GLOBAL ENVIRONMENTAL PRODUCTS

GLOBAL R3Air

Operator's Manual

Regenerative Air Sweeper **Manual_GS 335173**

GLOBAL R3Air

Operator's Manual

pn: GS335173, Jan 2018

GLOBAL ENVIRONMENTAL PRODUCTS

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Service Assistance

Upon delivery, fill out the information below and use as a reference when calling for assistance.

General Instructions:

1. Provide name and address.
2. Provide complete model and serial number.
3. Provide description of procedure, function or problem.

MFD BY: **Global Environmental Products** MFG: _____ MO/YR

GVWR: _____

GAWR FRONT: _____ LB SUITABLE TIRE _____

RIM _____ AT _____ PSI COLD SINGLE

GAWR REAR: _____ LB SUITABLE TIRE _____

RIM _____ AT _____ PSI COLD _____

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE STDS IN EFFECT ON DATE OF MFG. SHOWN ABOVE.

VEHICLE IDENTIFICATION NO. _____

TYPE OR CLASS OF VEHICLE _____

Note: Identification Nameplate is located inside operator's cab on the right side-wall below the companion seat.

Options _____

_____

Global Environmental Products
5405 Industrial Pkwy.
San Bernadino CA, 92407

Tel: 909 713-1601
Fax: 909 713-1613 Sales & Marketing
www.Info@globalsweeper.com

Foreword

The Global R3Air sweeper represents the highest grade of craftsmanship and reliability that have made Global Sweepers a leader. Use Parts, Service and Operator manuals as reference tools to assist in ordering parts, assembly/disassembly procedures and general knowledge. The manuals are designed to help you find information fast and accurately.

Safety Notice

Detailed descriptions of standard workshop procedures, safety principles and service operations are not included in this manual. Follow service industry standards and accepted practices when working on or around any vehicles. Warnings can not cover all conceivable ways in which service, whether or not recommended by GEP, might be done or of the possible hazardous consequences of each conceivable way which service might be done.

Anyone using service procedures or tools, whether or not recommended by GEP must satisfy himself thoroughly that neither personal safety nor vehicle safety will be jeopardized by the service method or tools selected.

How To Use This Manual

Chapters are divided into major functions 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.

Bend pages back to match black tab of the desired chapter number with black tab on the edge of each chapter title page. Refer to sectional table of contents for exact pages to locate the specific procedure. A detailed complete table of contents at the beginning of manual is designed in outline form. An alphabetical index of important items is at the end of manual.

In addition, procedure titles and chapters are positioned in margins for easy reference while flipping though the manual.

Your GEP Authorized dealer has trained service and parts personnel, genuine GEP replacement parts, product knowledge and experience to better satisfy your service and parts needs.

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. GEP reserves the right to make changes at any time without notice and without incurring any obligation to make such changes to products manufactured previ-ously. 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, Inc. (GEP) Technical Publications*

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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
CNG	compressed natural gas
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
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

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CHAPTER 1

General Information

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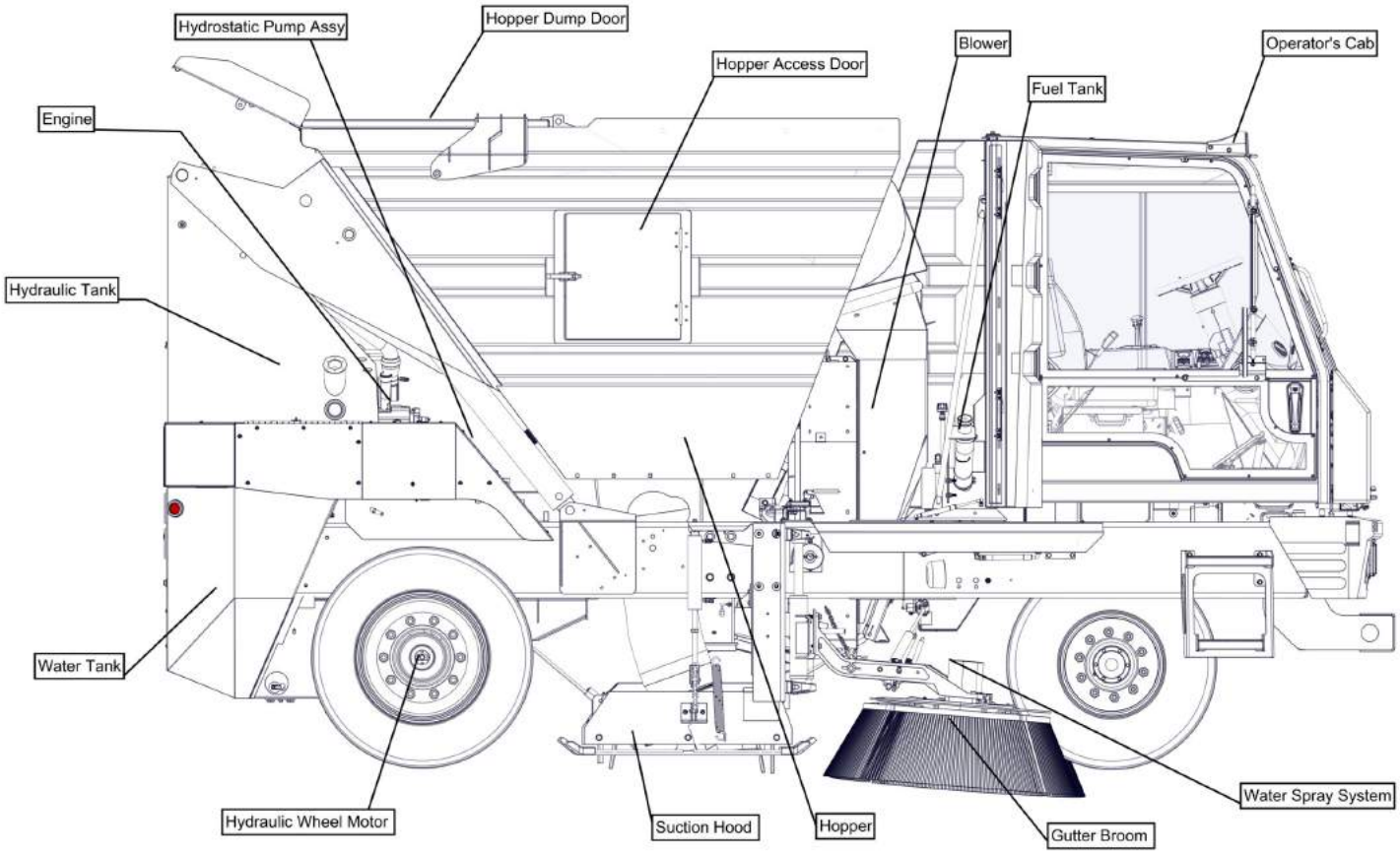


***Fig. 1.1** – Major component locations on Global R3Air Street Sweeper.*

SWEEPER FUNCTIONS

The Global R3Air sweeper is a special purpose three–wheel vehicle built to clean streets, highways, parkways and any other large paved areas.

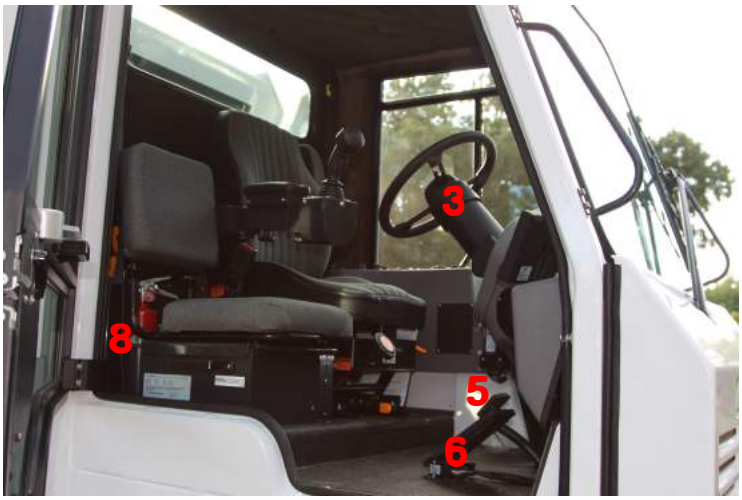
Many various options are available to suit each individual customers needs. For example, the Global R3Air can be purchased with either a high dump hopper, designed for large containers, or with a low dump hopper. Many other extras can be installed on the machine ranging from various warning gauges to a beacon safety lights.

Engine — A standard Isuzu 172hp Final Tier 4 turbocharged inter–cooled diesel engine powers the R3Air. Def tank is included to meet the Tier 4 Final Emissions.

Hydrostatic Traction — A hydrostatic traction system is used on the Global R3Air in place of a standard automatic transmission (common on most conventional trucks); therefore, engine rpm's are separate from the mile–per— hour speed. This allows engine speed to be set at a high rpm to run sweeping operations while traveling at slow speeds.

Three major components make up the traction system: traction pump, bent axis hydraulic motor, and torque hubs. The traction pump consist of a single variable displacement hydrostatic pump accompanied with a fixed displacement charge pump. A variable displacement bent axis hydraulic motor enables sweeper to either shift in high range or low range which changes torque and mile–per–hour capabilities. Torque hubs are the last link in drive system. Each rear wheel is mounted to its own torque hub which is mounted to the frame. There is no rear axle.

General Information
Sweeper Funcitons



1. Shift Lever
2. Side Instrument Panel
3. Steering Wheel/Column
4. Front Instrument Panel
5. Brake Pedal
6. Speed Control Go–Pedal
7. Engine Throttle–Idle/Run
8. Water Shut Off Valves

***Fig. 1.2** – Controls and indicators located in operators cab.*

Auxiliary Hydraulic Drive (Blower) — The blower is driven by a fixed displacement auxiliary hydraulic drive pump. Overall rotation speed of the blower is controlled by engine rpm speed and is fully adjustable.

Auxiliary Hydraulic Drive and Control — A fixed displacement auxiliary drive pump provides hydraulic power to raise and lower brooms, dump and close hopper, open and close hopper door, drive gutter brooms and drive charge air cooler motor.

Separate hydraulic motors drive gutter brooms. Individual hydraulic cylinders adjust the height of right and left gutter brooms to suit specific sweeping conditions. Hydraulic cylinders also raise and lower suction hood. In addition, cylinders dump and lower hopper and hopper door.

Water Spray — A water spray system is designed to control dust created when sweeping. Water sprays in front of each gutter broom. An optional system sprays water in front of each side of the sweeper for extremely dusty conditions. Also, an optional water flusher system will clean out hopper after dumping.

Water tanks are designed to be filled from a fire hydrant through a single filler hole and water fill strainer. A fire hydrant hose and tools needed to fill water tanks are in tool box above right rear wheel.

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

The throttle is a hand lever that controls engine rpm. The go–pedal (similar to a gas pedal in a conventional truck) controls sweeper speed and rpm simultaneously. A built–in hydraulic braking system activates when go–pedal is fully released. A standard mechanical brake pedal activates wheel brakes. Parking brake automatically engages when high/low/reverse gear shifter is in park.

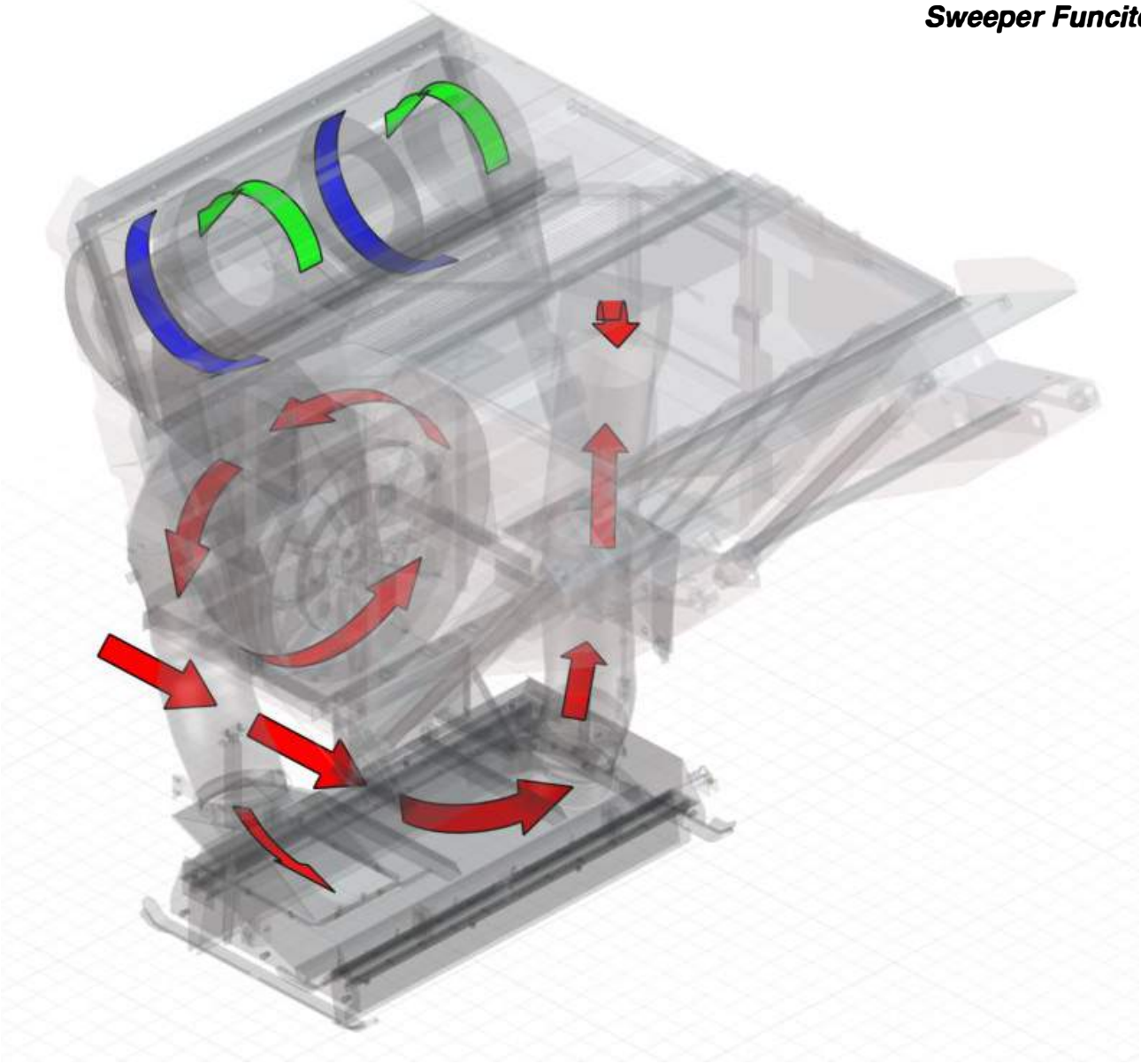


Fig. 1.3 – *Flow of the recirculating air is powered by the blower through the pressure nozzle to loosen debris from the street. Then the debris travels up the suction tube, through the dust separator and into the hopper. Debris is removed from the air by the screens and dust separator before it returns to the blower.*

Blower — The R3Air sweeping system uses air to perform sweeping and loading functions. The blower impeller is a hydraulically driven centrifugal type that creates negative pressure to load material into the hopper and positive pressure to lift debris off the street.

The adjustable vacuum regulator door is used to control the air pressure balance in the sweeping system. An open regulator door decreases nozzle pressure and increases suction inside the hood.

Flow of the recirculating air is powered by the blower through the pressure nozzle to loosen debris from the street. Then the debris travels up the suction tube, through the dust separator and into the hopper. Debris is removed from the air by the screens and dust separator before it returns to the blower.

Table 1.1
Cab Mounted Controls and Indicators
(refer to Fig. 1.2)

Index No.	Description	Function/Indication
1.	**Shift Lever**	Allows selection of two forward speeds, reverse and park (similar to an automatic transmission shifter in a conventional truck).
	(a) **HI** Position	Selects high ratio of hydrostatic system. Sweeper travels forward at speeds up to up to 23 mph.
	(b) **LO** Position	Selects low ratio of hydrostatic system to provide greater torque to rear wheels. Sweeper travels forward at speeds up to 7 mph.
	(c) **P** Position	Position shift lever in park position to start engine. Emergency brake is automatically activated when shift lever is in park position. Allows sweeper to move in reverse.
	CAUTION	**DO NOT shift into R position while sweeper is moving. Damage to hydrostatic traction system may result.**
2	**Side Instrument Panel**	Allows operator to adjust and monitor sweeping operations. Refer to Fig. 1.4 and Table 1.3 for a detailed explanation of gauges and controls.
3.	**Steering Wheel/Column**	Besides performing standard turning applications, steering wheel tilts for operator comfort and easy access in and out of cab. Refer to Fig. 1.5 and Table 1.4 for detailed explanation of steering wheel/column functions.
4.	**Front Instrument Panel**	Allows operator to monitor driving and engine performance. Refer to Fig. 1.3 and Table 1.2 for detailed explanation of front instrument panel.
5.	**Foot Brake Pedal**	Foot brake pedal applies wheel brakes simultaneously when activated.
6.	**Go–Pedal**	Controls sweeper speed and engine rpm simultaneously (similar to a gas pedal in a conventional truck). Hydrostatic braking occurs when go–pedal is released.
7.	**Engine RPM and BLOWER FAN SPEED SELECTOR**	**Used to adjust engine rpm and Blower Speed. Both are sent simaltaneously. 1750 is Utilized for LIght sweeping Debris such as leaves. 1875 is utilized to standard sweeping. 2000 RPM setting is for Heavy Sweeping such as sand. Fan Speed will adjust with Engine RPM Setting.**

(continued)

Table 1.1 *(continued)*
Cab Mounted Controls and Indicators
(refer to Fig. 1.2)

Index No.	Description	Function/Indication
8.	**Water Valves**	Valves control overall water flow to spray
		(not shown)
9.	**Fire Extinguisher (optl)**	Located left of seat to enable access from inside cab or from outside through left window.
10.	**Sun Visor**	Sun Visors are located inside cab near top of front windshield. Visors independently rotate down and swing to the side helping to block sun reflections from all directions.

Notes

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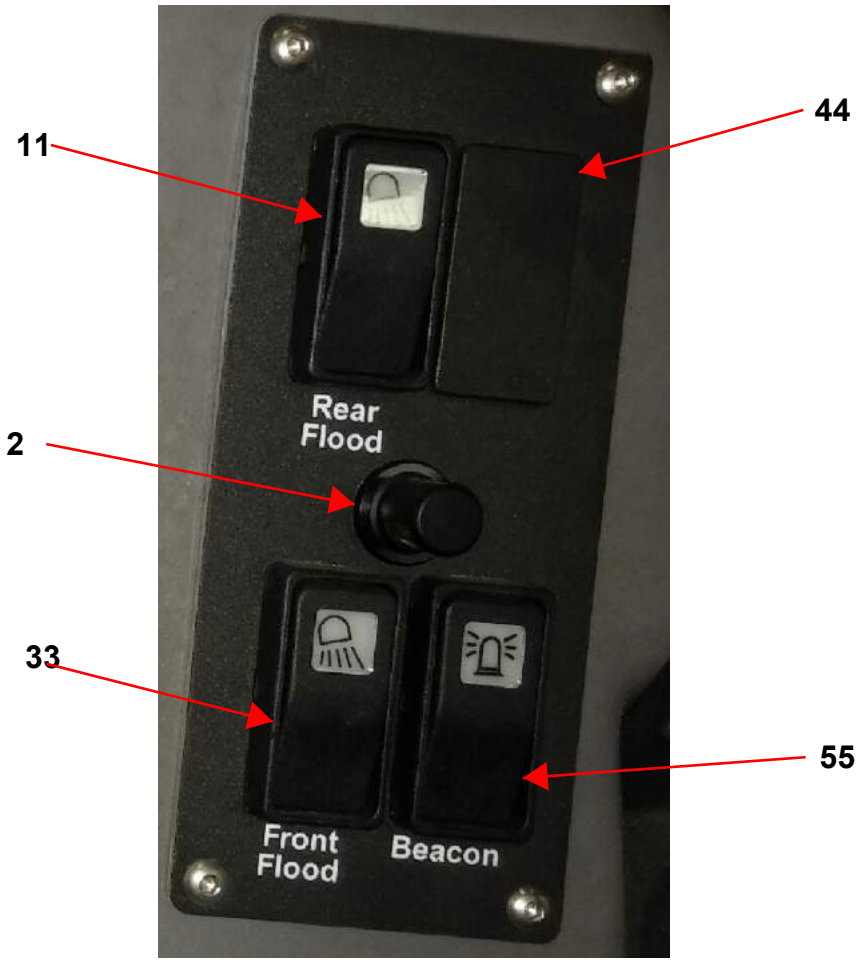
Rear Side Control Panel

Index No.	Description	Function/Indication
1.	**Vacuum Air Bleeder Gauge**	Air Bleeder Valve allows for air to escape through the sweeper hood. With the Air Valve completed Open, the Air is exhausted allowing highest amount of suction while sweeping.
2.	**Low Water Light**	When Low Water Light is On (RED), the sweeping Water System is low on Water. Must hook up to Water Hydrant and Re-fill Water Tanks. Never sweeper without water as damage to Fan and Fan Housing may occur.
3.	**Water PUmp Off/Low/High.**	Turns on Sweeper Water System. Low means 3.5 GPM and High Means 7GPM.

1. Air Filter Restriction Gauge. 2
2. Optional Remote Hopper Raise/Lower Switch
3. Hopper raise/Lower Switch.

Hopper Control Panel

Index No.	Description	Function/Indication
1.	**Air Filter 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.	**External Hopper Function(option)**	When Selected to Front, Hopper/Raise Lower Switch operates from within the Cab/ When Selector to REAR, Hopper Raise Lower Switch operates from Right, Rear Fender.
3.	**Hopper raise/Lower Switch.**	Raises hopper to dump position. Lower switch selection lowers hopper to sweeping and driving position.



1. Rear Flood Light On/Off Switch.
2. Dash Illuminating light.
3. Front Flood Light On/Off Switch.
4. Additional Option for Switch
5. Beacon light On/Off Switch.

Light Switch Option Control Panel

Index No.	Description	Function/Indication
1.	**Rear Flood Light On/Off Switch.**	Activates rear floodlights to illuminate rear.
2.	**Illuminating light.**	Illuminates dash panel.
3.	**Front Flood Light On/Off Switch.**	Activates front floodlights to illuminate front.
4.	**Additonal Slot for Optional Equipment**	
5.	**Beacon light On/Off Switch.**	Activates Beacon light.

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

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.

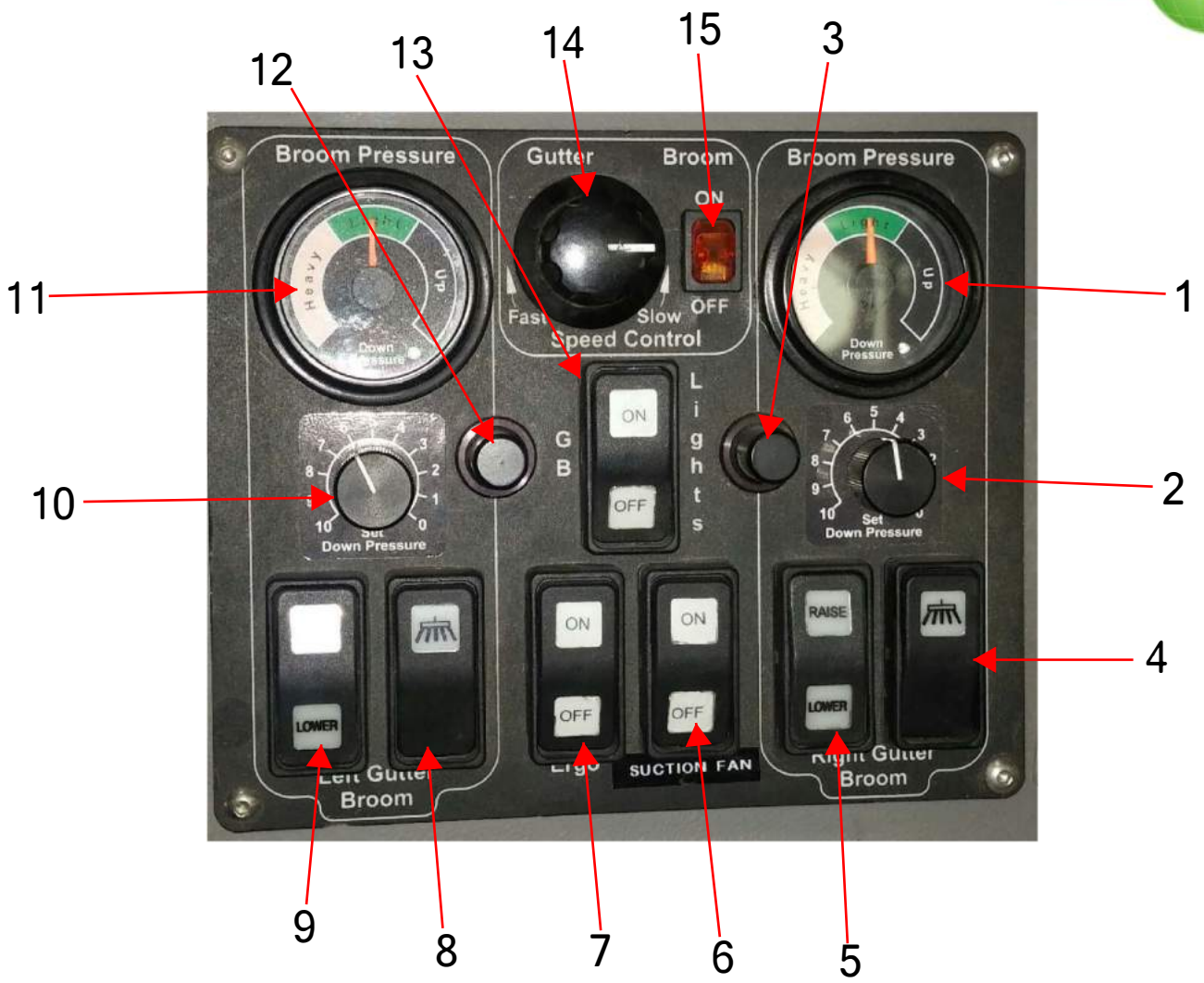


Table 1.6 Elevator/ Broom Control Panel

1- RH Gutter Broom Pressure Gauge.
2- RH Gutter Broom Pressure Adjustment.
3- Panel Illuminating lights
4- RH Gutter Broom Drive Switch.
5- RH Gutter Broom Raise/ Lower Switch.
6- Suction Fan On/Off Switch.
7- Ergo On/Off Switch.
8- LH Gutter Broom Drive Switch.
9- LH Gutter Broom Raise/ Lower Switch.
10- LH Gutter Broom Pressure Adjustment.
11- LH Gutter Broom Pressure Gauge.
12- Panel Illuminating lights.
13- Gutter Broom Lights.
14- Gutter Broom Speed control.
15- Gutter Broom Speed Control ON/OFF switch.

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.	**Dash Light**	Illuminates switches and gauges.
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.	**RH Gutter Broom Raise/Lower Switch**	Raises or lower the right hand gutter broom to the desired adjustment.
6.	**Suction Fan Switch**	First, Lowers the Pick Up Hood, then it Starts the Fan. *Must be In Sweep Mode to Proceed.*
7.	**ERGO SWITCH On/Off Switch**	Raises or lowers all selected present functions such as gutterbrooms. Will activate water pumps when selected.
8.	**LH Gutter Broom Drive Switch**	Drives the left hand gutter broom and turns on the flood-light.
		**Stay clear of a rotating gutter broom. Personal injury may occur.**
9.	**LH Gutter Broom Raise/Lower Switch**	Raises or lower the left hand gutter broom to the desired adjustment.
10.	**LH Gutter Broom Pressure Adjustment**	Increases or decreases the left hand side gutter broom pressure.
11.	**LH Gutter Broom Pressure Gauge**	Indicates the down pressure of the left hand side gutter broom.
12.	**Dash Light**	Illuminates switches and gauges.
13.	**Gutter Broom Lights On/Off Switch**	Illuminates Gutter broom lights.
14.	**Gutter Broom Speed Control.**	Controls the Gutter Broom rotational speed.
15.	**Gutter Broom Speed Control On/Off Switch.**	Activates Gutter Broom Speed control.

1. Def Tank Monitor and FAULT CODE READER
2. Fan Speed (RPM)

Index No.	Description	Function/Indication
1.	**Def Tank Monitor.**	Monitors Def Level & Temperature. *(If Engine Fault code DTC is present. Every 45 seconds it will show DTC for a few seconds and return to Def level & Def temperature screen).*
2.	**Illuminating light.**	Illuminates dash panel.

General Information
Notes

1. Turn Signal
2. Tilt Steering Wheel Lever
3. Horn Pad/Telescope
4. Hazard Warning Flasher

– Controls located on steering wheel and column

Table 1.4
Left Steering Column Controls
(refer to Fig. 1.5)

Index No.	Description	Function/Indication
1.	**Turn Signal/High Beam**	Used for the following applications:
	(a) Turn Signal	Click lever forward to signal right turn. Click lever backward to indicate left turn. Green light will flash indicating turn signal. When turn is completed, lever automatically returns to neutral position and signal stops.
	(b) Lane Change	Without clicking, hold lever part way forward or backward (first stop) until lane change is completed.
	(c) High/Low Beam	With headlights on, click lever up toward operator. Lights change from low beam to high beam, or from high beam back to low beam. When high beams are on, the blue dash light illuminates.
2.	**Tilt Steering Wheel**	Pull lever up towards operator to adjust steering wheel to desired driving position.
3.	**Horn Pad/Telescope**	Press firmly on horn pad to activate horn. Rotate horn pad assembly to adjust telescope height of steering wheel.
4.		Push to cause right and left turn signal lights to flash during emergency stops or any time sweeper becomes a traffic hazard. ❑

CHAPTER 2

Operation

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PRELIMINARY CHECKS

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

Perform preliminary maintenance checks on a daily basis. These checks aid in trouble–free operation by reducing wear and mechanical failure.

1. **Engine Oil** — Check 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 (refer to Engine Oil Viscosity, Chart 4.4). **Never over fill engine with oil.**

NOTE: *When inserting, ensure that dipstick is fully seated by pushing it all the way down to get a proper oil level reading and prevent contamination from entering engine.*

2. **Hydraulic Oil** — Check oil in each hydraulic tank at sight gauges located on outside of hopper towers. With engine turned off add hydraulic oil as required (Mobil DTE 15).

CAUTION

Do not add hydraulic oil while engine and exhaust are hot.

3. **Brake Fluid** — Check brake fluid level in master cylinder. Fluid level should indicate between *Add* and *Full* marks. If necessary, add fluid by removing filler cap (refer to Brake Fluid Type, Chart 4.4).
4. **Engine Coolant** — Check engine coolant level at deaeration tank sight gauge. If liquid is not visible in sight gauge, wait for radiator to cool, remove filler cap and add coolant as required (refer to Engine Coolant Mixture, Chart 4.2).

WARNING

Never remove deaeration tank cap or any radiator hose when engine coolant is hot.

Fig. 2.1 –

Engine coolant is filled through deaeration tank accessed from behind access door.

Check coolant level through deaeration tank sight gauge.

Fig. 2.1 –

5. **Coolant and Oil Leaks** — Visually check for engine coolant, hydraulic oil and engine oil leaks. Repair or replace parts, seals and hoses as required.

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.

6. **Radiator and Oil Cooler** — Inspect radiator and oil cooler for damage, leaking weldments and clogged fins. Repair all leaks and clean clogged fins. Check mounting screws for proper tightness.
7. **Belts** — Check all engine driven belts (commonly referred as fan belts) for wear and tension. Belts should reflect 1/2 inch free play when a force of 12 pounds is applied between pulleys. Adjust belt tension as required. Replace worn belts.
8. **Air Cleaner Service Indicator** — With engine running, check air cleaner service indicator located on inside of right hydraulic tank. Clean or replace air cleaner filter element before yellow indicator spool reaches red line. Reset indicator after servicing air cleaner.

NOTE: *Frequent air cleaner and dust cap cleaning is necessary when sweeping under severe conditions.*

9. **Fuel Level** — Turn ignition key to driving position and observe fuel gauge. Add fuel as required (refer to Diesel Fuel, Chart 4.1).
10. **Tires** — Check tires for correct inflation pressure and add air as required: Front=130 psi *(Goodyear 11R17.5)*, Rear=115 psi *(Goodyear 11R22.5)*. Perform inflation checks when tires are cool. Visually inspect tires for damage or wear and replace as required.
11. **Lights** — Pull headlight switch to first position. All running lights and panel lights should illuminate. Pull headlight switch to second position. Check that both high and low beam headlights also illuminate. Check beacon (option) and signal lights also. If lights do not operate properly, return headlight switch to off position and replace burned out bulbs and/or repair damaged wiring.
12. **Water Spray Level** — Check water spray level. Add water as requried (refer to Fill Water Tank procedure in this chapter).

Fig. 2.2 – *Air cleaner service indicator is mounted on inside wall Air Filter Canister or inside the cab.*

13. **Service and Lubrication** — Perform all daily service and lubrication functions (refer to Daily Maintenance Procedures–Table 4.1 and Daily Maintenance Guide).

STARTING ENGINE

Enter cab from front–right side of sweeper. Step plates and a handle are provided. **Do not** step on right gutter broom to enter cab.

CAUTION

Never step on gutter broom, injury may result.

Normal start

Normal starting procedure will fire up engine in most conditions. If outside temperature measures below 40° F (5° C), refer to Cold Start procedure.

***Fig. 2.3** – Each hydraulic fluid tank is equipped with a filler cap and sight gauge.*

1. Place shift lever in *Park*.
2. Push engine throttle approximately 1/4 from *Idle* toward *Run*.
3. Turn ignition key switch to start position.

CAUTION

Do not run starter motor 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.

4. As soon as engine fires, release ignition key switch allowing it to automatically return to run position. Engine alarm will sound until oil pressure is 10 psi. If alarm continues, stop engine and check engine oil level. If engine oil is at proper level and alarm continues to sound when engine is running, notify a qualified mechanic to troubleshoot oil pressure and/or electrical system.
5. Engine oil pressure gauge should read 20 psi 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.

Cold Start

Cold start option will aid in starting procedure when outside temperature measures below 40° F (5° C). Tune key to run position and pause until Wait Light is illuminated. Then proceed to use Cold Start push button switch when cranking engine. Follow normal start procedures.

***NOTE:** Use proper diesel fuel in cold weather (refer to Diesel Fuel, Chart 4.1).*

DRIVING SWEEPER

Follow safety related operating suggestions discussed throughout manual. When sweeping public streets follow local and state highway laws.

