



A Member of the **ALAMO GROUP**

PRIME MOVER

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Part No. 32118001

OPERATOR'S MANUAL



This Operator's Manual is an integral part of the safe operation of this machine and must be maintained with the unit at all times. **READ, UNDERSTAND, and FOLLOW** the Safety and Operation Instructions contained in this manual before operating the equipment.

Important Operating and Safety Instructions are found in the Boom Mower Safety Video that can be instantly accessed on the internet at: www.algqr.com/abv C01-Cover_AB

Safety Video



www.algqr.com/abv



Mantis

1502 East Walnut
Seguin, Texas 78155

Mantis
Web Page



www.algqr.com/mwe

¡ATENCIÓN!
LEA EL INSTRUCTIVO



Si No Lee Ingles, Pida
Ayuda a Alguien
Que Se Lo Lea Para Que le
Traduzca Las
Medidas de Seguridad

! PELIGRO	! DANGER
Si no puede leer inglés: antes de poner en funcionamiento este equipo, solicite que alguien le traduzca los mensajes de seguridad o vaya al sitio web para consultar los mensajes de seguridad y las etiquetas ya traducidos.	Si vous ne pouvez pas lire l'anglais : avant d'utiliser l'équipement, demandez à une personne de vous traduire les messages de sécurité ou allez sur le site Internet pour voir la traduction des autocollants et des messages de sécurité.
El Manual del Operador Seguridad vídeo    www.algqr.com/abs www.algqr.com/avs	Manuel de l'Opérateur   www.algqr.com/abf

! PERIGO	! GEFAHR
Caso você não leia inglês: antes de operar o equipamento, peça para alguém traduzir as mensagens de segurança ou visite a web e obtenha tais mensagens ou os decalques traduzidos.	Falls Sie nicht Englisch sprechen: Bevor Sie die Geräte in Betrieb nehmen, bitten Sie eine Englisch sprechende Person darum, Ihnen die Sicherheitsmeldung zu übersetzen, oder besuchen Sie die Website; dort finden Sie übersetzte Aufkleber und Sicherheitsmeldungen. D835_3
Manual do Operador   www.algqr.com/abp	Benutzerhandbuch   www.algqr.com/abg

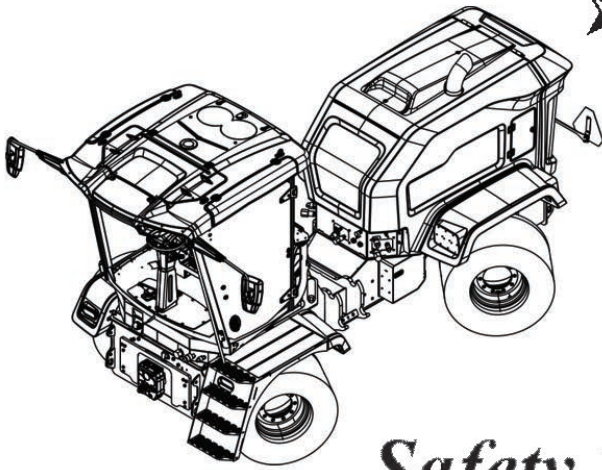
Safety Video	Operator's & Parts Manuals	General Safety Boom
		
www.algqr.com/abv	www.algqr.com/mom	www.algqr.com/abe

➤ **BE SAFE!**

➤ **BE ALERT!**

➤ **BE ALIVE!**

➤ **BE TRAINED**
before operating
the Mower!



Safety Training Makes the Difference

In order to reduce accidents and enhance the safe operation of mowers, Alamo Group Inc., in cooperation with other industry manufacturers has developed the AEM/FEMA Industrial and Agricultural Mower Safety Practices video and guide book.

The video will familiarize and instruct mower-tractor operators in safe practices when using industrial and agricultural mowing equipment. It is important that Every Mower Operator be educated in the operation of their mowing equipment and be able to recognize the potential hazards that can occur while operating a mower. This video, along with the mower operator's manual and the warning messages on the mower, will significantly assist in this important education.

Your Authorized Mantis Dealer may have shown this video and presented you a DVD Video when you purchased your mower. If you or any mower operator have not seen this video, watch the Video, Read this Operator's Manual, and Complete the Video Guidebook before operating your new mower. If you do not understand any of the instructions included in the video or operator's manual or if you have any questions concerning safety of operation, contact your supervisor, dealer or Mantis.

If you would like a VHS video tape of the video, please email AEMVideo@alamo-group.com or Fax AEM VHS Video at (830) 372-9529 or mail in a completed copy of the form on the back of this page to AEM VHS Video 1502 E Walnut Street, Seguin, TX 78155. and request the VHS video version. Please include your name, mailing address, mower model and serial number.

Every operator should be trained for each piece of equipment (Tractor and Mower), understand the intended use and the potential hazards before operating the equipment.

The information and material listed above along with this Operator's Manual can assist you in meeting the OSHA requirement for Operator annual training.

OSHA TRAINING REQUIREMENTS

The following training requirements have been taken from Title 29, Code of Federal Regulations Part 1928.57 (a)(6). www.osha.gov

Operator Instructions. At the time of initial assignment and at least annually thereafter, the employer shall instruct every employee who operates an agricultural tractor or implement in the safe operating practices and servicing of equipment with which they are or will be involved, and of any other practices dictated by the work environment.

Alamo Group Ag. Division will provide one (1) AEM Mower Safety Practices Video

Please Send Me:

- ☐ VHS Format – AEM/FEMA Mower Operator Safety Video
- ☐ DVD Format – AEM/FEMA Mower Operator Safety Video
- ☐ Mower Operator's Manual
- ☐ AEM Mower Operator's Safety Manual

Requester Name: _____ Phone: _____

Requester Address: _____

City: _____

State: _____

Zip Code: _____

Mower Model: _____ Serial Number: _____

Date Purchased: _____ Dealer Salesperson: _____

Dealership Name: _____ Dealership Location: _____

Mail to:

AEM Video Services
1502 E. Walnut Street
Seguin, TX 78155

Or Fax to:

(830) 372-9529

Or email to:

AEMVideo@alamo-group.com

To the Owner/Operator/Dealer

This Operator's Manual is an integral part of the safe operation of this machine and must be maintained with the implement at all times. A manual canister is provided on the implement where this manual can be properly stored. If you lose or damage this manual a free replacement manual can be obtained from an authorized Mantis dealer or by downloading the manual from the Alamo Industrial website www.alamo-industrial.com

BEFORE YOU START! READ, UNDERSTAND, and FOLLOW the information provided in this manual, the AEM Mower Safety manual and the power unit operator's manual carefully to learn how to operate and service your machine properly. Failure to do so could result in personal injury to you and bystanders. All implements with moving parts are potentially hazardous. Every effort has been made to ensure that the machine is safe but operators must avoid engaging in unsafe practices and follow the written instructions provided. The manufacturer has designed this implement to be used with all its safety equipment properly attached to minimize the chance of accidents.

SAFETY FIRST. Completely read and understand the safety section of this manual before operating this equipment. Do not allow anyone to operate this equipment who has not fully read and understood this manual. Contact your Dealer to explain any instructions that you do not fully understand.

The care you give your Mantis Implement will greatly determine your satisfaction with its performance and its service life. Carefully read and follow the instructions in this manual to provide you with a thorough understanding of your new implement and its intended use and service requirements.

Replacement Parts information is located in a separate Parts Manual. Mantis mowers use balanced and matched system components for blade carriers, blades, cuttershafts, knives, knife hangers, rollers, drivetrain components, and bearings. These parts are made and tested to Mantis specifications. Non-genuine "will fit" parts do not consistently meet these specifications. The use of "will fit" parts may reduce mower performance, void warranties, and present a safety hazard. Use genuine Mantis mower parts for economy and safety.

For future reference, record your Mantis product model number and serial number.

Dealer		Telephone		Model Number	
Owner		Purchase Date		Serial Number	



DEALER to CUSTOMER Pre-Delivery / Operation Instructions

Dealer should inform the Purchaser of this product of Warranty terms, provisions, and procedures that are applicable. Dealer should also inform the Purchaser to review the contents of the Operator's Manual including safety equipment, safe operation and maintenance, to review the Safety Signs on the implement (and tractor if possible) and of Purchaser's responsibility to train his/her operators in safe operation procedures..

- **IMPLEMENTS:** I have explained that Deflectors, Chain Guards, or Solid Skirts must be installed and maintained in good repair
- **DRIVELINES:** I have made certain that all driveline, gearbox, and other shields are in good repair and fastened securely in place to prevent injuries from entanglement or thrown objects.
- **HYDRAULIC MACHINES:** I have explained the necessity of using clean hydraulic oil, changing filters as instructed, stopping leaks, damage caused by operating with over-heated oil, caring for hoses, using hoses of proper rating, maintaining the specified operating pressure and the potential hazard of oil's penetrating the skin.
- **FOLDING-TYPE IMPLEMENTS:** I have explained that it is not possible to guard against thrown objects when the head is lifted off ground and that operator is responsible to watch out for persons in the area. I have explained that the lifted mower head or boom can contact overhead obstructions with damage to cables and telephone lines and possible injury. I have explained that the extended head or boom or retracted boom can contact power lines with resulting electrocution, injury or death and that operator is responsible for keeping clear of such hazards.

PRE-DELIVERY SERVICE

CHECK AND ADJUST OR LUBRICATE AS REQUIRED

See Operator's Manual for Details

Inspection Performed - Warranty and Safety Procedures Explained - Installation Complete

LUBRICATION & HYDRAULICS

- ☐ Gearbox (Oil Levels)
- ☐ Hydraulic Oil Level (External Tank)
- ☐ Tractor Hydraulic Oil Level
- ☐ Hydraulic Hoses (Not Kinked Tighten Connections)
- ☐ Front Pump Drive (Assembly Is Tight And Shaft Properly Aligned)

MOWER

- ☐ Spindle And Motor Bolts Properly Torqued
- ☐ Spindle Oil Level
- ☐ Blade Carrier Bolts Properly Torqued/Retaining Pin In Place
- ☐ Mower Cutting Height And Level Adjusted
- ☐ Cutting Shaft Bearings Lubricated
- ☐ All Hardware Properly Torqued
- ☐ Tire and Air Pressure/Lug Nuts (Correct Torque)
- ☐ Wheel Bearings (Check, Grease, and Preload)

ATTACHMENTS & INSTALLATION

- ☐ Deflectors Front And Rear
- ☐ Shredding Attachments
- ☐ Correct Blade Rotation Direction
- ☐ Axle Arms And Beams
- ☐ Tongue And Control Rods (Installed And Adjusted)
- ☐ All Bolts - Pins And Nuts (Proper Torque)

MOWER TO TRACTOR CONNECTIONS

- ☐ Draw Bar Length (Check And Set)
- ☐ A-Frame Pivot & Links
- ☐ Control Rods (Adjusted Equal)
- ☐ Axle Height (Adjusted)
- ☐ Cutting Height (Adjust)
- ☐ Mount Kit-Pre-Operation Check Complete
- ☐ Mower Wing (Adjust Level With The Center)
- ☐ Mower Wing (Check For Proper Raising Operation)
- ☐ C.V. Drivelines (Check Max Turn Radius)

- ☐ Pull Type Hitch (Height Adjustment)
- ☐ Mounting Hardware Properly Torqued

SAFETY ITEMS

- ☐ Protective Shields (Operation And Installation)
- ☐ Driveline Clutch (Torque Limiter) (Adjust And Run In)
- ☐ Safety Decals (Installed)
- ☐ Operator's Manual (Supplied)
- ☐ Tractor PTO Shield (Installed)
- ☐ S.M.V. Emblem (Installed If Needed)
- ☐ Tongue Jack (Installation and Operation)
- ☐ Safety Tow Chain (Installed)
- ☐ ADMA Driveline Safety Manual Supplied
- ☐ AEM Mower Safety Manual (Supplied in Canister)
- ☐ AEM Mower Safety Video has been shown to Purchaser

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SAFETY SECTION

Safety Section 1-1

SAFETY

SAFETY MESSAGES

A careful operator is the best operator. Safety is of primary importance to the manufacturer and should be to the owner/operator. Most accidents can be avoided by being aware of your equipment, your surroundings, and observing certain precautions. The first section of this manual includes a list of Safety Messages that, if followed, will help protect the operator and bystanders from injury or death. Read and understand these Safety Messages before assembling, operating, or servicing this Implement. This equipment should only be operated by those persons who have read the manual, who are responsible and trained, and who know how to do so responsibly.



The Safety Alert Symbol combined with a Signal Word, as seen below, is used throughout this manual and on decals which are attached to the equipment. The Safety Alert Symbol means: "ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!" The Symbol and Signal Word are intended to warn the owner/operator of impending hazards and the degree of possible injury faced when operating this equipment.

Practice all usual and customary safe working precautions and above all---remember safety is up to YOU. Only YOU can prevent death or serious injury from unsafe practices.



Indicates a hazardous situation which, if not avoided, WILL result in DEATH OR SERIOUS INJURY.



Indicates a hazardous situation which, if not avoided, COULD result in DEATH OR SERIOUS INJURY.



Indicates a hazardous situation which, if not avoided, COULD result in MINOR OR MODERATE INJURY.

NOTICE

Is used to address practices not related to physical injury.

Important

Identifies special instructions or procedures that, if not strictly observed, could result in damage to, or destruction of the machine, attachments or the environment.

NOTE: Identifies points of particular interest for more efficient and convenient operation or repair.

READ, UNDERSTAND, and FOLLOW the following Safety Messages. Death or serious injury may occur unless care is taken to follow the warnings and instructions stated in this Manual and in the Safety Messages on the implement. Always follow the instruction in this manual and use good common sense to avoid hazards.



Pictographs are used throughout this manual to help bring your visual attention to safety issues.

SAFETY HAZARD	SAFETY AVOIDANCE	SAFETY PREVENTION
Pictograph surrounded by a triangle indicates a Safety Hazard that must be avoided. Example:  Equipment contacting overhead electrical lines	Pictograph in a circle with blue or black background, by itself or inside a box, indicates an avoidance procedure or action that should be followed to prevent injuries. Example:  Wear safety footwear.  Always shut off engine and remove key before working on equipment.	A circle with a slash through it indicates an action that is prohibited. Example:  No Smoking

NOTE: If you want a translation of this safety section in one of the following Languages, please contact: Translations at 1502 E. Walnut Street Seguin, TX 78155; Fax: (830) 372-9529; Safety Section Translations are available in Spanish, Portuguese, French, German, Russian. GS01str

SAFETY

OPERATOR SAFETY

				
Read and understand Operator's Manual	Always wear Safety Glasses with side shields marked to comply with ANSI Z87	Wear Hard Hat Safety Shoes	Never use Drugs or Alcohol when operating equipment	Wear Safety Vest when operating on or near roads

WARNING

TO AVOID DEATH OR SERIOUS INJURY DO THE FOLLOWING:

DANGER

Keep the power unit away from the edges of any ditches, cliffs, drop-offs, unstable ground, or water. The power unit can become unstable in these situations, even with the brake applied, and cause the power unit to go over the edge or into the water and result in death or serious injury

- **READ, UNDERSTAND and FOLLOW** Operator's Manual instructions, Warnings and Safety Messages.
- **WEAR SAFETY GLASSES WITH SIDE SHIELDS MARKED TO COMPLY WITH ANSI Z87**, safety shoes, hard hat, hearing protection and gloves when operating or repairing equipment
- **WEAR** appropriate breathing respirator when operating in dusty conditions to avoid respiratory diseases.
- **DO NOT WEAR** loose clothing or jewelry to avoid rotating parts entanglement injury.
- **DO NOT USE DRUGS or ALCOHOL** before or while operating equipment.
- **DO NOT ALLOW** anyone to operate equipment under the influence of drug or alcohol.
- **CONSULT** medical professional for medication impairment side effects.
- **STAY CLEAR** of hot surfaces such as Mufflers, hydraulic pumps, valves and tanks.
- **STAY ALERT**, prolonged operation can cause fatigue, STOP and REST.

GENERAL OPERATING SAFETY

VISIBILITY CONDITIONS WHEN MOWING:

- **OPERATE IN DAYLIGHT** or with lights that gives at least 100 yards clear visibility.
- **BE ABLE TO SEE** and identify passersby, steep slopes, ditches, drop-offs, overhead obstructions, power lines, debris and foreign objects.
- Avoid backing up while mowing, vision may be limited, severe damage or injury can occur.
- **DO NOT** run tractor in enclosed building without adequate exhaust ventilation.

GROUND SPEED WHEN MOWING:

- **NORMAL SPEED** range is between 1 to 2 mph(1-3 kph).
- **ADJUST MOWING SPEED** for terrain conditions and grass type, density and cut height.
- **REDUCE MOWING SPEED** when near steep slopes, ditches, drop-offs, overhead obstructions, power lines and to avoid debris and foreign objects.

POWER UNIT and MOWER:

- **DO NOT** operate the power unit or mower unless the equipment is maintained and operating properly.
- Keep the power unit away from the edges of any ditches, cliffs, drop-offs, unstable ground, or water. The power unit can become unstable in these situations, even with the brake applied, and cause the power unit to go over the edge or into the water and result in death or serious injury.
- **DISCONTINUE OPERATION** if power unit or mower electrical and hydraulic controls do no function properly.
- **DISCONTINUE OPERATION** of the power unit if the braking or steering systems do not function properly.
- **DO NOT** operate the power unit or mower if there are any hydraulic leaks.

OPERATION ON SLOPES:

- Operation of the unit on slopes greater than 10°(18% grade) is not recommended under any circumstances. On mantis with a 102" outside to outside tire spread, a 10° (18% grade) slope occurs when one front tire is about 18" lower than the other front tire. *PN OSMS-01str*

SAFETY

OPERATOR SAFETY - CONTINUED

				
Prolonged Exposure to loud noise can cause hearing loss.	Cab does not protect against inhaling vapor or dust.	Wear gloves when handling fuel, oil and chemicals.	Engine, Muffler, Radiator and Hydraulic components may be hot.	Use 3 point contact when entering or leaving cab.

WARNING

TO AVOID DEATH OR SERIOUS INJURY DO THE FOLLOWING:

- READ, UNDERSTAND and FOLLOW Operator's Manual instructions, Warnings and Safety Messages.
- WEAR hearing protection if loud noise occurs when operating or repairing equipment.
- WEAR appropriate breathing respirator when operating in dusty conditions to avoid respiratory diseases.
- STAY CLEAR of hot surfaces such as Mufflers, hydraulic pumps, valves and tanks.
- WEAR safety gloves when handling fuel, oils, lubricants and chemicals to prevent injury.
- STAY ALERT, prolonged operation can cause fatigue, STOP and REST.

INSECT INFESTATION

- DO NOT operate in areas where bees or insects may attack unless you WEAR PROTECTIVE CLOTHING or use enclosed power unit cab.

PTO SPEED

- DO NOT EXCEED IMPLEMENT RATED PTO SPEED
- AVOID exceeding rated PTO speeds that may result in broken drivelines or blade failures

SAFETY SIGNS

- REPLACE missing, damaged or unreadable safety signs immediately.

CLIMBING ONTO AND OFF EQUIPEMENT:

- Use Steps Hand holds correctly
- Prevent falls by facing the machine when getting on and off. Maintain 3-point contact with steps, handholds, and hand rails.
- Use extra care when mud, snow or moisture present slippery conditions. Keep steps clean and free of grease and mud.
- Never jump when existing the machine. Never mount or dismount a moving machine.



WARNING

Cancer and Reproductive Harm www.P65Warnings.ca.gov.

PN OSMS-02 str

SAFETY

OPERATOR SAFETY - CONTINUED

			
Wear Gloves when refueling unit.	No smoking or open flames while refueling	Shut off Engine before refueling	Handle Fuel with care.

⚠ WARNING

TO AVOID DEATH OR SERIOUS INJURY DO THE FOLLOWING:

- READ, UNDERSTAND and FOLLOW Operator's Manual instructions, Warnings and Safety Messages.
- WEAR safety gloves when handling fuel, oils, lubricants and chemicals to prevent injury.

HANDLE FUEL SAFELY-AVOID FIRES

Handle fuel with care! It is highly flammable!

- Do not refuel the machine while smoking or when near open flame or sparks.
- Always stop engine before refueling machine. Fill fuel tank outdoors. Never add fuel when the engine is operating.
- Allow machine to cool for at least five minutes or longer if needed before refueling.
- Prevent fires by keeping machine clean of accumulated trash, grease, and debris. Always clean up spilled fuel.
- Use only an approved fuel container for transporting flammable liquids.
- Touch fuel container with fuel dispenser nozzle before removing can lid.
- Keep fuel dispenser nozzle in contact with fuel container inlet when filling.

AVOID STATIC ELECTRICITY RISK WHEN REFUELING

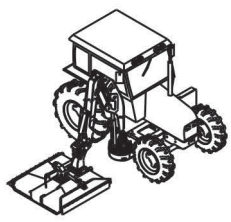
- Ultra-Low Sulfur Diesel (ULSD) fuel increases its ability to store a static charge. Static Charges can build up in ULSD fuel while it is flowing through the delivery hose. Static electric can discharge when combustible fuel vapors are present can result in a fire or explosion.
- Therefore it is important to ensure the entire system (fuel supply, transfer pump, hoses, filters and nozzles) used to refuel your power unit is properly grounded and bonded.

HANDLE STARTER FLUID SAFELY

- Starter Fluid is highly flammable.
- Keep all sparks and flames away when using it. Keep starting fluid away from batteries and cables
- Do not use starting fluid on an engine equipped with glow plugs or an intake heater. *PN OSMS-03 str*

SAFETY

CRUSHING HAZARDS

				
Crushing injury from roll over	Use Cab Tractor With Boom Mowers	Always wear seatbelt	Pinch Point Hazard Keep Hands and body parts clear of pinch points	Crushing injury from boom or mower head falling



DANGER

TO AVOID DEATH OR SERIOUS INJURY FROM FALLING OFF POWER UNIT, EQUIPEMENT RUN OVER, ROLLOVER AND CRUSHING BY FALLING WING OR IMPLEMENT:

- Keep ROPS installed properly. The protection offered by ROPS will be impaired if ROPS is subjected to structural damage or is involved in a turnover incident. A damaged ROPS should be replaced not reused. Inspect the seat belt once a year. Look for signs of loose hardware or belt damage such as cuts, fraying or unusual wear. Replace entire seatbelt if mounting hardware, buckle, belt or repower unit shows signs of damage.
- ALWAYS BUCKLE UP seat belt when operating power unit and equipment.
- ONLY OPERATE power unit and equipment while seated in power unit seat.
- Never leave the driver's seat while the vehicle is moving.
- Emergency Exit: The right hand side window in the cabin is designed for being an emergency exit. In case of an emergency the cabin can be left over the emergency exit. To do this, the right hand side window must be manually unlocked before opening.

Sudden movement of machine can result in Crushing Hazard due to movement of the machine or machine parts. If the machine has not come to a standstill, the machine or parts of the machine can move unintentionally. People may be seriously injured or killed as a result.

Before leaving the machine, shut down and secure the machine.

- To park the machine securely: Park the machine on a stable, paved and even surface. Switch off the drives and wait until coasting parts have come to a standstill. Apply the parking brake. Switch off the engine, remove the ignition key and take it with you. Switch off the main battery switch.
- Secure the machine against rolling away with wheel chocks and the parking brake.

WHEN RAISING MOWERS

- Raise or lower ONLY WHILE SEATED in power unit seat with seat belt buckled.
- KEEP BYSTANDERS CLEAR of area TO AVOID crushing.

DANGER ZONE

10 Feet in front of machine, 20 Feet in rear of machine, 10 feet to the side of machine.

- KEEP sufficient clearance around implement and wings TO AVOID contacting buildings or overhead power lines.

LIFTED Equipment can fall from mechanical or hydraulic failure or inadvertent Control Lever movement.



WARNING

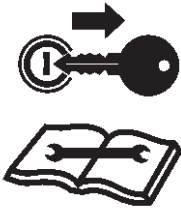
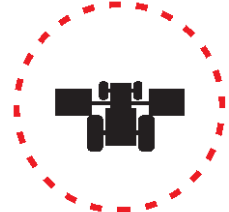
TO AVOID EQUIPMENT FALLING while working near or under lifted boom, components and Mower Head:

- SECURELY SUPPORT or block up raised equipment, wings and components.
- BLOCK UP and securely support equipment before putting hands, feet or body under raised equipment or lifted components.
- KEEP BYSTANDERS CLEAR of raised boom or mower head until securely blocked up.

PN CHMS-01 str

SAFETY

CRUSHING HAZARDS- CONTINUED

			
Remove Key	Do Not allow children to play around equipment	Danger Zone	Use mirrors and back up camera to prevent back over injuries

⚠ DANGER TO AVOID DEATH OR SERIOUS INJURY FROM FALLING OFF POWER UNIT, EQUIPEMENT RUN OVER, ROLLOVER AND CRUSHING BY FALLING WING OR IMPLEMENT:

TO PARK THE MACHINE SECURELY:

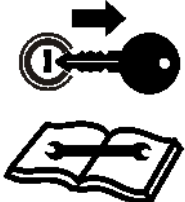
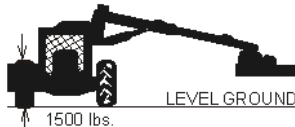
- Park the machine on a stable, paved and even surface.
- **LOWER** Mower Head to the ground or **BLOCK** lifted parts before leaving equipment.
- Switch off the drives and wait until coasting parts have come to a standstill.
- Apply the parking brake.
- Switch off the engine, remove the ignition key and take it with you.
- Switch off the main battery switch.
- Secure the machine against rolling away by engaging the parking brake.
- **NEVER** leave implement unattended in a raised position.

⚠ WARNING TO AVOID CHILDREN FALLING OFF OR BEING CRUSHED BY EQUIPMENT:

- **NEVER ALLOW** children to play on or around Power Unit or Implement.
- **DO NOT** operate without operator CAB or OVERHEAD protection. Falling limbs and debris can cause injuries. *PN CHMS-02 str.*

SAFETY

CONNECTING OR DISCONNECTING IMPLEMENT SAFETY

			
Stop Tractor Remove Key Read Manual	Crushing Hazard Do Not get under boom when connecting mower head to boom	Stability Hazard Ensure 20% of tractor weight is on front wheels	Stability Hazard Ensure 1500lbs down force on left tire with boom extended



TO AVOID DEATH OR SERIOUS INJURY FROM BEING CRUSHED BY POWER UNIT OR IMPLEMENT:

WHEN connecting mower head to the boom:

- KEEP BYSTANDERS AWAY from power unit and mower.
- No one should stand between the mower and the implement unless the engine has been shut off and the machine has been secured against rolling by means of the parking brake.
- Ensure there is enough room to lift and swing the boom with out hitting objects

BEFORE CONNECTING AND DISCONNECTING THE MOWER HEAD OR BOOM:

- STOP POWER UNIT ENGINE, place transmission into park, engage parking brake and remove key.

WHEN CONNECTING AND DISCONNECTING THE MOWER HEAD OR BOOM:

- DO NOT crawl or walk under raised mower head or boom. (Refer to Instructions in Operation Section)

WHEN CONNECTING IMPLEMENT DRIVELINE: (If equipped)

TO AVOID implement driveline coming loose during operation:

- LUBRICATE yoke spring locking collar to ensure it freely slides on PTO shaft.
- SECURELY seat yoke locking balls in PTO shaft groove.
- PUSH and PULL DRIVELINE on both the power unit and implement PTO SHAFTS to ensure it is SECURELY ATTACHED.

TO AVOID BROKEN DRIVELINE DURING OPERATIONS:

- CHECK driveline for proper length between PTO shaft and implement gearbox shaft.(Refer to Instructions in Operation Section)
- Drivelines too short can pull apart or disengage.
- Drivelines too long can bottom out.
- Bottoming driveline telescoping assembly will stop sliding and become solid.
- Driveline bottoming can push through support bearings and break off PTO shaft.

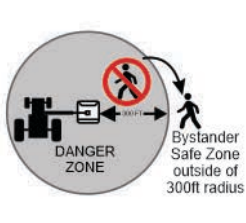
CONTACT DEALER IF IMPLEMENT DRIVELINE DOES NOT MATCH POWER UNIT PTO SHAFT:

- DO NOT USE PTO ADAPTER. Using a PTO adapter can cause:
- Excessive vibration, thrown objects, blade and implement failures by doubling operating speed.
- Increased working length exposing unshielded driveline areas and entanglement hazards.

PN CDMS-01str

SAFETY

THROWN OBJECT HAZARDS

				
Mower Thrown Objects Hazard	Raised Mower Thrown Objects	Keep mower door closed when traffic comes within 300 feet of Danger Zone	Inspect Area remove foreign objects	Do not let blades contact solid objects



DANGER

ROTARY MOWERS CAN THROW OBJECTS 300 FEET OR MORE UNDER ADVERSE CONDITIONS.

TO AVOID DEATH OR SERIOUS INJURY TO OPERATOR OR BYSTANDERS FROM THROWN OBJECTS:

- KEEP bystanders 300 feet away

STOP MOWING IF PASSERSBY ARE WITHIN 300 FEET UNLESS:

- **ALL THROWN OBJECT SHIELDING** including, Front and Rear Deflectors, Chains Guards, Steel Guards, Bands, Side Skirts and Skid Shoes in place and in good condition when mowing.
- Mower is close and parallel to ground without exposing blades.
- **MOWING AREA** has been inspected and foreign materials and debris have been removed.
- **PASSERSBY** are inside enclosed vehicle.

INSPECT AREA FOR POTENTIAL THROWN OBJECTS BEFORE MOWING:

- **REMOVE** debris, rocks, wire, cable, metal objects and other foreign material from area.
- Wire, cable, rope, chains and metal objects can be thrown or swing outside deck with great velocity:
- **DO NOT** allow the mower blades to contact decaying animal carcasses or other hazardous materials. The mower blades could throw hazardous and biologic material out from under mower exposing the operator and bystanders to health risks. Always wear required OSHA approved Personal Protective Equipment (PPE) when cleaning or removing potentially hazardous material from equipment.

