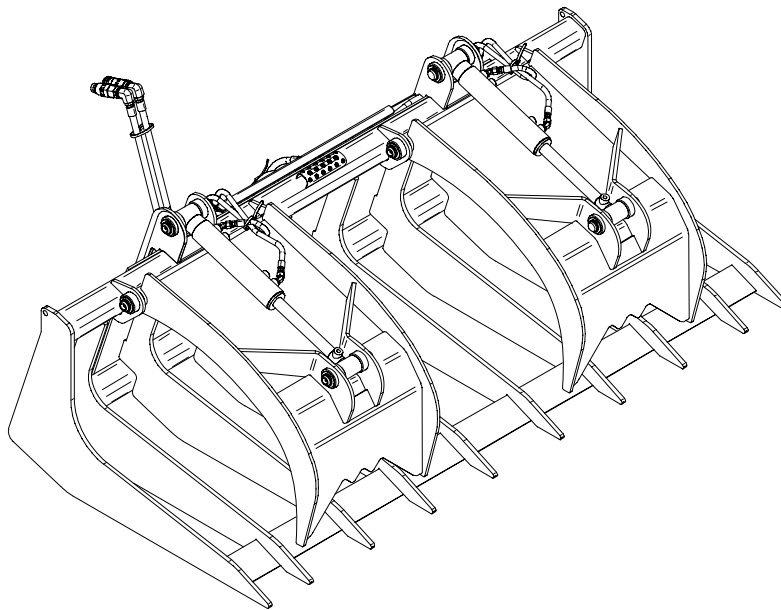




BTR & GP BRUSH GRAPPLE RAKES



PALADIN LIGHT CONSTRUCTION



FFC SERIAL NUMBER: _____

MACHINE SERIAL NUMBER: _____

Manual Number: 51-10000

Models:

**BTR: 10066, 10078, 10090; 10166, 10178, 10190;
GP: 10065, 10077; 10165, 10177.**

Optional Kits:

10050, 10150, LAF5000, LAF5001

Release Date: July 31, 2005

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Notes

Operation and Maintenance

BTR & GP Brush Grapple Rakes

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Introduction

Importance of this Manual



Read this manual before attempting to operate the equipment.

This operator's manual should be regarded as part of the attachment. Suppliers of both new and secondhand attachments are advised to keep documentation indicating that this manual was provided with the attachment.

The manual contains information regarding installation, operation and maintenance required for this attachment. It also includes detailed parts lists.

Purpose of the Rake

This attachment is designed solely for use in material handling. Use in any other way is considered contrary to the intended use. Compliance with the strict adherence to operation, service and repair conditions, as specified by the manufacturer, are also essential elements of the intended use.

This attachment should be operated, serviced and repaired only by persons who are familiar with its characteristics and acquainted with relevant safety procedures.

Accident prevention regulations, all other generally recognized safety regulations, and all road traffic regulations must be observed at all times.

Any modifications made to this attachment may relieve the manufacturer of liability for any resulting damage or injury.

Safety Alert Symbol



This safety alert symbol indicates important safety messages in this manual. When you see this symbol, be alert to the possibility of injury. Carefully read the message that follows and inform other operators.

Warranty

To validate the warranty for this unit, fill out the warranty card or warranty pages located at the back of this manual. Then, send this information to FFC.

Contacting FFC

If you have any questions about information in this manual or need to order parts, please call, write, fax or e-mail FFC:

FFC
100 East Lee Road
Lee, Illinois 60530
Phone: (800) 747-2132
FAX: (815) 824-2071
www.ffcattachments.com

For help with installation, operation or maintenance procedures, contact our Technical Service Department. Direct product questions and parts orders to our Sales Department.

When ordering parts or accessories, be prepared to give the following information:

- Attachment model number, serial number and date of purchase
- Prime mover, make and model
- Part number, description and quantity

Terms Used in Manual

Right-hand, left-hand, front and rear are determined from the operator's perspective (either the operator's seat or standing behind a walk-behind unit), facing forward in the normal operating position.

Prime mover refers to the vehicle on which this attachment is mounted.

Optional Equipment

Installation instructions for optional equipment, if applicable, appear in the Service Manual Section.

Specifications & Features

Due to continuous product improvement, specifications and features may change without notice.

Safety Information

Read this manual

Read all safety information in this manual. All operators must read and understand the entire contents of this manual before using this attachment. General safety practices are listed on Safety Information pages and specific safety information is located throughout this manual.

Hazard Definitions

Four hazard classifications are used in this manual.



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 property damage.

CAUTION - Used for instructions when machine damage may be involved.

Operation



CAUTION - Attachment material handling can result in potentially hazardous situations. Only fully trained operators under the close supervision of a fully trained person should use this attachment.

Before operating the attachment:

- Learn the prime mover controls.
- Check all hardware holding the attachment to the prime mover, making sure it is tight.
- Replace any damaged or fatigued hardware with properly rated fasteners. See Maintenance Section.
- Replace any damaged or excessively worn parts.
- Make sure all hardware and hydraulic fittings are tight.
- Replace any damaged or fatigued fittings or hoses.
- Make sure all persons operating the attachment know the maximum load permitted. See Specification Section.

- Check tire ratings to be sure they match the prime mover load. Weigh the attachment end of the prime mover with a full load, if necessary, to insure proper tire ratings.
- Be sure all persons not operating the attachment are clear of the work area.
- Always wear proper apparel such as safety glasses, goggles or a face shield.

While operating the attachment:

- When operating attachment, adhere to all government rules, local laws and other professional guidelines for your material handling application.
- Before leaving the operator's area for any reason - lower the attachment to the ground, stop the prime mover engine, set the parking brake and remove the key from the ignition.
- Only operate the attachment while you are in the operator's position of the prime mover. The safety restraints must be fastened while you operate the prime mover.
- Leave all shields and safety equipment in place when operating the attachment and prime mover.
- Be aware of the extra weight of a load and reduce travel speed accordingly.
- **THE GRAPPLE MOVES QUICKLY!** Do not allow anyone near the grapples.
- Never get between the grapple and the rake.
- Do not lift any load that is taller than the height of the fully opened grapple.
- Do not roll back this product so far that the load falls off toward or on the operator.
- Do not lift or transport personnel on attachment.
- Raise the load to the **minimum** height required for the terrain that must be crossed with the load.
- Operate the prime mover so that:
 - the load always remains level,
 - accelerating, turning, and braking are done very gradually,
 - and any obstacles, bumps, or holes in your intended path are avoided.
- Frequently check the load to make sure that the load has not become unstable.

SAFETY SECTION
GENERAL SAFETY INFORMATION

Service & Repair - General



CAUTION - Do not modify the attachment in any way. Personal injury could result. If you have questions, contact your dealer or FFC.

Repair or adjust the attachment in a safe area, away from traffic and other hazards.

Before adjusting or servicing - lower the attachment to the ground, set parking brake, shut down the prime mover and remove the key from the ignition.

When working on or around the attachment, safely secure it from falling or shifting.

Replace the parts if any of the following conditions are present:

- The end fittings are damaged or leaking.
- The outer covering is chafed or cut.
- The reinforcing wire layer is exposed.
- The outer covering is ballooning locally.
- The hose is kinked or crushed.
- The hoses have been pulled or stretched.

Make sure that all clamps, guards, and shields are installed correctly.

Service & Repair - Hydraulic Safety

CAUTION - Any Wheel Loader with a single cylinder dump circuit must install a Flow Control Device. This device is necessary to prevent the loader from dumping the attachment too fast and slamming against the stops. Failure to install a Flow Control Device on Wheel Loaders with a single cylinder dump circuit:

CAN result in damage to the power unit and **WILL** void all FFC warranties.

Stop the prime mover engine and release hydraulic pressure before servicing or adjusting attachment hydraulic systems.

