

Backhoe Loaders Operation and Test

TECHNICAL MANUAL TM1512 07NOV03 (ENGLISH)

For complete service information also see:

410D, 510D, Backhoe Loader Operation and Test (Complete)	TM1512
410D, 510D Backhoe Loader Repair (Complete)	TM1513

**Worldwide Construction
And Forestry Division**
LITHO 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 you see this symbol on the machine or in this manual, be alert to the potential for personal injury.

Technical manuals are divided in two parts: repair and operation and tests. Repair sections tell how to repair the components. Operation and tests sections help you 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.

See DB1990 Service Publications Catalog to order a Technical Manual (TM).

TX,410DIFC -19-31AUG95-1/1

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INDX

Section 9000

General Information

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Handle Fluids Safely—Avoid Fires

When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.



TS227 -UN-23AUG88

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

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).



TS204 -UN-23AUG88

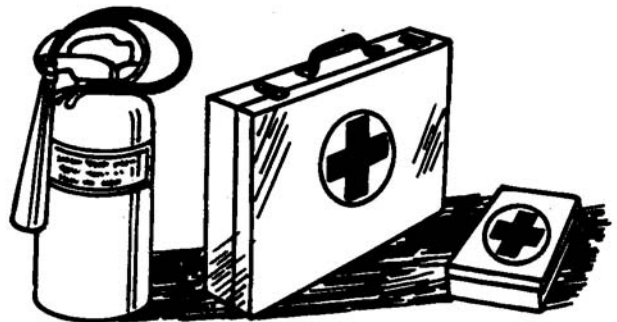
DX,SPARKS -19-03MAR93-1/1

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-23AUG88

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

Prevent Acid Burns

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid the hazard by:

1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

If you spill acid on yourself:

1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 15—30 minutes. Get medical attention immediately.

If acid is swallowed:

1. Do not induce vomiting.
2. Drink large amounts of water or milk, but do not exceed 2 L (2 quarts).
3. Get medical attention immediately.



TS203 -UN-23AUG88

DX,POISON -19-21APR93-1/1

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-26NOV90

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

Avoid High-Pressure Fluids

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 from Deere & Company Medical Department in Moline, Illinois, U.S.A.



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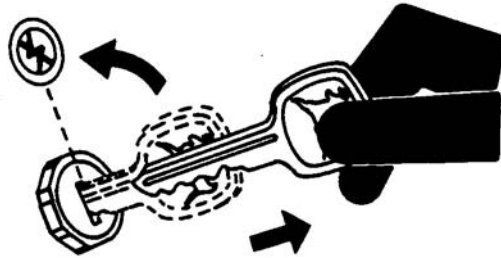
DX,FLUID -19-03MAR93-1/1

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Park Machine Safely

Before working on the machine:

- Lower all equipment to the ground.
- Stop the engine and remove the key.
- Disconnect the battery ground strap.
- Hang a "DO NOT OPERATE" tag in operator station.



TS230 -UN-24MAY89

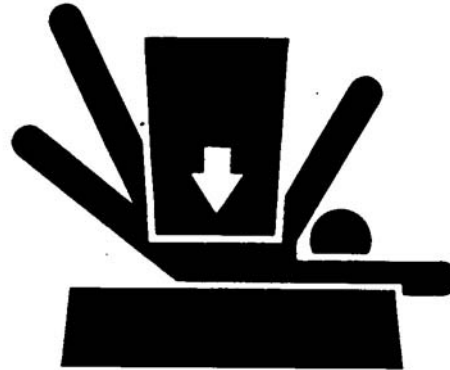
DX,PARK -19-04JUN90-1/1

Support Machine Properly

Always lower the attachment or implement to the ground before you work on the machine. If you must work on a lifted machine or attachment, securely support the machine or attachment. 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 tractor, always follow safety precautions listed in the implement operator's manual.



