TM 5-2420-232-10

TECHNICAL MANUAL

OPERATOR'S MANUAL

FOR

HIGH MOBILITY ENGINEER EXCAVATOR TYPE I (HMEE-I) (NSN 2420-01-535-4061)

HEADQUARTERS, DEPARTMENT OF THE ARMY

JULY 2007

WARNING SUMMARY

This warning summary contains general safety warnings and hazardous materials warnings that must be understood and applied during operation and maintenance of this equipment. Failure to observe these precautions could result in serious injury or death to personnel. Also included are explanations of safety and hazardous materials icons used within the technical manual.

BIOLOGICAL - abstract symbol bug shows that a material may contain bacteria or viruses that present a danger to life or health.

CHEMICAL - drop of liquid on hand shows that the material will cause burns or irritation to human skin or tissue.

EAR PROTECTION - headphones over ears show that noise level will harm ears.

ELECTRICAL - electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.

EYE PROTECTION - person with goggles shows that the material will injure the eyes.

FIRE - flame shows that a material may ignite and cause burns.

FLYING PARTICLES - arrows bouncing off face with face shield shows that particles flying through the air will harm face.

HEAVY OBJECT - human figure stooping over heavy object shows physical injury potential from improper lifting technique.

HEAVY PARTS - hand with heavy object on top shows that heavy parts can crush and harm.

HEAVY PARTS - heavy object on human figure shows that heavy parts present a danger to life or limb.

HEAVY PARTS - heavy object on human figure shows that heavy parts present a danger to life or limb.

HOT AREA - hand over object radiating heat shows that part is hot and can burn.

HYDRAULIC FLUID PRESSURE - hydraulic fluid spraying human hand shows that fluid escaping under great pressure can cause injury or death to personnel.

RADIOACTIVE - identifies a material that emits radioactive energy and can injure human tissue or organs.

VAPOR - human figure in a cloud shows that material vapors present a danger to life or health.

FOR INFORMATION ON FIRST AID, REFER TO FM 4-25.11.

WARNING

CARBON MONOXIDE (EXHAUST GASES) CAN KILL!

- **Carbon monoxide is a colorless, odorless, deadly poison which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to air containing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death to personnel can result from severe exposure.**
- **Carbon monoxide occurs in exhaust fumes from internal combustion engines. It also occurs in exhaust fumes from engine coolant heater (arctic machine only). Carbon monoxide can become dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to ensure safety of personnel when engine is operated.**

1. **DO NOT operate engine in enclosed areas without adequate ventilation.**
2. **DO NOT idle engine without adequate ventilation.**
3. **DO NOT drive machine with inspection plates or cover plates removed.**
4. **BE ALERT for exhaust poisoning symptoms. They are:**
   - **Headache.**
   - **Dizziness.**
   - **Sleepiness.**
   - **Loss of muscular control.**
5. **If you see another person with exhaust poisoning symptoms:**
   - **Remove person from area.**
   - **Expose to fresh air.**
   - **Keep person warm.**
   - **DO NOT permit physical exercise.**
   - **Administer Cardiopulmonary Resuscitation (CPR) if necessary.**
   - **Notify a medic.**
6. **BE AWARE. The field protective mask for nuclear-biological-chemical (NBC) protection will not protect you from carbon monoxide poisoning.**

The Best Defense Against Carbon Monoxide Poisoning Is Good Ventilation!

WARNING

BATTERIES

- **To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electrical shock, damage to equipment, and injury to personnel.**
- **Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes, or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these warnings may result in injury or death to personnel.**

1. **Eyes. Flush with cold water for no less than 15 minutes and seek medical attention immediately.**
2. **Skin. Flush with large amounts of cold water until all acid is removed. Seek medical attention as required.**
3. **Internal. If corrosion or electrolyte is ingested, drink large amounts of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Seek medical attention immediately.**
4. **Clothing/Equipment. Wash area with large amounts of cold water. Neutralize acid with baking soda or household ammonia.**

WARNING

BLACKOUT LIGHTING SYSTEM

Black out lighting system disables backup alarm, horn, and exterior lights, posing a hazard to personnel in the area. Follow proper safety procedures when operating in blackout mode. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

WARNING

BRAKE SYSTEM

If emergency use of parking brake is required due to service brake failure, ensure that brakes are inspected and repaired, if necessary, before resuming machine operation. Injury or death to personnel or equipment damage could result from improperly or non-functioning brakes.

WARNING

COMPRESSED AIR

Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Ensure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield. Failure to follow this warning may result in injury or death to personnel.

WARNING

FIRE EXTINGUISHER

Discharging large quantities of dry chemical fire extinguisher inside an enclosed cab may result in temporary breathing difficulty during and immediately after the discharge event. Discharge fire extinguisher from outside the cab. Ventilate cab thoroughly prior to reentry. Failure to follow this warning may cause injury to personnel.

WARNING

FUEL HANDLING

- **DO NOT smoke or permit any open flame in area of machine while you are servicing fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may result in injury or death to personnel or damage to equipment.**
- **Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.**
- **ALWAYS stop engine prior to refueling. If equipped with an arctic cold weather starting aid system, turn engine coolant heater off.**
- **DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing injury or death to personnel or damage to equipment.**

WARNING

HAZARDOUS WASTE DISPOSAL

When servicing this machine, performing maintenance, or disposing of materials such as engine coolant, hydraulic fluid, lubricants, battery acids or batteries, windshield cleaning compound, and CARC paint, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance. If further information is needed, please contact The Army Environmental Hotline at 1-800-872-3845.

WARNING

HEARING PROTECTIONS

Hearing protection is required if within 20 ft (6 m) of an operating machine. Hearing protection is also required if operating machine without ROPS/FOPS during transport procedures. Failure to wear hearing protection may cause hearing loss.

WARNING

HIGH PRESSURE ACCUMULATOR

This system contains high pressure gas. DO NOT expose to fire. DO NOT weld. DO NOT drill. Relieve pressure before discharging. Failure to follow instructions and warnings could result in an explosion, causing injury or death to personnel.

WARNING

HYDRAULIC SYSTEM PRESSURE

DO NOT disconnect or remove any hydraulic system line or fitting unless engine is shut down and hydraulic system pressure has been relieved. Tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing injury or death to personnel.

WARNING

MACHINE OPERATION

- **Use caution and maintain three-point contact at all times when mounting or dismounting machine. Failure to follow this warning may result in injury or death to personnel.**
- **BE ALERT for personnel in the area while operating machine. Always check to ensure area is clear of personnel and obstructions before moving. Failure to follow this warning may result in injury or death to personnel or damage to equipment.**
- **Use of seat belt while operating machine is mandatory. Fasten belt BEFORE operating machine. Trying to fasten belt during operation creates a hazardous condition. Failure to follow this warning may result in injury or death to personnel in the event of an accident or machine overturn.**
- **DO NOT allow riders on machine. Failure to follow this warning may result in injury or death to personnel.**
- **NEVER leave operator compartment without engaging parking brake. Failure to follow this warning may result in injury or death to personnel.**
- **Always use a ground guide when driving machine with work tools, if visibility is impaired. Failure to use a ground guide may cause injury or death to personnel or damage to equipment.**


WARNING

NBC EXPOSURE

- **If NBC exposure is suspected, personnel wearing protective equipment must handle all air cleaner media. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures.**
- **Refer to FM 3-3, *Chemical and Biological Contamination Avoidance,* FM 3-5, *NBC Decontamination,* and FM 3-3-1, *Nuclear Contamination Avoidance.***
- **NBC contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel.**
- **Failure to follow these warnings may cause injury or death to personnel.**

IF NBC EXPOSURE IS SUSPECTED ALL AIR FILTER MEDIA WILL BE HANDLED BY PERSONNEL WEARING FULL NBC PROTECTIVE EQUIPMENT. SEE OPERATOR/ MAINTENANCE MANUAL.

7690-01-114-3702

To order this NBC decal use:

National Stock Number (NSN) - 7690-01-114-3702
Part Number (PN) - 12296626
Commercial and Government Entity Code (CAGEC) - 19207

WARNING

PRESSURIZED COOLING SYSTEM

- **DO NOT service cooling system unless engine has cooled. This is a pressurized cooling system and escaping steam or hot coolant will cause serious burns.**
- **DO NOT remove radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may cause serious burns.**
- **Wear effective eye, glove, and skin protection when handling coolants. Failure to follow this warning may cause injury to personnel.**

WARNING

SLAVE STARTING

When slave starting machine:

- **DO NOT use NATO slave cable that has loose or missing insulation.**
- **DO NOT proceed if cable is not available.**
- **DO NOT use civilian-type jumper cables.**
- **DO NOT allow "dead" and "live" machines to come in contact with each other at any time during slave starting.**

Failure to follow these warnings may cause injury or death to personnel.


WARNING

SOLVENT CLEANING COMPOUND


Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to follow this warning may cause injury or death to personnel.

WARNING

TIRES

- **Operating machine with underinflated or defective tire may lead to tire failure and loss of traction or control. Failure to follow this warning may cause damage to equipment or injury to personnel.**
- **If tire pressure is 20 psi (138 kPa) or less, DO NOT inflate. Notify Unit Maintenance. Failure to follow this warning may cause injury or death to personnel.**
- **Stand at a distance behind and to the side of tire when inflating tire. Failure to follow this warning may cause injury or death to personnel.**


WARNING

WORK SAFETY

- **Lifting cables, chains, hooks, and slings used for lifting machine must be in good condition and of suitable capacity. Failure to follow this warning may cause injury or death to personnel or damage to equipment.**
- **Improper use of lifting equipment and improper attachment of cables to machine may cause injury to personnel or damage to equipment. Observe all standard rules of safety.**
- **Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death to personnel.**
- **DO NOT perform maintenance under carrier/work tool unless carrier/work tool is lowered to the ground. If procedure requires carrier/work tool to be raised, a suitable support device must be used to provide support. Failure to follow this warning may cause injury or death to personnel or damage to equipment.**

WARNING

WORK SAFETY - MACHINE OPERATION

- **Never operate the backhoe control levers from outside the cab. Operate the control levers only when you are correctly seated inside the cab. Failure to follow this warning could result in injury or death to personnel.**
- **Never operate the stabilizer control levers from outside the cab. Operate the control levers only when you are correctly seated inside the cab. Failure to follow this warning could result in injury or death to personnel.**
- **Never operate the front bucket control levers from outside the cab. Operate the control levers only when you are correctly seated inside the cab. Failure to follow this warning could result in injury or death to personnel.**
- **Never attempt to install or remove the swing lock pin while sitting in the cab. You will be leaning over the backhoe control levers. Accidental operation of the control levers may result in injury or death to personnel.**

LIST OF EFFECTIVE PAGES/WORK PACKAGES

NOTE: Zero in the "Change No." column indicates and original page or work package.

Date of issue for the original manual is:

Original . . . . . 14 July 2007

Total number of pages for front and rear matter is 34 and total number of work packages is 47 consisting of the following:

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON D.C., 14 JULY 2007

TECHNICAL MANUAL

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HIGH MOBILITY ENGINEER EXCAVATOR TYPE I (HMEE-I)

(NSN 2420-01-535-4061)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Equipment Technical Publications), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is: https://aeps.ria.army.mil. The DA Form 2028 is located under the Public Applications section in the AEPS Public Home Page. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or E-mail your letter or DA Form 2028 direct to: TACOM Life Cycle Management Command, ATTN: AMSTA-LC-LPIT/TECH PUBS, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The E-mail address is ROCK-TACOM-TECH-PUBS@conus.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

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WP Sequence No.

HOW TO USE THIS MANUAL

NOTE

If at any time you are unsure how to use this manual or you cannot locate the information you need, notify your supervisor.

INTRODUCTION

1. This manual is designed to help you operate the High Mobility Engineer Excavator, Type I (HMEE-I) and to perform operator troubleshooting and maintenance on the equipment.
2. This manual is written in work package format:
   a. Chapters divide the manual into major categories of information.
   b. Each Chapter is divided into work packages, which are identified by a 4-digit number (e.g., 0001, 0002) located on the upper right-hand corner of each page. The work package page number (e.g., 0001-1, 0001-2) is located centered at the bottom of each page.
3. Read through this manual to become familiar with its organization and contents before attempting to operate or maintain the equipment.

CONTENTS OF THIS MANUAL

1. A *Warning Summary* is located at the beginning of this manual. Become familiar with these warnings before operating or performing operator troubleshooting or maintenance on the machine.
2. A *Table of Contents*, located in the front of the manual, lists all chapters and work packages in this manual.
   a. The Table of Contents also provides *Reporting Errors and Recommending Improvements* information and DA Form 2028 addresses, for the submittal of corrections to this manual.
   b. If you cannot find what you are looking for in the Table of Contents, refer to the alphabetical *Index* at the back of this manual.
3. Chapter 1, *Introductory Information, Equipment Description, and Theory of Operation*, provides general information on the manual and the equipment.
4. Chapter 2, *Operator Instructions*, explains and illustrates all operator controls and indicators and contains a *Stowage and Decal, Data Plate, and Stencil Guide*. It also describes how to perform all operating procedures for the machine: *Operation Under Usual Conditions* and *Operation Under Unusual Conditions*.
5. Chapter 3 covers all *Troubleshooting Procedures*. WP 0009 contains a *Troubleshooting Symptom Index*. If the machine malfunctions, this index should always be consulted to locate the appropriate troubleshooting procedure.
6. Chapter 4 covers *PMCS Maintenance Instructions*. Areas covered are *Preventive Maintenance Checks and Services (PMCS),* including lubrication instructions.
7. Chapter 5 covers *Maintenance Instructions*. Areas covered are operator-level maintenance tasks.
8. Chapter 6 describes *Transport Procedures*.
9. Chapter 7 includes *Supporting Information. References, Components of End Item (COEI) and Basic Issue Items (BII) Lists, Additional Authorization Lists,* and *Expendable and Durable Items List* are covered. Also included are the hydraulic hand tools and special purpose kits.

FEATURES OF THIS MANUAL

1. WARNINGs, CAUTIONs, NOTEs, subject headings, and other important information are highlighted in **BOLD** print as a visual aid.

WARNING

A WARNING indicates a hazard which may result in injury or death to personnel.

CAUTION

A CAUTION is a reminder of safety practices or directs attention to usage practices that may result in damage to equipment.

NOTE

A NOTE is a statement containing information that will make the procedures easier to perform.

2. Statements and words of particular interest may be printed in underlined or CAPITAL letters to create emphasis.
3. Within a procedural step, reference may be made to another work package in this manual or to another manual. These references indicate where you should look for more complete information.
   a. If you are told: "Start engine (WP 0005)," go to WP 0005 in this manual for instructions on engine starting.
   b. If you are told: "For complete information on servicing batteries, refer to TM 9-6140-200-14," go to the *References* work package (WP 0030) for complete information.
4. Illustrations are placed after, and as close to, the procedural steps to which they apply. Callouts placed on the art are text or numbers.
5. Numbers located at lower right corner of art (e.g., 435-A001; 435-A002) are art control numbers and are used for tracking purposes only.
6. Dashed leader lines used in the PMCS Table and Lubrication Chart (WP 0017) indicate that called out lubrication points are located on both sides of the machine.
7. Dashed leader lines also indicate an item that is hidden from view.
8. Technical instructions include metric units as well as standard units. For your reference, a *Metric Conversion Chart* is located on the inside back cover of this manual.

CHAPTER 1

INTRODUCTORY INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

INTRODUCTORY INFORMATION

GENERAL INFORMATION

SCOPE

1. **Type of Manual.** This manual is for use in operating and performing operator troubleshooting and maintenance on the machine.
2. **Equipment Name and Model Number.** High Mobility Engineer Excavator, Type I (HMEE-I).
3. **Purpose of Equipment.** The HMEE-I is used in worldwide earthmoving and construction projects by U.S. Army forces in engineer troop support.

END OF TASK

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for the equipment maintenance will be those prescribed by DA PAM 750-8, *The Army Maintenance Management System (TAMMS*) *Users Manual*.

END OF TASK

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design or performance. If you have Internet access, the easiest and fastest way to report problems or suggestions is to go to https://aeps.ria.army.mil/aepspublic.cfm (scroll down and choose the “Submit Quality Deficiency Report” bar). The Internet form lets you choose to submit an EIR, a Product Quality Deficiency Report (PQDR), or a Warranty Claim Action (WCA). You may also submit your information using an SF Form 368 (*Product Quality Deficiency Report*). You can send your SF Form 368 via e-mail, regular mail, or facsimile using the addresses/facsimile numbers specified in DA PAM 750-8, *TAMMS Users Manual*. We will send you a reply.

END OF TASK

CORROSION PREVENTION AND CONTROL (CPC)

1. CPC of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.
2. Corrosion specifically occurs with metals. It is an electrochemical process that causes the degradation of metals. It is commonly caused by exposure to moisture, acids, bases, or salts. An example is the rusting of iron. Corrosion damage in metals can be seen, depending on the metal, as tarnishing, pitting, fogging, surface residue, and/or cracking.
3. Plastics, composites, and rubbers can also degrade. Degradation is caused by thermal (heat), oxidation (oxygen), solvation (solvents), or photolytic (light, typically UV) processes. The most common exposures are excessive heat or light. Damage from these processes will appear as cracking, softening, swelling, and/or breaking.
4. SF Form 368, *Product Quality Deficiency Report* should be submitted to the address specified in DA PAM 750-8, *TAMMS Users Manual*.

END OF TASK

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

For destruction of Army materiel to prevent enemy use, refer to TM 750-244-3.

END OF TASK

PREPARATION FOR STORAGE OR SHIPMENT

Notify Unit Maintenance to perform preparation for storage or shipment procedures.

END OF TASK

NOMENCLATURE CROSS-REFERENCE LIST

OFFICIAL NOMENCLATURE	COMMON NOMENCLATURE
Powerpack gauge	Dipstick
Socket head screw key	Hex key

END OF TASK

LIST OF ABBREVIATIONS/ACRONYMS

NOTE

Refer to ASME Y14.38-1999, *Abbreviations and Acronyms*, for standard abbreviations.

ABBREVIATION/ACRONYM	DEFINITION
2WD	Two-Wheel Drive
4WD	Four-Wheel Drive
2WS	Two-Wheel Steer
4WS	Four-Wheel Steer
A	Ampere
AAR	Association of American Railroads
ABS	Antilock Braking System
A/C	Air Conditioning
BII	Basic Issue Item
B.O.	Blackout
C	Celsius
CAGEC	Commercial and Government Entity Code
CCW	Counterclockwise
CID	Cubic Inch Displacement
cm	Centimeter
COEI	Component of End Item
CONUS	Continental United States
CPC	Corrosion Prevention and Control
CPR	Cardiopulmonary Resuscitation
CW	Clockwise

LIST OF ABBREVIATIONS/ACRONYMS – CONTINUED

dc . . . . . Direct Current
ECU . . . . . Electronic Control Unit
EIR . . . . . Equipment Improvement Recommendation
EMS . . . . . Electronic Monitoring System
F . . . . . Fahrenheit
FOPS . . . . . Falling Object Protective Structure
ft . . . . . Foot
gal . . . . . Gallon
GIC . . . . . Gabarit International de Chargement
HMEE-I . . . . . High Mobility Engineer Excavator, Type I
HVAC . . . . . Heating, Ventilation, and Air Conditioning
I.D. . . . . Identification
in. . . . . Inch
kg . . . . . Kilogram
km . . . . . Kilometer
kPa . . . . . Kilopascal
kph . . . . . Kilometers per Hour
kW . . . . . Kilowatt
L . . . . . Liter
LASH . . . . . Lighter Aboard Ship
lb . . . . . Pound
lb-ft . . . . . Pound-Foot
lb-in. . . . . Pound-Inch
LCD . . . . . Liquid Crystal Display
LED . . . . . Light Emitting Diode
m . . . . . Meter
min. . . . . Minute
mm . . . . . Millimeter
MOPP . . . . . Mission Oriented Protective Posture
mph . . . . . Miles per Hour
NATO . . . . . North Atlantic Treaty Organization
NBC . . . . . Nuclear, Biological, and Chemical
Nm . . . . . Newton-meter
NSN . . . . . National Stock Number
OCONUS . . . . . Outside Continental United States
PMCS . . . . . Preventive Maintenance Checks and Services
psi . . . . . Pounds per Square Inch
pt . . . . . Pint
ROPS . . . . . Rollover Protective Structure
RO/RO . . . . . Roll-on/Roll-off

LIST OF ABBREVIATIONS/ACRONYMS – CONTINUED

rpm . . . . . Revolutions per Minute
SDDC . . . . . Surface Deployment and Distribution Command
SEABEE . . . . . Naval Construction Engineer, Sea Barge
SPK . . . . . Special Purpose Kit
TAMMS . . . . . The Army Maintenance Management System
TOE/MTOE. . . . . Table of Organization and Equipment/Modified Table of Organization and Equipment
U/M . . . . . Unit of Measure
V . . . . . Volt
WP. . . . . Work Package

END OF TASK

END OF WORK PACKAGE

INTRODUCTORY INFORMATION

EQUIPMENT DESCRIPTION AND DATA

Characteristics, Capabilities and Features, Location and Description of Major Components, Equipment Data

CHARACTERISTICS

The HMEE-I is a pneumatic-tired, diesel-engine-driven, all-wheel-drive tractor with work tools for the excavation of small emplacements, material handling, and general construction tasks. It has tactical mobility over rough terrain and high mobility on roadways. The machine meets with federal highway safety standards as well as the emission standards as applied to heavy-duty, off-highway engines. The machine can be conveyed by rail, marine, highway, and air modes.

CAUTION

The HMEE-I must not be used for large earthmoving blade work, obstacle blade reduction, or assault breaching. Failure to follow this caution will result in damage to equipment.

NOTE

The GP front bucket and 4:1 front bucket are provided to push, scoop, and load material. The ability to open the 4:1 to a light dozer blade provides leveling and limited dozing (movement of loose soil) capability.

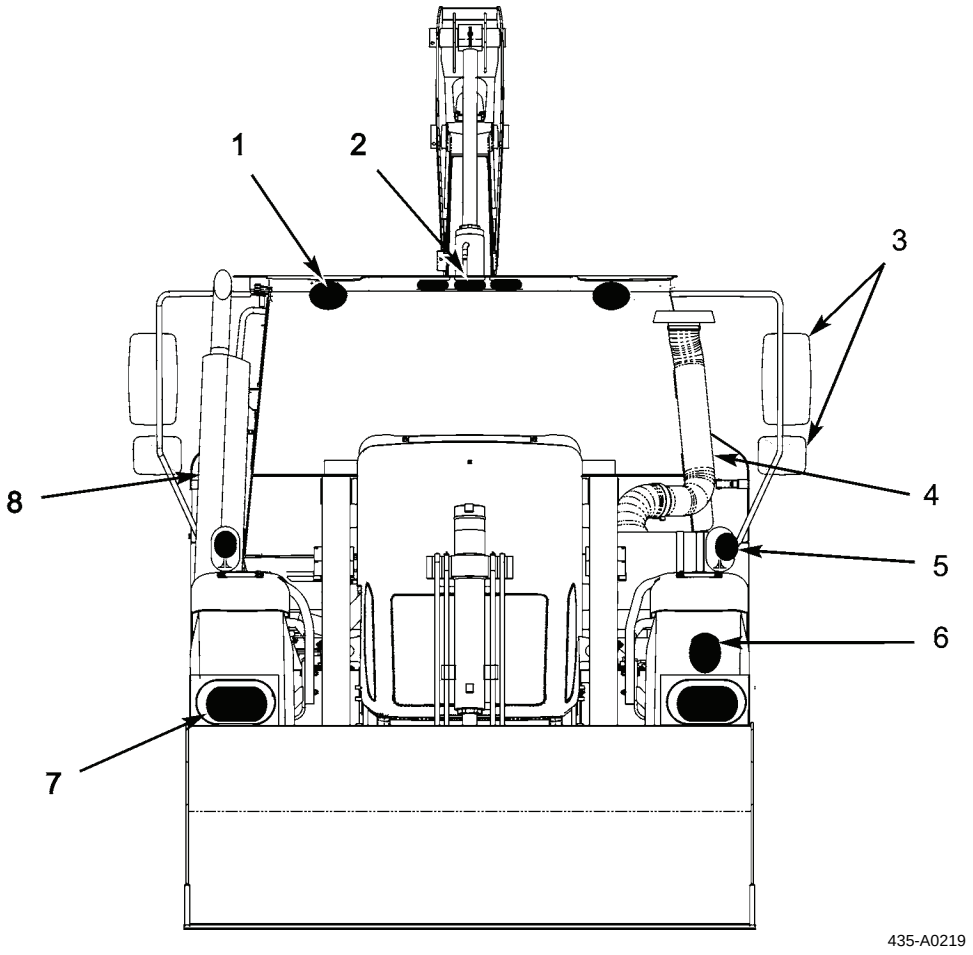
END OF TASK

CAPABILITIES AND FEATURES

- Capable of convoy speeds. Maximum road speed 56 mph (90 kph).
- Selectable 4-wheel steering, giving a small turning circle, and enhanced maneuverability.
- Selectable 4-wheel drive, with soft-engage differential locks.
- Four selectable suspension modes for optimum operational ability.
- Power-assisted steering.
- Air conditioned cab.
- ROPS cab.
- FOPS cab.
- Trailer towing capabilities.
- Detachable work tools.
- Hydraulic hand tools.
- Capable of air transportation as cargo by C-130.
- Fording capable up to a depth of 40 in. (1 m) with wake.
- High-mounted air intake and vertical exhaust.
- Power-assisted disc brakes on all four wheels with anti-lock brakes.

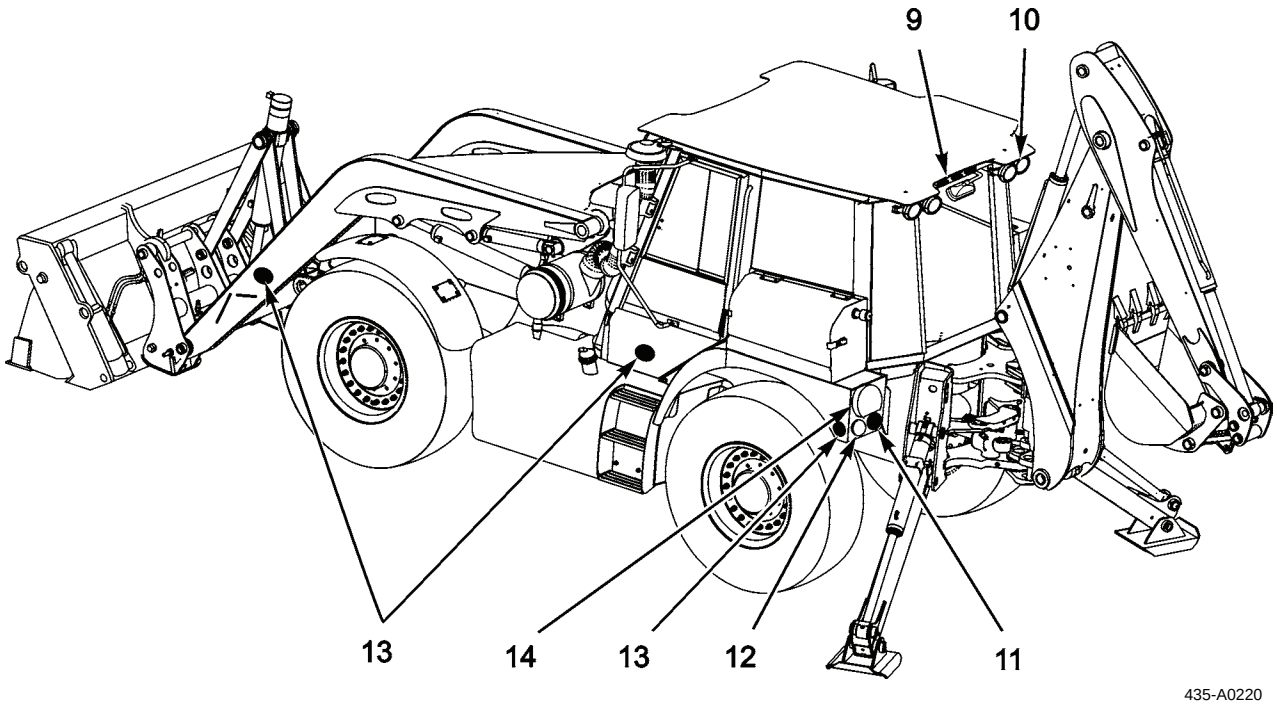
END OF TASK

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS



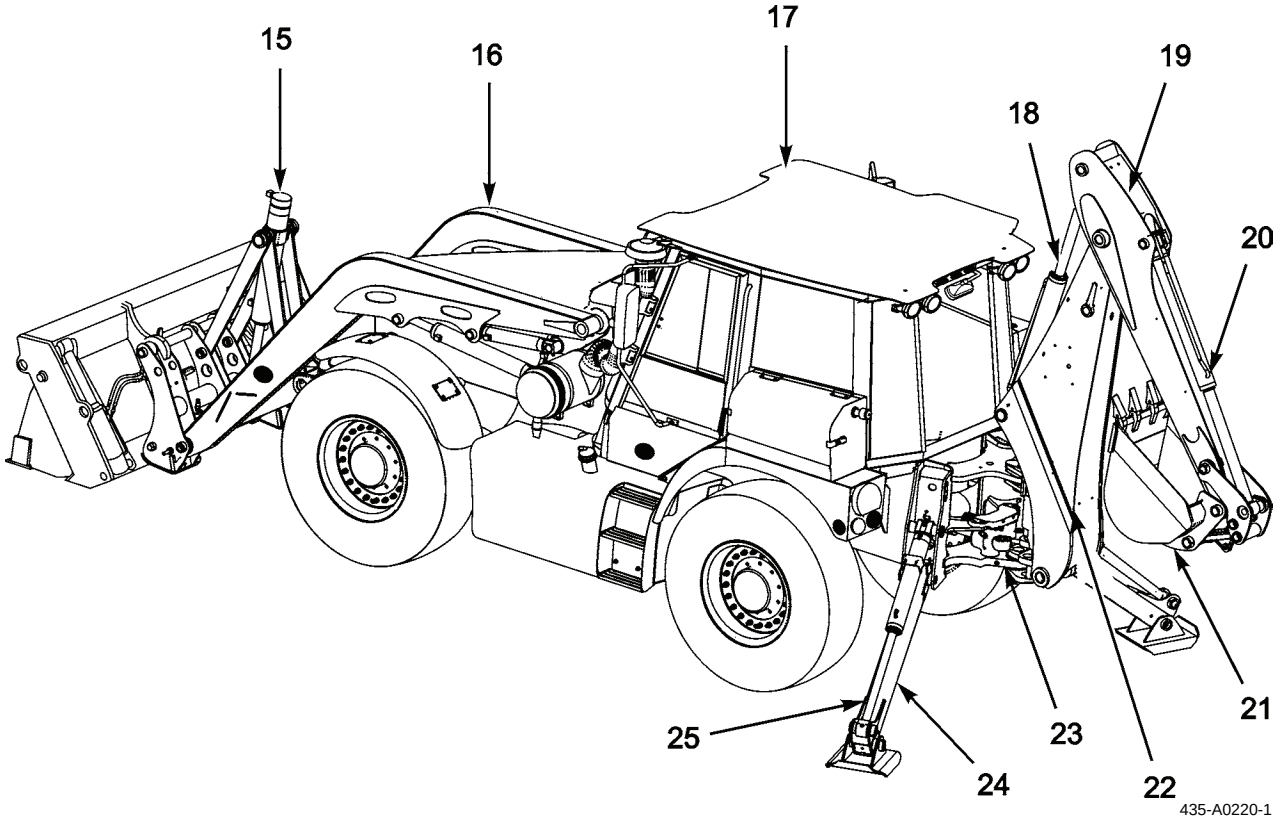
KEY	COMPONENT	DESCRIPTION
1	Front worklights	Used when carrying out loading operations for illumination.
2	Front I.D. lights	Amber identification lights.
3	Rearview mirror	Provides operator with a view to the rear when facing forwards.
4	Air intake stack	Allows air to be drawn into the air filter from a high level to assist when fording.
5	Turn signal light and B.O. front marker light	Used when driving to indicate intended turns. Includes blackout front marker light.
6	Blackout drive light	Used to provide light under blackout conditions.
7	Service lights	Used to provide light for driving at night under normal conditions.
8	Exhaust muffler	Allows used exhaust gases to exit the engine at a high level to assist when fording.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED



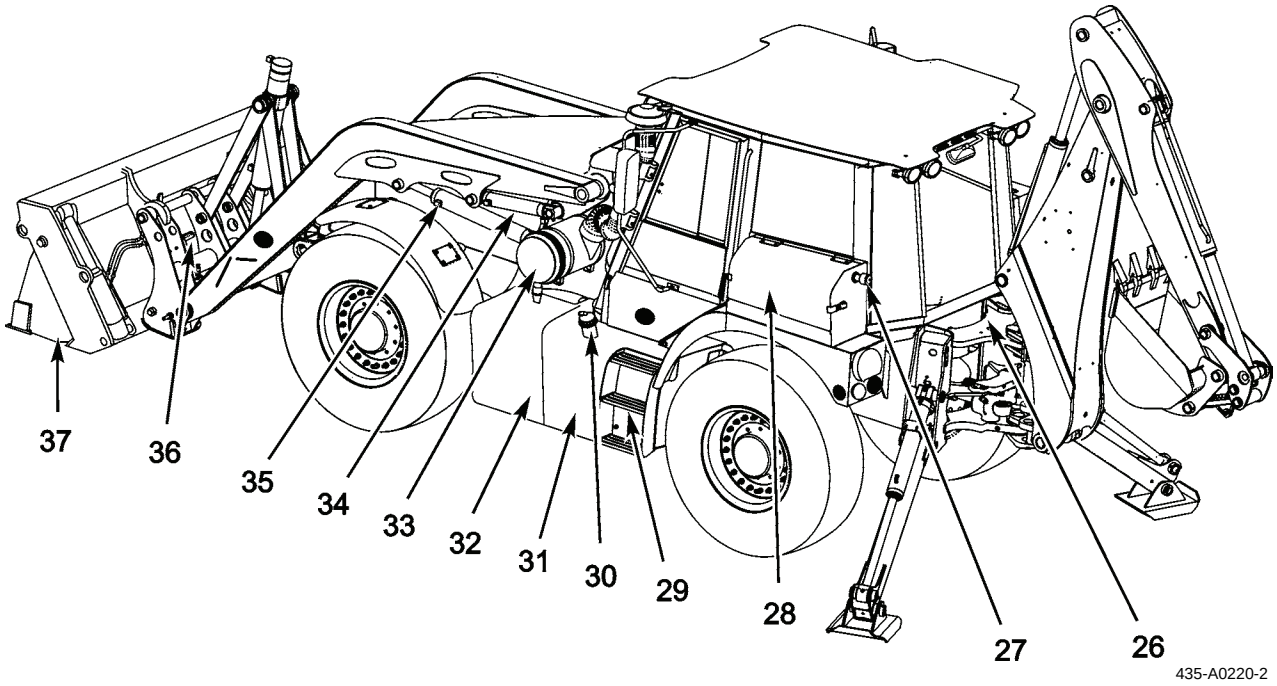
KEY	COMPONENT	DESCRIPTION
9	Rear I.D. lights	Red identification lights.
10	Rear worklights	Used when carrying out excavating operations for illumination.
11	Reverse light	Illuminates when reverse gear selected, to illuminate an area behind the machine when reversing. Acts as a visual warning to personnel that the machine intends to/is reversing.
12	Rear reflectors	Used as a warning to the machine's position when parked without lights. Red in color.
13	Side reflectors	Used as a warning to the machine's position when parked without lights. Amber and red in color.
14	Rear light unit	Provides light to the rear for night driving, indicates the application of the machine brakes by emitting a high intensity steady light, and flashes to indicate the intention to turn. All operations emit a red light. Incorporates the blackout taillight and stoplight.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED



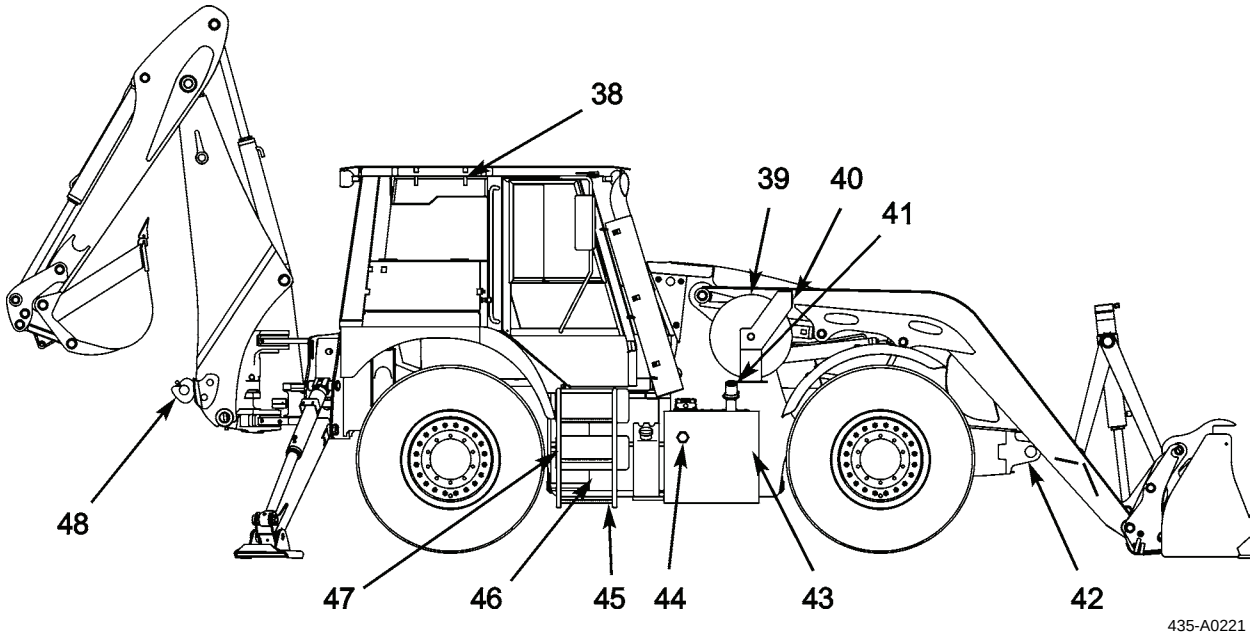
KEY	COMPONENT	DESCRIPTION
15	Front bucket crowd cylinder	Hydraulic cylinder that provides the hydraulic power for the loading actions of the front bucket.
16	Front loader arms	Mechanical lifting arms.
17	ROPS and FOPS cab	Rollover and falling object protective cab structure.
18	Dipper cylinder	Hydraulic cylinder that provides the hydraulic power for the loading actions of the backhoe bucket.
19	Dipper assembly	Mechanical dipper arm of backhoe.
20	Backhoe bucket cylinder	Hydraulic cylinder that provides the hydraulic power for the loading actions of the backhoe bucket.
21	Backhoe bucket	Digging bucket.
22	Boom assembly	Mechanical boom arm of backhoe.
23	Kingpost	Provides the pivot around which the backhoe swings during excavating operations.
24	Stabilizers	Provide machine stability during excavating operations.
25	Stabilizer cylinder	Hydraulic cylinder that provides the hydraulic power for the raising and lowering of the stabilizers.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED



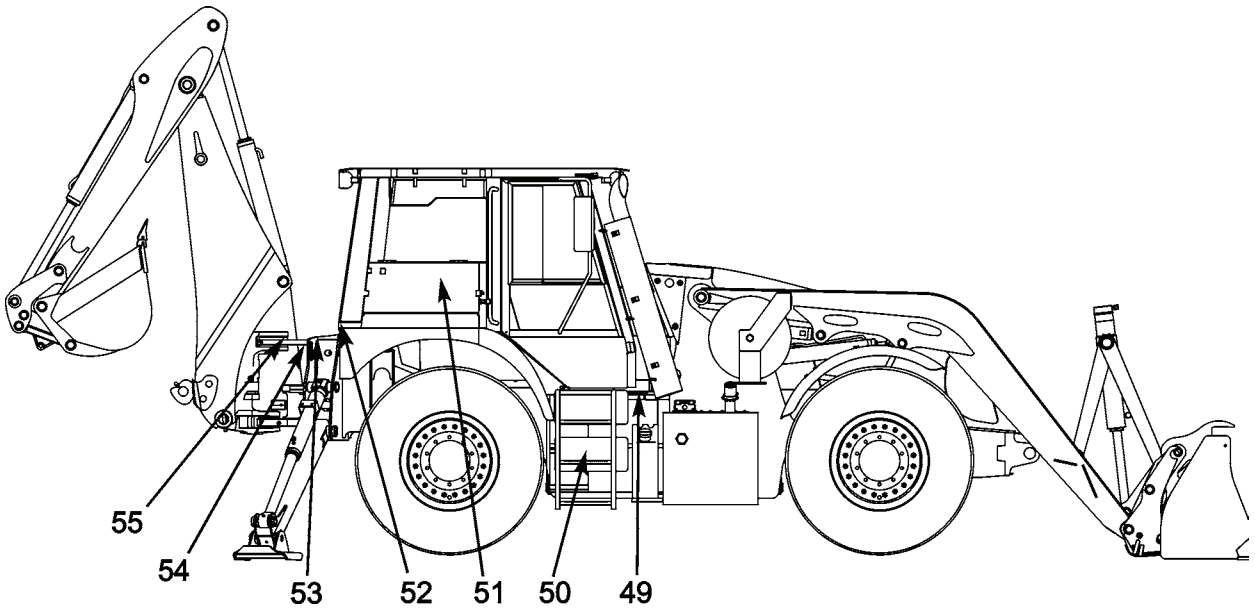
KEY	COMPONENT	DESCRIPTION
26	Gladhand	Trailer air supply gladhand (red). Air system charger (recovery).
27	NATO slave receptacle	Provides the connection for the NATO slave cable when slave starting a machine.
28	Battery box	Contains the machine's batteries.
29	Cab steps	Used to gain safe access to the cab.
30	Fuel filler cap	Provides a weatherproof and fuel proof seal for the fuel tank filler.
31	Fuel tank	Carries the machine's supply of fuel oil.
32	Toolbox	Stowage for BII.
33	Engine air filter	Filters the air before it passes to the engine, to remove particles that could cause engine damage.
34	Compensator cylinder	Hydraulic cylinder connected into the bucket crowd circuit in such a way that the cylinder helps to provides the self-leveling action of the front bucket/forklift forks when lifting.
35	Loader arm cylinder	Hydraulic cylinder that provides the hydraulic power for raising and lowering the loader arms.
36	Quick-hitch assembly	Provides a quick and simple way of replacing the work tool.
37	4:1 front bucket	Hydraulic clamshell bucket used for loading operations.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED



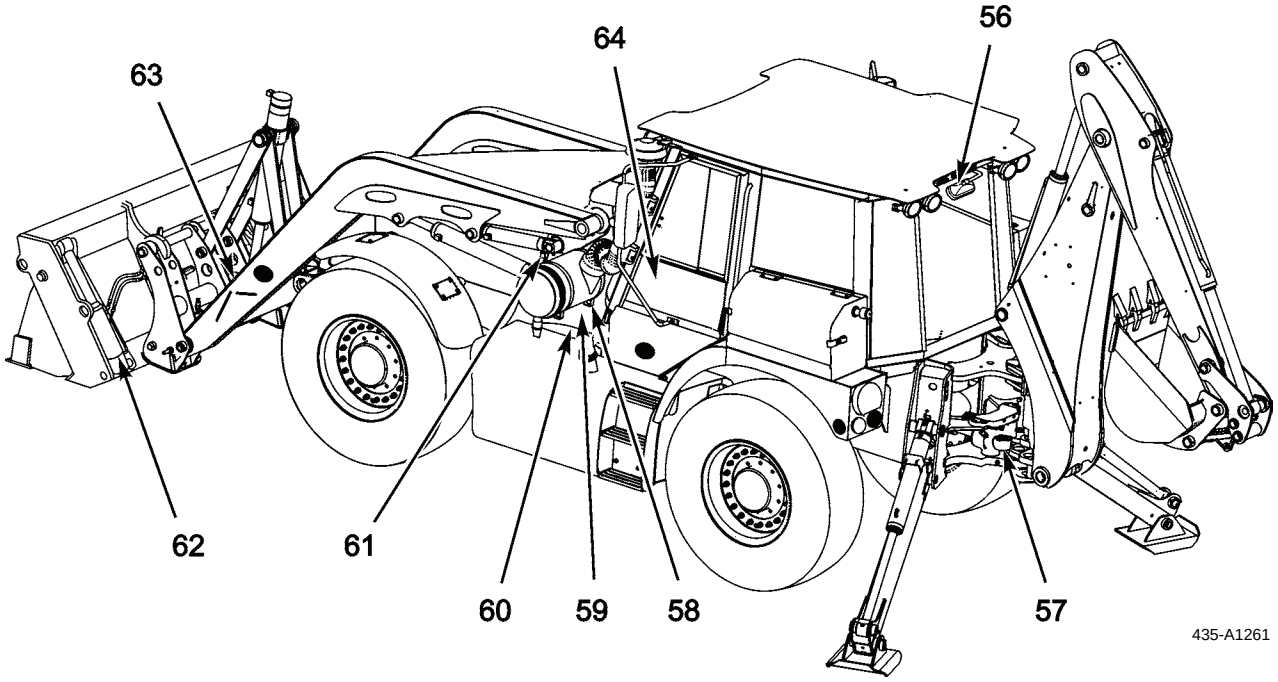
KEY	COMPONENT	DESCRIPTION
38	HVAC unit	Cleans, freshens, and cools the air entering the cab for a more comfortable working environment. Unit houses a replaceable paper filter.
39	Auxiliary hose reel	Flexible hose holder for the auxiliary hydraulic powered hand tools.
40	Emergency shut-off button	Provides a means to disconnect the hydraulic power to the auxiliary hand tool circuit quickly in an emergency.
41	Hydraulic tank filler cap	Provides a weatherproof and oil proof lockable cover for the hydraulic fluid reservoir.
42	Front chassis tiedown and recovery points	Used to provide positive tiedown facility for transportation or for the recovery of the machine.
43	Hydraulic fluid reservoir	Contains the machine's supply of hydraulic fluid.
44	Sight glass	Provides a visual means of checking the hydraulic reservoir fluid level.
45	Steps	Provides access to cab.
46	Air tank drain tap	Provides a means of draining the water from the machine's air system.
47	Air tanks	Hold the machine's supply of pressurized air for the brake system.
48	Tow pintle	Towing point for trailer.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED



KEY	COMPONENT	DESCRIPTION
49	Transmission oil filler/dipstick	Provide means of checking and topping-off/refilling the transmission oil.
50	Cold start valve	Used to divert the flow of the hydraulic system during extreme cold start procedures.
51	Brake actuator housing	Contains the brake system's air controlled hydraulic brake actuators and fluid reservoirs.
52	Air point	Connection point for the tire inflation air line.
53	Trailer electrical connection plug	Connection point for the trailer electrical supply cable.
54	Trailer gladhands	Connection points for trailer service and auxiliary brake air supply (red and blue).
55	Electrical connection	Connection point for the rear protrusion lamp electric supply cable.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – CONTINUED



KEY	COMPONENT	DESCRIPTION
56	Blindspot mirror	Provides a means of viewing behind the machine.
57	Slew cylinder	Hydraulic cylinder that provides the hydraulic power for lateral movement of the backhoe.
58	Air filter restriction gauge	Provides a visual means of air filter condition.
59	Fuel shutoff valve	Provides a means to isolate the fuel tank from the rest of the system.
60	Sampling valve station	Oil sampling points for the engine, transmission, and hydraulic oils.
61	Remote fill points for engine and transmission	Connection points for use with vacuum oil replacement equipment. (Note: The hood needs to be raised to access these points.)
62	Clamshell bucket cylinder	Hydraulic cylinder that provides the hydraulic power for opening and closing the clamshell bucket.
63	Auxiliary hydraulic connection points	Connection points for auxiliary hydraulics.
64	Rifle racks	One on each side inside cab. Stows rifles.

EQUIPMENT DATA

Weight:

Combat loaded . . . . . 30,450 lb (13,812 kg)

Dimensions:

Length (operational). . . . . 362.4 in. (9.21 m)

Width:

Operational Position (stabilizers deployed) . . . . . 128.7 in. (3.270 m)

Transport Position. . . . . 93.9 in. (2.385 m)

Height:

Operational Position . . . . . .152 in. (3.860 m)

Transport Position. . . . . .102 in. (2.588 m)

Length (without front bucket and backhoe bucket) . . . . . .337 in. (8.560 m)

Angle of Approach. . . . . 36.6 degrees

Angle of Departure. . . . . 31.5 degrees

Ground Clearance:

All Dimensions are Travel Conditions:

Ground to Suspension Arm. . . . . 12.7 in. (.323 m)

Ground to Differentials. . . . . 18.0 in. (.458 m)

Ground to Chassis. . . . . 14.4 in. (.366 m)

Backhoe Minimum Dig Depth . . . . . 155.2 in. + 3.5 in. suspension travel (3.94 m + .085 m)

Backhoe Reach:

from Swing Center . . . . . 207.1 in. (5.259 m)

from Centerline Rear Axle . . . . . 257.6 in. (6.542 m)

from Swing Center @ Full Height . . . . . 112.4 in. (2.856 m)

Backhoe Operating Height. . . . . 221.7 in. + 3.5 in. suspension travel (5.631 m + 0.085 m)

Backhoe Load-Over Height . . . . . 152.2 in. + 3.5 in. suspension travel 5.31 in. (0.135 m)

Backhoe Bucket Rotation . . . . . 185 degrees max. power, 204.5 degrees max. rotation

Backhoe Side Reach. . . . . .207 in. (5.259 m)

Backhoe Bucket Width. . . . . .24 in. (0.610 m)

Front Bucket Reach to Ground . . . . . 91.4 in. (2.390 m)

Front Bucket Dig Depth Toe Plate Horizontal. . . . . 5.31 in. (0.135 m)

Front Bucket Roll Back @ Ground Level . . . . . 40.7 degrees

Front Bucket Dump Height . . . . . 120.6 in. (3.063 m)

Front Bucket Load-Over Height . . . . . .152 in. (3.86 m)

Front Bucket Dump Angle. . . . . 45 degrees

Front Bucket Maximum Reach @ Full Height . . . . . 74.3 in. (1.888 m)

Front Bucket Reach @ Full Height Dumped. . . . . 54.2 in. (1.376 m)

Front Bucket Width . . . . . .96 in. (2.438 m)

Forklift Reach @ Ground. . . . . 97.4 in. (2.474 m)

Forklift Reach @ Full Height . . . . . 74.7 in. (1.897 m)

EQUIPMENT DATA – CONTINUED

Dimensions - Continued:

Forklift Full Lift Height . . . . . 155.7 in. (3.954 m)
Forklift Tine Length . . . . . 48 in. (1.220 m)
Forklift Maximum Load . . . . . 4,500 lb @ 24 in. load center. (2,041 kg @ 0.60 m load center)

Wheelbase: . . . . . 10.03 ft (3.06 m)

Capacities (Refill Approximate):

Fuel Tank . . . . . 65.5 gal. (247.9 L)
Cooling System (engine) . . . . . 9.25 gal. (35.0 L)
Engine Oil (with filter) . . . . . 4.00 gal. (15.1 L)
Transmission (with filter) . . . . . 5.70 gal. (21.5 L)
Hydraulic System . . . . . 36.9 gal. (140 L)
Front Axle . . . . . 4.08 gal. (15.5 L)
Rear Axle . . . . . 4.08 gal. (15.5 L)
Hubs, Front and Rear . . . . . 0.39 gal. (1.5 L)
Brake Fluid . . . . . 0.8 gal. (3 L)

Electrical System:

Batteries . . . . . 2 x 12V 6TMF
Battery Power . . . . . 24V DC
Alternator Power . . . . . 28V 130 A

Performance:

Speed (max) (without towed load) . . . . . 56 mph (90 kph)
Grade Ascending Ability (max.) 60%
Grade Descending Ability (max.) 60%
Side Slope Grade (max.) 30%
Maximum Vertical Wall . . . . . 18 in. (0.457 m)
Theroretical Speed for Each Gear @ 2,500 rpm:
1st . . . . . 7.3 mph (11.82 kph)
2nd . . . . . 11.3 mph (18.21 kph)
3rd . . . . . 17.3 mph (27.87 kph)
4th . . . . . 26.6 mph (42.78 kph)
5th . . . . . 39.5 mph (63.54 kph)
6th . . . . . 54.6 mph (87.93 kph)
1st Reverse . . . . . 7.7 mph (12.44 kph)
2nd Reverse . . . . . 18.3 mph (29.33 kph)
Fording Maximum Depth with Wake . . . . . 40 in. (1 m)

EQUIPMENT DATA – CONTINUED

Turning Diameter as Specified in SAE J695:

Wall to Wall (4-wheel steer) . . . . . 43.1 ft (13.13 m)
Curb to Curb (4-wheel steer) . . . . . 34.1 ft (10.38 m)
Wall to Wall (2-wheel steer) . . . . . 68.5 ft (20 89 m)
Curb to Curb (2-wheel steer) . . . . . 60.3 ft (18.37 m)

Tires:

Size . . . . . VGT 445/80 R 25 170 E
Inflation Pressure . . . . . 102 psi (703 kPa)
Run-Flat Characteristics . . . . . 30 miles distance @ 30 mph (48.3 kph)
Make . . . . . Bridgestone
Wheels (2-piece bolted rims) . . . . . 25 x 14.5 x 1.5 (.635 x .368 x .038 m)
Run Flat Inserts . . . . . Hutchinson & Hutchinson

Major Components:

Engine . . . . . Cummins QSB - 03, 6-Cylinder Diesel
Horse Power Rating . . . . . 200 hp (140 kW) @ 2,300 rpm
Peak Torque Rating . . . . . 520 lb (705 Nm)
Bore . . . . . 4.21 in. (107 mm)
Stroke . . . . . 4.88 in. (124 mm)
Displacement . . . . . 409 cubic in. (6.71 L)
Transmission . . . . . ZF Ergopower 6WG160
Torque Converter . . . . . Fichtel & Sachs W340 (lock-up)
Torque Converter Weight . . . . . 27 lb. (12 kg)
Axles . . . . . JCB International HMEE SD80
Heater:
- Make . . . . . Red Dot
- Capacity . . . . . 10.2 kW @ free air discharge

Air Conditioning:
- Make . . . . . Red Dot
- Model R-9793
- Cooling Capacity . . . . . 5.8 kW @ free air discharge

Hydraulics:
- P1 Main Pump:
  - Make . . . . . David Brown Hydraulics
  - Drive . . . . . Gearbox 1:1
  - Size cc/rev 46
  - Maximum Operating Pressure . . . . . 3,306 psi (22,794 kPa)
  - Output @ Idle . . . . . 10.83 gal./min. (41 L/min.)
  - Output Excavating 1,800 rpm . . . . . 20.86 gal./min. (79 L/min.)
  - Output Roading 2,300 rpm . . . . . 26.68 gal./min. (101 L/min.)

EQUIPMENT DATA – CONTINUED

Major Components - Continued:

Hydraulics - Continued:

Rated 2,500 rpm . . . . . 28.79 gal./min. (109 L/min.)

P2 Rear Steer and Fan Drive:

Make . . . . . .David Brown Hydraulics

Drive . . . . . .Gearbox 1:1

Size cc/rev. 33

Maximum Operating Pressure . . . . . 3,306 psi (22,794 kPa)

Output @ Idle . . . . . 7.92 gal./min. (30 L/min.)

Output Excavating 1,800 rpm. . . . . 14.79 gal./min. (56 L/min.)

Output Roading 2,300 rpm . . . . . 19.02 gal./min. (72 L/min.)

Rated 2,500 rpm . . . . . 20.6 gal./min. (78 L/min.)

Power Steering Gear Assembly:

Make . . . . . .Sheppard M110 PJ1

Maximum Operating Pressure . . . . . 2,175 psi (14,996 kPa)

Flow . . . . . 6.0 gal./min. (22.7 L/min.)

Brakes:

Air/Hydraulic:

Air Compressor . . . . . Wabco, engine-driven

Air Tank Volume:

Front Axle . . . . . .8.03 gal. (30.6 L)

Rear Axle. . . . . .4.04 gal. (15.3 L)

Air System Components . . . . . Knorr-Bremse/Haldex

Brake Calipers . . . . . Vimoter

END OF TASK

END OF WORK PACKAGE

INTRODUCTORY INFORMATION

THEORY OF OPERATION

Introduction, Powertrain, Cooling System, Air Intake System, Exhaust System, Fuel System, Suspension, Hydraulic System, Steering System, Braking System, Heating, Ventilation, and Air Conditioning (HVAC)

INTRODUCTION

This work package provides a functional description of each major system and explains how the systems of the HMEE-I work together. The HMEE-I contains 10 functional systems: powertrain, engine air intake system, engine cooling system, exhaust system, engine fuel system, suspension, hydraulic systems, power steering system, HVAC system, and braking system.

END OF TASK

POWERTRAIN

1. **Engine** (1) - is a liquid cooled, in-line 6-cylinder, 4-cycle, turbocharged/charge air cooled compression ignition engine. The engine develops 200 brake horsepower at 2,300 rpm and maximum rated speed of 2,500 rpm and is capable of being run on JP-8. The engine delivers power to the transmission (2).
2. **Transmission** (2) - the transmission provides power to the front and rear axle drive heads. There are six forward and two reverse gears. The transmission has a selectable 4-wheel-drive option.
3. **Axles** - the axles transmit the power to the road wheels. Both axles are fitted with torque limiting differentials and differential locks. Both front and rear axles steer.

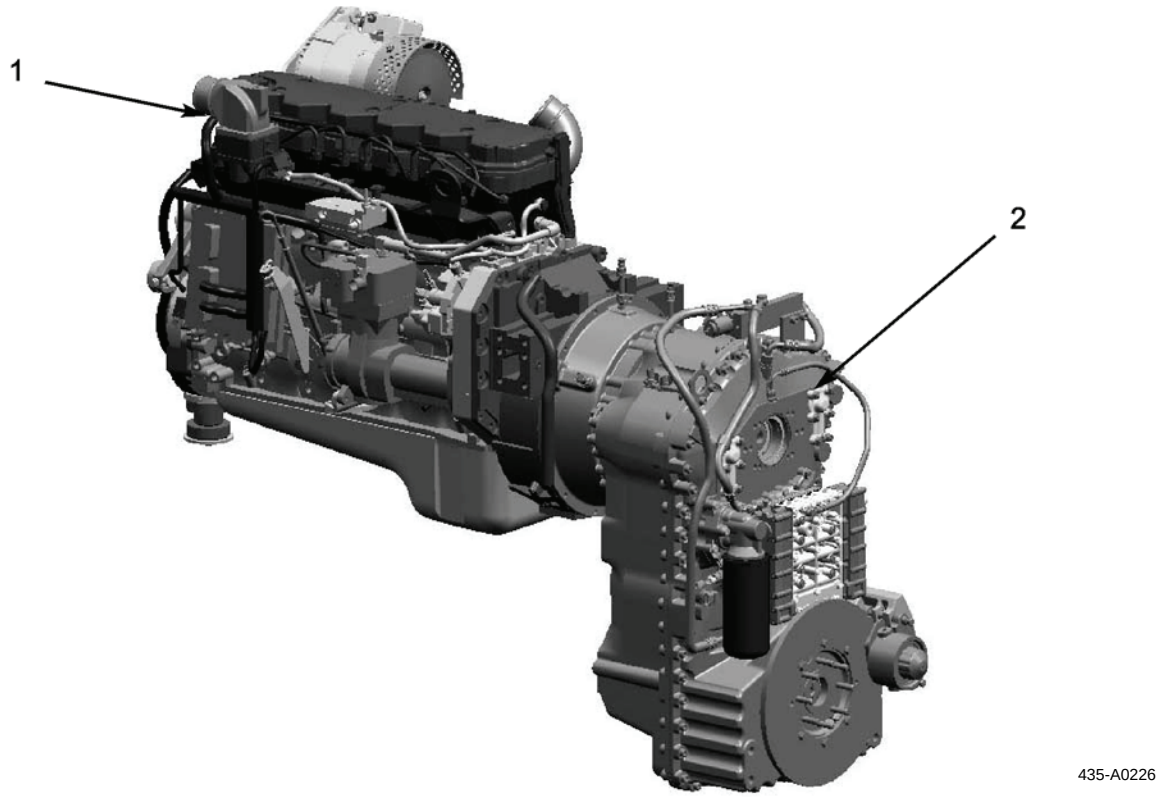


Figure 1. Powertrain

END OF TASK

COOLING SYSTEM

1. **Air Intake Grille** - allows air to enter the engine compartment.
2. **Air Blast Radiators** - a combined cooling pack, comprising a condenser, charge air cooler, transmission oil cooler, hydraulic system cooler, and engine radiator.
3. **Condenser** - allows the refrigerant gas contained in the machine A/C system to be cooled and condensed. As the refrigerant gas flows through the system, air is drawn over the condenser by machine movement and the action of the engine cooling fan removing excess heat.
4. **Charge Air Cooler** (1) - allows cooling of the turbocharged induction air for the engine. This cooling increases the density of the air, which helps the engine run more efficiently. As the charged air flows around the system, air is drawn over the cooling radiator by machine movement and the action of the engine cooling fan removing excess heat.

COOLING SYSTEM – CONTINUED

5. **Engine Coolant Radiator** (2) - allows cooling of the engine coolant. As the coolant circulates it passes through the coolant radiator. Air is drawn over the coolant radiator by machine movement and the action of the engine cooling fan removing excess heat.
6. **Brake Aftercooler** (3) - air for the braking system is supplied from an engine mounted and powered compressor. The compressed air is cooled by a cooler assembly mounted on top of the main cooling pack.
7. **Combination Cooler Transmission Oil Section** (4) - allows cooling of the transmission oil. As the oil circulates, it passes through the transmission oil cooler. Air is drawn over the cooler radiator by machine movement and the action of the engine cooling fan removing excess heat.
8. **Combination Cooler Hydraulic Oil Section** (5) - allows cooling of the hydraulic oil. As the oil circulates, it passes through the hydraulic oil cooler. Air is drawn over the cooler radiator by machine movement and the action of the engine cooling fan removing excess heat.
9. **Engine Cooling Fan** - draws air through the cooling pack and circulates it around the engine compartment. The cooling fan is driven via a drivebelt from the engine crankshaft.

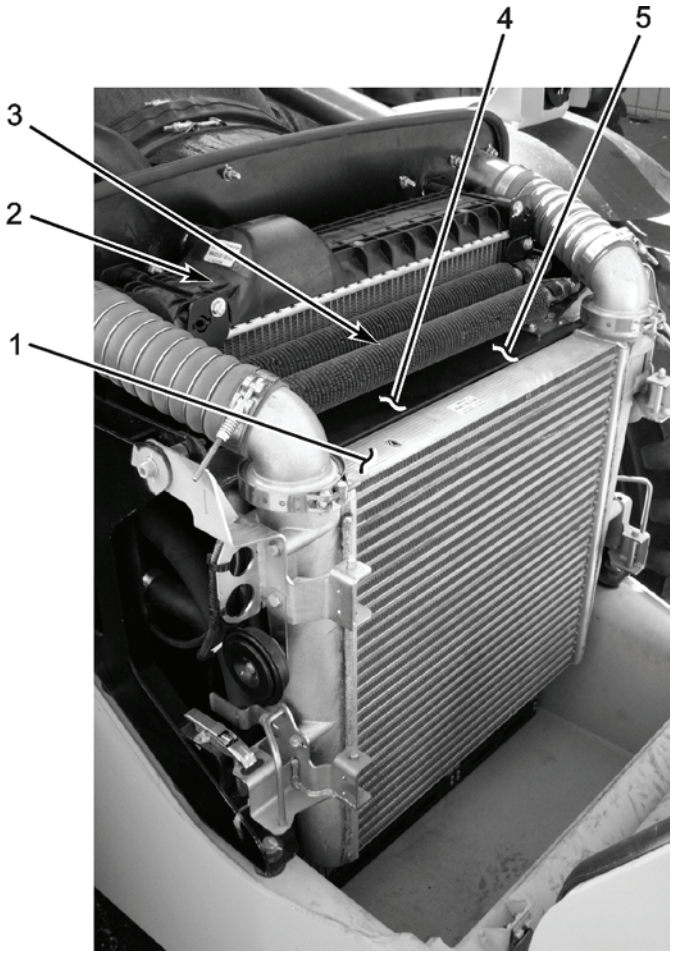


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Figure 2. Cooling System

END OF TASK

AIR INTAKE SYSTEM

1. **Dry-Type Air Filter** (1) - filters dust and dirt from the air before it enters the turbocharger and the engine.
2. **Intake Manifold** (2) - distributes the pressurized and cooled air to the individual cylinders of the engine.
3. **Turbocharger** (3) - is an exhaust gas-driven twin turbine device to increase the amount and pressure of the air entering the intake manifold and the engine. Each turbine is secured to a central shaft and is contained in its own housing. As the exhaust gas passes over the exhaust turbine it turns the shaft, thus turning the intake turbine (compressor) which forces air into the intake manifold. The effect is to increase the engine horsepower.

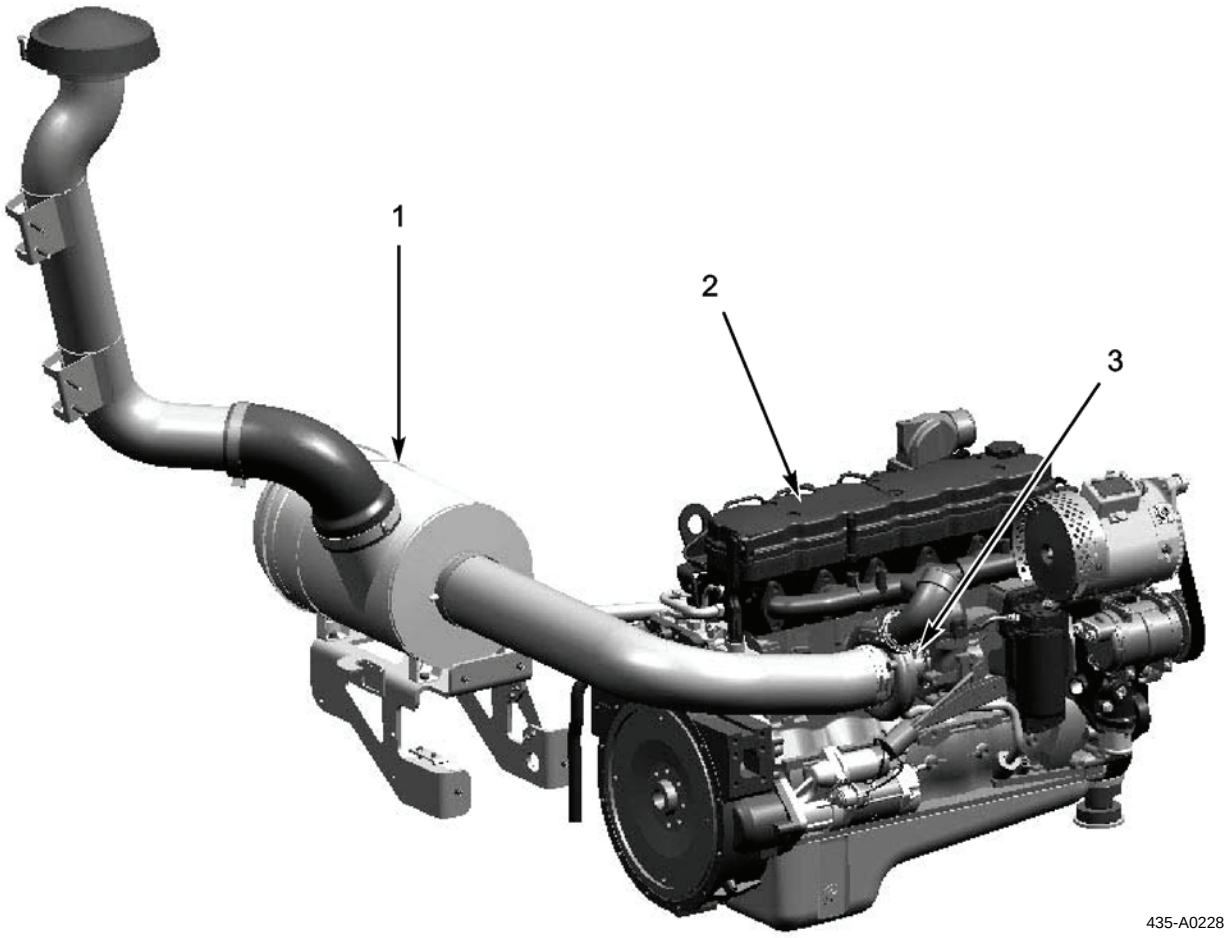


Figure 3. Air Intake System

END OF TASK

EXHAUST SYSTEM

1. **Exhaust Manifold** (1) - collects exhaust gas from each cylinder of the engine and directs it to the turbocharger.
2. **Turbocharger** (2) - is an exhaust gas-driven twin turbine device to increase the amount and pressure of the air entering the intake manifold and the engine. Each turbine is secured to a central shaft and is contained in its own housing. As the exhaust gas passes over the exhaust turbine, it turns the shaft, thus turning the intake turbine (compressor) which forces air into the intake manifold. The effect is to increase the engine horsepower.
3. **Exhaust Pipe** - directs exhaust gases from the engine compartment.

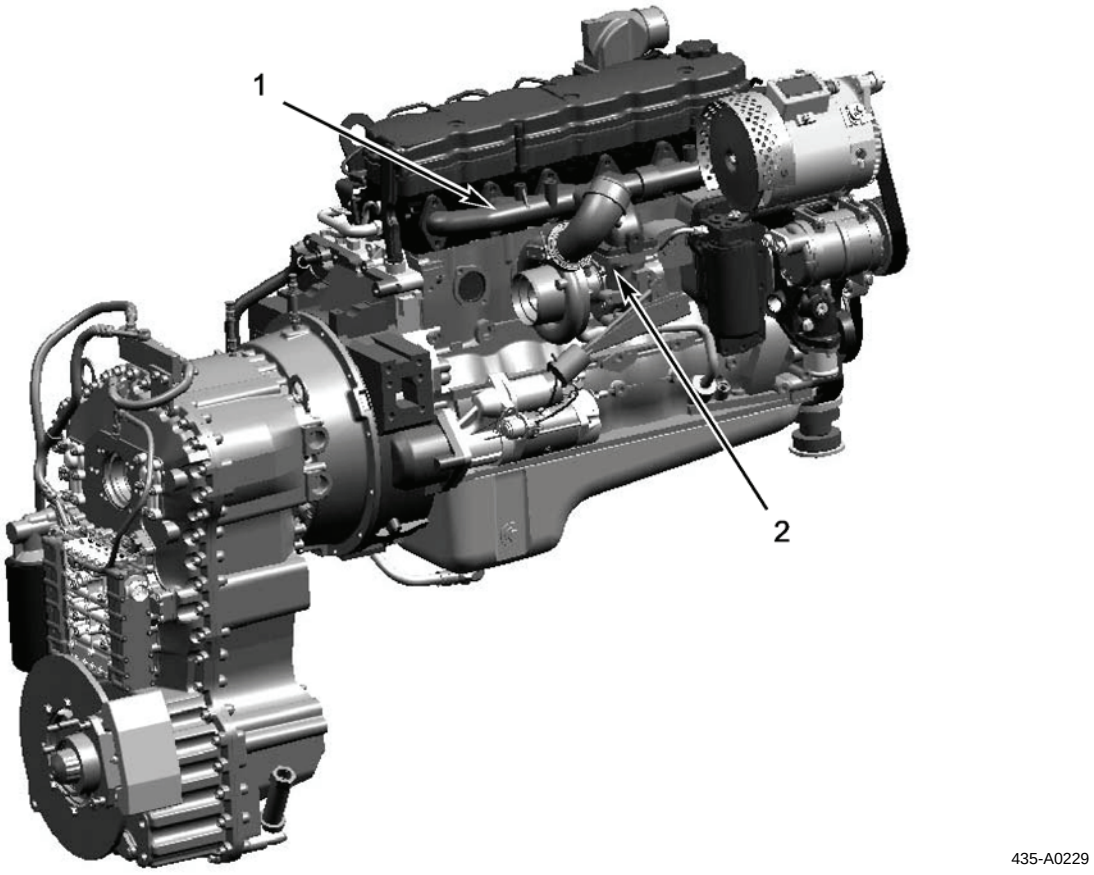


Figure 4. Exhaust System

END OF TASK

FUEL SYSTEM

A low pressure fuel pump draws fuel from the tank through an on/off tap and a pre-filter/water separator. The fuel is then pumped through a fine fuel filter to the high pressure pump which supplies fuel to the injectors, which are individually controlled electronically.

END OF TASK

SUSPENSION

Hydraulic Spring Suspension - smooths out the bumps and shocks produced when traveling on the highway or on site, located between the machine's axles and the body. The suspension system uses hydraulic cylinders (springs) (1) to control the machine's suspension operations. These hydraulic springs can be electronically controlled to provide special suspension settings. They can be set to give a pre-determined ride height or give different operating settings to individual axles.

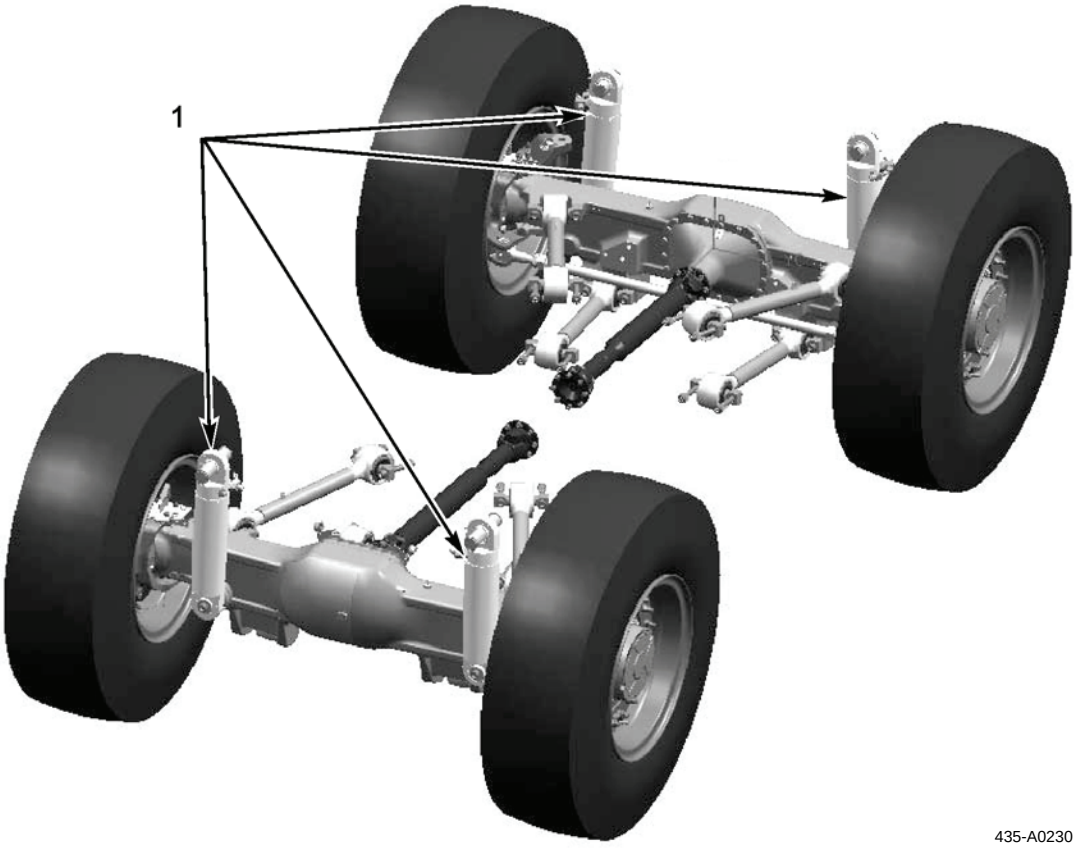


Figure 5. Suspension

END OF TASK

HYDRAULIC SYSTEM

1. **Hydraulic Reservoir** - contains the hydraulic oil used by the hydraulic system.
2. **Hydraulic Pumps** - provide hydraulic pressure to operate the hydraulic circuits. There are three hydraulic pumps. The first pump (P1) provides the hydraulic power for all the machine's main hydraulic functions, i.e., loader and excavator functions along with all their associated auxiliaries (hammer, auger, fork tilt, and slide). The second pump (P2) provides the hydraulic power for the steering, including rear steering, the suspension, hose reel, 4-wheel drive disconnect, and the parking brake. The third pump is driven by an electric motor; its function is to provide enough hydraulic power to be able to stow the backhoe, loader, and stabilizers should the machine suffer an engine failure. The third pump also provides emergency steer.
3. **Front Bucket Crowd Cylinder** (1) - used to rollback or dump the bucket.
4. **Dipper Cylinder** (2) - used to raise or lower the dipper.
5. **Backhoe Bucket Cylinder** (3) - used to rotate the bucket.
6. **Slew Cylinder** (4) - used to move backhoe laterally.
7. **Loader Arm Cylinders** (5) - used to raise or lower the loader arms for loading operations.
8. **Clamshell Bucket Cylinders** (6) - used to open or close the clamshell bucket.

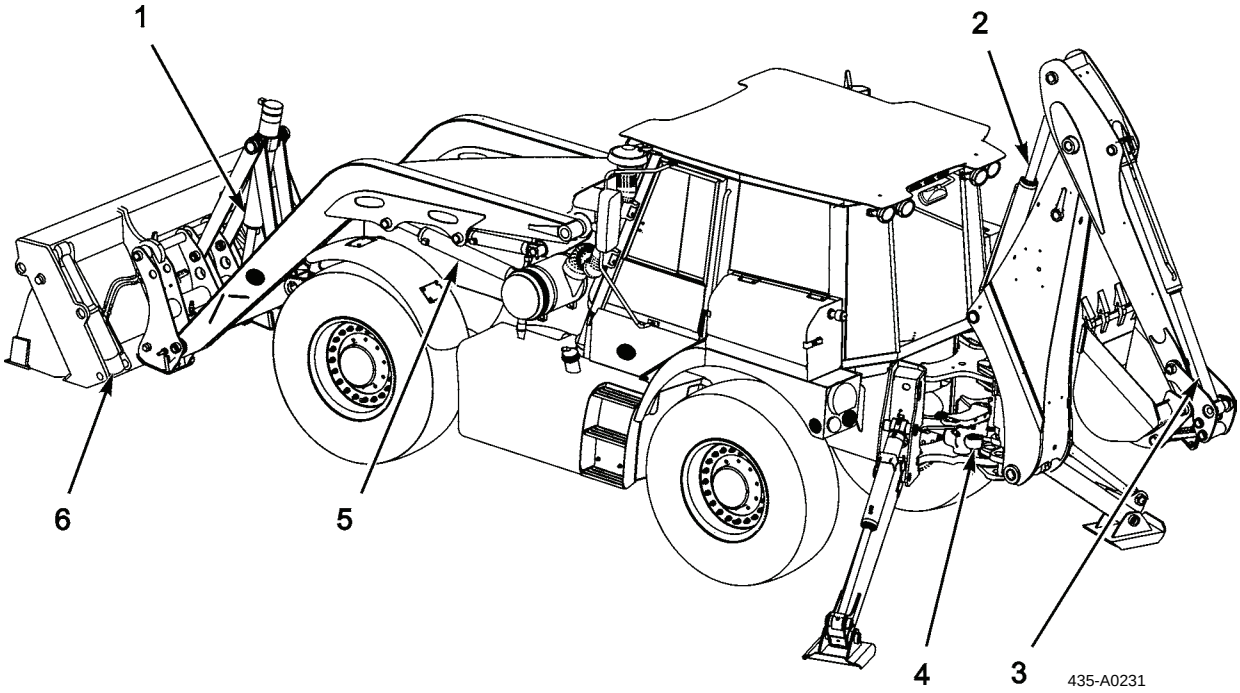


Figure 6. Hydraulic System

END OF TASK

STEERING SYSTEM

1. **Steering Fluid** - The fluid for the steering system is supplied from the main hydraulic oil tank.
2. **Steering System (Front)** - The power for the front axle steering box (1) is provided by an engine-driven pump. The steering wheel (2) is mechanically connected to the steering box. The steering box is mechanically linked to the front wheels. When the steering wheel is rotated, the actuating valves in the steering box open. Pressurized fluid is applied to one end of the steering box piston, causing it to move the sector shaft and pitman arm (3). The pitman arm is mechanically linked to the drag link (4). The drag link moves the steering mechanism (5) on the front axle to the left or right, causing the machine to steer in the same direction. In the event of a total failure of the hydraulic system, mechanical control is retained, though the physical effort required by the operator to steer the machine is increased.
3. **Steering System (Rear)** - The rear wheels can also be steered. When the operator selects 4-wheel steer or crab steer, the rear wheels will be steered using pressurized oil in a steering cylinder (6) that is electronically operated. In the case of 4-wheel steering, when it is selected in the cab, as the driver turns the steering wheel, electronic sensors will detect the movement of the front wheels, which in turn supply via an Electronic Control Unit (ECU) a signal to the valves in the supply to the rear axle steering cylinder. The cylinder is mechanically connected to the rear axle steering mechanism that will cause the wheels to steer. In 4-wheel steer, the rear wheels will steer in the opposite direction, but to the same degree as the front wheels. With crab steer, the same principles apply, except the rear wheels will steer in the same direction and to the same degree as the front wheels.

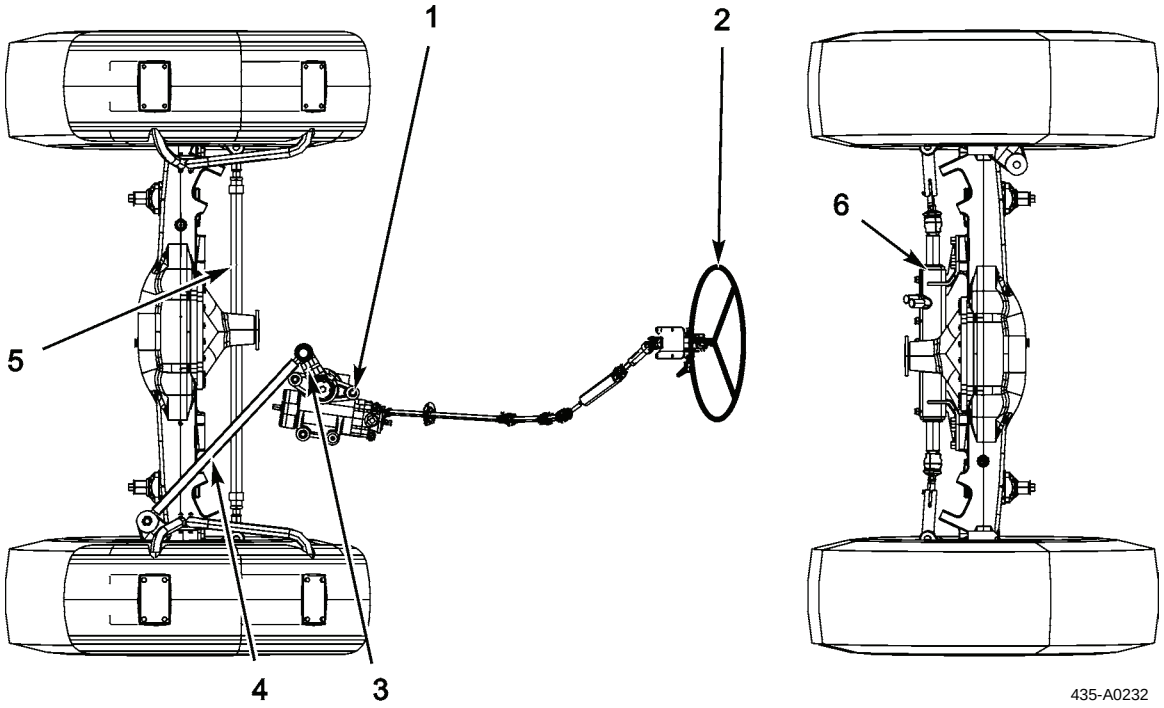


Figure 7. Steering System

END OF TASK

BRAKING SYSTEM

1. **Service Brakes (Foot Brake)** - A service brake system consisting of an air-over-silicone-based hydraulic brake fluid system with electronic ABS and a load sensing valve which reduces rear axle braking effort in proportion to rear axle load. The front axle has a pair of 2.36-in. (60-mm) diameter piston calipers and a pair of 2.95-in. (75-mm) diameter piston calipers (one of each on each side comprises a pair). Each pair has hydraulic fluid provided by a single air/hydraulic actuator. The rear axle has two 2.36-in. (75-mm) diameter piston calipers, each with its own air/hydraulic actuator. Electronic ABS system has a wheel speed sensor on each wheel, all front calipers are controlled by single modulator, but both rear calipers each have their own modulator. Air is supplied from an engine-mounted and engine-powered compressor. The compressed air is cooled by a cooler assembly mounted on top of the main cooling pack and dried by an electronic dryer with automatic drain. An automatic 4-way circuit protect valve preferentially distributes the compressed air through the system (service brakes first, then parking brake, and ancillary circuits) and isolates individual circuits in the event of failure. A quick release valve is installed to ensure the required front caliper release times are achieved. Air tank volume is 55.6 pt (30.6 L) for the front axle and 27.8 pt (15.3 L) for the rear; front and rear tank pressures are independently monitored on air gauges. The operator is further alerted to low air pressure by visible and audible alarms on the EMS unit.
2. **Parking Brake** - Two transmission-mounted discs and calipers independently provide park braking for the front and rear axles. Calipers are spring apply, hydraulic release. The hydraulic release pressure is supplied by the machine's hydraulic system and is controlled by a cab-mounted control button operating a pneumatic valve which delivers a signal to a pneumatic/hydraulic relay.

END OF TASK

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

1. **HVAC Heating Operation** - Cab heating consists of a heater radiator inside the cab, a temperature control valve to moderate the amount of water flowing through the heater radiator, the engine, and an electric fan. Hot coolant from the engine flows through the temperature control valve into the heater radiator and back to the engine. The electric fan circulates air over the heater radiator, extracting the heat from the coolant and warming the cab. The coolant flows from the heater radiator back to the engine.
2. **HVAC Cooling Operation** - The cab cooling system consists of an engine-driven refrigerant compressor, a condenser mounted in front of the engine cooling pack, a refrigerant dryer unit, an expansion valve, and an evaporator coil. The compressor pumps refrigerant and oil around the system. It raises the temperature and pressure of the refrigerant gas and forces it to the condenser where it changes state and becomes a liquid. The compressor also sucks the vaporized refrigerant out of the evaporator and back inside itself in the form of gas.

   The refrigerant leaves the compressor and moves through a high pressure hose to the condenser. Inside the condenser the gas changes state and becomes a liquid. It is still hot and under pressure. The liquid refrigerant continues to move inside the system, out of the condenser to the receiver/dryer. The receiver/dryer serves as a storage tank and filter for the refrigerant. When the refrigerant moves from the receiver/dryer, it travels to an expansion valve at the inlet to the evaporator coil. The expansion valve bleeds high pressure refrigerant into the evaporator coil, where the pressure is low. The refrigerant expands rapidly in this low pressure environment. When it expands it changes state to a gas and rapidly cools and absorbs heat from the air as the blower forces air through the fins.

   Any moisture in the air (humidity) condenses on the fins of the evaporator as water droplets, which drain through a drain tube from the A/C unit. This action dehumidifies the air in the cab, contributing to driver comfort. Cab air forced across the evaporator coil gives up its heat energy to the cold refrigerant inside the coil. The cooled air circulates the cab. The refrigerant continues to expand and absorb heat energy in the evaporator coil. The refrigerant changes from a liquid to a gas before it leaves the evaporator coil on its way back to the compressor to start the cycle again.

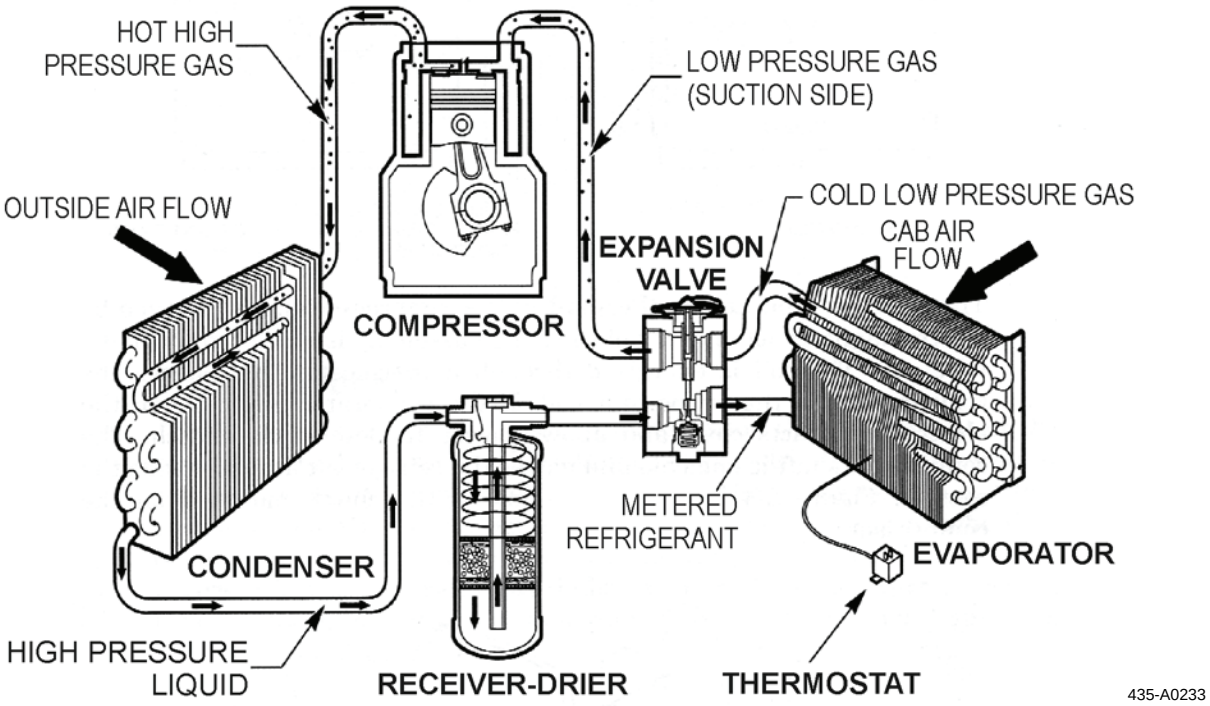


Figure 8. HVAC

END OF TASK

END OF WORK PACKAGE

CHAPTER 2

OPERATOR INSTRUCTIONS

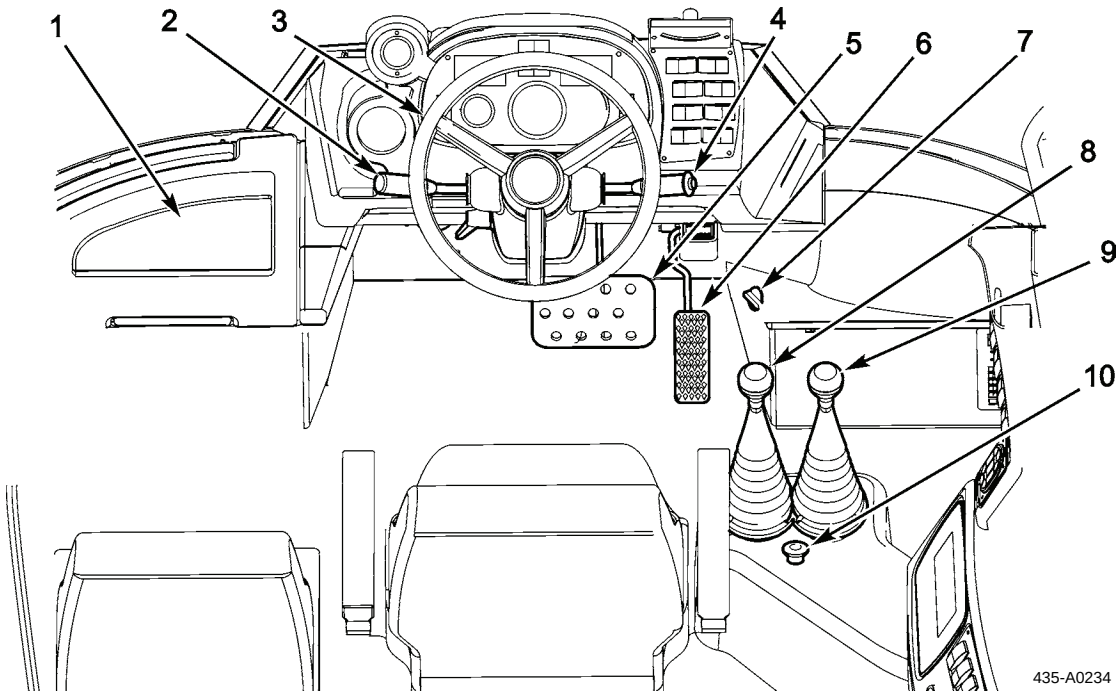
OPERATOR INSTRUCTIONS

DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

INTRODUCTION

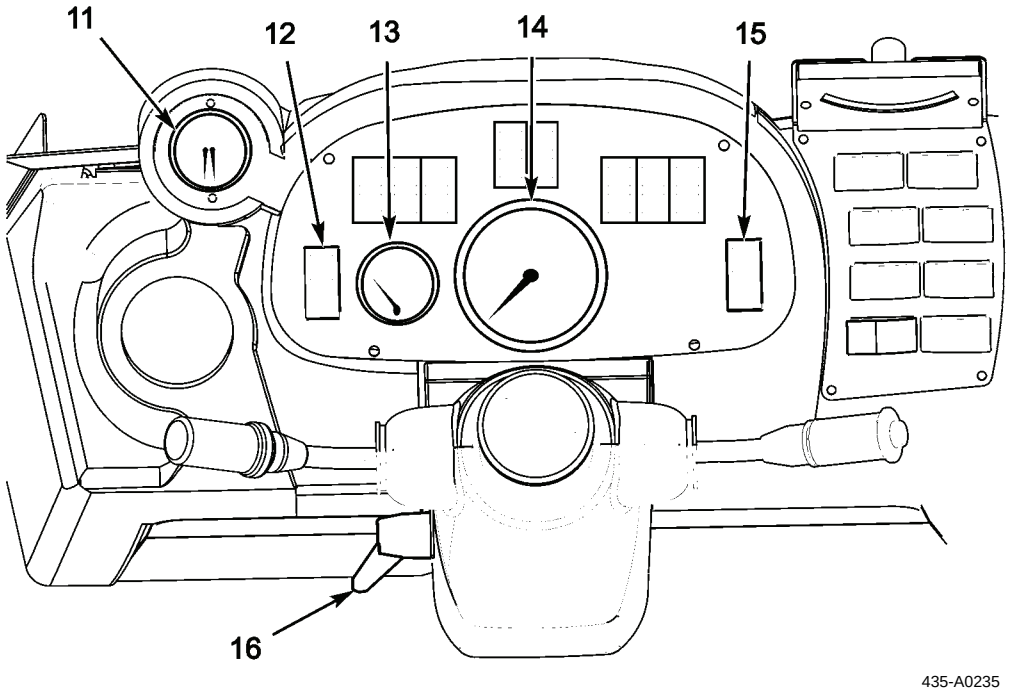
An overview of the controls and indicators is provided on pages 0004-2 through 0004-12. More detailed information is provided starting on page 0004-12. Below is an alphabetical listing of the more detailed information and the page numbers on which it can be found:

CONTROLS AND INDICATORS INSIDE CAB



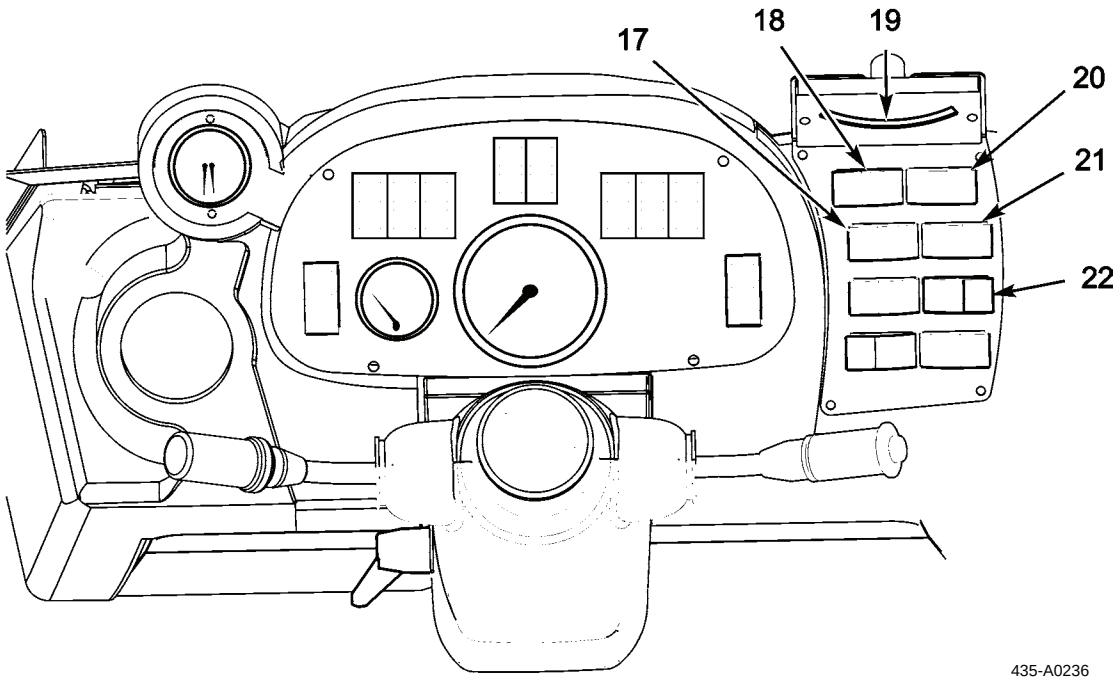
KEY	COMPONENT	DESCRIPTION
1	Electrical access panel	Allows access to the three fuse boards and the relays controlling the machine's electrics except for the main lighting fuses.
2	Gear selection column switch/horn switch	Used to select forward and reverse travel and the gear ratios. Press in on end of stalk to activate horn. Includes neutral lock (red).
3	Steering wheel	Used to steer the machine.
4	Multi-function switch	Controls the operation of the front windshield washer and wipers, and switches between headlight high and low beams.
5	Brake pedal	Used to slow and stop the machine.
6	Accelerator pedal	Used to control the speed of the machine while driving.
7	Temperature control switch	Used to control the cab temperature.
8	Loader control lever	Controls the movement of the loader arms and the front loader bucket. Knob includes function buttons.
9	Auxiliary loader control lever	Controls the auxiliary hydraulics for the loader. Opens and closes the clamshell bucket. Also, operates the sideshift and fork rotation facilities when the forklift is fitted. Knob includes function button.
10	Loader auxiliary hydraulics emergency cut-off switch	When pressed, cuts the auxiliary hydraulic pressure to the front loader. To reactivate the circuit, pull the switch out. Works in conjunction with the auxiliary hydraulics detent enable switch (pg. 0004-9, Item 44)

CONTROLS AND INDICATORS INSIDE CAB – CONTINUED



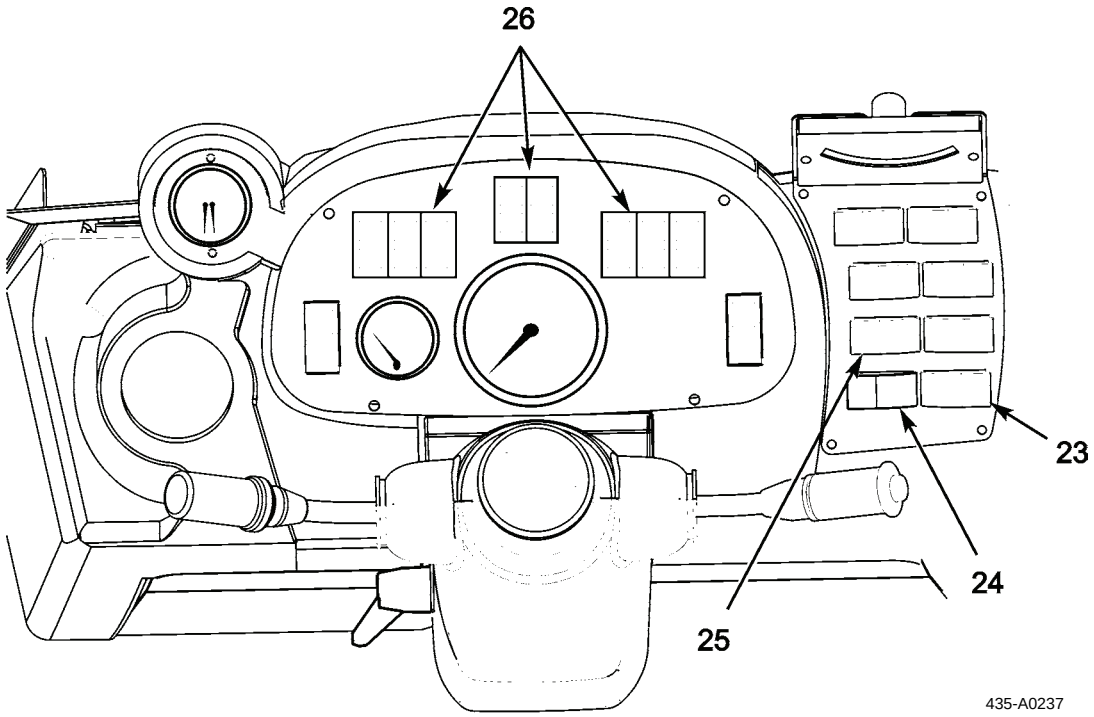
KEY	COMPONENT	DESCRIPTION
11	Twin air gauge	Shows the air pressure in the air tanks.
12	Differential lock switch	Operates the differential lock. Press in top of switch to disengage; press in bottom of switch to engage. Switch illuminates to confirm system active.
13	Voltmeter	Indicates state of battery charge when the engine is running.
14	Speedometer/Odometer	Displays the machine's road speed and mileage while traveling.
15	4-wheel-drive (4WD) switch	Controls the 4WD function. Press in the top of the switch to turn OFF the 4WD function, press the bottom of the switch to activate the 4WD. The switch will illuminate to confirm that 4WD is operational.
16	Steering column lock lever	Used to adjust the angle of the steering column to provide a comfortable driving position. Locked when in the down position.

CONTROLS AND INDICATORS INSIDE CAB – CONTINUED



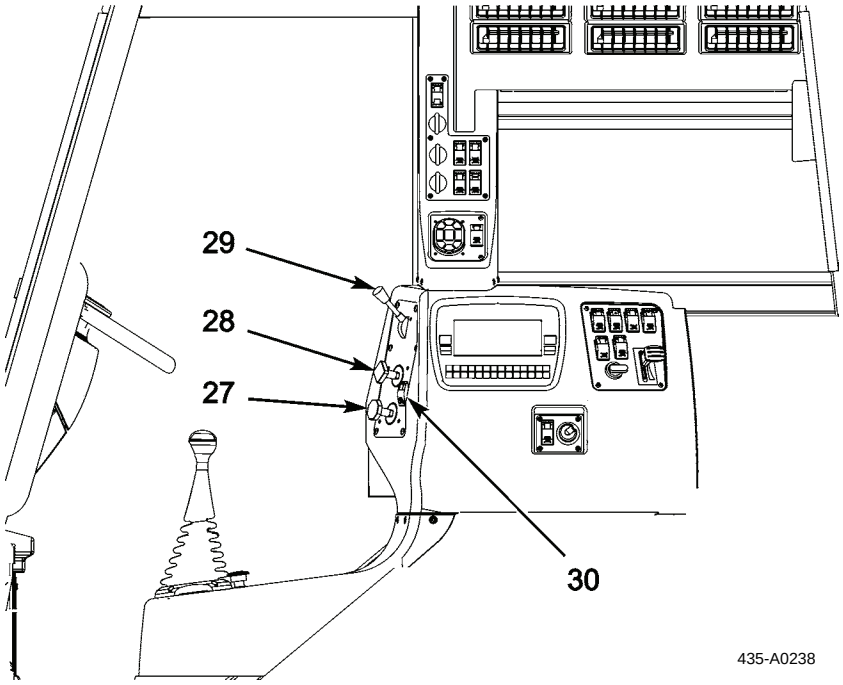
KEY	COMPONENT	DESCRIPTION
17	Suspension mode selection switch (loader/ forklift)	Used to select the loader/forklift suspension mode when pressed. The switch is a spring return type that will return to the off position when released.
18	Suspension mode selection switch (nor- mal)	Used to select the normal suspension mode when pressed. The switch is a spring return type that will return to the off position when released.
19	Inclinometer	Use the inclinometer to ensure the machine is level before operating the backhoe. The machine is level when the inclinometer shows 0 degrees. Also indicates the maximum slope the machine can traverse.
20	2-wheel-steer (2WS) mode selection switch	Used to select the 2WS when pressed. The switch is a spring return type that will return to the off position when released.
21	4-wheel-steer (4WS) mode selection switch	Used to select the 4WS mode when pressed. The switch is a spring return type that will return to the off position when released.
22	Crab steer mode selection switch	Used to select the crab steer mode when pressed. The switch is a spring return type that will return to the off position when released.

CONTROLS AND INDICATORS INSIDE CAB – CONTINUED



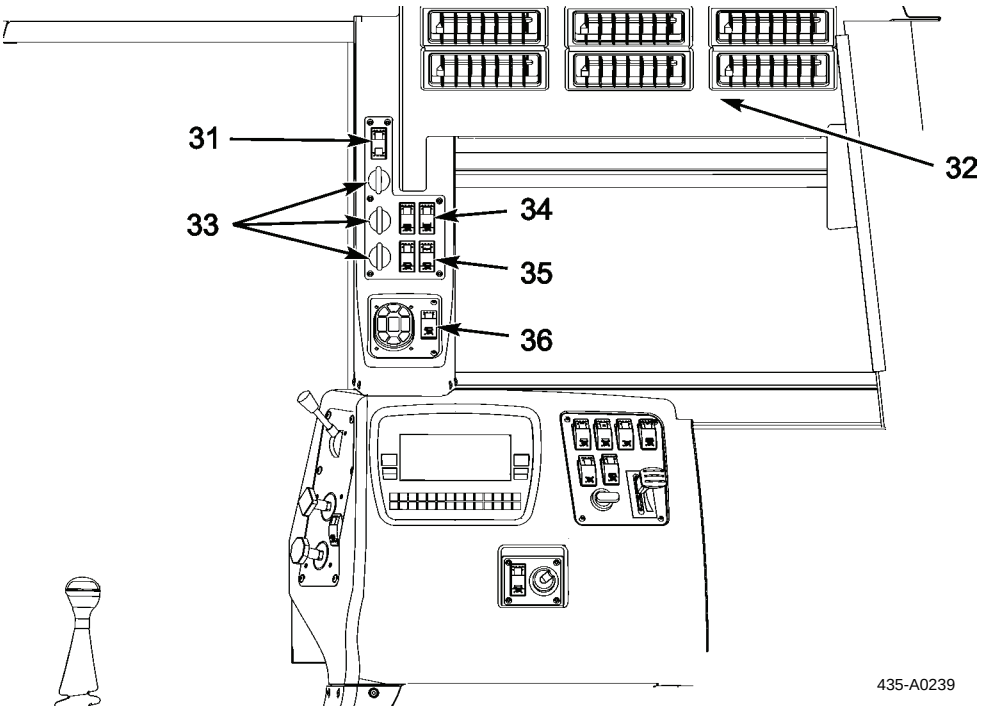
KEY	COMPONENT	DESCRIPTION
23	4-way flasher switch	Used to turn on/off the 4-way flashers.
24	Suspension mode selection switch (transport/workshop/limp-home)	Used to select the transport/workshop/limp-home suspension mode when pressed. The switch is a spring return type that will return to the off position when released.
25	Suspension mode selection switch (excavator)	Used to select the excavator suspension mode when pressed. The switch is a spring return type that will return to the OFF position when released.
26	Front console warning lights	Contains warning lights for: front worklight ON, headlight main beam activation, turn signal activation, service required notification, master stop warning, Antilock Braking System (ABS) fault warning, 4WD activation, suspension lock-out warning, cooling fan inhibited notification, differential lock activation, low fuel warning, and rear worklight activation (see Figure 24 of this work package).

CONTROLS AND INDICATORS INSIDE CAB – CONTINUED



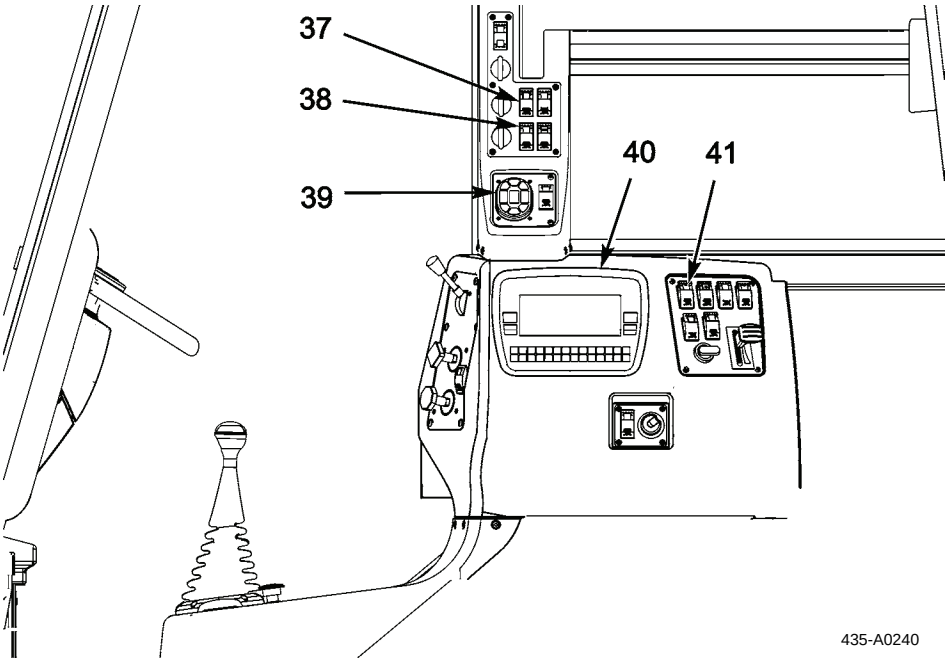
KEY	COMPONENT	DESCRIPTION
27	Trailer air supply valve	The valve operating knob is colored red. It operates the trailer air supply. Push the knob to supply air to the trailer. Pull the knob to exhaust the trailer supply.
28	Parking brake operating valve	The valve operating knob is colored yellow. It operates the parking brake. Pull the knob to engage the parking brake. To release the parking brake, push the knob down.
29	Independent trailer brake lever	The lever is colored black. It operates the trailer braking system. Pull the lever towards you to engage the trailer brakes. Release the lever to release the trailer brakes (this lever has no locking mechanism to hold the trailer brakes in the engaged position). When a trailer is attached and the machine is parked, the trailer brakes will be engaged by the (red) parking brake lever.
30	Parking brake test switch	Used when testing the parking brake (WP 0005).

CONTROLS AND INDICATORS INSIDE CAB – CONTINUED



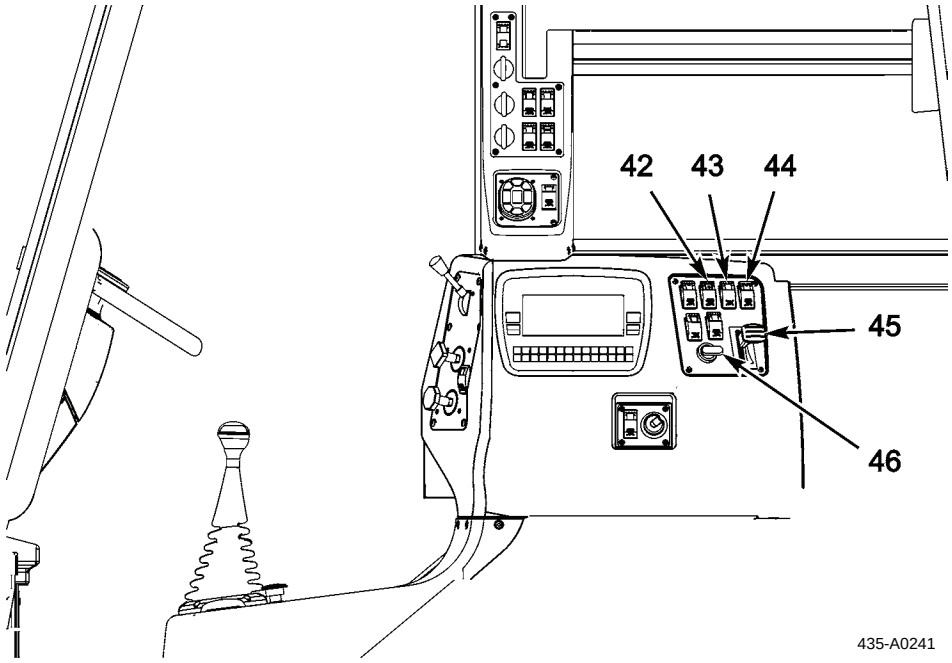
KEY	COMPONENT	DESCRIPTION
31	Heater/A/C change over switch	Switches between cab heating and A/C functions.
32	A/C unit	Contains the A/C filter, motor condenser, and valves.
33	A/C controls	Operates the heater, A/C, and electric fans.
34	Engine cooling fan inhibit switch	Operates the hydraulic engine cooling fan. The fan is engaged when the switch is in the OFF position. Press in the bottom of the switch to inhibit the engine cooling fan for fording operations. The switch will illuminate to confirm the fan is inhibited.
35	Auxiliary hydraulic circuit switch	Operates the auxiliary hydraulic (tool reel) circuit. Spring return switch. Press in bottom of switch to turn ON; switch illuminates to confirm circuit is activated. Press bottom of switch a second time to turn OFF.
36	Convoy warning light switch	Operates the convoy warning lights. Press in top of switch for OFF; bottom of switch for ON. Operates in conjunction with (pg. 0004-8, Item 39) (master lighting switch).

