



4310 and 4310A Beet Harvesters



JOHN DEERE

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4310 AND 4310A BEET HARVESTERS

TECHNICAL MANUAL
TM-1166 (Jul-82)

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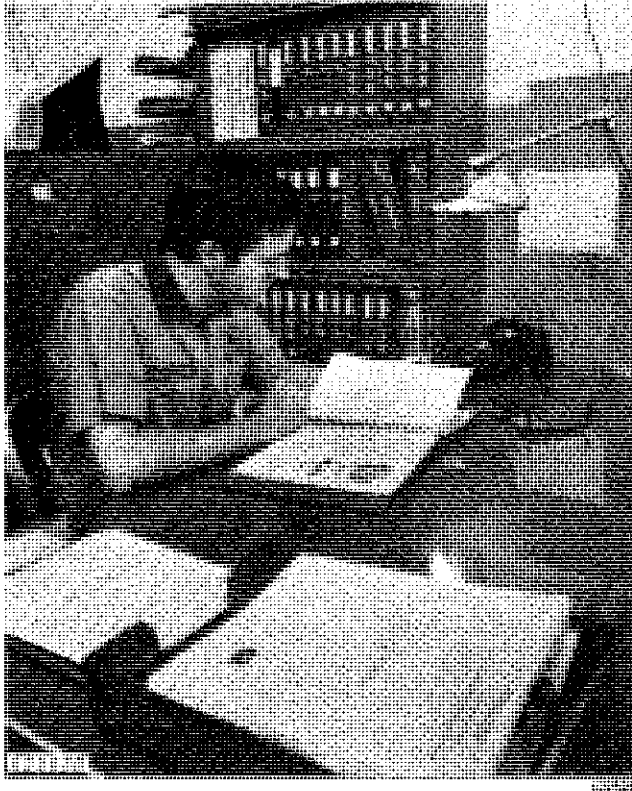
SECTION 50 - ALPHABETICAL INDEX

The specifications and design information contained in this manual were correct at the time this machine was manufactured. It is John Deere's policy to continually improve and update our machines. Therefore, the specifications and design information are subject to change without notice. Wherever applicable, specifications and design information are in accordance with SAE and IEMC standards.

Because John Deere sells its products worldwide, U.S. units of measure are shown with their respective Metric equivalents throughout this technical manual. These equivalents are the SI (International System) Units of Measure.

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INTRODUCTION



Use FOS Manuals for Reference

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 people and for reference by experienced technicians.

Technical Manuals are concise service guides for a specific machine. Technical Manuals are on-the-job guides containing only the vital information needed by an experienced technician for a specific machine.

NOTE: Whenever the service technician should refer to a FOS Manual for more information, a specific reference is provided.

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Use Technical Manuals for Actual Service

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—an experienced technician. 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.

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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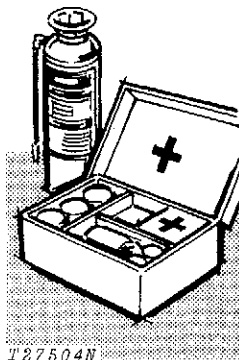
SAFETY AND YOU



T27999

INTRODUCTION

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



T27504N

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.

PERSONAL SAFETY

Shut off tractor engine and remove switch key before working on the beet harvester.

If it is necessary to make checks with the engine running. **ALWAYS USE TWO PEOPLE**—with the operator at the controls able to see the person checking the machine. **KEEP HANDS AWAY FROM MOVING PARTS.**

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

RIGHT



H23440N

Always avoid loose clothing or any accessory—flopping cuffs, dangling neckties and scarves—that might catch in moving parts and cause an injury.

Always wear your safety glasses while on the job.

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.

FLUIDS UNDER PRESSURE

Escaping fluid under pressure can have sufficient force to penetrate the skin, causing serious personal 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.

