

SERVICE MANUAL

870400 Rev A (April 2015)

**220/225E #, MKII
ROCKSCALER**

Original Instruction



DISCLAIMER:

Due to AARD MINING EQUIPMENT'S policy of continuous product improvement, the information contained in this manual was correct up to the time of printing (issue date of manual). Any changes after this date will only be included in the next update of this manual.

The illustrations in this manual are pictorial and not necessarily true representations of components. Photographs and illustrations may show optional equipment.



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Bulletins

Record the relevant information from the Service Bulletins into this manual as follows:

1. Ensure the manual number reflected in the bulletin is the same as the manual number on the front page or in the footer of this manual
 2. Carry out the instructions as detailed in the bulletin
 3. Record the required information below
 4. File the bulletins in numerical order in a suitable binder



BULLETINS



Feedback Form

Should you, as user of this manual, have any suggestion for improving the manual, or you find any errors or omissions, then we would like to know.

Please complete a copy of this form and hand it in to your **AARD Mining Equipment** Engineering Department or post it directly to the **AARD Mining Equipment** head office at the following address:
Engineering Department
AARD Mining Equipment SA (Pty) Ltd
PO Box 3993 WITBEECK

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Comments, suggestions or queries (please state page number):

Please circle YES or NO below:

Does the manual meet your needs?	YES	NO
Did you find the information accurate?	YES	NO
Did you find the information easy to read?	YES	NO
Did you find the information easy to retrieve?	YES	NO

OVERALL, how would you rate the quality of this manual?									
Poor		Fair		Good		Very Good		Excellent	
1	2	3	4	5	6	7	8	9	10

Machine model: _____
PIN: _____
Your name: _____ Job title: _____
Company name: _____
Address: _____ Tel: _____
Fax: _____
Email: _____

Thank you for your co-SERVICE & CHECKS.



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INTRODUCTION

- INTRODUCTION



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Foreword



WARNING

WARNING - All specifications in this manual apply to standard machine as supplied by the factory and any modifications done to the machine will result in different specifications and we as OEM cannot take responsibility for this.

Read this manual carefully for it has been produced to assist you in the correct SERVICE & CHECKS, maintenance and care of your **AARD Mining Equipment** machine. Failure to do so could result in personal injury or equipment damage.

This manual should be considered a permanent part of your machine and should remain with the machine when you sell it.

Be sure all operators of this machine understand every safety message.

Replace operator's manual and safety labels immediately if missing or damaged.

For Your Safety



WARNING

WARNING - Do not operate the machine unless you have read the operator's manual and fully understand how to operate the machine properly.

The safe SERVICE & CHECKS of your **AARD Mining Equipment** machine is very important to prevent any personal injury and / or damage. This manual must be read and fully understood before operating or carrying out any maintenance or tests on your **AARD Mining Equipment** machine.

The following symbols and words are used throughout this manual:



This is the safety alert symbol. When you see this symbol on your machine or in this manual, follow the safety message to avoid personal injury or death.



DANGER

DANGER indicates a hazard with a high level or risk which, if not avoided, will result in death or serious injury. These symbols are red in colour.



WARNING

WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury. These symbols are orange in colour.



CAUTION

CAUTION indicates a hazard with a low level risk which, if not avoided, will result in minor or moderate injury. These symbols are yellow in colour.



NOTES:

Highlights information of special interest.

DANGERS, WARNINGS and **CAUTIONS** must be read, fully understood and followed, before carrying out the action or maintenance procedure concerned.

DANGERS, WARNINGS and **CAUTIONS** are always placed before any action or maintenance procedure where personal injury and/or damage to the machine could occur if that action, test or maintenance procedure is not carried out correctly.



WARNING

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.

INTRODUCTION



Machine Identification

Write product identification numbers (P.I.N.) in the Machine Numbers section of this manual. Accurately record all the numbers to help in tracing the machine should it be stolen. Your dealer also needs these numbers when you order parts. File the identification numbers in a secure place off the machine.

Warranty

Warranty is provided as part of **AARD MINING EQUIPMENT'S** support program for customers who operate and maintain their equipment as described in this manual. The warranty is explained on the warranty certificate which you should have received from your dealer.

Should the equipment be abused, or modified to change its performance beyond the original factory specifications, the warranty will become void and field improvements may be denied.

Disclaimer

This manual has been produced by the Technical Documentation Department of **AARD MINING EQUIPMENT**. Every effort has been made to ensure that the information in this manual was correct at the time of publication. **AARD EQUIPMENT** has a policy of continuous product development, improvement and design. **AARD EQUIPMENT** reserves the rights to change, amend and update the design of its product at any time without prior notice. With this policy, changes may have occurred that are not included in this manual. Whilst every endeavour has been made to provide accurate and reliable information, **AARD EQUIPMENT** specifically disclaims any actual or implied warranty and under no circumstances shall be liable for any loss, damage or injury to person or property suffered, whether direct, or indirect or consequential, arising from the use of this manual.

In particular and without detracting from the above, the disclaimer also applies in the event of any specification, warning, or representation contained in this manual being inadequate, inaccurate, or unintentionally misleading.

Contact Details

Please do not hesitate to contact your **AARD MINING EQUIPMENT** Technical Support Representative whenever you have a query on your **AARD MINING EQUIPMENT** product or this manual.

The contact details of the **AARD MINING EQUIPMENT SERVICE & CHECKS**s can be obtained from the following sources:

- The LOCATION OF SERVICE & CHECKSS page found in this manual
- The **AARD MINING EQUIPMENT** website at www.aardme.co.za by clicking the CONTACT US link
- The **AARD MINING EQUIPMENT** head office by phoning +27 (0) 11 279 5300 or emailing info@aardme.co.za.

Dealer Stamp



SAFETY

- CERTIFICATIONS AND STANDARDS
- SAFETY AND OPERATOR CONVENIENCES
 - GENERAL SAFETY PRECAUTIONS
 - OPERATING SAFETY PRECAUTIONS
 - SAFETY SIGNS
 - TYRE INFORMATION
- PRODUCT RISK ASSESSMENT



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Safety Specification

Unauthorised Machine Modifications

WARNING

WARNING - All specifications in this manual apply to a standard machine as supplied by the factory. Any modifications done to the machine such as greedy boards, etc. will result in different specifications and we as OEM cannot take responsibility for this.

Roll Over And Falling Objects Protective Structure (ROPS/FOPS)

The Falling Objects Protective Structure has been certified to meet specified test requirements according to ISO 3449, Level II.

Unauthorized Modifications Of Machine Cab (FOPS)

WARNING

WARNING - A damaged FOPS must be replaced, not reused.

Do not perform or undertake any unauthorized modification or alteration to the machine Cab (FOPS) such as: welding on extinguisher brackets, CB aerial brackets, fire suppression systems etc. Unauthorised modifications will affect the structural limits of the Cab (FOPS) and will void the certification (and increase the risk of an adverse safety incident).

Any planned modification or change must be reviewed in advance by the **AARD EQUIPMENT** Engineering Department to determine if the modification or change can be made within the limits of the certifying tests. It is important that each person in your organisation, including management, be made fully aware of these rules involving the machine Cab (FOPS). Whenever anyone sees unauthorised modification or change to a machine's Cab (FOPS) both the customer and manufacturer must be

notified in writing. The protection offered by FOPS will be impaired if they are subjected to structural damage, is involved in an overturn incident, or is altered in any way and as such Machine Cab's (FOPS) must be replaced, not reused.

Loosening Or Removal Of FOPS

Make sure that all parts are installed correctly if the Cab (FOPS) is loosened or removed for any reason.

Once the mounting bolt and nut assembly has been removed or loosened it must be replaced with new parts as specified in the parts manual. Tighten the mounting bolts to the correct torque specification as specified in the parts manual. Failure to comply could compromise product safety and increase the risk to safety.

Material Safety Data Sheet (MSDS)

The Federal Occupational, Safety and Health Administration (OSHA) Standard 29 CFR 1910. 1200 and in some cases, State and Local Right-to-Know laws, may require that specific MSDS be available to the employees prior to operating this equipment. This may include information on substances contained in this equipment such as antifreeze, engine oil, battery acid, hydraulic fluid and Freon (if equipped with an air conditioner).

To ensure a prompt response, please be sure to include your return address and ZIP (postal) code, along with the model, serial number and/or VIN number of your machine.

Safety Regulations

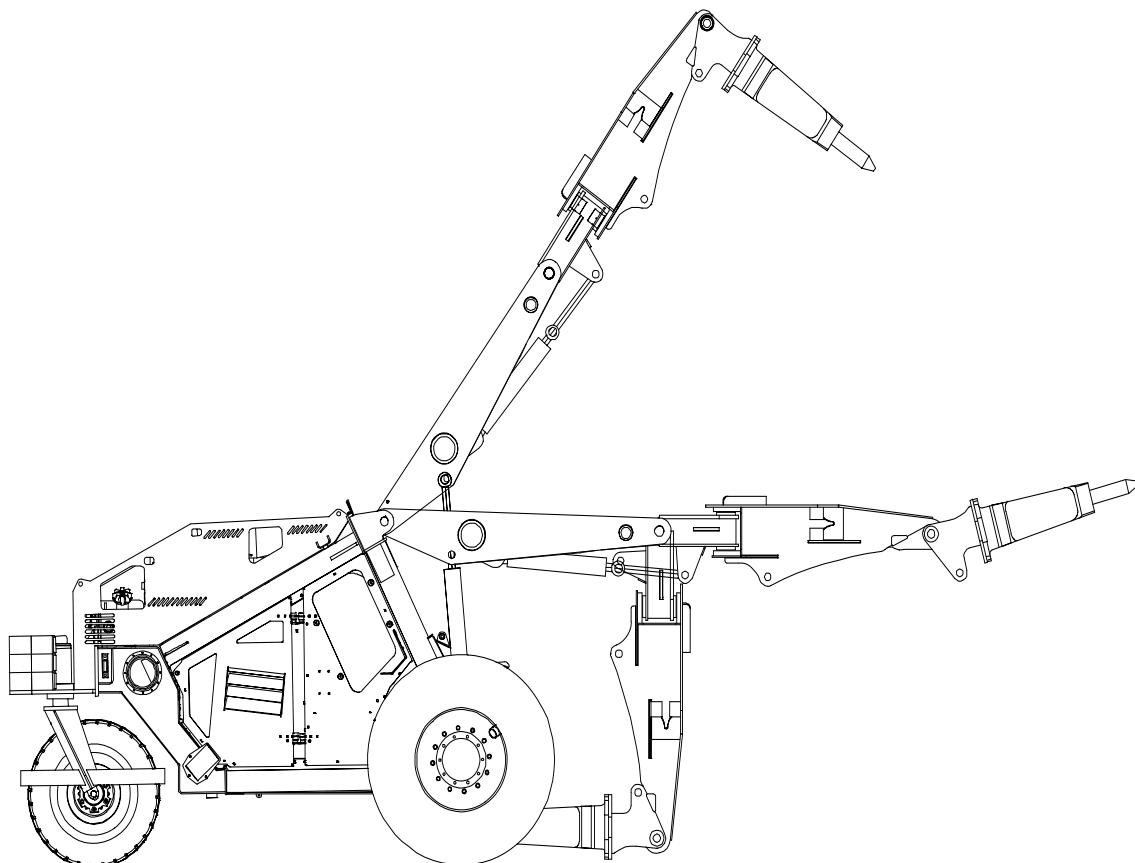
It is the obligation of the operator to know and apply any safety regulation in the country where the machine is operated and apply this manual.



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Safety Features



1. **FOPS Cab Protection.** The Roll Over Protective Structure has been certified to meet specified test requirements according to ISO 3471. The Falling Objects Structure has been certified to meet specified test requirements according to ISO 3449.
2. **LED Lights**
3. **Horn**
4. **Beacon lights**
5. **Backup Alarm**
6. **Spring applied Hydraulic release brakes (Fail safe brakes on all four wheel ends)**



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General Safety

Be sure all operators of this machine understand every safety message. Replace operator's manual and safety decals immediately if missing or damaged.

Accidents and injuries must be reported immediately. Site management must also be informed of any "narrow escapes" and areas and situations which may present an accident risk.

If possible, after an accident, the machine must be left in position.

Do not do anything to the machine that may hamper an investigation into the accident.

Follow the instructions given by site management and familiarise yourself with the job site and your surroundings before operating the machine.

Know and observe all safety rules that may apply to your work situation and your job site.

Never drive the machine with the doors open.

Keep bystanders away from the machine and in sight at all times. Use barricades or a person nominated as the spotter to keep vehicles and pedestrians away.

Use the spotter if moving the machine in congested or restricted vision areas. Always keep the spotter in sight and co-ordinate hand signals before starting the machine.

Lower bin during work interruptions, apply park brake and be careful not to accidentally actuate controls when co-workers are present.

Keep bystanders away from a raised bin.

Operator Qualifications



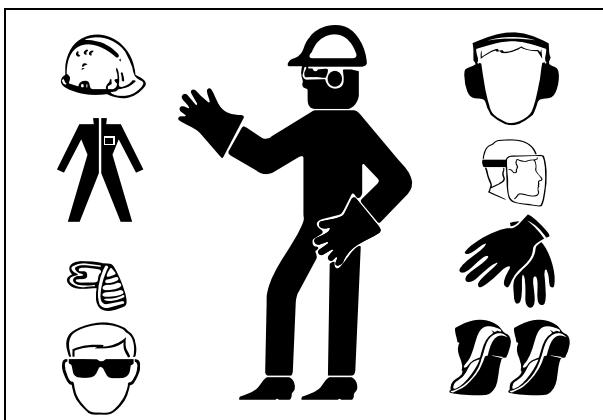
Operators must be trained and supervised by a training instructor before operating the machine.

The operator must read and understand the Operator's manual to familiarize him/her self with the safety and controls of the machine.

The operator will need to also familiarize him/her self with the machine risk assessment.

Qualified operators must familiarise themselves with the work site and surroundings before operating the machine. Test all controls and machine functions in an open area before starting work.

Wear Protective Equipment



GENERAL SAFETY PRECAUTIONS

Wear a hard hat, protective glasses and other protective equipment as required by the job conditions. Do not wear loose clothing or jewellery that can catch on controls or other parts of the machine.

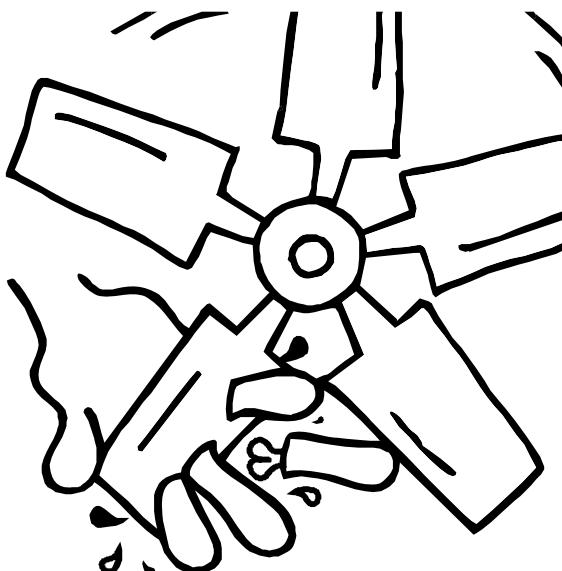
When you drive connecting pins in or out, guard against injury from flying pieces of debris by wearing goggles or protective glasses.

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear suitable hearing protective device such as earmuffs or earplugs.

Wear gloves when handling wire rope cable.

Always wear protective goggles or safety glasses and other protective equipment before striking hardened parts.

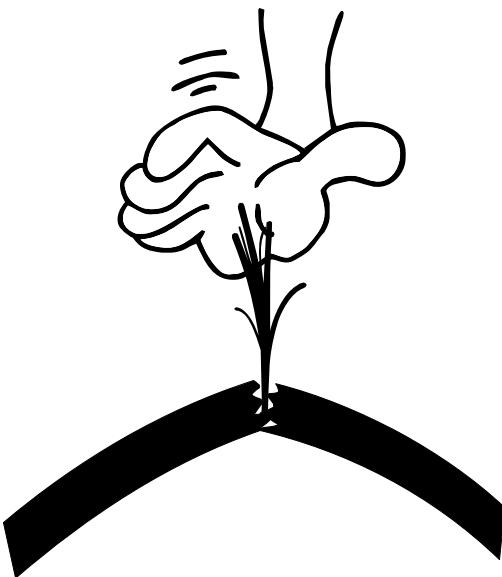
Hammering hardened metal parts such as pins and bucket teeth may dislodge chips at high velocity. Use a soft hammer or a brass bar between hammer and object to prevent chipping.

Stay Clear of Moving Parts

Entanglements in moving parts can cause serious injury.

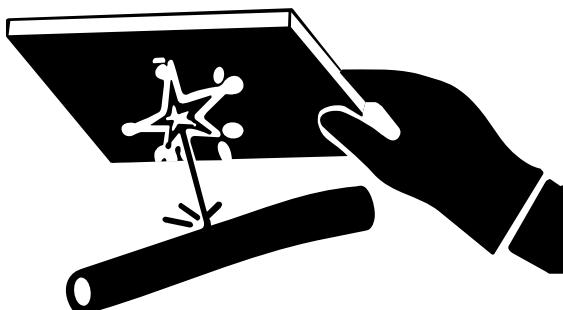
Stop engine and park the machine safely before examining, adjusting or maintaining any part of the machine with moving parts.

Keep guards and shields in place. Replace any guard or shield that has been removed for access as soon as service or repair is complete.

Avoid High Pressure Fluids

Relieve the pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

The pressure relief on pressurised vessels must be performed by Service Personnel only.



Escaping fluid under pressure can penetrate the skin causing serious injury.

Relieve the pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Keep hands and body away from pin-holes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks.

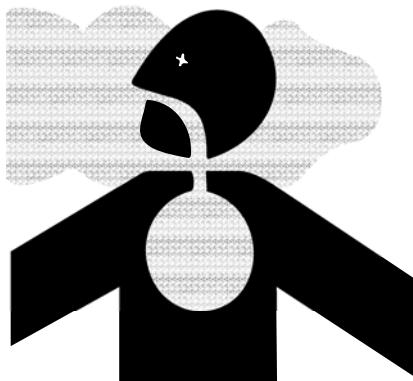
If any fluid is injected into the skin it must be surgically removed within a few hours by a doctor who is familiar with this type of injury or gangrene may result.

Ensure that leaking hydraulic hoses are replaced immediately and clean up any fluid spills.



GENERAL SAFETY PRECAUTIONS

Beware Of Toxic Fumes



Prevent inhalation of engine exhaust fumes, which can cause sickness or death.

Operate only in well ventilated areas. Avoid hazardous fumes by first removing paint on painted surfaces before welding.

Wear an approved respirator when sanding or grinding painted surfaces.

If a solvent or paint stripper is used, wash surface with soap and water. Remove solvent or paint containers before welding and allow at least 15 minutes before welding or heating.

Measures To Prevent Fires



WARNING

WARNING - Do not point the pressure jet at personnel.



CAUTION

CAUTION - If a high pressure jet is used for cleaning, take great care as the insulation of electrical leads can become damaged even at a moderately high pressure and temperature.



CAUTION

CAUTION - Switch OFF the battery isolator switch or disconnect the batteries, when welding on the machine.

Find out which type of fire extinguisher to use, where it is kept and how to use it.

Any fire fighting equipment stored on the machine must be maintained in working order.

At the slightest sign of fire, and if the situation allows, take the following steps:

- Move the machine away from the danger area.
- Shut down the engine and leave the cab.
- Start putting out the fire and notify the fire brigade if required.
- Do not smoke or have a naked flame near a machine when filling with fuel or when the fuel system has been opened.
- Diesel fuel oil is flammable and should not be used for cleaning, use an approved solvent.
- Remember that certain solvents can cause skin rashes and are usually flammable. Do not inhale solvent vapour.
- Store flammable starting aids in a cool, well ventilated location. Remember that such aids (starting gas) must not be used in connection with preheating of the induction manifold.
- Keep the work place clean. Oil and/or water on the floor makes it slippery.
- Oil and/or water in close proximity to electrical equipment or electrically powered tools are dangerous and any spills should be cleaned up immediately.
- Oily clothes are a serious fire hazard.
- Check daily that the machine and equipment are free from dirt and oil. In this way the risk of fire is reduced and it is easier to detect faulty or loose components.
- Check if the electric leads have damaged by chafing which could lead to a short circuit and fire.
- Check that there is no damage to hydraulic and brake hoses caused by chafing.

Welding and grinding may only be done on the machine when it is placed in a clean area where there are no fuel tanks, hydraulic pipes or similar lying around. Take extra care when welding and grinding near flammable objects. A fire extinguisher should be kept handy.



GENERAL SAFETY PRECAUTIONS

Clean Trash From Machine

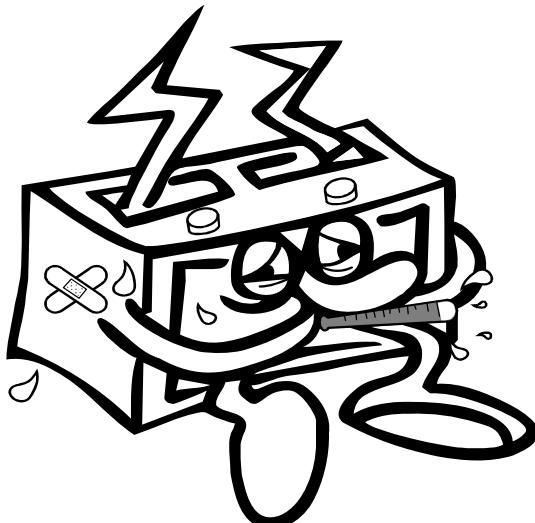
Keep engine compartment, radiator, batteries, hydraulic lines, exhaust components, fuel tank and operator's station clean and free of debris.

Clean any oil spills or fuel spills on machine surfaces.

Temperature in engine compartment may go up immediately after engine is stopped. BE ON GUARD FOR FIRES DURING THIS PERIOD.

Open access door(s) to cool the engine faster, and clean engine compartment.

Prevent Battery Explosions And Acid Burns



The standard battery supplied with the machine is a sealed type that does not need maintenance.

Keep sparks and flames away from the batteries.

Keep batteries clean and check that all cables are properly secured.

If a non-sealed battery is subsequently installed, keep sparks and flames away from the batteries. Use a flashlight to check the battery electrolyte level. Use a voltmeter to check battery charge. Never place a metal object across the posts.

Always remove the grounded (Negative -) battery clamp first and replace it last.

Do not smoke in areas where batteries are being charged.

Do not attempt to charge a frozen battery. If the battery temperature is below 16°C (60°F) there is a danger it may explode while charging.

Sulphuric acid in battery electrolyte is poisonous and is strong enough to burn skin, eat holes in clothing and cause blindness if splashed into the eyes.

Avoid the hazard by:

- Filling the batteries in a well ventilated area.
- Wearing eye protection and rubber gloves.
- Avoid breathing fumes when electrolyte is added.
- Avoid spilling or dripping electrolyte.

Handling Chemical Products And Flammable Fluids Safely



Exposure to hazardous chemicals can cause serious injury. Under certain conditions, lubricants, coolants, paints and adhesives used with this machine may be hazardous.



If uncertain about safe handling or use of these chemical products, contact your authorised dealer for a **Material Safety Data Sheet (MSDS)**. The MSDS describes physical and health hazards, safe use procedures and emergency response techniques for chemical substances. Follow MSDS recommendations to handle chemical products safely.

Refer to **Health and Safety Information on Lubricants and Fluids** at the end of this section for further information.

Handle fuel with care, as it is highly flammable. Do not smoke or go near an open flame or sparks while refuelling. Always stop the engine before refuelling the machine and fill the fuel tank outdoors.

Keep all fuels and lubricants in properly marked containers and away from all unauthorised persons. Do not smoke in the storage areas.

Store oily rags and other flammable material in a protective container, in a cool, safe area, away from fire hazards. Never store oily rags or flammable materials inside a machine compartment.

Do not weld or flame cut pipes or tubes that have contained flammable fluids. Clean them thoroughly with non flammable solvent before welding or flame cutting them.

Starting fluid is highly flammable. Keep all sparks and flames away when using it. To prevent accidental discharge when storing the pressurised can, keep the cap on the can and store it in a cool protected place. Do not burn or puncture a starting fluid container.

Clean Machine Regularly

Wait until the engine has cooled before removing trash from areas such as the engine, radiator, batteries, hydraulic lines, fuel tank and operators cab. Remove any grease, oil or debris build-up. Keep the machine, especially the walkways and steps, free of foreign material, such as debris, oil, tools and other items which are not part of the machine.

Ensure that service personnel replace hydraulic hoses immediately if they show signs of leaking. Clean up any oil spills. Regularly examine electrical wiring and connectors for damage.

Keep a fire extinguisher available, on or near the machine and know how to use it properly.

The build-up of combustible material on and around high heat areas must be removed on a regular basis and the machine cleaned to prevent build-up and ignition of material. Critical areas are the areas around the exhaust, turbo charger, between the cab and the transmission cooler / exhaust silencer and the area on top of the horizontal heat shield leading into the silencer heat shield. It may require that from time to time the heat shields have to be removed by service personnel to clean this areas properly.



The Material Safety Data Sheet (MSDS) is a document containing data regarding the properties of a particular substance. An important component of product management and work place safety. It is intended to provide workers and emergency personnel with procedures for handling or working with that particular substance in a safe manner, and includes information such as physical data (melting point, boiling point, flash point, etc.), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill handling procedures.

GENERAL SAFETY PRE-CAUTIONS**Fluids And Lubricants**
CAUTION

CAUTION - If uncertain about safe handling or use of any lubricant, fluid or other chemical products, contact your authorised dealer for a Material Safety Data Sheet (MSDS). The MSDS describes in detail the physical and health hazards, safe use procedures and emergency response techniques for chemical substances.

AARD Mineral Engine Oil 10W40

AARD Semi Synthetic Engine Oil

80W10 Gear Oil Limited Slip 80W90

The MSDS classifies the above products as having no significant hazard.

Eyes — Cause no more than minor irritation. Flush eyes for 15 minutes with fresh water. Avoid by wearing safety goggles when splashing may occur.

Skin — Cause no more than minor irritation. Avoid by washing thoroughly with soap and water after contact and by wearing gloves and protective clothing.

Ingestion — If swallowed, give water or milk and DO NOT induce vomiting.

Inhalation — Move the person to fresh air. Avoid by using the product only in a well ventilated area. If any effects continue, refer to a doctor.

Fire Hazard — Products may be combustible at high temperatures or if pressurised.

Waste Disposal (environment protection) — Prevent the product from contaminating soil and from entering drainage, sewer systems and all bodies of water.

AARD Multi Purpose Grease

AARD Wheel Bearing

AARD High Temperature Grease

WARNING

WARNING - Handle grease in pressure equipment carefully. Accidental injection can cause serious tissue damage. See a doctor as soon as possible.

Eyes — Cause no more than minor irritation. Flush eyes for 15 minutes with fresh water. Avoid by wearing safety goggles when splashing may occur.

Skin — Cause no more than minor irritation. Avoid by washing thoroughly with soap and water after contact and by wearing gloves and protective clothing.

Ingestion — If swallowed, give water or milk and DO NOT induce vomiting.

Inhalation — Move the person to fresh air. Avoid by using the product only in a well ventilated area. If any effects continue, refer to a doctor.

Fire Hazard — Products may be combustible at high temperatures or if pressurised.

Waste Disposal (environment protection) — Prevent the product from contaminating soil and from entering drainage, sewer systems and all bodies of water.

Extended Life Coolant
WARNING

WARNING - This product is harmful or fatal if swallowed. It can enter lungs and cause damage.

Ingestion — May be toxic.

Eyes and Skin — Irritation, redness, tearing or burning sensation. Avoid by washing thoroughly with soap and water after contact and by wearing safety goggles and protective clothing when splashing may occur.

Inhalation — Not volatile at ambient temperatures, spraying or heating in an enclosed space may cause irritation.

AARD EQUIPMENT do not assume any liability for consequences of the use of this information since it may be applied under conditions beyond our control or knowledge. Also, it is possible that additional data could be made available after this MSDS was issued.

If any effects continue, refer to a doctor.



Gas Hazards on Site

WARNING

WARNING - *The machine user / owner must conduct a gas test on the work site that the machine is working on.*

A gas test must be conducted on the work site, to determine if there are any gas hazards that may be present on the site.

If there are gas supply line that are present on or close to the work site, the owner of the site should obtain the relevant MSDS's.

Dispose Of Waste Properly



Improper disposal of waste can threaten the environment. Fuel, oils, coolants, filters and batteries used with this machine may be harmful if not disposed of properly.

Never pour waste onto the ground, down a drain or into any water source.

Air conditioning refrigerants can damage the atmosphere. Government regulations may require using a certified service centre to recover and recycle used refrigerants.

If uncertain about the safe disposal of waste, contact your local environmental centre or your dealer for more information.

Prepare For Emergencies



Keep a first aid kit and fire extinguishers handy and know how to use them.

Inspect and have your extinguisher serviced as recommended on its instruction plate. When an extinguisher is discharged, no matter for how long, it must be re-charged. Keep record of inspections on the tag supplied with the extinguisher.

Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

Mounting And Dismounting Machine

Maintain a three-point contact when climbing on/off the machine or moving around on the machine exterior. (The three-point contact is both hands and a foot or both feet and a hand).

Never get on or off a moving machine.

Never jump off the machine.

Use extra care when mud, snow, or moisture present slippery conditions.

Keep steps clean and free of grease, oil and foreign objects.

Never use machine controls as hand-holds.

Inspect all access systems (steps, handrails, handholds), including slip-resistant surfaces, for signs of wear or damage. Repair/replace as necessary.



Start From Operator's Seat Only



Avoid unexpected machine movement. Start engine only while sitting in operator's seat. Ensure all controls and working tools are in proper position for a parked machine.

Never attempt to start engine from the ground. Do not attempt to start engine by shorting across the starter solenoid terminals.

Use Seat Belt



Use a seat belt at all times to minimise the chance of injury in an accident.

The seat belt must not be altered or modified in any way. Such changes can render the belt ineffective and unsafe.

The seat belt is designed and intended for the seat's occupant to be of adult build and for one occupant of the seat only.

Keep Riders Off Machine

Do not allow un-authorised personnel on the machine.

Riders may fall from the machine, be caught in moving parts or be struck by objects. Riders will also impair the operator's view and his control of the machine.

Avoid Machine Tipping Accidents

Use seat belt at all times.

Do not jump out of the cab if the machine tips over. It would be unlikely, that you would jump clear of the machine which could result in the machine crushing you.

Before operating machine after any accident, carefully inspect all hydraulic and electrical lines.

Operating On Slopes

Avoid side slope travel whenever possible.

Check service brakes frequently when operating on slopes.



Prepare For Maintenance And Service

Warn others of maintenance or service work.

Park the machine on a level surface.

Engage the park brake.

Stop the engine.



Attach the "Do Not Operate" tag in full view of anyone entering the operator's station.

Before working under the machine ensure that the machine and attachments are securely supported.

The use of appropriate wheel chocks is recommended to prevent movement of the machine during maintenance.

Do not support the machine with a single jack or other devices that may slip out of place.

Understand maintenance procedures before beginning any maintenance.

Keep the maintenance and service area clean and dry.

The operator should assist the service personnel whenever the engine must be running during service or repair.

Make Welding Repairs

Disable electrical power before welding.

- Turn off battery isolator switch (or disconnect positive battery cable).
- Separate harness connectors to engine, alternator and vehicle microprocessors if necessary.

Separate the harness connectors to the engine and to the machine microprocessors.

Avoid welding or heating near pressurised fluid lines. Flammable spray may result and cause severe burns if pressurised lines fail as a result of heating. Prevent heat going beyond the immediate work area towards any nearby pressurised lines.

Use a qualified welding technician for structural repairs.

Ensure that there is good ventilation in the welding area.

Do not earth though any assemble that has bearings in it because this could cause the bearing to fail.

In cases where the repair is done close to a bearing assemble, ensure that the earth point is as close to where the repair is being done and that the current does not have to pass through a bearing.

Storage For Flexible Hoses

Store hoses in a dark, dry environment away from electrical equipment below 33°C with sealed end caps.

Replacing Hoses

Damaged hoses and fittings should be replaced and not repaired.

Replacing of high pressure hoses should only be done by qualified personnel.

Only original parts must be used when replacing components / parts.

Filter And Filter Elements

This machine should be operated in a well-ventilated area.

The design intent of the Heating, Ventilation and Air Conditioning (HVAC) system on this machine is not to filter toxic gasses.

Only use a AARD Equipment approved ventilation filter element.



Safety Decals

There are several safety decals on your **AARD MINING EQUIPMENT** machine. Their exact location and description of the hazard are reviewed in this section. Please take the time to familiarise yourself with these safety decals.

Keep the decals clean by using a soft cloth, water and soap. Do not use solvent, gasoline, etc. You must replace a decal if it is damaged, missing or cannot be read. If a decal is on a part that is replaced, ensure a new decal is installed on the replacement part. Contact your **AARD MINING EQUIPMENT** representative for new decals.

There are other decals on your machine, such as the **AARD** identification decal only the decals of special relevance to the safety of the operator are shown here. Refer to the Parts Manual for the identification decals etc.



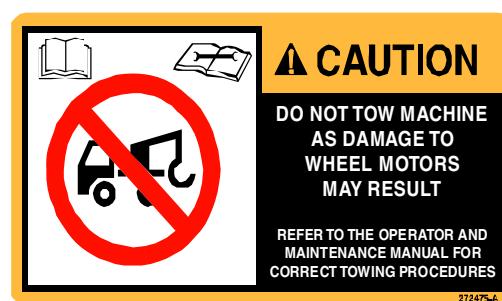
Located inside the PM pack wallet.

DIESEL FUEL

Located on the tank below the fuel filler cap.

HYDRAULIC OIL

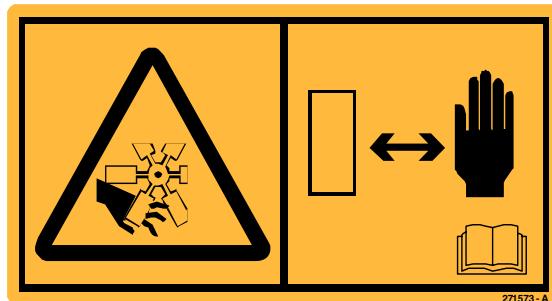
Located on the right of the machine frame outside the cab above the wheels.



Located on the right side of the machine frame inside the cab above the operators seat.



Located on the right side of the machine below the operators seat.



Located on the engine fan housing.



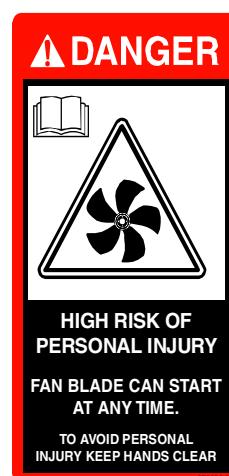
Located at the rear of the machine on the counter weight.



Located on the back - Firewall Top Right.



Located on the front, left and right sides of the machine frame outside the cab above the wheels.



Located on the left and right hand side of the machine.



Located inside the cab next to the right side control lever.



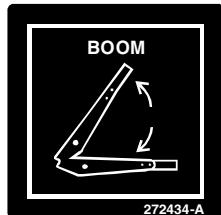
Located on the valve bank in the cab. (Hammer)



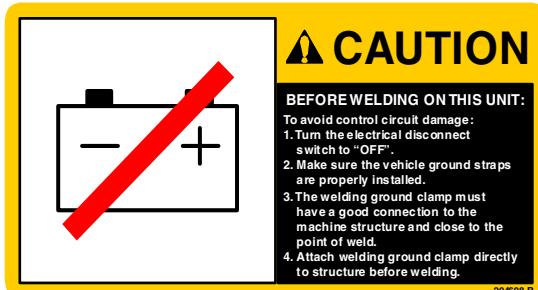
Located on the valve bank in the cab. (Slew - move left & right)

SAFETY

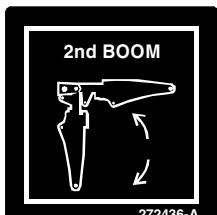
SAFETY SIGNS



Located on the valve bank in the cab. (Boom - move up & down)



Located on the valve bank in the cab. (Hammer - move Up & Down)



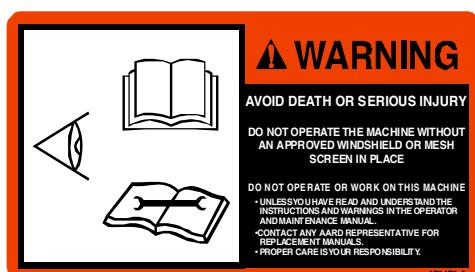
Located on the valve bank in the cab. (2nd Boom - move up & down)

DAILY HYDRAULIC TANK FLUID LEVEL CHECK

COLD OIL LEVEL

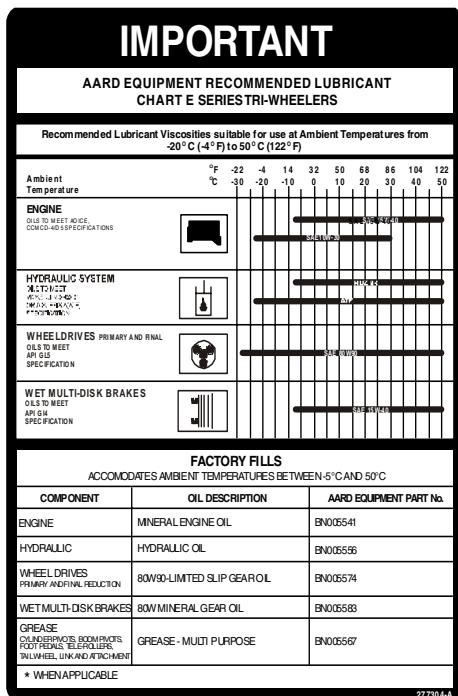
(ENSURE THE MACHINE IS PARKED ON LEVEL GROUND WITH THE ATTACHMENT LOWERED AND HORIZONTAL)

272480-A

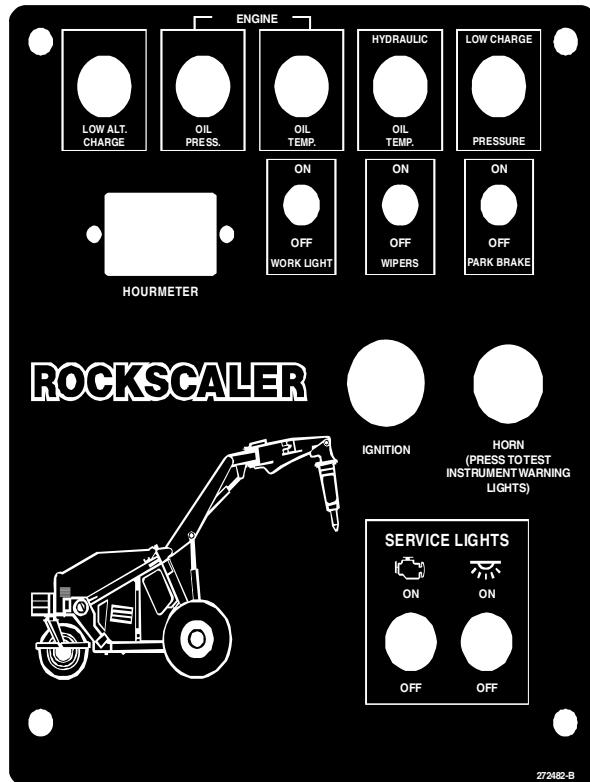


Located on the right side of the machine frame inside the cab above the operators seat.

Located on the machine - hydraulic tank.



Located on the machine - hydraulic tank.



Located in the cab of the machine.



Located on the firewall behind the seat.



Located on the machine frame right of the secondary / water separator / fuel filter.



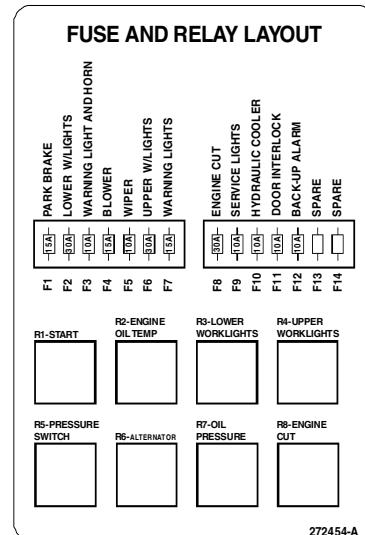
Located in the cab of the machine.



