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500 Series Harrow- Finisher

Owner's Manual



Many thanks for choosing Penta as the brand of your new tillage equipment! This equipment has been designed and manufactured to provide you with optimal performance and maximum durability for years of safe and economical use.

As with any piece of equipment, there are numerous settings and adjustments to insure optimum performance and ease of operation while maximizing the life and reducing wear on your new Penta tillage component; we suggest you take a few moments to review this operator's manual for some of these tips and procedures.

Safety is always of concern for any operators of equipment; a brief review of some of the safety features and procedures is outlined for you and any operators of this equipment.

Keep this manual readily available for reference and be sure to pass it on to any new operators or owners.

Customer Reference Information

Penta Machine and Model #: _____

Serial #: _____

Standard Equipment: _____

Options: _____

Date Purchased: _____

Dealer Name: _____

Dealer Telephone #: _____

Contents

Warranty Registration

Safety

Settings and Adjustments

Recommended Maintenance

Service or Repair Tips

Machine Schematics and Parts

Section 1- Safety

Above all else WORK SAFELY!!!

General Safety

1. Do not wear loose fitting clothes that can catch in moving parts or snag on obstructions.
2. Use caution when making any adjustments.
3. Always use the proper tools or equipment.
4. Ensure all parts, service equipment, and tools are clear of the machine before operating any component or moving the machine.
5. Never allow any person to ride on the machine when in motion.
6. Do not attempt to remove obstructions or debris while the machine is in motion.
7. Warning and Caution stickers are affixed to your machine; be aware of their location and message and do not remove.
8. Use extreme caution when working on hillsides, near ditches or fence rows, or around other people or machinery.
9. Be aware of clearances all around your machine! Generally your Penta tillage equipment is much wider than the towing vehicle.
10. Never rely on hydraulic operating systems to hold your machine! Always use mechanical locks or stands and blocking to support the machine when working under or around it.
11. Do not work on any towed equipment with the tow vehicle running. Wise operators always remove keys from towing vehicles and insure all hydraulic systems are in the neutral or "float" position to avoid possible unanticipated movement of the machine.
12. Always work at a deliberate pace; rushing can often result in accidents!
13. Use mechanical chocks or blocks on wheels and tires before disconnecting from any tow vehicle.
14. Relieve all hydraulic pressure before disconnecting any hydraulic connections or servicing any hydraulic components. Place tractor hydraulic controls in the "neutral" or float position.
15. Ensure all guards, shields or safety decals remain in place and in good condition.
16. Be aware of others around you or the machine!

Working with Hydraulics

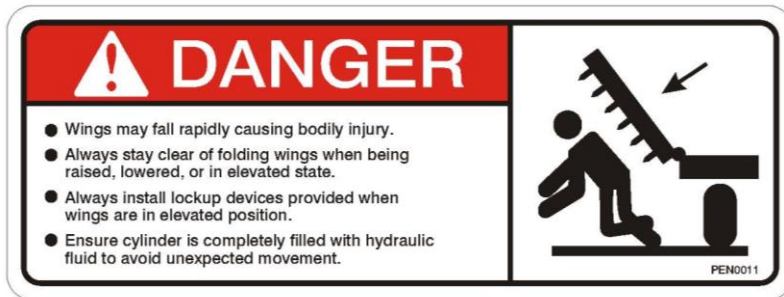
1. Never rely on hydraulics to hold your machine in position when working around or under it! Failure of simple components can result in drastic and sudden movements of any components. Always use mechanical locks, stands or supports to hold the machine.
2. Hydraulic systems rely on fluids under high pressure! Ensure all hydraulic components are free from pinching, abrasion areas or possible shear points.
3. Always visually inspect hydraulic components and connections for fluid leakage or seeping. Minor staining or seepage may indicate a pending component failure resulting in a hazardous rupture or failure.
4. Hydraulic systems can generate heat and high oil temperatures. Avoid contact with hot oils and fluids.
5. Proper eye protection should be worn when working around hydraulic systems to avoid eye contact with any hydraulic fluids.
6. Insure all hydraulic fittings and couplings are free of any debris or dirt before coupling or connecting. These fittings rely on excellent surface contact to preserve their integrity!
7. Visually inspect hydraulic lines for any signs of abrasion, pinching or wear.
8. Insure all hydraulic lines are secured and positioned with minimal movement to avoid snagging, catching or dragging.
9. IMPORTANT: Always loosen or “crack open” hydraulic fittings slowly and with proper caution to insure there is no latent pressure in the hydraulic system. Once determined the system is at zero pressure it is safe to disconnect.
10. Always “cap” or cover any open hydraulic lines or fittings to prevent contaminants from entering the system.

