

50G Excavator Repair

(PIN: 1FF050GX_ _H280001—)

REPAIR TECHNICAL MANUAL

50G Excavator (PIN: 1FF050GX_ _H280001—)

TM12888 14FEB19 (ENGLISH)

<https://johndeere manuals.com>


**Worldwide Construction
And Forestry Division**
PRINTED IN U.S.A.

Introduction

Foreword

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

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 this symbol is seen on the machine or in this manual, be alert for the potential of personal injury.

Technical manuals are divided in two parts: repair and operation and tests. Repair sections tell how to repair the components. Operation and test sections help to quickly identify the majority of routine failures quickly.

Information is organized in groups for the various components requiring service instruction. At the beginning of each group are summary listings of all applicable essential tools, service equipment and tools, other materials needed to do the job, service parts kits, specifications, wear tolerances, and torque values.

Technical manuals are concise guides for specific machines. They are on-the-job guides containing only the vital information needed for diagnosis, analysis, testing, and repair.

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.

MM16284,00026ED -19-17SEP18-1/1

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Contents

Section 00—General Information

Group 0001—Safety
Group 0003—Torque Values

Group 9900—Dealer Fabricated Tools

Section 01—Tracks

Group 0130—Track System

Section 02—Axles and Suspension Systems (Travel)

Group 0250—Axle Shaft, Bearings, and Reduction Gears
Group 0260—Hydraulic System

Section 04—Engine

Group 0400—Removal and Installation

Section 05—Engine Auxiliary System

Group 0510—Cooling Systems
Group 0530—External Exhaust Systems
Group 0560—External Fuel Supply Systems

Section 07—Damper Drive (Flex Coupling)

Group 0752—Elements

Section 17—Frame or Supporting Structure

Group 1740—Frame Installation
Group 1749—Chassis Weights

Section 18—Operator's Station

Group 1800—Removal and Installation
Group 1810—Operator Enclosure
Group 1821—Seat and Seat Belt
Group 1830—Heating and Air Conditioning

Section 32—Blade (Backfill)

Group 3201—Blades
Group 3260—Hydraulic System

Section 33—Excavator

Group 3302—Buckets
Group 3340—Frames
Group 3360—Hydraulic System

Section 43—Swing or Pivoting System

Group 4350—Mechanical Drive Elements
Group 4360—Hydraulic System

Section 99—Dealer Fabricated Tools

Original Instructions. All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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Section 00 General Information

Contents

	Page		Page
Group 0001—Safety			
Recognize Safety Information	00-0001-1	Additional Metric Cap Screw	
Follow Safety Instructions	00-0001-1	Torque Values	00-0003-2
Operate Only If Qualified	00-0001-1	Unified Inch Bolt and Cap Screw	00-0003-3
Wear Protective Equipment	00-0001-2	Service Recommendations for	
Avoid Unauthorized Machine		37° Flare and 30° Cone Seat	
Modifications	00-0001-2	Connectors	00-0003-4
Control Pattern Selector—If		Service Recommendations for	
Equipped	00-0001-2	O-Ring Boss Fittings	00-0003-4
Add Cab Guarding for Special		Service Recommendations for	
Uses	00-0001-2	Flared Connections—Straight or	
Inspect Machine	00-0001-3	Tapered Threads	00-0003-6
Stay Clear of Moving Parts	00-0001-3	Service Recommendations for Flat	
Avoid High-Pressure Fluids	00-0001-3	Face O-Ring Seal Fittings	00-0003-7
Avoid High-Pressure Oils	00-0001-4	Service Recommendation	
Work In Ventilated Area	00-0001-4	O-Ring Boss Fittings In Aluminum Housing	
Prevent Fires	00-0001-5	Excavators	00-0003-8
Prevent Battery Explosions	00-0001-5	O-Ring Face Seal Fittings with SAE Inch Hex Nut and	
Handle Chemical Products Safely	00-0001-6	Stud End for High Pressure	00-0003-10
Decommissioning — Proper		O-Ring Face Seal Fittings with Metric Hex Nut and	
Recycling and Disposal of Fluids		Stud End for Standard Pressure	00-0003-12
and Components	00-0001-6	O-Ring Face Seal Fittings with Metric Hex Nut and	
Exhaust Filter Ash Handling and		Stud End for High Pressure	00-0003-14
Disposal	00-0001-6	Service Recommendations for	
Prepare for Emergencies	00-0001-7	Metric Series Four Bolt Flange	
Clean Debris from Machine	00-0001-7	Fitting	00-0003-16
Use Steps and Handholds		Service Recommendations For	
Correctly	00-0001-7	Inch Series Four Bolt Flange	
Start Only From Operator's Seat	00-0001-7	Fittings	00-0003-17
Use and Maintain Seat Belt	00-0001-8	Inch Series Four Bolt Flange For High	
Prevent Unintended Machine		Pressure	00-0003-18
Movement	00-0001-8	Service Recommendations	
Avoid Work Site Hazards	00-0001-9	For Non-Restricted Banjo	
Keep Riders Off Machine	00-0001-9	(Adjustable) Fittings	00-0003-19
Avoid Backover Accidents	00-0001-10	Service Recommendations For	
Inspect and Maintain ROPS	00-0001-10	O-Ring Boss Fittings With	
Avoid Machine Tip Over	00-0001-11	Shoulder	00-0003-20
Use Special Care When Lifting		Metric 24 O-Ring Seal DIN 20078	00-0003-22
Objects	00-0001-11		
Add and Operate Attachments			
Safely	00-0001-11		
Park and Prepare for Service			
Safely	00-0001-12		
Service Cooling System Safely	00-0001-12		
Remove Paint Before Welding or			
Heating	00-0001-13		
Make Welding Repairs Safely	00-0001-13		
Drive Metal Pins Safely	00-0001-13		
Clean Exhaust Filter Safely	00-0001-14		
Group 0003—Torque Values			
Torque Value			
Metric Bolt and Cap Screw	00-0003-1		

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Recognize Safety Information

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

Follow the precautions and safe operating practices highlighted by this symbol.

A signal word — DANGER, WARNING, or CAUTION — is used with the safety alert symbol. DANGER identifies the most serious hazards.

On your machine, DANGER signs are red in color, WARNING signs are orange, and CAUTION signs are yellow. DANGER and WARNING signs are located near specific hazards. General precautions are on CAUTION labels.



TX,RECOGNIZE -19-28JUN10-1/1

T133555 —UN—15APR13

T133588 —19—28AUG00

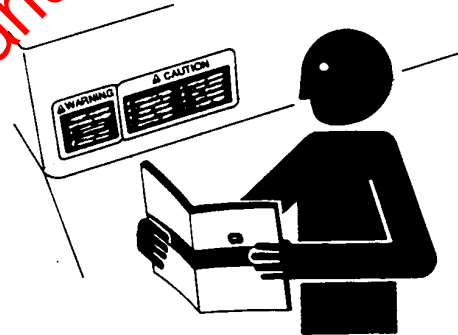
Follow Safety Instructions

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. Use this operator's manual for correct safety sign placement. Be sure that 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 could impair the function or safety and affect machine life.