Normal Driving

1. Adjust rear view mirrors, seat (refer to Table 2.1) and steering wheel (tilt and height) to suit individual operator comfort.
2. Fasten seat belt.
3. Start and warm up engine. Refer to Starting Engine procedure. Set engine throttle at 1500 rpm minimum.

***NOTE:** Gutter brooms, blower and suction hood should be off and in fully raised position for normal driving conditions.*

4. Hold hopper switch in *Close* position making sure hopper is down. Transmission will not shift into a drive gear with hopper up (even slightly).

***NOTE:** Whenever sweeper is traveling at slow speeds, pull On beacon (option) and rear flasher switches as a safety precaution.*

5. Position engine throttle to *Idle*. There are two forward speed settings available (refer to Table 1.1). Position shift lever in *High* to reach a maximum speed of 23 mph.

Table 2.1
Seat Adjustments

For safety and operator comfort, drivers seat is fully adjustable: weight, height, fore and aft. Perform seat adjustments **prior** to driving sweeper. **Always wear your seat belt.**

- **Weight/Ride Adjustment**—With no weight on seat, set desired weight adjustment. Turn knob clockwise to stiffen bounce and counterclockwise to soften bounce.

  NOTE: *Weight/Ride adjustment can be made while sitting on seat but knob is hard to turn.*

- **Height Adjustment**—Height of seat is adjustable to four levels. To raise, pull lever and lift seat until it automatically engages in next highest position.

  To lower seat, pull lever and let weight of operators body push seat down to next level.

  NOTE: *Always adjust Tether Belt after changing seat height.*

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

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

- **Seat Belt Adjustment**—Seat belt is a common lift type release without a shoulder harness. Adjust belt by pulling extra strap material through buckle.

- **Tether Belt Adjustment**—Tether belt is a safety device which allows seat to travel up a maximum distance. 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.*

CAUTION

Do not shift into PARK while sweeper is in motion.

6. Step on go–pedal and hold foot steady. Observe speed recorded by speedometer located on front instrument panel.
7. When reducing vehicle speed, slowly remove pressure from go–pedal.

CAUTION

When go–pedal is fully released, hydraulic drive system automatically applies hydrostatic braking.

Wheel braking is applied by stepping on brake pedal.

8. To drive in reverse, position shift lever in *Reverse* and step on go–pedal. When backing up sweeper, a warning alarm sounds and back–up lights illuminate cautioning bystanders to stay clear.

NOTE: *In a safe area designed specifically for training, first time operators should practice driving, turning, acceleration, stopping and familiarizing themselves with the Global Street Sweeper.*

PARKING SWEEPER

Only park sweeper in an area designated for large vehicles. Abide by all local and state highway laws. It is important to follow specific parking procedures which include lifting all brooms to their up position.

1. Bring vehicle to a complete stop in a safe parking area. Place shift lever in *Par* , automatically activat ing parking brake.

2. Gutter brooms, blower and suction hood should be off and in fully raised position while sweeper is parked.

CAUTION

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

   a. Turn off gutter broom drive/light switches and turn off blower switch.

   b. Raise each gutter broom by holding switch in *Up* position until broom pressure gauge indicates fully raised.

   c. Raise suction hood by holding suction hood switch in *Up* position for approximately five seconds until relief valve activates.

3. Position engine throttle to *Idle* and wait 30 seconds. Turn ignition switch off and remove key.
4. Turn off all switches including headlights, floodlights, beacon and rear flashers. Shut water spray valve.
5. Always use provided steps plates to exit cab. **Do not** step on right gutter broom to exit cab.

CAUTION

Never step on gutter broom, injury may result.

SWEEPING

For most conditions the Global R3 sweeps best when engine rpm is at 1875 and machine traveling 3 to 7 mph. Only experienced drivers should sweep streets and high-ways. Follow safety related operating suggestions dis-cussed throughout manual. When sweeping public streets follow local and state highway laws.

Preliminary Procedures

1. Check suction hood and suction hood flaps at start of each operators work shift. Suction hood and flap adjustments are made in shop area by experienced mechanics (refer to Adjustments, Chap 3).
2. Adjust gutter broom pattern at sweeping site to suit specific sweeping conditions (refer to Adjustments, Chap 3).

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

Fill Water Tank

Fill water tanks from a local fire hydrant. All tools required to fill tanks are supplied in right rear fender tool box.

Fig. 2.4 *– Fire hydrant filler hose and related tools are located in right rear fender tool box.*

Operation
Sweeping

1. Close water system valves in cab.
2. Using fire hydrant tool provided, remove hydrant cap. Run water through hydrant flushing out dirt and other foreign objects. Do not fill sweeper water system with contaminated water.
3. With hydrant valve off, unroll filler hose from tool box and connect to hydrant.
4. Slowly open hydrant valve and fill water tank until it overflows.

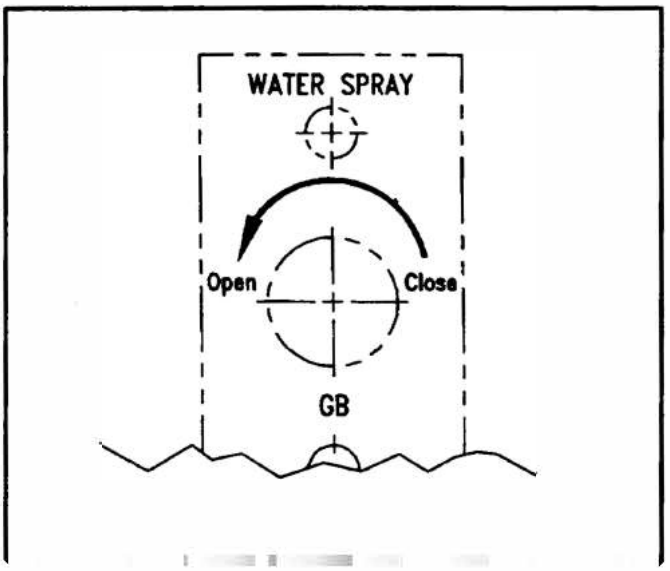

***Fig. 2.5** – Water spray control valves for each gutter broom is located, inside the Cab, behind the jump seat. Turn valves counterclockwise to open and clockwise to close.*

WARNING

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

5. Slowly close hydrant valve.
6. Disconnect filler hose from hydrant and replace hydrant cap. Drain excess water out of hose. Stow filler hose and hydrant wrench in tool box.

Standard Water Spray System

The application of water spray in appropriate areas of sweeping is important for efficient sweeper function and durability. Dampening of debris will actually minimized abrasive wear on componentry and improve performance.

Water spray requirements vary widely in direct relationship to sweeping speed, sweeping conditions, type of debris and volume of debris swept. Therefore, it is impractical to attempt to lay down firm direction for water spray volume to be utilized. The recommendations throughout this procedure can only be accurately determined by the sweeper operator when confronting actual sweeping conditions. Refer to the following procedure to help set water spray requirements.

1. Check water spray level. Fill water tanks if required.
2. Check water spray nozzle jets for obstruction. Clean, repair or replace clogged nozzles.
3. From inside cab, adjust standard variable flow valves to provide sufficient water required for dampening debris in front of gutter broom (refer to chart 2.2 for general recommendations).

Extremely Dusty Water Spray System

To enable the operator full adjustment of the water spray system, two additional valves control the flow of water to left and right fronts of the sweeper. These two valves are also located inside the cab.

Only open the extremely dusty water spray valves when required. During normal sweep conditions, close the extremely dusty water spray valves (refer to table 2.2). If too much water sprays in front of the sweeper during normal sweep conditions, mud cakes up and oozes out of the sweep system.

***NOTE:** When all four water spray valves are open, a tremendous amount of water is used causing the water tanks to empty rapidly.*

Sweeping Procedures

1. If using right gutter broom, open water spray valve, located behind the training seat.

NOTE: *Turn off opposite gutter broom water spray valve, unless both brooms are being used.*

2. If using left gutter broom, open water spray valve located behind the seat. Select Water to Low
3. Open water shut–off valves located in cab.
4. Select Sweep Mode and set Engine Speed to 1875rpm.
5. Select each gutter broom switch to **On**. Adjust pressure on gutter broom for specific sweeping conditions.
6. Select Suction Fan to ON.
7. TURN ON ERGO SWITCH.
8. Gutterbrooms shall lower along with the hood, fan will start automatically and RPM will adjust.

WARNING

Avoid sweeping near bystanders or in congested areas. Debris thrown from sweeper brooms may cause injury.

NOTE: *When sweeper is operating at slow speeds in traffic, pull On beacon (option) and rear flasher switches.*

9. Position engine throttle to appropriate engine speed for sweeping conditions (**1875** rpm is recommended).
10. Press go–pedal for appropriate sweeper ground speed to suit sweeping conditions.

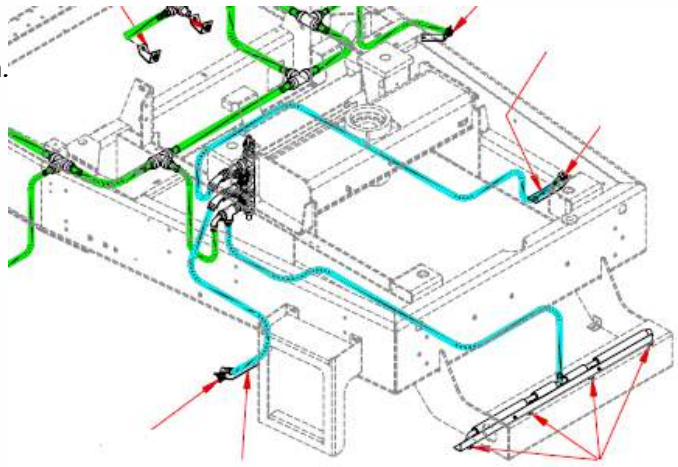

Fig. 2.6 *– Additional water spray valves are for extremely dusty sweep conditions. Individual shut–off valves are located in cab. Turn valves counterclockwise to open and clockwise to close.*

Table 2.2
Water Spray Settings

Water spray mist dampens debris as it is swept. Dampening of debris will actually minimize abrasive wear on componentry and improve performance. The following recommendations for water spray settings can only be accurately determined by the sweeper operator when confronting sweeping conditions.

• Dust cloud created by sweep system.	**Increase** standard cab valve openings to enhance water flow to Gutter Broom spray nozzles.
• Extreme dust cloud created by sweep system.	**Increase** heavy duty cab valve openings to enhance water flow to left & right front spray nozzles.
• Mud cakes up and oozes out of sweep system.	**Decrease** cab valve openings to reduce water flow to spray nozzles.
• No evidence of dust cloud or muddy debris.	**Adequate** water flow to spray nozzles.

Operation
Dumping

NOTE: *Observe all local and state traffic laws during sweeper operation. Follow good safety procedures (refer to Operating Safety Advice, Table 2.1).*

11. Continuously observe gauges on front and side instrument panels. Stop sweeping if any sign of trouble is indicated.
12. Occasionally look in rear view mirror and observe sweeping area. If area is not being swept clean, sweeping system is not operating properly. Stop sweeper and determine problem.
13. Hopper full alarm (option) activates when hopper reaches full capacity. Stop sweeper and position shift lever to *Park* setting parking brake.
14. Close water shutoff valves.
15. Select Sweeper to TRAVEL MODE.
    a. Select Ergo Switch to OFF.
    b. All Functions will stop and will Raise Automatically.
    c. Water System will stop working when selecting the ERGO Switch.
16. Throttle will go down to IDLE when in TRAVEL Mode

DUMPING

1. Park sweeper in position so hopper clears any overhead obstructions such as trees, buildings or power lines. If dumping into a container, truck or dumpster, make sure hopper lip clears.

CAUTION

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

Stay clear of electrical power lines and other overhead obstructions.

Be sure bystanders are clear from sweeper before dumping.

2. With engine running at Idle (Travel Mode) and shifter in *Park*, hold hopper switch in *Dump* position until hopper is fully raised. Alarm sounds while dumping. Observe hopper operation through cab rear window.
3. Once hopper is empty, hold hopper switch in *Close* position until hopper is in fully lowered.

TOWING SWEEPER

Do not tow sweeper without following instructions. Strict procedures must be performed before towing to alleviate further damage to inoperable sweeper.

Rear Towing

CAUTION

Do Not tow sweeper from rear. Serious damage may occur.

NOTE: *An alternative to towing is, load sweeper onto a flat bed truck or trailer to be transported.*

Front Towing

WARNING

Chock wheels before preparing sweeper for towing.

First disengage rear wheel torque hubs, then release parking brake before towing R3Air.

1. Chock rear wheels.
2. Disengage left and right rear wheel torque hubs.
   a. Remove two holes securing tow plate to center of torque hub.

NOTE: *Tow plate is a 1/2" by 3" diameter part with a dimple sticking out from the center of one side.*

   b. Turn tow plate over and install on torque hub with round dimple facing toward the middle of sweeper.

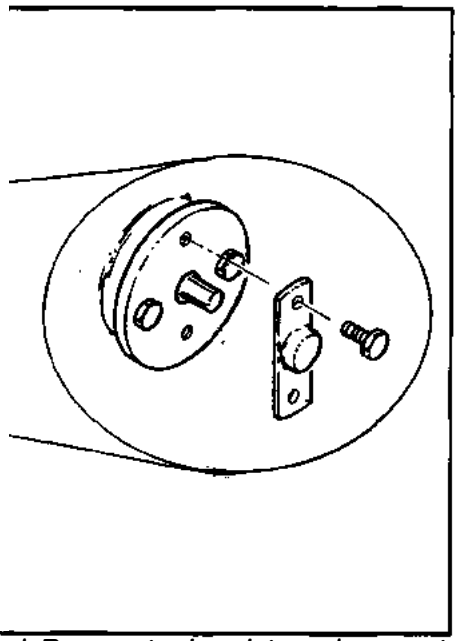

Fig. 2.7 – *Each rear wheel torque hub must be disengaged before sweeper can be towed. Remove towing plate and remount with dimple facing inward disengaging torque hub.*

c. Install and tighten two bolts securing tow plate to torque hub. Dimple will force torque hub to disengage when bolts are tight.

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

3. Hitch front end of sweeper to towing vehicle (use rigid tow hitch).
4. Remove parking brake release hair pen from linkage screw. Remove gutter broom angle adjustment tool from storage chain.
5. Disengage parking brake by using gutter broom tool to mechanically screw parking brake turnbuckle counterclockwise (relative to brake canister) until spring is compressed.

NOTE: *On old sweepers, pressurize actuator canister with air and remove clevis pin from large parking brake clevis and equalizer plate.*

6. With front end of sweeper hitched to towing vehicle, raise front wheel off the ground.
7. Ensure rear wheels spin freely with torque hubs and parking brake disengaged.
8. Remove wheel chocks.

Chock wheels before unhitching sweeper from tow vehicle.

First engage parking brake, then engage rear wheel torque hubs towing Global R3AIR.

WARNING

Do not tow sweeper over 20 mph. Use extreme caution.

Use proper tow–vehicle lighting. Observe local towing regulations.

Unhitch Sweeper From Towing Vehicle

Operation
Towing

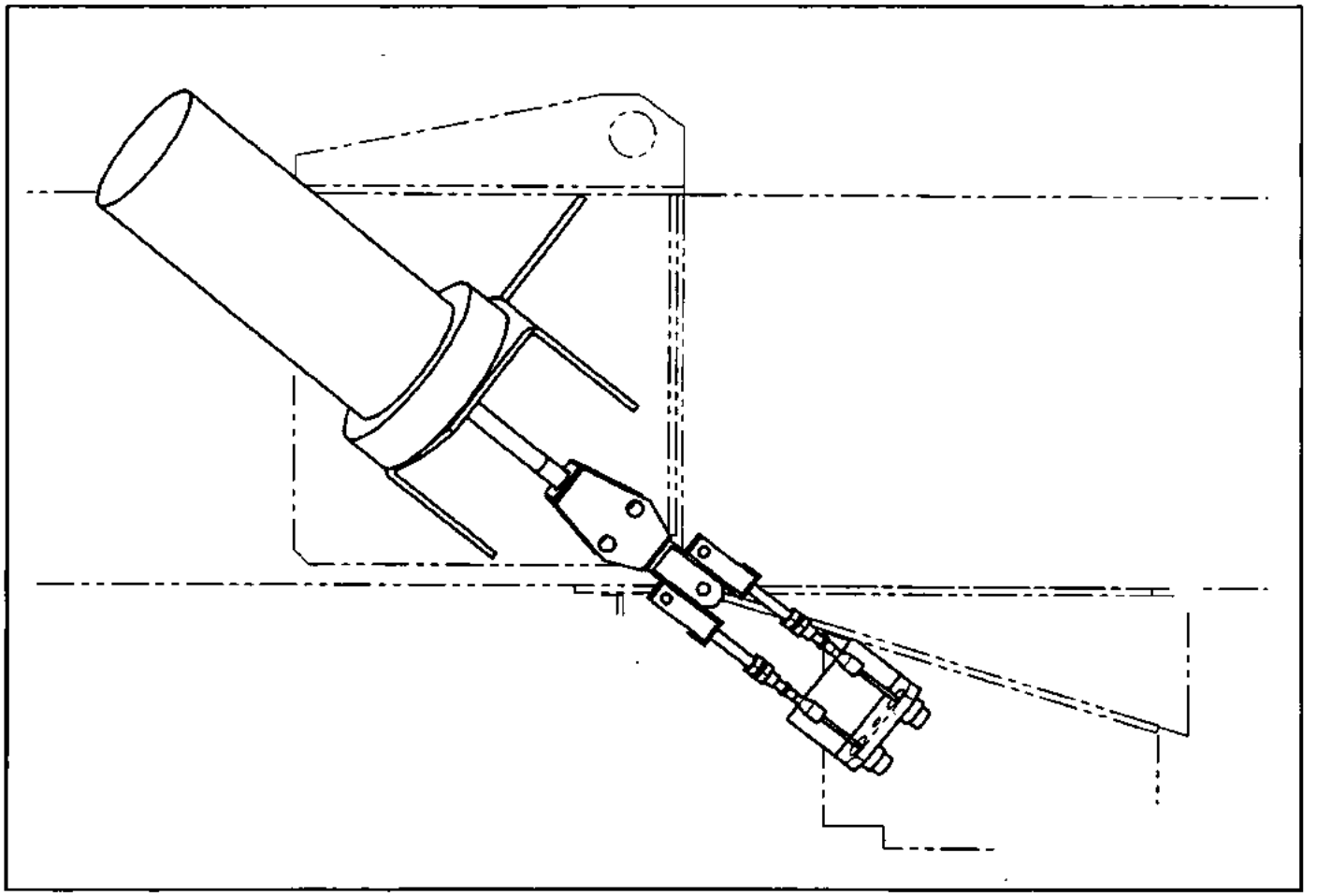

***Fig. 2.8** – Disengage parking brake by mechanically screwing turnbuckle counterclockwise (relative to brake canister) until spring is compressed. Screw turnbuckle clockwise to engage parking brake.*

1. Install wheel chocks after towing transportation is complete.
2. Engage parking brake by using gutter broom tool to mechanically screw parking brake turnbuckle clockwise (relative to brake canister) until spring is decompressed.
3. Replace parking brake release hair pen in linkage screw. Return gutter broom angle adjustment tool to its stow position.

***NOTE:** On old sweepers, pressurize actuator canister with air and replace clevis pin through large parking brake clevis and equalizer plate.*

4. Check parking brakes for proper operation. If required, refer to Parking Brake Adjustment, chapter 3.
5. Lower sweeper to ground and unhitch from towing vehicle.
6. Engage left and right rear wheel torque hubs.
   a. Remove two holes securing tow plate to center of torque hub. Torque hub will disengage.

***NOTE:** Tow plate is a 1/2" by 3" diameter part with a dimple sticking out from the center of one side.*

   b. Turn tow plate over (it's original position) and install on torque hub with round dimple facing away from the middle of sweeper.
   c. Install and tighten two bolts securing tow plate to torque hub.
7. Remove wheel chocks.

Table 2.3
Operating Safety Advice

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 pulling 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 blower impeller becomes jammed, turn **off** blower drive motor and **stop** engine before proceeding to clear debris.
11. 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.
12. **Do not** overload sweeper.
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 or truck 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 (option) and rear flashers lights.
20. **Never** step on suction hood for any reason. Serious injury may result. Use provided step plates and handle to enter cab. ❑

CHAPTER 3

Adjustments

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3

GUTTER BROOM — ADJUSTMENTS

Properly adjusted gutter brooms are essential in sweeper performance. Each gutter broom requires two variable and one constant adjustment: broom angle in relation to street and curb, broom pressure and forward tilt. 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 — Angle Adjustment

Angle adjustment is controlled by position of gutter broom arm in relation to the vertical bracket. A correctly adjusted gutter broom allows bristles to sweep at a 90 degree angle where street and curb meet (gutter broom plate is parallel to gutter).

1. Remove lock pin tool chained to vertical gutter broom assembly bracket.
2. Pry gutter broom pillow block bearing and arm to a new position. Secure assembly in new position with lock pin tool.

NOTE: *Bolts holding gutter broom pillow block bearing to vertical bracket do not require any mechanical work when adjusting gutter broom angle. Gutter broom pillow block bearing is designed to pivot. Bolts should not be loosened or tightened while adjusting gutter broom angle.*

3. Check for correct gutter broom angle. Repeat procedures 1 and 2 until correct broom angle is achieved.

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 pattern should always overlap pickup broom pattern to avoid streaking.*

Gutter Broom — Pressure Adjustment

Gutter broom pressure is altered using left and right gutter broom pressure adjustment switches in cab.

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

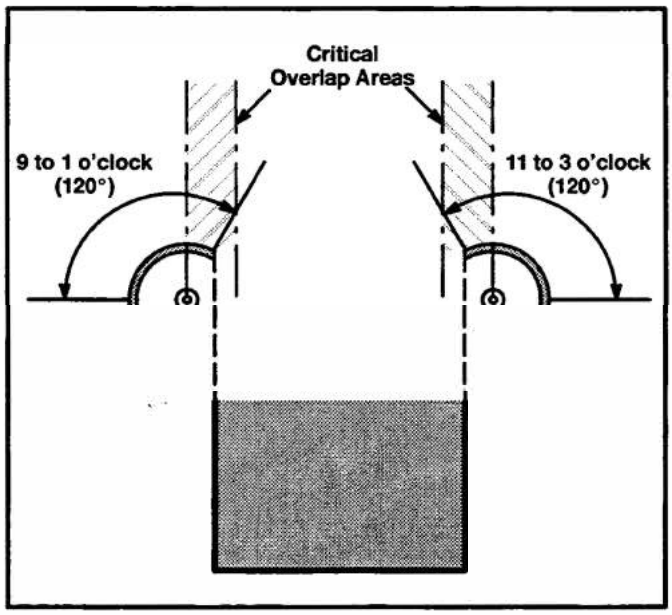


Fig. 3.1 *– Broom overlap pattern is controlled by the gutter broom pressure adjustment. A correct gutter broom pressure pattern creates a 120° angle. Insufficient overlap results in streaking and poor sweeping.*

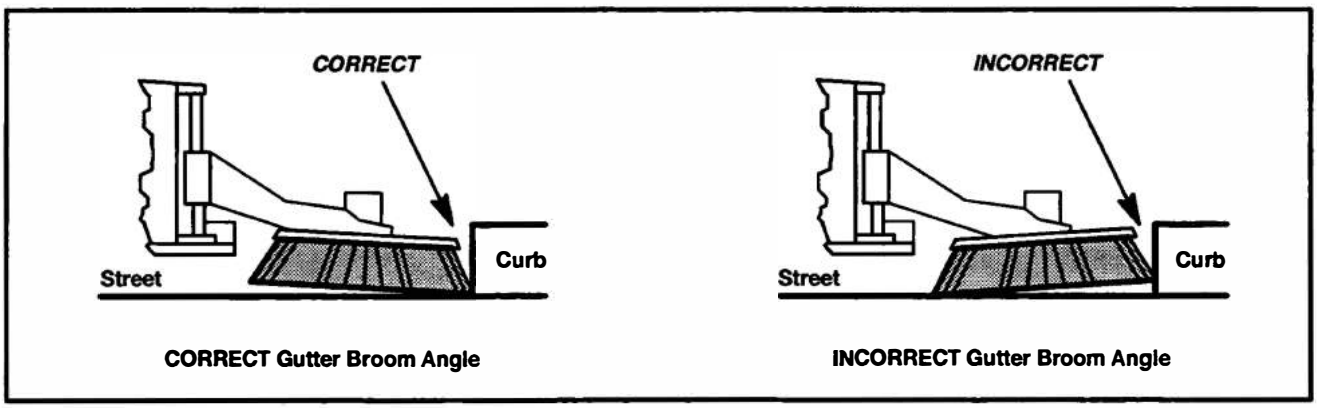
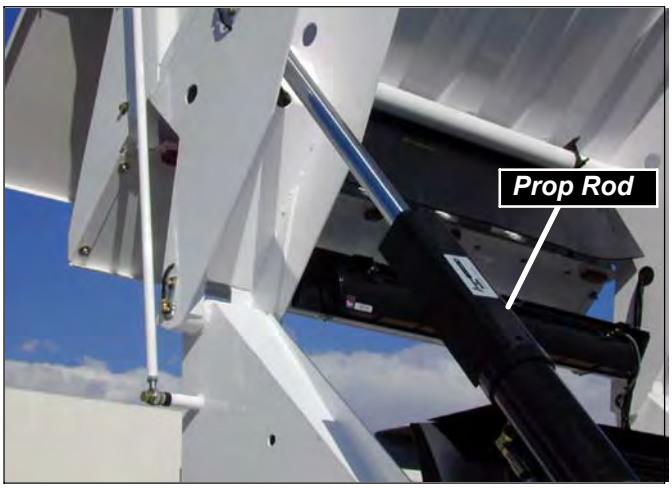


Fig. 3.2 *– A correctly adjusted gutter broom angle allows bristles to sweep at a 90° angle where street and curb meet. Angle adjustment is controlled by position of gutter broom arm in relation to the vertical bracket.*

2. Run engine at 1875 rpm and perform the following procedures.
   a. Lower gutter brooms. Blower/Suction Hood should be off.
   b. Turn *On* gutter broom drive switches and run for approximately 10 seconds.



WARNING

Serious INJURY or DEATH may result if 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.

***Fig. 3.3** – With hopper raised, use a ladder to climb up to hopper cylinder and install safety prop on hopper cylinder rod. Safety prop rests on top edge of cylinder body. Install safety props on both hopper cylinders.*

   c.. Turn *Off* and raise gutter brooms. Drive sweeper forward a few feet. UTILIZE ERGO SWITCH
   d. Lower suction hood. Gutter brooms should be off.
   e. Turn *On* blower drive switch and run for approximately 10 seconds.
   f. Turn *Off* and raise suction hood. Drive sweeper forward, clear of test site.
3. Place shift lever 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 suction hood pattern.

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

4. Adjust gutter brooms using the pressure gauge adjustment knobs in the operators cab.
   a. If broom pattern is too light: broom is not scrubbing ground hard enough causing broom bounce and streaking.
   b. If broom pattern is too heavy: broom is scrubbing ground too hard causing excessive wear.

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

5. Repeat procedures 1–3 after readjustments.

SUCTION HOOD/BLOWER ADJ

The blower and suction hood generate a vacuum flow of recirculating air which picks up debris and filters it into the hopper. Although suction hood and blower speed adjustments are not prone to change, they need to be checked at regular intervals.

Suction Hood Nozzle Flap Adjustment

Suction hood nozzle flap adjustment may be required due to damage caused by sweeping heavy debris. The nozzle flap backing strip can get bent out of tolerance.

1. Position sweeper on clean, level surface with front wheel pointing forward and rear wheels on ramps. Place shifter in *Park* and stop engine. Block wheels using wheel chocks.
2. Check the distance between suction hood nozzle flap and the nozzle opening. Nozzle flap is located about 1 foot forward from the back of the hood.

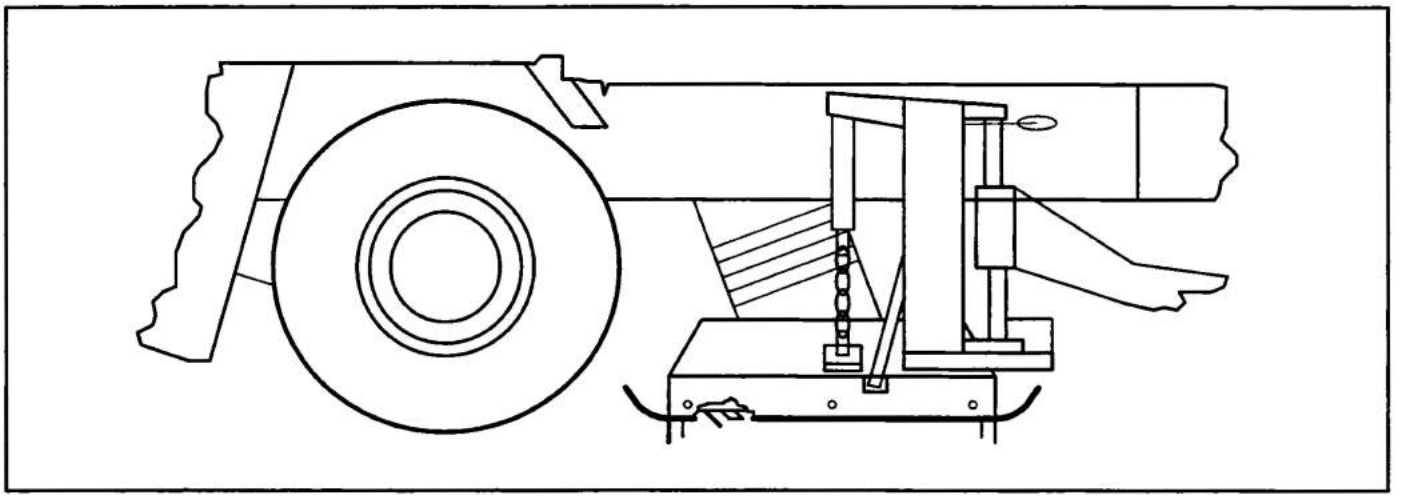


Fig. 3.4 *– Suction hood nozzle flap is visible from under the hood. Suction hood standard flaps (sets of two) are located at each end of the hood which are visible from the side of sweeper.*

NOTE: *Suction hood nozzle flap is visible from under the hood. Do not get the suction hood nozzle flap confused with suction hood standard flaps (sets of two) located at each end of the hood which are visible from the side of sweeper.*

   a. Bend nozzle flap backing strip to achieve 5/8" clearance.

3. Remove wheel chocks and wheel ramps.

Suction Hood Skate Adjustment

Suction hood Skate adjustment is required for misalignment, not for hood height.

1. Position sweeper on clean, level surface with front wheel pointing forward. Lower hood to sweeping position. Place shifter in *Park* and stop engine. Block wheels using wheel chocks.
2. Check left and right skate to ground seal. If skate to ground seal is good, proceed to step 6.
3. Raise hood a few inches off the ground.
4. Adjust right skate parallel to ground.
   a. Loosen skate attachment bolts on both ends of suction hood.
   b. Pivot skate from center bolt making it parallel to ground.
   c. Tighten skate attachment bolts.
5. Adjust left skate parallel to ground with suction hood still a few inches off the ground.
   a. Loosen skate attachment bolts on both ends of suction hood.
   b. Lower suction hood to ground. Skate will self adjust parallel to ground.
   c. Tighten skate attachment bolts.
6. Raise suction hood and remove wheel chocks.

Blower Speed Adjustment

Blower access requires hopper raised to dump position. Install safety props on cylinders (Fig. 3.9) whenever working under hopper.

Blower Speed is controlled electronically and various based on set RPM.

WARNING

Stay clear from running blower. Personal injury may occur.

large hex–centering bolt. Remove two round rubber dust cover plugs from gauge slots located forward and aft on outer rim of backing plate.

4. Loosen large hex–head centering bolt next to star–nut access hole using a 3/4 inch wrench.
5. With adjusting spoon, turn star–nut while sliding **.015** feeler gauge (Snap–On FB326A) in forward slot between brake shoe and drum. Adjust star–nut (clockwise–tighten, counterclockwise–loosen) until gauge makes slight contact between brake shoe and drum.

BRAKE ADJUSTMENTS

The R3AIR sweeper has internal, expanding drum brake assemblies on rear wheels. Rear brakes need to be manually centered when adjusted. Other areas that need adjusting are brake shoe wear, free play in brake pedal and parking brake linkage.

Rear Brake Adjustment

1. Position sweeper on clean, level surface with front wheels pointing forward. Place shifter in *Park* and stop engine. Block wheels using wheel chocks.
2. Disengage parking brake. Remove parking brake release hair pen from linkage screw. Using gutter broom angle adjustment tool, mechanically screw parking brake turnbuckle counterclockwise (relative to brake canister) until spring is compressed.

WARNING

Chock wheels before releasing parking brake.

