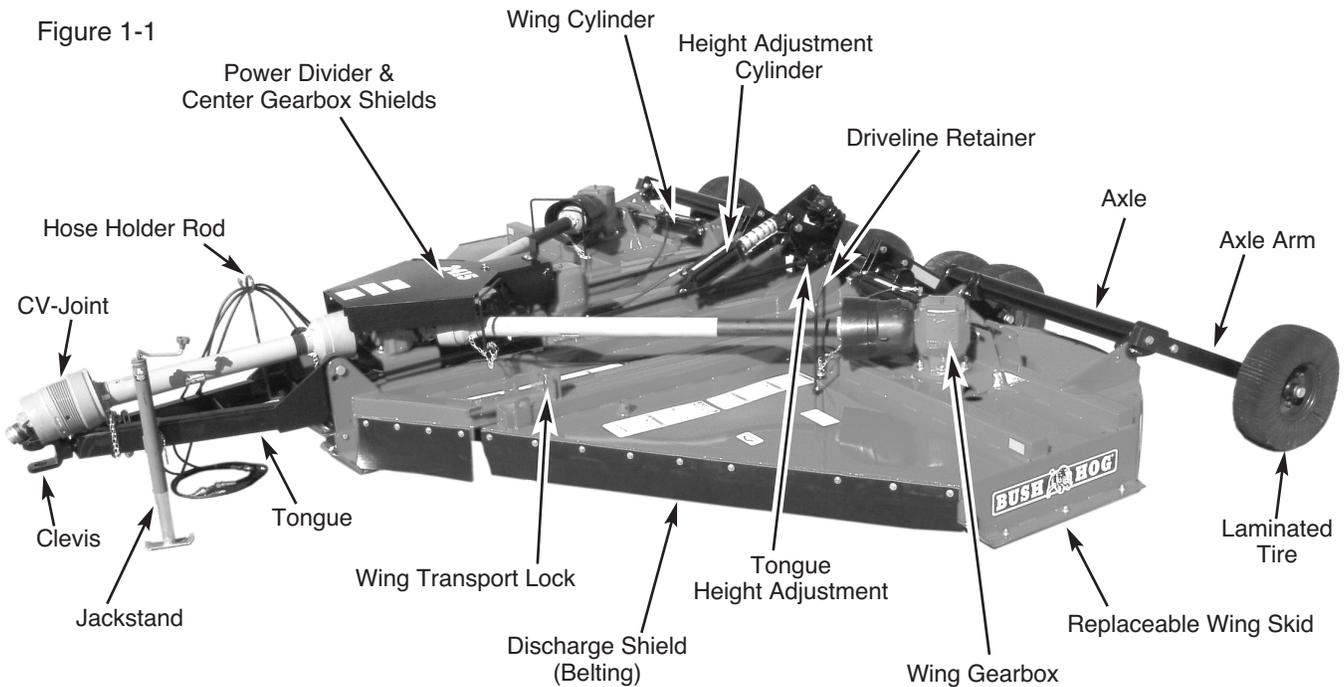


SECTION I INTRODUCTION AND DESCRIPTION

Figure 1-1



1-1 INTRODUCTION

We are pleased to have you as a Bush Hog customer. Your Model 2415 Flex Wing Rotary Cutter has been carefully designed to give maximum service with minimum down time. This manual is provided to give you the necessary operating and maintenance instructions for keeping your rotary cutter in top operating condition. Please read this manual thoroughly. Understand what each control is for and how to use it. Observe all safety precautions decaed on the machine and noted throughout the manual for safe operation of implement. If any assistance or additional information is needed, contact your authorized Bush Hog dealer.

NOTE

All references made in this manual to right, left, front, rear, top or bottom is as viewed facing the direction of forward travel with implement properly attached to tractor.

1-2 DESCRIPTION

The Model 2415 Rotary Cutter (Figure 1-1) consists of a center unit with two variable position wings together having a cutting width of 15 feet (4.5m). Wing operating angles and machine cutting height are independently controlled using hydraulic cylinders. A self-leveling linkage maintains a level cutter at all cutting heights. Power from the tractor PTO is split at the center gearbox and supplied to each of the blade gearboxes. Each blade gearbox has two

free-swinging uplift blades designed for light mowing. Free-swinging blades reduce the shock of impact when a stationary object is hit. Slip clutches are installed on each gearbox for additional protection. Front and rear center discharge shields are included as standard equipment. **(Note: Dealer or purchaser may elect to delete the front shields at their option.)** Machine specifications are given in Table 1-1.

TABLE 1-1 SPECIFICATIONS

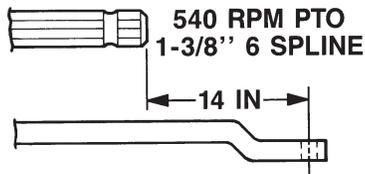
Length	.....183 in.
Transport Width @ Tire in Transport	.....114 in.
Transport Height	......81 in.
Working Width	.....186 in. (472.4 cm)
Cutting Height	......2-14 in. (5.1 - 35.6 cm)
Cutting Capacity	.....Through 2 in. diameter Varies according to cutting conditions
Blades	.....1/2 x 4 in. (12.7 x 101.6 mm) uplift
Blade Overlap	......6 in. (15.2 cm)
Blade Tip Speed	.....15,268 rpm @ 540 PTO rpm
Gearbox Horsepower	..... Power Divider - 160 hp Center & Wing Gearbox - 80 hp
Minimum Required Tractor Horsepower	......50 hp
Maximum Tractor Horsepower	.....100 hp
Working Angles w/Driveline Engagement	... .90° up to 22° down
Wing Angles	......90° up to 22° down
Hitch	.....Clevis type standard

