RED P1/2(27) 231 RED CB15

RED 231C LT1/2(F) 231D RED

LH FLASHER LMP BLK FLS 194B WHT

RH FLASHER LMP BLK FLS 194C WHT

194A WHT REAR FLASHER 256 DPUR BK1/2(28) 256B DPUR LT1/2(E) REAR FLASHER SW 231G RED

RH REAR FLOOD BLK G139 FL 225D WHT

LH REAR FLOOD BLK G119A FL 225C WHT

225B WHT BK1/2(9) 225A WHT LT1/2(B) REAR FLOOD SW RED 231E

(OPTIONS)

RH FRNT FLOOD BLK GRFFL FL 224C LPUR

LH FRNT FLOOD BLK GLFFL FL 224B LPUR

224A LPUR LT5/6 224 LPUR FRONT FLOOD SW RED 231F

BLK G115 REAR BEACON BC 192D ORA 192B ORA BK1/2(10) 192A ORA LT1/2(C) 192 ORA BEACON SW 191B RED LT1/2(A) 191A RED P1/2(19) 191 RED CB12

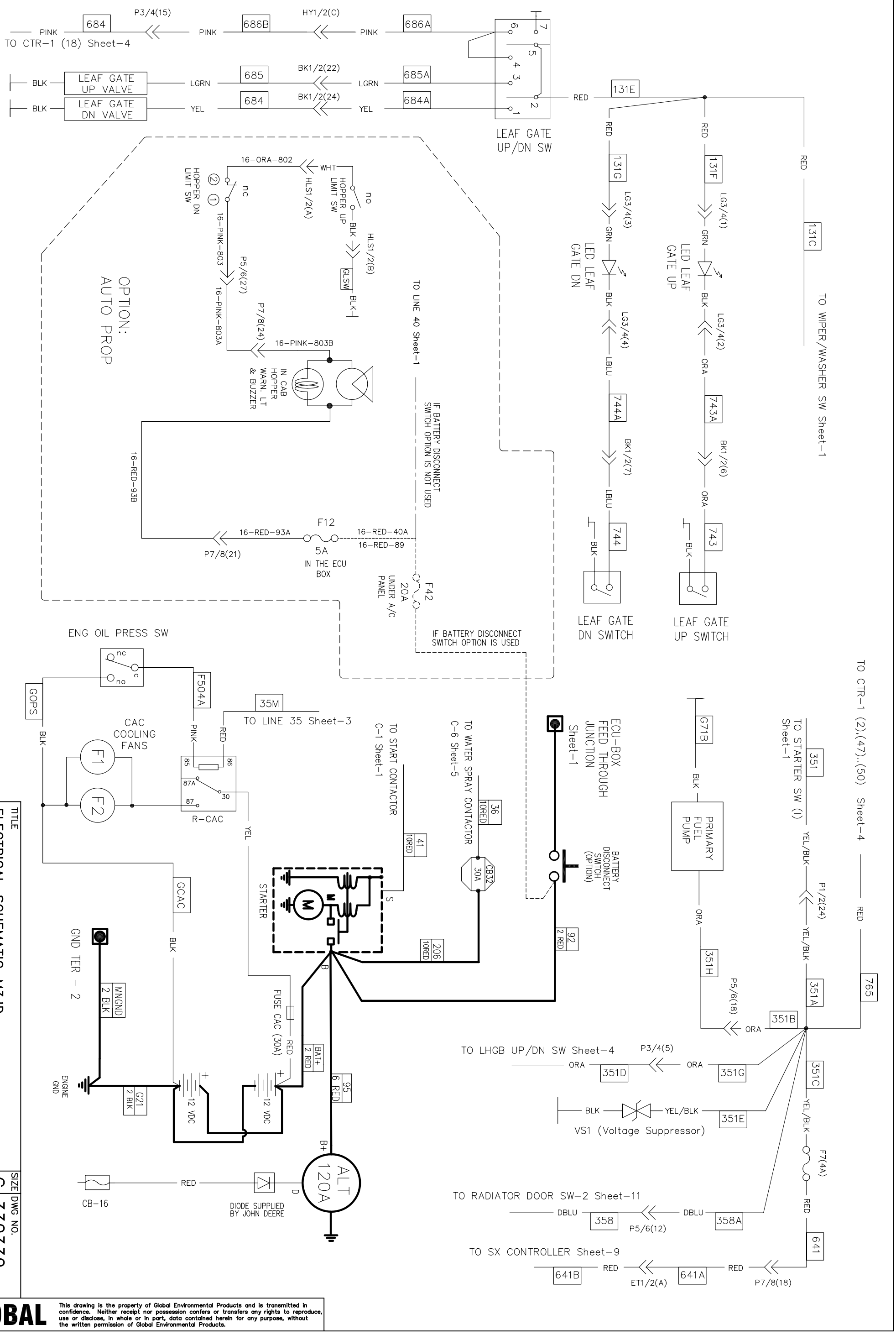
CAB BEACON BLK GBAC BC 192C ORA CA3/4(A) ORA 192E

(OPTION) G96 BLK GB SPEED CONTROL SOL-GS 365B ORA BK1/2(20) 365A ORA HY3/4 365 ORA RHEOSTAT

366 TAN BLK GB SPEED CONTROL ON/OFF SW LGRN 301D TO GB LITE SW Sheet-6

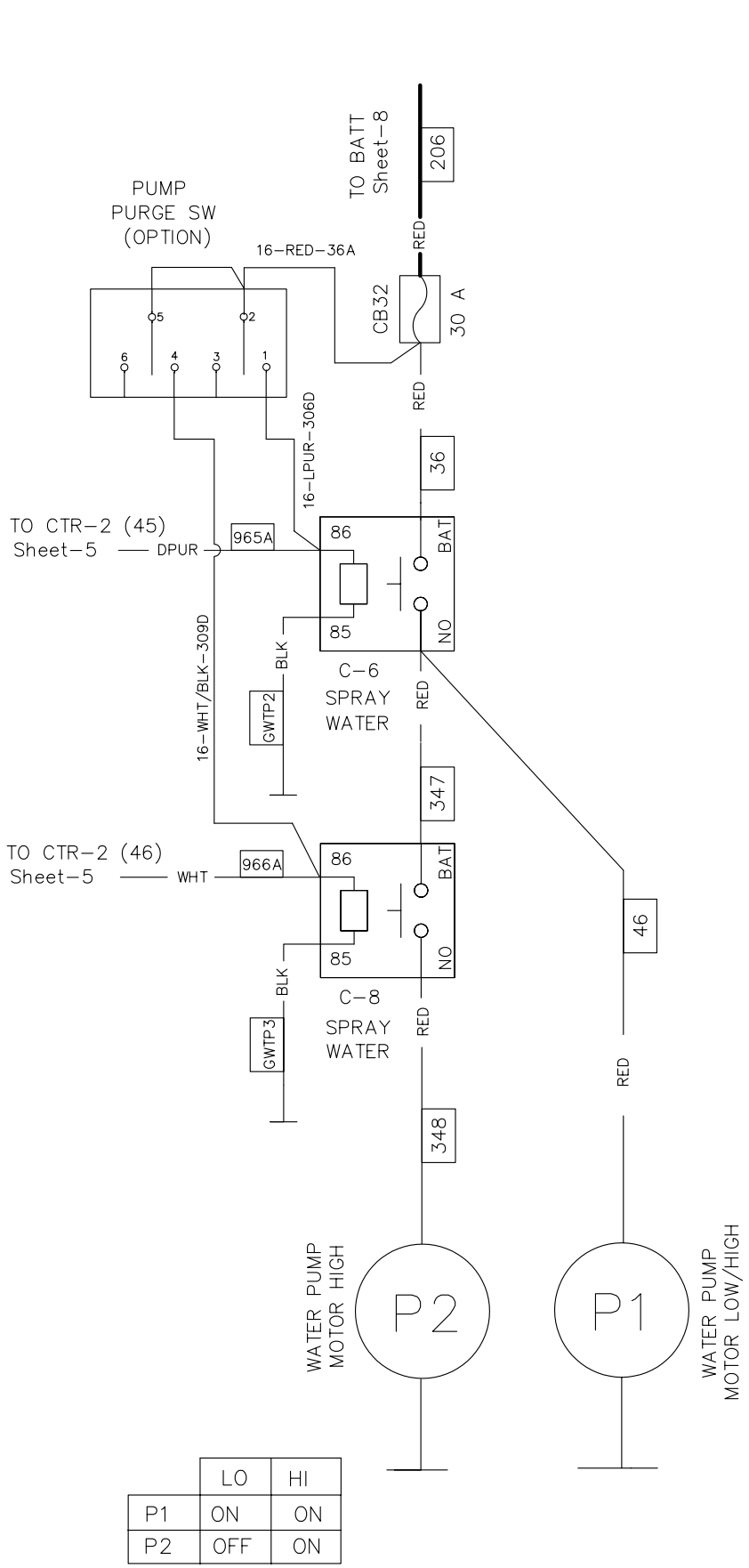
TITLE ELECTRICAL_SCHEMATIC_M3JD

DRAWN BY	BA
DATE DRAWN	09/23/14
ENGINEER	
SCALE	–
SIMILAR P/N	–
PAGE	7 OF 12
CURRENT ER & REV	28651 3
SIZE	C
DWG NO.	330330

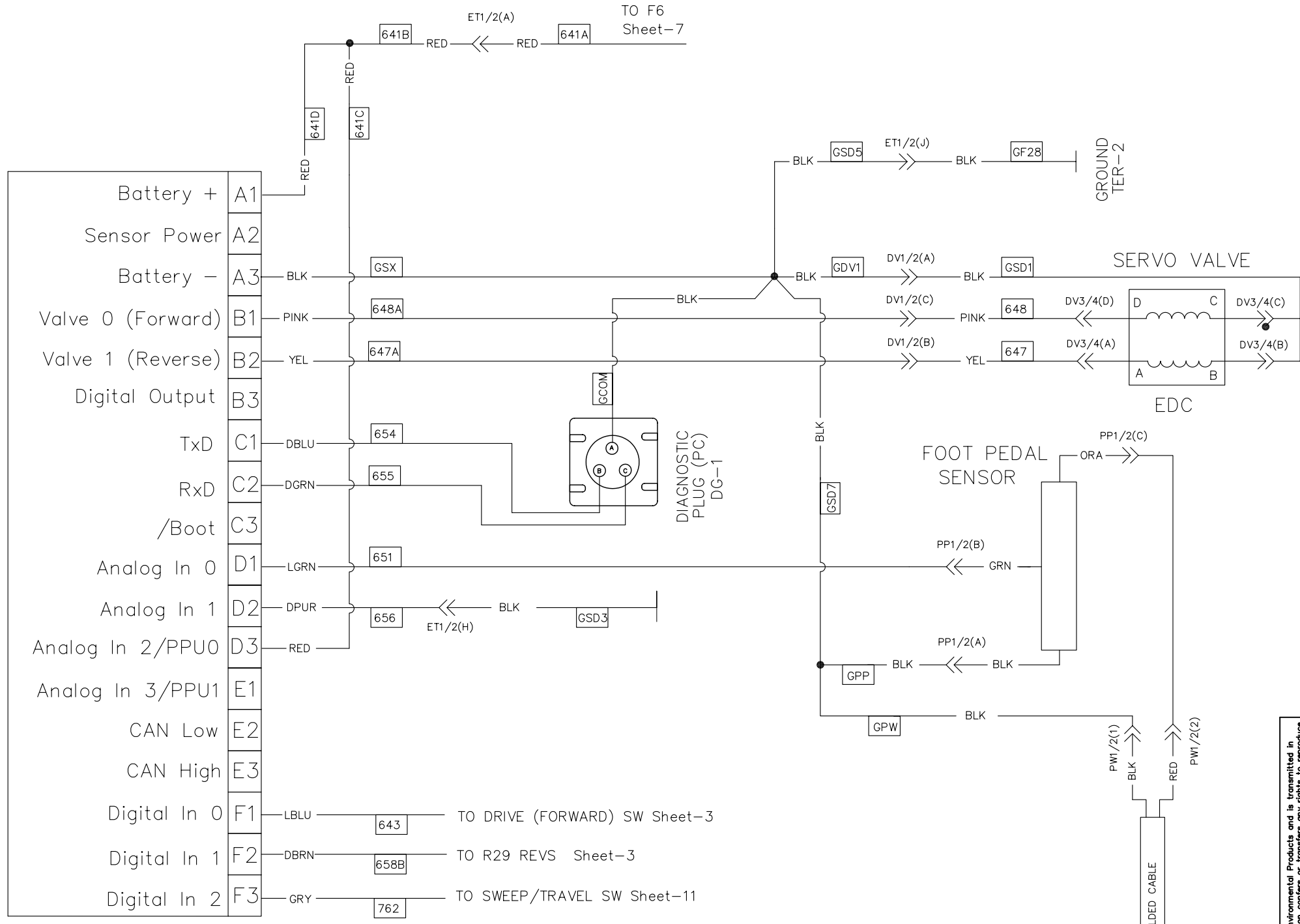


Sheet-8

TITLE	ELECTRICAL_SCHEMATIC_M3JD
BA	
DRAWN BY	
09/23/14	
DATE DRAWN	
–	
ENGINEER	
–	
SCALE	
–	
SIMILAR P/N	
PAGE 8 OF 12	
SIZE C	DWG NO. 330330
28651	3
CURRENT ER & REV	



