MX-700-IC

MAINTENANCE MANUAL

A GUIDE FOR PERFORMING MAINTENANCE AND REPAIRS ON MX-700 IC

UPDATED 12.10.2023
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 usage 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.

MOTREC INTERNATIONAL INC.

5-YEAR LIMITED WARRANTY

FOR VEHICLES PRODUCED AFTER NOVEMBER 1, 2024

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.

INTELLECTUAL PROPERTY

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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.

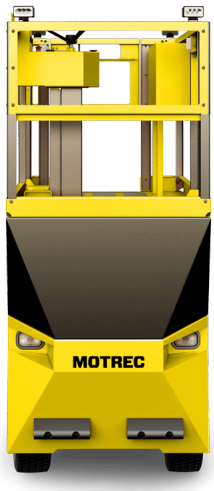
MOTREC®

“AYONE CAN WORK WE PERFORM THAT’S MOTREC ”

-Motrec Tagline

CONTENTS

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-700 experienced technician to accelerate the maintenance process. The Quick References should not be used by any untrained or inexperienced personnel.

The MX-700

The IC (diesel or gas engine) powered MX-700 offers an elevated platform and bi-directional steering (stand up version), making it an ideal choice for tasks in confined spaces at elevated heights. Safety and productivity are paramount in its design, with precise controls ensuring smooth operation for easy maneuvering. Crafted entirely from durable steel, this robust model demands minimal maintenance and is engineered for rigorous use, promising long-lasting dependability. As with all Motrec vehicles, the MX-700 can be customized to your exact requirements for a perfect fit.

Modular Design

The Motrec MX-700 electric vehicle showcases an intelligent and The IC (diesel or gas engine) powered MX-700 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-700'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
HPD : High Pedal Disable
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
PMC : Power Motor Controller
PWM : Pulse Width Modulation
SOC : State of Charge
SRO : Static Return To Off
VAC/AC : Volts Alternating Current / Alternating Current
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-700 specifications and configurations can vary depending on the specific model and year of the MX-700. 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 :

NOTE 1 : The EMB Service Knobs Compartment is typically located in the back of the vehicle and is easily accessible for maintenance and servicing purposes. The knobs themselves are usually located within the compartment and tightening and loosening the knobs can be done manually.

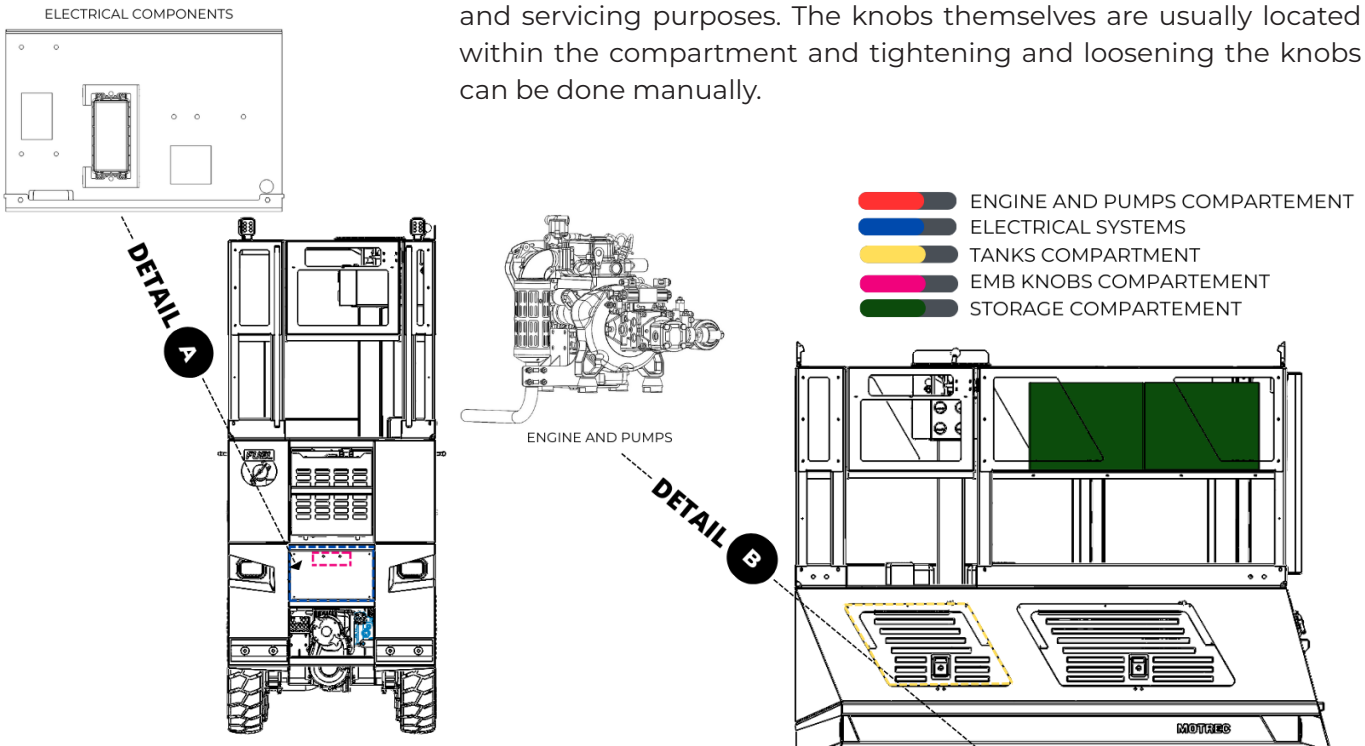


Figure 1.a. Equipment Compartments Front View.

Figure 1.b. Equipment Compartments Side View.

NOTE 2 : To access the compartment of electrical components, you need to remove the Motrec plate of the vehicle.

NOTE 3 : There is an engine and pumps access door that allows access these elements.

EQUIPMENT COMPARTMENTS FOR CONFIGURATION 2 : STEATED VERSION :

NOTE 1 : The EMB Service Knobs Compartment is typically located in the back of the vehicle and is easily accessible for maintenance and servicing purposes. The knobs themselves are usually located within the compartment and tightening and loosening the knobs can be done manually.

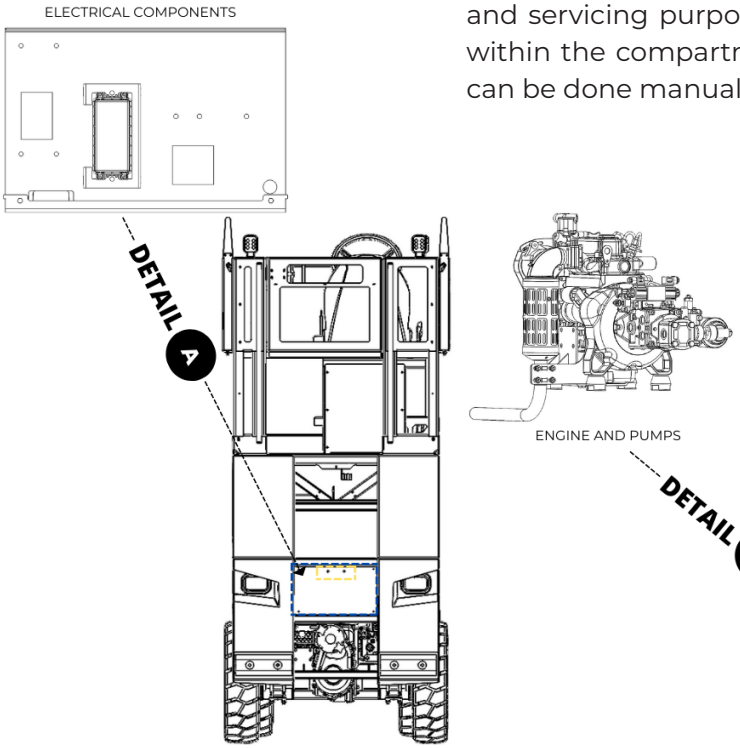


Figure 2.a. Equipment Compartments Front View.

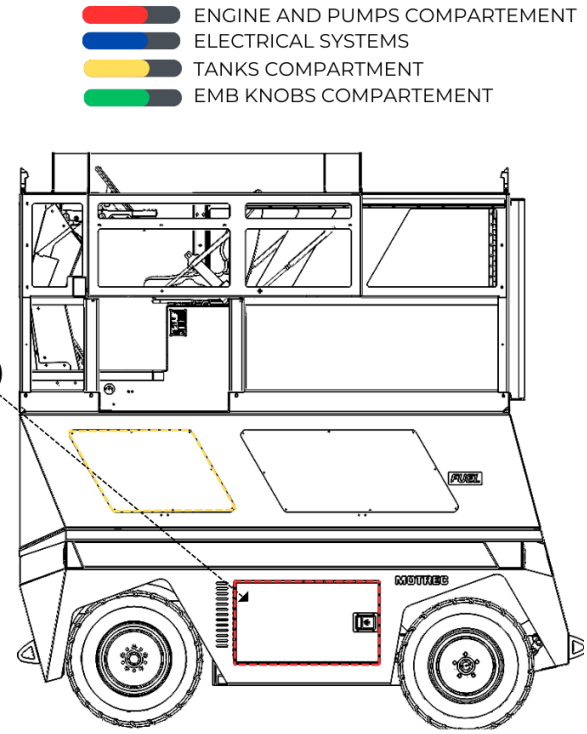


Figure 2.b. Equipment Compartments Side View.

NOTE 2 : To access the compartment of electrical components, you need to remove the Motrec plate of the vehicle.

NOTE 3 : There is an engine and pumps access door that allows access these elements.

NOTE 4 : While not depicted in the illustration provided, it's important to note that this version also includes an IBC bin storage compartment.

3.2 ELECTRICAL SYSTEMS

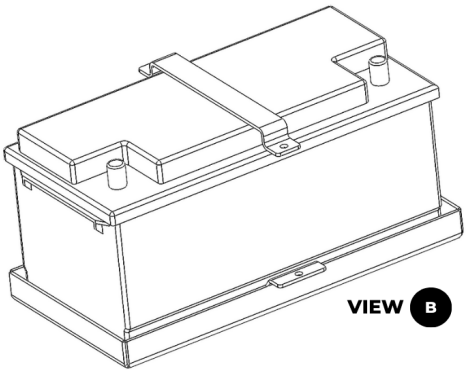


Figure 3. b. 12 V Battery (View B).

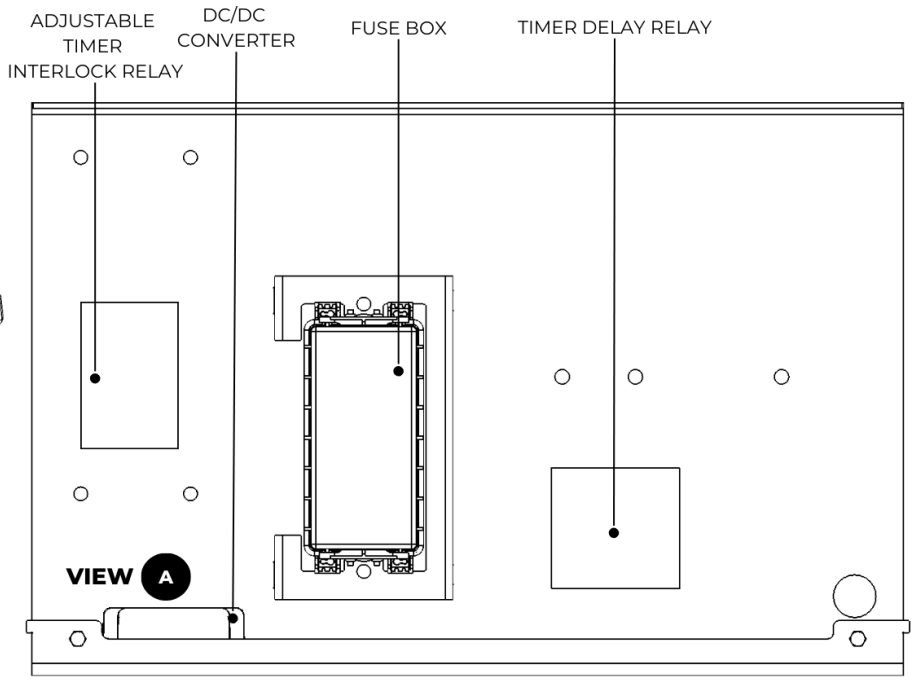


Figure 3. a. Electrical System Compartments (View A).

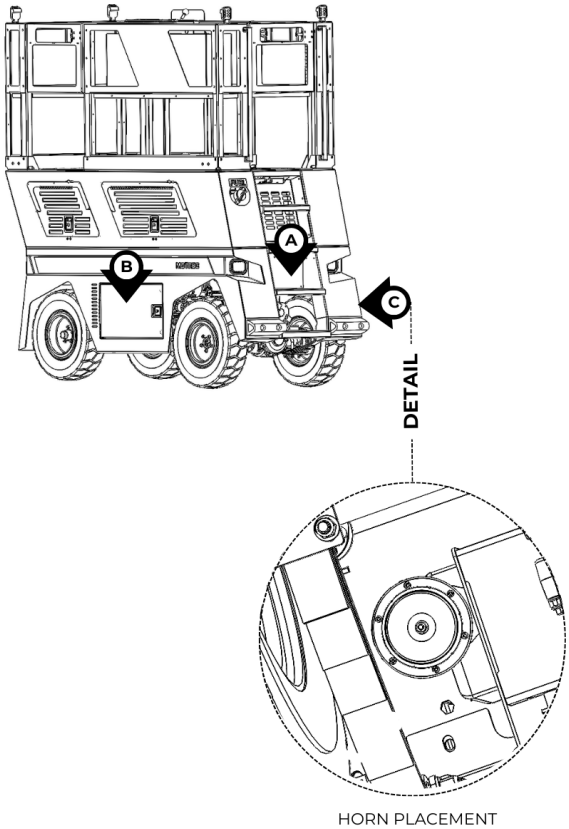


Figure 3. c. Horn Placement (View C).

This compartment receives the energy from the 12VDC 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.) (12V).

For connection details, refer to the vehicle's electrical schematic in section 5QUICK REFRENCES.

NOTE 1 : The stand-up and seated versions of the MX700 IC, whether gas or diesel-powered, have nearly identical electrical components.

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

3.2.1 TIMER DELAY RELAY

1. **Purpose** : The timer delay annunciator serves as a crucial safety feature designed to promptly shut off the power and bring the vehicle to a stop when specific conditions are met. It is programmed to initiate this action when the temperature exceeds 220°F or when a significant drop in oil pressure is detected. This vital function is executed with a predefined delay of 30 seconds to ensure controlled and safe vehicle shutdown. Additionally, time delay annunciators include a visual alert by activating the emergency lights. This serves as an added layer of safety by alerting the operator.