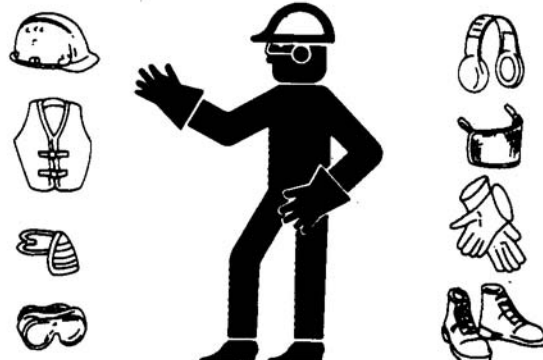
TS229 -UN-23AUG88

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

Wear Protective Clothing

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.



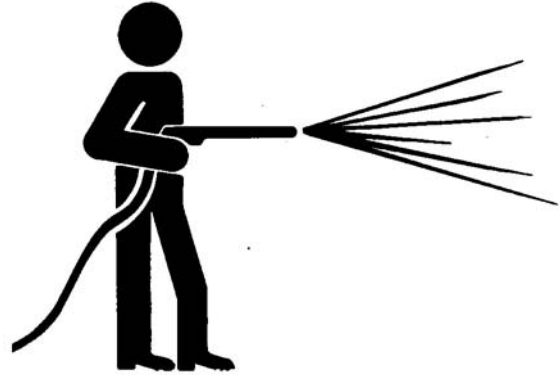
TS206 -UN-23AUG88

DX,WEAR2 -19-03MAR93-1/1

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.



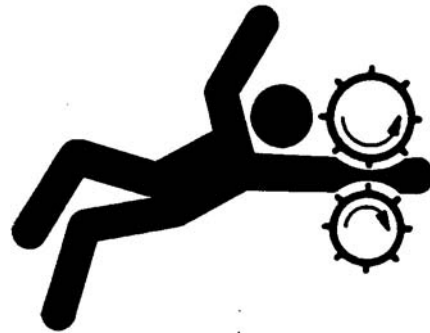
DX,CLEAN -19-04JUN90-1/1

T6642EJ -UN-18OCT88

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.



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

TS228 -UN-23AUG88

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



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

TS220 -UN-23AUG88

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.



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

TS223 -UN-23AUG88

Replace Safety Signs

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



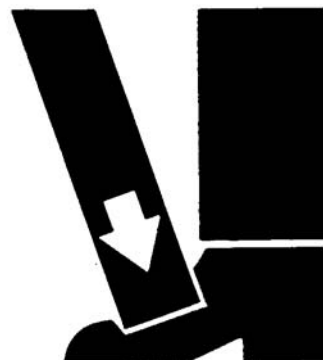
TS201 -UN-23AUG88

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

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

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.

Do all work outside or in a well ventilated area. Dispose of paint and solvent properly.

Remove paint before welding or heating:

- 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.



TS220 -UN-23AUG88

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

Avoid Heating Near Pressurized Fluid Lines

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials. Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area.



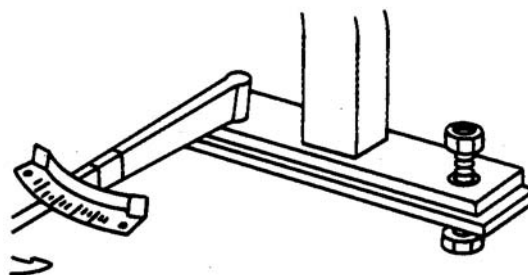
TS953 -UN-15MAY90

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

Keep ROPS Installed Properly

Make certain all parts are reinstalled correctly if the roll-over protective structure (ROPS) is loosened or removed for any reason. Tighten mounting bolts to proper torque.

The protection offered by ROPS will 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. A damaged ROPS should be replaced, not reused.



