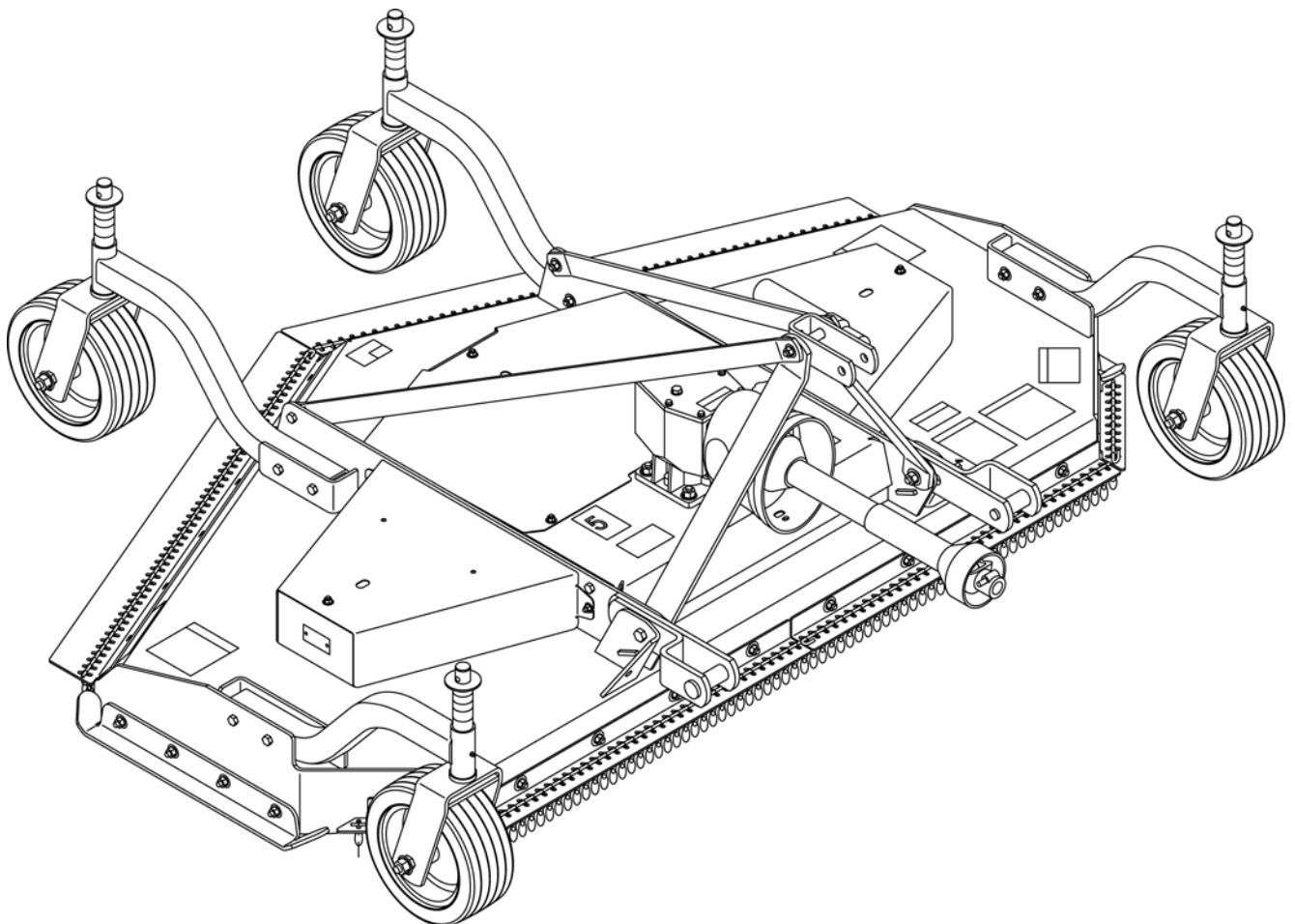


# GROOMING MOWERS

GM1190

Rear Discharge

Serial Number 1XFGM11XKB0000121 & Above



## TO THE DEALER:

Assembly and proper installation of this product is the responsibility of the Frontier dealer. Read manual instructions and safety rules. Make sure all items on the Dealer's Pre-Delivery and Delivery Check Lists in the Operator's Manual are completed before releasing equipment to the owner.

## TO THE OWNER:

Read this manual before operating your Frontier equipment. The information presented will prepare you to do a better and safer job. Keep this manual handy for ready reference. Require all operators to read this manual carefully and become acquainted with all the adjustment and operating procedures before attempting to operate. Replacement manuals can be obtained from your selling dealer.

The equipment you have purchased has been carefully engineered and manufactured to provide dependable and satisfactory use. Like all mechanical products, it will require cleaning and upkeep. Lubricate the unit as specified. Observe all safety information in this manual and safety decals on the equipment.

For service, your authorized Frontier dealer has trained mechanics, genuine Frontier service parts, and the necessary tools and equipment to handle all your needs.

Use only genuine Frontier service parts. Substitute parts will void the warranty and may not meet standards required for safe and satisfactory operation. Record the model number and serial number of your equipment in the spaces provided:

**Model:** \_\_\_\_\_ **Date of Purchase:** \_\_\_\_\_

**Serial Number: (see Safety Decal section for location)** \_\_\_\_\_

Provide this information to your dealer to obtain correct repair parts.

Throughout this manual, the term **NOTICE** is used to indicate that failure to observe can cause damage to equipment. The terms **CAUTION**, **WARNING** and **DANGER** are used in conjunction with the Safety-Alert Symbol, (a triangle with an exclamation mark), to indicate the degree of hazard for items of personal safety.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



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



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



Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

**IMPORTANT**  
or **NOTICE**

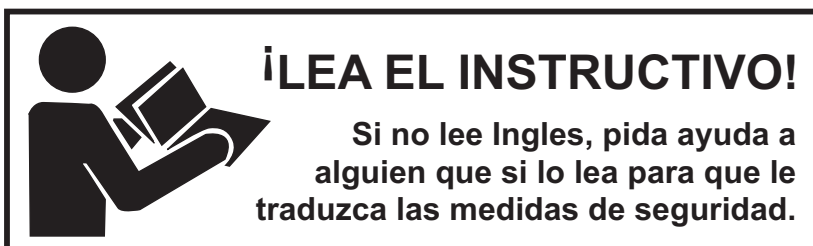
Is used to address practices not related to personal injury.

**NOTE**

Indicates helpful information.

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**This Operator's Manual should be regarded as part of the machine. Suppliers of both new and second-hand machines must make sure that this manual is provided with the machine.**

# SPECIFICATIONS

## GM1190

3-Point Hitch	Category 1 and 2
Cutting Width	90"
Cutting Height Range	1-1/2" - 7"
Operating Weight with Chain Shielding	1200 lbs
Blade Speed (feet per minute)	17,000
Blade Speed (RPM)	2,074
Blade Spindles	3
Number of Blades	6
Universal Drive Series	ASAE Cat. 4
Caster Wheels	13 x 5 x 10 Solid Rib Tire <b>-or-</b> 13 x 5 x 6 Pneumatic Tire
Tractor PTO Speed RPM	540
Recommended Maximum Tractor Horsepower	75HP
Mower Frame Thickness	5/16"

---

## GENERAL INFORMATION

 **WARNING**

■ **Some illustrations in this manual show the mower with safety shields removed to provide a better view. The mower should never be operated with any safety shielding removed.**

The purpose of this manual is to assist you in operating and maintaining your mower. Read it carefully. It furnishes information and instructions that will help you achieve years of dependable performance. These instructions have been compiled from extensive field experience and engineering data. Some information

may be general in nature, due to unknown and varying operating conditions. However, through experience and these instructions, you should be able to develop procedures suitable to your particular situation.

The illustrations and data used in this manual were current at the time of printing. However, due to possible inline production changes, your machine may vary slightly in detail. We reserve the right to redesign and change the machines as may be necessary without notification.

Throughout this manual, references are made to right and left directions. These are determined by standing behind the tractor facing the direction of forward travel.

# SAFETY RULES



**ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**



Safety is a primary concern in the design and manufacture of our products. Unfortunately, our efforts to provide safe equipment can be wiped out by an operator's single careless act.

In addition to the design and configuration of equipment, hazard control and accident prevention are dependent upon the awareness, concern, judgement, and proper training of personnel involved in the operation, transport, maintenance and storage of equipment.

It has been said "The best safety device is an informed, careful operator." We ask you to be that kind of operator.

## **TRAINING**

- Safety instructions are important! Read all attachment and power unit manuals; follow all safety rules and safety decal information. (Replacement manuals and safety decals are available from your dealer.) Failure to follow instructions or safety rules can result in serious injury or death.
- Know your controls and how to stop engine and attachment quickly in an emergency.
- If you do not understand any part of this manual and need assistance, see your dealer.
- Operators must be instructed in and be capable of the safe operation of the equipment, its attachments, and all controls. Do not allow anyone to operate this equipment without proper instructions.
- Never allow children or untrained persons to operate equipment.

## **PREPARATION**

- Check that all hardware is properly installed. Always tighten to torque chart specifications unless instructed otherwise in this manual.
- Always wear relatively tight and belted clothing to avoid getting caught in moving parts. Wear sturdy, rough-soled work shoes and protective equipment for eyes, hair, hands, hearing, and head; and respirator or filter mask where appropriate.
- Make sure attachment is properly secured, adjusted, and in good operating condition.
- Make sure spring-activated locking pin or collar slides freely and is seated firmly in tractor PTO spline groove.
- If equipped with driveline guard tether chains, make sure they are attached to the tractor and

equipment as shown in the pamphlet that accompanies the driveline. Replace if damaged or broken. Check that driveline guards rotate freely on driveline before putting equipment into service.

- Before starting the power unit, check all equipment driveline guards for damage. Replace any damaged guards. Make sure all guards rotate freely on all drivelines. If guards do not rotate freely on drivelines, repair and replace bearings before putting equipment into service.
- Power unit must be equipped with ROPS or ROPS cab and seat belt. Keep seat belt securely fastened. Falling off power unit can result in death from being run over or crushed. Keep foldable ROPS system in "locked up" position at all times.
- Remove accumulated debris from this equipment, power unit, and engine to avoid fire hazard.
- Make sure all safety decals are installed. Replace if damaged. (See Safety Decals section for location.)
- Make sure shields and guards are properly installed and in good condition. Replace if damaged.
- A minimum 25% of tractor and equipment weight must be on the tractor front wheels when attachments are in transport position. Without this weight, tractor could tip over, causing personal injury or death. The weight may be attained with a loader. Weigh the tractor and equipment. Do not estimate.

## **OPERATION**

- Full chain shielding must be installed when operating in populated areas or other areas where thrown objects could injure people or damage property.
  - If this machine is not equipped with full chain shielding, operation must be stopped when anyone comes within 300 feet (92 m).
  - This shielding is designed to reduce the risk of thrown objects. The mower deck and protective devices cannot prevent all objects from escaping the blade enclosure in every mowing condition. It is possible for objects to ricochet and escape, traveling as much as 300 feet (92 m).
- Inspect and clear area of stones, branches, or other hard objects that might be thrown, causing injury or damage.
- Never direct discharge toward people, animals, or property.

# SAFETY RULES



**ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**



- Keep bystanders away from equipment.
- Do not operate or transport equipment while under the influence of alcohol or drugs.
- Operate only in daylight or good artificial light.
- Keep hands, feet, hair, and clothing away from equipment while engine is running. Stay clear of all moving parts.
- Always comply with all state and local lighting and marking requirements.
- Never allow riders on power unit or attachment.
- Always sit in power unit seat when operating controls or starting engine. Securely fasten seat belt, place transmission in neutral, engage brake, and ensure all other controls are disengaged before starting power unit engine.
- Operate tractor PTO at 540 RPM. Do not exceed.
- Look down and to the rear and make sure area is clear before operating in reverse.
- Do not operate or transport on steep slopes.
- Do not stop, start, or change directions suddenly on slopes.
- Use extreme care and reduce ground speed on slopes and rough terrain.
- Watch for hidden hazards on the terrain during operation.
- Stop power unit and implement immediately upon striking an obstruction. Dismount power unit, using proper procedure. Inspect and repair any damage before resuming operation.

## TRANSPORTATION

- Use additional caution and reduce speed when under adverse surface conditions, turning, or on inclines.
- Do not operate PTO during transport.
- A minimum 25% of tractor and equipment weight must be on the tractor front wheels when attachments are in transport position. Without this weight, tractor could tip over, causing personal injury or death. The weight may be attained with a loader. Weigh the tractor and equipment. Do not estimate.
- Do not operate or transport on steep slopes.
- Do not operate or transport equipment while under the influence of alcohol or drugs.
- Always comply with all state and local lighting and marking requirements.

- Never allow riders on power unit or attachment.

## MAINTENANCE

- Before working underneath, carefully read Operator's Manual instructions, disconnect driveline, raise mower, securely block up all corners with jackstands, and check stability. Secure blocking prevents equipment from dropping due to hydraulic leak down, hydraulic system failures, or mechanical component failures.
- Do not modify or alter or permit anyone else to modify or alter the equipment or any of its components in any way.
- Always wear relatively tight and belted clothing to avoid getting caught in moving parts. Wear sturdy, rough-soled work shoes and protective equipment for eyes, hair, hands, hearing, and head; and respirator or filter mask where appropriate.
- Make sure attachment is properly secured, adjusted, and in good operating condition.
- Keep all persons away from operator control area while performing adjustments, service, or maintenance.
- Make certain all movement of equipment components has stopped before approaching for service.
- Never go underneath equipment (lowered to the ground or raised) unless it is properly blocked and secured. Never place any part of the body underneath equipment or between moveable parts even when the engine has been turned off. Hydraulic system leak down, hydraulic system failures, mechanical failures, or movement of control levers can cause equipment to drop or rotate unexpectedly and cause severe injury or death. Follow Operator's Manual instructions for working underneath and blocking requirements or have work done by a qualified dealer.
- Frequently check blades. They should be sharp, free of nicks and cracks, and securely fastened.
- Do not handle blades with bare hands. Careless or improper handling may result in serious injury.
- Your dealer can supply genuine replacement blades. Substitute blades may not meet original equipment specifications and may be dangerous.
- Tighten all bolts, nuts, and screws to torque chart specifications. Check that all cotter pins are

# SAFETY RULES



**ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**



installed securely to ensure equipment is in a safe condition before putting unit into service.

■ Make sure all safety decals are installed. Replace if damaged. (See Safety Decals section for location.)

■ Make sure shields and guards are properly installed and in good condition. Replace if damaged.

■ Wear gloves when installing belt. Be careful to prevent fingers from being caught between belt and pulley.

■ Use care when installing or removing belt from spring-loaded idler. Springs store energy when extended and, if released suddenly, can cause personal injury.

## STORAGE

■ Follow manual instructions for storage.

■ Keep children and bystanders away from storage area.



# SAFETY & INSTRUCTIONAL DECALS



**ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**  
**Replace Immediately If Damaged!**



**! DANGER**



**ROTATING BLADES AND  
THROWN OBJECTS**

- Do not put hands or feet under or into mower when engine is running.
- Before mowing, clear area of objects that may be thrown by blade.
- Keep bystanders away.
- Keep guards in place and in good condition.

**BLADE CONTACT OR THROWN OBJECTS CAN  
CAUSE SERIOUS INJURY OR DEATH.**

15503-C

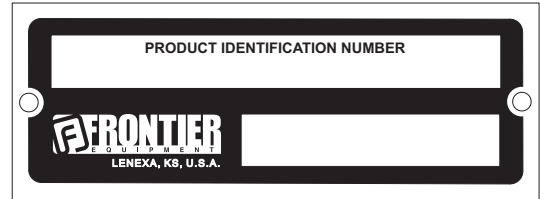
6 - 5WP15503

**! DANGER**

**SHIELD MISSING**  
DO NOT OPERATE  
PUT SHIELD ON

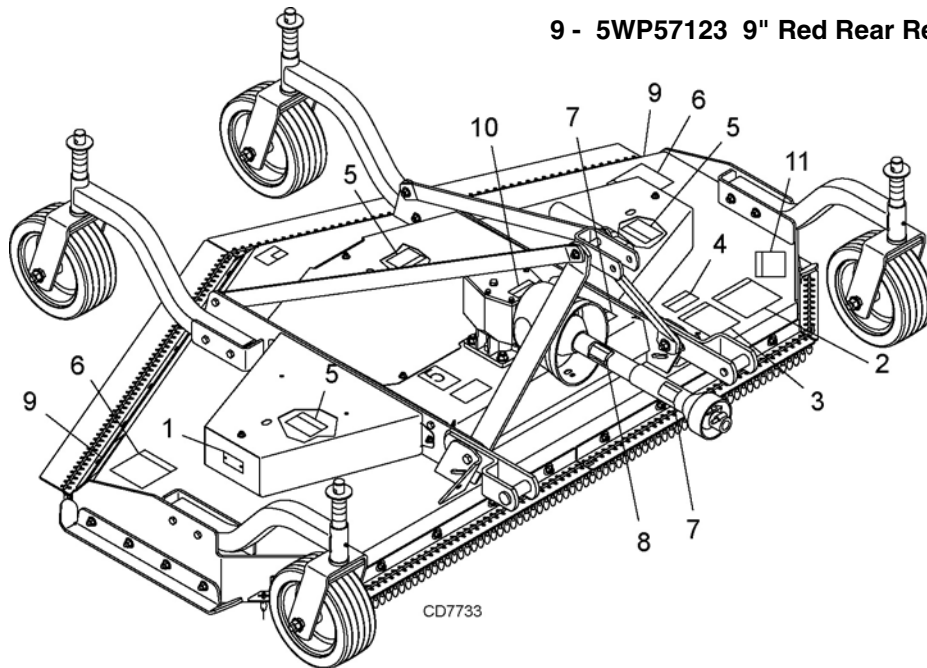
18867-B

5 - 5WP18867



1 - Serial Number Plate

9 - 5WP57123 9" Red Rear Reflector



## BE CAREFUL!

Use a clean, damp cloth to clean safety decals.

Avoid spraying too close to decals when using a pressure washer; high-pressure water can enter through very small scratches or under edges of decals causing them to peel or come off.

Replacement safety decals can be ordered free from your dealer.





# SAFETY & INSTRUCTIONAL DECALS

**ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**



**Replace Immediately If Damaged!**

**⚠ WARNING**

**DO NOT EXCEED PTO SPEED OF  
540 RPM**

PTO speeds higher than 540 RPM can cause equipment failure and personal injury.

18866-D

4 - 5WP18866

**⚠ DANGER**



**ROTATING DRIVELINE  
CONTACT CAN CAUSE DEATH  
KEEP AWAY!**

**DO NOT OPERATE WITHOUT -**

- All driveline guards, tractor and equipment shields in place
- Drivelines securely attached at both ends
- Driveline guards that turn freely on driveline

18864-C

7 - 5WP18864

3 - 5WP18877

**⚠ WARNING**

**TO AVOID SERIOUS  
INJURY OR DEATH:**

- Read Operator's Manual (available from dealer) and follow all safety precautions.
- Keep all shields in place and in good condition.
- Operate mower from tractor seat only.
- Lower mower, stop engine and remove key before dismounting tractor.
- Allow no children or untrained persons to operate equipment.
- Do not transport towed or semi-mounted units over 20 mph.

**FAILURE TO OPERATE SAFELY  
CAN RESULT IN  
INJURY OR DEATH.**

18877-C

8 - 5WP33347

**⚠ DANGER**



**GUARD MISSING.  
DO NOT OPERATE.**

**⚠ DANGER**

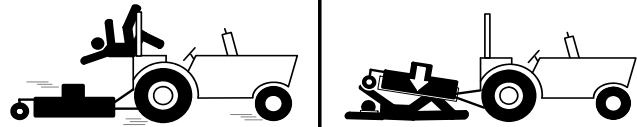


**GUARD MISSING.  
DO NOT OPERATE.**

33347E

**⚠ DANGER**

**⚠ WARNING**



**FALLING OFF CAN RESULT IN BEING RUN OVER.**

- Tractor must be equipped with ROPS (or ROPS CAB) and seat belt. Keep foldable ROPS systems in "locked up" position at all times.
- Buckle Up! Keep seat belt securely fastened.
- Allow no riders.

