

Model 2970H
Leveling System
Operator's Manual
D-082301DJC01E



SERIAL NUMBER LOCATION



Serial Number Location

Write the serial number and the model number of the Leveling System and combine on the lines provided. If needed, give these numbers to your dealer when you need parts or information for your machine.

LEVELING SYSTEM MODEL NUMBER 2970H

LEVELING SYSTEM SERIAL NUMBER _____

COMBINE MODEL NUMBER _____

COMBINE SERIAL NUMBER _____

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WARRANTY POLICY



Statement of Limited Warranty (North American Harvest Products)

Hillco Technologies, Inc. (Hillco) warrants its new products to be free from defects in material and workmanship for a period of twelve (12) consecutive months following the warranty start date.

The warranty start date for Hillco products invoiced by Hillco from October 1st through May 31st is the first day of June following the Hillco invoice date, or the first date of use, whichever is earliest. For Hillco products invoiced by Hillco from June 1st through September 30th the warranty start date is the date of invoice. Once the warranty period has begun, it cannot be stopped or interrupted.

Hillco's obligation under this warranty shall be limited to repairing or replacing, free of charge to the original purchaser, any part that, in Hillco's judgment, shows evidence of such defect. Hillco additionally agrees to repair, at no cost to the original purchaser, any physical damage to the product to which the Hillco product is directly attached provided that the damage is directly attributable to a defect in the design or manufacture of the Hillco product, as determined by Hillco, and that the damage occurs during the effective warranty period of the Hillco product.

Hillco warrants genuine Hillco replacement parts and components to be free from defects in material and workmanship for a period of ninety (90) consecutive days following the Hillco invoice date, or the remainder of the original equipment warranty period, whichever is longer.

Limitations to Warranty

This warranty does not cover:

- 1) Any product damaged by accident, abuse, misuse, negligence, or improper maintenance.
- 2) Any unauthorized product alteration or modification.
- 3) Any unauthorized repairs made with parts other than genuine Hillco parts unless specifically authorized by Hillco.
- 4) Any repairs performed by anyone other than Hillco or an authorized Hillco dealer unless specifically authorized by Hillco.
- 5) Any claims directly resulting from improper installation, except those installations performed by Hillco.

Warranty Procedure

A Hillco Warranty Registration Form must be fully completed and returned to Hillco within 30 days of sale of the product to the retail customer or the first day of use, whichever is earlier.

All warranty claims must be submitted on a fully completed Hillco Warranty Claim Form.

All warranty work must be performed, and claims submitted, within thirty (30) days of the occurrence of the claim and within the warranty period.

All parts removed during warranty repair should be held for a period of sixty (60) days after the warranty claim has been submitted to Hillco.

Hillco reserves the right to either inspect the product at the original retail purchaser's location, or the authorized Hillco dealer's location; or require it to be returned to Hillco, transportation charges prepaid, for inspection.

Limitation of Liability

Hillco makes no express warranties other than those, which are specifically described herein. Any description of the goods sold hereunder, including any reference to buyer's specifications and any descriptions in circulars and other media published by Hillco is for the sole purpose of identifying such goods and shall not create an express warranty that the goods shall conform to such description.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED. There are no implied warranties of merchantability or fitness for a particular purpose. This warranty states Hillco's entire and exclusive liability and buyer's exclusive remedy for any claim for damages in connection with the sale or furnishing of Hillco products, their design, suitability for use, installation, operation, or for any claimed defects herein. **HILLCO WILL IN NO EVENT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER, NOR FOR ANY SUM IN EXCESS OF THE PRICE RECEIVED FOR THE GOODS FOR WHICH LIABILITY IS CLAIMED.**

No representative of Hillco nor any dealer associated with Hillco has the authority to change the items of this warranty in any manner whatsoever, and no assistance to purchaser by Hillco in the repair or operation of any Hillco product shall constitute a waiver of the conditions of this warranty, nor shall such assistance extend or revive it.

Hillco reserves the right to make improvements in design or changes in specifications at any time, without incurring any obligation to owners of units previously sold.

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INTRODUCTION

Thank you for choosing the Hillco 2000 Series Leveling System to compliment your farming operation. This product has been designed and manufactured to meet the needs of a discriminating buyer for increasing the performance of a combine.

Safe, efficient and trouble free use of your Hillco 2000 Series Leveling System requires that you and anyone else who will be operating or maintaining the leveling system, read and understand the safety, operation, and maintenance information contained in the Operator's Manual.

If extra copies of the Operator's Manual are needed, contact Hillco at 1-800-937-2461 or download it from the Hillco Technologies' website at www.hillcotechnologies.com. The document number for this manual is located on the front page.



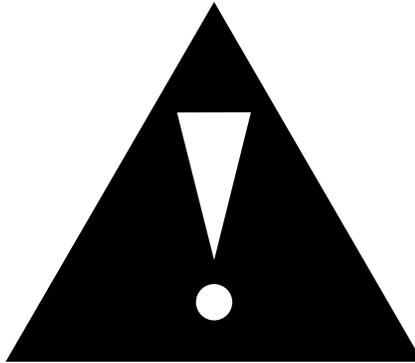
HILLCO MODEL 2970H LEVELING SYSTEM

This manual covers the Hillco 2000 Series Model 2970H Leveling System (For 9650, 9750, 9660, 9760, and 9860 STS Combines) built by Hillco. Use the Table of Contents as a guide when searching for specific information.

Keep this manual handy for frequent reference and to pass on to new operators or owners. Call your Hillco dealer or Hillco if you need assistance or information at 1-800-937-2461.

OPERATOR ORIENTATION – The directions left, right, front, and rear, as mentioned throughout this manual, are as seen from the combine operator's seat and facing in the direction of forward travel.

SAFETY ALERT SYMBOL



This Safety Alert symbol means
ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

The Safety Alert symbol identifies important safety messages on the Hillco 2000 Series Leveling System and in the manual. When you see this symbol, be alert to the possibility of personal injury or death. Follow the instructions in the safety message.

SIGNAL WORDS

Note the use of the signal words **DANGER**, **WARNING**, and **CAUTION** with the safety messages. The appropriate signal word for each message has been selected using the following guidelines:

DANGER - An immediate and specific hazard, which **WILL** result in severe personal injury or death if the proper precautions are not taken.

WARNING - A specific hazard or unsafe practice, which **COULD** result in severe personal injury or death if proper precautions are not taken.

CAUTION - Unsafe practices which **COULD** result in personal injury if proper practices are not taken, or as a reminder of good safety practices.

OPERATION SAFETY

1. Read and understand the Operator's Manual and all safety labels before operating the leveling system.
2. Make sure that all controls are in the manual position before starting the combine.
3. Clear the area of all bystanders, especially children, before starting the leveling system and during operation.
4. Make sure all safety shields are in place before operating the combine. Never operate the machine with the shields removed.
5. Keep hands, feet, hair and clothing away from all moving and/or rotating parts.
6. Stay seated in the cab during operation.
7. Operate controls only when sitting in the seat of the combine.
8. To avoid engine damage, do not run the machine for extended periods of time when it is in the leveled over position.
9. Always travel at a safe speed. Use caution when making turns or traversing ditches.
10. There are restrictions as to tread width and tire selection. Refer to page 13 for important information on these restrictions.
11. The use of after-market grain tank extensions is prohibited from use on combines equipped with the Model 2970 leveling system.