Located on the outside of the machine - on the left & right hand side. (Branding)



Located on the outside of the machine - on the left & right hand side. (Branding)



Located on the fuse panel inside the cab.

220E ROCKSCALER

Located on the outside tubing of the machine - on the Left & right hand side. (Branding)



Located on all greasing points on the machine.



Located on the outside (window) of the cab.



Located on outside of the machine on the left & right hand side.



Located inside the cab on the door.



Located inside the cab, Rear Firewall.



Tyres And Rims

Unless otherwise specified, the standard Tyres and rims fitted to **AARD** ADTs are approved for use at the specified machine tyre loads (half of the axle loads) at a maximum speed of 50 km/hr, at the cold tyre inflation pressures specified by each tyre supplier. Site specific investigations are required to ensure that the machines operate within the capabilities of the machines and Tyres.



NOTES:

Pressure amendments to allow for overloads are not permitted, as it will not only result in excessive vibration during the unladen state of the vehicle, but also overload load-carrying components which could result in premature failure.

Tyre Pressure - General

Air under pressure, in the correct quantity, enables a tyre to carry the load approved conditions. The quantity of air necessary for optimal functioning of a tyre is determined by the tyre inflation pressure.

These tyre pressures are specially calculated for **AARD** ADTs to provide maximum tyre life and should be used in all normal operating conditions. It is important to note that design axle loads are used to calculate the Cold Inflation Pressures appearing on the vehicles' Tyre Pressure Decals. Additionally, some tyre companies have allowed for extreme conditions and have recommended higher pressures to protect the Tyres from excessive deflection. As a result of these factors, optimum performance and safe SERVICE & CHECKS can only be ensured by determining inflation pressure from SERVICE & CHECKS and site specific data, e.g. real axle loads, haul conditions and ambient operating temperature. Both over- and under-inflation of a tyre result in decreased tyre tread life.

Tyres of different manufacturers should never be used on the same vehicle. Tyres of different types and / or from different manufacturers have different dimensions and constructions which, when mixed on a vehicle, will have a negative impact on the drivetrain, as well as the safety of the machine, as the handling and stability will be affected.

Tyre Pressure - Inflation Pressure, Hot vs. Cold

The pressures specified on the tyre pressure decals are Cold Inflation Pressures. These pressures are typically used when new machines start on a job site and / or new wheels are fitted to vehicles and / or after long periods without operating the vehicle. In this case the tyre temperature will be the same as the ambient temperature. The load / pressure tyre tables in the tyre companies' data books are usually based on a reference ambient temperature of 18°C and indicate Cold Inflation Pressures. Here 'ambient' refers to environment at the place and time of tyre inflation, not the work site. These tables may be used without adjustment between 0°C and 25°C. However, if ambient temperature varies significantly, adjusted cold inflation pressures must be used.

As a general rule of thumb, for ambient (at place of inflation) temperatures exceeding 25°C, the following applies:

- from (25 to 29°C) increase the Cold Inflation Pressure by 4%
- from (30 to 34°C) increase the Cold Inflation Pressure by 6%
- from (35 to 39°C) increase the Cold Inflation Pressure by 8%
- from (40 to 45°C) increase the Cold Inflation Pressure by 10%

TYRE INFORMATION

The adjusted Cold Inflation Pressure is a one-time change based on the recommended inflation pressure for the vehicle / site and the temperature at the time the pressure is being checked or adjusted. This adjustment is required to ensure that the tyre **does not become under-inflated should the ambient operating temperature drop below the temperature at which the tyre pressures were set.** Once the vehicle starts operating, the pressure will increase due to heat build-up inside the tyre. The increasing of pressure on an SERVICE & CHECKS al vehicle should be monitored until stabilised, at which time the pressure is noted as the Hot Inflation Pressure. Future pressure checks and adjustments should be done according to the Hot Inflation Pressure with the tyre at operating temperature.

⚠ WARNING

WARNING - AARD Mining Equipment has done everything in its power to source Tyres suited for the ADT application. ADT Customers and Operators are reminded that AARD Equipment cannot control the applications in which AARD ADTs are being applied. Inspection and maintenance of Tyres needs to be conducted continuously by trained tyre professionals. Failure to do so may result in unexpected tyre failure which poses serious risk to the operators and bystanders.

AARD strongly recommends that respective tyre companies are approached to establish safe working parameters of each ADT & Tyre combination prior to SERVICE & CHECKS on any site.

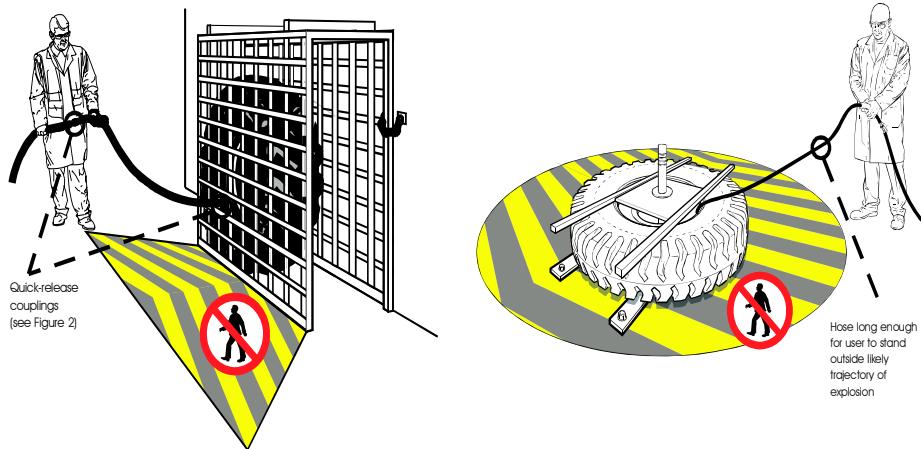
⚠ WARNING

WARNING - Welding or modifying rims is strictly prohibited. Rims are manufactured in a controlled environment and any welding or other modifications to factory issued rims will immediately render the rims unsafe. Overheating of a tyre caused by application of an external heat source, internal heat source e.g. excessive use of brakes, or operating conditions will cause a steep rise in internal tyre pressure. This could result in tyre explosion which could propel projectiles in excess of 500m (1640 ft) from the machine, posing a serious risk to anyone or anything in the affected area. If tyre overheating is suspected or noticed, do not approach the tyre within any area included in the shaded area in the drawing and restrict access underneath the truck, until such time that the tyre has cooled down sufficiently. Never deflate overheated Tyres. When inflating Tyres, stand behind the tread and use a self attaching chuck with extension hose. Use a safety cage on loose wheel-sets if available. Do

DO use a clip-on chuck to connect the airline with a quick-release coupling at the operator's end (this allows tyre inflation from a safe position if problems occur).	DON'T use valve connectors that require the operator to hold them in place.
DO use airline hoses long enough to allow the operator to stay outside the likely explosion trajectory during inflation.	DON'T exceed the manufacturer's recommended tyre pressure for the size and rating of the tyre.
DO use enough bead lubricant when seating the tyre. Consider removing the valve core or using a 'bead-blaster' if seating is difficult.	DON'T use 'unrestricted' airlines (ie without a gauge or pressure control device).
DO remove the airline after use to prevent air seepage and possible over inflation.	DON'T allow the control valve to be jammed open (which could allow the operator to leave the inflating tyre unattended).



Recommended Operator Position During Tyre Inflation



Schrader MASTAIR gauge with 6 mm input and output hose.

Schrader Gauge Instructions:

1. Measurement Scale: 0.7 to 12 bar (10 to 170 psi).
2. Recommendations and first time SERVICE & CHECKS:
 - Use only filtered oil and water free compressed air.
 - Max. pressure of air source: 15 bar.
 - Do not use inflating or checking pressure of hydroflated Tyres or those containing corrosives.
 - Attach a hose (7 mm interior diameter) to air-intake neck (fitted with an R987 - 2 coupler)
 - Insert a flexible intermediate connector:
 - Ref. R153-1 on the air-intake neck for connection to a quick-acting coupler. Ref. 39066-67 for a 1/4 thread connection.
3. Check regularity to see that the hose and the seal on the quick-acting coupler are airtight.
 - Fit the connector to the valve mouth.
 - Press the + button for inflation.
 - Press the - button for deflation.



 NOTES:



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Pages 25 - 44**



MACHINE INFORMATION

- MACHINE NUMBERS
- MACHINE SPECIFICATIONS
- MACHINE DIMENSIONS



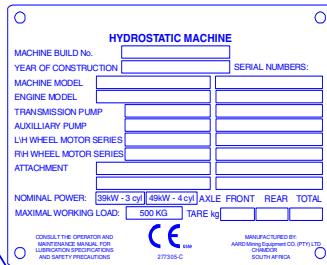
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MACHINE INFORMATION
MACHINE NUMBERS

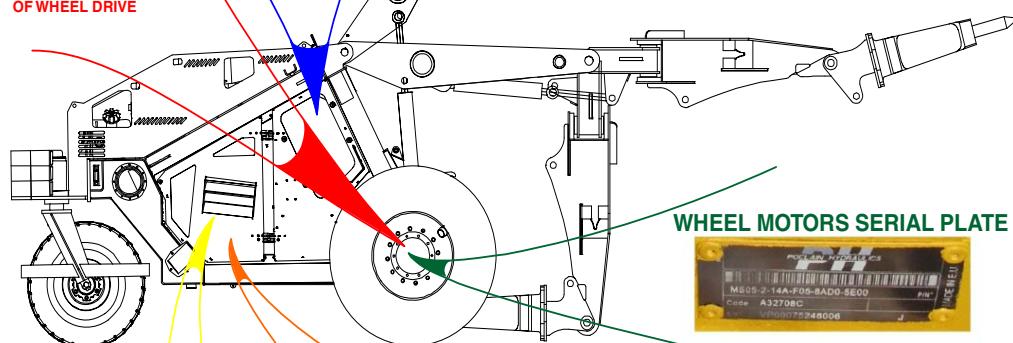
Product Identification Number (PIN) & Vehicle Identification Number (VIN)

MACHINE SERIAL PLATE



LOCATED UNDER THE ROOF ABOVE
THE OPERATORS SEATING POSITION

**WHEEL DRIVE
SERIAL NUMBER**
2008-27ES-006
STAMPED ON TOP
OF WHEEL DRIVE



ENGINE SERIAL PLATE



ON RHS OF ENGINE



LOCATED ON THE BOTTOM
OF PUMP



 **NOTES:**



CHAPTER 1. SPECIFICATIONS

Machine Specifications

The specifications for the 220E Rockscaler are as follows:

220E# Rockscaler	
BN030412	
Engine	
Model	Deutz F4L912W
Configuration	Four cylinder, in-line, air cooled with integrated blower fan.
Governed Power (Kw)	40
Maximum torque (NM @ RPM)	198@1550
Governed full Power Engine speed (RPM)	2500
Max. Rated Speed (RPM)	2800
Aspiration	Naturally aspirated
Displacement (cc)	4086
Cylinder bore (mm)	102
Stroke (mm)	125
Compression Ratio	22:1
Frame Mounting	4 point rubber mounting
Dynamic balancer	With
Sump material	Cast Aluminium
Oil Capacity	9L
V-Belt	Dual belt- separate blower (with spring tensioned jockey pulley) and alternator. No aircon belt provision.
Blower pulley	104mm- single groove
Crank pulley	Double groove- separate blower and alternator belt. No provision for air conditioner belt.
Blower failure warning	Mechanical linkage induces injector pump shut-off.
Injection type	Direct, in-line pump with mechanical governor. 5-hole nozzles.
Injection Pressure (bar)	250
Oil Cooling System	Air cooled with integrated axial-flow blower and spray-oil piston cooling
Max oil temperature (Deg C)	135
Inlet / exhaust valve clearance (cold) (mm)	0.15
Low idle (RPM)	650
High idle (RPM)	2500
Fuel filtration	Two stage. Spin-on water separator primary, replaceable spin-on secondary.
Oil filtration	Replaceable spin-on paper type micro filter- full flow.
Width (mm)	679
Height (mm)	796
Length (mm)	807
Basic dry weight (kg)	300
Angularity Limit	20 degrees flywheel up / down, 30 degrees left / right.
Exhaust	
Type	Rigid frame mounted stainless steel vertical silencer with short stack pipe outlet.
Cooling fin hot air outlet	Open sided gridded engine covers.
Air cleaner	
Type	Dual (primary and secondary) paper element cyclonic canister type with restriction visual indicator.
Pre-cleaner system	
Type	Cyclonic dust bowl. Daily emptying requirement.
Fuel Inlet System	
Water separator primary filter- spin-on.	Engine mounted, 5 Microns.
Secondary filter- spin-on.	Engine mounted, 5 Microns.
Engine / transmission Coupling	
Type	Nylon gear coupling

MACHINE SPECIFICATIONS

220E# Rockscaler	
Hydrostatic Transmission	
Type	Variable displacement closed loop manual control axial piston tandem pump, Closed Loop motor circuit with remote charge pump, filtered charge pressure with non-filtered direct-return to tank.
Drive Pumps	
Make	Eaton
Type	Axial piston, closed loop servo controlled.
Control	Direct control, foot linkage.
Pump Displacement (CC / rev per wheel)	41
Relief pressure (Bar)	310
Flow rate at governed RPM (L / min per wheel)	92
Drive Motors	
Make	Poplain
Type	Axial piston, closed loop.
Motor Displacement (CC / rev per wheel)	560
Transmission Charge Circuit	
Model	Bosch Double
Type	Aluminium gear pump
Pump displacement (CC / rev)	16
Pump Flow (L / min) @ Governed engine RPM	36.8
Relief Pressure Setting (Bar)	17
Pressure Filter Rating- Beta 75 rating (micron)	13
Wheel Drive System	
Primary wheel motor reduction	14.06
Primary reduction oil capacity (L)	1.50
Secondary (hub) reduction ratio	4.82
Hub reduction oil capacity (L)	5.00
Total wheel drive reduction	67.77
Motor Vol. / wheel rev. (L/Rev)	2.751
Drive motor series	29
Wheel torque (KNm per drive wheel)	13.58
Wheel RPM @ governed engine RPM	33.4
Transmission Corner Power (Kw)	95.1
Drive Wheels	
Drive Tyre Type	17.5R25 L5 Mine Spec, 20 ply
Drive Tyre Size	17.5 x 25
Drive Wheel Rim	14 x 25 1 piece
Drive Tyre rolling radius (m)	0.664
Drive Wheels Tractive Effort (KN- machine)	40.889
Road speed (Km/Hr at governed engine speed)	8.4
Drive Wheel Inflation Pressure (Bar)	1.5
Drive Wheel Free Radius (m)	0.675
Drive Wheel Width (m)	0.462
Unladen Ground Pressure- Front (Bar)	0.62
Tail Wheel	
Tail Wheel Tyre Type	High Floating, 14 ply, with inner tube.
Tail Wheel Tyre Size	18 x 15,5
Tail Wheel Rim	16 x 15,5, 3 piece
Tail Wheel Free Radius (m)	0.4375
Tail Wheel Width (m)	0.4
Tail Wheel Inflation Pressure (Bar)	2
Unladen Ground Pressure- Rear (Bar)	1.22
Service Brakes	
Type	Closed Loop Hydrostatic Wheel retardation
Maximum Wheel Brake Torque (KNm- machine)	27.15
Maximum Wheel Retardation Force (KN)	40.89



220E# Rockscaler	
Park Brakes	
Type	Spring applied, hydraulic release wet multi disc
Full release (multi disc hold-off) pressure (Bar)	16
Wheel motor SAHR brake torque (ea wheel) (Nm)	226
Maximum Wheel Brake Torque (KNm- machine)	30.63
Maximum Wheel Retardation Force (KN)	46.13
Attachment	
Type	Hydraulic Hammer Drill
Hydraulic Tank	
Type	External
Oil Type	VG 68
Capacity (L)	264 liter
Maximum operating temperature	90°C @ 45 ambient
Level Measurement	High - Low level sight
Filler	Lockable
Breather	Remote to filler cap, 3 Micron, 0.75 bar pressurised
Hydraulic system cleanliness	ISO 20/18/15- ISO 4406
Implement Hydraulic System	
Type	Fixed displacement, gear pumps with full flow suction filtering. WO return filtration or cooling.
Suction Filtration	20 Micron
Return Filtration	None
Boom / mast Hydraulic Function	
Pump Type	Gear, open centre, engine geartrain drive
Pump displacement (CC / rev)	16
Pump Flow (L / min) @ Governed engine RPM	36.8
Relief Pressure setting- up (Bar)	138
Relief Pressure setting- down (Bar)	69
Non-Boom aux. hyd. functions	Cooling
Fuel Tank	
Type	Remote to frame, rear mounted
Capacity (L)	100
Level Measurement	3 x round-type sight glasses
Filler	Lockable
Breather	Remote to cap, 40 Micron with anti-slosh check valve
Electrical System	
Voltage	12V
Battery type	Maintenance free, sealed type
Starter motor rating (Kw)	2.7 kW
Alternator rating (V/A)	14V / 55A
Battery rating (Ah)	100
Fuse box	Inside cabin- instrumentation box
Steering System	
Type	Front wheel hydraulic skid steer via foot operated treadle control system.
Cabin	
Type	Integral with steel frame, with doors
Guarding	HD windscreen guard and bonnet guard. Additional bonnet rock guard and window expanded metal mesh. Rear engine bay doors.
Safety / Ergonomics	FOPS Certified Cab Over- centre lock-down latches x 2 to prevent accidental seat plate tip-up. Low profile padded seat with retraceable lap strap seat belt.

MACHINE SPECIFICATIONS**220E# Rockscaler****Warning Lights**

Engine Oil	Pressure sensor switch-on point: 0.25 + .1 bar
Operator Switches / Controls	Brake-on safe start Key ignition Automatic engine cut off solenoid Friction-hold hand throttle lever Dash mounted direct acting hydraulic control levers Electrical toggle switch park brake actuation with switched light. Compact scroll-type hour meter

Noise Levels

7 m ahead of machine (dBA)	76
7 m behind machine (dBA)	80
7 m to left of machine (dBA)	83
7 m to right of machine (dBA)	86
Cabin	97

Operating Mass

Unladen Front (Kg)	5,905
Unladen Rear (Kg)	1,675
Unladen Total (Kg)	7,580
Shortest Wheelbase	2,753



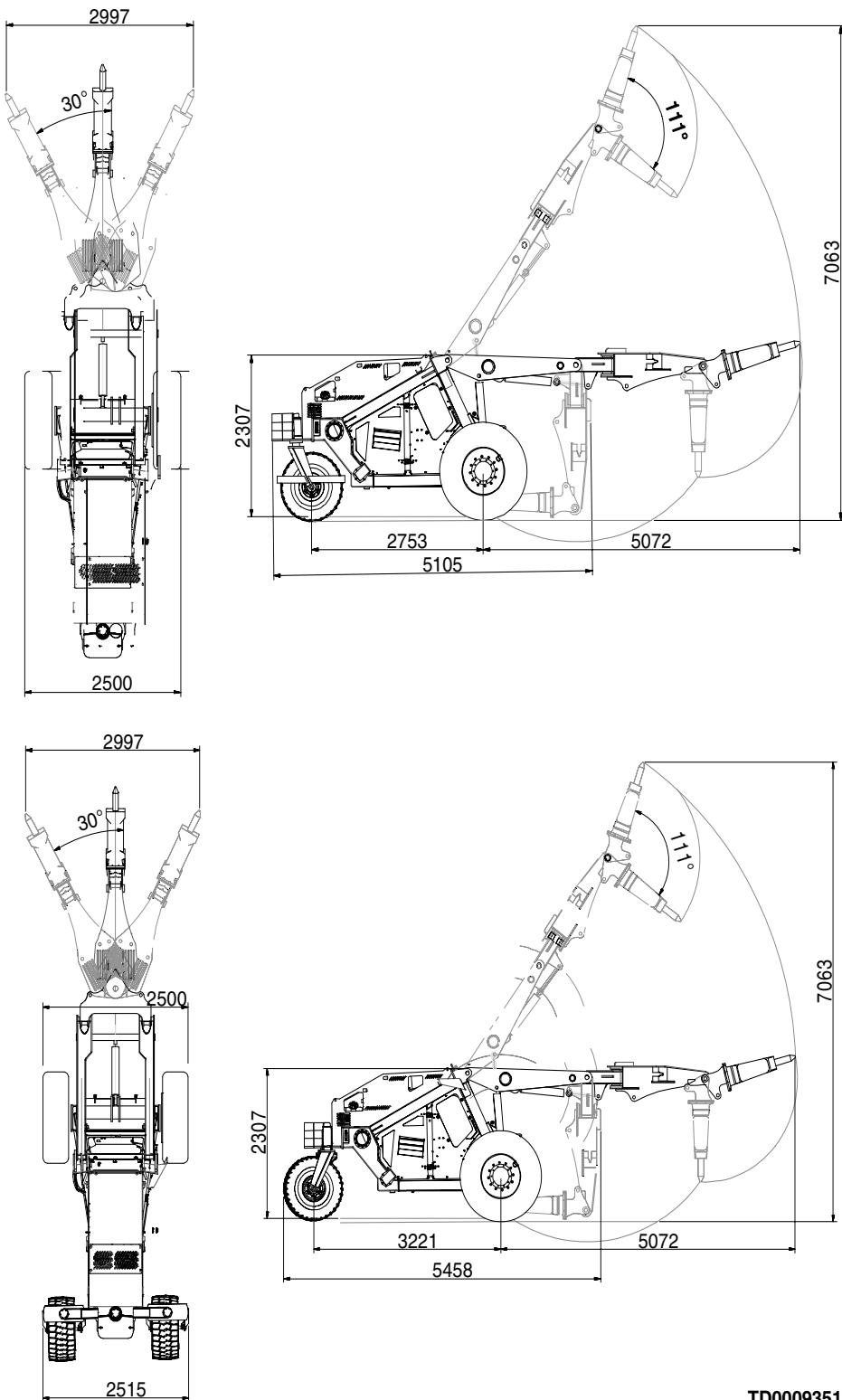
RECOMMENDED FUEL AND LUBRICANTS

Recommended Fuel and Lubricants

The following illustration details the recommended fuel and lubricants.

IMPORTANT										
AARD EQUIPMENT RECOMMENDED LUBRICANT CHART E SERIES TRI-WHEELERS										
Recommended Lubricant Viscosities suitable for use at Ambient Temperatures from -20° C (-4° F) to 50° C (122° F)										
Ambient Temperature	°F °C	-22 -30	-4 -20	14 -10	32 0	50 10	68 20	86 30	104 40	122 50
ENGINE OILS TO MEET AOCIE, CCMCD-4/D5 SPECIFICATIONS									SAE 15W-40	
								SAE 10W-30		
HYDRAULIC SYSTEM OILS TO MEET VICKERS M-2952-S OR A SUFFIX A(ATF) SPECIFICATION								HDZ 68		
								ATF		
WHEELDRIVES PRIMARY AND FINAL OILS TO MEET API GL5 SPECIFICATION								SAE 80W90		
WET MULTI-DISK BRAKES OILS TO MEET API GI4 SPECIFICATION								SAE 15W-40		
FACTORY FILLS ACCOMODATES AMBIENT TEMPERATURES BETWEEN -5°C AND 50°C										
COMPONENT	OIL DESCRIPTION				EQUIPMENT PART No.					
ENGINE	MINERAL ENGINE OIL				BN005541					
HYDRAULIC	HYDRAULIC OIL				BN005556					
WHEEL DRIVES PRIMARY AND FINAL REDUCTION	80W90-LIMITED SLIP GEAR OIL				BN005574					
WET MULTI-DISK BRAKES	80W MINERAL GEAR OIL				BN005583					
GREASE CYLINDER PIVOTS, BOOM PIVOTS, FOOT PEDALS, TELE-ROLLERS, TAIL WHEEL, LINK AND ATTACHMENT	GREASE - MULTI PURPOSE				BN005567					
* WHEN APPLICABLE										

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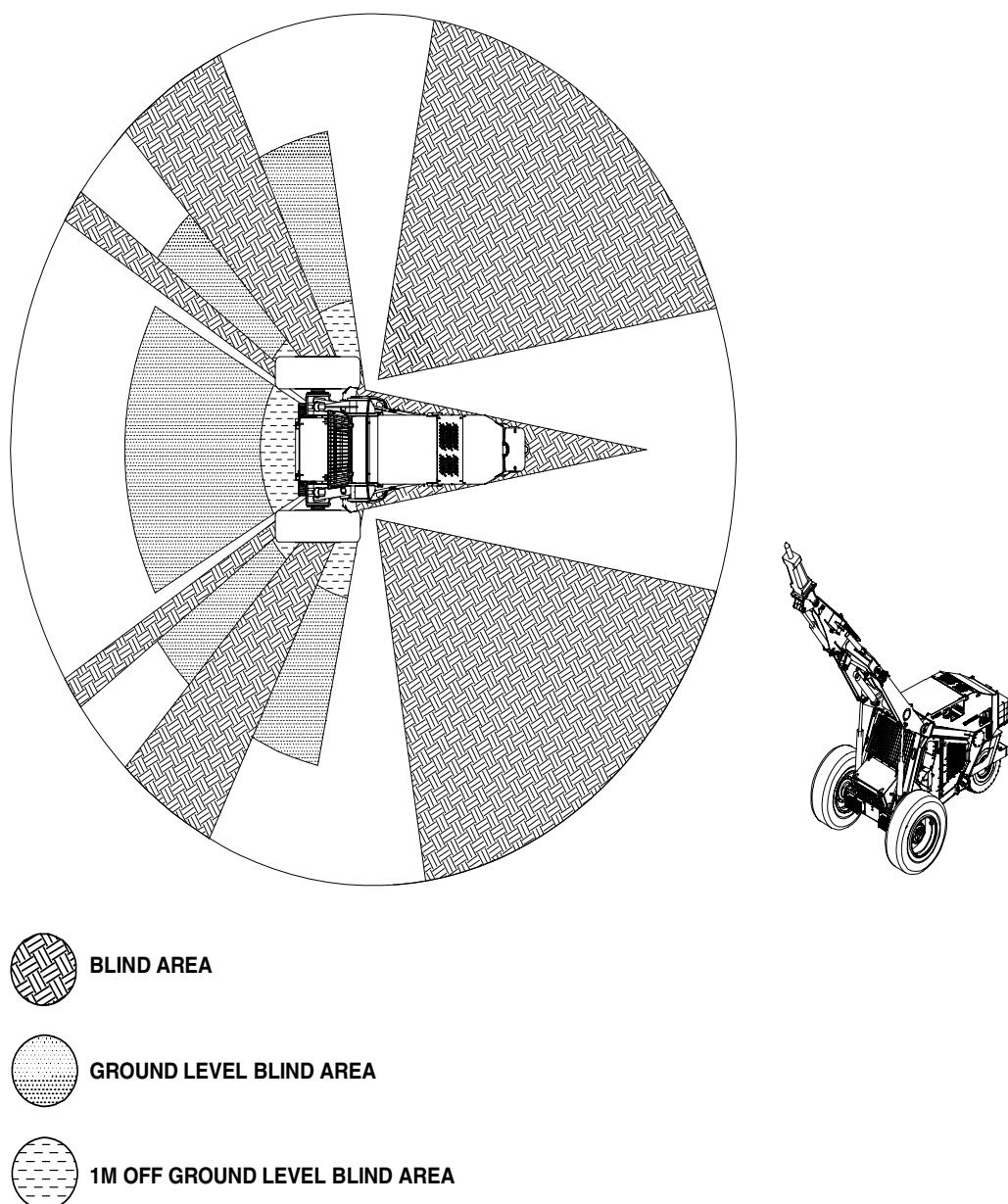
MACHINE DIMENSIONS

TD0009351-A



220E# ROCKSCALER VISABILITY

NOTE:
THE ILLUSTRATION IS FOR THE MACHINE IN A WORKING POSITION WITH
THE BOOM IN AN UPRIGHT ORIENTATION



TD0009638-A

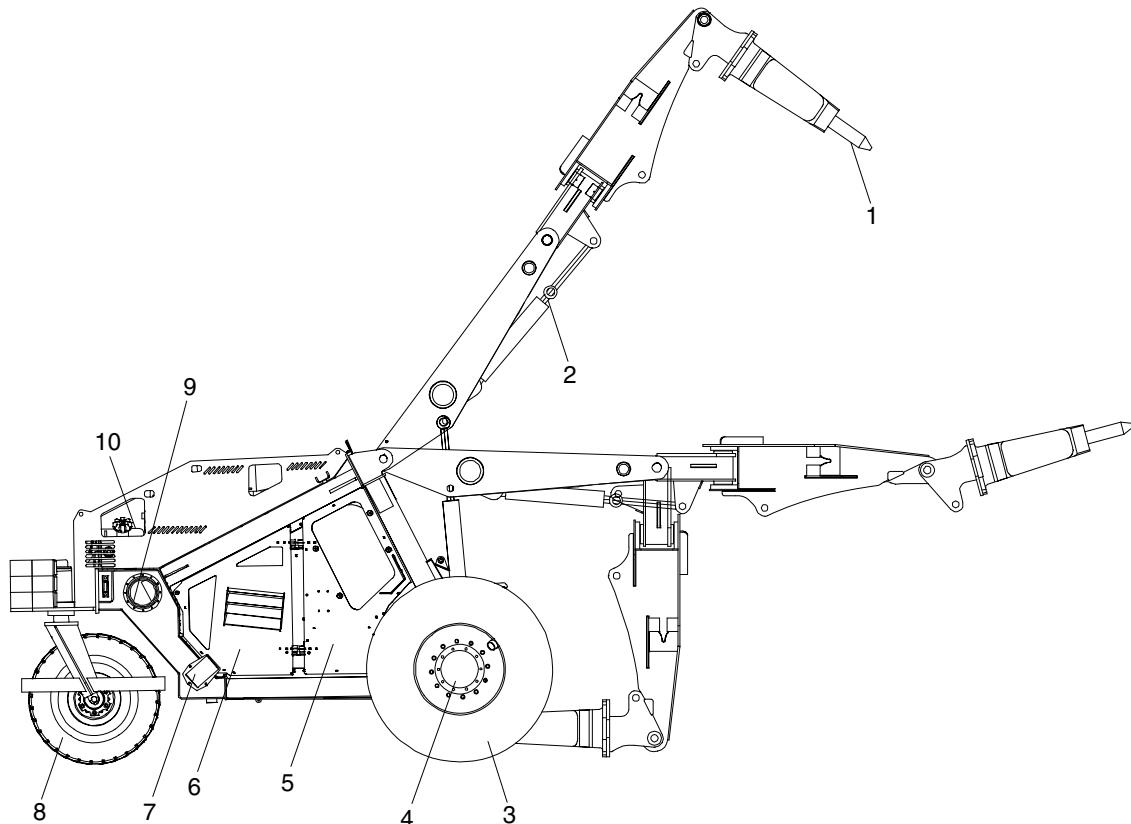


 NOTES:



Component Terminology

The following illustration details the component terminology used throughout the manual.



- | | |
|------------------|-------------------------------------|
| 1. Hammer | 6. Engine Access Door |
| 2. Cylinder | 7. Hydraulic Filter Cover |
| 3. Front Wheel | 8. Tail Wheel |
| 4. Final Drive | 9. Cover / Hydraulic Tank / Coolers |
| 5. Operator Seat | 10. Fuel Tank |



 NOTES:



SERVICE & CHECKS

- OPERATING COMPONENTS
- OPERATING INSTRUCTIONS



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Blank**



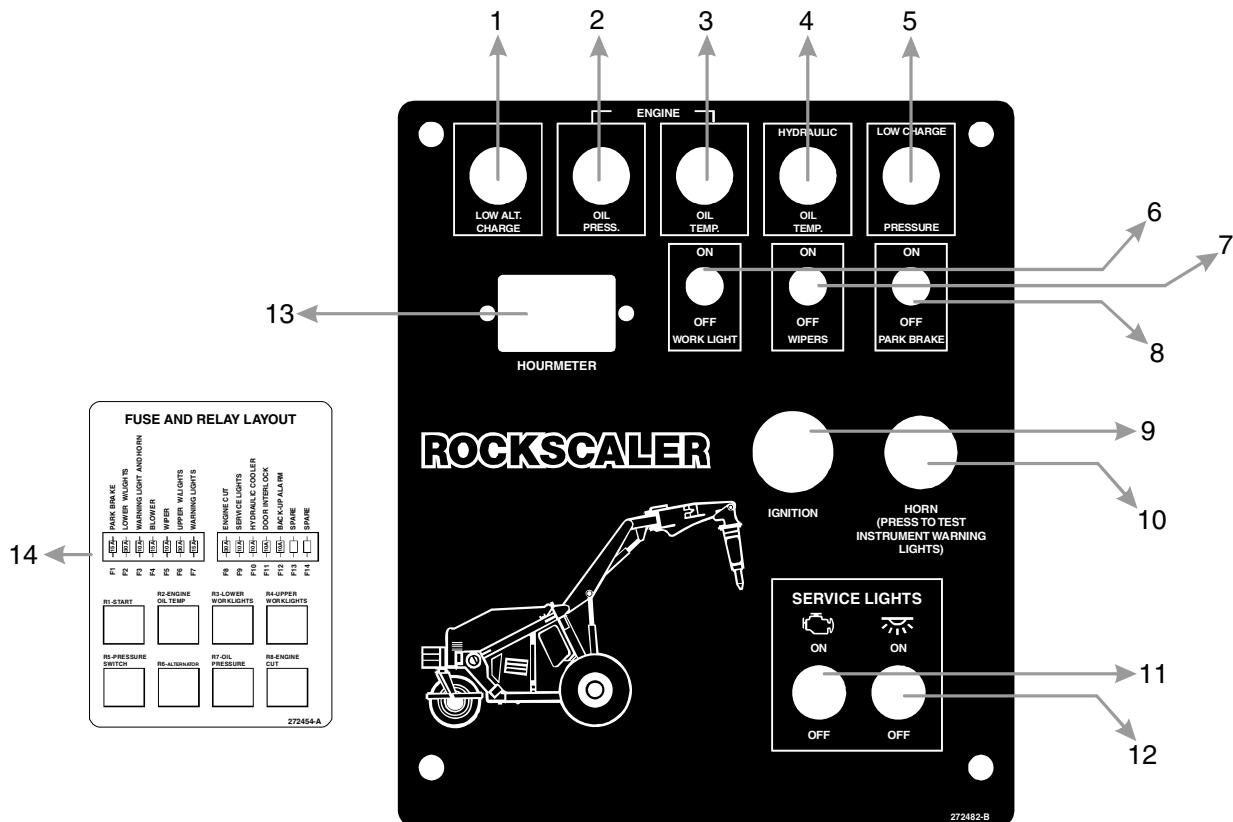
CHAPTER 2. OPERATOR CONTROLS AND INSTRUMENTS

INTRODUCTION

This chapter details the layout and SERVICE & CHECKS of the controls and instruments in the 220E Rockscaler.

All the operator controls and instruments for the 220E Rockscaler are located in the cab.

The following figure details the controls and instruments on the instrument panel.



- | | |
|------------------------------|--------------------------------------------------|
| 1. LIGHT ALT. CHARGE | 8. PARK BRAKE (ON / OFF SWITCH) |
| 2. ENGINE - OIL PRESSURE | 9. IGNITION |
| 3. ENGINE - OIL TEMPERATURE | 10. HORN |
| 4. HYDRAULIC OIL TEMPERATURE | 11. SERVICE LIGHTS - ENGINE (ON / OFF SWITCH) |
| 5. LOW CHARGE PRESSURE | 12. SERVICE LIGHTS - CAB LIGHT (ON / OFF SWITCH) |
| 6. LIGHTS (ON / OFF SWITCH) | 13. HOURMETER |
| 7. WIPERS (ON / OFF SWITCH) | 14. FUSE BOX LAYOUT |

OPERATING COMPONENTS



GAUGE

Hour meter



The hour meter is located on the instrument panel.

The hour meter displays the service meter readings (SMR) for the machine service life.

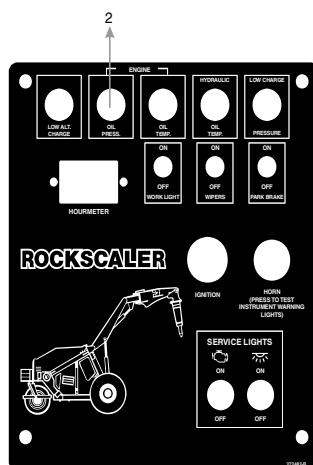
The purpose of the meter is to determine the service intervals for the machine.

Warning Indicators

When the start push button is in the **ON** position and the ignition switch is turned to the **ON** position the following indicators illuminate / flash:

- Engine Oil Pressure Indicator.
- Alternator Charge Indicator.

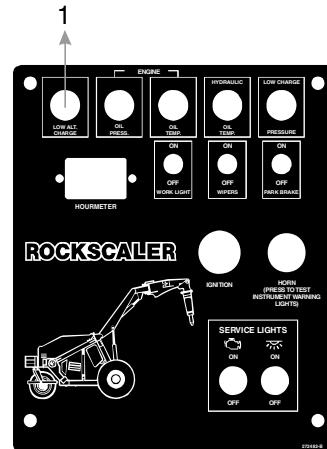
Engine Oil Pressure Indicator



The engine oil pressure indicator is located on the instrument panel.

The indicator illuminates when the oil pressure is low.

Alternator Charge Indicator



The alternator charge indicator is located on the instrument panel.

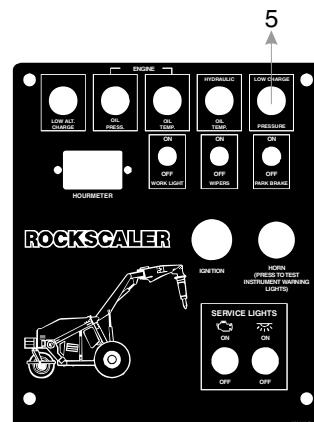
The indicator will illuminate when the alternator is not charging the battery.

When the indicator illuminates the cause must be investigated and rectified immediately.

CAUTION

CAUTION - Failure to rectify the cause of the alternator charge indicator illuminating will result in battery failure.

Park Brake Indicator

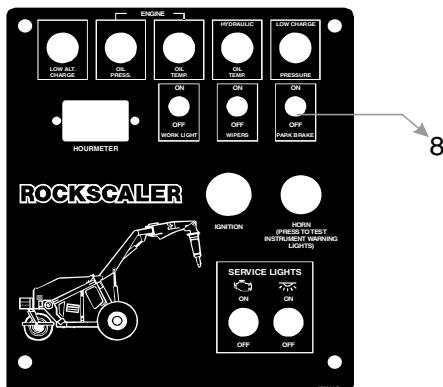


The park brake indicator is located on the instrument panel.

The indicator will illuminate when the park brake is applied.

Switches

Park Brake Switch



The park brake switch (8) is located on the instrument panel.

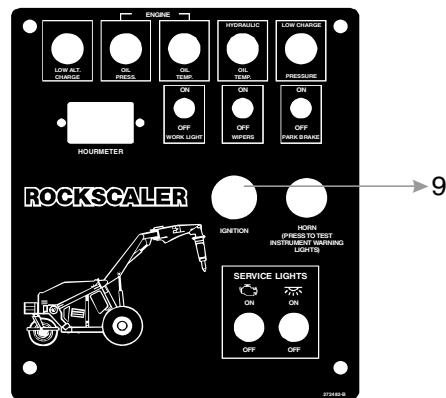


NOTES:

The switch has two positions:

- The first position (down) is working lights **OFF**.
- The second position (switch in the up position) is working lights **ON**.

Ignition Switch



The ignition switch (1) is located on the instrument panel.

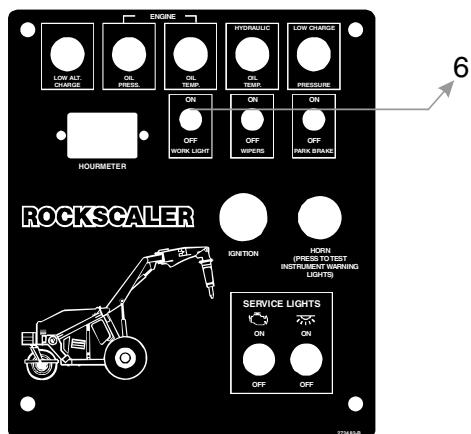


NOTES:

The switch has two positions:

- The first position (down) is park brake **OFF**.
- The second position (switch in the up position) is park brake **ON**.

Light Switch



The lights switch (6) is located on the instrument panel.

The ignition switch is a key operated switch which has two positions:

- ON
- OFF

When the ignition switch is moved to the **ON** position the following indicators will illuminate or are activated:

- Engine Oil Pressure Warning Indicator.
- Park Brake indicator.
- Alternator Charge Indicator.