**RAISED EQUIPMENT CAN DROP AND CRUSH.**

- Before working underneath, follow all instructions and safety rules in operator's manual and securely block up all corners of equipment with jack stands.
- Securely blocking prevents equipment dropping from hydraulic leak-down, hydraulic system failures or mechanical component failures.

**FALLING OFF OR FAILING TO BLOCK SECURELY CAN  
RESULT IN SERIOUS INJURY OR DEATH.**

18865-C

2 - 5WP18865

**⚠ DANGER**

If shaft connection is visible, shield is missing. Replace shield before operating equipment.

1004114

10 - 5WP1004114

11 - 5WP1003751

**⚠ WARNING**



**CRUSHING AND PINCHING HAZARD**

- Be extremely careful handling various parts of the machine. They are heavy and hands, fingers, feet, and other body parts could be crushed or pinched between tractor and implement.
- Operate tractor controls from tractor seat only.
- Do not stand between tractor and implement when tractor is in gear.
- Make sure parking brake is engaged before going between tractor and implement.
- Stand clear of machine while in operation or when it is being raised or lowered.

**FAILURE TO FOLLOW THESE  
INSTRUCTIONS COULD RESULT IN  
SERIOUS INJURY OR DEATH.**

1003751-A

# OPERATION

The operator is responsible for the safe operation of the mower. The operator must be properly trained. Operators should be familiar with the mower, the tractor, and all safety practices before starting operation. Read the safety rules and safety decals on pages 5 to 9.

This mower is designed for light brush shredding and grass mowing. It is especially useful in cane, berry, grape and vegetable crops for mowing and shredding prunings.

Recommended mowing speed for most conditions is from 2 to 5 mph.

## **⚠ DANGER**

■ Full chain shielding must be installed when operating in populated areas or other areas where thrown objects could injure people or damage property.

- If this machine is not equipped with full chain shielding, operation must be stopped when anyone comes within 300 feet (92 m).
- This shielding is designed to reduce the risk of thrown objects. The mower deck and protective devices cannot prevent all objects from escaping the blade enclosure in every mowing condition. It is possible for objects to ricochet and escape, traveling as much as 300 feet (92 m).

## **⚠ WARNING**

- Never allow children or untrained persons to operate equipment.
- Keep bystanders away from equipment.
- Make sure spring-activated locking pin or collar slides freely and is seated firmly in tractor PTO spline groove.
- Before working underneath, carefully read Operator's Manual instructions, disconnect driveline, raise mower, securely block up all corners with jackstands, and check stability. Secure blocking prevents equipment from dropping due to hydraulic leak down, hydraulic system failures, or mechanical component failures.
- Keep all persons away from operator control area while performing adjustments, service, or maintenance.

## **⚠ CAUTION**

■ Stop power unit and implement immediately upon striking an obstruction. Dismount power unit, using proper procedure. Inspect and repair any damage before resuming operation.

## **⚠ CAUTION**

■ Always wear relatively tight and belted clothing to avoid getting caught in moving parts. Wear sturdy, rough-soled work shoes and protective equipment for eyes, hair, hands, hearing, and head; and respirator or filter mask where appropriate.

## **TRACTOR STABILITY**

## **⚠ WARNING**

■ A minimum 25% of tractor and equipment weight must be on the tractor front wheels when attachments are in transport position. Without this weight, tractor could tip over, causing personal injury or death. The weight may be attained with a loader. Weigh the tractor and equipment. Do not estimate.

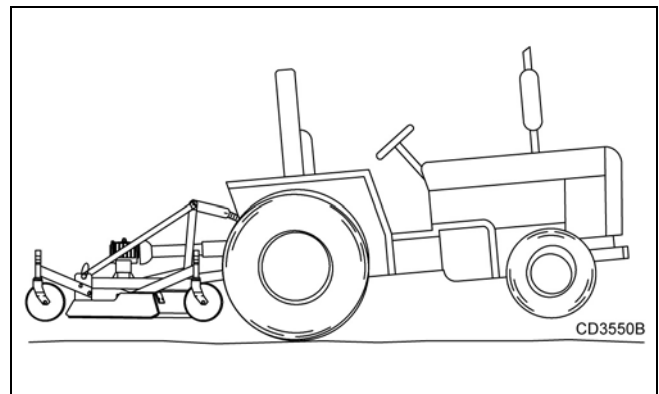


Figure 1. Tractor Stability

## **ATTACHING MOWER TO TRACTOR**

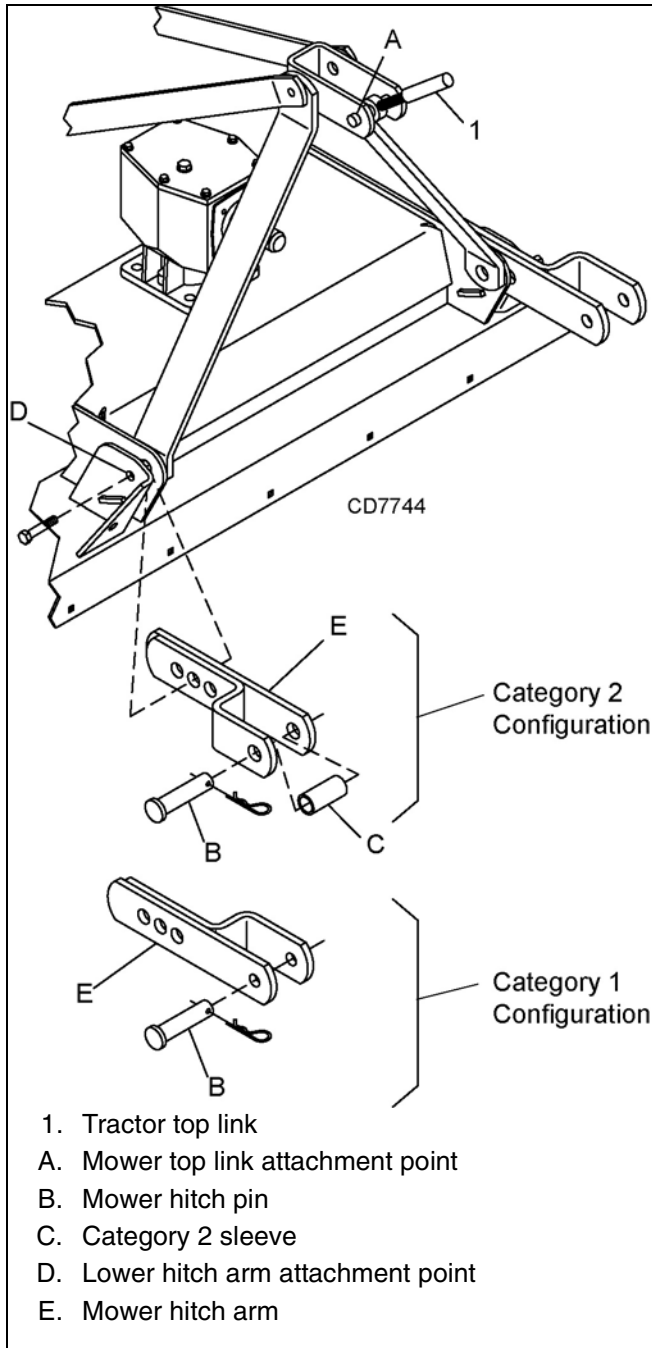
## **⚠ WARNING**

■ Make sure spring-activated locking pin or collar slides freely and is seated firmly in tractor PTO spline groove.

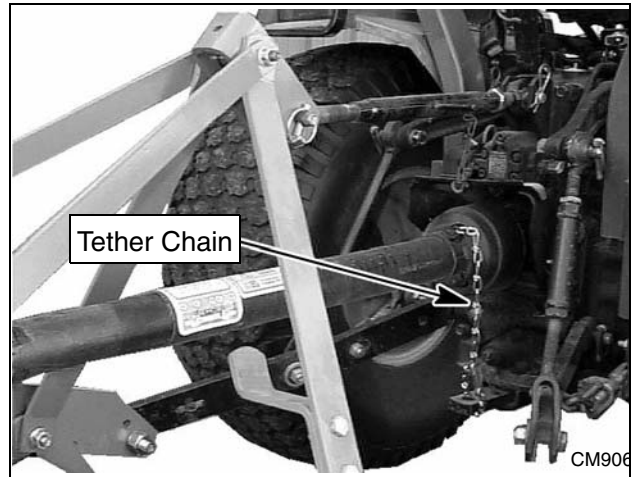
The standard 1-3/8" 6B-spline driveline with a QD yoke is used to connect the mower to the tractor.

## Refer to Figure 2

1. For Category 1 hitch, position mower hitch arms (E) with offset toward center of mower. For Category 2 hitch, position mower hitch arms (E) with offset toward outside of mower.
2. Attach the mower hitch pins (B) to lower tractor lift arms and secure.
3. Attach tractor top link (1) to mower top link bracket attachment point A. Connect driveline to tractor PTO shaft.



**Figure 2.** Attachment Points



**Figure 3.** Attaching Mower to Tractor

4. Attach tether chain to tractor drawbar if drive equipped with chain, (Figure 3).
5. Adjust the tractor lower 3-point arm anti-sway devices to prevent mower from swinging side to side during transport.

## **CUTTING HEIGHT ADJUSTMENT**

### **⚠ WARNING**

- Keep all persons away from operator control area while performing adjustments, service, or maintenance.

### **NOTICE**

- Avoid low cutting heights. Striking the ground with blades produces one of the most damaging shock loads a mower can encounter. Allowing blades to contact ground repeatedly will cause damage to mower and drive.

1. Level mower from side to side. Check by measuring from mower frame to the ground at each deck rail.
2. Verify that the same amount of spacers are under all caster arms.
3. Loosen cap screws that attach caster arm assembly to deck.
4. Set mower on the ground.
5. Retighten cap screws. This equalizes the clearance in the bolt holes.
6. Adjust front of mower level with or slightly lower than the rear to obtain best mowing results. See Figure 4.
7. Control cutting height by adjusting front and rear caster wheels.
8. To raise rear of mower, move caster adjustment spacers under rear caster arms. See Figure 6.

9. To raise front of mower, move spacers under front caster wheel arms.

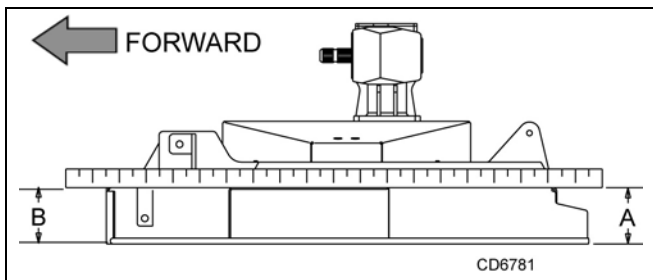


Figure 4. Cutting Height Adjustment

Remember, measurement at location A (Figure 4) should not be less than location B and should not be over 1/2" greater than location B.

Spacers under caster arm pivot tube				
Cut Height	Axle Position	1/2" Spacer	3/4" Spacer	1" Spacer
1-1/2"	A			
2"	A	1		
2-1/2"	A			1
3"	A	1		1
3-1/2"	A			2
4"	A	1		2
4-1/2"	A	2		2
5"	A		2	2
5-1/2"	A	1	2	2
6"	A	2	2	2
6-1/2"	B	1	2	2
7"	B	2	2	2

Figure 5. Cutting Height Chart

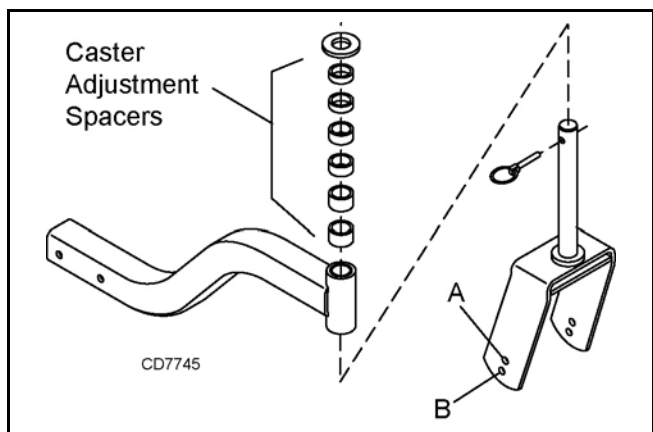


Figure 6. Height Adjustment with Caster Arm Spacers

## TRACTOR TOP LINK ADJUSTMENT

When the cutting height is set, adjust tractor top link until mower top link attachment point (A) is aligned vertically with mower hitch pin (B), Figure 7.

Adjust tractor top link so mower is level between caster wheel and ground (dimension C), Figure 8. This will allow the mower to follow ground contour.

The mower has three lower hitch plate attachment points (D), Figure 7. It may be necessary to change the mower hitch plate attachment point to obtain proper tire clearance and/or lift height.

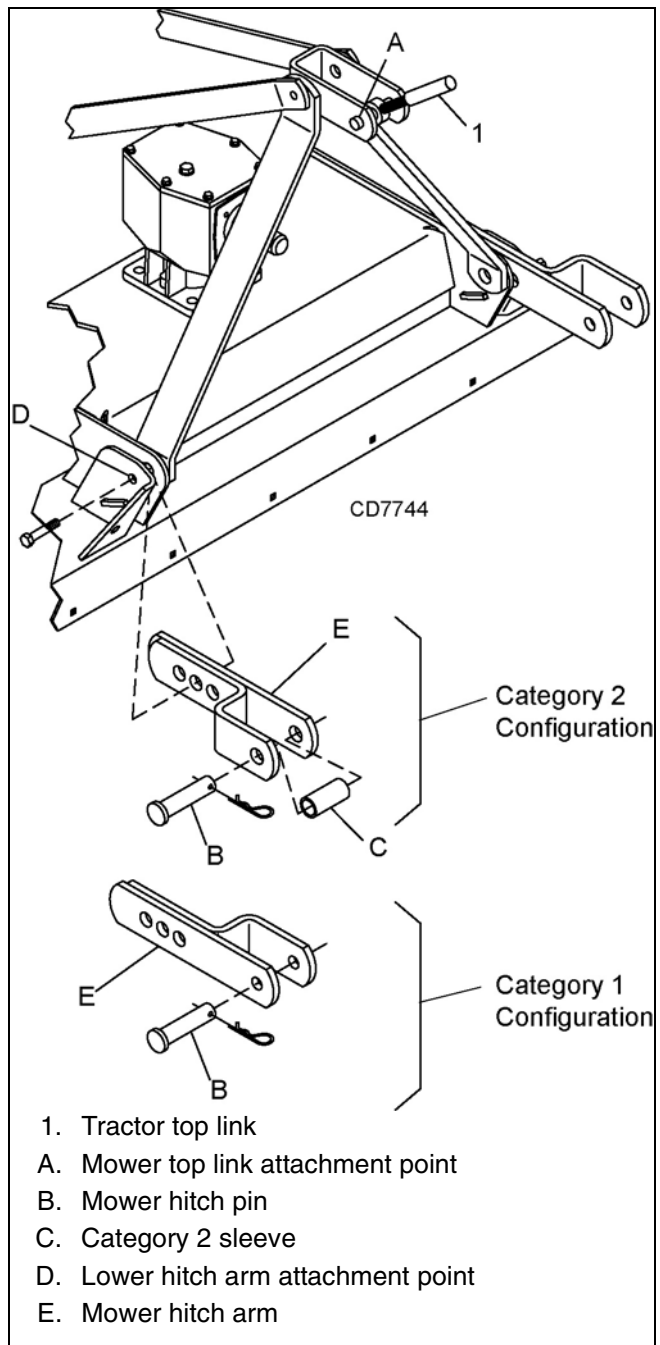
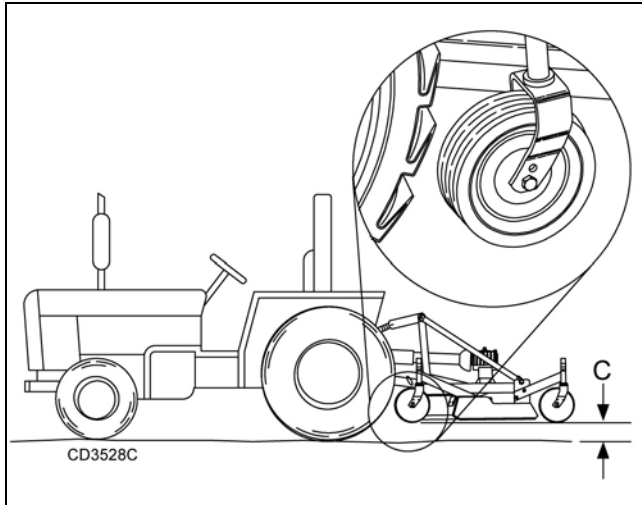


Figure 7. Top Link Adjustment

## **FRONT CASTER WHEEL INTERFERENCE CHECK**

### ***NOTICE***

■ **Do not operate tractor and mower until this interference check has been performed. If you change tractors, you must perform the check for that mounting.**



**Figure 8.** Front Caster Wheel Interference Check

Perform this check with all of the spacers above caster wheel arm. This will place caster wheels in their highest position and provide lowest cutting height for mower.

1. Raise mower with tractor hydraulics to 16" at dimension C or maximum height of tractor lift, whichever is less.
2. Pivot both front caster wheels forward and check that there is clearance between caster wheels and tractor tires.
3. If there is interference adjust mower hitch arm (E) as shown in Figure 7.

**NOTE:** If interference continues, see tractor operator's manual and adjust tractor wheels to narrower spacing.

## **FRONT ROLLER (OPTIONAL)**

The caster wheels and side skids effectively reduce scalping in most cases. However, you may encounter areas where the caster wheels and/or side skids drop into depressions and allow center of the mower to contact ground and scalp. An optional front roller may be installed to minimize scalping. See page 31.

## **OPERATING TECHNIQUE**

### **CAUTION**

■ **Stop power unit and implement immediately upon striking an obstruction. Dismount power unit,**

**using proper procedure. Inspect and repair any damage before resuming operation.**

Power for operating mower is supplied by tractor PTO. Operate PTO at 540 rpm. Know how to stop tractor and mower quickly in an emergency.

If mower becomes plugged causing belt to slip for over two seconds follow these steps:

1. Maneuver equipment into a previously cut area and allow mower to clear accumulated material.
2. Continue running at least two minutes, allowing pulleys to cool. Stopping the mower in contact with a very hot pulley will bake and ruin belt.

Proper ground speed will depend upon the terrain, the height, and type and density of material to be cut.

Normally, ground speed will range from 2 to 5 mph. Tall dense material should be cut at a low speed; thin medium-height material can be cut at a faster ground speed.

Always operate tractor PTO at 540 rpm to maintain proper blade speed and produce a clean cut.

Under certain conditions, tractor tires may roll some grass down and prevent it from being cut at the same height as the surrounding area. When this occurs, reduce your ground speed, but maintain PTO at 540 rpm. The lower ground speed will permit grass to partially rebound.

In general, lower cutting heights give a more even cut and leave less tire tracks. However, it is better to cut grass frequently rather than too short. Short grass deteriorates rapidly in hot weather and invites weed growth during growing seasons. Follow local recommendations for the suitable cutting height in your area.

## **Operating Tips**

### **WARNING**

■ **Inspect and clear area of stones, branches, or other hard objects that might be thrown, causing injury or damage.**

Extremely tall material should be cut twice. Set mower at a higher cutting height for the first pass. Then cut at desired height, 90 degrees to the first pass.

Remember, sharp blades produce cleaner cuts and require less power.

Analyze area to be cut to determine the best procedure. Consider height and type of grass and terrain type: hilly, level, or rough.

Plan your mowing pattern to travel straight forward whenever possible. Mow with uncut grass to the right. This will distribute the clippings over the cut area.

## Uneven Terrain

 **WARNING**

- Do not operate or transport on steep slopes.
- Do not stop, start, or change directions suddenly on slopes.
- Use extreme care and reduce ground speed on slopes and rough terrain.
- Watch for hidden hazards on the terrain during operation.

Pass diagonally through sharp dips and avoid sharp drops to prevent hanging up tractor and mower.