NOTE: *On old sweepers, pressurize actuator canister with air and remove clevis pin from large parking brake clevis and equalizer plate.*

3. Remove rubber rectangle dust cover from brake backing plate exposing star–nut adjuster next to

Table 3.1
Brake Adjustment
Speciality Tools & Reference Chart

❍	**Torque Wrench**	✓
❍	**Star–Nut Adjusting Spoon**	✓
❍	**0.015 Feeler Gauge**	✓
❍	**Rubber Hammer**	✓
❍	**Wheel Chocks**	✓

❍	**Rear Brake Shoe/ Drum Clearance**	**0.015**
❍	**Parking Brake Free Play (disengaged)**	**1/8"**
❍	**Brake Pedal Free Play (disengaged)**	**1/8"**

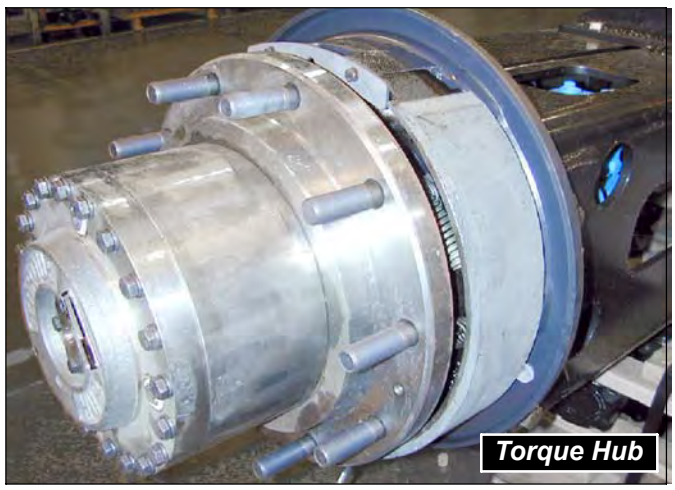
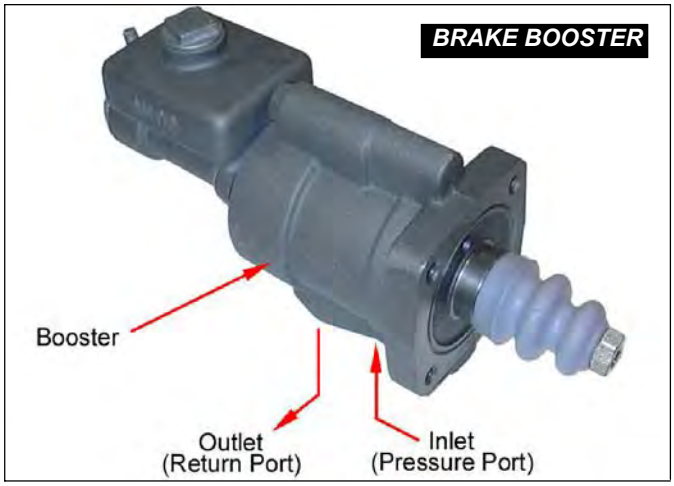


Fig. 3.5 *– Rear brake feeler gauge adjusting holes are on the edge of backing plate. Star nut adjusting holes are next to the large centering bolt.*



Master Cylinder/Brake Booster Fig: 3.6

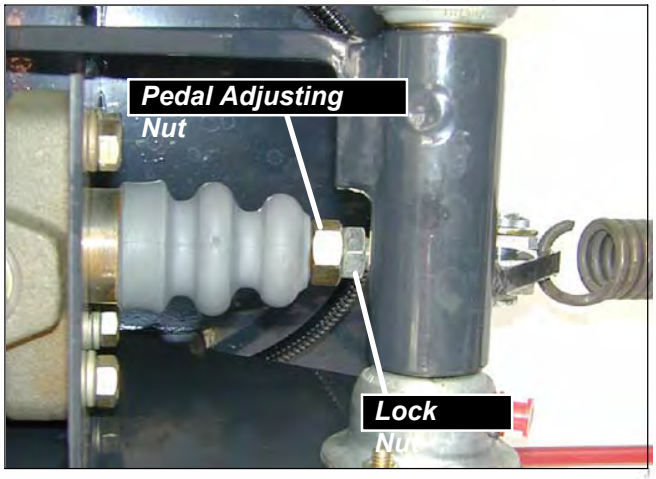


Fig. 3.6 –The hydraulically powered booster in conjuction with the master cylinder, provides a power assist for applying hydraulic brakes. The brake system is composed of the following:

6. Slide **.015** feeler gauge in aft adjusting hole. If both brake shoes are equal distance from drum, go to step 8.
7. If brake shoes are not equal distance from drum, center shoes by lightly tapping large hex–head centering bolt with a rubber hammer. Slightly tighten centering bolt and repeat steps 5 and 6.
8. Once shoes are properly adjusted and centered, torque centering nut to 85 foot–pounds (115 Nm). Double check centering and brake shoe clearance.
9. Replace round rubber dust covers over gauge holes and rectangular dust cover over star–nut hole.
10. Repeat steps 3–9 for opposite wheel.
11. Engage parking brake. Using gutter broom angle adjustment tool, mechanically screw parking brake turnbuckle clockwise (relative to brake canister) until spring is decompressed. If required, refer to Parking Brake Adjustment procedure. Replace parking brake release hair pen in linkage screw. Return gutter broom angle adjustment tool to its stow position.

***NOTE:** On old sweepers, pressurize actuator canister with air and replace clevis pin through large parking brake clevis and equalizer plate.*

12. Remove wheel chocks.

Brake Pedal Adjustment

1. Position sweeper on clean, level surface with front wheel pointing forward. Place shift lever in *Park* and stop engine. Block wheels using wheel chocks.
2. Measure free play in brake pedal where arm goes through floor inside operators cab. If free play is **1/8 inch**, go to step 6.
3. On right side of sweeper between cab and fender, remove side panel (6 bolts) using 7/16 inch wrench gaining access to brake pedal and go–pedal linkage.
4. Loosen lock nut on both ends of long tubular linkage adjusting nut using a 3/4 inch open–end wrench. Take care not to damage any linkage parts while loosening lock nuts. Turn adjusting nut by hand to achieve **1/8 inch** free play in brake pedal.
5. Tighten lock nuts and replace side panel.

Parking Brake Adjustment

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

WARNING

Chock wheels before adjusting parking brake.

2. Start engine and place shifter into a forward gear.
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 pen from linkage screw. Using gutter broom angle adjustment tool, mechanically 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 pen in linkage screw. Return gutter broom angle adjustment tool to its stow position.
6. Place gear shifter in *Park* and turn off engine.
7. Remove wheel chocks. ❑

Notes

CHAPTER 4

Service & Lubrication

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4

GENERAL INFORMATION

Service

To ensure good performance, dependability and safety, regular preventive maintenance is essential on the Global R3Air Isuzu sweeper. The following charts, figures and tables outline periodic maintenance for a sweeper subjected to average use. A vehicle that is extensively exposed to abusive conditions requires more frequent attention. Sweepers which spend a lot of time parked also require periodic maintenance. Rust, dirt and corrosion cause unnecessary damage if the vehicle is ne-glected. Following routine maintenance suggestions in this chapter will help avoid expensive repairs.

Lubrication

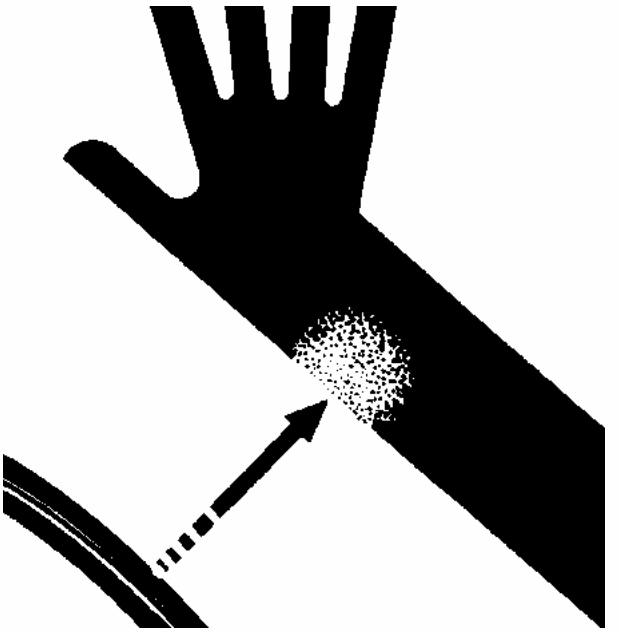
Strict adherence to a detailed lubrication schedule is as important as timely preventive maintenance. The recom-mended lubrication schedule in the following charts, fig-ures and tables is based on average vehicle use under normal sweeping conditions in moderate whether and climate. Abnormal use such as sweeping in dusty, dirty conditions, or in extremely hot or cold climates, requires lubri-cants to be checked and changed more frequently than suggested in lubrication schedule.

Acids that form in engine and hydraulic oil during short-haul driving, or during operation in extremely cold cli-mates, are injurious to moving parts and will wear out parts as quickly as dirty lubricants. Lack of lubrication on these items will make control operation difficult in addition to causing premature wear. However, lubricants should be used sparingly and wipe excess oil and grease away to prevent it from attracting dirt which will also accelerate wear.

Symbols

The following symbols are used throughout the Service & Lubrication chapter to help define procedures:

✔	**Check Procedure**
	Lubricate Procedure
	Service Procedure • **Change** • **Clean** • **Replace**



WARNING

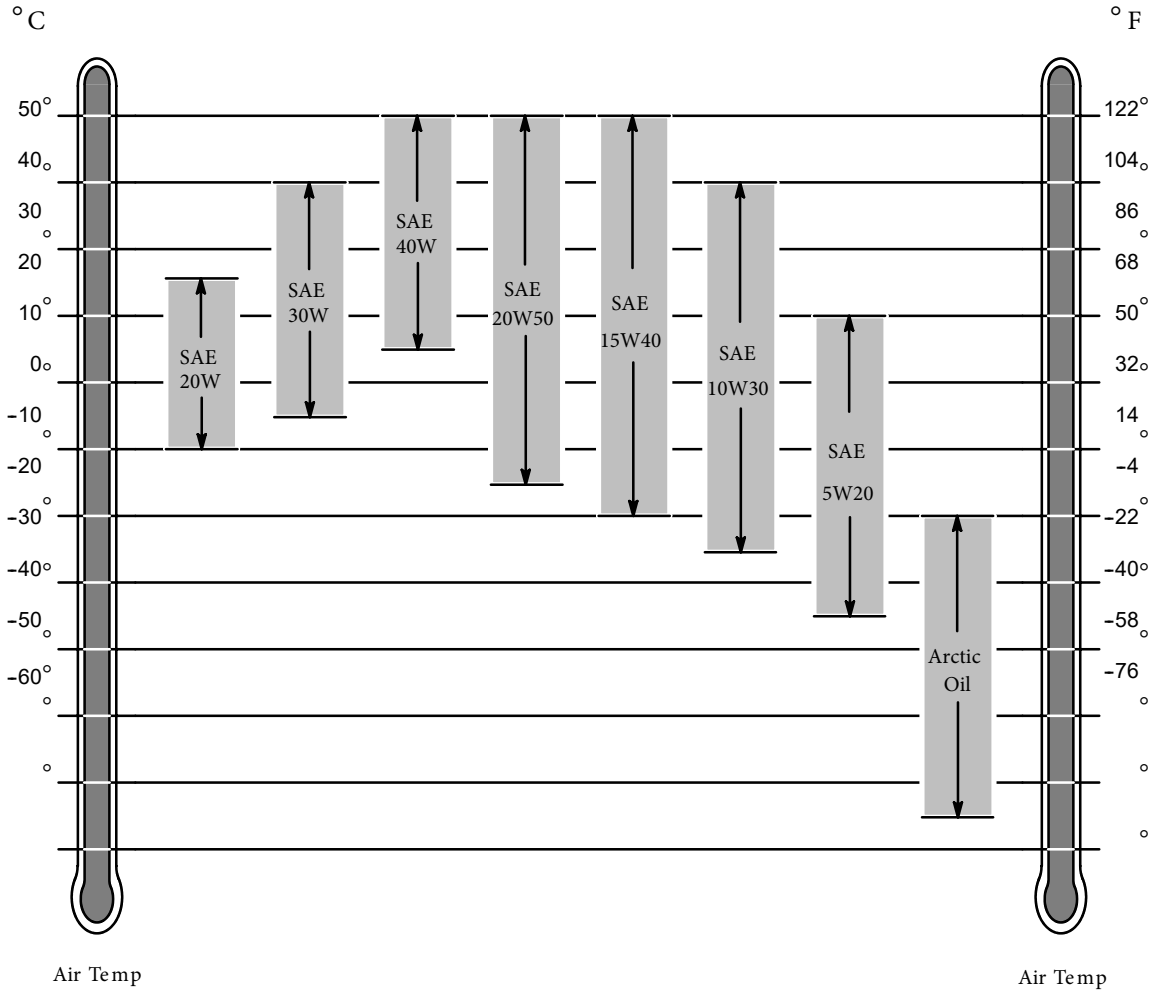
Do not attempt to check for hydraulic oil leaks without hand and eye protection. Oil under pressure can penetrate skin and cause severe injury.

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 and cause serious injury.

Use extreme caution when inspecting hydraulic system for oil leaks.

***Fig. 4.1** – Check for leaks prior to working on or near hydraulic system and always wear appropriate clothing and eye protection.*



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.

Table 4.1
Daily Maintenance Procedures

No.	Daily Procedure	Daily Maint Guide Pg 4–15	Periodic Maint Guide Pg 4–17	Detail Ref Fig	Recommended Fluid/Lubricant
	Check:				
1.	Air cleaner dust cap. Clean as required. Do not clean safety element.	1	1	4.5	–
2.	Air cleaner hoses and connections. Repair or replace as required.	2	2	–	–
3.	Air cleaner service indicator with engine running. Clean main element before yellow indicator reaches 20 in. vacuum level.	3	3	4.5	–
4.	Engine coolant level at deaeration tank. Add coolant as required.	4	6	–	ref to Cht 4.4
5.	Engine coolant systems for leaks. Repair or replace as required.	5	7	–	–
6.	Engine oil level. Add oil as required.	6	8	–	ref to Cht 4.3
7.	Engine oil system for leaks. Repair or replace as required.	7	9	–	–
8.	Fan belt tension. Adjust as required.	8	10	–	–
9.	Fuel level on gauge in operators cab. Add fuel as required.	9	11	–	ref to Cht 4.2
10.	Hydraulic oil level in each tank by observing sight gauge. Engine must be warm. Add oil as required.	10	15	–	
	CAUTION **Filler breather cap is under slight pressure, about 5 psi. Open with caution.**				
11.	Hydraulic oil system for leaks. Repair or replace as required.	11	16	4.1	–
12.	Tire pressure in all tires. Add air as required.	12	19	–	–
	Lubricate:	13	20.1	–	ref to Cht 4.1
13.	Blower bearings.				

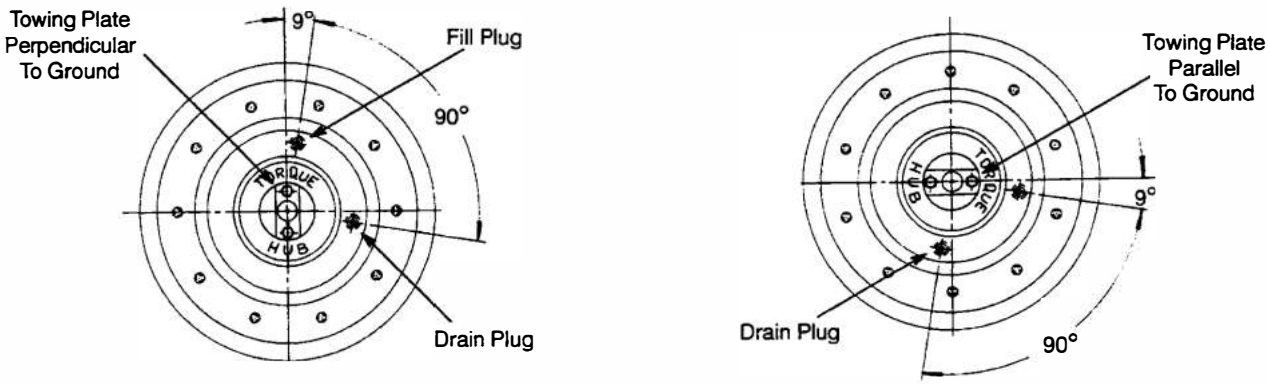
Table 4.2
50–Hour Maintenance Procedures

No.	50–Hour Procedure	Periodic Maint Guide Pg 4–17	Detail Ref Fig	Recommended Fluid/Lubricant
1.	Perform all Daily maintenance procedures Table 4.1.	–	–	–
✔	**Check:**			
2.	Brake fluid level. Add fluid as required.	5	–	SAE Bk Fl DOT 3
3.	Hydraulic oil filter gauge, suction line. After engine is operating for 15 minutes, observe gauge on suction of hydraulic oil filter. If pointer exceeds 10 in. Hg at 2100 rpm's, replace hydraulic filter.	13	4. 1 4.4	
4.	Hydraulic oil filter gauges, high pressure and filters. With hydraulic oil at operating temperature and engine at 2100 RPM observe the indicators on the filters. If indicating red replace filters.	14	4. 1 4.4	
5.	Steering ball joints for wear. Replace as required.	17	4.3	–
6.	Steering spindle bearing for wear. Replace as required.	18	4. 3	–
	CAUTION **Always chock wheels before working on torque hubs or under any area of sweeper.**			
7.	Torque hub oil level. Rotate wheel positioning tow plate perpendicular to ground. Check plugs will be at 3 o'clock and 0 o'clock (45°). Remove both upper and lower plugs. Fill torque hub through upper plug until oil drains from lower plug.	20	4.2	SAE Multpurp Gear Oil– EP 90W
	Lubricate:			
8.	Front wheel bearings.	22	–	ref to Cht 4. 1
9.	Gutter broom lift bearings.	23	–	ref to Cht 4.1
10.	Hopper pivot bearings.	24	–	ref to Cht 4. 1
11.	Hopper ram pivot bearing, lower.	25	–	ref to Cht 4. 1
12.	Hopper ram pivot bearing, upper.	26	–	ref to Cht 4. 1
13.	Steering ball joints.	27	4. 3	ref to Cht 4. 1
14.	Steering spindle bearing.	28	4. 3	ref to Cht 4. 1

(continued)

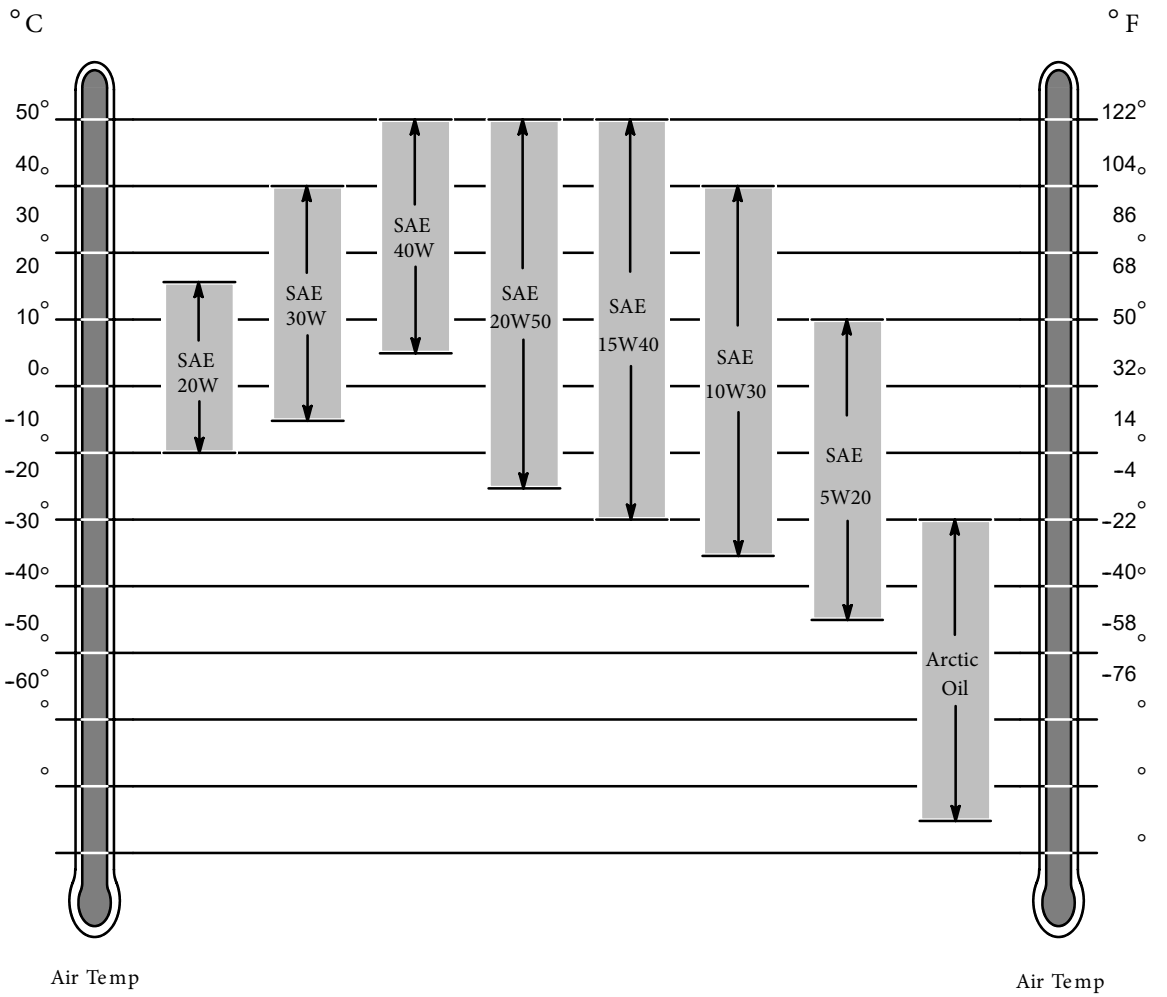
Table 4.3 (continued)
50–Hour Maintenance Procedures

No.	50–Hour Procedure	Periodic Maint Guide Pg 4–17	Detail Ref Fig	Recommended Fluid/Lubricant
	Service–Change:			
15.	Torque hub oil if sweeper is new or torque hub has been replaced or rebuilt. Thereafter, replace torque hub oil during 500–Hour periodic maintenance.	29	4.2	SAE Multpurp Gear Oil– EP 90W
	Service–Clean:			
16.	Water strainer. Disconnect filler hose from elbow on top of water tank. Loosen lock nuts and remove thumb screws from flange gaining access to screen. Remove and clean strainer screen.	34	–	–
	Take precautionary measures to keep all dirt, grime, dust and debris from contaminating hydraulic oil when working on hydraulic system. Contaminated oil may cause severe damage to hydraulic components.			
	Service–Replace:			
17.	Hydraulic oil filters if sweeper is new or any components such as motors or pumps have been replaced. Thereafter, replace hydraulic oil filters during 500–Hour periodic maintenance.	40	4.1 4.4	



Fill Torque Hub Oil **Drain Torque Hub Oil**

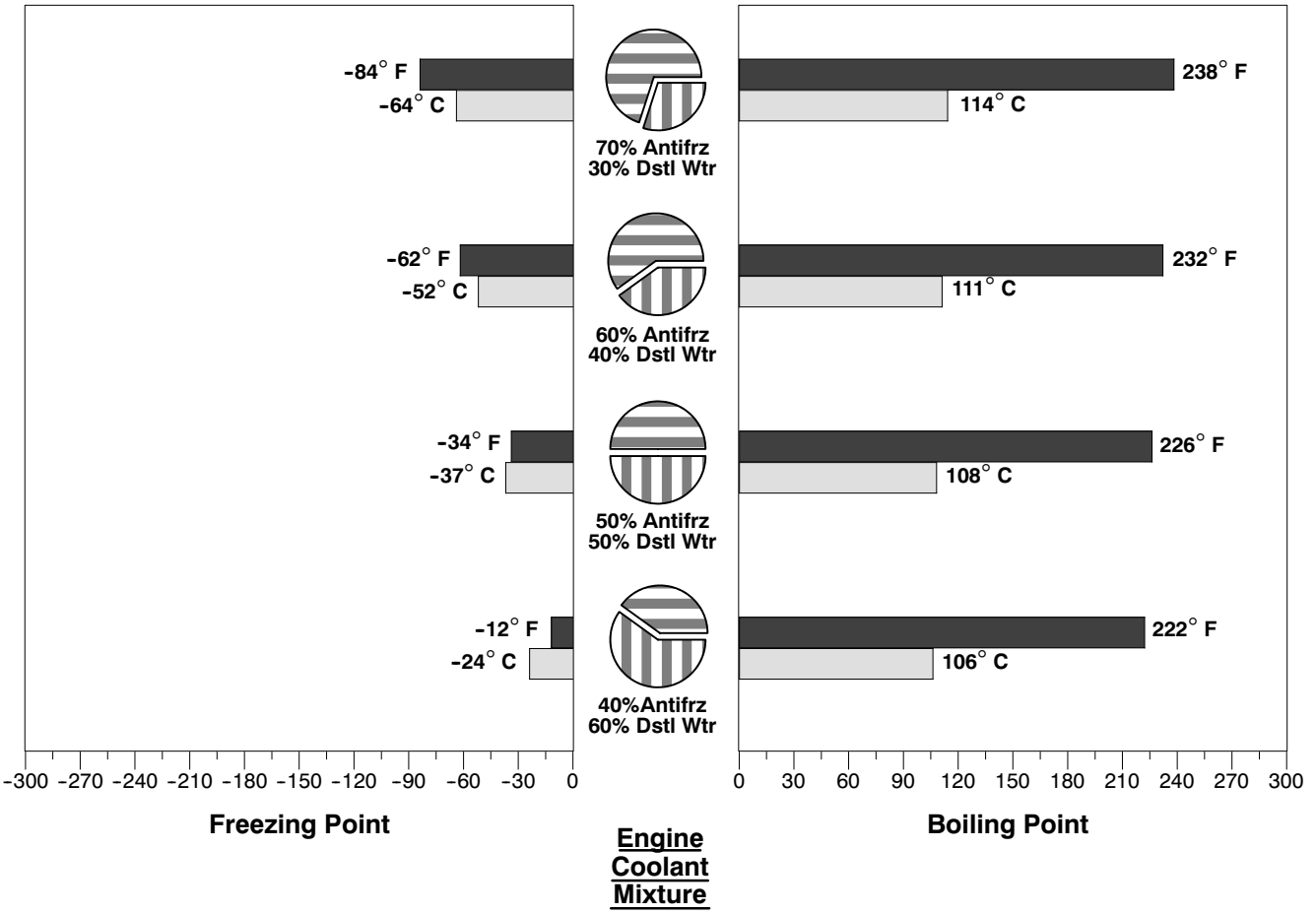
***Fig. 4.2** – To fill torque hub, rotate wheel positioning tow plate perpendicular to ground. Check plugs are positioned at 3 o'clock or 9 o'clock. Fill torque hub through upper check plug until oil drains from lower check plug. To drain torque hub, rotate wheel positioning tow plate parallel to ground. Remove lower check plug at 6 o'clock to drain oil.*



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.



CAUTION

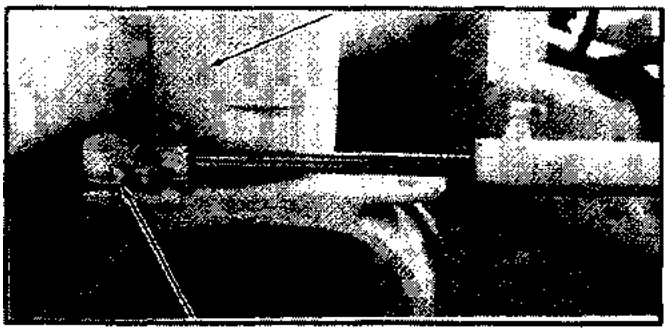
Do not use methyl alcohol base antifreeze. Do not use methoxy propanol antifreeze. Damage may occur to rubber seals on cylinder liners which are in contact with coolant.

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.

Table 4.3
100–Hour Maintenance Procedures

No.	100–Hour Procedure	Periodic Maint Guide Pg 4–17	Detail Ref Fig	Recommended Fluid/Lubricant
1.	Perform 50–Hour maintenance procedures 1 through 17 and 19 in Table 4.2.	–	–	–
✓	**Check:**			
2.	Hydraulic oil composition. Run engine for 15 minutes while operating several hydraulic components such as brooms or hopper dump. Turn engine off. Clean a convenient hydraulic fitting and draw sample of hydraulic oil into a sterile container. Test composition of oil. Change hydraulic oil if analysis indicates composition breakdown, excess dirt or deterioration.	12	–	
3*	Blower Impeller for wear. Replace as required.	4	–	–
	Service–Change:			
4.	Engine oil. Operate engine for 15 minutes before draining old oil. Do not run engine while changing oil.	30	–	ref to Cht 4.3
	CAUTION **Shut engine off when changing either hydraulic or engine oil. Use caution when working around warm engine and exhaust parts.**			
5.	Hydraulic oil. Check hydraulic oil composition every 250 hours and change as needed. Follow procedure 2 (above) to test oil composition.	32	–	ISO– 46
	Service–Replace:			
6.	Engine oil filter. After draining old oil from motor, change engine oil filter. Then fill motor with new oil.	37	–	ref to Cht 4.3



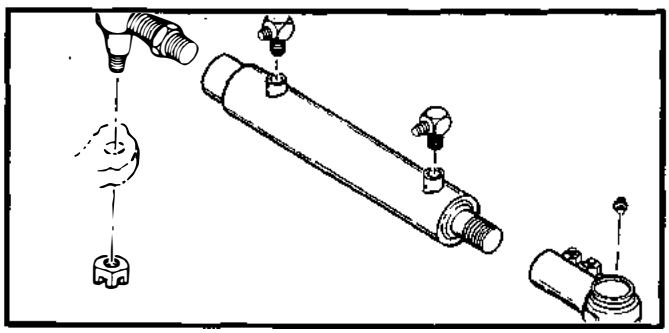


***Fig. 4.3** – Steering Ball Joints and Spindle Bearing lube points are accessed from under the front of the sweeper. Lube points are located on top corner of frame and top of front fork.*

Table 4.4
250–Hour Maintenance Procedures

No.	250–Hour Procedure	Periodic Maint Guide Pg 4–17	Detail Ref Fig	Recommended Fluid/Lubricant
1.	Perform 100–Hour maintenance procedures 1 through 3 and 5 in Table 4.3.	–	–	–
	Lubricate:			
2.	Door hinges and latches.	21	–	Light General Purpose Oil
	Service–Replace:			
3.	Air cleaner, primary element.	35	4.5	–
4.	Air cleaner, safety element. Change safety element when required or at least every third time primary element is replaced.	36	4.5	–
5.	Fuel filter, primary. Fill new filter with fuel before installing. Use fuel primer switch when starting engine for the first time after filter is installed. Longer engine cranking time may be required.	38	4.6	ref to Cht 4.2
	CAUTION **Do not run starter motor 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.**			
6.	Fuel filter, secondary. Fill new filter with fuel before installing. Secondary fuel filter is located on engine block. Use fuel primer switch when starting engine for the first time after filter is installed. Longer engine cranking time may be required.	39	4.6	ref to Cht 4.2

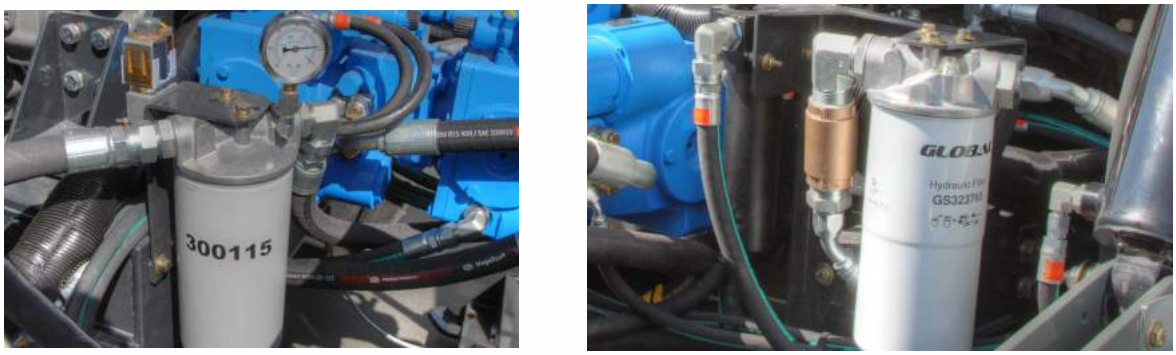


***Fig. 4.4** – Hydraulic suction and high pressure line filters are equipped with gauges which monitor flow performance. Suction filter and gauge is located on right side of engine compartment. High pressure line filter and gauge is located on left side of engine compartment. Check filter gauges with engine/hydraulic oil warm.*

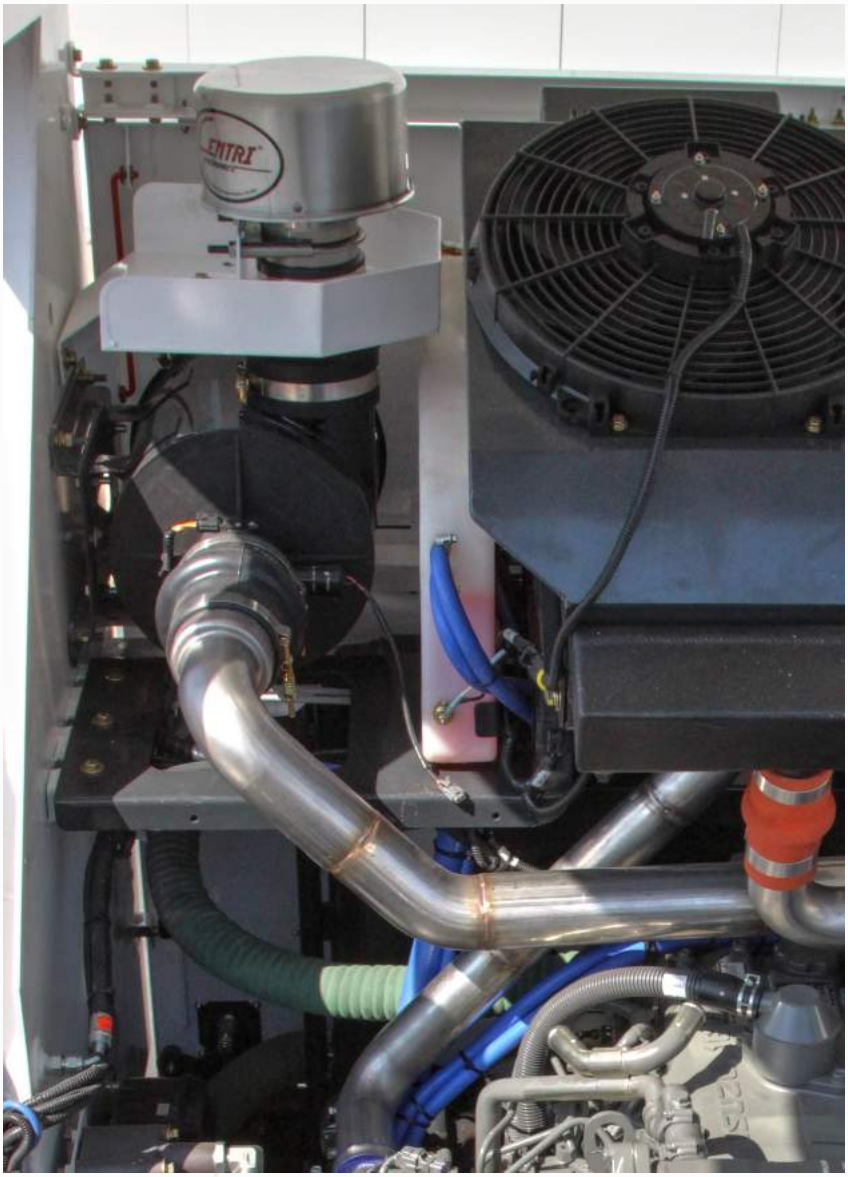


***Fig. 4.5** – From behind the sweeper, check air cleaner service indicator daily. Clean air cleaner before vacuum level reaches 20 inches.*

***Fig. 4.6** – Primary fuel filter is mounted on inside wall of right hydraulic tank. When replacing, fill new filter with fuel before installing. Secondary fuel filter system is located on right side of engine block.*

Table 4.5
500–Hour Maintenance Procedures

No.	500–Hour Procedure	Periodic Maint Guide Pg 4–17	Detail Ref Fig	Recommended Fluid/Lubricant
1.	Perform 250–Hour maintenance procedures 1 through 6 in Table 4.4.	–	–	–
	Service–Change:			
2.	Front wheel bearings grease. Thoroughly clean old grease from bearings and associated parts before applying new grease.	31	4.3	ref to Cht 4.1
	CAUTION **Take precautionary measures to keep all dirt, grime, dust and debris from contaminating hydraulic oil when working on hydraulic system. Contaminated oil may cause severe damage to hydraulic components.**			
3.	Hydraulic oil. Change when lab results indicate replacement is needed or if contaminated.	32	4.1	
	CAUTION **Always chock wheels before working on differential or under any area of sweeper.**			
4.	Torque hub oil. Rotate wheel positioning tow plate parallel to ground. One check plug will be at 6 o'clock (180°). Remove lower plug. Drain torque hub oil through lower plug. To fill torque hub with new oil, Rotate wheel positioning tow plate perpendicular to ground. Check plugs will be at 3 o'clock or 9 o'clock (45°). Remove both upper and lower plugs. Fill torque hub through upper plug until oil drains from lower plug.	29	4.2	**SAE Multpurp Gear Oil–EP 90W**
	Service–Clean:			
5.	Front wheel bearings. Thoroughly clean front wheel bearings and associated parts.	33	–	**Genl Purp Clng Solvent**
	Service–Replace:			
6.	Hydraulic oil filters. After draining old oil from hydraulic tanks, change hydraulic suction line and return line filters. Then fill hydraulic tanks with new oil.❑	40	4.1 4.4	

Notes

CHAPTER 5

Maintenance/Overhaul

Table of Contents

5

GENERAL INFORMATION

Procedures for removal, installation, repair and overhaul of VV3000 sweeper is discussed throughout the following pages. Refer to the supplied Engine manual to perform any service, maintenance, overhaul or troubleshooting procedures on engine.