	LO	HI
P1	ON	ON
P2	OFF	ON



SAUER DANFOSS TRANSMISSION
SX CONTROLLER

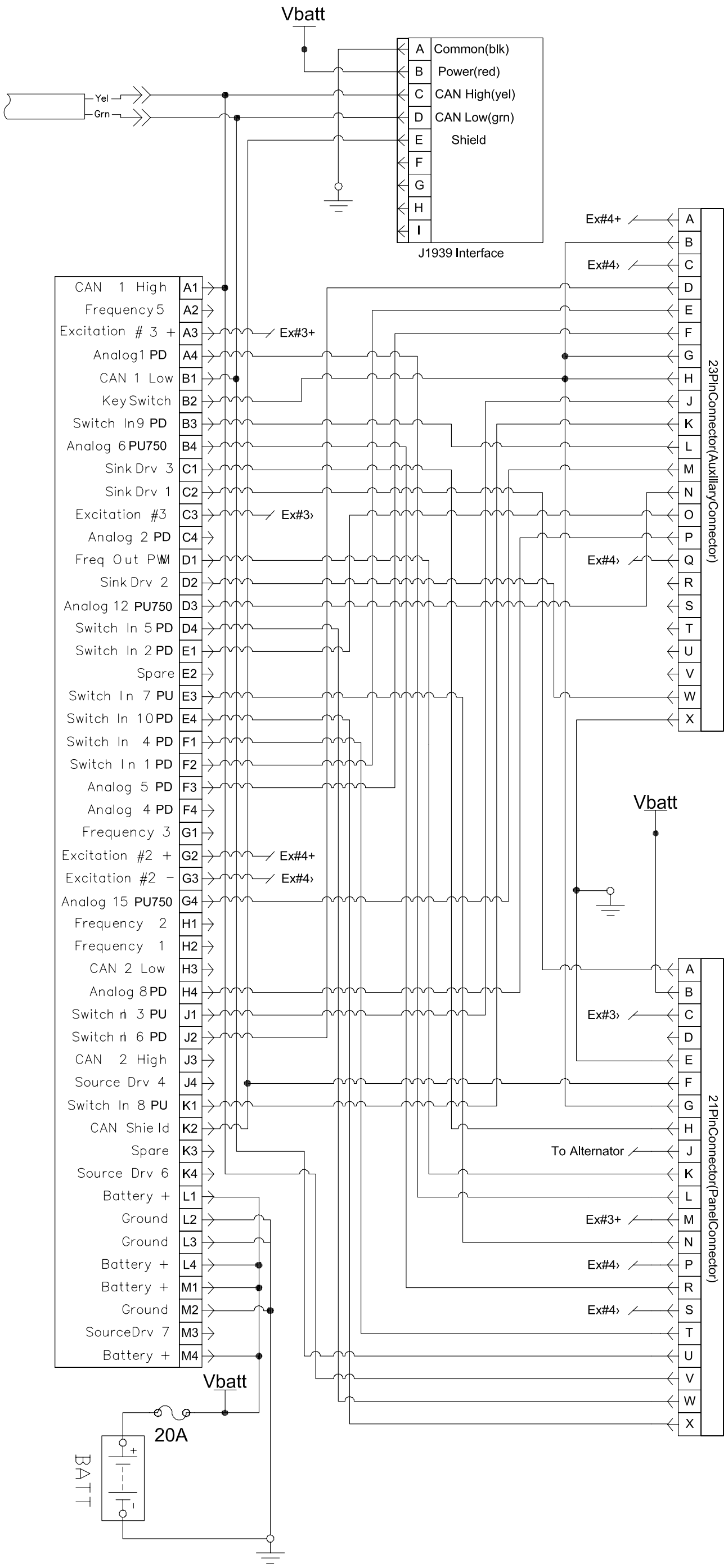
GLOBAL

TITLE	SIZE	DWG NO.
ELECTRICAL_SCHEMATIC_M3JD	C	330330

DRAWN BY	DATE DRAWN	ENGINEER	SCALE	SIMILAR P/N	PAGE	CURRENT ER & REV
BA	09/23/14		–	–	9 OF 12	28651 3

L16 Truck Engine Application Interface

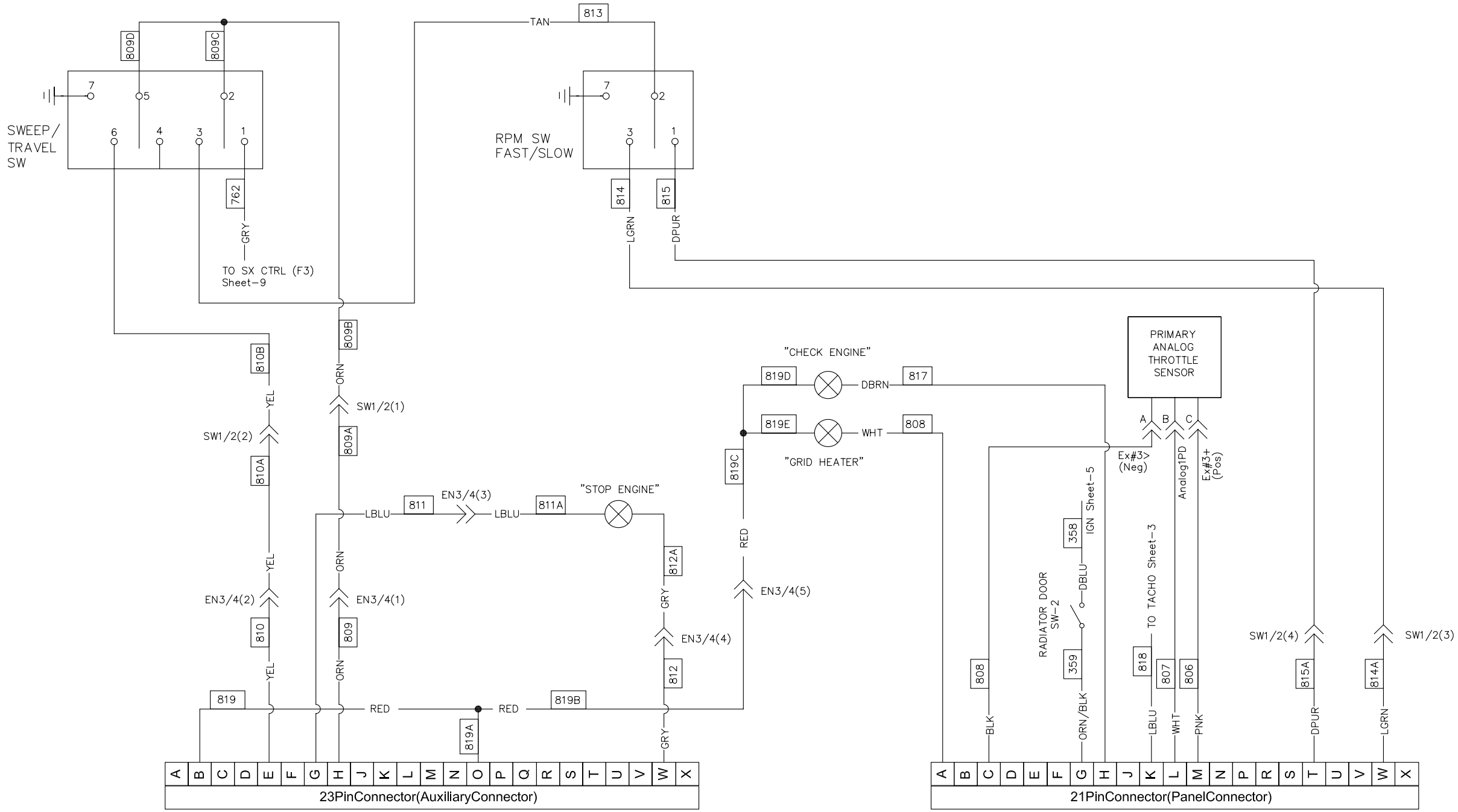
CAN J1939
TO CTR- 1 & 2 Sheet-4 & 5



Sheet-10

TITLE
ELECTRICAL_SCHEMATIC_M3JD

DRAWN BY	
DATE DRAWN	09/23/14
ENGINEER	
SCALE	–
SIMILAR P/N	–
PAGE 10OF12	
CURRENT ER & REV	28651 3
SIZE	C
DWG NO.	330330



GLOBAL

Sheet-11

TITLE	SIZE	DWG NO.
ELECTRICAL_SCHEMATIC_M3JD	C	330330

BA	09/23/14		–	–	PAGE 11OF12	28651	3
DRAWN BY	DATE DRAWN	ENGINEER	SCALE	SIMILAR P/N		CURRENT ER	& REV

L16 Truck Engine Application Interface

6 Cylinder Firing Order:
Injector 0 = Cylinder 1
Injector 1 = Cylinder 5
Injector 2 = Cylinder 3
Injector 3 = Cylinder 6
Injector 4 = Cylinder 2
Injector 5 = Cylinder 4

4 Cylinder Firing Order:
Injector 0 = Cylinder 1
Injector 1 = Cylinder 3
Injector 2 = Cylinder 4
Injector 3 = Cylinder 2

6 Cylinder Engine Only

Inj 1, 3, 5 High
Inj 5 Low
Shield
5
Inj 0, 2, 4 High
Inj 4 Low
Shield
4
Inj 1, 3, 5 High
Inj 3 Low
Shield
3
Inj 0, 2, 4 High
Inj 2 Low
Shield
2
Inj 1, 3, 5 High
Inj 1 Low
Shield
1
Inj 0, 2, 4 High
Inj 0 Low
Shield
0

Cold Start Diagnostics

Vbatt
(OPTION)
Air Heater
Air Heater Relay
B
A
Cold Start Air

J1

Injector 5 ›	A1	Inj 5 Low
Switch In 11PD	A2	
Analog 7PD	A3	
CAM Speed +	A4	
Injector 4 ›	B1	Inj 4 Low
Analog 14PU10k	B2	
Analog 9PD	B3	
CRANK Speed +	B4	
Injector 3 ›	C1	Inj 3 Low
Analog 13PU750	C2	
Analog 3PD	C3	
Analog 10PU750	C4	
Injector 2 ›	D1	Inj 2 Low
Excitation #2 ›	D2	Ex#2›
Excitation #1+	D3	Ex#1+
CRANK Speed ›	D4	
Injector 0 ›	E1	Inj 0 Low
Excitation #1 ›	E2	Ex#1›
Analog PU150K	E3	
CAM Speed ›	E4	
Injector 1 ›	F1	Inj 1 Low
Shield Drain	F2	Shield
Excitation #2 +	F3	Ex#2+
Analog 11 PU750	F4	
Inject 0, 2, 4 +	G1	Inj 0, 2, 4 High
Inject 1, 3, 5 +	G2	Inj 1, 3, 5 High
Frequency 3	G3	
Switch In PU	G4	
Pump Solenoid +	H1	
Pump Solenoid ›	H2	
Frequency Out	H3	
Driver 6PWM	H4	Cold Start Aid

Cam
A
B
Crank
B
A
Mating View of RP Connector
2 1 3

Oil Pressure
Ex#2›
Ex#2+
1
3
2
Inc P

WIF
A
B
200K
Ex#2›

Fuel Pressure
Ex#2›
Ex#2+
1
3
2
Inc P

Manifold Temperature
Ex#2›
A
B
t

Manifold Pressure
Ex#2›
Ex#2+
1
3
2
Inc P

Coolant Temp
Ex#2›
A
B
t

Rail Pressure
Ex#1›
Ex#1+
2
1
3
Inc P

Fuel Temp
Ex#2›
1
2
t

Low Pressure Fuel Pump
Ex#2+
1 Speed CMD
2 Current Out
3 Status Out
4 Power On Sig
5 Power
6 Ground

Shield (24V)
Shield
Twisted Pair (12V)
HP Pump
Vbatt

Sheet-12

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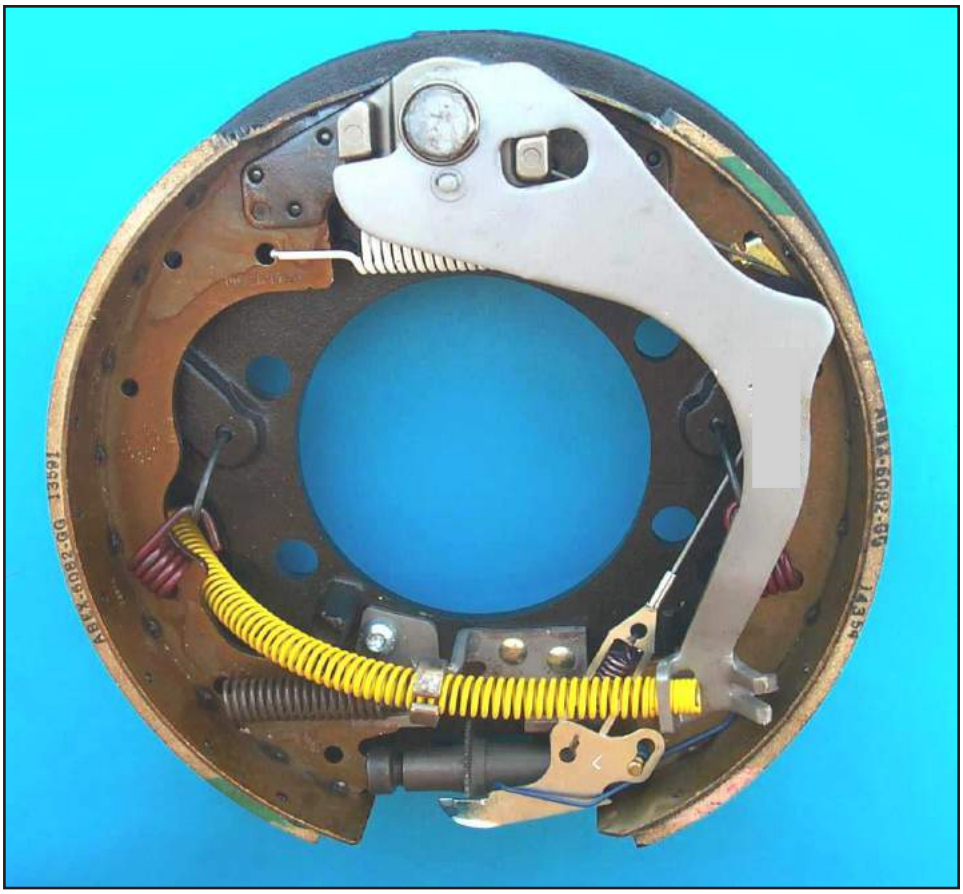
Brake systems for medium duty trucks

305x76 Park Brake



Service Manual
2nd Edition

Important Service Notes

The information in this publication was current at the time of printing. The information presented in this publication is subject to change without notice or liability.

The information contained in this publication is intended for use by properly trained and equipped professional technicians and is NOT for the “Do It Yourselfer.”

⚠WARNING

Failure to follow safety and vehicle repair procedures either contained in this manual, in the chassis and vehicle manufacturer’s repair manuals or in accordance with other accepted methods can result in personal injury, death, or damage to components, vehicles, or personal property.

2nd Edition
February 2006

Contents

305x76 mm Park Brake

EXPLODED VIEW
(Typical)

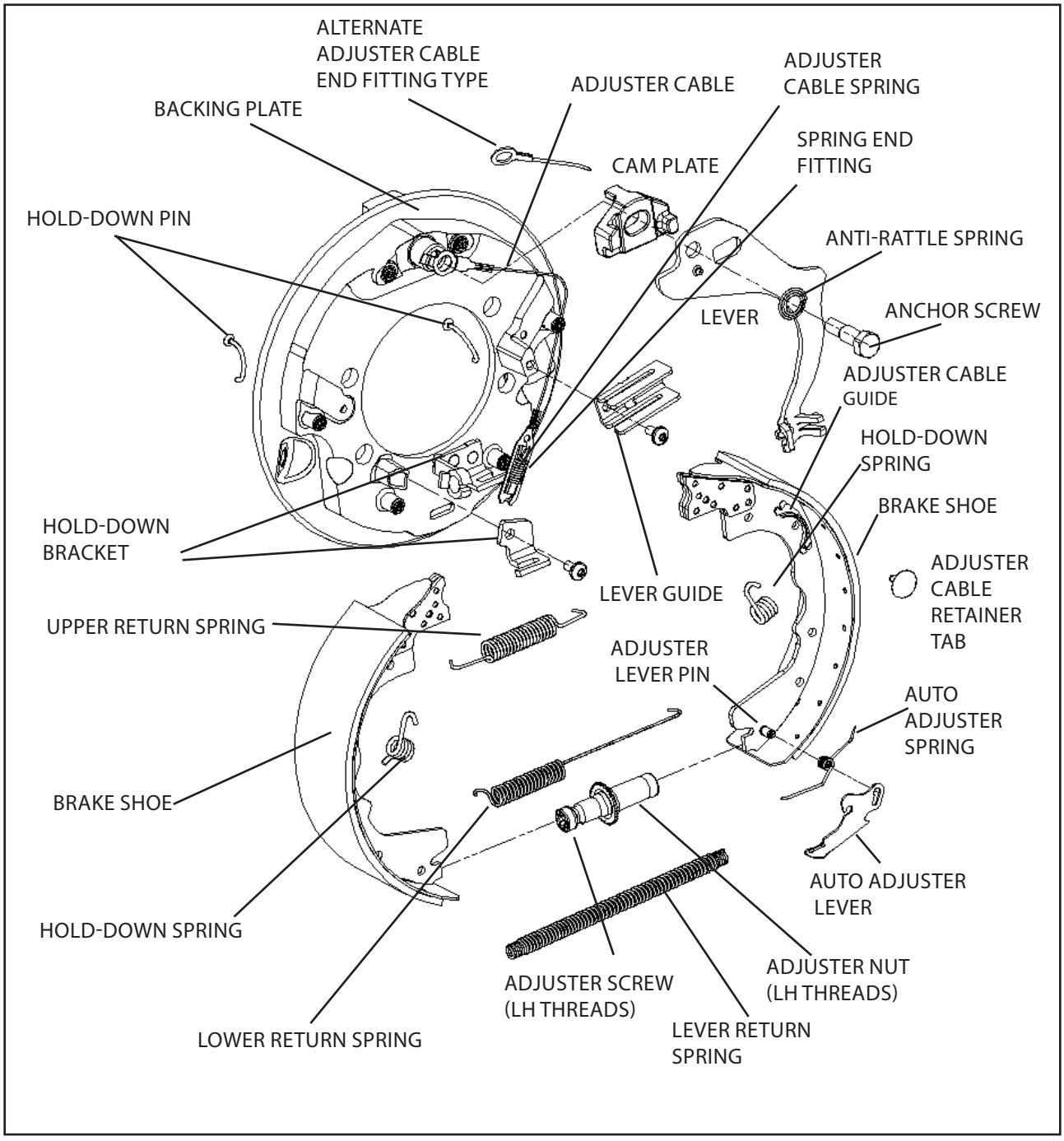


Figure 1.