CONTROLS AND INDICATORS INSIDE CAB – CONTINUED



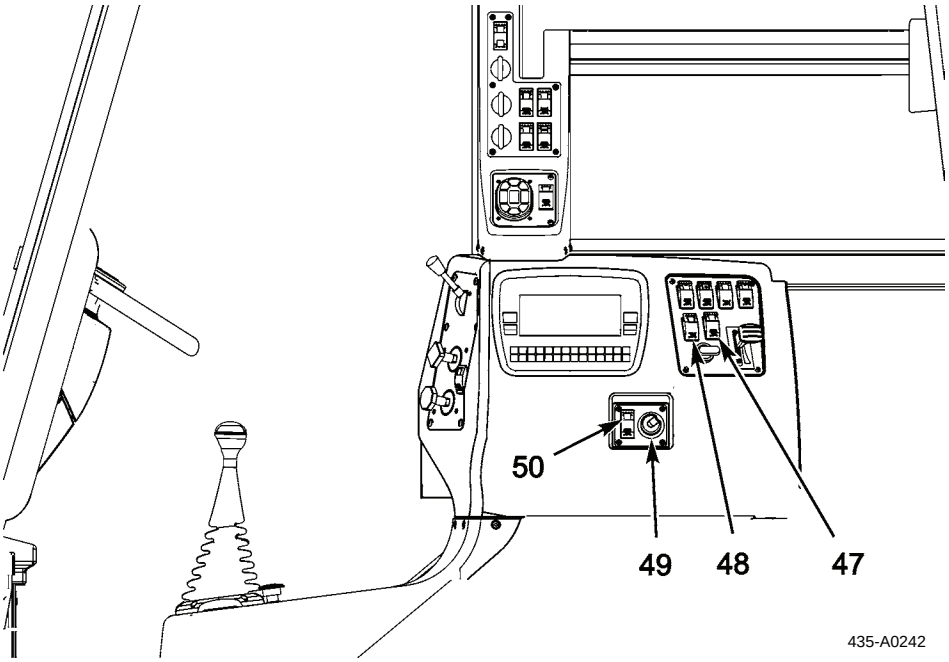
KEY	COMPONENT	DESCRIPTION
37	Front worklight operating switch	Switches on the front worklights and front worklights with low beam headlights. Press in top to turn OFF. Press bottom of switch to ON position to turn on front worklights.
38	Heated windshield switch	Controls the heated windshield function. This switch is of a momentary spring-return type. Switch on to activate timer for the heated windshield, press again to stop the time. Illumination indicates the state of the windshield heater.
39	Master lighting switch	Controls the machine's headlights, tail lights, blackout marker, drive lights, and panel lights.
40	Electronic Monitoring System (EMS) unit	Controls all the machine's electrics. Displays the warning lights and function lights. Contains fuel gauge, transmission temperature gauge, hydraulic temperature gauge, and engine coolant temperature gauge. It also displays text error messages and system confirmation data.
41	EMS test switch	Tests the operation of the EMS warning lights. When pressed, the EMS enters a self-test mode. All bar graphs and LCD segments will be checked along with all warning icons.

CONTROLS AND INDICATORS INSIDE CAB – CONTINUED



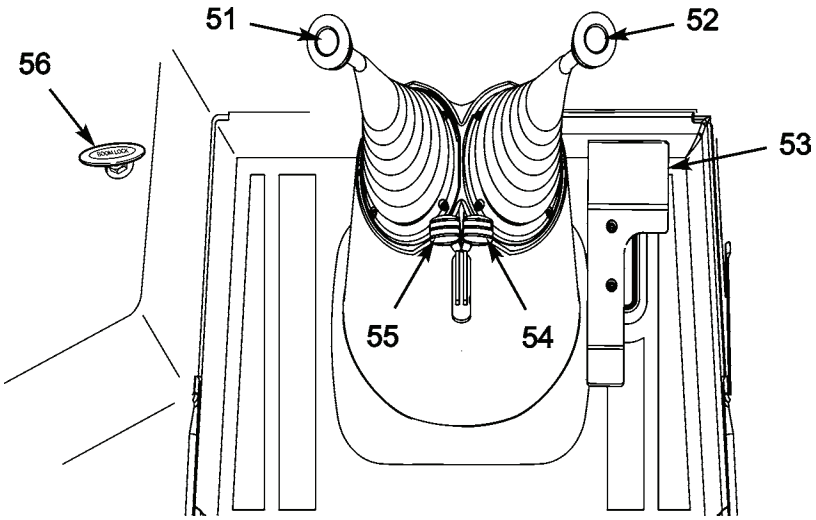
KEY	COMPONENT	DESCRIPTION
42	ABS system warning indicator and test switch	The ABS warning light illuminates when the ignition is turned on. The light stays on while the system self-tests, then goes out. To test the warning light operation, press in the bottom of the switch. The light will illuminate while the switch is held. If the switch lights up while driving, it indicates a system fault with the ABS. Report the fault as soon as possible. **NOTE** If the battery has been disconnected and then re-connected, the light will come on when the ignition is turned on, and will stay on until the machine's road speed exceeds 3 mph (5 kph).
43	Rear horn switch	Used to sound the front and rear horn when operating the backhoe.
44	Auxiliary hydraulics detent enable switch	Used to enable the auxiliary hydraulics detent function. Also enables the loader auxiliary emergency cut-off switch (Item 10).
45	Hand throttle control lever	Used to control the engine speed when operating the backhoe.
46	Ignition switch	Key switch to turn on the ignition and to start and stop the machine.

CONTROLS AND INDICATORS INSIDE CAB – CONTINUED



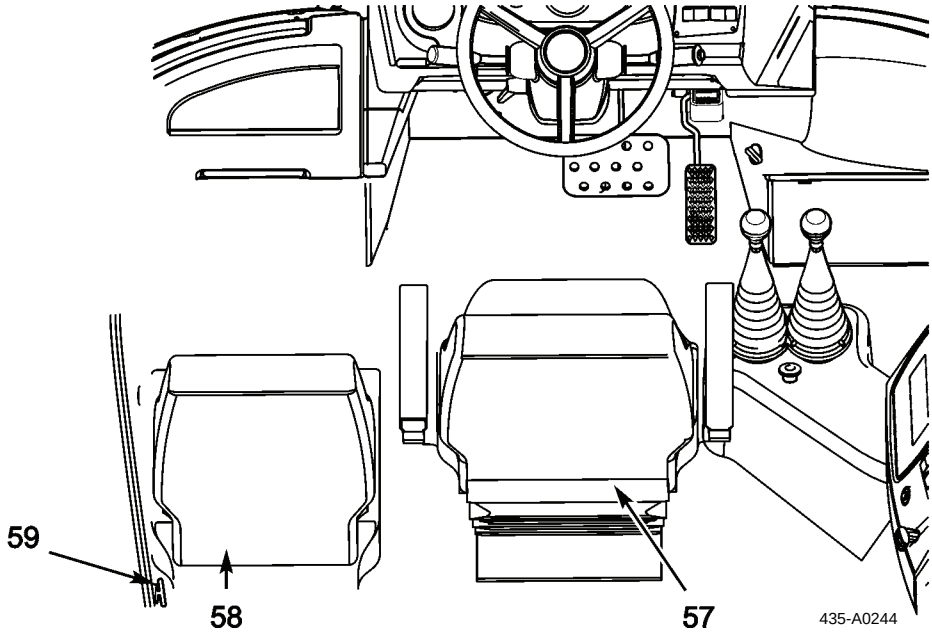
KEY	COMPONENT	DESCRIPTION
47	Rear worklight switch	Switches on the rear worklights. Three-position switch. Press in top to turn OFF. Press bottom of switch to 1st ON position to turn on inner rear worklights. Press bottom of switch to 2nd position to turn on inner and outer rear worklights.
48	Rear window wiper/washer switch	Controls the rear window wiper/washer function. Press the bottom of the switch to the 1st position to operate the wiper. Press the bottom of the switch again (against spring pressure) to activate the window washer. When the switch is released, the washer stops and the switch returns to the wiper ON position. Press in the top of the switch to turn OFF.
49	Auxiliary cab heating switch	Controls the operation and adjusts the temperature of the auxiliary cab heating system.
50	Engine coolant (arctic) heater switch	Switches ON/OFF the engine coolant heater, used to heat the coolant in the engine when operating under extreme cold conditions.

CONTROLS AND INDICATORS INSIDE CAB – CONTINUED



KEY	COMPONENT	DESCRIPTION
51	Backhoe control lever (boom)	Operates backhoe boom and slew.
52	Backhoe control lever (dipper/bucket)	Operates backhoe dipper and bucket.
53	Backhoe foot pedal	Operates the auxiliary hydraulic power to the backhoe attachments when fitted (i.e., rock breaker attachment).
54	RH stabilizer control lever	Controls the right-hand stabilizer when seated facing the rear.
55	LH stabilizer control lever	Controls the left-hand stabilizer when seated facing the rear.
56	Boom lock control	Secures backhoe boom in upright position.

CONTROLS AND INDICATORS INSIDE CAB – CONTINUED



KEY	COMPONENT	DESCRIPTION
57	Operator's seat	Used for driving the machine and operating the loader/backhoe controls. The seat is fitted with a 3-point seat belt.
58	Passenger's seat	Seat for the passenger. Fitted with a 3-point seat belt. This is a fixed seat with no adjustments.
59	Battery disconnect switch	Used to isolate the machine's electrical systems from the batteries. Do not use to stop the engine.

END OF TASK

BATTERY DISCONNECT SWITCH

CAUTION

- Except in an emergency, do not use the battery disconnect switch to turn OFF the engine. Failure to follow this caution may result in damage to the electrical circuits.
- Before carrying out arc welding on the machine, disconnect the battery and alternator to protect the circuits and components. Unplug all vehicle ECUs. The battery must be disconnected even if the battery disconnect switch is turned OFF. Failure to follow this caution may result in damage to the electrical circuits.

At the end of a working cycle or if the machine is being left unattended, provided the lights are not required, the battery must be isolated. Before attempting to start the engine or use the machine's electrics, the battery disconnect switch must be turned ON.

NOTE

When the battery disconnect switch is turned OFF, battery power is retained for approximately 30 seconds. This is to allow the electronics to shut down correctly.

CONTROLS AND INDICATORS INSIDE CAB – CONTINUED

1. To isolate the battery, turn the battery disconnect switch (Figure 9, Item 1) to the horizontal (OFF) position as shown.
2. To connect the battery, turn the battery disconnect switch (Figure 9, Item 1) to the vertical (ON) position.

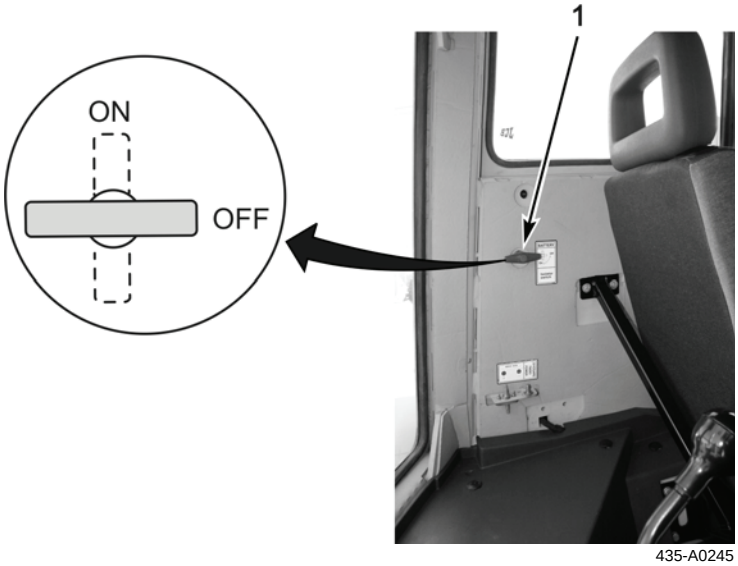
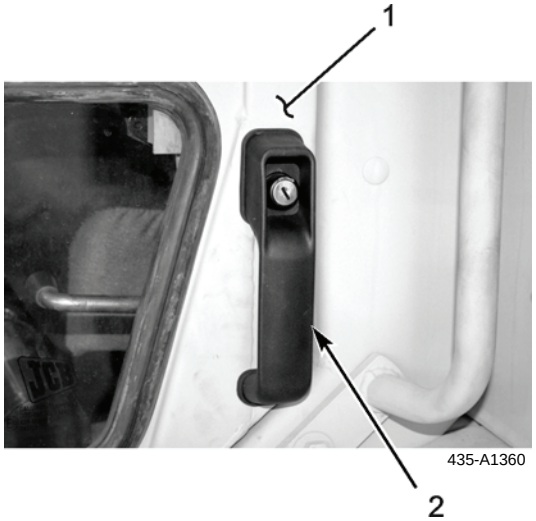


Figure 9. Battery Disconnect Switch

END OF TASK

DOORS

1. To open a door (Figure 10, Item 1) from outside the machine, press lock barrel (Figure 10, Item 2).
2. Close a door (Figure 10, Item 1) from inside the machine by pulling firmly; it will latch itself.
3. To open a door (Figure 10, Item 1) from inside the machine, push lever (Figure 10, Item 3) towards the front of the machine.
4. To lock door (Figure 10, Item 1), push lever (Figure 10, Item 4) up.
5. To unlock door (Figure 10, Item 1), pull lever (Figure 10, Item 4) in and rotate down.



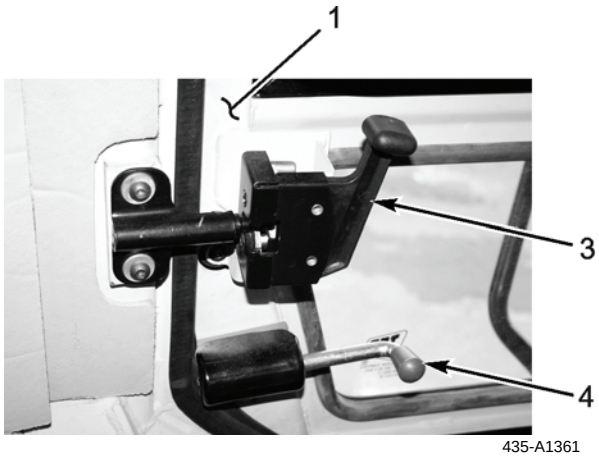


Figure 10. Doors

END OF TASK

CAB DOOR WINDOWS

Open Window

To open the window, grasp handle (Figure 11, Item 1) and pull back.

Close Window

To close the window, push the handle (Figure 11, Item 1) forward until the catch locks.

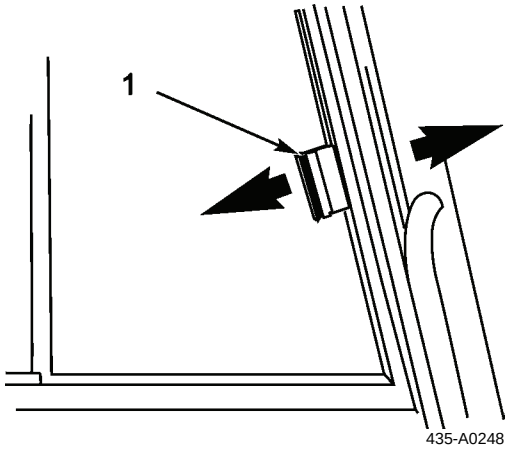


Figure 11. Cab Door Windows

END OF TASK

REAR WINDOW

CAUTION

Do not operate the rear window wiper when the window is open. Failure to follow this caution will result in damage to equipment.

1. To open the window (Figure 12, Item 1), press locking levers (Figure 12, Item 2). Lower the window to the required position and release locking levers to lock in required position.
2. To close the window (Figure 12, Item 1), press locking levers (Figure 12, Item 2). Raise the window and release locking levers to lock.

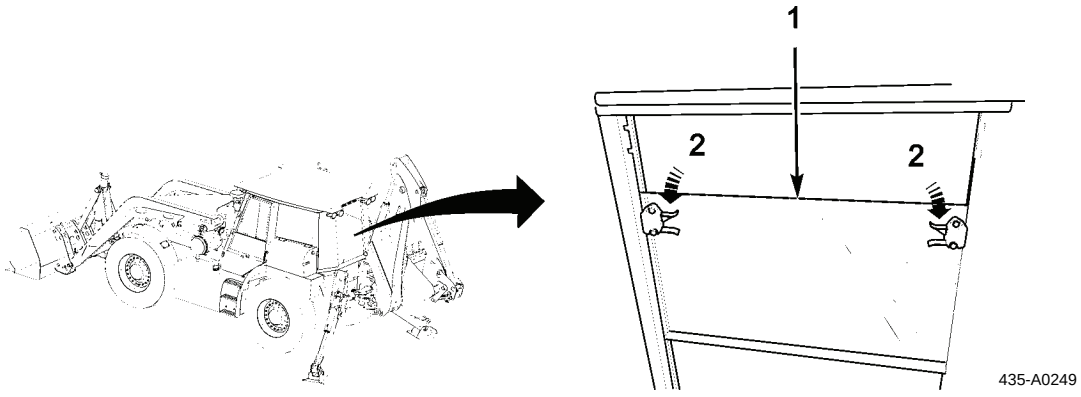


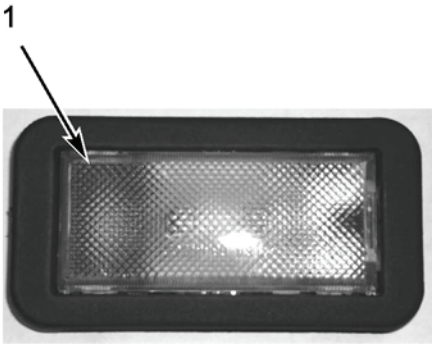
Figure 12. Rear Window

END OF TASK

INTERIOR LIGHT

There are two interior lights, both of the same design, fitted in the cab. One is located in the center above the operator's seat, and one is above the passenger seat.

1. Select either "SER DRIVE" or "PARK" on the military light switch.
2. Press on one end of the light (Figure 13, Item 1) to turn the light on. Press on the opposite end to turn the light off.



435-A0250

Figure 13. Interior Light

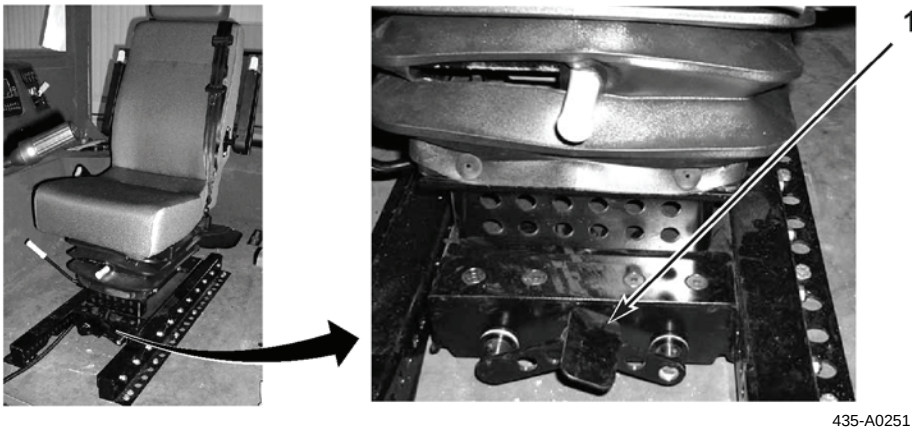
END OF TASK

OPERATOR'S SEAT CONTROLS

The operator's seat can be adjusted for your comfort. A correctly adjusted seat will reduce operator fatigue. Position the seat so that you can comfortably reach the machine's controls. For driving the machine, adjust the seat so that you can depress the brake pedals fully with your back against the seat back.

Controls

1. **Forward/Backward.** To move the seat forward or backward, press down on the foot pedal (Figure 14, Item 1) and slide the seat to the desired position. Release the foot pedal to lock the seat in position. It may be necessary to move the seat slightly, once the foot pedal has been released, to fully engage the slide locks.



435-A0251

Figure 14. Operator Seat Controls - Forward/Backward

OPERATOR'S SEAT CONTROLS – CONTINUED

2. **Turn.** To turn the seat (from forward facing to rear or vice-versa), press down on the foot pedal (Figure 15, Item 1) and, with the pedal held depressed, slide the seat fully backwards until it reaches its stop. Release the foot pedal. Pull the turn release lever (Figure 15, Item 2) toward the rear of the seat and turn the seat (right to turn from forward facing; left to turn from rear facing). Release the turn handle once the seat has started to turn, and continue to turn the seat until it locks in the required facing position. Adjust the forward/backward position as described earlier until a comfortable operating position is obtained.

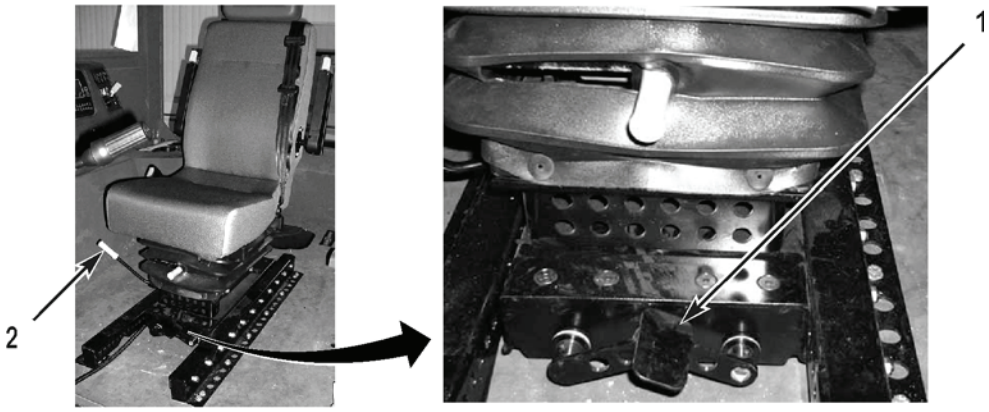


Figure 15. Operator Seat Controls - Turn

3. **Armrests.** The angle of the armrests can be adjusted. Rotate the control knob (Figure 16, Item 3) clockwise to raise the armrest and counterclockwise to lower the armrest. The armrest should be folded up when getting in or out of the machine.

Figure 16. Operator Seat Controls - Armrests

OPERATOR'S SEAT CONTROLS – CONTINUED

4. **Pneumatic Controls.** The pneumatic controls operate airbags beneath and inside the seat to provide the suspension and lumbar/upper back support features. To raise or lower the seat and to adjust the level of suspension, increase or decrease the air in the support bag using control button (Figure 17, Item 4). Lower lumbar support can be adjusted by increasing/ decreasing the air pressure using the lumbar control button (Figure 17, Item 5). Upper back support can be adjusted using the upper back control button (Figure 17, Item 6).

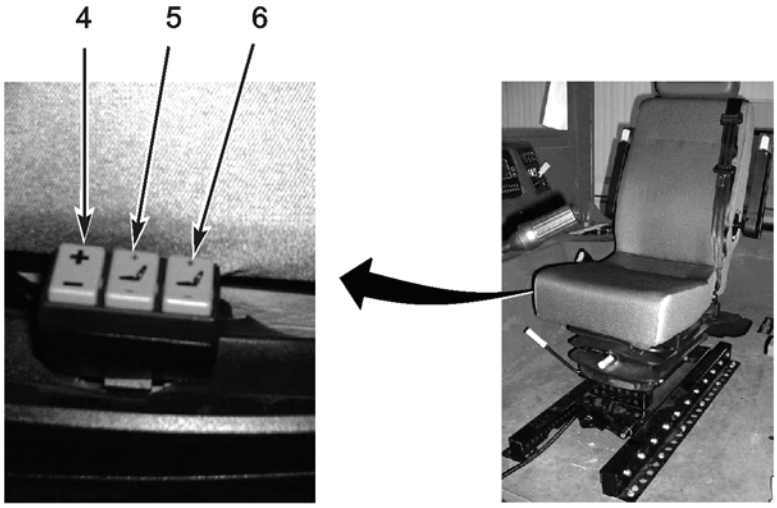


Figure 17. Operator Seat Controls - Pneumatic Controls

5. **Lock-Out.** In the event of a failure of the air suspension system, the seat can be locked in a raised position to improve the operator's seating position until a repair can be effected.

   To install this facility, manually raise the seat base by pulling up under the front edge of the seat cushion and operating the lock lever (Figure 18, Item 7) until the locking pegs engage into the seat frame.

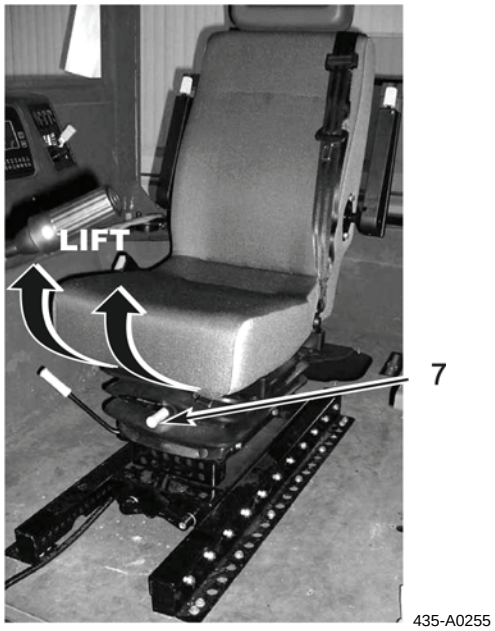


Figure 18. Operator Seat Controls - Lockout

END OF TASK

SEAT BELT

Fastening the Seat Belt

WARNING

- The ROPS cab is designed to give you protection in an accident. If you do not wear your seat belt you could be thrown about inside the machine, or thrown out of the machine and crushed. You must wear a seat belt when using the machine. Fasten the seat belt before starting the engine.
- Release the seat belt only after turning off the engine. Failure to follow this caution can result in serious injury or death to personnel.

NOTE

If the ignition is turned ON, a warning light on the EMS display panel will illuminate and a buzzer will sound while you are sitting in the seat with the seat belt not fastened. The buzzer can be canceled by pressing the OK button on the EMS display unit.

1. Sit correctly in the seat. Pull the belt (Figure 19, Item 1) from its reel holder in one continuous movement.
2. Push the male fitting (Figure 19, Item 2) into the buckle (Figure 19, Item 3) until it latches into position. Ensure the seat belt is not twisted and the lap portion of the 3-point harness is over your hips, not over your stomach.

NOTE

- If the belt locks before the male fitting (Figure 19, Item 2) has been engaged, allow the belt to fully retract in its reel holder and then try again. The inertia mechanism may lock if you pull the belt too sharply or if the machine is parked on an incline. In such cases, ease the belt gently from its reel holder.
- If the ignition is turned ON, the warning light will go out and the buzzer will stop when the seat belt is fastened.

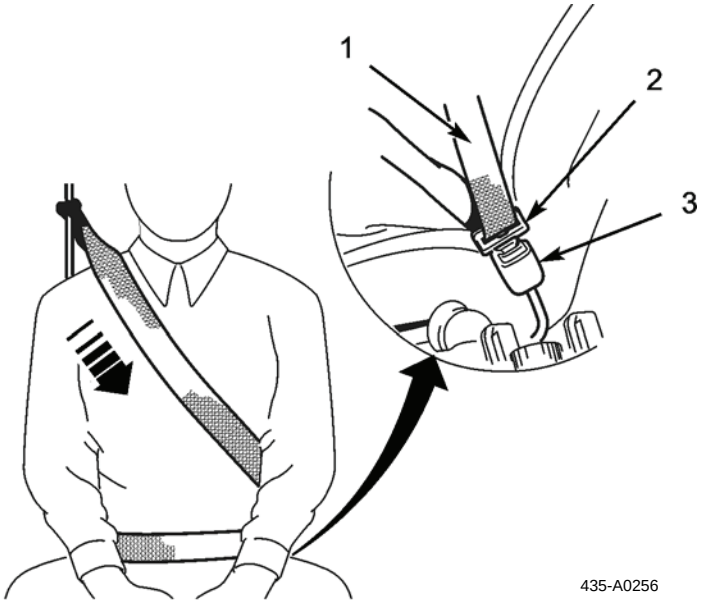


Figure 19. Seat Belt - Fastening

Releasing the Seat Belt

1. Press release button (Figure 20, Item 4) and pull the male fitting (Figure 20, Item 2) from the buckle (Figure 20, Item 3).

SEAT BELT – CONTINUED

Releasing the Seat Belt - Continued

2. Let the seat belt retract fully into its reel holder.

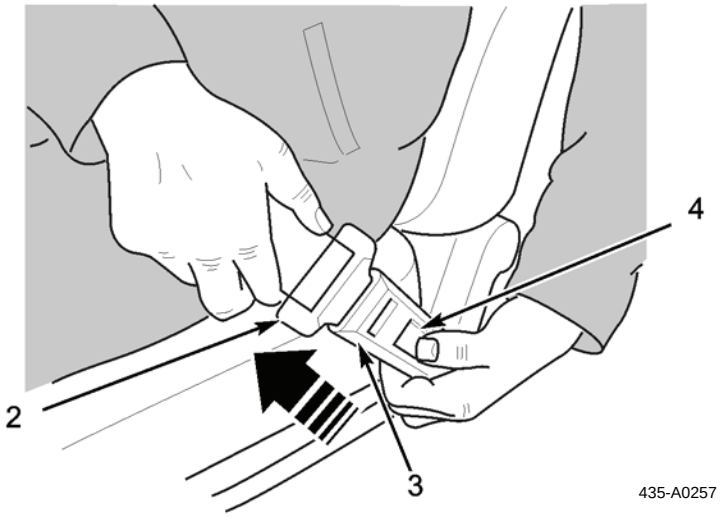


Figure 20. Seat Belt - Release

Checking that the Seat Belt is Operating Correctly

WARNING

If the seat belt does not lock when you check, or if the male fitting releases without the release button being pressed, do not drive the machine. Report the fault immediately to Unit Maintenance. Failure to do so could result in injury or death to personnel.

1. Take hold of the seat belt and tug. The seat belt should lock. If the seat belt does not lock, report the fault immediately to Unit Maintenance.
2. Fasten the seat belt as described earlier. Take hold of the belt webbing and attempt to pull the male fitting (Figure 21, Item 2) from the buckle (Figure 21, Item 3). If the buckle releases the male fitting without the release button (Figure 21, Item 4) being depressed, report the fault immediately to Unit Maintenance.

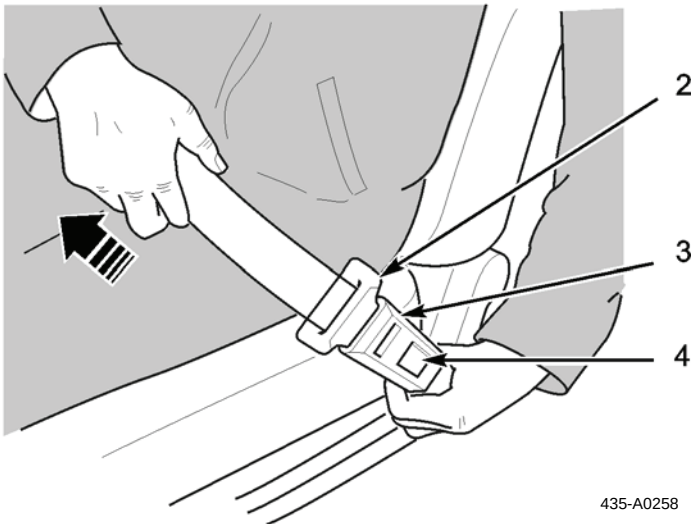


Figure 21. Seat Belt - Check

END OF TASK

STEERING WHEEL TILT ADJUSTMENT

The steering column can be adjusted to provide a more comfortable operating position.

WARNING

Ensure the steering column is fully clamped before driving the machine. Failure to follow this warning could result in your losing control of the machine, causing injury or death to personnel.

1. Rotate lever (Figure 22, Item 1) counterclockwise to unlock the steering column (Figure 22, Item 2).
2. Adjust the steering column (Figure 22, Item 2) position.
3. Re-tighten the lever (Figure 22, Item 1) to lock the steering column (Figure 22, Item 2) in position.

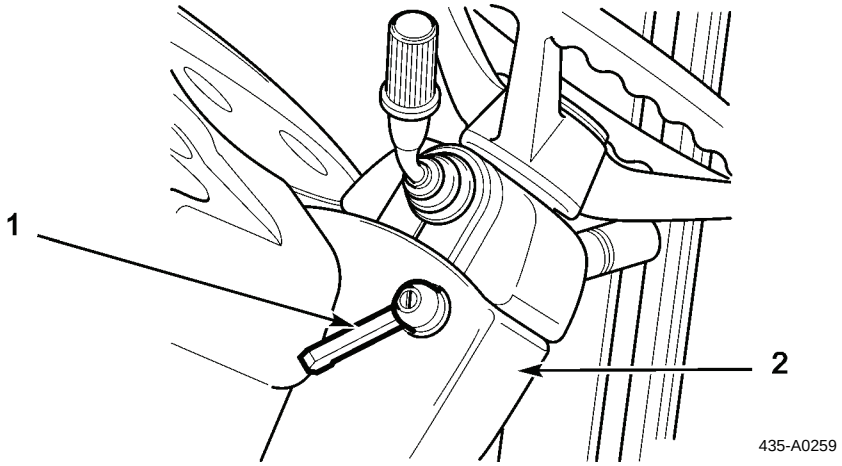


Figure 22. Steering Wheel Tilt Adjustment

END OF TASK

MULTI-PURPOSE STEERING COLUMN SWITCH

1. **DIRECTION INDICATORS (RIGHT).**

   Pull the lever (Figure 23, Item 1) towards you to indicate a right turn.

2. **DIRECTION INDICATORS (LEFT).**

   Push the lever (Figure 23, Item 1) away from you to indicate a left turn.

3. **WINDSHIELD WIPER.**

   Rotate the lever barrel (Figure 23, Item 3) to switch the windshield wipers ON and OFF.

   II Fast

   I Slow

   0 Off

NOTE

The windshield wipers will self-park when switched off.

4. **WINDSHIELD WASHERS.**

   Push the button (Figure 23, Item 2) towards the steering wheel to operate the windshield washer.

5. **HEADLIGHT HIGH BEAM.**

   Push the lever (Figure 23, Item 1) down for high beam. Center position is low beam. Functions only with the side/headlights ON.

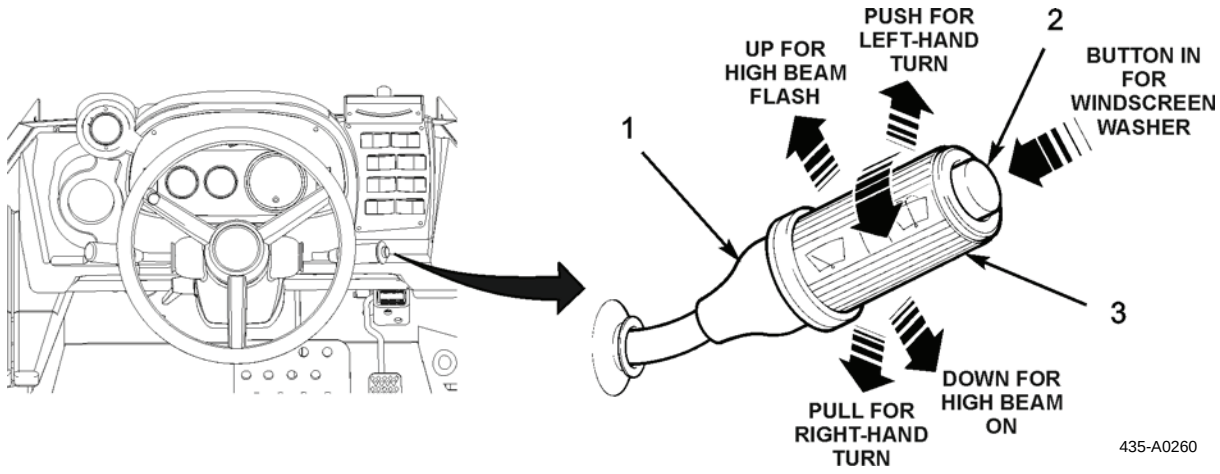


Figure 23. Multi-Purpose Steering Column Switch

END OF TASK

FRONT CONSOLE WARNING LIGHT PANEL

The main machine warning systems are incorporated into the EMS unit. However, certain indicators important for the safe operation of the machine are also displayed on this front console warning panel as detailed below.

Front Console Warning Lights (Figure 24)

1. **FRONT WORKLIGHTS ON.** Lights up when the front worklights are switched ON.
2. **HIGH BEAM ON**. Lights up when the headlight high beams are switched ON. Switch the high beams OFF for on-coming vehicles.
3. **TURN SIGNALS (Left).** Flashes when the left turn signal is active.
4. **SERVICE WARNING LIGHT.** Will advise of non-critical condition. The machine can carry on with its mission, e.g., low fuel light activation. In addition, the EMS will display the message “SERVICE.”
5. **MASTER STOP LIGHT.** Will light when a critical condition is activated. The operator should stop the machine as soon as it is safe to do so. In addition, the EMS will display the message “STOP NOW.”
6. **ABS LIGHT.** Will illuminate if a fault is detected with the ABS system.
7. **BATTERY NO CHARGE LIGHT.** Lights up, with the engine stopped, when the ignition is turned ON and, with the engine running, illuminates when the alternator is not charging the batteries.
8. **TURN SIGNALS (Right).** Flashes when the right turn signal is active.
9. **4-WHEEL-DRIVE ENGAGED.** Lights up when 4WD is active.
10. **FRONT SUSPENSION LOCKED.** Lights up when the front suspension is locked.
11. **COOLING FAN INHIBITED.** Lights up when the engine cooling fan is inhibited. (Fording operations.)
12. **DIFFERENTIAL LOCK.** Lights up when the axle differential locks are active.
13. **POWER STEERING.** Lights up when power steering assistance is inoperative.
14. **PARK BRAKE WARNING.** Lights up when the park brake is applied.
15. **LOW FUEL WARNING.** Lights up when the fuel reserve is low.
16. **REAR WORKLIGHTS.** Lights up when the rear worklights are switched on.

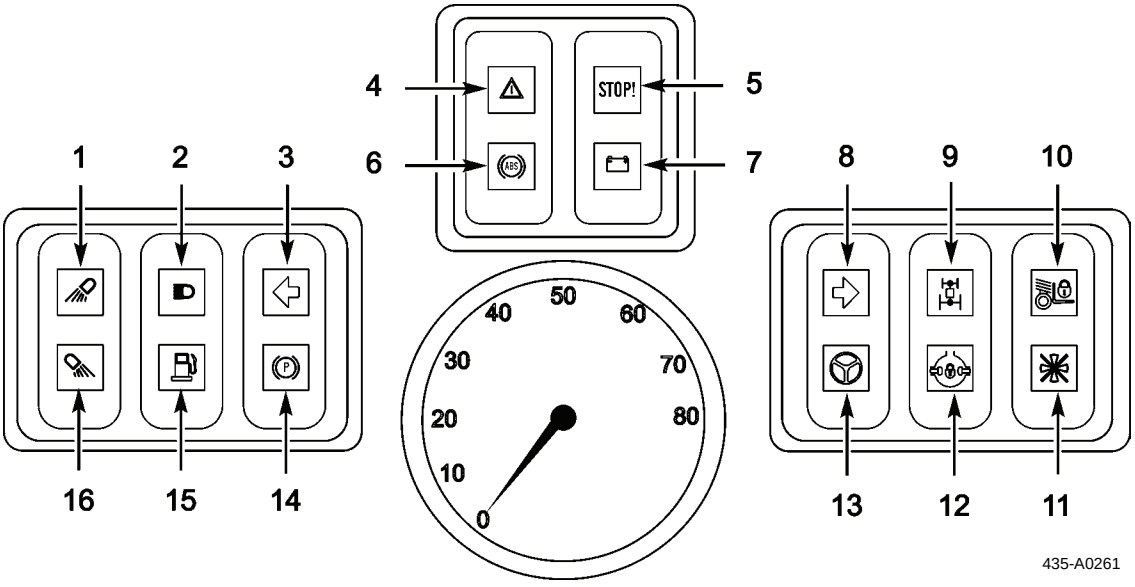


Figure 24. Front Console Warning Lights

END OF TASK

GEAR SELECTION COLUMN SWITCH

The left-hand steering column switch (Figure 25, Item 1) controls the gear selection requirements.

Neutral Lock

Lock the forward/reverse lever (Figure 25, Item 3) in the neutral position by turning the neutral lock lever (Figure 25, Item 2) to the “N” position, to prevent accidental operation while entering or leaving the cab.

- **N** The lever is locked in Neutral position
- **D** Forward or Reverse drive can be selected

Forward/Reverse Lever

NOTE

The engine will not start unless the forward/reverse lever is in “**N**” Neutral.

To select forward/reverse, release the neutral lock (Figure 25, Item 2), move the lever (Figure 25, Item 3) to the position required “**F**” Forward, “**R**” Reverse.

Gear Mode Selection

NOTE

- Foot brake must be applied and parking brake released before selecting a direction of travel.
- Machine can be driven in any gear range depending on ground conditions.

Rotate barrel (Figure 25, Item 4) so that the arrow on the lever (Figure 25, Item 3) aligns with the required gear mode.

	Forward:		**Reverse:**
1	1st Gear	1	1st Gear
2	2nd Gear	2	2nd Gear
3	3rd Gear	3	AUTO (AUTO 1st-2nd)
4	AUTO (Auto 1st to 6th with initial start in 2nd)	4	AUTO (AUTO 1st-2nd)

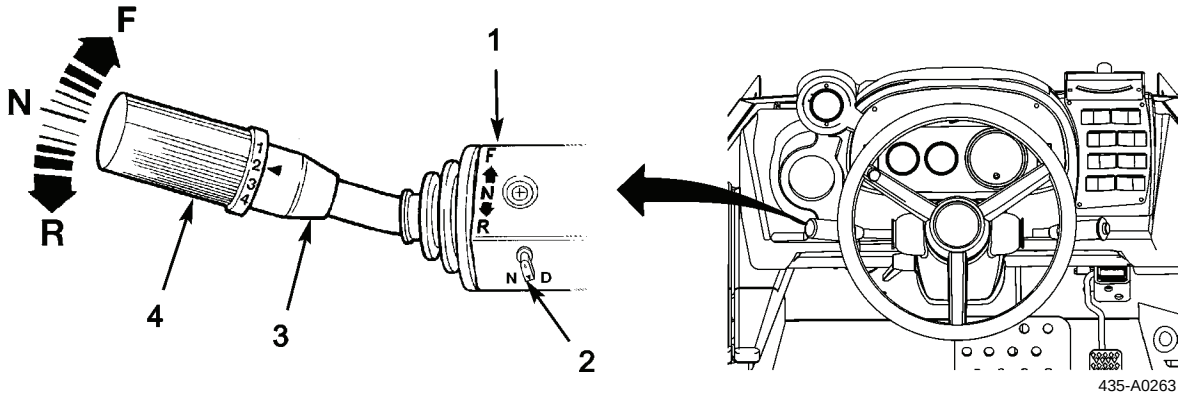


Figure 25. Gear Selection Column Switch

GEAR SELECTION COLUMN SWITCH – CONTINUED

Operation Gear Mode Selection

CAUTION

Do not change from a high gear to a low gear (for instance, 4th to 1st) in one sudden movement while the machine is moving. When selecting lower gears, allow the engine speed to drop before each gear change. Failure to follow this caution may lead to damage to equipment.

1. When moving or stationary, to select a gear mode, rotate the barrel (Figure 26, Item 4) so that the arrow (Figure 26, Item 5) marked on the lever aligns with the required gear number.
2. When selecting lower gears, allow the engine speed to drop before each gear change.

NOTE

Should you select any steering mode other than 2WS or any suspension mode other than travel mode, the transmission will be restricted to 1st, 2nd, and 3rd gears.

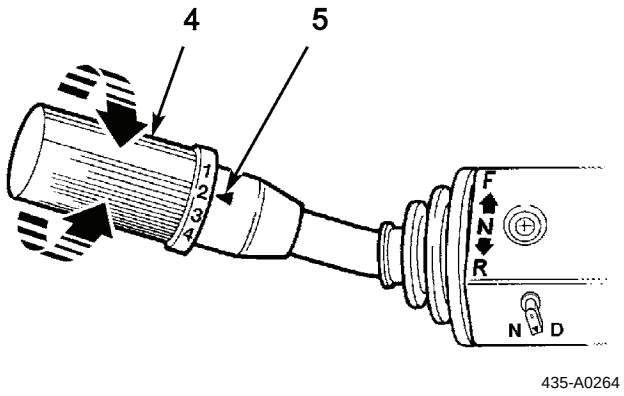


Figure 26. Gear Mode Selection Operation

Forward/Reverse Mode Selection Operation

CAUTION

If you operate the forward/reverse lever while traveling, the machine will maintain its current direction of travel. It will not select the opposite direction until the machine comes to rest. Follow the recommended procedure for proper use of this selector. Failure to follow this caution may result in damage to equipment.

NOTE

All four gear modes are available for both forward and reverse direction of travel.

Ensure the neutral lock (Figure 27, Item 2) is deselected. Stop the machine before moving the forward/reverse lever (Figure 27, Item 3). To select Forward, Reverse, or Neutral, move the lever (Figure 27, Item 3) to the required position.

GEAR SELECTION COLUMN SWITCH – CONTINUED

To Reverse Direction of Travel:

1. Stop the machine, keeping the foot brakes applied.
2. Let the engine speed drop to idle.
3. Select the new direction.
4. Release the foot brakes and accelerate away.

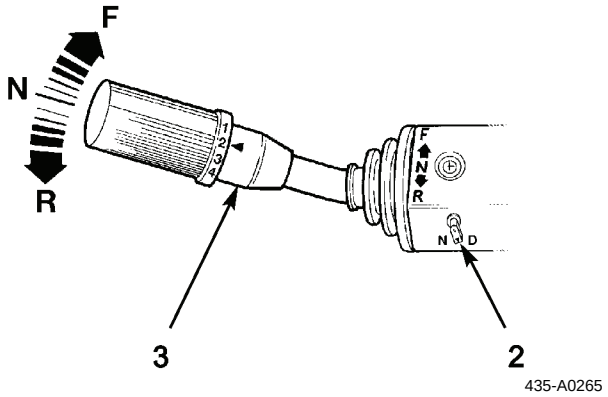


Figure 27. Direction of Travel - Reverse

END OF TASK

AUDIBLE WARNING (HORN)

The machine's audible warning is operated by a spring-loaded pushbutton switch. The switch is built into the end of the gear selection column switch.

1. To operate the audible warning, press on the end of the switch (Figure 28, Item 1).
2. Release the switch (Figure 28, Item 1) to silence the audible warning.

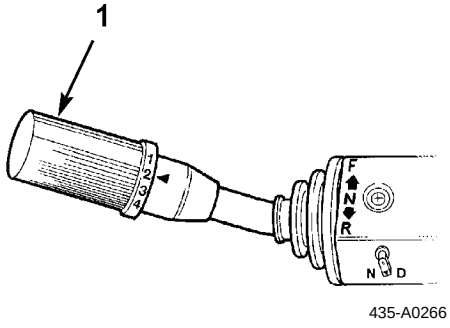


Figure 28. Audible Warning (Horn)

END OF TASK

MILITARY LIGHT SWITCH ASSEMBLY - MECHANICAL

NOTE

For B.O. DRIVE, B.O. MARKER, STOPLIGHT, and SER DRIVE, use the UNLOCK lever.

1. Turn ON the battery disconnect switch.
2. Push up the UNLOCK lever (Figure 29, Item 1) to release selector switch (Figure 29, Item 2). Release the unlock lever once the selector switch is correctly positioned.
3. Operate the instrument panel light switch (Figure 29, Item 3) to turn on and vary the brightness of the instrumentation lighting. Push down on the instrument panel light switch (Figure 29, Item 3) to select the parking lights.

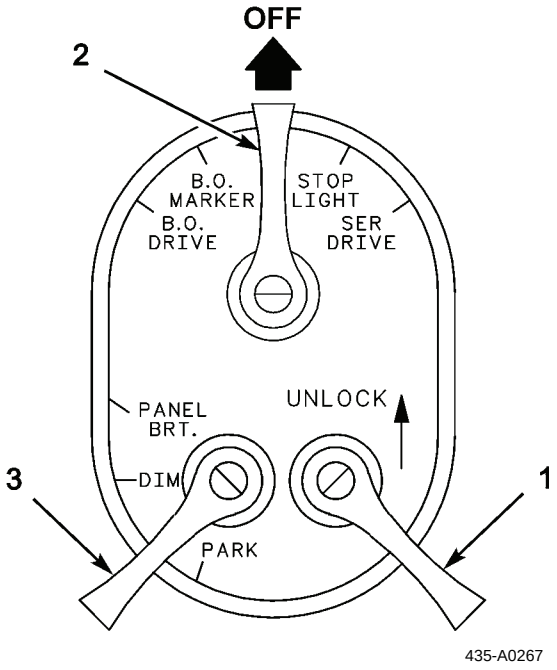


Figure 29. Military Light Switch Assembly

MILITARY LIGHT SWITCH ASSEMBLY - MECHANICAL – CONTINUED

The following lights will be activated when the corresponding switch positions are selected:

MODE	LIGHT ACTIVATION AVAILABLE
B.O. DRIVE	B.O. Driving Light B.O. Marker Light B.O. Stop Light ON when brakes are applied
B.O. MARKER	B.O. Marker Light B.O. Stop Light ON when brakes are applied
All OFF	All lights OFF
STOP LIGHT	Service Stop Light ON when brakes are applied Service Turn Indicators when switch is activated Backup Lights and Alarm are also active
SER DRIVE	NOTE To switch between high and low beam headlights, use the multi-purpose column switch. Service Stop Light ON when brakes applied Service Tail Light Service Turn Indicators when switch activated Service Headlights
PARK	Parking Lights

END OF TASK

MILITARY LIGHT SWITCH ASSEMBLY - DIGITAL

The following diagram show the operation of the digital master light switch. The switch contains nine function keys (Figure 30, Item 1). Each of these function keys is backlit by an amber light. The text on the function pads will be white. Each function key also incorporates a blue function active light (Figure 30, Item 2) to indicate that the function is active.

NOTE

If there are no blue indicators lighted, then no external machine lights are turned on. The amber backlight is for the keypad only.

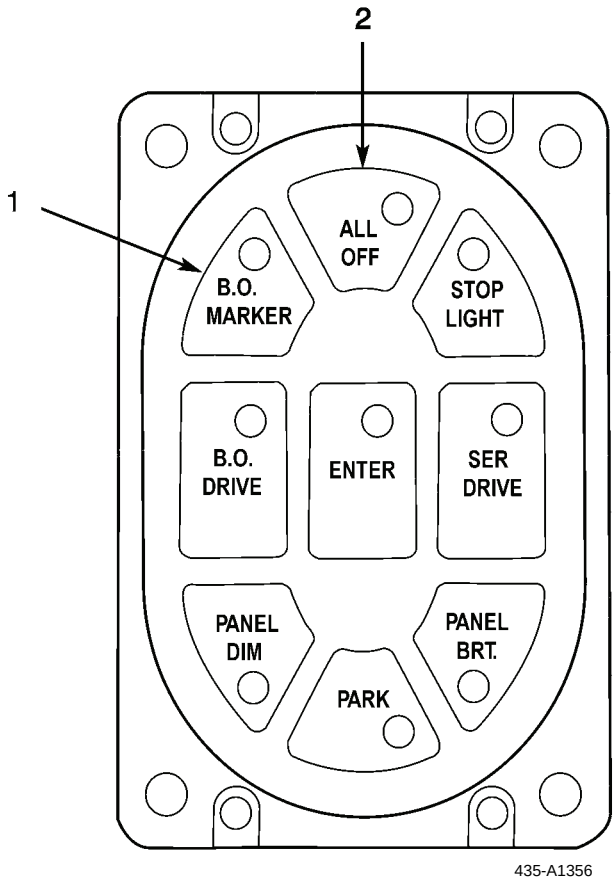


Figure 30. Military Light Switch Assembly

MILITARY LIGHT SWITCH ASSEMBLY - DIGITAL – CONTINUED

Initialize the Switch

1. Press any function key (Figure 30, Item 1). All the function keys' blue function active LEDs (Figure 30, Item 2) will flash once, and the amber function key backlights will be turned on.
2. The switch will go into "alert" mode, the primary modes will be set to ALL OFF, and the secondary modes will be set to OFF.

NOTE

If no mode selection is made within 20 seconds, the switch will return to its standby condition.

The switch modes are as follows (Figure 31):

PRIMARY MODES	SECONDARY MODES
ALL OFF (3)	PANEL BRIGHT (7)
STOP LIGHT (4)	PANEL DIM (9)
PARK (8)	
B.O. DRIVE (10)	
B.O. MARKER (11)	

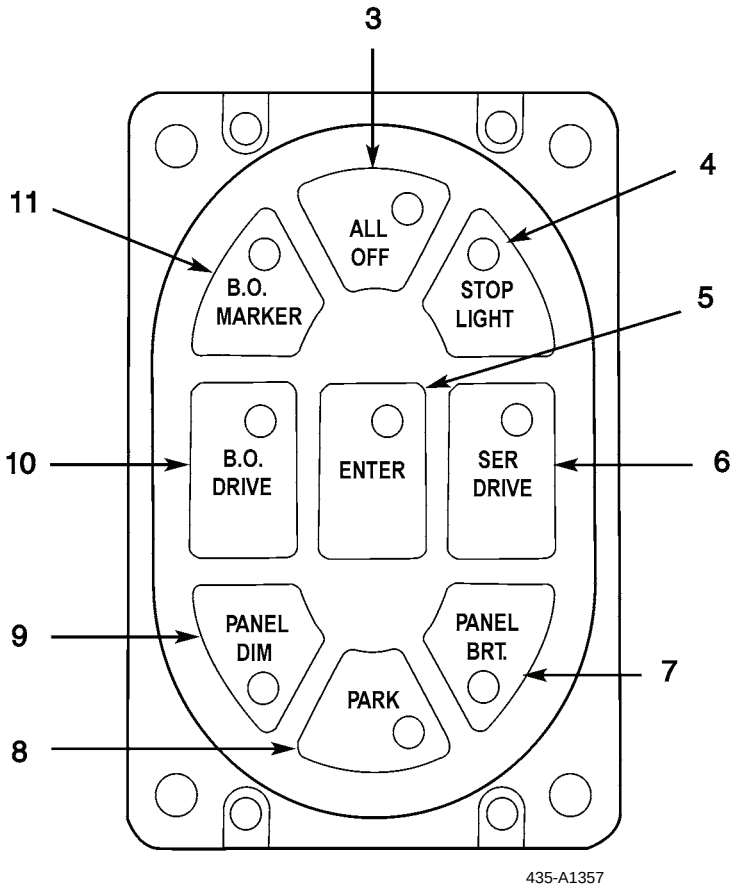


Figure 31. Military Light Switch Assembly

MILITARY LIGHT SWITCH ASSEMBLY - DIGITAL – CONTINUED

Mode Selection (Primary)

1. Press the desired mode/function key. The selected mode/function key and the enter key LED indicators will flash.
2. Press the ENTER key.

NOTE

If the ENTER key is not pressed within 5 seconds of the required mode key being pressed, the switch will automatically reset to the previous mode. This prevents accidental switching.

3. The desired function will be selected. Confirmation of this is by way of the “blue” function active LED, which will be lit and emitting a steady light.

NOTE

If no blue function active LED is illuminated, then no external vehicle lights are turned on. The amber backlight is for keypad illumination only.

Mode Selection (Secondary)

1. Press the desired mode/function key. If a primary mode has already been selected, and the desired selection is NOT the currently selected secondary mode, the desired function will be operated and the blue indicator LED will be lit and emitting a steady light.
2. To change the secondary function, press the mode/function key for a different secondary mode to the one which is currently selected. The desired function will be selected. Confirmation of this is by way of the blue function active LED, which will be lit and emitting a steady light. (For example, with the panel light on bright and the indicator light for “PANEL BRT” illuminated, to select panel light dim, press the “PANEL DIM” mode/function key. The panel lights will dim and the “PANEL DIM” blue indicator light will illuminate.)

Turn Off Mode Selection (Secondary)

1. To turn OFF the panel lights, reselect the present secondary mode (as indicated by the function active LED).
2. The function active LED will extinguish, and the panel lights will go out.

Turn OFF the Switch

1. Press the ALL OFF key.
2. Press the ENTER key. The switch will turn off after 20 seconds.

MILITARY LIGHT SWITCH ASSEMBLY - DIGITAL – CONTINUED

The following lights will be activated in the corresponding modes:

MODE	LIGHT ACTIVATION AVAILABLE	
	Primary (External lighting)	**Secondary (Panel lighting)**
B.O. Drive	B.O. Driving light B.O. Marker light B.O. Turn Indicator L & R B.O. Tail light B.O. Stop light	Panel lights can be either On Bright, Dim, or Off. (Amber backlighting and “blue” indicator LED’s at reduced illumination.)
B.O. Marker	B.O. Marker light B.O. Turn Indicator L & R B.O. Tail light B.O. Stop light	Panel lights can be either On Bright, Dim, or Off. (Amber backlighting and “blue” indicator LED’s at reduced illumination.)
All Off	All lights OFF	Panel lights off
Stop Light	Service Stop Light Service Turn Indicators	Panel lights can be either On Bright, Dim, or Off.
	NOTE To switch between high and low beam head lights, use the multi-purpose column switch (WP 0004).	
Service Drive	Service Stop Light Service Tail Light Service Turn Indicators Service Head Lights	Panel lights can be either On Bright, Dim, or Off.
Park	Service Stop Light Service Tail Light Service Turn Indicators Parking Light	Panel lights can be either On Bright, Dim, or Off.

END OF TASK

EMS INSTRUMENT CLUSTER

The EMS instrument panel is located in the side console to the right of the operator and can be viewed from the operator's seat in the loader or excavator positions. Repeater warning lamps are provided in a front console warning light panel. It provides the operator interface with the machine's systems. The LCD incorporates 20-segment bar graphs for Fuel, Engine Oil Pressure, Coolant, Transmission Oil, and Hydraulic Oil temperature. A gear indication icon and rpm text are normally displayed. A 14-character, 14-segment alphanumeric display is used to display operating messages and warnings. This can be switched to display other functions or more details of events by means of user selectable menus. Twenty-eight tell-tale indicators are included below the LCD. These will appear as Red, Orange, or Green dependant on their function.

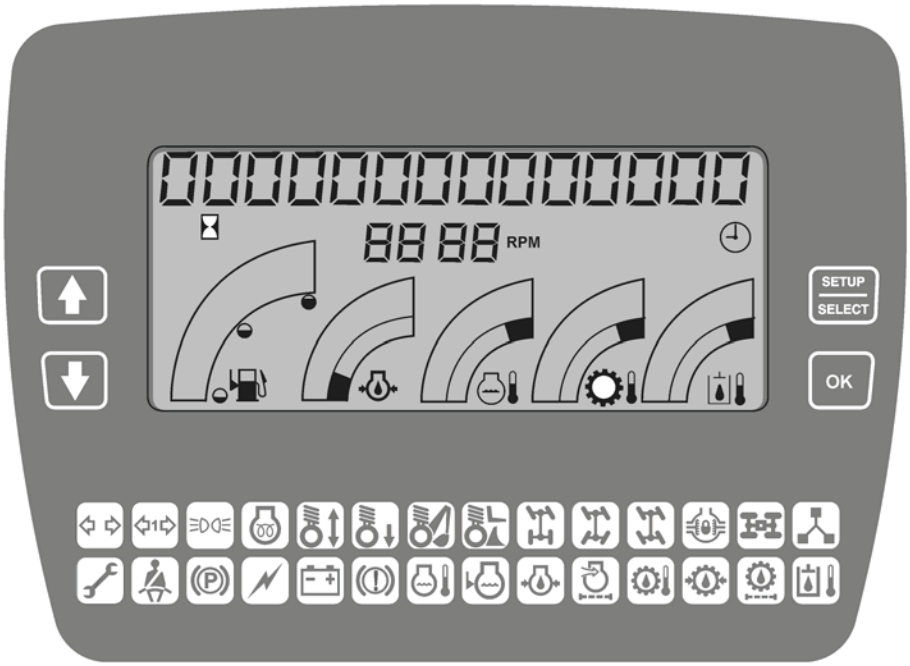


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Figure 32. EMS Instrument Cluster

EMS INSTRUMENT CLUSTER – CONTINUED

Engine RPM and Hours

The engine hours are displayed only on ignition start-up. Once the engine has been cranked and the engine has been running for 5 seconds, the engine hours are extinguished and the real-time rpm are displayed. The display for the engine hours is a 4-digit number (Figure 33, Item 3). When the engine hours are being displayed, the 5-digit number (the fifth digit is tenths) is followed by the text “Hours.” When the real-time rpm are being displayed, the 4-digit number will be followed by the text “RPM.”

The timer symbol (Figure 33, Item 2) will flash intermittently. This is just a means of showing that the engine hours are being recorded.

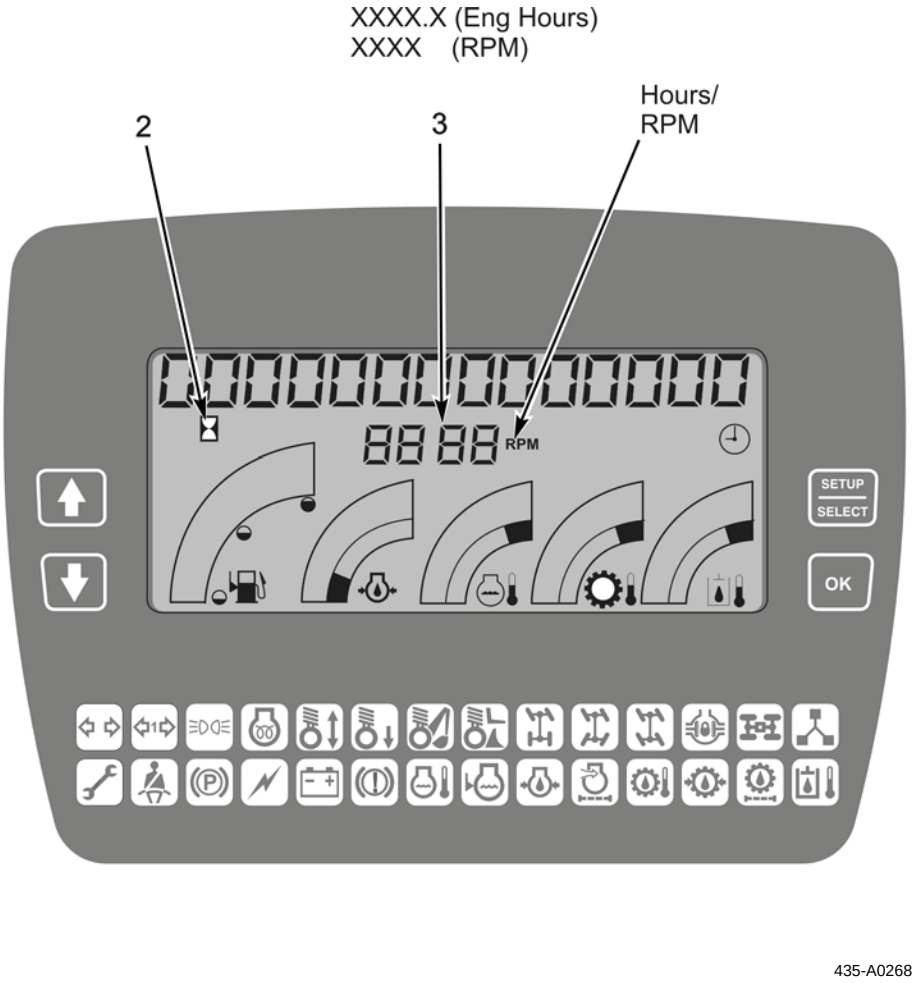


Figure 33. Engine RPM and Hours

EMS INSTRUMENT CLUSTER – CONTINUED

Machine Gear Selection Display

The gears are selected using the column-mounted gear selection switch. The gear selection is displayed in the top left-hand corner of the display unit (Figure 34, Item 4). Once the engine is running, the displayed Engine Hours figures are extinguished, and the gear selection information is displayed in its place.

NOTE

The “X” in the above formats denotes the number of the selected gear. Reverse automatic selection will only select 1st or 2nd gear as appropriate.

Table 1. Display Format.

MODE	LIGHT ACTIVATION AVAILABLE
N	Neutral
FX	Forward
RX	Reverse
FX AUTO	Forward Automatically Selected 2nd to 6th gears
RX AUTO	Reverse Automatically Selected 1st and 2nd gears

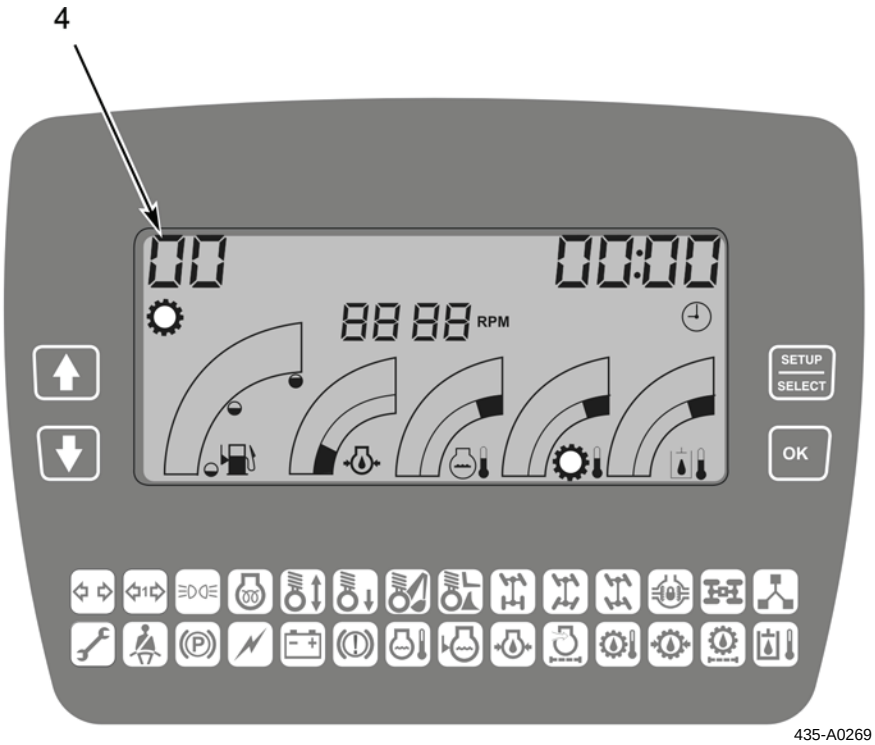


Figure 34. Machine Gear Selection Display

EMS INSTRUMENT CLUSTER – CONTINUED

Side Lights

The machine is equipped with normal road lighting. The parking/marker lights are switched ON by turning on the military light switch. When the lamps are turned ON, a warning light (Figure 35, Item 6) is illuminated. If the ignition is turned OFF while the side lights are still turned ON, the warning light (Figure 35, Item 6) will stay illuminated and a warning buzzer will sound. The warning buzzer and the warning light (Figure 35, Item 6) will be turned OFF once the parking/marker lights are turned OFF. The buzzer can be canceled by pressing the OK button (Figure 35, Item 5).

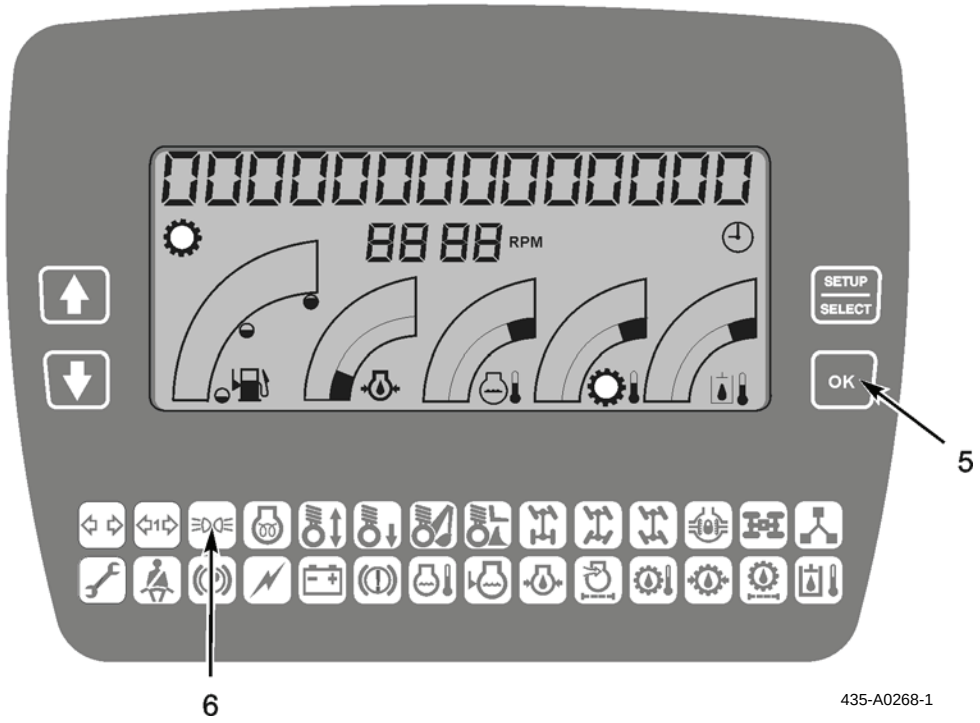


Figure 35. Side Lights

EMS INSTRUMENT CLUSTER – CONTINUED

Indicators and 4-Way Flashers

The machine is fitted with directional indicator lighting for road use. These indicators are switched by means of the right-hand column switch. The switch, once activated, is canceled by the steering action. A warning light (Figure 36, Item 7) for the left- and right-hand indicators and a buzzer is included in the EMS. The EMS will illuminate the direction indicator warning light (Figure 36, Item 7) in synchronization with the flashing machine lamp. The direction indicators will not operate until the ignition switch is turned ON. The appropriate turn signal indicator on the front console warning panel will also be illuminated in synchronization with the flashing machine lamp.

The 4-way flashers are switched on by operating the 4-way flashers switch on the front console. When the switch is activated, a warning light on the front console warning light panel will flash in synchronization with the flashing machine lamps and a buzzer will sound. The 4-way flashers will operate with the ignition switched ON or OFF.

The 4-way flashers are not available in blackout mode.

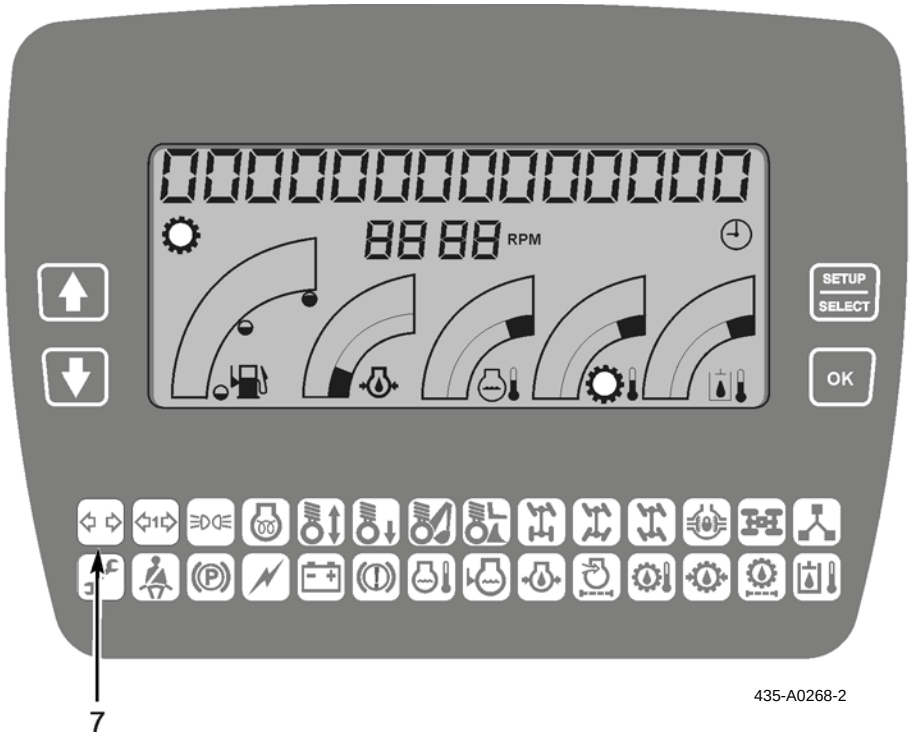


Figure 36. Indicators and 4-Way Flashers

EMS INSTRUMENT CLUSTER – CONTINUED

Seat Belt Warning

The operator and passenger seats are each fitted with two electrical sensors. One sensor detects the weight of a person (or object) on the seat; the second senses when the seat belt is fastened. When the engine is running and the seat belt(s) is/are NOT fastened correctly, the EMS will scroll the following messages; (a) for driver only, “BELT DRIVER, (b) passenger only “BELTS PASSENGER,” (c) if both driver’s and passenger’s belts are not fastened, “FASTEN BELTS.” The warning buzzer and the warning light (Figure 37, Item 8) will be activated. The buzzer can be canceled by pressing the OK button (Figure 37, Item 5). If the condition repeats, i.e., seat belt ON or seat belt OFF, then the buzzer will sound again.

NOTE

The seat “person present” sensor will operate if any item heavy enough to be detected by the switch is placed on either seat. To extinguish the warning, either remove the object from the seat or fasten the belt around it.

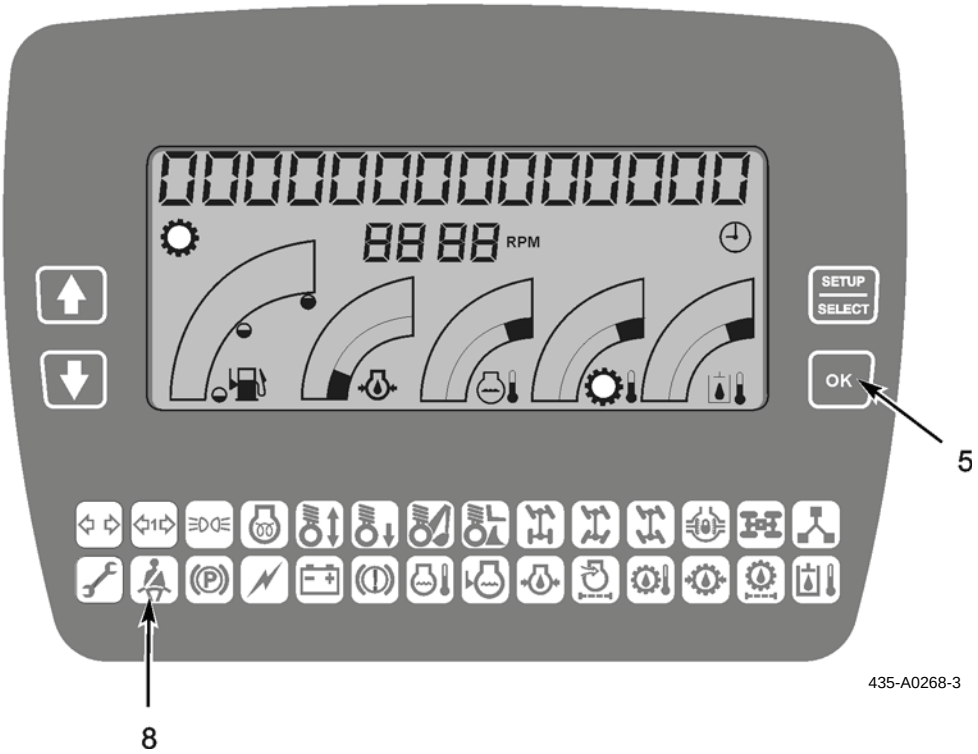


Figure 37. Seat Belt Warning

EMS INSTRUMENT CLUSTER – CONTINUED

Steering Modes

A separate ECU controls the steering. The front axle steering is controlled mechanically and its position is monitored by the ECU. The machine has three steer modes: 2WS (2-wheel steer), in which the rear axle is locked and the machine steers by the front wheels only; 4WS (4-wheel steer), in which the rear axle steers in the opposite direction and at the same rate as the front axle; and crab steer, in which the rear axle steers in the same direction and rate as the front axle.

The EMS displays information obtained from the steering sensors and displays this to the operator by means of the warning lights (Figure 38, Items 9, 10, and 11) and the LCD will display the message “SPEED RESTRICT” when a steering mode other than 2WS is selected.

NOTE

At startup, the ECU will indicate to the operator that a mode change to 2WS will occur, provided the last mode was a 4WS mode. If a 4WS mode is required, it must be positively selected.

Warning Lights

9	Crab Steer
10	4WS (4-Wheel Steer)
11	2WS (2-Wheel Steer)

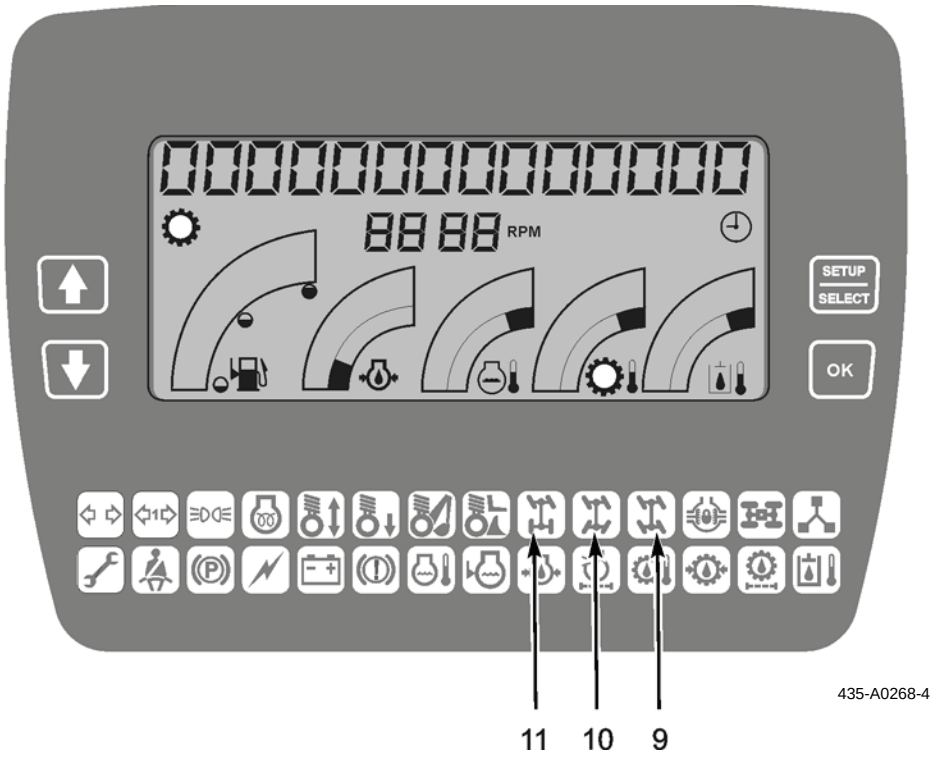


Figure 38. Steering Modes

EMS INSTRUMENT CLUSTER – CONTINUED

Suspension Modes

The EMS displays the machine suspension modes. The machine suspension system has four modes: Normal travel, Loader/Forklift operation, Excavating operations, and Transport/Workshop/Limp-Home. The EMS receives information from the ECU and displays this information to the operator by means of warning lights (Figure 39, Items 12, 13, 14, and 15). The LCD will display a message “SPEED RESTRICT” for a period of 3 seconds when any mode other than “Normal Travel” is selected. When the Loader/Forklift mode is active, the EMS causes a warning light on the front console warning light panel to illuminate. This light will only illuminate once the lockout of the system is fully activated.

Warning Lights

12	Loader/Forklift
13	Excavating
14	Transportation/Workshop/Limp-Home
15	Normal Travel

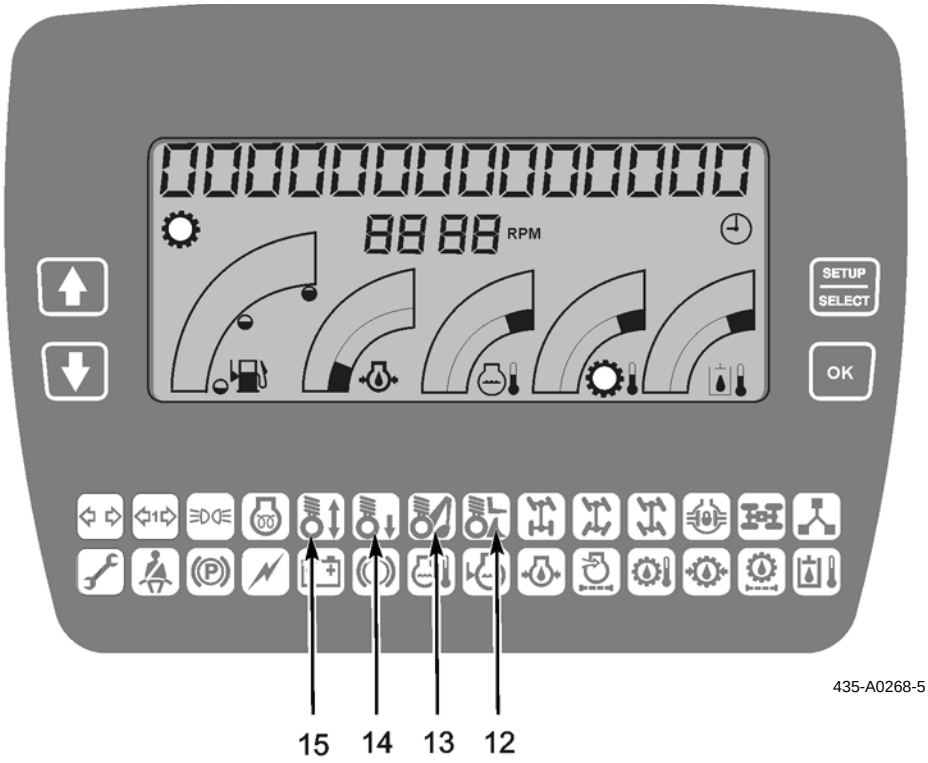


Figure 39. Suspension Modes

EMS INSTRUMENT CLUSTER – CONTINUED

Parking Brake

When the parking brake is applied, a warning light (Figure 40, Item 16) is illuminated. The EMS will also activate the warning lamp on the front console warning light panel. The EMS will also monitor the gear selection. This will activate the warning buzzer if any forward or reverse gears are selected while the parking brake is applied.

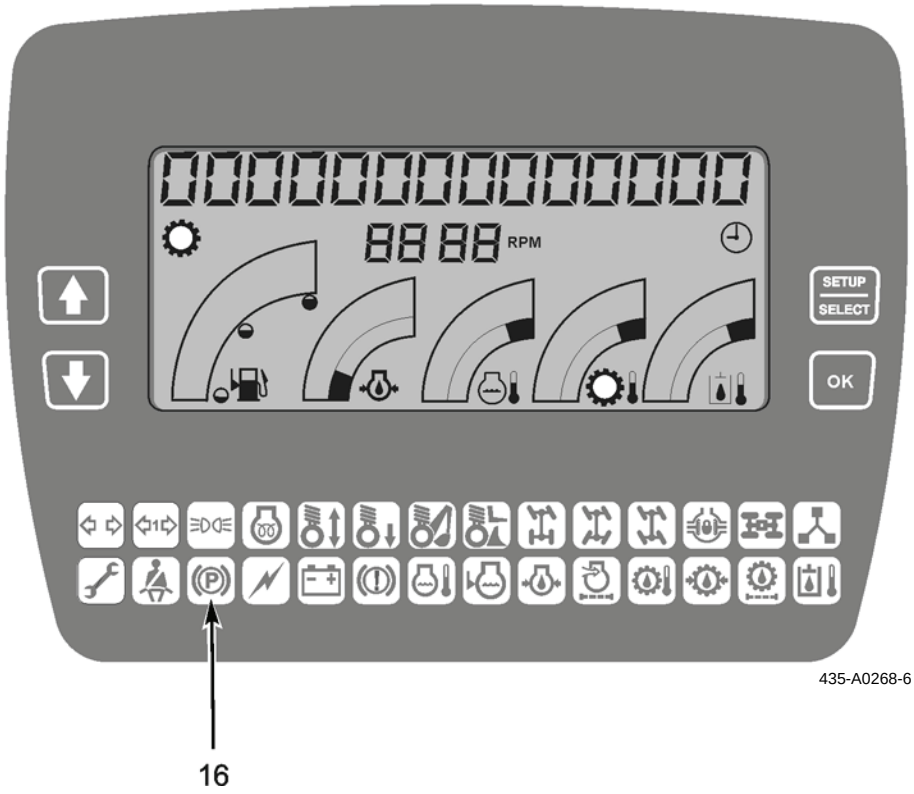


Figure 40. Parking Brake

Low Brake Pressure/Failure Warning

The machine is fitted with an air brake system. When the ignition is ON and low pressure in the air brake system is detected by one of the low pressure switches, the EMS will illuminate the warning lamp (Figure 41, Item 17), sound the internal and external buzzers, display the message “BRAKE PRESSURE” on the LCD, and activate the “STOP” warning light in the front console warning panel. Note: The “STOP” warning light will only activate if the pressure drops while the machine is traveling; it will not illuminate if building up the pressure from startup.

EMS INSTRUMENT CLUSTER – CONTINUED

Brake Pad Wear

The machine is fitted with a disc brake system operating disc pads on all four wheels. Embedded into each pair of pads are contacts. The contacts are connected electronically to the EMS. When the pads wear to a pre-set minimum level, the contacts are exposed. When the machine ignition is ON and the foot brakes are applied, the contacts in the pads are shorted together by the brake discs and complete the electrical circuit. When the EMS senses this condition in one or more pad contacts, the EMS illuminates the warning light (Figure 41, Item 17), sounds the internal buzzer, and displays the message “BRAKE PADS” on the LCD. The message will be displayed for a period of five seconds, after which it will extinguish until the circuit is activated again by applying the brakes. The buzzers can be canceled by pressing the OK button (Figure 41, Item 5). As soon as the brake pad wear light and message are displayed, contact Unit Maintenance.

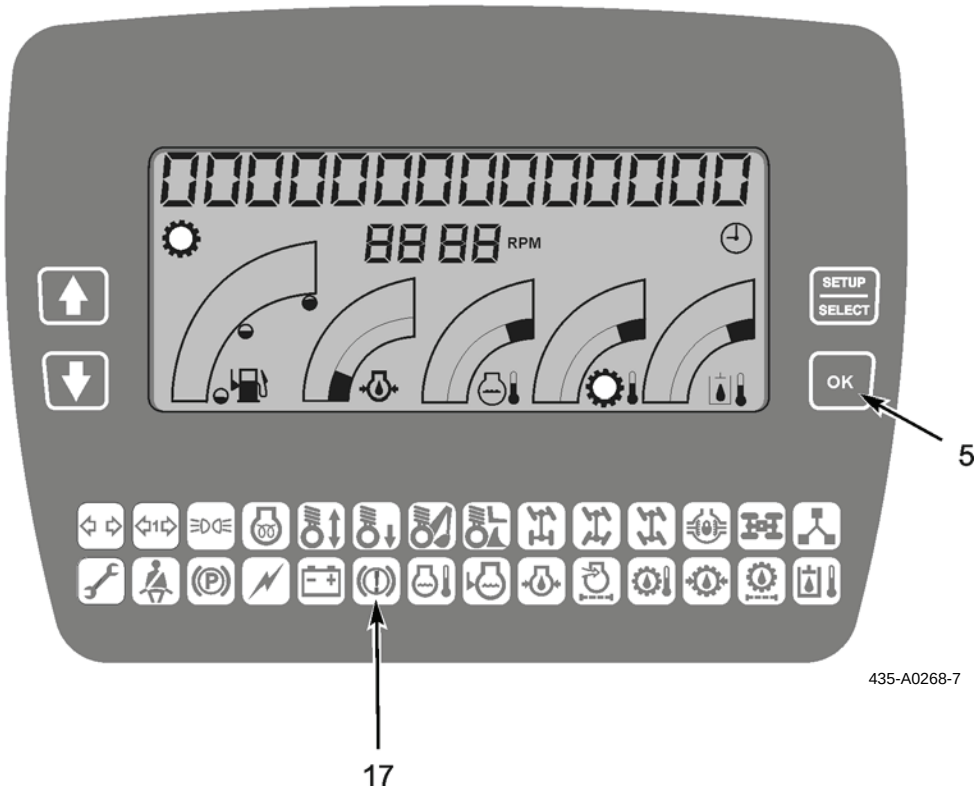


Figure 41. Brake Pad Wear

Low Brake Fluid Level

The machine’s braking system fluid reservoirs are fitted with electrical float switches. When the fluid level in one or more of the reservoirs falls below a pre-determined level, the EMS unit is activated. The EMS will illuminate the warning light (Figure 41, Item 17) on the EMS panel, sound the internal and external buzzers, and display the message “BRAKE FLUID LO” on the LCD. The buzzers can be extinguished by pressing the OK button (Figure 41, Item 5).

EMS INSTRUMENT CLUSTER – CONTINUED

4-Wheel-Drive Function

In order to control traction on the machine, 4WD is available. When the ignition is ON and the engine is running the function can be enabled. The system is turned ON/OFF by a switch on the front console. When the switch is turned ON and the 4WD is engaged, the warning light (Figure 42, Item 18) on the EMS will be illuminated. Simultaneously, a warning light on the front console warning panel will be illuminated. When each change of mode is made, the EMS will display a message for a period of three seconds. When the 4WD feature is activated, the message “4 WHEEL DRIVE” will be displayed; when the function is deactivated, the message “2 WHEEL DRIVE” will be displayed.

4WD cannot be switched on if the machine’s road speed is greater than 3 mph (5 kph).

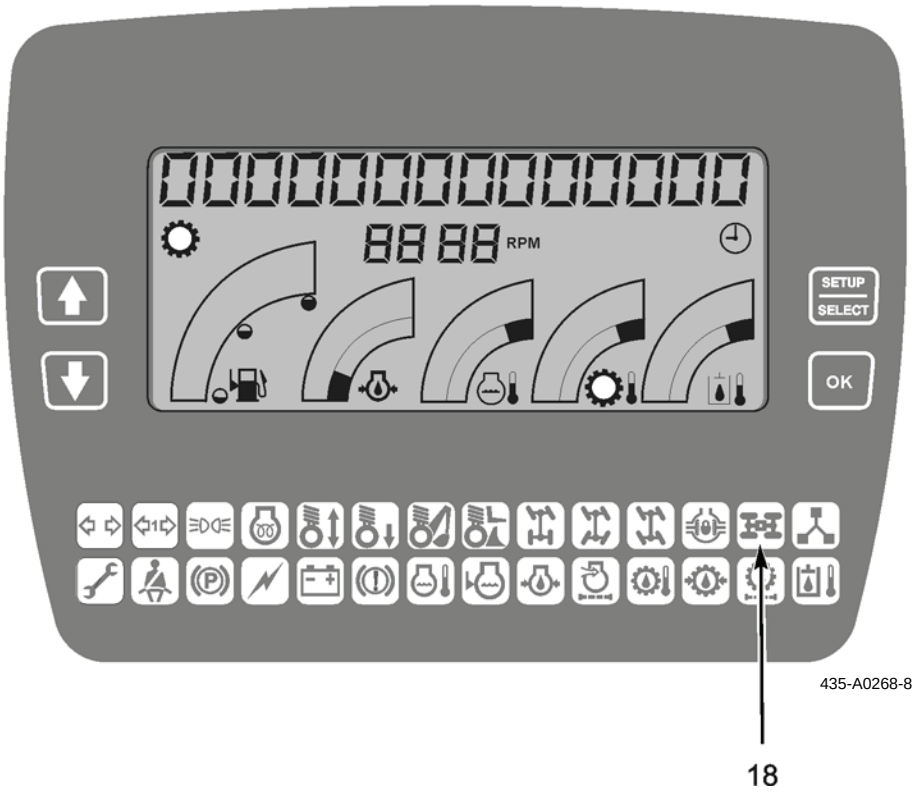


Figure 42. 4-Wheel-Drive Function

EMS INSTRUMENT CLUSTER – CONTINUED

Alternator No Charge Warning

The EMS monitors the voltage from the alternator. If the engine is running and the output voltage from the alternator falls below a pre-determined limit, the EMS will illuminate the warning lamp (Figure 43, Item 19). Simultaneously, the amber service light on the front console warning panel will illuminate.

The system voltage is also displayed on a voltmeter located on the front dash panel. Normal system voltage with the engine running will be between 24 and 28V.

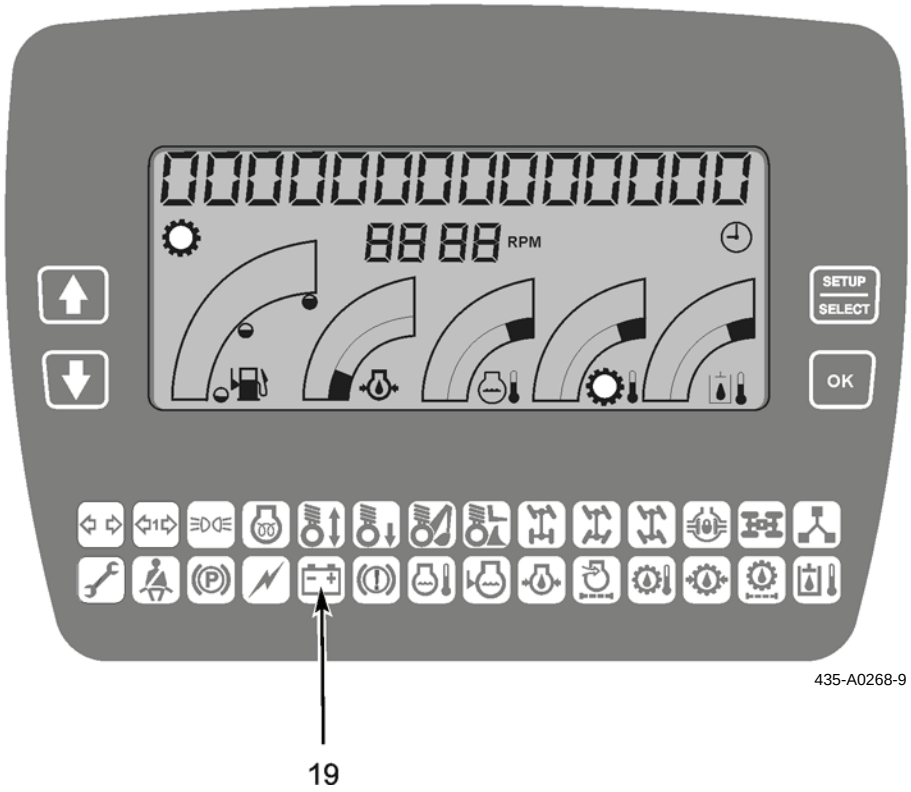


Figure 43. Alternator No Charge Warning

EMS INSTRUMENT CLUSTER – CONTINUED

CAN-BUS Error

The CAN-BUS is used to exchange data between the ECUs.

If there is any communication breakdown from any of the ECUs, the EMS will illuminate the CAN-BUS error warning light (Figure 44, Item 20). The warning light will not extinguish until communications have been properly established and are working correctly.

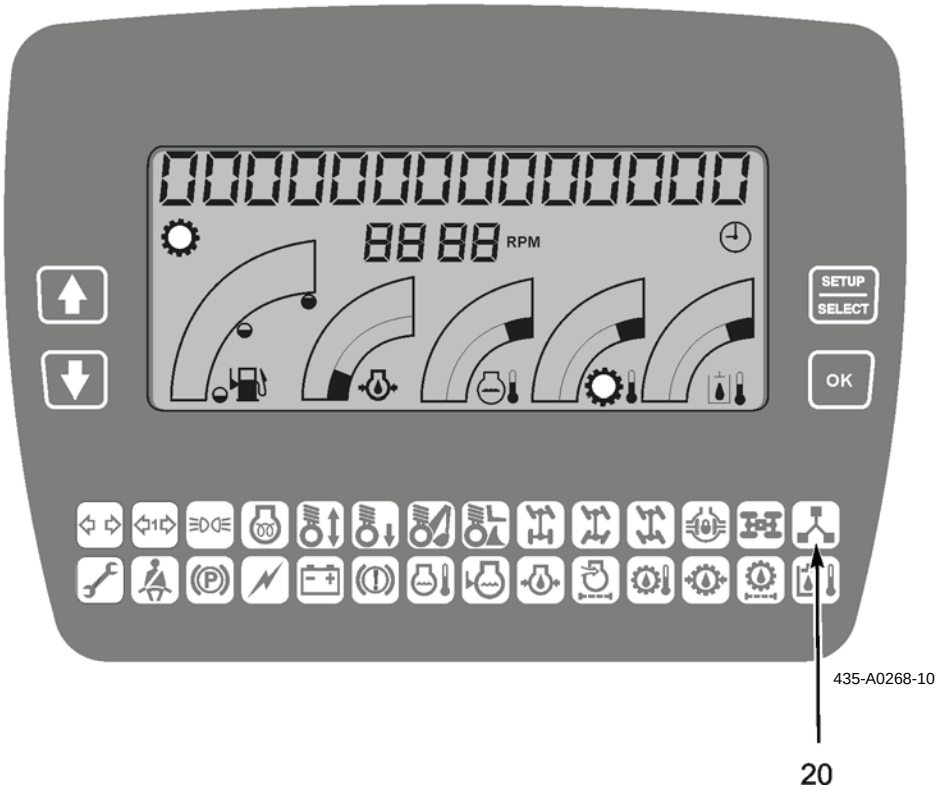


Figure 44. CAN-BUS Error

EMS INSTRUMENT CLUSTER – CONTINUED

Engine Oil Pressure

A pressure sensor is fitted to the engine to monitor engine oil pressure. When the ignition is ON and the engine is NOT running, there is no oil pressure and the operator is informed of this by a warning lamp (Figure 45, Item 22) on the EMS.

The pressure is further monitored by a 20-segment bar graph gauge (Figure 45, Item 21). This gauge measures and displays the "real-time" pressure when the engine is running.

When the ignition is ON and the engine is running, if the engine oil pressure fall below a pre-determined level the EMS will illuminate the warning lamp (Figure 45, Item 22), sound the internal and external buzzers, display the message "ENGINE OIL" on the LCD, activate a warning light on the front console warning light panel, and the segments of the bar graph gauge (Figure 45, Item 21) will flash.

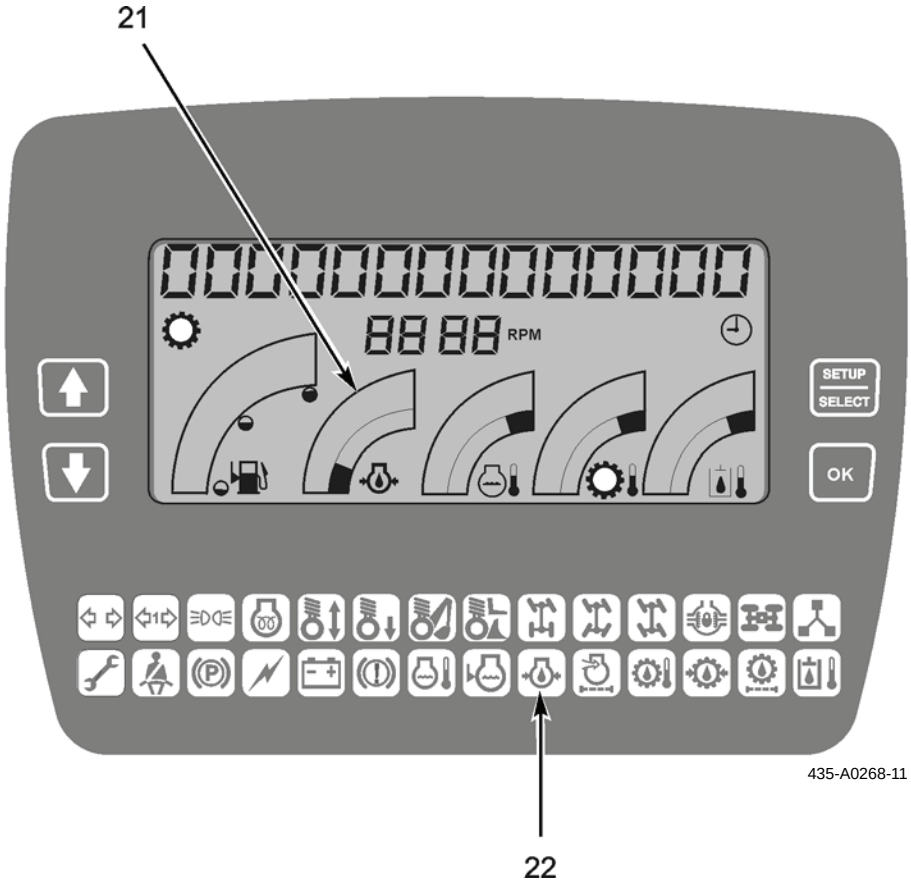


Figure 45. Engine Oil Pressure

EMS INSTRUMENT CLUSTER – CONTINUED

Engine Coolant Temperature Sensor/Warning

A sensor is fitted to the engine to measure the temperature of the engine coolant. The temperature is displayed by means of a 20-segment bar graph (Figure 46, Item 23). The segments of the bar graph are color coded. Segments 1 to 16 will appear green, segments 17 to 20 will appear red.

When the coolant temperature reaches 208°F (98°C), the warning light (Figure 46, Item 24) on the EMS will illuminate. (Red segment 17 of the bar graph will also be illuminated.)

If the temperature continues to rise at 214°F (101°C), not only will the warning light (Figure 46, Item 24) be illuminated, but the internal buzzer will sound, the message “ENGINE TEMP” will be displayed by the LCD, and a warning light on the front console warning light panel will be illuminated. The internal buzzer can be canceled by pressing the OK button (Figure 46, Item 5).

If the temperature is allowed to rise any higher, at 221°F (105°C), along with warning light (Figure 46, Item 24), the internal and external buzzers will sound, the LCD message and the front console warning light will be activated, plus all the segments on the bar graph will flash. Once this condition is reached, the buzzers can no longer be canceled by pressing the OK button (Figure 46, Item 5).

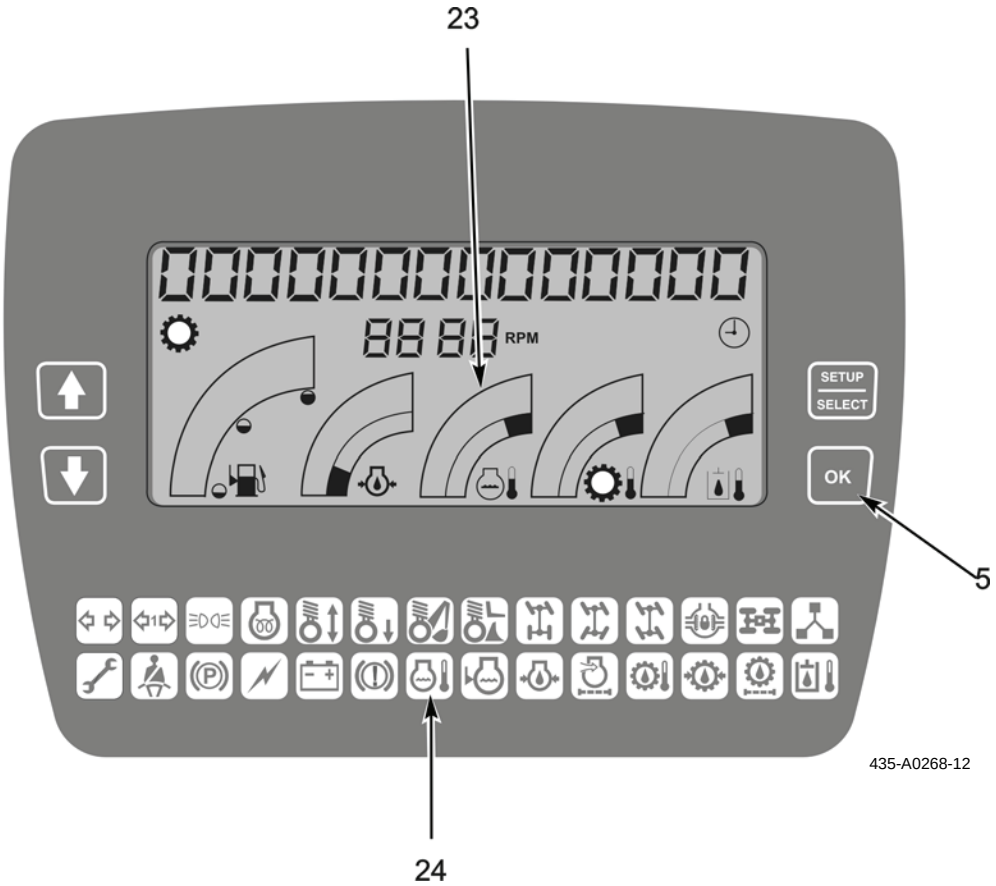


Figure 46. Engine Coolant Temperature Sensor/Warning

EMS INSTRUMENT CLUSTER – CONTINUED

Engine Pre-Heat (Wait to Start)

There are certain conditions imposed on the start circuit for reasons of safety. The machine must meet these conditions before the engine can be started:

1. The air intake heaters (grid heaters) must have completed their initial cycle and the Wait-to-Start lamp (Figure 47, Item 25) is deactivated.
2. The engine must not already be running.
3. The gear selection column switch must be in Neutral.
4. The ignition switch must be turned to position 3 (to enable the starter motor to be energized).

Before the engine is cranked, the air intake heaters (grid heaters) are activated. This happens regardless of temperature. In certain conditions the air intake heaters can remain active or be reactivated by the engine ECU while the engine is running.

When the ignition is turned ON, the warning light (Figure 47, Item 25) will be illuminated, the internal buzzer will sound, and the LCD will display the message “WAIT TO START.” Once the air intake heaters (grid heaters) have completed their cycle, the warning light (Figure 47, Item 25) will be extinguished and the LCD message will change to “OK TO START” (for 3 seconds or until the engine is running). This will inform the driver that the pre-heating has finished and the engine can be started.

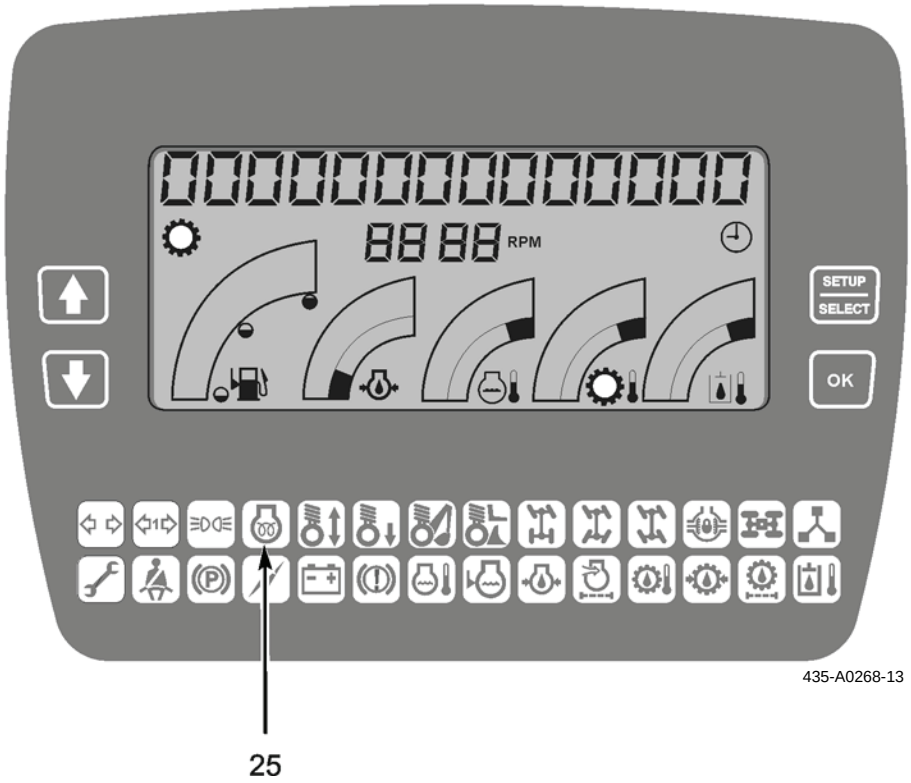


Figure 47. Engine Pre-Heat (Wait to Start)

EMS INSTRUMENT CLUSTER – CONTINUED

Engine Maintenance

CAUTION

If any error messages are displayed, note the 3-digit error code and report the occurrence to Unit Maintenance. Failure to follow this caution may result in damage to equipment.

When a service is required, the warning lamp (Figure 48, Item 26) will be illuminated and the LCD will display the message "SERVICE." When the service message is activated, the service warning light on the front console warning light panel will also be illuminated.

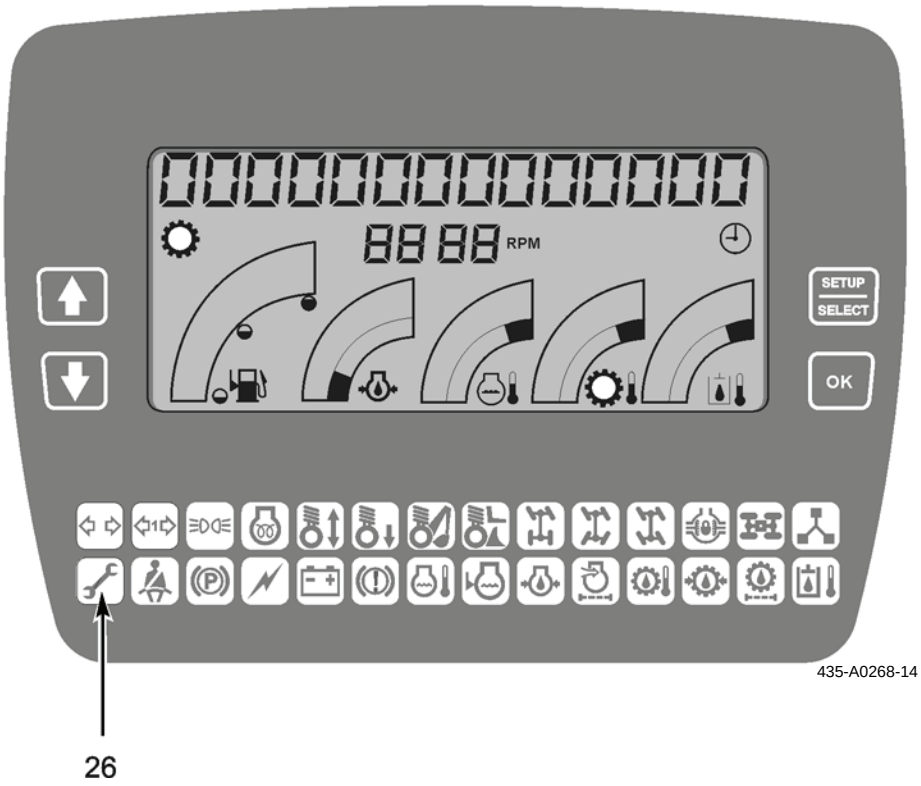


Figure 48. Engine Maintenance

EMS INSTRUMENT CLUSTER – CONTINUED

Engine Air Filter Warning

A pressure switch is fitted to the air intake of the engine air filter. When the filter is blocked, the pressure decreases and the warning lamp (Figure 49, Item 27) will be illuminated, the EMS internal buzzer will sound, and the LCD will display the message “AIR FILTER.” The buzzer can be canceled by pressing the OK button (Figure 49, Item 5) on the EMS. As soon as the message is displayed, contact Unit Maintenance.

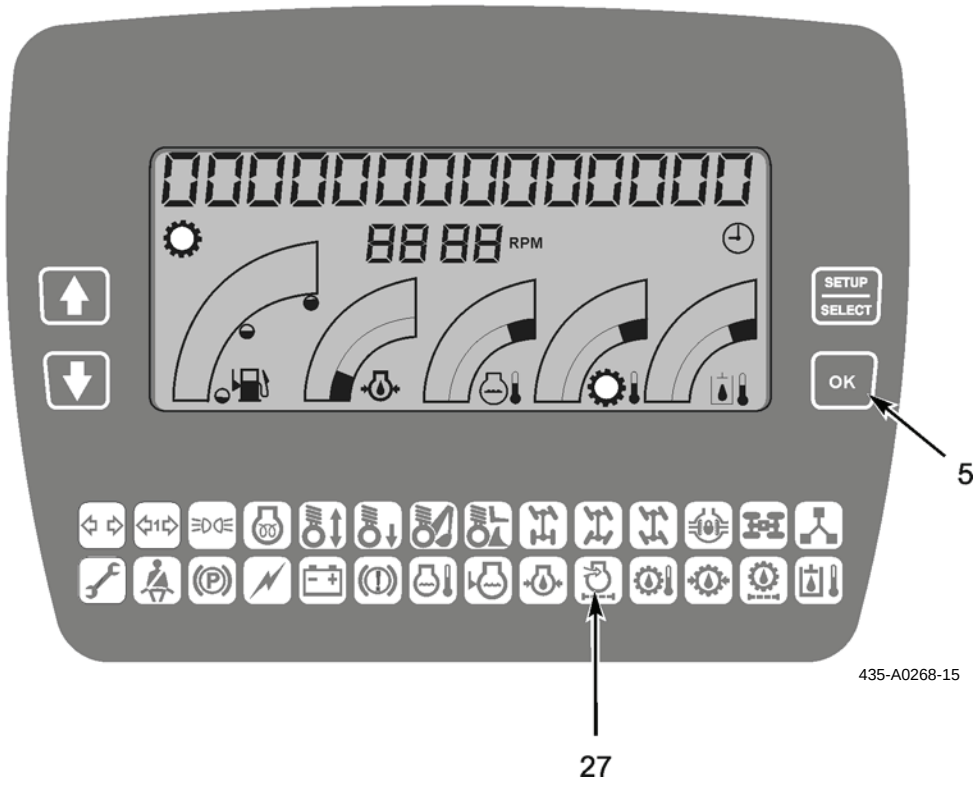


Figure 49. Engine Air Filter Warning

EMS INSTRUMENT CLUSTER – CONTINUED

Fuel Level Sensor/Warning

NOTE

The terms “reserve fuel” and “low fuel” refer to a level of fuel in the main fuel tank. The machine is not equipped with an additional fuel supply.

A sensor is fitted to the fuel tank to measure the level of fuel in the tank. The fuel level is displayed to the driver/operator by means of a 20-segment bar graph (Figure 50, Item 28). Text warnings are also displayed on the LCD for both “Reserve Fuel” and “Low Fuel” conditions.

1. When the Reserve Fuel condition is detected:
   a. When three segments of the bar graph are illuminated, the LCD will display the message “RESERVE FUEL.”
   b. When two segments of the bar graph are illuminated, the internal buzzer will be activated and the LCD will display the message “RESERVE FUEL.”

The internal buzzer can be canceled by pressing the OK button (Figure 50, Item 5) on the EMS.

2. When the “Low Fuel” condition is detected, there will only be one segment showing on the bar graph. The internal buzzer will be activated and the bar graph will flash. The LCD will display the warning “LOW FUEL.”