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

TX,FOLLOW -19-20JAN11-1/1

TS201 —UN—15APR13

Operate Only If Qualified

Do not operate this machine unless the operator's manual has been read carefully, and you have been qualified by supervised training and instruction.

Operator should be familiar with the job site and surroundings before operating. Try all controls and

machine functions with the machine in an open area before starting to work.

Know and observe all safety rules that may apply to every work situation and work site.

TX,QUALIFIED -19-18JAN11-1/1

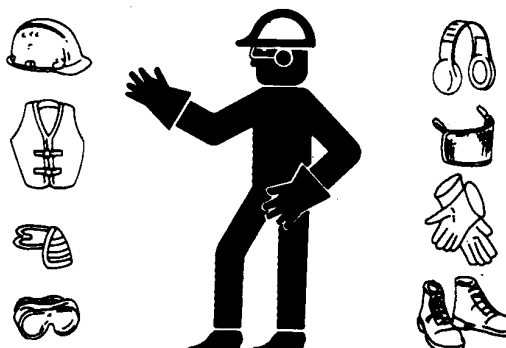
Wear Protective Equipment

Guard against injury from flying pieces or metal or debris; wear goggles or safety glasses.

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

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

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear suitable hearing protection such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises. Radio or music headphones are not suitable to use for hearing protection.



TS206—UN—15APR13

TX,WEAR,PE -19-22SEP10-1/1

Avoid Unauthorized Machine Modifications

John Deere recommends using only genuine John Deere replacement parts to ensure machine performance. Never substitute genuine John Deere parts with alternate parts not intended for the application as these can create hazardous situations or hazardous performance. Non-John Deere parts, or any damage or malfunctions resulting from their use, are not covered by any John Deere warranty.

Modifications of this machine, or addition of unapproved products or attachments, may affect machine stability or

reliability, and may create a hazard for the operator or others near the machine. The installer of any modification which may affect the electronic controls of this machine is responsible for establishing that the modification does not adversely affect the machine or its performance.

Always contact an authorized dealer before making machine modifications that change the intended use, weight or balance of the machine, or that alter machine controls, performance, or reliability.

AM40430,00000A9 -19-01JUL15-1/1

Control Pattern Selector—If Equipped

This machine may be equipped with a control pattern selector valve. Ensure all bystanders are clear of machine

and area is large enough to operate machine functions. Verify the machine response to each control movement.

DB84312,00000A5 -19-07JUL15-1/1

Add Cab Guarding for Special Uses

Special work situations or machine attachments could create an environment with falling or flying objects. Working near an overhead bank, demolition work, using a hydraulic hammer or winch, working in a forestry application or wooded area, or working in a waste management application, for example, could require added guarding to protect the operator.

Additional level II FOPS (falling object protective structure), forestry protection packages, and special screens or guarding should be installed when falling or flying objects could enter or damage the machine. A rear screen should always be used with a winch to protect against a snapping cable. Before operating in any special work environments, follow the operator protection recommendations of the manufacturer of any specialized attachment or equipment. Contact your authorized John Deere dealer for information on protective guarding.

TX,CABGUARD -19-12FEB13-1/1

Inspect Machine

Inspect machine carefully each day by walking around it before starting.

Keep all guards and shields in good condition and properly installed. Fix damage and replace worn or broken parts immediately. Pay special attention to hydraulic hoses and electrical wiring.



TX,INSPECT -19-08SEP10-1/1

T6607AQ —UN—15APR13

Stay Clear of Moving Parts

Entanglements in moving parts can cause serious injury.

Stop engine before examining, adjusting, or maintaining any part of machine with moving parts.

Keep guards and shields in place. Replace any guard or shield that has been removed for access as soon as service or repair is complete.



TX,MOVING,PARTS -19-20JAN11-1/1

T133592 —UN—15APR13

Avoid High-Pressure Fluids

Inspect hydraulic hoses periodically – at least once per year – for leakage, kinking, cuts, cracks, abrasion, blisters, corrosion, exposed wire braid or any other signs of wear or damage.

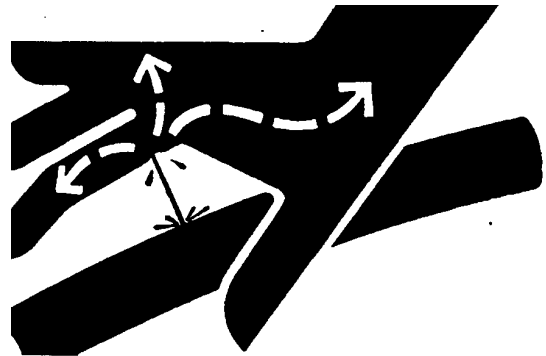
Replace worn or damaged hose assemblies immediately with John Deere approved replacement parts.

Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high-pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid 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 in English from Deere & Company Medical Department in Moline, Illinois, U.S.A.

KR46761,00007FD -19-18DEC12-1/1

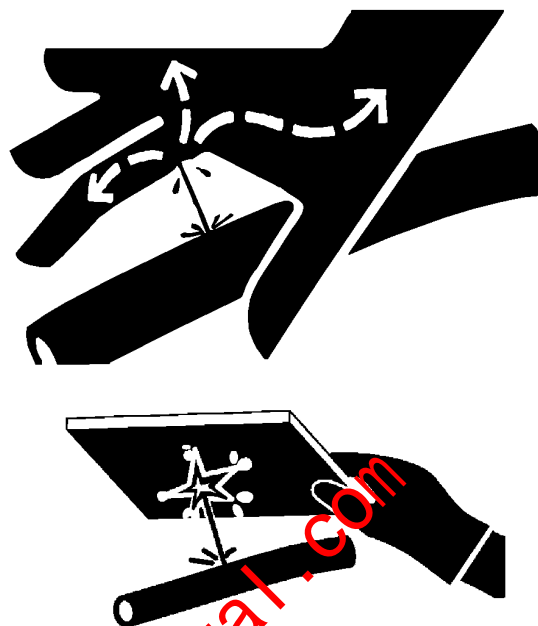
X9811 —UN—23AUG88

Avoid High-Pressure Oils

This machine uses a high-pressure hydraulic system. Escaping oil under pressure can penetrate the skin causing serious injury.

Never search for leaks with your hands. Protect hands. Use a piece of cardboard to find location of escaping oil. Stop engine and relieve pressure before disconnecting lines or working on hydraulic system.

If hydraulic oil penetrates your skin, see a doctor immediately. Injected oil must be removed surgically within hours or gangrene could result. Contact a knowledgeable medical source or the Deere & Company Medical Department in Moline, Illinois, U.S.A.