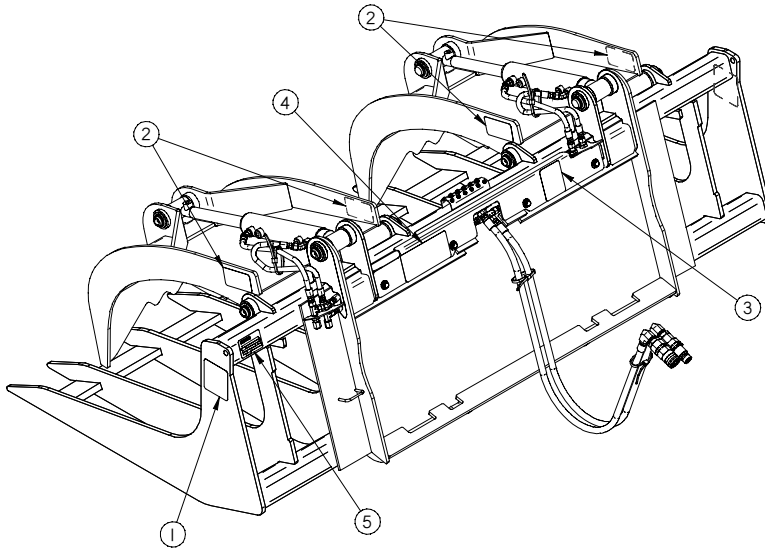


WARNING - Escaping hydraulic fluid can have enough pressure to penetrate the skin, causing serious personal injury.

Check lines, tubes and hoses carefully. Do not use your hand to check for leaks. Use a board or cardboard to check for leaks. Tighten all connections to the recommended torque. See Appendix.

Do not bend high pressure lines. Do not strike high pressure lines. Do not install bent lines, bent tubes, or kinked hoses. Do not install damaged lines, damaged tubes, or damaged hoses.

Repair loose lines, loose tubes, and loose hoses. Repair damaged lines, damaged tubes, and damaged hoses. Leaks can cause fires. See your FFC dealer for repair or replacement parts.



ITEM	QTY	PART #	DESCRIPTION
1	2	RDL3125	Crush
2	4	50-0737	Pinch Point
3	1	50-0725	Hydraulics
4	1	50-0723	Read Manual
5	1	RDL3254	Serial Tag

Placement or Replacement of Safety Signs

1. Clean the area of application with nonflammable solvent, and 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.

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.

Item 1



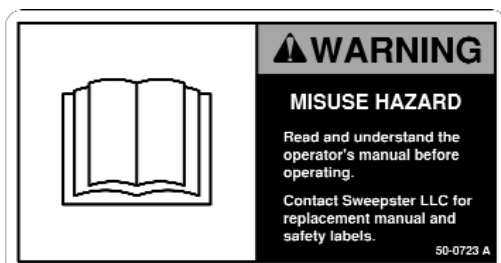
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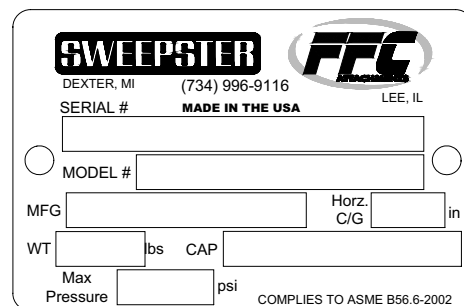
Item 3



Item 4



Item 5



OPERATION SECTION
MOUNTING & OPERATING TIPS

Operating Tips

Before each Use

Perform daily maintenance as indicated in the Maintenance Schedule.

Activate the attachment cylinder(s) with the prime mover at a slow idle. Check for hydraulic leaks or other problems and make corrections, if necessary, before using. See "Hydraulic Inspection Guidelines" (pg. 11).

During Use



WARNING - Avoid serious injury.

- **THE GRAPPLE MOVES QUICKLY!** Do not allow anyone near the grapples
- Never get between the grapple and the rake.
- Do not lift any load that is taller than the height of the fully opened grapple.
- Do not roll back this product so far that the load falls off toward or on the operator.

Positioning the Load

Approach the load so that the weight will be centered on the floor of the attachment. If the load has a heavy side, then that side should be closest to the rear of the rake rather than near the rake edge.

If the grapple is ever used as a rake to drag materials into a position for being picked up, **the grapple must be completely open**. Applying a raking-type force to the partially open grapple will greatly magnify the fluid pressure in the hydraulic hoses, fittings, and cylinders and may cause those components to fail.

CAUTION - **Using the partially open grapple as a rake CAN result in damage to this product and WILL void all FFC warranties!**

Make certain that the rake is completely under the load and make certain that the rake floor is level.

Close the grapple to the fullest extent possible.

Lift the load slightly and make sure that the load is secure. If the load appears to be unstable, lower the load, reposition the load to achieve full stability, and repeat above steps until full stability is achieved.

Transporting the Load



WARNING - Avoid serious injury.

- Raise the load to the **minimum** height required for the terrain that must be crossed with the load.
 - Operate the prime mover so that:
 - the load always remains level,
 - accelerating, turning, and braking are done very gradually,
 - and any obstacles, bumps, or holes in your intended path are avoided.
 - Frequently check the load to make sure that the load has not become unstable.
-

Rake Installation (Attachment to Prime Mover)



WARNING - Improper attachment of Rake could result in injury or death. Do not operate this product until you have positive indication that the attachment is securely mounted.

1. Position the attachment on a level surface.
2. Enter the prime mover.
3. Fasten the safety restraints.
4. Start the engine.
5. Disengage the parking brake.
6. Align the attachment mechanism with the mounting on the rake, attach to the prime mover. Follow the attaching procedure in the prime mover owners manual.
7. Engage the parking brake and shut down the prime mover. Be sure to relieve pressure to the auxiliary hydraulic lines.
8. Unfasten safety restraints and exit the prime mover.
9. Ensure that the hydraulic quick couplers are clean. Connect hydraulic lines for the attachment to the prime mover. Twist the collar of the quick couplers one quarter of a turn in order to secure hydraulic connections. Purchase proper couplers and hoses, as needed, and attach to the prime mover per the instructions in your prime movers' operators manual.
10. Carefully raise the loader and cycle the rollback / dump cylinders to check clearances, that limiting stops make proper contact and verify that all mounting procedures have been successfully completed. Contact FFC for instructions if the limiting stops do not contact properly.
11. 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.

12. While the loader arms are lowered, visually inspect the attachment mechanism to ensure that it is securely mounted.

Removing the Rake



WARNING - Serious injury or death may result from disengaging the attachment when the attachment is in an unstable position or carrying a load. Place the attachment in a stable position before disengaging.

CAUTION - Hoses for the attachment must be removed before the quick attach is disengaged. Pulling the attachment with the hoses could result in damage to the prime mover or the attachment.

1. Lower the attachment to the ground.
2. Engage the parking brake and shut down the prime mover. Be sure to relieve pressure to the auxiliary hydraulic lines.
3. Unfasten safety restraints and exit prime mover.
4. Disconnect the attachment hydraulic lines from the prime mover. Connect quick couplers together to keep clean.
5. Disengage attachment locking mechanism (mechanical type).
6. Enter prime mover, fasten safety restraints and start the prime mover.
7. Disengage attachment locking mechanism (hydraulic type).
8. Disengage the parking brake, and back away from the attachment.