MARK objects that cannot be removed.

AVOID these objects when mowing.

HIGH GRASS and WEED AREA INSPECTION:

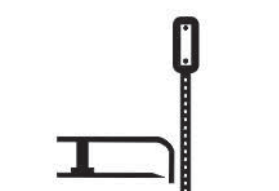
- **INSPECT** for and **REMOVE** any hidden large debris.
- **MOW** at Intermediate height
- **INSPECT** and remove remaining debris
- **MOW** at final height.

MOWER THROWN OBJECT SHIELDING:

- **KEEP** all thrown object shielding including, Front and Rear Deflectors, Chains Guards, Steel Guards, Bands, Side Skirts and Skid Shoes in place and in good condition when mowing.
- **DO NOT OPERATE** with any thrown object shielding missing, damaged or removed. *PN TOMS-01 str*

SAFETY

THROWN OBJECTS HAZARDS (CONTINUED)

				
Mower Thrown Objects Hazard	Raised Mower Thrown Objects	Keep mower door closed when traffic comes within 300 feet of Danger Zone	Inspect Area remove foreign objects	Do not let blades contact solid objects

MOWER OPERATION:

- DO NOT exceed mower's rated Cutting Capacity or cut non-vegetative material.
- USE ENCLOSED CABS when two or more mowers are operating in mowing area.
- Do Not mow in areas where bees or insects may attack unless you WEAR PROTECTIVE CLOTHING or use enclosed tractor cab.
- ADJUST mower head close and parallel to ground without exposing blades.
- ADJUST cutting HEIGHT to AVOID BLADE CONTACT with solid objects like wire, rocks, posts, curbs, guard rails and fixed obstructions.
- CLOSE Mower door and stop operating if bystanders come within 300 feet of the mower.
- Keep bystanders out of the Danger zone, which is 300 ft radius from mower. If using spotters make sure they are outside of the 300 ft radius Danger Zone.
- Keep mower door closed when cutting close to the ground.
- Open door only to cut large brush or tree limbs. Close door immediately after cutting limb.
- DO NOT push mower head down onto material to cut it, use the front tips of the mower blades to cut into the material.
- DO NOT operate mower when mower is in transport position.
- STOP MOWING immediately if blades strike heavy objects, fixed structures, metal guard rails and concrete structures:
- BLADES CAN FAIL from impact and objects can be thrown with great velocity.
- INSPECT and REPLACE any damaged blades.

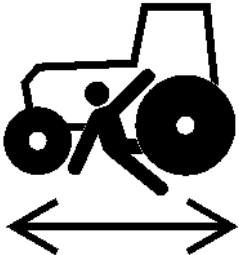
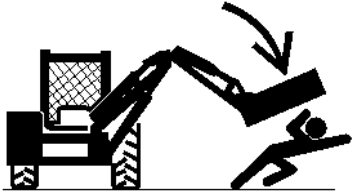
CHECK blade carrier and REPLACE if damaged

- DO NOT mow in standing water TO AVOID possible BLADE FAILURE.
- AVOID MOWING in reverse:
- STOP PTO and back up mower
- LOWER mower, engage PTO and mow forward while looking for bystanders who may be behind or to the side of the machine.
- DISENGAGE mower head and wait until BLADES stop rotating before raising mower to transport position.
- DO NOT ENGAGE PTO with mower in transport position.
- STOP mowing when EXCESSIVE VIBRATION occurs:
- STOP PTO and tractor ENGINE.
- INSPECT mower for vibration source.

REPLACE any damaged parts and bent or damaged BLADES. PN TOMS-02 str

SAFETY

RUN OVER HAZARDS

		
Operator run over hazard	Rider fall off run over hazard	Bystander run over hazard



DANGER

TO AVOID DEATH OR SERIOUS INJURY FROM FALLING OFF TRACTOR OR EQUIPMENT RUN OVER:

- USE ROPS and SEAT BELT equipped tractors for mowing operations.
- KEEP ROPS locked in UP position.
- ONLY start tractor while seated in tractor seat.
- ALWAYS BUCKLE UP seat belt when operating tractor and equipment.
- ONLY OPERATE tractor and equipment while seated in tractor seat.
- NEVER ALLOW RIDERS on tractor or implement.
- When not mowing stow Boom and Mower head in transport location before moving.

WHEN MOUNTING AND DISMOUNTING TRACTOR:

- ONLY mount or dismount when tractor and moving parts are stopped.
- STOP ENGINE AND PTO, engage parking brake, lower implement, allow all moving parts to stop and remove key before dismounting from tractor.

RUN OVER HAZARDS

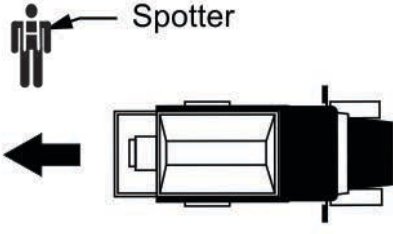
- Before starting or moving the machine, make certain that nobody is in the vicinity of the machine. (Watch for children) Make sure that you have a clear view.
- Ensure than no one is in the Danger Zone around the vehicle.

DANGER ZONE

- 10 feet In front of machine
- 20 feet In rear of machine
- 10 feet to the side of machine *PN ROMS-01 str*

SAFETY

BACKING RUN-OVER HAZARD

		
Equipment contacting overhead electrical lines	Look out for and Avoid other personnel	Always use a spotter when possible

This power unit is equipped with a rear view camera to assist the driver in avoiding backing into object or co-workers and bystanders. This rear-view camera is not a substitute for the power unit's rear view mirrors.

WARNING

Use care when backing. Never try to back using the rear-view camera and monitor only! Use side rear view mirrors to aid vision as normal and use the rear-view monitor as you would a rear-view mirror on your automobile to watch for obstacles.

WARNING

Make sure that no bystander, animals, or obstruction such as a vehicle, building, or street sign are behind the power unit when backing up. The design of the power unit impairs operator rear vision when backing. Use extreme caution to ensure that the power unit is not backed into the path of pedestrian or vehicle traffic. If you cannot see to back clearly, stop the power unit and examine the area. Serious injury or death and property damage could result from running into, being crushed by, or run over by a power unit.

WARNING

You will always have blind spots. Know their location, and try to minimize them. If you cannot see clearly request assistance to guide you while backing the power unit.

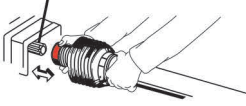
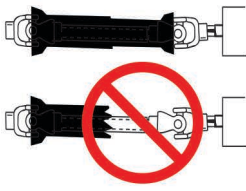
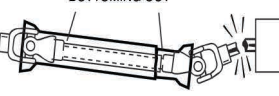
- Always clean the rear-view mirrors and the rear-view camera and monitor daily before operating the power unit. DO NOT put hands or feet under mower decks
- Check the rear view monitor at the beginning of each shift to ensure you can see clearly to the rear of the power unit including the rear bumper. If the rear bumper is not visible in the monitor adjust the camera to ensure you can see the edge of your rear bumper. That way there will be no space between the rear bumper and camera viewing area that cannot be seen.

WHEN BACKING FOLLOW THESE BEST SAFETY PRACTICES:

- Park and back defensively to prevent having to back up and possibly hitting co-workers, passersby, or objects.
- Always use a spotter when possible.
- Avoid backing whenever possible; Don't back up if you don't have to.
- When in doubt, don't back up.
- If turning in reverse, turn toward driver side if possible.
- Get out and look prior to backing.
- Check for all types of obstacles, including overhead.
- Back immediately after checking.
- Continually check mirrors on both sides of the power unit while backing.
- Eliminate noise and other distractions before backing.
- Open your window so you can hear outside noises.
- Back slowly, in the lowest gear possible. *PN BROMS-01 str*

SAFETY

PTO ENTANGLEMENT HAZARDS

	 PTO (Barra Gitatoria)		 BOTTOMING OUT
Entanglement hazard Do Not approach or touch a rotating PTO driveshaft	Make sure PTO shaft is securely attached Do Not Use PTO Adapter	DO NOT Operate if PTO shields are damaged or missing	Make sure PTO shafts are proper length



KEEP AWAY FROM ROTATING DRIVELINES AND ELEMENTS TO AVOID DEATH OR SERIOUS INJURY:

STAY AWAY and KEEP hands, feet and body AWAY from rotating blades, drivelines and parts until all moving elements have stopped.

- STOP, LOOK and LISTEN before approaching the mower to make sure all rotating motion has stopped.
- ROTATING COMPONENTS CONTINUE to ROTATE after the PTO is shut off.

PTO SHIELDING:

TO AVOID SERIOUS INJURY OR DEATH FROM ENTANGLEMENT WHEN OPERATING IMPLEMENT:

- KEEP PTO shields, integral driveline shields and input shields installed
- DO NOT OPERATE mower without shields and guards in place or missing
- REPAIR OR REPLACE if damage, broken or missing
- ALWAYS REPLACE GUARDS that have been removed for service or maintenance.
- Do Not use PTO or PTO guard as a step.

TO AVOID BROKEN DRIVELINE DURING OPERATIONS:

- CHECK driveline for proper length between PTO shaft and implement gearbox shaft.(Refer to Instructions in Operation Section)
- Drivelines too short can pull apart or disengage.
- Drivelines too long can bottom out.
- Bottoming driveline telescoping assembly will stop sliding and become solid.
- Driveline bottoming can push through support bearings and break off PTO shaft
- AVOID sharp turns or lift mower to heights to cause driveline "knocking".
- Lubricate driveshaft-telescoping components weekly.

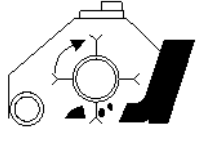
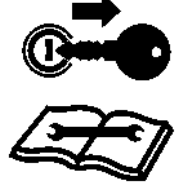
CONTACT DEALER IF IMPLEMENT DRIVELINE DOES NOT MATCH TRACTOR PTO SHAFT:

- DO NOT USE PTO ADAPTER.
- Using a PTO adapter can cause excessive vibration, thrown objects, blade and implement failures by doubling operating speed. Increased working length exposing unshielded driveline areas.

PN PEMS-01str

SAFETY

MOWER BLADE CONTACT HAZARDS

					
Do not put fingers underneath mower	Do not put hands underneath Flail Mower	Do not put foot underneath mower	Do not put foot underneath Flail Mower	Shearing Hazard from Sickle blades	Stop Tractor Remove Key Read Manual



KEEP AWAY FROM ROTATING BLADES TO AVOID DEATH OR SERIOUS INJURY FROM BLADE CONTACT:

- **STAY AWAY** and **KEEP HANDS, FEET** and **BODY AWAY** from rotating blades, drivelines and parts until all moving elements have stopped.
- **DO NOT** put hands or feet under mower decks
- STOP rotating BLADES disengage mower switch and PTO and wait for blade to stop rotating before raising mower head.
- DO NOT approach implement head until Power Unit Engine has been shut off.
- STOP LOOK and LISTEN before approaching the mower to make sure all rotating motion has stopped.
- Keep Hands and Fingers away from engine fan blades and belt. *PN MBMS-01 str*

SAFETY

SAFETY

HIGH PRESSURE OIL LEAK HAZARDS

			
High pressure oil penetrating skin	High pressure oil eroding skin	Using cardboard to check for oil leaks	Tank contents under pressure. Allow oil to cool for at least 5 minutes before slowly removing cap



DANGER

TO AVOID DEATH OR SERIOUS INJURY FROM HIGH PRESSURE HYDRAULIC OIL LEAKS PENERATING SKIN:

- DO NOT OPERATE equipment with oil or fuel leaks.
- KEEP all hydraulic hoses, lines and connections in GOOD CONDITION and TIGHT before applying system pressure.
- RELIEVE HYDRAULIC PRESSURE before disconnecting lines or working on the system.
- REMOVE and replace hose if you suspect it leaks. Have dealer test it for leaks.

HIGH PRESSURE FLUID LEAKS CAN BE INVISIBLE.

WHEN CHECKING FOR HYDRAULIC LEAKS AND WORKING AROUND HYDRAULIC SYSTEMS:

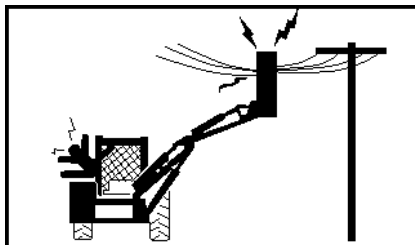
- ALWAYS WEAR safety glasses with side shields (marked with ANSI Z87) and impenetrable gloves.
- USE paper or cardboard to search for leaks.
- DO NOT USE hands or body parts to search for leak.
- KEEP hands and body AWAY from pin holes and nozzles ejecting hydraulic fluid.
- Injected Hydraulic fluid may cause gangrene if not surgically removed immediately by a doctor familiar with this form of injury.

USE CAUTION WHEN REMOVING HYDRAULIC TANK CAP.

- Tank contents may be under pressure.
- Allow oil to cool before removing cap.
- Relieve oil pressure before removing cap slowly.
- Stay away from hot oil that may spray from tank. *PN HPMS-01 str*

SAFETY

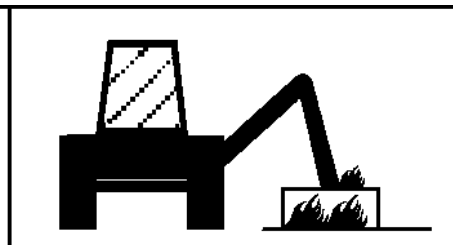
ELECTRICAL & FIRE HAZARDS



Mower head or Boom contacting overhead electrical lines



Strike and explosion Hazard
Blades Contacting Utility or Gas Lines



Fire Hazard Do Not operate near fires. Keep debris away from hydraulic pumps and valves



TO AVOID DEATH OR SERIOUS INJURY FROM ELECTRICAL CONTACT WHEN WORKING AROUND ELECTRICAL POWER LINES, GAS LINES AND UTILITY LINES:

- INSPECT mowing area for overhead or underground electrical power lines, obstructions, gas lines, cables and Utility, Municipal, or other type structure.
- KEEP all raised wings at a 10 feet or greater distance from all power lines and overhead obstructions.
- DO NOT allow mower to contact with any Utility, Municipal, or type of structures and obstructions.
- CALL 811 and 1-800-258-0808 for identifying buried utility lines

FIRE PREVENTION GUIDELINES WHILE OPERATING, SERVICING, AND REPAIRING MOWER AND POWER UNIT TO REDUCE EQUIPMENT AND GRASS FIRE RISK:

- EQUIP Power Unit with a FIRE EXTINGUISHER.
- DO NOT OPERATE mower on a power unit equipped with under frame exhaust.
- DO NOT SMOKE, have open flame or sparks near Mower or Power Unit.
- DO NOT DRIVE into burning debris or freshly burnt area.
- AVOID FIRE IGNITION by not allowing mower blade to contact solid objects like metal or rock.
- DO NOT operate if oil is leaking. Repair oil leak and remove all accumulated oil before operating.
- CLEAR any grass clippings or debris buildup around mower hydraulic pumps, valves or tanks.
- SHUT OFF ENGINE while refueling.

REDUCE RISK OF FIRE

To reduce the risk of fire, your power unit should be regularly Inspected and cleaned.

Birds and other animals may build nests or bring other flammable materials into the engine compartment. The power unit should be inspected and cleaned prior to use each day.

A buildup of grass and other debris may occur during normal operation. This is especially true when operating in very dry conditions or conditions where airborne material or dust is present. Any such build up must be removed to ensure proper machine function and reduce the risk of fire. The power unit must be inspected and cleaned periodically throughout the day.

Regular and thorough cleaning of the power unit combined with routine maintenance procedures listed in this operator's manual greatly reduces the risk of fire and damage.

Check fuel lines, tank, cap and fittings frequently for damage, cracks or leaks and replace if necessary.

Follow all operational and safety procedures posted on the machine and in the Operator's Manual. Be careful of hot engine and exhaust components during the inspection and cleaning. Before carrying out any inspection or cleaning, always SHUT OFF the engine, place the transmission in park, set the parking brake and remove the key. Removal of the key will prevent others from starting the power unit during inspection and cleaning.

PN EFMS-01 str

SAFETY

ELECTRICAL & FIRE HAZARDS - CONTINUED

		
In Case Of Fire	Stop the unit immediately. Move safely away from unit and fire.	Use Fire Extinguisher only for a small fire.

IN CASE OF FIRE:

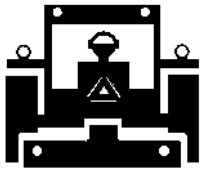
- Stop machine immediately at the first sign of fire. Fire may be identified by the smell of smoke or sight of flames. Because fire grows and spreads rapidly, get off the machine immediately and move safely away from the fire. Do not return to the machine. The number one priority is your safety.
- Call the fire department. A portable fire extinguisher can put out a small fire or contain it until the fire department arrives, but portable extinguishers have limitations. Always put the safety of the operator and bystanders first. If attempting to extinguish a fire, keep your back to the wind with an unobstructed escape path so you can move away quickly if the fire cannot be extinguished.
- Do not attempt to extinguish a large fire and ensure the operator and bystanders move away from the machine as quickly as possible
- Read the fire extinguisher instructions and become familiar with their location, parts, and operation before a fire starts.

PN EFMS-02 str

SAFETY

SAFETY

TRANSPORTING HAZARDS

		
Use SMV signs and Flashing Lights	Loss of Control Stopping Hazard	Loss of Control Speeding Hazard

⚠ DANGER

TO AVOID DEATH OR SERIOUS INJURY WHEN TOWING OR TRANSPORTING EQUIPMENT:

- KEEP transport speed BELOW 20 mph to maintain control of equipment.
- REDUCE SPEED on inclines, on turns and in poor towing conditions..
- DO NOT TOW with trucks or other vehicles
- USE only properly sized and equipped tractor for towing equipment.
- FOLLOW all local traffic regulations.

POWER UNIT REQUIREMENTS FOR TOWING OR TRANSPORTING IMPLEMENTS:

- ONLY TRANSPORT with power unit with ROPS in the raised position.
- USE properly sized and equipped tractor that exceeds implement weight by at least 20%
- KEEP 20% of power unit weight on front wheels to maintain safe steering.

BEFORE TRANSPORTING OR TOWING IMPLEMENT:

POWER UNIT INSPECTION:

- CHECK steering and braking for proper operation and in good condition.
- CHECK SMV sign, reflectors and warning lights for proper operation and visibility behind unit.
- CHECK that your driving vision is not impaired by tractor, cab, or implement while seated in power unit seat.
- ADJUST your operating position, mirrors, and implement transport for clear vision for traveling and traffic conditions.

PREPARE IMPLEMENT FOR TRANSPORTING OR TOWING:

- Store Boom and Mower in transport positions and engage transport locks if equipped.

DETERMINE STOPPING CHARACTERISTICS OF POWER UNIT AND IMPLEMENT FOR TRANSPORTING OR TOWING:

BRAKE TESTS:

- Stopping distance with implement attached may increase
- Observe STOPPING distances increases with increased speeds.
- DETERMINE the maximum safe transport speed that does not exceed 20 mph.
- Reduce travel speed on wet or icy roads, stopping distances increase.

DETERMINE MAXIMUM TURNING SPEED BEFORE OPERATING ON ROADS OR UNEVEN GROUND:

- TEST equipment by slowly increasing speed in turns to determine if it can be operated at higher speeds.
- USE REDUCED turning speeds on sharp turns to avoid equipment turning over.

WHEN TOWING OR TRANSPORTING EQUIPMENT:

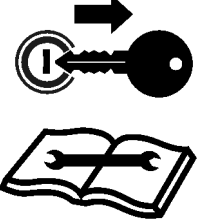
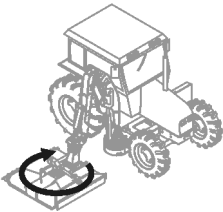
- Always WEAR SEAT BELT when operating or transporting mower.
- USE low speeds to avoid overturn with raised wings.
- USE low speeds and gradual steering on curves, hills, rough or uneven surfaces, and on wet roads.
- TURN ON power unit FLASHING WARNING LIGHTS.
- ALLOW clearance for implement swing while turning.

KEEP raised boom mower 10 feet or greater distance from all power lines and overhead obstructions.

PN THMS-01 str

SAFETY

HAZARDS WITH MAINTENANCE OF IMPLEMENT

				
Periodically inspect all moving parts, lubricate drivelines, and tighten all fasteners	Lower mower head to ground or block up before servicing	Stop engine remove key before conducting maintenance	Set mower head securely on the ground before servicing blades	Thrown Objects Hazard Ensure blades rotate clockwise viewed from above mower head



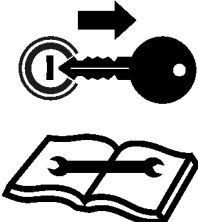
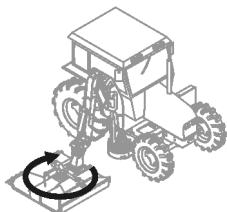
WARNING AVOID DEATH OR SERIOUS INJURY FROM COMPONENT FAILURE BY KEEPING IMPLEMENT IN GOOD OPERATING CONDITION IN PERFORMING PROPER SERVICE, REPAIRS AND MAINTENANCE.

BEFORE PERFORMING SERVICE, REPAIRS AND MAINTENANCE ON THE IMPLEMENT:

- STOP ENGINE AND PTO, engage parking brake, lower implement, allow all moving parts to stop and remove key before dismounting from tractor.
- PLACE implement on ground or securely block up raised equipment. Use large blocks on soft or wet soil.
- PUSH and PULL Remote Hydraulic Cylinder lever to relieve hydraulic pressure.
- DISCONNECT Pump solenoid valve or PTO driveline connection before servicing mower head.
- WEAR SAFETY GLASSES (with side shields marked to comply with ANSI Z87), PROTECTIVE GLOVES and follow SAFETY PROCEDURES when performing service, repairs and maintenance on the implement:
- Always WEAR protective GLOVES when handling blades, knives, cutting edges or worn component with sharp edges.
- Always WEAR GLOVES and SAFETY GLASSES when servicing hot components.
- AVOID CONTACT with hot hydraulic oil tanks, pumps, motors, valves and hose connection surfaces. Always WEAR GLOVES and SAFETY GLASSES when servicing hot components.
- SECURELY support or BLOCK UP raised implement, framework and lifted components before working underneath equipment.
- FOLLOW INSTRUCTIONS in maintenance section when replacing hydraulic cylinders to prevent component falling.
- STOP any implement movements and SHUT-OFF engine before doing any work procedures.
- USE ladder or raised stands to reach high equipment areas inaccessible from ground.
- ENSURE good footing by standing on solid flat surfaces when getting on implement to perform work.
- FOLLOW manufacturer's instructions in handling oils, solvents, cleansers, and other chemical agents
- DO NOT change any factory-set hydraulic calibrations to avoid component or equipment failures.
- DO NOT modify or alter implement, functions or components.
- DO NOT WELD or repair rotating mower components. These may cause vibrations and component failures being thrown from mower. *PN HMMS-01 str*

SAFETY

HAZARDS WITH MAINTENANCE OF IMPLEMENT - CONTINUED

				
Periodically inspect all moving parts, lubricate drivelines, and tighten all fasteners	Lower mower head to ground or block up before servicing	Stop engine remove key before conducting maintenance	Set mower head securely on the ground before servicing blades	Thrown Objects Hazard Ensure blades rotate clockwise viewed from above mower head

PERFORM SERVICE, REPAIRS, LUBRICATION AND MAINTENANCE OUTLINED IN IMPLEMENT MAINTENANCE SECTION:

- INSPECT for loose fasteners, worn or broken parts, leaky or loose fittings, missing or broken cotter keys and washers on pins, and all moving parts for wear.
- REPLACE any worn or broken parts with authorized service parts.
- Inspect mower blade spindle to ensure bearing pre-load. If loose repair before operating.
- LUBRICATE unit as specified by lubrication schedule
- NEVER lubricate, adjust or remove material while it is running or in motion.
- TORQUE all bolts and nuts as specified.

BLADE INSPECTION:

- Inspect blade carrier and blades daily.
- Check blade and blade carrier BOLT TORQUE daily. Loose bolts can cause blade or blade bolt failures.
- REPLACE, bent, damage, cracked and broken blades immediately with new blades.
- AVOID blade failures and thrown broken blades. DO NOT straighten, weld, or weld hard-facing blades

SAFETY SHIELDS, GUARDS AND SAFETY DEVICES INSPECTION:

- KEEP all Deflectors, Chain Guards, Steel Guards, Gearbox Shields, and PTO integral shields, Bands, Side Skirts and Skid Shoes in place and in good condition.
- REPLACE any missing, broken or worn safety shields, guards and safety devices.



WARNING Cancer and Reproductive Harm www.P65Warnings.ca.gov PN HMMS-02 str

SAFETY

PARTS INFORMATION

Mantis mowers use balanced and matched system components for blade carriers, blades, cuttershafts, knives, knife hangers, rollers, drivetrain components, and bearings. These parts are made and tested to Mantis specifications. Non-genuine "will fit" parts do not consistently meet these specifications. The use of "will fit" parts may reduce mower performance, void mower warranties, and present a safety hazard. Use genuine Mantis mower parts for economy and safety. (SPMM-1str)

See Your Mantis Dealer

Operator's & Parts Manuals

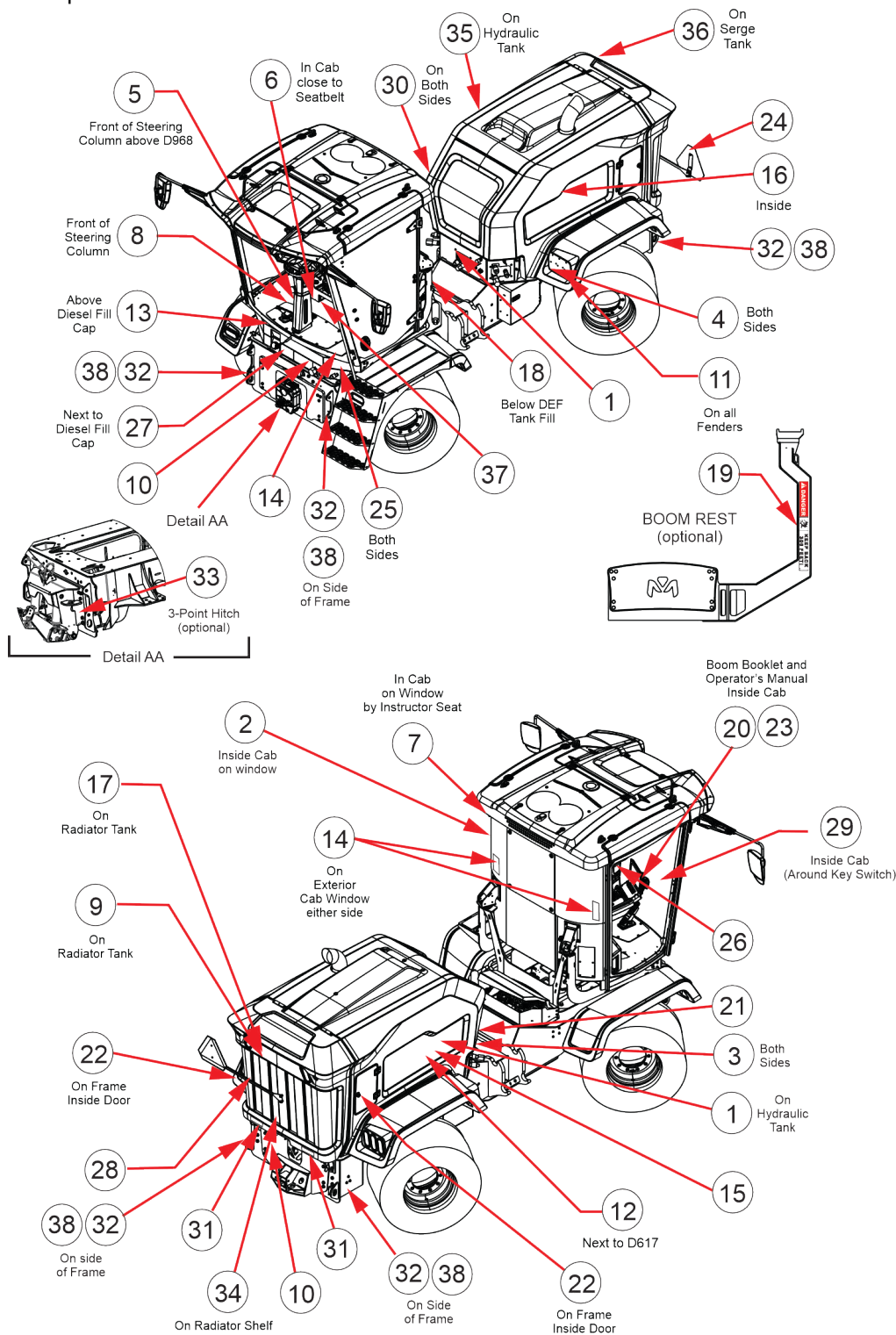


www.algqr.com/mom

SAFETY

DECAL LOCATION

NOTE: Mantis supplies safety decals on this product to promote safe operation. Damage to the decals may occur while in shipping, use, or reconditioning. Mantis cares about the safety of its customers, operators, and bystanders, and will replace the safety decals on this product in the field, free of charge. Contact your Mantis dealer to order replacement decals.