2. **Connection in the vehicle :**

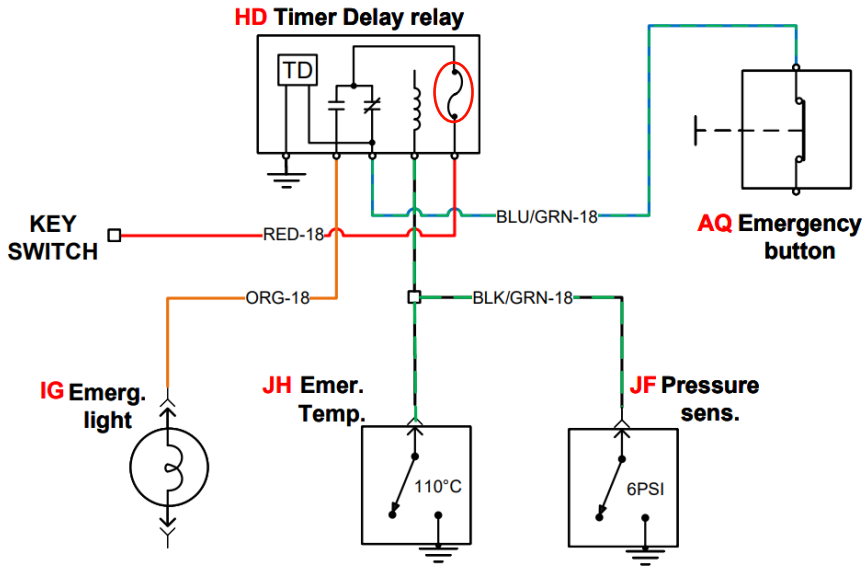


Figure 4. Timer Delay Annunciator Connection -Electrical Diagram-.

IMPORTANT NOTE : A fuse 14 A is connected below the timer delay relay (circled in red) to protect it from potential damage caused by electrical faults. If a fault occurs that could harm the timer delay relay, the fuse will blow, preventing damage to this crucial component.

3.2.2 ADJUSTABLE TIMER INTERLOCK RELAY

1. **Purpose** : The main role of the adjustable timer interlock relay is to prevent the vehicle from moving when the doors are open.

2. **Connection in the vehicle :**

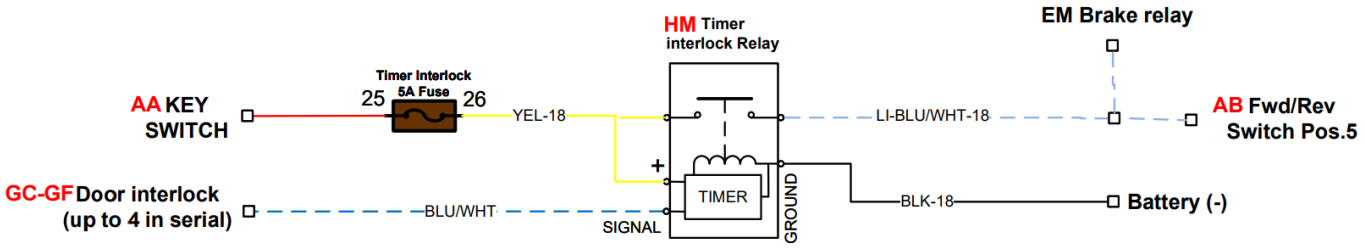


Figure 5. Adjustable Timer Interlock Delay Connection -Electrical Diagram-.

3.2.3 MAIN ENERGY

The main energy system encompasses all the elements responsible for the vehicle's movement, such as the engine, hydraulic pumps, seat switch (seated version), and movement alarms, among others.

When the driver turns the key switch ON, it enables the flow of electrical energy from the system's primary energy source, the 12V battery. This battery stores electrical energy in the form of direct current (DC) and delivers it to the fuse and key contactor, which subsequently transmit power to the engine. Additionally, the system includes an alternator, which can recharge the battery and supply supplementary electrical power.

NOTE: Refer to the electrical diagram in **section 5 QUICK REFRENCES**. The wiring remains the same, but the component placement may vary from one vehicle model to another.

3.2.4 AUXILIARY ENERGY

The vehicle's auxiliary systems, which encompass functions such as the backup alarm, lighting, horn, and other components, are supplied with electrical power at 12 volts direct current (12 VDC). This essential power source is derived either directly from the vehicle's battery or generated by the alternator. Whether from the battery or the alternator, the 12 VDC supply ensures the reliable operation of these auxiliary systems.

NOTE: Refer to the electrical diagram in **section 5 QUICK REFRENCES**. The wiring remains the same, but the component placement may vary from one vehicle model to another.

3.3 ENGINES

The MX-700 IC, offered in stand-up and seated versions, can be powered by one of the following engine types :

- Gas engine
- Diesel engine

3.3.1 GAS ENGINE

A gas engine, transforms stored fuel energy into mechanical power through controlled explosions within its cylinders. It operates on a four-stroke cycle: intake, compression, power, and exhaust. Fuel is ignited by a spark plug, driving the three pistons and producing mechanical movement.

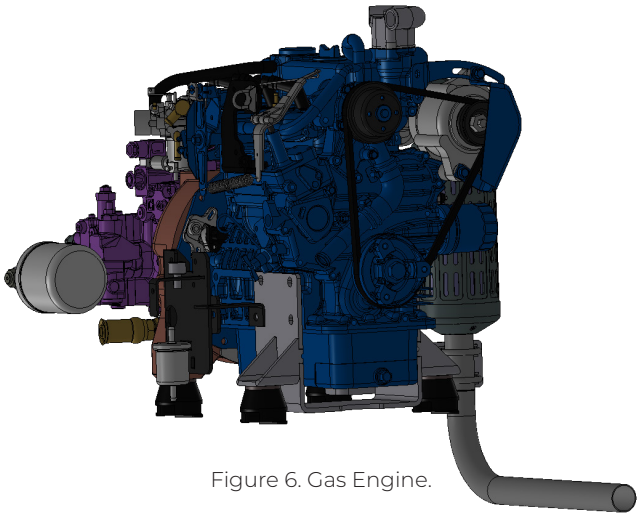


Figure 6. Gas Engine.

3.3.2 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, power, and exhaust. Unlike gas engines, 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.

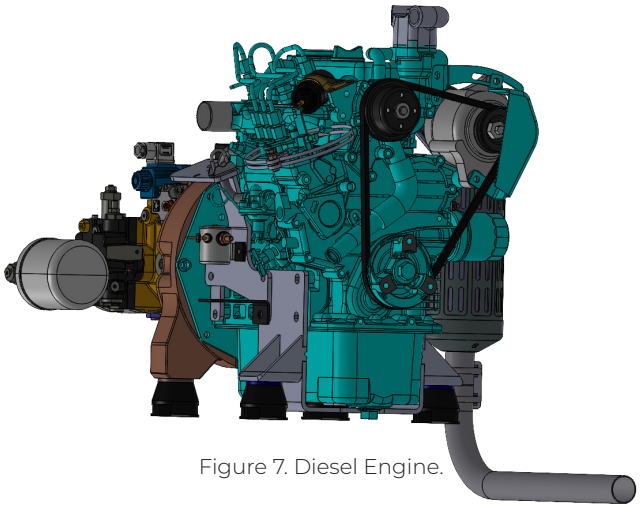


Figure 7. Diesel Engine.

3.4. ELECTROMAGNETIC BRAKE (EMB)

The MX-700 electric 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.

The Electromagnetic Brake System (EMB) is powered by a 24V voltage supplied by a DC/DC converter. This converter takes a 12V input voltage and transforms it into a 24V output voltage, efficiently supplying power to the EMB (Please refer to the electrical diagram shown in Figure 9).

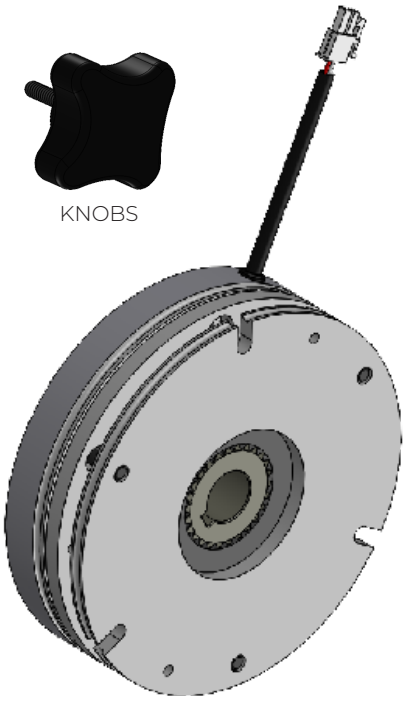


Figure 8. EMB Brake System.

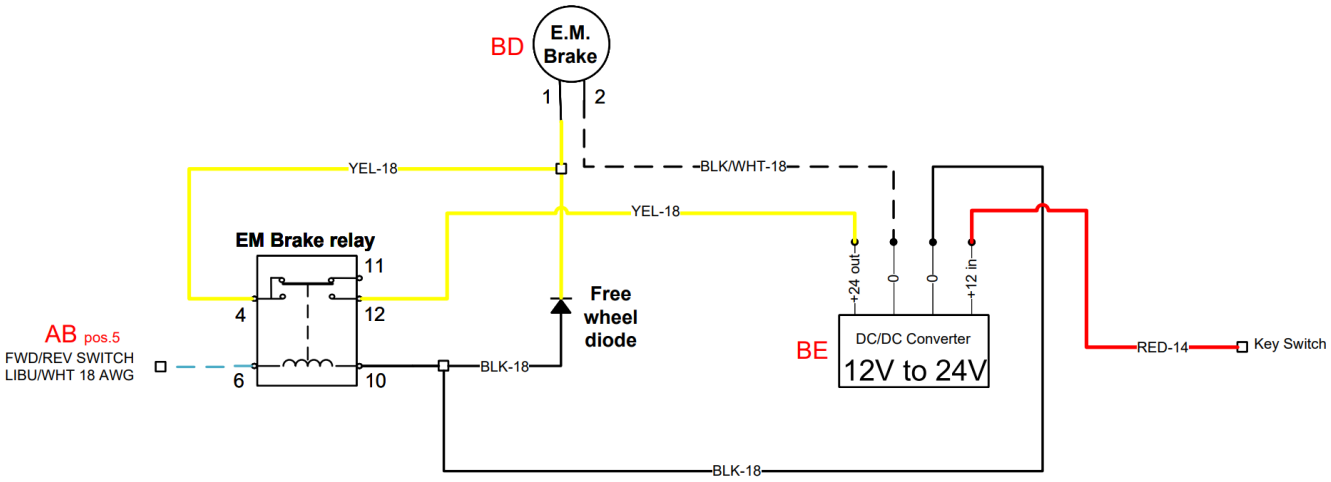


Figure 9. EMB Connection -Electrical Diagram-.

3.5 HYDRAULIC PUMPS

Two hydraulic pumps have been installed within the MX-700.

These are the two types of hydraulic pumps :

1. The hydrostatic pump is responsible for enabling forward and reverse movement. This pump, often referred to as the hydraulic propulsion pump, pressurizes hydraulic fluid from the reservoir and directs it to an axial piston hydraulic motor and a motor-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.

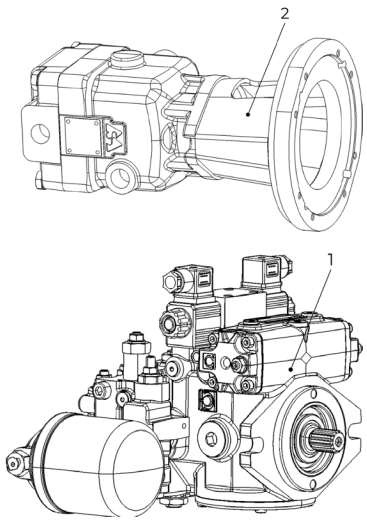


Figure 10. Hydrostatic Pump (1) and Axial Piston Hydraulic Motor / Motor-differential adapter Assembly (2).

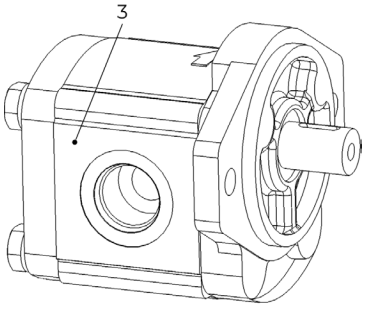


Figure 11. Power Steering Pump (3).

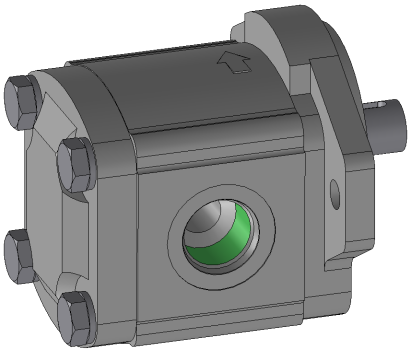


Figure 12. Connections.

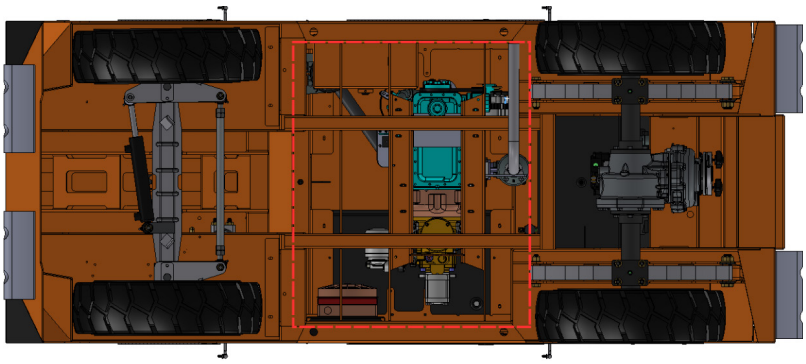


Figure 13. Hydraulic Pumps Compartement (bottom view).

NOTE : Colors are used to denote connections between elements, as depicted in the figure 12 above with the highlighted green color (encircled in red).

3.6 STEERING SYSTEM (STAND UP OR SEATED VERSION)

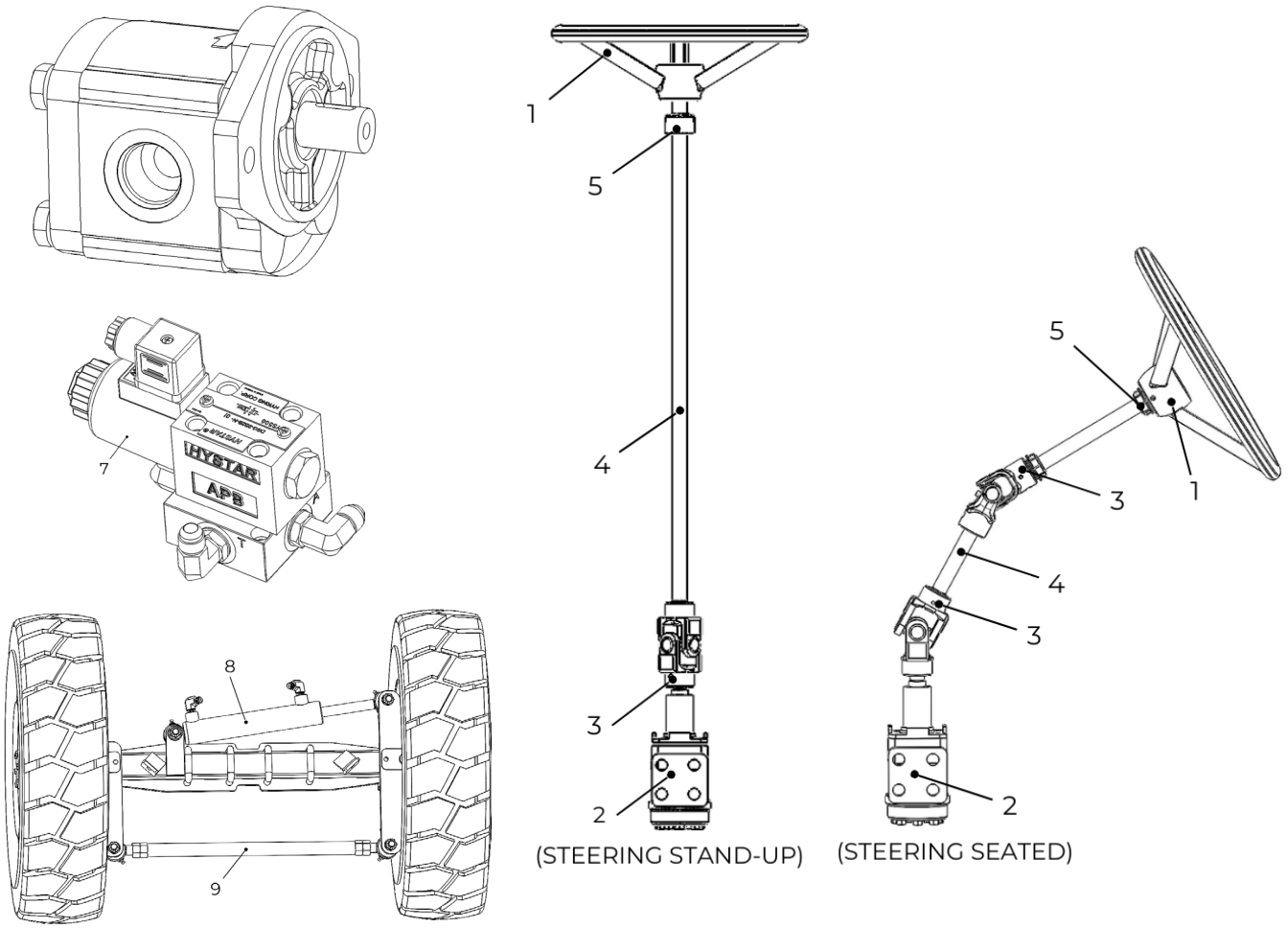


Figure 14. Steering System.

