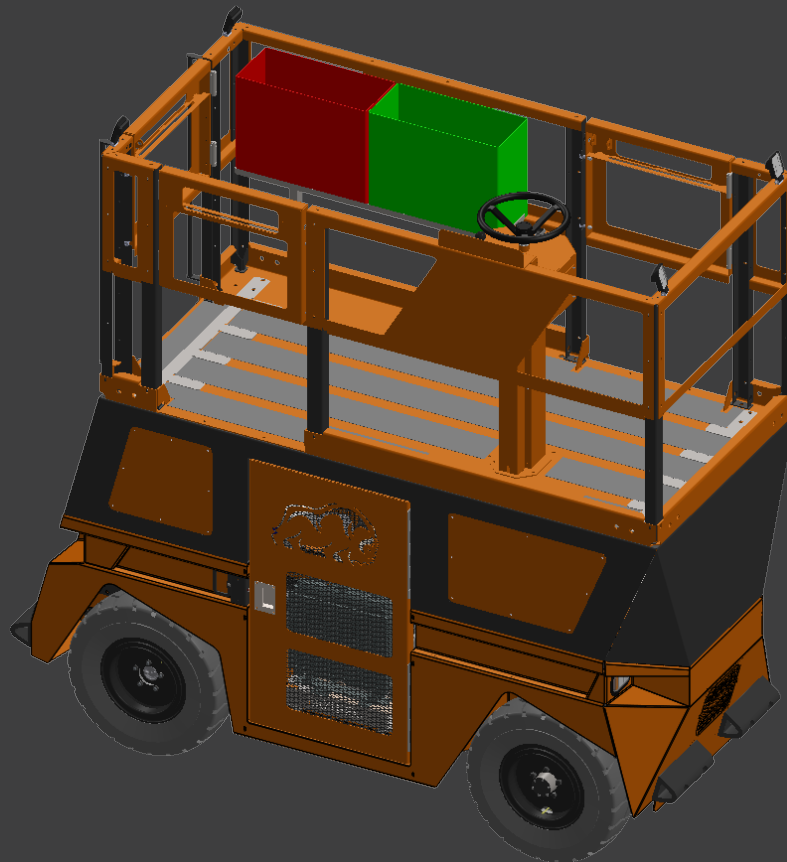


MX-705-IC



MAINTENANCE MANUAL

A GUIDE FOR PERFORMING MAINTENANCE AND REPAIRS ON MX-705 IC

UPDATED 24.07.2024
DESIGNED BY MOTREC INTERNATIONAL

MOTREC INTERNATIONAL INC.

5-YEAR LIMITED WARRANTY

FOR VEHICLES PRODUCED AFTER NOVEMBER 1, 2024



5-YEAR LIMITED WARRANTY ON AC-POWERED PRODUCTS, STOCK CHASERS AND TRAILERS

2-YEAR LIMITED WARRANTY ON DC OR IC POWERED PRODUCTS AND OTHER MOTREC PRODUCTS

Motrec warrants to the original purchaser that its products are free from defects in parts and workmanship.

STARTING DATE OF WARRANTY. The present terms and conditions of the Motrec Limited Warranty apply to new Motrec products only and do not replace any pre-existing warranty. The warranty period is effective from the date the purchaser receives the product, provided it is registered within ninety (90) days of reception and in conformity with Motrec's registration process.

REGISTRATION. IMPORTANT : AIMPORTANT: AS A PURCHASER OF A MOTREC PRODUCT, IT IS IMPORTANT THAT YOUR PRODUCT BE REGISTERED UNDER YOUR NAME AS REQUIRED BY MOTREC'S PRODUCT REGISTRATION PROCEDURE. PLEASE ASK YOUR MOTREC DEALER TO REGISTER YOUR PRODUCT. MOTREC'S LIMITED WARRANTY WILL BECOME EFFECTIVE AT THE TIME OF PRODUCT REGISTRATION. IF YOU DO NOT REGISTER YOUR PRODUCT, THE STARTING DATE OF YOUR MOTREC LIMITED WARRANTY WILL TAKE EFFECT ON THE DATE THE PRODUCT WAS DELIVERED TO YOUR MOTREC DEALER. IF YOU PURCHASED THE PRODUCT DIRECTLY FROM MOTREC AND NOT FROM A MOTREC DEALER, MOTREC HAS AUTOMATICALLY REGISTERED YOUR PRODUCT./

DEFECTS. Subject to the terms and conditions described below, parts, components, or accessories installed on the product by Motrec that fail under normal use within the warranty period, and that are proven to be defective, will be repaired or replaced without charge for parts or labor unless stated otherwise herein. This is Motrec's sole liability under this Warranty. Motrec reserves the right to require that all parts or components claimed to be defective be returned for inspection and verification of defect. The purchaser is responsible for any and all shipping fees of any and all parts or components that it alleges to be defective.

WARRANTY SERVICES. All warranty services must be rendered by authorized Motrec distributors and approved in writing by Motrec prior to initiating any repairs or adjustments. All approved warranty services will be paid for based on standard rates established by Motrec. Rather than replace or repair parts or components, Motrec may, at its discretion, replace the product or refund a prorated amount of its purchase price (based on service time, wear and tear) upon return of the defective product.

AUTHORIZATION PROCESS. No product shall be returned to Motrec without its prior authorization. All warranty claims must be disclosed to Motrec or its authorized distributor as soon as the purchaser is aware of a suspected defect or any event susceptible to give rise to a claim under the Motrec Limited Warranty. All claims must be processed through an authorized Motrec distributor using the warranty claim procedure approved by Motrec.

THE ABOVE TERMS AND CONDITIONS REPRESENT THE ONLY REPRESENTATIONS MADE BY MOTREC IN RELATION TO ITS PRODUCTS. MOTREC DOES NOT PROVIDE ANY OTHER PARTICULAR WARRANTY TO THE USER OF ITS PRODUCTS. MOTREC DOES NOT MAKE ANY EXPRESS OR IMPLIED WARRANTIES OR REPRESENTATION WITH RESPECT TO ANY RESULT, PERFORMANCE OR DURABILITY EXPECTED FROM THE USE OF ANY OF ITS PRODUCTS. MOTREC EXCLUDES AND DECLINES ANY OTHER WARRANTY OF SUITABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE WOULD THEY BE PROVIDED BY LAW, BY CONTRACT OR OTHERWISE.

PRODUCT MODIFICATIONS ARE PROHIBITED. Motrec prohibits and disclaims all liability for any modification made to the product, including but not limited to, modifications that are susceptible to altering the weight distribution and stability of the product, increasing its speed or affecting its safety. Such modifications can cause serious personal injury or property damage, which Motrec disclaims and excludes all responsibility. It is the purchaser's responsibility to ensure that any technicians servicing the product are properly trained as required by OSHA (Occupational Safety and Health Administration: <https://www.osha.gov/>) and ANSI-B56 (American National Standards Institute: <https://webstore.ansi.org/default.aspx>). Service technicians shall read, understand and follow the instructions in the Motrec Owner's Manual before servicing the product. Only qualified and authorized personnel shall be permitted to maintain, repair, adjust and inspect the product.

TRAINING. It is the purchaser's responsibility to ensure that the driver or any person operating, using, maintaining or handling the product (or its accessories) is properly trained and instructed on the product's safety features and operation, including its stability. Operators shall read, understand and follow the safety and operating instructions in the Motrec Owner's Manual before driving the vehicle. Operators shall not be permitted to operate the product unless complete and adequate training has been provided by the purchaser. Driving an electric vehicle constitutes a hazard. The driver is responsible for the control of the product while driving and must always evaluate all unusual situations that he or she may encounter while driving. The driver assumes the inherent hazards related to this activity. Motrec products are designed for off-road use only.

EXCLUSION OF LIABILITY. Motrec disclaims any liability for incidental or consequential damages, including, but not limited to, personal injury or property damage arising from misuse of the product, lack of maintenance or any defect in the vehicle.

UNDER NO CIRCUMSTANCE WILL MOTREC BE LIABLE FOR ANY DAMAGE, WHETHER DIRECT, INDIRECT OR OTHERWISE, RESULTING FROM THE USE OF ITS PRODUCTS, EVEN IF MOTREC OR ONE OF ITS REPRESENTATIVES WAS AWARE OF THE POSSIBILITY OF SUCH DAMAGE. ANY LIABILITY FOR LATENT DEFECT IS LIMITED TO THE PRICE OF THE PRODUCT.



1. Definitions

"Product": the complete electrical vehicle manufactured and/or assembled by Motrec, including its parts, components and accessories installed by Motrec.

"Purchaser": The party in whose name the product is originally registered at the time of purchase pursuant to the product registration procedure maintained by Motrec at that time, either: (a) the party to whom Motrec sold the product, if that party purchased the product for its own use, or (b) the customer of a Motrec dealer, who bought the product directly from such dealer.

2. Warranty Period

Your Motrec product is covered by the Motrec Limited Warranty for a period of five (5) years or **5,000 hours** of use, whichever comes first. This period of three (3) years starts on the date the product is registered, as mentioned hereinabove. This coverage does not apply to wearable parts, normal use or abusive usage of the product.

3. Warranty Registration

The warranty registration must be completed within ninety (90) days of purchase of the product. If registration is not completed within this time, the warranty will begin on the date the product was delivered. If you purchased the product from a Motrec dealer, please make sure the dealer has completed the registration. If you purchased the product directly from Motrec, Motrec has automatically registered your purchase.

4. Maintenance

Motrec requires that scheduled maintenance be performed at the times shown in the Owner's Manual. If this scheduled maintenance is not done and the product fails as a result of a failure to properly maintain it, repairs will not be covered under any warranty.

5. Warranty will be void if :

- The product has been modified in any manner not approved in writing by Motrec.
- The product has been overloaded beyond its rated capacity.
- The product's maximum speed has been increased.
- The product's motor controller parameters have been tampered without Motrec's authorization.
- The product has been used abusively
- (including, but not limited to improper use; twisted, bent, misaligned front or rear axles; any signs of abusive use).
- The product has been involved in an accident.
- The product has been transferred to a second owner without Motrec's authorization.
- The product has been used in extreme environments (including, but not limited to freezers, excessive moisture areas, corrosive environments, etc.).
- The product has had its serial number modified or altered.
- The product was not maintained as specified in the Motrec Owner's Manual.

6. The following items are not covered by the limited Motrec warranty :

- Batteries, charger, wheels
- Wearable parts (fuses, tires, wheel bearings, seats, brake pads and shoes)
- Wear and Tear resulting from normal use
- Adjustments, including field set-up
- Damage or defects caused by using non-Motrec parts, components, or accessories
- Shipping damage caused by freight carrier
- Shipping fees for warranty parts
- Travel fees for technical support and repair

FOREWORD

WELCOME

MOTREC International Inc. has built a rock-solid reputation as a world-class designer and manufacturer of electric industrial vehicles for the horizontal transportation of goods and people. We innovated, reimagined, engineered, and drove ourselves tirelessly to this preeminent position.

We also consistently exceeded customer expectations, which is why legions of satisfied customers worldwide have been driving MOTREC since 1988.

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MOTREC INFORMATION

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ABOUT THE MANUAL

Make sure to read the manual in its entirety before operating or servicing the vehicle. Keep the manual close for reference when necessary. Do not discard the manual. If the vehicle is sold or transferred, provide this manual with it.

This manual is based on the latest available information at the time of publication.





**“AYONE CAN WORK
WE PERFORM
THAT’S MOTREC ”**

-Motrec Tagline

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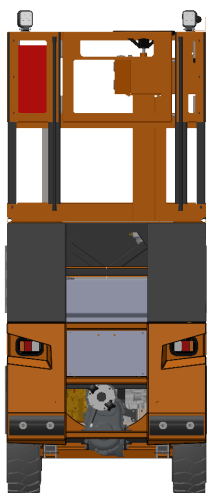
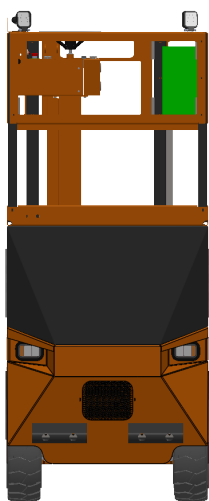
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1. PREFACE



1.1. INTRODUCTION

Read Before Operating

Make sure to read and understand the content of this Maintenance Manual before operating or attempting maintenance on the vehicle. The present document provides a vehicle overview and safety information for the operator, passengers, and others, as well as a detailed list of the maintenance to be executed over the lifespan of the vehicle.

Keep this manual for future reference. If the vehicle is sold or transferred, provide this manual with the vehicle.

A list of [quick maintenance references](#) is included at the back of this document. These references are intended for an MX-705 experienced technician to accelerate the maintenance process. The Quick References should not be used by any untrained or inexperienced personnel.

The MX-705

With its elevated platform, the MX-705 is the ideal vehicle for working at height in a narrow space. Its design prioritizes driver safety and productivity. The precise controls operate smoothly, ensuring maneuverability and ease of use. Made entirely of steel, this robust, low-maintenance model is designed for heavy-duty use and long-term reliability. Powered by an IC engine, it is suitable for intensive applications. Like all Motrec vehicles, the MX-705 can be customized to meet your specific needs.

Modular Design

The Motrec MX-705 electric vehicle showcases an intelligent and The IC (diesel engine) powered MX-705 by Motrec boasts an intelligent and efficient modular design that supports various configurations. This approach delivers a range of benefits, enhancing the vehicle's functionality, adaptability, and maintenance convenience. In this guide, we will delve into the advantages of the Motrec MX-705's modular design, with a focus on its exceptional features.

1.2. ACRONYMS AND ABBREVIATIONS

°C :	Celsius
°F :	Fahrenheit
ANSI :	American National Standards Institute
AUX :	Auxiliary
EMB :	Electromagnetic Brake
ft :	Feet
A :	Amperes
HD :	Heavy Duty
HP :	Horsepower
Hz :	Hertz
ITSDF :	Industrial Truck Standards Development Foundation
kg :	Kilogram
km/h :	Kilometer per Hour
kW :	Kilowatt
kWh :	Kilowatt-Hour
lb :	Pounds (Weight)
lbf :	Pound (Force)
LD :	Low Duty
LED :	Light Emitting Diode
m :	Meter
mL :	Milliliter
mm :	Millimeter
N/A :	Not Applicable
N·m :	Newton Meter
OSHA :	Occupational Safety and Health Administration
P/N :	Part Number
VDC/DC :	Volts Direct Current / Direct Current

2. SAFETY INFORMATION

2.1 SAFETY SIGNAL WORDS AND SYMBOLS

Before operating the vehicle and reading the manual, it is important to familiarize yourself with the signal words and symbols that appear throughout the manual and on the vehicle. Understanding their meanings will help ensure safe and effective use of the vehicle.

WARNING

WARNING INDICATES A HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN SERIOUS INJURIES.

CAUTION

CAUTION INDICATES A SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DAMAGE TO SOME EQUIPMENT.

NOTICE : Notice is used to address practices not related to personal injury.

2.2 SAFETY DECALS AND LABELS

WARNING

DECALS, MARKINGS, OR STICKERS MUST REMAIN UNALTERED AND READABLE AT ALL TIMES. REPLACE ANY UNREADABLE DECALS, MARKINGS OR STICKERS. FAILURE TO COMPLY COULD CAUSE SERIOUS INJURIES.

The vehicle contains numerous safety decals that provide essential information for both the operator and technicians. To view a complete list of all the decals, please refer to the **PARTS CATALOG (MPV)**.

3. VEHICULE OVERVIEW

3.1. SPECIFICATIONS AND CONFIGURATIONS

The MX-705 specifications and configurations can vary depending on the specific model and year of the MX-705. For more information and the most up-to-date details, it is best to consult with Motrec directly or refer to our website www.motrec.com.

EQUIPMENT COMPARTMENTS FOR CONFIGURATION 1 : STAND UP VERSION :

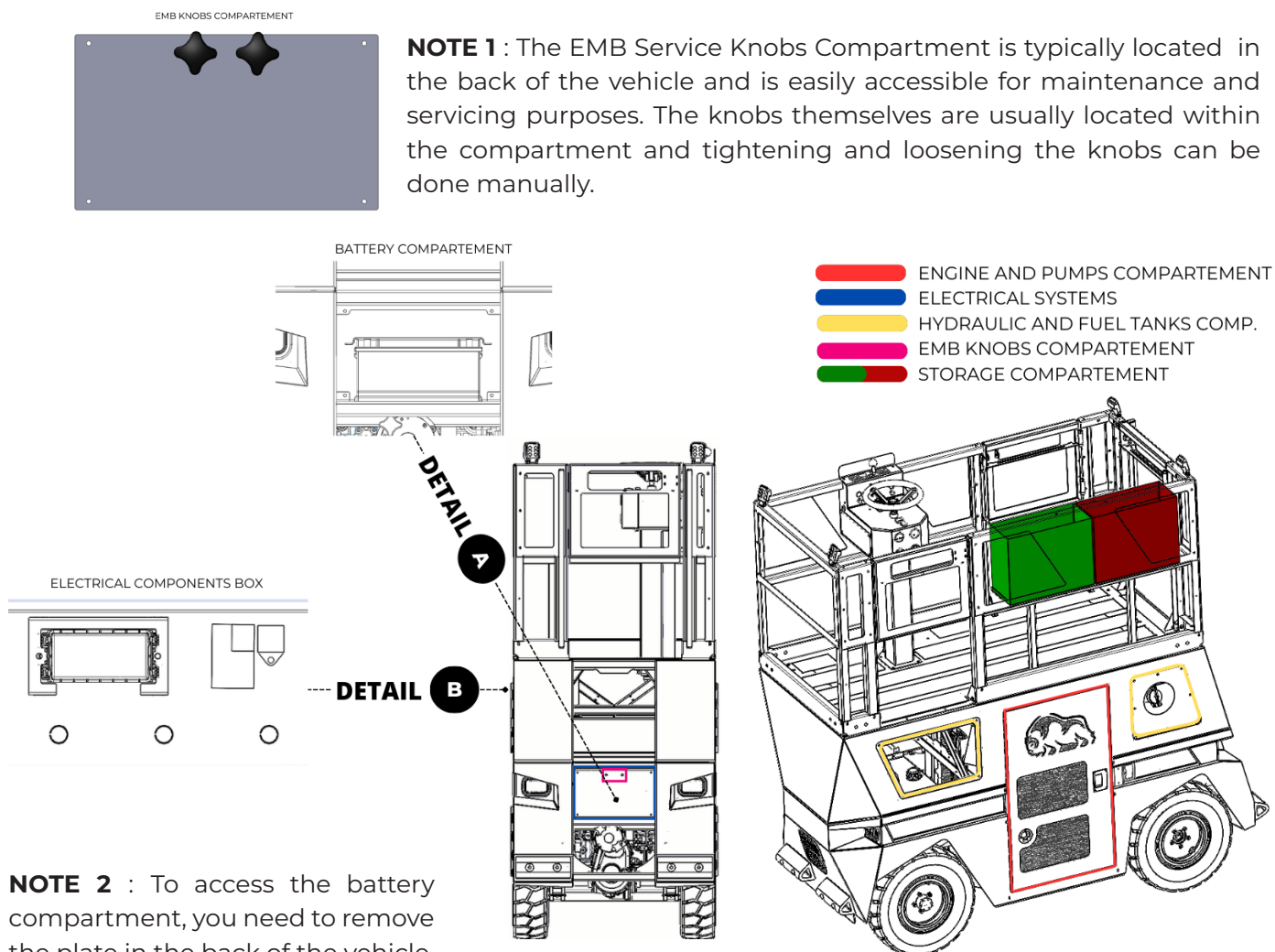


Figure 1. Equipment Compartments Front and Side View.

3.2 ELECTRICAL SYSTEMS

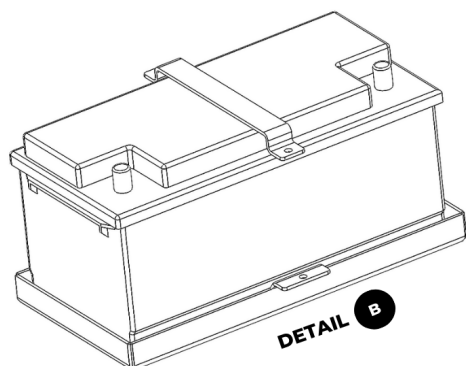


Figure 2. b. 12 V Battery (Detail B).

