

410 and 510 Round Balers



JOHN DEERE

TECHNICAL MANUAL

410 and 510
Round Balers

TM1194 (01JUL77) English

John Deere Ottumwa Works
TM1194 (01JUL77)

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410 and 510 ROUND BALERS

TECHNICAL MANUAL

TM-1194 (Apr-79)

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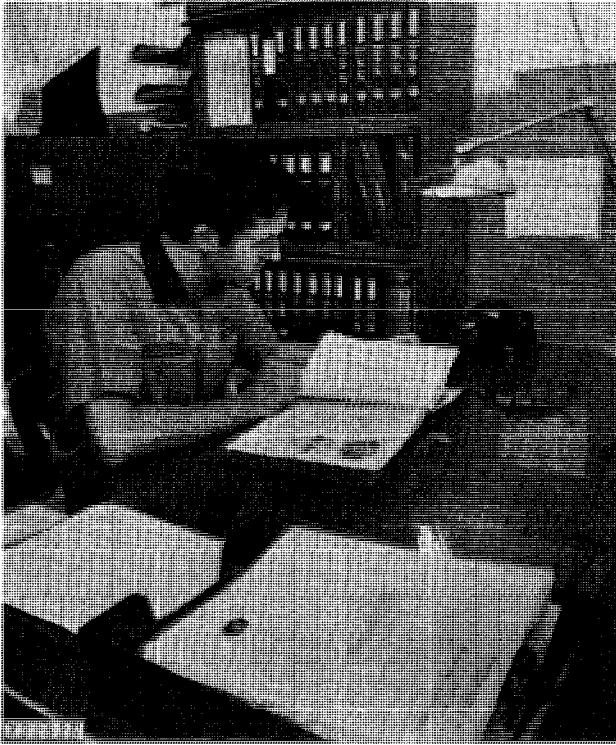
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All information, illustrations and specifications contained in this technical manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

Because John Deere sells its products world-wide, 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.

INTRODUCTION



Use FOS Manuals for Reference

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

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

•FOS Manuals—for reference

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



When a service technician 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.

•Technical Manuals—for actual service

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.



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—a service 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.

**Thanks very much for your reading,
Want to get more information,
Please click here, Then get the complete
manual**

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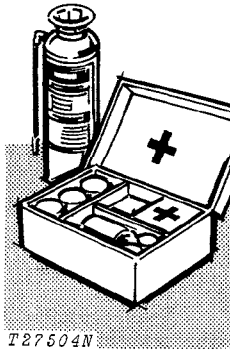
SAFETY AND YOU



T27999N

INTRODUCTION

! This safety alert symbol identifies important safety messages in this manual and on the balers. 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 in your area—know how to use them.

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.

AVOID FIRE HAZARDS



E11866N

WRONG

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.

Don't allow sparks or open flame near batteries.

Don't smoke near a battery.

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

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

CLEANING THE ROUND BALER



E14806N

Always stop the tractor engine before cleaning the baler.

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.

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

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

PERSONAL SAFETY



T27502 ●

Always avoid loose clothing or any accessory—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.

Before removing any shielding, stop tractor engine. Take all objects from your pockets which could fall. Don't let adjusting wrenches fall into opened areas.

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

Avoid working on equipment with the tractor engine running. If it is necessary to make checks with the engine running, **ALWAYS USE TWO PEOPLE**—one, the operator, at the controls, the other checking the machine, always in view of the operator. Also, place the transmission in neutral, set the brake, and apply any safety locks provided. **KEEP HANDS AWAY FROM MOVING PARTS.**

Use extreme caution when raising gate or testing round baler.

Section 10 GENERAL

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Group 5 SPECIFICATIONS

Bale

Diameter:		
410		5 ft. (1.5 m)
510		6 ft. (1.8 m)
Width:		
410		4 ft. (1.2 m)
510		5 ft. 3 in. (1.6 m)
Weight:		
410		Approx. 850 lbs. (386 kg)
510		Approx. 1700 lbs. (771 kg)

Pickup

Width:		
410		5 ft. (1.5 m)
510		6 ft. (1.8 m)
Cylinder Diameter		
410 and 510		10 in. (254 mm)
Teeth:		
410		32 double teeth and 4 single teeth
510		48 double teeth
Speed:		
410 and 510		118 rpm

Weight:

410	2950 lbs. (1338 kg)
510	3895 lbs. (1767 kg)

SPECIFICATIONS—Continued

Size of tractor recommended:

410	Minimum 40 horsepower (30 kW)*
510	70 hp (52 kW) minimum*

*With dual hydraulics or single hydraulics with use of selector control valve attachment.