Introduction

The 305 x 76 mm park brake is a lever actuated, duo-servo, single-anchor drum brake. The brake is designed for driveline mounted applications typically on the rear axle differential carrier housing. Its self-adjusting feature enables the brake to maintain a consistent functional clearance between the brake shoes and the drum as the shoe linings wear.

There are three (3) releases of this brake in service. Release 1 was the original release and manufactured prior to April 2002. The Release 2 design has a brake manufacture date after April 2002 and up to December 2005. The Release 3 design has a manufacture date after December 2005. Figure 2 shows the Release 1 brake, highlights the differences between the Release 1 and Release 2 brakes. Figure 3 shows the Release 2 brake and highlights the differences between Release 1 and Release 2 brakes. Figure 4 shows the Release 3 brake and highlights the differences between Release 2 and Release 3.

Basic Major Components

The foundation of the brake is a ductile iron backing plate. Major actuating components are a cam and a lever, which are fastened to the backing plate by an anchor screw. An anti-rattle spring under the head of this screw reduces clatter. Brakes with hex socket anchor screw (Release 1) will also have two flat washers immediately under the head of the screw. The anchor point for brake actuation and shoe abutment is located at the 12 o'clock position when the assembly is properly mounted. See Figures 1, 2, 3 and 4.

Service Component Interchangeability

Only use Release 1 brake components on Release 1 brakes.
Only use Release 2 brake components on Release 2 brakes.
Release 3 brake components can be used on Release 2 brakes.

305 x 76 mm Park Brake

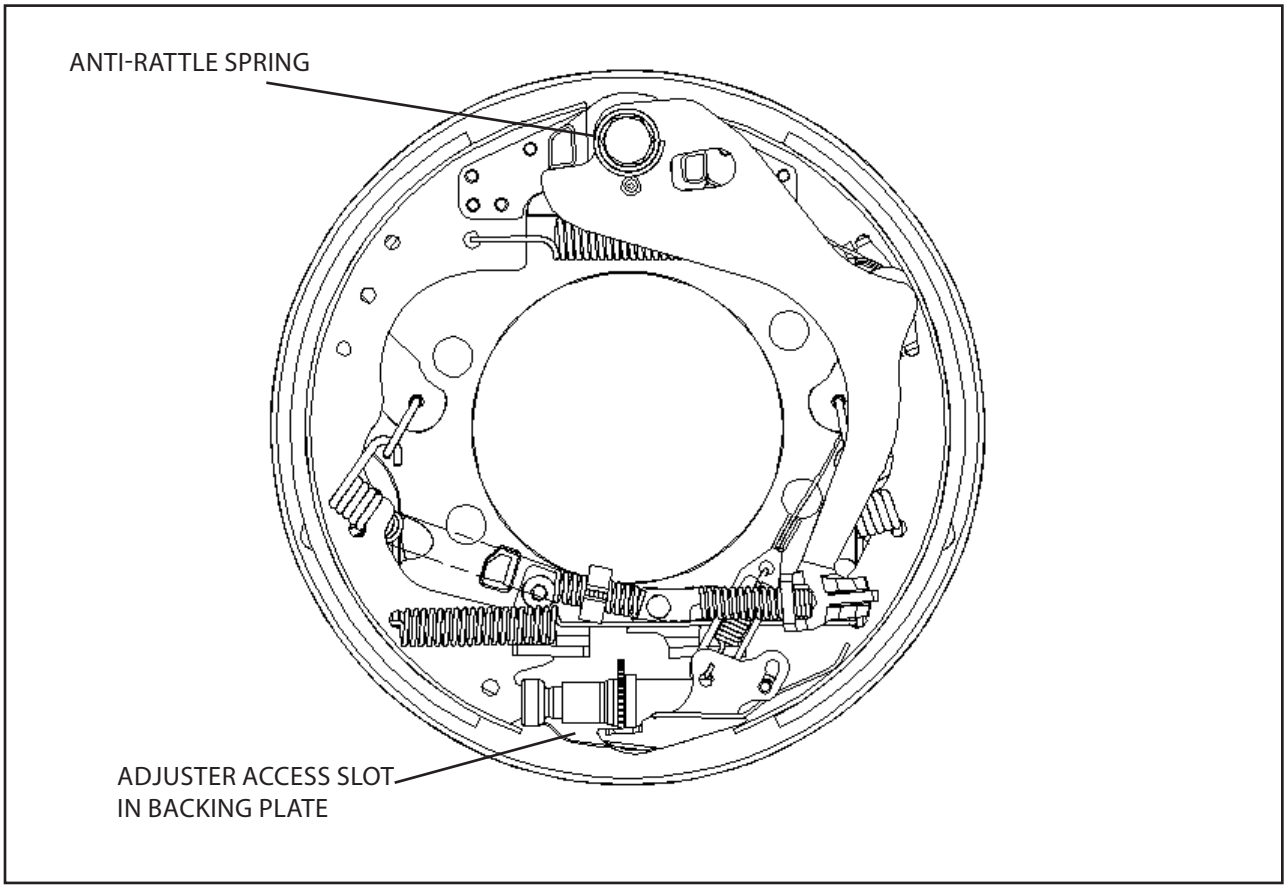


Figure 4. 305x76 Park Brake Major Components
(Release 3 Shown)

Release 3 - Manufactured beginning December 2005.

Features:
- No apply lever guide
- Revised anti-rattle spring
- Adjuster access slot size increased

Includes features from Release 2:
- Apply lever with bump stop
- External hex head style anchor screw with M12 thread
- Abex-6082-GG lining codes
- Revised adjuster cable anchor end fitting
- Adjuster cable retainer tab

Shoes and Related Components

Brake shoes are attached to the backing plate by hold-down springs and pins, shown in Figure 5. Both shoes seat against the backing plate anchor post at the top and are connected by the adjuster nut and screw assembly at the bottom. Shoe hold-down brackets are permanently mounted to the backing plate to assist in guiding the shoes. The shoes are pulled toward each other by two low-tension shoe return springs. Proper orientation of the various springs, including their hook ends, must be maintained for proper function. The starwheel used for adjusting the shoe clearance to the drum is on the adjuster nut.

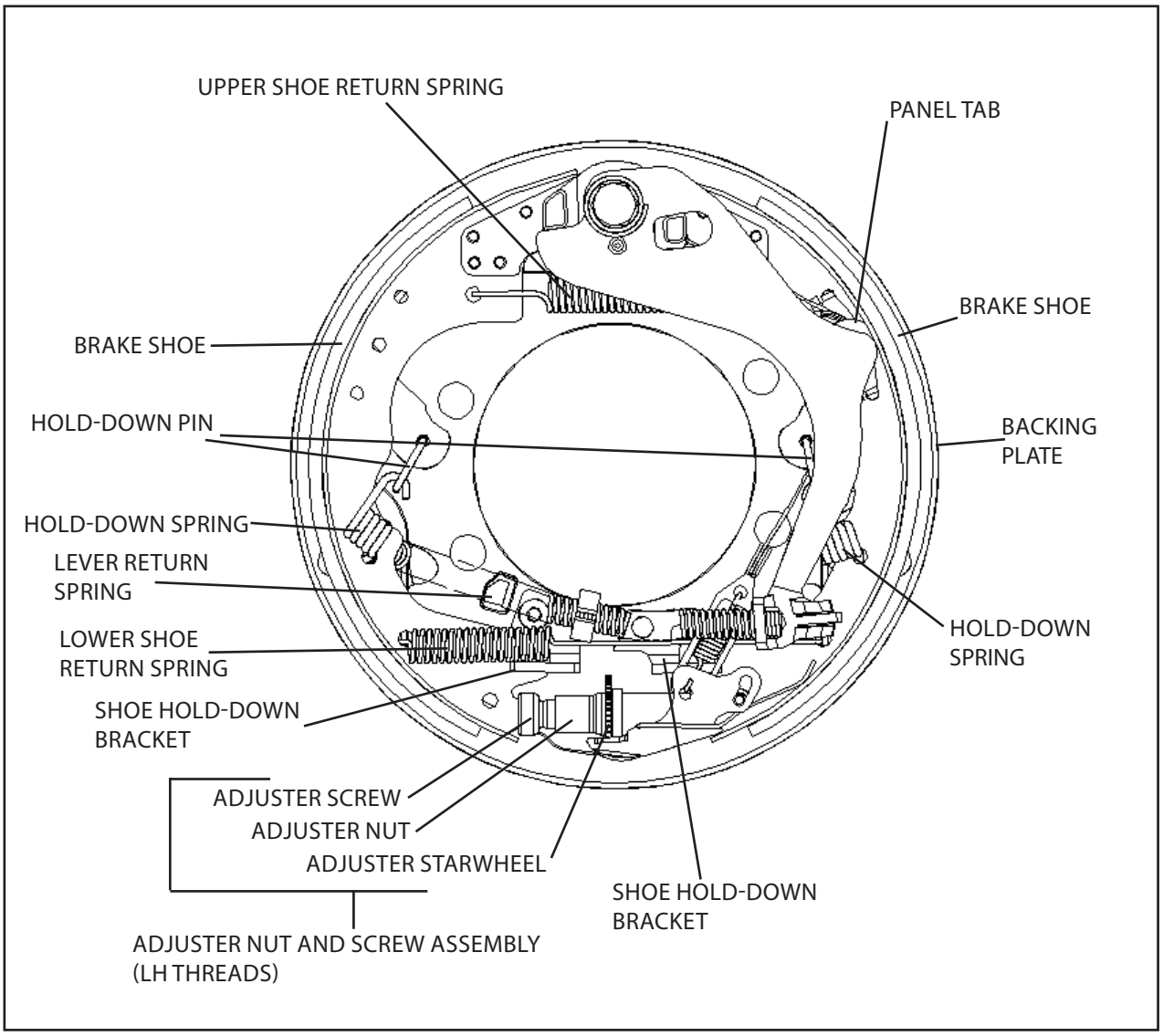


Figure 5. Brake Shoes and Related Components (Release 3 shown)

Shoe Cage Adjusting Components

The clearance between the shoe linings and the inside drum surface is adjusted in response to excessive movement of a given shoe when the brake is actuated. This excessive movement is typically due to normal wear of the lining during use. (See SHOE REPLACEMENT and SHOE CAGE ADJUSTMENT procedures for details.) The adjuster cable is anchored on top of the anchor post, under the cam, by the anchor screw, routed along the side of the shoe by a cable guide, and attached to the auto adjuster lever via a spring (assembled on the cable end-fitting) at the bottom of the brake. A push in panel tab retains the cable in the cable guide. The adjuster lever seats against the starwheel on the adjuster nut. The adjuster screw and adjuster nut/starwheel assembly use left hand threads to expand the shoes to compensate for lining wear.

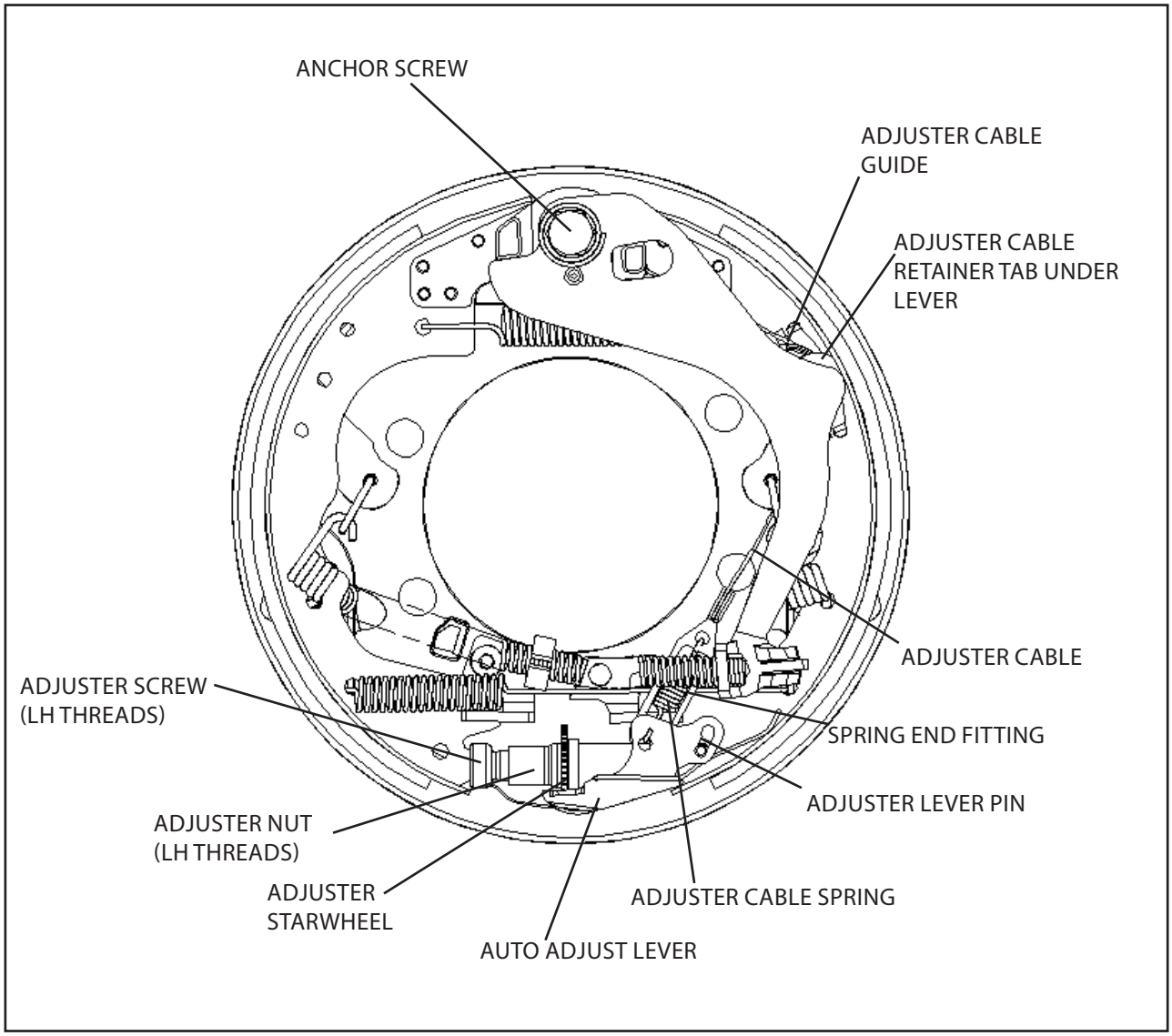


Figure 6. Shoe Cage Adjusting Components (Release 3 shown)

Before Servicing Brakes...