SECTION II PREPARATION FOR USE

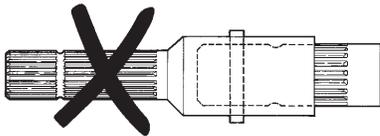
2-1 ATTACHING TO TRACTOR

A. **IMPORTANT** - Adjust tractor drawbar length to dimension shown in Figure 2-1. Incorrect drawbar length will change angle of driveline causing possible damage to driveline. Do not use PTO adaptors. Use of PTO adaptors will invalidate your warranty. See tractor operator's manual for drawbar adjustment procedures.

Figure 2-1



IMPORTANT
PTO ADAPTORS SHOULD NOT BE USED WITH ANY BUSH HOG EQUIPMENT. FAILURE TO FOLLOW THESE INSTRUCTIONS WILL CAUSE DRIVELINE FAILURE AND POSSIBLE TRACTOR DAMAGE.



B. Raise cutter using jackstand until tongue is at drawbar height.

C. Connect cutter to tractor using 1-inch (25.4mm) diameter approved pin with linch pin retainer or equivalent.

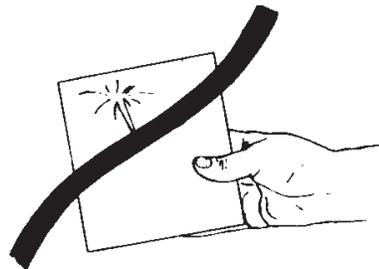
D. **If connecting cutter hydraulic lines directly to tractor, wing hydraulic lines must be connected to tractor outlets that permit flotation of wings.**

E. If optional Bush Hog valve is used, mount hydraulic lines as shown in Figure 5-14b. If optional valve mounting bracket is used with valve, attach to tractor as described in paragraph 2-2.

F. Connect hydraulic lines to tractor auxiliary outlets(s).

WARNING

USE A PIECE OF CARDBOARD OR WOOD RATHER THAN HANDS AND WEAR EYE PROTECTION WHEN SEARCHING FOR HYDRAULIC LEAKS. ESCAPING HYDRAULIC OIL UNDER PRESSURE CAN PENETRATE SKIN. IF OIL IS INJECTED INTO SKIN, IT MUST BE SURGICALLY REMOVED WITHIN A FEW HOURS BY A DOCTOR OR GANGRENE MAY RESULT.



G. Unpin wing lift cylinders at rod end. Fully extend cylinders by pulling on clevis. Retract cylinders using hydraulic valve. This removes most of the air from cylinder. Repin cylinders.

H. Attach driveline to tractor. Pull on driveline section to be sure yokes lock into place. Make certain driveline shielding is in place and in good condition.

I. Attach driveline shield chains from both ends of driveline shielding to stationary location. **NOTE: The shield around the constant velocity joint should not be chained in place.**

J. Remove jackstand and pin in storage position on deck.

2-2 OPTIONAL VALVE MOUNTING BRACKET INSTALLATION (Figure 2-2)

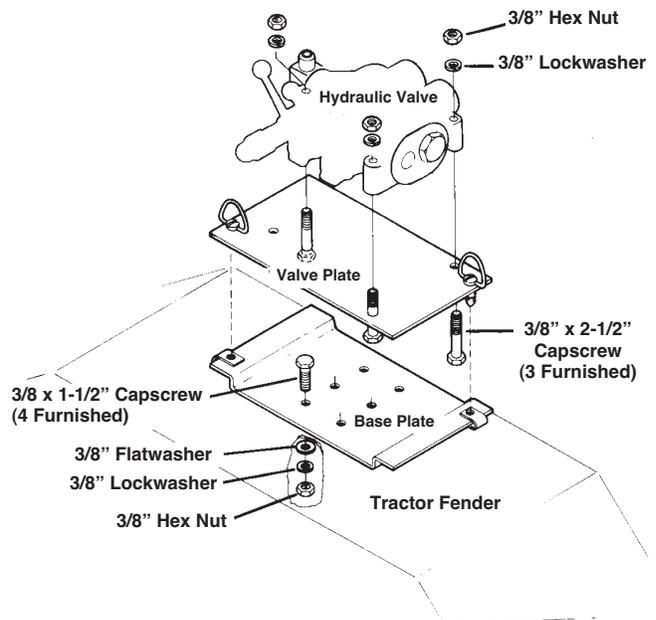
A. Place bottom bracket at desired mounting location. Mark 2-4 holes (as needed) for drilling using bracket as pattern. Drill holes using 13/32 drill bit.

B. Mount lower bracket using four 3/8 x 1-1/2" bolts, nuts, flatwashers and lockwashers.

C. Attach valve to top bracket using three 3/8" x 2-1/2" bolts, nuts and lockwashers.

D. Mount top bracket to bottom bracket using quarter turn fasteners. Insert quarter turn fastener into clip-on receptacle and turn 90 degrees.