Drive Protection:

410 and 510	Slip Clutch
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Tires:

410	9.5L-14 4-ply rating
Inflation pressure	193 kPa [1.7 bar] (28 psi)
51011L-14 6-ply rating
Inflation pressure	193 kPa [1.7 bar] (28 psi)

PTO shaft speed:

410	ASAE-SAE standard (540 rpm)
510	ASAE-SAE standard (540 rpm) optional 1000 rpm

Transmission:

Gears

410	90° bevel gear drive; 1:1 gear ratio
510	90° bevel gear drive; 1:1.35 gear ratio

Capacity

410	2-1/2 U.S. pints (1.2 l) SAE 85-140 API-GL5
510	2 U.S. qts. (1.9 l) SAE 85-140 API-GL5

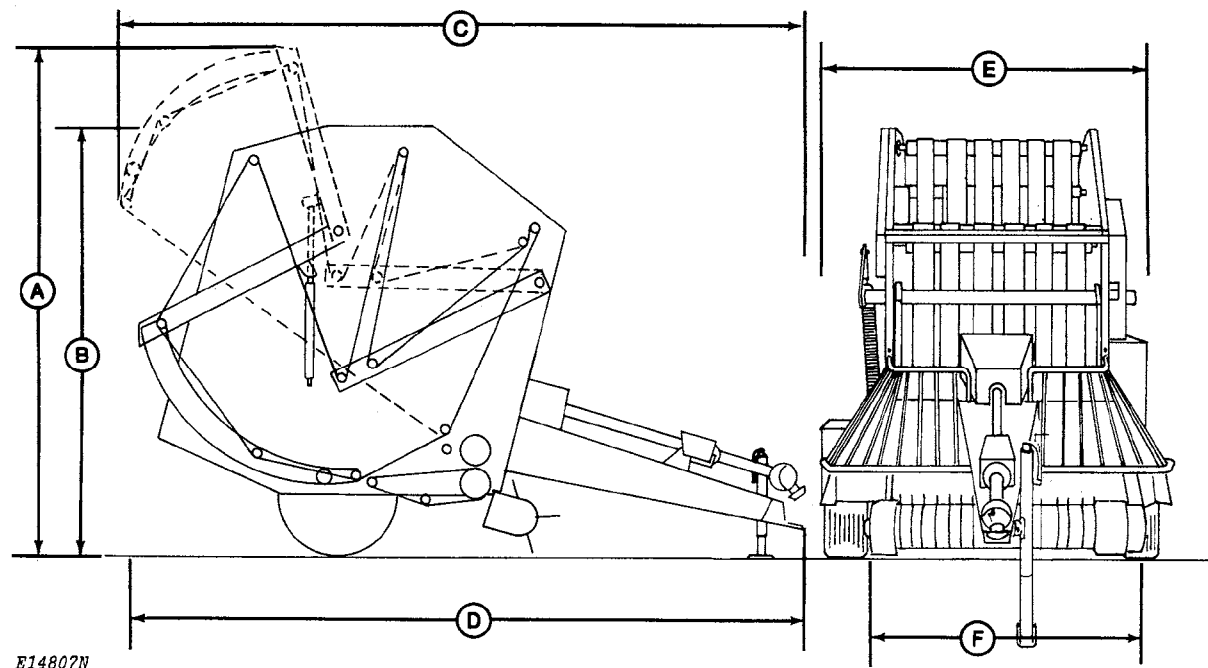
Belts:

Upper

410	6 rubber coated belts
510	9 rubber coated belts

Lower

410	5 individual rubber coated belts
510	7 individual rubber coated belts








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A—Height (gate open)		D—Length (gate closed)	
410	9 ft. 9 in. (2.9 m)	410	13 ft. 1 in. (4 m)
510	10 ft. 10 in. (3.3 m)	510	14 ft. 1 in. (4.3 m)
B—Height (gate closed)		E—Pickup Width	
410	8 ft. 4 in. (2.5 m)	410	5 ft. (1.5 m)
510	9 ft. 1 in. (2.8 m)	510	6 ft. (1.8 m)
C—Length (gate open)		F—Width	
410	14 ft. 8 in. (4.5 m)	410	6 ft. 10 in. (2.1 m)
510	15 ft. 7 in. (4.7 m)	510	8 ft. 2 in. (2.5 m)

Fig. 1-Dimensions of 410 - 510 Round Balers

TORQUE CHART

RECOMMENDED TORQUE IN FT-LBS (Nm) COARSE AND FINE THREADS			
    			
Bolt Diameter	Plain Head	Three Dashes	Six Dashes
1/4	Not used	10 (14)	14 (19)
5/16	Not used	20 (27)	30 (41)
3/8	Not used	35 (47)	50 (68)
7/16	35 (47)	55 (75)	80 (108)
1/2	55 (75)	85 (115)	120 (163)
9/16	75 (102)	130 (176)	175 (237)
5/8	105 (142)	170 (230)	240 (325)
3/4	185 (251)	300 (407)	425 (576)
7/8	160 (217)	445 (603)	685 (929)
1	250 (339)	670 (908)	1030 (1397)
1-1/8	330 (447)	910 (1234)	1460 (1980)
1-1/4	480 (651)	1250 (1695)	2060 (2793)

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The types of bolts and cap screws are identified by head markings as follows:

Plain Head: regular machine bolts and cap screws.

3-Dash Head: tempered steel high-strength bolts and cap screws.

6-Dash Head: tempered steel extra high-strength bolts and cap screws.

Machine bolts and cap screws 7/8-inch and larger are sometimes formed hot rather than cold, which accounts for the lower torque.

Group 10

DIAGNOSING MALFUNCTIONS

The majority of operating problems that occur with the round balers can be sometimes traced to improper adjustment or delayed service. The following malfunctions are designed to help you when a problem develops by suggesting a problem cause and the recommended solution.

These suggested malfunctions should be applied with caution. Make certain that the source of the problem is not located someplace other than where the problem exists. A thorough understanding of the round baler is a must if operating problems are to be corrected satisfactorily.

Hay Wraps Around Rollers

Windrows light and/or short hay.

Recommended larger windrows and slow tractor speed to 1700-1800 rpm.

Moisture content too high or wet "slugs" in bottom of windrows.

Moisture content of hay should be between 20 to 25 per cent.

"Barrel" Shaped Bale

Windrow not proper width.

Weaving too often and baling more hay in the center of the bale.

See How The Bale is Formed, page 10-15-3.

"Cone" Shaped Bale

Not baling enough hay on small end of cone.

See How The Bale is Formed, page 10-15-3.

Compression spring broken on one end.

Ends of Bale Not Square

Not crowding hay into sides of pickup when baling.

Unable to Make a Bale

Baler being operated in hay or straw with the rear gate unlatched.

The gate must always be latched when starting and while baling.

Top Belts Not Turning

Rubber worn on upper drive roll.

See page 20-25-4.

PTO slip clutch slipping.

Adjust drive slip clutch. See page 20-20-9.

Material too wet.

Not weaving properly.

See page 10-15-3.

Excessive bale density.

Move tension spring to forward hole. See page 10-15-5.

Bottom Belts Not Turning

Lower belt tension springs not adjusted.

Adjust lower belt tension springs. See page 20-25-13.

Compression spring broken.

Replace spring.

DIAGNOSING MALFUNCTIONS—Continued**Broken Top Belt**

Material wet causing hay to build up on rollers.

Not weaving properly when starting to bale, causing the end belts to go under the bale.

See page 10-15-3.

Lacing worn.

Repair belt. See page 40-10-1.

Slip clutch frozen or not adjusted properly.

Adjust drive slip clutch, see page 20-20-9.