HYDRAULIC SAFETY

1. Do not search for high-pressure hydraulic leaks without hand and face protection. A tiny, almost invisible leak can penetrate skin, thereby requiring immediate medical attention. Gangrene may set in, in as few as 3 hours!
2. Use cardboard or wood to detect leaks – never your hands!
3. Double check that all is clear before operating hydraulics.
4. Maintain proper hydraulic fluid levels.
5. Ensure all fittings and hoses are in good repair.
6. Do not make any repairs to the leveling system hydraulic system including: cylinders, valves, hydraulic hoses, adapters, pumps, manifolds, or reservoirs without first contacting your authorized Hillco dealer. These hydraulic components stabilize the chassis of the combine. Improper repair or replacement of these components could lead to uncontrolled leveling of the combine's chassis.

SERVICING AND MAINTENANCE SAFETY

1. Review the Operator's Manual and all safety items before servicing or maintaining the leveling system.
2. Place the Auto/On/Off leveling switch in the "Off" position, stop the combine engine, wait for any moving parts to stop, block the tires, the header, and the cylinder areas before servicing, repairing, adjusting, or maintaining the leveling system.
3. Hydraulic oil is under pressure. Use caution when dealing with the hydraulic system.
4. Keep hands, feet clothing and hair away from all moving and/or rotating parts. Clear the area of bystanders, especially children, when carrying out any maintenance, repairs or making any adjustments.

USE PROPER TOOLS

Use tools appropriate to the work. Makeshift tools and procedures can be a safety hazards.

Use power tools only to loosen threaded parts and fasteners.

For loosening and tightening hardware, use correct size tools. **DO NOT** use U.S. measurement tools on metric fasteners. Avoid bodily caused by slipping wrenches.



HIGH PRESSURE FLUIDS

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

Search for leaks with a piece of cardboard, never your hands.

Relieve pressure before disconnecting hydraulic or other lines.

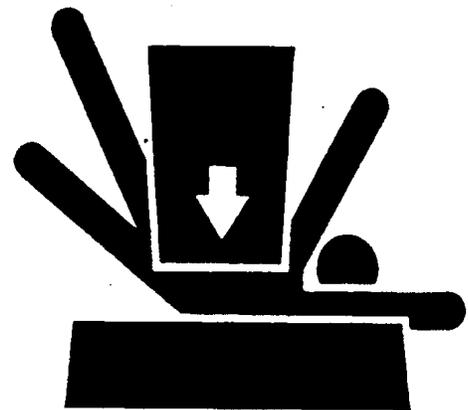
If an accident occurs consult a doctor immediately. Fluid injection into the skin must be surgically removed within a few hours or gangrene may result.



SUPPORT MACHINE PROPERLY

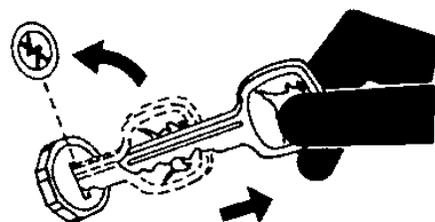
Always use proper lifting and support equipment, when working on jacked up machine.

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.



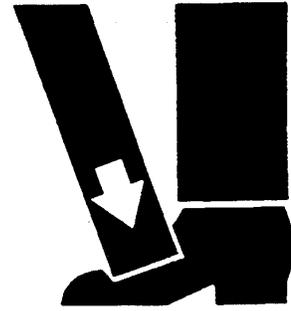
REMOVE KEY

Always remove the key from the ignition before working on machine.



USE PROPER LIFTING EQUIPMENT

Lifting heavy components or parts improperly can cause severe injury or even death.



REMOVE ALL SPILLED FLUIDS

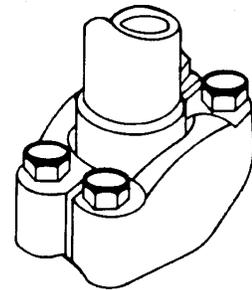
Keep work area free of all spilled oil.

Keep all access areas clean and free of obstruction.



SAE CODE 62 FOUR BOLT FLANGE FITTING TORQUE CHART

1. Inspect the sealing surfaces for nicks or scratches, roughness or out-of-flat condition. Scratches causes seal wear. Out-of-flat causes seal extrusion. If these defects cannot be polished out, replace the component.
2. Lubricate the o-ring and install into the groove.
3. For split flange; loosely assemble split flange halves being sure that the split flange is centrally located and perpendicular to the port. Hand tighten cap screws to hold parts in place. **DO NOT PINCH O-RING.**
4. For single piece flange; put hydraulic line in the center of the flange and install four cap screws. With the flange centrally located on the port, hand tighten cap screws to hold it in place. **DO NOT PINCH O-RING.**
5. For both single and split flange, be sure the components are properly positioned and cap screws are hand tight. Tighten one cap screw, then tighten the diagonally opposite cap screw. Tighten all cap screws within the specified limits shown in the chart.



DO NOT USE AIR WRENCHES. DO NOT TIGHTEN ONE CAP SCREW FULLY BEFORE TIGHTENING THE OTHERS. DO NOT OVER TIGHTEN.

O-RING BOSS FITTING TORQUE CHART

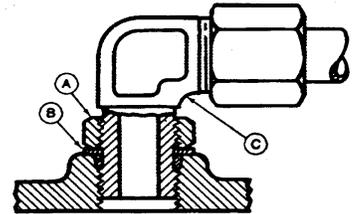
Straight fitting

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



Angle fitting

1. Back-off lock nut (A) and back-up washer (B) completely to head-end (C) of fitting.
2. Turn fitting into threaded boss until back-up washer contacts face of boss.
3. Turn fitting head-end counterclockwise to proper angle, maximum of one turn.
4. Hold fitting head-end with a wrench and tighten lock nut and back-up washer to the proper torque specification.

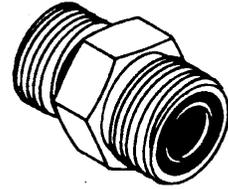


NOTE: DO NOT ALLOW HOSES TO TWIST WHEN TIGHTENING FITTINGS.

Torque Value Chart		
Thread Size	Torque	
	N-m	lb-ft
3/8-24 UNF	8	6
7/16-20 UNF	12	9
1/2-20 UNF	16	12
9/16-18 UNF	24	18
3/4-16 UNF	46	34
7/8-14 UNF	62	45
1-1/16-12 UNF	102	75
1-3/16-12 UNF	122	90
1-5/16-12 UNF	142	105
1-5/8-12 UNF	190	140
1-7/8-12 UNF	217	160
NOTE: Torque Tolerance is +/- 10%		

O-RING FACE SEAL FITTING TORQUE CHART

1. The sealing surfaces must be free of dirt or defects.
2. The O-ring must be free of dirt or defects.
3. Lubricate O-rings and install into groove.
4. Tighten the fitting or nut to torque specification show on the chart.