Throughout chapter 5, Front and Rear refer to front and rear of vehicle. Beware that the engine actually sits 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). The front of any component is determined by the area which is towards the front of vehicle when assembled on the sweeper. Left and Right sides of the vehicle refer to the orientation of a person sitting in the drivers cab facing forward.

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

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

Perform preventive maintenance and overhaul tasks when required to avoid additional expensive repairs resulting from damage caused by operating a malfunctioning sweeper. A good mechanical working sweeper increases reliability and improves long term overall performance.

Table 5.1
Jacking Procedure

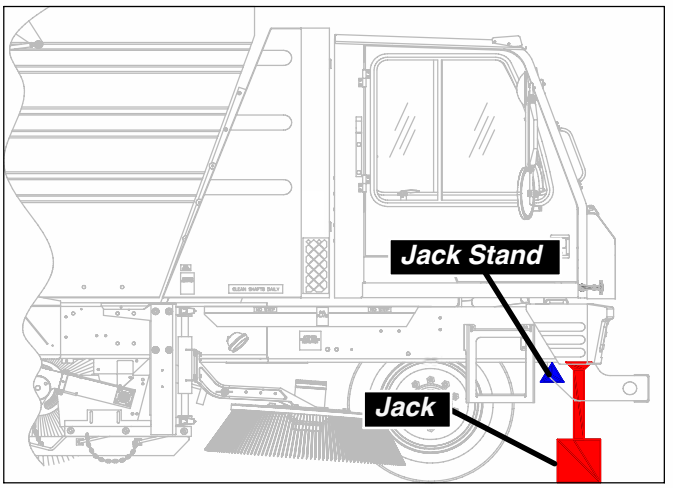


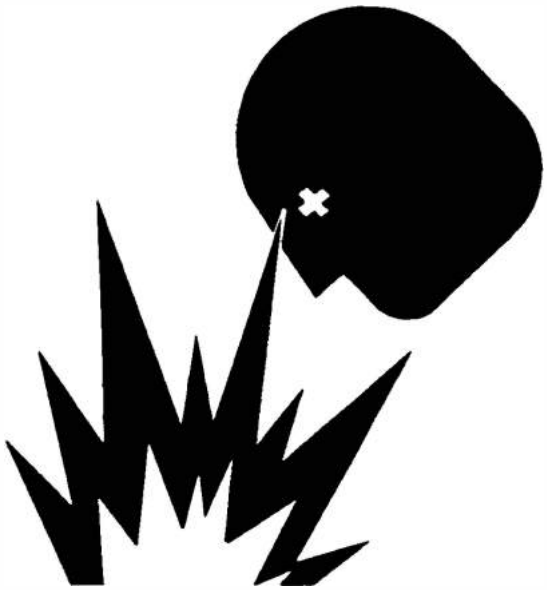
Fig: 2.15 A

Equipment Required

- 5–ton hydraulic jack with an adjustable stroke of 9 in. min to 19 in. max.
- Wheel chocks
- Jackstands

Procedure

1. Position sweeper on level surface.
2. Place shift lever in "P," setting parking brake.
3. Stop engine.
4. Jacking front:
   a. Chock rear wheels.
   b. Place jack under front frame.
5. Jacking rear:
   a. Chock opposite rear and front wheel.
   b. Place jack under rear jack pad.
6. Place jackstands under vehicle. Do not trust a hydraulic jack to hold sweeper up by itself.



WARNING

Always use an approved OSHA cage when working on or with a tire/wheel assembly. Split flange type rims and extremely high air pressure can cause personnel injury.

Attempting to work on a tire wheel assembly may result in a high air pressure explosion. Wearing safety glasses, ear plugs and working within an approved OSHA cage will help avoid serious injury.

Deflate tire prior to attempting to remove tire or any rim component.

Do not pound on rim or wheel components with steel hammers.

***Fig. 5.1** – Use an approved OSHA cage when working on tire/wheel assemblies to prevent possible injury. Follow all safety procedures when working on or with inflated tires because of the extreme pressures involved.*

WHEELS & BRAKES

Tire/Wheel –*Overhaul*

1. Place tire/wheel assembly in an approved OSHA cage.

WARNING

Always use an approved OSHA cage when working on or with tire/wheel assembly. Do not remove any rim or tire component with tire inflated. Rim assemblies are split flange type and tires are under high air pressure (Fig. 5.1).

2. Remove valve core to deflate tire. If air does not escape, check for a clogged valve stem.
3. Disassemble split flange rim and remove tire.
4. Check rim components for fatigue and cracks. Replace all cracked, worn, damaged or rusted components.

CAUTION

Do not pound on tire or wheel components with steel hammers. If necessary to tap on components, use rubber, lead, brass or plastic mallets.

5. Assemble split flange rim and tire.
6. Around tire bead, use approved vegetable oil soap solution for lubrication or an approved tire lubricant.
7. Seat tire bead by inflating the assembled tire to 130 psi for front and 110 psi for rear with valve stem core removed. Once bead is seated, deflate tire.

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.

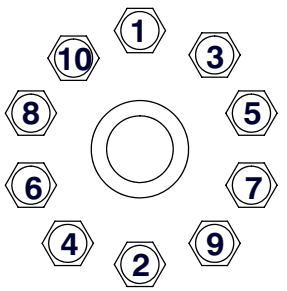
Rear Wheel – *Removal/Installation*

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.

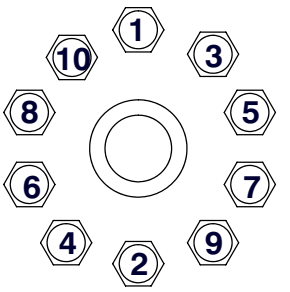
WARNING

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: 5.6 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

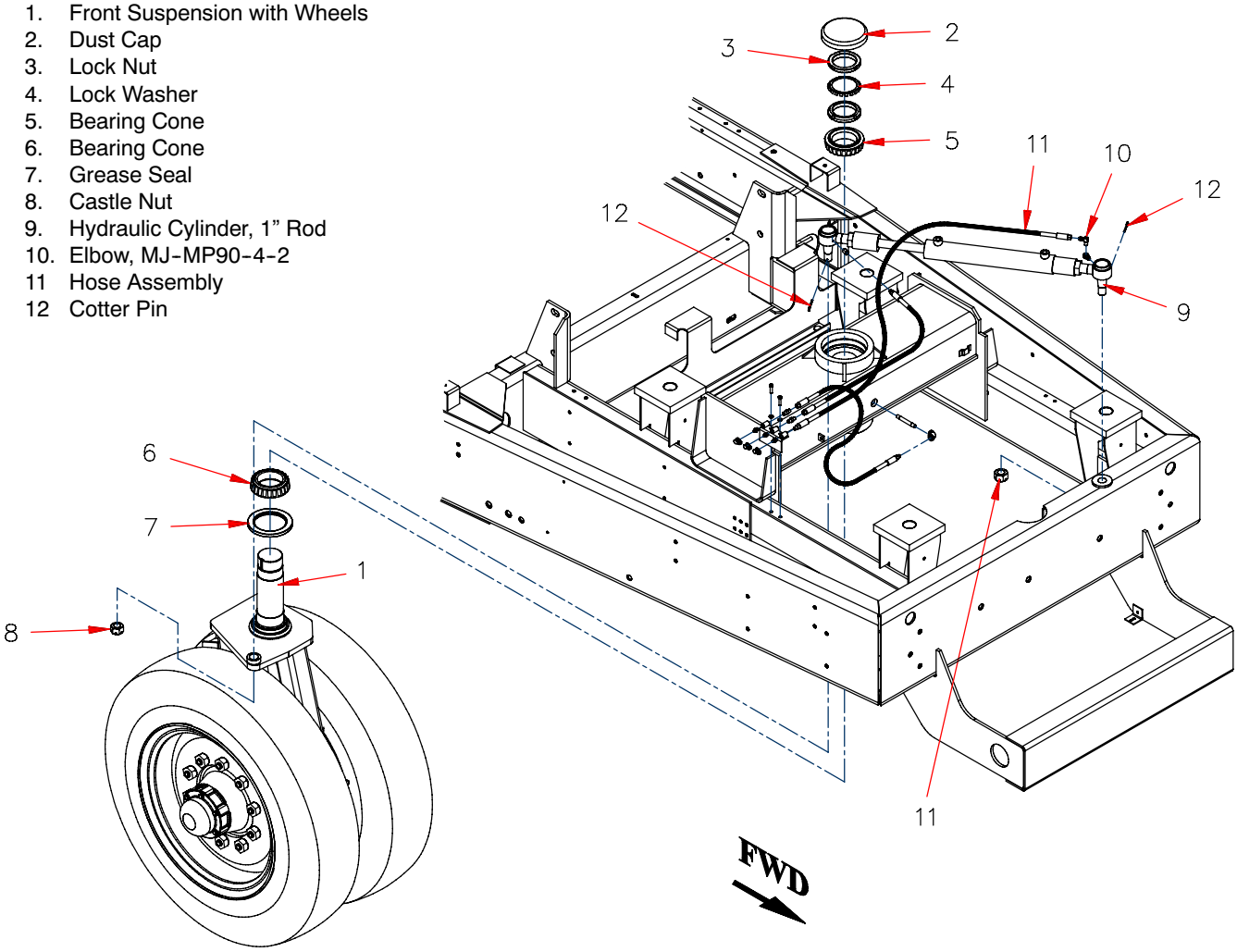


Fig: 5.6 A *Front Suspension Removal/Installation*

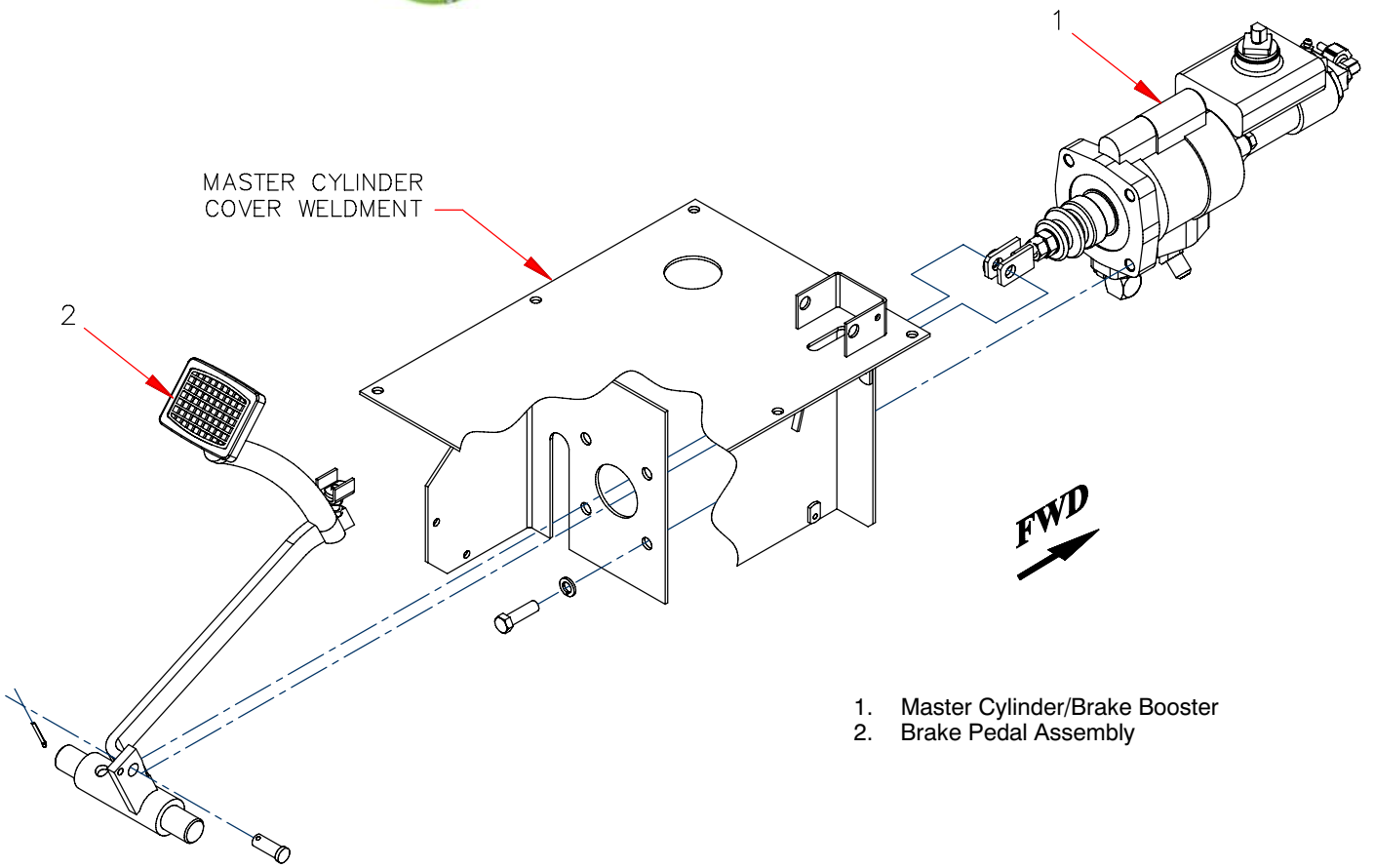


Fig: 5.6 A *Master Cylinder/Brake Booster Removal/Installation*

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

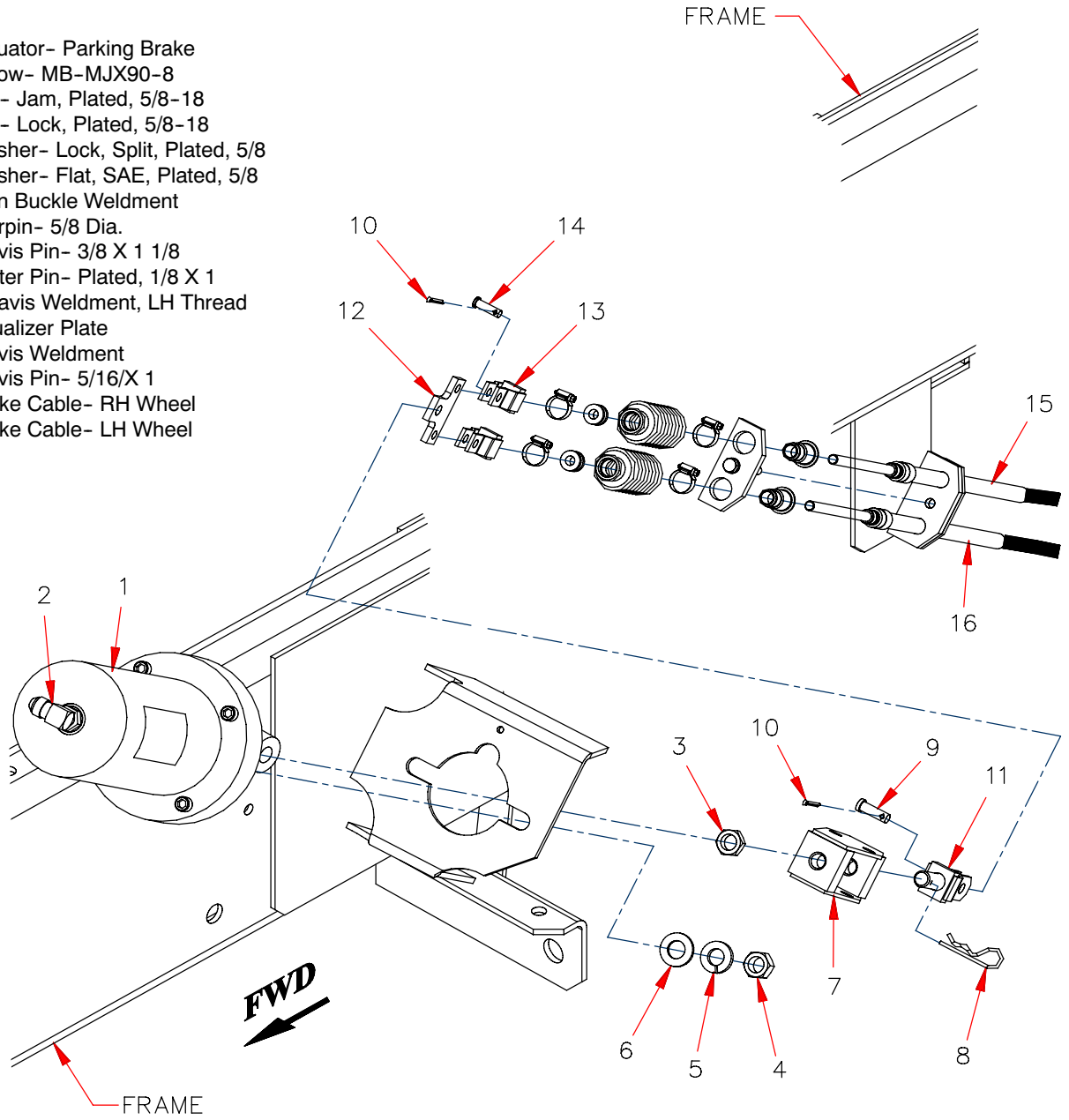


Fig: 5.7 A *The Parking Brake Actuator is located in front of the left rear fender. Do not cut into, disassemble or torch the canister. The spring is under compressed force. The actuator canister must be replaced if a failure occurs.*

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

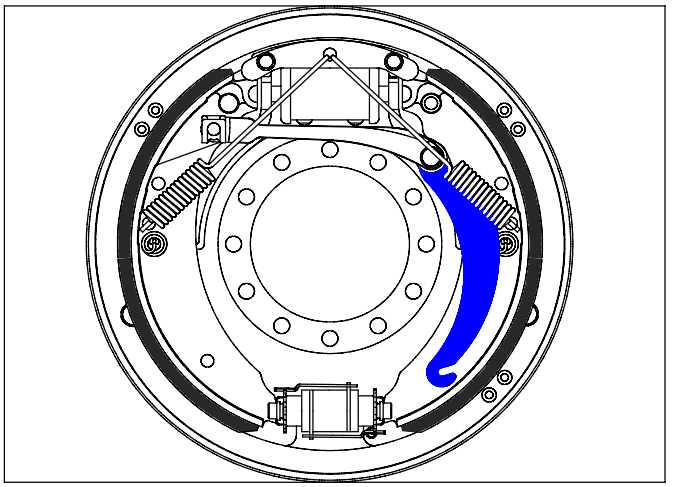


Fig: 5.8 B

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.

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

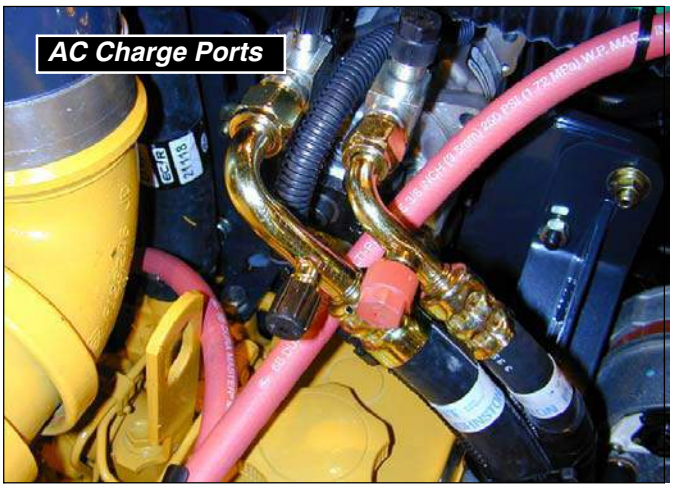


Fig: 5.12 B

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.

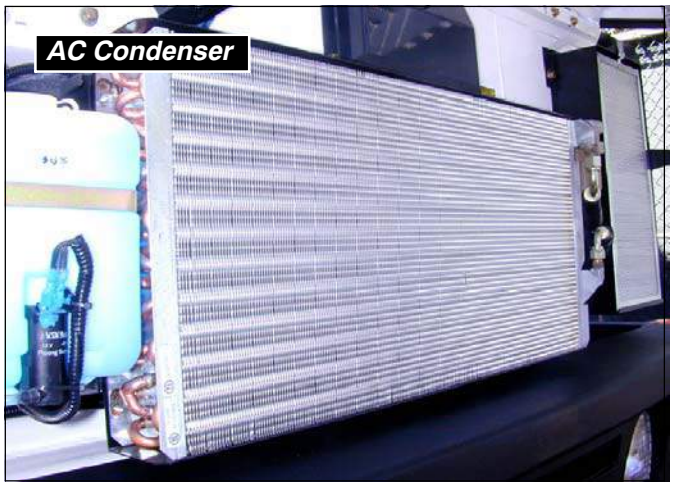


Fig: 5.13 A

Fig: 5.13 B

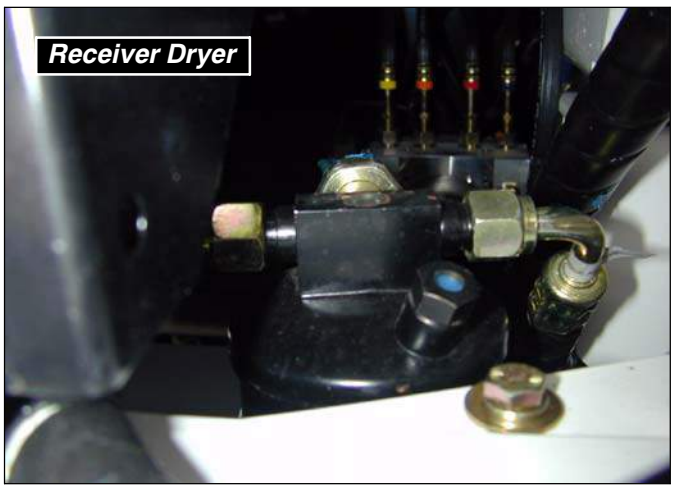


Fig: 5.13 C

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).*

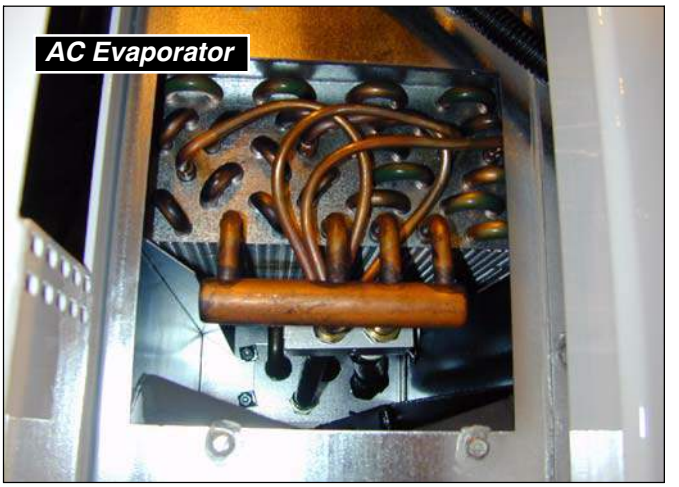


Fig: 5.14 A

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).*

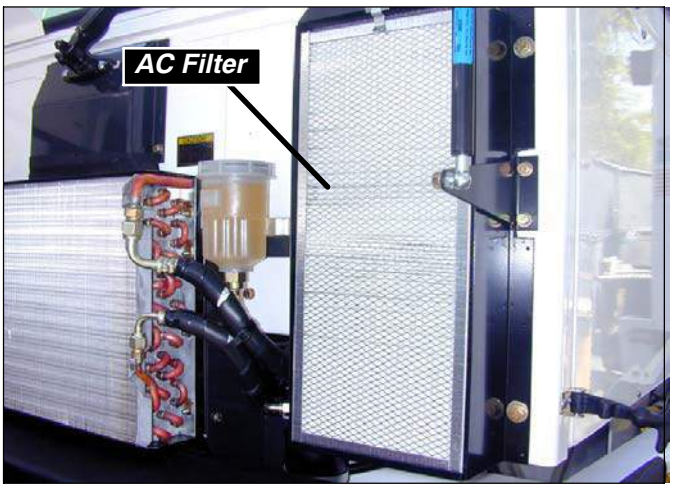


Fig: 5.14 B

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 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)*.

BLOWER GROUP

Blower Impeller –*Removal/Installation*

1. Position sweeper on a level surface under an overhead crane or hoist capable of lifting blower assembly.
2. Place shift lever in "P" position, setting parking brake.
3. Stop engine.

Fig: 5.17 A

WARNING

Serious INJURY or DEATH may result if 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.

Fig. 5.8 – With hopper raised, use a ladder to climb up to hopper cylinder and install safety prop on hopper cylinder rod. Safety prop rests on top edge of cylinder body. Install safety props on both hopper cylinders.

4. Clean area around blower impeller and connecting hardware.
5. Remove hydraulic hoses from blower motor (Fig. 5.9: 1). Drain fluid into a container.

CAUTION

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

***note:** Provide a container to catch excess hydraulic fluid from gutter broom motor prior to removing hoses.*

6. Support blower drive motor with a overhead crane (or similar device).
7. Remove bolts and lock washers (2, 3) that support blower drive motor. Remove hydraulic motor.
8. Loosen bolts and washers (4, 5) holding impeller cover to blower scroll.
9. Remove top bolts to allow upper part of cover (6) to hang away from blower scroll (7).
10. Attach a lift chain to blower impeller cover.
11. With impeller assembly supported by an overhead crane (or similar device), remove remaining impeller cover bolts and washers.
12. Remove impeller assembly.

***note:** Shaft spline must slide out toward the rear of sweeper before impeller assembly can be pulled up.*

13. Remove cotter pin, nut and washer (6, 9, 10) form end of blower shaft.
14. Place a puller plate (similar to figure 5.10) over end of shaft using two 1/2"–13 x 2 1/4" bolts. Tighten bolts evenly to pull impeller off shaft.

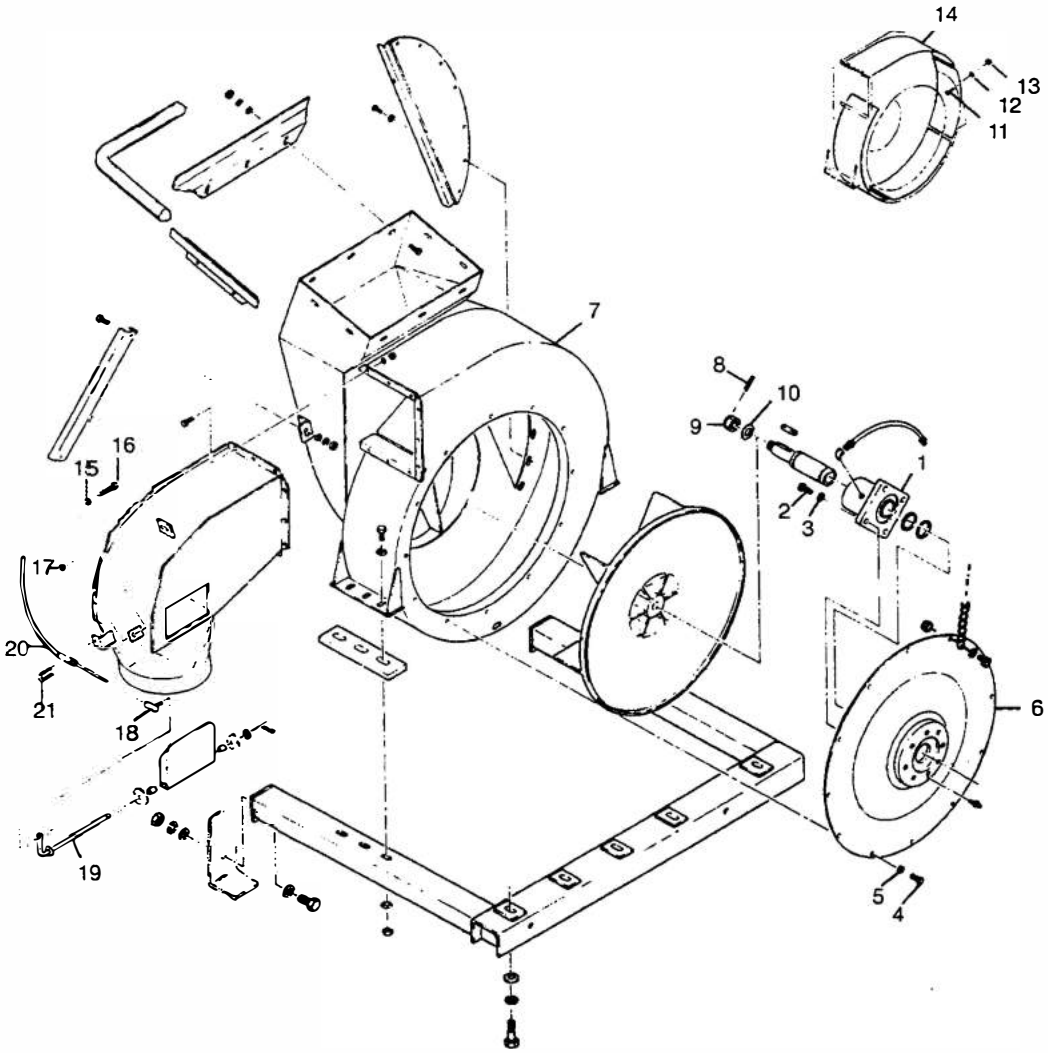
***note:** Threaded holes in impeller are a 1" depth.*

15. Install impeller by reversing steps.

***note:** Impeller must be pressed onto shaft with key aligned.*

Blower Scroll Liner –*Removal/Installation*

1. Position sweeper on a level surface under an overhead crane or hoist capable of lifting blower assembly.
2. Place shift lever in "P" position, setting parking brake.



1. Hydraulic Motor
2. Bolt
3. Washer
4. Bolt
5. Washer
6. Blower Cover
7. Scroll
8. Cotter Pin
9. Nut
10. Washer
11. Bolt
12. Washer
13. Nut
14. Liner
15. Nut
16. Washer
17. Bolt
18. Ball Joint
19. Lever
20. Cable
21. U-Bolt

***Fig. 5.9** – Blower Assembly is located behind operator cab. Blower removal/Installation requires two experienced mechanics and (usually) an overhead crane.*

3. Raise hopper and install safety props (ref Fig 5.8).

WARNING

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

4. Stop engine.
5. Clean area around blower.
6. Remove blower impeller (refer to the preceding procedure).
7. Remove lock nuts, washers and bolts (Fig. 5.9: 11, 12, 13) from blower scroll (7).
8. Remove four rubber liner pieces (14).
9. Install scroll liners by reversing steps.

Blower Vacuum Regulator Cable –*Removal/Installation*

1. Position sweeper on a level surface.
2. Place shift lever in "P" position, setting parking brake.
3. Raise hopper and install safety props (ref Fig 5.8).

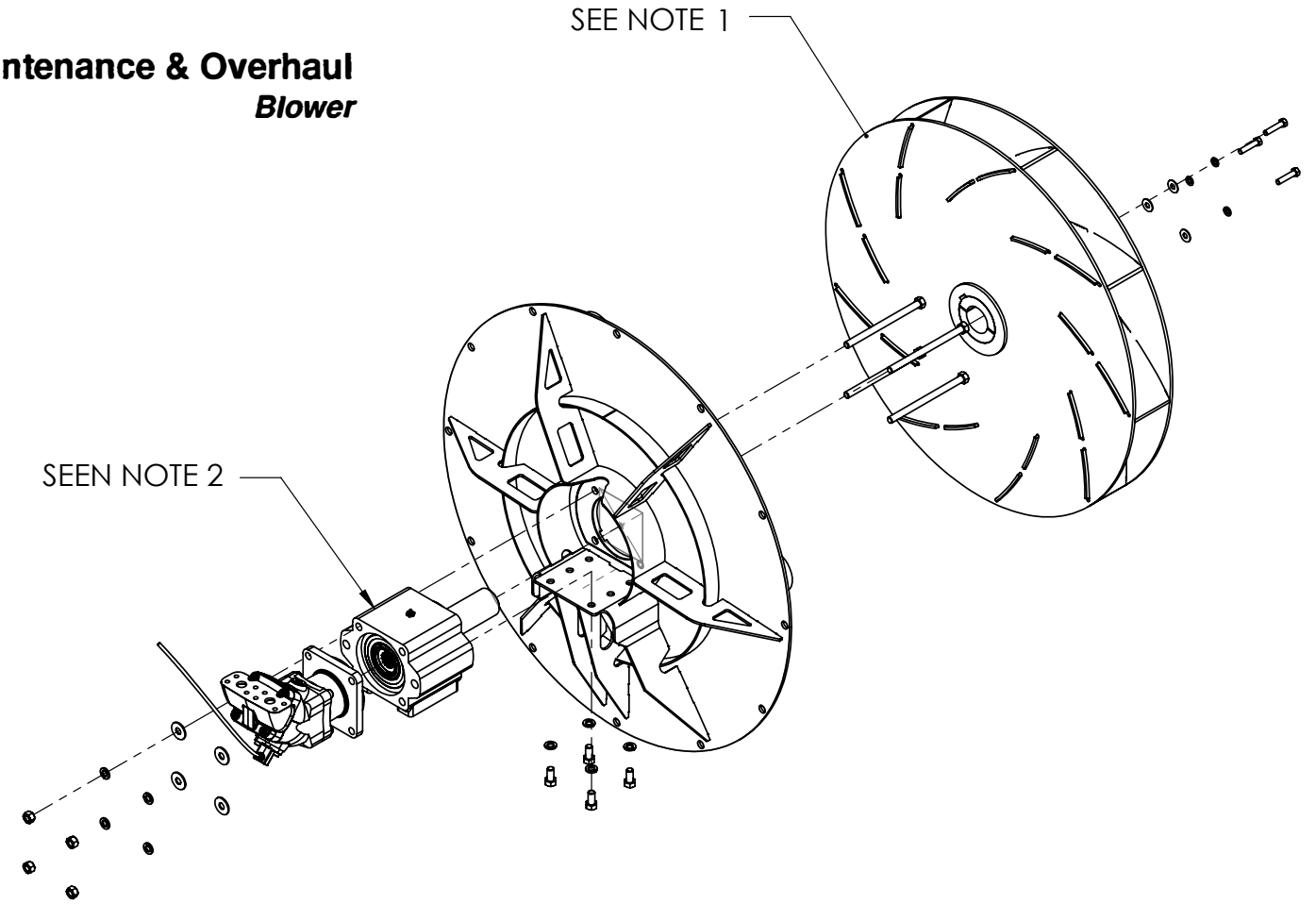


***Fig. 5.10** – Blower Impeller puller is 6" x 2" x 1/2". Holes are 4" apart and .56" diameter. Do not force impeller off of shaft. Damage to both shaft and impeller could occure.*

WARNING

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

4. Stop engine.
5. Clean area around blower.
6. Remove center body panel from left side of sweeper.
7. Remove nut and lock washer freeing ball joint (Fig. 5.9: 18) from vacuum regulator door arm.
8. Remove nuts, washers and u–bolts (15, 16, 17, 21) securing cable to side of blower. Remove cable (20) from the bracket.
9. Inside the cab, loosen retaining nut below cable handle and pull cable out of bracket.
10. Install cable by reversing steps.