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 igus bushing (5). In essence, the orbital steering unit takes the hydraulic pressure generated by the power steering pump (6) and converts it into mechanical force to control the movement of the vehicle's wheels. Furthermore, when the driver changes driving position, the flow diverter valve (7) responds to this adjustment, modulating hydraulic fluid flow correspondingly. The valve ensures that hydraulic pressure is directed to the relevant side of the steering system based on the driver's orientation, leading to wheel movement in the intended direction. This hydraulic pressure is channeled towards the steering cylinder (8) on the appropriate side of the vehicle (determined by the driver's position), prompting the wheel to turn as required. This coordinated movement is mirrored by the opposite wheel through an interconnected linkage system (9).

Collectively, these components harmonize their functions, allowing the driver's touch to translate into precise wheel movements, ensuring effortless steering, and ultimately, enhancing the vehicle's navigation and maneuvering capabilities.

NOTE :The flow diverter valve (7) only exists in a stand up version due to its two driving positions.

Important for the stand-up version : The direction of the wheels strongly relies on the driver's input, closely tied to their position and determined by the presence pedal they press on.

3.7 REAR SUSPENSIONS (STAND UP OR SEATED VERSION)

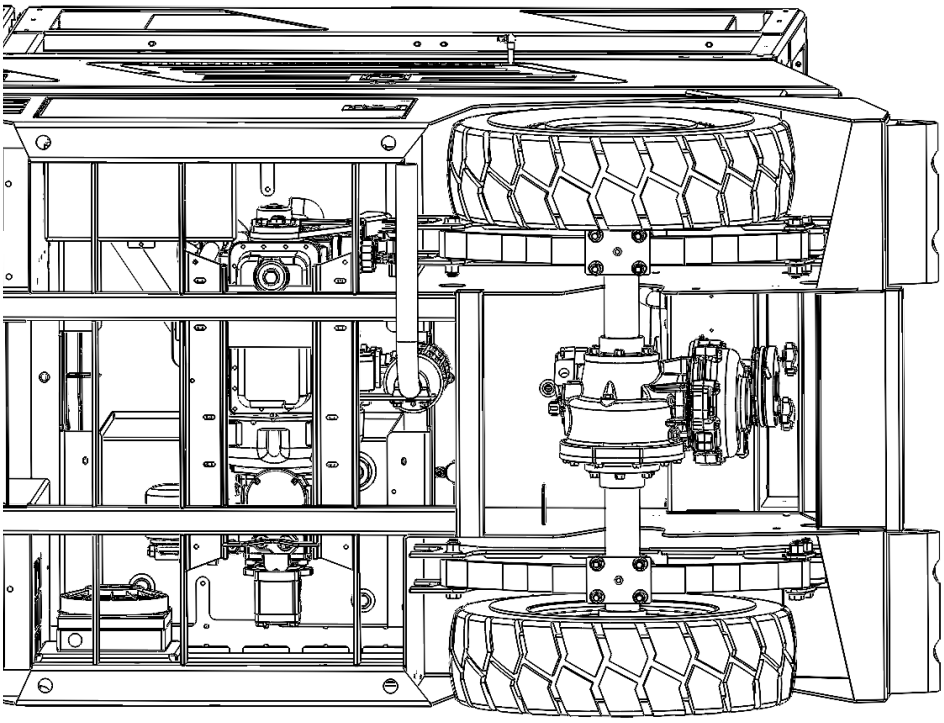
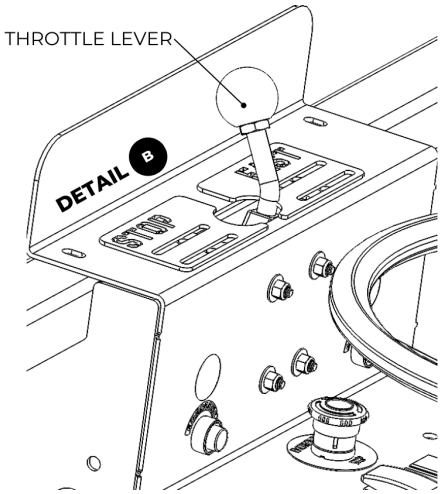


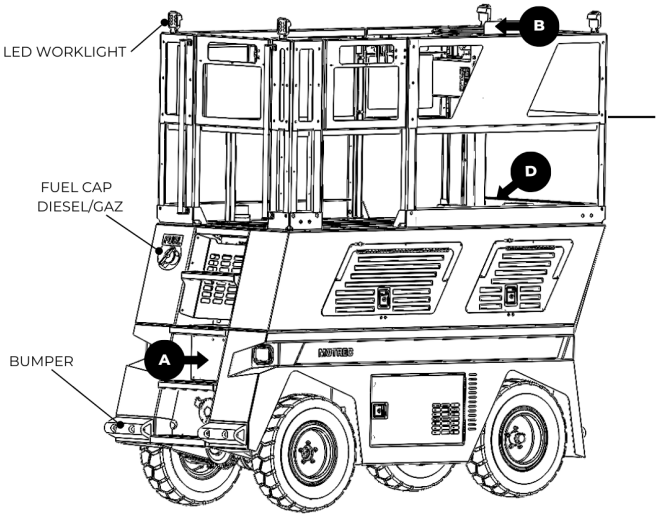
Figure 15. Rear Suspensions.

As the default configuration, all MX-700 models feature a leaf spring suspension at the back of the vehicle. This design ensures effective stabilization by distributing the vehicle's weight evenly, absorbing road shocks and vibrations, and enhancing overall handling. The leaf spring suspension's simplicity, reliability, and impressive load-carrying capacity make it a practical and reliable choice, providing a comfortable and stable ride.

3.8.1 GENERAL COMPONENTS : STAND UP VERSION

The electrical cables 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 cables are neatly organized and protected from potential hazards or obstructions. Their ultimate destination is the console, where they connect to various electrical components, allowing for seamless operation and control within the vehicle.





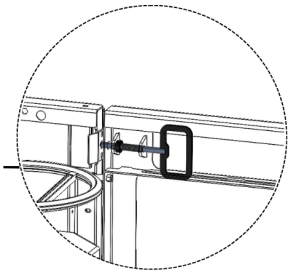


Figure 16. General Cmponents (Detail A, B and C).

NOTE : if any of the vehicle's doors is open, the vehicle will not move from its current position. This safety measure is in place to prevent any accidental movement while doors are ajar, ensuring the safety of occupants and the surrounding environment. Additionally, there is an adjustable delay (3 second recommmanded) after opening a door before the vehicle can be operated, thereby improving safety.

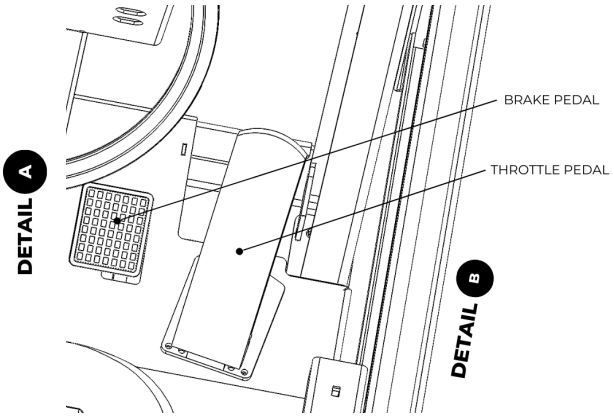
Figure 17. General Cmponents (Detail D).

Operator's presence detection pedal (Detail D)

Two operator's presence detection pedals are strategically positioned adjacent to the driver's feet with the purpose of discerning the driver's seating orientation. By utilizing these pedals, the system can effectively identify whether the driver is positioned on the front or rear of the vehicle. When the driver's foot engages either of the pedals, the system registers this input and determines the corresponding driving configuration. This information is then utilized to tailor various vehicle functions, such as steering behavior, to suit the driver's specific placement. Additionally, if all the vehicle's doors are closed, engaging the pedal also starts the power steering pump.

3.8.2 GENERAL COMPONENTS : SEATED VERSION

The electrical cables 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 cables are neatly organized and protected from potential hazards or obstructions. Their ultimate destination is the console, where they connect to various electrical components, allowing for seamless operation and control within the vehicle.



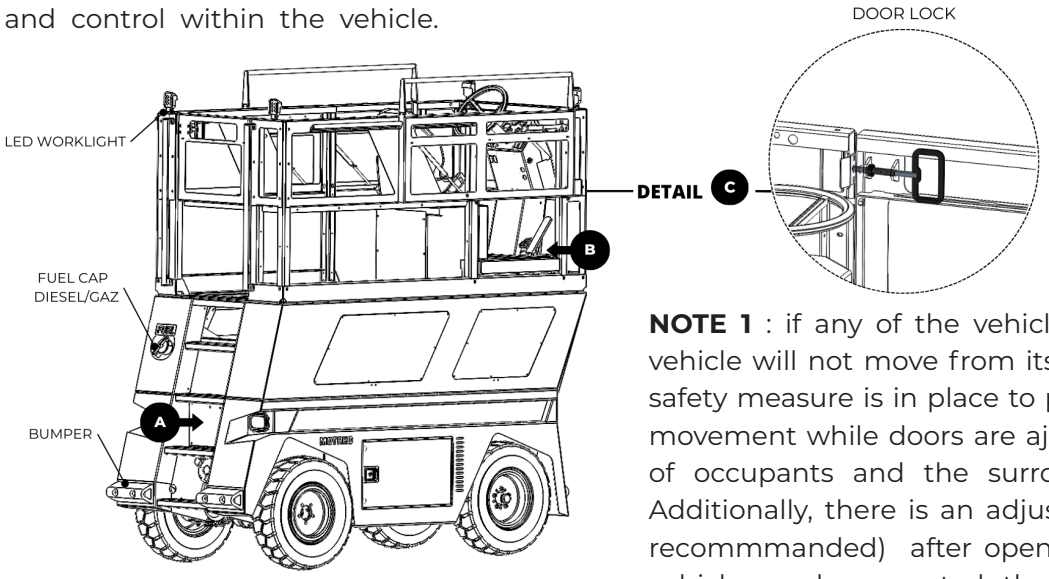


Figure 18. General Cmponents (Detail A, B and C).

NOTE 1 : if any of the vehicle's doors is open, the vehicle will not move from its current position. This safety measure is in place to prevent any accidental movement while doors are ajar, ensuring the safety of occupants and the surrounding environment. Additionally, there is an adjustable delay (3 second recommmanded) after opening a door before the vehicle can be operated, thereby improving safety.

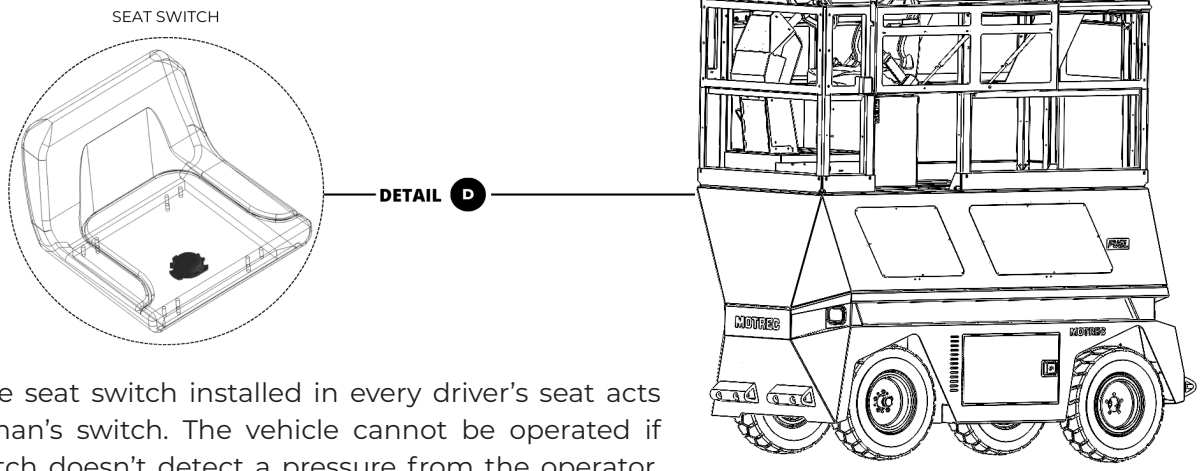


Figure 19. General Cmponents (Detail D).

NOTE 2 : The seat switch installed in every driver's seat acts as a dead man's switch. The vehicle cannot be operated if the seat switch doesn't detect a pressure from the operator.

3.9.1 CONSOLE : STAND UP VERSION

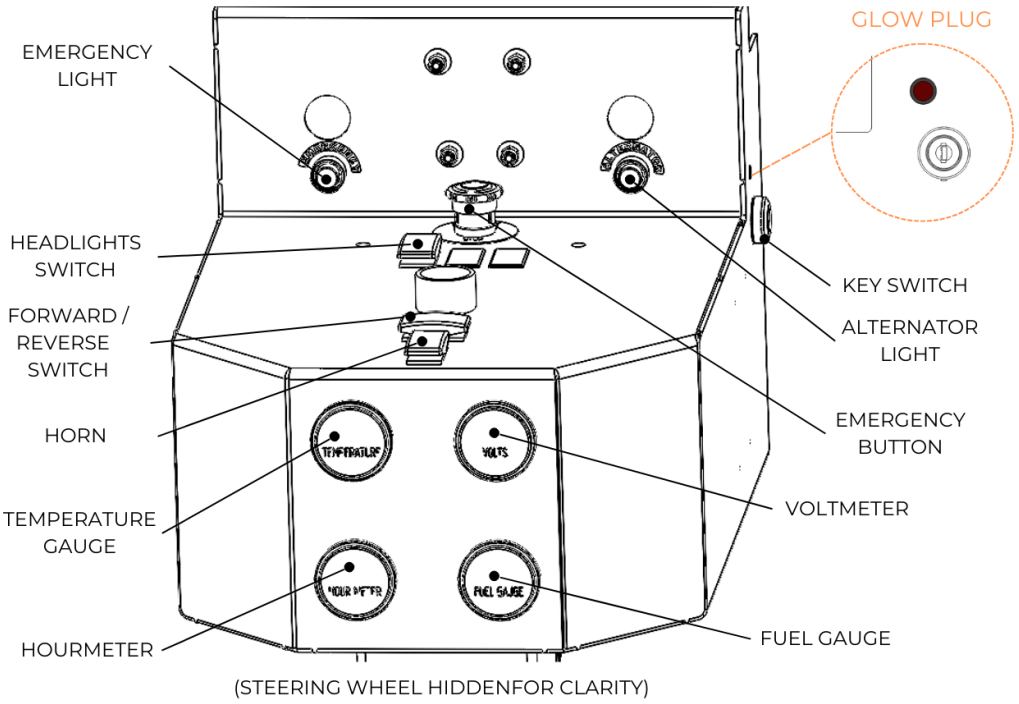


Figure 20. Console.

