

# **6090 Diesel Engine — Level 33 ECU**

**COMPONENT TECHNICAL MANUAL  
6090 Diesel Engine — Level 33 ECU  
CTM117719 14JUN19 (ENGLISH)**


# Introduction

## Foreword

This repair manual is valid for the engines.

This manual is written for an experienced technician. Essential tools required in performing certain service work are identified in this manual.

Live with safety: Read the safety messages in the introduction of this manual and the cautions presented throughout the text of the manual.

 This is the safety-alert symbol. When you see this symbol on the machine or in this manual, be alert to the potential for personal injury.

Information in this manual is organized in sections and sub divided into groups.

Section 01 covers the safety measures to follow while repairing the engine; engine identification features, engine emission & application details, and information about the fuels, lubricants & coolants.

Section 02 covers the Repair and Adjustment procedures.

Section 03 explains Systems Theory of Operation.

Section 04 is the diagnostics section that provides troubleshooting procedures to find problems.

Section 05 lists all applicable service equipment and tools, other materials needed to do the job.

Section 06 details all specifications, wear tolerances, torque values and contains the wiring diagrams.

This manual contains SI Metric units of measure followed immediately by the U.S. customary units of measure. Most hardware on these engines is metric sized.

Read each block of material completely before performing service to check for differences in procedures or specifications. Follow only the procedures that apply to the component you are working on.

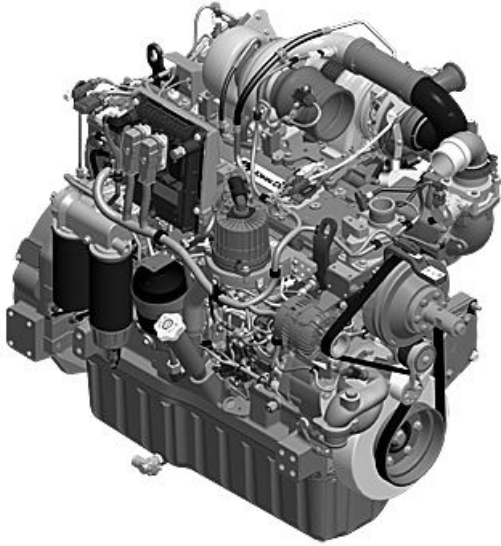
Component Technical Manuals are concise service guides for specific components. Component technical manuals are written as stand-alone manuals covering multiple machine applications.

Fundamental service information is available from other sources covering basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic type of failures and their causes.

**CALIFORNIA PROPOSITION 65 WARNING**  
**Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.**

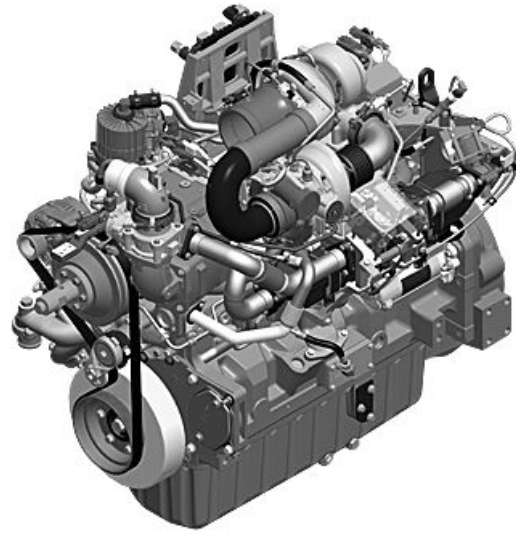
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## Identification Views



