170
Skid-Steer Loader

JOHN DEERE

TECHNICAL MANUAL

170
Skid-Steer Loader

TM1075 (01JUL74) English

John Deere
Lawn & Grounds Care Division
TM1075 (01JUL74)

LITHO IN U.S.A.
ENGLISH

170 SKID-STEER LOADER

TECHNICAL MANUAL
TM-1075 (Jul-74)

CONTENTS

All information, illustrations and specifications contained in this technical 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.

SI (International System) Units of Measure

Metric equivalents have been included, where applicable, throughout this technical manual.

FOR YOUR CONVENIENCE

Vertical lines appear in the margins of many of the pages. These lines identify new material and revised information that affects specifications, procedures, and other important instructions.

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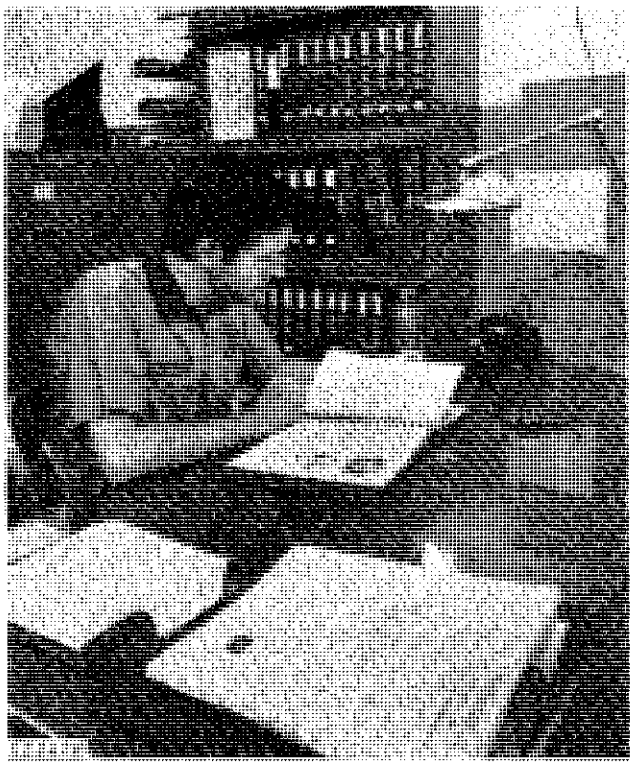
INTRODUCTION



Use FOS Manuals for Reference

Use Technical Manuals for Actual Service

This technical manual is part of a twin concept of service:

- **FOS Manuals—for reference**
- **Technical Manuals—for actual service**

The two kinds of manuals work as a team to give you both the general background and technical details of shop service.

Fundamentals of Service (FOS) Manuals cover *basic* theory of operation, *fundamentals* of trouble shooting, *general* maintenance, and *basic* types of failures and their causes. FOS Manuals are for training new men and for reference by experienced men.

Technical Manuals are concise service guides for a *specific* machine. Technical Manuals are on-the-job guides containing only the vital information needed by a journeyman mechanic.

When a serviceman should refer to a FOS Manual for more information, a FOS symbol like the one at the left is used in the TM to identify the reference.

Some features of this technical manual:

- *Table of contents at front of manual*
- *Exploded views showing parts relationship*
- *Photos showing service techniques*
- *Specifications grouped for easy reference*

This technical manual was planned and written for you—a journeyman mechanic. Keep it in a permanent binder in the shop where it is handy. Refer to it whenever in doubt about correct service procedures or specifications.

Using the technical manual as a guide will reduce error and costly delay. It will also assure you the best in finished service work.

This safety alert symbol identifies important safety messages in this manual. When you see this symbol, be alert to the possibility of personal injury and carefully read the message that follows.

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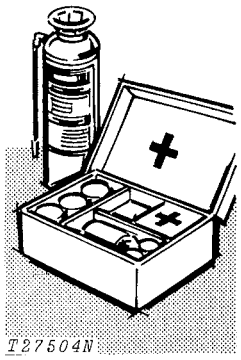
SAFETY AND YOU

T27999N

INTRODUCTION

This safety alert symbol identifies important safety messages in this manual and on the skid-steer loader. When you see this symbol, be alert to the possibility of bodily injury and carefully read the message that follows.