Section 10 GENERAL

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Group 5 DESCRIPTION

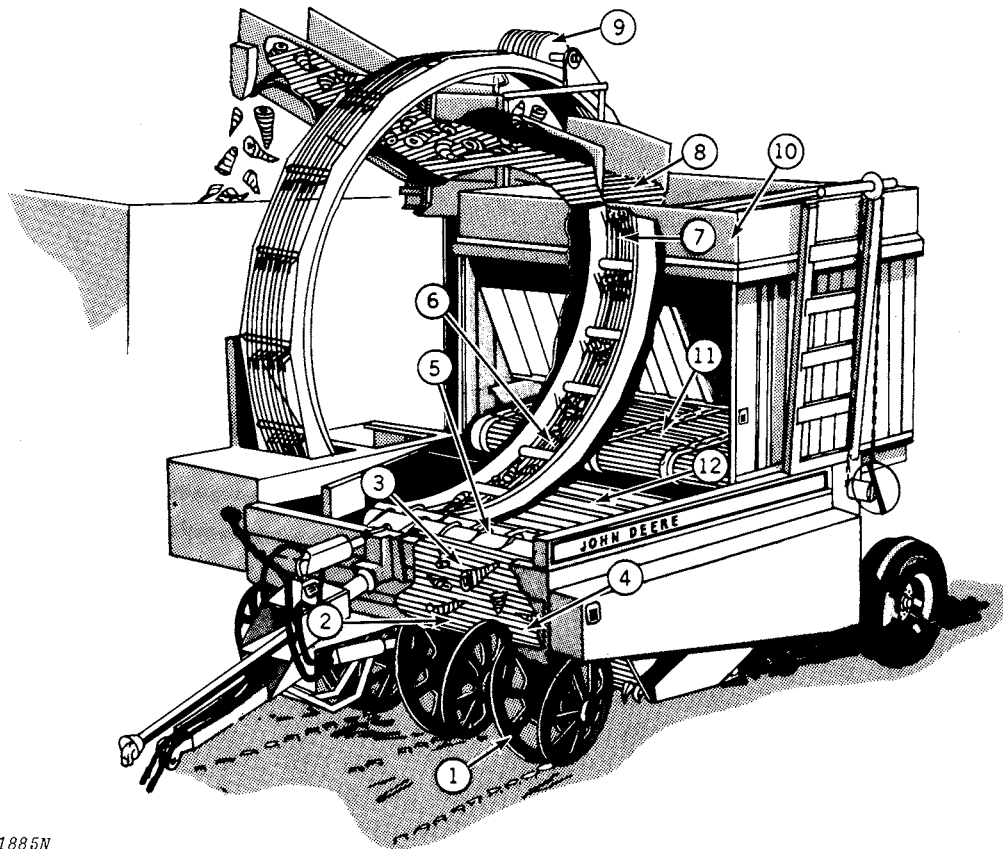
The basic components of the harvester include the frame and wheels, lifter wheels, lifter wheel paddles, potato chain primary conveyor or optional star wheel cleaning bed, grab rolls, rotary conveyor, loading conveyor and tank with bottom unloading conveyor.

The tank has an 8,000 pound (3 629 kg) storage capacity, providing maximum storage time between unloading functions in high-yield beet crop conditions.

The 3- or 4-row harvester can be used with tractors having 100-180 HP (75-134 kW); the 6-row harvester can be used with 130-180 HP (97-134 kW). All tractors must be equipped with 1000 rpm power take-off. Three remote cylinder outlets and controls are required, with power beyond outlets required for hydraulic override when row finder is installed. A 12-volt electrical system is required to operate the electromagnetic clutch.

Attachments include an auxiliary hydraulic system for the truck conveyor. The hydraulic system should be used when ambient temperatures during digging are 85°F. (29°C.) or more, or if tractor Power Front Wheel Drive is used, or if the tractor is not capable of supplying 14 gallons (53 L) per minute of hydraulic oil flow continuously. The need for a third selective control valve and outlet is eliminated when the auxiliary hydraulic system is used.

BEET FLOW



N31885N

Fig. 1 - Beet Flow—Lifter-Loader

N31885N

The following is a step-by-step description of the beet flow through the beet harvester:

The lifter wheels (1, Fig.1) penetrate the soil and lift the beets out of the ground.

The revolving steel paddles (2) at the rear of the lifter wheels knock off dirt as they flip the beets against the rubber curtains (3), which deflect them onto the cleaning bed (4).

The cleaning bed consists of a potato chain or optional star wheels (3- or 4-row only). The separation between the chain links (or star wheels) sifts out dirt and rocks as the beets are carried back to the grab rolls (5).

Four spiral grab rolls strip dirt, mud, and trash from the beets as they are moved into the rotary conveyor (6).

The rotary conveyor revolves at approximately 12 rpm in the direction of travel, (at 1000 PTO rpm) carrying the beets up to the truck-or-tank conveyor. A retainer (7) holds the beets in the wheel until they reach the top and fall into the truck-or-tank conveyor (8). A stripper (9) clears the wheel of any rocks or beets that wedge between the rods.

The truck-or-tank conveyor delivers the beets to a truck or the holding tank.

The tank (10) bottom unloading conveyor (11) is actuated by an electromagnetic clutch — moving the beets down across a baffle plate (12) (optional) onto the rear of the grab rolls, into the rotary conveyor and truck-or-tank conveyor.