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 neutral 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 starting, 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.

3.9.2 CONSOLE : SEATED VERSION

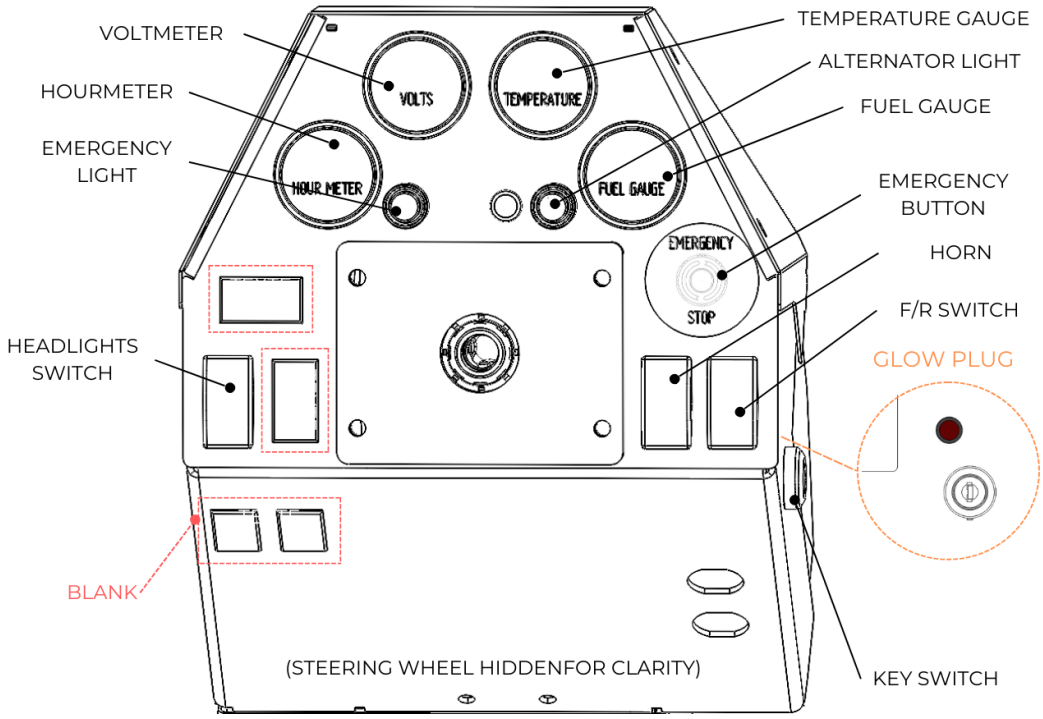


Figure 21. Console.

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 neutral 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 starting, 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-700 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-700 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 installed on the deck. 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 OR THE AC MOTOR CONTROLLER. 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 22), 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 23) 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.

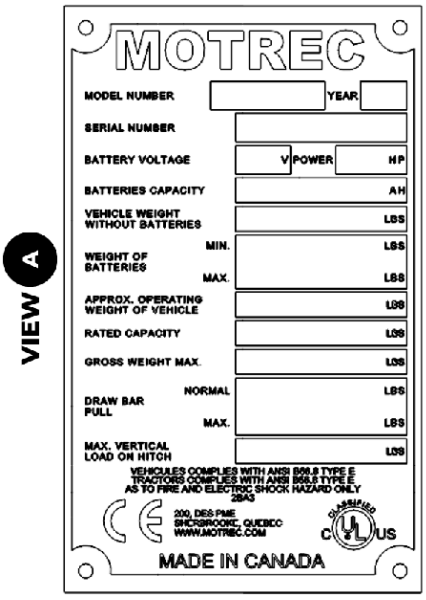


Figure 22. Serial Data Plate.

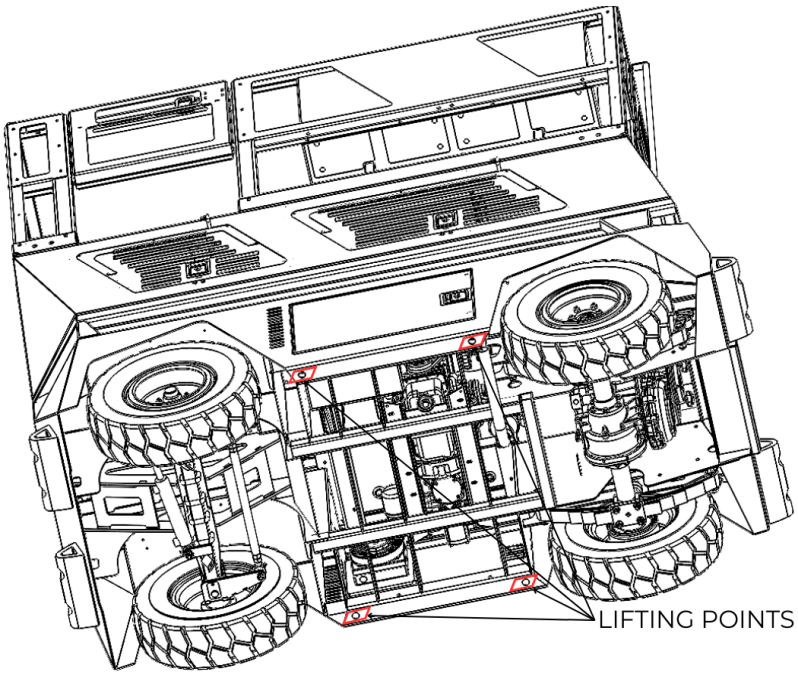


Figure 23. Lifting Points.

4.2.1 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.
2. Inspect the master cylinder (1) (**Applicable for the seated version only**).

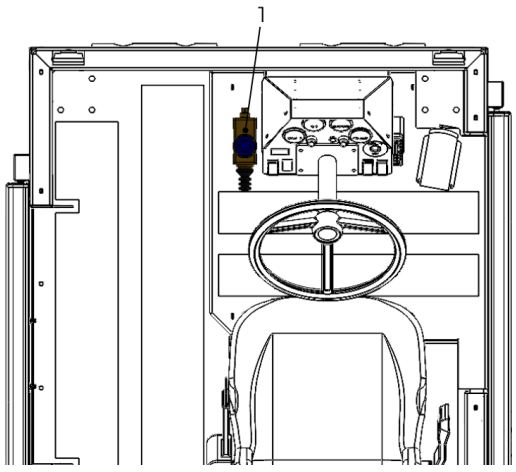


Figure 24. Front Fluid Leaks In The Master Cylinder.

Engine Maintenance (Diesel or Gas)

1. Check levels of engine and hydraulic oil.
2. Check the coolant level in the recovery tank.

   Note 1 : 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.

   Note 2 : If you need to add coolant when the engine is cold, do so through the radiator.
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.

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.

Operator's presence detection Pedals Inspection (Stand up version Only)

Examine both pedals to check their feel and travel.

Seat Switch Inspection (Seated version Only)

1. Check that the seat switch is operational by sitting on the driver's seat and validating that no fault is generated on the display while sitting.

WARNING

DO NOT EXCEED SPEED OF 1 MPH (2 KM/H) WHEN TESTING THE SEAT SWITCH. THE ACTIVATION OF THE SEAT SWITCH WILL STOP THE VEHICLE SUDDENLY. FAILURE TO COMPLY CAN CAUSE INJURY.

2. Validate that the vehicle stops 3 seconds later after removing all weight from driver's seat.

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.

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 of punctures, damage, or excessive wear.

Doors Safety switch inspection

1. Examine the safety switch for any visible damage, wear, or corrosion.
2. Check for loose or frayed wires and connections.
3. Verify that labels or markings indicating the switch's function are legible and in the correct position.

Hydrostatic Pump Inspection

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.

Before each starting up of the machine:

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

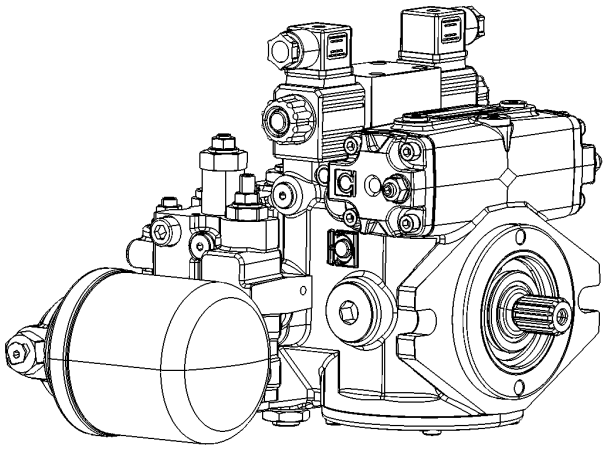


Figure 25. Hydrostatic Pump.

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.

4.2.2 WEEKLY MAINTENANCE

Special Tools	Consumables
▸ Oil drain pan ▸ Safety glasses and gloves	▸ 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 “Engine Oil and Oil Filter Replacement” and “Hydraulic Oil Filter Replacement” after the first 50 hours of operation. Subsequently, repeat these tasks at intervals of 1000 or 2000 hours.

Maintenance Procedures

Engine Oil and Oil Filter Replacement

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.

1. Replace engine oil filter that is located on the engine block under the alternator.
2. For engine oil replacement you may proceed as follows (both diesel and gas engine) :

   2. 1. Place an oil drain pan beneath the engine to catch the draining oil.

   2. 2. Loosen and remove the drain plug (1) at the bottom of the engine.

   2. 3. Allow the old engine oil to drain completely into the oil drain pan.

   2. 4. Once the oil has drained completely, replace, and tighten the drain plug.
3. For oil filter replacement you may proceed as follows (both diesel and gas engine) :

   3. 1. Place an oil drain pan under the oil filter to catch any residual oil when you remove it.

   3. 2. loosen old oil filter (2) and remove it.

   3. 3. Allow any remaining oil in the filter and filter housing to drain into the drain pan.

   3. 4. 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.

   3. 5. 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.
4. Add engine oil.
5. 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.
6. Check oil level.

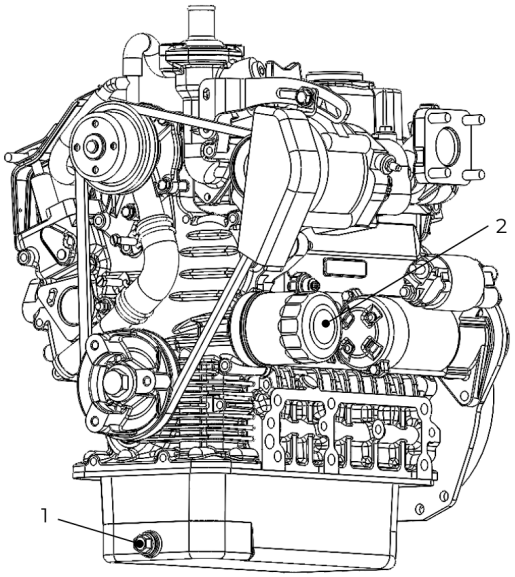


Figure 26. Gas Engine.

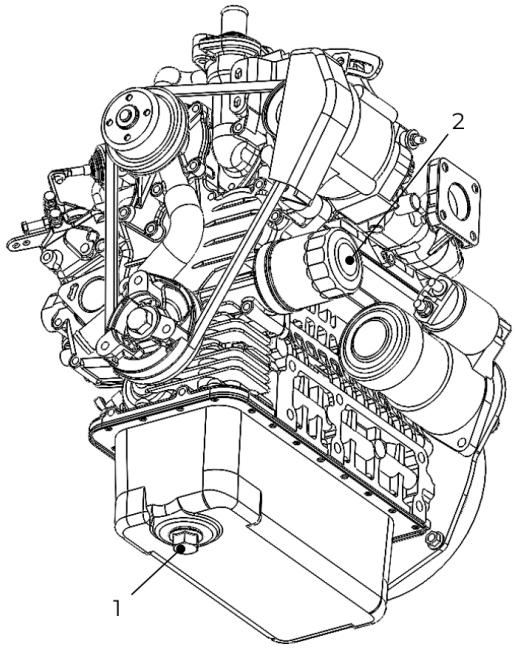


Figure 27. Diesel Engine.

Hydraulic Oil Filter 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.

Replace, if necessary, the hydraulic oil filter (1) to keep the fluid clean (every 50 hours is recommanded).

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

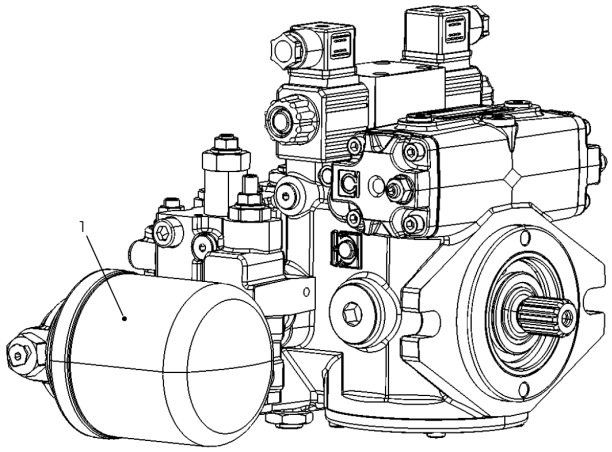


Figure 28. Hydrostatic Pump Oil Filter Replacment.

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.
2. Inspect the master cylinder (1) (**Applicable for the seated version only**).

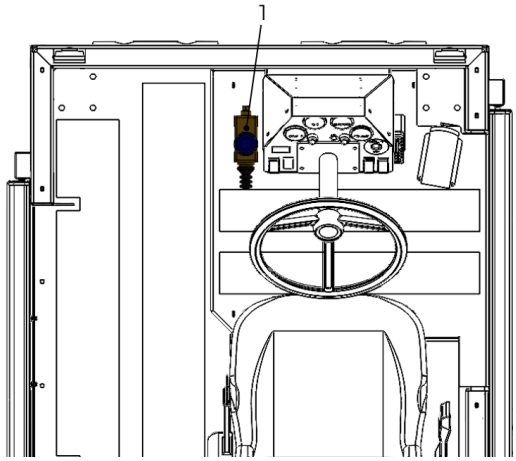


Figure 29. Front Fluid Leaks In The Master Cylinder.

Engine Maintenance (Diesel or Gas)

1. Check levels of engine and hydraulic oil.
2. Check the coolant level in the recovery tank.

   Note 1: 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.