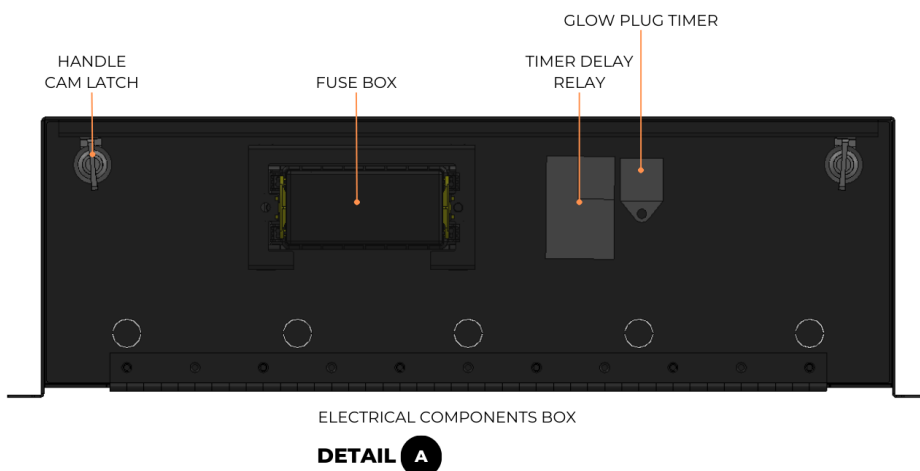
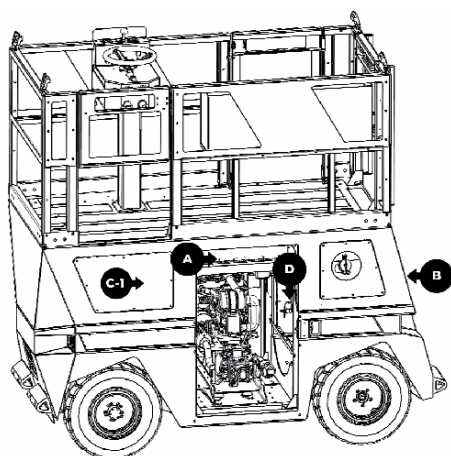


Figure 2. a. Electrical System Compartments (Detail A).



The electrical compartment receives the energy from the 12 VDC battery redistributes it to the different electrical systems of the vehicle. The energy systems can be divided into two categories:

- Engine Energy : which uses the full battery voltage to power the engine.
- Accessories Energy : which powers the different accessories of the vehicle (backup alarm, horn, console, etc.) (12 V).

For connection details, refer to the vehicle's electrical schematic

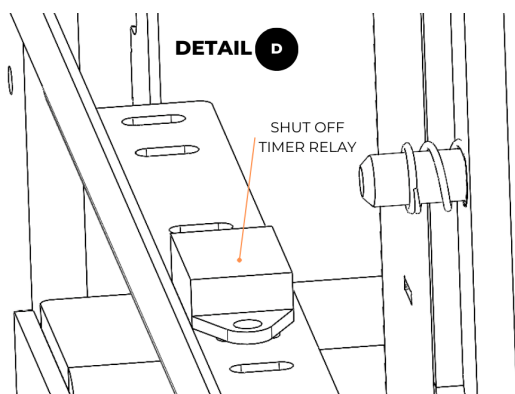


Figure 2. d. Shut Off Timer (Detail D).

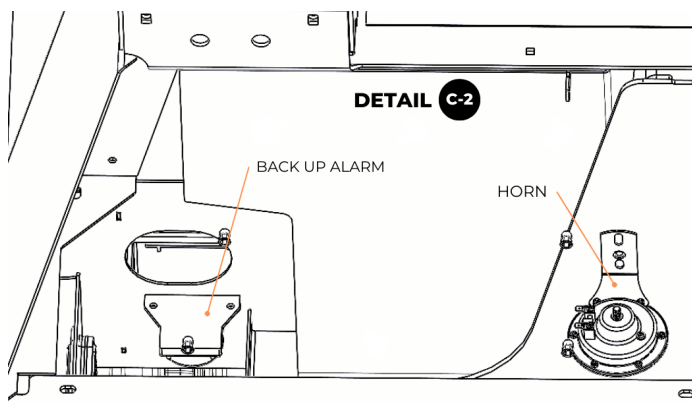


Figure 2. c. Horn And Backup Alarm Placement (Detail C-2).

NOTE 1 : The C-2 zone is parallel to the C-1 zone on the opposite side of the vehicle.

NOTE 2 : The wiring remains the same, but the component placement may vary from one vehicle model to another.

3.2.1 WARNING SYSTEM

- Purpose :** The vehicle's warning system is designed to alert the driver of potential engine issues. When the driver turns the key, the horn initially sounds because, after the engine has been off for a while, there is naturally no engine oil pressure. This is a normal part of the start-up process. However, if the horn continues to sound beyond the initial start-up phase, it indicates a potential engine malfunction. This extended horn warning serves as an audible alert, prompting the driver to take immediate action, such as checking the engine or shutting it off, to prevent damage and ensure the vehicle's safety and reliability. Additionally, if the horn activates while driving, it indicates either an engine oil pressure drop or a temperature rise, signaling the driver to address these critical issues immediately.
- Connection in the vehicle :**

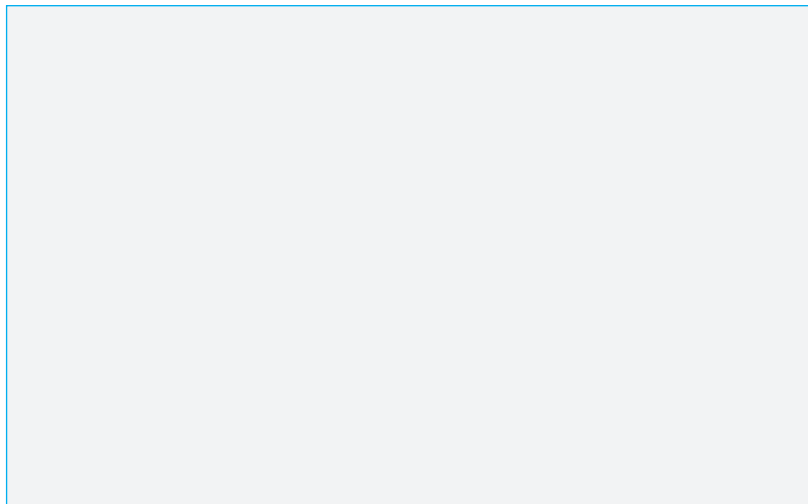


Figure 3. Warning System -Electrical Diagram-.

3.2.2 SHUT-OFF SOLENOID

- Purpose :** In diesel engines, the shut-off solenoid is used to stop the engine by cutting off the fuel supply to the fuel high pressure pump. When the ignition switch is turned off, the solenoid is deactivated, closing the valve and stopping the fuel flow, thereby shutting down the engine. It acts as a safety device to prevent engine runaway.
- Connection in the vehicle :**

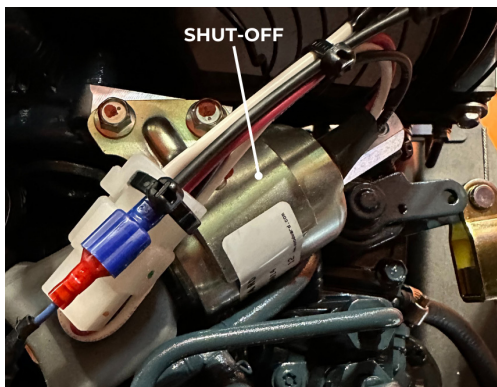


Figure 4.a Shut-Off (Engine compartement).

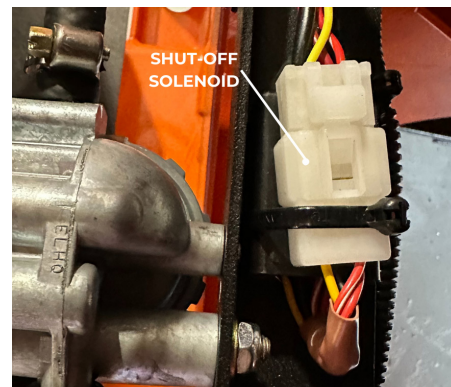


Figure 4.b Shut-Off Solenoid Connection In The Vehicule.

3.2.3 ADJUSTABLE TIMER INTERLOCK RELAY

- Purpose :** When the key is turned off, the vehicle doesn't stop immediately but instead waits for a preset duration, such as 3 seconds (adjustable), before engaging the EMB and placing the vehicle in neutral.
- Connection in the vehicle :**

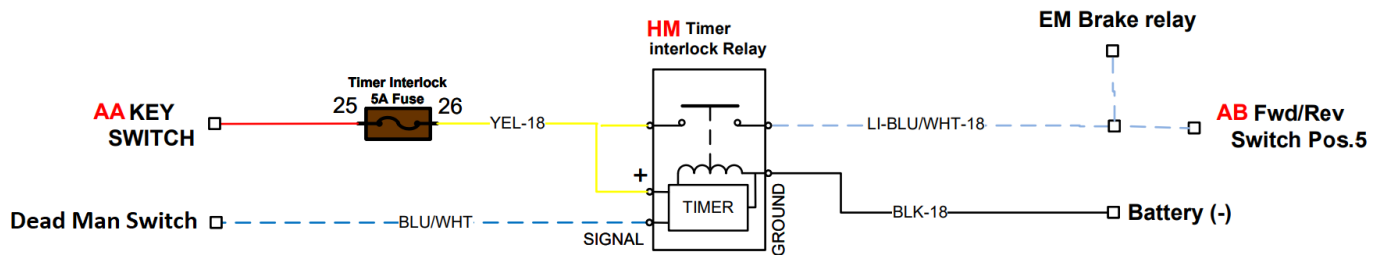


Figure 5. Adjustable Timer Interlock Delay Connection -Electrical Diagram-.

3.3 ENGINE

The MX-705 IC is a versatile vehicle exclusively powered by a reliable diesel engine. This standard version ensures consistent performance and efficiency for various applications.

3.3.1 DIESEL ENGINE

A diesel engine operates by converting the energy stored in diesel fuel into mechanical power through a series of controlled combustion events within its cylinders. It also operates on a four-stroke cycle: intake, compression, combustion, and exhaust. Diesel engines rely on compression ignition, where the air in the cylinder is highly compressed until it's hot enough to ignite the diesel fuel injected into the cylinder. This combustion drives the engine's three pistons, which are connected to the crankshaft, ultimately producing mechanical movement.

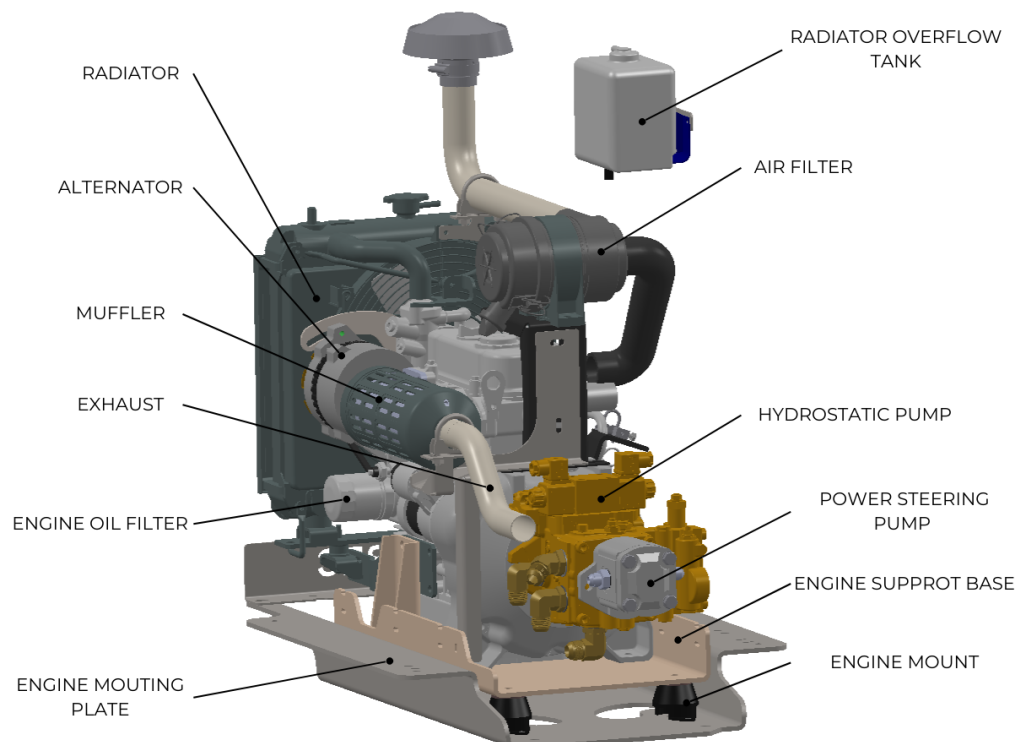


Figure 6. Diesel Engine.

3.4. ELECTROMAGNETIC BRAKE (EMB)

The MX-705 vehicle is equipped with an electromagnetic brake (EMB).

The electromagnetic brake is in a Normally Applied state and is electrically released during operation. This means it requires current to be released and allow movement of the vehicle. This safety feature automatically stops the vehicle in the event of loss of power, therefore removing the need for a handbrake (parking brake).

The spring-applied brake keeps the vehicle stationary when it comes to a stop, or when the power is cut off. In situations where the vehicle is not powered and requires movement, it is necessary to insert the electromagnetic brake's service knobs. Please refer to the electrical diagram shown in Figure 8.

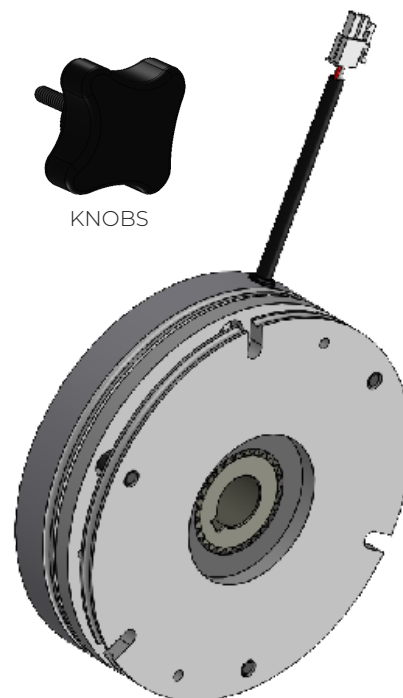


Figure 7. EMB Brake System.

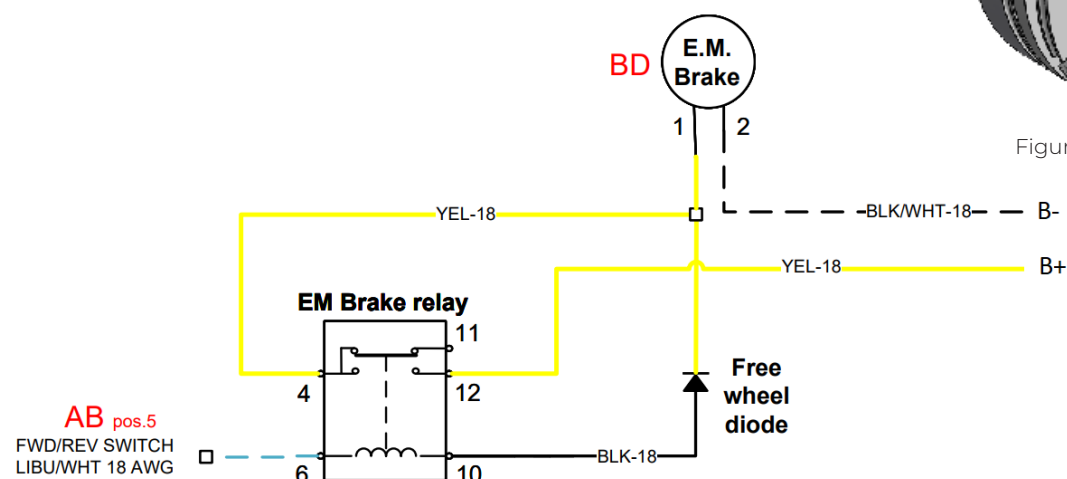


Figure 8. EMB Connection -Electrical Diagram-.

3.5 HYDRAULIC PUMPS

Two hydraulic pumps have been installed within the MX-705.

These are the two types of hydraulic pumps :

1. The hydrostatic pump is responsible for enabling forward and reverse movement. This pump, pressurizes hydraulic fluid from the reservoir and directs it to an axial piston hydraulic motor and a differential adapter that drive the vehicle's wheels forward and backwards.

Regular inspections for leaks, monitoring fluid levels, and checking for any unusual noises during operation are essential tasks. Additionally, proper maintenance of the entire hydraulic system, including filters and hoses, is necessary to maintain the reliability and efficiency of the propulsion pump.

2. The power steering pump is driven by the vehicle's engine, ensuring a continuous supply of hydraulic pressure while the engine is running. It draws hydraulic fluid from the reservoir, pressurizes it, and sends it through the power steering system to control the right or left movement of the vehicle's wheels.

Proper maintenance of the power steering pump is essential to ensure optimal steering performance. Regular checks for leaks and proper fluid levels are crucial to the pump's longevity and the overall safety of the vehicle.

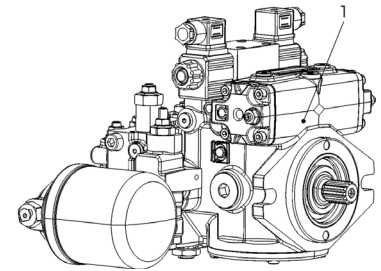
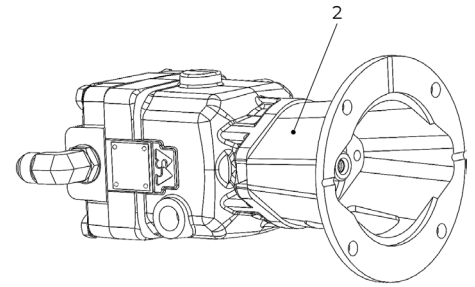


Figure 9. Hydrostatic Pump (1) and Axial piston Hydraulic Motor / Differential adapter Assembly (2).

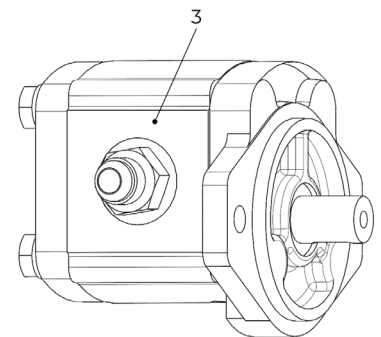


Figure 10. Power Steering Pump (3).

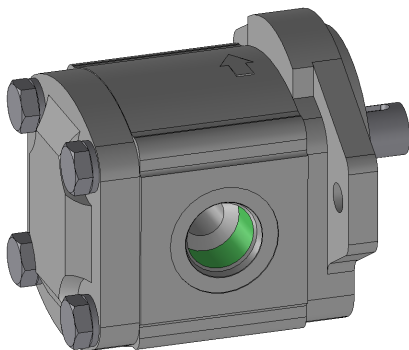


Figure 11. Connections.

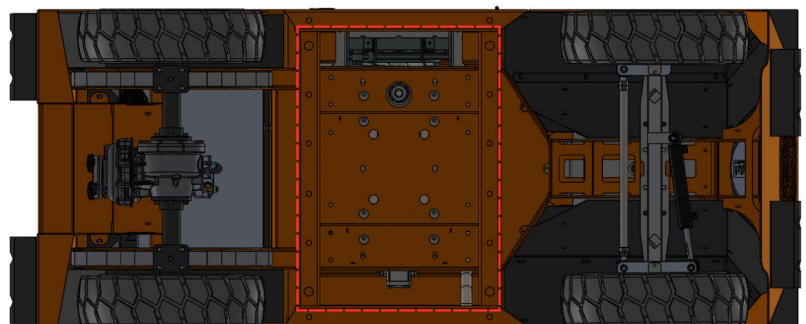


Figure 12. Hydraulic Pumps Compartment (bottom view).

NOTE : Colors are used to denote connections between elements, as depicted in the figure 11 above with the highlighted green color.