Practice will improve your skills in maneuvering rough terrain.

## **MOWER REMOVAL & STORAGE**

1. Disengage PTO, place tractor and mower on solid, level surface. Raise mower with 3-point hitch.
2. Place blocks under mower side skids. Lower mower onto blocks.
3. Set parking brake, stop engine and remove key. Disconnect mower driveshaft from tractor PTO.
4. Collapse driveshaft as far as possible and store in driveshaft hanger bracket to prevent ground contact.
5. Disconnect mower from tractor 3-point hitch. Start tractor and carefully drive away from mower.
6. Before extended storage, see page 18 for cleaning instructions.

## **OWNER PRE-OPERATION CHECK LIST**

(OWNER'S RESPONSIBILITY)

- \_\_\_ Review and follow all safety rules and safety decal instructions on pages 5 to 9.

- \_\_\_ Check that all safety decals are installed and in good condition. Replace if damaged.
- \_\_\_ Check that all shields and guards are properly installed and in good condition. Replace if damaged.
- \_\_\_ Check that chain shielding is in good condition and replace any damaged chain links.
- \_\_\_ Check that all hardware and cotter pins are properly installed and secured.
- \_\_\_ Check to ensure blades are sharp, in good condition, and installed correctly. Replace if damaged.
- \_\_\_ Check that equipment is properly and securely attached to tractor.
- \_\_\_ Make sure driveline spring-activated locking pin or collar slides freely and is seated firmly in tractor PTO spline groove.
- \_\_\_ Make sure the driveline guards and tether chains are in good condition. Guards must rotate freely on driveline. Fasten tether chains to the tractor and the equipment as instructed.
- \_\_\_ Inspect area and remove stones, branches or other hard objects that might be thrown, causing injury or damage.
- \_\_\_ Do not allow riders.
- \_\_\_ Check all lubrication points and grease as instructed in "Lubrication Information" on page 15. Make sure the PTO slip joint is lubricated and that the gearbox fluid levels are correct.
- \_\_\_ Set tractor PTO at 540 rpm.
- \_\_\_ Make sure tractor ROPS or ROPS cab and seat belt are in good condition. Keep seat belt securely fastened during operation.
- \_\_\_ Before starting engine, operator must be in tractor seat with seat belt fastened. Place transmission in neutral or park, engage brake, and disengage tractor PTO.

# OWNER SERVICE

The information in this section is written for operators who possess basic mechanical skills. If you need help, your dealer has trained service technicians available. For your protection, read and follow the safety information in this manual.

## WARNING

- Never allow children or untrained persons to operate equipment.
- Keep bystanders away from equipment.
- Before working underneath, carefully read Operator's Manual instructions, disconnect driveline, raise mower, securely block up all corners with jackstands, and check stability. Secure blocking prevents equipment from dropping due to hydraulic leak down, hydraulic system failures, or mechanical component failures.
- Keep all persons away from operator control area while performing adjustments, service, or maintenance.
- Operate tractor PTO at 540 RPM. Do not exceed.

## CAUTION

- Always wear relatively tight and belted clothing to avoid getting caught in moving parts. Wear sturdy, rough-soled work shoes and protective equipment for eyes, hair, hands, hearing, and head; and respirator or filter mask where appropriate.

## BLOCKING METHOD

Do not work underneath mower unless it is properly attached to the tractor and blocked securely. When properly attached, the unit will be anchored to minimize front to rear movement.

Raise mower completely, set tractor brakes, turn engine off, remove key, block tractor wheels front and rear, and disconnect mower driveline from tractor.

The only approved blocking device for this mower is a jackstand with a load rating of 1000 pounds or more. One jackstand under each corner of the mower (four total) must be installed before working underneath.

When blocking, you must consider overall stability of the unit. Just blocking under the unit will not ensure your safety. The working surface must be level and solid to support the loaded weight of the jackstands. Test jackstands stability before working under any portion of the mower.

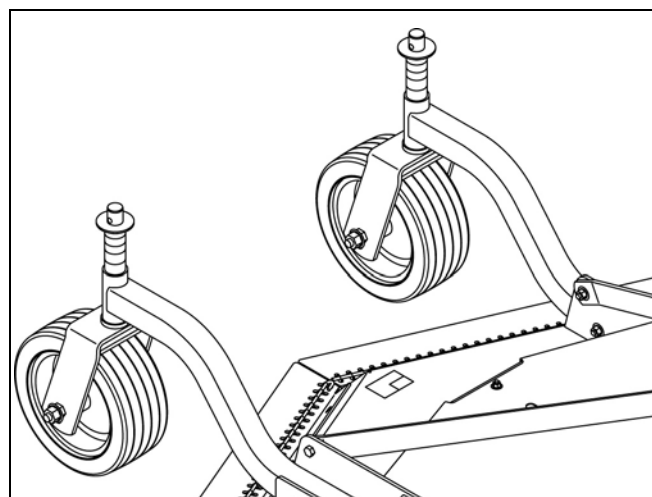


Figure 9. Blocking Method

## LUBRICATION INFORMATION

Do not let excess grease collect on or around parts, particularly when operating in sandy areas.

Figure 10 shows the lubrication points. The accompanying chart gives the frequency of lubrication in operating hours, based on normal operating conditions.

Severe or unusual conditions may require more frequent lubrication. Some reference numbers have more than one location; be sure you lubricate all locations.

Use a lithium grease of #2 consistency with a MOLY (molybdenum disulfide) additive for all locations. Be sure to clean fittings thoroughly before attaching grease gun. When applied according to the lubrication chart, one good pump of most guns is sufficient.

Use SAE 90W gear lube in the gearbox. Fill to plug on side of gearbox.

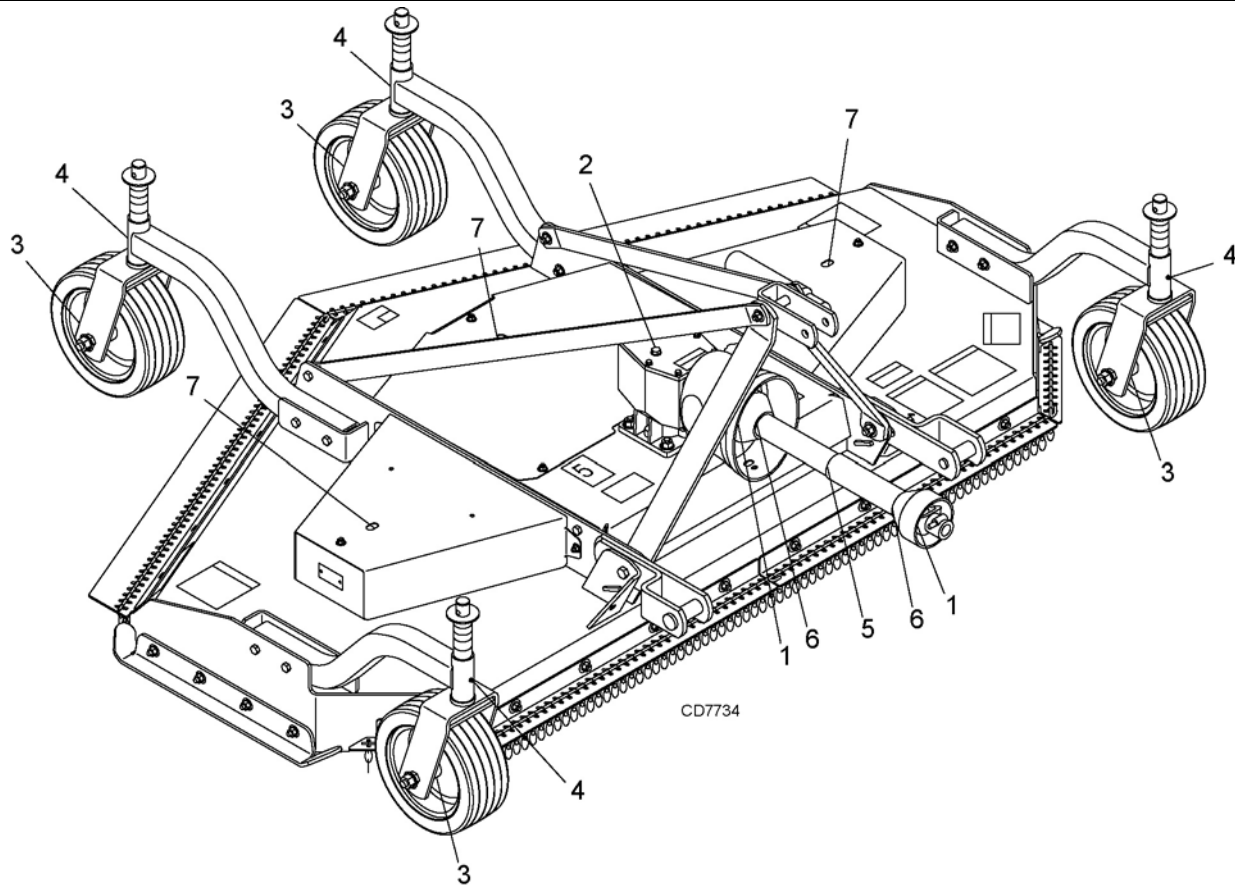
Check gearbox daily for evidence of leakage at both seals and the gasket between the housing and cover. If leakage is noted, repair immediately. There may be a small amount of lube emitted from the vent plug; this is not considered leakage.

Overfilling the gearbox will cause the excess gear lube to blow out vent plug and ruin the belt.

## **Driveshaft Lubrication**

Lubricate the driveshaft slip joint every 8 operating hours. Failure to maintain proper lubrication could result in damage to U-joints, gearbox, and driveshaft.

1. Lower mower to ground.
2. Apply grease at five locations shown in Figure 10.
3. Raise and lower mower several times to distribute grease.



REF	DESCRIPTION	FREQUENCY
1	Driveline U-Joints	8 Hours
2	Gearbox (Fill to center of horizontal shaft with SAE 90W gear lube)	Check for leaks daily
3	Caster Wheel (Four Wheels)	8 Hours
4	Caster Pivot (Four Yokes)	8 Hours
5	Slip Joint	8 Hours
6	Shield Bearing	8 Hours
7	Blade Spindles (Access through hole)	8 Hours

**Figure 10.** Lubrication Points & Chart



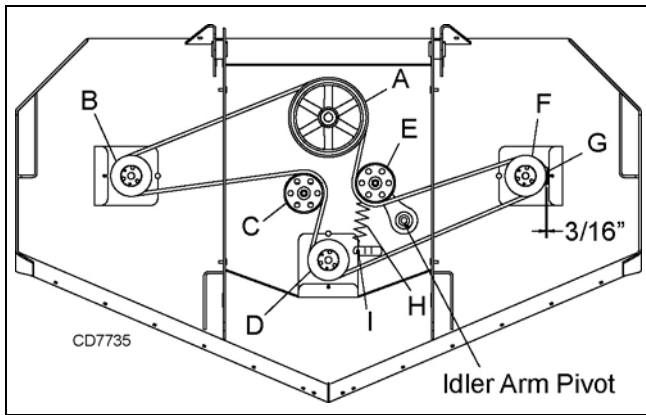


Figure 11. Belt Routing

## **BELT SERVICE**

### **Belt Replacement**

One of the major causes of belt failure is improper installation. Before installing a new belt, check the following:

1. Check pulley shafts and bearings for wear.
2. Check pulley grooves for cleanliness.
3. Make sure spindles turn freely and without wobble.

If grooves require cleaning, moisten a cloth with a non-flammable, non-toxic degreasing agent or commercial detergent and water.

Avoid excessive force during installation. Do not use tools to pry belt into pulley groove. Do not roll belt over pulleys to install. This can cause hidden damage and premature belt failure.

### **Belt Installation**

1. Disconnect idler spring from deck lug I.
2. Slide belt under drive pulley A and over idler arm. Position belt around drive pulley A.
3. Route belt around pulley B, idler C and pulley D as shown.
4. Make sure belt is on drive pulley A, route around idler E, and connect idler spring to lug I on deck.
5. Loosen bolt holding belt guide G and swing it away from pulley F.
6. Grasp belt between spindle pulley F, spring loaded idler E and spindle pulley D. Pull spring loaded idler with belt to obtain enough belt length to route it over pulley F. Make sure spring-loaded idler pivots freely with belt installed.

## **NOTICE**

■ Use care when installing or removing belt from spring-loaded idler at step 6. Springs store energy when extended and, if released suddenly, can cause personal injury.

7. Adjust belt guide G to provide 1/8" to 3/16" clearance from belt. Tighten bolt to 85 lbs-ft.

## **BLADE SERVICE**

### **⚠ WARNING**

■ Before dismounting power unit or performing any service or maintenance, follow these steps: disengage power to equipment, lower the 3-point hitch and all raised components to the ground, operate valve levers to release any hydraulic pressure, set parking brake, stop engine, remove key, and unfasten seat belt.

■ Keep all persons away from operator control area while performing adjustments, service, or maintenance.

### **Blade Removal**

1. Remove Nylok bolt (5).
2. Remove blade lock (4) from groove in blade pin.
3. Remove blade (2) and pin (3) from spindle assembly (1).

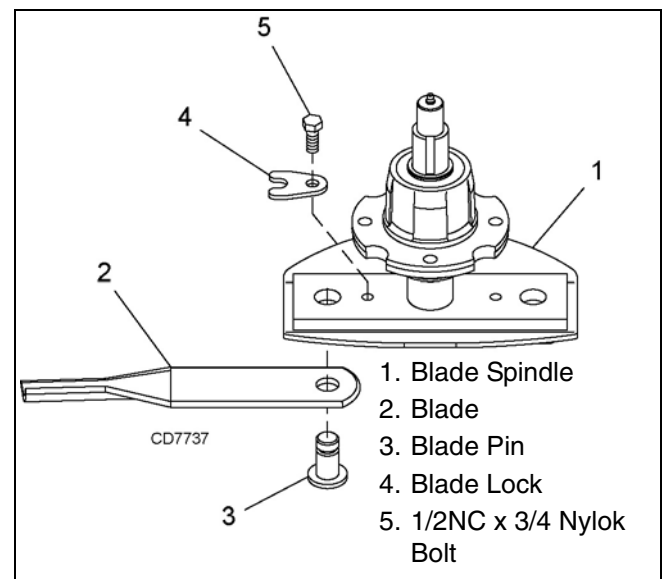


Figure 12. Blade Removal

## Blade Installation

### **CAUTION**

■ Your dealer can supply genuine replacement blades. Substitute blades may not meet original equipment specifications and may be dangerous.

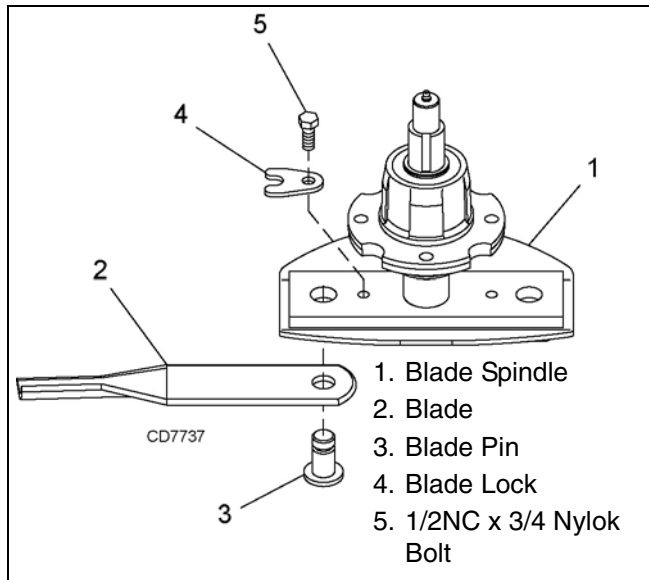


Figure 13. Blade Assembly

1. Install blade pin (3) thru blade (2) and blade spindle (1).
2. Make sure blade cutting edge is positioned to lead in a clockwise rotation, as viewed from top of mower.
3. Insert blade lock (4) into groove of blade pin (3).
4. Secure lock (4) with Nylok bolt (5).

## Blade Sharpening

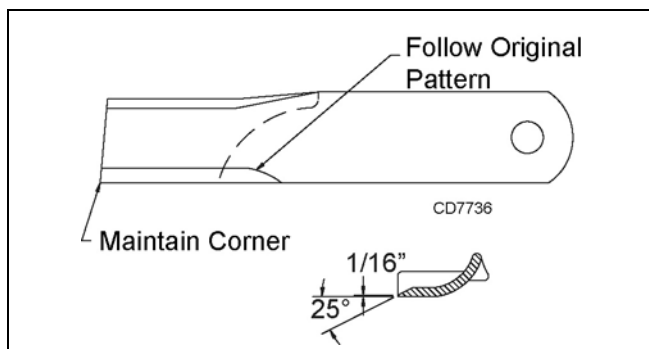


Figure 14. Blade Sharpening

### **NOTICE**

■ When sharpening blades, grind the same amount on each blade to maintain balance. Replace blades in pairs. Unbalanced blades will cause excessive vibration, which can damage gearbox bearings. Vibration may also cause structural cracks to cutter.

1. Always sharpen both blades at the same time to maintain balance. Follow original sharpening pattern.
2. Do not sharpen blade to a razor edge. Leave at least a 1/16" blunt edge.
3. Do not sharpen back side of blade.

## CHAIN SHIELDING

### **DANGER**

■ Full chain shielding must be installed when operating in populated areas or other areas where thrown objects could injure people or damage property.

- If this machine is not equipped with full chain shielding, operation must be stopped when anyone comes within 300 feet (92 m).
- This shielding is designed to reduce the risk of thrown objects. The mower deck and protective devices cannot prevent all objects from escaping the blade enclosure in every mowing condition. It is possible for objects to ricochet and escape, traveling as much as 300 feet (92 m).

Check that chain shielding is in good condition and replace any damaged chain links.

## CLEANING

### After Each Use

- Remove large debris such as clumps of dirt, grass, crop residue, etc. from machine.
- Inspect machine and replace worn or damaged parts.
- Replace any safety decals that are missing or not readable.

### Periodically or Before Extended Storage

- Clean large debris such as clumps of dirt, grass, crop residue, etc. from machine.
- Remove the remainder using a low-pressure water spray.
  1. Be careful when spraying near scratched or torn safety decals or near edges of decals as water spray can peel decal off surface.
  2. Be careful when spraying near chipped or scratched paint as water spray can lift paint.
  3. If a pressure washer is used, follow the advice of the pressure washer manufacturer.
- Inspect machine and replace worn or damaged parts.
- Sand down scratches and the edges of areas of missing paint and coat with Woods spray paint of matching color (purchase from your Woods dealer).
- Replace any safety decals that are missing or not readable (supplied free by your Woods dealer). See Safety Decals section for location drawing.

# TROUBLE SHOOTING

## MOWING CONDITIONS

PROBLEM	POSSIBLE CAUSE	SOLUTION
Grass cut higher in center of swath than at edge	Height of mower higher at rear than at front	Adjust mower height and attitude so that mower rear and front are within 1/2 inch of same height. See instructions on page 11.
Grass cut lower in center of swath than at edge	Height of mower lower at rear than at front	Adjust mower height and attitude so that mower rear and front are within 1/2 inch of same height. See instructions on page 11.
Streaking conditions in swath	Conditions too wet for mowing	Allow grass to dry before mowing.
	Blades unable to cut that part of grass pressed down by path of tractor tires	Slow ground speed of tractor but keep engine running at full PTO rpm. Cutting lower will help. Adjust tractor tire spacing if possible.
	Dull blades	Sharpen or replace blades.
Material discharges from mower unevenly; bunches of material along swath	Material too high and too much material	Reduce ground speed but maintain 540 rpm at tractor PTO, or make two passes over material. Raise mower for the first pass and lower for the second and cut at 90 degrees to first pass. Raise rear of mower high enough to permit material to discharge, but not so high that conditions listed above occur.
	Grass wet	Allow grass to dry before mowing. Slow ground speed of tractor but keep engine running at full PTO rpm.
	Rear of mower too low, trapping material under mower	Adjust mower height and attitude.