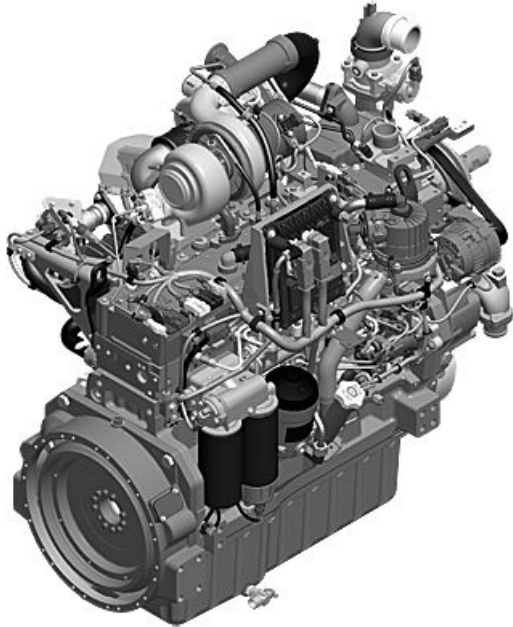
*Final Tier 4 6090 Engine — Right Front View*

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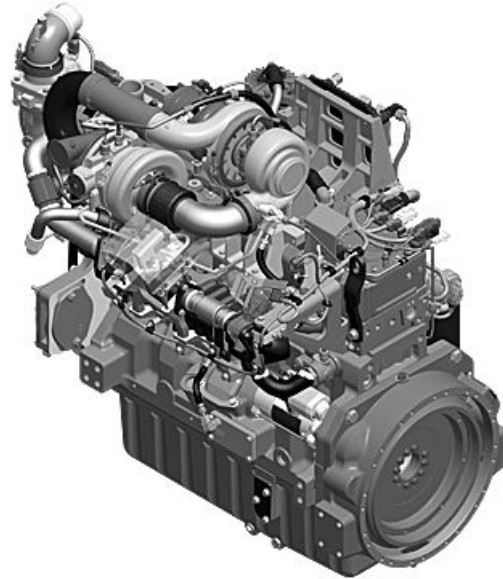
*Final Tier 4 6090 Engine — Left Front View*

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*Final Tier 4 6090 Engine — Right Rear View*

RG22200 —UN—12DEC12



*Final Tier 4 6090 Engine — Left Rear View*

RG22202 —UN—12DEC12

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## Related Manuals

### Tool Manual

When working through the instructions in this manual, you may require the use of special tools. For a complete listing of John Deere approved essential and dealer fabricated engine tools, please refer to the JDPS Master Tool Manual Technical Manual (TM).

### Application List Manual

For more information on which engine manuals should be referred to for a specific machine or engine, please refer to the Application List Manual Component Technical Manual (CTM). This manual provides a listing of machine and engine models, and their appropriate base engine and fuel system manual numbers. For OEM applications, the operators manual number for the engine is also included.

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## Training Information

John Deere University offers the following related training for the engine covered in this manual. More

information on each of these courses can be found online on the John Deere University website (example: <https://jdu.deere.com/>).

Course Title
Diesel Engine Systems I
Diesel Engine Basics
Diesel Fuel Fundamentals
Biodiesel Fundamentals
Electrical Methods and Techniques
Electrical Systems I
Electrical Systems II
Engine - Aftertreatment System Fundamentals
Engine - Aftertreatment System Overview
Engine - Introduction to Interim Tier 4/Stage III B
Engine - Introduction to Final Tier 4/Stage IV Technologies
Engine - Final Tier 4/Stage IV Advanced Engine Diagnostics
Engine - Integrated Emissions Control System Overview
Engine - Integrated Emissions Control System Basic Diagnostics
Engine - Final Tier 4/Stage IV Sales and Marketing Overview
Engine - 6068/6090 Final Tier 4/Stage IV Engine Overview
Hydraulic Methods & Techniques
Hydraulic Systems I
Hydraulic Systems II
John Deere Custom Performance
John Deere Plus 50™ II & COOL-GARD™ II
Service ADVISOR Methods & Techniques
Service ADVISOR Overview
JDPS - Service ADVISOR - Systems Overview