The internal buzzer can be canceled by pressing the OK button (Figure 50, Item 5) on the EMS.

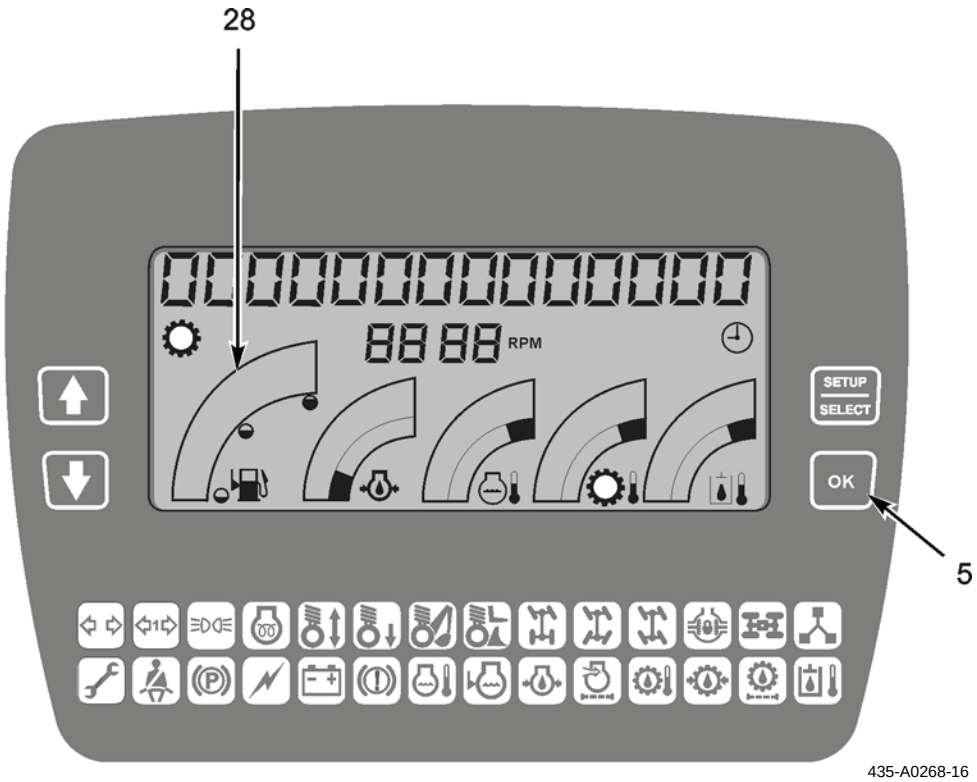


Figure 50. Fuel Level Sensor/Warning

EMS INSTRUMENT CLUSTER – CONTINUED

Transmission (Gear Box) Filter Blocked

The machine is fitted with a separate transmission oil filter. If the filter becomes blocked, the warning light (Figure 51, Item 29) will be illuminated, the internal and external buzzers will sound, and the message “TRANS FILTER” will be displayed on the LCD. The buzzer can be canceled by pressing the OK button (Figure 51, Item 5) on the EMS.

The warning light, buzzers, and message will be extinguished once the condition has been corrected.

CAUTION

If the transmission filter warning light and message are displayed, report the occurrence to Unit Maintenance as soon as the tactical situation allows. Continuing to use the machine could result in damage to equipment.

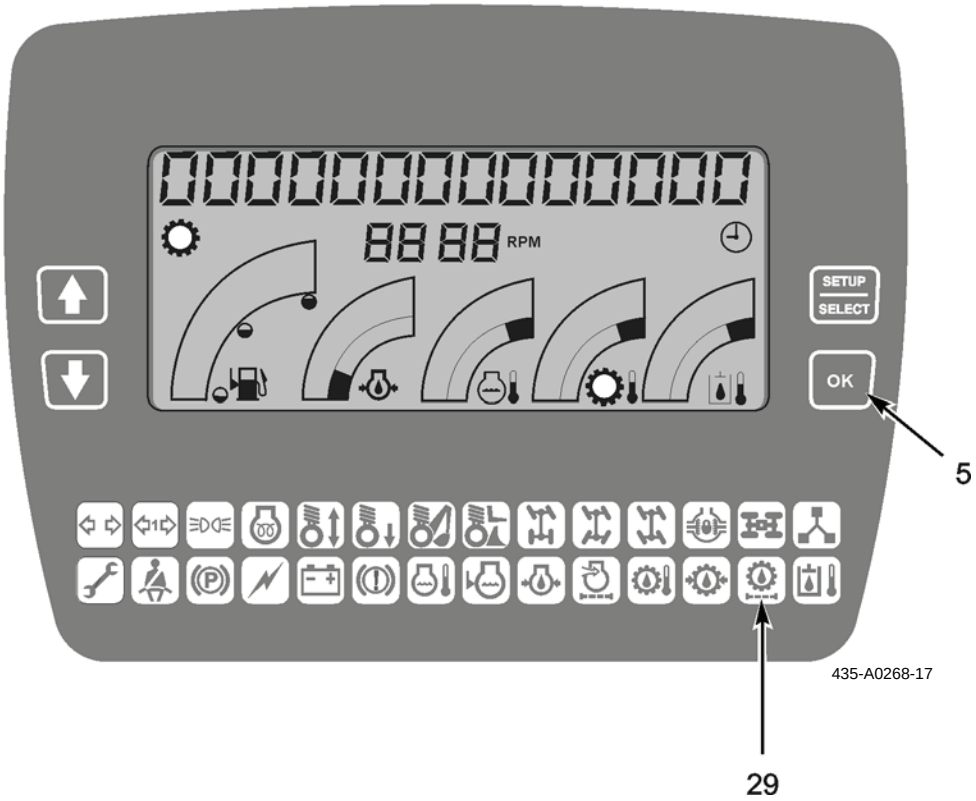


Figure 51. Transmission (Gear Box) Filter Blocked

Transmission Oil Temperature Sensor/Warning

A sensor is fitted to the transmission to measure the temperature of the transmission oil. The temperature is displayed to the operator by means of a 20-segment bar graph (Figure 52, Item 30). The segments of the bar graph are color coded. Segments 1 to 16 will appear green, segments 17 to 20 will appear red.

High Temperature Reading

When the transmission oil temperature reaches 248°F (120°C), the warning light (Figure 52, Item 31) on the EMS will illuminate. (Red segment 17 of the bar graph will also be illuminated.)

If the oil temperature continues to rise, at 250°F (121°C), not only will the warning light (Figure 52, Item 31) be illuminated, but the internal buzzer will sound and the message “TRANS TEMP +” will be displayed by the LCD.

EMS INSTRUMENT CLUSTER – CONTINUED

High Temperature Reading - Continued

If the temperature is allowed to rise any higher, at 255°F (124°C), along with the above indications, the external buzzer will sound and a warning light on the front console warning light panel will illuminate. The buzzers can be canceled by pressing the OK button (Figure 52, Item 5) on the EMS.

If the temperature reaches 260°F (127°C), along with the above indications, the bar graph will flash. Once this condition is reached, the buzzers can no longer be canceled by pressing the OK button (Figure 52, Item 5). When the oil temperature drops below 248°F (120°C), the warning light (Figure 52, Item 31) will be automatically extinguished.

Low Temperature Reading

When the gearbox oil temperature falls below 158°F (70°C), the EMS will illuminate the warning light (Figure 52, Item 31) and the gearbox is inhibited. If the temperature continues to fall below 158°F (70°C), the first green segment of the bar graph will start to flash and the message “TRANS COLD” will be displayed.

The audible warning and message can be canceled by pressing the OK button (Figure 52, Item 5) on the EMS.

When the transmission oil temperature rises above 176°F (80°C), the warning light (Figure 52, Item 31) will automatically be extinguished.

Cold Start-Up

When starting from cold in cold ambient temperatures and with the transmission oil temperature below 158°F (70°C), the EMS will display the message “TRANS COLD.”

The message will be displayed until the oil temperature reaches 158°F (70°C), at which point it will be extinguished. The display can be extinguished at anytime by pressing the OK button (Figure 52, Item 5) on the EMS.

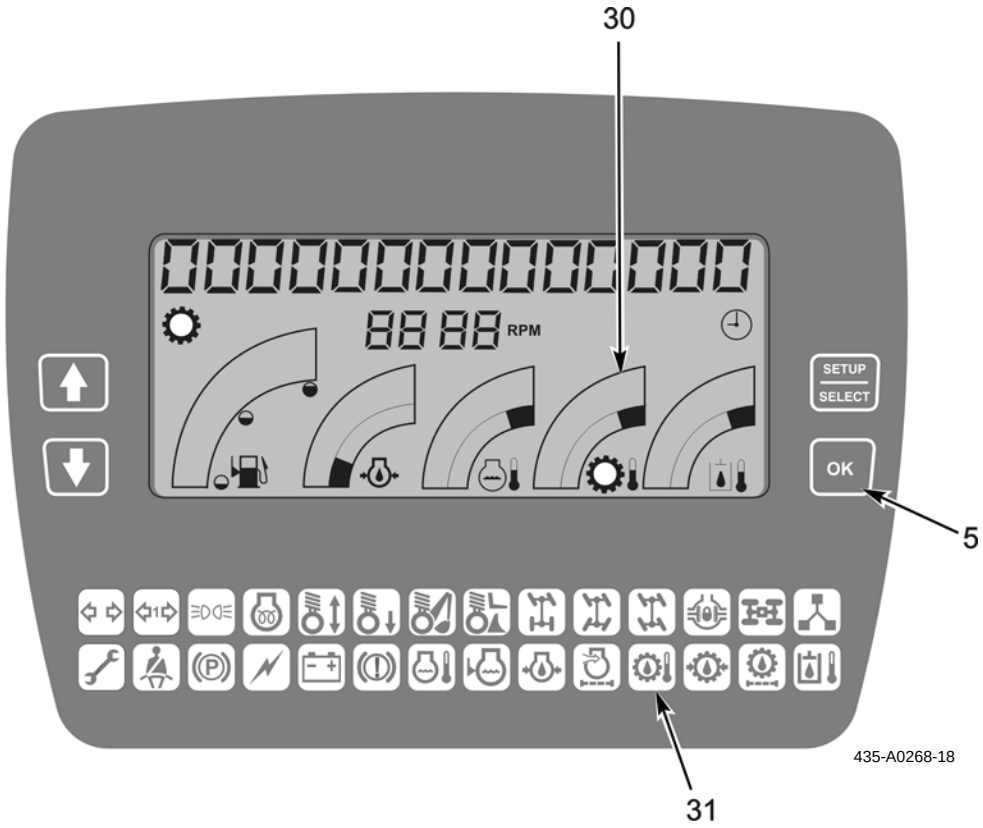


Figure 52. Transmission Oil Temperature Sensor/Warning

EMS INSTRUMENT CLUSTER – CONTINUED

Hydraulic Oil Temperature Sensor/Warning

A sensor is fitted to the hydraulic oil circuit to measure the temperature of the oil. The temperature is displayed to the operator by means of a 20-segment bar graph (Figure 53, Item 32). The segments of the bar graph are color coded. Segments 1 to 16 will appear green, segments 17 to 20 will appear red.

When the hydraulic oil temperature reaches 217°F (102.5°C), the warning light (Figure 53, Item 33) on the EMS will illuminate. (Red segment 17 of the bar graph will be illuminated.

If the oil temperature continues to rise, at 221°F (105°C), not only will the warning light (Figure 53, Item 33) be illuminated, but the internal buzzer will sound and the message “HYD OIL TEMP” will be displayed by the LCD.

If the temperature is allowed to rise any higher, at 225°F (107°C), along with the warning light (Figure 53, Item 33), the internal buzzer, and the LCD message, the external buzzer and a warning light on the front console warning light panel will be illuminated. The buzzers can be canceled by pressing the OK button (Figure 53, Item 5) on the EMS.

If the temperature reaches 230°F (110°C), along with the above indications, the bar graph will flash. Once this condition is reached, the buzzers can no longer be canceled by pressing the OK button (Figure 53, Item 5).

When the oil temperature falls below 212°F (100°C), the warning light (Figure 53, Item 33) and the buzzers will automatically be extinguished.

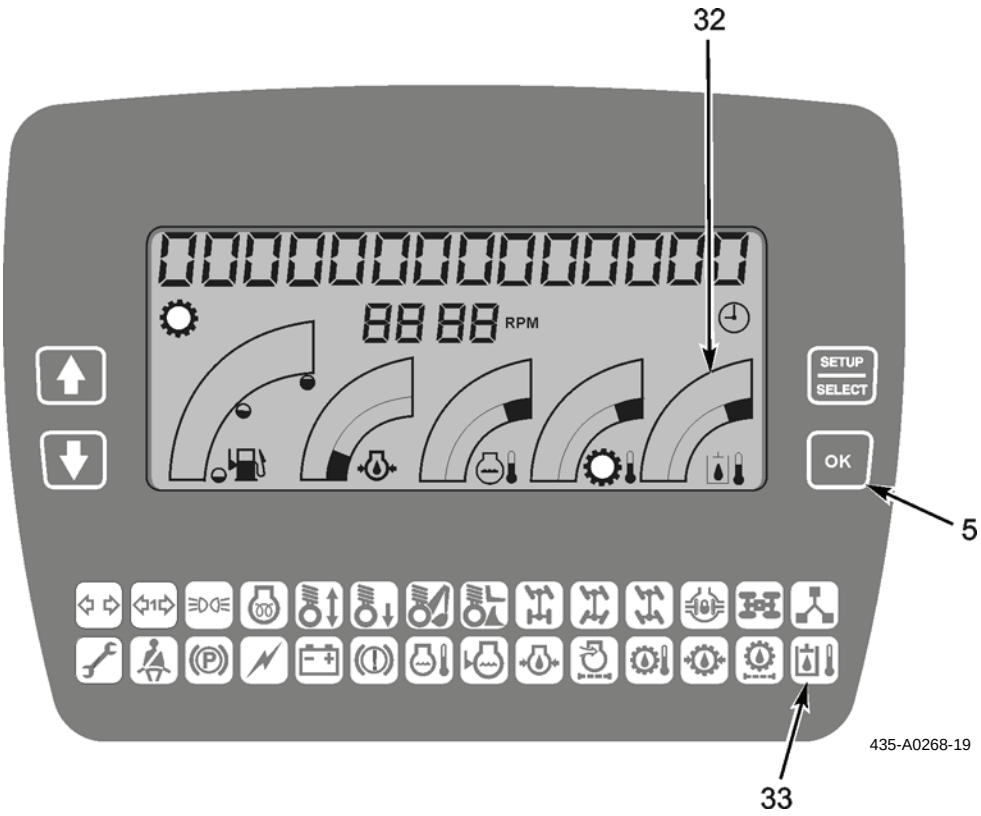


Figure 53. Hydraulic Oil Temperature Sensor/Warning

EMS INSTRUMENT CLUSTER – CONTINUED

Differential Lock Warning

In order to control traction on the axles, differential locks can be engaged to distribute the power across the axle in the event of a wheel spinning.

When the ignition is turned ON and the engine is running, the differential locks can be engaged by switching the Differential Lock switch to ON.

Differential Locks Engaged

When the Differential Lock switch is operated, the switch LED will illuminate, as will the EMS warning light (34), the LCD will display the message “DIFFS LOCKED” for 3 seconds (after which the LCD display will be extinguished). Simultaneously, a warning lamp on the front console warning light panel will be illuminated. This will remain lit as long as the condition is active.

Differential Locks Disengaged

When the Differential Lock switch is operated to the OFF position, the switch LED will be extinguished along with the EMS warning light (Figure 54, Item 34) and the LCD will display the message “DIFFS UNLOCKED” for 3 seconds, after which the LCD display will be extinguished.

With the differential locks engaged, should the road speed rise above 10 mph (16 kph), the differential locks will be automatically disengaged. The “DIFFS UNLOCKED” message will be displayed.

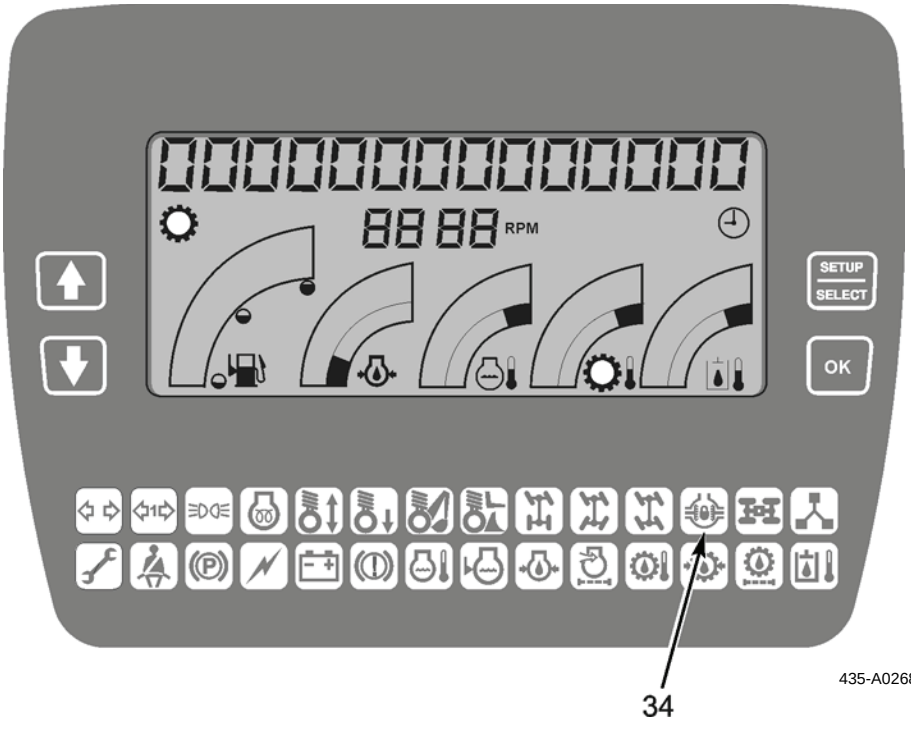


Figure 54. Differential Locks

EMS INSTRUMENT CLUSTER – CONTINUED

Ignition Warning Light

A warning light (Figure 55, Item 35) is provided to warn the driver/operator when the ignition is turned ON, but the engine is NOT running.

When the ignition is switched ON (engine not running), the warning light (Figure 55, Item 35) will be illuminated, the internal and external buzzers will sound, and a warning light on the front console warning light panel will be illuminated.

The warning light (Figure 55, Item 35), the internal and external buzzers, and the front console warning light will be extinguished when the engine is running.

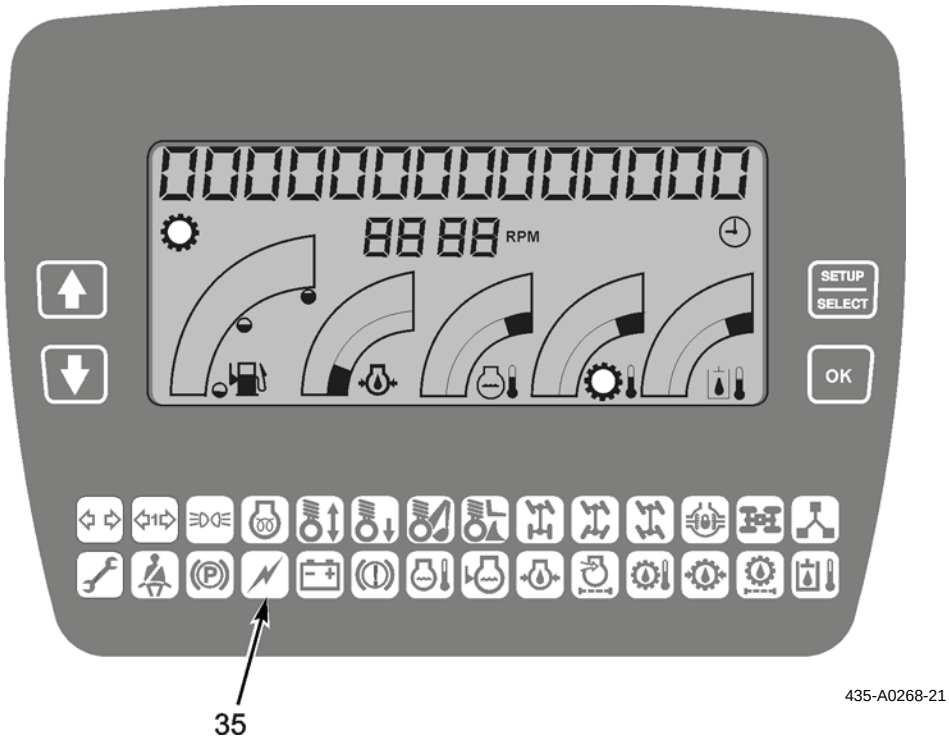


Figure 55. Ignition Warning Light

EMS INSTRUMENT CLUSTER – CONTINUED

Engine Cooling Fan Inhibit Function Warning

The EMS system monitors the engine cooling fan and transmits the status of the engine cooling fan inhibit switch to the operator. When the engine cooling fan inhibit switch is pressed, the EMS will display the message “COOL FAN OFF?” on the LCD and the internal buzzer will be activated. If no confirmation of the request is made within 3 seconds, the message will be deleted and the buzzer turned OFF. The EMS will assume the request was an error, and the fan will not be deactivated.

If the operator presses the OK button (Figure 56, Item 5) within the 3 seconds to confirm the request, the EMS will then activate the fan disconnect system. A warning light on the front console warning light panel will be illuminated, the internal buzzer will become active for 3 seconds, after which it will be activated for 2 seconds in every 10 seconds.

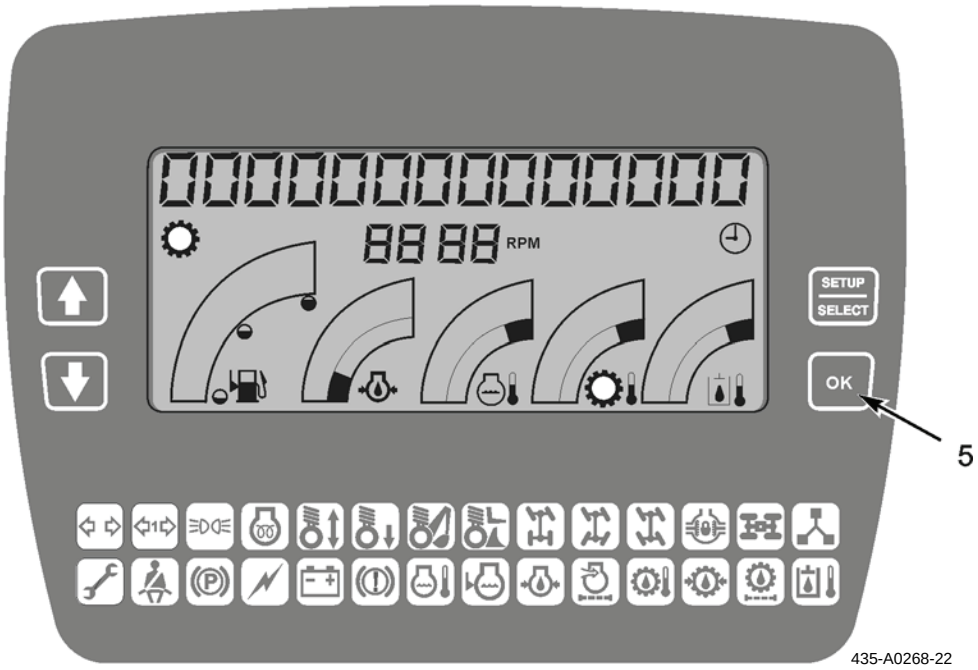


Figure 56. Engine Cooling Fan Inhibit Function Warning

END OF TASK

SETTING TIME CLOCK (EMS UNIT DISPLAY)

NOTE

Repeated pressing of the SETUP/SELECT button (5) will cycle the display through items a to j below. Use the DOWN and UP arrow keys (1) and (2) to adjust the settings.

Press the SET-UP/SELECT button (5) to cycle the display through the following items:

a. CLK FORMAT
b. The clock format (12/24 Hour) is shown in the top right corner (4).
c. HOUR
d. AM/PM with 12-Hour selected, AM or PM is selected and is displayed in the top left corner (3).
e. MINUTE
f. YEAR
g. MONTH
h. DATE (Day)
i. LANGUAGE - English.
j. Returns the display to the pre-setup mode.

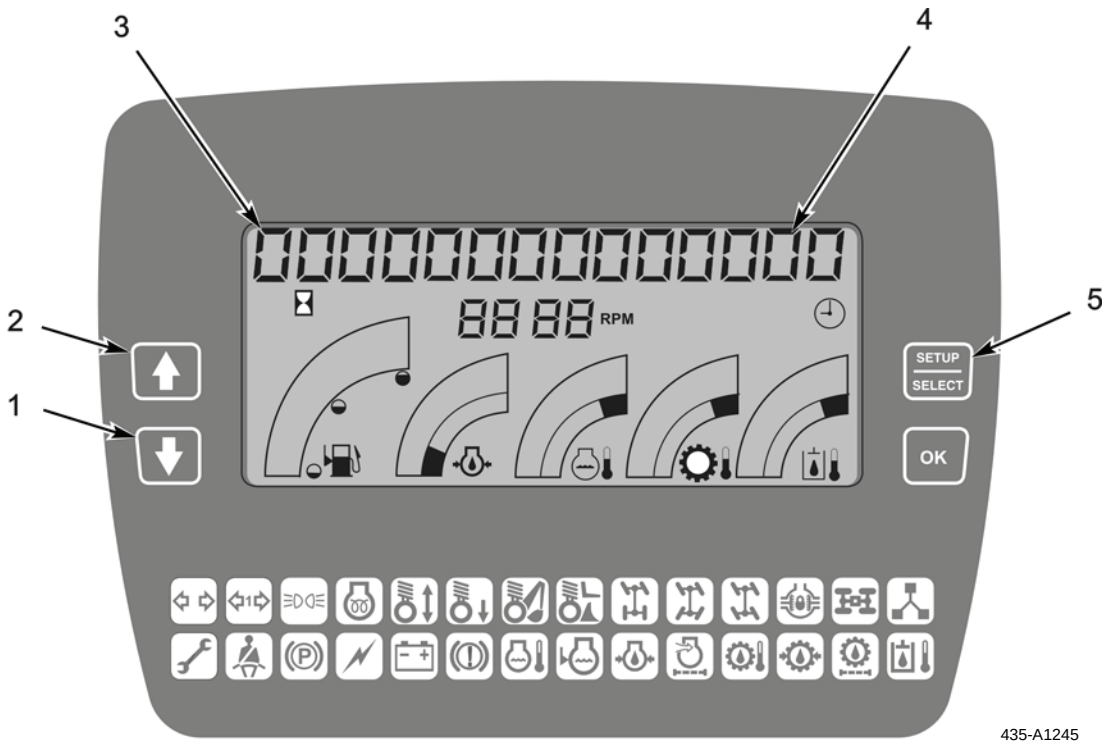


Figure 57. Setting Time Clock

END OF TASK

STEERING MODE SELECTION

The machine has three different selectable steering modes to aid maneuverability. Use the steering mode selector switches on the front console panel to switch between 2-wheel (2WS), 4-wheel (4WS) and crab-steer modes. Use the mode of steering which is most suitable for the terrain and the work you are doing. An “orange” warning/information light on the front console will illuminate only when 2WS is selected. The EMS unit will display an icon to reflect the operational mode, and the corresponding switch will be illuminated. When any mode other than 2WS is selected the EMS will also display the text warning “SPEED RESTRICT.” While traveling in either crab-steer or 4WS mode, if the road speed increases above 24 mph (37 kph), then 2WS will automatically be selected as the rear road wheels pass through the straight-ahead position.

Indicator lights on the EMS panel and in the switches tell you what steering mode the machine is in. If you have any doubt about the steering mode the machine is in, always remember that it is the indicator light which is correct.

To change the steering mode, the machine must be stationary. Only change the steering mode when the engine is at low rpm/idling.

Steer Modes

1. 2WS (1)

   The front wheels only are controlled by the steering wheel. This position must be used for driving on public roads.

2. 4WS (2)

   The front wheels steer one way and the rear wheels steer in the opposite direction. This position provides the tightest turning circle.

3. Crab Steer (3)

   The front and rear wheels steer in the same direction. This position improves maneuverability in confined spaces.

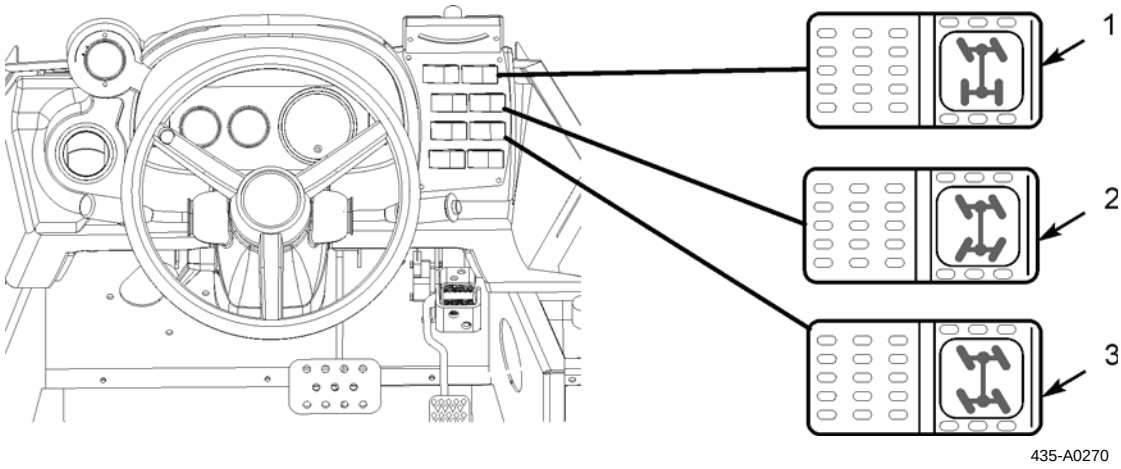


Figure 58. Steer Modes

STEERING MODE SELECTION – CONTINUED

Mode Change

WARNING

At the start of each work period, when switching on the ignition, the system will by default pre-select 2WS. If the machine is driven, when the rear axle wheels pass through the center position, 2WS will be selected. If having parked the machine in 4WS/crab and that mode is still required at startup, the mode will need to be selected prior to moving the machine. Failure to follow this warning may result in injury or death to personnel.

NOTE

Follow the procedure detailed below to change from one steer mode to another.

1. Stop the machine and apply the park brake.

NOTE

- Sensors on the axles prevent the steer mode from changing until the wheels straighten up or pass through the “straight ahead” position. During this phase the switch illumination light will flash to inform you that the change from one mode to the next, though requested, has not yet taken place.
- The steering wheel must be rotated back and forth before changing modes.

2. Press the switch for the required mode, (Figure 59, Items 1, 2, or 3). The switch is spring loaded and will return to its rest position. The switch (Figure 59, Items 1, 2, or 3) illumination light will flash. Once all the conditions controlling the change have been met, the light will go steady. The corresponding icon on the EMS unit will be illuminated and if a mode other than 2-wheel steer has been selected the “Speed Restrict” message will be displayed. If 2-wheel steer has been selected, the information light on the front console master warning light panel will be illuminated.

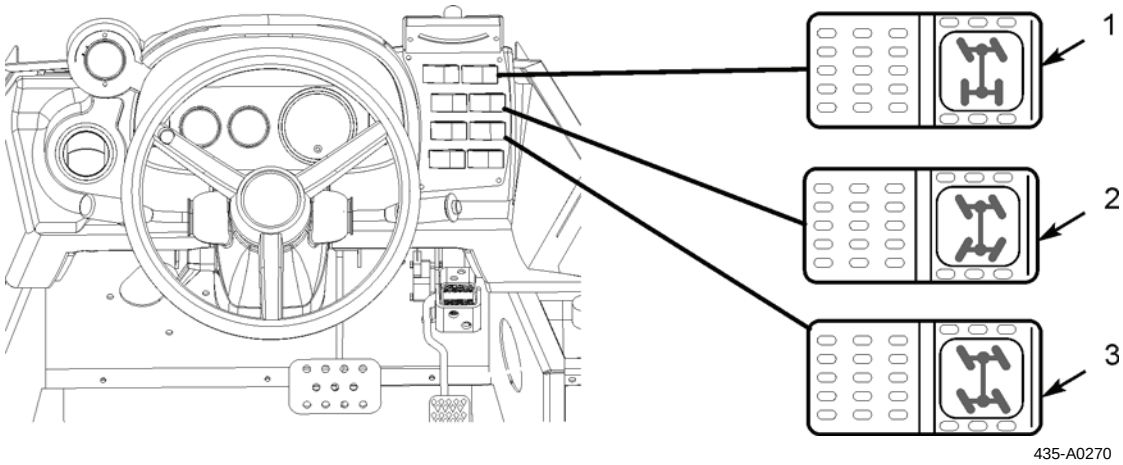


Figure 59. Mode Change

END OF TASK

SUSPENSION MODE SELECTION

The control of the suspension system allows the operator to select one of four suspension modes, dependant on the operational conditions. The modes can be selected using the suspension switches on the front console.

The EMS unit will display an icon to reflect the operational mode, and the corresponding switch will be illuminated. When any mode other than “Normal Travel” is operational, the EMS will display the message “SPEED RESTRICT.” The system will automatically block the transmission from selecting either of the top two forward gears, thereby restricting the machine speed to approximately 24 mph (37 kph).

Indicator lights on the EMS panel and in the switches tell you what suspension mode the machine is in. If you have any doubt about the suspension mode the machine is in, always remember that it is the indicator light which is correct.

To change from one suspension mode to another, the machine must be stationary, with the ignition switched ON and the engine running. There may be a hydraulic pressure induced delay in selecting some modes.

1. **Suspension Modes.**

NOTE

Suspension mode changes are best carried out with the machine on firm level ground. All four wheels must be in contact with the ground for any mode change to be made.

2. **Normal Travel.** This mode is selected when the machine is required to travel, either on the road, convoying, or normal site travel. In this mode the hydraulic system maintains the front and rear ride-height at a predetermined level.

NOTE

In the event of a major systems fault, the machine will automatically default to this setting, and the speed will be restricted by the blocking of the top two forward gears, thereby restricting the machine road speed to approximately 24 mph (37 kph).

3. **Loader/Forklift.** This mode is used for loading operations with a bucket or with the fork attachment. In this mode the front suspension is locked down to provide front roll-stiffness during lifting operations. The rear suspension is allowed to oscillate.
4. **Excavating.** This mode is used for rear-end excavating operations. In this mode the front suspension is allowed to oscillate, but the rear suspension is locked down.
5. **Transportation/Maintenance/Limp-Home.** This mode is selected to transport the machine in space-constrained situations, (e.g., by rail or air). Both front and rear suspension are locked down to minimize the machine height, to prevent any suspension movement during transportation, and to provide a positive tiedown ability. This mode should also be used for all maintenance tasks, as it brings the machine height to its lowest level and will avoid any “creep” of the suspension when stood over time.

WARNING

At the start of each work period, the machine will start in the last selected suspension mode before the machine was switched off. Ensure the correct suspension mode for your requirements has been selected before operating the machine. Failure to follow this warning may result in injury or death to personnel.

NOTE

Follow the procedure detailed below to change from one suspension mode to another.

6. Stop the machine and apply the parking brake.
7. Press the switch for the required mode (Figure 60, Items 1, 2, 3, or 4). The switch is spring loaded and will return to its rest position. The switch illumination light will flash. Once all the conditions controlling the change have been met, the light will become steady. The corresponding icon on the EMS unit will be illuminated and, if a mode other than normal travel has been selected, the “SPEED RESTRICT” message will be displayed.

SUSPENSION MODE SELECTION – CONTINUED

8. **Switch Layout.**
    - Normal travel (Figure 60, Item 1)
    - Loader/forklift (Figure 60, Item 2)
    - Excavating (Figure 60, Item 3)
    - Transportation/Maintenance/Limp-Home (Figure 60, Item 4)

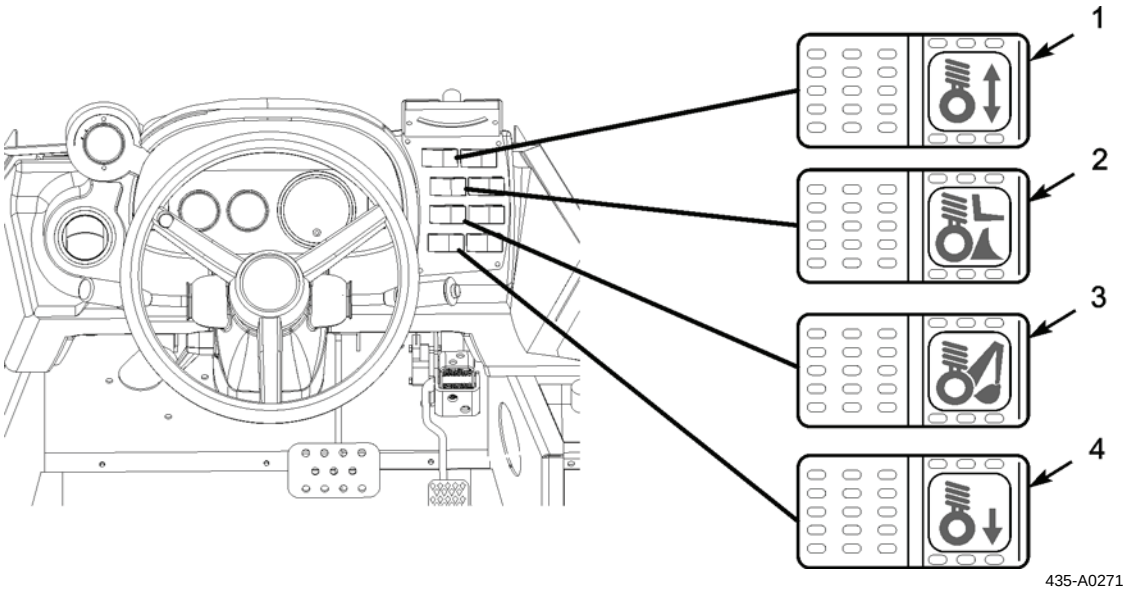


Figure 60. Switch Layout

END OF TASK

4-WHEEL-DRIVE OPERATION

NOTE

4WD will not engage in speeds greater than 3 mph (5 kph).

In order to control traction, the machine has a 4WD capability. When the ignition is ON and the engine is running, the capability can be enabled. The 4WD operating switch (Figure 61, Item 1) is located in the switch panel on the right-hand side of the dash. The system allows the operator to select 4WD while the machine is moving. With 4WD operational, warning lights on the EMS unit, inside the switch and on the front master warning light panel will be illuminated. The machine can be switched from 4WD to 2WD at any road speed.

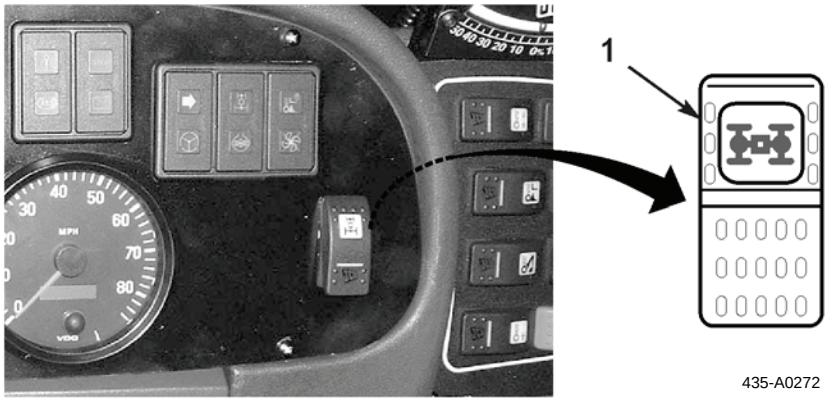


Figure 61. 4-Wheel-Drive Operation

CAUTION

The 4WD operation is positively switched. It will stay in the mode to which it is switched. Ensure the correct mode is selected before driving the machine. Do not use 4WD when traveling on hard surfaces. Failure to follow this caution may result in damage to equipment.

Turn ON 4WD Function

Press the bottom of the switch (Figure 62, Item 1) in. Providing the ignition is ON, the engine is running, and the road speed is below 3 mph (5 kph) the switch will illuminate as will the 4WD icon on the EMS unit and the warning light on the front master warning light panel to confirm 4WD is enabled. Engagement may not be immediate, in which case, drive the machine slowly forward to allow the clutches to fully engage.

Turn OFF 4WD Function and Enable 2WD Function

Press the top of the switch (Figure 62, Item 1) in. The switch illumination will deactivate, as will any corresponding icon on the EMS unit and the master warning light panel. 2WD is now enabled.

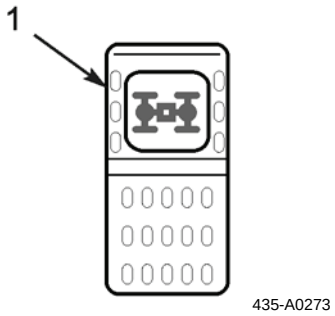


Figure 62. 4WD Function

END OF TASK

DIFFERENTIAL LOCKS

As an aid to traction on slippery surfaces, the machine is fitted with differential locks. When the ignition is ON and the engine is running, the differential locks can be engaged. The differential lock operating switch (Figure 63, Item 1) is located in the switch panel on the left-hand side of the dash. When the locks are engaged, the switch icon is illuminated, together with an icon on the EMS unit. The EMS unit will also display a text message “DIFFS LOCKED.” The differential locks are speed sensitive, and can be engaged while the machine is moving, providing the road speed is below 10 mph (16 kph). Once the machine road speed increases above 10 mph (16 kph), the differential locks will be automatically disengaged.

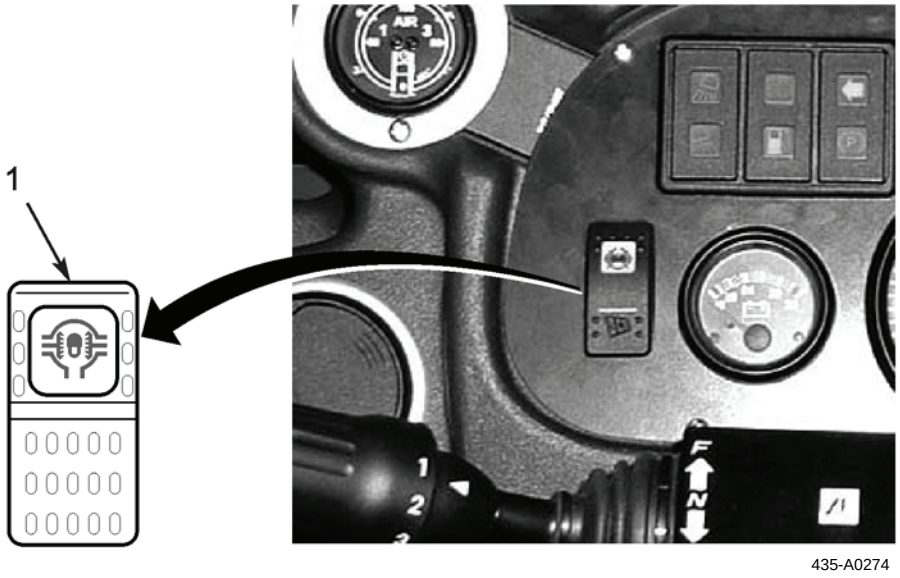


Figure 63. Differential Locks

CAUTION

Do not use differential locks when traveling on hard surfaces. Failure to comply may result in damage to equipment.

Turn ON Differential Lock Function

Press the bottom of switch (Figure 63, Item 1) in. Switch will illuminate (as will the differential lock icon on the EMS unit) to confirm differential locks are engaged. EMS unit will display the text message “DIFFS LOCKED” for 3 seconds, after which time the message will be deleted.

Turn OFF Differential Lock Function

Press top of switch (Figure 63, Item 1) in. Switch illumination will go out, as will any corresponding icon on the EMS unit. EMS unit will display the text message “DIFFS UNLOCKED” for 3 seconds, after which time the message will be deleted. Differential locks are now disengaged.

Automatic Speed Disengagement

If machine road speed increases above 10 mph (16 kph), the electronic control system will automatically disengage the differential locks. EMS unit will display the text message “DIFFS UNLOCKED” for 3 seconds, after which the display will be extinguished. The operating switch illumination will be extinguished along with the EMS icon. Differential locks are now disengaged.

DIFFERENTIAL LOCKS – CONTINUED

To Re-Activate Differential Lock Function Following an Automatic Speed Disengagement

NOTE

Following an automatic speed disengagement of the differential locks, the cab operating switch will still be in the downward ON position though the locks will be disengaged. If you are in any doubt as to whether the differential locks are engaged, remember it is the illumination of the switch icon and the icon on the EMS unit that are correct.

Turn switch (Figure 64, Item 1) OFF and then back ON again. Providing all conditions required in **Turn ON Differential Lock Function** have been met, differential locks will be engaged as previously described.

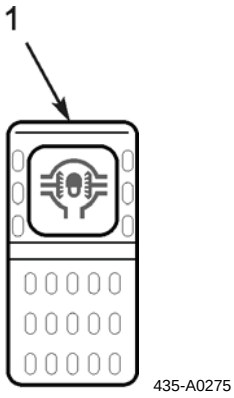


Figure 64. Differential Lock Switch

END OF TASK

FRONT BUCKET CONTROLS

The front bucket's main functions are operated from the control lever (Figure 65, Item 1). Pressing the transmission creep pushbutton (Figure 65, Item 3) in the lever knob reduces the tractive effort and releases horsepower to the hydraulic system. A second pushbutton (Figure 65, Item 2) in the side of the loader lever knob operates the downchange facility. This facility is only available when 2nd gear is selected. By pressing and releasing the operating button (Figure 65, Item 2), the transmission will downchange from 2nd gear to 1st. Pressing and releasing the button a second time will cause the transmission to upchange from 1st gear to 2nd. To open the clamshell bucket, push the auxiliary loader control lever (Figure 65, Item 4) forward. To close the clamshell bucket, pull the lever (Figure 65, Item 4) straight back.

For individual front movements (raise, lower, roll forward, roll back) the lever (Figure 65, Item 1) is moved in a "+" pattern.

Combined movements can be selected by moving the lever (Figure 65, Item 1) in directions between the four main ones. For example, the bucket is raised by pulling the lever straight back, while to roll the bucket back the lever must be moved to the left.

Another example is if you pull the lever (Figure 65, Item 1) diagonally back and left, the bucket will both rise and roll back.

The speed of bucket actions depends on how far you move the lever (Figure 65, Item 1). The further you move it, the faster the action. The lever is spring-loaded to its central (hold) position. The bucket will stay in any position until you move it.

A decal, located on top of the control lever (Figure 65, Item 1), shows by symbols what lever movements cause which bucket actions. The symbols, lever movements, and bucket actions are described on the following pages.

WARNING

- This machine is designed for use in normal outdoor atmospheric conditions. It should not be used in an enclosed area without adequate ventilation. Do not use the machine in a potentially explosive atmosphere, i.e., combustible vapors, gas, or dust. Failure to follow this warning may result in injury or death to personnel.
- Ensure the correct suspension mode is selected for the operation you are carrying out. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

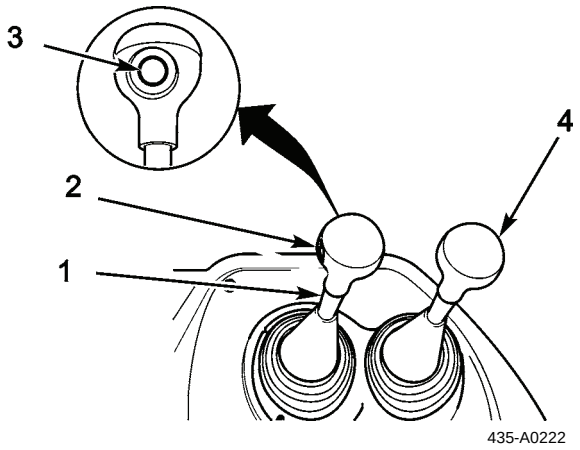


Figure 65. Front Bucket Controls

Select the correct suspension mode before commencing operations.

WARNING

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility. Do not operate the machine if you cannot see properly. Failure to follow this warning may result in injury or death to personnel.

FRONT BUCKET CONTROLS – CONTINUED

Raise Bucket

NOTE

As the bucket rises, it will stay at the same angle to the ground. This is due to the design of the hydraulic system.

To raise the bucket (Figure 66, Item 1), pull the lever (Figure 66, Item 2) straight back.

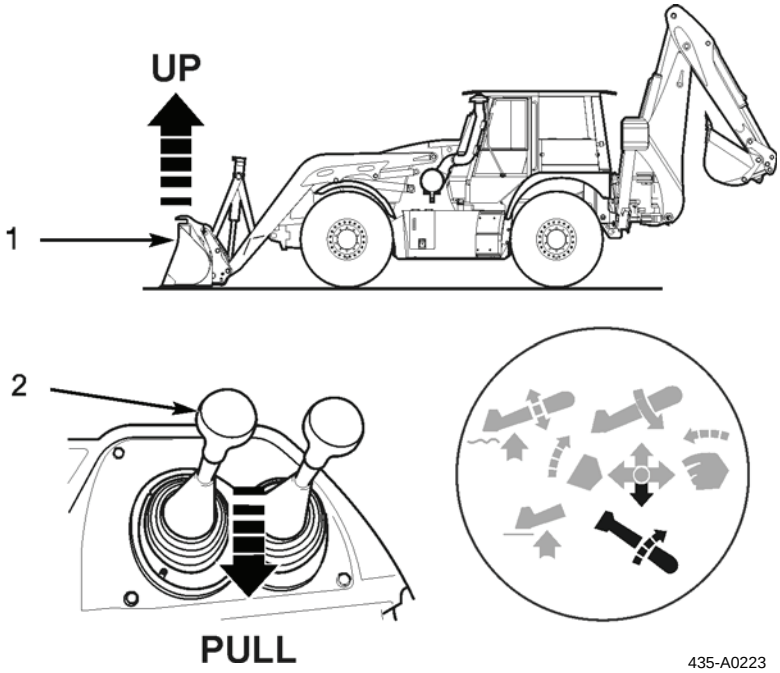


Figure 66. Raise Bucket

FRONT BUCKET CONTROLS – CONTINUED

Lower Bucket

NOTE

As the bucket lowers, it will stay at the same angle to the ground. This is due to the design of the hydraulic system.

To lower the bucket (Figure 67, Item 1), push the lever (Figure 67, Item 2) forward.

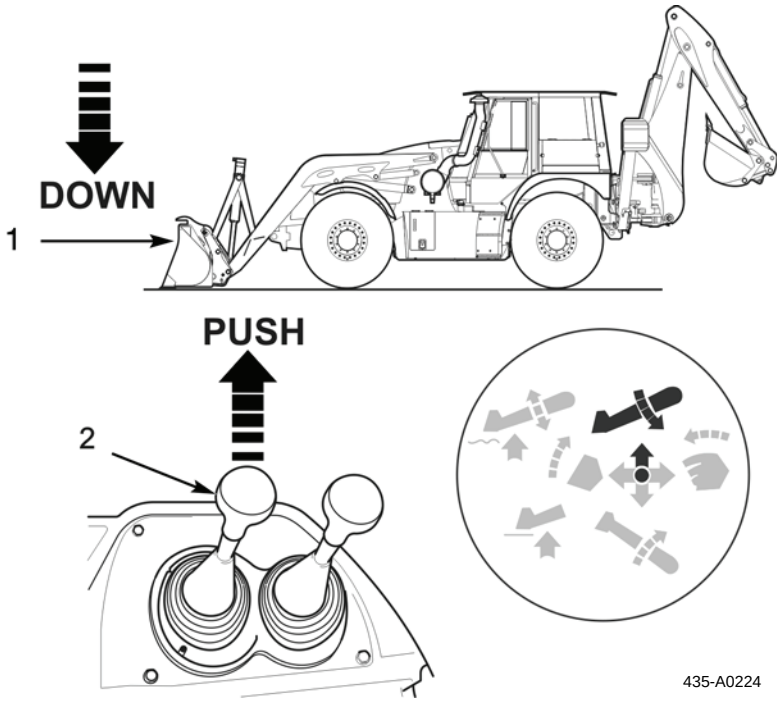


Figure 67. Lower Bucket

FRONT BUCKET CONTROLS – CONTINUED

Roll Forward (Down)

To roll the bucket (Figure 68, Item 1) forward, push the lever (Figure 68, Item 2) to the right.

Crowd (Up)

To crowd the bucket (Figure 68, Item 1) back, pull the lever (Figure 68, Item 2) to the left.

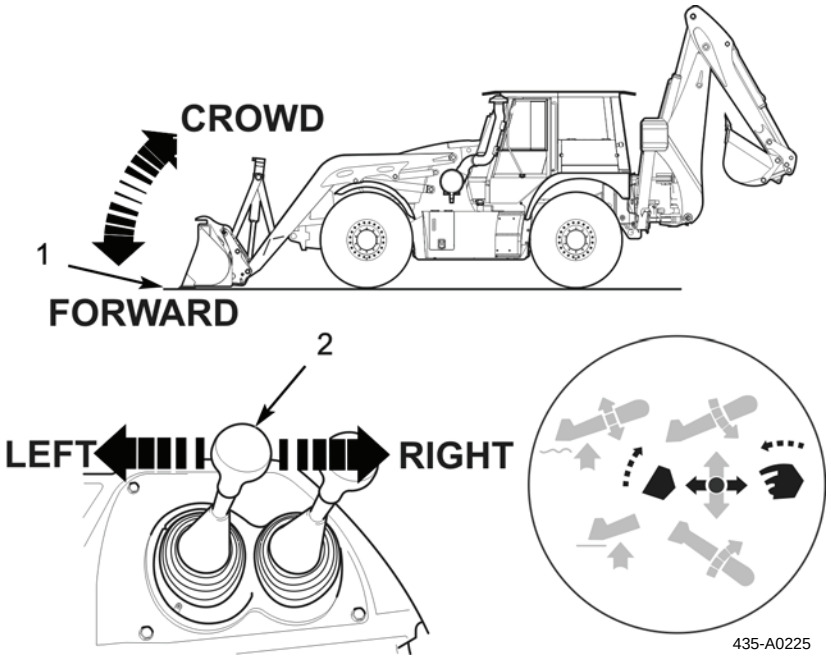


Figure 68. Forward/Back Bucket Controls

END OF TASK

STABILIZER CONTROLS

The stabilizers are powered from the main hydraulic system and are used to stabilize the machine while working with the backhoe.

WARNING

- The stabilizers must be down when you use the backhoe, or the machine may become unstable. Each stabilizer has its own control lever and can be operated independently. Failure to follow this warning may result in injury to personnel.
- You must be sitting in the driver's seat when operating the stabilizer controls. Do not operate the stabilizers from outside the machine. Failure to follow this warning may result in injury or death to personnel.
- Lower each stabilizer to level the machine and take the weight off the rear tires. The loader shovel should be used along with the stabilizers to level and steady the machine. Failure to follow this warning may result in injury to personnel or damage to equipment.
- Bystanders could be crushed and obstacles could be damaged if they are beneath the stabilizers while they are being lowered. Before lowering the stabilizers, ensure all bystanders are clear of the machine. Ensure there are no obstacles beneath the stabilizers and lower them onto firm ground. Failure to follow this warning may result in injury or death to personnel or damage to equipment.
- Ensure the correct suspension mode is selected for the operation you are carrying out. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

1. Select the excavator suspension mode.
2. To raise the stabilizers (Figure 69, Items 1 and 2), pull the control levers (Figure 69, Items 3 and 4) towards the front of the machine.
3. To lower the stabilizers (Figure 69, Items 1 and 2), push the levers (Figure 69, Items 3 and 4) towards the rear of the machine.

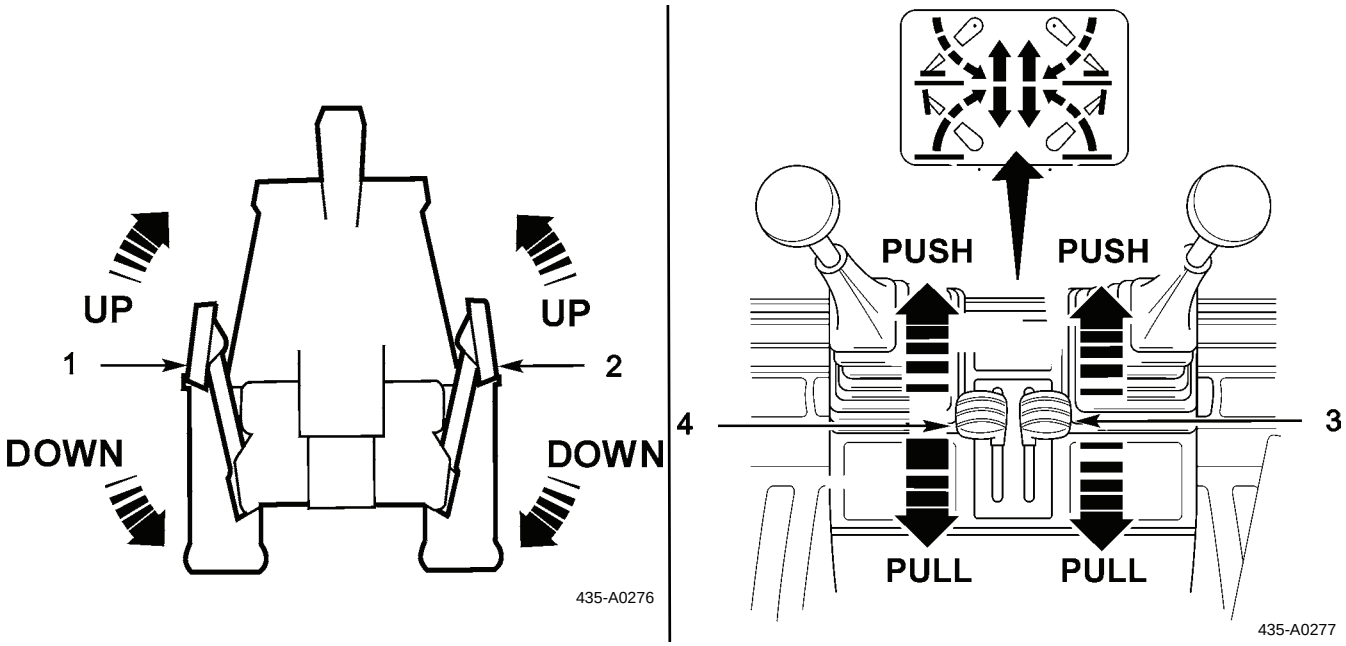


Figure 69. Stabilizer Controls

STABILIZER CONTROLS – CONTINUED

Occasionally there may be a need for fully extending one or both stabilizers in order to level the machine on steep slopes.

In these conditions, it may be necessary to use the boom (Figure 70, Item 5) to apply a down force to enable the stabilizers (Figure 70, Item 6) to fully extend. In these conditions, raising the bucket (Figure 70, Item 7) off the ground also helps. Make use of the inclinometer to ensure the machine is level before starting excavating operations.

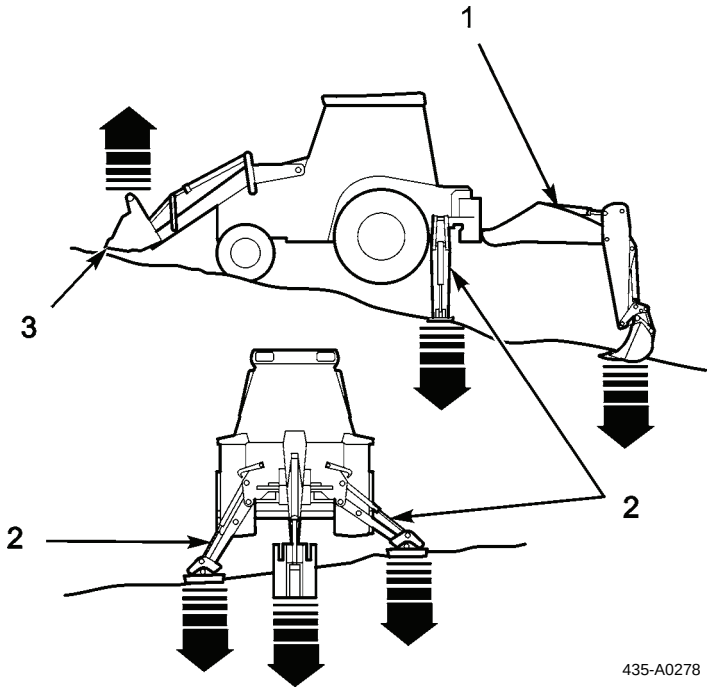


Figure 70. Leveling Machine on Steep Slopes

END OF TASK

BACKHOE CONTROLS

Prepare Backhoe for Operation

WARNING

The stabilizers must be down when you use the backhoe or the machine may become unstable. Each stabilizer has its own control lever and can be operated independently. Failure to follow this warning may result in injury to personnel.

The machine is equipped with SAE (“+”) pattern controls. There are two backhoe control levers. The left-hand lever operates the boom and swing. The right-hand lever operates the dipper and bucket.

Both levers move in a “+” pattern for individual backhoe actions. Combined actions can be selected by moving the levers in directions between the four main ones.

Both levers can be operated at the same time, for more efficient operation. The speed of the backhoe action depends on how far you move the levers. The further you move a lever, the faster the action.

Both levers are spring-loaded to their central (hold) positions. The backhoe will stay in any position until you move it with the levers.

A decal near the controls shows, by symbols, what lever movements cause which backhoe actions. The lever movements and backhoe actions are explained on the following pages.

WARNING

- Before you start using the backhoe, you must convert the machine into a safe and suitable working platform. Failure to follow this warning could lead to injury or death to personnel.
- Ensure the correct suspension mode is selected for the operation you are carrying out. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

NOTE

Choose a suitable digging position, avoid digging uphill if possible. Whenever possible, dump the load on the uphill side of the excavation. Both these precautions will help to keep the machine stable.

1. When the machine is in the desired position, select the suspension excavator mode.

NOTE

When working on asphalt surfaces, do not roll the bucket fully forward. Keep the bottom of the bucket flat on the ground. This will minimize damage to the surface.

2. Roll the bucket forward, then lower it to take the weight off the front tires.
3. Set the gear selection column switch to Neutral. Ensure it is in its detent position.
4. Engage the parking brake (WP 0005).
5. Turn the operator’s seat to face the backhoe controls. Ensure the seat locks into position.
6. Set the engine speed using the hand throttle to 1,800 rpm (this speed is considered suitable for most backhoe operations).
7. Lower the stabilizers.
8. Release the backhoe boom lock.
9. Release the backhoe swing lock.

BACKHOE CONTROLS – CONTINUED

Raise Boom

WARNING

- The stabilizers must be down when you use the backhoe or the machine may become unstable. Each stabilizer has its own control lever and can be operated independently. Failure to follow this warning may result in injury to personnel.
- You or others can be killed or seriously injured if you carry out unfamiliar operations without first practicing them. Keep all bystanders clear of the operating area. Operating the wrong control lever or moving controls violently may result in injury or death to personnel.
- Before raising the boom, check that it is clear overhead. Failure to follow this warning may result in injury or death to personnel.

To raise the boom (Figure 71, Item 1), pull the left-hand lever (Figure 71, Item 2) towards the front of the machine.

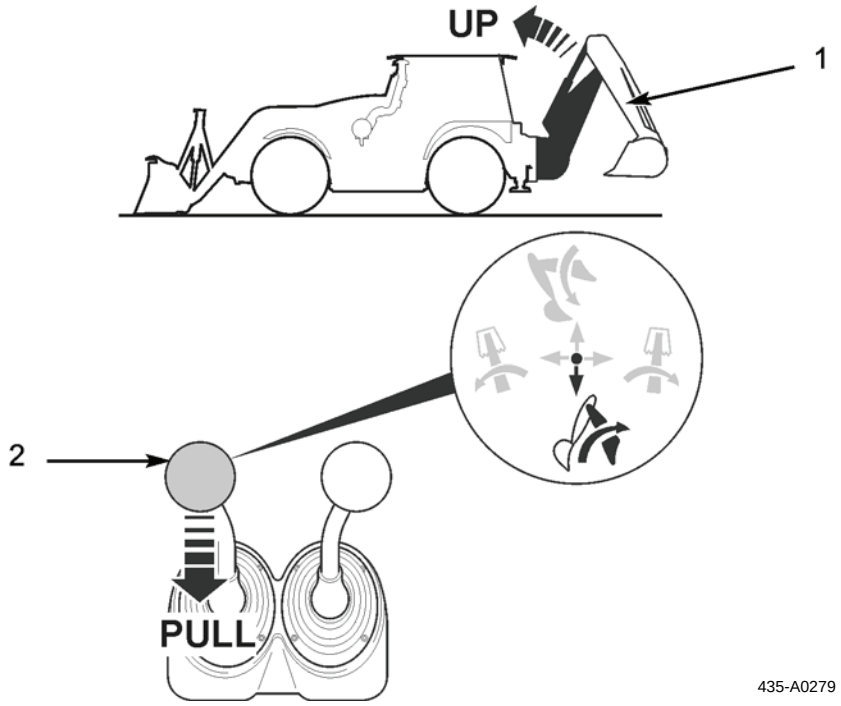


Figure 71. Raise Boom

BACKHOE CONTROLS – CONTINUED

Lower Boom

To lower the boom (Figure 72, Item 1), push the left-hand lever (Figure 72, Item 2) towards the rear of the machine.

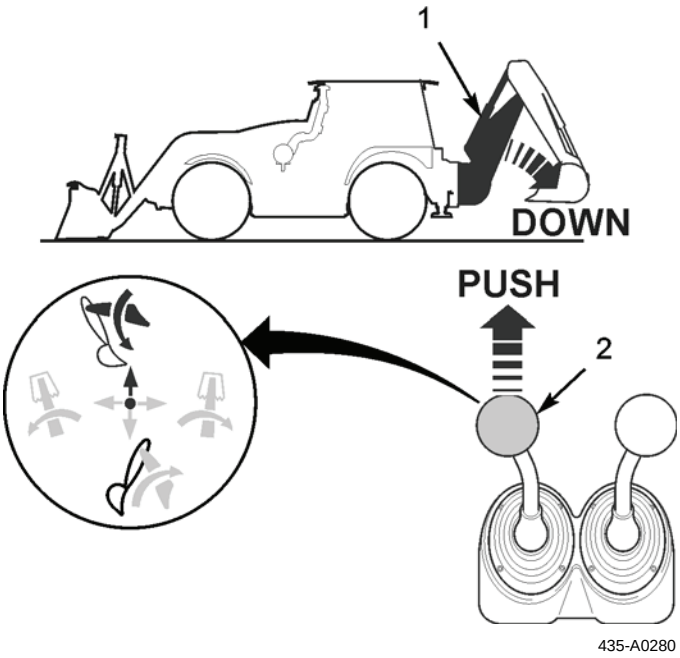


Figure 72. Lower Boom

BACKHOE CONTROLS – CONTINUED

Swing Boom

1. To swing the boom (Figure 73, Item 1) to your left, move the left-hand lever (Figure 73, Item 2) to your left.

CAUTION

Some backhoe buckets and work tools may collide with the stabilizer legs if swung too far around. Check for clearance before using attachments. Failure to do so could result in damage to equipment.

2. To swing the boom (Figure 73, Item 1) to your right, move the left-hand lever (Figure 73, Item 2) to your right.

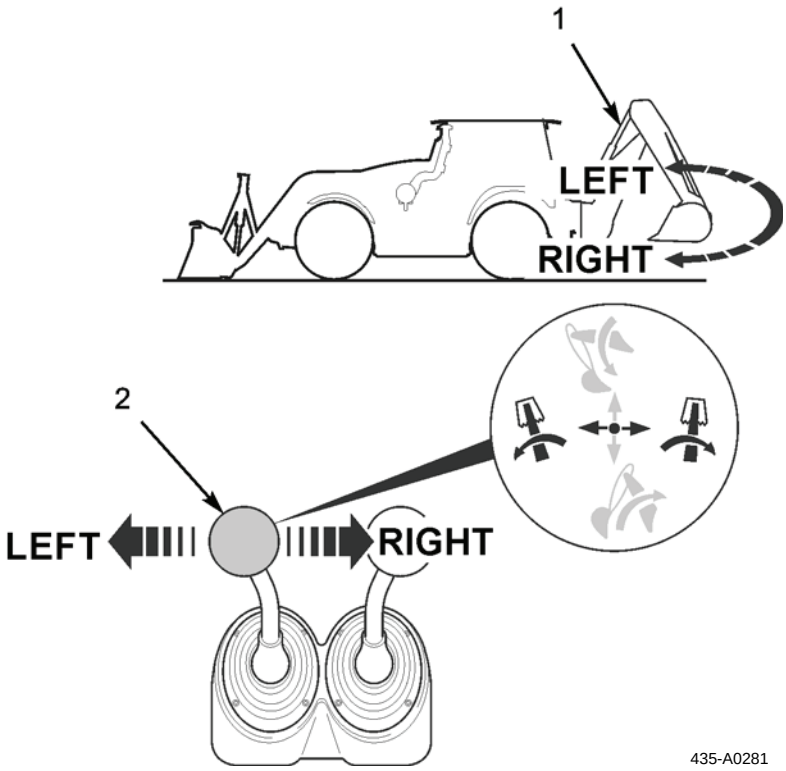


Figure 73. Swing Boom

BACKHOE CONTROLS – CONTINUED

Dipper In

To bring the dipper (Figure 74, Item 3) in, pull the right-hand lever (Figure 74, Item 4) towards the front of the machine.

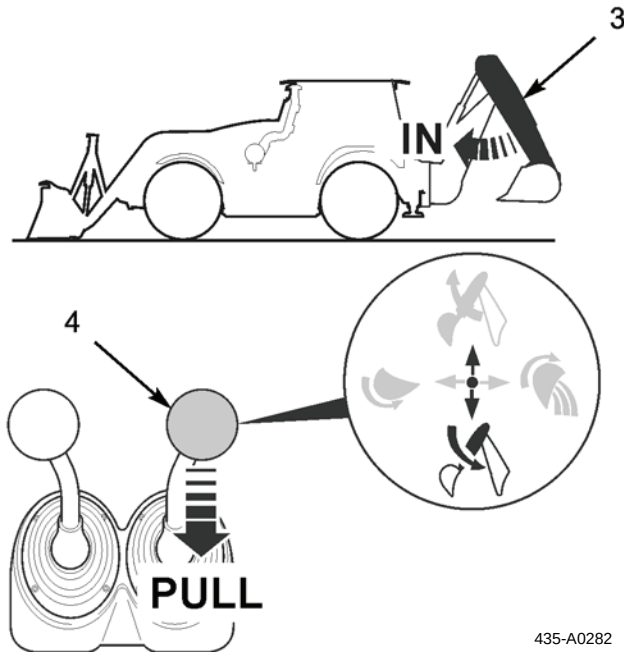


Figure 74. Dipper In

BACKHOE CONTROLS – CONTINUED

Dipper Out

WARNING

If the boom is already up, ensure there is sufficient overhead clearance before swinging the dipper out. Failure to follow this warning may result in injury or death to personnel.

To push the dipper (Figure 75, Item 3) out, push the right-hand lever (Figure 75, Item 4) towards the rear of the machine.

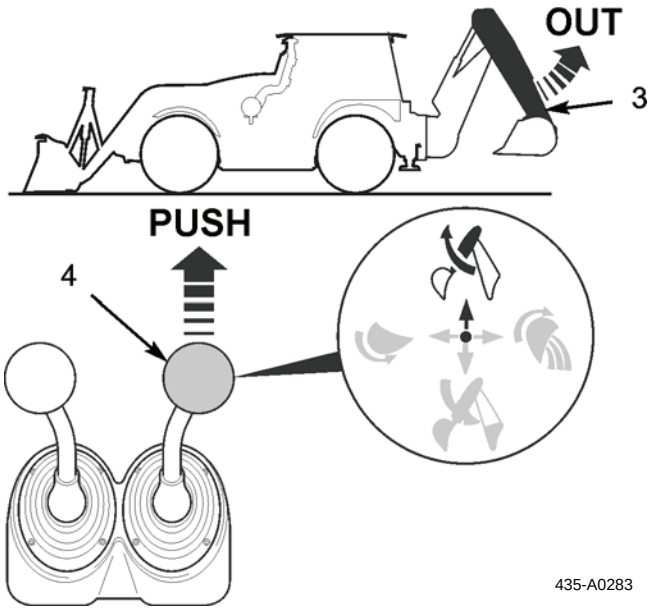


Figure 75. Dipper Out

BACKHOE CONTROLS – CONTINUED

Rollback Bucket

To crowd the bucket (Figure 76, Item 5), move the right-hand lever (Figure 76, Item 4) to your left.

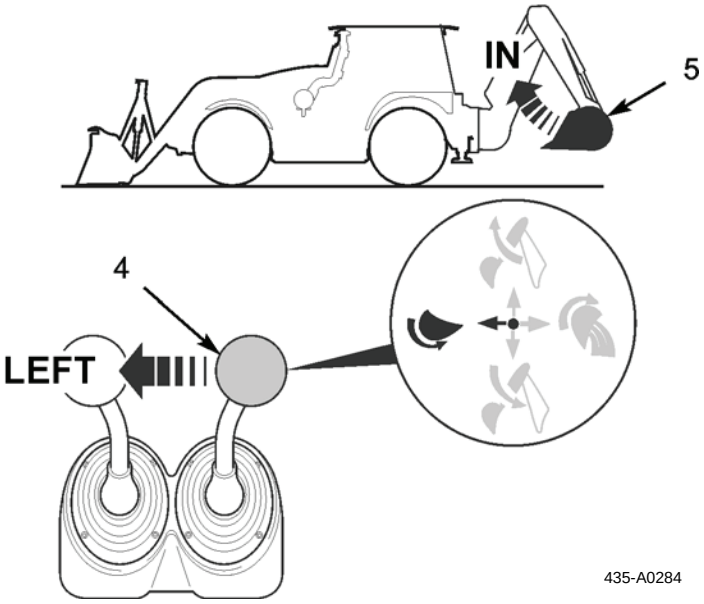


Figure 76. Rollback Bucket

Dump Bucket

To dump the bucket (Figure 77, Item 5), move the right-hand lever (Figure 77, Item 4) to your right.

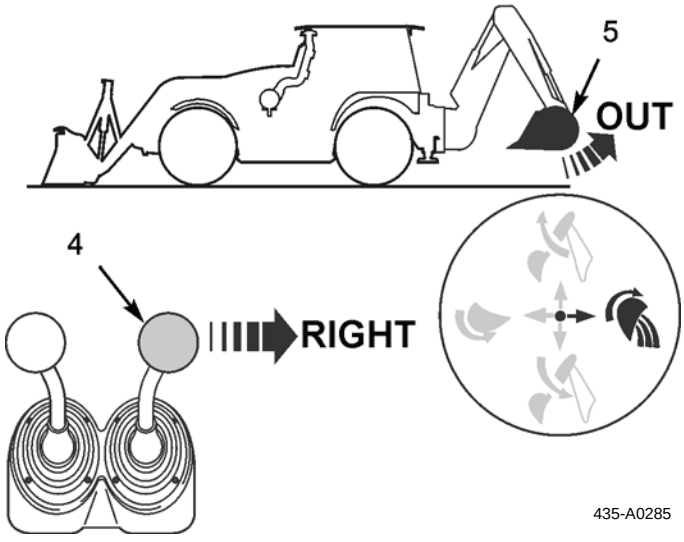


Figure 77. Dump Bucket

END OF TASK

BACKHOE BOOM LOCK

WARNING

Engage the boom lock before traveling on the road. Failure to follow this warning may result in injury or death to personnel.

NOTE

It is recommended that the boom lock be engaged before fitting the swing lock.

Engage Boom Lock

1. Set the backhoe straight out behind the machine. Lower the boom enough so the boom lock (Figure 78, Item 1) is clear of the boom (Figure 78, Item 3).
2. Fully raise the boom lock (Figure 78, Item 1) by pulling on the lever (Figure 78, Item 2).
3. Close the boom cylinder.
4. Push in lever (Figure 78, Item 2) to lower the boom lock (Figure 78, Item 1). Ensure the lock is fully engaged in the boom lugs (Figure 78, Item 4).
5. Lower the boom (Figure 78, Item 3) slightly to tighten the lock.

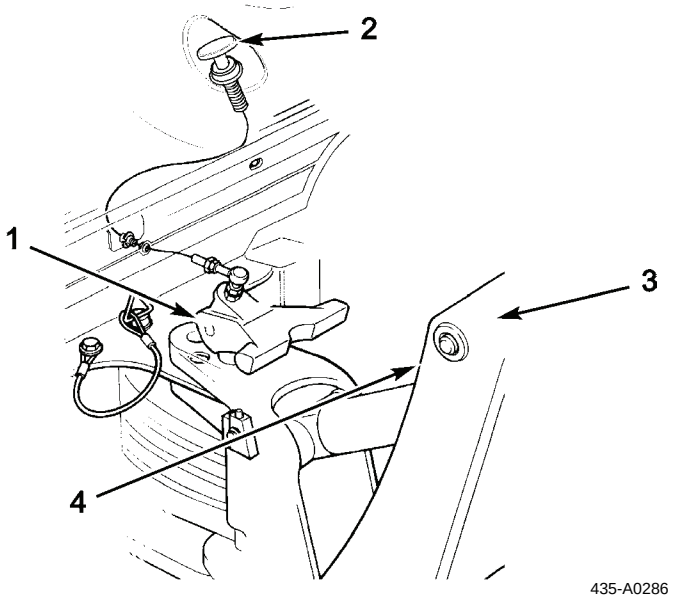


Figure 78. Backhoe Boom Lock

Disengage Boom Lock

1. Raise the boom (Figure 78, Item 3) a little to release the boom lugs (Figure 78, Item 4).
2. Pull out the lever (Figure 78, Item 2) to raise the boom lock (Figure 78, Item 1).
3. Lower boom (Figure 78, Item 3) to clear the boom lock (Figure 78, Item 1) before releasing the lock.

END OF TASK

BACKHOE SWING LOCK

WARNING

Engage the swing lock before traveling on the highway. Failure to follow this warning may result in injury or death to personnel.

Engage Swing Lock

1. Set the backhoe straight out behind the machine.
2. Ensure hole (Figure 79, Item 1) in the mainframe aligns with hole (Figure 79, Item 2) in the kingpost.
3. Stop the engine (WP 0005).
4. Remove the swing lock pin (Figure 79, Item 3) from its stowage point in the mainframe and install in the aligned holes (Figure 79, Items 1 and 2).

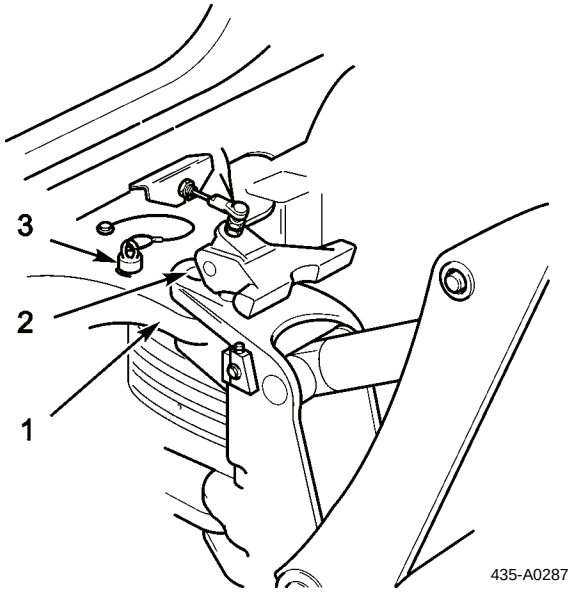


Figure 79. Engage Backhoe Swing Lock

BACKHOE SWING LOCK – CONTINUED

Disengage Swing Lock

1. Stop the engine (WP 0005).
2. Remove the swing lock pin (Figure 80, Item 3) from the aligned holes and install in its stowage point in the mainframe.

Figure 80. Disengage Backhoe Swing Lock

END OF TASK

BACKHOE BUCKET REPLACEMENT

Removing a Bucket

1. **Position the Bucket.** Position the backhoe straight out behind the machine. Rest the bucket on level ground, with the bucket flat. Block the bucket to prevent its movement.

WARNING

Stand clear and to one side of the bucket while you remove the pivot pins. With the pivot pins removed, the bucket may roll over. Failure to follow this warning may result in injury to personnel.

2. **Remove Pivot Pins.** Unclip and remove the tipping lever linch pin (Figure 81, Item 1) and spacer (Figure 81, Item 2). Use drift and hammer (Items 5 and 9, Table 2, WP 0031) to remove the pivot pin (Figure 81, Item 3), then remove the dipper pivot linch pin (Figure 81, Item 4), spacer (Figure 81, Item 5), and pivot pin (Figure 81, Item 6).

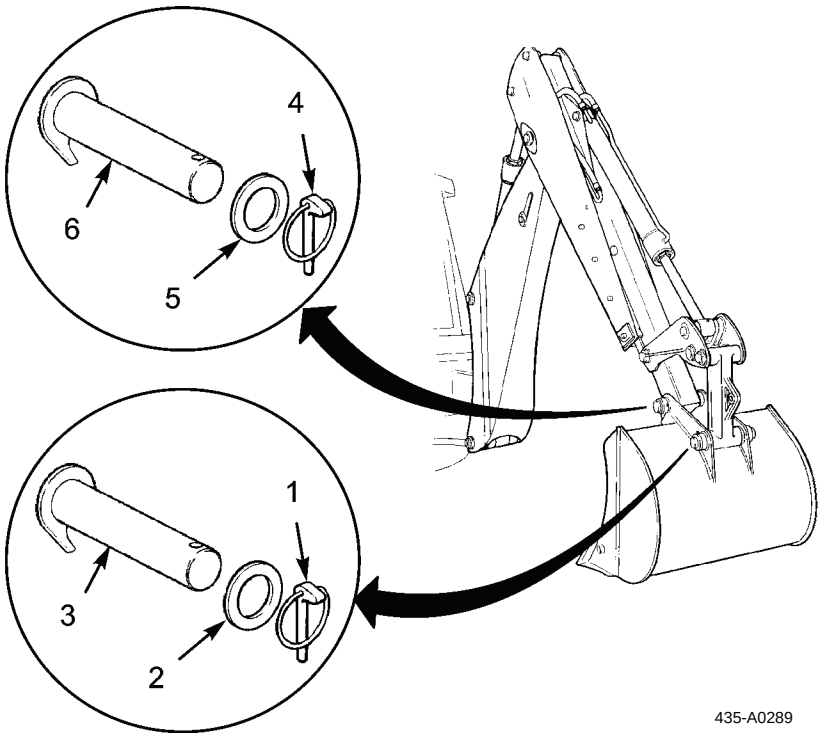


Figure 81. Remove Pivot Pins

3. **Withdraw Dipper.** Using the backhoe controls, carefully lift the dipper clear of the bucket.

Installing a Bucket

1. **Position Bucket.**
   a. Set the bucket flat on the ground.
   b. Reverse the machine while aligning the dipper end with the bucket hinged area.

BACKHOE BUCKET REPLACEMENT – CONTINUED

Removing a Bucket - Continued

2. **Engage Dipper.**
   a. Carefully operate the controls to line up the holes in the dipper (Figure 82, Item 7) and the tipping link (Figure 82, Item 8) with the holes in the bucket (Figure 82, Item 9).
   b. Fit the pivot pin (Figure 82, Item 6).
   c. Fit the spacer (Figure 82, Item 5) and the linch pin (Figure 82, Item 4).
   d. After the dipper pivot pin has been locked in, fit the tipping link pivot pin (Figure 82, Item 3), spacer (Figure 82, Item 2), and linch pin (Figure 82, Item 1).

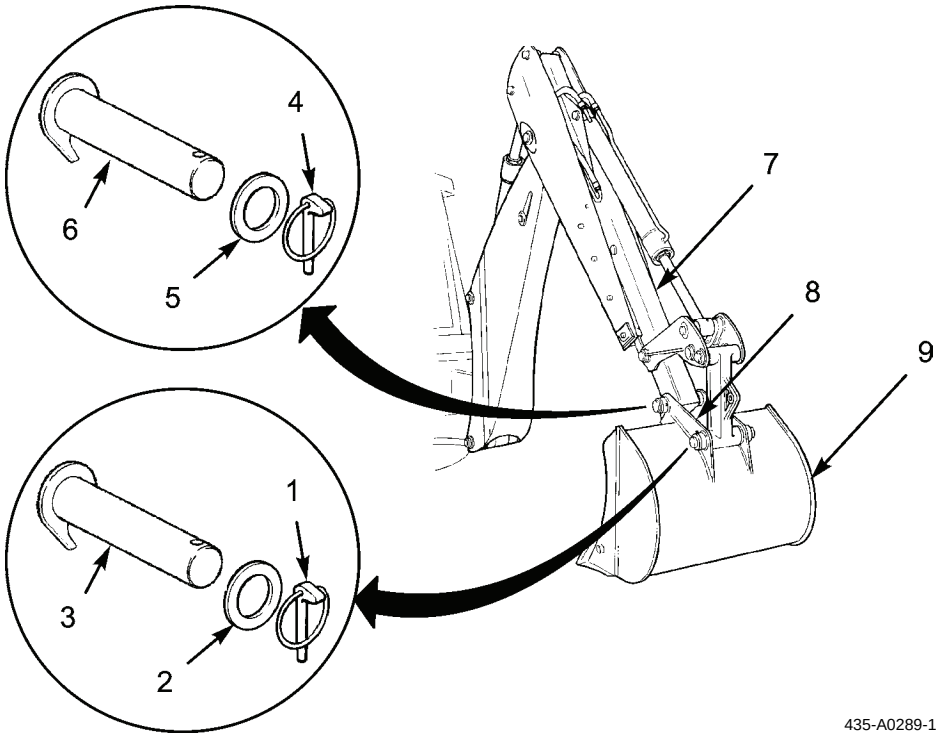


Figure 82. Engage Dipper

END OF TASK

WORK TOOL CHANGING

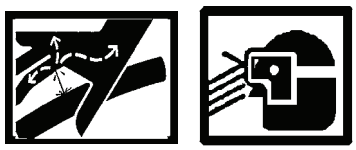
NOTE

Always deposit “Quick-Hitch” work tools on firm level ground whenever possible. This will make later refitting easier.

The following procedures are the same to remove/install a bucket as to remove/install the forklift.

Remove Quick-Hitch Work Tool

1. With the attachment rolled back, lower the loader arms to the ground.
2. Slowly roll the attachment forward until it just contacts the ground, but its weight is still reacted by the quick-hitch at its base.
3. Engage the parking brake. Set the gear selection and forward/reverse lever to Neutral. Stop the engine (WP 0005).
4. Operate both loader control levers through their full travel several times to vent the residual hydraulic pressure.



WARNING

Wear effective eye protection and gloves. Fine jets of hydraulic fluid at high pressure can penetrate the skin. Do not use your fingers to check for hydraulic fluid leaks. Do not put your face close to suspected leaks. Hold a piece of cardboard close to suspected leaks. Then inspect the cardboard for signs of hydraulic fluid. If hydraulic fluid penetrates your skin, get medical help quickly. Failure to follow this warning may result in injury or death to personnel.

5. Disconnect the hoses and fit the coupling blanking caps.

WORK TOOL CHANGING – CONTINUED

Remove Quick-Hitch Work Tool - Continued

WARNING

Keep other people clear of the area while you disengage the work tool. Failure to comply may result in injury or death to personnel.

6. Remove linch pin (Figure 83, Item 1) and withdraw the carrier lock pin (Figure 83, Item 2).
7. Start the engine (WP 0005).
8. Tilt the carrier (Figure 83, Item 3) forward slowly to withdraw the lower end of the carrier from the work tool (Figure 83, Item 4). Then lower the loader arms (Figure 83, Item 5) slowly to withdraw the carrier from the hook plates (Figure 83, Item 6). Carefully reverse the machine away from the work tool.

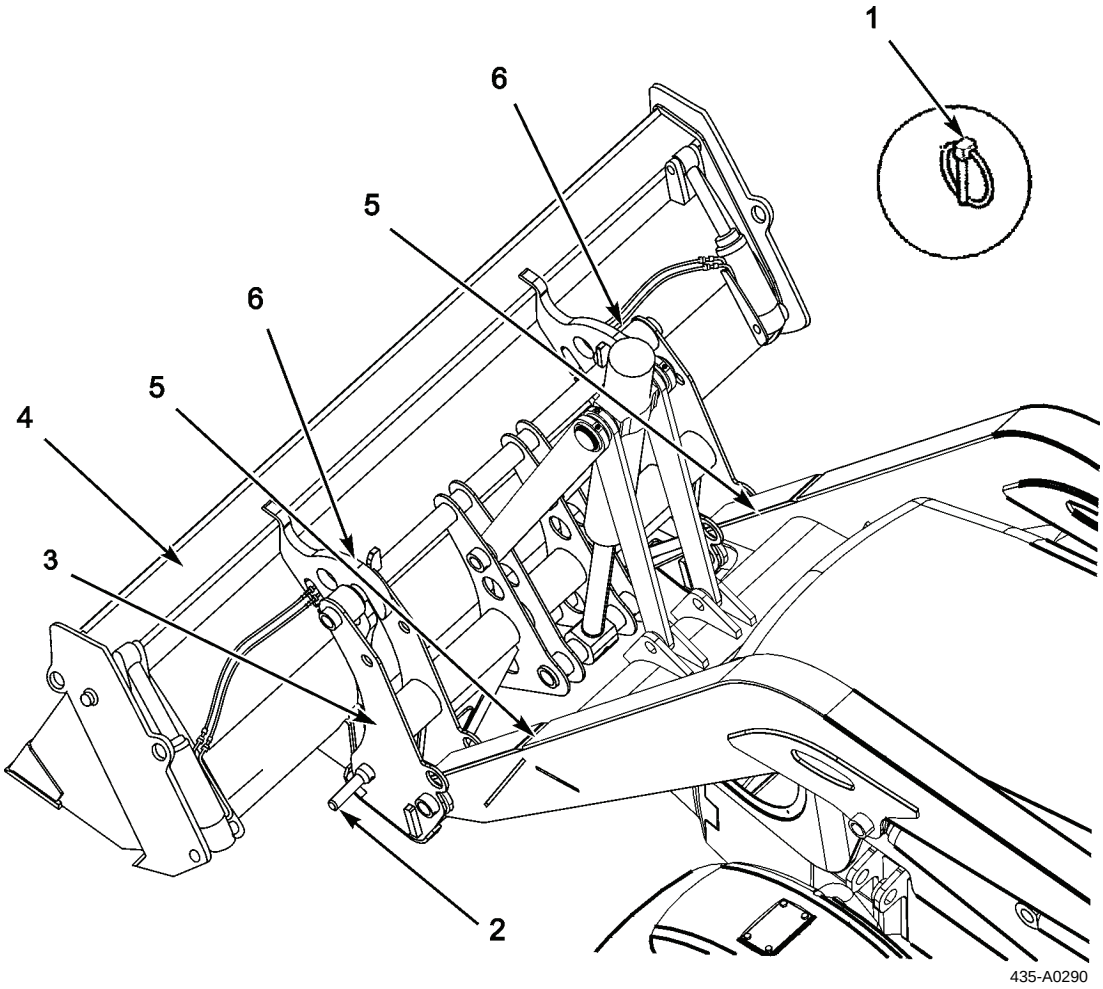


Figure 83. Quick-Hitch Work Tool

WORK TOOL CHANGING – CONTINUED

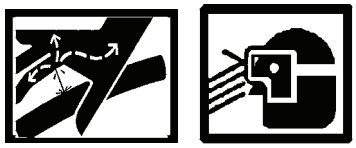
Installing Quick-Hitch Work Tool

1. Ensure the work tool (Figure 83, Item 4) is on firm, level ground. Ensure the work tool will not tip over.
2. Ensure the carrier lock pin (Figure 83, Item 2) is withdrawn.

WARNING

Keep other people clear of the area while you engage the work tool. If a second person is to be involved in this procedure, ensure he keeps clear of the machine and work tool until signaled by you to proceed. Failure to follow this warning may result in injury or death to personnel.

3. Use the controls to line up the carrier (Figure 83, Item 3) with the work tool (Figure 83, Item 4) and just below the work tool hook plates (Figure 83, Item 6).
4. Engage the parking brake and set the gear lever and forward/reverse lever to Neutral.
5. Using the loader controls, engage the support bar on the carrier into the hook plates (Figure 83, Item 6) on the work tool (Figure 83, Item 4). Ensure that both hook plates are engaged equally.
6. Lift and tilt the carrier back, to line up the locking holes in the carrier with those in the work tool.
7. Ensure the gear selection and forward/reverse lever are set to Neutral, and that the parking brake is engaged. Stop the engine (WP 0005).
8. At the carrier, insert the carrier lock pin (Figure 83, Item 2) into the locking holes in the carrier and work tool. Secure with linch pin (Figure 83, Item 1).



WARNING

Wear effective eye protection and gloves. Fine jets of hydraulic fluid at high pressure can penetrate the skin. Do not use your fingers to check for hydraulic fluid leaks. Do not put your face close to suspected leaks. Hold a piece of cardboard close to suspected leaks. Then inspect the cardboard for signs of hydraulic fluid. If hydraulic fluid penetrates your skin, get medical help quickly. Failure to follow this warning may result in injury to personnel.

9. Remove blanking caps and connect hoses.
10. Engage the parking brake. Set the gear lever and forward/reverse lever to neutral. Stop the engine (WP 0005).
11. Operate the loader control levers several times to vent all the hydraulic pressure from the hoses.

ENGINE COOLING FAN INHIBIT FACILITY

Machine is fitted with an engine cooling fan driven by a belt from engine crankshaft. A switch allows the fan to be inhibited under certain operating conditions. When fan is inhibited, EMS unit will display a message and sound a warning buzzer to remind you and warning light on the master warning panel will illuminate.

CAUTION

When fording machine, the fan must be inhibited before engaging in a fording operation. The fan will be very badly damaged if it comes into contact with water at normal rotational speeds.

Switch Operation

NOTE

The cooling fan inhibit switch (Figure 84, Item 1) is located in the switch bank to the right of the operator (when the operator is facing the front of the machine) on the cab “B” post.

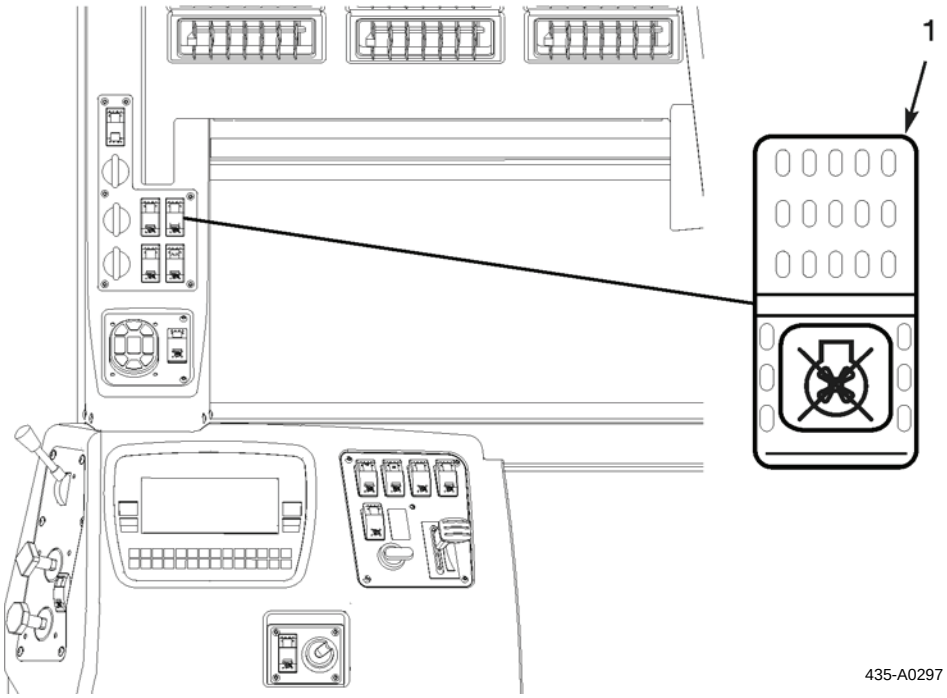


Figure 84. Cooling Fan Inhibit Switch Location

ENGINE COOLING FAN INHIBIT FACILITY – CONTINUED

Switch Operation - Continued

CAUTION

The cooling fan inhibit mode is positively switched. Once the mode is operated, the condition will remain until the switch is operated to re-enable the fan. Do not operate the machine for extended periods with the fan inhibited. Be aware of the engine coolant temperature. Failure to follow this caution may lead to damage to equipment.

1. **Inhibit Fan.** With the ignition turned ON and the engine running, the fan inhibit facility can be activated. This reduces drive torque to fan. To activate the facility, press the bottom of the operating switch (Figure 85, Item 1); the switch icon will illuminate. The EMS unit will show the message “COOL FAN OFF.” Press the OK button on the EMS to confirm the request. The EMS will then inhibit the engine cooling fan. As confirmation the EMS will display the message “COOL FAN OFF.” This message will remain until the fan is enabled. The EMS will also sound a buzzer initially for 5 seconds, and thereafter for 2 seconds every 10 seconds. A warning light on the front console warning light panel will also be illuminated while the fan is deactivated.
2. **Enable Fan.** Press the top of the operating switch (Figure 85, Item 1). The switch illumination will be extinguished, the front console warning light panel light will be extinguished, and the EMS unit will extinguish the text message and silence the buzzer. When all the warning displays are extinguished, the engine fan will be enabled.

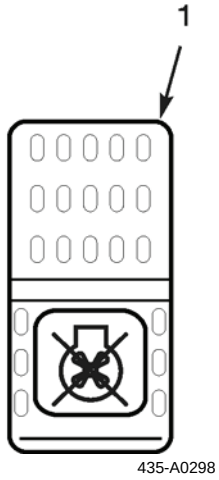


Figure 85. Cooling Fan Inhibit Switch

END OF TASK

HOOD AND NOSECONE

The hood on the HMEE-I is sectional, comprising a nosecone, the main hood section, and a fixed plenum panel. The design allows for greater access and ease of maintenance.

WARNING

The engine has rotating parts. Do not open the engine compartment hood while the engine is running. Do not use the machine with the engine compartment hood open. Do not place hands in the engine compartment with the engine running. Failure to follow this warning may result in injury or death to personnel.

NOTE

Loader arms must be raised to open hood and nosecone.

Opening Hood and Nosecone

1. Release the latches on both sides of the main hood (Figure 86, Item 1).
2. Release the latches on both sides of the nosecone (Figure 86, Item 2).

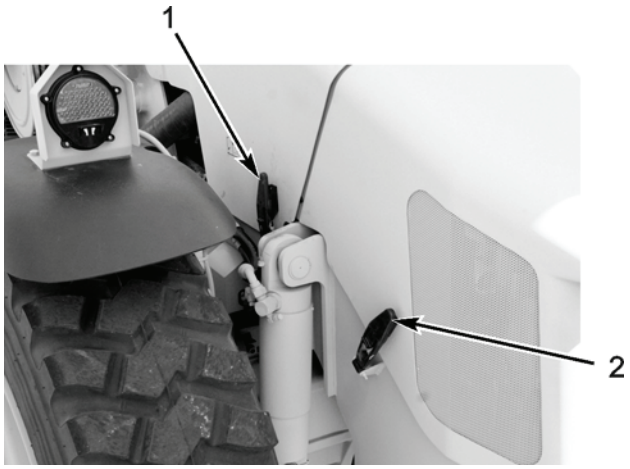


Figure 86. Opening Hood and Nosecone

HOOD AND NOSECONE – CONTINUED

Opening Hood and Nosecone - Continued

3. Lift the main hood (Figure 87, Item 3); at approximately 20 degrees it will start to rise automatically, assisted by the gas struts, until it reaches the fully open position where it will be held by the gas struts.
4. Lift the nosecone (Figure 87, Item 5) from the back edge (the nosecone opens forward) until it is fully open and restrained by its cable.

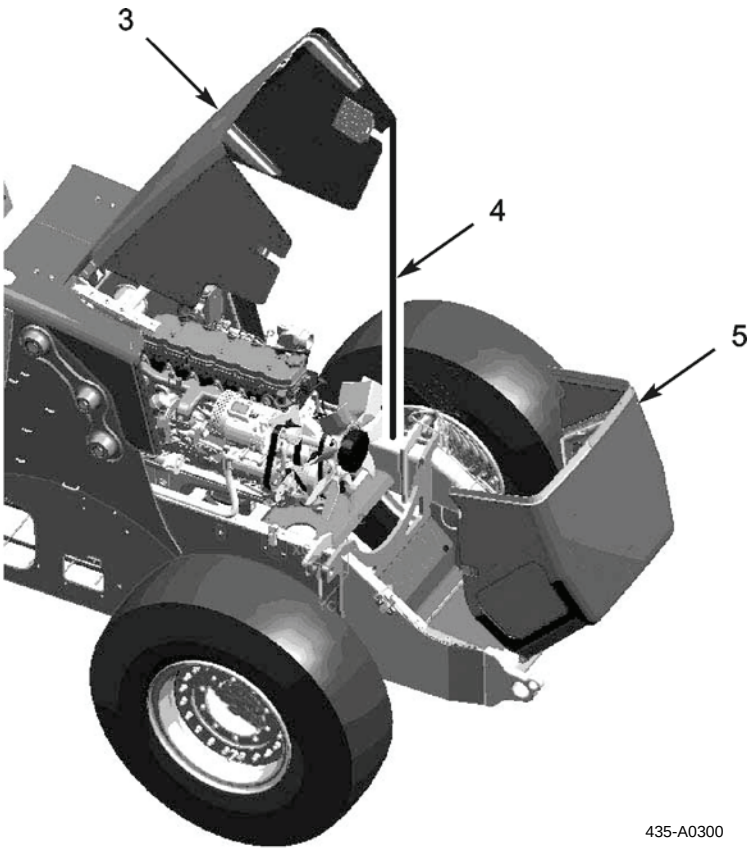


Figure 87. Closing Hood and Nosecone

Closing Hood and Nosecone

Close the nosecone. Pull down the main hood by means of the cable (Figure 87, Item 4) and secure the latches.

END OF TASK

EMERGENCY HYDRAULICS

The HMEE-I has an emergency hydraulic function. It utilizes an electrically driven hydraulic pump powered by the machine's batteries. If main hydraulic power is lost, this system can provide enough power to raise the loader arms, backhoe, and stabilizers ready for machine recovery. The system can then be switched to provide hydraulic power to the steering to provide limited assistance during recovery. Fully charged batteries should provide power for approximately 4 minutes.

CAUTION

Use the emergency hydraulics only in the event of main hydraulic failure, to stow the loader arms, backhoe and stabilizers ready for machine recovery, or to provide emergency steering. Using the emergency hydraulics in any other situation or for any other purpose can cause equipment failure.

Activate Emergency Circuit

1. Open the left dash fuse access panel (Figure 88, Item 1).
2. Release the locking latch (Figure 88, Item 2) on the operating switch (Figure 88, Item 3) by sliding the latch to the left and press the latch end of the switch down. The emergency circuit is now operational.

NOTE

Before selecting steering system, turn ignition switch on.

3. Switch the changeover switch to activate either the loader hydraulic (Figure 88, Item 4) or steering systems (Figure 88, Item 5).
4. Close the access panel (Figure 88, Item 1).
5. Operate the loader and/or backhoe controls as required, or the steering system dependant on current settings and requirements.

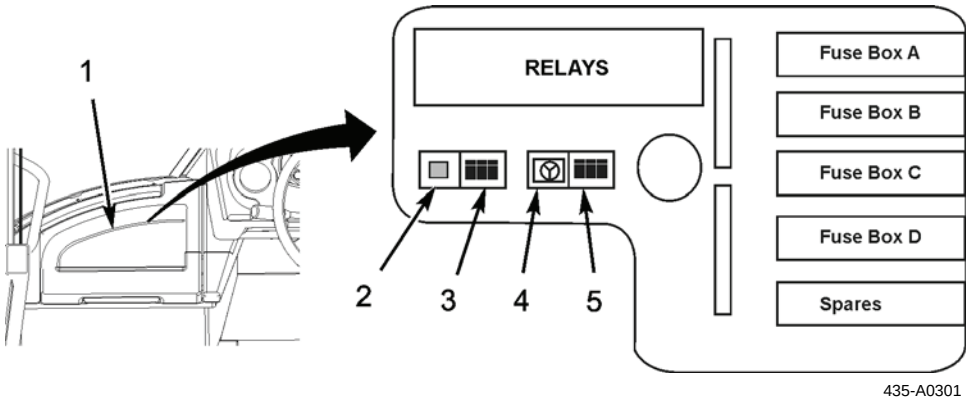


Figure 88. Emergency Hydraulics Circuit

Deactivate Emergency Circuit

1. Open the left dash fuse access panel (Figure 88, Item 1).
2. Press the non-latch end of the switch (Figure 88, Item 3) down. Ensure the switch has locked in the OFF position by pressing on the latch end without releasing the latch. You should not be able to push the switch (Figure 88, Item 2) down. The emergency circuit is now turned OFF.
3. Close the access panel (Figure 88, Item 1).

END OF TASK

HVAC

Air Conditioning

WARNING

The A/C system is a closed loop system and contains pressurized refrigerant. No part of the system should be disconnected until the system has been discharged. Failure to follow this warning may result in you being severely frostbitten or injured by escaping refrigerant.

CAUTION

To keep the A/C system in good condition during the winter months, it is advisable to periodically switch on the system for a short time.

1. To obtain A/C, select the A/C position on the change-over switch (Figure 89, Item 1) by pressing on the upper section of the switch.
2. To control the temperature from ambient downward, turn knob (Figure 89, Item 2) to the desired setting.
3. Turn on the A/C fan switch (Figure 89, Item 3) to the desired speed.

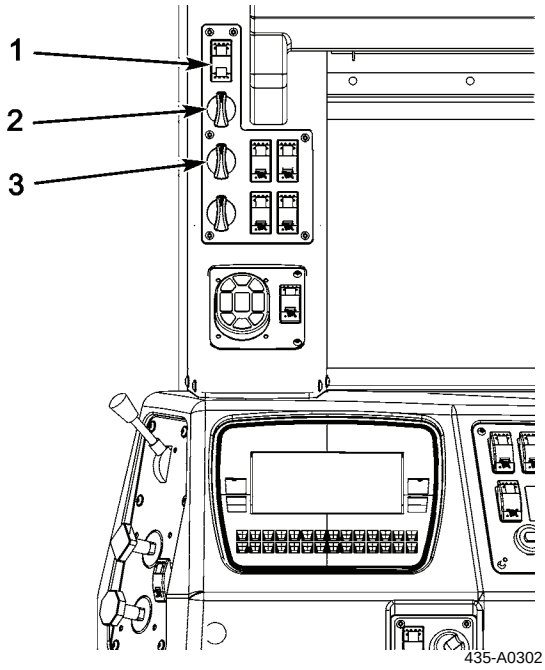


Figure 89. Air Conditioning

HVAC – CONTINUED

Heating

To admit heated air through vents to the operator's footwell area and windshield de-misting slots, press on the lower section of the change-over switch (Figure 90, Item 1) and select the desired temperature using heat control (Figure 90, Item 2). Select a suitable fan speed by turning knob (Figure 90, Item 5).

Defrosting

To provide maximum defrosting of the windows, press on the upper section of the change-over switch (Figure 90, Item 1), select fan speed 3 on knob (Figure 90, Item 5), select maximum temperature on control (Figure 90, Item 4), and close driver's footwell vents.

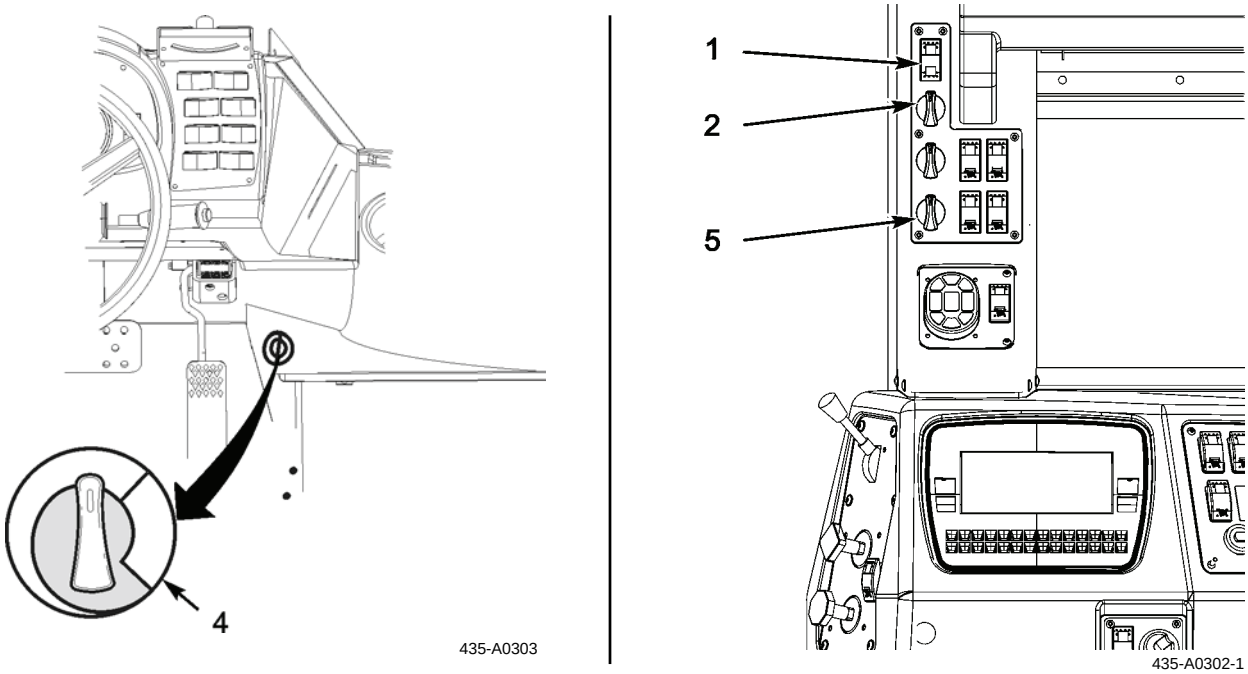


Figure 90. Heater/Defroster

HVAC – CONTINUED

Supplementary Cab Heater

The machine is equipped with a supplementary heating system, which is a self-contained cab mounted heater unit fueled from the machine's main fuel tank. The heater unit is mounted in the space beneath the passenger seat.

CAUTION

The heater unit is mounted in the space beneath the passenger seat. Do not block the inlet or outlet grille with equipment or clothing. Serious damage may result from overheating of the heater.

1. Turn the control knob (Figure 91, Item 6) clockwise to the first notch.

NOTE

There will be a 5-second delay while the heater completes its system self-test. After that, there will be an approximate 1-minute delay until the heater blows hot air, with maximum heater output available within 2 minutes.

2. Turn the control knob (Figure 91, Item 6) clockwise to set the thermostat to the required temperature.

NOTE

If the cab is already up to temperature, the heater will come on and cycle low.

3. To turn the heater OFF, turn the control knob (Figure 91, Item 6) counterclockwise until it stops. The blower motor may continue to run for up to 3 minutes as the heater cools down. Once the blower stops running, the heater is completely OFF.

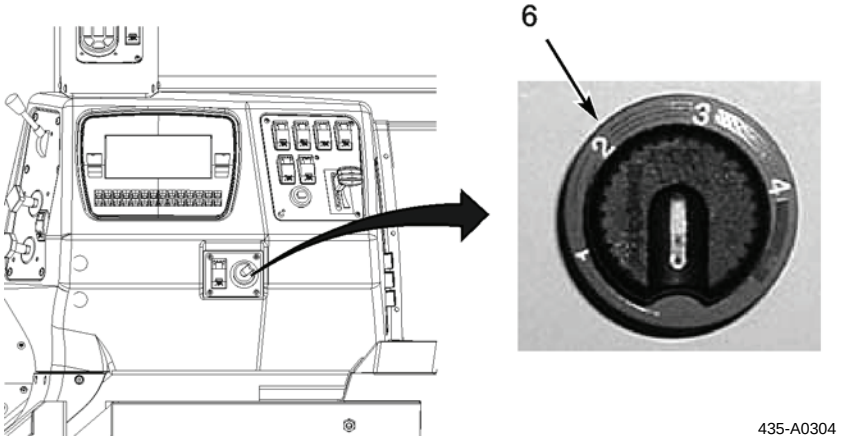


Figure 91. Supplementary Cab Heater - Control Knob

FIRE EXTINGUISHER

The portable fire extinguisher (Item 6, Table 2, WP 0031) contains “dry powder” and is intended for use extinguishing local fires inside or outside the machine.

WARNING

Dry-powder fire extinguishers can cause suffocation. Exit the machine immediately after discharging fire extinguisher. Handle fire extinguisher carefully. Do not bang or drop the cylinder. Failure to follow this warning may result in injury or death to personnel.

1. Remove extinguisher (Figure 92, Item 1) from its stowage bracket (Figure 92, Item 2).
2. Hold the extinguisher upright, and remove safety pin (Figure 92, Item 3) which will snap the tamper-proof seal (Figure 92, Item 4).
3. Stand back from the fire a safe distance and aim, wherever possible, at the base of the fire.
4. Keeping the extinguisher upright, squeeze the triggers (Figure 92, Item 5) together to discharge and sweep from side to side to cover the whole area of the fire. Move closer as the fire is extinguished but not so close as to scatter burning material. Release the triggers to stop the discharge as soon as the fire is extinguished.
5. Watch out for re-ignition and use any remaining powder to extinguish.
6. At the first opportunity, notify Unit Maintenance about a discharged fire extinguisher.

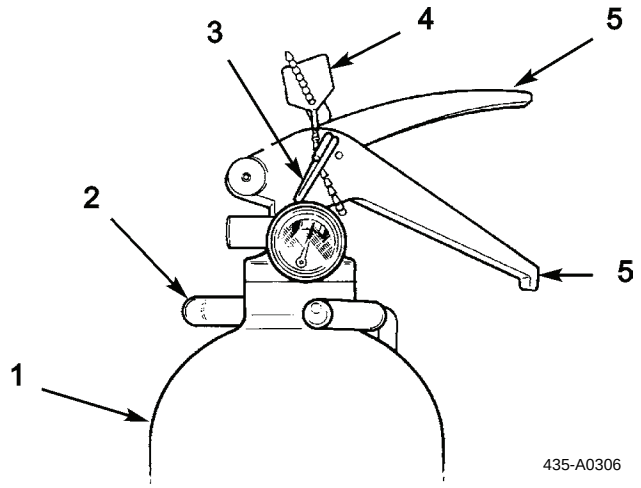


Figure 92. Fire Extinguisher

FIRE EXTINGUISHER – CONTINUED

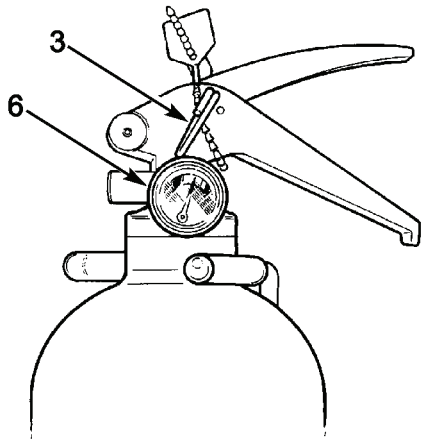
Checking the Fire Extinguisher

1. Check the fire extinguisher for damage, security, and signs of leaking.
2. Ensure the gauge (Figure 93, Item 6) shows a full charge, i.e., the pointer is in the green segment.