Information in this manual is not intended to replace the vehicle manufacturer's service manual. Always refer to the latest vehicle manufacturer's service information. Information contained in this manual is subject to change without notice.

Always verify proper operation of the park brake prior to returning vehicle to service.

⚠WARNING

Always wear eye protection. Keep fingers, hands and other body parts away from the brake when verifying operation. Do not stand by or under a vehicle at this time.

⚠WARNING

Always block vehicle to prevent vehicle movement, such as with suitable wheel chocks. Failure to do this could result in personal injury or property damage.

⚠WARNING

Do not work under or around a vehicle supported by a mechanical or hydraulic jack. Vehicle must be supported by suitable floor stands. Failure to do so can result in personal injury or propery

⚠CAUTION

Keep grease and other foreign materials away from the shoe lining and drum surfaces. Contamination of shoe linings or drum surface may result in degradation of brake holding capability, possibly resulting in personal injury or property damage.

⚠WARNING

Use only original equipment parts, available through the vehicle manufacturer's Service department.

Failure to do so may result in reduced brake performance, possibly resulting in personal injury or property damage.

Inspection

Note: It is not necessary to raise vehicle for "inspection" in most cases. However, if required, follow steps 1 through 3 in SHOE REPLACEMENT section.

Anytime service is required, it is recommended that a complete visual inspection be performed on all components in the park brake assembly. This includes:

1. Follow manufacturer's recommended procedures to ready the vehicle for servicing. Pay attention to all WARNING and CAUTION notes throughout this booklet.

2. Remove the drum. See vehicle manufacturer's service manual for details.

3. Clean the individual brake components, removing dust and grease.

4. Visually inspect the brake shoes (Figure 5). Shoes should be replaced if there is uneven lining wear or when the remaining lining reaches 0.76 mm (0.030" or approximately 1/32") thickness or less above the shoe. If grease, automotive fluids, or other foreign material that would compromise operation is found on, soaked into or embedded in the linings, the shoes should be replaced. Also, if cracks, excessive deformation, or wear on either end is found, the shoes should be replaced. See section on SHOE REPLACEMENT for service details.

5. Visually inspect the brake lever and cam (Figure 1). If cracks, excessive wear, or abnormal deformation is found in either part, they should be replaced. Light wear, which typically shows up as polishing is acceptable. If unsure, replace brake lever, cam plate and anchor screw. See section on ANCHOR SCREW, LEVER, AND CAM REPLACEMENT for service details.

6. Inspect various springs and hold down pins (Figure 5) for excessive wear, heat discoloration, heavy corrosion or other damage and replace as necessary. See section on SHOE REPLACEMENT for service

⚠WARNING

Whenever possible, work on brakes in a separate area away from other operations. Always wear a respirator approved by NIOSH or MSHA during all brake service procedures. NEVER use compressed air or dry brushing to clean brake parts or assemblies. OSHA recommends that you use cylinders that enclose the brake. These cylinders have vacuums with high efficiency HEPA filters and worker's arm access sleeves. But, if such equipment is not available, carefully clean parts and assemblies in the open air.

Clean brake parts and assemblies in the open air. During disassembly, carefully handle all parts to avoid getting dust in the air. Use an industrial vacuum cleaner with a HEPA filter system to clean dust from the brake drums, backing plates and other brake parts. After using the vacuum, remove any remaining dust with a rag soaked in water and wrung until nearly dry.

Inspection (continued)

7. Inspect adjuster cable assembly for damage or wear (Figure 5). Replace as necessary. See section on SHOE REPLACEMENT for service details.

8. Inspect adjuster nut and screw (Figure 5) for any damage or corrosion to the threads or burrs, chips, corrosion or other damage to the teeth on the adjuster nut starwheel. Damaged teeth or threads may prevent proper function of the brake self-adjusting function. Replace as necessary. See section SHOE REPLACEMENT for service details.

9. Clean-out all dust or grease present on the inside of drum. Use a 12 inch caliper or an inside diameter micrometer to measure the manufacturer's recommended inside diameter of the drum. Replace drum if it exceeds maximum inside diameter (which typically is stamped on the inside of the drum near the mounting holes), is worn unevenly, has deep grooves, heavy corrosion or excessive runout. See vehicle manufacturer's service manual for details.

10. Inspect the parking brake lever-apply cable for excessive wear or damage, and replace as necessary. See vehicle manufacturer's service manual for details.

11. Inspect the axle pinion oil seal for leakage that can contaminate the park brake system parts and repair as necessary. See vehicle manufacturer's service manual for details.

12. After a thorough inspection, if the brake and its components are found to be in good working condition, check parking brake for proper shoe cage adjustment. See Shoe Cage Adjustment Procedures section for details.

Shoe Replacement

Removing the Shoes

1. Block the front wheels to keep the vehicle from moving.
2. With the engine off and battery disconnected, place the transmission in gear and release the parking brake.
3. If recommended in vehicle manufacturer's service manual, raise the rear of the vehicle so the wheels clear the floor and install safety stands to support.
4. Remove the drum. See vehicle manufacturer's service manual for details, if necessary.

⚠CAUTION

Do not use a drum puller or a torch to remove a brake drum. Drum distortion may result.

Note: If the drum proves difficult to remove, insert a thin flat bladed screwdriver through the brake adjusting hole in the backing plate and disengage the adjuster lever from the adjuster nut teeth. With the adjuster lever disengaged as shown in Figures 14 and 15, insert a brake adjusting tool (or flat bladed screw driver) through the adjusting hole to engage the adjusting nut teeth. Move the teeth upward enough times to retract the brake shoes to clear the drum. If the drum is rusted to the axle input flange yoke pilot, tap the center of the brake drum with a nonmetallic mallet to loosen.

5. Inspect the brake per the INSPECTION PROCEDURE in this service manual.

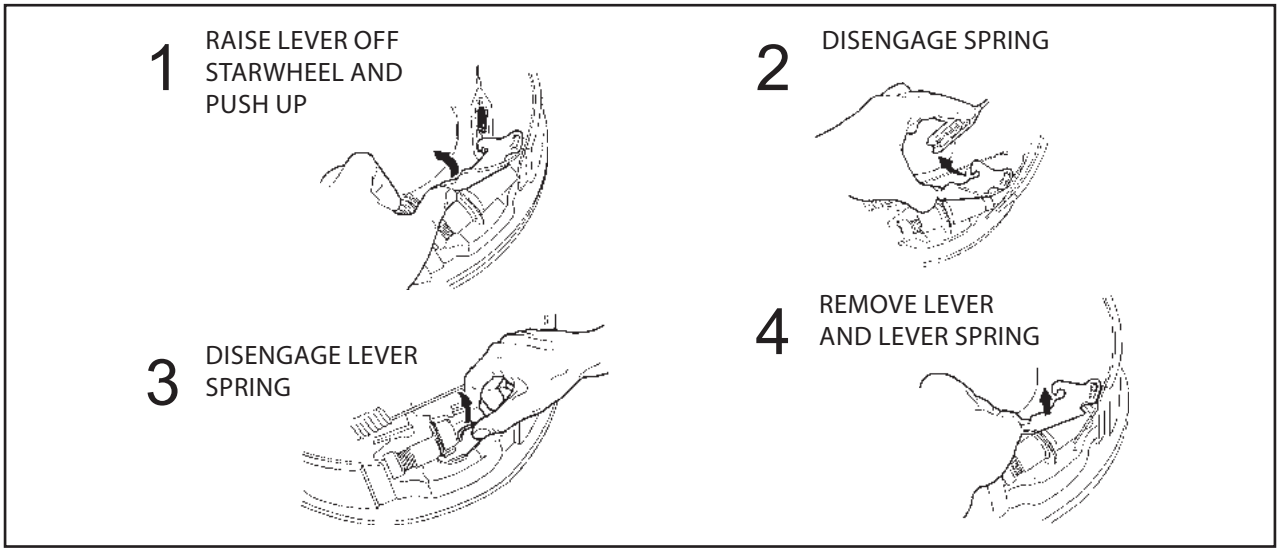


Figure 7. Adjuster Lever and Adjuster Spring Removal

Removing the Shoes (continued)

6. Detach adjuster cable from adjuster lever, slide cable off of adjuster cable guide, and remove the cable retaining tab if so equipped. See Figure 7.

7. Remove the adjuster lever and the adjuster spring. (These parts will need to be placed on the new replacement shoe, along with the adjuster lever mounting pin, in the opposite order removed.) See Figure 7.

8. Remove both shoe-return springs. Use pliers, vice-grips, or a heavy duty brake spring tool as shown in Figure 8.

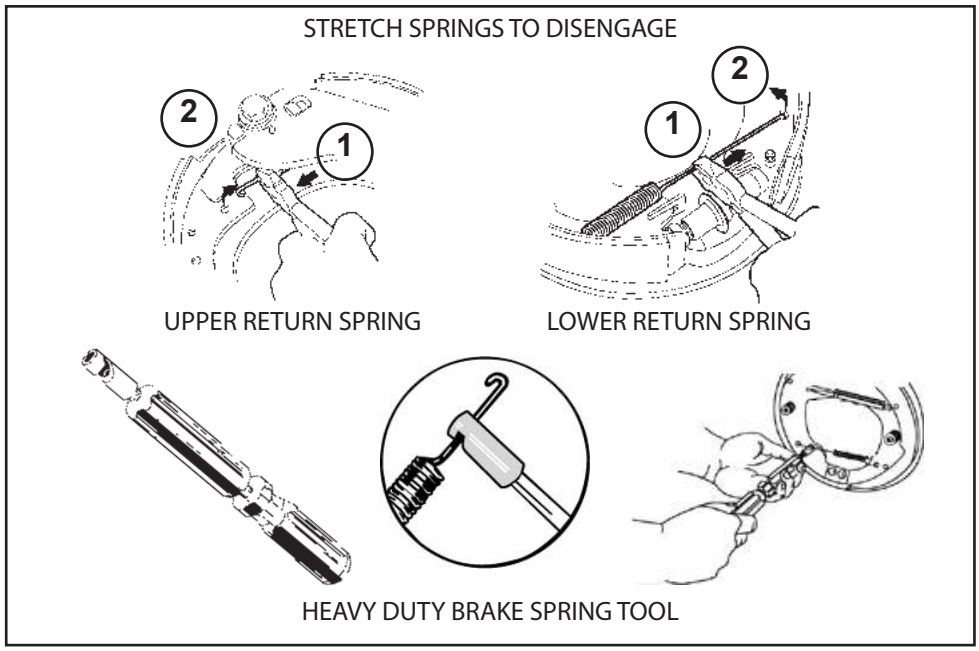


Figure 8. Shoe Return Spring Removal

9. Remove both shoe hold-down springs. Use a brake shoe spring tool as shown in Figure 9.

TIP: Detach the parking brake apply cable and lever return spring from the end of the lever to allow easier access to the spring on the lever side.

Note: If the brake is a Release 2 level design with a lever guide present, it will need to be removed to provide access to the spring underneath with the tool shown in Figure 9. Upon removal of the hold down springs, the shoes, and the adjuster nut screw assembly will fall if not secured by hand.

10. Remove brake shoes from backing plate.

11. Disassemble the adjuster nut and screw assembly for cleaning and inspection of the threads.

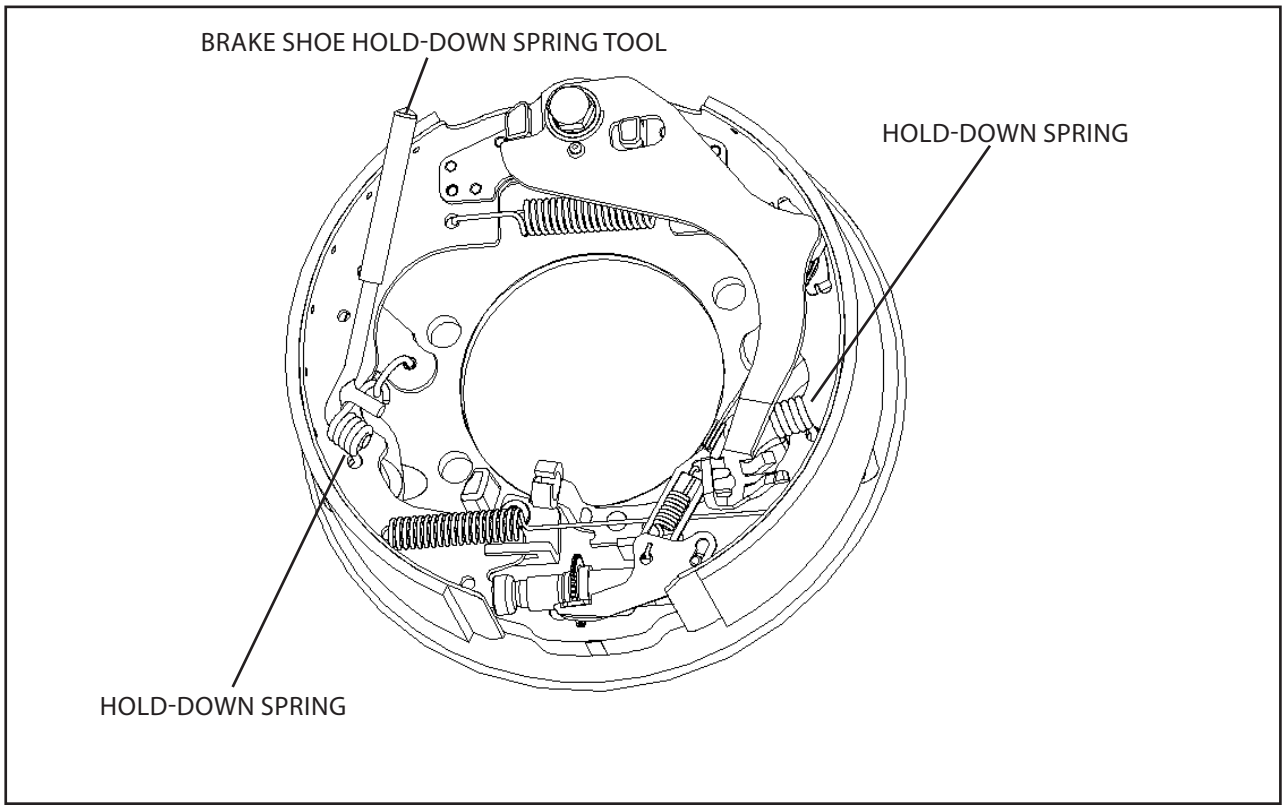


Figure 9. Shoe Hold-Down Spring Removal

Installing the Shoes

⚠WARNING

Failure to correctly assemble the Adjuster Cable may result in reduced brake performance that could cause personal injury or property damage.

⚠WARNING

Torque all fasteners to the manufacturer's recommended torque using a torque wrench. Failure to do so could possibly result in personal injury or property damage.

Installing the Shoes (continued)

1. Clean backing plate and adjuster screw assembly. Remove old grease from shoe contact points and adjuster threads as well as debris and corrosion that could contaminate linings or interfere with proper brake operation.
2. Apply a light film of Wolfrakote paste ledge grease to the six (6) backing plate shoe ledges and one (1) anchor post as shown in Figure 10.
3. Apply Chevron RPM heavy duty, lithium complex, molybdenum disulfide, extreme pressure grease, or equivalent, to the cam plate lugs where they contact the shoe ends, the end of the shoes that contact the cam lugs, and the brake lever.

