ROADTEC
an Astec Industries Company

SB-2500ex Material Transfer Vehicle

OPERATION AND MAINTENANCE MANUAL



SN 4057-4061
PN 262916

www.roadtec.com

HOW TO ORDER PARTS

THE **ROADTEC** PARTS DEPARTMENT NEEDS THE FOLLOWING INFORMATION TO PROCESS YOUR ORDER PROPERLY AND ACCURATELY.

1. YOUR COMPANY'S NAME AND PURCHASE ORDER NUMBER.
2. NAME AND ADDRESS OF PERSON OR PLACE TO WHOM PARTS ARE TO BE SHIPPED.
3. METHOD OF SHIPMENT (MOTOR FREIGHT, AIR, UPS, etc.)
4. MODEL AND SERIAL NUMBER OF THE MACHINE FOR WHICH PARTS ARE BEING ORDERED.
5. PART NUMBER, DESCRIPTION AND QUANTITY OF PARTS.
6. THE LOCATION OF PART(S) IN THE ROADTEC PARTS MANUAL.

ONCE THE ABOVE INFORMATION HAS BEEN OBTAINED, CONTACT THE ROADTEC PARTS DEPARTMENT AT:

ROADTEC INC. PARTS DEPARTMENT
800 MANUFACTURERS ROAD
CHATTANOOGA, TN. 37405

PHONE: 1-423-265-0600
TOLL FREE: 1-800-272-7100
SERVICE / PARTS FAX: 1-423-267-8686

RECEIPT OF PARTS:

RESPONSIBILITY FOR BREAKAGE, LOSS OR DAMAGED GOODS, CEASES UPON DELIVERY OF THE MERCHANDISE TO THE TRANSPORTATION COMPANY FOR WHICH A RECEIPT IS RECEIVED SHOWING THAT THE SHIPMENT WAS ACCEPTED BY THEM IN GOOD CONDITION. IF ANY OF THE MATERIAL LISTED ON THE BILL OF LADING OR EXPRESS RECEIPT IS SHORT, BROKEN, OR DAMAGED, DO NOT ACCEPT THE SHIPMENT UNTIL THE CARRIER'S AGENT MAKES A NOTATION OF THE SHORTAGE OR DAMAGED ON THE EXPENSE BILL. NOTIFY THE TRANSPORTATION COMPANY'S AGENT AT ONCE AND REQUEST AN INSPECTION.

THIS IS ABSOLUTLEY NECESSARY:

IF THE AGENT DOES NOT MAKE AN INSPECTION, THEN AN AFFIDAVIT SHOULD BE MADE THAT THEY WERE NOTIFIED (ON A CERTAIN DATE) AND FAILED TO DO SO. THIS AFFIDAVIT WITH OTHER PAPERS WILL PROPERLY SUPPORT YOUR CLAIM.

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1.1 ABOUT THIS MANUAL

This manual has been prepared to assist you in the start-up and safe operation of the SB-2500ex Shuttle Buggy® Material Transfer Vehicle. It is important that all persons that come in contact with this machine be thoroughly familiar with the contents of this manual.

1.2 RECEIVING THE MACHINE

Upon receiving the Shuttle Buggy, "**before unloading**", carefully inspect it for loss or damage, which may have occurred in transit. Check your shipment against the freight bill or against the packing list. If any loss or damage is discovered, immediately notify the transportation company's agent.

Give the Roadtec, inc. service department several days' notice prior to your planned first day of operation. They can provide qualified service department personnel to assist you with start-up, and discuss with you machine capabilities, safe operation and maintenance program.

AS WITH ANY MACHINERY, PROPER OPERATION AND MAINTENANCE IS CRITICAL.

A revision history is provided for keeping track of alterations or added options made to the SB-2500ex Shuttle Buggy. This is to ensure that all current information is provided for the machine.

Always refer to the machine serial number when ordering parts or writing for information. Space is provided below to record important information concerning your machine.

SERIAL NUMBER:_____

DATE PURCHASED:_____

ENGINE MAKE:_____

ENGINE MODEL:_____

FOR INFORMATION AND/OR ASSISTANCE:

ROADTEC, INC.
800 MANUFACTURERS ROAD
PO BOX 180515
CHATTANOOGA, TN 37405-0600

PHONE: 1-423-265-0600 OR
1-800-272-7100
FAX: 1-423-267-7104

1.3 MACHINE DESCRIPTION

The Roadtec SB-2500ex “Shuttle Buggy®” Material Transfer Vehicle is designed to transfer hot asphalt material from an unloading truck into the paving machine hopper, without contact.

The SB-2500ex has incorporated a dual position operator’s station with a pivoting control panel for operation of the machine from either side.

The shuttle buggy is powered by a 300 h.p. Caterpillar C9 Tier III diesel engine. A two speed hydrostatic transmission delivers smooth power in both speed ranges.

Three high capacity conveyor systems convey asphalt through the machine. The truck-unloading conveyor (C-1) has a capacity of 1,000 tons per hour (907 mtph). The surge bin (C-2) and paver-loading conveyors (C-3) both have a 600 ton per hour capacity. The paver-loading conveyor can swing 55 degrees left or right to allow paver loading from an adjacent lane.

The engine compartment hood can be raised hydraulically thus giving full access to the engine, hydraulic pumps and other components when performing maintenance or repair.



FIGURE 1

A. ENGINE

CATERPILLAR C9 Tier III, 6-cylinder diesel engine. This engine is capable of producing 300 hp (224 kw) @ 1,900 rpm. The center console includes an electronic engine diagnostic gauge which also functions as an engine tachometer, oil pressure gauge, voltage meter and engine temperature gauge.

1.3 MACHINE DESCRIPTION (CONTINUED)

B. DRIVE SYSTEM

The hydrostatic drive system consists of a main transmission pump driving all four drive motors. The drive system is equipped with two speed selection.

MAX WORKING RANGE	MAX TRAVEL RANGE
3.0 MPH (4.8 KPH)	9.0 MPH (14.5 KPH)



DANGER **THE TWO SPEED DRIVE SYSTEM SHOULD ONLY BE SHIFTED WHEN THE VEHICLE IS COMPLETELY STOPPED**.

C. STEERING

26'- 6" (8.1M) inside turning radius.

D. CONVEYORS

C-1 Truck unloading conveyor (1,000 TPH / 907 MTPH)
9' 2" truck opening; 29" (737mm) OD x 8" (203mm) deep segmented converging auger; Removable liner plates and power dump front hopper with standard fixed push rollers.

C-2 Surge bin conveyor (600 TPH / 544 MTPH)
29" (737mm) OD x 8" (203mm) deep anti-segregation auger in hopper.

C-3 Paver loading conveyor (600 TPH / 544 MTPH)
Welded conveyor flights with bolted and replaceable floor plates in conveyor. The conveyor can swing 55 degrees to either side of center. ON/OFF controls work in conjunction with the C-2 conveyor.

E. SURGE HOPPER

The surge hopper on the SB-2500ex has a 25-ton capacity with anti-segregation triple pitch augers in the hopper bottom. Hydraulically operated flow gates control the flow of material from the surge hopper into the C-2 conveyor.

F. TIRES

Large, high-flotation - 21 X 25 (533mm X 635mm)

G. ELECTRICAL SYSTEM

Standard system includes a 24-volt (starting) and 24-volt electrical system, heavy-duty alternator, battery and circuit breaker protection of all systems.

H. FUME EXTRACTION SYSTEM

The fume extraction system is equipped with two blowers. One located on the C-1 conveyor and one located on the C-3 conveyor. This system is equipped with 10" (254mm) fold down exhaust pipes.

1.4 OPTIONAL EQUIPMENT

A. WINDROW ATTACHMENT

The windrow pickup head makes the SB-2500ex ideal for those areas where belly dump trailers are the preferred method of material delivery.

B. HYDRAULIC GENERATOR SET

The SB-2500ex can be equipped with a 110 vac hydraulic generator set. This provides power for numerous accessories such as lighting for nighttime paving.

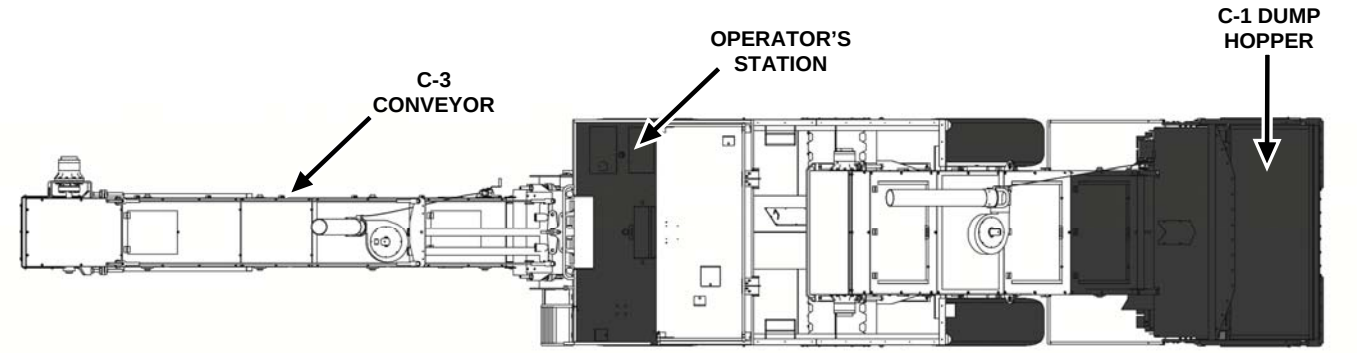
C. RELEASE AGENT TANK FOR WASHDOWN SYSTEM

A chemical release agent tank is available for use with the washdown system. The release agent can be used to clean the machine instead of using diesel fuel.

D. PAVER HOPPER INSERT

A paver hopper insert can be added for use with a shuttle buggy. The insert is capable of holding 10 to 15 tons of material. It is designed to provide a mass flow of material directly to the paver slat conveyors.

1.5 UNIT NOMENCLATURE



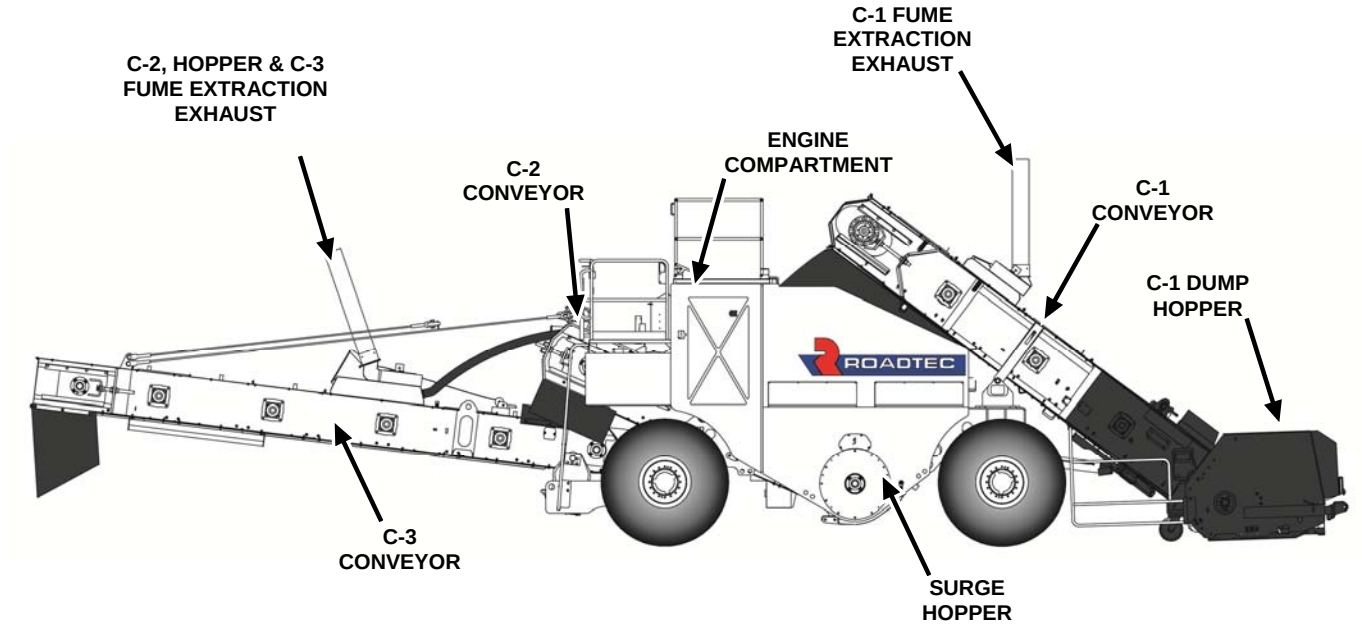


FIGURE 2

1.6 MACHINE DIMENSIONS

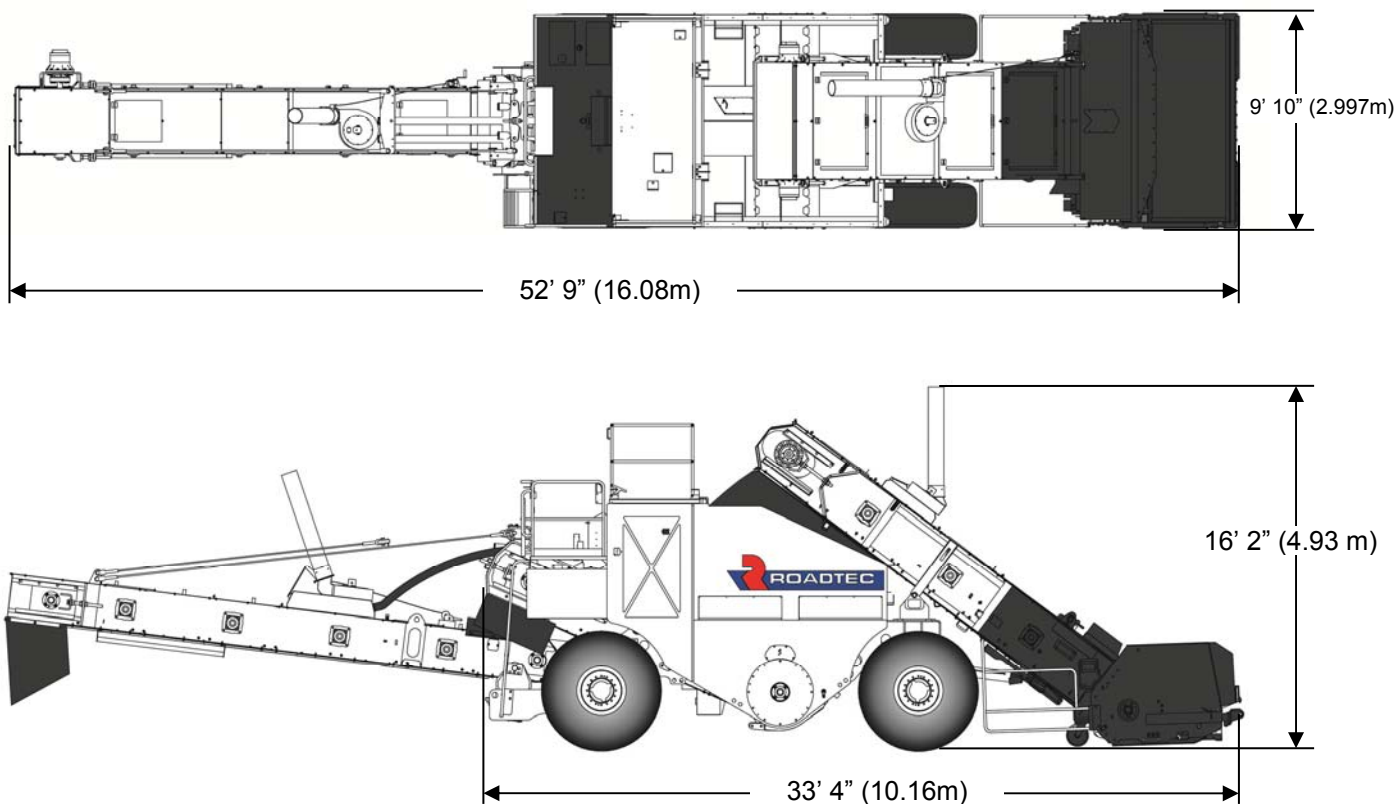


FIGURE 3

1.	OVERALL LENGTH…….....	52’ 9” (16.08m)
2.	LENGTH WITH C-3 REMOVED……..	33’ 4” (10.16m)
3.	OUTSIDE TO OUTSIDE WHEELS.....	19’ 11” (6.07m)
4.	WHEEL BASE.....	14’ 4” (4.37m)
5.	SHIPPING HEIGHT…….....	12’ 0” (3.66m)
6.	OPERATING HEIGHT.....	16’ 2” (4.93 m)
7.	WIDTH.....	9’ 10” (2.997m)
8.	C-3 CONVEYOR HEIGHT (FULLY RAISED)……..….	15’ 7” (4.75m)
9.	PUSH ROLLER HEIGHT…….....	18” (.46m)

1.7 MACHINE SPECIFICATIONS

OPERATIONAL CAPACITIES	ENGLISH	METRIC
HOPPER CAPACITY	25 TONS OF 120 LB/CU FT MATERIAL	22 TONS OF 1,922kg/CU M MATERIAL
C-1 CONVEYOR LOADING RATE	1000 TPH	907 MTPH
C-2 AND C-3 CONVEYOR UNLOADING RATE	600 TPH	544 MTPH
WORKING SPEED RANGE	0 – 3.0 MPH	0 – 4.8 KPH
TRANSPORT SPEED RANGE	0 – 9.0 MPH	0 – 14.5 KPH
INSIDE TURNING RADIUS	26 FT - 6 IN	8.1 m
C-3 CONVEYOR SWING	+/- 55 DEGREES	+/- 55 DEGREES
FLUID CAPACITIES		
FUEL	140 GAL	529 LITERS
HYDRAULIC TANK	112 GAL (90% capacity)	424 LITERS (90% capacity)
ENGINE LUBE OIL	8 GAL (32 QUARTS)	30 LITERS
DIMENSIONS		
OPERATING HEIGHT (MAX.)	16 FT - 2 IN	4.92 m
TOWING HEIGHT	12 FT - 0 IN	3.66 m
OPERATING LENGTH	52 FT - 9 IN	16.08 m
TOWING LENGTH	53 FT - 2 IN	16.2 m
WHEEL BASE	14 FT - 4 IN	4.4 m
WIDTH	9 FT - 10 IN	3.0 m
WEIGHT		
STANDARD MACHINE	75,000 LBS.	34,019 KG
OPTIONAL PAVER HOPPER INSERT	2,000 LBS	907 KG
TEMPERATURE		
ACCEPTABLE AMBIENT OPERATING TEMPERATURE RANGE	32°-120° FARENHIET	0°-48.8° CELSIUS

1.8 MACHINE SAFETY PRECAUTIONS

You will observe the “attention” symbols below throughout this manual. These symbols are used to draw your attention to important information, which affects safe unit operation, or the safety of people. These symbols will be accompanied by the following:



DANGER **This word denotes the most serious hazard**.



WARNING **This word denotes an intermediate hazard**.



CAUTION **This word denotes the least serious hazard and is usually used in conjunction with those operation and maintenance instructions, which affect safe practice**.

A. Preliminary safety and operation instructions

1. Improper use or maintenance of this machine can result in personnel injury. Reduce the potential for injury by complying with the following instructions. To obtain replacement manuals, send model and serial numbers to: Roadtec inc., 800 Manufacturers Road Chattanooga, TN 37405, telephone: 423-265-0600, 1-800-272-7100, fax 423-267-7104.

2. Read and study the operation section of this manual thoroughly.

3. Read and study the service section of this manual thoroughly.



NOTE Follow all maintenance and service instructions carefully. Failure to do so may void the warranty.

4. Operator’s platform is for properly trained and qualified personnel only. One operator only is allowed on the platform. **“No riders!”**

5. Never fuel the unit with the engine running, or when smoking.

6. Perform a walk-around visual inspection for signs of fluid leakage or component wear. Visually inspect high-wear components such as auger, liner plates and engine belts.

7. Before starting this unit or when stopping this unit, always set the parking brake, put the travel and conveyor controls in neutral.

8. Become familiar with the controls and know how to stop the machine and engine quickly.

9. Always wear the appropriate type of work shoes such as steel toe work boots. Do not operate the machine while wearing tennis shoes, flip-flops or any other casual attire. Do not wear loose fitting clothing that can get caught in moving parts and possibly cause injury.
chauffeur

1.8 MACHINE SAFETY PRECAUTIONS

10. Personal safety equipment as required. Use the proper safety equipment for job conditions and type work being performed. For instance, you may need: hardhat, safety shoes, eye protection, gloves, reflective vest, hearing protection or a respirator.

WARNING **Since the sound pressure level at the operator's seat averages around 88 dB(A) and can possibly reach 123 dB(A), Any person who is at the operators station while the machine is in operation must wear appropriate hearing protection.**



FIGURE 6

The symbol in figure 6 indicates that hearing protection must be worn.

11. Do not operate in transport (high) gear with material in the hopper. Maximum speed with material in the hopper is 348 ft/min (4.0 mph).

12. Do not process anything but hot-mix asphalt through this machine. Running other types of material through this machine will cause severe damage.

13. Never enter the truck dump or the main hopper with the engine running. Never attempt to retrieve material from the hopper with a shovel. Never service, clean or repair equipment with the engine running.

14. Stop the engine and turn the battery disconnects off before performing any kind of maintenance or repair on this machine.

1.8 MACHINE SAFETY PRECAUTIONS

15. Engage the C-1 (front) conveyor lift cylinder ram stop and stop engine when working on or under the C-1 conveyor.



FIGURE 7

16. Do not operate the machine on grades of more than 6% in high (transport) gear range.

17. Do not use drugs or alcohol on the job.

18. All untrained personnel and bystanders must keep a distance of 16.5 feet (5 meters) between them and the machine while the machine is in operation.

1.8 MACHINE SAFETY PRECAUTIONS

19. The SB-2500ex is equipped with various tie down points that are to be used only for securing the machine while in transport. Do not use these points for towing, pulling or anything other than what they are designed for. These tie down points can be found in several locations around the machine. Please refer to the following figures when locating the tie down points.

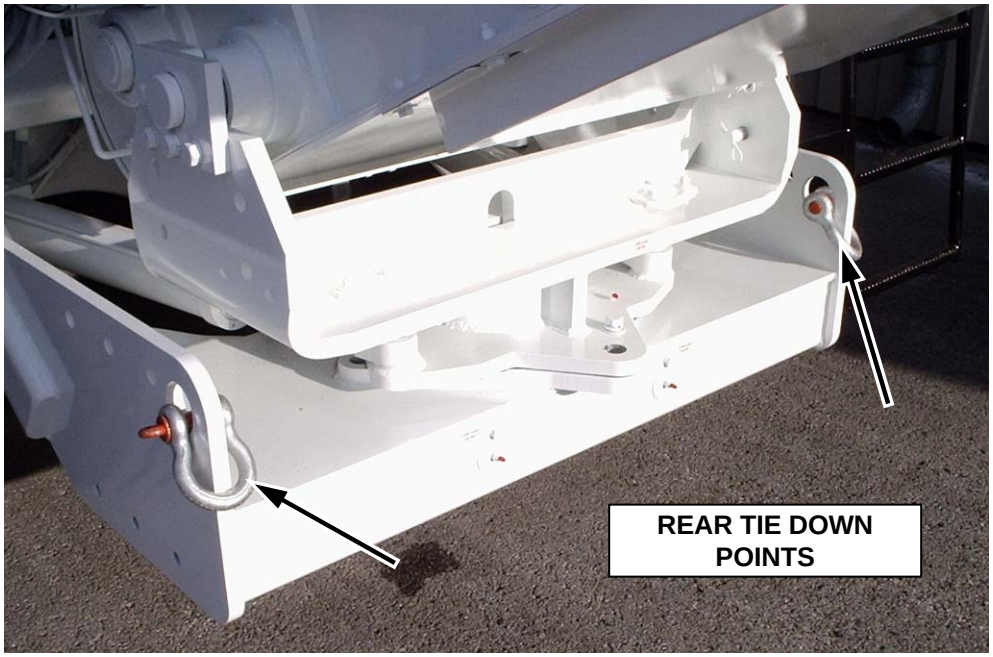


FIGURE 8



FIGURE 9

1.8 MACHINE SAFETY PRECAUTIONS

Tie down points are located on both sides of the machine (figure 10).

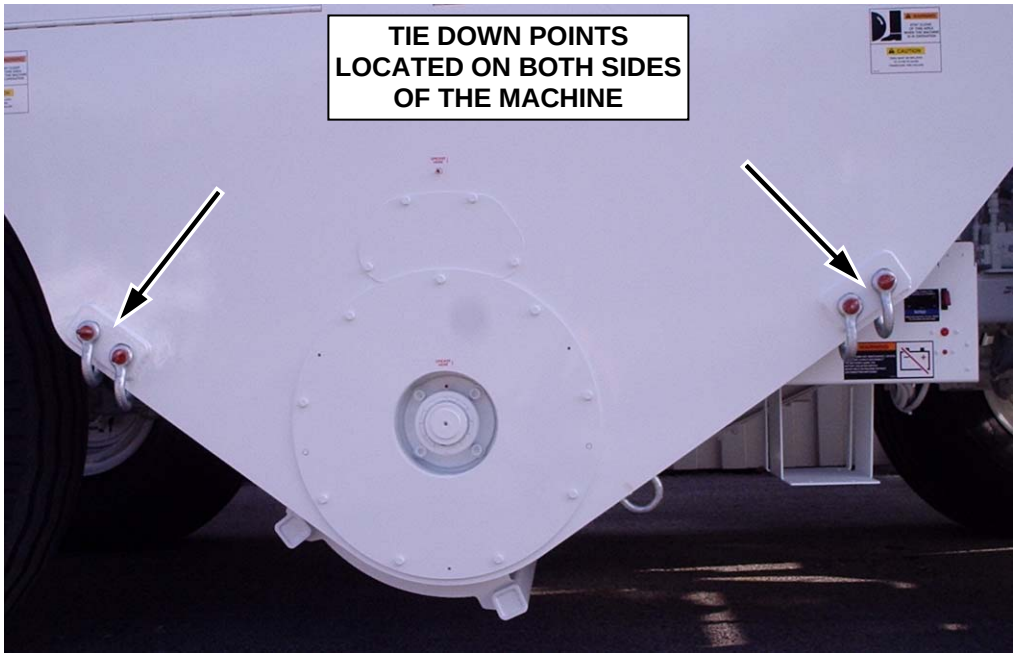


FIGURE 10

Tie down points can also be found at the front of the machine underneath the C-1 conveyor (figure 11).

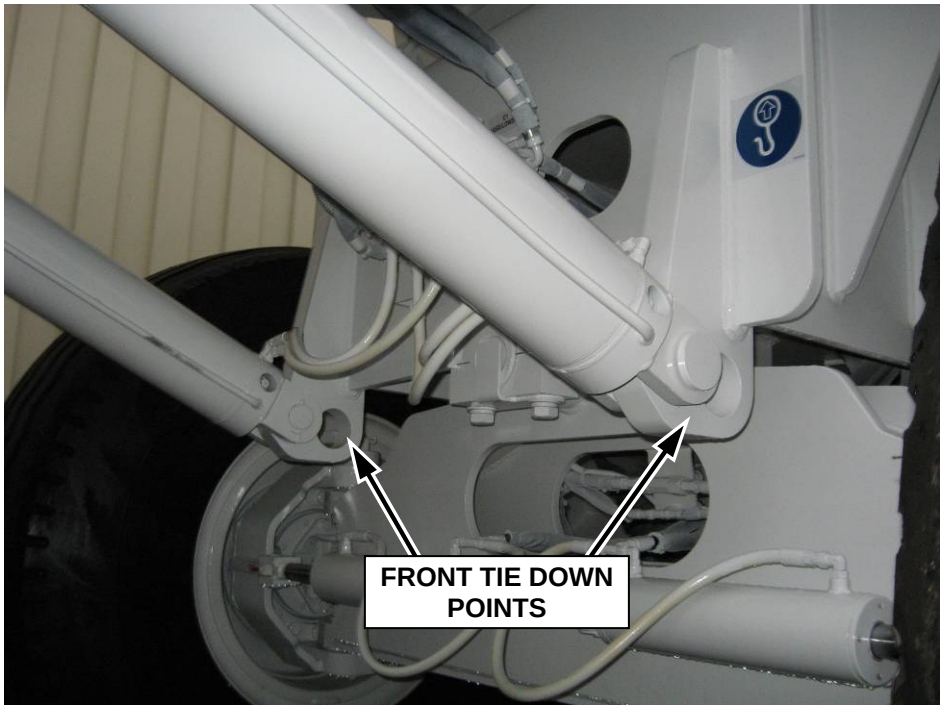


FIGURE 11

1.8 MACHINE SAFETY PRECAUTIONS

20. The SB-2500ex is equipped with mirrors positioned so the operator can see the ground in several positions around the machine. **Do not remove these mirrors** except in transport of the machine, which after the machine has reached the destination and before unloading from truck the mirrors must be reinstalled.

Refer to the following diagram for proper mirror installation and adjustment on the SB-2500ex.

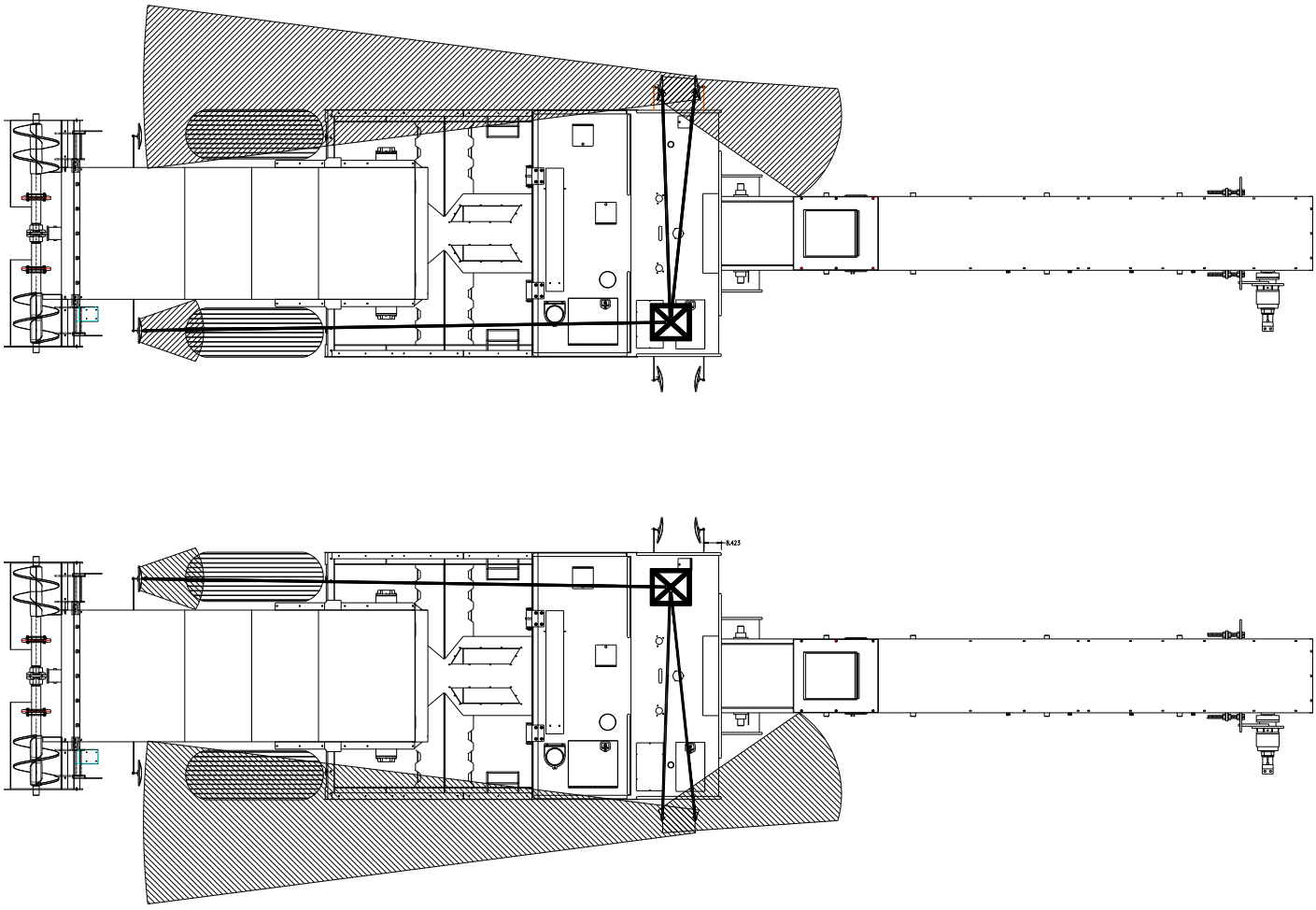


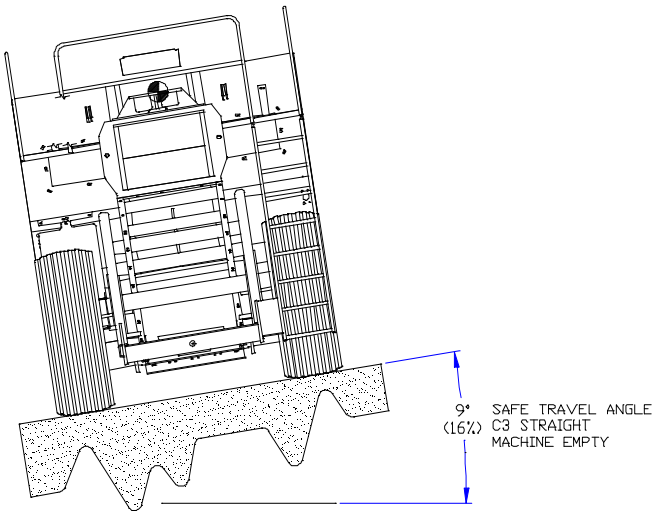
FIGURE 12

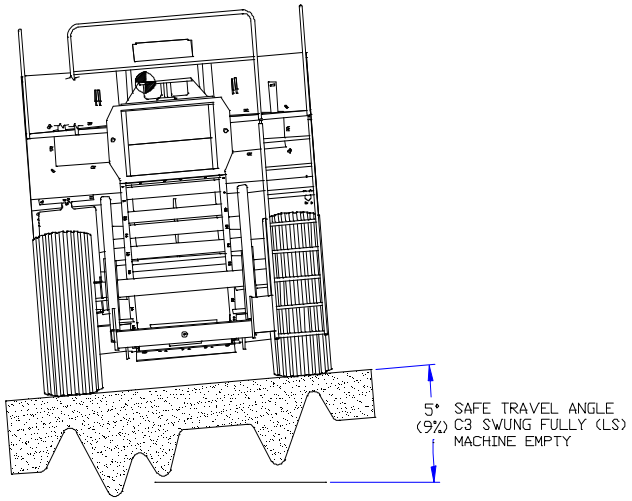
1.8 MACHINE SAFETY PRECAUTIONS

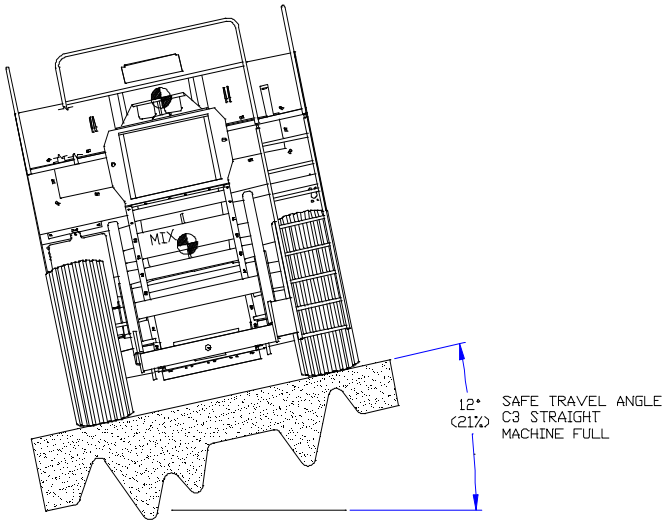
CENTER OF GRAVITY AND TIPPING INFORMATION

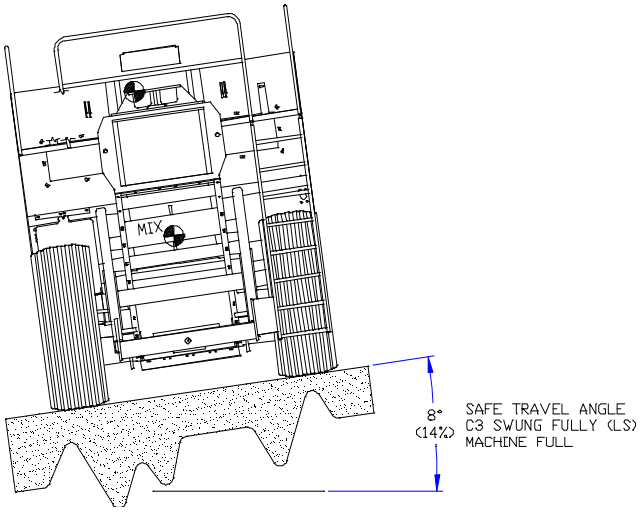
Please read and understand the following center of gravity and tipping information. When operating the machine on an angled surface stay within the given parameters in order to maintain safe travel.

DANGER **Be extremely cautious when operating the machine in close proximity of ditches or deep ruts. If the machine were to slip into a ditch or rut it would be possible for the machine to tip over and cause serious injury or even death.**









DANGER **Do not operate this machine on muddy or soft surfaces.**
Do not operate this machine on wet, slick or slippery surfaces.

1.8 MACHINE SAFETY PRECAUTIONS

21. The operator platform hand rails must be in the raised position before operating or servicing the machine (figure 13).

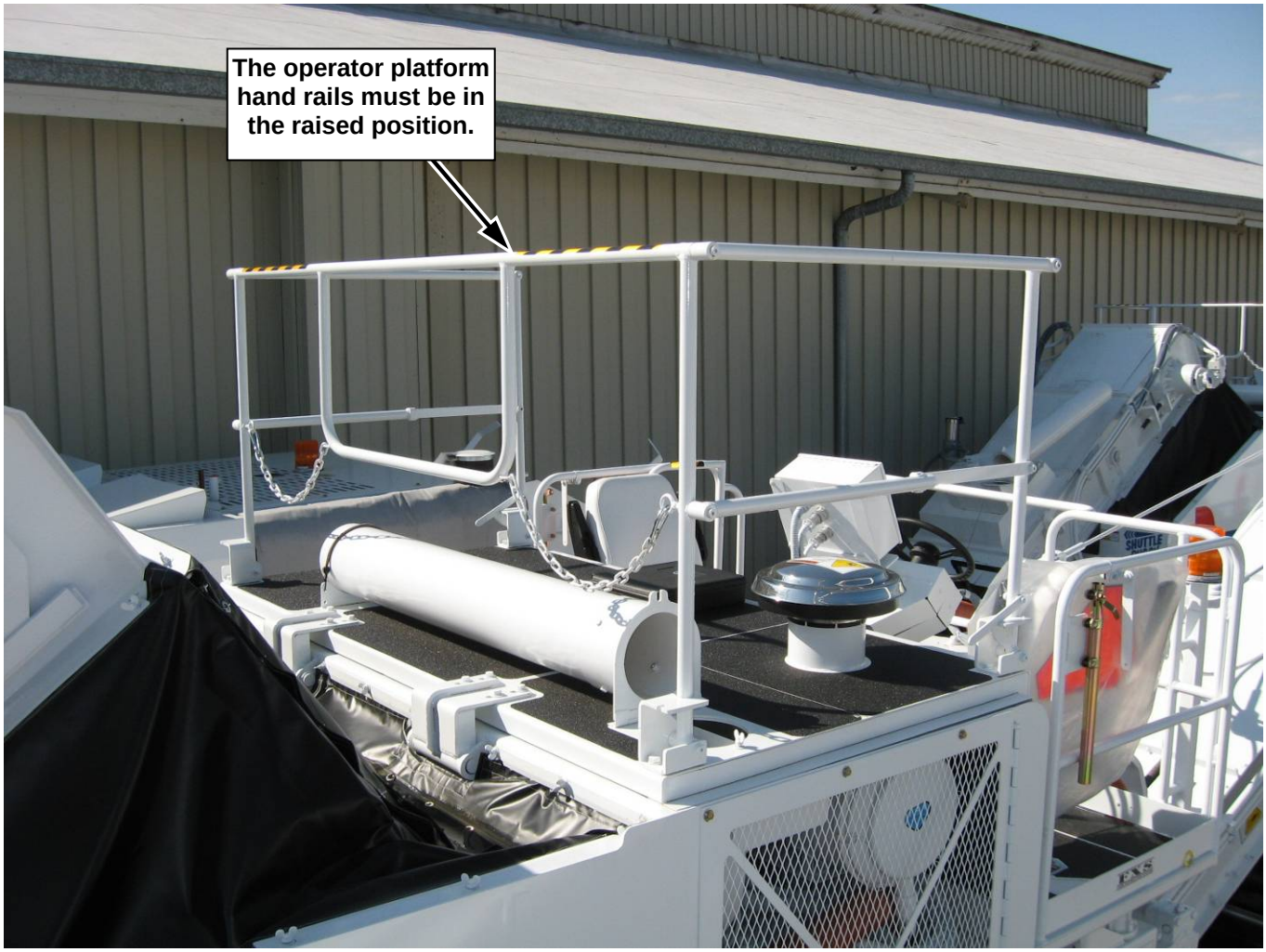


FIGURE 13

1.8 MACHINE SAFETY PRECAUTIONS

B. OPERATIONAL CHECKS

1. Work safely. Follow all decal instructions and recommended operation procedures. Working safely is not just equipment related items. The most important part of a safe working environment is an **attitude** towards safety of each individual. Putting safety first above all other jobs, operations are a key part of working safely.

2. Safety is no laughing matter! **Clowning around causes accidents**. There is a time and a place for clowning around. **It's not around moving or operating machinery.**

3. Use extreme caution when loading or unloading machinery. Please read and follow the **drive off procedure** found in this manual

4. Check it out. Know what safety devices your machine is equipped with and see that each item is securely in place and in operating condition

5. Do not operate the machine if guards or other safety devices are missing. Due to the many possible option configurations, it may be necessary to acquire and install additional guards, covers and other safety devices. Consult your manufacturer for recommended device configurations if you are unsure.

6. Inspect tires daily. Inspect daily for cuts, wear, bubbles, and damage to rims or missing lug nuts. **Do not** operate the machine if any of these conditions exist.

7. Remove all trash and debris from the machine daily. Keep all walkways steps and operator platforms clear of tools, buckets and other items that might cause someone to trip or fall. Trash oil and other debris must be removed from engine compartment to prevent fire hazard. Oil and other liquids must be kept off walkways, steps and handrails to prevent slips.

8. Pre-test steering, brakes and all other controls.

9. Use caution on uneven surfaces and rough terrain. Do not operate this machine on surfaces that are heavily sloped. Refer to and follow the center of gravity and tipping information discussed earlier in this section.

10. Do not operate this machine on soft, slick or muddy surfaces. This is a heavy piece of equipment that may easily become stuck or slip on questionable surfaces such as muddy ground and wet or slick surfaces.

11. Never climb on or off the machine when the unit is moving and always use the proper steps and rails when climbing on or off the machine.

12. Make sure the area around the machine is clear. A second person should be available on the ground and always in full view of the operator to assist when backing the machine or when in confined areas.

1.8 MACHINE SAFETY PRECAUTIONS

13. Power lines will kill, operator and ground man must be aware of all overhead clearance and ground obstacles.

14. Sit on the seat when starting and operating this machine. Always apply the parking brakes and stop the engine when leaving the operator's station.

15. Know where all personnel and parts are before starting and moving your machine. Don't just assume that everyone is out of harms way. Check before you go.

16. Advise operator when adjustment is to be made. No adjustments to the auger, conveyors or chains are to be made when the machine is operating or when the engine is running.

17. Parking brake should never be applied while the shuttle buggy is in motion.

Note: Use safety cover over brake switch on unattended operator's console, to prevent accidental application.

18. When leaving the machine unattended, it should be parked on a level surface with the C-1 conveyor lowered to the ground and the parking brake set. Mark your machine with approved safety cones, barrels, flashing lights or flags. Lock all consoles and shut off master switch if your machine is so equipped.

19. **Know what to do in case of an accident**. Protect yourself from danger. Warn others of any danger. Administer first aid and seek medical help. Report accidents to your supervisor and proper authorities. Correct the cause of the accident.

20. Know where to get assistance. Know how to use the first aid kit and fire extinguisher.

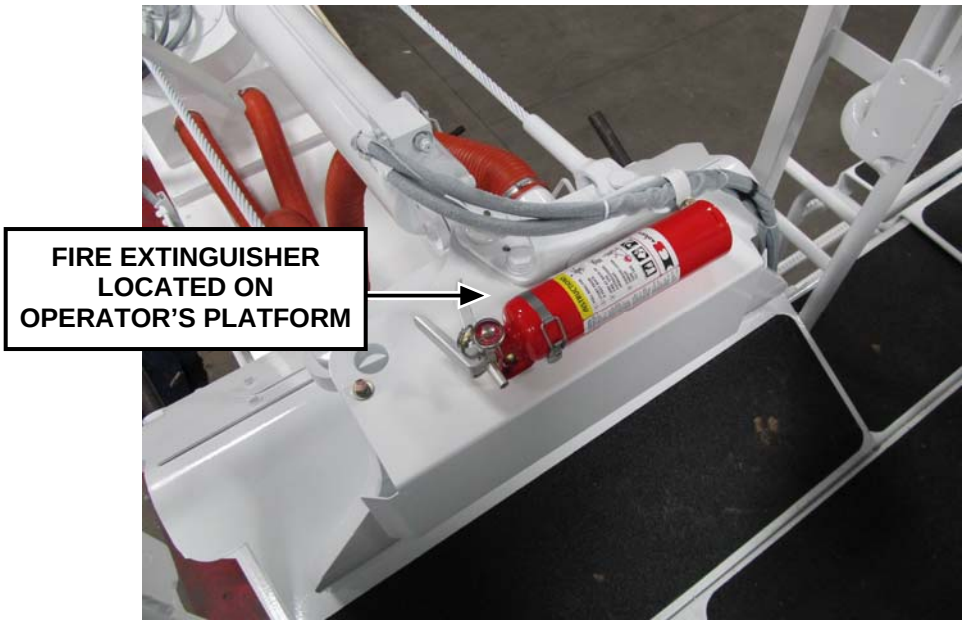


FIGURE 14

1.8 MACHINE SAFETY PRECAUTIONS

C. MAINTENANCE

1. Always set safety bars and shut off the engine, when working on or servicing the machine.

2. Keep all covers, safety devices and decals in place. If a cover, safety device or decal is defective or damaged, repair or replace it before operating the machine.

3. Before performing any maintenance, including and most importantly **WELDING**, on the machine disconnect the battery and the engine electronics from the electrical system by using the quick disconnect switches seen in figure 15. Be sure to attach a **DO NOT OPERATE** tag to the disconnect switches when performing maintenance or repairs. Do not attempt to start or use any machine with a **DO NOT OPERATE** tag on it. Contact your service department or the department that tagged the machine before attempting to use or start the machine.

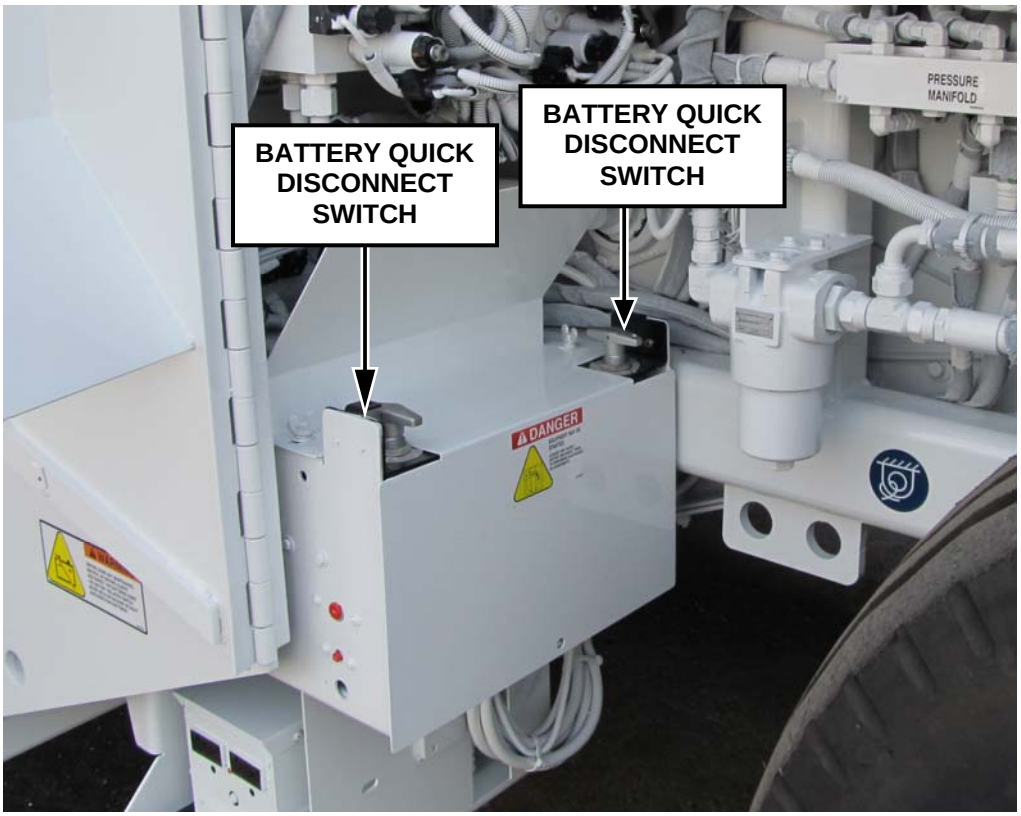


FIGURE 15

4. Use only approved or recommended fluids and filters.

1.8 MACHINE SAFETY PRECAUTIONS

5. Do not modify this machine in any way, which will affect safety.

6. Check emergency stop buttons regularly to ensure proper operation.

7. Use the proper tools for the job. Do not use tools that are in bad repair or for anything but their designed purpose.

8. Maintain proper tire inflation pressure. Stand to the side of the tire when checking pressure. Explosive separation of tire and rim can cause severe injury or death.

9. Never weld on tire rim.

10. Do not weld or cut on fuel or hydraulic tanks.

11. Never deviate from the factory recommended hydraulic pressure setting associated with the truck hitch (if so equipped). Doing so could result in damage, injury or even death.

12. Never interfere with the operation of a truck hitch. Doing so could result in damage, injury or even death.

13. Never attempt to open or crack a hydraulic line or hydraulic fitting on a system under pressure. Make sure pressure is at **zero** before opening or cracking a line or fitting.

14. DO NOT perform any repair or maintenance on a machine that has just recently been in operation. All machine fluids and operating components will be dangerously hot and could cause serious personal injury and possibly even death. **ALLOW A HOT MACHINE TO COOL DOWN FOR A MINIMUM OF 2 HOURS BEFORE PERFORMING ANY KIND OF REPAIR OR MAINTENANCE ON IT.**

15. **Do not attempt** to find a leak with your bare hand. Fluid under pressure can penetrate skin, causing severe injury and possible death. In addition fluid temperatures can exceed 200 degrees Fahrenheit in some circuits.

16. Use cardboard to check for leaks. When replacing hoses, tubes or fittings, ensure they are replaced only with ones that have the same pressure rating. When having hoses made locally, be sure to specify to local supplier hoses that are designated as high-pressure lines.

1.8 MACHINE SAFETY PRECAUTIONS

17. **Do not remove radiator cap while engine is hot**. Wait until engine temperature is below 120 degrees Fahrenheit (figure 17).

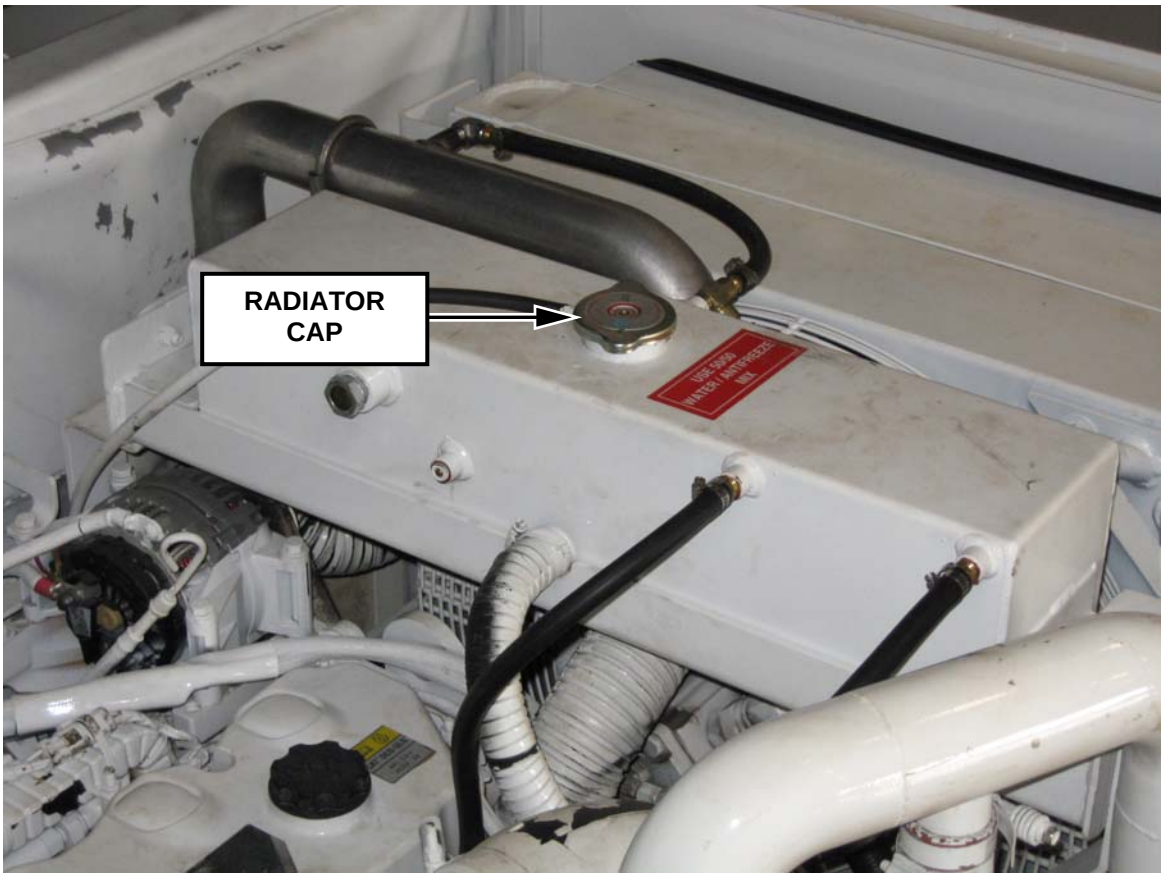


FIGURE 17

18. Never use the conveyors as lifting booms or any other part of the machine for anything other than what it is intentionally designed to do! **Note:** The C3 conveyor may be used to lift only a Roadtec manufactured hopper insert. Use only chains or cables rated for 2 tons each.

19. The SB-2500ex is not designed for towing. Do not attempt to tow anything with this machine!

1.8 MACHINE SAFETY PRECAUTIONS

20. Keep all open flames and sparks away from batteries. Follow the battery manufacturer's recommendations for jump-starting machines or charging batteries.

21. Always use eye protection, gloves, and long sleeved shirts when working on or around batteries. Battery acid will cause severe injury if allowed to come in contact with skin or eyes.

22. Use only jacks, stands and blocks rated for the machine weight. Never depend on hydraulic jacks for support. Always add stands or blocking to support the machine or component when you are working on or under it.

23. Always apply the hood stop locking pin when working in the engine compartment (figure 18).



FIGURE 18

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

The SB-2500ex requires and contains from the factory various substances that are required for proper operation of the machine. These substances include; 80W-90 high performance gear lube, 15W-40 diesel engine oil, antifreeze coolant, anti-wear 46 hydraulic oil, cerulean #2 grease, ultra low sulfur diesel fuel.

These materials may pose a health hazard if one were to be exposed to them. The following pages contain the actual Material Safety Data Sheets (MSDS) that are provided for the substances and fluids that ROADTEC puts in the SB-2500ex for proper operation.

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR (15W-40) DIESEL ENGINE OIL:

ASHLAND
SAFETY DATA SHEET

Page: 1
Revision Date: 05/03/2011
Print Date: 7/20/2011
MSDS Number: R0171784
Version: 2.1

All-Fleet Plus® SAE 15W-40 DIESEL ENGINE OIL
762587

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Ashland P.O. Box 2219 Columbus, OH 43216	Regulatory Information Number Telephone Emergency telephone number	1-800-325-3751 614-790-3333 1-800-ASHLAND (1-800-274-5263)
Product name	All-Fleet Plus® SAE 15W-40 DIESEL ENGINE OIL	
Product code Product Use Description	762587 No data	

2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance: liquid, amber

WARNING! CAUSES EYE IRRITATION. PROLONGED OR REPEATED CONTACT MAY DRY THE SKIN AND CAUSE IRRITATION AND BURNS. MAY BE HARMFUL IF SWALLOWED.

Potential Health Effects

Exposure routes
Inhalation, Skin absorption, Skin contact, Eye Contact, Ingestion

Eye contact
Can cause severe eye irritation. Symptoms include stinging, tearing, redness, and swelling of eyes. Can injure eye tissue.

Skin contact
May cause mild skin irritation. Symptoms may include redness and burning of skin. Prolonged or repeated contact may dry the skin. Symptoms may include redness, burning, and drying and cracking of skin, skin burns, and other skin damage.

Ingestion

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR (15W-40) DIESEL ENGINE OIL:

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Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful.

Inhalation

It is possible to breathe this material under certain conditions of handling and use (for example, during heating, spraying, or stirring). Breathing small amounts of this material during normal handling is not likely to cause harmful effects. Breathing large amounts may be harmful. Symptoms are not expected at air concentrations below the recommended exposure limits, if applicable (see Section 8.).

Aggravated Medical Condition

Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material:, Skin, lung (for example, asthma-like conditions)

Symptoms

Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include:, acne, stomach or intestinal upset (nausea, vomiting, diarrhea), irritation (nose, throat, airways)

Target Organs

No data

Carcinogenicity

This material is not listed as a carcinogen by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP), or the Occupational Safety and Health Administration (OSHA). Used motor oil has been shown to cause skin cancer in laboratory animals continually exposed by repeated applications. Avoid prolonged or repeated skin contact.

Reproductive hazard

There are no data available for assessing risk to the fetus from maternal exposure to this material.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Components	CAS-No.	Concentration
HEAVY PARAFFINIC DISTILLATE	64742-54-7	>=80-<90%
ZINC COMPOUNDS	68649-42-3	>=1.5-<5%

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR (15W-40) DIESEL ENGINE OIL:

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4. FIRST AID MEASURES

Eyes

If symptoms develop, immediately move individual away from exposure and into fresh air. Flush eyes gently with water for at least 15 minutes while holding eyelids apart; seek immediate medical attention.

Skin

Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

Ingestion

Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth; place individual on the left side with the head down. Contact a physician, medical facility, or poison control center for advice about whether to induce vomiting. If possible, do not leave individual unattended.

Inhalation

If symptoms develop, move individual away from exposure and into fresh air. If symptoms persist, seek medical attention. If breathing is difficult, administer oxygen. Keep person warm and quiet; seek immediate medical attention.

Notes to physician

Hazards: Acute aspiration of large amounts of oil-laden material may produce a serious aspiration pneumonia. Patients who aspirate these oils should be followed for the development of long-term sequelae. Repeated aspiration of small quantities of mineral oil can produce chronic inflammation of the lungs (i.e. lipoid pneumonia) that may progress to pulmonary fibrosis. Symptoms are often subtle and radiological changes appear worse than clinical abnormalities. Occasionally, persistent cough, irritation of the upper respiratory tract, shortness of breath with exertion, fever, and bloody sputum occur. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities.

Treatment: No information available.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

Dry chemical, Carbon dioxide (CO2), Water spray

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR (15W-40) DIESEL ENGINE OIL:

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Hazardous combustion products

carbon dioxide and carbon monoxide, Hydrocarbons, hydrogen sulfide, zinc oxide, oxides of sulfur, nitrogen and phosphorus, Amines

Precautions for fire-fighting

Wear full firefighting turn-out gear (full Bunker gear), and respiratory protection (SCBA). DO NOT direct a solid stream of water or foam into hot, burning pools of liquid since this may cause frothing and increase fire intensity. Frothing can be violent and possibly endanger any firefighter standing too close to the burning liquid. Use water spray to cool fire exposed containers and structures until fire is out if it can be done with minimal risk. Avoid spreading burning material with water used for cooling purposes.

NFPA Flammable and Combustible Liquids Classification

Combustible Liquid Class IIIB

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

For personal protection see section 8. Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed.

Environmental precautions

Prevent spreading over a wide area (e.g. by containment or oil barriers). Do not let product enter drains. Do not flush into surface water or sanitary sewer system.

Methods for cleaning up

Keep in suitable, closed containers for disposal. Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust).

Other information

Comply with all applicable federal, state, and local regulations.

7. HANDLING AND STORAGE

Handling

Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR (15W-40) DIESEL ENGINE OIL:

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Storage
Store in a cool, dry, ventilated area.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines
Contains no substances with occupational exposure limit values.

General advice
These recommendations provide general guidance for handling this product. Personal protective equipment should be selected for individual applications and should consider factors which affect exposure potential, such as handling practices, chemical concentrations and ventilation. It is ultimately the responsibility of the employer to follow regulatory guidelines established by local authorities.

Exposure controls
Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below exposure guidelines (if applicable) or below levels that cause known, suspected or apparent adverse effects.

Eye protection
Wear chemical splash goggles when there is the potential for exposure of the eyes to liquid, vapor or mist. Maintain eye wash station near work area.

Skin and body protection

Wear normal work clothing including long pants, long-sleeved shirts and foot covering to prevent direct contact of the product with the skin. Launder clothing before reuse. If skin irritation develops, contact your facility health and safety professional or your local safety equipment supplier to determine the proper personal protective equipment for your use.
Wear resistant gloves (consult your safety equipment supplier).

Respiratory protection
A NIOSH-approved air-purifying respirator with an appropriate cartridge and/or filter may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits (if applicable) or if overexposure has otherwise been determined. Protection provided by air-purifying respirators is limited. Use a positive pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are not known or any other circumstances where an air-purifying respirator may not provide adequate protection.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR (15W-40) DIESEL ENGINE OIL:

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9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	liquid
Form	no data available
Colour	amber
Odour	hydrocarbon-like
Boiling point/boiling range	no data available
Melting point/range	no data available
Sublimation point	no data available
pH	no data available
Flash point	(>)390 °F / 199 °C Cleveland open cup
Ignition temperature	no data available
Evaporation rate	no data available
Lower explosion limit/Upper explosion limit	1 %(V) / 6 %(V)
Particle size	no data available
Vapour pressure	0.013 hPa @ 70.00 °F / 21.11 °C Calculated Vapor Pressure
Relative vapour density	no data available
Density	0.880 g/cm3 @ 60.1 °F / 15.6 °C 7.4 lb/gal @ 60.1 °F / 15.6 °C
Bulk density	No data
Water solubility	negligible
Solubility(ies)	no data available
Partition coefficient: n-octanol/water	no data available
log Pow	no data available
Autoignition temperature	no data available
Viscosity, dynamic	no data available
Viscosity, kinematic	no data available
Solids in Solution	no data available
Decomposition temperature	no data available
Burning number	no data available
Dust explosion constant	no data available
Minimum ignition energy	no data available

10. STABILITY AND REACTIVITY

Stability
Stable.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

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Conditions to avoid
excessive heat

Incompatible products
Strong oxidizing agents

Hazardous decomposition products
carbon dioxide and carbon monoxide, Hydrocarbons

Hazardous reactions
Product will not undergo hazardous polymerization.

Thermal decomposition
No data

11. TOXICOLOGICAL INFORMATION

Acute oral toxicity

HEAVY PARAFFINIC DISTILLATE	:	LD 50 Rat: > 15 g/kg
ZINC COMPOUNDS	:	LD 50 Rat: 2,000 - 5,000 mg/kg

Acute inhalation toxicity

HEAVY PARAFFINIC DISTILLATE	:	no data available
ZINC COMPOUNDS	:	no data available

Acute dermal toxicity

HEAVY PARAFFINIC DISTILLATE	:	LD 50 Rabbit: > 5 g/kg
ZINC COMPOUNDS	:	LD 50 Rabbit: > 2,000 mg/kg

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12. ECOLOGICAL INFORMATION

Biodegradability

HEAVY PARAFFINIC DISTILLATE	:	no data available
ZINC COMPOUNDS	:	no data available

Bioaccumulation

HEAVY PARAFFINIC DISTILLATE	:	no data available
ZINC COMPOUNDS	:	no data available

Ecotoxicity effects

Toxicity to fish

HEAVY PARAFFINIC DISTILLATE	:	no data available
ZINC COMPOUNDS	:	no data available

Toxicity to daphnia and other aquatic invertebrates.