The park brake indicator will extinguish when the park brake switch is pressed to the **OFF** position.

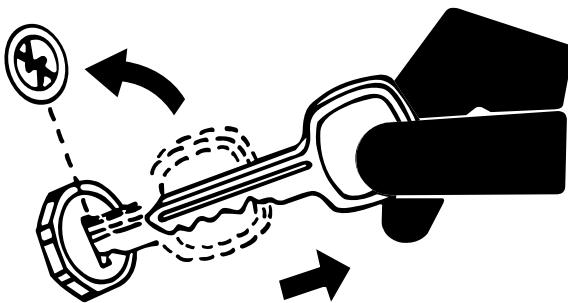


NOTES:

The engine will not start until the park brake switch is in the **ON** position.

OPERATING COMPONENTS**Start (Ignition - key)**

To start - Place key in ignition & turn the key.



To start the engine proceed as follows:

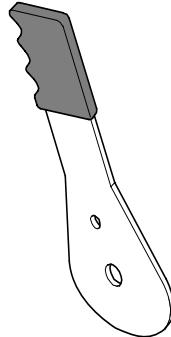
1. The key placed in the ignition.
2. The park brake is applied.
3. The control pedals are in the neutral position.
4. The engine throttle is set at quarter throttle.
5. Turn the key in the ignition.

**CAUTION**

CAUTION - Do not turn and hold the key in the ignition or operate the starter for more than 17 seconds. If the engine does not start, wait one minute before attempting to restart the engine. If the engine does not start after two attempts, investigate the cause.

**CAUTION**

CAUTION - Do not continually operate/turn the key in the ignition when the battery is flat as this may cause serious damage to the starter motor.

Controls**Engine Throttle and Shutdown**

The engine throttle is located on the left side of the cab behind the operators seat.

Push the engine throttle back to increase the engine rev/min.

Push the engine throttle forward to decrease the engine rev/min.

CAUTION

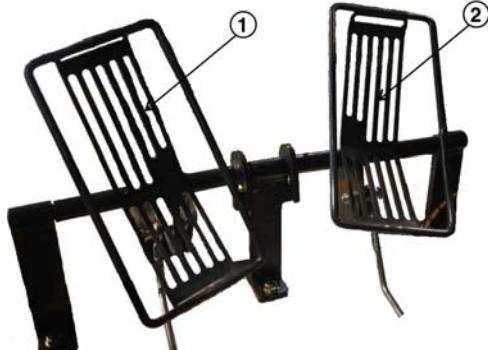
CAUTION - Allow the engine to run at low idle for three minutes before turning the machine off. This allows the engine temperature to stabilize.



The engine will shut down when the key is turned off in the ignition.



Control Pedals



The machine is directionally controlled by two foot control pedals (1 and 2) which are located on the floor in front of the operator's seat.

Pushing the top of the right or left control pedals rotates the respective sprocket drives forwards.

Pushing the bottom of the right or left control pedals rotates the respective sprocket drives backwards.

Control Levers

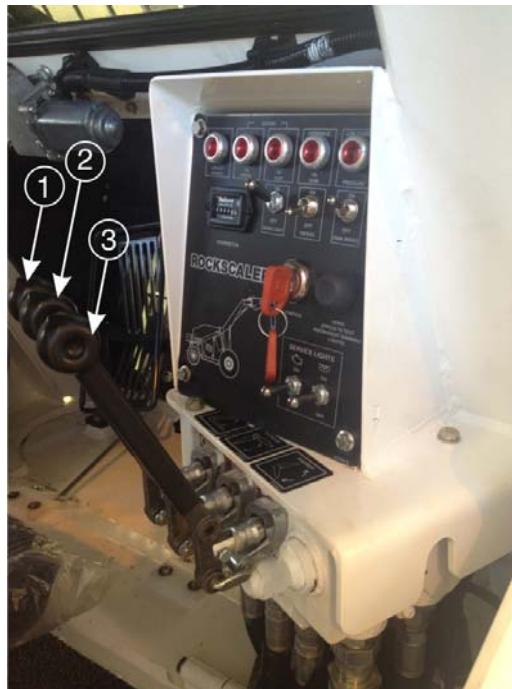
Left Side Control Lever



Slew - The left side control lever (1) is used to move the slew boom left and right.

Hammer - The left side control lever (2) is used to operate the hammer.

Right Side Control Levers



The right side control lever (1) is used to move the 1st Boom up and down.

The right side control lever (2) is used to move the second Boom up and down.

The right side control lever (3) is used to move the Hammer up and down.

NOTE:

The control levers are spring loaded to the central position.

OPERATING COMPONENTS**Operator Seat****Backward and Forward Adjustment**

The slide adjustment lever (1) is located on the left side of the seat.

The slide adjustment lever allows the seat to be moved closer or further away from the control pedals.

To move the seat the following needs to be done:

1. Pull and hold the lever up.
2. Move seat towards or away from the control pedals until the required position is reached.
3. Release the lever.

Backrest Adjustment

The backrest adjustment control (2) is located on the left side of the seat.

Move the backrest adjustment control upwards and hold to obtain the required angle of the backrest.

Release the backrest adjustment control.

Armrest Adjustment (if fitted)

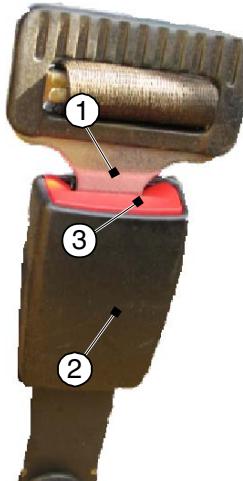
The armrest adjustment knob (3) allows the height of the armrest to be adjusted.

Turn the knob clockwise to raise or counterclockwise to lower the armrest.

Seat Belt

A fully adjustable, lap strap seat belt (1) is an integral part of the seat.

The seat belt is designed to fit firmly across the front of the pelvis.

Fastening

Firmly push the buckle (1) into the fixed clasp (2) until it clicks, check the connection is secure.

Releasing

Press the red button (3) on the fixed clasp and remove the buckle.



WARNING

WARNING - Always wear a seat belt when operating the machine. in an accident it may save your life.

WARNING

WARNING - Check the condition of the seat belt and mounting hardware before operating the machine. replace the seat belt at least every three years, regardless of the condition.

Adjusting

When fastening, the seat belt may be adjusted as follows:

Shorten

1. Hold the buckle in your right hand in front of you and pull the free end of the belt across to the left.

Lengthen

2. Hold the buckle in your right hand, tilt until the buckle is perpendicular to the belt and pull across to the right.



 **NOTES:**

**PROCEDURE BEFORE STARTING****CHAPTER 3. PROCEDURES
BEFORE STARTING****Safety Instructions**

Before operating the machine the following safety instructions must be observed.

Read and fully understand this manual, before you start operating the machine.

Never operate the machine while under the influence of alcohol, medication or any other drugs.

Wear the required protective clothing for safe machine SERVICE & CHECKS.

When mounting or dismounting the machine always face the machine. Never jump off the machine.

The cab has 2 access and exit points.

Running-in Instructions

The machine run-in period is the First 100 SMR (hours) of SERVICE & CHECKS. The machine **MUST** be serviced at 100 SMR (hours) to ensure maximum service life.

The 100 SMR (hour) service must only be done by **AARD Mining Equipment** Service Personnel.

Procedures Before Starting**Safety Rules****Operator Duties**

The operator must know the rules and safety aspects of the site. The operator must study the following rules and become aware of how to avoid serious injury and / or machine damage.

- It is the operator's duty to report all damage and wear which may endanger the operator or cause damage to the machine.
- Only trained personnel may operate the machine.
- Check that a "**DO NOT OPERATE**" tag is not attached to the instrument panel. If the tag is attached, do not operate the machine.

- Complete the Walk Round Check. if any defects are found, do not operate the machine. Attach the "**DO NOT OPERATE**" tag to the instrument panel and remove the machine key.
- Report all defects and problems encountered during the Walk Round Check to the **SERVICE PERSONNEL**.

Daily Walk Round Check

CAUTION - Ensure that service personnel have performed the Daily Checks (10 hourly service) before starting the machine.

The Walk Round Check must always be carried out before operating the machine.

**NOTES:**

The machine must be parked on level ground with the hammer on the ground.

It is recommended that the machine is thoroughly washed before starting the Walk Round Check.

NOTE:

For detailed instructions of the different maintenance procedures, refer to the Maintenance Information of this manual, Service and Maintenance Section.

NOTE:

The following checks are VISUAL inspection procedures of the machine and its components and must be completed prior to operating the machine.

The following is a list of the tasks required in the Daily Walk Round Check. For a more detailed description of the tasks refer to the Daily or 10 Hourly Service Checks.

1. Open the engine access covers.
2. Check the engine oil level.
3. Check the condition and tension of the alternator belt.
4. Check for loose, frayed or corroded connections in the wiring harness.

PROCEDURES BEFORE STARTING

5. Check the engine mountings are secure and are not damaged.
6. Ensure that all the hose connections are tight and inspect for leaks, cracks or chafing damage.
7. Check that the exhaust connections are secure.
8. Check that the battery is secure and the connections are tight.
9. Check the cooling system for cleanliness and ensure there are no restrictions to the cooling function.
10. Inspect the air cleaner assembly for damage and security.
11. Check the hydraulic fluid level.
12. Check the throttle linkage connections are secure.
13. Drain the fuel / water separator filter.
14. Lubricate all the lubrication points.
15. Check the fuel level.
16. Ensure that there are no obstructions around the machine before moving off.
17. Ensure that there are no obstructions in the cab, especially under and around the pedals and controls before moving off.
18. Ensure that the seat belt is in proper working order and fasten the seat belt before start-up.



CHAPTER 4. DAILY CHECKS SAFETY INFORMATION

Maintenance Position

Before starting to work on the machine, wash it thoroughly and park it on firm level ground in the required maintenance position.

Prepare for the daily checks and maintenance as detailed below:

Place the Machine in the Maintenance Position



WARNING

WARNING - If the following steps are not observed it could result in injury or death.

1. Park the machine on firm, level ground.
2. Apply the park brake.
3. Stop the engine and remove the keys from the ignition switch.
4. Chock the wheels.
5. Attach the “DO NOT OPERATE” warning sign to the instrument panel.
6. Allow the machine to cool down.
7. Ensure that the attachment is safely resting on the ground.



WARNING

WARNING - If work must be done on a warm machine, beware of hot fluids and components.

Rules When Working On The Machine

General

Do not carry out any work on the machine unless you are trained and have the knowledge to carry out the work.

Services and maintenance procedures which are not carried out in the correct way may be dangerous.

Make sure that you have sufficient knowledge, the correct information, the correct tools and the correct equipment in order to carry out the service or maintenance in the correct way. Repair or change broken tools and faulty equipment.

Read all plates and decals on the machine and in the manual before you start any work on the machine.

Each of the instructions contains important information about handling and servicing.

Do not wear loose fitting clothing or jewellery when working on the machine.

Always wear safety glasses, gloves, shoes and other protective articles as the job requires.

Always stop the engine before any service or maintenance procedure is carried out on the machine, unless otherwise instructed in this manual.

When changing oil in the engine or fluid in the hydraulic system, remember that the oil and fluid may be hot and can cause burns.

When lifting or supporting components, use equipment with a lifting capacity which is at least as great as the components.

All lifting devices, for example slings and ratchet blocks, must comply with national regulations for lifting devices. AARD MINING EQUIPMENT will not accept any responsibility if any lifting devices, tools or working methods are used other than those described in this manual.

Stop the engine before removing engine covers or similar.

Make sure that no tools or other objects which can cause damage are left in or on the machine.

All pressurised vessels must be de-pressurised and then opened very carefully.

PROCEDURES BEFORE STARTING



When checking for leaks, use a piece of paper or wood, not your hand.

Never set a pressure limiting valve to a higher pressure than that recommended by the manufacturer.

Before starting the engine in doors, ensure that the ventilation is sufficient to cope with the exhaust gases.

Do not stand behind the machine while the engine is running.

Keep the work place clean. Oil or water on the floor makes it slippery.

Oil and water in close proximity to electrical equipment are dangerous and any spills should be cleaned up immediately.

Oily clothes are a serious fire hazard.

CAUTION

CAUTION - If a high pressure jet is used for cleaning, take great care as the insulation of electrical leads can become damaged even at a moderately high pressure and temperature.

WARNING

WARNING - Do not point the high pressure jet at personnel.

CAUTION

CAUTION - Disconnect the battery when welding on the machine.

Welding and grinding may only be done on the machine when it is placed in a clean area where there are no fuel tanks, hydraulic pipes or similar lying around. Take extra care when welding and grinding near flammable objects. a fire extinguisher should be kept handy.

Working on Painted Surfaces

When welding and cutting, the paint must first be removed up to a distance of 100 mm (4") from the weld-

ing or cutting point. Paint which is heated gives off unhealthy gases.

Ideally paint should be removed using sand blasting.

If the paint cannot be removed using sandblasting, it must be removed in some other way for example using paint stripper or high speed grinder.

NOTES:

When suing paint stripper or a high speed grinder, you must use a portable air extractor, safety glasses and protective gloves.

Working with Polymer Material

Polymer materials, such as rubber and certain kinds of plastics, can, when heated, give off gases which are dangerous to health and environment.

The following protective measures should be taken:

1. Protect the polymer material from heat before welding or cutting near the material.
2. Do not burn polymer materials when disposing of them.

Contaminated Oils and Fluids

When ever the engine oil and / or hydraulic fluid is changed always inspect the old oil and fluid for any signs of contamination (water and foreign matter etc.). The presence of contamination could indicate a fault in the system.

The old oil and hydraulic filters must also be checked for contamination.

Always use new, clean oil, fluids and filters when replenishing the system.

Measures to Prevent Fires.

Find out which type of fire extinguisher to use, where it is kept and how to use it.

Any fire fighting equipment stored on the machine must be maintained in working order.



At the slightest sign of fire, and if the situation allows, take the following steps:

1. Move the machine away from the danger area if possible.
2. Stop the engine and turn the ignition to the **OFF** position.
3. Leave the cab.
4. Start putting out the fire and notify the fire brigade if required.

Do not smoke or have a naked flame near a machine when filling with fuel or when the fuel system has been opened.

Diesel / fuel / oil is flammable and should not be used for cleaning, instead use an approved solvent.

Remember that certain solvents can cause skin rashes and are usually flammable. Do not inhale solvent vapour.

Store flammable starting aids in a cool, well ventilated location. Remember that such aids (starting gas) must not be used in connection with pre-heating of the induction manifold.

IMPORTANT

Some environment in which the machine may be employed require additional care and maintenance to ensure safe and sustainable component and machine performance.

In these applications particular care needs to be taken to keep the machine clean and free of any excessive build up of debris and / or split hazardous fluids such as oil and fuel. Failure to do so will pose a **SAFETY RISK** and **FIRE HAZARD** in addition to possibly reducing the reliable and safe operating life of the equipment.

In particular, the areas associated with containing high heat sources need to be kept clean e.g. the exhaust pipes and heat shield areas. The heat shields will need to be inspected daily for debris which may lie on the shield and affect its functionality. Combustible material will need to be removed, because this is a high heat area.

In addition to the removal of debris, regular maintenance should include the checking and reporting of any oil leaks. This should form part of the daily inspection routing.



 NOTES:



CHAPTER 5. MAINTENACE SCHEDULES

The preventive maintenance is most important. It includes lubrication and various checks and adjustments which the operator can perform.

Most of these service measures are simple to carry out and do not need any detailed explanation. The instructions which require specific procedures are detailed in the Chapters which follow this one.

The following table lists the major tasks, associated tasks are detailed in the procedures in the relevant Chapter.

Note: The 100 hour service is done by **AARD Mining Equipment** Technical Support.

Maintenance Schedule in Running Hours								
Details	Daily	1st 100	Every 250	Every 500	Every 1 000	Every 2 000	Every 3 000	
ENGINE								
Note: For further maintenance and service procedures, refer to the W Spec Engine								
Check the oil level	X							
Drain the water separator / fuel filter	X							
Check the engine and components	X							
Check and clean the cooling system	X							
Check the drive belts	X							
Check the exhaust assembly	X							
Check the air intake assembly	X							
Check the fuel level	X							
Change the oil and oil filters		X	X					
Change the fuel filters		X		X				
Change the fuel screen		X	X					
Change the air cleaner filter elements		X	When the indicator shows red.					
Check and adjust the drive belts tensioning		X	X					
Adjust the valve clearance				X				
Change the drive belts					X			
Change the blower fan bearings					X			
Change the pulley tensioner					X			
Check the fuel feed pump strainer					X			
Change the Bowex coupling								X
Service the injectors								X
Service and calibrate the injector pump								X

**MAINTENANCE SCHEDULES**

Maintenance Schedule in Running Hours							
Details	Daily	1st 100	Every 250	Every 500	Every 1 000	Every 2 000	Every 3 000
TRANSMISSION							
Check the transmission and components	X						
WHEEL MOTORS, WHEELS AND TAIL WHEEL							
Check the wheel motor assemblies	X						
Check the wheels	X						
Check the tyres and tyre pressures	X						
Check the final drive oil level			X				
Check and adjust the tail wheels spindle bearings		X			X		
Check and adjust the tail wheel axle bearing		X			X		
Change the final drive oil		X			X		
Strip and check the final drive						X	
Check the wheel motors							X
HYDRAULICS							
Check the hydraulic fluid level	X						
Check the park brake & emergency	X						
Check the breather	X						
Check the filter, hoses and connections	X						
Change the charge filter		X		X			
Change the hydraulic fluid and filters					X		
HAMMER AND BOOM							
Check the hammer and components	X						
Check the boom and components	X						
Check the boom pins and bushes					X		
Check the boom cylinder pins and bushes					X		
CAB AND ELECTRICAL							
Check all safety guards	X						
Check the battery	X						
Check the operator controls and instruments	X						
Check the seat and seat belt	X						
LUBRICATION							
Grease all the lubrication points	X						



RECOMMENDED SERVICE GUIDE

The following tables list all the required services for the Rockscaler, check with **AARD Mining Equipment** for any updates to the Service Bulletin after the publication date of this manual. **NOTE:** There are separate RSG's available on the **AARD Mining Equipment website** for the Rockscaler.

AARD RECOMMENDED SERVICE GUIDE 220E# ROCKSCALER (REV 1)	Customer:
	VIN (Vehicle Identification Number):
	BAT Serial Number

Recommended Service Guide		250 HOURS	500 HOURS	1 000 HOURS	3 000 HOURS	TASK COMPLETE
1	Engine					
1.1	Change oil and oil filters.	X				
1.2	Change primary fuel filter.		X			
1.3	Change secondary fuel filter.		X			
1.4	Check fan belt condition and adjust alternator / Aircon belt tensioning.	X				
1.5	Adjust valve clearance.		X			
1.6	Change fan belts.			X		
1.7	Change blower fan bearings.			X		
1.8	Change the Bowex coupling.				X	
1.9	Change primary air cleaner filter element.		X	Or when suction indicator shows red		
1.10	Change secondary air cleaner filter element.			X		
1.11	Change fuel tank breather.				X	
1.12	Service injectors and injector pump.				X	
2	Wheel motors, wheels and tail wheel					
2.1	Change final drive oil.			X		
2.2	Change primary drive oil (Mk1 machines fitted with auborn reduction)			X		
2.3	Check and adjust tail wheel spindle bearings.			X		
2.4	Check and adjust tail wheel axle bearings.			X		
3	Hydraulics					
3.1	Change hydraulic charge filter.		X			
3.2	Change hydraulic oil and suction strainers.				X	
3.3	Change the hydraulic return filter.	X				
3.4	Check and adjust all hydraulic pressures.				X	
3.5	Change hydraulic tank breather filter.				X	
4	Cab					
4.1	Change fresh air filter.		X			

Notes	
1	Note: For further maintenance and service procedures, refer to the Deutz Engine Repair Manual F3-6L912/W
2	Note: The 100 hour service task to be done by a AARD Mining Equipment Service Technician (Refer to QER). Daily Checks to be done by Customer.
3	Note: The RSG Checklist must be performed in conjunction with the "Daily Checks" and repairing task as details outlined in the Owners maintenance Manual supplied with the machine.

Please return this form, even if all items are satisfactory			
CUSTOMER SERVICE CENTER / DEALER + SERVICE TECHNICIAN	SMR	DATE	CUSTOMER SIGNATURE



 NOTES:



CHAPTER 6. DAILY CHECKS & MAINTENANCE TASKS

Introduction

The daily or hourly maintenance checks must be performed by qualified operators or service personnel.



NOTES:

It is recommended that the machine is thoroughly washed before starting the tasks.

Ensure that the machine is in the maintenance position. Refer to Chapter 7.

Check the Engine and Engine Compartment Components

Open the Engine Compartment Doors



1. Ensure that the lock, hinges and door stop are undamaged and functional.
2. Ensure that the wheel spanner and brace are secure.

Check the Engine Compartment

1. Make a thorough inspection of the engine compartment.
2. Check for cleanliness and trash build-up. Clean and remove trash if necessary.
3. Report any problems immediately.
If it is necessary to remove fittings, caps or plugs
4. always wipe them clean first to reduce the chance of system contamination.

WARNING

Trash build-up on and around high heat areas must be removed daily and the machine cleaned to prevent build-up and ignition of material.

1. Oil leakage in these critical areas is also a fire hazard. Critical areas are the areas around the exhaust, exhaust manifold and heat shields.

2. Machines being operated in areas where combustible material is being handled may require the heat shields to be removed by service personnel to clean these areas properly.

Check for Fuel and Oil Leaks

The following fuel system, electrical and lubrication components must be checked for leaks, and security:



Engine Left Side.

Injector pump and injectors (1).

Fuel filter (2).

Fuel hoses (3) and pipes.

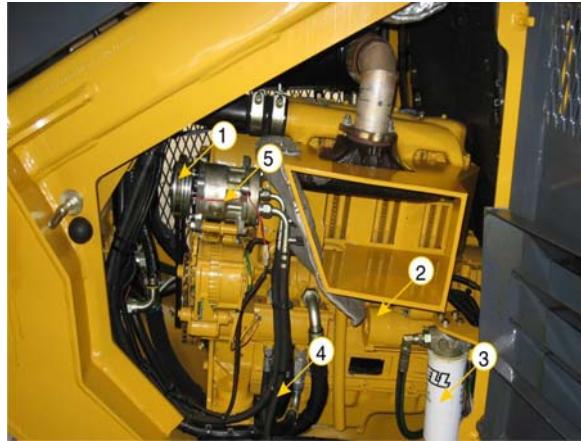
Hydraulic hoses (4).

Oil filler cap (5).

Oil Filter (6).

Blower box cover (7).

Throttle linkage (8).



Engine Right Side

Alternator (1).

Starter motor (2).

Hydraulic charge filter (3) (Duramax).

Hoses and pipes (4).

Air conditioner compressor (5).

If any leaks, damage or loose mountings are found contact service personnel.

Check the Engine Mountings



1. Inspect all four engine mountings front and rear for security and damage.

Check the Oil Level

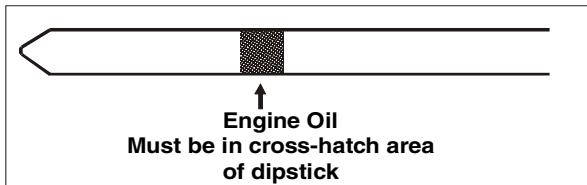
1. Ensure that the machine is on level ground.



2. Remove the dipstick (1).
3. Wipe the dipstick clean with a lint free cloth.
4. Re-insert the dipstick into the dipstick tube, ensuring it is properly seated.
5. Remove the dipstick.

Check Wiring, Hoses and Clamps

1. Visually inspect all the hoses in the engine compartment for leaks, cracks, deterioration and chafing damage.
Ensure that the hoses are routed correctly and that all securing straps are functional and undamaged.
2. Check that the hoses are fastened in the correct position and that no chafing can occur when the machine is in use.
3. Check that all clamps are secure.
4. Visually inspect all the sender units and switches in the engine compartment for damage.
5. Ensure that the electrical cables and wires are routed correctly and that all securing straps are functional and undamaged.
6. Check that the cables and wires are fastened in the correct position and that no chafing can occur when the machine is in use.
7. Check that all electrical connections in the engine compartment are secure.



6. Check the oil level.
7. If the level is in the crosshatch area it is within the acceptable operating range.
8. Replenish immediately if the level is below the area.

⚠ CAUTION

CAUTION - Do not over-fill above the top of the cross-hatch area.

Adding Oil

NOTES:

Whenever the oil filler cap is removed, check for any visible damage.



1. Clean the oil filler cap and the area around it.
2. Unscrew and remove the oil filler cap.
3. Place a funnel into the oil filler.
4. Fill with oil until the oil level is within crosshatch area on the dipstick. **Refer to Specifications** for the recommended oil.

⚠ CAUTION

CAUTION - Do not overfill the engine with oil.

- Check continuously during the filling procedure to
5. ensure that the engine oil reaches the crosshatch area on the dipstick.
 6. Remove the funnel and clean any oil spillage.

⚠ CAUTION

CAUTION - Re-fit the oil filler cap securely.

7. Clean the inside of the oil filler cap. Ensure that there is no damage.
8. Ensure that the oil filler cap seals tightly when replaced.



9. Check the dipstick and seal for damage.
10. Re-insert the dipstick into the dipstick tube, ensuring it is properly seated.



NOTES:

Checking the oil level prior to starting the engine ensures that there is sufficient lubrication for starting the engine.

⚠ CAUTION

CAUTION - It is recommended that the double check of the oil level is carried out before any prolonged engine SERVICE & CHECKS, particularly if the check prior to engine start-up showed an oil level near to a level where oil needed to be added.

11. Clean the inside of the oil filler cap. Ensure that there is no damage.
12. Ensure that the oil filler cap seals tightly when replaced.



Drain the Primary Fuel Filter



1. Push and hold up the drain valve (1).
2. Drain the accumulated water into a container.
3. Release the valve when the water is drained and fuel starts to drain. The spring loaded valve will automatically close when released.
4. Clean the valve and the area around it.



1. Check the fins at the right of the engine. If they are choked with dirt and debris, clean with low pressure air.



2. Open the blower box cover clips on the left of the engine.



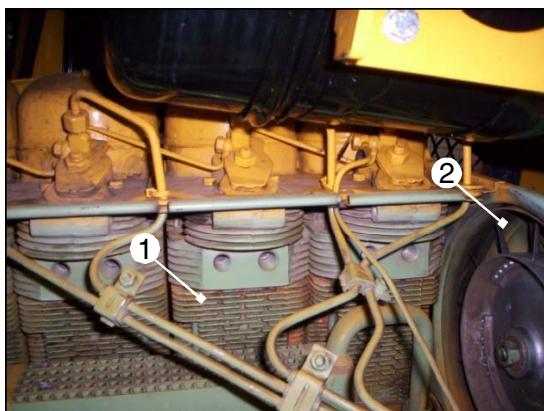
3. Check the inside for cleanliness. If the fins and fan are choked with dirt and debris, remove the cover.

CAUTION

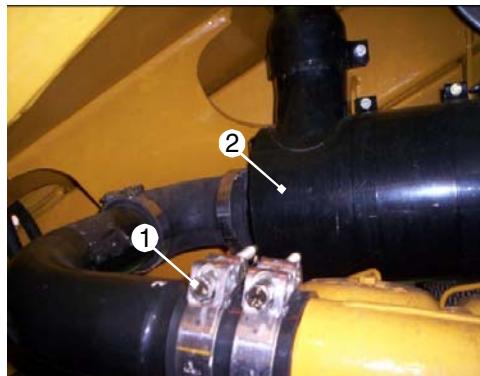
CAUTION - Do not use cold solvent or water on a hot engine. Do not force water onto the fins.

WARNING

WARNING - Compressed air is dangerous. Do not direct the jet of compressed air at yourself or any personnel.

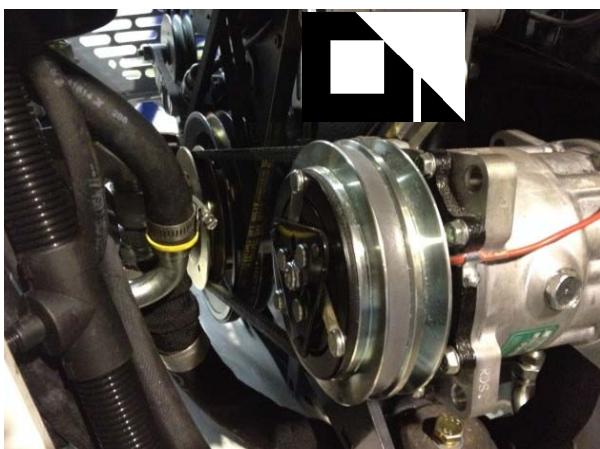


4. Blow clean the fins (1) with low pressure air.
5. Ensure fan (2) is undamaged and free of obstructions.



1. Ensure that the air cleaner components are clean prior to inspection.
2. Check the hoses and hose clamps (1) on the intake manifold.
3. Ensure that the air cleaner mounting is secure.
4. Check the housing (2) for security and damage.

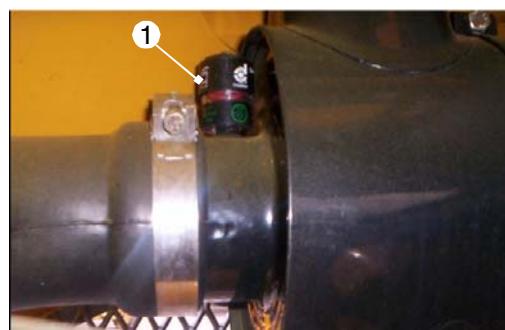
Check the Drive Belts



1. Inspect the drive belt of cracks, fraying and wear.



5. Ensure that the housing is secure in the bracket.



6. Check that the indicator is secure and that a green flag is showing.
Reset the indicator (1) by pressing the top down if the red flag is showing. Report to service personnel if it continues to show red.
- 7.

Check the Air Intake Components

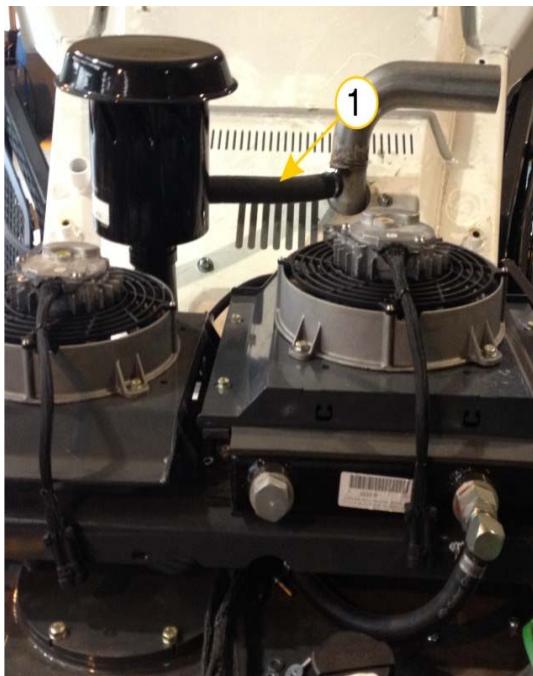
Check the Air Cleaner Assembly

CAUTION

CAUTION - A clogged air cleaner element will cause excessive intake restriction and a reduced air supply to the engine.

DAILY CHECKS & MAINTENANCE TASKS**Check the Pre-cleaner**

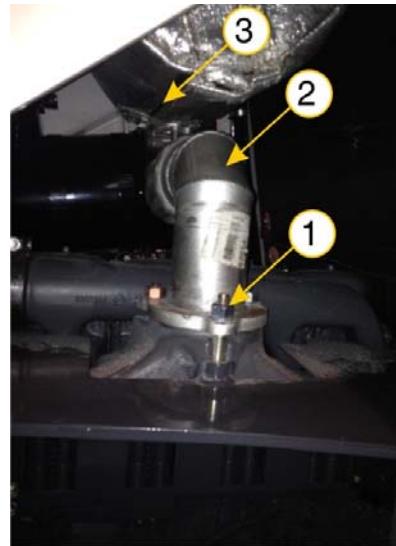
1. Check the hoses and hose clamps (1) on the pre-cleaner.
2. Check the housing for security and damage.



3. Check the hose from the pre-cleaner to the exhaust for damage. Ensure that the clamps are secure.

Check the Exhaust Assembly

1. Visually inspect the exhaust pipes for damage and security.



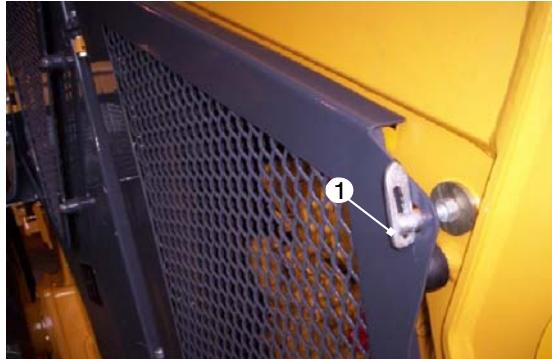
2. Check that the manifold bolts (1) are secure on the flange.
3. Check that the exhaust flexible hose, clamps and pipes (2) are secure.
4. Ensure that the muffler / silencer (3) is secure and not damaged.

Check the Insulation Panels

Ensure that the insulation panels (1) are not damaged and firmly secured by the mounting bolts (2).



Close the Engine Compartment Doors



1. Close the doors and ensure they are secured by the fasteners (1).



2. Inspect the inside of the compartment for cleanliness. remove any trash build-up.
3. Check inside for oil leaks and ensure that all hoses, pipes and connectors are secure.
4. Ensure that the fan (1) is undamaged and spins freely without obstructions.
5. Check that the hydraulic filler cap (2) is secure.
6. Ensure that the hydraulic tank breather (3) is undamaged.
7. Check that the air conditioner receiver drier (4) is undamaged and that the electrical connections for the switch on top are secure.

Check Oil Cooler and Air Conditioner Condenser

Open Cooler Cover



WARNING - Before opening the cover, ensure that the engine is shut-down, the fan is stationary and that the battery isolator switch is OFF. Always use the steps and handholds when mounting or dismounting to obtain access to the cooler and condenser compartment.



1. Unlock the two latches.



The oil cooler can be tied to the grille in an upright position if required.

Raise the air conditioner Condenser and check both sides for damage and cleanliness. Clean if necessary with low pressure air only.

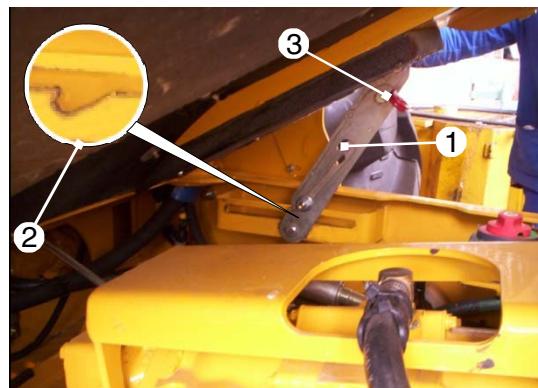


Check the Components Under Cab Floor Plate

**Raise the Cab's Floor Plate
(Standard suspension seat fitted).**



1. Slide the seat back as far as it will go by holding the lever (1) and pushing back on the seat.



2. Raise the floor plate and ensure that the pin (1) is in position and securing the two stay plates together.
3. Locate the stays (1) in the notch (2) of the support bracket.
4. Ensure that the floor plate is secure and that the pin (3) is secure before starting to check under the floor.

This position will raise the floor plate sufficiently for the operator to perform his checks around the transmission.

WARNING

WARNING - Two people must be used to safely raise the floor plate. To avoid crushing injury, ensure that the floor plate is safely secured by the supporting stays.



DAILY CHECKS & MAINTENANCE TASKS

To raise the floor plate high enough for servicing tasks proceed as follows:



1. Support the floor plate while removing the pin (1).

⚠ WARNING

WARNING - Keep the pin in your hand so that you do not lose it or forget to replace it.

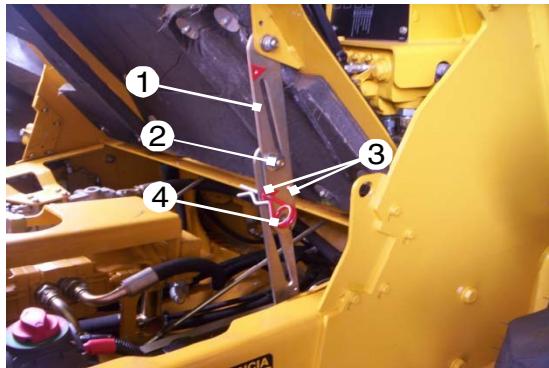


Figure 1

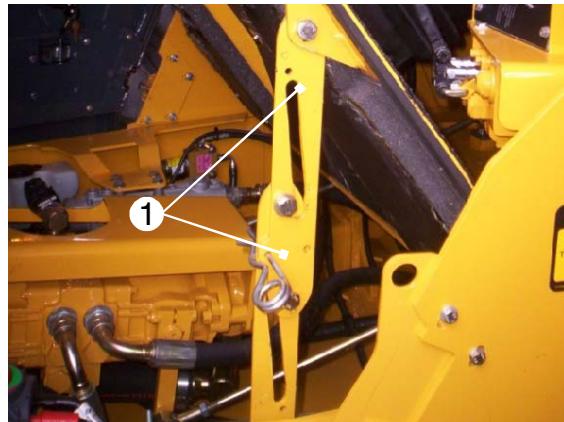
2. Raise the floor plate to locate the top section of the stay (1).

⚠ WARNING

WARNING - The stays are only located correctly when the retaining lock (2) is located in the notch of the stay's

top section AND the two holes (3) are aligned with the two holes in the bottom section.

3. When alignment is correct, insert the pin (4) securely in position as shown.



Both alignment holes are clearly marked with yellow painted arrows (1).

⚠ WARNING

WARNING - If the top and bottom sections of the strut are not aligned parallel to each other the holes will not align and the pin will not be able to be located. If the pin is not secured correctly the floor plate will be in an UNSAFE position and could cause injury.

DAILY CHECKS & MAINTENANCE TASKS**Lower the Cab's Floor Plate**

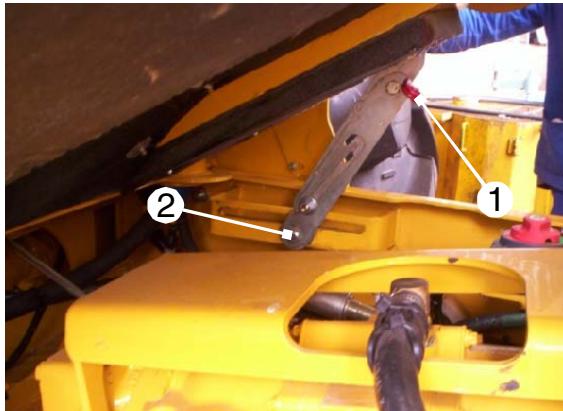
After performing the checks on the components under the floor plate, the floor plate must be secured as follows:

1. Support the weight of the floor plate and remove the pin (4) (Figure 1).



WARNING - Keep the pin in your hand so that you do not lose it or forget to replace it.

2. Disengage the retaining lock (2) (Figure 1).
3. Lower the floor plate and raise the seat's backrest.



4. Ensure that the holes are aligned when the stays are fully retracted (top hole marked with yellow paint) and insert the pin (1).

**NOTES:**

The pin (1) must be installed from the inside as shown.

5. Release the stays from the notch (2), slide forward and allow the floor plate to close fully.
6. Lock the securing catches on both sides.

Raise the Cab's Floor Plate (Optional non-suspension seat fitted).

1. Unlock the floor securing catches on each side of the cab floor.
2. Use the handles (2) (each side) to raise the cab floor plate.



WARNING - Two people must be used to safely raise the floor plate. To avoid crushing injury, ensure that the floor plate is safely secured by the supporting stays.



3. Raise the floor plate and ensure that the pin (1) is in position and securing the two stay plates together.



4. Locate the stays (1) in the notch (2) of the support bracket.
5. Ensure that the floor plate is secure and that the pin (3) is secure before starting to check under the floor.

This position will raise the floor plate sufficiently for the operator to perform his checks around the transmission.

To raise the floor plate high enough for servicing tasks proceed as follows:



Figure 2.