T133509 —UN—15APR13

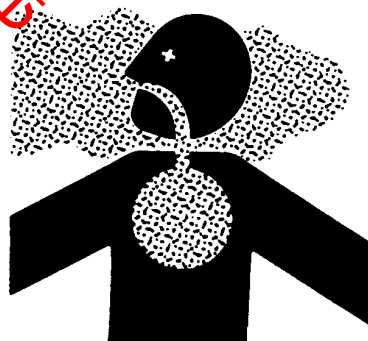
T133840 —UN—20SEP00

TX,HPOILS -19-20JAN11-1/1

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

Prevent Fires

Handle Fluids Safely: All fuels, most lubricants, and some coolant mixtures are flammable. Store flammable fluids away from fire hazards. Never refuel machine while smoking or when near sparks or flame.

Clean Machine Regularly: Keep flammable debris (trash, leaves, twigs, straw, and so forth), grease and oil from accumulating in engine compartment, around fuel lines, hydraulic lines, exhaust components, and electrical wiring. Never store oily rags or flammable materials inside a machine compartment.

Maintain Hoses, Tubes, and Wiring: Replace hoses and tubes immediately if they begin to leak, and clean up any oil spills. Examine electrical wiring and connectors frequently for damage.

Keep A Fire Extinguisher Available: Always keep a multipurpose fire extinguisher on or near the machine. Know how to use an extinguisher properly.

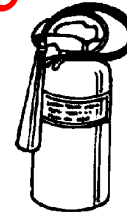
Be Aware of the Operating Environment: Airborne debris may contain sparks or embers. Do not operate near any flame.



T133553 —UN—07SEP00



T133554 —UN—07SEP00



TX,PREVENT,FIRE -19-09JUN16-1/1

Prevent Battery Explosions

Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.

Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).



DX,SPARKS -19-03MAR93-1/1

T133552 —UN—15APR13

TS204 —UN—15APR13

Handle Chemical Products Safely

Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with John Deere equipment include such items as lubricants, coolants, paints, and adhesives.

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.

Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and recommended equipment.

(See your John Deere dealer for MSDS's on chemical products used with John Deere equipment.)



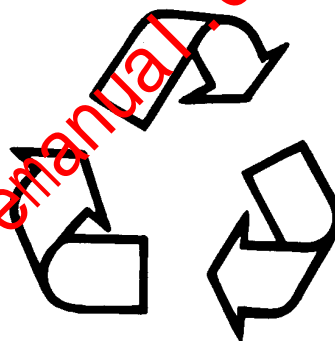
TS1132 —UN—15APR13

DX,MSDS,NA -19-03MAR93-1/1

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

Exhaust Filter Ash Handling and Disposal

CAUTION: Under federal, state, and local laws or regulations, exhaust filter ash can be classified as a hazardous waste. Hazardous waste must be disposed of in accordance with all applicable federal, state, and local laws or regulations

governing hazardous waste disposal. Only a qualified service provider should remove ash from the exhaust filter. Personal protective equipment and clothing, maintained in a sanitary and reliable condition, should be used when handling and cleaning exhaust filter. See your authorized dealer for exhaust filter ash handling and disposal.

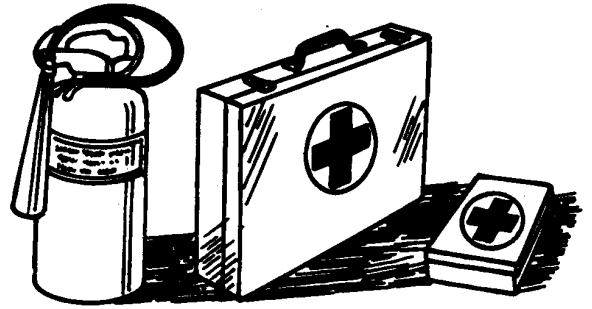
TX,ASH,DISP -19-20JAN11-1/1

Prepare for Emergencies

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



TS291 —UN—15APR13

DX,FIRE2 -19-03MAR93-1/1

Clean Debris from Machine

Keep engine compartment, radiator, batteries, hydraulic lines, exhaust components, fuel tank, and operator's station clean and free of debris.

Clean any oil spills or fuel spills on machine surfaces.

Temperature in engine compartment could go up immediately after engine is stopped. **BE ON GUARD FOR FIRES DURING THIS PERIOD.**

Open access door(s) to cool the engine faster, and clean engine compartment.



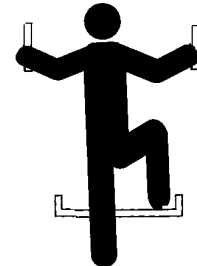
T6669AG —UN—15APR13

TX,DEBRIS -19-20JAN11-1/1

Use Steps and Handholds Correctly

Prevent falls by facing the machine when you get on and off. Maintain 3-point contact with steps and handrails. Never use machine controls as handholds.

Use extra care when mud, snow, or moisture present slippery conditions. Keep steps clean and free of grease or oil. Never jump when exiting machine. Never mount or dismount a moving machine.



T133468 —UN—15APR13

TX,STEPS -19-09FEB11-1/1

Start Only From Operator's Seat

Avoid unexpected machine movement. Start engine only while sitting in operator's seat. Ensure that all controls and working tools are in proper position for a parked machine.

Never attempt to start engine from the ground. Do not attempt to start engine by shorting across the starter solenoid terminals.



T133715 —UN—15APR13

TX,SOFOS -19-20JAN11-1/1

Use and Maintain Seat Belt

Use seat belt when operating machine. Remember to fasten seat belt when loading and unloading from trucks and during other uses.

Examine seat belt frequently. Be sure that webbing is not cut or torn. Replace seat belt immediately if any part is damaged or does not function properly.

The complete seat belt assembly should be replaced every three years, regardless of appearance.



**USE
SEAT
BELT**

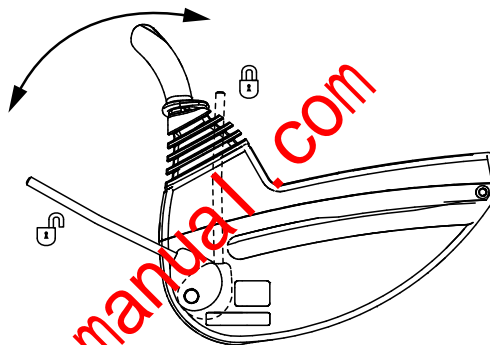
T133716 —19—17APR13

TX,SEAT,BELT -19-20JAN11-1/1

Prevent Unintended Machine Movement

Be careful not to accidentally actuate control levers when coworkers are present. Pull pilot shutoff lever to locked (UP) position during work interruptions. Pull pilot shutoff lever to locked (UP) position and stop engine before allowing anyone to approach machine.

Always lower work equipment to the ground and pull pilot shutoff lever to locked (UP) position before standing up or leaving the operator's seat. Stop engine before exiting.



T216779 —UN—22NOV05

VD76477,000036D -19-19APR11-1/1

Avoid Work Site Hazards

Avoid contact with gas lines, buried cables, and water lines. Call utility line location services to identify all underground utilities before digging.