NOTE: DO NOT ALLOW HOSES TO TWIST WHEN TIGHTENING FITTINGS

O-RING FACE SEAL FITTING TORQUE CHART					
Nominal Tube O.D.				Swivel Nut	
mm	in.	Dash Size	Thread Size in.	N-m	lb-ft
6.35	0.2500	-4	9/16/2018	5.0	3.5
9.52	0.3750	-6	11/16/2016	9.0	6.5
12.70	0.5000	-8	13/16-16	17.0	12.5
15.88	0.6250	-10	1-14	17.0	12.5
19.05	0.7500	-12	1-3/16-12	17.0	12.5
22.22	0.8750	-14	1-3/16-12	17.0	12.5
25.40	1.0000	-16	1-7/16-12	17.0	12.5
31.75	1.2500	-20	1-11/16-12	17.0	12.5
38.10	1.5000	-24	2-12	17.0	12.5
Torque Tolerance is +15 -20%					

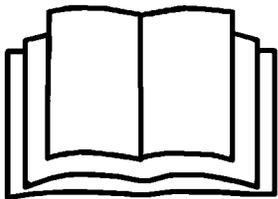
HIGHWAY OPERATION AND TRANSPORT SAFETY

1. Check with local authorities regarding combine transport on public roads. Obey all applicable regulations and laws.
2. Check clearance elevations and widths of combine for travel near power lines, bridges, trees, etc.
3. Make sure the Auto Leveling Indicator is in "Manual" mode (not lit) for all transport and highway travel situations.
4. Always travel at a safe speed. Use caution when making corners or meeting traffic.

SAFETY LABELS

Familiarize yourself with the location of all safety labels. Read them carefully to understand the safe operation of your machine.

"Read Operator's Manual" Symbol

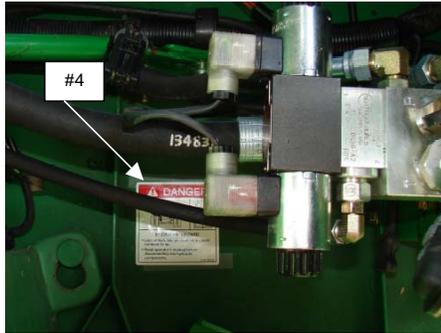


Decals, which display the "Read Operator's Manual" symbol, are intended to direct the operator to the Operator's Manual for further information regarding maintenance, adjustments and/or procedures for particular areas of the leveling system. When a decal displays this symbol refer to the Operator's Manual for further instructions.

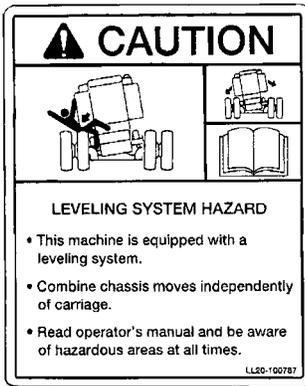
TO APPLY NEW OR REPLACEMENT LABELS:

1. Make sure the label area is smooth by removing any debris such as dirt or old labels.
2. Wash the area with soap and water and then dry it thoroughly.
3. After the area has completely dried, peel the backing off the safety label and place it onto the cleaned area.
4. Make sure all areas of the label have adhered to the machine by pressing down on the entire face of the label, including the corners.

SAFETY LABEL LOCATIONS



SAFETY LABEL SPECIFICATIONS



Label #1
Part number: LL20-100787
Locations: 2 (left and right side of combine on axle cover plates)



Label #2
Part Number: LL20-100783
Locations: 6 (front and rear of undercarriage and each side of drop axle assembly)



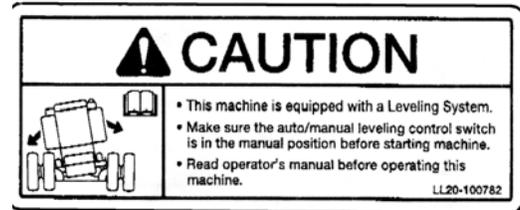
Label #3
Part number: LL20-10784
Locations: 2 (left and right side of upper transition face plate)



Label #4
Part number: LL20-100788
Locations: 3 (main cylinders and above leveling manifold)



Label #5
Part number: LL20-100786
Locations: 1 (front of electrical box)



Label #6
Part number: LL20-100782
Locations: 1 (inside cab window beyond console)



Label #7
Part number: LL20-100785
Locations: 1 (ladder well)



Label #8
Part number: LL-143621
Locations: 2 (rear of undercarriage)



Label #9
Part number: LL-143671
Locations: 1 (RWA Warning Box)

These safety labels should be present and legible at all times. If new labels are needed, or you have any questions concerning safety, please contact Hillco at 1-800-937-2461.

OPERATION, SETUP, AND MAINTENANCE

ELECTRICAL OPERATION

LEVELING SYSTEM CONTROLS

MANUAL LEFT / RIGHT LEVELING SWITCH

LEVEL LEFT: Push down on the left side of the Manual Left/Right Leveling Switch.
LEVEL RIGHT: Push down on the right side of the Manual Left/Right Leveling Switch.

AUTO/MANUAL LEVELING BUTTON

AUTO: Push the Auto/Manual Leveling Button once to light the Auto Leveling Indicator Light and engage automatic leveling operation. The automatic leveling controller monitors changes in slope and corrects chassis position to maintain a level chassis position. The Manual Left/Right Leveling Switch will override the automatic leveling controller while the switch is depressed. Upon release of the switch, the leveling system will return to automatic leveling mode.

MANUAL: Push the Auto/Manual Leveling Button once to enter the Manual Leveling mode (Auto Leveling Indicator Light not lit). With the Auto Leveling Indicator Lamp not lit the Manual Left/Right leveling switch will level the combine left and right. When the switch is released the combine chassis will maintain the current chassis position.

HEADER TRIM SWITCH

The header trim switch is the four-position header control switch mounted in the combine's hydro handle control lever. It is used to raise and lower the header as well as trim the header left and right.

TILT LEFT: Depress the left side of the switch to tilt the header counterclockwise.
TILT RIGHT: Depress the right side of the switch to tilt the header clockwise.

MAXIMUM LEVEL LAMP

The leveling system is equipped with a maximum level warning lamp. This lamp, located on the face of the steering column, indicates when the machine has reached its maximum leveling capability. Important tire and tread width restrictions apply to the use of combines equipped with the Model 2970H Leveling system that are intended for use on slopes exceeding the maximum leveling capability. See the "Slope Restrictions" section of this manual for important details of these restrictions.



REAR WHEEL ASSIST WARNING ALARM

The Rear Wheel Assist (RWA) Warning Alarm is located in the upper left corner of the cab on the main upright. It will sound an alarm and a warning light will flash if the combine is traversing down a slope that is greater than 20% and the Rear Wheel Assist is engaged in either low or high-speed. Disengage the Rear Wheel Assist and the warning alarm and light will stop. On downhill slopes less than 20%, level ground or uphill slopes the alarm will never sound if RWA is engaged.

See your combine's Operator's Manual to understand how to operate the Rear Wheel Assist (RWA).



WARNING!

When the Rear Wheel Assist Warning Alarm Sounds and Warning Light Flashes **IMMEDIATELY DISENGAGE** the Rear Wheel Assist or Control or the Combine **COULD** be lost.

ELECTRICAL SETTINGS

LIMIT SWITCHES

The leveling system is equipped with left and right level limit switches that disable the automatic leveling when the combine reaches its maximum leveling capability in either direction. These switches are preset by the installer at either the maximum leveling capability of the combine or in some cases at a lesser angle to provide for proper tire clearance. It is important to note that in the event of a limit switch failure the combine may continue to level to its maximum capability. Care should be taken to make sure tire clearances are adequate in the maximum level position to prevent damage to the tire or chassis in the event that a limit switch failure should occur. The operator should daily level the combine to its maximum level position, with the bulk tank empty, using the manual leveling switch to insure the limit switches are operational.