1. Raise the floor plate to locate the top section of the stay (1).

WARNING

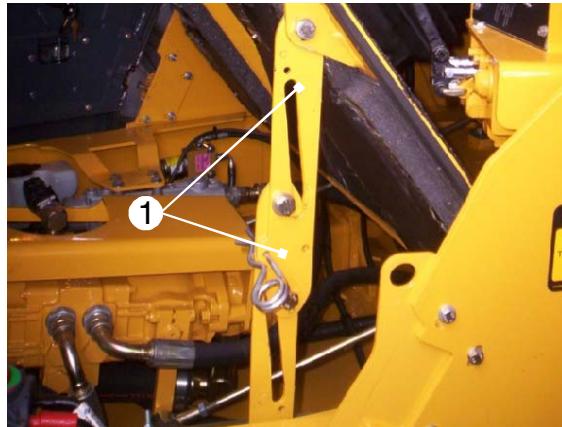
WARNING - The stays are only located correctly when the retaining lock (2) is located in the notch of the stay's top section AND the two holes (3) are aligned with the two holes in the bottom section.

2. When the alignment is correct, insert the pin (4) securely in position as shown.



WARNING

WARNING - Keep the pin in your hand so that you do not lose it or forget to replace it.



3. Both alignment holes are clearly marked with yellow painted arrows (1).



⚠ WARNING

WARNING - If the top and bottom sections of the strut are not aligned parallel to each other the holes will not align and the pin will not be able to be located. If the pin is not secured correctly the floor plate will be in an UNSAFE position and could cause injury.

Lower the Cab's Floor Plate

After performing the check on the components under the floor plate, the floor plate must be secured as follows:

1. Support the weight on the floor plate and remove the pin (4) (Figure 2).

⚠ WARNING

WARNING - Keep the pin in your hand so that you do not lose it or forget to replace it.

2. Disengage the retaining lock (2) (Figure 2).
3. Lower the floor plate.



4. Ensure that the holes are aligned when the stays are fully retracted (top hole marked with yellow paint) and insert the pin (1).



NOTES:

The pin (1) must be installed from the inside as shown.

5. Release the stays from the notch (2), slide forward and allow the floor plate to close fully.
6. Lock the securing catches on both sides.

Check the Transmission

Raise the floor plate to the first position as described in the previous procedure.



1. Inspect the transmission for damage and security.
2. Ensure that all mounting bolts, hoses and connectors are secure and not damaged.
3. Check for fluid leaks around the assembly.

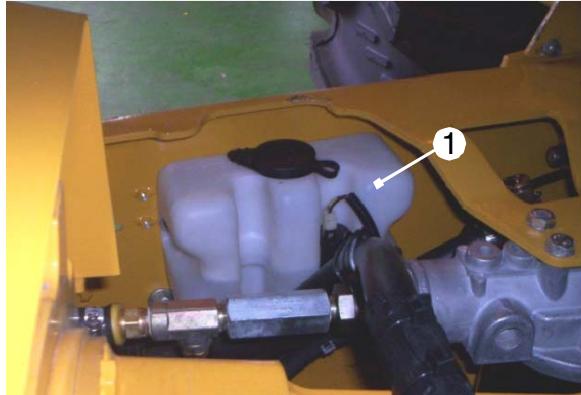


Check the Control Pedal Linkage



1. Ensure that the pedal linkage (1) on both sides of the transmission is not damaged.
2. Check that the SERVICE & CHECKS is smooth when the pedals are operated.

Check the Windscreen Wiper Reservoir



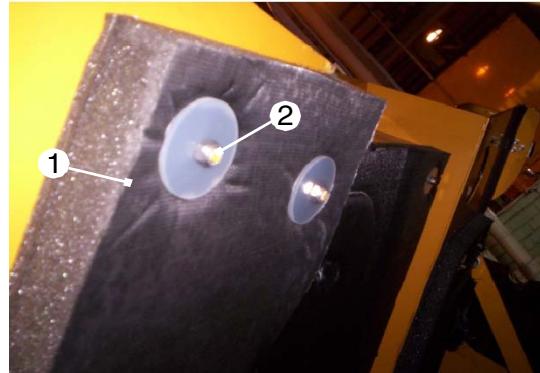
1. Check that the reservoir (1) is secure and undamaged.
2. Check the electric cable for security.
3. Top up the reservoir if required.

Check the Battery



1. Check the battery for damage and leaks.
2. Check the battery is secured with the hold-down bar.
3. Check the battery cables for the following:
 - * Cables' condition.
 - * Loose cables.
 - * Frayed cables.
 - * Broken or loose connections.
 - * Any corrosion build-up on the posts.

Check the Insulation Panels



Ensure that the insulation panels (1) are not damaged and firmly secured by the mounting bolts (2).

Close the cab floor plate and secure with the clips as described in the procedure “**Lower the Cab’s Floor Plate**”.



Checks on Exterior of Machine

1. Check the machine exterior for general appearance of the bodywork.
2. Check for damage to the structure, frame and components. Report any damage.
3. Check for general cleanliness, especially to the mirrors, windows and lights.
4. Check that the decals are in place, not damaged and legible.
5. Report any problems immediately.

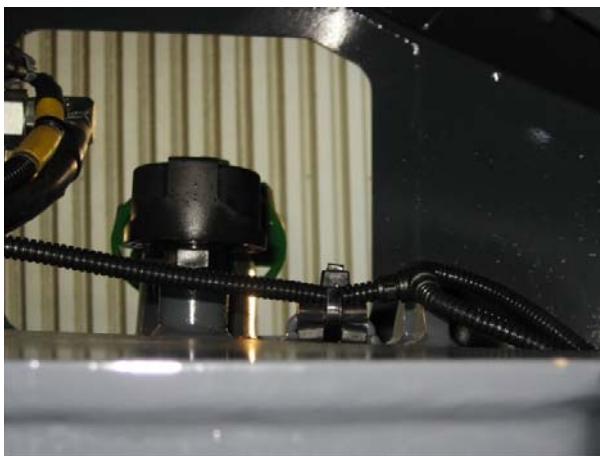


Check the Diesel Fuel Breather



NOTES:

This check is important to perform daily if operating the engine in dusty conditions.



1. Check the diesel fuel breather (1) for damage and security.

Check the Hydraulic Fluid Level

1. Ensure that the machine is parked on level ground and that the grapple is lowered to the ground.



NOTES:

This check is carried out when the hydraulic fluid is cold.



CAUTION - Check that the level of hydraulic fluid in the sight glass (1) is level with the mark as shown on the decal (2).

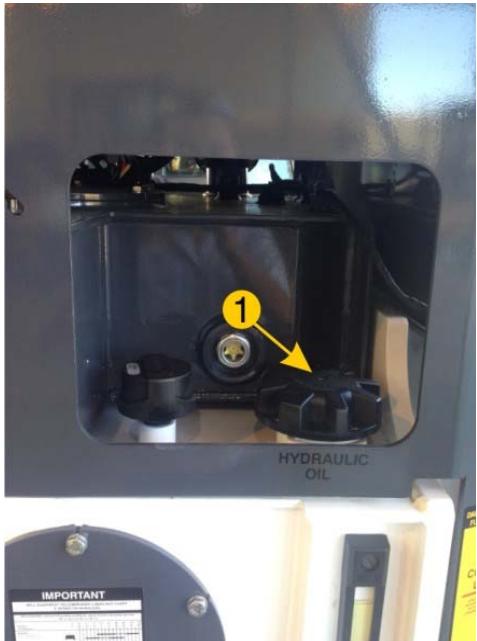
3. Replenish the fluid if necessary.

Replenish the Hydraulic Fluid



CAUTION - Do not allow the level to fall to the red, low level mark (3).

1. Raise the hydraulic oil cooler cover as described in this chapter.



2. Unscrew and remove the hydraulic fluid cap (1).
3. Replenish the hydraulic fluid in the hydraulic tank.

Check the Fuel Filler Cap and Seal

Whenever the diesel fuel filler cap (1) is removed, check for any visible damage.

1. Unscrew and remove the diesel fuel filler cap (1).
2. Clean the filler cap.
3. Inspect the filler cap, seal and screen for damage.
4. Ensure that the filler cap closes and seals securely.



CAUTION - Do not overfill the hydraulic tank.

4. Fill to the level in the sight glass (refer to previous instructions).
5. Remove the hydraulic fluid container to the storage area.
6. Close the cooler cover and secure.

Check the Hydraulic Fluid Filler Cap and Seal

Whenever the hydraulic fluid filler cap is removed, check for any visible damage.

1. Clean the filler cap.
2. Inspect the filler cap, seal and screen for damage.
3. Ensure that the filler cap closes and seals securely.



DAILY CHECKS & MAINTENANCE TASKS

Check the Wheels and Tyres

1. Ensure that the wheel nuts are secure (550 Nm {406 ft lb}).



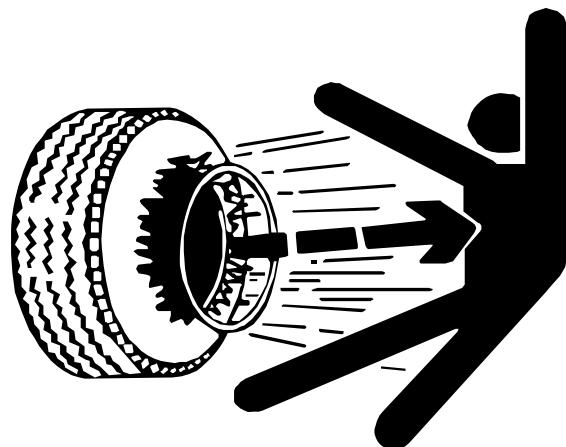
NOTES:

Service Personnel must check the wheel nuts torque after the first 5 hours and then every 50 hours.

2. Ensure that there are no oil leaks at the final drives.
3. Check that the tyre valves are not damaged.
4. Check the tyres for wear, large cuts and pressures.



WARNING - Improperly inflated tyres can cause excessive heat build-up, excessive or uneven tyre wear or rim damage resulting in blow outs.



NOTES:

Service Personnel must check the tyre inflation pressure (refer to specifications for the recommended tyre pressures relevant to the machine application and tyres fitted).

Hammer and Boom

Check the Hammer



1. Check the rotator for damage and cracks.
2. Inspect all hoses, pipes and connections for leaks.
3. Ensure that the connections, pipes and hoses are secure and not damaged.
4. Check that the hoses are fastened in the correct position and that no chafing can occur when the machine is in use.
5. Ensure that the spiral wrap is secure and not damaged.
6. Ensure that the stop block is fitted.

Check the Boom



1. Check the boom for damage and cracks.
2. Inspect all hoses, pipes and connections for leaks.
3. Ensure that the connections, pipes and hoses are secure and not damaged.
4. Check that the hoses are fastened in the correct position and that no chafing can occur when the machine is in use.

**NOTES:**

If the nuts require tightening, torque to 600 Nm (435 ft lb).

Check the Boom

1. Check the boom for damage.
2. Ensure there are no leaks at the cylinder seals.
3. Inspect all hoses, pipes and connections for leaks.
4. Ensure that the connections, pipes and hoses are secure and not damaged.
Check that the hoses are fastened in the correct position and that no chaffing can occur when the machine is in use.
5. Ensure that the spiral wrap is secure and not damaged.



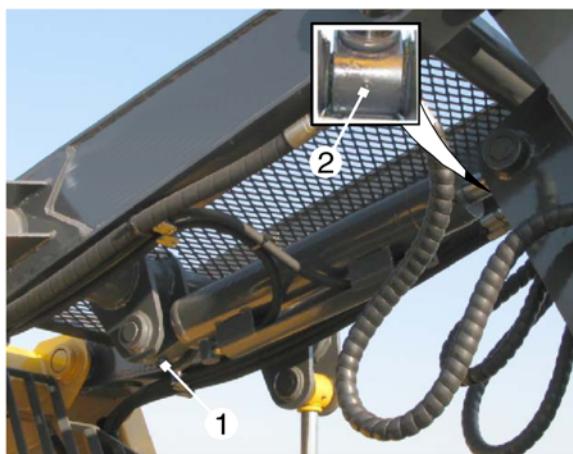
2. Grease the lower cylinders end (1) LHS and RHS of machine.

Lubrication Points

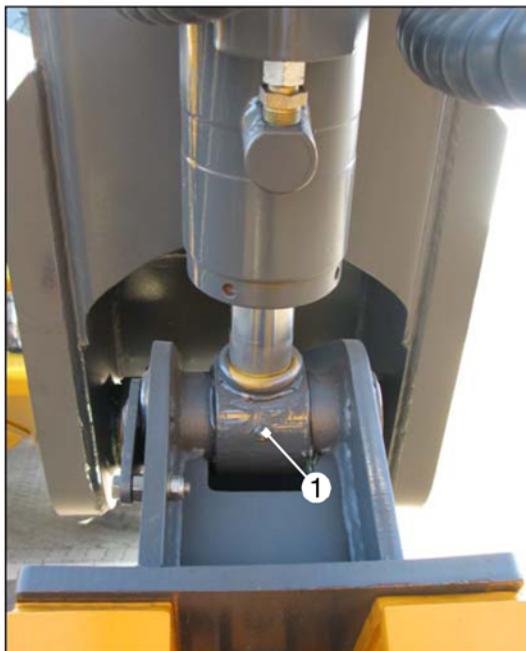
Boom Lift Cylinder



1. Grease the top cylinder end (1) LHS and RHS of machine.

DAILY CHECKS & MAINTENANCE TASKS**Boom Tilt Cylinder**

1. Grease the tilt top end of cylinder pivot point (1) and pivot end point (2).

Jib Angle Cylinder

1. Grease the top and bottom pivot (1) points on jib angle cylinder.

Pedal Assembly

1. Grease the pedal pivots .

Attachment**Lubricate the tool**

1. Lubricate the tool with BTI chisel paste or a moly-based grease every two hours of continuous SERVICE & CHECKS.



CAUTION - Failure to lubricate regularly reduces the life of the tool, tool bushings and front head. Never use ordinary grease, this will result in poor lubrication.



For proper tool lubrication the breaker must be vertical with enough down-force applied to push the tool into the breaker. This will prevent grease from entering the area above the tool.



2. Check that the tool moves freely in the bushings.
Visually check the tool retainer pins. The round
retainer pins rotate during normal SERVICE &
CHECKS.



4. Confirm that they are rotating by looking at the ends
of the pins for fresh radial marks in the grease on the
cross pin.

Check the Boom Hoses, Connectors and Attachment

1. Inspect all hoses and connections for leaks.
2. Ensure that the connections and hoses are secure
and not damaged.
3. Ensure that the spiral wrap is secure and not
damaged.
4. Check that the hoses are fastened in the correct
position and that no chafing can occur when the
machine is in use.

Cab and Electrical

Check All Safety Guards

! WARNING

WARNING - Ensure that all shields and guards installed
around the cab are secure and not damaged.

Windscreen Grille



The windscreen protection grilles are hinged to enable access to the windscreens and wipers.



IMPORTANT:

To enable the grille to hinge down without fouling
on the boom it is necessary to lower the boom with
the grapple OPEN and resting on the tines.

To hinge down the grille, remove the securing bolts (1).

Check the Cab

1. Ensure that the interior of the cab is clean and free
from trash build-up, especially under the pedals.
2. Ensure that the doors and window latches are
functional.
3. Ensure that the SERVICE Manual is present in the
cab.

DAILY CHECKS & MAINTENANCE TASKS**Check the Operator Controls and Instruments****Check the Control Levers****Check the Control Pedals**

1. Check the control pedals for damage and security.



2. Check the pedal rod end pivots (1) for security and damage and ensure that the lock nuts are in position and secure.
3. Check that all the pedals are in the neutral position.

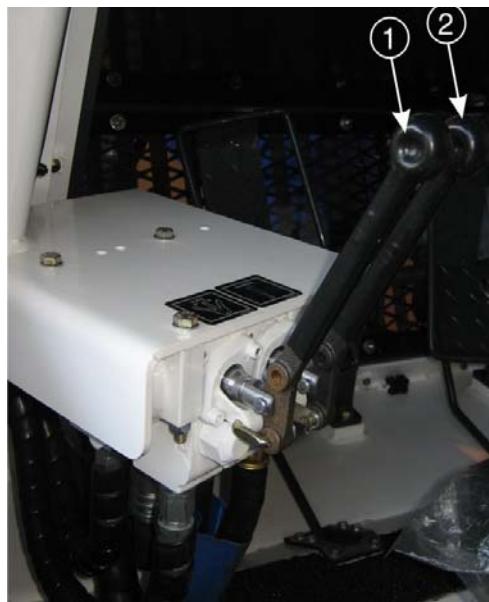
**IMPORTANT:**

The three neutral indicating plates (2) must be in line for the pedals to be in the neutral position.

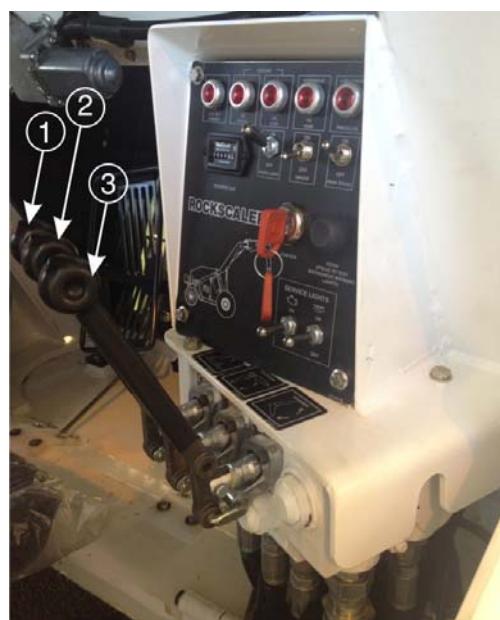
WARNING

WARNING - If the pedals do not return to neutral, do not start the machine. Report the fault to Service Personnel immediately.

4. Check that the pedals are functional.



1. Check the boom control lever (1) for damage and security.
2. Ensure that the split pins (2) are installed and not damaged.



3. Check the boom (1) 220E only, rotator (2) and grab (3) control levers for damage and security.
4. Ensure that the split pins (4) are installed and not damaged.



Check the Instrument Panel



1. Check the instrument panel for damage and security.

Check the Seat and Seat Belt

Seat

- Test all the seat positions and controls. Refer to previous chapter for controls for the seat adjustments.
2. Ensure the seat and back rest are clean and undamaged.
 3. Ensure the seat is mounted securely.

Seat Belt



1. Check the fixed clasp (1) for damage and security.
2. Check the buckle for damage and security.
3. Check the belt for cuts and security.

Fire Extinguisher



1. Ensure that the fire extinguisher and bracket are secure.
2. Check that the needle of the gauge (1) is in the green area. Report immediately to service personnel if the needle is in the red area.
3. Ensure that the pin is in position and that the seal is unbroken.



Control Pedals



1. Grease the pedal's rod at two grease nipples behind the pedals.



If the machine starts moving the park brake needs to be replaced. Report to Service Personnel.

6. Ensure that the park brake fully releases when switches off.

Check the Levers

Check for correct lever functions and smooth boom and grab movements.

Unscheduled Maintenance

The following maintenance procedures may be required periodically depending upon working conditions.

Door Locks

Use an oil can to lubricate the locking mechanisms of both cab door.



CAUTION - If a problem occurs with an electrical component function, first check the circuit breaker and fuses.

Fuses

On the instrument panel is a graphic illustration of the layout of the fuses and solenoids in the electrical distribution box. For access to the fuses the instrument panel cover must be removed.

Perform Park Brake Test

1. Ensure that there are no personnel on or around the machine.
2. Ensure that the park brake is applied.
3. Start the machine.
4. Move the throttle lever to the $\frac{3}{4}$ idle position.
5. Press down on the top of the foot control pedals.



NOTES:

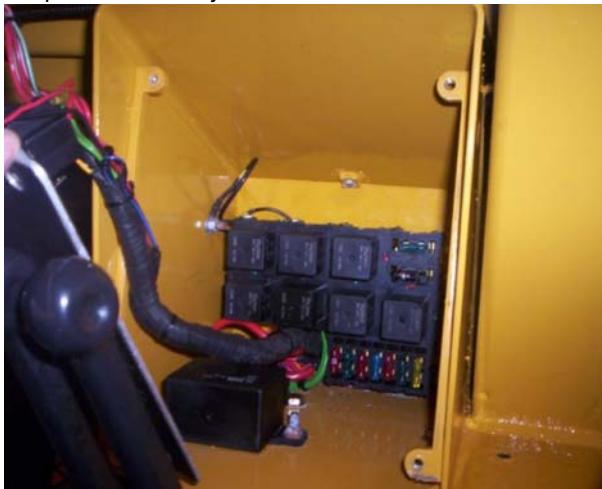
If the machine remains stationary the park brake is still serviceable.



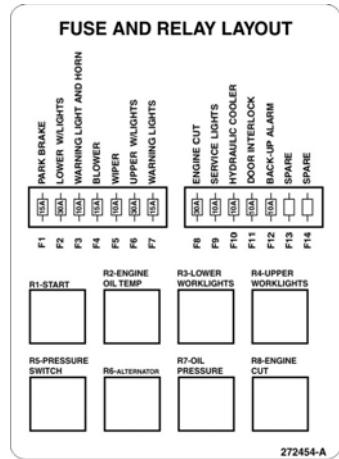
Remove Instrument Panel Cover



Unscrew and remove the four retaining bolts and remove the panel sufficiently to access the fuses.



The fuses and relays are arranged as shown on the cover.



LAYOUT

Set Isolator Switch and Circuit Breaker



Set the isolator switch (1), on or off as required.

Press in the circuit breaker (2) to re-set if necessary.



 NOTES:



CHAPTER 7. FIRST 100 HOUR SERVICE

Introduction

The 100 hours service must be performed by **AARD Mining Equipment** Technical Support service personnel.



NOTES:

For further engine information or detail not shown in this manual, refer to the W-Spec Engine SERVICE & CHECKS Manual.

Change the Oil and Oil Filter



WARNING - When changing the oil and oil filters always inspect the old oil filters for contamination. If in doubt contact a **AARD Mining Equipment** representative for advice.

Drain the Oil



WARNING - Be careful when draining oil. Hot oil can cause burns to unprotected skin.



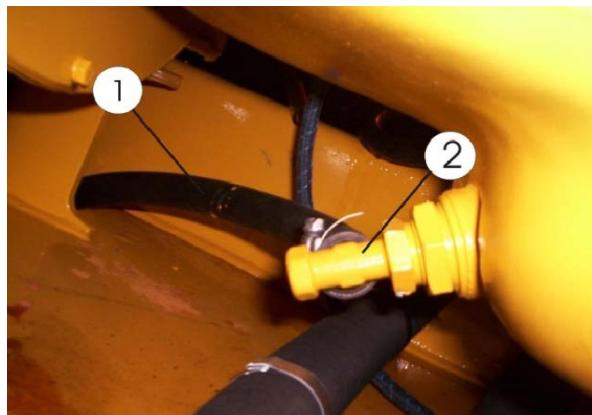
NOTES:

The engine oil is easier to drain when the engine is hot.

1. Start the engine and allow it to idle until the engine temperature is approximately 60°C (140°F).
2. Switch off the engine.



3. Unscrew and remove the engine oil filler cap (1).



4. Place a 20 litre (5.3 USGAL) container under the machine below the cutout for the engine oil drain pipe (1).
5. Open the drain nut (2) and sealing washer from the engine oil drain assembly.



NOTES:

The sealing washer may stick to the engine oil drain assembly, ensure that it is removed.

6. Allow the oil to drain into the container.
7. Check the old oil for metal particles and contamination.
8. Dispose of the oil at a suitable disposal facility.
9. Clean the drain plug and check for damage to the thread. If the drain plug is damaged, replace it with a new one.
10. Re-install the drain plug with a new sealing washer into the engine oil drain assembly.

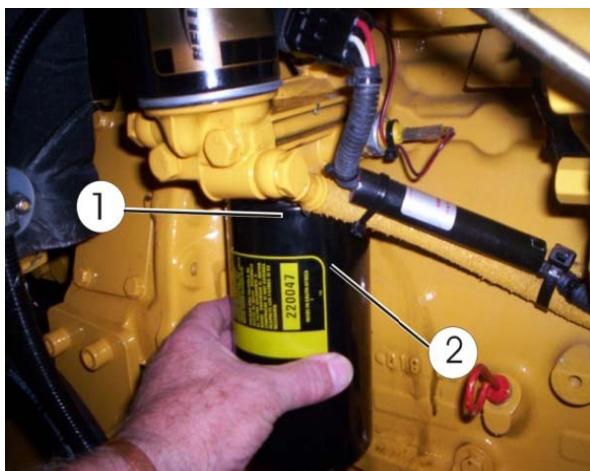
FIRST 100 HOUR SERVICE**Change the Oil Filter**

The oil filter must be changed at every oil change.

CAUTION

CAUTION - The oil filter must be changed and cannot be re-used.

1. Place a 1 litre (0.3 USGAL) container under the oil filter.



2. Clean the area around the oil filter head (1).
3. Unscrew and remove the oil filter (2).
4. Allow the oil to drain into the container.
5. Check the old oil for metal particles and contamination.
6. Dispose of the oil at a suitable disposal facility.

**NOTES:**

The O-Ring may stick to the filter head, ensure that it is removed.

7. Discard the oil filter and O-Ring.
8. Clean the filter head with a lint free cloth.

CAUTION

CAUTION - The oil filter must be filled with the correct grade of oil before installation.

9. Smear a film of oil onto the new O-Ring.
10. Position the filter bowl to the centre of the filter head.
11. Tighten the filter by hand. When the filter makes contact with the filter head, turn it another $\frac{1}{3}$ to $\frac{1}{2}$ turn.

**NOTES:**

After replacing the oil filter and replenishing the engine oil allow the engine to run at low idle for at least one minute.

Fill the Engine with Oil

1. Clean the oil filler cap and the area around it.
2. Unscrew and remove the oil filler cap.
3. Place a funnel into the oil filler.
4. Fill with oil until the oil level is on the FULL mark on the dipstick. Refer to section "Specifications for the recommended oil".

CAUTION

CAUTION - Do not overfill the engine with oil.

5. Check continuously during the filling procedure to ensure that the engine oil reaches the FULL mark on the dipstick.
6. Remove the funnel and clean any oil spillage.

CAUTION

CAUTION - Re-fit the oil filler cap securely.

CAUTION

CAUTION - The oil filter must be filled with the correct grade of oil before installation.



Check the Oil Filler Cap and Seal

1. Whenever the oil filler cap is removed, check for any visible damage.
2. Clean the seal and the inside of the oil filler cap.



3. Ensure that the seal (1) and cap are not damaged.
4. Ensure that the oil filler cap seals tightly when replaced.

Change the Fuel Filters

Change the Primary Fuel Filter



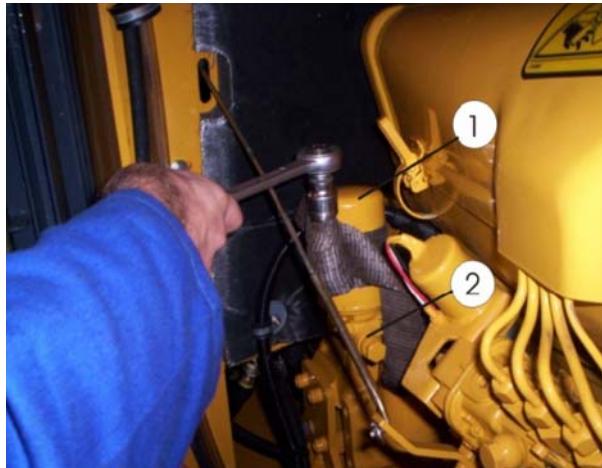
1. Fit a hose clamp on the fuel hose (1) between the fuel tank and the primary fuel filter to stop the fuel flow.



2. Clean the area around the primary fuel filter head (1).
3. Unscrew and remove the primary filter (2) from the filter head.
4. Discard the primary filter, do not re-use. Clean the filter head with a lint free cloth.
5. Smear a little oil on the seal and secure the new primary fuel filter in place.
6. Remove the hose clamp from the fuel hose.

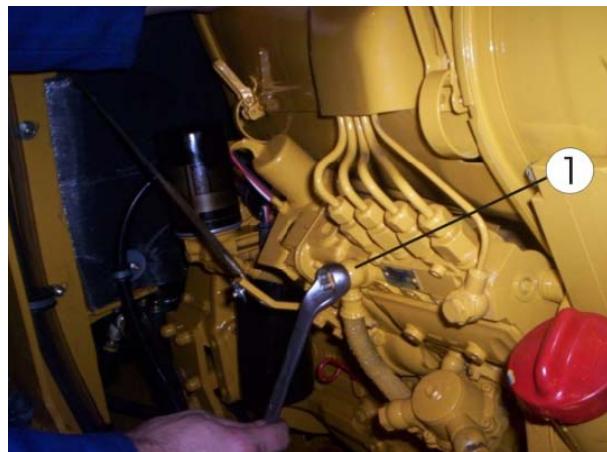
FIRST 100 HOUR SERVICE

7. Bleed the fuel system. Refer to Bleed the Fuel System in this chapter.
8. Start the engine and check for leaks at the fuel filter head.

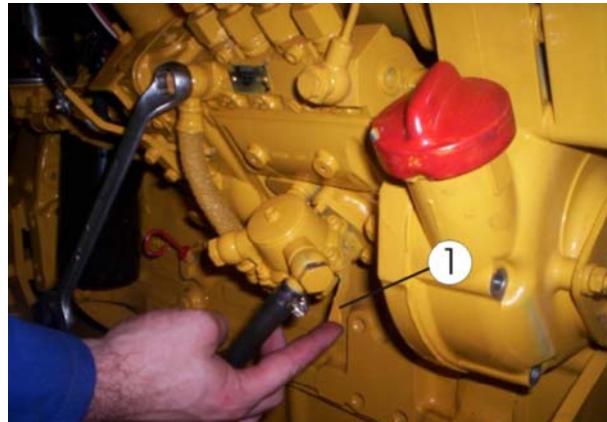
Change the Secondary Fuel Filter

1. Clean the area around the secondary fuel filter head (1).
2. Unscrew and remove the secondary fuel filter (2) from the filter head.
3. Discard the O-Ring.
4. Discard the secondary fuel filter, do not re-use.
5. Smear a little clean lubricating oil on the sealing ring of the new secondary fuel filters.
6. Re-fit the new secondary fuel filters and O-Rings to the filter head.
7. Tighten the secondary fuel filters by hand and the one half turn further.
8. Bleed the fuel system. Refer to Bleed the Fuel System in this chapter.
9. Start the engine and check for leaks at the fuel filter head.

1. Ensure that there is at least a quarter tank of fuel in the tank.



2. Unscrew the bleed screw (1) two or three turns.



3. Operate the hand priming pump (1) until an air free flow of fuel flows from the bleed point.
4. Tighten the bleed screw (9 Nm {7 ft lb}).

Bleed the Fuel System

The fuel system must be bled after performing certain services. This ensures that any air that may have entered the fuel system is expelled.

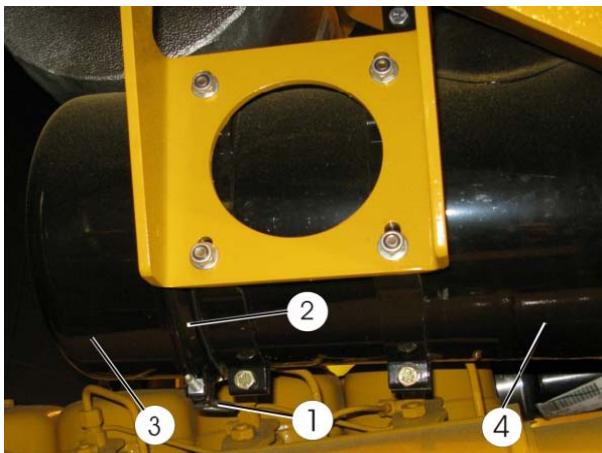
**CAUTION**

CAUTION - If the fuel tank has been re-filled after it has been drained or allowed to run empty, it is important to bleed the fuel system before attempting to start the engine.



Change the Air Cleaner Filter Elements

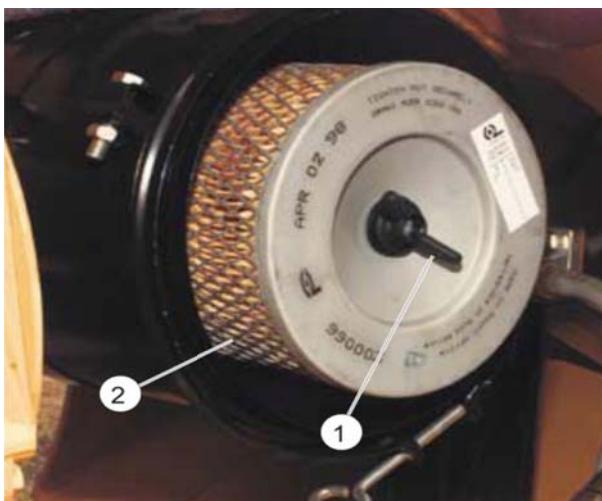
Change the Primary Filter Element



1. Unscrew the T-bolt (1) securing the clamp (4) to the end cover (2) and filter housing (3).
2. Remove the clamp from the end cover.
3. Remove the end cover from the filter housing.



7. Remove the baffle (1) from the end cover (2).
8. Clean the baffle, end cover and the inside of the air cleaner housing. Inspect for damage.
9. Install a new primary filter element into the air cleaner housing and then secure with the wing nut and seal. Do not over tighten the wing nut.
10. Inspect the baffle for damage, replace if necessary.



4. Unscrew and remove the wing nut (1) and seal securing the primary filter element inside the filter housing.
5. Remove the primary filter element (2) from the filter housing.
6. Discard the primary filter, do not re-use.

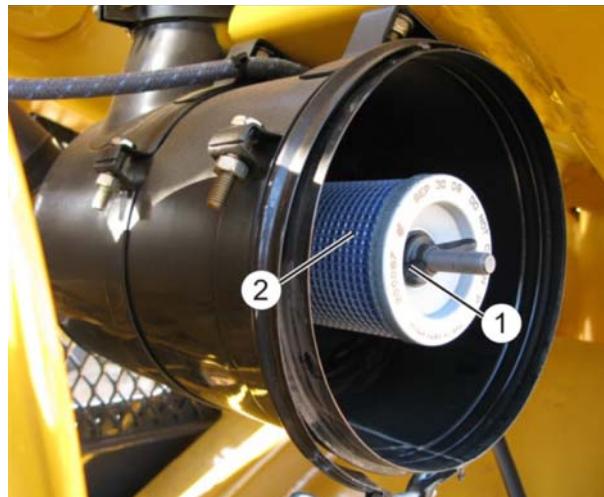
CAUTION

CAUTION - Replace the end cover as indicated on the outside of the end cover.

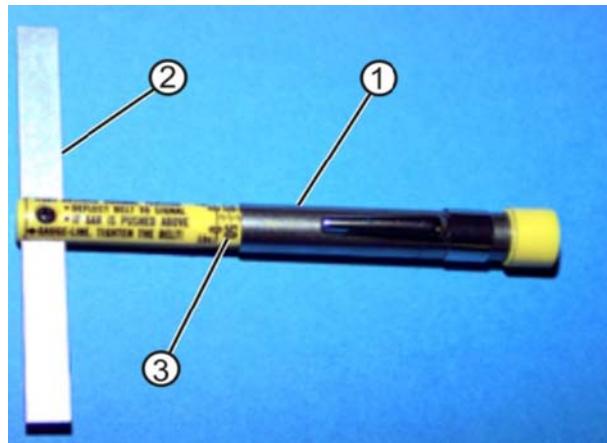
11. Install the end cover with the baffle onto the air cleaner housing securing it with the clamp.

Change the Safety Filter Element

1. When the primary filter element is changed for the third time, the safety filter element must also be changed.
2. Remove the primary filter element. Refer to "Change the Primary Filter Element" in this chapter.
3. Remove the wing nut (1) and seal securing the safety filter element (2) to the filter housing (3).



4. Remove the safety filter element from the air cleaner housing and discard.
5. Install a new safety filter element into the air cleaner housing and secure with the wing nut and seal. Do not over tighten the wing nut.



1. Unscrew the sleeve (1) and release the feeler bar (2).
2. Place the feeler bar in the perpendicular position.
3. Pull the feeler bar down.
4. Set the tension for measuring new or old drive belts by turning the sleeve to the required mark on the scale (3).
5. Position the tension tester feeler bar on the middle of the drive belt.
6. Press down on the tension tester until the touch signal is felt at the top of the cap.
7. Carefully remove the tension tester from the drive belt and read the scale.

Check and Adjust the Drive Belt Tensioning

Check the Drive Belt Tension



NOTES:

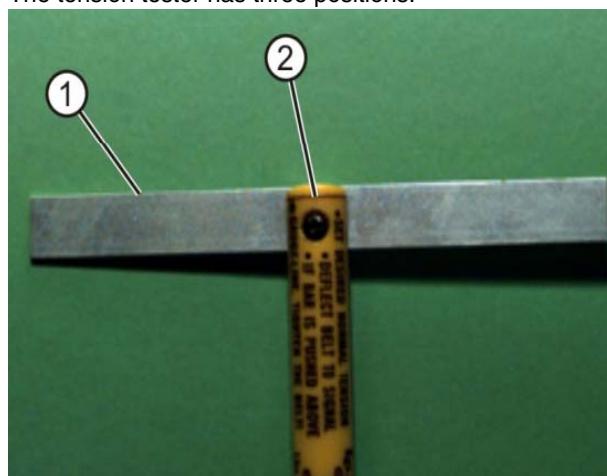
The following procedure is applicable to the alternator and air conditioning compressor drive belts.

The drive belt tension should be:

- New belts: 40 to 45 kg (88 to 99 lb).
- Old belts: 30 to 40 kg (66 to 88 lb).

Use an automotive tension tester to measure the drive belt tension.

The tension tester has three positions:



- If the bottom of the feeler bar (1) is on the gauge line (2), the belt tension is correct.
- If the bottom of the feeler bar (1) is below the gauge line (2), the belt tension is too tight.
- If the bottom of the feeler bar (1) is above the gauge line (2), the belt tension is too loose.

If the correct reading is not obtained, adjust the drive belts.

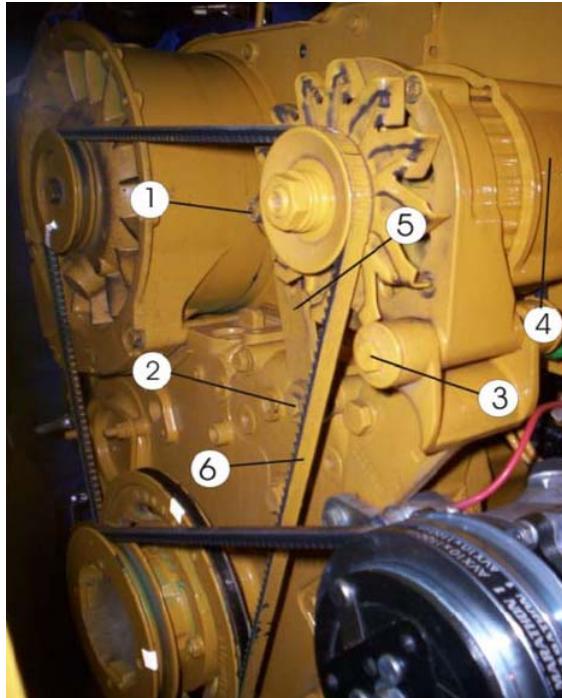


NOTES:

If the correct alternator belt tension cannot be attained it may be necessary to replace the belt tensioner.

Adjust the Drive Belt Tension

Adjust the Alternator / Blower Drive Belt

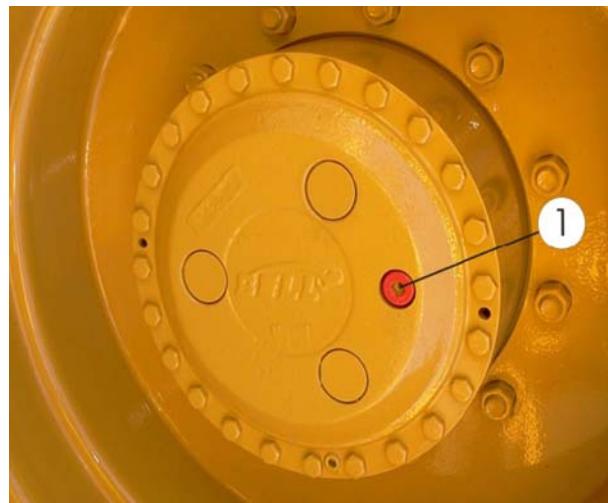


3. Loosen the adjusting bolts (1, 2 and 3) and manually move the alternator (4) up or down on the bracket (5) to obtain the correct tension to the drive belt (6).
4. Secure the adjusting bolts and measure the tension.