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## Definition of Terms

<b>Actuator</b>	A device controlled by the ECU to perform a certain function.
<b>Analog</b>	Signal which has a continuous range of possible voltages, usually 0 V (low) to 24 V (high).
<b>Application</b>	Either a movable or stationary piece of equipment that the engine is placed in. Applications include, Tractors, Harvesters, Loaders, Irrigation Pumps, Generator Sets, and others.
<b>BAP</b>	Barometric Air Pressure. Pressure of the atmosphere (atmospheric pressure).
<b>Boost</b>	Pressurized air in the intake manifold.
<b>CAC</b>	Charge Air Cooler. Cools the compressed air from the turbine before it enters the intake manifold.
<b>CAN</b>	Controller Area Network. The network on applications that allows communication between the engine control unit and some components.
<b>Circuit Power</b>	Power supplied to a device for use by its internal component circuits.
<b>Crankshaft Position Sensor</b>	Used to determine the angular position and velocity of the crankshaft in the 360° field of rotation.
<b>DEF</b>	Diesel Exhaust Fluid. A urea water solution that is injected into the exhaust stream before the SCR to reduce NOx.
<b>Digital</b>	A signal which consists of only two levels of voltage — usually 0 V (low) to 24 V (high).
<b>DOC</b>	Diesel Oxidation Catalyst. Part of the exhaust filter or aftertreatment device. Used to help reduce emissions.
<b>DPF</b>	Diesel Particulate Filter. Part of the exhaust filter or aftertreatment device. Used to help reduce emissions.
<b>DTC</b>	Diagnostic Trouble Code. A code that is stored in ECU memory when it detects a problem in the electronic control system. There are two types of codes: Active and Stored. These codes are displayed on monitor panels and can be recalled by the service tool.
<b>ECT</b>	Engine Coolant Temperature. The temperature of the engine coolant.
<b>ECU</b>	Engine Control Unit. Computer that controls the fuel, air, and ignition systems on the engine.
<b>EGR</b>	Exhaust Gas Recirculation. Used to help reduce emissions.
<b>EI</b>	An Electronic Injector that is regulated by the ECU to control the proper amount of fuel on High-Pressure Common rail fuel systems.
<b>EOL</b>	This is the abbreviation for End of Line which is where the ECU gets programmed at the factory.
<b>EUI</b>	An Electronic Unit Injector that is regulated by the ECU to control the proper amount of fuel on non-High-Pressure Common rail fuel systems.
<b>FMI</b>	Failure Mode Identifier. The second part of a two-part code that identifies control system fault codes according to the J1939 standard. This two-digit code identifies the type of failure that has occurred. The first half of the code is the Suspect Parameter Number (SPN).
<b>H-Bridge</b>	Circuits in the ECU set up in an H-configuration. This allows for current to be reversed to drive DC motors forward and reverse.
<b>HPCR</b>	High-Pressure Common-Rail. A device that distributes high-pressure fuel to the injectors.
<b>Input</b>	This identifies a signal as an input to a device or control unit.

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[admin@servicemanualperfect.com](mailto:admin@servicemanualperfect.com)**