***note:** Feed cable through access hole in floor of cab. Replace rubber grommet if necessary.*

SUCTION HOOD GROUP

Proper operation of the sweeper requires air passages to remain open without leaks. It is important that all hoes and seals fit tight.

Blower & Suction Hose *–Removal/Installation*

1. Position sweeper on a level surface under an overhead crane or hoist capable of lifting blower assembly.
2. Place shift lever in "P" position, setting parking brake.
3. Raise hopper and install safety props (ref Fig 5.8).

FAN AND BEARING MAINTENANCE

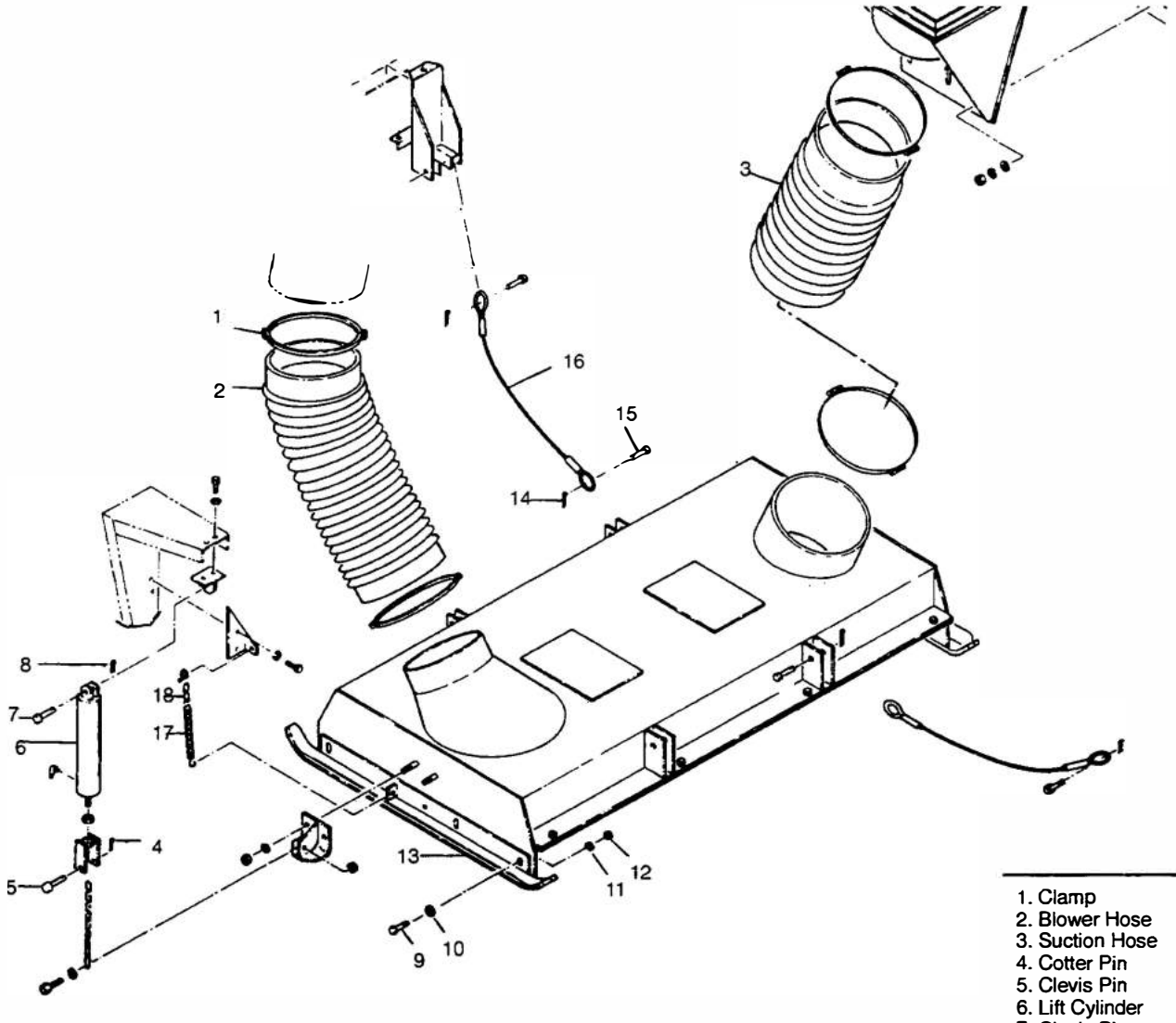
Recommend settings for fan are: 1875 Engine RPM which relates to 2450 fan RPM
Note 1 (33" centrifugal fan):

1. Fan can be run for 6000 cycles before replacement is needed.
2. Periodically inspect the shaft and wheel for dirt buildup, corrosion, and signs of excess stress or fatigue. Clean the components. If the wheel is removed for any reason, make sure that it is properly attached to the shaft before restarting the fan.
3. Check fan for dents and damage regularly
4. If any of the previous is evident, please contact manufacturer for proper maintenance procedure/instructions.
5. Trial "bump": after replacing the fan or doing maintenance do the follow

-turn on the power just long enough to start the assembly rotating.
-check rotation for agreement with rotation arrow.
-listen for any unusual noise.

Note 2 (OHLA bearing):

1. Bearing is rated for 7,500 hours @ 2700 RPM.
2. If increased vibration is noticed report to manufacturer.
3. Added one hand pump of grease every year.
4. Check all hardware for damage or loosening. Tighten or replace as necessary.



1. Clamp
2. Blower Hose
3. Suction Hose
4. Cotter Pin
5. Clevis Pin
6. Lift Cylinder
7. Clevis Pin
8. Cotter Pin
9. Bolt
10. Washer
11. Washer
12. Nut
13. Skate
14. Cotter Pin
15. Clevis Pin
16. Cable
17. Spring
18. Chain

***Fig. 5.11** – Suction Hood requires a tight seal with the ground and blower system and proper operation of the sweeper requires air passages to remain open without leaks.*

WARNING

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

4. Stop engine.
5. Clean area around suction hood.
6. Loosen clamps (Fig. 5–11: 1) on both ends of suction hose (2) (or blower hose (3)).
7. Lift bottom of hose off the hose flange on suction hood. Pull hose down behind hood and out from under sweeper.
8. Install suction hose (or blower hose) by reversing steps.

Hood Lift Cylinder
–*Removal/Installation*

1. Position sweeper on a level surface under an overhead crane or hoist capable of lifting blower assembly.
2. Place shift lever in "P" position, setting parking brake.
3. Raise hopper and install safety props (ref Fig 5.8).

WARNING

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

4. Stop engine.
5. Clean area around suction hood.
6. Remove cotter pin and clevis pin (Fig. 5–11: 4, 5) from cylinder clevis.
7. Remove hydraulic hoses from cylinder (6). Drain fluid into a container.

CAUTION

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

note: *Provide a container to catch excess hydraulic fluid from gutter broom motor prior to removing hoses.*

8. Remove cotter pin and clevis pin (7, 8) from clevis at the top of cylinder.
9. Remove suction hood cylinder (6).
10. Install cylinder by reversing steps.

Hood Skate
–*Removal/Installation*

1. Position sweeper on a level surface under an overhead crane or hoist capable of lifting blower assembly.
2. Place shift lever in "P" position, setting parking brake.
3. Raise suction hood.
4. Remove bolts, nuts and washers (Fig. 5–11: 9, 10, 11, 12) from skates.
5. Remove skates (13) from each end of suction hood.
6. Install new skates. Do not tighten bolts.
7. Start engine and lower hood to the down position.
8. With the top of hood parallel to the ground, adjust the skates to touch the ground.
9. Tighten skate attachment bolts (9, 12).

Suction Hood
–*Removal/Installation*

1. Position sweeper on a level surface under an overhead crane or hoist capable of lifting blower assembly.
2. Place shift lever in "P" position, setting parking brake.
3. Raise hopper and install safety props (ref Fig 5.8).

WARNING

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

4. Stop engine.
5. Clean area around suction hood.
6. Remove blower and suction hoses (Fig. 5–11: 2, 3) following a previous procedure.
7. Remove cotter pins and clevis pins (14, 15) to disconnect four hood cables (16).
8. Remove lift cylinder (6) following a previous procedure.
9. Remove spring (17) by taking shackle out of mount bracket.

note: *Take note of spring mounting position in chain link (18). Install in same position.*

10. Slide hood from under sweeper by pulling out the side and slightly rearward.
11. Install hood by reversing steps.

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.*

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

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.

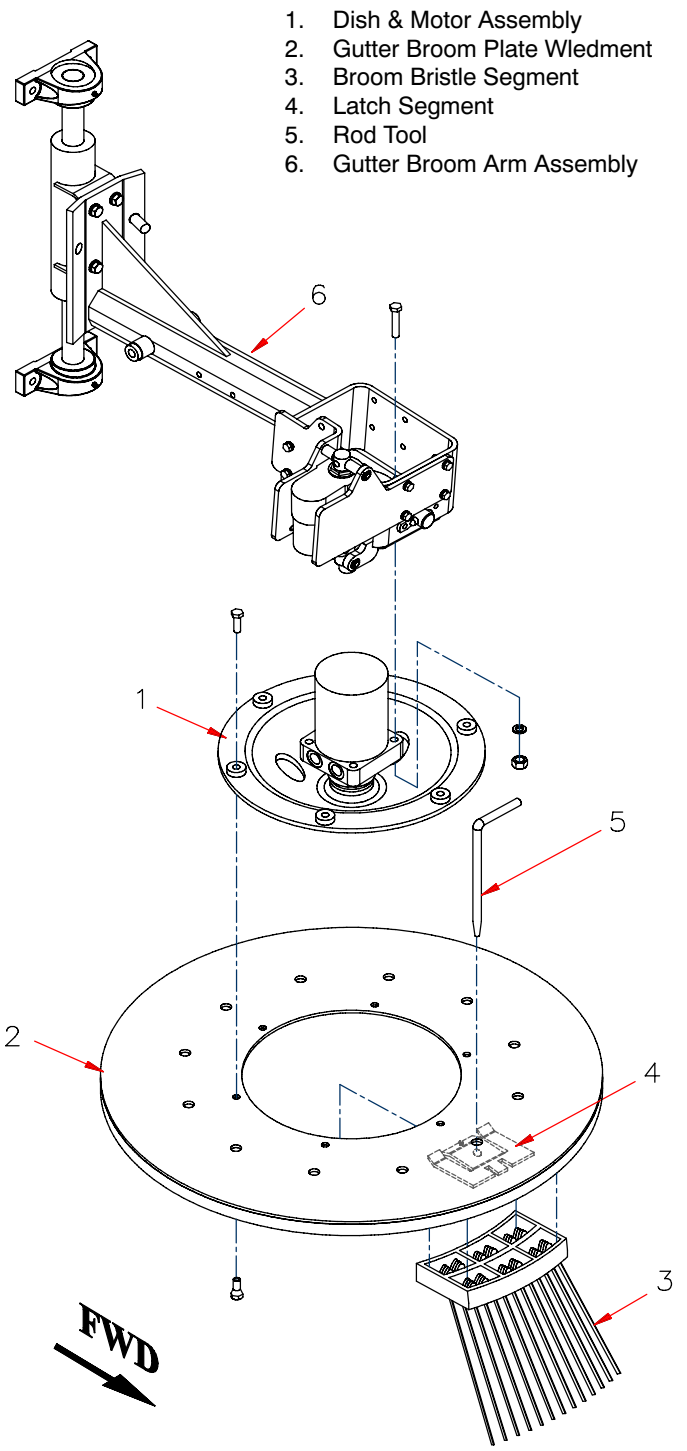


Fig: 5.24 A *Gutter Broom Plate/Brush Removal and Installation are basically the same on both sides.*

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

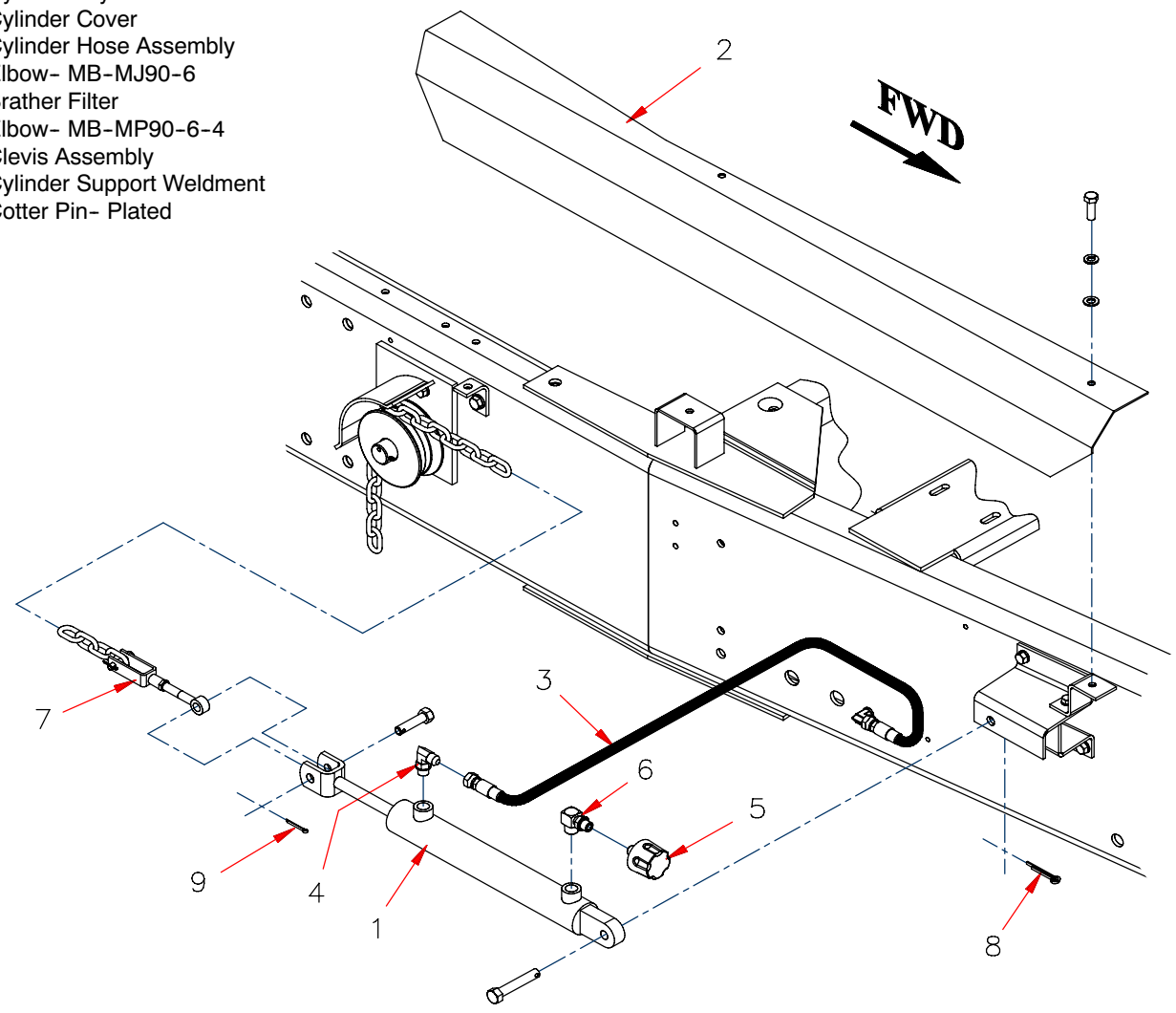


Fig: 5.25 A *The Gutter Broom Lift Cylinder is located outside of the frame rail. A cable chain is connected to the cylinder and runs through a pulley down to the gutter broom arm.*

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).*

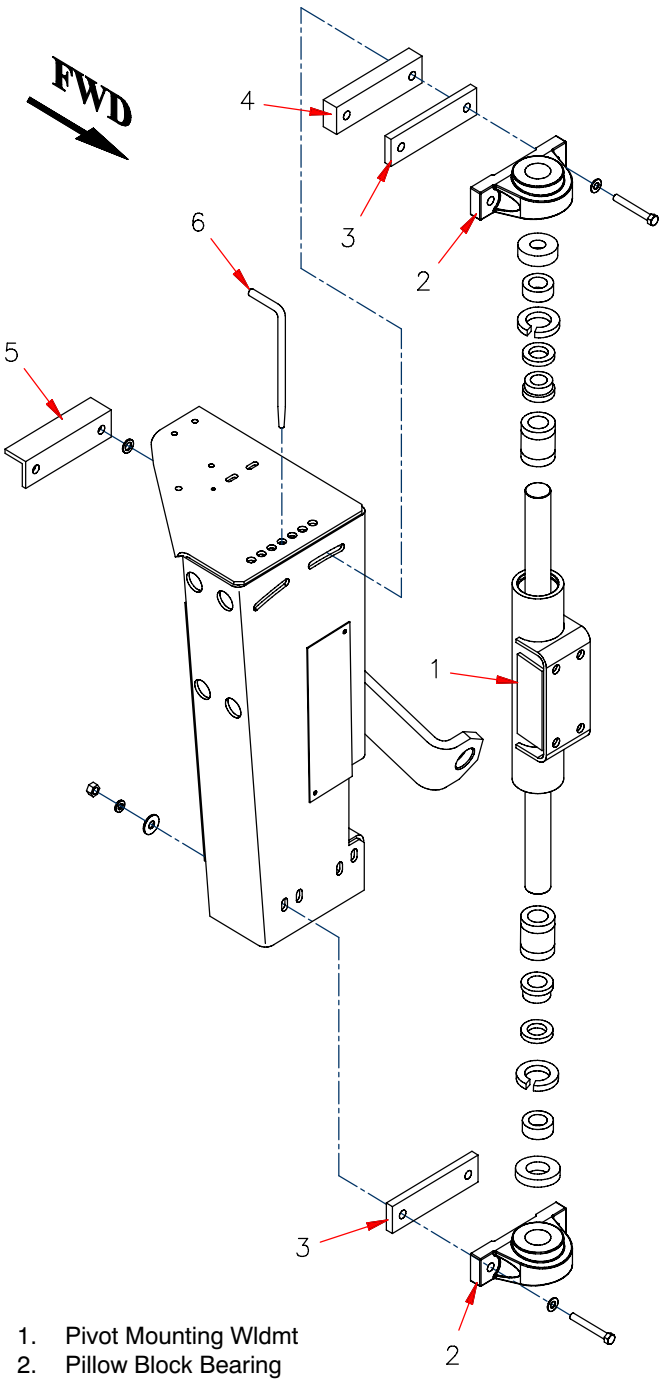
13. Remove the screws, washers and nuts securing the gutter broom arm to the lift shaft pivot assembly.

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.

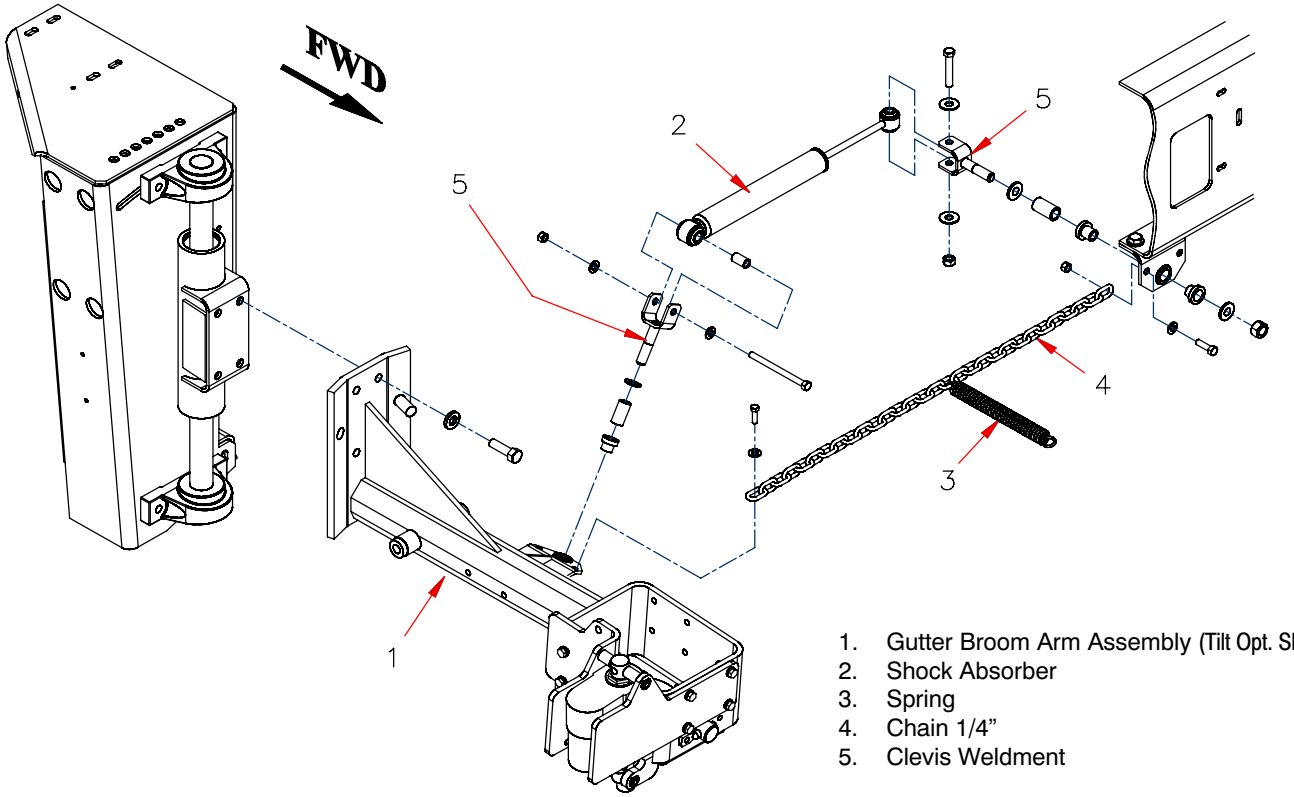
Gutter Broom Shock Absorber – *Removal/Installation*

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.

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

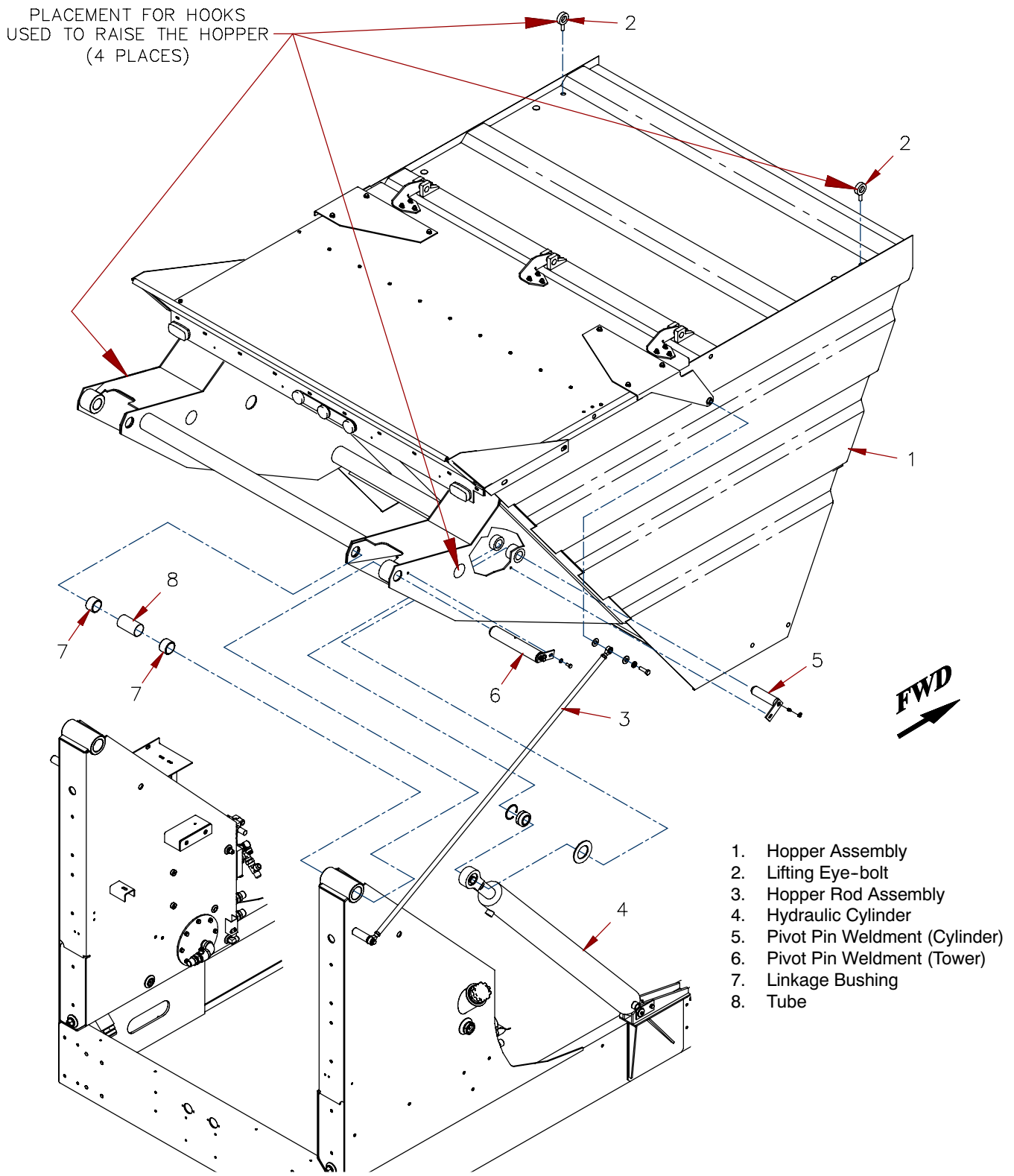
The battery is extremely heavy. To prevent injury, always lift with your leg and arm muscles, not your back.

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.

Hopper Screen –*Removal/Installation*

1. Position sweeper on a level surface.
2. Place shift lever in "P" position, setting parking brake.
3. Stop engine.
4. Open hopper access door.

   note: *To open hopper door, it may be required to raise the hopper about a half of foot to release pressure.*

5. From inside hopper, remove screen brackets.

CAUTION

Support clogged screens prior to removing brackets. The weight of debris may cause the screen to fall.

6. Remove screens by dropping the rear of screen about an inch and pulling the screen back.
7. Scrape dirt and debris from all mounting surfaces and screens.
8. Install screens by reversing steps.

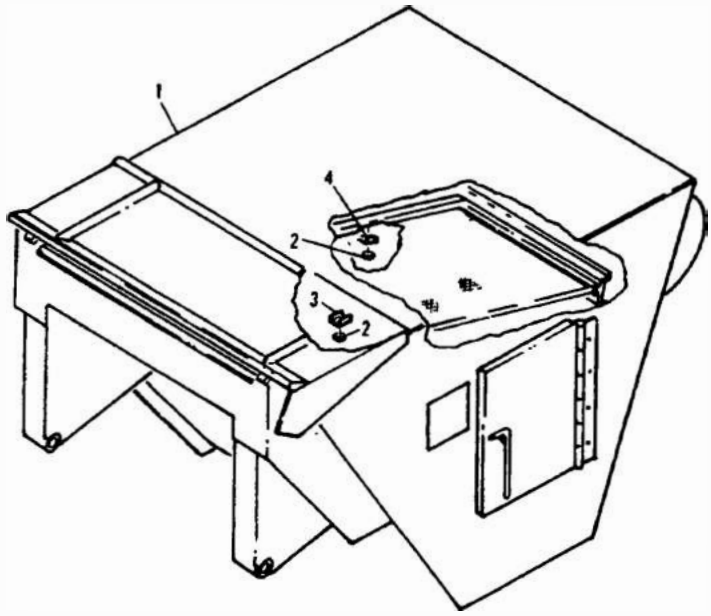
Hopper Seal –*Removal/Installation*

1. Position sweeper on a level surface.
2. Place shift lever in "P" position, setting parking brake.
3. Raise hopper and install safety props (ref Fig 5.10).

WARNING

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

4. Stop engine.
5. Remove damaged seal by scraping material out of seal channel.
6. Thoroughly clean area in and around seal channel. Allow channel area to dry.
7. Apply contact cement to new seal and the bottom of seal channel.
8. Install seal into channel until adhesive surfaces on seal and channel contact firmly.
9. Allow time for contact cement to dry completely.❑



1. Hopper
2. Nut
3. Bracket
4. Bolt

Fig. 5.20 *– Hopper screens are located inside of hopper. Thorough the access door, you can get to the screens to work on. If the screens are clogged, beware that the debris may be heavy.*

Notes

Notes

CHAPTER 6

Isuzu Engine Troubleshooting Information and Global R3Air Schematics

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6

ISUZU DIESEL

2015 DEALER DIRECTORY

ISUZU MOTORS AMERICA, LLC

PowerTrain Division

46401 Commerce Center Drive
Plymouth, Michigan 48170

Phone: (734) 582-9470 **Fax:** (734) 455-7581 **www.isuzuengines.com**

Engines are the heart of Isuzu, an industry leader of over 20 million diesel engines worldwide.

The Isuzu Motors America, LLC, PowerTrain Division (ISZAPT) Engine Distribution Network consists of Distributors and Authorized Dealers. Each is an Isuzu diesel engine expert in its respective market. For service outlet referrals, please contact the Distributor listed in the state in which you are interested.

Contact information is continually updated and available on the www.isuzuengines.com website.

Market responsibilities are identified as follows:

Industrial Distributor	All off-highway industrial applications including marine applications.
Marine Distributor	All off-highway industrial applications including marine applications.
24 Hour Service	
Industrial Full Service Dealer	All off-highway industrial applications.
Industrial OEM Dealer	The Dealer provides product support for Isuzu engines installed into a specific make of equipment. Please contact the local Isuzu Distributor to determine the appropriate Dealer for a specific make of equipment.
Marine Dealer	All commercial marine engine applications.

ISUZU MOTORS AMERICA, LLC

North American Engine Distributor Network

UNITED STATES

Company	Phone	Fax	Website
1. Mack Boring & Parts Co – NJ	908.964.0700	908.964.8475	www.mackboring.com
2. Penn Power Group	716.823.7242	716.823.2769	www.pennpowergroup.com
3. Blue Ridge Diesel Injection Co	540.389.7296	540.387.2792	www.blueridgediesel.com
4. M & L Engine LLC	985.857.8000	985.851.0006	www.mlengine.com
5. United Engines LLC – AR	501.562.5565	501.565.7754	www.unitedengines.com
6. United Engines LLC – OK	405.947.3321	405.947.3406	www.unitedengines.com
7. United Engines LLC – OK	918.627.8080	918.663.0467	www.unitedengines.com
8. UE Powertrain – United Engines LLC	806.762.0455	806.762.6246	www.uepowertrain.com
9. UE Powertrain – United Engines LLC	806.355.8228	806.358.1308	www.uepowertrain.com
10. Southwest Products Corp – AZ	602.269.3581	602.269.2306	www.southwestproducts.com
11. Southwest Products Corp – CA	562.424.0913	562.989.1622	www.southwestproducts.com
12. Valley Power Systems Inc – West Sacramento	916.372.5078	916.372.2721	www.valleypowersystem.com
13. Valley Power Systems Inc – Fresno	559.486.6900	559.442.6056	www.valleypowersystem.com
14. Hamilton Engine Sales Inc	503.288.6714	503.287.8289	www.hamiltonengines.com
15. UE Compression – United Engines LLC	307.577.8100	307.577.4091	www.unitedengines.com
16. UE Compression – United Engines LLC	303.297.8100	303.297.2765	www.unitedengines.com
17. Husker Power Products	402.463.1531	402.463.1313	www.huskerpowerproducts.com
18. Isuzu Diesel Midwest	701.282.7915	701.282.2472	www.isuzu-tk.com
19. Total Energy Systems LLC – Milwaukee	414.357.7900	414.357.6278	www.totalenergysystems.com
20. Total Energy Systems LLC – Green Bay	920.964.1400	920.964.1409	www.totalenergysystems.com
21. W.W.Williams Midwest Inc - Brunswick	330.225.7751	330.273.8110	www.wwwilliams.com
22. W.W.Williams Midwest Inc - Columbus	614.527.9400	614.527.1699	www.wwwilliams.com
23. W.W.Williams Midwest Inc - Toledo	419.837.5067	419.837.5229	www.wwwilliams.com
24. W.W.Williams Midwest Inc -Youngstown	330.534.1161	330.534.1529	www.wwwilliams.com
25. W.W.Williams Midwest Inc - Dearborn	313.584.6150	313.584.1444	www.wwwilliams.com
26. W.W.Williams Midwest Inc - Saginaw	989.753.4411	989.753.1620	www.wwwilliams.com
27. W.W.Williams Midwest Inc - Grand Rapids	616.878.7071	616.878.0659	www.wwwilliams.com

ISUZU MOTORS AMERICA, LLC

North American Engine Distributor Network

CANADA

Company	Phone	Fax	Website
1. ADF Diesel – Quebec City	418.681.0631	418.681.3686	www.adfdiesel.com
2. ADF Diesel – Saint-Stanislas	418.328.8713	418.328.3974	www.adfdiesel.com
3. ADF Diesel – Alma	418.668.5040	418.668.8141	www.adfdiesel.com
4. ADF Diesel – Candiac	450.659.1316	450.659.4432	www.adfdiesel.com
5. ADF Diesel – Sherbrooke	819.563.8880	819.563.8882	www.adfdiesel.com
6. ADF Diesel – Montreal	514.684.0440	514.684.2417	www.adfdiesel.com
7. ADF Diesel – Toronto	905.565.1110	905.565.1155	www.adfdiesel.com
8. Isuzu Diesel Mid Canada	204.694.1368	204.632.0929	
9. Westquip Diesel Sales - Acheson	780.960.5560	780.486.2676	www.westquip.ca
10. Westquip Diesel Sales - Calgary	403.261.0601	403.263.3702	www.westquip.ca
11. Klassen Diesel Sales LTD – Delta	604.940.6400	604.940.6500	www.klassenengine.com

International Distributor Network

A listing of Isuzu international locations is continually updated and can be found by accessing the distributor map located on www.isuzuengines.com.