# TROUBLE SHOOTING

## BELT CONDITIONS

PROBLEM	POSSIBLE CAUSE	SOLUTION
Belt slippage	Mower overloading; Material too tall or heavy	Reduce tractor ground speed but maintain full PTO rpm. Cut material twice, one high pass and then mow at desired height. Cut at 90 degrees to first pass.
	Oil on belt from over lubrication	Be careful not to over-lubricate. Clean lubricant from belt and pulleys with clean rag. Replace oil-soaked belt.
	Belt hung up or rubbing	Check belt position in pulleys and idlers. Check belt for free travel in pulleys. Check under mower and around blade spindle shaft for wire, rags, or other foreign material. Clean all material from under mower.
Frayed edges on belt cover	Belt misaligned or belt rubbing guide	Re-align belt. Be sure belt does not rub any other part while running.
	Pulley misaligned	Inspect to ensure belt is running in center of backside idler. Shim idler as necessary to align.
Damaged belt	Rollover, high shock loads or installation damaged	Replace belt.*
Belt breakage	High shock loads	Avoid abusive mowing. Avoid hitting the ground or large obstructions.
	Belt came off drive	Check pulleys for foreign material in grooves. Avoid hitting solid objects or ground.

\* Check belt for damage by laying it flat on the floor. A belt that does not lie flat (has humps or twists, indicating broken or stretched cords) must be replaced.

# NOTES

# DEALER SERVICE

The information in this section is written for dealer service personnel. The repair described here requires special skills and tools. If your shop is not properly equipped or your mechanics are not properly trained in this type of repair, you may be time and money ahead to replace complete assemblies.

## WARNING

■ Before working underneath, read manual instructions, securely block up, and check stability. Secure blocking prevents equipment from dropping due to hydraulic leak down, hydraulic system failure, or mechanical component failure.

■ Keep all persons away from operator control area while performing adjustments, service, or maintenance.

## CAUTION

■ Always wear relatively tight and belted clothing to avoid getting caught in moving parts. Wear sturdy, rough-soled work shoes and protective equipment for eyes, hair, hands, hearing, and head; and respirator or filter mask where appropriate.

### BLOCKING METHOD

See "Blocking Method" instructions on page 15.

### BLADE SPINDLE SERVICE

Spindle repair requires special skills and tools. If your shop is not properly equipped or your mechanics are not trained in this type of repair, you may be time and money ahead to use a new spindle assembly.

For reference, the grease fitting is in the top of the spindle shaft.

Permatex® 3D Aviation Form-A-Gasket or equivalent is recommended as a sealant.

### Spindle Removal

1. Remove blade (11) from spindle (7).
2. Remove belt from pulleys.
3. Remove jam nut (16) and washer (15) from top of spindle shaft, Figure 15.

4. Disassemble split taper bushing (13) (located on top of pulley) by removing the two bolts and key (14).
5. Insert bolts into the threaded holes of bushing flange.
6. Tighten bolts alternately to remove split taper bushing.
7. Remove pulley (12).
8. Remove bolts that attach spindle to mower frame and remove spindle.
9. Remove grease fitting (17) from top of shaft.

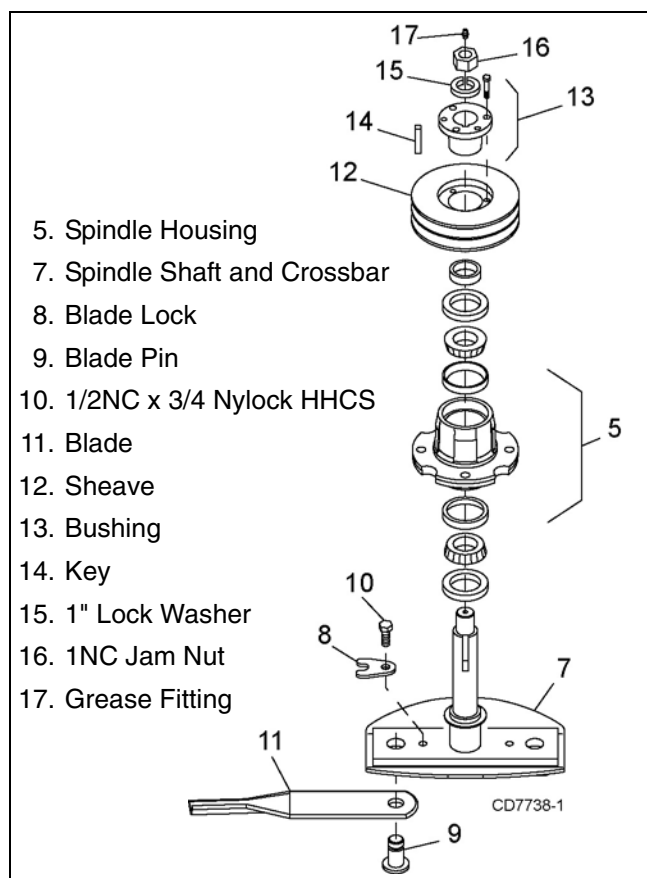
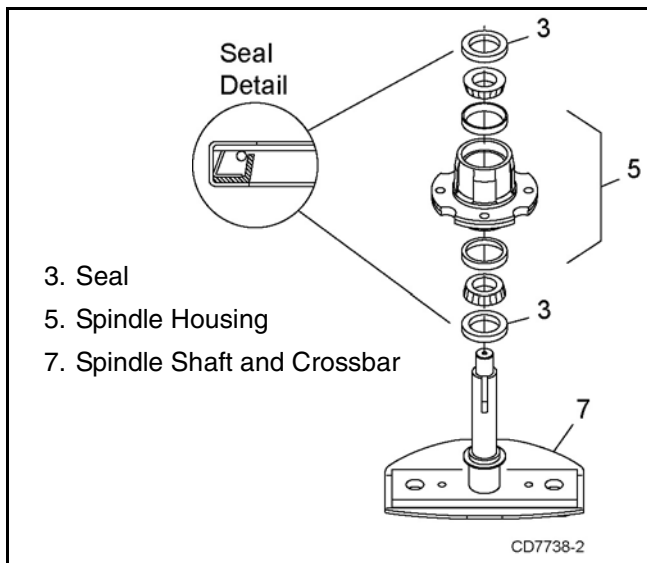


Figure 15. Sheave and Blade Assembly

### Spindle Disassembly

1. Place spindle assembly in press and press shaft down through housing.
2. Remove seals from housing.
3. Remove bearing cups from housing by placing a punch in the slots provided and driving them out. Alternate punch positions from side to side. Take care to prevent housing damage.



**Figure 16.** Spindle Disassembly

## Spindle Assembly

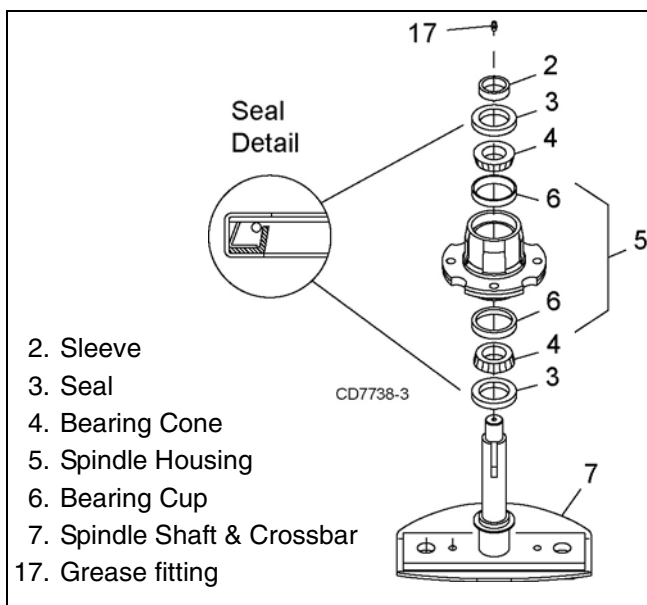
*Refer to Figure 17.*

Bearing cones and cups are designed to work together. It is important to position them so bearing cone taper mates with cup taper.

1. Lubricate new cups (6) with a light oil. Place them in spindle housing (5) so they will mate with bearing cones (4). Cups (6) and cones (4) are a press fit to minimize wear.

Seat cups (6) securely with a press or place a large drift in the flat lip and drive them into housing (5) until cup seats against machined shoulder of housing.

2. Place bottom bearing cone (4) into spindle with taper positioned to mate with cup (6).



**Figure 17.** Spindle and Shaft Assembly

## NOTICE

■ **Improper positioning of seals can cause seal damage. An improperly installed seal will leak and could cause bearing failure.**

3. Identify the open side of the seal (3) containing the spring.
4. Apply a thin coat of Permatex to the area of housing where seals seat.
5. Install bottom seal (3) with spring up toward center of housing.
6. Place seal squarely on housing and select a piece of pipe or tubing with an OD that will set on outside edge of seal. A tubing with an OD that is too small will bow seal cage.
7. Carefully press seal into housing, to prevent distortion to metal seal cage. Bottom seal should seat firmly and squarely against machined shoulder in housing.
8. Make sure seal lip did not roll under. Distortion to seal cage or damage to seal lip will cause seal to leak. Damaged seals must be replaced.
9. Insert shaft (7) through bottom of housing (5).
10. Fill housing cavity with a medium grade grease.
11. Install top bearing (4) on shaft (7) to mate with top cone (6).
12. Apply a thin coat of Permatex to shaft area where sleeve will seat.
13. Install sleeve (2) on shaft and press sleeve and bearing into housing until all free play is removed and there is a very light drag on bearings (similar to adjusting front wheel bearings on an automobile). Check by spinning spindle. It should turn freely.
14. Be careful not to overtighten bearings. Proper bearing adjustment is essential to good bearing life.
15. If you overtighten bearings, hold spindle housing and rap spindle shaft with a lead hammer.
16. Carefully press top seal (3) in with spring up. Top seal should be flush with or to within 1/16" above the housing.
17. Rotate housing on spindle shaft, checking for free movement.
18. Install grease fitting (17) in spindle shaft.

## Spindle Installation

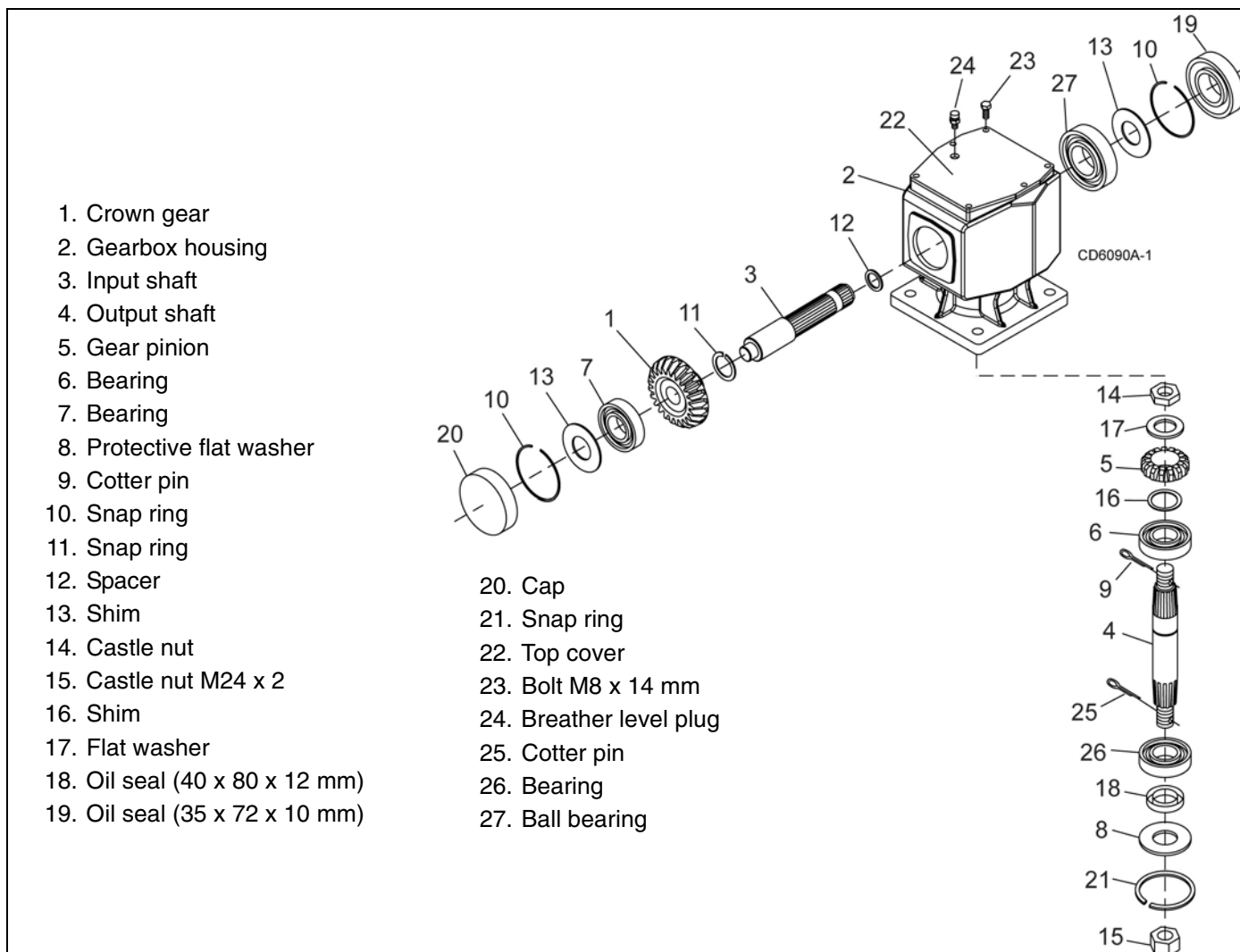
## NOTICE

■ **Pulley installation sequence is very important for bearing life. Follow the sequence exactly.**

1. Install spindle through bottom of mower and secure with four mounting bolts.

2. Install pulley (12) and split taper bushing (13) with integral key (14) on spindle shaft. Make sure bushing is in contact with sleeve on spindle shaft.
3. Alternately tighten split taper bushing cap screws to 20 lbs-ft.

4. Install lock washer and nut on spindle shaft. Tighten nut until snug, but do not over-tighten. Check shaft to make sure it spins freely..



**Figure 18.** Gearbox Assembly

## **GEARBOX REPAIR**

Read this entire section before starting any repair. Many steps are dependent on each other.

Repair to this gearbox is limited to replacing bearings, seals, and gaskets. Replacing gears, shafts, and a housing is not cost effective. It is more economical to purchase a complete gearbox if repair to anything other than replacement of bearings, seals or gaskets is required.

Fill gearbox with SAE 80W or 90W gear lube until it runs out the side level plug.

Inspect gearbox for leakage and bad bearings.

Leakage is a very serious problem and must be corrected immediately.

Bearing failure is indicated by excessive noise and side to side or end play in gear shafts.

## **Seal Replacement**

Recommended sealant for gearbox repair is Permatex® Aviation 3D Form-A-Gasket or equivalent.

Leakage can occur at the vertical or horizontal gaskets and shaft seals.

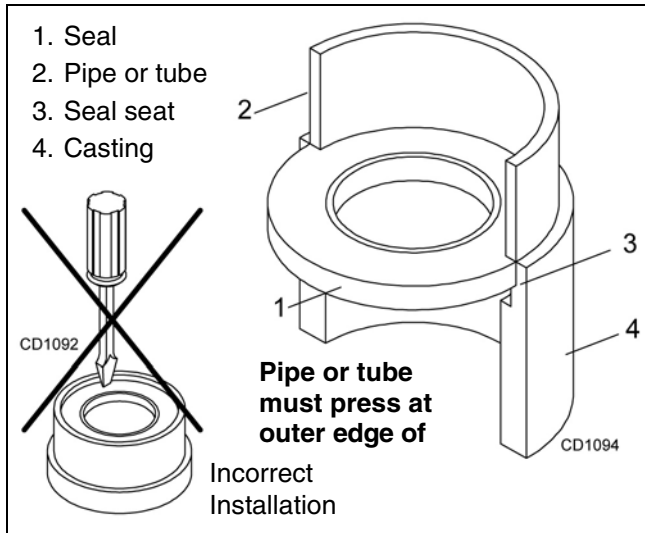
Leakage at the horizontal gasket or seal can be repaired without removing the gearbox from the cutter.

## **Seal Installation**

**NOTE:** Proper seal installation is important. An improperly installed seal will leak.



1. Clean area in housing where seal outer diameter (OD) seats. Apply a thin coat of Permatex.
2. Inspect area of shaft where seal seats. Remove any burrs or nicks with an emery cloth.
3. Lubricate gear shaft and seal lips.
4. Place seal squarely on housing, spring-loaded lip toward housing. Select a piece of pipe or tubing with an OD that will sit on the outside edge of the seal but will clear the housing. Tubing with an OD that is too small will bow seal cage and ruin seal.
5. Carefully press seal into housing, avoiding distortion to the metal seal cage.



**Figure 19.** Seal Installation

### Vertical Shaft Seal Replacement

1. Disconnect and remove the driveline from the gearbox.
2. Remove vent plug (24). Figure 18, and siphon gear lube from housing through this opening.
3. Remove gearbox stand from mower deck.
4. Remove gearbox and pulley from gearbox stand.
5. Remove vertical shaft seal (18). Replace with new seal (see Seal Replacement, page 24).

Vertical seal should be recessed in housing.

**NOTE:** Distortion to seal cage or damage to seal lip will cause seal to leak.

6. Fill gearbox with SAE 80W or 90W gear lube until it runs out the level plug.
7. Assemble gearbox and pulley to gearbox stand. Attach gearbox stand to mower deck.

### Horizontal Shaft Seal Replacement

1. Disconnect and remove the driveline from the gearbox.
2. Remove vent plug (24), Figure 18, and siphon gear lube from housing through this opening.

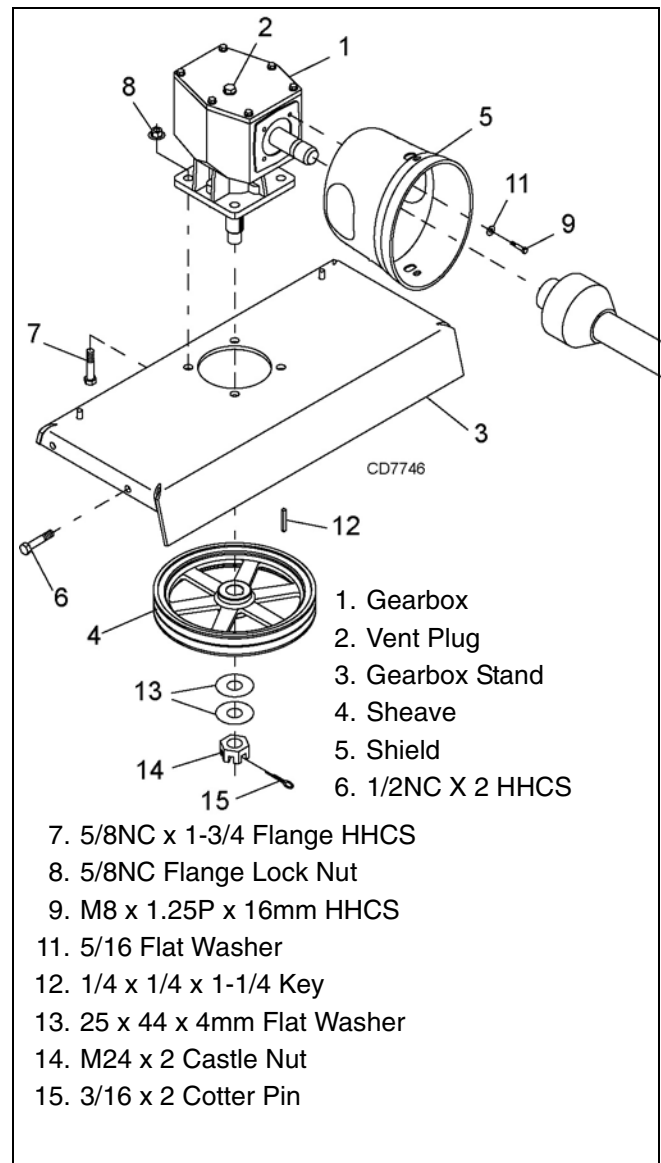
3. If the leak occurred at either end of horizontal shaft, remove oil cap (20) and/or oil seal (19). Replace with new one (see Seal Replacement, page 24).