Figure 2-2 Valve Bracket Installation



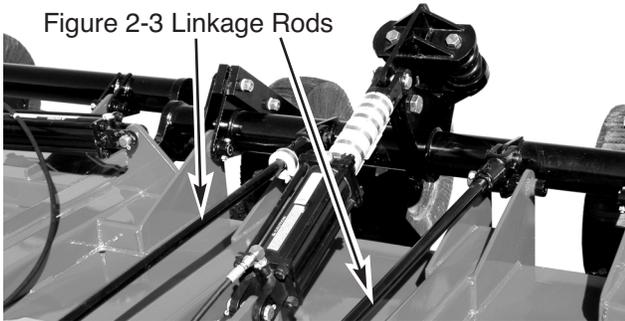
IMPORTANT

FAILURE TO MATCH VALVE TO TRACTOR HYDRAULIC SYSTEM BY USING INCORRECT PLUG WILL CAUSE DAMAGE TO TRACTOR.

2-3 PITCH ADJUSTMENT

The pitch of the cutter (front to rear) is controlled by adjusting the linkage rods (Figure 2-3). **Shortening the linkage rod assemblies will raise the front of the cutter. Lengthening the linkage rod assemblies will lower the front of the cutter.** The pitch adjustment is primarily for compensating for the different height of tractor drawbar. As described in the following, it can also be used to alter the cutting performance. Note that operating the cutter at any pitch other than parallel to the ground will produce a slightly uneven cut.

Figure 2-3 Linkage Rods



Additional mulching of cut material may be attained by operating with the rear of the cutter slightly lower than the front. This will keep the foliage underneath cutter longer, resulting in smaller pieces of cut material. This will increase the cutter horsepower requirements.

If you are cutting in dense material, operating cutter with the rear slightly higher than the front will allow an increased volume of cut material to exit from underneath cutter. This will decrease the cutter horsepower requirements.

WARNING

TO AVOID SERIOUS INJURY OR DEATH: OPERATING CUTTER WITH REAR LOWERED EXCESSIVELY WILL RESULT IN AN UNEVEN CUT AND COULD CAUSE RAPID BLADE, SKID AND DRIVELINE WEAR AND POSSIBLY CAUSE STRUCTURAL FAILURES IN THE WING HINGE AREA.

Adjust the pitch as follows:

WARNING

TO AVOID SERIOUS INJURY OR DEATH: DO NOT PLACE HANDS, FEET OR OTHER PARTS OF THE BODY UNDER CUTTER WHILE MAKING ADJUSTMENTS. NEVER MAKE ADJUSTMENTS WITH CUTTER OPERATING.

IMPORTANT

NEVER ADJUST THE LEVELING ROD SO THAT THE THREADED END OF ANY ROD IS NOT FULLY ENGAGED IN THE TURNBUCKLE.

A. Loosen jam nut on each linkage rod assembly (Figure 2-3).

B. Rotate the rod to lengthen or shorten the leveling rod assemblies. Shortening the rods will raise the front of the cutter and lengthening rods will lower the front of the cutter. While adjusting, alternate from one rod to the other.

C. When the desired pitch is attained, make a final adjustment of the rods so that each will be under the same amount of tension. This may be done by tapping the rods and “tuning” them to the same sound.

D. Re-tighten jam nut.

NOTE

If the cutter is allowed to rest on the ground in order to relieve tension on the rods, the tongue must be disconnected from the tractor to allow it to move.

2-4 WING ADJUSTMENT

Wings should be adjusted before use if they are not level (parallel) left to right with center deck section. Adjust as follows:

A. Lower cutter until skids on center section are approximately 1-2 inches (25-51mm) off ground.

B. Remove wing transport lock pin(s) and place in pin storage hole. (Figure 2-4)

Figure 2-4 Wing Transport Lock Pin Stored For Work

Transport Location



WARNING

TO AVOID SERIOUS INJURY OR DEATH: STAND CLEAR OF WING(S) DURING AND AFTER REMOVAL OF TRANSPORT LOCK PIN(S). AIR IN HYDRAULIC COMPONENTS MAY ALLOW WING(S) TO FALL. DO NOT “DRIVE-OUT” PIN IF IT IS TIGHT AGAINST WING LUG. TO REMOVE PIN, RETRACT WING LIFT CYLINDER TO RELIEVE LOAD ON PIN.

C. Lower wing(s) to ground allowing weight to rest on wheel(s).

D. If wing(s) are not level (parallel to center section, disconnect one end of the wing adjustment linkage (Figure 2-5) and **adjust shorter to raise the wing outside edge and longer to lower the wing outside edge**. It may be necessary to use wing lift cylinder to relieve pressure from the linkage retaining pin.

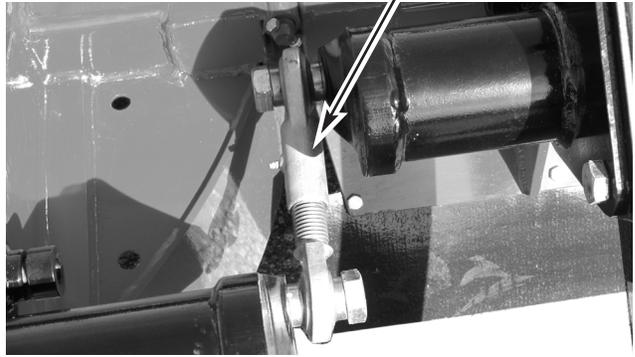
E. Reconnect linkage.