Group 10 SPECIFICATIONS

TRACTOR REQUIREMENTS

Recommended Horsepower Rating:

3, 4-Row.....	100-180 PTO HP (75-134 kW)
6-Row.....	130-180 PTO HP (97-134 kW)

NOTE: Recommended for two-wheel drive tractors only.

Hydraulic Requirements:

Tractor must be equipped with three remote hydraulic outlets (one of which may be the "Power Beyond") when the harvester is equipped with the auxiliary hydraulic system. If the tractor hydraulic system is used to drive the truck conveyor, four remote hydraulic outlets are needed (one of which is the "Power Beyond") and the tractor must be capable of supplying 14 gallons per minute continuously. In both cases the "Power Beyond" is used to operate the row finder.

PTO Shaft:

Tractors must have 1.38-inch (35 mm) diameter 1000 rpm PTO shaft. (For 4640 and 4840 John Deere Tractors, order AR72476 PTO Shaft Adapter Kit).

Front Ballast:

Maximum tractor front ballast is required.

Drawbar Support (Standard):

Used with 1-3/8 x 2-1/2-inch (35 x 64 mm), 1-1/2 x 2-1/2-inch (38 x 64 mm) and 1-3/4 x 3-inch (44 x 76 mm) drawbars.

Electrical system:

12-Volt

HARVESTER

Description..... 3, 4, or 6-row tank-type harvester

Row Spacing:

3 rows.....	22 to 30 inches (0.54 to 76 m)
4 rows.....	22 to 30 inches (0.54 to 76 m)
6 rows.....	22-inches (0.54 m)

Operating Speed..... 3 to 7 mph (5 to 11 km/h)

Lift and depth control*.....Hydraulic

Lateral hitch control**.....Hydraulic

Lifter wheels:

(2 per row).....29-inch (737 mm)
diameter solid rim

Paddles:

Type.....Steel
Number.....4 per row
Shaft speed.....157 rpm (fast)
or 132 rpm (slow)

Primary Conveyor and Cleaning Bed:

Size...3, 4-row-46 x 102-inches (1168 x 2591 mm)
6-row-46 x 125.2-inches (1168 x 3180 mm)

Type: 3, 4-Row — Three 32-inch (813 mm) wide potato chains OR optional bed containing four shafts with 36 star wheels each and one shaft with 36 hexagon plates, all spaced with rubber to expel rocks.

6-Row — Two 32-inch (813 mm) potato chains. Two 27-inch (686 mm) potato chains.

Cross Conveyor:

Size.....30 x 110-inches (762 x 2794 mm)
Type: Four 5-1/2-inch (140 mm) grab rolls with 3/4-inch (19 mm) spiral rods, adjustable spring loading and spacing.

**Requires 3-1/2 x 8-inch (89 x 203 mm) Remote Hydraulic Cylinder (not furnished)*

***Requires 3 x 8-inch (76 x 203 mm) Remote Hydraulic Cylinder (not furnished)*

Rotary Conveyor:

Size.....12 feet (3 658 mm) O.D. x 18 in.
(457 mm) wide
Speed.....12 rpm

Loading Conveyor:

Size.....Width, 26-1/2 in. (673 mm)
Type: Hydraulic motor-driven chain, reversible
for tank or truck loading, retractable for
transport.

Tank:

Construction.....Welded Steel
Capacity.....8,000 pounds (3 632 kg)
Unloading: Chain-type-conveyor, actuated by
12-volt, 12-1/2-inch (318 mm) elec-
tro-magnetic clutch.
Light bulb for switch box..(Early Models) Type 57
(Later Models) Type 1895TR

Tread Width.....Adjustable to row spacing

Wheels and Tires.....2-12.5L x 15 — 6 PR Impl.
2-12.5L x 16 — 8 PR Impl.
Operating pressure.....36 psi
(250 kPa)

Weight: (Approximate).....11,300 lbs. (5 130 kg)

ATTACHMENTS

Lifter wheel fillers: to prevent loss of small beets
through lifter wheels (two types available).

Lifter wheel scrapers: to prevent mud buildup on
lifter wheels.

Lifter wheel spacers: to increase lifter wheel open-
ing by 1/4-inch (6.3 mm) increments.

Lifter wheel rocksprings: to protect lifter wheels in
rocky soil conditions.

Flashing Warning Light Kit: recommended where
regulations allow when towing harvester. Order
JD No. TY9305.

Tractor installed electrical outlet socket: installed
with flashing warning light kit. Order JD No.
AR75694.