NOTE

If the needle is in or near the red segment at either end of the gauge, the extinguisher must be serviced or replaced. Notify Unit Maintenance.

3. Ensure the safety pin (Figure 93, Item 3) is fitted and secure.
4. The extinguisher should be serviced every 12 months. Check the introduction into service/last serviced date stamp label on the extinguisher. Report to Unit Maintenance any extinguisher with a last serviced date exceeding 11 months.



435-A0306-1

Figure 93. Checking Fire Extinguisher

END OF TASK

SERVICE LIGHT REPOSITIONING

Under normal circumstances the service lights are to be fitted to the cab “A” posts. However, when the machine is to be used on the road, the service lights need to be repositioned to conform with the lighting regulations. In the on-road position the service lights are located on top of the front bucket. Their alignment has been pre-set by the use of special locating dowels.

Position Service Lights for Road Travel

1. Release the securing clamp (Figure 94, Item 2).
2. Lift the service light (Figure 94, Item 3) by the front edge and slide from support frame (Figure 94, Item 4).
3. Disconnect the wiring harness behind the service lights (Figure 94, Item 3) by releasing the multi-plug connector (Figure 94, Item 1).

NOTE

Blackout drive light is attached to left-hand service light.

4. Repeat for second service light.

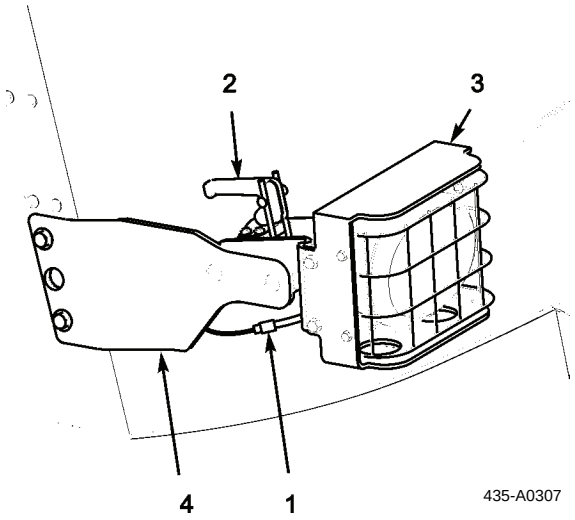


Figure 94. Positioning Service Lights for Road Travel

SERVICE LIGHT REPOSITIONING – CONTINUED

Position Service Light for Road Travel - Continued

WARNING

If the bucket or the holding brackets are damaged so that the service lights cannot be positively located or firmly secured, notify Unit Maintenance. Do not use the machine on a public road when service lights are required unless they are correctly located and secured. Failure to follow this warning may result in injury to personnel and/or other road users.

5. Position service light (Figure 95, Item 3) into holding bracket (Figure 95, Item 5) on front bucket and ensure it locates fully on its mountings.
6. Secure service light (Figure 95, Item 3) in position using latch (Figure 95, Item 2).

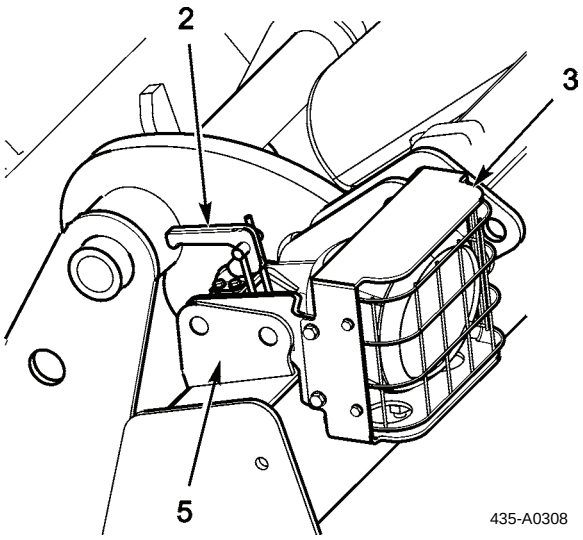


Figure 95. Positioning Service Lights for Road Travel

SERVICE LIGHT REPOSITIONING – CONTINUED

Position Service Light for Road Travel - Continued

7. Once both service lights are secured, remove the lighting cable (Item 11, Table 2, WP 0031) from the toolbox and connect between the service lights (Figure 96, Items 6 and 7) and chassis multi-plug connector (Figure 96, Item 8).

CAUTION

Ensure the lighting cables are secure and not trapped.

NOTE

Screw caps together.

8. Check the operation of the service lights.

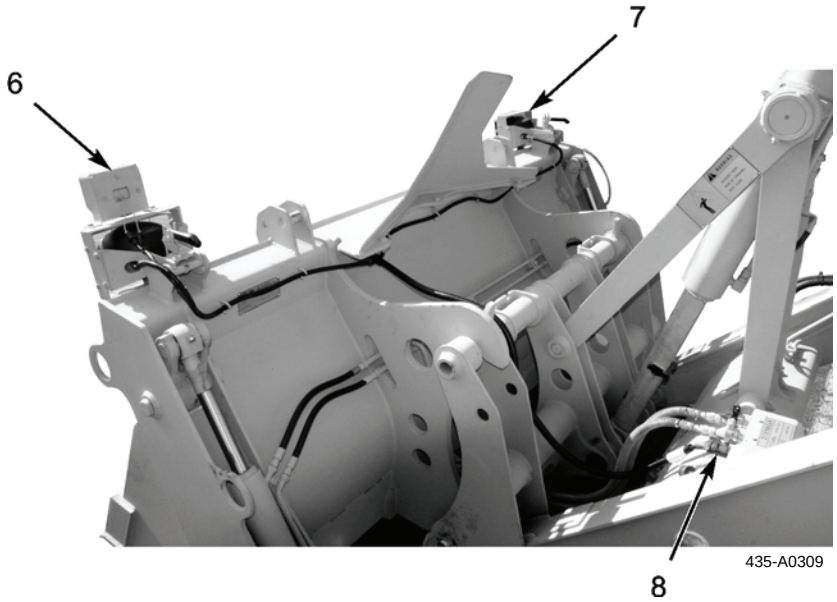


Figure 96. Positioning Service Lights for Road Travel

Position Service Light for Loading and All Off-Road Use

CAUTION

Before carrying out any loading operations, service light must be located on cab “A” posts. Failure to comply will result in damage to equipment.

To position service lights for all operations except on-road use, reverse the above procedure.

END OF TASK

QUICK-RELEASE COUPLINGS

Flat face quick-release couplings allow the operator to remove and install work tools swiftly and efficiently. Generally, your machine pipe work will have male and female couplings. The optional work tool hoses will have corresponding female and male couplings.

The quick-release couplings should be trouble free and relatively easy to connect and disconnect, provided they are kept clean and used correctly. The instructions listed below should always apply when using flat face quick-release couplings.

Follow the correct fitting and releasing procedures before installing or removing any optional work tool fitted with quick-release couplings.

Quick-Release Couplings – Do's & Don'ts

DO wipe the two faces of the coupling and ensure they are clean before connecting.

DO ensure the outside sleeve (female coupling) is pulled back when disconnecting.

DO connect and disconnect a new coupling two or three times to "work" the seals – sometimes a new coupling will stick if the seals have not been "worked."

DO use a spanner on the hexagonal flats of the coupling when fitting adaptors.

DO use a rubber or hide hammer to disconnect a coupling if it sticks – sticking may occur if there is dirt present in the coupling.

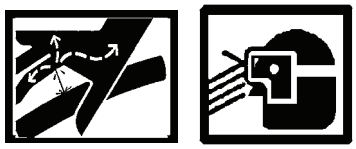
DON'T attempt to reconnect a damaged half coupling – this will destroy the seals and necessitate replacing both half couplings.

DON'T leave the coupling where it may be run over by a machine or otherwise crushed – this will distort the coupling sleeve and prevent correct connection and disconnection.

DON'T clamp on the smooth diameter of the coupling when fitting adaptors – always use the hexagon.

DON'T damage the faces of the couplings – this can prevent connection and disconnection, or damage seals and cause leakage.

DON'T try to dismantle the couplings – they are non-serviceable parts. If a coupling is damaged it should be replaced with a new one.



WARNING

Hydraulic fluid at pressure can injure you. Before attempting to connect or disconnect attachment couplings remove any residual hydraulic pressure trapped in the service lines by fully operating all the control levers pertaining to the circuit to be connected. Failure to follow this warning may result in injury to personnel.

QUICK-RELEASE COUPLINGS – CONTINUED

Connecting Quick-Release Couplings

1. Stop the engine (WP 0005).
2. Remove any residual hydraulic pressure trapped in the service line hose by operating the control levers several times in both directions.
3. Wipe the two faces (Item 17, WP 0033) of the male (Figure 97, Item 1) and female (Figure 97, Item 2) couplings and ensure they are clean.
4. Fit the male couplings into the female couplings. Ensure the sleeve on the female coupling snaps into place.

Disconnecting Quick-Release Couplings

1. Stop the engine (WP 0005).
2. Remove any residual hydraulic pressure trapped in the service line hose by operating the control levers several times in both directions.
3. Rotate sleeve (Figure 97, Item 3) until sleeve lock pin (Figure 97, Item 4) aligns with the cut out (Figure 97, Item 5). Pull back sleeve to release the coupling.

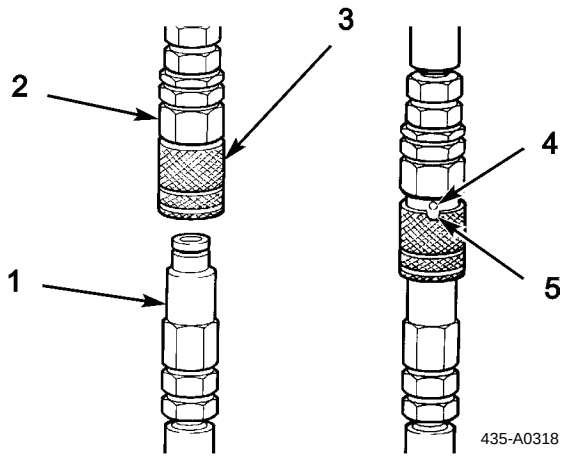


Figure 97. Quick-Release Couplings

END OF TASK

AUXILIARY HYDRAULIC CIRCUIT (HAND TOOLS)

The machine is equipped with an auxiliary hydraulic circuit to power the hand held tools (impact wrench, chainsaw, etc.). When the circuit is enabled, hydraulic power is supplied by the hydraulic circuit to the auxiliary tool reel hoses. The circuit is enabled by a switch (Figure 98, Item 1) in the cab. When the switch is turned OFF, the hydraulic supply to the auxiliary hoses will be disconnected, allowing safe disconnection of the hand tool. The circuit also includes an external circuit deactivation switch (Figure 99, Item 2) mounted outside the machine next to the hose reel. This switch is a simple push OFF/pull ON, red emergency type switch. When operated it will deactivate the tool reel hydraulic circuit, removing all pressure to the tool. The circuit will automatically be deactivated if the parking brake is released, drive is selected, or if the engine is stopped.

Circuit Operation

With the system activated, oil is diverted to the circuit from the steering, thereby removing power steering ability while the tools are being operated. However, should any transmission mode other than neutral be made, the supply will be returned to the steering and the tool reel supply will be terminated.

NOTE

For the auxiliary hydraulic circuit to provide the optimum pressure for the tools circuit, set the hand throttle, once the circuit is activated, to achieve an engine speed of 1,250 rpm.

Switch Location

The operating switch is located in the switch bank to the right of the operator (when the operator is facing the front of the machine) on the cab “B” post.

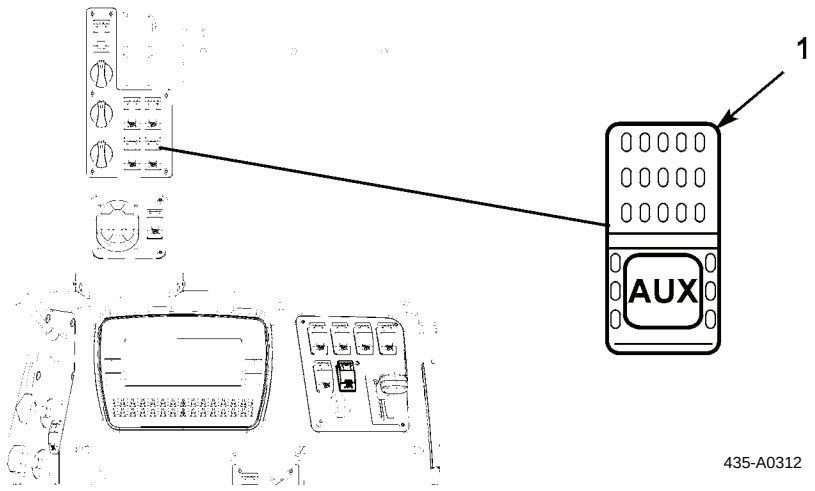
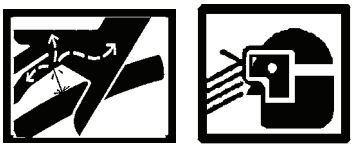


Figure 98. Switch Location

AUXILIARY HYDRAULIC CIRCUIT (HAND TOOLS) – CONTINUED

Enable Auxiliary Hydraulic Circuit (Hand Tools)



WARNING

Wear effective eye protection and gloves. Hydraulic fluid at pressure can injure you. Before attempting to connect or disconnect attachment couplings, remove any residual hydraulic pressure trapped in the service lines. Failure to follow this warning may result in injury or death to personnel.

NOTE

The operating switch is of a momentary spring return type, so will return to the OFF position when released (confirmation of the circuit's status is by the switch icon illumination). The switch icon will illuminate to confirm the circuit is now enabled. (If the circuit fails to deliver hydraulic power, ensure the external deactivation switch has not been operated. If it has, reset the switch by pulling the switch out, and restart the above procedure.) If the circuit is deactivated by the engine being stopped, the parking brake being released, or the external deactivation button having been pressed, this will be confirmed by the switch icon light being extinguished. The above procedure must be followed to reactivate the circuit.

Press the bottom of the operating switch (Figure 98, Item 1) in.

Disable Auxiliary Hydraulic Circuit (Hand Tools)

NOTE

When the circuit is deactivated, the hydraulic system is designed to vent the pressure from the auxiliary tool lines back to the tank. This will enable you to connect/disconnect the quick-release couplings.

Press the bottom of the switch (Figure 98, Item 1) in. The switch illumination will be extinguished to confirm the circuit is deactivated.

Once the circuit has been deactivated, operate the tool activation trigger to vent any residual pressure held in the line before disconnecting the hoses.

AUXILIARY HYDRAULIC CIRCUIT (HAND TOOLS) – CONTINUED

External (Emergency) Deactivation Switch

Switch Location. The deactivation switch (Figure 99, Item 2) is located on the hose reel bracket (Figure 99, Item 3) on the right-hand side of the machine.

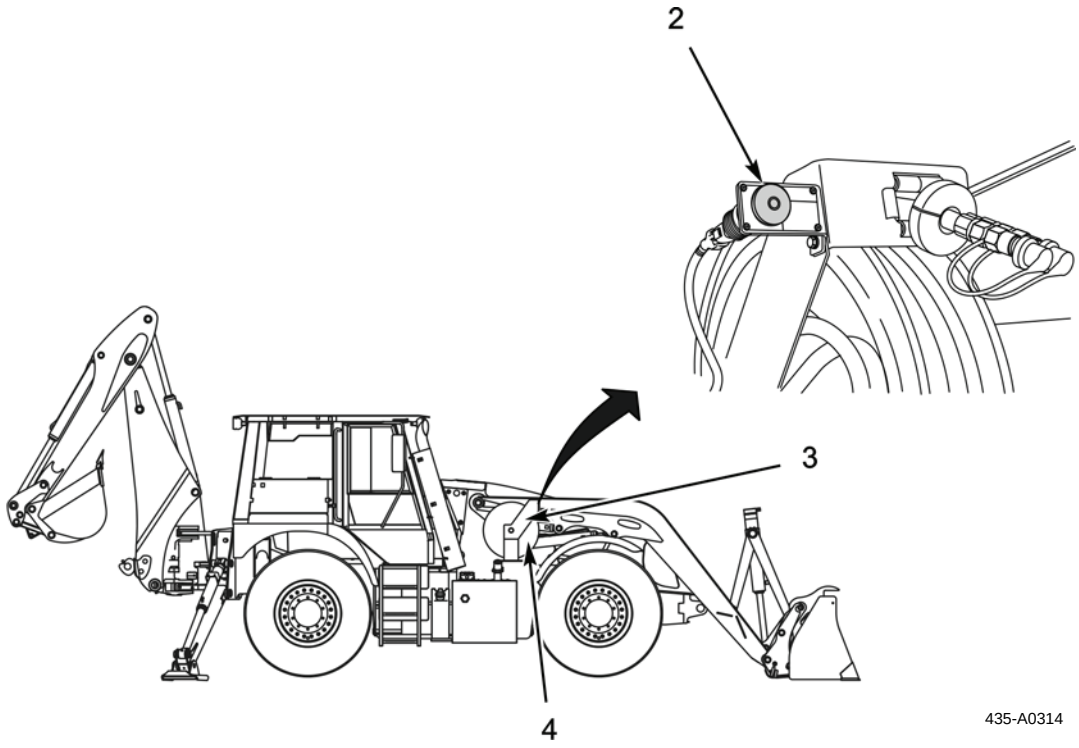


Figure 99. Switch Location

Operation.

1. **Deactivate Circuit (Using External Deactivation Switch).** To deactivate the hydraulic service, push the switch (Figure 99, Item 2) in. The hydraulic circuit will be deactivated. The pressure in the hoses will be vented to tank.
2. **Reactivate the Circuit.**

NOTE

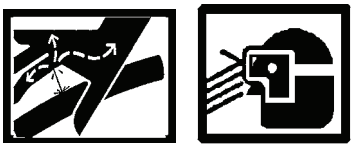
If the external deactivation switch is used, the following procedure must be used to reactivate the system. Simply pulling out the external deactivation switch will not reactivate the system.

a. Pull the switch (Figure 99, Item 2) out. This will reset the external circuitry only; it will not reactivate the circuit.

b. Operate the circuit activation switch as described above *(Enable Auxiliary Hydraulic Circuit [Hand Tools])*.

AUXILIARY HYDRAULIC CIRCUIT (HAND TOOLS) – CONTINUED

Attaching Hydraulic Hand Tools and Hose Reel Operation



WARNING

- Do not activate the hydraulic tool circuit when the tools are disconnected from the hose reel fittings. Doing so will cause excessive oil temperature resulting in damage to the pump and possible injury to personnel.
- Always connect the tool to the reel hydraulic lines before activating the hydraulic reel circuit. Failure to follow this warning may result in injury to personnel.

NOTE

The following procedures apply to all hydraulic tools.

1. Lay tool on tarp or clean, dry surface.
2. Pull the hoses (Figure 99, Item 3) from the reel (Figure 99, Item 4).

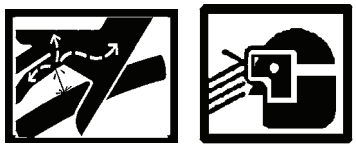
CAUTION

Wipe the quick-release coupling with a lint-free cloth before attaching the hoses. Damage to the internal parts of the tool could result from dirt on the couplings.

3. Clean the couplings of both the tool and the hoses with a clean, lint-free cloth.
4. Connect the quick-release coupling between the tool and the hoses.
5. Switch ON the hydraulic circuit activation switch in the cab.

AUXILIARY HYDRAULIC CIRCUIT (HAND TOOLS) – CONTINUED

Disconnecting Hydraulic Hand Tools



WARNING

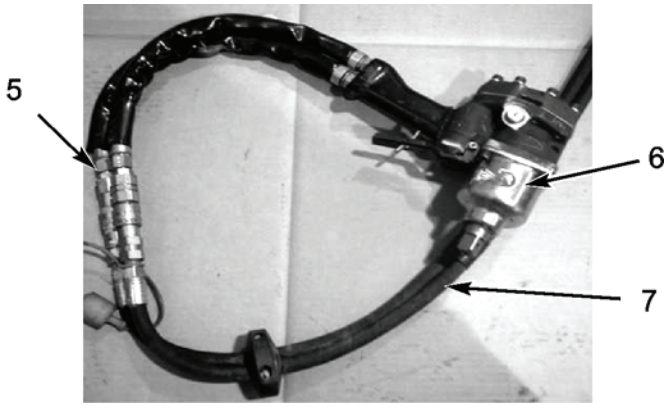
Ensure the hydraulic hose reel activation switch is turned OFF before attempting to disconnect the hose reel hoses from the tool. Failure to do so may result in injury to personnel.

1. Lay tool on tarp or clean, dry surface.

NOTE

When the hydraulic hose reel activation switch is turned OFF, the circuit will automatically release any residual pressure in the hoses so they can be uncoupled safely.

2. Switch OFF the hydraulic hose activation circuit switch.
3. Unlock the quick-release couplings (Figure 100, Item 5).
4. Wipe the quick-release couplings (Figure 100, Item 5) and the tool (Figure 100, Item 6) clean.



435-A0315

Figure 100. Disconnect Hydraulic Hand Tools

AUXILIARY HYDRAULIC CIRCUIT (HAND TOOLS) – CONTINUED

Retracting the Hose

NOTE

Ensure deactivation switch (Figure 101, Item 2) is pulled out.

1. Wipe the hoses (Figure 100, Item 7) with a clean rag while retracting them onto the hose reel (Figure 101, Item 4).
2. Ensure the hoses (Figure 101, Item 3) retract smoothly and fully onto the hose reel (Figure 101, Item 4). Report any difficulties retracting the hoses correctly to Unit Maintenance.

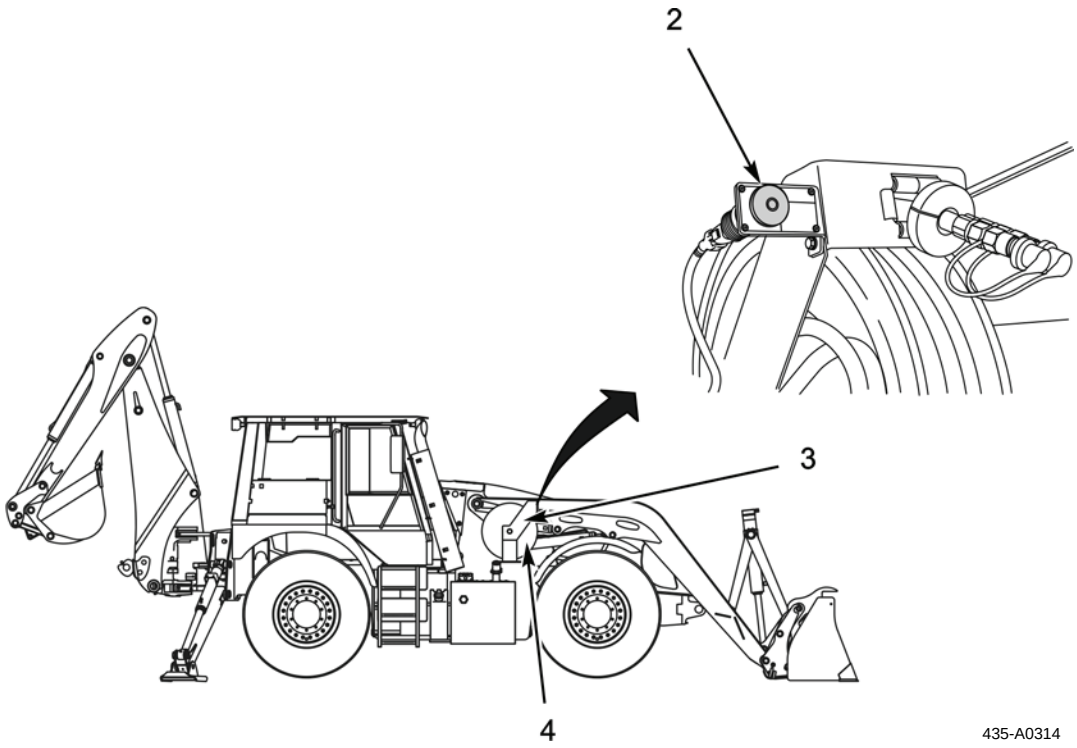


Figure 101. Switch Location

TOWING PINTLE

The towing pintle is mounted to a frame attached to the backhoe boom. The frame can be secured in either of two positions. Under normal operating conditions, the pintle will be mounted in the “stowed” position to give the maximum amount of clearance. For operations where towing a trailer is required, the frame and pintle will need to be moved to the “deployed” position.

Stowed Position

WARNING

Install backhoe boom lock before deploying/stowing the tow pintle. Failure to do so may result in injury to personnel.

For all operations other than towing, the pintle frame (Figure 102, Item 1) should be positioned as shown below.

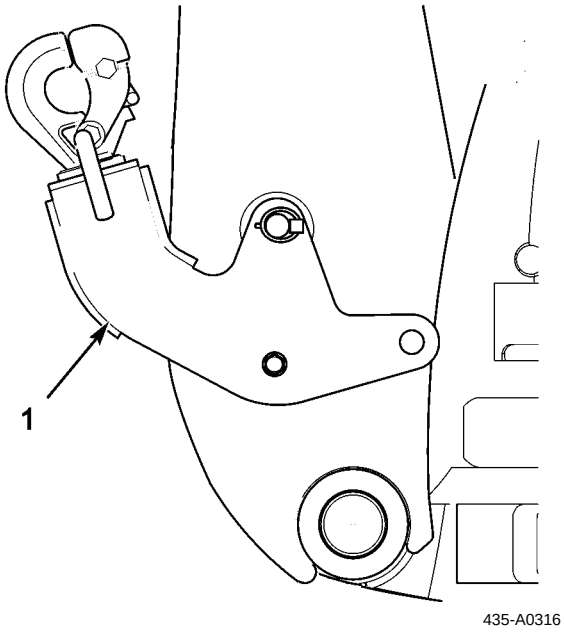


Figure 102. Stowed Position

TOWING PINTLE – CONTINUED

Deployed Position

When the mission requires the towing of a trailer, the pintle must be repositioned as detailed below.

1. Release the linch pin (Figure 103, Item 2) from the pivot pin (Figure 103, Item 3).
2. Support the pintle frame (Figure 103, Item 1) and withdraw pivot pin (Figure 103, Item 3).
3. Lower the pintle frame (Figure 103, Item 1) until the holes align with the lower holes in the boom.
4. Install the pivot pin (Figure 103, Item 3) and secure with the previously removed linch pin (Figure 103, Item 2).

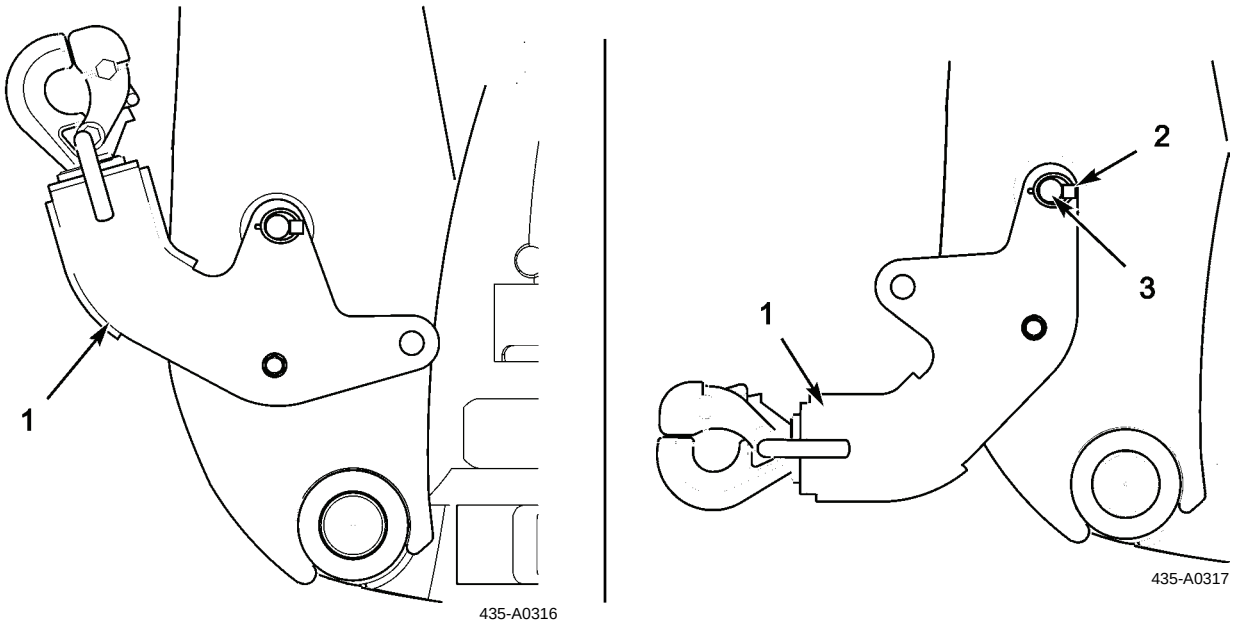


Figure 103. Deployed Position

TOWING PINTLE – CONTINUED

Operate Pintle

1. Remove secondary lock pin (Figure 104, Item 4).
2. Pull locking handle (Figure 104, Item 5) upwards.
3. Lift pintle lock (Figure 104, Item 6) of towing pintle.
4. Place tow bar in towing pintle.
5. Close pintle lock (Figure 104, Item 6).
6. Ensure the pintle lock handle (Figure 104, Item 5) has returned to the locked position and install the secondary lock pin (Figure 104, Item 4).

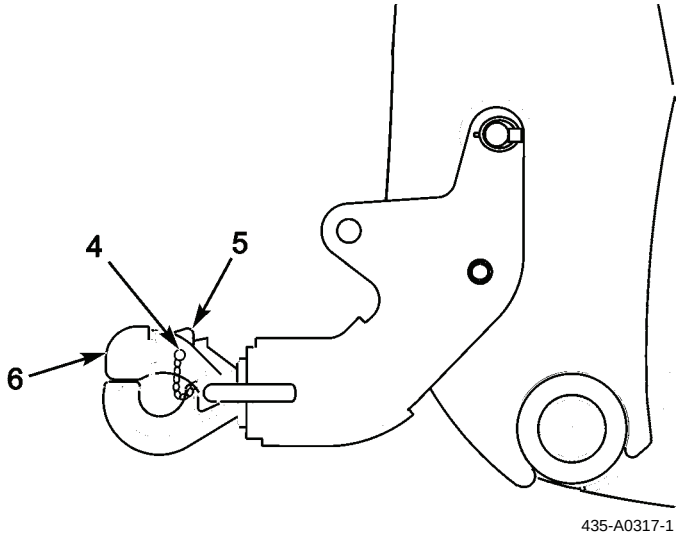


Figure 104. Operate Pintle

END OF TASK

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS

OPERATION UNDER USUAL CONDITIONS

Assembly and Preparation for Use, Engine Prestart Operation, Starting Engine, Normal Operation, Preparing for Road Travel, Machine Driving Procedures, Stopping and Parking Machine, Testing Parking Brake, Stopping Engine

INITIAL SETUP

Personnel Required	References
One	WP 0004 WP 0007 WP 0008 WP 0017 WP 0021 WP 0031

ASSEMBLY AND PREPARATION FOR USE

When a new machine is received by the unit, it must be thoroughly inspected. If anything is wrong with the machine, record it on DA Form 2404 or DA Form 5988-E. Check the machine for completeness of assembly. Ensure that all equipment and controls are present and in good shape. Check the Components of End Item (COEI) and Basic Issue Items (BII) against the lists in WP 0031 to be sure they are all present. Stow all COEI and BII in their designated stowage locations (WP 0007).

Initial Adjustment Checks and Self-Test. Perform all BEFORE operation checks and services in Preventive Maintenance Checks and Services (PMCS) (WP 0017).

END OF TASK

ENGINE PRESTART OPERATION

1. Before operating the machine, become familiar with the controls and indicators (WP 0004).
2. Adjust the operator's seat to a comfortable and safe position (WP 0004).
3. Ensure all doors are secured properly (WP 0004).
4. Engage the parking brake. The parking brake should have been engaged when the machine was last parked. If not already engaged, engage parking brake now (WP 0004).

WARNING

Before lowering the work tools to the ground, ensure that the machine and the area around it are clear of other personnel. Anyone close to the machine could fall and be crushed by the work tools, or get caught in the linkages. Failure to follow this warning may result in injury or death to personnel.

5. Lower the work tools to the ground. Ensure that both the loader and the backhoe are on the ground, or the backhoe is in its transport position (WP 0004).

ENGINE PRESTART OPERATION – CONTINUED

CAUTION

Use only a brush and damp rag to clean cab interior. Do not use a pressurized hose. Failure to follow this caution will cause damage to cab electronics.

6. Use a brush and damp rag to remove dirt and rubbish from the cab interior, especially around the pedals and control levers.

WARNING

Keep the machine controls clean and dry. Your hands and feet could slide off slippery controls. If that happens, you could lose control of the machine, which could result in injury or death to personnel.

7. Remove oil, grease, and mud from the pedals, control levers, and steering wheel.
8. Ensure that your hands and boots are clean and dry.

WARNING

Loose articles can fall and strike you or roll on the floor. You could be knocked unconscious, or the controls could get jammed. If that happens, you will lose control of the machine, which could result in injury or death to personnel.

9. Remove or secure all loose articles in the cab.
10. Adjust the steering column to a comfortable and safe position (WP 0004).
11. Set the rearview mirrors to give you a good view close behind the machine when you are correctly seated.
12. Fasten the seat belt(s) (WP 0004).
13. Check that the gear selection lever is in the Neutral position. If not, select Neutral now (WP 0004).
14. Check that the correct steering mode is selected (WP 0004).
15. Check that the correct suspension mode is selected (WP 0004).
16. Check that the correct drive mode is selected (WP 0004).

NOTE

- The cold start hydraulic valves are located on the right side of the machine behind the steps.
- If the cold start valves are incorrectly set, normal hydraulic services will fail to operate.

17. Check that the cold start hydraulic valves are in the correct position, as shown in Figure 1, for starting under normal ambient temperatures.

ENGINE PRESTART OPERATION – CONTINUED

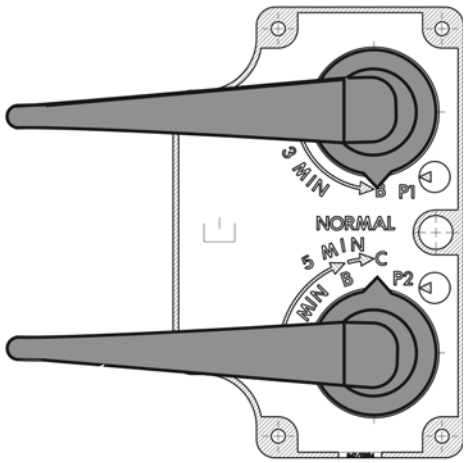


Figure 1. Cold Start Valves - Positions B and C

END OF TASK

STARTING ENGINE

NOTE

- Before starting the engine and driving the machine, perform all the Before operation procedures in PMCS (WP 0017).
- The engine will not start unless the gear selection column switch is in Neutral.

1. Turn battery disconnect switch to ON position (WP 0004).
2. Put the gear selection column switch (Figure 2, Item 1) in Neutral (WP 0004).

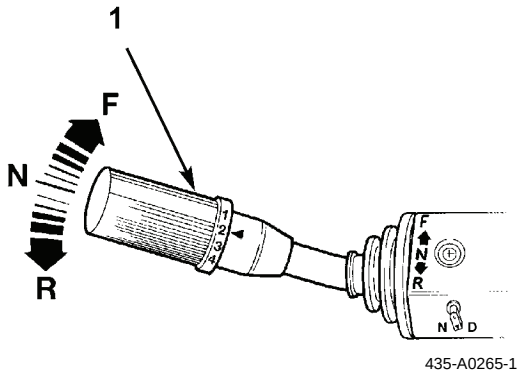


Figure 2. Gear Selection Column Switch

STARTING ENGINE – CONTINUED

3. Ensure the parking brake is ON and the throttle controls are in the idle position (WP 0004).

CAUTION

Do not crank the engine for longer than 30 seconds. Allow the starter to cool for 2 minutes before cranking again. Failure to do so could result in damage to equipment.

4. Turn the starter key (Figure 3, Item 2) to the "I" (ignition) position. Ensure the wait to start light on the EMS panel (WP 0021) has come on. When the light goes off to indicate that the engine pre-heat system has reached the required temperature, start the engine by turning the switch to the "S" (start) position. Once the engine has started, release the starter key; the key will return to the "I" position.

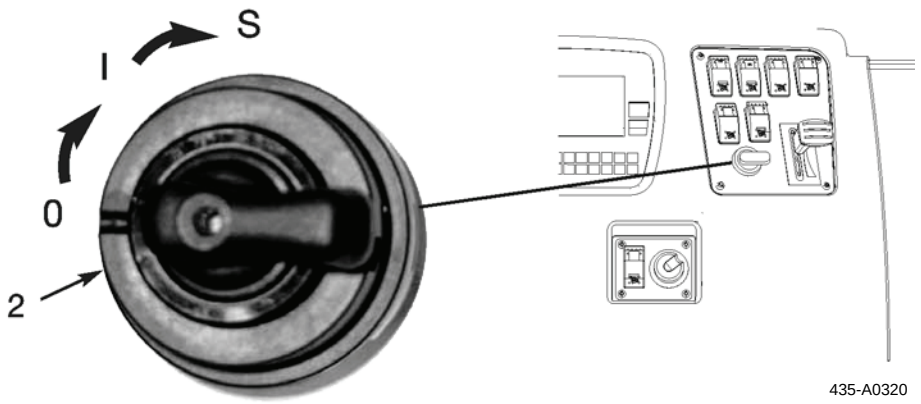


Figure 3. Starter Key

5. If the engine has not started after 30 seconds, release the starter key (Figure 3, Item 2). Wait 2 minutes before attempting another start. If the engine does not start after the third try, troubleshoot (WP 0008).

NOTE

Under certain conditions, the air intake heaters (grid heaters) can remain active or be reactivated by the engine ECU while the engine is running.

6. Ensure the warning lights on the display panel (WP 0004) have extinguished.

CAUTION

Under no circumstances should the engine be allowed to idle for extended periods as this could result in under lubrication; however, the engine should be operated gently for 3 to 5 minutes before putting it under heavy load. Failure to follow this caution could result in damage to equipment.

NOTE

- If any warning lights fail to go out or come on while the engine is running, stop the engine as soon as it is safe to do so, and troubleshoot (WP 0008).
- The electronic control system will cause the engine to run at an increased idle speed until the engine is warm and will prevent the engine speed from rising until the oil pressure is at the correct level. Stop the engine if the low oil pressure light does not go out after a few seconds. The engine will not respond to the throttle until all sensors have achieved required levels.

END OF TASK

NORMAL OPERATION

Once the engine has started, check the following gauges for normal engine operating ranges. If SYSTEM WARNING indicator lights and/or audible warning device sounds while operating the machine, check the following gauges and indicators for normal operation. Shut down the engine as soon as it is safe to do so.

CAUTION

If any of the following gauges or indicators indicate conditions out of the normal stated below, stop the engine and troubleshoot (WP 0008). Failure to follow this caution may result in damage to equipment.

1. All warning indicators should go out after the engine has run for about 20 seconds.
2. **Engine Coolant Temperature.** Displayed on the LCD bar graph (Figure 4, Item 1) should be below 212°F (100°C). If the temperature of the engine's coolant exceeds 221°F (105°C), the segments of the bar graph will flash and an audible warning will sound. Shut down the engine as soon as it is safe to do so and troubleshoot (notify Unit Maintenance).
3. **Transmission Oil Temperature.** A warning lamp (Figure 4, Item 2) will illuminate and the audible warning will sound if the transmission oil temperature is too high. Shut down the engine as soon as it is safe to do so and troubleshoot (notify Unit Maintenance).
4. **Engine Oil Pressure.** A warning lamp (Figure 4, Item 3) will illuminate and the audible warning will sound if the engine oil pressure is too low. Shut down the engine as soon as it is safe to do so and troubleshoot (notify Unit Maintenance). The oil pressure, with the engine running, is displayed in real-time on an LCD bar graph (Figure 4, Item 5).
5. **No Charge.** A warning lamp (Figure 4, Item 4) will illuminate and the audible warning will sound if the battery charging circuit fails. Shut down the engine as soon as it is safe to do so and troubleshoot (WP 0008).

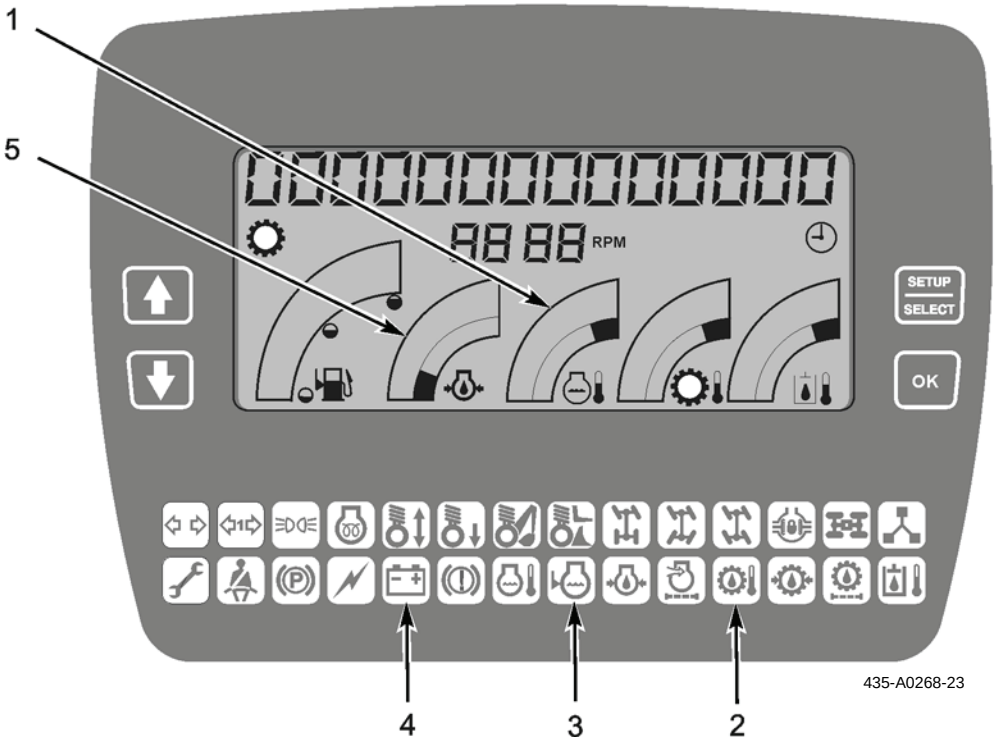


Figure 4. Normal Operation

NORMAL OPERATION – CONTINUED

NOTE

If the transmission oil filter light comes on when the engine is running and the oil is warm, the filter element requires changing. Contact Unit Maintenance.

6. **Transmission Oil Filter.** A warning lamp (Figure 5, Item 6) will illuminate and the audible warning will sound if the transmission oil filter requires replacing.

WARNING

If any of the warning lights and audible warnings associated with the braking systems illuminate or sound during the normal operation of the machine, stop the machine immediately. Do not use a machine with a brake system warning light illuminated or an audible warning device sounding. Failure to follow this warning could cause injury or death to personnel.

7. **Brake Fluid.** A warning lamp (Figure 5, Item 7) will illuminate and the audible warning will sound if the level in either of the four reservoirs falls too low. Shut down the engine as soon as it is safe to do so and troubleshoot (WP 0008).

NOTE

When the engine is started, the pressure builds up progressively though the circuits. The warning lights for the front and rear brake circuits should go out before the warning light for the parking brake. The foot brakes require air pressure to apply them, while the parking brake requires air pressure to release. This ensures the machine cannot be driven away until there is sufficient air pressure to operate the foot brake.

8. **Front Brake Circuit Air Tank Pressure.** A warning lamp (Figure 5, Item 7) will illuminate and the audible warning will sound if the air pressure is low in the relevant circuit.
9. **Rear Brake Circuit Air Tank Pressure.** A warning lamp (Figure 5, Item 7) will illuminate and the audible warning will sound if the air pressure is low in the relevant circuit.

NORMAL OPERATION – CONTINUED

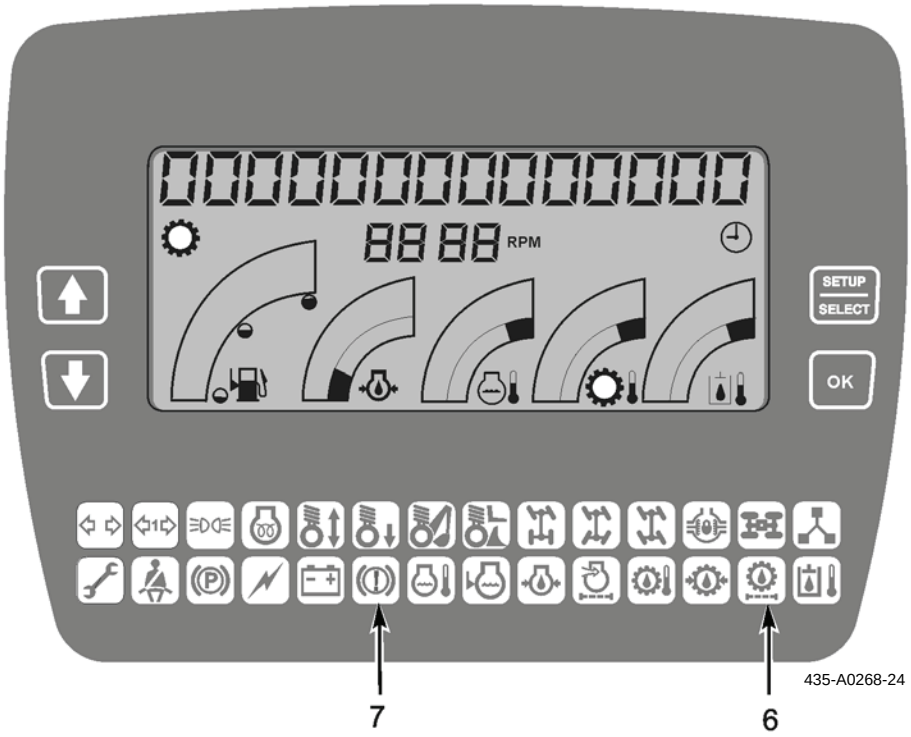


Figure 5. Normal Operation

END OF TASK

PREPARING FOR ROAD TRAVEL

1. Reposition the service lights for road travel (WP 0004).
2. Engage the backhoe boom lock (Figure 6, Item 1) and swing lock (Figure 6, Item 2) (WP 0004).
3. Ensure the rear stabilizers (Figure 6, Item 3) are fully raised (WP 0004).
4. Secure any additional equipment to be carried in the front bucket (Figure 6, Item 4).

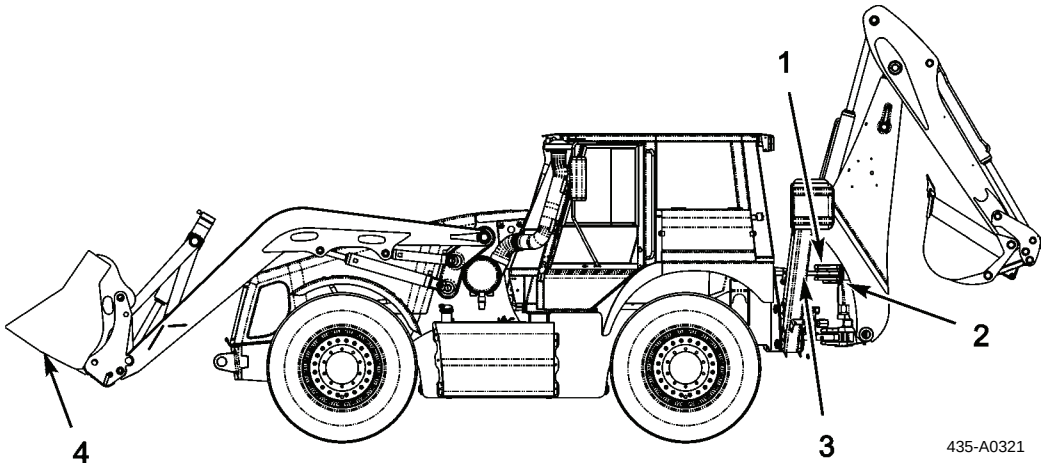


Figure 6. Preparing for Road Travel

CAUTION

Travel struts are required for road travel to prevent damage to equipment.

5. Fit the securing struts to the front bucket crowd ram (Figure 7, Item 5), front bucket arms (Figure 7, Item 6), and rear bucket crowd ram (Figure 7, Item 7) (WP 0021). Connect the protrusion lamp (built into the rear securing strut).
6. Select the correct suspension, steering, and drive modes for road travel:
   a. Select 2WS mode (WP 0004).
   b. Select 2WD mode (WP 0004).
   c. Select travel suspension mode (WP 0004).

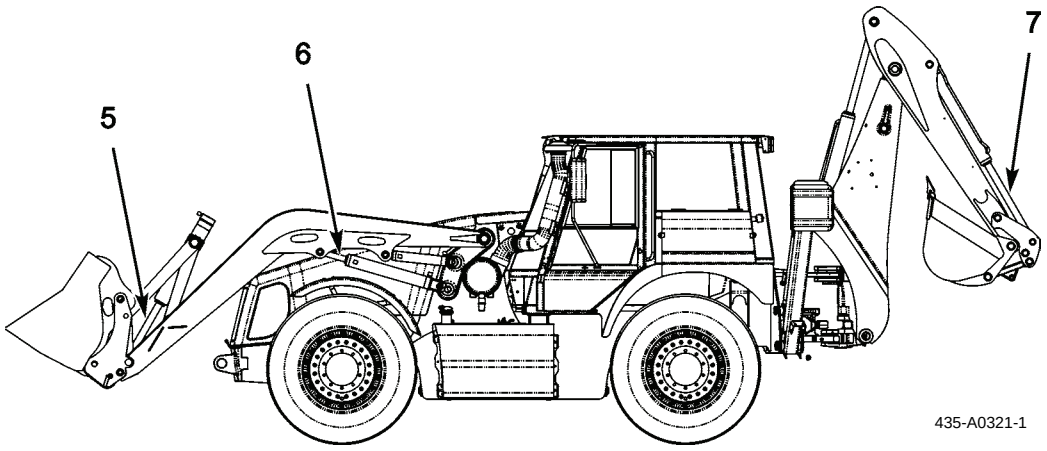


Figure 7. Struts

END OF TASK

MACHINE DRIVING PROCEDURES

WARNING

- Fasten seatbelt before operating machine. Failure to follow this warning may result in injury or death to personnel in the event of an accident or machine overturn.
- When moving the machine, keep it under control at all times. Stay alert for obstructions and possible hazards.
- Do not use the brake pedal as a footrest. Sudden application of the brakes may lead to injury to personnel.
- Select the necessary gear before starting down a slope. Use the same gear you would use to go up the slope. Do not change gear on the slope. If operating the machine in automatic transmission mode, select low gears in manual mode before starting down a steep slope.
- Use the brake pedal to prevent overspeeding down a slope.
- Approach deep mud in 1st gear with the front wheels straight.
- Failure to follow these warnings may result in injury or death to personnel or damage to equipment.

CAUTION

- The machine can be put in motion in any gear, but do not overwork the engine unnecessarily by using too high a gear, for example on a hill. Operating in too high a gear will overheat the torque converter fluid.
- Do not coast the machine in Neutral; you will not have full control. Also, coasting the machine will damage the transmission.

NOTE

After you have warmed up the engine and tested the parking brake, move off as described below.

1. **Check Your Seat Belt and Seat.** Ensure your seat belt is correctly fastened and adjusted (WP 0004).

CAUTION

Do not use 4WD on the road or hard surfaces, as it will cause excessive tire wear and fuel consumption.

2. **Select 2WD or 4WD.** Ensure you have selected the correct drive for the current situation (WP 0004).
3. **Select Required Steer Mode.** Ensure you have selected the correct steer mode (WP 0004).
4. **Select Required Suspension Mode.** Ensure you have selected the correct suspension mode (WP 0004).

WARNING

Always use a ground guide when driving machine with work tools, if visibility is impaired. Failure to use a ground guide may result in injury or death to personnel or damage to equipment.

5. **Work Tools**. Ensure the work tools are in one of their travel positions, with the correct support struts secured into place if required (WP 0021).

MACHINE DRIVING PROCEDURES – CONTINUED

6. **Apply Foot Brake.** Push down hard on the foot brake pedal and hold there (Figure 8, Item 1) (WP 0004).
7. **Release Parking Brake.** Release the parking brake (Figure 9, Item 3) (WP 0004).
8. **Select Forward/Reverse Gear.** Select the required gear using gear selection switch (Figure 8, Item 2) (WP 0004).

NOTE

When forward or reverse drive is selected, an audible alarm will sound and a warning light will show to remind you it the parking brake is still engaged.

9. **Release Brake Pedal.** Release the foot brake pedal (Figure 8, Item 1) (WP 0004).

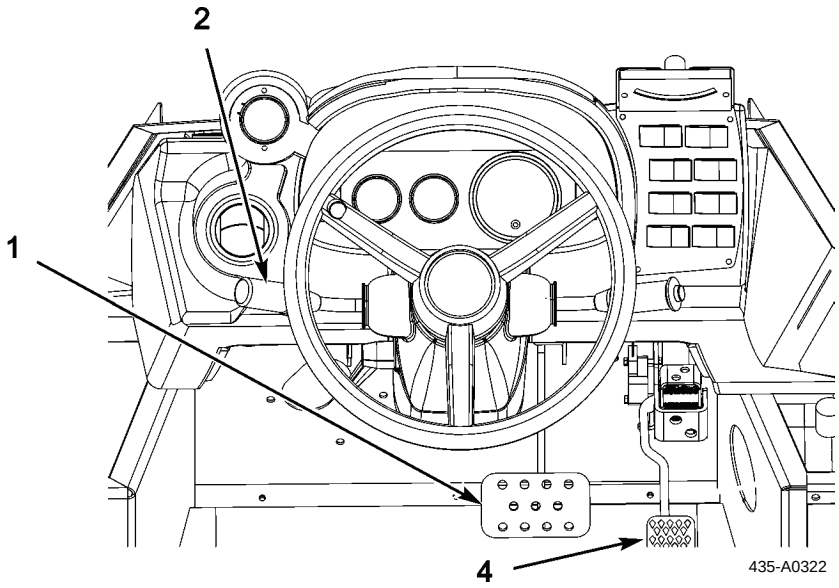


Figure 8. Apply Foot Brake

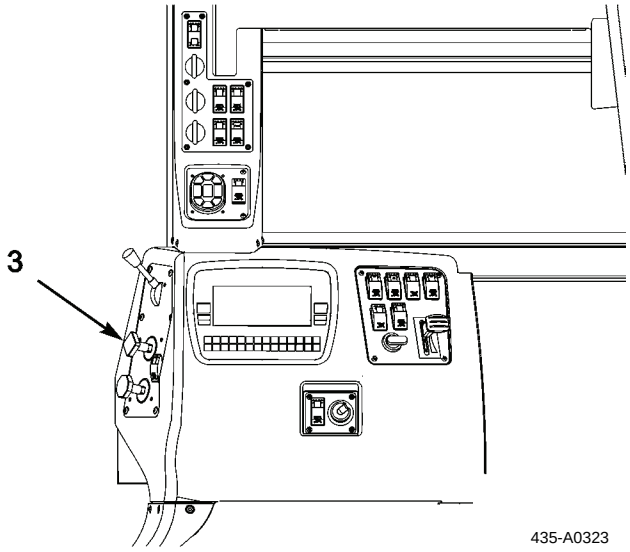


Figure 9. Release Parking Brake

MACHINE DRIVING PROCEDURES – CONTINUED

WARNING

- When driving the machine, use only the accelerator pedal to control the engine speed. Do not use the hand throttle lever to set the engine speed while driving. Failure to follow this warning may result in injury or death to personnel.
- Do not allow riders on machine. Failure to follow this warning may result in injury or death to personnel.

10. **Driving.** Ensure it is safe to drive away, then release the brake pedal (Figure 8, Item 1) and push down gradually on the accelerator pedal (Figure 8, Item 4).

END OF TASK

STOPPING AND PARKING MACHINE

Stop the machine on dry and level ground where it will not be a hazard. If the backhoe or stabilizers are to be extended when parking, ensure there is enough room.

WARNING

An incorrectly parked machine can move without an operator. Follow the instructions below to park the machine correctly. Failure to follow this warning may result in injury or death to personnel.

1. Ease up on the accelerator pedal (Figure 10, Item 1) and down on the brake pedal (Figure 10, Item 2) to bring the machine to a smooth stop. Keep the foot brake on until the parking brake has been engaged.

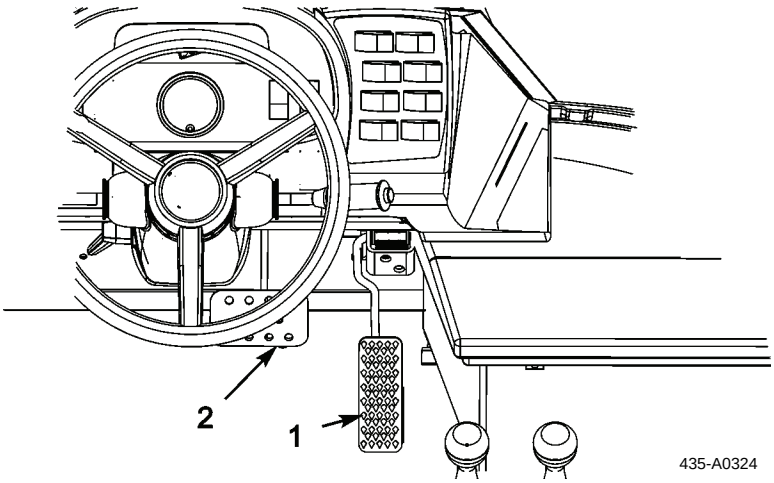


Figure 10. Accelerator/Brake Pedals

STOPPING AND PARKING MACHINE – CONTINUED

WARNING

- The parking brake must not be used to slow the machine from traveling speed, except in an emergency. Whenever the parking brake has been used in an emergency, the parking brake pads must be replaced. Contact Unit Maintenance and inform them the parking brake has been used to perform an emergency stop. Do not use the machine until new pads have been fitted. Failure to comply may result in injury or death to personnel.
- Do not dismount a moving machine. Failure to follow this warning may result in injury or death to personnel.
- Never leave operator compartment without engaging parking brake. Failure to follow this warning may result in injury or death to personnel.

2. Pull the parking brake button (Figure 11, Item 3) fully out. Ensure the parking brake indicator lights up. Release the brake pedal.

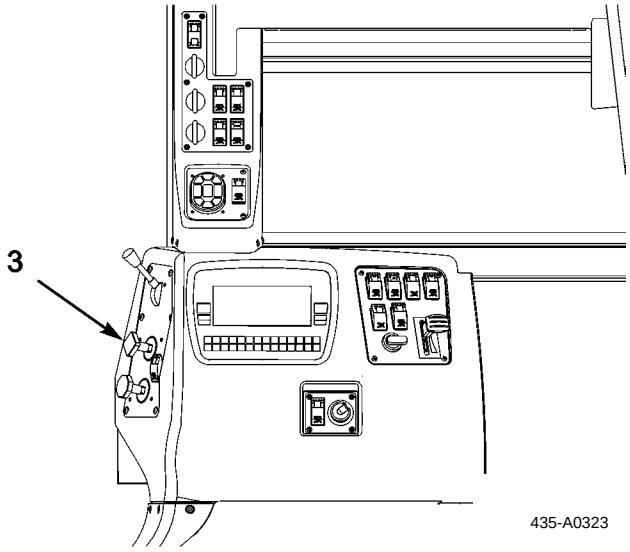


Figure 11. Parking Brake Button

3. Set the gear selection column switch to Neutral (WP 0004). Ensure the lever is in its detent position and apply the neutral lock.
4. Front bucket:
   a. If the bucket is in the road transport mode with the travel securing struts in place, the machine can be parked without any other action being taken.
   b. Otherwise, lower the bucket flat to the ground (WP 0004).

STOPPING AND PARKING MACHINE – CONTINUED

5. Backhoe:
   a. If the backhoe boom lock (WP 0004) and swing locks (WP 0004) are installed, the machine can be parked without any other action to the backhoe being taken.
   b. Otherwise, engage both the backhoe boom lock and swing locks (WP 0004).
      or
      Lower the backhoe work tools to the ground, as shown below (bucket fully open, boom and dipper fully extended) (WP 0004).

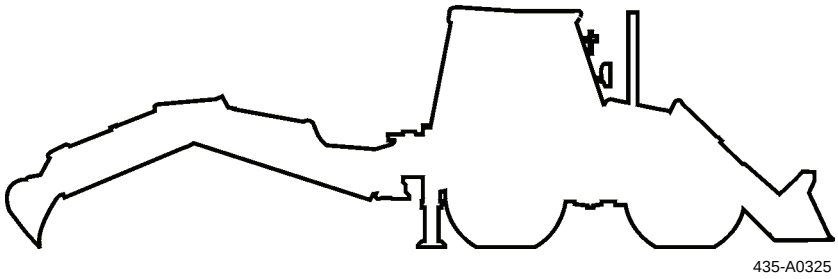


Figure 12. Machine Position for Parking

6. Run the engine at 1,000 rpm (approximately) and reduced load for 2 to 3 minutes before shut down. This will allow the turbocharger to cool.
7. If you are leaving the machine, ensure all switches are set to OFF, close and latch all windows, and close both doors.
8. If the lights are not required, turn OFF the battery disconnect switch (WP 0004).
9. Use the handholds and 3-point contact method when you climb down from the machine.
10. Ensure the filler cap is locked on.

END OF TASK

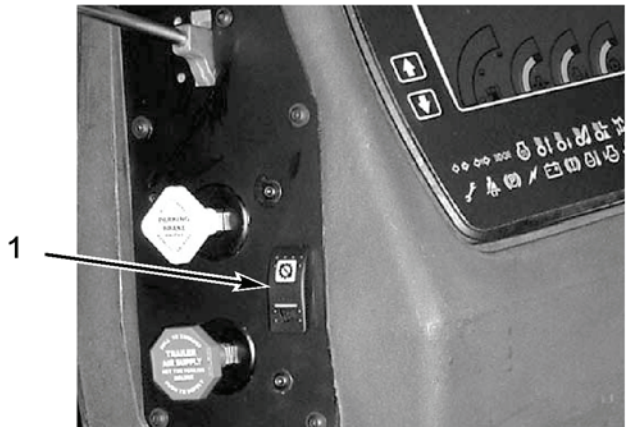
TESTING PARKING BRAKE

WARNING

- Before testing the parking brake, ensure the area around the machine is clear of personnel.
- Do not use a machine with a faulty parking brake.
- If the machine starts to move during the following test, immediately apply the foot brake and reduce the engine speed. Report the fact to Unit Maintenance. Do not use the machine.
- Ensure your seat belt is securely fastened before you start the test (WP 0004).
- Ensure the foot brake performance is adequate before carrying out this test.

Failure to follow these warnings may result in injury or death to personnel or damage to equipment.

1. Start engine using procedures beginning on pg. 0005-3.
2. Select 4WD mode (WP 0004).
3. Select 2WS mode (WP 0004).
4. Set the work tools in the travel position.
5. Ensure the parking brake is applied and the parking brake warning light is ON (WP 0004).
6. Press and hold the parking brake test switch (Figure 13, Item 1) on the “B” post alongside the parking brake button. The switch must be held in the ON position for the duration of the test.



435-A0326

Figure 13. Parking Brake Test Switch

TESTING PARKING BRAKE – CONTINUED

NOTE

- An audible alarm will sound and a warning light will illuminate when a gear is selected with the parking brake applied. The alarm will stop when neutral is selected.
- Under normal conditions, when engaged, the parking brake electronically disconnects the transmission drive; this prevents the machine from being driven with the parking brake on.

7. Ensuring that neutral lock is in D position, select 2nd gear (WP 0004).
8. Push down hard on the brake pedal and select forward drive (WP 0004).

WARNING

If the machine starts to move during the following test, immediately apply the foot brake and reduce the engine speed. Failure to follow this warning may result in injury or death to personnel.

CAUTION

Do not perform this test for longer than 20 seconds. Failure to follow this caution will result in damage to equipment.

9. Release the brake pedal (WP 0004).
10. If the machine has not moved, use the accelerator pedal to increase the engine speed to 1,500 rpm (WP 0004). The machine should not move.
11. Reduce the engine speed to idle and set the forward/reverse lever to Neutral (WP 0004).
12. Release the parking brake test switch (Figure 13, Item 1).
13. Lower the work tools to the ground and stop the engine (WP 0004).

WARNING

Do not use a machine with a faulty parking brake. Failure to follow this warning may result in injury or death to personnel.

14. If the machine has moved during this test, report the occurrence to Unit Maintenance. Do not use a machine with a faulty parking brake.

END OF TASK

STOPPING ENGINE

WARNING

Use caution and maintain three-point contact at all times when mounting or dismounting machine. Failure to follow this warning may result in injury or death to personnel.

CAUTION

Stopping the engine immediately after the machine has been under load could result in overheating and accelerated wear. Allow the engine to idle for 3 minutes before turning off.

1. Park the machine and allow engine to idle for 3 minutes (WP 0004).
2. Turn the starter switch (Figure 14, Item 1) to the “0” position.
3. Turn OFF the battery disconnect switch (WP 0004).
4. Perform all After PMCS checks (WP 0017).

WARNING

- Do not smoke or permit any open flame in area of machine while you are servicing fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may result in injury or death to personnel or damage to equipment.
- Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.
- Always stop engine prior to refueling. If equipped with an arctic cold weather starting aid system, turn engine coolant heater off.
- Do not perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing injury or death to personnel or damage to equipment.

5. Fill fuel tank up to filler neck if the machine is to be parked for an extended length of time, to prevent the formation of condensation.
6. When leaving the machine, close and secure cab doors and windows (WP 0004).

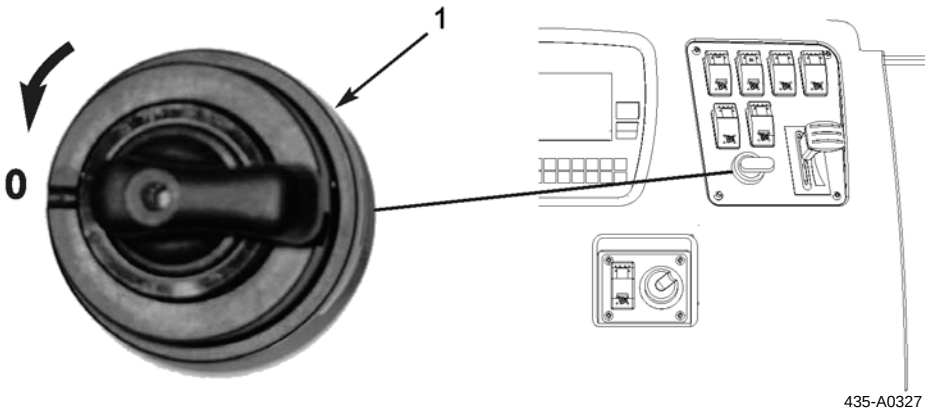


Figure 14. Starter Switch

END OF TASK

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS

OPERATION UNDER UNUSUAL CONDITIONS

Slave Starting Machine; Extreme Cold Weather Operation +32° to -25°F (0° to -31°C); Starting Engine in Extreme Cold Weather +32° to -25°F (0° to -31°C); Parking Machine in Extreme Cold Weather Operation +32° to -25°F (0° to -31°C); Preparation of Hydraulic System for Operation in Extreme Cold Weather +32° to -25°F (0° to -13°C); Extreme Hot Weather Operation; Unusual Terrain Operation; Fording Procedures; Nuclear, Biological, and Chemical (NBC) Decontamination, Run-Flat Operations

INITIAL SETUP

Materials/Parts

Oil, lubricating (Item 13, 14, 15 or 16, WP 0033)
Rag, wiping (Item 17, WP 0033)

Personnel Required

Two

References

FM 3-3
FM 3-4
FM 3-5
FM 4-25.11
FM 9-207

References - Continued

FM 21-305
FM 31-70
FM 31-71
FM 90-6
WP 0002
WP 0004
WP 0005
WP 0009
WP 0017
WP 0019
WP 0033
TM 3-4230-214-12&P

SLAVE STARTING MACHINE

If the engine does not start due to low or discharged batteries, it can be started with the help of another machine. The HMEE-I is equipped with an auxiliary power (NATO slave) receptacle.

WARNING

When slave starting machine:

- Do not use NATO slave cable that has loose or missing insulation.
- Do not proceed if suitable cable is not available.
- Do not use civilian-type jumper cables.
- Do not allow “dead” and “slave” machines to come in contact with each other at any time during slave starting.
- Do not connect the booster (slave) supply directly to the starter motor. Doing this bypasses the neutral gear safety switch. If the machine is in gear, it may “runaway” and kill or injure bystanders.

Failure to follow these warnings may cause injury or death to personnel.

SLAVE STARTING MACHINE – CONTINUED

CAUTION

A HMEE-I should not assist another machine in starting operations by providing electrical assistance (through the NATO slave receptacle), unless the HMEE-I (assisting) machine has fully charged batteries, and all other non-essential electrical load is removed on both machines. Failure to do so may result in premature wear or failure of the HMEE-I auxiliary drive belt and/or the alternator.

NOTE

Slave starting is a two-person task.

The following sequence must be followed when slave starting from another machine using the NATO slave cable:

1. Set all switches in the cab to OFF.

WARNING

Before lowering the work tools to the ground, ensure the machine and the area around it are clear of other people. Anyone on or close to the machine, could fall and be crushed by the work tools, or get caught in the linkages. Failure to comply may result in injury or death to personnel.

2. If the slave (assisting) machine is another HMEE-I, ensure its batteries are fully charged.
3. Position a suitable slave machine so that the NATO slave cable can be plugged into both NATO slave receptacles.

CAUTION

Ensure all connectors are free of dirt, sand and debris. Failure to do so could result in damage to equipment.

4. Remove protective covers (Figure 1, Item 1) and connect NATO slave cable to the NATO slave receptacles (Figure 1, Item 2) of both machines, ensuring the connection is made to the slave machine first, and then to the machine to be assisted.

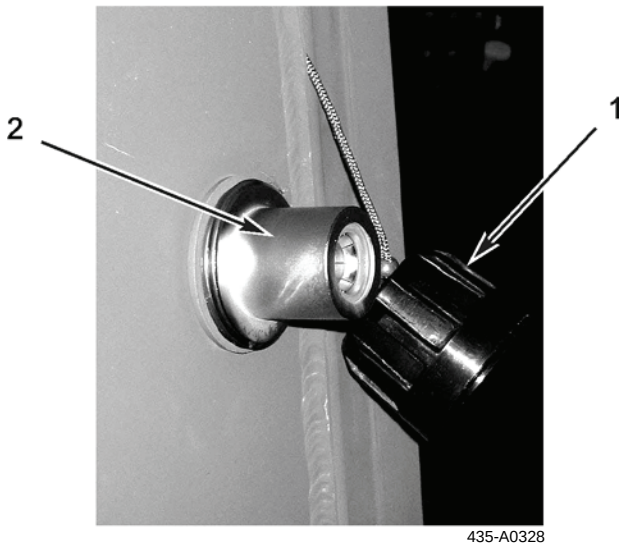


Figure 1. NATO Slave Receptacle

SLAVE STARTING MACHINE – CONTINUED

5. Ensure all non-essential systems on both machines are switched OFF.
6. Turn battery disconnect switch to the ON position (WP 0004) (also ensure that the battery disconnect switch on the dead machine is also in the ON position), start engine of the slave (assisting) machine, and set the engine speed to 1,800 rpm (see slave machine operator's manual).
7. Start engine of the dead machine using normal or cold start procedures as appropriate (WP 0005 or WP 0006).

CAUTION

Do not crank the engine longer than 30 seconds. Allow the starter to cool for 2 minutes before cranking again. Failure to do so could result in damage to the alternator.

8. When engine starts, set the engine speeds of both machines to idle (see slave machine operator's manual) before disconnecting NATO slave cable. Do not turn OFF the battery disconnect switch on either machine.
9. Disconnect NATO slave cable from assisted machine first and then from the slave machine. Secure protective caps (Figure 1, Item 1) on both machines.
10. Ensure engine is operating properly (WP 0004). If not, notify Unit Maintenance.
11. If the assisted machine is not to be driven for 30 minutes, idle engine at 1,000 to 1,200 rpm for 30 minutes to recharge batteries.

END OF TASK

EXTREME COLD WEATHER OPERATION +32° TO -25°F (0° TO -31°C)

Extreme cold weather causes oil to thicken, insulation to crack, materials to become brittle and break, and engine coolant and batteries to freeze. Because of these and other problems, the machine will be more difficult to operate. Refer to and study the information in FM 31-70, FM 31-71, FM 90-6, and FM 9-207. This information is necessary for effective operation of the machine during extreme cold weather.

The following precautions will make for easier starting and prevent possible damage to your machine:

1. Ensure the engine has been filled with the correct viscosity oil (WP 0017).
2. Ensure the correct coolant mixture has been added to the engine cooling system (WP 0017).
3. Keep the batteries fully charged.
4. Fill the fuel tank at the end of each work period. This will help to prevent condensation forming on the tank walls.
5. Protect your machine when not in use.

Maintenance

1. Special care in cleaning and lubricating the machine must be taken where extremes in temperature, humidity, and terrain exist. Good care of the machine ensures proper operation and functioning, it also guards against excessive wear of the working parts and the deterioration of the material. Approved storage and handling instructions for lubricants and fuels should be followed.
2. Refer to WP 0017 for lubrication instructions. These services should be done often during extremely cold and hot weather, prolonged travel periods, fording, continued exposure to wet or salty air, operation in sand, dust, mud or for short stop/start operation periods. Any of these conditions may reduce the effectiveness of the lubricants.
3. When repeated failure of the material results from exposure to extreme conditions, report the problem on DA Form 2404 and notify Unit Maintenance.

EXTREME COLD WEATHER OPERATION +32° TO -25°F (0° TO -31°C) – CONTINUED

Maintenance - Continued

WARNING

- To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. Do not smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electrical shock, damage to equipment, and injury to personnel.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes, or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these warnings may result in injury or death to personnel.

Eyes. Flush with cold water for no less than 15 minutes and seek medical attention immediately.

Skin. Flush with cold water for no less than 15 minutes and seek medical attention immediately.

Internal. If corrosion or electrolyte is ingested, drink large amounts of water or milk. Follow with Milk of magnesia, beaten egg, or vegetable oil. Seek medical attention immediately.

Clothing/Equipment. Wash area with large amounts of cold water. Neutralize acid with baking soda or household ammonia.

NOTE

Frequently inspect inactive machines. Remove corrosion from exterior and apply a protective coat of lubricating oil (Item 13, 14, 15, or 16, WP 0033).

4. **Batteries.**

   Extreme cold causes batteries to freeze and prevents them from furnishing enough power for engine starts. FM 9-207 gives information about the effects of cold weather on batteries. Have Unit Maintenance remove the batteries from the machine and store them in a warm place whenever the machine is not used for long periods of time.

5. **Wheels and Tires.**

   Park the machine on planks or brush to prevent the tires from freezing to the ground. Chock the front and rear wheels if necessary. Clean mud, snow, and ice from the wheels, tires, and suspension as soon as possible before it freezes. Refer to FM 9-207 for the effects of cold weather on wheels and tires.

6. **Metal Parts (Not Including Hydraulic Cylinder Piston Rods).**

   Metal parts may become brittle and cannot take shock loads at arctic temperatures. Make frequent inspections of metal areas. Remove corrosion from exterior metal surfaces and apply a protective coat of lubricating oil.

EXTREME COLD WEATHER OPERATION +32° TO -25°F (0° TO -31°C) – CONTINUED

Maintenance - Continued

CAUTION

Care must be taken when cleaning the hydraulic cylinder chrome piston rods. Do not use abrasive materials of any kind on the chrome piston rods. Clean only with a soft brush or soft cloth. Failure to follow this caution could result in damage to equipment.

7. **Hydraulic Cylinder Chrome Piston Rods.**

   Clean snow, ice, and mud from the cylinders before it freezes. Report any signs of corrosion to Unit Maintenance.

8. **Plastic and Rubber Parts.**

   Any parts made of plastic or rubber material must be handled carefully. These become brittle in cold weather and may break due to vibration or handling. To prevent insulation from cracking and causing short circuits, warm plastic or rubber insulation before bending and be sure all cables are secure in the machine.

Shutdown in Temperatures Below +32°F (0°C)

1. If a machine is to be switched off for extended periods at temperatures below 32°F (0°C), it is advisable the suspension should be set in transport mode (lowered) (WP 0004).
2. The machine should be parked on level ground.

END OF TASK

COLD START GENERAL PROCEDURES

Ensure Unit Maintenance has installed the proper grade of oil in the engine, transmission, and hydraulic systems. Unit Maintenance should flush out and refill the oil reservoirs prior to operating under extreme cold weather conditions.

In extreme cold weather, the engine electronic control system modifies the normal engine startup in the following ways:

1. The system will automatically increase the engine idle speed from 750 rpm to 900 rpm until the engine coolant temperature reaches +32°F (0°C), at which point it will revert to 750 rpm.
2. The engine will not accelerate above 900 rpm until the engine oil pressure has stabilized at the required level.
3. Allow grid heaters to operate as controlled by engine ECU.
4. If the engine has not started after 30 seconds cranking or cranking speed drops noticeably, release the starter key and key back on to initialize grid heaters - **unless operator deems engine is about to start**. Wait 2 minutes before cranking again.

NOTE

- Engine block heater is piped up to bypass the cab heater, therefore cab heater control is OFF.
- Start defined as successful when normal throttle operation achieved.

5. After each successful start, run engine for at least 10 minutes to prevent internal condensation.

END OF TASK

COLD START PROCEDURES FOR +32° TO -26°F (0° TO -32°C) AND -26° TO -40°F (-32° TO -40°C)

Machine Condition

For the temperature range +32°F to -26°F (0°C to -32°C):

1. The suspension should be set in transport mode (lowered) (WP 0004).

NOTE

The cold start hydraulic valves are located on the right side of the machine behind the steps.

2. The cold start valves (Figure 2, Items 3 and 4) should be set to open (position A on both).

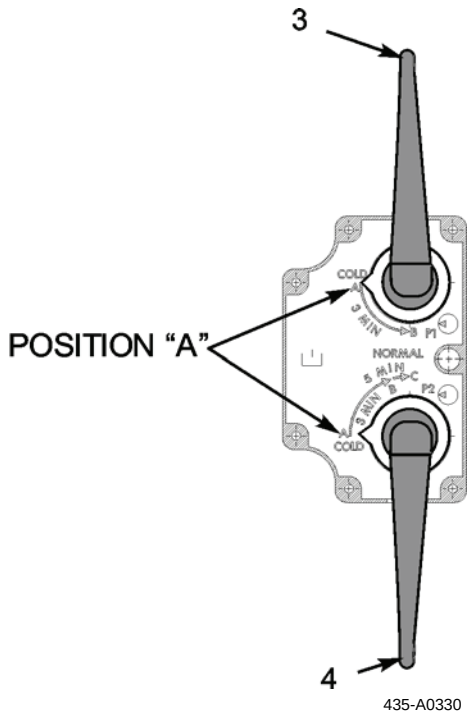


Figure 2. Cold Start Valves - Position A

3. The conventional cab heater temperature knob in the cold position (valve closed).
4. Machine parked on level ground.
5. Ensure the handbrake is applied and all hydraulic services are in the neutral position.

COLD START PROCEDURES FOR +32° TO -26°F (0° TO -32°C) AND -26° TO -40°F (-32° TO -40°C) — CONTINUED

Start Procedure +32° to -26°F (0° to -32°C)

1. Turn the cold start valves 1 and 2 to position A (Figure 2, Items 3 and 4).
2. Turn the battery disconnect switch (WP 0004) to the ON position.

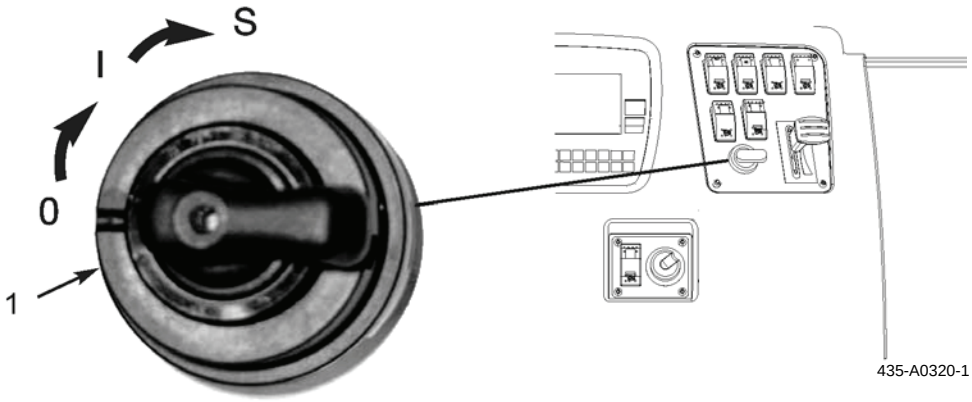


Figure 3. Starter Switch

3. Turn the starter switch (Figure 3, Item 1) to the first position and wait for the grid heater light to extinguish.
4. Commence cranking for up to 30 seconds unless the engine speed drops noticeably, in which case stop cranking and key off. Turn the ignition key to the first position and wait for the grid heater light to extinguish. Then continue cranking for up to 30 seconds unless the engine starts.
5. Once the engine has started allow it to idle for 2 minutes.

CAUTION

Failure to follow the following step will lead to over-pressurizing the hydraulic cooler.

6. Slowly close cold start valve number 1 (Figure 4, Item 3) to position B, then slowly close cold start valve number 2 (Figure 4, Item 4) to position B.

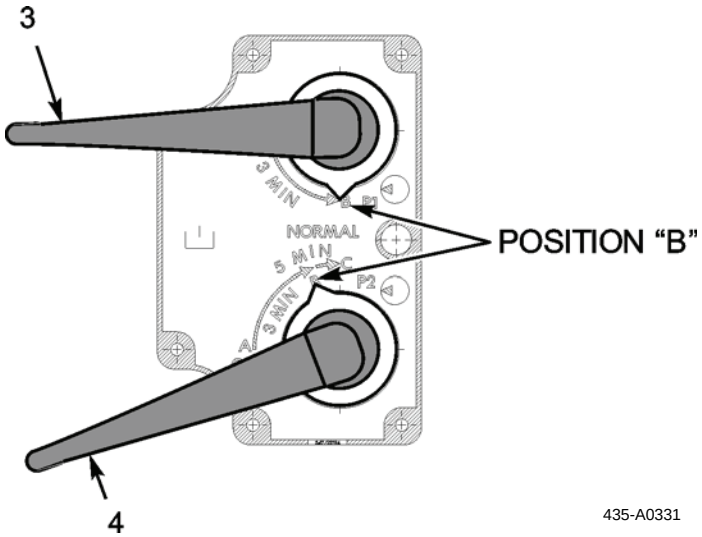


Figure 4. Cold Start Valves - Position B

COLD START PROCEDURES FOR +32° TO -26°F (0° TO -32°C) AND -26° TO -40°F (-32° TO -40°C) — CONTINUED

Start Procedure +32° to -26°F (0° to -32°C) - Continued

7. Using the loader bucket crowd service, blow relief pressure for 10 sec. on and 5 sec. off for the next 8 minutes. Then slowly close cold start valve number 2 (Figure 5, Item 4) to position C.

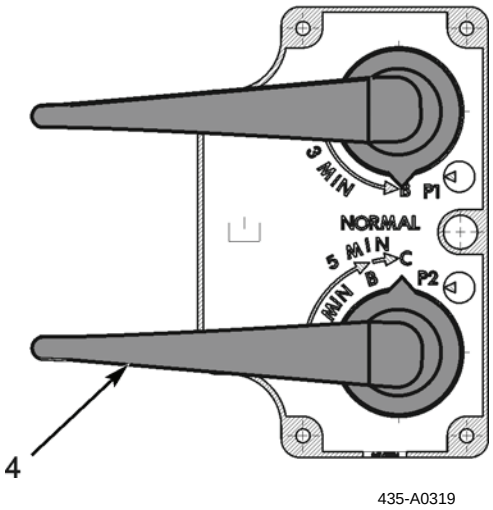


Figure 5. Cold Start Valves - Position C

8. Proceed with the -26°F (-32°C) warm up procedure detailed below.

Warm Up Procedure: +32° to -26°F (0° to –32°C)

1. Slowly operate the steering to full lock each way for 1 minute.
2. Then select the hose reel (without hand tool attached) for 1 minute.
3. With the service brake pedal depressed operate park brake 5 seconds off, 5 seconds on for 1 minute. The handbrake should be ON before proceeding on to step 4.
4. Then operate each of the loader and backhoe services (up and down, crowd and dump etc. as relevant) in turn blowing relief for 10 seconds only each time.

WARNING

Test and ensure correct operation of the brake system when moving off. Failure to do so may result in injury or death to personnel.

COLD START PROCEDURES FOR +32° TO -26°F (0° TO -32°C) AND -26° TO -40°F (-32° TO -40°C) — CONTINUED

Start Procedure: -26° to -40°F (-32° to -40°C)

1. Turn battery disconnect switch to ON position (WP 0004) and run the engine block heater for 15 mins.
2. Turn the cold start valves 1 and 2 (Figure 6, Items 3 and 4) to position A.

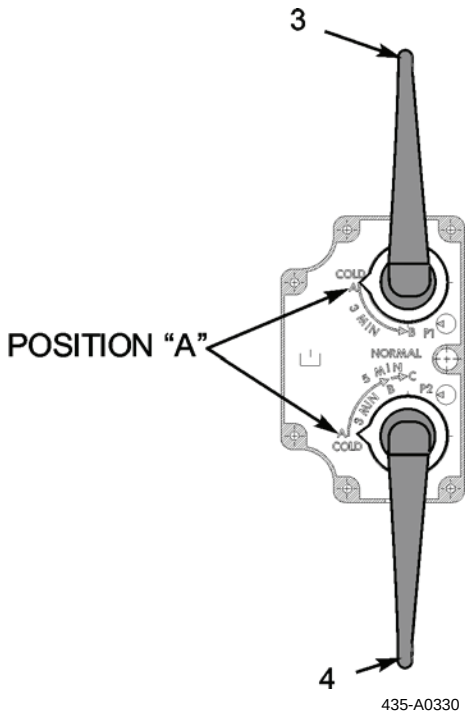


Figure 6. Cold Start Valves - Position A

3. Turn the ignition key to the first position and wait for the grid heater light to extinguish.
4. Commence cranking for up to 30 seconds unless the engine speed drops noticeably, in which case stop cranking and turn key off. Wait 2 minutes before cranking again. Turn the ignition key to the first position and wait for the grid heater light to extinguish. Then continue cranking for up to 30 seconds unless the engine starts.
5. Once the engine has started allow it to idle for 2 minutes.

CAUTION

Failure to follow the following step will lead to over-pressurizing the hydraulic cooler.

6. Slowly close cold start valve number 1 (Figure 7, Item 3) to position B, then slowly close cold start valve number 2 (Figure 7, Item 4) to position B.

COLD START PROCEDURES FOR +32° TO -26°F (0° TO -32°C) AND -26° TO -40°F (-32° TO -40°C) — CONTINUED

Start Procedure: -26° to -40°F (-32° to -40°C) - Continued

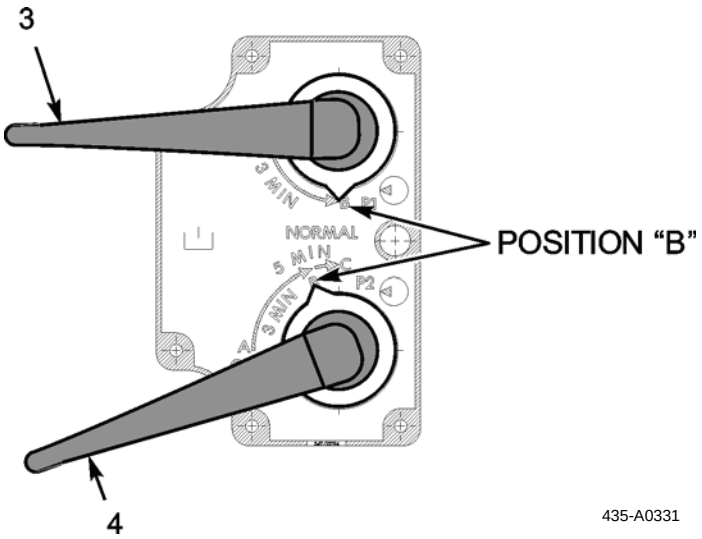


Figure 7. Cold Start Valves - Position B

7. Using the loader bucket service, blow relief pressure for 10 sec. on and 5 sec. off for the next 8 minutes. Then SLOWLY close cold start valve number 2 (Figure 8, Item 4) to position C.

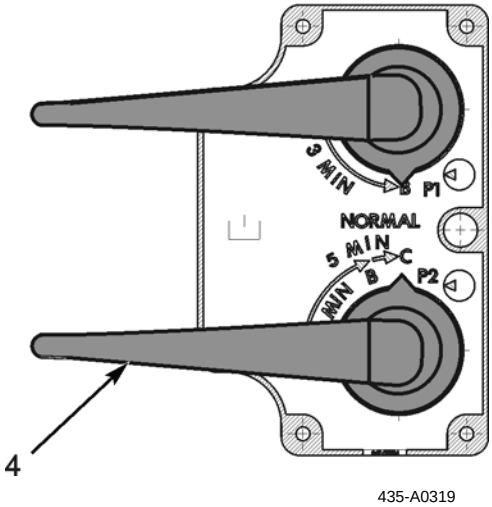


Figure 8. Cold Start Valve - Position C

8. Continue to blow relief pressure on the loader bucket crowd service 10 sec. on 5 sec. off for the next 5 minutes.
9. Then proceed with the -40°F (-40°C) warm up procedure

COLD START PROCEDURES FOR +32° TO -26°F (0° TO -32°C) AND -26° TO -40°F (-32° TO -40°C) — CONTINUED

Warm Up Procedure: -26° to -40°F (-32° to -40°C)

1. Slowly operate the steering to full lock each way for 1 minute.
2. Then select the hose reel (without hand tool attached) for 1 minute.
3. With the service brake depressed operate parking brake 5 seconds off, 5 seconds on for 1 minute. The handbrake should be ON before proceeding on to step 4.
4. Then operate each of the loader and backhoe services (up and down, crowd and dump, etc. as relevant) in turn blowing relief for 10 seconds only each time.
5. Repeat steps 1 through 4 for at least 10 minutes.
6. When the hydraulic oil temperature reaches 32°F (0°C) (when oil cold light goes off) you can begin to operate the suspension from transport mode (down) to travel mode (up) repeat for 5 minutes, making sure the suspension is locked in mode (light is solid on selected mode) before proceeding to the next step.

WARNING

Test and ensure correct operation of the brake system when moving off. Failure to do so may result in injury or death to personnel.

END OF TASK

PARKING MACHINE IN EXTREME COLD WEATHER +32° TO -25°F (0° TO -31°C)

1. Refuel the machine immediately after operation. This will reduce condensation inside the fuel tank.
2. Park the machine in a sheltered area, if possible. Cover to protect engine, accessories, and controls from snow and ice.
3. Park the machine on high, dry ground, or on planks or brush. This will prevent the tires from freezing to the ground.
4. Block up the front loader bucket, to prevent it freezing to the ground.
5. Clean wet snow or mud from the tires and the hydraulic cylinders before it freezes.
6. In extremely cold weather, notify Unit Maintenance to remove the batteries and store them in a moderately warm area. Have the batteries reinstalled just prior to starting the engine.

END OF TASK

PREPARATION OF HYDRAULIC SYSTEM FOR OPERATION IN EXTREME COLD WEATHER 32° TO -25°F (0° TO -31°C)

Before operating the hydraulic system in extreme cold weather conditions, +32° to -4°F (0° to -20°C), perform the following procedures:

1. Start the engine (WP 0005).
2. Close all doors and windows and operate cab heater (WP 0004).

CAUTION

In cold start conditions of below +32° to -4°F (0° to -20°C), avoid running the engine above 1,000 rpm or operation of the hydraulic system during the first 3 minutes after start up. This will avoid possible damage to the hydraulic system.

3. Slowly operate all hydraulic systems control levers to warm the hydraulic oil (WP 0004). Cycle each control lever several times. Normal warm-up period is 3 to 10 minutes.
4. Operate under light load for first 5 minutes of operation.

END OF TASK

EXTREME HOT WEATHER OPERATION

WARNING

Machine operation in hot weather can increase the risk of heat stress to the operator. Follow individual preventative medicine measures in FM 4-25.11 to reduce the risk of heat stress in the HMEE-I. Failure to follow this warning may result in injury or death to personnel.

CAUTION

Failure to follow the following step may result in damage to equipment.

The machine may overheat during long, hard loading/excavating operations or when driving at high speed. Check the temperature gauge and warning lights often. Allow the engine to recover at idle speed. If the temperature does not reduce or if the warning buzzers continue to operate, shut down the engine. Keep the ventilation cooling system on during operation. Inspect the air cleaner and coolers often. Inspect the cooling pack and clean as necessary (WP 0019). Have Unit Maintenance add tropical electrolyte to the batteries.

Operation of Hydraulic System

CAUTION

Failure to follow the following step may result in damage to equipment.

In hot weather and during continuous operation, the hydraulic system may generate more heat than can be removed by the hydraulic cooler. If the hydraulic temperature gauge rises to the red section or the high hydraulic temperature warning buzzer sounds, stop the engine as soon as possible (WP 0004). Notify Unit Maintenance.

EXTREME HOT WEATHER OPERATION – CONTINUED

Maintenance

WARNING

- To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. Do not smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electrical shock, damage to equipment, and injury to personnel.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes, or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these warnings may result in injury or death to personnel.

Eyes. Flush with cold water for no less than 15 minutes and seek medical attention immediately.

Skin. Flush with cold water for no less than 15 minutes and seek medical attention immediately.

Internal. If corrosion or electrolyte is ingested, drink large amounts of water or milk. Follow with Milk of magnesia, beaten egg, or vegetable oil. Seek medical attention immediately.

Clothing/Equipment. Wash area with large amounts of cold water. Neutralize acid with baking soda or household ammonia.

1. **Batteries.**

   Electrolyte level - in hot climates, check electrolyte level daily.

   Specific gravity - Batteries should have a weaker electrolyte in hot areas (1.200 to 1.225 at full charge); have the specific gravity checked by Unit Maintenance.

   Self-discharge - A battery will self-discharge faster if left standing for long periods in high temperatures. If the machine is parked for several days, have Unit Maintenance remove the batteries and store them in a cool place.

2. **Machine Structure.** In hot, damp areas, corrosion will occur on all parts of the machine. It will appear as rust and paint blisters on metal surfaces and mildew; mold or fungus on fabrics or glass. Protect all unfinished, exposed metal surfaces with a film of lubricating oil.

   Frequently inspect inactive machines. Remove corrosion from exterior and apply a protective coat of oil.

3. **Glazing.** Inspect parts for moisture, corrosion, or fungus growth. In dry, dusty, or sandy areas, keep exposed glass surfaces protected from blowing sand and dirt.

END OF TASK

UNUSUAL TERRAIN OPERATION

Mud

Use 1st gear when driving through mud. Go up and down gradients as straight as possible and avoid sharp turns. If the machine becomes stuck, and you are unable to safely extricate it with the bucket or backhoe, get the machine towed out. In cold weather operation, park on high, dry ground, on planks or brush. Chock the wheels if necessary. This will keep the tires from freezing to the ground. Clean the tires, wheels, and hydraulic cylinders of mud before it freezes.

Snow

You can drive over heavily crusted snow. If the machine breaks through the crust, select first gear and drive slowly to get back on top. Go up and down gradients as straight as possible and avoid sharp turns. When the snow is soft and fine, drive cautiously.

Ice

Drive carefully and steadily on ice. If the machine starts to skid, let off the accelerator. Move out slowly. For cold weather operation, review the procedures in FM 31-71 and FM 9-207.

Sand and Dust

Sand and dust are abrasive and can cause wear on many parts of the machine.

1. Drive carefully and steadily in sand. Where possible, pull away smoothly in second gear to avoid wheel spin. When traveling in soft sand, do not make sharp turns.
2. Monitor the air filter restriction warning light. Check the air filter more frequently and clean the dust discharge valve regularly. Notify Unit Maintenance if the filter element requires replacing.
3. Check the cooling system radiator frequently for foreign matter blocking the radiator. Check the hydraulic cylinders frequently. Do not allow dust, dirt, or sand to collect on these surfaces.
4. Parking and Non-Use. Ensure the operator’s compartment doors and windows are tightly closed. Protect the engine compartment from windblown sand and dust. When the machine is not in use, cover external components to protect exposed cylinder rods from windblown sand and dust.

Rainy and Humid

Protect the machine from moisture. Keep the operator’s compartment as clean and dry as possible. Whenever possible, park the machine on a raised or elevated area with good drainage. Keep the fuel tank filled; this will cut down on condensation in the tank. Protect the fuel filler opening when refilling in rainy conditions.

Saltwater Areas

Saltwater is extremely corrosive. Keep the machine as clean as possible. Wash down with clean fresh water after use. Inspect exposed cylinder rams and wiring connections closely for signs of corrosion. Report any signs of corrosion to Unit Maintenance.

High Altitudes

Closely monitor coolant level. Check all engine instrumentation and warning indicators. Report any unusually high readings to Unit Maintenance. For high altitude operations, review the procedures in FM 90-6.

UNUSUAL TERRAIN OPERATION – CONTINUED

Maintenance

1. **Mud.** Clean and lubricate all parts as soon as possible after operation in mud (WP 0017).
2. **Sand and Dust.** Operation in dusty or sandy areas requires more frequent cleaning and servicing of filters to prevent dust entering the engine, transmission, fuel system, and hydraulic system. Dust build-up on major components increases the chance of entry into internal areas and interferes with adequate cooling. Pay particular attention to the following areas:
   - Lubricate the machine as specified in WP 0017, shortening the service intervals as required.
   - Carefully clean all areas around the lubrication fittings, fill ports, dipsticks, breathers, and filters with wiping rags before servicing or inspecting.
   - Have Unit Maintenance service the engine oil filters, fuel filters, transmission filters, hydraulic filters, and air filters.
   - Check and clean door hinges, fuel filler protective cap and vent, boom and swing locks, and sideshift slides with wiping rags before servicing or inspecting.
   - Check and clean the cooling pack radiators as specified in WP 0019.
   - Monitor brake and steering operation for binding (failure to release fully). Report malfunctions to Unit Maintenance.

END OF TASK

FORDING PROCEDURES

During an operation, it may be necessary to drive the machine through water. The depth of the water may be from a few inches to a few feet. Normal fording is allowable up to 40 in. (102 cm) including the bow wake. Perform the following when fording:

Before Fording

CAUTION

Entering water deeper than 40 in. (102 cm) (with wake) can allow water to rise in the engine compartment to a level where possible engine component damage could occur.

1. Check the depth of water at its deepest point. Ensure the bottom is even enough for fording. Do not attempt to ford even the narrowest of streams if it is more than 40 in. (102 cm) including the bow wake.
2. Set all work tools to their transport position (WP 0005).
3. Be sure the engine is fully operational.

FORDING PROCEDURES – CONTINUED

Fording

1. Shift the transmission into 1st gear (WP 0004).

CAUTION

Inhibit the engine cooling fan drive before fording. Failure to comply could result in equipment damage.

2. Inhibit the engine cooling fan drive before attempting to ford the machine (WP 0004).
3. Increase the engine speed to above 1,000 rpm to reduce the risk of stalling. Keep the engine speed above 1,000 rpm.

NOTE

Be prepared during wading operations to operate the front bucket to improve the entry and departure angles.

4. Enter the water slowly to minimize waves and backwash. Drive at 3 to 4 mph (5 to 6 kph) to prevent making a "bow wave."

CAUTION

Do not attempt to restart an engine that has stalled due to being completely submerged. Serious engine damage could be caused if water has entered the engine cylinders.

5. If you completely submerge the machine to a point where water enters the engine compartment, keep the engine speed up to prevent water from entering the engine. Move the machine out of the water immediately and allow the water to drain from the engine compartment. If the engine stalls while completely submerged, notify Unit Maintenance.
6. If it is necessary to stop the machine while fording, use the brakes (WP 0004) to stop the machine and shift the transmission (WP 0004) into Neutral. Keep the engine speed above 1,000 rpm. To move off again, select 1st gear and move forward slowly at 3 to 4 mph (5 to 6 kph). Keep the engine speed above 1,000 rpm.

After Fording

1. Enable the engine cooling fan drive (WP 0004).

WARNING

Check the brakes for proper operation. Failure to do so could result in injury or death to personnel.

2. Drive the machine for a short distance in 1st gear while repeatedly applying the foot brake (WP 0004). This will generate heat in the brake components to help dry them out.
3. Run the engine for a few minutes to help evaporate and blow out any water that may have entered the engine bay.
4. Check the engine and transmission oil for the presence of water (WP 0017). If water is present, the oil color will be lighter or water will be seen. If the oil color is changed or if water is present, notify Unit Maintenance to drain and refill with the correct oil (WP 0017).
5. Check and clean the cooling pack radiators of any debris that may be blocking the air flow (WP 0019).
6. Notify Unit Maintenance to wash and clean the machine, especially if the machine was forded in salt water. Do not allow any water to enter the engine exhaust or air intakes.
7. Perform after fording maintenance.

FORDING PROCEDURES – CONTINUED

Maintenance After Fording

Although the machine housings are sealed to prevent leakage, water may enter, especially during submersion. The following services should be performed when the machine is exposed to partial or total submersion, especially in salt water:

1. **Machine Structure and Cab.** Drain water from superstructure and from work tools. Coat unpainted metal parts with lubricating oil.
2. **Engine and Transmission.** Check the lubricant in the engine and transmission. If water or signs of water are present, have Unit Maintenance drain and refill the assemblies with the correct lubricant (WP 0017).
3. **Suspension - Axle Swivels and Steering Joints.** Clean and lubricate all parts of the suspension and steering as specified in WP 0017. Force lubricant generously into each lubrication fitting to force out water.
4. **Front Bucket and Backhoe.** Clean and lubricate all parts of the front bucket and backhoe as specified in WP 0017. Force lubricant generously into each lubrication fitting to force out water.
5. **Electrical Connections.** Check all electrical connections for signs of corrosion. Notify Unit Maintenance to clean or repair electrical connectors.
6. **Fuel System.** Drain the fuel system of any accumulated water. Notify Unit Maintenance.
7. **Condensation.** The sudden cooling of the warm interior air upon fording may cause condensation of any moisture within the instruments. A period of exposure to warm air after fording should eliminate this condition.
8. **Propshafts.** Clean and lubricate all parts of the propshafts as specified in WP 0017. Force lubricant generously into each lubrication fitting to force out water.
9. **Excavator Valve - Valve Spool End Caps.**

   Check all valve functions by operating each service fully in both directions. If the service is slow or doesn't function one way, notify Unit Maintenance to service the end caps.

Maintenance After Fording if Maximum Fording Depth is Exceeded

If the maximum fording depth of 40 in. (102 cm) with wake is exceeded, notify Unit Maintenance.

END OF TASK

NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) DECONTAMINATION

WARNING

- If NBC exposure is suspected, personnel wearing protective equipment must handle all air cleaner media. Consult your NBC NCO for appropriate handling or disposal procedures.
- Refer to FM 3-3, *Chemical and Biological Containment Avoidance*, FM 3-5, *NBC Decontamination*, and FM 3-3-1, *Nuclear Contamination Avoidance*.
- NBC contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel.
- Failure to follow these warnings may cause injury or death to personnel.

NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) DECONTAMINATION – CONTINUED

NOTE

Detailed decontamination procedures can be found in FM 3-3, FM 3-4, and FM 3-5.

The following emergency procedures can be performed until field NBC decontamination facilities are available.

Emergency Procedures

If NBC attack is known or suspected, mask at once and continue mission. If inside, do not leave machine. If outside, follow decontamination procedures below to avoid taking contaminates into the machine. Do not unmask until told to do so.

1. **Nuclear Decontamination.** Brush fallout from skin, clothing, and equipment with available brushes, rags, and tree branches. Wash skin and have radiation check made as soon as tactical situation permits. You can find instructions for the check in FM 3-5.
2. **Biological Decontamination.** The operator of the HMEE-I has no method to detect or decontaminate biological agents. Remain masked and continue mission until told to unmask.

WARNING

Do not use decontamination spray on personnel. It could cause injury to personnel.

3. **Liquid Chemical Agent Decontamination.** If exposure to liquid agent is known or suspected, clean exposed skin, clothing, and personal gear, in that order. Use the buddy system. Wash exposed skin and thoroughly decontaminate as soon as tactical situation permits.

Internal Decontamination

WARNING

- NBC contamination filters must be handled using adequate precautions (FM 3-3) and must be disposed of by trained personnel.
- Do not use decontaminants on eyes, mouth, or open wounds. This may cause injury to personnel. Flush these areas with water.
- Use the decontaminating apparatus as instructed on the apparatus or in the technical manual. If a chemical agent monitor or other appropriate chemical agent detection device is not available, remain in full Mission-Oriented Protection Posture (MOPP) until safe levels are verified. Failure to follow these warnings could result in injury or death to personnel.

NOTE

Decontamination procedures take time. Do as much as you can based on the tactical situation.

If decontamination apparatus is available, use the decontamination apparatus to decontaminate the following areas:

1. Control handles, levers, and switches used to operate the machine.
2. Radios.
3. Weapons.

If decontamination apparatus is not available, use soap and water.

NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) DECONTAMINATION – CONTINUED

External Decontamination

WARNING

- Do not use decontamination spray on personnel. It could cause injury to personnel.
- Use the decontaminating apparatus as instructed in TM 3-4230-214-12&P. If a chemical agent monitor or other appropriate chemical agent detection device is not available, remain in full MOPP until safe levels are verified. Failure to follow this warning could result in death or injury to personnel.

If the outside of the machine is contaminated during a chemical or biological attack, open and exit the machine, use the decontamination kit (if available) to spray the following areas: around the doors, steps, grab handles, window apertures, and any horizontal panels where a contaminant could settle.

END OF TASK

RUN-FLAT OPERATIONS

This machine is equipped with run-flat tire capabilities. Should the tactical situation demand, this machine can be operated with a tire in a run-flat condition at the speed and for the distance specified in WP 0002.

END OF TASK

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS

STOWAGE AND DECAL, DATA PLATE, AND STENCIL GUIDE

INTRODUCTION

1. This work package provides the stowage location of the BII and COEI (WP 0031).
2. This work package also shows the location of all decals, data plates, and stencils.

Table 1. BII Stowage Location.

NOMENCLATURE	QTY	STOWAGE LOCATION
Adapter, Extension, Grease Gun	1	In toolbox located on left side of machine
Air-Line Palm Coupling	1	In toolbox located on left side of machine
Bar, Pry	1	In toolbox located on left side of machine
Drift	1	In toolbox located on left side of machine
Fire Extinguisher	1	In left side of cab interior
Grease Gun	1	In toolbox located on left side of machine
Hammer, Ball Peen	1	In toolbox located on left side of machine
Hammer, Copper-Faced 6.5 lb	1	In toolbox located on left side of machine
Kit, Cable, Headlight Harness	1	In toolbox located on left side of machine
Kit, Cable, Protrusion Harness	1	In toolbox located on left side of machine
Large Bore Inflation Gauge	1	In toolbox located on left side of machine
Pliers, Combination GP	1	In toolbox located on left side of machine
Screwdriver, Combination GP	1	In toolbox located on left side of machine
Suzi Hose	1	In toolbox located on left side of machine
Wrench, Adjustable	1	In toolbox located on left side of machine
Wrench, Socket, 3/4 in.	1	In toolbox located on left side of machine
Wrench, Socket, 1 in.	1	In toolbox located on left side of machine
Wrench, Socket, 1-1/8 in.	1	In toolbox located on left side of machine
Wrench, Socket, 1-5/16 in.	1	In toolbox located on left side of machine
Wrench, Socket, 17 mm	1	In toolbox located on left side of machine
Wrench, Socket, 19 mm	1	In toolbox located on left side of machine
Wrench, Socket, 22 mm	1	In toolbox located on left side of machine
Wrench, Socket, 24 mm	1	In toolbox located on left side of machine
Wrench, Socket, 30 mm	1	In toolbox located on left side of machine
Wrench, Socket, Extension Bar	1	In toolbox located on left side of machine

IINTRODUCTION – CONTINUED

Table 2. COEI Stowage Location.