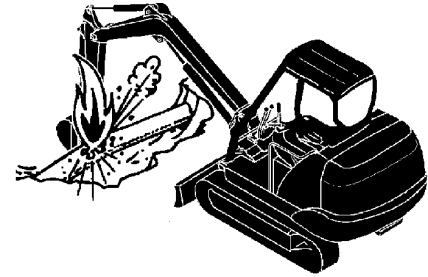
Prepare work site properly. Avoid operating near structures or objects that could fall onto the machine. Clear away debris that could move unexpectedly if run over.

Avoid boom or arm contact with overhead obstacles or overhead electrical lines. Never move any part of machine or load closer than 3 m (10 ft) plus twice the line insulator length to overhead wires.

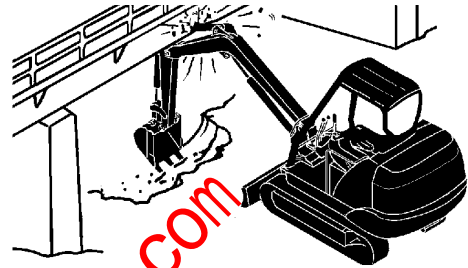
Keep bystanders clear at all times. Keep bystanders away from raised booms, attachments, and unsupported loads. Avoid swinging or raising booms, attachments, or loads over or near bystanders. Use barricades or a signal person to keep vehicles and pedestrians away. Use a signal person if moving machine in congested areas or where visibility is restricted. Always keep signal person in view. Coordinate hand signals before starting machine.

Operate only on solid footing with strength sufficient to support machine. When working close to an excavation, position travel motors away from the hole.

Reduce machine speed when operating with tool on or near ground when obstacles may be hidden (e.g., during snow removal or clearing mud, dirt, etc). At high speeds hitting obstacles (rocks, uneven concrete, or manholes) can cause a sudden stop. Always wear seat belt.



T153094 —UN—01APR02



T153096 —UN—01APR02



T153097 —UN—01APR02

VD76477,0000136 -19-27FEB17-1/1

Keep Riders Off Machine

Only allow operator on machine.

Riders are subject to injury. They may fall from machine, be caught between machine parts, or be struck by foreign objects.

Riders may obstruct operator's view or impair his ability to operate machine safely.



T120807

T120807 —UN—14APR99

TX14740,0001E7A -19-19MAR02-1/1

Avoid Backover Accidents

Before moving machine, be sure that all persons are clear of machine path. Turn around and look directly for best visibility. Use mirrors to assist in checking all around machine. Keep windows and mirrors clean, adjusted, and in good repair.

Be certain reverse warning alarm is working properly.

Use a signal person when backing if view is obstructed or when in close quarters. Keep signal person in view at all times. Use prearranged hand signals to communicate.

Do not rely on the rear camera and radar object detection systems, if equipped, to determine if personnel are behind the machine. The system has limitations due to maintenance practices, environmental conditions, and operating range.



PC10857XW —UN—15APR13

TX,AVOID,BACKOVER -19-04MAR16-1/1

Inspect and Maintain ROPS

A damaged rollover protective structure (ROPS) should be replaced, not reused.

The protection offered by ROPS could be impaired if ROPS is subjected to structural damage, is involved in an overturn incident, or is in any way altered by welding, bending, drilling, or cutting.

If ROPS was loosened or removed for any reason, inspect it carefully before operating the machine again.

To maintain the ROPS:

- Replace missing hardware using correct grade hardware.
- Check hardware torque.
- Check isolation mounts for damage, looseness, or wear; replace them if necessary.
- Check ROPS for cracks or physical damage.

TX,ROPS -19-20JAN11-1/1

Avoid Machine Tip Over

Use seat belt at all times.

Do not jump if the machine tips. Operator will be unlikely to jump clear and the machine may crush the operator.

Load and unload from trucks or trailers carefully. Be sure truck is wide enough and on a firm level surface. Use loading ramps and attach them properly to truck bed. Avoid trucks with steel beds because tracks slip more easily on steel.

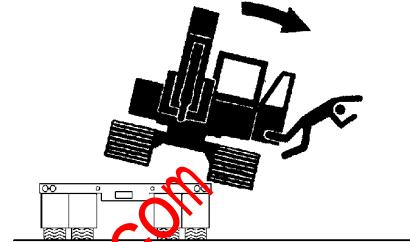
Be careful on slopes. Use extra care on soft, rocky or frozen ground. Machine may slip sideways in these conditions. When traveling up or down slopes, keep the bucket on uphill side and just above ground level.

Be careful with heavy loads. Using oversize buckets or lifting heavy objects reduces machine stability. Extending a heavy load or swinging it over side of undercarriage may cause machine to tip.

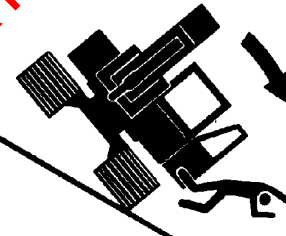
Ensure solid footing. Use extra care when operating near banks or excavations that may cave-in and cause machine to tip or fall.



Use Seat Belt



Unloading Machine



Do Not Jump

TX03679,00016DF -19-30JUN16-1/1

T133716 -19-17APR13

T133545 -UN-15SEP00

T133803 -UN-27SEP00

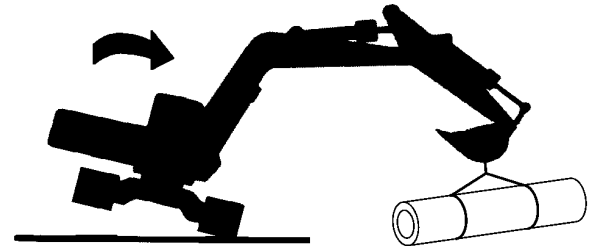
Use Special Care When Lifting Objects

Never use this machine to lift people.

Never lift a load above another person. Keep bystanders clear of all areas where a load might fall if it breaks free. Do not leave the seat when there is a raised load.

Do not exceed lift capacity limits posted on machine and in this manual. Extending heavy loads too far or swinging over undercarriage side may cause machine to tip over.

Use proper rigging to attach and stabilize loads. Be sure slings or chains have adequate capacity and are in good



Use Special Care When Lifting Objects

condition. Use tether lines to guide loads and prearranged hand signals to communicate with co-workers.

TX03679,00016E1 -19-08JUL15-1/1

T133839 -UN-27SEP00

Add and Operate Attachments Safely

Always verify compatibility of attachments by contacting your authorized dealer. Adding unapproved attachments could affect machine stability or reliability and could create a hazard for others near the machine.

Ensure that a qualified person is involved in attachment installation. Add guards to machine if operator protection

is required or recommended. Verify that all connections are secure and attachment responds properly to controls.

Carefully read attachment manual and follow all instructions and warnings. In an area free of bystanders and obstructions, carefully operate attachment to learn its characteristics and range of motion.