Plugging on either end between starting and scraper rolls with outside belts forced inward.

See remedy for problem of "Plugging Between Starter and Scraper Rolls" page 10-10-3.

Hay Passes Through Baler

Gate is not all the way down, adjusted properly, or latched.

Adjust gate latch. Make sure gate is latched when in "home" position. See page 20-25-16.

Relief valve pressure is too low.

See page 30-10-8.

Top or bottom belts not turning.

Belts not tensioned properly. See page 20-25-13 or 20-25-15.

Twine Not Going Around Bale

Twine not threaded properly.

Check baler for proper threading. See page 50-10-10.

Twine not being fed in with hay.

Continue feeding hay until twine goes between compression rolls. See page 10-15-4.

Build-up on top compression roll.

Clean compression roll. See page 10-15-5.

Build-up on lower feed roll.

Remove build-up from lower feed roll. Continue baling whenever beginning tying cycle. See page 10-15-3.

Not Enough Twine On Bale

Flow control valve not adjusted properly.

Adjust flow control valve. See page 30-15-5.

Oil filter screen plugged.

See page 30-15-4.

Twine Cutter Not Cutting

Anvil arm not tensioned properly.

Adjust tension. See page 50-10-7.

Anvil not parallel to knife.

Model anvil arm. See page 50-10-7.

Twine cutter out of adjustment.

Adjust knife, see page 50-10-7.

Dull knife.

Sharpen knife, see page 50-10-6.

Top Belts Not Tracking Properly

Belts not equal length.

Remove and repair belts to within 2 inches (51 mm) of each other in length. See page 40-10-1.

Top rollers bent due to foreign objects or bale made too large.

Belt not cut squarely.

Remove and cut ends squarely. See page 40-10-1.

Bottom Belt Not Tracking Properly

Baling or wrapping twine with gate unlatched.

Make sure gate is latched.

Twin or hay wrapped around lower belt rollers.

Remove twine or hay. See Wrapping the Bale page 10-15-4. Make certain roll scraper is installed and adjusted properly, see page 20-25-13.

Raise gate to discharge bale with PTO engaged.

Disengage PTO before discharging bale, see page 10-15-4.

Lower belt tension springs not adjusted properly.

Adjust tension springs, see page 40-15-3.

Pickup Not Running

Pickup belt broken.

See page 50-10-1.

Cam followers worn or damaged, causing belt to slip.

See page 50-10-4.

Windrows too large to feed into baler.

Pickup set too low to the ground.

Adjust pickup, see page 50-10-9.

Pickup drive release engaged.

Adjust pickup drive release, see page 20-25-14.

Bale Density Too Low

Compression roll springs broken.

See page 40-15-2.

Insufficient belt tension.

Move tension spring to rear set of holes, page 15-4.

Bale Partially Made and Stops Turning

Gate unlatched.

Discharge bale and latch gate.

High moisture hay.

Moisture content should be below 25 percent.

Slip clutch not properly adjusted.

Adjust slip clutch, see page 20-20-9.

Upper belt tension too high.

Move tension spring to the forward hole, see page 10-15-5.

High friction caused by newly painted side sheets.

Remove paint where bale contacts side sheets.

Hay Not Passed Into Baler

Heavy windrows or adverse haying conditions.

Remove the compressor rods and/or reduce windrow size.

Light, short, dry material.

Make windrows heavier, adjust compression rods, raise pickup, see page 50-10-9.

Plugging Between Starter and Scraper Rolls Which Occurs Gradually

Loose material comes off end of bale and gradually builds up.

Reduce PTO speed. Reduce tractor engine speed to 1500 rpm or below. Use higher gear ratio if increased ground speed is desired. See Unloading the Bale, page 10-15-4.

DIAGNOSING MALFUNCTIONS—Continued**Plugging Between Starter and Scraper Rolls Which Occurs Quickly**

Improper starting and driving.

Hay flows between outside belt and side sheet forcing belts to center of baler.

See page 10-15-3.

Twine Wrappage Too Far From Left-Hand End of Bale

Twine arm not adjusted properly.

Adjust twine cutter. See page 50-10-7.

Twine tube bent.