   Note 2 : If you need to add coolant when the engine is cold, do so through the radiator.
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.

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.

Operator's presence detection Pedals Inspection (Stand up version Only)

Examine both pedals to check their feel and travel.

Seat Switch Inspection (Seated version Only)

1. Check that the seat switch is operational by sitting on the driver's seat and validating that no fault is generated on the display while sitting.

⚠ WARNING

DO NOT EXCEED SPEED OF 1 MPH (2 KM/H) WHEN TESTING THE SEAT SWITCH. THE ACTIVATION OF THE SEAT SWITCH WILL STOP THE VEHICLE SUDDENLY. FAILURE TO COMPLY CAN CAUSE INJURY.

2. Validate that the vehicle stops 3 seconds later after removing all weight from driver's seat.

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.

Tire Pressure Inspection

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

Doors Safety switch inspection

1. Examine the safety switch for any visible damage, wear, or corrosion.
2. Check for loose or frayed wires and connections.
3. Verify that labels or markings indicating the switch's function are legible and in the correct position.

4.2.3 EVERY 250 HOURS OR 3 MONTHS MAINTENANCE

Special Tools	Consumables
▸ Lifting device ▸ Oil drain pan ▸ Safety glasses and gloves	▸ 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.

IMPORTANTE NOTE : **All** maintenance **procedures** in the "**weekly maintenance**" section need to be **repeated**, except for the "Engine Oil and Oil Filter Replacement" subsection.

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.

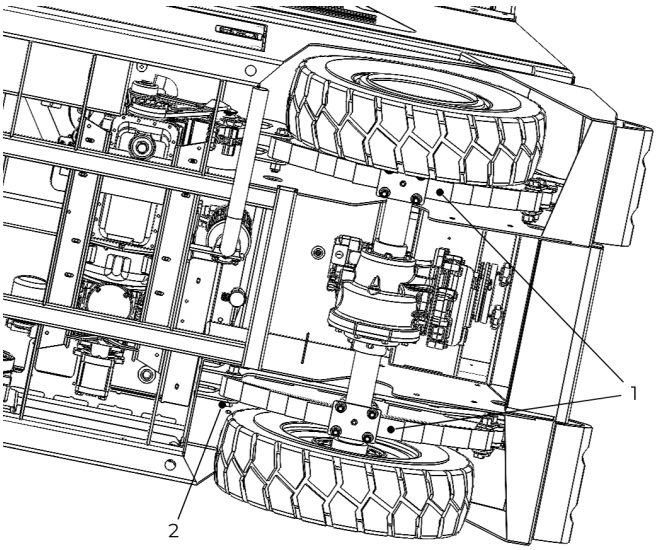


Figure 30. Rear Suspension Inspection.

Rubber Bump Stop Inspection

Inspect rubber bellows installed on the vehicle components for signs of damage, cracks or dryness.

Steering Inspection

1. Inspect the universal joint (1) and the four tie rods ends (2) for (See Figures 31, 32 and 33):
   - Play.
   - Damage.
   - Binding.
   - Corrosion.

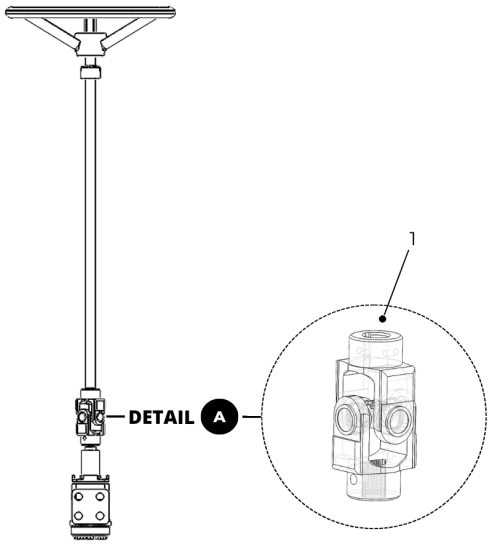


Figure 31. Universal Joint Inspection (Stand-Up Version).

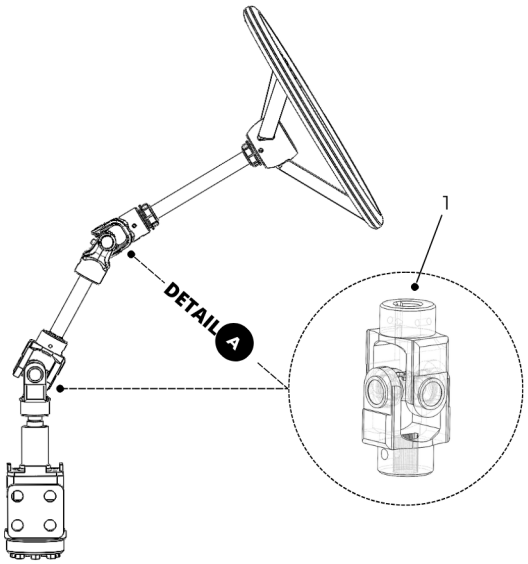


Figure 32. Universal Joint Inspection (Seated Version).

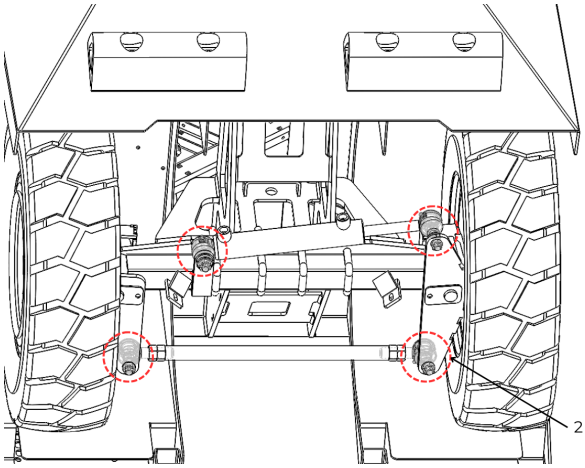


Figure 33. Tie rods Inspection (For Both Versions).

2. Inspect the following elements for damage , corrosion or loose :

   - Steering cylinder (3). (See Figure 34)
   - Steering shafts (4). (See Figure 14)
   - Axle beam (5). (See Figure 34)
   - Right and left knuckles (6). (See Figure 34)
   - Tie rod (7). (See Figure 34)

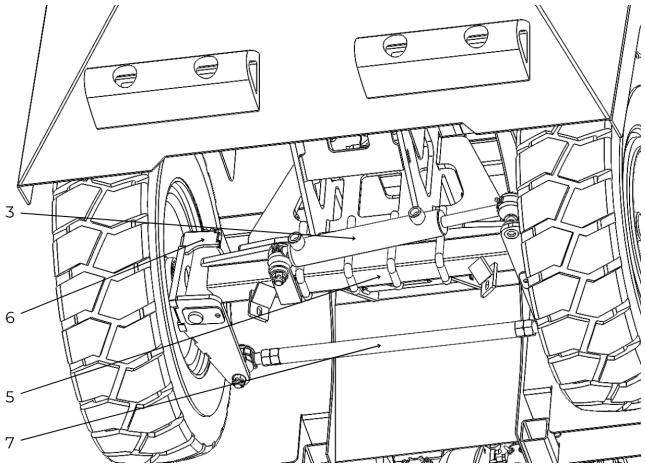


Figure 34. General Steering Inspection.

Grease Fittings Lubrication

Lubricate the grease fittings of the following components (See Figures 31, 32 and 33) :

- 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.

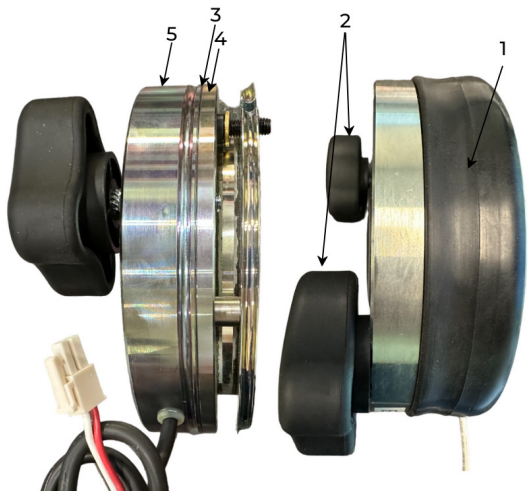


Figure 35. EMB Inspection.

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.
   - – Replace the EMB assembly if a Warner 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 (Diesel or Gas)

1. Check levels of engine and hydraulic oil.
2. Check the coolant level in the recovery tank.

   Note 1 : 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.

   Note 2 : If you need to add coolant when the engine is cold, do so through the radiator.
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.
6. Check alternator belt tension and adjust it if necessary.

   6. 1. loosen the adjustment bolt (1). Turn it counterclockwise to allow the alternator to move more freely.

   6. 2. Insert a pry bar behind the alternator, applying pressure to push it away from the engine.

   6. 3. Apply pressure with the pry bar to create tension on the V-belt. This will increase the tension as the alternator moves away from the engine (Deflection 1/64'' per inch per span).

   6. 4. While maintaining pressure with the pry bar, tighten the adjustment bolt (1). Turning it clockwise will secure the alternator in the new position and maintain the desired tension on the belt.

   6. 5. After tightening the adjustment bolt (1), check the tension of the belt. Ensure that it is tight enough to prevent slipping but not overly tight, causing strain on the components.

   6. 6. Rotate the alternator pulley by hand to ensure the belt is properly seated and aligned. Check for any signs of misalignment or unusual noises.

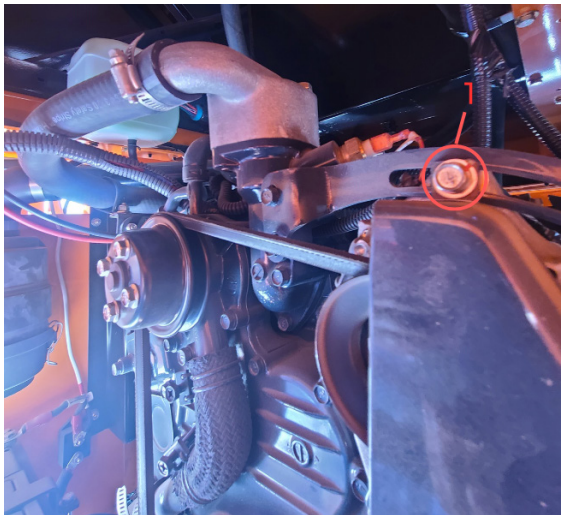


Figure 36. Belt Tension Adjustment.

7. Replace fuel filter element.

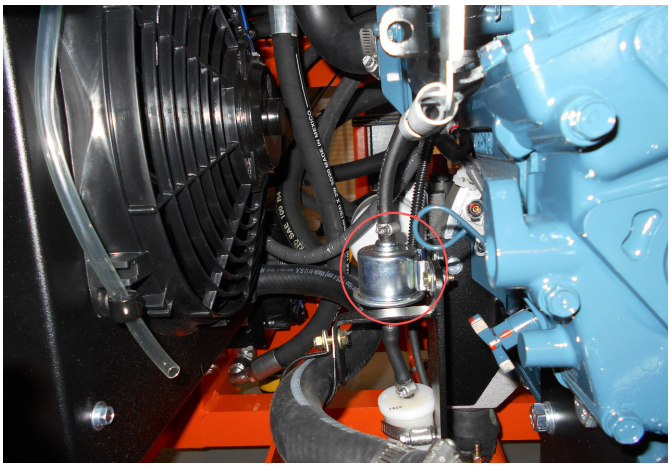


Figure 37. Location of the Fuel Filter In a Gas Engine.

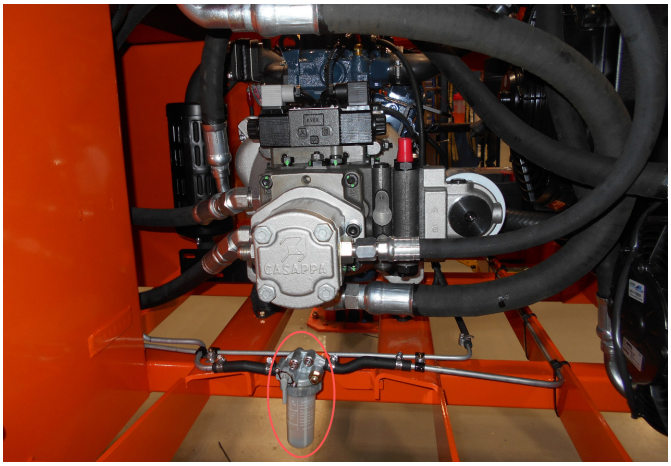


Figure 38. Location of the Fuel Filter In a Diesel Engine.

8. Check all engine gaskets and seals for leaks.

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 backward 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 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. Please consult the maintenance checklist in the QUICK REFERENCES section for the specific steps that are required.

IMPORTANTE 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

1. Inspect the following components for signs of rust, corrosion, or damage :

   - Door locks (1).

   - Hinges (2).

2. Lubricate the following components with lubricant spray to reduce friction and prevents squeaking :

   - Door locks (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.

3. Inspect the hinge screws on both the door and the frame. If you find any loose screws, tighten them.

4. 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.

5. Examine the switch (31) for any physical damage or signs of wear. Turn on the power and test the switch to ensure it operates correctly.

   NOTE : To verify proper operation, the vehicle should move forward or backward based on the chosen direction when the operator presses the presence detection pedals (for Stand-Up version) or the seat switch (for Seated version) with all doors closed. It should come to a stop 3 to 5 seconds later if any door is opened.

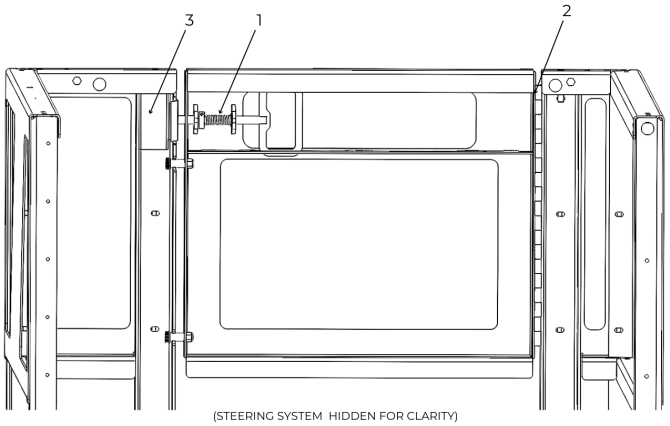


Figure 39. Door Maintenance.

Frame Inspection

1. 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 40).
   - Suspension mounting tabs (2) (see Figure 41).
   - Weld zones (see Figure 42: not all welds are shown).
   - Front and rear bumpers. (see Figure 43).

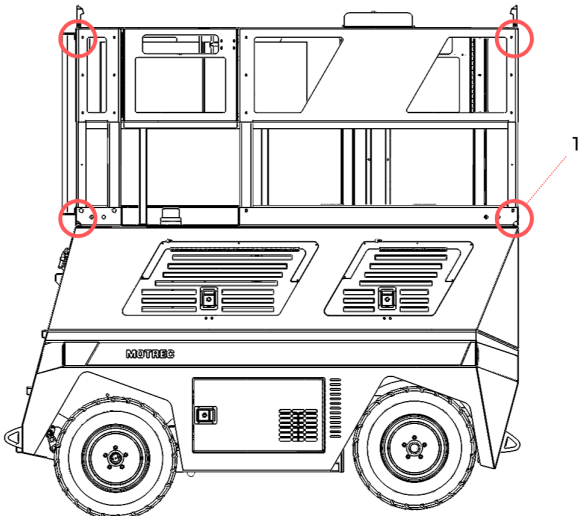


Figure 40. Guardrails.