HEAVY PARAFFINIC DISTILLATE	:	no data available
ZINC COMPOUNDS	:	no data available

Toxicity to algae

HEAVY PARAFFINIC DISTILLATE	:	no data available
ZINC COMPOUNDS	:	no data available

Toxicity to bacteria

HEAVY PARAFFINIC DISTILLATE	:	no data available
ZINC COMPOUNDS	:	no data available

Biochemical Oxygen Demand (BOD)

HEAVY PARAFFINIC DISTILLATE	:	no data available
ZINC COMPOUNDS	:	no data available

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

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Chemical Oxygen Demand (COD)

HEAVY PARAFFINIC DISTILLATE	:	no data available
ZINC COMPOUNDS	:	no data available

Additional ecological information

HEAVY PARAFFINIC DISTILLATE	:	no data available
ZINC COMPOUNDS	:	no data available

13. DISPOSAL CONSIDERATIONS

Waste disposal methods

Dispose of in accordance with all applicable local, state and federal regulations.

14. TRANSPORT INFORMATION

REGULATION

ID NUMBER	PROPER SHIPPING NAME	*HAZARD CLASS	SUBSIDIARY HAZARDS	PACKING GROUP	MARINE POLLUTANT / LTD. QTY.

U.S. DOT - ROAD

Not dangerous goods

U.S. DOT - RAIL

Not dangerous goods

U.S. DOT - INLAND WATERWAYS

Not dangerous goods

TRANSPORT CANADA - ROAD

Not dangerous goods

TRANSPORT CANADA - RAIL

Not dangerous goods

TRANSPORT CANADA - INLAND WATERWAYS

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

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Not dangerous goods

INTERNATIONAL MARITIME DANGEROUS GOODS

Not dangerous goods

INTERNATIONAL AIR TRANSPORT ASSOCIATION - CARGO

Not dangerous goods

INTERNATIONAL AIR TRANSPORT ASSOCIATION - PASSENGER

Not dangerous goods

MEXICAN REGULATION FOR THE LAND TRANSPORT OF HAZARDOUS MATERIALS AND WASTES

Not dangerous goods

***ORM = ORM-D, CBL = COMBUSTIBLE LIQUID**

Dangerous goods descriptions (if indicated above) may not reflect quantity, end-use or region-specific exceptions that can be applied. Consult shipping documents for descriptions that are specific to the shipment.

15. REGULATORY INFORMATION

California Prop. 65

Proposition 65 warnings are not required for this product based on the results of a risk assessment.	

SARA Hazard Classification
Acute Health Hazard

SARA 313 Component(s)

ZINC COMPOUNDS	1.59 %

New Jersey RTK Label Information

HEAVY PARAFFINIC DISTILLATE	64742-54-7
LUBRICANT ADDITIVE	
ZINC COMPOUNDS	
ZINC COMPOUNDS	68649-42-3

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR (15W-40) DIESEL ENGINE OIL:

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Pennsylvania RTK Label Information

HEAVY PARAFFINIC DISTILLATE LUBRICANT ADDITIVE	64742-54-7

Notification status

US. Toxic Substances Control Act	y (positive listing)
Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL). (Can. Gaz. Part II, Vol. 133)	y (positive listing)
Australia. Industrial Chemical (Notification and Assessment) Act	y (positive listing)
New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand	n (Negative listing)
Japan. Kashin-Hou Law List	n (Negative listing)
Korea. Toxic Chemical Control Law (TCCL) List	y (positive listing)
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act	y (positive listing)
China. Inventory of Existing Chemical Substances	y (positive listing)

Reportable quantity - Product

US. EPA CERCLA Hazardous Substances (40 CFR 302)	66666 lbs

Reportable quantity-Components

ARSENIC	7440-38-2	1 lbs

	HMIS	NFPA
Health	2	1
Flammability	1	1
Physical hazards	0	
Instability		0
Specific Hazard	--	--

16. OTHER INFORMATION

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances. This MSDS has been prepared by Ashland's Environmental Health and Safety Department (1-800-325-3751).

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTI-WEAR 46 HYDRAULIC OIL

MSDS: ANTI-WEAR 46 HYDRAULIC OIL BULK Page 1 of 6

The Valvoline Company Date Prepared: 01/14/02

MSDS No: 505.0067073-008.010I
ANTI-WEAR 46 HYDRAULIC OIL BULK

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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Material Identity
Product Name: ANTI-WEAR 46 HYDRAULIC OIL BULK
General or Generic ID: PETROLEUM BASED-LUBRICATING OIL

Company	Telephone Numbers
The Valvoline Company	Emergency: 1-800-274-5263
P.O. Box 14000	
Lexington, KY 40512	Information: 1-859-357-7206

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2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient(s)	CAS Number	% (by volume)
ALIPHATIC PETROLEUM DISTILLATES	64742-65-0	94.0-100.0

---

3. HAZARDS IDENTIFICATION

Potential Health Effects

Eye
Unlikely to cause eye irritation or injury.

Skin
May cause mild skin irritation. Prolonged or repeated contact may dry and crack the skin.

Swallowing
Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful.

Inhalation
It is possible to breathe this material under certain conditions of handling and use (for example, during heating, spraying, or stirring). Symptoms usually occur at air concentrations higher than the recommended exposure limits (See Section 8).

Symptoms of Exposure
stomach or intestinal upset (nausea, vomiting, diarrhea), irritation (nose, throat, airways), pain in the abdomen.

Target Organ Effects
No data

Developmental Information
No data

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTI-WEAR 46 HYDRAULIC OIL

MSDS: ANTI-WEAR 46 HYDRAULIC OIL BULK Page 2 of 6

Cancer Information
No data

Other Health Effects
No data

Primary Route(s) of Entry
No data

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4. FIRST AID MEASURES

Eyes
If symptoms develop, move individual away from exposure and into fresh air. Flush eyes gently with water while holding eyelids apart. If symptoms persist or there is any visual difficulty, seek medical attention.

Skin
Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

Swallowing
Do not induce vomiting. Give one glass of milk or water, and get medical attention immediately. If possible, do not leave victim unattended.

Inhalation
If symptoms develop, immediately move individual away from exposure and into fresh air. Seek immediate medical attention; keep person warm and quiet. If person is not breathing, begin artificial respiration. If breathing is difficult, administer oxygen.

Note to Physicians
Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin.

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5. FIRE FIGHTING MEASURES

Flash Point
405.0 F (207.2 C)

Explosive Limit
No data

Autoignition Temperature
No data

Hazardous Products of Combustion
May form: carbon dioxide and carbon monoxide, oxides of sulfur, nitrogen and phosphorus.

Fire and Explosion Hazards
Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively. Dense

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTI-WEAR 46 HYDRAULIC OIL

smoke may be generated while burning.

Extinguishing Media
regular foam, carbon dioxide, dry chemical.

Fire Fighting Instructions
Water or foam may cause frothing which can be violent and possibly endanger the life of the firefighter. Wear a self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode with appropriate turn-out gear and chemical resistant personal protective equipment. Refer to the personal protective equipment section of this MSDS.

NFPA Rating
Health - 1, Flammability - 1, Reactivity - 0

---

6. ACCIDENTAL RELEASE MEASURES

Small Spill
Absorb liquid on vermiculite, floor absorbent or other absorbent material.

Large Spill
Prevent run-off to sewers, streams or other bodies of water. If run-off occurs, notify proper authorities as required, that a spill has occured. Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed. Stop spill at source, dike area of spill to prevent spreading, pump liquid to salvage tank. Remaining liquid may be taken up on sand, clay, earth, floor absorbent, or other absorbent material and shoveled into containers.

---

7. HANDLING AND STORAGE

Handling
Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed.

Storage
Not applicable

---

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection
Not required under normal conditions of use. However, if misting or splashing conditions exist, then safety glasses or chemical splash goggles are advised.

Skin Protection
Not normally required. However, wear resistant gloves such as nitrile rubber to prevent irritation which may result from prolonged or repeated skin contact with product., Wear normal work

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTI-WEAR 46 HYDRAULIC OIL

clothing covering arms and legs..

Respiratory Protections
Not required under normal conditions of use. However, if oil mists are generated above recommended PEL/TLV of 5 mg/m3, then a NIOSH/MSHA approved respirator is advised in absence of proper environmental control. (See your industrial hygienist.)

Engineering Controls
Not required under normal conditions of use. However, if unusual operating conditions exist, then provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below PEL/TLV (s).

Exposure Guidelines
Component

ALIPHATIC PETROLEUM DISTILLATES (64742-65-0)
OSHA VPEL 5.000 mg/m3 - TWA Oil Mist
ACGIH TLV 5.000 mg/m3 - TWA Oil Mist

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9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point
(for product) > 425.0 F (218.3 C) @ 760.00 mmHg

Vapor Pressure
(for component) < .100 mmHg

Specific Vapor Density
No data

Specific Gravity
.879 @ 60.00 F

Liquid Density
7.320 lbs/gal @ 60.00 F
.879 kg/l @ 15.60 C

Percent Volatiles (Including Water)
No data

Evaporation Rate
SLOWER THAN ETHYL ETHER

Appearance
DRY, CLEAR & BRIGHT

State
LIQUID

Physical Form
No data

Color
No data

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTI-WEAR 46 HYDRAULIC OIL

Odor
No data

pH
Not applicable

Viscosity
42.0 - 50.0 cst @ 40 C

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10. STABILITY AND REACTIVITY

Hazardous Polymerization
Product will not undergo hazardous polymerization.

Hazardous Decomposition
May form: carbon dioxide and carbon monoxide, oxides of sulfur, nitrogen and phosphorus.

Chemical Stability
Stable.

Incompatibility
Avoid contact with: strong oxidizing agents.

---

11. TOXICOLOGICAL INFORMATION

No data

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12. ECOLOGICAL INFORMATION

No data

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13. DISPOSAL CONSIDERATION

Waste Management Information
Dispose of in accordance with all applicable local, state and federal regulations.

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14. TRANSPORT INFORMATION

DOT Information - 49 CFR 172.101
DOT Description:
Not Regulated

Container/Mode:
CASES/SURFACE - NO EXCEPTIONS

NOS Component:
None

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTI-WEAR 46 HYDRAULIC OIL

MSDS: ANTI-WEAR 46 HYDRAULIC OIL BULK Page 6 of 6

RQ (Reportable Quantity) - 49 CFR 172.101
Not applicable

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15. REGULATORY INFORMATION

US Federal Regulations
TSCA (Toxic Substances Control Act) Status
TSCA (UNITED STATES) The intentional ingredients of this product are listed.

CERCLA RQ - 40 CFR 302.4
None

SARA 302 Components - 40 CFR 355 Appendix A
None

Section 311/312 Hazard Class - 40 CFR 370.2
Immediate(X) Delayed( ) Fire( ) Reactive( ) Sudden Release of Pressure( )

SARA 313 Components - 40 CFR 372.65
None

International Regulations
Inventory Status
DSL (CANADA) The intentional ingredients of this product are listed.

State and Local Regulations
California Proposition 65
None

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16. OTHER INFORMATION

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR CERULEAN #2 GREASE

MSDS: CERULEAN #2 GREASE 1/35 LB Page 1 of 6

The Valvoline Company Date Prepared: 01/14/02

MSDS No: 999.0290465-001.010I
CERULEAN #2 GREASE 1/35 LB

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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Material Identity
Product Name: CERULEAN #2 GREASE 1/35 LB
General or Generic ID: PETROLEUM GREASE

Company	Telephone Numbers
The Valvoline Company	Emergency: 1-800-274-5263
P.O. Box 14000	
Lexington, KY 40512	Information: 1-859-357-7206

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2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient(s)	CAS Number	% (by weight)
GREASE	Trade Secret	100.0

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3. HAZARDS IDENTIFICATION

Potential Health Effects

Eye
May cause mild eye irritation.

Skin
Can cause skin irritation.

Swallowing
Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful.

Inhalation
It is possible to breathe this material under certain conditions of handling and use (for example, during heating, spraying, or stirring). Symptoms usually occur at air concentrations higher than the recommended exposure limits (See Section 8).

Symptoms of Exposure
stomach or intestinal upset (nausea, vomiting, diarrhea), irritation (nose, throat, airways).

Target Organ Effects
No data

Developmental Information
No data

Cancer Information

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR CERULEAN #2 GREASE

No data

Other Health Effects
No data

Primary Route(s) of Entry
Skin contact.

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4. FIRST AID MEASURES

Eyes
If symptoms develop, move individual away from exposure and into fresh air. Flush eyes gently with water while holding eyelids apart. If symptoms persist or there is any visual difficulty, seek medical attention.

Skin
Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

Swallowing
Do not induce vomiting. Give one glass of milk or water, and get medical attention immediately. If possible, do not leave victim unattended.

Inhalation
If symptoms develop, move individual away from exposure and into fresh air. If symptoms persist, seek medical attention. If breathing is difficult, administer oxygen. Keep person warm and quiet; seek immediate medical attention.

Note to Physicians
Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin.

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5. FIRE FIGHTING MEASURES

Flash Point
460.0 F (237.7 C) COC

Explosive Limit
No data

Autoignition Temperature
No data

Hazardous Products of Combustion
May form: carbon dioxide and carbon monoxide, various hydrocarbons.

Fire and Explosion Hazards
Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively.

Extinguishing Media

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR CERULEAN #2 GREASE

regular foam, carbon dioxide, dry chemical.

Fire Fighting Instructions
Water or foam may cause frothing which can be violent and possibly endanger the life of the firefighter. Wear a self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode with appropriate turn-out gear and chemical resistant personal protective equipment. Refer to the personal protective equipment section of this MSDS.

NFPA Rating
Health - 1, Flammability - 1, Reactivity - 0

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6. ACCIDENTAL RELEASE MEASURES

Small Spill
Sweep up material for disposal or recovery.

Large Spill
Shovel material into containers. Thoroughly sweep area of spill to clean up any residual material.

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7. HANDLING AND STORAGE

Handling
Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed.

Storage
Not applicable

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection
Wear safety glasses in compliance with OSHA regulations. (Consult your safety representative.)

Skin Protection
Wear resistant gloves such as: neoprene, Wear normal work clothing covering arms and legs..

Respiratory Protections
Not required under normal conditions of use.

Engineering Controls
Not required under normal conditions of use.

Exposure Guidelines
Component

GREASE

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR CERULEAN #2 GREASE

No exposure limits established

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9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point
Not applicable

Vapor Pressure
(for product) < .100 mmHg @ 68.00 F

Specific Vapor Density
< 1.000 @ AIR=1

Specific Gravity
< 1.000

Liquid Density
No data

Percent Volatiles (Including Water)
No data

Evaporation Rate
< .01

Appearance
No data

State
SEMISOLID

Physical Form
GEL

Color
BLUE, MILD PETROLEUM ODOR

Odor
No data

pH
Not applicable

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10. STABILITY AND REACTIVITY

Hazardous Polymerization
Product will not undergo hazardous polymerization.

Hazardous Decomposition
May form: carbon dioxide and carbon monoxide, various hydrocarbons.

Chemical Stability
Stable.

Incompatibility

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR CERULEAN #2 GREASE

Avoid contact with: strong oxidizing agents.

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11. TOXICOLOGICAL INFORMATION

No data

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12. ECOLOGICAL INFORMATION

No data

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13. DISPOSAL CONSIDERATION

Waste Management Information
Dispose of in accordance with all applicable local, state and federal regulations.

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14. TRANSPORT INFORMATION

DOT Information - 49 CFR 172.101
DOT Description:
Not Regulated

Container/Mode:
CASES/SURFACE - NO EXCEPTIONS

NOS Component:
None

RQ (Reportable Quantity) - 49 CFR 172.101
Not applicable

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15. REGULATORY INFORMATION

US Federal Regulations
CERCLA RQ - 40 CFR 302.4
None

SARA 302 Components - 40 CFR 355 Appendix A
None

Section 311/312 Hazard Class - 40 CFR 370.2
Immediate(X) Delayed( ) Fire( ) Reactive( ) Sudden Release of Pressure( )

SARA 313 Components - 40 CFR 372.65
None

International Regulations
Inventory Status
Not determined

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR CERULEAN #2 GREASE

MSDS: CERULEAN #2 GREASE 1/35 LB Page 6 of 6

State and Local Regulations
California Proposition 65
None

16. OTHER INFORMATION

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR HIGH PERFORMANCE 80W-90 GEAR OIL

The Valvoline Company Date Prepared: 01/14/02

MSDS No: 505.0091437-009.0111
HP GEAR OIL 80W-90 1/16 GA

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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Material Identity
Product Name: HP GEAR OIL 80W-90 1/16 GA
General or Generic ID: PETROLEUM BASED-LUBRICATING OIL

Company	Telephone Numbers	
The Valvoline Company	Emergency:	1-800-274-5263
P.O. Box 14000		
Lexington, KY 40512	Information:	1-859-357-7206

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2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient(s)	CAS Number	% (by weight)
ALIPHATIC PETROLEUM DISTILLATE		87.0- 97.0
GEAR OIL ADDITIVE		3.6- 14.0

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3. HAZARDS IDENTIFICATION

Potential Health Effects

Eye
Unlikely to cause eye irritation or injury.

Skin
Prolonged or repeated contact may dry and crack the skin.

Swallowing
Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful.

Inhalation
Breathing small amounts of this material during normal handling is not likely to cause harmful effects. Breathing large amounts may be harmful.

Symptoms of Exposure
Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: stomach or intestinal upset (nausea, vomiting, diarrhea)

Target Organ Effects
No data

Developmental Information
No data

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR HIGH PERFORMANCE 80W-90 GEAR OIL

Cancer Information
This material is not listed as a carcinogen by the International Agency for Research on Cancer, the National Toxicology Program, or the Occupational Safety and Health Administration.

Other Health Effects
No data

Primary Route(s) of Entry
Skin contact.

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4. FIRST AID MEASURES

Eyes
If eye contact with liquid occurs, hold eyelids apart and flush eyes gently with lukewarm water. Seek immediate medical attention.

Skin
Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

Swallowing
Do not induce vomiting. Give one glass of milk or water, and get medical attention immediately. If possible, do not leave victim unattended.

Inhalation
First aid is not normally required. If symptoms develop, move individual away from exposure and into fresh air. If symptoms persist, seek medical attention.

Note to Physicians
Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin.

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5. FIRE FIGHTING MEASURES

Flash Point
300.0 F (148.8 C) COC

Explosive Limit
Not applicable

Autoignition Temperature
No data

Hazardous Products of Combustion
May form: carbon dioxide and carbon monoxide, various hydrocarbons.

Fire and Explosion Hazards
Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively. Dense smoke may be generated while burning.

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR HIGH PERFORMANCE 80W-90 GEAR OIL

Extinguishing Media
regular foam, water fog, carbon dioxide, dry chemical.

Fire Fighting Instructions
Water or foam may cause frothing which can be violent and possibly endanger the life of the firefighter.

NFPA Rating
Health - 1, Flammability - 1, Reactivity - 0

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6. ACCIDENTAL RELEASE MEASURES

Small Spill
Absorb liquid on vermiculite, floor absorbent or other absorbent material.

Large Spill
Prevent run-off to sewers, streams or other bodies of water. If run-off occurs, notify proper authorities as required, that a spill has occured. Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed. Stop spill at source, dike area of spill to prevent spreading, pump liquid to salvage tank. Remaining liquid may be taken up on sand, clay, earth, floor absorbent, or other absorbent material and shoveled into containers.

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7. HANDLING AND STORAGE

Handling
Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed. Avoid prolonged or repeated contact.

Storage
Keep containers closed when not in use.

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection
Not required under normal conditions of use. However, if misting or splashing conditions exist, then safety glasses or chemical splash goggles are advised.

Skin Protection
Not normally required. However, wear resistant gloves such as nitrile rubber to prevent irritation which may result from prolonged or repeated skin contact with product.

Respiratory Protections
Not required under normal conditions of use. However, if oil mists are generated above recommended PEL/TLV of 5 mg/m3, then a NIOSH/MSHA approved respirator is advised in absence of proper

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR HIGH PERFORMANCE 80W-90 GEAR OIL

environmental control. (See your industrial hygienist.)

Engineering Controls
Not required under normal conditions of use. However, if unusual operating conditions exist, then provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below PEL/TLV (s).

Exposure Guidelines
Component

ALIPHATIC PETROLEUM DISTILLATE
No exposure limits established

GEAR OIL ADDITIVE
No exposure limits established

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9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point
(for component) > 425.0 F (218.3 C)

Vapor Pressure
Not applicable

Specific Vapor Density
No data

Specific Gravity
.890 @ 60.00 F

Liquid Density
7.480 lbs/gal @ 60.00 F
.890 kg/l @ 15.60 C

Percent Volatiles (Including Water)
No data

Evaporation Rate

Appearance

State
LIQUID

Physical Form
No data

Color
AMBER

Odor
PETROLEUM

pH
Not applicable

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR HIGH PERFORMANCE 80W-90 GEAR OIL

Viscosity
14.0 - 15.0 cst @ 100 C

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10. STABILITY AND REACTIVITY

Hazardous Polymerization
Product will not undergo hazardous polymerization.

Hazardous Decomposition
May form: carbon dioxide and carbon monoxide, various hydrocarbons.

Chemical Stability
Stable. Avoid heat, open flame, and prolonged storage at elevated temperatures.

Incompatibility
Avoid contact with: strong oxidizing agents.

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11. TOXICOLOGICAL INFORMATION

No data

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12. ECOLOGICAL INFORMATION

No data

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13. DISPOSAL CONSIDERATION

Waste Management Information
Dispose of in accordance with all applicable local, state and federal regulations.

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14. TRANSPORT INFORMATION

DOT Information - 49 CFR 172.101
DOT Description:
Not Regulated

Container/Mode:
CASES/SURFACE - NO EXCEPTIONS

NOS Component:
None

RQ (Reportable Quantity) - 49 CFR 172.101
Not applicable

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR HIGH PERFORMANCE 80W-90 GEAR OIL

15. REGULATORY INFORMATION

US Federal Regulations
TSCA (Toxic Substances Control Act) Status
TSCA (UNITED STATES) The intentional ingredients of this product are listed.

CERCLA RQ - 40 CFR 302.4
None

SARA 302 Components - 40 CFR 355 Appendix A
None

Section 311/312 Hazard Class - 40 CFR 370.2
Immediate(X) Delayed( ) Fire( ) Reactive( ) Sudden Release of Pressure( )

SARA 313 Components - 40 CFR 372.65
None

International Regulations
Inventory Status
AICS (AUSTRALIA) The intentional ingredients of this product are listed.
DSL (CANADA) The intentional ingredients of this product are listed.
ECL (SOUTH KOREA) The intentional ingredients of this product are listed.
ENCS (JAPAN) The intentional ingredients of this product are listed.
PICCS (PHILIPPINES) The intentional ingredients of this product are listed.

State and Local Regulations
California Proposition 65
None

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16. OTHER INFORMATION

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTIFREEZE AND COOLANT

Initial Preparation Date: *7/3/1997*
Last Revision Date: *9/18/2003*
Effective Date: *10/4/2004*

MATERIAL SAFETY DATA SHEET

PRODUCT IDENTITY: SERVICE PRO ANTIFREEZE & COOLANT

1. CHEMICAL PRODUCT & COMPANY INFORMATION

OLD WORLD INDUSTRIES, INC.
4065 COMMERCIAL AVENUE
NORTHBROOK, ILLINOIS 60062
PHONE: 847-559-2000
EMERGENCY PHONE: 1-800-424-9300 (CHEMTREC)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Material	*CAS#*	*% by Wt*	*PEL (OSHA)*	*TLV (ACGIH)*
Ethylene Glycol	107-21-1	90 - 95	50 ppm	50 ppm
Diethylene Glycol	111-46-6	0 - 5	None	None
Dipotassium Phosphate	7758-11-4	1 - 2	None	None

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Slight odor. *May be fatal if swallowed.* *Vapors can cause eye irritation.*

Lowest Known LD50 (Oral)	107-21-1	5840 mg/kg (Rats)
Lowest Known LD50 (Skin)	107-21-1	9530 mg/kg (Rabbits)

HAZARD RATING SYSTEM

NFPA: HEALTH: 1	**FLAMMABILITY: 1**	**REACTIVITY: 0**
HMIS: HEALTH: 2	**FLAMMABILITY: 1**	**REACTIVITY: 0**

KEY: 0 – Minimal 1 – Slight 2 - Moderate 3 - Serious 4 - Severe

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTIFREEZE AND COOLANT

POTENTIAL HEALTH EFFECTS

Routes of Exposure: Inhalation, Ingestion, Skin Contact/Absorption, Eye Contact

Eye: May cause slight transient (temporary) eye irritation. Corneal injury is unlikely. Vapors or mists may cause eye irritation.

Skin: Prolonged or repeated exposure not likely to cause significant skin irritation. A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts. Repeated skin exposure may result in absorption of harmful amounts. Massive contact with damaged skin or of material sufficiently hot to burn skin may result in absorption of potential lethal amounts.

Ingestion: Single dose oral toxicity is considered to be moderate. Excessive exposure may cause central nervous system effects, cardiopulmonary effects (metabolic acidosis), and kidney failure. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; however, swallowing amounts larger than that may cause serious injury, even death.

Inhalation: At room temperature, exposures to vapors are minimal due to physical properties; higher temperatures may generate vapor levels sufficient to cause adverse effects.

Systemic (Other Target Organ) Effects: Repeated excessive exposures may cause severe kidney and also liver and gastrointestinal effects. Signs and symptoms of excessive exposure may be central nervous system effects. Signs and symptoms of excessive exposure may be nausea and/or vomiting. Signs and symptoms of excessive exposure may be anesthetic or narcotic effects. Observations in animals include formation of bladder stones after repeated oral doses of ethylene glycol. Reports of kidney failure and death in burn patients suggest the ethylene glycol may have been a factor. The use of topical applications containing this material may not be appropriate in severely burned patients or individuals with impaired renal function.

Cancer Information: Based on data from long-term animal studies, ethylene glycol is not believed to pose a carcinogenic risk to man.

Teratology (Birth Defects): Exposure to ethylene glycol has caused birth defects in laboratory animals only at doses toxic to the mother.

Reproductive Effects: Ethylene glycol has not interfered with reproduction in animal studies except at very high doses.

CHRONIC, PROLONGED OR REPEATED OVEREXPOSURE

Effects of Repeated Overexposure: Repeated inhalation of ethylene glycol mist may produce signs of central nervous system involvement, particularly dizziness and nystagmus.

Other Effects of Overexposure: repeated skin contact with ethylene glycol may, in a very small proportion of cases, cause sensitization with the development of allergic contact dermatitis. The incidence is significantly less than 1% with the undiluted material.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTIFREEZE AND COOLANT

4. FIRST AID MEASURES

Ensure physician has access to this MSDS.

TREATMENT

Eyes: Immediately flush eyes with large amounts of water for 15 minutes, lifting lower and upper lids. Get medical attention as soon as possible. Contact lenses should never be worn when working with this chemical.

Skin: Flush area of skin contact immediately with large amounts of water for at least 15 minutes while removing contaminated clothing. If irritation persists after flushing, get medical attention promptly. Wash clothing before re-use.

Inhalation: If inhaled, immediately remove victim to fresh air and call ***emergency medical care.*** If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Ingestion: Obtain medical attention immediately. If patient is fully conscious, give two glasses of water. Do not induce vomiting. If medical advice is delayed, and if the person has swallowed a moderate volume of material (a few ounces), then give three to four ounces of hard liquor, such as whisky. For children, give proportionally less liquor, according to weight.

Notes to Physician:

It is estimated that the lethal oral dose to adults is of the order of 1.0 ml/kg. Ethylene glycol is metabolized by alcohol dehydrogenate to various metabolites including glyceraldehydes, glycolic acid and oxalic acid which cause an elevated anion-gap metabolic acidosis and renal tubular injury. The signs and symptoms in ethylene glycol poisoning are those of metabolic acidosis, CNS depression, and kidney injury. Urinalysis may show albuminuria, hematuria and oxaluria. Clinical chemistry may reveal anion-gap metabolic acidosis and uremia. The currently recommended medical management of ethylene glycol poisoning includes elimination of ethylene glycol and metabolites, correction of metabolic acidosis and prevention of kidney injury. It is essential to have immediate and follow up urinalysis and clinical chemistry. There should be particular emphasis on acid-base balance and renal function tests. A continuous infusion of 5% sodium bicarbonate with frequent monitoring of electrolytes and fluid balance is used to achieve correction of metabolic acidosis and forced diuresis. As a competitive substrate for alcohol dehydrogenase, ethanol is antidotal. Given in the early stages of intoxication, it blocks the formulation of nephrotoxic metabolites. A therapeutically effective blood concentration of ethanol is in the range 100-150 mg/dl, and should be achieved by a rapid loading dose and maintained by intravenous infusion. For severe and/or deteriorating cases, hemodialysis may be required. Dialysis should be considered for patients who are symptomatic, have severe metabolic acidosis, a blood ethylene glycol concentration greater than 25 md/dl, or compromise of renal functions.

A more effective intravenous antidote for physician use is 4-methylpyrazole, a potent inhibitor of alcohol dehydrogenases, which effectively blocks the formation of toxic metabolites of ethylene glycol. It has been used to decrease the metabolic consequences of ethylene glycol poisoning before metabolic acidosis coma, seizures, and renal failure have occurred. A generally recommended protocol is a loading dose of 15 mg/kg followed by 10 mg/kg every 12 hours for 4 doses and then 15 mg/kg every 12 hours until ethylene glycol concentrations are below 20 mg/100 ml. Slow intravenous infusion is required. Since 4-methyplyrozole is dialyzable, increased dosage may be necessary during hemodialysis. Additional therapeutic measures may include the administration of cofactors involved in the metabolism of ethylene glycol. Thiamine (100 mg) and pyridoxine (50 mg) should be given every six hours.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTIFREEZE AND COOLANT

Pulmonary edema with hypoxemia has been described in a number of patients following poisoning with ethylene glycol. The mechanism of production has not been elucidated, but it appears to be non-cardiogenic in origin in several cases. Respiratory support with mechanical ventilation and positive end expiratory pressure may be required. There may be cranial nerve involvement in the late stages of toxicity from swallowed ethylene glycol. In particular, effects have been reported involving the seventh, eighth and ninth cranial nerves, presenting with bilateral facial paralysis, diminished hearing and dysphasia.

5. FIRE FIGHTING MEASURES

Flammable Properties
Flash Point: 119°C (247°F)
Method Used: Setaflash
Autoignition Temperature: Autoignition temperature for ethylene glycol is 398°C (748°F).

Flammability Limits - % of vapor concentration at which product can ignite in presence of spark.
Lower Flammability Limit: 3.2%
Upper Flammability Limit: 15.3%

Hazardous Combustion Products: Hazardous combustion products may include and are not limited to carbon monoxide, carbon dioxide and trace amounts of aldehydes and organic acids. When available oxygen is limited, as in a fire or when heated to very high temperatures by a hot wire or plate, carbon monoxide and other hazardous compounds such as aldehydes might be generated.

Extinguishing Media: Water fog or fine spray. Alcohol resistant foams (ATC type) are preferred if available. General purpose synthetic foams (including AFFF) or protein foams may function, but much less effectively. Carbon dioxide. Dry chemical. Do not use direct water stream. May spread fire.

Fire Fighting Instructions: No fire and explosion hazards expected under normal storage and handling conditions (i.e. ambient temperatures). However, ethylene glycol or solutions of ethylene glycol and water can form flammable vapors with air if heated sufficiently. Keep people away. Isolate fire area and deny unnecessary entry.

Protective Equipment for Fire Fighters: Wear positive-pressure, self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire-fighting helmet, coat, pants, boots and gloves).

6. ACCIDENTAL RELEASE MEASURES

Protect People: Material is moderately toxic when ingested. Take adequate precautions to keep people, especially children away from spill site. PVC-coated rubber gloves and monogoggles or face shield can be used during cleanup of spill site. Product on surfaces can cause slippery conditions. Practice reasonable care and cleanliness. Avoid breathing spray mists if generated. Keep out of reach of children. Product may become a solid at temperatures below -18°C (0°F). Do not store near food, foodstuffs, drugs or potable water supplies.

Protect the Environment: Do not dump used product or diluted material into sewers, on the ground, or into any body of water.

Cleanup: Small spills: Soak up with absorbent material. Large spills: Dike and pump into suitable containers for disposal. Ensure compliance with all applicable statues that require notification of appropriate government officials.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTIFREEZE AND COOLANT

7. HANDLING AND STORAGE

Steps to be Taken in Case Material is Released or Spilled: Eliminate all sources of ignition in vicinity of the spilled or released fluid.

Other Precautions: Use normal precautions in handling any combustible liquid. Keep container closed when not in use. Store away from heat or open flame. Product on surfaces can cause slippery conditions. Practice reasonable care and cleanliness. Avoid breathing spray mists if generated. Keep out of reach of children. Product may become a solid at temperatures below -18°C (0°F). Do not store near food, foodstuffs, drugs or potable water supplies.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Respiratory Protection: Respiratory protection is required if airborne concentration exceeds TLV. At any detectable concentration any self-contained breathing apparatus with a full face piece and operated in a pressure-demand or other positive pressure mode or any supplied-air respirator with a full face piece and operated in a pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

Escape: Any air-purifying full face piece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister or any appropriate escape-type self-contained breathing apparatus.

Skin Protection: Protective gloves recommended when prolonged skin contact cannot be avoided. Polyethylene; Neoprene; Nitrile; Polyvinyl alcohol; Natural Rubber, Butyl Rubber. Safety shower should be available.

Eye Protection: Safety goggles and face shield. Emergency eyewash should be available. Contact lenses should not be worn when working with this chemical.

Engineering Controls: Use general or local exhaust ventilation to meet TLV requirements.

EXPOSURE LIMITS

Component	Exposure Limits	Skin Form
Ethylene glycol	100 mg/m3 CEILING ACGIH	Aerosol
Ethylene glycol	125 mg/m3 CEILING OSHA-vacated	
	50 ppm CEILING OSHA – vacated	
	100 mg/m3 CEILING UCC	Aerosol and Vapor
Diethylene glycol	50 ppm TWA8 AIHA WEEL	Aerosol and Vapor
Diethylene glycol	10 mg/m3 TWA8 AIHA WEEL	Aerosol

In the Exposure Limits Chart above, if there is no specific qualifier (i.e., Aerosol) listed in the Form Column for a particular limit, the listed limit includes all airborne forms of the substance that can be inhaled.

A "blank" in the Skin column indicates that exposure by the cutaneous (skin) route is not a potential significant contributor to overall exposure.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTIFREEZE AND COOLANT

9. PHYSICAL / CHEMICAL PROPERTIES

Boiling Range:	171 - 175°C (339 - 348°F)
Freeze Point:	-18°C (0°F)
Specific Gravity (Water =1):	1.12
Pounds/Gallons:	9.3
Vapor Pressure (mm of Hg) @ 20C:	<0.1
Vapor Density (air=1):	2.1
Water Solubility:	Complete
Evaporation Rate (BuAc = 1):	Nil
% Volatile By Volume:	97.0
Appearance:	Green
Odor:	Mild
pH (50% Water Solution):	10.5-11.0

10. STABILITY & REACTIVITY DATA

Stability:	Stable
Conditions to Avoid:	Keep away from flame
Incompatibility (Materials to Avoid):	Strong acid or oxidizing agents
Hazardous Decomposition Products:	Incomplete combustion may produce CO gas
Hazardous Polymerization:	Will not occur

11. TOXICOLOGICAL INFORMATION

Skin: The dermal LD50 has not been determined.

Ingestion: The lethal dose in humans is estimated to be 100 ml (3 ozs.). The oral LD50 for rats is in the 6000-13,000-mg/kg range.

Mutagenicity (The Effects on Genetic Material): In vitro mutagenicity studies were negative. Animal mutagenicity studies were negative.

Significant Data with Possible Relevance to Humans: Ethylene glycol has been shown to produce dose-related teratogenic effects in rats and mice when given by gavage or in drinking water at high concentrations or doses. The no-effect doses for developmental toxicity for ethylene glycol given by gavage over the period of organogenesis has been shown to be 150 mg/kg/day for the mouse and 500 mg/kg/day for the rat. Also, in a preliminary study to asses the effects of exposure of pregnant rats and made to aerosis at concentrations of 150, 1000 and 25000 mg/m3 for 6 hours a day throughout the period of organogenesis, teratogenic effects were produced at the highest concentration, but only in mice. The conditions of these latter experiments did not allow a conclusion as to whether the developmental toxicity was mediated by inhalation of aerosol percutaneous absorption of ethylene glycol from contaminated skin, or swallowing ethylene glycol as a result of grooming the wetted coat. In a further study, comparing effects from high aerosol concentration by whole-body or nose-only exposure, it was shown that nose-only exposure resulted in maternal toxicity (1000 and 25000 mg/m3) and developmental toxicity with minimal evidence of teratogenicity (2500 mg/m3). The no-effects concentration (based on maternal toxicity) was 500 mg/m3. In a further study in mice, no teratogenic effects could be produced when ethylene glycol was applied to skin of pregnant mice over the period of organogenesis. The above observations suggest that ethylene glycol is to be regarded as an animal teratogen. There is currently no available information to suggest that ethylene glycol has caused birth defects in humans. Cutaneous application of ethylene glycol is ineffective in producing developmental

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTIFREEZE AND COOLANT

toxicity. Exposure to high aerosol concentrations is only minimally effective in producing developmental toxicity. The major route for producing developmental toxicity is perorally. Two chronic feeding studies, using rats and mice, have not produced any evidence that ethylene glycol causes dose-related increases in tumor incidence or a different pattern of tumors compared with untreated controls. The absence of carcinogenic potential for ethylene glycol has been supported by numerous in vitro genotoxicity studies showing that it does not produce mutagenic or clastogenic effects.

A chronic dietary feeding study of diethylene glycol with rats showed mild kidney injury at 1%, while concentrations of 2% and 4% caused more marked kidney injury. In addition, at 2% and 4% of diethylene glycol in the diet, some rats developed benign papillary tumors in the urinary bladder. These have been attributed to the presence of urinary bladder calcium oxalate stones. No evidence for carcinogenicity was found with a chronic skin-painting study with diethylene glycol in mice. The absence of a direct chemical carcinogenic effect addords with the results in vitro genotoxicity studies that show that it does not produce mutagenic or clastogenic effects. A feeding study employing up to 5.0% diethylene glycol in the diet failed to produce any teratogenic effects. In a mouse continuous breeding study with large doses of diethylene glycol in drinking water, there was evidence for reproductive toxicity at 3.5% (equivalent to 6.1 g/kg/day) as reduced number of litter, live pups per litter and live pup weight. No such effects were seen at 1.75% (approximately 3.05 g/kg/day). The relevance of these very high dosages to human health is uncertain. Pregnant rats receiving undiluted diethylene glycol by gavage over the period of organogenesis had toxic effects at 4.0 and 8.0 ml/kg/day as mortality, decreased body weight, decreased food consumption increased water consumption and increased liver and kidney weights. Fetotoxicity was seen only at these maternally toxic dosages. Decreased fetal body weight occurred at 8.0 ml/kg/day, and increased skeletal variants at 4.0 and 8.0 ml/kg/day. No embryotixic or teratogenic effects were seen. Neither maternal toxicity nor fetotoxicity occurred at 1.0 ml/kg/day. In a study with mice also receiving undiluted diethylene glycol over the period of organogenesis, maternal toxicity occurred at 2.5 and 10.0 ml/kg/day, but not at 0.5 ml/kg/day. Definitive developmental toxicity was not seen in this species.

ACUTE TOXICITY

Peroral: The lethal dose in humans is estimated to be 3 oz. or 100 ml.
Rat: LD50 (6000 – 13000) mg/kg

Percutaneous:
Rabbit: LD50 = >22270 mg/kg; 24 h occluded

Inhalation:
Rat: 8-hour exposure, substantially saturated vapor studies, dynamic generation method

Mortality: 0/6

Inhalation: Mist/vapor study, rat, at 170°C, 8-hour exposure = 2.2 mg/l

Mortality: 0/6

Inhalation:
Rat: 8-hour exposure, fog = 10000 ppm; 65° - 70°C

Mortality: 0/6

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IRRITATION

Skin:

Rabbit: 24-hour occluded contact, 0.5 ml
Results: Minor erythema and edema

Skin:

Human: Primary irritation patch test, 48-hour occluded, 0.2 ml
Results: Evidence of irritation

Eye:

Rabbit: 0.1 ml
Results: Minor transient iritis, conjunctival irritation with discharge

REPEATED EXPOSURE

In a 7-day dietary study with rats, a significant increase in kidney weights in females was observed at 5.0 gm/kg. The NOEL was 2.5 gm/kg.

In a 24-month dietary study with rats, increased mortality in males was observed at the highest dose, 1.0 gm/kg/day. There were multiple signs: mineralization of several organs, including the cardiac vessels, cardiac muscle, vas deferens, stomach and pulmonary vessels; cellular hyperplasia of the parathyroids, hemosiderosis of the spleen, myocardial fibrosis, portal fibrosis of the liver, bile duct hyperplasia and hydronephrosis and oxylate nephrosis of the kidneys. Ethylene glycol was not oncogenic.

In a 90-day dietary study with dogs, repeated exposures to 2.5 gm/kg resulted in acute renal failure and deaths. The NOAEL was 1.0 gm/kg.

SENSITIZATION (ANIMAL AND HUMAN STUDIES)

Repeated skin contact with ethylene glycol may, in a very small proportion of cases, cause sensitization with the development of allergic contact dermatitis. The incidence is significantly less than 1% with the undiluted material.

REPRODUCTIVE TOXICITY

A three-generation study indicated that ethylene glycol did not affect reproductive parameters at dietary concentrations up to 1.0 gm/kg/day in any generation.

CHRONIC TOXICITY AND CARCINOGENICITY

Two chronic feeding studies, using rats and mice, have not produced any evidence that ethylene glycol causes dose-related increases in tumor incidence or a different pattern of tumors compared with untreated controls. The absence of a carcinogenic potential for ethylene glycol has been supported by numerous in vitro genotoxicity studies showing that it does not produce mutagenic or clastogenic effects.

GENETIC TOXICOLOGY

In Vitro: Ethylene glycol was devoid of genotoxic activity in an Ames test, forward gene mutation and sister chromatid exchange (SCE) studies in Chinese Hamster Ovary (CHO) cells and an in vitro cytogenetics study.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

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In Vivo: Ethylene glycol by three different routes (intravenous, peroral and percutaneous) demonstrates apparent first-order pharmacokinetic behavior for the disposition in and the elimination from the plasma. Dose-dependent changes occur for the elimination of metabolites in the urine and as $14CO^2$ after single doses for the intravenous and peroral, but not the percutaneous route. The hypothesis from literature sources exists that developmental toxicity is caused by a metabolite of ethylene glycol, called glycolic acid, and not parent ethylene glycol. Under most conditions of ethylene glycol exposure, the glycolic acid metabolite is present in the blood in very low levels. However, it can become the major metabolite following large doses of ethylene glycol due to saturation of glycolic acid oxidation and/or elimination. When levels of this acidic metabolite exceed the capacity of maternal blood buffers to neutralize it, a maternal metabolic acidosis ensues, which has been hypothesized to be the true agent responsible for ethylene glycol induced developmental toxicity. Research suggests that ethylene glycol developmental toxicity is due to a dose-rate dependent toxicokinetic shift leading to glycolate accumulation and metabolic acidosis.

ADDITIONAL STUDIES

Ethylene glycol has been shown to produce dose-related teratogenic effects in rats and mice when given by gavage or in drinking water at high concentrations or doses. The no-effect doses for developmental toxicity for ethylene glycol given by gavage over the period of organogenesis has been shown to be 150 mg/kg/day for the mouse and 500 mg/kg/day for the rat. Also, in a preliminary study to assess the effects of exposure of pregnant rats and mice to aerosols at concentrations of 150, 1000 and 2500 mg/m^3 for 6 hours a day throughout the period of organogenesis, teratogenic effects were produced at the highest concentration, but only in mice. The conditions of these latter experiments did not allow a conclusion as to whether the developmental toxicity was mediated by inhalation of aerosol, percutaneous absorption of ethylene glycol from contaminated skin, or swallowing of ethylene glycol as a result of grooming the wetted coat. In a further study, comparing effects from high aerosol concentration by whole-body or nose-only exposure, it was shown that nose-only exposure resulted in maternal toxicity (1000 and 2500 mg/m^3) and developmental toxicity with minimal evidence of teratogenicity (2500 mg/m^3). The no-effects concentration (based on maternal toxicity) was 500 mg/m^3. In a further study in mice, no teratogenic effects could be produced when ethylene glycol was applied to the skin of pregnant mice over the period of organogenesis. The above observations suggest that ethylene glycol is to be regarded as an animal teratogen. There is currently no available information to suggest that ethylene glycol has caused birth defects in humans. Cutaneous application of ethylene glycol is ineffective in producing developmental toxicity. Exposure to high aerosol concentrations is only minimally effective in producing developmental toxicity.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE

Movement & Partitioning: Bioconcentration potential is low (BCF less than 100 or Log Kow less than 3). Log octanol/water partition coefficient (log Kow) is -1.36. Henry's Law Constant (H) is 6.0E-08 atm-m3/mol. Bioconcentration factor (BCF) is 10 in golden orfe.

Degradation & Transformation: Biodegradation under aerobic static laboratory conditions is high (BOD20 or BOD28/ThOD greater than 40%). 5-Day biochemical oxygen demand (BOD5) is 0.78 p/p. 10-Day biochemical oxygen demand (BOD10) is 1.06 p/p. 20-Day biochemical oxygen demand (BOD20) is 1.15 p/p. Theoretical oxygen demand (THOD) is calculated to be 1.29 p/p. Biodegradation may occur under both aerobic and anaerobic conditions (in either the presence or absence of oxygen). Inhibitory concentration (IC50) in OECD "Activated Sludge, Respiration Inhibition Test" (Guideline # 209) is < 1000 mg/L. Degradation is expected in the atmospheric environment within days to weeks.

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTIFREEZE AND COOLANT

Ecotoxicology: Material is practically non-toxic to aquatic organisms on an acute basis (LC50 greater than 100 mg/L in most sensitive species). Acute LC50 for fathead minnow (Pimephales promelas) is 51000 mg/L. Acute LC50 for bluegill (Lepomis macrochirus) is 27549 mg/L. Acute LC50 for rainbow trout (Oncorhynchus mykiss) is about 18000-46000 mg/L. Acute LC50 for guppy (Poecilia reticulata) is 49300 mg/L. Acute LC50 for water flea (Daphnia magna) is 46300-51100 mg/L. Acute LC50 for the cladoceran Ceriodaphnia dubia is 10000-25800 mg/L. Acute LC50 for crayfish is 91430 mg/L. Acute LC50 for brine shrimp (Artemia salina) is 20000 mg/L. Acute LC50 for golden orfe (Leuciscus idus) is greater than 10000 mg/L. Acute LC50 for goldfish (Carassius auratus) is greater than 5000 mg/L. Growth inhibition EC50 for green alga Selenastrum capricornutum is 9500-13000 mg/L.

BOD (% Oxygen Consumption):

Day 5	Day 10	Day 15	Day 20	Day 30
51%	80%		97%	

ECOTOXICITY

Toxicity to Micro-organisms:
Bacterial / NA: 16 h; IC50
Result Value: >10000 mg/l

Toxicity to Aquatic Invertebrates:
Daphnia: 48 h; LC50
Result Value: >100000 mg/l

Toxicity to Fish
Fathead Minnow: 94 h; LC50
Result Value: 70000 mg/l

FURTHER INFORMATION

Chemical Oxygen Demand (COD) – Measured: 1.29 mg/mg
Theoretical Oxygen Demand (THOD) – Calculated: 1.30 mg/mg

Octanol/Water Partition Coefficient – Measured: -1.36

13. DISPOSAL CONSIDERATIONS

DO NOT discharge to sewer. Wear appropriate personal protection. Take up with sand, vermiculite, or similar inert material. Dispose in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION
Non-Bulk
Not regulated by the US D.O.T. (in quantities under 5,000 lbs in any one inner package)

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTIFREEZE AND COOLANT

Bulk

Proper Shipping Name:	Environmentally Hazardous Substance, LIQUID N.O.S. (ETHYLENE GLYCOL)
Technical Name:	ETHYLENE GLYCOL
ID Number:	UN 3082
Hazard Class:	9
Packing Group:	PG III
Reportable Quantity:	5,000 lb.

IATA
Non-Bulk
Not Regulated by IATA

IMDG
Non-Bulk
Not regulated by IMDG (in quantities under 5,000 lbs in any one inner package)

15. REGULATORY INFORMATION

THIS PRODUCT CONTAINS COMPONENT(S) CITED ON THE FOLLOWING REGULATIONS.

	Chemical Name	***Cas Number***
	Ethylene Glycol	107-21-1

United States - TSCA Inventory: Listed

Water Standards: No data available

Atmospheric Standards: Clean Air Act (1990) - List of Hazardous Air Contaminants: listed

CERCLA: Reportable Quantity (RQ): 5,000 pounds (532 gallons)

OSHA Hazard Communication Standard: This product is a "hazardous chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III:

Section 311/312 - Categories: Acute hazard; chronic hazard

Section 312 - Inventory Reporting: Ethylene glycol is subject to Tier I and/or Tier II annual inventory reporting.

Section 313 - Emission Reporting: Ethylene glycol is subject to Form R reporting requirements.

Section 302 - Extremely Hazardous Substances: Ethylene glycol is not listed.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ANTIFREEZE AND COOLANT

State Right-To-Know:

California - Exposure Limits - Ceilings:	vapor-50 ppm ceiling; 125 mg/m3 ceiling
Director's List of Hazardous Substances:	listed
Florida - Hazardous Substances List:	listed
Massachusetts - Right-to-Know List:	listed
Minnesota - Haz. Subs. List:	listed (particulate and vapor)
New Jersey - Right-to-Know List (Total):	Present greater than 1.0%
Pennsylvania Right-to-Know List:	environmental hazard

Canadian Regulations: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required.

WHMIS Information: D2A - material has potential toxic effects. Refer elsewhere in the MSDS for specific warnings and safe handling information. Refer to the employer's workplace education program.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986): The normal consumer use of this product does not result in exposure to chemicals known to the state of California to cause Cancer and/or reproductive harm above the significant risk level for carcinogens or the maximum allowable dose levels for reproductive toxins. Warnings are not required for consumer packaging. However, industrial or other occupational use of this product at higher frequency and using larger quantities of this product may result in exposures exceeding these levels and are labeled accordingly.

California SCAQMD Rule 443.1 (South Coast Air Quality Management District Rule 443.1, Labeling of Materials Containing Organic Solvents):

VOC: Vapor pressure 0.06 mmHg at 20°C
1113.38 g/l

16. OTHER INFORMATION

Contact: Thomas Cholke Phone: (847) 559-2225

Old World Industries, Inc. makes no warranty, representation or guarantee as to the accuracy, sufficiency or completeness of the material set forth herein. It is the user's responsibility to determine the safety, toxicity and suitability of his own use, handling and disposal of this product. Since actual use by others is beyond our control, no warranty, expressed or implied, is made by Old World Industries, Inc. as to the effects of such use, the results to be obtained or the safety and toxicity of this product, nor does Old World Industries, Inc. assume liability arising out of the use by others of this product referred to herein. The data in this MSDS relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

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1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ULTRA LOW SULFUR DIESEL FUEL

Material Safety Data Sheet

bp

1. Chemical product and company identification

Product name	ULTRA LOW SULFUR DIESEL (ULSD) FUEL Whiting Refinery & Toledo Refinery
MSDS #	0000003588
Historic MSDS #:	None.
Code	0000003588
Product use	Fuel.
Supplier	BP Products North America Inc. 150 West Warrenville Road Naperville, Illinois 60563-8460 USA
EMERGENCY HEALTH INFORMATION:	1 (800) 447-8735 Outside the US: +1 703-527-3887 (CHEMTREC)
EMERGENCY SPILL INFORMATION:	1 (800) 424-9300 CHEMTREC (USA)
OTHER PRODUCT INFORMATION	1 (866) 4 BP - MSDS (866-427-6737 Toll Free - North America) email: bpcares@bp.com

2. Composition/information on ingredients

Ingredient name	CAS #	% by weight
Petroleum distillates	8008-20-6	100

3. Hazards identification

Physical state	Liquid.
Color	Amber. to Various colors.
Emergency overview	WARNING! COMBUSTIBLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED. ASPIRATION HAZARD. HARMFUL OR FATAL IF LIQUID IS ASPIRATED INTO LUNGS. CAUSES SKIN IRRITATION. MAY CAUSE RESPIRATORY TRACT IRRITATION. INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS, AND NAUSEA, AND MAY LEAD TO UNCONSCIOUSNESS. Do not ingest. If ingested do not induce vomiting. Avoid contact with eyes, skin and clothing. Do not breathe vapor or mist. Keep away from heat, sparks and flame. Keep container closed. Use with adequate ventilation. Use only with adequate ventilation Wash thoroughly after handling.
Routes of entry	Dermal contact. Eye contact. Inhalation. Ingestion.
Potential health effects	
Eyes	Slightly irritating to the eyes.
Skin	Causes skin irritation.

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ULTRA LOW SULFUR DIESEL FUEL

Inhalation	May cause respiratory tract irritation. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. See toxicological Information (section 11).
Ingestion	Harmful if swallowed. Aspiration hazard if swallowed -- harmful or fatal if liquid is aspirated into lungs. See toxicological Information (section 11).
Medical conditions aggravated by over-exposure	None identified.

See toxicological Information (section 11).

4. First aid measures

Eye contact	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.
Skin contact	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Inhalation	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion	If swallowed, do NOT induce vomiting. Never give anything by mouth to an unconscious person. Aspiration hazard if swallowed- can enter lungs and cause damage. Get medical attention immediately.

5. Fire-fighting measures

Flammability of the product	Combustible liquid.
Flash point	51.667 °C (Closed cup) Tagliabue.
Explosion limits	Lower: 0.6 % Upper: 7.5 %
Products of combustion	These products are carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide).
Unusual fire/explosion hazards	Combustible liquid and vapor. Vapor may cause flash fire. Vapors may accumulate in low or confined areas, travel considerable distance to source of ignition and flash back. Runoff to sewer may create fire or explosion hazard. Explosive in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.
Fire-fighting media and instructions	In case of fire, use water fog, foam, dry chemicals, or carbon dioxide. DO NOT FIGHT FIRE WHEN IT REACHES MATERIAL. Withdraw from fire and let it burn. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. First move people out of line-of-sight of the scene and away from windows. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.
Protective clothing (fire)	Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.
Special remarks on fire hazards	Do not use water jet.

6. Accidental release measures

Personal precautions	Immediately contact emergency personnel. Eliminate all ignition sources. Keep unnecessary personnel away. Use suitable protective equipment (See Section: "Exposure controls/personal protection"). Follow all fire fighting procedures (See Section: "Fire-fighting measures"). Do not touch or walk through spilled material.

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ULTRA LOW SULFUR DIESEL FUEL

Environmental precautions and clean-up methods	If emergency personnel are unavailable, contain spilled material. For small spills add absorbent (soil may be used in the absence of other suitable materials) and use a non-sparking or explosion proof means to transfer material to a sealed, appropriate container for disposal. For large spills dike spilled material or otherwise contain material to ensure runoff does not reach a waterway. Place spilled material in an appropriate container for disposal. Avoid contact of spilled material with soil and prevent runoff entering surface waterways. See Section 13 for Waste Disposal Information.
Personal protection in case of a large spill	Splash goggles. Chemical resistant protective suit. Vapor respirator. Boots. Gloves. CAUTION: The protection provided by air-purifying respirators is limited. Use a positive pressure air-supplied respirator if there is any potential for an uncontrolled release, if exposure levels are not known, or if concentrations exceed the protection limits of air-purifying respirator. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

7. Handling and storage

Handling	Aspiration hazard if swallowed- can enter lungs and cause damage. Never siphon by mouth. Do not ingest. If ingested do not induce vomiting. When using do not eat, drink or smoke. Avoid contact with skin and clothing. Avoid prolonged or repeated contact with skin. Avoid contact with eyes. Use only with adequate ventilation Avoid breathing vapor or mist. Keep away from heat, sparks and flame. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling. Empty containers may contain harmful, flammable/combustible or explosive residue or vapors. Do not cut, grind, drill, weld, reuse or dispose of containers unless adequate precautions are taken against these hazards.
Storage	Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Store and use only in equipment/containers designed for use with this product.

8. Exposure controls/personal protection

Occupational exposure limits

Ingredient name	Occupational exposure limits
Petroleum distillates	**ACGIH TLV (United States, 1/2006). Skin** TWA: 200 mg/m³ 8 hour(s).

Control Measures	Provide exhaust ventilation or other engineering controls to keep the relevant airborne concentrations below their respective occupational exposure limits. In accordance with good industrial hygiene and safety work practices, airborne exposures should be controlled to the lowest extent practicable.
Hygiene measures	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period.
Personal protection	
Eyes	Avoid contact with eyes. Safety glasses with side shields.
Skin and body	Avoid contact with skin and clothing. Wear suitable protective clothing.
Respiratory	Use only with adequate ventilation Do not breathe vapor or mist. If ventilation is inadequate, use a NIOSH certified respirator with an organic vapor cartridge and P95 particulate filter. CAUTION: The protection provided by air-purifying respirators is limited. Use a positive pressure air-supplied respirator if there is any potential for an uncontrolled release, if exposure levels are not known, or if concentrations exceed the protection limits of air-purifying respirator.

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ULTRA LOW SULFUR DIESEL FUEL

Hands	Wear gloves that cannot be penetrated by chemicals or oil.
	The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.
	Consult your supervisor or S.O.P. for special handling directions

Consult local authorities for acceptable exposure limits.

9. Physical and chemical properties

Physical state	Liquid.
Odor	Petroleum
Color	Amber. to Various colors.
Heat of combustion	Not available.
Boiling point / Range	171.11 to 357.22 °C
Specific gravity	<1 (Water = 1)
Solubility	negligible <0.1%
Viscosity	Kinematic: 1.8 to 3.6 mm^2/s (1.8 to 3.6 cSt) at 37.778°C

10. Stability and reactivity

Stability and reactivity	Stable under recommended storage and handling conditions (See Section: "Handling and storage").
Conditions to avoid	Keep away from heat, sparks and flame. Avoid all possible sources of ignition (spark or flame).
Incompatibility with various substances	Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis. halogenated compounds.
Hazardous decomposition products	These products are carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide)
Hazardous polymerization	Will not occur.

11. Toxicological information

Acute toxicity	Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.
Chronic toxicity	
Carcinogenic effects	No component of this product at levels greater than 0.1% is identified as a carcinogen by ACGIH or the International Agency for Research on Cancer (IARC). No component of this product present at levels greater than 0.1% is identified as a carcinogen by the U.S. National Toxicology Program (NTP) or the U.S. Occupational Safety and Health Act (OSHA).
Other chronic toxicity data	Middle distillate: From skin-painting studies of petroleum distillates of similar composition and distillate range, it has been shown that these types of materials often possess weak carcinogenic activity in laboratory animals. In these tests, the material is painted on the shaved backs of mice twice a week for their lifetime. The material is not washed off between applications. Therefore, there may be a potential risk of skin cancer from prolonged or repeated skin contact with this product in the absence of good personal hygiene. This particular product has not been tested for carcinogenic activity, but we have chosen to be cautious in light of the findings with other distillate streams.

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ULTRA LOW SULFUR DIESEL FUEL

Occasional skin contact with this product is not expected to have serious effects, but good personal hygiene should be practiced and repeated skin contact avoided. This product can also be expected to produce skin irritation upon prolonged or repeated skin contact. Personal hygiene measures taken to prevent skin irritation are expected to be adequate to prevent risk of skin cancer.

Diesel exhaust particulates have been classified by the National Toxicological Program (NTP) to be a reasonably anticipated human carcinogen. Exposure should be minimized to reduce potential risk.

12. Ecological information

Ecotoxicity	Toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.
Mobility	Spillages may penetrate the soil causing ground water contamination.
Bioaccumulative potential	This product is not expected to bioaccumulate through food chains in the environment.
Other ecological information	Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

13. Disposal considerations

Waste information	Avoid contact of spilled material and runoff with soil and surface waterways. Consult an environmental professional to determine if local, regional or national regulations would classify spilled or contaminated materials as hazardous waste. Use only approved transporters, recyclers, treatment, storage or disposal facilities. Dispose of in accordance with all applicable local and national regulations.

Consult your local or regional authorities.

14. Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	NA1993	Diesel Fuel	Combustible liquid.	III	----	Reportable quantity 100 lbs. (45.36 kg)
TDG Classification	UN1202	Gas oil	3	III		Not determined.
IMDG Classification	UN1202	Gas oil	3	III		Not determined.
IATA Classification	UN1202	Gas oil	3	III		Not determined.

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ULTRA LOW SULFUR DIESEL FUEL

15. Regulatory information

U.S. Federal regulations

US INVENTORY (TSCA): In compliance.

This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

SARA 311/312 MSDS distribution - chemical inventory - hazard identification: ULTRA LOW SULFUR DIESEL (ULSD) FUEL: Fire hazard, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard

SARA 313

Form R - Reporting requirements

This product does not contain any hazardous ingredients at or above regulated thresholds.

Supplier notification

This product does not contain any hazardous ingredients at or above regulated thresholds.

CERCLA Sections 102a/103 Hazardous Substances (40 CFR Part 302.4):: This material is not regulated under CERCLA Sections 103 and 107.

State regulations

Massachusetts RTK:Straight run kerosine
New Jersey:Straight run kerosine
Pennsylvania RTK:Straight run kerosine (generic environmental hazard)

California Prop 65: No products were found

Prop 65 chemicals will result under certain conditions from the use of this material. For example, burning fuels produces combustion products including diesel exhaust, a Prop 65 carcinogen, and carbon monoxide, a Prop 65 reproductive toxin.

Inventories

AUSTRALIAN INVENTORY (AICS): Not determined.

CANADA INVENTORY (DSL): In compliance.

CHINA INVENTORY (IECS): Not determined.

EC INVENTORY (EINECS/ELINCS): Not determined.

JAPAN INVENTORY (ENCS): Not determined.

KOREA INVENTORY (ECL): Not determined.

PHILIPPINE INVENTORY (PICCS): Not determined.

16. Other information

Label requirements

WARNING!

COMBUSTIBLE LIQUID AND VAPOR.
VAPOR MAY CAUSE FLASH FIRE.
HARMFUL IF SWALLOWED.
ASPIRATION HAZARD.
HARMFUL OR FATAL IF LIQUID IS ASPIRATED INTO LUNGS.
CAUSES SKIN IRRITATION.
MAY CAUSE RESPIRATORY TRACT IRRITATION.
INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS, AND NAUSEA, AND MAY LEAD TO UNCONSCIOUSNESS.

HMIS® Rating :

Health	0	*
Flammability	2	
Physical Hazard	0	
Personal protection	X	

National Fire Protection Association (U.S.A.)



History

Date of issue 07/05/2006.

1.9 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS SHEET FOR ULTRA LOW SULFUR DIESEL FUEL

Date of previous issue	No Previous Validation.
Prepared by	Product Stewardship

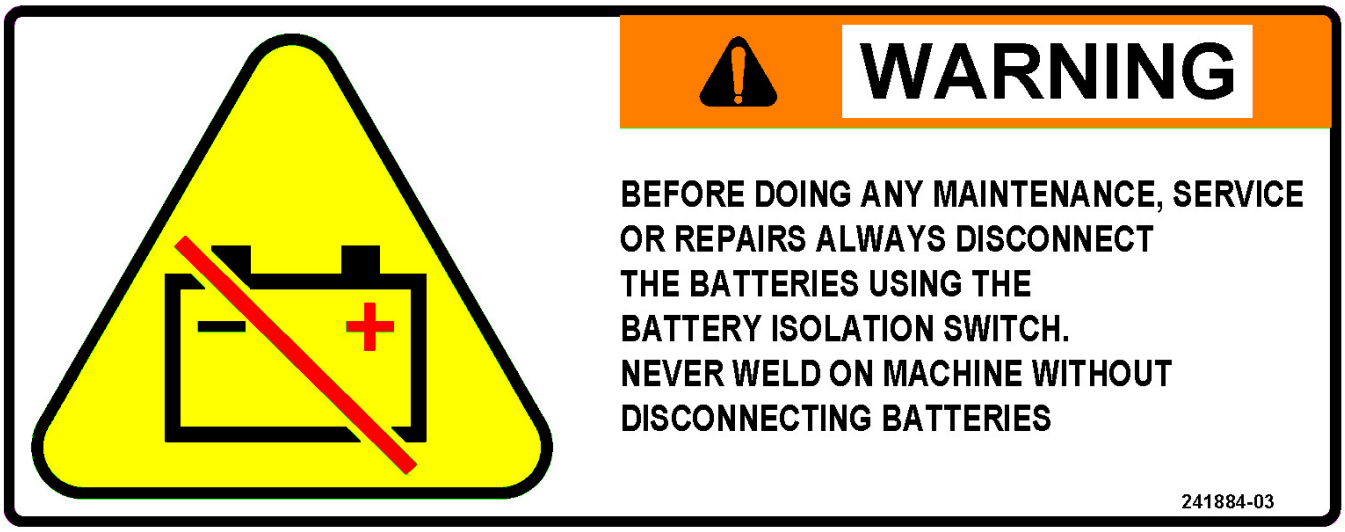
Notice to reader

NOTICE : This Material Safety Data Sheet is based upon data considered to be accurate at the time of its preparation. Despite our efforts, it may not be up to date or applicable to the circumstances of any particular case. We are not responsible for any damage or injury resulting from abnormal use, from any failure to follow appropriate practices or from hazards inherent in the nature of the product.

1.10 DECALS

The SB-2500ex has been equipped with various safety decals placed in various locations on the machine. These decals have been applied for the safety of everyone involved with this machine. Every single person that has anything to do with this machine must thoroughly examine the entire machine and read every safety decal that has been placed on it.

The following is a listing of safety decals that can be found on the machine along with a brief description of each. Read this entire listing and refer back to it if you have any question about a decal.