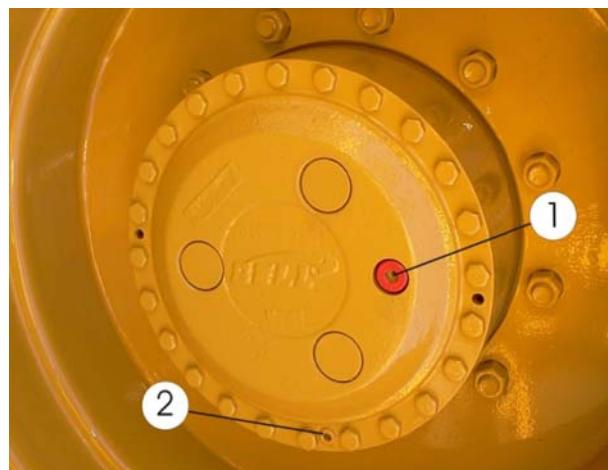
Wheel Motors, Wheels and Tail Wheel

Change the Oil in the Final Drive

Drain the Final Drive



1. Drive the machine forward or backward until the filler plug (1) on the right side final drive is in the 3 O'clock position. The word **AARD** in the horizontal position. Drain plug (2) will be at the 6 O'clock position.



2. Unscrew and remove the filler plug (1).
3. Unscrew and remove the drain plug (2) and allow the oil to drain into a 5 litre (1.3 USGAL) container.
4. Clean the drain plug and apply Lock tight 572 to the threads.
5. Install the drain plug into the final drive.

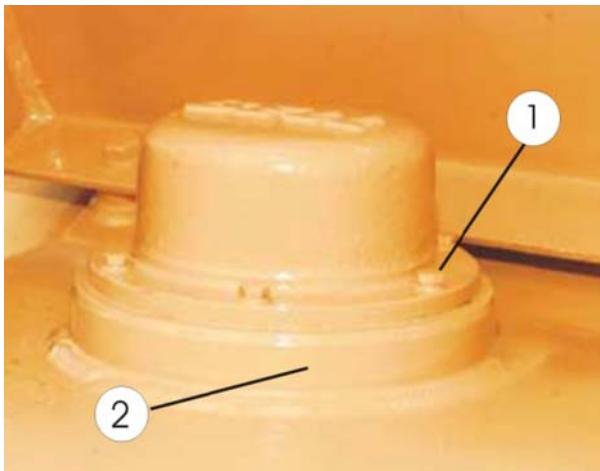
FIRST 100 HOUR SERVICE

Check and Adjust the Tail Wheel Spindle Bearing

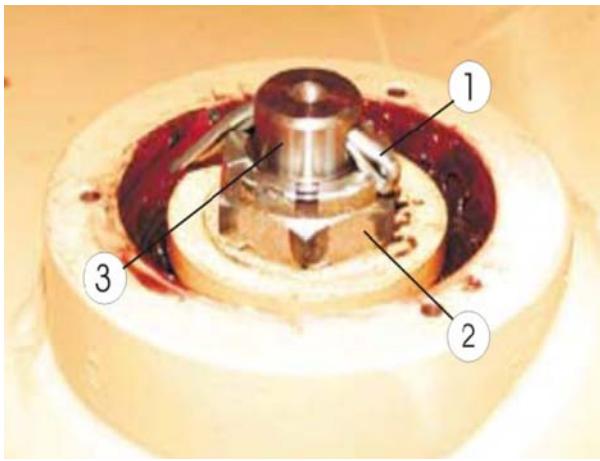


The procedure is the same for right and left bearing.

1. Lift the tail wheel clear of the ground and place the rear of the machine onto a suitable stand.



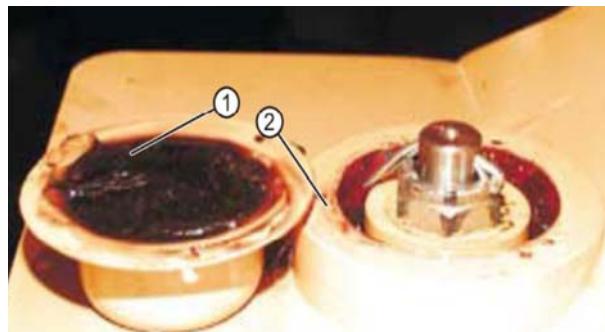
2. Unscrew and remove the bolts (1) securing the cover (2) to the machine.
3. Remove and clean the inside of the cover.
4. Clean the area around the castle nut and split pin.



5. Remove the split pin (1) from the castle nut (2) and spindle shaft (3).
6. Discard the split pin.
7. Tighten the castle nut.
8. Turn the tail wheel assembly by hand.

9. The following observations and adjustments should be made:

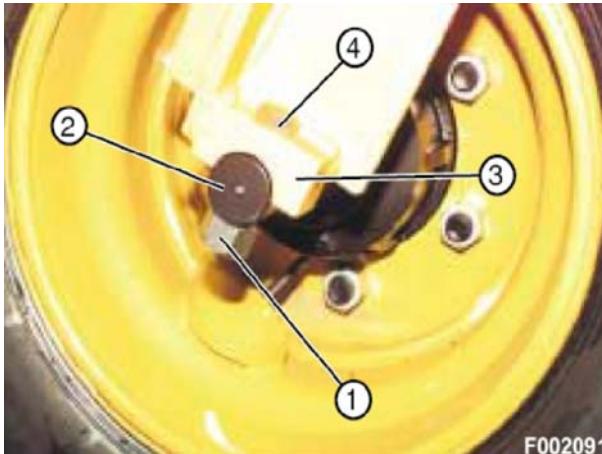
- If the tail wheel assembly turns with a reasonable amount of effort, then no adjustment is required.
 - If the tail wheel assembly turns freely, replace the bearings. Refer to "As Required Service: Replace the Tail Wheel Spindle Bearings" section for procedures.
 - If the tail wheel assembly is very difficult or fails to turn, replace the bearings. Refer to "As Required Service: Replace the Tail Wheel Spindle Bearings" section for the procedures.
10. Install a new split pin into the castle nut.



11. Fill the inside of the cover (1) and the recess around the castle nut (2) with clean grease. Refer to "Specifications for Recommended Lubricants" section.
12. Place the cover over the spindle and secure in position with the bolts.
13. Lift the rear of the machine, remove the stand and then lower the machine to the ground.

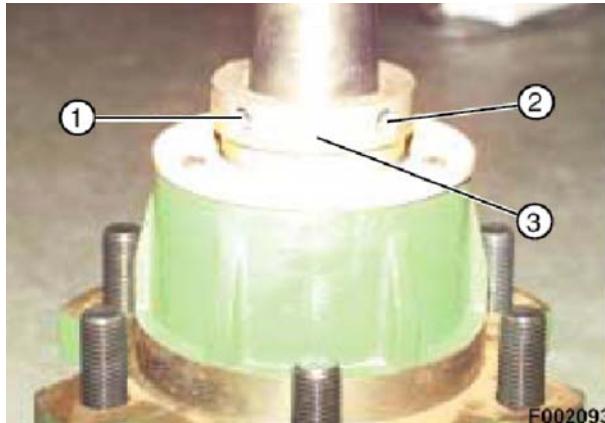
Check and Adjust the Tail Wheel Axle Bearing

1. Lift the tail wheel clear of the ground and place the rear of the machine on a suitable stand.
2. Position on a trolley jack (or similar) under the tyre.
3. Raise the trolley jack until it touches against the underside of the tyre.



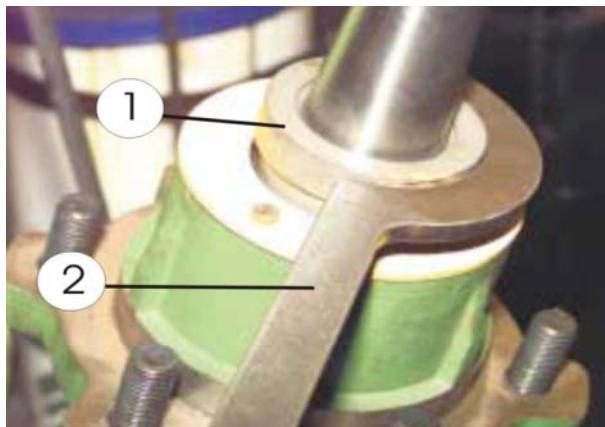
F002091

4. Unscrew and remove the nuts (1) on both sides securing the axle (2) to the fork assembly (3).
5. Carefully remove the bolts (4) from the axle.
6. Slowly lower the trolley jack and remove the tail wheel from the fork assembly.

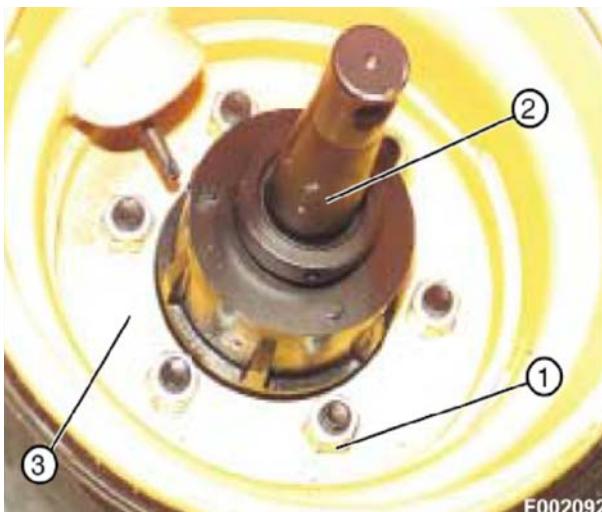


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9. Loosen the grub screws (1 and 2).

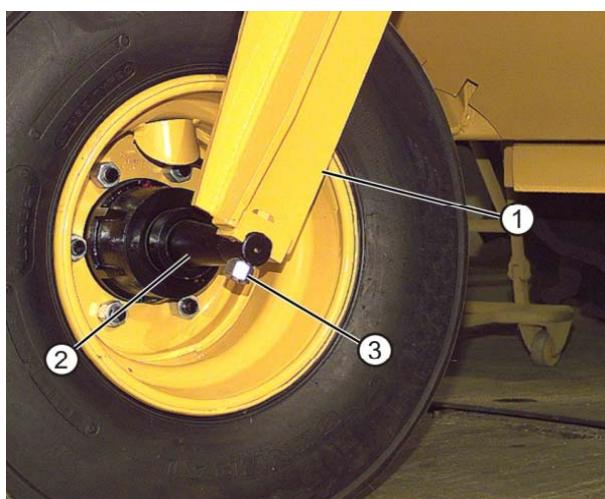


10. Tighten the tail wheel nut (1) using a C-spanner (2).
11. Tighten the grub screws in the tail wheel nut.
12. Install the axle assembly in the wheel.



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7. Unscrew and remove the nuts (1) securing the axle (2) to the wheel hub (3).
8. Remove the axle from the hub.



13. Position the fork assembly (1) so that it points to the rear of the machine.



FIRST 100 HOUR SERVICE

14. Ensure that the tail wheel nut (2) is on the right side of the machine.
15. Secure the wheel assembly to the fork assembly with the nuts (3).

The following observations and adjustments should be made:

- If the tail wheel turns with a reasonable amount of effort, then no adjustment is required.
- If the tail wheel assembly turns freely, replace the bearings. Refer to "As Required Service: Replace the Tail Wheel Axle Bearings" section for the procedures.
- If the tail wheel assembly is very difficult or fails to turn, replace the bearings. Refer to "As Required Service: Replace the Tail Wheel Axle Bearings" section for the procedures.

Lift the rear of the machine, remove the stand and then lower the machine to the ground.

Hydraulics



NOTES:

The machine must be parked on firm level ground and in the service position.



CAUTION

CAUTION - Only Automatic Transmission Fluid (ATF) must be used in the hydraulic system.

Recycle the Hydraulic Fluid and Change the Filter

Drain and Recycle the Hydraulic Fluid



NOTES:

The hydraulic fluid is easier to drain when the hydraulic fluid is at normal operating temperature (60°C to 70°C {140°F to 158°F}).

WARNING

WARNING - Be careful when draining the hydraulic fluid. Hot fluid can cause burns to unprotected skin.

Ensure that the hydraulic fluid has reached normal operating temperature.

Replenish the Hydraulic Fluid

1. Clean the drain plugs and apply Lock Tight 572 to the threads.
2. Install the drain plugs.
3. Replenish the hydraulic tank with clean hydraulic fluid. Refer to "Specifications for Recommended Fluid" section for the procedures.



Change the Charge Filter

1. Clean the area around the charge filter.



2. Unscrew and remove the charge filter (1).



NOTES:

The O-Ring may stick to the filter head (2), ensure that it is removed.

3. Discard the filter and O-Ring.



CAUTION

1. Only **AARD** filters are to be used. **AARD Mining Equipment** filters have the correct micron filtration rating for the hydraulic system.
The charge filter must be filled with the correct grade of automatic transmission fluid before installation.

2. Fill the charge filter with automatic transmission fluid.
3. Refer to "Specifications for Recommended Fluid" section for the procedure.
4. Smear a film of oil onto the new O-Ring.
5. Install the charge filter into the filter head and tighten by hand.
6. When the charge filter makes contact with the filter head, turn a further $\frac{1}{3}$ to $\frac{1}{2}$ turn.
7. Replenish the hydraulic fluid. Refer to "Replenish the Hydraulic Fluid" section for the procedure.
8. Operate the machine and check for leaks at the filter head, re-tighten if necessary.

SERVICE & CHECKS

FIRST 100 HOUR SERVICE



 NOTES:



CHAPTER 8. 250 HOURS INTERVAL SERVICE

Introduction

This chapter provides information for the service of the machine every 250 hours.

The 250 hours service must be performed when the machine has operated for 250 hours and the service must be repeated every 250 hours thereafter.

Every 250 hours service must be performed by qualified service personnel.

Ensure that the machine is in the service position. Refer to "Pre-Service Instructions".

Perform all the Daily or 10 Hourly Service Checks.

Perform the following additional tasks:

Engine



NOTES:

For further engine information or details not shown in this manual, refer to the "W Spec Engine" Operation Manual.

Change the Oil and Oil Filters.

Procedures described in Chapter 7.

Clean the Fuel Screen.

Procedures described in Chapter 7.

Check and Adjust the Drive Belts Tensioning.

Procedures described in Chapter 7.

Hydraulics

Change the Charge Filter

Procedures described in Chapter 7.

Wheel Motors, Wheels and Tail Wheel

Check the Final Drive Oil Level



- Drive the machine forward or backward until the filler plug (1) on the left side final drive (2) is in the 3 O'Clock position. The work **AARD** in the horizontal position.
1. Unscrew and remove the filler plug.
 2. The oil level must be level with the bottom of the filler hole. Top up the oil if necessary.
 3. Replace the filler plug.
 4. Repeat the procedure for the right side final drive oil level.

SERVICE & CHECKS

250 HOURS INTERVAL SERVICE



 NOTES:



CHAPTER 9. 500 HOURS INTERVAL SERVICES

Introduction

This chapter provides information for the service of the machine every 500 hours.

The 500 hours service must be performed when the machine has operated for 500 hours and the service must be repeated every 500 hours thereafter.

Every 500 hours service must be performed by qualified service personnel.

Ensure that the machine is in the service position. Refer to "Pre-Service Instructions" section.

Perform all the Daily or 10 Hourly Service Checks and the 250 Hours Service Checks.

Perform the following additional tasks:

Engine

Adjust the Valve Clearance

Refer to the "W-Spec Engine" operation manual for the procedures. If in doubt, contact your nearest **AARD Mining Equipment** Representative.

Change the Fuel Filters

Procedures described in Chapter 7.

SERVICE & CHECKS

500 HOURS INTERVAL SERVICES



 NOTES:



CHAPTER 10. 1 000 HOURS INTERVAL SERVICE

Introduction

This chapter provides information for the service of the machinery every 1 000 hours.

The 1 000 hours service must be performed when the machine has operated for 1 000 hours and the service must be repeated every 1 000 hours thereafter.

Every 1 000 hours service must be performed by qualified service personnel.

Ensure that the machine is in the service position. Refer to "Pre-service Instructions" section.

Perform all the Daily or 10 Hourly Service Checks, the 250 Hours and 500 Hours Service Checks.

Perform the following additional tasks:

Engine



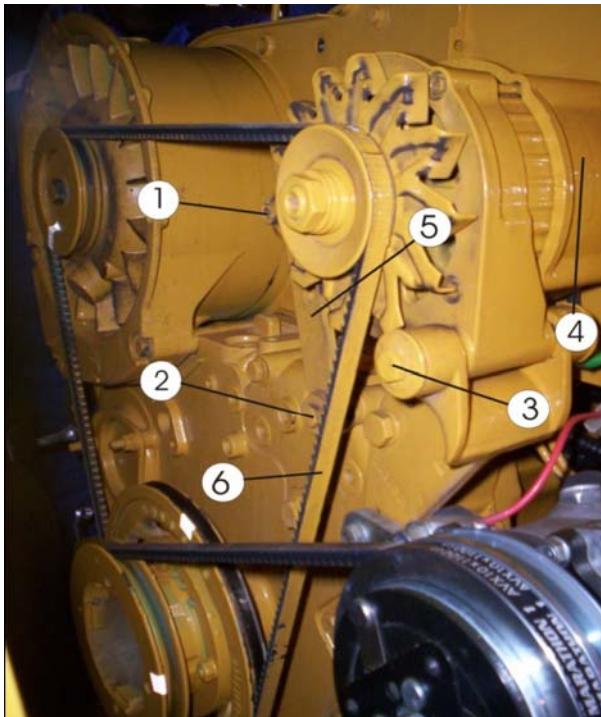
NOTES:

For further engine information or details not shown in this manual, refer to the "W Spec Engine" Operation Manual.

Change the Drive Belts

Change the Alternator / Blower Drive Belt

Removal



1. Loosen the adjusting bolts (1, 2 and 3) and manually move the alternator (4) up to loosen the drive belt (5).
2. Remove the drive belt from the alternator engine drive pulley (6) and the blower.

Installation

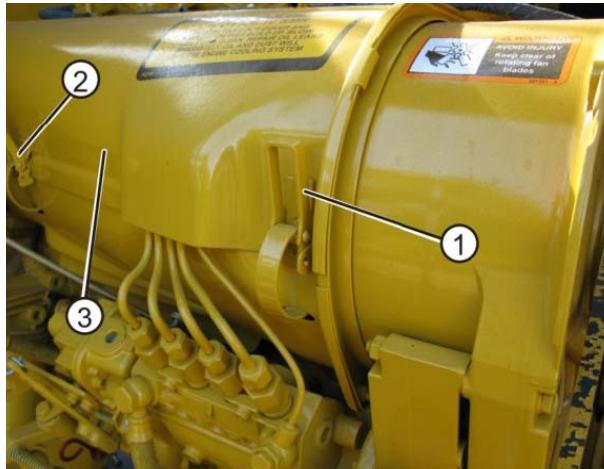
3. Place the blower drive belt onto the tensioning pulley and the engine drive pulley.
4. Push the engine cut-out striker plate on the automatic tensioning pulley upwards and hold in position.
5. Place the drive belt onto the blower pulley and carefully release the engine cut-out striker plate.
6. Place the alternator drive belt onto the alternator pulley and engine drive pulley.
7. Tension the drive belt. Refer to Chapter 7 "Check the Drive Belt Tensioning".



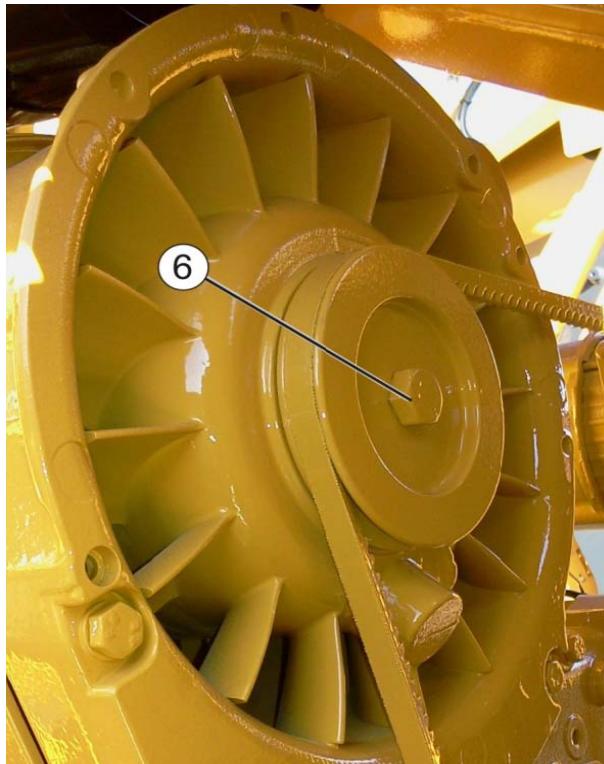
Change the Blower Fan Bearings

Removal

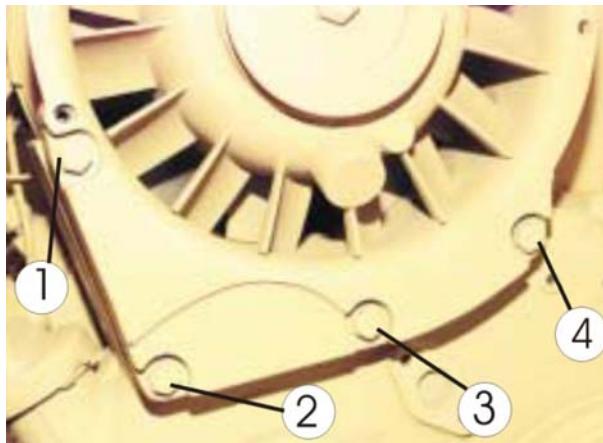
Remove the blower drive belt from the blower pulley. Refer to Change the Blower Drive Belt (previous procedure).



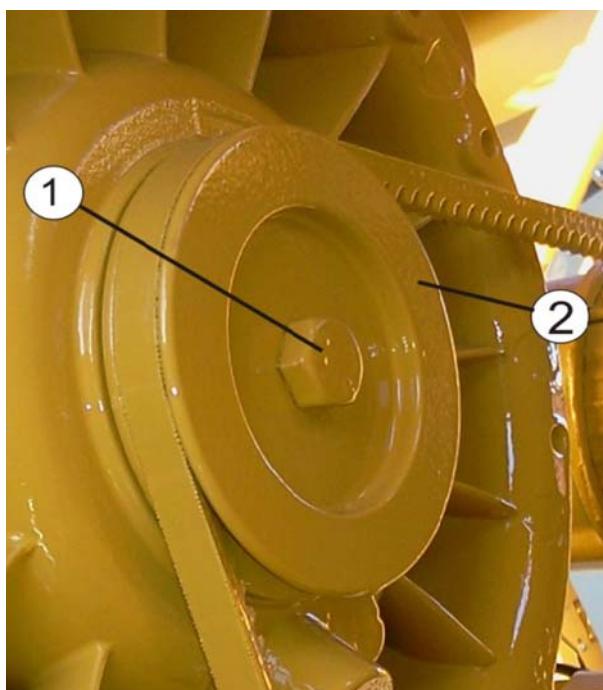
- Release the clips (1 and 2) securing the cowling cover (3) to the engine.



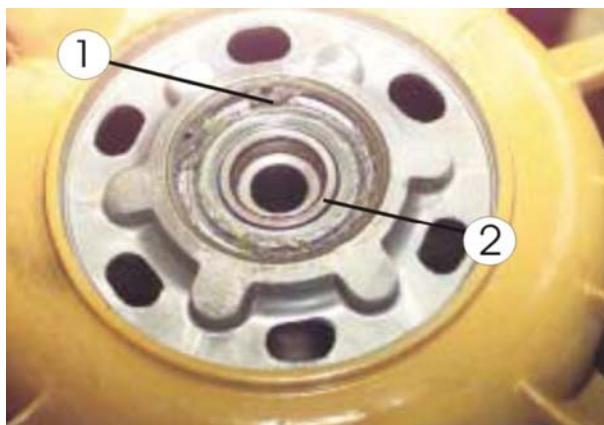
- Loosen the nut (1) securing the blower pulley assembly in position.



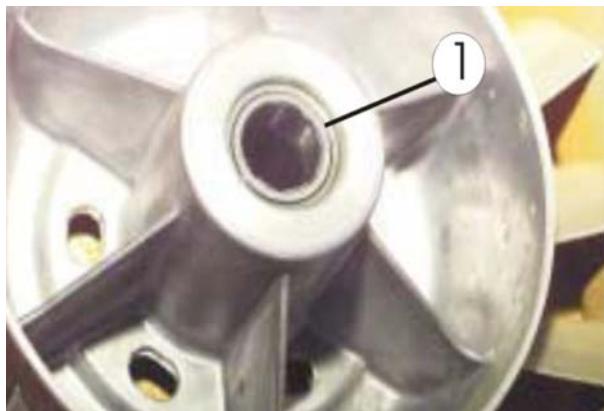
- Unscrew and remove the bolts (1, 2, 3 and 4) securing the blower engine.
- Remove the blower from the engine.



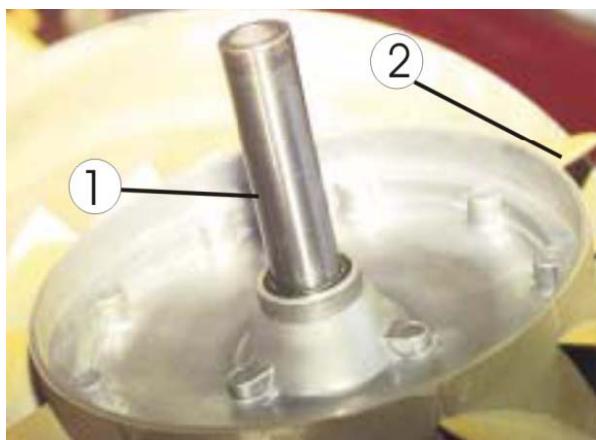
- Unscrew and remove the nut on the inside of the blower then remove the bolt (10) securing the pulley (2) to the blower.
- Remove the pulley assembly from the blower.
- Remove the impeller from the blower housing.



8. Remove the cir-clip (1) securing the front bearing in position.
9. Remove the bearing and discard.



10. Remove the rear bearing (1) and discard.



11. Inspect the shaft (1) for damage.
12. Inspect the impeller blade (2) for damage.

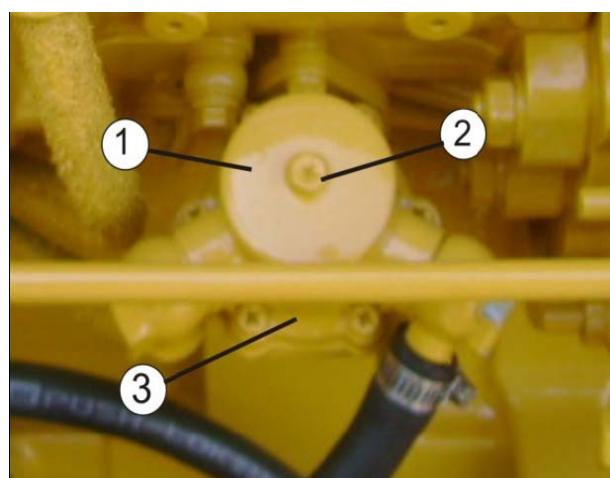
Installation

13. Clean the blower pulley assembly and impeller.
14. Install new bearings into the impeller.
15. Secure the front bearing in position with the cir-clip.
16. Install the impeller into the blower housing.
17. Install the pulley assembly and secure in position with the nut.

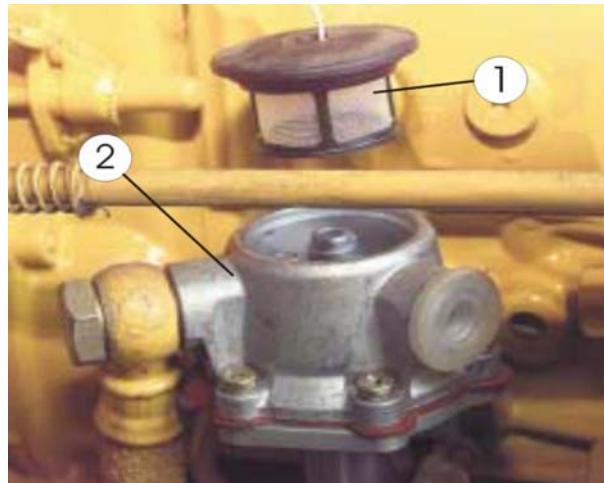
Clean the Fuel Feed Pump Strainer



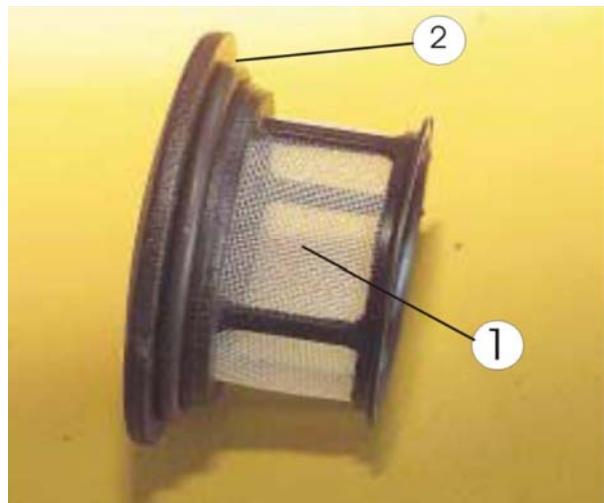
1. Fit a hose clamp on the fuel hose (1) between the fuel tank and the primary fuel filter to stop the fuel flow.



2. Unscrew and remove the bolt (1) securing the cover (2) to the fuel feed pump (3).

1 000 HOURS INTERVAL SERVICE

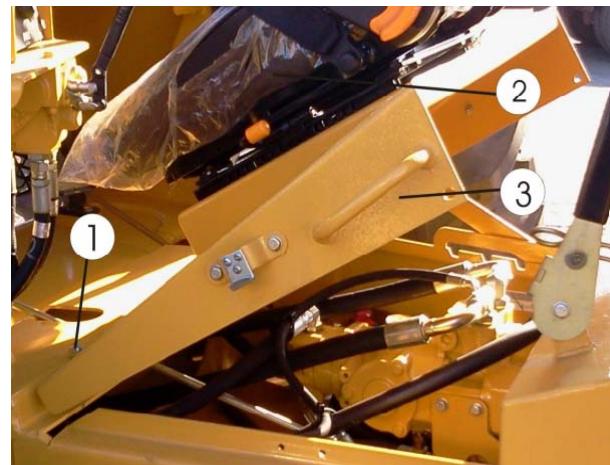
3. Remove the cover and strainer (1) from the fuel feed pump (2).
4. Clean the strainer.



5. Inspect the strainer (1) and O-Ring (2) for damage.
6. Replace the cover and strainer and secure in position with the bolt.
7. Remove the hose clamp from the fuel hose.

Change the Bowex Coupling Between Engine and Transmission

Removal



1. Remove the bolts (1) holding the seat (2) and its mounting platform (3) to gain access to the pump and engine assembly.



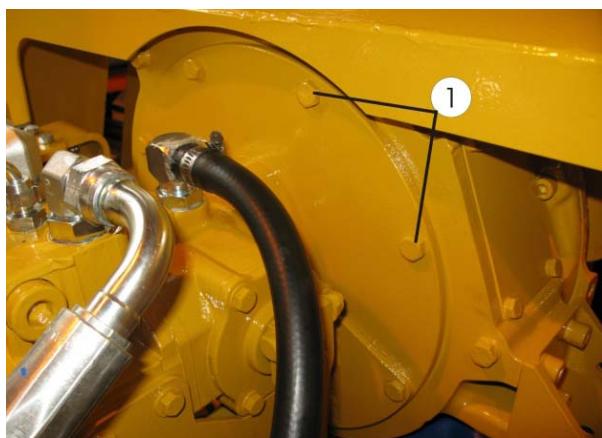
2. Remove all hoses.



3. Remove the right and left foot pedal linkages (1).



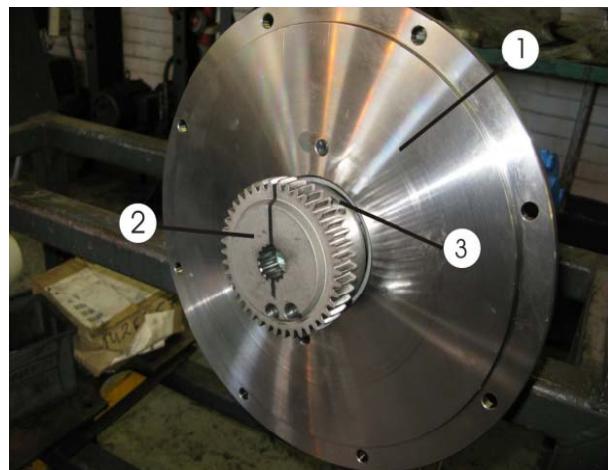
4. Using a sing, rig the hydraulic pump using a chain block.



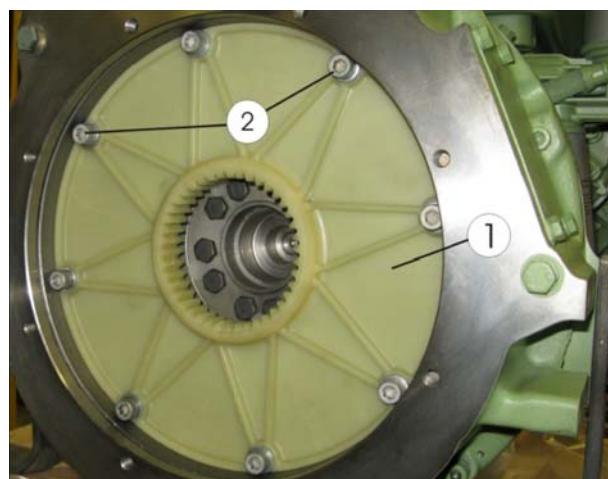
5. Remove the eight bolts (1) holding the adapter plate fixed to the engine.

NOTES:

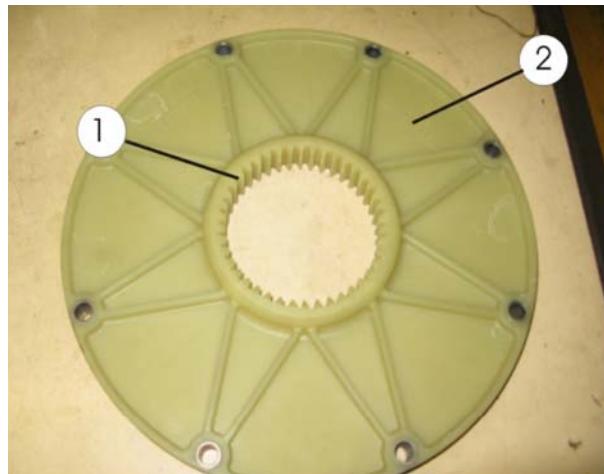
The pump is fixed to the adapter plate and will separate from the engine with the bracket sill bolted to the pump.



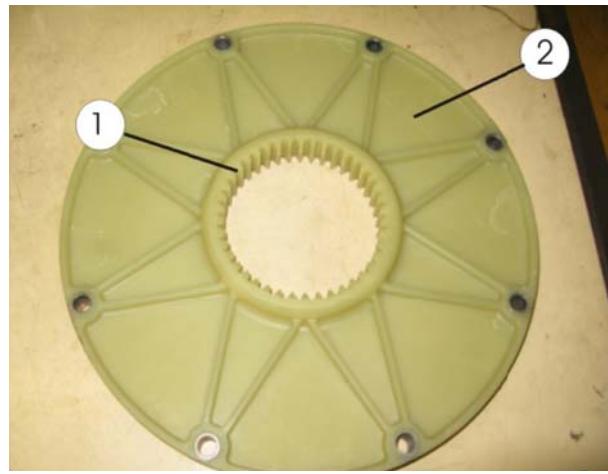
6. Once the Pump is off the engine, move it to a suitable work bench. Inspect the adapter plate (1) for signs of stress or damage. Inspect the gear (2) teeth for excessive wear or broken teeth and ensure that the grub screw (3) is tight.



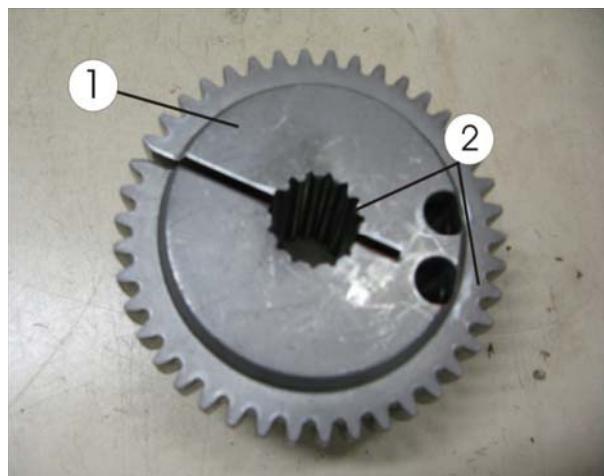
7. Remove the Bowex Coupling (1) from the engine fly wheel, by opening the eight bolts holding the coupling to the fly wheel (2).

1 000 HOURS INTERVAL SERVICE

8. Inspect the Bowex Coupling for signs of stress, excessive wear to the teeth (1) or damage to the surface (2).



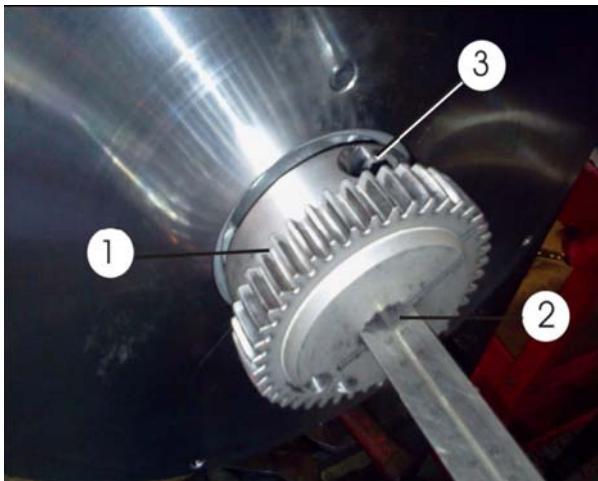
2. Obtain a new Bowex Coupling. Inspect the teeth (1) for damage and the surface (2) for scuff marks or cracks that may have been caused while in storage.

Installation

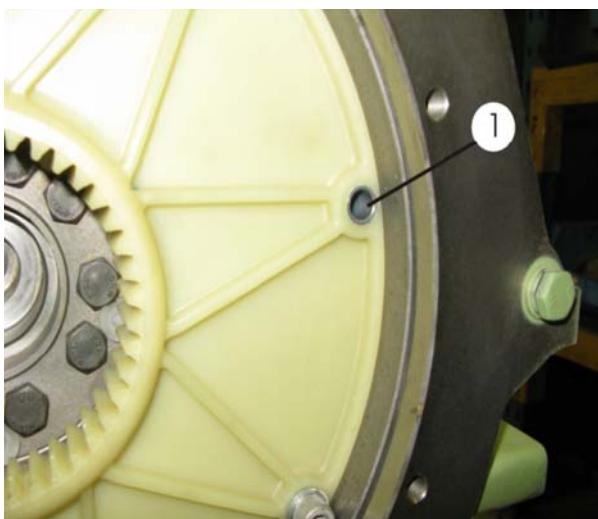
1. Obtain a new Gear (1). Inspect the gear teeth (2) to ensure that they are not damaged.



3. Test fit / Mesh the new gear to the Bowex coupling to ensure that they fit correctly.



- Fit the new gear to the pump shaft, using a steel rule (2) or a depth gauge. Measure the depth that the gear is tightened at (21mm) from the end of the pump shaft to the outside of the gear. Tighten the gear grub screw using a torque wrench (95 Nm) in order to hold it in place.



- Install the new Bowex coupling by placing the coupling against the fly wheel and align the bolt hole on the coupling to the fly wheel (ensure that the side marked 1 is facing the fly wheel), and then bolt the coupling to the fly wheel.



- Using a sling, rig the pump so that it could be fitted to the engine.

1 000 HOURS INTERVAL SERVICE



7. Align the gear teeth to that of the Bowex coupling and gently slide the pump in until the adapter plate meets the engine housing.



8. Align the bolt hoses 91) on the plate to that of the engine housing, using 2 bolts to pull the adapter plate and the engine housing together.



NOTES:

Apply a generous amount of Lock tight 507 to the bolts before tightening them - to a torque of 49 Nm.

