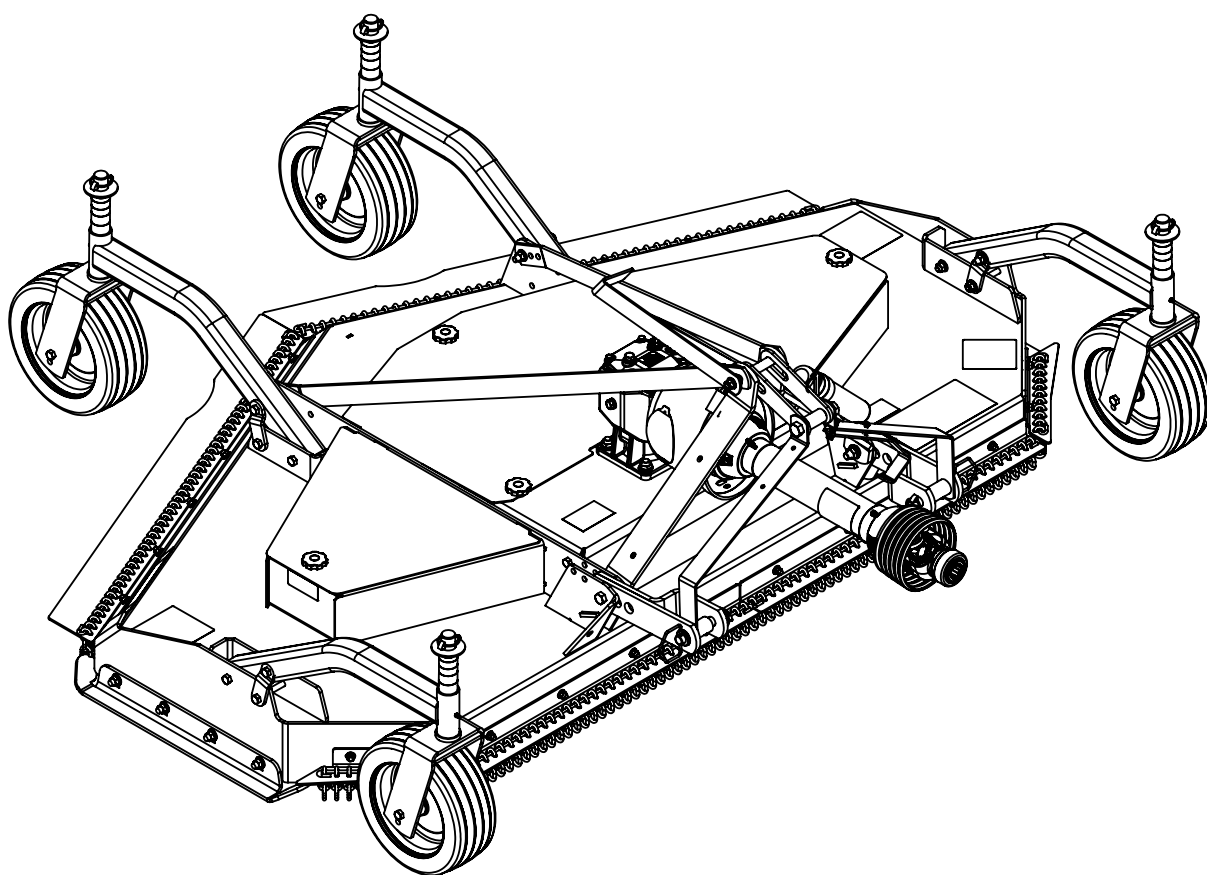


WOODS[®]

REARMOUNT MOWERS

TW990X



MAN1415
(Rev 09/03/2026)

OPERATOR'S MANUAL

TO THE DEALER:

Assembly and proper installation of this product is the responsibility of the Woods® 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.

The dealer must complete the online Product Registration form at the Woods Dealer Website which certifies that all Dealer Check List items have been completed. Dealers can register all Woods product at dealer.WoodsEquipment.com under Product Registration.

Failure to register the product does not diminish customer's warranty rights.

TO THE OWNER:

Read this manual before operating your Woods 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 adjustment and operating procedures before attempting to operate. Replacement manuals can be obtained from your dealer. To obtain complete warranty details, visit WoodsEquipment.com/warranty. You may also request a hard copy by calling 1-800-319-6637 or mail your request to: Woods Equipment Company, Attn: Warranty Dept. 2606 South Illinois Route 2, Oregon, IL 61061. To locate your nearest dealer, check the Dealer Locator at www.WoodsEquipment.com, or in the United States and Canada call 1-800-319-6637.