Tractor installed electric remote control switch: to
control electromagnetic clutch and auxiliary
hydraulic system, if equipped. (JD No. AR62360
Electric Remote Control Switch.)

Truck conveyor height extension: to increase dump
height 11 inches (279 mm).

Auxiliary hydraulic system: to eliminate truck con-
veyor hydraulic motor from tractor hydraulics.

Grab roll wear plates: to extend grab roll life.

Lifter wheels: to convert a three-row harvester to a
four-row harvester.

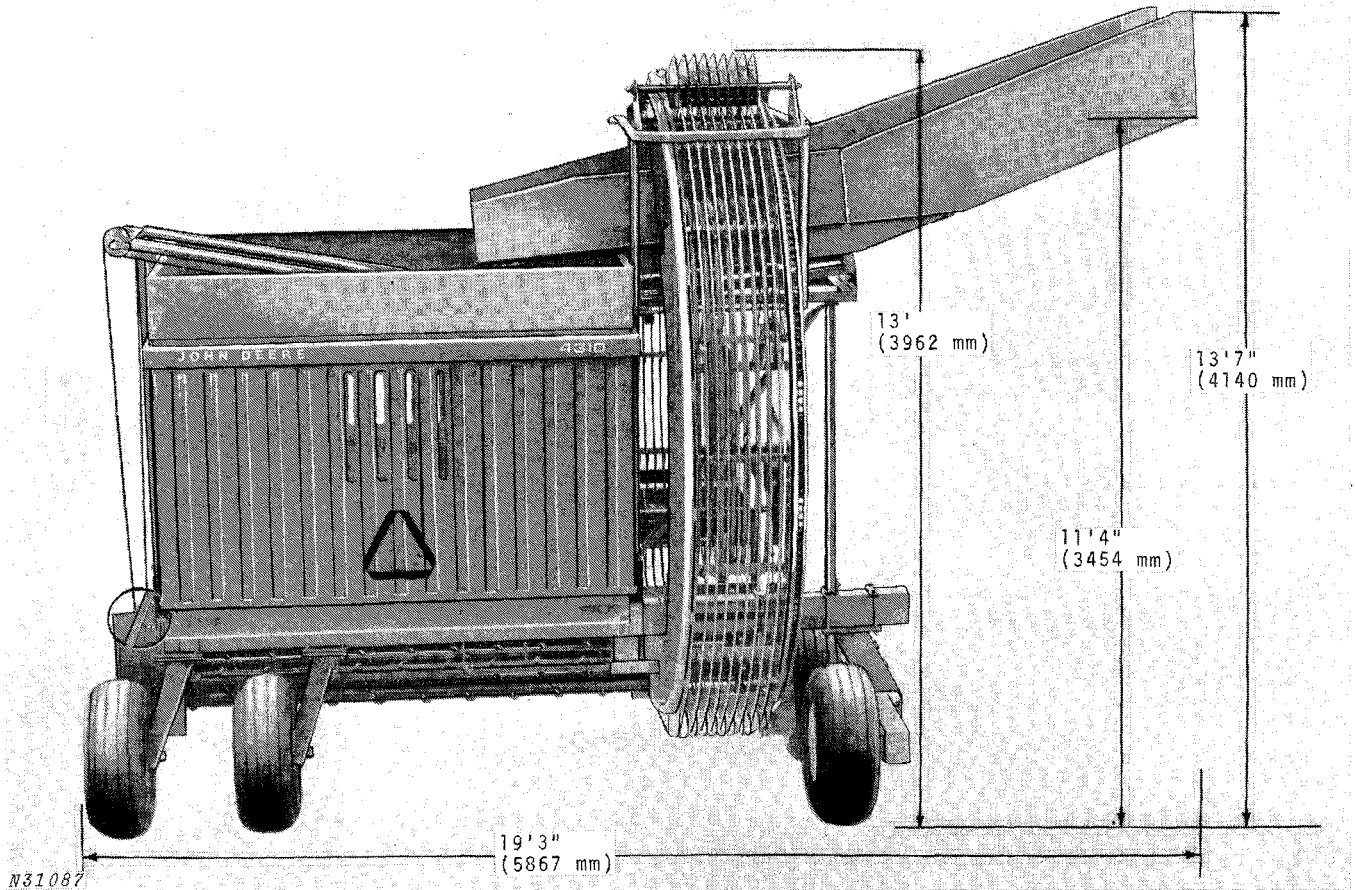
Wheel and tire assembly: a third single wheel and
tire can be installed for additional flotation.

Cleaning Bed: to convert a star wheel or potato
chain cleaning bed to the other type.