NOMENCLATURE	QTY	STOWAGE LOCATION
Impact Wrench	1	In toolbox located on left side of machine
Cylinder Struts	5	On spare tire carrier
Backhoe Dipper Trolley	1	On spare tire carrier
Chain Saw	1	In toolbox located on right side of spare tire carrier
•Bar Sheath	1	On chain saw
•Adjustment Tool	1	In toolbox located on right side of spare tire carrier
•Sharpening Kit	1	In toolbox located on right side of spare tire carrier
Pavement Breaker	1	In toolbox located on right side of spare tire carrier
•Moil Point Bit	1	In toolbox located on right side of spare tire carrier
•Chisel Bit	1	In toolbox located on right side of spare tire carrier
•Clay Spade	1	In toolbox located on right side of spare tire carrier
Hammer Drill	1	In toolbox located on left side of spare tire carrier
•3/4 in. dia. Carbide Bit	1	In toolbox located on left side of spare tire carrier
•1 in. dia. Carbide Bit	1	In toolbox located on left side of spare tire carrier
•2 in. dia. Carbide Bit	1	In toolbox located on left side of spare tire carrier
Post Driver	1	In toolbox located on left side of spare tire carrier

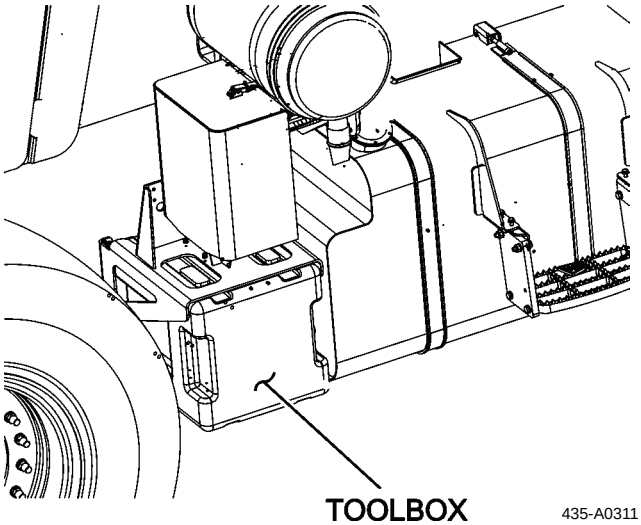


Figure 1. Toolbox Located on Left Side of Machine

END OF TASK

SPARE TIRE CARRIER

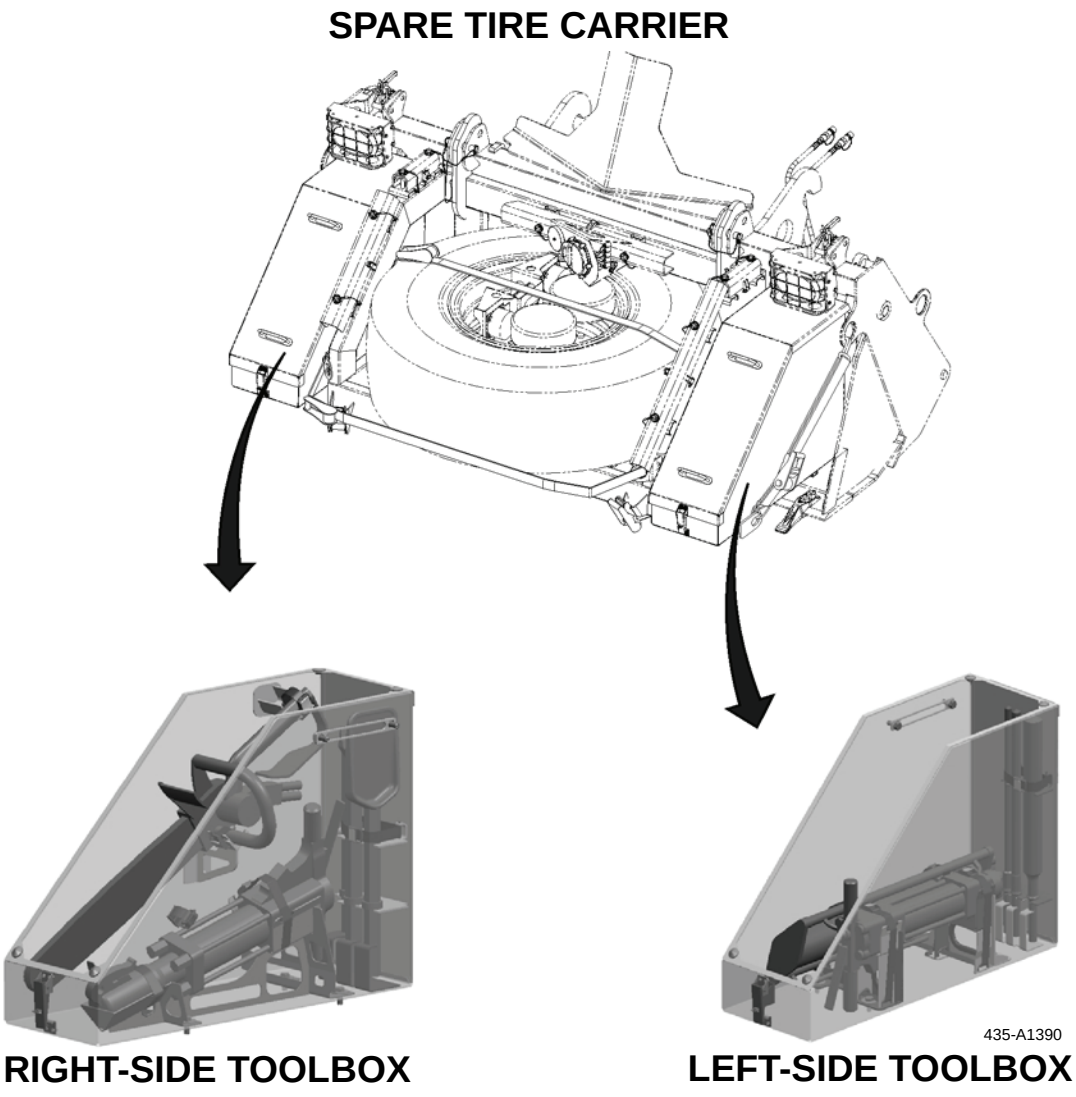


Figure 2. Spare Tire Carrier with Toolboxes

DECALS AND DATA PLATES

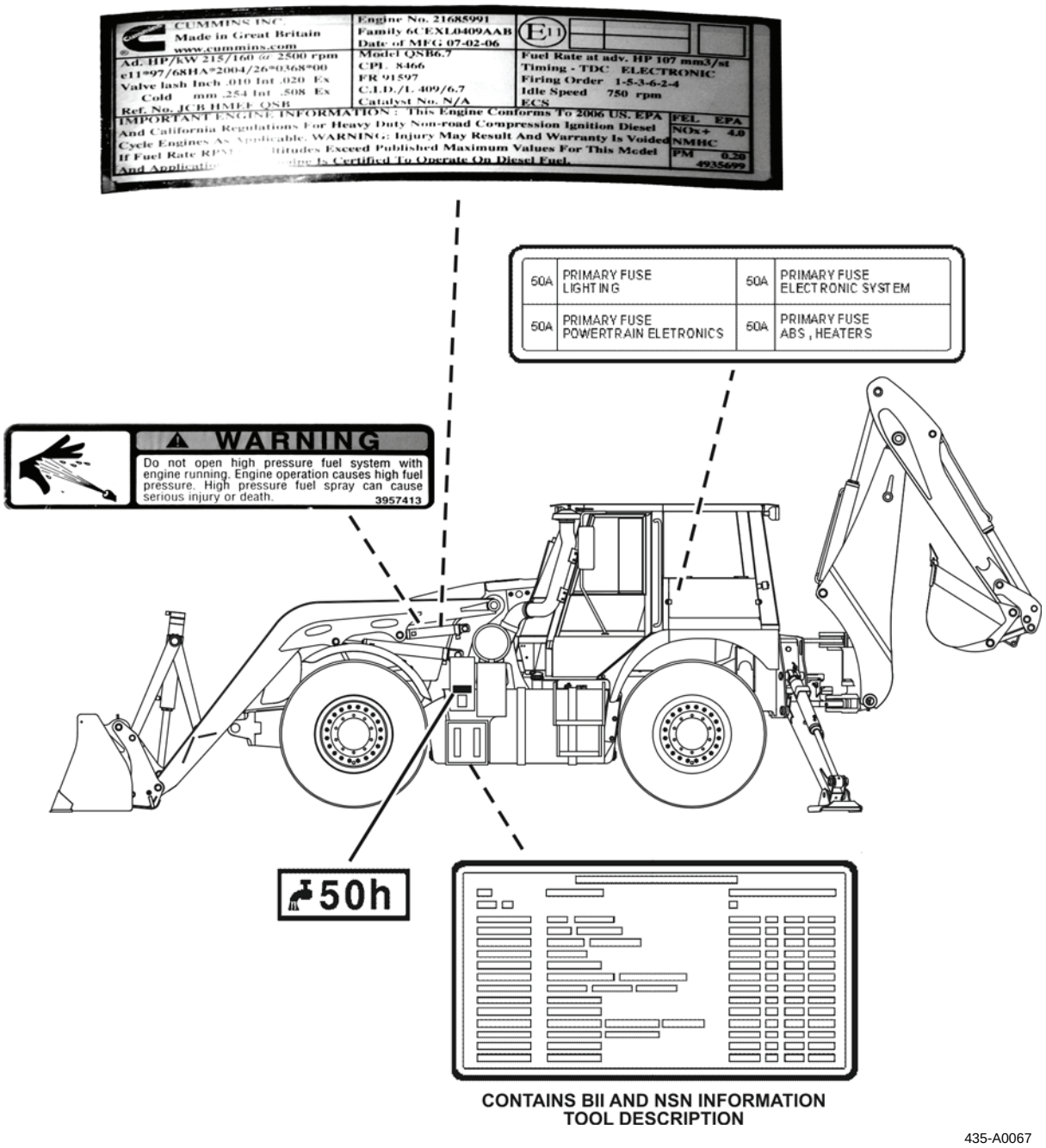


Figure 3. Decals/Data Plates

DECALS AND DATA PLATES – CONTINUED

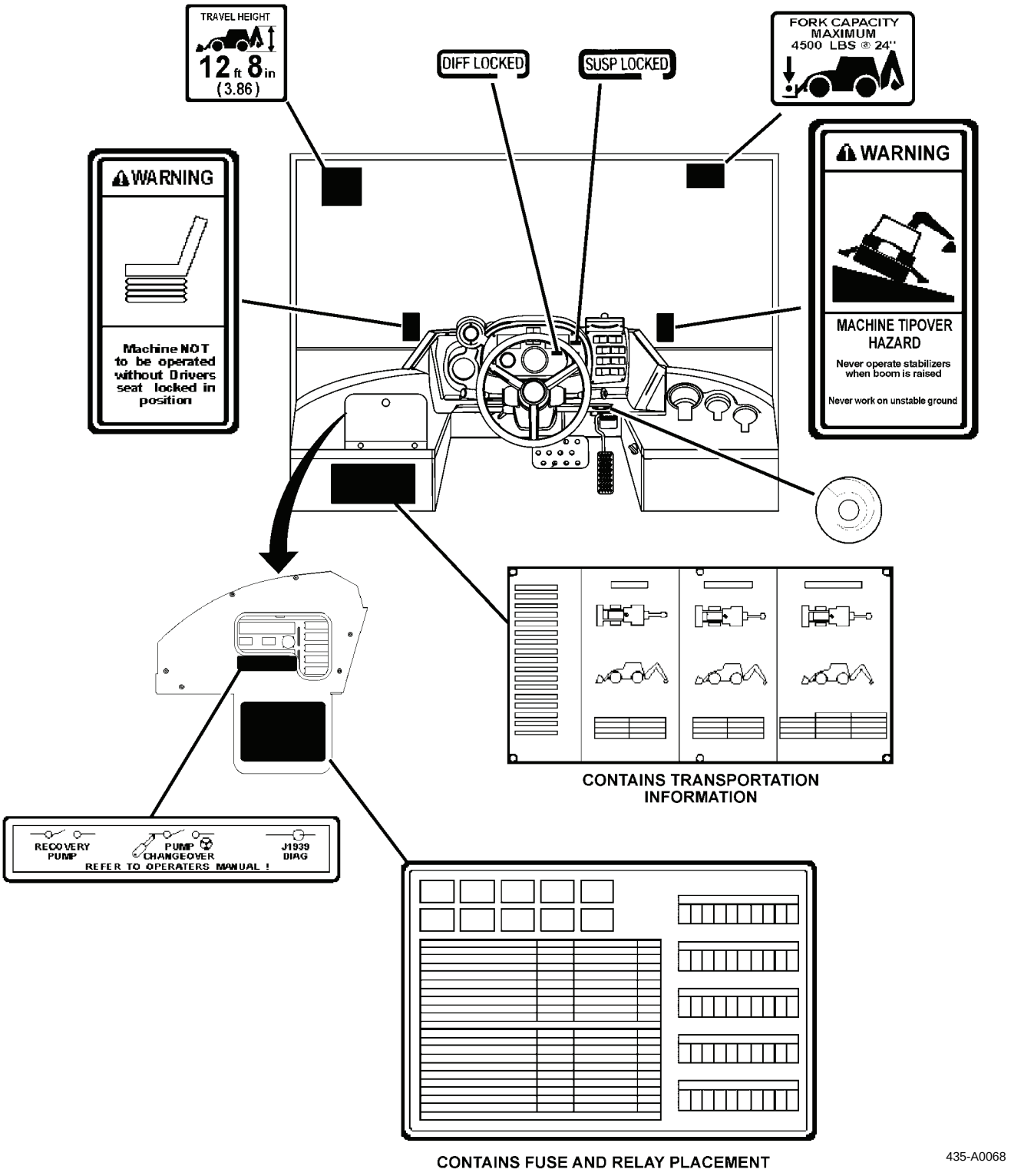


Figure 4. Decals/Data Plates

DECALS AND DATA PLATES – CONTINUED

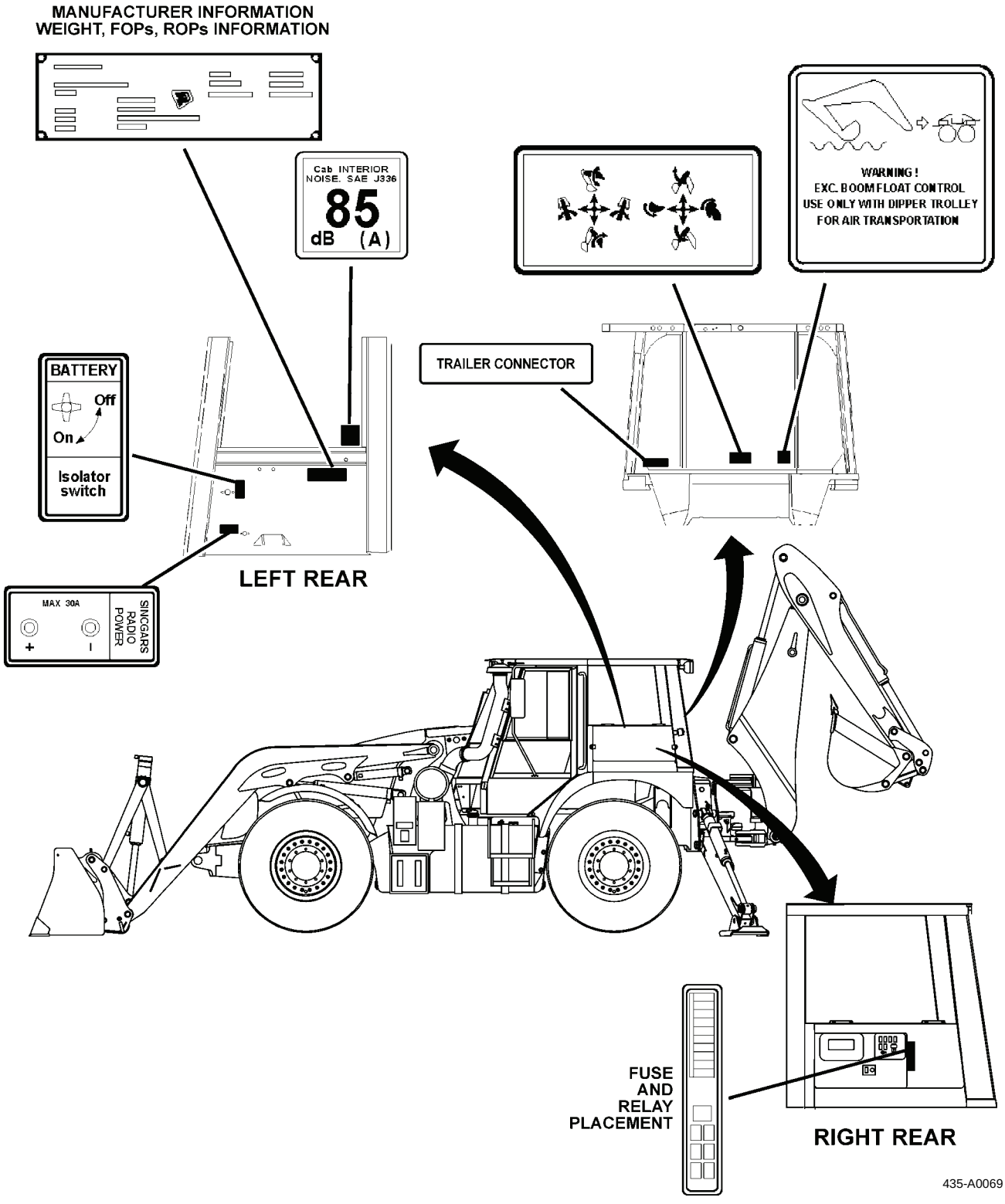


Figure 5. Decals/Data Plates

DECALS AND DATA PLATES – CONTINUED

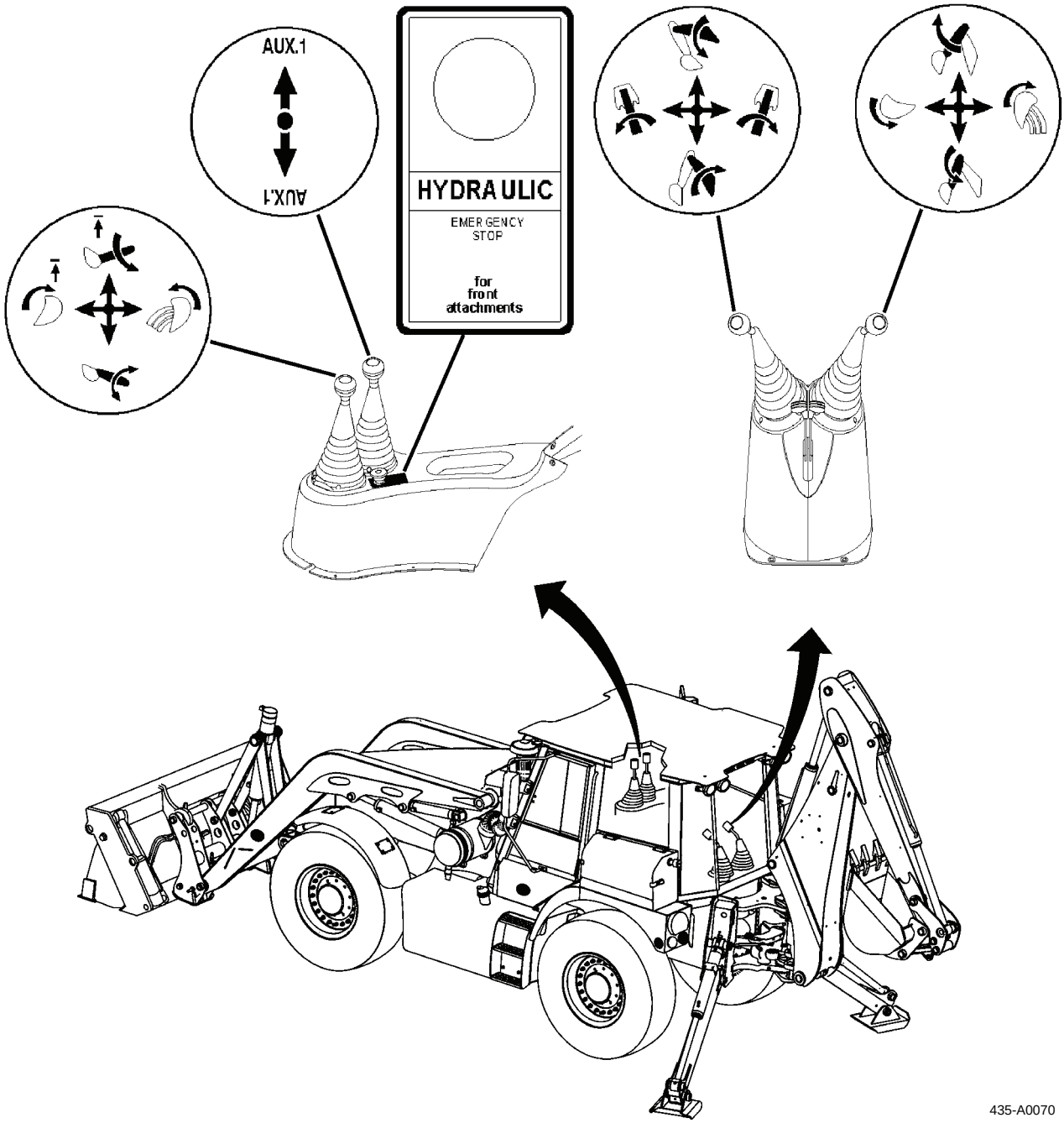


Figure 6. Decals/Data Plates

DECALS AND DATA PLATES – CONTINUED

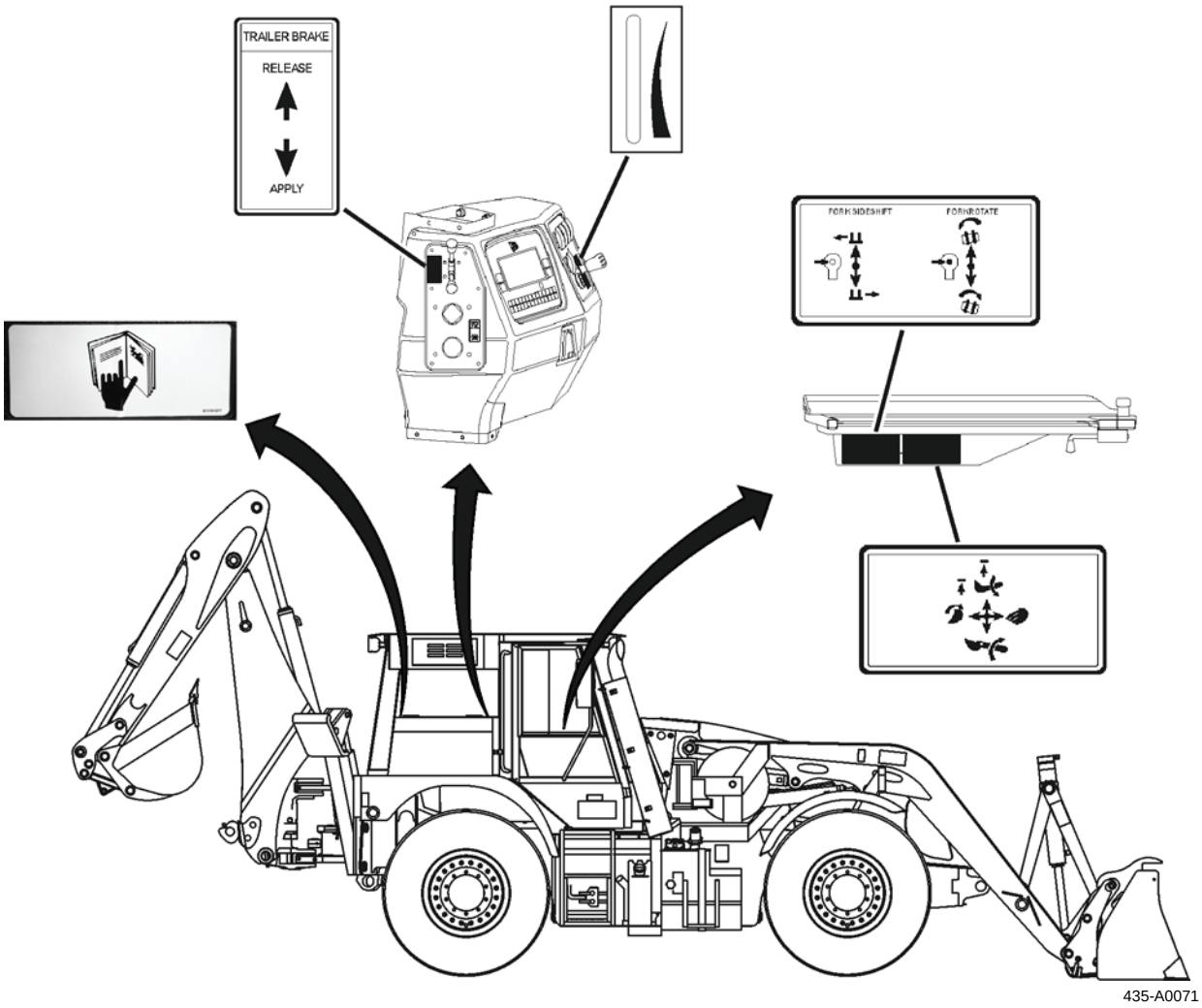


Figure 7. Decals/Data Plates

DECALS AND DATA PLATES – CONTINUED

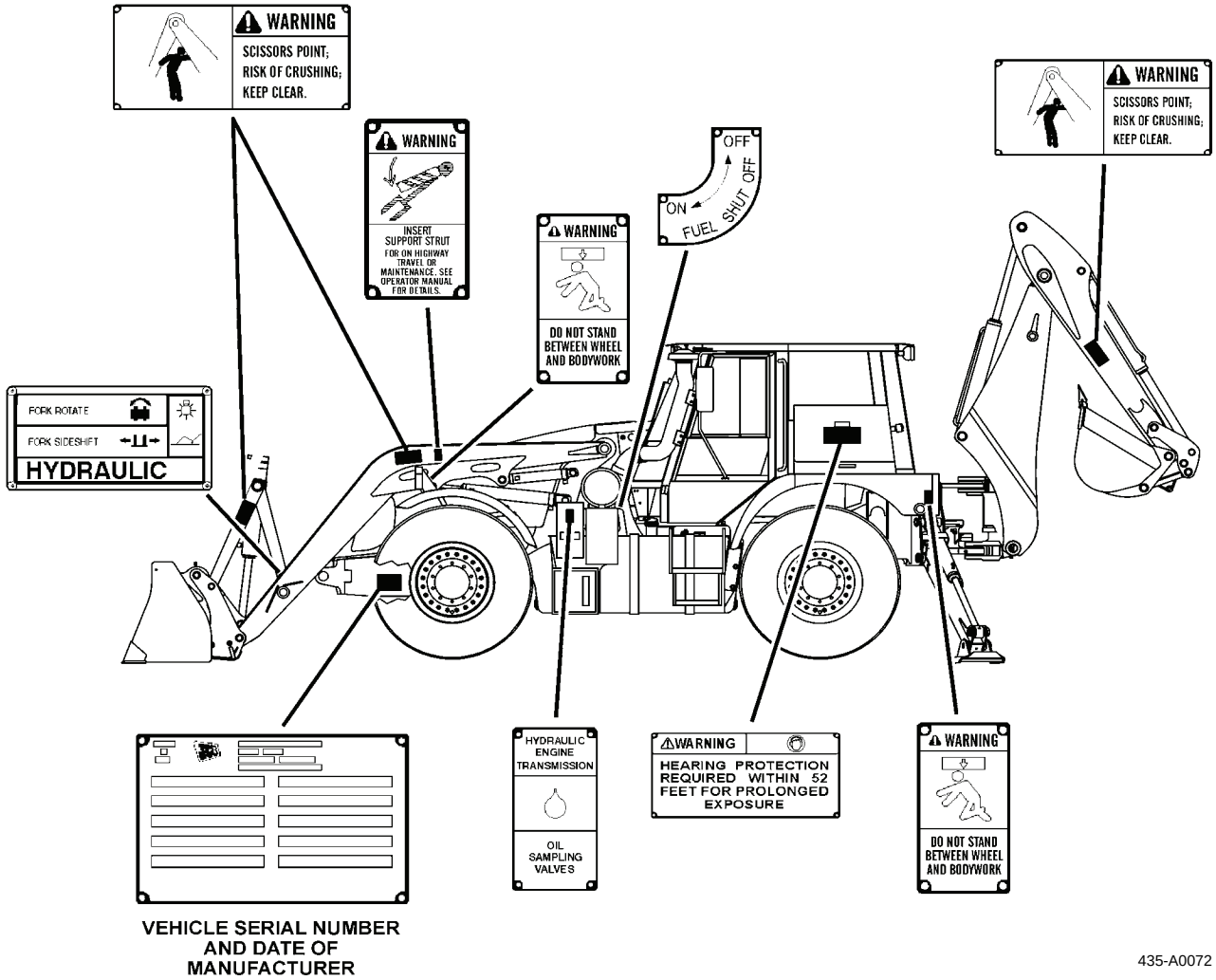
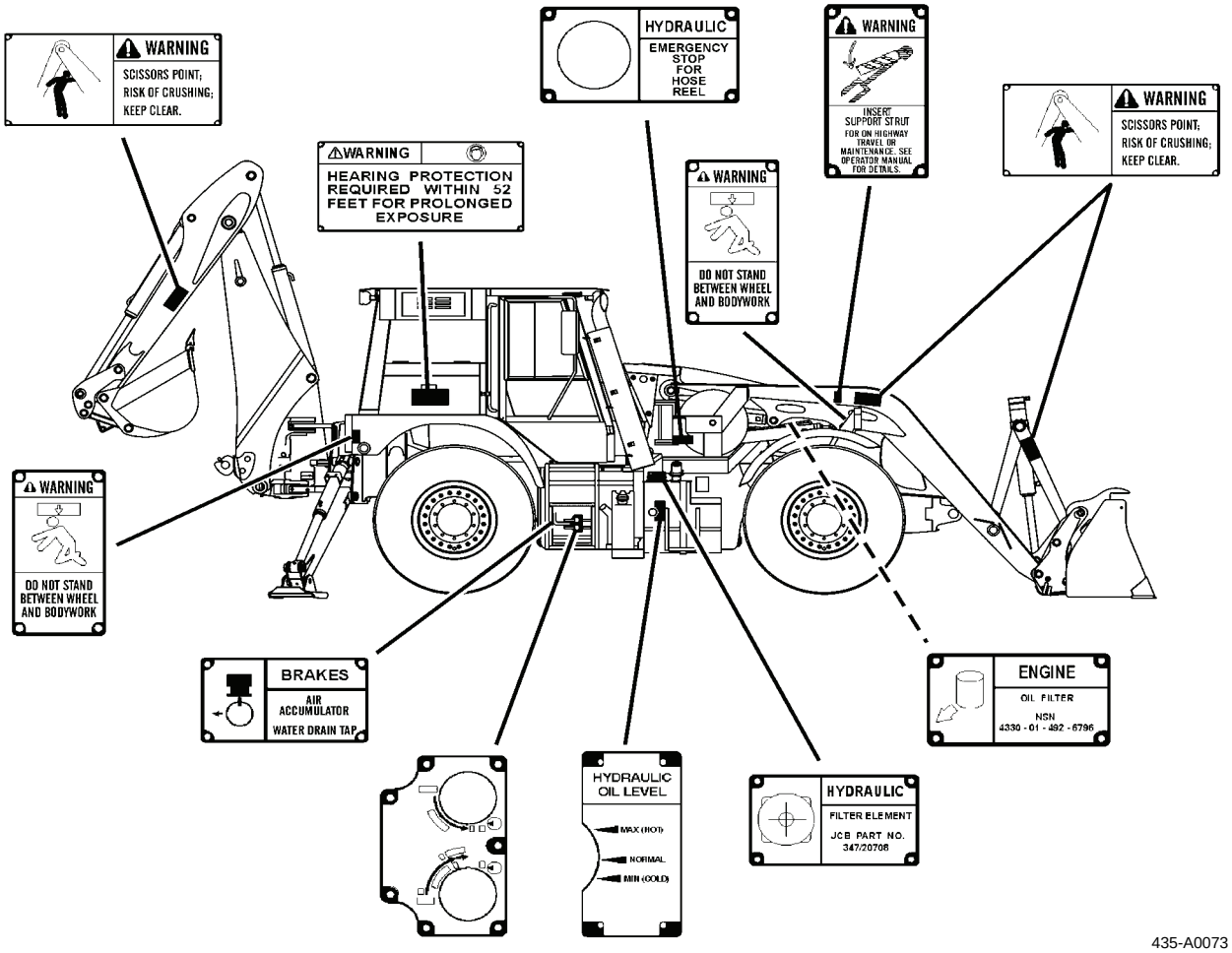


Figure 8. Decals/Data Plates

DECALS AND DATA PLATES – CONTINUED



435-A0073

Figure 9. Decals/Data Plates

DECALS AND DATA PLATES – CONTINUED

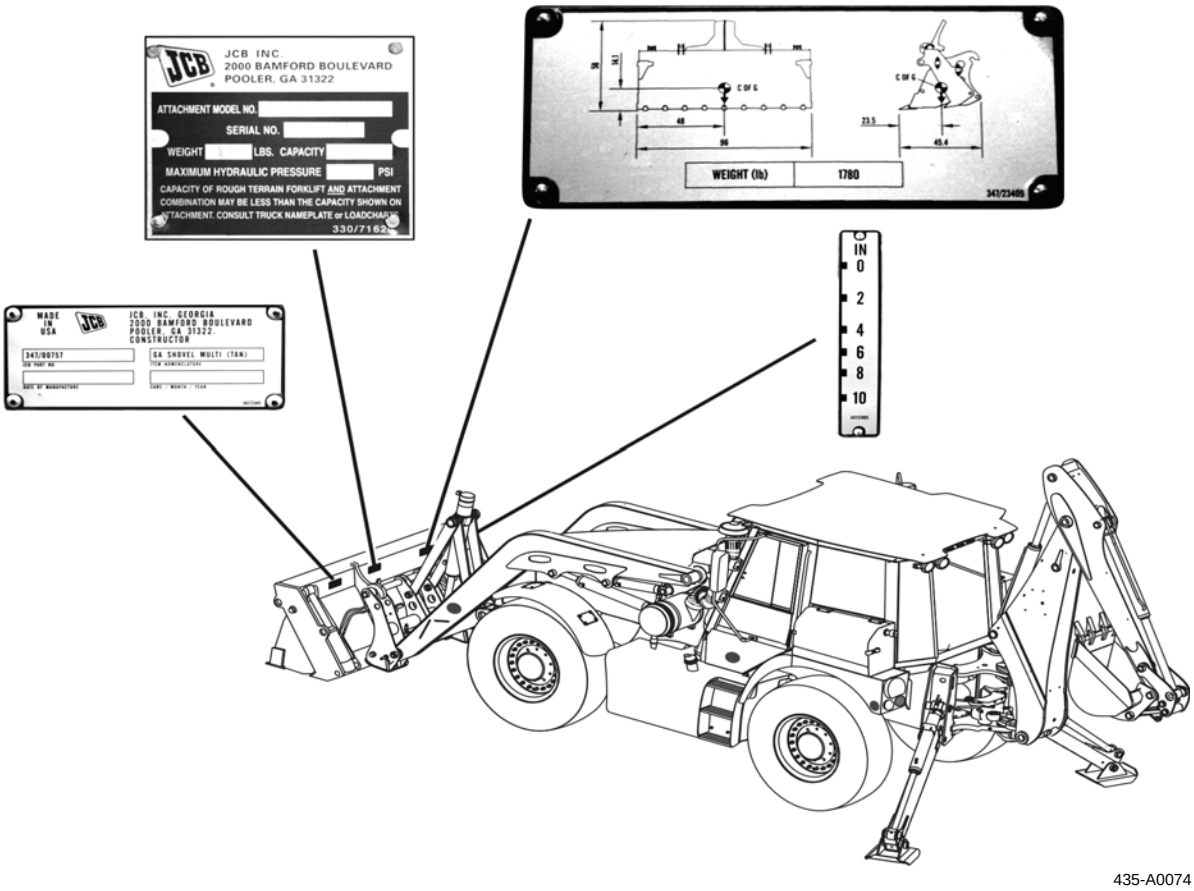
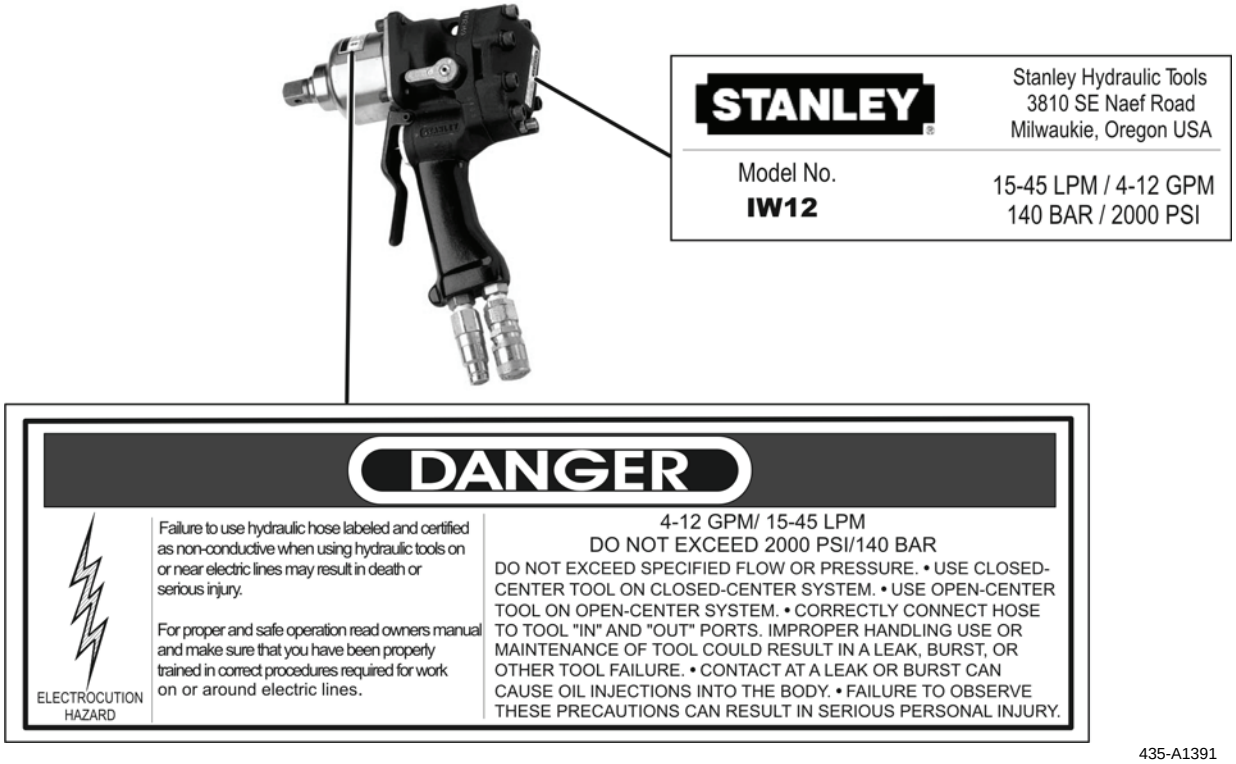


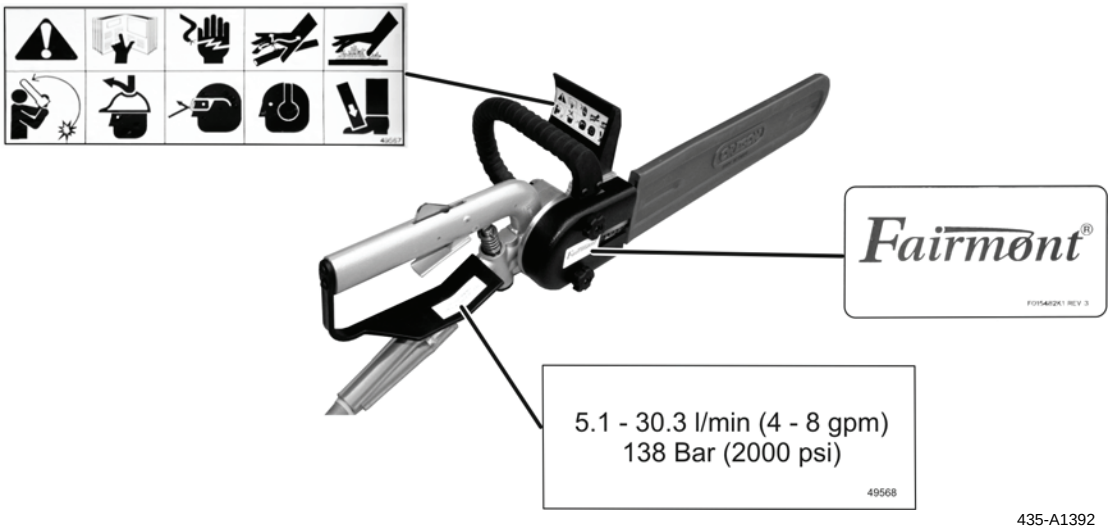
Figure 10. Decals/Data Plates

DECALS AND DATA PLATES – CONTINUED



435-A1391

Figure 11. Impact Wrench Decals



435-A1392

Figure 12. Chain Saw Decals

DECALS AND DATA PLATES – CONTINUED

Figure 13. Pavement Breaker Decal

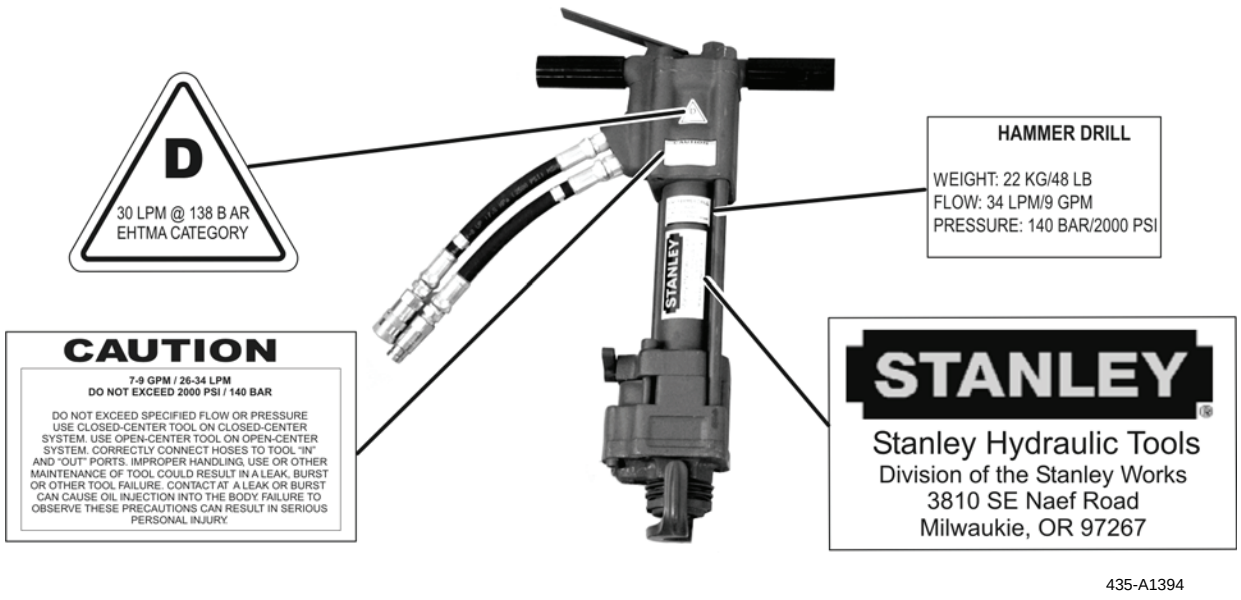


Figure 14. Hammer Drill Decals

DECALS AND DATA PLATES – CONTINUED

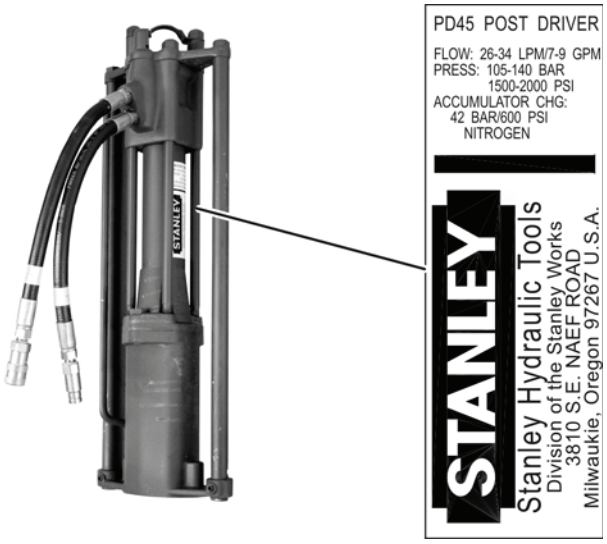


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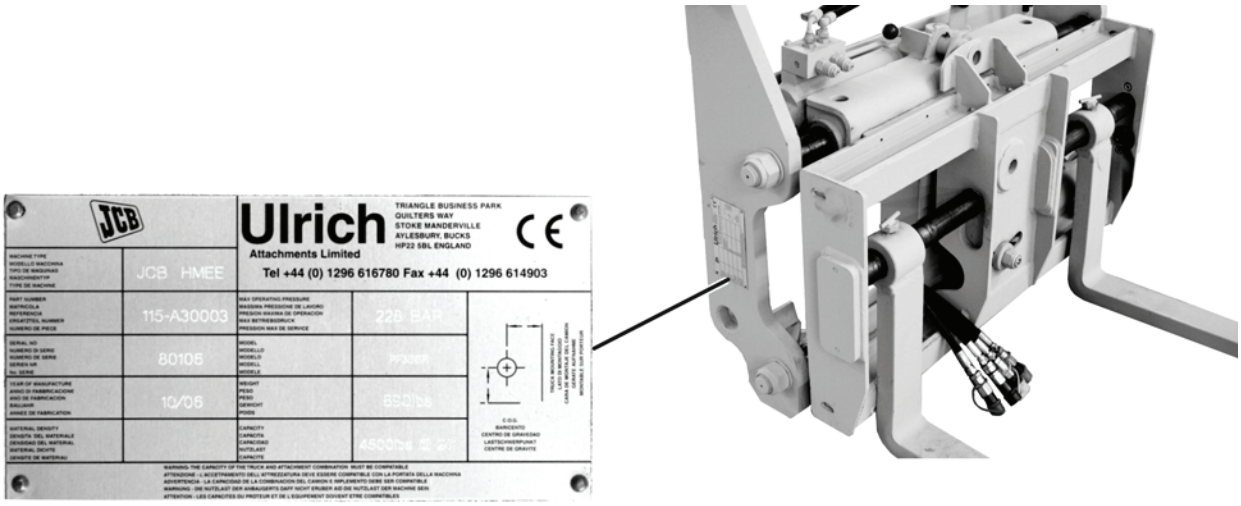
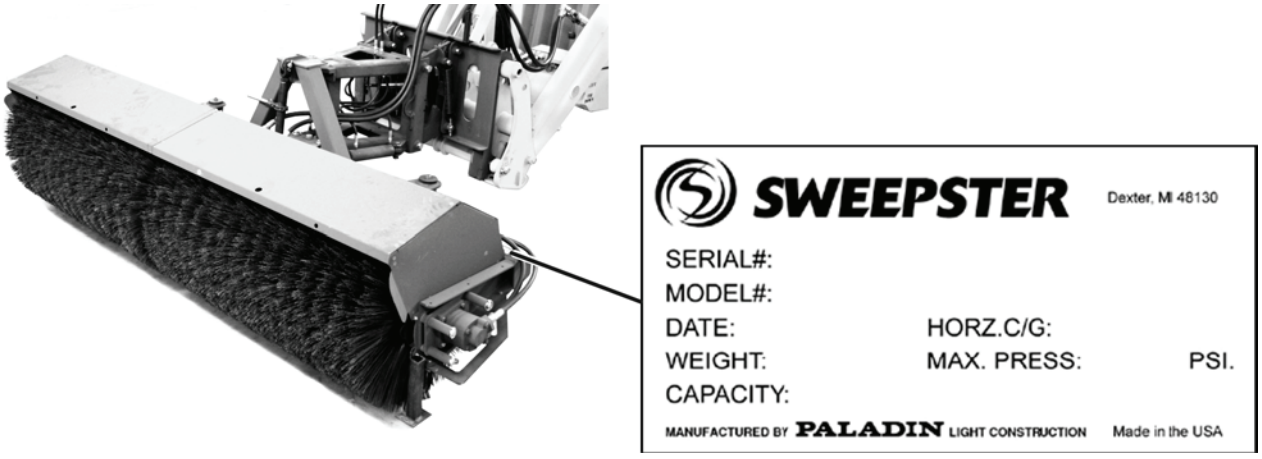
Figure 15. Post Driver Decal



435-A1396

Figure 16. Forks Data Plate

DECALS AND DATA PLATES – CONTINUED



435-A1397

Figure 17. Rotary Sweeper Decal

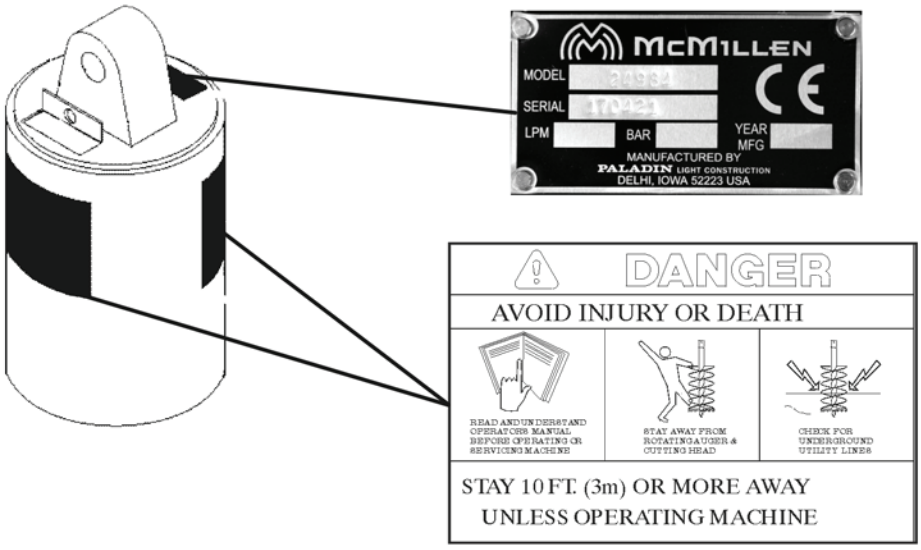


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Figure 18. Auger (Earth Drill) Decals/Data Plate

END OF TASK

STENCILS

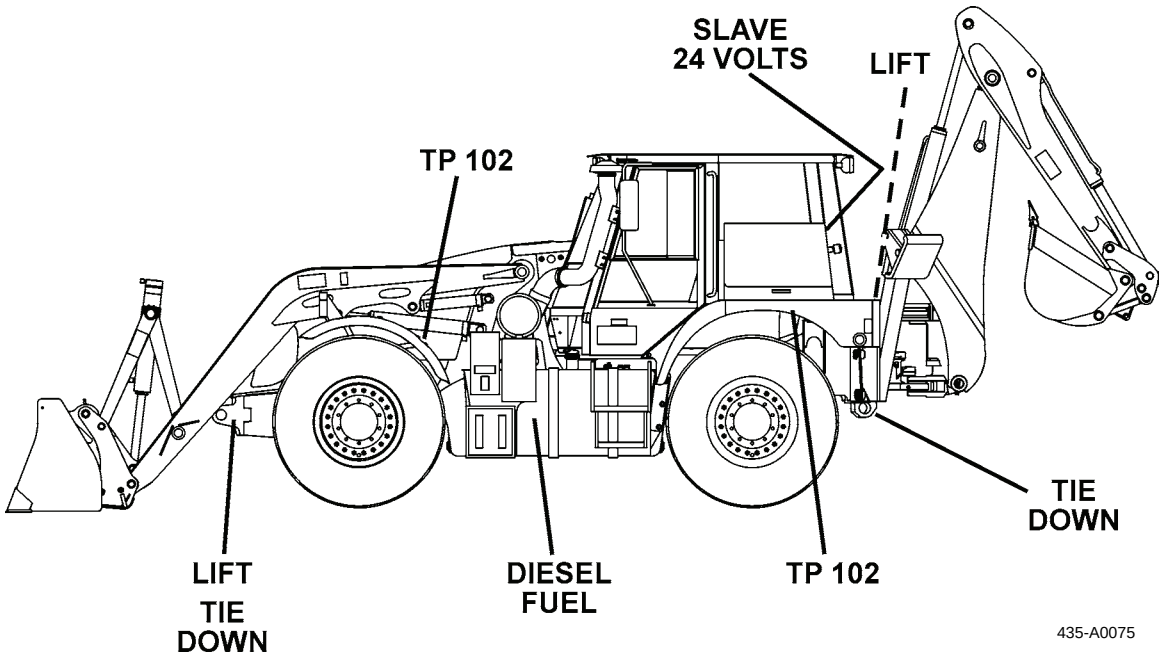


Figure 19. Stencils

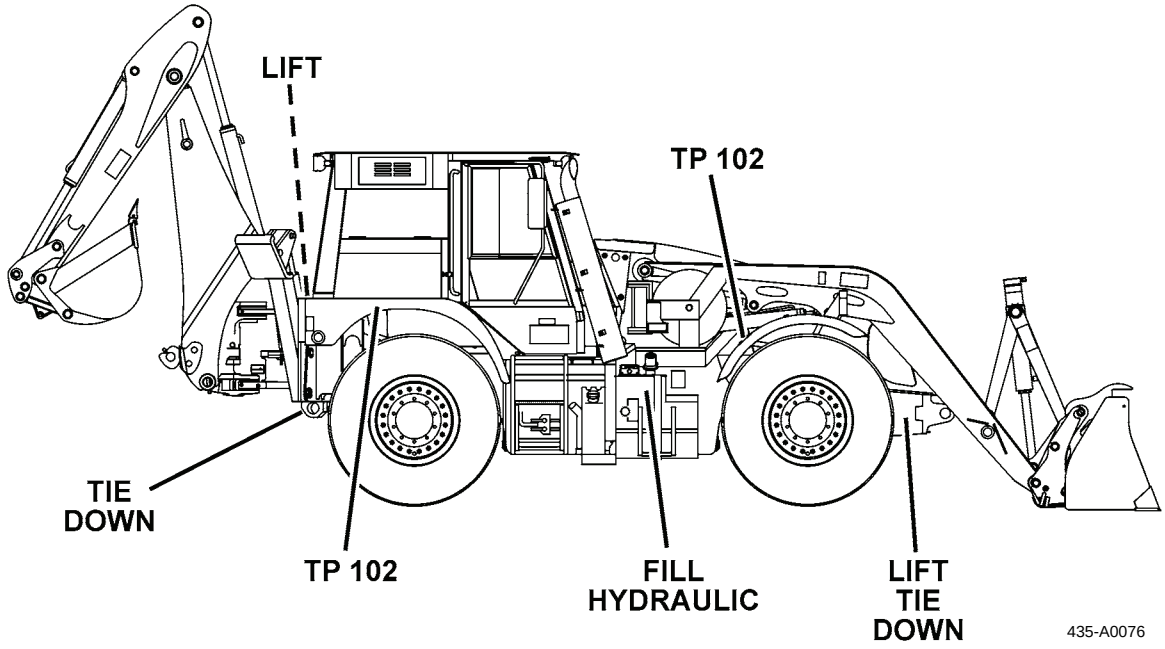


Figure 20. Stencils

END OF TASK

END OF WORK PACKAGE

CHAPTER 3

TROUBLESHOOTING PROCEDURES

TROUBLESHOOTING PROCEDURES

TROUBLESHOOTING INTRODUCTION

This section contains information on the corrective actions used to return the HMEE-I to normal operation. This section lists most malfunctions that may occur along with the associated tests, inspections, and corrective actions. If a malfunction is not listed, or is not easily corrected, notify Unit Maintenance.

Always be on the alert for unusual noises. Check out any evidence of failure or malfunction. Report all malfunctions that are seen, felt, or heard to Unit Maintenance. Troubleshooting the HMEE-I requires the operator to perform unscheduled and scheduled maintenance procedures and to monitor system functions at all times. Discovering and correcting a problem when it first appears will usually result in less serious damage to the machine and provide safer conditions for the operator. When a fault or malfunction is encountered, use the malfunction index for fault identification. The *Troubleshooting Malfunction/ Symptom Index* (WP 0009) will lead the operator to the applicable system work package troubleshooting procedures and the corrective action to be taken.

END OF TASK

END OF WORK PACKAGE

TROUBLESHOOTING PROCEDURES

TROUBLESHOOTING MALFUNCTION/SYMPTOM INDEX

MONITORING SYSTEM TROUBLESHOOTING

Engine OIL PRESSURE WARNING fails to operate properly . . . . . .Notify Unit Maintenance
Engine COOLANT gauge fails to operate properly . . . . . Notify Unit Maintenance
Engine maintenance light comes on . . . . . Notify Unit Maintenance (when mission allows)
TRANS FILTER CLOGGED indicator stays on. . . . . Notify Unit Maintenance (when mission allows)
Transmission oil constantly overheats. . . . . .Notify Unit Maintenance

STEERING SYSTEM TROUBLESHOOTING

Machine difficult to steer. 0012-1
Machine will not select a steering mode . . . . . .Notify Unit Maintenance

TRANSMISSION TROUBLESHOOTING

Machine will not select a gear range . . . . . .Notify Unit Maintenance
Machine will not select forward direction travel. . . . . .Notify Unit Maintenance
Machine will not select reverse direction travel . . . . . Notify Unit Maintenance
Machine will not select gears in range smoothly. . . . . .Notify Unit Maintenance

END OF TASK

END OF WORK PACKAGE

TROUBLESHOOTING PROCEDURES

ENGINE TROUBLESHOOTING

Engine Fails to Crank When Start Switch Is Operated; Engine Cranks at Normal Speed but Will Not Start; Engine Cranks Slowly and Will Not Start; Engine Smokes Excessively After Normal Warmup; Engine Overheats During Normal Operation; Oil Temperature is Too High; Engine Runs Rough or Misfires and/or Knocks, Engine Starts but Fails to Keep Running; Engine Uses Excessive Oil; Low (or High) Engine Oil Pressure, Oil Temperature is Normal

INITIAL SETUP

Personnel Required

One

References

WP 0004

References - Continued

WP 0006
WP 0017
WP 0018
WP 0019

ENGINE FAILS TO CRANK WHEN START SWITCH IS OPERATED

Step 1. Check battery disconnect switch is turned ON (WP 0004).

If OFF, turn the battery disconnect switch ON.

Step 2. Check if the battery cables are loose, broken, or corroded.

If loose, broken, or corroded, notify Unit Maintenance.

Step 3. If problem still exists, notify Unit Maintenance.

ENGINE CRANKS AT NORMAL SPEED BUT WILL NOT START

WARNING

- Do not smoke or permit any open flame in area of machine while you are servicing fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may result in injury or death to personnel or damage to equipment.
- Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.
- Always stop engine prior to refueling. If equipped with arctic cold weather starting aid system, turn engine coolant heater off.
- Do not perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing injury or death to personnel or damage to equipment.

Step 1. Check the fuel gauge to ensure enough fuel is present.

If empty, refuel the machine.

Step 2. Check for broken, leaking, or kinked fuel lines and hoses.

If any of these conditions are found, notify Unit Maintenance.

Step 3. Check for contaminates in the pre-filter by opening the drain tap.

If contaminated, continue to drain until fuel runs clean (WP 0018).

ENGINE CRANKS AT NORMAL SPEED BUT WILL NOT START –CONTINUED

Step 4. Check for air trapped in the fuel lines.

Prime the system using the hand prime pump fitted to the fuel pre-filter (WP 0018). Slowly operate the pump until resistance is felt. (Any remaining air will be bled from the system during cranking.)

Step 5. If problem still exists, notify Unit Maintenance.

ENGINE CRANKS SLOWLY BUT WILL NOT START

Step 1. Check if the battery cables are loose, broken, or corroded.

If loose, broken, or corroded, notify Unit Maintenance.

Step 2. Carry out slave start procedure (WP 0006).

If problem still exists, notify Unit Maintenance.

ENGINE SMOKES EXCESSIVELY AFTER NORMAL WARMUP

Step 1. Check if the air filter indicator light is ON.

If indicator light is ON, contact Unit Maintenance.

Step 2. Check for wrong grade of fuel.

Have Unit Maintenance check the grade of fuel.

Step 3. If problem still exists, notify Unit Maintenance.

ENGINE OVERHEATS DURING NORMAL OPERATION

Step 1. Check for low coolant in reservoir.

When the engine is hot, remove the reservoir cap slowly to relieve pressure. Wear gloves, eye protection, and protective clothing. Failure to follow this warning could result in injury to personnel.

Top off the coolant level (WP 0017).

Step 2. Check for debris blocking the air flow through the radiator.

CAUTION

Do not use a screwdriver or any other sharp instrument to remove debris from the radiator. To do so could result in damage to equipment.

Remove any debris from grille and radiator (WP 0019). If cooling fins are plugged, notify Unit Maintenance.

Step 3. Check for low engine oil level.

If low, fill as specified in WP 0017.

Step 4. Check for restricted exhaust system, such as bent or crushed exhaust pipes.

If exhaust pipes are damaged, notify Unit Maintenance.

Step 5. If problem still exists, notify Unit Maintenance.

ENGINE OIL TEMPERATURE IS TOO HIGH

Step 1. Check engine oil level.

If low, fill as specified in WP 0017.

Step 2. If problem still exists, notify Unit Maintenance.

ENGINE RUNS ROUGH OR MISFIRES AND/OR KNOCKS

Step 1. Check if the air filter indicator light is ON.

If indicator light is ON, contact Unit Maintenance.

Step 2. Check for fuel leaks.

If leaks are found, shut down engine and notify Unit Maintenance.

Step 3. Check if engine is running at below normal operating temperature.

Run engine at a higher rpm (1,000 to 1,500) for 3 to 5 minutes.

Step 4. Check for wrong grade of fuel.

Have Unit Maintenace check the grade of fuel.

Step 5. If problem still exists, notify Unit Maintenance.

ENGINE STARTS BUT FAILS TO KEEP RUNNING

Step 1. Check fuel level gauge to ensure enough fuel is present.

If empty, refuel the machine.

Step 2. Check for air trapped in the fuel lines.

Bleed fuel system (WP 0018).

Step 3. Check if the air filter indicator light is ON.

If indicator light is ON, notify Unit Maintenance.

Step 4. If problem still exists, notify Unit Maintenance.

ENGINE USES EXCESSIVE OIL

Step 1. Check for oil leaks in engine compartment.

If leaks are found, notify Unit Maintenance.

Step 2. Check engine oil level for overfill (WP 0017).

If overfull, notify Unit Maintenance.

Step 3. If problem still exists, notify Unit Maintenance.

LOW (OR HIGH) ENGINE OIL PRESSURE, OIL TEMPERATURE IS NORMAL

Step 1. Check engine oil level.

If low, fill as specified in WP 0017.

Step 2. If problem still exists, notify Unit Maintenance.

END OF TASK

END OF WORK PACKAGE

TROUBLESHOOTING PROCEDURES

BRAKES TROUBLESHOOTING

Low Fluid Warning Light Stays On, Low Brake Pad Warning Light Operates When Brake is Applied, Parking Brake Does Not Hold Machine or Cannot be Engaged

INITIAL SETUP

Personnel Required	References
One	WP 0017

LOW FLUID WARNING LIGHT STAYS ON

Check the fluid level in the reservoirs, and for obvious signs of fluid leaks.

Top off as specified in WP 0017. Report any leaks immediately to Unit Maintenance.

LOW BRAKE PAD WARNING LIGHT OPERATES WHEN BRAKE IS APPLIED

Report the occurrence to Unit Maintenance.

PARKING BRAKE DOES NOT HOLD MACHINE OR CANNOT BE ENGAGED

Report the occurrence to Unit Maintenance.

END OF TASK

END OF WORK PACKAGE

TROUBLESHOOTING PROCEDURES

STEERING SYSTEM TROUBLESHOOTING

Machine Difficult to Steer

INITIAL SETUP

Personnel Required	References
One	WP 0004
	WP 0017
	WP 0020

MACHINE DIFFICULT TO STEER

1. Check that power steering assistance light on front console warning panel is extinguished.

   Ensure suspension mode change is completed. If warning light does not extinguish, contact Unit Maintenance.

2. Check that 2-wheel steer (2WS) mode is selected (WP 0004).

   Select 2WS.

3. Visually check the tires for proper inflation and the wheels for damage (WP 0020).

   Correct tire pressure is 102 psi (703 kPa) on all missions. Report any wheel damage to Unit Maintenance.

4. Check for physical damage to steering linkage. Also check for debris trapped on steering linkages, steering shaft, and around axle swivels.

   Report any damage to Unit Maintenance.

NOTE

When selecting 4-wheel steer (4WS), the rear wheels will not start to operate until the front steered wheels pass through the straight ahead position.

5. Repeat the above checks for steering linkage damage with 4WS selected.

   Report any damage to Unit Maintenance.

6. Check the hydraulic reservoir fluid level (WP 0017).

   Fill as specified in WP 0017.

7. If problem still exists, notify Unit Maintenance.

END OF TASK

END OF WORK PACKAGE

TROUBLESHOOTING PROCEDURES

ELECTRICAL SYSTEM TROUBLESHOOTING

Voltmeter Indicates Unusual Battery Condition, Charge Indicator Light Indicates Charging Circuit Undercharging

INITIAL SETUP

Personnel Required	References
One	WP 0017

VOLTMETER INDICATES UNUSUAL BATTERY CONDITION

Check if the battery cables are loose, broken, or corroded.

If loose, broken, or corroded, contact Unit Maintenance.

CHARGE INDICATOR LIGHT INDICATES CHARGING CIRCUIT UNDERCHARGING

1. Check for broken or slipping alternator drive belt.

   Check belt deflection (WP 0017). If belt is loose, notify Unit Maintenance.
2. Check if alternator cables are loose, broken, or corroded.

   If loose, broken, or corroded, notify Unit Maintenance.
3. Check if battery cables are loose, broken, or corroded.

   If loose, broken, or corroded, notify Unit Maintenance.
4. If problem still exists, notify Unit Maintenance.

END OF TASK

END OF WORK PACKAGE

TROUBLESHOOTING PROCEDURES

LIGHTS TROUBLESHOOTING

Any Light (Except Warning Indicator) Flickers, Will Not Go Off or Come On; Machine Lights Do Not Work

INITIAL SETUP

Personnel Required

One

ANY LIGHT (EXCEPT WARNING INDICATOR) FLICKERS, WILL NOT GO OFF OR COME ON

Step 1. Check lamp.

Tighten or replace lamp as required.

Step 2. If problem still exists, notify Unit Maintenance.

MACHINE LIGHTS DO NOT WORK

Step 1. Check lamp.

Replace lamp.

Step 2. If problem still exists, notify Unit Maintenance.

END OF TASK

END OF WORK PACKAGE

TROUBLESHOOTING PROCEDURES

HYDRAULIC SYSTEM TROUBLESHOOTING

Hydraulic Equipment Fails to Operate

INITIAL SETUP

Personnel Required	References
One	WP 0004
	WP 0005
	WP 0006
	WP 0017

HYDRAULIC EQUIPMENT FAILS TO OPERATE

Step 1. Check the hydraulic fluid level in the sight glass with the equipment in its transport/travel position (WP 0017).

Fill as specified in WP 0017.

Step 2. Check for hydraulic fluid leaks or damage to the system.

If leaks or damage are found, notify Unit Maintenance.

Step 3. Check that the deactivation switches both inside the cab and adjacent to the hose reel are not in their deactivation position (WP 0004).

Reactivate switch as required.

Step 4. Check the cold start valves are in the correct position (WP 0005 and WP 0006).

Reposition the valves as required.

Step 5. If problem still exists, notify Unit Maintenance.

END OF TASK

END OF WORK PACKAGE

CHAPTER 4

PMCS MAINTENANCE INSTRUCTIONS

MAINTENANCE INSTRUCTIONS

PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION

Maintenance Forms and Records, General Information, Explanation of Table Entries, Things to Remember While Performing PMCS

MAINTENANCE FORMS AND RECORDS

Every mission begins and ends with paperwork. There isn't much of it, but you have to keep it up. The forms and records you fill out have several uses. They are a permanent record of services, repairs, and modifications made on your machine. They are reports to Unit Maintenance and to your commander. They are also checklists that tell you what is wrong with the equipment after its last use and whether those faults have been repaired. For information on those forms and records, see DA PAM 750-8 (TAMMS).

END OF TASK

GENERAL INFORMATION

1. PMCS (WP 0017) is divided into five tables: Table 1 is Before PMCS; Table 2 is During PMCS; Table 3 is After PMCS; Table 4 is Weekly PMCS; Table 5 is Lubrication Instructions.
2. Safe and efficient machine operation requires regular checks of equipment. When performing PMCS, the crew discovers malfunctions or performs routine maintenance for upkeep of the machine's systems. Malfunctions require corrective action to avoid equipment failure or injury to personnel. The suspension system requires special attention. Ensure that all lubrication tasks in Table 5 are performed.
3. Always observe the WARNINGs and CAUTIONs appearing in the PMCS tables. WARNINGs and CAUTIONs appear before applicable procedures. You must observe these WARNINGs and CAUTIONs to prevent injury to yourself or others or prevent equipment damage.

END OF TASK

EXPLANATION OF TABLE ENTRIES

1. **Item Number column.** Numbers in this column are for reference. When completing DA Form 2404 (Equipment Inspection and Maintenance Worksheet), include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.
2. **Interval column.** This column tells you when you must do the procedure listed in the procedure column. Before procedures must be done before you operate or use the equipment for its intended mission. During procedures must be done during the time you are operating the equipment for the intended mission. After procedures must be done immediately after you have operated the equipment.
3. **Man-Hours column.** This column indicates the man-hours required to complete the prescribed lubrication.
4. **Location, Item To Check/Service column.** This column provides the location and the item to be checked or serviced. The item location is underlined.
5. **Procedure column.** This column gives the procedure you must perform, check, or service the item listed in the Check/Service column to know if the equipment is ready or available for its intended mission or for operation. You must perform the procedure at the time stated in the Interval column.
6. **Not Fully Mission Capable If: column.** Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If you determine that a fault exists on your machine as listed in this column, do not operate your machine. Once a malfunction is identified, troubleshoot it using the instructions in this manual. If unable to correct the fault, write it on DA Form 2404 or DA Form 5988-E and notify Unit Maintenance immediately.
7. **Other Table Entries.** Be sure to observe all special information and notes that appear in the tables.

END OF TASK

THINGS TO REMEMBER WHILE PERFORMING PMCS

1. Always do PMCS in the same order so it gets to be a habit. Once you have had some practice, you will spot anything wrong in a hurry.
2. When performing PMCS, take along the tools needed to make the check or service. Always take along clean wiping rags (Item 17, WP 0033).
3. Keep the machine and individual components clean. Dirt, grease, oil, and debris may conceal a serious problem. Clean as you go. Use solvent (Item 2, WP 0033) on all surfaces. Use mild soap and water to clean rubber or plastic parts. Avoid spraying water directly into engine air intakes.
4. Check all attaching hardware for looseness. Tighten loose hardware before operating machine. For hardware that requires staking, lockwires, or nylon fasteners, notify Unit Maintenance.
5. Look for loose or chipped paint, rust, or gaps where parts are welded together. Report all bad welds to Unit Maintenance for repair before operating the machine.
6. Look for cracked or broken electrical insulation, bare wires, and loose or broken connectors. Tighten loose connectors and ensure wires are in good shape before operating the machine.
7. Look for fluid leaks from hoses and fittings. Check for wear and damage to hoses and fluid lines and be sure clamps and fittings are tight. Report all stains, wet spots, and leaks to Unit Maintenance.
8. Check all fluids for contamination. If contamination such as rust, water, or sediment is found in the fluid, notify Unit Maintenance before operating the machine.
9. Perform PMCS more often to compensate for continuous operation and abnormal conditions such as high or low temperatures, prolonged periods of high rate operation, continued operation in sand, dust, or exposure to moisture or salt which may cause excessive wear or damage.
10. Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.
11. While corrosion is typically associated with rusting metals, it can also include deterioration of other materials such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.
12. If a problem is identified, it can be reported using DA Form 2404 or DA Form 5988-E. Use of key words such as “corrosion,” “rust,” “deterioration,” or “cracking” will ensure that the information is identified as a CPC problem.
13. Classification of Fluid Leaks. The following definitions concern types/classes of fluid leakage. Each operator must be familiar with these definitions in order to determine whether or not the machine is mission capable:

WARNING

Do not operate machine with any class of fuel leak. Fuel may ignite causing injury or death to personnel.

CAUTION

Equipment operation is allowable with minor leakage (Class I or II). Consideration must be given to the fluid capacity in the item/system being checked/inspected. When in doubt, notify the commander. When operating with Class I or Class II leaks, continue to check fluid levels as required in your PMCS. Do not operate machine with any Class III leaks. Report Class III leaks to Unit Maintenance. Failure to follow this caution may result in damage to equipment.

THINGS TO REMEMBER WHILE PERFORMING PMCS –CONTINUED

Class I: Seepage of fluids as indicated by wetness or discoloration not great enough to form drops.

Class II: Leakage of fluid great enough to form drops, but not enough to cause drops to drip from item being checked/inspected.

Class III: Leakage of fluids great enough to form drops that fall from the item being checked/inspected.

14. The following routing diagram may help complete the Before and After part of the PMCS. The diagram follows the sequence of the PMCS to be performed (Figure 1).

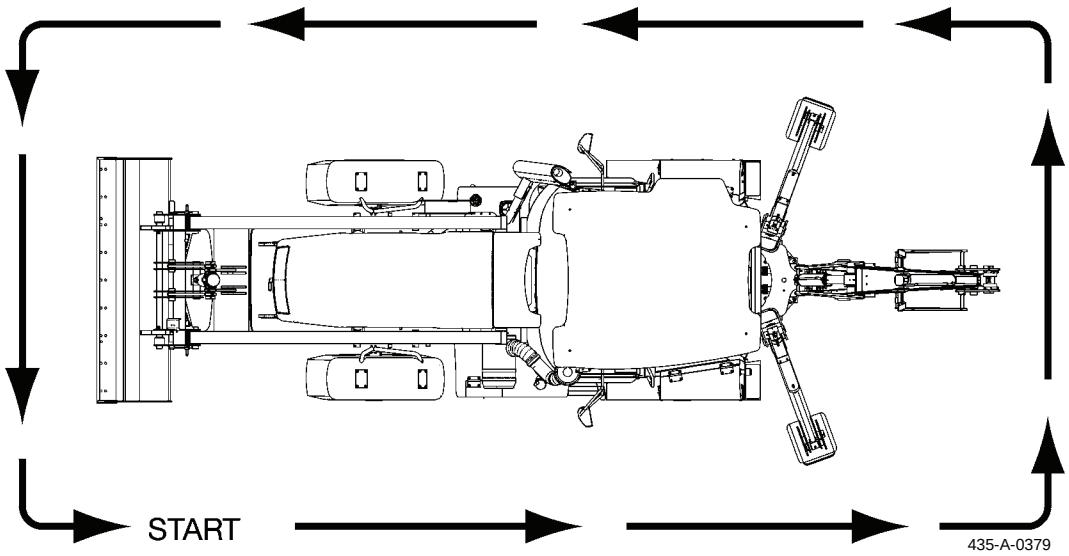


Figure 1. PMCS Walk-Around

END OF TASK

END OF WORK PACKAGE

MAINTENANCE INSTRUCTIONS

PMCS (INCLUDING LUBRICATION INSTRUCTIONS)

Table 1: Before PMCS; Table 2: During PMCS; Table 3: After PMCS; Table 4: Weekly PMCS; Table 5: Lubrication Instructions

INITIAL SETUP

Tools and Special Tools

Pry bar (Item 4, Table 2, WP 0031)

Materials/Parts

Cleaning compound, solvent (Item 2, WP 0033)
Rag, wiping (Item 17, WP 0033)

Personnel Required

One

References

WP 0018
WP 0019
WP 0021

References - Continued

WP 0034
WP 0035
WP 0036
WP 0037
WP 0037
WP 0040
WP 0041
WP 0042
WP 0043

Equipment Conditions

Machine parked on level ground (WP 0005)
Suspension in Maintenance Mode (WP 0004)

Table 1. Before PMCS.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
			EXTERIOR		
1	**Before**		**Left Side Front**	Check for exterior fluid leaks, missing items, or damage to equipment.	Any brake fluid leak. Any fuel leak or Class III oil or coolant leak. Sheet metal torn or sharp edges exposed.
2	**Before**		**Left Side Wheels and Tires**	WARNING Operating a machine with a tire in an under-inflated condition or with a questionable defect may lead to premature tire failure and may cause injury or death to personnel or damage to equipment.	
				a. Check wheel rim for damage and missing or broken wheel or rim nuts or studs.	One or more wheel nuts or rim nuts loose or missing. One or more studs broken off.

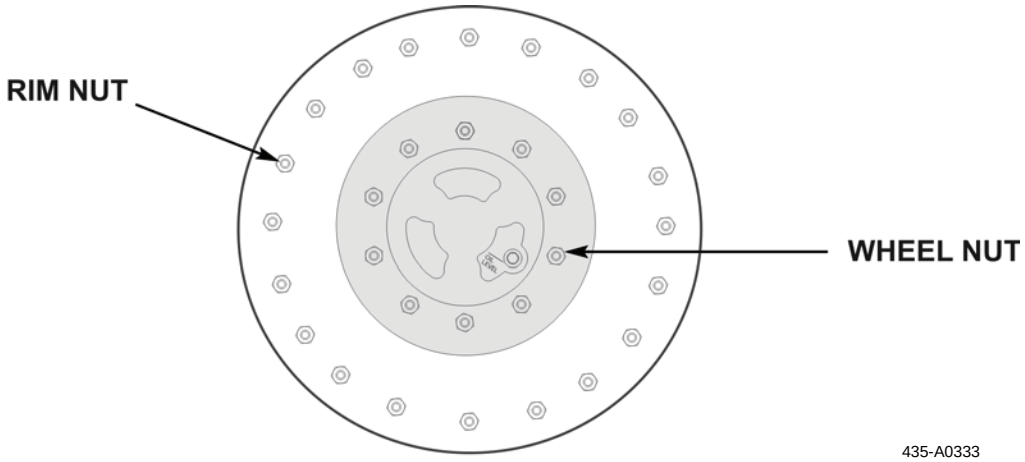


Figure 1. Wheels and Tires - Left Side

				b. Check tires for cuts, cracks, bulges, or damage that exposes the cords. Listen for obvious air leaks.	Any tire will not hold air. Any tire has cuts, cracks, leaks, bulges, or damage that exposes the cords.
3	**Before**		**Air Filter Housing**	Check air filter housing for damage. Check the dust discharge valve is present and not damaged.	Air discharge valve missing or damaged.
4	**Before**		**Left Side Rear**	Check for exterior fluid leaks, missing items, or damage to equipment.	Any brake fluid leak. Any fuel leak or Class III oil or coolant leak. Sheet metal torn or sharp edges exposed.

Table 1. Before PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
5	**Before**		**Stabilizers**	Check for presence of or damage to the stabilizers.	Hardware missing or damaged.
6	**Before**		**Backhoe Securing Strut and Hardware**	Verify all locking devices, safety pins, and latches are present and implements can be securely locked in the travel position.	Securing strut, locking device, or safety pins are missing or damaged.
7	**Before**		**Right Side Rear**	Check for exterior fluid leaks, missing items, or damage to equipment.	Any brake fluid leak. Any fuel leak or Class III oil or coolant leak.
8	**Before**		**Right Side Wheels and Tires**	WARNING Operating a machine with a tire in an under-inflated condition or with a questionable defect may lead to premature tire failure and may cause injury or death to personnel and damage to equipment.	
				a. Check wheel rim for damage and missing or broken wheel or rim nuts or studs.	One or more wheel nuts or rim nuts loose or missing. One or more studs broken off.

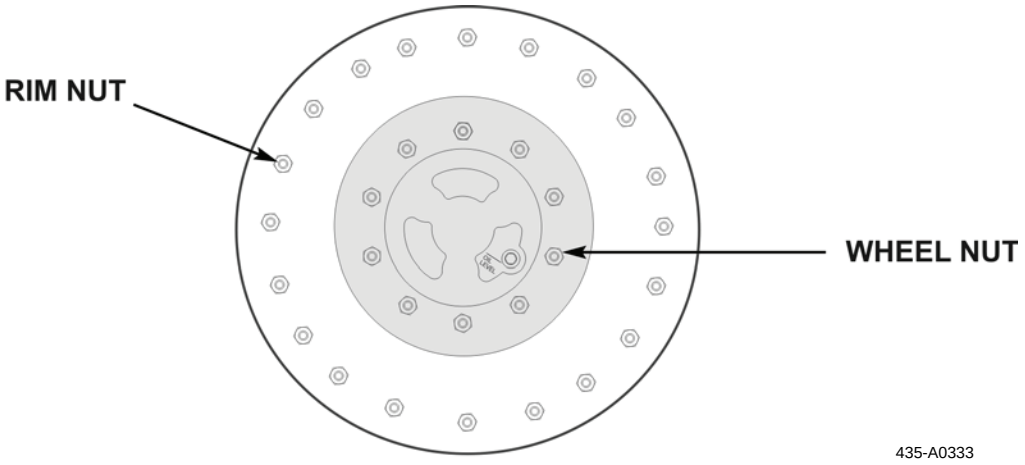


Figure 2. Wheels and Tires - Right Side

				b. Check tires for cuts, cracks, bulges, or damage that exposes the cords. Listen for obvious air leaks.	Any tire will not hold air. Any tire has cuts, cracks, leaks, bulges, or damage that exposes the cords.

Table 1. Before PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
9	Before	0.2	Hydraulic Tank	NOTE • Open filler cap slowly. • Park machine on level surface.	
				Check hydraulic oil level via sight glass in tank. If required, clean around filler cap (Rag, wiping (Item 17, WP 0033) and add proper grade of oil (Table 5) to bring to the correct level. Check for presence of chain. Check for presence and condition of gauge. Refit and secure filler cap.	Cap missing. Class III oil leak. Oil is above or below marks on the sight glass.
10	Before		Right Side Front	Check for exterior fluid leaks, missing items, or damage to equipment.	Any brake fluid leak. Any fuel leak or Class III oil or coolant leak. Sheet metal torn or sharp edges exposed.
11	Before		Front Bucket	Verify all cylinder securing struts, bars, locking devices, and safety pins are present and can be used to securely lock the machine in the travel/maintenance positions (WP 0021).	Travel bars, locking devices, or safety pins are missing or damaged.

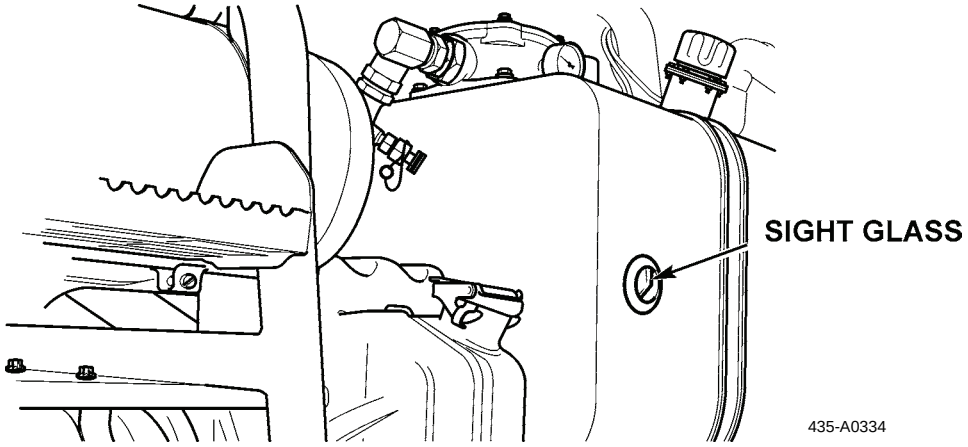
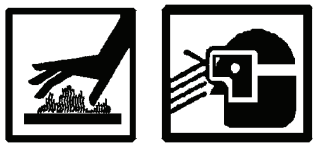


Figure 3. Hydraulic Oil Level

Table 1. Before PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
			ENGINE COMPART-MENT		
12	**Before**		**Cooling System**	a. Check hoses and clamps for secure connections.	Class III leak.
				 WARNING The cooling system is pressurized when the coolant is hot. Hot coolant will burn you. Ensure the engine is cool before checking the coolant level.	
				b. Check coolant level, to ensure expansion tank level is halfway between "HOT MAX" or "COLD MIN" marks stamped on tank (Table 5). If low, fill to correct level.	Coolant level is low. Class III leak.
				NOTE If the expansion tank is below half full, further investigation is required. If the expansion tank needs regular filling, report the fact to Unit Maintenance.	

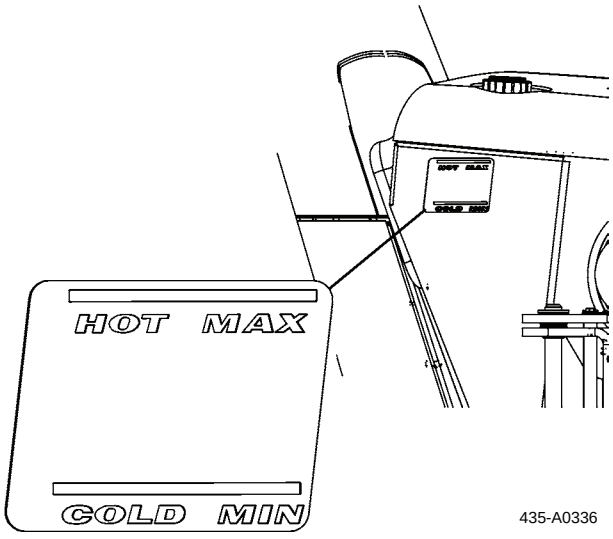


Figure 4. Coolant Level

Table 1. Before PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
13	Before	0.2	Engine Oil Level Check	 **WARNING** Ensure maintenance strut is fitted before working in the engine compartment (WP 0021). Failure to follow this warning may result in injury or death to personnel. **NOTE** In order to obtain an accurate reading, the machine must be parked and not running on a level surface for at least 2 hours.	
				a. Open the engine compartment hood (WP 0004).	
				b. Remove the dipstick (Table 5) and wipe clean. Insert dipstick in dipstick tube. Remove the dipstick and verify oil level. Correct level is between the ADD and FULL marks on the dipstick.	Oil level is above FULL or below ADD on dipstick.
				NOTE Report constant oil usage to Unit Maintenance.	
				c. If the oil level is low, add the amount of oil necessary to bring the level to just below the FULL mark indicated on the dipstick. Do not overfill. To add the proper grade of oil (Table 5), remove the oil filler cap and add oil as required.	

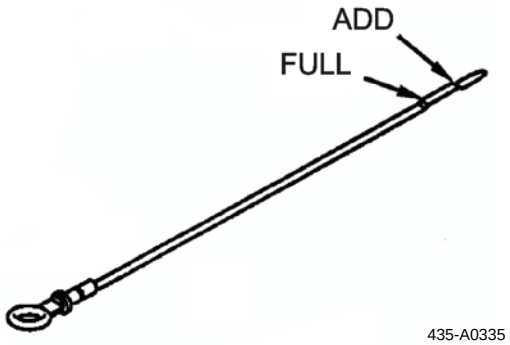


Figure 5. Engine Oil Level

Table 1. Before PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
14	**Before**		**Fuel System**	Check fuel lines for broken or damaged fittings and ensure all lines and fittings are secure inside the engine compartment.	Any fuel leak.
15	**Before**	**0.2**	**Transmission Oil Level**	 **WARNING** The transmission oil level is checked with the engine running, at idle speed. Great care must be taken with hot components. Failure to follow this warning may result in injury to personnel. **CAUTION** • The transmission oil must be at its operating temperature before you check the oil level. Failure to comply with this instruction could result in the transmission being incorrectly filled with oil and becoming damaged. • Do not overfill as this would cause overheating problems and foaming of the oil. A low oil level will cause cavitation and loss of drive. a. Refer to pg. 0017-38 for detailed instructions. b. Remove the transmission oil gauge rod (Table 5) from the filler tube and clean. c. Insert transmission oil gauge rod into transmission filler tube. Remove oil gauge rod and verify oil level is between ADD and FULL marks. d. If indicated oil level is below ADD mark on oil gauge rod, add enough proper grade oil (Table 5) to bring oil level to between the ADD and FULL marks. e. After adding oil, leave the engine idling for 1 minute, then repeat steps b, c, and d, if necessary. f. Turn off the engine.	The oil level is above or below the ADD and FULL marks on the transmission oil gauge rod.

Table 1. Before PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
			CAB INTERIOR		
16	**Before**		**Fire Extinguisher**	a. Check for missing or damaged fire extinguisher.	Fire extinguisher not properly charged, missing, or damaged.
				b. Ensure the seals or locking wire are not broken.	Seal or locking ring missing or broken.
17	**Before**		**Horn**	If tactical situation permits, check operation of horn.	Horn does not operate, if tactical situation permits.
18	**Before**		**Seat Belts and Mounting Hardware**	Check seat belts for proper operation. Check all belt webbing for signs of fraying, tears, or holes. Ensure belt retracts fully and latch fastens securely. Check for loose or damaged seat and seat belt hardware. Check seat belt P (installation) date.	Either belts webbing worn, torn, or frayed. Retractor inoperative, or seat belt latch inoperative or broken. Seat belt mounting hardware loose, damaged, or broken. Date more than 3 years.
19	**Before**		**Seats**	Check security of seats. Adjust operator's seat. Ensure operator's seat moves backwards and forwards, turns to face the rear controls smoothly, and locks into all required positions.	A seat cannot be adjusted, secured, or is broken.
20	**Before**		**Side and Rearview Mirrors**	Check mirrors for presence, cracks, and serviceability.	Mirrors missing, broken, cracked, or side mirrors covered with frost, ice, snow, dirt, mud, or grime.
21	**Before**		**Lights and Reflectors, All**	Check for presence and operation of all lights.	Lights inoperative, lenses broken, cracked, discolored, or covered by frost, ice, snow, dirt, mud, or grime (if tactical situation allows).
22	**Before**		**Windshield and Windows**	CAUTION To prevent damage to electrical equipment, prevent moisture from entering the cab.	
				Check windshield and windows for completeness or damage that would impair operator's vision.	Windshield or any window missing, broken, cracked, discolored, or covered by frost, ice, snow, dirt, mud, or grime.
23	**Before**		**Windshield Wipers Front and Rear and Fluid Pump**	Check windshield wiper and blade for presence and operation. Check pump for operation.	Wipers inoperative.

Table 1. Before PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
24	**Before**		**EMS Monitoring System**	Turn on the ignition and check the EMS panel warning lights are operational. Ensure the master warning panel illuminates and the warning buzzer sounds.	EMS fails to activate. Master warning light fails to illuminate. Any warning light will not light.
25	**Before**		**Hood/ Nosecone**	Close and secure the engine compartment hood/nosecone (WP 0004).	Hood/nosecone section that will not fully close or cannot be fully secured.
26	**Before**		**Brakes**	a. Start engine (WP 0005). Observe air pressure gauge. Approximately 3 minutes after the engine has started the gauge should read a minimum of 87 psi (600 kPa) and the warning buzzer and low pressure warning light on the EMS unit must be extinguished.	Air pressure fails to reach 87 psi (600 kPa). Warning light or buzzer will not extinguish.
				b. Move the machine forward and apply the brakes to see if the machine stops or if the pedal binds.	Brakes are inoperative or pedal binds.
27	**Before**		**Impact Wrench**	NOTE Perform Before PMCS on Item Nos. 27 thru 34 if required for the mission.	
				a. Inspect tool for damage, loose hardware, and leaks.	Tool is damaged, has loose hardware, or leaks.
				b. Inspect hoses and fittings for damage and leaks.	Hose or fitting is damaged or leaks.
				c. Perform operational check (WP 0034).	Does not operate properly.
28	**Before**		**Chain Saw**	a. Inspect tool for damage, loose hardware, and leaks.	Tool is damaged, has loose hardware, or leaks.
				b. Inspect hoses and fittings for damage and leaks.	Hose or fitting is damaged or leaks.
				c. Inspect entire chain. Tension and sharpen chain if necessary (WP 0035).	Chain tension incorrect. Chain is dull, worn, or damaged.
				d. Check operation of automatic oiler (WP 0035).	Oiler improperly set.
29	**Before**		**Pavement Breaker**	a. Inspect tool for damage, loose hardware, and leaks.	Tool is damaged, has loose hardware, or leaks.
				b. Inspect hoses and fittings for damage and leaks.	Hose or fitting is damaged or leaks.
				c. Perform operational check (WP 0036).	Does not operate properly.

Table 1. Before PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
30	**Before**		**Hammer Drill**	a. Inspect tool for damage, loose hardware, and leaks.	Tool is damaged, has loose hardware, or leaks.
				b. Inspect hoses and fittings for damage and leaks.	Hose or fitting is damaged or leaks.
				c. Perform operational check (WP 0037).	Does not operate properly.
31	**Before**		**Post Driver**	a. Inspect tool for damage, loose hardware, and leaks.	Tool is damaged, has loose hardware, or leaks.
				b. Inspect hoses and fittings for damage and leaks.	Hose or fitting is damaged or leaks.
				c. Perform operational check (WP 0038).	Does not operate properly.
32	**Before**		**Forklift Assembly**	a. Inspect forklift assembly for cracks, damage, broken welds, and loose or missing hardware.	Forklift assembly is cracked, damaged, has broken welds, or has loose or missing hardware.
				b. Inspect hoses and fittings for damage and leaks.	Hose or fitting is damaged or leaks.
33	**Before**		**Rotary Sweeper**	a. Inspect sweeper for cracks, damage, broken welds, and loose or missing hardware.	Sweeper is cracked, damaged, has broken welds, or has loose or missing hardware.
				b. Inspect hoses and fittings for damage and leaks.	Hose or fitting is damaged or leaks.
				c. Remove stowage stands.	
34	**Before**		**Auger (Earth Drill)**	a. Inspect for missing or broken teeth or point.	If teeth or point is missing or broken.
				b. Inspect for cracks, damage, and broken welds.	Auger has cracks, damage, or broken welds.

END OF TASK

Table 2. During PMCS.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
1	During		Controls, Steering, Gear Selector, Accelerator, and Brake	a. Operate steering controls and note any binding or excessive play.	Binding or excessive play or controls unresponsive.
				b. Operate gear selector controls and note any binding or excessive play.	Binding or excessive play in gear selector controls.
				c. Operate accelerator pedal and note any binding or excessive play.	Accelerator pedal not working properly.
				d. Operate brake pedal and note any binding or excessive play.	Binding or excessive play in brake pedal.
2	During		Controls, Suspension Mode, Steer Mode, and Drive Mode Operation	a. Operate suspension mode switches and check for correct selection and operation (WP 0004).	Suspension mode inoperable.
				b. Operate steer mode switches and check for correct selection and operation (WP 0004).	Steer mode inoperable.
				c. Operate drive mode switch and check for correct selection and operation (WP 0004).	Drive mode inoperable.
3	During		Unusual Noises	Be alert to unusual noises, odors, or visual indications of problems with the engine, transmission, suspension, or hydraulic systems.	
4	During		Front Bucket	WARNING Never operate the front bucket control levers from outside the cab. Operate the control levers only when you are correctly seated inside the cab. Failure to follow this warning could result in injury or death to personnel.	
				Operate bucket and listen for unusual noises. Check cylinders and control valves for leakage.	Class III leak.
5	During		Backhoe	WARNING Never operate the backhoe control levers from outside the cab. Operate the control levers only when you are correctly seated inside the cab. Failure to follow this warning could result in injury or death to personnel.	
				Operate backhoe and listen for unusual noises. Check cylinders and control valves for leakage.	Class III leak.

Table 2. During PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
6	**During**		**Warning Lights, Gauges, Buzzers, Instruments, and Messages**	Observe instruments gauges, warning lights, buzzers, instruments, and warning messages to ensure indicators during operation are normal as indicated.	
				a. Charge indicator light.	Indicator light/buzzer on, or voltage not in normal range when the engine is running.
				b. Low engine oil pressure warning light, buzzer, and message display.	Indicator light, buzzer, and message on when the engine is running.
				c. Engine temperature exceeds 208°F (98°C).	Indicator light, buzzer, and message on when the engine is running.
				d. Transmission filter is blocked.	Indicator light, buzzer, and message on when the engine is running.
				e. Transmission oil temperature exceeds 248°F (120°C).	Indicator light, buzzer, and message on when the engine is running.
				f. Brake fluid warning indicators.	Indicator light, buzzer, and message on when the engine is running.
				g. Low brake air pressure indicators.	Minimum pressure fails to be reached or warning light and message will not extinguish.
				h. Fuel gauge shows correct level.	
				i. Engine air filter restriction indicator.	Indicator light on when the engine is running.
				j. Speedometer functions correctly. Should operate without excessive fluctuation or unusual noise. k. Check blue high beam indicator light. l. Check turn signal indicator light. m. Check 4-way flasher red indicator light. n. Check 4-wheel drive (4WD) indicator light. o. Check 2-wheel steer (2WS) indicator light.	

Table 2. During PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
6 - Con't	**During**		**Warning Lights, Gauges, Buzzers, Instruments, and Messages**	p. Check "STOP" warning light.	Indicator light on when the engine is running.

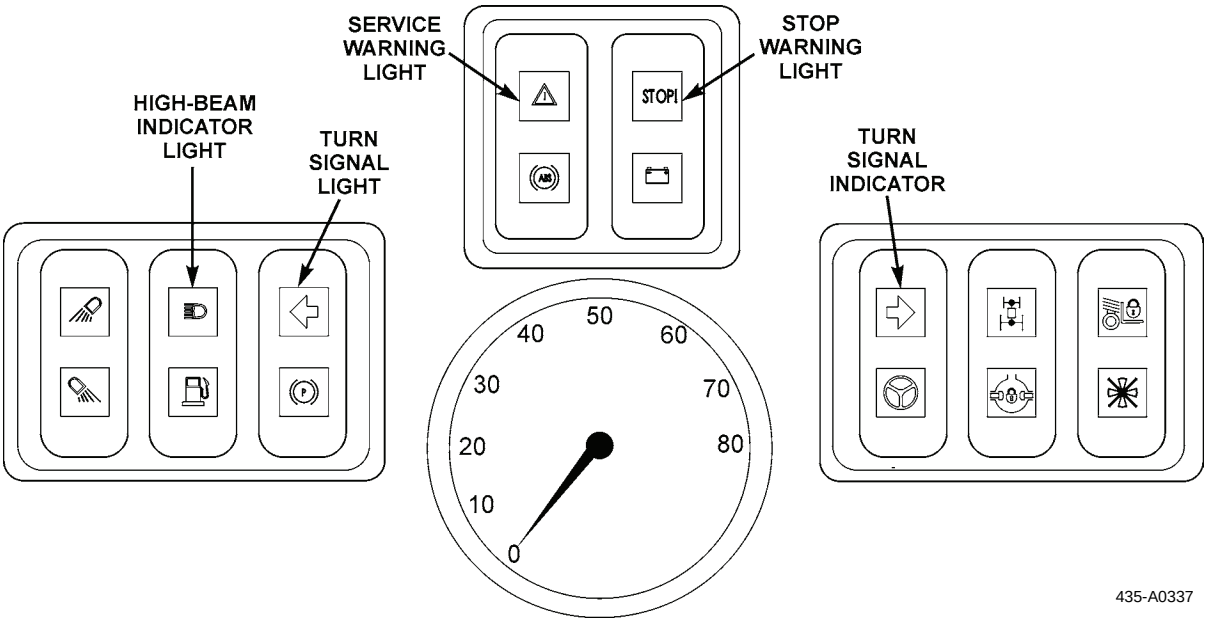


Figure 6. Lights, Gauges, and Buzzers

7	**During**		**Service Brakes**	a. Operate service brakes to determine stopping ability. Check for pulling, grabbing, or other abnormal operation.	Pedal goes to floor. Brakes do not operate properly or warning light comes on during operation.
				b. Check trailer air supply lines and fittings for damage.	Fitting damaged or leaking air.
8	**During**		**Steering System**	During normal driving, check for unusual free-play, binding, wander, or shimmy.	Binding, excessive play, or unresponsive.
9	**During**		**Transmission**	Shift transmission in all ranges, observing any unusual stiffness, binding, or snatching when changing gears.	Transmission does not operate or makes unusual noises.
10	**During**		**Driveline**	a. Listen for unusual noises, vibrations, clicking, or clunking noises which indicate worn U-joints or damaged propeller shafts.	Unusual noises or vibrations are present.

Table 2. During PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
10 - Con't	**During**		**Driveline**	CAUTION Do not make sharp turns while the differential locks are engaged. Failure to follow this caution may result in damage to equipment.	
				b. Operate the differential locks (WP 0004). Listen for unusual noises and check for correct operation.	Differential locks inoperative or noisy.
				c. Check differential lock indicator light for proper operation.	
11	**During**		**Hand Throttle**	Ensure hand throttle operates correctly.	Hand throttle not working properly.
12	**During**		**Reverse Alarm**	If the tactical situation permits, check the operation of the reverse alarm.	Fails to work properly if the tactical situation permits.
13	**During**		**Parking Brake**	Check the operation of the parking brake.	Does not hold machine.
14	**During**		**Inclinometer**	Check the operation of the inclinometer.	Not operating properly.
15	**During**		**Forklift Assembly**	NOTE Perform During PMCS on Item Nos. 15 thru 18 if required for the mission.	
				Perform operational test (WP 0040). Listen for unusual noises. Check cylinders, hoses, and control valves for leaks.	Unusual noises or Class III leak. Does not operate properly.
16	**During**		**Rotary Sweeper**	Perform operational test (WP 0041). Listen for unusual noises and watch for changes in rotation speed of brush head.	Unusual noises or changes in rotation speed of brush head. Does not operate properly.
17	**During**		**Auger (Earth Drill)**	Perform operational test (WP 0043). Listen for unusual noises.	Unusual noises or does not operate properly.
18	**During**		**Arctic Heater**	Perform operational test (WP 0043).	Does not operate properly.

END OF TASK

Table 3. After PMCS.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
1	After		Left Hand Side	Exterior fluid leaks, missing items, or damage to equipment.	Any brake fluid leak. Any fuel leak or Class III oil or coolant leak. Sheet metal torn or sharp edges exposed.
2	After		Front Axle, Brakes, and Steering	 WARNING Never reach between the axle case and the chassis. The chassis could lower, trapping you, causing injury to personnel.	
				a. Check tie rods, drag links, steering, and control arms for damage, loose, or missing hardware or leaks. Check suspension struts for leaks, security, and damaged or missing hardware. Check brake lines for damage or leaks.	Class III leak. Broken components or loose or missing hardware.
				b. Check for large stones or build up of debris on top of axle casings, between axle case and chassis, or around the steering box. Remove any large stones carefully with pry bar (Item 4, Table 2, WP 0031).	
3	After		Fuel Tank	Check fuel tank for leaks, missing cap, and damage.	Fuel leak present. Cap missing or leaking fuel.
4	After		Air Intake	Check the air induction pipework and hoses for completeness and damage. Check rain cap is in place.	Evidence of damage to pipework or hoses. Rain cap missing.
5	After		Cab and Body ROPS and FOPS	Check the ROPS and the FOPS for damage and loose mountings.	Cracked welds, buckled or loose seams, missing or loose bolts.

Table 3. After PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
6	**After**		**Rear Axle, Brakes, and Steering**	 WARNING Never reach between the axle case and the chassis. The chassis could lower, trapping you, causing injury to personnel.	
				a. Check tie rods, drag links, steering, and control arms for damage, loose, or missing hardware or leaks. Check suspension struts for leaks, security, and damaged or missing hardware. Check brake lines for damage or leaks.	Any brake fluid leak. Class III oil leak. Broken components or loose or missing hardware.
				b. Check for large stones or build up of debris on top of axle casings, between axle case and chassis. Remove any large stones carefully with pry bar (Item 4, Table 2, WP 0031).	
7	**After**		**Backhoe**	a. Inspect backhoe controls, cables, and linkages for damage or binding.	Will not function. Cable frayed.
				b. Visually check for loose or missing bolts, fittings, hoses, and digging teeth. Check for broken or cracked shanks, cutting edges, and mounting points.	Any part missing. Class III leak. Mounting point cracked or damaged. Tighten teeth if loose.
				c. Visually inspect hydraulic lines, fittings, control valve, and cylinders for leaks or damage.	Class III leak.
				d. Check backhoe boom, dipper, stabilizers, main frame, and kingpost assembly for cracks, broken welds, and loose or missing hardware.	Broken or cracked welds. Loose or missing hardware.
				e. Verify all locking devices, safety pins, and latches are present and implements are securely locked in the travel position.	Locking devices or safety pins are missing or damaged, and latches are not locked.
8	**After**		**Tow Pintle**	Inspect tow pintle for damaged or missing parts.	Cracked, damaged, or missing hardware and the mission requires trailer.
9	**After**		**Trailer Connection Gladhands**	Check for completeness and damage. Ensure the rubber grommet is in place and in good condition.	Rubber grommet missing or cracked.

Table 3. After PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
10	**After**		**Hose Reel**	a. Check for proper extraction and retraction of hose assemblies.	Class III leaks. Damage to quick disconnect coupling and mission requires hose reel.
				b. Check hydraulic couplings and hoses for leaks and damage.	
11	**After**		**Air Reservoirs**	Check air reservoirs for leaks, damage, and security.	Air leaks or damage.
12	**After**		**Right Hand Side**	Exterior fluid leaks, missing items, or damage to equipment.	Any brake fluid leak. Any fuel leak or Class III oil or coolant leak. Sheet metal torn or sharp edges exposed.
13	**After**		**Front Bucket**	a. Visually check for loose or missing bolts, fittings, hoses, shanks, and digging teeth. Check for cracks or broken welds and mounting points.	Any part missing. Class III leak. Mounting points cracked or damaged. Tighten teeth if loose.
				b. Visually inspect hydraulic lines, fittings, control valve, and cylinders for leaks or damage.	Class III leak.
				c. Check front bucket frame assembly, lift arms, quick hitch, and bucket assemblies for physical damage or broken welds.	Broken or cracked welds. Loose or missing hardware.
				d. Verify all cylinder securing struts, bars, locking devices, and safety pins are present.	Travel bars, locking devices, or safety pins are missing or damaged.
			ENGINE COMPART-MENT		
14	**After**		**Fuel System**	 **WARNING** Ensure all safety devices are fitted and secured before working in the engine compartment (WP 0021). Failure to follow this warning may result in injury or death to personnel.	
				a. Open engine compartment hood (WP 0004).	
				b. Check fuel line for broken or damaged fittings and ensure all lines and fittings are secure.	Any fuel leak.

Table 3. After PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
14 - Con't	**After**		**Fuel System**	c. Check fuel sedimenter bowl for contamination and leaks. Service if required (WP 0018).	Excessive debris in sedimenter bowl or fuel leak.
15	**After**		**Cooling Pack**	a. Check for debris blocking the cooling pack intake grille or the cooling pack radiators (WP 0019).	Excessive debris blocking cooling pack air intake or cooling pack radiators.
				b. Check coolant radiator for leaks and/or damage.	Radiator damaged. Class III coolant leak.
				c. Check hydraulic cooler radiator for leaks and/or damage.	Radiator damaged. Class III oil leak.
				d. Check transmission cooler radiator for leaks and/or damage.	Radiator damaged. Class III oil leak.
				e. Check intercooler radiator for leaks or damage.	Radiator damaged. Visual audible leakage.
16	**After**		**A/C**	WARNING The A/C system is a closed loop system and contains pressurized refrigerant. No part of the system should be disconnected until the system has been discharged by a refrigeration engineer or a suitable trained person. You can be severely frostbitten or injured by escaping refrigerant.	
				Check A/C condenser for damage. Report any damage to Unit Maintenance.	Condenser damaged.
17	**After**		**Hood and Nosecone**	Close and securely latch the hood and nosecone.	Hood/nosecone cannot be securely latched.
18	**After**		**Mirrors Side and Rearview**	Check mirrors for presence, cracks, and serviceability.	Mirrors missing, broken, or cracked, or side mirrors covered with frost, ice, snow, dirt, mud, or grime.
19	**After**		**Impact Wrench**	NOTE Perform After PMCS on Item Nos. 19 thru 26 if required for mission.	
				a. Wipe all tool surfaces clean.	
				b. Inspect tool for damage and leaks.	Tool is damaged or leaks.
				c. Check all fittings and fasteners for looseness and leaks.	Fitting or fasteners is loose or leaks.
20	**After**		**Chain Saw**	a. Wipe all tool surfaces clean.	
				b. Inspect entire chain tension and sharpen chain if necessary (WP 0035).	Chain tension incorrect. Chain dull, worn, or damaged.
				c. Check operation of automatic oiler (WP 0035).	Oiler improperly set.

Table 3. After PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
20 - Con't	**After**		**Chain Saw**	d. Inspect tool for damage and leaks.	Tool is damaged or leaks.
				e. Inspect hoses for cuts, cracks, bulges, and leaks.	Hose is cut, cracked, bulged, or leaks.
				f. Check all fittings and fastener for looseness and leaks.	Fittings or fasteners are loose or leaks.
21	**After**		**Pavement Breaker**	a. Wipe all tool surfaces clean.	
				b. Inspect tools for damage and leaks.	Tool is damaged or leaks.
				c. Inspect hoses for cuts, cracks, bulges, and leaks.	Hose is cut, cracked, bulged, or leaks.
				d. Check all fittings and fasteners for looseness and leaks.	Fitting or fastener is loose or leaks.
22	**After**		**Hammer Drill**	a. Wipe all tool surfaces clean.	
				b. Inspect tool for damage and leaks.	Tool is damaged or leaks.
				c. Inspect hoses for cuts, cracks, bulges, and leaks.	Hose is cut, cracked, bulged, or leaks.
				d. Check all fittings and fasteners for looseness and leaks.	Fitting or fastener is loose or leaks.
23	**After**		**Post Driver**	a. Wipe all tool surfaces clean.	
				b. Inspect tool for damage and leaks.	Tool is damaged or leaks.
				c. Inspect hoses for cuts, cracks, bulges, and leaks.	Hose is cut, cracked, bulged, or leaks.
				d. Check all fittings and fasteners for looseness and leaks.	Fitting or fastener is loose or leaks.
24	**After**		**Forklift Assembly**	a. Check for loose or missing bolts, fittings, and hoses. Check mounting points for security.	Parts are loose or missing or mounting points are cracked or damaged.
				b. Inspect hoses, fittings, control valves, and cylinders for leaks and damage.	Damage or leaks are evident.
				c. Check front loader frame assembly, lift arms, and quick-hitch assembly for physical damage or broken welds.	Cracks or broken welds. Damaged or missing hardware.
				d. Inspect forklift mast carriage, rotator assembly, and forks for damage and security of mounting.	Excessive wear, damage, or cracks.
				e. Inspect forklift mount and tines.	Excessive wear, damage, or cracked or bent tines.

Table 3. After PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
25	**After**		**Rotary Sweeper**	a. Install stowage stands.	
				b. Check for loose or missing bolts, fittings, and hoses.	Parts are loose or missing.
				c. Inspect hoses, fittings, motors, and cylinders for leaks and damage.	Damage or leaks are evident.
				d. Inspect sweeper and brush head for damage.	Damage is evident.
				e. Check length of brush strands.	If brush strands are less than 6 in. (15.2 cm), notify Unit Maintenance.
26	**After**		**Auger (Earth Drill)**	Inspect auger for damage.	Damage is evident.

END OF TASK

Table 4. Weekly PMCS.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
1	Weekly		Batteries and Cables	**WARNING** • To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. Do not smoke, use open flame, make sparks or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating, damage to equipment, and injury to personnel. • Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes, or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these warnings may result in injury or death to personnel. **NOTE** • For complete information on servicing batteries, refer to TM 9-6140-200-14. • Perform service to all batteries.	
				a. Open the battery compartment access door.	Hardware broken or damaged.
				b. If applicable, check the electrolyte level. Electrolyte level should be to the ledge in battery filler opening (vent). If low or boiling, notify Unit Maintenance.	Electrolyte level is low or boiling.
				c. Check the connections are tight and not corroded. If corroded or loose, notify Unit Maintenance. Caps should be screwed on tightly.	Cables or terminals are broken, loose, or heavily corroded.
				d. Check for cracked batteries. If cracked, notify Unit Maintenance.	Battery is cracked.
2	Weekly		Brake Reservoirs	Open the brake reservoir compartment. Check for low fluid level or fluid leaks. The level should be between the MIN and MAX marks. Report the need to constantly top up fluid level to Unit Maintenance.	The level is below or above MIN or MAX marks on reservoir. Any brake fluid leak.
3	Weekly		Frame	Check side rails, crossmembers, and underbody supports for deteriorated bushings, broken bolts, cracks, broken welds, or missing hardware.	Obviously loose or broken side rails, crossmembers, bolts, or welds.

Table 4. Weekly PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
4	**Weekly**		**Tires and Wheels**	a. Check wheels for damaged and missing wheel nuts or studs. Ensure all wheel nuts are tight.	One or more missing wheel nuts or studs.
				NOTE If loose wheel nuts are found, have Unit Maintenance check the wheel nuts, and tighten to 370 lb-ft (500 Nm).	
				b. Check all tires, including the spare, for cuts, cracks, bulges, or damage that exposes the cords, gouges, or foreign objects that may impede traction and reduce tire life. Check for abnormal tread pattern wear.	Any questionable defect.
				WARNING • Over-inflated or over-heated tires can explode. Do not cut or weld the wheel rims. Have a specialist member of personnel do any repair work. Failure to follow this warning may lead to injury or death to personnel. • If a tire has lost all its air pressure, contact Unit Maintenance. A specialist member of personnel will be required to inflate a completely flat tire. Failure to follow this warning may lead to injury or death to personnel.	
				c. Check all tires for obvious signs of under inflation. Tire pressure should be 102 psi (703 kPa) on all missions.	Tire is deflated or unserviceable.

Table 4. Weekly PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
5	**Weekly**		**Air Tanks**	Check air reservoir tanks for leaks and security. Drain moisture from tank drain cocks. Report excessive moisture release or sludge to Unit Maintenance.	Air leaks or damage.

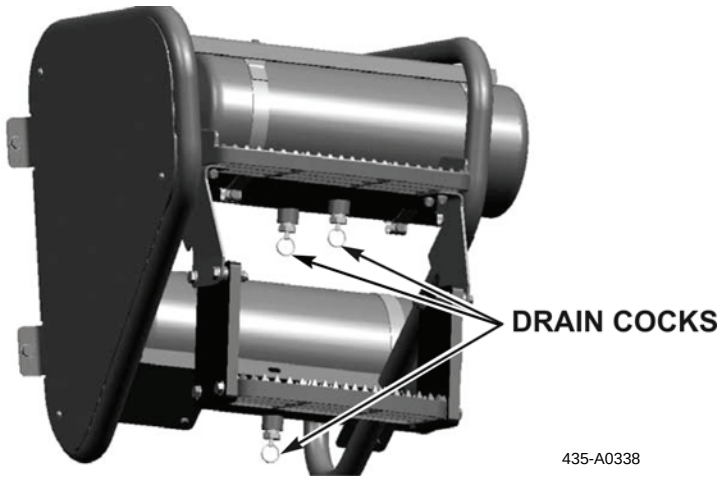


Figure 7. Air Tank Drain Cocks

6	**Weekly**		**Exhaust System**	Visually check muffler, pipes, and clamps for leaks and damage.	Exhaust leaks around clamps, loose pipe, or muffler connection.
7	**Weekly**		**Engine Drive Belts**	Inspect engine drive belts for cracking, fraying, and breaks. Inspect for tension on the longest run between pulleys. If the deflection is excessive, notify Unit Maintenence.	Drive belt fiber has one or more cracks running along the length of the belt or has frays more than 2 in. (51 mm) long.
8	**Weekly**		**Windshield Washer Reservoir**	NOTE Cracks running across the belt width that do not intersect with any crack running along the belt length are acceptable. Check the windshield washer reservoir for missing or loose hardware, fluid level, and physical damage.	

Table 4. Weekly PMCS - Continued.

ITEM NO.	INVERVAL	MAN-HOURS	LOCATION / ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF
			ENGINE COMPART -MENT		
9	**Weekly**		**Cooling System**	 WARNING Ensure all securing devices are fitted before working in the engine compartment (WP 0021). Failure to follow this warning may result in injury or death to personnel.	
				a. Open the engine compartment hood/ nosecone (WP 0004). Check cable for wear and damage.	Wear or damage is evident.
				b. Check clamps and hoses for leakage and secure connections. Check thermostat housing and water manifolds and gaskets for leaks.	Class III coolant leak.
				c. Check cooling fan for cracked or damaged blades.	Fan is cracked or damaged.
				d. Close and latch engine compartment hood/nosecone (WP 0004).	Hood/nosecone cannot be securely latched.
			CAB INTERIOR		
10	**Weekly**		**Machine Fuses**	a. Check that machine fuse holders are secure.	Machine fuse holder insecure.
				b. Check for blown or missing machine fuses.	Machine fuses blown or missing.
11	**Weekly**		**HVAC/D4**	Check cab heaters for leaks and proper operation.	Heater leaks or does not operate properly. Defroster fan air flow is restricted or A/C system is not operating properly and mission requires a heater, defroster, or A/C system.
12	**Weekly**		**Parking Brake**	Carry out the test procedure as laid out in WP 0005.	Parking brake fails the test.

END OF TASK

Table 5. Lubrication Instructions.

1. This section lists and prescribes cleaning and lubrication procedures as to locations, intervals, and proper materials for this machine.
2. Notes. The notes referenced on the overhead lubrication views are provided immediately following the overhead lubrication view to which they pertain.
3. Service intervals. Service intervals specified in this table for normal operations and where moderate temperature, humidity, and atmospheric conditions prevail. Report unsatisfactory performance of prescribed fuels, lubricants, or preserving materials using DA Form 2407, Maintenance Request.
4. Lubrication point pictures with dashed lines means there are lubrication points on both sides of the machine.

WARNING

- All PMCS and scheduled maintenance as required by operation and maintenance manuals must be performed before operating the machine.
- In ALL cases where PMCS and scheduled maintenance procedures require the loader arms to be raised, the Maintenance Cylinder Support Struts must be fitted. Never work or stand under work tools that are not securely blocked.
- Before carrying out any PMCS and scheduled maintenance procedures, ensure the machine's suspension mode is set to Maintenance Mode (WP 0004).
- Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- Failure to follow these warnings may result in injury or death to personnel and damage to equipment.

5. Clean parts with Cleaning compound, solvent (Item 2, WP 0033).
6. Before you start your lubrication service, observe the following:
    - NEVER
        - Use the wrong type of lubricant.
        - Use too much lubricant.
    - ALWAYS
        - Clean grease fitting before lubrication.
        - Use this lubrication order as your guide.
        - Check for lubricant and fuel leaks along with daily check services.
        - Ensure the machine is level when checking oil levels. If it is not, you will get an incorrect reading on the dipstick and in the sight gauges.
        - Lubricate after water fording.

Table 5. Lubrication Instructions - Continued.

- Oil filters shall be serviced/cleaned/changed as applicable, when:
  a. They are known to be contaminated or clogged.
  b. At the prescribed hard-time intervals.