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

Use only genuine Woods 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 physical injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



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



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



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

**IMPORTANT
or NOTICE**

Is used to address practices not related to physical injury.

NOTE

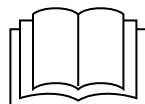
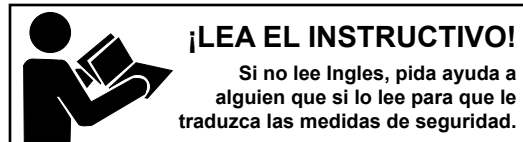
Indicates helpful information.

2 Introduction

MAN1415
(09/03/2026)

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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

	<u>TW990X</u>
Recommended Tractor Horsepower	45 - 75
Tractor PTO Speed RPM	540
3-Point Hitch	Category 1 and 2
Cutting Width	90"
Cutting Height Range	1-1/2" - 7"
Operating Weight with Chain Shielding	1248 lbs
Blade Speed (feet per minute)	17,000
Blade Speed (RPM)	2,074
Blade Spindles	3
Number of Blades	6
Blade Overlap	2"
Driveline Size	ASAE Cat. 4
Belt	Powerband w/ Dbl B-section
Operating Temperature Range	-20° to 110° F
Caster Wheels	13 x 5 x 10 Solid Rib Tire
Mower Frame Thickness	5/16"

GENERAL INFORMATION

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.

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.

4 Introduction

MAN1415
(09/03/2026)

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

- This machine is capable of amputating hands and feet and throwing objects. Failure to observe the following safety instructions could result in serious injury or death.
- 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. To locate your nearest dealer, check the Dealer Locator at www.WoodsEquipment.com, or in the United States and Canada call 1-800-319-6637.) 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 responsible, trained, familiar with the instructions and be physically 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 entanglement 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.
- Connect PTO driveline directly to power unit PTO shaft. Never use adapter sleeves or adapter shafts. Adapters can cause driveline failures due to incorrect spline or incorrect operating length and can result in personal injury or death.
- Before starting 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 systems 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 20% 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 front wheel weights, ballast in tires or front tractor weights. Weigh the tractor and equipment. Do not estimate.
- Inspect and clear area of stones, branches, or other hard objects that might be thrown, causing injury or damage.
- Always walk around tractors and machinery instead of stepping over or on the PTO driveline shafts or tongue.

SAFETY RULES



ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!



- Keep the area of operation clear of all bystanders, particularly small children [within 300 ft (92 m)]. Stop the machine and attachment(s) if anyone enters the area.
- If installed, make sure driveline guard tether chains 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.
- Do not put this equipment into service unless all side skids are properly installed and in good condition. Replace if damaged.
- Equip tractor with a fire extinguisher and first aid kit.
- Always walk around tractors and machinery instead of stepping over or on the PTO shaft, PTO master shield, Power Input Connection or guards.
- Do not allow bystanders or animals within 25 feet (7.6 m) when attaching, removing, assembling, or servicing equipment.
- Keep bystanders, children, and animals away from equipment.
- Disengage the tractor's PTO to stop blade rotation before crossing gravel surfaces.
- Do not stand between tractor and implement when tractor is in gear.
- 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.

OPERATION

- To avoid injury from thrown objects, do not allow bystanders or animals within 300 feet (92 m) of the area when operating the equipment.
- Full chain shielding is recommended when operating in populated areas or other areas where thrown objects could injure people or damage property.
 - If the machine is not equipped with full chain shielding, operation must be stopped.
 - 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.
- Do not put hands or feet near rotating parts or under the machine. Keep clear of the discharge opening at all times.
- To avoid damage to mower or driveline, make sure driveline holder is properly stored before operation.
- Never direct discharge toward people, animals, or property.
- Avoid discharging material against a wall or obstruction. It is possible for objects to ricochet and escape, traveling as much as 300 feet (92 m).
- Do not operate machine when shields or guards are removed.
- 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. Refer to tractor manual for proper ballasting and slope recommendations.
- Use caution while operating near dropoffs.
- Power unit must be equipped with Roll Over Protection System (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.

SAFETY RULES



ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!