Product Information

Specifications

	BTR Rake	G.P. Rake
Approx. Overall Length with No Mounting Ears (Mounting ears add approx. 8".)	39.6 inches	36.1 inches
Overall Width	10066 = 66-1/2 inches 10078 = 79 inches 10090 = 91 inches	10065 = 66-1/4 inches 10077 = 78-3/4 inches
Maximum Hydraulic Oil Pressure	4,000 psi	4,000 psi
Weight of Power Unit without BTR Rake	20,000 lbs. maximum	8,000 lbs. maximum
Operating Capacity of Power Unit's Loader	5,000 lbs. maximum	2,500 lbs. maximum
Lift Capacity of Power Unit's Loader or Static Tip Load Straight	10,000 lbs. maximum	5,000 lbs. maximum

Maintenance Schedule

Procedure	Before Each Use	After Each Use	100 Hours	500 Hours	See Prime Mover Manual
Fittings/hoses, hydraulic - Check for leaks/tighten - Check for damage	✓				
Fittings, zerk - Grease (See Lubrication Points)	✓				
Oil, hydraulic (Prime Mover) - Check level	✓	See Below for Requirements.			
Hardware - Check for tightness	✓				

Oil Cleanliness Requirements

IMPORTANT - All hydraulic fluid shall be filtered before use in any FFC product to obtain the ISO cleanliness standard of 20/18/15. Unless explicitly specified otherwise.

Fittings/Hoses Inspection Guideline

Stop the prime mover engine and release hydraulic pressure before servicing or adjusting hydraulic system.



WARNING - Escaping hydraulic fluid can have enough pressure to penetrate the skin, causing serious personal injury.

Do not bend high pressure lines. Do not strike high pressure lines. Do not install bent lines, bent tubes, or kinked hoses. Do not install damaged lines, damaged tubes, or damaged hoses.

Repair loose lines, loose tubes, and loose hoses. Repair damaged lines, damaged tubes, and damaged hoses. Leaks can cause fires. See your FFC dealer for repair or replacement parts.

Check lines, tubes, and hoses carefully. Do not use your hand to check for leaks. Use a board or cardboard to check for leaks. Tighten all connections to the recommended torque.

Replace the parts if any of the following conditions are present:

- The end fittings are damaged or leaking.
- The outer covering is chafed or cut.
- The reinforcing wire layer is exposed.
- The outer covering is ballooning locally.
- The hose is kinked or crushed.
- The hoses have been pulled or stretched.

Make sure that all clamps, guards, and shields are installed correctly.

Parts

BTR & GP Brush Grapple Rakes

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PARTS MANUAL
BTR RAKE**BTR Rake**
(Standard Models)

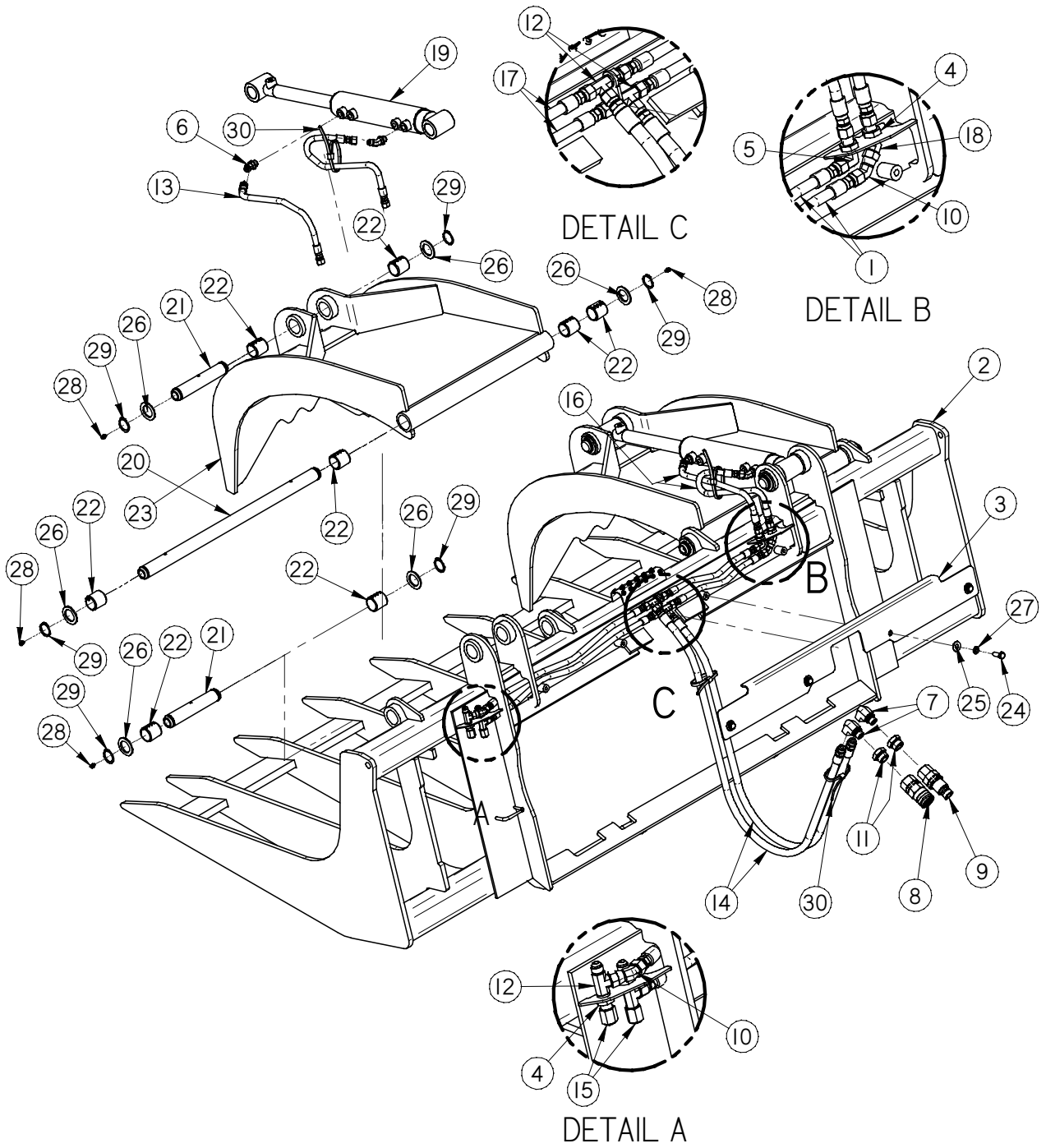
Ref.	Qty.	10066 66"	10078 78"	10090 90"	Description
1.	2	03-10019	03-10019	03-10019	Hose, 1/4 x 13.2", 100R2, 6FJ-6FJ
2.	1	13-50000	13-50011	13-50010	Weldment, Frame, BTR Rake
3.	1	13-50012	13-50012	13-50012	Hose Guard (varies by model)
4.	6	LAF4098	LAF4098	LAF4098	#6 Bulkhead Jam Nut .56-18
5.	1	LAF4157	LAF4157	LAF4157	90° Elbow Bulkhead 6MJ-6MJ w/o Nut
6.	4	LAF4246	LAF4246	LAF4246	45° Elbow 6MB-6MJ
7.	2	Contact FFC for correct item			Elbow, Hydraulic (not required on some models)
8.	1	Contact FFC for correct item			Quick Coupler, Hydraulic, Female End
9.	1	Contact FFC for correct item			Quick Coupler, Hydraulic, Male End
10.	2	LAF4261	LAF4261	LAF4261	45° Elbow 6MJ-6FJX
11.	2	Contact FFC for correct item			Adaptor, Hydraulic (not required on some models)
12.	4	LAF4275	LAF4275	LAF4275	Run Tee Bulkhead 6MJ
13.	2	LAF4302	LAF4302	LAF4302	Hose, 1/4 x 19", 6FJ-6FJ
14.	2	Contact FFC for correct item			Hose, Hydraulic
15.	2	LAF4483	LAF4483	LAF4483	6FJ Cap
16.	2	LAF4485	LAF4485	LAF4485	Hose, 1/4 x 17.25", 6FJ-6FJ
17.	2	LAF4486	LAF4486	LAF4486	Hose, 1/4 x 23.5", 6FJ-6FJ
18.	1	LAF4504	LAF4504	LAF4504	45° Elbow Bulkhead 6MJ
19.	2	LAF4796	LAF4796	LAF4796	Cylinder, Hydraulic
20.	2	LAF9387	LAF9387	LAF9387	Grapple Pivot Pin 1-1/4 x 24.06 (greasable/silver)
21.	4	LAF9388	LAF9388	LAF9388	Cylinder Pin 1-1/4 x 6.81 (greasable/silver)
22.	16	LAF9544	LAF9544	LAF9544	Split Bushing, 1.50 OD x 1.25 ID x 1.50
23.	2	Contact FFC for correct item			Weldment, Grapple
24.	4	RHW1205	RHW1205	RHW1205	Screw, Hex, Cap, 3/8-16 x 1, Gr5
25.	4	RHW5262	RHW5262	RHW5262	Washer, Flat, 3/8, Gr5, USS
26.	12	RHW5972	RHW5972	RHW5972	Bushing, Machinery, .135-1.25ID-1.88OD
27.	4	RHW6202	RHW6202	RHW6202	Washer, Lock, 3/8, Gr5
28.	8	RHW8090	RHW8090	RHW8090	Zerk, Grease, .1/4-28TPI, Self-Tapping
29.	12	RHW8167	RHW8167	RHW8167	Ring, Retaining, 1-1/4 External
30.	4	RMR5002	RMR5002	RMR5002	Nylon Cable Ties: 1/4" x 11" L, Black, Outdr.