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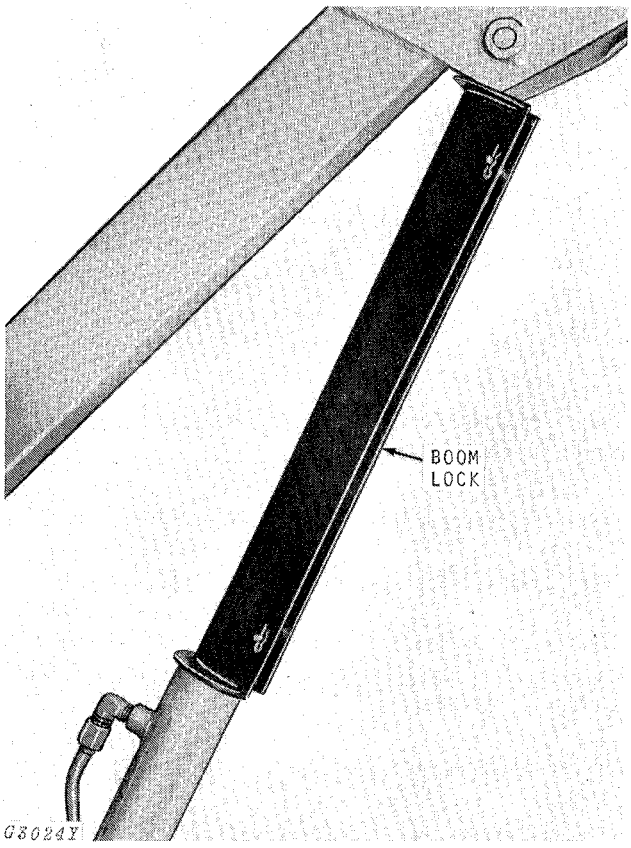
Be prepared if an accident or fire should occur. Know where the first aid kit and the fire extinguishers are located—know how to use them.

BOOM LOCKS

CAUTION



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Install the boom locks on the lift cylinders as follows whenever work or repair is being done on the loader with the boom raised:

1. Start the engine and raise the boom to its greatest height. Shut off the engine.

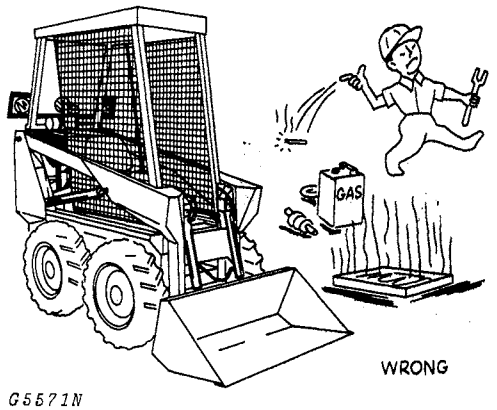
2. Lay the boom locks on the cylinder rods and install the drilled pins and spring pins.

3. Install boom blocks on other cylinder rods in the same manner.

4. Lower the boom until it contacts the boom locks.

IMPORTANT: After servicing the loader, raise the boom and remove the boom locks.

AVOID FIRE HAZARDS



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Don't smoke while refueling or handling highly flammable material.

Engine should be shut off when refueling.

Use care in refueling if the engine is hot.

Don't use open pans of gasoline or diesel fuel for cleaning parts. Good commercial, nonflammable solvents are preferred.

Provide adequate ventilation when charging batteries.

Don't check battery charge by placing metal objects across the posts.

Don't allow sparks or open flame near batteries.

Don't smoke near battery.

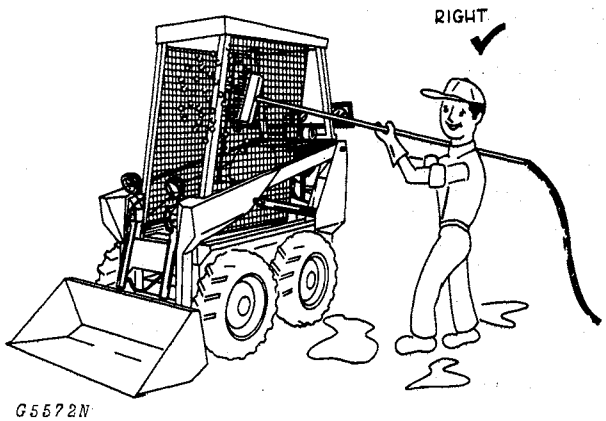
Never check fuel, battery electrolyte, or coolant levels with an open flame.

Never use an open flame to look for leaks anywhere on the equipment.

Never use an open flame as a light anywhere on or around the equipment.

When preparing engine for storage, remember that internal corrosion inhibitor is volatile and therefore dangerous. Seal and tape openings after adding the inhibitor. Keep container tightly closed when not in use.

CLEANING THE LOADER



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Always stop the engine before cleaning the loader.

Keep the operator's platform clean. Do not use it as a storage area.

Keep the engine closure screens free of foreign matter. Avoid a possible fire hazard.

Keep all equipment free of dirt and oil. In freezing weather, beware of snow and ice on operator's platform.

SERVICE AREA

Keep the service area clean and dry. Wet or oily floors are slippery. Wet spots can be dangerous when working with electrical equipment.

Make sure the service area is adequately vented.