Horizontal seal should be pressed flush with outside of housing.

4. Fill gearbox with SAE 80W or 90W gear lube until it runs out the level plug

### Gearbox Removal from Mower

Refer to Figure 20.



**Figure 20.** Gearbox Stand Assembly

1. Disconnect and remove the driveline from the gearbox (1).
2. Remove vent plug (2) and siphon gear lube from housing through this opening.
3. Remove gearbox stand (3) from mower deck rails by removing four cap screws (6).

4. Remove four cap screws (9), flat washer (11), and remove shield (5) from gearbox.
5. Remove castle nut (14) and hardware from output shaft of gearbox.
6. Remove sheave (4) from gearbox.
7. Remove four bolts (9) that attach gearbox to gearbox stand and remove gearbox.

## Gearbox Disassembly

*Refer to Figure 18.*

1. Remove top cover (22) from housing. Turn gearbox upside down and pour out remaining gear oil from gearbox.
2. Remove oil cap (20) (to be replaced).
3. Remove snap ring (10) and shim (13) from input shaft (3).
4. Support gearbox in hand press and push on input shaft (3) to remove bearing (7).
5. Remove gear (1) from inside housing.
6. Remove oil seal (19) from front of housing (to be replaced).
7. Remove snap ring (10) and shim (13) from front of housing (2).
8. Remove input bearing (7) by using a punch and hammer from outside of housing.
9. Support housing in vise in a horizontal position.
10. The castle nut (15) and cotter pin (25) are already removed with the drive sheave. Remove snap ring (21), washer (8), and seal (18).
11. Remove cotter pin (9), castle nut (14), and washer (17) from output shaft (4).
12. Remove output shaft (4) by using a punch and hammer and tap on top to drive down.
13. Remove gear (5) and shim (16) from inside housing.
14. Remove bearing (26) by using a punch and hammer from the top, outside the housing.
15. Support housing upside down (top cover surface) and remove bearing (6) by using a punch and hammer from the bottom side of the housing.
16. Inspect gears for broken teeth and wear. Some wear is normal and will show on loaded side. Forged gear surfaces are rough when new. Check that wear pattern is smooth.
17. Inspect vertical and horizontal shafts for grooves, nicks, or bumps in the areas where the seals seat. Resurface any damage with emery cloth.
18. Inspect housing and caps for cracks or other damage.

## Gearbox Reassembly

*Refer to Figure 18.*

**NOTE:** Repair to this gearbox is limited to replacing bearings, seals, and gaskets. Replacing gears, shafts, and a housing is not cost effective. Purchasing a complete gearbox is more economical.

1. Clean housing, paying specific attention to areas where gaskets will be installed.
2. Wash housing and all components thoroughly. Select a clean area for gearbox assembly. Replace all seals, bearings, and gaskets. All parts must be clean and lightly oiled before reassembling.
3. Insert output bearings (6 & 26) in the housing, using a round tube of the correct diameter and a hand press.
4. Slide output shaft (4) through both bearings (6 & 26) until it rests against bearing (6).
5. Slide shim (16) over output shaft (4).
6. Press gear (5) onto output shaft (4) and secure with washer (17), castle nut (14), and cotter pin (9).
7. Apply grease to lower seal lips (18) and press seal over output shaft (4), using a tube of the correct diameter. Be sure not to damage the seal lip. Press in housing so that seal is recessed.
8. Insert protective washer (8) by hand. Install snap ring (21) and position it together with dual lip seal (18) by pressing it into position. Verify that snap ring is seated correctly.
9. Press bearing (7) into the housing, using a round tube of the correct diameter and a hand press. Secure with shim (13) and snap ring (10).
10. Secure snap ring (11) on input shaft (3) if not already secure.
11. Place gear (1) through top of housing and align gear (1) and gear (5) so that gear teeth are a match.
12. While holding gear (1) in place, slide input shaft (3) through gear (1) and bearing (7). Align splines on shaft (3) and gear (1).
13. Slide spacer (12) over input shaft (3) and press bearing onto input shaft (3), using a round tube of the correct diameter and a hand press.
14. Slide shim (13) over input shaft (3) and secure with snap ring (10).
15. Check input shaft end float by moving the input shaft (3) by hand. If end float is higher than 0.012", insert shim between input shaft (3) and rear bearing (7). Repeat until end float is less than 0.012". Check rotational torque by hand. The torque should be less than 2.2 lbs-inch.

16. Check that the gear backlash is between 0.006" and 0.016". You should not have to adjust the backlash.
17. Press in input oil seal (19), using tube of correct diameter. Be careful not to damage seal lip.
18. Press oil cap (20) on to cover the rear of housing, using a tube of the correct diameter.
19. Check gearbox housing for leaks by plugging all holes except one. Apply 4 psi compressed air and immerse the gearbox in water to verify that there are no leaks.
20. Remove gearbox from water and dry off with compressed air. Add SAE 80W or 90W EP oil until it runs out of side level hole. Tighten all plugs.

### Gearbox Installation

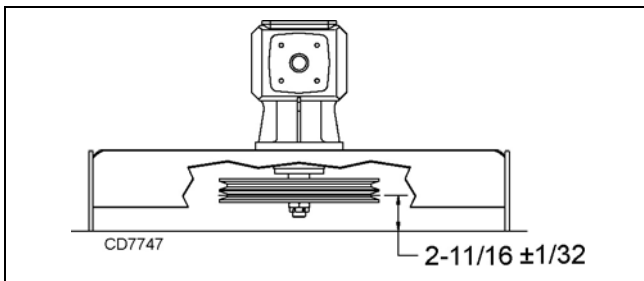
**NOTE:** Gearbox is heavy: do not attempt to move without mechanical assistance.

1. Set gearbox on gearbox stand and fasten with bolts and nuts. Torque bolts to 175 lbs-ft.
2. Attach drive sheave to output shaft. Secure using castle nut and hardware previously removed. Torque castle nut to 170 lbs-ft.
3. Attach gearbox stand to mower using four flanged 1/2" cap screws.

### Drive Sheave Installation

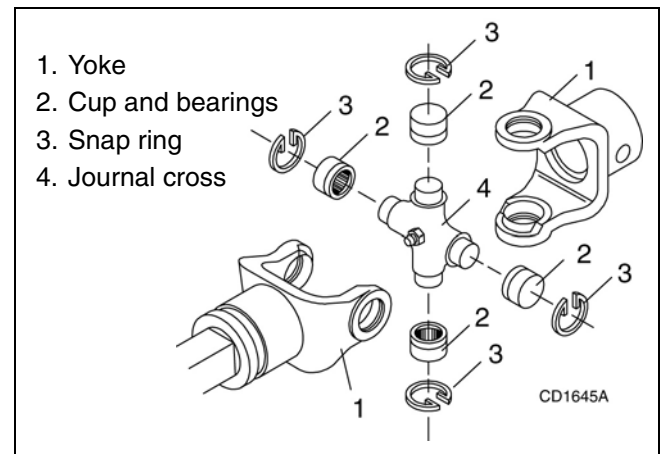
**Refer to Figure 21.**

1. When gear stand is installed on mower, the distance from the top of the mower deck to the center line of the lower groove on the drive pulley must be 2-21/32" ( $\pm 1/32$ "). This is a critical dimension and must be carefully adjusted for proper belt life.
2. Tighten gear stand hardware.
3. Fill gearbox half full with SAE 90W gear lube.
4. Check level after waiting five minutes to permit lube to work through bearings. Add lube, if necessary, until gearbox is half full.
5. Replace driveline shield. Attach driveline to gearbox.



**Figure 21.** Drive Sheave Installation

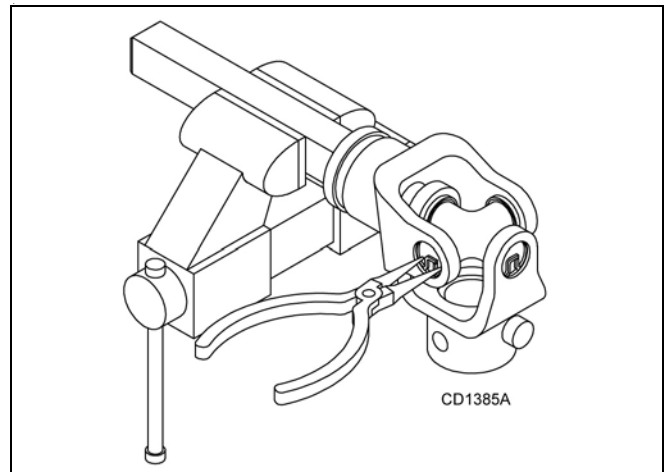
### UNIVERSAL JOINT REPAIR



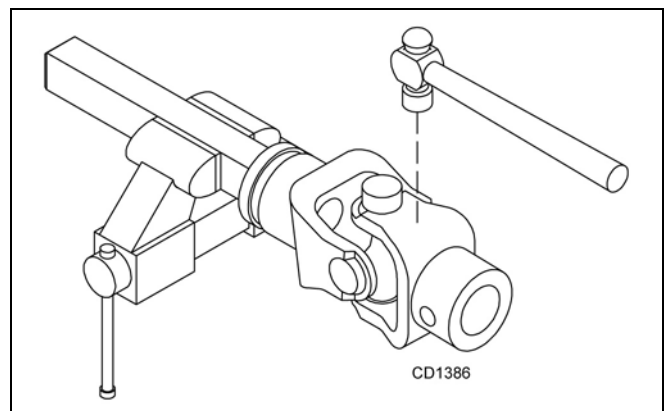
**Figure 22.** U-Joint Exploded View

### U-Joint Disassembly

1. Remove external snap rings from yokes in four locations as shown in Figure 23.



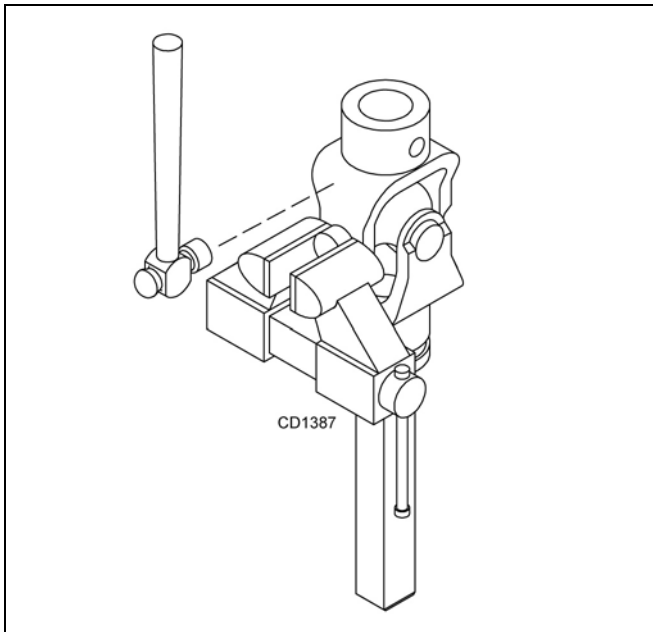
**Figure 23**



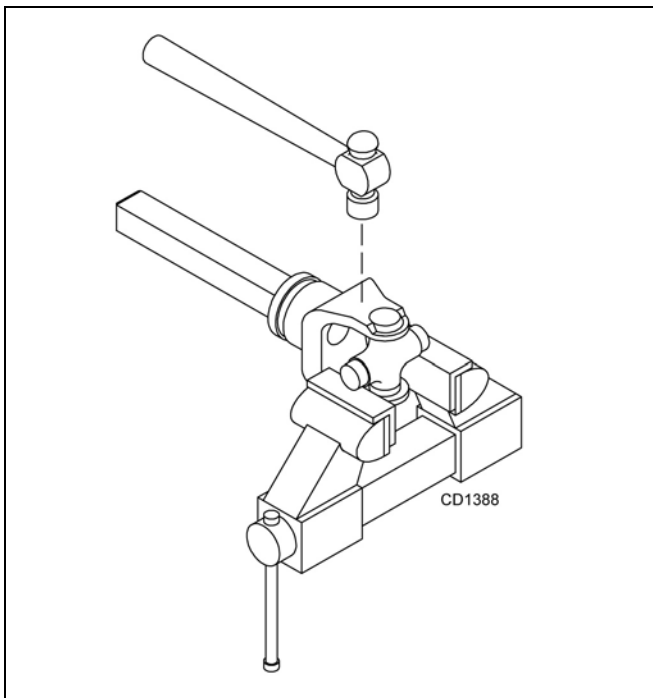
**Figure 24**

2. With snap rings removed, support drive in vise, hold yoke in hand and tap on yoke to drive cup up out of yoke. See Figure 24.

3. Clamp cup in vise as shown in Figure 25 and tap on yoke to completely remove cup from yoke. Repeat Step 2 and Step 3 for opposite cup.



**Figure 25**



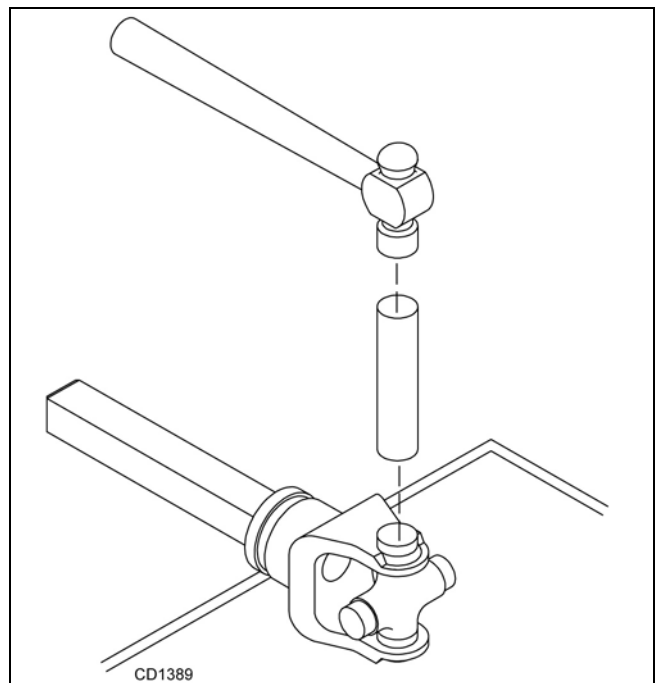
**Figure 26**

4. Place universal cross in vise as shown in Figure 26 and tap on yoke to remove cup. Repeat Step 3 for

final removal. Drive remaining cup out with a drift and hammer.

## U-Joint Assembly

1. Place seals securely on bearing cups. Insert cup into yoke from outside and press in with hand pressure as far as possible. Insert journal cross into bearing cup with grease fitting away from shaft. Be careful not to disturb needle bearings. Insert another bearing cup directly across from first cup and press in as far as possible with hand pressure.
2. Trap cups in vise and apply pressure. Be sure journal cross is started into bearings and continue pressure with vise, squeezing in as far as possible. Tapping the yoke will help.
3. Seat cups by placing a drift or socket (slightly smaller than the cup) on cup and rap with a hammer. See Figure 27. Install snap ring and repeat on opposite cup.
4. Repeat Step 1 & Step 2 to install remaining cups in remaining yoke.
5. Move both yokes in all directions to check for free movement. If movement is restricted, rap on yokes sharply with a hammer to relieve any tension. Repeat until both yokes move in all directions without restriction.



**Figure 27**

# ASSEMBLY INSTRUCTIONS

## DEALER SET-UP INSTRUCTIONS

Assembly of this mower is the responsibility of the Frontier dealer. It should be delivered to the owner completely assembled, lubricated, and adjusted for normal cutting conditions.

Complete Dealer Check Lists on page 33 when you have completed the assembly.

The mower is shipped partially assembled. Assembly will be easier if components are aligned and loosely assembled before tightening hardware. Recommended torque values for hardware are located on page 43.

Select a suitable working area. Open parts boxes and lay out parts and hardware to make location easy. Refer to illustrations, accompanying text, parts lists and exploded view drawings.

### WARNING

■ Before working underneath, carefully read Operator's Manual instructions, disconnect driveline, raise mower, securely block up all corners with jackstands, and check stability. Secure blocking prevents equipment from dropping due to hydraulic leak down, hydraulic system failures, or mechanical component failures.

### CAUTION

■ Always wear relatively tight and belted clothing to avoid getting caught in moving parts. Wear sturdy, rough-soled work shoes and protective equipment for eyes, hair, hands, hearing, and head; and respirator or filter mask where appropriate.

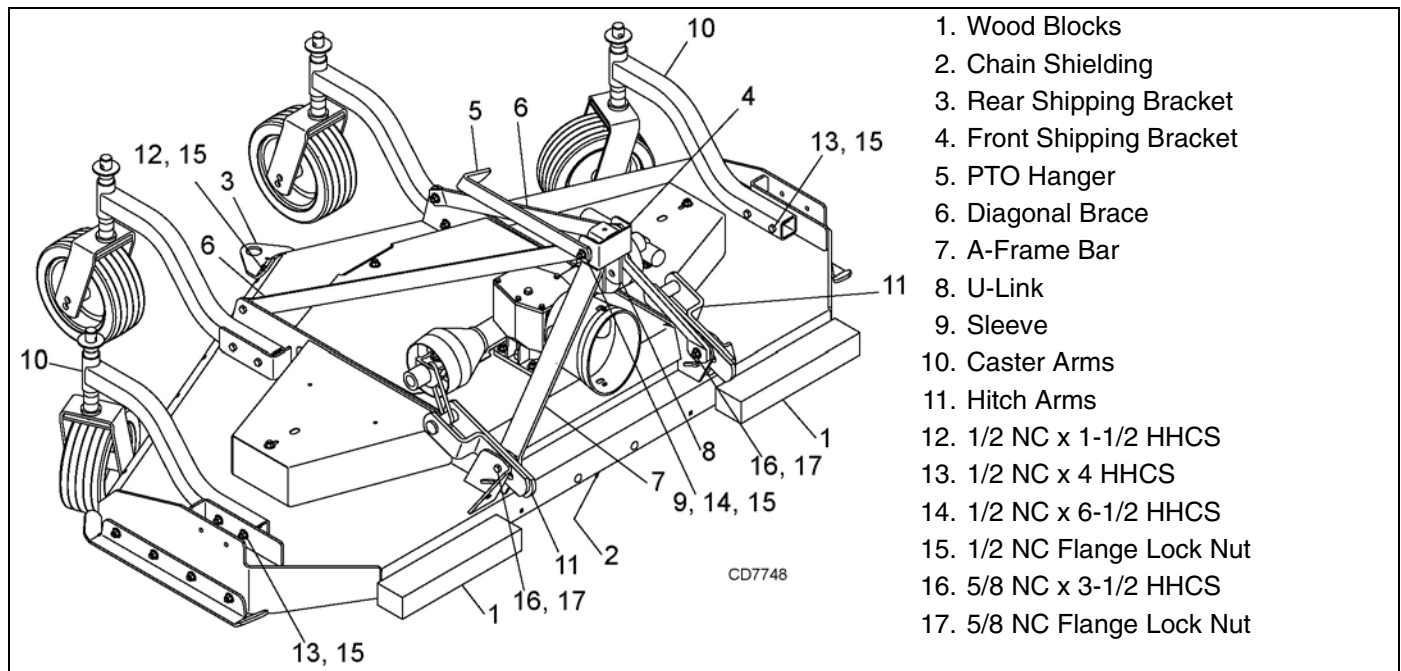


Figure 28. Shipping Unit

### Disassemble Shipping Unit (Figure 28)

1. Remove all parts that are wired and strapped to mower.
2. Remove wood blocks (1) and chain shielding (2) attached to front of mower. Discard blocks.
3. Remove cap screws (12) and lock nuts (15) from rear shipping bracket (3). Discard bracket.
4. Remove cap screw (14) and lock nuts (15) from front shipping bracket (4). Discard bracket and

replace hardware through PTO hanger (5), diagonal braces (6), A-frame bars (7), U-link (8) and sleeve (9). Do not over tighten lock nut against the PTO hanger. PTO hanger should rotate freely.

