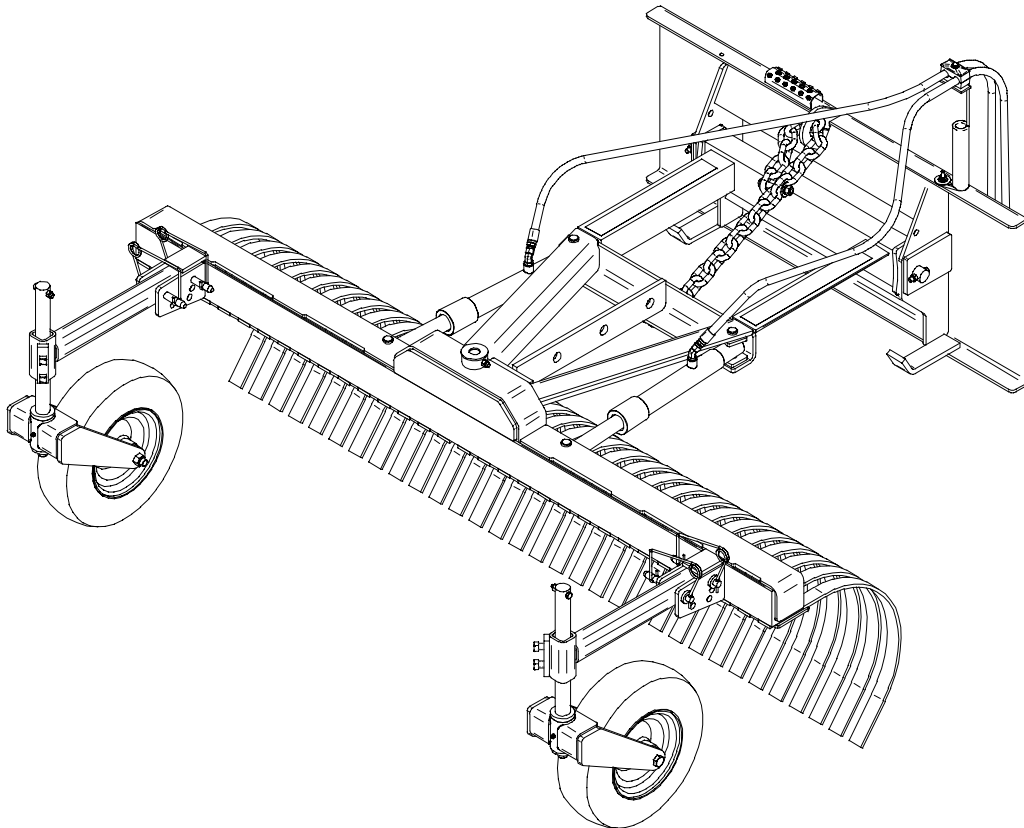




GRADER RAKE



PALADIN LIGHT CONSTRUCTION



FFC SERIAL NUMBER: _____

MACHINE SERIAL NUMBER: _____

Manual Number: MR25551

Models Covered:

660 (LAF6682, LAF6692, LAF6697, LAF6602)

670 (LAF6696, LAF6608, LAF6618)

Release Date: October 5, 2005

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INTRODUCTION

Congratulations on your purchase of a new **FFC Attachments Grader Rake**. This product has been designed and built to grade, level, and crown gravel or dirt. Your Grader Rake can also be used to rake debris, move snow, and scrape ice. You or any other person who will be assembling, operating, maintaining, or working with this product are required to read and completely understand the information and instructions contained in this manual. If anyone does not fully understand every part of this manual, please obtain further assistance by contacting the dealer from which this product was purchased or by contacting FFC at the telephone number or address listed on the cover of this manual. Keep this manual available for reference whenever this product is being handled or used. Provide this manual to any new owners and/or operators.

This manual covers model(s) **660** (LAF6682, LAF6692, LAF6697, LAF6602): **Utility Grade** and **670** (LAF6696, LAF6608, LAF6618): **Construction Grade**. The difference between the models is the width and grade of the product, details of which are covered on the parts list and specifications page(s).

GENERAL INFORMATION

The purpose of this manual is to assist in assembling, mounting, operating, and maintaining your **Grader Rake**. Read this manual carefully to obtain valuable information and instructions that will help you achieve years of safe and dependable service.

The illustrations and data used in this manual were current at the time of printing, but due to possible engineering and/or production changes, this product may vary slightly in detail. FFC reserves the right to redesign and/or change components as may be necessary without notification to anyone.

Throughout this manual, references may be made to:

Power Unit	The engine-driven machine to which this product must be attached.
Right, Left, Front, Rear	Directions that are determined in relation to the operator of the equipment when seated in the normal operating position.
IMPORTANT NOTICE	Precautions that must be followed to prevent damage to equipment.
	Precautions that must be followed to prevent substandard performance.

SERIAL NUMBER LOCATION

Always refer to the model and serial number when ordering parts or requesting information from your dealer. The serial number plate for this product is located **on the top left surface of the loader attachment plate** of your **Grader Rake**.

Reference Information

Model Number _____	Loader Make _____
Serial Number _____	Loader Model _____
Date Purchased _____	Loader Serial # _____

DEFINITION OF SAFETY TERMS AND SYMBOLS

Throughout this manual, the terms **DANGER**, **WARNING**, and **CAUTION** are used to indicate the degree of hazard to personnel if proper safety procedures are not followed. These words will be used in conjunction with the Safety Alert Symbol: a dark triangle containing a white exclamation mark.



The Safety Alert Symbol means:

ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

DANGER Indicates an imminently hazardous situation which, if not avoided,
WILL result in death or serious injury.

WARNING Indicates a potentially hazardous situation which, if not avoided,
could result in death or serious injury.

CAUTION Indicates a potentially hazardous situation which, if not avoided,
may result in minor or moderate injury;

OR

may also be used to alert against unsafe practices which **may result in personal injury.**

ACCIDENTS CAN BE PREVENTED WITH **YOUR HELP !**

No accident prevention program can be successful without the wholehearted cooperation of the person who is directly responsible for the operation of the equipment.

To read equipment accident reports from all over the country is to be convinced that a large number of accidents can be prevented only by operators who consistently anticipate the results of their actions and thus prevent accidents from ever occurring. No power-driven equipment, whether it is on the highway, in a farm field, or in an industrial plant, can be any safer than the person who is at the controls.

If accidents are to be prevented (and accidents can be prevented), that prevention will come from equipment operators who accept their complete responsibility.

The designer, the manufacturer, and the safety engineer all help create a safe product, but their combined efforts can be wiped out with a single careless act by the operator of that product.

The best safety device is a careful operator. FFC and your dealer ask that **YOU** be that careful, responsible equipment operator.

YOU ARE THE KEY TO SAFETY BECAUSE:

YOU are responsible for the SAFE operation and maintenance of **YOUR Grader Rake.**

YOU are responsible to familiarize yourself, and anyone else who will assemble, operate, maintain, or work around this product, with the SAFETY information contained in this manual.

YOU are responsible to read ALL information contained in this manual to any operators or maintenance personnel who are not fully able to read the written English language. Whether **YOU** read the manual as written or translate it into another language, **YOU** must make certain that all operators and maintenance personnel have a complete understanding of the full and exact contents of this manual. Translations of this manual into other languages are available by submitting an order to FFC

YOU can reduce the risk of injury or death by following all safety precautions and by using good safety practices.