TX,ATTACH -19-20JAN11-1/1

Park and Prepare for Service Safely

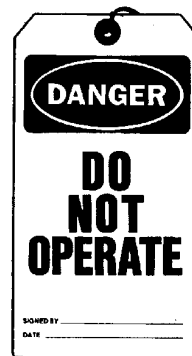
Warn others of service work. Always park and prepare machine for service or repair properly.

- Park machine on a level surface and lower equipment to the ground.
- Place pilot shutoff lever in locked (UP) position. Stop engine and remove key.
- Attach a "Do Not Operate" tag in an obvious place in the operator's station.

Securely support machine or attachment before working under it.

- Do not support machine with any hydraulically actuated equipment.
- Do not support machine with cinder blocks or wooden pieces that may crumble or crush.
- Do not support machine with a single jack or other devices that may slip out of place.

Understand service procedures before beginning repairs. Keep service area clean and dry. Use two people whenever the engine must be running for service work.



Do Not Operate Tag



Support Machine Properly

OUT4001,000089A -19-02JUL15-1/1

T133332 —19—17APR13

TS229 —UN—23AUG88

Service Cooling System Safely

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



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

TS281 —UN—15APR13

Remove Paint Before Welding or Heating

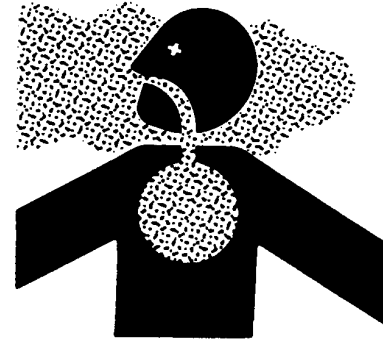
Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Remove paint before heating:

- Remove paint a minimum of 100 mm (4 in.) from area to be affected by heating. If paint cannot be removed, wear an approved respirator before heating or welding.
- If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.
- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

Do not use a chlorinated solvent in areas where welding will take place.



Do all work in an area that is well ventilated to carry toxic fumes and dust away.

Dispose of paint and solvent properly.

DX,PAINT -19-24JUL02-1/1

Make Welding Repairs Safely

IMPORTANT: Disable electrical power before welding.
Turn off main battery switch and disconnect positive (+) and negative (-) battery cables.

Do not weld or apply heat on any part of a reservoir or tank that has contained oil or fuel. Heat from welding and cutting can cause oil, fuel, or cleaning solution to create gases which are explosive, flammable, or toxic.

Avoid welding or heating near pressurized fluid lines. Flammable spray may result and cause severe burns if pressurized lines malfunction as a result of heating. Do not let heat go beyond work area to nearby pressurized lines.

Remove paint properly. Do not inhale paint dust or fumes. Use a qualified welding technician for structural repairs.



Heating Near Pressurized Fluid Lines

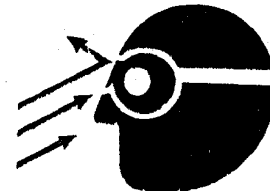
Make sure there is good ventilation. Wear eye protection and protective equipment when welding.

MB60223,0000212 -19-02JUL15-1/1

Drive Metal Pins Safely

Always wear protective goggles or safety glasses and other protective equipment before striking hardened parts. Hammering hardened metal parts such as pins and bucket teeth could dislodge chips at high velocity.

Use a soft hammer or a brass bar between hammer and object to prevent chipping.



TX,PINS -19-20JAN11-1/1

Clean Exhaust Filter Safely

During exhaust filter cleaning operations, the engine may 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.

Keep machine away from people, animals, or structures which may be susceptible to harm or damage from hot exhaust gases or components. Avoid potential fire or explosion hazards from flammable materials and vapors near the exhaust. Keep exhaust outlet away from people and anything that can melt, burn, or explode.

Closely monitor machine and surrounding area for smoldering debris during and after exhaust filter cleaning.

Adding fuel while an engine is running can create a fire or explosion hazard. Always stop engine before refueling machine and clean up any spilled fuel.

Always make sure that engine is stopped while hauling machine on a truck or trailer.

Contact with exhaust components while still hot can result in serious personal injury.

Avoid contact with these components until cooled to safe temperatures.

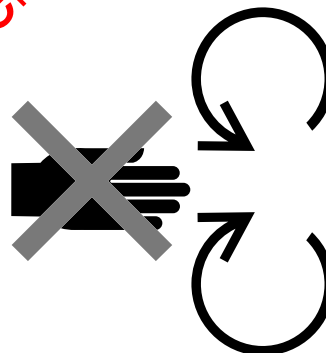
If service procedure requires engine to be running:

- Only engage power-driven parts required by service procedure
- Ensure that other people are clear of operator station and machine

Keep hands, feet, and clothing away from power-driven parts.

Always disable movement (neutral), set the parking brake or mechanism and disconnect power to attachments or tools before leaving the operator's station.

Shut off engine and remove key (if equipped) before leaving the machine unattended.