Safe Transport Practices

1. Always use locking pins and safety chains when transporting.
2. Engage all mechanical transport locks on the machine. Do not rely on the hydraulic system!
3. Travel at reasonable speeds. No tillage tool is designed for higher speed balance in transport position.
4. Be mindful of weights and momentum!
5. Use proper safety lighting (signal flashers, etc) and signage to make others aware of over width or over dimensional, slower moving potential hazards.
6. Be aware of dimensions! Be alert for overhead wires and signs as well as obstructions on the road shoulders.
7. Always practice courteous operation!

Safety Warnings and Decals

The following decals and safety warnings are affixed to your Penta tillage tool. Please insure that all operators are aware of their locations and they are kept in clear and legible condition.



Section 2- Settings and Adjustments

To insure best performance and optimal results with your Penta Harrow-Finisher it is manufactured with some very basic adjustments. Your machine should arrive from your dealer with these adjustments preset but it is a good practice to check and reset these measurements from time to time to accommodate changes in field conditions, normal wear of the machine or changes in the configuration (towing behind the tractor as a stand-alone machine, used behind another tillage piece as finishing harrows, etc).

Your new Penta 500 Harrow-Finisher is one of the most versatile tillage machines on the market; designed for a wide range of tasks- from post-harvest field conditioning and trash management to final pass seed bed preparation. Adjustment of tine angle, weight bias on the machine, working speed and tine depth can drastically alter the function of the machine to best accomplish the desired results.

A few simple adjustments and measurements can assure that your Penta Harrow-Finisher will do the desired job while reducing uneven stressing on the machine as well as the power required for optimal operation.

We suggest you familiarize yourself with these settings in order to best adapt the machine to the job desired, minimize horsepower required (and fuel consumption) and monitor the overall performance of the machine throughout its use for any signs of requirement to reset.

The best tillage jobs are ones with thorough and complete fracture and mixing of the soil, uniform incorporation of the desired amount of residue and the job done to a consistent depth.

The Penta 500 Harrow Finisher is designed to deal with surface finish and the seed germination layer in the top 3 inches of the soil structure. In working configuration the machine rides on the back finishing baskets (for optimal weight transfer) and the towing implements drawbar geometry to set frame bias and weight transfer.

Because of this design the Penta 500 requires the following simple steps be taken to assure your harrow- finisher is working at its best!

1. Tires

During field operations the 500 Harrow Finisher relies on the back finishing baskets and the front drawbar geometry to determine frame bias. In most field operations the tires and lift assemblies are in the fully retracted position; however in transport configuration the following steps should be taken to insure your Harrow Finisher transports level with equal weight distribution on all undercarriages. This will assure maximum safety at road transport speeds.

-Always insure all tires on cultivator are the correct (and same) size.

-Make sure all tires are at the same air pressure. A difference of 10 lbs. of air pressure may alter the circumference of the tire by several inches.

2. Side-to-Side Leveling

The Penta 500 Harrow Finisher is designed to ride on the rear mounted basket for maximum leveling and finishing effect. In order to adjust for best weight transfer and frame flex these mounts are both cushioned and adjustable.