MANTIS 04/25

Safety Section 1-22

SAFETY

SAFETY

ITEM	PART NO.	QTY	TYPE	DESCRIPTION
1.	D617	2	WARNING	Hydraulic Hose Leak
2.	D1178	1	INSTRUCT	Emergency Exit Plate, Mantis
3.	D628	2	DANGER	Crushing Hazard & Pinch Points
4.	D876	2	WARNING	Crushing Hazard - Tire Extremely Heavy
5.	D960	1	WARNING	Proposition 65 - California
6.	D966	1	WARNING	Crushing Hazard - Roll Over Wear Seatbelt
7.	D967	1	WARNING	Injury Hazard - Instructor Seat Only for Training
8.	D968	1	CAUTION	Read and Understand Operator's Manual
9.	D969	1	WARNING	Pressurized Tank - Radiator Cap
10.	D970	2	DANGER	Entanglement Hazard - Driveline (optional)
11.	D971	4	WARNING	Fall Hazard
12.	D972	1	DANGER	Crushing Hazard - Don't Attempt to Jump Start
13.	D973	1	INSTRUCT	Ultra Low Sulfur Diesel Fuel Only
14.	D974	2	DANGER	Thrown Object Hazard
15.	D975	1	WARNING	Avoid Equipment and Grass Fire
16.	D976	1	WARNING	Hot Surface Hazard
17.	D592	1	WARNING	Keep Away - Hot Surface
18.	D979	1	INSTRUCT	DEF Only
19.	D1119	1	DANGER	Keep Back 300 Feet
20.	D965	1	INSTRUCT	Safety Booklet
21.	D1180	1	WARNING	Engine Cover Lift Switch
22.	D641	2	WARNING	Pinch Point Hazards
23.	32118001	1	INSTRUCT	Operator's Manual-Inside Cab
24.	03200347	1	REFLECT	SMV - Slow Moving Vehicle Emblem
25.	D1011	1	WARNING	Crushing Hazard - Block Up Unit
26.	D1013	1	DANGER	Electrocution Hazard
27.	D1031	1	WARNING	Proposition 65 - California Diesel
28.	D997	1	INSTRUCT	Safety Information Symbol - 25 MPH
29.	D1179	1	INSTRUCT	OFF/ON/START
30.	D683	2	DANGER	Crushing Hazard - Rotary (optional)
	D697	2	DANGER	Crushing Hazard - Flail (optional)
31.	1458392	2	LOGO	Red Reflectors
32.	D1177 (32121190)	4	INSTRUCT	Decal, Lift Point
33.	D1183	1	DANGER	Crushing Hazard, 3-Point Hitch (optional)
34.	D1176	1	WARNING	Always Use Safety Prop
35.	32113693	1	INSTRUCT	Hydraulic Fluid
36.	32113694	1	INSTRUCT	Coolant Service
37.	32113696	1	INSTRUCT	Console
38.	D982	4	INSTRUCT	Tie Down

SAFETY

DECAL DESCRIPTION

SAFETY

⚠ WARNING



TO AVOID DEATH OR SERIOUS INJURY FROM HIGH PRESSURE HYDRAULIC OIL LEAKS PENETRATING SKIN:

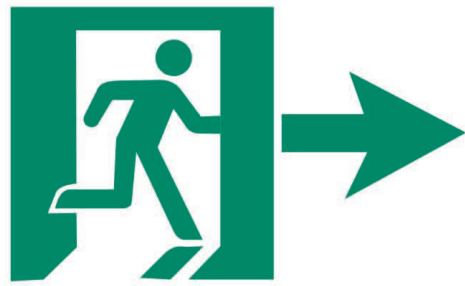
- DO NOT OPERATE equipment with oil or fuel leaks.
- KEEP all hydraulic hoses, lines and connections in good condition and tight before applying system pressure.
- Relieve hydraulic pressure before disconnecting lines or working on the system.
- REMOVE and replace hose if you suspect it leaks. Have dealer test it for leaks.

HIGH PRESSURE FLUID LEAKS CAN BE INVISIBLE. WHEN CHECKING FOR HYDRAULIC LEAKS AND WORKING AROUND HYDRAULIC SYSTEMS:

- DO NOT use hands to check for leaks.
- ALWAYS WEAR safety glasses with side shields (marked to comply with ANSI Z87) and impenetrable gloves.
- USE paper or cardboard to search for leaks.
- KEEP hands and body AWAY from pin holes and nozzles ejecting hydraulic fluid.
- Hydraulic fluid may cause gangrene if not surgically removed immediately by a doctor familiar with this form of injury.

D617

EMERGENCY EXIT

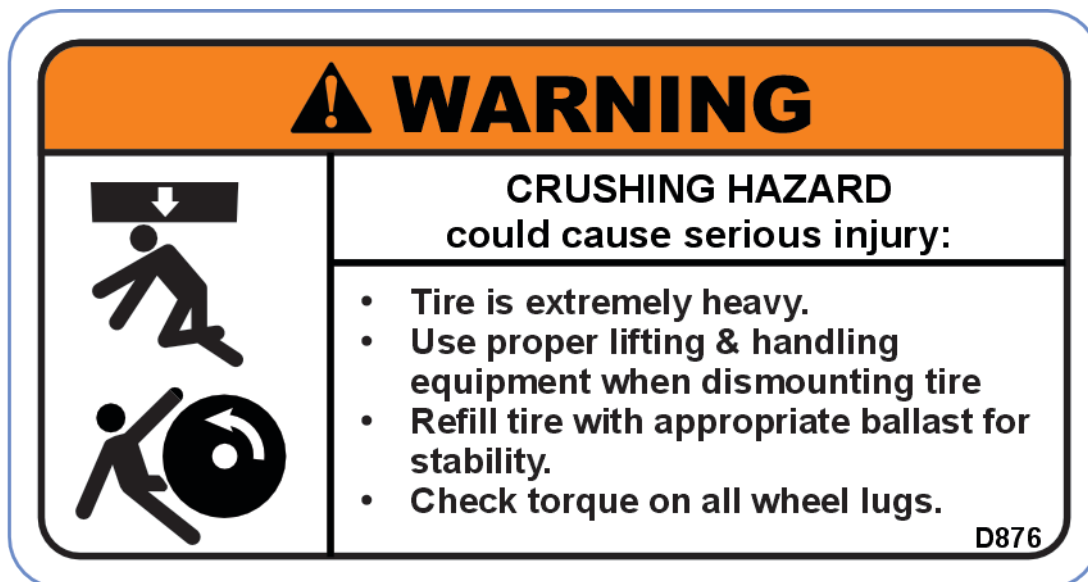


BREAK GLASS TO EXIT

D1178

SAFETY

SAFETY



SAFETY

SAFETY



WARNING



TO AVOID DEATH OR SERIOUS INJURY:

1. Read and understand Operator's Manual and safety signs before operating this mower.
2. Keep all shields and guards in place, replace damaged or missing shields and guards.
3. Do not allow riders except for instructional purposes.
4. Always use the instructional and operator's seat belts.
5. Do not start engine, lower or engage mower units until all bystanders are clear.
6. Keep hands, feet, clothing and hair away from moving parts.
7. Stop engine, remove key, set parking brake and wait for all movement to stop before servicing, adjusting or unclogging machine.
8. Reduce speed when turning, while on rough ground or on wet steep slopes.
9. Avoid contact with overhead power lines.
10. Always use flashing warning lights when traveling on a public roadway.
11. Stop engine, remove key and set park brake before leaving machine unattended.

D968



WARNING



PRESSURIZED TANK RADIATOR CAP IS PRESSURE RELIEF CAP

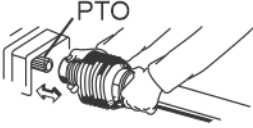
TO AVOID DEATH OR SERIOUS INJURY FROM HIGH PRESSURE FLUID:

- STAY AWAY from high pressure fluid that may spray out of tank.
- ALLOW radiator to cool down BEFORE removing cap .
- SLOWLY remove cap to relieve pressure BEFORE removing completely.

D969

SAFETY

SAFETY

! DANGER		
		
TO AVOID DEATH OR SERIOUS INJURY FROM DRIVELINE CONTACT, DRIVELINE SEPARATION OR PTO STUB SHAFT FAILURE: ● STOP, LOOK and LISTEN for rotating motion before approaching implement. ● STAY AWAY and KEEP hands, feet and body AWAY from rotating parts until all moving elements have stopped. ● ALWAYS shut off PTO before dismounting. ● DO NOT operate if PTO shields are damaged or missing. ● PUSH AND PULL on yoke until collar clicks and locks yoke in place. ● CHECK driveline guards for free rotation and sufficient overlap to avoid unshielded areas. ● DO NOT USE PTO ADAPTER		
		D970

! DANGER	
	CRUSHING HAZARD Start Only from the operator's seat. Do not attempt to jump start terminals.
	D972

SAFETY

SAFETY

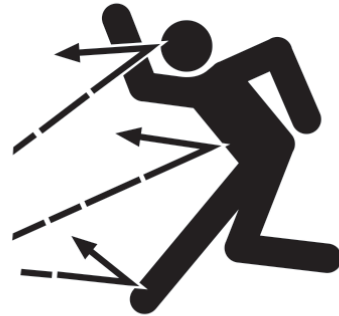
Ultra Low
Sulfur Diesel
fuel only.

D973

DEF
only

D979

 **DANGER**



**THROWN OBJECT
HAZARD**

**TO AVOID DEATH OR
SERIOUS INJURY :**

DO NOT OPERATE if
Thrown Object Shielding
is damaged or missing.
Always maintain Thrown
Object Shielding in good
condition.

D974

 **WARNING**

**TO AVOID EQUIPMENT AND
GRASS FIRES:**

- Do not operate Engine if oil or fuel leaks are observed.
- Clear away grass and debris from engine and hydraulic lines.
- Disconnect electrical switch when in storage or during maintenance.

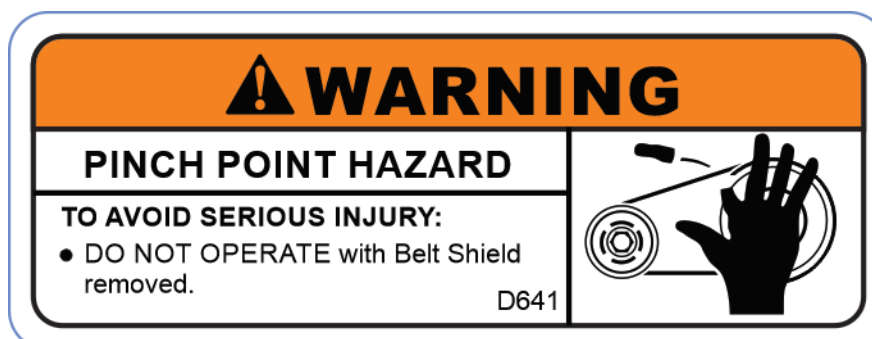
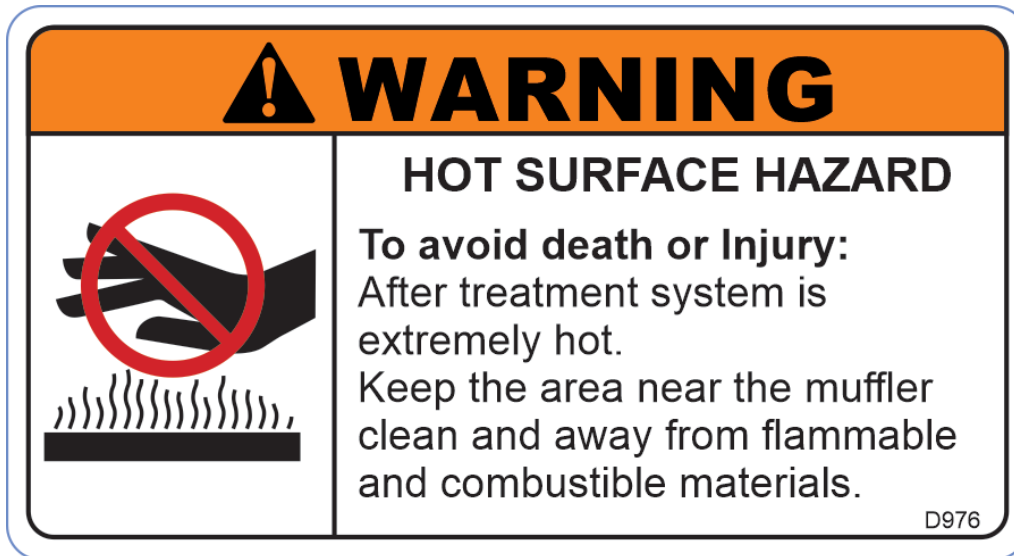
D975



SWITCH

SAFETY

SAFETY



SAFETY



WARNING

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65Warnings.ca.gov

D1031



WARNING



Crushing Hazard

To Avoid Death or Serious Injury by Crushing:

- Before servicing be sure machine is on level surface, parking brake engaged, attachments lowered, engine shut off, key removed, and battery disconnected.
- When servicing implements or power unit ensure that they are supported by jack stands rated to hold implements weight.
- Never support implements with cinder blocks or hollow tiles or props that could crumble with continuous load.
- Never support with hydraulic jack.

D1011

SAFETY

⚠ WARNING



USE
SEAT
BELT

CRUSHING HAZARD

- Always Wear Seatbelt and securely fasten around your body.
- Do not attempted to jump, if machine tips.
- Keep Rollover Protection is in good working condition.
- Maintain unimpaired operator protection and manufacture's ROPS certification.
- Damaged ROPS structures must be replaced, not repaired or revised.
- Any alteration to the ROPS must be approved by the manufacturer.

D966

⚠ WARNING

RUN-OVER HAZARD



To avoid death or serious injury from being run-over;

- Do not allow riders at anytime on any part of machine.
- Riders could fall and be run-over by machine.

D971

⚠ WARNING



INJURY HAZARD

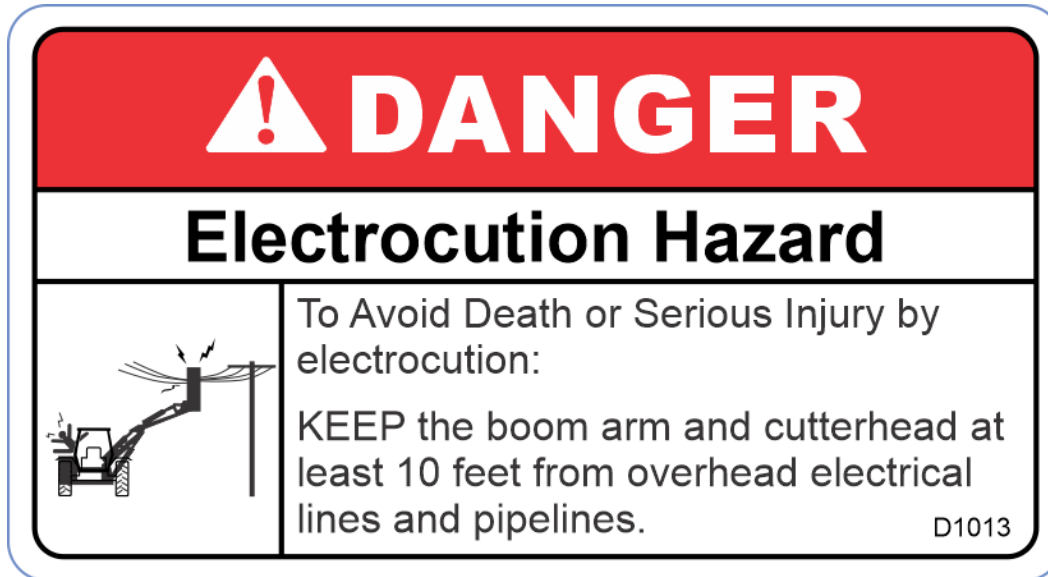
The Instructor seat has been provided only for training operators or diagnosing machine problems.

- Keep all other riders, including children off of tractor and equipment.
- Always wear the seat belt.

D967

SAFETY

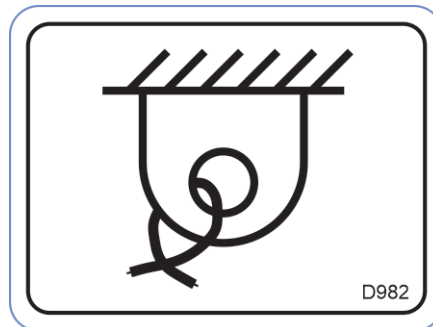
SAFETY

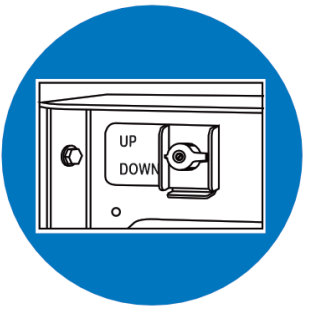


SAFETY

SAFETY

! DANGER	
CRUSHING HAZARD	
	To avoid death or serious injury from 3-Point unit falling: • Ensure 3-Point valve is in the maintenance position before working on unit. • Ensure attachment is on level ground and blocked up. • CLEAR AREA OF PERSONS near or under equipment D1183
 3-Point Valve Maintenance Position	



! WARNING	
	TO AVOID DEATH OR SERIOUS INJURY: • Keep all persons away from the engine and engine cover lift when operating engine cover lift switch. • Never remove switch guard and replace if missing. • Do not operate engine cover lift switch without switch guard in place. D1180

SAFETY

SAFETY

NOTICE: HYDRAULIC FLUID SHOULD BE SERVICED BY A QUALIFIED SERVICE TECHNICIAN. USE ONLY HYDRAULIC OIL THAT MEETS THE REQUIREMENTS OF BOSCH REXROTH RIDE 90235 OR BOSCH REXROTH FLUID RATING LIST RDE 90245 VISCOSITY 68 @ (40°C),CST/AW68.

KNOWN PRODUCTS THAT MEET OR EXCEED THAT SPECIFICATION:
CNH PREMIUM HYDRAULIC OIL HM/HV 68
MOBILE DTE 20 ULTRA ISO GRADE 68
SHELL TELLUS S2MX68

32113693

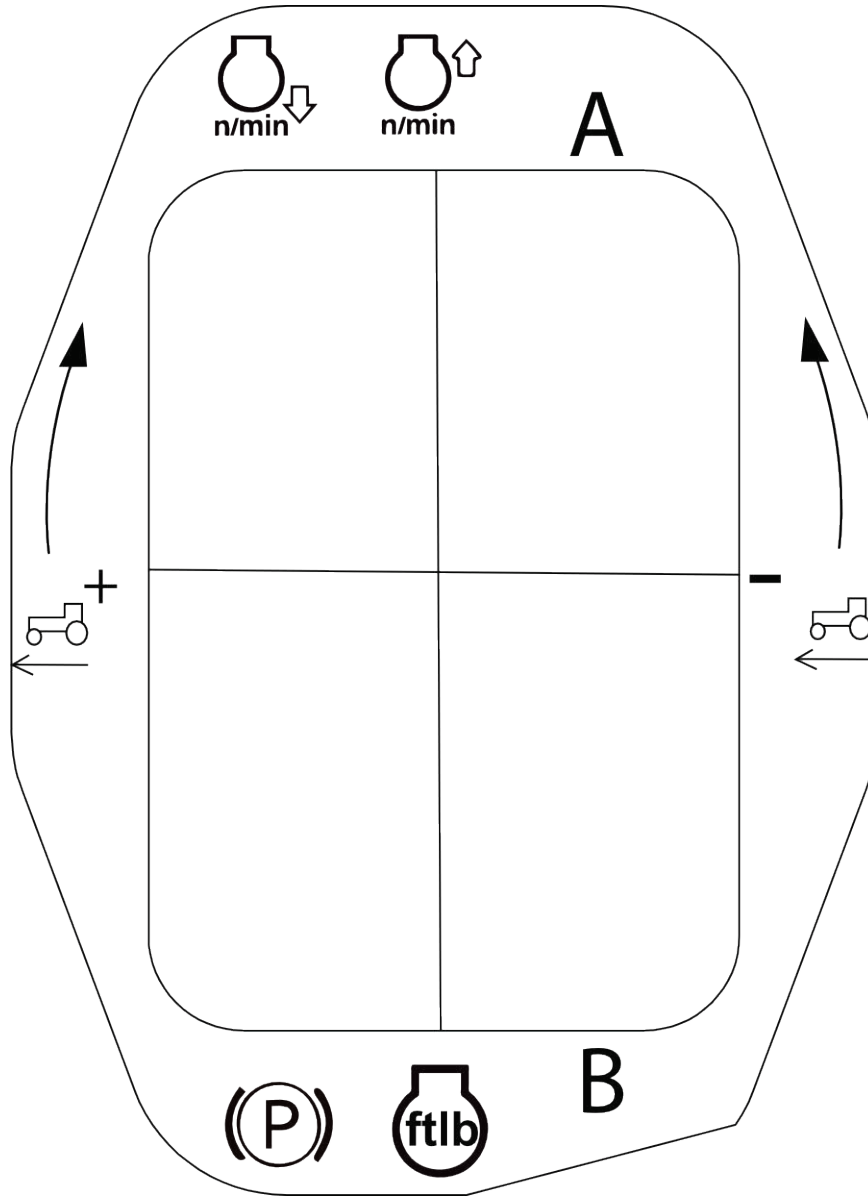
NOTICE: ENGINE COOLANT FLUID SHOULD BE SERVICED BY A QUALIFIED SERVICE TECHNICIAN. USE ONLY A 50/50 MIX, HIGH QUALITY, EXTENDED LIFE, NITRITE FREE ANTIFREEZE/COOLANT (AFC) DESIGNED FOR DIESEL ENGINES.

KNOWN PRODUCTS THAT MEET OR EXCEED THAT SPECIFICATION:
SHELL ROTELLA ETC
PRESTONE COR-GUARD COMMAND
PEAK FINAL CHARGE PRO

32113694

SAFETY

SAFETY



32113696

SAFETY

FEDERAL LAWS AND REGULATIONS

This section is intended to explain in broad terms the concept and effect of federal laws and regulations concerning employer and employee equipment operators. This section is not intended as a legal interpretation of the law and should not be considered as such.

Employer-Employee Operator Regulations

U.S. Public Law 91-596 (The Williams-Steiger Occupational and Health Act of 1970) OSHA

This Act Seeks:

“...to assure so far as possible every working man and woman in the nation safe and healthful working conditions and to preserve our human resources...”

DUTIES

Sec. 5 (a) Each employer-

- (1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;
- (2) shall comply with occupational safety and health standards promulgated under this Act.
- (b) Each employee shall comply with occupational safety and health standards and all rules, regulations and orders issued pursuant to this Act which are applicable to his own actions and conduct.

OSHA Training Requirements

Title 29, Code of Federal Regulations Part 1928.57(a)(6). www.osha.gov

Operator instructions. At the time of initial assignment and at least annually thereafter, the employer shall instruct every employee who operates an agricultural tractor and implements in the safe operating practices and servicing of equipment with which they are or will be involved, and of any other practices dictated by the work environment.

Keep all guards in place when the machine is in operation.

Permit no riders on equipment.

Stop engine, disconnect the power source, and wait for all machine movement to stop before servicing, adjusting, cleaning, or unclogging the equipment, except where the machine must be running to be properly serviced or maintained, in which case the employer shall instruct employees as to all steps and procedures which are necessary to safely service or maintain the equipment.

Make sure everyone is clear of machinery before starting the engine, engaging power, or operating the machine.

Employer Responsibilities:

To ensure employee safety during Tractor and Implement operation, it is the employer's responsibility to:

1. Train the employee in the proper and safe operation of the Tractor and Implement.
2. Require that the employee read and fully understand the Tractor and Implement Operator's Manual.
3. Permit only qualified and properly trained employees to operate the Tractor and Implement.
4. Maintain the Tractor and Implement in a safe operational condition and maintain all shields and guards on the equipment.
5. Ensure the Tractor is equipped with a functional ROPS and seat belt and require that the employee operator securely fasten the safety belt and operate with the ROPS in the raised position at all times.
6. Forbid the employee operator to carry additional riders on the Tractor or Implement.
7. Provide the required tools to maintain the Tractor and Implement in a good safe working condition and provide the necessary support devices to secure the equipment safely while performing repairs and service.
8. Require that the employee operator stop operation if bystanders or passersby come within 300 feet.

Child Labor Under 16 Years of Age

Some regulations specify that no one under the age of 16 may operate power machinery. It is your responsibility to know what these regulations are in your own area or situation. (Refer to U.S. Dept. of Labor, Employment Standard Administration, Wage & Home Division, Child Labor Bulletin #102.)

INTRODUCTION SECTION

Introduction Section 2-1

INTRODUCTION

INTRODUCTION

We are pleased to have you as an MANTIS customer. Your self-propelled machine has been designed with care and built with quality materials by skilled workers to give maximum service with minimum down time. This manual is provided to give you the necessary operating and maintenance instructions to keep your machine in top operating condition. Responsible use and timely service will save extensive repairs and downtime losses. Please read this manual thoroughly. Understand what each control is for and how to use it.

Safety is of primary importance to the owner/operator and to the manufacturer. The first section of this manual includes a listings of safety messages that will help protect the operator and bystanders from injury or death. Some safety messages are repeated throughout the manual. The owner/operator/dealer should understand these safety messages and be aware of the hazards of operating and maintaining. The safety alert symbol combined with a signal word, as seen below, is intended to warn the owner/operator of impending hazards and the degree of possible injury or property damage faced when operating or maintaining this machine.



Indicates a hazardous situation that, if not avoided, **WILL** result in **DEATH OR VERY SERIOUS INJURY**.



Indicates a hazardous situation that, if not avoided, **COULD** result in **DEATH OR SERIOUS INJURY**.



Indicates a hazardous situation that, if not avoided, **MAY** result in **MINOR OR MODERATE INJURY**.



Identifies special instructions or procedures that, if not strictly observed, could result in damage to, or destruction of the machine, attachments or the environment.



Indicates information considered important, but not hazard-related (e.g. messages relating to property damage).

Note: Identifies points of particular interest for more efficient and convenient operation or repair.

INTRODUCTION



INTRODUCTION

The Mantis gives you a wide array of attachment possibilities with its' quick change-out, mid-mounting features, and optional front and rear attachments. Conduct roadside mowing one day and clear the snow from the streets the next day.

Mantis
Web Page



www.algqr.com/mwe

WIDE AREA MOWER (201P MODEL REQUIRED)

- Hydraulically driven-two wing mowers with center deck out front with option of rotary or flail type
- Telescopic side wing mowers raise or lower within 5 seconds
- Adjustable mowing heights between 1–9 inches
- Domed mower decks prevent heavy debris accumulation
- Float capability
- Flail knives available in 3 oz. and 4 oz. weights
- Cutting Swath: 17' to 23'
- An optional front mower offset kit allows for a 24" hydraulic shift to the left & right of centerline

HEAVY BOOM MOWER

- Available Boom Lengths - 24' and 30'
- Exclusive Design - Boom features a 180° front to back hydraulic swing utilizing a turret-style mechanism fastened to a slewing ring bearing.
- Ease of Transport - Two-piece boom rest is mounted to the tractor to cradle the boom securely when in transport position.
- Operator Safety - Polycarbonate window protection is standard equipment.
- Hydraulic System - Self contained hydraulic circuit for both mowing head and boom control, front-mounted hydraulic reservoir for improved visibility, safety and operator access.
- Minimum Tractor Requirement - 90 PTO HP, 100 wheelbase, 4WD 10,000 LB shipping weight.
- Warranty - One Year parts and labor. Non-governmental users subject to a modified policy. Only genuine MANTIS OEM parts may be used for warranty replacement.

FRONT ATTACHMENT

- Most 3PT Category II Implements

Direction

Throughout this Manual front and rear, left and right are determined by the normal direction of travel, the same as driving an automobile.

INTRODUCTION

ATTENTION OWNER/OPERATOR

BEFORE OPERATING THIS MACHINE:

1. Carefully read the Operator's Manual, completely understand the Safety Messages and instructions, and know how to operate correctly both the tractor and implement.
2. Fill out the Warranty Card in full. Be sure to answer all questions, including the Serial Number of the implement. Mail within 30 days of delivery date of this implement.

NOTE: Warranties are honored only if completed "Owner Registration and Warranty" forms are received by MANTIS within thirty days of delivery of the implement.

3. Record the Model and Serial Numbers on the Warranty page at the front of the Operator's Manual. Keep this as part of the permanent maintenance file for the implement.

INTRODUCTION

MANTIS LIMITED WARRANTY

1. LIMITED WARRANTIES

- 1.01. Mantis warrants for one year from the purchase date to the original non-commercial, governmental, or municipal purchaser ("Purchaser") and warrants for six months to the original commercial or industrial purchaser ("Purchaser") that the goods purchased are free from defects in material or workmanship.
- 1.02. Manufacturer will replace for the Purchaser any part or parts found, upon examination at one of its factories, to be defective under normal use and service due to defects in material or workmanship.
- 1.03. This limited warranty does not apply to any part of the goods which has been subjected to improper or abnormal use, negligence, alteration, modification, or accident, damaged due to lack of maintenance or use of wrong fuel, oil, or lubricants, or which has served its normal life. This limited warranty does not apply to any part of any internal combustion engine, or expendable items such as blades, shields, guards, or pneumatic tires except as specifically found in your Operator's Manual.
- 1.04. Except as provided herein, no employee, agent, Dealer, or other person is authorized to give any warranties of any nature on behalf of Manufacturer.