SAFETY INSTRUCTIONS

WORK SAFELY - A CAREFUL OPERATOR IS THE BEST INSURANCE AGAINST ACCIDENTS !!

SECTION 1



WARNING

Obey all the safety instructions listed in this section and throughout this manual. Failure to obey instructions in this section could result in death or serious injury.

BEFORE ATTEMPTING ANY TYPE OF ASSEMBLY, OPERATION, MAINTENANCE, OR OTHER WORK ON OR NEAR THIS PRODUCT:

- **READ AND COMPLETELY UNDERSTAND THIS MANUAL.**
- **READ AND COMPLETELY UNDERSTAND THE MANUALS PROVIDED WITH YOUR *power unit, loader, and quick-attach.***
- Read and understand all safety signs on this product and on your power unit, loader, and quick-attach.
- Know all your controls and know how to quickly stop all power unit movement, the Grader Rake movement, and the engine in case of an emergency.
- Know and obey all applicable government rules, O.S.H.A. regulations, local laws and other professional guidelines for your operation.
- Make sure that anyone who will be assembling, mounting, maintaining, repairing, removing, and/or storing this product:
 - has been instructed in the safe operation of this product and of the power unit, loader, and quick-attach to which this product is attached.
 - is physically and mentally capable of the safe operation of this type of equipment.
 - is not under the influence of drugs or alcohol.
 - is carefully supervised from a safe distance, especially if such person is inexperienced.
 - wears appropriate protective equipment (i.e. hardhat, safety glasses, work gloves, protective shoes, respirator, ear protection, etc.).
 - does not wear loose fitting clothing, loose or uncovered hair, or any accessories (jewelry, necktie, scarf, wrist watch, etc.) that can catch in moving parts.
 - has annually reviewed all safety instructions.
- Know and follow good work practices when assembling, mounting, maintaining, repairing, removing, and storing this product:
 - Work on a level surface in a well lit area.
 - Keep the area clean and dry.
 - Use properly grounded electrical outlets & tools.
 - Use the right tool for the job at hand.

- Make sure that your tools are in good condition for performing the desired function.
- When using tools, wear the protective equipment specified by the tool manufacturer. (i.e. hardhat, safety glasses, work gloves, protective shoes, etc.)

WHEN YOUR POWER UNIT IS USED DURING ANY TYPE OF ASSEMBLY, OPERATION, MAINTENANCE, OR OTHER WORK ON OR NEAR THIS PRODUCT:

- Before leaving the operator's position or before beginning any type of work on this product, lower this product to the ground, apply your power unit's parking brake, stop the engine, remove the starter key, wait for all moving parts to stop, and then relieve all pressure in the hydraulic lines. Refer to your power unit's operator's manual for instructions on how to relieve hydraulic pressure in lines.
- Know your loader's safe lifting and operating capacity and the weight of this product. See the specifications in this manual for the weight of this product and refer to your power unit's and your loader's operator's manuals for safe operating limits. Lift capacity may be reduced if using a quick-attach.
- Never allow anyone, except the operator, to be around the power unit or this product when either is in motion. Do not startup unless others are clear of the work area.
- Never allow anyone to get between the rake and any part of this product or your power unit.
- Do not allow riders on this product or the power unit.
- Do not stand or climb on this product when raised.
- Never lift this product above (a.) the operator's eye level or (b.) to a height where visibility is obstructed, whichever is lower.
- Do not place any part of your body under any part of this product unless this product is securely resting on adequate blocking or on the ground.
- Do not use blocking made of concrete blocks, logs, buckets, barrels or any other material that could suddenly collapse or shift positions. Do not use wood or steel blocking that shows any signs of material decay. Do not use blocking that is warped, twisted, or tapered.
- Never operate controls from the ground. Operate the controls only from the operator's position.
- Never leave equipment unattended with the engine running or with this product raised on the loader.
- Be aware of the added weight and width of this product. Reduce travel speeds accordingly, especially when traveling over rough ground.
- Keep this product close to the ground and under control when transporting.

SAFETY INSTRUCTIONS

WORK SAFELY - A CAREFUL OPERATOR IS THE BEST INSURANCE AGAINST ACCIDENTS !!

SECTION 1 (CONTINUED)



WARNING

Obey all the safety instructions listed in this section and throughout this manual. Failure to obey instructions in this section could result in death or serious injury.

WHEN DEALING WITH HYDRAULICS DURING ANY TYPE OF ASSEMBLY, OPERATION, MAINTENANCE, OR OTHER WORK ON OR NEAR THIS PRODUCT:

- Hydraulic fluid under pressure can penetrate the skin and cause serious injury or death. Hydraulic leaks under pressure may not be visible!
- If any fluid penetrates the skin, GET IMMEDIATE MEDICAL ATTENTION!!
- Wear safety glasses, protective clothing, and use a sound piece of cardboard or wood when searching for hydraulic leaks. DO NOT USE YOUR HANDS!
- Before connecting or disconnecting hydraulic hoses, read your power unit's operator's manual for detailed instructions on connecting and disconnecting hydraulic attachments.
- Make certain that all parts meet the specifications for this product when installing or replacing hydraulic hoses or fittings.
- After connecting hydraulic lines:
 - Slowly and carefully raise the loader and cycle the rollback / dump cylinders to check hose clearances and to check for any interference.
 - Operate the hydraulics on this product to check hose clearances and to check for any interference.
 - Make certain that the hoses cannot interfere with or actuate the quick-attach mechanism.
 - Make certain that hoses will not be pinched, or get tangled, in any equipment.
- Refer to your power unit's operator's manual and this manual for procedures and intervals, then inspect and maintain the entire hydraulic system to insure that the fluid remains clean, that all devices function properly, and that there are no fluid leaks.

WHEN MOUNTING THIS PRODUCT TO YOUR POWER UNIT:

- Refer to the operator's manuals of your power unit, your loader, and your quick-attach for special or detailed mounting instructions.
- This product should fit onto the quick-attach or loader arms of your power unit the same as the original products that were designed by your loader / quick-attach manufacturer.
- If this product does not fit properly, contact FFC before operating.
- When this product is not attached to a loader, do not lift the bottom of the loader attachment plate more than 2'-0" above the bottom of the rake tines. When the wheels are off or in the vertical position, this product could suddenly flip forward.
- Never place your finger into the mounting plate or loader holes. A slight movement of the power unit or this product could cause serious injury.

BEFORE EACH USE, THOROUGHLY INSPECT THIS PRODUCT AND:

- Make certain that all safety signs are in place and legible. Refer to the safety sign page in this manual for the placement of safety signs for this product.
- Replace all damaged or excessively worn parts and hardware only with genuine FFC parts or with properly rated fasteners, hydraulic hoses, or fittings.
- Make certain that all locking pins, latches, and connection devices are properly installed and secured.
- Make certain that all protective guards, canopies, doors, etc., are in place and secure.

WHEN OPERATING THIS PRODUCT IN ACCORDANCE WITH DESIGN INTENTIONS:

- Keep all others at least 50' away from this product. Stones and debris could be thrown by the springing action of the rake tines, of roots, etc. during operation of this product.