NOTE : The same guardrails are present in the seated version as well.

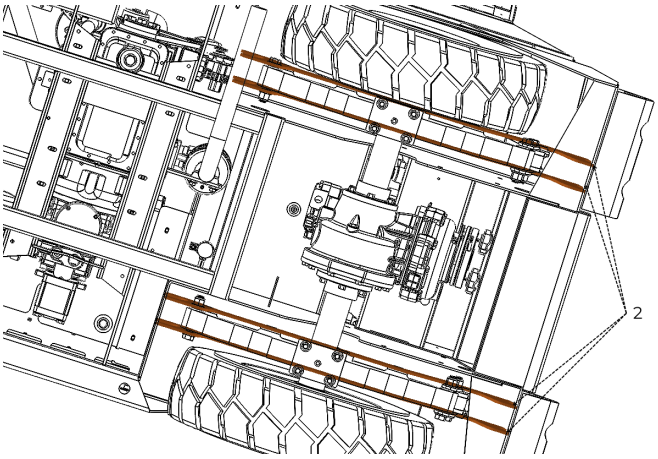


Figure 41. Suspension Mounting Tabs.

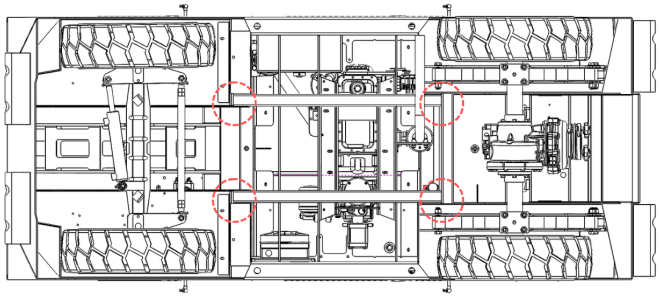


Figure 42. Weld Zones.

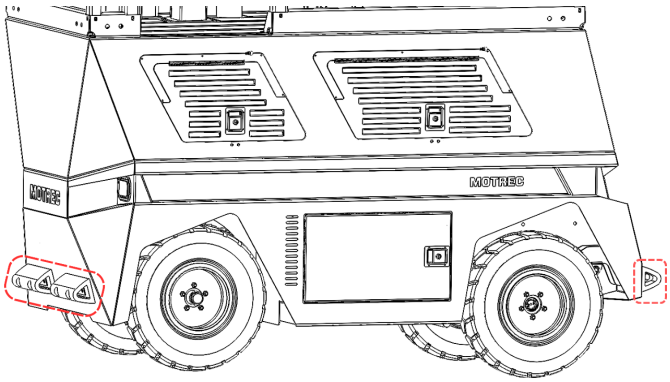


Figure 43. Front And Rear Bumpers.

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).

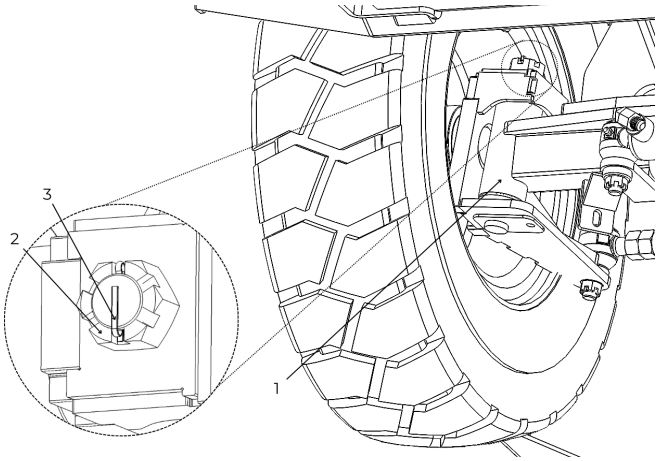


Figure 44. Kingpins Inspection.

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 (Diesel or Gas)

1. Check alternator belt for cracks.
2. Check sparkplugs (Gas engine only).
3. Check glow plug (Diesel engine only).

Hydrostatic Pump Inspection

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.

Replace, if necessary, the hydraulic oil filter (1) to keep the fluid clean (every 500 hours is recommanded).

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

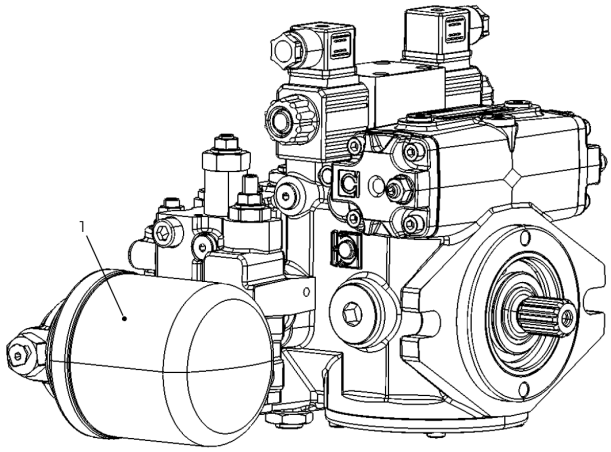


Figure 45. Hydrostatic Pump Oil Filter Replacment.

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 backward 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 speedometer, 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.

4.2.5 EVERY 1000 HOURS OR 12 MONTHS MAINTENANCE

Special Tools	Consumables
▸ Lifting device ▸ Oil recipient / Drip pan	▸ 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. Please consult the maintenance checklist in the QUICK REFERENCES section for the specific steps that are required.

IMPORTANTE NOTE : **All** maintenance **procedures** in the "**6 Months maintenance**" section need to be **repeated**.

Maintenance Procedures

Engine Maintenance (Diesel or Gas)

1. Replace cooling system anti-freeze.
2. Replace air filter.
3. Check all coolant hoses for cracks or leaks.
4. Check engine mounts.

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 46)
3. Remove the cast-iron case filler plug (3). (Figure 47)

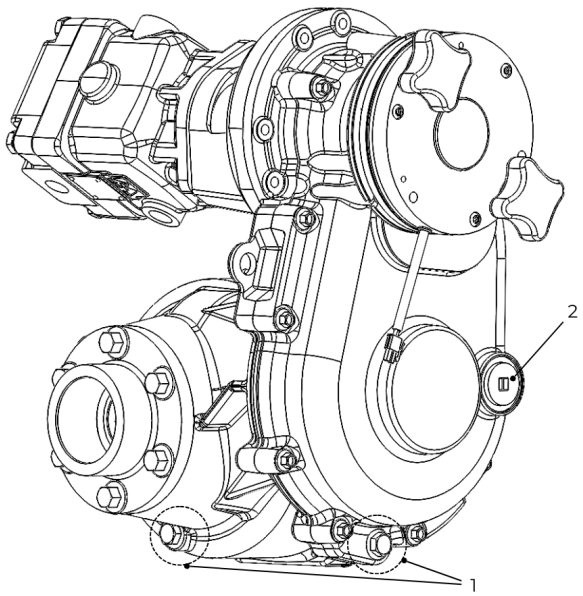


Figure 46. Aluminum Case Drain and Filler Plugs.

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.
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.
9. Reinstall the cast-iron case filler plug (3).

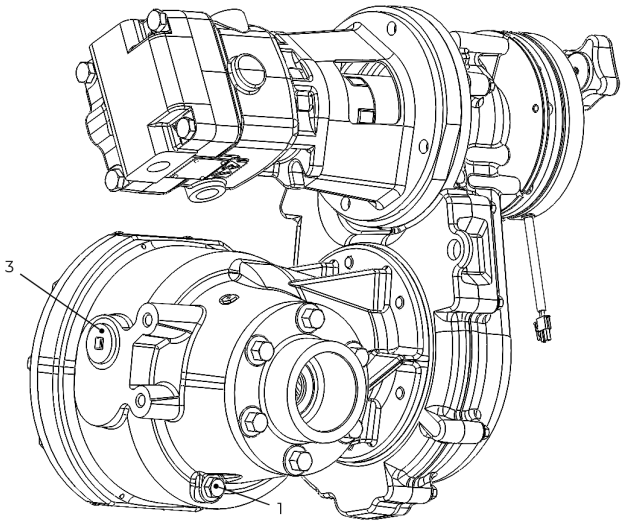


Figure 47. Cast-iron Case Drain and Filler Plugs.

Differentiel Spline Drive Maintenance

1. Disconnect all hoses from the axial piston hydraulic motor (1).
2. 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.

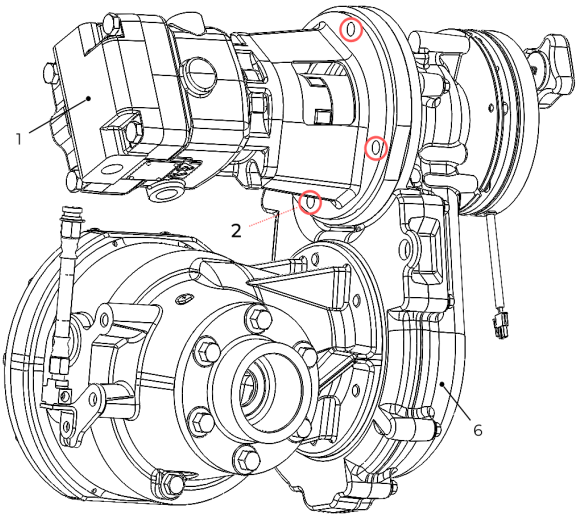


Figure 48. Removing screws.

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

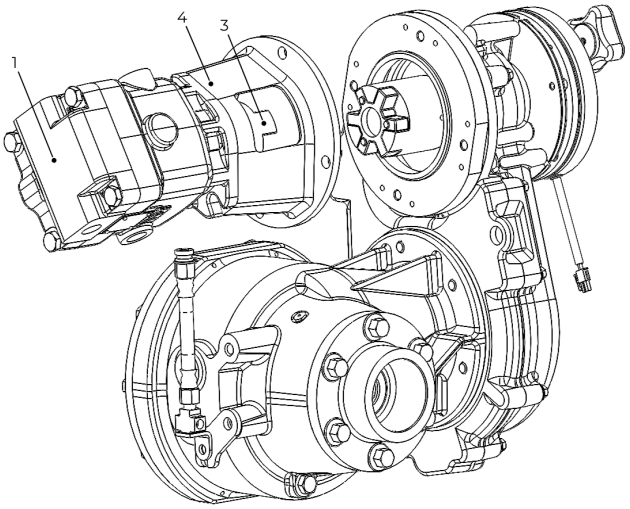


Figure 49. Disconnecting Motor, coupling 7/8 and motor-differential adapter.

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

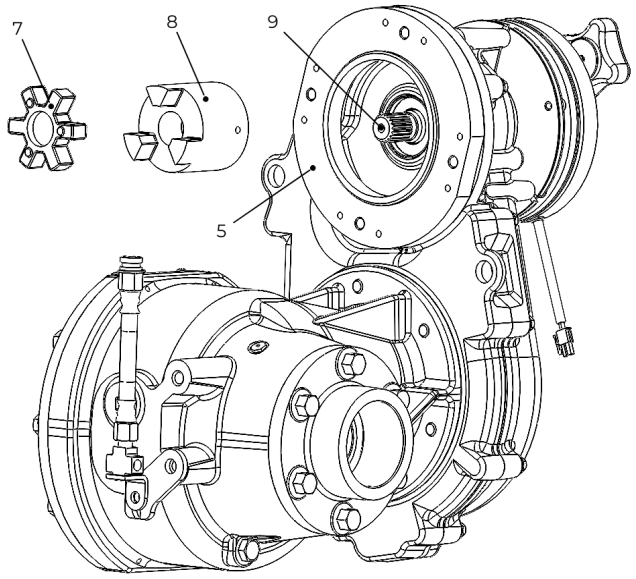


Figure 50. Spline Drive Lubrication.

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

Axial Hub Maintenance

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

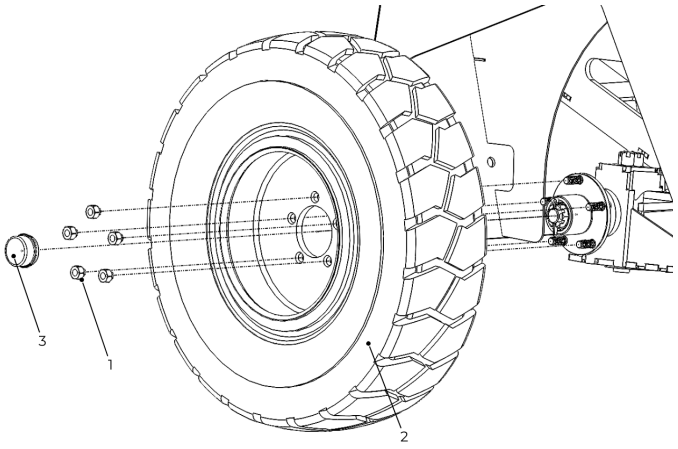


Figure 51. Wheel Removal.

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

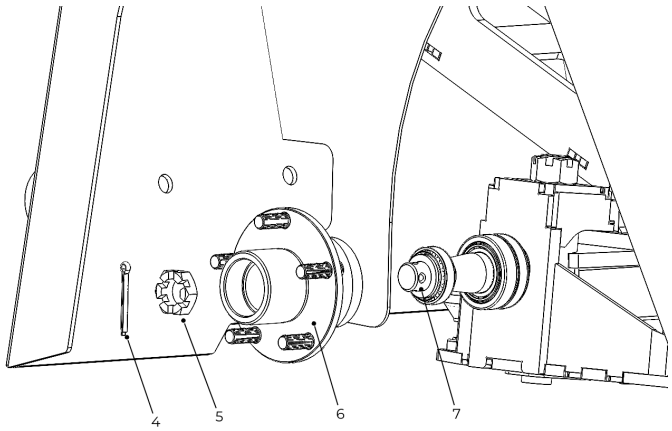


Figure 52. Hub Maintenance.

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.

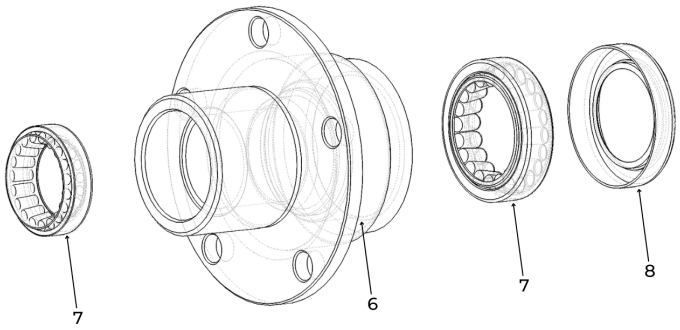


Figure 53. Wheel Hub Inspection.

Pumps 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.

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 backward 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 speedometer, 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.

4.2.6 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.

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

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

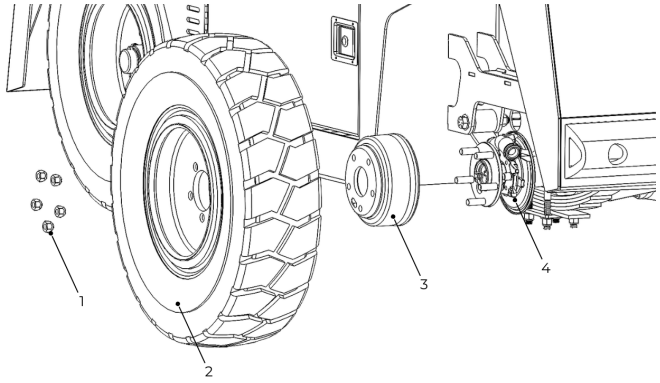


Figure 54. Wheel and Drum Brake Removal.