- Do not stop, start, or change directions suddenly on slopes. Make turns slowly and gradually.
- Do not operate at ambient temperatures above 110°F. Gearboxes may become too hot to safely touch.
- Use extreme care and reduce ground speed on slopes and rough terrain.
- Watch for hidden hazards on the terrain during operation.
- Do not operate machine under any condition where traction, steering, or stability is in question. Tires could slide even if the wheels are stopped.
- Except in emergencies, reduce tractor engine speed to low idle before disengaging tractor PTO to prevent blades from sticking together.
- Stop power unit and implement immediately upon striking an obstruction. Dismount power unit, using proper procedure. Inspect and repair any damage before resuming operation.
- Do not leave a running machine unattended. Always park on level ground, disengage tractor PTO, set parking brake, and stop engine.
- Tragic accidents can occur if the operator is not alert to the presence of children. Children are often attracted to the machine and the mowing activity. Never assume that children will remain where you last saw them.
- Keep children out of the operating area and under the watchful care of a responsible adult other than the operator.
- Do not carry children, even with the blade(s) shut off. Children could fall off and be seriously injured or interfere with safe machine operation. Children who have been given rides in the past could suddenly appear in the mowing area for another ride and be run over or backed over by the machine.
- Do not operate or transport on steep slopes. Refer to tractor manual for proper ballasting and slope recommendations.
- 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. Turn on flashing warning lights whenever traveling on a public roadway.
- Never allow riders on power unit or attachment.
- Never exceed 25 mph (40 kph) during transport.
- Check SMV sign and reflector condition before proceeding onto public roads.

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 entanglement 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.
- ## TRANSPORTATION
- Use additional caution and reduce speed when under adverse surface conditions, turning, or on inclines.
 - Do not operate PTO during transport.
 - A minimum 20% 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 front wheel weights, ballast in tires or front tractor weights. Weigh the tractor and equipment. Do not estimate.

- Always make sure any material and waste products from the repair and maintenance of the implement are properly collected and disposed.
- Wear long sleeves, long pants, boots, and gloves when cleaning machine to avoid contact with poisonous plants.
- 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 installed securely to ensure equipment is in a safe condition before putting unit into service.
- Keep machine in good working order. Replace worn or damaged parts.
- 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 sheave.
- Use care when installing or removing belt from spring-loaded idler. Springs store energy when extended and, if released suddenly, can cause personal injury.
- Do not allow bystanders or animals within 25 feet (7.6 m) when attaching, removing, assembling, or servicing equipment.
- Never perform cleaning, service, or maintenance with engine running.
- When lubricating telescoping PTO drives, keep fingers out of shield access slots to prevent injury.
- Service and maintenance work not covered in OWNER SERVICE must be done by a qualified dealership. Special skills, tools, and safety procedures may be required. Failure to follow these instructions can result in serious injury or death.

STORAGE

- Follow manual instructions for storage.
- Keep children, bystanders, and animals away from the equipment and the storage area.

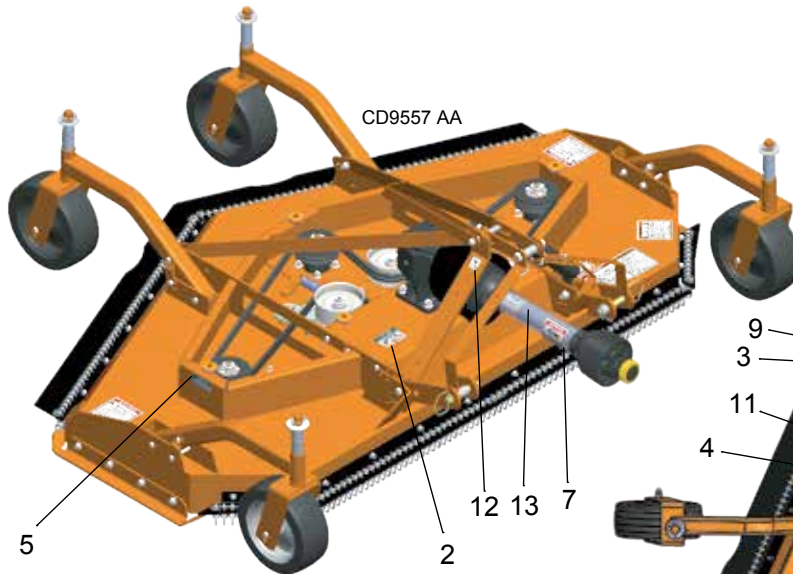
SAFETY & INSTRUCTIONAL DECALS



ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!



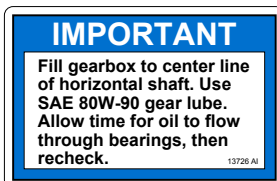
Replace Immediately If Damaged!