NOTE

Prior to engaging PTO drive, all gearboxes should have the proper level of gear oil and all lubrication points should be serviced according to the "Maintenance Section."

Figure 2-5

Adjustable Link



SECTION III OPERATING INSTRUCTIONS

3-1 GENERAL SAFETY

Only qualified people should operate this machine. Operator should wear hard hat, safety glasses and safety shoes. Use a Rollover Protective Structure (ROPS) and a seat belt equipped tractor. be used. Before beginning operation, clear work area of objects that may be picked up and thrown. Check for ditches, stumps, holes or other obstacles that could upset tractor or damage cutter. Always turn off tractor engine, set parking brake, and allow cutter blades to come to a complete stop before dismounting tractor.

3-2 TRANSPORTING

When implement is transported on road or highway, day or night, use tractor flashing warning lights unless prohibited by law. A slow moving vehicle (SMV) sign must be visible from the rear by approaching vehicles. A bracket for SMV sign is provided on the center section shield. **Do not exceed 15 mph (24 kph) when traveling.** Prepare machine for transporting as follows:

A. Disengage tractor PTO.

B. Raise cutter and install stop collars on height adjustment cylinder. (Figure 2-3)

C. Raise wing(s) and insert transport lock pin(s).

3-3 OPERATION

A. Perform BEFORE EACH USE maintenance listed in paragraph 4-1.

B. Make certain jackstand is stored for work.

C. Start tractor. Raise cutter and remove stop collars. Remove wing transport lock pins and place in storage hole (Figure 2-4). Lower wings to working position. Raise/lower cutter to working height. The cutter should be operated at the highest position that will give desired cutting results. This will help prevent the blades from striking the ground, reducing blade wear and undue strain on the whole machine. Continuous ground and blade contact could force blades into deck area.

D. Install stop collars on axle cylinder at desired cutting height. Store remaining stop collars (if any)

around self-leveling linkage rod.

E. With tractor at idle speed, engage PTO drive.

IMPORTANT

DURING OPERATION THE HYDRAULIC VALVE WING LEVERS MUST BE LOCKED IN THE FLOAT POSITION TO AVOID DAMAGE TO THE CYLINDERS AND AXLES.

WARNING

TO AVOID SERIOUS INJURY OR DEATH: KEEP CLEAR OF MACHINE WHEN RAISING OR LOWERING WINGS. DO NOT "DRIVE-OUT" TRANSPORT LOCK PIN IF IT IS TIGHT AGAINST WING LUG. TO REMOVE PIN, RETRACT WING LIFT CYLINDER TO RELIEVE LOAD ON PIN.

DANGER

STAY CLEAR OF ROTATING DRIVE-LINES. DO NOT OPERATE WITHOUT DRIVELINE SHIELDS IN PLACE AND IN GOOD CONDITION. FAILURE TO HEED THESE WARNINGS MAY RESULT IN PERSONAL INJURY OR DEATH.

DANGER

ROTARY CUTTER BLADES. STAND WELL CLEAR UNTIL ALL MOTION HAS STOPPED. TO AVOID AN ACCIDENTAL FALL FROM TRACTOR AND POSSIBLE INJURY BY MOWER, USE A ROPS AND SEATBELT EQUIPPED TRACTOR FOR ALL MOWING OPERATIONS.

F. Place tractor in gear and proceed forward. Advance tractor throttle to correct PTO speed for implement (540 RPM). Tractor forward speed should be controlled by gear selection, not engine speed. **For maximum cutting efficiency, forward speed should allow cutter to maintain a constant, maximum blade speed.** Failure to maintain proper blade RPM will result in poor cutting performance and excessive blade and blade bolt wear. If PTO drive is disengaged due to cutter stalling or tractor engine bogging, cutter must be raised to maximum cutting height and tractor throttle reduced to idle before re-engaging. When in areas with tall, dense material, the front skids may push material over and hold it down long enough to prevent blades from cutting it. This will be evidenced by streaking in the skid area. **To alleviate this problem, remove the front skids.**

IMPORTANT
DURING OPERATION, STOP AT REGULAR INTERVALS AND CLEAN ACCUMULATED DEBRIS FROM THE TOP OF CUTTER DECK, ESPECIALLY AROUND DRIVELINES AND GEARBOXES. THIS WILL HELP PREVENT MATERIAL FROM CATCHING FIRE.

 **WARNING**

ALL ROTARY CUTTERS HAVE THE ABILITY TO DISCHARGE OBJECTS AT HIGH SPEEDS WHICH COULD RESULT IN SERIOUS INJURY TO BYSTANDERS OR PASSERS-BY.

THEREFORE, THIS CUTTER IS NOT TO BE OPERATED ALONG HIGHWAYS OR IN ANY AREA WHERE PEOPLE MAY BE PRESENT UNLESS ALL SIDES OF THE UNIT ARE ENCLOSED BY PERMANENT BANDS, SAFETY CHAINS, OR OTHER FACTORY APPROVED SAFETY SHIELDS THAT ARE IN GOOD REPAIR.

SECTION IV MAINTENANCE

4-1 MAINTENANCE CHECK LIST

Perform scheduled maintenance as outlined below. Lower machine to ground, turn off tractor and set parking brake before doing maintenance, inspections, or work. Some checks may require raising machine off ground and supporting with blocks. All bolts should be torqued as recommended in Torque Chart unless otherwise indicated.