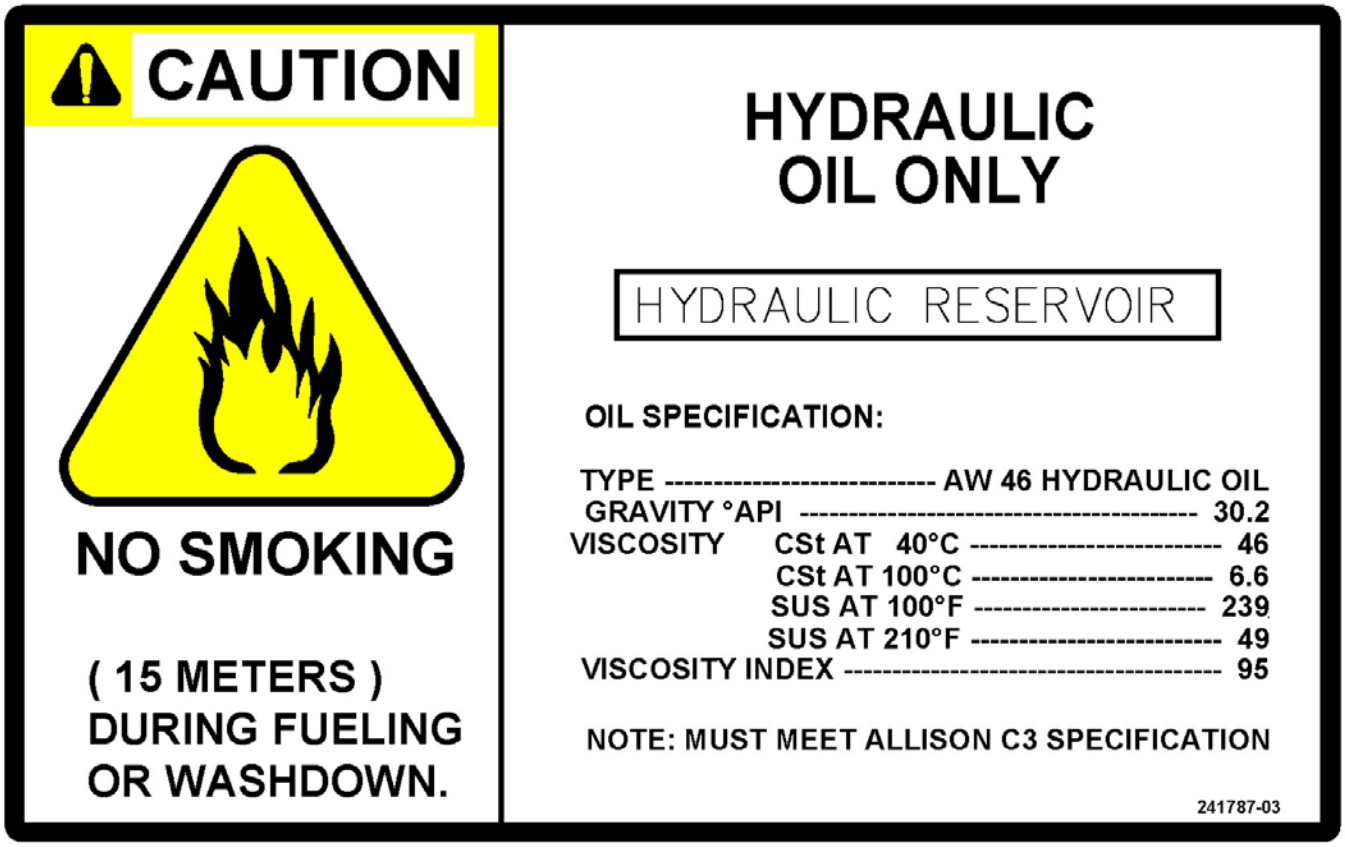


This decal can be found around the machine's batteries and indicates that one should disconnect the machine's batteries using the battery isolation switches (quick disconnects) before doing any type of maintenance, service or repair on the machine. Always disconnect the batteries before welding on the machine.

1.10 DECALS



This decal can be found on the hydraulic tank, next to the hydraulic tank sight glass. What this decal is indicating is that the hydraulic fluid should not drop below or filled past the indication line. This is done to avoid overflowing of the tank due to heat expansion of the fluid.



This decal can be found on the hydraulic tank. It specifies exactly what type of hydraulic fluid is to be added to the hydraulic tank in order to ensure proper function of the hydraulic system.

1.10 DECALS



This decal can be found on all three conveyors (C-1, C-2 & C-3). It is positioned next to the conveyor chain tension view slot for each conveyor. The bottom corner of the conveyor flights should stay within the limits of the blue line in order for the conveyor chain tensioned properly.

DANGER When checking or adjusting the conveyor chains, machine must be shut down with engine not running

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This decal can be found on all conveyors. It is cautioning to not adjust conveyor while engine is running.

1.10 DECALS



This decal can be found at various locations around the machine. It is indicating that hearing protection must be worn to prevent one's hearing from being damaged by loud noises.



This decal is affixed to the sides of the machine and indicates that loud noises produced during operation of the machine can reach 123 dB(A). Noises that reach 123 dB(A) can damage one's hearing so it is absolutely necessary that hearing protection be worn at all times.

1.10 DECALS



This decal is affixed to the side of the C-3 conveyor. It is indicating that no one should stand near the conveyor discharge area since material that is being discharged from the conveyor could hit someone causing them severe personal injury or even death.



This decal can be found in various locations around the machine and is indicating that a particular area of the machine can pin or crush a person. Stand clear of these areas while the machine is in operation to avoid being seriously injured or even killed.

1.10 DECALS



This decal is affixed to the machine in various locations. It is warning anyone who is going to be working on the machine to set all the safety bars in the support position. The C-1conveyor is equipped with support safety bars as well as the engine compartment hood lift cylinders. Be sure to set all these support bars when working around or under these areas to help prevent falling components from causing severe injury or even death.



This decal is located on the fuel tank and near the washdown hose. It is indicating that there is to be no smoking or open flames within 50 feet (15 meters) of the machine while fueling or during washdown. Diesel fuel is highly flammable please pay particular attention to this warning to prevent any accidents.

1.10 DECALS



This decal is located in various locations around the machine. It is affixed close to moving components that could pinch a person and cause them severe injury. Please take notice of surrounding components when one of these decals is seen.

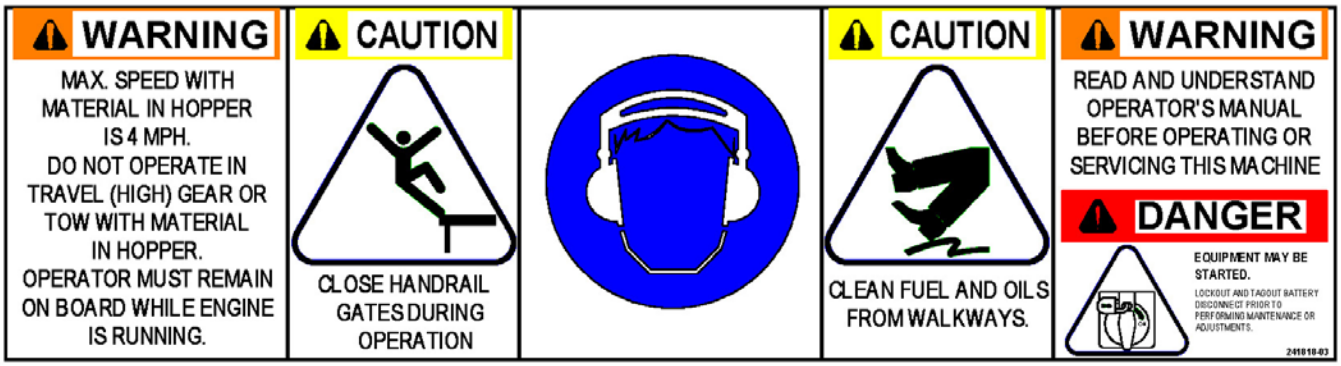


This decal is affixed to the machine just above each one of the machines wheels. This decal is stating that everyone must stay clear of these areas while the machine is in operation. It is also stating that the tires must be inflated to 75 psi. (517 kPa) as to avoid premature tire failure.

1.10 DECALS



This decal can be found around areas such as the C-1 and C-3 conveyor service points as well as the engine compartment. It is warning of a burn hazard in an area and that the machine should be allowed to cool before attempting to service it.



This decal can be found at the operator's station. It includes a variety of warnings that should be strictly followed. First it is warning that the maximum travel speed of the machine with material in the hopper must not exceed 4 miles per hour. It is also warning to not operate in travel (high) gear or tow (transport) the machine with material in the hopper. And the operator must remain on board the machine while the engine is running.

This decal is cautioning to install the handrail safety bars in order to help prevent one from falling from the machine. It is also cautioning that hearing protection should be worn since loud noises that are produced by the machine can reach 123 dB(A) with average noise levels at the operator's station being around 92 dB(A). This decal is also cautioning that all fuel and oils be cleaned from the walkways to help prevent one from slipping and falling.

This decal is also warning that anyone who is to operate or service this machine must read and understand the operator's manual.

This decal is also indicating the danger of the engine starting and that the battery disconnect should be locked out and tagged out before performing any maintenance or adjustments to the machine.

1.10 DECALS



This decal can be found in areas of the machine that pose a possible entanglement hazard. They are affixed to the hopper area warning of the danger of a person becoming entangled in machine components while the machine is in operation and to keep clear. It is also warning people to not wear loose clothing, jewelry or long hair around this area. Please read and strictly follow the warnings of this decal to prevent severe injury or even death.

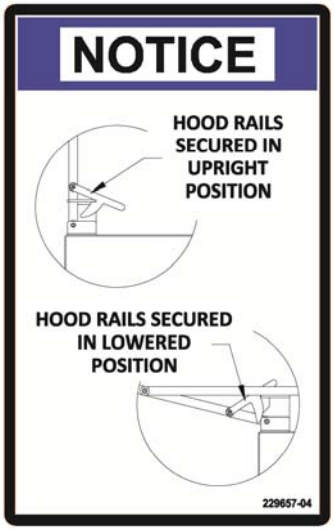


This decal can be found on both sides of the machine. It is cautioning all unauthorized personnel and bystanders to keep 16.5 feet (5 meters) away from the machine.



This decal can be found at the operator platform. It is giving notice of the requirement to lower the hood rails before shipping the machine or while opening the hood.

1.10 DECALS



This decal can be located at the operator's platform. It is illustrating how to secure the hood rails in the upright and lowered positions.

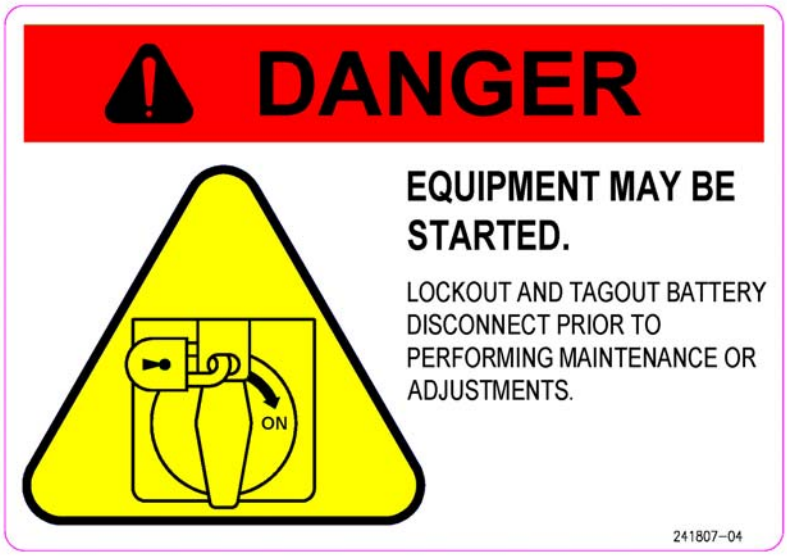


This decal can be found at the operator's platform. It is warning of the danger of a fall hazard if the handrails are not secured in the upright position before operating the machine.

1.10 DECALS

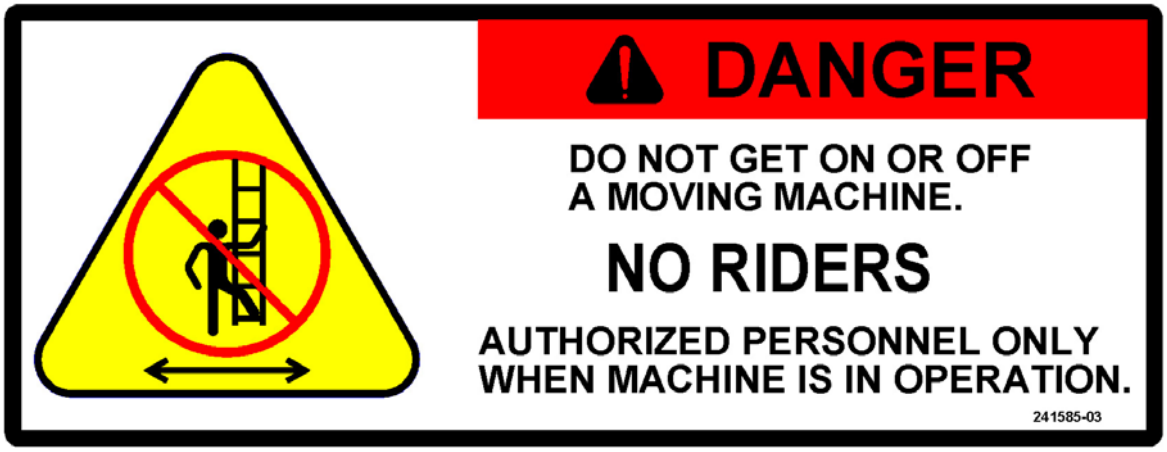


This decal can be found at various locations around the machine. It is marking the location of tie down points.



This decal can be found on the battery box lid. It is warning of the danger that the equipment may be started. It is informing that the battery disconnects must be turned to the "OFF" positions and must be locked out and tagged out before performing any maintenance or adjustments to the machine.

1.10 DECALS

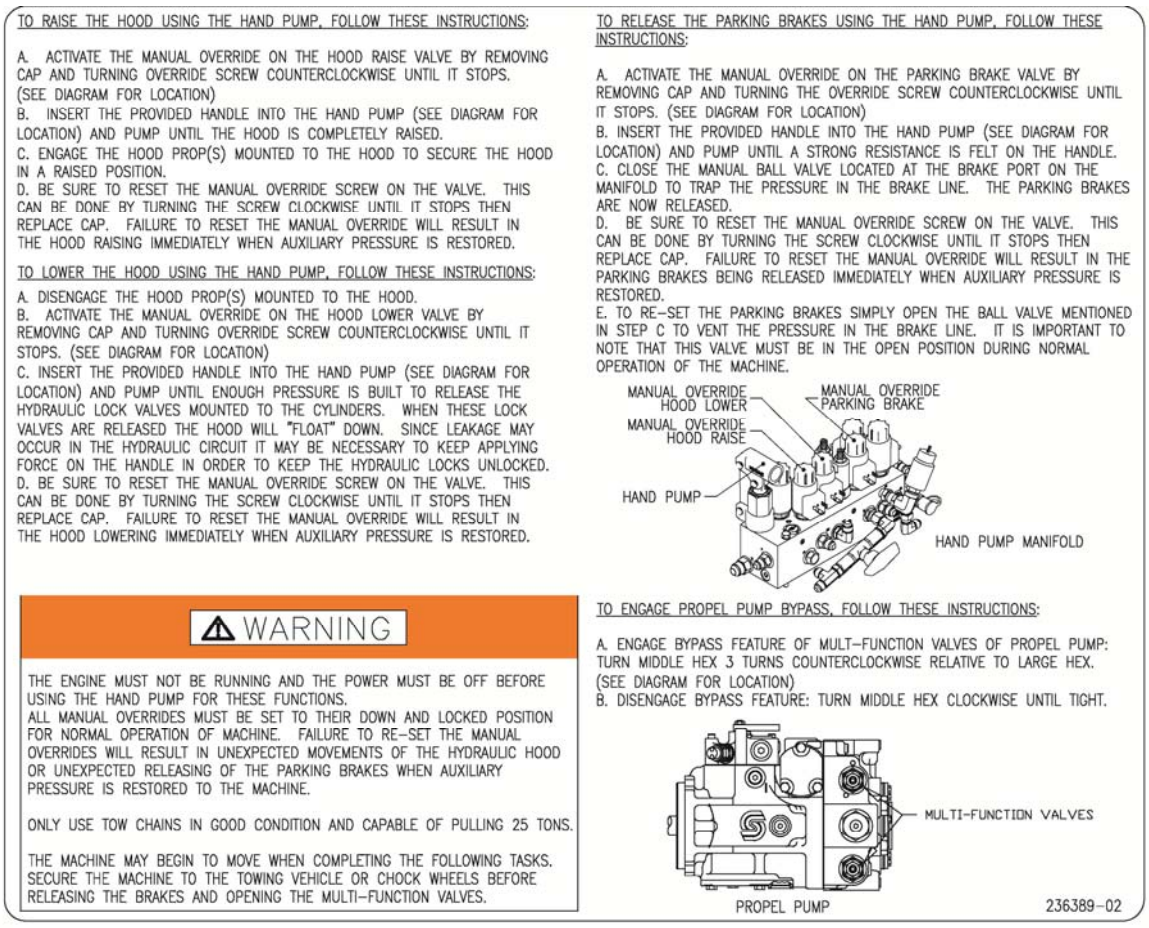


This decal can be found on the fuel tank. It is warning that there are to be no riders on the machine and that only an authorized operator is to be on the machine while it is in operation. This decal is also cautioning not to get on or off a moving machine.



This decal is located on the end of the C3 conveyor. It is designed to get attention and indicate the presence of a slow moving vehicle.

1.10 DECALS



This decal can be found on the left hand side of the machine just inside the valve stack cover plate. This decal is explaining the steps necessary to manually raise and lower the hood and how to manually release the parking brake.

This decal is also providing the following warnings:

The engine must not be running and the power must be off before using the hand pump for these functions

All manual overrides must be set to their down and locked position for normal operation of the machine. Failure to reset the manual overrides will result in the unexpected movements of the hydraulic hood or the unexpected releasing of the parking brakes when auxiliary pressure is restored to the machine.

Use only tow chains in good condition and capable of pulling 25 tons.

The machine may begin to move when completing the following tasks. Secure the machine to the towing vehicle or chock wheels before releasing the brakes and opening the multi-function valves.

1.10 DECALS



This decal can be found on the conveyors. It is warning to not move the machine or swing the C3 conveyor when a hopper insert is attached. Severe personal injury or even death can result and will most certainly damage the machine.



This decal can be found on the C3 conveyor. It is giving notice to the fact that this machine has been equipped to allow the C3 conveyor to lift an empty Roadtec built hopper insert only. Do not assume other machines have been equipped so. Do not use the C3 conveyor to lift any other objects. Use only chains or cables rated for 2 tons each.

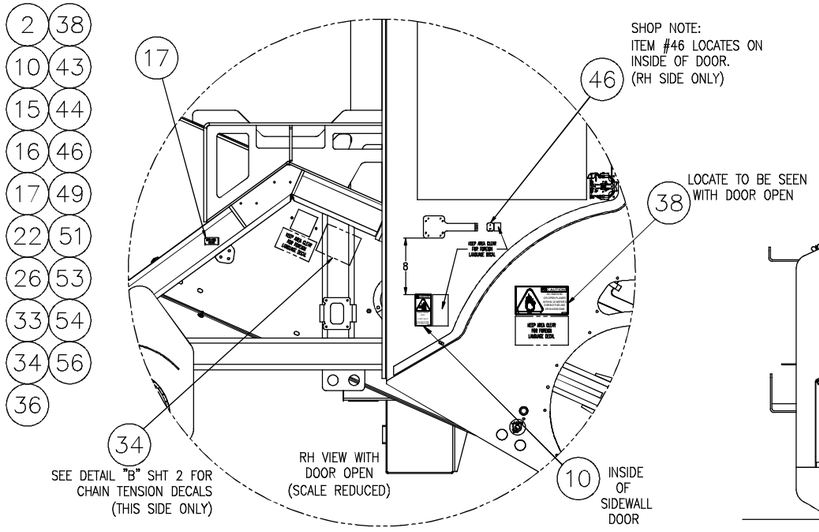
1.10 DECALS

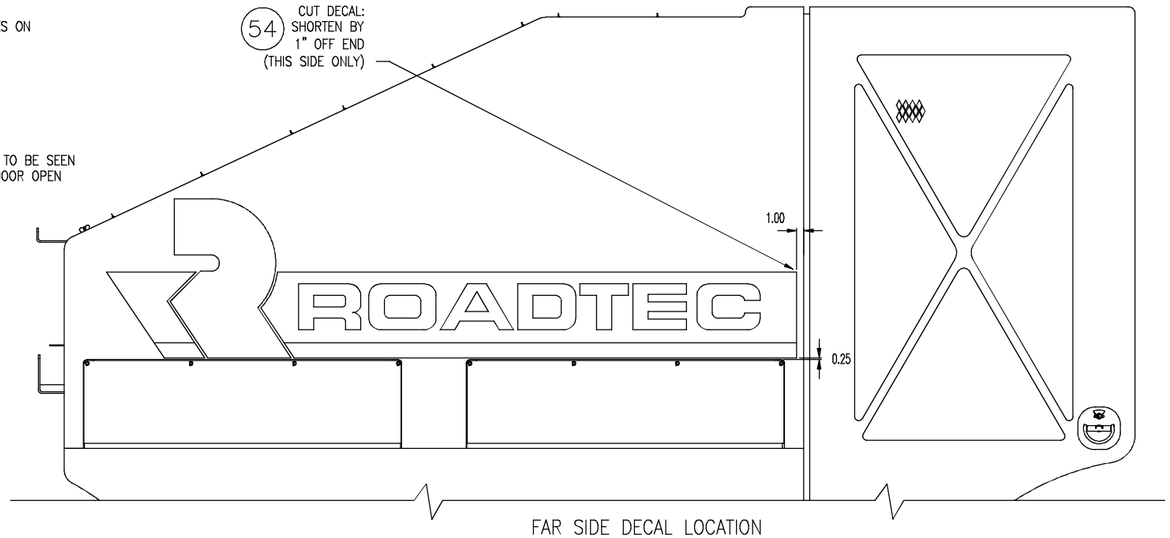


This decal can be found at the operators station. It is marking the location of the fire extinguisher.

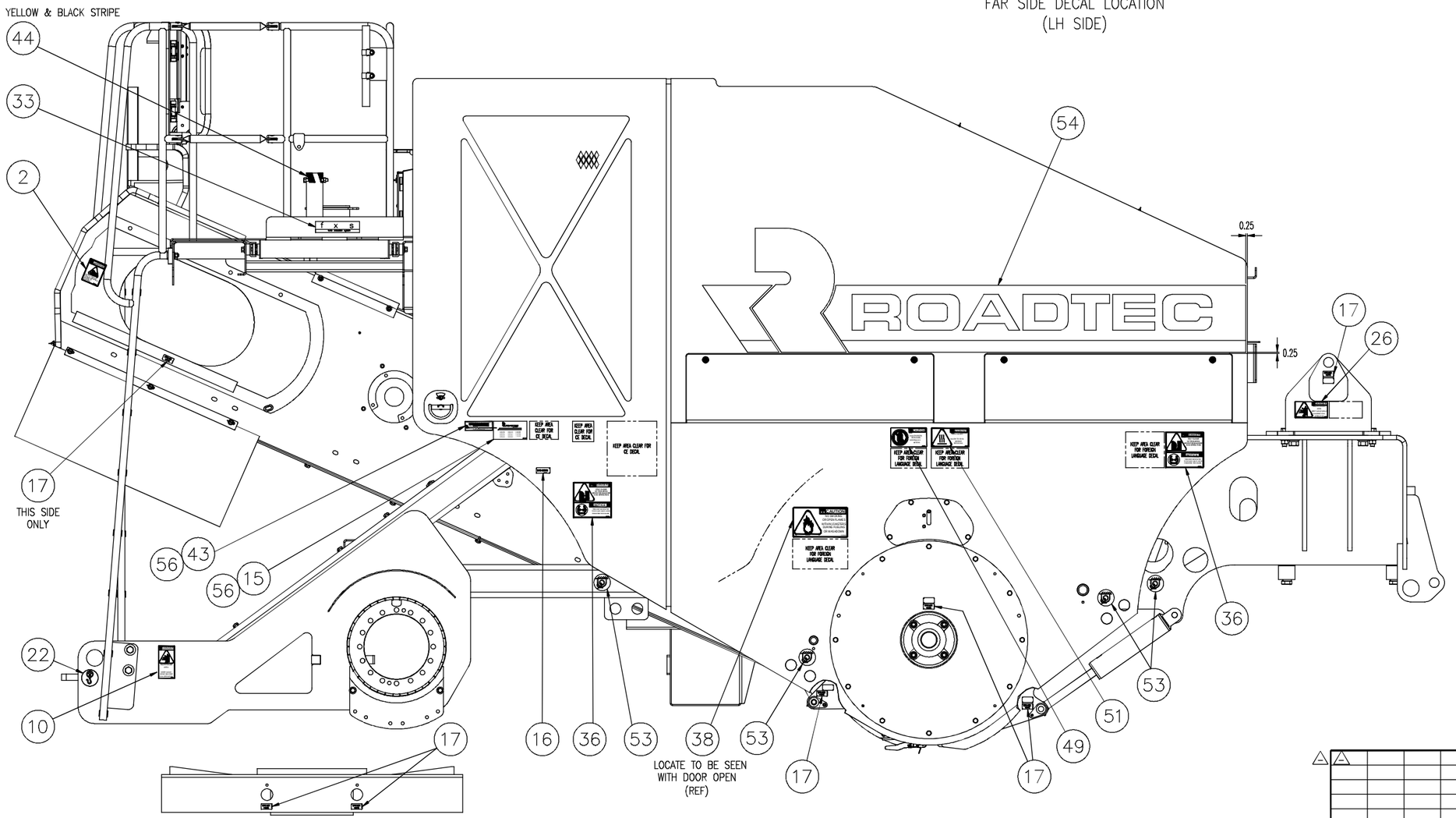


This decal can be found on the hood platform. It is warning of an explosion hazard. Do not use starting fluids.





FAR SIDE DECAL LOCATION
(LH SIDE)



REAR VIEW OF C3 PIVOT BOX

QTY	ITEM	IDENT	DESCRIPTION
1	1	236389-02	DECAL* HAND PUMP INSTRUCTIONS
6	2	241524-04	DECAL* CONVEYOR ADJUSTMENT
2	3	241798-04	DECAL* WARNING! DISCHARGE AREA
1	4	241884-03	DECAL* BATTERY WARNING
2	5	211262-04	DECAL* WARNING DISCHARGE AREA
2	6	95906-03	DECAL* AMERICAN FLAG - 8 1/4" X 15"
2	7	95875-02	DECAL* SHUTTLE BUGGY (BLUE)
7	8	211263-04	DECAL* PINCH POINT
4	9	241806-04	DANGER! CRUSH ZONE SET SAFETY SUPPORTS
6	10	211266-04	DECAL* DANGER! PINCH/CRUSH AREA
2	11	211256-04	DECAL* EAR PROTECTION
2	12	211259-04	DECAL* DANGER! PINCH/CRUSH AREA
-	13	-	-
REF	14	SEE PAINT BOM	DECAL* SB-2500e
REF	15	SEE PAINT BOM	DECAL* PATENT PLATE
1	16	99535-04	DECAL* WASHDOWN
53	17	96088-04	DECAL* GREASE HERE (1" X 2")
1	18	223987-04	DECAL* USE 50/50 WATER/ANTIFREEZE MIX
1	19	144443-04	DECAL* C3 CLEAN OUT DOOR
1	20	241814-04	DECAL* CAUTION NO SMOKING
1	21	95885-04	DECAL* DIESEL FUEL ONLY
4	22	211274-04	DECAL* TOW TIE DOWN POINT
1	23	89716-04	DECAL* SLOW MOVING SAFETY
1	24	89715-04	DECAL* FUEL
1	25	254653-01	DECAL* SB-2500E LUBE CHART
5	26	211265-04	DECAL* DANGER! PINCH/CRUSH AREA
1	27	122129-04	DECAL* FIRE EXTINGUISHER
2	28	229618-03	DECAL* C3 LIFT WARNING
2	29	250163-04	DECAL* NO STARTING FLUID-T4
-	30	-	-
-	31	-	-
1	32	211257-03	DECAL* NOTICE OIL LEVEL
2	33	135910-04	DECAL* FXS TRADEMARK
3	34	241628-03	DECAL* CHAIN TENSION GUIDE
1	35	241787-03	DECAL* HYDRAULIC TANK
4	36	241591-04	DECAL* DANGER! CRUSH & TIRE PRESSURE
2	37	241585-03	DECAL* DANGER! NO RIDERS (ON FUEL TANK)
2	38	211264-04	DECAL* CAUTION! NO SMOKING
5	39	211268-04	DECAL* DANGER! ENTANGLEMENT HAZARD
1	40	241818-03	DECAL* CENTER CONSOLE
1	41	239666-01	DECAL* VALVE LABELS (SEE VALVE LABEL NOTE)
1	42	242339-03	DECAL* VALVE LABELS (SEE VALVE LABEL NOTE)
REF	43	SEE PAINT BOM	DECAL* SERIAL NUMBER ID. PLATE
REF	44	SEE PAINT BOM	DECAL* BLACK & YELLOW CAUTION TAPE
-	45	-	-
1	46	202078-04	ON/OFF DECAL
1	47	252068-04	DECAL* CLOSE GATES, DRIVER CONSOLE
1	48	241807-04	DECAL* BATTERY LOCKOUT/TAGOUT
2	49	211276-04	DECAL* UNAUTHORIZED PERSONNAL-KEEP BACK
1	50	211269-04	DECAL* SAFE TRAVEL GRADE
7	51	211270-04	DECAL* WARNING! BURN HAZARD
1	52	211348-04	DECAL* SAFE TRAVEL GRADE
8	53	211275-04	DECAL* TIE DOWN POINT
REF	54	SEE PAINT BOM	DECAL* ROADTEC W/ R LOGO, 99"
REF	55	SEE PAINT BOM	DECAL* 3M REFLECTION TAPE DOT RED/WHITE
REF	56	SEE PAINT BOM	RIVET* GAMD45A/1/8" X 1/2"
1	57	225311-03	DECAL* DANGER ENTANGLEMENT ~ HOOD
1	58	225312-03	DECAL* DANGER FALL HAZARD ~ HOOD
1	59	225305-03	DECAL* NOTICE ~ HOOD RAILS
6	60	229652-04	DECAL* PINCH POINT
2	61	229657-04	DECAL* LATCH, HOOD HAND RAILS
2	62	229619-03	DECAL* C3 LIFT NOTICE
1	63	238791-03	DECAL* 24 VOLT ELECTRICAL SYSTEM
1	64	242320-04	DECAL* TEST PORT PROPEL
1	65	242321-04	DECAL* TEST PORT FORWARD
1	66	251820-04	DECAL * C2 CLEAN OUT DOOR

VENDOR NOTES:
-KIT TO BE ARRANGED SEQUENTIALLY BY ITEM NUMBER IN BILL
-INCLUDE (1) COPY OF THIS PAGE ON 11" X 17" PAPER IN EACH KIT

VALVE LABEL NOTE:
EACH VALVE LABEL CONTAINS MULTIPLE DECALS.
EACH DECAL HAS IT'S OWN SUB PART NUMBER.
BALLOONS FOR THESE DECALS HAVE A DECIMAL
POINT AND A NUMBER THAT CORRESPONDS TO
THE DECAL SUB PART NUMBER.

REPLACES DWG# 254652-01 EX SN 3000s

all fractional dim's ± 1/32" - all decimal dim's ± .005 unless noted

REV.	E.C.N.	DATE	REVISIONS	CH'G. BY	APPR. BY

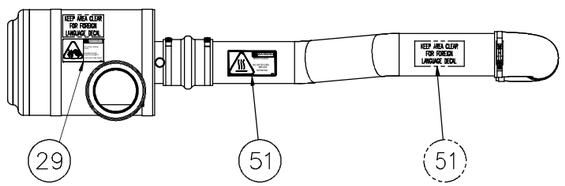
ROADTEC

PART NAME:
DECAL * KIT SB-2500ex 4K

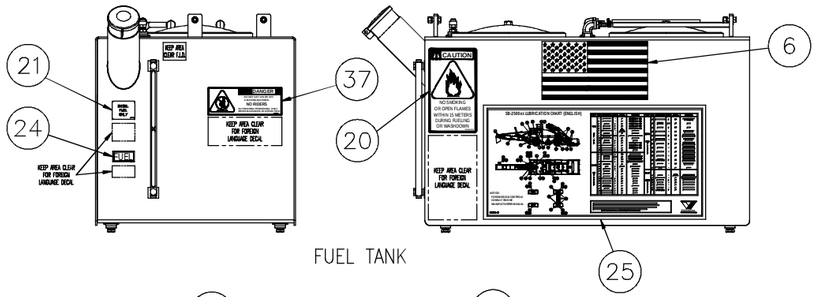
01 REQ'D PER SB2500ex | SHEET NO 1 of 6 | FAB CODE 625 | EFFECTIVE S/N

DRAWN BY BL | CHECKED BY

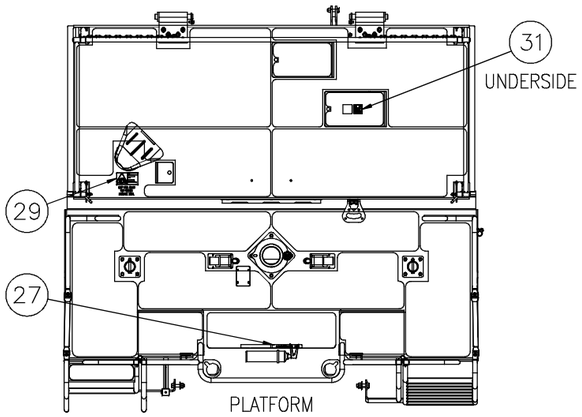
SCALE 3/32=1 | DATE 12/19/14 | DWG NO 262450-01 | REV. 0



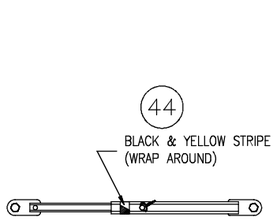
AIR INTAKE
TOP VIEW
(FROM INSIDE HOOD)



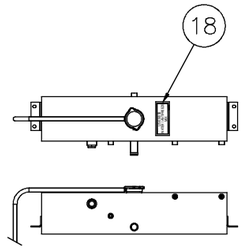
FUEL TANK



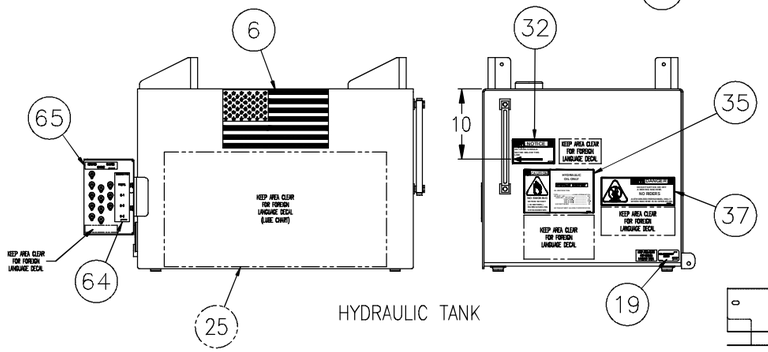
PLATFORM
TOP VIEW
(SCALE REDUCED)



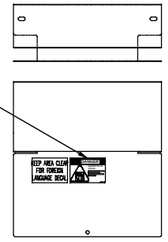
HOOD PROP



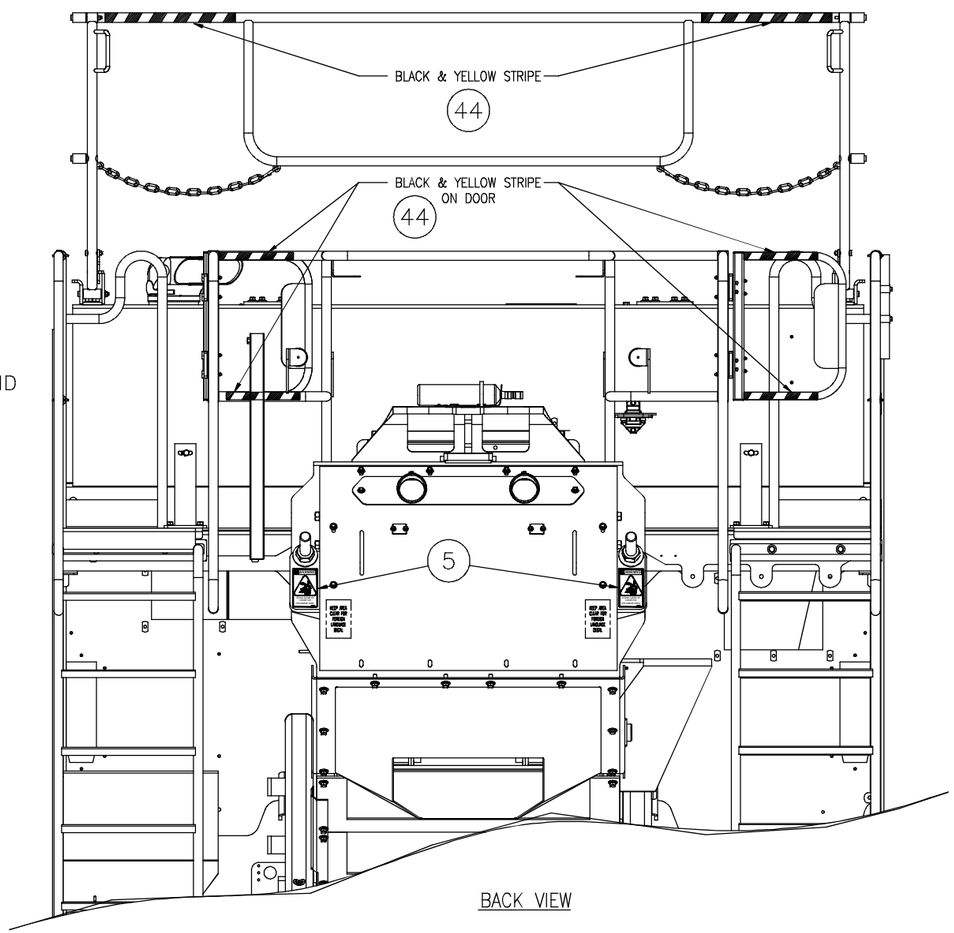
EXPANSION TANK



HYDRAULIC TANK

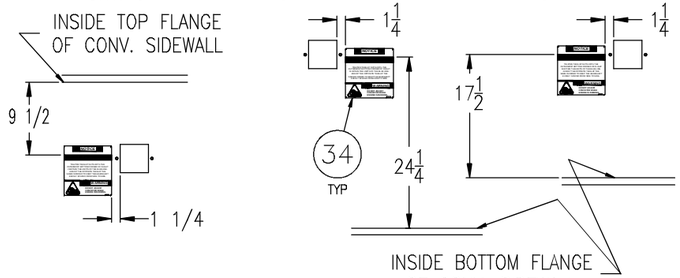


BATTERY BOX LID



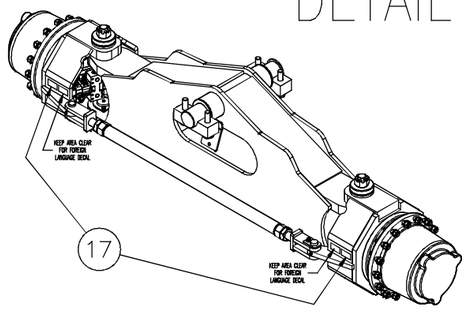
BACK VIEW

CHAIN TENSION DECAL PLACEMENT

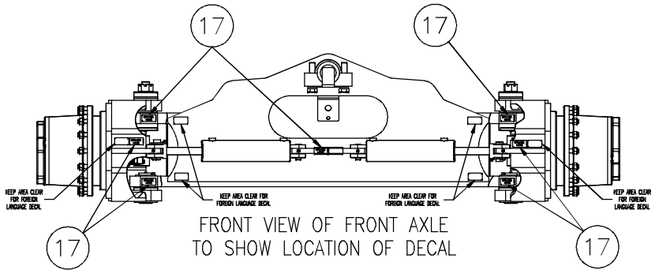


(NOT TO SCALE)

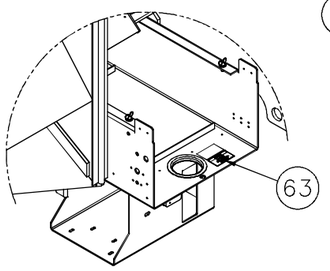
DETAIL "B"

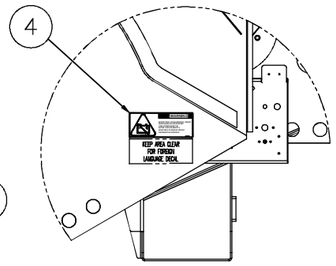


ISO VIEW BACK OF FRONT AXLE



FRONT VIEW OF FRONT AXLE
TO SHOW LOCATION OF DECAL





BATTERY BOX
(LEFT DOOR OPEN)

all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

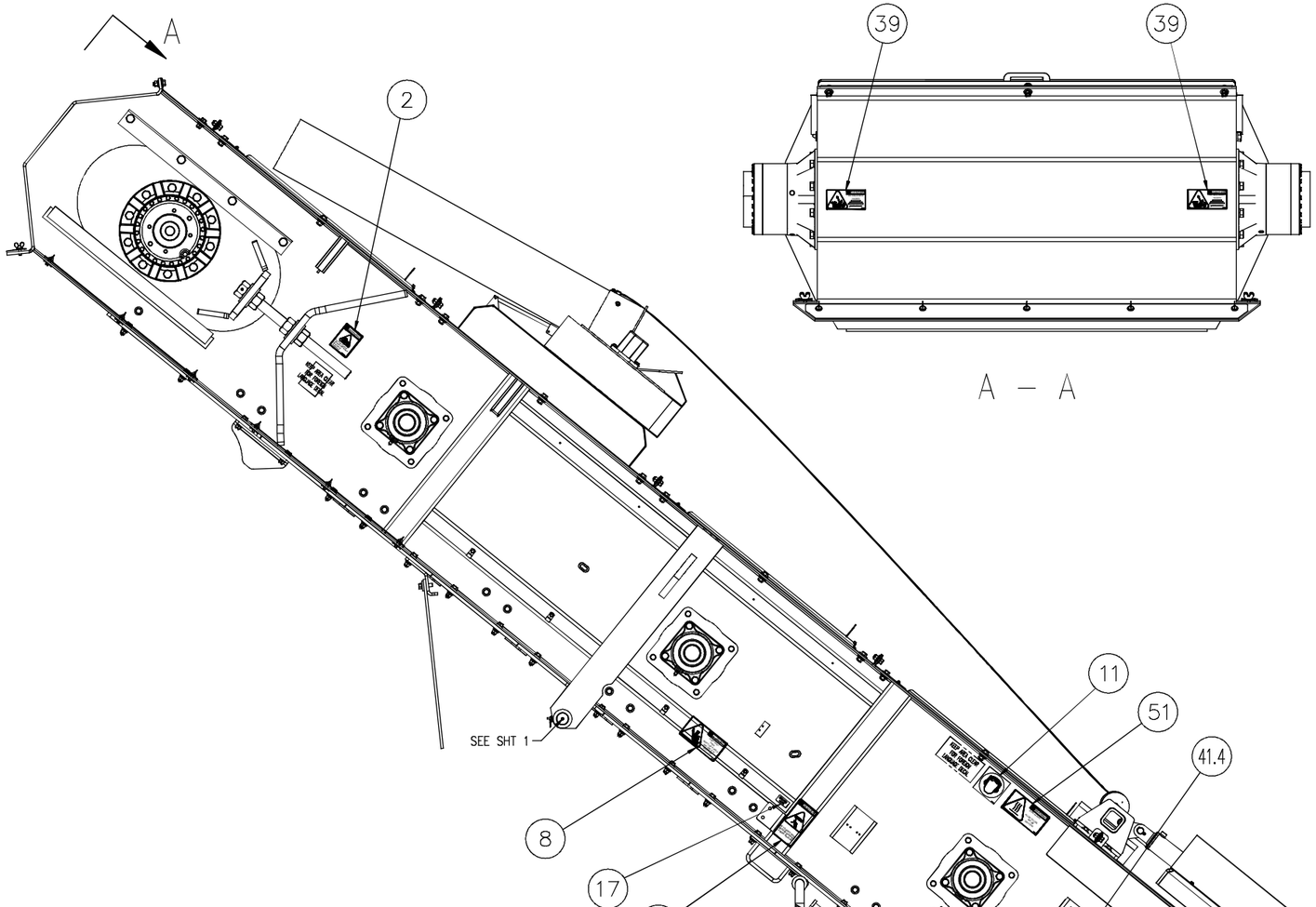
REV.	E.C.N.	DATE	REVISIONS	CH'G. BY	APPR. BY

ROADTEC

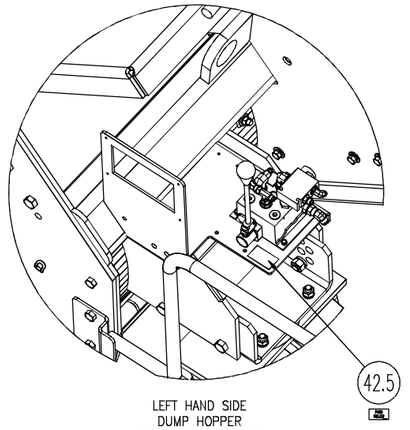
PART NAME: DECAL * KIT SB-2500ex 4K

01 REQ'D PER SB2500ex	SHEET NO 2 of 6	FAB CODE 625	EFFECTIVE S/N
DRAWN BY BL	CHECKED BY	DWG NO 262450-01	REV. 0
SCALE 3/32=1	DATE 12/19/14		

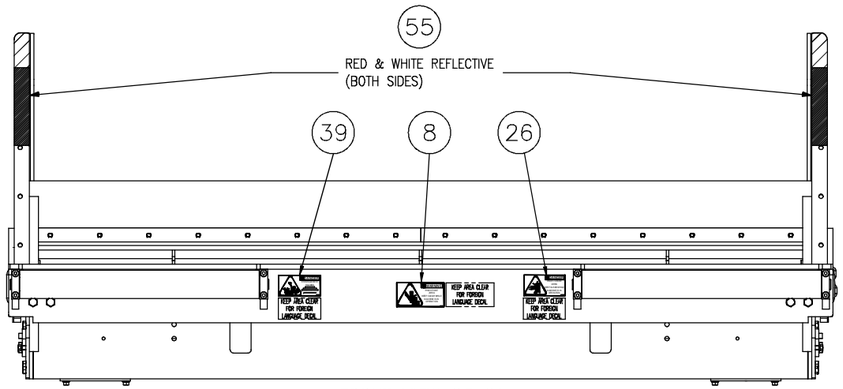
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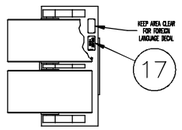
A – A



LEFT HAND SIDE
DUMP HOPPER
PUSH ROLLER VALVE



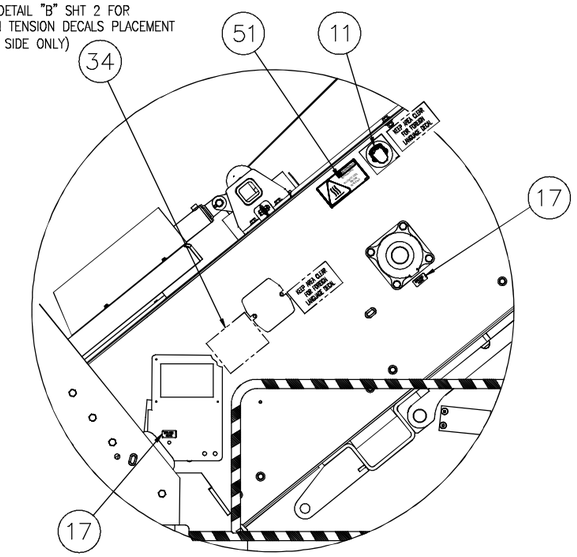
FRONT VIEW OF C1



BOTTOM VIEW OF CASTER

RH VIEW OF C1

SEE DETAIL "B" SHT 2 FOR
CHAIN TENSION DECALS PLACEMENT
(THIS SIDE ONLY)



LEFT SIDE

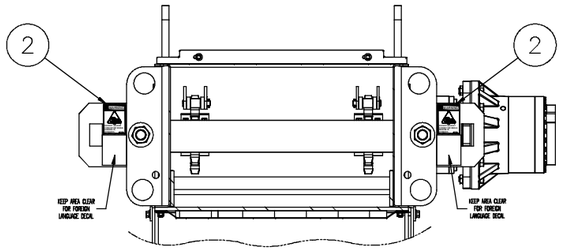
all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	E.C.N.	DATE	REVISIONS	CH'G. BY	APPR. BY

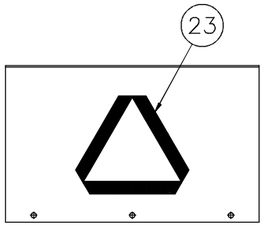
ROADTEC

PART NAME: DECAL * KIT SB-2500ex 4K

01 REQ'D PER SB2500ex	SHEET NO 3 of 6	FAB CODE 625	EFFECTIVE S/N
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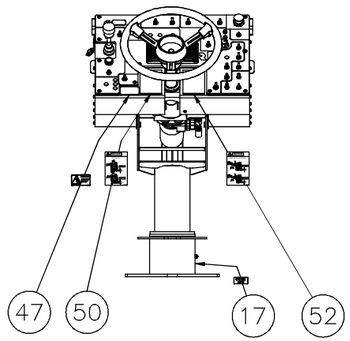


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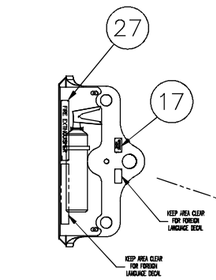


END VIEW

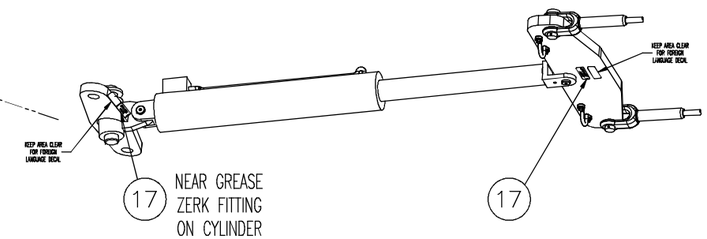
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OPERATOR'S CONSOLE

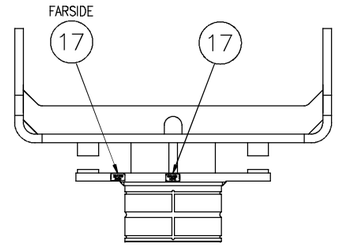


DETAIL C3 PIVOT GUARD
TOP VIEW



17 NEAR GREASE ZERK FITTING ON CYLINDER

C3 LIFT CYLINDER
BOTTOM ISO VIEW



REAR VIEW OF
C3 CONVEYOR PIVOT

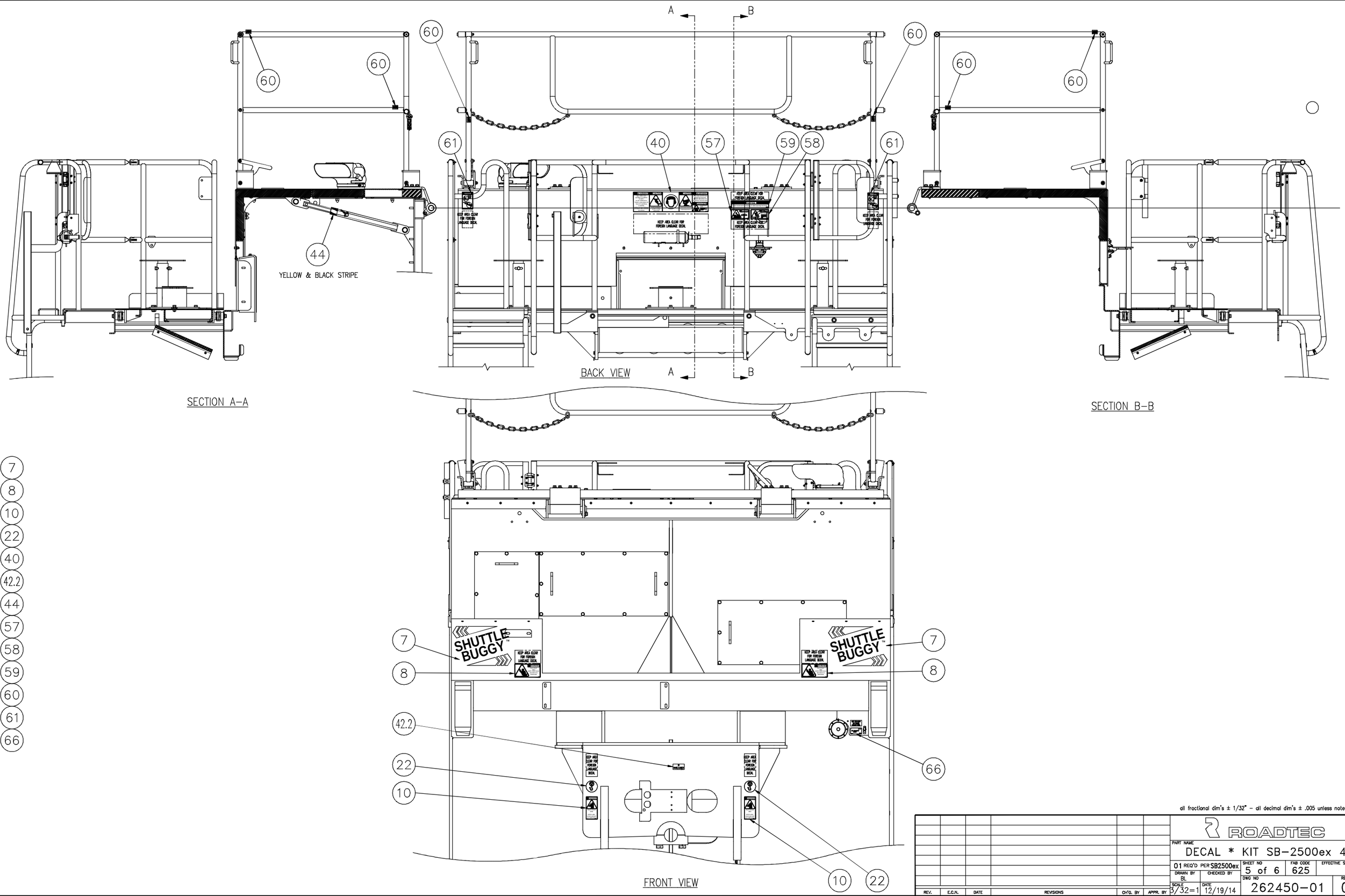
all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	E.C.N.	DATE	REVISIONS	CH'G. BY	APPR. BY

ROADTEC

PART NAME: DECAL * KIT SB-2500ex 4K

01 REQ'D PER SB2500ex	SHEET NO 4 of 6	FAB CODE 625	EFFECTIVE S/N
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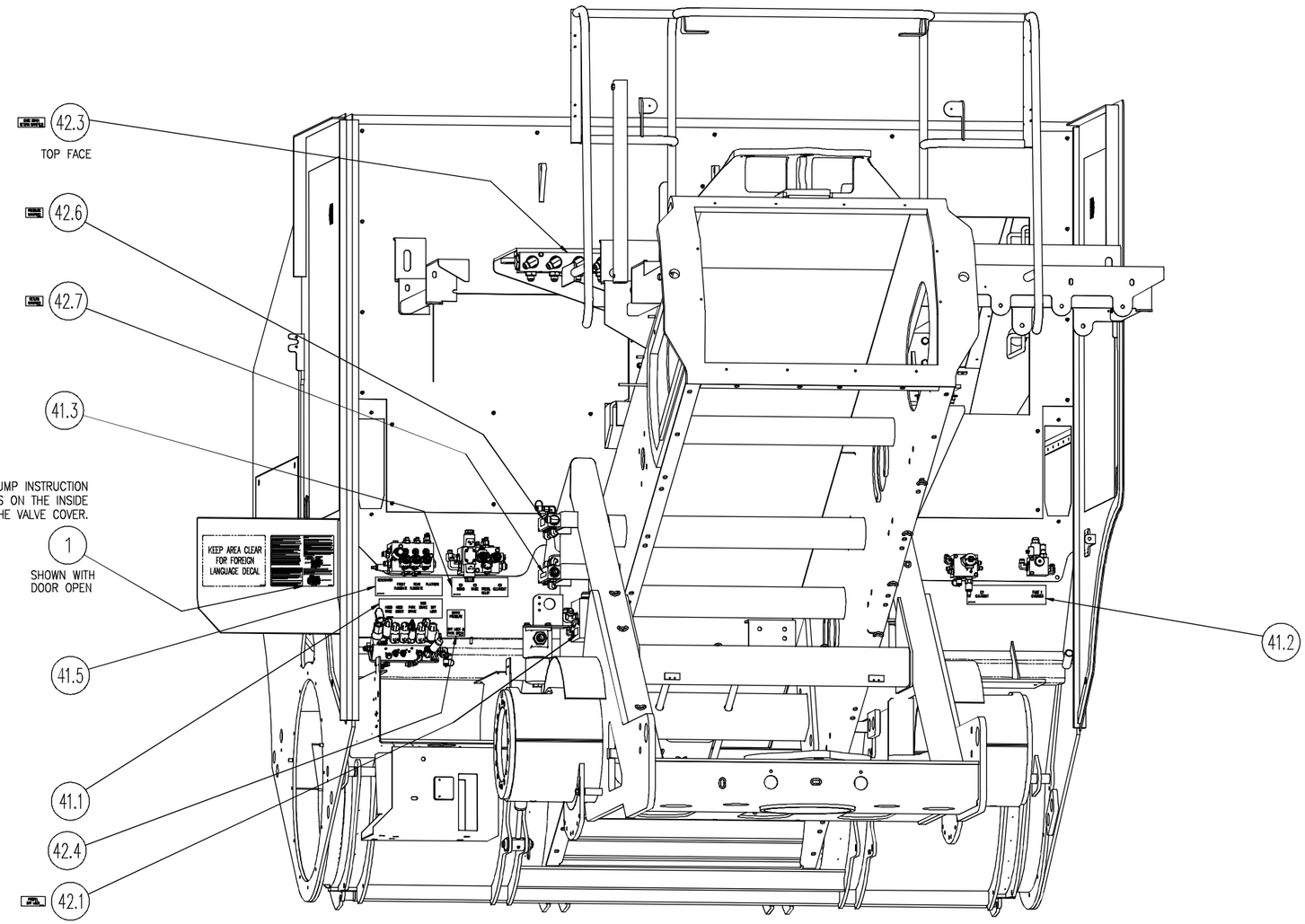
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ROADTEC

PART NAME: DECAL * KIT SB–2500ex 4K					
01 REQ'D PER SB2500ex	SHEET NO 5 of 6	FAB CODE 625	EFFECTIVE S/N		
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SCALE 3/32=1	DATE 12/19/14				

REV.	E.C.N.	DATE	REVISIONS	CH'G. BY	APPR. BY

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BACK VIEW

all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	E.C.N.	DATE	REVISIONS	CH'G. BY	APPR. BY

ROADTEC

PART NAME: DECAL * KIT SB-2500ex 4K

01 REQ'D PER SB2500ex	SHEET NO 6 of 6	FAB CODE 625	EFFECTIVE S/N
DRAWN BY BL	CHECKED BY		
SCALE 3/32=1	DATE 12/19/14	DWG NO 262450-01	REV. 0

SYSTEM DESCRIPTION

SECTION **PAGE**

2.1 ENGINE..... 91
2.2 HYDRAULIC SYSTEMS..... 93
2.3 ELECTRICAL SYSTEM..... 94

2.1 ENGINE

The SB-2500ex shuttle buggy is equipped with a Caterpillar C9, Tier III, 6-cylinder diesel engine, which is capable of producing 300 hp (224 kw) @ 1,900 rpm. This is an electronically controlled engine that is equipped with certain safety shutdowns. Malfunctions such as high engine temperature or low oil pressure will cause the engine to automatically shut down to prevent any unnecessary damage being done to the engine. The operator is supplied with instrumentation that displays certain system readings. This instrumentation includes: tach/hour meter, oil pressure gauge, and voltage meter which are all incorporated into an electronic engine diagnostic gauge. This gauge will also display certain engine fault codes in case of a engine malfunction.

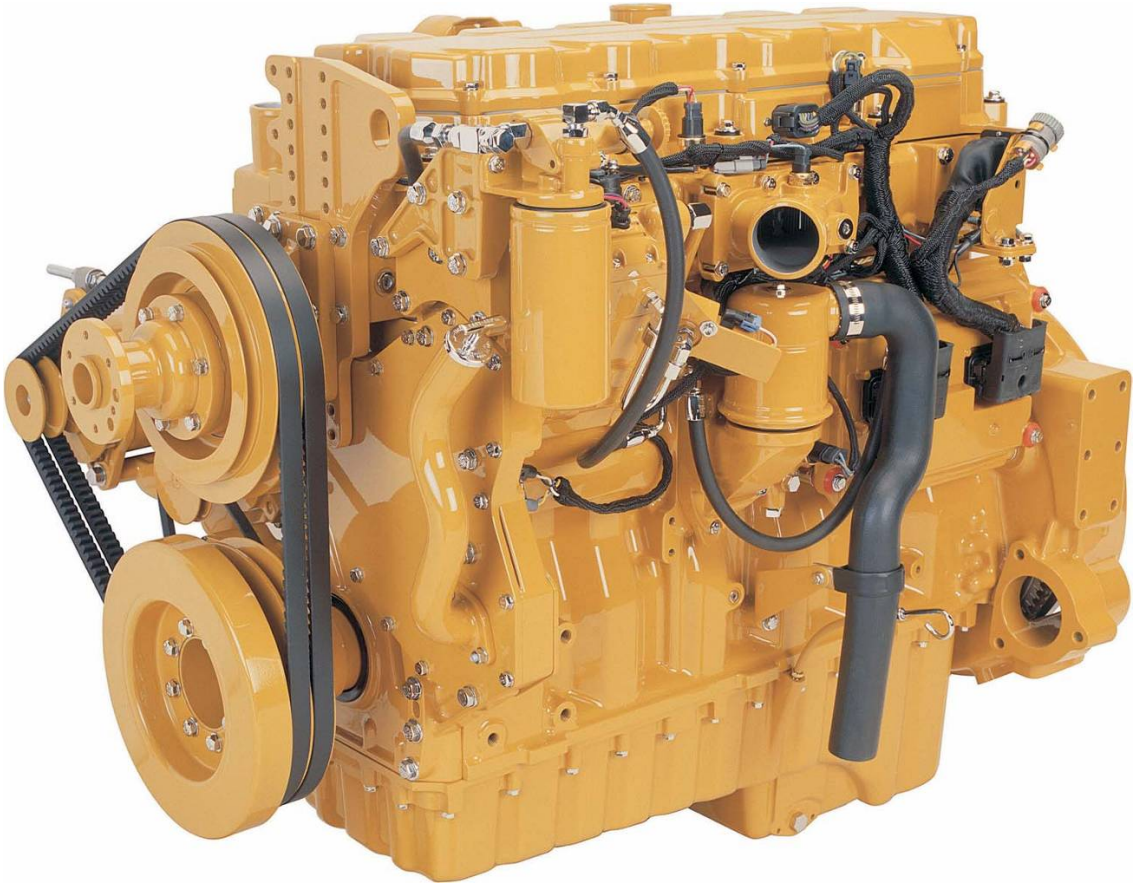


FIGURE 1

The turbocharger uses exhaust gas energy to pack more air into the cylinders, which results in highly efficient combustion, improved fuel consumption and reduces the heat that is produced by the engine itself. The turbocharger also compensates to maintain combustion air density for operating in areas of higher altitudes. The engine will deliver full rated power to 8500 ft. (2590 meters) above sea level.

The after cooler cools the pressurized intake air from the turbocharger, which permits greater air density for the more complete combustion of fuel.

2.1 ENGINE

The engine is equipped with an electronic control module (ECM), which is connected to many sensors on the engine. These sensors relay vital information to the ECM for monitoring engine functions. High coolant temperature or low oil pressure will activate sensors that open the circuit to the fuel injector solenoid, shutting off the fuel supply to the engine.

The engine data plate shows specific information about your engine: The engine serial number (ESN), control parts list (CPL), model, horsepower and rpm rating provide information for ordering parts and service needs (figure 2).

The engine data plate must not be changed unless approved by the engine manufacturer.