1. REMEDIES AND PROCEDURES

- 2.01. This limited warranty is not effective unless the Purchaser returns the Registration and Warranty Form to Manufacturer within 30 days of purchase.
 - 2.02. Purchaser claims must be made in writing to the Authorized Dealer ("Dealer") from whom Purchaser purchased the goods or an approved Authorized Dealer ("Dealer") within 30 days after Purchaser learns of the facts on which the claim is based.
 - 2.03. Purchaser is responsible for returning the goods in question to the Dealer.
 - 2.04. If after examining the goods and/or parts in question, Manufacturer finds them to be defective under normal use and service due to defects in material or workmanship, Manufacturer will:
 - (a) Repair or replace the defective goods or part(s) or
 - (b) Reimburse Purchaser for the cost of the part(s) and reasonable labor charges (as determined by Manufacturer) if Purchaser paid for the repair and/or replacement prior to the final determination of applicability of the warranty by Manufacturer.
- The choice of remedy shall belong to Manufacturer.
- 2.05. Purchaser is responsible for any labor charges exceeding a reasonable amount as determined by Manufacturer and for returning the goods to the Dealer, whether or not the claim is approved. Purchaser is responsible for the transportation cost for the goods or part(s) from the Purchaser to the Dealer

1. LIMITATION OF LIABILITY

- 3.01. MANUFACTURER DISCLAIMS ANY EXPRESS (EXCEPT AS SET FORTH HEREIN) AND IMPLIED WARRANTIES WITH RESPECT TO THE GOODS INCLUDING, BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
- 3.02. MANUFACTURER MAKES NO WARRANTY AS TO THE DESIGN, CAPABILITY, CAPACITY, OR SUITABILITY FOR USE OF THE GOODS.
- 3.03. EXCEPT AS PROVIDED HEREIN, MANUFACTURER SHALL HAVE NO LIABILITY OR RESPONSIBILITY TO PURCHASER OR ANY OTHER PERSON OR ENTITY WITH RESPECT TO ANY LIABILITY, LOSS, OR DAMAGE CAUSED OR ALLEGED TO BE CAUSED DIRECTLY OR INDIRECTLY BY THE GOODS INCLUDING, BUT NOT LIMITED TO, ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES RESULTING FROM THE USE OR OPERATION OF THE GOODS OR ANY BREACH OF THIS WARRANTY. NOTWITHSTANDING THE ABOVE LIMITATIONS AND WARRANTIES, MANUFACTURER'S LIABILITY HEREUNDER FOR DAMAGES INCURRED BY PURCHASER OR OTHERS SHALL NOT EXCEED THE PRICE OF THE GOODS.
- 3.04. NO ACTION ARISING OUT OF ANY CLAIMED BREACH OF THIS WARRANTY OR TRANSACTIONS UNDER THIS WARRANTY MAY BE BROUGHT MORE THAN TWO (2) YEARS AFTER THE CAUSE OF ACTION HAS OCCURRED.

1. MISCELLANEOUS

- 4.01. Proper Venue for any lawsuits arising from or related to this limited warranty shall be only in Guadalupe County, Texas
- 4.02. Manufacturer may waive compliance with any of the terms of this limited warranty, but no waiver of any terms shall be deemed to be a waiver of any other term.
- 4.03. If any provision of this limited warranty shall violate any applicable law and is held to be unenforceable, then the invalidity of such provision shall not invalidate any other provisions herein.
- 4.04. Applicable law may provide rights and benefits to purchaser in addition to those provided herein.

KEEP FOR YOUR RECORDS

ATTENTION: Purchaser should fill in the blanks below for his reference when buying repair parts and/or for proper machine identification when applying for warranty.

Mantis Model _____ Serial Number _____

Date Purchased _____ Dealer _____

ATTENTION: READ YOUR OPERATOR'S MANUAL

MANTIS

An Alamo Group Company
Post Office Drawer 549
Seguin, Texas 78156
830-379-1480



OPERATION SECTION

Operation Section 3-1

OPERATION

OPERATION

MANTIS PRIME MOVER

Mantis self-propelled vehicles are manufactured with quality material by skilled workers. The vehicle is designed to attach to, and operate various attachment heads for a wide range of vegetative maintenance applications. The base machine and attachments are equipped with safety warning decals, protective deflectors, shields, and other safety features to provide operator and passerby protection, however, no shielding is 100% accurate. ALL safety equipment and safety warning decals must be maintained on the unit in good operational condition at all times. It is the operator's responsibility to be knowledgeable of all potential operating hazards and to take every reasonable precaution to ensure oneself, others, animals, and property are not injured or damaged by the mower, power unit, or a thrown object. Do not operate the mower if passersby, pets, livestock, or property are within 300 feet of the unit unless:

- All THROWN OBJECT SHIELDING including, Front, Rear Deflectors and Skid Shoes are in place and in good condition when mowing.
- Mower is adjusted to be close and parallel to ground without exposing blades.
- MOWING AREA has been inspected and foreign materials and debris have been removed.
- PASSERSBY are inside enclosed vehicle.

This section of the operator's manual is designed to familiarize, instruct, and educate safe and proper use to the operator. Pictures contained in this section are intended to be used as a visual aid to assist in explaining operation and some pictures may show shields removed or assemblies partially disassembled for purposes of clarity.

NEVER OPERATE this implement without all shields in place and in good operational condition. The operator must be familiar with the power unit and attachment operation along with all associated safety practices before operating the power unit and attachments. Proper operation of the machine, as detailed in this manual, will help ensure years of safe and satisfactory use of the mower

READ AND UNDERSTAND THE ENTIRE OPERATING INSTRUCTIONS AND SAFETY SECTION OF THIS MANUAL AND THE TRACTOR MANUAL BEFORE ATTEMPTING TO USE THE TRACTOR AND IMPLEMENT. If you do not understand any of the instructions, contact your nearest authorized dealer for a full explanation. Pay close attention to all safety signs and safety messages contained in this manual and those affixed to the implement and tractor. *OPS-U- 0001str*

READ, UNDERSTAND, and FOLLOW the following Safety Messages. Death or serious injury may occur unless care is taken to follow the warnings and instructions stated in the Safety Messages. Always use good common sense to avoid hazards. (SG-2str)



Si no lee ingles, pida ayuda a alguien que si lo lea para que le traduzca las medidas de seguridad. (SG-3) str



OPERATION

1. OPERATOR REQUIREMENTS

Safe operation of the unit is the responsibility of a qualified operator. A qualified operator has read and understands the implement and tractor Operator's Manuals and is experienced in implement and tractor operation and all associated safety practices. In addition to the safety messages contained in this manual, safety signs are affixed to the implement and tractor. If any part of the operation and safe use of this equipment is not completely understood, consult an authorized dealer for a complete explanation.

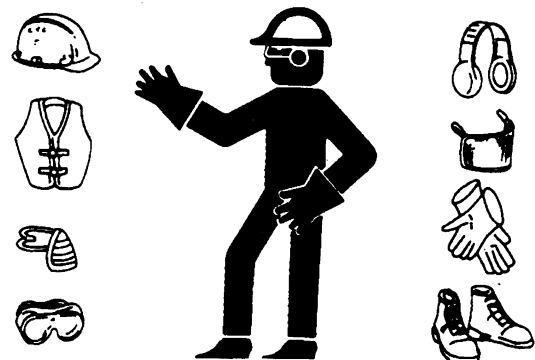
If the operator cannot read the manuals for themselves or does not completely understand the operation of the equipment, it is the responsibility of the supervisor to read and explain the manuals, safety practices, and operating instructions to the operator.

Safe operation of equipment requires that the operator wear approved Personal Protective Equipment (PPE) for the job conditions when attaching, operating, servicing, and repairing the equipment. PPE is designed to provide operator protection and includes the following safety wear:

PERSONAL PROTECTIVE EQUIPMENT (PPE)

- Always Wear Safety Glasses (with side shields marked to comply with ANSI Z87)
- Hard Hat
- Steel Toe Safety Footwear
- Gloves
- Hearing Protection
- Close Fitting Clothing
- Respirator or Filter Mask (depends on operating conditions)

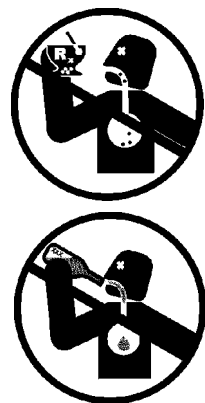
OPS-U- 0002str



⚠ DANGER

DO NOT use drugs or alcohol immediately before or while operating the Tractor and Implement. Drugs and alcohol will affect an operator's alertness and coordination and therefore affect the operator's ability to operate the equipment safely. Before operating the Tractor or Implement, an operator on prescription or over-the-counter medication must consult a medical professional regarding any side effects of the medication that would hinder their ability to operate the Equipment safely. NEVER knowingly allow anyone to operate this equipment when their alertness or coordination is impaired. Serious injury or death to the operator or others could result if the operator is under the influence of drugs or alcohol.

(SG-27) str



OPERATION

2. PRE-OPERATION INSPECTION AND SERVICE

Before each use, a pre-operation inspection and service of the implement and power unit must be performed. This includes routine maintenance and scheduled lubrication, inspecting that all safety devices are equipped and functional, and performing needed repairs. DO NOT operate the unit if the pre-operation inspection reveals any condition affecting safe operation. Perform repairs and replacement of damaged and missing parts as soon as noticed. By performing a thorough pre-operation inspection and service, valuable down time and repair cost can be avoided.



Always disconnect the main PTO driveline from the power unit before performing service on an implement. Never work on an implement with the power unit PTO driveline connected and running. Rotating parts, blades or drivelines could turn without warning and cause immediate entanglement, injury or death.



DO NOT allow any person under a folded wing unless wing is securely locked up or supported. DO NOT approach the implement unless the power unit is turned off and all motion has ceased. Never work under the frame work, or any lifted component unless the implement is securely supported or blocked up. A sudden or inadvertent fall by any of these components could cause serious injury or even death.



All safety shields, guards and safety devices including (but not limited to) - the deflectors, chain guards, steel guards, gearbox shields, PTO integral shields, and retractable door shields should be used and maintained in good working condition. All safety devices should be inspected carefully at least daily for missing or broken components. Missing, broken, or worn items must be replaced at once to reduce the possibility of injury or death from thrown objects, entanglement, or blade contact.

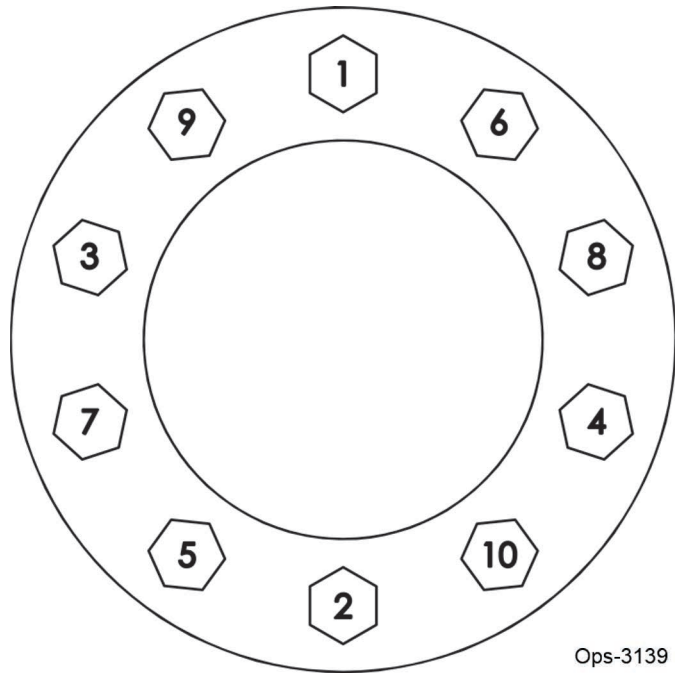
OPERATION

OPERATION

2.1 Power Unit Pre-Operation Inspection/Service

The following are some of the items that require daily service and inspection:

- Tire condition/air pressure
- Wheel lug bolts
- PTO shield
- SMV sign is clean and visible
- Power Unit's lights are clean and functional
- Power Unit seat belt is in good condition
- Power Unit ROPS is in good condition
- No power unit fluid leaks
- Remove debris from radiator screen
- Radiator free of debris
- Engine oil level and condition
- Engine coolant level and condition
- Hydraulic oil level
- Hydraulic fluid filter condition
- Fuel and DEF levels
- Sufficient lubrication at all lube points
- Engine air filter condition
- No indicator/warning lights on
- Counterweights (where applicable) are properly installed if side attachment is being used that affects the stability of the unit.



The operator's manual and safety signs affixed on the unit contain important instructions on the safe and proper use of the equipment. Maintain these important safety features on the implement in good condition to ensure the information is available to the operator at all times.

- Ensure a operator's manual is in the manual pocket located in the cabin behind the operator's seat.
- Ensure all safety signs are in place and legible. Replace missing, damaged, and illegible decals.



OPERATION

Mantis PRE-OPERATION Inspection



Mantis S/N# _____ Make: _____

Date: _____ Shift: _____



WARNING

Before conducting the inspection, make sure the Mantis engine is off, all rotation has stopped and is in park with the parking brake engaged. Make sure the mower is resting on the ground or securely blocked up and all hydraulic pressure has been relieved.

Item	Condition at Start of Shift	Specific Comments if not OK
The tires are in good condition with proper pressure		
The wheel lug bolts are tight		
The right side Polycarbonate window is intact		
The ROPS is in good condition		
The hydraulic tank level is full		
There are no visible oil leaks		
The engine oil level is full		
The SMV sign is clean and visible		
The engine coolant level is full		
The air filter is in good condition		
The radiator is free of debris		
The engine belts are in good condition		
The fan blades are not damaged		
The drawbar pins are securely in place, if equipped		
The 3-Point hitch is in good condition, if equipped		
The mirrors are clean and adjusted		
The seatbelt is in place and in good condition		
The DEF level is adequate		
The fuel level is adequate		
The beacon lights function properly		
The hydraulic controls function properly		
The brakes are in good condition		
The steering linkage is in good condition		

Operator's Signature: _____

DO NOT OPERATE an UNSAFE POWER UNIT or MOWER

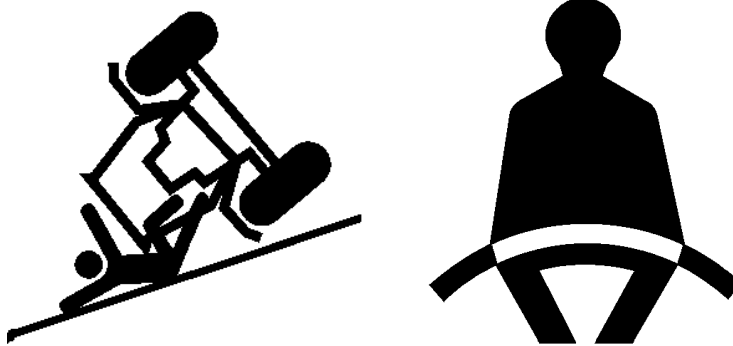
This Inspection Form may be freely duplicated for extra copies.

OPERATION

2.2 ROPS and Seat Belt

The power unit is equipped with a Fixed Cab ROPS designed and tested to ISO 8082-1 and seat belt to hold the operator within a "zone of safety", especially during a roll over where the driver could otherwise be crushed and killed.

The rotating cab ROPS was designed and tested to: ISO 8082-2.



Operate this equipment only with the approved ROPS in place. Always wear seat belts. Serious injury or even death could result from falling off the power unit--particularly during a rollover when the operator may become pinned or crushed by the machine.

2.3 Seat

Seat Handling

Seat weights: 17÷21 daN for seats without suspension completely accessorized, 35÷43 daN for seats with suspension completely accessorized (add 10 daN if the rotating plate is present). The seats must be moved by hand using one or more persons according to the instructions given in current standards.

Weight Adjustment

Make the adjustment while the operator is seated, so that the seat is loaded.

Pneumatic Suspension:

Press the button to load the suspension, pull the button to unload it. The correct adjustment is reached when the seat height is taken to half the travel stroke of the suspension. Adjusting according to the weight read on the indicator if the seat is equipped with a window with weight indicator. If the suspension does not have mechanical height limiting device, both the weight adjustment and the height limit are carried out with the button.



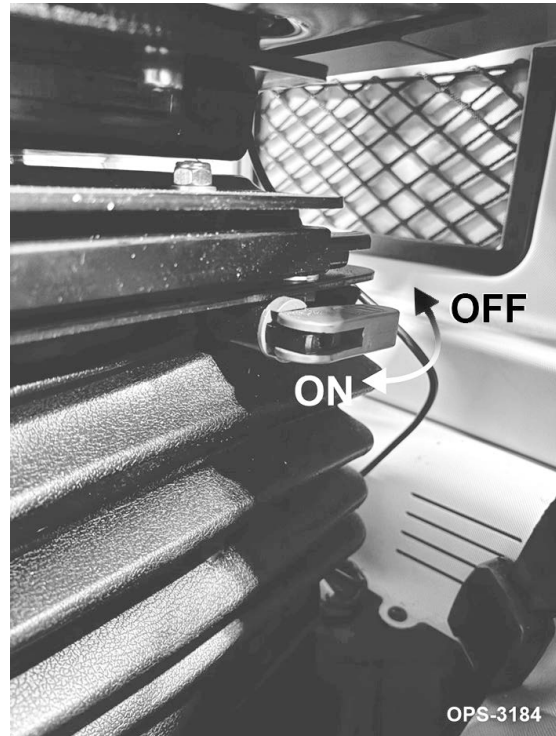
OPERATION

OPERATION

Antishock (Horizontal Shock Absorber)

It cushions the longitudinal shocks (in direction of movement). It can be on or off. It is turned on or off by turning the lock/release lever.

OFF Longitudinal Shock Absorber Off
ON Longitudinal Shock Absorber On



Longitudinal Adjustment

For seats with suspensions, pull the adjustment lever upward to unlock the guides. For seats without suspension (equipped with guides only), move the adjustment lever to the right to unlock the guides. The lever may be on the left guide of the seat. When adjustment is completed, ensure that the lever "Click" and locks the guides. Check that the seat does not move longitudinally.



Adjustment Lever

OPERATION

Arms

The arms can be tilted backwards up to reaching the vertical position.

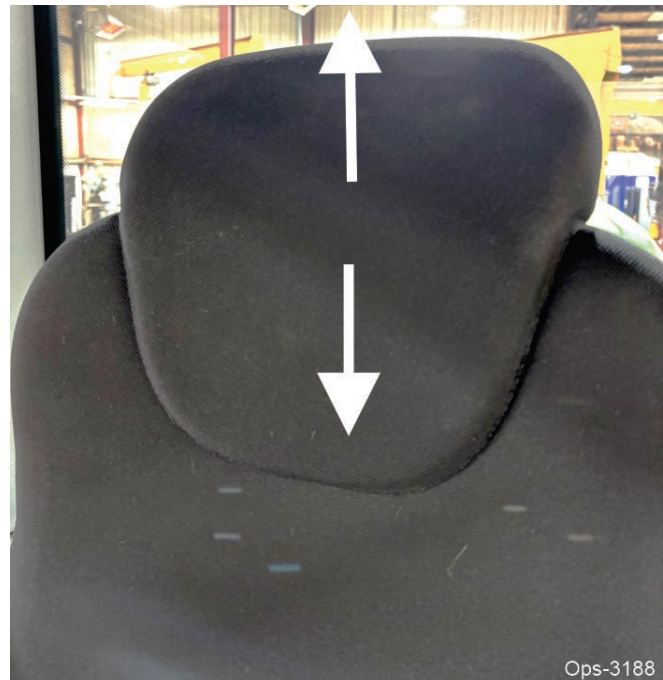
Height is adjusted (4 positions) for each arm by unscrewing handle E, using the nut below with a hexagon wrench 13. Adjust the vertical position of the arm, fasten the nut and screw the knob back on.

The arm angle is adjusted by turning the ring nut place below the arm.



Extension Of The Seatback

Adjust by pulling the extension of the seatback upward or downward until reaching one of the five positions. The extension of the seatback can be removed by pulling upward with force.



OPERATION

OPERATION

Inclination Of The Seatback

Make the adjustment while the operator is seated and resting against the seatback.

Use the blocking lever by pulling it upwards to unlock the adjustment mechanism.

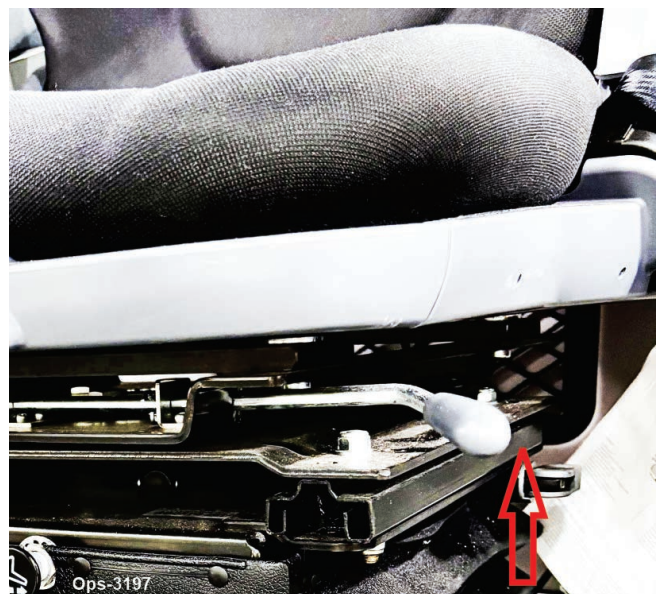
While keeping the lever in the release position, with the back oppose the rotation movement of the seatback (it pushes towards the operator) up to finding the optimum angle; release the blocking lever and check that the mechanism “clicks”, blocking the seatback in position.

IMPORTANT: If the operator is not seated, operate the blocking lever keeping a hand placed on the upper part of the seatback to prevent the seatback from springing forward.



Rotating Plate

Raise the lever to unlock the rotating plate and with your body weight, applying pressure on the seat, turn it until you reach the correct position. When adjustment is completed, ensure that the lever “Clicks” and locks the seat. Check that the seat does not turn.



OPERATION

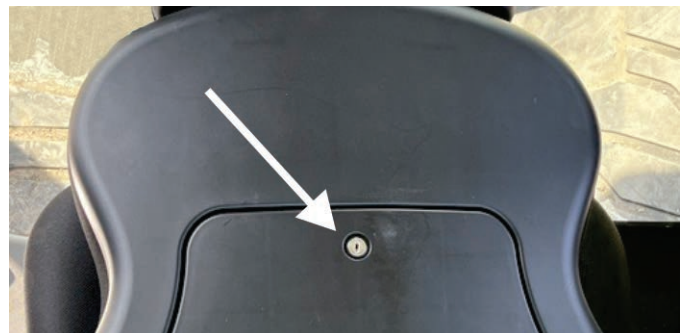
Lumbar Adjustment

Adjust using the knob placed on the right side of the seatback cowling. Turning the knob upwards, the seatback roundness increases; turning the knob downwards, the seatback roundness decreases. The adjustment is continuous.



Document Holder Pocket

The document holder is used to hold format documents. The pocket opens and closes with key rotation. The pocket cover is to be turned backwards to access the pocket compartment.



OPERATION

OPERATION

Abdominal Safety Belt

Static Safety Belt: Adjust the length based on the operator' abdominal size while he is resting against the seatback, and keeping the safety belt adherent to the lower part of the abdomen on the thigh side. Adjustment is automatic is fastened by trying to remove it, pulling on the belt. This winding operation blocks the belt when the safety belt is fastened. Check that the belt is locked by trying to slowly slip it out of the winding mechanism. Unfasten the safety belt by pressing on the red buckle button until it clicks and the tongue is released.



2.4 Fire Extinguisher

The power unit is equipped with a fire extinguisher mounted on the rear cab entry handrail as shown in the picture below. Inspect the fire extinguisher charge level weekly to ensure that it will be in working order if it is needed. Once a fire extinguisher has been used, it will need to be recharged or replaced. Due to the possibility of dried vegetation igniting on hot engine and machine components, never operate the machine without a fire extinguisher available and clear debris from the machine daily, or more often if required



Never attempt to remove the fire extinguisher if the operator cannot safely remove the fire extinguisher from the equipment. Never enter a large or out of control fire in an attempt to retrieve the fire extinguisher and call the fire department for assistance. Entering a large or out of control fire will result in death or serious injury.

OPERATION

2.5 Cab Safety Windows

The power unit cab is equipped with shatter resistant polycarbonate front window, right rear and right side. All other windows are laminated safety glass.



Ops-0088

OPERATION

OPERATION

2.6 Cab Emergency Exit

If for reason it is necessary to exit the cab in an emergency and the normal access door is not functioning, you may break the rear window, left rear window and the access door. A hammer device designed to break these glass widows is located on the inside left rear pillar of the cab. The glass breaking hammer is within reach of the operator seat or the trainer seat and features a cutter that can be used on seat belts.



Emergency Exit
Windows that will
break.

Glass Breaking
Hammer

Ops-3176

OPERATION

OPERATION

3. GETTING ON AND OFF THE POWER UNIT

Before getting onto the tractor, the operator must read and completely understand the implement and tractor operator manuals. If any part of either manual is not completely understood, consult an authorized dealer for a complete explanation.



WARNING Do not mount or dismount the power unit while the power unit is moving. Mount the power unit only when the power unit and all moving parts are completely stopped. Dismounting a moving power unit can result in a crushing hazard that can cause death or serious injury.



3.1 Boarding the Power Unit

Use hands and equipped handrails and steps for support when boarding the power unit. Handrail attached to the cab is installed for entering and exiting the cab. To avoid falling DO NOT use door handle as a handrail. When seated in the operator's seat always secure the seat belt around you.

Never allow passengers to ride on the power unit or attached equipment. Riders can easily fall off and be seriously injured or killed from falling off and being ran over. It is the operator's responsibility to forbid all extra riders at all times.



DANGER Never allow children to operate, ride on, or come close to the Tractor or Implement. Persons that do not have a motor vehicle license should not operate this equipment. (SG-44str)



DANGER Never allow children or other persons to ride on the Tractor or Implement. Falling off can result in death or serious injury. (SG-10)str



WARNING Do not mount or dismount the Tractor while the tractor is moving. Mount the Tractor only when the Tractor and all moving parts are completely stopped. Dismounting a moving power unit can result in a crushing hazard that can cause death or serious injury. (SG-12) str



OPERATION

3.2 Dismounting the Tractor

Before dismounting, idle the power unit engine down, disengage any attachments and retract the boom arm if a boom type implement is being used. Park the power unit on a level surface with the transmission in neutral and the parking brake engaged. Shut down the power unit engine, and wait for all motion to come to a complete stop before exiting the operator's seat. NEVER leave the seat until the power unit, its engine, and mower head movement have come to a complete stop.



WARNING

Do not shut off the engine if a person is standing next to cab door.

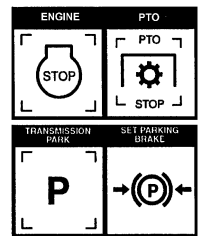
Use handrail and steps when exiting the power unit. Be careful of your step and use extra caution when mud, ice, snow, and other matter has accumulated on the steps and handrail. Never rush or jump off the power unit.



DANGER

BEFORE leaving the tractor seat lower the implement, set the parking brake and/or set the tractor transmission in parking gear, disengage the PTO, stop the engine, remove the key, and wait for all moving parts to stop. Place the tractor shift lever into a low range or parking gear to prevent the tractor from rolling. Never dismount a Tractor that is moving or while the engine is running. Operate the Tractor controls from the tractor seat only.

(SG-9)str



OPERATION

3.3 Starting the Power Unit

The operator must have a complete understanding of the placement, function, and operational use of all power unit controls before starting the power unit. Review the power unit operator's manual and consult an authorized dealer for power unit operation instructions if needed.

ESSENTIAL POWER UNIT CONTROLS:

- Locate the ignition keyswitch.
- Locate the engine shut off control (keyswitch).
- Locate the hydraulic controls
- Locate the light controls
- Locate the brake pedal
- Locate the inching pedal
- Locate the PTO controls
- Locate the 3-point hitch controls switch
- Locate the attachment operating controls (joystick)



BEFORE STARTING THE POWER UNIT ENSURE THE FOLLOWING:

- Conduct all pre-start operation inspection and service according to the power unit operator's manual.
- Make sure all guards, shields, and other safety devices are securely in place.
- The battery main power disconnect is on.
- The parking brake is on.
- The propulsion control lever is in neutral.
- The attachment operating controls are in the neutral and off position.
- The PTO and mower ON / OFF switches are in the off position.
- The remote hydraulics ON / OFF switches are in the off position.



To avoid death or serious injury: Start power unit only when properly seated in the power unit seat. Starting a power unit in gear can result in injury or death. Never attempt to bypass the ignition switch by short circuiting the starter solenoid. After the power unit engine is running, avoid accidental contact with the power unit Forward - Neutral - Reverse (FNR) lever to prevent sudden and unexpected power unit movement. Read the power unit operators manual for proper starting instructions.



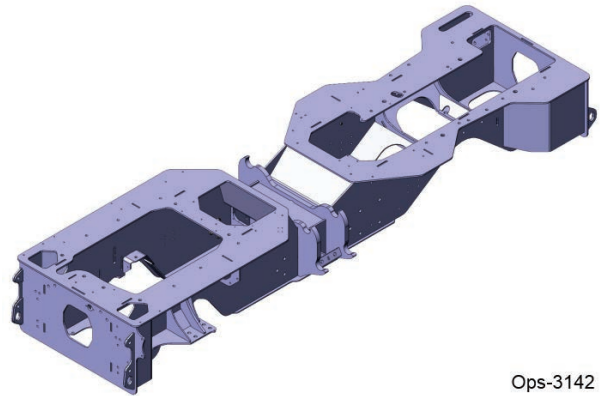
Never start or run the power unit engine in a confined space, building, near open windows, or in other unventilated space where dangerous carbon monoxide fumes can collect. Carbon monoxide is a colorless, odorless, and extremely dangerous gas that will cause unconsciousness or death.

- Check the area around the machine and make sure all people are clear before starting the machine. Sound the horn as a warning, then pause before cranking the engine.
- The engine will not crank unless the FNR lever is in neutral and all PTO / attachment switches are in the off position.
- The attachment shutoff switch state does not affect startup.
- The engine starts regardless of the seat operator presence switch state.
- The machine may start if any hydraulic function switches (WAM joystick, for example) are not in their neutral state, but they will be non-operational; they must return to their neutral state for a minimum of 1 second before becoming operational.

OPERATION

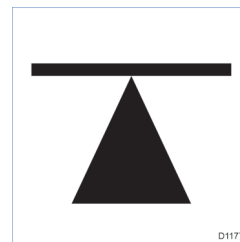
3.4 Frame Assembly

- Inspect condition of mounting frame weldment.
- Inspect condition of attachment structures.
- Ensure bolts and screws are in position and properly torqued.
- Ensure all pins are in place and fastened with screws
- Ensure major components are properly mounted to power unit and hardware is properly installed and tightened.



Ops-3142

If it becomes necessary to lift or support the machine for service; designated areas of the frame have been marked with decal D1177.