OPTIONAL (LAF5001) CUSHION CYLINDER KIT:

19.	2	LAF4661	LAF4661	LAF4661	Cylinder, Hydraulic, Cushioned
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OPTIONAL (LAF5000) HARDENED PINS KIT:

20.	2	LAF9543	LAF9543	LAF9543	Grapple Pivot Pin 1-1/4 x 24.06 (greasable/yellow)
21.	4	LAF9542	LAF9542	LAF9542	Cylinder Pin 1-1/4 x 6.81 (greasable/yellow)

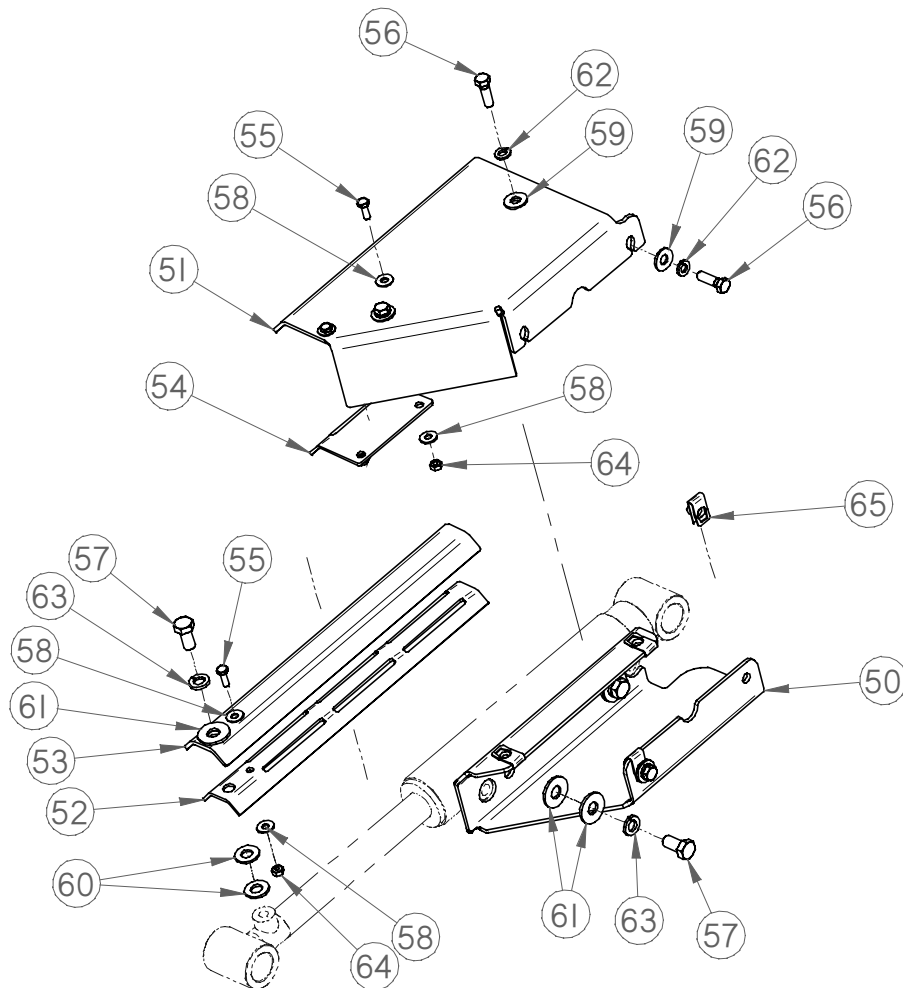


PARTS MANUAL
BTR RAKE**BTR Rake**
(Full Featured Models)

Ref.	Qty.	10166 66"	10178 78"	10190 90"	Description
1.	2	03-10019	03-10019	03-10019	Hose, 1/4 x 13.2", 100R2, 6FJ-6FJ
2.	1	13-50000	13-50011	13-50010	Weldment, Frame, BTR Rake
3.	1	13-50012	13-50012	13-50012	Hose Guard (varies by model)
4.	6	LAF4098	LAF4098	LAF4098	#6 Bulkhead Jam Nut .56-18
5.	1	LAF4157	LAF4157	LAF4157	90° Elbow Bulkhead 6MJ-6MJ w/o Nut
6.	4	LAF4246	LAF4246	LAF4246	45° Elbow 6MB-6MJ
7.	2	Contact FFC for correct item			Elbow, Hydraulic (not required on some models)
8.	1	Contact FFC for correct item			Quick Coupler, Hydraulic, Female End
9.	1	Contact FFC for correct item			Quick Coupler, Hydraulic, Male End
10.	2	LAF4261	LAF4261	LAF4261	45° Elbow 6MJ-6FJX
11.	2	Contact FFC for correct item			Adaptor, Hydraulic (not required on some models)
12.	4	LAF4275	LAF4275	LAF4275	Run Tee Bulkhead 6MJ
13.	2	LAF4302	LAF4302	LAF4302	Hose, 1/4 x 19", 6FJ-6FJ
14.	2	Contact FFC for correct item			Hose, Hydraulic
15.	2	LAF4483	LAF4483	LAF4483	6FJ Cap
16.	2	LAF4485	LAF4485	LAF4485	Hose, 1/4 x 17.25", 6FJ-6FJ
17.	2	LAF4486	LAF4486	LAF4486	Hose, 1/4 x 23.5", 6FJ-6FJ
18.	1	LAF4504	LAF4504	LAF4504	45° Elbow Bulkhead 6MJ
19.	2	LAF4661	LAF4661	LAF4661	Cylinder, Hydraulic, Cushioned
20.	2	LAF9543	LAF9543	LAF9543	Grapple Pivot Pin 1-1/4 x 24.06 (greasable/yellow)
21.	4	LAF9542	LAF9542	LAF9542	Cylinder Pin 1-1/4 x 6.81 (greasable/yellow)
22.	16	LAF9544	LAF9544	LAF9544	Split Bushing, 1.50 OD x 1.25 ID x 1.50
23.	2	Contact FFC for correct item			Weldment, Grapple
24.	4	RHW1205	RHW1205	RHW1205	Screw, Hex, Cap, 3/8-16 x 1, Gr5
25.	4	RHW5262	RHW5262	RHW5262	Washer, Flat, 3/8, Gr5, USS
26.	12	RHW5972	RHW5972	RHW5972	Bushing, Machinery, .135-1.25ID-1.88OD
27.	4	RHW6202	RHW6202	RHW6202	Washer, Lock, 3/8, Gr5
28.	8	RHW8090	RHW8090	RHW8090	Zerk, Grease, .1/4-28TPI, Self-Tapping
29.	12	RHW8167	RHW8167	RHW8167	Ring, Retaining, 1-1/4 External
30.	4	RMR5002	RMR5002	RMR5002	Nylon Cable Ties: 1/4" x 11" L, Black, Outdr.
50.	2	LAF9529	LAF9529	LAF9529	Cylinder Guard Bottom (varies by model)
51.	2	LAF9530	LAF9530	LAF9530	Cylinder Guard Top (varies by model)
52.	2	LAF9531	LAF9531	LAF9531	Cylinder Guard Liner
53.	2	LAF9532	LAF9532	LAF9532	Cylinder Guard
54.	2	LAF9533	LAF9533	LAF9533	Cylinder Cover Top Liner
55.	6	RHW1004	RHW1004	RHW1004	Screw, Hex, Cap, 1/4-20 x 3/4, Gr5
56.	8	RHW1207	RHW1207	RHW1207	Screw, Hex, Cap, 3/8-16 x 1-1/4, Gr5
57.	6	RHW1403	RHW1403	RHW1403	Screw, Hex, Cap, 1/2-13 x 1, Gr5
58.	12	RHW5062	RHW5062	RHW5062	Washer, Flat, 1/4, USS, Gr5
59.	8	RHW5262	RHW5262	RHW5262	Washer, Flat, 3/8, USS, Gr5
60.	4	RHW5432	RHW5432	RHW5432	Washer, Flat, 1/2, SAE, Gr5
61.	10	RHW5462	RHW5462	RHW5462	Washer, Flat, 1/2, USS, Gr5
62.	8	RHW6202	RHW6202	RHW6202	Washer, Lock, 3/8, Gr5
63.	6	RHW6402	RHW6402	RHW6402	Washer, Lock, 1/2, Gr5
64.	6	RHW7003	RHW7003	RHW7003	Nut, Lock, 1/4-20, Gr5
65.	8	RHW7210	RHW7210	RHW7210	Nut, U-Style Clip, 3/8-16