WHEN ADJUSTING, SERVICING OR REPAIRING THIS PRODUCT:

- Make no modifications to your Grader Rake.
- When making repairs, use only genuine FFC parts or, for fasteners, hydraulic hoses, or hydraulic fittings, use only properly rated parts.
- Replacement parts, for parts with safety signs attached, must also have safety signs attached.

SAFETY INSTRUCTIONS

WORK SAFELY - A CAREFUL OPERATOR IS THE BEST INSURANCE AGAINST ACCIDENTS !!

SECTION 2

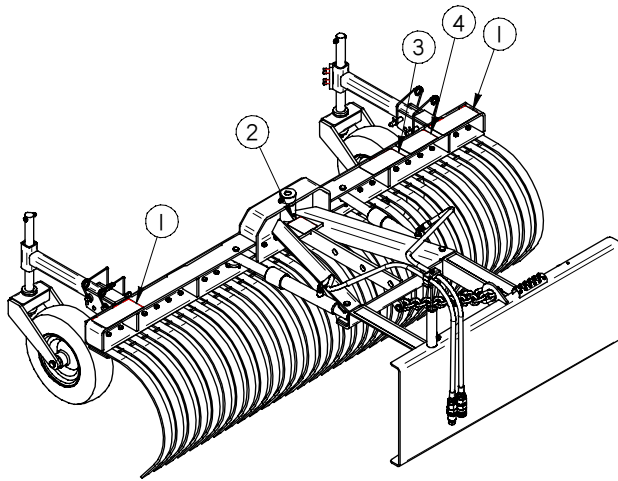


CAUTION

Obey all the safety instructions listed in this section and throughout this manual. Failure to obey instructions in this section may result in personal injury.

- Stones and debris could be thrown by the springing action of the rake tines, of roots, etc. during operation of this product. Therefore, when operating:
 - Always wear eye protection (minimum, full face protection preferred) and protective clothing.
 - Always lift the rake before backing up.
- Never attempt to adjust the wheel arm height by repositioning the setscrews. If tine wear or unusual conditions dictate that the position of the setscrews be changed, make sure that no weight is being carried by the tires. Keep your hands off the wheel pivot shaft and your feet out from underneath the tire when loosening the setscrews.
- Never place your hands between the tines when attempting to dislodge debris that is caught between the tines. In certain circumstances, the debris could give way suddenly and allow the tines to spring back to the normal position.
- Do not attempt to straighten a bent rake tine. Straightening will cause a localized reduction in strength, which could cause a sudden failure of the tine during the straightening process or while operating.

SAFETY SIGN LOCATIONS



ITEM	QTY.	PART #- DESCRIPTION
1	2	RDL3123-PIVOTING ATT
2	1	50-0724 -HYDRAULIC
3	1	50-0723 -READ MANUAL
4	1	RDL3159-FLYING DEBRIS
5	1	RDL3254-SERIAL TAG

INSTRUCTIONS

- Keep all safety signs clean and legible.
- Replace all missing, illegible, or damaged safety signs.
- Replacement parts for parts with safety signs attached must also have safety signs attached.
- Safety signs are available, free of charge, from your dealer or from FFC.

PLACEMENT OR REPLACEMENT OF SAFETY SIGNS

1. Clean the area of application with non-flammable solvent, then wash the same area with soap and water.
2. Allow the surface to fully dry.
3. Remove the backing from the safety sign, exposing the adhesive surface.
4. Apply the safety sign to the position shown in the diagram above and smooth out any bubbles.

ITEM 1

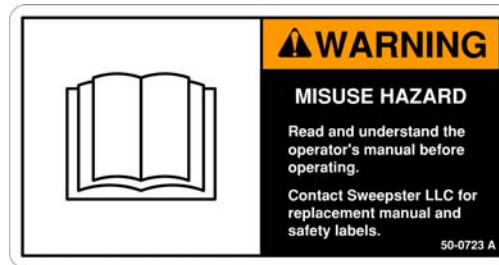


ITEM 2

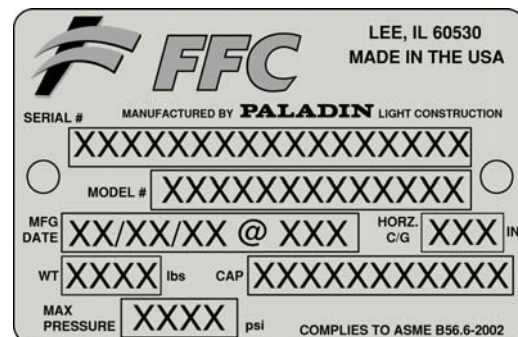
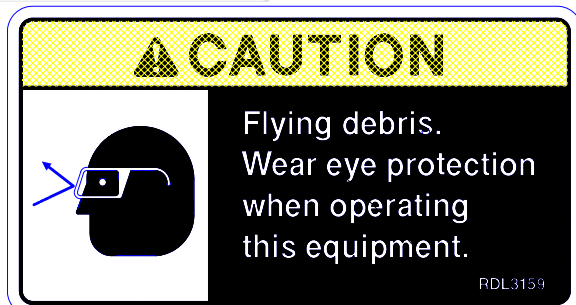


ITEM 3

ITEM 3



ITEM 4



POWER UNIT SPECIFICATIONS

IMPORTANT

Exceeding any of the maximum recommended power unit specifications **CAN** result in damage to this product and **WILL** void all FFC warranties.

DESCRIPTION	SPECIFICATIONS	
	MODEL 660	MODEL 670
Weight of Power Unit without Grader Rake	10,000 lbs. maximum	32,000 lbs. maximum
Hydraulic Pressure Output	4,000 psi. maximum	3,000 psi. maximum
Rear Ballast	As required to maintain full power unit stability. (Note the Shipping Weight on page 15, then see the operator's manual(s) for your power unit, loader, and quick-attach for ballasting needs.)	

GRADER RAKE MOUNTING

SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS (pages 2-6 of this manual) BEFORE BEGINNING ANY GRADER RAKE MOUNTING

WARNING
When this product is not attached to a loader, do not lift the bottom of the loader attachment plate more than 2'-0" above the bottom of the rake tines. When the wheels are off or in the vertical position, this product could suddenly flip forward. Failure to obey this warning could result in death or serious injury.

1. Place this product on a firm, level surface that is large enough to safely accommodate this product, your power unit and all workers involved in the mounting process. Your Grader Rake should rest on the rake tines and the base of the loader attachment plate. For the first time this product is mounted, the rake tines should be supported on each end by blocking that is 7" high. A 2x6 x 3'-0" (minimum) nailed to a 6x6 x 3'-0" (min.) placed perpendicular to the rake under each end of the rake should be sufficient if sound wood is used.
2. Refer to the operator's manual(s) for your power unit, loader, and quick-attach and follow the mounting instructions contained therein.
3. Carefully raise the loader and cycle the tilt cylinders to check clearances and to verify that all mounting procedures have been successfully completed.
4. **IMPORTANT** Lubricate all grease fittings before connecting this product to your power unit's hydraulic system. Refer to **GRADER RAKE MAINTENANCE** on page 11 and follow the instructions.