## Introduction

<b>J1939</b>	The Society of Automotive Engineers (SAE) standard for communication between the electronic control units on heavy-duty vehicles, both on- and off-highway.
<b>JDCP</b>	John Deere Custom Performance Program allows the customer to select software features and feature combinations prior to loading the software into the ECU. It is also one way by which embedded software is managed and updated in control units without removal of the control unit from the machine.
<b>JDPS</b>	John Deere Power Systems.
<b>MAP</b>	Manifold Air Pressure. The pressure of the air in the intake manifold, sometimes referred to as "boost" pressure.
<b>MAT</b>	Manifold Air Temperature. The temperature of the air in the intake manifold.
<b>Meter Zero</b>	This is the value the multimeter reads in the ohm position, when the meter lead tips are held together.
<b>Mis-pin</b>	An incorrect placement of male pins or female sockets within an electrical connector. Also known as an incorrect swapping of wires and terminals.
<b>NOx</b>	Nitrogen oxides. A gas that is produced as a by product of combustion, especially at higher combustion temperatures.
<b>OOR</b>	Out-of-Range. The signal received by the ECU is out of the expected range of the device.
<b>OORH</b>	Out-of-Range High. Signal sensed by the ECU is higher than the component can produce (outside of acceptable limit). For some circuit types, this could be caused by an open input wire, an open ground wire, or an input wire shorted to a voltage higher than the ECU expects (+ battery).
<b>OORL</b>	Out-of-Range Low. Signal sensed by the ECU is lower than the component can produce (outside of acceptable limits). For some circuit types, this could be caused by an input wire or circuit power wire shorted to ground.
<b>Output</b>	This identifies a signal as an output from a device or control unit.
<b>Pin</b>	A style of terminal that makes the electrical connection to a connector. Also called a male terminal.
<b>Pressure Relief Valve</b>	Used in conjunction with the pressure control valves to control the fuel pressure in the HPCR.
<b>PWM</b>	Pulse Width Modulation. A digital electronic signal of a fixed frequency. The on-time of the signal is increased or decreased (modulated) to indicate a change in condition.
<b>SCR</b>	Selective Catalytic Reduction. Used in conjunction with DEF to reduce NOx emissions coming out of the exhaust.
<b>RAM</b>	Random Access Memory. The portion of the computer memory within the ECU that is used when the ECU is running. All data in this memory is lost when the ECU is "OFF".
<b>Socket</b>	A style of terminal that makes the electrical connection to a connector. Also called a female terminal or receptacle.
<b>Pressure Control Valve</b>	Two pressure control valves regulate the amount of fuel that the high-pressure fuel pump supplies to the HPCR.
<b>SDS</b>	Software Delivery System. Used by JDPS to maintain software and programming records.
<b>Sensor</b>	Device used by the ECU to monitor various engine parameters.
<b>SPN</b>	Suspect Parameter Number. The first half of a two-part code that identifies control system fault codes according to the J1939 Standard. The SPN identifies the system or component that has the failure. The second half of the code is the Failure Mode Identifier (FMI).
<b>TDC</b>	Top Dead Center. Point of uppermost piston travel.
<b>Throttle Rate</b>	How quickly the ECU changes the engine fuel rate in response to a throttle increase signal. Throttle rate has no impact on deceleration.

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## Introduction

<b>Trim Options</b>	Options that can be enabled or disabled in the ECU programming, such as throttle selection, torque adjustment, governor gains, derates, and shutdowns, and others.
<b>TWV</b>	Two-Way Valve. A component in the Electronic Injector (EI).
<b>VGT</b>	Variable Geometry Turbo. Used to reduce emissions.
<b>WIF</b>	Water-In-Fuel. The WIF sensor sends a signal to the ECU when water is detected in the fuel.

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# Section 01 General Information

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## Understand Signal Words

**DANGER;** The signal word DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING;** The signal word WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION;** The signal word CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. CAUTION may also be used to alert against unsafe practices associated with events which could lead to personal injury.

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards. DANGER or WARNING safety signs are located near specific hazards. General

precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.



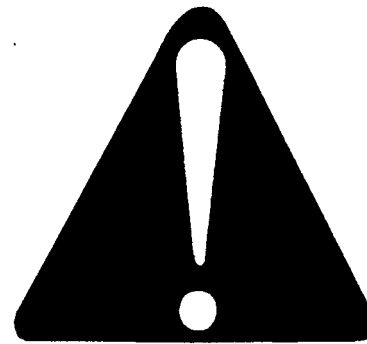
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DX,SIGNAL -19-05OCT16-1/1

## Recognize Safety Information

This is a safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.



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DX,ALERT -19-29SEP98-1/1

## Replace Safety Signs

Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.