### Install Front Casters (Figure 28)

1. Remove cap screws (13) and lock nuts (15) from outer caster arms (10).
2. Place arms inside of pockets in front corners of deck. Replace hardware.

## Torque Caster Arms

1. Place mower on a hard level surface.
2. Loosen cap screws and lock nuts on all four caster wheel arms. This allows clearance in the caster wheel assemblies to be equalized.
3. Torque all cap screws and nuts to 85 lbs-ft.

## Install Hitch Arms

1. Remove cap screws, lock nuts and hitch arms (E) from lower hitch arm attachment point (D).
2. Position arms according to Figure 29 and replace hardware.

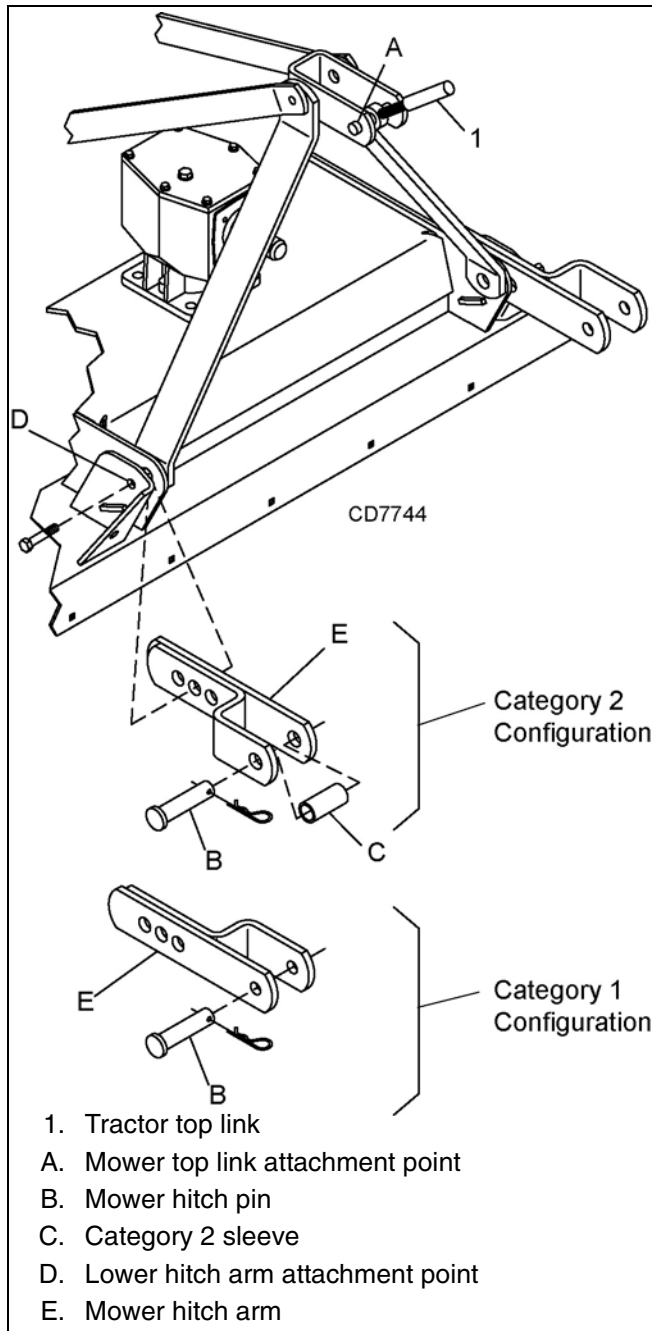


Figure 29. Hitch Arm Installation

## Install Driveshaft

1. Pull locking collar (B) back and, at the same time, push driveline onto gearbox shaft until locking device engages.
2. Rotate PTO hanger forward. Rest driveline on PTO hanger.
3. If so equipped, hook anti-rotation chain (C) on shield (2).

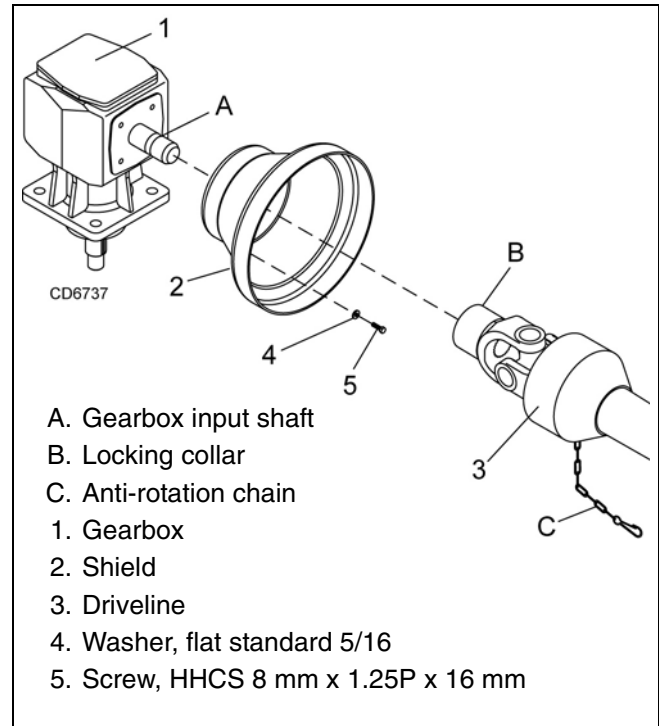


Figure 30. Driveshaft Installation

## Fill Gearbox

### NOTICE

■ Gearbox is not filled at the factory. Prior to delivery, make sure each gearbox is filled half-full with 80W or 90W API GL-4 or GL-5 gear lube.

1. Make sure vent plug hole is clear. Fill gearbox half-full with high quality gear oil that has a viscosity index of 80W or 90W and an API service rating of GL-4 or GL-5.
2. Fill gearbox until oil runs out the side plug on gearbox.
3. Pour in one pint of gear lube, wait five minutes and add additional gear lube until it just comes out of side hole.
4. Allow an additional five minutes for the lube to flow through bearings, then check to make sure oil level is at bottom of side hole. Replace side plug. Install vent plug.

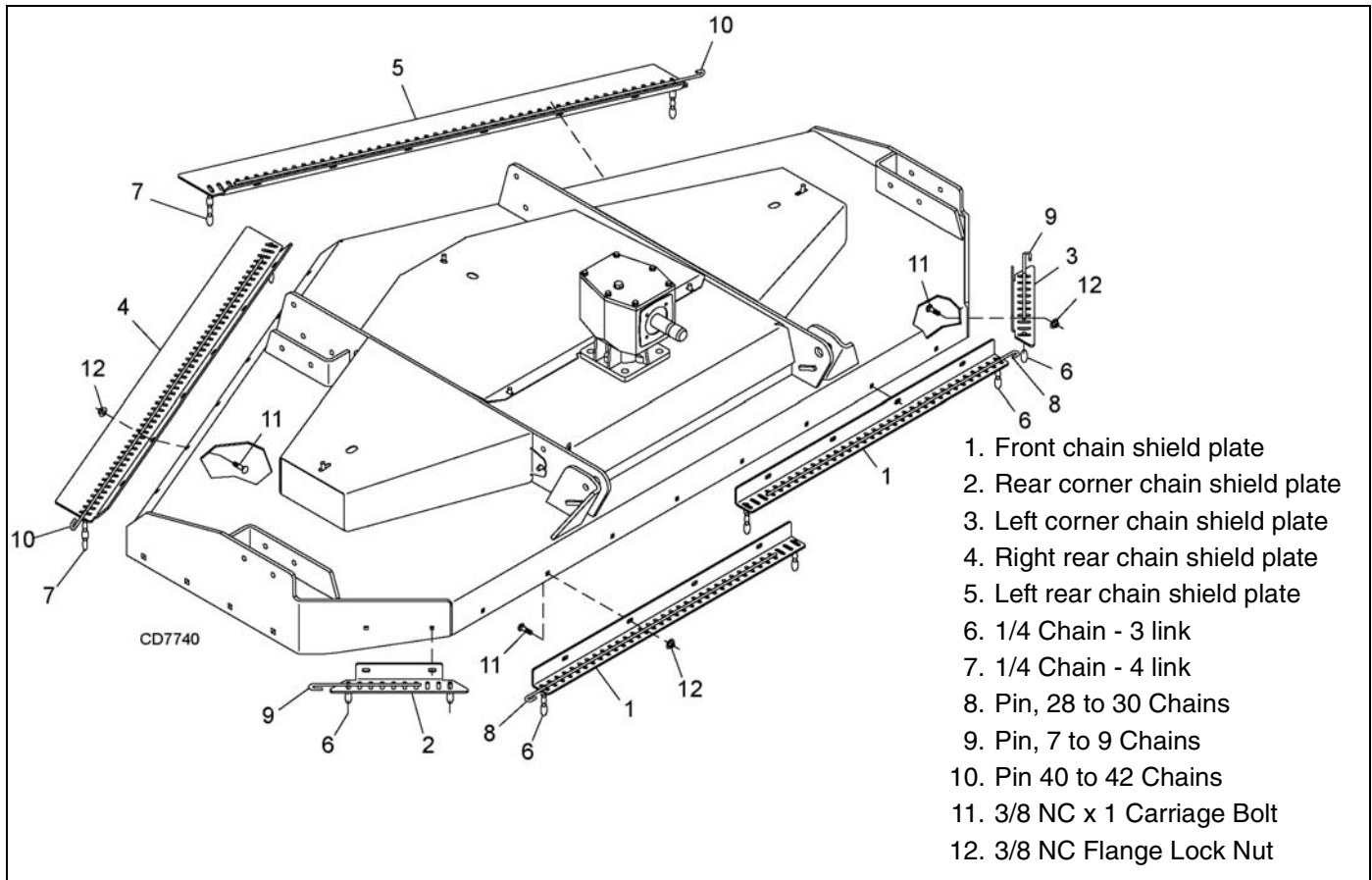


Figure 31. Chain Shield Installation

## Install Chain Shielding

### **⚠ DANGER**

■ Full chain shielding must be installed when operating in populated areas or other areas where thrown objects could injure people or damage property.

- If this machine is not equipped with full chain shielding, operation must be stopped when anyone comes within 300 feet (92 m).
- This shielding is designed to reduce the risk of thrown objects. The mower deck and protective devices cannot prevent all objects from escaping the blade enclosure in every mowing condition. It is possible for objects to ricochet and escape, traveling as much as 300 feet (92 m).

1. Install front and rear chain shields with hardware shown.

## Install Front Roller (Optional)

1. Remove center belt shield from mower.
2. Insert four carriage bolts (8) through top of deck plate.

3. Place roller bracket (1) over bolts; then install flange lock nuts (9) on bolts and tighten.
4. Place front roller (2), two bearings (4), spacer (3) and two SAE flat washers (6) between roller bracket as shown in Figure 32.
5. Insert cap screw (5) through bracket and roller.
6. Secure with flanged lock nut (7). Do not overtighten, roller must spin freely.

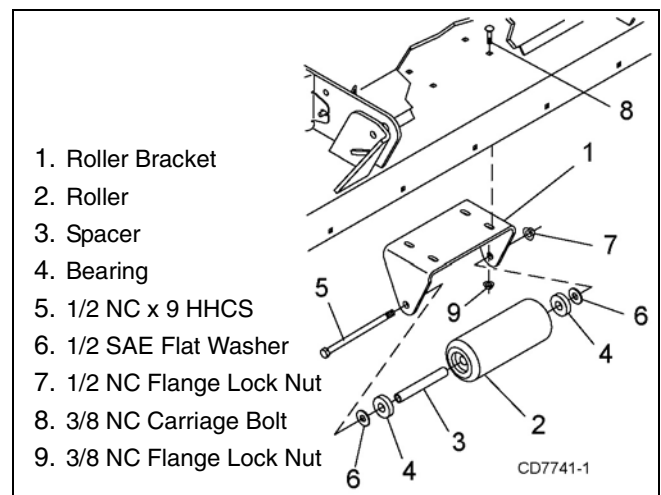
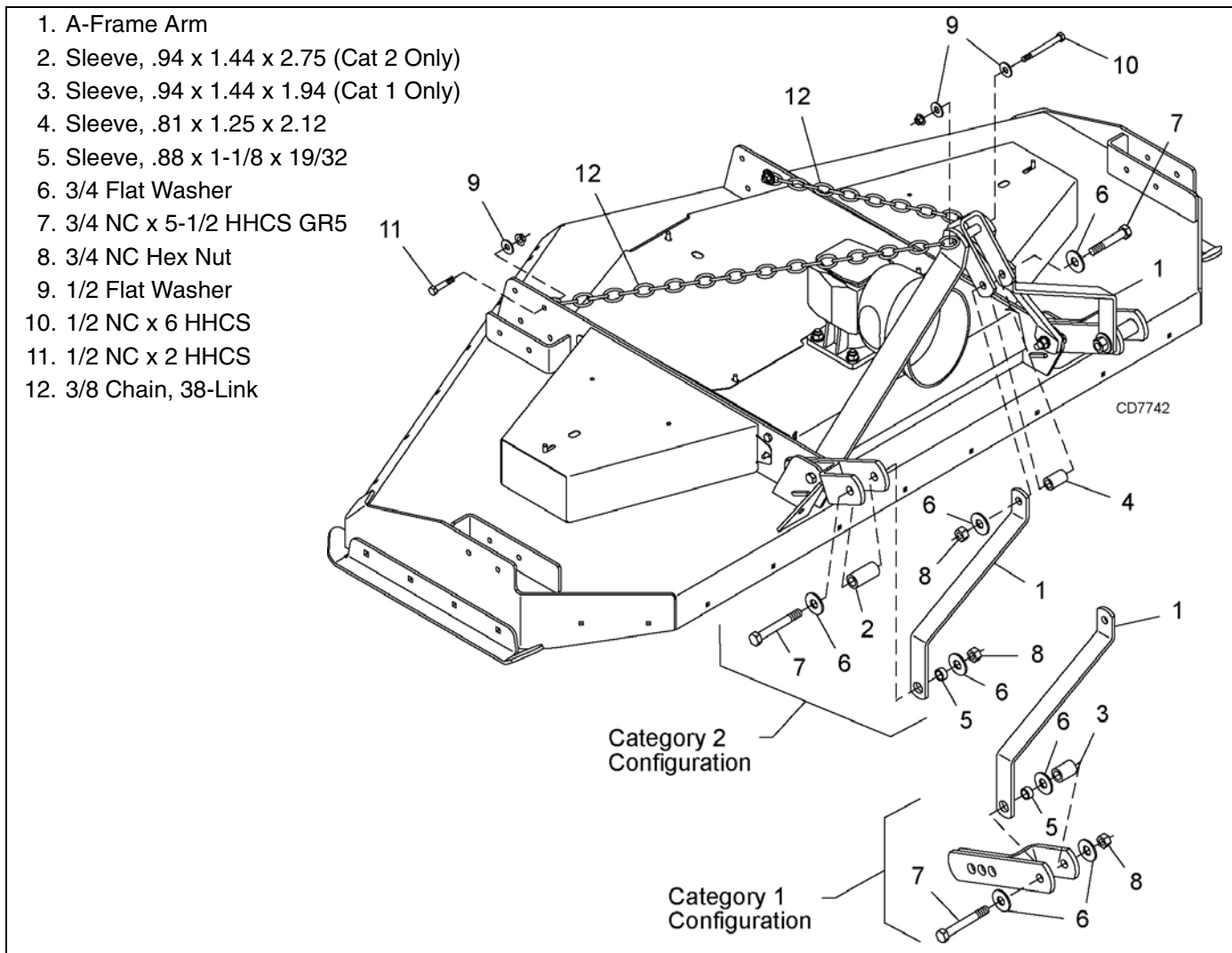


Figure 32. Front Roller Installation



**Figure 33.** Quick Hitch Kit Installation (Optional)

## Install Quick Hitch (Optional)

**NOTE:** This kit allows mower to fit Category 1 or Category 2 standard quick hitches.

1. Lower hitch arms must be located in center attachment hole. See Figure 33 for adjustment.
2. For use with Category 1 quick hitch, lower hitch arms should be positioned with offset toward inside of mower. For use with Category 2 quick hitch, lower hitch arms should be positioned with offset toward outside of the mower.
3. Remove clevis pins from lower hitch arms. Pins will not be used for quick hitch.
4. Attach A-Frame arms (1) and sleeve (2) to lower hitch arms using cap screws (7), sleeve (5), washers (6) and hex nut (8).
5. Attach upper end of A-Frame arms (1) and sleeve (4) to U-bracket, using cap screw (7), washers (6) and hex nut (8).
6. Remove rear offset links. They will be replaced with chains (12).
7. Attach chains (12) to top of A-frame on both sides as shown, using cap screw (10), washers (9), and flange lock nut.
8. Attach opposite ends of chains (12) to rear mower frame using cap screws (11), washers (9), and flange lock nut. Vary length slightly as desired. Twist chain to make finite adjustments in length until unit lifts level.
9. Tighten all hardware.



# DEALER CHECK LISTS

## **PRE-DELIVERY CHECK LIST**

(DEALER'S RESPONSIBILITY)

Inspect the equipment thoroughly after assembly to ensure it is set up properly before delivering it to the customer.

The following check lists are a reminder of points to inspect. Check off each item as it is found satisfactory or after proper adjustment is made.

- Check that all safety decals are installed and in good condition. Replace if damaged.
- Check that shields and guards are properly installed and in good condition. Replace if damaged.
- Check all bolts to be sure they are properly torqued.
- Check that all cotter pins and safety pins are properly installed. Replace if damaged.
- Check and grease all lubrication points as identified in "Lubrication Information" on page 15."
- Gearboxes are not filled at the factory. Prior to delivery, fill as specified in the "Owner Service, lubrication information" on page 15 and check to see that there are no leaking seals.
- Check that blades have been properly installed.