Product Registration

Registering Isuzu engines for warranty purposes can easily be accomplished on the www.isuzuengines.com website. Registration provides the user with contact information for the respective distributor responsible for any updated maintenance. Registration also continues to keep the customer informed of any information related specifically to that particular product and allows for service support when needed.

ISUZU MOTORS AMERICA, LLC
Latin American Engine Distributor Network

LATIN AMERICA

Company	Phone	Fax	Website
1. SVF Consulting Representaciones, C.A.	+58 212 975 34 11	+58 212 975 21 12	www.svf-consuting.com
2. SVF Ecuador, S.A.	+593 04 2287768	+593 04 2691258	www.svf-consuting.com
3. SVF International, N.V	+599 9 434 3605	+599 9 434 3533	www.svf-consuting.com
4. Almacenes Santa Clara S.A.	+419 326 4441	+419 326 4490	www.isuzuperu.com.pe

International Distributor Network
A listing of Isuzu international locations is continually updated and can be found by accessing the distributor map located on www.isuzuengines.com.

Product Registration
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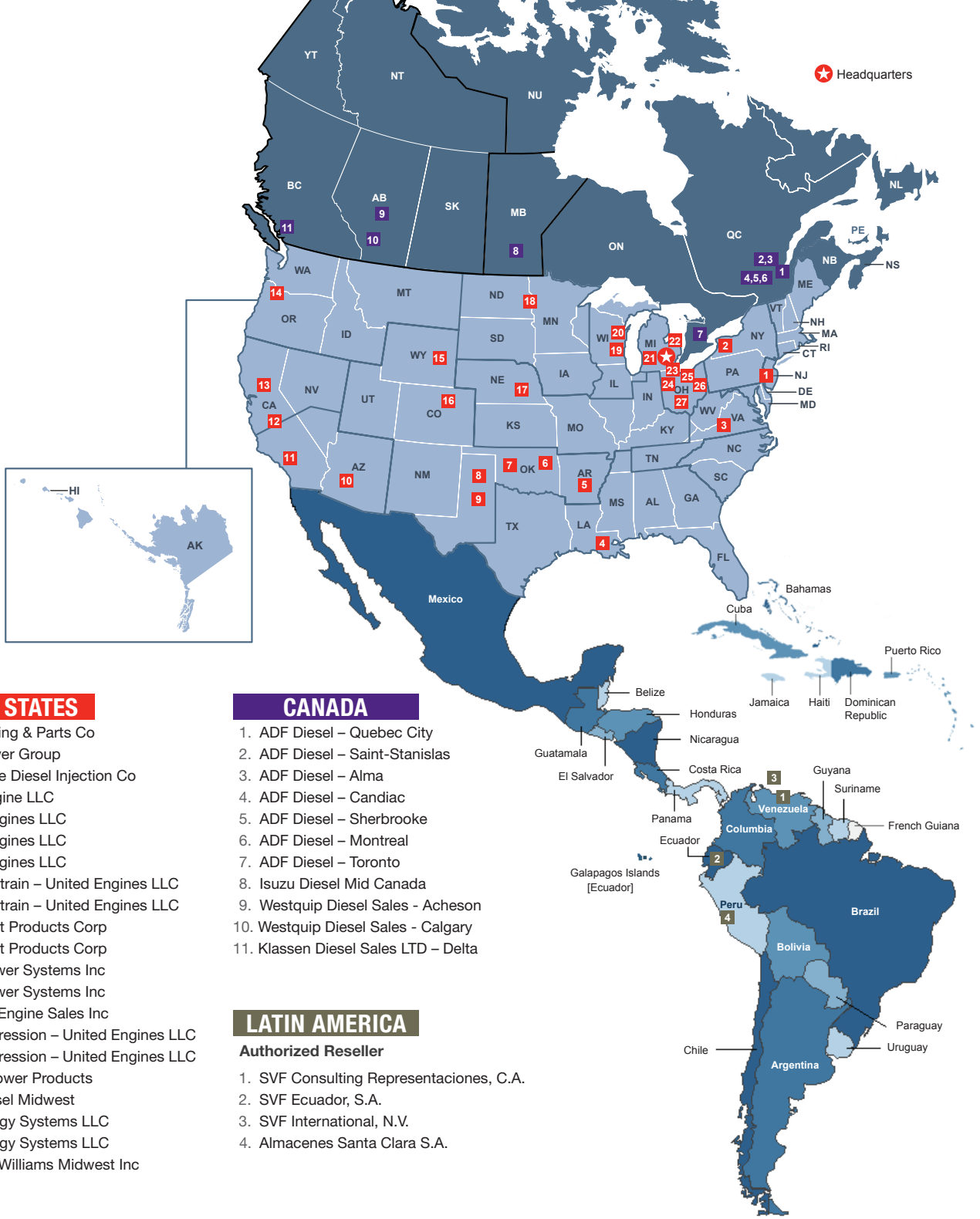

UNITED STATES

1. Mack Boring & Parts Co
2. Penn Power Group
3. Blue Ridge Diesel Injection Co
4. M & L Engine LLC
5. United Engines LLC
6. United Engines LLC
7. United Engines LLC
8. UE Powertrain – United Engines LLC
9. UE Powertrain – United Engines LLC
10. Southwest Products Corp
11. Southwest Products Corp
12. Valley Power Systems Inc
13. Valley Power Systems Inc
14. Hamilton Engine Sales Inc
15. UE Compression – United Engines LLC
16. UE Compression – United Engines LLC
17. Husker Power Products
18. Isuzu Diesel Midwest
19. Total Energy Systems LLC
20. Total Energy Systems LLC

21 - 27. W.W.Williams Midwest Inc

CANADA

1. ADF Diesel – Quebec City
2. ADF Diesel – Saint-Stanislas
3. ADF Diesel – Alma
4. ADF Diesel – Candiac
5. ADF Diesel – Sherbrooke
6. ADF Diesel – Montreal
7. ADF Diesel – Toronto
8. Isuzu Diesel Mid Canada
9. Westquip Diesel Sales - Acheson
10. Westquip Diesel Sales - Calgary
11. Klassen Diesel Sales LTD – Delta

LATIN AMERICA

Authorized Reseller

1. SVF Consulting Representaciones, C.A.
2. SVF Ecuador, S.A.
3. SVF International, N.V.
4. Almacenes Santa Clara S.A.

ECM故障時動作一覧/ECM Trouble Diagnosis Specifications

更新日	2014/1/31
エンジン型式:	FT4 4HK1X
仕向け先:	ISZA
用途:	General power
試験:	

INDUCEMENT TYPE

TYPE A・・・4Hrでfinal。リピート時30minでfinal

TYPE B・・・100Hrでfinal。リピート時5Hrでfinal

・U/Q : UREA QUALITY(尿素品質)・・・TYPE A

・D/A : DOSING ACTIVITY(尿素噴射異常)・・・TYPE A

・TAMPERING ・・・TYPE A

EGR : EGR VALVE妨害 ・・・TYPE B

	Q制限1 Q limit level 1	Q制限2 Q limit level 2	Q制限3 Q limit level 3	回転数制限1 Engine speed limit level 1	回転数制限2 Engine speed limit level 2	レール圧制限 Common rail pressure limit
4HK1	INDUCEMENT制限件 Same as INDUCEMENT level 1	36 0Nm	360Nm	1700	12 00	80MPa

診断継続: ○:故障発生後も診断を継続する。×:故障が発生するとKey-ONし直すまで診断しない。○: Continue diagnosis after failure occurs. ×: Stop diagnosis until re-Key-ON when

チェックエンジンランプ: ○: OC=1で送信、×: OC=0で送信、–: 送信しない W:以下のように送信。1回目/Lamp_Status=0, OC=0, 2回目/Lamp_Status=1, OC=1

CAN故障コード送信: ○:送信する、×:送信しない W:以下のように送信。1回目/Lamp_Status=0, OC=0, 2回目/Lamp_Status=1, OC=1 ○:transmit, ×:don't transmit

故障コード記録: ○:記録する、×:記録しない W:2回連続成立で記録 ○: Recording, ×: No recording W: Recording, when diagnosis occurs two times in succession.

故障発生時処理:
0:制限なし、1:Q制限レベル1、2:Q制限レベル2、3:Q制限レベル3、4:エンジン停止
0: No limit, 1:Fuel limit level 1, 2:Fuel limit level 2, 3: Fuel limit level 3, 4: engine stop
0:制限なし、1:制限レベル1、2:制限レベル2
0:No limit, 1: Rail pressure limit level 1, 2: Rail pressure limit level 2
0:制限なし、1:レール圧制限
0:No limit, 1:Limit rail pressure
0:制限なし、1:マルチ停止
0:No limit, 1:Stop multi injection
(S):SOFT設定、(C):CALI設定
(S):Software setting, (C):Calibration setting

故障回復時の動作:
○:即復帰
×:KEY-ONサイクル中は復帰しない
—:作動しない
○: Instantly return
×: Not return during KEY-ON cycle.
—: No operation

故障コード / Failure code: ランプ表示 Lamp display	DTC	CAN SPN-FMI	故障種類 Malfunction type	法規対応/Corresponding regulations: EMISSION EPA	EMISSION CARB	INDUCEMENT対象 Inducement target: EPA	CARB	EU	DOM	INDUCEMENT分類 Inducement category: U/Q	D/A	TAMPERING	EGR	ENG保護 ENG protection	診断実施条件①/ Diagnosis conditions①	診断実施条件②/ Diagnosis conditions②	故障判定条件/ Malfunction decisions conditions	故障判定時間/ Malfunction decision time	演算周期/ Calculation cycle (msec)	診断継続/ Diagnosis continuation	チェックエンジンランプ/ Check engine lamp	CAN故障コード送信/ CAN malfunction code transmission	故障コード記録/ Malfunction code recording	エンジン制御制限度 Engine control level: Q制限 Fuel injection limit	回転数制限 Speed limit	レール圧制限 Rail pressure limit	マルチ停止 Multi stop	バックアップ制御/ Backup control: EGR	ITH	ターボ Turbo	パージ Purge	その他/Others	故障回復時の動作 Operation at failure recovery: ランプ動作 Check engine lamp operation	コード送信 Failure code transmission by CAN	フェイルセーフ動作 Fail safe operation
センサー系 Sensor system																																			
14	P0340	636-2	カムセンサ 異常(信号なし) Cam sensor malfunction (no signal)											○	エンジン回転中でカムセンサー、クランクセンサー系の他の診断が立っていないこと。Cam sensor, crank sensor diagnosis are not being run during engine operation	-	90rpm以上でカムセンサから信号がない。No signal from cam sensor, at 90rpm or above.	4J:30カウント 4H:30カウント 6H:30カウント 6UW:30カウント 4J:30 count 4H:30 count 6H:30 count 6UW:30	エンジン1回転=1周期 Engine 1 rotation = 1 cycle	×	○	○	○	0	0	0	0					エンジン運転中は、クランクセンサ基準で通常制御 エンジン停止時は、気筒判別不能のため始動不可 (裏噛きによるエンジン破壊の防止)/During engine operation, when normal-control engine controls stop working based on crank sensor levels, cylinder identification becomes disabled, thus disabling engine operation. (Prevents	×	×	×
15	P0335	723-2	クランクセンサ 異常(信号なし) Crank sensor malfunction (no signal)											○	エンジン回転中でカムセンサー、クランクセンサー系の他の診断が立っていないこと。/ Cam sensor, crank sensor diagnosis are not being run during engine operation	-	90rpm以上でカム信号があるが、クランク信号がない/There is cam signal at 90rpm or above, but no crank signal.	7回転連続 7 rotations continuously.	エンジン1回転=2周期 Engine 1 rotation =	×	○	○	○	0	0	0	0				停止 Stop	カムセンサーによる制御に切り替える Switch to control by cam sensor.	×	×	×
	P0336	723-8	クランクセンサ 異常(信号異常) Crank sensor malfunction (abnormal signal)											○		-	750rpm以上でクランク信号のパルス数が合わない Crank signal pulse does not match at 750rpm or above.	14回転連続 14 rotations continuously.		×	○	○	○	0	0	0	0						×	×	×
16	P0016	636-7	カムセンサ位相ずれ Cam sensor phase shifting											○	エンジン回転中でカムセンサー、クランクセンサー系の他の診断が立っていないこと。/ Cam sensor, crank sensor diagnosis are not being run during engine operation	-	クランクのギャップの位置に正しいカムPulseがない No correct cam pulse in the position of the gap of the crank.	50回転連続 50 rotations continuously.	エンジン1回転=1周期 Engine 1 rotation =	×	○	○	○	0	0	0	0					エンジン運転中は、クランクセンサ基準で通常制御 エンジン停止時は、気筒判別不能のため始動不可(裏噛きによるエンジン破壊の防止) During engine operation, normal control by crank sensor. During engine stop, unable to start due to cylinder being unidentifiable. (to	×	×	×
22	P0113	172-3	吸気温センサ 異常(高電圧異常) Intake air temperature sensor malfunction (high voltage)	○	○			○				A			P060C,P160B,P06A8が無い、始動後3分経過/No detection of P060C,P160B,P06A8; Perform diagnosis3 minutess		吸気温センサ電圧が4.9Vを超えた Intake air temperature sensor voltage exceeded 4.9V.	5秒連続 5 seconds continuously	128	×	○	○	○	1	0	0	0	全閉 Fully closed	全開 Fully open	全開 Fully open		吸気温-10℃とみなす Intake air temperature is regarded as -10℃.	×	×	×
	P0112	172-4	吸気温センサ 異常(低電圧異常) Intake air temperature sensor malfunction (low voltage)	○	○			○				A			P060C,P160B,P06A8が無い/No detection of P060C,P160B,P06A8		吸気温センサ電圧が0.1Vを下回った Intake air temperature sensor voltage fell below 0.1V			×	○	○	○	1	0	0	0						×	×	×
23	P0118	110-3	水温センサ 異常(高電圧異常) Water temperature sensor malfunction (high voltage)	○	○			○				A			P060C,P160B,P06A8が無い、始動後3分経過/No detection of P060C,P160B,P06A8; Perform diagnosis 3 minutes		水温センサ電圧が4.9Vを超えた Water temperature sensor voltage exceeded 4.9V.	5秒連続 5 seconds continuously	128	×	○	○	○	1	0	0	0	全閉 Fully closed	全開 Fully open	全開 Fully open	停止 Stop	始動時…-20℃とみなす 運転時…90℃とみなす In starting…regarded as -20℃. During operation…regarded as 90℃.	×	×	×
	P0117	110-4	水温センサ 異常(低電圧異常) Water temperature sensor malfunction (low voltage)	○	○			○				A			P060C,P160B,P06A8が無い/No detection of P060C P160B,P06A8		水温センサ電圧が0.1Vを下回った Water temperature sensor voltage fell below 0.1V.			×	○	○	○	1	0	0	0						×	×	×
27	P0098	1131-3	マニホールド温度センサ異常(高電圧異常) Manifold temperature sensor malfunction (high voltage)	○	○										P060C,P160B,P06A8,P0112,P0113が無い/No detection of P060C,P160B,P06A8,P0112,P0113	TABLE1参照	マニホールド温度センサ電圧が4.9Vを超えた Manifold temperature sensor voltage exceeded 4.9V.	5秒連続 5 seconds continuously	128	○	○	○	○	0	0	0	0					マニホールド温度60℃とみなす Manifold temperature is regarded as 60℃.	×	×	–
	P0097	1131-4	マニホールド温度センサ異常(低電圧異常) Manifold temperature sensor	○	○										P060C,P160B,P08A8が無い/No detection of P060C P160B P06A8		マニホールド温度センサ電圧が0.1Vを下回った Manifold temperature sensor voltage fell below 0.1V			○	○	○	○	0	0	0	0						×	×	–
121	P2123	91-3	アクセルセンサ1異常(高電圧異常) Accelerator sensor 1 malfunction (high voltage)											○	P060C,P06A6が無い/No detection of P060C,P06A6		アクセルセンサ1電圧が4.9Vを超えた Accelerator sensor 1 voltage exceeded 4.9V.	0.3秒連続 0.3 seconds continuously	32	×	–	×	×	0	0	0	0					1系統異常…バックアップ無し 2系統異常…アクセル開度を0%に制限 1 system malfunction…No backup 2 systems malfunction…Accelerator opening degree limited to 0%	—	—	×
	P2122	91-4	アクセルセンサ1異常(低電圧異常) Accelerator sensor 1 malfunction (low voltage)											○			アクセルセンサ1電圧が0.2Vを下回った Accelerator sensor 1 voltage fell below 0.2V.			×	–	×	×	0	0	0	0						—	—	×
122	P2128	91-3	アクセルセンサ2異常(高電圧異常) Accelerator sensor 2 malfunction (high voltage)											○	P060C,P06A6が無い/No detection of P060C,P06A6		アクセルセンサ2電圧が4.9Vを超えた Accelerator sensor 2 voltage exceeded 4.9V.			×	–	×	×	0	0	0	0						—	—	×
	P2127	91-4	アクセルセンサ2異常(低電圧異常) Accelerator sensor 2 malfunction (low voltage)											○			アクセルセンサ2電圧が0.2Vを下回った Accelerator sensor 2 voltage fell below 0.2V.			×	–	×	×	0	0	0	0						—	—	×
124	P2138	91-2	アクセルセンサ1-2比較異常 Accelerator sensor 1-2 comparison malfunction											○	P060C,P06A6,P2122,P2123,P2127,P2128が無い/No detection of P060C,P06A6,P2122,P2123,P2127,P2128		アクセルセンサ1、2の開度差が45%以上 Opening degree difference of accelerator sensor 1 and 2 is 45% or more.	2.6秒連続 2.6 seconds continuously	32	×	–	×	×	0	0	0	0						—	—	×
32	P0238	102-3	ブースト圧センサ異常(高電圧異常) Boost pressure sensor malfunction	○	○			○				A		○	P060C,P160B,P06A8が無い No detection of P060C,P160B,P06A8		ブースト圧センサ電圧が4.9Vを超えた Boost pressure sensor voltage exceeded 4.9V.	5秒連続 5 seconds continuously	64	×	○	○	○	0	0	0	0	全閉 Fully closed	全開 Fully open	全開 Fully open		ブースト圧100kPaとみなす Boost pressure is regarded as 100kPa.	×	×	×
	P0237	102-4	ブースト圧センサ異常(低電圧異常) Boost pressure sensor malfunction	○	○			○				A		○			ブースト圧センサ電圧が0.1Vを下回った Boost pressure sensor voltage fell below 0.1V.			×	○	○	○	0	0	0	0						×	×	×
44	P0409	10001-2	EGRポジションセンサ異常 EGR position sensor malfunction	○	○			○					B	○	P060C,P06A9が無い No detection of P060C,P06A9		EGRポジションセンサの出力信号があり得ない状態となった/EGR position sensor output signal became improbable state.	5秒連続 5 seconds continuously	64	×	○	○	○	1	0	0	0	全閉 Fully closed	全開 Fully open		停止 Stop		×	×	×
48	P0428	173-3	排気温度センサ1異常(DOC出口)(高電圧異常) Exhaust gas temperature sensor1 malfunction (DOC outlet) (High voltage)	○	○									○	P060C,P06A8,P0112,P0113,P0117,P0118,P2228,P2229が無い No detection of P060C,P06A8,P0112,P0113,P0117,P0118,P2228,P2229	TABLE2参照	排気温度センサ1電圧が4.9Vを超えた Exhaust gas temperature sensor 1 voltage exceeded 4.9V.	5秒連続 5 seconds continuously	128	○	○	○	○	0	0	0	0				停止 Stop	排気温(DOC出口)を0℃とみなす Exhaust gas temperature(DOC exit)is regarded as 0℃	×	×	○
	P0427	173-4	排気温度センサ1異常(DOC出口)(低電圧異常) Exhaust gas temperature sensor1 malfunction (DOC outlet) (Low voltage)	○	○									○	P060C,P06A8が無い No detection of P060C, P06A8		排気温度センサ1電圧が0.1Vを下回った(排気温度1000℃相当)/Exhaust gas temperature sensor 1 voltage fell below 0.1V. (equivalent to exhaust gas temperature 1000℃)	5秒連続 5 seconds continuously		○	○	○	○	0	0	0	0						×	×	○
49	P042D	10024-3	排気温度センサ2異常(DOC入口)(高電圧異常) Exhaust gas temperature sensor 2 malfunction (DOC inlet) (High voltage)	○	○									○	P060C,P160B,P06D5,P0112,P0113,P0117,P0118,P2228,P2229が無い No detection of P060C,P160B,P06D5,P0112,P0113,P0117,P0118,P2228,P2229	TABLE3参照	排気温度センサ2電圧が4.9Vを超えた Exhaust gas temperature sensor 2 voltage exceeded 4.9V.	5秒連続 5 seconds continuously	128	○	○	○	○	0	0	0	0				停止 Stop	排気温(DOC入口)を0℃とみなす Exhaust gas temperature(DOC entrance)is regarded as 0℃	×	×	○
	P042C	10024-4	排気温度センサ2異常(DOC入口)(低電圧異常) Exhaust gas temperature sensor 2 malfunction (DOC inlet) (low	○	○									○	P060C,P160B,P06D5が無い No detection of P060C,P160B,P06D5		排気温度センサ1電圧が0.1Vを下回った(排気温度1000℃相当)/Exhaust gas temperature sensor 1 voltage fell below 0.1V. (equivalent to exhaust gas temperature	5秒連続 5 seconds continuously		○	○	○	○	0	0	0	0						×	×	○
43	P0123	10022-3	インテークスロットルポジションセンサ異常(高電圧異常) Intake throttle position sensor malfunction (high voltage)	○	○									○	P060C,P06A8が無い No detection of P060C,P06A8		インテークスロットルポジションセンサ電圧が4.9Vを超えた Intake throttle position sensor voltage exceeded 4.9V	5秒連続 5 seconds continuously	64	○	○	○	○	1	0	0	0	全閉 Fully closed	全開 Fully open		停止 Stop		×	×	○
	P0122	10022-4	インテークスロットルポジションセンサ異常(低電圧異常) Intake throttle position sensor malfunction (low voltage)	○	○									○			インテークスロットルポジションセンサ電圧が0.3Vを下回った Intake throttle position sensor voltage fell below 0.3V			○	○	○	○	1	0	0	0						×	×	○
71	P2229	108-3	大気圧センサ異常(高電圧異常) Barometric pressure sensor malfunction (high voltage)	○	○										P060C,P06A8が無い No detection of P060C,P06A8		大気圧センサ電圧が4.9Vを超えた Barometric pressure sensor voltage exceeded 4V.	5秒連続 5 seconds continuously	128	○	○	○	○	1	0	0	0	全閉 Fully closed	全開 Fully open	全開 Fully open	停止 Stop	大気圧デフォルト値設定 Barometric pressure default value setting	×	×	○
	P2228	108-4	大気圧センサ異常(低電圧異常) Barometric pressure sensor malfunction (low voltage)	○	○												大気圧センサ電圧が0.1Vを下回った Barometric pressure sensor voltage fell below 0.1V			○	○	○	○	1	0	0	0						×	×	○

ECM故障時動作一覧/ECM Trouble Diagnosis Specifications

更新日	2014/1/31
エンジン型式:	FT4 4HK1X
仕向け先:	ISZA
用途:	General power
試験:	

INDUCEMENT TYPE

TYPE A・・・4HrでFinal、リピート時30minでFinal

TYPE B・・・100HrでFinal、リピート時5HrでFinal

・U/Q ：UREA QUALITY(尿素品質)・・・TYPE A

・D/A ：DOSING ACTIVITY(尿素噴射異常)・・・TYPE A

・TAMPERING ・・・TYPE A

EGR : EGR VALVE妨害 ・・・TYPE B

	Q制限1 Q limit level 1	Q制限2 Q limit level 2	Q制限3 Q limit level 3	回転数制限1 Engine speed limit level 1	回転数制限2 Engine speed limit level 2	レール圧制限 Common rail pressure limit
4HK1	INDUCEMENT1と同一 Same as INDUCEMENT level 1	360Nm	360Nm	1700	1200	80MPa

Column legends:

- 診断継続: ○:故障発生後も診断を継続する。×:故障が発生するとKey-OFFし直すまで診断しない。/ ○: Continue diagnosis after failure occurs. ×: Stop diagnosis until re-Key-ON when
- チェックエンジンランプ: ○:DC=1で送信、×:DC=0で送信、―:送信しない ※以下のように送信、1回目/Lamp.Status=0, DC=0, 2回目/Lamp.Status=1, DC=1
- CAN故障コード送信: ○送信する、×送信しない ※以下のように送信、1回目/Lamp.Status=0, DC=0, 2回目/Lamp.Status=1, DC=1 ○:transmit, ×:don't transmit
- 故障コード記録: ○記録する、×記録しない ※2回連続成立で記録 ○: Recording, ×: No recording ※: Recording when diagnosis occurs two times in succession.
- Q制限: 0:制限なし、1:Q制限レベル1、2:Q制限レベル2、3:Q制限レベル3、4:エンジン停止 / 0: No limit, 1:Fuel limit level 1, 2:Fuel limit level 2, 3: Fuel limit level 3, 4: engine stop
- 回転数制限: 0:制限なし、1:制限レベル1、2:制限レベル2 / 0:No limit, 1: Rail pressure limit level 1, 2: Rail pressure limit level 2
- レール圧制限: 0:制限なし、1:レール圧制限 / 0:No limit, 1:Limit rail pressure
- マルチ停止: 0:制限なし、1:マルチ停止 / 0:No limit, 1:Stop multi injection
- (S):SOFT設定、(C):CAL設定 / (S):Software setting, (C):Calibration setting
- 故障発生時処理
- 故障回復時の動作: ○:即復帰 ×:KEY-ONサイクル中は復帰しない ―:作動しない / ○: Instantly return ×: Not return during KEY-ON cycle. ―: No operation

Part 1 (故障コード / Failure code, 法規対応 / Corresponding regulations, 診断条件 / Diagnosis conditions)

ランプ表示 Lamp display	DTC	CAN SPN-FMI	故障種類 Malfunction type	EMISSION EPA	EMISSION CARB	INDUCEMENT対象 Inducement target EPA	INDUCEMENT対象 CARB	INDUCEMENT対象 EU	DOM	INDUCEMENT分類 Inducement category U/Q	D/A	TAMPERING	EGR	ENG保護 ENG protection	診断実施条件①/ Diagnosis conditions①	診断実施条件②/ Diagnosis conditions ②	故障判定条件/ Malfunction decisions conditions	故障判定時間/ Malfunction decision time	演算周期/ Calculation cycle (msec)
91	P0103	132-3	エアフロセンサー異常（高電圧異常） Airflow sensor malfunction (high	○	○			○				A			P060C,P0560が無い No detection of P060C,P0560	ENG回転700rpm以上	エアフロセンサ電圧が4.9Vを超えた Airflow sensor voltage exceeded 4.9V.	5秒連続 5 seconds continuously	64
	P0102	132-4	エアフロセンサー異常（低電圧異常） Airflow sensor malfunction (low	○	○			○				A			P060C,P0560が無い No detection of P060C,P0560	ENG回転700rpm以上	エアフロセンサ電圧が1.50Vを下回った Airflow sensor voltage fell below 1.5V.		
211	P0183	174-3	燃温センサ 異常(高電圧異常) Fuel temperature sensor malfunction (high voltage)											○	P060C,P160B,P06A9が無い、エンジン始動後3分経過後/No detection of P060C,P160B,P06A9; Perform diagnosis 3 minutes after engine starts		燃温センサ電圧が4.9Vを超えた Fuel temperature sensor voltage exceeded 4.9V.	5秒連続 5 seconds continuously	128
	P0182	174-4	燃温センサ 異常(低電圧異常) Fuel temperature sensor malfunction (low voltage)											○	P060C,P160B,P06A9が無い /No detection of P060C,P160B,P06A9		燃温センサ電圧が0.1Vを下回った Fuel temperature sensor voltage fell below 0.1V.		
221	P20E0	1381-3	燃料フィルター目詰まりセンサ異常(高電圧異常) Fuel filter clogging sensor malfunction (high voltage)											○	P060C,P06D5が無い No detection of P060C,P06D5		目詰まりセンサー電圧が4.9Vを超えた Clogging sensor voltage exceeded 4.9V.	5秒連続 5 seconds continuously	128
	P20DF	1381-4	燃料フィルター目詰まりセンサ異常(低電圧異常) Fuel filter clogging sensor malfunction (low voltage)											○			目詰まりセンサー電圧が0.1Vを下回った Clogging sensor voltage fell below 0.1V.		
245	P0193	157-3	コモンレール圧センサ異常(高電圧異常) Common rail pressure sensor malfunction (high voltage)					○				A		○	P060C,P06A7が無い No detection of P060C,P06A7		コモンレール圧センサ電圧が4.8Vを超えた Common rail pressure sensor voltage exceeded 4.8V	1秒連続 1 seconds continuously	32
	P0192	157-4	コモンレール圧センサ異常(低電圧異常) Common rail pressure sensor malfunction (low voltage)					○				A		○			コモンレール圧センサ電圧が0.7Vを下回った Common rail pressure sensor voltage fell below 0.7V		
295	P0523	100-3	エンジンオイル圧センサ異常(高電圧異常) Engine oil pressure sensor malfunction											○	P060C,P06A9が無い No detection of P060C,P06A9		エンジンオイル圧センサ電圧が4.9Vを超えた Engine oil pressure sensor voltage exceeded 4.9V.	5秒連続 5 seconds continuously	128
	P0522	100-4	エンジンオイル圧センサ異常(低電圧異常) Engine oil pressure sensor malfunction											○		ENG回転600rpm以上	エンジンオイル圧センサ電圧が0.1Vを下回った Engine oil pressure sensor voltage fell below 0.1V.		
213	P1098	105-3	ブースト温度センサ異常(高電圧異常)(インタークーラ出口) Boost temperature sensor malfunction (high voltage)(Intercooler outlet)												P060C,P06A8,P0112,P0113が無い No detection of P060C,P06A8,P0112,P0113		ブースト温センサ電圧が4.9Vを超えた Boost temperature sensor voltage exceeded 4.9V	5秒連続 5 seconds continuously	128
	P1097	105-4	ブースト温度センサ異常(低電圧異常)(インタークーラ出口) Boost temperature sensor malfunction (low voltage)(Intercooler outlet)												P060C,P06A8が無い No detection of P060C,P06A8		ブースト温センサ電圧が0.1Vを下回った Boost temperature sensor voltage fell below 0.1V.		
313	P1077	10051-3	インタークーラー入口温度センサ異常(高電圧異常) Intercooler inlet temperature sensor malfunction (High voltage)	○	○										P060C,P06A8,P160B,P0112,P0113が無い No detection of P060C,P06A8,P160B,P0112,P0113	TABLE4参照	インタークーラー入口温度センサ電圧が4.9Vを超えた Intercooler inlet temperature sensor voltage exceeded 4.9V	10秒連続 10 seconds continuously	128
	P1076	10051-4	インタークーラー入口温度センサ異常(低電圧異常) Intercooler inlet temperature sensor malfunction (Low voltage)	○	○										P060C,P06A8,P160Bが無い No detection of P060C,P06A8,P160B		インタークーラー入口温度センサ電圧が0.1Vを下回った Intercooler inlet temperature sensor voltage fell below 0.1V		
39	P0546	10053-3	EGRクーラー入口1ガス温度センサ異常(高電圧異常) EGR cooler inlet #1 gas temperature sensor malfunction (High voltage)	○	○										P060C,P160B,P06A8,P0112,P0113が無い No detection of P060C,P160B,P06A8,P0112,P0113	TABLE5参照	EGRクーラー入口1ガス温度センサ電圧が4.9Vを超えた EGR cooler inlet #1 gas temperature sensor voltage exceeded 4.9V	10秒連続 10 seconds continuously	128
	P0545	10053-4	EGRクーラー入口1ガス温度センサ異常(低電圧異常) EGR cooler inlet #1 gas temperature sensor malfunction (Low voltage)	○	○										P060C,P160B,P06A8が無い No detection of P060C,P160B,P06A8		EGRクーラー入口1ガス温度センサ電圧が0.1Vを下回った (排気温度800℃相当)/EGR cooler inlet#1 gas temperature sensor voltage fell below 0.1V(Exhaust temperature equivalent to		
52	P041D	10014-3	EGRクーラー出口1ガス温度センサ異常(高電圧異常) EGR cooler outlet #1 gas temperature sensor malfunction (High voltage)	○	○										P060C,P160B,P06A8,P0112,P0113,P0409,P140Bが無い No detection of P060C, P160B, P06A8, P0112, P0113, P0409, P140B	TABLE6参照	EGRクーラー出口1ガス温度センサ電圧が4.9Vを超えた EGR cooler exit #1 gas temperature sensor voltage exceeded 4.9V	10秒連続 10 seconds continuously	128
	P041C	10014-4	EGRクーラー出口1ガス温度センサ異常(低電圧異常) EGR cooler outlet #1 gas temperature sensor malfunction (Low voltage)	○	○										P060C,P160B,P06A8が無い No detection of P060C,P160B,P06A8		EGRクーラー出口1ガス温度センサ電圧が0.1Vを下回った (排気温度250℃相当)/EGR cooler outlet #1 gas temperature voltage fell below 0.1 V		
93	P0401	2791-2	EGRフロー異常 EGR flow malfunction					○					B		P2228,P2229,P0409,P140B,P0122,P0123,P0112,P0113,P0560,P0102,P0103,P0117,P0118,P0404,P045B,P0538が無い No detection of P2228, P2229, P0409, P140B, P0122, P0123, P0112, P0113, P0560, P0102, P0103, P0117, P0118, P0404, P045B, P063	IDLE運転時(始動毎に1回) 水温75℃以上で作動、70℃以下で停止 水温100℃以下で作動、101℃以上で停止 吸気温度-7℃以上で作動、-8℃以下で停止 大気圧84kPa以上で作動、83kPa以下で停止 回転速度850rpm以下で作動、900rpm以上で停止 噴射量(見直し予定)4J:検討中 4H:32mm3/st以下で作動、35mm3/st以上で停止 6H:25mm3/st以下で作動、28mm3/st以上で停止 6U:34mm3/st以下で作動、37mm3/st以上で停止 6W:43mm3/st以	EGR VALVE開度0%(5秒)-30%(5秒)に変化させた時にMAF流量が変化しない MAF flow rate does not change when EGR VALVE opening degree changes from 0%(5secs) to 30%(5secs)	即実施 Instantly executed	20秒