BTR GRAPPLE HOSE/CYLINDER GUARD KIT

Ref.	Qty.	10050	Description
50.	2	LAF9529	Cylinder Guard Bottom (varies by model)
51.	2	LAF9530	Cylinder Guard Top (varies by model)
52.	2	LAF9531	Cylinder Guard Liner
53.	2	LAF9532	Cylinder Guard
54.	2	LAF9533	Cylinder Cover Top Liner
55.	6	RHW1004	Screw, Hex, Cap, 1/4-20 x 3/4, Gr5
56.	8	RHW1207	Screw, Hex, Cap, 3/8-16 x 1-1/4, Gr5
57.	6	RHW1403	Screw, Hex, Cap, 1/2-13 x 1, Gr5
58.	12	RHW5062	Washer, Flat, 1/4, USS, Gr5
59.	8	RHW5262	Washer, Flat, 3/8, USS, Gr5
60.	4	RHW5432	Washer, Flat, 1/2, SAE, Gr5
61.	10	RHW5462	Washer, Flat, 1/2, USS, Gr5
62.	8	RHW6202	Washer, Lock, 3/8, Gr5
63.	6	RHW6402	Washer, Lock, 1/2, Gr5
64.	6	RHW7003	Nut, Lock, 1/4-20, Gr5
65.	8	RHW7210	Nut, U-Style Clip, 3/8-16

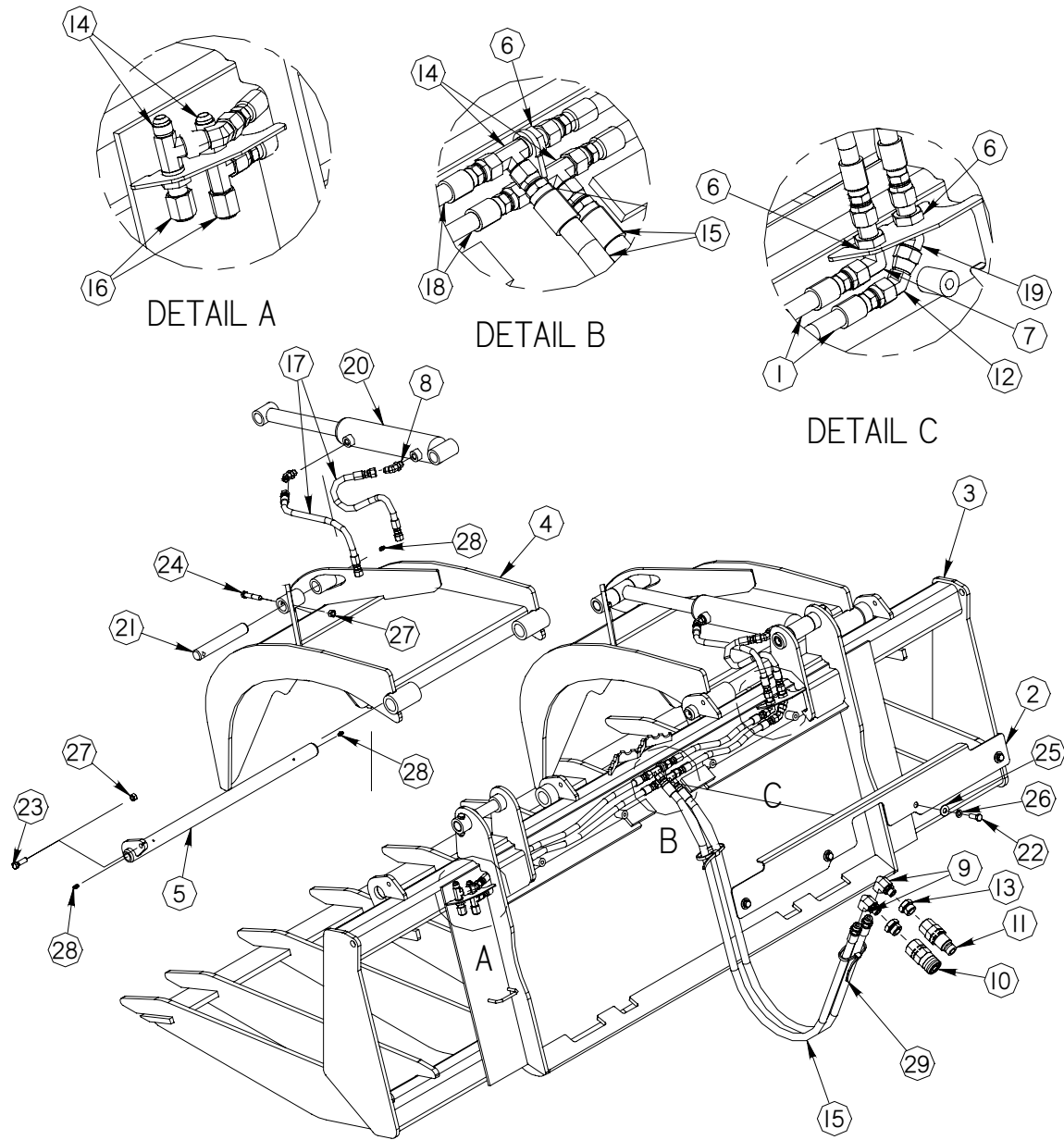


PARTS MANUAL
GP BRUSH GRAPPLE RAKE

GP Brush Grapple Rake (Standard Models)