Periodically check the shop exhaust system for leakage. Engine exhaust gas is dangerous.

Be sure all electrical outlets and tools are properly grounded.

Use adequate light for the job at hand.

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FLUIDS UNDER PRESSURE

Escaping fluid under pressure can have sufficient force to penetrate the skin, causing serious bodily injury. Before disconnecting lines, be sure to relieve all pressure. Before applying pressure to the system, be sure all connections are tight and that lines, pipes and hoses are not damaged. Fluid escaping from a very small hole can be almost invisible. Use a piece of cardboard or wood, rather than hands, to search for suspected leaks.

If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.

Don't forget the hydraulic system may be pressurized! To relieve pressure, follow the technical manual.

When checking hydraulic pressure, be sure to use the correct test gauge for the pressure in the particular system.

PERSONAL SAFETY

Always avoid loose clothing—flopping cuffs, dangling neckties and scarves—that can catch in moving parts and put you out of work.

Always wear your safety glasses while on the job.

Keep transmission and brake control units properly adjusted at all times. Before making adjustments, stop engine.

Before removing any housing covers, stop engine. Take all objects from your pockets which could fall into the opened housings. Don't let adjusting wrenches fall into opened housings.

Don't attempt to check chain belt tension while the engine is running.

Don't adjust the fuel system while the machine is in motion.

Before repairing the electrical system, or performing a major overhaul, make sure the batteries are disconnected.

Avoid working on equipment with the engine running. If it is necessary to make checks with the engine running, ALWAYS USE TWO MEN—one, the operator, at the controls, the other checking where the operator can see him. Also, put the transmission in neutral, set the brake, and apply any safety locks provided. KEEP HANDS AWAY FROM MOVING PARTS.

Use extreme caution in removing drain plugs, grease fittings, or hydraulic pressure caps.

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Section 10
GENERAL

CONTENTS OF THIS SECTION

Group 5
SPECIFICATIONS

LOADER DESIGN

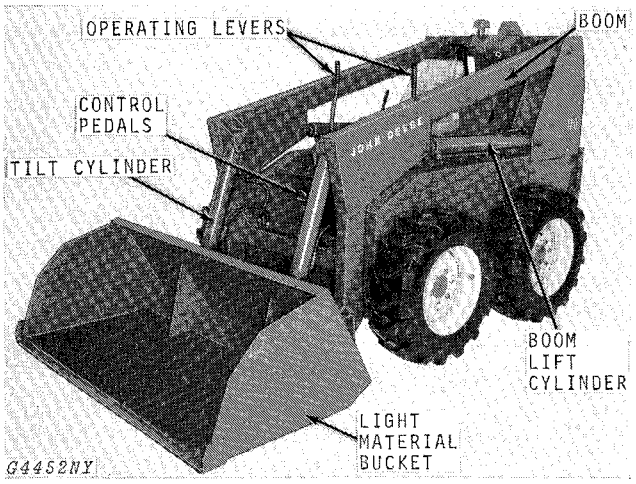

Fig. 1-170 Skid-Steer Loader

The John Deere 170 Skid-Steer Loader is a 1700-pound capacity, self-propelled, four-wheel drive loader used for various material handling operations. It also has the ability to maneuver in small, tight areas.

All references in this manual to front, rear, left-hand and right-hand are in relation to the position of the operator seated in the operator's station.

SERIAL NUMBERS

The serial number plate is located on the right-hand side; inside the frame under the boom pivot.

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LOADER SPECIFICATIONS

HORSEPOWER (@ 2,400 engine rpm):
Brake(SAE)* ..... 37 (49.617 Kw)
* Brake horsepower is for an engine equipped with fan, air cleaner and muffler; and is maximum under SAE standard conditions at sea level and 60°F (16°C).

ENGINE: Wisconsin VG4D, 4-cylinder, 4-stroke cycle, gasoline

Maximum torque @ 1,600 rpm ..... 93.8 ft-lb (127.18 Nm)
Number of Cylinders 4
Bore and Stroke .3.50 x 4 in. (8.89 x 10.16 cm)
Piston Displacement .... 154 cu. in. (252.41 cm^3)
Compression Ratio ..... 5.05 to 1
Intake Valve Clearance .....008 in. (0.2032 mm)
Exhaust Valve Clearance ...016 in. (0.4064 mm)
Slow Idle ..... 900 RPM
Fast Idle ..... 2550 RPM
Starting ..... Electric
Fuel ..... Gasoline (Regular Grade)
Governor ..... Cam Gear Driven
Lubrication ..... Pressure system w/full-flow filter
Cooling fan ..... Suction
Air cleaner w/restriction indicator ..... Dry
Electrical System ..... 12 volt w/alternator