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

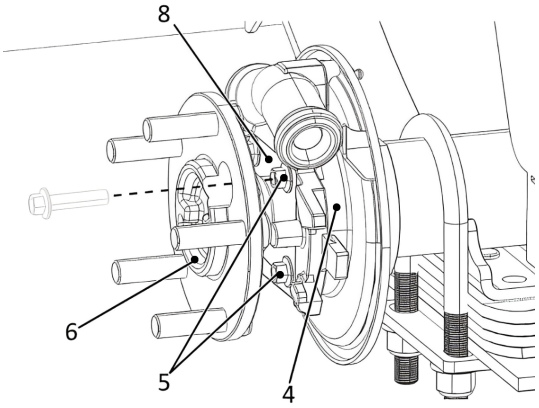


Figure 55. Axle Screws (1 of 2).

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

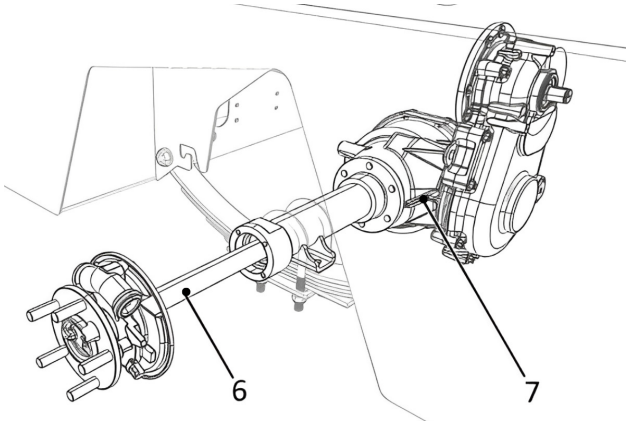


Figure 56. Rear Axle Removal (2 of 2).

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.

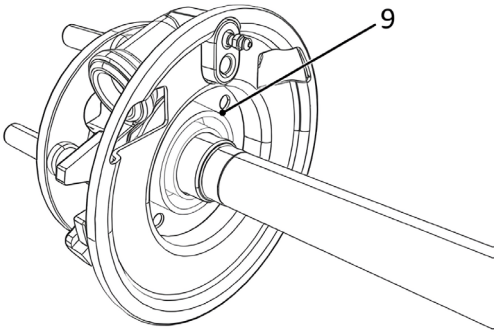


Figure 57. Wheel Bearing.

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 **4.3.5 DIFFERENTIAL** subsection *Oil Change*.

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.

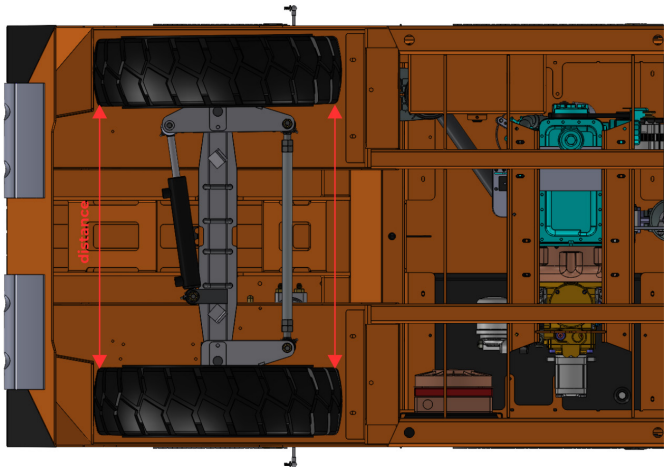


Figure 58. Distance between the front tires.

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-700 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

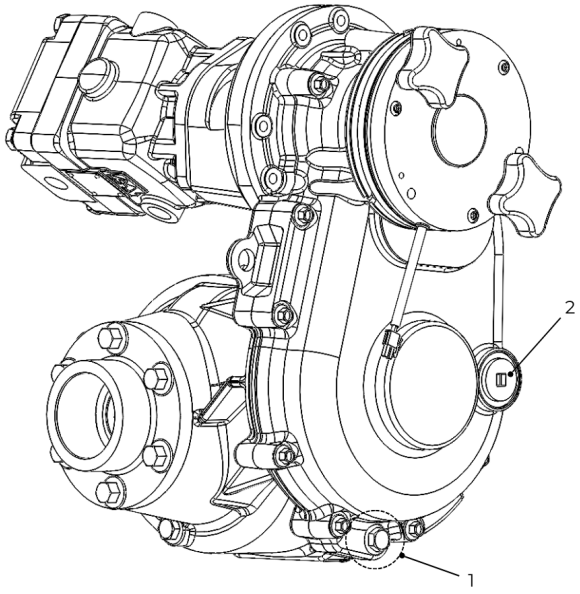


Figure 59. Schafer Aluminum Case.

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

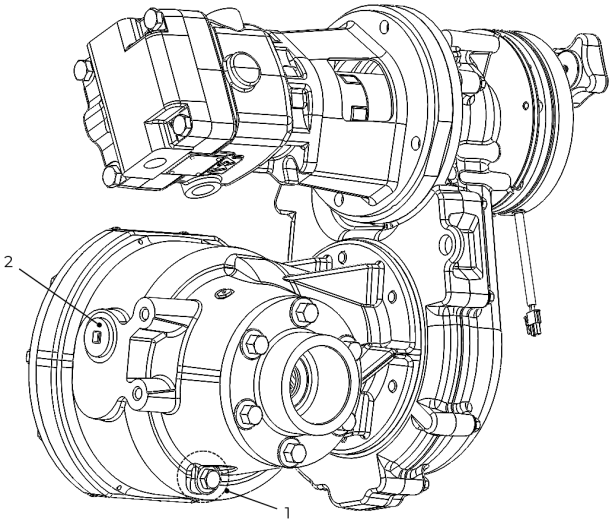


Figure 60. Schafer Cast-Iron Case.

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 : STAND UP VERSION

The hydraulic steering system within your vehicle functions as an integrated ensemble as illustrated in figure 61.

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.

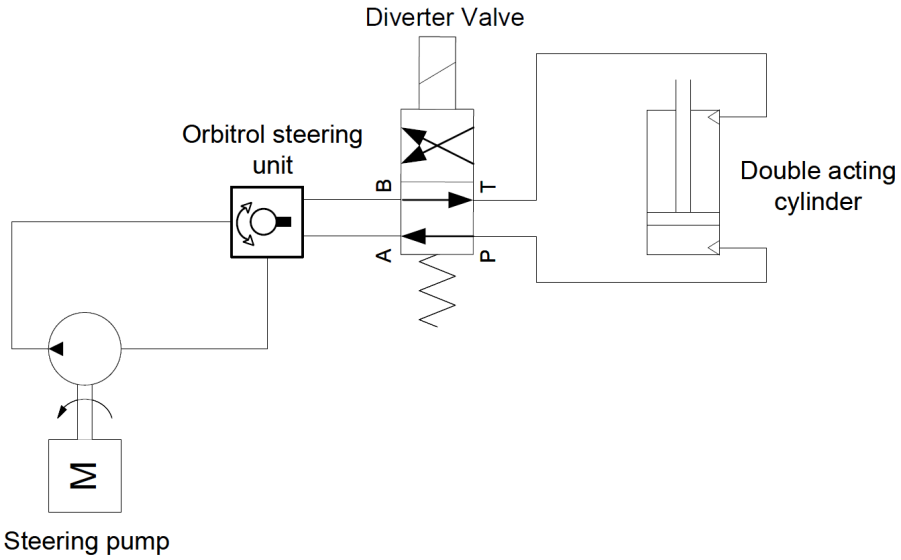


Figure 61. Hydraulic Steering System.

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.
3. Examine the power steering pump for any signs of damage and ensure that all connections and hoses are secure. Additionally, check the fluid level in the reservoir and inspect for any leaks.

4.3.5 HYDRAULIC STEERING SYSTEM : SEATED VERSION

The hydraulic steering system within your vehicle functions as an integrated ensemble as illustrated in figure 62.

The power steering pump serves as the primary source of hydraulic pressure, generating force for the system. The orbitrol steering unit, acting as a central control hub, directs the distribution of hydraulic fluid based on steering inputs. Unlike the stand-up version no diverter valve is needed. The double-acting cylinder then transforms hydraulic energy into rotational movement, facilitating wheel articulation.

This integrated system ensures a smooth and responsive steering experience, with the power steering pump activated in tandem with steering actions, pressure modulation regulated by the orbitrol unit, and fluid flow directed without the use of a diverter valve.

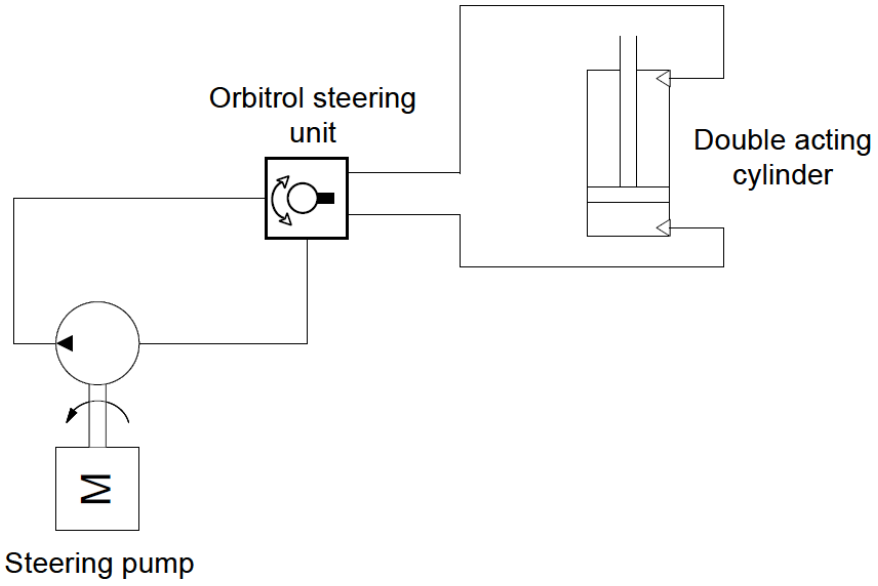


Figure 62. Hydraulic Steering System.

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 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.
3. Examine the power steering pump for any signs of damage and ensure that all connections and hoses are secure. Additionally, check the fluid level in the reservoir and inspect for any leaks.

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. RINCE 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

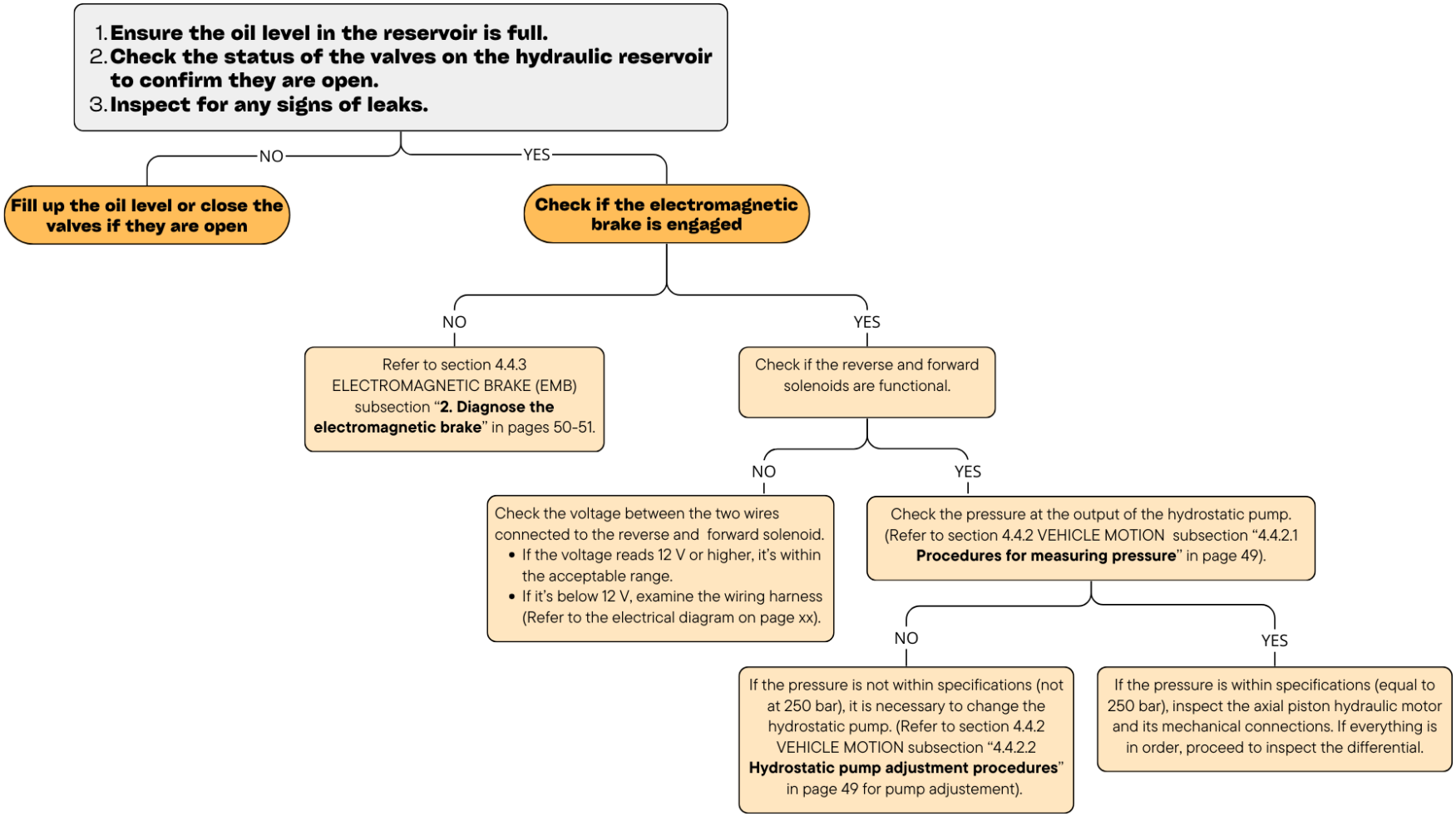
1. Turn the key to the ON position.
2. Depress the accessory switch, measure voltage across accessory terminals.

- 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.

4.4.2 VEHICLE MOTION

Vehicle Does Not Move



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).

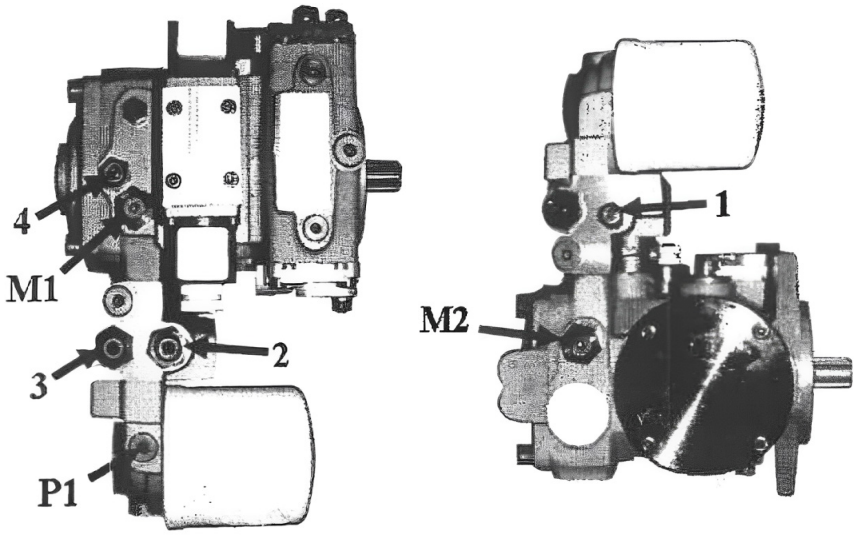


Figure 63. Hydrostatic Pump Adjustement.