Part 2 (故障発生時処理)

DTC	診断継続/ Diagnosis continuation	チェックエンジンランプ/ Check engine lamp	CAN故障コード送信/ CAN malfunction code transmission	故障コード記録/ Malfunction code recording	エンジン制御制限度 Engine control level Q制限 Fuel injection limit	回転数制限 Speed limit	レール圧制限 Rail pressure limit	マルチ停止 Multi stop	バックアップ制御/ Backup control EGR	ITH	ターボ Turbo	パージ Purge	その他/Others	故障回復時の動作 Operation at failure recovery ランプ動作 Check engine lamp operation	コード送信 Failure code transmission on by CAN	フェイルセーフ動作 Fail safe operation
P0103	×	○	○	○	0	0	0	0	全閉 Fully closed	全開 Fully open			MAFセンサー値250g/secとみなす MAF sensor value is regarded as 250g/sec.	×	×	×
P0102	×	○	○	○	0	0	0	0						×	×	×
P0183	○	○	○	○	0	0	0	0					始動時…-20℃とみなす 運転時…50℃とみなす In starting…regarded as -20℃. During operation…regarded as 50℃.	×	×	○
P0182	○	○	○	○	0	0	0	0						×	×	○
P20E0	○	○	○	○	0	0	0	0					燃圧0kPaとみなす 目詰まり警報停止 Fuel pressure is regarded as 0kPa. Clogging warning stop	×	×	○
P20DF	○	○	○	○	0	0	0	0					燃圧0kPaとみなす 目詰まり警報停止 Fuel pressure is regarded as 0kPa. Clogging warning stop	×	×	○
P0193	×	○	○	○	2	0	1	1	全閉 Fully closed	全開 Fully open		停止 Stop	レール圧80MPaとみなす Rail pressure is regarded as 80MPa.	×	×	×
P0192	×	○	○	○	2	0	1	1						×	×	×
P0523	○	○	○	○	0	0	0	0					エンジンオイル圧120kPaとみなす 油圧警報停止 Engine oil pressure is regarded as 120kPa. Discontinued oil pressure warning.	×	×	○
P0522	○	○	○	○	0	0	0	0						×	×	○
P1098	○	○	○	○	0	0	0	0					ブースト温45℃とみなす ブースト温警報停止 Boost temperature is regarded as 45℃ Discontinue boost temperature warning	×	×	○
P1097	○	○	○	○	0	0	0	0						×	×	○
P1077	○	○	○	○	0	0	0	0					ブースト温160℃とみなす ブースト温警報停止 Boost temperature is regarded as 160℃ Discontinue boost temperature warning	×	×	○
P1076	○	○	○	○	0	0	0	0						×	×	○
P0546	○	○	○	○	0	0	0	0					EGR温度(E/C IN)デフォルト値設定 EGR temperature(E/C IN) default setting	×	×	○
P0545	○	○	○	○	0	0	0	0						×	×	○
P041D	○	○	○	○	0	0	0	0					EGR温度(E/C IN)デフォルト値設定 EGR temperature(E/C IN) default setting	×	×	○
P041C	○	○	○	○	0	0	0	0						×	×	○
P0401	×	○	○	○	0	0	0	0						×	×	×

ECM故障時動作一覧/ECM Trouble Diagnosic Specifications

更新日	2014/1/31
エンジン型式:	FT4 4HK1X
仕向け先:	ISZA
用途:	General power
試験:	

INDUCEMENT TYPE

TYPE A･･･4HrでFinal，リピート時30minでFinal

TYPE B･･･100HrでFinal，リピート時5HrでFinal

･U/Q ：UREA QUALITY(尿素品質)･･･TYPE A

･D/A ：DOSING ACTIVITY(尿素噴射異常)･･･TYPE A

･TAMPERING ･･･TYPE A

EGR：EGR VALVE妨害 ･･･TYPE B

	Q制限1 Q limit level 1	Q制限2 Q limit level 2	Q制限3 Q limit level 3	回転数制限1 Engine speed limit level 1	回転数制限2 Engine speed limit level 2	レール圧制限 Common rail pressure limit
4HK1	INDUCEMENT1と同一 Same as INDUCEMENT level 1	360Nm	360Nm	1700	1200	80MPa

診断継続/Diagnosis continuation: ○：故障発生後も診断を継続する。×：故障が発生するとKey-ONし直すまで診断しない。 ○: Continue diagnosis after failure occurs. ×: Stop diagnosis until re-Key-ON when

チェックエンジンランプ: ○: OC=1で点灯、×: OC=0で点灯、—: 点灯しない W:以下のように点滅、1回目/Lamp_Status=0, OC=0, 2回目/Lamp_Status=1, OC=1

CAN故障コード送信: ○:送信する、×:送信しない W:以下のように送信、1回目/Lamp_Status=0, OC=0, 2回目/Lamp_Status=1, OC=1 ○:transmit, ×:don't transmit

故障コード記録: ○:記録する、×:記録しない W:2回連続成立で記録 ○: Recording, ×: No recording, W: Recording when diagnosis occurs two times in succession.

Q制限: 0:制限なし、1:Q制限レベル1、2:Q制限レベル2、3:Q制限レベル3、4:エンジン停止 0: No limit, 1:Fuel limit level 1, 2:Fuel limit level 2, 3: Fuel limit level 3, 4: engine stop

回転数制限: 0:制限なし、1:制限レベル1、2:制限レベル2 0:No limit, 1: Rail pressure limit level 1, 2: Rail pressure limit level 2

レール圧制限: 0:制限なし、1:レール圧制限 0:No limit, 1:Limit rail pressure

マルチ停止: 0:制限なし、1:マルチ停止 0:No limit, 1:Stop multi injection

(S):SOFT設定 、(O):CAL設定 (S):Software setting, (C):Calibration setting

故障発生時処理

故障回復時の動作: ○:即復帰 ×:KEY-ONサイクル中は復帰しない —:作動しない ○: Instantly return ×: Not return during KEY-ON cycle. —: No operation

故障コード / Failure code: ランプ表示 Lamp display	DTC	CAN SPN-FMI	故障種類 Malfunction type	法規対応/Corresponding regulations: EMISSION EPA	EMISSION CARB	INDUCEMENT対象 Inducement target: EPA	CARB	EU	DOM	INDUCEMENT分類 Inducement category: U/Q	D/A	TAMPERING	EGR	ENG保護 ENG protection	診断実施条件①/ Diagnosis conditions①	診断実施条件②/ Diagnosis conditions ②	故障判定条件/ Malfunction decisions conditions	故障判定時間/ Malfunction decision time	演算周期/ Calculation cycle (msec)	診断継続/ Diagnosis continuation	チェックエンジンランプ/ Check engine lamp	CAN故障コード送信/ CAN malfunction code transmission	故障コード記録/ Malfunction code recording	エンジン制御制限度 Engine control level: Q制限 Fuel injection limit	回転数制限 Speed limit	レール圧制限 Rail pressure limit	マルチ停止 Multi stop	バックアップ制御/ Backup control: EGR	ITH	ターボ Turbo	パージ Purge	その他/Others	故障回復時の動作 Operation at failure recovery: ランプ動作 Check engine lamp operation	コード送信 Failure code transmission by CAN	フェイルセーフ動作 Fail safe operation
外部デバイス系 External device system																																			
33	P0045	10023-12	VNTターボ異常 VNT turbo malfunction	○	○									○	U0001,U0110が無い 9V＜バッテリー電圧＜16V No U0001,U0110 9V<Battery voltage<16V		ターボコントローラーからの異常メッセージ受信 Received abnormity message from turbo controller.	(3秒連続) ターボコントローラーが判定	64	○	○	○	○	1	0	0	0	全閉 Fully closed	全開 Fully open	全開 Fully open		ターボコントローラーがフェイルセーフ制御を行いブースト圧が低下する Turbo controller performs fail safe control and lowers boost pressure	×	×	○
45	P0404	10002-2	EGRバルブコントロール異常 EGR valve control malfunction	○	○			○					B	○	P0409,P06A9が無い 9V<バッテリー電圧<16V EGR目標開度変化が2%以下 No detection of P0409,P06A9. 9V<Battery voltage<16V EGR target opening degree change is less than 2%		目標バルブリフトと実位置の差が20%より大きくなった Difference between targeted valve lift and actual position exceeded 20%.	9.6秒連続 9.6 seconds continuously	64	×	○	○	○	1	0	0	0	全閉 Fully closed	全開 Fully open		停止 Stop		×	×	×
45	P1404	10001-13	EGRゼロ点学習異常 EGR zero-point learning malfunction					○					B	○	P06A9が無い ゼロ点学習終了後 No detection of P06A9 After zero point learning ends		ゼロ点学習値が所定範囲外	即実施 Instantly executed	KEY OFF時 When KEY OFF	×	○	○	○	1	0	0	0	全閉 Fully closed	全開 Fully open		停止 Stop		×	×	×
61	P0638	10022-2	インテークスロットルコントロール異常 Intake throttle control malfunction											○	P06A8,P0122,P0123が無い、目標開度の変化量が少ない No detection of P06A8,P0122,P0123. Target opening degree change is small		目標バルブリフトと実位置の差が40%より大きい Difference between targeted valve lift and actual position exceeded 40%.	10秒連続 10 seconds continuously	64	×	○	○	○	1	0	0	0	全閉 Fully closed	全開 Fully open		停止 Stop		×	×	×
247	P0092	1347-3	SCV駆動系 +Bショート SCV driving system + B short circuit											○	15% < SCV Duty < 85%		SCV電流が2400mA以上、もしくは目標電流に対し1000mA以上高い/SCV current above 2400mA, or more than 1000mA higher than targeted current.	1.6秒連続 1.6 seconds continuously	64	○	○	○	○	3	2	1	1	全閉 Fully closed	全開 Fully open		停止 Stop		×	×	○
	P0091	1347-4	SCV駆動系断線、GNDショート SCV driving system disconnection, GND short circuit											○			SCV電流が50mA以下、もしくは目標電流に対し1000mA以上低い/SCV current below 50mA, or more than 1000mA lower than targeted current.			○	○	○	○	3	2	1	1	全閉 Fully closed	全開 Fully open		停止 Stop		×	×	○
271	P0201	651-5	噴射ノズル#1駆動系断線 Injection nozzle #1 driving system disconnection											○	P2146,P1262,P06AFが無い、70rpm以上 No detection of P2146,P1262,P06AF Above 70rpm		インジェクター1モニタ入力信号がない No injector 1 monitor input signal.	2.6秒連続 2.6 seconds continuously	64	×	○	○	○	1	0	0	1	全閉 Fully closed	全開 Fully open		停止 Stop	気筒#1の噴射停止 Cylinder #1 injection stop	×	×	×
272	P0202	652-5	噴射ノズル#2駆動系断線 Injection nozzle #2 driving system disconnection											○	P2146,P1262,P06AFが無い、70rpm以上 No detection of P2145,P1262,P06AF Above 70rpm		インジェクター2モニタ入力信号がない No injector 2 monitor input signal.			×	○	○	○	1	0	0	1	全閉 Fully closed	全開 Fully open		停止 Stop	気筒#2の噴射停止 Cylinder #2 injection stop	×	×	×
273	P0203	653-5	噴射ノズル#3駆動系断線 Injection nozzle #3 driving system disconnection											○	P2146,P1262,P06AFが無い、70rpm以上 No detection of P2146,P1262,P06AF Above 70rpm		インジェクター3モニタ入力信号がない No injector 3 monitor input signal.			×	○	○	○	1	0	0	1	全閉 Fully closed	全開 Fully open		停止 Stop	気筒#3の噴射停止 Cylinder #3 injection stop	×	×	×
274	P0204	654-5	噴射ノズル#4駆動系断線 Injection nozzle #4 driving system disconnection											○	P2146,P1262,P06AFが無い、70rpm以上 No detection of P2146,P1262,P06AF Above 70rpm		インジェクター4モニタ入力信号がない No injector 4 monitor input signal.			×	○	○	○	1	0	0	1	全閉 Fully closed	全開 Fully open		停止 Stop	気筒#4の噴射停止 Cylinder #4 injection stop	×	×	×
燃料系 Fuel system																																			
151	P0089	157-15	コモンレール圧力異常 (ポンプ過圧送) Common rail pressure malfunction (pump pressure over-fed)											○	P06A7,P0192,P0193,P0091,P0092が無い、INJECTOR系の故障が無い No detection of P06A7,P0192,P0193,P0091,P0092, without injector failure		実レール圧が目標レール圧より40MPa以上高い。 Actual rail pressure is higher than target rail pressure 40MPa or more.	5秒連続 5 seconds continuously	64	×	○	○	○	3	0	1	1	全閉 Fully closed	全開 Fully open		停止(C)		×	×	×
225	P0087	633-7	プレッシャーリミッターオープン Pressure limiter open									-		○	P06A7,P0192,P0193が無い No detection of P06A7,P0192,P0193		レール圧の変化パターンで判定 Decided by rail pressure change pattern.	1秒連続 1 seconds continuously	8	×	○	○	○	3	0	1	1	全閉 Fully closed	全開 Fully open		停止(C)		×	×	×
227	P1093	1239-17	コモンレール圧力低下 (ポンプ圧送不足) Common rail pressure decline (Insufficient pump pressure feed)											○	P06A7,P0192,P0193,P0091,P0092,P0087が無い、INJECTOR系の故障が無い No detection of P06A7,P0192,P0193,P0091,P0092,P0087, without injector system failure		実レール圧が目標レール圧より50MPa以上低い。 Actual rail pressure is lower than target rail pressure 50MPa or more.	5秒連続 5 seconds continuously	64	×	○	○	○	3	0	1	1	全閉 Fully closed	全開 Fully open		停止(C)		×	×	×
	P3093	1239-31 (燃温<5℃)												○							○	○	○				1	全閉 Fully closed	全開 Fully open		停止(C)				

ECM故障時動作一覧/ECM Trouble Diagnosis Specifications

	更新日	2014/1/31
エンジン型式:	FT4 4HK1X	
仕向け先:	ISZA	
用途:	General power	
試験:		

INDUCEMENT TYPE

TYPE A・・・4Hrでfinal。リピート時30minでfinal

TYPE B・・・100Hrでfinal。リピート時5Hrでfinal

・U/Q ：UREA QUALITY(尿素品質)・・・TYPE A

・D/A ：DOSING ACTIVITY(尿素噴射異常)・・・TYPE A

・TAMPERING・・・TYPE A

EGR：EGR VALVE妨害・・・TYPE B

	Q制限1 Q limit level 1	Q制限2 Q limit level 2	Q制限3 Q limit level 3	回転数制限1 Engine speed limit level 1	回転数制限2 Engine speed limit level 2	レール圧制限 Common rail pressure limit
4HK1	INDUCEMENT1と同一 Same as INDUCEMENT level 1	360Nm	360Nm	1700	1200	80MPa

診断継続: ○：故障発生後も診断を継続する。×：故障が発生するとKey-ONし直すまで診断しない。 ○: Continue diagnosis after failure occurs. ×: Stop diagnosis until re-Key-ON when

チェックエンジンランプ: ○：DC=1で送信、×：DC=0で送信、－：送信しない W:以下のように送信。1回目/Lamp_Status=0, DC=0, 2回目/Lamp_Status=1, DC=1

CAN故障コード送信: ○送信する、×送信しない W:以下のように送信。1回目/Lamp_Status=0, DC=0, 2回目/Lamp_Status=1, DC=1 ○transmit, ×:don't transmit

故障コード記録: ○記録する、×:記録しない W:2回連続成立で記録 ○: Recording, ×: No recording W: Recording, when diagnosis occurs two times in succession

エンジン制御制限度: 0:制限なし、1:Q制限レベル1、2:Q制限レベル2、3:Q制限レベル3、4:エンジン停止 0: No limit, 1:Fuel limit level 1, 2:Fuel limit level 2, 3: Fuel limit level 3, 4: engine stop

0:制限なし、1:制限レベル1、2:制限レベル2 0:No limit, 1: Rail pressure limit level 1, 2: Rail pressure limit level 2

0:制限なし、1:レール圧制限 0:No limit, 1:Limit rail pressure

0:制限なし、1:マルチ停止 0:No limit, 1:Stop multi injection

(S):SOFT設定 、(C):CAL設定 (S):Software setting, (C):Calibration setting

故障発生時処理

故障回復時の動作: ○:即復帰 ×:KEY-ONサイクル中は復帰しない －:作動しない ○: Instantly return ×: Not return during KEY-ON cycle. －: No operation

故障コード / Failure code: ランプ表示 Lamp display	DTC	CAN SPN-FMI	故障種類 Malfunction type	法規対応/Corresponding regulations: EMISSION EPA	EMISSION CARB	INDUCEMENT対象 Inducement target: EPA	CARB	EU	DOM	INDUCEMENT分類 Inducement category: U/Q	D/A	TAMPERING	EGR	ENG保護 ENG protection
エンジンプロテクション Engine protection														
542	P0217	110-0	オーバーヒート Overheat											○
543	P0219	190-0	オーバーラン Overrun											○
42	P0234	102-0	ブースト圧オーバー Excessive boost pressure											○
315	P1236	5285-1	インタークーラー性能低下 Decline in intercooler performance	○	○									
95	P2457	10054-17	EGRクーラー性能低下 Decline in EGR cooler performance	○	○									

DTC	診断実施条件①/ Diagnosis conditions①	診断実施条件②/ Diagnosis conditions ②	故障判定条件/ Malfunction decisions conditions	故障判定時間/ Malfunction decision time	演算周期/ Calculation cycle (msec)	診断継続/ Diagnosis continuation	チェックエンジンランプ/ Check engine lamp	CAN故障コード送信/ CAN malfunction code transmission	故障コード記録/ Malfunction code recording
P0217	運転中でP06A8,P0117,P0118が無い No detection of P06A8,P0117,P0118, during operation		水温が101℃を越えた Water temperature exceeded 110°C.	10秒連続 10 seconds continuously	128	○	×	○	○
P0219	常時 P06A6,P06A7が無い Always, No detection of P06A6,P06A7		エンジン回転数が所定回転数を超えた ショベル:2500rpm、ローダー:2800rpm Engine speed exceeded predetermined engine speed. Excavator : 2500rpm, Loader : 2800rpm	5秒連続 5 seconds continuously	64	○	○	○	○
P0234	運転中でP06A8,P0237, P0238, P0045, U0001, U0110,U0411が無い No detection of P06A8,P0237, P0238, P0045, U0001, U0110,U0411, during		ブースト圧が最大目標ブースト圧より20kPa以上高い。 Boost pressure exceeds highest target boost pressure by 20kPa.	5秒連続 5 seconds continuously	64	○	○	○	○
P1236	P06A8,P1076,P1077,P1097,P1098,P0237,P0238,P2228,P2229,P0182,P0183,P0545,P0546,P0112,P0102,P0103,P0122,P0123,P0638,U0001,U0110,P0045,U0411,P0117,P0118が無い、ENG始動後10分経過、パージ終了後5秒経過 No detection of P06A8,P1076,P1077,P1097,P1098,P0237,P0238,P2228,P2229,P0182,P0183,P0545,P0546,P0112,P0102,P0103,P0122,P0123,P0638,U0001,U0110,P0045,U0411,P0117,P0118 Perform after 10 minutes from engine start, 5 seconds	TABLE7参照	インタークーラー出入口温度差が閾値以下 (ブースト温度が80℃を超えた) Intercooler outlet temperature difference is below threshold (Boost temperature is above 80℃)	10秒連続 10 seconds continuously	64	○	○	○	○
P2457	P06A8,P0409,P140B,P0237,P0238,P2228,P2229,P0182,P0183,P0545,P0546,P041C,P041D,P0112,P0113,P0122,P0123,P0638,U0001,U0110,P0045,U0411,P0548,P0549,P040C,P040Dが無い、常時、ENG始動後10分経過、パージ終了後5秒経過 No detection of P06A8,P0409,P140B,P0237,P0238,P2228,P2229,P0182,P0183,P0545,P0546,P041C,P041D,P0112,P0113,P0122,P0123,P0638,U0001,U0110,P0045,U0411,P0548,P0549,P040C,P040D, perform after 10 minutes from engine start, 5 seconds after purge is over	TABLE8参照	EGRクーラー出入口温度差が閾値以下 (EGR温度が200℃を超えた) EGR cooler outlet temperature difference is below threshold(EGR temperature exceeds 200℃)	10秒連続	64	○	○	○	○

DTC	エンジン制御制限度 Engine control level: Q制限 Fuel injection limit	回転数制限 Speed limit	レール圧制限 Rail pressure limit	マルチ停止 Multi stop	バックアップ制御/ Backup control: EGR	ITH	ターボ Turbo	パージ Purge	その他/Others	故障回復時の動作 Operation at failure recovery: ランプ動作 Check engine lamp operation	コード送信 Failure code transmission by CAN	フェイルセーフ動作 Fail safe operation
P0217	0	0	0	0						－	－	○
P0219	0	0	0	0						×	×	○
P0234	0	2	0	0	全閉 Fully closed	全開 Fully open	全開(C)			×	×	○
P1236	0	0	0	0						×	×	○
P2457	0	0	0	0						×	×	○

ECM故障診断動作一覧/ECM Trouble Diagnosis Specifications

更新日	2014/1/31
エンジン型式:	FT4 4HK1X
仕向け先:	ISZA
用途:	General power
試験:	

INDUCEMENT TYPE

TYPE A・・・4Hrでfinal、リピート時30minでfinal

TYPE B・・・100Hrでfinal、リピート時5Hrでfinal

・U/Q ：UREA QUALITY(尿素品質)・・・TYPE A

・D/A ：DOSING ACTIVITY(尿素噴射異常)・・・TYPE A

・TAMPERING ・・・TYPE A

EGR：EGR VALVE妨害 ・・・TYPE B

	Q制限1 Q limit level 1	Q制限2 Q limit level 2	Q制限3 Q limit level 3	回転数制限1 Engine speed limit level 1	回転数制限2 Engine speed limit level 2	レール圧制限 Common rail pressure limit
4HK1	INDUCEMENT 1と同一 Same as INDUCEMENT level 1	350Nm	250Nm	1200	1200	60MPa

Legend:

- 診断継続/Diagnosis continuation: ○：故障発生後も診断を継続する。×：故障が発生するとKey-ONし直すまで診断しない。○: Continue diagnosis after failure occurs. ×: Stop diagnosis until re-Key-ON when
- チェックエンジンランプ/Check engine lamp: ○: OC=1で送信、×: OC=0で送信、－：送信しない W:以下のように送信、1回目/Lamp_Status=0, OC=0, 2回目/Lamp_Status=1, OC=1
- CAN故障コード送信/CAN malfunction code transmission: ○:送信する、×:送信しない W:以下のように送信、1回目/Lamp_Status=0, OC=0, 2回目/Lamp_Status=1, OC=1 ○:transmit × don't transmit
- 故障コード記録/Malfunction code recording: ○:記録する、×:記録しない W:2回連続成立で記録 ○: Recording, ×: No recording W: Recording, when diagnosis occurs two times in succession.
- 0:制限なし、1:Q制限レベル1、2:Q制限レベル2、3:Q制限レベル3、4:エンジン停止 / 0: No limit, 1:Fuel limit level 1, 2:Fuel limit level 2, 3: Fuel limit level 3, 4: engine stop
- 0:制限なし、1:制限レベル1、2:制限レベル2 / 0:No limit, 1: Rail pressure limit level 1, 2: Rail pressure limit level 2
- 0:制限なし、1:レール圧制限 / 0:No limit, 1:Limit rail pressure
- 0:制限なし、1:マルチ停止 / 0:No limit, 1:Stop multi injection
- (S):SOFT設定、(C):CAL設定 / (S):Software setting, (C):Calibration setting
- ○:即復帰 ×:KEY-ONサイクル中は復帰しない —:作動しない / ○: Instantly return ×: Not return during KEY-ON cycle. —: No operation

故障発生時処理

故障コード / Failure code: ランプ表示 Lamp display	DTC	CAN SPN-FMI	故障種類 Malfunction type	法規対応/Corresponding regulations: EMISSION EPA	EMISSION CARB	INDUCEMENT対象 Inducement target: EPA	CARB	EU	DOM	INDUCEMENT分類 Inducement category: U/Q	D/A	TAMPERING	EGR	ENG保護 ENG protection	診断実施条件①/ Diagnosis conditions①	診断実施条件②/ Diagnosis conditions ②	故障判定条件/ Malfunction decisions conditions	故障判定時間/ Malfunction decision time	演算周期/ Calculation cycle (msec)	診断継続/ Diagnosis continuation	チェックエンジンランプ/ Check engine lamp	CAN故障コード送信/ CAN malfunction code transmission	故障コード記録/ Malfunction code recording	エンジン制御制限度 Engine control level: Q制限 Fuel injection limit	回転数制限 Speed limit	レール圧制限 Rail pressure limit	マルチ停止 Multi stop	バックアップ制御/ Backup control: EGR	ITH	ターボ Turbo	パージ Purge	その他/Others	故障回復時の動作 Operation at failure recovery: ランプ動作 Check engine lamp operation	コード送信 Failure code transmission by CAN	フェイルセーフ動作 Fail safe operation
後処理装置 After treatment device																																			
139	P2456	10029-0	PURGEタイムアウト回数過多 Excessive purge timeouts											○	常時 Always		PURGEタイムアウトが3回連続した場合 3 consecutive Purge time outs	即実施 Instantly executed	—	○	○	○	○	0	0	0	0				停止(S)		×	×	○
611	P207F	4332-12	尿素品質異常 Urea quality abnormality			○	○	○	○	A					-	-	DCUからエラーメッセージを受信 Received error messages from DCU	DCUで判定 Determine by DCU	—	○	○	○	○	0	0	0	0				停止(S)		×	×	○
611	P20C9	10044-1	SCR SYSTEM異常(inducement有り) SCR system malfunction (with			○	○	○	○		A	A			-	-	DCUからエラーメッセージを受信 Received error messages from DCU	DCUで判定 Determine by DCU	—	○	○	○	○	0	0	0	0						×	×	○
611	P204F	10043-2	SCR SYSTEM異常(inducement無し) SCR system malfunction (without												-	-	DCUからエラーメッセージを受信 Received error messages from DCU	DCUで判定 Determine by DCU	—	○	○	○	○	0	0	0	0						×	×	○
611	P2BA7	4332-12	尿素水欠乏 Urea water deficiency												-	-	DCUからエラーメッセージを受信 Received error messages from DCU	DCUで判定 Determine by DCU	—	○	—	—	○	0	0	0	0				停止(S)		—	—	—
611	P2BAA	10042-12	SCR SYSTEM異常(inducement有りパージ禁止)/ SCR system malfunction (with inducement, purge prohibited)			○	○	○	○		A	A			-	-	DCUからエラーメッセージを受信 Received error messages from DCU	DCUで判定 Determine by DCU	—	○	○	○	○	0	0	0	0				停止(S)		×	×	○
外部回路系 External circuit system																																			
416	P0685	1485-5	メインリレー系 異常(入らず) Main relay system malfunction (not connected)											○	KEY ON後3秒経過 After 3 seconds from KEY ON		メインリレーコイル出力ONでメインリレーの系統の電圧が1V以下・ With main relay coil output ON, main relay system voltage is below 1V.	3.2秒連続 3.2 seconds continuously	128	○	○	○	○	0	0	0	0						×	×	○
416	P0687	1485-6	メインリレー系 異常(切れず) Main relay system malfunction (not disconnected)											○	常時 Always		メインリレーコイル出力OFF命令が出てもリレーが切れない。 Even with the issuance of main relay coil output OFF command, the relay is not disconnected.	5.1秒連続 5.1 seconds continuously		×	○	○	○	0	0	0	0						×	×	×
35	P0563	158-3	バッテリー系高電圧異常 Battery system high voltage malfunction											○	P060Cが無い No detection of P060C		IG-KEY電圧が32Vを超えた IG-KEY voltage exceeded 32V.	5秒連続 5 seconds continuously	128	○	○	○	○	0	0	0	0						×	×	○
66	P0380	676-5	GLOW RELAY 異常 Glow relay malfunction											○	・IG-KEY電圧9～16V ・P0380発生なし IG-KEY voltage is 9～16V No detection of P0380		・グローリレーON指示に対し、グローリレーモニタ信号がない又は、グローリレーOFF指示に対し、グローリレーモニタ信号がある。 ・No detection of glow relay monitor signal when glow relay ON indication, OR, there is a glow relay monitor signal towards glow relay OFF indication.	3.2秒連続 3.2 seconds continuously	128	○	○	○	○	0	0	0	0						×	×	-
19	P0615	677-5	スターターカットリレー異常 Starter cut relay malfunction											○	・IG-KEY電圧9～16V ・P0615発生なし IG-KEY voltage is 9～16V No detection of P0615		・スターターカットリレーON指示に対し、スターターカットリレーモニタ信号がない又は、スターターカットリレーOFF指示に対し、スターターカットリレーモニタ信号がある。 ・No detection of starter cut monitor signal when starter cut relay ON indication, OR, there is a starter cut relay monitor signal towards starter cut relay OFF indication.	3.2秒連続 3.2 seconds continuously	128	○	○	○	○	0	0	0	0						×	×	-
75	P1669	10025-5	DPDランプ異常 DPD lamp malfunction											○	制御上ランプ消灯または点灯中 Control lamp is OFF or lighting		DPDランプモニタ信号がない No signal of DPD lamp monitoring	10秒連続 10 seconds continuously	128	×	○	○	○	0	0	0	0						×	×	×
内部回路系 Internal circuit system																																			
34	P1261	10005-2	チャージ回路異常(バンク1) Charge circuit malfunction (bank											○	常時 Always	ENG回転70rpm以上	ECM内チャージ回路バンク1電圧が低い In ECM, charge circuit bank 1 voltage is low.	2.5秒連続 2.5 seconds continuously	64	×	○	○	○	0	0	0	0	全閉 Full	全開 Full		停止(S)	コモン1停止(#1,4気筒停止) Common 1 stop (#1, 4cylinder stop)	×	×	×
	P1262	10006-2	チャージ回路異常(バンク2) Charge circuit malfunction (bank											○	常時 Always	ENG回転70rpm以上	ECM内チャージ回路バンク2電圧が低い In ECM, charge circuit bank 2 voltage is low.			×	○	○	○	0	0	0	0	全閉 Full	全開 Full		停止(S)	コモン2停止(#2,3気筒停止) Common 1 stop (#2, 3cylinder stop)	×	×	×
36	P060C	10008-2	A/D変換異常 A/D conversion malfunction											○	常時 Always		AD-ICの内部異常を検出 AD-IC internal abnormality detected	即実施 Instantly executed	4	×	○	○	○	2	0	1	1	全閉 Fully closed	全開 Fully open	全開 Fully open	停止(S)	アナログセンサ系デフォルト処理 Analogue sensor system default processing	×	×	×
36	P160B	10045-2	ADIC異常/ADIC malfunction											○	P060Cが無い、バッテリー電圧が9Vから16V No detection of P060C, Battery voltage is 9V～16V		AD-IC2の内部異常を検出 AD-IC2 internal abnormality detected	1.2秒連続 1.2 seconds continuously.	128	○	○	○	○	1	0	0	0	全閉 Fully closed	全開 Fully open	全開 Fully open	停止(S)	インタークーラー入口温度センサ、燃料フィルタ目詰まりセンサ、マニホールド温度センサ、水温センサ、燃温センサ、ブースト温度センサ、EGRクーラー入口ガス温度センサ1/2、EGRクーラー出口ガス温度センサ1/2、排気温度センサー2、吸気温センサのデフォルト処理 Intercooler entrance temperature sensor, fuel filter clogging sensor, manihold temperature sensor, coolant temperature sensor, fuel temperature sensor, boost temperature sensor, EGR cooler entrance gas temperature sensor 1/2, EGR cooler exit gas temperature sensor 1/2, exhaust gas temperature sensor 2, intake air temperature sensor default processing	○	×	○
36	P160C	10078-12	ADIC2異常/ADIC2 malfunction											○	P060Cが無い、バッテリー電圧が9Vから16V No detection of P060C, Battery voltage is 9V～16V		SW-ICの内部異常を検出 SW-IC internal abnormality detected	1.2秒連続 1.2 seconds continuously.	128	○	×	×	○	0	0	0	0					なし None	○	×	—
51	P1606	10046-2	SWIC-1異常/SWIC-1 malfunction												常時 Always		SW-ICの内部異常を検出 SW-IC internal abnormality detected	0.3秒連続 0.3 seconds continuously.	16	○	○	○	○	0	0	0	0					DPD手動再生スイッチ、DRMマニュアルトリガースイッチが無効 DPD manual regeneration switch, DRM manual trigger switch is invalid	○	×	○
51	P1606	10048-2	SWIC-1通信異常 SWIC-1 communication malfunction												常時 Always		SW-ICとの通信異常を検出 SW-IC communication abnormality detected	0.3秒連続 0.3 seconds continuously.	16	○	○	○	○	0	0	0	0						○	×	○
51	P1606	10047-2	SWIC-2異常 SWIC-2 malfunction												常時 Always		SW-ICの内部異常を検出 SW-IC internal abnormality detected	0.3秒連続 0.3 seconds continuously.	16	○	×	×	○	0	0	0	0					SWIC2制御のスイッチがデフォルト処理 SWIC2 control switch undergoes default processing	○	×	○
51	P1606	10049-2	SWIC-2通信異常 SWIC-2 communication malfunction												常時 Always		SW-ICとの通信異常を検出 SW-IC communication abnormality detected	0.3秒連続 0.3 seconds continuously.	16	○	×	×	○	0	0	0	0					SWIC2制御のスイッチがデフォルト処理 SWIC2 control switch undergoes default processing	○	×	○
51	P0606	1077-2	CPU異常 CPU malfunction											○	バッテリー電圧が9V以上、KEY ON後480msecの間 Battery voltage is over 9V, perform in 480msec after KEY ON		メインCPUの異常をサブCPUが検出 (SUB-CPUがCPUをリセットする) Sub CPU detected abnormality in the main CPU (Sub CPU resets CPU)	即実施 Instantly executed	Power ON時 When power ON	×	○	○	CPU復帰時 ○	1	1	1	1	全閉 Fully closed	全開 Fully open		停止(C)		×	×	×
																							復帰しない時 ×	—	—	—	—					SUB-CPUが制御を停止 SUB-CPU stops control	×	×	×
51	P060A	10007-2	CPU監視用IC異常 CPU monitoring IC malfunction											○	バッテリー電圧が9V以上、KEY ON後480msecの間 Battery voltage is over 9V, perform in 480msec after KEY ON		RUN-SUBパルスが20msec以上の間変化無し RUN-SUB pulse without change for more than 20msec.	0.16秒連続 1.2 seconds continuously	4	○	○	○	○	1	0	0	0						×	×	○
53	P0601	628-2	ROM異常 ROM malfunction											○	常時 Always		チェックサム判定がNG Check sum decision is NG.	即実施 Instantly executed	-	×	○	○	○	4	0	1	1						×	×	×
54	P1621	10013-2	EEPROM異常 EPROM malfunction											○	常時 Always		EEPROM異常検出 EPROM abnormity is detected.	即実施 Instantly executed	Power ON時 When power ON	×	○	○	○	0	0	0	0						×	×	×

ECM故障時動作一覧/ECM Trouble Diagnosis Specifications

更新日	2014/1/31
エンジン型式：	FT4 4HK1X
仕向け先：	ISZA
用途：	General power
試験：	

INDUCEMENT TYPE

TYPE A・・・4HrでfinaI、リピート時30minでfinal

TYPE B・・・100Hrでfinal、リピート時5Hrでfinal

・U/Q ：UREA QUALITY(尿素品質)・・・TYPE A

・D/A ：DOSING ACTIVITY(尿素噴射異常)・・・TYPE A

・TAMPERING ・・・TYPE A

EGR : EGR VALVE妨害 ・・・TYPE B

	Q制限1 Q limit level 1	Q制限2 Q limit level 2	Q制限3 Q limit level 3	回転数制限1 Engine speed limit level 1	回転数制限2 Engine speed limit level 2	レール圧制限 Common rail pressure limit
4HK1	INDUCEMENT1と同一 Same as INDUCEMENT level 1	360Nm	360Nm	1700	1200	80MPa

診断継続/Diagnosis continuation: 〇：故障発生後も診断を継続する。×：故障が発生するとKey-ONし直すまで診断しない。〇: Continue diagnosis after failure occurs. ×: Stop diagnosis until re-Key-ON when...