Straighten or replace.

Hay Feeds Back Over Compression Roll

Wrappage around starter roll.

Hay too wet to bale.

Upper (rubber) compression roll too aggressive.

Avoid bunched windrows. With PTO disengaged and tractor engine off, spray the roll with a high gloss lacquer (quick drying).

Gate Won't Latch

Hay buildup on axle prevents gate from closing completely.

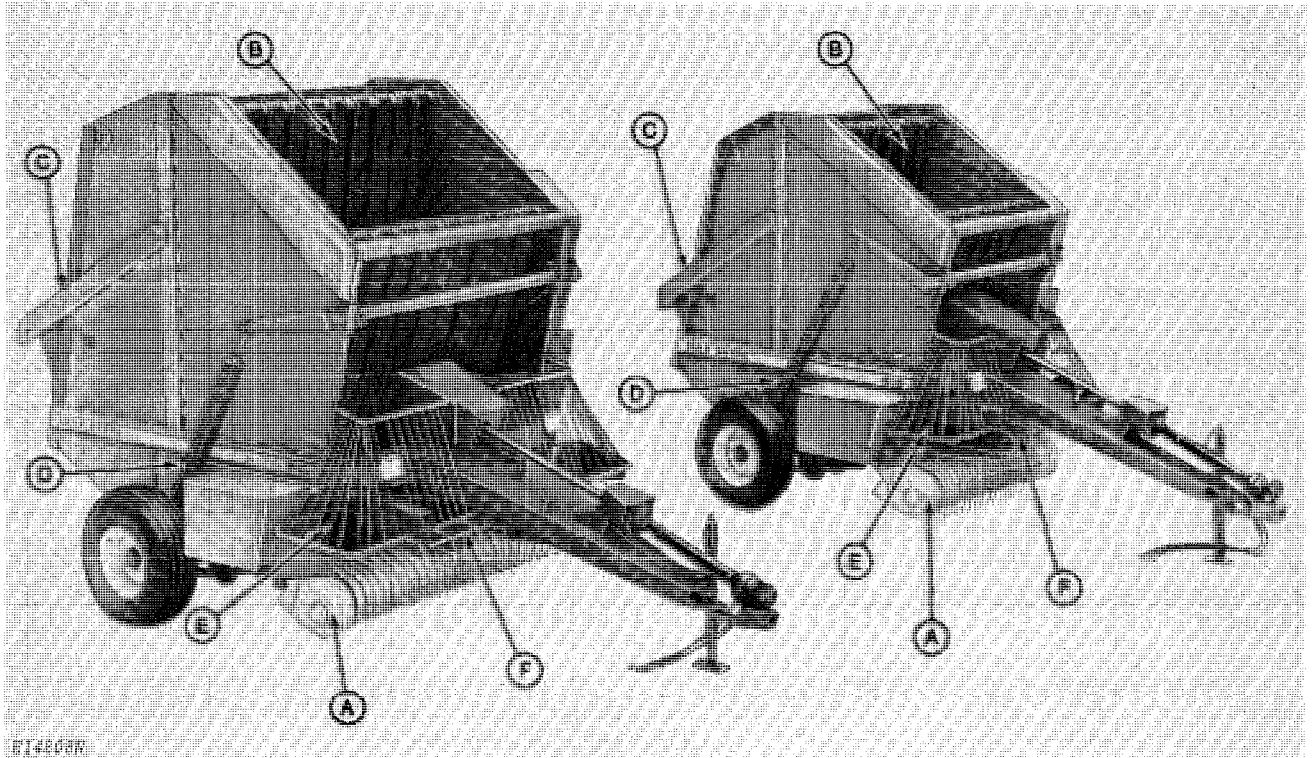
Remove material. Engage PTO while lowering gate and reduce PTO speed to 1500 rpm or below while forming bale.

Latch indicator rod may have gone over-center.

Rotate into correct position and adjust gate latch properly. See page 20-25-16.