ELECTRICAL SYSTEM

Battery Voltage 12-volt
Battery Terminal Grounded..... Negative Ground
Alternator Regulation ..... Regulator-Rectifier
Alternator ..... Belt Driven, Motorola
Breaker Point Gap .....020 in. (0.508 mm)
Spark Plugs
Size ..... 18 mm
Gap ..... .030 in. (0.762 mm)

CAPACITIES (U.S. STANDARD MEASURES)

Fuel Tank ..... 25 gal. (94.63 l)
Engine Crankcase .....4-1/2 qts. (4.26 l)
Hydraulic System..... 20 gal. (5.68 l)
Oil Filter..... 1/2 qt., Spin-On (13.24 l)

TIRES

Type ..... Flotation, grip-type
Size.... 10-16.5, 6-ply-rated (25.40 x 41.91 cm)

DRIVE SYSTEM

Gearbox..... Transmits engine power to clutch packs. It drives hydraulic pump and variable drive pulley.
Clutch Packs ..... Multi-disk type, roller cam actuated with 11 wear surfaces and heavy-duty separator springs.

TRAVEL SPEEDS: mph

Forward or reverse.....0-7 (11.3 km/hr)
Turning Radius:..... 360 degrees in its own length

FINAL DRIVES:

Axle is specially-treated, forged 2.56 in. (6.50 cm) dia. steel. Chain and sprocket primary, secondary, and final drives.

STEERING ..... Multiple-disk clutch. Control levers for left and right drive wheels. Front or reverse.

HYDRAULIC SYSTEM:

Pressure .....1,750 psi (12.06 MPa)
Control ..... Dual-pedal, double hydraulic system
Pump ..... Gear, 18 gpm (68.13 1/min) @ 2,400 engine rpm
Oil lines.....Welded JIC steel tubing; single-wire-braid hose
Filter ...33-micron paper cartridge in suction line

HYDRAULIC CYLINDERS

	Bore	Stroke
Boom (2)	3 in. (7.62 cm)	27.5 in. (69.85 cm)
Bucket (2)	3 in. (7.62 cm)	16.5 in. (41.91 cm)
Grapple (2)	2.5 in. (6.32 cm)	8 in. (20.32 cm)

Cylinder Rods..... Ground, heat-treated, chrome plated, polished
Boom cylinder rods.....1.5 in. dia. (3.81 cm)
Bucket cylinder rods .... 1.25 in. dia. (3.18 cm)
Grapple cylinder rods .. 1.125 in. dia. (2.88 cm)

LOAD CAPACITY Load capacity is 1,700 lbs. (771.11 kg) Bucket capacities vary according to application

SHIPPING WEIGHT ..... 4,400 lbs.
Distribution..... Rear-82%, Front-18%

OPERATING WEIGHT
Distribution..... Rear-70%, Front-30%
(With dirt bucket)

BUCKET SPECIFICATIONS

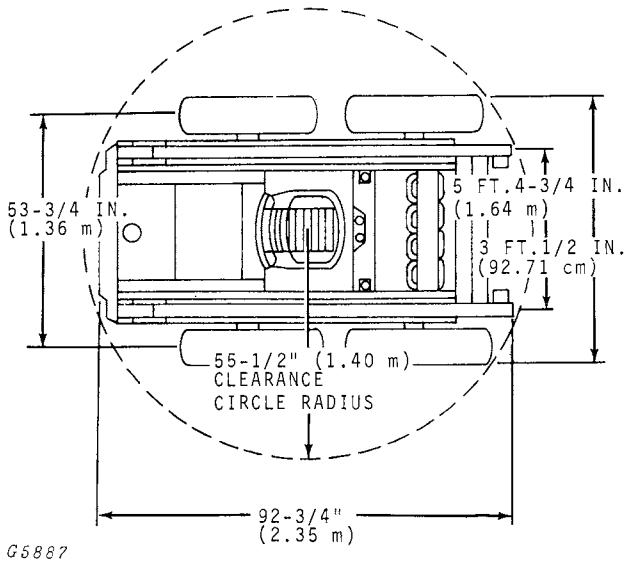
REGULAR BUCKETS	Width	Height	Capacity Cu. Ft.	Wt. Lbs.
Dirt	65″ (1.65m)	18-5/8″ (47.31cm)	10.0 (0.28m³)	335 (14.99kg)
Produce	72″ (1.83m)	28″ (71.12cm)	15.0 (0.425m³)	405 (18.37kg)
Light Materials	67″ (1.70m)	22-7/8″ (58.10cm)	20.2 (3/4 yd.) (0.57m³)	455 (20.65kg)
Fertilizer	65″ (1.65m)	21-3/8″ (54.29cm)	15.3 (0.43m³)	400 (18.14kg)
Utility	65″ (1.65m)	20-1/8″ (51.12cm)	12.5 (0.35m³)	380 (17.24kg)
Manure Bucket	65″ (1.65m)	18-7/8″ (47.94cm)		375 (17.01kg)