 **WARNING**

THE CUTTER CAN FALL FROM HYDRAULIC SYSTEM FAILURE . TO AVOID SERIOUS INJURY OR DEATH, SECURELY SUPPORT CUTTER BEFORE WORKING UNDERNEATH.

BEFORE EACH USE

1. Make certain driveline shields are in place and in good repair to minimize entanglement injuries to persons by rotating drivelines. **Driveline shields should be chained for non-rotation.**
2. Make certain deflector shields (chains, bands, etc.) are in good repair to minimize injuries to person by the discharge of high speed thrown objects.
3. Inspect blades for wear. Replace if necessary per paragraph 4-3. **Always replace both blades on spindle with two blades equal in weight. Use only genuine Bush Hog replacement blades.**
4. **Check blade bolts for tightness. Tighten to 450 ft./lbs.**
5. Check blades and spindles to be sure that no foreign objects such as wire or steel strapping bands are wrapped around them.
6. Inspect hydraulic lines and fittings for wear or leaks. Repair or replace if needed.

 **WARNING**

USE A PIECE OF CARDBOARD OR WOOD RATHER THAN HANDS AND WEAR EYE PROTECTION WHEN SEARCHING FOR HYDRAULIC LEAKS. ESCAPING HYDRAULIC OIL UNDER PRESSURE CAN PENETRATE THE SKIN. IF OIL IS INJECTED INTO THE SKIN, IT MUST BE SURGICALLY REMOVED WITHIN A FEW HOURS BY A DOCTOR OR GANGRENE MAY RESULT.

7. Inspect wheel(s) for wear, damage or foreign objects. Repair or replace if necessary.
8. Check tractor tire air pressure. Refer to tractor operator's manual.
9. Perform BEFORE EACH USE lubrication per paragraph 4-2.
10. During operation, listen for abnormal sounds which might indicate loose parts, damaged bearings or other damage.
11. **Check tapered pin retaining each end of each driveline for tightness. Tighten nut to 30 ft./lbs. Use only genuine Bush Hog replacement parts.**

AFTER EACH USE

1. Clean all debris from machine and affixed safety decals. Replace any missing or illegible decals.
2. Inspect cutter for worn or damaged components. Repair or replace before next use. Any replacement components installed during repair shall include the components current safety decals specified by the manufacturer to be affixed to the component.
3. Store cutter in a dry place.

4-2 LUBRICATION (Figure 4-1)

NOTE

The multi-purpose grease referenced in this section is an NLGI Grade 2 type grease.

BEFORE EACH USE

1. Driveline Universal Joints - Apply 2-3 shots of multi-purpose grease with grease gun.
2. Driveline Guard - Apply 2-3 shots of multi-purpose grease with grease gun to plastic fitting.
3. Wing Driveline - Unfold cutter, rotate inner and outer shields until holes align. Apply multi-purpose grease to grease fitting accessible through exposed hole.
4. **Constant Velocity (CV) Joint - Position CV joint as straight as possible to be sure grease will penetrate to ball joint. Lubricate the central body with a minimum of 30 shots of grease every 8 hours. Lubricate telescoping members with 10 shots every 8 hours and clean telescoping members every 40 hours and completely coat with grease.**
5. Axle Pivots - Apply multi-purpose grease slowly with grease gun.

6. Gearboxes - Add EP80W-90 oil, if necessary, to bring oil level to check plug located on side of housing. Capacity of center and wing gearboxes is 3 quarts, 6 ozs. (3L). Capacity of power divider gearbox is 1 quart, 29 ozs. (1.8L).