チェックエンジンランプ/Check engine lamp: 〇: OC=1で送信、×: OC=0で送信、－: 送信しない W:以下のように送信、1回目/ Lamp Status=0, OC=0, 2回目/ Lamp Status=1, OC=1

CAN故障コード送信/CAN malfunction code transmission: 〇:送信する、×:送信しない W:以下のように送信、1回目/ Lamp Status=0, OC=0, 2回目/ Lamp Status=1, OC=1 〇:transmit ×:don't transmit

故障コード記録/Malfunction code recording: 〇:記録する、×:記録しない W:2回連続成立で記録 〇: Recording, ×: No recording W: Recording, when diagnosis occurs two times in succession.

0:制限なし、1:Q制限レベル1、2:Q制限レベル2、3:Q制限レベル3、4:エンジン停止
0: No limit, 1:Fuel limit level 1, 2:Fuel limit level 2, 3: Fuel limit level 3, 4: engine stop

0:制限なし、1:制限レベル1、2:制限レベル2
0:No limit, 1: Rail pressure limit level 1, 2: Rail pressure limit level 2

0:制限なし、1:レール圧制限
0:No limit, 1:Limit rail pressure

0:制限なし、1:マルチ停止
0:No limit, 1:Stop multi injection

(S):SOFT設定 、(C):CALI設定
(S):Software setting, (C):Calibration setting

故障発生時処理

〇：即復帰
×：KEY-ONサイクル中は復帰しない
－：作動しない
〇: Instantly return
×: Not return during KEY-ON cycle
－: No operation

ランプ表示 Lamp display	DTC	CAN SPN-FMI	故障種類 Malfunction type	法規対応/Corresponding regulations EMISSION EPA	EMISSION CARB	INDUCEMENT対象 Inducement target EPA	CARB	EU	DOM	INDUCEMENT分類 Inducement category U/Q	D/A	TAMPERING	EGR	ENG保護 ENG protection	診断実施条件①/ Diagnosis conditions①	診断実施条件②/ Diagnosis conditions ②	故障判定条件/ Malfunction decisions conditions	故障判定時間/ Malfunction decision time	演算周期/ Calculation cycle (msec)	診断継続/ Diagnosis continuation	チェックエンジンランプ/ Check engine lamp	CAN故障コード送信/ CAN malfunction code transmission	故障コード記録/ Malfunction code recording	エンジン制御制限度 Engine control level: Q制限 Fuel injection limit	回転数制限 Speed limit	レール圧制限 Rail pressure limit	マルチ停止 Multi stop	バックアップ制御/ Backup control: EGR	ITH	ターボ Turbo	パージ Purge	その他/Others	故障回復時の動作 Operation at failure recovery: ランプ動作 Check engine lamp operation	コード送信 Failure code transmission on by CAN	フェイルセーフ動作 Fail safe operation
55	P06A6	1079-2	5V電源1電圧異常 5V power supply 1 voltage malfunction											〇			5V1もしくは5V6電源電圧が5.5V以上または4.5V以下 5V1 or 5V6 power supply voltage is above 5.5V or below 4.5V.			×	〇	〇	〇	0	0	0	0				停止(S)		×	×	×
56	P06A7	1080-2	5V電源2電圧異常 5V power supply 2 voltage malfunction											〇			5V2もしくは5V7電源電圧が5.5V以上または4.5V以下 5V2 or 5V7 power supply voltage is above 5.5V or below 4.5V.			×	〇	〇	〇	2	0	1	0	全閉 Fully closed	全開 Fully open				×	×	×
57	P06A8	10009-2	5V電源3電圧異常 5V power supply 3 voltage malfunction											〇	P0600が無い、バッテリー電圧が9Vから16V No detection of P0600, Battery voltage is 9~16V		5V3もしくは5V8電源電圧が5.5V以上または4.5V以下 5V3 or 5V8 power supply voltage is above 5.5V or below 4.5V.	0.4秒連続 0.4 seconds continuously.	8	×	〇	〇	〇	1	0	0	0	全閉 Fully closed	全開 Fully open		停止(S)		×	×	×
59	P06A9	10010-2	5V電源4電圧異常 5V power supply 4 voltage malfunction											〇			5V4もしくは5V9電源電圧が5.5V以上または4.5V以下 5V4 or 5V9 power supply voltage is above 5.5V or below 4.5V.			×	〇	〇	〇	1	0	0	0	全閉 Fully closed	全開 Fully open		停止(S)		×	×	×
56	P06D5	10011-2	5V電源5電圧異常 5V power supply 5 voltage malfunction											〇			5V5もしくは5V10電源電圧が5.5V以上または4.5V以下 5V5 or 5V10 power supply voltage is above			×	〇	〇	〇	1	0	0	0	×	×		停止(C)		×	×	×
153	P0604	10033-2	RAM異常 RAM malfunction											〇	常時 Always		RAM異常検出 RAM abnormity is detected.	即実施 Instantly executed	KEY OFF時 When KEY OFF	×	〇	〇	〇	4	0	1	1						×	×	×
154	P0602	10032-2	QRコード異常 QR code malfunction											〇	常時 Always		QRコード、Q調書き込み未完了 QR code, Q adjustment writing not completed.	即実施 Instantly executed	128	〇	W	W	W	0	0	0	0					インジェクター補正不能 Injector adjustment is disabled	×	×	〇
155	P0560	10012-2	12V回路異常 12V circuit malfunction											〇	P0600が無い、バッテリー電圧が9Vから16V No detection of P0600 Battery voltage is 9~16V		12V電源電圧が19V以上または7V以下 12V power supply voltage above 19V or below 7V.	1.2秒連続 1.2 seconds continuously.	128	×	〇	〇	〇	0	0	0	0	全閉 Fully closed	全開 Fully open				×	×	×
277	P06AF	10050-2	INJ-IC異常 INJ-IC malfunction											〇	P6AFが無い エンジン回転が70rpm以上		INJ-ICの内部異常を検出 INJ-IC internal abnormality detected	1.2秒連続 1.2 seconds continuously.	64	×	〇	〇	〇	0	0	0	0				停止(S)	全インジェクター噴射停止 All injectors are disabled	×	×	×
277	P06AF	10082-2	INJ-IC通信異常 INC-IC communication malfunction											〇	P6AFが無い エンジン回転が70rpm以上 No detection of P6AF engine speed is over 70rpm		INJ-ICとの通信異常を検出 INJ-IC communication abnormality detected	2.6秒連続 2.6 seconds continuously.	64	×	〇	〇	〇	0	0	0	0						×	×	×
277	P06AF	10083-2	INJ-ICチェックサム異常 INJ-IC check sum malfunction											〇	P6AFが無い エンジン回転が70rpm以上 No detection of P6AF engine speed is over 70rpm		INJ-ICのチェックサムが合わない INJ-IC check sum does not match	2.6秒連続 2.6 seconds continuously.	64	×	〇	〇	〇	0	0	0	0						×	×	×
158	P2146	10003-2	噴射ノズルコモン1駆動系異常 Injection nozzle common 1 driving system malfunction											o	P0201,P0204,P06AFが無い No detection of P0201,P0204,P06AF		インジェクター1,4のモニタ入力信号がない No input signal for injector 1,4	2.6秒連続 2.6 seconds continuously.	64	×	〇	〇	〇	0	0	0	1	全閉 Fully closed	全開 Fully open		停止(S)	コモン1停止(#1,4気筒停止) Common 1 stop (#1, 4 cylinder stop)	×	×	×
159	P2149	10004-2	噴射ノズルコモン 2駆動系異常 Injection nozzle common 2 driving system malfunction											o	P0202,P0203,P06AFが無い No detection of P0202,P0203,P06AF		インジェクター2,3のモニタ入力信号がない No input signal for injector 2,3	2.6秒連続 2.6 seconds continuously.	64	×	〇	〇	〇	0	0	0	1	全閉 Fully closed	全開 Fully open		停止(S)	コモン2停止(#2,3気筒停止) Common 1 stop (#2, 3 cylinder stop)	×	×	×
通信系 Communication system																																			
84	U0073	639-19	CAN Bus異常 CAN Bus malfunction											〇	バッテリー電圧9Vから16V Battery voltage 9-16V		バスオフ検出 Bus off is detected.	3秒連続 3 seconds continuously	64	〇	〇	〇	〇	0	0	0	0				停止(C)	CAN通信不能 CAN communication is not possible	×	×	〇
84	U0001	10040-19	ISO-CAN Bus異常 ISO-CAN Bus malfunction											〇	バッテリー電圧9Vから16V Battery voltage 9-16V		バスオフ検出 Bus off is detected.	3 seconds	64	×	〇	〇	〇	0	0	0	0	全閉 Fully closed	全開 Fully open	全開 Fully open		ターボコントローラーがフェイルセーフ制御を行いブースト圧が低下する Turbo controller performs fail safe control and	×	×	×
85	U0101	639-2	CANタイムアウト異常 CAN time-out malfunction	〇	〇									〇	バッテリー電圧9V以上 クランキング中以外 Battery voltage is over 9V, except while cranking		SA=228からのTSC1メッセージを受信しない Not receiving TSC1 message from SA=228.	5秒連続 5 seconds continuously	64	〇	〇	〇	〇	0	0	0	0				停止(C)	CAN通信不能 CAN communication is not possible	×	×	〇
87	U0110	10023-2	CAN VNTタイムアウト 異常 CAN VNT timeout malfunction	〇	〇									〇	U0001が無い バッテリー電圧9V以上(IHI) No detection of U0001 Battery voltage is over 9V (IHI)		ターボコントローラからのメッセージを受信しない Not receiving message from turbo controller	5秒連続 5 seconds continuously	64	〇	〇	〇	〇	1	1	0	0	全閉 Fully closed	全開 Fully open	全開 Fully open		CAN通信不能 CAN communication is not possible	×	×	〇
87	U0411	10023-19	VNT通信異常 VNT communication malfunction	〇	〇									〇	U0073が無い 9V<バッテリー電圧<16V No detection of U0073 Battery voltage is 9~16V		ターボコントローラから通信異常メッセージを受信 Received communication malfunction message from turbo controller	1秒連続 1 seconds continuously	64	〇	〇	〇	〇	0	0	0	0	全閉 Fully closed	全開 Fully open	全開 Fully open		ターボコントローラーがフェイルセーフ制御を行いブースト圧が低下する Turbo controller performs fail safe control and lowers boost pressure	×	×	〇
83	U010E	10041-2	DCU通信異常 DCU communication malfunction			〇	〇	〇				A		〇	U0001が無い No detection of U0001		DCUからの通信を受信しない DCUからエラーメッセージを受信 Not receiving signal from DCU Received error message from DCU	5秒連続 5 seconds continuously	64	×	〇	〇	〇	0	0	0	0				停止(S)		×	×	×

SPN-FMI	P Code	Description
10001-13	P1404	**EGR BLOC Zero Position**
		EGR Position Fault
	Pl404	**EGR 1 closed position characteristic malfunction**
10001-2	P0409	**EGR 1 position sensor system malfunction**
		EGR Sensor Circuit
		EGR Valve BLOC Position Circuit
10002-2	P0404	**EGR 1 control system characteristic malfunction**
		EGR Control Circuit Range/Performance
		EGR Valve Control Circuit
10003-2	P2146	**Fuel Injector Group 1 Supply Voltage Circuit**
		Fuel injector supply voltage system malfunction, group 1
		Injector Circuit Group 1
10004-2	P2149	**Fuel Injector Group 2 Supply Voltage Circuit**
		Fuel injector supply voltage system malfunction, group 2
		Injector Circuit Group 2
10005-1	Pl 261	**Fuel injector supply voltage system malfunction, group 1**
10005-2	P1261	**Fuel Injector Group 1 Supply Voltage Circuit**
		Injector Positive Voltage Control Circuit Group 1
10006-1	Pl262	**Fuel injector supply voltage system malfunction, group 2**
10006-2	P1262	**Fuel Injector Group 2 Supply Voltage Circuit**
		Injector Positive Voltage Control Circuit Group 2
10007-2	P060A	**Internal Control Module CPU IC Error**
	(blank)	**SUB-CPU Error**
		(blank)
10008-2	P060B	**A/O Converter Error**
		Control module AID conversion processor characteristic error
	P060C	**Internal Control Module A/D Processing Performance**
10009-2	P0697	**5 Volt Reference 3 Circuit**
		Sensor voltage system malfunction (Reference 3)
	P06A8	**Sensor Reference Voltage 3 Circuit**
100-1	P0521	**Engine Oil Low Pressure Malfunction**
10010-2	P06A9	**Sensor Reference Voltage 4 Circuit**
	P1655	**5 Volt Reference 4 Circuit**
	Pl655	**Sensor voltage system malfunction (Reference 4)**
10011-2	P06D5	**Sensor Reference Voltage 5 Circuit**
10012-2	P0560	**12 Volt Circuit Error**
10013-12	P1622	**Control Module EEPROM Hardware Error**
10013-2	P1621	**Control Module EEPROM Error**
		Control Module Long Term Memory Performance
	Pl621	**Control module EEPROMIHD EEPROM malfunction**
10014-3	P041D	**EGR Cooler Outlet 1 Temp Sensor Circuit High**
10014-4	P041C	**EGR Cooler Outlet 1 Temp Sensor Circuit Low**
10020-2	P045B	**EGR 2 Control Circuit Range/Performance**
10021-13	P140C	**EGR 2 Closed Position Performance**
10021-2	P140B	**EGR 2 Sensor Circuit**

10022-2	P0638	**Throttle Actuator Control Range/Performance**
10022-3	P0123	**Throttle Position Sensor Circuit High**
10022-4	P0122	**Throttle Position Sensor Circuit Low**
10023-12	P0045	**Turbocharger Boost Control VNT Error**
10023-19	U0411	**Lost CAN Communications With VNT Control Module**
10023-2	U0110	**Lost Communication With VNT System**
10024-3	P042D	**Catalyst Temperature Sensor Circuit High Sensor 2**
	P042O	**Exhaust Temperature Sensor 2 Circuit High Input**
10024-4	P042C	**Catalyst Temperature Sensor Circuit Low Sensor 2**
		Exhaust Temperature Sensor 2 Circuit Low Input
10025-5	P1669	**DPD Lamp Control Circuit**
10029-0	P2458	**Purge time Out Error**
100-3	P0523	**Engine Oil Pressure Sensor Circuit High Input**
		Engine oil pressure sensor malfunction (high voltage)
10032-2	P0602	**Control module program malfunction error**
		Injector Tolerance-QR Code Error
		Internal Control Module QR Code Error
10033-2	P0604	**Control module RAM malfunction random access memory error**
		Internal Control Module RAM Error
		Internal Control Module Random Access Memory Error
10034-2	U2106	**Lost CAN Communications With Wheel Loader Transmission Control System**
100-4	P0522	**Engine Oil Pressure Sensor Circuit Low Input**
		Engine oil pressure sensor malfunction (low voltage)
10040-19	U0001	**CAN Bus Error (ISO-CAN)**
		ISO-CAN bus reset counter overrun
10041-2	U010E	**Lost Communications With Dosing Control Module**
10042-12	P2BAA	**SCR System Error (Inducement, No Purge)**
		SCR System Error (Inducement, No Purge)
10043-2	P204F	**SCR System Error (No Inducement)**
10044-1	P20C9	**SCR System Error**
10045-2	P160B	**AD-IC Failure Error**
	Pl60B	**AD-IC malfunction**
10046-2	P1606	**SW-IC Internal failure**
		SW-IC internal malfunction
	Pl606	**SW-ICl internal malfunction**
10047-2	(blank)	**(blank)**
10048-2	(blank)	**SW-ICl communication circuit malfunction**
		(blank)
10049-2	(blank)	**(blank)**
10050-2	P06AF	**Injector IC Failure**
		Injector IC malfunction
		Torque Management System - Forced Engine Shutdown
10051-2	(blank)	**Injector IC Communication Line Failure**
		Injector IC communication malfunction
10051-3	P1077	**Charge Air Cooler (CAC) Temperature Sensor 1 Circuit High Voltage**
		Charge air cooler temperature sensor 1 malfunction (High voltage)
10051-4	P1076	**Charge Air Cooler (CAC) Temperature Sensor 1 Circuit Low Voltage**

10051-4	P1076	**Charge air cooler temperature sensor 1 (Low voltage)**
10052-2	(blank)	**Injector IC Checksum Failure**
		Injector IC checksum malfunction
10053-3	P0546	**EGR Cooler Inlet 1Temp Sensor Circuit High**
10053-4	P0545	**EGR Cooler Inlet 1 Temp Sensor Circuit Low**
10054-17	P2457	**Exhaust Gas Recirculation (EGR) Cooling System Performance**
10055-3	P0549	**EGR Cooler Inlet 2 Temp Sensor Circuit High**
10055-4	P0548	**EGR Cooler Inlet 2 Temp Sensor Circuit Low**
10078-12	P160C	**AD-IC2 Failure Error**
10082-2	(blank)	**(blank)**
10083-2	(blank)	**(blank)**
102-0	P0234	**Turbocharger Overboost Condition**
102-3	P0238	**Turbo Charger Boost Sensor Circuit High**
		Turbo Charger Boost Sensor Circuit High Input
		Turbocharger boost sensor circuit high input
102-4	P0237	**Turbo Charger Boost Sensor Circuit Low**
		Turbo Charger Boost Sensor Circuit Low Input
		Turbocharger boost sensor circuit low input
105-3	P1098	**Compressor Outlet Temperature Sensor Circuit High**
	P1113	**Boost temperature sensor malfunction (high voltage)**
105-4	P1097	**Compressor Outlet Temperature Sensor Circuit Low**
	Pll 12	**Boost temperature sensor malfunction (low voltage)**
1077-2	P0606	**Control module processor error**
		CPU Error Record
		Internal Control Module CPU Error
1079-2	P0641	**5 Volt Reference 1 Circuit**
		Sensor voltage system malfunction (Reference 1)
	P06A6	**Sensor Reference Voltage 1 Circuit**
1080-2	P0651	**5 Volt Reference 2 Circuit**
		Sensor voltage system malfunction (Reference 2)
	P06A7	**Sensor Reference Voltage 2 Circuit**
108-3	P2229	**Barometric Pressure Circuit High Input**
		Barometric Pressure Sensor Circuit High
		Barometric pressure sensor system high input
108-4	P2228	**Barometric Pressure Circuit Low Input**
		Barometric Pressure Sensor Circuit Low
		Barometric pressure sensor system low input
110-0	P0217	**Engine coolant high temperature malfunction**
		Engine Coolant Over Temperature Condition
		Engine Over Heat Condition
110-3	P0118	**Engine Coolant Temperature Circuit High Input**
		Engine Coolant Temperature Sensor Circuit High
		Engine coolant temperature sensor system high input
110-4	P0117	**Engine Coolant Temperature Circuit Low Input**
		Engine Coolant Temperature Sensor Circuit Low
	POl 17	**Engine coolant temperature sensor system low input**
1131-3	P0098	**Intake Air Temperature (IAT) Sensor 2 Circuit High Voltage**
	P041C	**EGR Gas Temperature Sensor Circuit Low Input**
		IMT sensor system high input
1131-4	P0097	**Intake Air Temperature (IAT) Sensor 2 Circuit Low Voltage**

1131-4	P041D	**IMT sensor system low input**
	P041O	**EGR Gas Temperature Sensor Circuit High Input**
1239-1	P0093	**Fuel Rail Pressure Too Low**
		Fuel system leakage detection
	P1093	**Fuel Rail Pressure Too Low**
1239-17	P1093	**Fuel Rail Pressure Low Ouring Power Enrichment**
		Fuel rail pressure low pressure malfunction
		Fuel Rail Pressure Too Low
1239-31	P3093	**Fuel Rail Pressure Too Low**
132-3	P0103	**Mass Air Flow Sensor Circuit High Input**
132-4	P0102	**Mass Air Flow Sensor Circuit Low Input**
1347-12	P1062	**Fuel Pressure Regulator 1 Solenoid Control Circuit**
1347-3	P0092	**Fuel Pressure Regulator Control Circuit High**
		Fuel rail pressure regulator control system high input
1347-4	P0091	**Fuel Pressure Regulator Control Circuit Low**
		Fuel rail pressure regulator system low input
1348-12	P1063	**Fuel Pressure Regulator 2 Solenoid Control Circuit**
1348-3	P2296	**Fuel Pressure Regulator 2 Control Circuit High**
1348-4	P2295	**Fuel Pressure Regulator 2 Control Circuit Low**
1381-1	P2540	**Fuel filter clogging malfunction (Second stage)**
1381-17	P20DE	**Fuel filter clogging malfunction (First stage)**
1381-3	P1294	**Fuel Filter Pressure Sensor Circuit High Voltage**
	P20E0	**Exhaust After-treatment Fuel Pressure Sensor Circuit High**
	Pl294	**Fuel filter pressure sensor system high input**
1381-4	P l293	**Fuel filter pressure sensor system low input**
	P1293	**Fuel Filter Pressure Sensor Circuit Low Voltage**
	P20DF	**Exhaust After-treatment Fuel Pressure Sensor Circuit Low**
1485-5	P0685	**ECM main relay control system low input**
		ECM Power Relay Control Circuit Open
		Main Relay Circuit Stuck Open
1485-6	P0687	**ECM main relay control system high input**
		ECM Power Relay Control Circuit High
		Main Relay Circuit Stuck Close
157-15	P0089	**Fuel Pressure Regulator Performance**
		Fuel rail pressure regulator control characteristic malfunction
157-3	P0193	**Fuel Rail Pressure Sensor Circuit High**
		Fuel Rail Pressure Sensor Circuit High Voltage
		Fuel rail pressure sensor system high input
157-4	P0192	**Fuel Rail Pressure Sensor Circuit Low**
		Fuel Rail Pressure Sensor Circuit Low Voltage
		Fuel rail pressure sensor system low input
158-3	P0563	**System Voltage High**
		System voltage high input
172-3	P0113	**Intake Air Temperature Circuit High Input**
		Intake Air Temperature Sensor Circuit High
	POl 13	**Intake air temperature sensor system high input**
172-4	P0112	**Intake Air Temperature Circuit Low Input**
		Intake Air Temperature Sensor Circuit Low
	POl 12	**Intake air temperature sensor system low input**
173-3	P0428	**Catalyst Temperature Sensor Circuit High Sensor 1**

173-4	P0427	**Catalyst Temperature Sensor Circuit Low Sensor 1**
174-3	P0183	**Fuel Temperature Sensor Circuit High**
		Fuel Temperature Sensor Circuit High Input
		Fuel temperature sensor system high input
174-4	P0182	**Fuel Temperature Sensor Circuit Low**
		Fuel Temperature Sensor Circuit Low Input
		Fuel temperature sensor system low input
190-0	P0219	**Engine Overspeed Condition**
		High engine speed malfunction
2791-2	P0401	**EGR Flow Insufficient Detected**
412-3	P040D	**EGR Cooler Outlet 2 Temp Sensor Circuit High**
412-4	P040C	**EGR Cooler Outlet 2 Temp Sensor Circuit Low**
4332-12	P207F	**Urea Fluid Concentration Too Low**
	P2BA7	**Urea Fluid Quantity Too Low**
5260-1	(blank)	**Degraded EGR cooler 2 performance**
5285-1	P1236	**Charge Air Cooler Performance Failure**
628-2	P0601	**Control module memory check sum error**
		Control Module Read Only Memory
		Internal Control Module Memory Check Sum Error
633-7	P0087	**Fuel Rail Pressure Limiter Open**
		Fuel rail system pressure low pressure malfunction
		Fuel Rail/System Pressure - Too Low
636-2	P0340	**Camshaft Position Sensor Circuit**
		CMP sensor system malfunction
636-7	P0016	**Crankshaft Position - Camshaft Position Correlation**
		Crankshaft Position - Camshaft Position Correlation Error
639-19	U0073	**CAN bus malfunction (Jl939)**
		CAN bus reset counter overrun
		Control Module Communication Bus Off
639-2	U0101	**Lost Communication With CAN**
		Lost Communication with IEC
		TCM communication malfunction
651-5	P0201	**Injector Circuit Cylinder 1**
		Injector Circuit Open - Cylinder 1
		Injector system malfunction No. 1 cylinder
652-5	P0202	**Injector Circuit Cylinder 2**
		Injector Circuit Open - Cylinder 2
		Injector system malfunction No. 2 cylinder
653-5	P0203	**Injector Circuit Cylinder 3**
		Injector Circuit Open - Cylinder 3
		Injector system malfunction No. 3 cylinder
654-5	P0204	**Injector Circuit Cylinder 4**
		Injector Circuit Open - Cylinder 4
		Injector system malfunction No. 4 cylinder
655-5	P0205	**Injector Circuit Open - Cylinder 5**
656-5	P0206	**Injector Circuit Open - Cylinder 6**
676-5	P0380	**Glow plug system malfunction**
		Glow Relay Circuit
		Glow Relay Circuit Error
677-5	P0615	**Starter Cut Relay Circuit**
		Starter Relay Circuit Error
		Starter relay system malfunction

723-2	P0335	**Crankshaft Position Sensor Circuit**
		Crankshaft position sensor system malfunction
	P0336	**Crankshaft position sensor system characteristic malfunction**
723-8	P0336	**Crankshaft Position Sensor Circuit Range/Performance**
91-2	P2138	**Pedal Position Sensor 1 - 2 Voltage Correlation**
91-3	P2123	**Pedal Position Sensor 1 Circuit High Input**
	P2128	**Pedal Position Sensor 2 Circuit High Input**
91-4	P2122	**Pedal Position Sensor 1 Circuit Low Input**
	P2127	**Pedal Position Sensor 2 Circuit Low Input**
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APPENDIX A

Supplements

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APPENDIX Ab

Specifications

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GLOBAL R3 AIR

Regenerative Air Sweeper

Specifications

Vehicle Configuration

Brakes

- Type - Hydraulic power boosted.
- Rear - 5 in. x 15 in. drum.

Chassis

- Frame-3 in. x 13 in. (76mm x 330mm) C-channel.
- Section Modules-16.63 in. (422 mm).
- Modular Body.
- Tow Hooks - Front and Rear.

Cab

- *Description* - Center forward mounted, single operator dust and weather sealed with filtered air intake. Integral ROPS structure with left and right side limb guards. All steel construction.
- Sound Suppression Interior - Utilizes padded insulation and isolated position to maintain 83 dBA OSHA recommended environment. Rubber mounted to frame.
- Windows - 4400 sq in. of tinted safety glass. Sliding windows left and right, configured for ultimate front visibility.
- Windshield Wiper - 2 speed with washer.
- Seat - Cloth covered, _mult!-adjustable for height and weight. Spring suspended with shock absorber, seat belt and arm rests.
- Automotive Controls - Tilt telescopic steering Wheel and positive position shift quadrant.
- Mirrors -Dual west coast type and large dual parabolic.
- Heater - Fresh air heater/defroster pressurizer.

Electrical

- Alternator- 130 Amp with dust shield.
- Battery - Dual system 1800 CCA @ 0° F.
- Lights-Sealed beam headlights with high beam indicator, LED combination stop and tail lights, self canceling turn signals with two way hazard flasher, LED backup lights, gutter broom spotlights and illuminated license plate holder.
- Wire Harness "No Splicen harness with weather resistant connectors.
- Alarms-Electronic backup alarm, hopper warning alarm, vehicle movement lockout (prevents movement when hopper is raised) and horn.
- Lighting -Illuminated panels and dome light.

Engine

- Isuzu - 16 Valve Inline 4-cylinder Turbocharged diesel inter cooled, direct injection, Model 4HK1 Tier 4 Final
- Displacement - 317 cu in. (5.1 L).
- Horsepower-172 HP @2550 rpm (128 kW).
- Torque-380 ft lb@ 1600 rpm (515 N.m).
- Radiator-39 qt (37 L) capacity, swing away design.
- Air Cleaner- Dry single safety element with primary element.

Fuel System

- Description-30 gallons, vented w/plastic construction.

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

- Body - White with accent blue striping and black matte cab.
- Frame and Fenders- White.

Steering

- Description- Heavy duty full power steering.

Sweeper Dimensions

- Wheel Base - 116 in. (2946 mm).
- Length-189 in. (4801 mm).
- Height-106 in. (2693 mm).
- Width-98 in. (2489 mm).
- Turning Radius- 12.5 ft (3810 mm).
- Weight, High Dump-15,860 lbs (7194 kg) w/duel gutter broom.

Tires and Wheels

- Front Tires (Dual) -11R x 17.5H 16 Ply.
- Front Rim -8.25 x 17.5.
- Rear Tire - 11A x 22.5G 14 Ply.
- Rear Rim - 8.25 x 22.5.

Traction Drive

- Description - Hydrostatic drive with two speed variable displacement wheel motors and an engine mounted variable displacement pump. The traction system provides constant blower speed independent of vehicle speed or direction.
- Range - Low (sweeping mode) 0-12 mph (19 km/h), High (travel mode) 0-25 mph (40 km/h).
- Controls - Automotive controls Including foot pedal and shift console. Infinitely variable speeds in sweeping and travel ranges.

GLOBAL R3 AIR

Regenerative Air Sweeper

Specifications

Sweeping Configuration

Auxiliary Hydraulics

- *Description* - dual power parallel hydraulics utilizes separate direct mounted gear pump to provide high torque power to blower, gutter brooms and lift systems.

Blower

- Drive - Direct hydraulic.
- Construction - 33 in. diameter (838.2 mm) ASTM-A514S with 9 blades.
- Blower Housing - Linedwith removable rubber inserts.
- Drive - Direct hydraulic.

Gutter Broom

- Diameter-47 in. (1194 mm).
- Segments-TufGripdisposable, 12 segmts. with 26in. (660 mm) steel wire.
- Speed- Variable.
- Drive - Direct high torque hydraulic.
- Lift - Hydraulic though accumulators.
- Impact Protection - Free floating vertically and horizontally.
- Overload Protection - Motor mounted relief caps.
- Adjustments - Simple "tool free" settings, in-cab controls for pressure andwear.

Hopper

- Capacity-5.8 cubic yards (4.4 cubic meters}.
- Lift-12,0001bs(5445kg).
- Full Stainless Steel Hopper (Optional)
- Hopper Screens -Stainless Steel (Optional)
- Lift Method - Dual 4 in. (102 cm) hydraulic cylinders.
- Dump Height-144 in. (2869 mm) high dump standard.
- Dump Position -Behind rear wheels, similar to dump truck.
- Dump Control - Cab mounted single toggle switch.
- Safety Lockout - Hopper lift controls automatically prevent movement while dumping.
- Location - Center mounted behind cab.

Suction Hood

- Type- Recirculating.
- Hood Width - 72 In. (1829 mm) outside dimension.
- Vacuum & Pressure Hoses-12in. (305 mm) diameter.
- Suspension - Springs with forward and reverse tow cables.
- Skates - Adjustable long life carbide,
- Ground Clearance- 5 in. (127 mm} for transport.

Water Spray System

- Gapacity- 230 gal (870 L).
- Construction - Molded Polyethylene.
- Location - Below frame for stability.
- Pumps - 2 Electrical diaphragm, 7.2 gal/min (42 Umin).
- SprayNozzles - gutterbrooms, suction hood,and inside dust separator and hopper.
- Controls - Variable flow valves in cab.
- Shutoff - Water pump switch in cab.
- Filter-100 mesh in-line type, cleanable.
- Fill Hose-15 ft (4.6m) hose stored in right rear fender box with hydrant coupling andwrench included.
- Flusher-Hopper and hydrant screen.

ADDITIONAL OPTIONS AVAILABLE:

ISO 9001:2008

- *GUTTEBROOM SPEED CONTROL*
- *100% STAINLESS STEEL HOPPER*
- *GUTTERBROOM SPEED CONTROL*
- *AIR RIDE SEAT*
- *HEATER POWER MIRRORS*
- *AM/FM/CD/AUX BLUETOOTH W/USB PORT*
- *ARROWSTICK (LED)*
- *DUAL OR SINGLE GUTTERBROOM TILT*
- *HOPPER WASH OUT SYSTEM*

- *Reliable / Durable Equipment*
- *Innovative Engineering / Design*
- *Industry Leading Reputation*
- *Dedicated Customer Service*
- *Outstanding Sales Professionals*
- *Fast Parts and Service National*
- *Dealer Network*

GLOBAL ENVIRONMENTAL PRODUCTS

5405 Industrial Parkway
San Bernardino, CA 92407 USA
Phone: 909-713-1600
info@globalsweeper.com

www.GlobalSweeper.com

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