GRADER RAKE HYDRAULIC CONNECTION



SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS (pages 2-6 of this manual) BEFORE BEGINNING ANY GRADER RAKE HYDRAULIC CONNECTION

1. You must purchase and install two hydraulic hoses that have fittings permanently attached to each end. These hoses and fittings must meet the following specifications: (NOTE: If your Grader Rake was supplied with hoses, skip to step 2.)
 - Inside Diameter:..... 0.375" (3/8")
 - Minimum Operating Pressure:..... 4,500 psi.
 - Hose End Fittings:..... One hose end must be a #6 male o-ring boss fitting. The fitting for the other end can be whatever you determine to be the most beneficial to making the connection to your power unit.
 - Length:..... You must make this determination based upon recommendations provided in your power unit's operator's manual. The hoses must be long enough to avoid applying any tension to them (i.e. stretching) in all operating positions of this product. The hoses must not be excessively long either, because this could cause the hoses to drag on the ground, be pinched in the equipment, become entangled in moving parts, etc., any of which will shorten the life of the hose and could cause injury to the operator or others near the equipment.
2. Slide the hoses through the hydraulic hose protector. Remove all the protective plastic caps from the hose ends and this product's connection fittings.
3. Make certain that the male and female threads, as well as the inside of the hoses, are clean, then place the #6 hose ends on/in to the fittings on this product and tighten to 27 ft. lbs., + or - 2.0 ft. lbs. (#6 is 9/16" dia. with 18 tpi.)
4. Make the connection to your power unit using the appropriate method below for your power unit:
 - If your power unit has male or female threads for connecting the hydraulic hoses to the auxiliary hydraulic lines, make certain that the threads, as well as the inside of the fittings and hoses, are clean, then secure the hoses to the fittings using the torque specified in your power unit's operator's manual.
 - If your power unit has quick-couplers for connecting the hydraulic hoses to the auxiliary hydraulic lines, you must purchase the proper quick-coupler fittings that you must install on the free ends of the two hoses. In most cases, the owner's manual for your power unit will describe the exact type of fitting that is needed for your hydraulic coupling system, but in no case should any fitting have an allowable operating pressure of less than 4,500 psi. Once all the quick-coupler fittings are properly installed, then the hoses can be coupled to the power unit's hydraulic valve body or auxiliary hydraulic lines as per the instructions found in your power unit's operator's manual.
5. Carefully raise the loader and cycle the tilt cylinders to check hose clearances and to check for any interference. Operate the hydraulic cylinder(s) on this product to make the same checks.
6. Cycle the hydraulic cylinder(s) on this product several times from fully retracted to fully extended until all air has been completely removed from the cylinder(s).

NOTICE: When shipped, the hydraulic cylinder(s) on this product contained air or an air-fluid mixture. Also, there are orifices beneath the port(s) in the hydraulic cylinder barrel(s) that will restrict the exit of that air. Failure to remove all the air from the hydraulic cylinder(s) can cause uneven, jerky cylinder movement when the hydraulic controls are being operated and unwanted cylinder movement when those controls are not being operated.

GRADER RAKE SETUP



SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS (pages 2-6 of this manual) BEFORE BEGINNING ANY GRADER RAKE SETUP

1. With your power unit still on the level surface and your Grader Rake on the 7" high blocking, place your power unit's transmission in "Park" and engage the parking brake.
2. Either (a.) fully lower the loader or (b.) lower the loader until the bottom of the loader attachment plate is 4" above the level surface, whichever is higher.
3. Fully roll back the roll back/dump cylinders of the loader.
4. Shut off your power unit's engine, remove the starter key, and wait for all moving parts to come to a stop.
If the lift chain is tight (i.e. holding some of the weight off of the tires), go to step 8.
5. Remove the jam nut, hex nut, flat washers, and bolt that holds the loader attachment plate end of the lift chain to the midsection of the lift chain.
6. Pull the lift chain through the chain hole in the loader attachment plate to stretch the lift chain tight. If the chain has any slack when checked with the bolt, then the end of the lift chain should be pulled one more link to further tighten the lift chain. If necessary, restart your power unit and slightly dump the roll back/dump cylinders to provide enough chain slack to perform this tightening. Make sure to shut off your power unit's engine, remove the starter key, and wait for all moving parts to come to a stop before exiting the operator's position.
7. Secure the end of the lift chain to the proper link in the lift chain with the bolt, washers, hex nut, and jam nut.
8. Restart your power unit, raise the loader enough to lift the rake off the blocking, move away from the blocking to a clear area of the level surface, place your power unit's transmission in "Park", and engage the parking brake.
9. Lower the loader as described in step 2.
10. Shut off your power unit's engine, remove the starter key, and wait for all moving parts to come to a stop.
11. Use the roll back/dump cylinder control to let the rake down so that the rake tines lightly touch the level surface.
12. With the two setscrews on the wheel arm loosened, install the wheel arm on the top front and the top rear holes of the rake head frame using the WHEEL INSTALLATION INSTRUCTIONS below.
13. Pivot the wheel fork back toward the loader in a normal trailing position with the tire resting on the level surface. In some cases, the tire may be supported by the bolt at the top of the pivot shaft and will not touch the level surface.
14. While lifting up on the wheel arm enough to remove all slack from the snap-lock pins, firmly secure the 2 set screws tightened to 95 ft-lbs., + or - 2.0 ft-lbs. Repeat for the other wheel arm. **If proper adjustment procedures are followed, setscrews should never need to be repositioned except to compensate for tine wear or unusual conditions.**

WHEEL INSTALLATION INSTRUCTIONS

1. Park your power unit and Grader Rake on a level surface with your power unit's transmission in "Park" and with the parking brake engaged.
2. With your power unit's loader fully lowered, shut off your power unit's engine, remove the starter key, wait for all moving parts to come to a stop, and relieve all pressure in the hydraulic lines.
3. Insert a snap-lock pin through the lower front holes of the rake head frame.
4. Rest the wheel arm tube on that pin.
5. Secure the wheel arm tube to the top front holes of the rake head frame using a second snap-lock pin.
6. Raise the front of the wheel arm enough to allow for the first pin to be removed from the lower front holes and be reinstalled in one of the 3 rear holes to fully secure wheel arm to the rake head frame.

For removal of a wheel, the process should be reversed with the pin installed during step 5 above being stored in the lower rear holes after removal.

GRADER RAKE OPERATION



SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS (pages 2-6 of this manual) BEFORE BEGINNING ANY GRADER RAKE OPERATION



WARNING

Failure to obey the following procedures could result in death or serious injury.

- Never allow anyone to get between the rake and any part of this product or your power unit.
- Never lift this product above (a.) the operator's eye level or (b.) to a height where visibility is obstructed, whichever is lower.
- Keep all others at least 50' away from this product. Stones and debris could be thrown by the springing action of the rake tines, of roots, etc. during operation of this product.



CAUTION

Failure to obey the following procedures may result in personal injury.

Stones and debris could be thrown by the springing action of the rake tines, of roots, etc. during operation of this product. Therefore, when operating:

- Always wear eye protection (minimum, full face protection preferred) and protective clothing.
- Always lift the rake before backing up.
- Never attempt to adjust the wheel arm height by repositioning the setscrews. If tines wear or unusual conditions dictate that the position of the setscrews be changed, make sure that no weight is being carried by the tires. Keep your hands off the wheel pivot shaft and your feet out from underneath the tire when loosening the setscrews.