TS227 —UN—15APR13

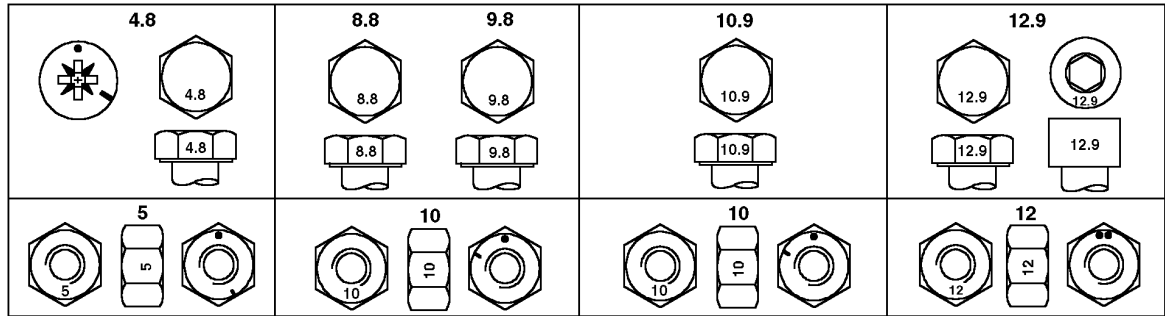
TS271 —UN—23AUG88

TS1693 —UN—08DEC09

TS1695 —UN—07DEC09

DX, EXHAUST, FILTER -19-12JAN11-1/1

Metric Bolt and Cap Screw Torque Values



Top—Property Class and Head Markings; Bottom—Property Class and Nut Markings

Bolt or Screw Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Hex Head ^a		Flange Head ^b		Hex Head ^a		Flange Head ^b		Hex Head ^a		Flange Head ^b		Hex Head ^a		Flange Head ^b	
	N-m	lb-in	N-m	lb-in	N-m	lb-in	N-m	lb-in	N-m	lb-in	N-m	lb-in	N-m	lb-in	N-m	lb-in
M6	3.6	31.9	3.9	34.5	6.7	59.3	7.3	64.6	9.8	86.7	10.8	95.6	11.5	102	12.6	112
M8	8.6	76.1	9.4	83.2	16.2	143	17.6	156	23.8	210	25.9	229	27.8	246	30.3	268
M10	16.9	150	18.4	163	31.9	281	34.7	306	46.8	412	51	449	55	485	60	529
M12	—	—	—	—	55	485	61	537	81	715	89	785	95	838	105	925
M14	—	—	—	—	87	765	96	845	128	1125	141	1245	150	1325	165	1465
M16	—	—	—	—	135	1195	149	1315	198	1735	219	1935	232	2045	257	2265
M18	—	—	—	—	193	1705	214	1895	275	2415	304	2685	322	2845	356	3125
M20	—	—	—	—	272	2395	301	2665	387	3395	428	3775	453	3985	501	4385
M22	—	—	—	—	365	3215	405	3565	520	4555	576	5035	608	5345	674	5925
M24	—	—	—	—	468	4095	518	4545	666	5845	738	6495	780	6855	864	7565
M27	—	—	—	—	653	5735	758	6665	973	8525	1080	9455	1139	10005	1263	11035
M30	—	—	—	—	932	8185	1029	9055	1327	11685	1466	12885	1553	13685	1715	15085
M33	—	—	—	—	1268	11085	1398	12335	1788	15685	1986	17435	2092	18385	2324	20385
M36	—	—	—	—	1617	14185	1789	15735	2303	20185	2548	22385	2695	23585	2982	26085

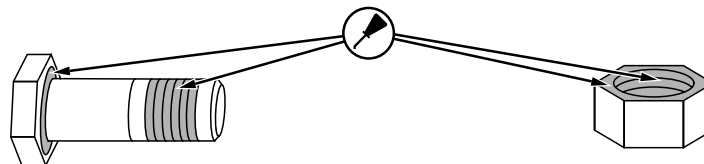
The nominal torque values listed are for general use only with the assumed wrenching accuracy of 20%, such as a manual torque wrench. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For lock nuts, stainless steel fasteners, or nuts on U-bolts, see the tightening instructions for the specific application.

Replace fasteners with the same or higher property class. If higher property class fasteners are used, tighten these to the strength of the original. Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

CAUTION: Avoid injury. Use only metric tools on metric hardware. Other tools may not fit properly, causing tool to slip resulting in injury.

- Make sure that fastener threads are clean.
- Apply a thin coat of Hy-Gard™ or equivalent oil under the head and on the threads of the fastener, as shown in the following image.
- Be conservative with the amount of oil to reduce the potential for hydraulic lockup in blind holes because of excessive oil.
- Properly start thread engagement.

TS1741 —UN—22MAY18



Lubricant Locations

^aHex head column values are valid for ISO 4014 and ISO 4017 hex head, ISO 4162 hex socket head, and ISO 4032 hex nuts.

Continued on next page

OUT3035,TORQUE2 -19-26JUN18-1/2

Torque Values

^bHex flange column values are valid for ASME B18.2.3.9M, ISO 4161, or EN 1665 hex flange products.

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OUT3035,TORQUE2 -19-26JUN18-2/2

Additional Metric Cap Screw Torque Values

CAUTION: Use only metric tools on metric hardware. Other tools may not fit properly. They may slip and cause injury.

Check tightness of cap screws periodically. Torque values listed are for general use only. Do not use these values if a different torque value or tightening procedure is listed for a specific application.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

Make sure fastener threads are clean and that the thread engagement is properly started. This will prevent fasteners from failing when tightening.

Tighten cap screws having lock nuts to approximately 50 percent of amount shown in chart.

METRIC CAP SCREW TORQUE VALUES ^a						
Nominal Diameter	T-Bolt		H-Bolt		M-Bolt	
	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft
8	29	21	20	15	10	7
10	63	46	45	33	20	15
12	108	80	88	65	34	25
14	176	130	137	101	54	40
16	265	195	206	152	78	58
18	392	289	294	217	118	87
20	539	398	392	288	167	125
22	735	542	539	398	216	159
24	931	687	686	506	274	202
27	1372	1012	1029	759	392	289
30	1911	1410	1421	1049	539	398
33	2548	1890	1911	1410	735	542
36	3136	2314	2401	1772	931	687

^aTorque tolerance is $\pm 10\%$.