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DX,SIGNS1 -19-04JUN90-1/1



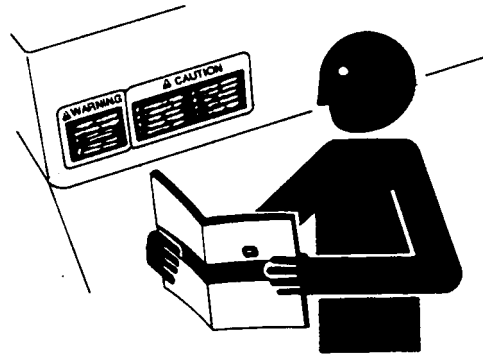
### Follow Safety Instructions

Carefully read all safety messages in this manual and on your machine safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs. Be sure new equipment components and repair parts include the current safety signs. Replacement safety signs are available from your John Deere dealer.

There can be additional safety information contained on parts and components sourced from suppliers that is not reproduced in this operator's manual.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without instruction.

Keep your machine in proper working condition. Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.



TS201—UN—15APR13

If you do not understand any part of this manual and need assistance, contact your John Deere dealer.

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### California Proposition 65 Warning

Diesel engine exhaust, some of its constituents, along with certain machine components contain or emit chemicals known to the State of California to cause cancer and birth

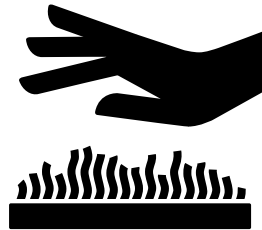
defects or other reproductive harm. In addition, certain fluids contained in the machine and certain products of component wear contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

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### Exhaust Filter Cleaning

Servicing machine or attachments during exhaust filter cleaning can result in serious personal injury. Avoid exposure and skin contact with hot exhaust gases and components.

During auto or manual/stationary exhaust filter cleaning operations, the engine will run at elevated idle and hot temperatures for an extended period of time. Exhaust gases and exhaust filter components reach temperatures hot enough to burn people, or ignite, or melt common materials.



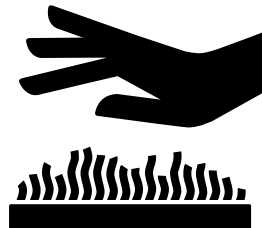
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DX,FILTER -19-20JAN10-1/1

### Avoid Hot Exhaust

Servicing machine or attachments with engine running can result in serious personal injury. Avoid exposure and skin contact with hot exhaust gases and components.

Exhaust parts and streams become very hot during operation. Exhaust gases and components reach temperatures hot enough to burn people, ignite, or melt common materials.



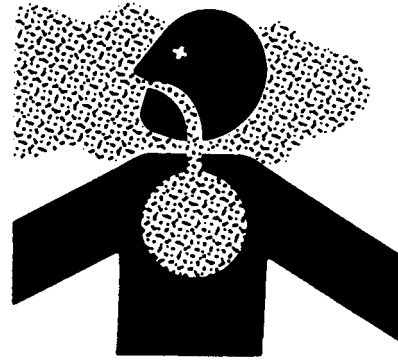
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## Work In Ventilated Area

Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension.

If you do not have an exhaust pipe extension, open the doors and get outside air into the area.



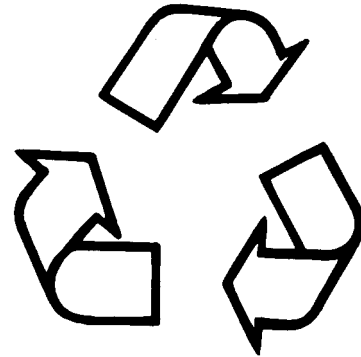
TS220—UN—15APR13

DX,AIR -19-17FEB99-1/1

## Decommissioning — Proper Recycling and Disposal of Fluids and Components

Safety and environmental stewardship measures must be taken into account when decommissioning a machine and/or component. These measures include the following:

- Use appropriate tools and personal protective equipment such as clothing, gloves, face shields or glasses, during the removal or handling of objects and materials.
- Follow instructions for specialized components.
- Release stored energy by lowering suspended machine elements, relaxing springs, disconnecting the battery or other electrical power, and releasing pressure in hydraulic components, accumulators, and other similar systems.
- Minimize exposure to components which may have residue from agricultural chemicals, such as fertilizers and pesticides. Handle and dispose of these components appropriately.
- Carefully drain engines, fuel tanks, radiators, hydraulic cylinders, reservoirs, and lines before recycling components. Use leak-proof containers when draining fluids. Do not use food or beverage containers.
- Do not pour waste fluids onto the ground, down a drain, or into any water source.
- Observe all national, state, and local laws, regulations, or ordinances governing the handling or disposal of waste fluids (example: oil, fuel, coolant, brake fluid);



TS1133—UN—15APR13

- filters; batteries; and, other substances or parts. Burning of flammable fluids or components in other than specially designed incinerators may be prohibited by law and could result in exposure to harmful fumes or ashes.
- Service and dispose of air conditioning systems appropriately. Government regulations may require a certified service center to recover and recycle air conditioning refrigerants which could damage the atmosphere if allowed to escape.
  - Evaluate recycling options for tires, metal, plastic, glass, rubber, and electronic components which may be recyclable, in part or completely.
  - Contact your local environmental or recycling center, or your John Deere dealer for information on the proper way to recycle or dispose of waste.

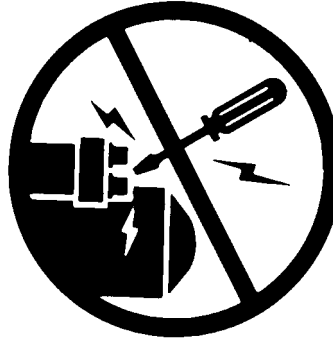
DX,DRAIN -19-01JUN15-1/1

## Prevent Machine Runaway

Avoid possible injury or death from machinery runaway.

Do not start engine by shorting across starter terminals. Machine will start in gear if normal circuitry is bypassed.

NEVER start engine while standing on ground. Start engine only from operator's seat, with transmission in neutral or park.



TS177 —UN—11JAN89

DX,BYPAS1 -19-29SEP98-1/1

## Practice Safe Maintenance

Understand service procedure before doing work. Keep area clean and dry.

Never lubricate, service, or adjust machine while it is moving. Keep hands, feet, and clothing away from power-driven parts. Disengage all power and operate controls to relieve pressure. Lower equipment to the ground. Stop the engine. Remove the key. Allow machine to cool.

Securely support any machine elements that must be raised for service work.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.

On self-propelled equipment, disconnect battery ground cable (-) before making adjustments on electrical systems or welding on machine.

On towed implements, disconnect wiring harnesses from tractor before servicing electrical system components or welding on machine.

Falling while cleaning or working at height can cause serious injury. Use a ladder or platform to easily reach each location. Use sturdy and secure footholds and handholds.



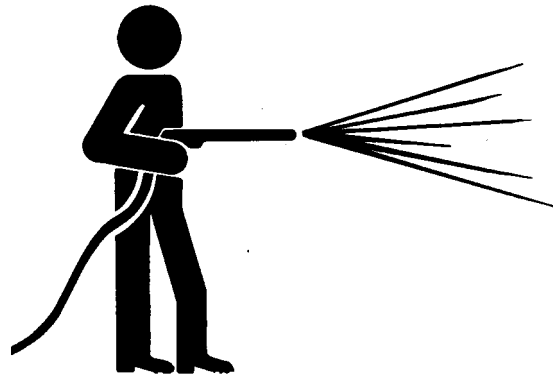
TS218 —UN—23AUG88

DX,SERV -19-28FEB17-1/1

### Work in Clean Area

Before starting a job:

- Clean work area and machine.
- Make sure you have all necessary tools to do your job.
- Have the right parts on hand.
- Read all instructions thoroughly; do not attempt shortcuts.