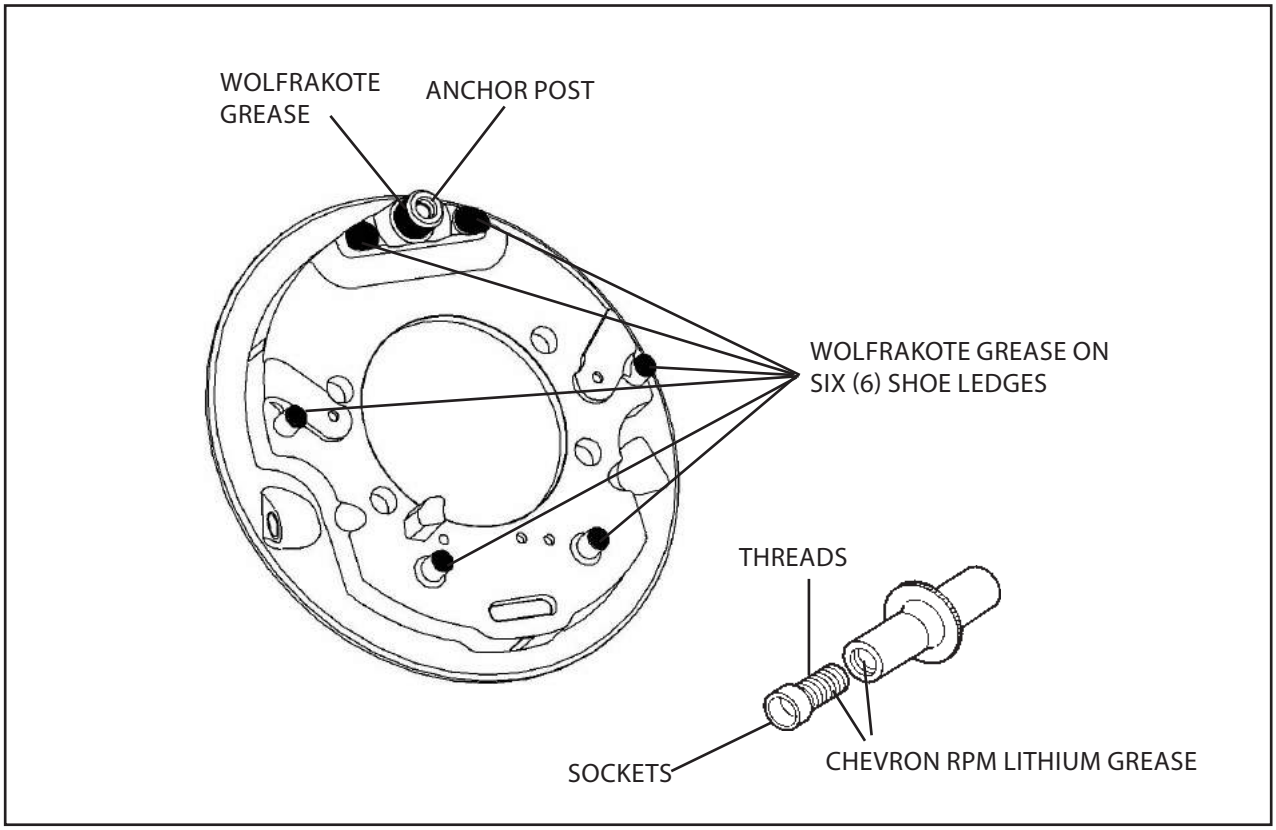


Figure 10. Application of Wolfrakote Paste Grease to Wear Points and Chevron RPM Lithium Shoe Grease to Adjuster Screw

Installing the Shoes (continued)

4. Apply Chevron RPM heavy duty, lithium complex, molybdenum disulfide, extreme pressure grease to the threads of the adjuster screw, adjuster nut, and the socket ends of the adjuster nut and install the screw fully into the adjuster nut. Insure the screw moves in and out freely. If any damage to the threads prohibits free movement, or if the starwheel is damaged, replace adjuster assembly. See Figure 10.

Note: Only use the approved lubricants as specified. Do not substitute.

Note: When installing new shoes, make sure the shoe with the adjuster cable guide and adjuster lever pin is installed on the correct side of the shoe. See Figure 11.

5. Place one shoe into the installed position. Reattach shoe hold-down spring and pin. See Figures 9 and 11.

⚠CAUTION

For Steps 5 through 10, proper orientation of the various springs, including their hook-ends must be maintained, as shown in Figure 11, for proper brake function.

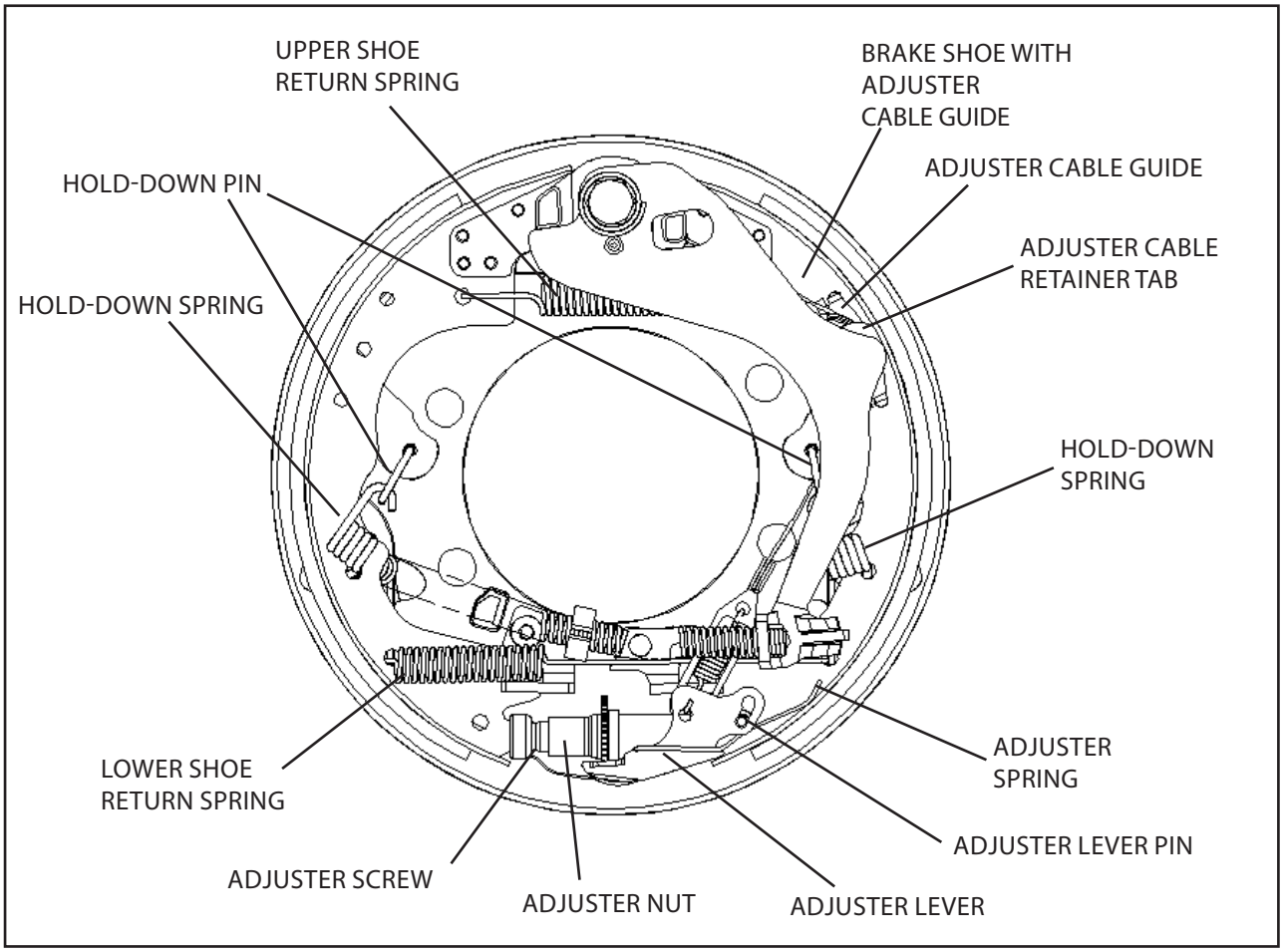


Figure 11. Brake Shoe Installation

Installing the Shoes (continued)

6. Position the second shoe and the adjuster nut and screw assembly as shown in Figure 11. The adjuster nut (internally threaded) should be seated against the shoe with the adjuster cable guide and pin. Reattach shoe hold-down spring to shoe hold-down pin using the brake spring tool as shown in Figure 9.

7. Install both shoe-return springs as shown in Figure 11.

8. Install the adjuster spring and the adjuster lever. Ensure that the adjuster lever is properly seated against the starwheel as shown in Figure 11.

9. If the lever has been removed, reinstall lever and associated components per the ANCHOR SCREW, LEVER, AND CAM REPLACEMENT section in the manual.

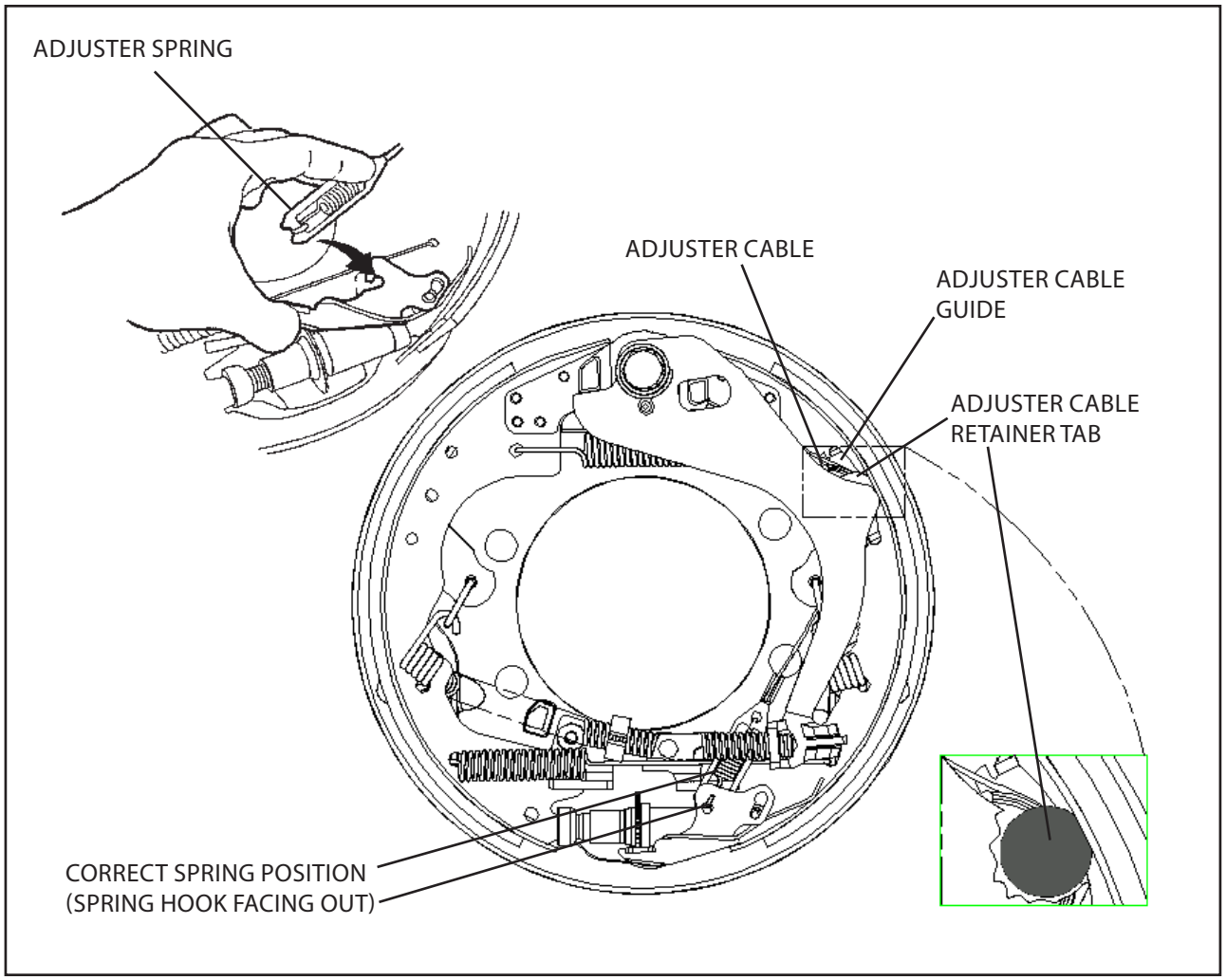


Figure 12. Adjuster Cable Installation

Installing the Shoes (continued)

10. Route the adjuster cable around the adjuster cable guide, under the shoe hold down spring, and attach to the adjuster lever as shown in Figure 12. Install adjuster cable retaining tab if so equipped.

Note: Correctly assembled, the adjuster cable end-fitting is behind the adjuster lever, with the spring hook facing out as shown in Figure 12.

11. The shoe cage should be adjusted now per the SHOE CAGE ADJUSTMENT PRIMARY procedure or after the drum has been reinstalled per the SHOE CAGE ADJUSTMENT ALTERNATE procedure in this service manual.

12. Make a final inspection of the shoe linings and the inside of the drum to ensure that no grease or other contamination was accidentally applied.

⚠WARNING

Keep grease and other foreign materials away from the shoe lining and drum surfaces. Contamination of shoe linings or drum surface may result in degradation of brake holding capability, possibly resulting in personal injury or property damage.

13. Inspect, service and reinstall drum per the vehicle manufacturer's service manual.

14. Lower the vehicle and test the brake for proper function before returning the vehicle for service use. If necessary, make adjustments per the vehicle manufacturer's service manual.

Shoe Cage Adjustment Procedures

Adjustment with Drum Off - Primary Procedure

1. Use a 12 inch caliper, or inside micrometer, to measure the inside diameter of the drum. Subtract 0.025 inches from the drum inside diameter measurement. Set the measurement caliper to this value, and lock the set screw.

2. Rotate the axle input flange yoke as necessary to provide clearance for the measurement caliper.

3. Place the pre-adjusted caliper over the shoes at the center of the shoes.

Adjustment with Drum Off - Primary Procedure (continued)

4. To adjust brake, rotate the starwheel until the shoes touch the measurement caliper jaws. It is necessary to disengage the adjuster lever away from the starwheel. See Figure 13.

Note: During adjustment the calipers should be moved up and down around the shoe center points to ensure adjustment at the highest points across the width of the shoes.