## **DELIVERY CHECK LIST**

(DEALER'S RESPONSIBILITY)

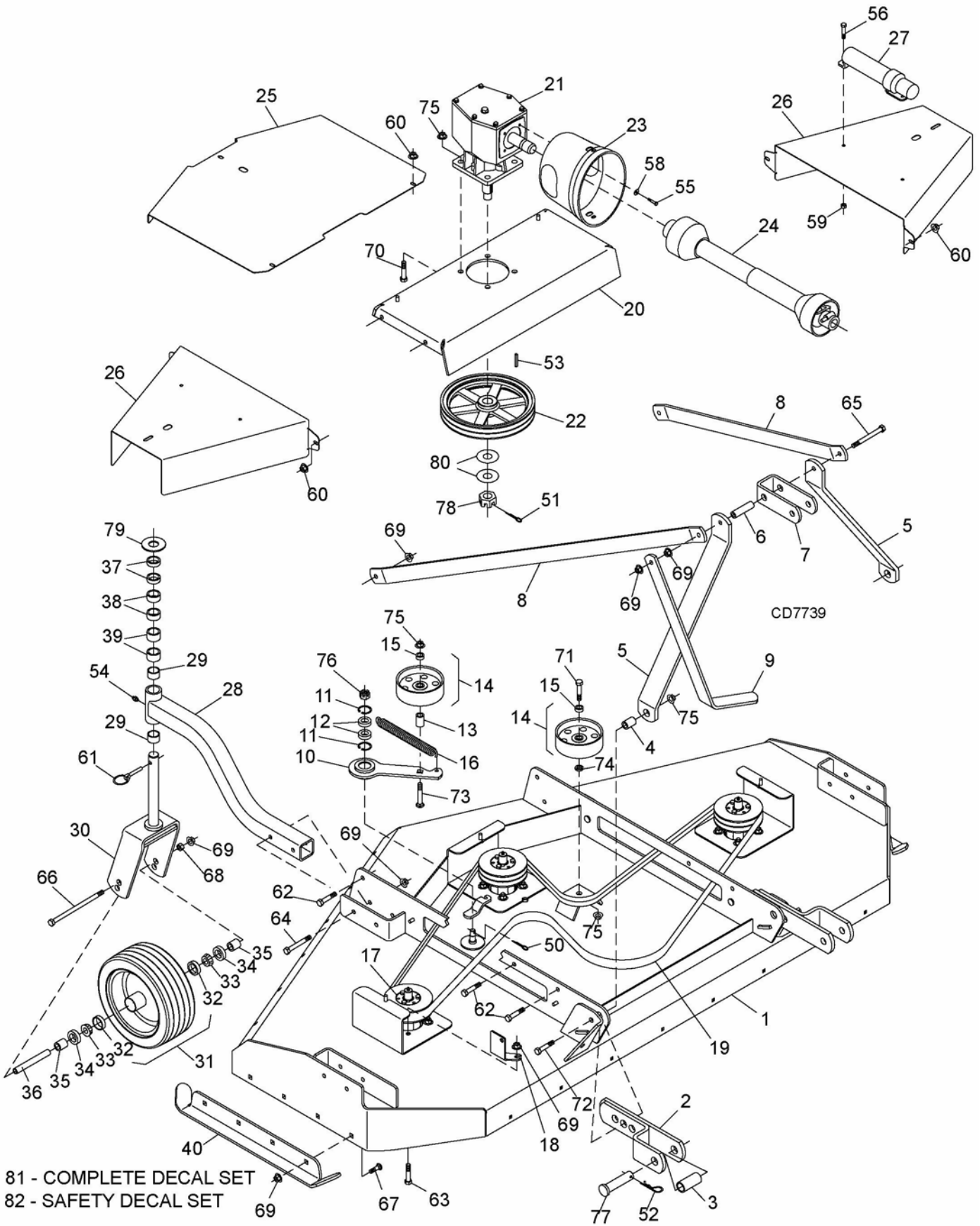
- Show customer how to make adjustments and select proper PTO speed.
- Instruct customer how to lubricate and explain importance of lubrication.
- Point out the safety decals. Explain their meaning and the need to keep them in place and in good condition. Emphasize the increased safety hazards when instructions are not followed.
- Present Operator's Manual and request that customer and all operators read it before operating equipment. Point out the manual safety rules, explain their meanings and emphasize the increased safety hazards that exist when safety rules are not followed.
- Show customer how to make sure driveline is properly installed and that spring-activated locking pin or collar slides freely and is seated in groove on tractor PTO shaft.
- Show customer the safe, proper procedures to be used when mounting, dismounting, and storing equipment.
- Explain to customer the potential crushing hazards of going underneath raised equipment. Instruct that before going underneath to disconnect the driveline, securely block up all corners with jack-stands and to follow all instructions in the "Owner Service, Blocking Methods" section of the Operator's Manual. Explain that blocking up prevents equipment dropping from hydraulic leak down, hydraulic system failures or mechanical component failures.
- For mounted units, add wheel weights, ballast in front tires, and/or front tractor weight to enhance front end stability. A minimum 20% of tractor and equipment gross weight must be on front tractor wheels. When adding weight to attain 20% of tractor and equipment weight on front tractor wheels, you must not exceed the ROPS weight certification. Weigh the tractor and equipment. Do not estimate!
- Make customer aware of optional equipment available so that customer can make proper choices as required.
- Point out all guards and shields. Explain their importance and the safety hazards that exist when not kept in place and in good condition.

# NOTES

## Grooming Mower: GM1190

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# GM1190 MAIN FRAME ASSEMBLY



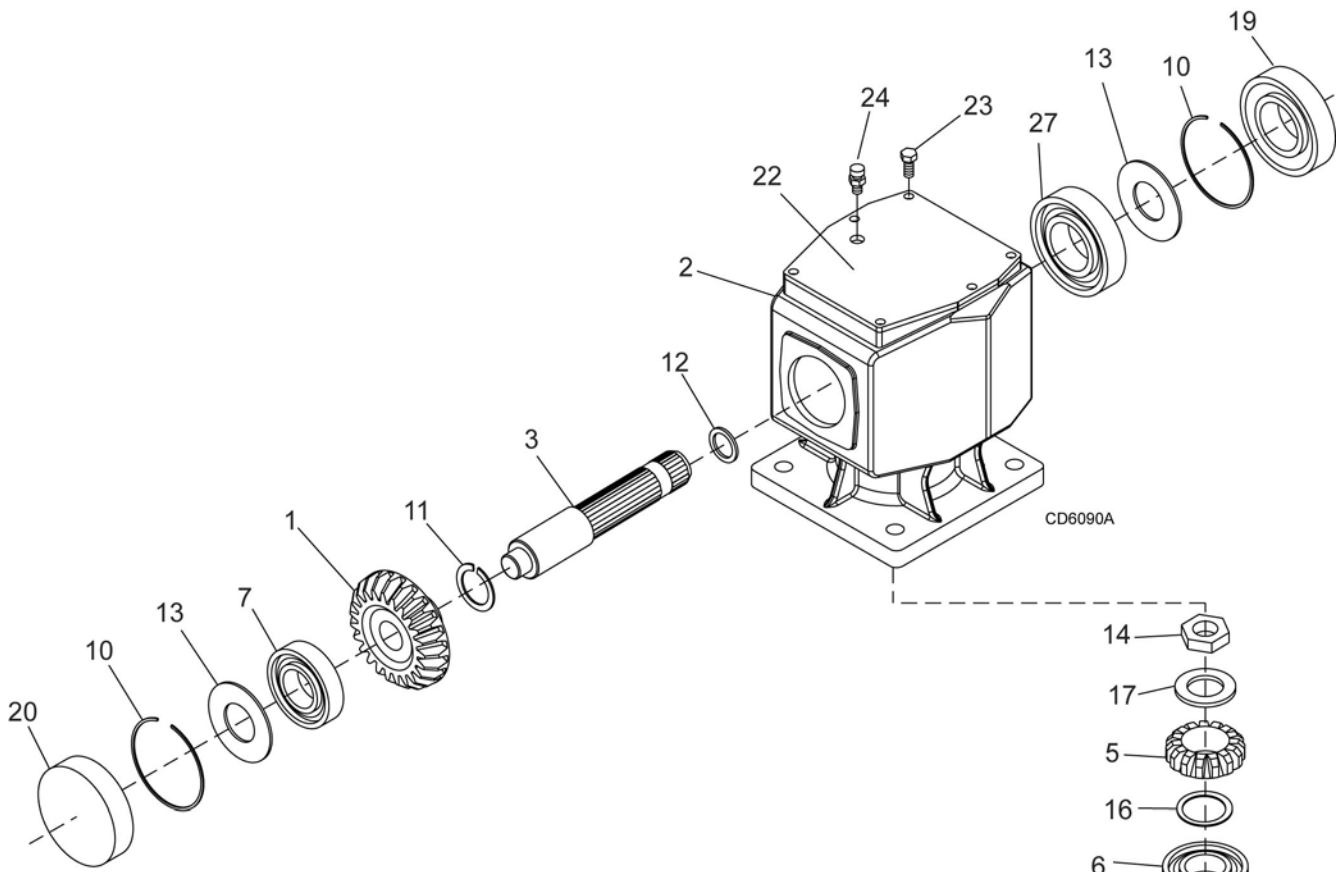
**36 Parts**

5WPMAN0879 (3/18/2011)

## GM1190 MAIN FRAME ASSEMBLY

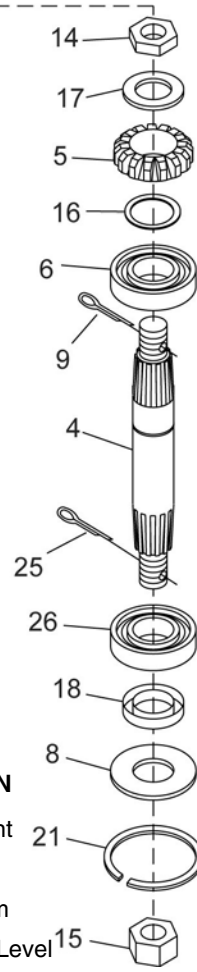
REF	PART	QTY	DESCRIPTION	REF	PART	QTY	DESCRIPTION
1	----	1	Deck (not sold separately)	50		*	3/16 x 1-1/2 Cotter Pin
2	5WP1032786	2	Lower Hitch Arm	51		*	3/16 x 2 Cotter Pin
3	5WP56598	2	Sleeve .885 x 1.125 x 2.62	51		*	3/16 Safety Pin
4	5WP19524	2	Sleeve .64 x 1.00 x 2.09 HT	53		*	1/4 x 1/4 x 1-1/4 Key
5	5WP1032795	2	A-Frame Arm	54		*	1/4-28 Grease Fitting
6	5WP1032798	1	Sleeve .62 x .94 x 3.13	55	5WP39254		M8 x 1.25P x 16mm HHCS
7	5WP1032797	1	U-Link	56		*	5/16 NC x 1 HHCS GR5
8	5WP1032796	2	Rear Offset Link	58		*	5/16 SAE Flat Washer
9	5WP1032811	1	PTO Hanger	59		*	5/16 NC Flange Lock Nut
10	5WP1032789	1	Idler Arm	60		*	3/8 NC Flange Lock Nut
11	5WP35141	2	Retaining Ring	61	5WP27542		7/16 Klik Pin
12	5WP35193	2	Bearing	62		*	1/2 NC x 1-1/2 HHCS GR5
13	5WP27211	1	Sleeve .63 x .88 x 1.18	63		*	1/2 NC x 2 HHCS GR5
14	5WP19570	2	Flat Pulley (includes item 15)	64		*	1/2 NC x 4 HHCS GR5
15	5WP6095	2	.626 x 1.85 Ball Bearing	65		*	1/2 NC x 6-1/2 HHCS GR5
16	5WP28928	1	Ext. Spring .187 x 1.3 x 8.17	66	5WP29604		1/2 NC x 8 HHCS GR5
17	----	3	Spindle Assembly (see page 40)	67		*	1/2 NC x 1-1/2 Carriage Bolt
18	5WP1032808	1	Belt Guide	68	5WP1093		1/2 NC Hex Nut
19	5WP1032799	1	2V Powerband Belt 2W174.5	69		*	1/2 NC Flange Lock Nut
20	5WP1032779	1	Gearbox Stand	70	5WP19024		5/8 NC x 1-3/4 Flange HHCS GR5
21	5WP1002499	1	Gearbox 1:1.92 (see page 38)	71		*	5/8 NC x 2 HHCS GR5
22	5WP1032751	1	Sheave, 11.50 PD, 2B	72	5WP23141		5/8 NC x 3-1/2 HHCS GR5
23	5WP1002048	1	Clutch Shield	73	5WP20419		5/8 NC x 3 Carriage Bolt GR5
24	----	1	Driveline (see page 39)	74	5WP1517		.625 x 1.38 x 7GA Flat Washer
25	5WP1032809	1	Belt Shield, Inner	75		*	5/8 NC Flange Lock Nut
26	5WP1032810	2	Belt Shield, Outer	76	5WP302178		5/8 NF Castle Nut
27	5WP1026530	1	Manual Tube	77	5WP1032818		7/8 x 3.9 Clevis Pin
28	5WP1032780	4	Caster Arm (includes item 29)	78	5WP51946		M24 x 2 Castle Nut
29	5WP31780	8	Bronze Bushing 1-1/4 x 1-1/2 x 1/2	79		*	1-1/4 Stand Flat Washer
30	5WP1032782	4	Caster Yoke	80	5WP20893		25 x 44 x 4 mm Flat Washer
31	5WP20718G	4	13 x 5 x 10 Solid Tire (includes item 32) -or-	81	5WP1032834	1	Complete Decal Set
31	5WP19744G	4	13 x 5 x 6 Pneumatic Tire (includes item 32)				
32	5WP2306	8	Bearing Cup		HHCS		Hex Head Cap Screw
33	5WP2304	8	Bearing Cone		*		Standard Hardware, Obtain Locally
34	5WP5624	8	Seal 1.13 x 1.78 x .47				
35	5WP52744	8	Bushing .752 x 1.125 x .625 HT				
36	5WP20714	4	Sleeve .525 x .75 x 5.80 HT				
37	5WP52853	8	Sleeve 1.25 x 1.90 x .50				
38	5WP52854	8	Sleeve 1.25 x 1.90 x .75				
39	5WP52855	8	Sleeve 1.25 x 1.90 x 1.00				
40	5WP1032812	2	Skid Shoe				

# GM1190 GEARBOX ASSEMBLY

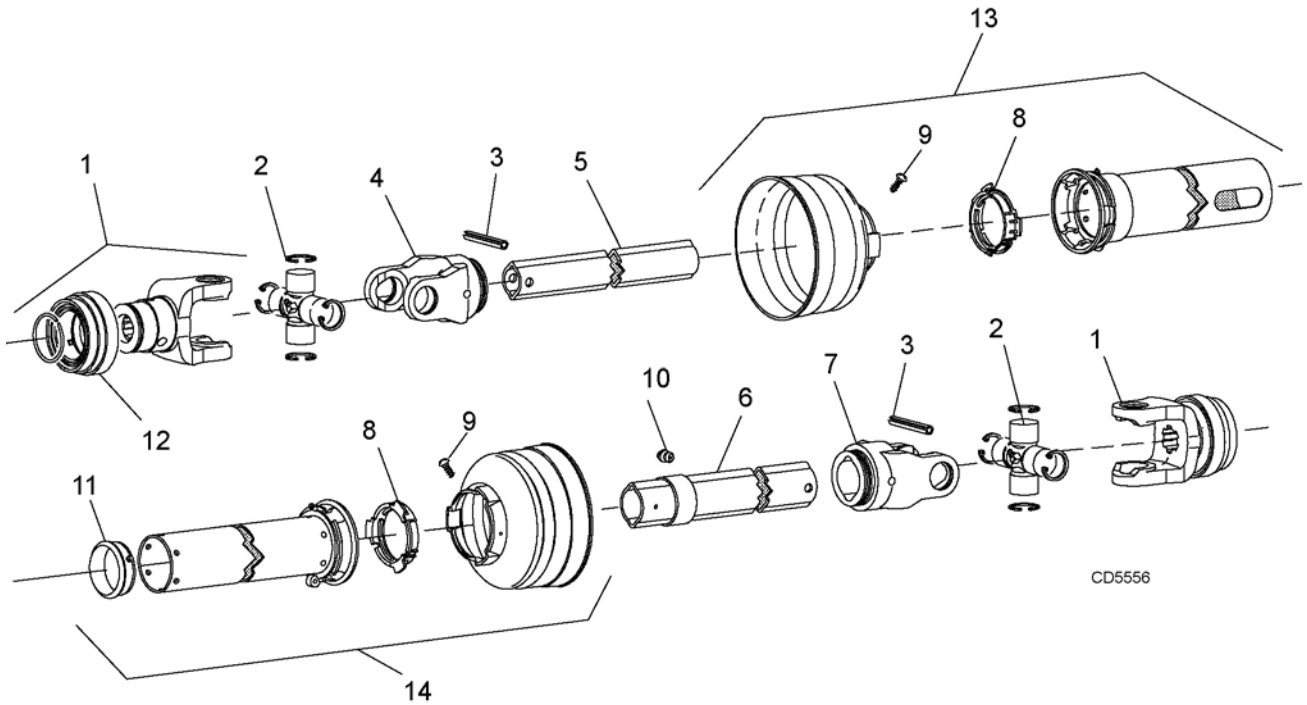


REF	PART	QTY	DESCRIPTION
A	5WP1002499	1	Gearbox Assembly, Complete
1	5WP57458	1	Gear, Crown 25T M5.3
2	NSS	1	Gearbox Housing
3	5WP1005320	1	Shaft, Input 1-3/8 -6
4	5WP1005321	1	Shaft, Output 1-1/4
5	5WP57491	1	Pinion Gear 13T M5.3
6	5WP57476	1	Bearing Cup & Cone
7	5WP57462	1	Bearing Cup & Cone
8	5WP20888	1	Washer, 1.58 x 3.13 x .04 Protective Flat
9		* 1	Pin, Cotter B4 x 50
10	5WP57466	2	Snap Ring
11	5WP20895	1	Snap Ring, 45 mm
12	5WP57373	1	Spacer, 35.3 x 48 x 2.5
13	5WP57328	2	Kit, Shim 60.3 x 71.6
14	5WP57468	1	Nut, Castle
15	5WP51946	1	Nut, Castle M24 x 2
16	5WP57328	1	Kit, Shim 30.3 x 44
17	5WP57473	1	Washer, 21 x 37 x 3 mm Flat
18	5WP20900	1	Seal, Oil 40 x 80 x 12 mm
19	5WP57463	1	Seal, Oil 35 x 72 x 10 mm

REF	PART	QTY	DESCRIPTION
21	5WP20897	1	Snap Ring SB 81 Int
22	5WP57375	1	Cover, Top
23		* 6	Bolt, 8 mm x 14 mm
24	5WP57076	1	Plug, 1/2 Breather Level
25		* 1	Pin, Cotter 5 x 50
26	5WP57478	1	Bearing Cup & Cone
27	5WP20890	1	Ball Bearing
* Standard Hardware, Obtain Locally			



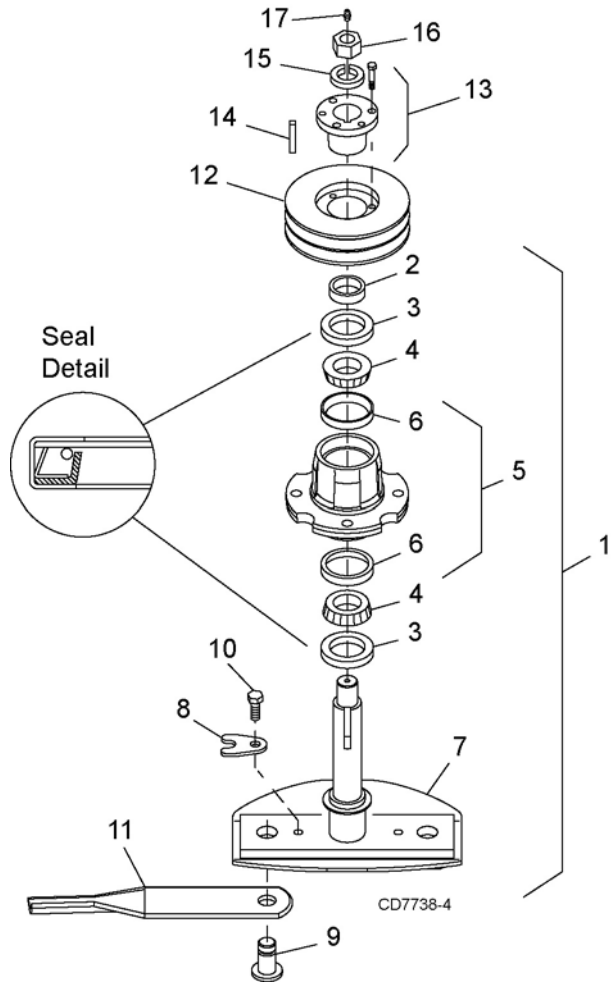
## GM1190 DRIVE SHAFT ASSEMBLY



REF	PART	QTY	DESCRIPTION
A	5WP1029937	1	Drive Assembly Complete
1	5WP40574	2	Yoke, 1-3/8-6SP (complete with lock collar)
2	5WP110	2	Cross and bearing kit
3	5WP40764	2	Spring Pin, 10 mm x 80 mm
4	5WP40575	1	Inboard Youk (male drive tube)
5	5WP40587	1	Inner Profile (cut to length)
6	5WP40588	1	Outer Profile (cut to length)
7	5WP40576	1	Inboard Yoke (female drive tube)
8	5WP40776	1	Bearing Ring Kit (set of 2)
9	5WP40778	1	Screw, Guard Retainer (Pkg of 10)
10	5WP40779	2	Grease Zerk, Drive Line (Pkg of 10)
11	5WP40767	1	Bearing, Guard Support
12	5WP40589	2	Slide Lock Collar Repair Kit (without yoke)
13	5WP1029938	1	Shield, Outer Half Non-Rotating (also includes items 8 & 9)
14	5WP1029939	1	Shield, Inner Half Non-Rotating (also includes items 8, 9 & 11)