This identifies the suggested locations on the frame that can be used to lift or support the machine. There are four locations, two on each side at each end of the frame. Use a suitable lifting device or support stand capable of 15,000 lb. capacity for each lift location. Be sure that all lifting and supporting is done on a level concrete surface.



OPERATION

3.5 Hydraulic Fluid

Maintaining the proper hydraulic oil level and oil cleanliness is very important for continued trouble-free operation of the mower. The fluid level should be checked daily and maintained within the sight gauge located on the left side of the reservoir. Never fill the tank above the sight gauge, allowing for expansion of the hydraulic oil. The tank fill cap is vented, so the tank should not be pressurized.

The hydraulic fluid can lose its ability to lubricate in a number of different ways, most commonly by contamination and overheating. Both scenarios can lead to catastrophic failure of the hydraulic components and costly repairs.



OPERATION

OPERATION

3.6 Hydraulic Inspections

Perform the inspections below daily:

- Check hydraulic fluid level.
- Visually inspect the hydraulic connections, hose guards and shielding.
- Ensure there are no oil leaks and fittings are properly connected.
- Inspect overall condition of hydraulic pumps.
- Check for hydraulic leaks along hoses, cylinders and fittings.
- Inspect the condition of the hydraulic hoses, especially hoses that move with equipment such as a boom.
- Inspect hydraulic valves and the wire harness connections to the valves.



DO NOT use your hands to check for oil leaks. Use a piece of heavy paper or cardboard to check for hydraulic oil leaks. Hydraulic oil leaks can cause serious injection injuries.



Do not operate the machine with fluid leaking. Oil and fuel are explosive and their presence could present a fire hazard. Do not check for leaks with your hand! High-pressure oil streams from breaks in the line may penetrate the skin and cause tissue damage including gangrene. To check for a leak, TURN ENGINE OFF and remove all hydraulic pressure. Wear oil impenetrable gloves, safety glasses (with side shields marked to comply with ANSI Z87), and use cardboard to check for evidence of oil leaks. If you suspect a leak, remove the hose and have it tested at a dealer. If oil does penetrate the skin, have the injury treated immediately by a physician knowledgeable and skilled in this procedure. Failure to follow these instructions can result in death or serious injury.



Avoid contact with hot surfaces including hydraulic oil tanks, pumps, motors, valves and hose connections. Relieve hydraulic pressure before performing maintenance or repairs. Use gloves and eye protection when servicing hot components. Contact with a hot surface or fluid can cause serious burn injuries.

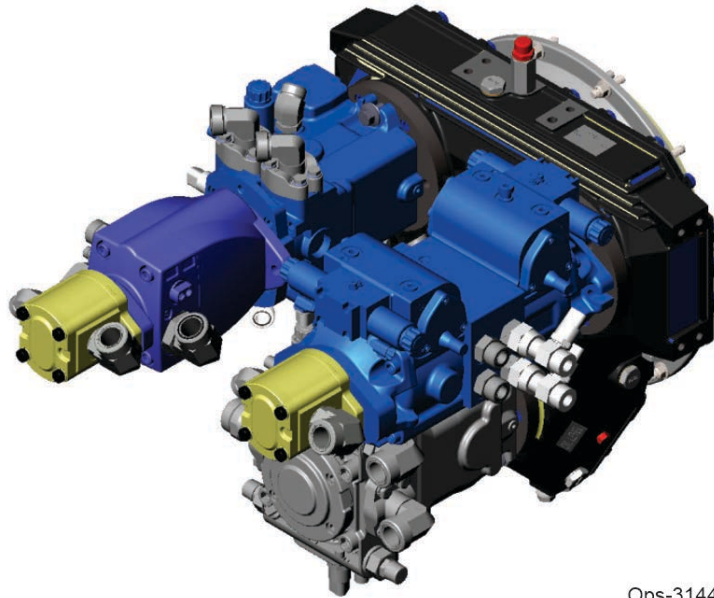
OPERATION

4. HYDRAULIC PUMPS & OIL RESERVOIR LAYOUT

All hydraulic pumps are directly driven by the engine, so if the engine crankshaft is turning all pumps will be turning. There can be up to 8 hydraulic pumps on the machine, all are driven by a pump drive gearbox attached to the engine.

- The pump drive gearbox increases engine speed by a factor of 1.4. When the engine is operating at full speed of 2100 rpm, the pumps will be operating at 2940 rpm.

The pump drive gearbox is located near the center of the machine and it has three different pump mounting pads. Multiple pumps are stacked on a single pad as shown in the images below. .



Ops-3144

The hydraulic reservoir is located higher than the pump drive gearbox and all hydraulic pumps, allowing pump suction ports to be supplied oil by gravity, however, upon hose disconnection air may become entrapped in hydraulic lines and air should be bled out before operation



Ops-3143

OPERATION

OPERATION

5. VEHICLE CONTROLS



The Mantis vehicle control system consists of a color touchscreen display, a primary (front) controller, a secondary (rear) controller, and dedicated drive controller. Controls dedicated to machine operation are routed through the primary controller while attachment controls are routed through the secondary controller. Additional expansion modules are installed when front or rear hydraulics are added to the machine.

The electronic controls system receives inputs from various locations throughout the vehicle including the operator's controls at the display screen and at the right side of the operator seat.

OPERATOR CONTROLS

- Steering Column and Inching/Brake Pedal
- Overhead Control Panel
- Main Control Switches
- Joystick Controls
- Forward Neutral Reverse (FNR) Lever
- Speed/Drive Controls
- Controls Display

The engine has its own electronic controller which is powered on through the vehicle controls system, therefore engine cranking will not operate without a signal from the vehicle controls system. The engine controls system supplies engine information to the vehicle controls system and controls display. The vehicle controls system also communicates with the engine controls system for the desired engine speed.

NOTICE

Read this manual before proceeding with any repairs or tests. The electronic controls system may provide diagnostics to aid in repairs.

Additional repair and diagnostic procedures for the main vehicle controller, implement controller, and display screen are available on the manufacturer's web site at: www.ifm.com.

NOTICE

DO NOT pressure wash electrical and controls components. While components are sealed, soaps and high water pressure could potentially damage seals, causing damage by allowing moisture to enter the electrical and controls systems.

OPERATION

NOTICE

DO NOT weld around electronic components. If welding is required, electronic components MUST be disconnected (unplugged). Unplug all components, joystick, modules, displays, and any other electronic component. If not unplugged the current from the weld may cause serious damage to electronic components.

6. BATTERIES

The electrical system is a 12-volt DC system. The Mantis Prime Mover has two batteries of a type Group 31S which are located under the colwing in the Neinge compartment on the machine's left hand side. A battery disconnect switch is located on the left hand side of the center hydraulic connections plate. This switch should be used to power down the machine when it is not in daily use.

NOTICE

After the engine is shut off, do not remove battery leads or turn off the main power disconnect immediately. The DEF system automatically purges itself of DEF after engine is stopped. If not allowed to be purged, DEF can freeze in lines and the DEF injector can be damaged because the purge cycle is used to cool the DEF injector. The engine's ECM will log every occurrence of a power disconnect before the DEF purge cycle is complete.



WARNING

Battery posts, terminals and related accessories contain lead and lead compounds and chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

OPERATION

6.1 Battery Replacement

Removing and replacing the batteries must be done by a trained technician. Start by parking the machine in a safe location and turning off the main power disconnect switch. Tilt the cowling back to expose the batteries. Use a step ladder on the left side of the machine to access the batteries.

First remove the negative battery cables from both batteries with a 9/16 wrench. Then remove the positive cables from the batteries.



With a 7/16 wrench loosen the 3-bolts used on the battery hold down bracket. Once loose enough the J-bolts can be removed and the hold down bracket set aside.



OPERATION

The battery can be tilted back and the battery slid over the lower retention plate. The second battery can be removed with the same process. Install the new batteries in the reverse procedure. Install the J-Bolts and hold down on the inner battery before the outer battery is installed.



OPERATION

7. INCHING AND SERVICE BRAKE PEDAL

The service brake pedal is located to the right of the steering column. This single pedal operates both the front and rear axle service brakes. The first 50% of pedal travel is dedicated to de-stroking the pump and allows the pedal to act as an inching pedal slowing the unit down without using the service brakes in the axles. The second 50% of pedal travel operates as a standard brake valve applying hydraulic pressure to the service brakes. An operator may leave the FNR lever in position when stopping with the service brakes, once the brake pedal is released, the propel pump will drive the machine according to the FNR lever position.

⚠ WARNING

If the engine is not running the service brakes will not operate! The service brake valve, located below the cab floor, requires hydraulic oil pressure (supplied by the mower charge pump) to operate. Failure to have operational service brakes can result in loss of control and cause death or serious injury.



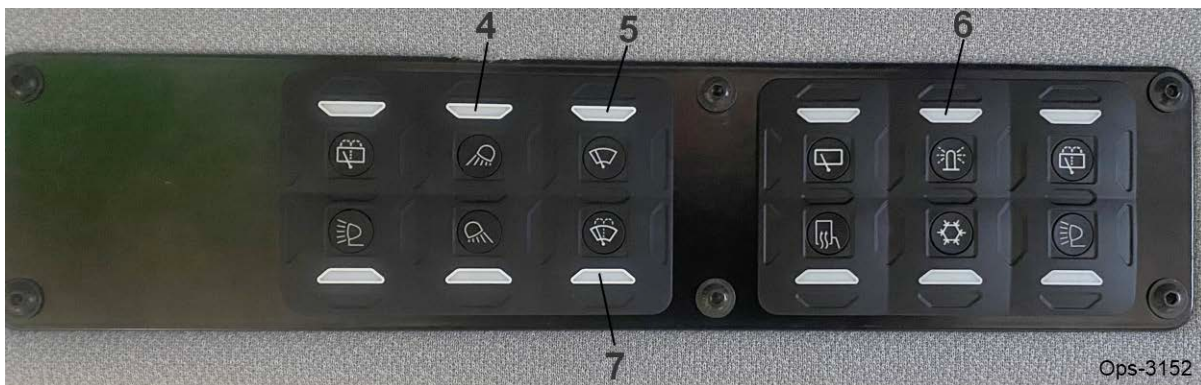
OPERATION

Because of the inching pedal feature, an operator may leave the FNR lever in position while stopping. The inching pedal is typically used to stop or slow the machine rather than the service brakes, because the machine speed can be better controlled. The service brakes should be used when the machine needs to be stopped quickly.

Brake Testing Standard:

The Mantis Prime Mower brakes have been tested in accordance with ASABE S648

8. OVERHEAD CONTROL PANELS



ITEM	DECSRIPTION
1.	A/C Fan Speed
2.	A/C Switch
3.	A/C Temperature Control
4.	Headlight
5.	Wiper
6.	Beacon
7.	Wiper Fluid

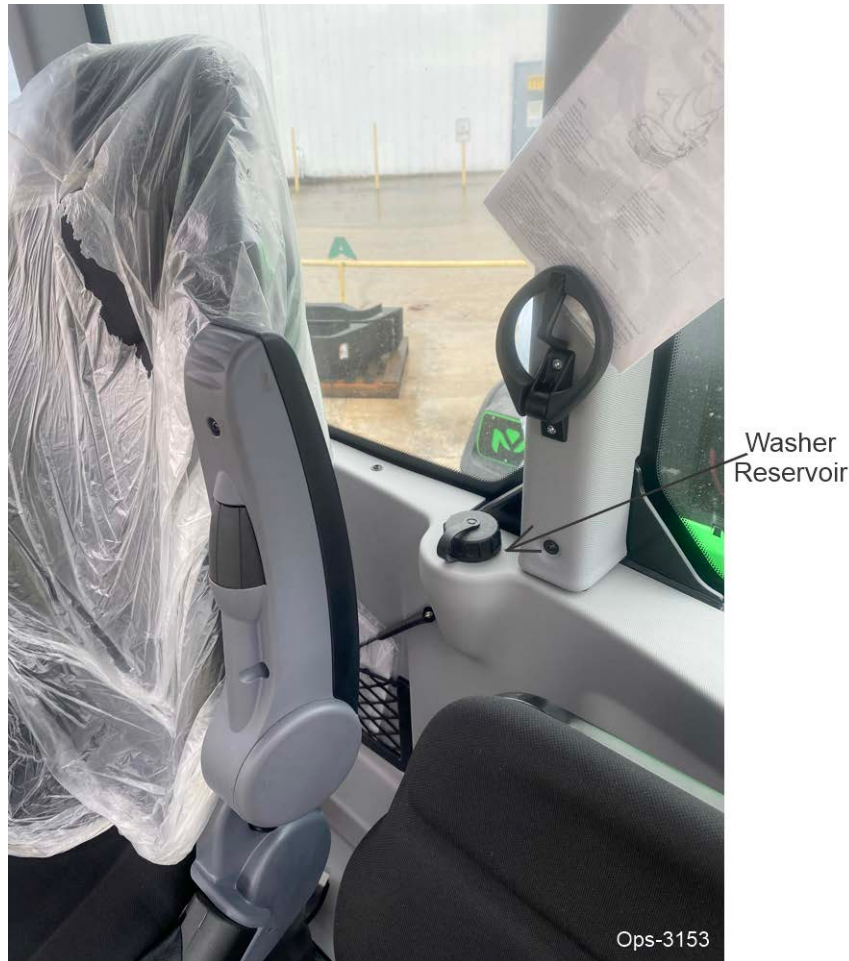
OPERATION

9. WINDSHIELD WIPERS AND WASHER SYSTEM

The wiper controls are located in the center overhead control panel next to the Head Lights. They have 3 modes:

- Off
- Interval
- Slow
- Fast

The washer button must be held to activate, and the wipers do not need to be on to use. The washer reservoir is located inside of the cab behind the operator seat.



OPERATION

10. LIGHTING AND SLOW MOVING VEHICLE (SMV) EMBLEM

Because this machine may be operated on or near public roadways it is equipped with proper warning lighting such as hazard flashers, rear strobes, roof mounted rotating beacon, turn signals, brake lights, and a beacon receptacle (beacon not included). A turn signal switch is located in the steering column.

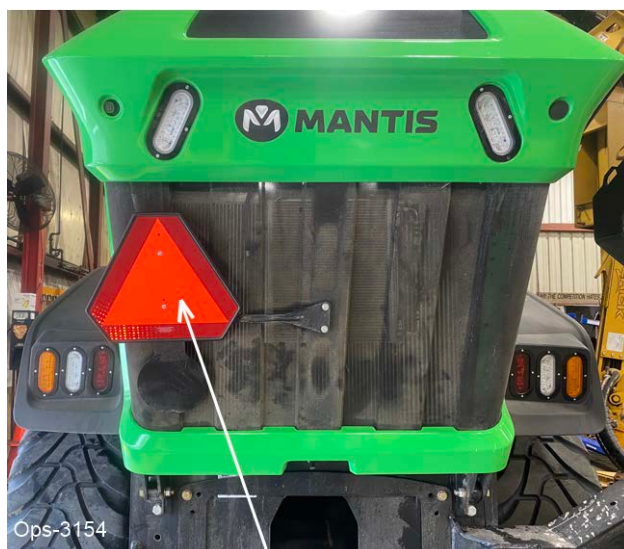
Hazard lights are not automatically turned on when the vehicle is in travel mode. Ensure lights are turned on when in travel mode. The brake lights are activated by the control system when the machine is slowing down.

A SMV emblem is mounted to the cooling package access door at the rear of the machine. Because the SMV emblem slides into a mounting slot, there may be a possibility of the sign becoming loose. If the machine is going to be trailered the SMV sign should be removed to prevent the possibility of it blowing out of its mounting slot.

OPERATION



1. Rear Strobes
2. Hazards
3. Differential Lock



**SLOW MOVING
VEHICLE (SMV)
SIGN**

OPERATION

11. BACKUP ALARM

The backup alarm is located at the rear of the machine at left side near the auxiliary hydraulics.

THE ALARM WILL SOUND UNDER THE FOLLOWING CONDITIONS:

- The drive handle is placed in reverse, regardless of park brake status.
- The drive handle is in neutral and the WAM wings are being lowered.



OPERATION

12. MAIN CONTROL SWITCHES



The Main Control Switches are used to actuate a variety of functions on the MANTIS. The Axle Stabilizer, Mower Pumps, Cab Rotation, 3-Pt Hitch, Auxiliary Remotes, and PTOs are all controlled by these switches. Users are able to change which switch controls what function, dependent on the user's preference. Each function needs to be "Unlocked" before it can be used. The table below shows one potential switch configuration.

ITEM	DESCRIPTION
1	Axle Stabilizer
2	Boom Mower
3	Center Mower
4	Rear PTO
5	Front 3-Pt Hitch
6	Front Aux 2



OPERATION

13. REAR AXLE STABILIZER

The rear axle's movement can be locked by way of a hydraulic cylinder. In travel mode operation this cylinder is in float and will allow the rear axle to move, creating a smoother ride. When in work mode the cylinder can be set to active, locked, or float. In active mode the cylinder will extend when the boom is lifted up to help stabilize the prime mover. When the cylinder is "Locked" the extend and retract can be controlled by an analog switch on the right hand console. For information on setting this function, refer to the Home Screen Section.

14. MOWER PUMPS

Up to 3 mowing attachments may be used on the machine. Each mowing attachment has a dedicated hydraulic pump; referenced as Left Pump, Center Pump, and Boom Pump. If a PTO is in use, the pump that runs it cannot be used to operate another attachment at the same time, see PTO section for more details. However, if a PTO is turned off the pump that was operating the PTO can then be used to operate another attachment without reconfiguring the machine. The 3 attachment pumps do not have any additional features available, only on or off. Prior to turning on these pumps each must be enabled or unlocked.

15. CAB ROTATION

The MANTIS is available with a rotating cab that allows for the operator to swivel the cab 90 degrees to the left or right of center. Swiveling the cab to side of the MANTIS that an attachment is on allows for the operator to have a better view of the area they are mowing while also watching for obstacles in their path. The rotating cab has 3 different modes available: Static (OFF), Manual (the user can define how the cab is positioned), and center (when selected the cab will return to center).

16. THREE POINT HITCH

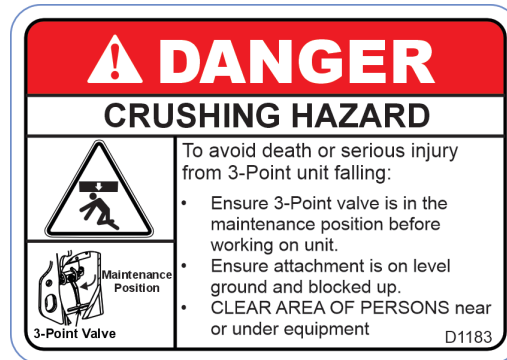
An optional 3-point hitch is available at the very front of the vehicle, rather than at the rear of the machine as found on a typical power unit. The hitch size is category 2. Any of the 6 paddle switches can be configured to control the 3-point hitch. The 3-point hitch has 2 modes, float on and float off (Static). When the 3-point hitch is in float mode the float symbol can be seen next to the unlock button. Float mode will allow the 3-point arms to move with the terrain.

16.1 3PT Hitch Lock Valve

The Three-Point Hitch feature contains a mechanical lock valve located on the left side of the hitch mounting frame. This valve is normally in the open position (handle vertical) allowing the hitch to function. If at any time the hitch arms are supporting a load and service work needs to be done in the area, the valve can be closed (handle horizontal) to prevent unintended lowering of the hitch. The lock valve will not prevent the falling of the lift arms if there is a mechanical or hydraulic failure in the hitch itself. The lock valve only prevents the loss of holding pressure caused by operator function or machine hydraulic failure. Regular maintenance inspections

OPERATION

are required to verify that the hoses, fittings, and cylinders between the lock valve and hitch arms, are in good working order.



OPERATION

17. REMOTE/AUXILIARY HYDRAULICS

The machine can be supplied with up to 4 sets of remote/auxiliary hydraulic connections. The main control panel controls each set of connections. All circuits setup with a float that can be enabled by selecting the mode button for the specific remote. When float is active a float symbol is visible. One paddle switch will be dedicated for each remote circuit. The order is configurable by the end user.



When a remote hydraulics rocker switch is pressed up, then hydraulic flow will be from the upper coupling, if a rocker switch is pressed down flow is reversed, coming from the lower coupling.

CIRCUITS ARE LABELED AS:

- Front Remote 1 (Vehicle Left)
- Front Remote 2 (Vehicle Right)
- Rear Remote 1 is (Vehicle Left)
- Rear Remote 2 is (Vehicle Right)

The machine uses female coupling connections that meet ISO 5675 interchangeability and performance requirements (Interchangeable with Parker/Pioneer 8200 Series). The body (coupling) half can be mated to either a ball or poppet type male nipple. Connection and disconnection under pressure is allowable.

NOTE: Thoroughly clean remote hydraulic connections before and after connecting to prevent contamination of the hydraulic system with debris. Use an aerosol solvent such as brake cleaner to wash away debris along with compressed shop air if necessary. Use appropriate personal protective equipment when working with solvents and compressed air. Reinstall dust caps on couplings when not in use.



OPERATION

OPERATION

18. POWER TAKE-OFFS (PTO)

1000 RPM (20 Spline 1-3/4 shaft) PTO options are available for the front, rear, or both locations of the machine. Each PTO gearbox is driven by a hydraulic motor which is powered by the center mower pump. The PTOs should be thought of as an attachment because if they are being used they consume the entire flow of center mower pump, just like other attachments. To ensure optimum performance, a 201P Model is required for when adding PTOs.

The PTO manifold (MA4) diverts hydraulic pump flow so that the pump flow may be used to run either the front PTO, rear PTO, or a mower, but not any of them simultaneously. Refer to Home Screen Section for assigning switches to PTO. Similar to the Attachment Pumps, the PTOS do not have any additional features available, only on or off. Prior to turning on a PTO it must be enabled or unlocked.



OPERATION

19. DIFFERENTIAL LOCK

The front and rear axle differentials are normally open with the capability of being 100 percent locked by a push button on the steering column. The control system allows the differential lock to only be operated in work mode. The differential lock is intended to be used temporarily to drive the machine out of a location where added traction is required, so the controls system disengages the differential lock after 1 minute to prevent accidental damage from forgetting to disengage the differential lock. Differential lock may be reengaged after 1 minute of operation has passed.

Do not engage the differential lock with the vehicle in motion and avoid turning on paved surfaces with the differential lock engaged.



Important

To prevent axle damage, do not engage the front differential lock unless the vehicle is stopped.

20. FORWARD NEUTRAL REVERSE (FNR) LEVER

The FNR lever is used to move the machine forwards and backwards. To start the machine and change drive modes the FNR lever must be in the neutral position. To release or engage the parking brake the FNR lever must be in the neutral position.

Shifting the FNR lever to the neutral position will remove all drive pressure resulting in the machine coming to a stop. Shifting out of neutral will result in the rear wheels steering automatically in the event that they are out of alignment with the front wheels.



OPERATION

21. PARKING BRAKE

The parking brakes are located in the front axle only. The brakes are spring activated hydraulically released (SAHR), so hydraulic pressure is required to disengage the parking brakes. The brakes are turned on and off using a pushbutton in the sub control panel at the operator's right arm rest. There is a parking brake indicator at the top of the home screen. If the indicator symbol is red, the brakes are on and if the symbol is grey, then the brakes are disengaged.

- Every time the machine is started, the park brake is on and remains engaged until turned off by the operator.
- The propel pump will not stroke when the park brake is on.
- The park brake is only allowed to disengage when the drive handle is in neutral.

22. ROTARY ENCODER

1. Decrease Engine Speed
2. Increase Engine Speed
3. N/A
4. Parking Brake
5. ECO Mode
6. N/A
7. Drive Speed (CW Increase, CCW Decrease)



OPERATION

23. ATTACHMENT POWER AND ATTACHMENT SHUTOFF

The attachment shutoff, located on the joystick, acts as a stop switch for all mower/attachment pumps. If the attachment shutoff is active, the display screen will show an attachment shutoff icon (below) until the shutoff conditions are cleared. Even after the attachment shutoff switch is disengaged, pumps will remain off until the pumps are turned off with their individual switches and then the switches are turned back on. In addition to the attachment shutoff switch, the controls system will activate the attachment shutoff or if the operator's seat is empty for more than 6 seconds.

- Regardless of switch positions, no attachment pumps may be engaged at engine start.
- When attachments are stopped, a full cycle of each function's switch is required to restart it.
- When the attachment shutoff is pressed, all PTO/attachment pumps are shut off (de-stroked) immediately.
- After attachment shutoff is pressed, the pumps do not restart until their individual switches are moved to the off position, then switched to the on position to reactivate.



OPERATION

24. HOME SCREEN

On the dashboard of the cab there is a touch screen monitor, shown below, that controls many of the machine functions. More detail on each of the following items will be given in the subsequent section.



Ops-3202

1. Area for Warning Lamps and Indicators
2. Forward, neutral, and reverse selection with machine velocity
3. DEF level
4. Fuel level
5. Engine RPM
6. Parking Brake
7. Drive Mode
8. Steering Mode
9. Dark/Light Mode
10. Joystick Speed
- 11.
12. Information
13. Error Messages
14. Settings
15. Joystick Controls
16. Parameters
17. Current Time
18. Engine Hours
19. Analog Switch Information

OPERATION

- With the key in the "RUN" position (keyed on without engine running), the wait to start light will be illuminated if grid heater operation is required before starting.

NOTE: The operating period of the warning light for the grid heater will change due to the ambient air temperature.

- If the low DEF level light is illuminated, add DEF to the machine's DEF tank. The light will turn on at 6% and it will flash at a tank level of 4% or less.
- If the amber warning light or the red stop light is illuminated, contact a dealer for service. If the red stop light is illuminated - TURN OFF THE ENGINE. The amber warning light may be turned on by many different causes, some of which are listed below.

Engine Coolant Temperature Sensor

Engine Oil Pressure Sensor

Exhaust Gas Temperature Sensor

The menu has four independent views that can be changed. On the bottom right of each view a button can be pressed and a popup will appear with a menu selection with the exception of the camera. These views will change when switching from Work Mode and Travel Mode unless each view is configured the same in both Drive Modes.



Not shown are the Analog Switches located below the display. The color of the button on the display will correlate with the color of the Analog Switch on the console. The function of each Analog Switch can be configured through the display. Pressing the Analog Switch's function button on the bottom of the screen displays a popup window. Depending on the configuration of the machine the available options can be picked. There are three pages to browse functions. When a selection is made, that function will no longer appear on the popup as no single function can be assigned to more than one Analog Switch.

OPERATION

OPERATION



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Each function has an unlock button that will need to be pressed to put the machine function into a ready state. The larger button to the left of the unlock button can be pressed to change how the function behaves. For Example, the front auxiliary functions have a float control and this button toggles the float, on or off.

25. HYDRAULIC ENABLE - CONTROLS/AUXILIARY PUMP

The base vehicle hydraulic functions such as the rear steering and axle stabilizer are powered by an open loop variable displacement load sensing controls pump (controlled through manifold MA1). Attachment cylinder functions are also powered by the controls pump. The actual mowing functions with blade rotation is not powered by the controls pump, but by a closed loop fixed displacement pump.

There is a valve within manifold MA1 that enables/disables flow from the controls pump to the machine functions. This valve opening is referred to as, "hydraulic controls enable". The controls system criteria below must to be satisfied for the vehicle control system to energize the electric solenoid and enable the MA1.

1. The machine has initialized.
2. The operator is present in the seat

OPERATION

26. OPERATOR PRESENCE SEAT SWITCH

- If the seat becomes empty when the machine is running and the drive handle is in neutral:
If the seat is empty for more than 7 seconds, the park brake is applied and the engine RPMS are decreased to idle.
- If the seat becomes empty when the machine is running and the drive handle is not in neutral:
If the seat is empty for more than 7 seconds, the propel pump will de-stroke to neutral at a safe rate and the park brake will be applied when machine velocity is under 1 mph.
If the operator returns to the seat before the machine has fully decelerated, the deceleration will still be completed, but the park brake will not be applied.
Re-engaging machine drive requires bringing the FNR back to the neutral position and manually turning off the park brake if it was applied.
- If the seat is empty for more than 7 seconds, attachment flow is turned off:
- At any point with the machine in neutral and the seat empty:
No attachments may turn on.
The park brake will not release.
The drive pump will not stroke.

27. DRIVE MODE SELECTION

Switching from Work Mode to Transport Mode changes the displacement of the hydraulic motor which propels the machine, and thus allows for high vehicle speed (approximately 25 mph) in travel mode and low vehicle speed in work mode (approximately 8 mph).

When entering Transport Mode, the machine must be in neutral and must be at a complete standstill. The cab will rotate to the center position when entering Transport Mode and the rear axle will center into 2 wheel steer mode. The position and selection of screen objects can change when entering Transport Mode. Other buttons will be blocked out. Choose a drive mode or press Drive Mode to return to the original layout.



OPERATION

28. STEERING MODE SELECTION

The vehicle has 3 different steering modes available: 2 wheel steering at the front axle, 4 wheel steering where the front axle steers in the opposite direction of the rear axle, and crab steering where both the front and rear axle will turn in the same direction. Steering modes may be changed with the vehicle in motion.

Any of the 3 steering modes are allowed with the machine in Work Mode, however in travel mode only, 2WS is allowed. Changing Steering Modes is only allowed while in Work Mode. The machine can change to different Steering Modes as long as the machine is driving below 5MPH. The rear axle steering is not physically linked to the front axle steering. It's movement is carried out by the machine controller.

To change Steering Modes, select the Steering Mode ICON and then select the desired mode.



For example, when leaving 2WS the front axle alignment screen will appear; or when leaving 4WS or Crab steering and going into 2WS the rear axle alignment screen will appear.

29. WARNING & ERRORS

Errors and warnings that occur while the machine is running will appear in this popup. Active errors will appear red and then will turn pink when not active. Warnings will appear a yellow color and will go away when not active. Information about the machine (such as a switch being on) will appear beige color and will go away when not active. At the bottom there is a history button that when pressed will show all the errors and warnings that have occurred on the machine. This popup window can be hidden by the errors button in the RH menu. If a message is active be sure to identify the cause of the message and then determine if immediate action is required for safe and reliable machine operation. Contact an Mantis dealer for service if needed.