H = Hourly
D = Daily
W = Weekly
M = Monthly
Q = Quarterly
B = Biannually
AR = As Required

Lubricants

	DESCRIPTION
OE/HDO	Lubricating Oil, ICE, Tactical Service (MIL-PRF-2104 15W/40)
OE/HDO	Lubricating Oil, Hydraulic Systems (MIL-PRF-2104 5W/40)
OEA	Lubricating Oil, Ice, Arctic (MIL-PRF-46167 0W/30)
BFS	Brake Fluid Silicone, Automotive (MIL-PRF-46176)
GO	Lubricating Oil, Gear, Multi-Purpose (MIL-PRF-2105 80W/90)
Antifreeze	Antifreeze, Multi-Engine Type (A-A-52624)
GAA	Grease, Automotive and Artillery (MIL-PRF-10924)

Table 5. Lubricating Instructions - Continued.

HMEE-I LUBRICATION DATA

	LOCATION	Capacity	AMBIENT OPERATING TEMPERATURE -40 F 0 F 20 F 40 F 80 F 120 F
1	ENGINE CRANKCASE OE/HDO-15/40 (MIL-PRF-2104H) OEA-30 (MIL-PRF-46167D)	4.0 gal. (15.1 L)	
2	ENGINE ANTI-FREEZE COOLANT A-A-52624A, Type I, CONCENTRATION C A-A-52624A, Type I, CONCENTRATION B	9.25 gal. (35.0 L)	-34 F
3	TRANSMISSION & TORQUE CONVERTER OE/HDO-15/40 (MIL-PRF-2104H) OEA-30 (MIL-PRF-46167D)	5.7 gal. (21.5 L)	
4	AXLE DIFFERENTIALS (FRONT & REAR) GO-80/90 (MIL-PRF-2105E/SAE J2360)	4.8 gal. (18 L) 4.8 gal. (18 L)	
5	AXLE HUBS (FRONT & REAR) GO-80/90 (MIL-PRF-2105E/SAE J2360)	0.8 gal. (3 L) 0.8 gal. (3 L)	
6	HYDRAULIC RESERVOIR OE/HDO-5/40 (MIL-PRF-2104H) OEA-30 (MIL-PRF-46167D)	31.7 gal. (120 L)	
7	HYDRAULIC BRAKE RESERVOIRS BFS (MIL-PRF-46176B)	As Required	
8	GREASE POINTS GAA (MIL-PRF-10924G)		
9	OIL CAN POINTS OE/HDO-5/40 or OE/HDO-15/40 (MIL-PRF-2104H), OR OEA-30 (MIL-PRF-46167D), AS AVAILABLE	As Required	

KEY NOTES:

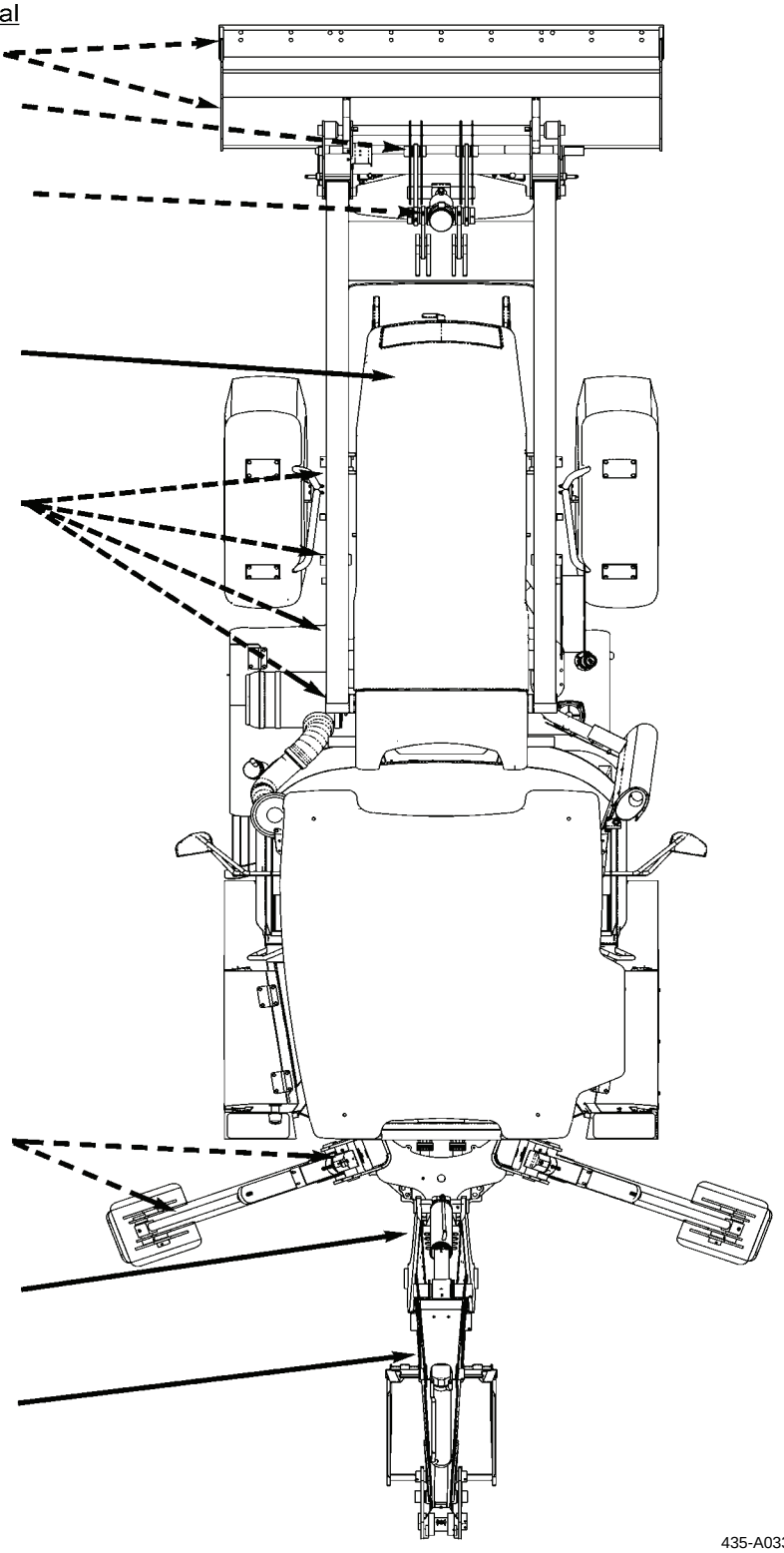
a. OEA must be used when the temperatures are consistently below 0°F.
b. OE/HDO-15W/40 must be used when the temperatures are consistently above 0°F.
c. After changing to OEA, drain 1 pt of oil from the oil sampling valve.
d. Refer to WP 0033 for lubricant information.
e. Hydraulic system fill from completely dry system: 36.9 gal. (140 L).

INTERVAL:

D (Daily) - 10 Hours
W (Weekly) - 50 Hours

DAILY

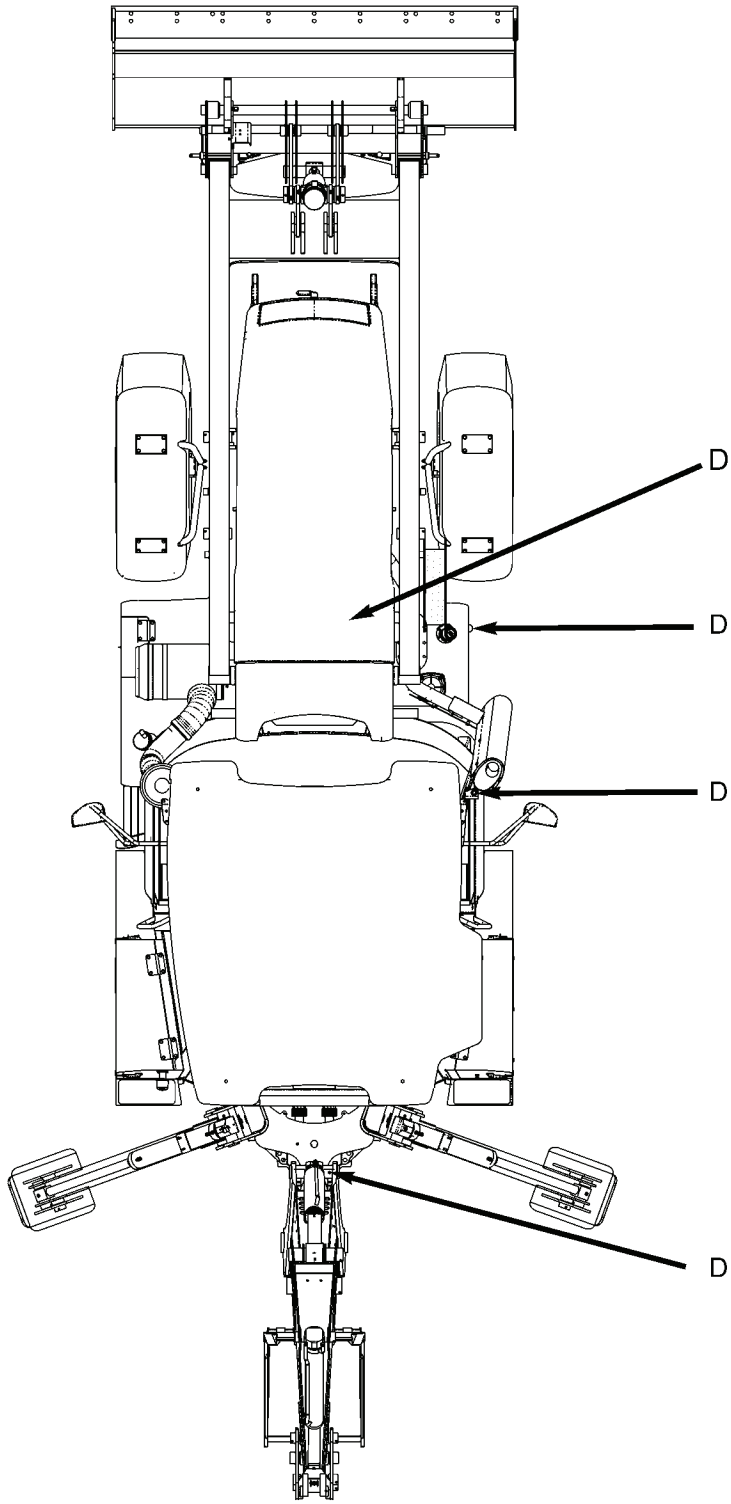
	Lubricant	Interval
CLAMP CYLINDER (NOTE 1)	GAA	D
FRONT QUICK-HITCH CARRIAGE (NOTE 1)	GAA	D
FRONT CROWD RAM PIVOTS (NOTE 1)	GAA	D
ENGINE, OIL LEVEL CHECK (NOTE 2)	OE/HDO	D
LOADER ARM & CYLINDER PIN PIVOTS (NOTE 3)	GAA	D
STABILIZER LEGS (NOTE 4)	GAA	D
BACKHOE KINGPOST (NOTE 5)	GAA	D
BACKHOE (NOTE 6)	GAA	D



435-A0339

DAILY

This page shows items to be lubricated daily when operating this machine.



	Interval	Lubricant	
D	ANTIFREEZE		ENGINE COOLANT LEVEL CHECK (NOTE 7)
D	OE/HDO		HYDRAULIC RESERVOIR LEVEL CHECK (NOTE 8)
D	OE/HDO		TRANSMISSION OIL LEVEL CHECK (NOTE 9)
D	GAA		TOW PINTLE (NOTE 10)

435-A1072

Table 5. Lubrication Instructions - Continued.

Note 1. Front Quick-Hitch, Crowd Ram, and Clamshell Bucket Lubrication

WARNING

You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with the loader arms raised, the cylinder support struts must be fitted (WP 0021). Failure to follow this warning may lead to injury or death to personnel.

Lubricate the front quick-hitch and crowd cylinder with GAA through the 14 fittings until grease is visible. Wipe excess grease with Rag, wiping (Item 17, WP 0033). Lubrication fitting 14 is on the opposite side of the machine.

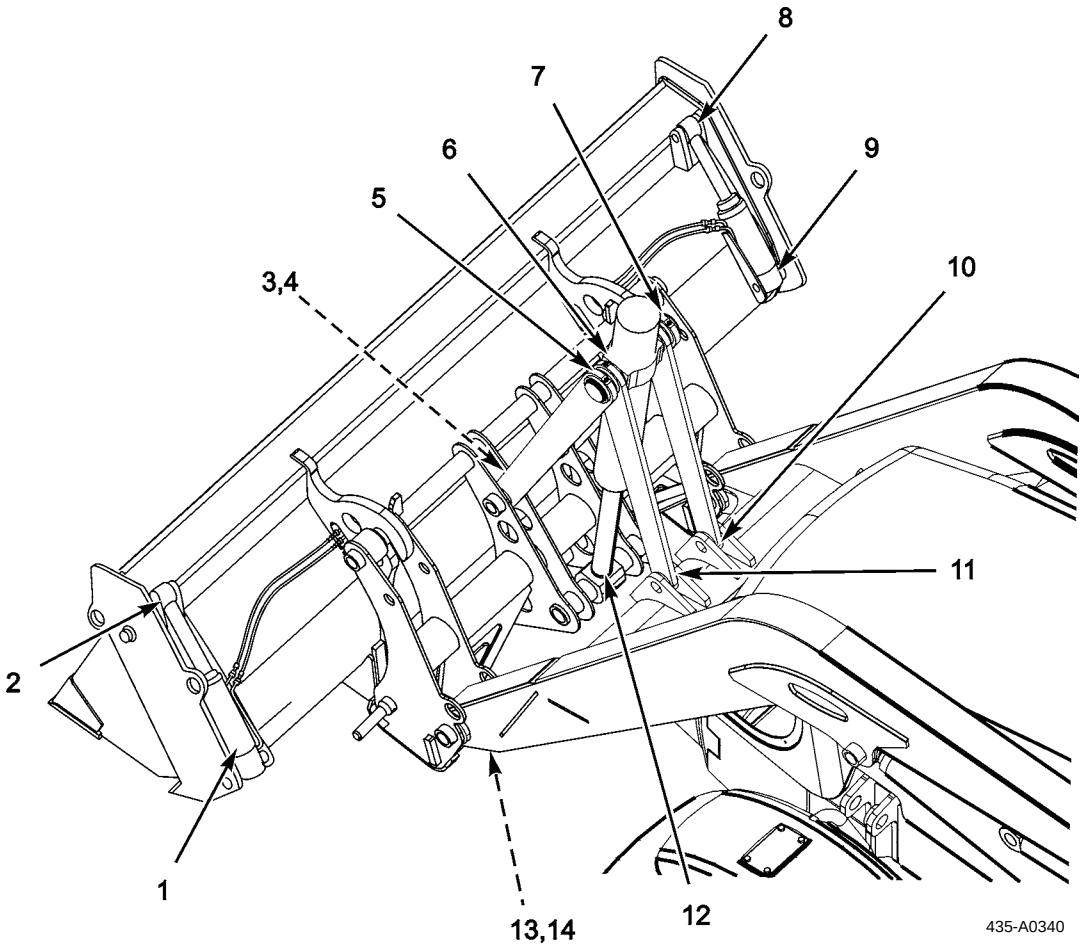


Figure 8. Quick-Hitch

Table 5. Lubrication Instructions - Continued.

Note 2. Engine Oil Level Check

WARNING

Engine oil can be ignited by hot engine surfaces. To avoid engine fire, take great care when you add engine oil. Clean oil from around oil filler tube area with Rag, wiping (Item 17, WP 0033) after filling. Ensure the engine oil filler cap is securely refitted after filling. Failure to follow this warning may result in injury or death to personnel.

CAUTION

Perform engine oil check with the machine on a level surface and the engine stopped for at least 2 hours. Failure to follow this warning may result in damage to equipment.

1. Park the machine on level ground.
2. Select the Maintenance Suspension Mode (WP 0004).
3. Open the engine compartment hood (WP 0004).
4. Remove the dipstick and wipe clean.
5. Insert dipstick in gauge tube.
6. Remove the dipstick and verify oil level. Correct level is between the MIN and MAX marks on the dipstick.
7. If the oil level is low, add the amount of oil necessary to bring the level to just below the MAX mark indicated on the gauge rod. Do not overfill.
8. Replace engine oil filler cap securely after filling.
9. Close engine compartment hood (WP 0004).

NOTE

Report constant oil usage to Unit Maintenance.

10. Check for oil leaks.

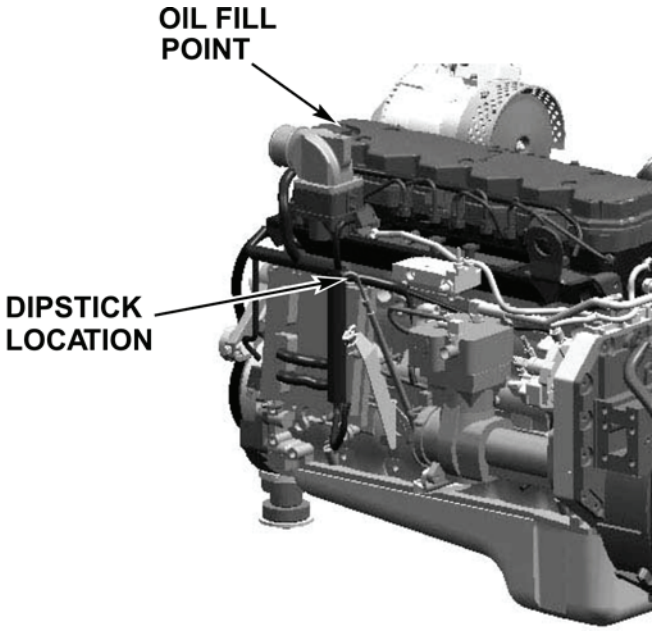


Figure 9. Engine Oil Level

Table 5. Lubrication Instructions - Continued.

Note 3. Loader Arms Lubrication

WARNING

You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with the loader arms raised, the cylinder support struts must be fitted (WP 0021). Failure to follow this warning may lead to injury or death to personnel.

Lubricate the loader arm pivots with GAA through the 10 fittings until grease is visible. Wipe excess grease with Rag, wiping (Item 17, WP 0033).

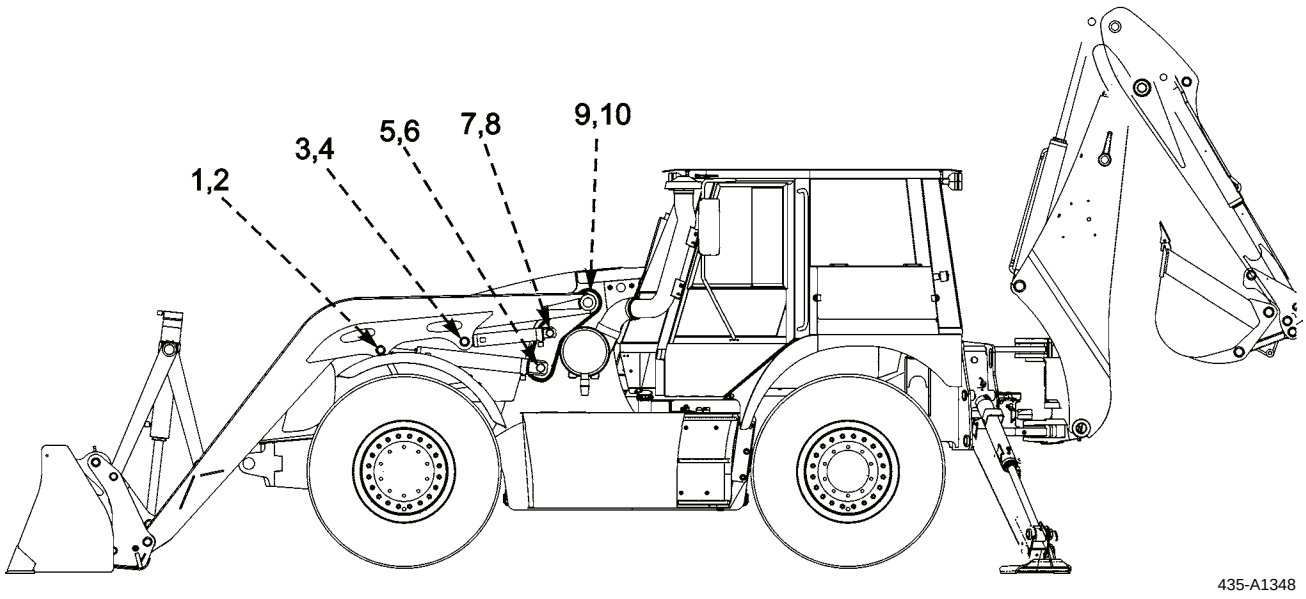


Figure 10. Loader Arm

Table 5. Lubrication Instructions - Continued.

Note 4. Stabilizers Lubrication

WARNING

You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with the loader arms raised, the cylinder support struts must be fitted (WP 0021). Failure to follow this warning may lead to injury or death to personnel.

Lubricate the stabilizers with GAA through the six fittings until grease is visible. Wipe excess grease with Rag, wiping (Item 17, WP 0033).

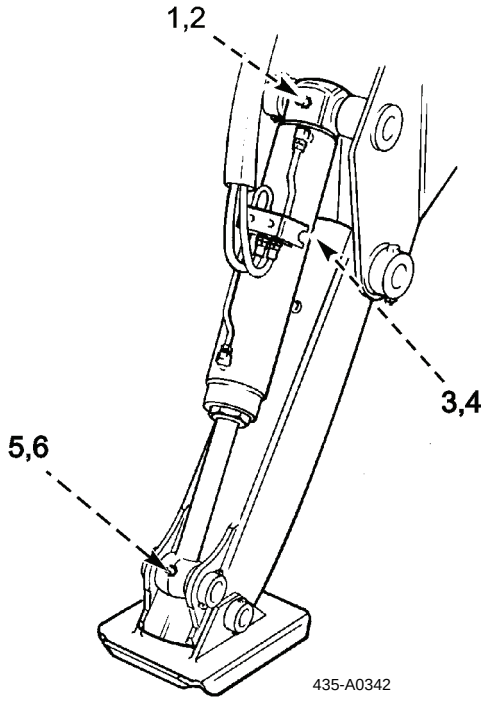


Figure 11. Stabilizer

Table 5. Lubrication Instructions - Continued.

Note 5. Kingpost Lubrication

WARNING

You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with the loader arms raised, the cylinder support struts must be fitted (WP 0021). Failure to follow this warning may lead to injury or death to personnel.

Lubricate the kingpost with GAA through the nine fittings until grease is visible. Wipe excess grease with Rag, wiping (Item 17, WP 0033).

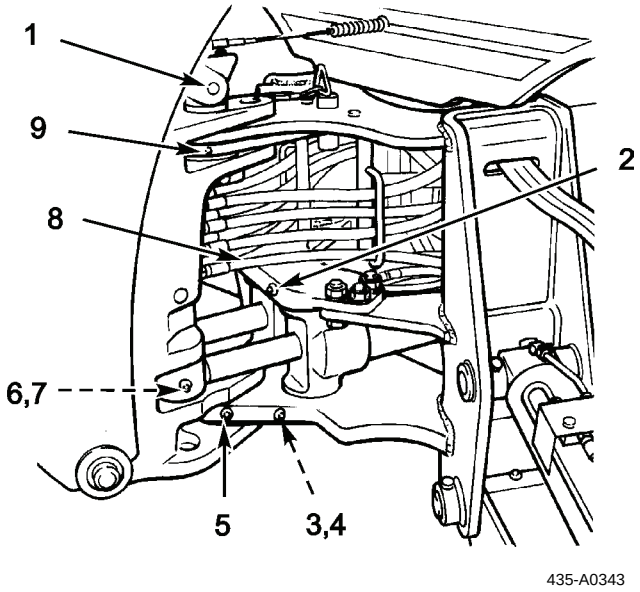


Figure 12. King Post

Table 5. Lubrication Instructions - Continued.

Note 6. Backhoe Lubrication

WARNING

You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with the loader arms raised, the cylinder support struts must be fitted (WP 0021). Failure to follow this warning may lead to injury or death to personnel.

Lubricate the backhoe with GAA through the 19 fittings until grease is visible. Wipe excess grease with Rag, wiping (Item 17, WP 0033).

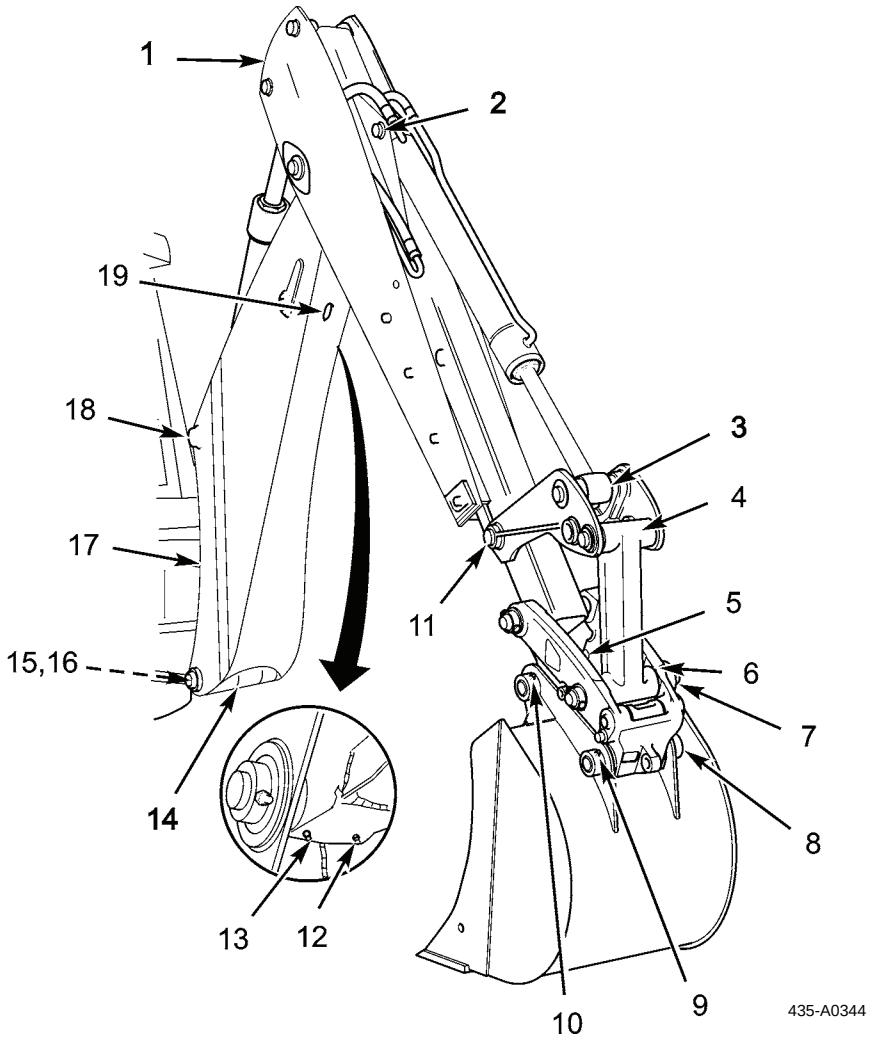


Figure 13. Backhoe

Table 5. Lubrication Instructions - Continued.

Note 7. Engine Coolant (Antifreeze) Level Check

WARNING

- The cooling system is pressurized when the coolant is hot. Hot coolant will burn you. Ensure the engine is cool before checking the coolant level or draining the system. Failure to follow this warning may result in injury to personnel.
- Do not remove radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may cause serious burns.

1. Park the machine on level ground.
2. Engage the parking brake.
3. Select the Maintenance Suspension Mode (WP 0004).
4. Lower the work tools to the ground.
5. Open the engine compartment hood (WP 0004).
6. Visually check that the level of coolant is up to the line marked COLD MIN, but below the line marked HOT MAX. If the level is low, top off with a water and antifreeze mixture as detailed below.
7. Remove filler cap and add pre-mixed water/antifreeze solution, until the level is up to the line marked COLD MIN. Do not overfill.
8. Refit filler cap and ensure it is tight.
9. Run the engine for a while to raise coolant to operating temperature and pressure.
10. Stop the engine and check for leaks.
11. Close the engine compartment hood (WP 0004).

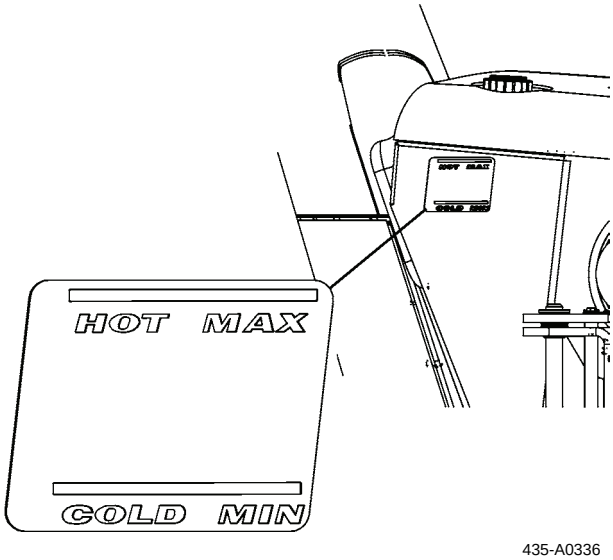
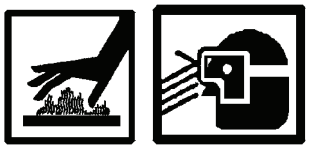


Figure 14. Engine Coolant

Table 5. Lubrication Instructions - Continued.

Note 8. Hydraulic Oil Level Check



WARNING

Wear effective eye protection and gloves. Fine jets of hydraulic oil at high pressure can penetrate the skin. Do not use your fingers to check for hydraulic oil leaks. Do not put your face close to suspected leaks. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of hydraulic oil. If hydraulic oil penetrates your skin, get medical help immediately. Failure to follow this warning may result in injury or death to personnel.

1. Position the machine on level ground.
2. Engage the parking brake.
3. Select the Maintenance Suspension Mode (WP 0004).
4. Set the loader bucket on the ground.
5. Raise the boom, swing in the dipper, and close the bucket.
6. Stop the engine.
7. Remove the starter key.
8. Check the oil level in the sight glass (1). The level should be in the center of the sight glass.

CAUTION

If the oil in the sight glass appears cloudy, then water or air has entered the system. The hydraulic pump could be severely damaged if the machine is operated. Report your findings to Unit Maintenance.

9. If necessary, add recommended oil through the filler cap. Refit and secure the filler cap.

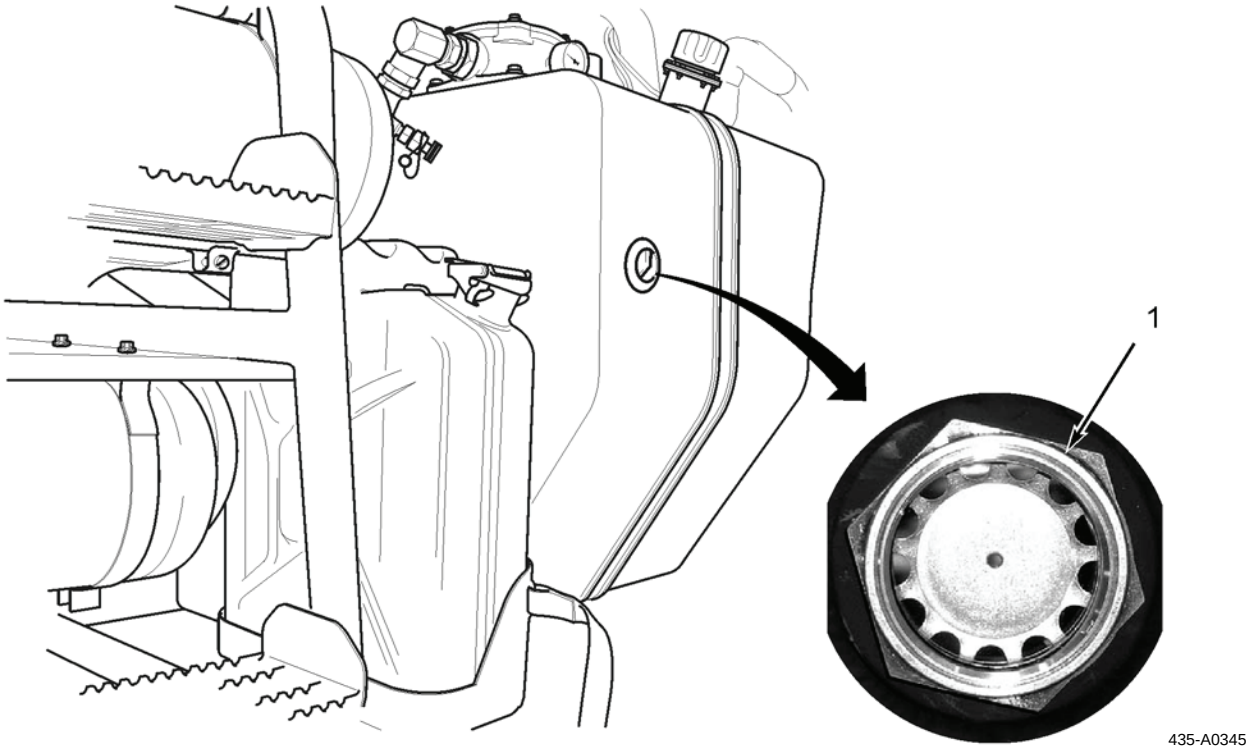


Figure 15. Hydraulic Oil Level

Table 5. Lubrication Instructions - Continued.

Note 9. Transmission Oil Level Check

WARNING

The transmission oil level is checked with the engine running at idle speed. Great care must be taken with hot components. Failure to follow this warning may result in injury to personnel.

CAUTION

The transmission oil must be at its operating temperature before you check the oil level. Failure to comply with this instruction could result in the transmission being incorrectly filled with oil and becoming damaged.

1. Park the machine on level ground.
2. Engage the parking brake.
3. Select the Maintenance Suspension Mode (WP 0004).
4. Open the engine compartment hood (WP 0004).
5. Start the engine (WP 0005) and allow engine to idle until low trans temp light is extinguished.
6. Remove the transmission dipstick from the filler tube and clean the dipstick.

CAUTION

When inserting the transmission dipstick into the filler tube, ensure that the words “THIS FACE UP” on the dipstick are properly oriented. If inserted improperly, the transmission oil level will be incorrect, resulting in damage to the transmission.

7. Insert transmission dipstick into the filler tube.
8. Remove dipstick and verify that oil level is between ADD and FULL marks.

CAUTION

Do not overfill as this would cause overheating problems and foaming of the oil. A low oil level will cause cavitation and loss of drive.

9. If indicated oil level is below ADD mark on dipstick, add enough proper grade oil to bring oil level to between the ADD and FULL marks.
10. After adding oil, leave the engine idling for 1 minute, then repeat above procedure until the oil level is correct. Once the transmission oil level is correct, turn off the engine.

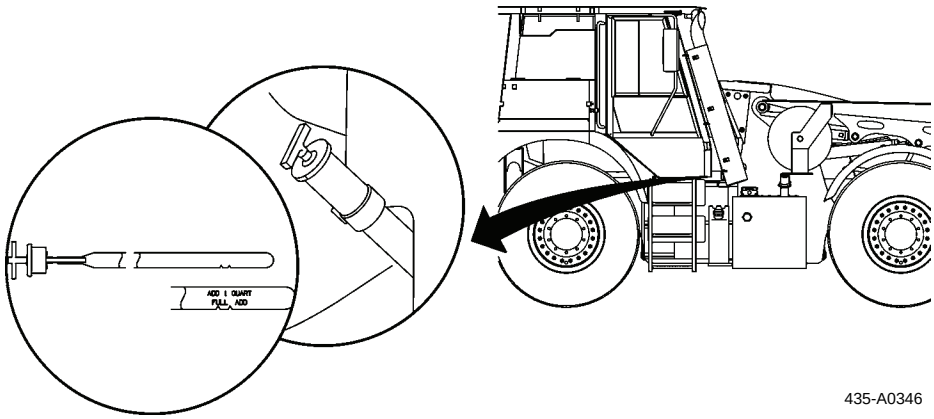


Figure 16. Transmission Oil Level

Table 5. Lubrication Instructions - Continued.

Note 10. Towing Pintle Lubrication

WARNING

You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with the loader arms raised, the cylinder support struts must be fitted (WP 0021). Failure to follow this warning may lead to injury or death to personnel.

Lubricate the towing pintle with GAA through the three fittings until grease is visible. Wipe excess grease with Rag, wiping (Item 17, WP 0033).

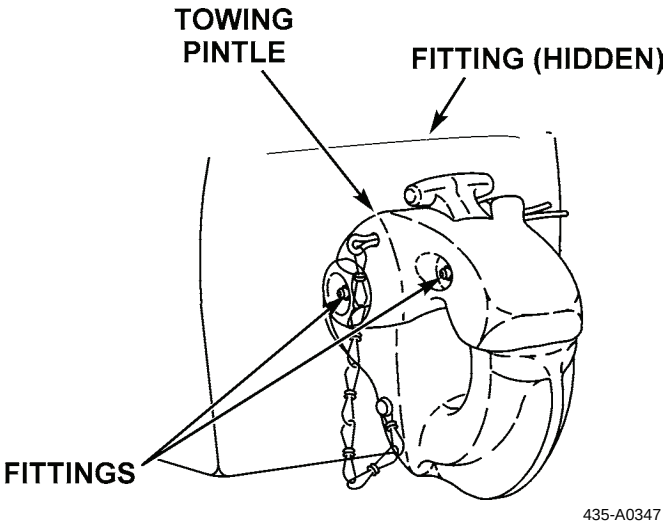
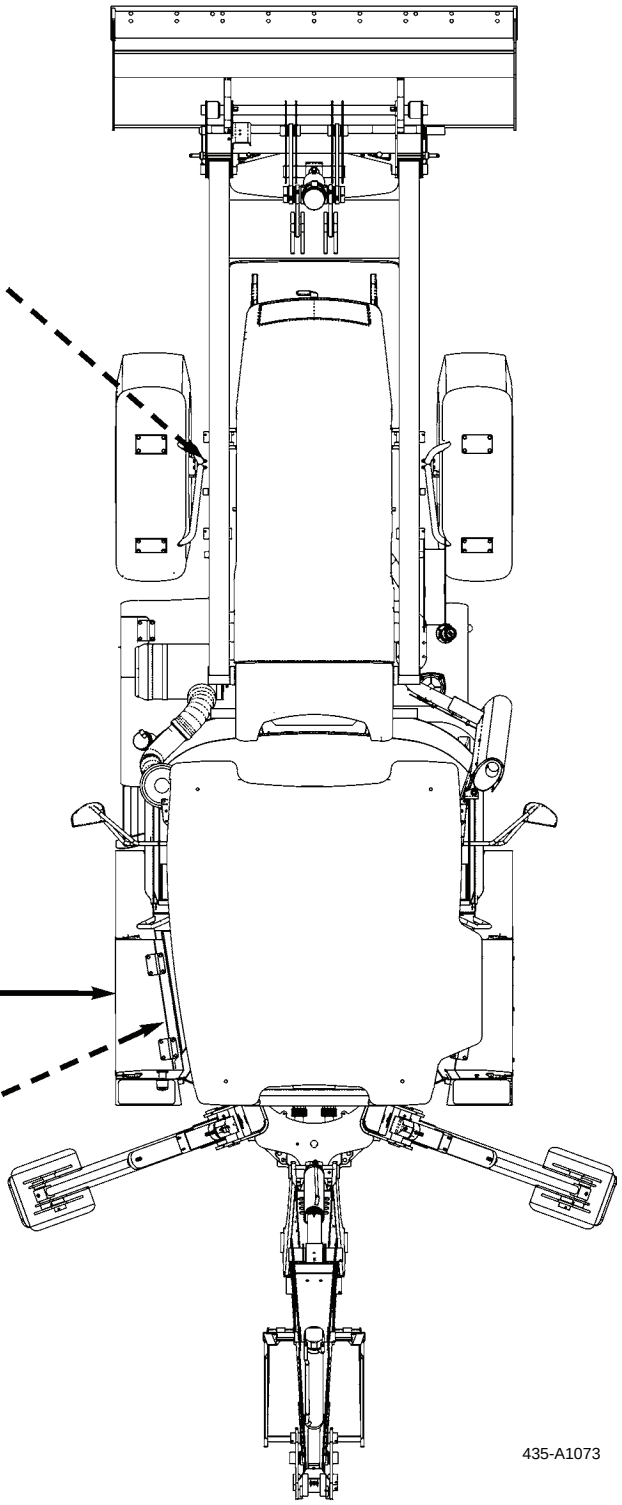


Figure 17. Towing Pintle

WEEKLY

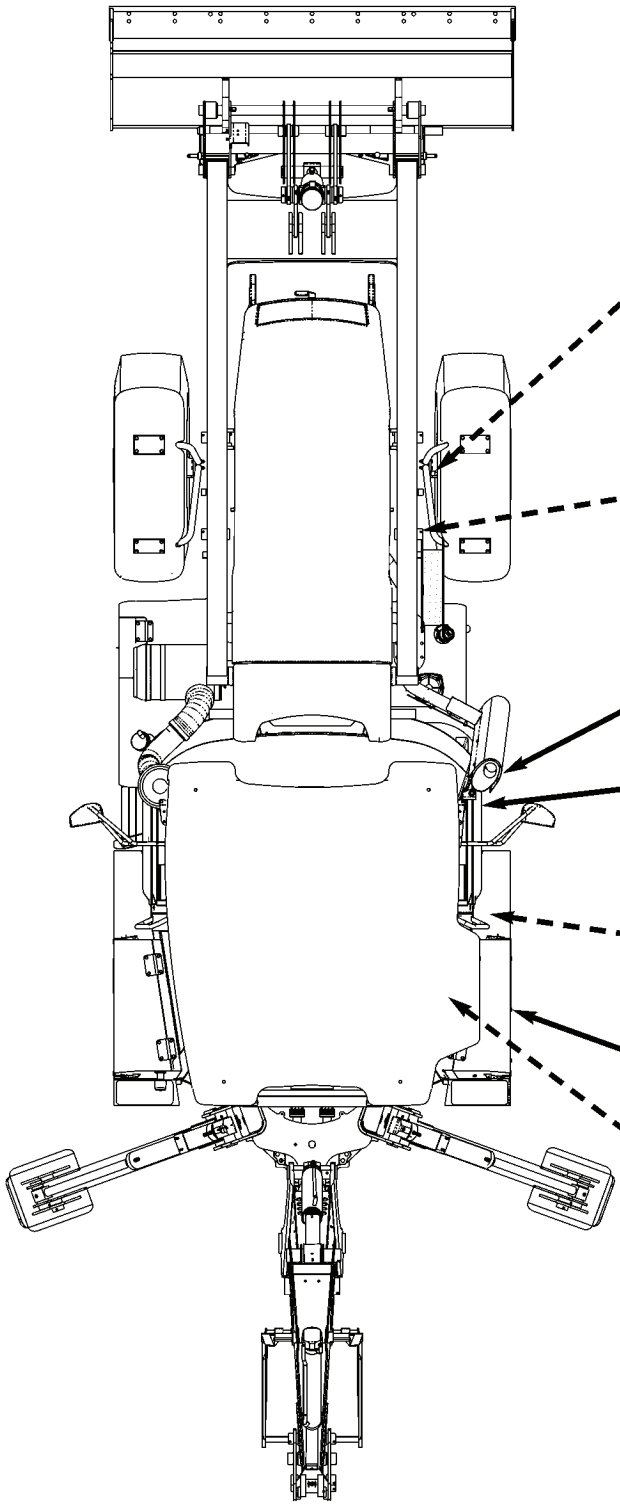
This page shows items to be lubricated weekly when operating this machine.

	Lubricant	Interval
SUSPENSION BEARINGS LUBRICATE (NOTE 11)	GAA	W
BATTERIES LEVEL CHECK (NOTE 13)	DISTILLED WATER	W
SUSPENSION BEARINGS LUBRICATE (NOTE 10)	GAA	W



WEEKLY

This page shows items to be lubricated weekly when operating this machine.



Interval	Lubricant	
W	GAA	AXLE SWIVELS LUBRICATE (NOTE 14)
W	GAA	STEERING JOINTS LUBRICATE (NOTE 15)
W	H_2O	WINDSHIELD WATER WASHER RESERVOIR LEVEL CHECK (NOTE 12)
W	N/A	AIR TANKS (DRAIN) (NOTE 16)
W	GAA	STEERING JOINTS LUBRICATE (NOTE 15)
W	BFS	BRAKE FLUID LEVEL CHECK (NOTE 17)
W	GAA	AXLE SWIVELS LUBRICATE (NOTE 14)

435-A1074

Table 5. Lubricating Instructions - Continued.

Note 11. Suspension Strut Bearings Lubrication

WARNING

You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with the loader arms raised, the cylinder support struts must be fitted (WP 0021). Failure to follow this warning may lead to injury or death to personnel.

1. Park the machine on level ground.
2. Engage the parking brake.
3. Select the Maintenance Suspension Mode (WP 0004).
4. Lower the work tools to the ground.

NOTE

The grease points are located on the side of the strut bearing housing. In some cases they are pointed inward towards the chassis.

5. Lubricate the suspension strut upper and lower bearings with GAA through the eight fittings (two on each strut) until grease is visible. Wipe excess grease with Rag, wiping (Item 17, WP 0033).

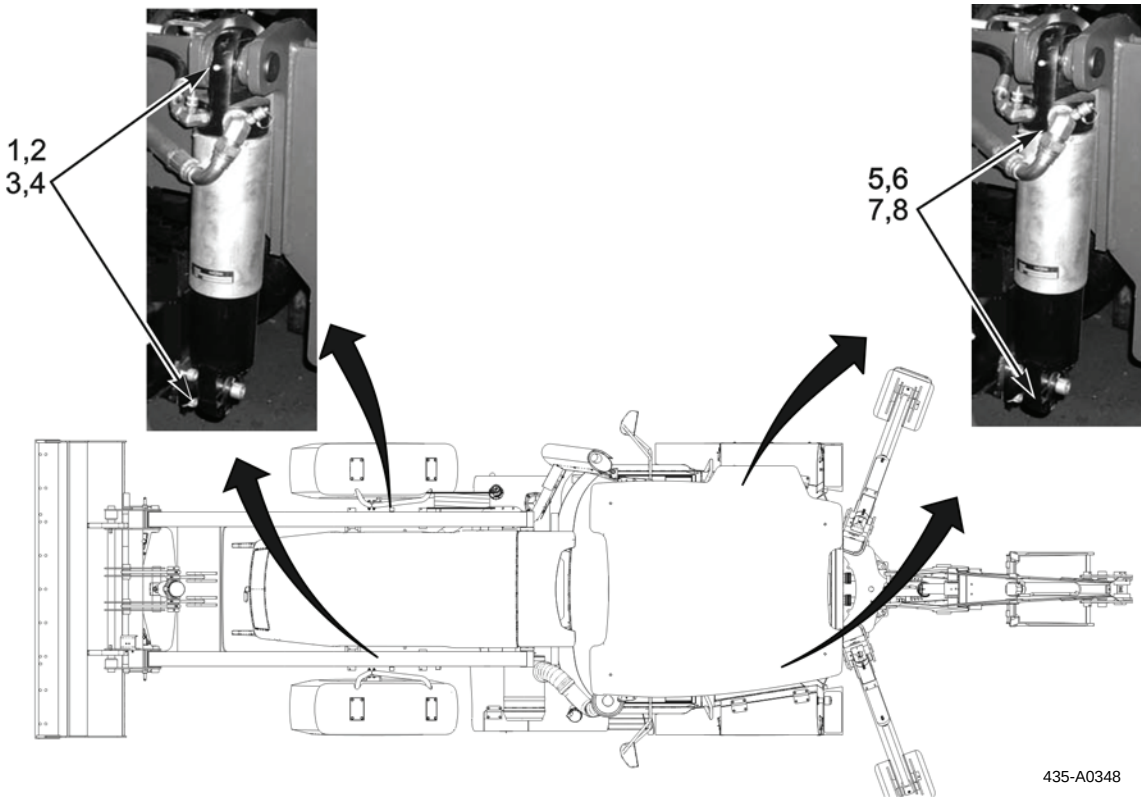


Figure 18. Suspension Strut Bearings

Table 5. Lubrication Instructions - Continued.

Note 12. Windshield Washer Reservoir Level Check

WARNING

Ensure the parking brake is engaged. Failure to follow this warning may lead to injury or death to personnel.

1. Park the machine on level ground.
2. Engage the parking brake.
3. Fill the washer bottle (1) with windshield cleaning compound (Item 3, WP 0033).

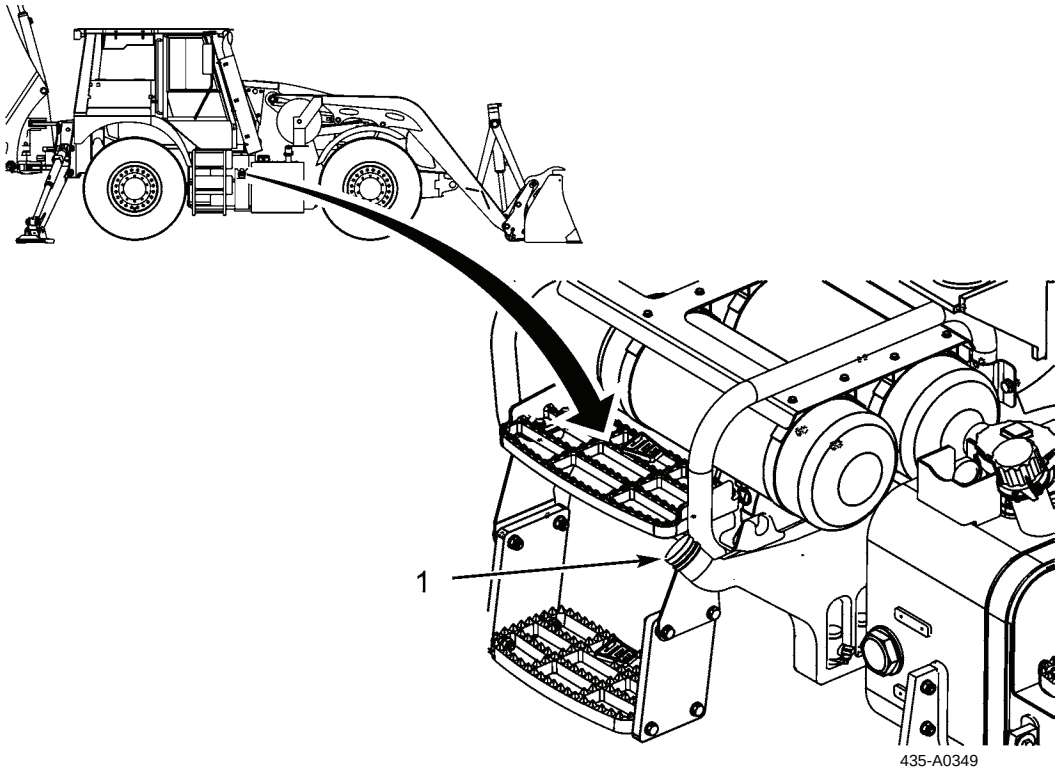
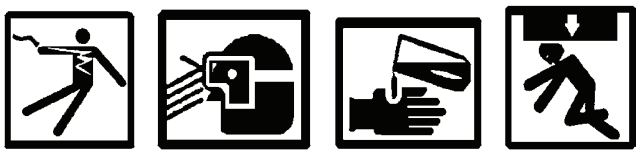


Figure 19. Windshield Washer Reservoir

Table 5. Lubrication Instructions - Continued.

Note 13. Batteries Electrolyte Level Check (If Equipped)



WARNING

- To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. Do not smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury or death to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating, damage to equipment, and injury to personnel.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes, or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these warnings may result in injury or death to personnel.

NOTE

- For complete information on servicing batteries, refer to TM 9-6140-200-14.
- Perform service to all batteries.

Maintenance-free batteries used in normal temperate climate applications should not need topping off. However, in certain conditions (such as prolonged operation at tropical temperatures or if the alternator overcharges), the electrolyte level should be checked as described below:

1. Open the battery box lid (1).
2. Remove the cell covers (2).
3. Check the electrolyte level in each cell. The electrolyte should be 1/4 in. (6 mm) above the plates. Notify Unit Maintenance if level is low.
4. Install the cell covers (2). Close and secure the battery box lid (1).

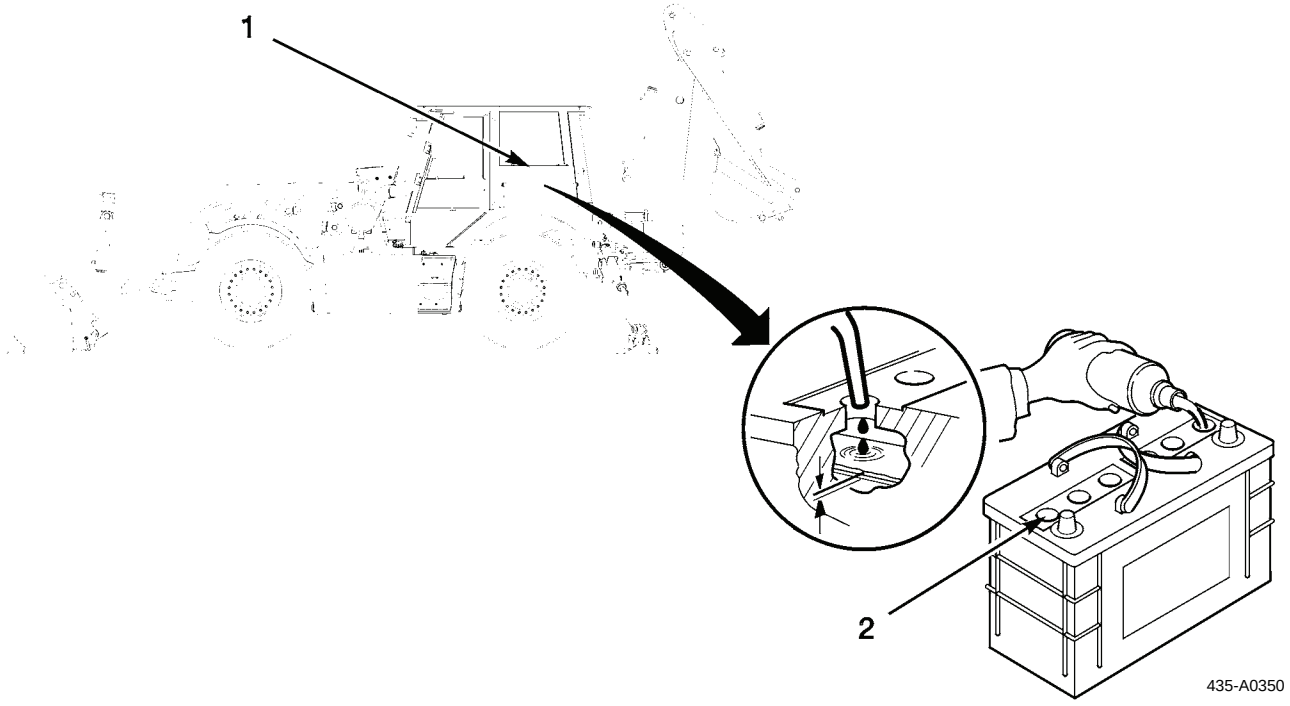


Figure 20. Batteries Electrolyte Level

Table 5. Lubrication Instructions - Continued.

Note 14. Axle Swivels Lubricate

WARNING

You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with the loader arms raised, the cylinder support struts must be fitted (WP 0021). Failure to follow this warning may lead to injury or death to personnel.

1. Park the machine on level ground.
2. Engage the parking brake.
3. Select the Maintenance Suspension Mode (WP 0004).
4. Lower the work tools to the ground.

NOTE

The right side front and left side rear grease fittings are hidden from direct view. Access the right side front grease fittings from the front, looking from the front of the machine. Access the left side rear grease fittings from the rear of the machine.

5. Lubricate the axle swivels upper and lower bearings with GAA through the eight fittings (two on each swivel) until grease is visible. Wipe excess grease with Rag, wiping (Item 17, WP 0033).

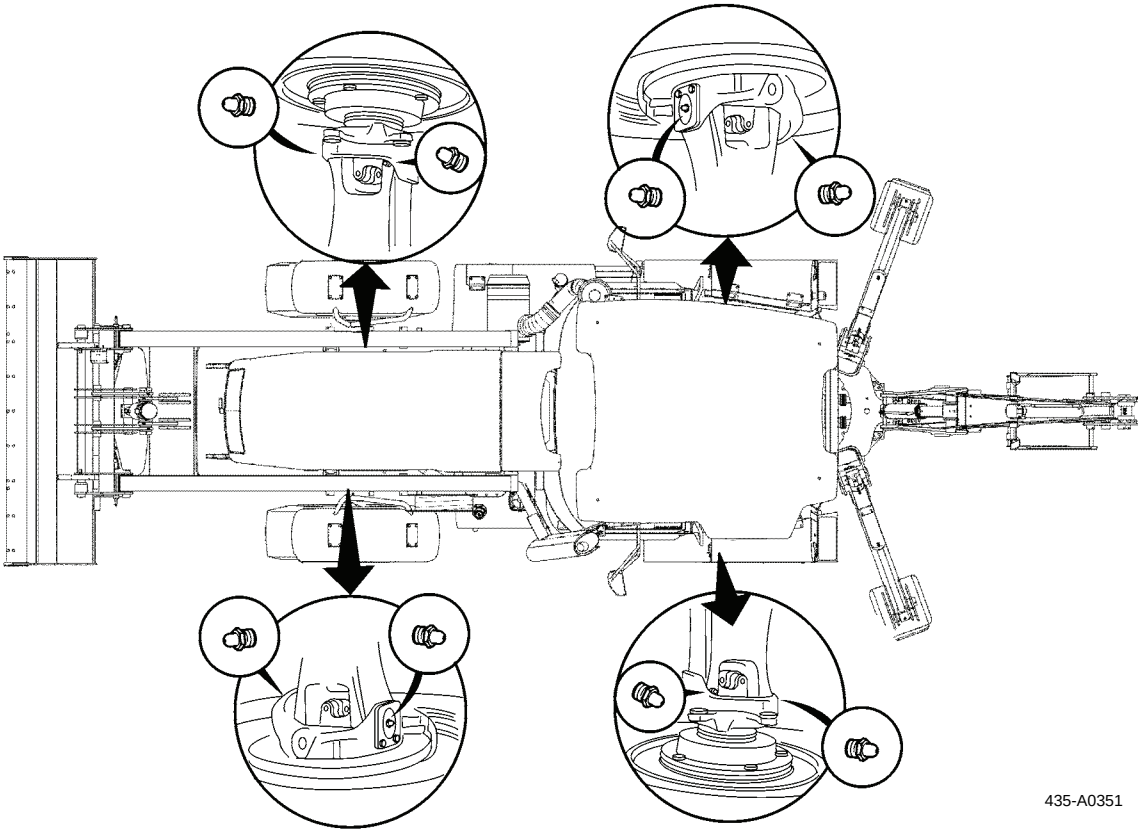


Figure 21. Axles Swivels

Table 5. Lubrication Instructions - Continued.

Note 15. Steering Joints Lubricate

WARNING

You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with the loader arms raised, the cylinder support struts must be fitted (WP 0021). Failure to follow this warning may lead to injury or death to personnel.

1. Park the machine on level ground.
2. Engage the parking brake.
3. Select the Maintenance Suspension Mode (WP 0004).
4. Lower the work tools to the ground.
5. Lubricate the steering joints with GAA through the four fittings until grease is visible. Wipe excess grease with Rag, wiping (Item 17, WP 0033).

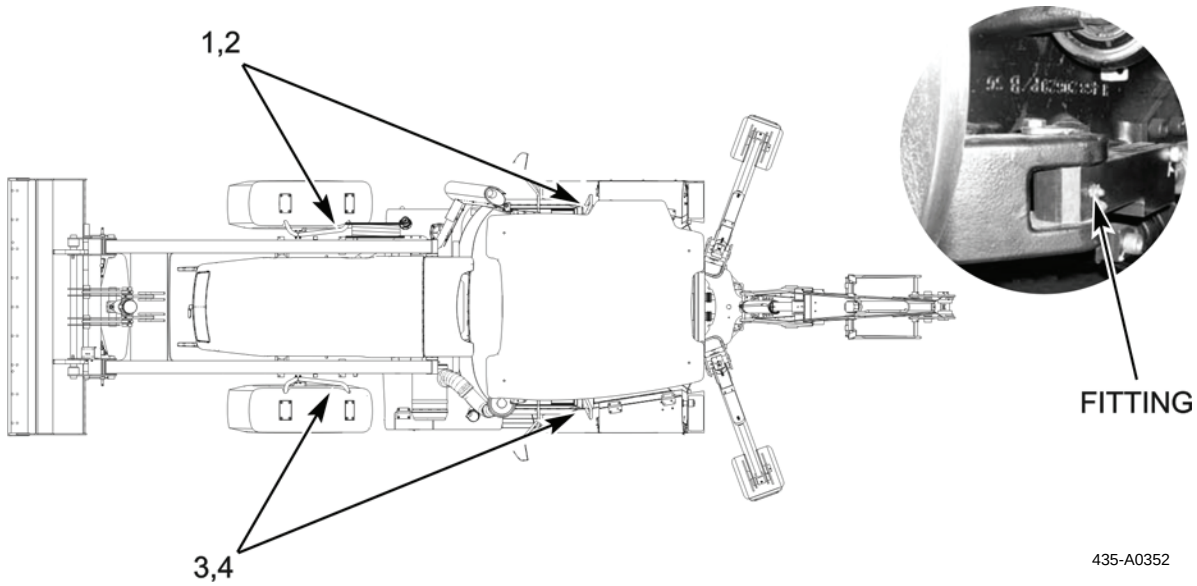


Figure 22. Steering Joints

Table 5. Lubrication Instructions - Continued.

Note 16. Air Tanks Condensation Draining

WARNING

You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with the loader arms raised, the cylinder support struts must be fitted (WP 0021). Failure to follow this warning may lead to injury or death to personnel.

1. Park the machine on level ground.
2. Engage the parking brake.
3. Select the Maintenance Suspension Mode (WP 0004).
4. Lower the work tools to the ground.
5. Charge the air system by starting the engine (WP 0005).
6. Wait for the tank warning lights to go out.
7. Stop the engine (WP 0005).

NOTE

There is a drain point in each tank.

8. Grip ‘keyring’ fitting (1) at the bottom of each tank and pull sideways until all water is expelled. The amount of water released is a guide to the functioning of dryer. If purging water takes much longer than about 5 seconds or if oil is present, the system must be checked by Unit Maintenance.

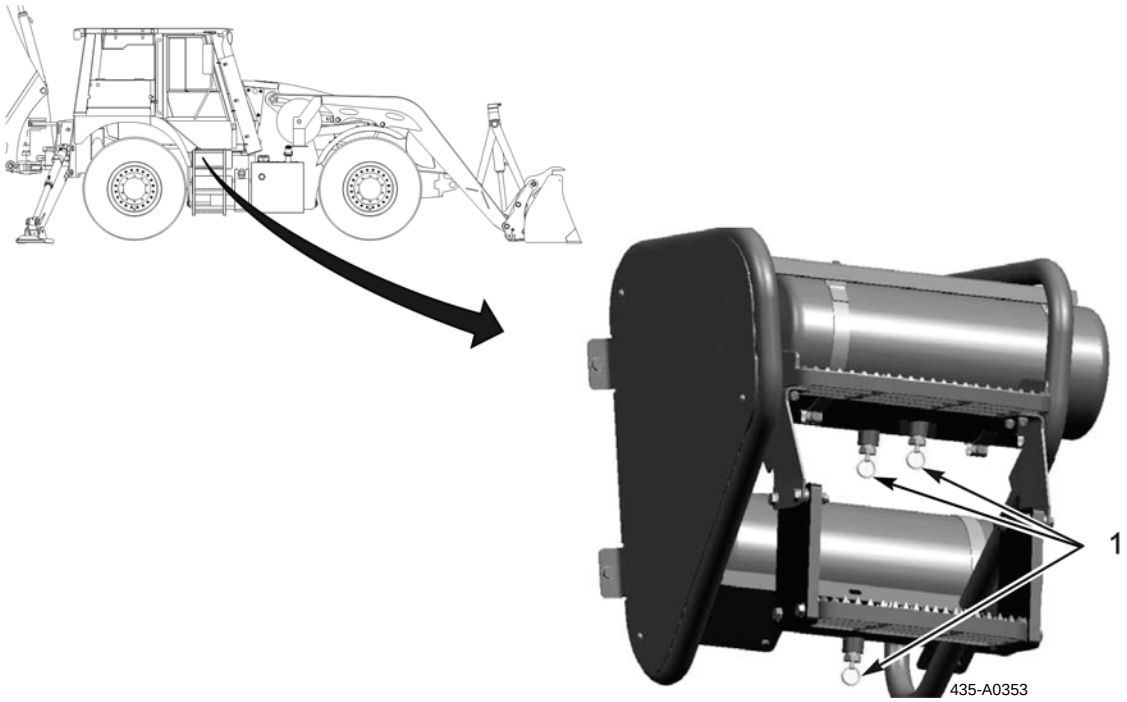


Figure 23. Air Tanks Drain Cocks

Table 5. Lubrication Instructions - Continued.

Note 17. Brake Fluid Level Check

WARNING

- You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with the loader arms raised, the cylinder support struts must be fitted (WP 0021).
- If the brake fluid warning light comes on, check the brake fluid level immediately. Faulty brakes can kill. If you have to top up the brake reservoir frequently, get the brake system checked by Unit Maintenance. Do not use the machine until the fault has been corrected.
- The fluid can harm your skin. Wear rubber gloves. Cover cuts and grazes.
- Failure to follow these warnings may result in injury or death to personnel.

1. Park the machine on level ground.
2. Engage the parking brake.
3. Select the Maintenance Suspension Mode (WP 0004).
4. Lower the work tools to the ground.
5. Open the brake reservoir box.
6. Check the fluid in all four reservoirs. If the level has fallen below the lower mark, report your findings at once to Unit Maintenance.

NOTE

The fluid level should be between the two lines (MIN) and (MAX) molded into the side of each reservoir. If necessary, add fluid as specified below.

7. Do not use ordinary hydraulic fluid. To add brake fluid, clean the area around the filler cap. Remove the cap and carefully pour in Fluid, Brake, Silicone, BFS (Item 5, WP 0033) until it reaches the correct level. Avoid spilling it. Wipe up any spillage. Do not allow dirt to enter the reservoir. Fit the cap securely.

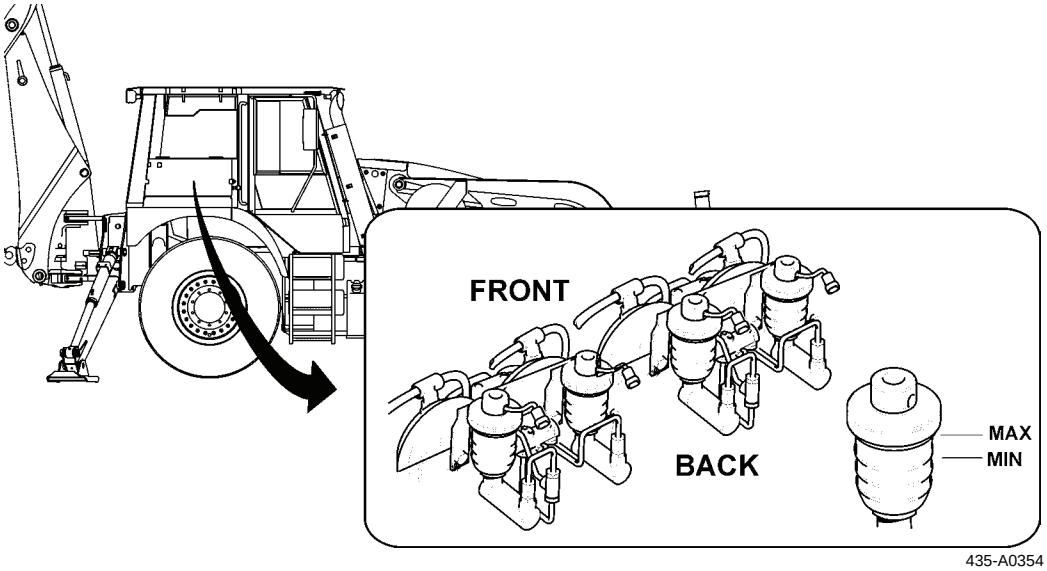


Figure 24. Brake Fluid Level

Biannually

This page shows items to be lubricated every 6 months when operating this machine.

	Lubricant	Interval
PROPSHAFTS LUBRICATE (NOTE 18)	GAA	B

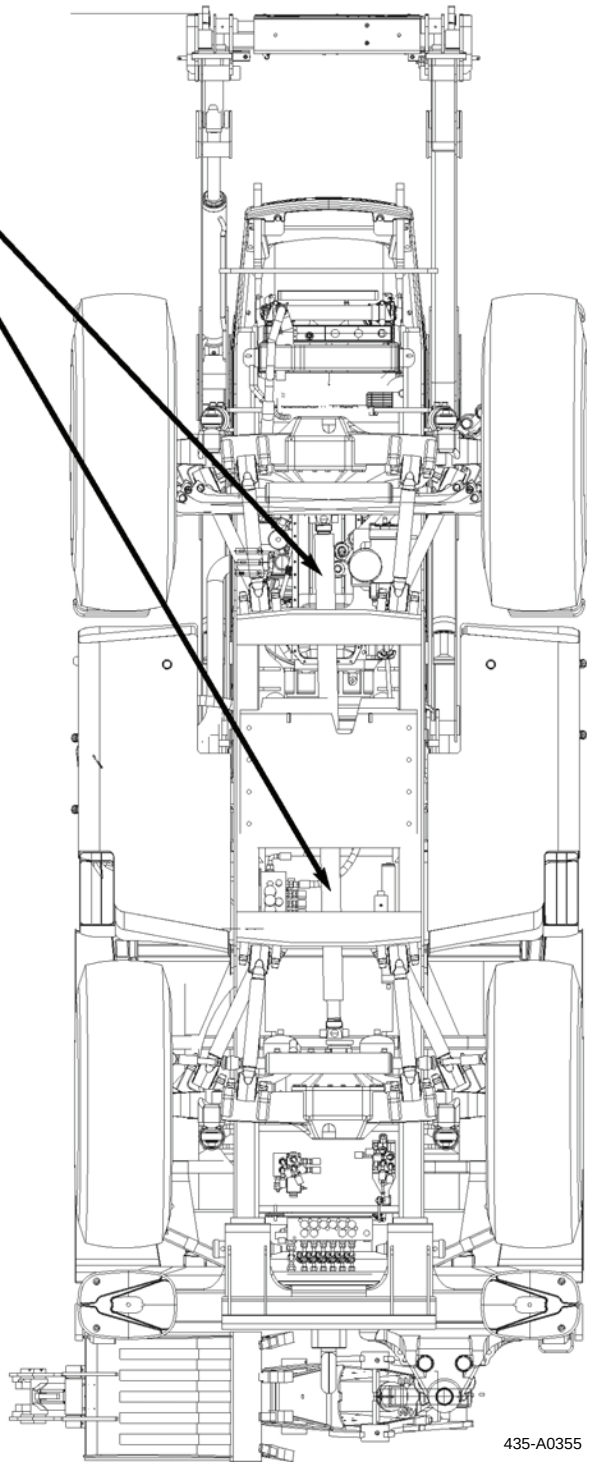


Table 5. Lubrication Instructions - Continued.

Note 18. Propshafts Lubricate

WARNING

Make the machine safe before getting underneath it. Select the Maintenance Suspension Mode (WP 0004). Lower the work tools. Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. Failure to follow this warning may lead to injury or death to personnel.

NOTE

When greasing the universal joints, you must ensure grease appears at all four bearing caps. If grease does not appear at any cap, move the shaft from side to side and then re-grease.

Lubricate the propshaft with GAA through the four fittings until grease is visible. Wipe excess grease with Rag, wiping (Item 17, WP 0033).

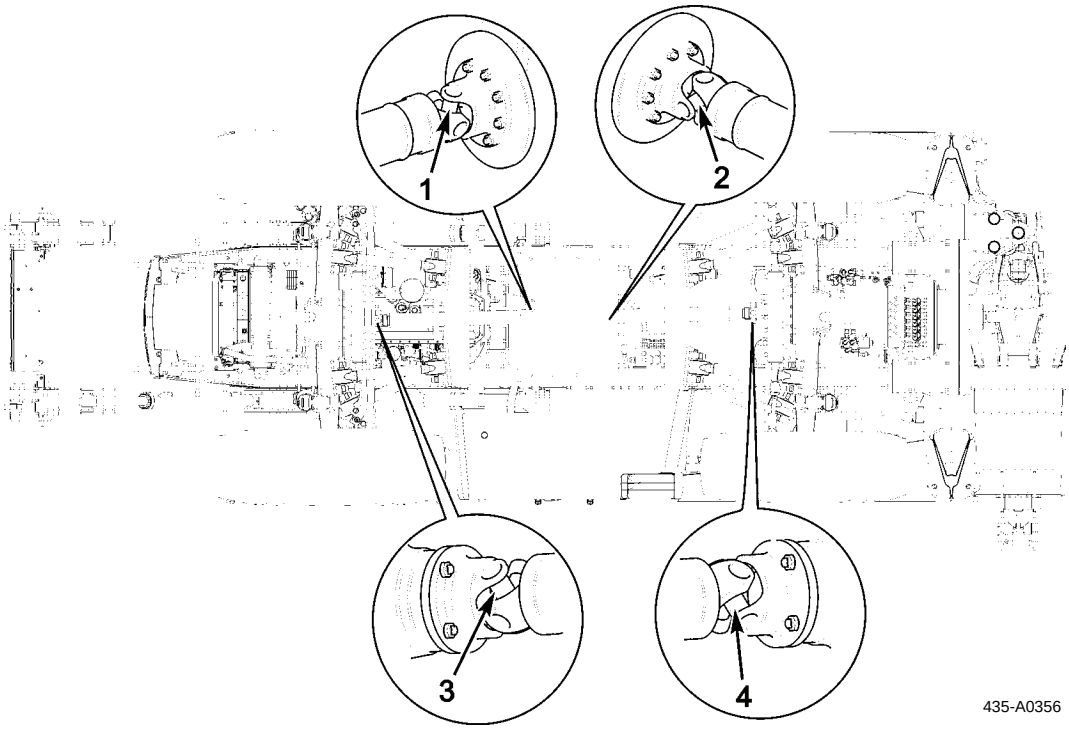
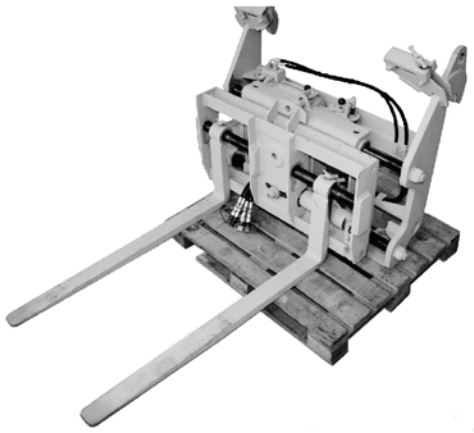


Figure 25. Propshafts

If Required For Mission

This page shows Special Purpose Kits to be lubricated before each use.

	Lubricant	Interval	
FORKLIFT ASSEMBLY LUBRICATE (NOTE 19)	GAA	AR	
ROTARY SWEEPER LUBRICATE (NOTE 20)	GAA	AR	

435-A1414

Table 5. Lubrication Instructions - Continued.

Note 19. Forklift Assembly Lubricate

WARNING

You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with loader arms raised, the cylinder support struts must be fitted (WP 0021). Failure to follow this warning may lead to injury or death to personnel.

Lubricate the forklift assembly with GAA through the 11 fittings until grease is visible. Wipe excess grease with Rag, wiping (Item 17, WP 0033).

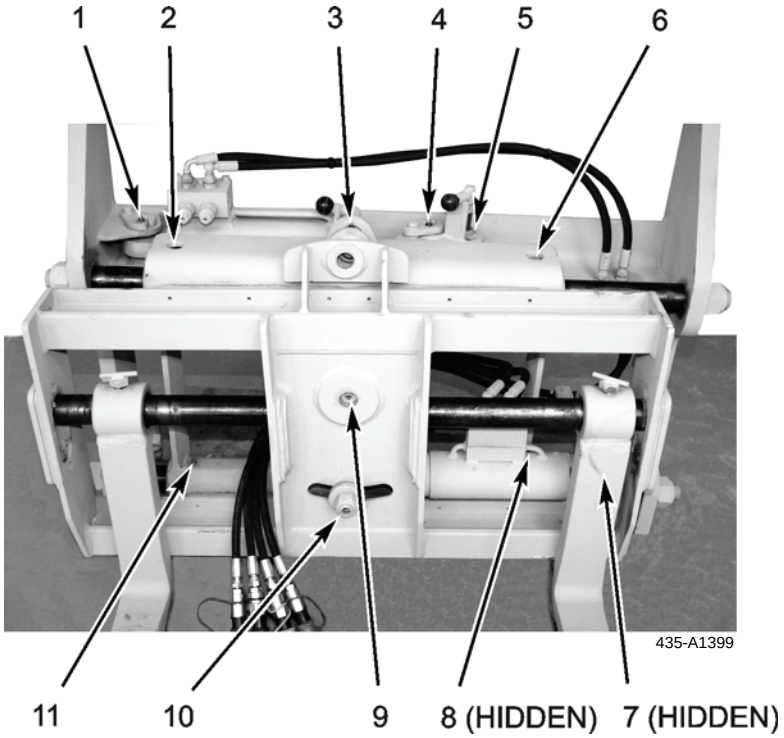


Figure 26. Forklift Assembly

Table 5. Lubrication Instructions - Continued.

Note 20. Rotary Sweeper Lubricate

WARNING

You will be working close to and inside the machine for these jobs. Lower the work tools if possible. Select the Maintenance Suspension Mode (WP 0004). Turn OFF the battery disconnect switch. This will prevent the engine from being started. Ensure the parking brake is engaged. If you must work with loader arms raised, the cylinder support struts must be fitted (WP 0021). Failure to follow this warning may lead to injury or death to personnel.

Lubricate the rotary sweeper through the seven fittings until grease is visible. Wipe excess grease with Rag, wiping (Item 17, WP 0033).

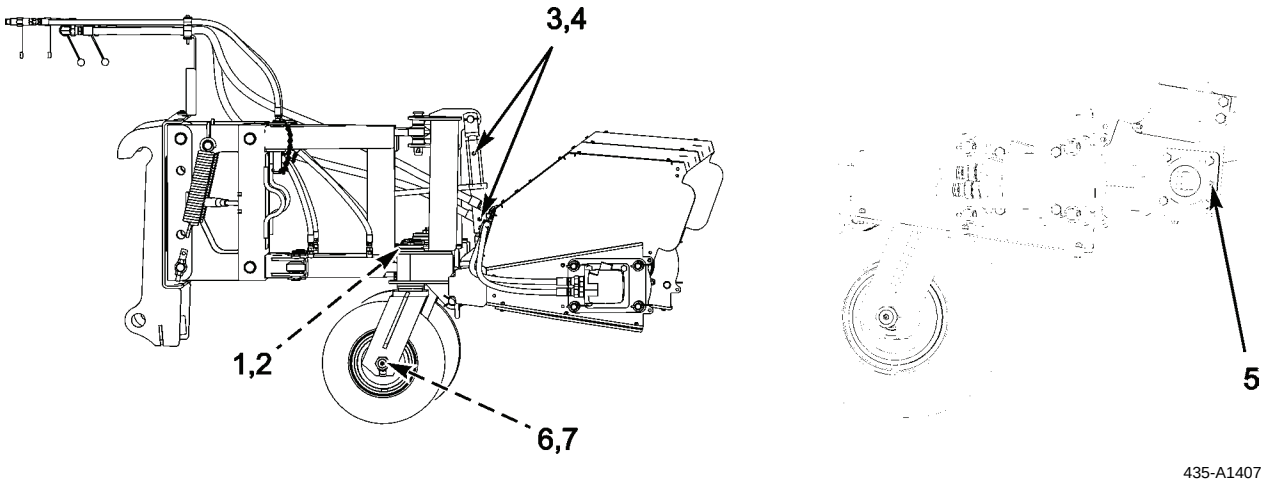


Figure 27. Rotary Sweeper

END OF TASK

END OF WORK PACKAGE

CHAPTER 5

MAINTENANCE INSTRUCTIONS

MAINTENANCE INSTRUCTIONS

FUEL SEDIMENT BOWL MAINTENANCE

Fuel Sediment Bowl Maintenance

INITIAL SETUP

Materials/Parts

Rag, wiping (Item 17, WP 0033)
Container, suitable

Personnel Required

One

Equipment Conditions

Machine parked, parking brake engaged, engine OFF (WP 0005)

FUEL SEDIMENT BOWL MAINTENANCE

1. Release the latch (1) on the fuel filter box (2).

NOTE

If the filter requires daily draining of water, report the fact to Unit Maintenance so the fuel system can be cleaned out.

2. Drain off any water from the pre-filter (3) by opening the drain tap (4).
3. Ensure the drain tap (4) is fully closed.
4. Close and securely latch (1) the fuel filter box (2).

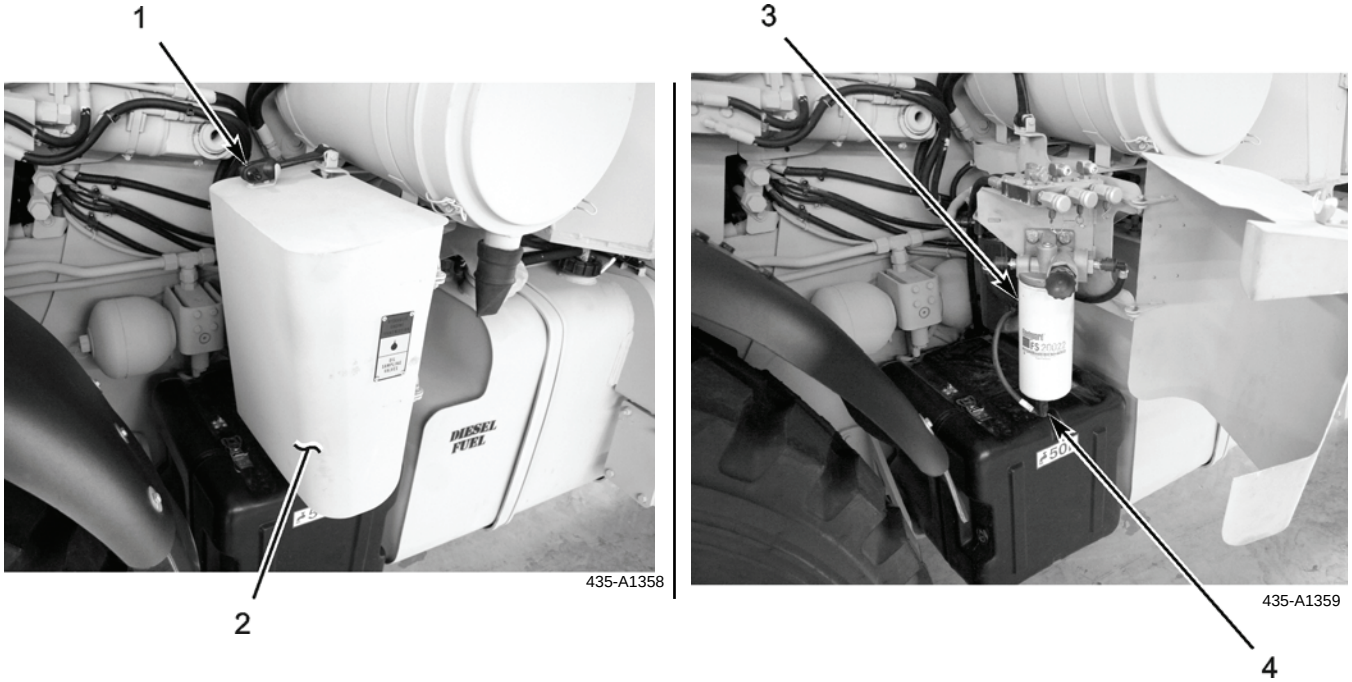


Figure 1. Fuel Sediment Bowl Maintenance

END OF TASK

END OF WORK PACKAGE

MAINTENANCE INSTRUCTIONS

COOLING PACK MAINTENANCE

Opening Cooling Pack, Cleaning, Closing Cooling Pack

INITIAL SETUP

Personnel Required

One

References

WP 0004

Equipment Conditions

Machine parked, parking brake engaged, engine OFF (WP 0005)

The machine is fitted with a cooling pack that consists of the engine coolant radiator, hydraulic oil cooler, transmission oil cooler, turbocharger air cooler, and brake aftercooler.

If the tubes or fins become clogged, the radiator and coolers will be less efficient.

For ease of maintenance, the sections of the pack slide and hinge to give the maximum accessibility without the need to disconnect/remove the individual sections.

WARNING

Ensure the engine cannot be started. Turn OFF the battery disconnect switch before performing this maintenance task (WP 0004). Failure to follow this warning may result in injury to personnel.

OPENING COOLING PACK

1. Open the engine compartment hood and nosecone (WP 0004).

OPENING COOLING PACK – CONTINUED

2. Release the cooling pack side catches (Figure 1, Item 3) (one on each side) and hinge the complete cooling pack forwards from the lower edge until latch-bar (Figure 1, Item 2) drops into place in latch (Figure 1, Item 1), securing the cooling pack in the opened position.

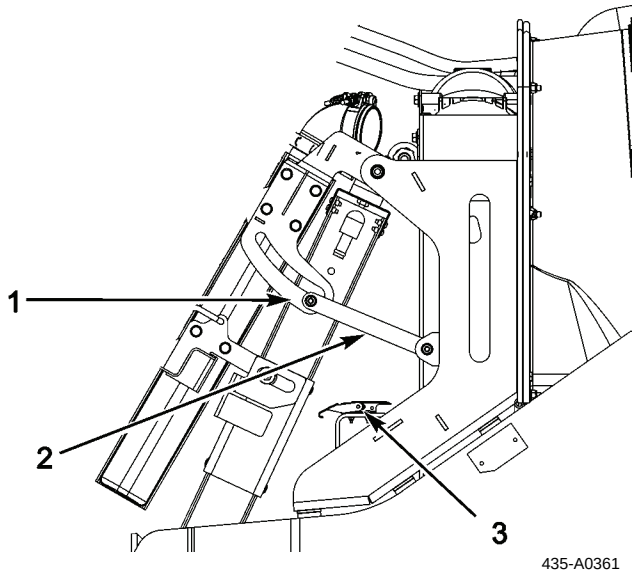


Figure 1. Cooling Pack

CLEANING

CAUTION

Do not use a screwdriver or any other object to clean fins of cooling pack. This will damage the equipment.

1. Remove large debris such as tree branches, rocks, and clumps of mud or dirt.
2. Notify Unit Maintenance to clean dust, debris, and insects from the cooling pack by flushing with low-pressure water.

CLOSING COOLING PACK

1. Support the lower edge of the cooling pack to take the weight off latch (Figure 1, Item 1) and lift latch-bar (Figure 1, Item 2).
2. Lower the cooling pack back into position and secure the latches (Figure 1, Item 3), one on each side of the cooling pack.
3. Close and secure the nosecone and hood (WP 0004).

END OF TASK

END OF WORK PACKAGE

MAINTENANCE INSTRUCTIONS

TIRE INFLATION

Tire Inflation

INITIAL SETUP

Tools and Special Tools

Impact wrench (Item 19, Table 1, WP 0031)
Socket (Item 22, Table 2, WP 0031)
Tire inflator (Items 1, 2, and 3, Table 2, WP 0031)

Personnel Required

One

References

WP 0004

Equipment Conditions

Machine parked, engine running (WP 0005)

TIRE INFLATION

WARNING

- Operating machine with under-inflated or defective tire may lead to tire failure and loss of traction or control. Failure to follow this warning may cause injury or death to personnel or damage to equipment.
- If tire pressure is 20 psi (138 kPa) or less, do not inflate. Notify Unit Maintenance. Failure to follow this warning may cause injury or death to personnel.

1. Remove tire inflator and hose assembly from the toolbox.

TIRE INFLATION – CONTINUED

2. Remove protective cap (Figure 1, Item 1) from connector on auxiliary air supply connection (Figure 1, Item 2) and connect tire inflator gladhand (Figure 1, Item 3) and hose assembly.

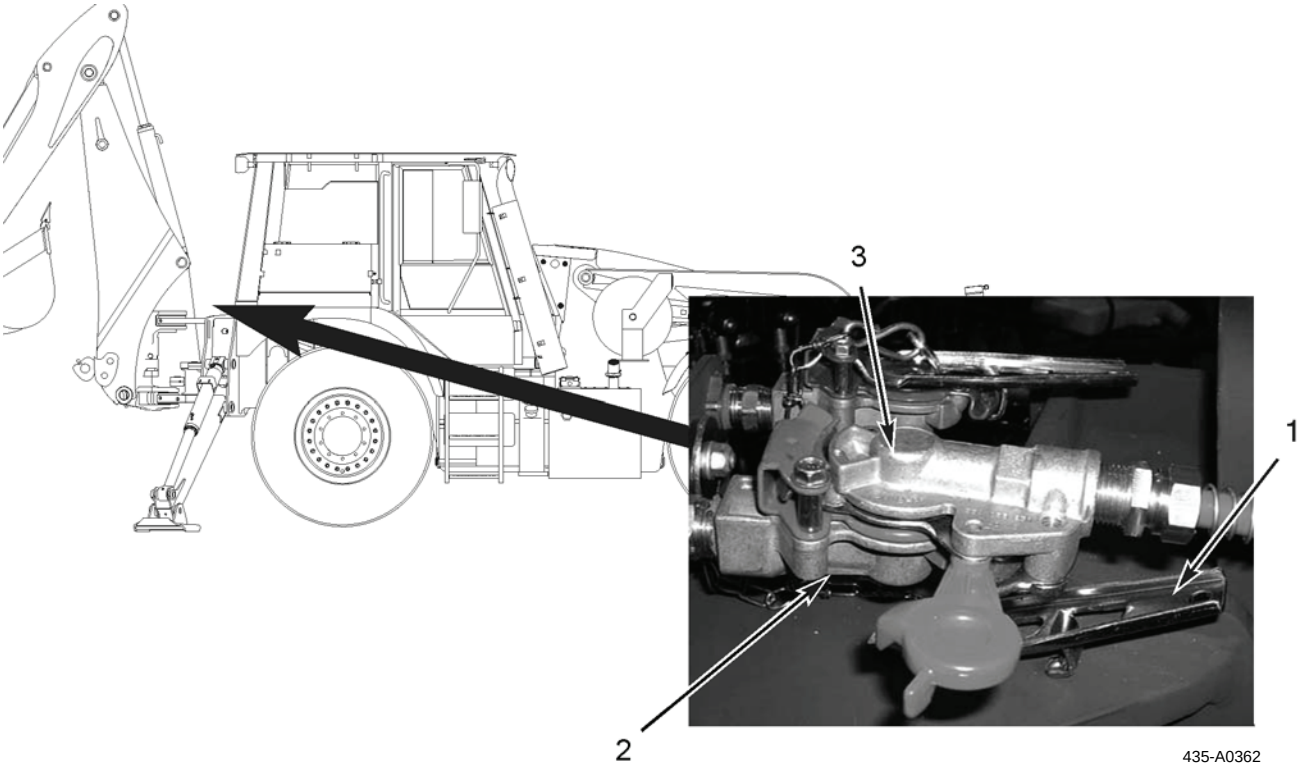


Figure 1. Tire Inflation

TIRE INFLATION – CONTINUED

3. With engine running (WP 0005) and air pressure at normal operating pressure, remove dust cap (Figure 2, Item 4) from tire valve (Figure 2, Item 5) and attach tire inflator and hose assembly to tire valve.
4. Operate the trailer air supply control valve in the cab to supply air to the trailer red line (WP 0004).
5. Operate inflation lever (Figure 2, Item 6) on tire inflator and hose assembly until the recommended tire pressure, 102 psi (703 kPa), is indicated on pressure indicator rod (Figure 2, Item 7). Overpressure can be released by operating the deflation button (Figure 2, Item 8).
6. Once the correct pressure has been obtained, shut off air supply, remove tire inflator and hose assembly from tire valve (Figure 2, Item 5), and refit the dust cap (Figure 2, Item 4).
7. Remove tire inflator and hose assembly from the auxiliary air supply, replace the protective cover, and stow tire gauge and hose assembly in the toolbox.

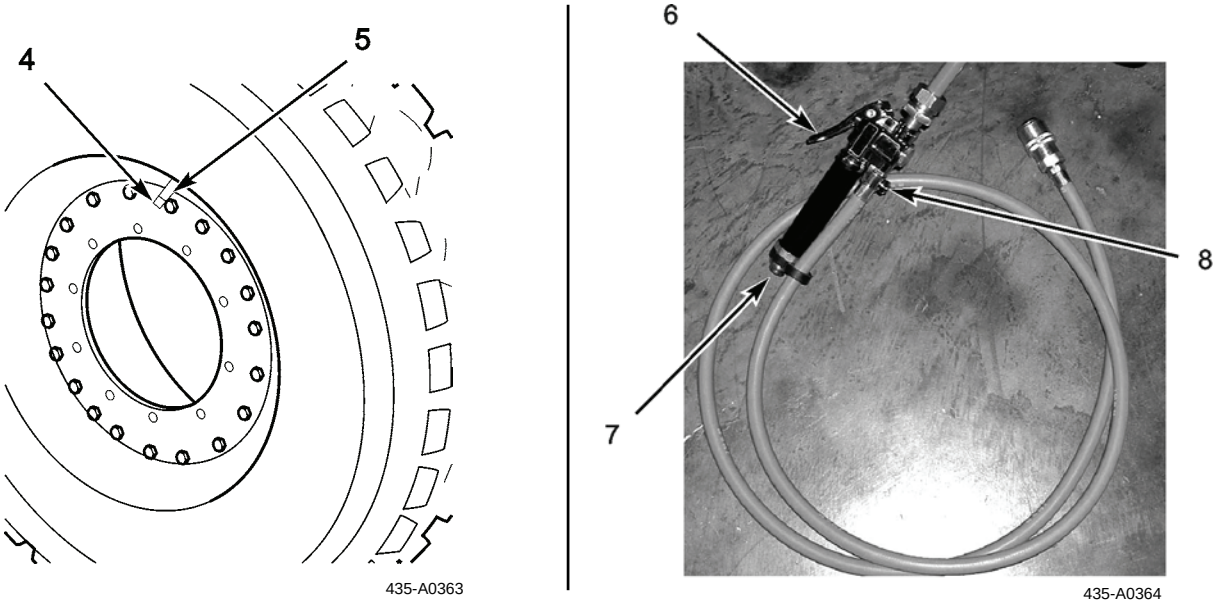


Figure 2. Tire Inflation

END OF TASK

END OF WORK PACKAGE

MAINTENANCE INSTRUCTIONS

CYLINDER SUPPORT STRUTS INSTALLATION

General, Strut Identification, Front Bucket Crowd Cylinder Strut Installation, Front Bucket Crowd Cylinder Strut Removal, Front Loader Arm Cylinder Travel Strut Installation, Front Loader Arm Cylinder Travel Strut Removal, Front Loader Arm Cylinder Maintenance Strut Installation, Front Loader Arm Cylinder Maintenance Strut Removal, Backhoe Bucket Crowd Cylinder Strut Installation, Backhoe Bucket Crowd Cylinder Strut Removal

INITIAL SETUP

Tools and Special Tools

Struts (Items 15 thru 18, Table 1, WP 0031)

References

WP 0004

Personnel Required

One

Equipment Conditions

Engine running (WP 0005)

GENERAL

There are four types of support struts (total five in quantity) supplied with your machine. They are stowed on the spare wheel carrier. Their purpose is to lock the cylinders into a pre-determined position. One is deployed to set the position of the front bucket in relation to the ground. A second type (set of two) is deployed to set the position of the loader arms to give the correct clearance between the bucket and the ground while traveling on the highway. A third type is deployed to hold the loader arms in an elevated position to allow access to the front of the machine for maintenance. The fourth type is deployed with the backhoe bucket crowd cylinder. This is to prevent the bucket from opening out (dumping) when traveling.

END OF TASK

STRUT IDENTIFICATION (FIGURE 1)

See the following descriptions and lengths to ensure the correct deployment of the struts:

1. **Front Bucket Crowd Cylinder Travel:** Sets Travel Position to 22.25 in. (565 mm) in length.
2. **Front Bucket Loader Arm Cylinder Travel:** Sets Travel Position to 8.9 in. (227 mm) in length (2 in quantity).
3. **Backhoe Bucket Crowd Cylinder Travel:** Sets Travel position to 29.5 in. (750 mm) in length.
4. **Front Bucket Loader Arm Cylinder Maintenance:** Sets Maintenance Position to 31.1 in. (790 mm) in length.

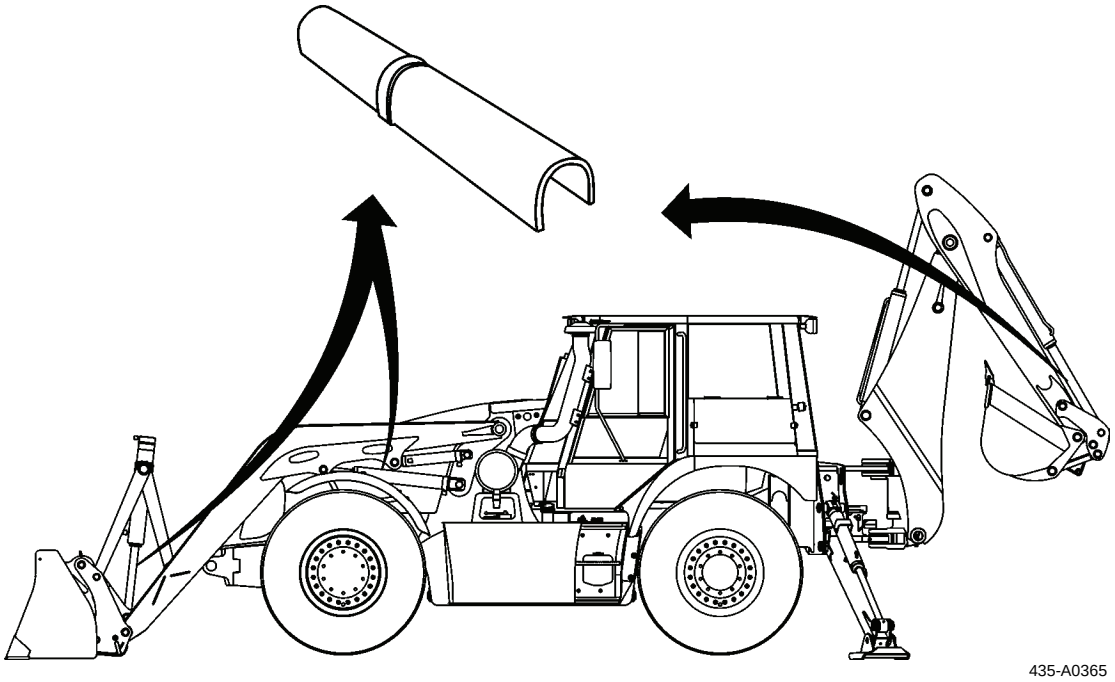


Figure 1. Strut Identification

END OF TASK

FRONT BUCKET CROWD CYLINDER STRUT INSTALLATION

WARNING

- You could be killed or injured if the bucket drops while you are working near it. Install the support strut as instructed below before traveling on the highway. Failure to follow this warning may result in injury or death to personnel.
- Keep people away from the machine while you fit or remove the strut. You or others could be killed or injured if the bucket is operated while you are close to it.
- You may have to climb onto the machine to fit or remove the strut. Take care, especially if the machine is wet. Remove mud and oil before climbing onto the machine. Never work on the machine with a load on the forks/buckets. Failure to follow this warning may result in injury or death to personnel.

1. Before fitting the support strut, remove any load on the forks, and empty buckets.

FRONT BUCKET CROWD CYLINDER STRUT INSTALLATION – CONTINUED

2. Raise the bucket sufficiently to give ground clearance to roll the bucket back (WP 0004).
3. Roll the bucket back enough to install the strut (WP 0004).
4. Ensure the parking brake is engaged and the transmission is in Neutral (WP 0004).
5. Stop the engine (WP 0005).
6. Remove the front bucket crowd cylinder travel strut (Figure 2, Item 1) from its stowage position on the spare wheel carrier.
7. Place the strut (Figure 2, Item 1) around the cylinder piston rod as shown. Fix it in place with clamp and latch (Figure 2, Item 2).

CAUTION

Roll the bucket carefully to prevent possible damage to the strut. Stop as soon as the weight of the bucket is on the strut. Failure to follow this caution may result in damage to equipment.

8. To prevent any chance of the strut (Figure 2, Item 1) becoming loose or creeping down, the bucket should be rolled forward to trap the strut in position (WP 0004).

END OF TASK

FRONT BUCKET CROWD CYLINDER STRUT REMOVAL

1. Roll the bucket sufficiently to take the weight off the strut (WP 0004).
2. Ensure the parking brake is engaged and the transmission is in Neutral (WP 0004).
3. Stop the engine (WP 0005).
4. Release the latch and clamp (Figure 2, Item 2), then remove the strut (Figure 2, Item 1).
5. Secure the strut (Figure 2, Item 1) in its stowage position on the spare wheel carrier.

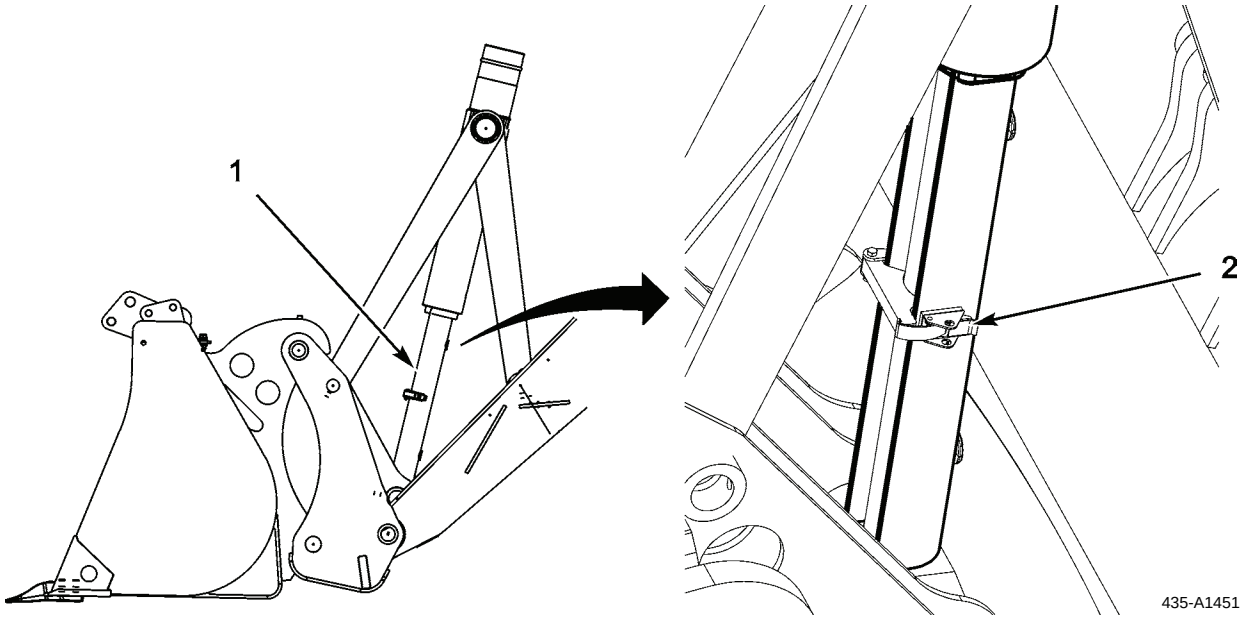


Figure 2. Front Bucket Crowd Cylinder Strut Location

END OF TASK

FRONT LOADER ARM CYLINDER TRAVEL STRUTS INSTALLATION

WARNING

- You could be killed or injured if the loader arms drop while you are working near them. Install the support struts as instructed below before traveling on the highway. Failure to follow this warning may result in injury or death to personnel.
- Keep people away from the machine while you fit or remove the struts. You or others could be killed or injured if the loader is operated while you are close to it.
- You may have to climb onto the machine to fit or remove the struts. Take care, especially if the machine is wet. Remove mud and oil before climbing onto the machine. Never work on the machine with a load on the forks/buckets. Failure to follow this warning may result in injury or death to personnel.

1. Before fitting the support struts, remove any load on the forks, and empty buckets.
2. Raise the loader arms sufficiently to insert the struts (WP 0004).
3. Ensure the parking brake is engaged and the transmission is in Neutral (WP 0004).
4. Stop the engine (WP 0005).
5. Remove the two struts (Figure 3, Item 3) from their stowage position on the spare wheel carrier.
6. Place the struts (Figure 3, Item 3) around the cylinder piston rods as shown. Fix it in place with clamp and latch (Figure 3, Item 4).

CAUTION

Lower the arms carefully to prevent possible damage to the struts. Stop as soon as the weight of the arms is on the struts. Failure to follow this caution may result in damage to equipment.

7. To prevent any chance of the struts (Figure 3, Item 3) becoming loose or creeping down, the arms should be lowered to trap the struts in position (WP 0004).

END OF TASK

FRONT LOADER ARM CYLINDER TRAVEL STRUTS REMOVAL

1. Raise the loader arms sufficiently to take the weight off the strut (WP 0004).
2. Ensure the parking brake is engaged and the transmission is in Neutral (WP 0004).
3. Stop the engine (WP 0005).
4. Release latch and clamp (Figure 3, Item 4), then remove the struts (Figure 3, Item 3).
5. Secure the struts (Figure 3, Item 3) in their stowage position on the spare wheel carrier.

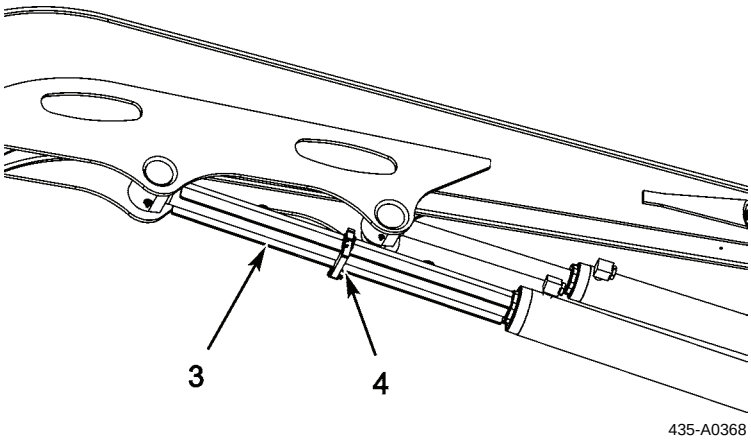


Figure 3. Front Loader Arm Cylinder Travel Struts Location

END OF TASK

FRONT LOADER ARM CYLINDER MAINTENANCE STRUT INSTALLATION

The Maintenance strut is the longer of the two which may be deployed to the loader arm cylinders. It is located on the spare wheel carrier.

WARNING

- You could be killed or injured if the loader arms drop while you are working near them. Install the support strut as instructed below before maintenance. Failure to follow this warning may result in injury or death to personnel.
- Keep people away from the machine while you fit or remove the strut. You or others could be killed or injured if the loader is operated while you are close to it.
- You may have to climb onto the machine to fit or remove the strut. Take care, especially if the machine is wet. Remove mud and oil before climbing onto the machine. Never work on the machine with a load on the forks/buckets. Failure to follow this warning may result in injury or death to personnel.

1. Before fitting the support strut, remove any load on the forks, and empty buckets.
2. Raise the loader arms sufficiently to be able to insert the strut (WP 0004).
3. Ensure the parking brake is engaged and the transmission is in Neutral (WP 0004).
4. Stop the engine (WP 0005).
5. Remove the front lift cylinder maintenance strut (Figure 4, Item 5) from its stowage position on the spare wheel carrier.
6. Place the strut (Figure 4, Item 5) around the cylinder piston rod as shown. Fix it in place with clamp and latch (Figure 4, Item 6).

CAUTION

Lower the arms carefully, to prevent possible damage to the strut. Stop as soon as the weight of the arms is on the strut. Failure to follow this caution may result in damage to equipment.

7. To prevent any chance of the strut (Figure 4, Item 5) becoming loose or creeping down, the arms should be lowered to just trap the strut in position (WP 0004).

END OF TASK

FRONT LOADER ARM CYLINDER MAINTENANCE STRUT REMOVAL

1. Raise the loader arms sufficiently to take the weight off the strut (WP 0004).
2. Ensure the parking brake is engaged and the transmission is in Neutral (WP 0004).
3. Stop the engine (WP 0005).
4. Release latch and clamp (Figure 4, Item 6), then remove the strut (Figure 4, Item 5).
5. Secure the strut (Figure 4, Item 5) in its stowage position on the spare wheel carrier.

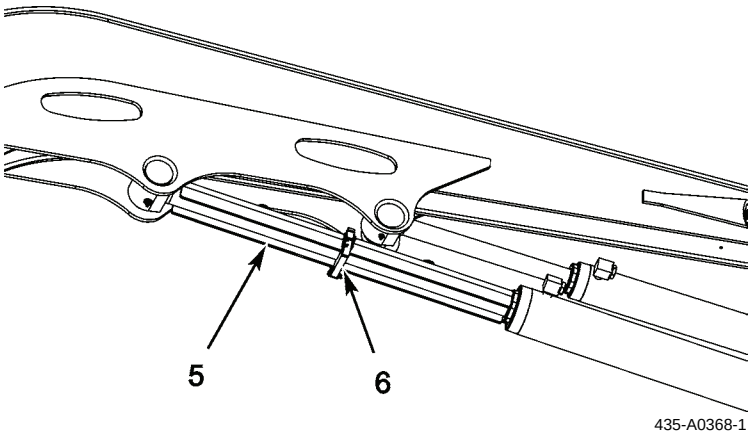


Figure 4. Front Loader Army Cylinder Maintenance Strut Location

END OF TASK

BACKHOE BUCKET CROWD CYLINDER STRUT INSTALLATION

The backhoe bucket crowd cylinder is deployed while traveling on the highway, to prevent the backhoe bucket from rolling open.

WARNING

- You could be killed or injured if the backhoe bucket drops while you are working near it. Install the support strut as instructed below before traveling on the highway. Failure to follow this warning may result in injury or death to personnel.
- Keep people away from the machine while you fit or remove the strut. You or others could be killed or injured if the loader is operated while you are close to it.
- You may have to climb onto the machine to fit or remove the strut. Take care, especially if the machine is wet. Remove mud and oil before climbing onto the machine. Never work on the machine with a load on the forks/buckets. Failure to follow this warning may result in injury or death to personnel.

NOTE

Before fitting the support strut, remove any load on the forks, and empty buckets or work tools.

1. Install the boom lock before installing the crowd cylinder strut.
2. Crowd the backhoe bucket sufficiently to be able to insert the strut (WP 0004).
3. Ensure the parking brake is engaged and the transmission is in Neutral (WP 0004).
4. Stop the engine (WP 0005).
5. Remove the excavator bucket cylinder travel strut (Figure 5, Item 6) from its stowage position on the spare wheel carrier.
6. Place the strut (Figure 5, Item 6) around the cylinder piston rod as shown. Fix it in place with clamp and latch (Figure 5, Item 7).
7. Thread cable thru loop (Figure 6, Item 8) and connect cable to connector (Figure 6, Item 9).

CAUTION

Dump the bucket carefully, to prevent possible damage to the strut. Stop as soon as the weight of the bucket is on the strut. Failure to follow this caution may result in damage to equipment.

NOTE

Screw caps together.

8. To prevent any chance of the strut (Figure 5, Item 6) becoming loose or creeping down, the bucket should be dumped to trap the strut in position (WP 0004).

BACKHOE BUCKET CROWD CYLINDER STRUT INSTALLATION – CONTINUED

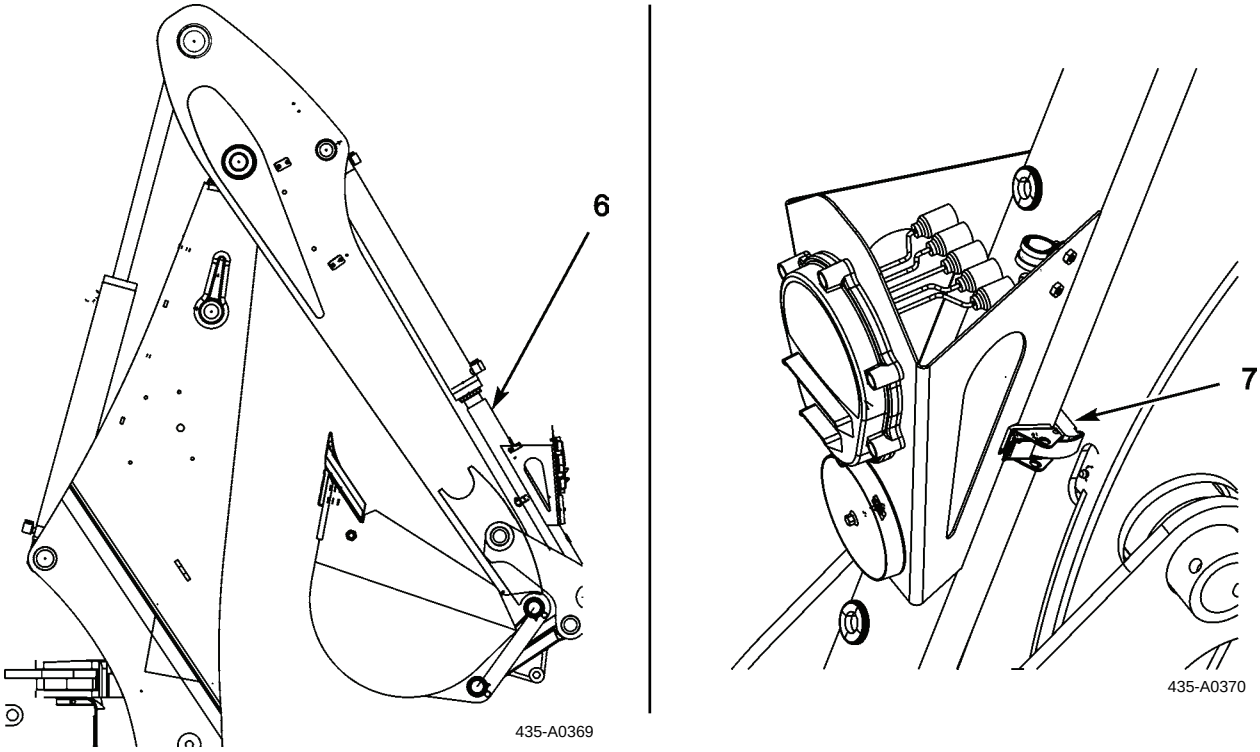


Figure 5. Backhoe Bucket Crowd Cylinder Strut Location

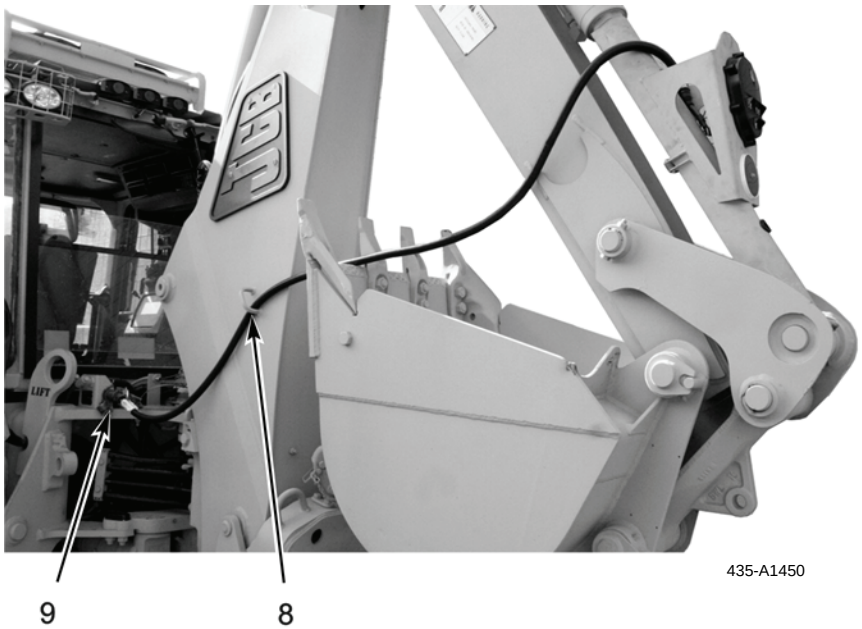


Figure 6. Cable

END OF TASK

BACKHOE BUCKET CROWD CYLINDER STRUT REMOVAL

1. Crowd the backhoe bucket sufficiently to take the weight off the strut (WP 0004).
2. Ensure the parking brake is engaged and the transmission is in Neutral (WP 0004).
3. Stop the engine (WP 0005).
4. Disconnect cable from connector (Figure 6, Item 9) and remove cable from loop (Figure 6, Item 8).
5. Release latch and clamp (Figure 5, Item 7), then remove the strut (Figure 5, Item 6).
6. Secure the strut (Figure 5, Item 6) in its stowage position on the spare wheel carrier.