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.

2. 1. Measure voltage across DC/DC converter **input** terminals.

2. 1. 1. Check for the presence of voltage between the positive terminal (**B+**) (Red Wire - 14 AWG) and the negative terminal (**B-**) (Black Wire - 18 AWG) of the DC/DC converter (As shown in Figure 64).

- If no voltage is present, it is necessary to inspect both the fuse and the wiring.

2. 2. Measure voltage across DC/DC converter **output** terminals.

2. 2. 1. Check for the presence of voltage between the Yellow wire (18 AWG) and the Black/White wire (18 AWG)of the DC/DC converter (As shown in Figure 64).

- If not between 23V and 25V, it indicates a defective converter that requires replacement.

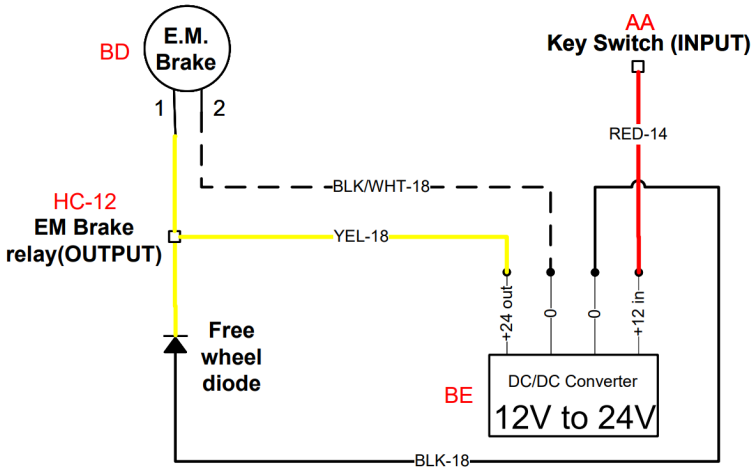


Figure 64. DC/DC Converter Input and Output Terminals Inspection.

4.4.2. 4 Throttle Lever Inspection (Stand up version only)

To verify the proper functioning of the throttle lever, inspect the mechanical cable connected to it.

4.4.2. 5 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. 6 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. 7 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.

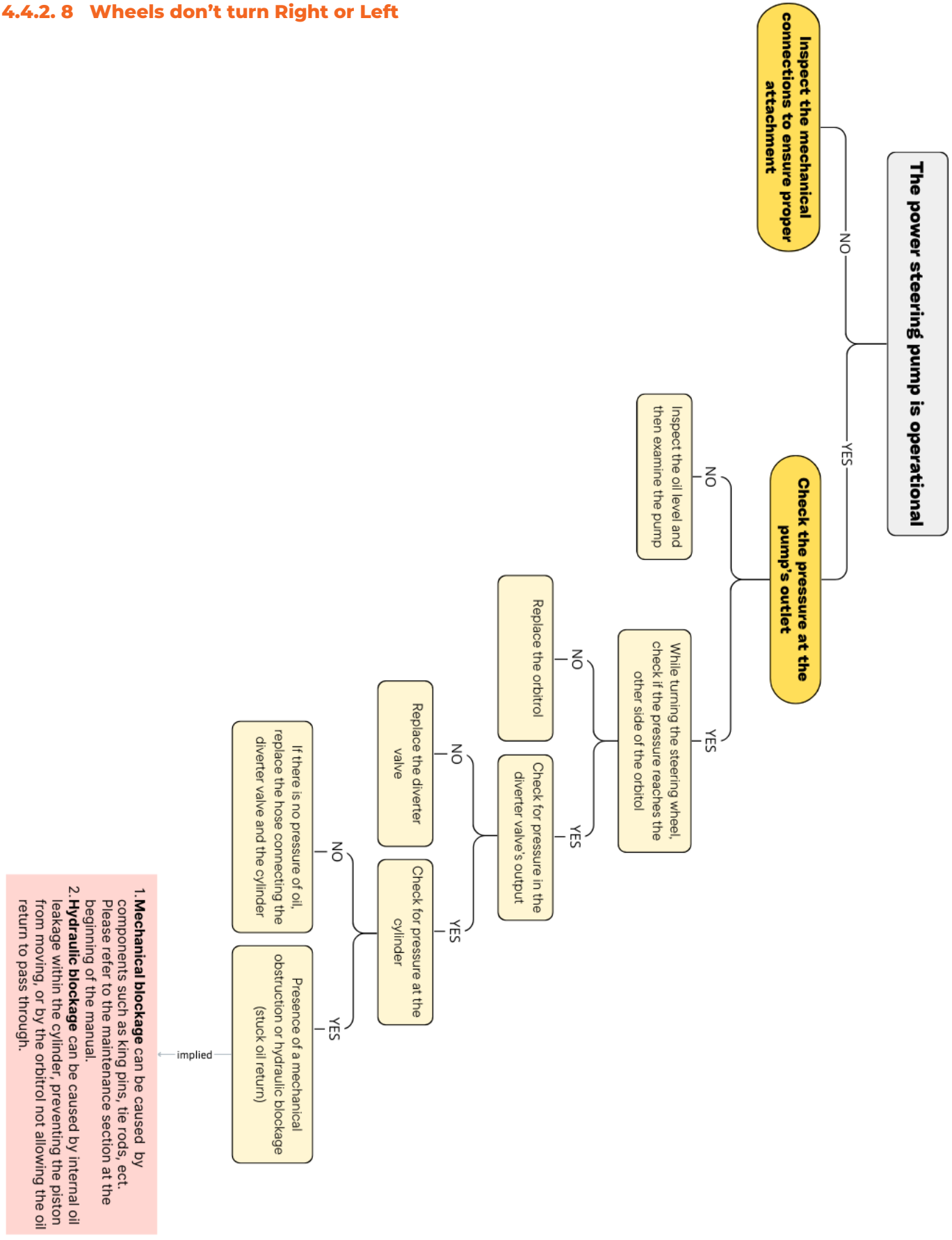
f. Seized gas pump (gas engine only).

g. Defected fuel solenoid.

h. Poor gas or fuel quality.

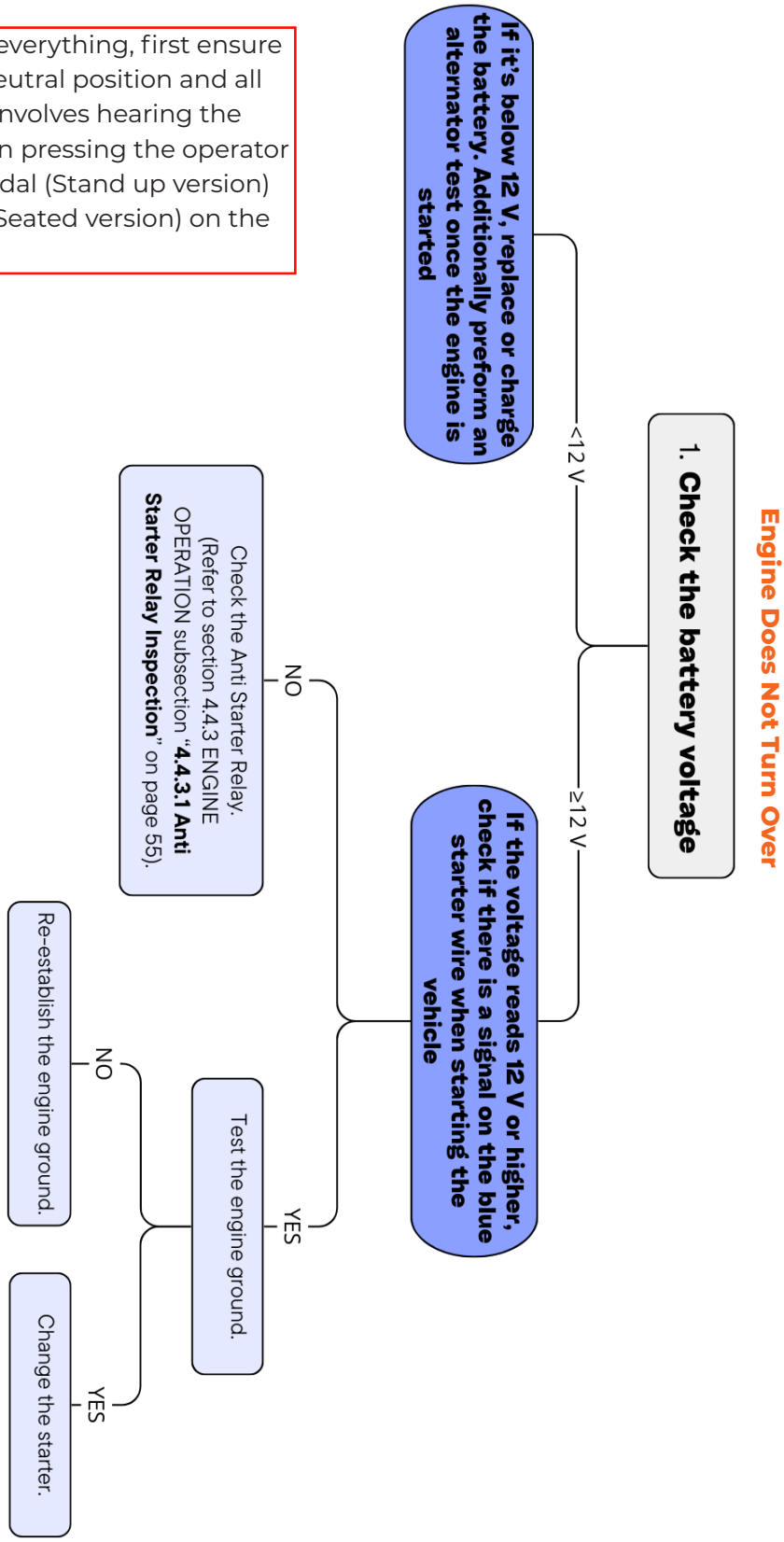
i. Engine damaged.

4.4.2. 8 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 pressing the operator presence detection pedal (Stand up version) and applying weight (Seated version) 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.

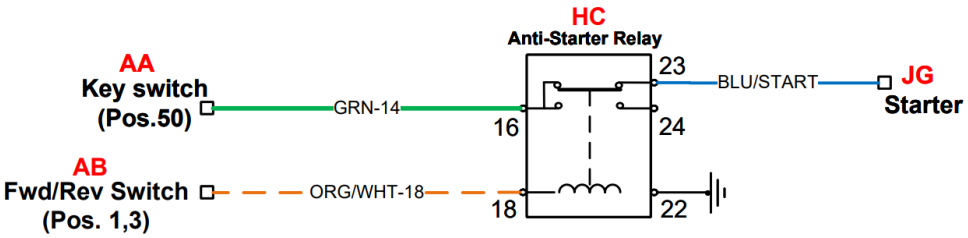
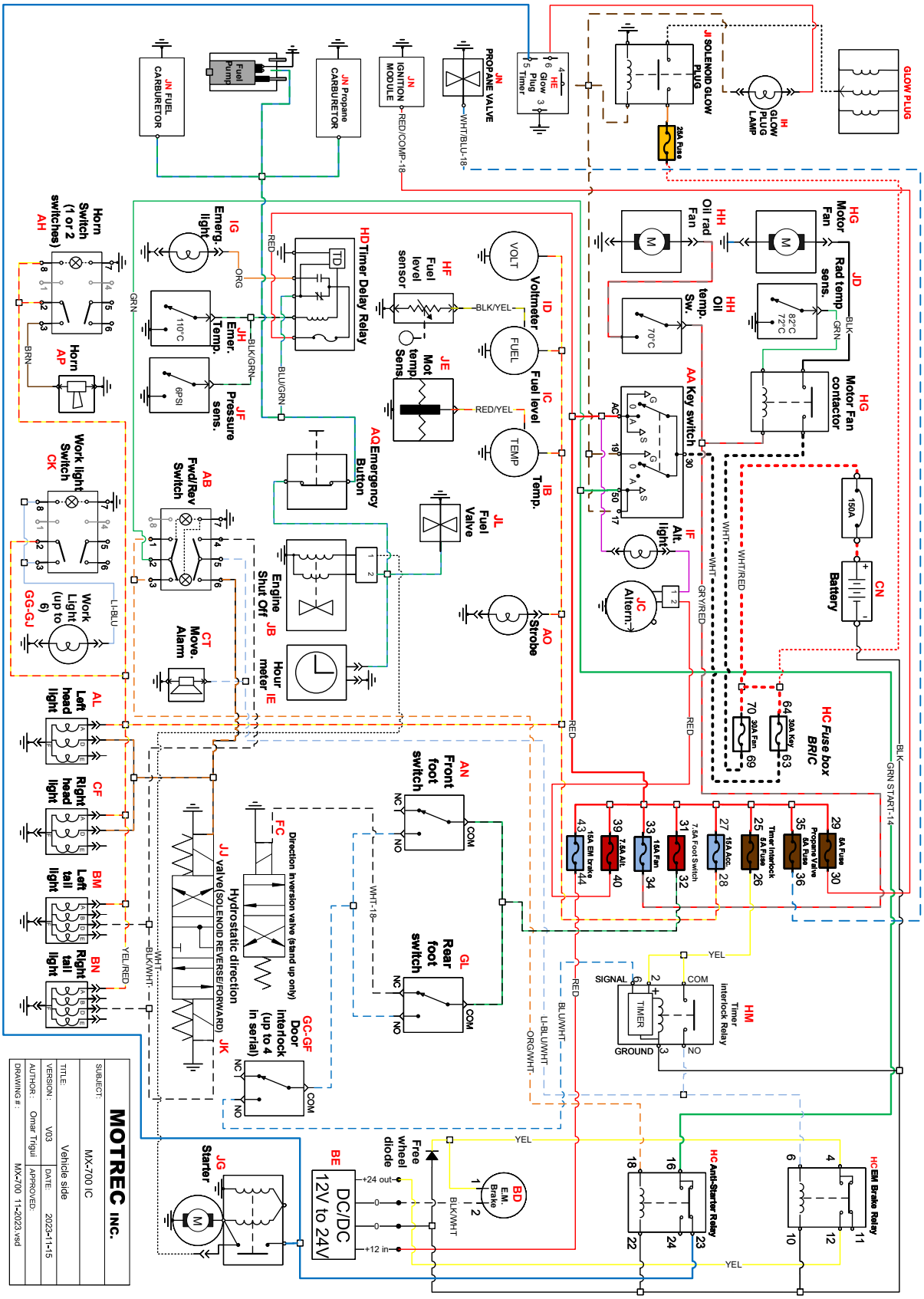


Figure 65. Anti Starter Relay connexions.

Electrical Diagram



Standard Torque

BOLT CLAMP LOADS

Suggested Assembly Torque Values

	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	2,850	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

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