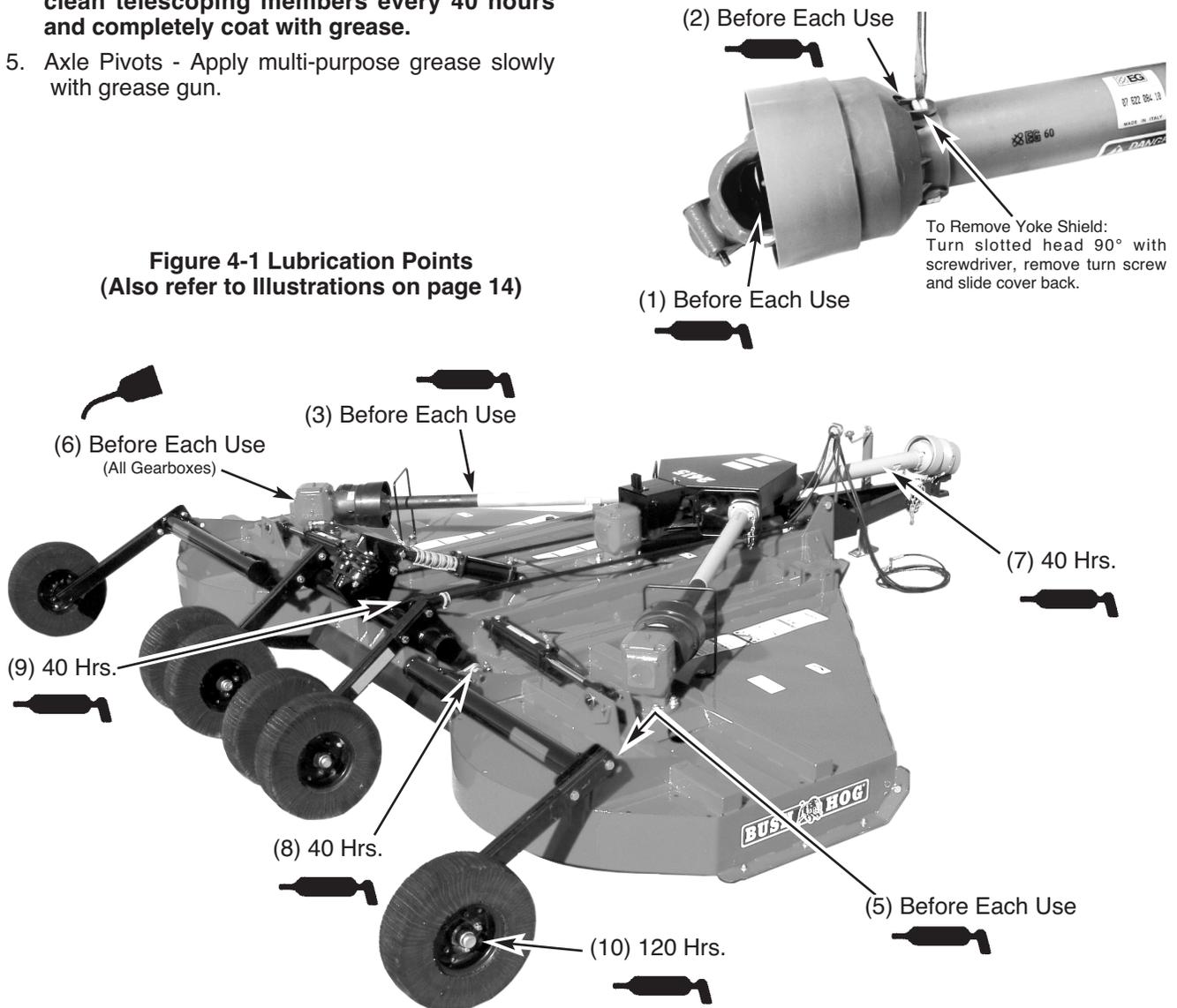
40 HOURS

7. Input Driveline - Disconnect driveline from tractor. Separate driveline. Clean telescoping members every 40 hours and completely coat with grease.
8. Wing Turnbuckles - Apply multi-purpose grease slowly with grease gun.
9. Leveling Rod Links - Apply multi-purpose grease slowly with grease gun.

120 HOURS

10. Wheel Bearings - Apply multi-purpose grease slowly with grease gun until grease relieves around seal.

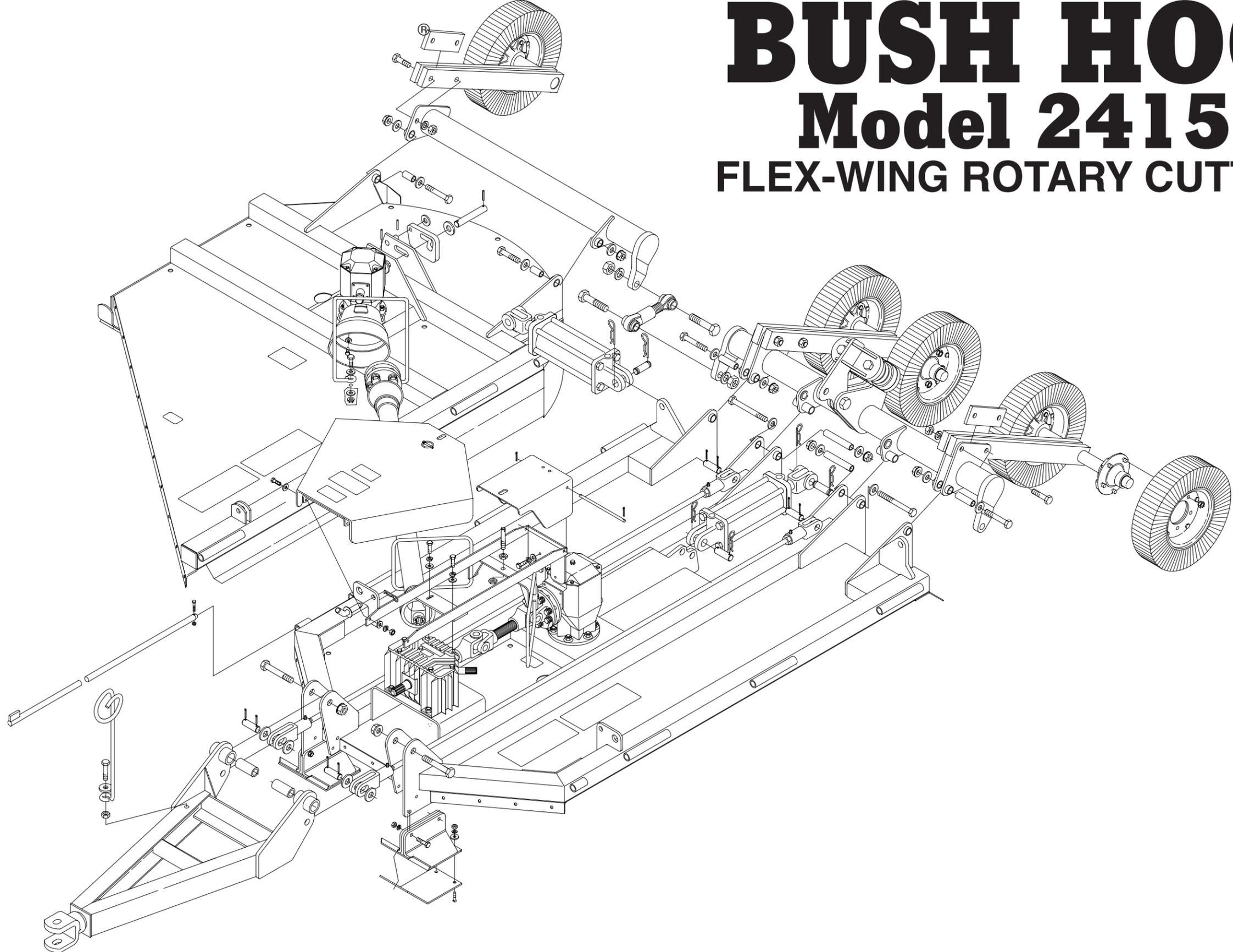
Figure 4-1 Lubrication Points
(Also refer to Illustrations on page 14)