Group 15 DESCRIPTION

GENERAL



A—Pickup
B—Upper Belts

C—Rear Gate
D—Belt Tension Spring

E—Lower Belt
F—Twine Tube

Fig. 1-410 and 510 Round Balers

The 410 Round Baler is a medium size baler for handling loose hay and corn stover at approximately 12 tons (10886 kg) per hour. It will produce high-density bales 4 ft. (1.22 m) wide by 5 ft. (1.52 m) in diameter weighing approximately 850 lbs. (386 kg).

The 510 Round Baler is a large size baler for handling loose hay and corn stover at approximately 15 tons (13608 kg) per hour. It will produce high-density bales 5 ft. 3 in. (1.63 m) wide and 6 ft. (1.83 m) in diameter weighing approximately 1700 lbs. (771 kg).

The basic components of the round balers include the main frame and wheels, pickup (A), upper (B) and lower (E) forming belts, rear gate and mechanism (C), and bale wrapping mechanism.

Operating power for the 410 Round Baler is provided from a 540 rpm tractor power take-off (PTO). The 510 Round Baler has a 540 rpm power take-off and can also be converted to 1000 rpm.

A hydraulic cylinder operates from the tractor hydraulic system and is used to raise and lower the rear gate of the baler. A double acting hydraulic cylinder is used to operate the bale wrapping mechanism.

Tractor Requirements

The baler is set for use on tractors with two sets of hydraulic outlets; one for the two hoses which control the rear gate and one for the two hoses to wrap the bale.

A selector control valve, with the shift mechanism, allows the use of the baler hydraulics on tractors with only one hydraulic outlet. The selector control valve is available as an attachment.

The tractor must have a 540 rpm PTO with a minimum of 40 horsepower (30 kW) to obtain the maximum capacity from the 410 Round Baler. A minimum of 70 horsepower (52 kW) is needed for the 510 round baler at either 540 or 1000 rpm.

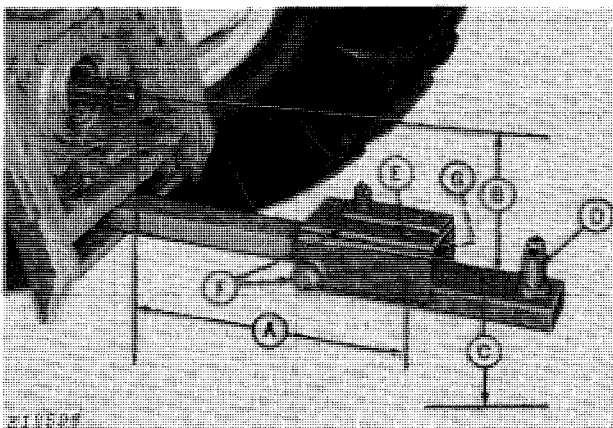
Tractor Hookup

When servicing the baler, pay particular attention to the tractor-baler hookup geometry, Fig. 2.

IMPORTANT: Unequal angles occur if the tractor drawbar is not set for the proper length relative to the PTO operating speed. If the equal angles are not maintained, the following problems could occur:

1. Premature failure of the powerline components.
2. Excessive noise and vibration.

The proper equal angle hitch hookup dimensions are illustrated in Fig. 2.



A—14 inches (356 mm) (540-rpm)	C—13-17 inches (330-432 mm)
16 inches (406 mm) (1000-rpm)	D—Equal Angle Hitch
B—6-12 inches (152-305 mm)	E—Hitch Pin
	F—Adjusting Bolts
	G—Shims

Fig. 2-Hookup Dimensions

Pickup

The 510 pickup is 72-inches (1.82 m) wide to adequately cover up to 5 foot (1.52 m) windrows. The 410 pickup is 60 inches (1.5 m) wide to cover up to 4 foot (1.2 m) windrows. It allows for variations in windrows and minimizes hay loss when turning.

The pickup is driven at 118 rpm by a spring loaded belt off the left-hand roll drive chains. The pickup operating height is adjusted by a crank located on the left side of the machine. The pickup should be adjusted to run as high off the ground as possible and still pick up all the hay. See page 50-10-9 for adjustment.

Bale Forming Belts

There are upper and lower belts to form the bale as hay is moved through the compression and starter rolls. The upper set consists of six (410) or nine (510) repairable rubber-coated forming belts. These belts can be repaired or replaced individually or as a set. (See page 40-10-1).