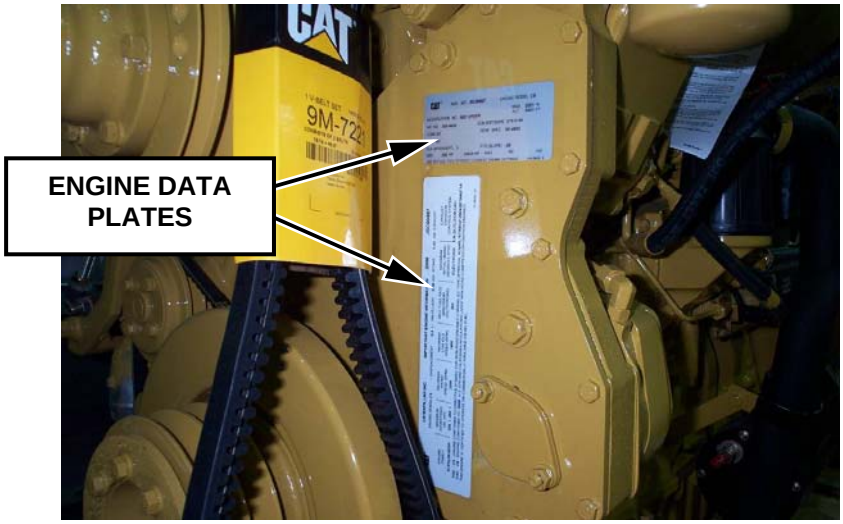
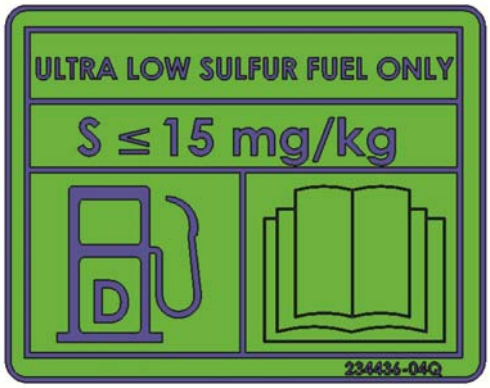


FIGURE 2

FUEL

Always use a reputable grade of ultra low sulfur diesel fuel (S ≤ 15 mg/kg), the sulfur content of which should be below 0.0015%. Higher sulfur contents affect oil change intervals. Observe strict cleanliness when filling tank. At low ambient temperatures, use winter-grade fuel only. The fuel must be replenished promptly to prevent the tank from running dry, otherwise the fuel filters and injection lines will have to be air-vented.



2.2 HYDRAULIC SYSTEMS

The hydraulic system is composed of six main circuits. These circuits are: PROPEL, C-1 CONVEYOR, C-2 CONVEYOR, C-3 CONVEYOR, AUXILIARY AND COOLING FANS.

Each circuit is made up of a hydraulic pump, valves, cylinders or motors. All circuits draw hydraulic fluid from the same hydraulic reservoir. The hydraulic pumps are mounted to a pump drive unit. This pump drive unit conveys power to the pumps from the machine's engine (FIGURE 4).

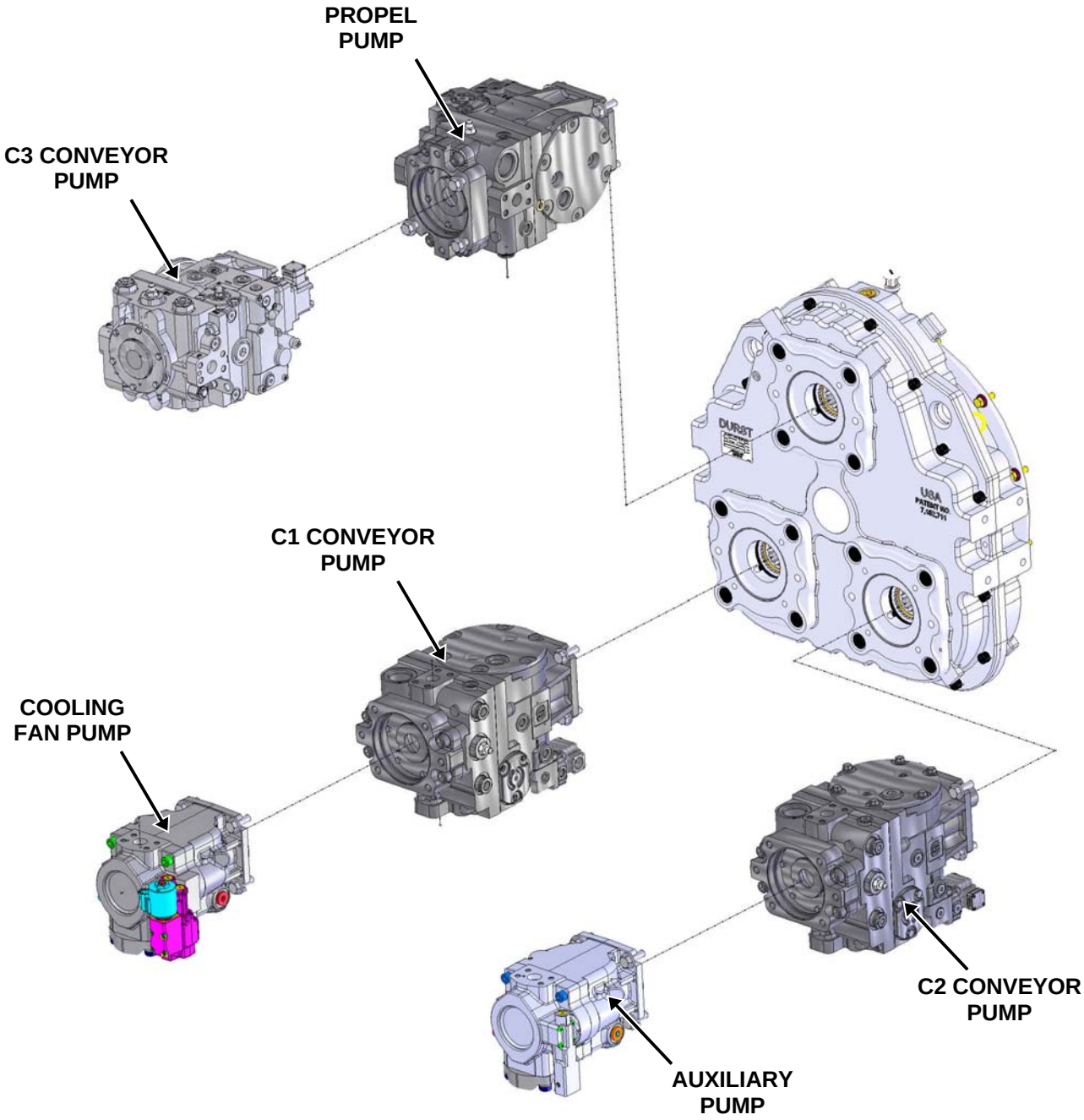


FIGURE 4

2.3 ELECTRICAL SYSTEM

The SB-2500ex is equipped with two 12-volt batteries, connected in a series, provide power to the 24-volt starting and electrical systems. The batteries are the center of the electrical system and with proper care will ensure trouble-free operation. A 90 amp alternator supplies the current that is necessary to maintain battery charge. Quick disconnect switches are incorporated into the electrical system to prevent power being delivered from the batteries.

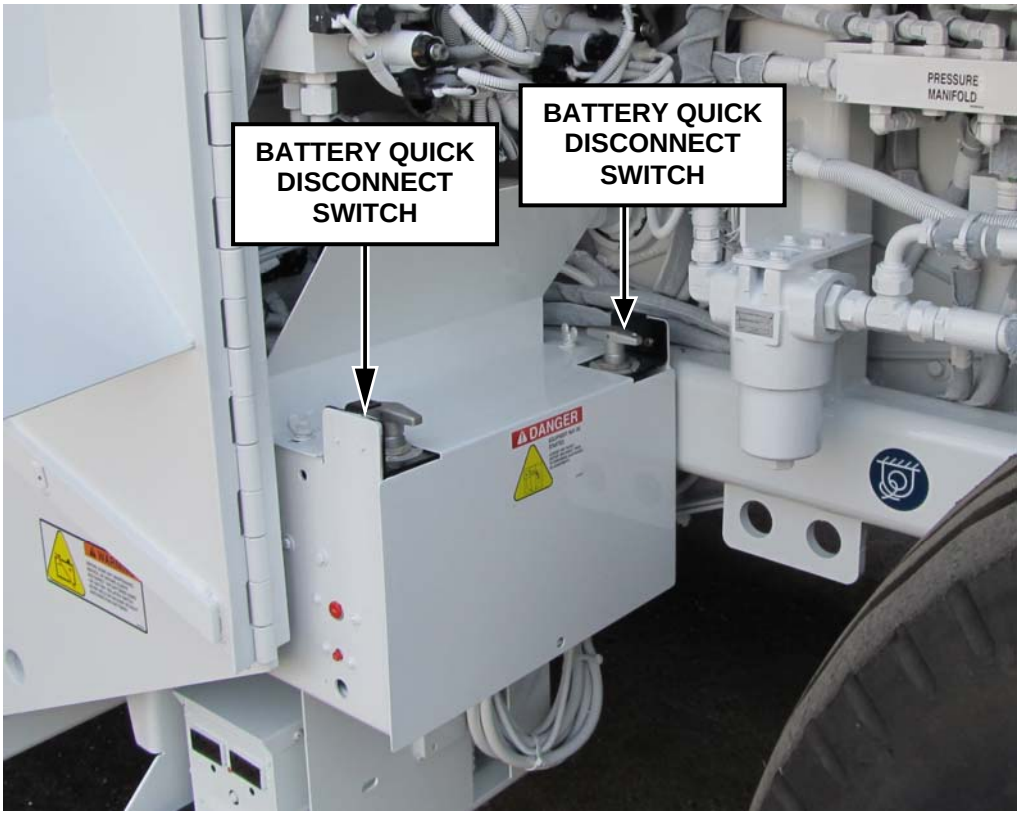


FIGURE 5

All electrical power must be disconnected from the machine when servicing or welding on the machine. When welding on the machine, be sure to ground the welder close the area where the welding is to be performed. Do not ground the welder to an electrical box. Do not ground the welder to the engine. If welding is to be performed near an electrical box or remote mounted controller, then be sure to disconnect that electrical box or controller before welding.

Always remember to disconnect the batteries after shutting the machine down. This will help prevent damage being done to the electrical system while the machine is not in operation.

This machine is equipped with an electronically controlled engine. An electronically controlled engine gives the operator the capability of accurately monitoring and controlling engine operation. The CPU will also help safeguard against any potential circumstances that could cause damage to the engine by automatically shutting the engine down. The CPU will also generate fault codes which aid in diagnosing engine malfunctions.

OPERATION AND PROCEDURES

SECTION **PAGE**

3.1 BEFORE STARTING THE MACHINE..... 97
3.2 ENGINE PRE-START CONDITIONS..... 97
3.3 SB-2500ex CONTROLS.....98
3.4 FUME EXTRACTION.....113
3.5 REFUELING PROCEDURE..... 115
3.6 DRIVE OFF PROCEDURE.....116
3.7 MANUAL HOOD RAISE/LOWER PROCEDURE.....117
3.8 MANUAL BRAKE RELEASE PROCEDURE..... 120

3.1 BEFORE STARTING THE MACHINE

Before operating this machine for the first time, carefully read and understand this manual. Familiarize yourself with the machine, its systems and controls.

FOLLOW ALL SAFETY PRECAUTIONS!

NOTE **Follow all maintenance and service instructions carefully. Failure to do so may void the warranty.**

PROPER MAINTENANCE OF YOUR MACHINE WILL MAXIMIZE ITS OPERATIONAL LIFE. PLEASE TAKE THE TIME TO PREFORM ANY NECESSARY OR SCHEDULED MAINTENANCE BEFORE OPERATING.

3.2 PRE-START CONDITIONS

1. The operator platform is for properly trained and qualified personnel only! There should be only one operator on the platform at a time. "NO RIDERS!"

2. Check the machine fluid levels such as: engine oil, hydraulic fluid and radiator coolant. Be sure that they are at the proper operational levels.

3. Perform a "walk around" visual inspection for signs of fluid leaks, low tire pressure and loose or broken parts.

4. Observe all safety decals and read them carefully. Be sure to strictly abide by them.

WARNING

The operator must read these instructions and be thoroughly familiarized with the SB-2500ex controls before attempting to operate this machine. Failure to do so may result in personal injury.

5. Be sure that all the safety mirrors are installed properly and positioned so that the operator is capable of seeing all areas around the machine.

6. Check to see if there are any objects in the dump hopper that should not be there and remove them.

7. Be sure that there are not any obstructions anywhere around, above or below the machine.

8. Clear all personnel away from the machine before starting the engine. Make sure no one is standing in front of or behind the machine prior to starting the engine.

3.3 SB-2500ex CONTROLS

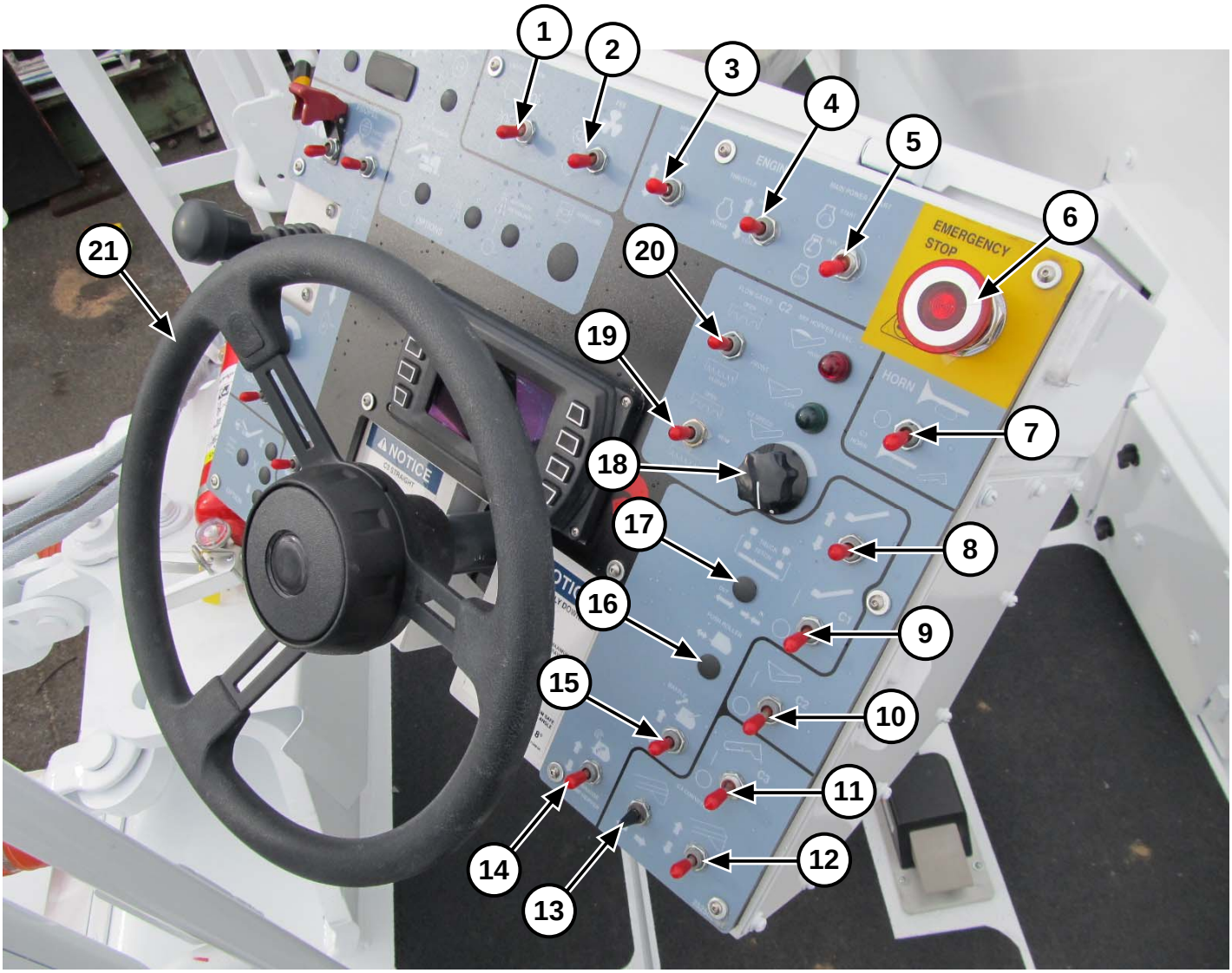


FIGURE 1

1. BEACON LIGHT - This switch activates and deactivates the yellow beacon light.

2. FUME EXTRACTION FANS ON/OFF - Activates and deactivates the fume extraction fans for the C1 conveyor and C2 conveyor. The fume extraction system is designed to direct fumes away from the work area.

3. HOOD RAISE/LOWER - Push this toggle switch up to raise the engine compartment hood and down to lower engine compartment hood.

4. ENGINE THROTTLE - This switch will increase or decrease the engine speed (RPM).

3.3 SB-2500ex CONTROLS

5. IGNITION SWITCH - This switch will turn the main power “on” and start the engine. It should be noted that the C-1, C-2 and C-3 have to be switched “off”, the travel joystick has to be in neutral and the parking brake has to be applied before the engine will start.

6. EMERGENCY STOP - When any one of these buttons is pushed, the engine will immediately shut down. The machine will not restart until all emergency stops have been reset. Any one of the three emergency stops, if pressed, will prohibit the engine from restarting.

7. HORN - Push this toggle switch up to sound the horn.

8. C-1 RAISE / LOWER - Push this toggle switch up to raise the C-1 conveyor; push this switch down to lower the C-1 conveyor. Under normal operation the C-1 conveyor should be kept approximately 3 inches above the ground.

9. C-1 CONVEYOR ON / OFF - Push this toggle switch up to activate the C-1 conveyor; push down to deactivate the C-1 conveyor.

10. C-2 CONVEYOR ON / OFF - Push this toggle switch forward to activate the C-2 conveyor; push down to deactivate the C-2 conveyor. C-2 conveyor speed can be adjusted with the C-2 speed control.

11. C-3 CONVEYOR ON / OFF - Push this toggle switch forward to activate the C-3 conveyor; push down to deactivate the C-3 conveyor.

12. C-3 CONVEYOR RAISE / LOWER - Push this toggle switch up to raise the C-3 conveyor; push this switch down to lower the C-3 conveyor.

13. C-3 CONVEYOR SWING - This toggle switch is used to swing the C-3 conveyor to the left or right.

The C-3 conveyor will move a total of 55 degrees to either side of the neutral position.



DANGER

Care should be taken when swinging the C-3 conveyor when the machine is on an uneven surface to prevent the machine from tipping. Care should also be taken when working in busy traffic to prevent the conveyor from being moved into the line of moving vehicles.

14. C-1 HOPPER DUMP - Push this toggle switch up to raise the dump hopper; push down to lower the dump hopper. Internal dump hopper vibrators will activate when toggling this switch.

15. C1 DUMP HOPPER BAFFLE - Moves baffle plate inside dump hopper to control flow of material in the augers and up the C-1 conveyor.

3.3 SB-2500ex CONTROLS

16. PUSH ROLLERS (IN\OUT) - This switch will cause the push rollers to hydraulically extend or retract.

17. TRUCK HITCH (OPTIONAL) - Use this toggle switch to engage or disengage the truck hitch.

18. C-2 SPEED CONTROL - Operated by a rotary potentiometer. Turning the potentiometer clockwise will increase the speed of the C-2 conveyor. The C-2 speed should be set to ensure that the C-3 is not overloaded.

19. REAR FLOW GATES - Push this switch up to open the rear flow gates; push down to close rear flow gates. Controlling the flow from the surge hopper into the remixing augers is very important to eliminate material segregation.

20. FRONT FLOW GATES - Push this switch up to open the front flow gates; push down to close front flow gates. Controlling the flow from the surge hopper into the remixing augers is very important to eliminate material segregation.

21. STEERING WHEEL - This machine is equipped with a hydrostatic steering system. Turning the steering wheel clockwise will steer the machine to the right, turning the steering wheel counterclockwise will steer the machine to the left.

3.3 SB-2500ex CONTROLS

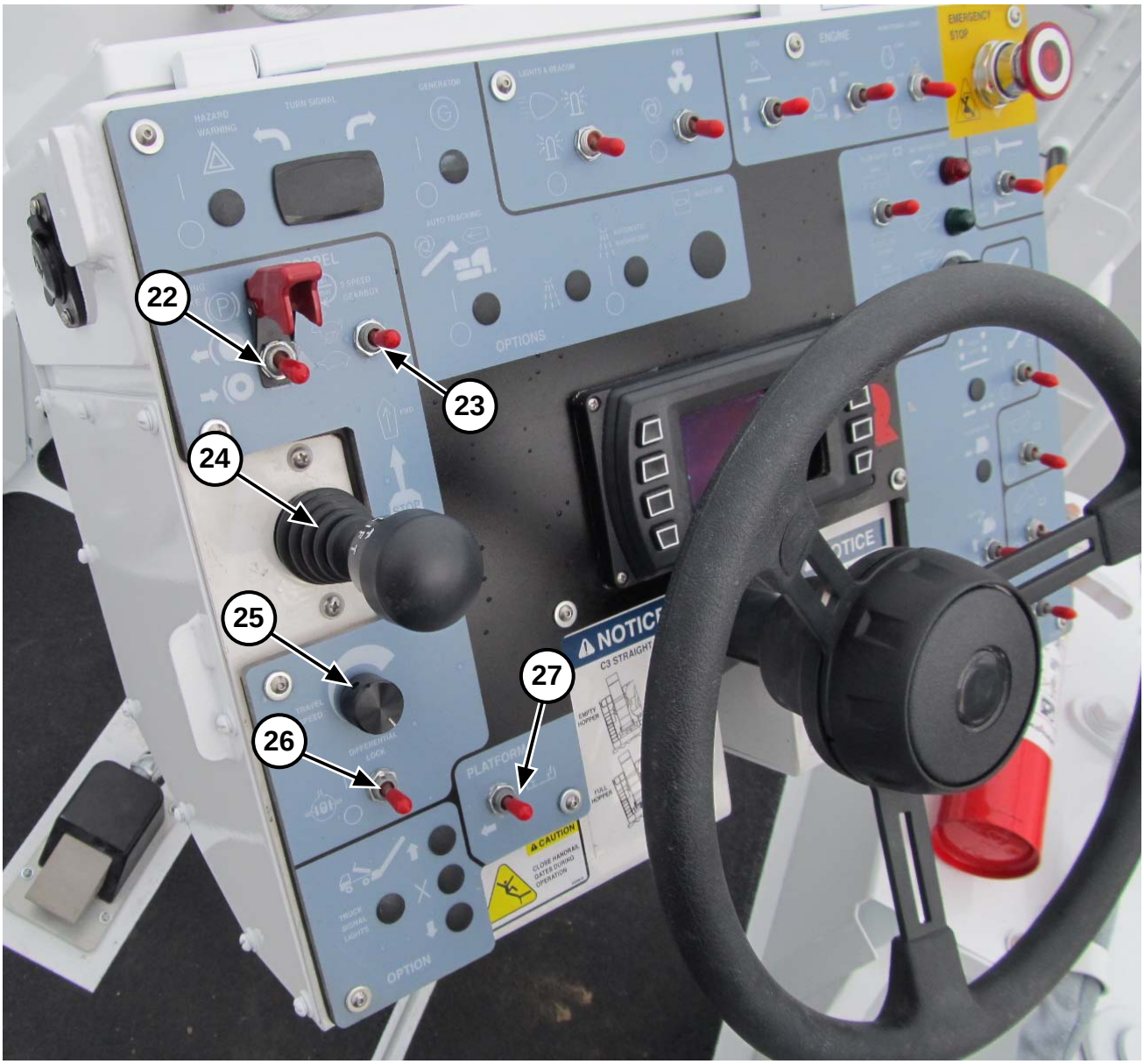


FIGURE 2

22. PARKING BRAKE - This switch engages the parking brake.

23. TWO SPEED GEARBOX - To shift between low and hi speeds: stop machine, set parking brake, switch from low to hi, release parking brake and then proceed forward.

WARNING **The two-speed gearbox should never be shifted while the machine is in motion.**

3.3 SB-2500ex CONTROLS

24. FORWARD / REVERSE LEVER - The forward / reverse lever is fitted with neutral detent. To operate, lift locking collar and move joystick forward to travel the machine forward. Move the joystick backward to travel the machine in reverse. Care should be taken before moving the machine to ensure the desired speed range has been selected and the parking brake has been released.

25. TRAVEL SPEED - Use this dial to set the constant drive speed. The drive ratio should be set to allow for maximum travel with the forward/reverse lever.

26. DIFFERENTIAL LOCK - Push this switch up to activate the differential lock. When released, switch will spring back to the “off” position. Do not activate the differential lock when operating the machine in a tight turning radius at high speed.

27. SLIDING CONSOLE - This switch will slide the operators platform left or right.

DANGER Keep all hands and feet away from the moving components of the sliding operator's platform while it is in motion. Severe injury could result.

28. SERVICE BRAKE - Pedal operated service brake; push to apply. Avoid applying brakes for long periods of time or using the pedal as a foot rest as this could cause excessive heat build up in the brakes, which may lead to premature failure. (Figure 3)



FIGURE 3

3.3 SB-2500ex CONTROLS

DISPLAY CONTROLS

The Roadtec SB-2500e material transfer machine is equipped with an electronic control display unit. This unit is located on the operator's console and will display various system operating conditions. It is designed to allow the operator to access machine operational information from one central location. This information includes: engine speed, oil pressure, electrical voltage, engine temperature, operational hours and many more. Please refer to the following illustrations to identify the electronic control display screens.

When the machine is first powered up, the following display is shown on the screen (Figure 4). Please refer to the callout numbers and their descriptions below when attempting to identity the various components of this screen.

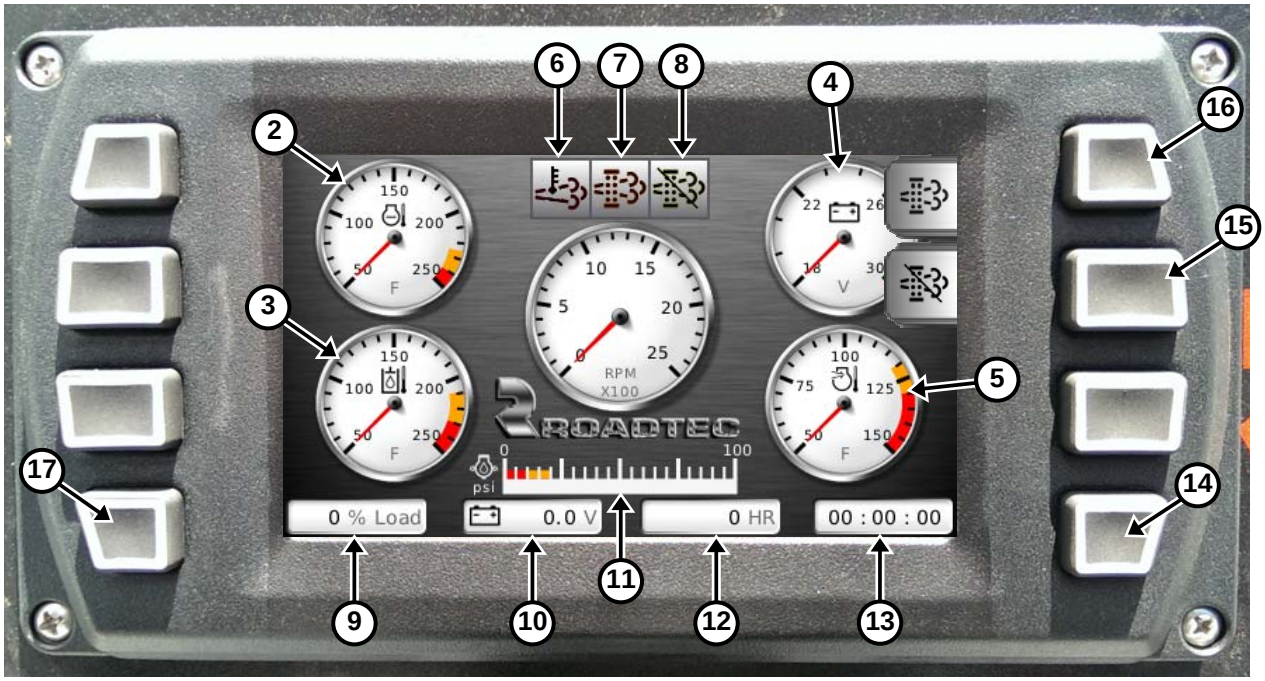


FIGURE 4

1. Engine Speed (R.P.M.)
2. Engine Coolant Temperature
3. Hydraulic Oil Temperature
4. Electrical Voltage
5. Charge Air Temp
6. DPF regeneration is in process
7. Force DPF regeneration
8. DPF regeneration is inhibited
9. Engine load
10. Electrical voltage
11. Engine oil pressure
12. Engine Hours
13. Current Time
14. Access DPF options ("e" models only)
15. Inhibit Regen
    (Appears after item 14 is pressed)
16. Force Regen
    (Appears after item 14 is pressed)
17. Access Main Menu & Exit Current Screen
    (see next page for main menu screen)

3.3 SB-2500ex CONTROLS

Main menu screen

This is the main menu screen (top level). From this screen all sub-screens can be accessed (Figure 5)



FIGURE 5

Engine Diagnostics Screen

The engine diagnostics screen will display any engine fault codes that may have occurred during operation. (Figure 6)

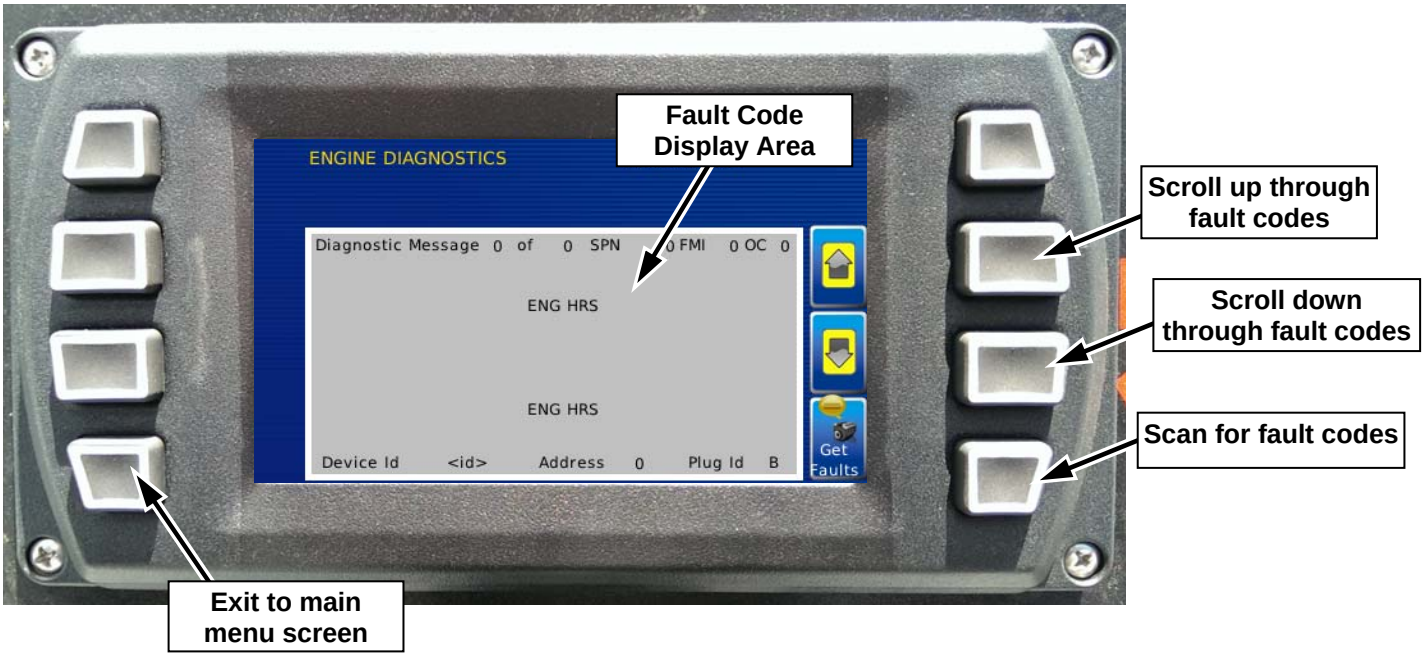


FIGURE 6

3.3 SB-2500ex CONTROLS

System Utilities Screen

From this screen access is available to various sub-screens such as system settings, service reminders and date & time settings. (Figure 7)



FIGURE 7

System Settings Screen

This screen is where the system software settings can be accessed. The system software settings are preset at the time of manufacture. Therefore, this screen should never have to be accessed unless the system settings have somehow been changed. The "B" & "C" source addresses should always be set to 242. (Figure 8)



FIGURE 8

3.3 SB-2500ex CONTROLS

Service Reminder Screen

The service reminder screen indicates when machine maintenance and service is due. In this screen service reminders can be viewed, reset or turned off. Service interval times can also be adjusted. Always remember to save any changes before leaving this screen. (Figure 9)

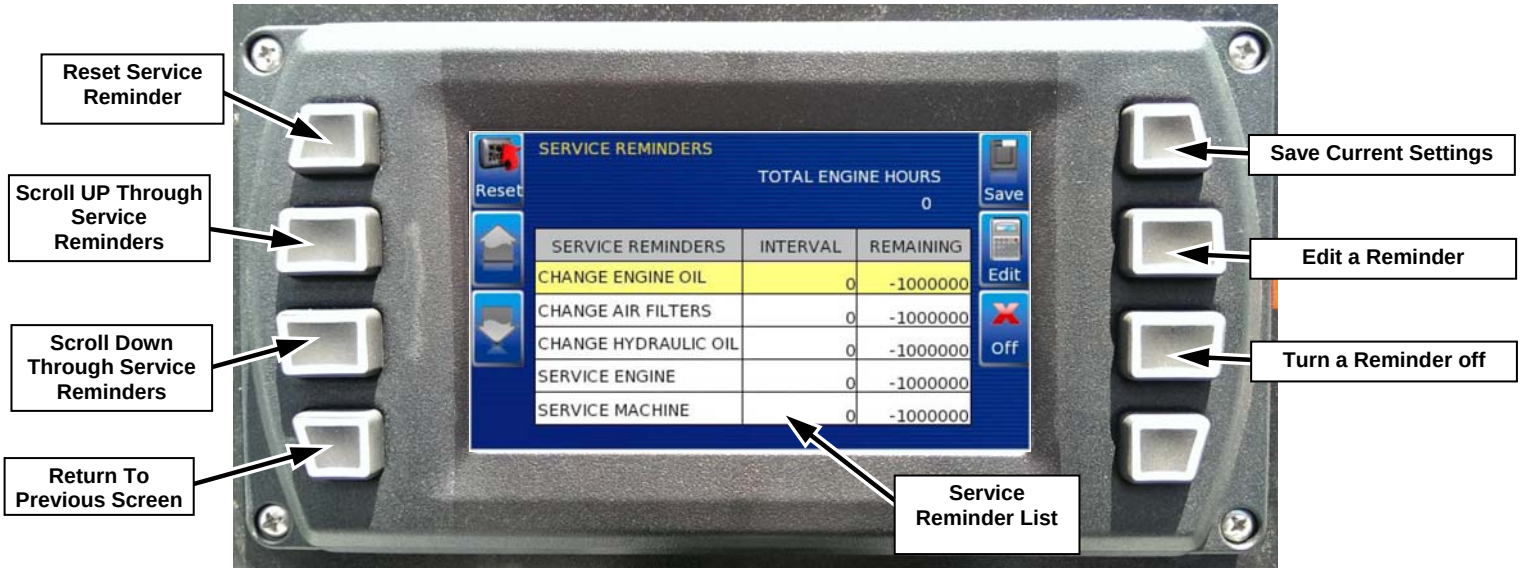


FIGURE 9

Date & Time Screen

The Date & Time Screen is where adjustments can be made to the system date and time. (Figure 10)



FIGURE 10

3.3 SB-2500ex CONTROLS

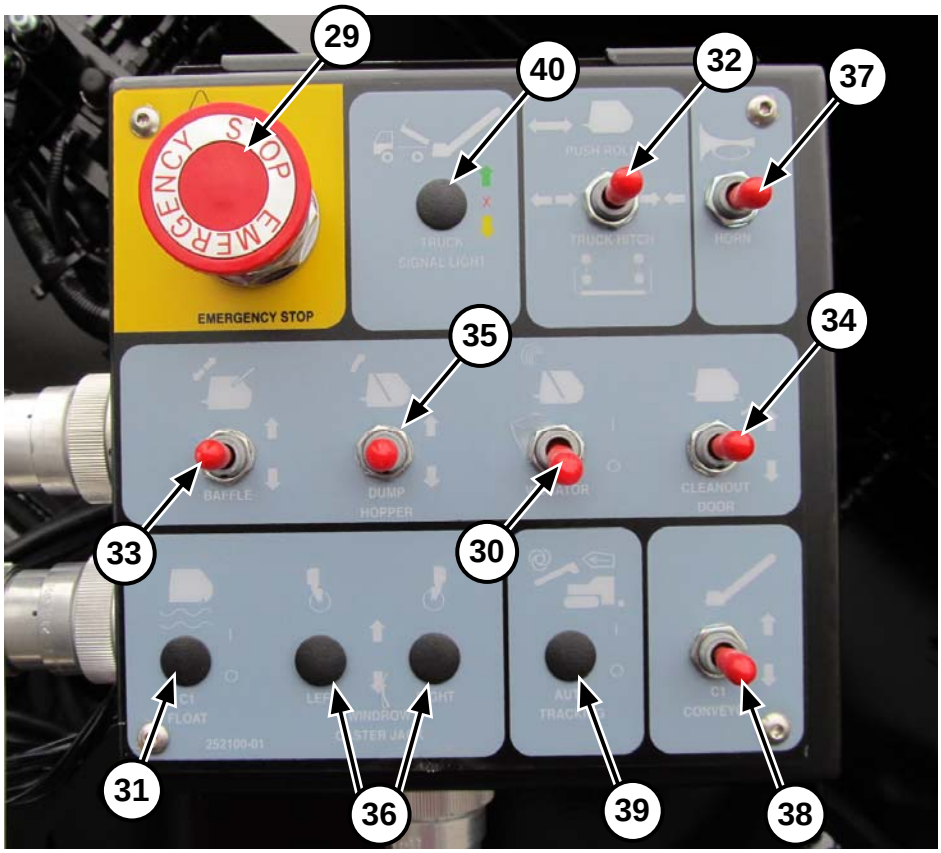


FIGURE 11

29. EMERGENCY STOP

When any one of these buttons is pushed, the engine will immediately shut down. The machine will not restart until all emergency stops have been reset. Any one of the three emergency stops, if pressed, will prohibit the engine from restarting.

30. C-1 VIBRATOR

This switch will activate or deactivate the C-1 vibrator.

31. WINDROW C1 FLOAT (OPTIONAL)

Allows the windrow attachment to float freely on the caster wheels to compensate for humps and dips in the roadbed.

32. PUSH ROLLER OR TRUCK HITCH (OPTIONAL)

Push this toggle switch to extend or retract the push rollers. If the machine is equipped with the truck hitch option, then use this switch to engage and disengage the truck hitch.

DANGER **DO NOT INTERFERE WITH AN ENGAGED OR OPERATING TRUCK HITCH. DO NOT MODIFIY THE HYDRAULIC SETTINGS ASSOCIATED WITH A TRUCK HITCH. SERVERE INJURY OR DEATH COULD RESULT.**

3.3 SB-2500ex CONTROLS

33. C1 DUMP HOPPER BAFFLE

Moves baffle plate inside dump hopper to control flow of material in the augers and up the C-1 conveyor.

34. C-1 CLEANOUT DOOR SWITCH

This switch will open the clean out doors on the C-1 dump hopper to facilitate the cleaning away of material that has accumulated.



WARNING **All conveyors must be deactivated (with ignition and battery disconnect switches in the "off" positions) before attempting to clean them.**

35. C-1 HOPPER DUMP

Push this toggle switch up to raise the dump hopper; push down to lower the dump hopper.

36. LEFT AND RIGHT CASTERS RAISE/LOWER (OPTIONAL)

Raises or lowers the caster wheels on the C-1 dump hopper if so equipped.

37. HORN

Push this toggle switch up to sound the horn.

38. C-1 RAISE / LOWER

Push this toggle switch up to raise the C-1 conveyor; push this switch down to lower the C-1 conveyor. Under normal operation the C-1 conveyor should be kept approximately 3 inches above the ground.

39. AUTOMATIC TRACKING (OPTION)

This switch will activate or deactivate the automatic tracking option. This option utilizes ultrasonic signals to maintain the same travel speed between the paver and Shuttlebuggy.

40. TRUCK SIGNAL LIGHTS (OPTION)

When fitted with this option, this switch will activate special lights that will signal the dump truck driver to either raise the dump bed, stop raising the dump bed or lower the dump bed.

3.3 SB-2500ex CONTROLS

41. C2 / SURGE HOPPER CLEAN-OUT DOORS

This switch will open or close the C2/Surge hopper cleanout door. The door locking pins have to be released before opening the doors. (Figures 12 & 13)

WARNING **All conveyors must be deactivated (with ignition and battery disconnect switches in the "off" positions) before attempting to clean them.**

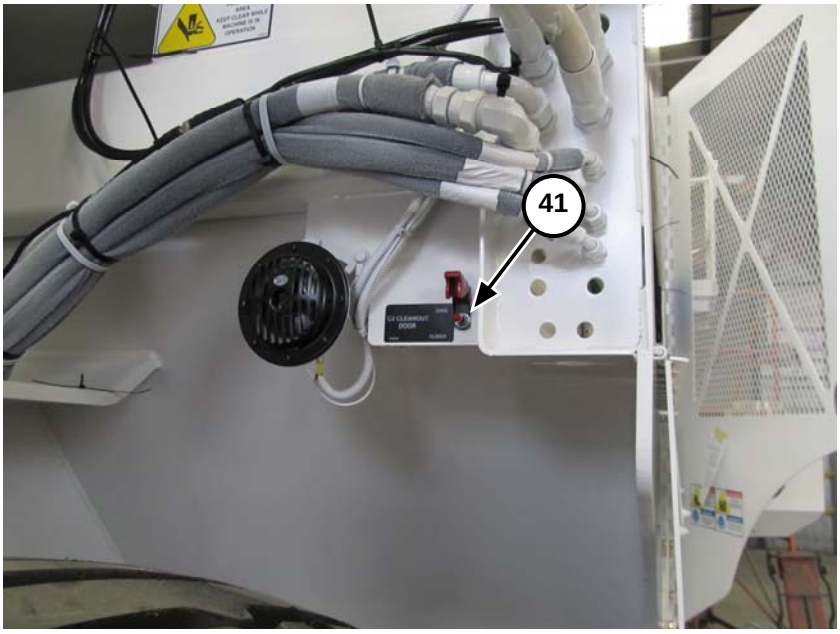


FIGURE 12

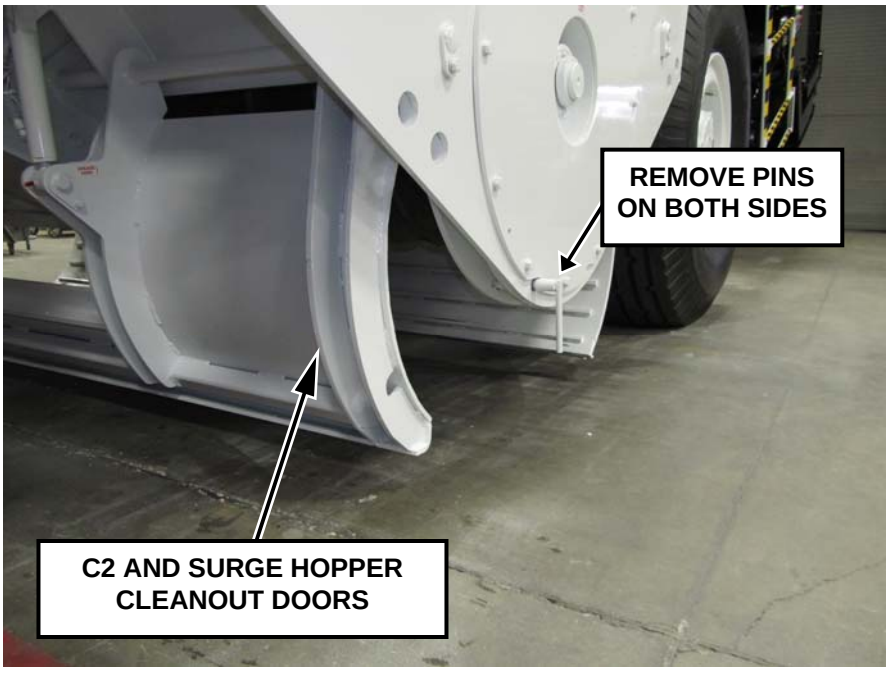


FIGURE 13

3.3 SB-2500ex CONTROLS

42. C3 CONVEYOR CLEANOUT DOOR SWITCH

This switch opens the cleanout door located at the rear of the C-3 conveyor to allow for clean out of built up material. (Figures 9 & 10)

WARNING **All conveyors must be deactivated (with ignition and battery disconnect switches in the “off” positions) before attempting to clean them.**

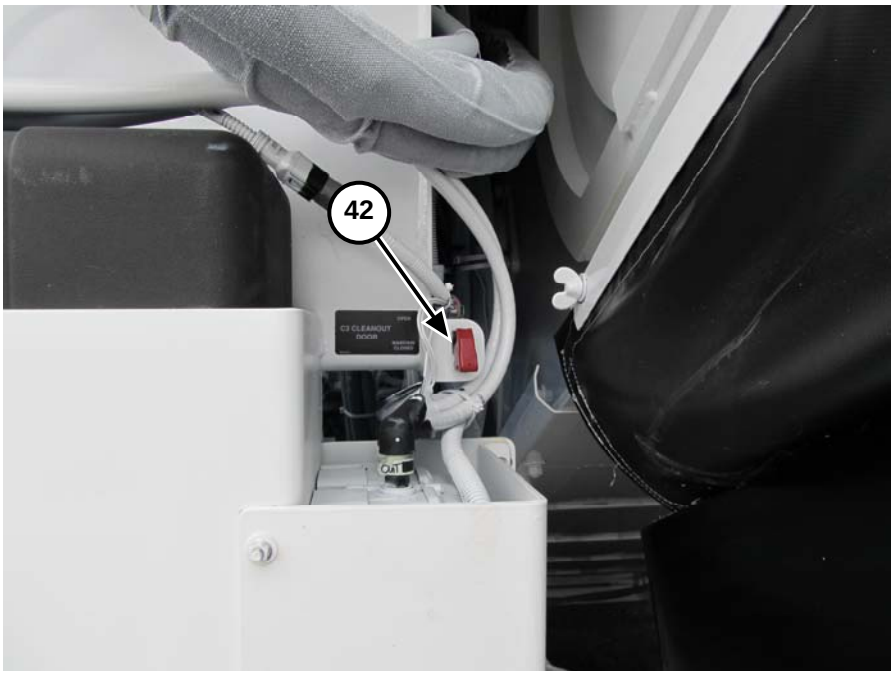


FIGURE 13

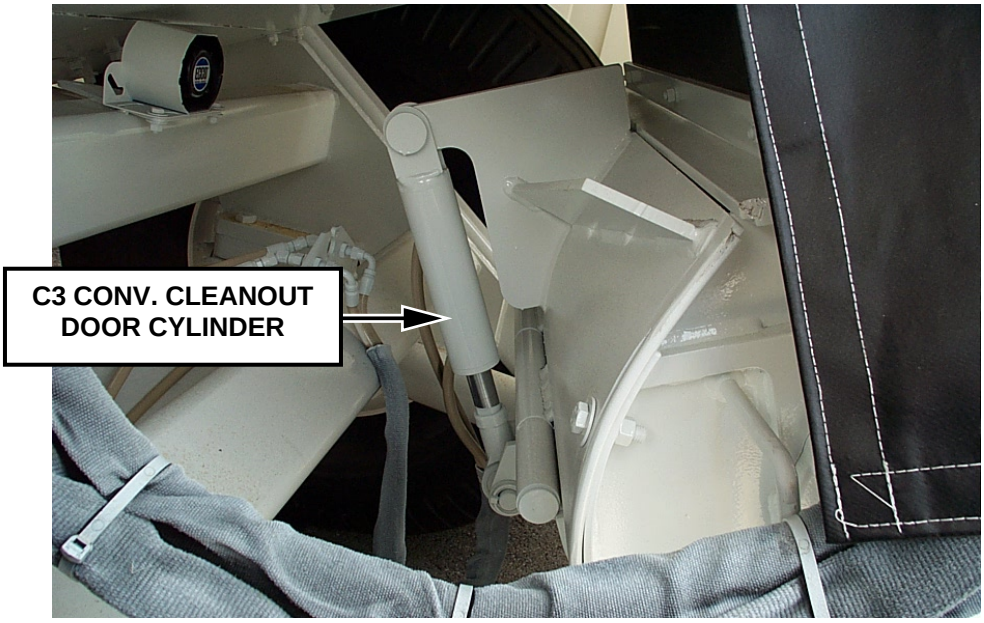


FIGURE 14

3.3 SB-2500ex CONTROLS

CONVEYOR REVERSING SWITCHES

The conveyor reversing switches are located inside the operator's console box. (Figure 15) The operator's console box must be opened in order to gain access to them. When activated, these switches place the conveyors in a reverse mode. Each switch is individually operated and reverses only the conveyor for which it is marked.

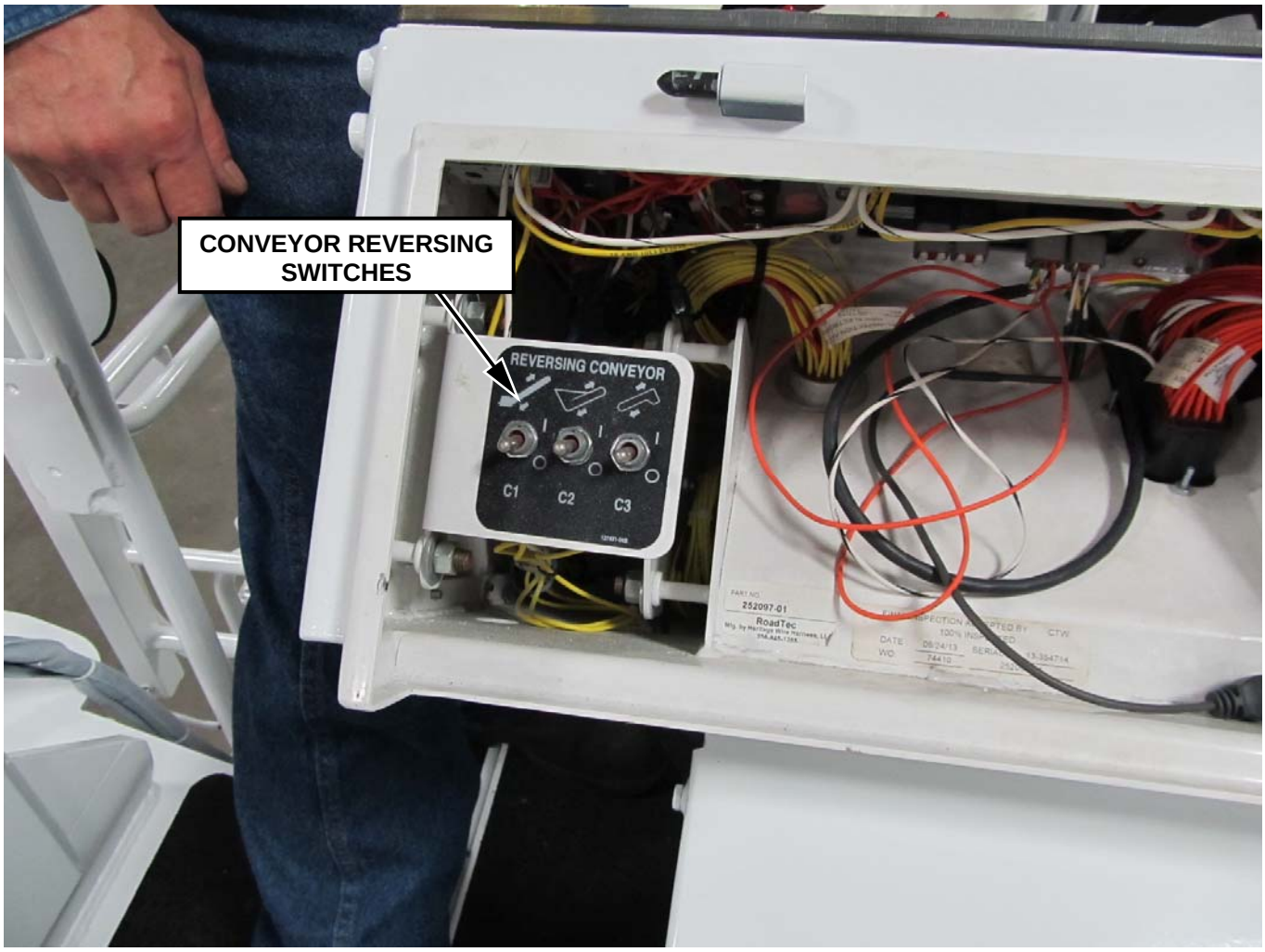


FIGURE 15

3.3 SB-2500ex CONTROLS

ENGINE COMPARTMENT HOOD

The SB-2500ex is equipped with a hydraulically raisable engine compartment hood and swing out engine compartment doors make the engine compartment more accessible to perform routine maintenance. (Figures 16 & 17)

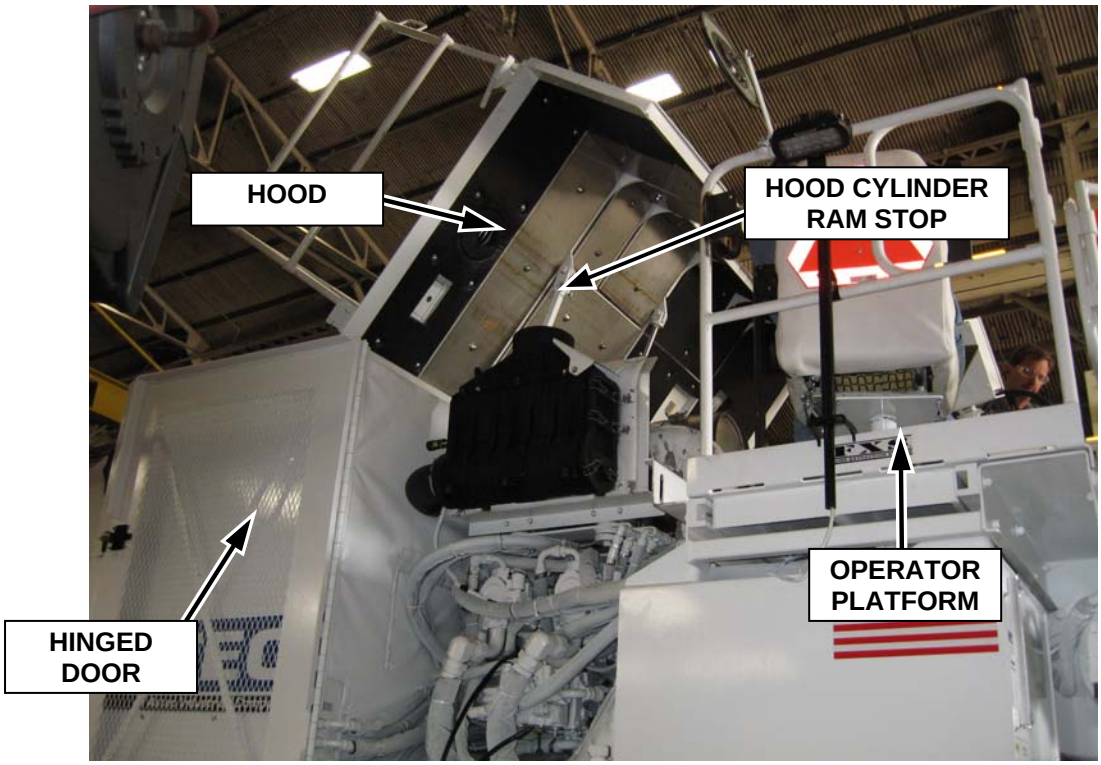


FIGURE 16

CAUTION Always engage the hood stop locking pin when engine hood is in the raised position.

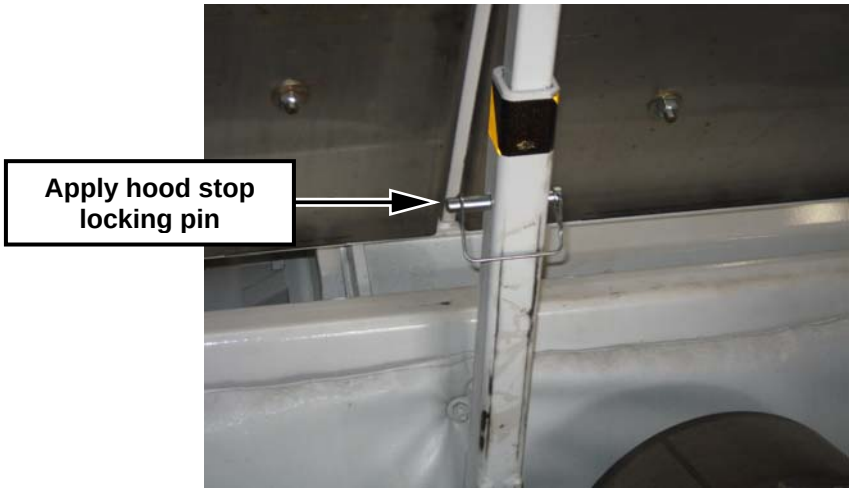


FIGURE 17

3.4 FUME EXTRACTION SYSTEM

The fume extraction system is designed to remove fumes and hot air away from the operators of the equipment. The fume extraction system is made up of three parts: The suction hoses, the fan and blower motors and the fume exhaust stacks.



FIGURE 18

The fume extraction system is equipped with two fan units. One is mounted on the C3 conveyor (Figure 19) and another one is mounted to the C1 conveyor (Figure 20). The blowers pull fumes away from the conveyors and blow them out of the exhaust stacks.



FIGURE 19

3.4 FUME EXTRACTION SYSTEM

C. The C1 fume extraction system has its own blower and exhaust stack (Figure 20). Both exhaust stacks can be folded down for transport of the machine.

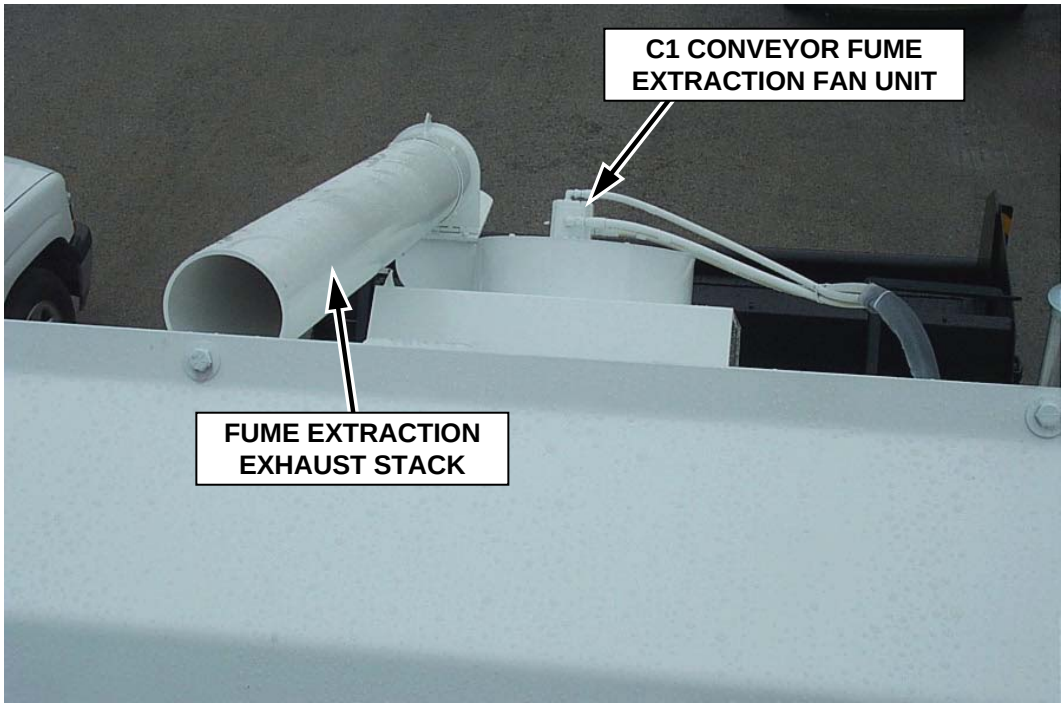


FIGURE 20



FIGURE 21

3.5 REFUELING PROCEDURE

FUEL

Always use a reputable grade of ultra low sulfur diesel fuel (S ≤ 15 mg/kg), the sulfur content of which should be below 0.0015%. Observe strict cleanliness when filling tank. At low ambient temperatures, use winter-grade fuel only. The fuel must be replenished promptly to prevent the tank from running dry, otherwise the fuel filter and injection lines will need air venting.

REFUELING PROCEDURE

Refuel the buggy at the end of the day to reduce water condensation in the fuel tank. Always shut down all the equipment (Shuttle Buggy, pavers and other surrounding equipment) while refueling, to avoid serious accidents.

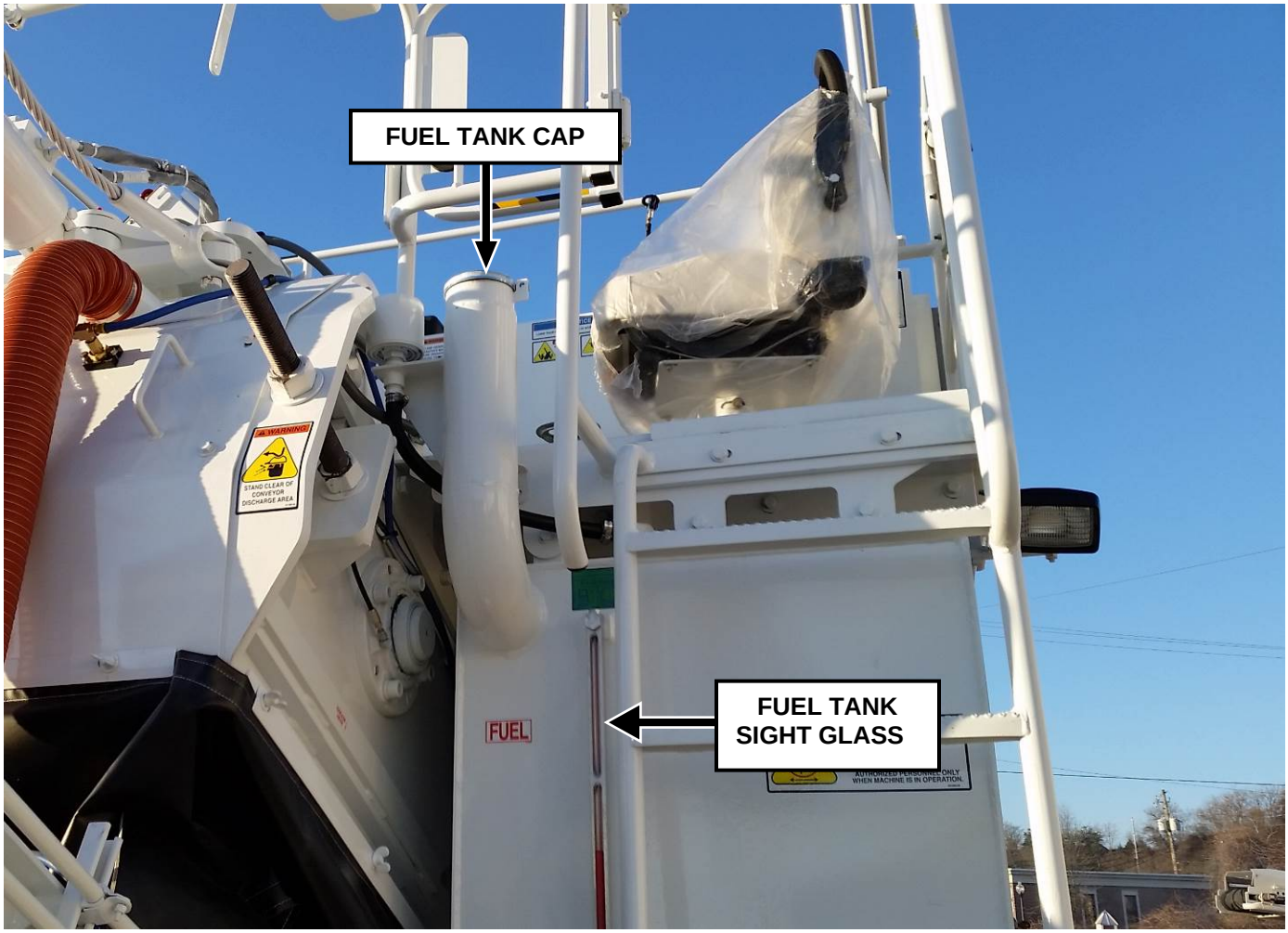


FIGURE 22

3.6 DRIVE OFF PROCEDURE

A. Always mount the machine at the rear using the steps and handrails provided.

B. Before starting machine, the following steps are required.

1. Check all lubricant, coolant, and fuel levels.
2. Select either the left or right side of machine to operate from.
3. Verify parking brake is on, and travel is in neutral.

C. Use low speed setting on motor, which is the working range.

D. Position the travel joystick to the center.

E. Start the engine by placing the ignition switch in the power position for a few moments then hold the ignition switch in the start position until it starts. Once the engine starts release the ignition switch and the engine will come to idle speed.

F. Increase engine speed to full throttle.

G. Disengage the parking brake.

H. Move travel joystick forward to move buggy in a forward direction or backward to move buggy in a reverse direction. The drive ratio dial determines buggy speed.



DANGER Do not operate this machine on soft, slick or muddy surfaces. This is a heavy piece of equipment that may easily become stuck or slip on questionable surfaces such as soft, muddy, wet or slick areas.



DANGER Be cautious when operating the machine in close proximity of ditches or deep ruts. If the machine were to slip into a ditch or rut it may be possible for the machine to tip over and cause serious injury or even death.



DANGER Please refer to the discussion of tipping information in section 1 before operating this machine on an unleveled surface.