QUIK-TATCH BUCKETS	Width	Height	Capacity Cu. Ft.	Wt. Lbs.
Dirt	65″ (1.65m)	20″ (50.80cm)	10.5 (0.297m³)	415 (18.82kg)
Light Materials	73″ (1.85m)	27-3/4″ (70.49cm)	25.5 (1 yd.) (0.722m³)	465 (21.09kg)
Light Materials	67″ (1.70m)	25-3/4″ (65.41cm)	20.2 (3/4 yd.) (0.57m³)	415 (18.82kg)
Fertilizer	65″ (1.65m)	23-3/16″ (58.90cm)	15.3 (0.43m³)	420 (19.05kg)
Utility	65″ (1.65m)	20″ (50.80cm)	12.5 (0.35m³)	402 (18.23kg)
Quik-Tatch Bar				100 (4.536kg)

PALLET FORKS

Width ..... 43″ (1.092m)
Weight
- Quik-Tatch Mounting Frame ... 290 lbs. (13.54kg)
- Standard Mounting Frame ..... 115 lbs. (5.23kg)
- Forks (two) 36″ (91.44cm) ..... 150 lbs. (6.80kg)
- Forks (two) 46″ (122.84cm) .... 170 lbs. (7.71kg)

TURNING RADIUS



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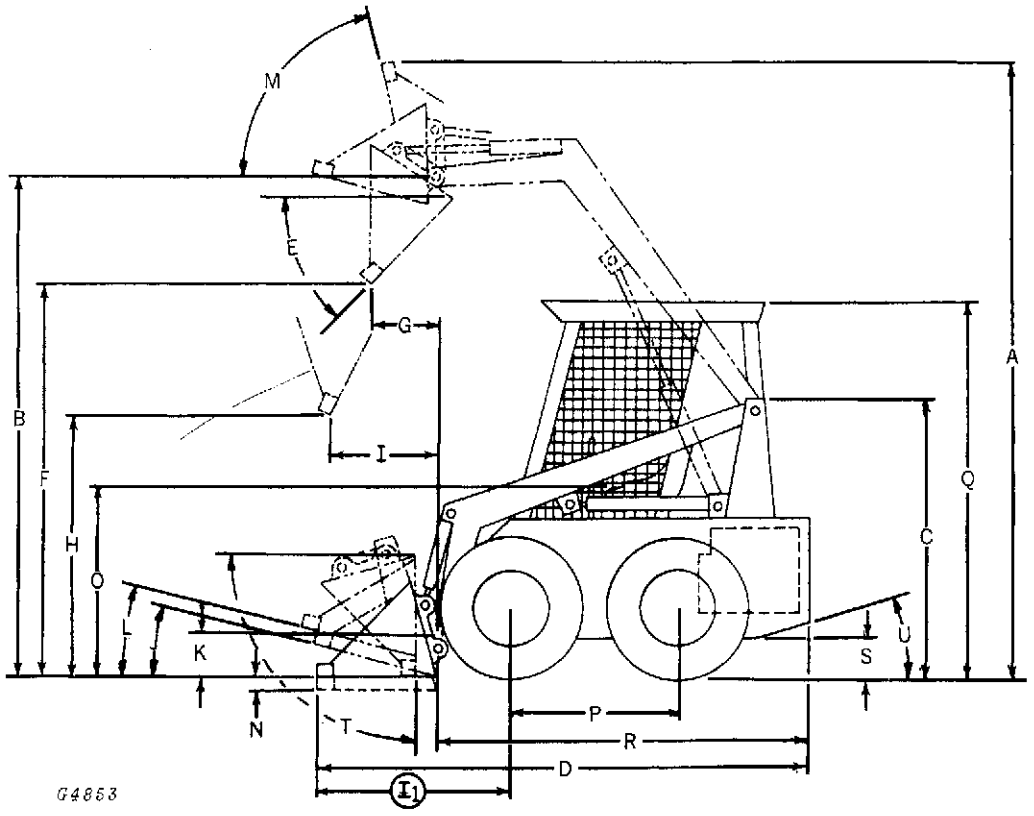

Specifications are in accordance with IEMC standards. Dimensions are with the Quik-Tatch Dirt and Foundry bucket.