To insure even soil pressure across the full working width of the machine as well as the machine being level from side to side the following two steps should be taken:

- A) A visual inspection of the control arm springs (the rubber contact point on the control arm: pictured) to insure all are equal and in good condition**
- B) All stop bolts (the bolt limiting the upper movement of the control arm: pictured- the bolt in the first position of the 4 point adjusting holes) are in the same position across the full width of the machine.**



These simple two steps assure the machine is running at the same settings across its full width. Once set there should be no requirement to change unless weight bias is adjusted front to back (changing the control arm limiting bolt) at which time one must ensure they are all in the same position.

3. Front to Back Weight Bias

The field adjustment allows the operator to adjust for soil and field conditions; as the Penta 500 Harrow Finisher relies on weight transfer and draft to change down force bias (more weight to the front causes the harrow tines to work more aggressively while more weight to the back increases the down pressure on the rolling baskets) – field adjustment will maximize results when changing soil types or field conditions occur.

The previous segment showing the “side to side” leveling mechanism is the first step in this process- assuring the swing arms are in the correct adjusted position for desired down pressure to the rear basket assembly.



At this point adjustment of the turnbuckle on the hinged drawbar assembly (pictured) increases or decreases the down force on the front of the machine when being pulled. Lengthening this turnbuckle lifts the front of the Harrow Finisher (decreasing down pressure on the harrow tines and increasing weight to the back baskets) while shortening this turnbuckle lowers the front (increasing weight on the harrow tines while decreasing the weight on the baskets).

4. Tines

Soil activity of the tines is based on several factors- both the physical characteristics of the tine itself, the configuration of the tine (length, coils of spring, etc) as well as the resistance being placed on it through contact with the ground (varied by depth in the ground, angle to the ground and forward speed). The basic or desired activity for maximum tillage results is with the tine being exposed to enough force to load against itself then unload through spring action. In motion and with the desired pressures acting on it (depth, forward speed, etc) the spring steel in the tine causes it to vibrate and move in a circular or lateral direction as well as forwards and back... creating a stirring or fracturing action within the soil structure.

As the key component of the Penta 500 Harrow Finisher the correct set-up on the tines can be the crucial element to maximizing the machines performance for best results. Please take a few moments and go over the following key features and characteristics of this component to better understand the effects of the various adjustments to enable maximum performance.

Physical Properties:

The Penta 500 Harrow Finisher is equipped with a hardened spring steel tine that is 18 inches in length and ½" in diameter. These compositions of the tines as well as the dimensions are critical as they determine the working action of the tines to allow for a range of results in a wide variety of conditions.

Tine wear will vary greatly to soil type and use (sandier soils are much more abrasive than clay base soils, drier soils more abrasive than wet, higher trash levels cause much less wear than deeper soil tillage, etc.); however design of the tines permit good results down to 50% wear at which time replacement is recommended. A simple measurement of the tine from the base at the spring coil to the tip is a good guideline to asses wear. As the tine length shortens the machine may have to be set less aggressively as the tine will have less spring activity as it becomes shorter. Uses in higher residue situations may be adversely affected as the shorter tine length will result in reduced trash clearance; however this is an individual call based on the use of the machine.

The Penta 500 Harrow Finisher is available with hardened chrome carbide tips on the tines (pictured). This option is highly recommended as field trials have shown it extends tine life by as much as 10 times as well as providing a much more aggressive action of the tine in harder soil conditions.



Penta Harrow tines with carbide tips

Tine Angle:

One of the most critical adjustments of the Penta 500 Harrow Finisher is the tine angle to the ground. The pictures below show a 500 in which one can easily see the angle the tines are running to the soil surface. In the picture on the left the tines are in or less aggressive stance (in more of a laid back position) while on the right they are in a much more up-right setting.



This tine angle adjustment is most critical to setting the machine to get the best results for the desired job... as well as what allows the Penta 500 Harrow finisher to be utilized for such a broad range of tillage functions.