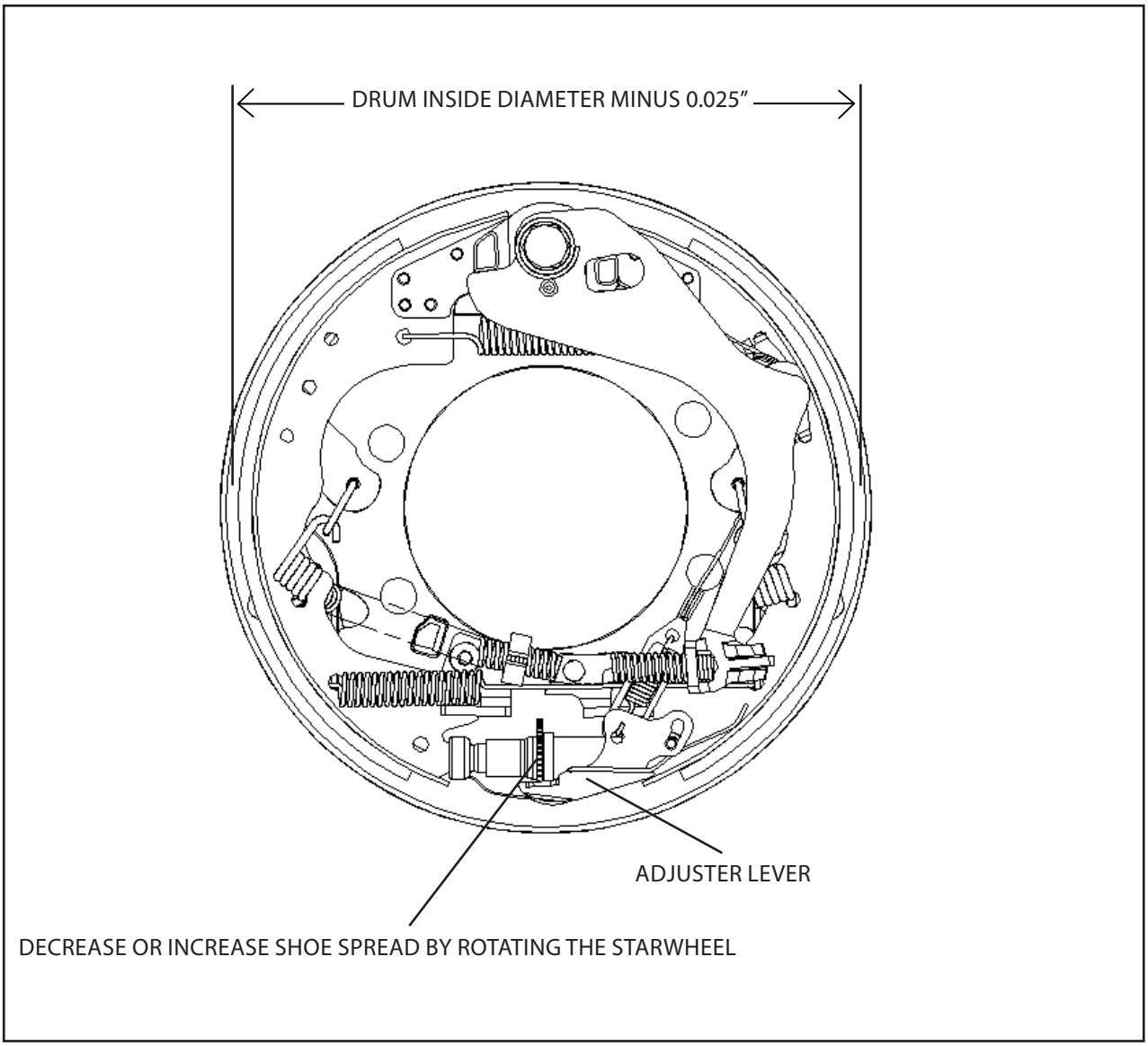


Figure 13. Initial Brake Shoe Adjustment

Adjustment with Drum Installed - Alternate Procedure

1. With the engine off, the battery disconnected, and the tires blocked to prevent vehicle movement, place transmission in neutral and fully release the parking brake. Check to see if the drum can be rotated back and forth by hand. If the drum cannot rotate, it will be necessary to raise the rear wheels off the ground, in order to allow rotation of the drum. Support the vehicle with suitable floor stands.

Note: Some vehicles may not have enough clearance behind the park brake to have direct access through the access slot to the adjuster lever. In these cases, an adjuster lever tool can be made from 3/32" diameter welding filler rod. See Figure 16.

2. Insert the adjuster lever tool or a thin flat bladed screw driver through the adjusting slot in the backplate and push on the adjuster lever to disengage it from the adjuster starwheel. Insert a brake adjusting tool (or flathead screwdriver) through the adjusting slot and move the starwheel teeth downward to expand the brake shoes outward. See Figures 14 and 15. Continue expanding the shoes until the drum can not be rotated by hand.

3. Now adjust the starwheel teeth upward to retract the shoes until the drum just begins to rotate freely by hand (without drag from the shoes). See Figures 14 and 15.

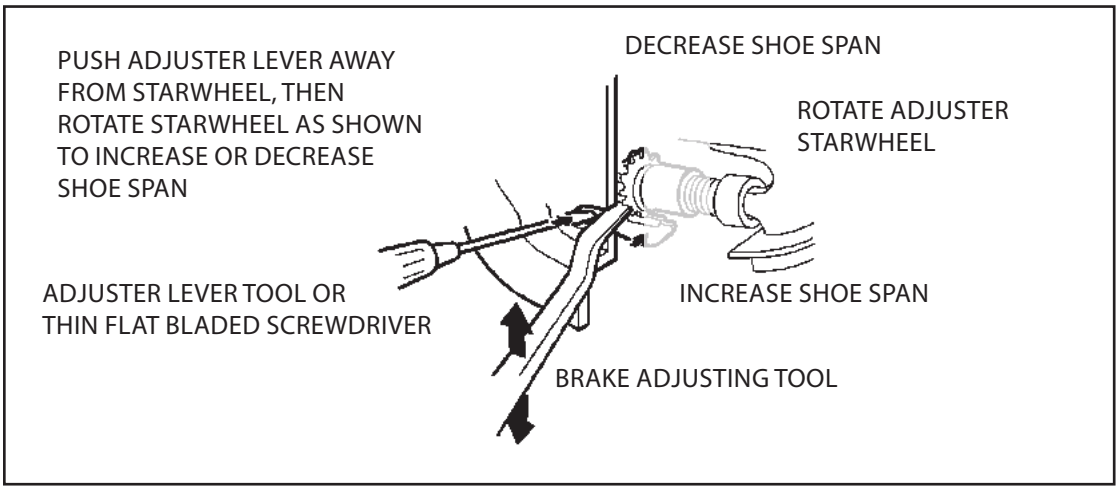


Figure 14. Brake Adjustment With Drum In Place (cut away view)

Disengaging Adjuster Lever from Adjuster Starwheel to Allow Retracting the Brake shoes (Loosen Brake)

Note: Some vehicles may not have enough clearance behind the park brake to have direct access through the access slot to the adjuster lever. In these cases, an adjuster lever tool can be made from 3/32" diameter welding filler rod. See Figure 16.

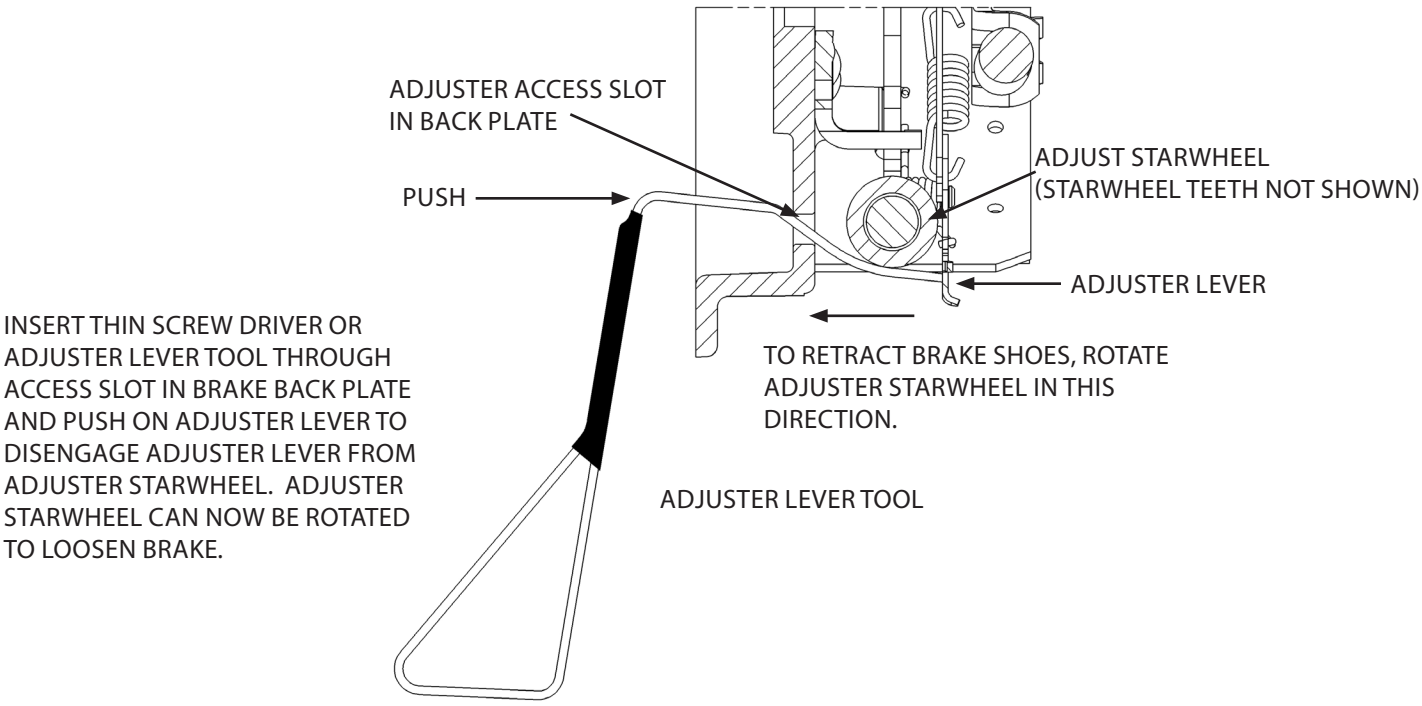


Figure 15. Disengaging Adjuster Lever from Adjuster Starwheel to Allow Retracting the Brake Shoes (Loosen Brake)

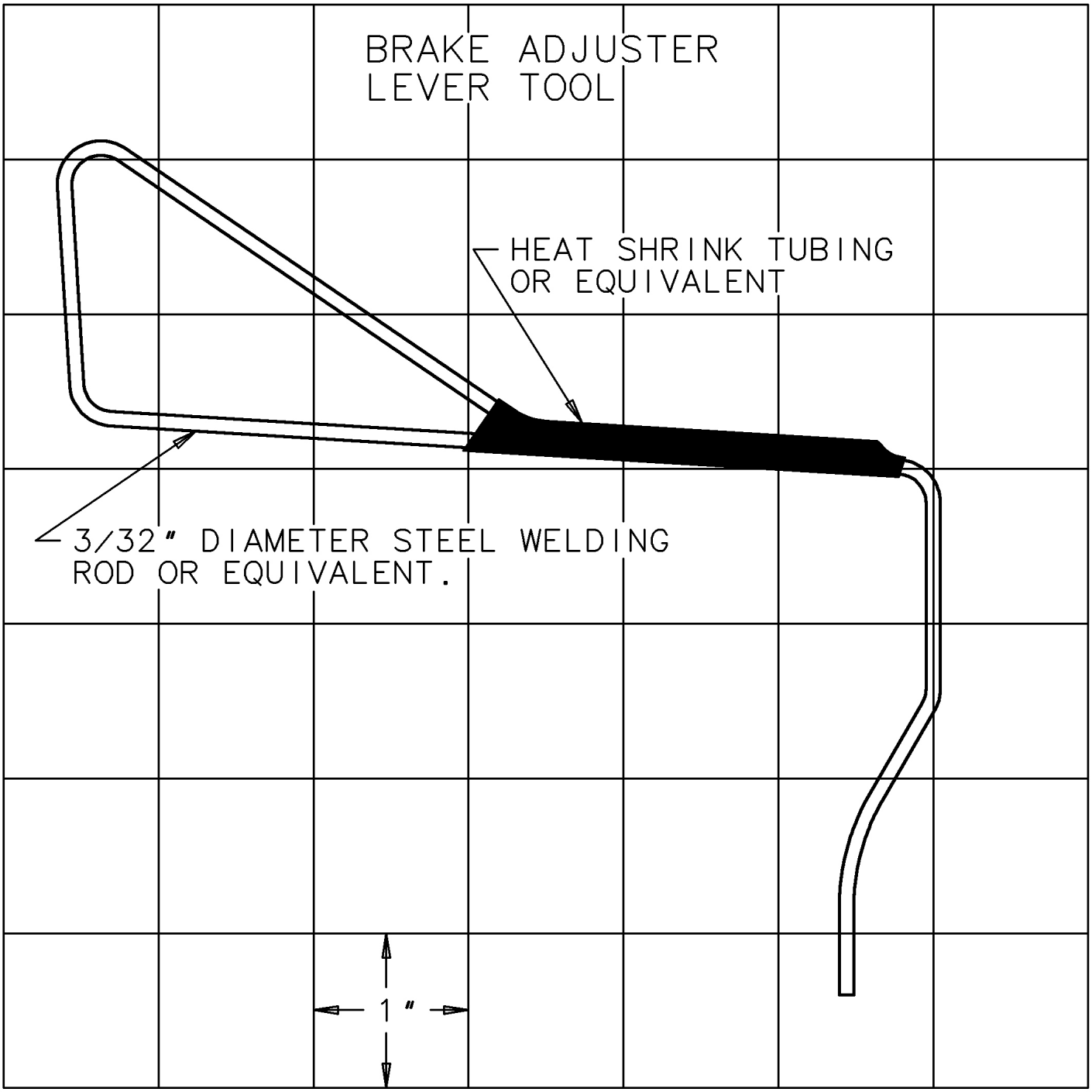


Figure 16. Brake Adjuster Lever Tool

Anchor Screw, Lever, and Cam Replacement

Removing Components

Note: The anchor screw, lever, and cam should all be replaced at the same time. Do not replace just one or two of the three parts at any time. Inspection of these parts is recommended at 250,000 miles or 5 years for typical use, or more often under severe operating conditions.

1. Block the front wheels to keep the vehicle from moving.

2. With the engine off and battery disconnected, place the transmission in gear and fully release the parking brake.

3. If recommended in vehicle manufacturer's service manual, raise the rear of the vehicle so the wheels clear the floor and install safety stands to support.

4. Remove the drum. See vehicle manufacturer's service manual for details, if necessary.

⚠CAUTION

Do not use a drum puller or a torch to remove a brake drum. Drum distortion may result.

Note: If the drum proves difficult to remove, insert a narrow screwdriver through the brake adjusting hole in the backing plate and disengage the adjuster lever from the adjuster nut starwheel teeth. With adjuster lever disengaged as shown in Figures 14 and 15, insert a brake adjusting tool (or screw driver) through the adjusting hole to engage the adjusting nut teeth. Move the teeth upward enough times to retract the brake shoes to clear the drum. If the drum is rusted to the axle input flange yoke pilot, tap the center of the brake drum with a non-metallic mallet to loosen.

5. Inspect the brake per the INSPECTION procedure in this service manual.

6. Detach the parking brake apply cable and lever return spring from end of brake lever. Remove the apply lever guide (on Release 2 brakes).

7. Detach adjuster cable from the adjuster lever and slide adjuster cable off the adjuster cable guide, remove retaining tab if so equipped. See Figure 7.

8. Remove the anchor screw. See Figure 17.

Removing Components (continued)

Note: On Release 1 brakes with a hex socket anchor screw, the use of a thread-locking compound may prevent removal of the anchor screw with a hex key and torque in excess of 55 Nm (40 ft.-lbs.) May break or deform a 6mm hex key. If necessary, use a pipe wrench, vice grips, or similar tool on the knurling of the head to loosen the anchor screw. Replace screw if removed, regardless of condition.