Rotator and Boom

Check and Clean the Rotator Magnetic Plug

Procedures described in Chapter 7.

Check the Boom Pins and Bushes



1. Inspect all the boom pins and bushes (1) for damage. If necessary contact your nearest **AARD Mining Equipment** Representative for the service instructions.



Check the Cylinder Pins and Bushes

Cylinder End



2. Inspect the boom cylinder pins (2) and bushes for damage. If necessary contact your nearest **AARD Mining Equipment** Representative for the service instructions.

Bar End



3. Inspect the boom cylinder pins (3) and bushes for damage. If necessary contact your nearest **AARD Mining Equipment** Representative for the service instructions.



 NOTES:



CHAPTER 11. 2 000 HOURS INTERVAL SERVICE

Introduction

This chapter provides information for the service of this machine every 2 000 hours.

The 2 000 hours service must be performed when the machine has operated for 2 000 hours and the service must be repeated every 2 000 hours thereafter.

Every 2 000 hours service must be performed by qualified service personnel.

Ensure that the machine is in the service position. Refer to Pre-Service Instructions section.

Perform all the Daily or 10 Hourly Service Checks and the 250, 500 and 1 000 Hours Service Checks.

Perform the following additional tasks:

Wheel Motors, Wheels and Tail Wheel

Strip and Check the Final Drive

The final drive planetary must be serviced every 2 000 hours.

Contact your nearest **AARD Mining Equipment** Representative for the service instructions.

Hydraulics

Change the Hydraulic Fluid and Filters

Drain the Hydraulic Fluid



NOTES:

The hydraulic fluid is easier to drain when the hydraulic fluid is at normal operating temperature (60°C to 70°C {140°F to 158°F}).

WARNING

WARNING - Be careful when draining the hydraulic fluid. Hot fluid can cause burns to unprotected skin.

Ensure that the hydraulic fluid has reached normal operating temperature.

Remove the Hydraulic Filters

1. Place a 20 litre (5.3 USGAL) container under the hydraulic filter housing on the right of the machine and one under the filler under the floor panel.
2. Unscrew and remove the charge hydraulic fluid filter (1).



3. Unscrew and remove the hydraulic fluid filler(1) that is situated under the floor panel.



Replenish the Hydraulic Fluid

1. Clean the drain plugs and apply Lock tight 572 to the threads.
2. Install the drain plugs.
3. Replenish the hydraulic tank with clean hydraulic fluid. Refer to chapter "Specifications for recommended fluid".

Change the Charge Filter

1. Clean the area around the charge filter.
2. Unscrew and remove the charge filter (1).



NOTES:

The O-Ring may stick to the filter head (2), ensure that it is removed.

3. Discard the filter and O-Ring.

CAUTION

CAUTION - Only **AARD Mining Equipment** filters should be used. **AARD Mining Equipment** filters have the correct micron filtration rating for the hydraulic system. The charge filter must be filled with the correct grade of automatic trans-mission fluid before installation.

- Fill the charge filter with automatic transmission fluid.
4. Refer to "Specifications for Recommended Fluid" Section.
 5. Smear a film of oil onto the new O-Ring.
 6. Install the charge filter into the filter head and tighten by hand.
 7. When the charge filter makes contact with the filter head, turn a further $\frac{1}{3}$ to $\frac{1}{2}$ turn.
 8. Replenish the hydraulic fluid. Refer to Replenish the Hydraulic Fluid in this chapter.
 9. Operate the machine and check for leaks at the filter head, re-tighten if necessary.

Replenish the Hydraulic Fluid

1. Clean the drain plugs and apply Lock Tight 572 to the threads.
2. Install the drain plugs.
3. Install the hydraulic filters. Refer to Chapter 7 for the procedures.
4. Replenish the hydraulic system with the correct grade of fluid. Refer to Specifications chapter.



CHAPTER 12. 3 000 HOURS INTERVAL SERVICE

Introduction

This chapter provides information for the service of the machine every 3 000 hours.

The 3 000 hours service must be performed when the machine has operated for 3 000 hours and the service must be repeated every 3 000 hours thereafter.

Every 3 000 hours service must be performed by qualified service personnel.

Ensure that the machine is in the service position. Refer to "Pre-Service Instructions" section.

Perform all the Daily or 10 Hourly Service Checks and the 250, 500, and 1 000 Hours Service Checks.

Perform the following additional tasks:

Engine



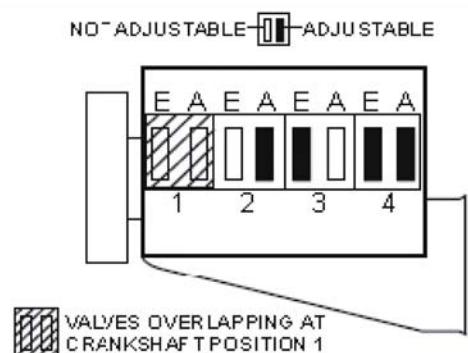
NOTES:

For further engine information or details not shown in this manual, refer to the "W Spec Engine" Operation Manual.

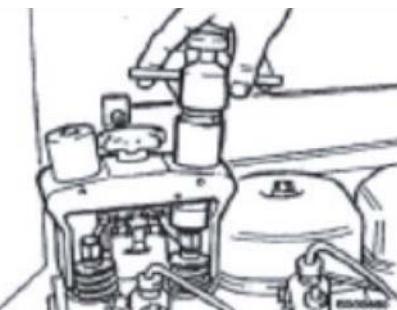
Check and Adjust the Engine Valve Clearance

Top Dead Centre Check and Adjustment

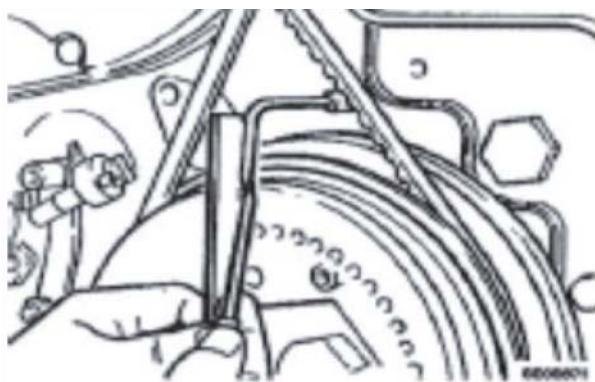
1. Remove the rocker cover from No. 1 cylinder head.



2. Turn the crank shaft until the valves overlap, then turn the crank shaft an other half-revolution.



3. Extend the dowel sleeve vertically down, using a piece of wire to form a pointer to the crankshaft pulley.



4. Install a setting tool on the No. 1 cylinder head and use the pressure screw to depress the rocker arm approximately 6 mm.

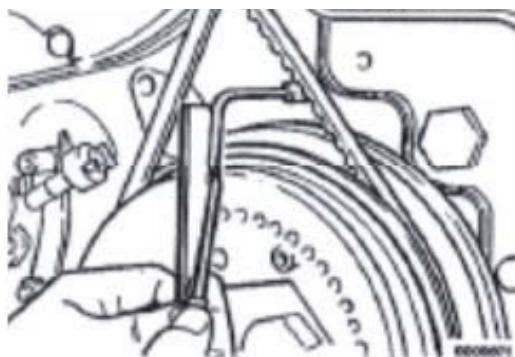


5. Fit the dial gauge with pre-load on the setting tool.
6. Carefully turn the crankshaft until the piston pushes the valve upwards.

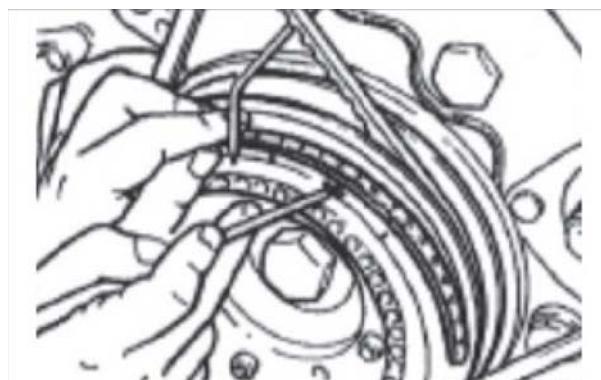


3 000 HOURS INTERVAL SERVICE

7. Continue to turn the crankshaft until the indicator on the dial gauge changes direction.
8. Reset the dial gauge to zero.
9. Back the crankshaft through one revolution of the dial gauge indicator, then turn the crankshaft forward up to 0.1 mm ahead of the previously determined zero.



10. Mark the V-belt pulley opposite the fixed pointer.
11. Turn the crankshaft until the indicator on the dial gauge changes direction and continue to turn slowly until the dial gauge indicator has moved through one revolution.
12. Turn the crankshaft back up to 0.1 mm ahead of the previously determined zero on the dial gauge indicator.
13. Mark the second position on the V-belt pulley opposite the fixed pointer.



14. Using a steel rule, mark the middle position between the two marks. This mark indicates the top dead centre.



NOTES:

**This mark must correspond with the fixed pointer
No. 1 cylinder to be at the top dead centre.**

15. Remove pointer, setting tool and dial gauge.
16. Replace rocker cover on No. 1 cylinder head and torque bolt to 12 Nm.

Adjusting the Engine Valve Clearance

1. Clean the area around the tappet covers carefully before removing them.
2. To adjust the engine valve clearance when the engine is cold, set both inlet and exhaust to 0.15mm.



NOTES:

If sufficient time has not elapsed to allow the engine to cool to ambient temperature, then the valve clearances may be set while the engine is still hot.

3. To adjust the engine valve clearance when the engine is hot, but after a minimum cooling period of 30 minutes, set both inlet and exhaust to 0.2 mm.
4. Use the following sequences to adjust all the valves at two engine positions.
5. Remove air cleaner. Clean between the cylinder heads before removing the tappet covers.
6. Turn the crankshaft until the valves on No. 1 cylinder over lap.

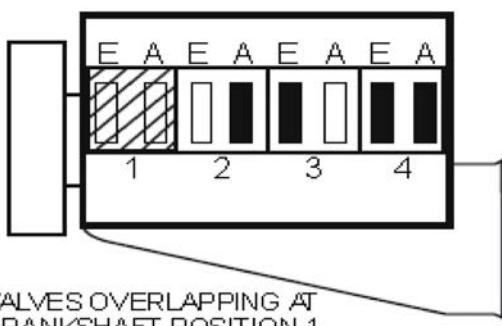


NOTES:

The valves on No. 1 cylinder overlap when the exhaust valve starts to close and the inlet valve starts to open.



NOT ADJUSTABLE ADJUSTABLE



VALVES OVERLAPPING AT CRANKSHAFT POSITION 1

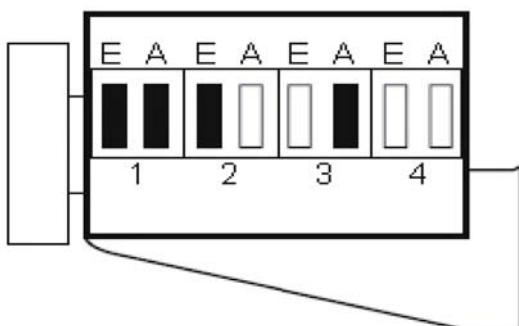


CAUTION

Turn the engine in the direction of rotation clockwise.

7. All valves shown in black can now be adjusted. Mark the crankshaft pulley in this position.
 - E = Inlet Valve
 - A = Exhaust Valve

NOT ADJUSTABLE ADJUSTABLE



8. Turn the crankshaft 360° clockwise and in this position, adjust all valves shown in black.

Service Injectors and Injector Pump

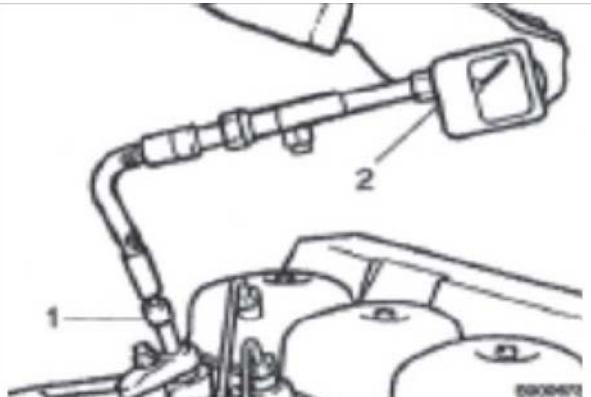
Compression Check



NOTES:

Prior to checking the compression, the engine must run until hot to ensure that an adequate film of lubricating oil is built-up to ensure sealing of the combustion chambers.

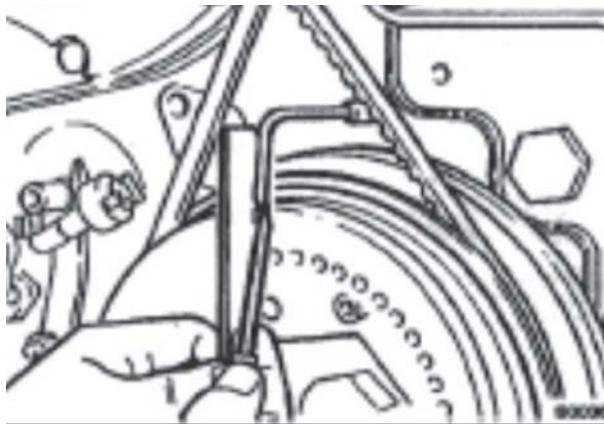
1. Remove all the injectors from the cylinder heads.
2. Ensure that the injection pump control is in the zero delivery position.



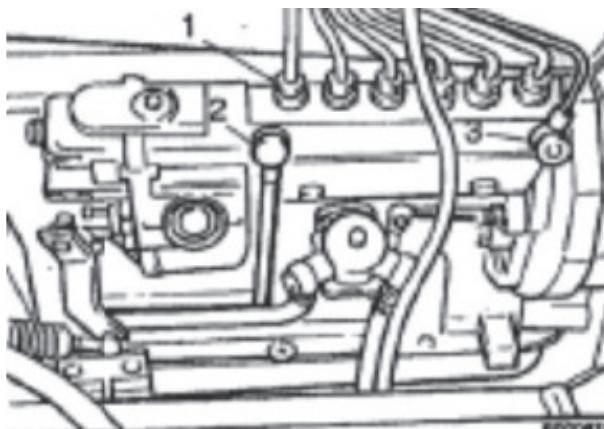
3. Install the adaptor (1) with a seal into the cylinder head. Start with No. 1 cylinder head.
4. Connect the compression tester (2) to the adaptor.
5. Turn the engine over with the starter motor until the pointer on the compression tester stops deflecting.
6. Make a note of the reading.
7. Repeat the procedure for the remaining cylinders.
8. The readings of all the cylinders must be within 15% of each other.
9. Disconnect the compression tester and remove the adaptor from the cylinder head.
10. Install all the injectors into the cylinder heads with new seals.

3 000 HOURS INTERVAL SERVICE**Fuel injection Timing Check**

1. Fit pointer to determine top dead centre and mark the belt pulley opposite fixed pointer.
2. Locate the commencement of injection mark (FB) on the V-belt pulley. If no mark is apparent then refer to the specifications and mark the V-belt pulley accordingly.



3. Turn the crankshaft backwards to 90° before top dead centre on No. 1 firing stroke.



4. Disconnect No. 1 cylinder injection line (1) from the injection pump and connect a gooseneck pipe to the injection pump.
5. Disconnect the injection pump fuel supply line (2) and connect the hand pump pressure line to it.
6. Disconnect the injector return fuel line (3) from the injection pump and fit a blank plug in its place.
7. Lock the speed control lever in full load position.
8. Operate the hand pump until fuel flows from the gooseneck pipe.

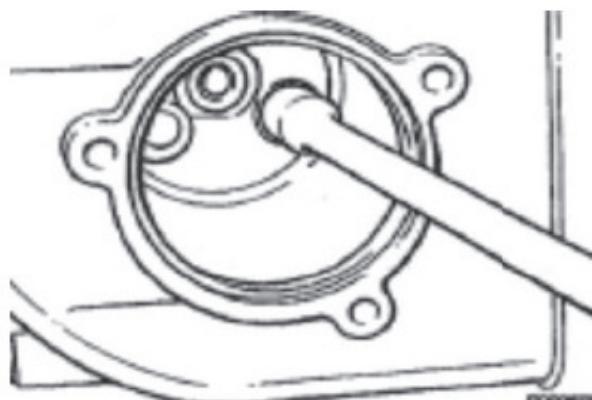
9. Continue to operate the hand pump and turn the crankshaft in the normal direction of rotation until the fuel flow is one drop every 5 - 8 seconds from the gooseneck pipe.
10. Stop operating the hand pump.
11. Check that the commencement of injection mark (FB) aligns with the fixed pointer.
12. If the commencement of injection is incorrect, adjust the timing as detailed next.

Fuel Injection Timing Adjustment

1. Turn the crankshaft backwards to 90° before the commencement of injection mark (FB).
2. Turn the crankshaft in the normal direction of rotation until the commencement of injection mark (FB) and the fixed pointer are aligned.

**NOTES:**

The subsequent tuning work must not change the present position of the crankshaft.



3. Remove the V-belt tensioner pulley together with the inspection cover.
4. Slacken off the injection pump drive gear bolts.
5. Operate the hand pump and slowly rotate the injection pump shaft until the pump starts to deliver fuel in droplets at intervals of 5 - 8 seconds from the gooseneck pipe.
6. Retain the injection pump shaft in this position and tighten the injection drive gear bolts.
7. Re-check the fuel injection timing as detailed in this chapter and repeat the procedure above if necessary.
8. Re-connect the fuel piping to No. 1 cylinder.
9. Remove the fixed pointer.



SERVICE & CHECKS

3 000 HOURS INTERVAL SERVICE



NOTES:

SERVICE & CHECKS

3 000 HOURS INTERVAL SERVICE



 NOTES:



CHAPTER 13. AS REQUIRED SERVICE

Introduction

The following services are only to be completed when it is required to do so and are unscheduled maintenance tasks.



NOTES:

It is recommended that the machine is thoroughly washed before starting the service.

Ensure that the machine is in the service position. Refer to "Pre-Service Instructions" section.

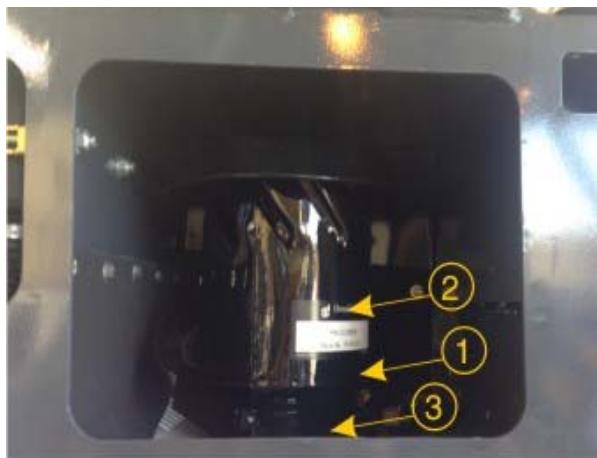
Engine

Change the injectors.

Refer to the "W-Spec Engine" Operation Manual.

Change the Air Cleaner Pre-Cleaner Assembly.

Removal



1. Unscrew the clamp (1) securing the pre-cleaner assembly (2) to the air cleaner stack (3).
2. Remove the pre-cleaner assembly and discard.
3. Clean the area around the air cleaner stack.

CAUTION

CAUTION - Do not over tighten the clamp when installing the air cleaner assembly.

4. Install a new air cleaner assembly onto the air cleaner stack and secure with the clamp.

Electrical

Change the Battery

The procedure is the same, whichever type of battery is fitted.

Removal

1. Ensure that the ignition switch is in the OFF position.



2. Unscrew and remove the nuts (1 and 2) and flat washers on the hold-down bracket (3) securing the battery in position.
3. Remove the hold-down bracket from the battery.
4. Remove the rubber protection covers (4 and 5) from the battery terminals.

AS REQUIRED SERVICE**Removal**

5. Unscrew and remove the terminal nut (3) and cable lug (4) from the negative battery terminal.
6. Unscrew and remove the terminal nut (1) and cable lug (2) from the Positive battery terminal.
7. Remove the battery from the machine.



1. Unscrew and remove the lens cap.
2. Remove the bulb from the holder.

Installation

8. Ensure that the area where the battery is to be installed is clean.
9. Ensure that the battery cables are in a serviceable condition. Replace if necessary.

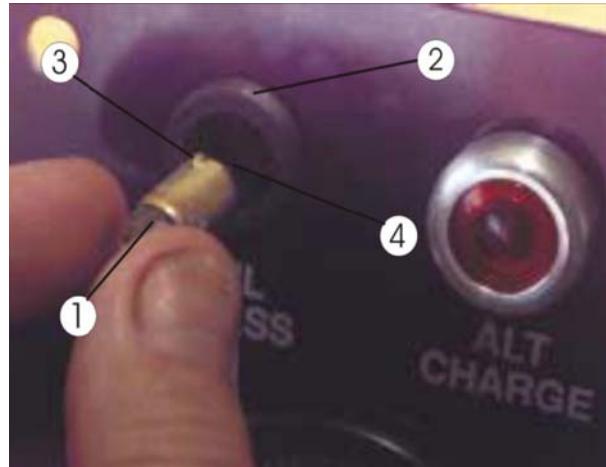


CAUTION - Ensure that the battery terminals are fitted to the correct terminals.

10. Place the battery in position.
11. Secure the battery terminals to their respective terminals and replace the rubber protection covers.
12. Secure the battery position with the hold-down clamp and nuts.

Change the Warning Indicator Light Bulbs**NOTES:**

The procedures for changing the warning indicator light bulbs are identical, therefore instructions are only provided for changing one bulb.

Installation

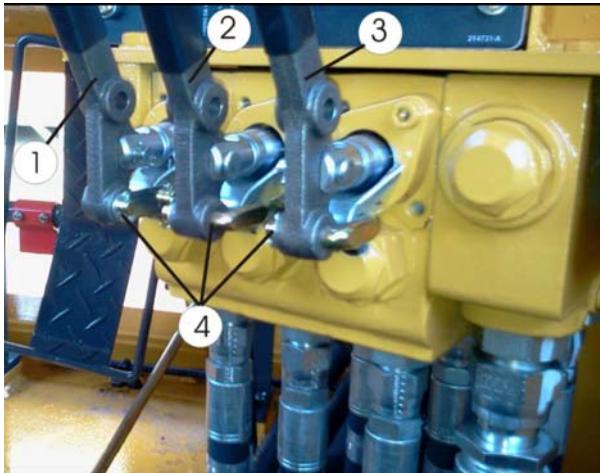
3. Insert the bulb (1) into the holder (2) and ensure that the bayonet fitting (3) on the bulb aligns with the grooves (4) on the inside of the holder.
4. Push the bulb fully into the holder.
5. Clean the lens cover.
6. Replace the lens cover. Do not over tighten.
7. Functionally test the warning indicators. Refer to the "Operator Control and Instruments" section of this manual.



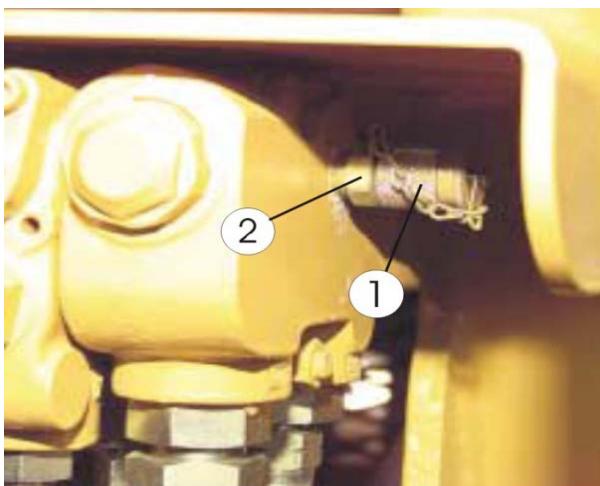
Hydraulic

Hydraulic Pressure Checks

Right & Left Side Control Valves



The right side control levers (1, 2 & 3) are used to operate the rotator, hammer & boom respectively. (Control Lever (3) specific to the 220E Model)



1. Unscrew and remove the cap (1) on the hydraulic pressure test port (2).



2. Connect a 25 000 kPa pressure gauge (1) to the pressure test port (2).
3. Start the engine and position the throttle at high idle.

Refer to the following tables for the pressure settings to be attained at maximum engine speed.

HAMMER		
FUNCTION	CONTROL LEVER POSITION	PRESSURE SETTING
Hammer ON	Forward	138 Bar
Hammer OFF	Rearwards	69 Bar

BOOM		
FUNCTION	CONTROL LEVER POSITION	PRESSURE SETTING
Boom DOWN	Forward	69 Bar
Boom UP	Rearwards	138 Bar

BOOM SLEW		
FUNCTION	CONTROL LEVER POSITION	PRESSURE SETTING
Slew LEFT	Forward	138 Bar
Slew RIGHT	Rearwards	138 Bar

BOOM EXTEND		
FUNCTION	CONTROL LEVER POSITION	PRESSURE SETTING
Boom Extend	Forward	138 Bar
Boom Retract	Rearwards	138 Bar

HAMMER EXTEND		
FUNCTION	CONTROL LEVER POSITION	PRESSURE SETTING
Hammer Extend	Forward	138 Bar
Hammer Retract	Rearwards	138 Bar



If the correct pressure setting cannot be attained, contact AARD Mining Equipment Support.

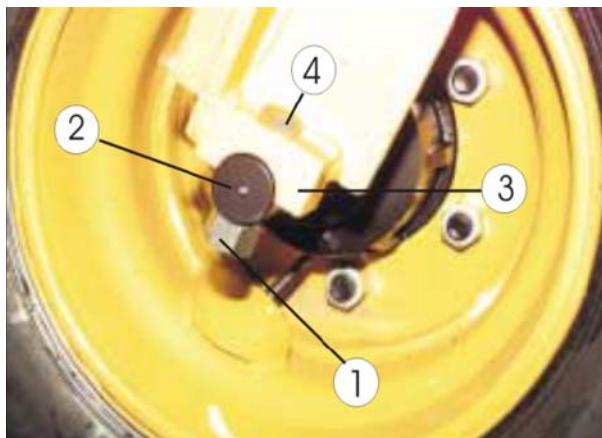


Wheel Motors and Tail Wheels

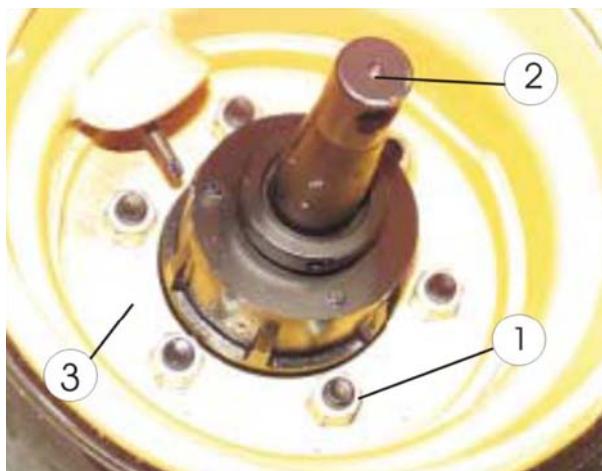
Change the Tail Wheel Axle Bearings

Removal

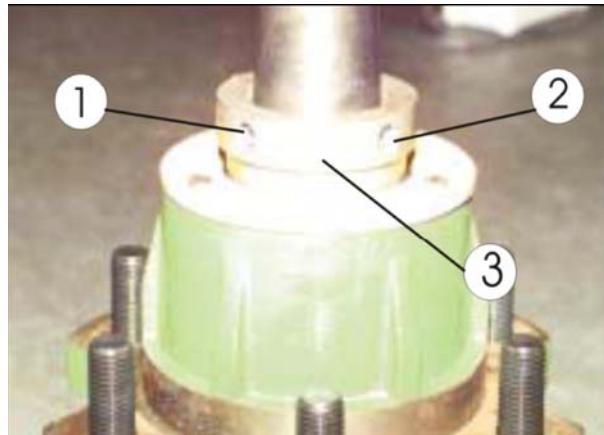
1. Lift the tail wheel clear of the ground and place the rear of the machine on a suitable stand.
2. Position a trolley jack (or similar) under the tyre.
3. Raise the trolley jack until it touches against the underside of the tyre.



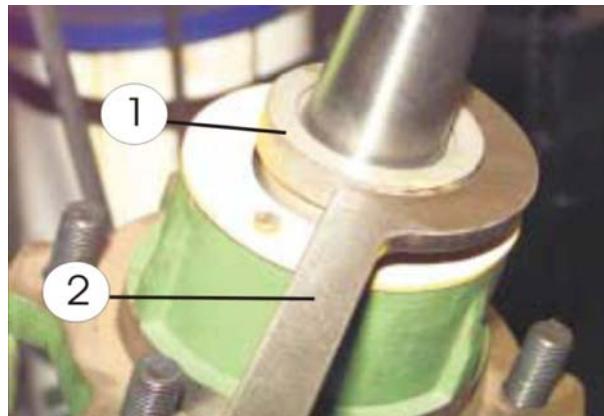
4. Unscrew and remove the nuts (1) on both sides securing the axle (2) to the fork assembly (3).
5. Carefully remove the bolts (4) from the axle.
6. Slowly lower the trolley jack and remove the tail wheel from the fork assembly.



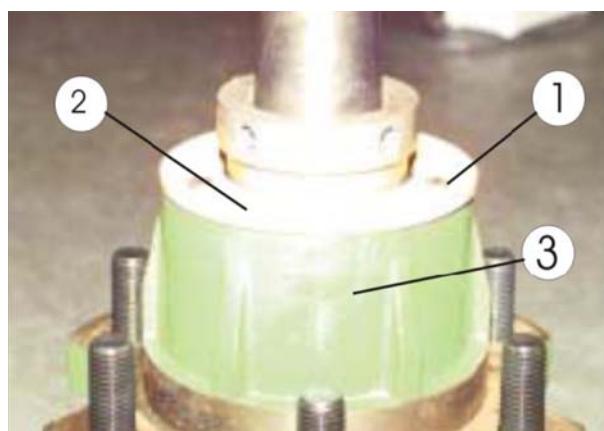
7. Unscrew and remove the nuts (1) securing the axle (2) to the wheel hub (3).
8. Remove the axle from the hub.



9. Unscrew and remove the grub screws (1 and 2) from the tail wheel nut (3).



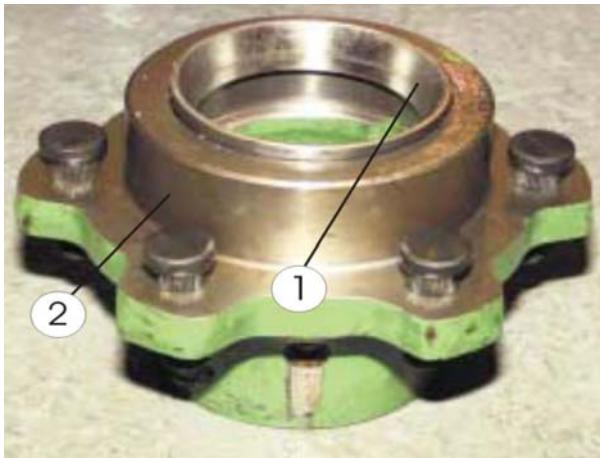
10. Unscrew and remove the tail wheel nut (1) using a C-spanner (2).



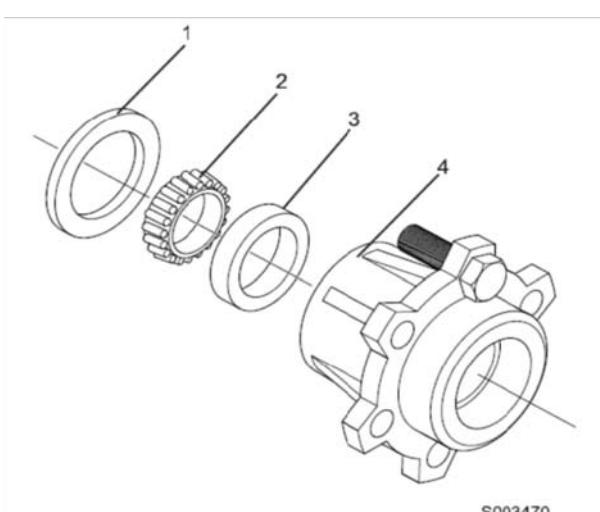
11. Unscrew and remove the bolts (1) securing the retainer ring (2) to the hub (3).
12. Remove the axle from the hub.



13. Remove the bearing inner race (1), oil seal (2) and axle ring (3) from the axle (4).



14. Remove the bearing outer race (1) from the hub (2).

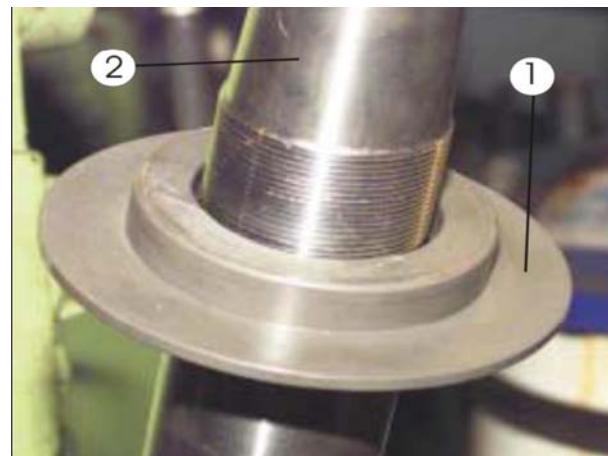


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15. Remove the oil seal (1), the bearing inner race (2) and outer race (3) from the hub (4).

Installation

1. Clean and remove any burrs on the hub and axle.
2. Visually inspect the hub and axle for wear and damage. Replace if necessary.
3. Install the bearing inner race into both sides of the hub.



4. Install the axle ring (1) onto the axle (2).



CAUTION - Ensure that the oil seal spring faces the axle ring.

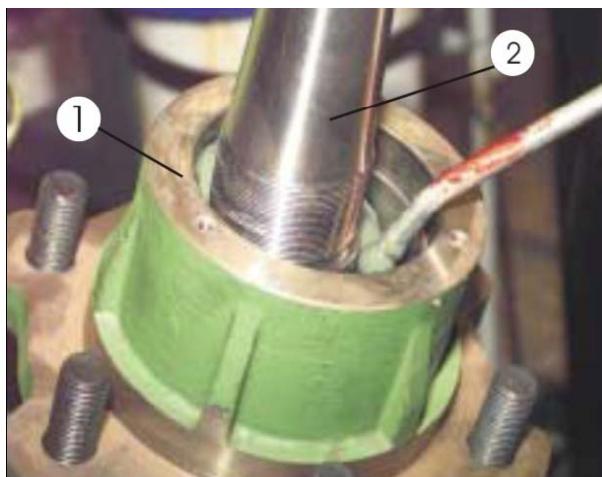


5. Install the oil seal (1) onto the axle ring (2). Ensure that the oil seal is fitted correctly.

AS REQUIRED SERVICE



6. Install the bearing inner race (1) onto the axle. Grease the bearing. Ensure that the bearing is properly packed with grease.



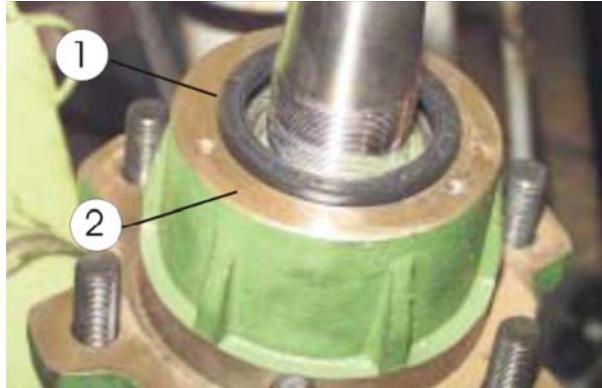
7. Install the hub (1) onto the axle (2) and fill the hub with grease. Ensure that the bearing is properly packed with grease.



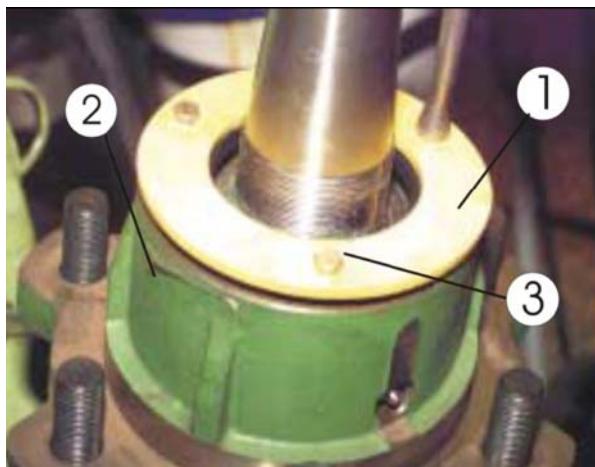
8. Install the bearing inner race (1) onto the axle.



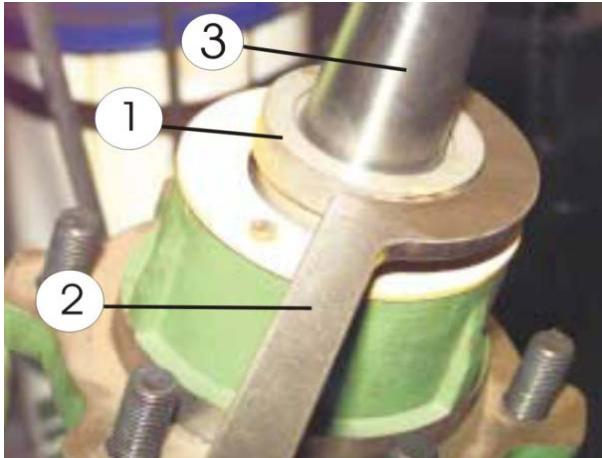
CAUTION - Ensure that the oil seal spring faces the bearing.



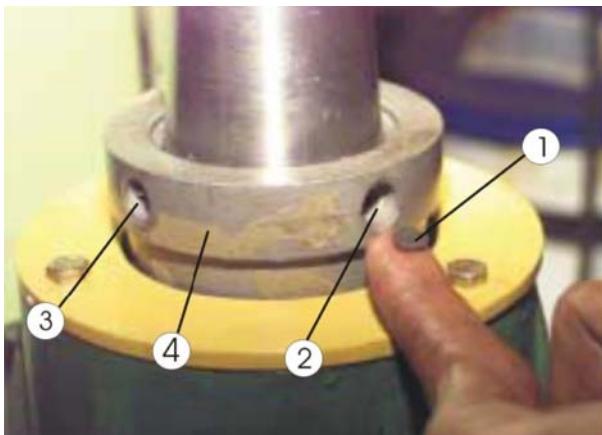
9. Install the oil seal (1) into the hub (2). Ensure that the oil seal is fitted correctly.



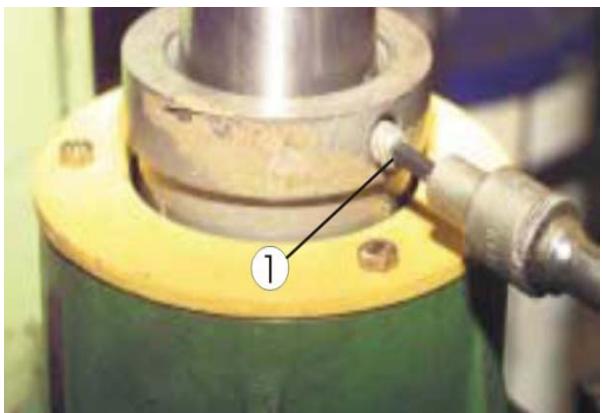
10. Install the retainer ring (1) onto the hub (2) and secure in position with the bolts (3).



11. Install the axle nut (10) onto the axle (3) and tighten with the C-spanner (2).



12. Install the Nylatron discs (1) into the threaded holes (2 and 3) in the axle nut (4).



13. Secure the axle nut to the axle with grub screws (1).
14. Install the axle assembly in the wheel.

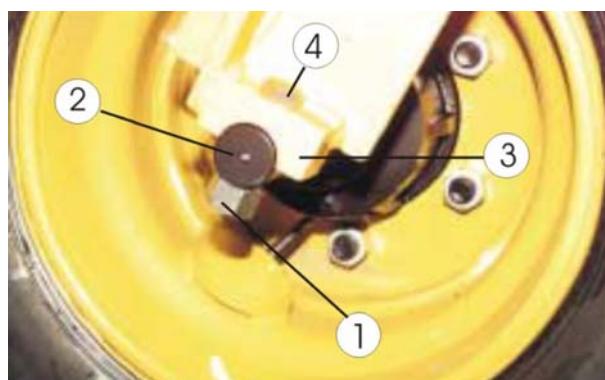


16. Position the fork assembly (1) so that it points away from the rear of the machine.
17. Ensure that the tail wheel nut (2) is on the right side of the machine.
18. Secure the wheel assembly to the fork assembly with the nuts (3). Torque the nuts to 550 Nm (406 ft lb).
19. Raise the machine and remove the stands from the rear of the machine and then lower the machine to the ground.