In the more upright or aggressive settings the tine will penetrate much deeper, carry and break up more residue as well as stir and vibrate more. In these positions much more horsepower is required to run the machine however it is doing a lot of work at a deeper depth. Excellent settings for shallow cultivation, opening up surface "hard capping", residue sizing, soil warming, flushing early weed germination and surface leveling.

In the more laid back settings the tines will do a much better job in final surface preparation, seedbed finishing, residue distribution and leveling. As the tines are digging much less aggressively horsepower requirements are greatly reduced. These are the settings often used when the Penta 500 is used in final pass application before the seeding operation.

This tine angle is easily field adjusted using the multi position lever found on each tine section which limits the tine coil spring rotation; adjusted with the machine in the raised position.



4. Baskets

Whether equipped with a single or double finishing basket all Penta 500 Harrow Finishers feature a 14" diameter reversible finishing basket for final firming and leveling. This larger diameter basket is designed to better compensate for increased field working speeds as the larger diameter slows down the basket revolutions, allowing improved performance.

Reversing the basket changes the angle the bars or tubes engage the soil surface. Due to the mounting angle of the flat bars and in conjunction with the baskets helix when changed from end to end the baskets contact point with the soil surface changes from one of leveling and firming the surface to lifting and fluffing the top (while still performing the leveling function). All baskets can be run either way or (in the case of dueled baskets) some producers choose to run the lead basket leveling and fluffing with the back basket reversed to firm and leave a level final job. This configuration actually throws loose soil into the second basket giving it more fine soil to finish and firm.



Reversing the baskets is as simple as unbolting the complete basket assembly from the mounts (U-bolts clearly seen in left hand picture mounting basket assembly to pivot assembly on attaching arm), turning the basket end for end and re-mounting with the U-bolts.

As the Penta 500 Harrow Finisher rides on the rear basket assembly it is important to insure the basket mounting arms are all set to the correct (and similar) mounting positions for desired weight bias (front to back) and working depth. These adjustments are a simple matter of setting the limiting bolts in the correct settings (pictured).



5. Extendable Tongue

All Penta 500 Harrow Finishers are equipped with a telescopic adjustable drawbar assembly. This allows for ease of hook up when coupling to other machines as well as adaptability to adjust tow behind distance; permitting the operator to adjust for much more towing clearance when hooking behind other primary tillage components or much closer trailed distances when coupled up directly to the tractor.

This feature permits the operator to adjust the machine for optimum weight transfer, inter machine clearances, overall physical length for maneuverability and minimum storage space requirements.



5. Speed of Operation

The balance of correct tine pressure (the resistance of the tine to the surface it is working) and working speed are keys in the final job accomplished by the Penta 500 Harrow Finisher. Active vibration and movement of the spring tines determines the amount of soil fracture and tillage. Several “rules of thumb”:

- Higher working speeds increase tine action and result in better soil fracture and residue mixing.
- If working to lower field speeds decreasing pressure on the tines result in better tine action (angling tines back or transferring weight bias to the back)
- Increasing tine angles will tend to gather and bunch more residues in the harrow section; allowing the vibration of the tines in conjunction with the drag on the ground to break up and size residue better; higher speeds also aid this.
- Decrease in tine angles feather out and distribute trash and residue much more evenly.
- A speed variance of only 2 miles an hour can drastically alter the finish or tillage job being accomplished; in most cases too slow is far worse than too fast.
- Optimal working speed is often dictated by soil type or condition; not the machines settings. The same machine setting may result in similar jobs in loam at lower field speeds than required for clay (more speed and vibration required for the tighter soil structure of the clay based soil)... operator experience and a bit of experimentation are needed to maximize results.

Section 4- Recommended Maintenance

Periodic maintenance can extend the life of your Penta tillage machine as well as preventing expensive lost time during busy periods due to break downs. Tillage equipment tends to be very durable and somewhat simple in design but a few basic steps can go a long way in preventing time consuming repairs.