3.6 STEERING SYSTEM

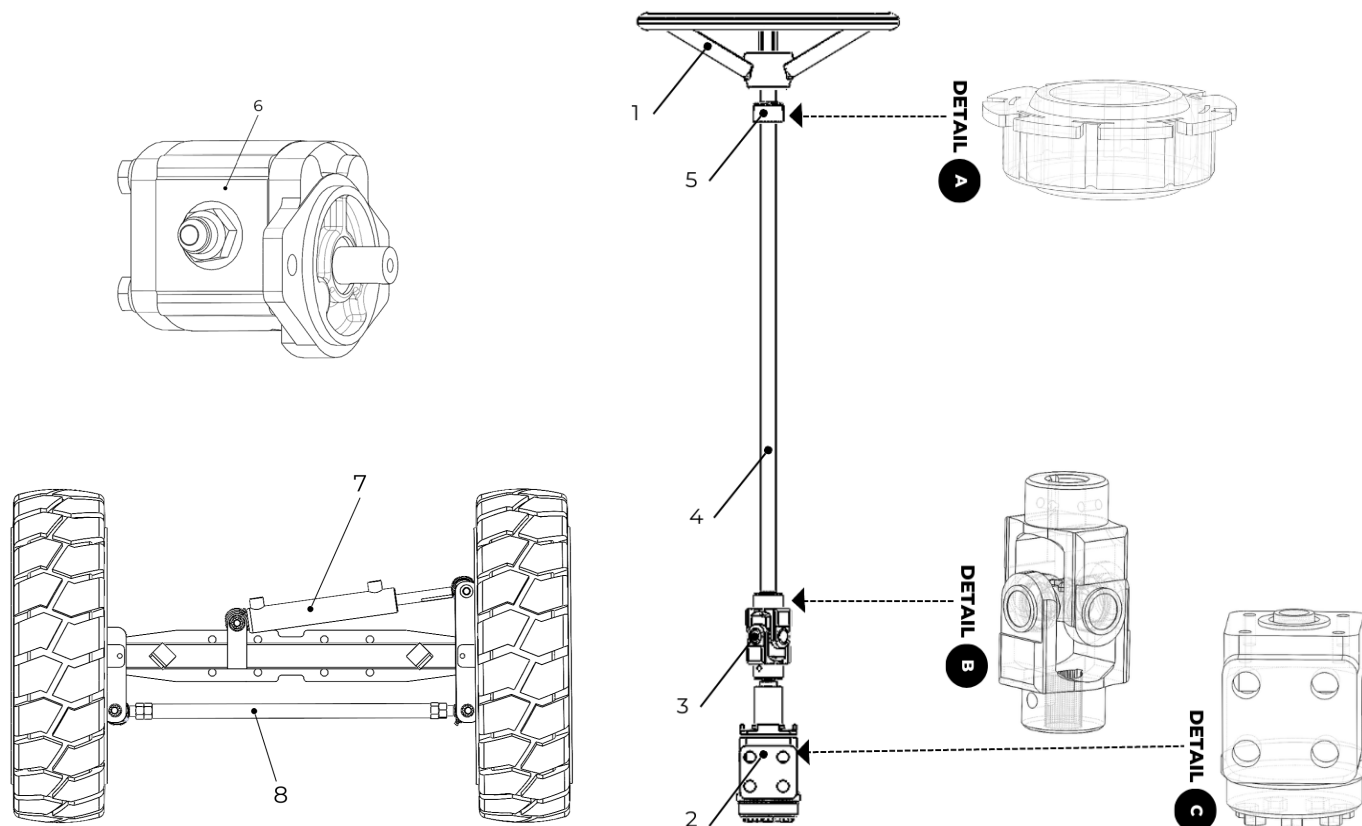


Figure 13. Steering System.

When the driver turns the steering wheel (1), the rotational motion is transmitted to the orbitrol (2) via the universal joint (3), the steering shaft (4), and the igus bushing (5). In essence, the orbitrol steering unit directs the hydraulic pressure generated by the power steering pump (6) towards the steering cylinder (7) on the appropriate side of the vehicle, converting it into mechanical force to control the movement of the vehicle's wheels. This hydraulic pressure causes the wheel to turn as required, and this coordinated movement is mirrored by the opposite wheel through an interconnected linkage system (8).

3.6.1 HYDRAULIC STEERING SYSTEM

The hydraulic steering system within your vehicle functions as an integrated ensemble as illustrated in figure 14.

The power steering pump, as the prime mover, engenders hydraulic pressure. The orbitrol steering unit, akin to a control center, orchestrates the hydraulic fluid's distribution in correspondence with steering inputs. The diverter valve operates as a hydraulic switch, managing fluid allocation towards the left or right. Finally, the double-acting cylinder translates hydraulic energy into pivotal motion for wheel articulation.

This collaborative assembly guarantees meticulous and fluid steering response, with power steering pump activation correlated to steering actuation, pressure modulation governed by the orbitrol unit, flow direction supervised by the diverter valve, and kinetic output enacted by the cylinder.

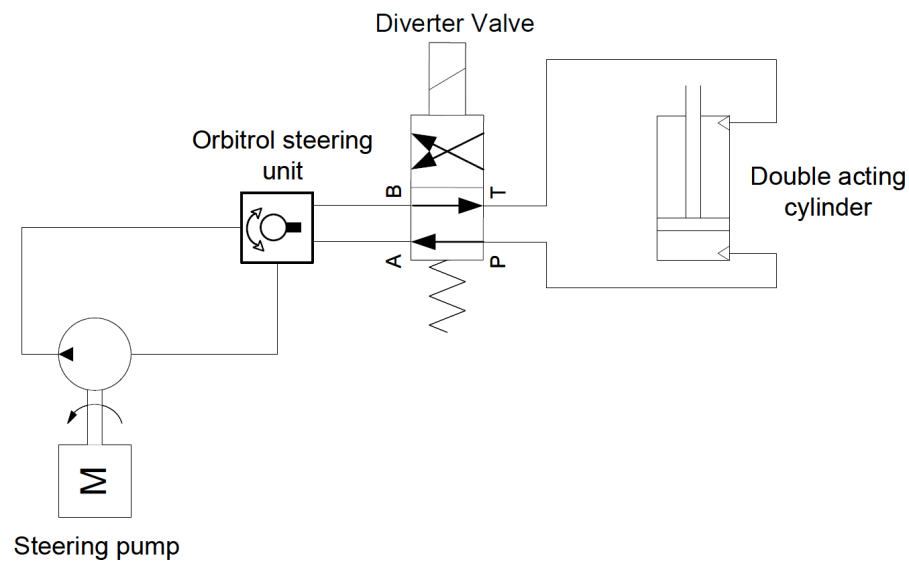


Figure 14. Hydraulic Steering System.

3.7 REAR SUSPENSIONS

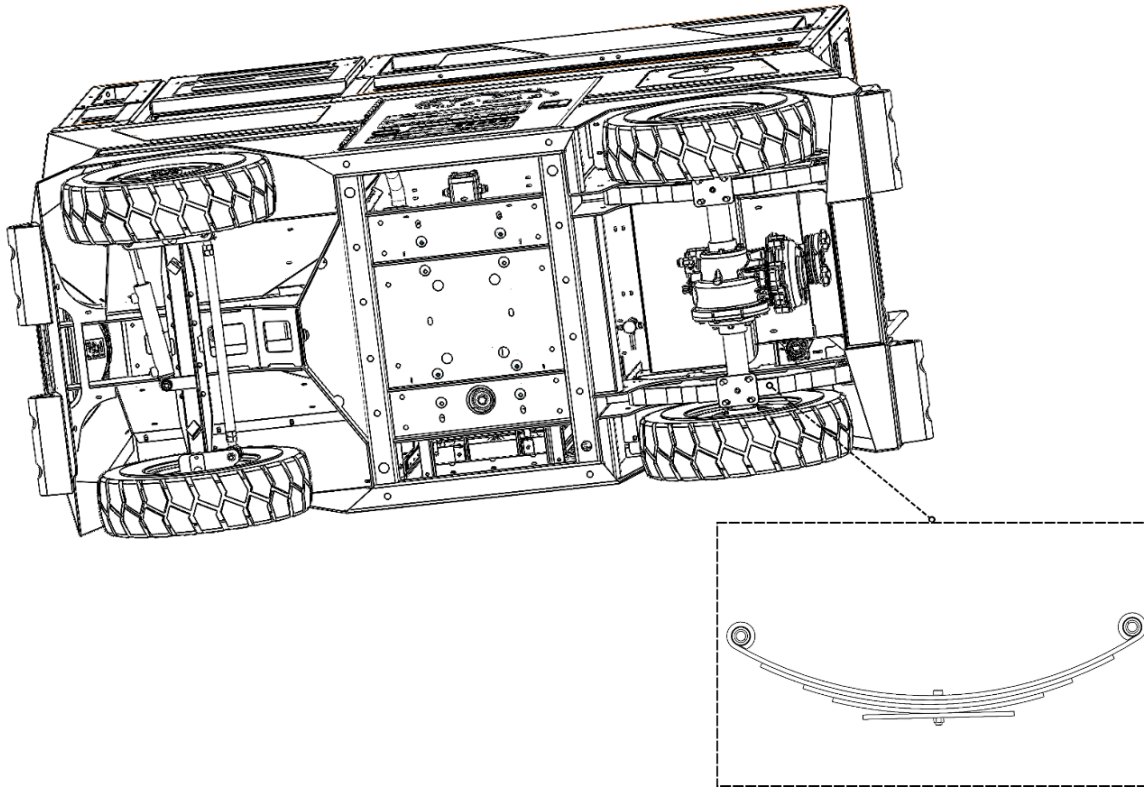


Figure 15. Rear Suspensions.

As the default configuration, the MX-705 features a leaf spring suspension system at the rear of the vehicle. This design is integral to the vehicle's performance, offering a range of benefits that enhance its functionality and driving experience.

Main Advantages of Leaf Spring Suspension :

1. **Effective Stabilization:** Distributes the vehicle's weight evenly across the rear axle, maintaining balance and stability.
2. **Shock and Vibration Absorption:** Minimizes impact felt by occupants and protects the vehicle's components from excessive stress.
3. **Load-Carrying Capacity:** Supports substantial weight without compromising stability, making it ideal for heavy loads.

Overall, the leaf spring suspension in the MX-705 offers stability, comfort, and durability, making it a reliable choice for various driving conditions.

3.8 GENERAL COMPONENTS

Electrical Harness

The electrical harness are carefully guided and routed through the vehicle. They follow the path provided by the frame, which acts as a designated cable tray. This routing ensures that the wires are neatly organized and protected from potential hazards or obstructions.

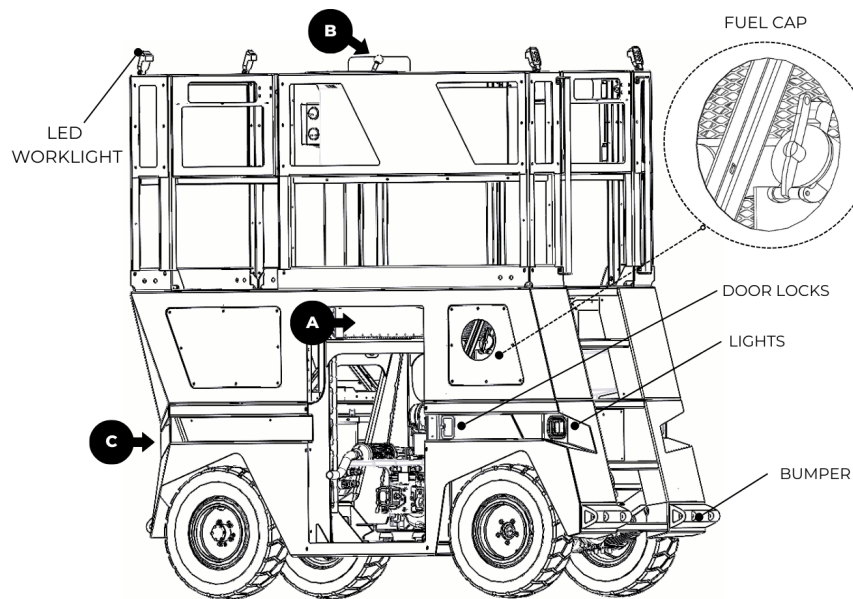
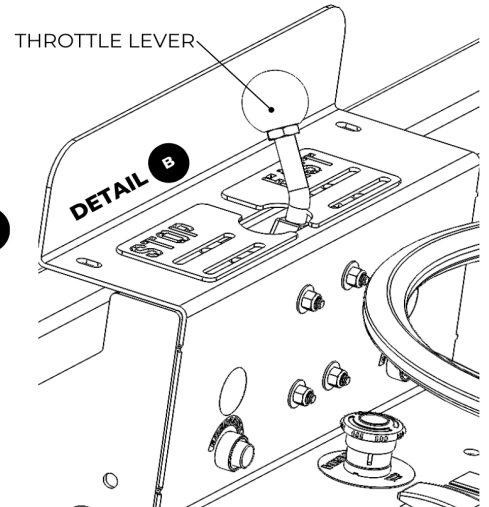
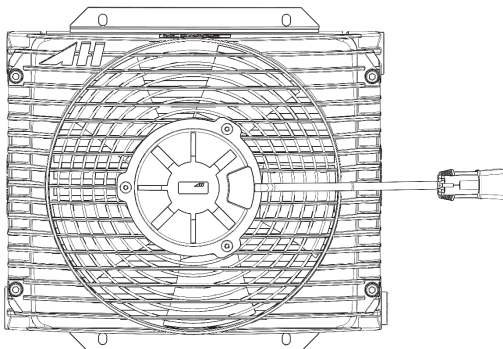


Figure 16. a. General Components (Detail A and B).



Oil cooler (Detail C)

The oil cooler is a device that helps regulate the temperature of oil in the vehicle, ensuring it remains within an optimal range. By dissipating excess heat, it prevents overheating, maintains proper oil viscosity for effective lubrication, and improves overall performance and efficiency. Additionally, it extends the lifespan of the hydraulic system by reducing wear and tear and prevents oil degradation, thereby ensuring consistent and reliable operation.

Figure 16. b. General Components (Detail C).

3.9 CONSOLE

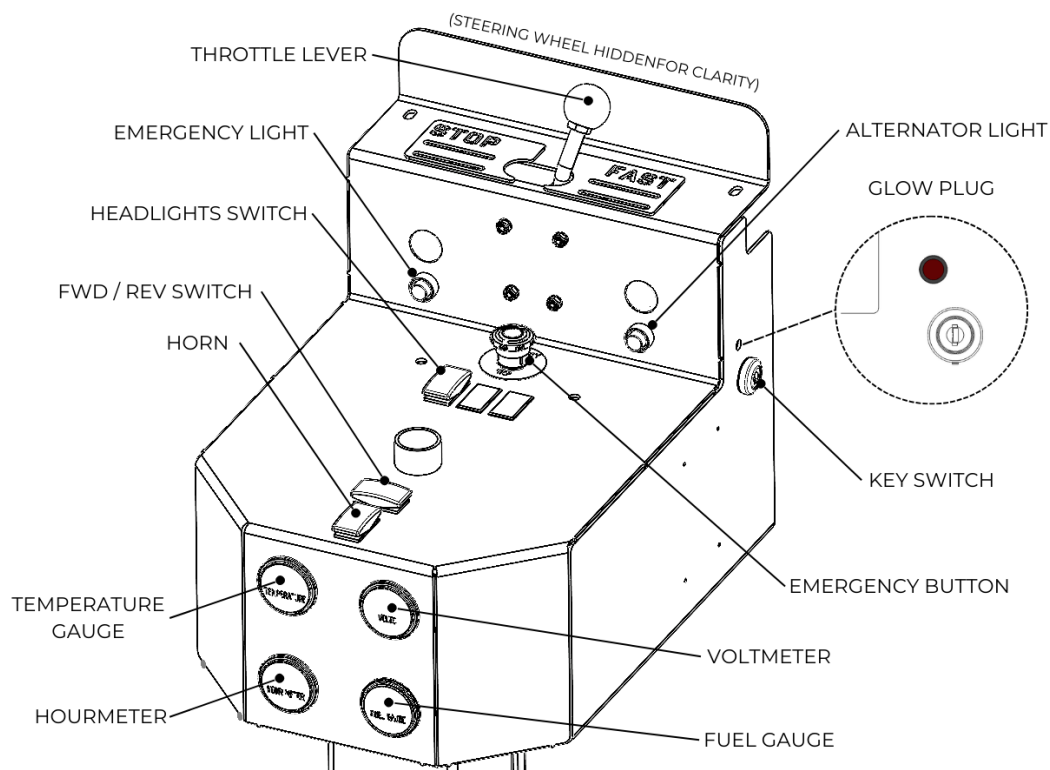


Figure 17. Console.

Direction Switch (Forward/Reverse)

This switch controls the motion direction of the vehicle:

- Pushing the forward arrow on the switch engages the vehicle in forward drive.
- Placing the switch in the central position disengages the vehicle.
- Pushing the backward arrow on the switch engages the vehicle in reverse drive.

Key Switch

The key is used to engage or disengage the switch, allowing or preventing the flow of electricity or the operation of the associated device. It also starts the engine, and in the case of a diesel engine, it also lights the glow plug.

Glow Plug (Diesel Engine Only)

Glow plugs are used to preheat the combustion chamber for easier starts particularly in cold weather.

Emergency Stop Button

The emergency stop button, should only be used in case of emergency. When applied, it will stop immediately the vehicle by engaging the electromagnetic brake (EMB).



CAUTION

DO NOT USE THE ENERGY STOP BUTTON TO TURN OFF THE VEHICLE. USE THE KEY SWITCH FOR NORMAL ON/OFF CONTROL. FAILURE TO COMPLY CAN DAMAGE THE EQUIPMENT.

4. MAINTENANCE

4.1 GENERAL INFORMATION

This section provides a general overview of the maintenance procedures for a standard MX-705 vehicle. While the images displayed may not match the exact product due to varying configurations and accessories, the maintenance steps outlined here are applicable to all MX-705 models as they cover the fundamental processes. If you have any maintenance-related questions specific to your product's features, please reach out to MOTREC for assistance.

Before undertaking any maintenance operations, except for daily and weekly preventive maintenance, it is recommended to remove any obstructing accessories. This will facilitate the necessary manipulations and ensure smoother maintenance procedures.

WARNING

DO NOT MANIPULATE ELECTRICAL CONNECTIONS OR GENERATE SPARKS AROUND 12 V BATTERIE. SPARKS CAN CAUSE A BATTERY EXPLOSION AND ACID SPLASHING. DURING MAINTENANCE, USE INSULATED TOOLS THAT DO NOT GENERATE SPARKS. FAILURE TO COMPLY CAN CAUSE SERIOUS INJURIES.

WARNING

KEEP CLEAR FROM MOVING PARTS SUCH AS TIRES, SHEAVES, AND MOTOR. FAILURE TO COMPLY CAN CAUSE INJURIES.

WARNING

WHEN WORKING AROUND BATTERIES, ALWAYS WEAR ACID PROOF PROTECTIVE EQUIPMENT, SUCH AS FACE SHIELD AND THE APPROPRIATE GLOVES. BATTERIES CONTAIN SULFUR ACID THAT CAN CAUSE SEVERE BURNS ON SKIN OR EYES. RINCE CONTAMINATED AREA IMMEDIATELY WITH WATER.

CAUTION

ONLY QUALIFIED AND AUTHORIZED PERSONNEL ARE PERMITTED TO MAINTAIN, REPAIR, ADJUST, AND INSPECT THE VEHICLES AND THEIR BATTERIES. FAILURE TO COMPLY CAN LEAD TO DAMAGE TO THE EQUIPMENT.

CAUTION

USE TWO COUNTERACTING TOOLS, DOUBLE-WRENCH TECHNIQUE, WHEN DISCONNECTING OR TIGHTENING TERMINALS ON THE BATTERY. FAILURE TO COMPLY COULD CAUSE CRACKING OF THE TERMINAL OR BATTERY POST WELDS.

NOTICE

Follow the maintenance instructions applicable to the type of repair, maintenance, or service.

NOTICE

Before maintenance operations, inspect safety decals and labels. Replace if any damage is found and part of the text can't be read.

NOTICE

Before replacing a fuse or circuit breaker, identify and repair the cause of failure.

4.1.1 LIFTING POINTS

Please refer to the serial data plate (see Figure 18), positioned on the left or right side of the console, to determine the total weight of the vehicle. It is important to note that the weight may differ based on the vehicle's specific configuration and accessories.

When utilizing a lifting device, ensure that it can support the precise weight of the vehicle. The suggested lifting points are highlighted below (Figure 19) as a guide for safe and efficient lifting operations.



WARNING

BEFORE LIFTING, ALWAYS VALIDATE THAT THE LIFTING DEVICE CAN SUPPORT THE TOTAL WEIGHT OF THE VEHICLE, AS INDICATED ON THE VEHICLE'S SERIAL DATA PLATE. FAILURE TO COMPLY CAN LEAD TO SERIOUS INJURIES OR DEATH.