A.	Overall height - lift arms raised	149-1/4″ (3.79 m)
B.	Height to hinge pin (Maximum)	116″ (2.95 m)
C.	Overall height	61-1/2″ (1.56 m)
D.	Overall length - with bucket	122-3/4″ (3.12 m)
E.	Dump angle	37°
F.	Dump height	91″ (2.31 m)
G.	Reach of maximum height	19-1/4″ (48.90 cm)
I.	Reach at "H" (25-1/4″ [64.14 cm] at 74° dump)	20″ (50.80 cm)
	(28″ [71.12 cm] at 45° dump)	35-3/4″ (90.81 cm)
I_1.	Reach bucket on ground	52-1/4″ (1.32 m)
J.	Maximum rollback at ground	32°
K.	Carry position	9-3/4″ (24.77 cm)
L.	Maximum rollback at carry position	34°
M.	Maximum rollback - fully raised	104°
N.	Digging depth	3/4″ (1.91 cm)
O.	Height to seat	42″ (1.07 m)
P.	Wheel base	35″ (88.90 cm)
Q.	Overall height with rollgard	85-1/4″ (2.16 m)
R.	Overall length - less bucket	91″ (2.31 cm)
S.	Ground clearance	7-3/4″ (19.69 cm)
T.	Maximum grading angle	94°
U.	Angle of departure	20°

(Specifications and design subject to change without notice)

Group 10

PREDELIVERY, DELIVERY, AND AFTER-SALES SERVICES

PREDELIVERY SERVICE

Service	Specifications	Reference
Check battery for electrolyte level and specific gravity	Use battery hydrometer	See operator's manual
Check battery terminal connections	.....	See operator's manual
Check variable speed drive belt for alignment	2-3/4-inch (6.98 cm)	See operator's manual
Adjust pressure of tires	45 to 50 PSI (310 to 344 kPa)	See operator's manual
Check nuts for tightness	90 ft-lbs torque (122.02 Nm)	
Check crankcase oil	Fill to top mark on oil level indicator	See operator's manual
Check gearbox oil level	1/4 pt (0.118 l) use SAE 80 gear oil	See operator's manual
Lubricate grease fittings	John Deere Multi-Purpose Lubricant or an equivalent SAE Multipurpose-Type Grease	See operator's manual
Check hydraulic reservoir level	Fill to top mark on bayonet gauge	See operator's manual

DELIVERY SERVICE

A thorough discussion of the operation and service of a new loader at the time of delivery helps to assure complete customer satisfaction.

Complaints may arise if the owner is not shown how to operate and service his new loader correctly. Devote enough time, at your customer's convenience, to introduce him to his new loader.

The following procedure is recommended before the serviceman delivers the loader to the owner.

Using the operator's manual as a guide, be sure the owner thoroughly understands the following points:

1. Operation and use of controls.
2. Operation of the engine.
3. Operation and functions of the hydraulic system.
4. Importance of lubrication and periodic services.
5. Importance of safety.
6. Terms and conditions of warranty.

After explaining and demonstrating the above points, have the owner sign the delivery receipt and give him his operator's manual.

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AFTER SALES SERVICE

The purpose of this inspection is to ensure that the customer is receiving satisfactory performance from his loader.

At the same time, the inspection should reveal whether or not the loader is being operated, lubricated, and serviced properly.

The following inspection program is recommended within the first 100 hours of operation:

Service	Specifications	Reference
Check battery specific gravity and electrolyte level	Use battery hydrometer	See operator's manual
Check engine crankcase oil	Fill to top mark on oil level indicator	See operator's manual
Check level of hydraulic oil	Top mark on gauge	See operator's manual
Check air cleaner for leaks	. . . . .	See operator's manual
Fill tank and start engine	25 U.S. gal. (94.63 l)	See operator's manual
Check operation of starter and gauges	. . . . .	See operator's manual
Check steering operation	. . . . .	See operator's manual
Check seat operation	. . . . .	See operator's manual
Check variable speed drive belt alignment	2-3/4 inch (6.98 cm)	See operator's manual

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Group 15
LOADER TUNE-UP

Perform all the tune-up steps to put the loader in top operating condition if major disassembly and repair is not required.

Operation	Specification	Reference
Air Intake System		Operator's Manual
Check air restriction indicator for air filter		
Backflush engine		
Ignition System		
Clean, test, or replace spark plugs	.030 in. gap (0.762 mm)	page 40-20-5
Check, adjust, or replace points	.020 in. gap (0.508 mm)	page 40-20-4
Check distributor and wiring		pages 40-10-3, 40-10-4, and 40-20-3
Time distributor to engine	23° @ 2000 RPM	page 40-20-3
Battery		
Check electrolyte level	1.260 specific gravity at 80°F (27°C)	Operator's Manual
Clean cables, terminals, and holder		page 40-10-2
Tighten cable clamps		
Fuel System		
Check fuel tank, lines, and filter for leakage		page 30-15-1
Check sediment bowl		page 30-15-1
Check carburetor		page 30-10-6
Tires and Wheels		
Check tire inflation	45 to 50 PSI (310 to 344 kPa)	Operator's Manual
Check wheel lug bolt nuts for tightness	90 ft-lbs torque (122.02 Nm)	
Electrical System		
Check for faulty ammeter gauge		
Check alternator (serial No. 000212 or above)		page 40-15-2
Check rectifier module (serial No.'s to 000212)		page 40-15-18
Check regulator module (serial No.'s to 000212)		page 40-15-18
Hydraulic System	Use John Deere all-weather hydrostatic fluid or an automotive automatic transmission oil (type F)	
Check hydraulic filter		
Check hydraulic oil level		Operator's Manual
Check control valves for leaks		
Check system for leaks		
Lubrication		
Replace engine oil filter	Throwaway-type filter	Operator's Manual
Lubricate Loader	John Deere Multi-Purpose lubricant or an equivalent SAE Multi-purpose-type grease	Operator's Manual
Drain and replace crankcase oil	5 U.S. quarts (4.73 l)	Operator's Manual