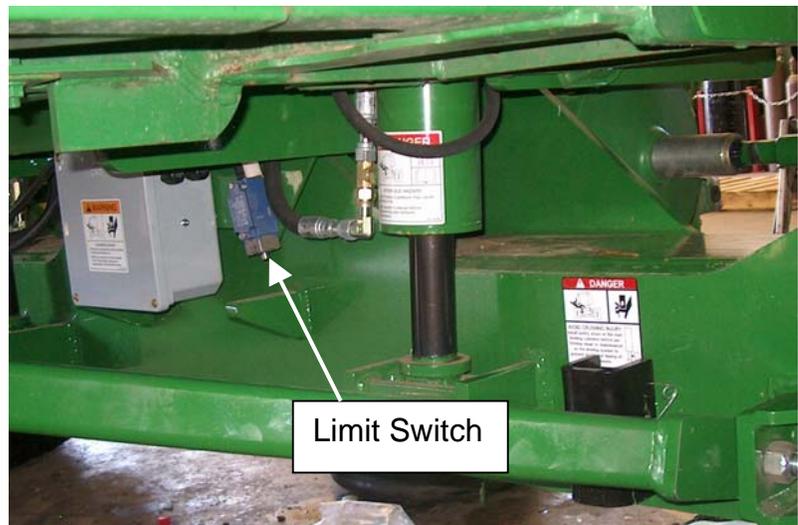
IMPORTANT!

With certain tire selections the limit switches can be used to prevent the need to modify the sheet metal on the left and right side panels of the combine. Installation of level limit stops is recommended to prevent sheet metal damage in the event of a limit switch failure.

To set the limit switches, park the combine on level ground and block the tires. Then raise the feeder spout and lock the feeder lift cylinder. Place the leveling system in the Manual Leveling mode (Auto Leveling Indicator Light not lit). Using the Manual Left/Right Leveling Switch, lean the combine to the left to maximum level of the cylinders or to the maximum point that there is no sheet metal to tire interference. It may be a good practice to level a small distance, stop and check for clearance issues before continuing. Next, set the parking brake and shut down the machine. The limit switches are located on each side of the control box near the main pivot pin. Loosen the bolt that holds the left limit switch stop in place. Adjust the left limit switch to the point where you can hear the contacts on the limit switch snap and move slightly past this point. Repeat this process for the right limit switch.

IMPORTANT!

If Leveling Cylinder Stops are used be sure that the limit switches are set to stop leveling before the stops make contact. Damage to the cylinders or other leveling system components may occur if limit switches aren't set properly.



LEVELING CYLINDER STOPS

If the tire selection that is used on the combine creates sheet metal clearance problems and requires using the limit switches to stop leveling prematurely it is **recommended to use Leveling Cylinder Stops**.

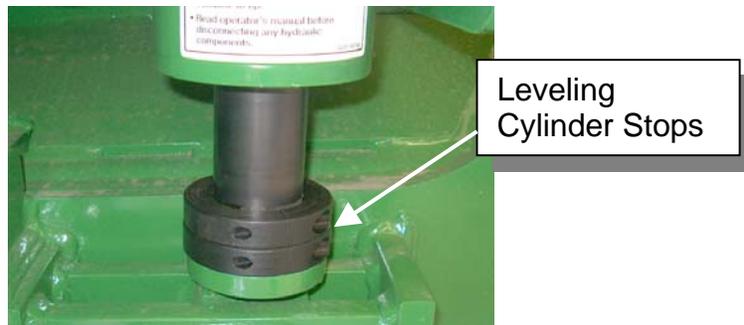
On the Model 2970 Leveling System the Leveling Cylinder Stops can be clamped on the main leveling cylinders to mechanically stop leveling if the limit switches were to fail. To determine how many spacers are needed to create a mechanical stop follow these steps:

1. Park the combine on level ground and apply the parking brake.
2. Raise the feeder spout and drop the header lift cylinder safety stop.
3. Place the Auto/Manual-leveling switch in the manual position and lean the combine to the left until the limit switch that was set previously stops leveling.
4. Shut off the machine and measure the distance between the packing gland on the rod end of the cylinder and the ring that is welded to the rod end.
5. Write down this dimension and repeat the process for the right side. (Both sides must be measured due to the fact that the combine may level further one direction than the other.)
6. The dimensions obtained will determine how many spacers are needed.

There is no additional charge for the leveling cylinder stops (Call Hillco with dimensions to order).

IMPORTANT!

If Leveling Cylinder Stops are used be sure that the limit switches are set to stop leveling before the stops make contact. Damage to the cylinders or other leveling system components may occur if limit switches aren't set properly.



LEVELING CONTROLLER FUNCTION

The Hillco Model 2950 & 2960 Leveling Systems are equipped with a proportional leveling system with manual control and automatic with manual override control. The clinometer, located in the control box, monitors changes in slope and corrects the position of the combine's chassis using proportional leveling. The clinometer maintains leveling accuracy to +/- 1/4th degrees by sending the leveling signal to the proportional leveling control valve on the manifold. As the combine reaches higher degrees of being out of level, the clinometer sends more voltage to the directional control valve's coil and pulls the spool open further to allow oil to flow faster and speed up leveling. As the combine gets closer to +/- 1/4th degrees out of level, less voltage is sent to the coil to slow leveling.

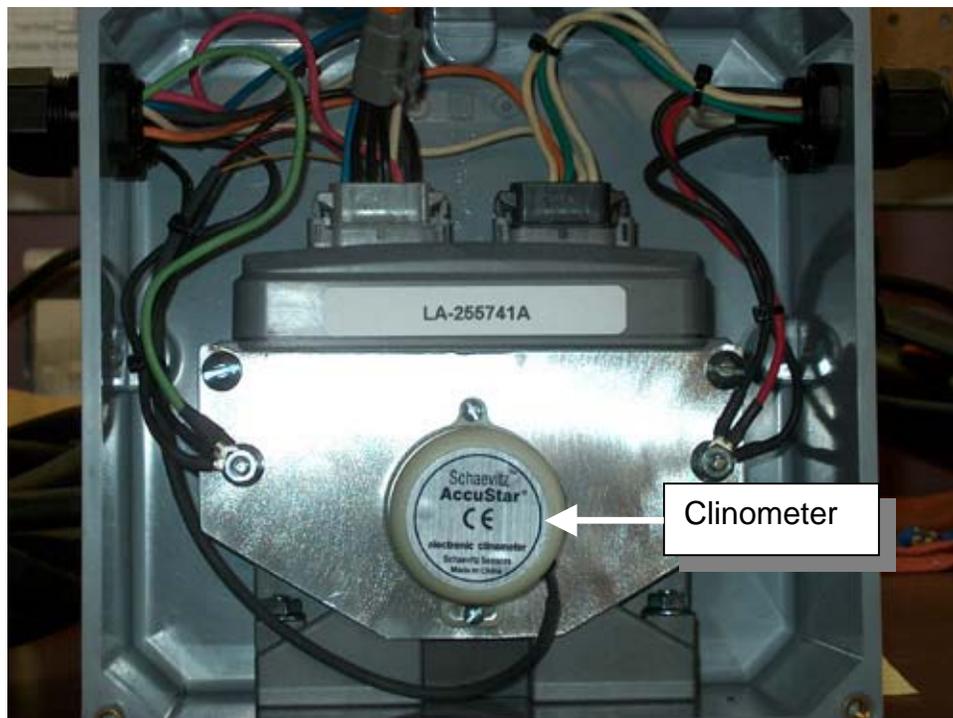
LEVELING CONTROLLER ADJUSTMENT

The clinometer is properly positioned when the combine returns to the level position in the automatic mode from both the left and the right. A 1/4th degree dead band each direction from level in the clinometer will prevent the chassis from returning to absolute level. If the combine does not return to the same level point from each side and the chassis leans more one direction than the other, then follow these adjustment steps:

1. Park the combine on level ground, raise the header, turn off the ignition, block the tires, and lock the feeder lift cylinder. It is often helpful to level the combine at low idle during this process so that the leveling speed is reduced during adjustment.
2. Open the control box and loosen the lower & upper mounting screws that mount the clinometer onto the aluminum plate. The bottom hole in the clinometer is slotted to allow the clinometer to be rotated.
3. Move the bottom of the clinometer in the direction you wish the combine to level. Once the clinometer has been moved and the mounting bolts retightened, level the combine to each side and return to level using automatic leveling and again check for level. It is often helpful to level the combine at low idle during this process so that the leveling speed is reduced during adjustment.
4. Repeat as necessary until the combine sits at the same amount out of level from each direction.