VIEW A

MOTREC	
MODEL NUMBER	YEAR
SERIAL NUMBER	
BATTERY VOLTAGE	V POWER HP
BATTERIES CAPACITY	AH
VEHICLE WEIGHT WITHOUT BATTERIES	LBS
WEIGHT OF BATTERIES	MIN. LBS
	MAX. LBS
APPROX. OPERATING WEIGHT OF VEHICLE	LBS
RATED CAPACITY	LBS
GROSS WEIGHT MAX.	LBS
DRAW BAR PULL	NORMAL LBS
	MAX. LBS
MAX. VERTICAL LOAD ON HITCH	LBS

VEHICLES COMPLY WITH ANSI SAE TYPE E TRACTORS COMPLY WITH ANSI SAE TYPE E AS TO FIRE AND ELECTRIC SHOCK HAZARD ONLY 2843

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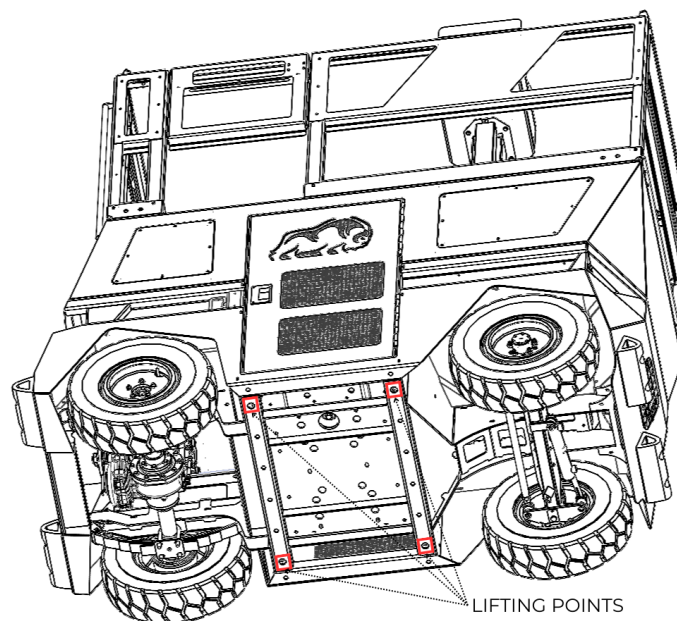


Figure 18. Serial Data Plate.

Figure 19. Lifting Points.

4.2.1 FIRST 50 HOURS OR 100 HOURS MAINTENANCE

Special Tools	Consumables
<ul style="list-style-type: none"> ▶ Oil drain pan ▶ Safety glasses and gloves 	<ul style="list-style-type: none"> ▶ Engine oil (for refilling) ▶ Engine oil filter ▶ Hydraulic oil filter

- NOTICE** — Replace any defective component found during the inspection listed in this procedure.
- NOTICE** — When required, lift the vehicle using a lifting device as per section 4.1.1 LIFTING POINTS.
- NOTICE** — Perform an “Engine Oil and Oil Filter Replacement” after the first 50 hours of operation. After that, replace the engine oil every 100 hours and the oil filter every 200 hours. Additionally, replace the “Hydraulic Oil Filter Replacement” after the first 100 hours and then every 500 hours.

First 50 Hours Maintenance Procedures

Engine Oil and Oil Filter Replacement

- Replace engine oil filter that is located on the engine block under the alternator.
- For engine oil replacement you may proceed as follows :
 - Place an oil drain pan beneath the engine to catch the draining oil.
 - Loosen and remove the drain plug (1) at the bottom of the engine (see figure 20).
 - Allow the old engine oil to drain completely into the oil drain pan.
 - Once the oil has drained completely, replace, and tighten the drain plug.
- For oil filter replacement you may proceed as follows :
 - Place an oil drain pan under the oil filter to catch any residual oil when you remove it.
 - loosen old oil filter (2) and remove it (see figure 20).
 - Allow any remaining oil in the filter and filter housing to drain into the drain pan.
- Before installing the new filter, lightly coat the rubber gasket on the top of the filter with a small amount of fresh engine oil. This will help create a good seal and make it easier to remove during the next oil change.
- Screw the new oil filter into place by hand.

NOTE : Do not use a wrench to tighten it, as this can damage the filter or make it difficult to remove during the next oil change.
- Add **3.7 L** of engine oil.
- Start the engine and allow it to run for a few seconds to circulate the new oil. Then, turn off the engine and check around the oil filter (2) and drain plug (1) for any signs of leaks. If you see any, tighten the filter or plug as needed.
- Check oil level.



WARNING

ENSURE THE VEHICLE OR EQUIPMENT IS SAFELY PARKED AND THE ENGINE IS OFF.



WARNING

ENSURE THE HYDRAULIC SYSTEM IS SHUT DOWN, AND THE VEHICLE IS SAFELY PARKED OR BLOCKED TO PREVENT ANY ACCIDENTAL MOVEMENT.

! WARNING

WEAR APPROPRIATE PROTECTIVE EQUIPMENT, SUCH AS SAFETY GLASSES AND GLOVES.

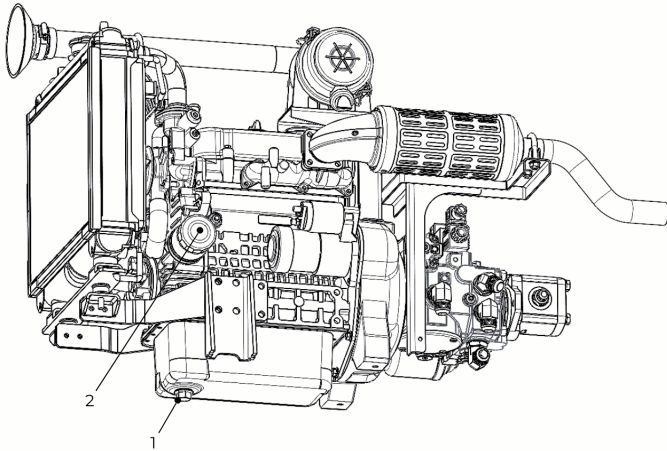


Figure 20. Diesel Engine.

First 100 Hours Maintenance Procedures

Hydraulic Oil Filter Replacement

1. Close the valves.
2. Replace, the hydraulic oil filter (1) (see figure 21) to keep the fluid clean.

! WARNING

ENSURE THAT THE HYDRAULIC SYSTEM IS SHUT OFF AND DEPRESSURIZED BEFORE STARTING ANY MAINTENANCE WORK. THIS WILL PREVENT ACCIDENTAL MOVEMENT OF HYDRAULIC COMPONENTS AND REDUCE THE RISK OF INJURY.

! WARNING

WEAR APPROPRIATE SAFETY GEAR, INCLUDING GLOVES AND GOGGLES, TO PROTECT YOURSELF FROM HYDRAULIC FLUID AND OTHER CONTAMINANTS.

NOTE : Place a drip pan or absorbent materials beneath the filter housing to catch any spilled hydraulic fluid.

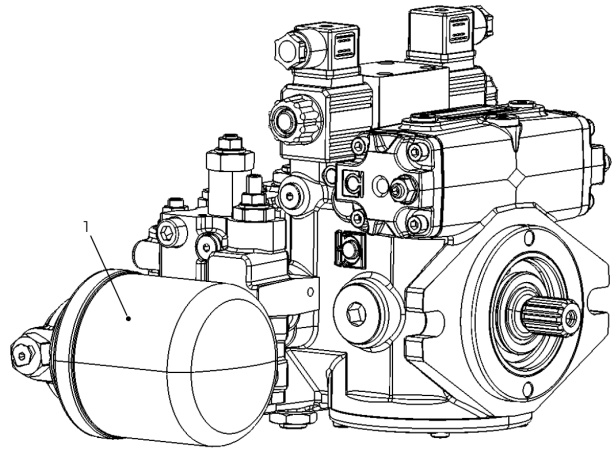


Figure 21. Hydrostatic Pump Oil Filter Replacement.

4.2.2 DAILY MAINTENANCE

Special Tools	Consumables
► N/A	► N/A

NOTICE — Replace any defective component found during the inspection listed below.

Maintenance Procedures

Visible Damage Inspection

Inspect for excessive visible damage on the exterior of the vehicle or to components under the vehicle (bolts, nuts, pins, ex..).

Fluid Leaks Inspection

A leak could come from the differential. The vehicle may be lifted for further inspection of this symptom as required.

Proceed as follows to inspect :

1. Inspect the following elements for signs of oil and antifreeze leakage :
 - Engine.
 - Radiator.
 - Hoses.
 - Hydraulic steering system.
 - Hydrostatic system.

Steering Inspection

Rock the steering wheel, inspect the steering system for hard steering, excessive play, or unusual sounds when turning.

Horn and Lights Inspection

Inspect the correct operation of all lights, strobes, horn, and reverse alarm.

Tire Pressure Inspection

Check that each tire maintains a pressure rating of approximately 60 psi (only if the tires are pneumatic). Additionally, thoroughly inspect the tires for any signs of punctures, damage, or excessive wear.

Emergency Button Inspection

1. Visually inspect the button for any visible damage or irregularities.
2. Test the emergency button to verify that it activates as intended. Ensure it depresses and releases smoothly without any sticking.

Electromagnetic brake (EMB) Inspection

1. Set the vehicle to neutral.
2. Engage the electromagnetic brake (EMB).
NOTE : turn OFF the vehicle in order for the EMB to automatically engage.
3. Push the vehicle to validate that the parking brake is correctly engaged. The vehicle should not move.

Hydrostatic Pump Inspection

Before each starting up of the machine:

1. Check oil level in the reservoir.
2. Clean heat exchanger.
3. Check reservoir breather cleanness.



WARNING

ENSURE THAT THE HYDRAULIC SYSTEM IS SHUT OFF AND DEPRESSURIZED BEFORE STARTING ANY MAINTENANCE WORK. THIS WILL PREVENT ACCIDENTAL MOVEMENT OF HYDRAULIC COMPONENTS AND REDUCE THE RISK OF INJURY.



WARNING

WEAR APPROPRIATE SAFETY GEAR, INCLUDING GLOVES AND GOGGLES, TO PROTECT YOURSELF FROM HYDRAULIC FLUID AND OTHER CONTAMINANTS.

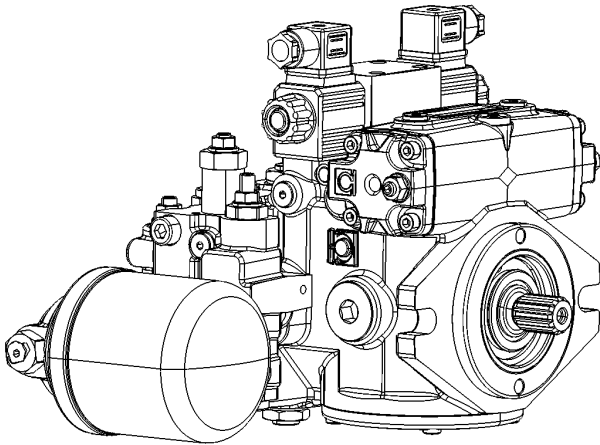


Figure 22. Hydrostatic Pump.

Engine Maintenance

1. Check levels of engine and hydraulic oil.
2. Check the coolant level in the recovery tank.
 - If you need to add coolant, do so through the recovery tank. Never open the radiator cap when the engine is hot, as it can cause burns.
 - If you need to add coolant when the engine is cold, do so through the radiator.
 - Ensure there are two drain cocks: one on the crankcase side and the other at the bottom of the radiator (see figures 23.a and 23.b).

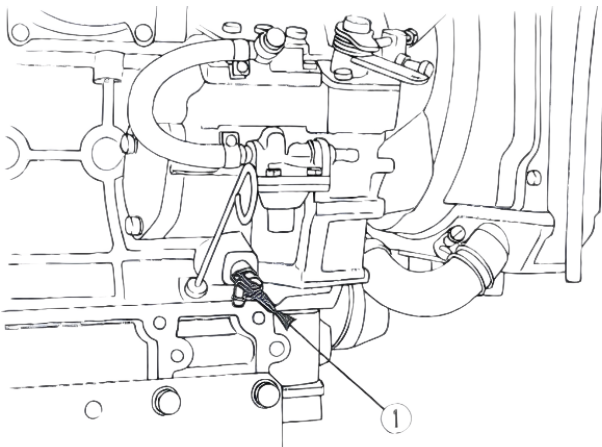


Figure 23. a. Drain Cocks Check.

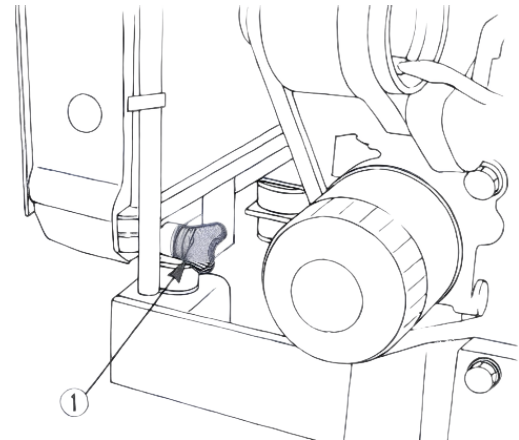


Figure 23. b. Drain Cocks Check.

3. Check the fuel gauge on your dashboard to determine the fuel level.
4. Check the engine for abnormal noise or vibrations.
5. Daily cleaning radiator screen and core, panel and hood screens, air filter primary element in the engine compartment.

4.2.3 WEEKLY MAINTENANCE

Special Tools	Consumables
<ul style="list-style-type: none"> ▶ Oil drain pan ▶ Safety glasses and gloves 	<ul style="list-style-type: none"> ▶ Engine oil (for refilling) ▶ Engine oil filter ▶ Hydraulic oil filter ▶ Hydraulic oil (for topping up, if necessary)

NOTICE — Replace any defective component found during the inspection listed in this procedure.

NOTICE — Perform “Fuel Pipes And Clamp Bands Check” every 50 hours. Additionally, perform “Air Cleaner Element Cleaning”, “Fuel Filter Cleaning” and “Fan Belt Tension Adjustment” every 100 hours.

Maintenance Procedures

Fuel Pipes And Clamp Bands Check

NOTE : Check the fuel pipes (2) (see figure 24) every 50 hours of operation.

1. If the clamp band (1) (see figure 24) is loose, apply oil to the screw of the band, and tighten the band securely.
2. If the fuel pipes, made of rubber, became worn out, replace them and clamp bands.
3. If the fuel pipes and clamp bands are found worn or damaged, replace them.
4. After replacement of the pipes and bands, air-bleed the fuel system.

⚠ CAUTION

TO AVOID PERSONAL INJURY, CHECK OR REPLACE THE FUEL PIPES AFTER STOPPING THE ENGINE. BROKEN-FUEL PIPES CAN CAUSE FIRES.

⚠ WARNING

WHEN THE FUEL PIPES ARE NOT INSTALLED, PLUG THEM AT BOTH ENDS WITH CLEAN CLOTH OR PAPER TO PREVENT DIRT FROM ENTERING. DIRT IN THE PIPES CAN CAUSE FUEL INJECTION PUMP MALFUNCTION.

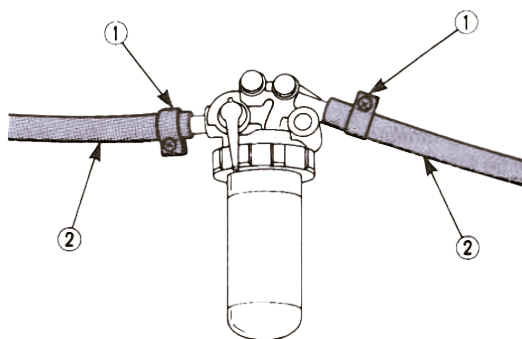


Figure 24. Fuel pipes and clamp bands check.

Engine Oil and Oil Filter Replacement

Refer to the “Engine Oil and Oil Filter Replacement” section on **page 23** for the procedures. This maintenance should be performed every 100 hours.

Hydraulic Oil Filter Replacement

Refer to the “Hydraulic Oil Filter Replacement” section on **page 24** for the procedures. This maintenance should be performed every 100 hours.

Air Cleaner Element Cleaning

NOTE 1: As the element of the air cleaner employed on this engine is a dry type, never apply oil on it.

1. Open the evacuator valve (4) once a week under normal conditions, or daily in dusty environments, to remove large dust and dirt particles.
2. If the inside of the air cleaner is dirty or wet, wipe it clean with a cloth or similar item.
3. Refrain from touching the element (2) except when performing cleaning.
4. For dry dust adhering to the element (2), blow compressed air from the inside while rotating the element (2).

IMPORTANT : Ensure the compressed air pressure is below 205 kPa.

5. If the element (2) has carbon or oil deposits, soak it in detergent for 30 minutes, then wash it multiple times in water, rinse with clean water, and allow it to air dry naturally.
6. Once the element is fully dried, use a light to inspect the inside of the element (2) and check for any damage.

NOTE 2 : Replace the element every year or every six cleanings.

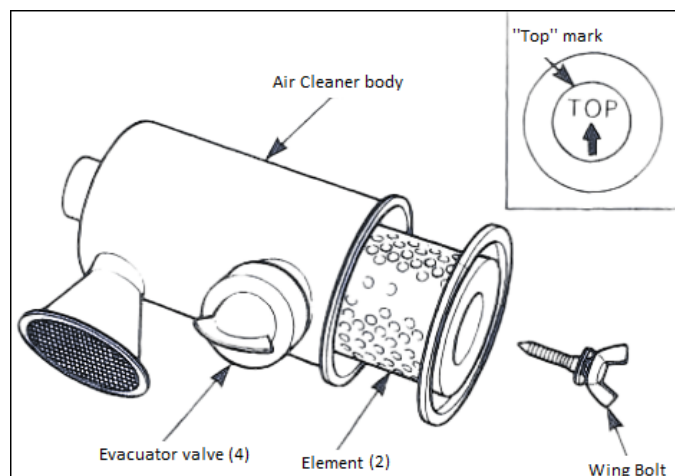


Figure 25. Air cleaner Element Cleaning.

! CAUTION

ENSURE THE WING BOLT FOR THE ELEMENT IS SUFFICIENTLY TIGHTENED. IF IT IS LOOSE, DUST AND DIRT MAY BE DRAWN IN, CAUSING PREMATURE WEAR OF THE CYLINDER LINER AND PISTON RING, WHICH CAN RESULT IN REDUCED POWER OUTPUT.

Fuel Filter Cleaning

NOTE : Every 100 hours of operation, clean the fuel filter in a clean place to prevent dust intrusion.

1. Close the fuel filter lever (1) (from position B to A).
2. Remove the top cap and clean the inside using diesel fuel.
3. Take out the element and rinse it thoroughly with diesel fuel.
4. After cleaning, reinstall the fuel filter, ensuring it remains free from dust and dirt.

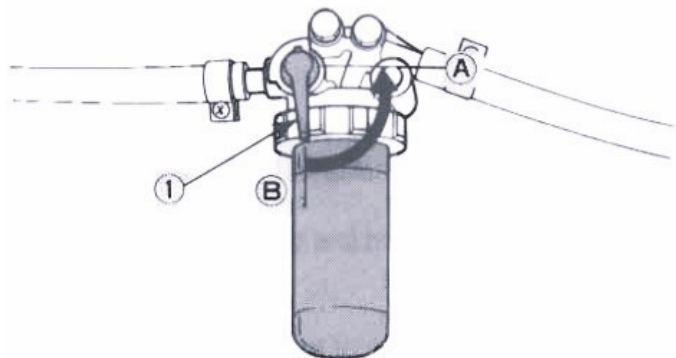


Figure 26. Fuel Filter Cleaning.

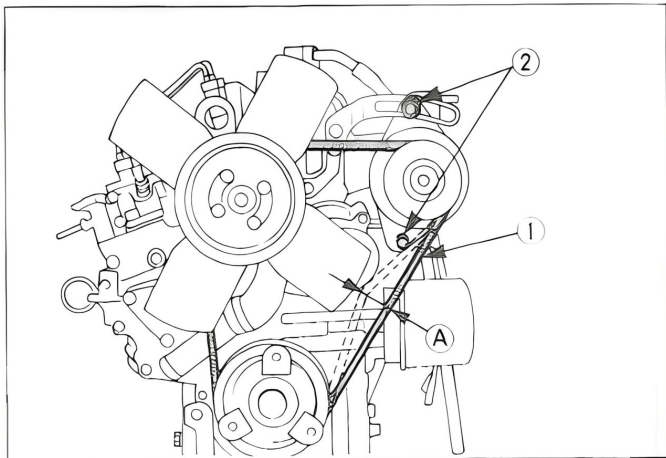
! CAUTION

ENTRANCE OF DUST AND DIRT CAN CAUSE A MALFUNCTION OF THE FUEL INJECTION PUMP AND THE INJECTION NOZZLE. WASH THE FUEL FILTER CUP PERIODICALLY.

Fan Belt Tension Adjustment

1. Stop the engine and remove the key.
 2. Apply moderate thumb pressure to the belt between the pulleys.
 3. If the tension is incorrect, loosen the alternator mounting bolts. Using a lever placed between the alternator and the engine block, pull the alternator outward until the belt deflection is within acceptable limits.
 4. Replace the fan belt if it shows signs of wear or cracking.
- **Proper fan belt tension :** A deflection of between 7 to 9 mm (0.28 to 0.35 in) when the belt is pressed in the middle of the span (under load of 10 kgf or 22.1 lbs).