Diversion Roll — install on right-hand side of
machine to improve cleaning of beets. Cannot be
installed with star wheel bed.

Tank unload baffle: diverts beets being unloaded
from tank onto the grab rolls. Helps reduce loss
of small beets between primary conveyor and
No. 1 Grab Roll.

DIMENSIONS

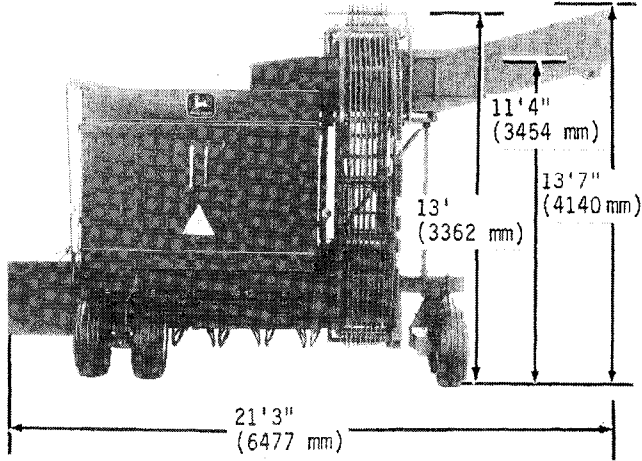


4310 Beet Harvester with Truck Conveyor Height Extension Installed

STANDARD TORQUE VALUE CHART

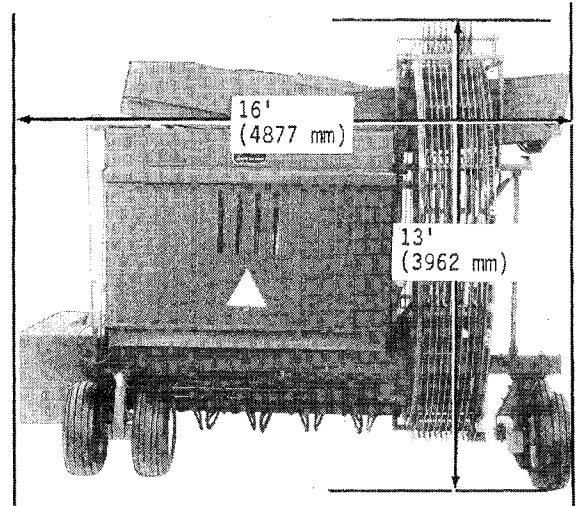
TORQUE VALUES		
Recommended Torque Value In lb-ft (N·m) Coarse and Fine Threads		
Bolt Diameter	Three Radial Dashes	Six Radial Dashes
1/4	10 (14)	14 (19)
5/16	20 (27)	30 (41)
3/8	35 (47)	50 (68)
7/16	55 (75)	80 (108)
1/2	85 (115)	120 (163)
9/16	130 (176)	175 (237)
5/8	170 (230)	240 (325)
3/4	300 (407)	425 (576)
7/8	445 (603)	685 (929)
1	670 (908)	1030 (1396)
1-1/8	910 (1234)	1460 (1979)
1-1/4	1250 (1695)	2060 (2793)

DIMENSIONS



N80324J1

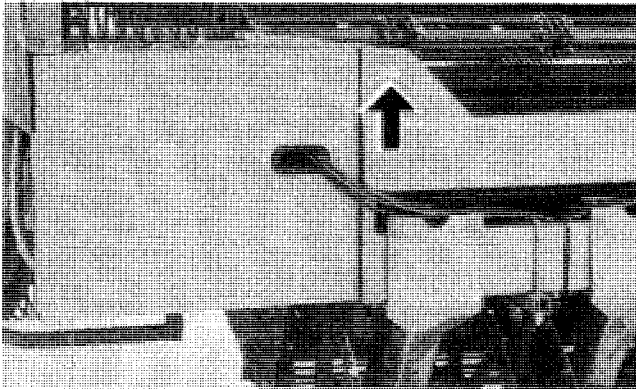
6-Row — Field Position With Truck Conveyor Height Extension
*12'8" (3 861 mm) Without Height Extension



N80324K1

6-Row Transport Position

SERIAL NUMBER



N80324A1

For All Models

The serial number plate is located on the front of the upper main frame tube (bold arrow).

Group 15 LUBRICATION

GENERAL LUBRICATION

Illustrated lubrication instructions are included in the operator's manual.