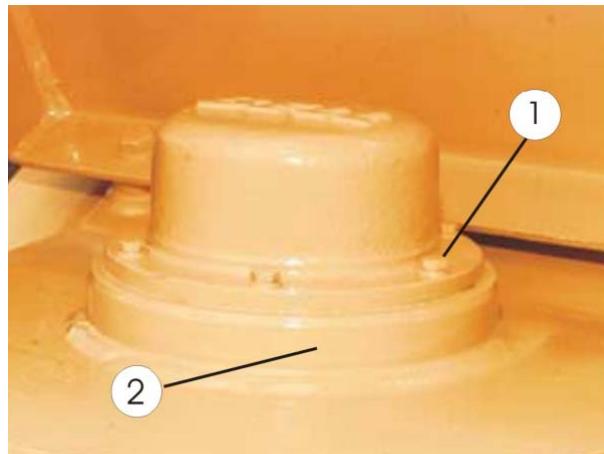
Change the Tail Wheel Spindle Bearings

Removal

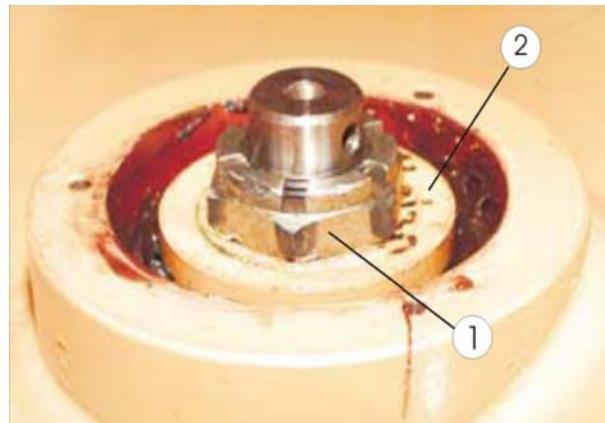
1. Lift the tail wheel clear of the ground and place the rear of the machine on a suitable stand.
2. Position a trolley jack (or similar) under the tyre.
3. Raise the trolley jack until it touches against the underside of the tyre.



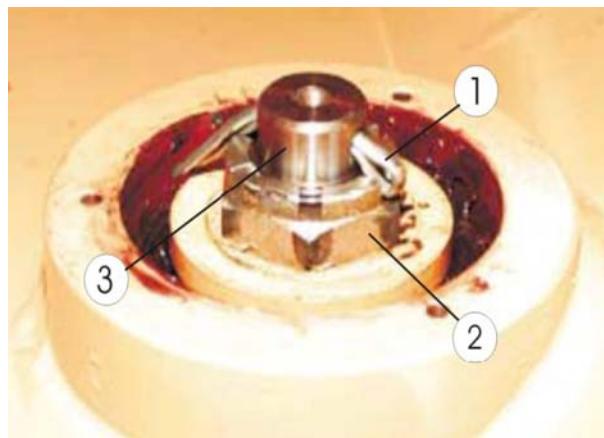
4. Unscrew and remove the nuts (1) securing the axle (2) to the fork assembly (3).
5. Carefully remove the bolts (4) from the axle.
6. Slowly lower the trolley jack and remove the tail wheel from the fork assembly.

AS REQUIRED SERVICE

7. Unscrew and remove the bolts (1) securing the cover (2) to the machine.
8. Remove the cover.
9. Clean the area around the castle nut and split pin.



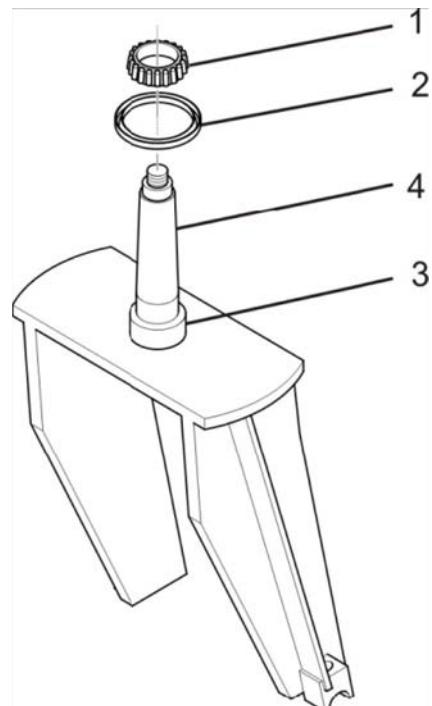
12. Unscrew and remove the castle nut (1) and washer (2).
13. Remove the fork assembly from the machine.



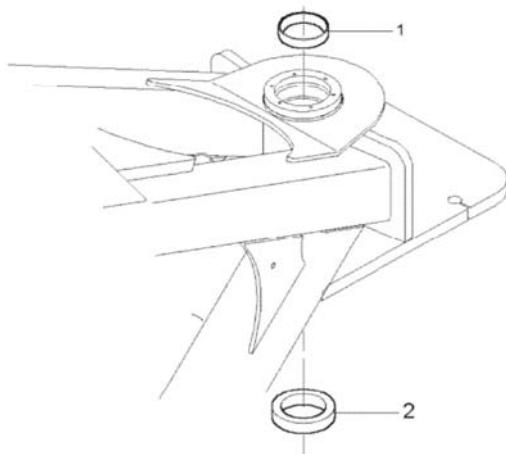
10. Remove the split pin (1) from the castle nut (2) and spindle shaft (3).
11. Discard the split pin. **Do not re-use.**

**WARNING**

WARNING - Support the tail wheel fork assembly with a suitable lifting device before removing the castle nut.



14. Remove the bearing inner race (1), oil seal (2) and spacer (3) from the spindle shaft (4).

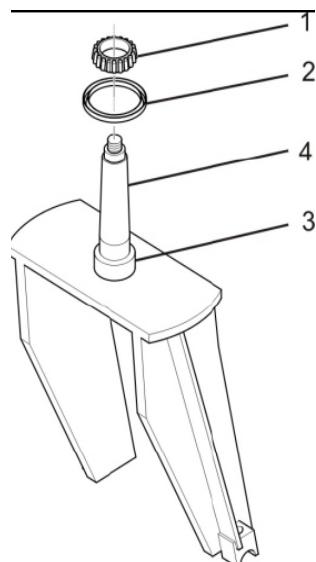


S003475A

15. Remove the bearing outer race (1) from the bottom of the spindle housing.
16. Remove the bearing inner and outer race (2 and 3) from the top of the spindle housing.

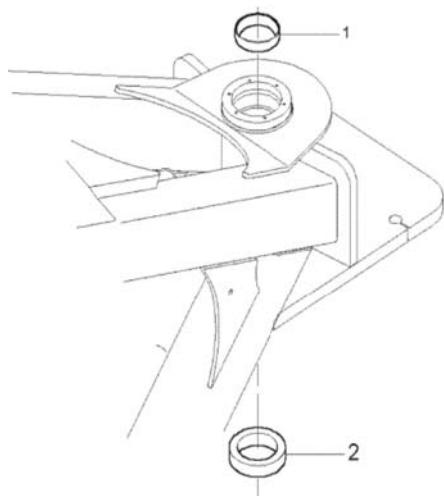


Ensure that the oil seal is fitted correctly.



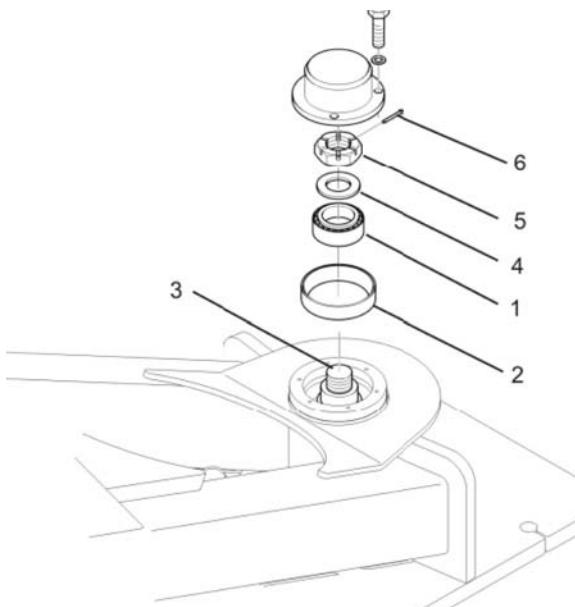
S005136a

5. Install the oil seal (1), bearing inner race (2) and spacer onto the spindle shaft (4).
Apply grease to the bearing and then install the tail wheel spindle shaft into the spindle housing. Refer to “Specifications for the Recommended Lubricant” section in this manual.



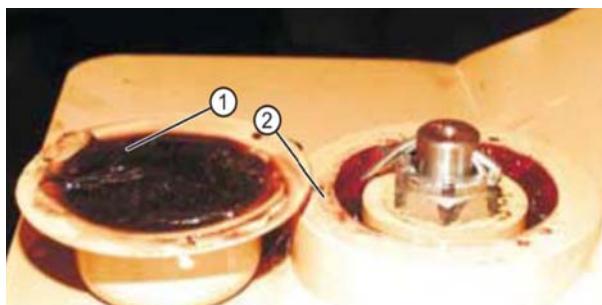
S003475A

4. Install the top and bottom bearing outer races (1 and 2) into the spindle housing.



AS REQUIRED SERVICE

7. Install the top bearing inner race (1) and spacer (2) onto the spindle shaft (3).
Apply grease to the top bearing assembly. Refer to “**Specifications for the Recommended Lubricant**” section in this manual.
8. Install the washer (4) onto the spindle shaft.
9. Install the castle nut (5) onto the spindle shaft.
10. Tighten the castle nut.
11. Turn the tail wheel assembly by hand.
12. The following observations and adjustments should be made:
 - If the tail wheel assembly turns with a reasonable amount of effort, then no adjustment is required.
 - If the tail wheel assembly turns freely, tighten the castle nut.
 - If the tail wheel assembly is very difficult or fails to turn, loosen the castle nut.
13. Install a new split pin (6) into the castle nut.



14. Fill the inside of the cover (1) with grease. Refer to “**Specifications for the Recommended Lubricant**” section in this manual.
15. Place the cover over the spindle and secure in position with the bolts.



16. Position the fork assembly (1) so that it points away from the rear of the machine.
17. Ensure that the tail wheel nut (2) is on the right side of the machine.
18. Secure the wheel assembly to the fork assembly with the nuts (3).
19. Lift the rear of the machine, remove the stand and lower the machine to the ground.

Change the Wheel Drives**Removal**

1. Unscrew and remove the bolts (1) securing the left and right side cover plates (2 and 3) to the machine.
2. Place the cover plates in a safe location, away from the machine.
3. Suitably mark the hoses prior to removal.



4. Unscrew and remove the hydraulic hose fittings from the hydraulic motor.

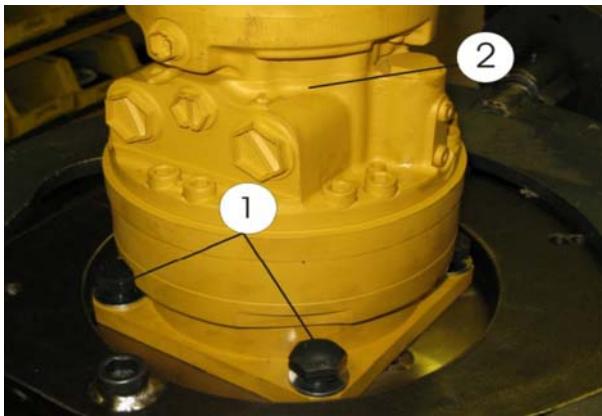


5. Remove the wheel from the Final drive hub.



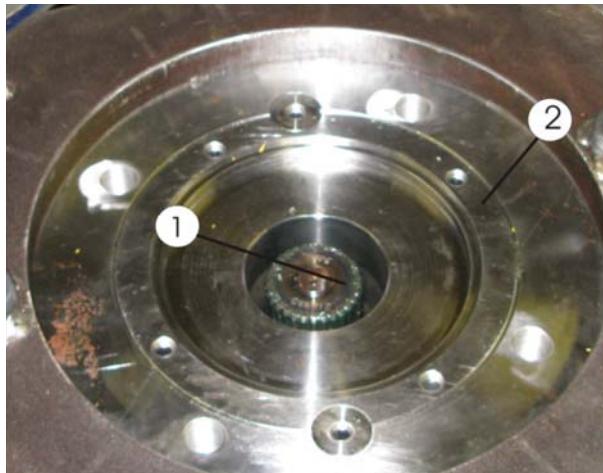
6. Use rigging equipment to hold the hub in place while you loosen the stub axle flange bolts (1).

Once all the bolts are removed, using the rigging equipment move the final drive / wheel motor assembly out of the axle box and move to a work bench.



9. Using a sling, rig the motor to a crane and lift the wheel motor off the final drive.

Once the wheel motor is removed, inspect the drive shaft splines (1) for damage that may cause the new wheel motor form meshing with the drive shaft (1).



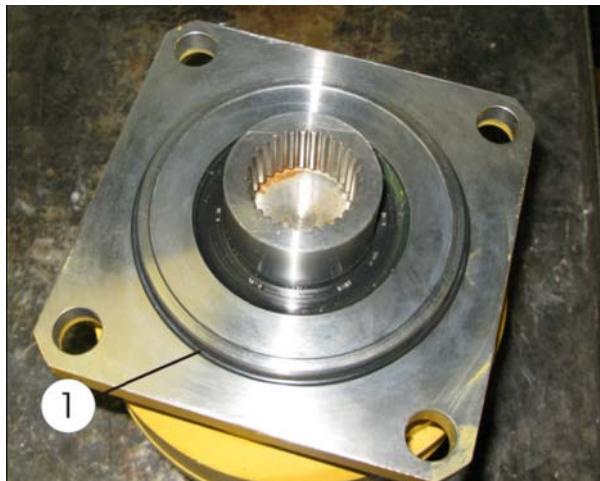
11. Inspect and clean the surface (2) on which the wheel motor is bolted too for burrs, rust and old gasket seal debris.

Installation of wheel motor

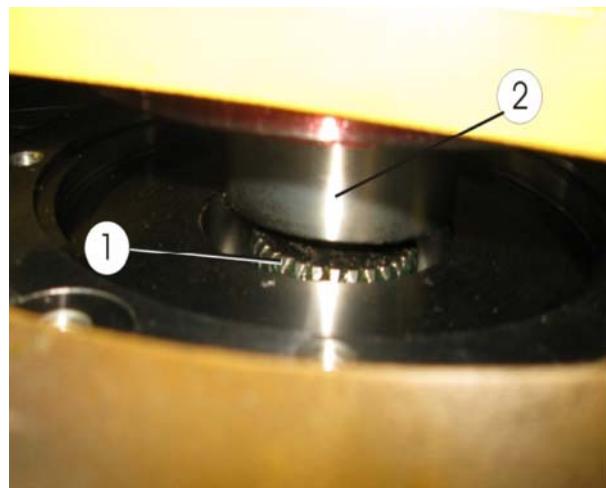


1. Before installing the new wheel motor (3), inspect the splines (2) for damage that may cause the new wheel motor form meshing with the drive shaft.

2. Inspect and clean the bolting surface of the wheel motor (3) for burrs and rust.

AS REQUIRED SERVICE

3. Install a new O-Ring seal onto the wheel motor, ensure that it is well seated and free of damage.



7. Once you have meshed the splines fully low the wheel motor onto the final drive assembly and remove the rigging sling.



4. After installing the O-Ring Seal (2), apply a thin layer of gasket sealer 91) to the O-Ring.



8. Apply a generous amount of lock-tight (1) to each bolt before installing and tightening the bolts (2).

**NOTES:**

The bolts are tightened using an open ended spanner, as a ring spanner or torque wrench can not access the bolts.



- Rig the wheel motor (2) using a sling (1) to lift the wheel motor off the work bench, and then lower it onto the final drive shaft.
5. While lowering the wheel motor onto the drive shaft (1) ensure that the wheel motor splines (2) mesh correctly with the splines of the drive shafts.



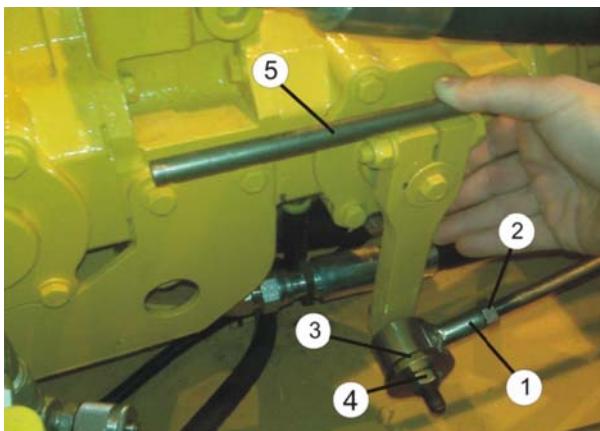
9. Fit all bolts and proceed to tighten them.



Taking care not to disturb pump lever from neutral position (i.e. do not tug / push rod), screw new Rod end assembly onto pedal-side of rod. Stop screwing when eye / eye length is such that the axis of the pedal-side rod eye is exactly in line with the centre of the post upright. Line up only, don't yet attach washers and nuts to bolt.

Control Rod Assembly Procedure

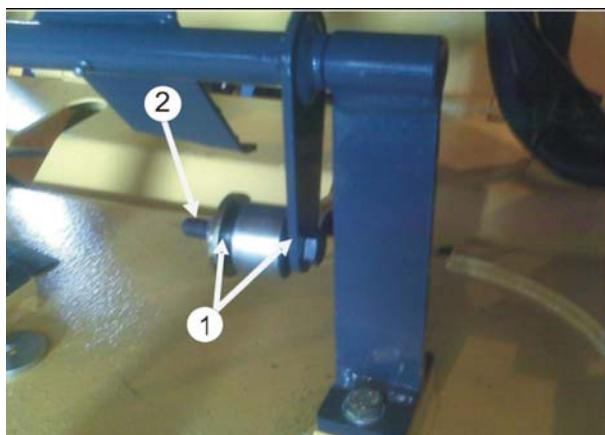
Metalastik Bush



Thread new Rod End Assembly onto pump side of control rod, ensuring that 20 mm of threaded portion is screwed into the nipple (1). Tighten rod lock nut (2) to ensure rod cannot turn in or out from the pre-set position.

Pin rod end to pump control lever with bolt, and fit disc washer (3) and plain nut on the outside and 2 spring washers on the inside (both sides of the bush centre sleeve). Finger tighten plain nut (4) only. (Don't even compress spring washers on inside)

Rotate lever until lever hangs perpendicular to pump axis. Use straight edge to verify that lever is perpendicular to pump long axis (5).



Do no further screw either end of rod, pull pedal lever forward and pin rod end to pedal lever with M12x75 bolt, and fit with disc washer and plain nut on the outside and 2 off M10 spring washers on the inside (both sides of the bush centre sleeve). Finger tighten plain nut, only. (Don't even compress spring washers on inside)

Return pedal lever to exact neutral position (bolt axis in the line with upright plate centre line).

AS REQUIRED SERVICE

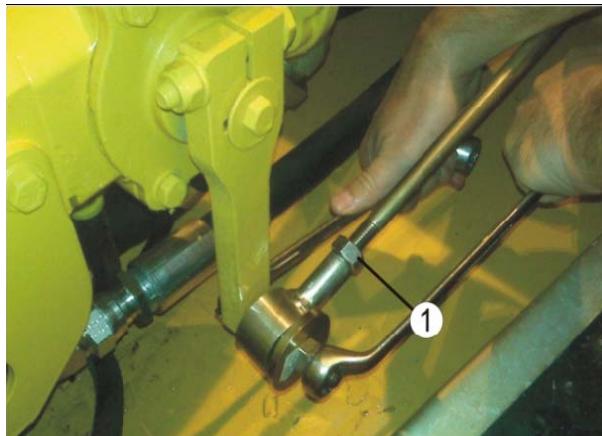
With pedal lever in exact neutral position, tighten plain nut and thereafter nyloc nut. While tightening, ensure that bolt head is held from turning. Plain nut must clamp rod-end inner bush and spring washers securely between pedal lever and disc washer. Nyloc nut must tighten firmly against plain nut and the two nuts must be twisted especially firmly against one another.



Test that pedal function is correct. Rotate pedal forward and quickly release. If correctly adjusted, the pedal should return to the neutral position under rubber spring-back.

Likewise, rotate pedal backwards and quickly release. If correctly adjusted, the pedal should return to the neutral position and rubber spring-back.

The rubber resistance force should be equal in both directions and not biased towards only one direction. If spring-back is not equal and pedal does not return to neutral, loosen joints on both the pump lever side and the pedal lever side and reset in exact neutral position before tightening again. To prevent unwanted twist-up of the rubber bush, it is important that while tightening the nuts (on both ends), the bolts are held stationary and the rod is not tugged away from the neutral position.



Return to pump lever side. Ensure that the control lever has remained in the exact neutral position.

Neutral means pump control lever perpendicular to pump axis and pedal lever eye-bolt axis exactly in line with upright bracket plate centre line.

Ensuring that the bolt head is held from turning, tighten first plain nut and thereafter nyloc nut against washers. Plain nut must clamp rod-end inner bush and spring washers securely between pedal lever and disc washer. Nyloc nut must tighten firmly on top of plain nut and the two nuts must be twisted especially firmly against one another. Now tighten rod locknuts-both ends of rod.



CHAPTER 14. TROUBLESHOOTING

Introduction



NOTES:

These lists are not exhaustive. If in doubt contact your **AARD Mining Equipment Representative**.

ENGINE		
SYMPTOM	POSSIBLE CAUSE	REMEDY
Engine fails or difficult to start.	Neutral not selected.	Select neutral.
	Below start limit temperature.	Refer to section of this manual for the correct operating procedures.
	Engine shut-down lever not in operating position.	Ensure that the engine shut-down lever is in the correct operating position.
	Engine throttle not in the correct starting position.	Refer to " Recommended Fuels and Lubricants Specifications ".
	Incorrect grade of oil.	Replenish the fuel tank. Bleed the fuel system.
	Fuel tank low / empty.	Bleed fuel system.
	Air in fuel system.	Replace fuel filters.
	Blocked fuel filters.	Inspect and clean the air filter and system.
	Blocked air filter.	Inspect and clean the exhaust system.
	Exhaust system blocked / damaged.	Clean the fuel feed pump strainer.
	Fuel feed pump blocked.	Refer to AARD Mining Equipment Technical Support .
	Fuel feed pump damaged.	Refer to AARD Mining Equipment Technical Support .
	Injectors sealing ring incorrect.	Refer to AARD Mining Equipment Technical Support .
	Commencement of delivery setting incorrect.	Refer to AARD Mining Equipment Technical Support .
	Battery not charged.	Recharge or replace battery.
	Loose and / or dirty battery terminals.	Clean and tighten battery terminals.
	Battery cables damaged.	Replace battery cables.
	Starter motor faulty.	Replace starter motor. If necessary contact AARD Mining Equipment Technical Support .
	Valves clearance incorrect / valves worn.	Reset valve clearance / replace valves. If necessary contact AARD Mining Equipment Technical Support .
	Low compression.	Refer to AARD Mining Equipment Technical Support .
	Cylinders and / or piston rings worn.	Refer to AARD Mining Equipment Technical Support .
	Piston crown clearance excessive.	Refer to AARD Mining Equipment Technical Support .
	Broken blower drive belt.	Replace blower drive belt.

TROUBLESHOOTING



ENGINE		
SYMPTOM	POSSIBLE CAUSE	REMEDY
Engine temperature excessive.	Oil level too low.	Replenish engine oil. Refer to Recommended Fuels and Lubricants Specifications section in this manual.
	Oil level too high.	Drain oil to correct level.
	Air filter blocked.	Inspect and clean the air filter and system.
	Air intake manifold and / or exhaust manifold blocked.	Inspect and clean the air intake manifold and / or exhaust manifold.
	Exhaust back pressure excessive.	Refer to AARD Mining Equipment Technical Support.
	Injectors damaged.	Refer to AARD Mining Equipment Technical Support.
	Commencement of delivery setting incorrect.	Refer to AARD Mining Equipment Technical Support.
	Cooling fins soiled.	Clean cooling fins.
	Air cowling cover loose.	Tighten cover.
	Air cowling plates loose, cracked or missing.	Refer to AARD Mining Equipment Technical Support.
Engine gives poor performance.	Blower drive belt loose or broken.	Replace blower drive belt.
	Oil cooler soiled.	Inspect and clean cooler.
	Oil level too high.	Drain engine oil to correct level.
	Engine shut-down lever not in the correct operating position.	Ensure that the engine shut-down lever is in the correct operating position.
	Engine speed control lever not reaching full-load stop.	Refer to AARD Mining Equipment Technical Support.
	Air filter blocked.	Inspect and clean the air filter and system.
	Air intake manifold and / or exhaust manifold blocked.	Inspect and clean the air intake manifold and / or exhaust manifold.
	Exhaust back pressure excessive.	Refer to AARD Mining Equipment Technical Support.
	Air in fuel system.	Bleed the fuel system.
	Fuel filters blocked,	Replace fuel filters.
	Fuel feed pump blocked.	Clean the fuel feed pump strainer.
	Fuel feed pump damaged.	Refer to AARD Mining Equipment Technical Support.
	Injectors damaged.	Refer to AARD Mining Equipment Technical Support.
	Commencement of delivery setting incorrect.	Refer to AARD Mining Equipment Technical Support.
	Valves clearance incorrect / valves worn.	Reset valve clearance / replace valves. If necessary contact AARD Mining Equipment Technical Support.
	Compression too low.	Refer to AARD Mining Equipment Technical Support.
	Cylinders and / or piston rings worn.	Refer to AARD Mining Equipment Technical Support.
	Piston crown clearance excessive.	Refer to AARD Mining Equipment Technical Support.
	Faulty hydraulic relief valves.	Refer to AARD Mining Equipment Technical Support.



ENGINE		
SYMPTOM	POSSIBLE CAUSE	REMEDY
Engine oil pressure low.	Oil level low.	Replenish engine oil. Refer to Recommended Fuels and Lubricants Specifications section.
	Excessive inclination of engine.	Refrain from driving the machine on steep inclines.
	Faulty oil pump.	Refer to AARD Mining Equipment Technical Support.
	Incorrect grade of oil.	Refer to Recommended Fuels and Lubricants Specifications section.
	Faulty oil circuit.	Refer to AARD Mining Equipment Technical Support.
	Oil pressure switch faulty.	Refer to AARD Mining Equipment Technical Support.
Engine oil consumption excessive.	Main and / or big-end bearing defective.	Refer to AARD Mining Equipment Technical Support.
	Oil level too high.	Drain oil to correct level.
	Excessive inclination of engine.	Refrain from driving the machine on steep inclines.
	Cylinders and / or piston rings worn.	Refer to AARD Mining Equipment Technical Support.
	Oil metering screw for rocker arm lubrication incorrectly set.	Refer to AARD Mining Equipment Technical Support.
Engine smoking blue.	Valve guides worn.	Refer to AARD Mining Equipment Technical Support.
	Oil level too high.	Drain oil to correct level.
	Excessive inclination of engine.	Refrain from driving the machine on steep inclines.
	Engine run mainly at low load.	Operate the engine correctly.
	Cylinders and / or piston rings worn.	Refer to AARD Mining Equipment Technical Support.
	Oil metering screw for rocker arm lubrication incorrectly set.	Refer to AARD Mining Equipment Technical Support.
Engine smoking white.	Valve guides worn.	Refer to AARD Mining Equipment Technical Support.
	Below start limit temperature.	Refer to section of this manual for the correct operating procedures.
	Injectors damaged.	Refer to AARD Mining Equipment Technical Support.
	Commencement of delivery setting incorrect.	Refer to AARD Mining Equipment Technical Support.
	Valve clearance incorrect / valves worn.	Refer to AARD Mining Equipment Technical Support.
	Compression pressure too low.	Refer to AARD Mining Equipment Technical Support.
	Piston crown clearance excessive.	Refer to AARD Mining Equipment Technical Support.

TROUBLESHOOTING

ENGINE		
SYMPTOM	POSSIBLE CAUSE	REMEDY
Engine smoking black.	Air filter blocked.	Inspect and clean the air filter and system.
	Air intake manifold and / or exhaust manifold blocked.	Inspect and clean the air intake manifold and / or exhaust manifold.
	Exhaust back pressure excessive.	Refer to AARD Mining Equipment Technical Support.
	Injectors damaged.	Refer to AARD Mining Equipment Technical Support.
	Valve clearance incorrect / valves worn.	Refer to AARD Mining Equipment Technical Support.
	Commencement of delivery setting incorrect.	Refer to AARD Mining Equipment Technical Support.
	Amount of fuel injected excessive.	Refer to AARD Mining Equipment Technical Support.
	Compression pressure too low.	Refer to AARD Mining Equipment Technical Support.
Engine does not run smoothly.	Air in fuel system.	Bleed the fuel system.
	Fuel filters blocked.	Replace fuel filters.
	Fuel feed pump blocked.	Clean the fuel feed pump strainer.
	Fuel feed pump damaged.	Refer to AARD Mining Equipment Technical Support.
	Injectors damaged.	Refer to AARD Mining Equipment Technical Support.
	Commencement of delivery setting incorrect.	Refer to AARD Mining Equipment Technical Support.
	Valve clearance incorrect / valves worn.	Refer to AARD Mining Equipment Technical Support.
	Compression pressure too low.	Refer to AARD Mining Equipment Technical Support.
	Cylinders and / or piston rings worn.	Refer to AARD Mining Equipment Technical Support.
TRANSMISSION		
SYMPTOM	POSSIBLE CAUSE	REMEDY
Drive fails to respond in either direction on both wheels.	Park brake applied.	Release park brake.
	Hydraulic fluid low.	Check hydraulic fluid level. Top-up if necessary.
	No charge pressure.	Refer to AARD Mining Equipment Technical Support.
	Broken engine to transmission coupling.	Replace the coupling. Refer to As Required Service section for the procedure.
	Faulty relief valves.	Refer to AARD Mining Equipment Technical Support.



TRANSMISSION

SYMPTOM	POSSIBLE CAUSE	REMEDY
Weak, slow, sluggish or erratic operation of either or both wheels.	Damaged pedal linkage.	Refer to AARD Mining Equipment Technical Support.
	Contaminated hydraulic fluid.	Drain and replenish the hydraulic fluid. Replace the hydraulic filters.
	Damaged transmission and / or sprocket drives.	Refer to AARD Mining Equipment Technical Support.
	Damaged wheel motor/s.	Replace the wheel motor/s. Refer to As Required Service section for the procedures.
	Faulty relief valves.	Refer to AARD Mining Equipment Technical Support.
Failure of one or both sprocket drives to rotate in either forward or reverse direction.	Failure in pump or drop charge pressure.	Refer to AARD Mining Equipment Technical Support.
	Damage to sprocket drives.	Refer to AARD Mining Equipment Technical Support.
	Damaged wheel motor/s.	Replace the wheel motor/s. Refer to As Required Service section for the procedures.
	Faulty relief valves.	Refer to AARD Mining Equipment Technical Support.

HYDRAULICS

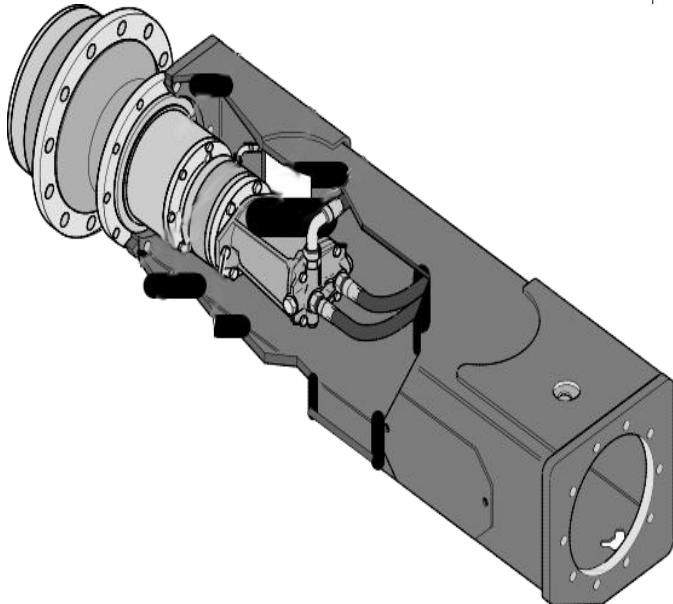
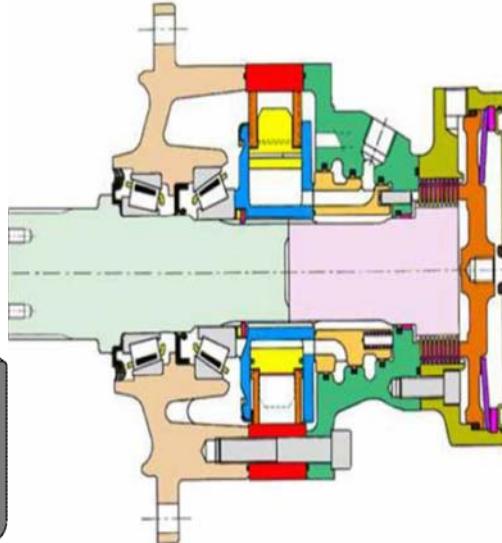
SYMPTOM	POSSIBLE CAUSE	REMEDY
Boom is slow or fails to respond in either direction.	Pressure setting incorrect.	Check pressure setting. If necessary contact AARD Mining Equipment Technical Support.
	Cylinder damaged.	Refer to AARD Mining Equipment Technical Support.
	Hydraulic fluid low.	Top-up hydraulic fluid.
	Hydraulic pump failure.	Refer to AARD Mining Equipment Technical Support.
	Contaminated hydraulic fluid.	Drain and replenish the hydraulic fluid. Replace the hydraulic filters.
	Control valve damaged.	Refer to AARD Mining Equipment Technical Support.
	Faulty relief valves.	Refer to AARD Mining Equipment Technical Support.

TROUBLESHOOTING

HYDRAULICS		
SYMPTOM	POSSIBLE CAUSE	REMEDY
Grapple fails or is slow to open and close.	Pressure setting incorrect.	Check pressure setting. If necessary contact AARD Mining Equipment Technical Support.
	Hydraulic fluid low.	Top-up hydraulic fluid.
	Contaminated hydraulic fluid.	Drain and replenish the hydraulic fluid. Replace the hydraulic filters.
	Hydraulic pump failure.	Refer to AARD Mining Equipment Technical Support.
	Control valve damaged.	Refer to AARD Mining Equipment Technical Support.
	Faulty relief valves.	Refer to AARD Mining Equipment Technical Support.
Rotator is slow to open and close.	Pressure setting incorrect.	Check pressure setting. If necessary contact AARD Mining Equipment Technical Support.
	Hydraulic fluid low.	Top-up hydraulic fluid.
	Contaminated hydraulic fluid.	Drain and replenish the hydraulic fluid. Replace the hydraulic filters and clean the magnetic plug.
	Rotator damaged.	Refer to AARD Mining Equipment Technical Support.
ELECTRICAL		
SYMPTOM	POSSIBLE CAUSE	REMEDY
Hour meter not working properly.	Gauge defective.	Refer to AARD Mining Equipment Technical Support.
	Instrument panel defective.	Refer to AARD Mining Equipment Technical Support.
	Loose wires.	Refer to AARD Mining Equipment Technical Support.
Warning indicators not illuminating.	Bulb defective.	Replace bulb. Refer to As Required Service section for the procedures.
	Instrument panel defective.	Refer to AARD Mining Equipment Technical Support.
	Loose wires.	Refer to AARD Mining Equipment Technical Support.
Alternator charge warning indicators fails to illuminate when ignition switch is in the ON position.	Bulb defective.	Replace bulb. Refer to As Required Service section for the procedures.
	Instrument panel defective.	Refer to AARD Mining Equipment Technical Support.
	Loose wires.	Refer to AARD Mining Equipment Technical Support.
Alternator charge warning indicator illuminated when engine is ON .	Alternator drive belt is loose or broken	Adjust drive belt. Fit new drive belt if necessary.
	Poor battery connections.	Clean and check battery connections.
	Regulator faulty.	Refer to AARD Mining Equipment Technical Support.



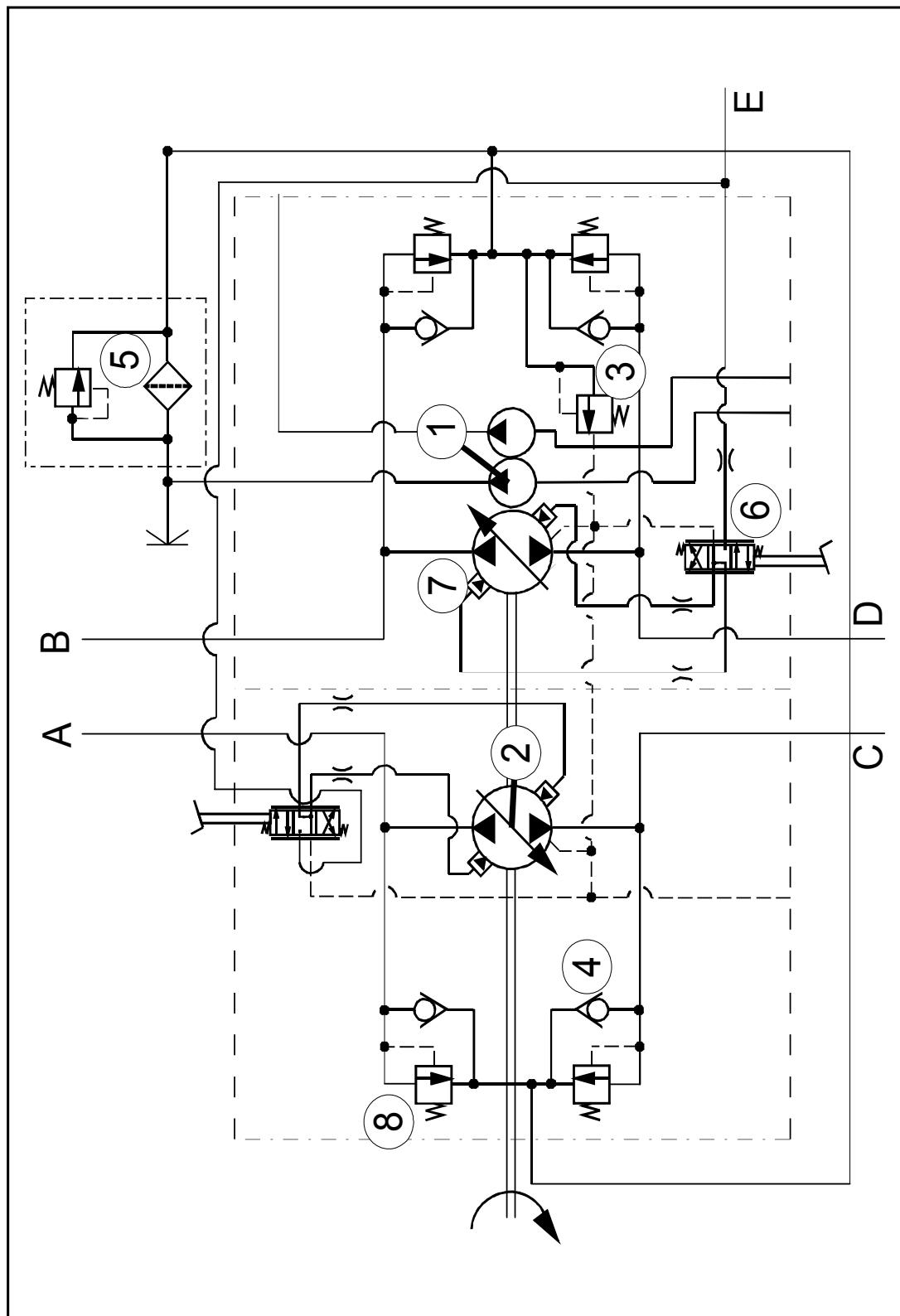
DRIVETRAIN

**EATON****POITAIN**

The drive line used in the AARD Rockscaler can be broken up into various sections. These are as follows:

- The transmission pump Eaton 70160 which replaced the (TA1919) and wheel motors (Poitain in the 220) which replaced the (MFE19) but Eaton motors still been used in the 120.
- Brake units
- Primary reduction units (auburn reduction)
- Secondary reduction units (final drive)

NB: The Poitain drive motor have the brake built into the drive motor.