OPERATION

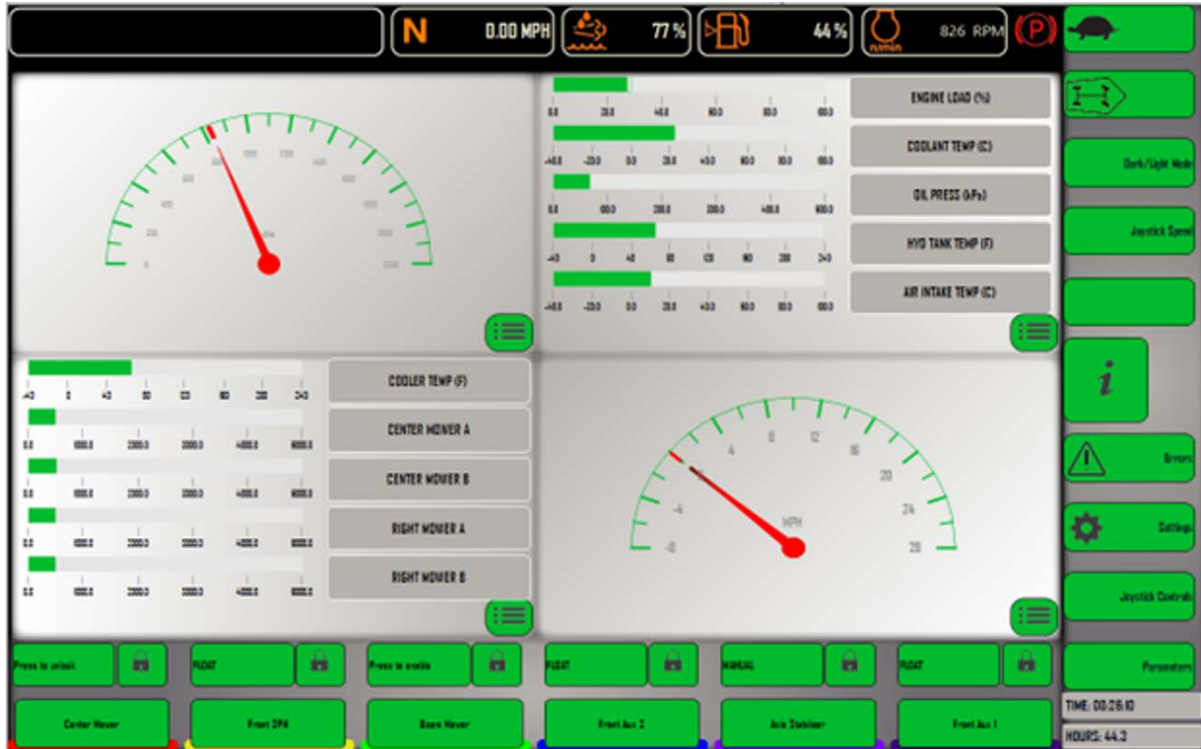


OPERATION

OPERATION

30. SCREEN BRIGHTNESS

Screen brightness has bright or dim settings which may be toggled by pressing the screen brightness button on the display home screen.



31. REAR VIEW CAMERA

The rear view camera can be assigned to a menu quadrant (See Home Screen Section) such that it is always visible. The rear view camera will also appear whenever the FNR Lever is in reverse. Shifting out of reverse will cause the display menus to revert back to their assigned views. An operator does have the option to navigate away from the camera screen with the FNR lever in reverse.

OPERATION

32. MACHINE INFORMATION

Selecting the “I” button, a pop up window appears over the menu to show available machine sensors. There are two pages to select from with a touch button at the bottom of the window. Primarily hydraulic information is on the first page and engine information is on the second page. Pressing the “I” button again will hide this information screen.



33. MACHINE CALIBRATION AND SETTINGS

- Steering position calibration
The rear axle will not match//mirror the front axle in 4WS or CRAB mode.
The rear axle will not be straight in 2WS model.
- Steering current calibration
The rear axle can appear jerky or lag significantly behind the movements of the front axle in 4WS or CRAB mode.
- Pump Current Calibration
The cutting head can be operating too fast or too slow.
- Boom Calibration
The minimum current values, maximum speed values, and the ramp values for controlling the attachment as adjusted by the operator will be affected. Does not change the main screen boom speed options.
- Analog Switch calibration
Can cause the engine not to start, the cutting head not to start, and other hydraulic functions o not operate correctly.
- Drive speed calibration
The unit will operate at a significantly slower speed than the requested speed.

OPERATION

34. HYDRAULIC RESERVOIR LOW LEVEL WARNING & ALARM

The Hydraulic tank utilizes a sending unit similar to a fuel tank to determine the amount of hydraulic oil present in the tank. In the event that the system is losing oil, the following messages will alert the operator that service is needed.

- Tank level of 65%
An error will appear indicating the tank level is low.
- Tank level of 25%
A critical hydraulic oil level warning will appear.
Hydraulic oil warning light will be present in the upper left of the display.

NOTE: the machine will not shut the engine off due to low hydraulic oil Some functions will be affected; however, it is possible to severely damage the engine as well as hydraulic components if the low hydraulic oil warnings are ignored.

35. FUEL FILLER



⚠ WARNING

Handle fuel with care: It is highly flammable. Do not refuel machine when near sparks or open flame or while smoking. Always stop engine before refueling and allow to cool at least five minutes. Fill fuel tank outdoors. Prevent fires by keeping machine clean of accumulated oil, grease, trash or debris. Failure to follow these instructions can result in a fire that can cause death or serious injury.

**SHUT OFF ENGINE
BEFORE
REFUELING
NO SMOKING**

OPERATION

NOTICE

To prevent damage to fuel injection system, never put Diesel Exhaust Fluid (DEF) into fuel tank.

NOTE: If the fuel level light begins to flash, fuel level is low. Fill the tank!

NOTE: Never run tank dry, the result will require bleeding of the fuel system.

Fill fuel tank at the end of each day using recommended fuel. Each time tank is filled, screw cap back onto filler neck. The fuel fill location is at the front of the machine under the cab.

36. DEF FILLER

CAUTION

DEF contains urea. Do not get in eyes. For eyes, IMMEDIATELY flush with large amounts of water for at least 15 minutes. Do NOT take internally. In the event DEF is ingested, contact a physician or poison control. Reference Material Safety Data Sheet (MSDS) for additional information.



NOTICE

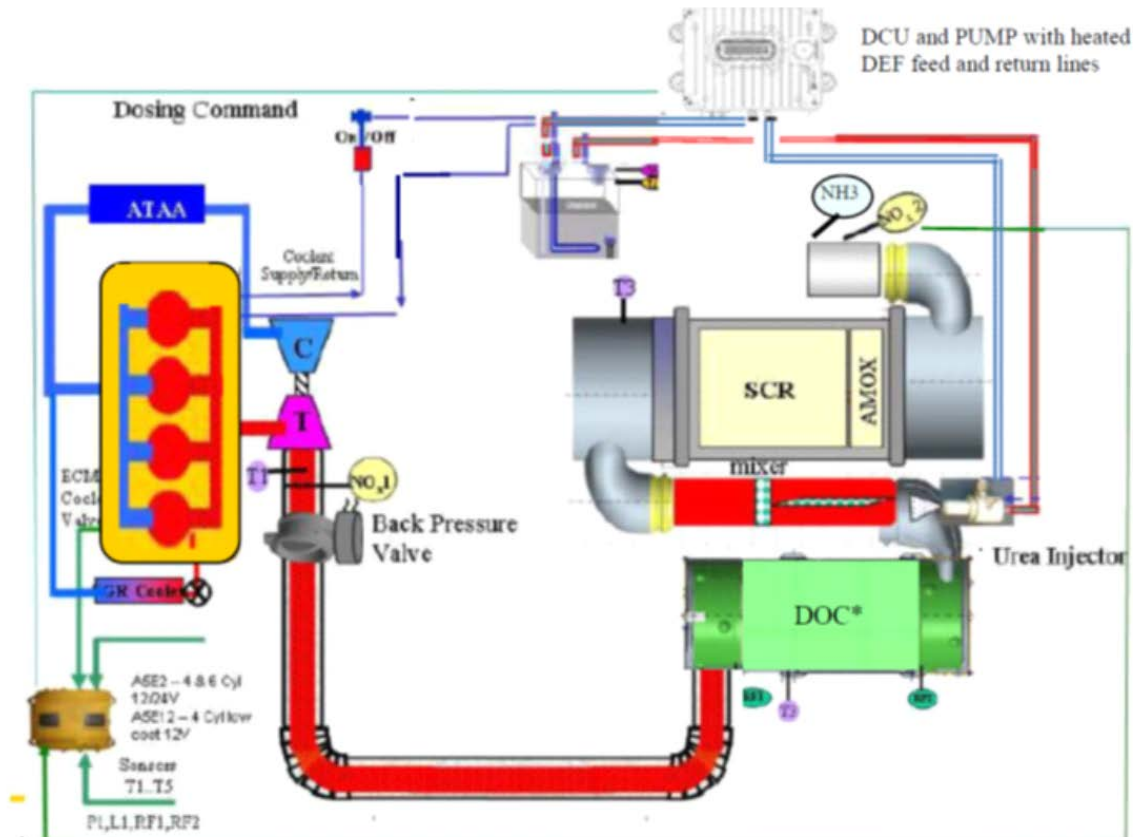
Never put Diesel Exhaust Fluid (DEF) into the fuel tank or Diesel fuel into DEF tank.

Fill DEF tank every time power unit is being refueled. If this cannot be done, monitor DEF level on instrument panel. The fill location is behind the cab on the left hand side of the machine. After instrument panel.

NOTE: Spilled DEF should be wiped away with a wet cloth and then rinsed with water. If unapproved fluids are accidentally added to DEF tank, drain tank and rinse with water, then refill tank.

OPERATION

37. DEF SYSTEM OVERVIEW



NOTICE

After the engine is shut off, do not remove battery leads or turn off the main power disconnect immediately. The DEF system automatically purges itself of DEF after engine is stopped. If not allowed to be purged, DEF can freeze in lines and the DEF injector can be damaged because the purge cycle is used to cool the DEF injector. The engine's ECM will log every occurrence of a power disconnect before the DEF purge cycle is complete.

OPERATION

38. SAHR PARKING BRAKE RELEASE PROCESS

The park brake that is integral to the front axle on the Mantis prime mover is spring applied/hydraulic released. When hydraulic power is not available the park brake must be manually disengaged to tow the machine.

Important

Power tools are not to be used for this process.

Hand Tools Required: 17mm Six-Point Socket, Reversible Ratchet, Torque Wrench
Equipment Required: Wheel Chocks

WARNING

Machine must be on level ground and have wheels/tires chocked to prevent machine from moving when park brake is being disengaged to prevent unintended movement of vehicle.

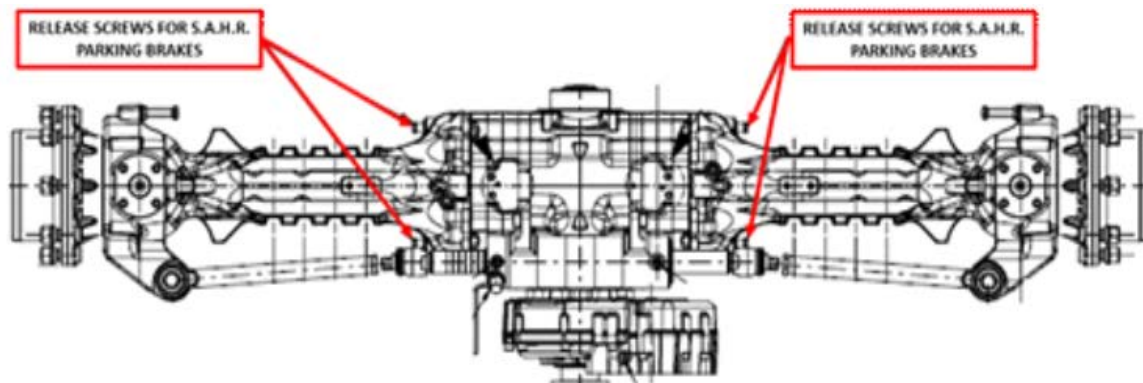


Ops-3222



Ops-3223

To disable the SAHR parking brakes, two screws must be removed from each side of the axle beam, 4 screws total on the front axle. Be aware that the machine will roll and needs to be chocked and restrained during this process of disabling the park brake. Remove the screws. Remove the spacers that are on the bolts and reinstall the bolts and tighten alternately, turning the screws 45° at a time. Starting with the left front, tighten 45°, then move to the left rear and tighten 45°. Repeat until the left screws are tightened to 35 ft-lbs. **DO NOT OVER TIGHTEN.** Permanent brake damage can occur if the bolts are tightened or released unevenly or tightened against the brake piston too tight. Repeat the process on the right side of the axle, alternating front to rear 45° at a time. The brakes will release as the bolts are tightened. Be aware that the machine will roll and needs to be chocked and restrained during this process of disabling the park brake.



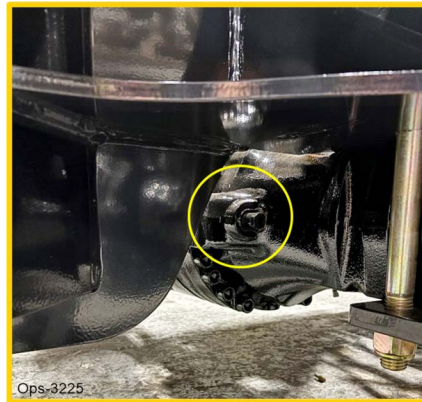
The Park Brake manual release bolts are located on the front and back of each side of the Axle Center Section.

OPERATION

OPERATION



Front Side of Axle



Back Side of Axle

The release process to remove the spring pressure applying the park brake is:

1. Remove axle park brake manual release bolt on front left side of axle.
2. Remove spacer from bolt and re-insert bolt and hand tighten until snug.



3. Remove axle park brake manual release bolt on back left side of axle.
4. Remove spacer from bolt and re-insert bolt and hand tighten until snug.

Important

Both bolts must be tightened evenly or damage will result to internal axle components.

5. Utilizing the handheld ratchet and 17mm socket tighten the front left bolt 1/4 turn inward.
6. Utilizing the handheld ratchet and 17mm socket tighten the back left bolt 1/4 turn inward.

OPERATION

7. Repeat this process alternating between the front and back bolt until both bolts have been tightened 2 full turns.
8. Utilizing handheld torque wrench (set at 35 ft. lbs.) and 17mm socket tighten the front left bolt 1/4 turn inward.
9. Utilizing handheld torque wrench (set at 35 ft. lbs.) and 17mm socket tighten the back left bolt 1/4 turn inward.
10. Repeat this process until both bolts are set to 35 ft. lbs.
11. Repeat steps 1 through 10 for the front right and back right bolts.

Important

Over torquing these bolts or tightening the bolts unevenly can cause permanent damage to the parking brake assembly. Take your time and DO NOT over torque the bolts.

The park brake is now released, and the vehicle can now be towed.

Use a Zip tie and hang the removed spacers from the steering wheel so that they will not be lost, and it will be a reminder to re-apply the parking brake before putting the machine back into service.

The process to return the park brake to original 'Spring Applied' state is the reverse of the process to release the spring pressure.

1. Utilizing the handheld ratchet and 17mm socket loosen the front left bolt 1/4 turn outward.
2. Utilizing the handheld ratchet and 17mm socket loosen the back left bolt 1/4 turn outward.
3. Repeat this process alternating between the front and back bolt until both bolts have been loosened completely and can be removed from the axle.
4. Install the spacer (removed in the release process) onto the bolt and re-install it onto the axle.



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5. Hand tighten the front and back bolts until snug against the spacer.
6. Utilize hand torque wrench and 17mm socket and tighten first the front bolt, then the back bolt to 35 ft. lbs.
7. Repeat steps 1 through 6 of the "Apply Process" to the front right and back right bolts.

The park brake is now spring applied and will require hydraulic pressure to release.

OPERATION

OPERATION

39. TOWING

Important

Before the machine may be towed the spring actuated hydraulically released (SAHR) parking brakes must be disabled. Only the front axle includes a parking brake, so only the brakes on the front axle need to be released. The hydraulic propel pump must be bypassed before the machine is towed as well.

DANGER

When the parking brake is disabled, the service brake on the front axle is unusable. The rear axle does have service brakes which will only operate if there is charge pressure supplied to the service brake valve from the mower charge pump. If the engine can run while the vehicle is being towed, then the rear brakes should function, but still use caution because only 1/2 of vehicle service braking force will be available. When the park brake is disabled and the engine is not running, the Mantis does not have any braking ability. To prevent the machine from rolling, the machine should be secured by external means (wheel chocks, or chains).

39.1 Towing Speed

NOTICE

The vehicle may only be towed out of the immediate danger zone. High towing speeds and long towing distances result in excessive heat generation and insufficient lubrication that may damage the hydraulic pump.

NOTICE

To prevent heat damage to components, do not exceed 1 mph, or tow for long distances with the drive pump bypass in place.

The Mantis can be towed a short distance, (less than 5 miles), not exceeding 20 mph. If the Mantis needs to be moved farther, it should be towed to a safe location to load onto a trailer. When towing the Mantis all four wheels will turn even if the front of the machine is supported by a truck. The propel motor defaults to a neutral position that will allow the axles and driveline to turn at a slow speed without damage. If the hydraulic system fluid level is not full, it is not acceptable to move the mantis more than 50 feet or the propel motor or pump could be damaged. The Mantis can easily be towed by a suitable two truck engaging on the bottom front of the frame and using the chain tie-down locations to secure the connection.



Towing the Mantis will require the spring actuated hydraulically released (SAHR) parking brakes be disabled. Only the front axle includes a parking brake so only the brakes on the front axle need to be released. Refer to the instructions for "Releasing the SAHR Parking Brakes". If the hydraulic propel pump and motor is in normal working condition the drive motor does not need to be bypassed. The propel motor defaults to a neutral position when it is shut down.

40. OPERATION - ATTACHMENTS SECTION

NOTE: *Please refer to Boom Manual*

OPERATION

OPERATION

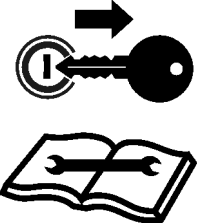
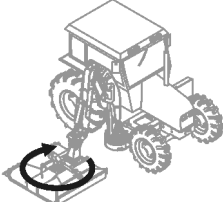
MAINTENANCE SECTION

Maintenance Section 4-1

MAINTENANCE

MAINTENANCE

HAZARDS WITH MAINTENANCE OF IMPLEMENT

				
Periodically inspect all moving parts, lubricate drivelines, and tighten all fasteners	Lower mower head to ground or block up before servicing	Stop engine remove key before conducting maintenance	Set mower head securely on the ground before servicing blades	Thrown Objects Hazard Ensure blades rotate clockwise viewed from above mower head



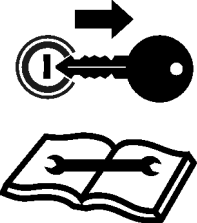
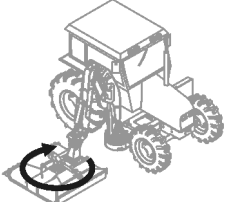
WARNING AVOID DEATH OR SERIOUS INJURY FROM COMPONENT FAILURE BY KEEPING IMPLEMENT IN GOOD OPERATING CONDITION IN PERFORMING PROPER SERVICE, REPAIRS AND MAINTENANCE.

BEFORE PERFORMING SERVICE, REPAIRS AND MAINTENANCE ON THE IMPLEMENT:

- STOP ENGINE AND PTO, engage parking brake, lower implement, allow all moving parts to stop and remove key before dismounting from tractor.
- PLACE implement on ground or securely block up raised equipment. Use large blocks on soft or wet soil.
- PUSH and PULL Remote Hydraulic Cylinder lever to relieve hydraulic pressure.
- DISCONNECT Pump solenoid valve or PTO driveline connection before servicing mower head.
- WEAR SAFETY GLASSES (with side shields marked to comply with ANSI Z87), PROTECTIVE GLOVES and follow SAFETY PROCEDURES when performing service, repairs and maintenance on the implement:
- Always WEAR protective GLOVES when handling blades, knives, cutting edges or worn component with sharp edges.
- Always WEAR GLOVES and SAFETY GLASSES when servicing hot components.
- AVOID CONTACT with hot hydraulic oil tanks, pumps, motors, valves and hose connection surfaces. Always WEAR GLOVES and SAFETY GLASSES when servicing hot components.
- SECURELY support or BLOCK UP raised implement, framework and lifted components before working underneath equipment.
- FOLLOW INSTRUCTIONS in maintenance section when replacing hydraulic cylinders to prevent component falling.
- STOP any implement movements and SHUT-OFF engine before doing any work procedures.
- USE ladder or raised stands to reach high equipment areas inaccessible from ground.
- ENSURE good footing by standing on solid flat surfaces when getting on implement to perform work.
- FOLLOW manufacturer's instructions in handling oils, solvents, cleansers, and other chemical agents
- DO NOT change any factory-set hydraulic calibrations to avoid component or equipment failures.
- DO NOT modify or alter implement, functions or components.
- DO NOT WELD or repair rotating mower components. These may cause vibrations and component failures being thrown from mower. *PN HMMS-01 str*

MAINTENANCE

HAZARDS WITH MAINTENANCE OF IMPLEMENT-CONTINUED

				
Periodically inspect all moving parts, lubricate drivelines, and tighten all fasteners	Lower mower head to ground or block up before servicing	Stop engine remove key before conducting maintenance	Set mower head securely on the ground before servicing blades	Thrown Objects Hazard Ensure blades rotate clockwise viewed from above mower head

PERFORM SERVICE, REPAIRS, LUBRICATION AND MAINTENANCE OUTLINED IN IMPLEMENT MAINTENANCE SECTION:

- INSPECT for loose fasteners, worn or broken parts, leaky or loose fittings, missing or broken cotter keys and washers on pins, and all moving parts for wear.
- REPLACE any worn or broken parts with authorized service parts.
- Inspect mower blade spindle to ensure bearing pre-load. If loose repair before operating.
- LUBRICATE unit as specified by lubrication schedule
- NEVER lubricate, adjust or remove material while it is running or in motion.
- TORQUE all bolts and nuts as specified.

BLADE INSPECTION:

- Inspect blade carrier and blades daily.
- Check blade and blade carrier BOLT TORQUE daily. Loose bolts can cause blade or blade bolt failures.
- REPLACE, bent, damage, cracked and broken blades immediately with new blades.
- AVOID blade failures and thrown broken blades. DO NOT straighten, weld, or weld hard-facing blades

SAFETY SHIELDS, GUARDS AND SAFETY DEVICES INSPECTION:

- KEEP all Deflectors, Chain Guards, Steel Guards, Gearbox Shields, and PTO integral shields, Bands, Side Skirts and Skid Shoes in place and in good condition.
- REPLACE any missing, broken or worn safety shields, guards and safety devices.

 **WARNING** Cancer and Reproductive Harm www.P65Warnings.ca.gov. PN HMMS-02 str

MAINTENANCE

FLUID TYPES AND CAPACITIES TABLE

FLUID TYPE	CAPACITY
HYDRAULIC TANK (SHELL TELLUS S2 MX68)	27 GALLONS (102 L) Center of Sight Glass
FUEL (DIESEL, ULTRA LOW SULFUR)	47 GALLONS (178 L)
ENGINE DEF (ISO 22241-1)	5 GALLONS (19 L)
ENGINE OIL (RIMULA R6 LM 10W-40)	16.0 QUARTS (15.1 L)
ENGINE COOLANT (SHELL RIMULA ELC NF)	7.0 GALLONS (26.5L)
HYDRAULIC PUMP DRIVE (MOBIL SHC630)	38 OUNCES (1.12 L)
AXLE, FRONT (SAE 10W-30)	9.5 QUARTS (9.0 L) HOUSING
	1.0 QUARTS (1.0l) EACH HUB
	1.8 QUARTS (1.7L) GEARBOX
AXLE, REAR (SAE 10W-30)	9.5 QUARTS (9.0 L) HOUSING
	1.0 QUARTS (1.0l) EACH HUB
FRONT PTO GEARBOX (SAE 75W-90 GEAR OIL)	1.75 QUARTS (1.66 L)
REAR PTO GEARBOX (SAE 75W-90 GEAR OIL)	1.75 QUARTS (1.66 L)
A/C REFRIGERANT (R134a REFRIGERANT)	60 OUNCES (1.8L)
A/C LUBRICATING OIL (PAG 46)	5 OUNCES (275mL)
GREASE - (NLGI EP#2)	GREASE GUN TUBES

MAINTENANCE

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HYDRAULIC OIL

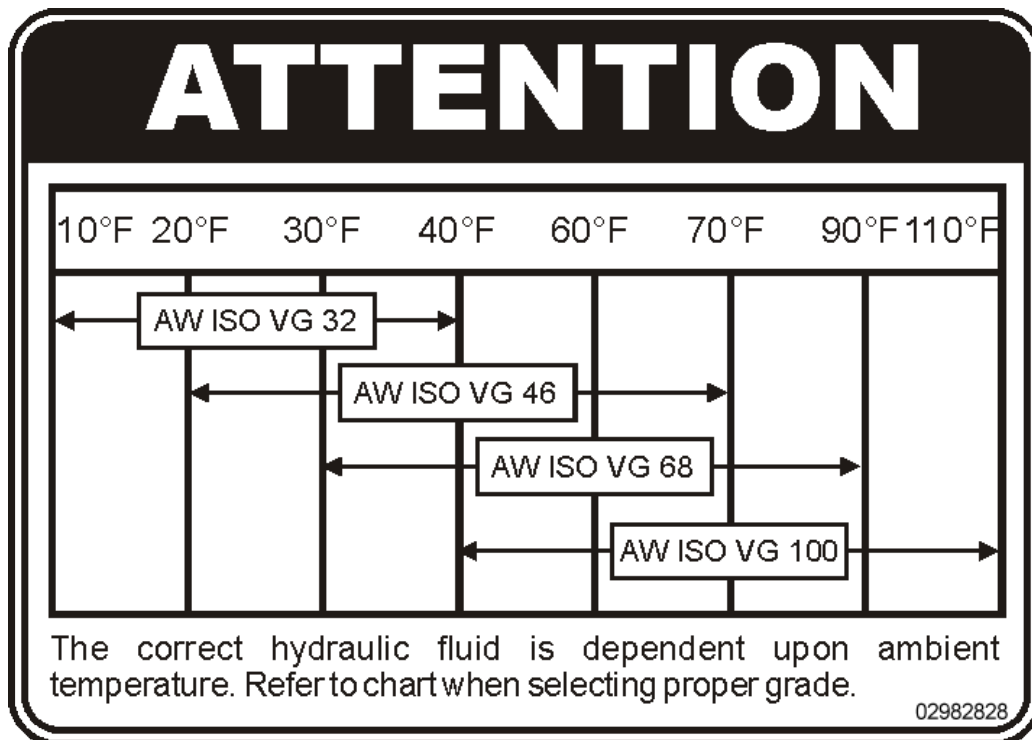
This vehicle has passed various hydraulic system qualification tests while using the standard recommended hydraulic fluid.

Recommended Hydraulic Oil (unless alternates approved by MANTIS): SHELL TELLUS S2 MX68

- Nominal Capacity (tank only): 27 gallons
- Additional oil is used in filling the other hydraulic system hoses and components.

For extreme hot or cold operating environments, a different hydraulic oil viscosity may be beneficial. For further information on alternate oil viscosities or extreme operating environments, please contact .

The chart below showing hydraulic oil viscosities at various operating temperatures is to be used and an example only, it is NOT a recommendation by . As mentioned above, contact if operating outside of the ambient temperature range shown for ISO VG 68.



MAINTENANCE

HYDRAULIC OIL LEVEL

Maintain the oil level within the sight gauge located on the reservoir. When oil is cold, the level should be within the sight gauge. Never fill the tank above the sight gauge level. A space is maintained above the sight gauge to allow for the expansion of the oil.

Oil is added through either return filter housing. Thoroughly clean the cap area around the filter to prevent oil from contamination. Remove the filter cap and element and add the proper viscosity grade of PREFILTERED oil to achieve the proper level. Oil installed into the hydraulic tank must meet a minimum cleanliness of 18/16/13 according to ISO 4406. Never assume any oil is clean, including new.

Low oil level in the reservoir is caused by leakage or improper filling. If leaking, locate the area of the leak and repair the leak at once. Loss of fluid can cause severe and catastrophic damage to hydraulic components.

NOTE: After initial startup, the mower may require more oil to bring the oil level back to the proper level. This is normal. Air trapped in the hydraulic components becomes displaced by the oil, causing the oil level to go down in the tank. Always maintain the hydraulic reservoir level within the viewable portion of the sight gauge. Most hydraulic functions require that the Tank Level be greater than 6 gallons.



MAINTENANCE

HYDRAULIC COMPONENTS



Prior to the removal of any holding valve, be certain the component or assembly is properly supported. Removing the holding valves will cause the load of the cylinder to free-fall unless supported.

Counterbalance valves are found within the Mantis Hydraulic System as well as within attachments. Counterbalance valves are used to hold pressure on the cylinders of attachments that have loads applied to them. When working on these hydraulic circuits be sure to relieve as much trapped pressure inside the cylinder as possible. This will prevent damage to the holding valve seals when the valves are removed. Always set the equipment securely on the ground before working on any hydraulic components. Add additional support with chains or stands as necessary to provide safe support of the equipment. Pressure may still be trapped in the cylinder, and it may be necessary to release pressure in cylinder by removing a hose slowly. Know and understand the hydraulic equipment that is being serviced. If you are unsure of the consequences of disconnecting the components please contact customer service for guidance.