BUSH HOG

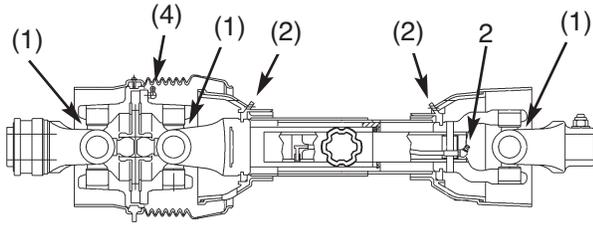
Model 2415

FLEX-WING ROTARY CUTTER

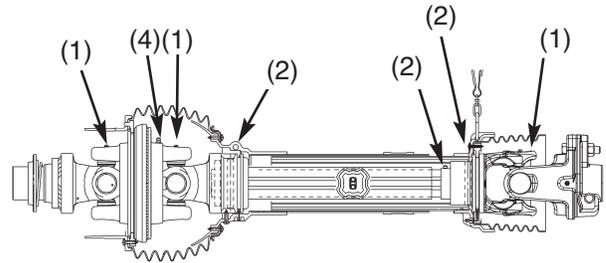


INPUT DRIVELINE LUBRICATION

COMER / EG



BONDIOLI & PAVESI



4-3 BLADE REPLACEMENT

It is not necessary to remove the complete blade holder assembly to replace the blades. Blade bolts are accessible through a hole in the top of the cutter deck. **Always replace both blades on a spindle using two blades having the same weight.** Use only genuine Bush Hog replacement blades.

A. Remove nuts from blade bolts. A blade nut socket (Part No. 6432) can be bought at your Bush Hog dealer and used with an adjustable wrench (not supplied) to remove blade nut. Blade nut can also be removed with a 1-11/16" socket.

B. Inspect blade bolt shoulder for wear. Replace if necessary.

C. Assemble new blades to blade holder using blade bolts, nuts and lockwashers. Refer to BLADE ROTATION DIAGRAM for blade placement. **Tighten nuts to 450 ft./lbs. Strike blade bolt head with heavy hammer to seat, then retighten.**

D. Check to be sure blades swing 360° freely. If blades will not swing freely, remove, locate problem, and repair. Operating cutter when blades will not swing freely will cause excessive vibration, damaging implement.

4-4 BLADE PAN REMOVAL

A. Blade pan can be removed by simply removing the blades and blade bolts. Note: Wear heavy gloves when handling blade pan due to possible sharp edges.

4-5 BLADE HOLDER ASSEMBLY REMOVAL AND INSTALLATION

A. Remove cotter pin and blade holder assembly retaining nut and washer. Retaining nut can be removed or tightened with a 1-13/16" socket.

B. Wearing heavy gloves, grasp blade holder and pull off shaft. If stuck, align blade bolt with access hole in top of cutter deck. Using hammer and a piece of pipe, strike blade bar. Repeat until blade holder comes off. Care should be taken not to damage blade bolt threads.

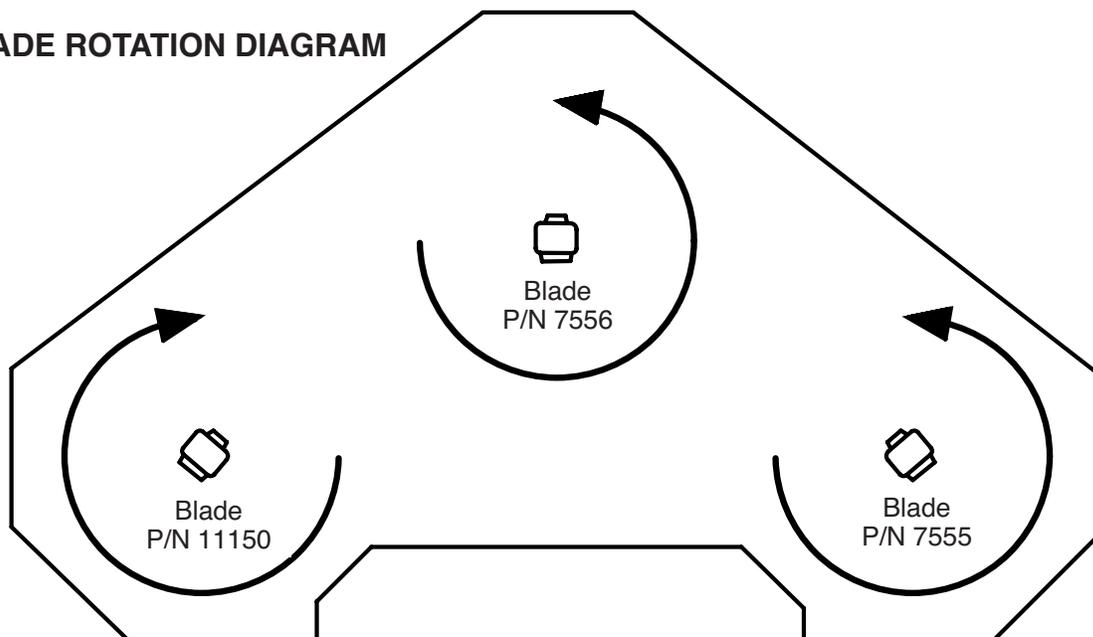
TO INSTALL:

A. Align the blade holder so the cotter pin hole is positioned 90 degrees to the blade bar (for ease of installing the cotter pin).

B. **Place blade holder assembly, washer, and retaining nut on lower shaft. Torque nut to 450 ft./lbs.**

C. Install cotter pin. It may be necessary to tighten nut slightly to install cotter pin.

BLADE ROTATION DIAGRAM



4-6 SLIP CLUTCH OPERATIONAL CHECK

After implement has been stored for 30 days or more, perform the following operational check:

- A. Loosen eight nuts retaining clutch springs 1/3 turn or until spring can be turned with fingers.
- B. With tractor at idle speed, engage tractor PTO drive for 2-3 seconds. Clutch should slip without turning blades. If clutch does not slip, contact your authorized Bush Hog dealer.
- C. Retighten nuts to within 1/64" of original position. Initial spring lengths are shown in Figure 4-2.

IMPORTANT

FAILURE TO RETIGHTEN SPRING NUTS TO ORIGINAL POSITION MAY CAUSE DAMAGE TO IMPLEMENT AND/OR TRACTOR DUE TO IMPROPER SLIP CLUTCH TORQUE SETTING.

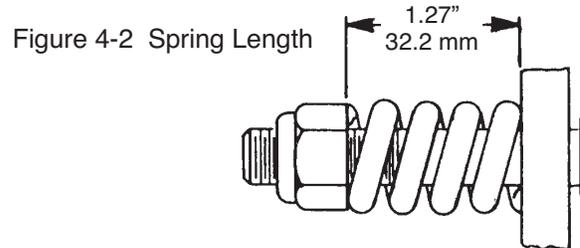
4-7 SLIP CLUTCH ADJUSTMENT

The slip clutch is factory preset to the correct torque for protecting implement and tractor. **Periodic adjustment is recommend**; refer to section 4-6. Should adjustment be needed, first check to be sure all spring lengths are the same. Initial spring lengths are shown in Figure 4-2. If necessary, adjust nut on

any spring that is unequal. Adjust all eight spring retaining nuts 1/3 of a turn (2 flats on a nut) and check clutch slippage. If further adjustment is necessary, do so in 1/3 turn increments. Adjust only to provide sufficient torque to prevent slippage under normal conditions. Occasional slippage is normal for drivetrain protection. If satisfactory results cannot be obtained consult your Bush Hog dealer.

IMPORTANT

DO NOT OVER-TIGHTEN NUT AND CAUSE SPRING TO BECOME SOLID AS THIS WILL CAUSE SHAFT TO FAIL.



4-8 TROUBLESHOOTING

Troubleshooting procedures are listed in Table 4-1. If the problem cannot be solved or replacement parts are necessary, contact your authorized Bush Hog dealer. Please have ready your machine name, model number, serial number, purchase date and exact cause or description of problem.

TABLE 4-1 GENERAL TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Uneven cut	Cutter not level side to side or front to rear. Worn or bent blades.	Refer to Section II. Replace blades per paragraph 4-3.
Streaking or Windrowing.	Possible build-up of material under cutter. Cutter not level. Worn blades. Cutter not being operated at RPM speed. Front skids holding tall material down.	Clean cutter. Refer to SECTION II. Replace per paragraph 4-3. Set tractor throttle for proper PTO speed during operation. Remove front skids.
Noisy cutter.	Loose components. Low oil in gearboxes.	Check all bolts for tightness. Check for proper oil level. Refer to paragraph 4-2.
Rapid blade wear. (cutting edge)	Blade contacting the ground.	Adjust cutter to operate at a height that will eliminate ground contact.
Rapid blade wear. (bolt hole)	Cutter not being operated at rated RPM speed.	Set tractor throttle for proper PTO speed during operation.
Cutter vibration.	Cutter not being operated at rated RPM speed. Blades on same spindle have unequal wgt.	Set tractor throttle for proper PTO speed during operation. Replace blades with matched set.
Wings will not raise.	Valve plumbed wrong.	Plumb as shown in Figure 5-12. Reverse hoses to tractor auxiliary hydraulics outlets.
Shields failing.	Excess debris accumulation. No grease. Not chained.	Clean debris from cutter. Lubricate shields per para. 4-2. Fasten shield chain to stationary location.