Component	Capacity	Type of Lubricant
Roller chains	-----	<p><i>Flush the chains with SAE 30 engine oil sufficient to wash away accumulated dust. Wipe away excess oil.</i></p> <p>IMPORTANT: Lubricate the grab roll drive chain with SAE 30 engine oil at least once daily and more frequently in extremely adverse conditions.</p>
Internal telescoping surface of rotating power shaft shield	-----	Brush with John Deere Multi-Purpose lubricant or an equivalent SAE multi-purpose type grease
Front and rear universal joints and telescoping shaft (near center of rotating shield) grease fittings	IMPORTANT: Only 1 or 2 strokes from grease gun.	John Deere Multi-Purpose lubricant or an equivalent SAE multi-purpose type grease
Hitch pivot points (3 above and 3 underneath)	1 stroke or less	John Deere Multi-Purpose lubricant or an equivalent SAE multi-purpose type grease
Slip clutch (right-hand drives)	1 stroke or less	John Deere Multi-Purpose lubricant or an equivalent SAE multi-purpose type grease
Slip clutch (left-hand drives)	1 stroke or less	John Deere Multi-Purpose lubricant or an equivalent SAE multi-purpose type grease
Countershaft drive sprocket	1 stroke or less	John Deere Multi-Purpose lubricant or an equivalent SAE multi-purpose type grease
<p><i>NOTE: Examine clutch jaws closely after greasing to be sure lubricant does not seep into clutch jaws and facings - causing them to slip excessively</i></p>		
Electromagnetic clutch shaft	1 stroke or less	John Deere Multi-Purpose lubricant or an equivalent SAE multi-purpose type grease
<p><i>NOTE: Examine clutch facings closely after greasing to be sure lubricant does not seep into facings - causing them to slip excessively</i></p>		

GENERAL LUBRICATION – Continued

Component	Capacity	Type of Lubricant
Lifter wheels	2 or 3 strokes of grease gun	John Deere Multi-Purpose lubricant or an equivalent SAE multi-purpose type grease
Main drive gear case	Fill within 2 to 3-inches (51 to 76 mm) of filler opening IMPORTANT: Do not overfill. Overfilling will cause heating, leakage, and possible damage to components.	John Deere SAE 90 gear lubricant or an equivalent multi-purpose gear oil (change at end of season)
Tandem wheel beam	Fill cavity until grease appears around seals	John Deere Multi-Purpose lubricant or an equivalent SAE multi-purpose type grease
Rear wheels	IMPORTANT: If dirt, moisture or other contamination is present, disassemble and clean bearings; then re-pack bearings and hub with grease and reassemble	Remove hub cap and add John Deere Multi-Purpose lubricant or an equivalent SAE multi-purpose type grease as necessary
Tank conveyor locating mechanism	1 or 2 strokes of grease gun	John Deere Multi-Purpose lubricant or an equivalent SAE multi-purpose type grease

ROW FINDER (ATTACHMENT)

Pivot pins	1 or 2 strokes (or until grease appears at the joint)	John Deere Multi-Purpose lubricant or an equivalent SAE multi-purpose type grease
Valve rod	A few drops	SAE 30 engine oil

AUXILIARY HYDRAULIC SYSTEM

Reservoir	To center of sight glass 5 Gal. (19 L) (System)	AR69444 HY-GARD™ transmission and hydraulic oil
-----------	--	---

GREASES

John Deere Multi-Purpose lubricant or an equivalent SAE multipurpose-type grease is recommended for all grease fittings. Application of grease as instructed in the lubrication chart will provide proper lubrication and will prevent contamination of bearings.

STORING LUBRICANTS

This beet harvester can operate efficiently only if clean lubricants are used. Use clean containers to handle all lubricants. Store them in an area protected from dust, moisture, and other contaminants.

Group 20 DIAGNOSING MALFUNCTIONS

DIAGNOSING AND TESTING PROCEDURES

To prevent the unnecessary loss of time and money, use the following seven steps for a quick accurate method of locating troubles:

1. Know the Unit

In other words, "Do your Homework." Study the Operator's Manual and this manual to know how the individual components work and what their function is in the overall system.

Keep up with the latest service information. Read and then file in a handy place. Information received today may have the cause and remedy of a problem being encountered.

2. Consult The Operator

Ask the operator how the unit was performing when it started to fail. Find out what was unusual about it.

Also find out if any "do-it-yourself" service was performed. (You may find the trouble somewhere else, but you should know if any corrective measures have already been taken).

Ask how the unit is used and how often it is serviced. Many problems are caused by poor maintenance or abuse.

3. Operate The Unit

If the unit is operable, operate it yourself. Don't rely completely on the operator's story - check it yourself.

Are gauges reading normally? (if not, perhaps the component being monitored is not functioning correctly or the gauge is faulty.)