INITIAL OPERATION

1. Use the loader lift cylinders and roll back/dump cylinders to set the A-frame approximately level while allowing the tires to lightly touch the ground. The rake tines should be 1" to 3" above the ground.
2. With the rake straight across, not angled, use the roll back and dump of the roll back/dump cylinders to raise and lower the rake tines.
3. When dictated by the terrain, additional slack in the chain may be necessary. This slack is best obtained by first using the loader lift cylinders to slightly raise the rear of the A-frame. The roll back/dump cylinders can then be dumped enough to restore the rear of the A-frame to the original height.

IMPORTANT

Dumping the loader attachment plate enough to contact the A-frame CAN result in damage to this product and WILL void all FFC warranties.

OPERATING ADJUSTMENTS

NORMAL OPERATION

- The rake can be straight or angled.
- Attach the wheel arms to the rake head frame using the top front and the top rear holes.

ROUGH LEVELING or SCARIFICATION

- The rake can be straight or angled.
- Attach the wheel arms to the rake head frame using the top front and the center rear holes.

CROWNING

- The rake should only be angled.
- Attach the front most wheel arm to the rake head frame using the top front and the top rear holes.
- Attach the rear most wheel arm to the rake head frame using the top front and the center or lower rear holes.

(Continued on page 11)

GRADER RAKE OPERATION (Continued)



SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS (pages 2-6 of this manual) BEFORE BEGINNING ANY GRADER RAKE OPERATION

PUSHING LARGE QUANTITIES OF LOOSE MATERIAL

- The rake should be straight.
- Attach the wheel arms to the rake head frame using the top front hole and rotate the wheel arms up until the pins can be inserted in the lower front holes on what was, prior to rotation, the top side of the wheel arm tubes.

IMPORTANT Grading without the wheels or with the wheels in the **PUSHING** position **CAN** result in damage to this product and **WILL** void all FFC warranties.

SUGGESTIONS FOR IMPROVED PERFORMANCE

- Do not exceed 12 mph when operating. Reduce your ground speed if the rake head begins to “bounce”.
- The recommended crown for a gravel road is 1/2” per foot of road width. (i.e. The center of a 20’ wide road should be 5” higher than each edge of the road.)
- The CROWNING position can be used to taper the backfill around a concrete pad or to dig a shallow trench.
- Grade gravel and sub bases when the materials are damp to reduce dust and improve workability.
- Grade topsoil only when the materials are dry so that the amount of compaction can be reduced.

GRADER RAKE MAINTENANCE



SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS (pages 2-6 of this manual) BEFORE BEGINNING ANY GRADER RAKE MAINTENANCE

BEFORE EACH USE

- Make sure that all nuts and bolts are in place and properly tightened.
- Make sure that all other fasteners are in place and are performing their specified function.
- Make sure that tires are inflated to maximum load pressure indicated on tire. Do not over inflate.
- Make sure that all hydraulic fittings are tightened to specifications and that there are no leaks in any fittings or hoses. (SEE THE HYDRAULIC CONNECTION SECTION ON PAGE 8.)
- Make sure that all safety signs are in place, are clean, and are legible. (SEE THE SAFETY SIGN SECTION ON PAGE 6.)
- Replace any damaged parts and excessively worn parts.

IF DEBRIS BECOMES WEDGED BETWEEN THE RAKE TINES

1. Lower the rake on to two pieces of blocking that are positioned under each end of the rake. Use a 4x4 x 2’-0”, minimum, for each piece of blocking.



CAUTION

Failure to obey the following procedures may result in personal injury.

- **Never place your hands between the tines when attempting to dislodge debris that is caught between the tines. In certain circumstances, the debris could give way suddenly and allow the tines to spring back to the normal position.**

2. Use a hammer to drive the debris forward and down off the tines or use other methods as may be appropriate for the type of debris encountered.

AFTER EVERY 10 HOURS OF USE

- Grease two fittings: one on the front of each of the two wheel fork pivot bushings.
- Grease one fitting: on the rear of the A-frame rake pivot bushing.

GRADER RAKE MAINTENANCE (Continued)



SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS (pages 2-6 of this manual) BEFORE BEGINNING ANY GRADER RAKE MAINTENANCE

ANNUALLY

Repack the bearings in the wheels as described in steps 1-4 below.

1. Make sure that there is no weight on the wheels. If the wheels are partially supporting the weight of this product, restart your power unit and move the loader and/or dump cylinders. Repeat the specified shutdown procedure.
2. Remove each wheel using two 15/16" wrenches and remove the bearing components from the wheels.
3. Clean the bearing components then use a high quality waterproof grease to repack the bearing components & hub.
4. Reassemble all components using a new seal.

GRADER RAKE SERVICE



SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS (pages 2-6 of this manual) BEFORE BEGINNING ANY GRADER RAKE SERVICE

REPLACEMENT OF RAKE TINES

1. Park your power unit on a level surface with this product properly attached.
2. Place your power unit's transmission in "Park" and engage the parking brake.
3. Lower this product on to two pieces of blocking that are positioned under each end of the rake. Use a 4x4 x 2'-0", minimum, for each piece of blocking.
4. Shut off your power unit's engine, remove the starter key, wait for all moving parts to come to a stop, and relieve all pressure in the hydraulic lines.
5. From the front of your Grader Rake, reach over the rake head frame with an 11/16" wrench and loosen the nut from the rake tine that is to be replaced while holding the bolt head with a 5/8" wrench. Remove the nut and the bolt.
6. Loosen the nuts on the two bolts that are on each side of where the nut and bolt was just removed.
7. Slide the tine back until the tine is clear of the rake head frame. Properly dispose of any bent, damaged, or excessively worn rake tines and any worn or damaged bolts or nuts.

CAUTION

Failure to obey the following procedures may result in personal injury.

Do not attempt to straighten a bent rake tine. Straightening will cause a localized reduction in strength, which could cause a sudden failure of the tine during the straightening process or while operating.

8. If the remaining rake tines have significant wear, trim off the end of the new rake tine with an abrasive wheel or torch.
9. Slide a new tine back into the rake head frame and install the correct bolt and nut. Make sure that the tine plate is correctly positioned and then tighten this nut and the other loosened nuts to 54 ft. lbs., + or - 4.0 ft. lbs.
10. Repeat for other rake tines as necessary.