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Operation	Specification	Reference
Engine		
Check engine compression		
Adjust tappets	Intake .008 in. (0.203 mm) Exhaust .016 in. (0.406 mm)	page 20-15-7
Drive Chains		
Check tension of all chains	1/2-inch deflection (1.27 cm)	page 50-45-1

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Group 20
LUBRICATION

GENERAL INFORMATION

Carefully written and illustrated lubrication instructions are included in the operator's manual. Remind the owner to follow these instructions.

The following chart shows capacities and types of lubricants of the loader components and systems. Specifications for lubricants follow the chart.

Component	Capacity	Type of Lubricant	Interval of Service
Engine Crankcase	5 U.S. qts. (4.73 l)	See below	10 hours - check 100 hours - Drain oil, refill, and change filter
Hydraulic System	20 U.S. gal. (75.70 l)	Use John Deere all-weather hydrostatic fluid or an Automotive automatic transmission oil (type F)	10 hours - check 50 hours - clean breather cap 1200 hours - change hydraulic fluid
Gearbox	1-1/4 pts. (0.59 l)	SAE 80 gear oil	50 hours - check 2500 hours - drain and refill
Grease fittings		John Deere Multi-Purpose Lubricant or an equivalent SAE multi-purpose-type grease	10 hours - loader, boom and bucket cylinders, pivot pins. 20 hours - control pedals and variable sheave
Brake		SAEJ1703d, or DOT-3 brake fluid	As required-fill reservoir 300 hours - refil. reservoir

ENGINE LUBRICATING OILS

X3377

We recommend John Deere Torq-Gard Supreme engine oil for use in the engine crankcase. Torq-Gard Supreme is compounded specifically for use in John Deere engines and provides superior lubrication under all conditions. NEVER PUT ADDITIVES IN THE CRANKCASE. Torq-Gard Supreme oil was formulated to provide all the protection your engine needs. Additives could reduce this protection rather than help it.

If oil other than Torq-Gard Supreme is used, it must conform to one of the following specifications:

SINGLE VISCOSITY OILS

API Service CD/SE, CD/SD, CC/SD or SD
MIL-L-46152
MIL-L-2104C*

MULTI-VISCOSITY OILS

API Service CC/SE, CC/SD or SD
MIL-L-46152

** As further assurance of quality, the oil should be identified as suitable for API Service Designation SD.*

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ENGINE LUBRICATING OILS—Continued

Depending on the expected prevailing temperature for the fill period, use oil of viscosity as shown in the following chart.

		Other Oils	
Air Temperature	John Deere Torq-Gard Supreme Oil	Single Viscosity Oil	Multi-Viscosity Oil
Above 32°F. (0°C)	SAE 30	SAE 30	Not recommended
−10°F. to 32°F.** (−24°C to 0°C)**	SAE 10W-20	SAE 10W	SAE 10W-30
Below −10°F. (−24°C)	SAE 5W-20	SAE 5W	SAE 5W-20

***SAE 5W-20 oil may also be used to insure optimum lubrication at starting, particularly when engine is subjected to −10°F. (−24°C) or lower temperatures for several hours.*

Some increase in oil consumption may be expected when SAE 5W-20 or SAE 5W oils are used. Check oil level more frequently.

Crankcase capacity is 5 U.S. quarts (4.37 l).

HYDRAULIC OILS

Use John Deere all-weather hydrostatic fluid or an automotive automatic transmission oil (type F) in the hydraulic system reservoir.

GREASES

John Deere Multi-Purpose Lubricant or an equivalent SAE multipurpose-type grease is recommended for all grease fittings. Wheel bearing grease is recommended for wheel bearings. Application of grease as instructed in the lubrication section will provide proper lubrication and will keep contamination out of bearings.

Gearbox

Use SAE 80 gear oil in the gearbox.

BRAKE FLUID

Fill master cylinder with SAE J1703d or DOT-3 brake fluid.