Hydraulic Transmission Pump

The Transmission Hydraulic Pump (2) is a bi – directional variable displacement axial piston pump, controlled by a servo piston (7) and a directional control valve (6).

Two of these pumps are connected after each other (back-to-back) to supply oil flow to a closed loop hydraulic circuit. Each pump controls a wheel motor speed and direction. These pumps are driven from the flywheel of the engine through a coupling.

The servo piston (7) is directly connected to the swash plate of the hydraulic pump. The displacement control valve (6) routes charge pressure oil to the servo piston (7) to stroke the pump into a respective direction.

Closed loop charging circuit

The Closed loop charging circuit consists of the following components:

- Fixed Displacement Charge Pump (1)
- High Pressure Charge oil filter (5)
- Charge Pressure Relief Valve (3)
- Charge Check Poppets X 4 (4)

A fixed displacement rotor type pump (1) is connected to the back of the variable displacement pumps (2). This pump supplies oil flow to the charge circuit to create charge pressure within the closed loop circuit.

Upon start up, oil flow from the charge pump (1) flows to a high pressure charge filter (5). From the Charge filter (5), oil flows into a port within the hydraulic transmission pump housing where it is routed to a charge pressure relief valve (3) as well as to the four charge check poppets (4).

As the hydraulic transmission pumps are in neutral, no pressure is created within the closed loop circuit. With charge pressure now higher than the pressure in the closed loop circuit, charge oil pressure opens all four of the Charge Check Poppets (4) and supplies charge pressure to the closed loop circuit.

Once the closed loop circuit is fully charged and the charge circuit pressure build up too high, the charge pressure relief valve (3) will open up and relief the excess charge pressure into the pump housing and through to the reservoir.

Charge pressure is also routed to the Park Brake Solenoid Valve. Once the Park Brake Solenoid Valve is energised, oil is directed to port (E) to the displacement

control valves (6) as well as the park brake units, releasing them. When the operator presses the foot pedals into a direction, charge oil is directed through the displacement control valves (6) to the servo pistons (7).

Charge oil flow to the servo pistons is regulated by the displacement control valves (6) proportional to the movement of the foot pedals.

Charge pressure from the directional control valve (6) now forces the servo piston (7) to rotate the pump swash plate.

Servo – Operated Transmission Hydraulic Pump Operation.

When the hydraulic transmission pumps (2) servo pistons are forced into a direction, the swash plate will rotate. With the rotation of the swash plate, oil will be forced out of the work ports to the wheel motors.

Forward Travel Direction

With the Engine running, Doors closed, Emergency Stop Valve released, Park Brake Solenoid Valve energised and the operator pressing both the foot pedals forward, the foot pedal rods will force the directional control valves (6) to move.

The directional control valves (6) will supply charge pressure through to the servo pistons (7) which will force the servo pistons (7) to move the swash plates. Oil returning from the other end of the servo piston will be directed through the directional control valve (6) into pump housing and through to the hydraulic reservoir.

The front transmission pump will supply oil out of port A to the left hand wheel motor and the rear transmission pump will supply oil pressure out of port B to the right wheel motor.

With the machine stalled, pressure will build up in the closed loop circuit until the inertia is overcome. This pressure will also be acting against the high pressure relief valve (8) as well as the charge check poppet (4) closing it. Charge pressure is now lower than the high pressure acting on the charge check poppet (4).

If the output pressure to the wheel motor had to build up too high, the high pressure relief valve (8) will relief the excess pressure into the charge circuit.

On the inlet side of the pump, pressure will now drop as the pump draws oil in. With the pressure drop on the inlet side, charge pressure will open the charge check poppet



(4) on the inlet side and allow the charge pressure to flow into the inlet side of the transmission hydraulic oil pump. Once the pressure acting on the wheel motors has overcome the inertial of the machine, the wheel motors will turn the final drives.

Oil returning from the left hydraulic wheel motor will return to the pump in port C of the transmission oil pump. Oil returning from the right wheel motor will return to the pump in port D of the transmission oil pump.

Reverse Travel Direction

With reverse travel all will apply as for the forward travel. Differences will be:

- Foot pedals will be forced in a backward direction.
- Directional control valves (6) will be forced into the opposite direction to forward travel.
- Pump servo pistons (7) will force the swash plates to rotate in the opposite direction to forward rotation.
- Port A will become the inlet port to the front hydraulic pump.
- Port C will become the outlet of the front hydraulic pump.
- Port B will become the inlet for the rear hydraulic pump.
- Port D will become the outlet for the rear hydraulic pump.
- Wheel motors will now run in the reverse direction.



 NOTES:



IDENTIFYING THE PUMP

IDENTIFYING THE PUMP

Identification Numbers - Manually Variable Displacement Piston Pump

Identification label on control arm side of housing.

A - Technical Number Description

70360 = Single Piston Pump

78362 = Single Piston Pump with Gear Pump

78361 = Tandem Piston Pumps

78364 = Tandem Piston Pumps with Gear Pump

B - Sequential Numbering

C - Engineering Design Code

Single Pump (back to front) - Product Number:

70360 - RAA - 02

I	I	I
A	B	C

Tandem Pumps (back to back) - Product Number:

78364 - RAB - 02

I	I	I
A	B	C

Serial Number Code:

A 96 01 31 JB

Revision level of parts list.	A	96	01	31	JB
Last two digits of year built. (91 for 1991 etc.)					
				Tester's Initials	
					Day of Month (two digits)
					Month (two digits)

Each order must include the following information:

1. Technical and / or Part Number
2. Serial Number Code
3. Part Name
4. Quantity

Tools Required

- 9/16, 7/8, 1-1/8 in. sockets and/or end wrenches
- Torque wrench (203 N·m [150 lbf ft] capacity)
- Ratchet wrench
- 7/16 in. Allen wrench or bit socket
- Internal and external retaining ring pliers
- Small screwdrivers (2)
- Hammer (soft face)
- Light Petroleum Jelly
- Seal driver or similar tool



HYDROSTATICS

The assembly and disassembly procedures for the wheel motors, brake units and transmission hydraulic pump will be discussed in the drive train section.

TRANSMISSION HYDRAULIC PUMP

The transmission hydraulic pump used in the AARD Rockscaler is Eaton pumps, model: 78364 (back to back) and the 70360 (back to front). The Rockscaler transmission pump is made of two Eaton piston pumps connected in tandem with a common charge pressure supply.

The pump is mounted under the operator's seat which is connected to the inspection plate which allows access to the pump and hoses to the wheel motors. The pump is driven by a nylon coupling which is connected to the engine by means of the foot operated levers. These are connected directly to the swash plates.

As the angle of the swash plate is varied, in either direction, the pistons move in and out of the rotating group bores and displaces oil as the rotating group is rotated by the drive shaft. During the first half of their revolution, as the piston moves out of their rotation, the pistons will move back into their bores. As the pistons move back into their bores, the oil will be forced out through the wafer plate into the drive system to the wheel motors.

The drive circuit of the AARD Rockscaler is a closed loop system. This means that oil is fed from the pump to the wheel motors and back to the pump. The oil is not returned to tank.

Leak-off that takes place in the wheel motors allows a certain amount of oil to return to tank. Once the leak-off has taken place this oil needs to be replenished so that the system can be filled to capacity. This oil will be replenished by the external charge valve.

The system is designed in such a way that the pumps will always work in tandem, supplying oil flow when there is a demand for it.

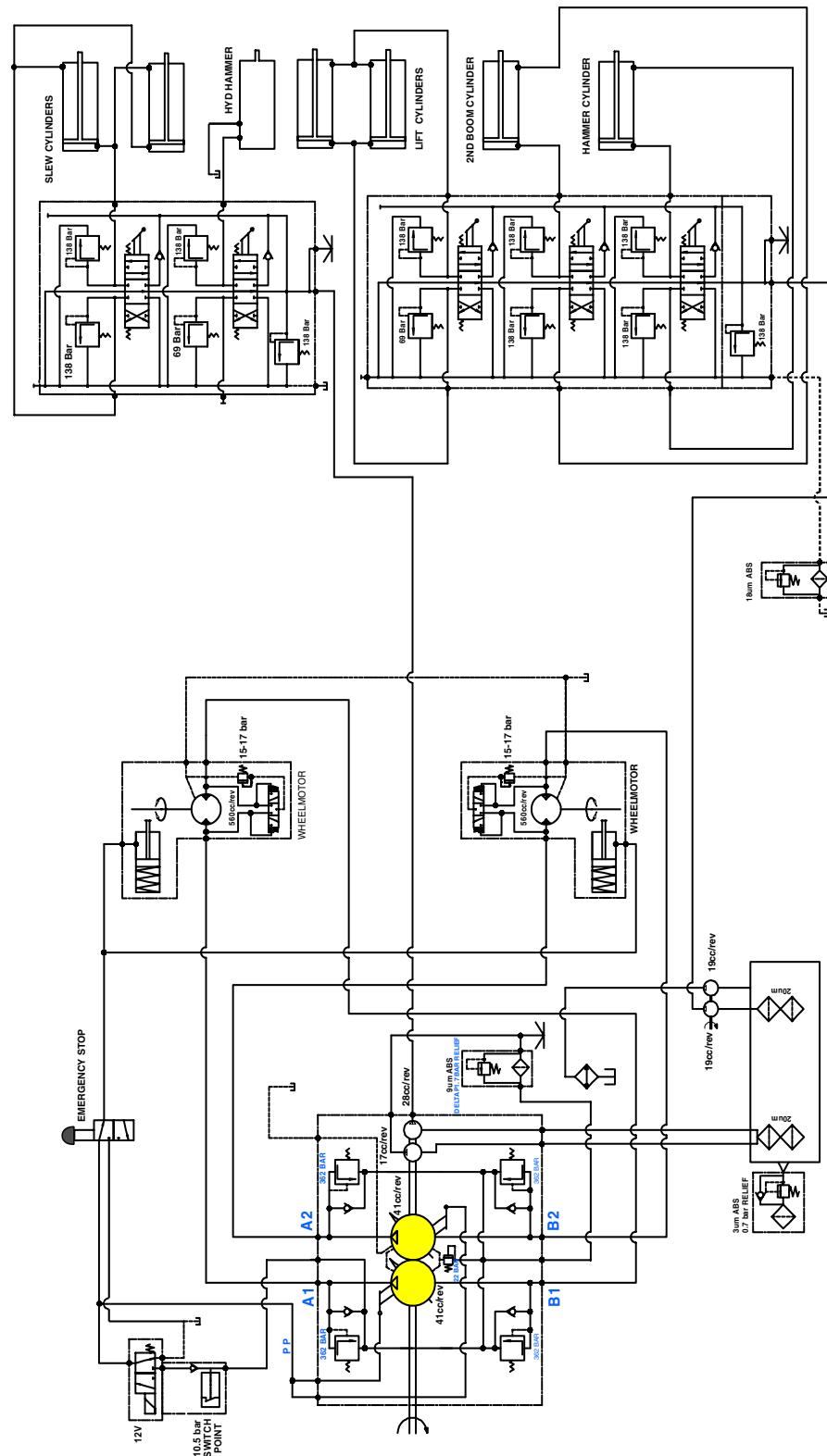
CHARGE PUMP (GEAR PUMP)

The charge pump is connected to the side of the engine and is driven off the engine timing gears. Depending on the engine / machine type, the charge pump will either be a single or a double pump.

The charge pump supplies oil to the right hand valve bank and to the Eaton transmission pump as well as to the park brake valve to release the park brake. The delivery size of the pump can vary from 16cc to 22cc.



HYDRAULIC SCHEMATIC



TD0009698-A



SERVICE & CHECKS

ELECTRICAL SCHEMATICS

ELECTRICAL

ELECTRICAL SCHEMATICS

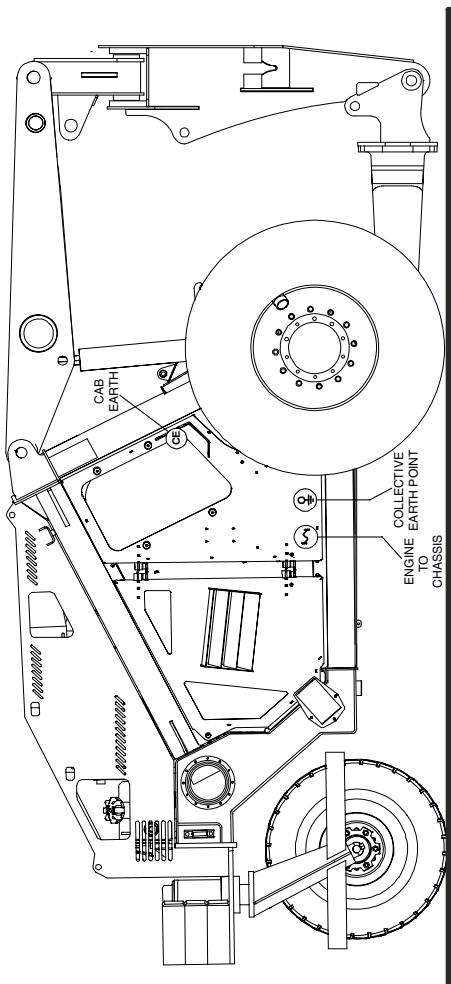
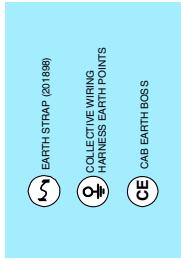
Electrical Schematics

220E ROCKSCALER

IMPORTANT!

IT IS VERY IMPORTANT THAT ALL EARTH CONNECTION POINTS ARE FREE OF PAINT AND CORROSION TO ENSURE METAL TO METAL CONTACT BETWEEN THE EARTH RING LUG AND MACHINE CHASSIS FOR PROPER ELECTRICAL CONNECTION.

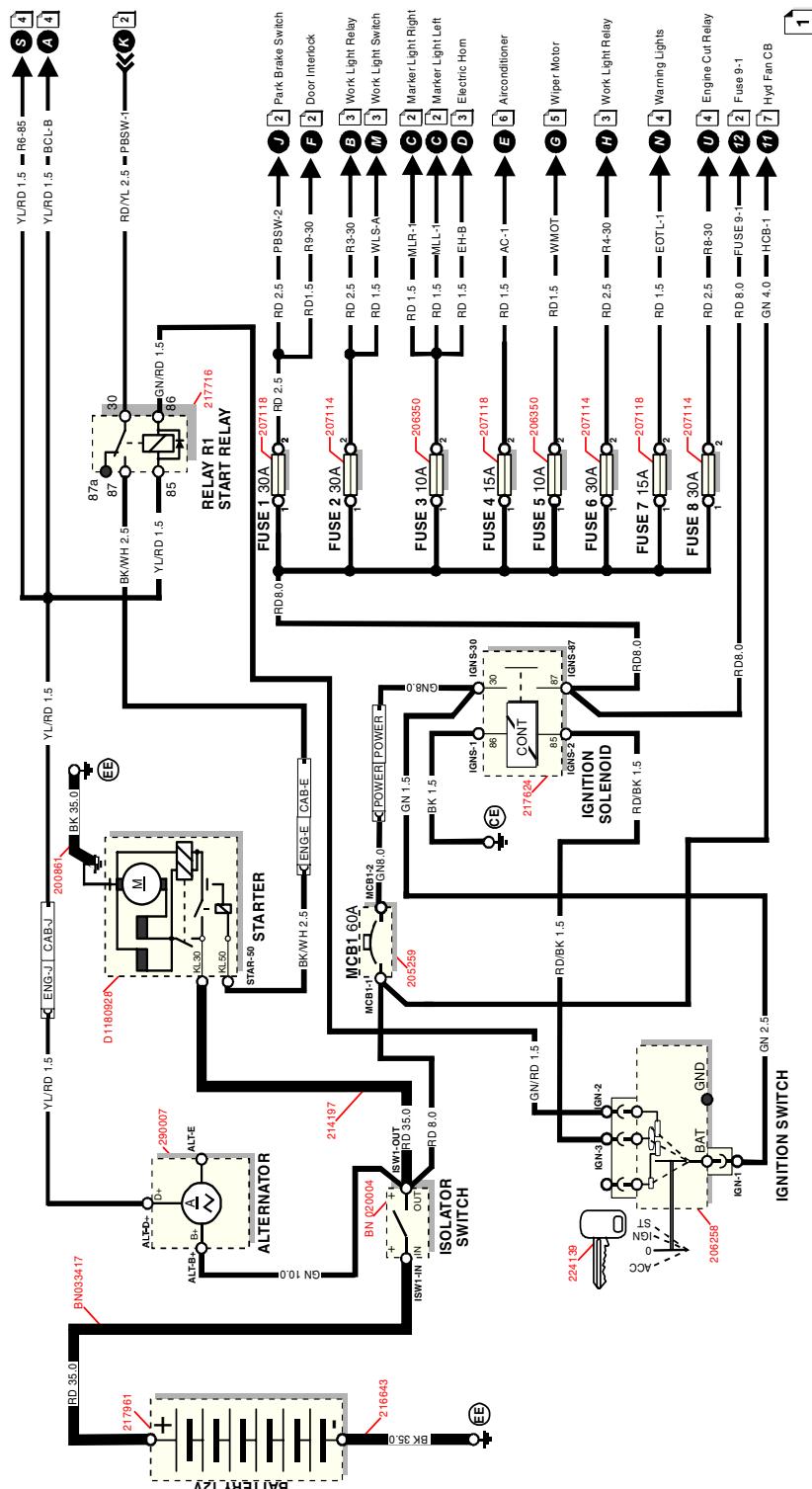
AARD Mining Equipment company reserves the right to change any details in the electrical systems.
AARD cannot be held responsible for misinterpretation of these schematics or faults that may arise from use
there of. Any errors in these must be reported back to the AARD Electrical Systems team.
All electrical repairs must be carried out by qualified AARD service personnel only.



TD0009699-B



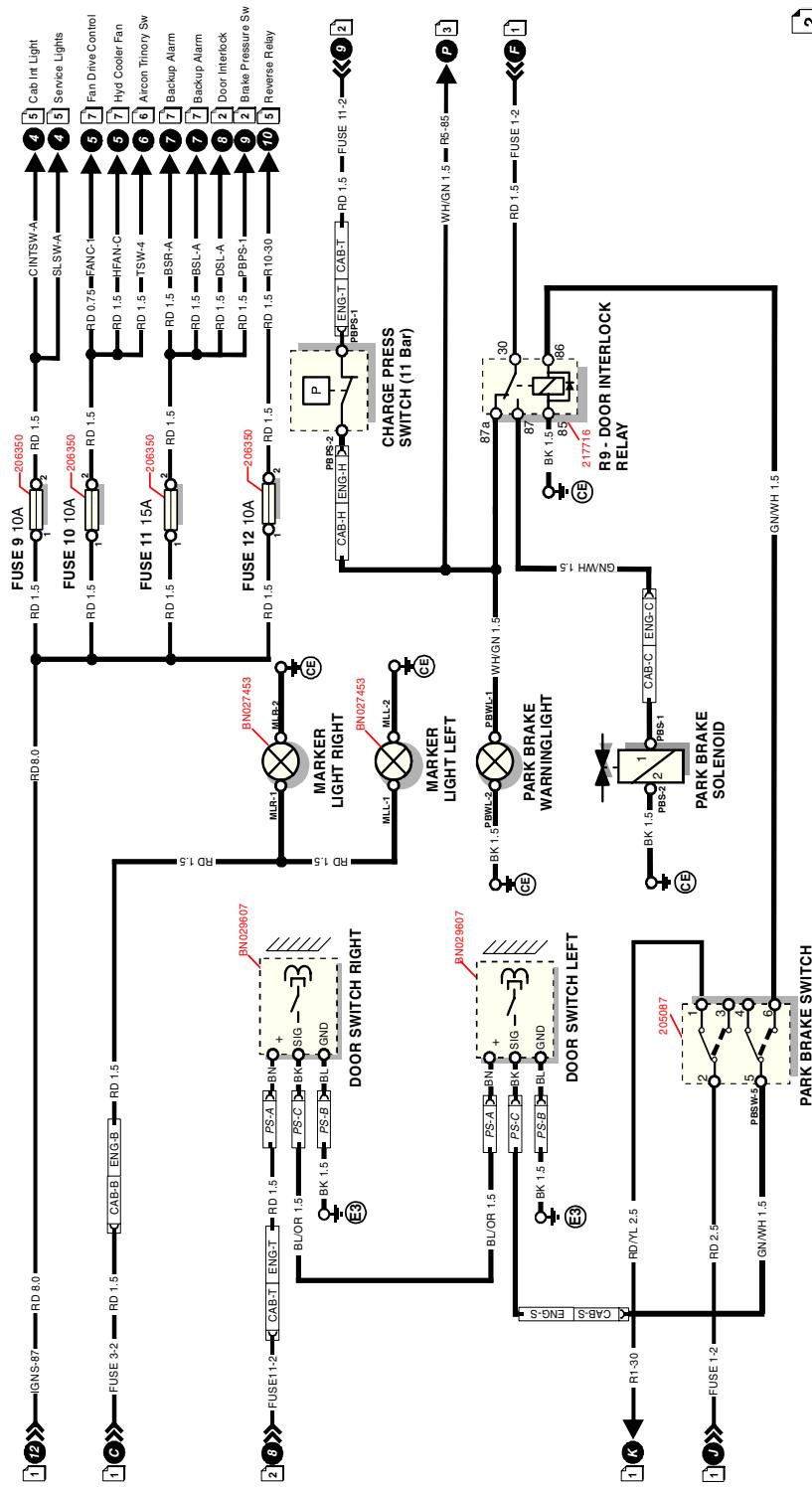
STARTING & CHARGING CIRCUIT



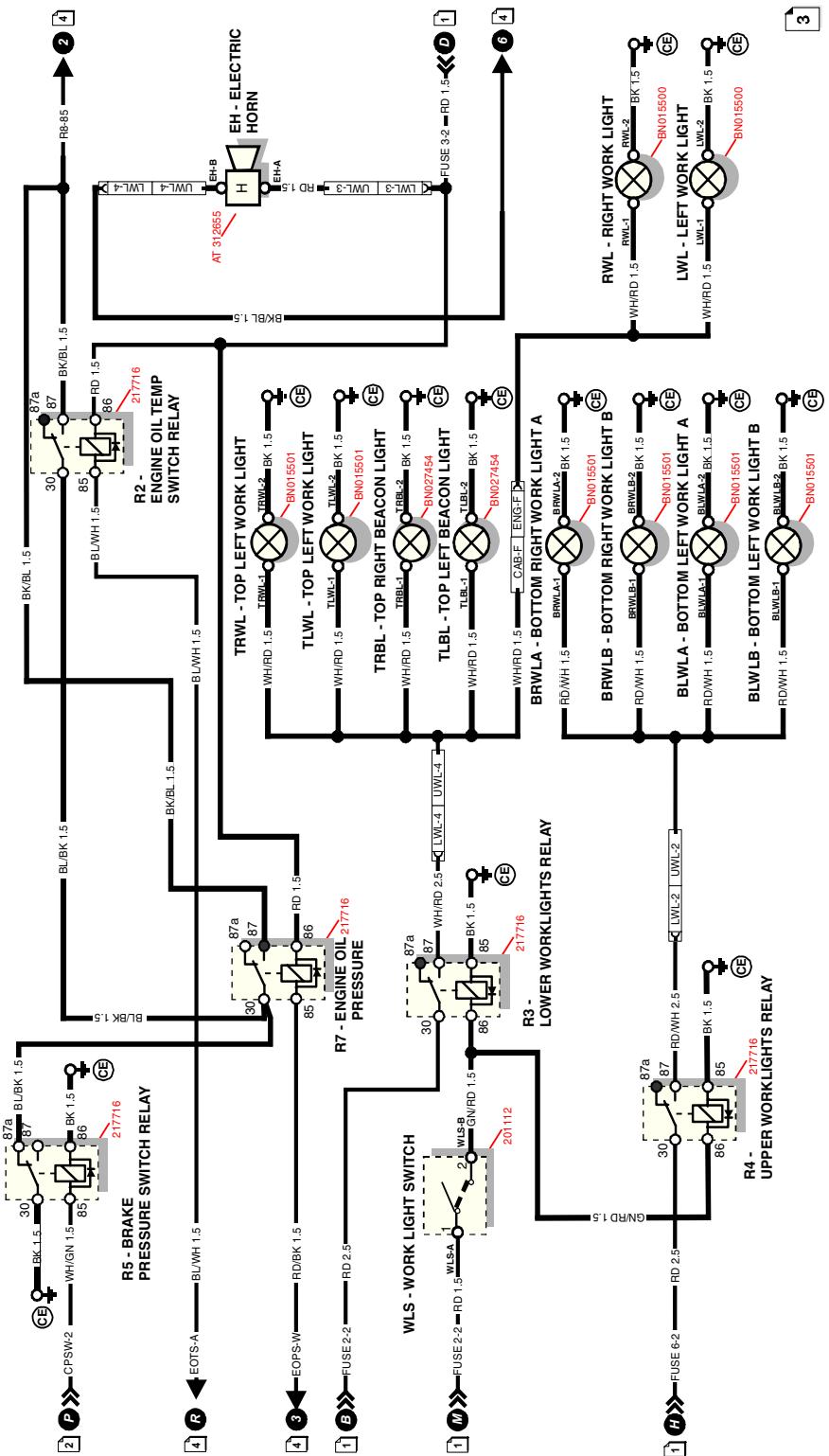
TD0009700-B



FUSES 9-12, DOOR INTERLOCK, MARKER LIGHTS & PARK BRAKE CIRCUITS



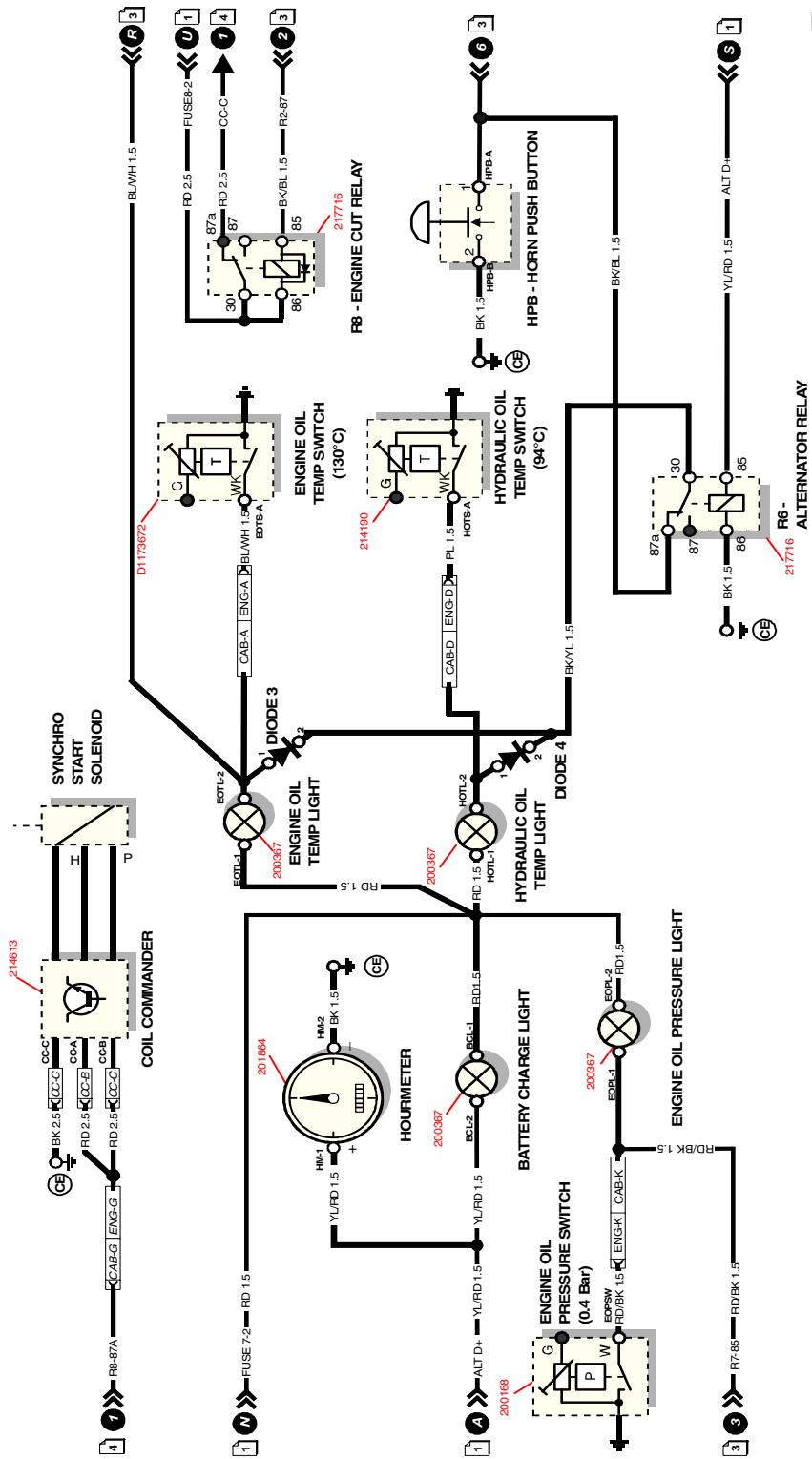
TD0009701-B



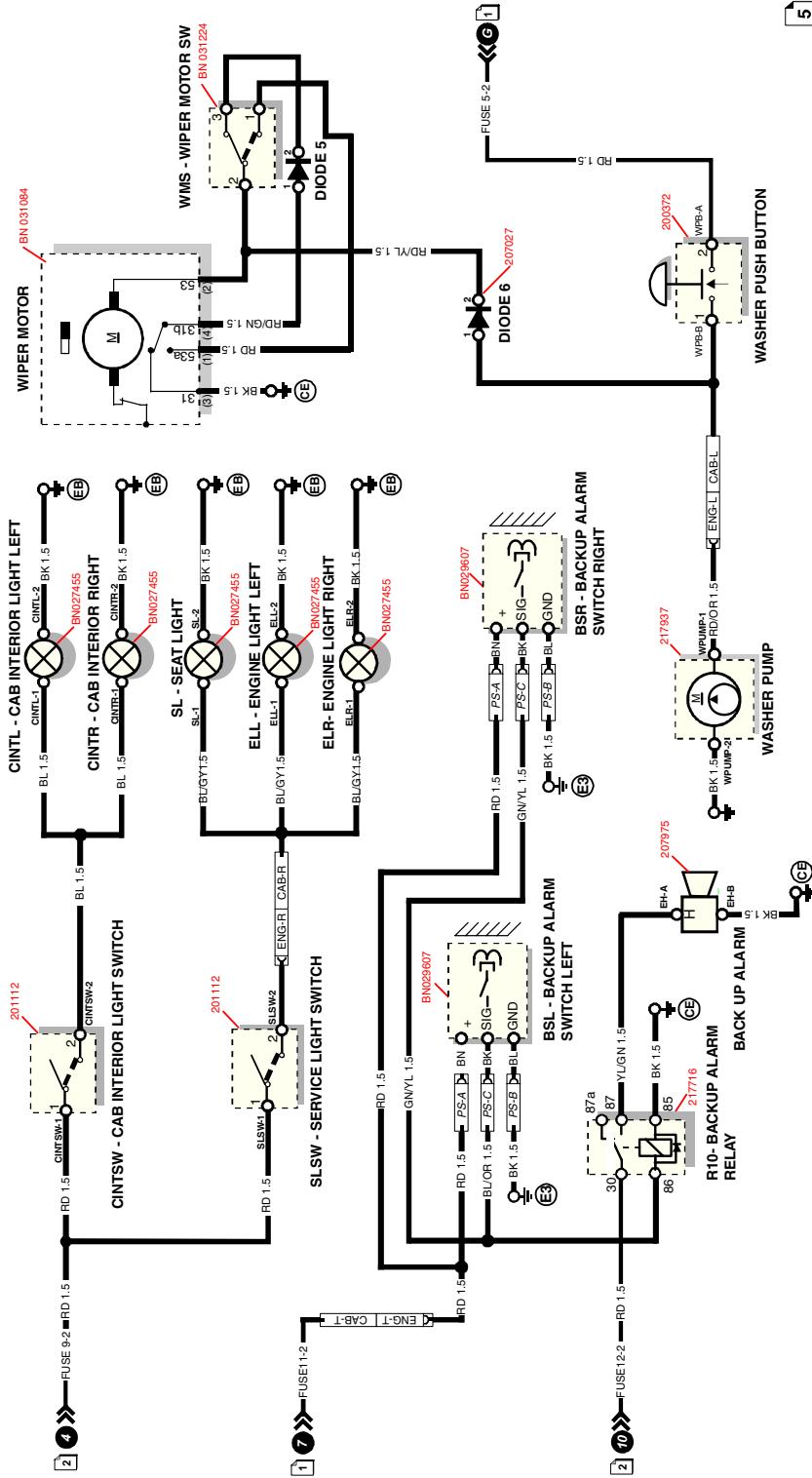
TD0009702-B



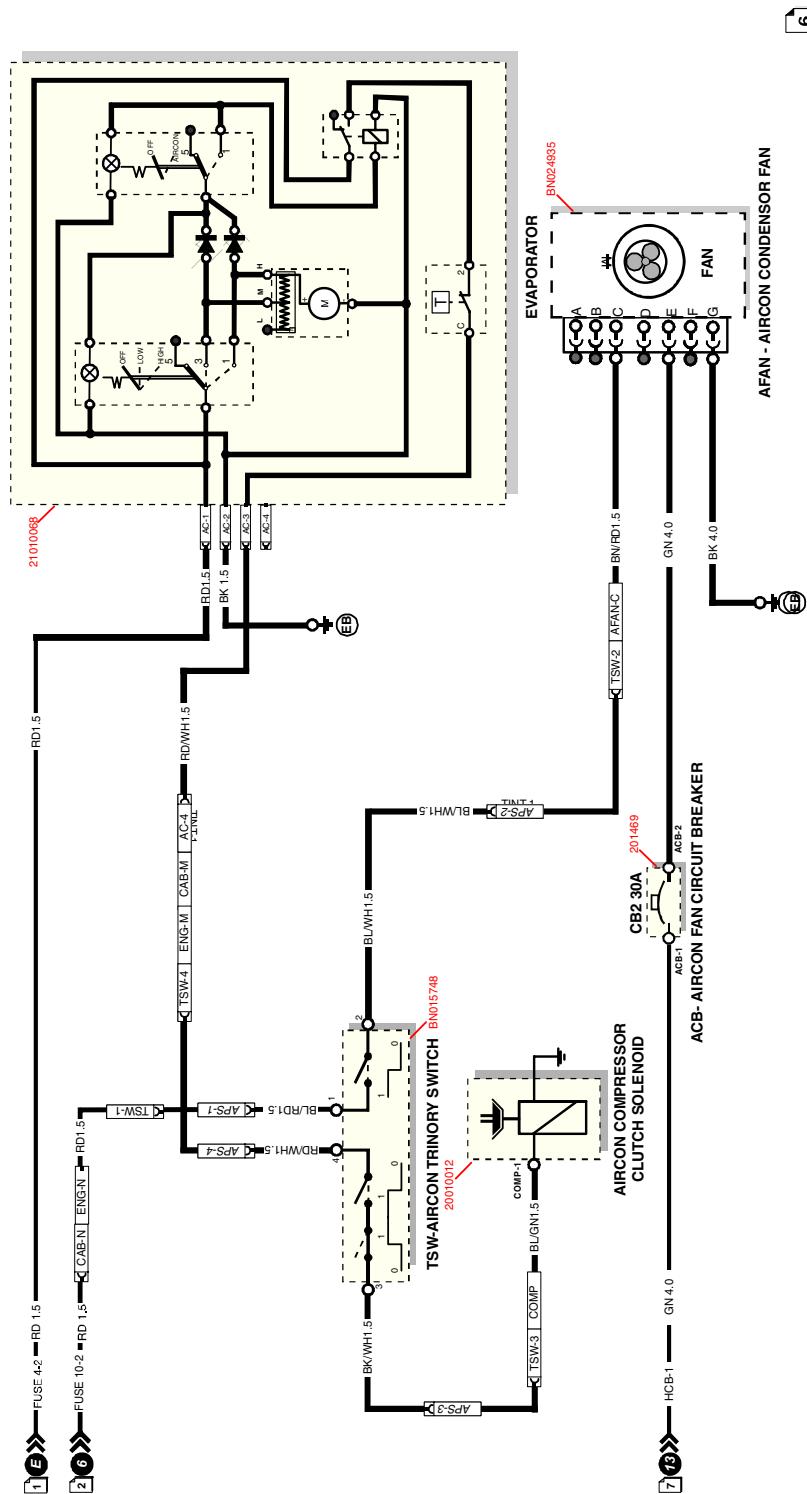
ENGINE CUT, WARNING LIGHTS & HOUR METER CIRCUITS



TD0009703-B

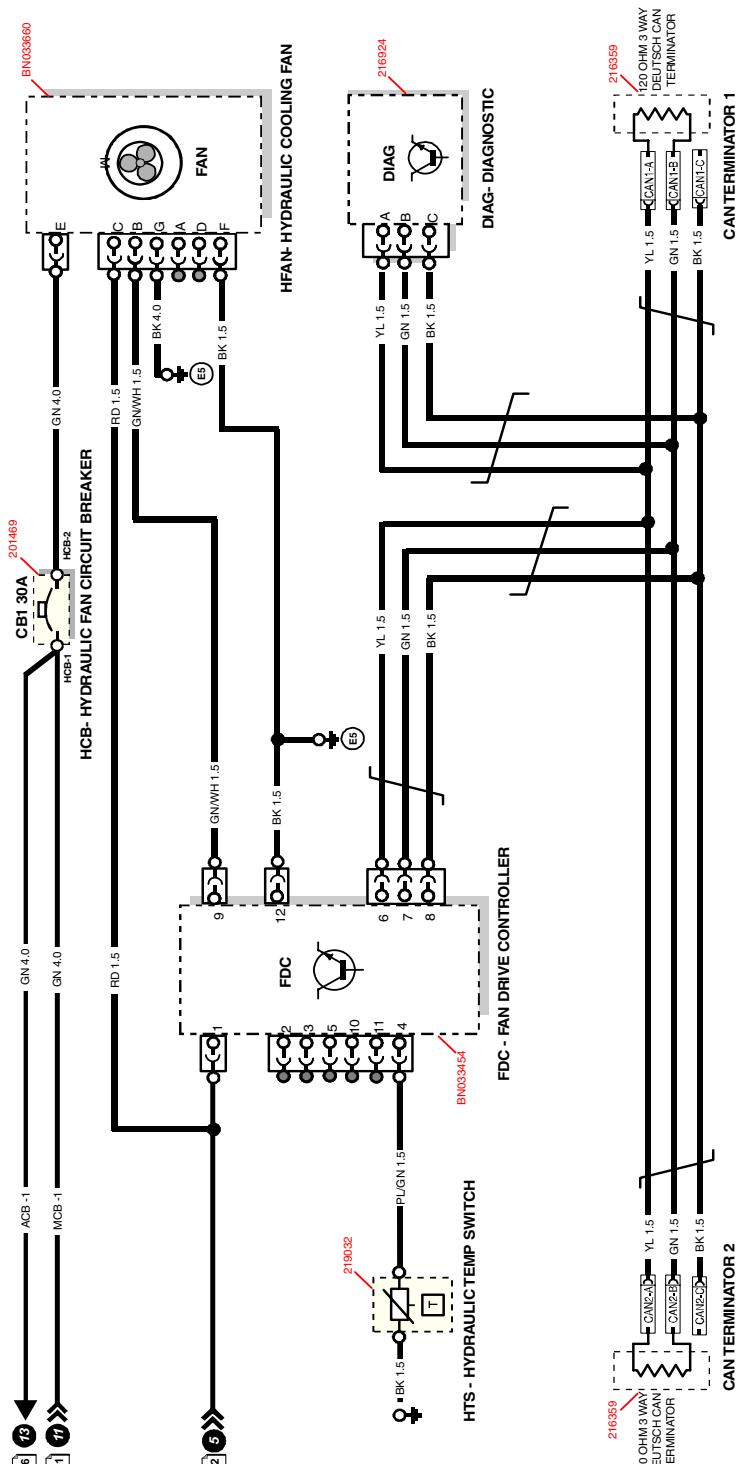


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TD0009705-B

HYDRAULIC COOLING CIRCUIT



TD0009921-A