TS212 -UN-23AUG88

DX,ROPS3 -19-03MAR93-1/1

Service Tires Safely

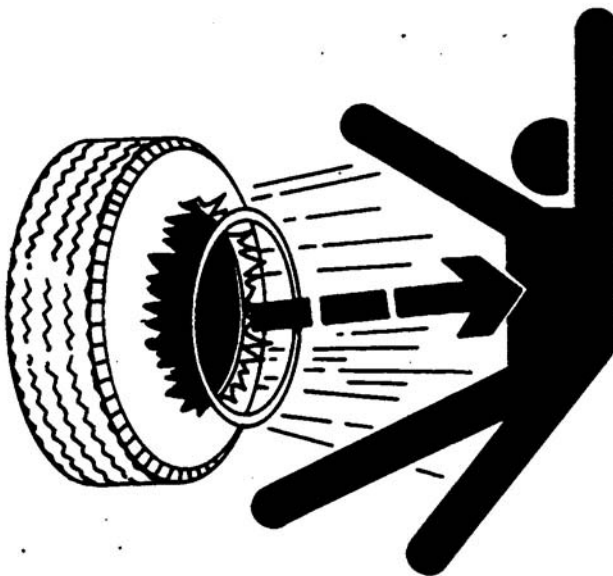
Explosive separation of a tire and rim parts can cause serious injury or death.

Do not attempt to mount a tire unless you have the proper equipment and experience to perform the job.

Always maintain the correct tire pressure. Do not inflate the tires above the recommended pressure. Never weld or heat a wheel and tire assembly. The heat can cause an increase in air pressure resulting in a tire explosion. Welding can structurally weaken or deform the wheel.

When inflating tires, use a clip-on chuck and extension hose long enough to allow you to stand to one side and NOT in front of or over the tire assembly. Use a safety cage if available.

Check wheels for low pressure, cuts, bubbles, damaged rims or missing lug bolts and nuts.



TS211 -UN-23AUG88

DX,RIM -19-24AUG90-1/1

Avoid Harmful Asbestos Dust

Avoid breathing dust that may be generated when handling components containing asbestos fibers. Inhaled asbestos fibers may cause lung cancer.

Components in products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates, and some gaskets. The asbestos used in these components is usually found in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust containing asbestos is not generated.

Avoid creating dust. Never use compressed air for cleaning. Avoid brushing or grinding material containing asbestos. When servicing, wear an approved respirator. A special vacuum cleaner is recommended to clean asbestos. If not available, apply a mist of oil or water on the material containing asbestos.

Keep bystanders away from the area.



TS220 -UN-23AUG88

DX,DUST -19-15MAR91-1/1

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 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.



TS218 -UN-23AUG88

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

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

Dispose of Waste Properly

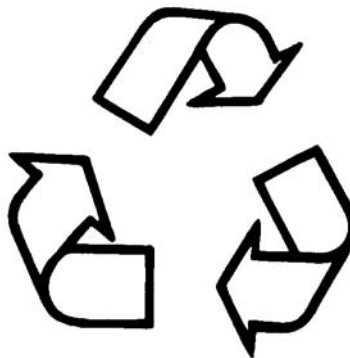
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere dealer.



TS1133 -UN-26NOV90

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

Live With Safety

Before returning machine to customer, make sure machine is functioning properly, especially the safety systems. Install all guards and shields.