END OF TASK

END OF WORK PACKAGE

MAINTENANCE INSTRUCTIONS

SPARE WHEEL CARRIER INSTALLATION

General, Spare Wheel Carrier Work Tool Installation, Spare Wheel Carrier Work Tool Removal

INITIAL SETUP

Personnel Required

Two

Equipment Conditions

Engine running (WP 0005)

References

WP 0004

GENERAL

WARNING

- For highway travel when the spare wheel carrier is to be carried, it must be carried using the front bucket and NOT the forklift work tool. Failure to follow this warning may result in injury or death to personnel or other road users.
- Before loading the spare wheel carrier on the machine, ensure the spare wheel is securely strapped to the carrier frame. Failure to follow this warning may result in injury or death to personnel.

1. The spare wheel carrier frame is designed to be carried in the front bucket. It is not intended to be carried using the forklift work tool.
2. Ensure the spare wheel (Figure 1, Item 1) is securely fastened to the carrier frame (Figure 1, Item 2) using the restraint mechanism (Figure 1, Item 3).

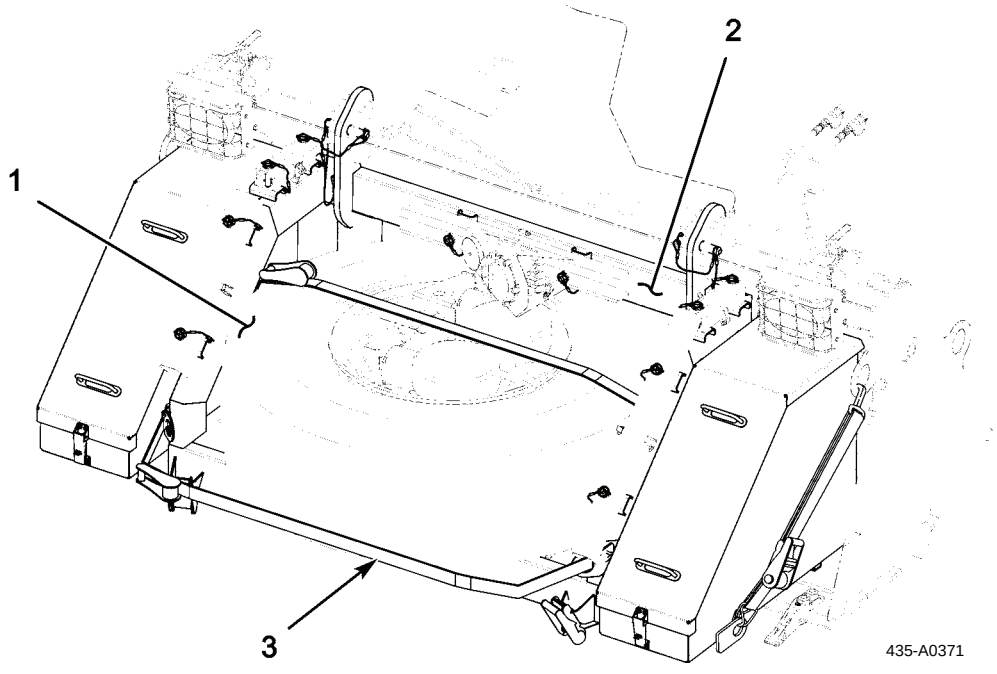


Figure 1. Spare Wheel Carrier

END OF TASK

SPARE WHEEL CARRIER WORK TOOL INSTALLATION

1. Drive the machine slowly forward (WP 0005) with the bucket rolled forward sufficiently to allow the hooks (Figure 2, Item 4) on the spare wheel carrier to engage with the pivots (Figure 2, Item 5) on the bucket.
2. Once the hooks (Figure 2, Item 4) have engaged, crowd the bucket (WP 0004) until the lock pin holes (Figure 2, Item 6) in the spare wheel carrier align with the holes (Figure 2, Item 7) in the bucket bracket.
3. Engage parking brake and place machine in Neutral (N) (WP 0005).
4. Lower bucket to ground.
5. Install the lock pins (Figure 2, Item 8) in the holes in the bucket brackets and secure with the linch pins (Figure 2, Item 9).
6. Secure the bottom of the spare wheel carrier to the bottom of the bucket using the restraints (Figure 2, Item 10).

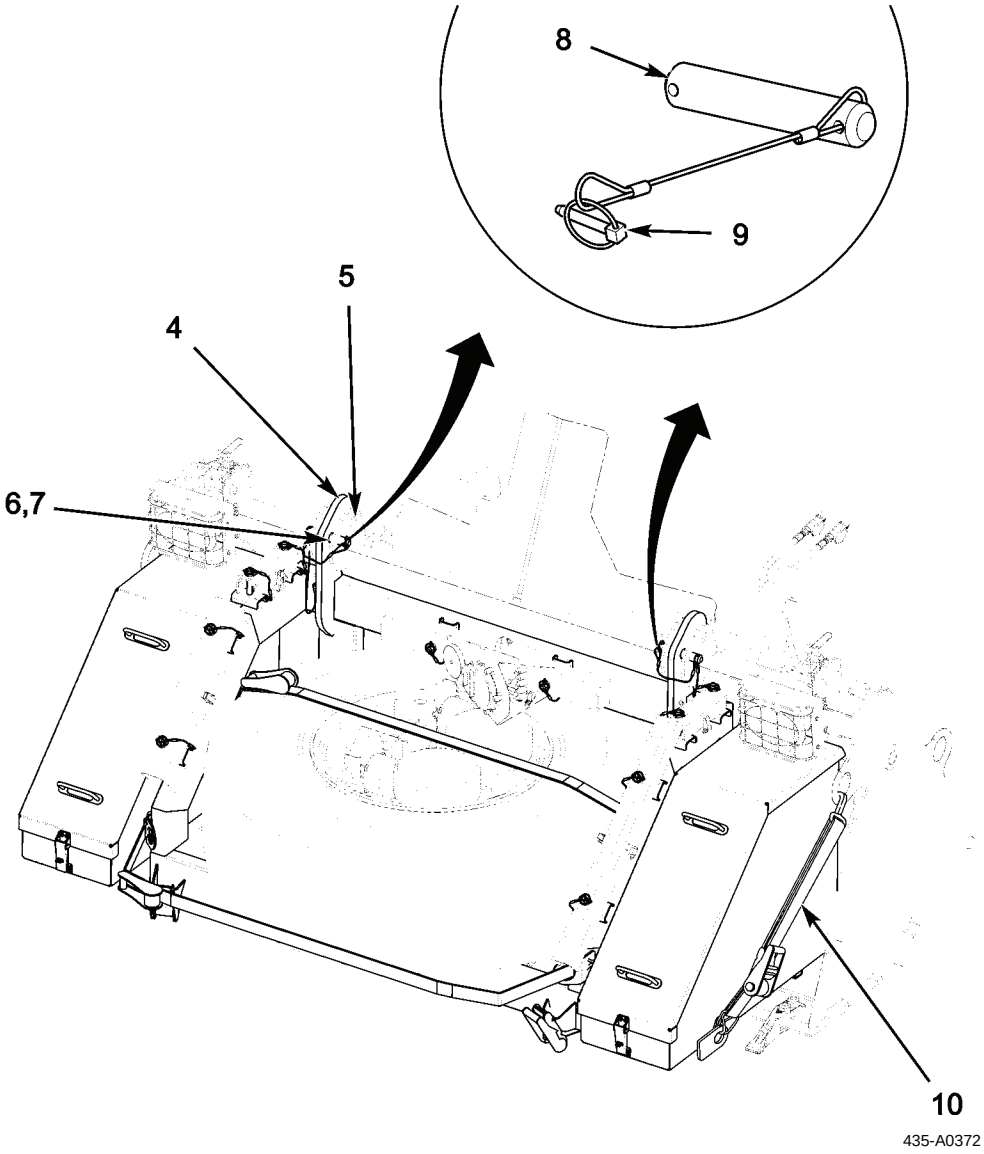


Figure 2. Spare Wheel Carrier

END OF TASK

SPARE WHEEL CARRIER WORK TOOL REMOVAL

1. Lower the bucket to the ground (WP 0004).
2. Release the restraints (Figure 2, Item 10) between the bottom of the spare wheel carrier and the bucket.
3. Release the linch pins (Figure 2, Item 9) from the lock pins (Figure 2, Item 8).
4. Raise bucket and dump bucket fully (WP 0006).
5. Slowly lower bucket to the ground until the front edge of the spare wheel carrier contacts the ground.
6. Slowly reverse the machine (WP 0004) and slowly lower the bucket at the same time until the bucket is clear of the spare wheel carrier frame.
7. Crowd the bucket and lower the bucket to the ground (WP 0004).

END OF TASK

END OF WORK PACKAGE

CHAPTER 6

TRANSPORT PROCEDURES

TRANSPORT PROCEDURES

PREPARATION FOR TRANSPORT INTRODUCTION

INTRODUCTION

1. This chapter describes how to prepare the HMEE-I for the following modes of transport:
   a. Roading machine (self-deployment)
   b. Rail transport - Continental United States (CONUS), Outside Continental United States (OCONUS), Association of American Railroads (AAR), and Gabarit International de Chargement (GIC)
   c. Marine transport - break-bulk vessel, Roll-on/Roll-off (RO/RO), Lighter Aboard Ship (LASH), Sea Barge (SEA-BEE), and LARC-L
   d. C-130 air transport
   e. Towing transport
   f. Highway truck-trailer transport
2. Depending on mode of transportation selected, assistance from Unit Maintenance may be required.
3. This chapter also provides tiedown and lifting provisions (Figure 1).

END OF TASK

LIFT AND TIEDOWN PROVISIONS

NOTE

The following illustration shows the location of lift points and tiedowns on the machine.

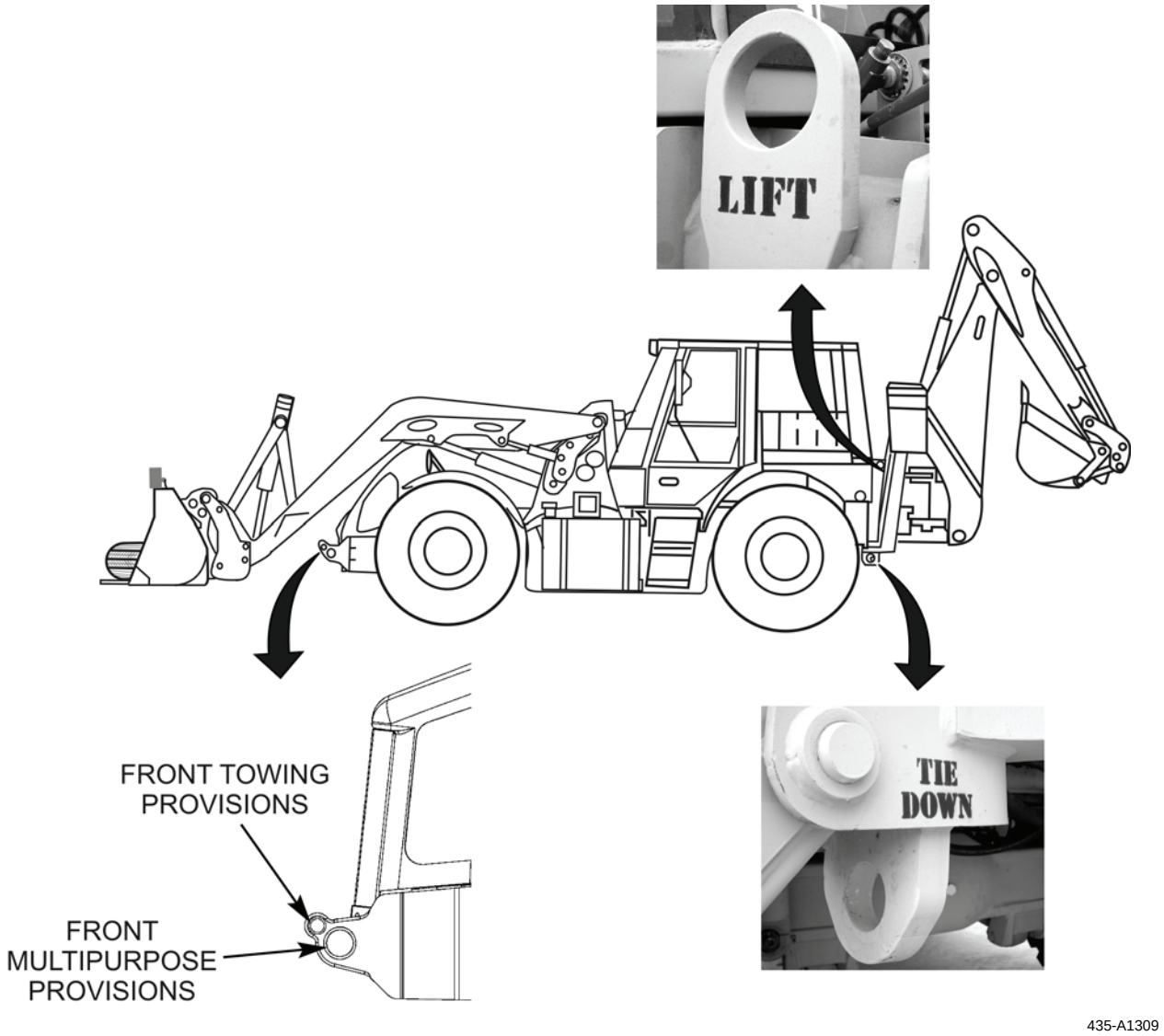


Figure 1. Lift and Tiedown Provisions

END OF TASK

END OF WORK PACKAGE

TRANSPORT PROCEDURES

ROADING MACHINE (SELF-DEPLOYMENT)

INTRODUCTION

This work package describes how to prepare the HMEE-I for self-deployment road transportation. Once configured as detailed below, the HMEE-I is capable of negotiating a crest angle of 25 degrees, achieve highway convoy speeds (max. 54 mph [87 kph]) and is capable of hard bottom fording to a depth of 40 in. (1.02 m) (including wake).

CONFIGURE FOR SELF-DEPLOYMENT

1. Check with proper authorities to obtain any necessary permits or licenses.
2. Perform Before operation Preventive Maintenance Checks and Services (PMCS) (WP 0016 and WP 0017).
3. Ensure tires are inflated to correct pressure:

Normal Operation

a. Front: 102 psi (703 kPa) b. Rear: 102 psi (703 kPa)

4. Load the spare wheel carrier into the front bucket and secure as detailed in WP 0022.
5. Raise the front loader arms and install two front bucket loader arm cylinder travel struts as detailed in WP 0021.
6. Angle the front bucket and install the front bucket crowd cylinder travel strut as detailed in WP 0021.
7. Remove the headlamps from their off road position on the cab A-posts and fit to the front bucket brackets (ensure the combined headlamp/blackout lamp assembly is fitted to the correct side of the machine) and connect up the wiring harnesses (WP 0004).
8. Position the backhoe in the travel position. Engage the boom lock and swing lock (WP 0005).

CONFIGURE FOR SELF-DEPLOYMENT – CONTINUED

9. Ensure the rear stabilizers (WP 0004) are fully raised.
10. Install the backhoe bucket crowd cylinder travel strut as detailed in WP 0021, and connect up the integral protrusion light harness.
11. Select the correct suspension, steering and drive modes for road travel:
    a. Select 2-wheel steer mode (WP 0004).
    b. Select 2-wheel drive mode (WP 0004).
    c. Select travel suspension mode (WP 0004).
12. Check the operation of all lights and mirrors before driving on the highway as detailed in PMCS (WP 0017).
13. Refer to *Driving Procedures* and familiarize yourself with them before driving the machine (WP 0005).
14. Watch gauges and alert indicators for any evidence of malfunction or overheating (WP 0004).
15. During stops, inspect machine for evidence of fluid leaks. Check fluid levels and maintain at optimum levels (WP 0017).

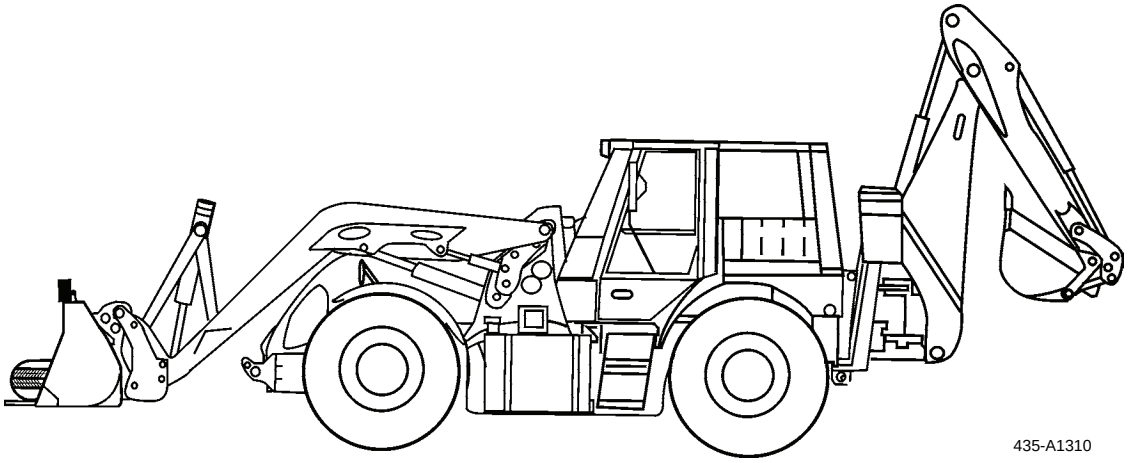


Figure 1. Self-Deployment Configuration

END OF TASK

END OF WORK PACKAGE

TRANSPORT PROCEDURES

HIGHWAY TRANSPORT

INTRODUCTION

1. This work package describes how to prepare the machine for highway transport, how to load and unload machine from trailer, and how to return machine to operational configuration after highway transport.
2. Machine must be configured to meet highway transport height requirements.
3. Before transporting machine, check with proper authorities to obtain any necessary permits.
4. Ensure cooling system of machine has proper antifreeze protection if being transported to a colder climate (WP 0017).

WARNING

- Hearing protection is required if within 20 ft (6 m) of an operating machine. Failure to follow this warning could result in hearing loss.
- Components removed and installed during this procedure are very heavy. Use assistance, caution, and follow safe work practices when handling them. Lifting equipment available at the staging area must be used. Stand clear of frame articulation area when machine is operating. There is no clearance for personnel in this area when machine turns. Crushing could occur, resulting in injury or death to personnel.

5. Throughout procedure, be aware of potential hazards from attachment operating zones. Stand clear of attachment operating zones when machine is maneuvering.
6. Ground guide assistance is mandatory when driving machine on or off trailer.

END OF TASK

CONFIGURE MACHINE FOR HIGHWAY TRANSPORT

1. Load the spare wheel carrier assembly into the front bucket and secure as detailed in WP 0022.

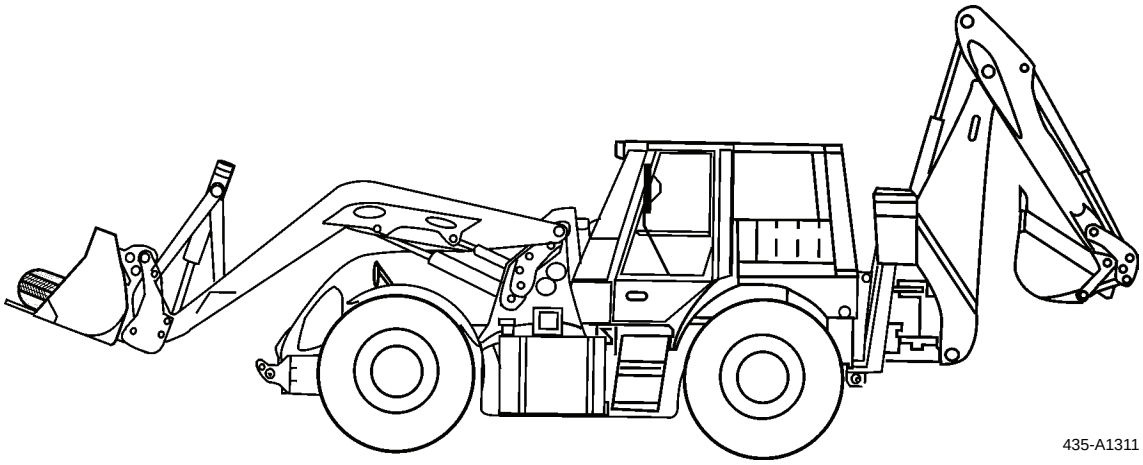


Figure 1. Load Spare Wheel Carrier

END OF TASK

LOADING MACHINE ON TRAILER

NOTE

Ensure wheels of trailer are chocked.

1. Start engine and allow to warm up (WP 0005).
2. Lower the suspension to the Transportation/Limp-home mode as detailed in WP 0004.

NOTE

If the crest angle to be negotiated when loading the HMEE-I onto the trailer is greater that 19 degrees, then it will be necessary to raise the loader arms as the machine is being loaded to obtain the necessary clearance.

3. Raise the front loader arms to the self-deployment position, but do not install the support struts.
4. Angle the front bucket to the self-deployment position, but do not fit the support.
5. Position the backhoe in the travel position. Engage the boom lock and swing lock (WP 0005).
6. Ensure the rear stabilizers (WP 0004) are fully raised.

LOADING MACHINE ON TRAILER – CONTINUED

WARNING

- Always use a ground guide when operating machine up ramp to load on trailer. Failure to use a ground guide may cause injury or death to personnel or damage to equipment.
- Drive with extreme caution, at low idle, and in 1st gear forward only. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

7. Using ground guide assistance and in 1st gear only, drive machine onto trailer bed slowly.
8. If necessary, and as directed by the ground guide, raise loader arm as required so that loader arm and work tool will clear crest of trailer ramp (WP 0004).
9. If necessary, and as directed by the ground guide, raise the dipper as required so that the dipper and work tool will clear the ground as the machine climbs the loading ramp.
10. The machine can be positioned in either of two modes depending on prevailing height restrictions. See Figures 2 and 3 for available modes.

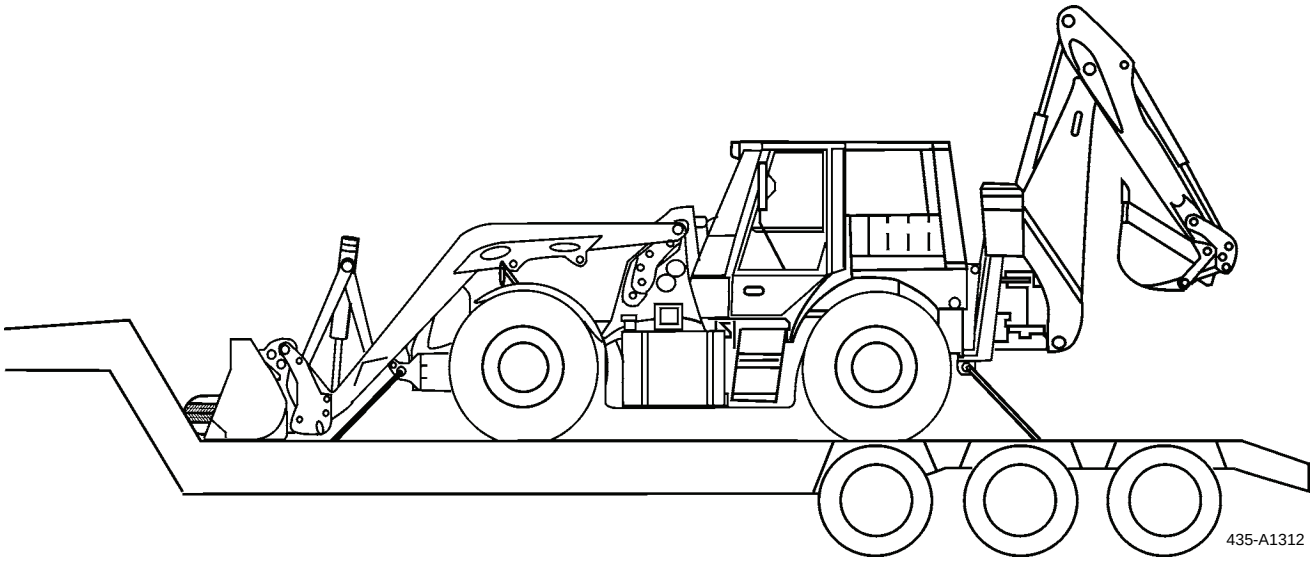


Figure 2. Backhoe in Normal Travel Configuration

11. Once machine is correctly positioned on trailer bed, lower loader arm (WP 0004). Secure as required.
12. If the configuration for reduced travel height is required, lower the backhoe (WP 0004) so that the work tool is resting on blocking.
13. Place transmission in N (Neutral) and engage parking brake (WP 0004).
14. Shut down engine (WP 0005).
15. Move hydraulic control levers through all positions to relieve hydraulic system pressure in lines. Return levers to neutral position (WP 0005).
16. Turn battery disconnect switch to OFF position (WP 0004).

LOADING MACHINE ON TRAILER – CONTINUED

CAUTION

- Machines transported without proper safeguards may incur wind damage. Ensure all doors and compartments are securely latched and secured against flying open. Failure to do so may cause equipment damage in transit.
- Exhaust opening must be taped closed to prevent wind from entering exhaust system and causing turbocharger to spin, without the benefit of lubrication. Failure to cover exhaust opening may damage turbocharger.

17. Use duct tape (Item 20, WP 0033) to cover exhaust opening.
18. Secure machine against vandalism.
19. Fold in the external rear view mirrors against the cab.
20. Provide assistance, as required, to secure machine on trailer bed with blocking and tie downs in accordance with shipping data plate on machine (WP 0007) and illustrations in WP 0023.

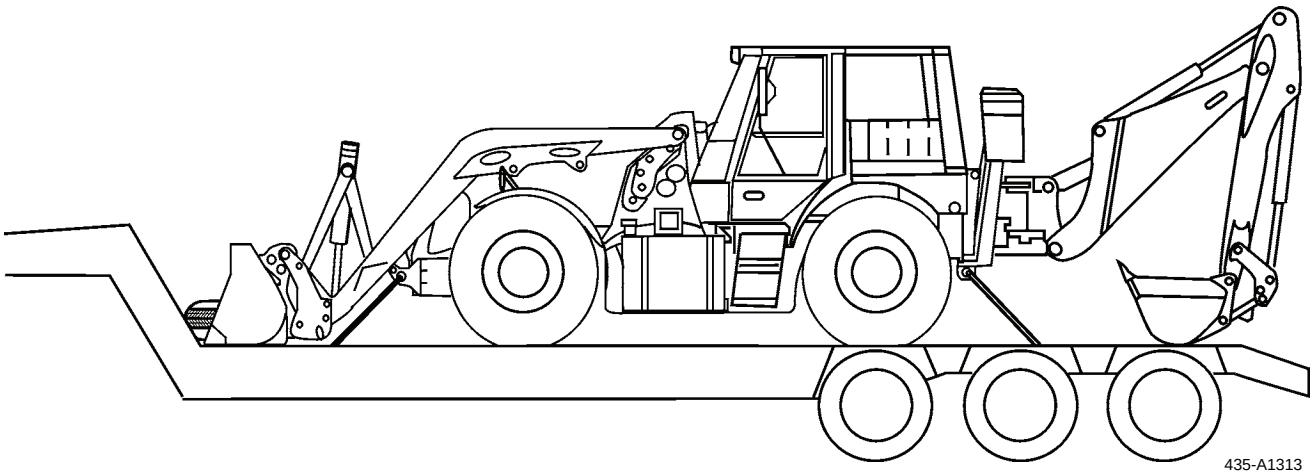


Figure 3. Backhoe in Reduced Travel Height Configuration

END OF TASK

UNLOADING MACHINE FROM TRAILER

NOTE

Ensure wheels of trailer are chocked.

1. Provide assistance, as required, to remove blocking and tiedowns from machine.
2. Remove vandalism protection devices.
3. Remove tape from exhaust opening.
4. Turn battery disconnect switch to ON position (WP 0004).
5. Start engine and allow to warm up (WP 0005).
6. Raise loader arm as required so that loader arm and work tool will clear crest of trailer ramp (WP 0004). Remove blocking from under work tool.

WARNING

- Always use a ground guide when operating machine down ramp to unload from trailer. Failure to use a ground guide may cause injury or death to personnel or damage to equipment.
- Drive with extreme caution, at low idle, and in 1st gear reverse only. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

7. If the backhoe was configured for Reduced Travel Height (Figure 3), raise backhoe as required so that the dipper will clear the ground when unloading (WP 0004). Remove blocking from under work tool.
8. Using ground guide assistance and in 1st gear only, slowly reverse straight off trailer until clear of ramp.
9. If removed, install backhoe boom lock and ensure swing lock is correctly installed (WP 0021).
10. Park machine in staging area clear of trailer (WP 0005).
11. Inspect machine to ensure it is operational. Perform PMCS (WP 0016 and WP 0017).

END OF TASK

END OF WORK PACKAGE

TRANSPORT PROCEDURES

RAIL TRANSPORT

INTRODUCTION

1. This work package describes how to load and unload the machine on a flatcar for rail transport within the Continental United States (CONUS), Canada, and Mexico. The machine is most often loaded/unloaded on a rail flatcar using drive-on/drive-off procedures at the railhead.
2. CONUS rail transport is governed by Association of American Railroads (AAR) regulations. CONUS rail transport requires no disassembly.
3. Outside Continental United States (OCONUS) rail transport is governed by Gabarit International de Chargement (GIC) regulations. OCONUS rail transport requires no disassembly.
4. Before transporting machine, check with proper authorities to obtain any necessary permits.
5. Ensure cooling system of machine has proper antifreeze protection if being transported to a colder climate (WP 0017).
6. Safest rail transport is with fuel tank as close to empty as possible. Rail transport with fuel tank more than three-quarters full is prohibited.
7. The spare-wheel and carrier are loaded and secured in the front bucket.

WARNING

Stand clear of loader/backhoe attachment area when machine is operating. There is no clearance for personnel in this area when machine turns. Crushing could occur, resulting in injury or death to personnel.

8. Throughout procedure, be aware of potential hazards from loader/backhoe attachment areas. Stand clear of attachments area when machine is operating.
9. Ground guide assistance is mandatory when driving machine on or off flatcar.

END OF TASK

LOADING MACHINE ON FLATCAR

NOTE

Ensure wheels of flatcar are chocked.

1. Start loader engine and allow to warm up (WP 0005).
2. Lower the suspension to the Transportation/Limp-home mode as detailed in WP 0004.

NOTE

If the crest angle to be negotiated when loading the HMEE-I onto the railcar is greater that 19 degrees, then it will be necessary to raise the loader arms as the machine is being loaded to obtain the necessary clearance.

3. Raise loader arm to the self-deployment position but do not install the cylinder supports (WP 0004).
4. Release the boom lock (WP 0004) but leave the swing lock (WP 0004) in place.
5. Ensure the rear stabilizers (WP 0004) are fully raised.
6. Configure the backhoe as shown in Figure 1.

WARNING

- Always use a ground guide when loading machine on flatcar. Failure to use a ground guide may cause injury or death to personnel or damage to equipment.
- Drive with extreme caution, at low idle, and in 1st gear forward only. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

7. If width restrictions dictate, fold in the external rear view mirrors against the cab.
8. Following instructions from flatcar load master and ground guides, slowly drive straight on flatcars.
   a. Use 1st gear only.
   b. If necessary, and as directed by the ground guide, raise loader arm as required so that loader arm and work tool will clear crest of railcar ramp (WP 0004).
   c. When passing over spanners between flatcars, maintain a constant speed. Do not jam on brakes or reverse direction.
9. Once machine is correctly positioned on flatcar bed, lower loader arm (WP 0004). Rest work tool on blocking.

WARNING

Stand clear of loader/backhoe attachment area when machine is operating. There is no clearance for personnel in this area when machine turns. Crushing could occur, resulting in injury or death to personnel.

10. Lower the backhoe (WP 0004). Rest work tool on blocking.
11. Place transmission in N (Neutral) and engage parking brake (WP 0004).
12. Shut down engine (WP 0005).
13. Move hydraulic control levers through all positions to relieve hydraulic system pressure in lines. Return levers to neutral position (WP 0005).

LOADING MACHINE ON FLATCAR – CONTINUED

14. Turn battery disconnect switch to OFF position (WP 0004).

WARNING

Allow exhaust pipe to cool before lowering. Failure to do so may result in serious burns to personnel.

CAUTION

- Machines transported without proper safeguards may incur wind damage. Ensure all doors and compartments are securely latched and secured against flying open. Failure to do so may cause equipment damage in transit.
- Exhaust opening must be taped closed to prevent wind from entering exhaust system and causing turbocharger to spin, without the benefit of lubrication. Failure to cover exhaust opening may damage turbocharger.

15. Use duct tape (Item 20, WP 0033) to cover exhaust pipe.
16. Secure machine against vandalism.
17. Provide assistance, as required, to secure machine on flatcar bed with blocking and tiedowns in accordance with shipping data plate on machine (WP 0007) and illustration in WP 0023.

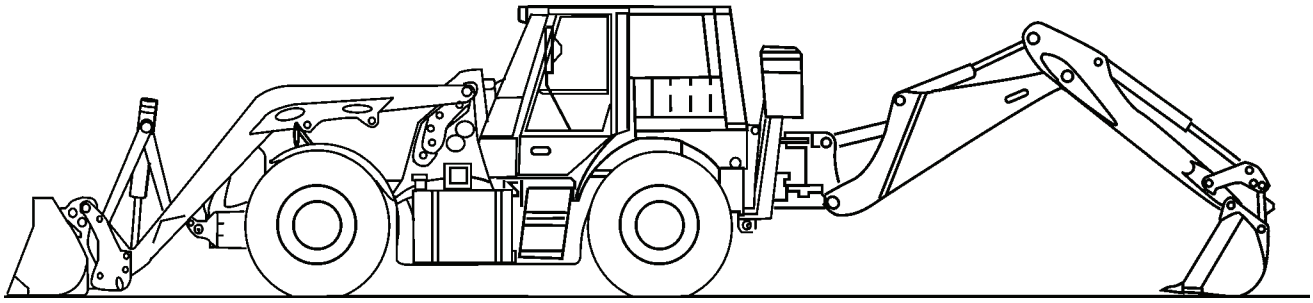


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Figure 1. Railcar Configuration

END OF TASK

UNLOADING MACHINE FROM FLATCAR

NOTE

Ensure wheels of flatcar are chocked.

1. Provide assistance, as required, to remove blocking and tiedowns from machine.
2. Remove vandalism protection devices.
3. Remove tape from exhaust pipe.
4. Turn battery disconnect switch to ON position (WP 0004).

WARNING

Stand clear of loader/backhoe attachment area when machine is operating. There is no clearance for personnel in this area when machine turns. Crushing could occur, resulting in injury or death to personnel.

5. Start engine and allow to warm up (WP 0005).
6. Raise loader arm (WP 0004). Remove blocking from under work tool.
7. Raise backhoe (WP 0004). Remove blocking from under work tool.

WARNING

- Always use a ground guide when loading machine on flatcar. Failure to use a ground guide may cause injury or death to personnel or damage to equipment.
- Drive with extreme caution, at low idle, and in 1st gear only. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

8. Following instructions from flatcar load master and ground guides, slowly drive straight off flatcars until clear of railhead.
   a. Use 1st gear only.
   b. When passing over spanners between flatcars, maintain a constant speed. Do not jam on brakes or reverse direction.
9. Park machine (WP 0005).
10. If removed, refit the boom lock (WP 0005).
11. Inspect machine to ensure it is operational. Perform PMCS (WP 0016 and WP 0017).

END OF TASK

END OF WORK PACKAGE

TRANSPORT PROCEDURES

MARINE TRANSPORT (RO/RO PROCEDURES)

INTRODUCTION

1. The HMEE-I may be transported on the following types of marine vessels:
   a. RO/RO
   b. Break bulk (general cargo)
   c. Barge carrying (LASH and SEABEE)
2. This work package describes how to load and unload machine onto vessels using RO/RO procedures.
3. At all times, the machine's movements are under the overall control of the RO/RO vehicle director. Loading and unloading is accomplished by following the vehicle director's traffic control pattern.
4. Machines are loaded by moving them from dockside to the appropriate level and hold on board ship. Once parked, crews secure machines for shipping by lashing, shoring, blocking or bracing, as appropriate. Unloading is accomplished by moving machines from on board ship to dockside.
5. In order to accomplish RO/RO, the machine must operate up and down ramps. The grade of the ramps will vary, depending on the tide and the weight of the ship at the time of loading or unloading. Ground guide assistance is mandatory when operating on ramps.
6. In order to ensure the safety of all personnel involved, the machine's operator must be familiar with all RO/RO regulations and procedures.
7. The spare wheel and carrier are loaded into the front bucket.

END OF TASK

RO/RO REGULATIONS

WARNING

Safe RO/RO operation depends on strict adherence to RO/RO regulations. Failure to do so may result in injury or death to personnel or damage to equipment.

1. Only qualified and screened operators are permitted to drive machine in RO/RO operations.

WARNING

All personnel working in machine operating areas during RO/RO operations must wear hearing protection. Failure to wear hearing protection may result in hearing loss to personnel.

2. All personnel working in machine operating areas must wear hearing protection.

CAUTION

- Machines transported without proper safeguards may incur wind damage. Ensure all doors and compartments are securely latched and secured against flying open. Failure to do so may cause equipment damage in transit.
- Exhaust opening must be taped closed to prevent wind from entering exhaust system and causing turbocharger to spin, without the benefit of lubrication. Failure to cover exhaust opening may damage turbocharger.

3. Do not move machine about vessel without ground guide assistance.
4. Do not start machine until directed to do so. Before moving out, test brakes.
5. Operate machine with lights on (WP 0004)
6. Only one machine may transit a ramp at any time.
7. Do not leave machine engine running unattended.
8. Fuel tank on machine must be filled in accordance with SDDC port call message.
9. Ground guide assistance is mandatory when driving machine on or off ship.

WARNING

Stand clear of loader/backhoe attachment area when machine is operating. There is no clearance for personnel in this area when machine turns. Crushing could occur, resulting in injury or death to personnel.

END OF TASK

LOADING MACHINE ON SHIP

1. Start loader engine and allow to warm up (WP 0005).
2. Lower the suspension to the Transportation/Limp-home mode as detailed in WP 0004.

NOTE

If the crest angle to be negotiated when loading the HMEE-I onto the ramp is greater that 19 degrees, then it will be necessary to raise the loader arms as the machine is being loaded to obtain the necessary clearance.

3. Raise the front loader arms to the self-deployment position, but do not install the support strut (WP 0004).
4. Angle the front bucket to the self-deployment position, but do not fit the support (WP 0004).
5. Position the backhoe in the travel position. Engage the boom lock and swing lock (WP 0004).
6. Ensure the rear stabilizers (WP 0004) are fully raised.

WARNING

- Always use a ground guide when operating machine up or down ramps. Failure to use a ground guide may cause injury or death to personnel or damage to equipment.
- Drive with extreme caution, at low idle, and in 1st gear ONLY. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

7. With ground guide assistance, negotiate ramps in 1st gear ONLY.
8. After loading, park machine where directed to do so.
9. Lower loader arm (WP 0004). Rest on shoring.
10. Lower backhoe (WP 0004). Rest on shoring.
11. Place transmission in N (Neutral) and engage parking brake (WP 0004).
12. Shut down engine (WP 0005).
13. Move hydraulic control levers through all positions to relieve hydraulic system pressure in lines. Return levers to neutral position (WP 0005).
14. Turn battery disconnect switch to OFF position (WP 0004).

LOADING MACHINE ON SHIP – CONTINUED

WARNING

Allow exhaust pipe to cool before lowering. Failure to do so may result in serious burns to personnel.

CAUTION

- Machines transported without proper safeguards may incur wind damage. Ensure all doors and compartments are securely latched and secured against flying open. Failure to do so may cause equipment damage in transit.
- Exhaust opening must be taped closed to prevent wind from entering exhaust system and causing turbocharger to spin, without the benefit of lubrication. Failure to cover exhaust opening may damage turbocharger.

15. If the machine is to be exposed to external air flows, use duct tape (Item 20, WP 0033) to cover exhaust pipe.
16. Secure machine against vandalism.
17. Provide assistance, as required, to ship's crew in blocking/shoring/lashing machine for transport.

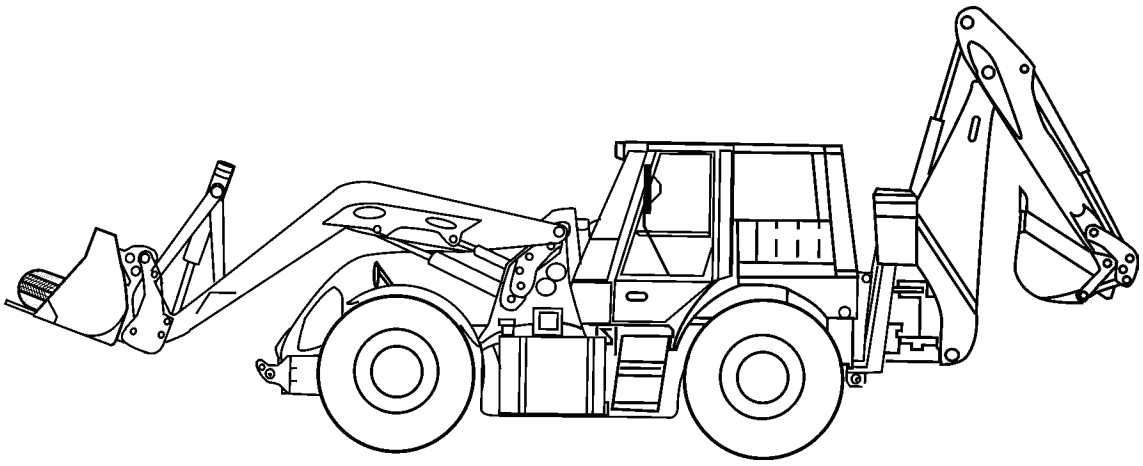

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Figure 2. RO/RO Configuration (No Height Restriction)

END OF TASK

UNLOADING MACHINE FROM SHIP

1. Provide assistance, as required, to ship's crew in removing blocking/shoring/lashing from machine.
2. Remove vandalism protection devices.
3. Remove tape from exhaust pipe.

UNLOADING MACHINE FROM SHIP – CONTINUED

4. Turn battery disconnect switch to ON position (WP 0004).

WARNING

Stand clear of loader/backhoe attachment area when machine is operating. There is no clearance for personnel in this area when machine turns. Crushing could occur, resulting in injury or death to personnel.

5. Start engine and allow to warm up (WP 0005).
6. Raise loader arm as required so that loader arm and work tool will clear crest of ship ramps (WP 0004). Remove shoring from under work tool.
7. Raise backhoe as required so that the dipper and work tool will clear crest of ship ramps (WP 0004). Remove shoring from under work tool.

WARNING

- Always use a ground guide when operating machine up or down ramps. Failure to use a ground guide may cause injury or death to personnel or damage to equipment.
- Drive with extreme caution, at low idle, and in 1st gear only. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

8. With ground guide assistance, negotiate ramps in 1st gear only.
9. Park machine clear of ship loading/unloading zone (WP 0005).
10. If removed, refit backhoe boom lock (WP 0005).
11. Inspect machine to ensure it is operational. Perform PMCS (WP 0016 and WP 0017).

END OF TASK

END OF WORK PACKAGE

TRANSPORT PROCEDURES

AIR TRANSPORT BY C-130

Introduction, Configure Machine for Air Transport, Load Machine, Unload Machine, Return Machine to Operational Configuration

INTRODUCTION

1. This work package describes how to load and unload machine into aircraft.

NOTE

Authorized personnel ONLY will configure the machine.

2. Machine must be configured to meet air transport weight and height requirements. Machine components that exceed these requirements must be relocated or removed prior to loading.
3. Machine is loaded/unloaded using Reverse on/Drive off procedures (WP 0005).
4. The amount of fuel left in machine's fuel tank must comply with guidance from SDDC: a maximum of 25% fuel tank capacity is allowed.
5. Ground guide assistance is mandatory when loading/unloading machine into C-130 aircraft.
6. Throughout procedure, be aware of potential hazards from loader/backhoe attachment areas. Stand clear of attachments area when machine is operating.

END OF TASK

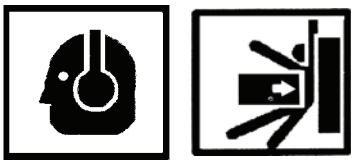
CONFIGURE MACHINE FOR AIR TRANSPORT

NOTE

Authorized personnel ONLY will configure the machine.

END OF TASK

LOAD MACHINE



WARNING

- Due to the need to conform to the weight loading characteristics of the C-130 airframe, it is most important that the machine is reversed into the airframe envelope. Failure to follow this warning may result in injury or death to personnel and damage to equipment
- All personnel working in machine operating areas during C-130 loading operations must wear hearing protection. Failure to wear hearing protection may result in hearing loss.
- Stand clear of loader/backhoe attachment area when machine is operating. There is no clearance for personnel in this area when machine turns. Crushing could occur, resulting in injury or death to personnel.
- Always use a ground guide when operating machine up or down ramps. Failure to use a ground guide may cause injury or death to personnel or damage to equipment.
- Drive with extreme caution, at low idle, and in 1st reverse gear only. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

1. Start loader engine and allow to warm up (WP 0005).
2. Lower the suspension to the Transportation/Limp-home mode as detailed in WP 0004.
3. Raise loader arm to the self-deployment position but do not install the cylinder supports (WP 0004).
4. With assistance of the ground crew, set excavator end to the correct dipper position 130 in. (330 cm) between dipper pivot and kingpost pivot (Figure 3). From this point on, lift excavator end only by the boom cylinder to preserve the correct dipper position.
5. Using ground guide assistance and in 1st gear reverse only, slowly reverse the machine towards the loading ramp of the aircraft with the backhoe extended out behind the machine.
6. Once the backhoe dipper trolley is inside the airframe, and before the rear wheels of the machine contact the entrance ramp, extend the boom rearwards and lower so that the dipper trolley wheels just make contact with the deck.
7. Stop the machine. Apply the parking brake (WP 0004). Put transmission in N (Neutral). Operate the boom float valve so that the boom assembly can “float” (the dipper trolley supporting the weight of the backhoe).
8. Release the parking brake (WP 0004). Following the load master’s instructions, very slowly reverse the machine into the aircraft, ensuring the load quick- hitch maintains sufficient height to clear the ground as the machine climbs the entrance ramp.
9. Position machine inside aircraft as directed by ground guide. Lower loader arm (WP 0004). Insert loader arm travel struts (WP).
10. Place transmission in N (Neutral) and engage parking brake (WP 0004).
11. Shut down engine (WP 0005).
12. Do not operate the hydraulic control levers through all positions to relieve hydraulic system pressure in lines.
13. Turn battery disconnect switch to OFF position (WP 0004).

LOAD MACHINE – CONTINUED

14. Provide assistance, as required, to secure machine inside aircraft with blocking and tie downs, in accordance with shipping data plate on machine (WP 0007) and illustration in WP 0023.
15. Provide assistance, as required, to ensure shipping pallets loaded with removed components are stowed inside aircraft and secured.

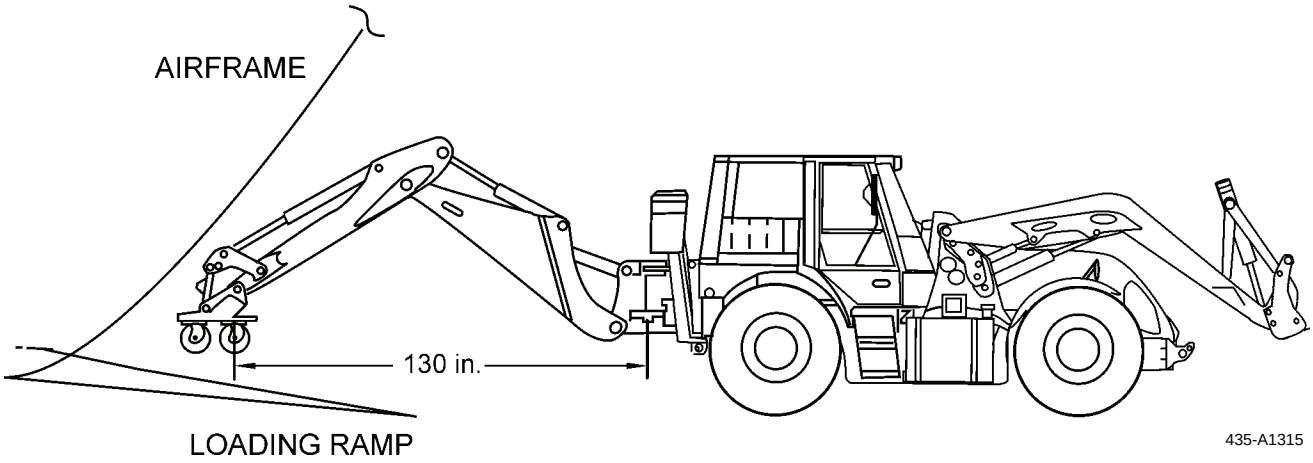


Figure 3. Loading Machine

END OF TASK

UNLOAD MACHINE

1. Provide assistance, as required, to ensure shipping pallets with stored components are removed from aircraft and placed in a staging area clear of aircraft.
2. Turn battery disconnect switch to ON position (WP 0004).
3. Start engine and allow to warm up (WP 0005).
4. Raise loader arm as required so that loader arm and work tool will clear crest of aircraft ramp (WP 0004). Remove blocking from under work tool.

WARNING

- Always use a ground guide when operating machine up or down ramps. Failure to use a ground guide may cause injury or death to personnel or damage to equipment.
- Drive with extreme caution, at low idle, and in 1st Forward gear only. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

5. Using ground guide assistance and in 1st gear forward only, slowly drive straight off aircraft until the rear wheels are clear of the loading ramp, but with the backhoe's weight still supported on the dipper trolley inside the airframe.
6. Once the rear wheels are clear, operate the boom float valve to reactivate hydraulic power to the boom cylinder.
7. Raise backhoe as required so that dipper arm and trolley will clear crest of aircraft ramp (WP 0004).
8. Drive the machine slowly forward until clear of the aircraft.
9. Park machine in staging area clear of aircraft (WP 0005).

END OF TASK

RETURN MACHINE TO OPERATIONAL CONFIGURATION

NOTE

Authorized personnel ONLY will return machine to operational configuration.

Carry out all PMCS checks before using the machine. Inspect machine to ensure it is operational.

END OF TASK

END OF WORK PACKAGE

TRANSPORT PROCEDURES

RECOVERY (TOWING) REQUIREMENTS

INTRODUCTION

1. The HMEE-I is designed so it can be towed by a recovery vehicle in the event of a catastrophic system failure.
2. The HMEE-I can be towed forwards with the front bucket removed and the loader arms in the self-deployed position. The backhoe should also be configured and locked in the self-deployed position.
3. If the HMEE-I became immobilized with any other attachment fitted, then that attachment must be removed before the machine is towed.
4. The HMEE-I has provisions, both front and rear, to allow the brake air system to be recharged from the assisting machine/vehicle, and can be kept charged during towing operations to provide the stricken machine with a means of independent braking.
5. All hydraulic pressure should be vented from the systems before towing operations begin.
6. The HMEE-I is equipped with a battery-powered recovery hydraulic pump that can be used to power the hydraulic system in the event of a dead engine for the stowage of the backhoe, removal of attachment, and to set the loader in position so that a tow bar can be connected.
7. The recovery hydraulic system can also be used to provide short-term steering assistance to assist where tight maneuvering is called for during the recovery process. It is not intended to supply long-term steering assistance.

END OF TASK

PREPARATION FOR TOWING

1. Stow the backhoe and install the swing and boom locks (WP 0021):
   a. If the backhoe is engaged in digging operations, or an attachment was in use (and is still attached) at the time of the failure, and the engine cannot be started, operate the recovery hydraulics (WP 0004) to stow the backhoe and install the swing and boom locks.
2. Stow the stabilizer legs:
   a. If the stabilizers were deployed at the time of the failure, and the engine cannot be started, operate the recovery hydraulics (WP 0004) to stow the stabilizers.
   b. Ensure the stabilizers are in the raised position.
3. Remove the front bucket from the quick hitch (WP 0004).
4. Set the quick hitch in the self-deployed position and install the front bucket crowd cylinder strut (WP 0021).
5. Raise the loader arms (employing the recovery hydraulics if necessary) and install the maintenance support strut (WP 0021).
6. Lower the suspension to the Transportation/Limp-home mode (WP 0004).
7. Position the recovery vehicle:
   a. Attach the tow bar to the HMEE-I front towing provisions (smaller hole) (Figure 1).
   b. Attach the tow bar to the towing hitch on the recovery vehicle.
   c. If required, connect the recovery vehicle air system to the HMEE-I using the glad-hand connection beneath the engine cover on the right hand side of the machine. (A second auxiliary air connection point can be found on the left-hand rear of the machine, adjacent to the boom lock.)

CAUTION

With the propshafts connected, the HMEE-I must not be towed for a distance greater than 5 miles or at a speed in excess of 6 mph (9.7 kph). Failure to follow this caution may lead to serious damage to the transmission.

8. **Extended Recovery.** Recovery in excess of 5 miles (8 km), or where the recovery road speed will be in excess of 6 mph (9.7 kph):

WARNING

Never get underneath the HMEE-I unless it is parked on firm level ground. If necessary, recover the machine to a suitable area before getting underneath the machine. Failure to follow this warning may result in injury or death to personnel.

   a. Ensure the machine is parked on firm, level ground. If not, recover to a safe area, within 5 miles (8 km) at a speed below 6 mph (9.7 kph).
   b. Ensure the HMEE-I is securely attached to the recovery vehicle and that the recovery vehicle's parking brake is securely applied.
   c. Block the wheels of the HMEE-I.

PREPARATION FOR TOWING – CONTINUED

WARNING

With the propshafts removed from the transmission, the parking brake is disabled. It is vital therefore that the machine must be secured against unintentional movement. Failure to follow this warning may result in injury or death to personnel.

d. Notify Unit Maintenance to remove the propshaft completely.

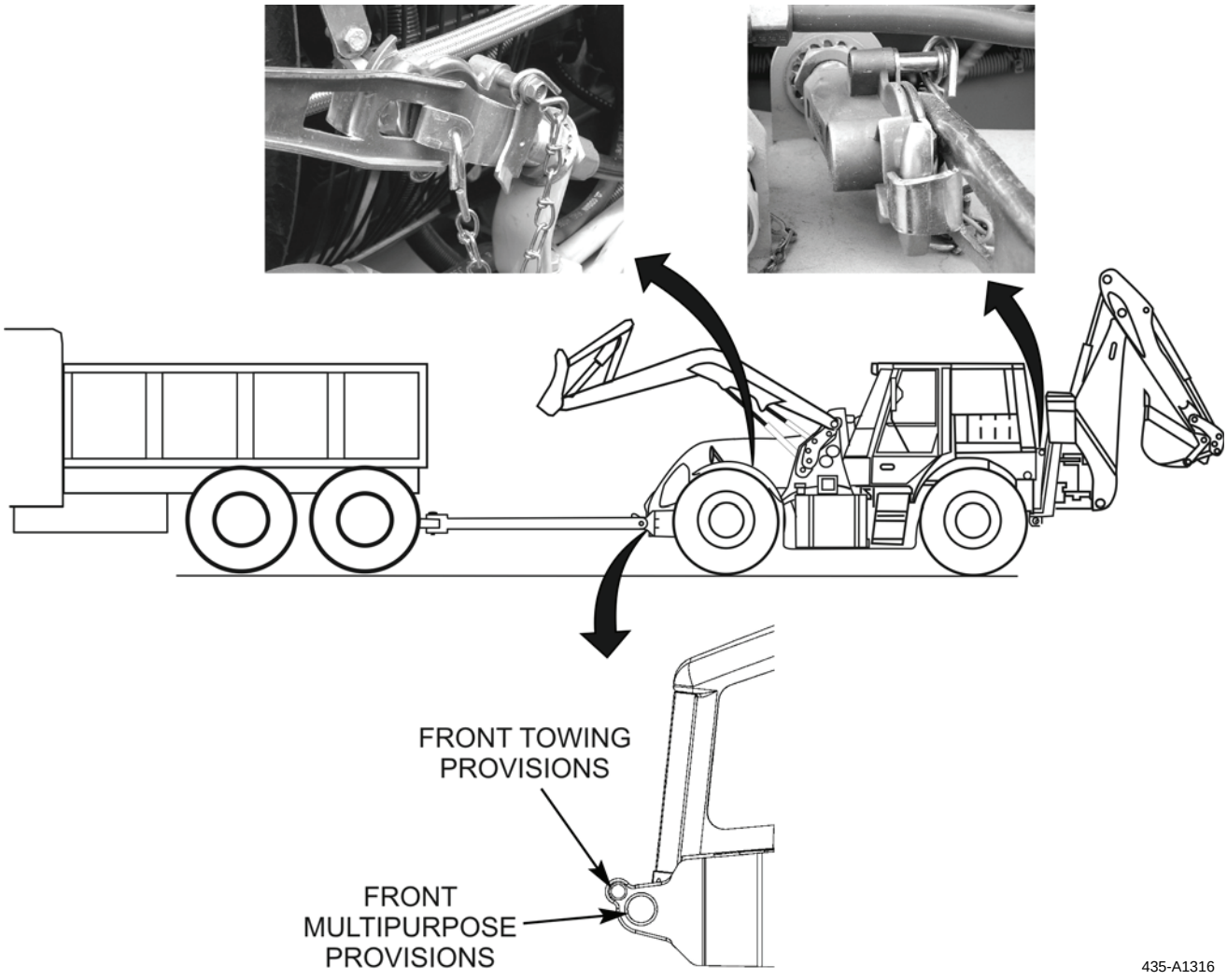


Figure 1. Towing

PREPARATION FOR TOWING – CONTINUED

9. **Limited Recovery.** When distance to HMEE-I to be recovered is less than 5 miles (8 km) and when the recovery road speed will be less than 6 mph (9.7 kph):
   a. Ensure the HMEE-I is securely attached to the recovery vehicle and that the recovery vehicle's parking brake is securely applied.
   b. Where the propshafts are not to be removed:
      (1) The parking brake, providing sufficient air and hydraulic pressures remain in the systems, may be released normally by the cab controls.
      (2) If the air system is depleted, it can be recharged from the recovery vehicle using either the front or rear air connection point gladhands (WP 0004).
      (3) If the hydraulic pressure is depleted, it can be charged enough to release the parking brake using the recovery hydraulic system (WP 0004).

NOTE

If the parking brake cannot be released, the propshafts must be removed.

   c. Where the propshafts are to be partially removed:

WARNING

Never get underneath the HMEE-I unless it is parked on firm level ground. If necessary recover the machine to a suitable area before getting underneath the machine. Failure to follow this warning may result in injury or death to personnel.

      (1) Ensure the machine is parked on firm, level ground. If not, recover to a safe area, within 5 miles (8 km) at a speed below 6 mph (9.7 kph)
      (2) Ensure the HMEE-I is securely attached to the recovery vehicle and that the recovery vehicle's parking brake is securely applied.
      (3) Block the wheels of the HMEE-I.

NOTE

Notify Unit Maintenance to do the following steps.

      (4) Disconnect the rear propshaft at its connection to the axle. Compress the propshaft to achieve its minimum length, then secure the released end to a non-moving part of the HMEE-I.
      (5) Disconnect the front propshaft at its connection to the axle. Compress the propshaft to achieve its minimum length, then secure the released end to a non-moving part of the HMEE-I.

END OF TASK

END OF WORK PACKAGE

CHAPTER 7

SUPPORTING INFORMATION

SUPPORTING INFORMATION

REFERENCES

SCOPE

This work package lists the publications referenced in this manual which apply to operation and operator maintenance of the HMEE-I.

END OF TASK

PUBLICATION INDEXES

The following indexes should be consulted frequently for latest changes or revisions and for new publications relating to material covered in this technical manual.

Consolidated Index of Army Publications and Blank Forms . . . . . DA PAM 25-30

The Army Maintenance Management System (TAMMS) Users Manual. . . . . DA PAM 750-8

END OF TASK

FORMS

NOTE

Refer to DA PAM 750-8, *TAMMS Users Manual,* for instructions on the use of maintenance forms.

Equipment Inspection and Maintenance Worksheet . . . . . DA Form 2404, DA Form 5988-E

Product Quality Deficiency Report . . . . . SF Form 368

Recommended Changes to Publications and Blank Forms. . . . . DA Form 2028

END OF TASK

FIELD MANUALS

Basic Cold Weather Manual . . . . . FM 31-70

Chemical and Biological Contamination Avoidance . . . . . FM 3-3

Desert Operations . . . . . FM 90-3

First Aid. . . . . FM 4-25.11

Manual for the Wheeled Vehicle Driver . . . . . FM 21-305

Mountain Operations. . . . . FM 9-6

NBC Decontamination . . . . . FM 3-5

Northern Operations . . . . . FM 31-71

Nuclear Contamination Avoidance . . . . . FM 3-3-1

Operation and Maintenance of Ordnance Materiel in Cold Weather . . . . . FM 9-207

END OF TASK

TECHNICAL MANUALS

Operator's, Unit, Direct Support, and General Support Maintenance Manual for Lead-Acid Storage Batteries . . . . . TM 9-6140-200-14

Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command) . . . . . TM 750-244-3

END OF TASK

OTHER PUBLICATIONS

Abbreviations and Acronyms . . . . . ASME Y14.38-1999

Army Medical Department Expendable/Durable Items . . . . . CTA 8-100

Department of Defense Interface Standard for Lifting and Tiedown Provisions MIL-STD-209K

Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items). . . . . CTA 50-970

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEM (BII) LISTS

This work package lists the COEI and BII for the HMEE-I to help inventory the items for safe and efficient operation of the equipment. Where to find stowage location, operation instructions, and troubleshooting procedures for the COEI are also provided.

STOWAGE LOCATION OF COEI

For stowage location of the COEI, go to WP 0007.

END OF TASK

OPERATION INSTRUCTIONS FOR COEI

For instructions on how to operate the COEI, go to WP 0034 for the impact wrench, WP 0035 for the chain saw, WP 0036 for the pavement breaker, WP 0037 for the hammer drill, and WP 0038 for the post driver.

END OF TASK

TROUBLESHOOTING PROCEDURES FOR COEI

Troubleshooting for the COEI is in WP 0044.

END OF TASK

INTRODUCTION TO TABLE 1 AND TABLE 2

COEI and BII are presented in the following lists:

Table 1. COEI. This listing is for information purposes only and is not authority to requisition replacements. These items are part of the HMEE-I, but they are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to help identify the items.

Table 2. BII. These essential items are required to place the HMEE-I in operation, operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the HMEE-I during operation and when transferred between property accounts. Listing these items is the authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help find and identify the items.

END OF TASK

EXPLANATION OF COLUMNS IN COEI AND BII LISTS

1. **Column (1) Illus Number.** Gives you the number of the item illustrated.
2. **Column (2) National Stock Number.** Identifies the stock number of the item to be used for requisitioning purposes.
3. **Column (3) Description, Part Number/(CAGEC).** Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The stowage location of COEI and BII is also included in this column. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).
4. **Column (4) Unit of Issue (U/I).** Unit of Issue (U/I) indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (2).
5. **Column (5) Quantity Required (QTY RQD).** Indicates the quantity required.

END OF TASK

COEI AND BII LISTS

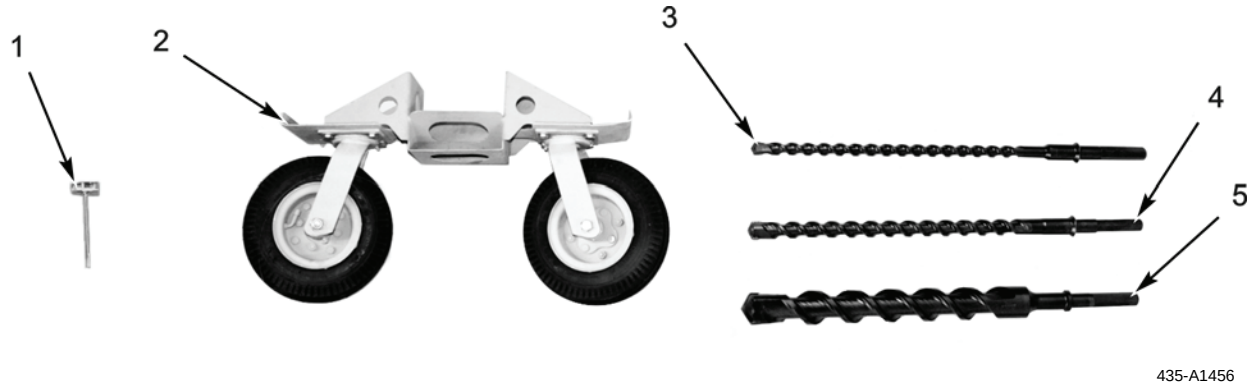


Table 1. COEI - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, PART NUMBER/(CAGEC)	(4) U/I	(5) QTY RQD
1		Adjustment Tool, Chain Saw (Oregon) 57-016	EA	1
2		Backhoe Dipper Trolley (OJKFO) 347/10940	EA	1
3		Carbide Bit: 3/4 in. diameter, 24 in. length (54252)	EA	1
4	5130-00-061-4115	Carbide Bit: 1 in. diameter, 24 in. length (54252) 02281	EA	1
5	3820-01-232-8048	Carbide Bit: 2 in. diameter, 24 in. length (54252) 02283	EA	1

COEI AND BII LISTS – CONTINUED

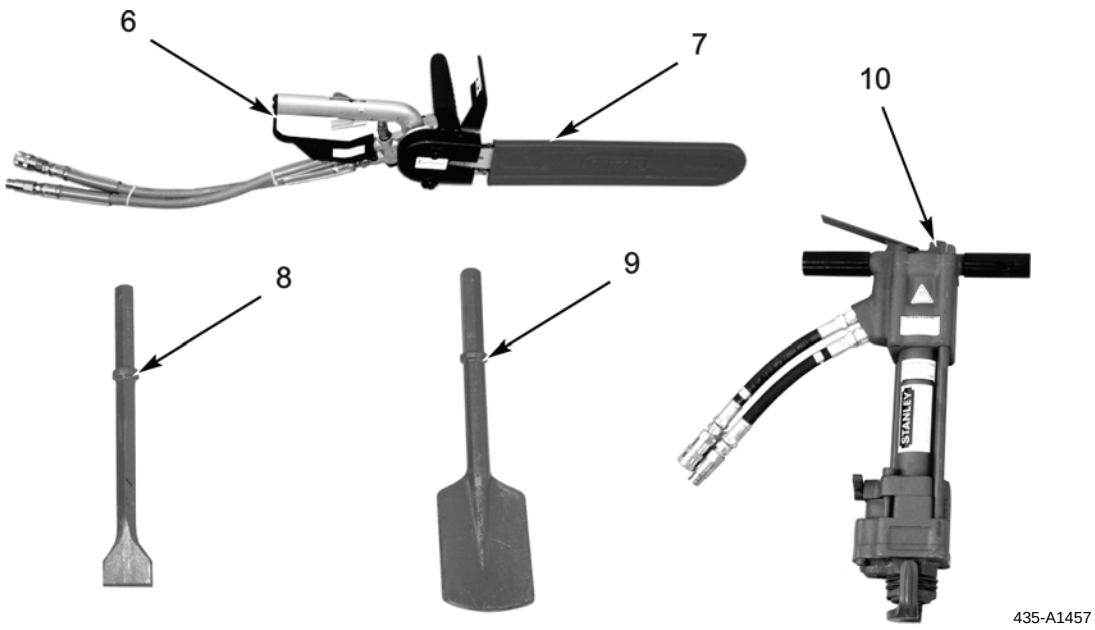


Table 1. COEI - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, PART NUMBER/(CAGEC)	(4) U/I	(5) QTY RQD
6		Chain Saw (0PU69) HCS820	EA	1
7		Chain Saw Bar, Sheath (Oregon) 28933	EA	1
8	3820-01-161-4753	Chisel Bit, Pavement Breaker: 6 x 1/14 in. hex shank, 3 in. point, 14 in. length (54252) 02337	EA	1
9	3820-01-242-1210	Clay Spade, Pavement Breaker: 6 x 1/14 in. hex shank, 5-1/2 in. wide (54252) 09262	EA	1
10	5130-01-178-6338	Hammer Drill (54252) HD45110D	EA	1

COEI AND BII LISTS – CONTINUED

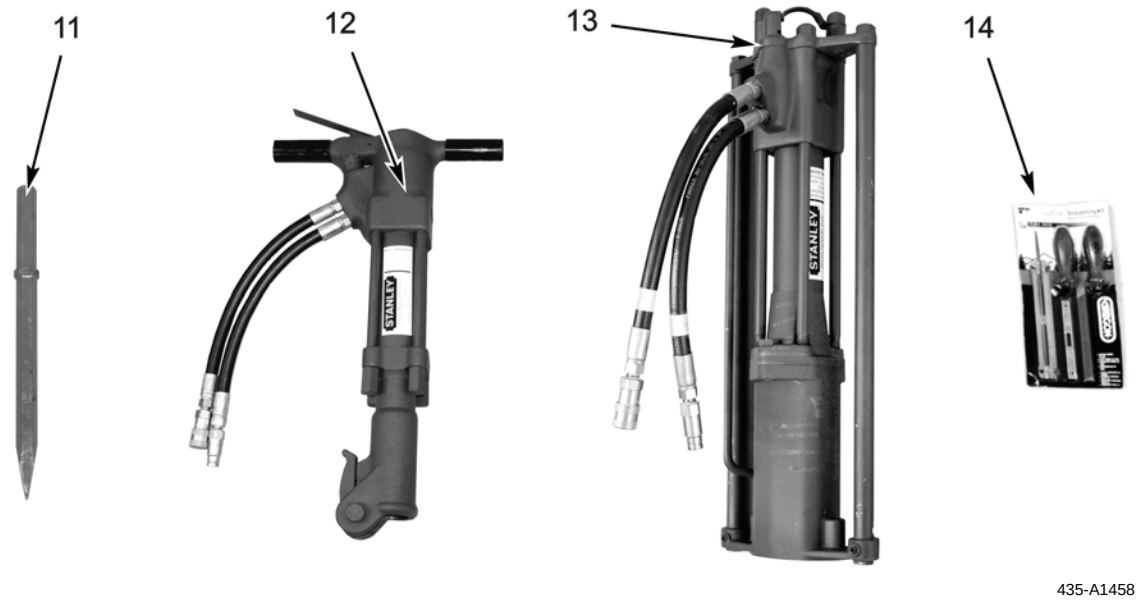


Table 1. COEI - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, PART NUMBER/(CAGEC)	(4) U/I	(5) QTY RQD
11	3820-01-160-2901	Moil Point Bit, Pavement Breaker: 6 x 1/14 in. hex shank, 14 in. length (54252) 02336	EA	1
12	3820-01-242-1440	Pavement Breaker (54252) BR6713016	EA	1
13		Post Driver (54252) PD45132D	EA	1
14		Sharpening Kit, Chain Saw (Oregon) 38275	EA	1

COEI AND BII LISTS – CONTINUED

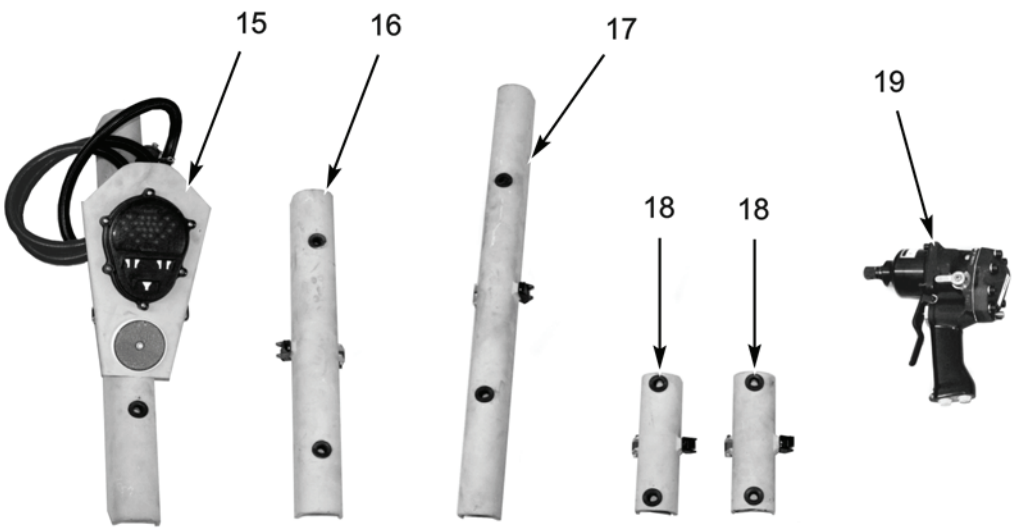


Table 1. COEI - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, PART NUMBER/(CAGEC)	(4) U/I	(5) QTY RQD
15		Strut, Backhoe Bucket Crowd Cylinder (Travel): 29.5 in. (750 mm) (OJKFO) 347/00362	EA	1
16		Strut, Front Bucket Crowd Cylinder (Travel): 22.25 in. (565 mm) (OJKFO) 347/00431	EA	1
17		Strut, Front Bucket Loader Arm Cylinder (Maint.): 31.1 in. (790 mm) (OJKFO) 347/00433	EA	1
18		Strut, Front Bucket Loader Arm Cylinder (Travel): 8.9 in. (227 mm) (OJKFO) 347/00432	EA	2
19	5130-01-300-6052	Wrench, Hydraulic, Impact (54252) 1W1214005	EA	1

END OF TASK

COEI AND BII LISTS – CONTINUED

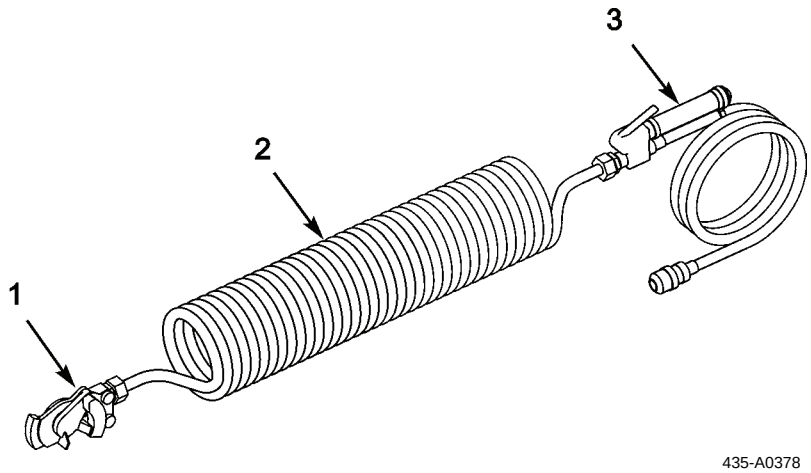


Table 2. BII.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, PART NUMBER/(CAGEC)	(4) U/I	(5) QTY RQR
1		Air-Line Coupling, Palm (Gladhand), Red, 347/20859	EA	1
2		Air-Line Hose, Suzi Red 347/21982	EA	1
3		Air-Line Large Bore Inflation Gauge 347/21981	EA	1

COEI AND BII LISTS – CONTINUED

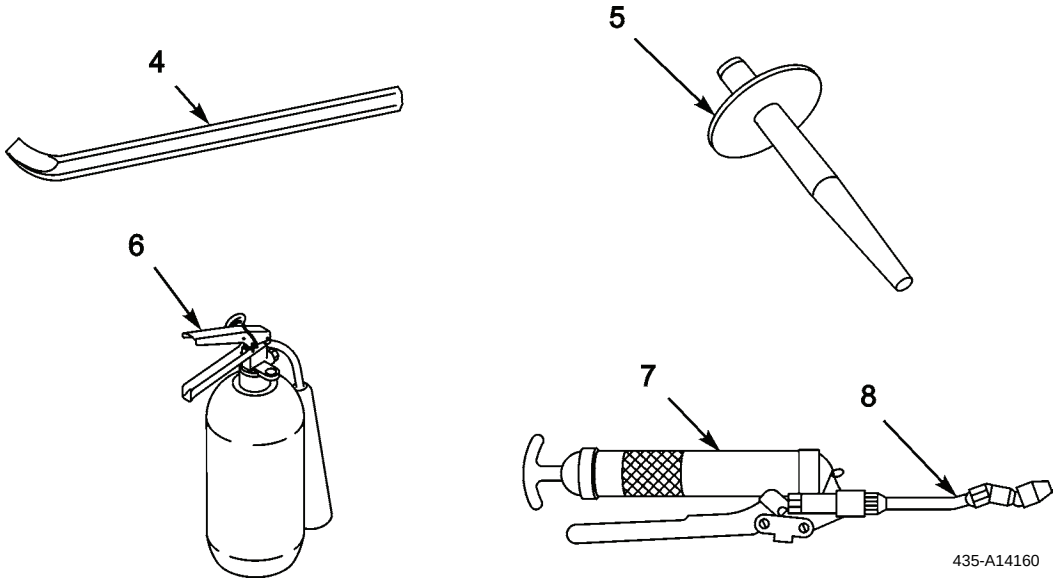


Table 2. BII - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, PART NUMBER/(CAGEC)	(4) U/I	(5) QTY RQR
4	5120-01-355-2068	Bar, Pry (55719) 2420	EA	1
5		Drift (115-A30020)	EA	1
6		Fire Extinguisher	EA	1
7	4930-00-253-2478	Grease Gun (81349) 1W1214005 MIL-G-3859	EA	1
8	4930-00-288-1511	Grease Gun Adapter Extension, Hydraulic Grease gun, Flex, 12 in. (81349) MIL-L-4387	EA	1

COEI AND BII LISTS – CONTINUED

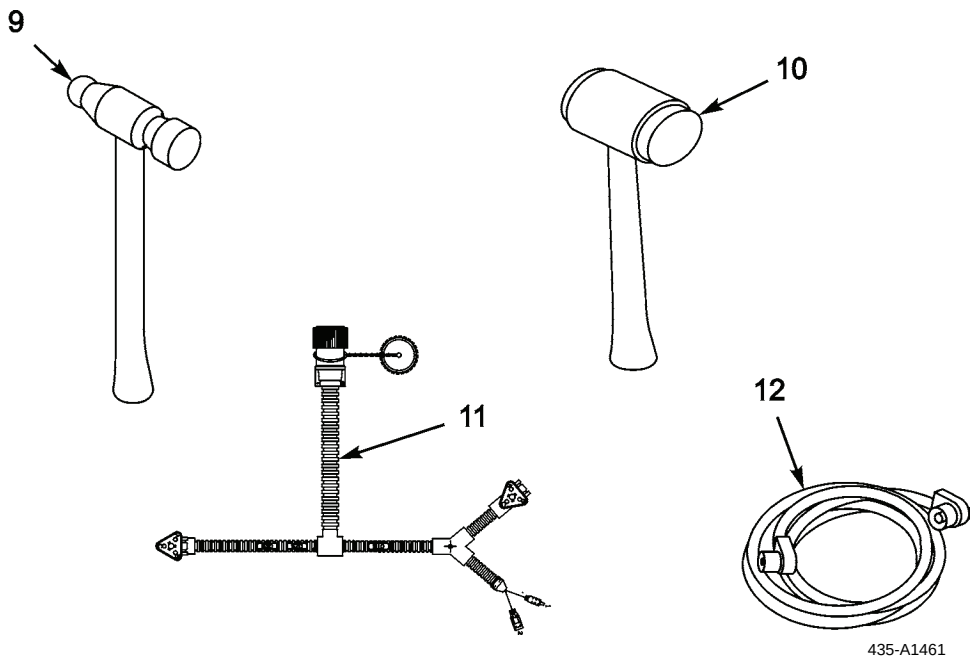


Table 2. BII - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, PART NUMBER/(CAGEC)	(4) U/I	(5) QTY RQR
9	5120-00-900-611	Hammer (Ball Peen 3 lb) 347/22133	EA	1
10		Hammer, Copper-Faced 6.5 lb 347/22132	EA	1
11		Kit, Cable Headlight Harness	EA	1
12		Kit, Cable Protrusion Harness	EA	1

COEI AND BII LISTS – CONTINUED

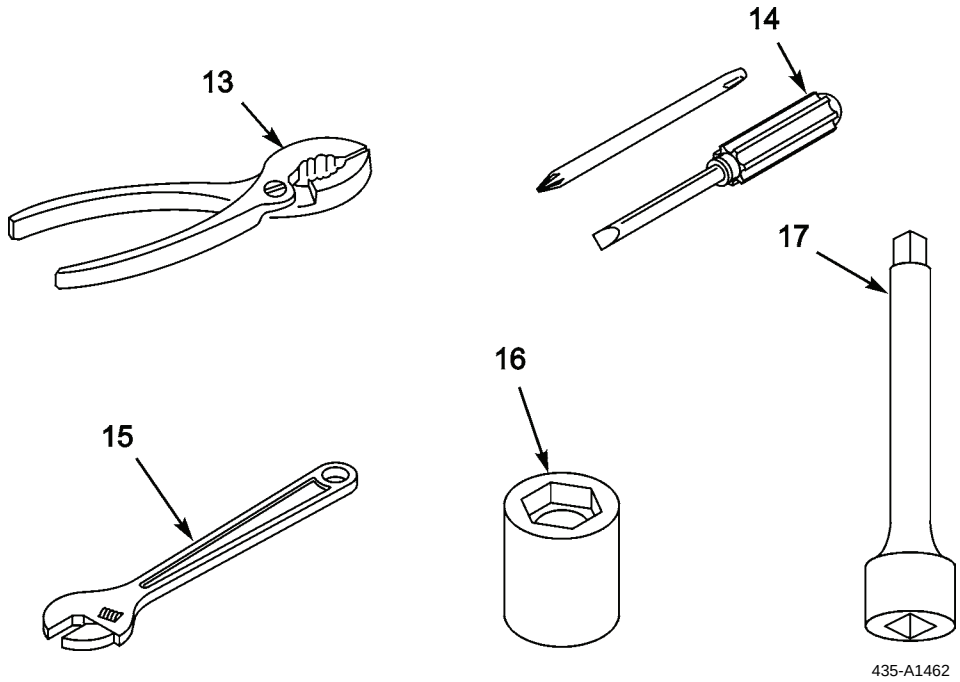


Table 2. BII - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, PART NUMBER/(CAGEC)	(4) U/I	(5) QTY RQR
13	5120-01-243-5332	Pliers, Combination GP 347/22127	EA	1
14	5120-01-243-53691	Screwdriver, Combination GP 347/22128	EA	1
15	5120-00-264-3796	Wrench, Adjustable, 12 in. 347/22129	EA	1
16		Wrench, Socket, 3/4 in. Square 1-5/16 in., IM422A	EA	1
17		Wrench, Socket, 3/4 in. Square Extension Bar, IM132	EA	1

COEI AND BII LISTS – CONTINUED

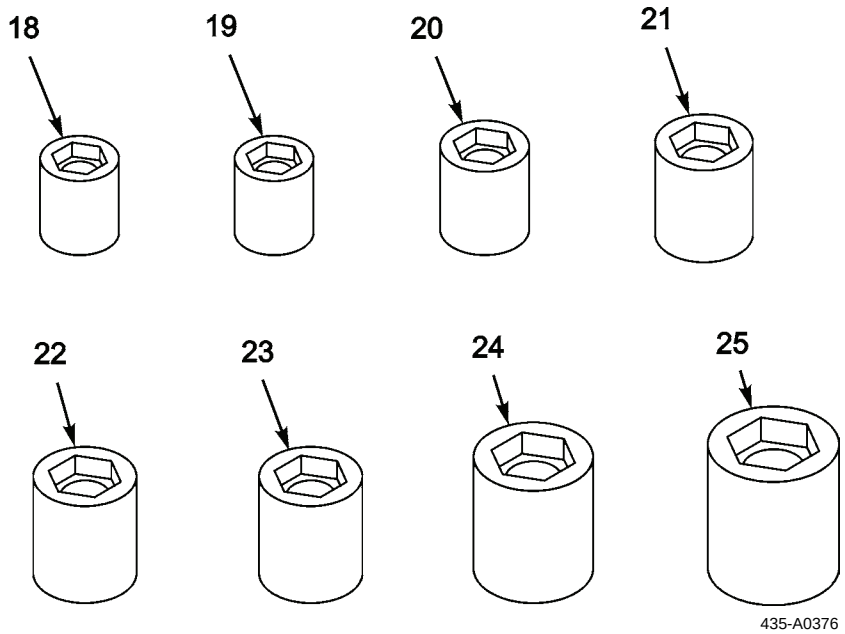


Table 2. BII - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, PART NUMBER/(CAGEC)	(4) U/I	(5) QTY RQR
18		Wrench, Socket, 3/4 in. Square 17 mm, IMM172A	EA	1
19		Wrench, Socket, 3/4 in. Square 19 mm, IMM192A	EA	1
20		Wrench, Socket, 3/4 in. Square 22 mm, IMM222A	EA	1
21		Wrench, Socket, 3/4 in. Square 24 mm, IMM242A	EA	1
22		Wrench, Socket, 3/4 in. Square 30 mm, IMM302	EA	1
23		Wrench, Socket, 3/4 in. Square 3/4 in., IM242A	EA	1
24		Wrench, Socket, 3/4 in. Square 1 in., IM322A	EA	1
25		Wrench, Socket, 3/4 in. Square 1-1/8 in., SIM362	EA	1

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

ADDITIONAL AUTHORIZATION LISTS

This work package lists additional items authorized for the support of the HMEE-I.

GENERAL

This list identifies items that do not have to accompany the HMEE-I and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

EXPLANATION OF COLUMNS

1. **Column (1) - National Stock Number (NSN).** Identifies the stock number of the item to be used for requisitioning purposes.
2. **Column (2) - Description, Part Number/(CAGEC).** Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).
3. **Column (3) - Usable On Code.** When applicable, gives you a code if the item you need is not the same for different models of equipment.
4. **Column (4) - Unit of Measure (U/M).** Unit of Issue (U/I) indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (1).
5. **Column (5) - (Qty Recm).** Indicates the quantity recommended.

Table 1. Additional Authorization List.

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION, PART NUMBER/(CAGEC)	(3) USABLE ON CODE	(4) U/M	(5) QTY RECM
	TBD			

END OF WORK PACKAGE

SUPPORTING INFORMATION

EXPENDABLE AND DURABLE ITEMS LIST

SCOPE

This work package lists the expendable and durable items you will need to operate and maintain the HMEE-I. This list is for information purposes only and is not authority to requisition the listed items. These items are authorized by CT 50-970, *Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic items)* or CTA 8-100, *Army Medical Department Expendable/Durable Items*.

EXPLANATION OF COLUMNS

1. **Column (1) - Item Number.** This number is referenced in the appropriate work package Initial Setup list or in the narrative instructions to identify the item; e.g., Use antifreeze (Item 1, WP 0033).
2. **Column (2) - Level.** This column identifies the lowest level of maintenance that requires the listed item.

   C - Operator/Crew
3. **Column (3) - National Stock Number.** This is the National Stock Number (NSN) assigned to the item, which you can use to requisition it.
4. **Column (4) - Description, CAGEC, and Part Number.** This provides the other information you need to identify the item.
5. **Column (5) - Unit of Measure (U/M).** This column shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
1	C		Antifreeze Permanent Ethylene Glycol, Inhibited, Heavy-Duty (58536) A-A-52624	
		6850-01-464-9125	1 Gallon Can	GL
		6850-01-441-3221	5 Gallon Can	CO
		6850-01-441-3223	55 GL Drum	DR
2	C		Cleaning Compound, Solvent Type III (81349) MIL-PRF-680	
		6850-01-474-2318	1 Gallon Can	GL
		6850-01-474-2320	5 Gallon Can	BX
		6850-01-474-2321	55 Gallon Drum	DR
3	C		Cleaning Compound, Windshield (0FTT5) 0854-000	
		6850-00-926-2275	16 Ounce Bottle	BX
4	C		Detergent, General Purpose, Liquid (83421) 7930-00-282-9699	
		7930-00-282-9699	1 Gallon Can	GL
5	C		Fluid, Brake, Silicone, BFS (81349) MIL-PRF-46176	
		9150-01-102-9455	1 Gallon Can	GL
6	C		Fuel, Diesel, DF-1 Grade, Arctic (81346) ASTM D 975	
		9140-00-286-5286	Bulk	GL
		9140-00-286-5287	5 Gallon Can	CN
		9140-00-286-5288	55 Gallon Drum	DR
7	C		Fuel, Diesel, DF-2 Grade (81346) ASTM D 975	
		9140-00-286-5294	Bulk	GL
		9140-00-286-5295	5 Gallon Can	CN
		9140-00-286-5296	55 Gallon Drum	DR
8	C	9130-01-031-5816	Fuel, Turbine, Aviation (81349) MIL-T-83133 GR JP-8	GL

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
9	C		Grease Automotive and Artillery (GAA)	
		9150-01-197-7688	(81349) M-10924-A 1-1/4 Ounce Tube	TU
		9150-01-197-7693	(81349) M-10924-B 14 Ounce Cartridge	CA
		9150-01-197-7690	(81349) M-10924-C 1-3/4 Pound Can	
		9150-01-197-7692	(81349) M-10924-E 35 Pound Can	
10	C		Oil, Lubricating, Gear, GO 75 (81349) MIL-PRF-2105	
		9150-01-035-5390	1 Quart Can	QT
		9150-01-035-5391	5 Gallon Can	CN
11	C		Oil, Lubricating, Gear, GO 80/90 (81349) MIL-PRF-2105	
		9150-01-035-5392	1 Quart Can	QT
		9150-01-001-9395	5 Gallon Can	CN
		9150-01-035-5394	55 Gallon Drum	DR
12			Oil, Lubricating, Gear, GO 85/140 (81349) MIL-PRF-2105	
		9150-01-048-4592	1 Quart Can	QT
		9150-01-035-5395	5 Gallon Can	CN
		9150-01-035-5396	55 Gallon Drum	DR
13			Oil, Lubricating, OE/HDO-40 (81349) MIL-PRF-2104	
		9150-00-188-9862	55 Gallon Drum	DR
14			Oil, Lubricating, OE/HDO-15/40 (81349) MIL-PRF-2104	
		9150-01-152-4117	1 Quart Can	QT
		9150-01-152-4118	5 Gallon Can	CN
		9150-01-152-4119	55 Gallon Drum	DR
15			Oil, Lubricating, OEA-30 Arctic	
		9150-00-402-4478	(81349) MIL-L-46167 1 Quart Can	QT
		9150-00-402-2372	(81349) MIL-PRF-46167 5 Gallon Can	CN
		9150-00-491-7197	(81349) MIL-PRF-46167 55 Gallon Drum	DR

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
16			Oil, Lubricating, OE/HDO-5/40 (81349) MIL-PRF-2104	
		9150-01-524-9155	55 Gallon Drum	DR
17	C		Rag, Wiping (64067) 7920-00-205-1711	
		7920-00-205-1711	50 Pound Bale	BE
18			Strap, Tiedown Electrical Components	
		5975-00-903-2284	4 Inch Length, Black, Package of 100 (96906) MS3367-4-0	HD
		5975-00-984-6582	6 Inch Length, Black, Package of 100 (96906) MS3367-1-0	HD
		5975-00-935-5946	13.35 Inch Minimum Length, Brown (96906) MS3367-2-1	EA
19	C		Tag, Marker (64067) 9905-00-537-8954	
		9905-00-537-8954	Bundle of 50	BD
20	C		Tape, Duct, 2 Inch Wide (39482) 1791K70	
		5640-00103-2254	60 Yard Roll	RL

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

IMPACT WRENCH

DESCRIPTION

The impact wrench is designed for 3/4-inch square sockets and accessories.

Normal applications include installation or removal of fasteners requiring torque in the range of 300-1200 lb-ft (407-1627 Nm) and auger bit wood boring. Do not use the wrench as a hammer drill for metal drilling.

END OF TASK

OPERATOR SAFETY/WARNINGS

Tool operators must always comply with safety precautions listed here and on stickers and tags attached to tool and hose.

These safety precautions are given for your safety. Review them carefully before operating tool and before performing general maintenance or repairs. Failure to do so could result in personal injury or equipment damage.

WARNING

- Operator must start in work area without bystanders. Flying debris can cause serious injury.
- Always wear safety equipment such as goggles, ear and head protection, and safety shoes at all times when operating tool. Use gloves and aprons when necessary.
- Operator must be familiar with all prohibited work areas such as excessive slopes and dangerous terrain conditions.
- Maintain proper footing and balance at all times.
- Do not inspect or clean tool while hydraulic power source is connected. Accidental engagement of tool can cause serious injury.
- Always connect hoses to tool hose couplers before energizing hydraulic power source. Be sure all hose connections are tight and are in good condition.
- Do not operate tool at oil temperatures above 140°F (60°C). Operation at higher temperatures can cause higher than normal temperatures at tool which can result in operator discomfort.
- Do not operate a damaged, improperly adjusted, or incompletely assembled impact wrench.
- Never wear loose clothing that can get entangled in working parts of tool.
- Keep all parts of your body away from rotating parts. Long hair or loose clothing can become drawn into rotating components.
- Do not reverse impact wrench rotation direction by changing fluid flow direction.
- Release trigger if power supply has been interrupted.
- When working near electrical conductors, always assume that all conductors are energized and that insulation, clothing, and hoses can conduct electricity. Use hose labeled and certified as non-conductive.
- Failure to observe these warnings may result in injury or death to personnel.

END OF TASK

EQUIPMENT PROTECTION AND CARE

NOTE

In addition to the WARNINGs in this work package, observe the following for equipment protection and care.

1. Ensure all couplers are wiped clean before connection.
2. Hydraulic circuit control valve must be in OFF position when coupling or uncoupling hydraulic tools. Failure to do so may result in damage to quick couplers and cause overheating of hydraulic system.
3. Always store tool in clean dry space, safe from damage or pilferage.
4. Ensure circuit pressure hose (with male quick disconnect) is connected to IN port. Circuit return hose (with female quick disconnect) is connected to opposite port. Do not reverse circuit flow. This can cause damage to internal seals.
5. Always replace hoses, couplings, and other parts with proper replacement parts. Supply hoses must have minimum working pressure rating of 2,500 psi (172 bar).
6. Always keep critical tool markings, such as warning stickers and tags legible.
7. Tool repair must be performed only by Unit Maintenance.
8. Make certain that recommended relief valves are installed in pressure side of system.
9. Do not use tool for applications for which it was not intended.

END OF TASK

OPERATION

During normal operation it is common to see some grease leakage from around anvil during hard use. Refer to correct lubrication procedures.

1. Observe all Safety Warnings.
2. Move hydraulic circuit control valve to ON position to operate wrench.

OPERATION – CONTINUED

WARNING

Always use sockets and accessories designed for impact type applications. Do not use standard sockets or accessories. These can crack or fracture during operation. Failure to follow this warning may result in injury or death to personnel.

3. Select direction of impact desired using rotary reversing valve (Figure 1, Item 1) located on left side of wrench. To select clockwise direction, move lever toward front (drive end) of wrench. To select counterclockwise direction, move lever to rear (handle end) of wrench.

NOTE

To more accurately tighten bolts, lubricate threads, check with a torque wrench and duplicate time of impacting for other bolts of same length and thread size.

4. Squeeze trigger (Figure 1, Item 2) to activate wrench.
5. Release trigger (Figure 1, Item 2) to stop wrench.

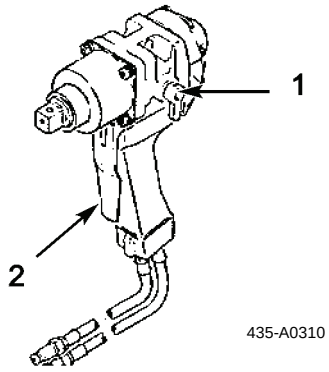


Figure 1. Impact Wrench

END OF TASK

COLD WEATHER OPERATION

If wrench is to be used during cold weather, preheat hydraulic fluid at low engine speed. When using normally recommended fluids, fluid temperature should be at or above 50°F (10°C) before use.

Damage to hydraulic system or wrench can result from use with fluid that is too viscous or too thick.

END OF TASK

ADJUSTMENT

For adjustment of impact wrench torque output, notify Unit Maintenance.

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

CHAIN SAW

DESCRIPTION

This chain saw is hydraulically powered and intended for pruning, limbing, and fell operations.

Using a rugged, direct-drive gear motor, this type of saw provides extraordinary cutting power for trimming and cutting.

END OF TASK

OPERATOR SAFETY/WARNINGS

Read and understand all of the instructions and safety information in this manual before operating or servicing this tool. Failure to observe this warning will result in severe injury or death.

WARNING

- This tool is not insulated. When using this unit near energized electrical lines, use only certified non-conductive hoses and proper personal protective equipment. Failure to observe this warning can result in severe injury or death.
- Oil under pressure easily punctures skin causing serious injury, gangrene or death. If you are injured by escaping oil, seek medical attention immediately. Do not use fingers or hands to check for leaks. Do not hold hose or couplers while the hydraulic system is pressurized. Depressurize the hydraulic system before servicing.
- Pull-in can occur when the blade at the bottom of the bar contacts a foreign object, such as a nail, or when the blade is pinched in the cut. The saw will be suddenly and forcefully pulled away from the operator.
- Push-back can occur when the blade at the top of the bar contacts a foreign object, such as a nail, or when the blade is pinched in the cut. The saw will be suddenly and forcefully pushed back toward the operator.
- Kickback can occur when the chain at the guide bar tip contacts anything. The bar of the saw will travel upward and back, toward the operator.
- Wear a hard hat when using this tool. Failure to observe this warning can result in severe injury or death.
- Wear eye protection when operating or servicing this tool. Failure to wear eye protection can result in serious eye injury from flying debris or hydraulic oil.
- Wear hearing protection when using this tool. Long-term exposure to high noise levels can result in hearing loss.
- Wear foot protection when using this tool. Failure to observe this warning can result in serious injury.
- Some types of timber can produce hazardous dust when cut. Wear a dust mask to prevent breathing hazardous dust. Failure to observe this warning can result in temporary breathing difficulty or serious injury.
- Do not change accessories, inspect, adjust or clean tool when it is connected to a power source. Accidental start-up can result in serious injury.
- Keep the handles clean, dry and free of hydraulic fluid.

OPERATOR SAFETY/WARNINGS – CONTINUED

WARNING - CONTINUED

- Maintain a firm grip on tool, using both hands with thumbs and fingers encircling the handles at all times. Serious injury can result if an operator does not control the tool.
- Do not lock the trigger in the Power-ON position. Operator cannot stop tool when trigger is locked.
- Do not remove or modify the trigger actuator. Accidental start-up can result in serious injury.
- Wear protective gloves when handling or adjusting the chain. The chain can cut even when stationary.
- To transport the chain saw: Allow the chain to stop rotating. Wait for the chain to cool. Use an appropriate guide bar sheath or scabbard. Carry the saw with the guide bar toward the rear.
- Do not disconnect tool, hoses or fittings while the power source is running or if the hydraulic fluid is hot. Hot hydraulic fluid can cause serious burns.
- Do not reverse hydraulic flow. Operation with hydraulic flow reversed can cause tool malfunction. Connect the pressure hose and tank hose to the proper ports.
- Use this tool for cutting wood only. Any other use can result in injury or property damage.
- Excuse all bystanders and unnecessary personnel from the work area when operating the tool. Nearby personnel can be injured by falling debris.
- Hydraulic oil can cause skin irritation. Handle the tool and hoses with care to prevent skin contact with hydraulic oil. In case of accidental skin contact with hydraulic oil, wash the affected area immediately to remove the oil.
- Vibration hazard: Apply just enough pressure to do the work. Applying excess pressure to the tool can cause operator discomfort or temporary numbness.
- Saw body, bar, blade and other components will be hot during and after use. Use care when handling the saw. Hot surfaces can cause serious burns.
- Emergency stop procedure: Release the trigger. Shut off the hydraulic power source.
- Failure to observe the above warnings can result in severe injury or death to personnel.

NOTE

Keep decals clean and legible. Replace decals when necessary — see the decals listed in WP 0007.

END OF TASK

HANDLE ADJUSTMENT

WARNING

- Do not change accessories, inspect, adjust or clean tool when it is connected to a power source. Accidental start-up can result in serious injury to personnel.
- Failure to observe this warning can result in severe injury or death to personnel.

The control handle on this saw can be set to one of three positions — horizontal, 30 degrees, or 60 degrees. Choose the setting that maximizes cutting efficiency and operator comfort, based on the particular cutting task.

1. Remove chain from saw (see *Chain Replacement* in this work package).
2. Remove the four cap screws from the mount plate (Figure 1).
3. Set the handle to the new handle orientation.
   - Position #1: Horizontal
   - Position #2: 30 degrees
   - Position #3: 60 degrees
4. Apply a small amount of thread locking and sealing compound to the threads in the mount plate and the threads of the cap screws. Follow the manufacturer's instructions for applying and curing. Tighten the cap screws to 80-90 lb-in. (9-10 Nm) (Figure 1).

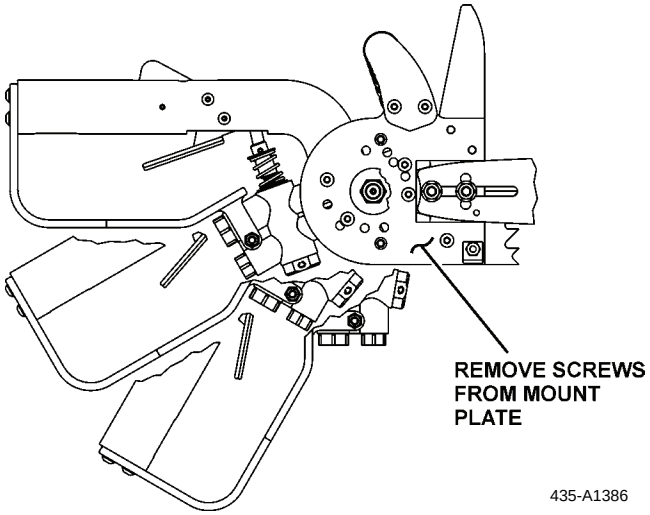


Figure 1. Handle Adjustment

5. Install chain on saw (see *Chain Replacement* in this work package).

END OF TASK

OPERATION

1. Grasp the front handle (Figure 2, Item 1) with your left hand and the trigger handle (Figure 2, Item 2) with your right hand.

NOTE

These hand placement instructions are for both right-handed and left-handed users.

2. Press down on the trigger actuator (Figure 2, Item 3) and pull the trigger (Figure 2, Item 4) until the saw reaches full rpm.
3. Feed the rotating saw chain using a steady, constant pressure.

WARNING

Cut straight through the wood — do not twist the saw in the cut. Failure to observe this warning may result in injury to personnel or damage to equipment.

4. To stop the saw, release the trigger (Figure 2, Item 4).
5. When the tool is not in use, stop the power source (WP 0005) to reduce heat and wear.

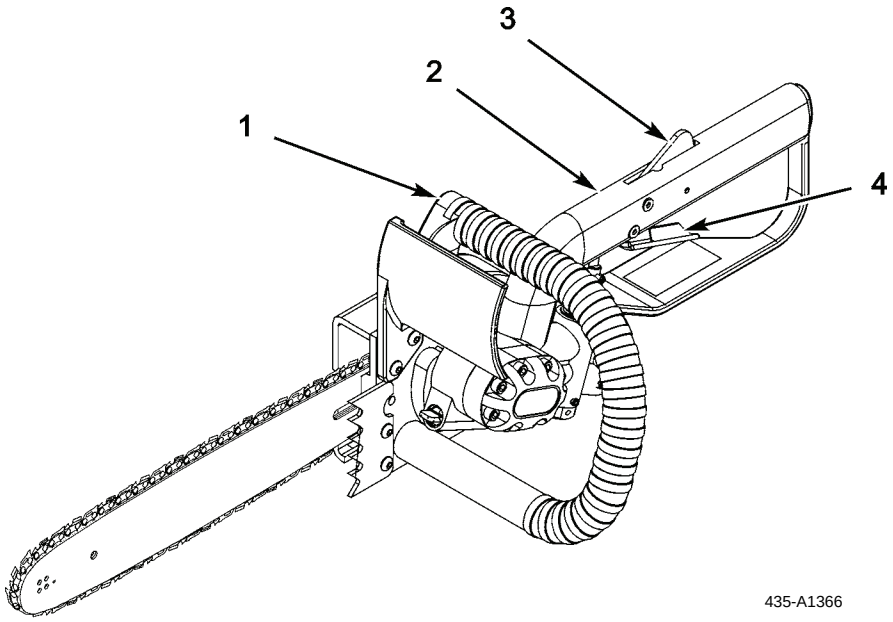


Figure 2. Operation

CHECKING AND SETTING THE AUTOMATIC CHAIN OILER

The automatic chain oiler provides a constant supply of oil to lubricate the bar and chain whenever the saw is operating. An adjustment screw controls the amount of oil supplied.

1. Run the saw at full rpm (WP 0005).
2. If the tip of the saw gives off a fine spray of oil, the automatic oiler is working properly. If the saw does not give off a spray of oil, adjust the oiler.

NOTE

For better results, hold saw so that the tip of the saw blade is pointing toward a clean sheet of paper or cardboard and run the saw at full rpm. If the automatic oiler is working properly, the paper or cardboard should soon show small droplets of oil.

3. Stop the hydraulic power source (WP 0005).
4. Twist the adjustment screw 1/2 turn as follows:
   - clockwise to decrease the oiler output.
   - counterclockwise to increase the oiler output.
5. Start the hydraulic power source (WP 0005).
6. Repeat until the oiler output is adjusted correctly (Figure 3).

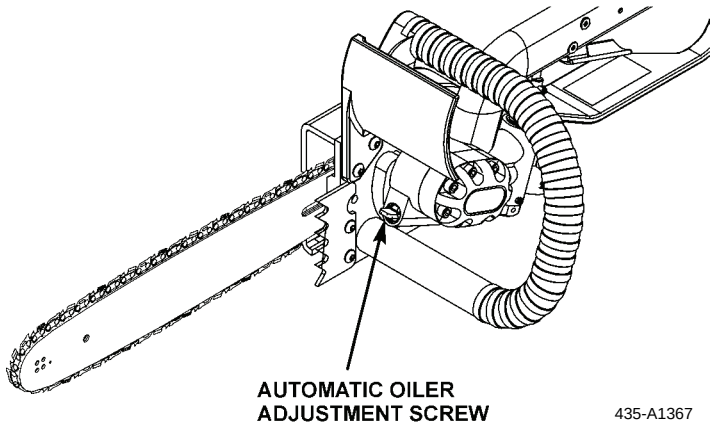


Figure 3. Automatic Oiler Adjustment Screw

SAW CHAIN AND BAR MAINTENANCE

New Chain Break-In

1. Run the saw at low chain speed without cutting wood for 2 to 3 minutes. Check the output from the automatic oiler.
2. Stop the hydraulic power source (WP 0005).
3. Disconnect the hoses (WP 0004).
4. Allow the bar and chain to cool. check the tension and adjust if necessary.
5. Connect the hoses (WP 0004).
6. Start the power source (WP 0005).
7. Make a few easy cuts at moderate chain speed.
8. Stop the hydraulic power source. Disconnect the hoses. Allow the bar and chain to cool. Check the tension and adjust if necessary.
9. Connect the hoses (WP 0004). Start the power source (WP 0005). Use the saw for moderate cuts during the next 30 minutes of use.

Checking Chain Tension

1. Stop the hydraulic power source (WP 0005).
2. Disconnect the hoses (WP 0004).
3. Allow the bar and chain to cool.
4. Pull the saw chain around the bar. The chain should rotate around the bar easily. If it does not, see Chain is Difficult to Rotate Manually in the Troubleshooting table.
5. Check the tension as follows:

   Pull the saw chain away from the bar using approximately 2 lbs (4.4 N) of force. The clearance between the chain and bar should be approximately 1/3 in. (3.2 mm). If there is too much or too little clearance, proceed to Adjusting Chain Tension (Figure 4).

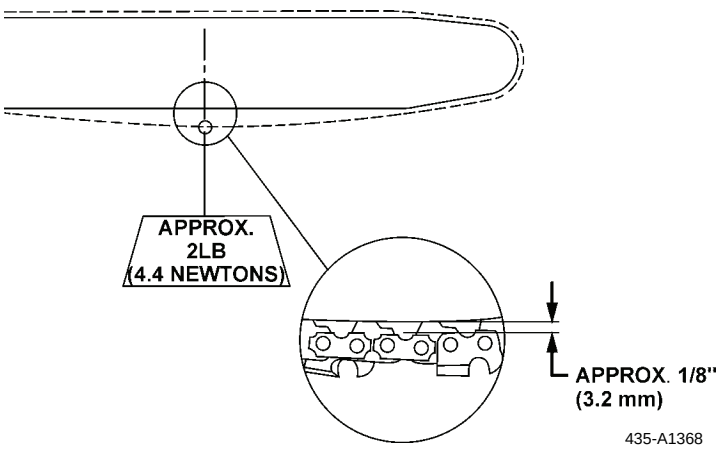


Figure 4. Proper Chain Tension

ADJUSTING CHAIN TENSION

1. Loosen the two bar flange nuts (Figure 5, Item 1).
2. Turn the saw chain tension adjusting screw (Figure 5, Item 2) until the proper tension is achieved, as follows:

   Pull the saw chain (Figure 5, Item 3) away from the bar (Figure 5, Item 4) using approximately 2 lbs (4.4 N) of force. The clearance between the chain and bar should be approximately 1/8 in.(3.2 mm).
3. Hold the bar (Figure 5, Item 4) hose up and tighten the two bar flange nuts (Figure 5, Item 1) 150 lb-in (16.9 Nm).
4. Check the chain tension again.
5. Rotate the chain around the bar manually. If you hear a clicking noise, the chain drive links are hitting the bar. Repeat the Adjusting Chain Tension procedure (Figure 5).

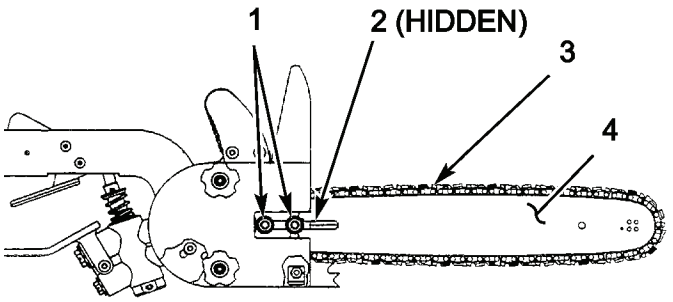


Figure 5. Adjusting Chain Tension

CHAIN REPLACEMENT AND BAR SERVICE

1. Mark the top side of the bar (Figure 6, Item 3) with a grease pencil or marker.
2. Remove two knobs (Figure 6, Item 5) and cover (Figure 6, Item 4) from saw (Figure 6, Item 6).
3. Remove two nuts (Figure 6, Item 1), chain (Figure 6, Item 2), and bar (Figure 6, Item 3) from saw (Figure 6, Item 6). Use a small cleaning brush to remove all residue from the bar groove.

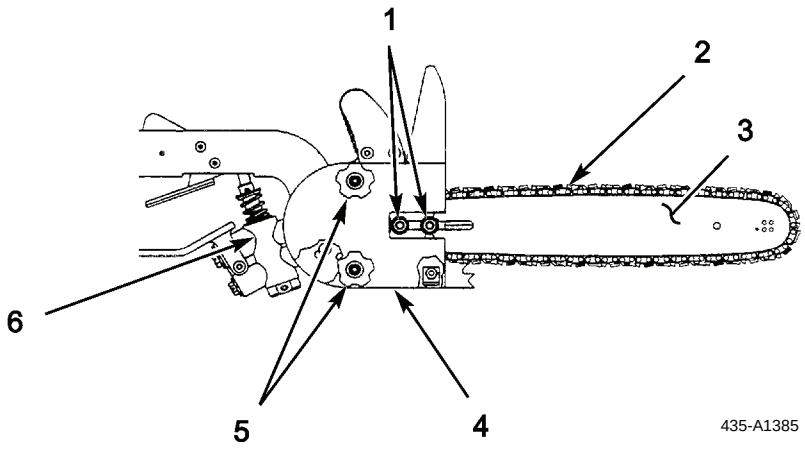


Figure 6. Chain Replacement

4. Clean the oil passage at the base of the guide bar. Use any instrument small enough to thoroughly clean the passage.
5. Check the bar rails for wear by placing a straight edge against the side of the bar and one cutter.
   a. Clearance between the bar and straight edge indicates that the bar rails are not worn.
   b. If the chain leans and there is little or no clearance between the bar and straightedge, the bar rails are worn and the bar should be replaced (Figure 7).