I. Move machine to desired location. To stop machine, move joystick to center.

J. Return engine to low idle by pushing throttle downward.

K. Engage the parking brake.

L. Turn off engine by turning the ignition switch to the “off” position.

M. Disconnect the batteries by turning the battery disconnect switches to “OFF”

3.7 MANUAL HOOD RAISE/LOWER PROCEDURE

To manually raise or lower the hood using the hand pump, follow these instructions:

DANGER

The engine must not be running and the power must be off before using the hand pump for these functions.

All manual overrides must be set to their original positions for normal operation of machine. Failure to re-set the manual overrides will result in unexpected movements of the hydraulic hood or unexpected releasing of the parking brakes when auxiliary pressure is restored to the machine.

TO RAISE THE HOOD:

1. Locate the hand pump/pilot manifold on the rear hopper wall just in front of the left rear tire.

2. Activate the manual override on the hood raise solenoid by removing the override cap and turning the override knob counterclockwise until it stops. (Figure 23)

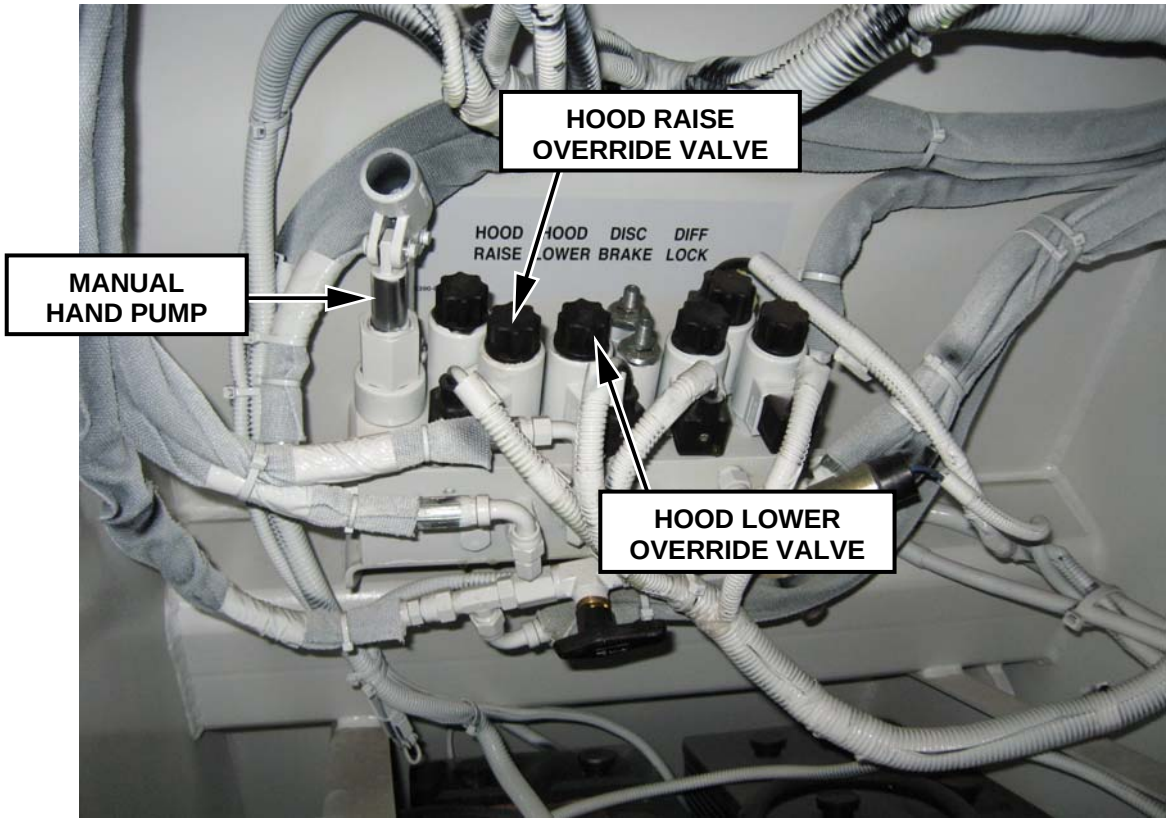


FIGURE 23

3.7 MANUAL HOOD RAISE/LOWER PROCEDURE

3. Insert the provided handle into the hand pump and pump until the hood is completely raised. (Figure 24)

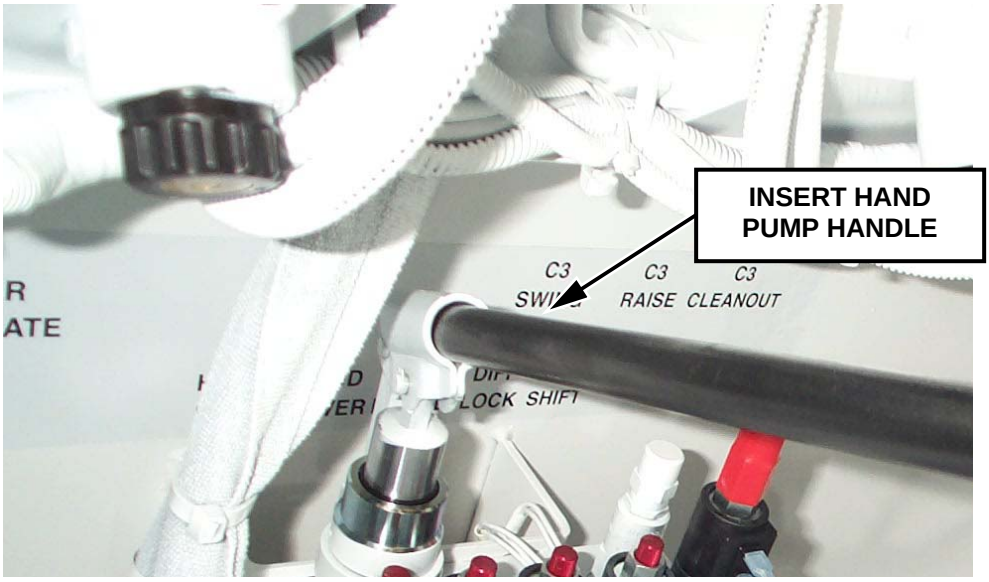


FIGURE 24

4. Once the hood is raised, apply the hood stop locking pin. (Figure 25)

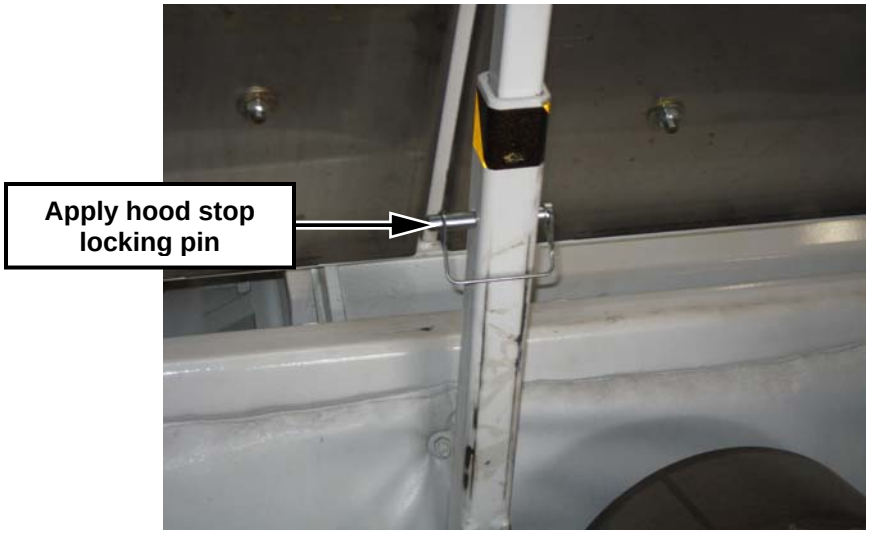


FIGURE 25

5. **<u>Be sure to reset the manual override to its original position</u>**. Do this by turning the override knob clockwise until it stops. Then replace the override cap. **<u>Failure to reset the manual override will result in the hood raising immediately when auxiliary pressure is restored</u>**.

3.7 MANUAL HOOD RAISE/LOWER PROCEDURE

TO LOWER THE HOOD:

1. Locate the hand pump/pilot manifold on the rear hopper wall just in front of the left rear tire. (Figure 23)

2 Activate the manual override on the hood lower solenoid by removing the override cap and turning the override knob counterclockwise until it stops. (Figure 23)

3 Remove the hood stop locking pin. (Figure 25)

4 Insert the provided handle into the hand pump and pump until the hood starts to float down slowly. It may be necessary to keep pumping to keep the hood floating down to a closed position. (Figure 24)

5 **Be sure to reset the manual override to its original position**. Do this by turning the override knob clockwise until it stops. Then replace the override cap. **Failure to reset the manual override will result in the hood lowering immediately when auxiliary pressure is restored.**

WARNING

THE ENGINE MUST NOT BE RUNNING AND THE POWER MUST BE "OFF" BEFORE USING THE HAND PUMP FOR THESE FUNCTIONS.

ALL MANUAL OVERRIDES MUST BE SET TO THEIR ORIGINAL POSITION FOR NORMAL OPERATION OF THE MACHINE. FAILURE TO RESET THE MANUAL OVERRIDES WILL RESULT IN UNEXPECTED MOVEMENTS OF THE HYDRAULIC HOOD OR UNEXPECTED RELEASING OF PARKING BRAKES WHEN AUXILIARY PRESSURE IS RESTORED TO THE MACHINE.

ONLY USE TOW CHAINS IN GOOD CONDITION AND CAPABLE OF PULLING 25 TONS.

THE MACHINE MAY BEGIN TO MOVE WHEN COMPLETING THE FOLLOWING TASKS. SECURE THE MACHINE TO THE TOWING VEHICLE OR CHOCK WHEELS BEFORE RELEASING THE BRAKES AND OPENING THE MULTI-FUNCTION VALVES.

3.8 MANUAL BRAKE RELEASE PROCEDURE

To release the parking brakes using the hand pump, follow these instructions:

1. Activate the manual override on the brake solenoid by removing the override cap and turning the override knob counterclockwise until it stops. (Figure 26)

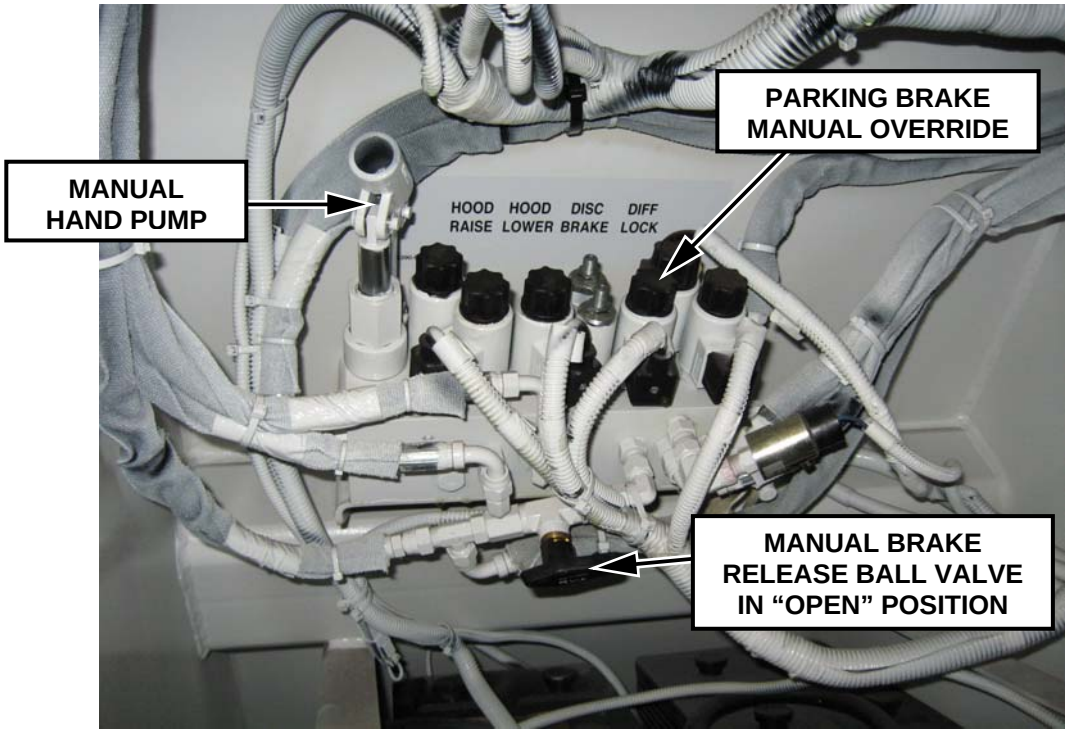


FIGURE 26

2. Insert the provided handle into the hand pump and pump until a strong resistance is felt on the handle. (Figure 27)

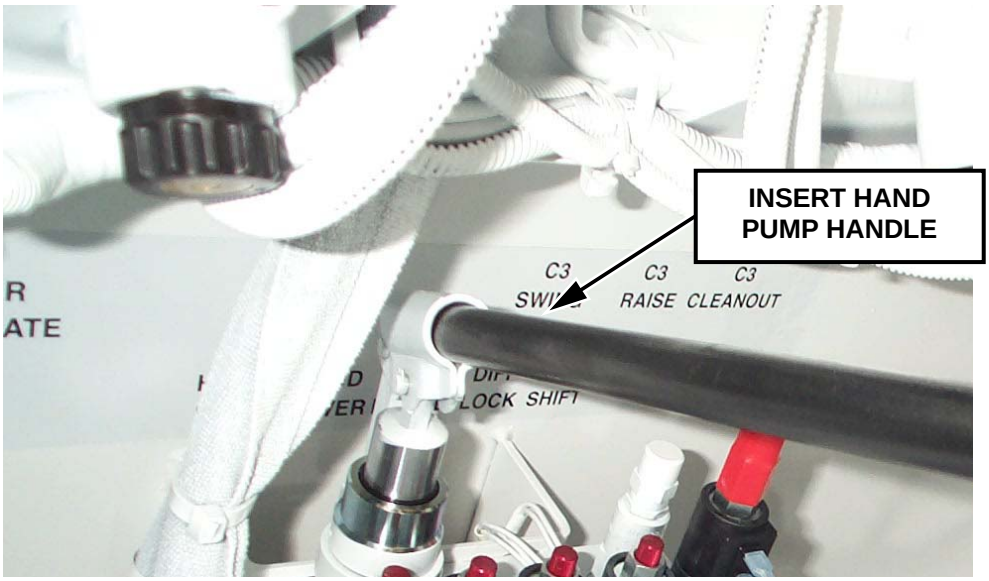


FIGURE 27

3.8 MANUAL BRAKE RELEASE PROCEDURE

3. Close the manual ball valve located at the brake port on the manifold to trap the pressure in the brake line. (Figure 28) The parking brakes are now released.

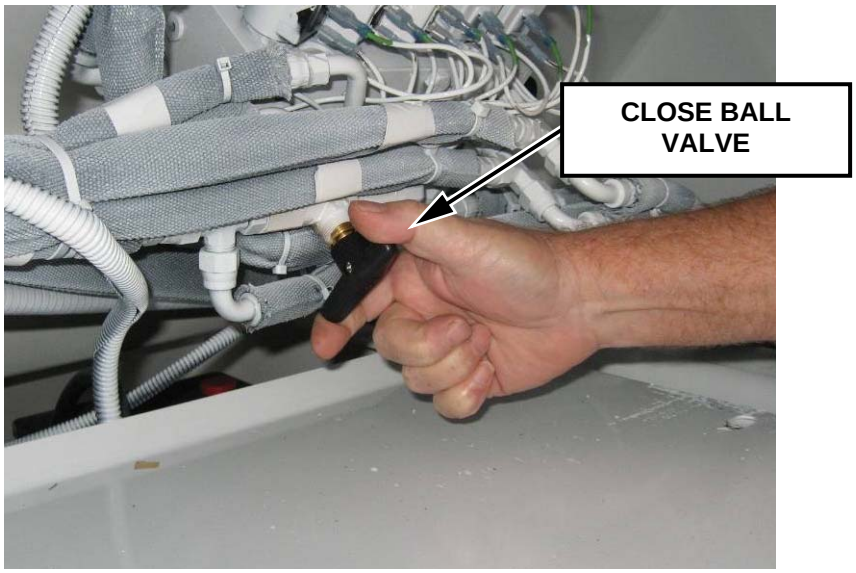


FIGURE 28

4. To reset the parking brakes simply open the ball valve mentioned in step 3 to vent the pressure in the brake line. It is important to note that this valve must be in the open position during normal operation of the machine.

5. Be sure to reset the manual override button on the parking brake solenoid. This can be done by turning the override knob clockwise until it stops. Then replace override cap. Failure to reset the manual override to its original position will result in the parking brakes being released immediately when auxiliary pressure is restored.

3.8 MANUAL BRAKE RELEASE PROCEDURE

To engage the travel pump bypass, follow these instructions:

1. Engage the bypass feature on the multi-function valves of the travel pump. To do this turn the middle hex, on both multi-function valves, 3 turns counter clockwise relative to the large hex. (Figure 29)

2. Turn middle hex nut clockwise until tight to disengage bypass.

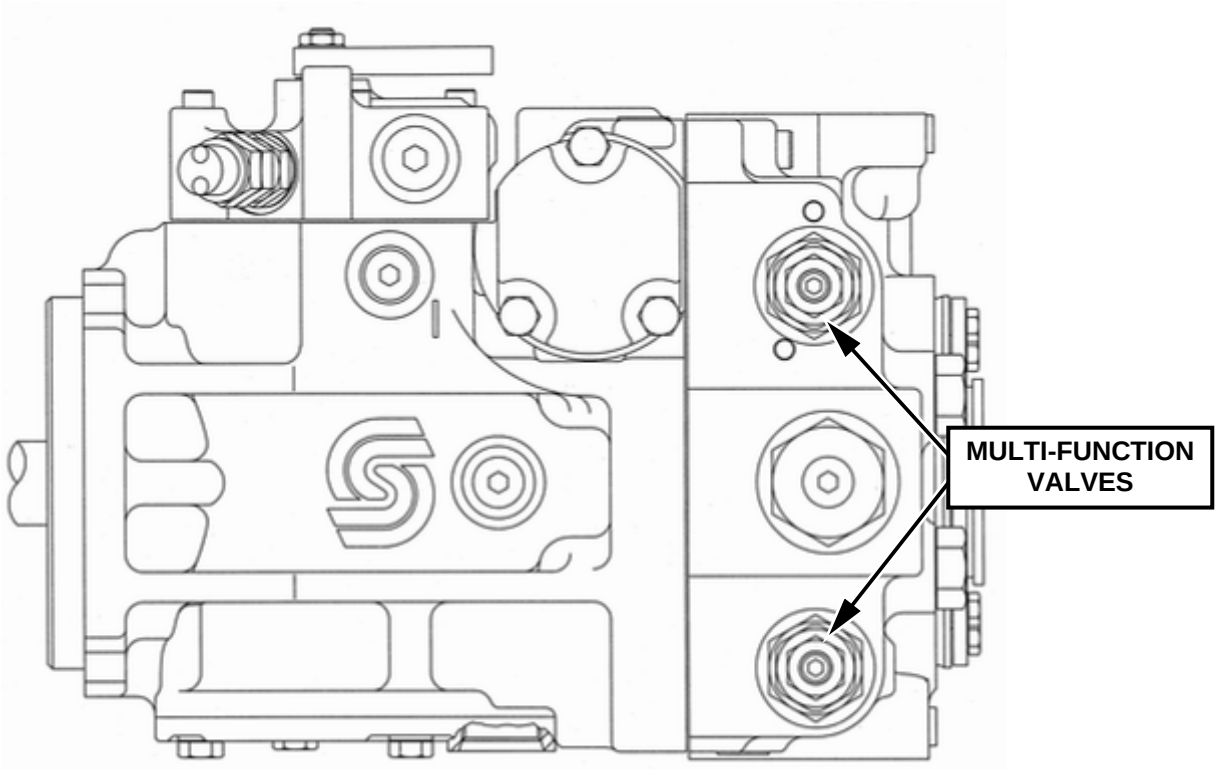


FIGURE 29

PRINCIPLES OF OPERATION

SECTION **PAGE**

4.1 PRINCIPLES OF OPERATION..... 125

4.1 PRINCIPLES OF OPERATION

The SB-2500ex shuttle buggy offers the paving contractor a number of features to help produce a smooth and consistent roadway. The main feature of the SB-2500ex is continuous paving with no contact between the asphalt truck and paver. This allows the paving crew to consistently pave smoother than previously obtained.

The hot asphalt material is dumped from the dump truck into the C-1 dump hopper. Then it is conveyed by the C-1 conveyor into the surge hopper. T-1 augers and liners ensure long life and low maintenance. The C-1 conveyor has an unloading rate of 1000 tph.

NOTE: When loading the C-1 dump hopper, be sure that the dump hopper baffle is all the way down. This will prevent any material from falling down on the backside of the augers.

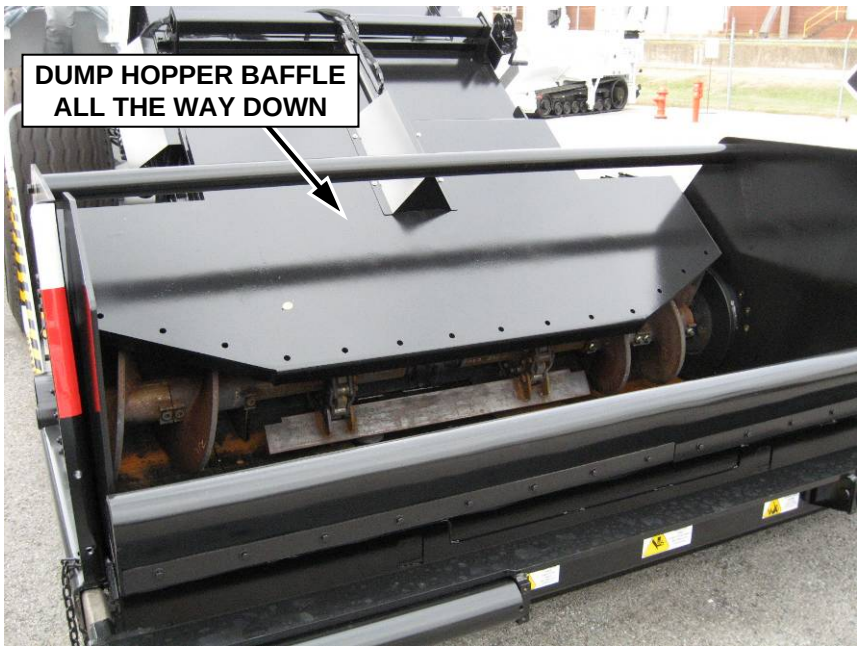


FIGURE 1

WARNING **Do not run aggregate larger than 2” or 50mm through this machine. Aggregate larger than 2” or 50mm will cause premature wear and damage to the machine.**

WARNING **Do not lift the C-1 conveyor without first deactivating the conveyor chain. Severe damage could result.**

NOTE: When operating the buggy for the first time on a job, run the first load of mix straight through the machine. This will heat the conveyor floors and help prevent the conveyors from binding or stalling the hydraulics. Do not try to store the first load of mix in the surge hopper.

4.1 PRINCIPLES OF OPERATION

Once the first load of material has been run through the machine, you can now begin to store some material in the surge hopper of the machine. Be careful to maintain the surge hopper between 1/3 and 2/3 full to ensure adequate remixing (figure 2). Never deviate from the suggested amount of storage.

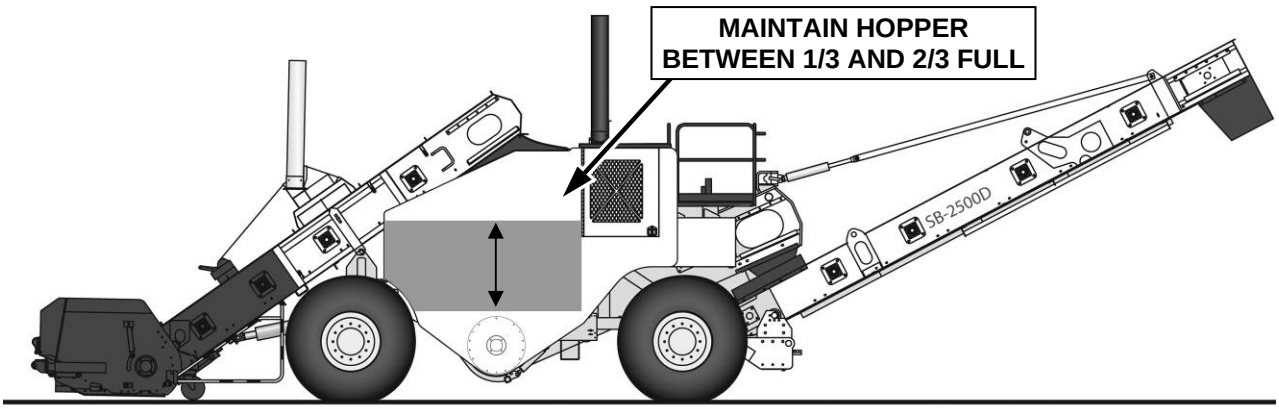


FIGURE 2

Within the surge hopper, a triple pitch-remixing auger moves the material onto the C-2 conveyor. The augers in the bottom of the surge hopper blend the mix from six different points, eliminating material segregation, which may have occurred in the truck (figure 3). Again, T-1 augers and liners ensure low maintenance and long life. The C-2 conveyor has an unloading rate of 600 tph.

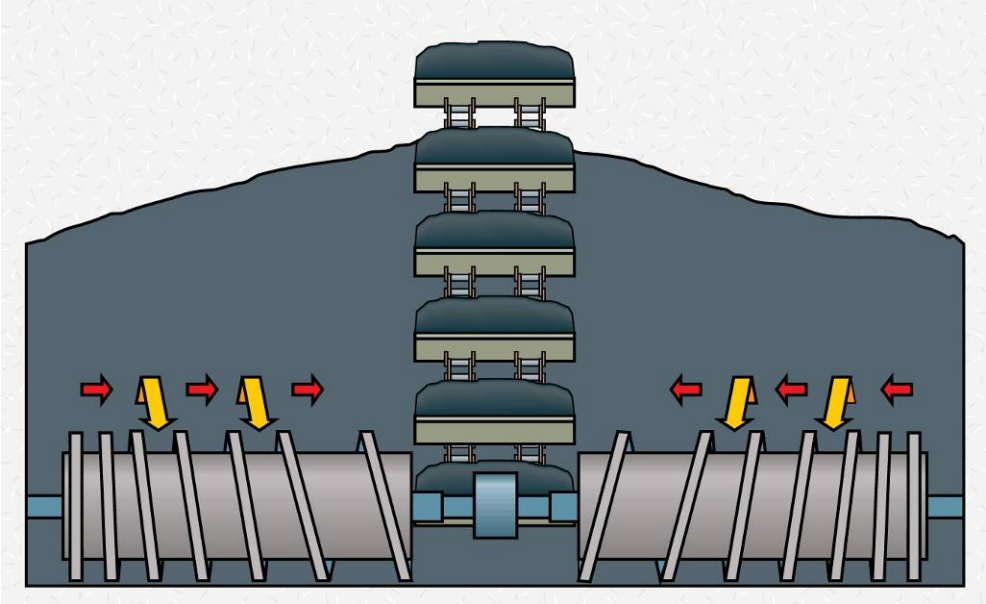


FIGURE 3

4.1 PRINCIPLES OF OPERATION

NOTE: It is important to remember to maintain the flowgates, located in the bottom of the surge hopper, at equal levels. This will help to ensure a more even unloading of material from the surge hopper to the C-2 conveyor.

DANGER **Do not attempt to lift the C-1 conveyor while the surge hopper is full of material. Severe damage could result.**

The remixed material is taken up the C-2 conveyor and delivered into the C-3 discharge conveyor. The C-3 conveyor can be swung from side to side to allow for loading the paver from an adjacent lane.

The machine is extremely versatile when paving shoulders or when adding new lanes (figure 4). Using the shuttle buggy saves the need for building down into the lane or shoulder and then ramping back out of these areas. This also eliminates the need to construct a temporary lane for trucks to go on the inside of the paver.

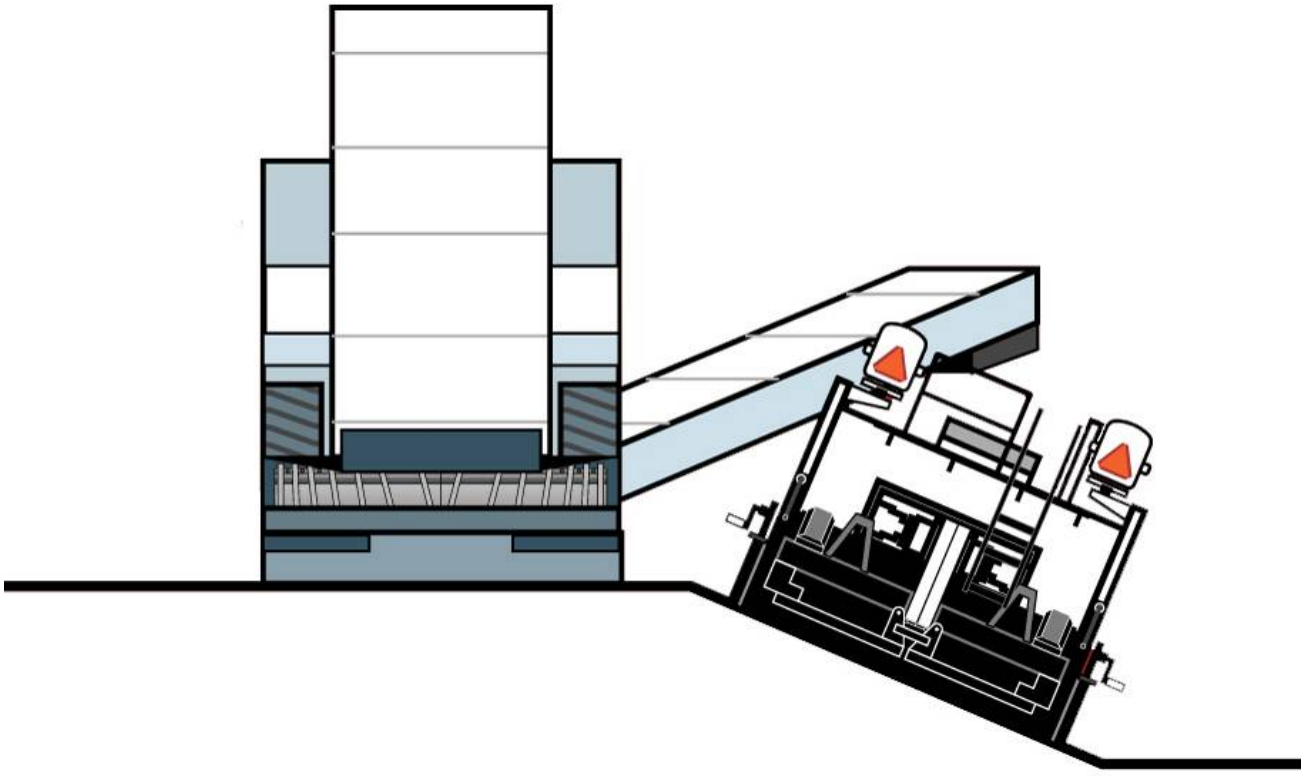


FIGURE 4

4.1 PRINCIPLES OF OPERATION

Figure 5 illustrates a paver operating between two string lines. Trucks are not required to back between the string lines, but can dump into the shuttle buggy from an adjacent lane which can then convey the mix across the string lines into the paver. It should be noted that this allows the trucks to stay out of the tack coat, which results in a much cleaner operation.

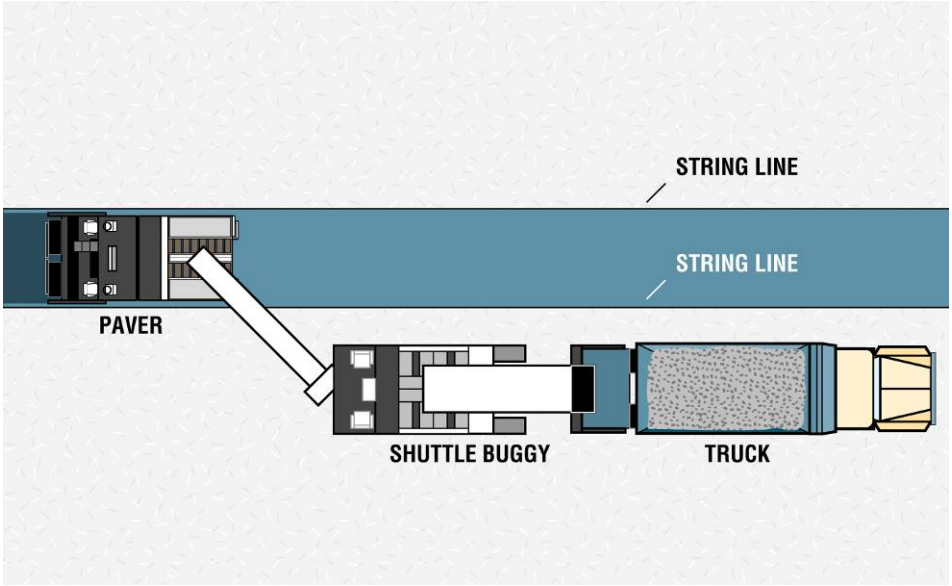


FIGURE 5

Another unique feature of the SB-2500ex is its ability to shuttle “go and get” the material from the truck and deliver it to the paver. This is extremely useful in city work where you have a number of overhead power lines, trees or overpasses (figure 6).

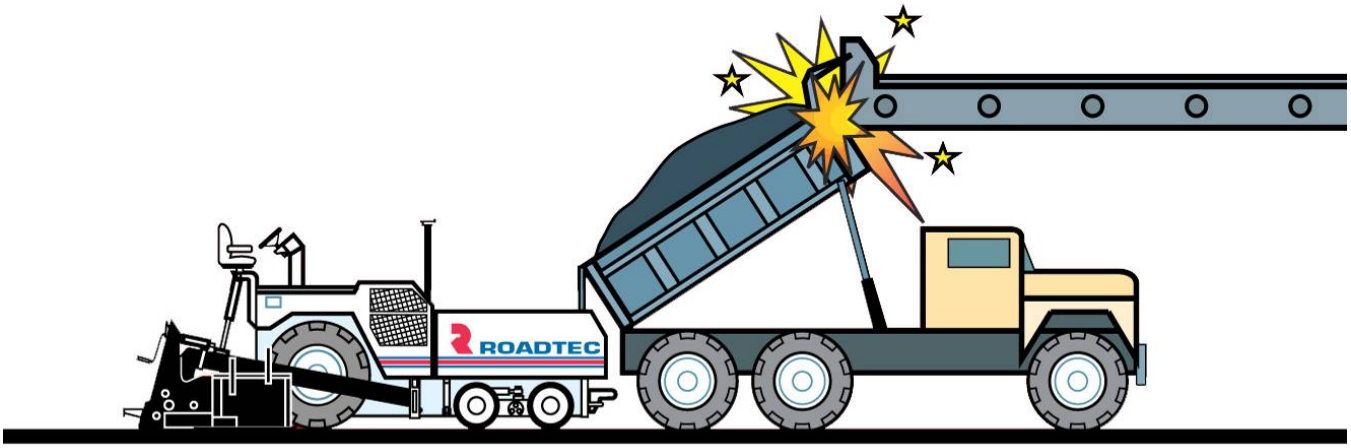


FIGURE 6

The SB-2500ex allows for the use of a hopper insert to be placed in the paver’s hopper. This insert is capable of holding 10 tons of material thus increasing the hopper capacity of a conventional paver.

LUBRICATION AND MAINTENANCE

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5.1 LUBRICATION

The life and reliability of this machine is greatly affected by the type, frequency and care of lubrication. Dirt particles that are difficult to see with the human eye can cause many thousands of dollars worth of damage to a mechanical or hydraulic system. Lubricants must be properly stored in clean, covered containers properly marked to identify their use. If containers are used to carry lubricants from bulk storage tanks, they should be thoroughly cleaned and provided with covers.

Before removing caps and plugs, thoroughly clean the area around them. Grease fittings and grease gun adapters must be cleaned before injecting grease. Funnels should be washed with solvents and thoroughly dried before and after use. Re-clean all grease fittings and wipe up spilled oils to avoid accumulation and hazardous walkways.

Lubrication should be performed at the end of the day right after the machine has been washed down. Lubricants and debris are most easily flushed while they are warm. This is particularly true in the material handling areas of the machine.

A lubrication schedule is provided with suggested service intervals. If operating conditions are severe, shorter intervals may be required. Only quality lubricants should be used which conform to the lubricant specifications. Fluid levels should be checked when the machine is parked on a level surface.

- Over lubrication on non-sealed fittings will not harm the fittings or components, but under lubrication will definitely lead to a shorter life.

- All grease fittings are SAE standard unless otherwise indicated. Grease non-sealed fittings until grease is seen extruding from the fitting. One ounce of EP-MPG equals one pump on a standard grease gun.



WARNING

Clean fuel, lubricants and hydraulic oil from walkways, or loss of footing may easily occur resulting in serious injury or even death.

Use caution when working with a hot, pressurized system. You can be burned by hot fluid.

Never fill the fuel tank while the engine is running, near an open flame or when smoking. Always wipe up any spilled fuel.

- Unless otherwise indicated, items not equipped with grease fittings, such as linkages, pins and levers. Should be lubricated with oil once a week. Motor oil, applied sparingly, will provide the necessary lubrication and help prevent the formation of rust. An anti-seize compound may be used if rust has not formed, otherwise the part must be cleaned first.

- Lubricants must be at operating temperature when draining.

5.1 LUBRICATION

- Visually check the entire unit in regard to cap screws, nuts and pins being properly secured. Spot-check several cap screws and nuts for proper torque. If any are found loose, a more thorough investigation must be made.

A. HYDRAULIC FLUID

HYDRAULIC OIL ONLY

Oil Specification:

Type: AW 46 hydraulic oil (ISO. VIS. GRADE 46 ANTI WEAR HYDRAULIC OIL)

Gravity API: 30.2

Viscosity: CSt AT 40°C------46
CSt AT 100°C----6.6
SUS AT 100°F----239
SUS AT 210°F----49
Viscosity Index----95

Note: Must meet Allison C3 Specification.

B. ENGINE OIL

Use only diesel engine oil. Refer to the engine operation and maintenance manual for more information on engine oil and variations in ambient temperatures.

C. GEAR OIL

Use only 80w-90 high performance gear oil in the planetaries and the hydraulic pump drive unit.

D. HIGH TEMPERATURE GREASE

High temperature grease – NGLI grade 2 valvoline cerulean, palladium or equivalent is recommended when lubricating the many grease points found on the machine.

5.2 FLUID CAPACITIES

SB-2500ex FLUID CAPACITIES				
COMPONENT	**FLUID TYPE**	**INTERVALS**	**CAPACITY**	
FUEL TANK	DIESEL FUEL	FILL DAILY	140 GALLONS	529 LITERS
HYDRAULIC TANK	ISO VIS. GRADE 46 HYDRAULIC OIL	CHECK DAILY DRAIN, FLUSH & REFILL EVERY 1000 HOURS	112 GALLONS (90% CAPACITY)	424 LITERS (90% CAPACITY)
ENGINE (CAT C9 ENGINE)	(SAE 15W-40) DIESEL ENGINE OIL	CHECK DAILY DRAIN AND REFILL EVERY 250 HOURS	32 QUARTS	30 LITERS
PUMP DRIVE	SAE 80W90 HIGH PERFORMANCE GEAR OIL	DRAIN, FLUSH & REFILL EVERY 1000 HOURS	1 GALLON	3.78 LITERS
COOLING SYSTEM	50/50 MIX ANTIFREEZE & WATER	CHECK DAILY DRAIN,FLUSH & REFILL EVERY 1000 HOURS	12 GALLONS	45.42 LITERS
WHEEL PLANETARIES	SAE 80W90 HIGH PERFORMANCE GEAR OIL	CHECK LEVEL EVERY 50 HOURS DRAIN, FLUSH & REFILL AFTER FIRST 250 HOURS THEN EVERY 1000 HOURS THEREAFTER	8.45 PINTS	4 LITERS
C-1 PLANETARIES	SAE 80W90 HIGH PERFORMANCE GEAR OIL	CHECK LEVEL EVERY 50 HOURS DRAIN, FLUSH & REFILL AFTER FIRST 250 HOURS THEN EVERY 1000 HOURS THEREAFTER	60 OUNCES	1.77 LITERS
C-2 PLANETARY	SAE 80W90 HIGH PERFORMANCE GEAR OIL	CHECK LEVEL EVERY 50 HOURS DRAIN, FLUSH & REFILL AFTER FIRST 250 HOURS THEN EVERY 1000 HOURS THEREAFTER	108 OUNCES	3.19 LITERS
C-3 PLANETARY	SAE 80W90 HIGH PERFORMANCE GEAR OIL	CHECK LEVEL EVERY 50 HOURS DRAIN, FLUSH & REFILL AFTER FIRST 250 HOURS THEN EVERY 1000 HOURS THEREAFTER	60 OUNCES	1.77 LITERS

5.3 LUBRICATION POINTS

A. C1 DUMP HOPPER AUGER BEARINGS

Clean any dirt and grease from fittings. Lubricate the auger bearings on both sides of the machine with 8 shots of high temperature grease daily (figure 1 & 2).

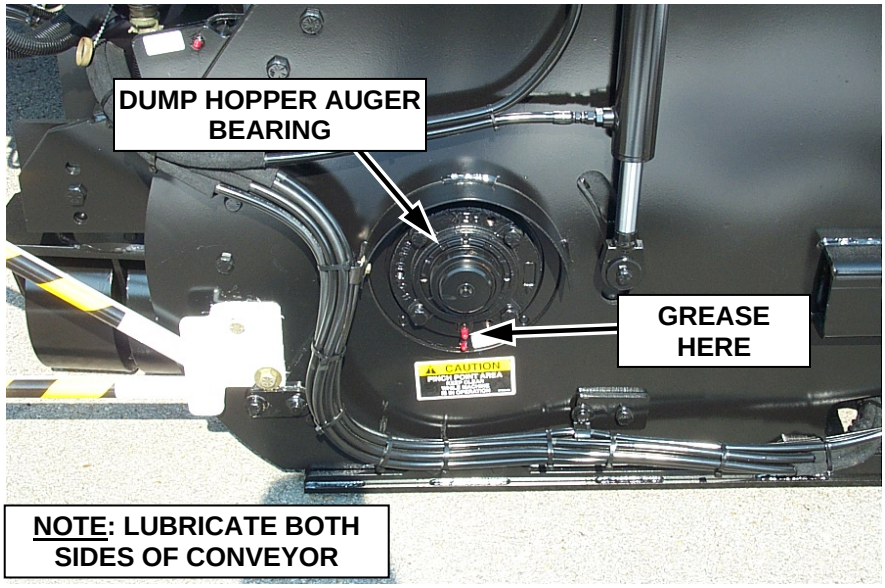


FIGURE 1

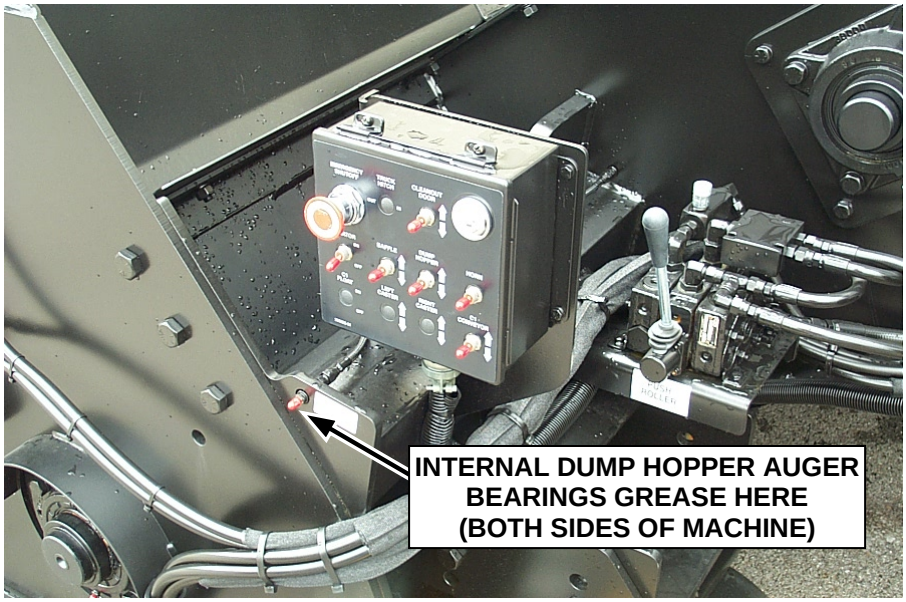


FIGURE 2

5.3 LUBRICATION POINTS

B. C2 HEAD AND TAIL SHAFTS

Clean any dirt and grease from fittings. Lubricate the head shaft bearings on both sides of the machine with 8 shots of high temperature grease daily. (Figure 3)

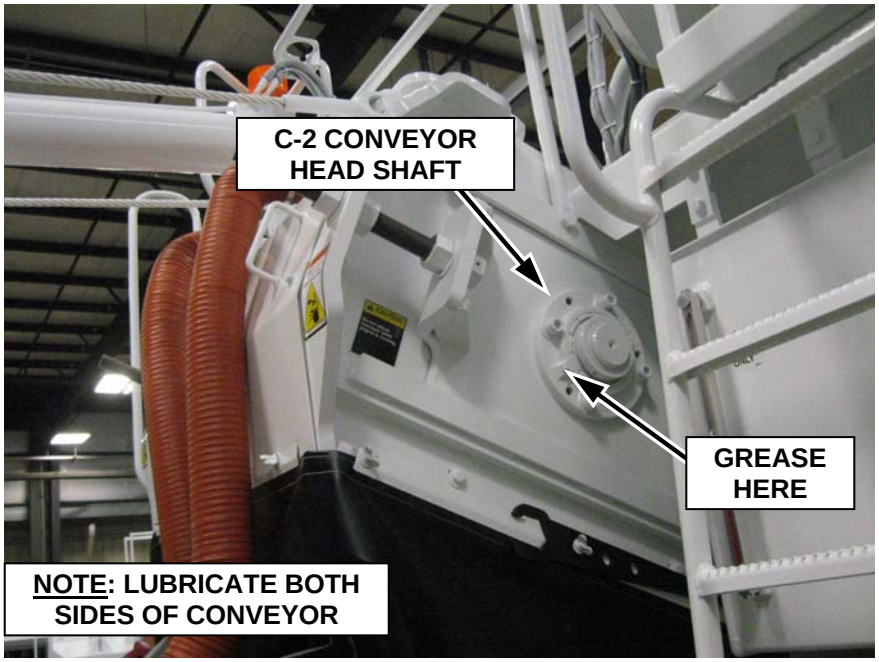


FIGURE 3

Clean any dirt and grease from fittings. Lubricate the inner auger (tail shaft) bearings on both sides of the machine with 8 shots of high temperature grease daily (figure 4).

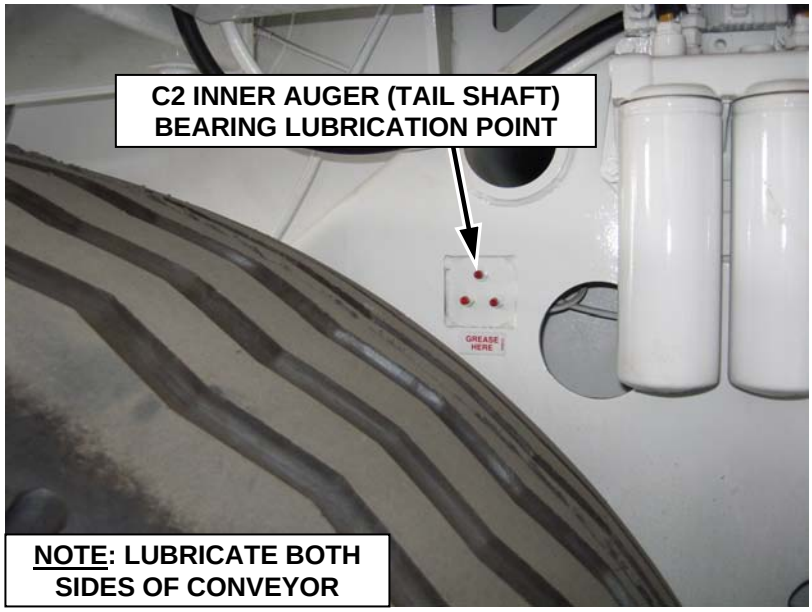


FIGURE 4

5.3 LUBRICATION POINTS

B. C2 HEAD AND TAIL SHAFTS

Clean any dirt and grease from fittings. Lubricate the outer auger (tail shaft) bearings on both sides of the machine with 8 shots of high temperature grease daily (figure 5).

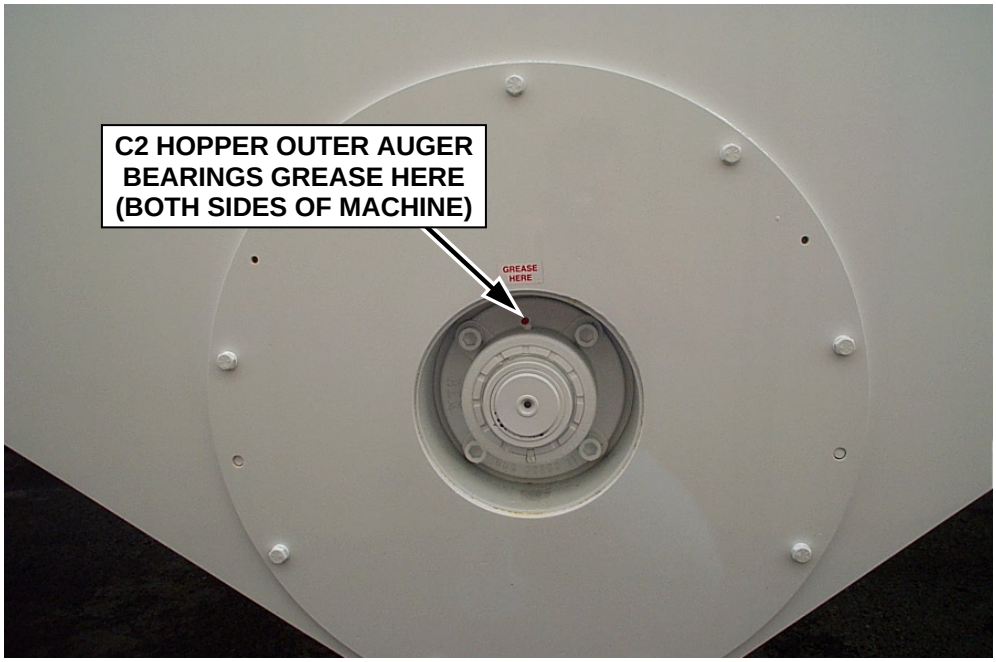


FIGURE 5

5.3 LUBRICATION POINTS

C. C3 HEAD AND TAIL SHAFTS

Clean any dirt from around the fittings. Lubricate both sides of the head and tail pulleys with 8 shots of high temperature grease daily (figures 6 & 7).

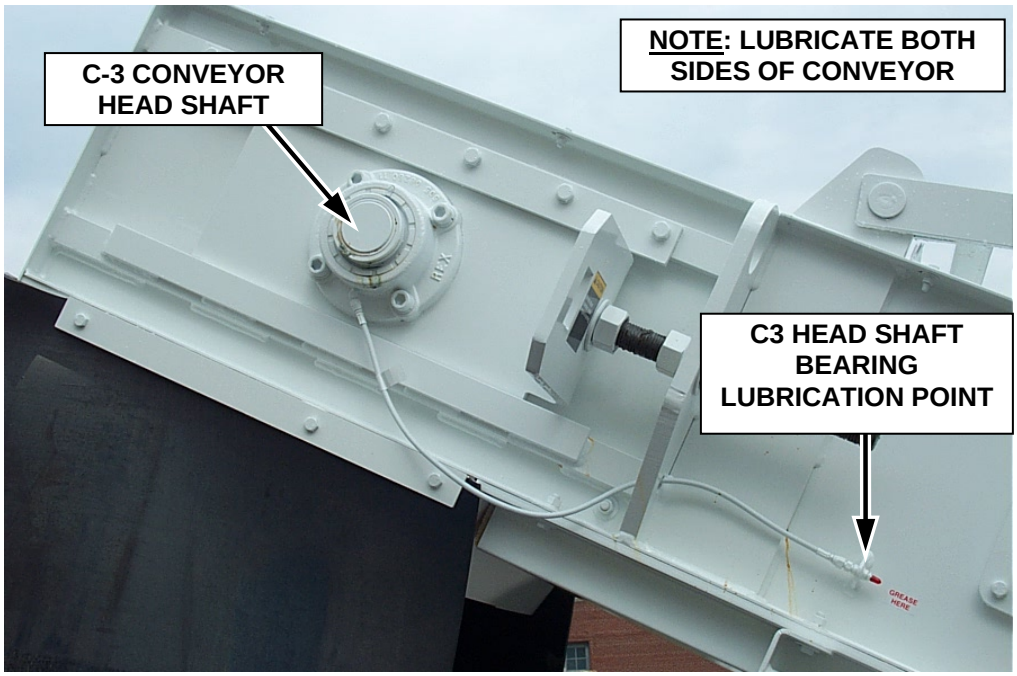


FIGURE 6

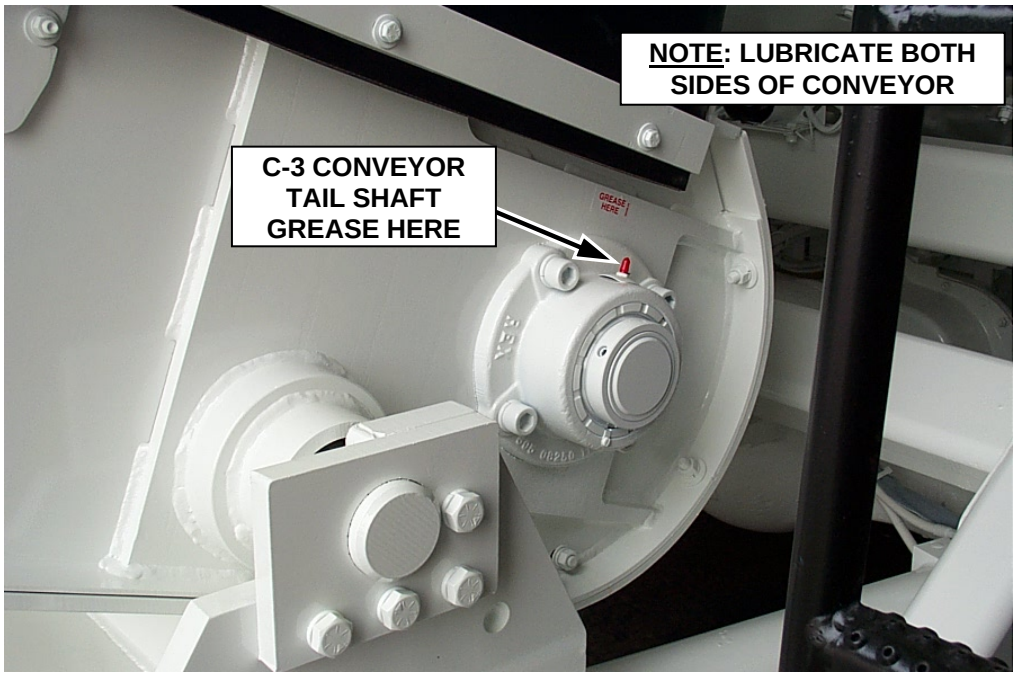


FIGURE 7

5.3 LUBRICATION POINTS

D. CONVEYOR IDLER BEARINGS

Clean any dirt from around all grease fittings. Lubricate the bearings on both sides of each idler with 5 shots of high temperature grease daily. Check for looseness or damage to bearings.

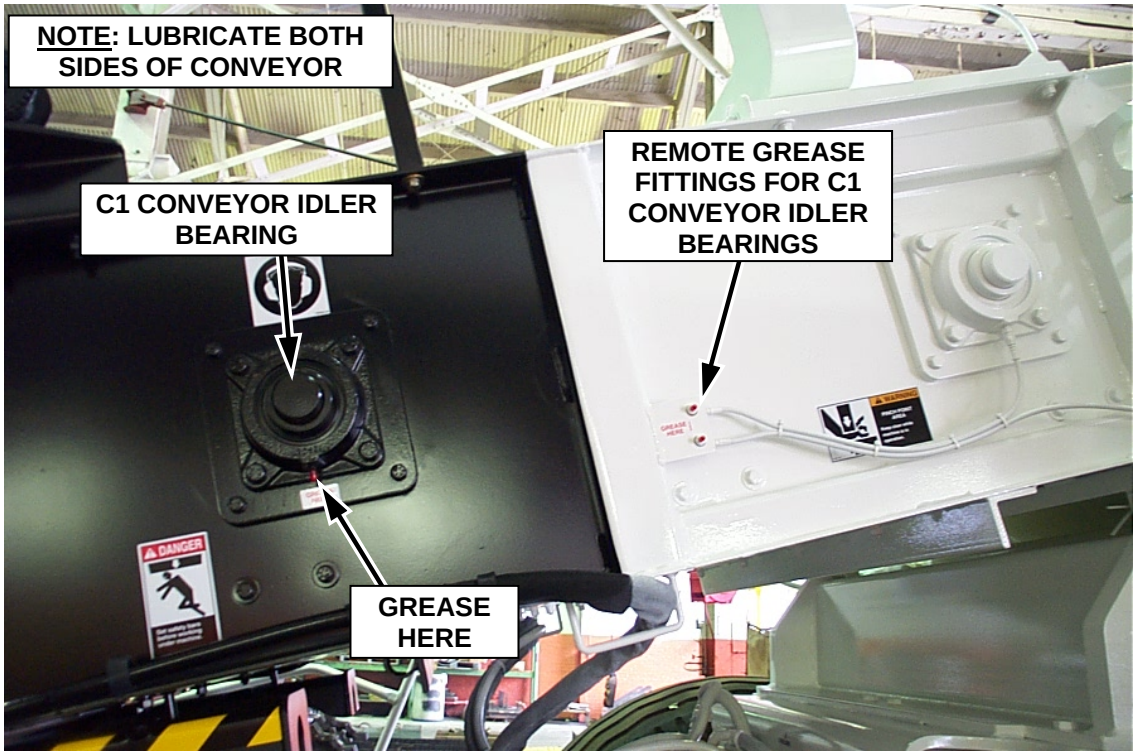


FIGURE 8

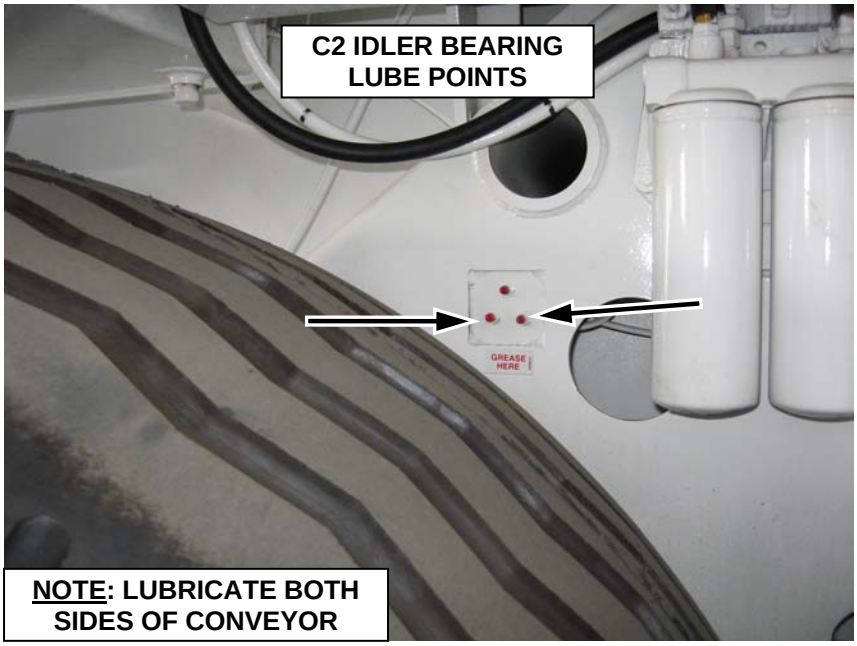


FIGURE 9

5.3 LUBRICATION POINTS

D. CONVEYOR IDLER BEARINGS

Clean any dirt from around all grease fittings. Lubricate the bearings on both sides of each idler with 5 shots of high temperature grease daily. Check for looseness or damage to bearings.

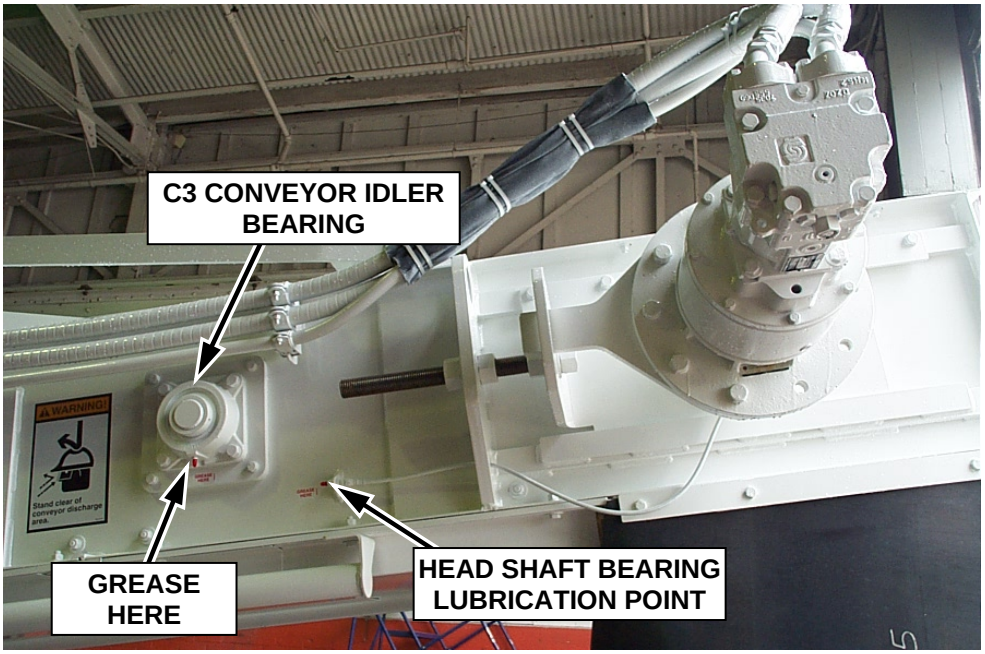


FIGURE 10

E. C3 CONVEYOR PIVOT TUBE ASSEMBLY

Clean any dirt and grease away from the fittings. Lubricate the C3 conveyor pivot tube with 5 shots of high temperature grease daily (figure 11).

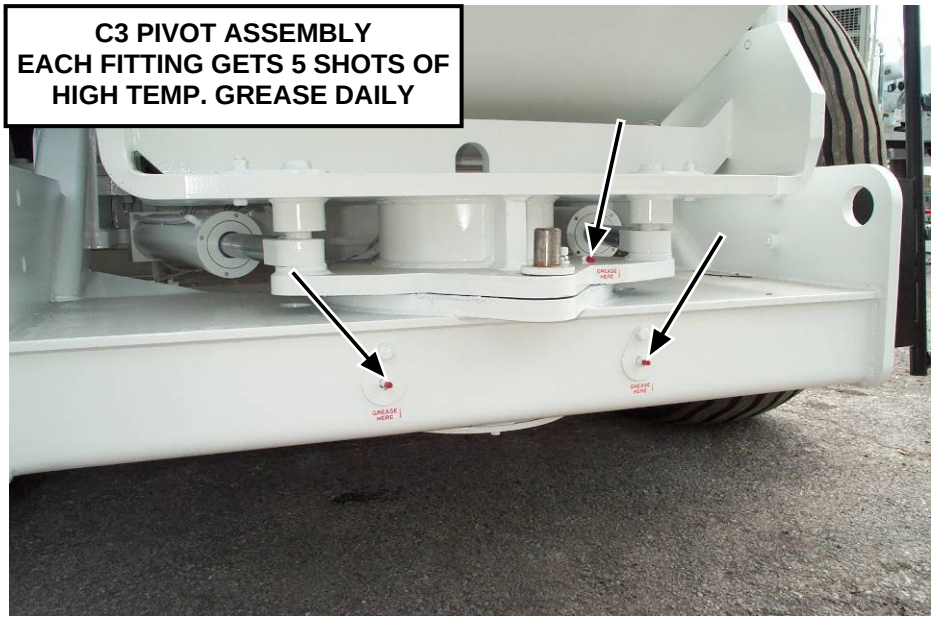


FIGURE 11

5.3 LUBRICATION POINTS

F. STEERING ASSEMBLY

Clean any dirt and grease from fittings. Lubricate steering assembly with high temperature grease. Each fitting gets 3 shots every 50 hours of operation. (Figures 12 & 13)

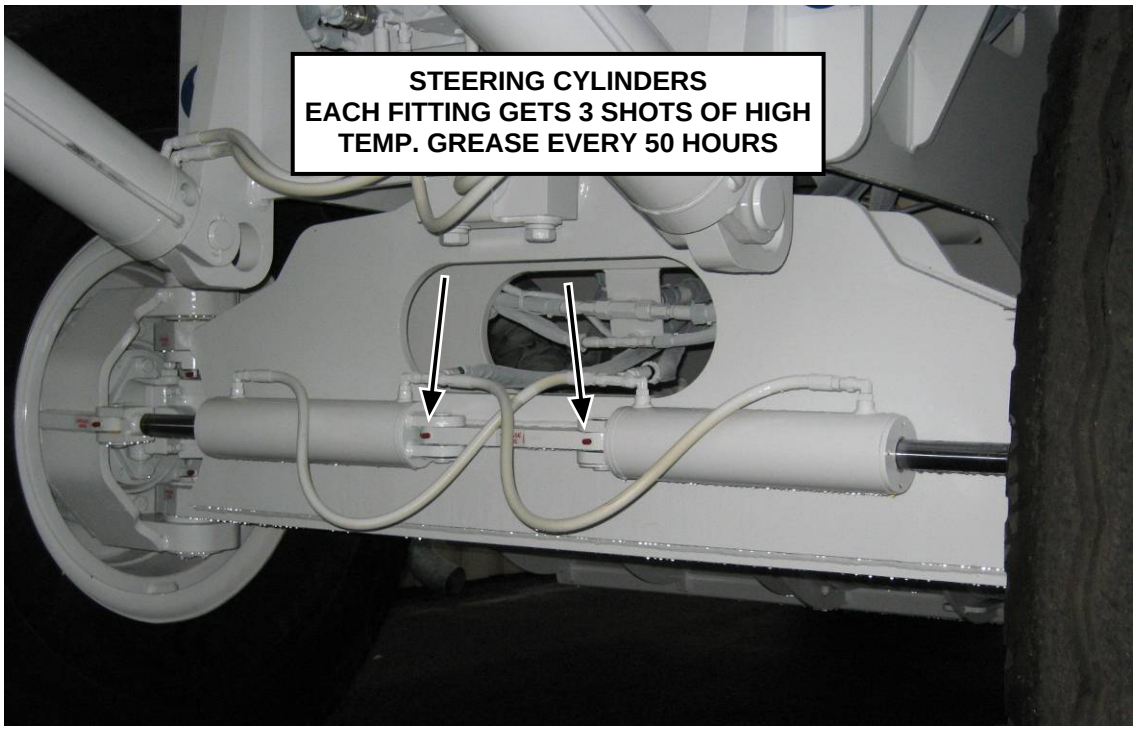


FIGURE 12



FIGURE 13

5.3 LUBRICATION POINTS

G. C3 LIFT PIVOT

Clean any dirt and grease from around the fittings. Lubricate the bearing with 2-3 shots of high temperature grease every 50 hours of operation (figure 15).