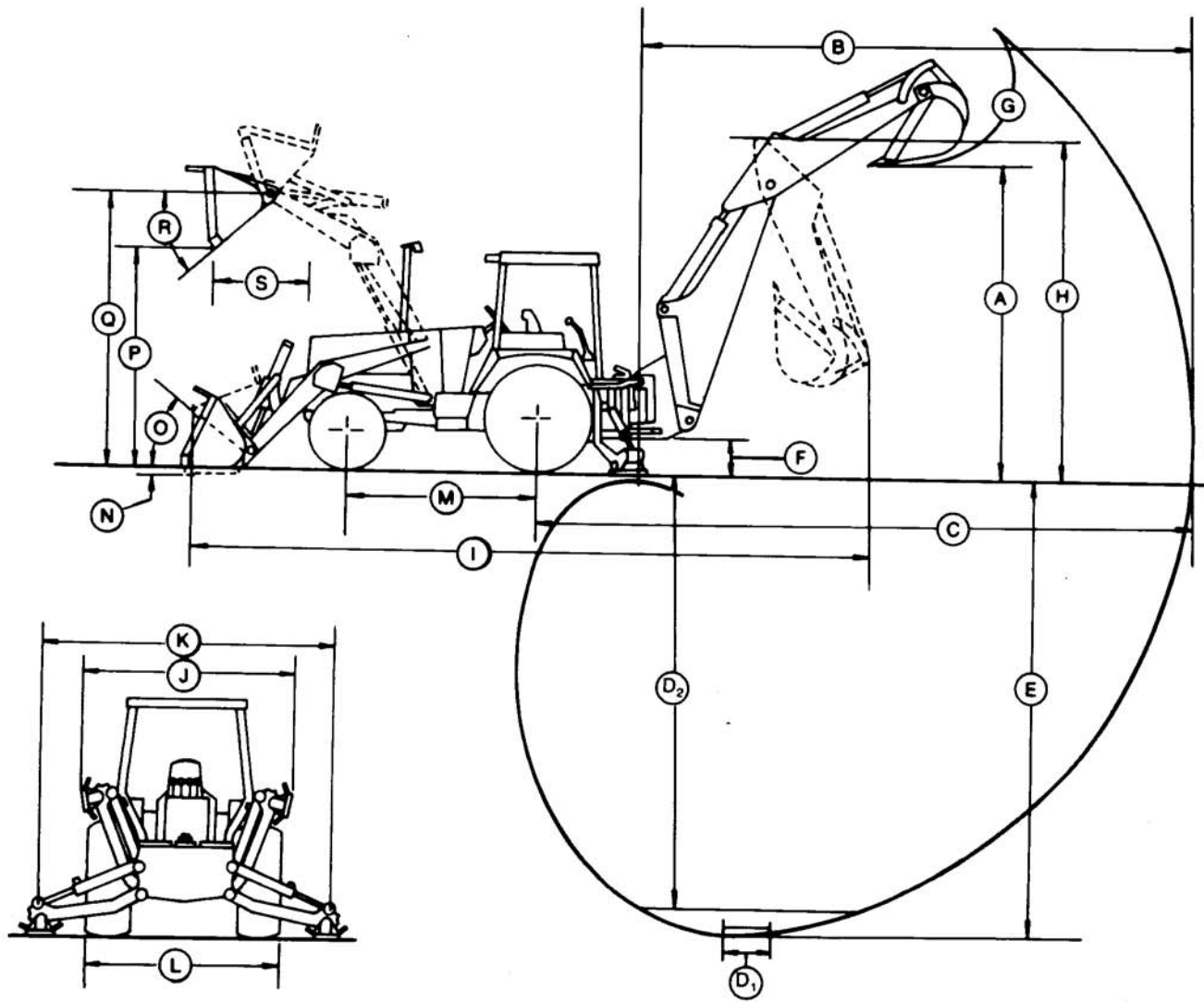


TS231 -19-07OCT88

DX,LIVE -19-25SEP92-1/1

410D Backhoe Loader With Standard Dipperstick

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TX,9000,DY609 -19-24JUL96-1/2