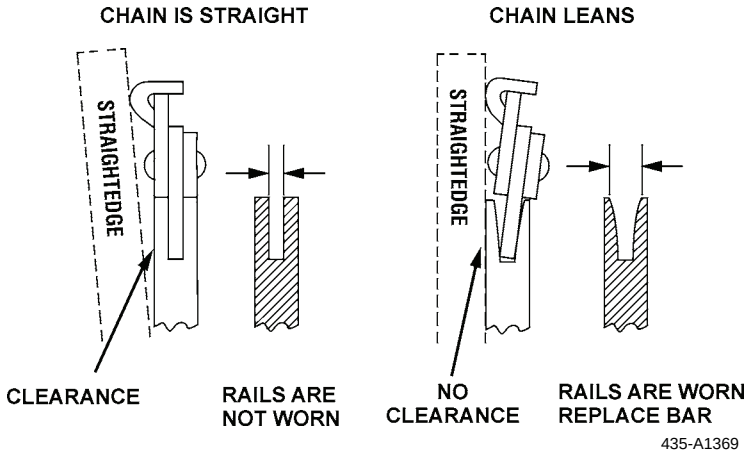


Figure 7. Checking Rails for Wear

CHAIN REPLACEMENT AND BAR SERVICE – CONTINUED

6. Inspect the rim sprocket and sprocket adapter. If worn or damaged, contact unit maintenance (Figure 8).

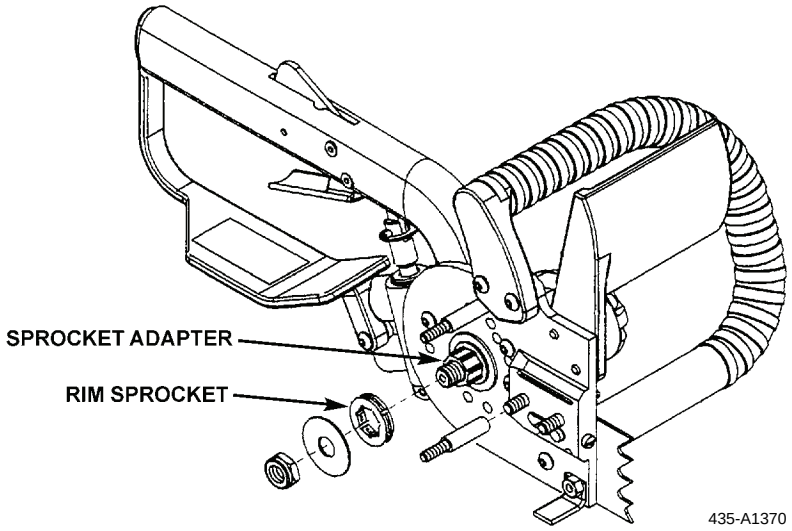


Figure 8. Rim Sprocket and Sprocket Adapter

7. Use the mark made in Step 1 to install the bar upside down, so that the bar will wear evenly. Ensure that adjustment dog is located in the lowest hole in the bar (Figure 9).

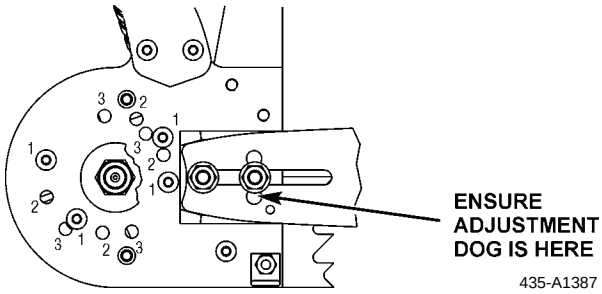


Figure 9. Adjustment of Dog Position

CHAIN REPLACEMENT AND BAR SERVICE – CONTINUED

8. Install chain (Figure 10, Item 2) and bar (Figure 10, Item 3) on saw (Figure 10, Item 6) with two loosely installed nuts (Figure 10, Item 1).
9. Install cover (Figure 10, Item 4) on saw (Figure 10, Item 6) with two knobs (Figure 10, Item 5).

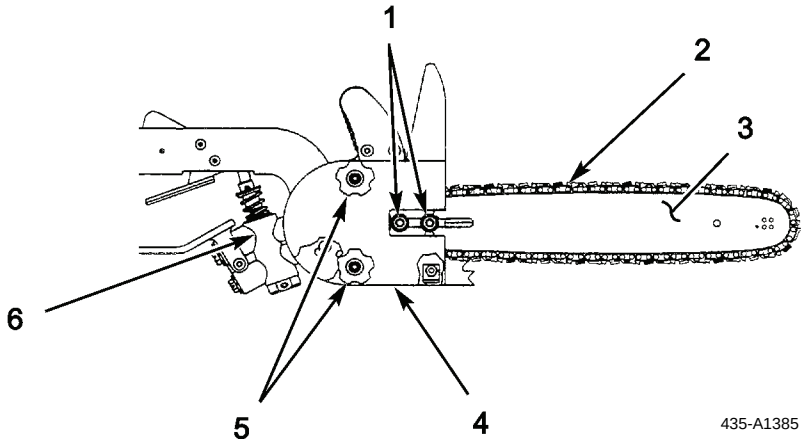


Figure 10. Chain Replacement

10. Ensure that chain is installed as shown (Figure 11). Adjust the tension of the chain as described under Adjusting Chain Tension.

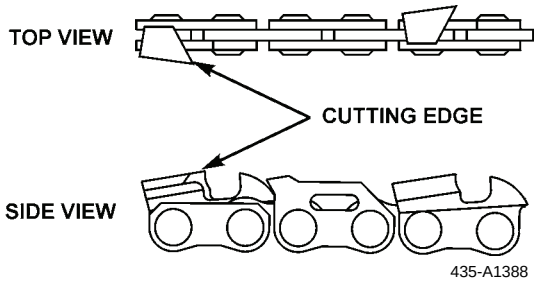


Figure 11. Direction of Chain Travel

SHARPENING THE SAW CHAIN

The saw chain must be sharpened to certain specifications. If the saw chain is not properly sharpened, the risk of kickback increases.

Saw Chain Pitch (Figure 12 and Figure 13)

Pitch refers to the saw chain measurement. A chain's pitch is the distance between any three consecutive rivets divided by two.

Saw Chain Gauge (Figure 12 and Figure 13)

Gauge refers to the thickness of that portion of the drive link which fits into the guide bar groove. The guide bar and saw chain gauge must match.

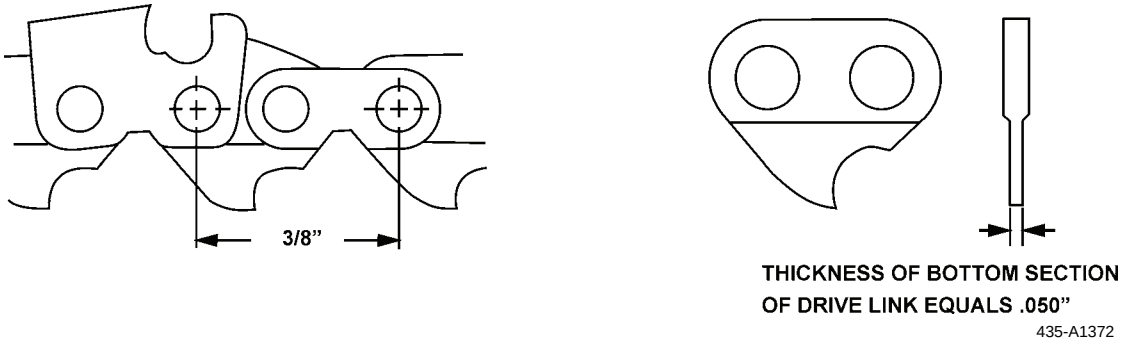


Figure 12. Saw Chain Pitch and Gauge

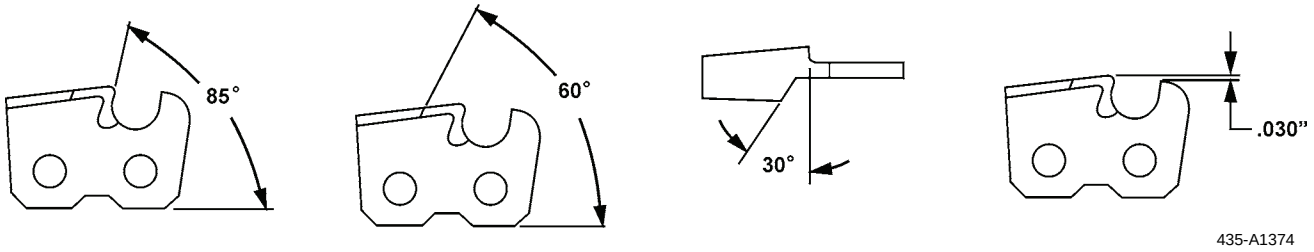


Figure 13. Side Plate Angle, Top Plate Cutting Angle, Top Plate Filing Angle, Depth Gauge Setting

SHARPENING THE SAW CHAIN – CONTINUED

Filing Depth Gauges (Figure 14 and Figure 15)

1. If the cutters are sharpened with a file holder, check and lower the depth gauges before sharpening the cutters.
2. Check the depth gauges every third sharpening.
3. Place the depth gauge tool on the cutter. If the depth gauge projects, file it level with the top of the tool. Always file from the inside of the saw chain toward an outside cutter.

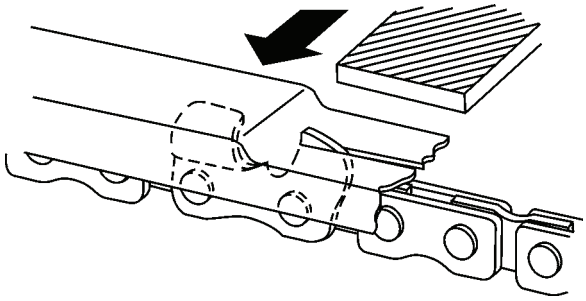


Figure 14. Lowering Depth Gauges

4. Round off the front corner to maintain the original shape of the depth gauge after using the depth gauge tool. Always follow the recommended depth gauge setting of the chain manufacturer. This is important for maximum performance throughout the saw chain's life as well as for protection against kickback (Figure 15).

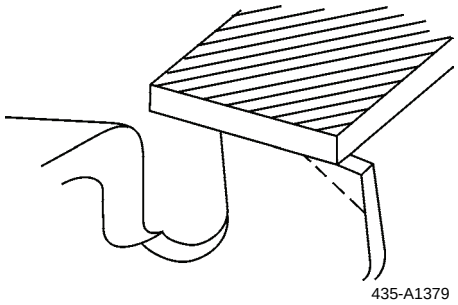


Figure 15. Rounding Off Depth Gauges

SHARPENING THE SAW CHAIN – CONTINUED

Filing Cutters - General

1. Support the file holder on the cutter top plate and depth gauge as shown (Figure 16).

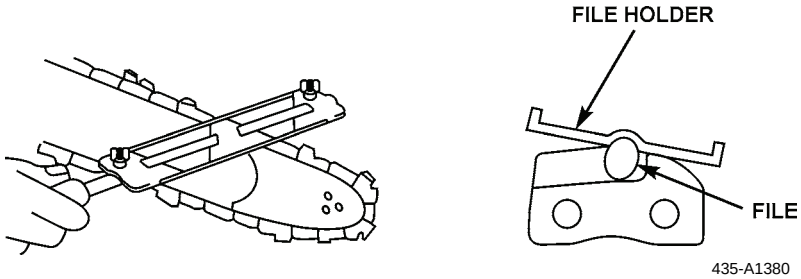


Figure 16. File Holder and Depth Gauge

2. File the cutters on one side of the saw chain from the inside out. File on the forward stroke only (Figure 17).

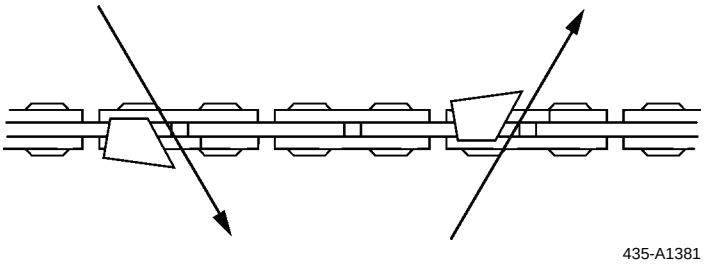


Figure 17. Filing Cutters

3. Keep the line on the file holder parallel to the center of the saw chain. Reverse the procedure for the other side.

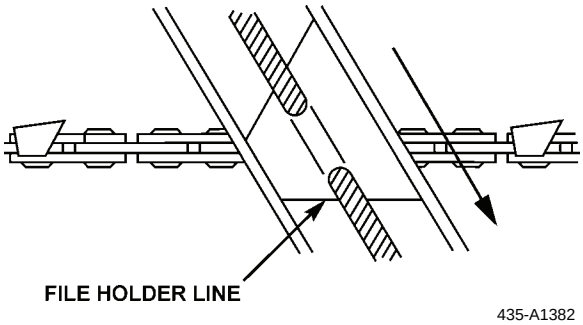


Figure 18. File Holder Line

SHARPENING THE SAW CHAIN – CONTINUED

Filing Cutters - General - Continued

4. Keep all cutters the same length.

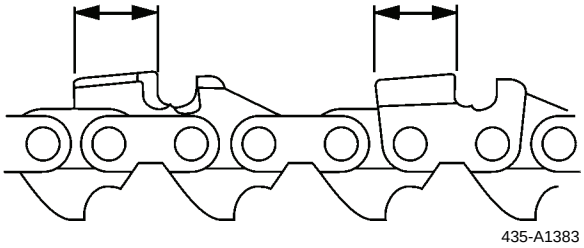


Figure 19. Cutter Length

5. File enough to remove any damage to the cutting edges (side plate and top plate) of the cutter.

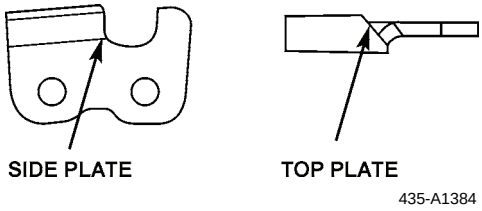


Figure 20. Verifying Edge

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

PAVEMENT BREAKER

DESCRIPTION

The pavement breaker is designed to handle medium-to-heavy demolition jobs and can be used to break up concrete, asphalt, and rock.

It is usually operated perpendicular to the ground.

END OF TASK

OPERATOR SAFETY/WARNINGS

Tool operators must always comply with safety precautions listed here and on the stickers and tags attached to tool and hose.

These safety precautions are given for your safety. Review them carefully before operating tool and before performing general maintenance or repairs. Failure to do so could result in personal injury or damage to equipment.

WARNING

- Operator must start in work area without bystanders. Operator must be familiar with all prohibited work areas such as excessive slopes and dangerous terrain conditions.
- Always wear safety equipment such as goggles, head protection, and safety shoes at all times when operating the tool.
- Do not inspect or clean tool while hydraulic power source is connected. Accidental engagement of tool can cause serious injury.
- Do not operate this tool without first reading Operating Instructions.
- Do not install or remove this tool while the hydraulic power source is connected. Accidental engagement of the tool can cause serious injury.
- Never operate tool if you cannot be sure that underground utilities are not present. Underground electrical utilities present an electrocution hazard. Underground gas utilities present an explosion hazard. Other underground utilities may present other hazards.
- Do not wear loose fitting clothing when operating tool. Loose fitting clothing can get entangled with tool and cause serious injury.
- Check fastener tightness often and before each use daily, also ensure all hose connections are tight.
- Hydraulic circuit control valve must be in “OFF” position when coupling or uncoupling tool. Wipe all couplers clean before connecting. Failure to do so may result in damage to quick couplers and cause overheating. Use only lint-free cloths.
- Do not operate tool at oil temperatures above 140°F (60°C). Operation at higher oil temperatures can cause operator discomfort and may cause damage to tool.
- Do not operate damaged, improperly adjusted, or incompletely assembled tool.
- To avoid personal injury or equipment damage, all tool repair, maintenance, and service must only be performed by authorized and properly trained personnel.
- Do not use tool for applications beyond its design capacity.
- Always keep critical tool markings, such as labels and warning stickers legible.
- Failure to follow these warnings may result in injury or death to personnel.

END OF TASK

EQUIPMENT PROTECTION AND CARE

NOTE

In addition to the WARNINGs in this work package, observe the following for equipment protection and care.

1. Ensure all couplers are wiped clean before connection.
2. Hydraulic circuit control valve must be in OFF position when coupling or uncoupling hydraulic tools. Failure to do so may result in damage to quick couplers and cause overheating of hydraulic system.
3. Always store tool in clean dry space, safe from damage or pilferage.
4. Ensure circuit pressure hose (with male quick disconnect) is connected to IN port. Circuit return hose (with female quick disconnect) is connected to opposite port. Do not reverse circuit flow. This can cause damage to internal seals.
5. Always keep critical tool markings, such as warning stickers and tags legible.
6. Do not force small breaker to do job of large breaker.
7. Use sharp tool bit for maximum breaker performance. Ensure that tools bits are not chipped or rounded on striking end.
8. Never operate breaker without tool bit or without holding it against work surface. This puts excessive strain on breaker foot.
9. Tool repair must be performed only by Unit Maintenance.
10. Make certain that recommended relief valves are installed in pressure side of system.
11. Do not use tool for applications for which it was not intended.

END OF TASK

OPERATION

1. Observe all WARNINGs.
2. Move hydraulic circuit control valve to ON position.
3. Place tool bit firmly on surface to be broken.

NOTE

Partially depressing trigger allows tool to operate at low speed, making it easy to start tool bit into surface to be broken.

4. Squeeze trigger (Figure 1, Item 1) to start the breaker. Adequate down pressure is very important.

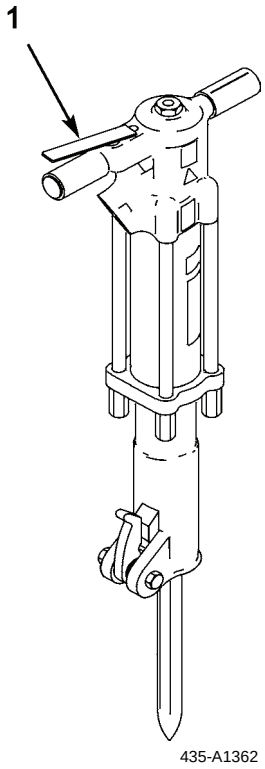


Figure 1. Pavement Breaker

END OF TASK

COLD WEATHER OPERATION

If breaker is to be used during cold weather, preheat hydraulic fluid at low engine speed. When using normally recommended fluids, fluid temperature should be at or above 50° F (10°C) before use.

Good maintenance practices will keep the breaker on the job and increase its service life.

A very important maintenance practice is to keep the hydraulic fluid clean at all times. Contaminated hydraulic fluid causes rapid wear and/or failure of internal parts.

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

HAMMER DRILL

DESCRIPTION

The hammer drill provides powerful rotary hammering action for percussion drilling of concrete and masonry.

Applications include drilling for concrete anchors, piping and mechanical openings, as well as other construction and repair work.

END OF TASK

OPERATOR SAFETY/WARNINGS

Tool operators must always comply with safety precautions listed here and on stickers and tags attached to tool and hose.

These safety precautions are given for your safety. Review them carefully before operating tool and before performing general maintenance or repairs. Failure to do so could result in personal injury or equipment damage.

WARNING

- Operator must start in work area without bystanders. Flying debris can cause serious injury.
- Always wear safety equipment such as goggles, ear and head protection, and safety shoes at all times when operating tool. Use gloves and aprons when necessary.
- Operator must be familiar with all prohibited work areas such as excessive slopes and dangerous terrain conditions.
- Do not inspect, clean or replace any part(s) if hydraulic power source is connected. Do not inspect or clean tool while hydraulic power source is connected. Accidental engagement of tool can cause serious injury.
- Always connect hoses to tool hose couplers before energizing the hydraulic power source. Be sure all hose connections are tight and are in good condition.
- Do not operate tool at oil temperatures above 140°F/60°C. Operation at higher temperatures can cause higher than normal temperatures at tool which can result in operator discomfort.
- Do not operate damaged, improperly adjusted, or incompletely assembled hammer drill.
- Never wear loose clothing that can get entangled in working parts of tool.
- Keep all parts of your body away from drill and maintain proper footing and balance at all times.
- When working near electrical conductors, always assume that all conductors are energized and that insulation, clothing and hoses can conduct electricity. Stay safe distance away from electrical conductors.
- If hydraulic power supply has been interrupted, place hammer drill in OFF position before restarting the hydraulic power supply.
- Never rest tool on your foot.
- Never allow your face to come close to tool.
- Never start tool while it is lying on ground.
- Failure to follow these warnings may result in injury or death to personnel.

END OF TASK

TOOL EQUIPMENT AND CARE

NOTE

In addition to the WARNINGs in this work package, ensure all couplers are wiped clean before connection.

1. Hydraulic circuit control valve must be in OFF position when coupling or uncoupling hydraulic tools. Failure to do so may result in damage to quick couplers and cause overheating of hydraulic system.
2. Always store tool in clean dry space, safe from damage or pilferage.
3. Ensure circuit pressure hose (with male quick disconnect) is connected to IN port. Circuit return hose (with female quick disconnect) is connected to opposite port. Do not reverse circuit flow. This can cause damage to internal seals.
4. Always keep critical tool markings, such as warning stickers and tags legible.
5. Tool repair should be performed only by Unit Maintenance.
6. Make certain that recommended relief valves are installed in pressure side of system.
7. Do not use tool for applications for which it was not intended.
8. Never operate hammer drill without drill bit or without holding it against work surface. To do so, places excessive strain on hammer drill.
9. Use sharp drill bits for maximum tool performance. Ensure drill bits are not chipped or rounded on striking end.

END OF TASK

OPERATION

1. Observe all safety precautions.
2. Install appropriate drill bit for job.
   a. Pull latch at foot of tool so that drill can be inserted into drive hex.

WARNING

Do not allow your fingers to come between latch and drill steel when closing latch. Failure to follow this warning may result in injury to personnel.

   b. Push latch back into “latched” (vertical) position to lock bit in place.

NOTE

- Rotation of drill bit is reversible. Drill bit speed is variable in each direction. This is accomplished by rotating lever on lower section of tool. Tool is in neutral when lever is in vertical up position. Lever can be rotated 90 degrees to horizontal position in each direction (Direction that bit rotates). Distance that lever is rotated determines speed of the bit. Horizontal position in either direction is maximum speed setting.
- Drill is not suitable for drilling steel or wood.

3. Select speed of bit best suited for material being drilled. Most drilling is best accomplished with lever halfway between fully ON (horizontal) and vertical UP position. Refer to above note.
4. Squeeze trigger (Figure 1, Item 1) to start the drill. Adequate down pressure is very important.

OPERATION – CONTINUED

Figure 1. Hammer Drill

NOTE

If trigger is partially depressed, piston will cycle at low rate and permit easier starting of drill bit into the work surface.

5. Periodically pull drill out of hole while bit is still rotating. This will clear hole and allow more efficient penetration.

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

POST DRIVER

DESCRIPTION

The post driver is designed to provide stable, powerful high-speed driving for a variety of post sizes.

Applications include driving in road barrier tubes, profiles, signposts, fence posts, T-posts, and a wide range of anchors.

END OF TASK

OPERATOR SAFETY/WARNINGS

Tool operators must always comply with the safety precautions listed here and on the stickers and tags attached to the tool and hose.

These safety precautions are given for your safety. Review them carefully before operating the tool and before performing general maintenance or repairs. Failure to do so could result in personal injury or equipment damage.

WARNING

- Operator must start in a work area without bystanders. The operator must be familiar with all prohibited work areas such as excessive slopes and dangerous terrain conditions.
- Always wear safety equipment such as goggles, head protection, and safety shoes at all times when operating the tool.
- Do not inspect or clean the tool while the hydraulic power source is connected. Accidental engagement of the tool can cause serious injury.
- Do not operate this tool without first reading the Operating Instructions.
- Do not install or remove this tool while the hydraulic power source is connected. Accidental engagement of the tool can cause serious injury.
- Never operate the tool if you cannot be sure that underground utilities are not present. Underground electrical utilities present an electrocution hazard. Underground gas utilities present an explosion hazard. Other underground utilities may present other hazards.
- Do not wear loose fitting clothing when operating the tool. Loose fitting clothing can get entangled with the tool and cause serious injury.
- Be sure all hose connections are tight.
- The hydraulic circuit control valve must be in the OFF position when coupling or uncoupling the tool. Wipe all couplers clean before connecting. Failure to do so may result in damage to the quick couplers and cause overheating. Use only lint-free cloths.
- Do not operate the tool at oil temperatures above 140°F (60°C). Operation at higher oil temperatures can cause operator discomfort and may cause damage to the tool.
- Do not operate a damaged, improperly adjusted, or incompletely assembled tool.
- To avoid personal injury or equipment damage, all tool repair, maintenance, and service must only be performed by authorized and properly trained personnel.
- Do not exceed the rated limits of the tool or use the tool for applications beyond its design capacity.
- Always keep critical tool markings, such as labels and warning stickers legible.
- Always replace parts with replacement parts recommended by Stanley Hydraulic Tools.
- Check fastener tightness often and before each use daily.
- Failure to follow these warnings may result in injury or death to personnel.

END OF TASK

EQUIPMENT PROTECTION AND CARE

NOTE

In addition to the WARNINGs in this work package, observe the following for equipment protection and care.

1. Ensure all couplers are wiped clean before connection.
2. The hydraulic circuit control valve must be in the OFF position when coupling or uncoupling hydraulic tools. Failure to do so may result in damage to the quick couplers and cause overheating of the hydraulic system.
3. Always store the tool in a clean dry space, safe from damage or pilferage.
4. Ensure the circuit pressure hose (with male quick disconnect) is connected to the IN port. The circuit return hose (with female quick disconnect) is connected to the opposite port. Do not reverse circuit flow. This can cause damage to internal seals.
5. Always keep critical tool markings, such as warning stickers and tags legible.
6. Do not use the tool for applications it was not designed for.
7. Tool repair should be performed by experienced personnel only.
8. Make certain that the recommended relief valves are installed in the pressure side of the system.
9. Do not use the tool for applications for which it was not intended.

END OF TASK

INSTALLING ADAPTERS

1. The post driver is designed to drive No. 1 thru No. 4 sign post, 2-1/2 in. square and up to 2-5/8 in. diameter round post without requiring adapters. If you are driving one of these types of posts, orient the post into the tightest fit in the post driver foot.
2. If you are driving smaller square or round post, insert the adapter to the post driver foot using two 1/2-hex head cap-screws.

END OF TASK

OPERATION

1. Observe all safety precautions.
2. Install the appropriate adapter as required.
3. Place the post driver foot firmly on the surface to be driven.
4. Press the lever assembly (Figure 1, Item 1) on handle to start the post driver.

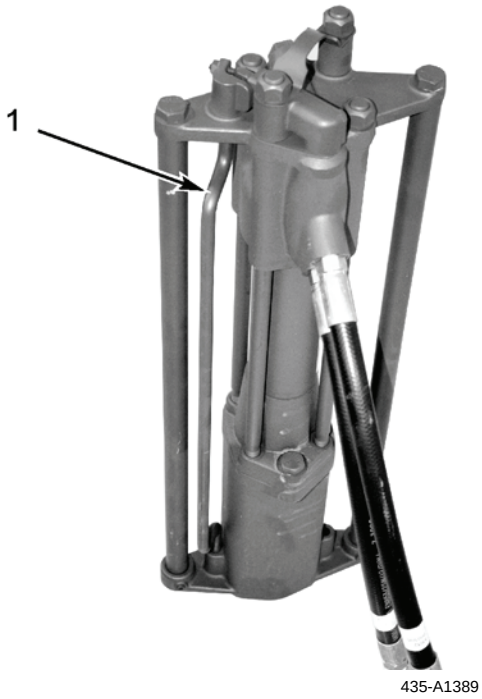


Figure 1. Post Driver

NOTE

- On Remote ON/OFF Valve Models Place the post driver on/off control valve in the ON position to start the post driver.
- Adequate down pressure is very important.

5. When the post is fully set in the ground, release the lever assembly on handle.

END OF TASK

COLD WEATHER OPERATION

1. If the post hammer is to be used during cold weather, preheat the hydraulic fluid at low engine speed. When using the normally recommended fluid, fluid temperature should be at or above 50°F (10°C) before use.
2. Damage to the hydraulic system or post driver can result from use with fluid that is too viscous or thick.
3. If bit binds in hole, reverse direction of bit rotation to assist in backing out drill.
4. Keep drill bit centered in hole.
5. If drill is to be used during cold weather, preheat hydraulic fluid at low engine speed. When using normally recommended fluids, fluid temperature should be at or above 50°F (10°C) before use.
6. Damage to hydraulic system or drill can result from use with fluid that is too viscous or too thick.

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

SPECIAL PURPOSE KITS LIST

This work package lists the Special Purpose Kits (SPKs) for the HMEE-I. Where to find operation instructions and trouble-shooting procedures for the SPKs are also provided.

END OF TASK

OPERATION INSTRUCTIONS FOR SPKS

For instructions on how to operate the SPKs, go to WP 0040 for the forklift assembly, WP 0041 for the rotary sweeper, WP 0042 for the auger (earth drill), and WP 0043 for the arctic heater.

END OF TASK

TROUBLESHOOTING PROCEDURES FOR SPKS

Troubleshooting for the SPKs is in WP 0044.

END OF TASK

INTRODUCTION TO TABLE 1

The listing in Table 1 is for information purposes only and is not authority to requisition replacements. These items are part of the HMEE-I, but they are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts.

END OF TASK

EXPLANATION OF COLUMNS IN TABLE 1

1. **Column (1) - National Stock Number (NSN).** Identifies the stock number of the item to be used for requisitioning purposes.
2. **Column (2) - Description, Part Number/(CAGEC).** Identifies the Federal item name followed by a minimum description when needed. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).
3. **Column (3) - Unit of Issue (U/I).** Unit of Issue (U/I) indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (1).
4. **Column (4) - (QTY RQD).** Indicates the quantity required.

Table 1. Special Purpose Kits.

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION, PART NUMBER/(CAGEC)	(3) U/I	(4) QTY RQD
	Forklift Assembly (OJKFO) 347/00526	EA	1
	Rotary Sweeper (OJKFO) 347/00530	EA	1
	Auger (Earth Drill) (OJKFO) 347/00534	EA	1
	Arctic Heater (OJKFO)	EA	1

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

FORKLIFT ASSEMBLY

DESCRIPTION

WARNING

- This machine is designed for use in normal outdoor atmospheric conditions. It should not be used in an enclosed area without adequate ventilation. Do not use the machine in a potentially explosive atmosphere, i.e., combustible vapors, gas, or dust. Failure to comply may result in injury or death to personnel.
- Before backing away from a load, ensure the quick hitch is angled slightly forward to prevent fork tines from springing upward when load is released. Failure to follow this warning may result in injury to personnel.

The forklift is operated by a main control lever (Figure 1, Item 1) and an auxiliary control lever (Figure 1, Item 2). Pressing the transmission dump pushbutton (Figure 1, Item 3) on the lever knob quickly disconnects the transmission from the engine. This gives more power to the forklift. The auxiliary solenoid button (Figure 1, Item 4) on the auxiliary control lever allows the forks to be either rotated or sideshifted. There is a second transmission kick-down button built into the main loader control knob, for use when loading with the front bucket.

For individual forklift movements (raise, lower, tilt forward, tilt back), the lever is moved in a "+" pattern. Combined movements can be selected by moving the lever in directions between the four main ones. For example, the forklift is raised by pulling the lever straight back, while to tilt the forklift back the lever must be moved to the left (e.g., if you pull the lever diagonally back-and-left, the forklift will both rise and tilt back).

The speed of forklift actions depends on how far you move the lever. The further you move it, the faster the action. The lever is spring-loaded to its central (hold) position. The forklift will stay in any position until you move it.

A decal, located beside the control lever, shows by symbols what lever movements cause which forklift actions. The symbols, lever movements, and forklift actions are described on the following pages.

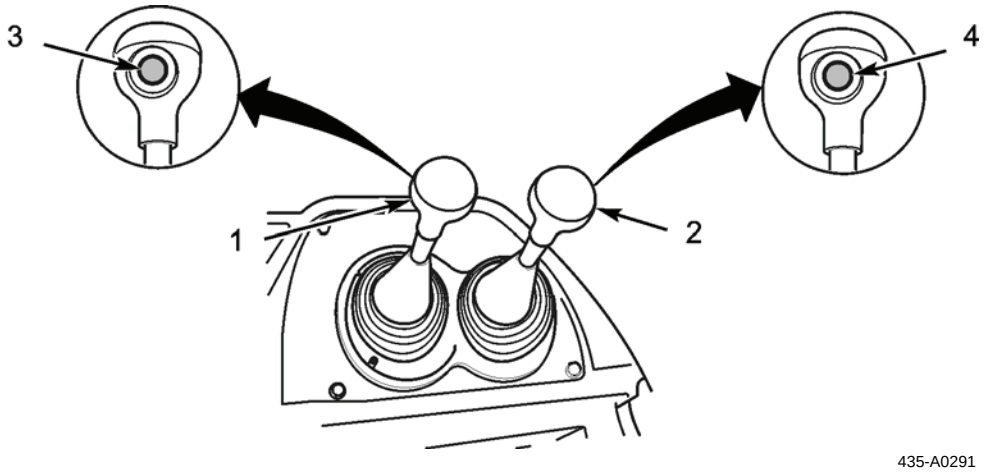


Figure 1. Forklift Controls

OPERATOR SAFETY/WARNINGS

WARNING

- Improper installation, operation, or maintenance of this equipment could result in serious injury or death. Operators and maintenance personnel should read this manual as well as all manuals related to this equipment thoroughly before beginning installation, operation, or maintenance. Follow all safety instructions.
- Read all safety decals and safety statements prior to operating this equipment. Know and obey all OSHA regulations local laws.
- Know your equipment.
- Know your equipment's capabilities, dimensions, and operations before operating.
- Do not disconnect or remove any hydraulic system line or fitting unless engine is shut down and hydraulic system pressure has been relieved. Tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing injury or death to personnel.
- At operating temperature, hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulic lines. Failure to follow this warning may result in injury or death to personnel.
- Ensure the correct suspension mode is selected for the operation you are carrying out. Failure to follow this warning may result in injury or death to personnel or damage to equipment.
- Select the correct suspension mode before commencing forklift operations.
- Failure to follow these warnings may result in injury or death to personnel.

END OF TASK

RAISE FORKLIFT

WARNING

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility. Do not operate the machine if you cannot see properly. Failure to follow this warning may result in injury or death to personnel.

To raise the forklift (Figure 2, Item 1), pull the lever (Figure 2, Item 2) straight back.

NOTE

As the forks rise, they will stay at the same angle to the ground. This is due to the design of the hydraulic system.

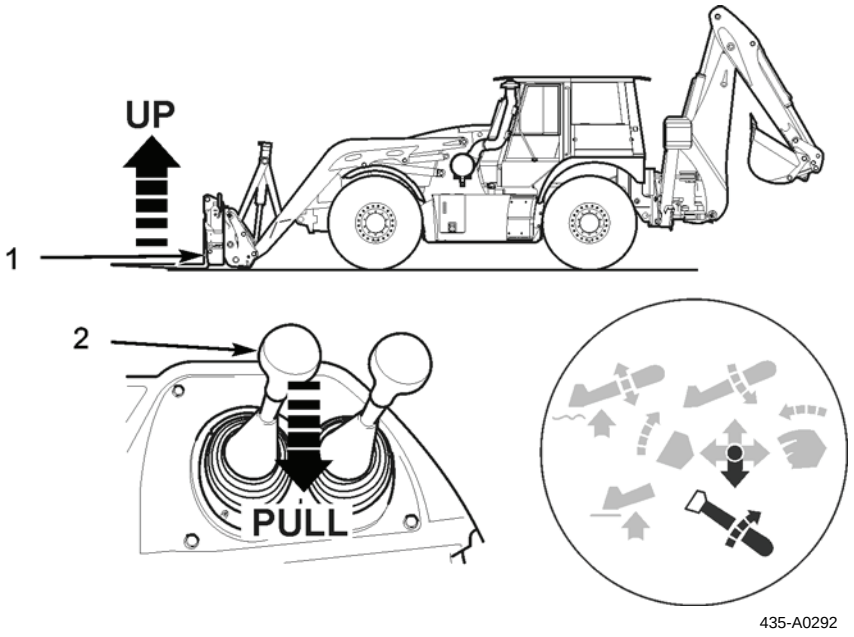


Figure 2. Raise Forklift

END OF TASK

LOWER FORKLIFT

WARNING

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility. Do not operate the machine if you cannot see properly. Failure to follow this warning may result in injury or death to personnel.

To lower the forklift (Figure 3, Item 1), push the lever (Figure 3, Item 2) forward.

NOTE

As the forks are lowered, they will stay at the same angle to the ground. This is due to the design of the hydraulic system.

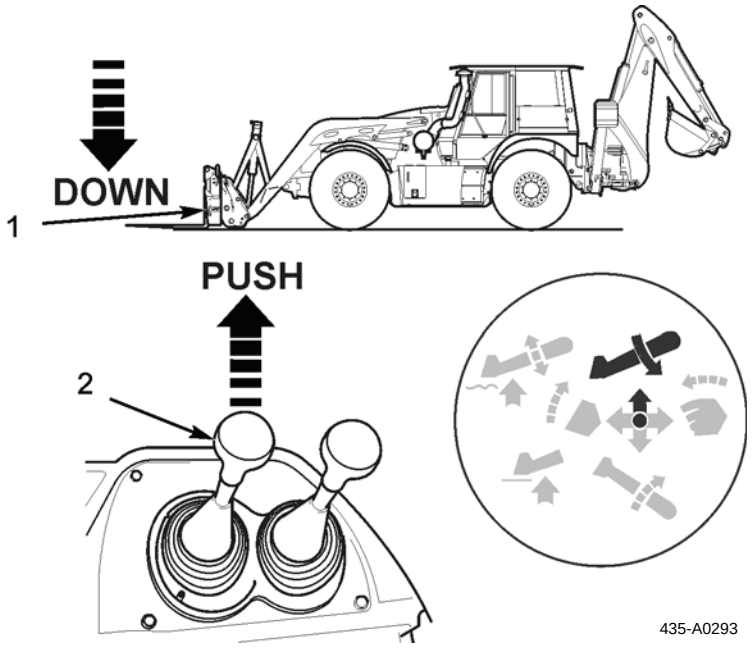


Figure 3. Lower Forklift

END OF TASK

TILT FORWARD/TILT BACKWARDS

WARNING

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility. Do not operate the machine if you cannot see properly. Failure to follow this warning may result in injury or death to personnel.

Tilt Forward

To tilt the forks (Figure 4, Item 1) forward, push the lever (Figure 4, Item 2) to the right.

Tilt Backwards

To tilt the forks (Figure 4, Item 1) back, pull the lever (Figure 4, Item 2) to the left.

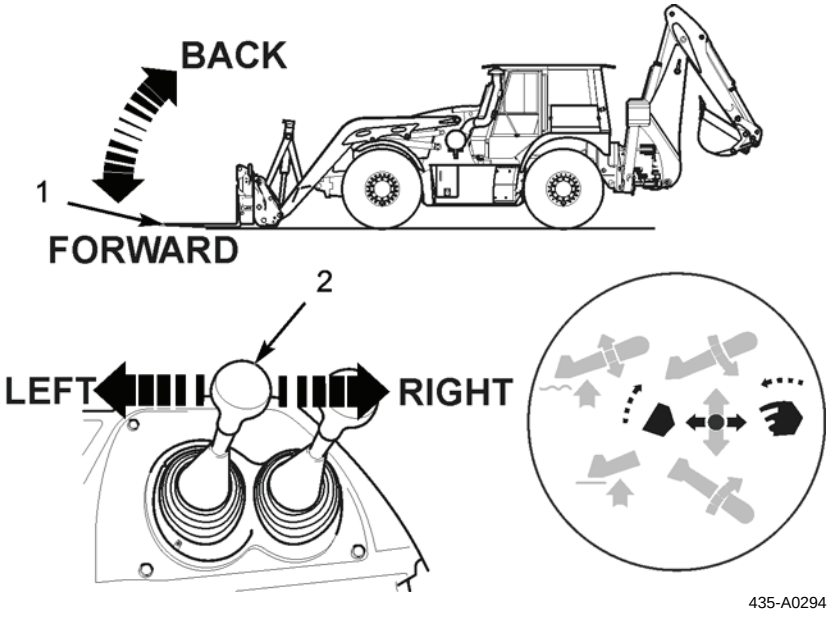


Figure 4. Tilting Forklift

END OF TASK

SIDESHIFT FORKLIFT CARRIAGE

There is a second (auxiliary) control lever next to the standard one. The standard lever operates as described earlier. The second (auxiliary) lever operates the sideshifting and the rotation of the forklift carriage.

The two levers can be operated at the same time to produce combined forklift actions. The lever movements and their effects on the forklift are shown on a plastic decal located close to the lever.

WARNING

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility. Do not operate the machine if you cannot see properly. Failure to follow this warning may result in injury or death to personnel.

1. Sideshift LEFT (As Seen from Operator's Seat). To sideshift the forklift carriage (Figure 5, Item 1) to the LEFT, push the lever (Figure 5, Item 2) forward.
2. Sideshift RIGHT (As Seen from Operator's Seat). To sideshift the forklift carriage (Figure 5, Item 1) to the RIGHT, pull the lever (Figure 5, Item 2) backwards.

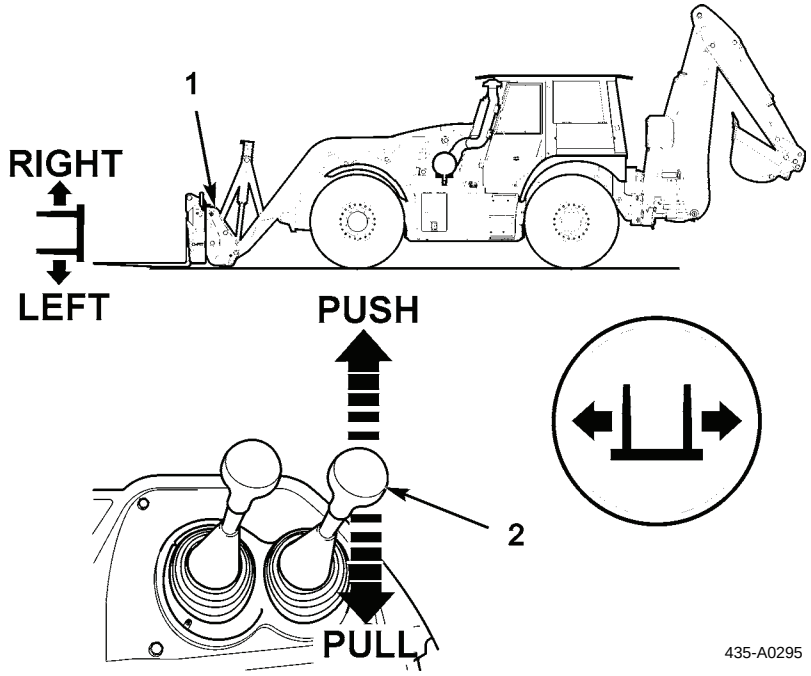


Figure 5. Sideshift Forklift Carriage

END OF TASK

ROTATION OF FORKLIFT CARRIAGE

The second (auxiliary) lever operates the sideshifting and the rotation of the forklift carriage. The lever has an auxiliary switch built into the lever knob. Without the switch being operated, the lever acts as described in Sideshifting the Forklift. When the button is depressed, it changes the sideshift operation to the rotation operation described below.

The main and auxiliary levers can be operated at the same time to produce combined forklift actions as previously described.

WARNING

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility. Do not operate the machine if you cannot see properly. Failure to follow this warning may result in injury or death to personnel.

1. To Rotate the Forklift Carriage counterclockwise (as seen from operator's seat). To rotate the forklift carriage (Figure 6, Item 1) counterclockwise, depress and hold the auxiliary system button (Figure 6, Item 2) in the auxiliary control lever (Figure 6, Item 3) and push the lever forwards.
2. To Rotate the Forklift Carriage clockwise (as seen from operator's seat). To rotate the forklift carriage (Figure 6, Item 1) clockwise, depress and hold the auxiliary system button (Figure 6, Item 2) in the auxiliary control lever (Figure 6, Item 3) and pull the lever backwards.

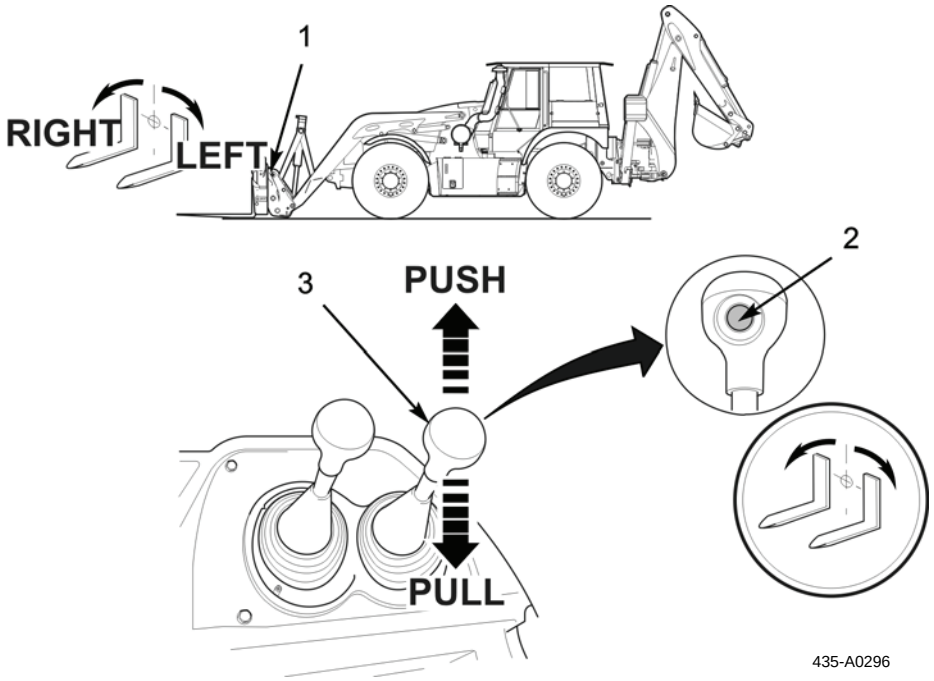


Figure 6. Rotate Forklift Carriage

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

ROTARY SWEEPER

DESCRIPTION

This sweeper is designed solely for the use in construction cleanup, road maintenance, and similar operations. Use in any way other than intended can be dangerous to personnel.

OPERATOR SAFETY/WARNINGS

Improper installation, operation, or maintenance of this equipment could result in serious injury or death. Operators and maintenance personnel should read this manual as well as all manuals related to this equipment thoroughly before beginning installation, operation, or maintenance. Follow all safety instructions.

Read all safety decals and safety statements prior to operating this equipment. Know and obey all OSHA regulations, local laws.

WARNING

- Know your equipment.
- Know your equipment's capabilities, dimensions and operations before operating.
- Protect against flying debris.
- Always wear proper safety glasses, goggles or a face shield when driving pins in or out or when operation causes dust, flying debris, or any other hazardous material.
- Do not disconnect or remove any hydraulic system line or fitting unless engine is shut down and hydraulic system pressure has been relieved. Tighten all connections before applying pressure. Escaping hydraulic fluid under pressure can penetrate the skin, causing injury or death to personnel.
- At operating temperature, hydraulic oil is hot. Allow hydraulic oil to cool before disconnecting any hydraulic lines. Failure to follow this warning may result in injury or death to personnel.
- Do not operate equipment until you are completely trained by a qualified operator in how to use the controls, know its capabilities, dimensions, and all safety requirements.
- Keep all step plates, grab bars, pedals, and controls free of dirt, grease, debris, and oil.
- Never allow anyone to be around the equipment when it is operating.
- Do not allow riders on the attachment.
- Do not operate the equipment from anywhere other than the correct operators position.
- Never leave equipment unattended with the engine running or with this attachment in a raise position.
- Do not alter or remove any safety feature from this attachment.
- Know your work site safety rules as well as traffic rules and flow.
- Failure to follow these warnings may result in injury or death to personnel.

END OF TASK

SWEEPER CONTROLS

WARNING

This machine is designed for use in normal outdoor atmospheric conditions. It should not be used in an enclosed area without adequate ventilation. Do not use the machine in a potentially explosive atmosphere, i.e., combustible vapors, gas, or dust. Failure to follow this warning may result in injury or death to personnel.

The sweeper is operated by a main control lever (Figure 1, Item 1) and an auxiliary control lever (Figure 1, Item 4). Pressing the transmission dump pushbutton (Figure 1, Item 2) on the lever knob quickly disconnects the transmission from the engine. This gives more power to the sweeper. The auxiliary solenoid button (Figure 1, Item 3) on the auxiliary control lever allows the sweeper to be either operated or slewed. There is a second transmission kick-down button built into the main loader control knob, for use when loading with the front bucket.

For individual sweeper movements (raise, lower, tilt forward, tilt back), the lever is moved in a "+" pattern.

Combined movements can be selected by moving the lever in directions between the four main ones. For example, the sweeper is raised by pulling the lever straight back, while to tilt the sweeper back the lever must be moved to the left (e.g., if you pull the lever diagonally back-and-left, the sweeper will both rise and tilt back).

The speed of sweeper actions depends on how far you move the lever. The further you move it, the faster the action. The lever is spring-loaded to its central (hold) position. The sweeper will stay in any position until you move it.

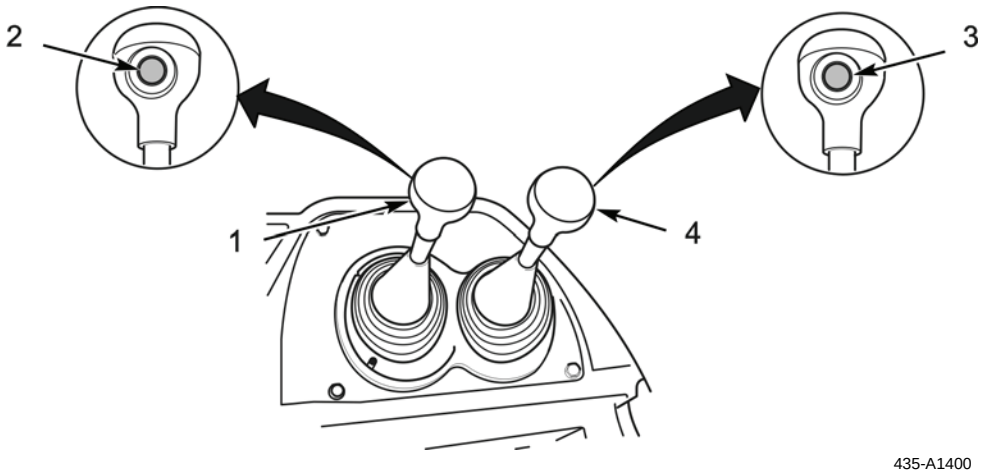


Figure 1. Sweeper Controls

SWEEPER CONTROLS – CONTINUED

WARNING

Ensure the correct suspension mode is selected for the operation you are carrying out. Failure to follow this warning may result in injury or death to personnel and/or damage to equipment.

1. Select the correct suspension mode before commencing sweeper operations.
2. Activate the sweeper detent circuit by selecting the detent switch (Figure 2, Item 1).

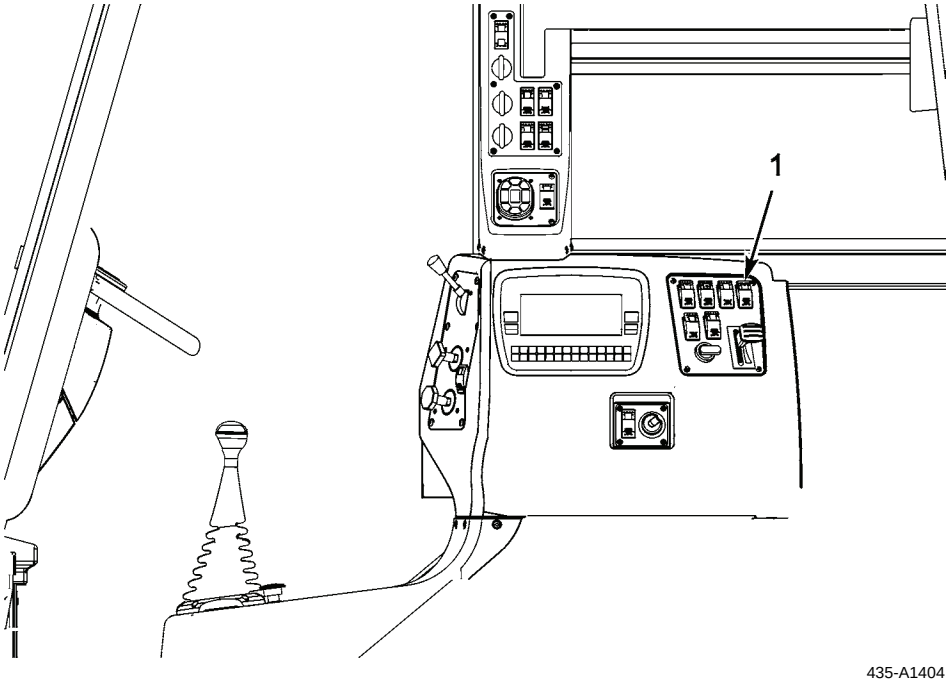


Figure 2. Detent Switch

SWEEPER CONTROLS – CONTINUED

Raise Sweeper

WARNING

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility. Do not operate the machine if you cannot see properly. Failure to follow this warning may result in injury or death to personnel.

To raise the sweeper (Figure 3, Item 1), pull the lever (Figure 3, Item 2) straight back.

NOTE

As the sweeper rises, it will stay at the same angle to the ground. This is due to the design of the hydraulic system.

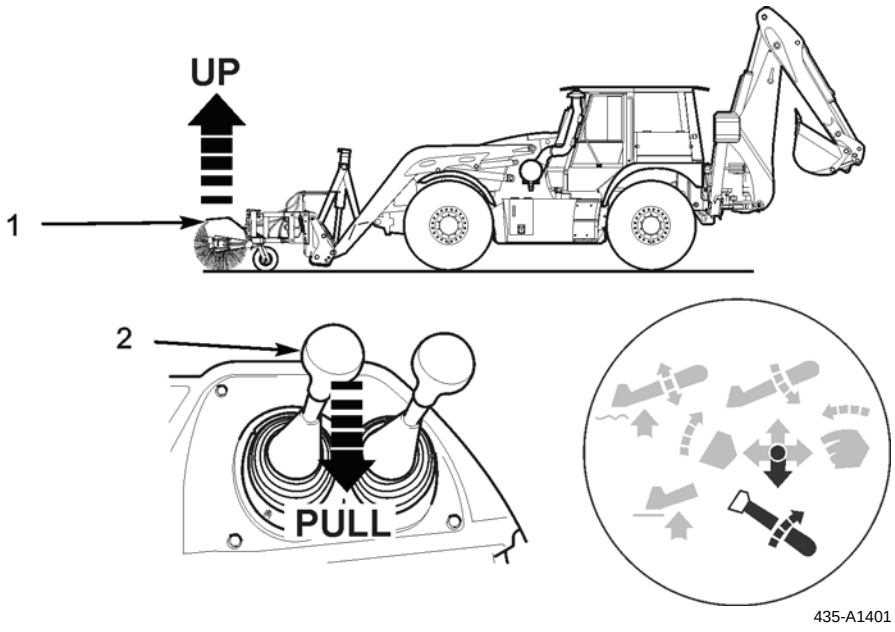


Figure 3. Raise Sweeper

SWEEPER CONTROLS – CONTINUED

Lower Sweeper

WARNING

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility. Do not operate the machine if you cannot see properly. Failure to follow this warning may result in injury or death to personnel.

To lower the sweeper (Figure 4, Item 1), push the lever (Figure 4, Item 2) forward.

NOTE

As the sweeper is lowered, it will stay at the same angle to the ground. this is due to the design of the hydraulic system.

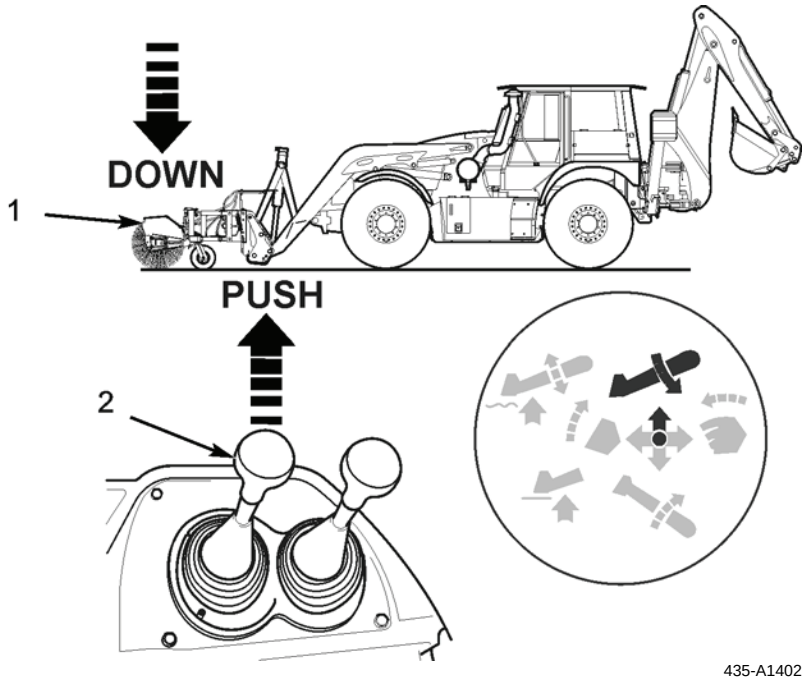


Figure 4. Lower Sweeper

SWEEPER CONTROLS – CONTINUED

Tilt Forward/Tilt Backwards

WARNING

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility. Do not operate the machine if you cannot see properly. Failure to follow this warning may result in injury or death to personnel.

Tilt Forward

To tilt the sweeper (Figure 5, Item 1) forward, push the lever (Figure 5, Item 2) to the right.

Tilt Backwards

To tilt the sweeper (Figure 5, Item 1) back, pull the lever (Figure 5, Item 2) to the left.

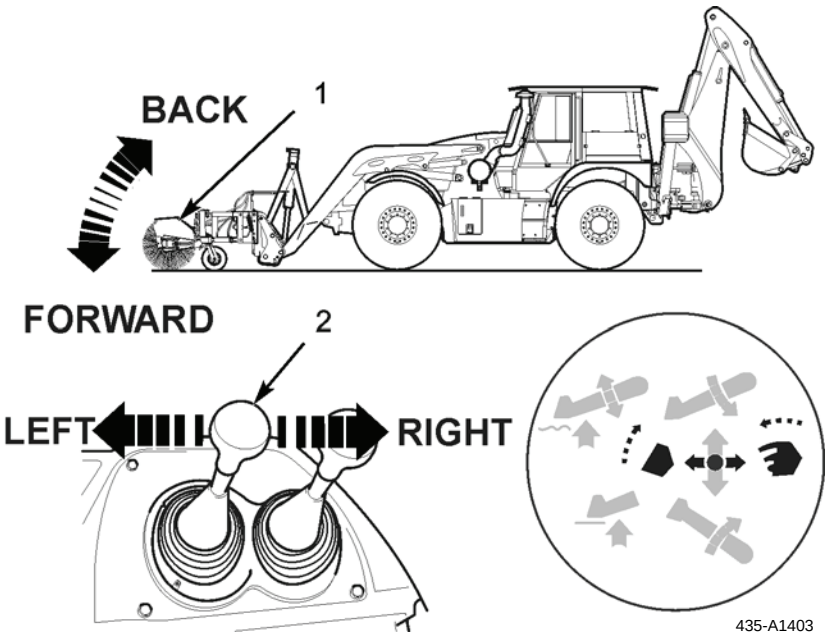


Figure 5. Tilt Sweeper

SWEEPER CONTROLS – CONTINUED

Engaging the Sweeper Brush Head

There is a second (auxiliary) control lever next to the standard one. The standard lever operates as described earlier. The second (auxiliary) lever operates the slewing and the engagement of the sweeper brush head.

WARNING

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility. Do not operate the machine if you cannot see properly. Failure to follow this warning may result in injury or death to personnel.

1. **Engage Brush Head for Sweeping.** To engage the brush head (Figure 6, Item 1) for sweeping, pull the lever (Figure 6, Item 2) backwards.
2. **To Engage Detent for Continuous Sweeping.** To engage the detent for continuous sweeping, pull the lever (Figure 6, Item 2) backwards until the lever locks in place.
3. **Engage Brush Head in Reverse.** To engage the brush head (Figure 6, Item 1) in reverse, push the lever (Figure 6, Item 2) forward.

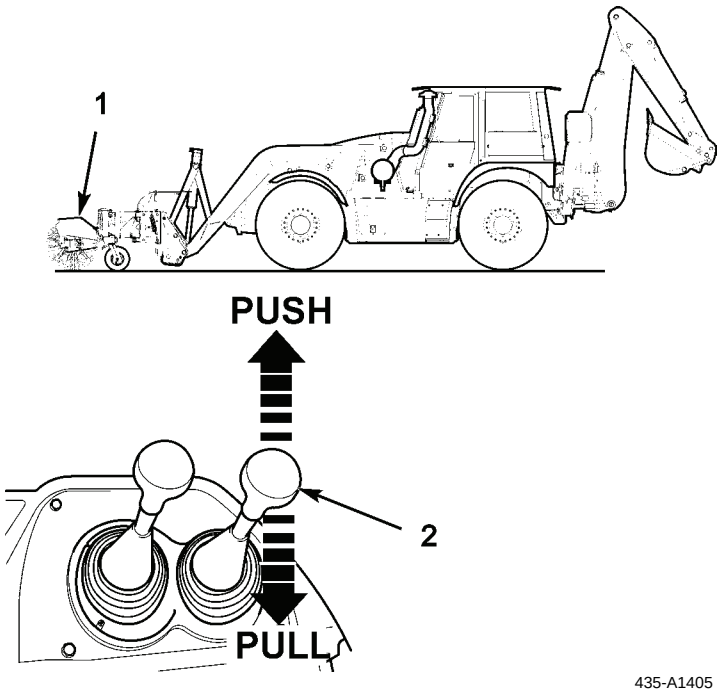


Figure 6. Engaging Sweeper

SWEEPER CONTROLS – CONTINUED

Slewing of the Sweeper Carriage

The second (auxiliary) lever operates the rotation and the slewing of the sweeper carriage. The lever has an auxiliary switch built into the lever knob. Without the switch being operated, the lever acts as described in *Engaging the Sweeper.* When the button is depressed, it changes the rotation operation to the slewing operation described below.

The main and auxiliary levers can be operated at the same time to produce combined sweeper actions as previously described.

WARNING

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility. Do not operate the machine if you cannot see properly. Failure to follow this warning may result in injury or death to personnel.

1. **To Slew the Sweeper Carriage to the RIGHT (As Seen from Operator's Seat).** To slew the sweeper carriage (Figure 7, Item 1) to the right, depress and hold the auxiliary system button (Figure 7, Item 2) in the auxiliary control lever (Figure 7, Item 3) and pull the lever backwards.
2. **To Slew the Sweeper Carriage to the LEFT (As Seen from Operator's Seat).** To slew the sweeper carriage (Figure 7, Item 1) to the left, depress and hold the auxiliary system button (Figure 7, Item 2) in the auxiliary control lever (Figure 7, Item 3) and push the lever forwards.

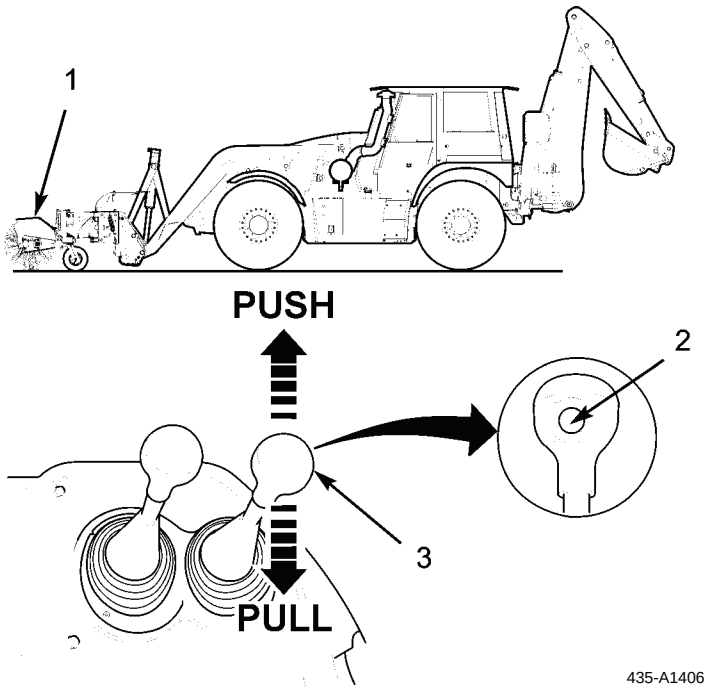


Figure 7. Slewing Sweeper

END OF TASK

ADJUSTING SWEEPER

NOTE

Adjust the four-bar linkage before each operation to avoid sweeper damage.

The mounting incorporates a four-bar linkage system that allows the sweeper to move up and down independently of the loader arms. This feature is very important because it permits the sweeper to follow the contours of the ground, offering a good sweep.

Sweeping with a properly adjusted mounting offers efficient performance, while using the mounting out of adjustment can cause severe damage to the sweeper and can result in a poor sweep. If the loader arms are positioned too low, the sweeper must support the loader arms, an amount of weight far greater than the sweeper is designed to carry. If the loader arms are too high, the sweeper cannot sweep into the low areas.

1. Drive the loader and sweeper to a flat surface.
2. Lower the sweeper so the casters sit on the ground.
3. Ensure loader arm travel struts are fitted to lift cylinders (WP 0021).
4. Adjust the loader arms so the top of the weldment on the sweeper and the top of the weldment connected to the loader arms are even and toplink is horizontal with the ground.

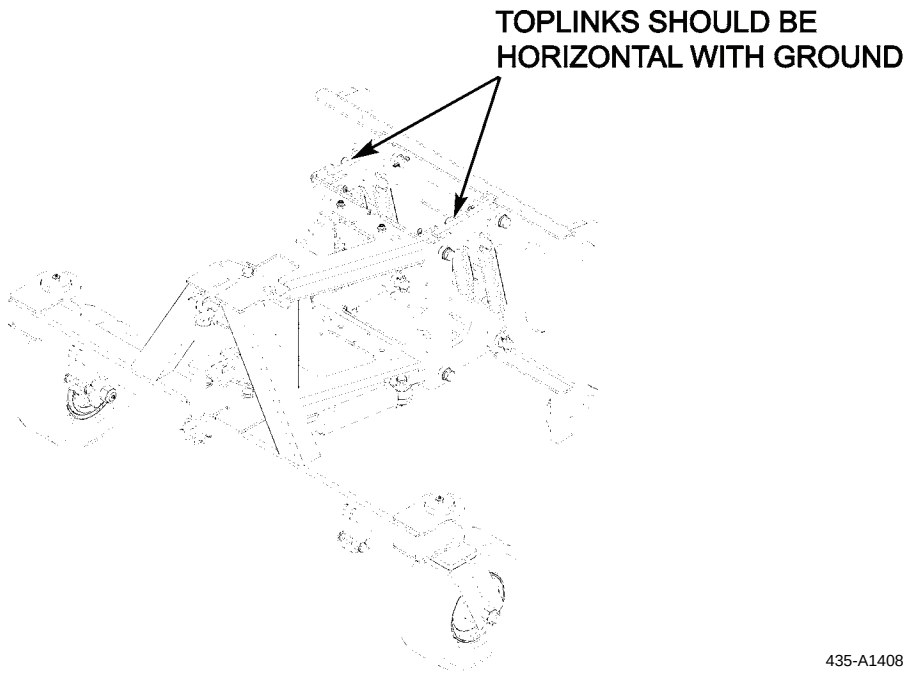


Figure 8. Adjusting Sweeper

END OF TASK

BRUSH PATTERN

NOTE

A properly adjusted brush offers the best sweeper performance. To check the brush pattern, use the following procedures.

1. Start the sweeper at a slow speed; then, lower it into sweeping position. Run the sweeper in a stationary position for 10 seconds.
2. Raise the sweeper and back away; switch off the engine and remove the key from the prime mover. The brush pattern left in the dust should be 2-4 in. wide, running the length of the brush (Figure 9).
3. Adjust the brush pattern as necessary using the adjusting ratchet.
4. Repeat steps 1 thru 3 until the brush pattern is 2-4 in. wide.

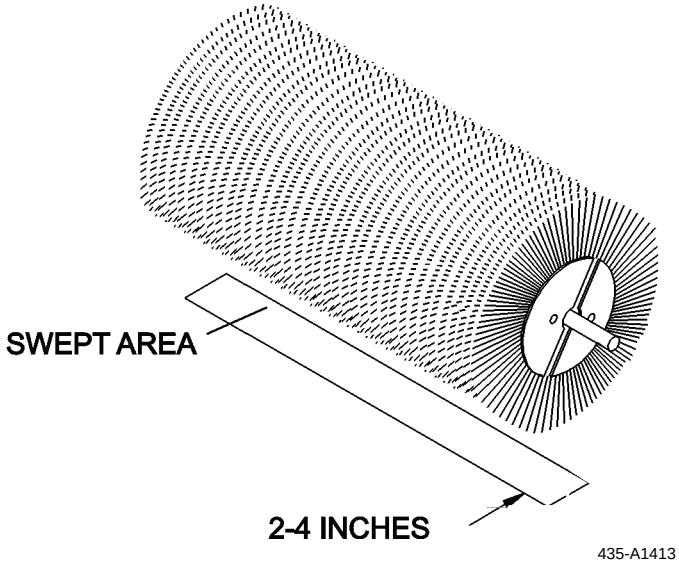


Figure 9. Brush Pattern

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

AUGER (EARTH DRILL)

DESCRIPTION

The auger is used to dig round vertical holes in different types of terrain. By changing the size of the auger bit, one can vary the diameter of the hole. By using the extension deep hole can be achieved. A clockwise rotation is the digging rotation. A counterclockwise rotation is used to free a stuck auger bit.

END OF TASK

OPERATOR SAFETY/WARNINGS

WARNING

- All bystanders should be kept a minimum of 10 ft (3 m) away from working area of the auger.
- Always wear a hard hat and safety eye protection when operating this equipment. Do not wear loose fitting clothing, flopping cuffs, dangling neckties and scarves, or rings and wrist watches that can catch moving parts.
- Always locate underground electrical wires, telephone cables, gas, water and sewer lines before digging. Maintain safe clearance and avoid contact with any underground or overhead utility lines or electrically charged conductors.
- Never alter or remove any safety decals or shields. Replace all missing or damaged safety decals or safety shields. Check this manual for location of these items and replace immediately if damaged or illegible.
- Whenever changing or installing this attachment, ensure all connections are securely fastened.
- Before disconnecting hydraulic lines or fittings be sure to relieve all pressure by cycling all hydraulic controls after shutdown. Remember hydraulic systems are under pressure whenever the engine is running and may hold pressure after shutdown. Before applying pressure to the system ensure all connections are tight and that there is no damage to lines, fittings, or hoses.
- Failure to follow these warnings may result in injury or death to personnel.

END OF TASK

STABILIZER CONTROLS

The stabilizers are powered from the main hydraulic system and are used to stabilize the machine while working with the backhoe.

WARNING

- The stabilizers must be down when you use the backhoe or the machine may become unstable. Each stabilizer has its own control lever and can be operated independently. Failure to follow this warning may result in injury to personnel.
- You must be sitting in the driver's seat when operating the stabilizer controls. Do not operate the stabilizers from outside the machine. Failure to follow this warning may result in injury or death to personnel.
- Lower each stabilizer to level the machine and take the weight off the rear tires. The loader shovel should be used along with the stabilizers to level and steady the machine. Failure to follow this warning may result in injury to personnel or damage to equipment.
- Bystanders could be crushed and obstacles could be damaged if they are beneath the stabilizers while they are being lowered. Before lowering the stabilizers, ensure all bystanders are clear of the machine. Ensure there are no obstacles beneath the stabilizers and lower them onto firm ground. Failure to follow this warning may result in injury or death to personnel or damage to equipment.
- Ensure the correct suspension mode is selected for the operation you are carrying out. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

1. Select the excavator suspension mode.
2. To raise the stabilizers (Figure 1, Items 1 and 2), pull the control levers (Figure 1, Items 3 and 4) towards the front of the machine.
3. To lower the stabilizers (Figure 1, Items 1 and 2), push the levers (Figure 1, Items 3 and 4) towards the rear of the machine.

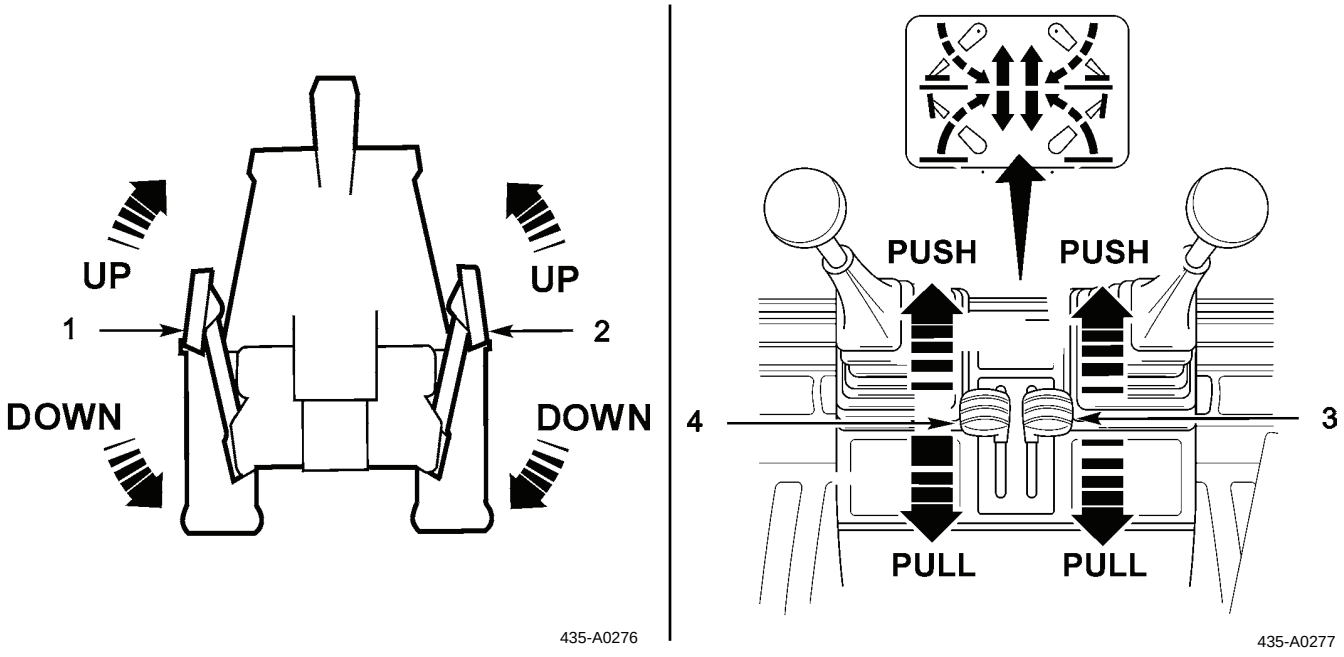


Figure 1. Stabilizer Controls

STABILIZER CONTROLS – CONTINUED

Occasionally there may be a need for fully extending one or both stabilizers in order to level the machine on steep slopes.

In these conditions, it may be necessary to use the boom (Figure 2, Item 1) to apply a down force to enable the stabilizers (Figure 2, Item 2) to fully extend. In these conditions, raising the bucket (Figure 2, Item 3) off the ground also helps. Make use of the inclinometer to ensure the machine is level before starting excavating operations.

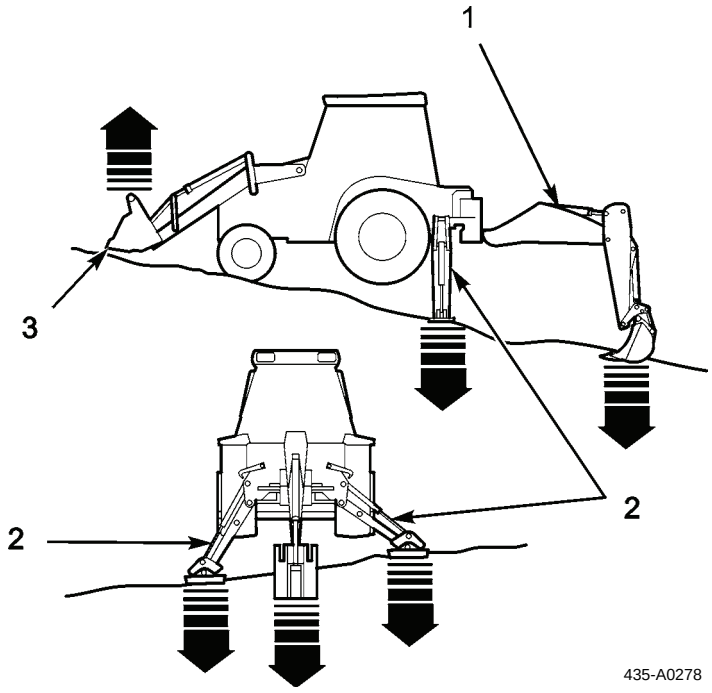


Figure 2. Leveling Machine on Steep Slopes

END OF TASK

BACKHOE CONTROLS

Prepare Backhoe for Operation

WARNING

The stabilizers must be down when you use the backhoe or the machine may become unstable. Each stabilizer has its own control lever and can be operated independently. Failure to follow this warning may result in injury to personnel.

The machine is equipped with SAE (“+”) pattern controls. There are two backhoe control levers. The left-hand lever operates the boom and swing. The right-hand lever operates the dipper.

Both levers move in a “+” pattern for individual backhoe actions. Combined actions can be selected by moving the levers in directions between the four main ones.

Both levers can be operated at the same time, for more efficient operation. The speed of the backhoe action depends on how far you move the levers. The further you move a lever, the faster the action.

Both levers are spring-loaded to their central (hold) positions. The backhoe will stay in any position until you move it with the levers.

A decal near the controls shows, by symbols, what lever movements cause which backhoe actions. The lever movements and backhoe actions are explained on the following pages.

WARNING

- Before you start using the backhoe, you must convert the machine into a safe and suitable working platform. Failure to follow this warning could lead to injury or death to personnel.
- Ensure the correct suspension mode is selected for the operation you are carrying out. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

NOTE

Choose a suitable digging position, avoid digging uphill if possible. Whenever possible, dump the load on the uphill side of excavation. Both these precautions will help to keep the machine stable.

1. When the machine is in the desired position, select the suspension excavator mode.

NOTE

When working on asphalt surfaces, do not roll the bucket fully forward. Keep the bottom of the bucket flat on the ground. This will minimize damage to the surface.

2. Roll the bucket forward, then lower it to take the weight off the front tires.
3. Set the gear selection column switch to Neutral. Ensure it is in its detent position.
4. Engage the parking brake (WP 0005).
5. Turn the operator’s seat to face the backhoe controls. Ensure the seat locks into position.
6. Set the engine speed using the hand throttle to 1,800 rpm (this speed is considered suitable for most backhoe operations).
7. Lower the stabilizers.
8. Release the backhoe boom lock.
9. Release the backhoe swing lock.

BACKHOE CONTROLS – CONTINUED

Raise Boom

WARNING

- The stabilizers must be down when you use the backhoe or the machine may become unstable. Each stabilizer has its own control lever and can be operated independently. Failure to follow this warning may result in injury to personnel.
- You or others can be killed or seriously injured if you carry out unfamiliar operations without first practicing them. Keep all bystanders clear of the operating area. Operating the wrong control lever or moving controls violently may result in injury or death to personnel.
- Before raising the boom, check that it is clear overhead. Failure to follow this warning may result in injury or death to personnel.

To raise the boom (Figure 3, Item 1), pull the left-hand lever (Figure 3, Item 2) towards the front of the machine.

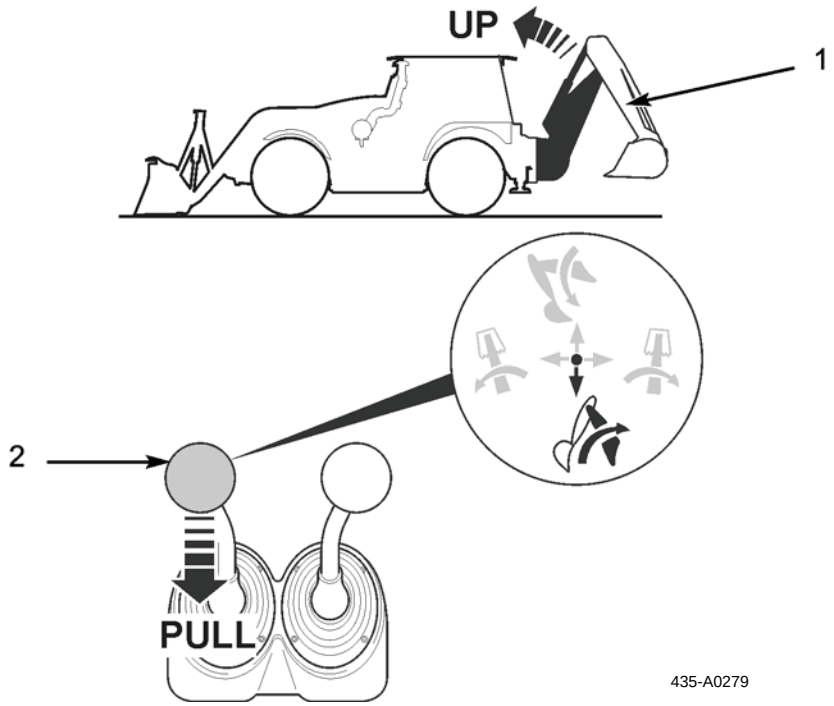


Figure 3. Raise Boom

BACKHOE CONTROLS – CONTINUED

Lower Boom

To lower boom (Figure 4, Item 1), push the left-hand lever (Figure 4, Item 2) toward the rear of the machine.

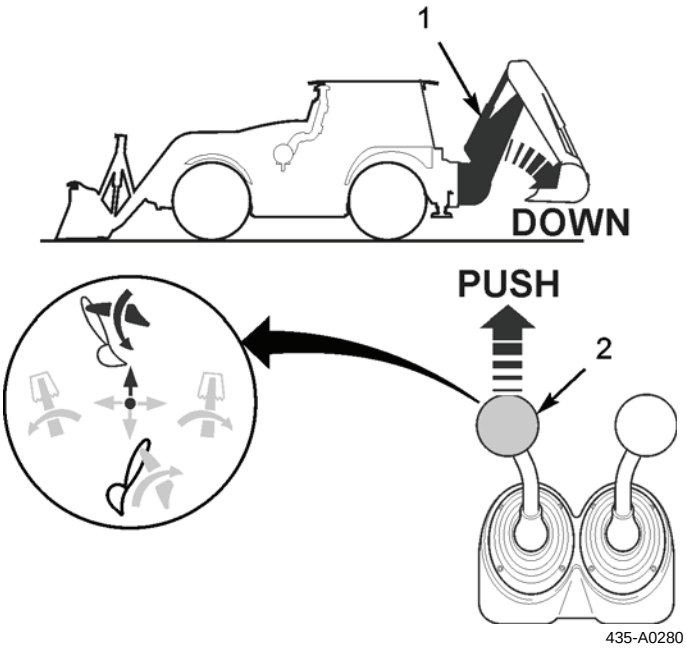


Figure 4. Lower Boom

BACKHOE CONTROLS – CONTINUED

Swing Boom

1. To swing the boom (Figure 5, Item 1) to your left, move the left-hand lever (Figure 5, Item 2) to your left.

CAUTION

Some backhoe buckets and work tools may collide with the stabilizer legs if swung too far around. Check for clearance before using attachments. Failure to do so could result in damage to equipment.

2. To swing the boom (Figure 5, Item 1) to your right, move the left-hand lever (Figure 5, Item 2) to your right.

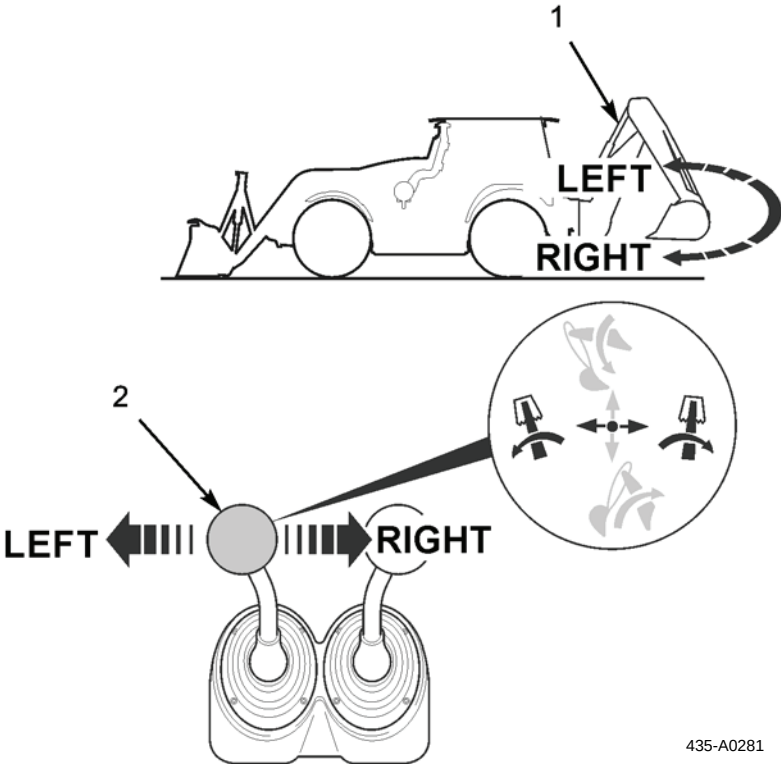


Figure 5. Swing Boom

BACKHOE CONTROLS – CONTINUED

Dipper In

To bring the dipper (Figure 6, Item 2) in, pull the right-hand lever (Figure 6, Item 1) towards the front of the machine.

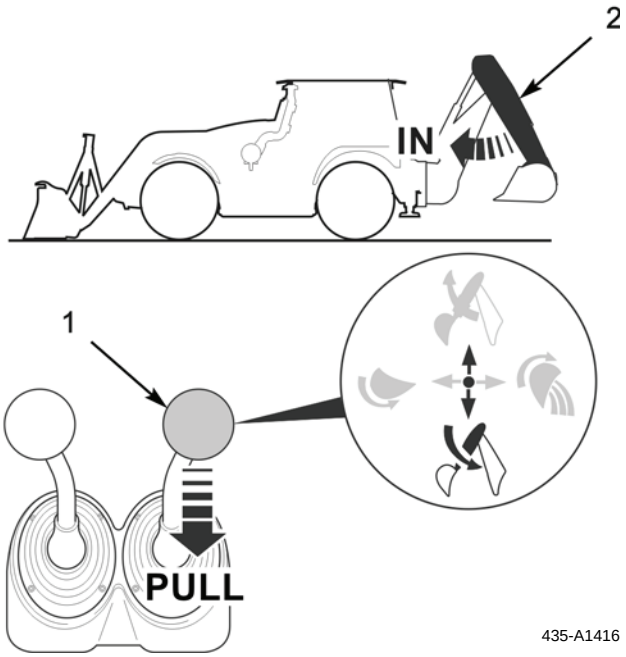


Figure 6. Dipper In

BACKHOE CONTROLS – CONTINUED

Dipper Out

WARNING

If the boom is already up, ensure there is sufficient overhead clearance before swinging the dipper out. Failure to follow this warning may result in injury or death to personnel.

To push the dipper (Figure 7, Item 2) out, push the right-hand lever (Figure 7, Item 1) towards the rear of the machine.

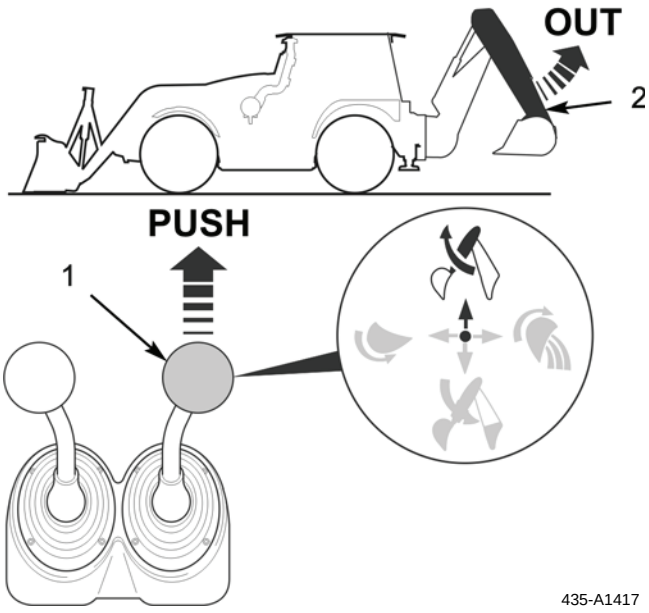


Figure 7. Dipper Out

BACKHOE CONTROLS – CONTINUED

Auger Rotation

To dig with the auger, press auxiliary foot pedal with heel of shoe. To extract the auger, press auxiliary foot pedal with toe of shoe.

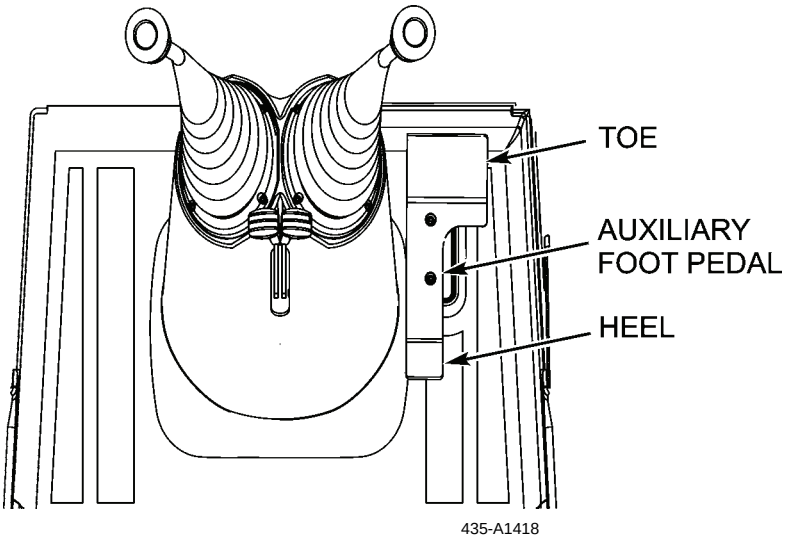


Figure 8. Auger Rotation

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

ARCTIC HEATER

DESCRIPTION

The arctic heater is used to warm the engine coolant in extreme temperatures of -26°F to -40°F (-32°C to -40°C).

END OF TASK

OPERATOR SAFETY/WARNING

WARNING

Ensure arctic heater starts before leaving the area or injury or death to personnel can occur.

END OF TASK

OPERATION

NOTE

It could take up to 3 minutes for arctic heater to start.

After preparing the machine for extreme cold shutdown, turn on arctic heater switch.

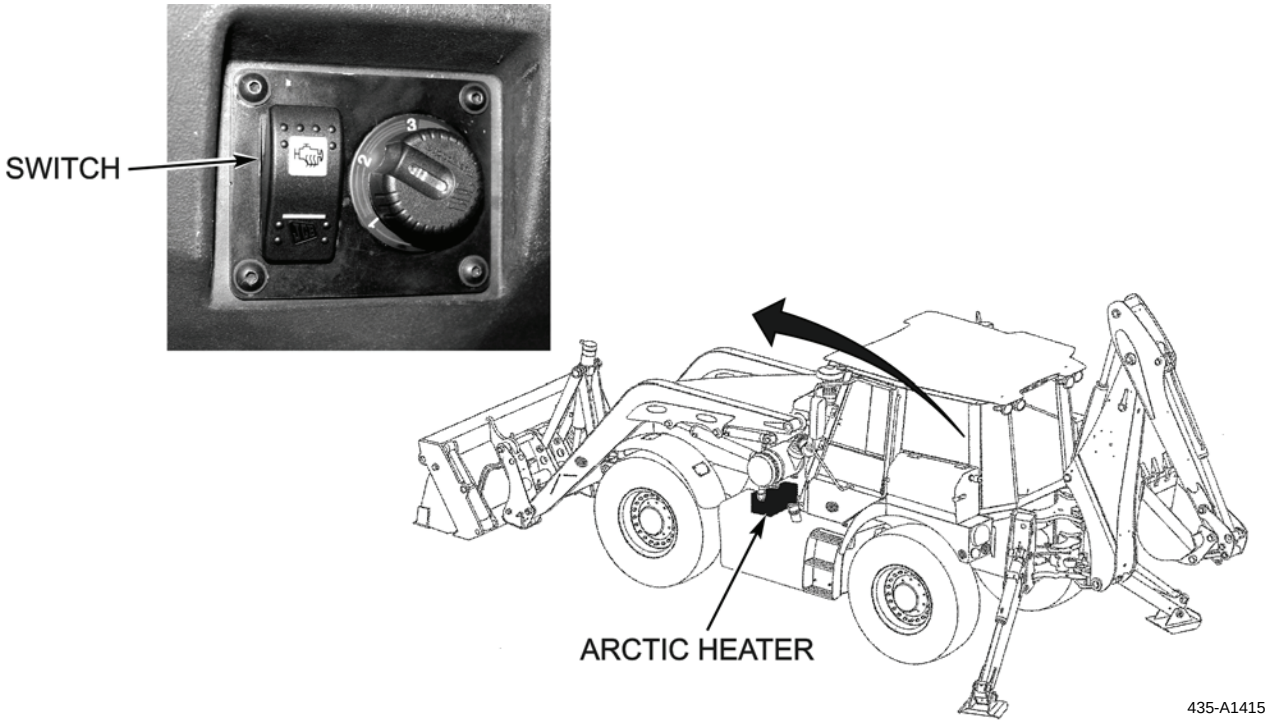


Figure 1. Operation of Arctic Heater

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

COEI/SPK TROUBLESHOOTING INTRODUCTION

INTRODUCTION

This work package contains information on the corrective actions used to troubleshoot the COEI and SPKs. This work package lists most malfunctions that may occur along with the associated tests, inspections, and corrective actions. If a malfunction is not listed, or is not easily corrected, notify Unit Maintenance.

Always be on the alert for unusual noises. Check out any evidence of failure or malfunction. Report all malfunctions that are seen, felt, or heard to Unit Maintenance. Troubleshooting requires the operator to perform unscheduled and scheduled maintenance procedures and to monitor system functions at all times. Discovering and correcting a problem when it first appears will usually result in less serious damage to the item and provide safer conditions for the operator. Following is a list of the items and the possible malfunctions.

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

COEI/SPK TROUBLESHOOTING MALFUNCTION/SYMPTOM INDEX

COEI TROUBLESHOOTING

Impact Wrench

Chain Saw

Pavement Breaker

Hammer Drill

Post Driver

END OF TASK

SPECIAL PURPOSE KITS TROUBLESHOOTING

Forklift Assembly

Rotary Sweeper

Auger (Earth Drill)

Arctic Heater

END OF TASK

END OF WORK PACKAGE

SUPPORTING INFORMATION

COEI/SPK TROUBLESHOOTING PROCEDURES

IMPACT WRENCH TROUBLESHOOTING PROCEDURES

Low Performance Or Impact

Step 1. Check if sockets or adapters are too heavy or loose.
Use correct impact type sockets or adapters.

Step 2. Check if correct periodic maintenance of impact is being performed.
Notify Unit Maintenance.

Step 3. Check if quick disconnects are defective.
If inoperative, notify Unit Maintenance.

Wrench Turns Too Fast. Impact Mechanism Or Screws Broken

Step 1. Check if adjusting screw is in too far.
Set screw according to adjustment procedure.

Step 2. Check if supply and return hoses are reversed.
Notify Unit Maintenance.

Step 3. If wrench is still inoperative, notify Unit Maintenance.

Grease Leaks At Anvil Bushing, Wrench Warm

Normal under hot conditions and hard duty cycle.

Grease Leaks At Anvil Bushing, Wrench Cold

Notify Unit Maintenance.

Oil Leak At Motor Cap Face

Notify Unit Maintenance.

Oil Leaks At Reversing Spool

Notify Unit Maintenance.

END OF TASK

CHAIN SAW TROUBLESHOOTING PROCEDURES

Saw Does Not Operate

Step 1. Check hydraulic fluid level.
Fill to proper level.

Step 2. If tool remains inoperative, notify Unit Maintenance.

CHAIN SAW TROUBLESHOOTING PROCEDURES – CONTINUED

Saw Operates Slowly Or Erratically

Step 1. Check if hydraulic fluid is cold.
Allow fluid to warm to operating temperature. Actuate tool intermittently to reduce warming time.

Step 2. Check hydraulic fluid level.
Fill to proper level.

Step 3. If tool remains inoperative, notify Unit Maintenance.

Trigger Difficult To Operate; Sticks When Released

Step 1. Clean and lubricate trigger and trigger spool.

Step 2. If tool remains inoperative, notify Unit Maintenance.

Chain Runs In Wrong Direction

Notify Unit Maintenance.

Chain Does Not Cut

Step 1. Check if chain is dull.
Sharpen chain to specifications.

Step 2. Check if there is too much tension on chain.
Adjust chain tension.

Step 3. Check if automatic oiler is not lubricating chain and bar.
Check and set automatic chain oiler.

Step 4. Check if chain is installed backward.
Remove chain and install correctly.

Step 5. Check if guide bar is worn.
If worn, notify Unit Maintenance.

Saw Feels Hot

Step 1. Check hydraulic fluid level.
Fill to proper level.

Step 2. If tool remains inoperative, notify Unit Maintenance.

Chain Is Difficult To Rotate Manually

Step 1. Check if chain and bar are properly adjusted.
Adjust chain tension.

Step 2. Check if hydraulic pressure is trapped in motor.
Disconnect and reconnect hoses.

Step 3. Check if chain drive links are damaged.
Replace chain.

Step 4. Check if guide bar is worn.
If worn, notify Unit Maintenance.

END OF TASK

PAVEMENT BREAKER TROUBLESHOOTING PROCEDURES

Breaker Does Not Run

Step 1. Check if pressure and return lines are reversed at ports.
Connect hoses to their proper ports.

Step 2. Check if couplers or hoses are blocked at ports.
Remove restriction.

Step 3. If breaker remains inoperative, notify Unit Maintenance.

Breaker Does Not Hit Effectively

Step 1. Check if couplers or hoses are blocked at ports.
Remove restriction.

Step 2. If breaker remains inoperative, notify Unit Maintenance.

Breaker Operates Slowly

Notify Unit Maintenance.

END OF TASK

HAMMER DRILL TROUBLESHOOTING PROCEDURES

Drill Does Not Run

Step 1. Check if pressure and return lines are reversed at ports.
Connect hoses to their proper ports.

Step 2. Check if couplers or hoses are blocked at ports.
Remove restriction.

Step 3. If tool remains inoperative, notify Unit Maintenance.

Drill Does Not Drill Effectively

Step 1. Check if couplers or hoses are blocked at ports.
Remove restriction.

Step 2. If tool remains inoperative, notify Unit Maintenance.

Drill Operates Slow

Step 1. Check if couplers or hoses are blocked at ports.
Remove restriction.

Step 2. If tool remains inoperative, notify Unit Maintenance.

Drill Gets Hot

Notify Unit Maintenance.

Oil Leakage On Drill Bit

Notify Unit Maintenance.

Oil Leakage Around Trigger

Notify Unit Maintenance.

HAMMER DRILL TROUBLESHOOTING PROCEDURES – CONTINUED

Low Rotation Torque

Step 1. Check with Unit Maintenance if motor is not completely broken in.
Continued operation will correct condition.

Step 2. Mechanical binding during drilling.
Take care to guide drill straight.

Step 3. If adverse conditions remain, notify Unit Maintenance.

END OF TASK

POST DRIVER TROUBLESHOOTING PROCEDURES

Driver Does Not Run

Step 1. Check if couplers or hoses are blocked.
Remove restriction.

Step 2. Check if supply and return hoses are reversed.
Notify Unit Maintenance.

Step 3. If tool is still inoperative, notify Unit Maintenance.

Driver Does Not Hit Effectively

Step 1. Check if couplers or hoses are blocked.
Remove restriction.

Step 2. If tool is still not hitting effectively, notify Unit Maintenance.

Driver Operates Slow

Step 1. Check if couplers or hoses are blocked.
Remove restriction.

Step 2. Check if orifice is blocked.
Remove restriction.

Step 3. If tool is still operating slow, notify Unit Maintenance.

Driver Gets Hot

Notify Unit Maintenance.

Oil Leakage On Post

Notify Unit Maintenance.

END OF TASK

FORKLIFT ASSEMBLY TROUBLESHOOTING PROCEDURES

Forklift Does Not Sideshift

Step 1. Check if no power from controls because wires are broken or disconnected.
If wires are disconnected, reconnect wires.
If wires are broken, notify Unit Maintenance.

Step 2. Check if no power from controls because switch is broken.
Notify Unit Maintenance.

Step 3. Check if hydraulic oil level too low.
Fill hydraulic tank to proper level.

Step 4. Check if hoses or fittings loose or disconnected.
Tighten hoses and fittings.

Step 5. Check if there is restriction in hoses.
Remove restriction.

Step 6. If forklift assembly still does not sideshift, notify Unit Maintenance.

Hydraulic System Overheats

Step 1. Check if hydraulic oil level too low.
Fill hydraulic tank to proper level.

Step 2. If hydraulic system still overheats, notify Unit Maintenance.

Control Valves Leak

Notify Unit Maintenance.

END OF TASK

ROTARY SWEEPER TROUBLESHOOTING PROCEDURES

Brush Rotates In Wrong Direction

Step 1. Check if hoses are installed correctly.
Switch hose connection.

Step 2. If brush still rotates in the wrong direction, notify Unit Maintenance.

Brush Slows Or Stops When Sweeping

Step 1. Check if brush pattern too wide.
Adjust brush pattern.

Step 2. Check if travel speed too fast.
Travel no more than 17 mph (27 kph) while sweeping.

Step 3. Check if sweeping too much material at once.
Make several passes with sweeper.

Step 4. If brush still slows or stops when sweeping, notify Unit Maintenance.

Brush Wears Very Quickly

Step 1. Check if brush pattern too wide.
Adjust brush pattern.

Step 2. If brush still wears very quickly, notify Unit Maintenance.

ROTARY SWEEPER TROUBLESHOOTING PROCEDURES – CONTINUED

Hydraulic Cylinder Neither Extends Nor Retracts

Step 1. Check if no power from controls because wires are broken or disconnected.
If wires are disconnected, reconnect wires.
If wires are broken, notify Unit Maintenance.

Step 2. Check if no power from controls because switch is broken.
Notify Unit Maintenance.

Step 3. Check if hydraulic oil level too low.
Fill hydraulic tank to proper level.

Step 4. Check if hoses or fittings loose or disconnected.
Tighten hoses and fittings.

Step 5. Check if there is restriction in hoses.
Remove restriction.

Step 6. If hydraulic cylinder still doesn't extend or retract, notify Unit Maintenance.

Hydraulic System Overheats

Step 1. Check if hydraulic oil level too low.
Fill hydraulic tank to proper level.

Step 2. Check if brush pattern too wide.
Adjust brush pattern.

Step 3. Check if sweeping too much material at once.
Make several passes with sweeper.

Step 4. If hydraulic system still overheats, notify Unit Maintenance.

Hydraulic Motor Seals Leak

Notify Unit Maintenance.

END OF TASK

AUGER (EARTH DRILL) TROUBLESHOOTING PROCEDURES

Auger Rotates In Wrong Direction

Step 1. Check if hoses are installed correctly.
Install hoses correctly.

Step 2. If auger still rotates in the wrong direction, notify Unit Maintenance.

Auger Has Slow Speed

Notify Unit Maintenance.

Insufficient Digging Power

Step 1. Check if teeth or point is worn.
Notify Unit Maintenance.

Step 2. Check if down pressure is too great.
Relieve downward pressure.

Step 3. If auger still has insufficient digging power, notify Unit Maintenance

AUGER (EARTH DRILL) TROUBLESHOOTING PROCEDURES – CONTINUED

Oil Overheating

Notify Unit Maintenance.

Oil Leaks

Step 1. Check if hoses are loose or damaged.
Tighten hoses or notify Unit Maintenance.

Step 2. Check if fittings are loose or damaged.
Tighten fittings or notify Unit Maintenance.

Step 3. Check if motor seals worn or damaged.
Notify Unit Maintenance.

END OF TASK

ARCTIC HEATER TROUBLESHOOTING PROCEDURES

Arctic Heater Does Not Operate

Notify Unit Maintenance.

END OF TASK

END OF WORK PACKAGE

UNIT MAINTENANCE INSTRUCTIONS

ROAD WHEEL REPLACEMENT

Road Wheel Replacement

INITIAL SETUP

Tools and Special Tools

Hydraulic trolley jack, 10-ton capacity
Jackstand
Wheel chock (4)

Personnel Required

Two

References

WP 0004

Equipment Conditions

Machine parked
Parking brake engaged, engine OFF (WP 0005)

ROAD WHEEL REPLACEMENT

Removing a Road Wheel

NOTE

The procedure for replacing a road wheel is included in this manual as a reference. This does not authorize performance by the operator. Notify Unit Maintenance to perform this procedure.

1. Park the machine of firm, level ground. Select the “Maintenance Suspension Mode,” lower the loader arms to the ground and engage the parking brake (WP 0004).

WARNING

The machine is equipped with “split rims” to accommodate the run-flat tires. The two halves of the wheel rim are held together by 20 rim nuts (Figure 1). Under no circumstances are any of these rim nuts to be loosened. If any rim nuts appear to be loose or rusty, notify Unit Maintenance. Do not drive the machine with suspect rim nuts. Failure to follow this warning may result in injury or death to personnel.

2. Shut down engine (WP 0005) and turn battery disconnect switch to OFF position (WP 0004).

WARNING

Once in position and the engine is shut down, Do not turn on the ignition again until either the road wheel has been fitted or the axle suitably blocked. The active suspension will cause the axle to drop if either of these conditions is not met and the ignition is turned on. Failure to follow this warning may result in injury or death to personnel.

3. Chock both sides of both wheels of axle not being raised.

ROAD WHEEL REPLACEMENT – CONTINUED

Removing a Road Wheel - Continued

WARNING

Never use the machine's hydraulics to raise the axle for road wheel replacement. Failure to follow this warning may result in injury or death to personnel.

4. Using the hydraulic trolly jack under the axle, raise the road wheel that is to be removed until it is just clear of the ground. Place a jack stand under the axle.
5. Loosen the 10 wheel nuts (Figure 1).

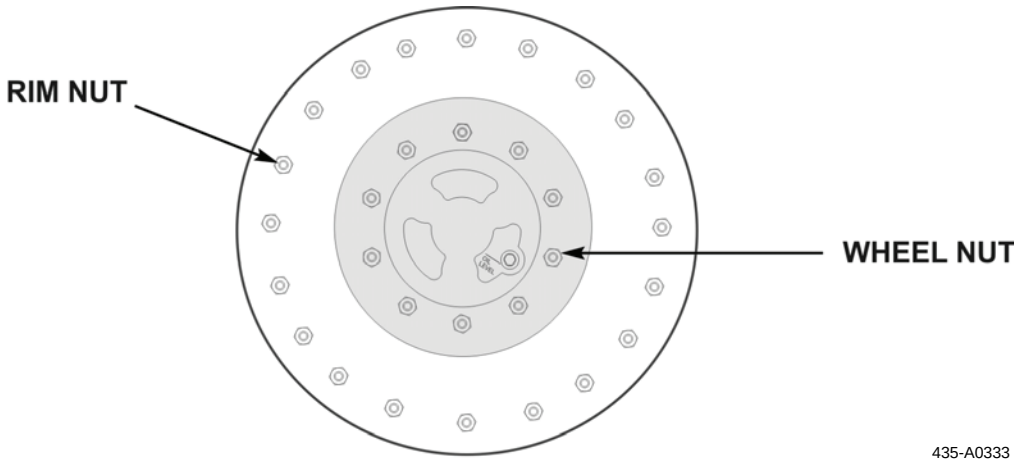


Figure 1. Road Wheel Rim Nuts and Wheel Nuts

WARNING

Road wheel weighs 800 lb (363 kg). Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure any lifting equipment used is in good condition and of suitable lift capacity. Keep clear of heavy parts supported only by lifting equipment. Failure to follow this warning may result in injury or death to personnel.

6. Support the road wheel. Remove the 10 wheel nuts. With assistance, pull the road wheel from the axle hub.

ROAD WHEEL REPLACEMENT – CONTINUED

Replacing a Road Wheel

WARNING

- If, for whatever reason, a wheel stud is renewed, all the studs for that wheel must be renewed as a set, since the remaining studs may have been damaged. Failure to follow this warning may result in the road wheel coming loose at convoy speeds, resulting in loss of machine control. This may result in injury or death to personnel.
- Do not use a machine with visible signs of damage to the road wheels or wheel nuts. Failure to follow this warning may result in injury or death to personnel.
- Once in position and the engine is shut down, do not turn on the ignition again until either the road wheel has been fitted or the axle suitably chocked. The active suspension will cause the axle to drop if either of these conditions is not met and the ignition is turned on. Failure to follow this warning may result in injury or death to personnel.

1. Ensure that the mating faces of the road wheel and axle hub are clean and free of debris. With assistance, position the road wheel on the wheel studs. Install the wheel nuts and tighten sufficiently to hold the road wheel in place.
2. Remove the jack stand from under the axle and lower the machine to the ground.

WARNING

The wheel nuts must be torque tightened. Failure to follow this warning may result in injury or death to personnel.

3. Tighten the wheel nuts to 369 lb-ft (500 Nm) in the order shown in Figure 2.

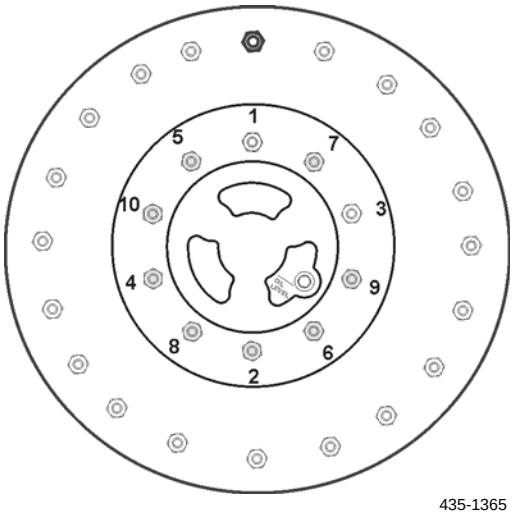


Figure 2. Wheel Nuts Tightening Sequence

4. Check and adjust the wheel nuts torque after every 10 hours of operation until they stay correct.

END OF TASK

END OF WORK PACKAGE

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U

W

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however, only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whoever" whoever@avma27.army.mil

To: whomever@avma27.army.mil

To: ROCK-TACOM-TECH-PUBS@conus.army.mil

Subject: DA Form 2028

1. ***From:*** Joe Smith
2. ***Unit:*** home
3. ***Address:*** 4300 Park
4. ***City:*** Hometown
5. ***St:*** MO
6. ***Zip:*** 77777
7. ***Date Sent:*** 19-OCT-93
8. ***Pub no:*** 55-1915-200-10
9. ***Pub Title:*** TM
10. ***Publication Date:*** 11-APR-88
11. ***Change Number:*** 12
12. ***Submitter Rank:*** MSG
13. ***Submitter Fname:*** Joe
14. ***Submitter Mname:*** T
15. ***Submitter Lname:*** Smith
16. ***Submitter Phone:*** 123-123-1234
17. ***Problem:*** 1
18. ***Page:*** 1
19. ***Paragraph:*** 3
20. ***Line:*** 4
21. ***NSN:*** 5
22. ***Reference:*** 6
23. ***Figure:*** 7
24. ***Table:*** 8
25. ***Item:*** 9
26. ***Total:*** 123
27. *Text:*

    This is the text for the problem below line 27.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE **1 July 2008**

TO: *(Forward to proponent of publication or form) (Include ZIP Code)* AMSTA-LC-LPIT/TECH PUBS 1 Rock Island Arsenal Rock Island, IL 61299-7630	**FROM:** *(Activity and location) (Include ZIP Code)*

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 5-2420-232-10	2007 June 22	Operator's Manual for High Mobility Engineer Excavator, Type I (HMEE-I)

ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON
	0017 00-2					Part number supplied for item 2 is incorrect.

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: *(Forward direct to addressee listed in publication)*	**FROM:** *(Activity and location) (Include ZIP Code)*	**DATE**
AMSTA-LC-LPIT/TECH PUBS 1 Rock Island Arsenal Rock Island, IL 61299-7630		

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

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By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0713807

DISTRIBUTION: To be distributed in accordance with the initial distribution requirements for IDN: 256938, requirements for TM 5-2420-232-10.

THE METRIC SYSTEM AND EQUIVALENTS

Linear Measure

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

Weights

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Pounds
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

Liquid Measure

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

Square Measure

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
1 Sq Kilometer = 1,000,000 Sq Meters = 0.0386 Sq Miles

Cubic Measure

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

Temperature

5/9 (°F - 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 C° +32 = F°

APPROXIMATE CONVERSION FACTORS

To Change	To	Multiply By
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Sq Inches	Sq Centimeters	6.451
Sq Feet	Sq Meters	0.093
Sq Yards	Sq Meters	0.836
Sq Miles	Sq Kilometers	2.590
Acres	Sq Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Sq Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

To Change	To	Multiply By
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Sq Centimeters	Sq Inches	0.155
Sq Meters	Sq Feet	10.764
Sq Meters	Sq Yards	1.196
Sq Kilometers	Sq Miles	0.386
Sq Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Sq Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621

PIN: 084048-000