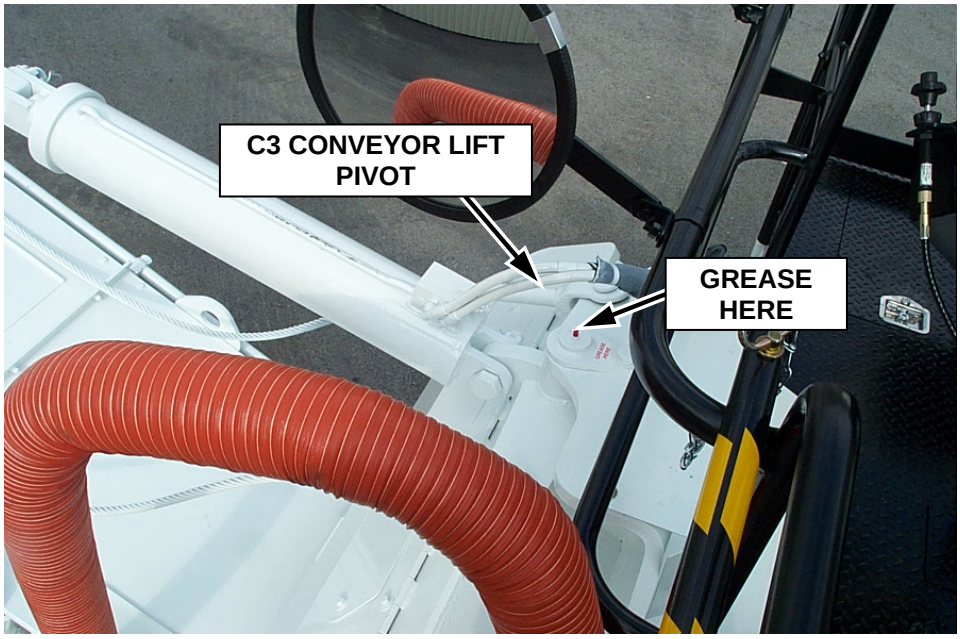


FIGURE 15

H. C1 CASTER WHEELS

Clean any dirt and grease from around the fittings. Lubricate both sides of the bearings with 2-3 shots of high temperature grease every 50 hours of operation.

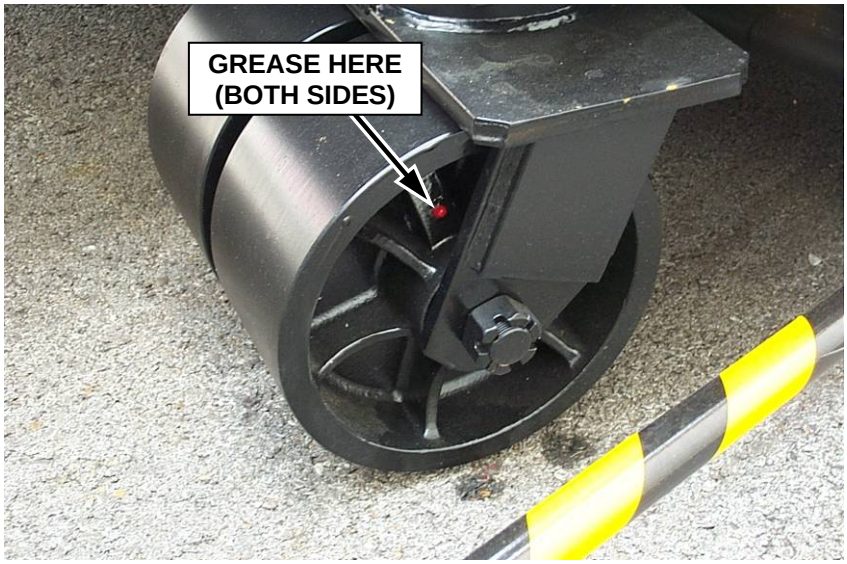


FIGURE 16

5.4 MAINTENANCE



DANGER

DO NOT WORK UNDER THE MACHINE WITH THE ENGINE RUNNING OR WITHOUT THE SAFETY BARS BEING IN PLACE. THIS COULD RESULT IN SERIOUS INJURY OR DEATH.



WARNING

Before doing any maintenance, service or parts, read and understand section 1 - safety precautions and guidelines of this manual to avoid personal injury.

Never service, clean or examine the unit with the engine running.

Never fill the fuel tank with the engine running, while near an open flame or when smoking. Always wipe up any spilled fuel.

Never remove the pressurized radiator cap until the engine's cooling system has cooled.

Do not alter the engine governor settings from that indicated in the engine manual and engine option plate.

Always replace damaged or lost decals. Refer to the parts manual for the proper location and part number of all decals.

Disconnect the battery cables when working on the electrical system or when welding on the machine.

Be sure the battery area is well ventilated should it become necessary to connect a jump battery or battery charger. Fumes can ignite by a spark and explode.

5.4 MAINTENANCE

A. REFUELING PROCEDURE

FUEL

Always use a reputable grade of ultra-low sulfur diesel fuel (S ≤ 15 mg/kg), the sulfur content of which should be below 0.0015%. Observe strict cleanliness when filling tank. At low ambient temperatures, use winter-grade fuel only. The fuel must be replenished promptly to prevent the tank from running dry, otherwise the fuel filter and injection lines will need air venting.

Refuel the buggy at the end of the day to reduce water condensation in the fuel tank. Always shut down all the equipment (Shuttle Buggy, pavers and other surrounding equipment) while refueling, to avoid serious accidents.

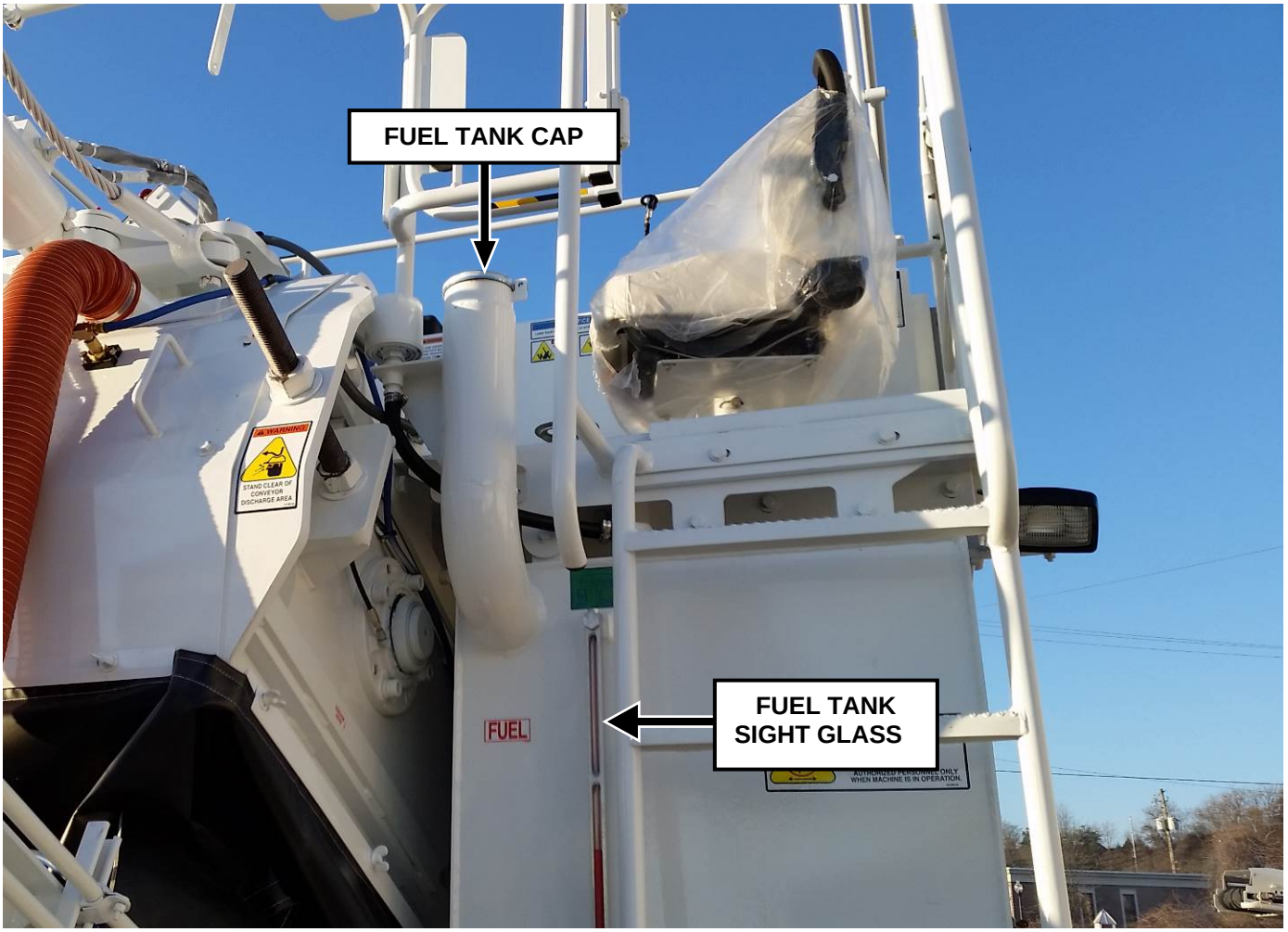


FIGURE 17

5.4 MAINTENANCE

B. WHEEL DRIVE PLANETARIES

The front wheel hub is filled with 80w-90 high performance gear oil. Check fluid level every 50 hours of operation. Drain, flush and refill the fluid after the first 250 hours of operation on a new machine. Then drain, flush and refill every 1000 hours of operation.

1. Position the machine so the oil drain port is at the bottom center of the planetary.

2. Clean any dirt and grease from around the port plugs on the drive planetary.

3. Remove the port plugs and allow the gear oil to drain into an appropriate container.

4. Dispose of used oil in a safe and legal manner.

5. Re-install the drain port plug.

6. Refill the drive planetary through the oil fill port with 80w-90 high performance gear oil.

7. The planetary is full when its internal gear oil level is even with the oil fill port.

8. Re-install the fill port plug when finished and check for leaks.

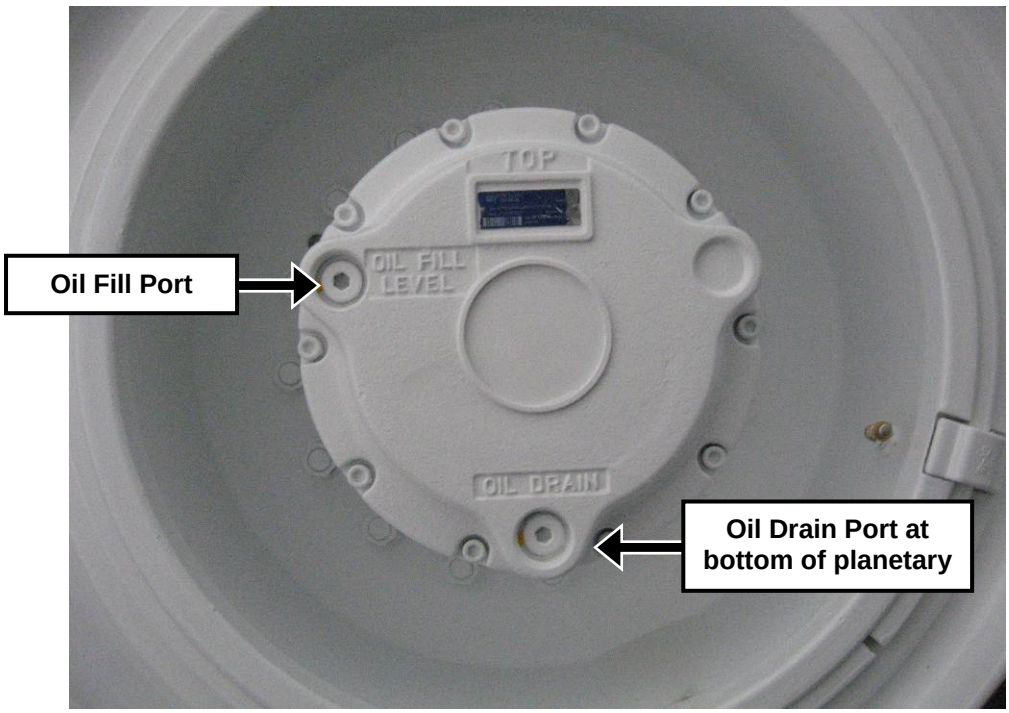


FIGURE 18

5.4 MAINTENANCE

C. CONVEYOR PLANETARIES

The conveyor planetaries are filled with 80w90 high performance gear oil. Check levels every 50 hrs. Drain, flush and refill after the first 250 hours on a new machine and then at 1000 hour intervals. Clean any dirt and grease away from the drain and fill ports before servicing (figures 19-21).

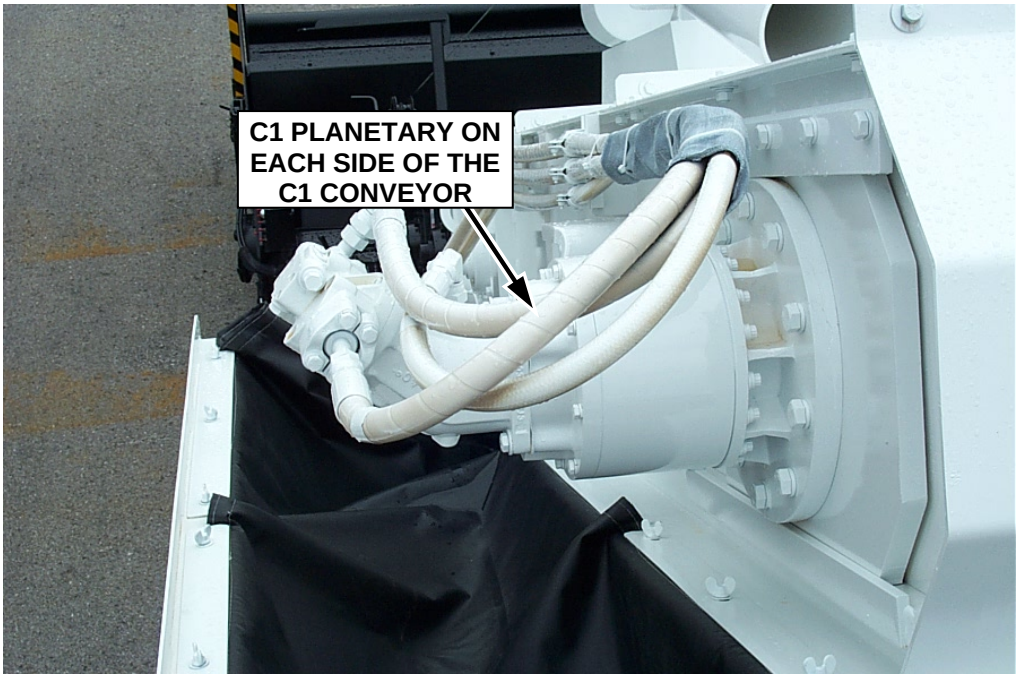


FIGURE 19

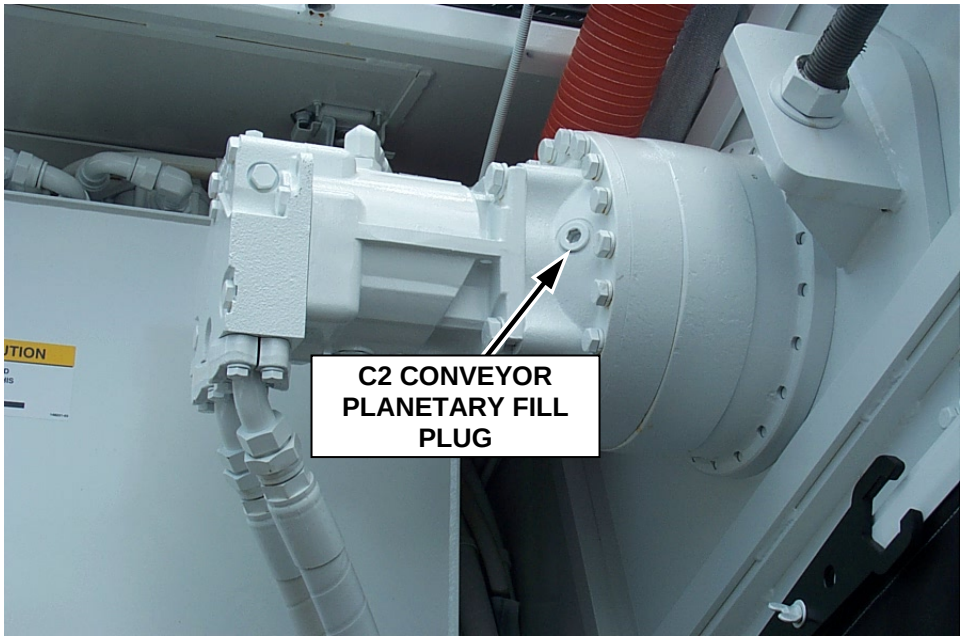


FIGURE 20

5.4 MAINTENANCE

D. CONVEYOR PLANETARIES

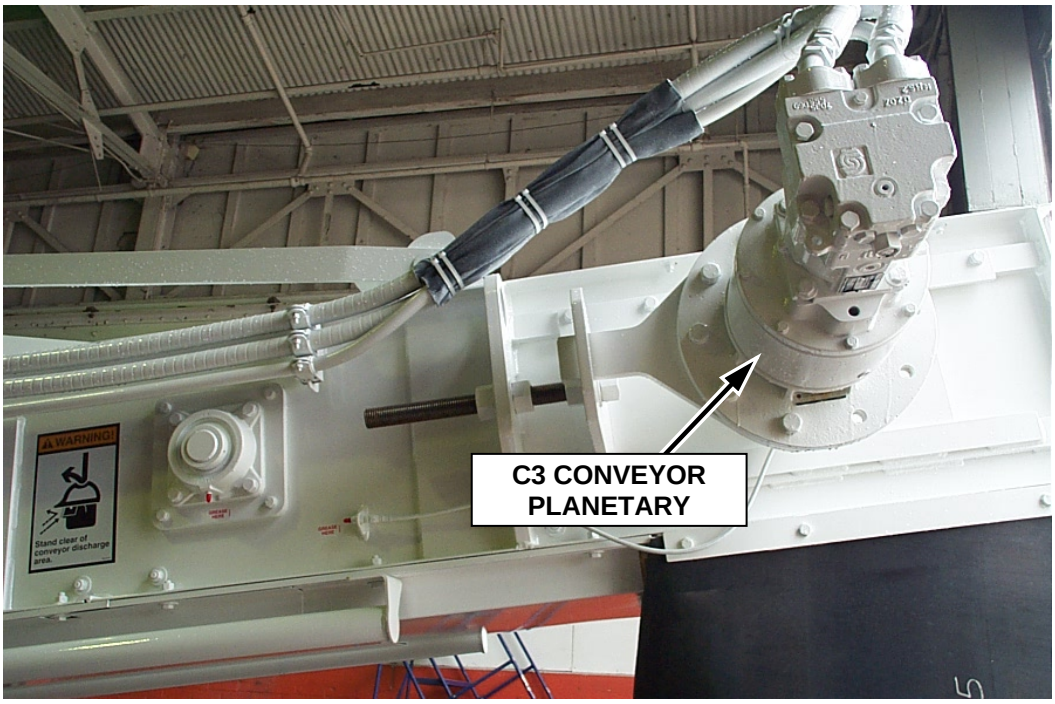


FIGURE 21

5.4 MAINTENANCE

D. ENGINE OIL AND FILTERS

Change the engine oil and oil filter after the first 50 hours of operation on a new machine. Then it is required that the engine oil and oil filter be changed every 250 hours of operation.

1. Operate the engine until the water temperature reaches 140 degrees Fahrenheit (60 degrees Celsius). Shut off the engine and locate the engine oil drain hose shown in figure 22. Remove the oil drain plug. Drain the oil immediately to make sure all the oil and suspended contaminates are removed from the engine.

DANGER **AVOID DIRECT CONTACT OF HOT OIL WITH YOUR SKIN. HOT OIL CAN CAUSE SEVERE PERSONAL INJURY.**



FIGURE 22

2. Clean the area around the lubricating oil filter head. Remove the oil filter. Clean the gasket surface of the filter head.

THE O-RING CAN STICK ON THE FILTER HEAD. MAKE SURE THE O-RING IS REMOVED.

Use the correct oil filter for your engine (please reference the engine manual for proper filter).

3. Fill the new oil filter with clean lubricating oil. The lack of lubrication during the delay until the filter is pumped full of oil is harmful to the engine.

Apply a light film of lubricating oil to the gasket seal before installing the new filter.

Mechanical over tightening can distort the threads or damage the filter element seal.

4. Install the filter as specified by the filter manufacturer.

5.4 MAINTENANCE

D. ENGINE OIL AND FILTERS

5. Check and clean the oil drain plug threads and the seal surface.

6. Install and tighten the oil drain plug.

7. Refill the engine with SAE 15w-40 diesel engine oil.

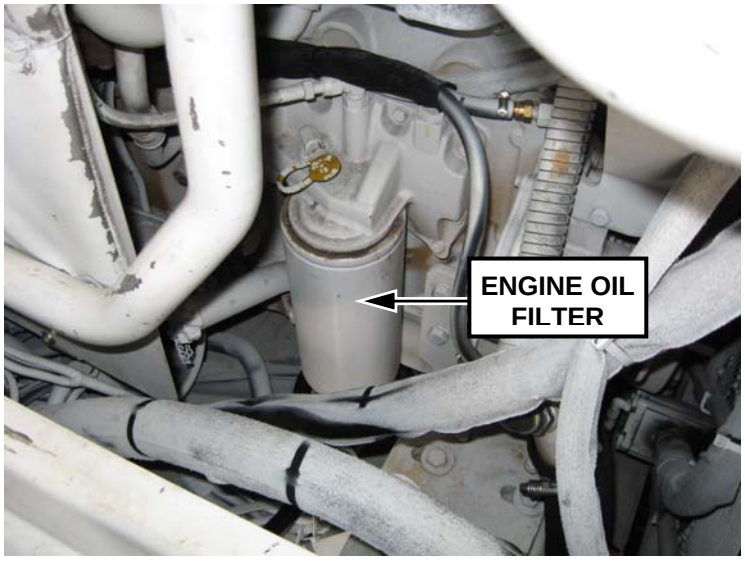


FIGURE 23

5.4 MAINTENANCE

E. HYDRAULIC OIL AND FILTERS

Check hydraulic oil levels daily to prevent a low oil situation and pump loss.

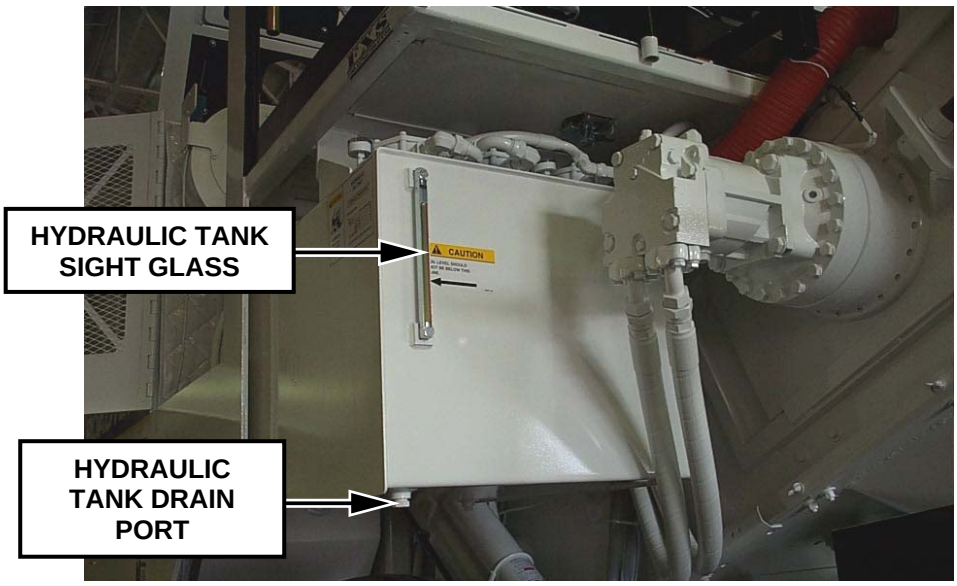


FIGURE 24

Check hydraulic oil level by viewing sight gauge on rear of hydraulic tank (Figure 24). Oil level (when hot) should always be visible in the upper levels of the sight glass. The level of oil should never be out of the sight gauge even when oil is cold.

WARNING Fill the hydraulic tank to only 90 percent capacity. Heat will cause the hydraulic oil to expand. So if the tank were to be filled to 100 percent capacity it would overflow when the fluid heats up during operation of the machine.

The hydraulic oil filters must be replaced with new clean filters after the first 50 hours of operation on a brand new machine. The filters must then be replaced every 250 hours of operation from then on.

Through the course of operation water may accumulate in the hydraulic tank. It is important to drain this water every 250 hours of operation. Since water will form at the bottom of the tank, all that needs to be done is to drain all the water out of the drain port. Then refill the tank to 90% capacity with fresh clean ISO VIS grade 46 hydraulic oil.

The hydraulic tank must be drained, cleaned and refilled with fresh clean ISO VIS grade 46 hydraulic oil every 1000 hours of operation. All hydraulic filters and strainers must be replaced every time the hydraulic tank is drained.

5.4 MAINTENANCE

E. HYDRAULIC OIL AND FILTERS

IN-TANK HYDRAULIC OIL FILTER ELEMENT CHANGE OUT PROCEDURE:

Note: This machine is equipped with a sliding operator's platform. To access the hydraulic oil filters, the position of the operator's platform must be adjusted accordingly. An access door is provided to assist with access to the filters.

DANGER Keep all hands and feet away from the moving components of the sliding operator's platform while it is in motion. Severe injury could result.

1. Shutdown the engine.
2. Clean any dirt and grease from around filter heads.
3. Unbolt filter heads from tank and remove internal filter containers.
4. Remove filters from filter containers.
5. Fill the new filters with clean hydraulic oil, that has been filtered through a 10-micron element.
6. Install the correctly rated micron filter element into the appropriate containers tank. Bolt down filter heads. Refer to figure 25.
7. Start engine and check for leaks.

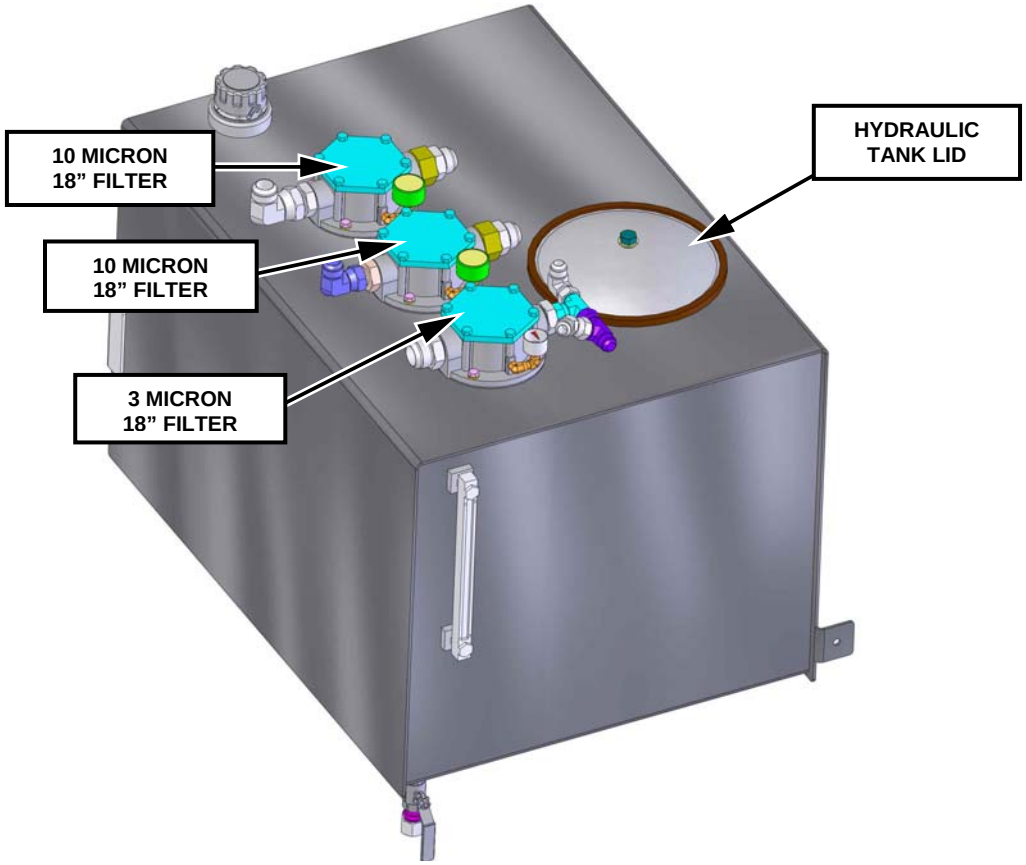


FIGURE 25

5.4 MAINTENANCE

E. HYDRAULIC OIL AND FILTERS

AUXILIARY HIGH PRESSURE FILTER

The auxiliary system is equipped with an in-line high pressure filter that filters the hydraulic oil flowing from the auxiliary pump. The filter used is a Hydac 10 micron DF series filter (figure 26).

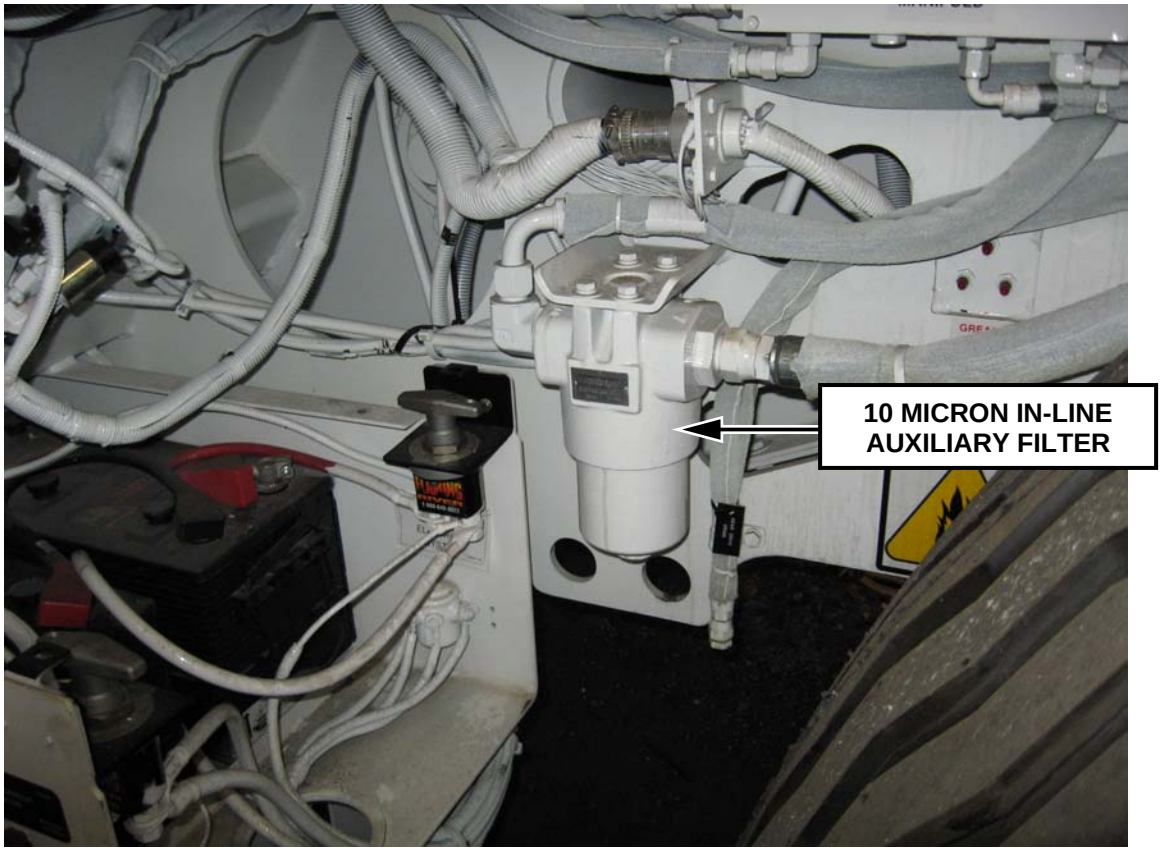


FIGURE 26

Auxiliary filter element change out procedure:

1. Shut down machine and relieve system pressure.
2. Remove filter bowl. Being careful of any hot oil standing in bowl.
3. Dispose of any oil in bowl properly.
4. Remove the filter element.
5. Inspect bowl o-ring for any damage.
6. Discard disposable element.
7. Lubricate the o-ring on new filter element.
8. Install new filter element.
9. Screw filter bowl back onto filter head.
10. Pressurize system and check for leaks.

5.4 MAINTENANCE

E. HYDRAULIC OIL AND FILTERS

HYDRAULIC TANK STRAINERS

The hydraulic tank strainers should be replaced every time the hydraulic oil is drained and replaced (every 1000 hours of operation). Clean any dirt and grease from tank strainers before attempting to replace them.



FIGURE 27

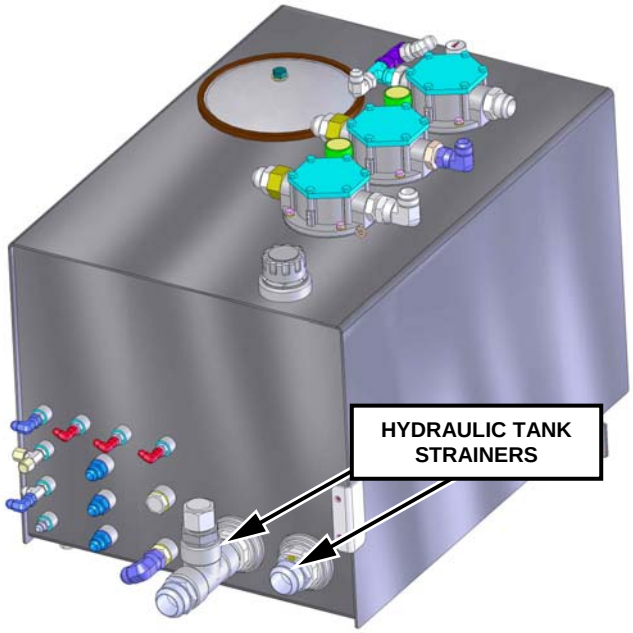


FIGURE 28

5.4 MAINTENANCE

F. PUMP DRIVE

The pump drive is filled with 80w90 high performance gear oil. Recommended oil changes for the pump drive are after the first 250 hrs of service and then every 1000 hrs of service. Fill only to the fill mark on the dipstick (figure 29).

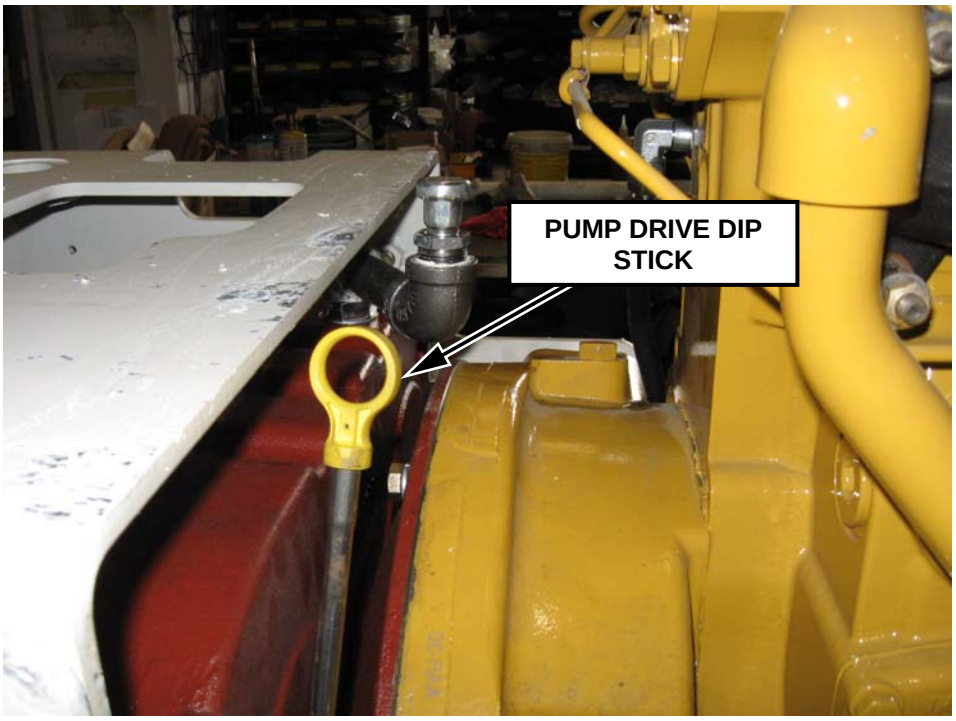


FIGURE 29



FIGURE 30

5.4 MAINTENANCE

G. ENGINE COOLANT

The coolant level and mix should be checked daily. Maintain the engine coolant to 4 inches from the bottom of the radiator cap. Use a 50/50 anti-freeze and water mixture (figure 31). The radiator must be drained, flushed and refilled every 1000 hours of operation.

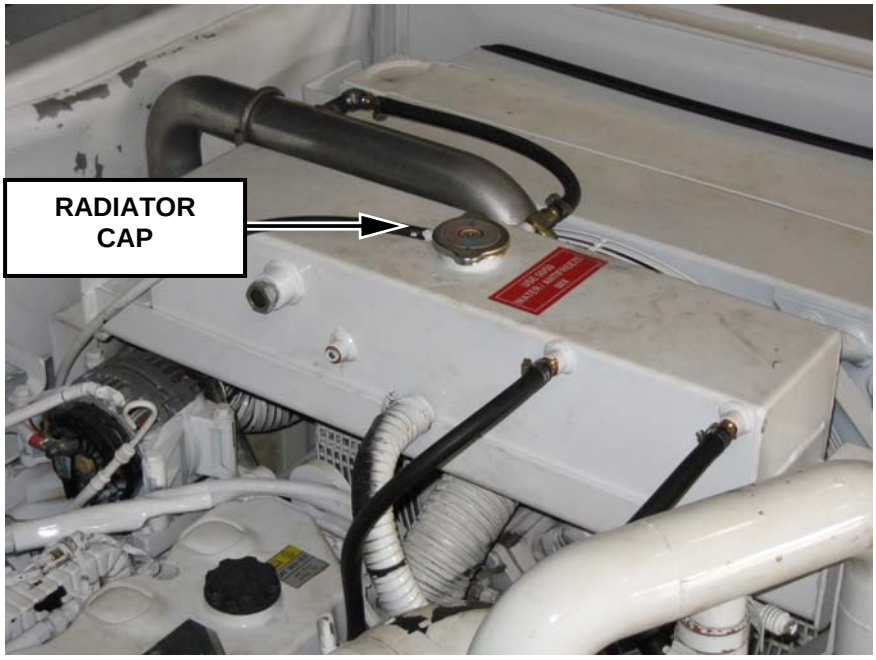


FIGURE 31

The radiator drain valve can be located at the base of the radiator as shown in figure 32.

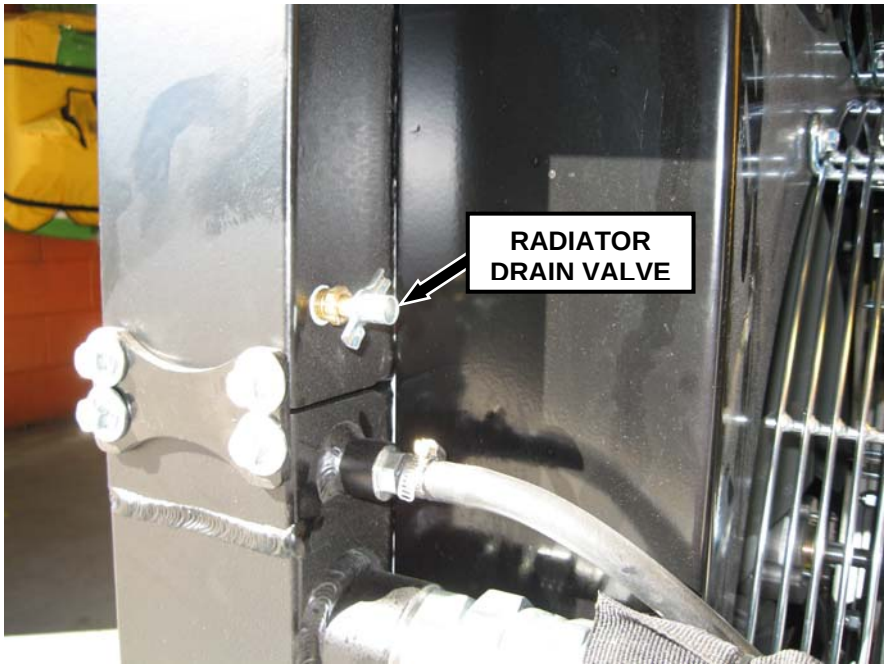


FIGURE 32

5.4 MAINTENANCE

H. FUEL/WATER SEPARATOR

The fuel/water separator should be drained daily. To drain, simply open the drain valve located at the bottom of the unit. The filter element should be changed every 250 hours of operation.

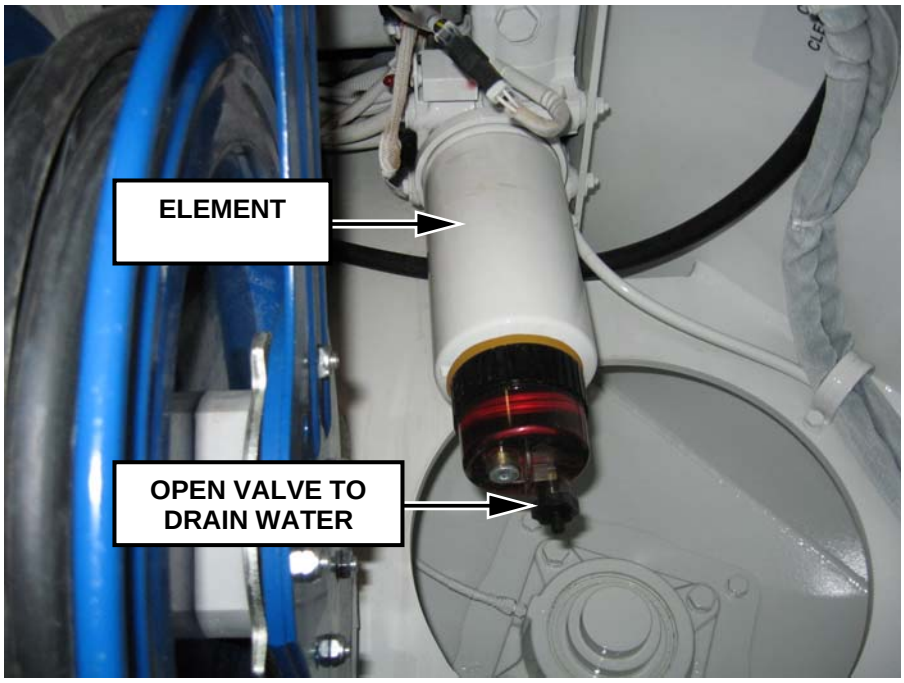


FIGURE 33

I. FUEL FILTER

The engine fuel filters should be changed after the first 50 hours of operation on a new machine, then every 250 hours of operation. Please refer to the Caterpillar engine service manual for proper replacement filters. (Figure 34)

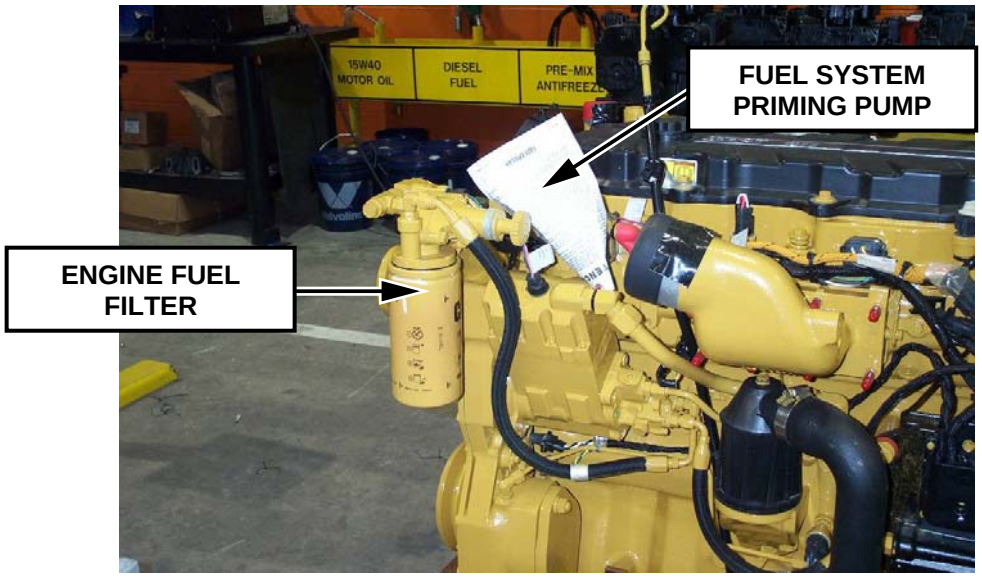


FIGURE 34

5.4 MAINTENANCE

J. ENGINE AIR CLEANER

The engine air cleaner elements should be removed and checked every 50 hours of operation. They should be replaced with new elements every 250 hours of operation or if the air cleaner restriction gauge indicates sooner (Figure 35 & 36).

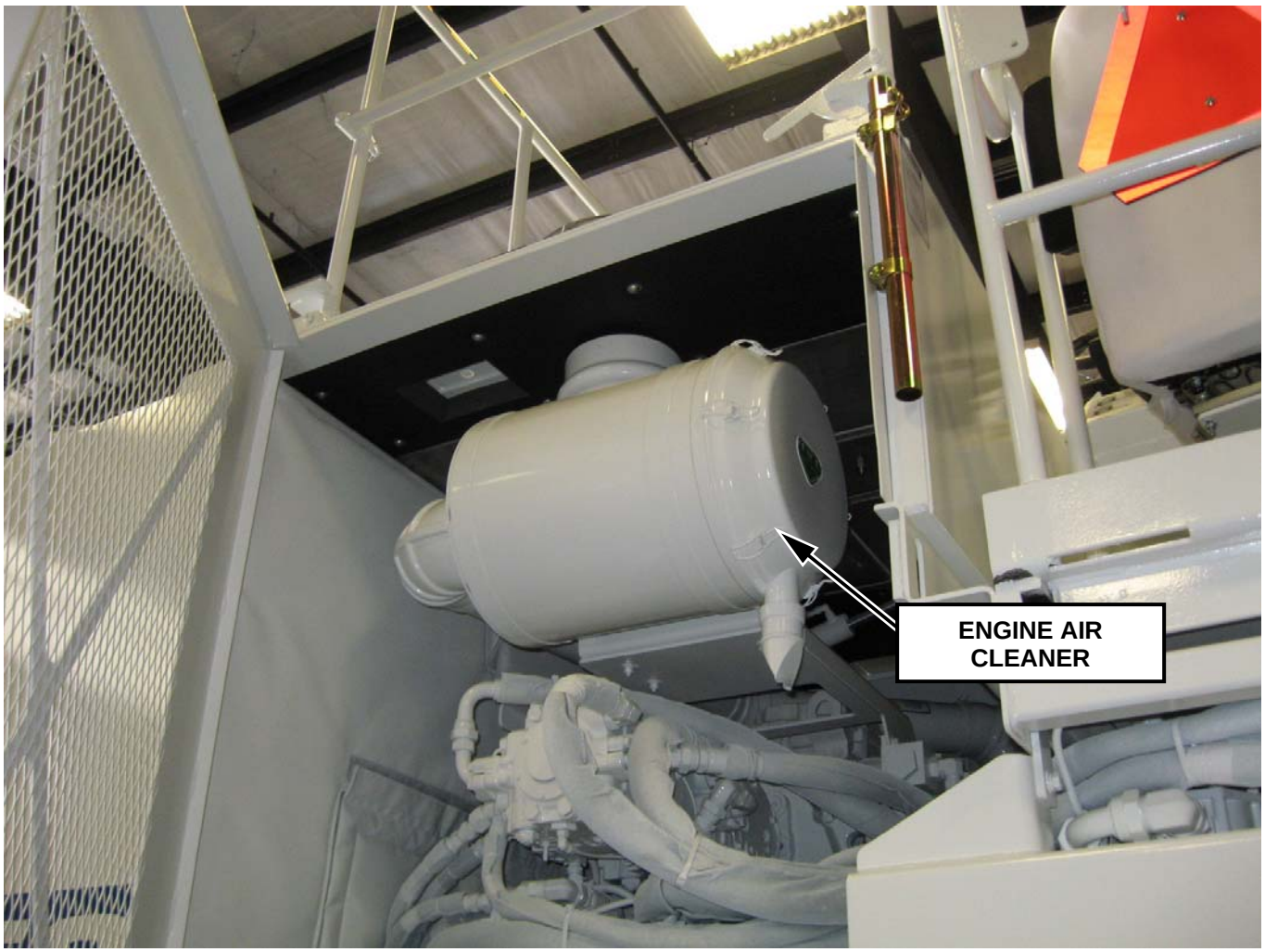


FIGURE 35

5.4 MAINTENANCE

K. CONVEYOR CHAIN TENSION

The life of the conveyor chains and conveyors depends on the maintenance and tension of the chains. If the chains are adjusted too tight they will prematurely wear and possibly break. If the chains are kept too loose they will prematurely wear and cause unnecessary wear to the conveyor frame itself. Keep the chains tensioned properly using the inspection panels provided on each conveyor. The decals beside each inspection panel indicate the position the flights need to be for proper chain tension.

1. Be sure that the conveyors are cold and have not been in use for quite some time. It will be impossible to accurately judge chain tension on a hot conveyor chain.

2. Position and park the machine on a completely level surface.

3. Apply the parking brake and shut down the engine. Turn the battery disconnect switches to the “OFF” positions and apply lock-out / tag-out devices.

4. Remove the C-1 conveyor chain inspection panel cover plate. Note: C-1, C-2 and C-3 conveyors are all fitted with an inspection panel just like the one shown in figure 37.

5. Look at the bottom of the visible conveyor chain flight to see if it is in alignment with the indicator mark beside the inspection panel. If they are in alignment then the conveyor chain is properly tensioned. If not, then the chain tension will require adjustment.



FIGURE 37

5.4 MAINTENANCE

K. CONVEYOR CHAIN TENSION

6. Adjust chain tension at the head shaft of the conveyor using the adjustment pulley. Adjust until proper tension is obtained.

7. Be careful to make even adjustments to the head shaft adjustment pulleys on each side of the conveyor (Figure 38). Improper alignment will cause the chain to run unevenly and will cause premature wear or possible damage.

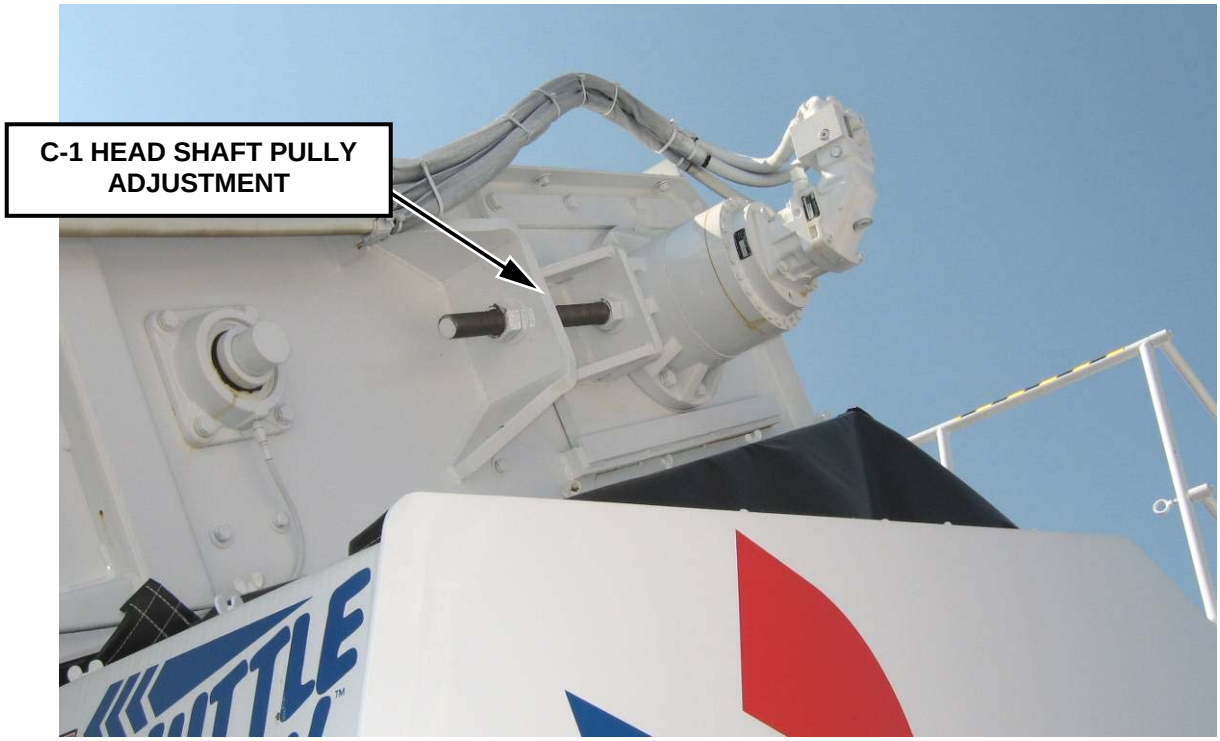


FIGURE 38

8. Re-install the C-1 inspection panel cover plate.

9. Repeat this same procedure to all conveyors to ensure proper operation.

5.4 MAINTENANCE

L. MACHINE WASHDOWN

The SB-2500ex is equipped with a diesel fuel washdown system or optionally with a environmentally friendly fluid washdown system. The washdown hose is located on the right hand side of the machine in front of the right rear tire (Figure 39). It is recommended that the machine be washed down at the end of each working day, while the machine and asphalt are still hot.

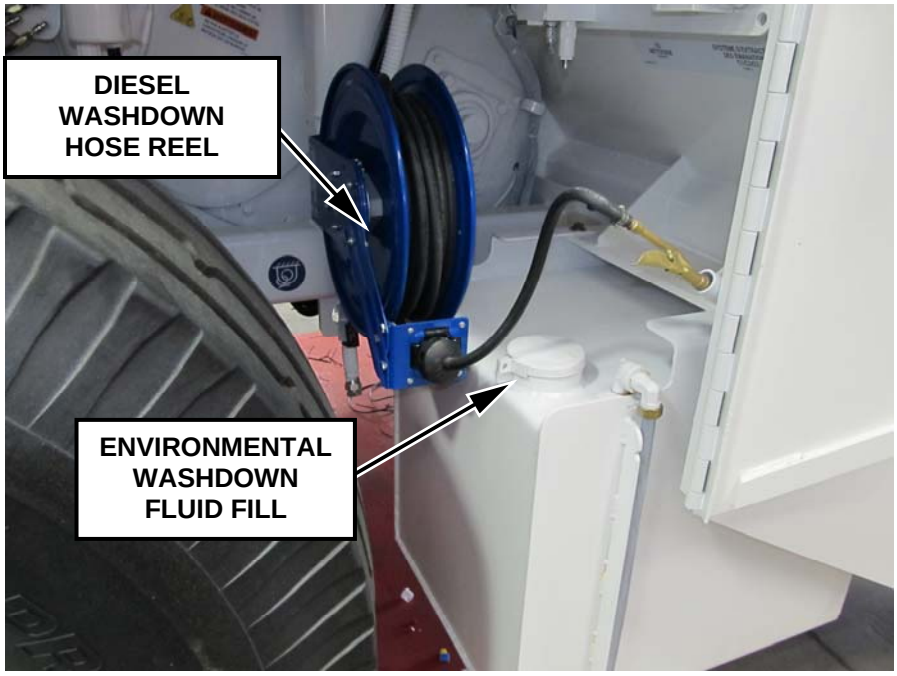


FIGURE 39



FIGURE 40

5.4 MAINTENANCE

M. TIRES

It is required that the machine's tires be checked daily for proper inflation and wear. Maintain the tire pressure at 75 psi (517 kPa). Do not exceed the recommended tire inflation pressure. It is important to inspect the tires daily for any signs of wear or damage. Have the tires replaced if they are not in proper operational condition.

DANGER **DO NOT EXCEED 75 PSI (517 kPa) TIRE INFLATION PRESSURE.**



FIGURE 41

5.5 ENGINE FAULT CODES

In the event of an engine malfunction the engine's ECM will detect the source of the malfunction and display a certain code on the engine diagnostic gauge (Figure 42). Each code will have an "SPN" number and an "FMI" number. In order to correctly identify the exact malfunction both the "SPN" and the "FMI" are required.

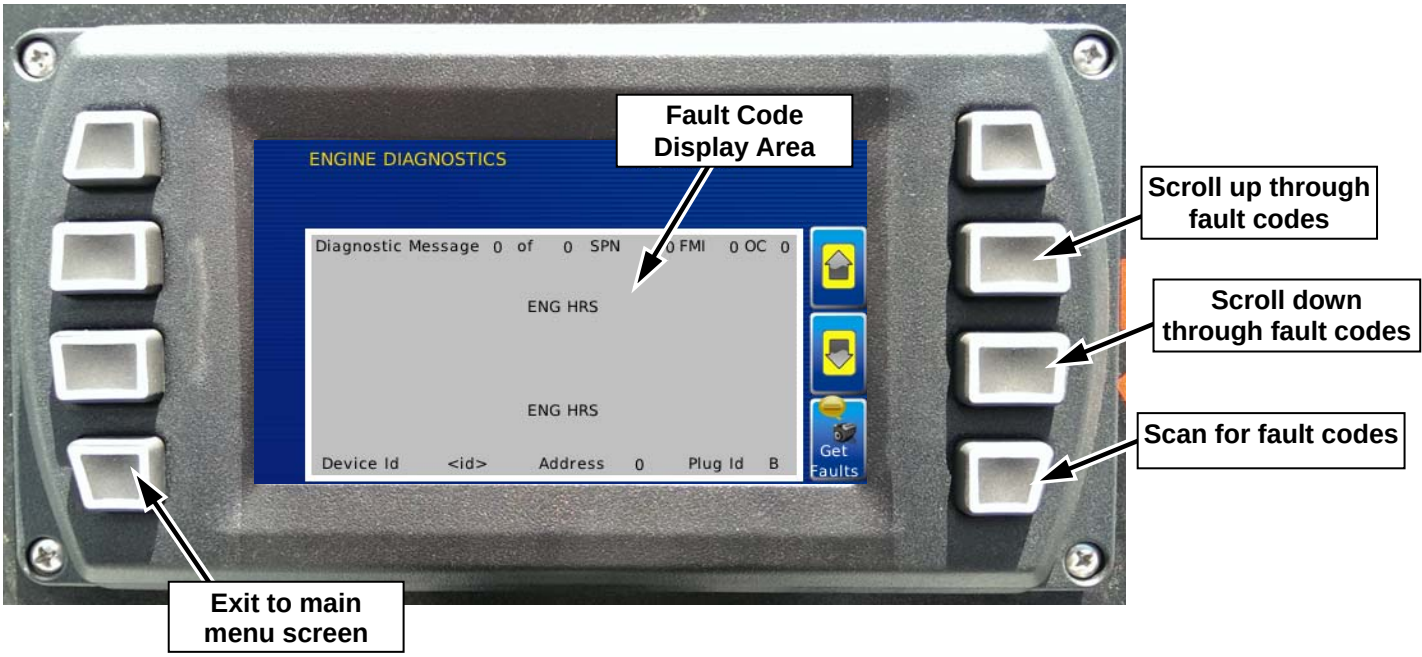


FIGURE 42

The "SPN" number, which stands for suspect parameter number, identifies the system or the component that has the failure. An example of this would be an SPN of 110, which represents a failure of the engine coolant temperature circuit.

The "FMI" number, which stands for failure mode identifier, represents the type of failure that has occurred. An example of this would be an FMI of 03. This is indicating an above average value.

When the SPN of 110 and the FMI of 03 are combined, a conclusion can be made that the engine coolant temperature input voltage is too high.

The society of automotive engineers has established an exact listing of SPN and FMI codes that are universally used by all engine manufacturers. The following pages contains a listing of common fault codes.