T6873AA

T-Bolt



T6873AB

H-Bolt



T6873AC

M-Bolt

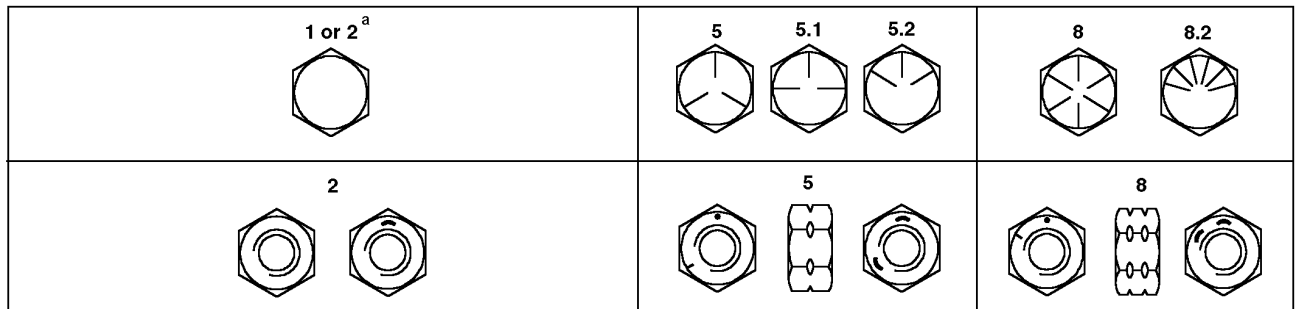
T6873AA —UN—15APR13

T6873AB —UN—18OCT88

T6873AC —UN—18OCT88

04T,90,M170 -19-29SEP99-1/1

Unified Inch Bolt and Cap Screw Torque Values



Top—SAE Grade and Head Markings; Bottom—SAE Grade and Nut Markings

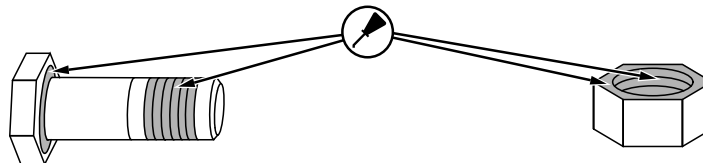
Bolt or Screw Size	SAE Grade 1 ^a				SAE Grade 2 ^b				SAE Grade 5, 5.1 or 5.2				SAE Grade 8 or 8.2			
	Hex Head ^c		Flange Head ^d		Hex Head ^c		Flange Head ^d		Hex Head ^c		Flange Head ^d		Hex Head ^c		Flange Head ^d	
	N-m	lb-in	N-m	lb-in	N-m	lb-in	N-m	lb-in	N-m	lb-in	N-m	lb-in	N-m	lb-in	N-m	lb-in
1/4	3.1	27.3	3.2	28.4	5.1	45.5	5.3	47.3	7.9	70.2	8.3	73.1	11.2	99.2	11.6	103
5/16	6.1	54.1	6.5	57.7	10.2	90.2	10.9	96.2	15.7	139	16.8	149	22.2	196	23.7	211
3/8	10.5	93.6	11.5	102	17.6	156	19.2	170	27.3	241	29.7	264	38.5	340	41.9	373
7/16	16.7	148	18.4	163	27.8	245	30.6	272	43	379	47.3	418	60.6	537	66.8	592
1/2	25.9	229	28.2	248	43.1	379	47	415	66.6	588	72.8	646	94	833	103	913
9/16	36.7	324	40.5	358	61.1	539	66.5	587	94.6	835	104	919	134	1188	148	1314
5/8	51	450	55.9	492	85	748	91.1	806	131	1159	144	1275	186	1648	203	1808
3/4	89.5	788	98	863	149	1314	164	1453	230	2034	252	2218	325	2870	357	3140
7/8	144	1268	157	1390	241	2114	260	2290	370	3265	405	3578	522	4600	572	5030
1	216	1908	236	2085	379	3340	415	3660	556	4900	609	5370	785	6920	860	7560
1-1/8	305	2690	335	2965	562	4930	615	5420	835	7370	915	8080	1170	10300	1280	11200
1-1/4	427	3770	469	4130	805	7090	880	7750	1180	10350	1290	11300	1620	14250	1760	15550
1-3/8	564	4950	618	5440	1060	9280	1160	10250	1570	13800	1710	15050	2200	19350	2400	21050
1-1/2	743	6570	815	7190	1410	12350	1540	13600	2060	18150	2240	19750	2890	25350	3140	27650

The nominal torque values listed are for general use only with the assumed wrenching accuracy of 20%, such as a manual torque wrench. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For lock nuts, stainless steel fasteners, or nuts on U-bolts, see the tightening instructions for the specific application.

Replace fasteners with the same or higher property class. If higher property class fasteners are used, tighten these to the strength of the original. Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

- Make sure that fastener threads are clean.
- Apply a thin coat of Hy-Gard™ or equivalent oil under the head and on the threads of the fastener, as shown in the following image.
- Be conservative with the amount of oil to reduce the potential for hydraulic lockup in blind holes because of excessive oil.
- Properly start thread engagement.

TS1741 —UN—22MAY18



Lubricant Locations

^aGrade 1 applies for hex cap screws over 6 in (152 mm) long, and for all other types of bolts and screws of any length.

^bGrade 2 applies for hex cap screws (not hex bolts) up to 6 in (152 mm) long.

^cHex head column values are valid for ISO 4014 and ISO 4017 hex head, ISO 4162 hex socket head, and ISO 4032 hex nuts.

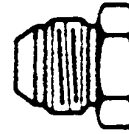
^dHex flange column values are valid for ASME B18.2.3.9M, ISO 4161, or EN 1665 hex flange products.

Hy-Gard is a trademark of Deere & Company

OUT3035,TORQUE1 -19-26JUN18-1/1

Service Recommendations for 37° Flare and 30° Cone Seat Connectors

1. Inspect flare and flare seat. They must be free of dirt or obvious defects.
2. Defects in tube flare cannot be repaired. Overtightening a defective flared fitting will not stop leaks.
3. Align tube with fitting before attempting to start nut.
4. Lubricate male threads with hydraulic fluid or petroleum jelly.
5. Index angle fittings and tighten by hand.
6. Tighten fitting or nut to torque value shown on torque chart. Do not allow hoses to twist when tightening fittings.



Cone Seat Connector

STRAIGHT FITTING OR SPECIAL NUT TORQUE CHART

Thread Size	N·m	lb·ft
3/8 - 24 UNF	8	6
7/16 - 20 UNF	12	9
1/2 - 20 UNF	16	12
9/16 - 18 UNF	24	18
3/4 - 16 UNF	46	34
7/8 - 14 UNF	62	46
1-1/16 - 12 UN	102	75
1-3/16 - 12 UN	122	90
1-5/16 - 12 UN	142	105
1-7/8 - 12 UN	190	140
2-1/8 - 12 UN	217	160

NOTE: Torque tolerance is $\pm 10\%$.

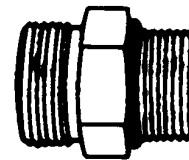
T82,BHMA,EL -19-29SEP99-1/1

T6234AC—UN—15APR13

Service Recommendations for O-Ring Boss Fittings

Straight Fitting

1. Inspect O-ring boss seat for dirt or defects.
2. Lubricate O-ring with petroleum jelly. Place electrical tape over threads to protect O-ring. Slide O-ring over tape and into O-ring groove of fitting. Remove tape.
3. Tighten fitting to torque value shown on chart.



Straight Fitting

Continued on next page

04T,90,K66 -19-29SEP99-1/2

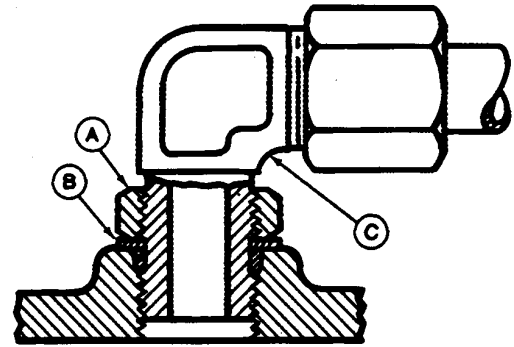
T6243AE—UN—15APR13

Angle Fitting

1. Back off lock nut (A) and backup washer (B) completely to head end (C) of fitting.
2. Turn fitting into threaded boss until backup washer contacts face of boss.
3. Turn fitting head end counterclockwise to proper index (maximum of one turn).

NOTE: Do not allow hoses to twist when tightening fittings.

4. Hold fitting head end with a wrench and tighten locknut and backup washer to proper torque value.



Angle Fitting

A—Lock Nut
B—Backup Washer

C—Head End

STRAIGHT FITTING OR SPECIAL NUT TORQUE CHART		
Thread Size	N·m	lb·ft
3/8-24 UNF	8	6
7/16-20 UNF	12	9
1/2-20 UNF	16	12
9/16-18 UNF	24	18
3/4-16 UNF	46	34
7/8-14 UNF	62	46
1-1/16-12 UN	102	75
1-3/16-12 UN	122	90
1-5/16-12 UN	142	105
1-5/8-12 UN	190	140
1-7/8-12 UN	217	160

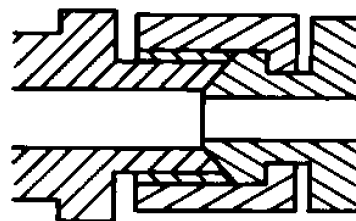
NOTE: Torque tolerance is $\pm 10\%$.