9. Remove the flat washers (if installed on your application for Release 1 level brake), anti-rattle spring, lever, cam, and adjuster cable. See Figures 2 and 17.

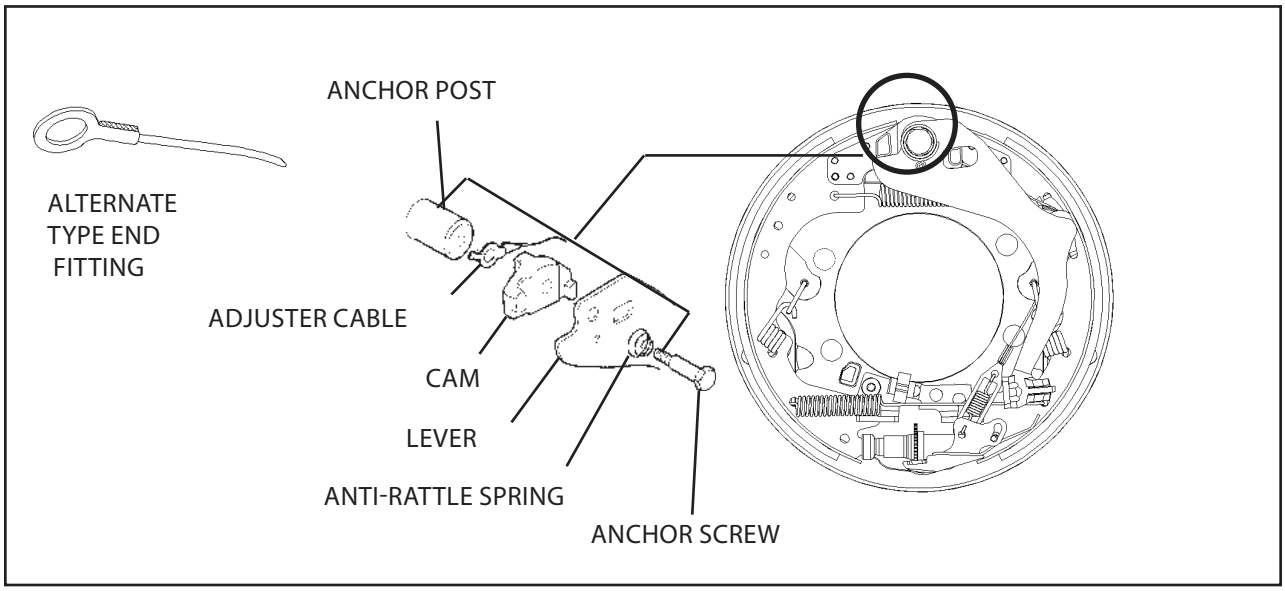


Figure 17. Spring, Lever, Cam, and Adjuster Cable Removal
(Release 3 Brake Shown)

Installing Components

Note: If for any reason the cam, lever, and anchor screw is removed, a complete new set is recommended for service.

1. Remove the cured thread-locking compound from the anchor post hole threads. Run the appropriate size tap completely into the anchor post and back out to clean the threads. Remove loose debris from anchor post hole.

Note: For brakes with a hex socket head anchor screw, use an M10 x 1.5 tap (brakes manufactured prior to April 2002). For brakes with an external hex head anchor screw, use and M12 x 1.75 tap (brakes manufactured after April 2002).

2. Apply Chevron heavy duty lithium complex extreme pressure grease, or equivalent, to the cam plate lugs where they contact the shoes and the apply lever, to the cam plate slotted hole and top and bottom faces. Apply grease to the brake lever pivot hole and the contact surfaces with the cam plate lugs. Apply grease to the non-threaded portion of the anchor screw. ***Do not get grease on anchor screw threads or in anchor post threaded hole.***

3. Reinstall the adjuster cable, new cam plate, new lever, anti-rattle spring (small coil end toward screw head for Release 2), flat washers (if previously installed on your application), and new anchor screw as shown in Figure 18. Make sure the adjuster cable end fitting is installed to allow the cam plate to sit flat on the fitting and anchor post.
   - Stepped type end fitting - the step faces towards the backplate. See Figure 18.
   - Alternate "eyelet" type fitting - cable crimp portion faces towards the backplate. See Figure 18.

⚠CAUTION

Only thread anchor screw into the anchor post 1 to 2 turns to temporarily hold assembly together. Do not thread in completely until ready to tighten to specification (step 4).

A faulty installation will result if the thread-locking compound is activated and begins to cure prior to tightening the screw.

⚠CAUTION

When installing the hex socket head anchor screw, careful attention should be taken during reassembly to ensure that the adjuster cable-end fitting is not clamped underneath the shoulder of the anchor screw during reassembly.

Clamping the adjuster cable may prevent proper functioning of the brake self-adjust feature.

Installing Components (continued)

4. Tighten the anchor screw per the appropriate specification:
   For the internal hex socket anchor screw tighten to 50 ± 3 Nm (37 ± 2 ft-lbs.)
   For the external hex head anchor screw tighten to 100 ± 10 Nm (74 ± 7 ft-lbs.)

⚠CAUTION

To tighten the anchor screw, only use a recently calibrated, known good, "clicker" type torque wrench set to the correct torque specification. Do not use add on devices such as universal joints, swivels, crows feet or other devices as these can cause inaccurate tightening results. Do not attempt this repair if a recently calibrated, known good "clicker" type torque wrench is not available. Failure to do so could result in personal injury or property damage.

Note: Remove excess grease that could contaminate brake drum or linings while the brake is in service.

5. Reinstall the lever return spring and parking brake cable to the end of the brake lever.

6. Route the adjuster cable around the adjuster cable guide, under the shoe hold-down spring, and attach to the adjuster lever as shown in Figure 12. Install adjuster cable retainer tab if equipped.

Note: When correctly assembled, the adjuster cable end-fitting is behind the adjuster lever with the spring hook facing out as shown in Figures 12 and 18. Failure to do so may result in reduced brake operation.

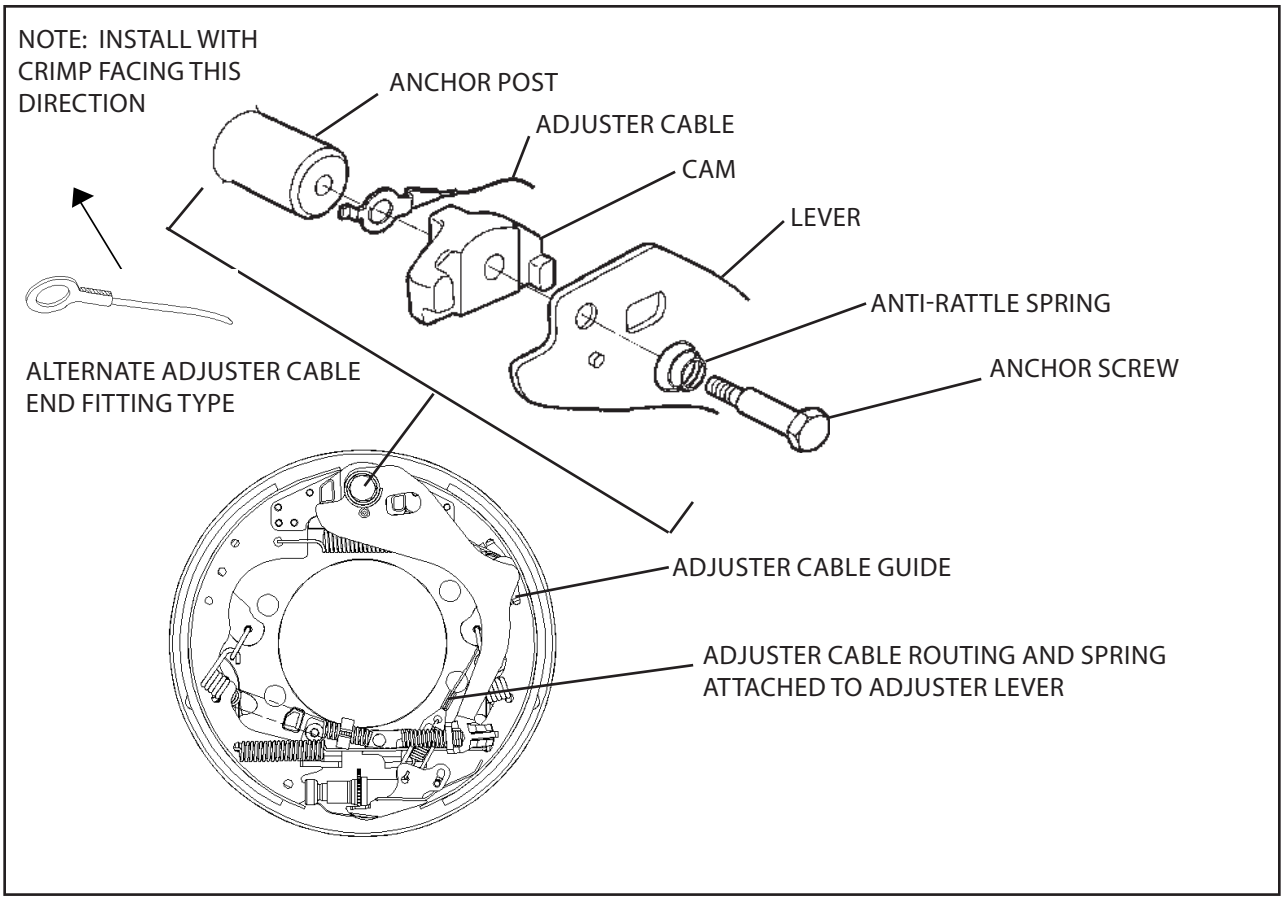


Figure 18. Install Adjuster Cable, Cam Lever, Anti-rattle Spring and Anchor Screw

7. The shoe cage should now be adjusted per the SHOE CAGE ADJUSTMENT PRIMARY procedure or after the drum has been reinstalled, per the SHOE CAGE ADJUSTMENT ALTERNATE procedure in this service manual.

8. Make a final inspection of the shoe linings and the inside of the drum to ensure that no grease or other contamination is present.

⚠CAUTION

Keep grease and other foreign materials away from the shoe lining and drum surfaces. Contamination of shoe linings or drum surface may result in degradation of brake holding capability, possibly resulting in personal injury or property damage.

9. Inspect, service, then reinstall drum per the vehicle manufacturer's service manual.

10. Lower vehicle and remove the blocks or wheel chocks from the front wheels.

11. Test the brake for proper function before returning the vehicle for service use. If necessary, make adjustments per the vehicle manufacturer's service manual.

Trouble Shooting

Condition	Cause	Remedy
Light force or lack of resistance when applying brake lever (on manual apply systems)	Shoe cage under-adjusted[1]	Adjust shoes per shoe cage adjustment procedure
	Worn or deformed actuation components (lever, cam lugs shoe ends)	Inspect and replace per Anchor Screw, Lever, and Cam Replacement procedure or Shoe Replacement procedure
	Apply system not operating properly	Repair per manufacturer's recommended procedure
Heavy force or excessive resistance when applying brake lever (on manual apply system)	Over adjusted brake	Adjust brake cage clearance diameter
	Apply system over adjusted	Adjust or repair per manufacturer's recommended procedures
Brake does not release	Internal damage to brake	Inspect and replace damaged components
	Apply cable bound up	Check cable for corrosion, binding, kinks, or damage. Repair per vehicle manufacturer's recommended procedures
	Apply system not operating properly	Repair per vehicle manufacturer's recommended procedure
Brake does not hold vehicle on hill	Grease, oil or other foreign material on or embedded in shoe linings	Replace shoes and clean drum[2]
	Damaged or incorrect shoes	Replace with correct shoes
	Worn out lining (metal shoe rim contacting drum)	Replace shoes and resurface or replace drum as necessary
	Excessive drum runout	Resurface or replace drum per manufacturer's recommended procedure
	Shoe cage under-adjusted	Adjust shoes per primary (or alternate) Shoe Cage Adjustment procedure
	Worn or deformed actuation components (lever, cam lugs, shoe)	Inspect and replace per Anchor Screw, Lever, and Cam Replacement procedure

[1] Inspect adjuster components to see if any are damaged or jammed.
[2] Inspect the rear pinion seal for leakage that can contaminate the park brake system parts. Repair as necessary.

Component Specifications

Item		Specifications
Shoe Lining:	thickness, new (above shoe)	7mm (0.277 inch) (at center)
	thickness, replace (above shoe)	0.76mm (0.030 inch)
	width	76mm (3.00 inch)
Drum (typical):	inside diameter	304.8mm (12.000 inch)
	max inside diameter	305.7mm (12.035 inch)
	thickness	8 mm (0.315 inch)
	surface finish	3.2 micro m (125 micro in) or less

Fastener Torque Specifications

Fastener Type	Size	Torque	Brake Manufacture Date
Anchor Screw, hex socket head	M10 x 1.5	50±Nm (37 ± 2 ft-lbs)	Before April 2002
Anchor Screw, external hex head	M12 x 1.75	100±1 Nm (74 ± 7 ft-lbs)	After April 2002

Special Tools

These tools aid in servicing the parking brake:

- Heavy duty brake spring tool such as those available from, Lisle (#44800), Matco Tools (#BST 4480), Snap-On Tools (#BT19A) and others.
- Brake shoe retaining spring tool is available from Matco Tools (#RST10), Vim Tools - Durston Manufacturing (#B10) and others.