Removing an O-ring Face Seal (ORFS) hose connection

Servicing hydraulic circuits or hoses on the Mantis may at times require that an O-ring Face Seal or ORFS connection be disconnected with hydraulic pressure present in the connection. If at all possible relieve pressure before disconnecting hydraulic lines. Keep away from leaks and pin holes. ORFS connections utilize an O-ring to seal between the two mating faces of the connection point. The O-ring on ORFS fittings will resist leaking oil at low torque values even with hydraulic oil at high pressure. This causes a dangerous situation with high pressure hydraulic oil escaping. Escaping fluid under pressure can penetrate skin causing serious injury. Wear gloves to disconnect high pressure ORFS connections. Loosen the connection 1/2 round carefully. Then wrap the connection with a shop towel to deflect the oil spray. Once covered, wiggle the connection to break the seal. If the pressure has not relieved then unscrew the connection another half turn with the shop towel in place. Again wiggle the connection. Continue this process until the pressurized oil escapes. Before reconnecting replace the O-ring seal and coat with hydraulic oil. Torque the connection to the appropriate ORFS torque value for the size.

MAINTENANCE

DIESEL FUEL REQUIREMENTS

Satisfactory engine performance depends on the use of a good quality fuel. The use of a good quality fuel will give the following results: Long engine life and acceptable exhaust emissions level

Cetane:

Cetane numbers of more than 45 are normally expected from current diesel fuel. However, a cetane number of 40 may be experienced in some territories. The United States of America is one of the territories that can have a low cetane value. A minimum cetane value of 40 is required during average starting conditions. A fuel with higher cetane number is recommended for operations at high altitudes or in cold-weather operations. Fuel with a low cetane number can be the root cause of problems during a cold start.

Viscosity:

The viscosity of the fuel is significant because fuel serves as a lubricant for the fuel system components. Fuel must have sufficient viscosity to lubricate the fuel system in both extremely cold temperatures and extremely hot temperatures. If the kinematic viscosity of the fuel is lower than 1.4 cSt at the fuel injection pump, damage to the fuel injection pump can occur. This damage can be excessive scuffing and seizure. Low viscosity may lead to difficult hot restarting, stalling and loss of performance. High viscosity may result in seizure of the pump

Density:

A fuel density of 841 kg/m³ is recommended to obtain the correct power output. Lighter fuels are acceptable but these fuels will not produce the rated power.

Sulfur:

The level of sulfur is governed by emissions legislations. Regional regulation, national regulations, or international regulations can require a fuel with a specific sulfur limit. The sulfur content of the fuel and the fuel quality must comply with all existing local regulations for emissions. The Deutz TCD 5.2L L4 engines are designed to operate only with Ultra Low Sulfur Diesel (ULSD). By using test methods ASTM D5453, or ISO 20846, the content of sulfur in ULSD must be below 15 PPM (mg/kg) or 0.0015% mass.

Lubricity:

The fluids lubricity describes the ability of the fluid to reduce the friction between surfaces that are under load. The lubricity of the fuel must not exceed wear scar diameter of 0.52 mm (0.0205 inch). The fuel lubricity test must be performed on an HFRR, operated at 60 °C (140 °F). Refer to "ISO 12156-1".

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Biodiesel Fuel

Fuel made from 100 percent Fatty Acid Methyl Esters (FAME) is generally referred to as B100 biodiesel or neat biodiesel. The neat biodiesel must conform to "EN14214" or "ASTM D6751" (in the USA) and can only be blended into acceptable standard mineral diesel fuel at a mixture of up to 20 percent by volume according to the latest edition of "EN590" and "ASTM D 975 S15" standards. This blend is commonly known as B20. Biodiesel blends are denoted as "BXX" with "XX" representing the content of neat biodiesel contained in the blend with mineral diesel fuel (for example B5, B10, B20). In United States Biodiesel blends of B6 to B20 must meet the requirements listed in the latest edition of "ASTM D7467" (B6 to B20) and must be of an API gravity of 30-45. In North America biodiesel and biodiesel blends must be purchased from the BQ-9000 accredited producers and BQ-9000 certified distributors. In other areas of the world, the use of biodiesel that is BQ-9000 accredited and certified, or that is accredited and certified by a comparable biodiesel quality body to meet similar biodiesel quality standards is required.

⚠ WARNING

Peak injection pressures in diesel fuel systems can exceed 29,000 psi. Contact with high pressure fuel may cause fluid penetration and burn hazards. High pressure fuel spray may cause a fire hazard. Failure to follow appropriate inspection, maintenance, and service instructions may cause personal injury or death. The high pressure fuel lines are the fuel lines that are between the high pressure fuel pump and the high pressure fuel manifold and the fuel lines that are between the fuel manifold and the cylinder head.

⚠ WARNING

After the engine has stopped, 10 minutes must be allowed for fuel pressure to be purged from the high-pressure fuel lines before any service or repair is performed on the engine fuel lines. The 10 minute wait will also allow static charge to dissipate from the low-pressure fuel system. Failure to follow these instructions can result in death or serious injury.

⚠ WARNING

After the fuel filter(s) have been changed, always prime the fuel system in order to remove air bubbles from the fuel system. Refer to the fuel priming procedure listed at the end of the Maintenance Section. Failure to follow these instructions can result in death or serious injury.

NOTICE

Operating with fuels that do not meet the engine manufacturers recommendations can cause the following effects: Starting difficulty, poor combustion, deposits in the fuel injectors, reduced service life of the fuel system, deposits in the combustion chamber and reduced service life of the engine. Engines are certified with the fuel that is prescribed by the United States Environmental Protection Agency. Manufacturers engines are certified with the fuel that is prescribed by the European Certification and other regulatory agencies. The engine manufacturer does not certify diesel engines on any other fuel. The owner and the operator of the engine has the responsibility of using the fuel that is prescribed by the Environmental Protection Agency (EPA) and other appropriate regulatory agencies.

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Approved Diesel Fuel Specifications:

The fuel types listed below are acceptable for use in the Deutz 5.2L engine found on the Mantis.

Acceptable Fuel Specification for 5.2L Engines	
Fuel Specification	Comments
EN500	European Automotive Diesel Fuel (DERV)
"ASTM D975 GRADE 1D S15"	"North American Light Distillate Diesel fuel with less than 15 PPM sulfur level"
"ASTM D975 GRADE 2D S15"	"North American Middle Distillate general purpose Diesel fuel with less than 15 PPM sulfur level"
"JIS K2204"	"Japanese Diesel Fuel" Must meet the requirements that are stated in the section "Lubricity".
"BS 2869: 2010 CLASS A2 or EU equivalent"	"EU Off-Road Diesel fuel. Acceptable from 2011 MIUST have less than 10 PPM sulfur level"

Fuel System Prime Procedure

NOTE: Do not crank the engine continuously for more than 30 seconds. Allow the starting motor to cool for two minutes before cranking the engine again.

If air enters the fuel system, the air must be purged from the fuel system before the engine can be started.

Air can enter the fuel system when the following events occur:

- The fuel tank is empty or the fuel tank has been partially drained.
- The low-pressure fuel lines are disconnected.
- A leak exists in the low-pressure fuel system.
- The fuel filter has been replaced.

Use the following procedure for initial system priming or to remove air from the system.

1. Make sure all fuel supply valves (not a MANTIS supplied option) is in the "ON" position and no fuel lines are pinched closed.
2. Ensure the fuel tank is at least 23% full.
3. Open the bleed screw on the top of the fuel pre-filter housing.
4. Using the hand pump on the pre-filter housing, pump fuel from the tank to the pre-filter (initial system priming will require approximately 60 pumps).
5. Close the bleeder screw when fuel begins to come out of it.
6. Operate the engine starter and crank the engine. After the engine has started, operate the engine at idle (830 RPM) for a minimum of 5 minutes. Ensure the fuel system has no leaks.

NOTE: DO NOT loosen the high-pressure fuel lines in order to purge air from the fuel system. This procedure is not required.

MAINTENANCE

DIESEL EXHAUST FLUID (DEF) REQUIREMENTS

DEF is a liquid that is injected into the after-treatment system before Selective Catalytic Reduction (SCR). This system of injecting the DEF into the exhaust will cause a reaction in the SCR system. The Nitrogen Oxide (NOx) molecules in the exhaust are converted to elemental nitrogen and water. This conversion reduces the emissions of the engine.

The DEF used must meet the ISO specification 22241-1 for quality. Spilled DEF will crystallize when the water within the solution evaporates. DEF spills will attack paint and metal, so they should be cleaned immediately by washing the area with water. If DEF is spilled onto hot components, ammonia vapor may be released, so do not breathe these vapors and do not clean any spills with bleach.

DEF can start to freeze at 12.2°F (-11°C). The machine is equipped with electrically heated DEF lines. The DEF tank is also heated by use of engine coolant. Park on level ground during freezing conditions when the machine is not in use.

Do not store DEF in direct sunlight and observe the expected DEF storage life as shown in the table below.

Storage	Expected DEF Life
Below 25° (77°F)	18 months
25°C (77° F) to 30° C (86° F)	12 months
30° C (86° F) to 35° C (95° F)	6 months
Above 35° C (95° F)	Test quality before use

The installed DEF tank has a capacity of 5 gallons and the blue fill cap is located behind the cab with the fill port accessible from the left hand side of the machine.

ENGINE OIL

Check engine oil level daily. With the engine stopped and the machine parked on level ground, the oil level should be between the upper and lower operating range markings on the dipstick as shown in the picture below. Add oil through the fill cap to maintain the oil level.

NOTE: Wait 10 minutes after the engine has be shut off, allowing the engine oil to drain to the oil pan, before checking the oil level



Use oil viscosity based on the expected air temperature range during the period between oil changes. Multi-viscosity diesel engine oils are preferred. Engine oil weight SAE 10W-40 that meets or exceeds API CJ-4 may be used in most conditions.

Generally, use the highest viscosity oil that is available to meet the requirement for the temperature at start-up.

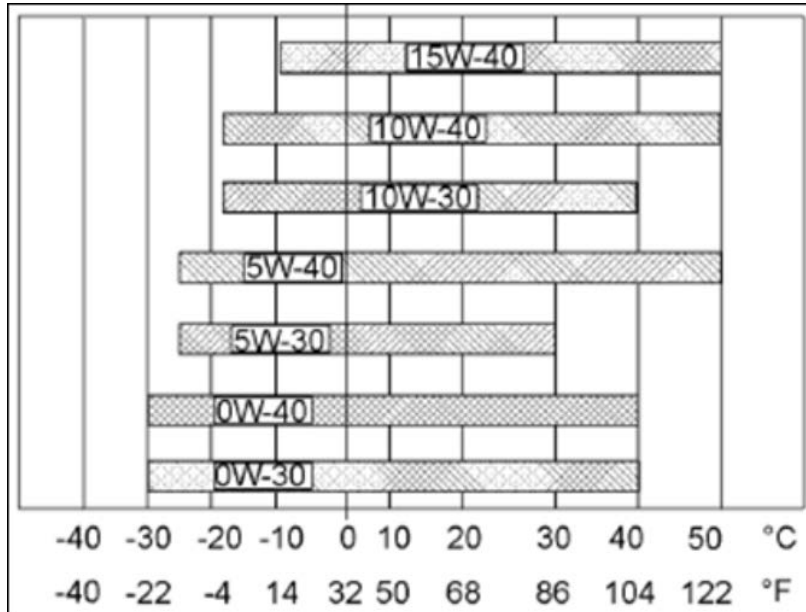
Service: Change engine oil and filter every 500 hrs. Check engine oil level daily.

Recommended Engine Oil (under most operating temperatures): SAE 10W-40

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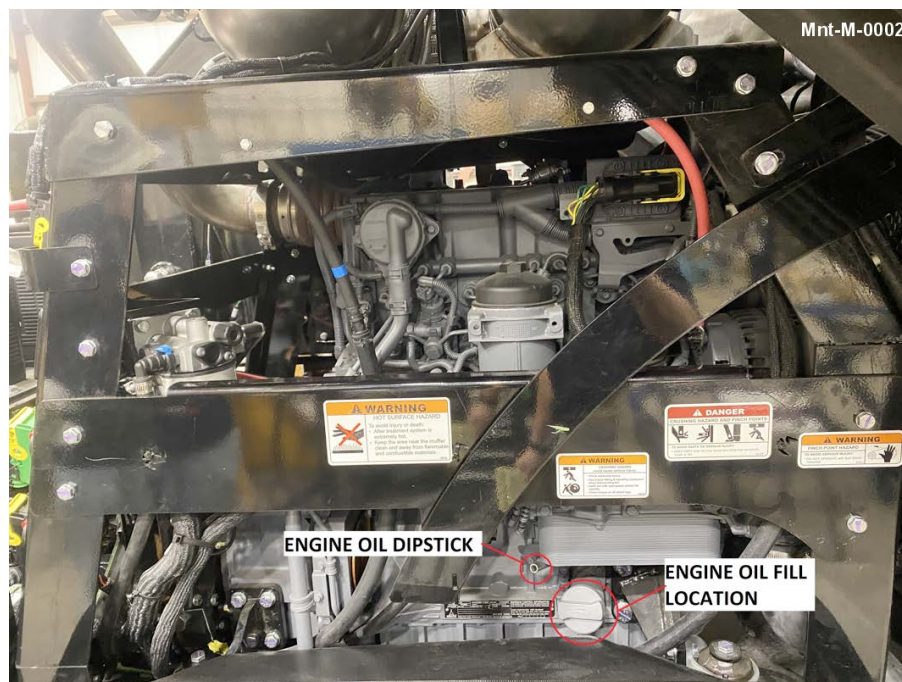
- Capacity (with filter change): 4 Gallons (15.1 L)



When installing a new oil filter, ensure the filter element is fully seated and the filter cap's O-ring has been lubricated with new clean oil prior to reinstalling the filter cap.

NOTICE

Do not drain the engine oil when the engine is cold. As the engine oil cools suspended waste particles settle on the bottom of the oil pan. The waste particles are not removed with draining cold oil. Drain the oil pan with the engine stopped and the oil warm. This allows suspended waste particles to be drained properly



MAINTENANCE

ENGINE COOLANT

Check engine coolant level daily. The coolant level should be visible in the sight glass on the surge tank. A float switch is installed in the surge tank shown below. If coolant level should become low an alarm becomes active on the "ERRORS" display screen.



Filling the Coolant Recovery Reservoir

Adding Engine Coolant to the Mantis is an operation that needs to be performed by a qualified service technician. Accessing the coolant recovery tank requires having the appropriate tools, lifting equipment and a suitable ladder. Be cautious and follow safe practices using the appropriate tools, and personal protection around safety hazards when maintenance and repair procedures are performed. Fill the reservoir to the sight glass center using quality 50% ethylene glycol / 50% distilled water, nitrite free coolant mixture. This concentration allows the NOx reduction system to operate correctly at high ambient temperatures.

RECOMMENDED COOLANTS & SERVICE INTERVALS:

- ELC - Extended Life Coolant (Service life 6,000 hours or Three years)
- SCA - Supplement Coolant Additive & Water (Service life 3,000 hours or One year)
- ASTM - American Society for Testing and Materials (Service life 3,000 hours or Two years)
- Cooling System Capacity: 7 gallons (26.5 L)

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Use distilled or deionized water. If distilled or deionized water is not available, use water that meets the properties listed in the table below

NOTE: Do not use the following types of water: Salt water/seawater, Hard water, Softened water that has been conditioned with salt.

Acceptable Water	
Property	Maximum Limit
Chloride (Cl)	40 mg/L
Sulfate (SO ₄)	100 mg/L
Total Hardness	170 mg/L
Total Solids	340 mg/L
Acidity	pH of 5.5 to 9.0

NOTICE

Never use water alone as a coolant. Supplemental Coolant Additives (SCA) are required because water is corrosive at engine operating temperatures. If water and a SCA are used, then the maximum top tank temperature must be reduced from 108°C to 100°C

NOTICE

Never add coolant to an overheated engine. Engine damage could result. Allow the engine to cool first.

Important

Frequently check the specific gravity of the coolant for proper freeze protection or for anti-boil protection.

NOTICE

If the engine is to be stored in, or shipped to an area with below freezing temperatures, the cooling system must be either protected to the lowest outside temperature or drained completely to prevent damage.

NOTICE

Never operate an engine without water temperature regulators in the cooling system. Water temperature regulators help to maintain the engine coolant at the proper operating temperature. Cooling system problems can develop without water temperature regulators..

Important

Do not use a conventional coolant to top-off a cooling system that is filled with Extended Life Coolant (ELC).

CLEAN THE COOLING SYSTEM FOR THE FOLLOWING REASONS:

- Contamination of the cooling system
- Overheating of the engine
- Foaming of the coolant

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Ethylene Glycol	
Concentration	Freeze Protection
50 Percent	-36 °C (-33 °F)
60 Percent	-51 °C (-60 °F)

Use a specific gravity tester similar to the picture below to ensure that the coolant mixture is appropriate for the temperatures that the MANTIS will be operated in.



MAINTENANCE

PUMP DRIVE GEARBOX

A pump drive gearbox is directly attached to the engine crankshaft to drive 3 hydraulic pump mounting pads. The gearbox output speed (hydraulic pump speed) is 1.42 times engine crankshaft speed. The pump drive gearbox is in operation any time the engine crankshaft is turning.

Check oil level daily, making sure the oil level is at the full mark on the dipstick with the vehicle parked on level ground.

Service: Check oil level daily. Change oil after the first 100 hours of service or after six months, whichever comes first. After the first service, change oil every 2000 hours or after six months, whichever comes first.

RECOMMENDED OIL: MOBIL SHC 630 GEAR OIL

- Capacity: 38 Ounces (1.12 L)

NOTICE

Too much oil in the pump drive may be an indication that an oil seal on a pump has failed and must be repaired.

NOTICE

Do not overfill with oil. Too much oil will cause the pump drive to overheat

NOTICE

The oil should be changed anytime it shows traces of dirt, contamination by other fluids or the effects of high temperature evidenced by discoloration or strong odor. Under no circumstances should the gear case oil go unchanged for more than six months. Condensation may contaminate the oil reducing its effectiveness

OIL SUMP TEMPERATURES:

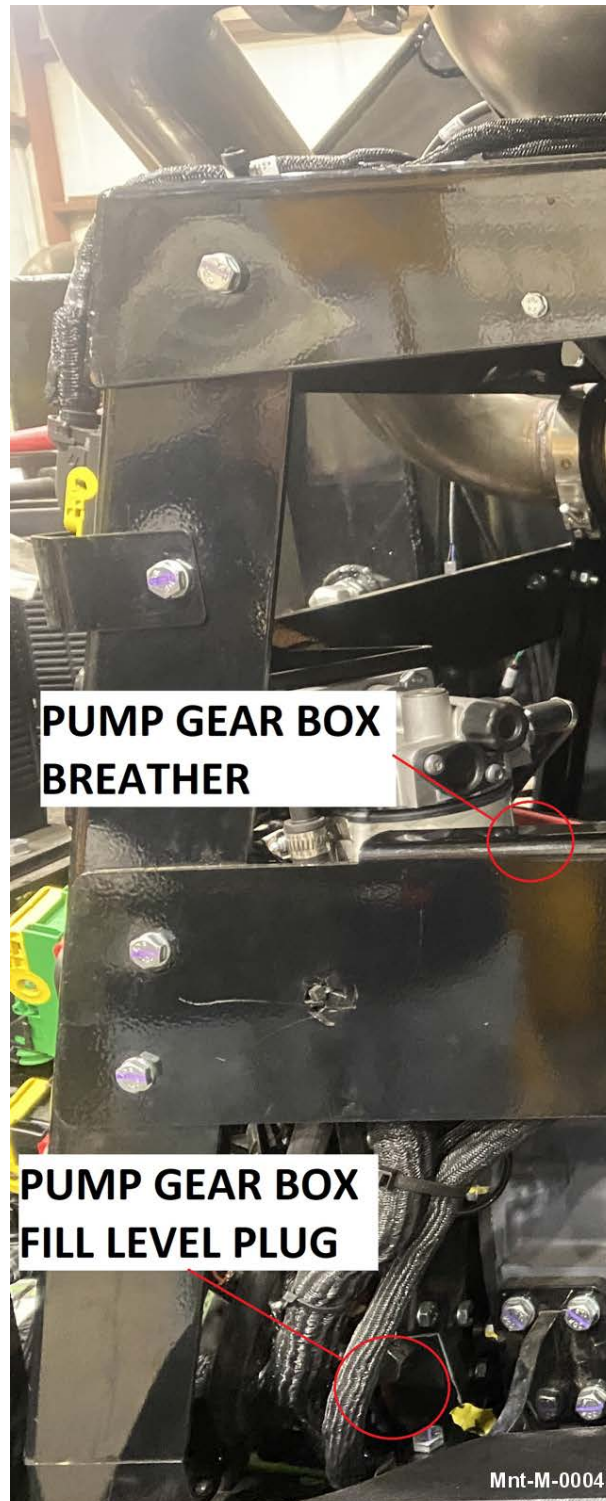
- Optimum continuous operation: 200 - 220°F (93 - 104°C)
- Maximum intermittent operation: 225°F (107°C)

OIL ANALYSIS - MAXIMUM ALLOWABLE CONTAMINATION:

- Iron - 350 parts per million
- Silicon - 150 parts per million

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A drain plug for the pump drive is located at the very bottom of the pump drive housing.

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GREASE

Before operating your implement, take the time to inspect and repair any damage to the machine or power unit. Only a minimum of time and effort is required to regularly maintain this machine to provide long life and trouble free operation.

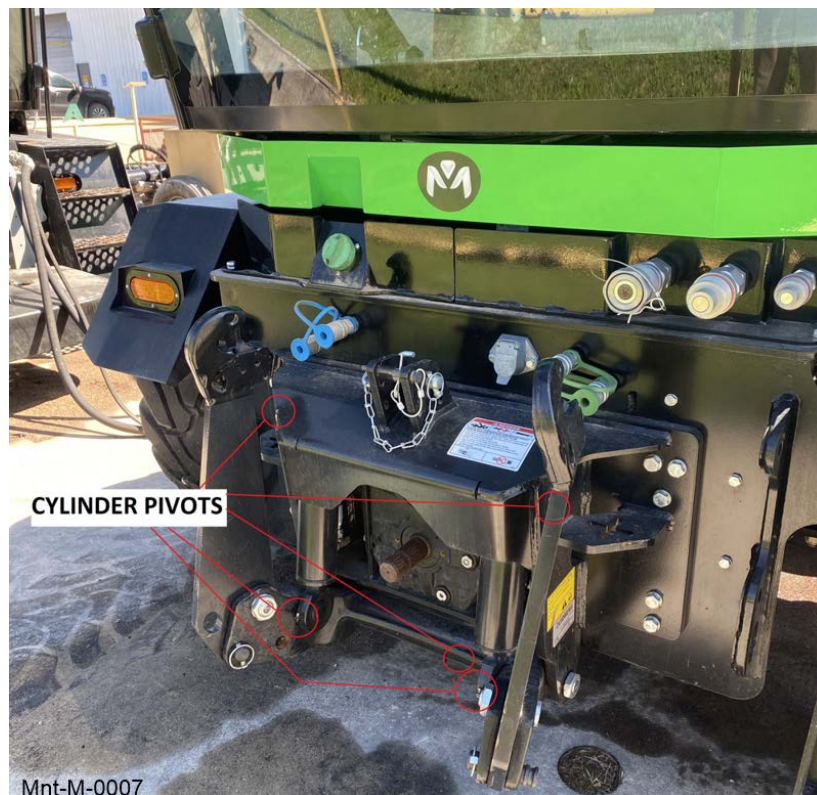
Use grease based on NLGI consistency number and the expected temperature range during service. NLGI EP#2 grease is appropriate in most cases. Some types of grease are not compatible with others. Consult your supplier before mixing different types.

Rear Axle Pivot/Lock Cylinder	40 Hours
Rotating Cab	Monthly or 200 Hours
3 Pint Hitch Pivots	40 Hours
Axle Points	Monthly or 200 hours - See Axle Maintenance Section



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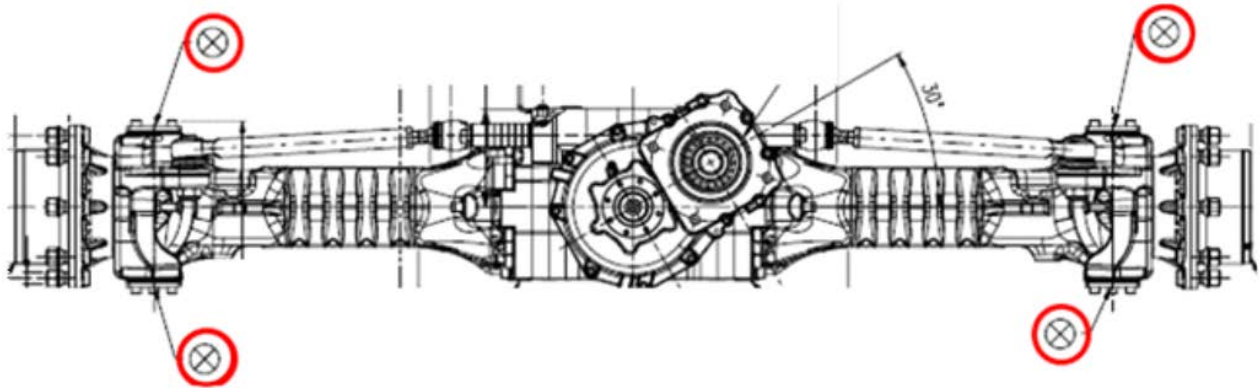
MAINTENANCE

AXLES

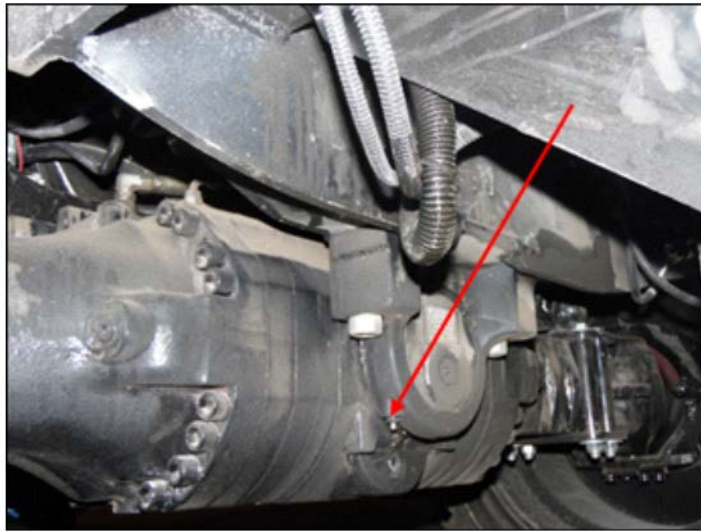
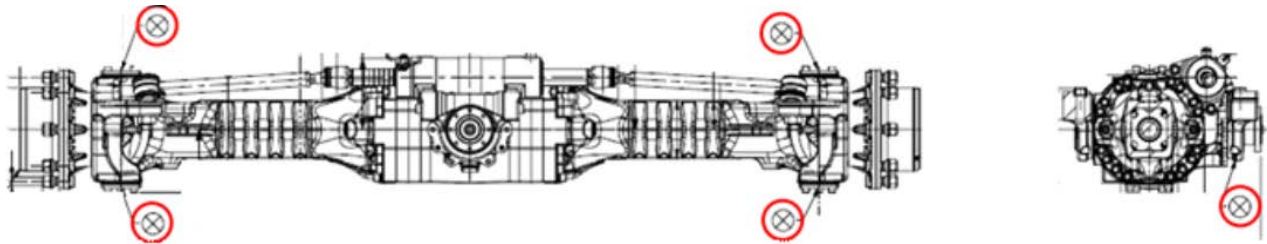
Service: Grease points should be greased weekly or every 200 hours. If machine use is severe, then grease every 50 hours.

Recommended Grease: GADUS S3 V220 C2

Front axle grease points



Rear axle grease points.



MAINTENANCE

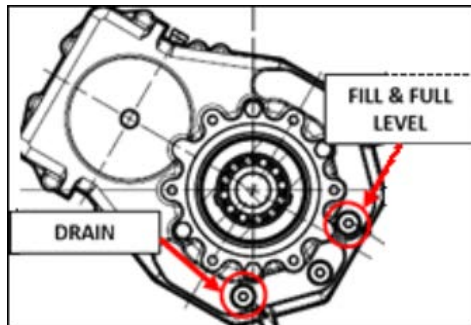
Service: Change axle oil after the first 200 hours and annually or every 1000 hours. The magnetic plug must be cleaned every time the oil is changed. The oil level should be checked after the first 100 hours and monthly or every 300 hours. The oil breather needs cleaning monthly or every 300 hours. Hub oil plug is on the exposed end of the hubs. The gearbox oil plugs are on the axle side of the gearbox.

RECOMMENDED GEAR OIL: SAE10W-30 + FRICTION ADDITIVE

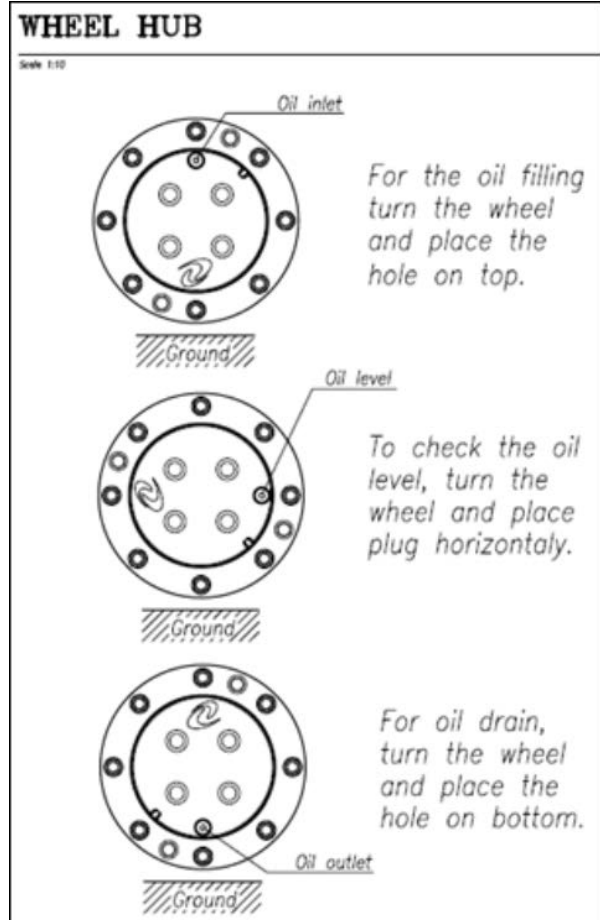
- Front Axle Total: 12.7L - Axle Housing: 9.0L, Each Wheel Hub: 1.0L, Gearbox: 1.7L
- Rear Axle Total: 11.0L - Axle Housing: 9.0L, Each Wheel Hub: 1.0L

Wheel hub filling, level check, and draining positions are illustrated in the image to the right.