## GM1190 BLADE & SPINDLE ASSEMBLY

REF	PART	QTY	DESCRIPTION
1	5WP1032800	1	Blade Spindle, Complete
2	5WP18359	1	Sleeve 1-3/8 x 1-3/4 x 5/8
3	5WP2715	2	Seal 1.75 x 2.56 x .5
4	5WP2717	2	Bearing Cone
5	5WP1032806	1	Spindle Housing w/ Cups
6	5WP2716	2	Bearing Cup
7	NSS	1	Spindle Shaft & Crossbar (Included In Item 1)
8	5WP1032815	2	Blade Lock
9	5WP1032814	2	Blade Pin
10	5WP13288	2	1/2 NC x 3/4 Nylock HHCS
11	5WP29186KT	1	CW Standard Blade Kit, 13" (Includes All 6 Blades)
12	5WP1032794	1	Sheave, 5.75 PD, 2B
13	5WP13557	1	Bushing, P1 1-3/8 Straight Bore
14	5WP24549	1	5/16 x 5/16 x 1-3/4 Key
15	*	-	1 Standard Lock Washer
16	5WP1386	-	1 NC Jam Nut
17	*	-	1/4-28 Tapered Grease Fitting
	HHCS		Hex Head Cap Screw
	NSS		Not Serviced Separately
	*		Standard Hardware, Obtain Locally

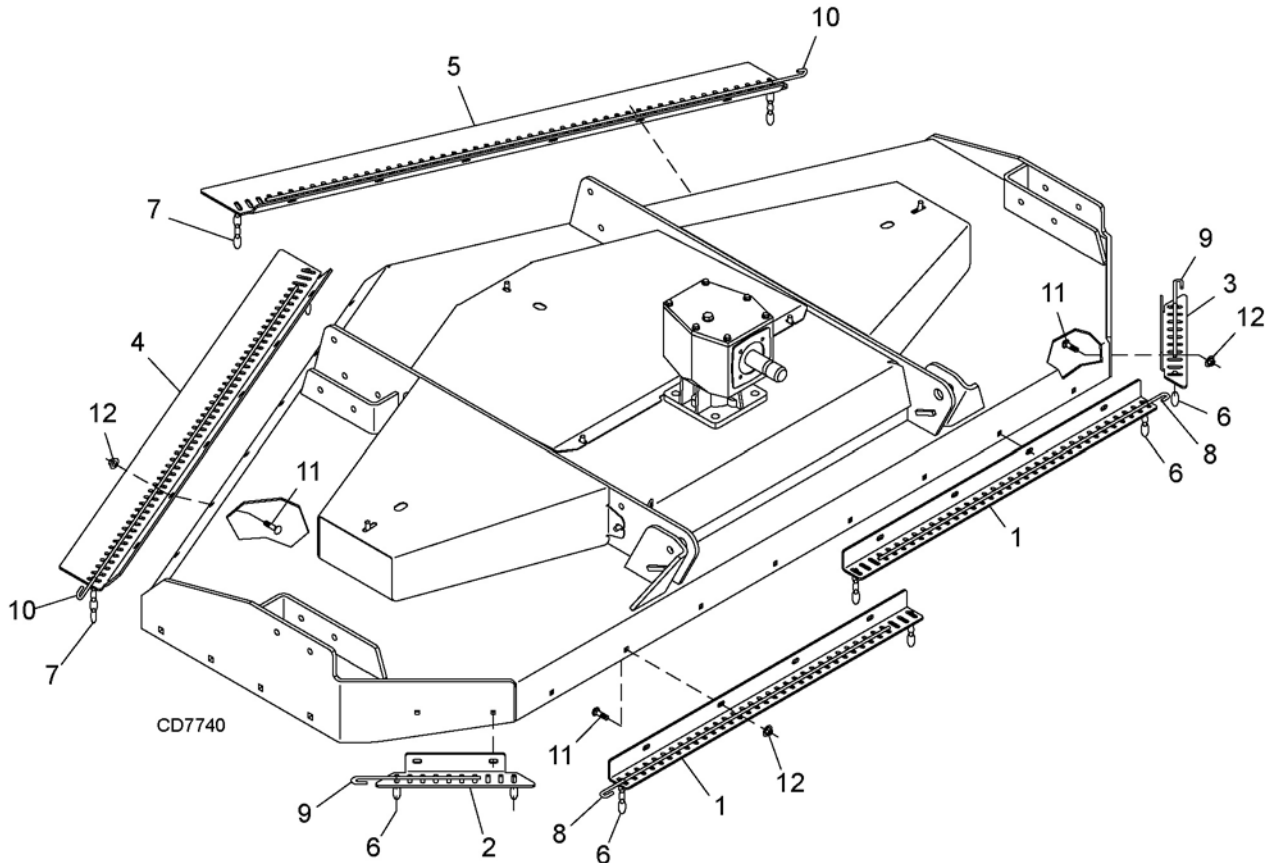


**40 Parts**

(Rev. 8/5/2011)  
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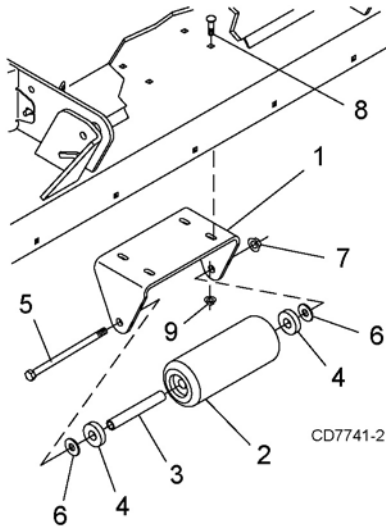


## GM1190 CHAIN SHIELDING ASSEMBLY



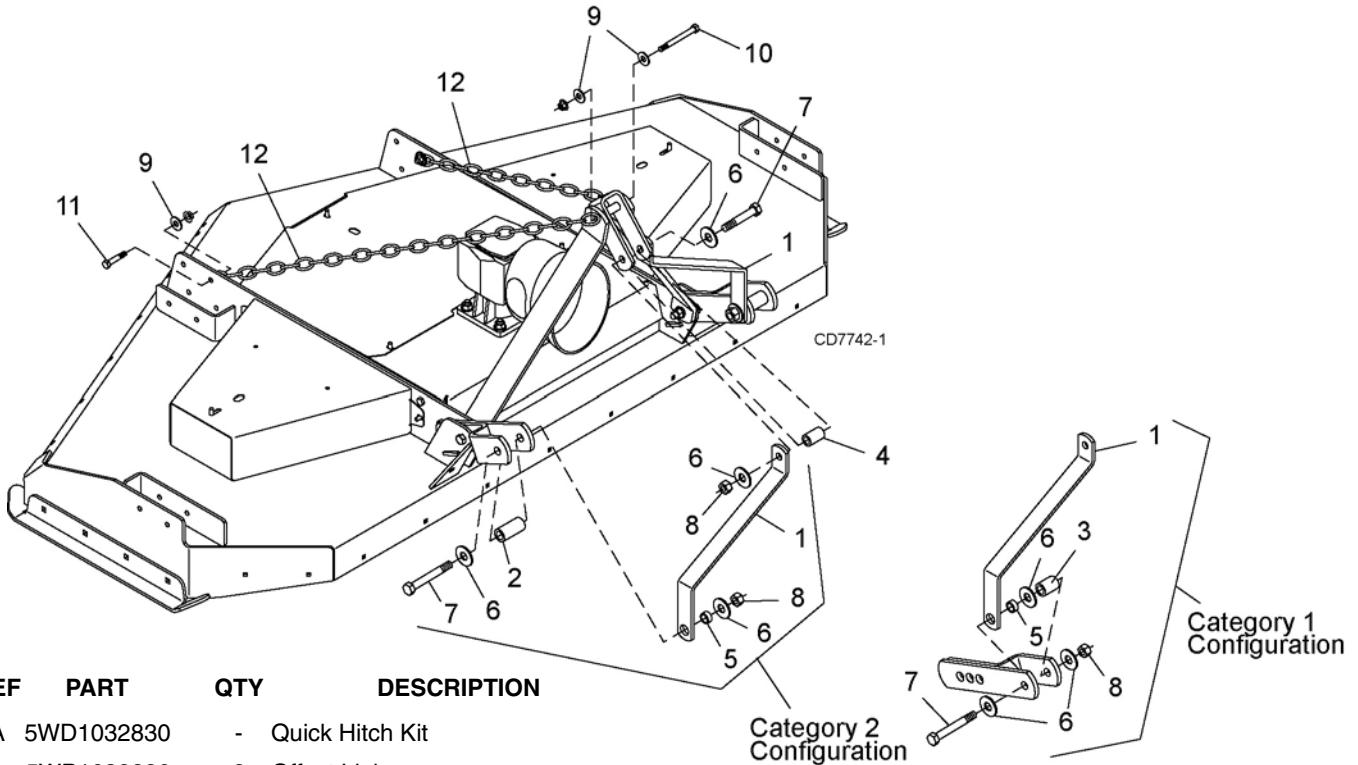
REF	PART	QTY	DESCRIPTION
1	5WP1032821	2	Front Chain Shield Plate
2	5WP1032832	1	Right Corner Chain Shield Plate
3	5WP1032833	1	Left Corner Chain Shield Plate
4	5WP1032822	1	Right Rear Chain Shield Plate
5	5WP1032823	1	Left Rear Chain Shield Plate
6	5WP4763	90	1/4 Chain - 3 Link
7	5WP4765	100	1/4 Chain - 4 Link
8	5WP1003646	2	Pin, 28 to 30 Chains
9	5WP1007852	2	Pin, 7 to 9 Chains
10	5WP1007854	2	Pin, 40 to 42 Chains
11	*	-	3/8 NC x 1 Carriage Bolt, GR5
12	*	-	3/8 NC Flange Lock Nut
			* Standard Hardware, Obtain Locally

## GM1190 FRONT ROLLER ASSEMBLY (OPTIONAL)



REF	PART	QTY	DESCRIPTION
A	5WD1032828	1	Front Roller Kit - Complete
1	5WP1032829	1	Roller Bracket
2	5WP1006418	1	Roller, 4 x 7.38
3	5WP1006420	1	Spacer, .75 x 7.27
4	5WP35193	2	Bearing
5	5WP38107	-	1/2 NC x 9 HHCS, GR5
6		*	1/2 SAE Flat Washer
7		*	1/2 NC Flange Lock Nut
8		*	3/8 NC x 1-1/4 Carriage Bolt, GR5
9		*	3/8 NC Flange Lock Nut
			* Standard Hardware, Obtain Locally

## QUICK HITCH KIT (OPTIONAL)



REF	PART	QTY	DESCRIPTION
A	5WD1032830	-	Quick Hitch Kit
1	5WP1032826	2	Offset Link
2	5WP1002012	2	Sleeve, .94 x 1.44 x 2.75 (Cat 2 only)
3	5WP1016517	2	Sleeve, .94 x 1.44 x 1.94 (Cat 1 only)
4	5WP1002018	1	Sleeve, .81 x 1.25 x 2.12
5	5WP29281	2	Sleeve, 7/8 x 1-1/8 x 19/32 HT
6		*	3/4 Flat Washer
7		*	3/4 NC x 5-1/2 HHCS, GR5
8		*	3/4 NC Plated Hex Nut
9		*	1/2 Flat Washer

REF	PART	QTY	DESCRIPTION
10		*	1/2 NC x 6 HHCS GR5
11		*	1/2 NC x 2 HHCS GR5
12	5WP1005401	2	Chain, 3/8 proof coil 38-link
			HHCS Hex Head Cap Screw
			* Standard Hardware, Obtain Locally

**42 Parts**

(Rev. 8/5/2011)  
5WPMAN0879 (3/18/2011)

# BOLT TORQUE CHART

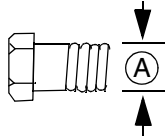
Always tighten hardware to these values unless a different torque value or tightening procedure is listed for a specific application.

Fasteners must always be replaced with the same grade as specified in the manual parts list.

Always use the proper tool for tightening hardware: SAE for SAE hardware and Metric for metric hardware.

Make sure fastener threads are clean and you start thread engagement properly.

All torque values are given to specifications used on hardware defined by SAE J1701 MAR 99 & J1701M JUL 96.



## SAE SERIES TORQUE CHART



SAE Grade 2  
(No Dashes)

SAE Bolt Head Identification

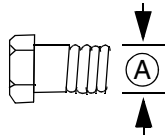


SAE Grade 5  
(3 Radial Dashes)



SAE Grade 8  
(6 Radial Dashes)

Ⓐ Diameter (Inches)	Wrench Size	MARKING ON HEAD					
		SAE 2		SAE 5		SAE 8	
		lbs-ft	N-m	lbs-ft	N-m	lbs-ft	N-m
1/4"	7/16"	6	8	10	13	14	18
5/16"	1/2"	12	17	19	26	27	37
3/8"	9/16"	23	31	35	47	49	67
7/16"	5/8"	36	48	55	75	78	106
1/2"	3/4"	55	75	85	115	120	163
9/16"	13/16"	78	106	121	164	171	232
5/8"	15/16"	110	149	170	230	240	325
3/4"	1-1/8"	192	261	297	403	420	569
7/8"	1-5/16"	306	416	474	642	669	907
1"	1-1/2"	467	634	722	979	1020	1383



## METRIC SERIES TORQUE CHART



8.8  
Metric  
Grade 8.8

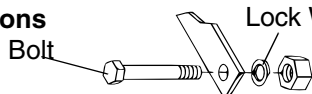
Metric Bolt Head Identification



10.9  
Metric  
Grade 10.9

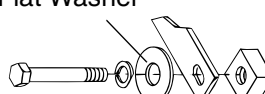
Ⓐ Diameter & Thread Pitch (Millimeters)	Wrench Size	Coarse Thread				Fine Thread				Ⓐ Diameter & Thread Pitch (Millimeters)
		Marking on Head				Marking on Head				
		Metric 8.8		Metric 10.9		Metric 8.8		Metric 10.9		
		N-m	lbs-ft	N-m	lbs-ft	N-m	lbs-ft	N-m	lbs-ft	
6 x 1.0	10 mm	8	6	11	8	8	6	11	8	6 x 1.0
8 x 1.25	13 mm	20	15	27	20	21	16	29	22	8 x 1.0
10 x 1.5	16 mm	39	29	54	40	41	30	57	42	10 x 1.25
12 x 1.75	18 mm	68	50	94	70	75	55	103	76	12 x 1.25
14 x 2.0	21 mm	109	80	151	111	118	87	163	120	14 x 1.5
16 x 2.0	24 mm	169	125	234	173	181	133	250	184	16 x 1.5
18 x 2.5	27 mm	234	172	323	239	263	194	363	268	18 x 1.5
20 x 2.5	30 mm	330	244	457	337	367	270	507	374	20 x 1.5
22 x 2.5	34 mm	451	332	623	460	495	365	684	505	22 x 1.5
24 x 3.0	36 mm	571	421	790	583	623	459	861	635	24 x 2.0
30 x 3.0	46 mm	1175	867	1626	1199	1258	928	1740	1283	30 x 2.0

### Typical Washer Installations



Lock Washer

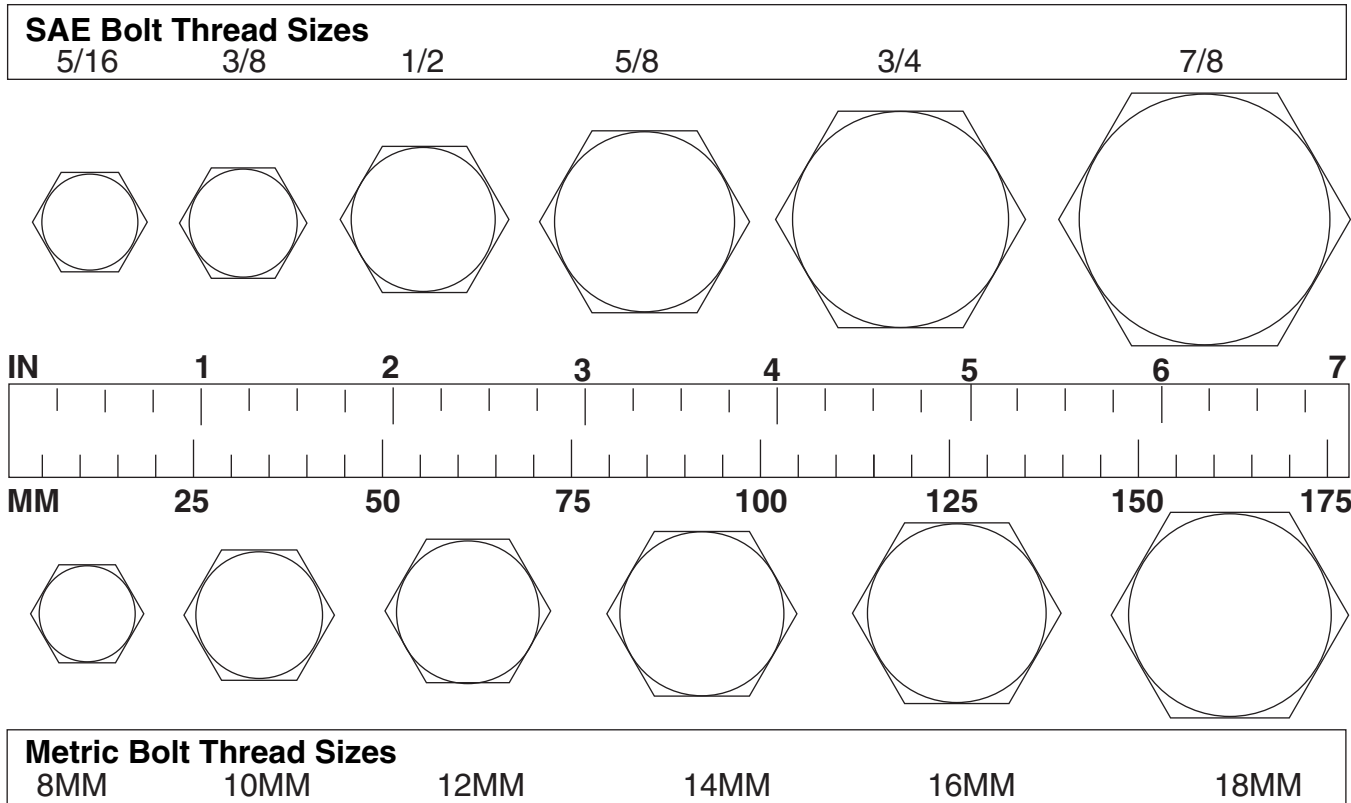
Flat Washer



8/9/00

# BOLT SIZE CHART

**NOTE:** Chart shows bolt thread sizes and corresponding head (wrench) sizes for standard SAE and metric bolts.



## ABBREVIATIONS

AG ..... Agriculture  
 ASABE ..... American Society of Agricultural & Biological Engineers (formerly ASAE)  
 ASAE..... American Society of Agricultural Engineers  
 ATF.....Automatic Transmission Fluid  
 BSPP..... British Standard Pipe Parallel  
 BSPTM..... British Standard Pipe Tapered Male  
 CV ..... Constant Velocity  
 CCW..... Counter-Clockwise  
 CW ..... Clockwise  
 F ..... Female  
 FT..... Full Thread  
 GA ..... Gauge  
 GR (5, etc.)..... Grade (5, etc.)  
 HHCS ..... Hex Head Cap Screw  
 HT ..... Heat-Treated  
 JIC..... Joint Industry Council 37° Degree Flare  
 LH..... Left Hand  
 LT ..... Left  
 m ..... Meter  
 mm ..... Millimeter  
 M ..... Male

MPa ..... Mega Pascal  
 N ..... Newton  
 NC..... National Coarse  
 NF ..... National Fine  
 NPSM ..... National Pipe Straight Mechanical  
 NPT.....National Pipe Tapered  
 NPT SWF..... National Pipe Tapered Swivel Female  
 ORBM ..... O-Ring Boss - Male  
 P ..... Pitch  
 PBY.....Power-Beyond  
 psi ..... Pounds per Square Inch  
 PTO.....Power Take Off  
 QD ..... Quick Disconnect  
 RH..... Right Hand  
 ROPS..... Roll-Over Protective Structure  
 RPM.....Revolutions Per Minute  
 RT ..... Right  
 SAE..... Society of Automotive Engineers  
 UNC ..... Unified Coarse  
 UNF ..... Unified Fine  
 UNS ..... Unified Special

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**PART NUMBER**  
**5WPMAN0879**