NOTE!

The 1/4th degree trip angle is adjustable in the clinometer only by a trained technician. This trip angle has been pre-set for maximum performance by Hillco and should not be readjusted without first contacting Hillco.



MECHANICAL ADJUSTMENTS

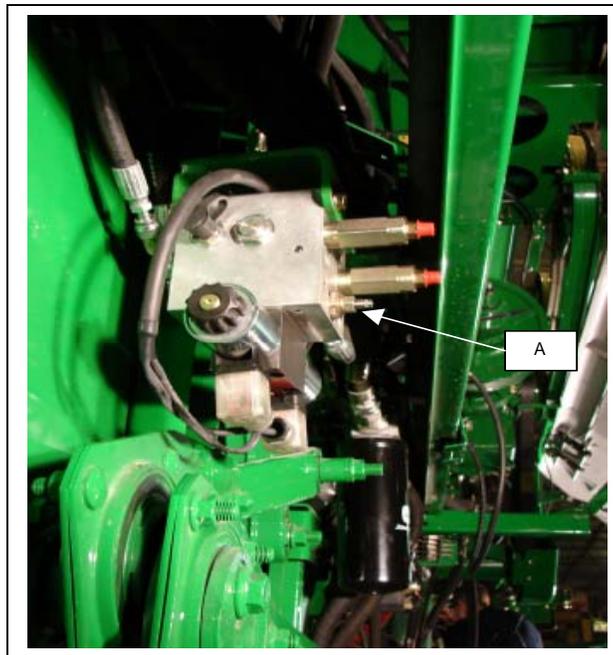
LATERAL TILT FLOW CONTROL ADJUSTMENT

The lateral tilt flow control valve adjusts the speed at which the header rotates. The header should rotate at the chassis' rotation rate. The rotation rate is set at the factory, however with larger header configurations it may be necessary to adjust the header's rotational rate.

To adjust the header rotational rate, push the tilt button to the left until the tilt frame is rotated to the left limit. Push the tilt button to the right until the tilt frame reaches its right limit. The cycle time should meet the following specification:

Specification - Left-to-Right Cycle Time-----22 sec

If the cycle time is shorter than the specification, turn the flow control set screw (A) clockwise a quarter turn at a time until the cycle time meets the specification. If the cycle time is longer than the specification, turn the flow control screw (A) counterclockwise a quarter turn at a time until the cycle time meets the specification.



IMPORTANT!

The pressure relief valve is pre-set at the factory. Changing the setting may cause damage to the tilt frame or hydraulic system. However in very large header configurations, it may be necessary to change the setting. Contact your dealer on the correct procedure to reset the relief valve.

TREAD WIDTH

The **Model 2970H Leveling System** is designed around a main undercarriage length of 114.5" or 122.5". The 114.5" undercarriage is designed for use with dual tire packages where 120-180" tread spacing is preferred for 30" rows. Use of the 114.5" undercarriage will limit the leveling capability of the combine from 27% to 23%. The 122.5" undercarriage was designed to move the dual tires outward to 128-188" tread spacing to allow for the maximum leveling capability of the combine or 27%. The final drives can be mounted directly to the 114.5" and 122.5" undercarriages. **Dual tires are required for all combines equipped with the Model 2960 Leveling System.**

TIRE SELECTION – SLOPE RESTRICTIONS



CAUTION!

All combines equipped with the Model 2970 Leveling System are required to use dual wheels & tires. The 24.5R-32, 5-Star, R1 (Tractor Lug) or the 24.5-32, 16-Ply, R3 (Diamond Tread) tires and 32-inch wheels can be purchased from Hillco. These are the only wheel and tire combinations approved for use on the 2970 Leveling Systems.

SEE RECOMMENDED TIRE PRESSURES AND GRAIN TANK SENSOR LOCATION SECTION FOR INFORMATION ON SLOPE RESTRICTIONS.

HEADER AND COMBINE CONNECTION

Refer to the John Deere Combine STS Operator's Manual for instructions on connecting the header to the combine.

IMPORTANT!

Hose lengths must be lengthened to allow for maximum rotation of the header. Check all hoses and wires connected between the combine and the header for proper length when first rotating the header.

All John Deere headers require a Header Kit to function properly during rotation of the transition. Contact your dealer for information on these kits.

REAR AXLE WEIGHTING

The HILLCO Model 2970 Leveling System is designed to transfer enough weight to the rear axle of the combine for proper balance that no additional weight is needed. If the operator determines that additional weight is needed on the rear axle to ensure optimal down hill performance it can be accomplished by adding:

- 1) Calcium Chloride in Rear Tires
- 2) John Deere Rear Wheel Weights

Use caution when using individual turning brakes. Installation of a Hillco Leveling System transfers additional weight to the rear axle of the combine. Excessive braking to turn can damage your combine chassis.



CAUTION!

The responsibility for making the final determination of appropriate rear axle weighting lies with the operator.

When first operating the Model 2970 Leveling System in hillside conditions, begin operation on gradual slopes and work up to more severe slopes only after you have determined that rear axle weighting is appropriate for downhill maneuvers. The first indication of insufficient rear axle weighting is sluggish or unresponsive steering while traveling down hill. This effect will worsen if the operator decelerates. Make sure rear axle weighting is sufficient for safe down hill maneuvers, under normal deceleration, in your most severe down hill conditions.

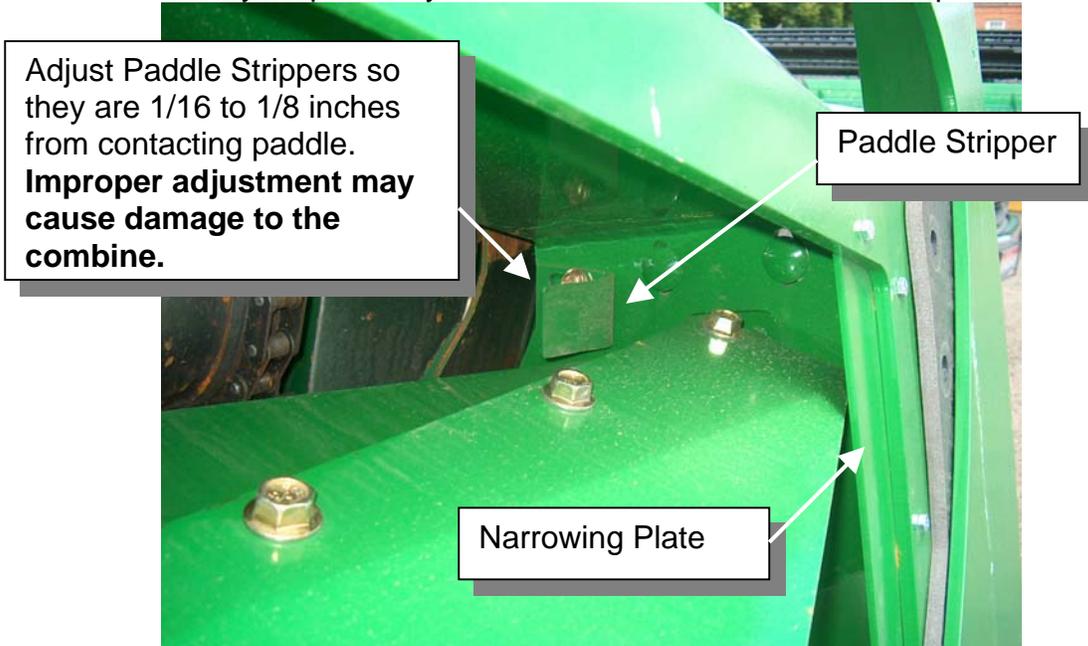
IMPORTANT!