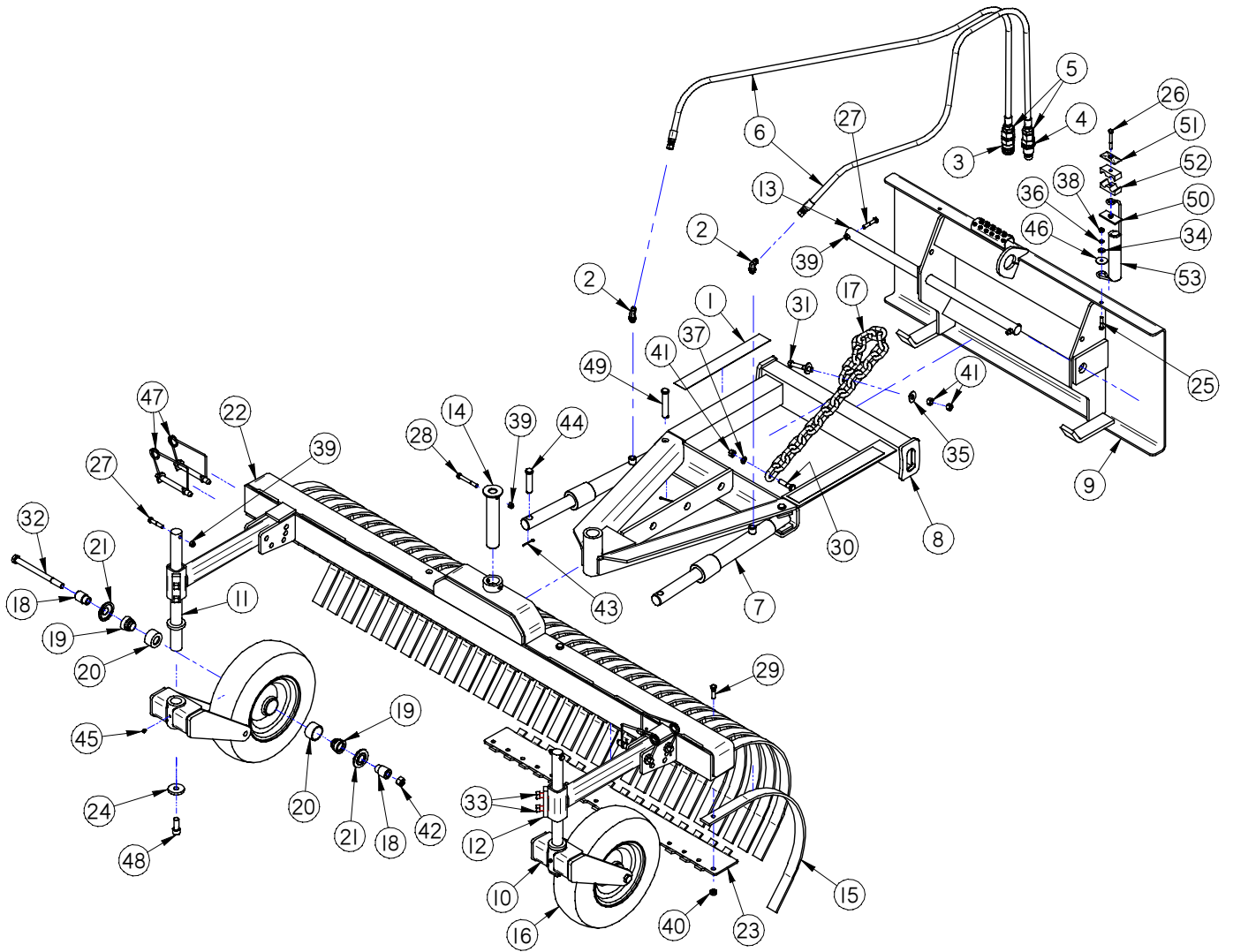
GRADER RAKE STORAGE



SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS (pages 2-6 of this manual) BEFORE BEGINNING ANY GRADER RAKE STORAGE

If after completely disconnecting your Grader Rake from your power unit, there is a need to lift this product on to a trailer, truck bed, or elevated storage area, the three holes through the center part of the A-Frame may be used as lifting points for attaching an eyehook or clevis. Carefully test which hole will provide the best balance point before lifting your Grader Rake completely off the ground.

PARTS ILLUSTRATION



GRADER RAKE PARTS LIST Model 660: Utility Grade

ITEM	QTY.	LAF6682	LAF6692	LAF6697	LAF6602	DESCRIPTION	
1	2				LAF3595	Anti-Slip Abrasive Tape: 2" x 15" Black	
2	2	Contact FFC to obtain the correct item					Hydraulic Elbow (not required on all models)
3	1	Contact FFC to obtain the correct item					Hydraulic Hose Quick Coupler: Female Connection
4	1	Contact FFC to obtain the correct item					Hydraulic Hose Quick Coupler: Male Connection
5	2	Contact FFC to obtain the correct item					Hydraulic Adapter (not required on all models)
6	2	Contact FFC to obtain the correct item					Hydraulic Hose
7	2				LAF4563	Hydraulic Cylinder: 1-1/2" Dia. X 11-1/2" Stroke with (1) #6 Female O-Ring Boss Port	
8	1				LAF6630	A-Frame Weldment	
9	1				LAF6631	Loader Attachment Plate Weldment	
10	2				LAF6632	Wheel Fork Weldment	
11	2				LAF6633	Wheel Pivot Shaft Weldment	
12	2				LAF6634	Wheel Arm Weldment	
13	1				LAF6636	Push Pin	
14	1				LAF6641	Rake Head Frame Pivot Pin	
15	Varies	(32)	(36)	(38)	(40) LAF6642	Rake Tine	
16	2				LAF6643	Wheel Assembly (Items 16, 18 - 21 in a Package)	
						(1) LAF6652 Rim / Hub: 8" x 3-3/4" Drop Center with 4-1/8" Hub Centered. Includes:	
						(1) LAF6650 Tire: 4.80 / 4.00 - 8, Load Range B High Speed, 590# @ 60 PSI	
						(1) LAF6651 Tube: 4.80 x 8 with TR-13 Valve	
						(2) LAF6654 Bearing Race: 1" Tapered	
17	1				LAF6644	Chain: 1/2" Dia. x 2'-6" Long, GR. 40	
18	4				LAF6645	Axle Bushing	
19	4				LAF6653	Bearing: 1" Tapered Roller Bearing (Timken L44643)	
20	4				LAF6654	Bearing Race: 1" Tapered (Timken:L44610)	
21	4				LAF6655	Seal: 1" Grease Seal (Chicago Rawhide: 12407)	
22	1	LAF6683	LAF6693	LAF6698	LAF6603	Rake Head Frame Weldment: 82",92",97",102"	
23	2	LAF6684	LAF6694	LAF6699	LAF6604	Rake Tine Plate: 82",92",97",102"	
24	2				LAF9965	Sprocket Retainer	
25	1				RHW1108	Grade 5 Hex Head Cap Screw: 5/16" x 1-1/2" (Not used for All models)	
26	1				RHW1112	Grade 5 Hex Head Cap Screw: 5/16" x 2-1/2" (Not used for All models)	
27	4				RHW1211	Hex Head Cap Screw: 3/8" Dia. x 2" Long, Grade 5	
28	1				RHW1215	Hex Head Cap Screw: 3/8" Dia. x 3" Long, Grade 5	
29	Varies	(32)	(36)	(38)	(40) RHW1305	Hex Head Cap Screw: 7/16" Dia. x 1-1/2" Long, Grade 5	
30	1				RHW1437	Hex Head Cap Screw: 1/2" Dia. x 2" Long, Grade 8	
31	1				RHW1441	Hex Head Cap Screw: 1/2" Dia. x 3" Long, Grade 8	
32	2				RHW1620	Hex Head Cap Screw: 5/8" Dia. x 8" Long, Grade 5	
33	4				RHW2439	Square Head Set Screw: 5/8" Dia. x 1-1/2" Long, Plain Steel	
34	1				RHW5162	Grade 5 Flat Washer: 5/16" (Not used for All models)	
35	2				RHW5462	Flat Washer: 1/2" Dia. USS	
36	1				RHW6102	Grade 5 Lock Washer: 5/16" (Not used for All models)	
37	1				RHW6402	Lock Washer: 1/2" Dia. Medium Split	

NOTE: All parts are the same as the LAF6602 except for those parts numbered under the other models.