IMPORTANT : If the belt is loose or damaged, and the fan is affected, it could lead to overheating and insufficient charging. Adjust or replace the belt as needed.



(1) Fan belt
(2) Bolt and nut
(A) 7 to 9 mm (0.28 to 0.35 in.)
(under load of 10 kgf (22.1 lbs))

Figure 27. Fan Belt Tension Adjustment.

! CAUTION

ENSURE THE ENGINE IS TURNED OFF AND THE KEY IS REMOVED BEFORE CHECKING THE BELT TENSION.

! CAUTION

MAKE SURE TO REINSTALL THE DETACHED SAFETY SHIELD AFTER MAINTENANCE OR INSPECTION.

Test Drive

After the maintenance is finished, it is necessary to reinstall any disassembled parts and conduct a thorough test on the vehicle to ensure that all systems are functioning correctly.

1. Turn on all switches and test lights.
2. Turn on the ignition and start the engine. For a diesel engine, you may need to wait a moment for the glow plugs to heat up before starting.
3. Test the vehicle's forward and reverse movement, steering, and handling for proper functionality and responsiveness. Ensure there is no excessive play in the steering and observe how the vehicle performs.
4. Listen for unusual noises and be alert to any unusual vibrations. These could indicate problems with the vehicle.
5. Keep an eye on the vehicle's gauges, such as the hour meter, fuel gauge, temperature gauge, and any warning lights. Ensure they're all functioning as expected.
6. Test any safety features, such as door locks, emergency stop button, operator's presence detection pedals (Stand up version), and seat switch (Seated version), to ensure they function as intended.

4.2.4 EVERY 250 HOURS OR 3 MONTHS MAINTENANCE

Special Tools	Consumables
<ul style="list-style-type: none"> ▶ Lifting device ▶ Oil drain pan ▶ Safety glasses and gloves 	<ul style="list-style-type: none"> ▶ Multi purpose Grease ▶ Compressed air

- NOTICE** — Replace any defective component found during the inspection listed in this procedure.
- NOTICE** — When required, lift the vehicle using a lifting device as per section 4.1.1 LIFTING POINTS.
- NOTICE** — All procedures in the “Weekly Maintenance” section must be performed at the specified intervals.

Maintenance Procedures

Suspension Inspection

1. Inspect the following equipment for damage and corrosion:
 - Leaf springs (1) and their fixtures(2).
2. Inspect all suspension frame bushing for play.

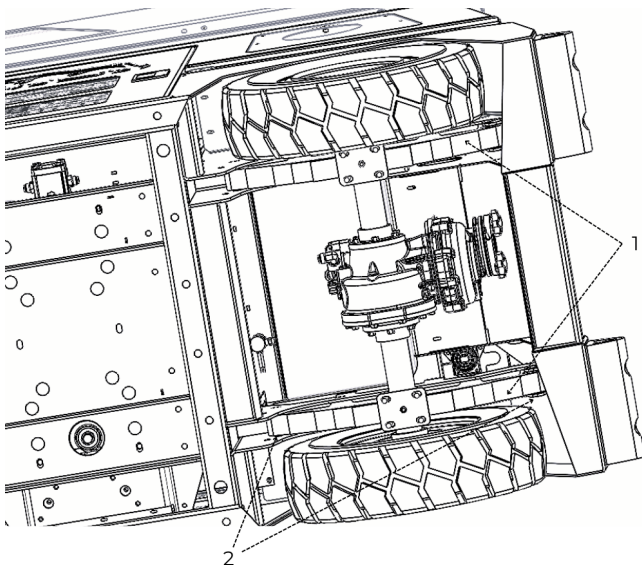


Figure 28. Rear Suspension Inspection.

Rubber Bump Stop Inspection

Inspect rubber bellows (1) (see figure 29) installed on the vehicle components for signs of damage, cracks or dryness.

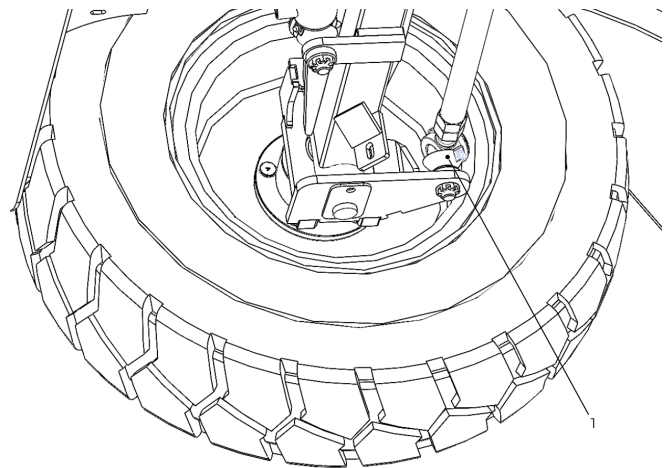


Figure 29. Rubber Bellows Inspection.

Steering Inspection

1. Inspect the universal joint (1) and the four tie rods ends (2) for (See Figures 30 and 31):
 - Play.
 - Damage.
 - Binding.
 - Corrosion.

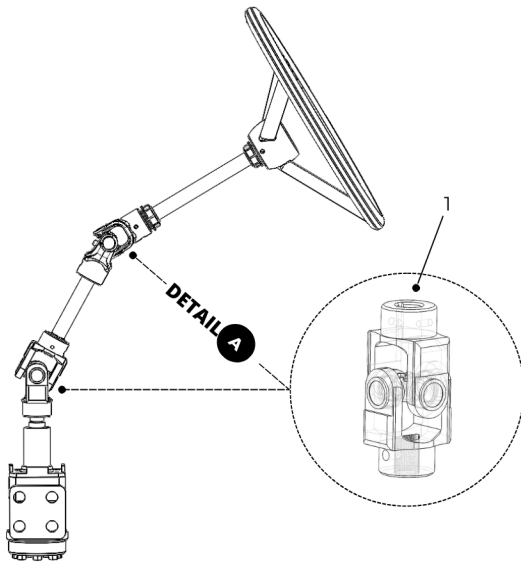


Figure 30. Universal Joint Inspection (Seated Version).

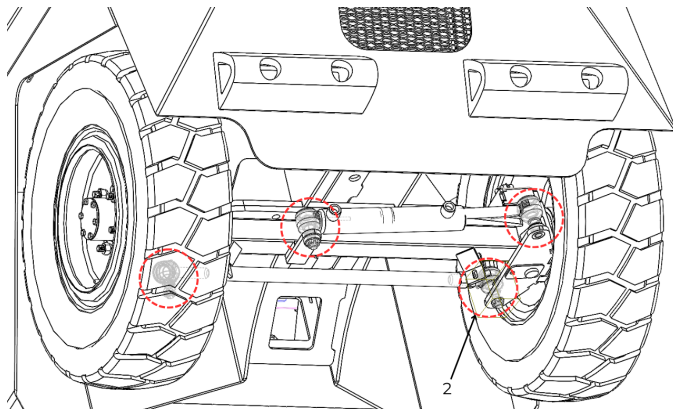


Figure 31. Tie rods Inspection (For Both Versions).

2. Inspect the following elements for damage , corrosion or loose :
 - Steering cylinder (3). (See Figure 32)
 - Steering shafts (4). (See Figure 30)
 - Axle beam (5). (See Figure 32)
 - Right and left knuckles (6). (See Figure 32)
 - Tie rod (7). (See Figure 32)

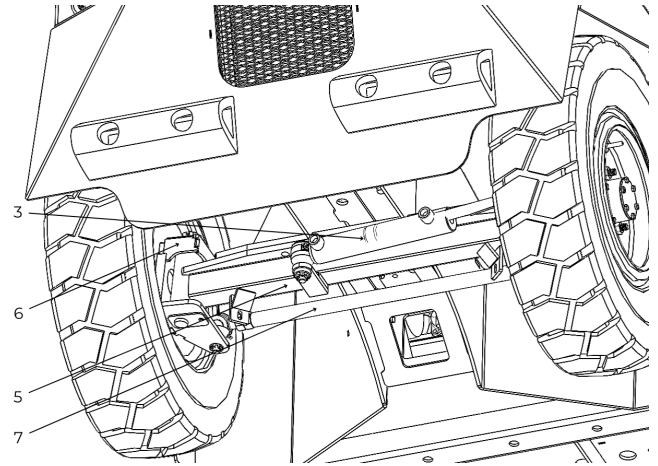


Figure 32. General Steering Inspection.

Grease Fittings Lubrication

Lubricate the grease fittings of the following components (See Figures 30, 31 and 32) :

- The universal joint (1).
- The four tie rods ends (2).

Electromagnetic Brake Inspection

1. Chock the vehicle's wheels.
2. Remove the electromagnetic brake's rubber shield (1).
3. Insert the service knobs (2) to free the electromagnetic brake's rotor.
4. Clean the gap (3) created with compressed air.
5. Remove the service knobs (2) from the electromagnetic brake.



WARNING

DO NOT BREATHE THE AIR WHILE CLEANING WITH COMPRESSED AIR. USE PROPER RESPIRATORY PROTECTION IF NECESSARY.

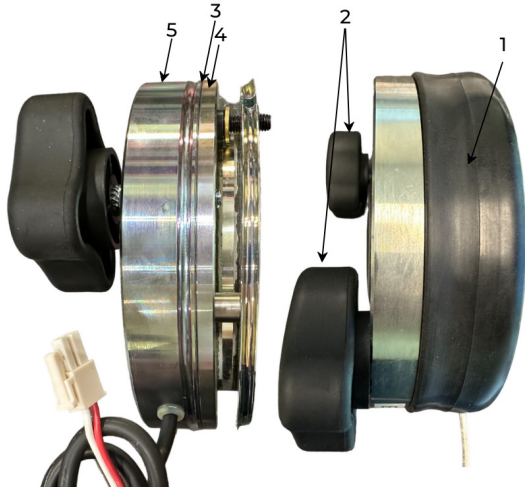


Figure 33. EMB Inspection.

6. Using a feeler gauge, measure the air gap (3) between pressure plate (4) and the electromagnet (5).
 - If the air gap is **0.030" or less**, skip to next step.
 - If the air gap is **greater than 0.030"**, check the tag on the electromagnetic brake:
 - Replace the EMB's rotor if a CNX brake is installed.
7. Reinstall the rubber shield (1). Replace rubber shield (1) if the rubber shows any sign of dryness or damages.

Engine Maintenance

1. Replace fuel filter element.
 1. 1. Close the fuel filter lever (1) (from position B to A).
 1. 2. Remove the top cap and clean the inside using diesel fuel.
 1. 3. Take out the element and replace it with a new one.
 1. 4. Reinstall the fuel filter, ensuring it remains free from dust and dirt.

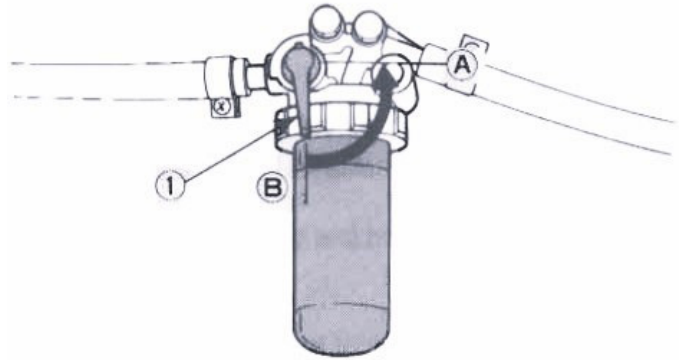


Figure 34. Fuel Filter Replacement.

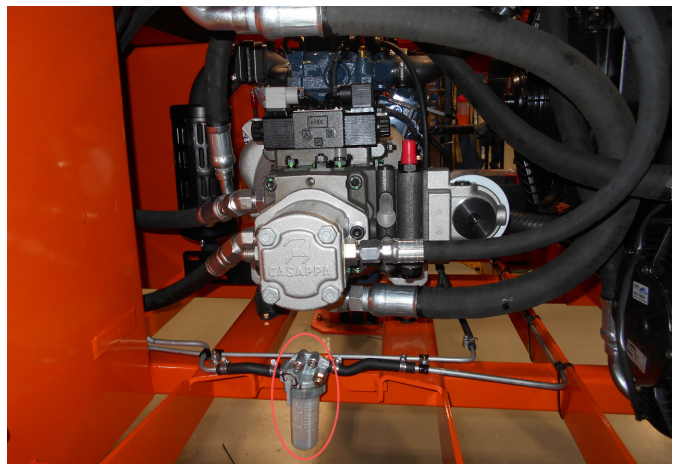


Figure 35. Location of the Fuel Filter In a Diesel Engine.

2. Check all engine gaskets and seals for leaks.
3. Check the radiator hoses and clamp bands.
 9. 1. If hose clamps are loose or there are water leaks, tighten the hose clamps securely.
 9. 2. If the radiator hoses are swollen, hardened, or cracked, replace the hoses and tighten the hose clamps securely.
4. Check the air intake line.

12 V Battery Check

1. Check for any signs of damage, leaks, or corrosion on the battery case, terminals, and connections.
2. Ensure that the battery is securely mounted.
3. Remove the vent caps and check the electrolyte levels in each cell. If the level is low, top up with distilled water to the recommended level. Do not overfill.
4. Use a voltmeter to measure the battery voltage. A fully charged 12V lead-acid battery should read between 12.6 and 12.8 volts.
5. Ensure the battery is fully charged. If the voltage is below 12.4 volts, charge the battery with an appropriate charger.



WARNING

DO NOT MANIPULATE ELECTRICAL CONNECTIONS OR GENERATE SPARKS AROUND BATTERIES. SPARKS CAN CAUSE A BATTERY EXPLOSION AND ACID SPLASHING. DURING MAINTENANCE, ALWAYS DISCONNECT THE CHARGER AND USE INSULATED TOOLS THAT DO NOT GENERATE SPARKS. FAILURE TO COMPLY CAN CAUSE SERIOUS INJURIES.



WARNING

WHEN WORKING AROUND BATTERIES, ALWAYS WEAR ACID PROOF PROTECTIVE EQUIPMENT, SUCH AS FACE SHIELD AND APPROPRIATE GLOVES. BATTERIES CONTAIN SULFUR ACID THAT CAN CAUSE SEVERE BURNS ON SKIN OR EYES. RINSE CONTAMINATED AREA IMMEDIATELY WITH WATER.

4.2.5 EVERY 500 HOURS OR 6 MONTHS MAINTENANCE

Special Tools	Consumables
► N/A	► Lubricant spray

- NOTICE** — Replace any defective component found during the inspection listed in this procedure.
- NOTICE** — When required, lift the vehicle using a lifting device as per section 4.1.1 LIFTING POINTS.
- NOTICE** — The 250 hours or 3 months preventive maintenance should be carried out concurrently with this maintenance. Certain steps may not be necessary due to redundancy.

IMPORTANT NOTE : All maintenance **procedures** in the “3 Months maintenance” section need to be repeated.

Maintenance Procedures

Decals and Labels Inspection

Inspect decals and safety labels for damage. Replace them if any part of the text is illegible.

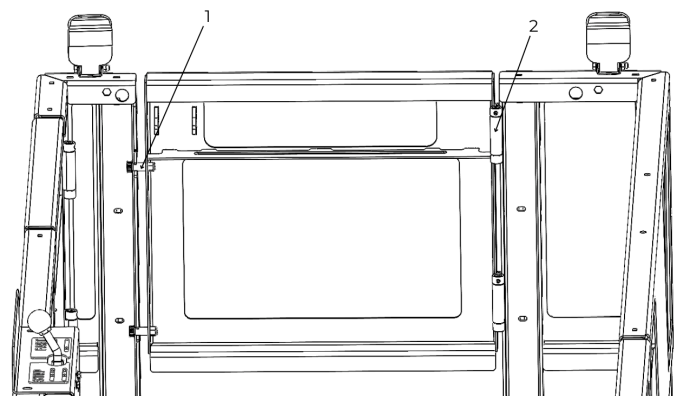
Door Maintenance

- Inspect the following components for signs of rust, corrosion, or damage :
 - Shoulder bolt (1).
 - Hinges (2).
- Lubricate the following components with lubricant spray to reduce friction and prevents squeaking :
 - Shoulder bolt (1).
 - Hinges (2).

NOTE : Apply a bit of lubricant to the hinges pivot points. Open and close the door several times to distribute the lubricant.

- Check the shoulder bolt for looseness. If it becomes loose, tighten it to prevent the door from sagging or becoming misaligned.
- Inspect the hinge screws on both the door and the frame. If you find any loose screws, tighten them.

- Ensure that the door is properly aligned with the frame. If the door is sagging or not closing properly, it might put extra stress on the hinges.



(STEERING SYSTEM HIDDEN FOR CLARITY)

Figure 36. Door Maintenance.

Frame Inspection

- Inspect the vehicle's frame for the following elements:
 - Cracks.
 - Damage.
 - Corrosion.
 - Deformation.

2. The following frame locations should be inspected with care:

- Guardrails (1). (see Figure 37).
- Suspension mounting tabs (2) (see Figure 38).
- Weld zones (see Figure 39: not all welds are shown).
- Front and rear bumpers. (see Figure 40).

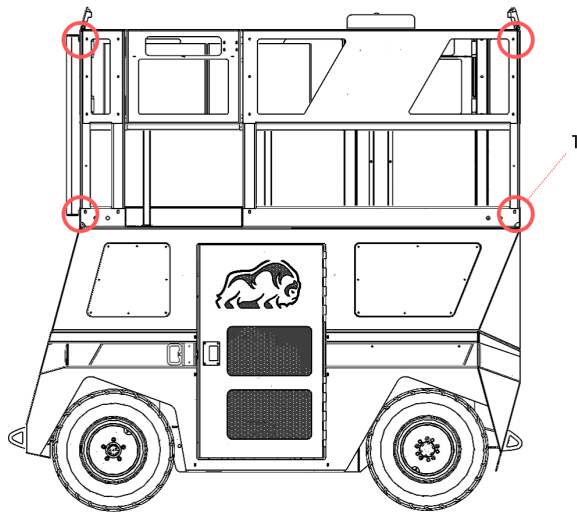


Figure 37. Guardrails.

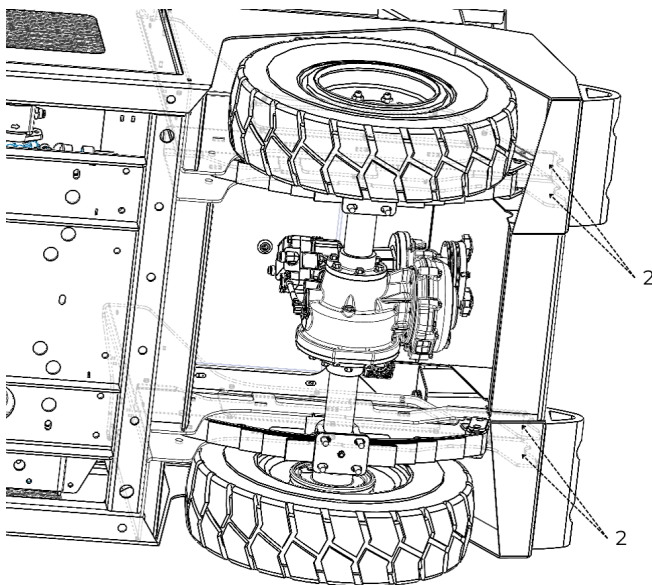


Figure 38. Suspension Mounting Tabs.

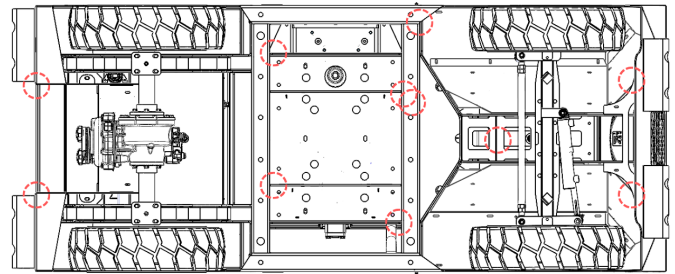


Figure 39. Weld Zones.

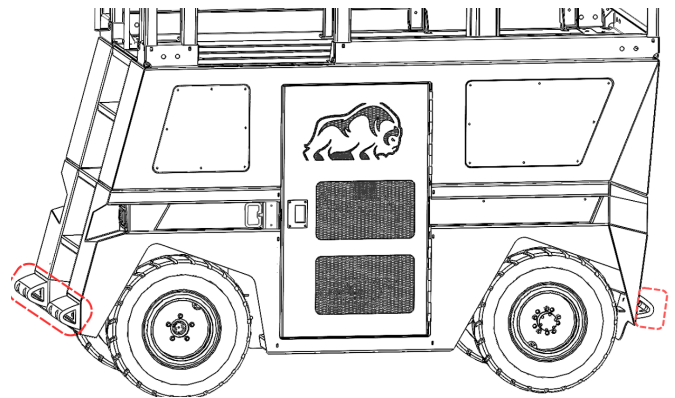


Figure 40. Front And Rear Bumpers.