Use of grain tank extensions is strictly forbidden. Use of such extensions voids both the Hillco and John Deere new equipment warranties.

PADDLE STRIPPERS & NARROWING PLATES

The purpose of the Paddle Stripper is to strip viney material from the paddle before it wraps tight around the end of the Beater Shaft, causing premature bearing failure. The Narrowing Plate forces the material in towards the center of the paddles to help prevent material from wrapping.

The Paddle Strippers & narrowing Plates are NOT REQUIRED. They are OPTIONAL and intended for use in viney crops. They can be added or removed at the Operator's Discretion.



IMPORTANT!
Rotate the Beater Shaft One Full revolution after adjusting Paddle Strippers to be sure they don't contact paddles. Adjust Paddle Strippers so they are 1/16 to 1/8 inches from contacting paddle. Improper adjustment may cause damage to the combine.



REAR AXLE EXTENSION POSITIONING

The rear axle on the combine is designed so that the axle extensions may be bolted in two different positions to adjust the rear height of the combine. The rear axle extension position may need to be adjusted after the correct tires and header are installed on the combine. The combine should sit level to two inches high in the rear. If it does not, then the axle extension position will have to be adjusted and the tire size may have to be changed. Consult your combine's operator's manual for more information on the proper stub axle position.

REAR AXLE TOE IN

If the rear tire and wheel size changed after the proper sized rear tires were installed the toe in should be checked. Consult your combine's operator's manual on the correct toe in for your tire and wheel size.

TRANSITION DRIVE CHAIN

Check to see that the transition drive chain is in proper alignment and has proper tension. Misalignment of these sprockets will cause premature wear of the sprockets and chain. Chain tension is maintained with the tensioner that is bolted to the right side of the transition. Tensioner adjustment can be found in the following paragraph.

CHAIN TENSIONER ADJUSTMENT INSTRUCTIONS

Step 1

Adjust the tensioner to the correct degree of tension by placing a wrench on the square portion of the tensioner body and a second wrench on the mounting bolt.

Step 2

Apply pressure to the tensioner body in the appropriate direction until the chain is properly tensioned. Note that the tensioner is designed to deflect up to 30 degrees either side of its normal position.

Step 3

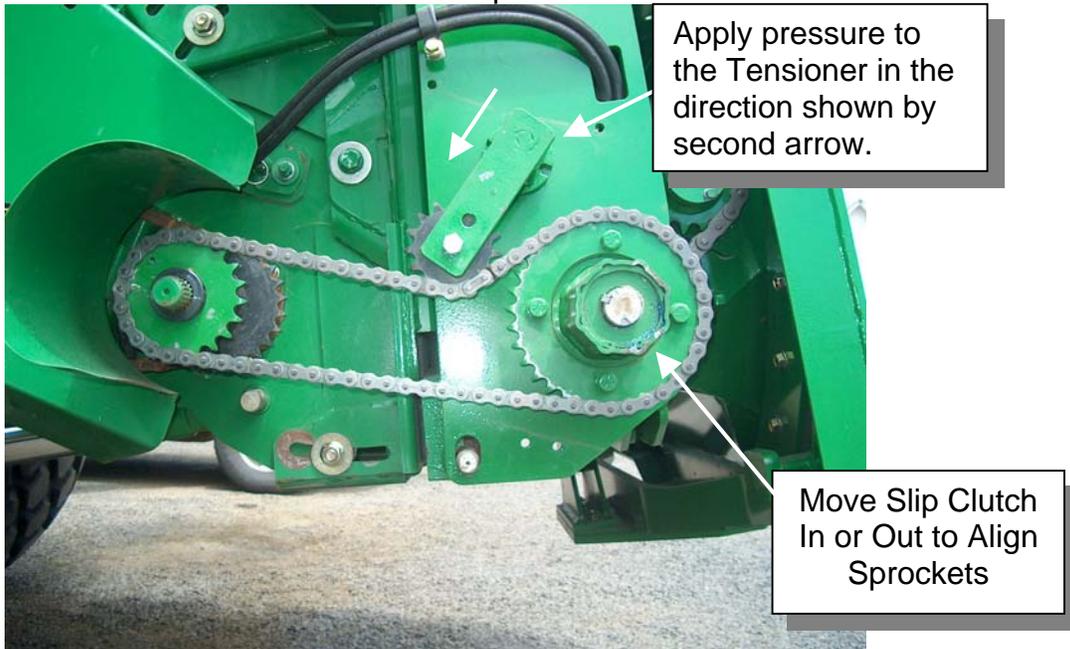
While holding the tensioner body in position, torque the mounting bolt to 60 lb ft.

Step 4

Before starting the drive, check the nuts on the idler bolt for tightness.

Step 5

After the drive has been started, visually inspect the tensioner for alignment and proper tensioning.



TRANSITION SLIP CLUTCH

The transition slip clutch is preset at the factory so that damage will not occur to any of the transition drive components; it cannot be adjusted and will never require any adjustment. **See Grease Locations for lubrication information.**

LADDER

If the ladder doesn't extend and retract properly check the fasteners in all of the pivot locations and make sure they aren't over tightened. Over tightening of these fasteners will cause the ladder to bind.

Make sure that the gas-charged struts keep the ladder fully retracted. Replace the struts if they appear to be weak. **If the ladder doesn't fully retract, permanent damage may occur during field operation.**



LEVELING CYLINDER SAFETY STOPS

When the leveling cylinder safety stops are installed on the leveling cylinders, the chassis cannot rotate. The stops must be installed before working on or around the leveling system and also when hauling the combine. It is recommended that the stops be used during long-term storage. When the stops are not being used, they should be stored on the hangar brackets located on the left and right sides of the undercarriage, just outside of the leveling cylinders. The shipping spacers will have to be trimmed if Leveling Cylinder Stops have been used for a mechanical safety stop.



GENERAL SHIELDING

Before operating the combine all shields must be in place and be in working condition.

Shield to tire clearance needs to be checked once the correct tires are installed on the combine. Check to see if the clearance is correct by having someone watch the tire and shields as the operator leans the combine to the far right and far left. Some tire selections require limit switches to be set slightly early to allow enough tire clearance between the left and right front side panels.

HYDRAULIC SETTINGS

Refer to the Hydraulic Safety section for precautions regarding the hydraulic system.