T6642EJ—UN—18OCT88

DX,CLEAN -19-04JUN90-1/1

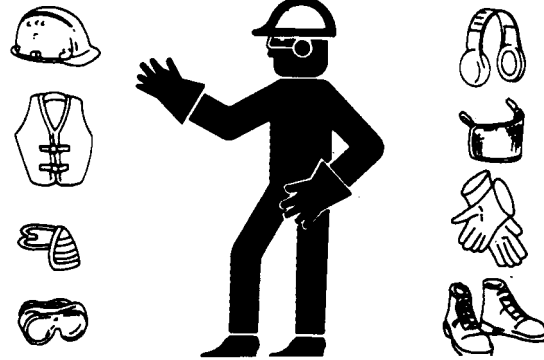
### Wear Protective Clothing

Wear close fitting clothing and safety equipment appropriate to the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.



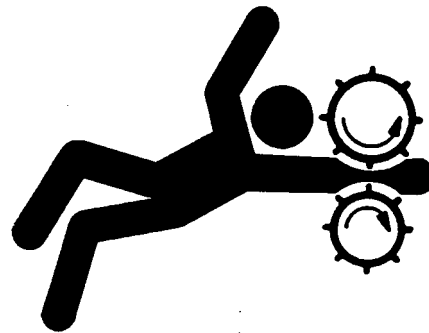
TS206—UN—15APR13

DX,WEAR -19-10SEP90-1/1

### Service Machines Safely

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.



TS228—UN—23AUG88

DX,LOOSE -19-04JUN90-1/1

### Use Proper Tools

Use tools appropriate to the work. Makeshift tools and procedures can create safety hazards.

Use power tools only to loosen threaded parts and fasteners.

For loosening and tightening hardware, use the correct size tools. DO NOT use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches.

Use only service parts meeting John Deere specifications.



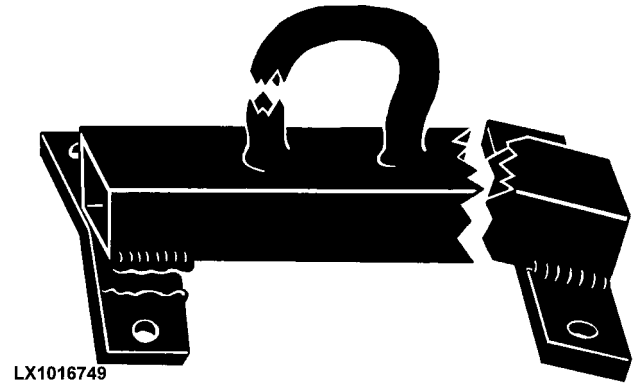
TS779 —UN—08NOV89

DX,REPAIR -19-17FEB99-1/1

### Construct Dealer-Made Tools Safely

Faulty or broken tools can result in serious injury. When constructing tools, use proper, quality materials, and good workmanship.

Do not weld tools unless you have the proper equipment and experience to perform the job.



LX1016749 —UN—01JUL97

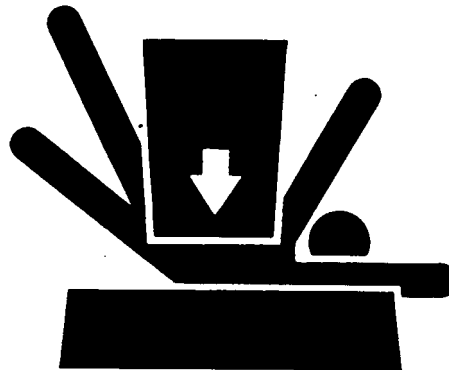
DX,SAFE,TOOLS -19-10OCT97-1/1

### Support Machine Properly

Always lower the attachment or implement to the ground before you work on the machine. If the work requires that the machine or attachment be lifted, provide secure support for them. If left in a raised position, hydraulically supported devices can settle or leak down.

Do not support the machine on cinder blocks, hollow tiles, or props that may crumble under continuous load. Do not work under a machine that is supported solely by a jack. Follow recommended procedures in this manual.