Kingpins Inspection

1. Inspect the kingpins (1) assembly of the two front wheels for the following:
 - Play.
 - Damage.
 - Corrosion.
2. Inspect the condition of the castle nut (2) and the cotter pin (3).

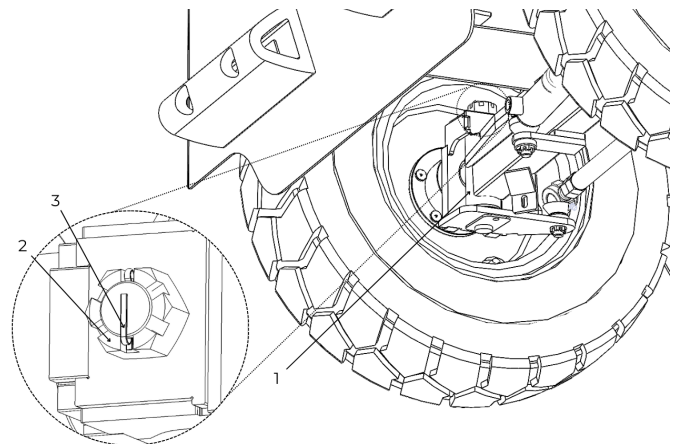


Figure 41. Kingpins Inspection.

Wheel Bearings Inspection

Inspect all wheel bearings for:

- Play.
- Stiffness.
- Abnormal noise.

NOTE : Please refer to page 39, specifically the “Axial Hub Maintenance” section, for instructions on replacing the bearing.

Engine Maintenance

1. Check alternator belt for cracks.
2. Check glow plug.
3. Replace fan belt (**Refer** to section “**Fan Belt Tension Adjustment**” page 29).
4. Replace the air cleaner element (**Refer to figure 25** page 28).

4.2.6 EVERY 1000 HOURS OR 12 MONTHS MAINTENANCE

Special Tools	Consumables
<ul style="list-style-type: none"> ▶ Lifting device ▶ Oil recipient / Drip pan 	<ul style="list-style-type: none"> ▶ Differential oil: SAE 80W90 GL5 ▶ Hydraulic pump oil : Iso 32 ▶ Reservoir bleed filter ▶ Molybdenum disulfide grease (6g) ▶ Lubricant spray ▶ Bearing grease ▶ Hub Seal ▶ Cotter pin (Size : 1/8x2)

NOTICE — When required, lift the vehicle using a lifting device as per section 4.1.1 LIFTING POINTS.

NOTICE — The 500 hours or 6 months preventive maintenance should be carried out concurrently with this maintenance. Certain steps may not be necessary due to redundancy.

IMPORTANT NOTE : All maintenance **procedures** in the “6 Months maintenance” section need to be repeated.

Maintenance Procedures

Engine Maintenance

1. Check all coolant hoses for cracks or leaks.
2. Check engine mounts.
3. Check the valve clearance
 4. 1. When it is difficult to start the engine or output is insufficient, adjust valve clearance to 0.145 - 0.185 mm (0.0057 in - 0.0072 in) when engine is cold.

Refer to Section 5, “Quick References”, on page 57 for the exact procedures to follow.

Differential Maintenance

Proceed as follows for the **Schafer twin-case** differential :

1. Position a recipient under the differential to collect the drained oil in next steps.
2. Remove the aluminum case filler plug (2) (Figure 42).
3. Remove the cast-iron case filler plug (3) (Figure 43).

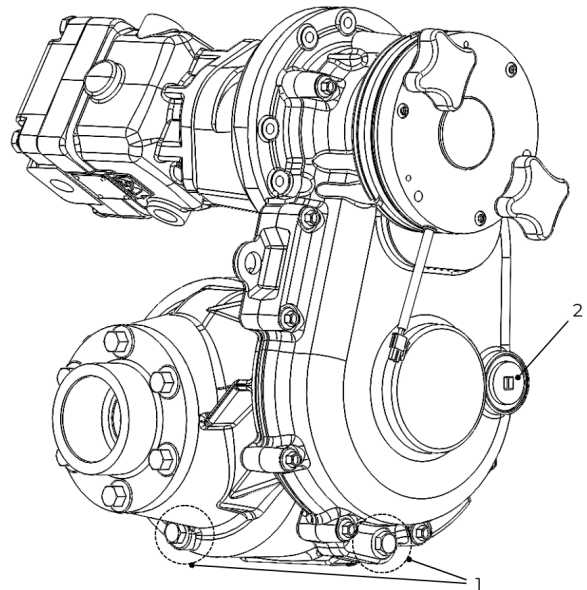


Figure 42. Aluminum Case Drain and Filler Plugs.

4. Remove the aluminium case and the cast-iron case drain plugs (1) to drain the differential oil.
5. Reinstall the drain plugs (1) once the oil is drained.

6. Add 625 mL (stop if the oil reaches the bottom of the filling hole) of SAE 80W90 GL5 differential oil (For the aluminium case).
7. Reinstall the aluminium case filler plug (2).
8. Add 390 mL (stop if the oil reaches the bottom of the filling hole) of SAE 80W90 GL5 differential oil (For the cast-iron case).
9. Reinstall the cast-iron case filler plug (3).

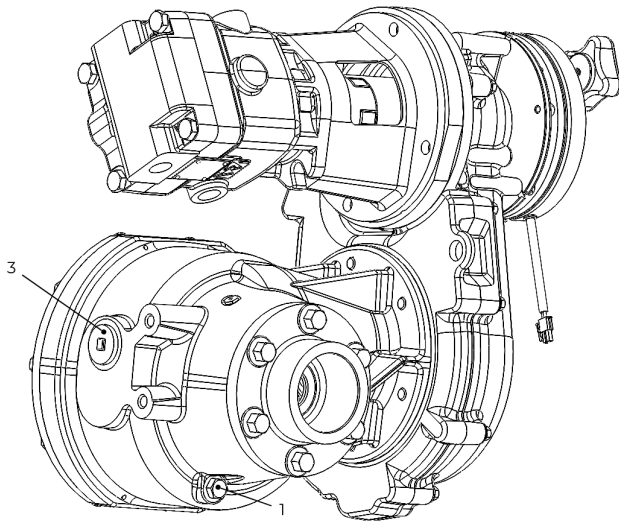


Figure 43. Cast-iron Case Drain and Filler Plugs.

Differential Spline Drive Maintenance

1. Support the motor (1) so that it can be slightly moved horizontally (Hydraulic motor is light enough to even do it by hands) once the screws (2) are removed.

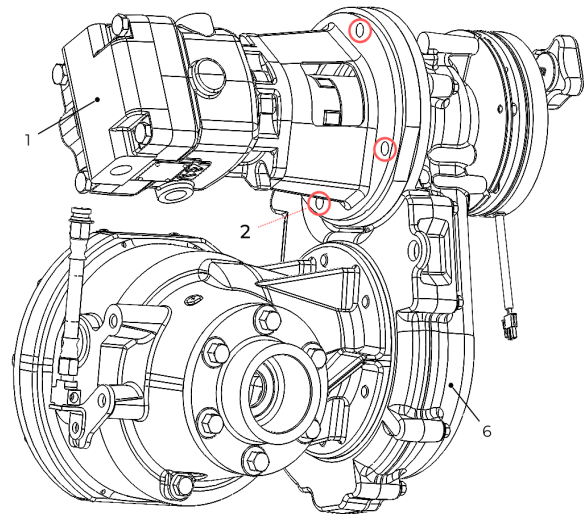


Figure 44. Removing screws.

2. Disassemble the following components: motor (1), coupling 7/8 (3), motor-differential adapter (4) and adapter flange (5) from the differential

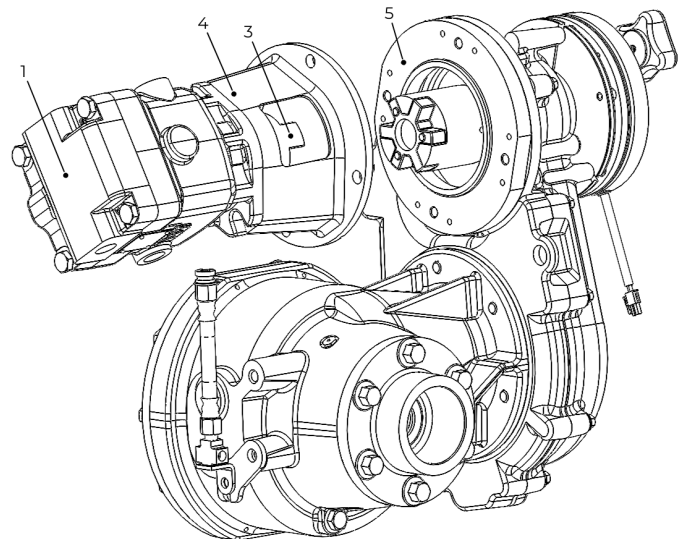


Figure 45. Disconnecting Motor, coupling 7/8 and motor-differential adapter.

3. Clean the motor (1) from dust or debris accumulation (if applicable).
4. Remove the urethan insert (love joy) (7) and machined coupling sleeve (8) to access the differential spline drive (9).
5. Inspect the motor (1) and the spline drive (9) for corrosion or damage.
6. Lubricate the differential spline drive (9) with molybdenum disulfide grease (2.5 ml is required).

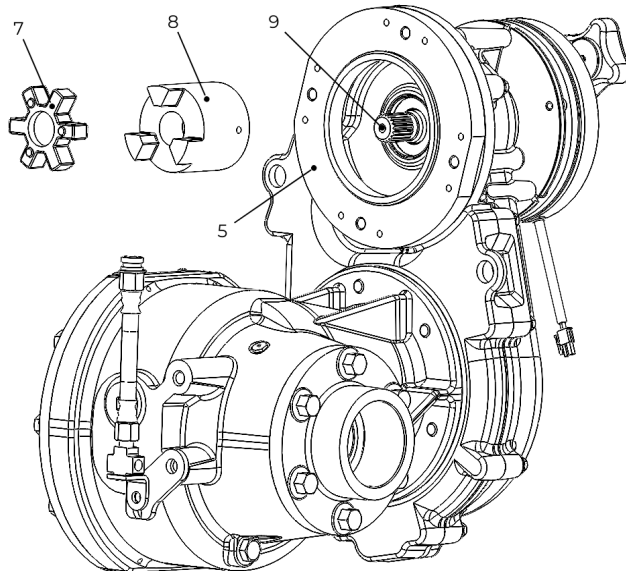


Figure 46. Spline Drive Lubrication.

7. Reconnect the urethan insert (love joy) (7), machined coupling sleeve (8) and adapter flange (8) to the differential spline drive (9).
8. Assemble the following components: motor (1), coupling 7/8 (3), motor-differential adapter (4) and adapter flange (5) to the differential (6).
9. Torque the screws (2) to standard values. The appropriate torque value is 24 ft lbs.
10. Remove the slings from the motor (1).

Front Axial Hub Maintenance

1. Secure the vehicle with jack stands.
2. Remove the wheel nuts (1).
3. Remove the wheel (2).

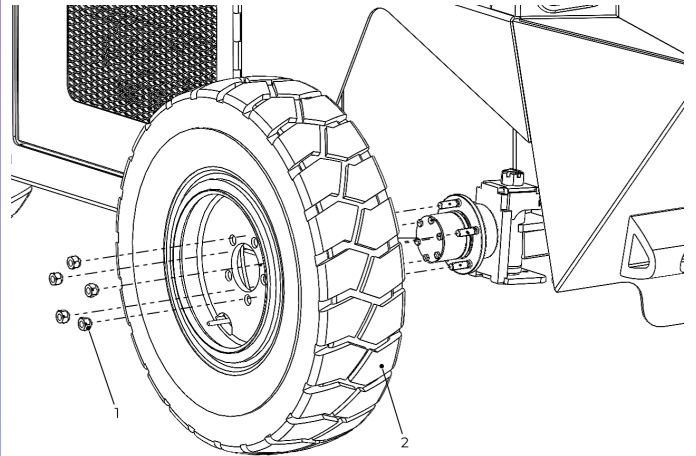


Figure 47. Wheel Removal.

1. Remove the hub cover (3).
5. Remove the cotter pin (4) and unscrew the castle nut (5).
6. Remove the hub (6) from the spindle (7).

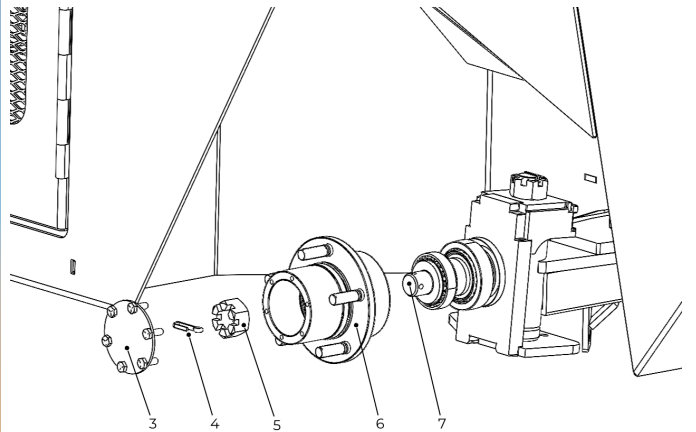


Figure 48. Hub Maintenance.

7. Inspect the bearings (8) and their races for wear.
8. Discard the seal (9). Refer to the MPV (*PARTS CATALOG*) for seal replacement.
9. Clean the bearing (8) and if they are still usable, apply the grease.
10. Install a new seal (9) and the bearings (8) into the hub (6).
11. On the spindle (7), clean the seating surface of the hub (6) from any debris.
12. Position the hub (6) on the spindle (7).
13. Tighten the castle nut (5) to 103 ft-lbf to seat the bearings (8), then loosen the castle nut (5) by unscrewing one full turn.
14. Hand-tighten the castle nut (5).
15. Install a new cotter pin (4).
16. Reinstall the dust cap (3).
17. Reinstall the wheel (2) and the wheel nuts (1). Torque the wheel nuts (1) to standard values. The appropriate torque value is 80 ft lbs.

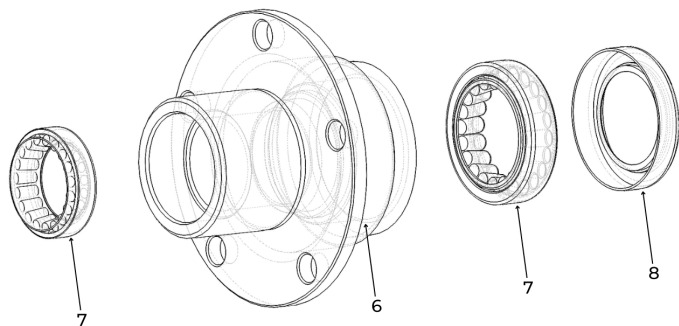


Figure 49. Wheel Hub Inspection.

Hydraulic Oil Replacement



WARNING

ENSURE THAT THE HYDRAULIC SYSTEM IS SHUT OFF AND DEPRESSURIZED BEFORE STARTING ANY MAINTENANCE WORK. THIS WILL PREVENT ACCIDENTAL MOVEMENT OF HYDRAULIC COMPONENTS AND REDUCE THE RISK OF INJURY.



WARNING

WEAR APPROPRIATE SAFETY GEAR, INCLUDING GLOVES AND GOGGLES, TO PROTECT YOURSELF FROM HYDRAULIC FLUID AND OTHER CONTAMINANTS.

1. Change the oil in the reservoir. Operate with warm oil.
2. Replace reservoir breather filter.

Hardware Maintenance

1. Inspect and tighten all electrical connections. Clean or replace any connection that shows signs of corrosion or damage.
2. Inspect and tighten all mechanical hardware. Replace any connection that shows signs of damage.

Refer to the **QUICK REFERENCES** at the end of this document for all torque values.

4.2.7 EVERY 2000 HOURS OR 24 MONTHS MAINTENANCE

Special Tools	Consumables
► N/A	► N/A

NOTICE

The 1000 hours or 12 months preventive maintenance should be carried out concurrently with this maintenance. Certain steps may not be necessary due to redundancy. Please consult the maintenance checklist in the QUICK REFERENCES section for the specific steps that are required.

IMPORTANT NOTE: All maintenance **procedures** in the “Every 1000 hours or 12 months Maintenance” section need to be **repeated**.

Maintenance Procedures

Engine Maintenance

1. Change the radiator coolant.
 1. 1. Open both drain cocks and the radiator cap simultaneously to drain the coolant. If the radiator cap remains closed, it prevents a full drainage of the water.
 1. 2. Disconnect the overflow pipe from the radiator pressure cap to drain the recovery tank.
 1. 1. Add 3.1 L of coolant.
2. Replace hoses and hose clamps.

Fuel Pipes And Clamp Bands Check

Refer to the “Fuel Pipes And Clamp Bands Check” section on **page 27** for the procedures. This maintenance should be performed every 2 years.

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4.3 CORRECTIVE MAINTENANCE

4.3.1 REAR AXLE

Procedures

Rear Axle Removal

Ensure that the vehicle is properly supported on jack stands or that the wheels are chocked to prevent any accidental movement.

NOTE : In order for the rear wheel bearings to be inspected/replaced, the differential oil must be drained to prevent oil leakage.

1. Remove the wheel nuts (1).
2. Remove the wheel (2).

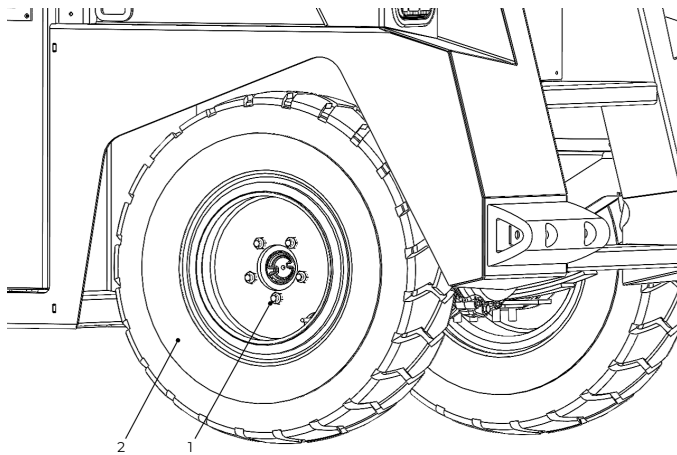


Figure 50. Wheel Removal.

3. Remove the drum brake (3).
4. Clean brake dust with water.

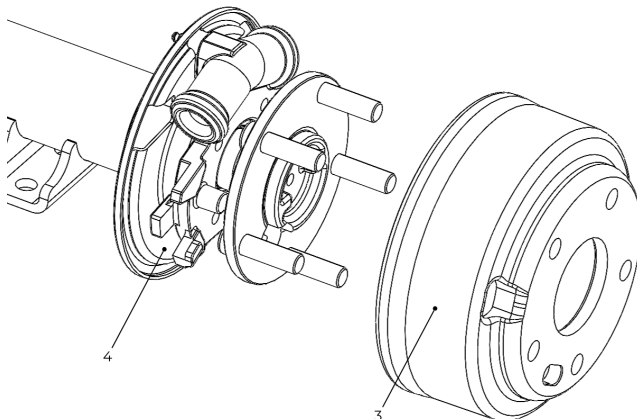


Figure 51. Drum Brake Removal.

5. Remove the backplate mounting screws (5) and their washers from the drum brake system (4).

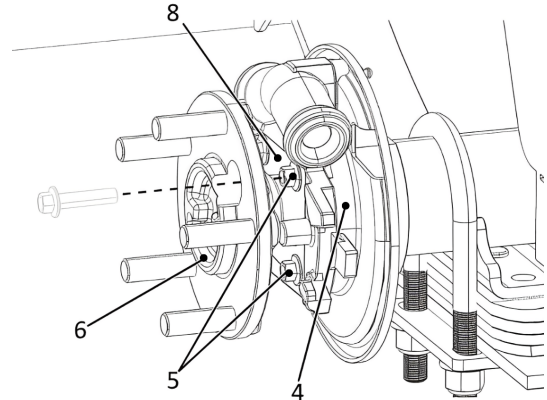


Figure 52. Axle Screws (1 of 2).