The Model 2970 Leveling System uses an auxiliary pump and two-station manifold for its leveling and a separate header trim manifold. Consult your combine's operator's manual or contact your John Deere dealer for diagnostic and maintenance support regarding the hydraulic system.

IMPORTANT!

All adjustments on the hydraulic system are preset at the factory for optimal leveling and header trim performance. **DO NOT MAKE ANY ADJUSTMENTS TO THESE SETTINGS WITHOUT FIRST CONTACTING YOUR AUTHORIZED HILCO DEALER.**

HYDRAULIC HOSES

Inspect the hydraulic system for leaks, damaged hoses, improper routing, and loose fittings.

Hydraulic hoses that are not routed correctly could become worn from working against abrasive edges or moving parts. If abrasions or holes do occur, the hydraulic hoses can only be replaced, not repaired. **Do not attempt repairs with tape or cements.** High pressure will burst such repairs and cause system failure and possible injury.

Hydraulic Hose Connections – When tightening loose hoses on the cylinders, pump, etc., always use one wrench to keep the hose from twisting and another wrench to tighten the union. Excessive twisting will shorten hose life and allow the fitting to loosen during operation. Do not over-tighten fittings or adapters.

Refer to the John Deere Combine's Operators Manual for information regarding hydraulic oil, check intervals, and reservoir fluid levels. High speed leveling, low speed leveling and header trim speeds are preset at the factory. If different speeds are desired please contact your Hillco dealer.

HYDRAULIC CYLINDERS

IMPORTANT!

Each leveling cylinder is equipped with a safety valve that is in place to prevent unintentional leak down of the cylinder. These safety valves are preset at the factory, and should not be adjusted.

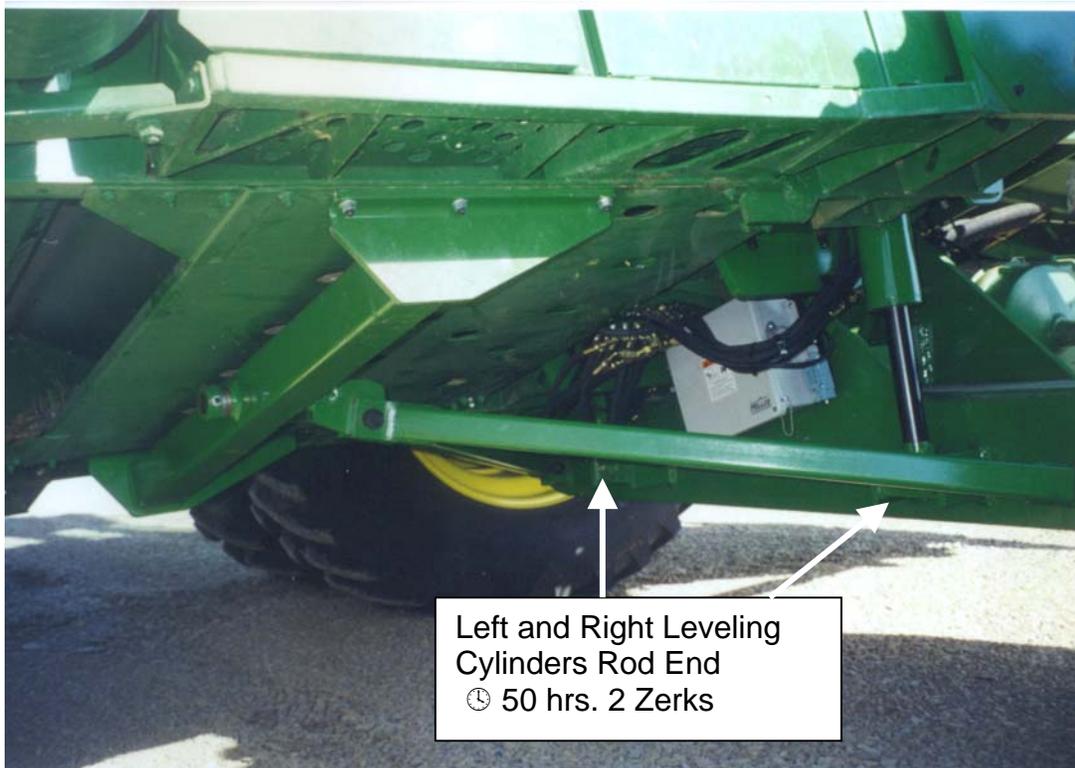
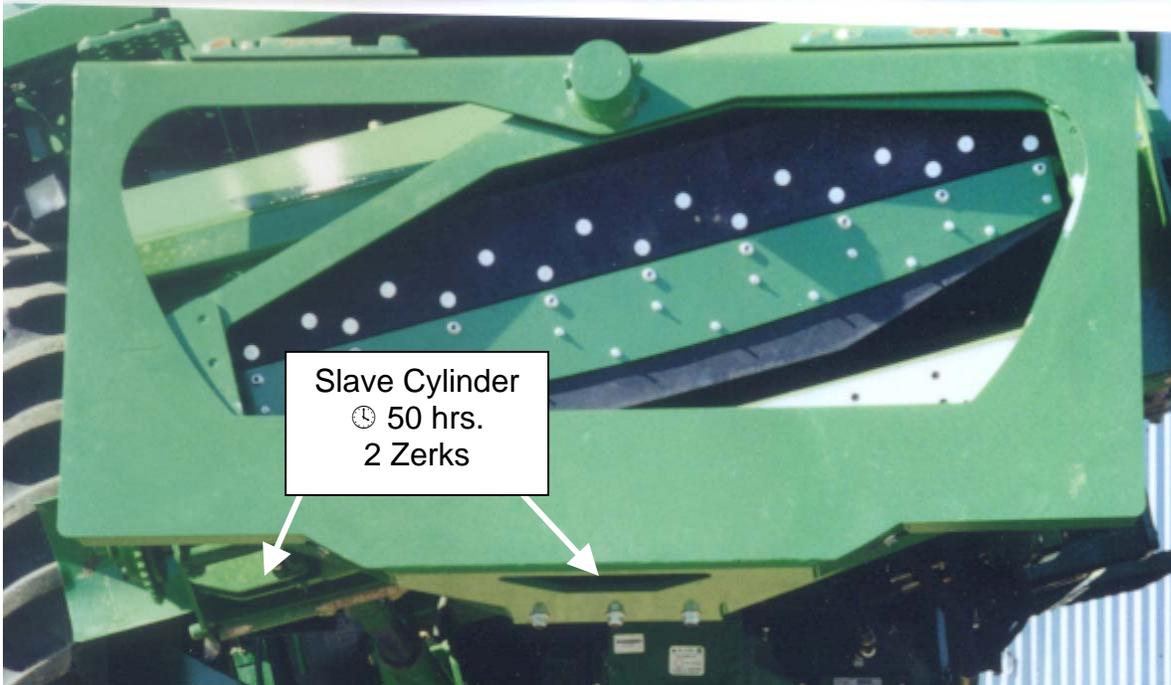
DANGER!

Do not make any repairs to the cylinders, disconnect valves, or disconnect any hoses connected to the cylinders, counterbalance valves, bulkhead mount or manifold without first contacting your authorized Hillco dealer. These hydraulic components stabilize the chassis of the combine. Improper repair or replacement of these components could lead to uncontrolled leveling of the combine's chassis. The leveling system's shipping spacers can be used to prevent accidental tipping of the combine during repair.



GREASE LOCATIONS

Use John Deere 251H EP grease or equivalent NLGI No. 2 Multi-Purpose Lithium Grease.