The following simple practices and procedures should be adopted and followed on a regular basis to insure a full season of trouble free operation:

Grease Points:

Please refer to the enclosed schematic (at the back of this manual) for location of greasing points on your particular machine. These points should be greased regularly (at the start or finish of the day). Grease serves as lubricant as well as forcing any foreign matter or particulate away from the wear point which can cause abrasion and wear. Of equal importance is its function as a water or moisture barrier preventing possibility of premature corrosion or rust.

Any grease nipples which do not take grease should be replaced immediately to allow proper penetration. Rotation of the component during greasing will assure fresh grease is spread throughout the lubricated area.

Tires and Wheels:

-Visually inspect tires on a regular basis for any cuts, loss of pressure, wear or checking. Remember, the tires and wheels are a key component of controlling machine leveling and stability during road transport.

Inspect all wheel lug nuts for tightness and re-torque regularly.

WARNING:

TIRE & WHEEL SERVICING CAN BE DANGEROUS!

MOUNTING/ DISMOUNTING MUST BE DONE BY TRAINED PERSONNEL ONLY!

Hydraulics:

Visually inspect all hydraulic lines and connections for possible leakage, wear or abrasion. Insure that all lines are firmly affixed to their mounts and securely held in place. Any signs of oil staining or dust build up are very visible signs of connections working loose, fitting failure or minor leaks developing and should be remedied immediately.

Hydraulic cylinders should be inspected for any signs of corrosion or pitting on the shafts or leakage around piston seals.

Hinge or Pivot Points:

Inspect for corrosion, premature wear or stress cracking. It is recommended to remove pivot pins once a year and thoroughly coat with a lubricant then replace. This practice can extend the life of these wear points substantially.

Tines:

Check mounts and mounting bolts for tightness and any possible bending or stress cracks.

The tines are made of spring steel and are made to flex and vibrate as part of their action in the soil; however in severe conditions they may break or fracture. Visibly inspect for wear or stress cracks developing and replace any showing initial signs of breakage.

Tine Wear:

These replaceable wear points determine the stirring or “action” of your Harrow Finisher in the soil and have many different wear characteristics dependent on soil type, use and configuration. Visually inspect to determine state of wear and possible breakage. Often the resulting soil finish or the job they are doing will determine if replacement is warranted. Inspect mounting bolts for tightness or potential breakage or loss.

MAINTENANCE SAFETY

Remember.....always safety first!!

-Be aware of others around you.

-Perform all maintenance with the tractor turned off, parking brake applied and the hydraulics in the “neutral” or float position.

-Never trust hydraulics to hold things in position.

-Never work under anything unless securely mechanically locked or blocked in position with stands or solid blocks.

-Take your time; slow deliberate action assures thoroughness as well as safety.

Section 5- Service or Repair Tips

Hydraulic Lift Cylinder Removal

1. With wings down lower the Harrow Finisher to a resting position so all of the weight is on the basket assemblies.
2. Position the lift circuit control (tractor control lever) in neutral or float position (de-pressurizing the hydraulic system). Turn tractor off.
3. In neutral or float there should be no pressure on the wheel lift cylinders! Attaching pins on either end of the lift cylinders should turn freely with no load on them.
4. Remove locking clips and attaching pins; freeing cylinder from harrow finisher.
5. Loosen hydraulic line fittings at the cylinder then disconnect.

IMPORTANT: Always loosen or “crack open” hydraulic fittings slowly and with caution to insure no latent pressure is in the system. Once it is ascertained it is at zero pressure then it can be safely disconnected and the lines removed from the cylinder. Always cover open hydraulic connections with caps or a clean rag to prevent entry of contaminants to the hydraulic system.



Note:

*It may be necessary to cycle the lift mechanism several times to re-charge the lines and cylinder with oil after replacement. It is always a good practice to recheck frame leveling after this procedure.