The upper belts are tensioned by the large springs on the sides of the 510 baler. (See page 40-10-3). Only one large spring is needed for the 410 baler.

The lower belts minimize leaf loss while the bale is being formed. Lower belt tension is controlled by a spring loaded idler roll.

Bale Wrapping System

The bale wrapping system is controlled by the tractor hydraulic system.

A check valve is used in the system to allow full flow to the cylinder for moving the twine arm to the left. The flow is metered on return by a flow control valve. This controls the number of wraps of twine on the bale.

This system can be used with either plastic or sisal twine.

Rear Gate

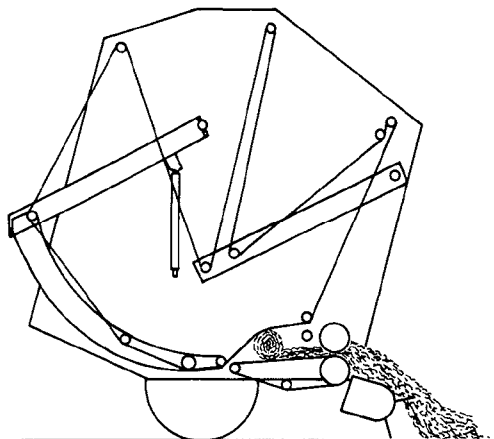
After the bale is formed, the rear gate is raised and the bale is discharged from the baler.

The rear gate is controlled by a cylinder supplied with oil by the tractor hydraulic system.

IMPORTANT: The gate is secured by a latching mechanism and must be securely closed when baling. See page 50-5-5 for adjustment.

HOW THE BALE IS FORMED

Forming the Bale



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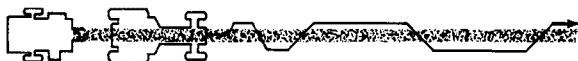
Fig. 3-Forming the Core

⚠ CAUTION: DON'T TAKE CHANCES! To avoid injury or death by being pulled into the machine:

Do not attempt to feed crop or twine into baler or unplug feed-roll area while baler is running.

Disengage PTO and shut off engine.

The starting of the bale is extremely important. The core must be carefully made to insure a satisfactory bale.



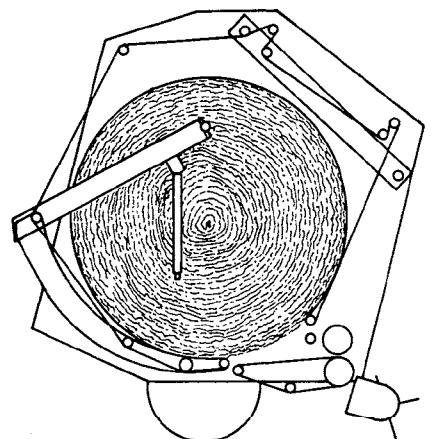
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Fig. 4-Starting the Bale

Start the bale by feeding the windrow into the middle of the baler. Then immediately drive to one side and then the other (this will vary according to windrow width), forming an even core in the bale chamber. After the core is started, feed alternate sides of the baler for longer periods of time, moving quickly when shifting from side to side to form well-shaped bales.

An alternate method for starting in heavy windrows is to push material ahead of the baler with the pickup prior to engaging PTO until the material is spread out to the width of the bale chamber. Then engage the PTO and continue to feed alternate sides as described.

IMPORTANT: When hay is fed into the side of the baler first, hay may be forced up through the space between the outside upper belt and side sheet. This will push the outside belts toward the center, wedging between the scraper roll and starter roll causing belt splice failure.



E16536

Fig. 5-Full Size Bale

When the bale is full size (Fig. 5), the word "Stop" will appear at the indicator on the upper right-hand side of the baler.

Failure to stop soon after the word "Stop" appears will result in the pickup disengaging. Slowly back the baler out of the windrow while allowing the PTO to continue turning until the pickup engages. See page 20-25-14 to adjust the pickup drive release if pickup disengages prematurely.

⚠ CAUTION: NEVER hand-feed twine in order to wrap a bale.