When implements or attachments are used with a machine, always follow safety precautions listed in the implement or attachment operator's manual.



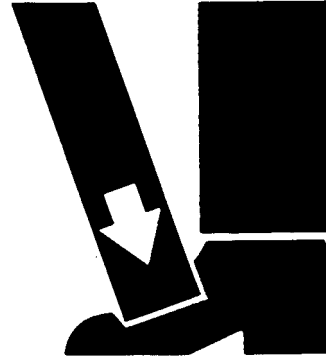
TS229 —UN—23AUG88

DX,LOWER -19-24FEB00-1/1

### Use Proper Lifting Equipment

Lifting heavy components incorrectly can cause severe injury or machine damage.

Follow recommended procedure for removal and installation of components in the manual.



TS226 —UN—23AUG88

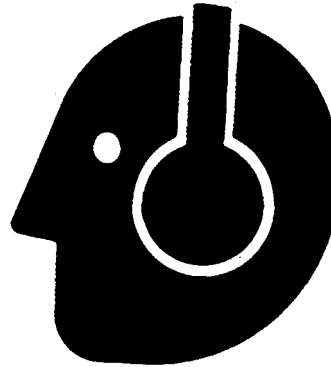
DX,LIFT -19-04JUN90-1/1

### Protect Against Noise

There are many variables that affect the sound level range, including machine configuration, condition and maintenance level of the machine, ground surface, operating environmental, duty cycles, ambient noise, and attachments.

Exposure to loud noise can cause impairment or loss of hearing.

**Always wear hearing protection.** Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

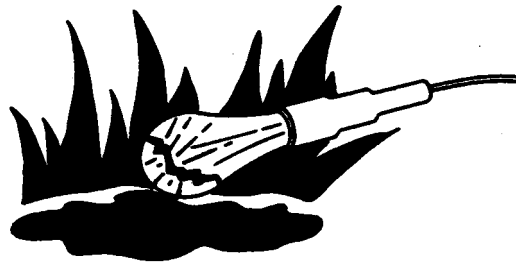


TS207 —UN—23AUG88

DX,NOISE -19-03OCT17-1/1

### Illuminate Work Area Safely

Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.



TS223 —UN—23AUG88

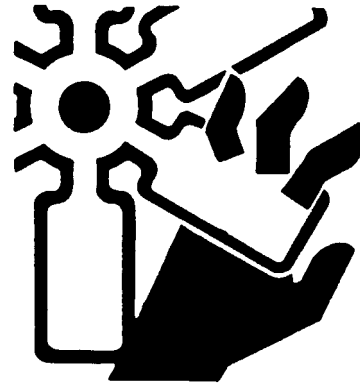
DX,LIGHT -19-04JUN90-1/1

### Install All Guards

Rotating cooling system fans, belts, pulleys, and drives can cause serious injury.

Keep all guards in place at all times during engine operation.

Wear close-fitting clothes. Stop the engine and be sure fans, belts, pulleys, and drives are stopped before making adjustments, connections, or cleaning near fans and their drive components.



TS677 —UN—21SEP89

DX, GUARDS -19-18AUG09-1/1

### Stay Clear of Rotating Drivelines

Entanglement in rotating driveline can cause serious injury or death.

Keep all shields in place at all times. Make sure rotating shields turn freely.

Wear close-fitting clothing. Stop the engine and be sure that all rotating parts and drivelines are stopped before making adjustments, connections, or performing any type of service on engine or machine driven equipment.



TS1644 —UN—22AUG95

DX, ROTATING -19-18AUG09-1/1

### Protect Against High Pressure Spray

Spray from high pressure nozzles can penetrate the skin and cause serious injury. Keep spray from contacting hands or body.

If an accident occurs, see a doctor immediately. Any high pressure spray injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.



TS1343 —UN—18MAR92

DX, SPRAY -19-16APR92-1/1