Hydraulic Wing Lift Cylinder Removal

1. Place Harrow Finisher in lowered position with wings down; everything resting on the ground.
2. Place hydraulic controls on tractor in float position (zero or neutral hydraulic pressure supplied). Shut tractor off.
3. Extend or retract wing lift cylinder so upper connecting pin is in the center or neutral position in the mounting slot.
4. Shake or move cylinder to determine and confirm it is bearing no weight.
5. Loosen hydraulic line fittings at the cylinder then disconnect.
IMPORTANT: Always loosen or “crack open” hydraulic fittings slowly and with caution to insure no latent pressure is in the system. Once it is ascertained it is at zero pressure then it can be safely disconnected from the cylinder.



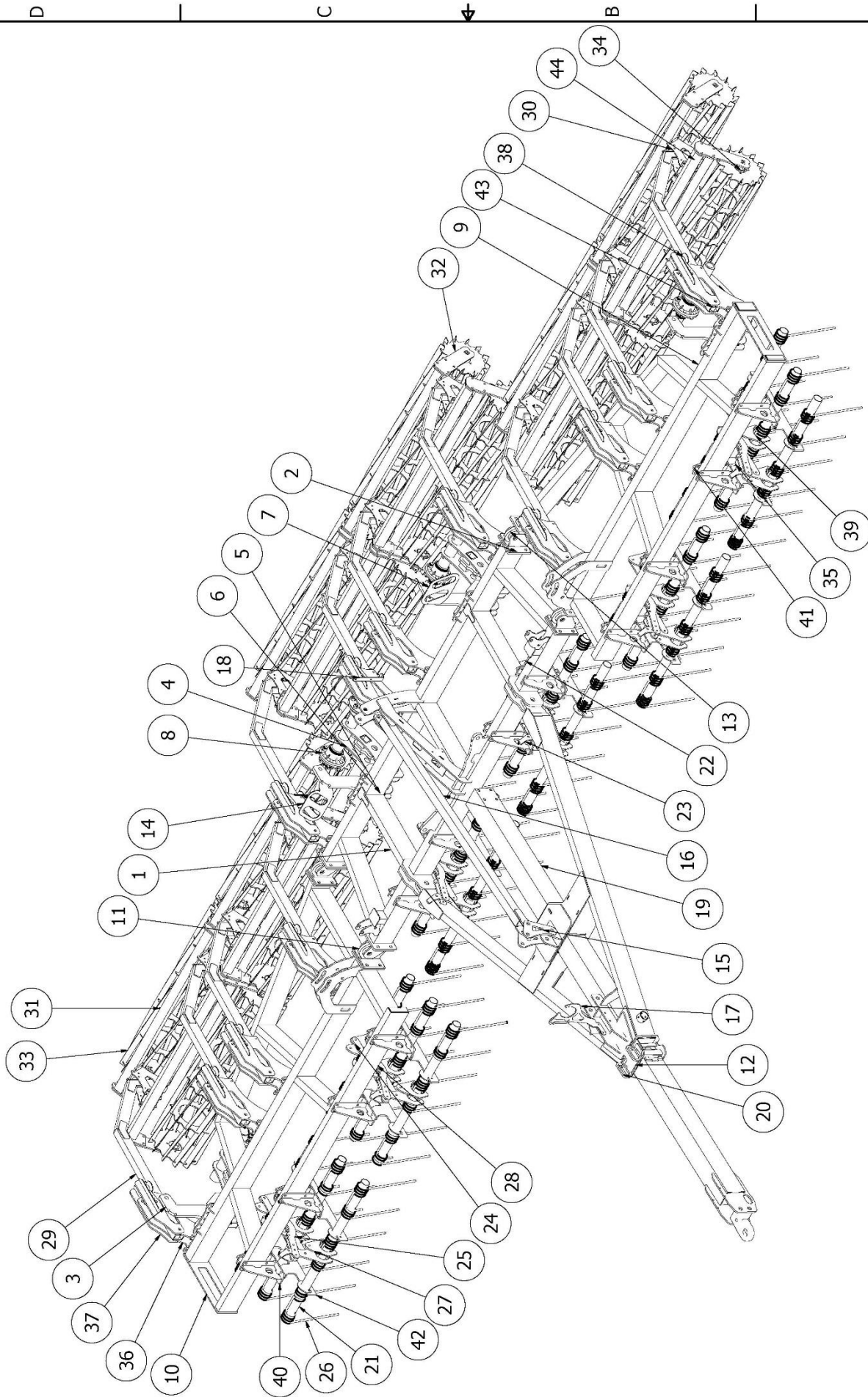
Always cover open hydraulic connections with caps or a clean rag to prevent entry of contaminants to the hydraulic system.