Ref.	Qty.	10065 66"	10077 78"	Description
1.	2	03-10019	03-10019	Hose, 1/4 x 13.2", 100R2, 6FJ-6FJ
2.	1	13-50012	13-50012	Hose Guard (varies by model)
3.	1	13-51739	13-51710	Weldment, Frame, GP Rake
4.	2	13-51718	13-51718	Weldment, Grapple
5.	2	13-51724	13-51724	Weldment, Pivot Pin
6.	6	LAF4098	LAF4098	#6 Bulkhead Jam Nut .56-18
7.	1	LAF4157	LAF4157	90° Elbow Bulkhead 6MJ-6MJ w/o Nut
8.	4	LAF4246	LAF4246	45° Elbow 6MB-6MJ
9.	2		Contact FFC for correct item	Elbow, Hydraulic (not required on some models)
10.	1		Contact FFC for correct item	Quick Coupler, Hydraulic, Female End
11.	1		Contact FFC for correct item	Quick Coupler, Hydraulic, Male End
12.	2	LAF4261	LAF4261	45° Elbow 6MJ-6FJX
13.	2		Contact FFC for correct item	Adaptor, Hydraulic (not required on some models)
14.	4	LAF4275	LAF4275	Run Tee Bulkhead 6MJ
15.	2		Contact FFC for correct item	Hose, Hydraulic
16.	2	LAF4483	LAF4483	6FJ Cap
17.	4	LAF4485	LAF4485	Hose, 1/4 x 17.25", 6FJ-6FJ
18.	2	LAF4486	LAF4486	Hose, 1/4 x 23.5", 6FJ-6FJ
19.	1	LAF4504	LAF4504	45° Elbow Bulkhead 6MJ
20.	2	LAF4605	LAF4605	Cylinder, Hydraulic
21.	4	LAF9611	LAF9611	Pin 1 x 6.25 (greasable/silver)
22.	4	RHW1205	RHW1205	Screw, Hex, Cap, 3/8-16 x 1, Gr5
23.	2	RHW1207	RHW1207	Screw, Hex, Cap, 3/8-16 x 1-1/4, Gr5
24.	4	RHW1211	RHW1211	Screw, Hex, Cap, 3/8-16 x 2, Gr5
25.	4	RHW5262	RHW5262	Washer, Flat, 3/8, Gr5, USS
26.	4	RHW6202	RHW6202	Washer, Lock, 3/8, Gr5
27.	6	RHW7203	RHW7203	Nut, Lock, Center Dent, 38-16, Gr5
28.	6	RHW8090	RHW8090	Zerk, Grease, .1/4-28TPI, Self-Tapping
29.	4	RMR5002	RMR5002	Nylon Cable Ties: 1/4" x 11" L, Black, Outdr.

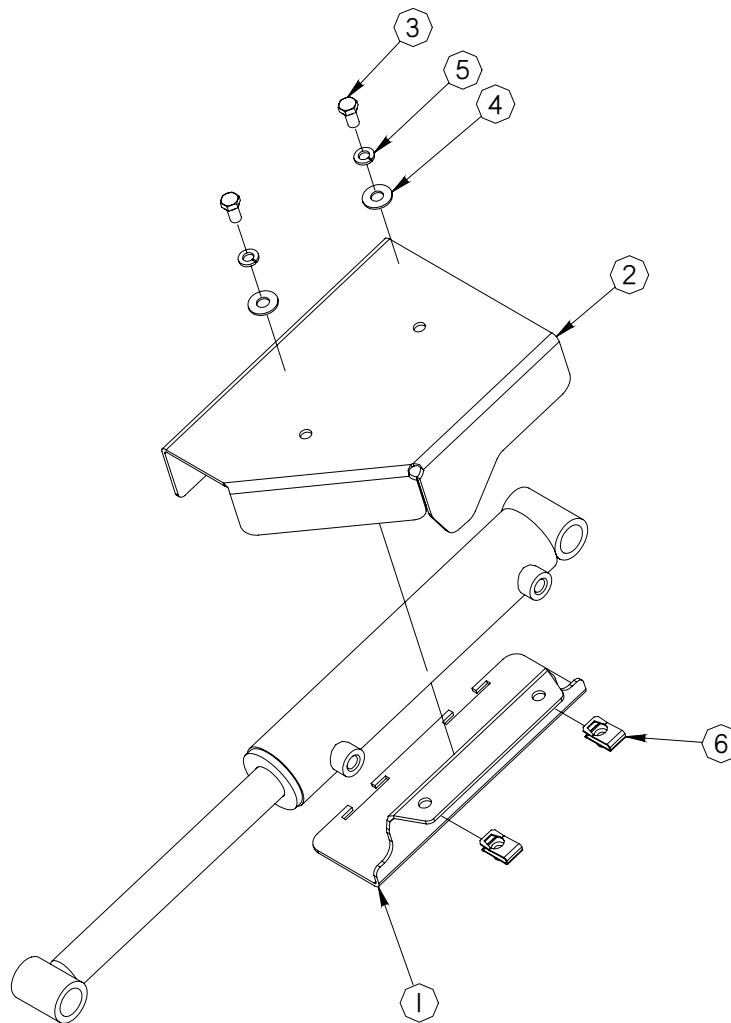
PARTS MANUAL
GP BRUSH GRAPPLE RAKE



PARTS MANUAL
GP GRAPPLE HOSE/CYL GUARD KIT

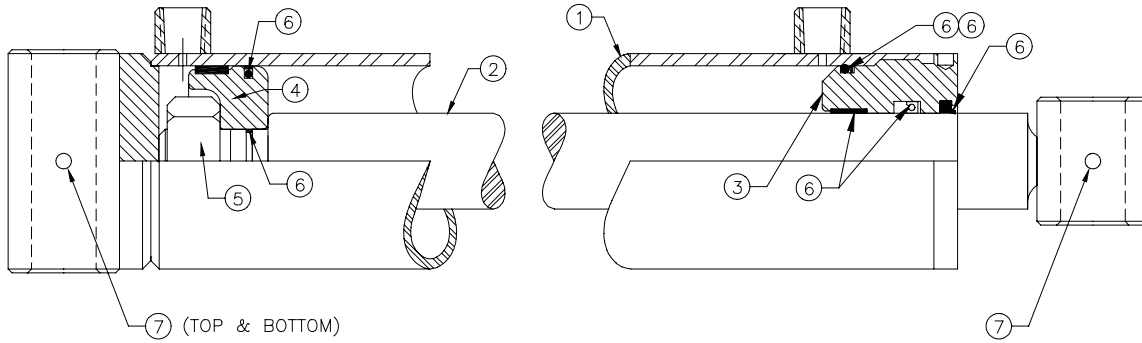
GP GRAPPLE HOSE/CYLINDER GUARD KIT*

Ref.	Qty.	10150	Description
1.	2	13-51730	Cylinder Cover Bottom
2.	2	13-51731	Cylinder Cover Top
3.	4	RHW1203	Screw, Hex, Cap, 3/8-16 x 1, Gr5
4.	4	RHW5262	Washer, Flat, 3/8, Gr5, USS
5.	4	RHW6202	Washer, Lock, 3/8, Gr5
6.	4	RHW7210	U-Style Clip Nut, 3/8-16 @ .75 in from edge



*Full Featured GP Models 10165 and 10177 include the above items.