GRADER RAKE PARTS LIST Model 660: Utility Grade (Continued)						
38	1				RHW7101	Grade 5 Hex Nut: 5/16" (Not used for All models)
39	5				RHW7202	Locknut: 3/8" Dia. Nylon Insert
40	Varies	(32)	(36)	(38)	(40) RHW7302	Locknut: 7/16" Dia. Nylon Insert
41	3				RHW7401	Hex Nut: 1/2" Dia. with 13 Threads per inch
42	2				RHW7602	Locknut: 5/8" Dia. Nylon Insert
43	4				RHW8018	Cotter Pin: 1/8" Dia. x 1-1/2" Long
44	2				RHW8067	Clevis Pin: 3/4" Dia. x 2-3/4" Long (Useable) Zinc Plated
45	3				RHW8090	Grease Zerk: 1/4" Dia. x 20 TPI Self Tapping
46	1				RHW8098	Grade 2 Fender Washer: 5/64" x 5/16" x 1-1/2" (Not used for All models)
47	4				RHW8104	Snap-Lock Pin: 5/8" Dia. X 4" Long (Useable)
48	2				RHW8214*	Socket Head Cap Screw: 5/8" Dia.-11 TPI x 1-1/2" L., Alloy
49	2				RHW8215	Clevis Pin: 3/4" Dia. x 3-1/2" Long (Useable) Zinc Plated
50	1				RHW8613	Weld Plate for 7/8" OD (Not used for All models)
51	1				RHW8614	Cover Plate for 7/8" OD (Not used for All models)
52	2				RHW8616	Hose Cradle for 7/8" OD (Not used for All models)
53	1				RHW8618	Hose Spring (Not used for All models)
NOTE: All parts are the same as the LAF6602 except for those parts numbered under the other models.						
* If this cap screw is removed for any reason, thread locking material should be applied before beginning reinstallation.						

GRADER RAKE PARTS LIST Model 670: Construction Grade

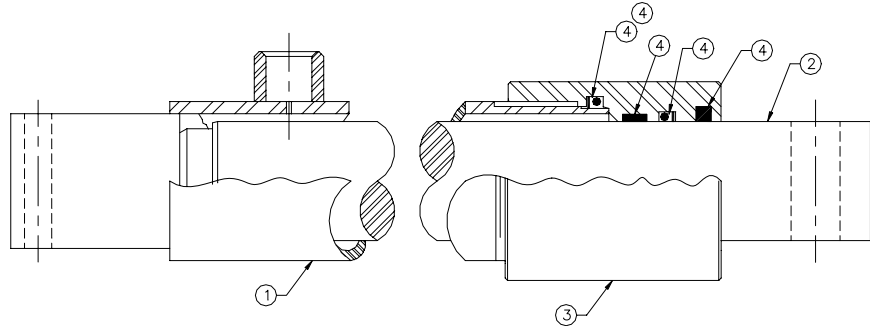
ITEM	QTY.	LAF6696	LAF6608	LAF6618	DESCRIPTION
1	2			LAF3595	Anti-Slip Abrasive Tape: 2" x 15" Black
2	2	Contact FFC to obtain the correct item			Hydraulic Elbow (not required on all models)
3	1	Contact FFC to obtain the correct item			Hydraulic Hose Quick Coupler: Female Connection
4	1	Contact FFC to obtain the correct item			Hydraulic Hose Quick Coupler: Male Connection
5	2	Contact FFC to obtain the correct item			Hydraulic Adapter (not required on all models)
6	2	Contact FFC to obtain the correct item			Hydraulic Hose
7	2			LAF4204	Hydraulic Cylinder: 2" Dia. X 11-1/2" Stroke with (1) #6 Female O-Ring Boss Port
8	1			LAF6646	A-Frame Weldment
9	1			LAF6647	Loader Attachment Plate Weldment
10	2			LAF6632	Wheel Fork Weldment
11	2			LAF6633	Wheel Pivot Shaft Weldment
12	2			LAF6634	Wheel Arm Weldment
13	1			LAF6636	Push Pin
14	1			LAF6641	Rake Head Frame Pivot Pin
15	Varies	(38)	(42)	(46) LAF6642	Rake Tine
16	2			LAF6643	Wheel Assembly (Items 16, 18 - 20 in a Package)
					(1) LAF6652 Rim / Hub: 8" x 3-3/4" Drop Center with 4-1/8" Hub Centered. Includes:
					(1) LAF6650 Tire: 4.80 / 4.00 - 8, Load Range B High Speed, 590# @ 60 PSI
					(1) LAF6651 Tube: 4.80 x 8 with TR-13 Valve
					(2) LAF6654 Bearing Race: 1" Tapered
17	1			LAF6648	Chain: 1/2" Dia. x 3'-6" Long, GR. 70
18	4			LAF6645	Axle Bushing
19	4			LAF6653	Bearing: 1" Tapered Roller Bearing (Timken L44643)
20	4			LAF6654	Bearing Race: 1" Tapered (Timken:L44610)
21	4			LAF6655	Seal: 1" Grease Seal (Chicago Rawhide: 12407)
22	1	LAF6695	LAF6609	LAF6619	Rake Head Frame Weldment: 97",108", 118"
23	2	LAF6699	LAF6610	LAF6620	Rake Tine Plate: 97",108", 118"
24	2			LAF9965	Sprocket Retainer
27	4			RHW1211	Hex Head Cap Screw: 3/8" Dia. x 2" Long, Grade 5
28	1			RHW1215	Hex Head Cap Screw: 3/8" Dia. x 3" Long, Grade 5
29	Varies	(38)	(42)	(46) RHW1305	Hex Head Cap Screw: 7/16" Dia. x 1-1/2" Long, Grade 5
30	1			RHW1437	Hex Head Cap Screw: 1/2" Dia. x 2" Long, Grade 8
31	1			RHW1441	Hex Head Cap Screw: 1/2" Dia. x 3" Long, Grade 8
32	2			RHW1620	Hex Head Cap Screw: 5/8" Dia. x 8" Long, Grade 5
33	4			RHW2439	Square Head Set Screw: 5/8" Dia. x 1-1/2" Long, Plain Steel
35	2			RHW5462	Flat Washer: 1/2" Dia. USS
37	1			RHW6402	Lock Washer: 1/2" Dia. Medium Split
39	5			RHW7202	Locknut: 3/8" Dia. Nylon Insert
40	Varies	(38)	(42)	(46) RHW7302	Locknut: 7/16" Dia. Nylon Insert
41	3			RHW7401	Hex Nut: 1/2" Dia. with 13 Threads per inch
42	2			RHW7602	Locknut: 5/8" Dia. Nylon Insert
43	4			RHW8017	Cotter Pin: 1/8" Dia. x 2" Long
44	2			RHW8213	Clevis Pin: 1" Dia. x 3-1/2" Long (Useable) Zinc Plated
45	3			RHW8090	Grease Zerk: 1/4" Dia. x 20 TPI Self Tapping
46					Not Used
47	4			RHW8104	Snap-Lock Pin: 5/8" Dia. X 4" Long (Useable)
48	2			RHW8214*	Socket Head Cap Screw: 5/8" Dia.-11 TPI x 1-1/2" L., Alloy
49	2			RHW8216	Clevis Pin: 1" Dia. x 3-3/4" Long (Useable) Zinc Plated

NOTE: All parts are the same as the LAF6618 except for those parts numbered under the other models.