5.5 ENGINE FAULT CODES

DIAGNOSTIC TROUBLE CODES		
SPN	**FMI**	**DESCRIPTION**
28	3	ANALOG THROTTLE (B) INPUT HIGH
28	4	ANALOG THROTTLE (B) INPUT LOW
29	3	ANALOG THROTTLE (A) INPUT HIGH
29	4	ANALOG THROTTLE (A) INPUT LOW
91	3	MULTI-STATE THROTTLE INPUT HIGH
91	4	MULTI-STATE THROTTLE INPUT LOW
91	8	THROTTLE POSITION SIGNAL ABNORMAL
91	9	VALID THROTTLE MESSAGE LATE OR NOT DETECTED
91	13	THROTTLE POSITION SENSOR CALIBRATION REQUIRED
91	14	THROTTLE SIGNAL VOLTAGE OUT OF RANGE
94	1	FUEL DELIVERY PRESSURE VERY LOW
94	3	FUEL PRESSURE OPEN/SHORT TO (+)BATTERY
94	4	FUEL PRESSURE SHORT TO GROUND
94	10	FUEL RAIL PRESSURE LOSS DETECTED
94	13	FUEL RAIL PRESSURE HIGHER THAN EXPECTED
94	16	FUEL PRESSURE HIGH
94	17	FUEL RAIL PRESSURE NOT DEVELOPED
94	18	FUEL PRESSURE LOW
97	0	WATER IN FUEL CONTINUOUSLY DETECTED
97	3	WATER IN FUEL SIGNAL CONTINUOUSLY HIGH
97	4	WATER IN FUEL SIGNAL CONTINUOUSLY LOW
97	16	WATER IN FUEL DETECTED
97	31	WATER IN FUEL DETECTED
100	1	ENGINE OIL PRESSURE EXTREMELY LOW
100	3	ENGINE OIL PRESSURE INPUT VOLTAGE HIGH
100	4	ENGINE OIL PRESSURE INPUT VOLTAGE LOW
100	5	CIRCUIT IS OPEN
100	16	ENGINE OIL PRESSURE READING INCORRECT
100	18	ENGINE OIL PRESSURE MODERATELY LOW
102	0	TURBO OUTLET PRESSURE ABOVE NORMAL

5.5 ENGINE FAULT CODES

DIAGNOSTIC TROUBLE CODES		
SPN	**FMI**	**DESCRIPTION**
102	3	TURBO OUTLET PRESSURE OPEN/SHORT TO (+)BATTERY
102	4	TURBO OUTLET PRESSURE SHORT TO GROUND
105	0	MANIFOLD AIR TEMPERATURE HIGH
105	3	MANIFOLD AIR TEMPERATURE INPUT VOLTAGE HIGH
105	4	MANIFOLD AIR TEMPERATURE INPUT VOLTAGE LOW
105	16	MANIFOLD AIR TEMPERATURE MODERATELY HIGH
107	0	AIR FILTER DIFFERENTIAL PRESSURE
107	31	AIR FILTER DIFFERENTIAL PRESSURE
108	3	ATMOSPHERIC PRESSURE OPEN/SHORT TO (+)BATTERY
108	4	ATMOSPHERIC PRESSURE OPEN/SHORT TO GROUND
110	0	ENGINE COOLANT TEMPERATURE HIGH
110	3	ENGINE COOLANT TEMPERATURE OPEN SHORT TO (+)BATTERY
110	4	ENGINE COOLANT TEMPERATURE SHORT TO GROUND
110	15	ENGINE COOLANT TEMPERATURE HIGH
110	16	ENGINE COOLANT TEMPERATURE HIGH
111	1	ENGINE COOLANT LEVEL LOW
158	2	INTERMITTENT CIRCUIT ERROR
158	17	ECU POWER DOWN ERROR
168	2	SYSTEM VOLTAGE INTERMITTENT/ERRATIC
172	3	INTAKE MANIFOLD AIR TEMP. OPEN/SHORT TO (+)BATTERY
172	4	INTAKE MANIFOLD AIR TEMP. SHORT TO GROUND
174	0	FUEL TEMPERATURE HIGH
174	3	FUEL TEMPERATURE INPUT VOLTAGE HIGH
174	4	FUEL TEMPERATURE INPUT VOLTAGE LOW
174	15	FUEL TEMPERATURE HIGH
174	16	FUEL TEMPERATURE HIGH
174	31	FUEL TEMPERATURE SENSOR OUT OF RANGE
175	3	ENGINE OIL TEMPERATURE OPEN/SHORT TO (+)BATTERY
175	4	ENGINE OIL TEMPERATURE SHORT TO GROUND
189	31	SPEED DERATE CONDITION EXISTS DUE TO FAULT

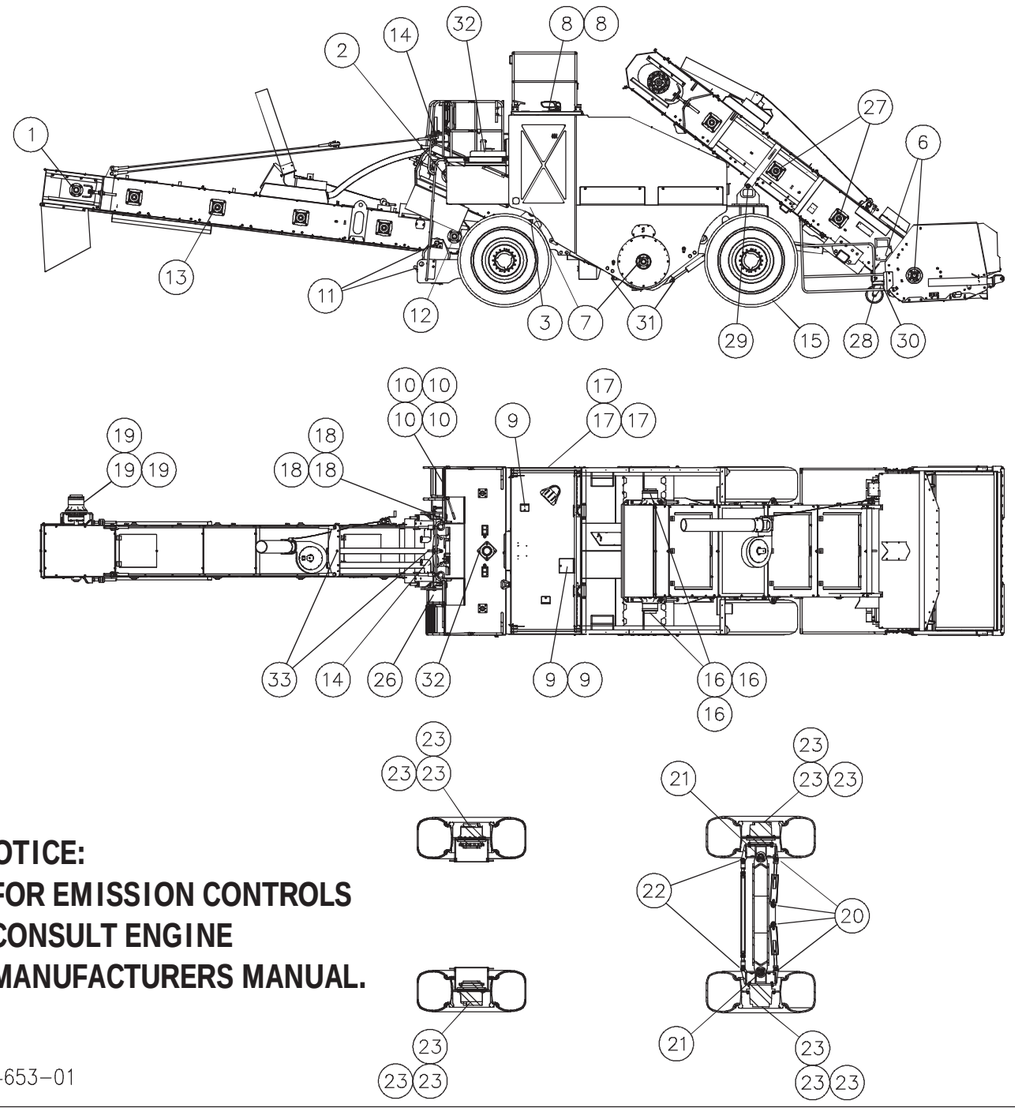
5.5 ENGINE FAULT CODES

DIAGNOSTIC TROUBLE CODES		
SPN	**FMI**	**DESCRIPTION**
190	0	ENGINE OVERSPEED EXTREME
190	2	SPEED/TIMING SENSOR LOSS OF SIGNAL
190	3	SENSOR VOLTAGE ABOVE NORMAL
190	4	SENSOR VOLTAGE BELOW NORMAL
190	11	SPEED TIMING SENSOR MECHANICAL FAILURE
190	16	ENGINE OVERSPEED MODERATE
228	13	ENGINE TIMING CALIBRATION REQUIRED
234	2	PERSONALITY MODULE MISMATCH
545	5	ETHER START RELAY OPEN/SHORT TO (+)BATTERY
545	6	ETHER START RELAY SHORT TO GROUND
611	3	ELECTRONIC INJECTOR WIRING SHORTED TO POWER SOURCE
611	4	ELECTRONIC INJECTOR WIRING SHORTED TO GROUND
620	3	SENSOR SUPPLY 1 VOLTAGE HIGH
620	4	SENSOR SUPPLY 1 VOLTAGE LOW
627	1	ELECTRONIC INJECTOR SUPPLY VOLTAGE PROBLEM
627	4	POWER INTERRUPTION
629	13	ECU ERROR
629	19	ECU NOT RECEIVING MESSAGES FROM PUMP
632	2	FUEL SHUTOFF ERROR DETECTED
632	5	FUEL SHUTOFF NON-FUNCTIONAL
632	11	FUEL SHUTOFF CIRCUIT OPEN OR SHORTED
636	2	PUMP POSITION SENSOR INPUT NOISE
636	8	PUMP POSITION SENSOR INPUT MISSING
636	10	PUMP POSITION SENSOR INPUT PATTERN ERROR
637	2	CRANK POSITION INPUT NOISE
637	7	ECU/PUMP TIMING MODERATELY OUT OF SYNC
637	8	CRANK POSITION INPUT MISSING
637	10	CRANK POSITION INPUT PATTERN ERROR
639	9	J1939 DATA LINK COMMUNICATIONS
639	13	CAN BUS ERROR

5.5 ENGINE FAULT CODES

DIAGNOSTIC TROUBLE CODES		
SPN	**FMI**	**DESCRIPTION**
651	5	CYLINDER #1 ELECTRIC INJECTOR CIRCUIT OPEN
651	6	CYLINDER #1 ELECTRIC INJECTOR CIRCUIT SHORTED
651	7	CYLINDER #1 ELECTRIC INJECTOR MECHANICAL FAILURE
651	11	INJECTOR CYLINDER #1 FAULT
652	5	CYLINDER #2 ELECTRIC INJECTOR CIRCUIT OPEN
652	6	CYLINDER #2 ELECTRIC INJECTOR CIRCUIT SHORTED
652	7	CYLINDER #2 ELECTRIC INJECTOR MECHANICAL FAILURE
652	11	INJECTOR CYLINDER #2 FAULT
653	5	CYLINDER #3 ELECTRIC INJECTOR CIRCUIT OPEN
653	6	CYLINDER #3 ELECTRIC INJECTOR CIRCUIT SHORTED
653	7	CYLINDER #3 ELECTRIC INJECTOR MECHANICAL FAILURE
653	11	INJECTOR CYLNDER #3 FAULT
654	5	CYLINDER #4 ELECTRIC INJECTOR CIRCUIT OPEN
654	6	CYLINDER #4 ELECTRIC INJECTOR CIRCUIT SHORTED
654	7	CYLINDER #4 ELECTRIC INJECTOR MECHANICAL FAILURE
654	11	INJECTOR CYLINDER #4 FAULT
655	5	CYLINDER #5 ELECTRIC INJECTOR CIRCUIT OPEN
655	6	CYLINDER #5 ELECTRIC INJECTOR CIRCUIT SHORTED
655	7	CYLINDER #5 ELECTRIC INJECTOR MECHANICAL FAILURE
655	11	INJECTOR CYLINDER #5 FAULT
656	5	CYLINDER #6 ELECTRIC INJECTOR CIRCUIT OPEN
656	6	CYLINDER #6 ELECTRIC INJECTOR CIRCUIT SHORTED
656	11	INJECTOR CYLINDER #6 FAULT
1111	2	CHECK PROGRAMMABLE PARAMETERS

SB-2500ex LUBRICATION CHART (ENGLISH)



INTERVAL HOURS	REF NO	IDENTIFICATION	NO. OF POINTS	TYPE OF LUBRICATION	REMARKS
RED DAILY	1	C3 HEADSHAFT	1	HTG	8 SHOTS (WHILE HOT)
	2	C2 HEADSHAFT	1	HTG	8 SHOTS (WHILE HOT)
	3	C2 IDLERS	4	HTG	5 SHOTS (WHILE HOT)
	6	C1 TAILSHAFT	4	HTG	8 SHOTS (WHILE HOT)
	7	C2 TAILSHAFT	4	HTG	8 SHOTS (WHILE HOT)
	8	RADIATOR COOLANT	1	50/50 ANTIFREEZE	CHECK LEVEL
	9	ENGINE OIL	1	EO	CHECK LEVEL
	9	ENGINE CRANKCASE COMPONENTS	N/A	VARIOUS	REFER TO ENGINE MANUAL
	10	HYDRAULIC TANK	1	HO	CHECK LEVEL
	11	C3 PIVOT	4	HTG	5 SHOTS
	12	C3 TAILSHAFT	2	HTG	8 SHOTS (WHILE HOT)
	13	C3 IDLER BEARINGS	8	HTG	5 SHOTS (WHILE HOT)
	27	C1 IDLER BEARINGS	6	HTG	5 SHOTS (WHILE HOT)
	28	C1 CASTER WHEEL	4	HTG	3 SHOTS
YELLOW 50 HOURS	9	ENGINE AIR FILTER	2	N/A	CLEAN OR REPLACE
	9	ENGINE OIL AND FILTER	1 EA	EO	CHANGE AT FIRST 50 HRS THEN EVERY 250 HRS
	9	FUEL FILTER	3	N/A	CHANGE AT FIRST 50 HRS THEN EVERY 250 HRS
	10	HYDRAULIC FILTERS	3	N/A	REPLACE ELEMENTS FIRST 50 HRS THEN EVERY 250 HRS
	14	C3 LIFT PIVOT	1	HTG	5 SHOTS
	15	TIRES	4	75 p.s.i.	CHECK PRESSURE
	16	C1 GEARBOX	2	GO	CHECK LEVEL
	17	PUMP DRIVE	1	GO	CHECK LEVEL
	18	C2 GEARBOX	1	GO	CHECK LEVEL
	19	C3 GEARBOX	1	GO	CHECK LEVEL
	20	STEERING CYLINDERS	4	HTG	3 SHOTS
	21	AXLE KINGPINS	4	HTG	3 SHOTS
	22	AXLE TIE RODS	2	HTG	3 SHOTS
	23	GEAR DRIVE W/PARK BRAKE	4	GO	CHECK LEVEL
	29	C1 PIVOT	2	HTG	3 SHOTS
	30	C1 CASTER SWIVEL	2	HTG	3 SHOTS
	31	C2 CLEAN OUT DOORS	4	HTG	3 SHOTS
	33	C3 LIFT CYLINDER	2	HTG	3 SHOTS

INTERVAL HOURS	REF NO	IDENTIFICATION	NO. OF POINTS	TYPE OF LUBRICATION	REMARKS
GREEN 250 HOURS	9	ENGINE AIR FILTER	2	N/A	CHECK AND REPLACE (IF NECESSARY)
	9	ENGINE OIL AND FILTER	1 EA	EO	CHANGE
	9	FUEL FILTER	3	N/A	CHANGE
	10	HYDRAULIC TANK	1	HO	DRAIN ACCUMULATED WATER & REFILL
	10	HYDRAULIC FILTERS	4	N/A	REPLACE ELEMENTS IN EACH CANISTER & THE HIGH PRESSURE FILTER
	10	HYDRAULIC TANK BREATHER FILTER	1	N/A	CHECK & REPLACE IF NECESSARY
	16	C1 GEARBOX	2	GO	DRAIN–FLUSH–REFILL FIRST 250 HRS THEN 1000 HRS THEREAFTER
	17	PUMP DRIVE	1	GO	DRAIN–FLUSH–REFILL FIRST 250 HRS THEN 1000 HRS THEREAFTER
	18	C2 GEARBOX	1	GO	DRAIN–FLUSH–REFILL FIRST 250 HRS THEN 1000 HRS THEREAFTER
	19	C3 GEARBOX	1	GO	DRAIN–FLUSH–REFILL FIRST 250 HRS THEN 1000 HRS THEREAFTER
	23	GEAR DRIVE W/PARK BRAKE	4	GO	DRAIN–FLUSH–REFILL FIRST 250 HRS THEN 1000 HRS THEREAFTER
	26	FUEL TANK	1	N/A	DRAIN ACCUMULATED WATER & REFILL
	32	STEERING CONSOLE PIVOT	1	HTG	2 SHOTS
BLUE 1000 HOURS	8	RADIATOR	1	50/50 ANTIFREEZE	DRAIN–CLEAN–REFILL REPLACE CONDITIONER
	10	HYDRAULIC TANK	1	HO	DRAIN & FLUSH OIL–CHANGE ALL FILTERS–CLEAN ALL BREATHERS
	16	C1 GEARBOX	2	GO	DRAIN–FLUSH–REFILL
	17	PUMP DRIVE	1	GO	DRAIN–FLUSH–REFILL
	18	C2 GEARBOX	1	GO	DRAIN–FLUSH–REFILL
	19	C3 GEARBOX	1	GO	DRAIN–FLUSH–REFILL
	23	GEAR DRIVE W/PARK BRAKE	4	GO	DRAIN–FLUSH–REFILL

NOTICE:
FOR EMISSION CONTROLS CONSULT ENGINE MANUFACTURERS MANUAL.

EO – ENGINE OIL–SAE 15W40–VALVOLINE PREMIUM BLUE, ALL–FLEET PLUS OR EQUIVALENT
HTG – HIGH TEMPERATURE GREASE–NGLI GRADE2–VALVOLINE CERULEAN, PALLADIUM, OR EQUIVALENT
HO – HYDRAULIC OIL–ISO VIS. GRADE 46–VALVOLINE ANTI–WEAR HYDRAULIC OIL OR EQUIVALENT
GO – GEAR OIL–EP–90 VALVOLINE HIGH PERFORMANCE GEAR OIL OR EQUIVALENT
(*FOR AXLES, USE MIL–L 2105C 80W/90 OR EQUIVALENT)

Valvoline.

254653–01

PUMPS, MOTORS AND VALVES

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6.1 PUMPS

AUXILIARY PUMP - The auxiliary system pump is a Sauer Danfoss series 45 variable displacement pump.

COOLER FAN PUMP - The cooler fan pump is a Sauer Danfoss series 45 variable displacement pump

CONVEYOR PUMPS - These three system pumps are all Sauer Danfoss series 90 pumps.

PROPEL PUMP- The propel pump is a Sauer Danfoss series 90 pump.

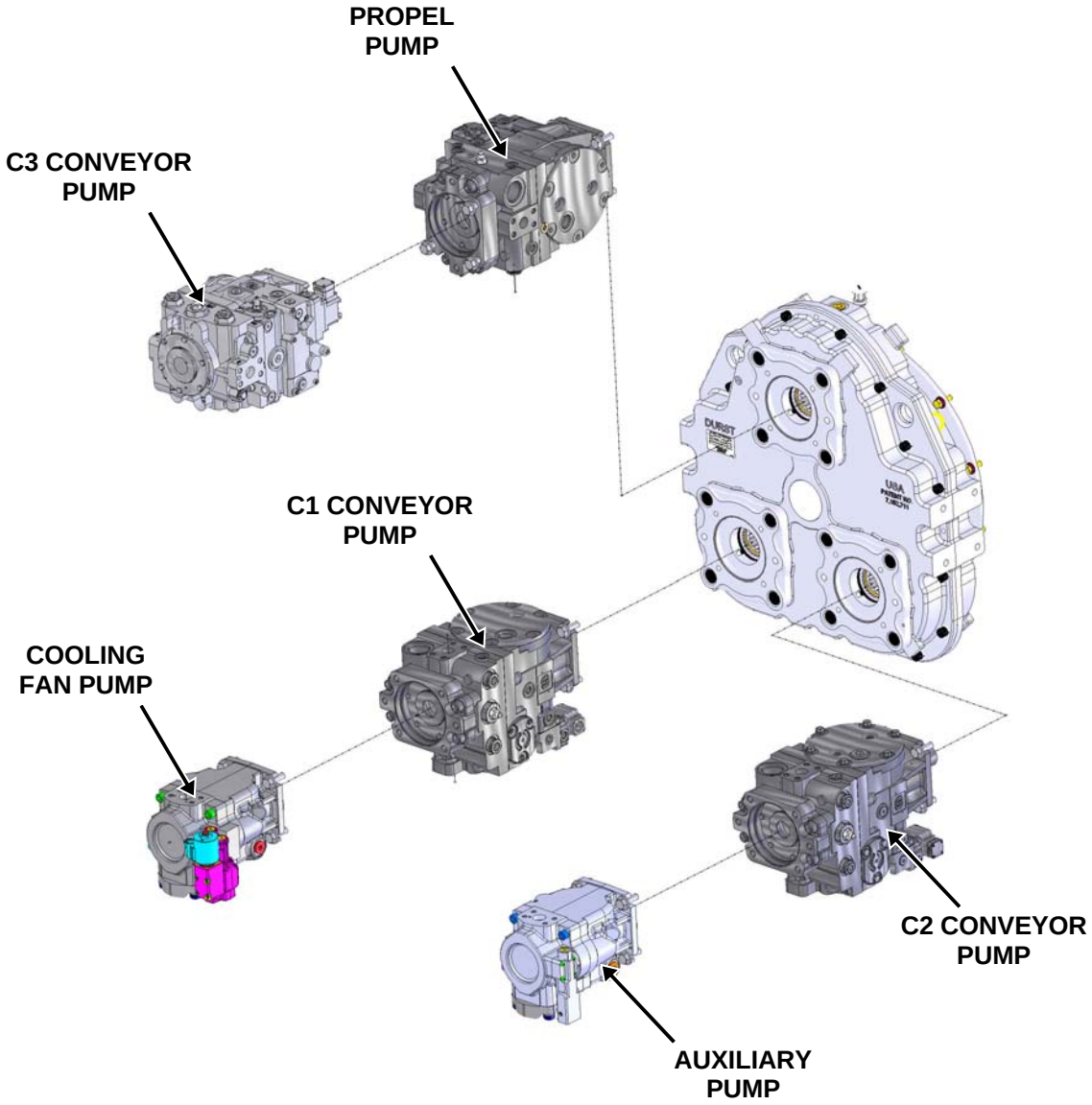


FIGURE 1

6.1 PUMPS

A. AUXILIARY PUMP (SAUER DANFOSS SERIES 45)

JR L 060B PC 18 NN NN N 3 S1N2 A2N NNN NNN NNN

Product: J Frame, variable displacement open circuit pump

Rotation: Left Hand (Counterclockwise)

Displacement and Pressure Rating: 060 cm3/rev [3.66 in3/rev] 310 bar [4495 psi] cont. working pressure

Control Type: Pressure Compensating

PC Setting: 180 bar [2610 psi]

Load Sensing Setting: N/A

Pilot Orifice: None

Gain Orifice: 0.7mm Diameter/Standard spool

Input Shaft: 14 Tooth, 12/24 Pitch

Auxiliary Mounting Flange Type and Coupling: None

Endcap Option: Radial, 4-Bolt Code 61 Split Flange, 2" Inlet, 1" Outlet

Shaft Seal: Single Lip Seal, Viton

Mounting Flange and Housing Port Style: SAE-C 4-Bolt, SAE O-ring boss housing ports

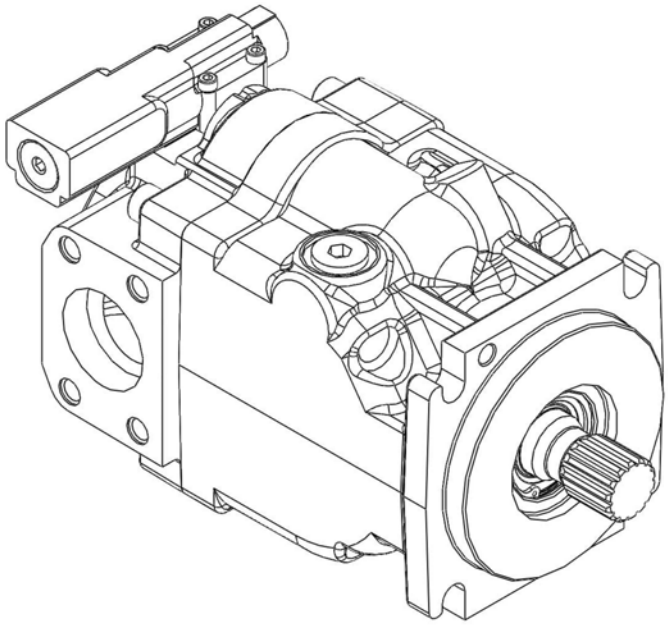


FIGURE 2

6.1 PUMPS

B. COOLER FAN PUMP (SAUER DANFOSS SERIES 45)

JR L 060B PC 18 NN NN N 3 S1N2 A2N NNN NNN NNN

Product: J Frame, variable displacement open circuit pump

Rotation: Left Hand (Counterclockwise)

Displacement and Pressure Rating: 45cc set for 38cc

Control Type: Pressure Compensated Control (1450-4060 PSI)

PC Setting: 210 BAR [3045 PSI]

Load Sensing: Load Sense Setting

Pilot Orifice: Standard

Gain Orifice: Standard

Input Shaft: 14 Tooth, 12/24 Pitch

Auxiliary Mounting Flange Type and Coupling: None

Endcap Option: Radial, 4-Bolt Split Flange

Shaft Seal: Single Lip Seal, Viton

Mounting Flange and Housing Port Style: SAE-C 4-Bolt, SAE O-ring boss housing ports

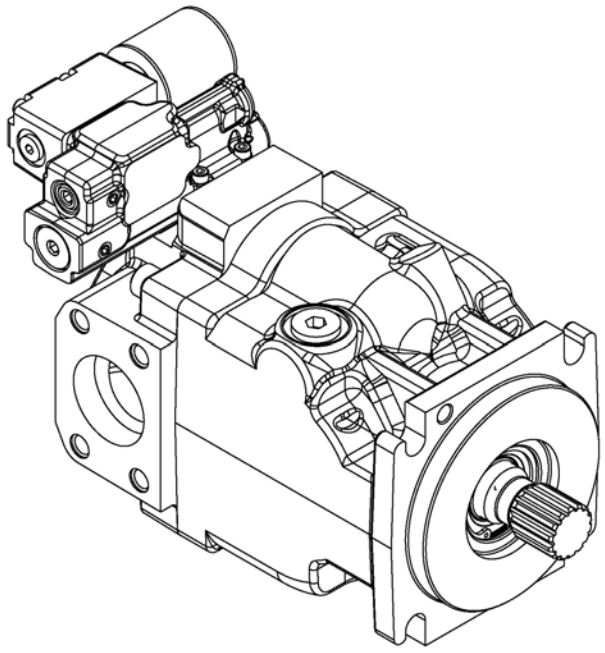


FIGURE 3

6.1 PUMPS

C. C1 & C2 CONVEYOR PUMPS (SAUER DANFOSS SERIES H1)

Variable displacement pump
Counter clockwise/100 cc per rev (6.10 CID)
High Pressure Side A 42, 420 BAR
High Pressure Side B 42, 420 BAR
Charge Pressure Relief 24, 24 BAR, 348 PSI

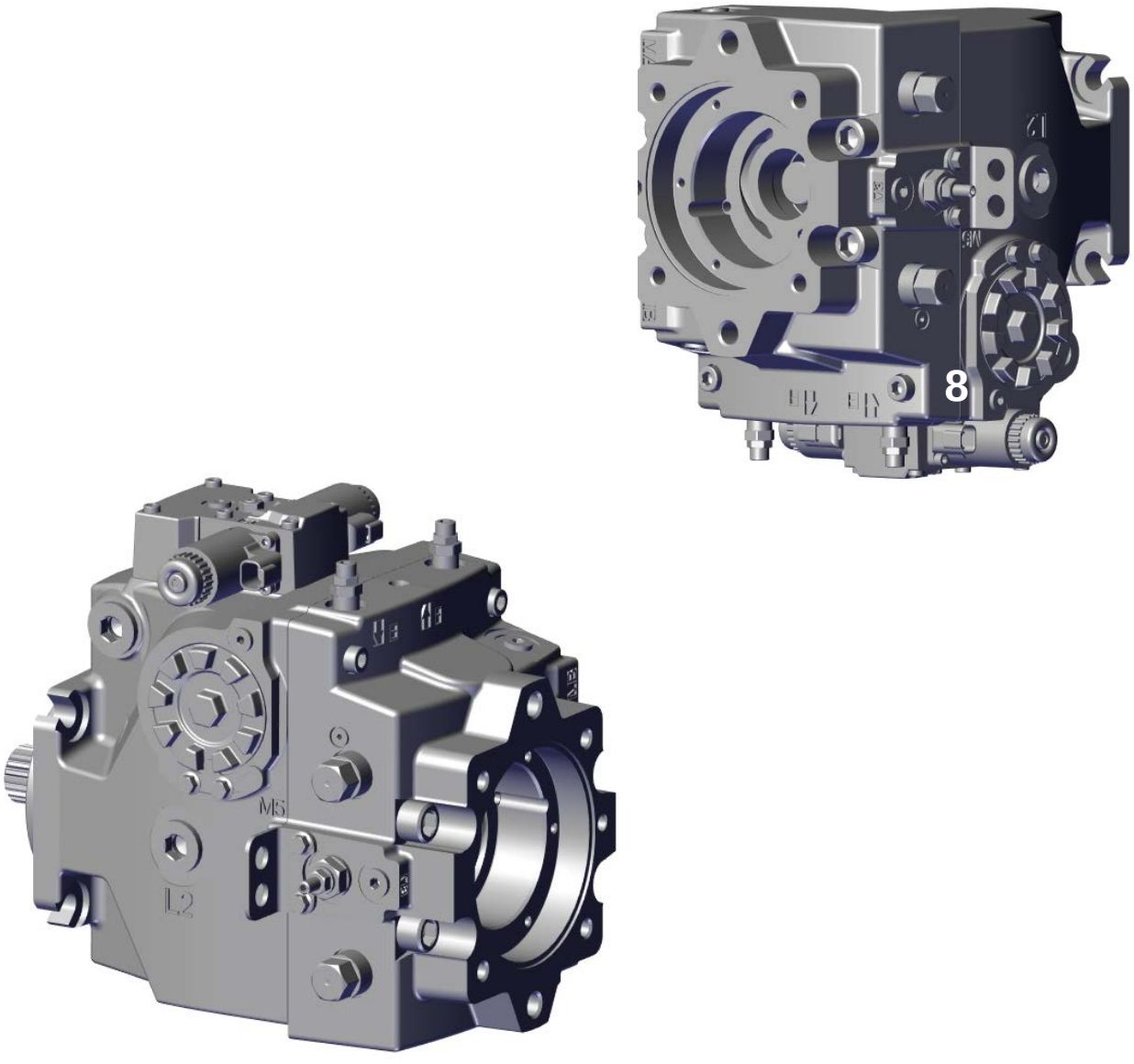


FIGURE 4

6.1 PUMPS

D. C3 CONVEYOR PUMP (SAUER DANFOSS SERIES H1)

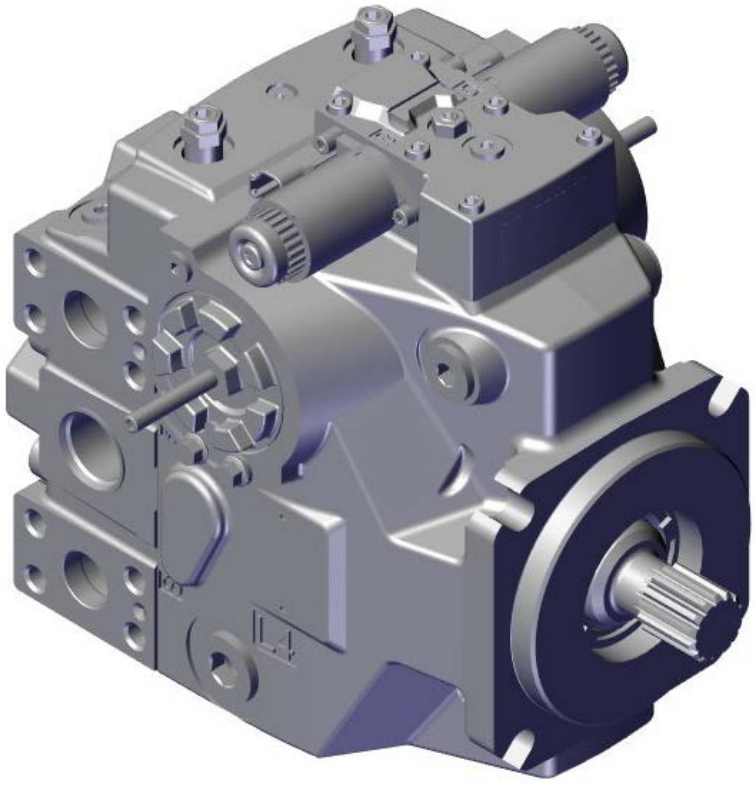


FIGURE 5

Variable displacement
Counter Clockwise Rotation
78 CC per rev (6.1 CID)
SAE C with cover aux mount
14 teeth, 12/24 DP input spline
17 CC per rev (1.03 CID) charge pump
0.81 MM control orifice
420 bar pressure settings on Port A & B
24 bar charge pressure setting
Model code 95-21343

6.1 PUMPS

E.PROPEL PUMP (SAUER DANFOSS SERIES H1)

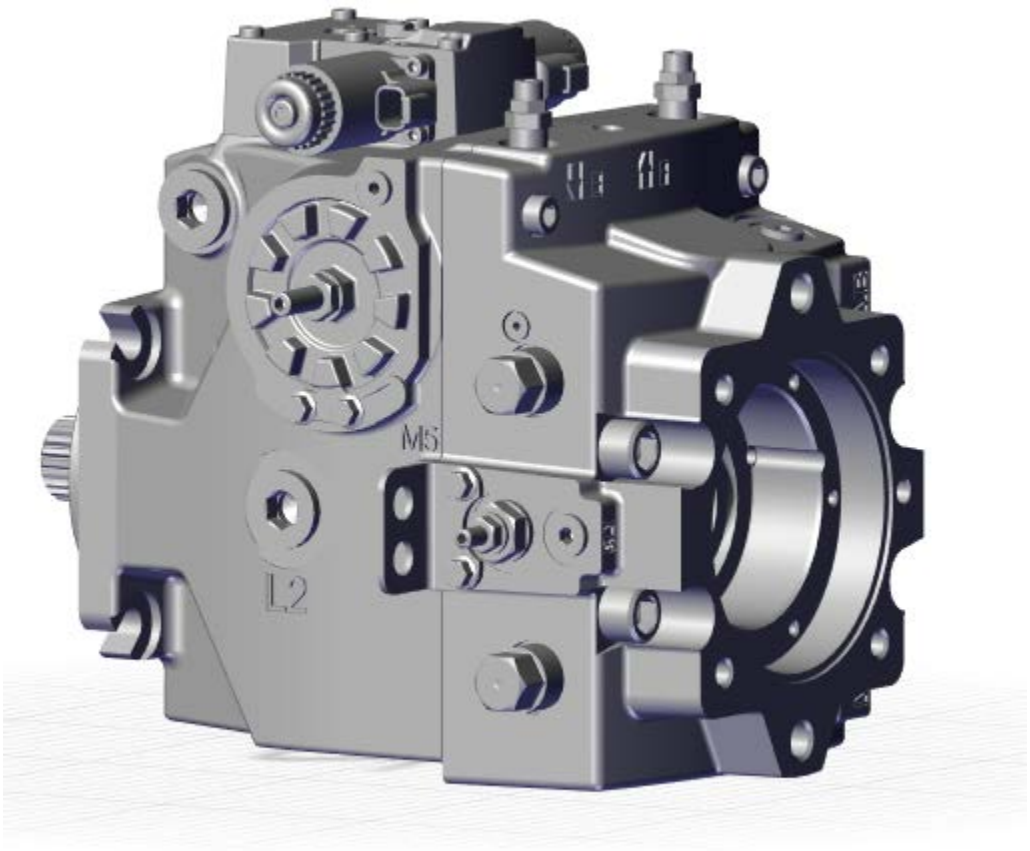


FIGURE 6

Axial Piston Pump
Variable displacement
100cc/REV MAX
High Pressure Side A 45, 450 BAR,
High Pressure Side B 45, 450 BAR
Charge Pressure Relief 24, 24 BAR

6.2 MOTORS AND PLANETARIES

A. C1 CONVEYOR MOTORS AND PLANETARIES

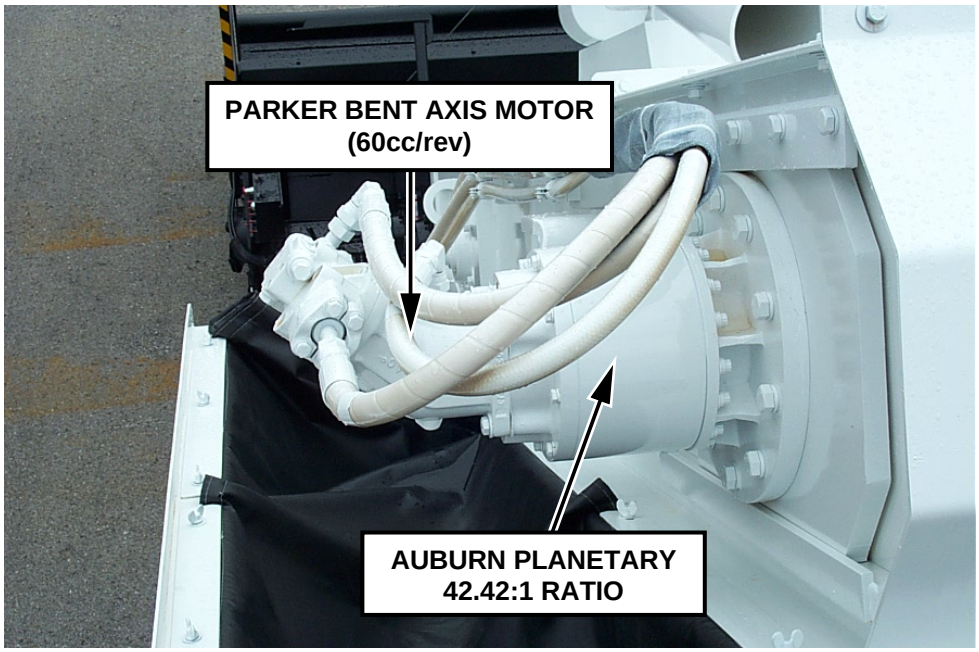


FIGURE 7

B. C2 CONVEYOR MOTOR AND PLANETARY

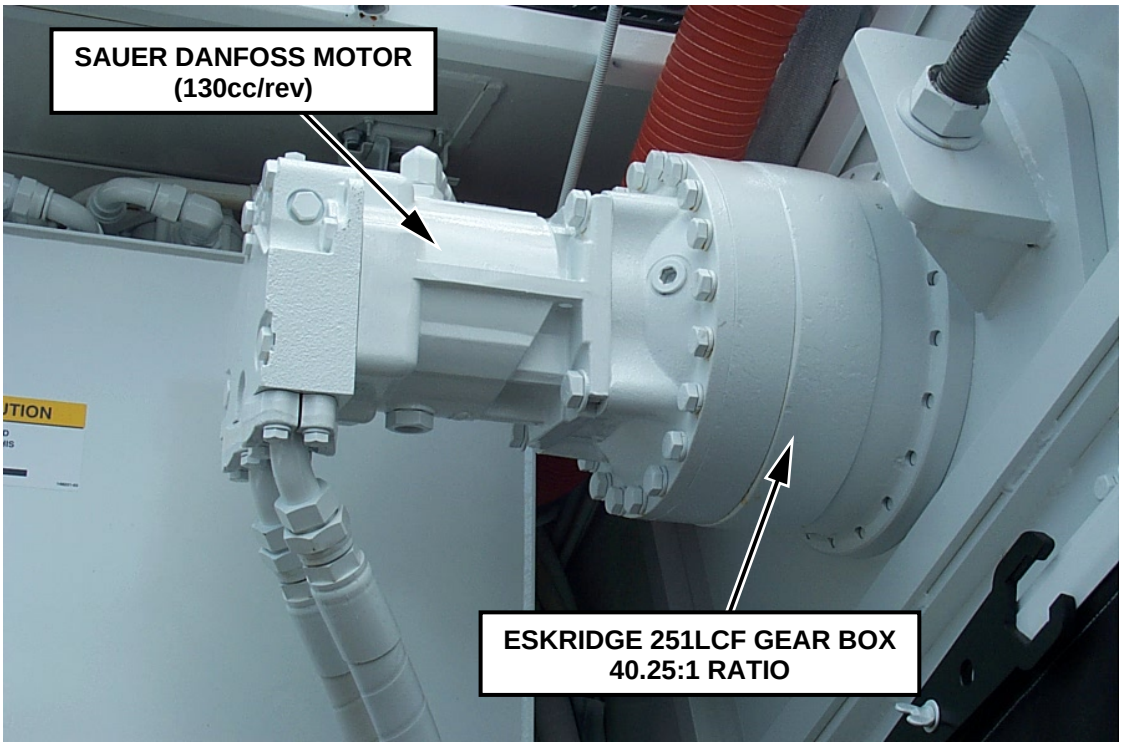


FIGURE 8

6.2 MOTORS AND PLANETARIES

C. C3 CONVEYOR MOTOR AND PLANETARY

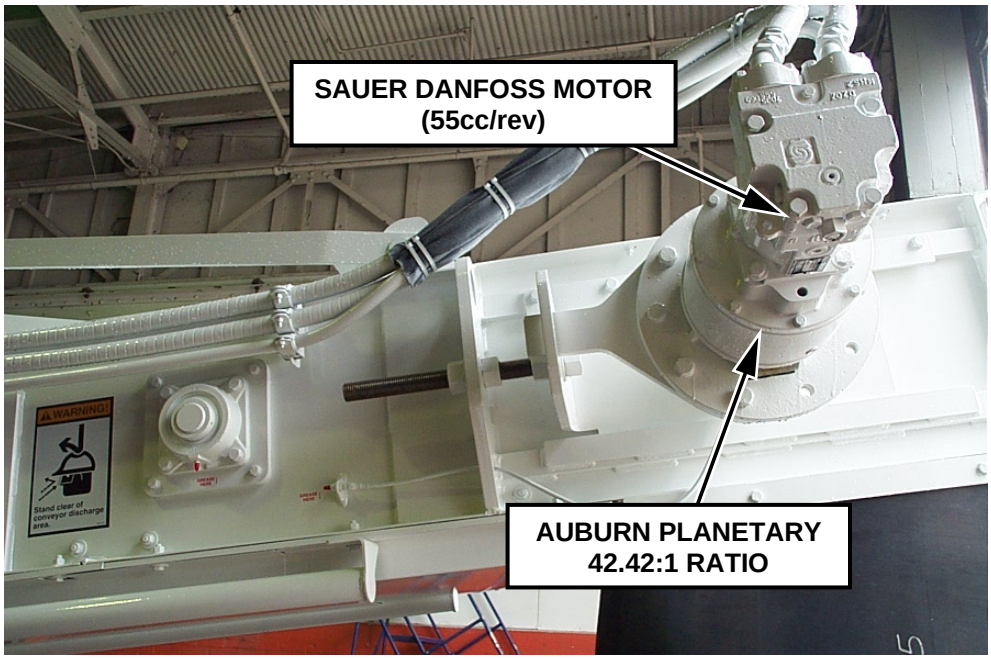


FIGURE 9

D. DRIVE MOTORS

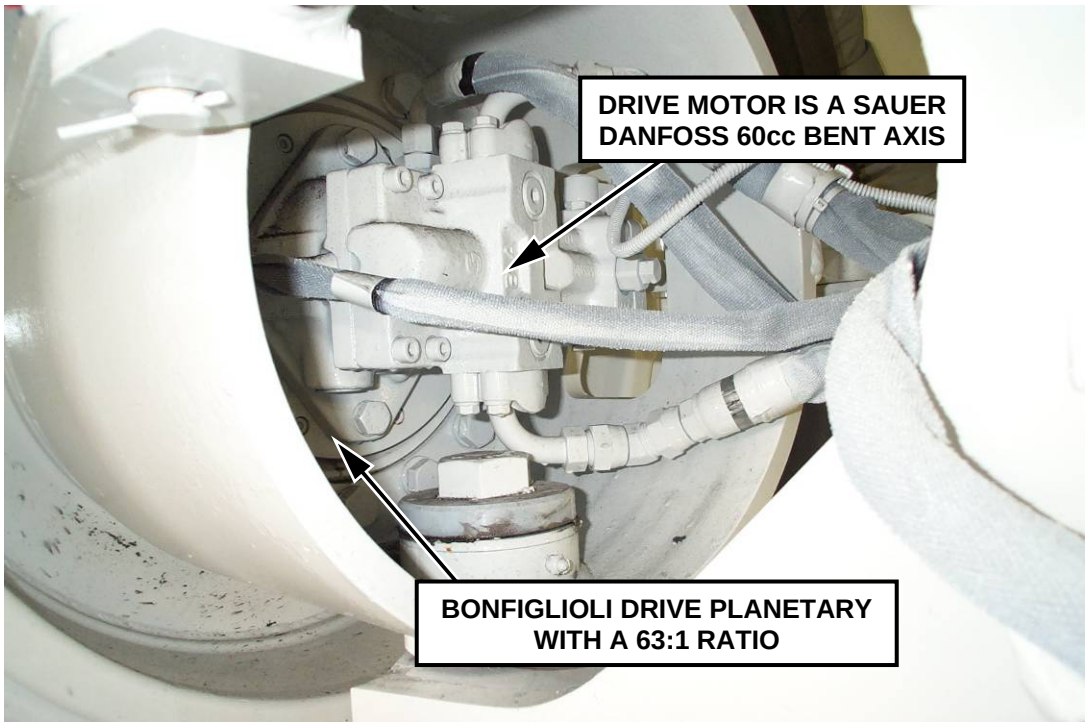


FIGURE 10

6.3 VALVES

C1 HOPPER CONTROLS MANIFOLD

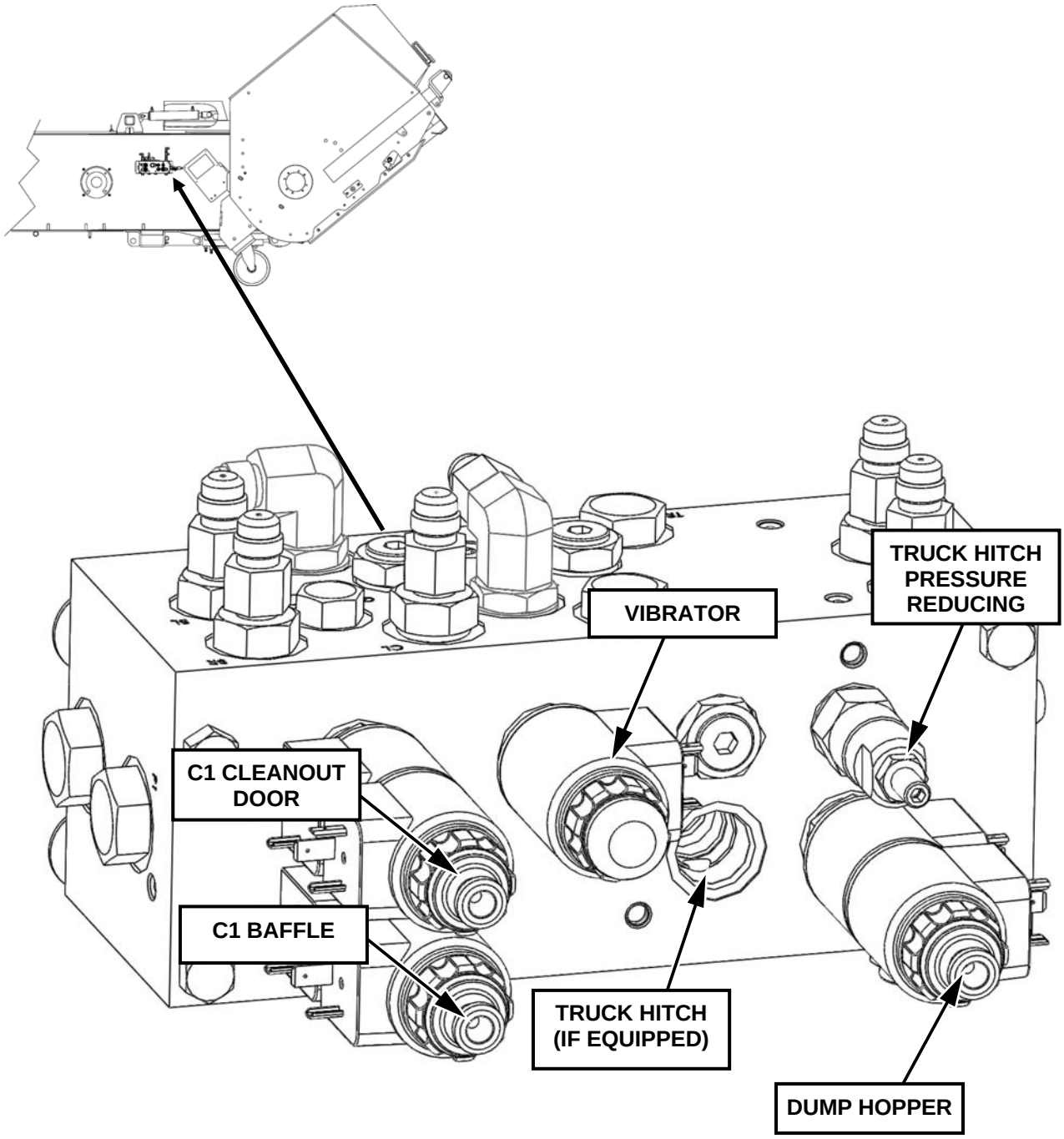


FIGURE 11

6.3 VALVES

C1 CONVEYOR LIFT VALVE

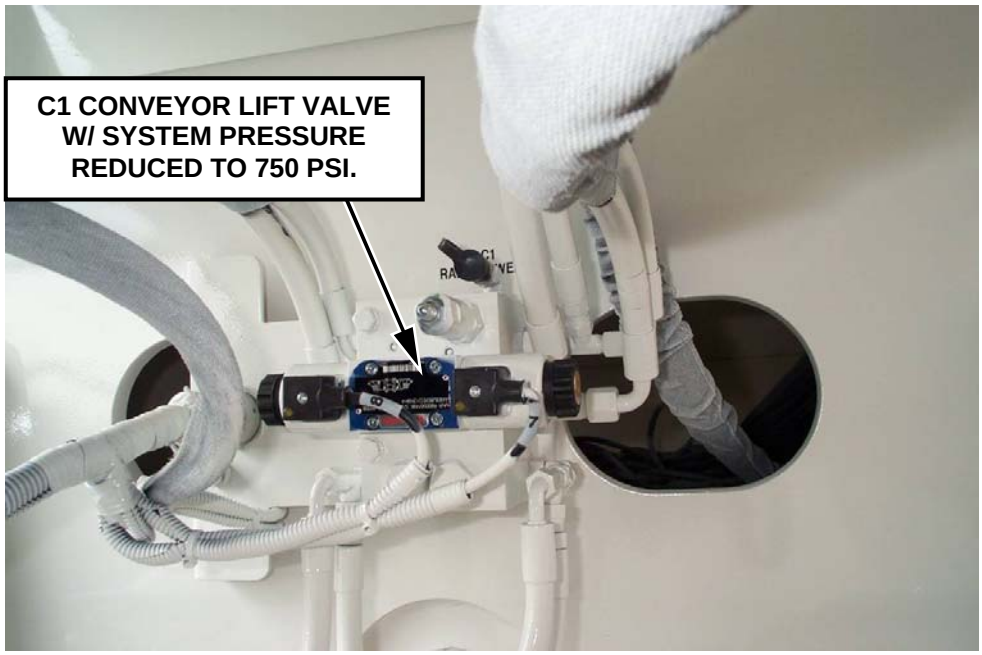


FIGURE 13

6.3 VALVES

FLOWGATE, GEN-SET & PLATFORM SLIDE VALVES

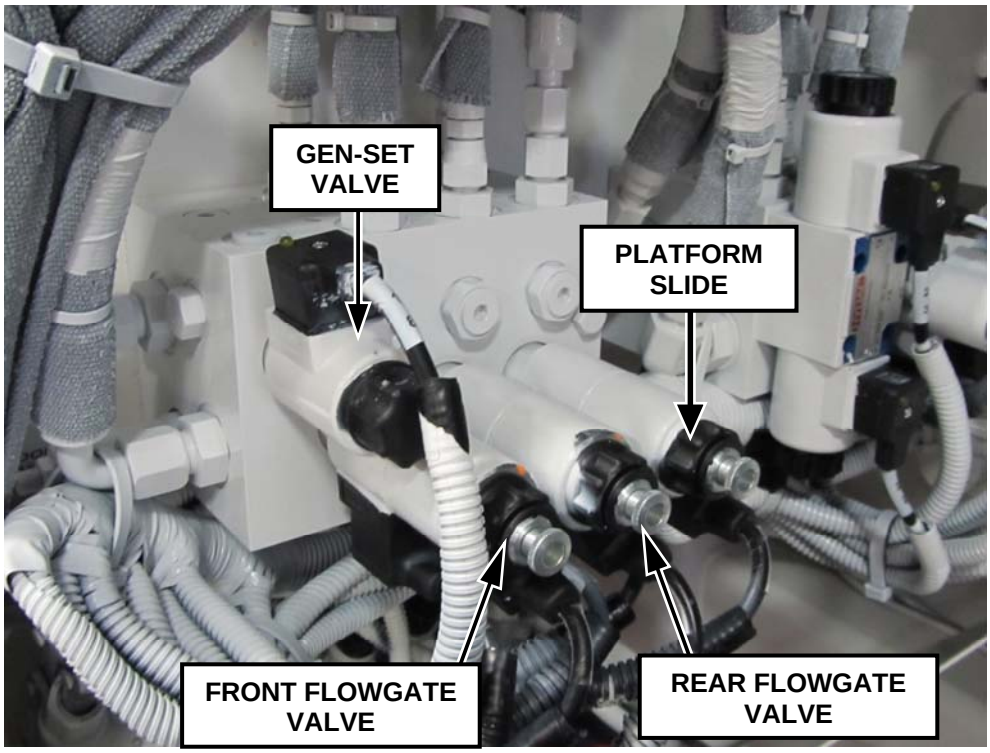


FIGURE 14

C3 CONTROL VALVES

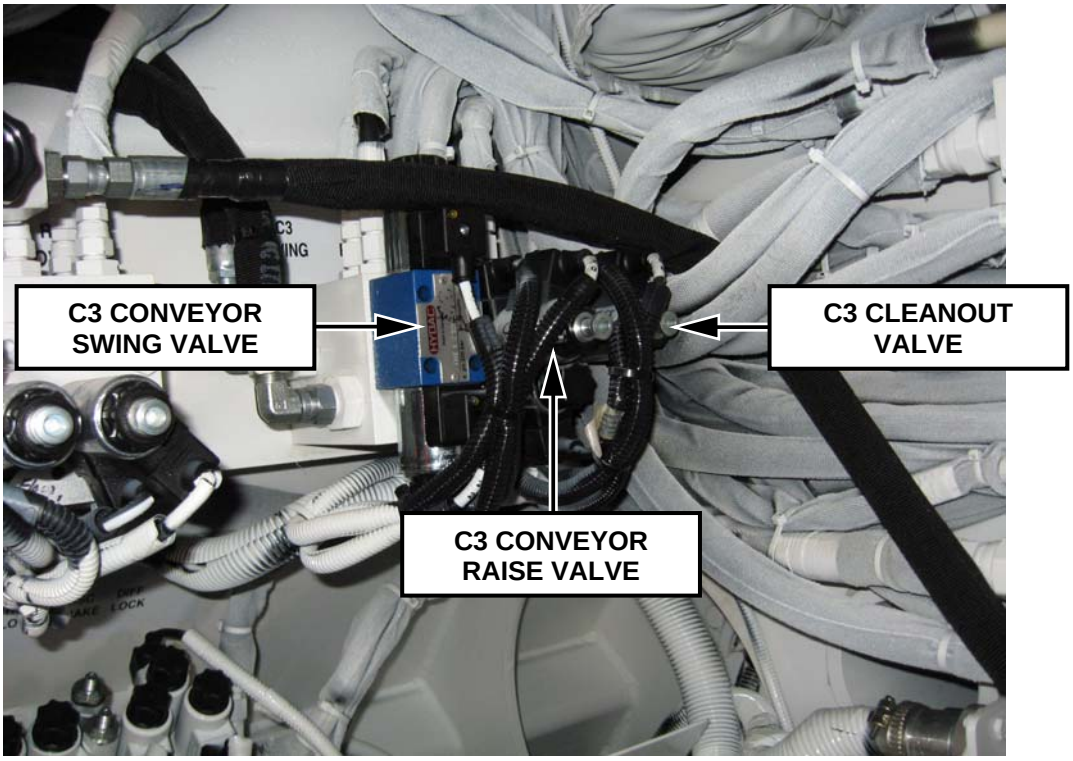


FIGURE 15

6.3 VALVES

HOOD AND BRAKE VALVE STACK WITH MANUAL CONTROLS

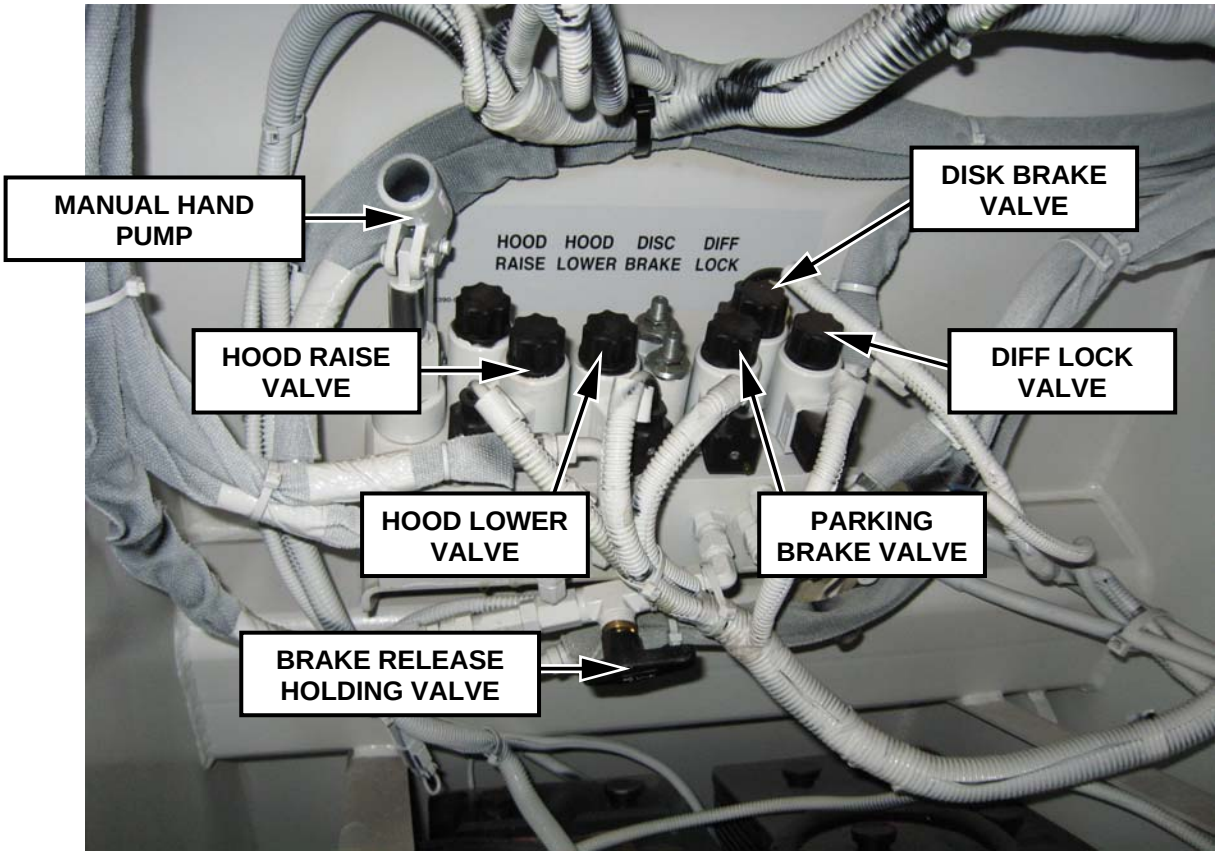


FIGURE 16

C2 CLEANOUT DOOR VALVE AND FUME EXTRACTION VALVE

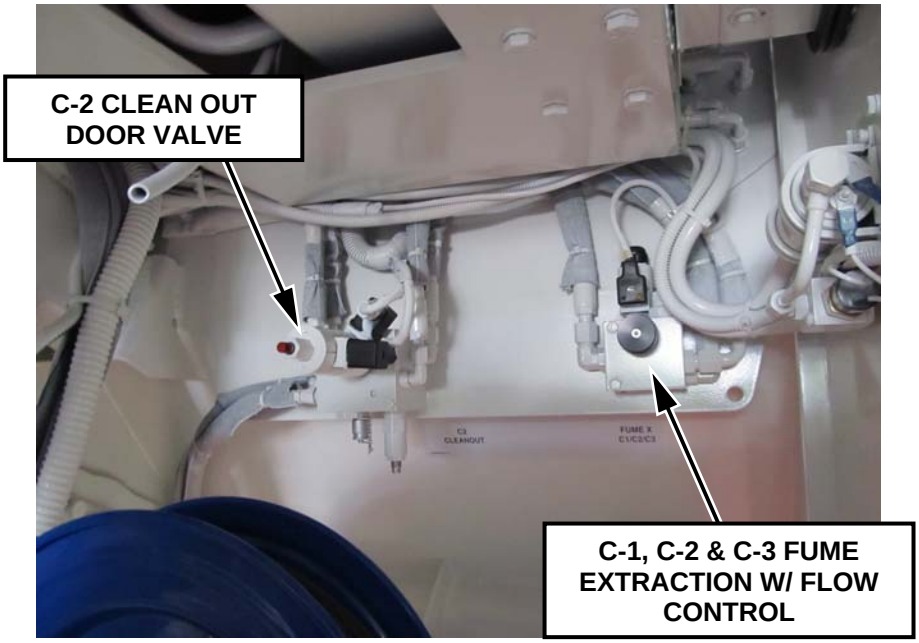
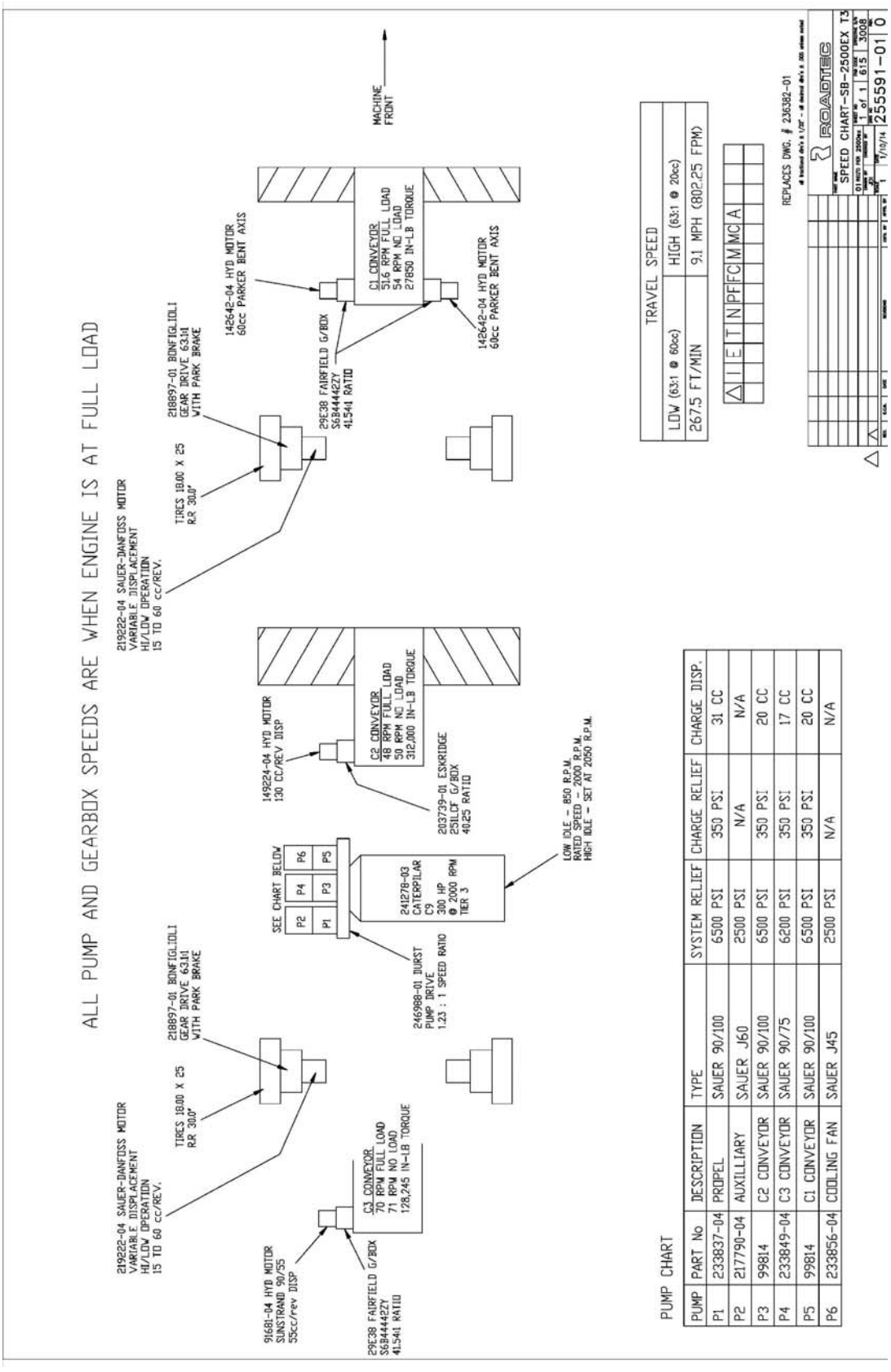


FIGURE 17

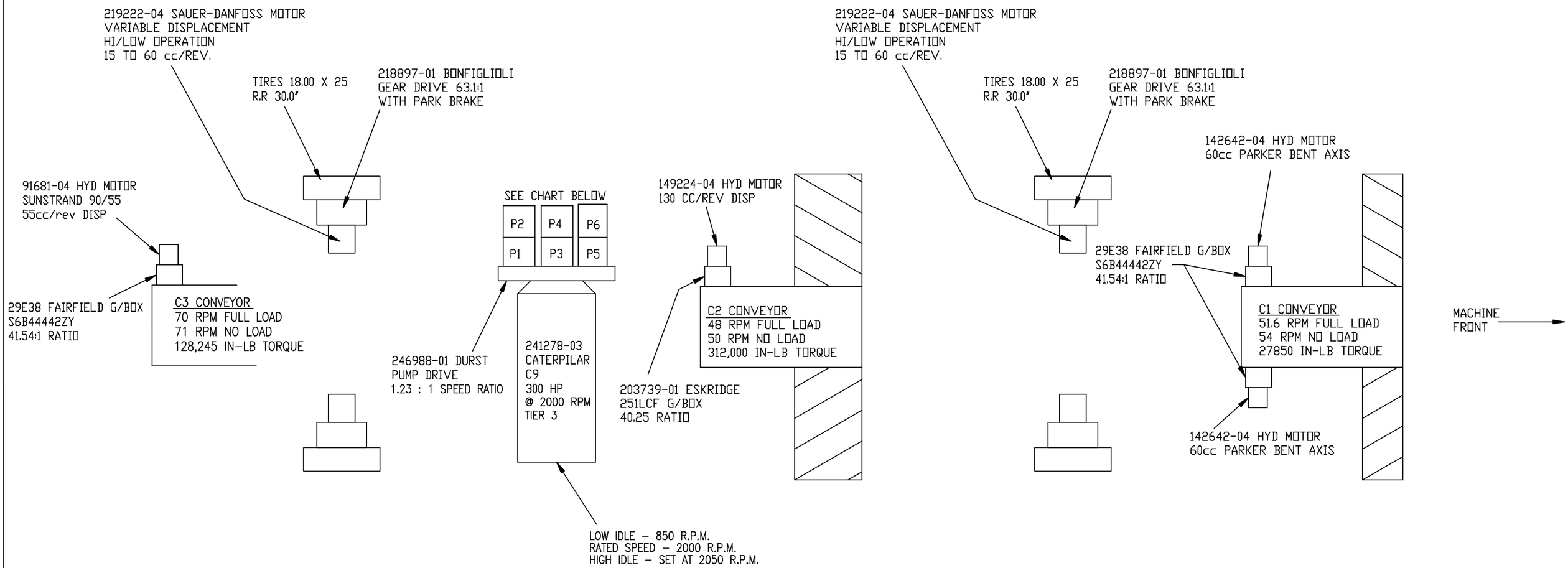
6.4. SPEED CHART



PUMP CHART

PUMP	PART No	DESCRIPTION	TYPE	SYSTEM RELIEF	CHARGE RELIEF	CHARGE DISP.
P1	233837-04	PROPEL	SAUER 90/100	6500 PSI	350 PSI	31 CC
P2	217790-04	AUXILLIARY	SAUER J60	2500 PSI	N/A	N/A
P3	99814	C2 CONVEYOR	SAUER 90/100	6500 PSI	350 PSI	20 CC
P4	233849-04	C3 CONVEYOR	SAUER 90/75	6200 PSI	350 PSI	17 CC
P5	99814	C1 CONVEYOR	SAUER 90/100	6500 PSI	350 PSI	20 CC
P6	233856-04	COOLING FAN	SAUER J45	2500 PSI	N/A	N/A