HYDRAULIC CYLINDER ILLUSTRATION (LAF4605)

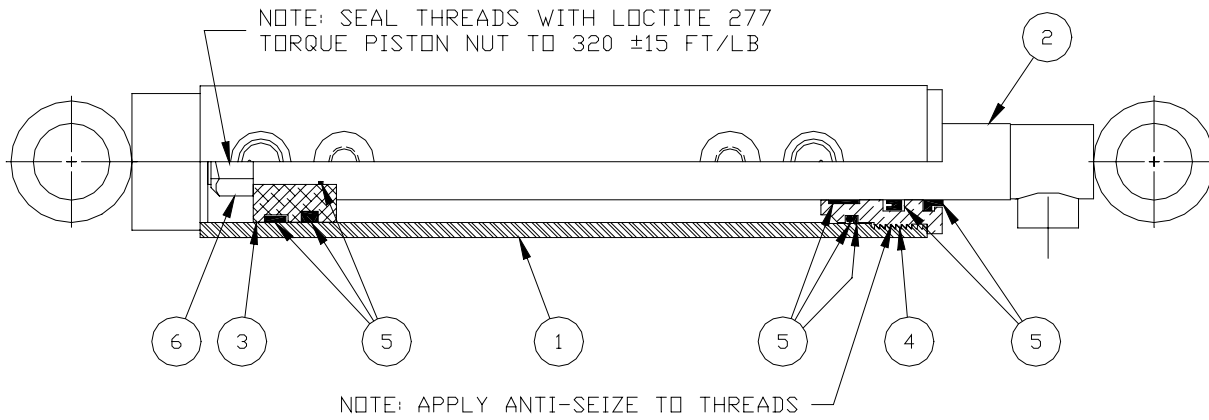


HYDRAULIC CYLINDER PARTS LIST

Ref.	Qty.	LAF4605	Description
1.	1	LAF4621	Barrel: 2" ID x 8" Stroke with Parallel Cross Tube End
2.	1	LAF4620	Shaft: 1-1/4" Dia. with Cross Tube End
3.	1	LAF4618	Piston: 2" OD
4.	1	LAF4619	Head: 2" OD, Nominal
5.	1	LAF4617	Seal Kit (includes all seals, o-rings, etc.)
6.	1	LAF4129	Piston Nut

PARTS MANUAL
HYDRAULIC CYLINDERS

HYDRAULIC CYLINDER ILLUSTRATION (LAF4796)

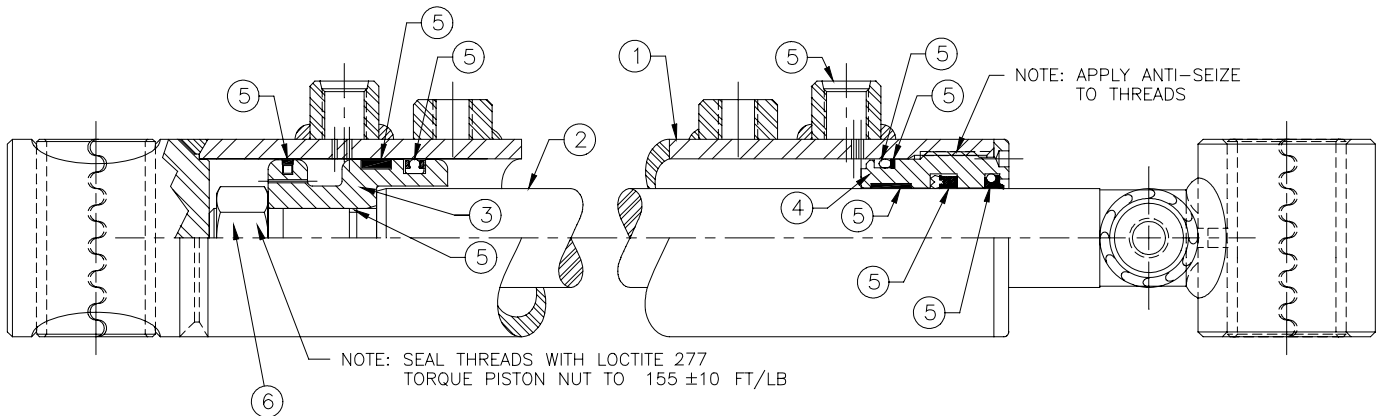


HYDRAULIC CYLINDERS PARTS LIST

Ref.	Qty.	LAF4796	LAF4661	Description
1.	1	LAF4801	LAF4662	Barrel: 2" ID x 8" Stroke with Parallel Cross Tube End
2.	1	LAF4800	LAF4663	Shaft: 1-1/4" Dia. with Cross Tube End
3.	1	LAF4618	LAF4664	Piston: 2" OD
4.	1	LAF4619	LAF4619	Head: 2" OD, Nominal
5.	1	LAF4617	LAF4617	Seal Kit (includes all seals, o-rings, etc.)
6.	1	LAF4802	LAF4129	Piston Nut

OPTIONAL (LAF5001) CUSHIONED CYLINDER KIT:

HYDRAULIC CYLINDER ILLUSTRATION (LAF4661)



OPTIONAL FLOW CONTROL KIT

IMPORTANT Any Wheel Loader with a single cylinder dump circuit must install a Flow Control Kit. This device is necessary to prevent the loader from dumping the attachment too fast and slamming against the stops. Failure to install a Flow Control Device on Wheel Loaders with a single cylinder dump circuit:

CAN result in damage to the power unit and
WILL void all FFC warranties.

Installation instructions listed below are only for models listed. Please contact your Loader's dealer for a Flow Control Device and installation instructions.

MODELS:

CASE 021D, 221D and 321D

NEW HOLLAND LW50.B, LW60.B, LW70.B and LW80.B

Action Required

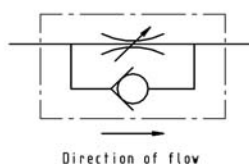
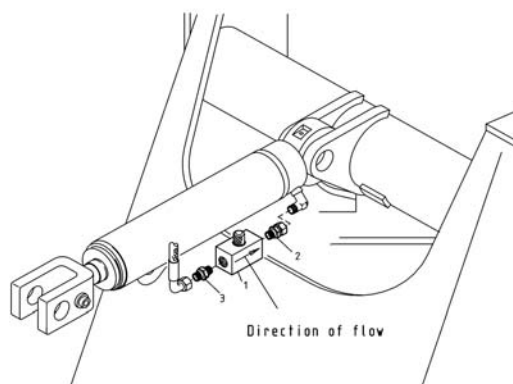
Install the Flow Restrictor Valve as shown below. The amount of flow restriction this valve provides is adjustable. Turning the knurled knob on the valve clockwise increases the flow restriction which reduces the speed of the bucket cylinder retraction. Turning the knurled knob counter-clockwise decreases the flow restriction which increases the speed of the bucket cylinder retraction. The bucket cylinder extension speed is not affected by this adjustment. After installation, adjust the valve so the attachment will not dump too fast and slam against the stops.

Parts Information

The Adjustable Flow Restrictor Valve Kit (FFC) part number is 03-10009 (Case part #424240A1).

This valve is made up of the following parts:

Item.	Qty.	Part No.	Designation
1	1	424239A1	Valve, Adjustable Flow Restrictor
2	1	421409A1	Union
3	1	420798A1	Union



Notes

Appendix

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APPENDIX
TORQUE SPECS.

Bolt Torque Specifications

Body Size Grade 5	Ft-lbs		Body Size Class 8.8	Ft-lbs
1/4 - 20	6 ± 1		M6 - 1.0	5 ± 1
- 28	7 ± 1		n/a	-
5/16 - 18	13 ± 3		n/a	-
- 24	14 ± 3		n/a	-
3/8 - 16	23 ± 5		M8 - 1.25	14 ± 3
- 24	26 ± 5		- 1.0	-
7/16 - 14	37 ± 8		M1 - 1.5	29 ± 6
- 20	41 ± 9		- 0.75	-
1/2 - 13	56 ± 11		M12 - 1.75	50 ± 10
- 20	63 ± 12		- 1.0	-
9/16 - 12	82 ± 14		M14 - 2.0	80 ± 14
- 18	91 ± 16		- 1.5	-
5/8 - 11	113 ± 20		M16 - 2.0	125 ± 22
- 18	127 ± 23		- 1.5	-
3/4 - 10	201 ± 26		n/a	-
- 16	223 ± 29		n/a	-
7/8 - 9	321 ± 41		M20 - 2.5	244 ± 31
- 14	355 ± 46		- 1.5	-
1 - 8	483 ± 62		M24 - 3.0	422 ± 54
- 12	528 ± 68		- 2.0	-

Body Size Grade 8	Ft-lbs		Body Size Class 10.9	Ft-lbs
1/4 - 20	9 ± 2		M6 - 1.0	8 ± 1
- 28	10 ± 2		n/a	-
5/16 - 18	18 ± 4		n/a	-
- 24	20 ± 4		n/a	-
3/8 - 16	32 ± 7		M8 - 1.25	20 ± 4
- 24	37 ± 8		- 1.0	-
7/16 - 14	52 ± 11		M1 - 1.5	40 ± 8
- 20	58 ± 12		- 0.75	-
1/2 - 13	80 ± 16		M12 - 1.75	69 ± 14
- 20	90 ± 18		- 1.0	-
9/16 - 12	115 ± 20		M14 - 2.0	110 ± 20
- 18	128 ± 23		- 1.5	-
5/8 - 11	159 ± 28		M16 - 2.0	173 ± 31
- 18	180 ± 32		- 1.5	-
3/4 - 10	282 ± 36		n/a	-
- 16	315 ± 41		n/a	-
7/8 - 9	454 ± 59		M20 - 2.5	337 ± 44
- 14	500 ± 65		- 1.5	-
1 - 8	681 ± 88		M24 - 3.0	583 ± 75
- 12	746 ± 97		- 2.0	-

Foot-pounds may be converted to Newton Meters by multiplying by 1.35582.