Section 20
ENGINE

CONTENTS OF THIS SECTION

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Group 5
DIAGNOSING MALFUNCTIONS

DIAGNOSING ENGINE MALFUNCTIONS

Problem	Possible Cause	Possible Remedy	Reference
Failure to start or slow starting	Faulty ignition	Clean plugs and adjust points	See page 40-20-4 and 40-20-5
	Out of fuel	Fill fuel tank	Operator's Manual
	Engine flooded	Wait a few minutes and restart	.....
	Poor quality fuel	Drain and refill fuel tank	Operator's Manual
	Low compression	Replace valves and piston rings	See page 20-15-2 and 20-15-6
	Clogged carburetor	Remove and clean	See page 30-10-1
	Leaking valves or valve seats	Replace valves and reseat	See page 20-15-6
	Ignition timing off	Reset timing	See page 40-20-3
	Fuel mixture too rich	Adjust choke	.....
	Dirty air cleaner	Replace filter	Operator's Manual
	Blown or leaking head gasket	Replace head gasket	See page 20-15-7
Engine cranks slowly	Battery discharged	Recharge or replace	See page 40-10-1
	Oil too heavy	Drain and refill with proper viscosity oil	See page 10-20-2
	Worn bearings	Replace engine bearings	See page 20-15-2
	Loose or corroded battery connections	Clean and tighten connections	See page 40-10-2
Backfires at carburetor	Fuel mixture too rich	Adjust throttle	See page 30-10-6
	Engine flooded	Wait a few minutes and restart	.....
	Poor quality fuel	Drain and refill fuel tank	Operator's Manual
	Spark too far advanced	Retard timing	See page 40-20-5

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Problem	Possible Cause	Possible Remedy	Reference
Engine misfires under light load	Faulty ignition	Clean plugs and adjust points	See pages 40-20-4 and 40-20-5
	Fuel mixture too rich	Adjust throttle	See page 30-10-6
	Air intake leak	Tighten hose clamps or replace hose	
	Leaking valves or valve seats	Replace valves and reseat	See page 20-15-6
Engine misfires under heavy load	Faulty ignition	Clean plugs and adjust points	See pages 40-20-4 and 40-20-5
	Poor quality fuel	Drain and refill fuel tank	Operator's Manual
	Clogged carburetor	Remove and clean	See page 30-10-1
	Clogged fuel filter	Replace filter	See page 30-15-1
	Dirty air cleaner	Clean or replace element	Operator's Manual
Low oil pressure	Light or diluted oil	Drain and refill with proper viscosity oil	See page 10-20-2
	Oil level too low	Check and fill	Operator's Manual
	Sludge on oil pump screen	Remove and clean	See page 20-15-5
	Oil pump worn	Replace pump	See page 20-15-5
	Worn bearings	Replace bearings	See page 20-15-2
High oil pressure	Oil too heavy	Drain and refill with proper viscosity oil	See page 20-10-2
	Sludge on oil pump screen	Remove and clean	See page 20-15-5
	Worn bearings	Replace engine bearings	See page 20-15-2

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DIAGNOSING ENGINE MALFUNCTIONS—Continued

Problem	Possible Cause	Possible Remedy	Reference
Excessive oil consumption, blue smoky exhaust	Low compression	Replace valves and piston rings	See page 20-15-2 and 20-15-6
	Leaking valves or valve seats	Replace valves and reseat	See page 20-15-6
	Light or diluted oil	Drain and refill with oil of proper viscosity	See page 10-20-2
	Excessive crankcase pressure	Install breather	See pages 20-15-7 and 20-15-8
Excessive fuel consumption, black smoky exhaust	Faulty ignition	Clean plugs and adjust points	See pages 40-20-4 and 40-20-5
	Fuel mixture too rich	Adjust throttle	See page 30-10-6
	Poor quality fuel	Drain and refill fuel tank	Operator's Manual
	Leaking valves or valve seats	Replace valves and reseat	See page 20-15-6
	Dirty air cleaner	Clean or replace element	Operator's Manual
	Governor linkage out of adjustment	Reset linkage or replace	. . . . .
	Ignition timing wrong	Reset timing	See page 40-20-3
Engine stops unexpectedly	Faulty ignition	Clean plugs and adjust points	See pages 40-20-4 and 40-20-5
	Out of fuel	Fill fuel tank	Operator's Manual
	Fuel mixture too rich	Adjust carburetor	See page 30-10-6
	Clogged carburetor or clogged sediment bowl screen	Clean carburetor and screen	See page 30-10-1
Engine races	Intake air leak	Tighten hose clamps or replace hose	. . . . .
	Governor linkage out of adjustment	Reset linkage or replace	. . . . .
	Loose throttle lever	Tighten lever	. . . . .

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