HOW THE BALE IS FORMED—Continued

Wrapping

When the bale has reached the discharge size it is ready to wrap.

Slowly continue baling and:

1. Pull the hydraulic lever rearward to actuate the twine arm to the left.
2. When the twine has been fed with the hay into the compression rolls, stop the forward travel of the tractor.

IMPORTANT: Twine can wrap around bottom roll and damage machine and bottom belts if hay is not fed with twine when wrapping bale.

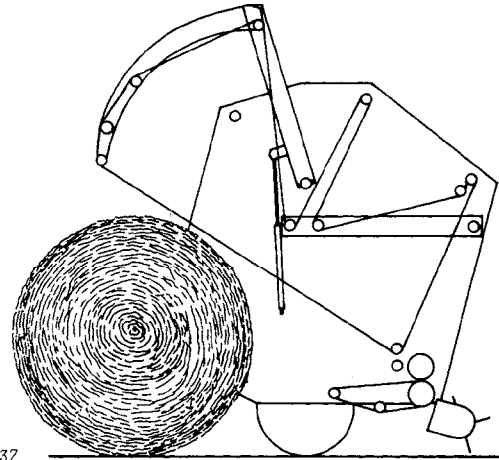
3. Continue to hold the hydraulic lever rearward until the twine arm has reached the extreme left-hand position. Hold there for a few seconds to allow at least one full turn of twine to go around the end of the bale.

NOTE: The number of wraps around the bale can be altered by the flow control valve. (See page 30-15-5.)

4. Push the tractor hydraulic lever forward to move the twine arm to the right, allowing at least one full turn of twine to go around the end of the bale before the twine is automatically cut off by the knife.

5. STOP THE TRACTOR POWER TAKEOFF and move tractor throttle to idle speed.

Unloading



E16537

Fig. 6-Removing the Bale

1. Back up the baler approximately eight to ten feet (2.4 to 3.0 m) to unload the bale.

CAUTION: To prevent injury or damage, always unload baler on level ground to prevent bales from rolling downhill.

2. Pull the tractor hydraulic lever rearward to raise the gate for bale ejection.

This will allow bale to drop to the ground. If the bale fails to drop out, engage the power takeoff for bale ejection.

CAUTION: Do not allow anyone to stand near the rear of the baler when a bale is being discharged.

3. Move forward approximately 8 feet (2.4 m) to avoid striking the bale with the gate, then hold the hydraulic lever forward until the gate has lowered. Return hydraulic lever to neutral after gate has been lowered.

IMPORTANT: Serious damage can result if the gate strikes the bale.

NOTE: If unsure gate has latched, open and close again until distinct noise of gate closing in the "home" position is heard. The hydraulic lever must be held for 5 seconds after the gate has closed to allow gate to be completely latched. Gate latch indicator should be in the latched position.

NOTE: If excessive build-up is observed on the gate after discharging bale, engage PTO while lowering the gate. This will reduce plugging between the starter and scraper rolls.

To continue baling, place tractor at 3/4 throttle and proceed into the windrow.

Adjusting for Bale Density

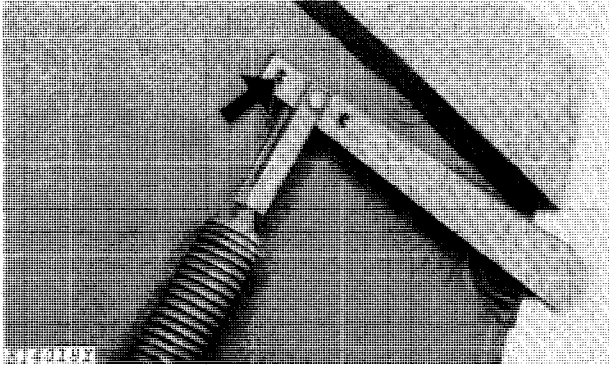


Fig. 7-Bale Density Settings

Three settings are provided in the lift arm to include most haying conditions. Bale density in light, dry hay will be increased if the tension spring is moved into the rear hole (arrowed).

Bale density will be decreased when the lift spring is moved to the forward position.

⚠ CAUTION: Remove all tension from tension spring before changing settings.