04T,90,K66 -19-29SEP99-2/2

T6520AB—UN—15APR13

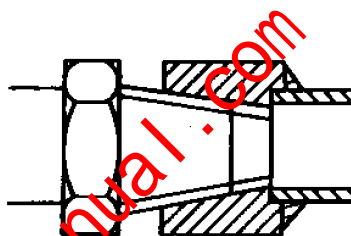
Service Recommendations for Flared Connections—Straight or Tapered Threads

1. Inspect flare and flare seat. They must be free of dirt or obvious defects.
2. Defects in the tube flare cannot be repaired. Overtightening a defective flared fitting will not stop leaks.
3. Align the tube with the fitting before attempting to start the nut.
4. Lubricate the male threads with hydraulic fluid or petroleum jelly.
5. Index angle fittings and tighten by hand.
6. Tighten fitting or nut to torque value shown on the chart. Do not allow hoses to twist when tightening fittings.



T6873AE

Straight Thread



T6873AD

Tapered Thread

TORQUE CHART^a

Thread Size	Straight Thread ^b		Tapered Thread	
	N·m	lb·ft	N·m	lb·ft
1/8	15	11		
1/4	20	15	45	33
3/8	29	21	69	51
1/2	49	36	93	69
3/4	69	51	176	130
1	157	116	343	253
1-1/2	196	145	539	398
2	255	188	588	434

^aTorque tolerance is $\pm 10\%$.^bWith seat face.

NOTE: If female thread is cast iron (control valves, brake valves motors, etc.), torque must be reduced approximately 10%.

04T,90,M171 -19-28JAN92-1/1

T6873AE—UN—15APR13

T6873AD—UN—15APR13

Service Recommendations for Flat Face O-Ring Seal Fittings

1. Inspect the fitting sealing surfaces and O-ring. They must be free of dirt or defects.
2. Lubricate O-rings and install into groove using petroleum jelly to hold in place.
3. Index angle fittings and tighten by hand pressing joint together to ensure O-ring remains in place.

4. Tighten fitting or nut to torque value shown on the chart. Do not allow hoses to twist when tightening fittings, use backup wrench on straight hose couplings.

IMPORTANT: Tighten fittings to 150% of listed torque value if indexing is necessary or if fitting is attached to an actuating device.

Tighten fittings to 50% of listed torque value if used in aluminum housing.

FLAT FACE O-RING SEAL FITTING TORQUE*						
Nominal Tube OD		Thread Size	Swivel Nut		Bulkhead Nut	
mm	in	in	N·m	lb·ft	N·m	lb·ft
6.35	0.250	9/16-18	16	12	12	9
9.52	0.375	11/16-16	24	18	24	18
12.70	0.500	13/16-16	50	37	46	34
15.88	0.625	1-14	69	51	62	46
19.05	0.750	1-3/16-12	102	75	102	75
22.22	0.875	1-3/16-12	102	75	102	75
25.40	1.000	1-7/16-12	142	105	142	105
31.75	1.250	1-11/16-12	190	140	190	140
38.10	1.500	2-12	217	160	217	160

*Torque tolerance is +15 -20% unless otherwise specified.

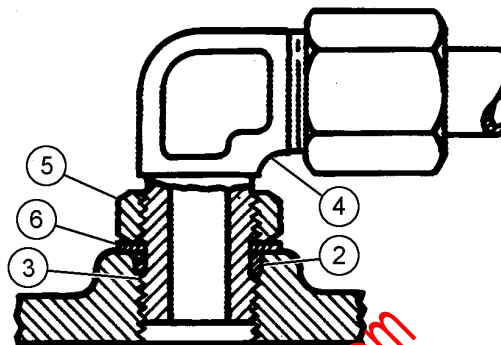
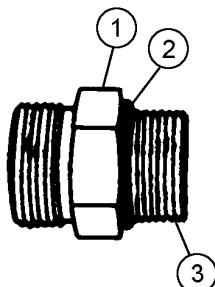
Stud End O-ring Seal Torque for Straight and Adjustable Fittings*				
Thread Size	Straight Hex Size	Locknut Hex Size	Straight Fitting or Locknut Torque	
in	in	in	N·m	lb·ft
3/8-24	5/8	9/16	12	9
7/16-20	5/8	5/8	21	15
1/2-20	3/4	11/16	26	19
9/16-18	3/4	3/4	34	25
3/4-16	7/8	15/16	73	55
7/8-14	1-1/16	1-1/16	104	76
1-1/16-12	1-1/4	1-3/8	176	130
1-3/16-12	1-3/8	1-1/2	230	170
1-5/16-12	1-1/2	1-5/8	285	210

*Torque tolerance is +15 -20% unless otherwise specified.

OUC6092,00010A4 -19-04MAR16-1/1

O-Ring Boss Fittings in Aluminum Housing Service Recommendations—Excavators

O-RING BOSS STRAIGHT OR ADJUSTABLE FITTING STUD END NUT WITH METRIC THREAD IN ALUMINUM HOUSING
TORQUE VALUES—Tolerance is $\pm 10\%$ unless otherwise specified.



T196315

O-Ring Boss Straight and Adjustable Fittings

1—Straight Fitting
2—O-Ring

3—Stud End
4—Adjustable Fitting

5—Hex Nut
6—Backup Washer

Thread Size mm	Hex Nut Size mm	N·m (lb·ft)
M12 x 1.5	17	39 (29)
M14 x 1.5	19	39 (29)
M16 x 1.5	22	55 (41)
M22 x 1.5	27	75 (55)
M27 x 2	32	110 (81)
M30 x 2	36	141 (104)
M33 x 2	41	165 (122)
M38 x 2	46	165 (122)
M42 x 2	50	275 (203)

O-RING BOSS STRAIGHT OR ADJUSTABLE FITTING STUD END NUT WITH INCH THREAD IN ALUMINUM HOUSING TORQUE VALUES—Tolerance is $\pm 10\%$ unless otherwise specified.

Thread Size in	N·m (lb·ft)
1/8	—
1/4	38 (20)
3/8	39 (29)
1/2	75 (55)
3/4	126 (93)
1	165 (122)
1-1/8	—
1-1/4	259 (191)
1-3/8	—
1-1/2	330 (243)
1-3/4	—
2	—

O-RING BOSS PLUG STUD END WITH INCH THREAD IN ALUMINUM HOUSING TORQUE VALUES—Tolerance is $\pm 10\%$ unless otherwise specified.

Thread Size in	N·m (lb·ft)
1/8	7.8 (5.80)
1/4	11.8 (8.70)
3/8	23 (17)
1/2	39 (29)
3/4	55 (41)
1	86 (64)
1-1/4	126 (93)
1-1/2	157 (116)
2	204 (150)

1. Inspect fitting and O-ring boss sealing surfaces and the O-ring. They must be free of dirt, scratches, nicks, or burrs. O-ring must be free of dirt, cuts, cracks, swelling, or flatten condition.
2. Back the stud end hex nut (5) off as far as possible. Push backup washer (6) towards the nut to fully expose the turn down section of stud end. Washer must fit turned down section and not be too loose.

Continued on next page

OUT3035,0000353 -19-04MAR16-1/2