6. Remove lower cylinder attaching bolt or pin.
7. Remove upper cylinder attaching bolt or pin.
8. Remove cylinder.
9. To re-install reverse the above procedure.

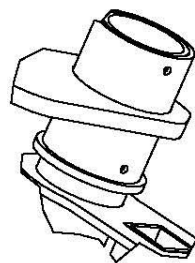
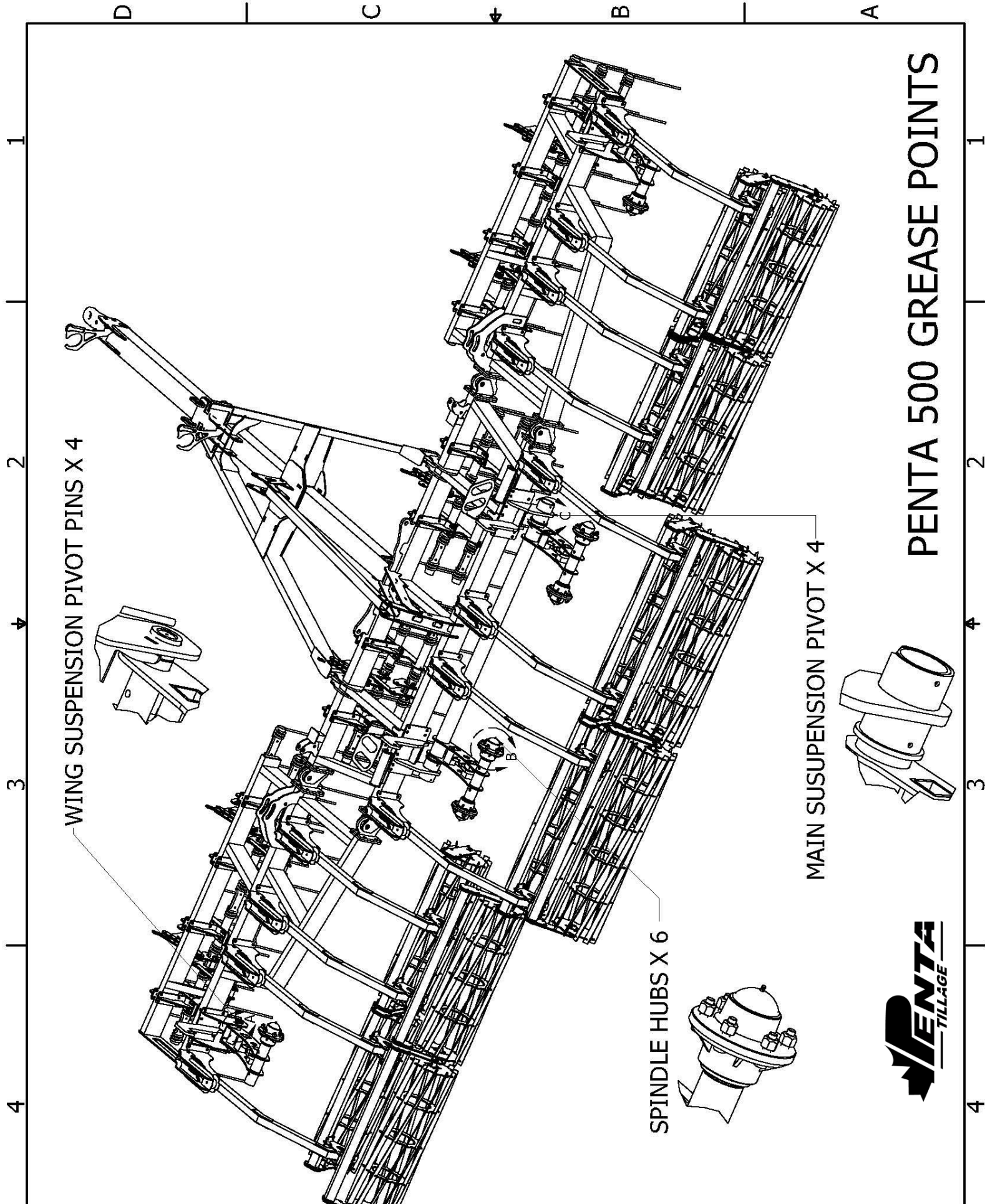
Note:

*You may have to cycle the wing lift system several times after this procedure to re-charge and replace line or cylinder oil lost during this procedure

Section 6- Machine Schematics
&
Part Breakouts



4		3		2		1	
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		PARTS LIST					
ITEM	QTY	PART NUMBER	DESCRIPTION				
1	1	320077	MAIN FRAME STANDARD TUBING				
2	4	320069	HINGE, MAIN				
3	4	320057	MAIN DOWNARM MOUNT				
4	4	320056	WING DOWNARM				
D 5	2	222001	MAIN DOWNARM PIN				
6	4	DIN 71412 - AM10 x 1 coned short	Lubricating Nipple, coned Type A				
7	1	121011	LIGHT MOUNT				
8	6	321003	6000LBS ASSEMBLY, 500 SERIES				
9	1	320078	114" Right Hand Wing				
10	1	320079	114" Left Hand Wing				
11	2	320067	HINGE, WING				
12	1	322012	TONGUE, STANDARD				
13	2	320068	HINGE, WING REAR				
14	1	121011, RIGHT	LIGHT MOUNT				
15	2	123090	TONGUE ADJUSTER BAR				
16	1	320072	TOP ADJUSTER BAR				
17	1	122043	TONUGE HOSE MOUNT				
18	1	122041	YIELD SIGN HANGER				
19	1	320074	HITCH, STANDARD				
C 20	2	124021	TONGUE LOCK				
21	18	224019	Finger Hanger Tube, 2.5OD x .188 x 60				
22	4	320189	FINGER TINE ANGLE HOLDER, LEFT				
23	4	320192	FINGER TINE ANGLE HOLDER ASSEMBLY, LEFT				
24	12	123064	FINGER ADJUSTMENT LINKAGE				
25	12	123238	FINGER TINE ANGLE ADJUSTMENT				
26	54	423031	Finger Harrow, Chrome Carbide Tipped				
27	2	320191	FINGER TINE ANGLE HOLDER ASSEMBLY, RIGHT				
28	108	224387	.4375" ID, .75"OD, .8125" LONG				
→ 29	12	320194	DOUBLE BASKET ARM				
30	12	320195	DOUBLE BASKET PIVOT				
31	12	320196	5' SPREADER BAR, 14" BASKET				
32	24	320197	14" SIDE MOUNT				
33	12	320064	ROLLING BASKET, 5'				
34	24	122044	BEARING WASHER				
35	36	122021	FINGER U PLATE				
36	12	320343	BASKET MOUNT				
B 37	12	320344	RUBBER SHOCK MOUNT				
38	12	423012	TIMBREN A180				
39	8	320370	FINGER TINE ANGLE HOLDER ASSEMBLY, RIGHT				
40	12	320368	FINGER TINE MOUNT, FRONT				
41	12	320369	FINGER TINE MOUNT, REAR				
42	12	123369	SOIL FINISHER FINGER TUBE HANGER				
43	12	220123	1.119OD, 0.75ID X 2.0625" LONG				
44	12	220125	1.369OD X 1.00ID X 2.0625" LONG				



PENTA 500 GREASE POINTS