How's the performance? Is the action perhaps too fast or too slow, erratic, or nil?

Do the controls feel solid or "spongy"? Do they seem to be "sticking"?

Do you smell or see any signs of smoke?

Do you hear any unusual sounds? Where? At what speeds or during what cycles?

4. Inspect The Unit

Get off the tractor and make a visual check. Use your eyes, ears, and nose to spot any signs of trouble.

Look closely at the components. Inspect for cracked welds, loose hardware, damaged linkages, worn or broken lines, etc.

During the inspection, make notes of all the trouble signs.

5. List The Possible Causes

With the information obtained during steps 1 through 4, make a list of the possible causes.

What were the signs you found while inspecting the unit? What is the most likely cause?

6. Reach Some Conclusions

Look over the list of possible causes and decide which are most likely and which are easiest to verify.

Review the "Diagnosing Malfunctions" section following as a helpful guide.

Reach your decision on the probable causes and plan to check them first.

7. Test Your Conclusions

Before repairing components in the system, test your conclusions to see which are correct.

Some of the possible causes may be verified without further testing. Check these possibilities first.

Tests will narrow the remaining list of possible causes and soon the actual cause(s) of trouble will be pinpointed.

With the cause(s) accurately located, it is now a simple matter to remove and repair the component(s) at fault.

POSSIBLE PROBLEMS AND REMEDIES

Drive Train - Section 20

- Excessive Noise or Vibration
 - Powershaft bearings defective. Group 10.
 - Power bent or twisted. Group 10.
- Gear Case Noisy
 - Bearings of gears defective. Group 15.
 - Lack of lubricant. Section 10, Group 15.
 - Gear misalignment. Group 15.
- Gears Wear too Fast
 - Lack of or improper lubricant. Section 10, Group 15.
 - Improper gear backlash. Group 15.
- Main Gear Case Hot, Leaking
 - Breather clogged. Group 15.
 - Dirty machine, or not lubricated. Section 10, Group 15.
 - Lubricant viscosity too low. Section 10, Group 15.

Hydraulic System - Section 30

- Hydraulic Motor
 - Motor runs backwards. Coupled to tractor or Scl. valve wrong.
 - Motor runs too slow. Dirty tractor filter. Clean filter.
 - Insufficient tractor hydraulic capacity. Install auxiliary hydraulic system.
 - Oil leaking around shaft. Group 10.
 - Oil leaking around body. Group 10.
- Row Finder Attachment
 - Lifters moving away from beets. Group 15.
 - Lifters tracking improperly. Group 15.
 - Feeler arms bouncing off rows. Group 15.
 - Lifters jump off rows too easily. Group 15.
 - Lifters missing loose beets. Group 15.
- Auxiliary Hydraulic System
 - Hydraulic motor inoperative. Faulty solenoid valve (Group 10), electrical switch (Group 15) hydraulic pump (Group 10), or hydraulic motor (See above).
 - Breaking conveyor chains. Incorrect switch operation.

Electromagnetic Clutch - Section 40

- Clutch Inoperative
 - Low voltage. Group 15.
 - Bad connections. Group 15.
 - Grease on drive surfaces - remove grease.
 - Faulty electrical switch. Group 15.

Lifter Wheels - Section 40

- Wheels Coming Loose
 - Loose bearings. Group 20
 - Improper lubrication. Section 10, Group 15.
 - Loose wheel bolts. Group 20.

Rear Wheels

- Wheels Coming Loose
 - Loose bearings. Group 25.
 - Improper lubrication. Group 25.
 - Loose wheel bolts. Group 20.