Lubrication

- Wolfrakote top paste (#89003-198)
  Manufacturer: Kluber Lubrication, 32 Industrical Dr., Londonberry, NH 03053, www.kluber.com, phone 603-647-4101
- Chevron RPM heavy duty LC EP NLGI 2 grease
  Distributor: Brenntag Southeast, 4200 Azelea Dr., Charleston, SC 29405, phone 843-744-7421

WIRE TABULATION

PLEASE REFER TO THE ELECTRICAL SCHEMATIC AT THE END OF THIS SECTION

APPENDIX **A**

Supplement

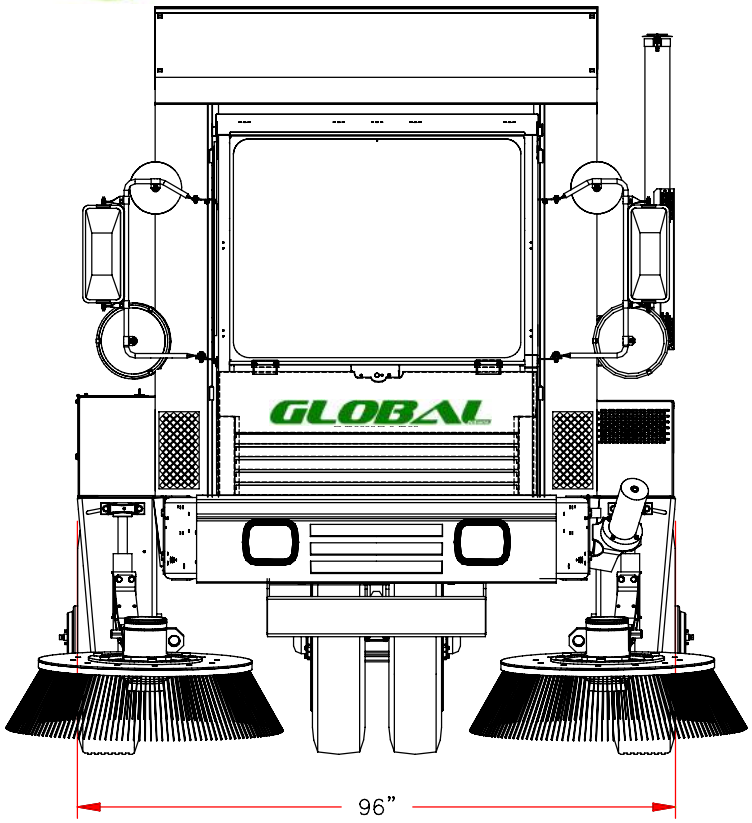
Table of Contents

A

APPENDIX Aa

Specifications

Table of Contents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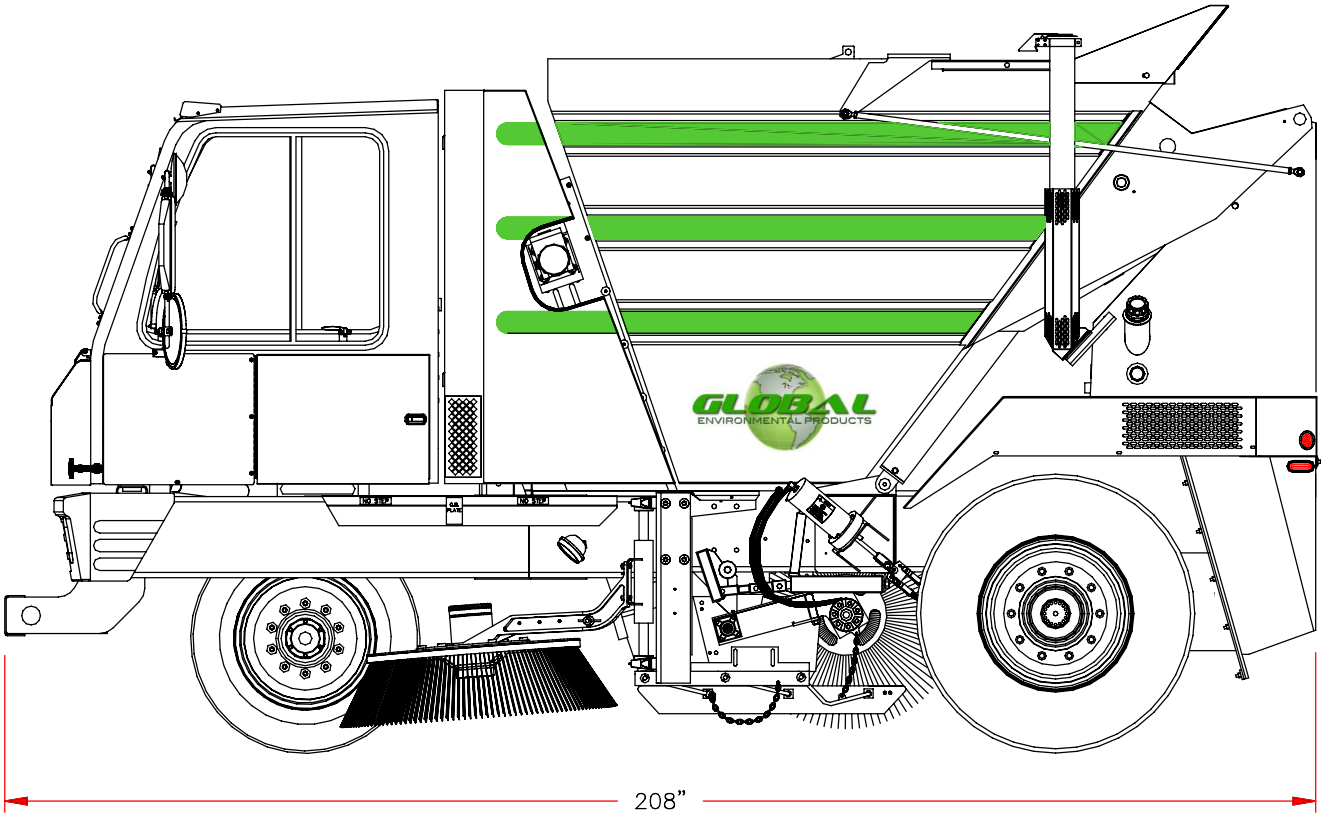
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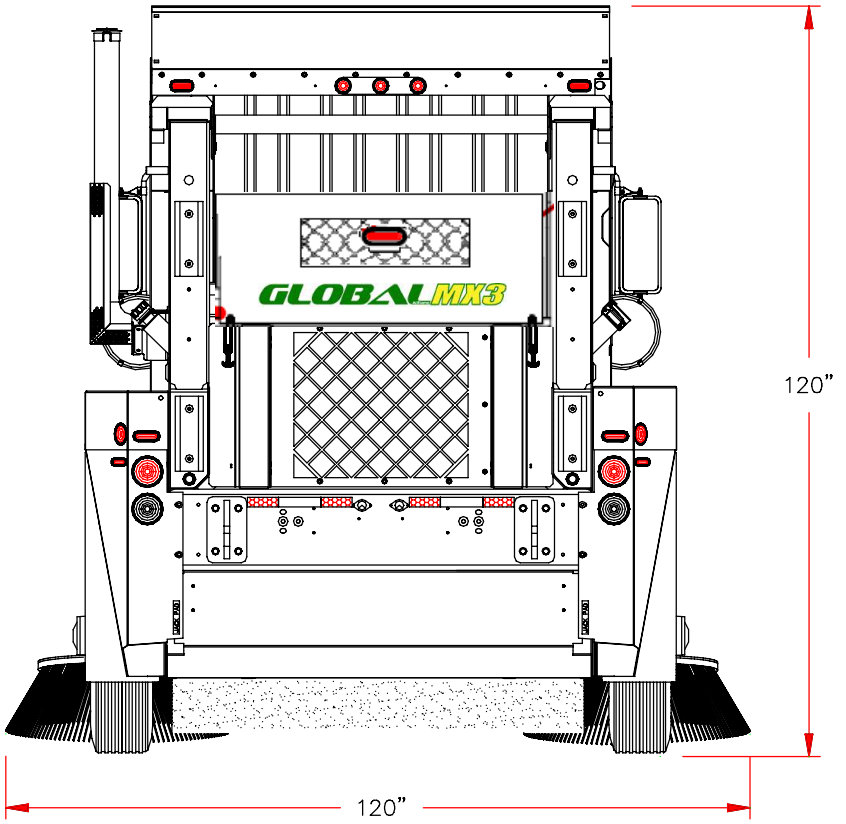
APPENDIX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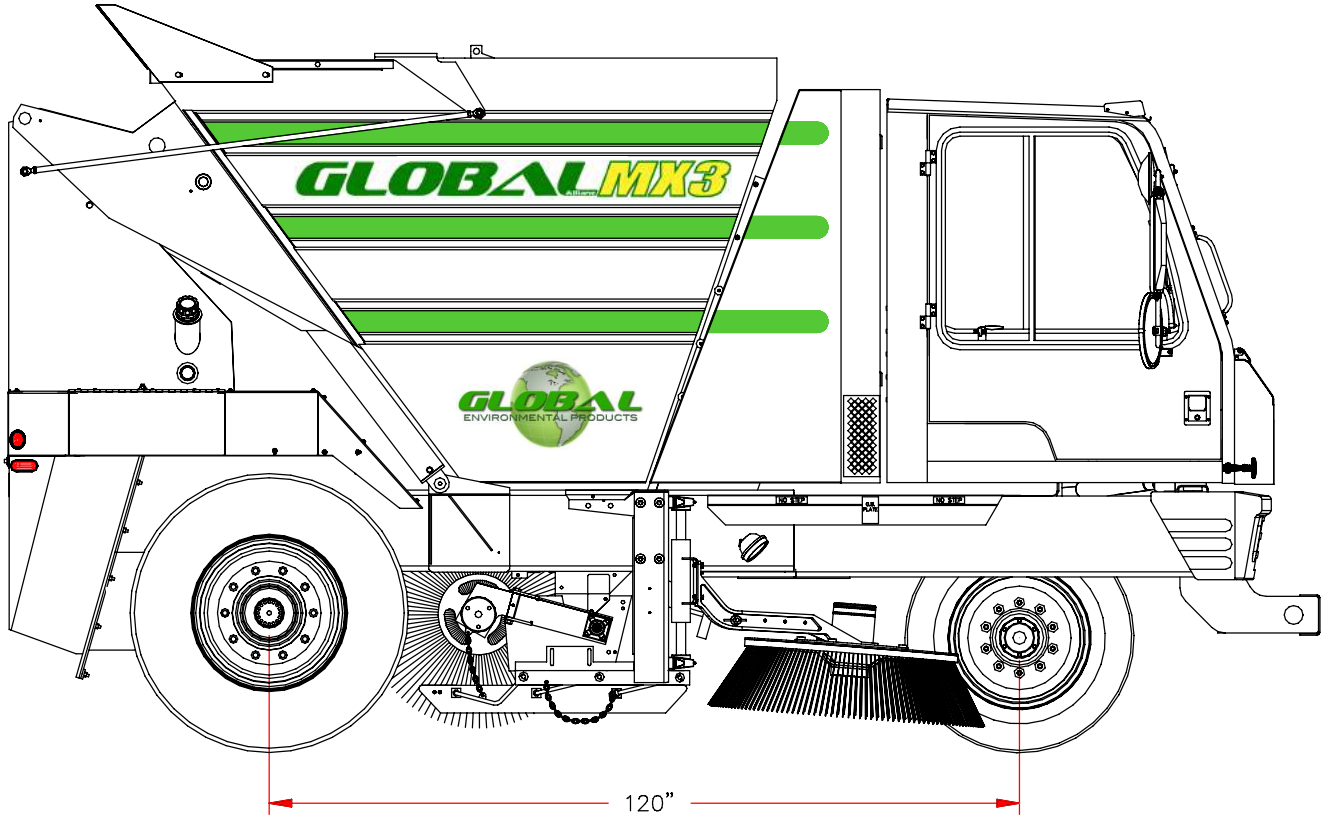
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Vehicle Configuration

Engine

- John Deere Engine – 4 cylinder injected diesel, turbocharged and intercooled. Tier 3
- Displacement – 276 cu in. (4.5 L)
- Horsepower – 115 HP (82 Kw) @ 2400 rpm
- Max Torque – 291 ft lb (395 Nm) @ 1600 rpm
- Cooling System – 42 qt (40 L) capacity, swing away design radiator.
- Engine Oil – 15 qt (14 L).
- Air Cleaner – Two stage dry with safety element.

Fuel System

- Description – 35 gallons, vented with steel construction.
- Fuel Filter – Fuel/Water separator and 10 micron filter.

Instruments

- Gauges – Speedometer/odometer, tachometer, hour-meter, engine oil pressure, engine water temperature, voltmeter, fuel gauge and gutter broom position indicators.
- Indicators – Water spray, low engine oil, high engine water temperature, low hydraulic oil level alarm, air restriction and high beam.

Paint

- Powder Coated – 100% TGIC.
- Body – White and black matte.
- Frame and Fenders – White.

Steering

- Description – Heavy duty full power steering.
- Turning Radius – 14 ft.

Sweeper Dimensions

- Wheel Base – 120 in.
- Length – 208 in.
- Height – 120 in.
- Width -96 in.
- Weight -16,300 lbs

Tires and Wheels

- Front Tire – 10R 17.5F (115 psi).
- Front Rim – 10 lug heavy duty disc type wheel.
- Rear Tire – 11R 22.5 (120 psi).
- Rear Rim – 10 lug Heavy duty disc type wheel.

Traction Drive

- Description – Hydrostatic drive. Engine mounted variable displacement pump and two variable displacement traction motors. The traction system provides constant broom speed independent of vehicle speed or direction.
- Range – Low (sweeping mode) = 0-8 mph, High (travel mode) = 0-25 mph.
- Controls – Automotive controls including foot pedal, steering and shifter. Infinitely variable speeds in sweeping and travel ranges.

Electrical

- Description – Sealed wire harness; solid color coded wires, numbered and function labeled every 12 inches, sealed pre-wired solenoids; circuit breakers protected.
- ECU – Electrical Control Unit is a sealed system locker with two sealed sub-compartments for high and low ampere components; low amperage system boxes are fully tested prior to installation. Electrical diagram is located in the ECU compartment.
- Battery – 900CCA at 0° F; 12 Volt system.

APPENDIX

Sweeping Configuration

Auxiliary Hydraulics

- Description – Triple hydraulic pump assembly utilizes separate direct mounted gear pumps to provide high torque power to elevator, main broom and gutter brooms.

Elevator

- Type – 7 or 11 Flight squeegee.
- Squeegee – Replaceable corded rubber tips.
- Belts – Continuous molded aramid.
- Drive – Direct hydraulic.
- Protection – Hydraulic relief cartridge.
- Speed – Variable forward and reverse.
- Bearings – Two 3/16 in. triple lip sealed, high load capacity with dust seals.
- Shaft – Split shaft design.
- Back Plate – Adjustable/replaceable bolt-on.
- Throw Plate – Adjustable for fill.

Gutter Broom

- Diameter – 47 in.
- Speed – Variable.
- Drive – Direct high torque hydraulic.
- Lift – Hydraulic displacement cylinders.
- Impact Protection – Hydraulic accumulators allow vertical free floating and shock absorbers allow horizontal protection.
- Overload Protection – Motor mounted relief caps.
- Adjustments – Simple in-cab controls for tilt, pressure and wear.

Hopper

- Capacity – 5.6 cubic volumetric yards.
- Lift – 12,000 lbs.
- Lift Method – Dual 4 in. hydraulic cylinders.
- Dump Height – 120 in. high dump.
- Dump Position – Behind rear wheels, similar to dump truck.
- Dump Control – Cab mounted single rocker switch.
- Safety Lockout – Hopper lift controls automatically prevent movement while dumping.
- Location – Center mounted behind cab.

Pickup Broom

- Type – Disposable polypropylene.
- Size – 32 in. x 58 in.
- Drive – Direct hydraulic.
- Speeds – Variable.
- Controls – Cab mounted hydraulically raised and lowered.
- Position – Self adjusting for pressure and wear.

Sweeping

- Swath – 91 in. single gutter broom, 120 in. dual gutter broom.
- Pickup System – Balanced components
- Elevator Width – 58 in.
- Hopper Width – 74 in.
- Broom Width – 58 in.

Water Spray System

- Capacity – 220 gal.
- Construction – Molded Polyethylene
- Location – Below frame for stability.
- Pump – 2 Electrical Diaphragm, 4.5 gal/min (15L/min) each.
- Spray Nozzles – 1 for each gutter broom, 4 nozzles on the front spray bar.
- PM-10 Option – 17 nozzles total, spread out all over the sweeper *(see Ch.4, Fig.18A)*.
- Controls – Variable flow valves over each broom, master variable flow valve and shutoff switch in cab.
- Filter – Cleanable screen mesh.
- Fill Hose – 15 ft hose, hydrant coupling and wrench are located inside the rear right fender.

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APPENDIX Ab

Notes

Table of Contents

NOTES

NOTES

NOTES

NOTES

NOTES

NOTES

INDEX **Ia**

Alphabetical Index

Table of Contents

INDEX Ia

Alphabetical

Index

E

F

G

H

I

J

K

(no listing)

L

M

N

O

P

Q

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R

S

T

U

V

W

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5405 Industrial Parkway
San Bernardino, CA 92407 USA

Phone: 909-713-1600
info@globalsweeper.com

www.GlobalSweeper.com