6. Remove the axle shaft (6) with the brake drum brake system (4) from the differential's cast-iron case (7).

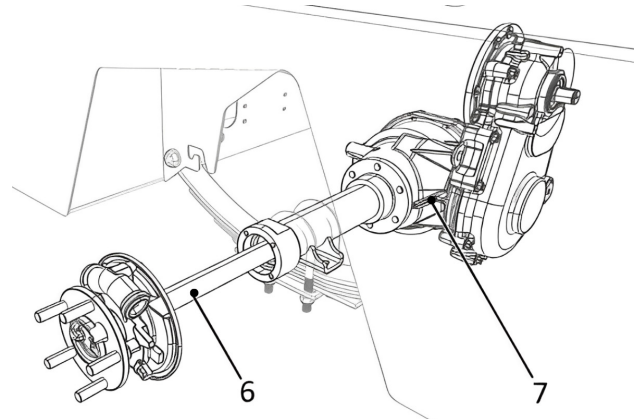


Figure 53. Rear Axle Removal (2 of 2).

7. Inspect the seal (8). Replace if required.
8. Inspect the wheel bearing (9) and its races for wear.
9. Clean and add bearing grease if required.

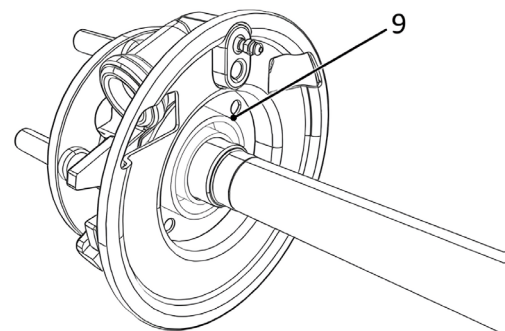


Figure 54. Wheel Bearing.

10. Reinstall the drum brake system (4) and the axle shaft (6) in the differential (7).
11. Reinstall the backplate mounting screws (5) and their washers on the drum brake system (4).
12. Torque the four backplate mounting screws (5) to the recommended standard torque of 58 ft lbs.
13. Reinstall the brake drum (3), wheel (2), and wheel nuts (1).
14. Torque the wheel nuts (1) to the recommended standard torque of 80 ft lbs.
15. Validate that the differential oil level is adequate (it should reach the bottom of the filler hole). For more details, refer to section **4.3.3 DIFFERENTIAL** subsection *Oil Change* page 42.

4.3.2 AXLE AND STEERING

Procedures

Toe-In Adjustment

1. With the wheels in straight forward direction, measure the inside (left to right) distance between the front tires, at the front and rear of the tires.

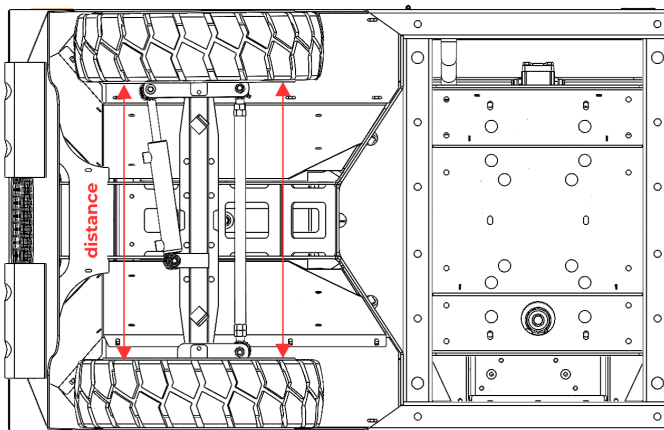


Figure 55. Distance between the front tires.

2. Adjust by turning the tie rod connecting both wheels until the distances are equal and tighten the two lock nuts on the tie rod.

4.3.3 DIFFERENTIAL

Inspection

1. Look for leaks around:
 - Covers.
 - At axle ends.
 - Casing mating surfaces.
 - Drain/fill plugs.
2. Look for signs of external damage cracks, deformed parts, signs of impacts.
3. Inspect for excessive looseness in internal gears by gently rocking wheels.
4. Drain and inspect oil for excessive shavings/debris. (If removing cover, perform visual inspection).
5. Inspect suspension mounting (U bolts, shocks, leaf springs, etc.).
6. Test drive: listen for abnormal noise, feel for excess play, **test while turning** as well.

Procedures

Oil Change

The MX-705 can be equipped with a Schafer Twin-Case, which includes :

- The aluminum case.
- The cast-iron case.

NOTE : Recommended oil for all cases : SAE 80W90 GL5.

Schafer Twin-Case Differential

ALUMINUM CASE

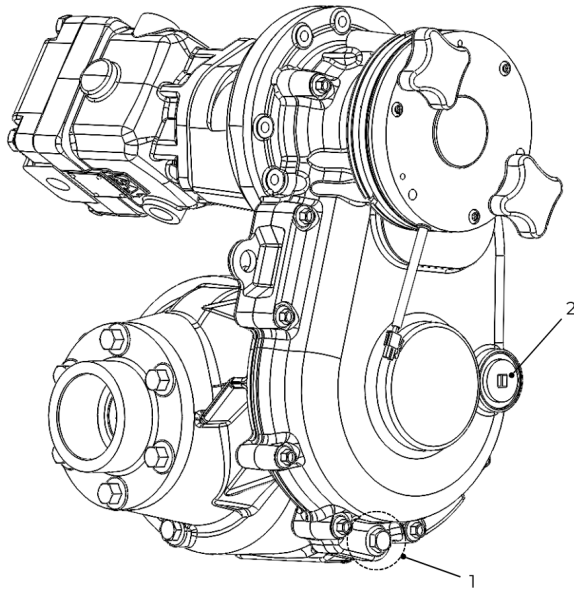


Figure 56. Schafer Aluminum Case.

1. Remove the filler plug (2).
2. Remove the drain plug (1) until the case is completely drained of oil.
3. Reinstall the drain plug (1)
4. Add **625 mL** (stop if the oil reaches the bottom of the filling hole) of SAE 80W90 GL5 differential oil.
5. Reinstall the filler plug (2).

CAST-IRON CASE

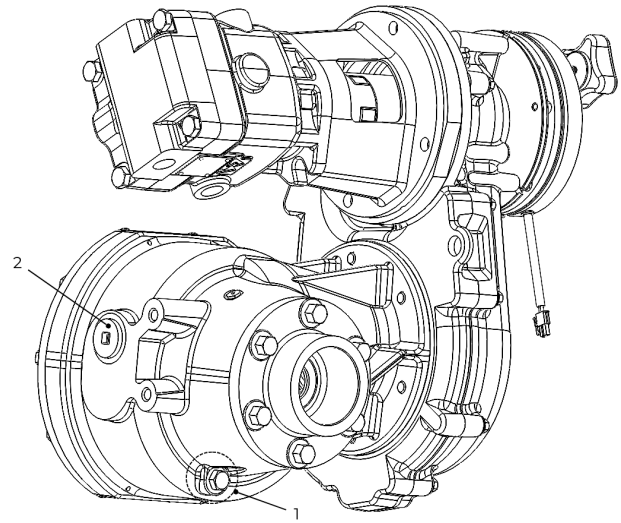


Figure 57. Schafer Cast-Iron Case.

1. Remove the filler plug (2).
2. Remove the drain plug (1) until the gearbox is completely drained of oil.
3. Reinstall the drain plug (1)
4. Add 390 mL (stop if the oil reaches the bottom of the filling hole) of SAE 80W90 GL5 differential oil.
5. Reinstall the filler plug (2).

4.3.4 HYDRAULIC STEERING SYSTEM

Maintenance procedures

Periodic maintenance of this symbiotic system is imperative to uphold consistent, reliable, and precision oriented steering performance.

To do preventive maintenance of the following elements of a hydraulic system: power steering pump, orbitrol steering unit, diverter valve and a double-acting cylinder, proceed as follows :

1. Inspect all the hydraulic system components for the following elements:
 - Inspect all components for signs of leaks, damage, or corrosion.
 - Look for loose fittings or connections.
2. Check the double-acting cylinder's condition by examining the rod and piston for signs of wear, scoring, and potential alignment issues.

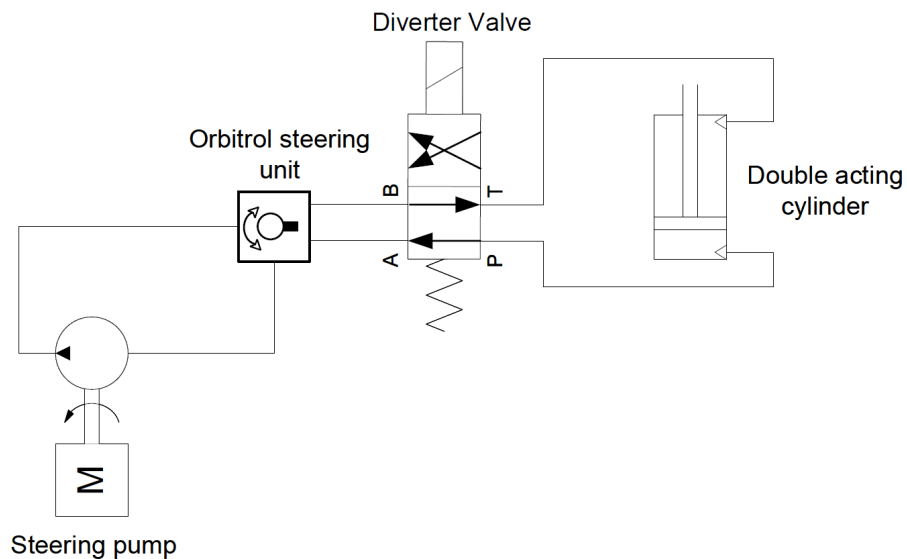


Figure 58. Hydraulic Steering System.

4.4 TROUBLESHOOTING

Battery Voltage (12 V Battery)



WARNING

DO NOT MANIPULATE ELECTRICAL CONNECTIONS OR GENERATE SPARKS AROUND BATTERIES. SPARKS CAN CAUSE A BATTERY EXPLOSION AND ACID SPLASHING. DURING MAINTENANCE, ALWAYS DISCONNECT THE CHARGER AND USE INSULATED TOOLS THAT DO NOT GENERATE SPARKS. FAILURE TO COMPLY CAN CAUSE SERIOUS INJURIES.



WARNING

WHEN WORKING AROUND BATTERIES, ALWAYS WEAR ACID PROOF PROTECTIVE EQUIPMENT, SUCH AS FACE SHIELD AND THE APPROPRIATE GLOVES. BATTERIES CONTAIN SULFUR ACID THAT CAN CAUSE SEVERE BURNS ON SKIN OR EYES. RINSE CONTAMINATED AREA IMMEDIATELY WITH WATER.

Some troubleshooting steps require to measure the voltage that the reaches the inspected components. The total battery voltage might be required for these inspections. Make sure that the 12 V battery is securely connected and measure the voltage between the battery terminals.

4.4.1 ACCESSORIES

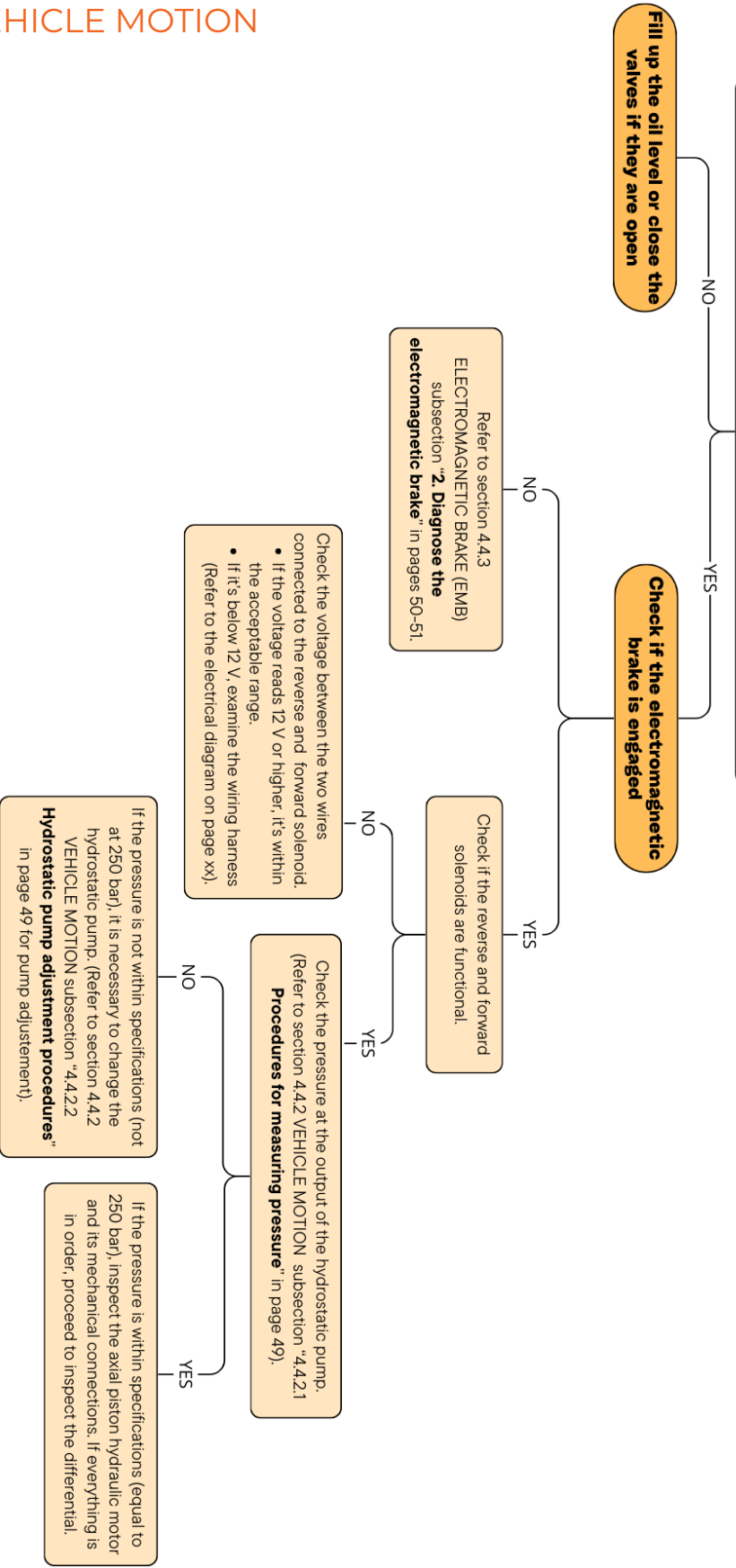
4.4.1.1 Accessories Not Working

1. Turn the key to the ON position.
2. Depress the accessory switch, measure voltage across accessory terminals.
 - ◆ If the measured voltage is not between 11.8V and 14.2V, it indicates a problem with the switch, and it should be replaced.
 - ◆ If the measured voltage is approximately 12V, it suggests a fault with the accessory itself, and it should be replaced.

NOTE : Ensure accurate voltage measurements by doing the voltage drop test between the switch's terminals, ensure that the voltage measurement is below 1 V. Alternatively, consider the voltage drop when measuring between the accessory's terminals.

Vehicle Does Not Move

1. Ensure the oil level in the reservoir is full.
2. Check the status of the valves on the hydraulic reservoir to confirm they are open.
3. Inspect for any signs of leaks.



4.4.2 VEHICLE MOTION

4.4.2.1 Procedures for measuring pressure at the outlet of the hydrostatic pump

1. Disconnect the axial piston hydraulic motor.
2. Remove the hoses from the pump connected to the motor.
3. Install a manometer at the outlet terminals of the hydrostatic pump on both sides.
4. Bleed air from the hoses.
5. Test the forward and reverse modes and check the pressure in each mode to ensure it is at 250 bars.

NOTE : Ensure that the manometer and hoses can withstand 250 bars.

4.4.2.2 Hydrostatic pump adjustment procedures

1. Drive the vehicle to raise the oil temperature to at least 100°F in closed-loop.
2. Elevate the vehicle, ensuring the wheels are off the ground, and secure it with blocks.
3. With the engine idling, engage forward direction.
4. Loosen screw (3) by one turn.
5. Adjust screw (1) to halt wheel rotation. If the wheels continue turning, turn screw (1) clockwise until they stop. If no turning occurs, unscrew screw (1) counter clockwise to locate the limit point.
6. Fully tighten screw (3).

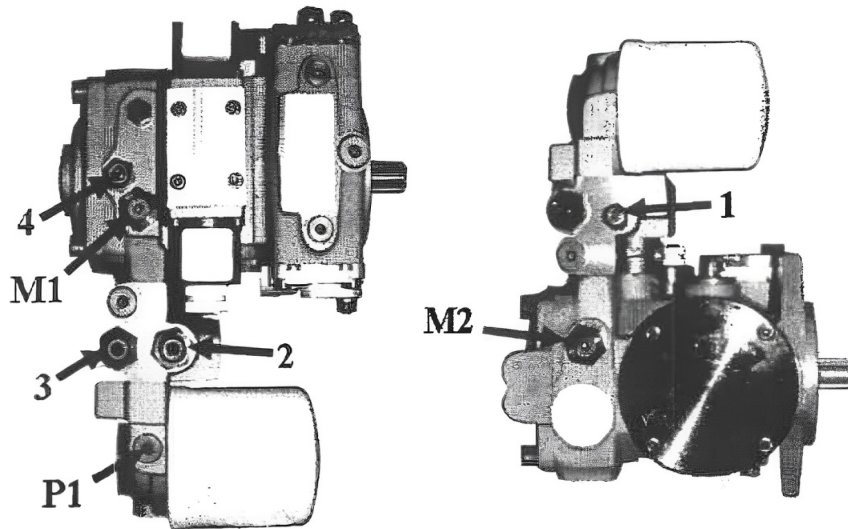


Figure 59. Hydrostatic Pump Adjustment.

4.4.2.3 Electromagnetic brake (EMB) inspection and diagnose

Before troubleshooting the EMB, validate that the non-moving vehicle issue is caused by the electromagnetic brake by screwing in the service knobs, therefore disengaging the electromagnetic brake.

1. Inspect the Electromagnetic Brake

1.1. Electromagnetic brake not releasing (vehicle doesn't move).

- ▶ Excessive air gap (over 0.030 in).
- ▶ No current to electromagnetic brake.



WARNING

PLEASE PAY ATTENTION TO THE VOLTAGE VALUE INDICATED BY THE VOLTMETER. THE VOLTMETER MAY NOT ACCURATELY DISPLAY THE REAL VOLTAGE; INSTEAD, IT MIGHT SHOW A HIGHER VALUE (E.G., 48V) RATHER THAN THE AVERAGE VALUE (E.G., 24V) DUE TO THE IMPLEMENTATION OF PULSE WIDTH MODULATION (PWM).

- ▶ Damaged wiring.
- ▶ Defective magnet.
- ▶ Mechanically stuck pressure plate.
- ▶ Defective controller.

1.2. Electromagnetic brake dragging (burnt smell / lack of power).

- ▶ Low current to electromagnetic brake.
- ▶ Defective magnet (partial release).
- ▶ Mechanically stuck pressure plate.
- ▶ Debris in electromagnetic brake.
- ▶ Gripping of rotor hub splines.

1.3. Electromagnetic brake not engaging.

NOTE: This symptom is sometimes the result of the operator regularly using the Emergency Stop button while the vehicle is still in motion. This wears off the thin friction material on the rotor. Such practice should be avoided.

- ▶ Service knobs installed.
- ▶ Damaged / broken rotor.
- ▶ Mechanically stuck open pressure plate.
- ▶ Damaged transaxle internal component.
- ▶ Defective controller.

2. Diagnose the electromagnetic brake

Important : EMB activation requires the closure of all doors and the detection of an operator by the operator's presence detection pedals.

4.4.2. 4 Vehicle Moves Forward Only

Check the voltage between the two wires connected to the reverse solenoid.

- ◆ If the voltage reads 12 V or higher, it's within the acceptable range.
- ◆ If it's below 12 V, examine the wiring harness (refer to the electrical diagram on page 57).

4.4.2. 5 Vehicle Moves Backward Only

Check the voltage between the two wires connected to the forward solenoid.