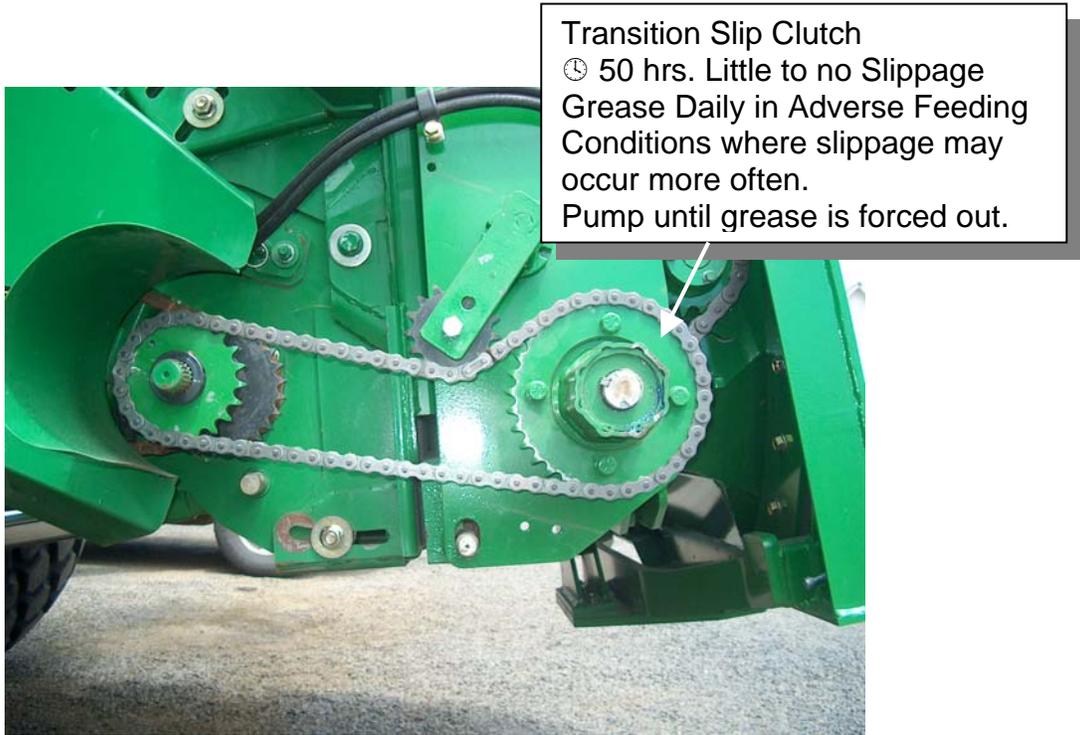


GREASE LOCATIONS

Use John Deere 251H EP grease or equivalent NLGI No. 2 Multi-Purpose Lithium Grease.



IMPORTANT!
Recommended Oil Change Interval for the Over-Hung Load Adapter is 1000 Hrs. Please order Part Number LA-260401 for 2.5 fl. oz. of replacement oil. Do Not Over or Under fill or Damage to the Over-Hung Load Adapter may occur.



FASTENERS

Check Bolt Tightness

- After the first 10 hours of operation
- Every season

The following bolts are torqued to special specifications because of the application in which they are used.

Transmission Mount Bolts:	John Deere Torque specifications
Final Drive Housing Bolts:	John Deere Torque specifications
Drive Wheel Hub Bolts:	John Deere Torque specifications
Steering Wheel Hub Bolts:	John Deere Torque specifications
Rear Axle Extension Bolts:	John Deere Torque Specifications
Unloading Auger Drive Shaft Locknut::	John Deere Torque Specifications

IMPORTANT!

Consult your John Deere Operator's Manual to verify that the correct bolts and spacers are used for the wheel application that is on the combine.

The following page shows torque specifications for both metric and standard fasteners. Use these charts for checking torques on bolts not shown above.

TORQUE CHARTS

Metric Bolt and Cap Screw Torque Values																
	Class 4.8				Class 8.8				Class 10.9				Class 12.9			
	Lubricated		Dry		Lubricated		Dry		Lubricated		Dry		Lubricated		Dry	
Size	N-m	lb-ft	N-m	lb-ft												
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	190
M16	100	73	125	92	190	140	240	175	275	200	350	255	320	240	400	300
M18	135	100	175	125	260	195	330	250	375	275	475	350	440	325	560	410
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	325	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	1500
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	2000
M33	900	675	1150	850	1750	1300	2200	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

"Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings.
 "Dry" means plain or zinc plated without any lubrication.

Unified Inch Bolt and Cap Screw Torque Values																
	Grade 1				Grade 2				Grade 5, 5.1, or 5.2				Grade 8 or 8.2			
	Lubricated		Dry		Lubricated		Dry		Lubricated		Dry		Lubricated		Dry	
Size	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	240	175	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750	1300	975
1-1/8	400	300	510	375	400	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2150	1550	2700	2000	3400	2550
1-1/2	1000	725	1250	925	990	725	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

Grade 1 applies for hex cap screws over 152mm (6in.) long, and for all other types of bolts and screws of any length.
 Grade 2 applies for hex cap screws (not hex bolts) up to 152mm (6in.) long.
 "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings.
 "Dry" means plain or zinc plated without any lubrication.

Torque specifications for certain fasteners may vary from these charts. Do not use any of the bolt torque specifications listed in this chart without first reading the bolt torque information listed on the previous pages.

TIRE INFLATION

Keep the tires properly inflated to the pressure shown in the combine's Operators Manual for the rear steer tires. For the front drive tires refer to the Recommended Tire Pressures and Grain Tank Sensor Location section at the bottom of this page for proper tire inflation. Both under-inflation and over-inflation are detrimental to tire life. Don't re-inflate a tire that has been run flat or when there is obvious or suspected damage to the tire or wheel components. Check the tire pressure weekly or after 50 hours of operation.



WARNING!

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



WARNING!

A tire can explode during inflation and cause serious injury or death. Never increase air pressure beyond 35 PSI to seat the bead on the rim. Replace a tire if it has a defect. Replace a wheel rim, which has cracks, wear or severe rust. Make sure that all the air is removed from a tire before removing the tire from the rim. Never use force on an inflated or partially inflated tire. Make sure the tire is correctly seated before inflating.

RECOMMENDED TIRE PRESSURES AND GRAIN TANK SENSOR LOCATION

24.5R-32, 5-Star, R1 (Tractor Lug) -

28-PSI - Grain Tank Sensor Left in Factory Position For 300 Bushel Grain Tank Capacity. NO SLOPE RESTRICTIONS.

25-PSI - Grain Tank Sensor must be Lowered to 250 Bushel Capacity, which is Primary Grain Tank Capacity with NO EXTENSIONS. MUST NOT OPERATE ON SLOPES GREATER THAN 20% IF GRAIN TANK CAPACITY EXCEEDS 250 BUSHELS.

24.5-32, 16-Ply, R3 (Diamond Tread) -

33-PSI - Grain Tank Sensor Left in Factory Position For 300 Bushel Grain Tank Capacity. NO SLOPE RESTRICTIONS.

30-PSI - Grain Tank Sensor must be Lowered to 250 Bushel Capacity, which is Primary Grain Tank Capacity with NO EXTENSIONS. MUST NOT OPERATE ON SLOPES GREATER THAN 20% IF GRAIN TANK CAPACITY EXCEEDS 250 BUSHELS.