General Specifications

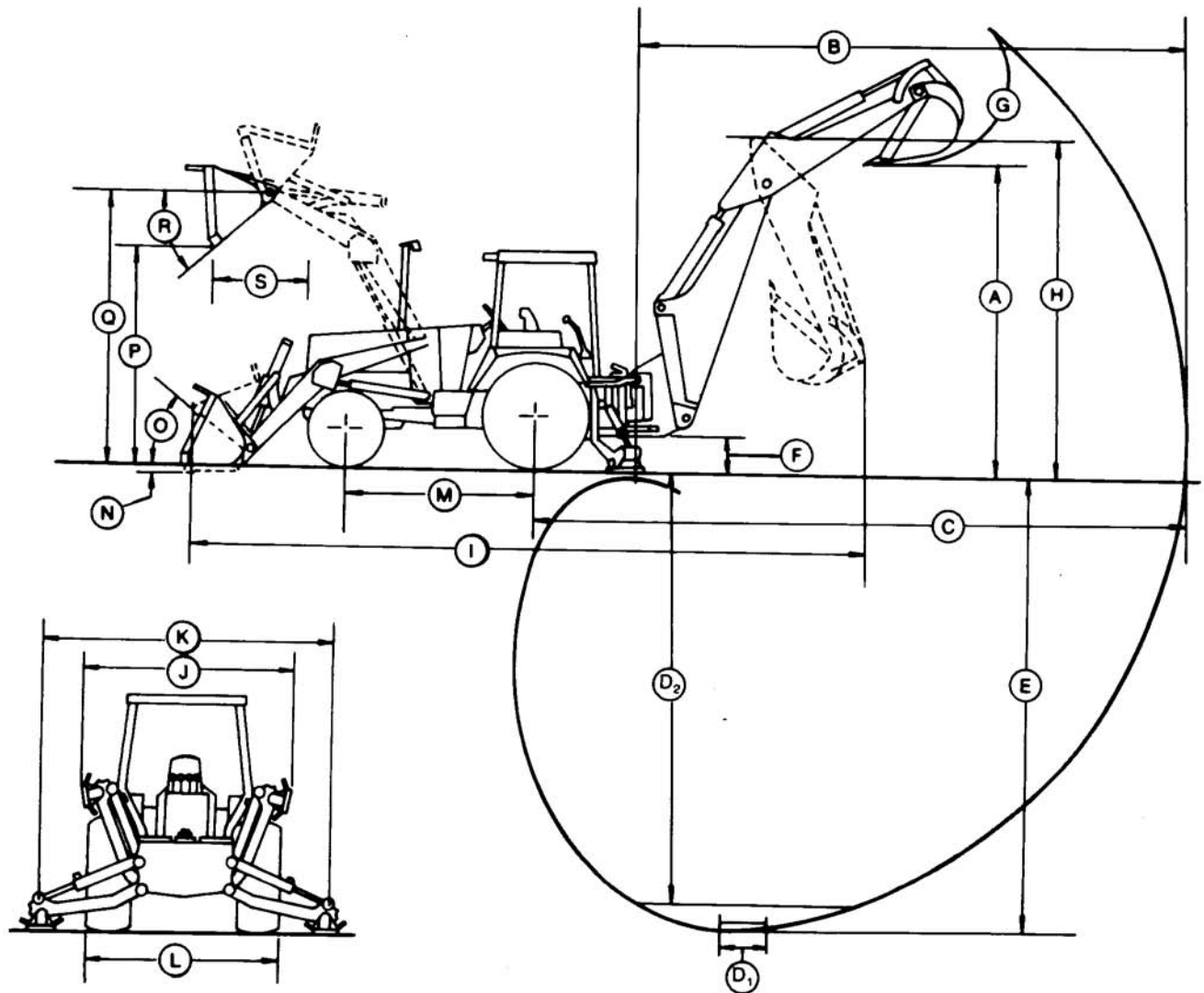
NOTE: Specifications and design subject to change without notice. Wherever applicable, specifications are in accordance with SAE Standards. Except where otherwise noted, these specifications are based on a standard

machine with 17.5L-24 rear tires; 11L-15 front tires; 1.0 cu. yd. (0.76 m³) loader bucket; 24 in. (610 mm) backhoe bucket; ROPS/FOPS; full fuel tank and 175 lb. (79 kg) operator.