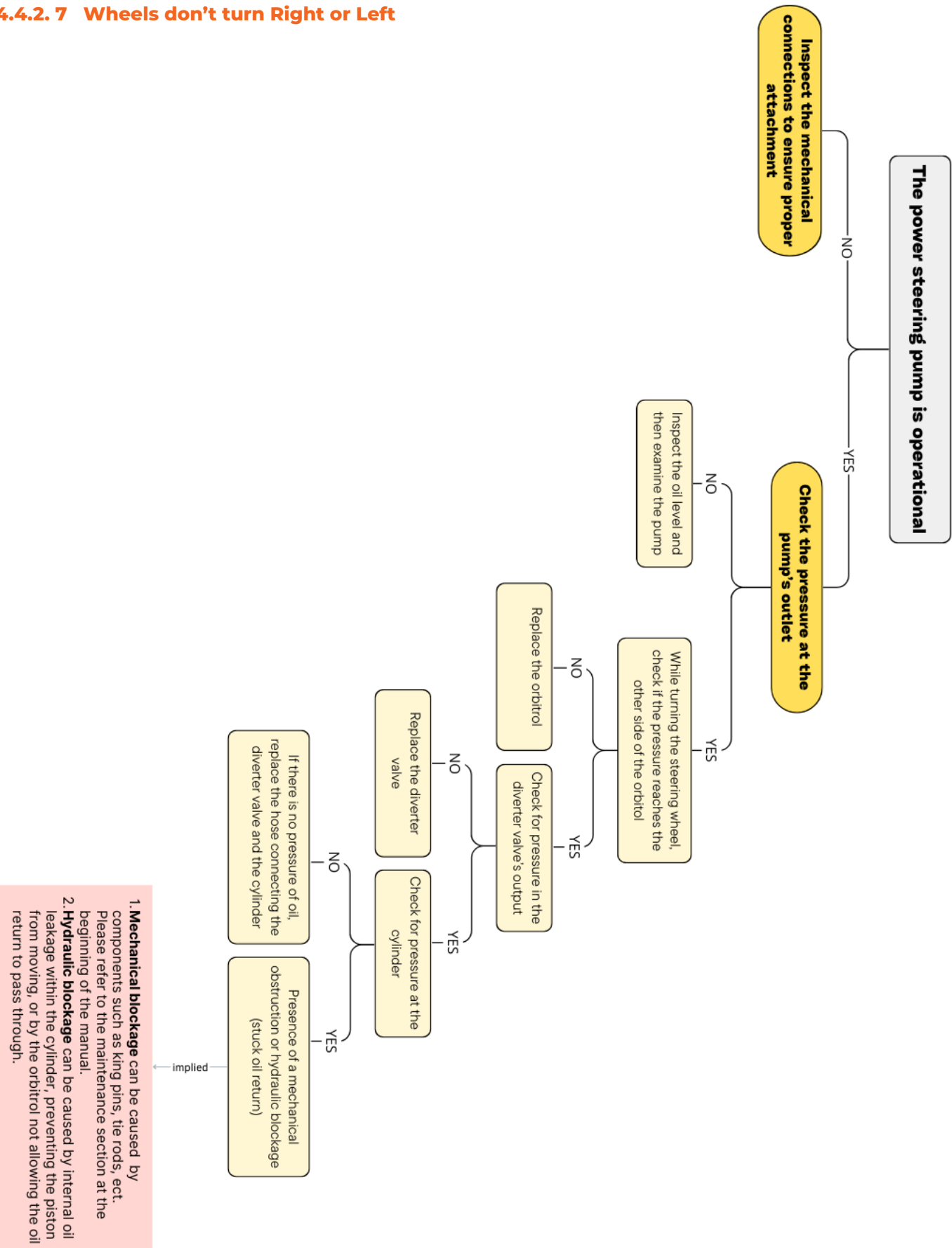
- ◆ If the voltage reads 12 V or higher, it's within the acceptable range.
- ◆ If it's below 12 V, examine the wiring harness (refer to the electrical diagram on page 57).

4.4.2. 6 Vehicle Travels at Reduced Speed

Inspect the vehicle for the following elements:

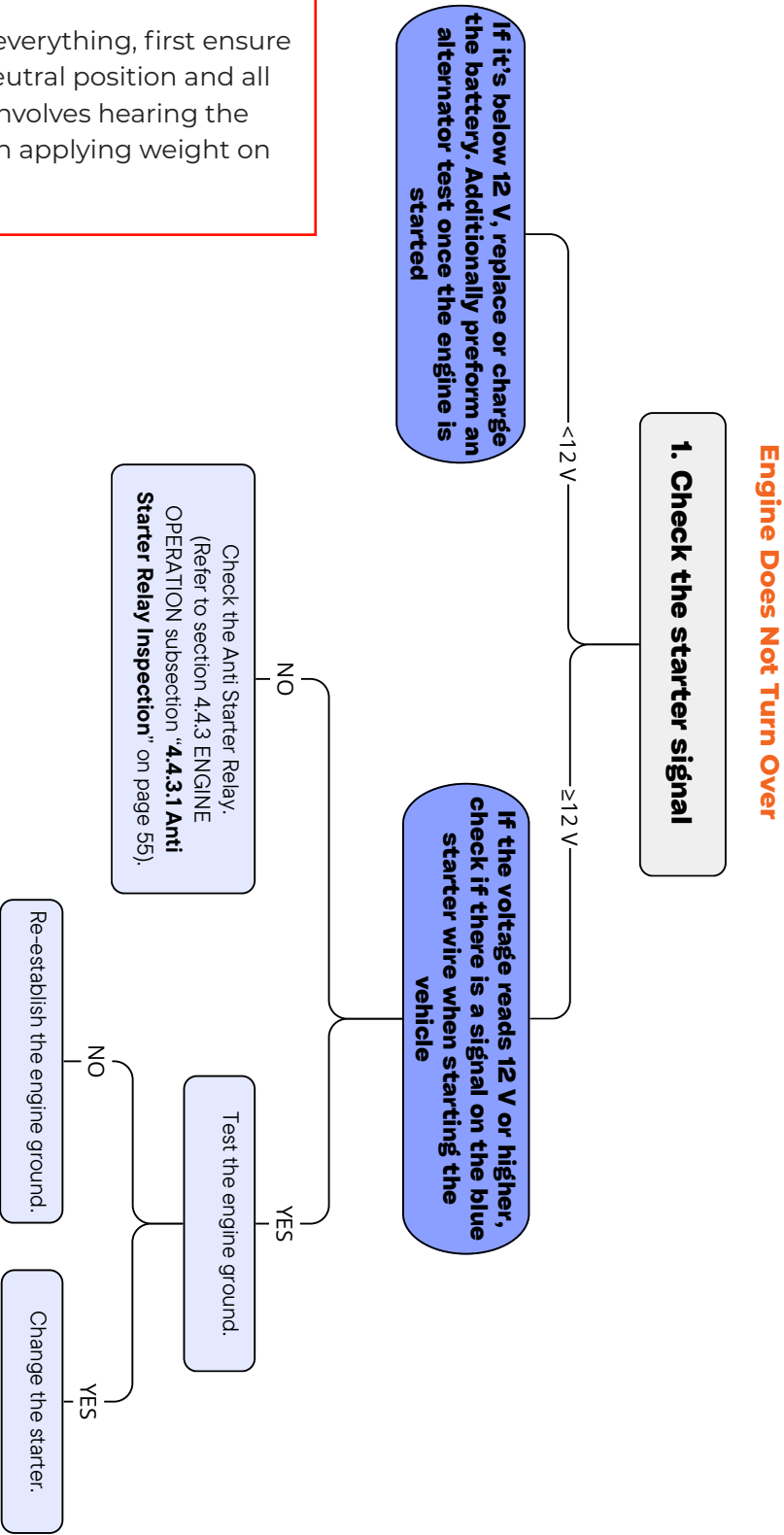
- a. Dragging brakes.
- b. Low fuel.
- c. Clogged air filter.
- d. Clogged fuel filter.
- e. Clogged Exhaust.
- f. Seized gas pump (gas engine only).
- g. Defected fuel solenoid.
- h. Poor gas or fuel quality.
- i. Engine damaged.

4.4.2. 7 Wheels don't turn Right or Left



4.4.3 ENGINE OPERATION

NOTE : Before testing everything, first ensure that the vehicle is in neutral position and all doors are closed. This involves hearing the movement alarm when applying weight on the Seat switch.



4.4.3.1 Anti Starter Relay Inspection

The anti-starter relay is configured with four pins :

- ▶ Pin 16 receives the signal from the key switch.
 - ▶ Pin 18 receives the signal from the FWD/REV switch.
 - ▶ Pin 23 sends the signal from the starter.
 - ▶ Pin 22 is the permanent ground connection.
1. Check the voltage continuity between pin 16 and the blue wire of the starter (pin 25).
 2. In case of no current at pin 16 (Signal from the key switch), check the harness, and then inspect the key switch.
 3. Verify that there is no current at pin 18 (Signal from the FWD/REV switch) to confirm that the vehicle is in neutral position. If this is not the case, check the FWD/REV switch and the harness.

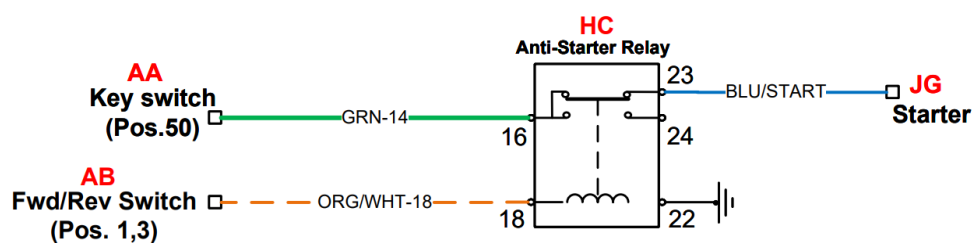


Figure 61. Anti Starter Relay connexions.

4.4.4 MX-705 CHART

MAINTENANCE
CHECK POINTS

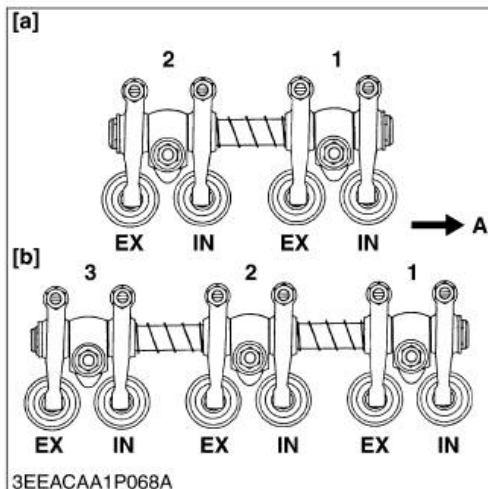
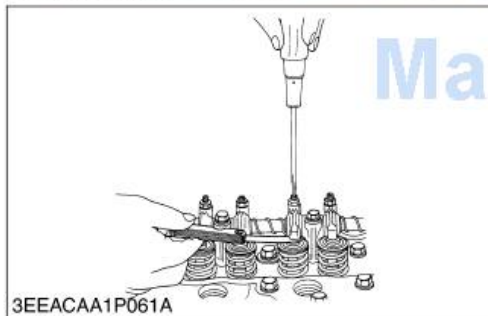
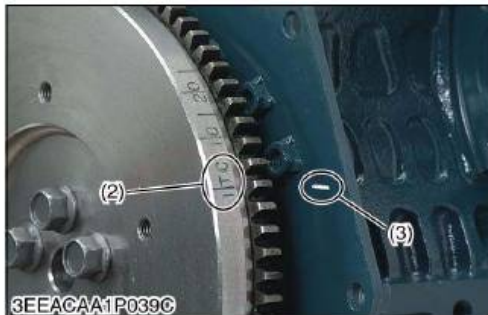
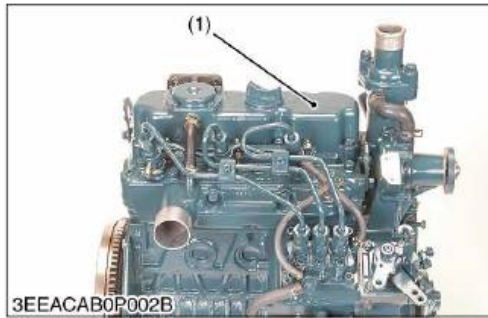
	AFTER FIRST 50 H OR 100 H	DAILY	WEEKLY	EVERY 250 H OR 3 MONTHS	EVERY 500 H OR 6 MONTHS	EVERY 1000 H OR 12 MONTHS	2000 H OR 24 MONTHS
Engine Oil and Oil Filter Replacement	✓		✓				
Hydraulic Oil Filter Replacement	✓		✓				
Visible Damage Inspection		✓					
Fluid Leaks Inspection		✓					
Steering Inspection		✓					
Horn and Lights Inspection		✓					
Tire Pressure Inspection		✓					
Emergency Button Inspection		✓					
Electromagnetic brake (EMB) Inspection		✓					
Hydrostatic Pump Inspection		✓					
Engine Maintenance		✓		✓	✓	✓	✓
Fuel Pipes And Clamp Bands Check			✓				✓
Air Cleaner Element Cleaning			✓				
Fuel Filter Cleaning			✓				
Fan Belt Tension Adjustment			✓				
Test Drive			✓				
Suspension Inspection				✓			
Rubber Bump Stop Inspection				✓			
Grease Fittings Lubrication				✓			
12 V Battery Check				✓			
Decals and Labels Inspection					✓		
Door Maintenance					✓		
Frame Inspection					✓		
Kingpins Inspection					✓		
Wheel Bearings Inspection					✓		
Differential Maintenance							
Differential Spline Drive Maintenance						✓	✓
Front Axial Hub Maintenance						✓	✓
Hydraulic Oil Replacement						✓	✓
Hardware Maintenance						✓	✓

Checking Valve Clearance

SM-E2B SERIES, WSM

G GENERAL

[12] CHECK POINT OF EVERY 800 HOURS



Checking Valve Clearance

■ IMPORTANT

- Valve clearance must be checked and adjusted when engine is cold.

1. Remove the cylinder head cover (1) and the glow plugs.
2. Align the "1TC" mark (2) on the flywheel and alignment mark (3) on the rear end plate so that the No. 1 piston comes to the compression top dead center.
3. Check the following valve clearance marked with " " using a feeler gauge. ★
4. If the clearance is not within the factory specifications, adjust with the adjusting screw.
5. Then turn the flywheel 6.28 rad (360 °), and align the "1TC" mark (2) on the flywheel and alignment mark (3) on the rear end plate so that the No. 1 piston comes to the overlap position.
6. Check the following valve clearance marked with " " using a feeler gauge. ☆
7. If the clearance is not within the factory specifications, adjust with the adjusting screw.

Number of cylinders Valve arrangement	Z482-E2B Z602-E2B		D662-E2B D722-E2B D782-E2B D902-E2B	
	Intake valve	Exhaust valve	Intake valve	Exhaust valve
No. 1	★	★	★	★
No. 2	☆	★	☆	★
No. 3	—	—	★	☆

★When No. 1 piston is at the compression top dead center position.

☆When No. 1 piston is at the overlap position.

Intake and exhaust valve clearance (cold)	Factory spec.	0.145 to 0.185 mm 0.00571 to 0.00728 in.
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■ NOTE

- The sequence of cylinder numbers is given as No. 1, No. 2 and No. 3 starting from the gear case side.
- After adjusting the valve clearance, secure the adjusting screw with the lock nut.

(1) Cylinder Head Cover

(2) "1TC" Mark

(3) Alignment Mark




A : Gear Case Side

[a] Z482-E2B, Z602-E2B

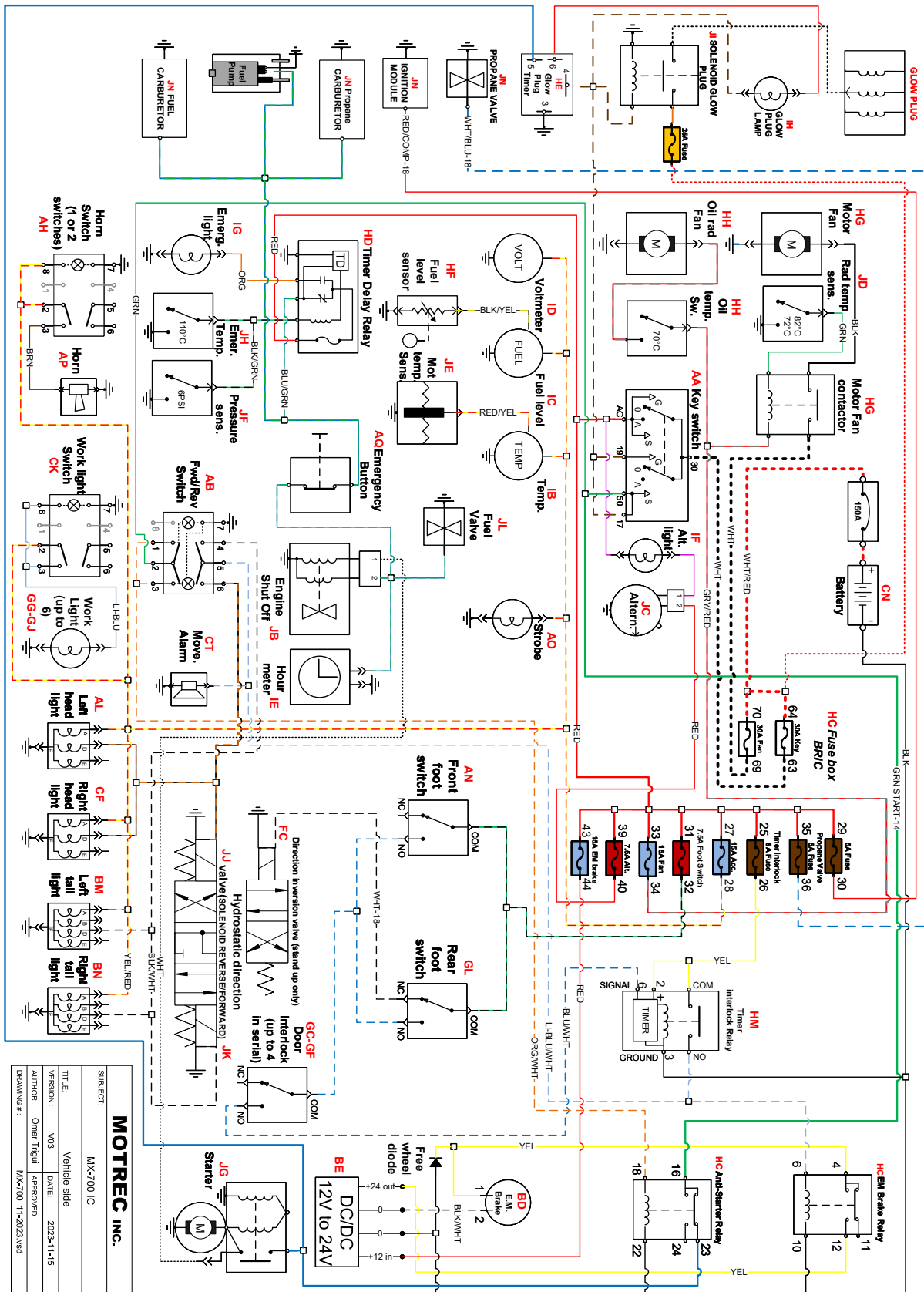
[b] D662-E2B, D722-E2B,
D782-E2B, D902-E2B

W10113200

Standard Torque

	<div>   BOLT CLAMP LOADS Suggested Assembly Torque Values  </div>									
	USS/SAE GRADE 5					USS/SAE GRADE 8				
DIAMETER & THREADS PER INCH	TENSILE STRENGTH MIN. PSI	PROOF LOAD LB	CLAMP LOAD LB	TORQUE DRY FT LB	LUBRICATED FT LB	TENSILE STRENGTH MIN. PSI	PROOF LOAD LB	CLAMP LOAD LB	TORQUE DRY FT LB	LUBRICATED FT LB
1/4-20	120,000	2,700	2,020	8	6.3	150,000	3,800	2,950	12	9
28	120,000	3,100	2,320	10	7.2	150,000	4,350	3,250	14	10
5/16-18	120,000	4,450	3,340	17	13	150,000	6,300	4,700	24	18
24	120,000	4,900	3,700	19	14	150,000	6,950	5,200	27	20
3/8-16	120,000	6,600	4,950	30	23	150,000	9,300	6,980	45	35
24	120,000	7,450	5,600	35	25	150,000	10,500	7,900	50	35
7/16-14	120,000	9,050	6,780	50	35	150,000	12,800	9,550	70	50
20	120,000	10,100	7,570	55	40	150,000	14,200	10,650	80	60
1/2-13	120,000	12,100	9,050	75	55	150,000	17,000	12,750	110	80
20	120,000	13,600	10,200	85	65	150,000	19,200	14,400	120	90
9/16-12	120,000	15,500	11,600	110	80	150,000	21,800	16,350	150	110
18	120,000	17,300	12,950	120	90	150,000	24,400	18,250	170	130
5/8-11	120,000	19,200	14,400	150	110	150,000	27,100	20,350	210	160
18	120,000	21,800	16,350	170	130	150,000	30,700	23,000	240	180
3/4-10	120,000	28,400	21,300	260	200	150,000	40,100	30,100	380	280
16	120,000	31,700	23,780	300	220	150,000	44,800	33,500	420	310
7/8-9	120,000	39,300	29,450	430	320	150,000	55,400	41,600	600	450
14	120,000	43,300	32,450	470	350	150,000	61,100	45,800	670	500
1-8	120,000	51,500	38,600	640	480	150,000	72,700	54,500	910	680
14	120,000	57,700	43,300	720	540	150,000	81,500	61,100	1,020	760

Electrical Diagram





MOTREC INTERNATIONAL