Section 20 DRIVE TRAIN

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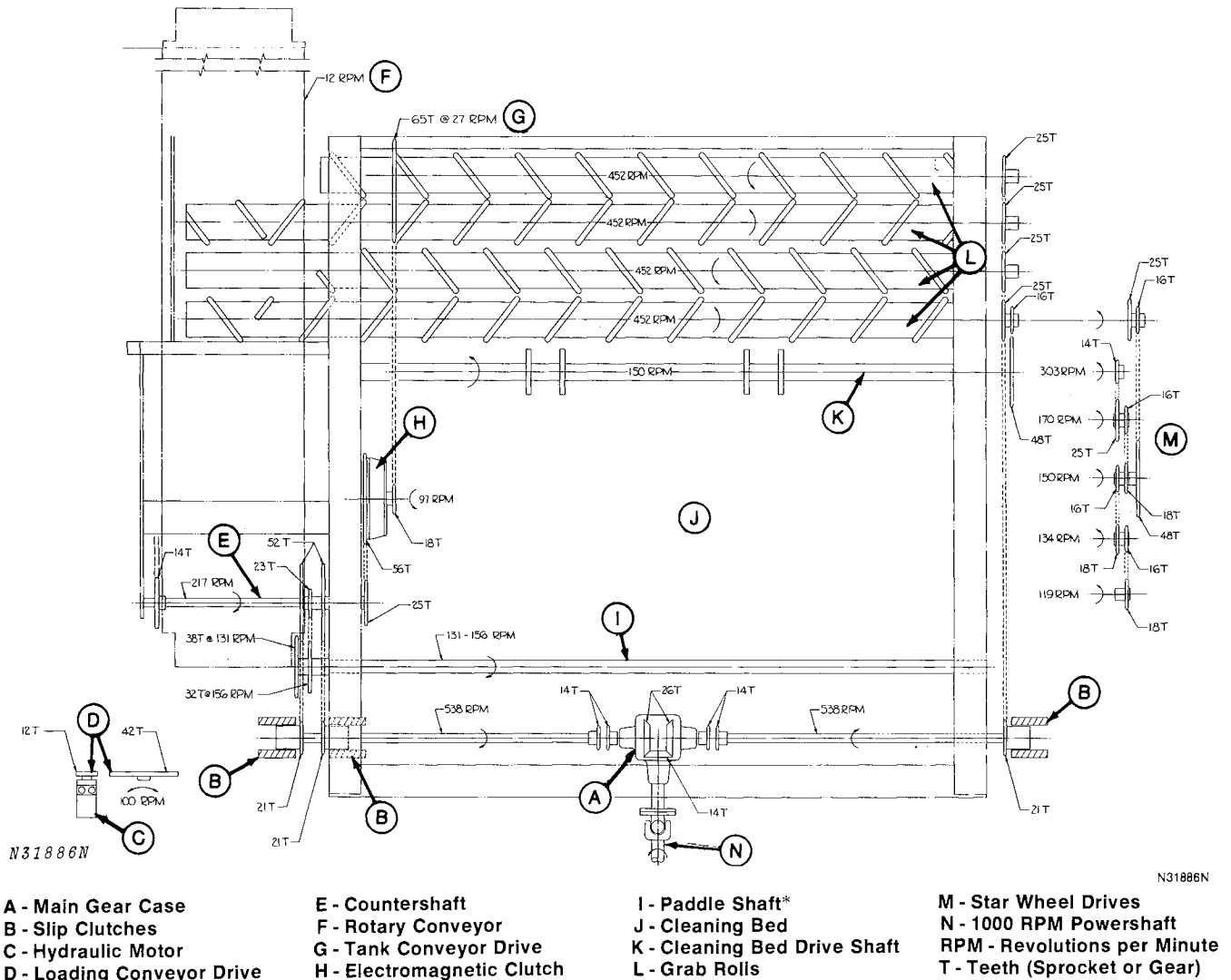
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Group 5 GENERAL INFORMATION



- | | | | |
|-----------------------------------|-----------------------------------|-------------------------------------|-------------------------------------|
| A - Main Gear Case | E - Countershaft | I - Paddle Shaft* | M - Star Wheel Drives |
| B - Slip Clutches | F - Rotary Conveyor | J - Cleaning Bed | N - 1000 RPM Powershaft |
| C - Hydraulic Motor | G - Tank Conveyor Drive | K - Cleaning Bed Drive Shaft | RPM - Revolutions per Minute |
| D - Loading Conveyor Drive | H - Electromagnetic Clutch | L - Grab Rolls | T - Teeth (Sprocket or Gear) |

*Higher shaft speeds occur when 32T Sprocket is used in lieu of 38T Sprocket on Paddle Shaft.

NOTE: Refer to Section 30 - "Hydraulic System", for Auxiliary Hydraulic System drive.

Fig. 1 - 3- and 4-Row Drive Train Diagram

DESCRIPTION

The powershaft connects the tractor PTO (1000 rpm only) to the main gear case input shaft. Two self-aligning sprockets on each side of the main gear case are chain-coupled to drive shafts supplying power to each side of the harvester.

Left-Hand Drives

The left-hand drive sprocket and jackshaft drive the four grab roll sprockets and the primary conveyor.

The slip clutches on the jackshaft and primary bed protect the left-hand drive in the event large rocks or other objects lodge in either the primary conveyor or the grab rolls. The spring-loaded grab rolls let smaller rocks pass through. The chain tightener, located above the number 4 grab roll, maintains constant tension on the drive chain throughout the full range of grab roll movements.

NOTE: Star wheel and grab roll references following were determined by counting from front to rear of harvester.

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