ALL PUMP AND GEARBOX SPEEDS ARE WHEN ENGINE IS AT FULL LOAD



PUMP CHART

PUMP	PART No	DESCRIPTION	TYPE	SYSTEM RELIEF	CHARGE RELIEF	CHARGE DISP.
P1	233837-04	PROPEL	SAUER 90/100	6500 PSI	350 PSI	31 CC
P2	217790-04	AUXILLIARY	SAUER J60	2500 PSI	N/A	N/A
P3	99814	C2 CONVEYOR	SAUER 90/100	6500 PSI	350 PSI	20 CC
P4	233849-04	C3 CONVEYOR	SAUER 90/75	6200 PSI	350 PSI	17 CC
P5	99814	C1 CONVEYOR	SAUER 90/100	6500 PSI	350 PSI	20 CC
P6	233856-04	COOLING FAN	SAUER J45	2500 PSI	N/A	N/A

TRAVEL SPEED	
LOW (63:1 @ 60cc)	HIGH (63:1 @ 20cc)
267.5 FT/MIN	9.1 MPH (802.25 FPM)

△	I	E	T	N	PF	FC	M	MC	A			

REPLACES DWG. # 236382-01

all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

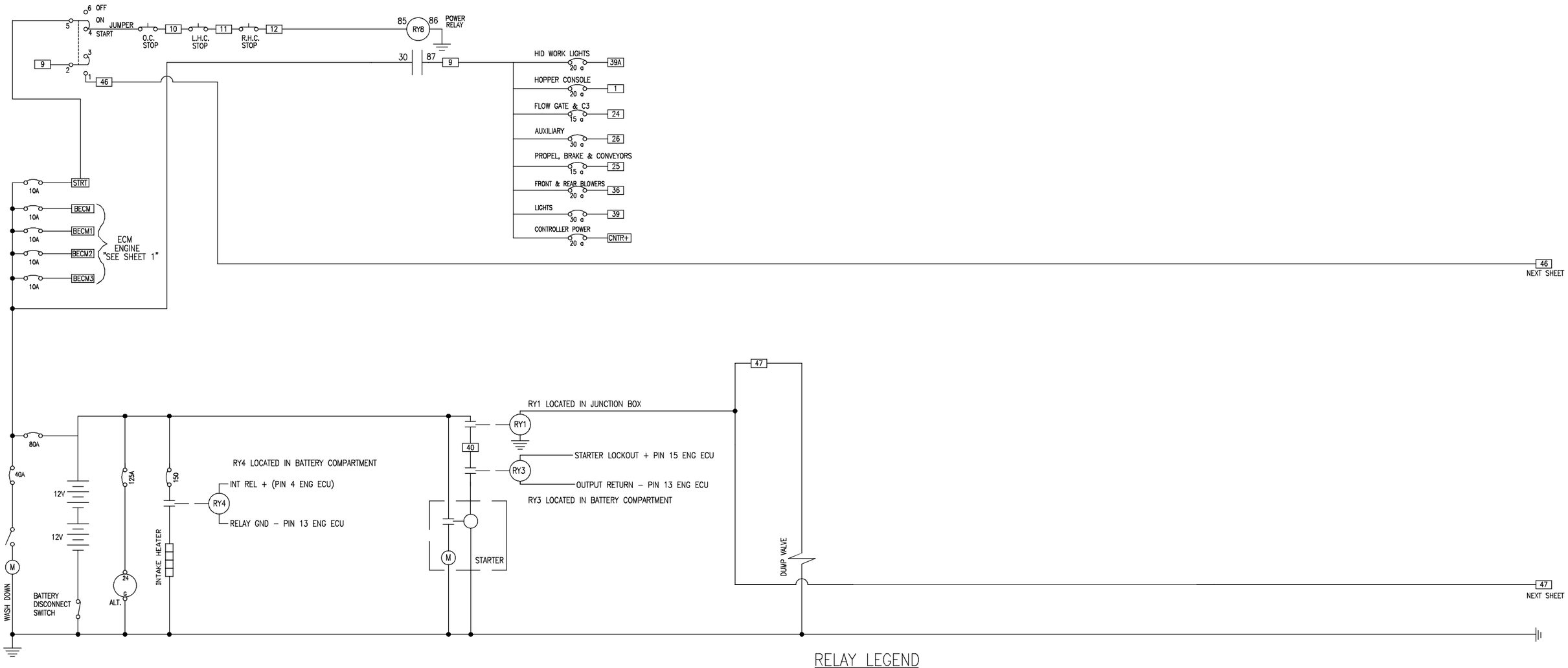
REV.	E.C.N.	DATE	REVISIONS	CH'G. BY	APPR. BY
△					

ROADTEC

PART NAME: SPEED CHART-SB-2500EX T3

01 REQ'D PER 2500ex	SHEET NO: 1 of 1	FAB CODE: 615	EFFECTIVE S/N: 3008
DRAWN BY: JEH	CHECKED BY:	DWG NO: 255591-01	REV.: 0
SCALE: 1	DATE: 1/10/14		

SCHEMATICS



RELAY LEGEND

RY1 – START ASSIST
RY2 – NEUTRAL START
RY3 – STARTED LOCKOUT
RY4 – INTAKE HEATER SOLENOID

RY7 – HORN
RY8 – MAIN POWER
RY9 – LATCHING (SPEED SHIFT)
RY10 – NEUTRAL BRAKE
RY11 – FXS DISABLE (ONLY NEEDED WHEN WASH DOWN IS ADDED)
RY12 – DISC BRAKE
RY13 – DISC BRAKE
RY14– HID LIGHTS

LEGEND

= SOLENOID (Y #)
= NORMALLY OPEN SWITCH (N.O.)
= LIMIT SWITCH (LS #)
= PRESSURE SWITCH (PS #)
= TEMPERATURE SWITCH (TS #)
= PUSH BUTTON (PB #)
= NORMALLY CLOSED SWITCH (N.C.)
= RESISTOR (R #)

(RY #) = RELAY
= WHITE LIGHT (L #)
= ORANGE LIGHT (L #)
= RED LIGHT (L #)
= TERMINAL NUMBER
= WIRE NUMBER OR WIRE CONNECTION
= BATTERY
= CIRCUIT BREAKER (CB #)

= DIODE (D #)
= TEMP. SENDING UNIT
INTLK = INTERLOCK
= RELAY
= GROUND
FRT = FRONT
ELEV = ELEVATION
(P #) = PLUG
= OPTIONAL ITEMS (EXCEPT SWITCH BORDERS, RELAYS, LIMIT SWITCHES, JUMPERS)
= PUMP COIL

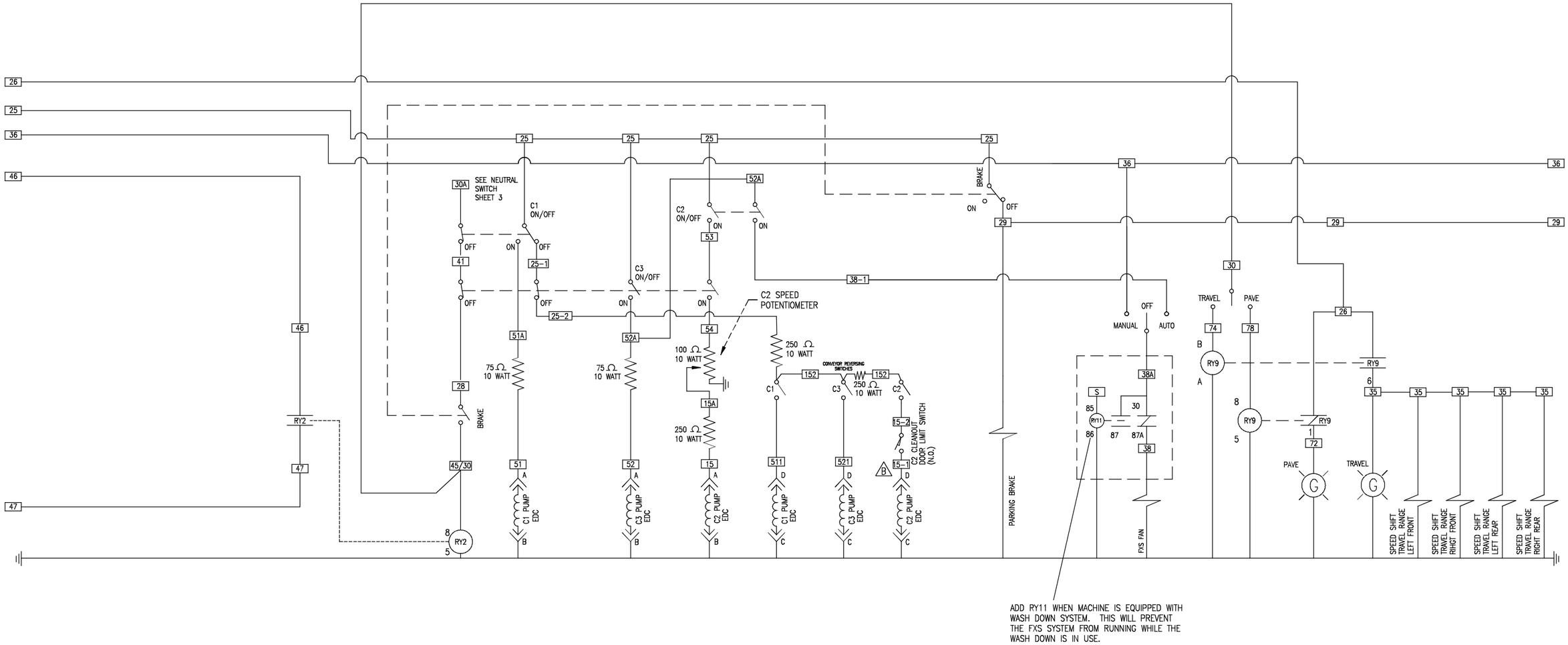
all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	DATE	ISSUES	LOCATION	BY
E	12-4-13	CLARIFIED WIRING OF POWER AND GROUND TO JOYTSICK 1/B		KDM
E	3-25-14	ADDED RELAY SHEET 6 RY15, RY16, & RY 17, DUMP LIGHT OPTIONS 1/B		JW

REV.	SN#	DATE	ISSUES	BY
A		10-1-13	REVISED BEACON LIGHT & LIGHT CIRCUIT AND DISC BRAKE 2/B	JW
B		10-23-13	15-1 WAS 15-2 SHEET 2 1/B	KDM
C		11-21-13	DU-LHC WAS AT PIN 9 OF CONTROLLER NOW AT PIN 24 1/B	KDM
			PIN 25 OF CONTROLLER WAS SPARE INPUT NOW "LIGHTS ON" WIRE 104,	
			PIN 26 OF CONTROLLER WAS SPARE INPUT NOW "PAVE SPEED" WIRE 72	
			REMOVED THR+ AND THR- FROM PINS 28 AND 29 OF ENGINE PLUG	
D		12-4-13	CORRECTED WIRING OF JOYSTICK/EDC AND SWITCHES SHTS 3 AND 4 1/B	KDM

ROADTEC

PART NAME: ELECTRICAL SCHEMATIC SB-2500E TIER IV
1 REQ'D PER: SB-2500E
SHEET NO: 1 OF 6
FAB CODE: 603
EFFECTIVE S/N: 3003
DRAWN BY: KDM
TOTAL WT. (LBS):
SCALE: 1=1
DATE: 7-31-13
DWG NO: 252557-01
REV: F

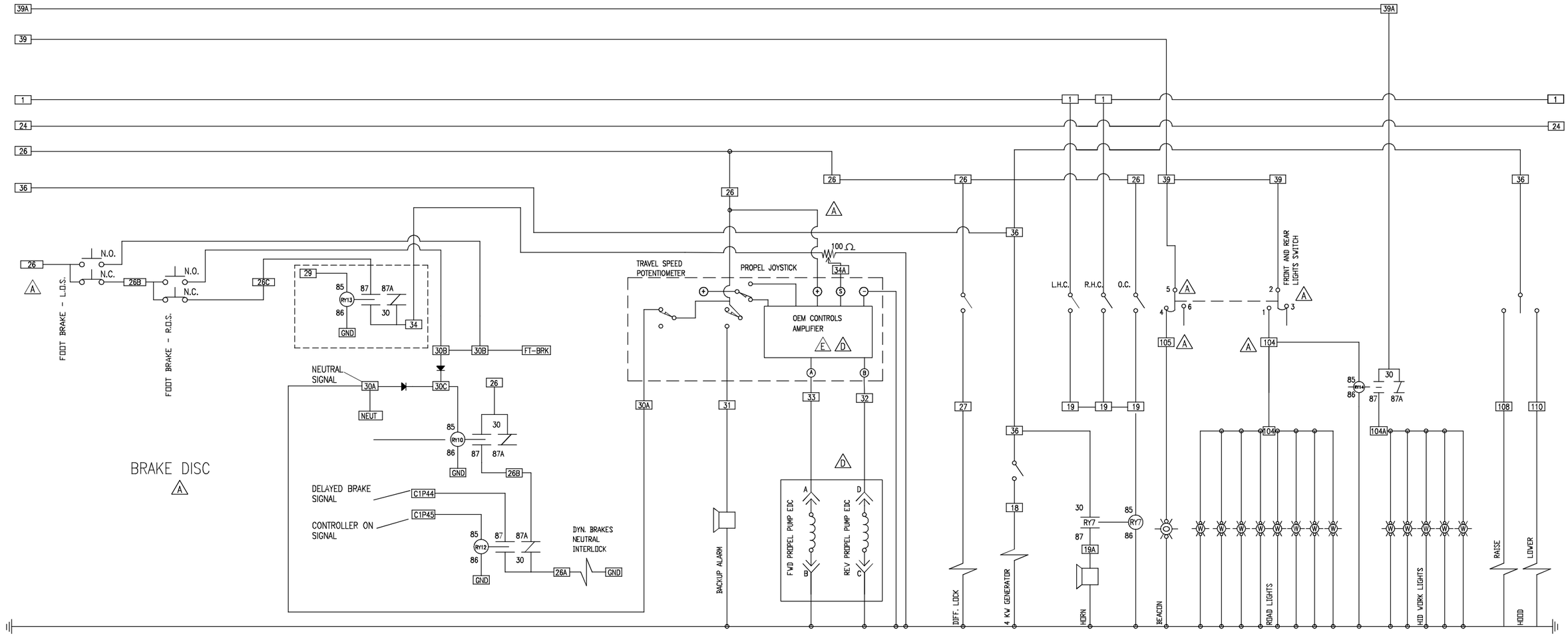


all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	SN#	DATE	ISSUES	BY

ROADTEC

PART NAME: ELECTRICAL SCHEMATIC SB-2500E TIER IV			
1 REQ'D PER: SB-2500E	SHEET NO: 2 OF 6	FAB CODE: 603	EFFECTIVE S/N: 3003
DRAWN BY: KDM	TOTAL WT. (LBS):	DWG NO: 252557-01	REV.: F
SCALE: 1=1	DATE: 7-31-13		



all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	SN#	DATE	ISSUES	BY

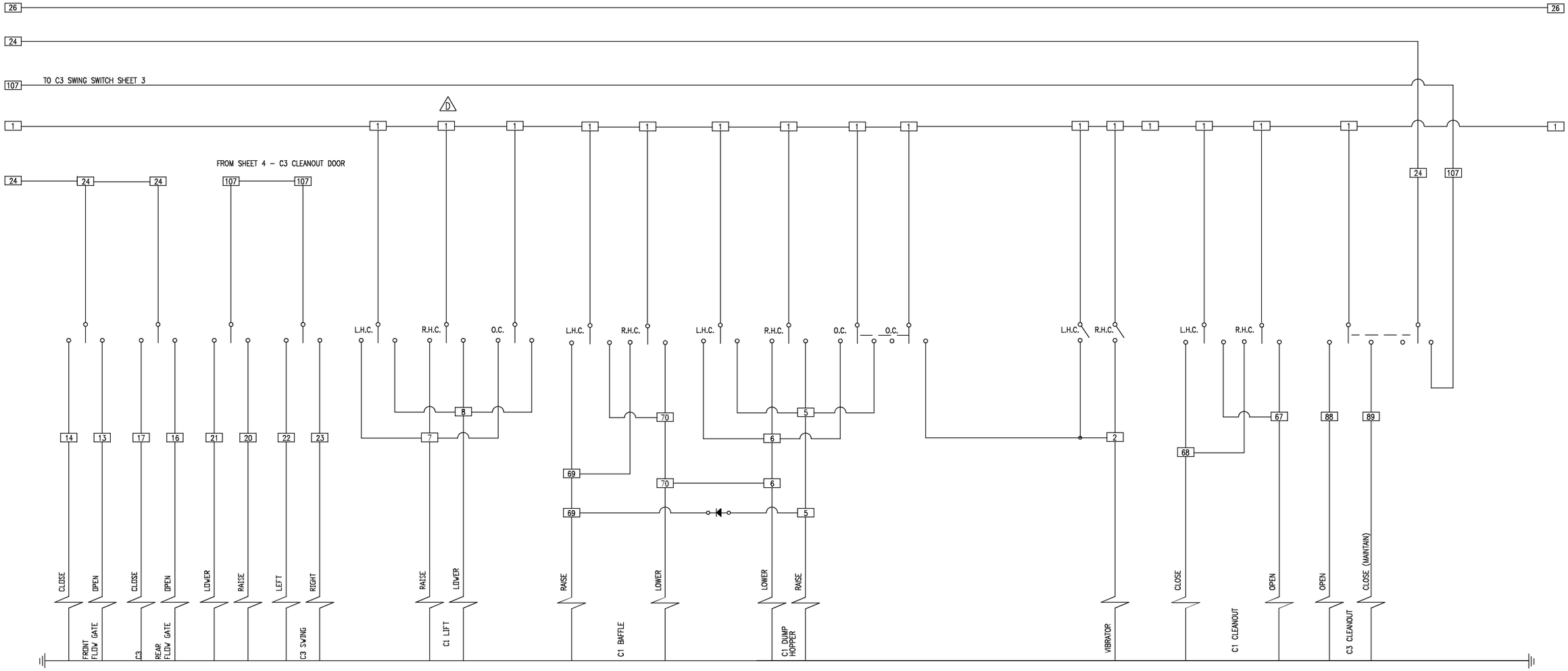
ROADTEC

PART NAME: ELECTRICAL SCHEMATIC SB-2500E TIER IV

1 REQ'D PER	SHEET NO	FAB CODE	EFFECTIVE S/N
SB-2500E	3 OF 6	603	3003

DRAWN BY	TOTAL WT. (LBS)	DWG NO	REV.
KDM		252557-01	F

SCALE	DATE
1=1	7-31-13



all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	SN#	DATE	ISSUES	BY

ROADTEC

PART NAME: ELECTRICAL SCHEMATIC SB-2500E TIER IV

1 REQ'D PER: SB-2500E

SHEET NO: 4 OF 6

FAB CODE: 603

EFFECTIVE S/N: 3003

DRAWN BY: KDM

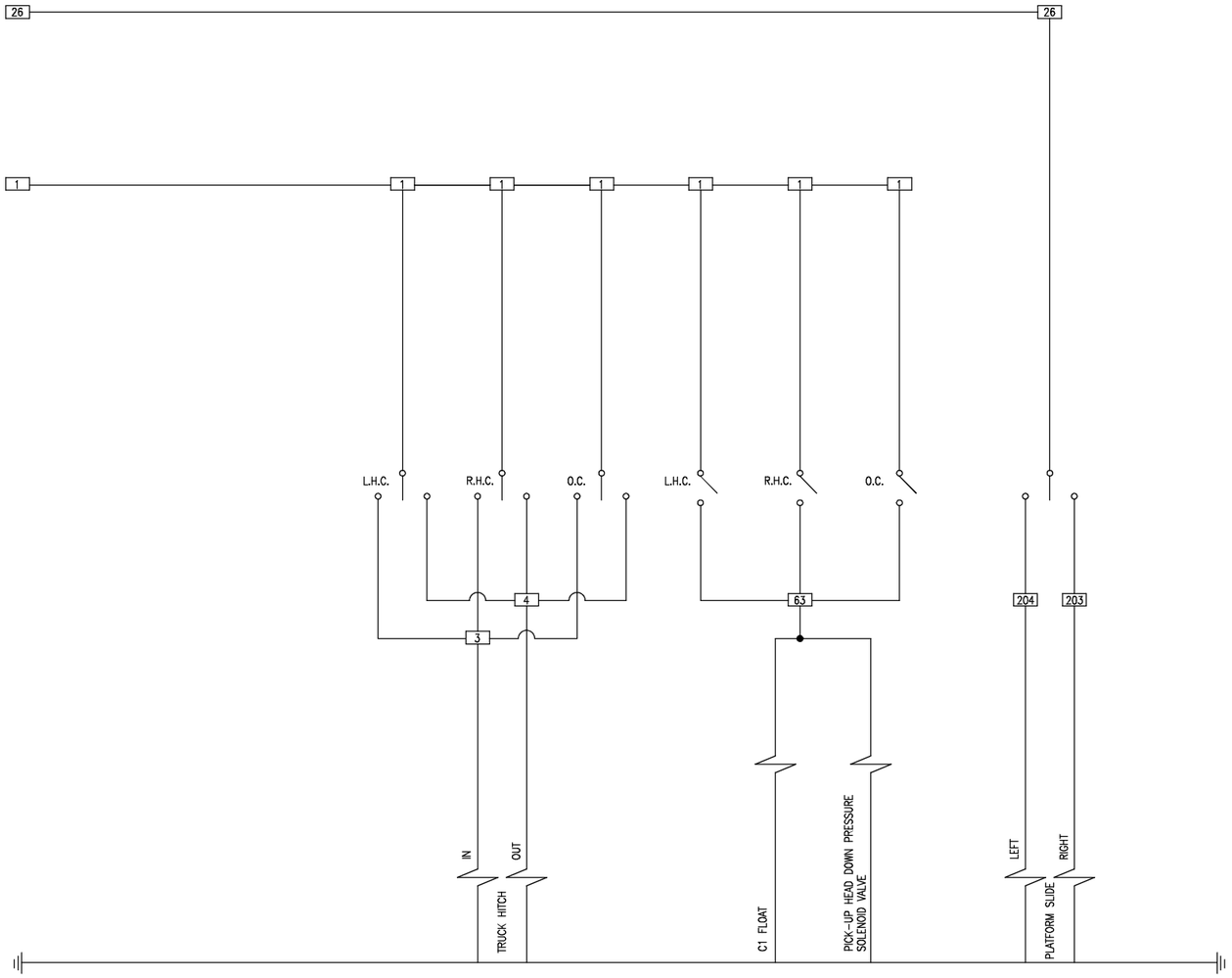
TOTAL WT. (LBS):

SCALE: 1=1

DATE: 7-31-13

DWG NO: 252557-01

REV: F



all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	SN#	DATE	ISSUES	BY

ROADTEC

PART NAME: ELECTRICAL SCHEMATIC SB-2500E TIER IV

1 REQ'D PER	SB-2500E	SHEET NO	FAB CODE	EFFECTIVE S/N
		5 OF 6	603	3003
DRAWN BY: KDM	TOTAL WT. (LBS):	DWG NO		REV.
SCALE: 1=1	DATE: 7-31-13	252557-01		F

PV-450 CONNECTORS

'D' 'C' 'B' 'A'

6-PIN DEUTSCH CONNECTOR 'B'

CNTR+ - PIN 1
J1939+ - PIN 2
J1939- - PIN 3
---- - PIN 4
CNTR+ - PIN 5
GND - PIN 6

NO CONNECTIONS TO 'A', 'C' & 'D'
DUMMY PLUGS TO BE INSTALLED IN
UNUSED CONNECTORS

120 OHM TERMINATING RECEPTACLE AND PLUG

CUMMINS DIAGNOSTIC CONNECTOR

GND	A	GROUND
BECM	B	POWER
	C	J1939+
	D	J1939-
	E	
	F	
	G	

60 PIN ECM CONNECTOR

	PIN	
BATTERY +	1	BECM
BATTERY +	2	BECM1
KEYSWITCH POWER	3	9
INT AIR HEATER RELAY	4	GRID HEAT +
	5	
WAIT TO START LIGHT	6	
	7	
	8	
	9	
	10	
BATTERY +	11	BECM2
BATTERY +	12	BECM3
RELAY GROUND	13	OUTPUT RETURN
	14	
STARTER LOCKOUT +	15	STARTER LOCK+
	16	
J1939 +	17	J1939+
J1939 -	18	J1939-
ANALOG/DIGITAL GND	19	AN/DIG-
	20	
	21	GND
	22	GND
	23	
	24	
	25	
	26	
	27	
	28	
	29	
	30	
	31	GND
	32	GND
	33	
	34	
	35	
	36	
	37	
	38	
	39	
	40	
	41	
	42	
OEM SENS-	43	OEM SENS-
COOL LEVEL	44	COOL LEVEL
INLET TEMP	45	INLET TEMP
	46	
	47	
DOC OUTLET TEMP	48	DOC OUTLET TEMP
	49	
	50	
	51	
SENSOR +	52	SENSOR +
	53	
DPF OUTLET TEMP	54	DPF OUTLET TEMP
DPF DELTA PRESS	55	DPF DELTA PRESS
	56	
	57	
DPF OUTLET PRESSURE	58	DPF OUTLET PRESS
	59	
	60	

WAIT TO START LAMP

CEM+

LOCATED IN 3-PIN CONNECTOR BRANCH OF ENGINE HARNESS

120 OHM

12V

12V

NEGATIVE BATTERY DISCONNECT SWITCH SHOWN HERE FOR REFERENCE ONLY. COMPLETE WIRING OF BATTERY CIRCUIT ON SHEET 1.

GROUND WIRES OUT OF ENGINE PLUG ARE IN (2) 3/8" RING TERMINAL AND ARE GROUNDED AT STUD ON ENGINE. GROUND WIRES FROM JUNCTION BOX ARE TERMINATED ON THE SAME STUD. AN 8 AWG WIRE IS TAKEN FROM THIS STUD TO NEGATIVE BATTERY DISCONNECT.

10-PIN AFTER TREATMENT PLUG 241672-04

FUNCTION	WIRE #	10-PIN LOCATION	60-PIN LOCATION
SENSOR RETURN	AN/DIG-	2	19
INLET TEMP	INLET TEMP	6	45
DOC OUTLET TEMP	DOC OUTLET TEMP	5	48
DPF OUTLET TEMP	DPF OUTLET TEMP	7	54

4-PIN FRAMATOME CONNECTOR (241671-04)

FUNCTION	WIRE #	4-PIN LOCATION	60-PIN LOCATION
INLET TEMP	OEM SENSOR -	1	43
DOC OUTLET TEMP	DPF DELTA PRESS	2	55
START LOCKOUT-	DPF OUTLET PRESS	3	58
POWER PACK	SENSOR +	4	52

MC050-10

POWER GROUND	1	GND GROUND
+24V	2	CNTR+ +24V
CAN0 HIGH	3	CAN0 DATA +
CAN0 LOW	4	CAN0 DATA -
CAN0 SHIELD	5	
THROTTLE INCREASE	6	THR+
THROTTLE DECREASE	7	THR-
5V SENSOR POWER	8	C1P8
DUMP UP LHC (OPTION)	9	
DUMP DOWN LHC (OPTION)	10	DD-LHC
DUMP HOLD LHC (OPTION)	11	DH-LHC
DUMP UP RHC (OPTION)	12	DU-RHC
DUMP DOWN RHC (OPTION)	13	DD-RHC
DUMP HOLD RHC (OPTION)	14	DH-RHC
DUMP UP OC (OPTION)	15	DU-OC
DUMP DOWN OC (OPTION)	16	DD-OC
DUMP HOLD OC	17	DH-OC
CAC TEMP IN	18	CAC TEMP IN
HYD TEMP IN	19	HYD TEMP IN
CAN1 HIGH (NO CONNECTION)	20	
CAN2 LOW (NO CONNECTION)	21	
FOOT BRAKE IN	22	FT-BRK
NEUTRAL IN	23	NEUT
WAIT TO START	24	F-24
DUMP UP LHC (OPTION)	25	DU-LHC
LIGHTS	26	104
PAVE SPEED	27	72
CW DUMP LIGHT OPTION RELAY GROUND	28	C1P28 SEE OPTION
SPARE INPUT	29	C1P29
SPARE INPUT	30	C1P30
DUMP UP LIGHT (OPTION)	31	C1P31
DUMP DOWN LIGHT (OPTION)	32	C1P32
DUMP HOLD LIGHT (OPTION)	33	C1P33
SPARE DIGITAL OUTPUT	34	C1P34
SPARE DIGITAL OUTPUT	35	C1P35
SPARE DIGITAL OUTPUT	36	C1P36
SPARE MULTI-FUNCTION OUTPUT	37	C1P37
SPARE MULTI-FUNCTION OUTPUT	38	C1P38
SPARE MULTI-FUNCTION OUTPUT	39	C1P39
SPARE MULTI-FUNCTION OUTPUT	40	C1P40
SPARE MULTI-FUNCTION OUTPUT	41	C1P41
SPARE MULTI-FUNCTION OUTPUT	42	C1P42
SPARE MULTI-FUNCTION OUTPUT	43	C1P43
NEUTRAL INTERLOCK RELAY SIG (SHEET 3)	44	C1P44
NEUTRAL INTERLOCK RELAY ON (SHEET 3)	45	C1P45
FAN PWM	46	FAN PWM
+24V	47	CNTR+
+24V	48	CNTR+
+24V	49	CNTR+
+24V	50	CNTR+

5K OHM

5K OHM

30B

30C

30A

DU-LT

DD-LHC

DH-LHC

GND

36

COOLING FAN

NOTE: ONLY CONNECT FT-BRK, NEUT, C1P44 & C1P45 IF MODIFIED DISC BRAKE KIT IS INSTALLED

all fractional dim's ± 1/32" - all decimal dim's ± .005 unless noted

REV.	SN#	DATE	ISSUES	BY

ROADTEC

PART NAME: ELECTRICAL SCHEMATIC SB-2500E TIER IV

1 REQ'D PER: SB-2500E | SHEET NO: 6 OF 6 | FAB CODE: 603 | EFFECTIVE S/N: 3003

DRAWN BY: KDM | TOTAL WT. (LBS) | DWG NO: 252557-01 | REV.: F

SCALE: 1=1 | DATE: 7-31-13

MANUAL OVERRIDE
"B" "O" "A"

M5 M4 X1 X2 M3 PROPEL PUMP

M1 A FORWARD

6500 PSI

65.3 GPM MAX

20.2 GPM

2460 RPM
FULL LOAD

6.10 CID
100 CC

1.89 CID
31 CC

350 PSI

6500 PSI

M2 B

L1 S L2

OIL COOLER
300 PSI MAX

RETURN
FILTER
3 MICRON
ABSOLUTE

10 MICRON
SUCTION
FILTER

M6 M4 M3 M1
A
MAX DISP
ELECTRIC SHIFT
M9
X3,M5
B M2
L1,L2

REAR DRIVES

FRONT DRIVES

A B
.047 ORIFICE
P1 P2
P1 P2
PS P (UP TO 55 GPM) L

PROPEL CIRCUIT

REPLACES DWG #251164-01 EX SN 3000s

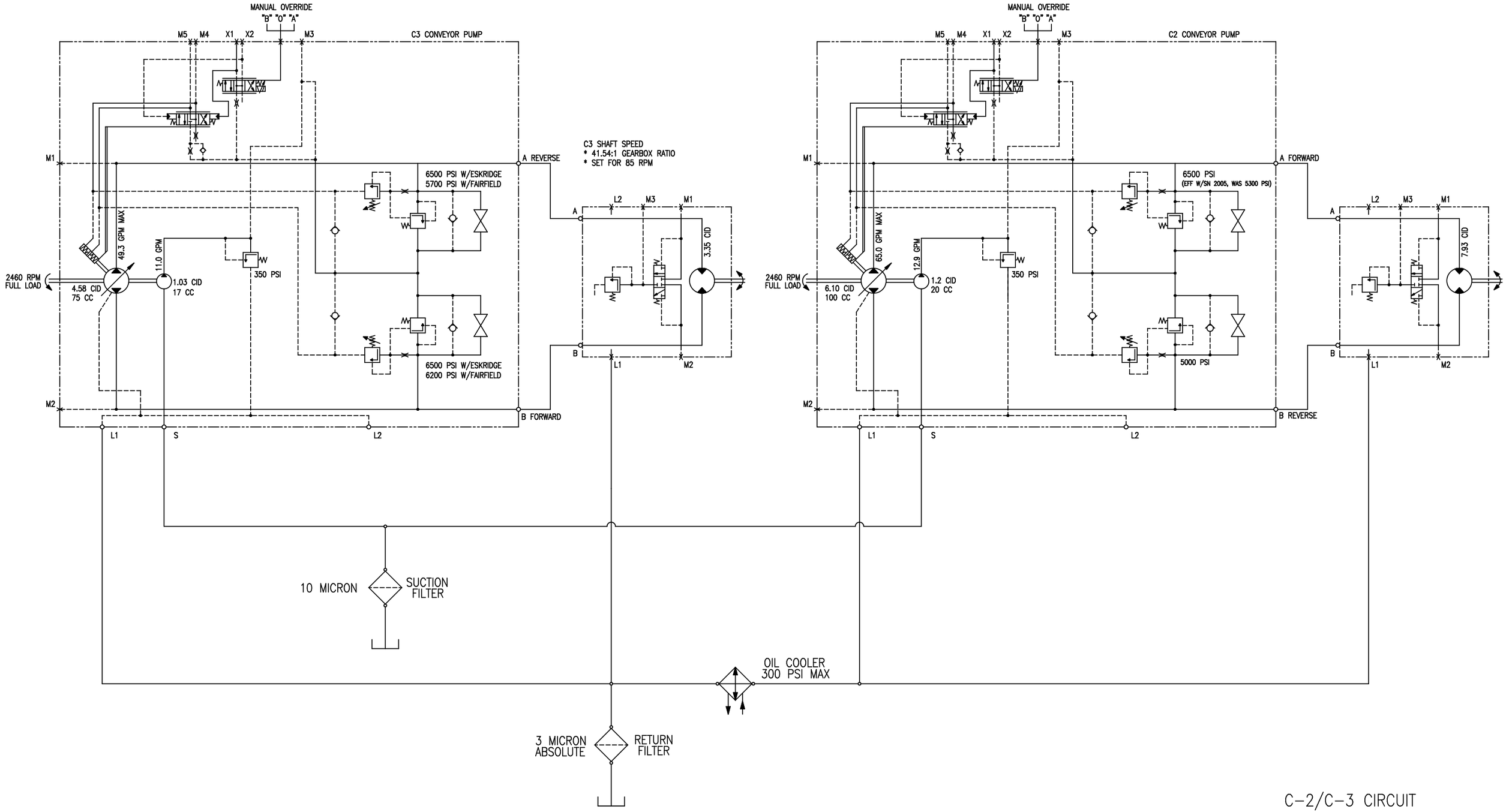
"E" "F" "G"
MATCH WITH LINES ON SHEET 4

all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	E.C.N.	DATE	REVISIONS	CH'G. BY	APPR. BY

ROADTEC

PART NAME: SCHEMATIC–HYDRAULIC SB–2500EX–3K			
01 REQ'D PER 2500ex	SHEET NO: 1 of 6	FAB CODE: 615	EFFECTIVE S/N: 3008
DRAWN BY: BL	CHECKED BY:	DWG NO: 253788–01	REV: 0
SCALE: 3/4	DATE: 11/19/13		



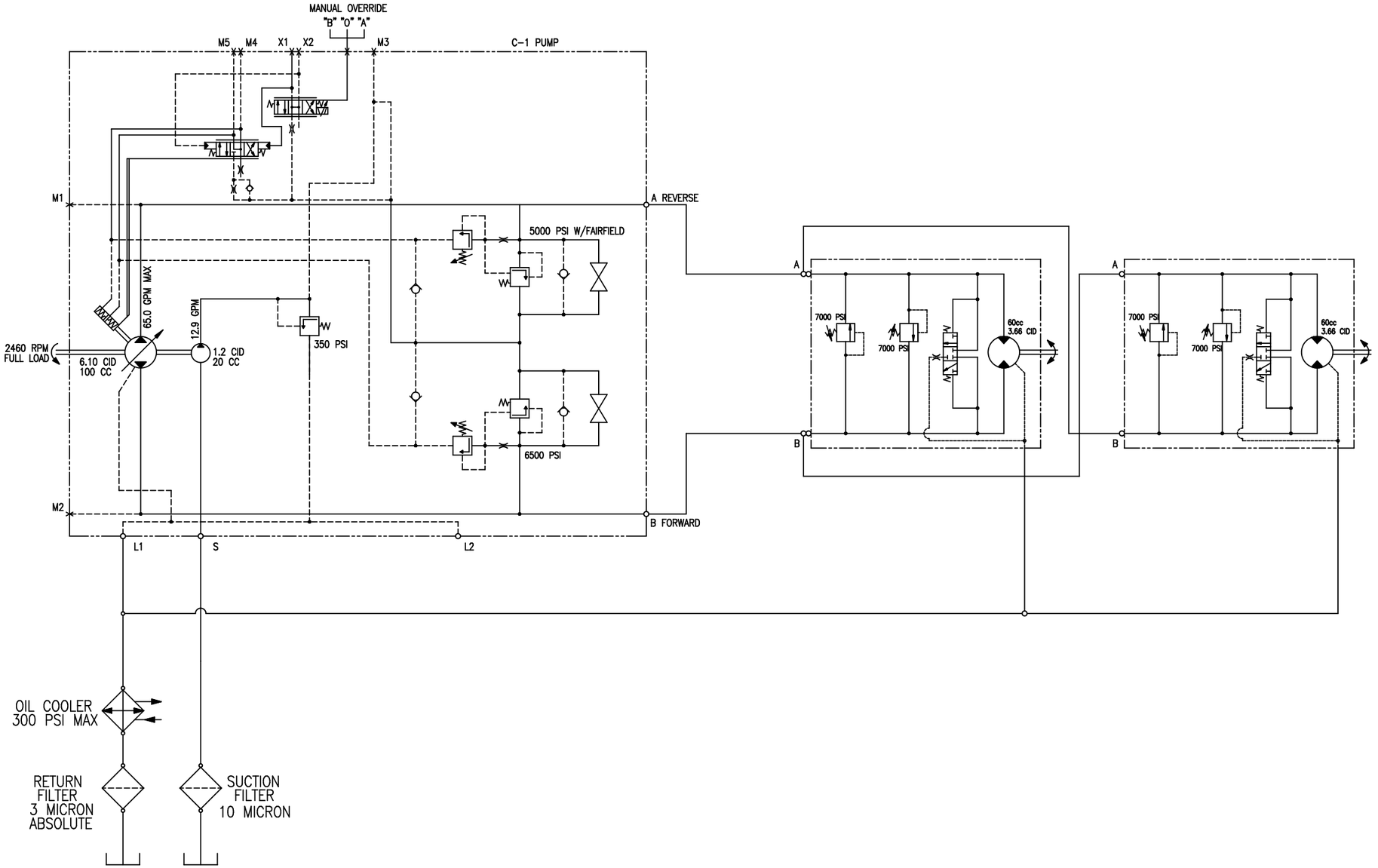
C-2/C-3 CIRCUIT

all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	E.C.N.	DATE	REVISIONS	CH'Q. BY	APPR. BY

ROADTEC

PART NAME: SCHEMATIC–HYDRAULIC SB–2500EX–3K			
01 REQ'D PER 2500ex	SHEET NO: 2 of 6	FAB CODE: 615	EFFECTIVE S/N: 3008
DRAWN BY: BL	CHECKED BY:		
SCALE: 3/4	DATE: 11/19/13	DWG NO: 253788–01	REV: 0



C-1 CIRCUIT

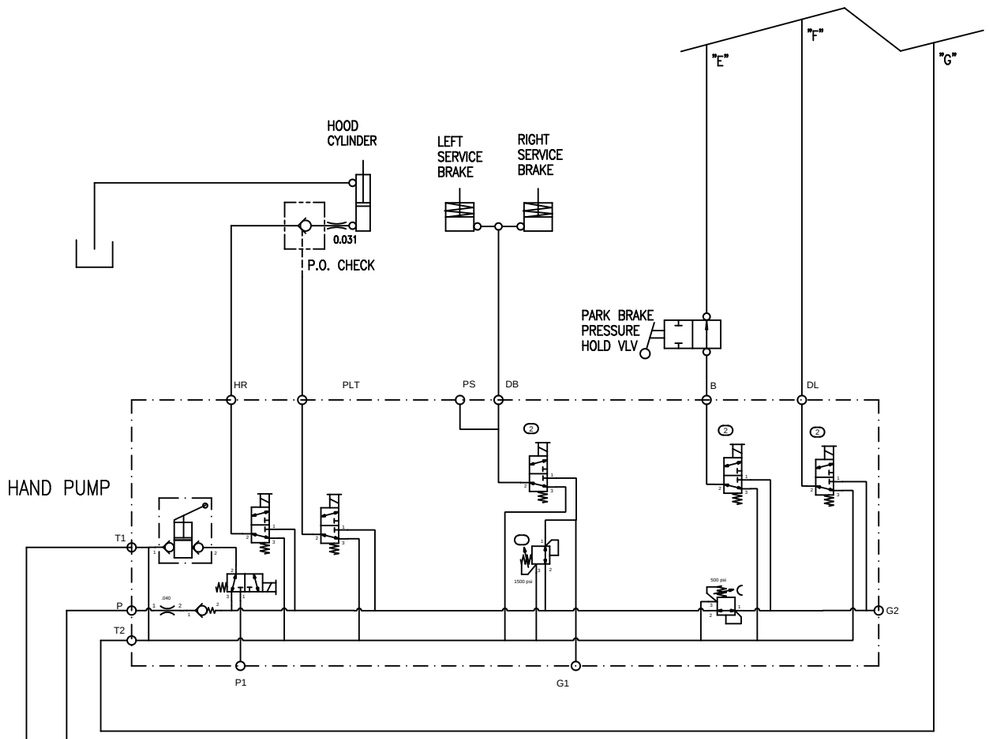
all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	E.C.N.	DATE	REVISIONS	CH'Q. BY	APPR. BY

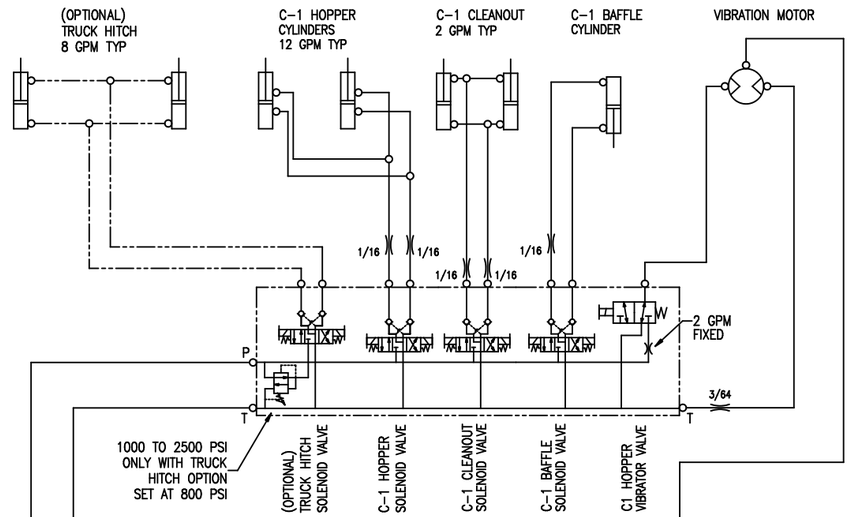
ROADTEC

PART NAME: SCHEMATIC–HYDRAULIC SB–2500EX–3K			
01 REQ'D PER 2500ex	SHEET NO: 3 of 6	FAB CODE: 615	EFFECTIVE S/N: 3008
DRAWN BY: BL	CHECKED BY:	DWG NO: 253788–01	REV: 0
SCALE: 3/4	DATE: 11/19/13		

MATCH WITH LINES ON SHEET 1

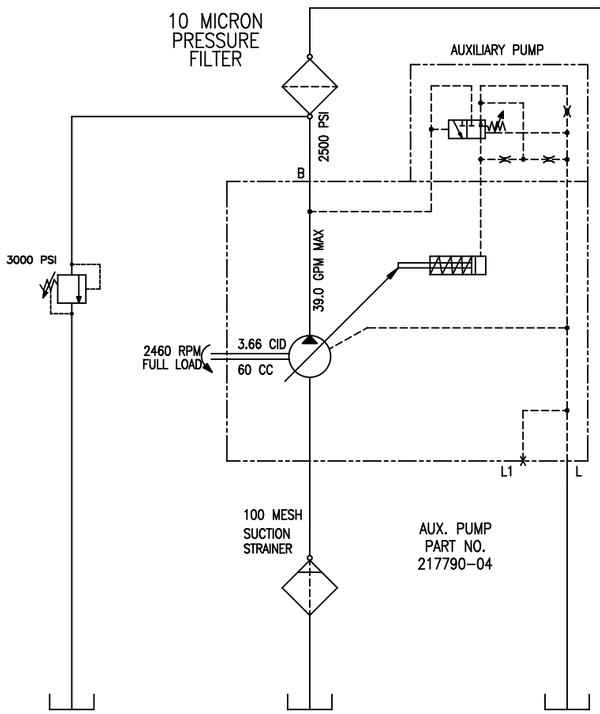


HAND PUMP/PILOT VALVE
MANIFOLD PART NUMBER 235771-03



C1 HOPPER CONTROL
MANIFOLD PART NO.
235752-01

NOTE: STANDARD MANIFOLD TO BE EQUIPPED WITH BLANKING PLATES (PLUGS) AT TRUCK HITCH STATION (SOLENOID VALVE AND REDUCING VALVE)



"A"

"B"

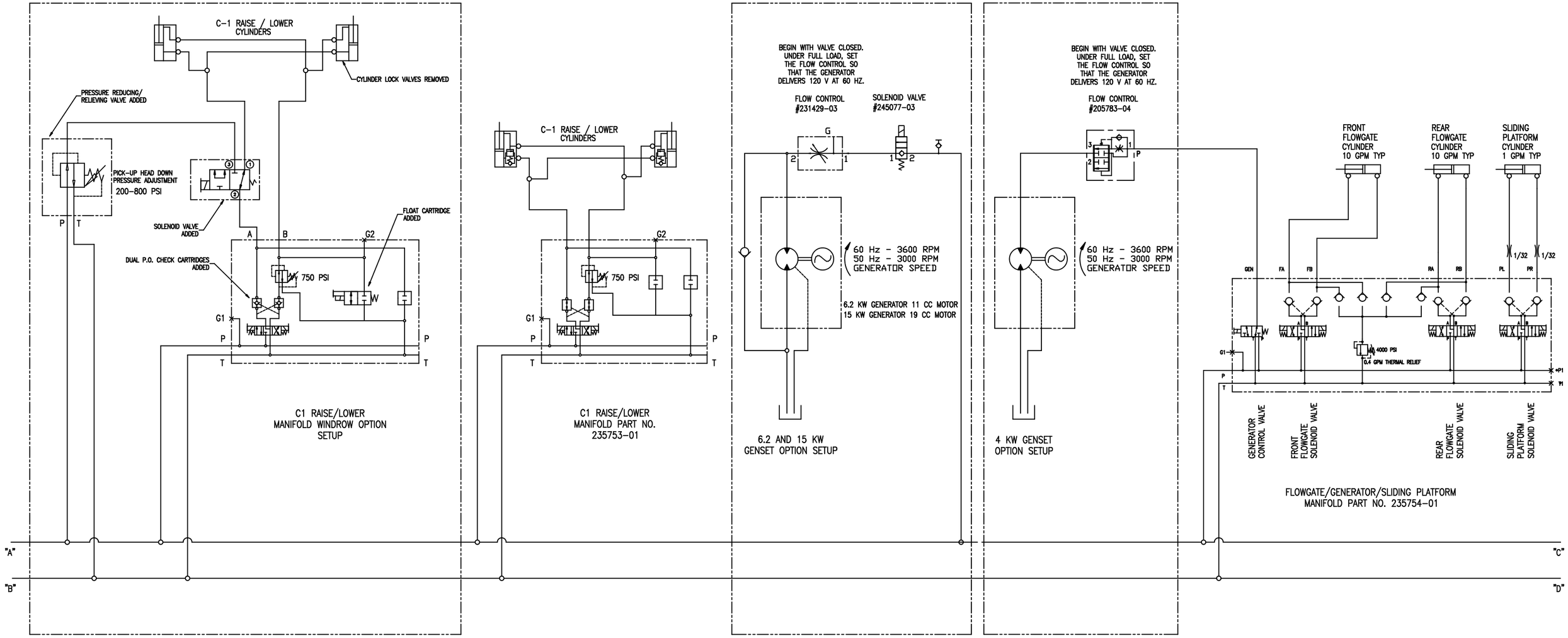
AUXILIARY CIRCUIT

all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	E.C.N.	DATE	REVISIONS	CH'G. BY	APPR. BY

ROADTEC

PART NAME: SCHEMATIC-HYDRAULIC SB-2500EX-3K			
01 REQ'D PER 2500ex	SHEET NO: 4 of 6	FAB CODE	EFFECTIVE S/N: 3008
DRAWN BY: BL	CHECKED BY	DWG NO: 253788-01	REV: 0
SCALE: 3/4	DATE: 11/19/13		



AUXILIARY CIRCUIT (CON'T)

all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	E.C.N.	DATE	REVISIONS	CH'G. BY	APPR. BY

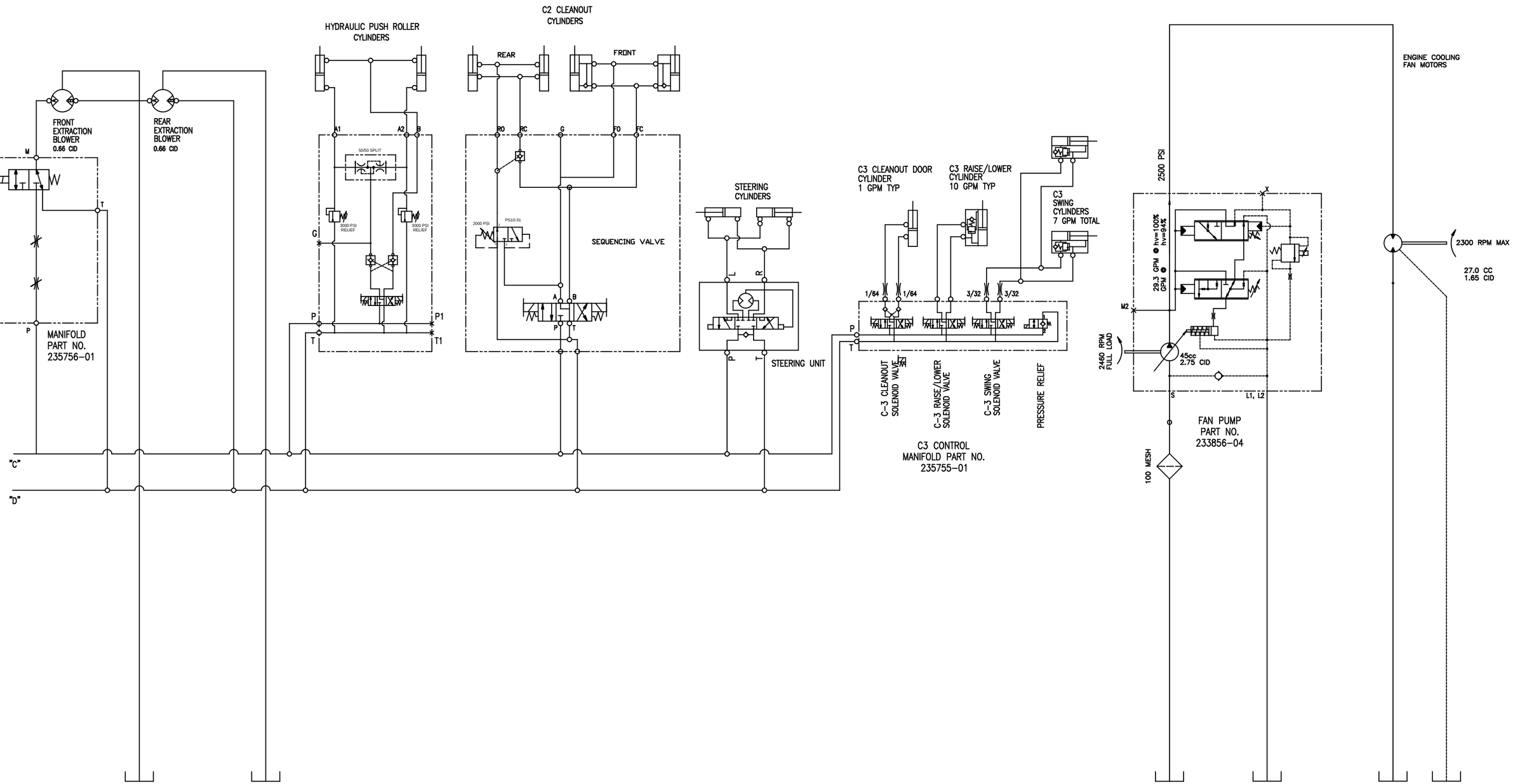
ROADTEC

PART NAME: SCHEMATIC-HYDRAULIC SB-2500EX-3K

01 REQ'D PER 2500ex | SHEET NO 5 of 6 | FAB CODE 615 | EFFECTIVE S/N 3008

DRAWN BY BL | CHECKED BY | DWG NO 253788-01 | REV. 0

SCALE 3/4 | DATE 11/19/13



AUXILIARY CIRCUIT (CON'T)

COOLING FAN CIRCUIT

all fractional dim's ± 1/32" – all decimal dim's ± .005 unless noted

REV.	E.C.N.	DATE	REVISIONS	CH'D. BY	APPR. BY

ROADTEC

PART NAME: SCHEMATIC–HYDRAULIC SB–2500EX–3K

01 REQ'D PER 2500ex | SHEET NO 6 of 6 | FAB CODE 615 | EFFECTIVE S/N 3008

DRAWN BY BL | CHECKED BY | SCALE 3/4 | DATE 11/19/13 | DWG NO 253788–01 | REV. 0

MAINTENANCE SCHEDULE

DAILY MAINTENANCE

IDENTIFICATION	TYPE OF SERVICE	REMARKS
ENGINE CRANKCASE AND COMPONENTS	CHECK	REFER TO ENGINE MANUAL FOR LUBE SPECS AND POINTS
FUEL/WATER SEPERATION FILTER	CHECK	DRAIN ANY ACCUMULATED WATER FROM THE TRANSPARENT RESERVOIR
ENGINE OIL	CHECK LEVEL	REFER TO ENGINE MANUAL FOR LUBE SPECS
RADIATOR	CHECK LEVEL	REFILL WITH A 50/50 MIX OF ANTIFREEZE AND WATER
HYDRAULIC TANK	CHECK OIL LEVEL	REFILL TO 90% CAPACITY WITH GRADE 46 HYDRAULIC OIL
C-3 HEADSHAFT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 8 SHOTS (WHILE HOT)
C-2 HEADSHAFT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 8 SHOTS (WHILE HOT)
C-2 IDLERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS (WHILE HOT)
C-1 TAILSHAFT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 8 SHOTS (WHILE HOT)
C-2 TAILSHAFT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 8 SHOTS (WHILE HOT)
C-3 TAILSHAFT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 8 SHOTS (WHILE HOT)
C-3 PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
C-1 IDLER BEARINGS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS (WHILE HOT)
C-3 IDLER BEARINGS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS (WHILE HOT)

50 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	ENGINE OIL AND FILTER	CHANGE	CHANGE AFTER THE FIRST 50 HOURS OF SERVICE ON NEW MACHINE.
	ENGINE FUEL FILTERS	CHANGE	CHANGE AFTER THE FIRST 50 HOURS OF SERVICE ON NEW MACHINE.
	HYDRAULIC FILTERS	CHANGE	CHANGE AFTER THE FIRST 50 HOURS OF SERVICE ON NEW MACHINE.
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS

50 HOUR MAINTENANCE (CONTINUED)

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

100 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

150 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

200 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

250 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	ENGINE OIL AND FILTER	CHANGE	REFER TO ENGINE MANUAL FOR OIL AND FILTER SPECIFICATIONS
	ENGINE FUEL FILTER	CHANGE	REFER TO ENGINE MANUAL FOR FILTER SPECIFICATIONS
	WATER/FUEL SEPERATOR	CHECK	DRAIN ACCUMULATED WATER
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	HYDRAULIC OIL FILTERS	CHANGE	REPLACE ALL IN-TANK ELEMENTS AND HIGH PRESSURE FILTER
	HYDRAULIC TANK	DRAIN WATER AND REFILL	REFILL TO 90% CAPACITY WITH ISO. VIS GRADE 46 ANTI-WEAR HYDRAULIC OIL ONLY
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	DRAIN, FLUSH AND REFILL	REFILL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	DRAIN, FLUSH AND REFILL	REFILL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	DRAIN, FLUSH AND REFILL	REFILL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	DRAIN, FLUSH AND REFILL	REFILL WITH 80W90 HIGH PERFORMANCE GEAR OIL

250 HOUR MAINTENANCE

	STEERING CYLINDERS	**LUBRICATE WITH HIGH TEMP. GREASE**	**EACH GREASE FITTING GETS 3 SHOTS**
	WHEEL PLANETARIES	**DRAIN, FLUSH AND REFILL**	**REFILL WITH 80W90 HIGH PERFORMANCE GEAR OIL**
	KING PINS	**LUBRICATE WITH HIGH TEMP. GREASE**	**EACH GREASE FITTING GETS 3 SHOTS**
	TIE RODS	**LUBRICATE WITH HIGH TEMP. GREASE**	**EACH GREASE FITTING GETS 3 SHOTS**
	C-1 CASTERS	**LUBRICATE WITH HIGH TEMP. GREASE**	**EACH GREASE FITTING GETS 2 SHOTS**

SB-2500ex MATERIAL TRANSFER VEHICLE

300 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

350 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

400 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

450 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

500 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	ENGINE OIL AND FILTER	CHANGE	REFER TO ENGINE MANUAL FOR OIL AND FILTER SPECIFICATIONS
	ENGINE FUEL FILTER	CHANGE	REFER TO ENGINE MANUAL FOR FILTER SPECIFICATIONS
	WATER/FUEL SEPERATOR	CHECK	DRAIN ACCUMULATED WATER
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	HYDRAULIC OIL FILTERS	CHANGE	REPLACE ALL IN-TANK ELEMENTS AND HIGH PRESSURE FILTER
	HYDRAULIC TANK	DRAIN WATER AND REFILL	REFILL TO 90% CAPACITY WITH ISO. VIS GRADE 46 ANTI-WEAR HYDRAULIC OIL ONLY
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL

SB-2500ex MATERIAL TRANSFER VEHICLE

500 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

550 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

600 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

650 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

700 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

750 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	ENGINE OIL AND FILTER	CHANGE	REFER TO ENGINE MANUAL FOR OIL AND FILTER SPECIFICATIONS
	ENGINE FUEL FILTER	CHANGE	REFER TO ENGINE MANUAL FOR FILTER SPECIFICATIONS
	WATER/FUEL SEPERATOR	CHECK	DRAIN ACCUMULATED WATER
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	HYDRAULIC OIL FILTERS	CHANGE	REPLACE ALL IN-TANK ELEMENTS AND HIGH PRESSURE FILTER
	HYDRAULIC TANK	DRAIN WATER AND REFILL	REFILL TO 90% CAPACITY WITH ISO. VIS GRADE 46 ANTI-WEAR HYDRAULIC OIL ONLY
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL

750 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

800 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

850 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

900 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

950 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	CHECK FLUID LEVEL	MAINTAIN OIL LEVEL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

SB-2500ex MATERIAL TRANSFER VEHICLE

1000 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	ENGINE AIR FILTER	CHECK	REPLACE IF DIRTY OR IN BAD REPAIR
	RADIATOR	DRAIN, FLUSH AND REFILL	REFILL WITH A 50/50 MIX OF ANTIFREEZE AND WATER
	ENGINE OIL AND FILTER	CHANGE	REFER TO ENGINE MANUAL FOR OIL AND FILTER SPECIFICATIONS
	ENGINE FUEL FILTER	CHANGE	REFER TO ENGINE MANUAL FOR FILTER SPECIFICATIONS
	WATER/FUEL SEPERATOR	CHECK	DRAIN ACCUMULATED WATER
	BATTERIES	CHECK ELECTROLYTE LEVEL	REFILL IF NECESSARY
	TIRE PRESSURE	CHECK PRESSURE	MAINTAIN AT 75 PSI (517 kPa)
	HYDRAULIC OIL FILTERS	CHANGE	REPLACE ALL IN-TANK ELEMENTS AND HIGH PRESSURE FILTER
	HYDRAULIC TANK	DRAIN, FLUSH AND REFILL	REFILL TO 90% CAPACITY WITH ISO. VIS GRADE 46 ANTI-WEAR HYDRAULIC OIL ONLY
	C-3 LIFT PIVOT	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 5 SHOTS
	C-1 PLANETARIES	DRAIN, FLUSH AND REFILL	REFILL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	PUMP DRIVE	DRAIN, FLUSH AND REFILL	REFILL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C2 PLANETARY	DRAIN, FLUSH AND REFILL	REFILL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	C3 PLANETARY	DRAIN, FLUSH AND REFILL	REFILL WITH 80W90 HIGH PERFORMANCE GEAR OIL

SB-2500ex MATERIAL TRANSFER VEHICLE

1000 HOUR MAINTENANCE

DATE WHEN COMPLETED	IDENTIFICATION	TYPE OF SERVICE	REMARKS
	STEERING CYLINDERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	WHEEL PLANETARIES	DRAIN, FLUSH AND REFILL	REFILL WITH 80W90 HIGH PERFORMANCE GEAR OIL
	KING PINS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	TIE RODS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 3 SHOTS
	C-1 CASTERS	LUBRICATE WITH HIGH TEMP. GREASE	EACH GREASE FITTING GETS 2 SHOTS

WARRANTY

Manufacturer (Roadtec, Inc.) warrants, commencing with the date of shipment to first end-user and for a period of 12 months thereafter or 1,000 hours of operation, whichever occurs first, all machinery and parts manufactured by Roadtec, Inc. to be free from defects in workmanship and material. **Warranty remains in force for the above time period only if all Manufacturer's operational procedures are followed and recommended maintenance is performed.** If, within such warranty period, any machinery or parts shall be proved to Manufacturer's satisfaction to be defective, it shall be repaired or replaced, at the Manufacturer's option, F.O.B. Manufacturer's warehouse. All failed parts or components must be returned to Manufacturer prepaid for inspection before credit will be issued for new parts or components.

Wear parts such as: conveyor lines, screed plates, cutter teeth, tooth holders, scraper blades, track pads, tires and conveyor belts are warranted only if found to be defective at time of shipment, but are not warranted for the warranty period against wear or abuse.

With respect to machinery, parts or accessories to Manufacturer's products which are furnished but not manufactured by Manufacturer, Manufacturer's warranty obligation shall in all respects conform and be limited to the warranty extended to Manufacturer by its supplier or, if none, to the warranties expressed herein. No warranty shall apply to machinery, parts or accessories which have been repaired or altered by others so as, in Manufacturer's judgment, to affect the same adversely or which shall have been subject to negligence, accident or improper care, installation, maintenance, storage or other than normal use or service, during or after shipment.

THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND MANUFACTURER SHALL NOT BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES WHATSOEVER WITH RESPECT TO MACHINERY, PARTS, ACCESSORIES OR SERVICES MANUFACTURED OR FURNISHED BY IT OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO. UNDER NO CIRCUMSTANCES SHALL MANUFACTURER BE LIABLE FOR ANY CONSEQUENTIAL OR OTHER DAMAGES, EXPENSES, LOSSES OR DELAYS HOWSOEVER CAUSED. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.

ROADTEC
an Astec Industries Company

ROADTEC, INC.
Chattanooga, Tennessee

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects and other reproductive harm.

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