* If this cap screw is removed for any reason, thread locking material should be applied before beginning reinstallation.

GRADER RAKE PARTS LIST				
		Model 660	Model 670	
ITEM	QTY.	All Widths	All Widths	DESCRIPTION
NUMBERS FROM HYDRAULIC CYLINDER ILLUSTRATION				
1	1	LAF4616	LAF4166	Barrel: 1-1/2" (Model 660) or 2" (Model 670) I.D. X 11-1/2" Stroke with Drl. End
2	1	LAF4615	LAF4167	Shaft: 1-1/2" (Model 660) or 2" (Model 670) Dia. with Drilled End
3	1	LAF4614	LAF4168	Head: 1-1/2" (Model 660) or 2" (Model 670) I.D., Nominal
4	1	LAF4613	LAF4169	Seal Kit (Includes All Seals, O-Rings, Wipers, Etc.)

HYDRAULIC CYLINDER ILLUSTRATION



GRADER RAKE SPECIFICATIONS							
Model Number	Overall Dimensions:			Cutting Width		Cutting Depth* for "Crowning" (See page 10)	Shipping Weight
	Rake Straight, Wheel Arms Level			with Rake Set			
	Width	Height	Depth	Straight	Max.Angle		
UTILITY GRADE							
					(28.5 DEG.)		
LAF6682	82-3/8"	36-1/2"	84"	81-1/2"	71-5/8"	5-1/4"	745 lbs.
LAF6692	92-5/8"	36-1/2"	84"	91-3/4"	80-5/8"	5-7/8"	775 lbs.
LAF6697	97-7/8"	36-1/2"	84"	97"	85-1/4"	6-3/16"	790 lbs.
LAF6602	103"	36-1/2"	84"	102-1/8"	89-3/4"	6-1/2"	805 lbs.
CONSTRUCTION GRADE							
					(27.2 DEG.)		
LAF6696	98-1/8"	36-3/4"	78-3/8"	97"	86-1/4"	6-3/16"	915 lbs.
LAF6608	108-3/8"	36-3/4"	78-3/8"	107-1/4"	95-3/8"	6-13/16"	950 lbs.
LAF6618	118-3/4"	36-3/4"	78-3/8"	117-5/8"	104-5/8"	7-7/16"	985 lbs.

* "Cutting Depth" is the max. difference in height between the two ends of the rake when the two tires are on grade.

TORQUE SPECIFICATION FOR STANDARD MACHINE HARDWARE						
Bolt Size	SAE Grade Bolt	Torque Ft./Lbs		Bolt Size	SAE Grade Bolt	Torque Ft./Lbs
0.38-16	5	30		0.50-13	8	110
0.44-14	5	50		0.63-11	5	150



PALADIN LIGHT CONSTRUCTION

Warranty Registration Form and Delivery Inspection Report

IMPORTANT! Warranty **Void** if card is not returned with 10 days.

All Applicable sections **must** be filled in.

This section to be filled out and signed by Dealer at time of delivery.

Warranty Registration

Customer's Name _____	Dealer's Name _____
Address _____	Address _____
City _____ State _____ Zip _____	City _____ State _____ Zip _____
Phone _____	CHECK ONE:
Loader / Tractor Model _____	Construction Use _____
Delivery Date _____	Agricultural Use _____
Model or Part # _____	Landscape Use _____
Serial # _____	Other: _____

Dealer Inspection *(check items applicable)*

- | | |
|---|---|
| <input type="checkbox"/> All Decals installed (see operator's manual) | <input type="checkbox"/> Review Operating and Safety Instructions |
| <input type="checkbox"/> Hydraulic fittings tight and free of leaks | <input type="checkbox"/> Guards and covers in place and secure |
| <input type="checkbox"/> Fasteners tight | <input type="checkbox"/> Does Product Function Properly |

I have thoroughly instructed the buyer on the above described equipment. This review included: The Operator's manual content, equipment care, adjustments, safe operation and applicable warranty policy.

Date _____ Dealer's Rep. signature _____

This section to be completed and signed by the customer

	1 Excellent	2 Good	3 Average	4 Unsatisfactory	5 Poor
QUALITY ASSURANCE RATING					
Question:		FFC		Local Dealer	
Quality of Product: Appearance		_____			
Construction		_____			
Quality of Service		_____		_____	
Value (Priced Fairly)		_____		_____	
Does it perform as claimed		_____			

The above described equipment and Operator's Manual have been received by me and I have been thoroughly instructed as to care, adjustments, safe operation and applicable warranty policy.

Date: _____ Owner's signature _____

NOTE! Make one copy each for the dealer's and owner's records. Mail original to FFC Attachments.



PALADIN LIGHT CONSTRUCTION

FFC LIMITED 12 MONTH WARRANTY

Thank you for purchasing a FFC product. Warranty protection is valid only when this Warranty Registration is completed and signed by the customer and dealer, and mailed to FFC. I hereby acknowledge that I have received a copy of the owners Limited Warranty and I accept the terms therein.

For a period of 12 months from date of delivery of product to the original user, FFC, warrants each product to be free from manufacturing defects, subject to the limitations contained in this policy.

This warranty does not apply to defect caused, in whole or in part, by unreasonable use while in the possession of the user, including, but not limited to: failure to properly set up product; failure to provide reasonable and necessary maintenance; normal wear; routine tune ups or adjustments; improper handling or accidents; operation at speed or load conditions contrary to published specification; improper or insufficient lubrication; improper storage. This warranty is also not a guarantee that the performance of each product will meet the expectations of the purchaser.

FFC shall not be liable for consequential damages of any kind, including, but not limited to: consequential labor costs or transportation charges in connection with the replacement or repair of defective parts; lost time or expense which may have accrued because of said defects. In no event shall FFC, Inc.'s total liability hereunder exceed the product purchase price.

FFC makes no warranty with respect to trade accessories or any component or accessory of the product which was not manufactured by FFC, including any purchased components on any kind. These are subject to the warranties of their respective manufacturers. The warranty will be considered void if the product or any part of the product is modified or repaired in any way not expressly authorized by FFC, or if closed components are disassembled prior to return. Closed components include, but are not limited to: gearboxes, hydraulic pumps, motors, cylinders, and actuators.

Our obligation under the warranty is expressly limited, at our option, to the replacement or repair at FFC, of Lee, Illinois, or at a service facility designated by us, or such part or parts as inspection shall disclosed to have been defective. We are not responsible for unauthorized repairs or replacements. Any implied or statutory warranties, including any warranty of merchantability or fitness for a particular purpose, are expressly limited to the duration of this written warranty. We make no other express or implied warranty, nor is anyone authorized to make any in our behalf. This warranty cannot be extended, broadened, or changed except in writing by an authorized officer of FFC.