Key:	Standard Dipperstick	1.22 m (4 ft) Extendible Dipperstick	
Retracted	Extended		
A—Loading height, truck loading position	3.61 m (11 ft 10 in.)	3.51 m (11 ft 6 in.)	4.24 m (13 ft 11 in.)
B—Reach from center of swing mast	5.61 m (18 ft 5 in.)	5.42 m (17 ft 9 in.)	6.53 m (21 ft 5 in.)
C—Reach from center of rear axle	6.76 m (22 ft 2 in.)	6.55 m (21 ft 6 in.)	7.67 m (25 ft 2 in.)
D—Digging depth (SAE):			
(1) 610 mm (2 ft.) flat bottom	4.65 m (15 ft 3 in.)	4.42 m (14 ft 6 in.)	5.61 m (18 ft 5 in.)
(2) 2440 mm (8 ft.) flat bottom	4.32 m (14 ft 2 in.)	4.09 m (13 ft 5 in.)	5.34 m (17 ft 6 in.)
E—Maximum digging depth	4.67 m (15 ft 4 in.)	4.46 m (14 ft 8 in.)	5.62 m (18 ft 5 in.)
F—Ground clearance, minimum	305 mm (12 in.)	305 mm (12 in.)	305 mm (12 in.)
G—Bucket rotation	160° and 180°	160° and 180°	160° and 180°
H—Transport height	3.49 m (11 ft 5 in.)	3.56 m (11 ft 8 in.)	3.56 m (11 ft 8 in.)
I—Overall length, transport	6.99 m (23 ft 5 in.)	7.01 m (23 ft)	7.01 m (23 ft)
J—Stabilizer width-transport	2.34 m (7 ft 8 in.)	2.34 m (7 ft 8 in.)	2.34 m (7 ft 8 in.)
K—Stabilizer spread-operating	3 m (9 ft 10 in.)	3 m (9 ft 10 in.)	3 m (9 ft 10 in.)
L—Width over tires	2.15 m (7 ft 1 in.)	2.16 m (7 ft 1 in.)	2.16 m (7 ft 1 in.)
M—Wheelbase	2100 mm (83 in.)		
N—Dig below ground—bucket level	100 mm (4 in.)	100 mm (4 in.)	100 mm (4 in.)
O—Rollback at ground level	40°	40°	40°
P—Dump clearance, bucket at 40°	2.74 m (9 ft)	2.74 m (9 ft)	2.74 m (9 ft)
Q—Maximum height to bucket hinge pin	3.35 m (11 ft)	3.35 m (11 ft)	3.35 m (11 ft)
R—Maximum bucket dump angle	45°		
S—Reach at full height, bucket at 40°	711 mm (28 in.)	711 mm (28 in.)	711 mm (28 in.)
Backhoe Performance Ratings:			
Digging force, bucket cylinder (power dig position)	52 kN (11 700 lb)	52 kN (11 700 lb)	52 kN (11 700 lb)
Digging force, crowd cylinder	28 kN (6300 lb)	30.3 kN (6800 lb)	20.50 kN (4600 lb)
Swing arc	180°	180°	180°
Operator control	Two levers	Right foot treadle	Right foot treadle
Bucket positions	9° and 18° rollback	8° and 17° rollback	12° and 22° rollback
Stabilizer angle rearward	14.5°	14.5°	14.5°
Lifting capacity, maximum boom @ 65°	1980 kg (4400 lb)	2087 kg (4600 lb)	1310 kg (2900 lb)
Leveling angle	14 °	14°	14°
NOTE: Backhoe specifications are with 610 mm x 0.21 m ³ (24 in. x 7.5 cu ft standard bucket. Loader specifications are with 1.5 m ³ (1.5 yd ³) bucket.			

410D Heavy Lift Backhoe Loader

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TX,9000,DY611 -19-24JUL96-1/2

General Specifications

NOTE: Specifications and design subject to change without notice. Wherever applicable, specifications are in accordance with SAE Standards. Except where otherwise noted, these specifications are based on a standard

machine with 17.5L-24 rear tires; 11L-15 front tires; 0.76 m³ (1.0 cu yd) loader bucket; 610 mm (24 in.) backhoe bucket; ROPS/FOPS; full fuel tank and 79 kg (175 lb) operator.