The front axle gearbox fill level, filling and drain hole locations are indicated in the image below.

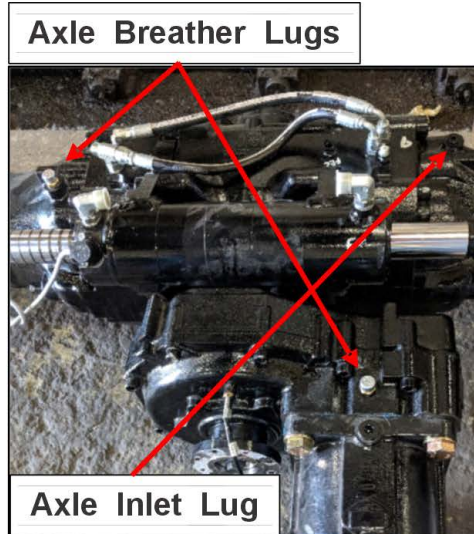


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Axle Inlet & Level Lug

Axle Drain Lug



Axle Inlet Lug

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PTO GEARBOX

Both the front and the rear PTO's are an optional feature, so they may not be installed.

Service: Change engine oil after the first 50 hours of operation, then every 500 hours. The oil fill is located at the top of the box and the drain is at the very bottom.

Oil level should be checked weekly using the sight glass at the side of the gearbox.

RECOMMENDED GEAR OIL: SAE 75W-90

- Front PTO Gearbox: 1.75 quart (1.66 L)
- Rear PTO Gearbox: 1.75 quart (1.66 L)



Mnt-M-0012

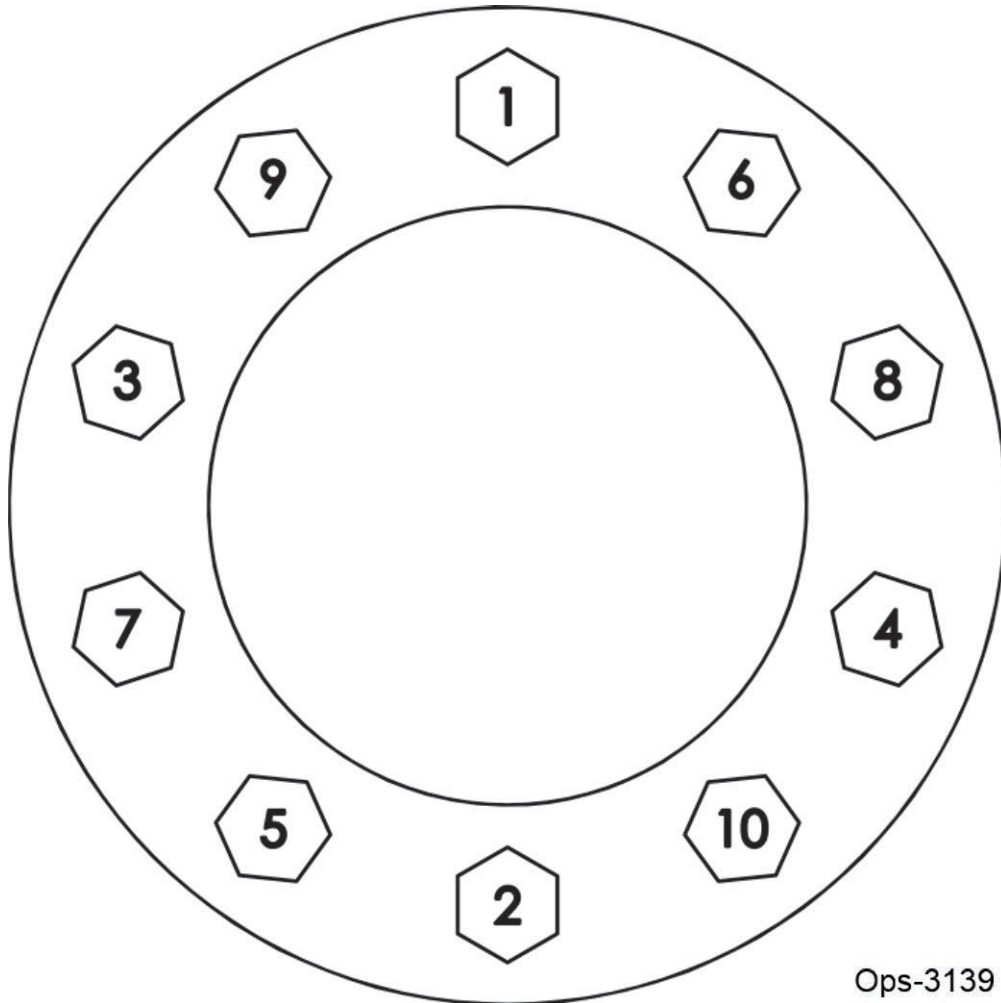
MAINTENANCE

WHEELS

INFLATION PRESSURE: 51 PSI FOR 500/50R22.5 OR 560/45R22.5 TIRES

- Lug Nut Torque: 425 ft-lbs (575 N-m)

Lug Nut Tightening Pattern



Ops-3139

PROPER TORQUE FOR FASTENERS

The chart below lists the correct tightening torque for fasteners. When bolts are to be tightened or replaced, refer to this chart to determine the grade of bolts and the proper torque except when specific torque values are assigned in manual text.

RECOMMENDED TORQUE IN FOOT-POUNDS UNLESS OTHERWISE STATED IN THE MANUAL *

NOTE: These values apply to fasteners as received from the supplier, dry or when lubricated with normal engine oil. They do not apply if special graphite or molydisulphide greases or other extreme pressure lubricants are used. This applies to both UNF fine and UNC coarse threads.

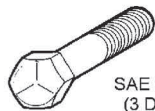
MAINTENANCE

TORQUE SPECIFICATIONS - DRY TORQUE

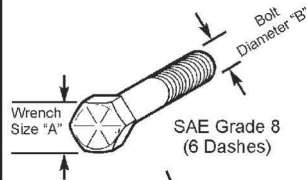
AMERICAN Bolt Head Markings



SAE Grade 2
(No Dashes)



SAE Grade 5
(3 Dashes)



SAE Grade 8
(6 Dashes)

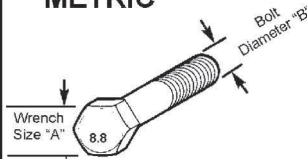


All Capscrews
SAE Grade 8

Proper torque for American fasteners.
Recommended Torque in Foot Pounds (Newton Meters).*

WRENCH SIZE (IN.) "A"	BOLT DIAMETER (IN.) "B" AND THREAD SIZE	SAE GRADE 2	SAE GRADE 5	SAE GRADE 8
7/16	1/4 - 20 UNC	6 (7)	8 (11)	12 (16)
7/16	1/4 - 28 UNF	6 (8)	10 (13)	14 (18)
1/2	5/16 - 18 UNC	11 (15)	17 (23)	25 (33)
1/2	5/16 - 24 UNF	13 (17)	19 (26)	27 (37)
9/16	3/8 - 16 UNC	20 (27)	31 (42)	44 (60)
9/16	3/8 - 24 UNF	23 (31)	35 (47)	49 (66)
5/8	7/16 - 14 UNC	32 (43)	49 (66)	70 (95)
5/8	7/16 - 20 UNF	36 (49)	55 (75)	78 (106)
3/4	1/2 - 13 UNC	49 (66)	76 (103)	106 (144)
3/4	1/2 - 20 UNF	55 (75)	85 (115)	120 (163)
7/8	9/16 - 12 UNC	70 (95)	109 (148)	153 (207)
7/8	9/16 - 18 UNF	79 (107)	122 (165)	172 (233)
15/16	5/8 - 11 UNC	97 (131)	150 (203)	212 (287)
15/16	5/8 - 18 UNF	110 (149)	170 (230)	240 (325)
1-1/8	3/4 - 10 UNC	144 (195)	266 (360)	376 (509)
1-1/8	3/4 - 16 UNF	192 (260)	297 (402)	420 (569)
1-5/16	7/8 - 9 UNC	166 (225)	430 (583)	606 (821)
1-5/16	7/8 - 14 UNF	184 (249)	474 (642)	668 (905)
1-1/2	1 - 8 UNC	250 (339)	644 (873)	909 (1232)
1-1/2	1 - 12 UNF	274 (371)	705 (955)	995 (1348)
1-1/2	1 - 14 UNF	280 (379)	721 (977)	1019 (1381)
1-11/16	1-1/8 - 7 UNC	354 (480)	795 (1077)	1288 (1745)
1-11/16	1-1/8 - 12 UNF	397 (538)	890 (1206)	1444 (1957)
1-7/8	1-1/4 - 7 UNC	500 (678)	1120 (1518)	1817 (2462)
1-7/8	1-1/4 - 12 UNF	553 (749)	1241 (1682)	2013 (2728)
2-1/16	1-3/8 - 6 UNC	655 (887)	1470 (1992)	2382 (3228)
2-1/16	1-3/8 - 12 UNF	746 (1011)	1672 (2266)	2712 (3675)
2-1/4	1-1/2 - 6 UNC	870 (1179)	1950 (2642)	3161 (4283)
2-1/4	1-1/2 - 12 UNF	979 (1327)	2194 (2973)	3567 (4820)

METRIC



Numbers appearing on bolt heads
indicate ASTM class.

*Use 75% of the specified torque value for plated fasteners. Use 85% of the specified torque values for lubricated fasteners.

Proper torque for Metric fasteners.
Recommended torque in Foot Pounds (Newton Meters).*

WRENCH SIZE (mm) "A"	BOLT DIA. (mm) "B"	ASTM 4.6	ASTM 8.8	ASTM 9.8	ASTM 10.9
8	5	1.8 (2.4)		5.1 (6.9)	6.5 (8.8)
10	6	3 (4)		8.7 (12)	11.1 (15)
13	8	7.3 (10)		21.1 (29)	27 (37)
16	10	14.5 (20)		42 (57)	53 (72)
18	12	25 (34)	74 (100)	73 (99)	93 (126)
21	14	40 (54)	118 (160)	116 (157)	148 (201)
24	16	62 (84)	167 (226)	181 (245)	230 (312)
30	20	122 (165)	325 (440)		449 (608)
33	22		443 (600)		611 (828)
36	24	211 (286)	563 (763)		778 (1054)
41	27		821 (1112)		1138 (1542)
46	30	418 (566)	1119 (1516)		1547 (2096)

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MAINTENANCE

PROPER TORQUE FOR HYDRAULIC HOSE FITTINGS AND PIPING

JIC 37° and 45° (Machined or Flared)

Size		Steel			
		Ft.-Lbs.		Newton-Meters	
Dash	Inches	Minimum	Maximum	Minimum	Maximum
-4	1/4	10	11	13	15
-5	5/16	13	15	18	20
-6	3/8	17	19	23	26
-8	1/2	34	38	47	52
-10	5/8	50	56	69	76
-12	3/4	70	78	96	106
-16	1	94	104	127	141
-20	1-1/4	124	138	169	188
-24	1-1/2	156	173	212	235
-32	2	219	243	296	329

Flat-Face O-Ring Seal (Steel)

Size		Ft. Lbs.		Newton-Meters	
Dash	Inches	Minimum	Maximum	Minimum	Maximum
-4	1/4	10	12	14	16
-6	3/8	18	20	24	27
-8	1/2	32	40	43	54
-10	5/8	44	55	60	75
-12	3/4	66	81	90	110
-14	7/8	66	81	90	110
-16	1	92	103	125	240
-20	1-1/4	125	140	170	190
-24	1-1/2	148	181	200	245

MAINTENANCE

MAINTENANCE

SAE O-Ring Boss (Steel)

Size		Ft.-Lbs. Working Pressures 4,000 Psi (27.5 Mpa) & Below		Newton-Meters Working Pressures 4,000 Psi (27.5 Mpa) & Below		Ft.-Lbs. Working Pressures Above 4,000 Psi (27.5 Mpa)		Newton-Meters Working Pressures Above 4,000 Psi (27.5 Mpa)	
Dash	Inches	Mini	Max	Mini	Max	Mini	Max	Mini	Max
-3	3/16	-	-	-	-	8	10	11	13
-4	1/4	14	16	20	22	14	16	20	22
-5	5/16	-	-	-	-	18	20	24	27
-6	3/8	24	26	33	35	24	26	33	35
-8	1/2	37	44	50	60	50	60	68	78
-10	5/8	50	60	68	81	72	80	98	110
-12	3/4	75	83	101-1/2	113	125	135	170	183
-14	7/8	-	-	-	-	160	180	215	245
-16	1	111	125	150	170	200	220	270	300
-20	1-1/4	133	152	180	206	210	280	285	380
-24	1-1/2	156	184	212	250	270	360	370	490

BSP 30° Inverted Cone

Size		Ft.-Lbs.		Newton Meters	
Dash	Inches	Minimum	Maximum	Minimum	Maximum
-2	1/8	7	9	9	12
-4	1/4	11	18	15	24
-6	3/8	19	28	26	38
-8	1/2	30	36	41	49
-10	5/8	37	44	50	60
-12	3/4	50	60	68	81
-16	1	79	95	107	129
-20	1-1/4	127	152	172	206
-24	1-1/2	167	190	226	258
-32	2	262	314	355	426

MAINTENANCE

DIN 2353 12°, 3° and Universal Inverted Cone

Size		Ft.-Lbs.		Newton-Meters	
Light Series Tube O.D. (mm)	Heavy Series Tube O.D. (mm)	Mini	Max	Mini	Max
-6	-	7	15	10	20
-8	-	15	26	20	35
-10	-8	18	30	25	40
-12	-10	22	33	30	45
-14	-12	26	37	35	50
-15	-14	30	52	40	70
-	-16	30	52	40	70
-18	-	44	74	60	100
-22	-20	59	89	80	120
-28	-25	74	111	100	150
-	-30	74	162	150	220
-35	-	133	184	180	250
-42	-38	148	221	200	300

Maximum Recommended Torque for Dry NPTF (Tapered) Pipe Threads

Size	Ft.-Lbs.	Newton Meters
-2	20	25

MAINTENANCE

FUSES AND RELAYS

MAINTENANCE

LOCATION	NUMBER	RATING	CIRCUIT	
MAIN	1	15	AUX LIGHT BAR	
	2	10	FRONT 711	
	3	10	FRONT 711	
	4	10	FRONT 711	
	5	5	CAB SENSORS	
	6	10	REAR 711	
	7	10	REAR 711	
	8	10	REAR 711	
	9	10	ATTACH INTER 2	
	10	5	HYD AND REAR SENSORS	
	11	20	DRIVE CONTROLLER	
	12	20	DRIVE CONTROLLER	
	13	5	DRIVE SENSOR	
	14	10	CAB DISPLAY/CAMERA	
	15	5	TELEMATICS	
	16	5	RH CONSOLE	
	17	10	F/P EXP MODULE 1	
	18	10	ATTACH INTER 1	
	19	10	REAR TRAILER PLUG	
	20	10	FRONT TRAILER PLUG	
	21	10	SS ATTACH	
	22	5	ENGINE 1 - 12V CONV	
	23	10	ENGINE 2 - EXHAUST FLAP	
	24	5	ENGINE 3 - DIAG PLUG	
	25	15	ENGINE 4 - NOX SENSOR	
	26	5	ENGINE 5 - DEF QUALITY	
	27	30	ENGINE 6 - DEF HEATER	
	28	15	F/P EXP MODULE 2	
	29	10	SPARE	
	30	OPEN	UNUSED	
	R1	20	MARKER LAMPS	
	R2	OPEN	UNUSED	
	R3	OPEN	UNUSED	
	37	OPEN	UNUSED	
	38	OPEN	UNUSED	
	39	OPEN	UNUSED	
	40	5	STEER COLUMN 1	
	41	10	R1 POWER	
	42	5	STEER COLUMN 2	

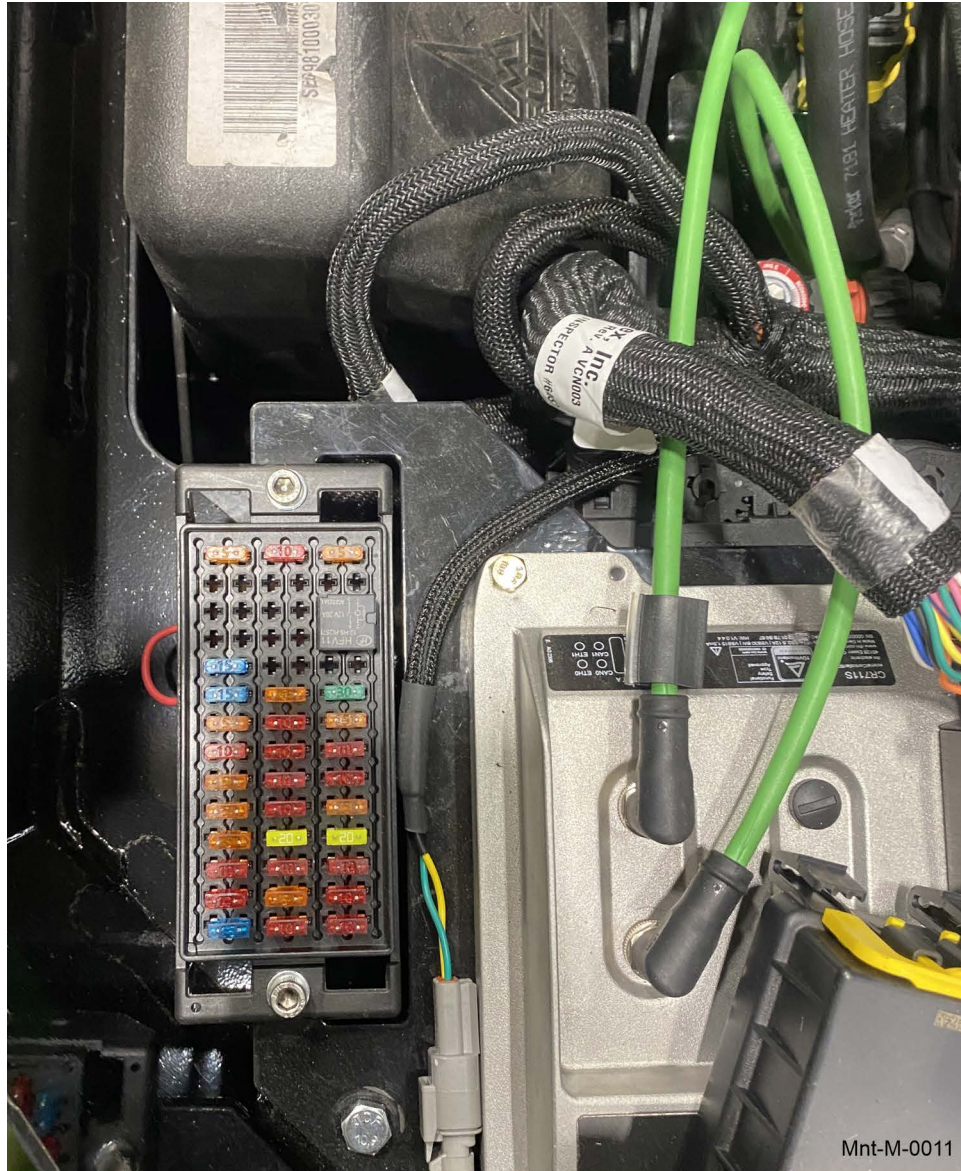
FUSE BLOCK LAYOUT					
F40	5A	F41	10A	F42	5A
F37	OPEN	F38	OPEN	F39	OPEN
R3	OPEN	R2	OPEN	R1	20A
F28	15A	F29	10A	F30	OPEN
F25	15A	F26	5A	F27	30A
F22	5A	F23	10A	F24	5A
F19	10A	F20	10A	F21	10A
F16	5A	F17	10A	F18	10A
F13	5A	F14	10A	F15	5A
F10	5A	F11	20A	F12	20A
F7	10A	F8	10A	F9	10A
F4	10A	F5	5A	F6	10A
F1	15A	F2	10A	F3	10A



HOLE LOCATOR

MAINTENANCE

MAINTENANCE



Main Fuse Block

Fuse Block is located behind the Cab
under the DEF Cover on the Machine Right Hand Side

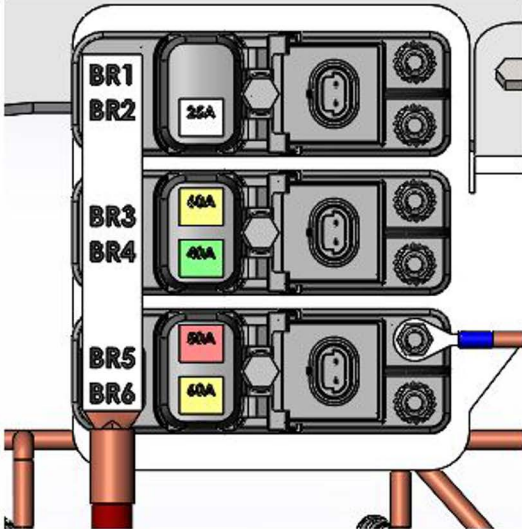
Important

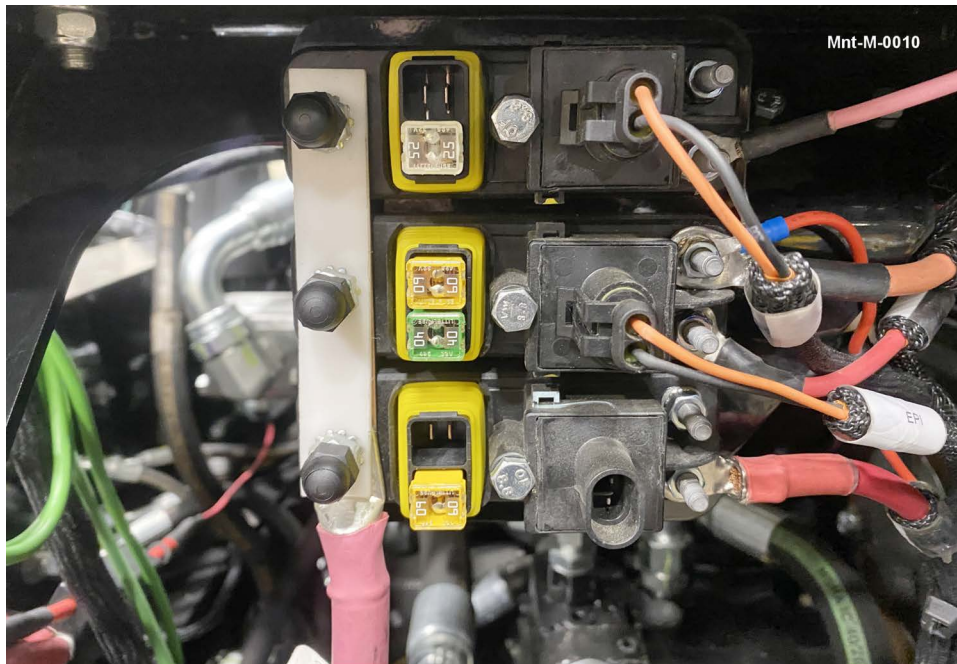
To prevent damage to the electrical system, never use a fuse with a rating higher than the rating stated in the table.

Some fuse positions are vacant. These must remain vacant until appropriate options are added.

MAINTENANCE

MAINTENANCE

BATTERY STAND RELAYS	BR1	OPEN	UNUSED	
	BR2	25	ECU	
	BR3	60	KEY ON FUSES	
	BR4	40	CONSTANT FUSES	
	BR5	50	ROTATING CAB	
	BR6	60	CAB POWER	



Battery Stand Relay

Relays are located immediately under the Batteries on the Machine Left Hand Side under the Cowling

MAINTENANCE

HYDRAULIC FLUID

Maintaining the proper hydraulic oil level and oil cleanliness is very important for continued trouble-free operation of the MANTIS. The fluid level should be checked daily before the mower is put into service. A visual inspection of the hydraulic connections, hose guards and shielding should occur daily as well. The hydraulic fluid can lose its ability to lubricate in a number of different ways, most commonly contamination and overheating. Both scenarios can lead to catastrophic failure of the hydraulic components and costly repairs.

Filling the Hydraulic Reservoir

Adding hydraulic oil to the Mantis is an operation that needs to be performed by a qualified service technician. Accessing the hydraulic tank requires having the appropriate tools, lifting equipment and a suitable ladder. Be cautious and follow safe practices using the appropriate tools around safety hazards when maintenance and repair procedures are performed.

offers fluids, filters, and oil analysis capabilities to help you maintain your hydraulic powered machine. Please be sure to follow the oil & filter change procedure that is outlined for your mower.

Note: *Recommended Hydraulic Fluid - Type ISO AW46 or ISO AW68 Shell Tellus and should be changed after the first 200 hours, and every 500 hours or 12 months. Oil should be changed every 2000 hours.*

MAINTENANCE

MAINTENANCE

LUBRICATION AND MAINTENANCE RECORDS

First 50 Hours

Hours Date

- Change Gearbox Oil
- Change PTO Gearbox Oil (If Required)
- Change Fuel Filter (Primary & Secondary)
- Change Oil & Engine Filter

First 100 Hours

Hours Date

- Change Hydraulic Oil Filter (Tank Returns (2), Charge (3), Pressure)
- Check Axle Oil Filter
- Check Air Filters (Primary & Secondary)

First 200 Hours

Hours Date

- Change Axle Oil
- Grease Axle Points

First 500 Hours

Hours Date

- Change Hydraulic Oil
- Change Cabin Filters

First 300 Hours or Monthly

Hours									
Date									
Hours									
Date									
Hours									
Date									

- Change Axle Oil
- Change Axle Oil Breather

MAINTENANCE

Every 500 Hours or Monthly

Hours									
Date									
Hours									
Date									
Hours									
Date									

- Change Hydraulic Oil Filter
- Clean Radiator (See Service Manual)

Every 1000 Hours or Once a Year

Hours									
Date									
Hours									
Date									

- Change Primary Fuel Filter (Water Separator) Element (See Service Manual)
- Change Secondary Fuel Filter (See Service Manual)
- Change Front and Rear PTO Gearbox Oil (If Equipped)
- Change Hydraulic Oil
- Inspect Engine Belt (See Service Manual)
- Inspect Engine Water Pump (See Service Manual)
- Check Engine Belt Tensioner (See Service Manual)
- Change Engine Oil and Filter
- Change Gearbox Oil
- Change Axle Oil

Every 1500 Hours

Hours									
Date									
Hours									
Date									

- Clean/replace Diesel Exhaust Fluid Filter (See Service Manual)
- Replace Engine Crankcase Breather Element (See Service Manual)

MAINTENANCE

MAINTENANCE

Every 2000 Hours

Hours									
Date									
Hours									
Date									

- Inspect Engine Mounts for deterioration (See Service Manual)

Every 3000 Hours

Hours									
Date									
Hours									
Date									

- Replace Alternator and Fan Belts (See Service Manual)

Every 4000 Hours

Hours									
Date									
Hours									
Date									

- Clean and test After Cooler

Every 4500 Hours

Hours									
Date									
Hours									
Date									

- Inspect Turbocharger (See Service Manual)

Every 6000 Hours or Three Years

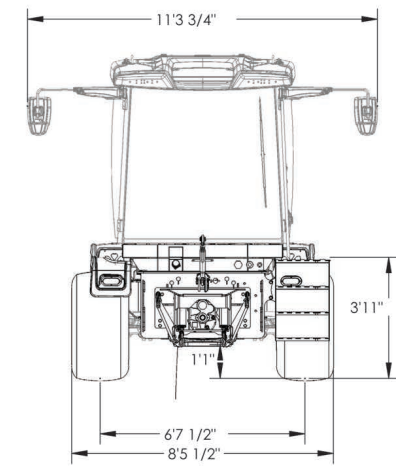
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- Change ELC Coolant

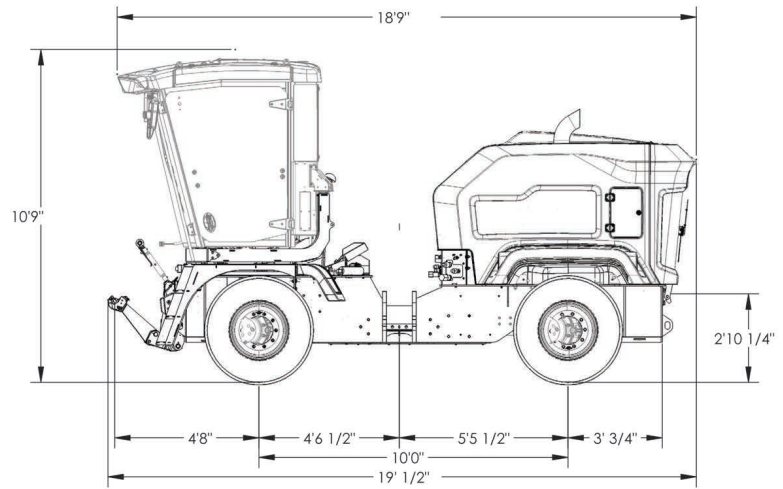
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MAINTENANCE

OVERALL DIMENSIONS



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MAINTENANCE