Foot-pounds may be converted to Inch-pounds by multiplying by 12.

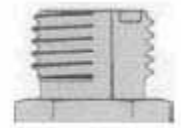
If the nut and screw are not the same grade, the lower grade will always be used.

NOTE - Nylock nuts are utilized when greater resistance to vibrating loose is required, and greater operating temperatures are not a factor. In addition, like lock nuts, nylock nuts have a safety feature that if the bolt does vibrate loose, the nut will remain on the screw. Install nylock nuts to the standard torque shown above.

Hydraulic Torque Specifications

Face Seal: Assembly, Tube to Fitting

NOTE - Face seal fittings have a very reliable sealing method and therefore, should be used whenever possible.



Installation

1. Make sure threads and sealing surfaces are free of burrs, nicks, scratches, or any foreign materials.
2. Install proper SAE o-ring to end of fitting if not already installed. Ensure o-ring is fully seated and retained properly.
3. Lubricate o-ring with a light coating of clean hydraulic oil.
4. Position tube and nut squarely on face seal of fitting and tighten nut finger tight.
5. Using appropriate torquing device, tighten to given torque rating from the table below.

Torque Values:

SAE Dash Size	Tube Side Thread Size	In-lbs	Ft-lbs
-4	9/16 - 18	220 ± 10	18 ± 1
-6	11/16 - 16	320 ± 25	27 ± 2
-8	13/16 - 16	480 ± 25	40 ± 2
-10	1 - 14	750 ± 35	63 ± 3
-12	1-3/16 - 12	1080 ± 45	90 ± 4
-16	1-7/16 - 12	1440 ± 90	120 ± 8
-20	1-11/16 - 12	1680 ± 90	140 ± 8
-24	2 - 12	1980 ± 100	165 ± 8

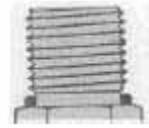
NOTE - ft-lbs may be converted to Newton Meters by multiplying by 1.35582.
NOTE - in-lbs may be converted to Newton Meters by multiplying by 0.11298.

APPENDIX
TORQUE SPECS.

Hydraulic Torque Specifications

Straight Thread O-ring Fitting: Assembly, Fitting to Port

NOTE - Straight thread o-ring fittings are utilized to adapt hydraulic systems to motors, pumps, cylinders, and valves.



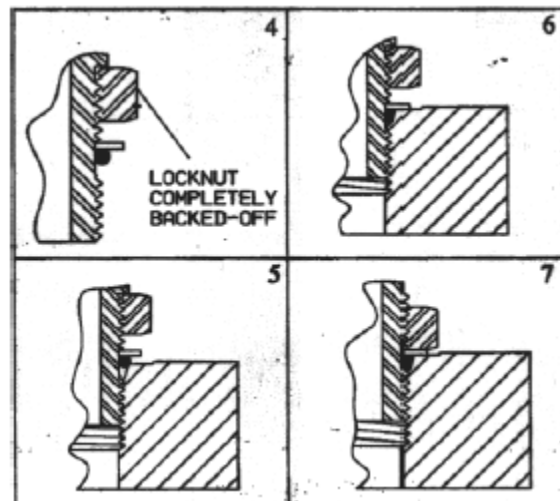
Installation (Adjustable Fitting)

1. Make sure thread and sealing surfaces are free of burrs, nicks, scratches, or any foreign materials.
2. Install proper SAE o-ring on port end of fitting if not already installed. Ensure o-ring is fully seated and retained properly.
3. Lubricate o-ring with a light coating of clean hydraulic oil.
4. Back off nut as far as possible and push washer up as far as possible (Figure 4 & 5).
5. Screw fitting into port. Hand tighten fitting until backup washer contacts face of port (Figure 6).
6. To position the fitting, unscrew to desired position, but not more than one full turn.
7. Hold fitting in position with wrench. Using appropriate torquing device, tighten nut to given torque rating from the table in section (Figure 7).

Torque Values

Fitting Size	SAE Port Thread Size	In - lbs	Ft - lbs
-4	7/16 - 20	190 ± 10	16 ± 1
-6	9/16 - 18	420 ± 15	35 ± 1
-8	3/4 - 14	720 ± 25	60 ± 2
-10	7/8 - 14	1260 ± 50	105 ± 5
-12	1-1/16 - 12	1680 ± 75	140 ± 6
-16	1-5/16 - 12	2520 ± 100	210 ± 8
-20	1-5/8 - 12	3100 ± 150	260 ± 12
-24	1-7/8 - 12	3800 ± 150	315 ± 12

Figures 4, 5, 6 and 7



NOTE - ft-lbs may be converted to Newton Meters by multiplying by 1.35582.

NOTE - in-lbs may be converted to Newton Meters by multiplying by 0.11298.

Hydraulic Torque Specifications

JIC 37° Flare Fitting: Assembly

NOTE - Do not over tighten this type of fitting.



Installation

1. Make sure threads and sealing surfaces are free of burrs, nicks, scratches, or any foreign materials.
2. Position fittings squarely and tighten nut finger tight.
3. Using appropriate torquing device, tighten to given torque rating from the table below.

Torque Values:

SAE Dash Size	Tube Side Thread Size	In-lbs	Ft-lbs
-4	7/16 - 20	140 ± 10	12 ± 1
-5	1/2 - 20	180 ± 15	15 ± 1
-6	9/16 - 18	250 ± 15	21 ± 1
-8	3/4 - 16	550 ± 25	45 ± 5
-10	7/8 - 14	700 ± 50	60 ± 5
-12	1-1/16 - 12	1000 ± 50	85 ± 5
-14	1-3/16 - 12	1250 ± 50	105 ± 5
-16	1-5/16 - 12	1450 ± 50	120 ± 5

NOTE - ft-lbs may be converted to Newton Meters by multiplying by 1.35582.

NOTE - in-lbs may be converted to Newton Meters by multiplying by 0.11298.

APPENDIX
GLOSSARY

attachment - a tool or machine that attaches to the prime mover to perform a special function.

carriage - the main frame of a Rake consisting of support for the teeth and prime mover mounting ears.

caution - indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.

danger - indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

F - female.

front - side that is in front when facing the normal forward direction of travel of the machine.

gpm - gallons per minute.

important - used for instructions when machine damage may be involved.

in. - inches.

kph - kilometers per hour.

lb - pounds.

left-hand - side that is on the left when facing the normal forward direction of travel of the machine.

load center - the point of a load where the maximum gravitational force occurs. Also called center of gravity.

M - male.

mph - miles per hour.

note - indicates supplementary information.

OR - o-ring.

psi - pounds per square inch.

prime mover - refers to the tractor, truck, loader or other vehicle to which a Rake is attached.

qty - quantity.

rpm - revolutions per minute.

rear - side that is in rear when facing the normal forward direction of travel of the machine.

right-hand - side that is on the right when facing the normal forward direction of travel of the machine.

warning - indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

zerk - grease fitting.



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.