Key:	Standard Dipperstick with Heavy Lift Package		1.52 m (5 ft) Extendible Dipperstick	
	Retracted	Extended		
A—Loading height, truck loading position	3.76 m (12 ft 4 in.)	3.76 m (12 ft 4 in.)	3.76 m (12 ft 4 in.)	4.65 m (15 ft 3 in.)
B—Reach from center of swing mast	5.87 m (19 ft 3 in.)	5.87 m (19 ft 3 in.)	5.87 m (19 ft 3 in.)	7.29 m (23 ft 11 in.)
C—Reach from center of rear axle	7.01 m (23 ft)	7.01 m (23 ft)	7.01 m (23 ft)	8.43 m (27 ft 8 in.)
D—Digging depth (SAE):				
(1) 610 mm (2 ft.) flat bottom	4.78 m (15 ft 8 in.)	4.78 m (15 ft 8 in.)	4.78 m (15 ft 8 in.)	6.27 m (20 ft 7 in.)
(2) 2440 mm (8 ft.) flat bottom	4.47 m (14 ft 8 in.)	4.47 m (14 ft 8 in.)	4.47 m (14 ft 8 in.)	6.05 m (19 ft 10 in.)
E—Maximum digging depth	4.80 m (15 ft 9 in.)	4.80 m (15 ft 9 in.)	4.80 m (15 ft 9 in.)	4.80 m (15 ft 9 in.)
F—Ground clearance, minimum	330 mm (13 in.)	330 mm (13 in.)	330 mm (13 in.)	330 mm (13 in.)
G—Bucket rotation	160° and 180°	160° and 180°	160° and 180°	160° and 180°
H—Transport height	3.68 m (12 ft 1 in.)	3.86 m (12 ft 8 in.)	3.86 m (12 ft 8 in.)	3.86 m (12 ft 8 in.)
I—Overall length, transport	6.99 m (22 ft 11 in.)	7.01 m (23 ft)	7.01 m (23 ft)	7.01 m (23 ft)
J—Stabilizer width-transport	2.34 m (7 ft 8 in.)	2.34 m (7 ft 8 in.)	2.34 m (7 ft 8 in.)	2.34 m (7 ft 8 in.)
K—Stabilizer spread-operating	3.00 m (9 ft 10 in.)	3.00 m (9 ft 10 in.)	3.00 m (9 ft 10 in.)	3 m (9 ft 10 in.)
L—Width over tires	2.15 m (7 ft 1 in.)	2.16 m (7 ft 1 in.)	2.16 m (7 ft 1 in.)	2.16 m (7 ft 1 in.)
M—Wheelbase	215 mm (85 in.)	215 mm (85 in.)	215 mm (85 in.)	215 mm (85 in.)
N—Dig below ground—bucket level	100 mm (4 in.)	100 mm (4 in.)	100 mm (4 in.)	100 mm (4 in.)
O—Rollback at ground level	40°	40°	40°	40°
P—Dump clearance, bucket at 40°	2.74 m (9 ft)	2.74 m (9 ft)	2.74 m (9 ft)	2.74 m (9 ft)
Q—Maximum height to bucket hinge pin	3.35 m (11 ft)	3.35 m (11 ft)	3.35 m (11 ft)	3.35 m (11 ft)
R—Maximum bucket dump angle	45°	45°	45°	45°
S—Reach at full height, bucket at 40°	711 mm (28 in.)	711 mm (28 in.)	711 mm (28 in.)	711 mm (28 in.)
Backhoe Performance Ratings:				
Digging force, bucket cylinder (power dig position)	48.9 kN (11 000 lb)	58.9 kN (11 000 lb)	58.9 kN (11 000 lb)	58.9 kN (11 000 lb)
Digging force, crowd cylinder	36 kN (8100 lb)	36 kN (8100 lb)	36 kN (8100 lb)	23.60 kN (5300 lb)
Swing arc	180°	180°	180°	180°
Operator control	Two levers	Right foot treadle	Right foot treadle	Right foot treadle
Bucket positions	8° and 17° rollback	8° and 16° rollback	12° and 21° rollback	12° and 21° rollback
Stabilizer angle rearward	14.5°	14.5°	14.5°	14.5°
Lifting capacity, maximum boom @ 65°	2925 kg (6500 lb)	2790 kg (6200 lb)	1530 kg 3400 lb (1530 kg)	1530 kg 3400 lb (1530 kg)
Leveling angle	13°	13°	13°	13°

NOTE: Backhoe specifications are with 610 mm x 0.21 m³ (24 in. x 7.5 cu ft) standard bucket. Loader specifications are with 1.5 m³ (1.5 yd³) bucket

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