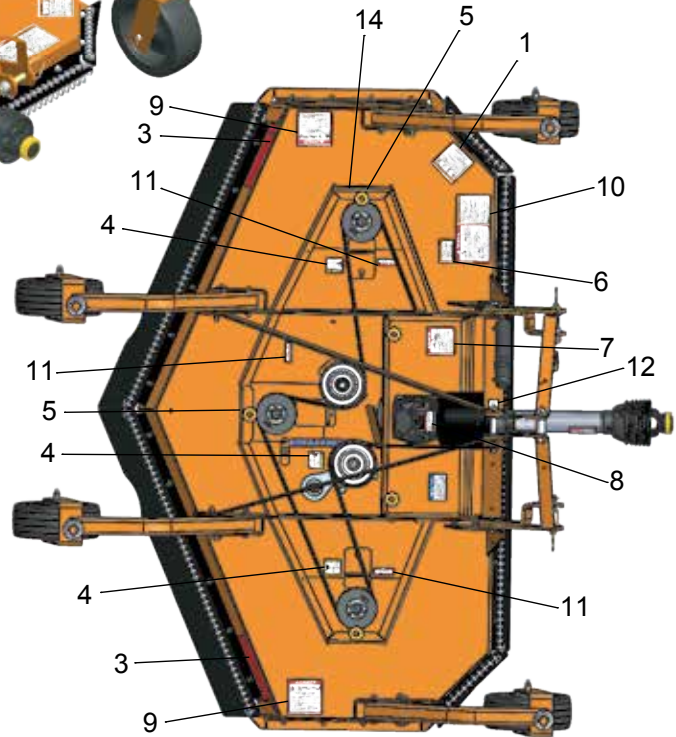
1 - 1003751



2 - 13726



4 - 626798



3 - 57123 Red Reflector

BE CAREFUL!

Keep safety decals clean and visible.

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.

Replace safety decals if they are missing or illegible.

Replacement safety decals can be ordered free from your Woods dealer. To locate your nearest dealer, check the Dealer Locator at www.WoodsEquipment.com, or in the United States and Canada call 1-800-319-6637.

SAFETY & INSTRUCTIONAL DECALS



ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!



Replace Immediately If Damaged!

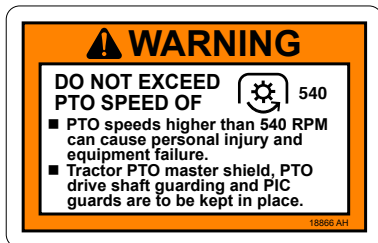
5 - 1032450



10 - 626774



6 - 18866



9 - 15503



13 - 33347



7 - 18864



8 - 1004114



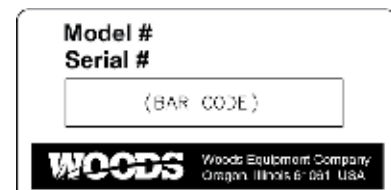
12 - 603626



11 - 18869



14 - Serial Number Plate



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 **page 5** through **page 10**.

This mower is capable of mowing rough weedy farmland and commercial lawns and landscapes with a finished cut quality.

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

DANGER

- Full chain shielding is recommended 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 is recommended to 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.

WARNING

- Do not operate machine when shields or guards are removed.
- Never allow children or untrained persons to operate equipment.
- Keep bystanders, children, and animals away from equipment.
- Make sure spring-activated locking pin or collar slides freely and is seated firmly in tractor PTO spline groove.
- Operate tractor PTO at 540 RPM. Do not exceed.
- 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.
- Always wear relatively tight and belted clothing to avoid entanglement 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 20% 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 front wheel weights, ballast in tires or front tractor weights. Weigh the tractor and equipment. Do not estimate.

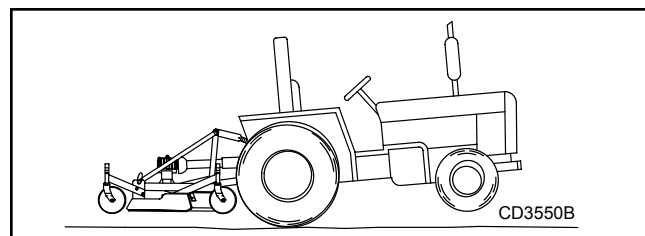


Figure 1. Tractor Stability

ATTACHING MOWER TO TRACTOR - STANDARD TRACTOR HITCH

WARNING

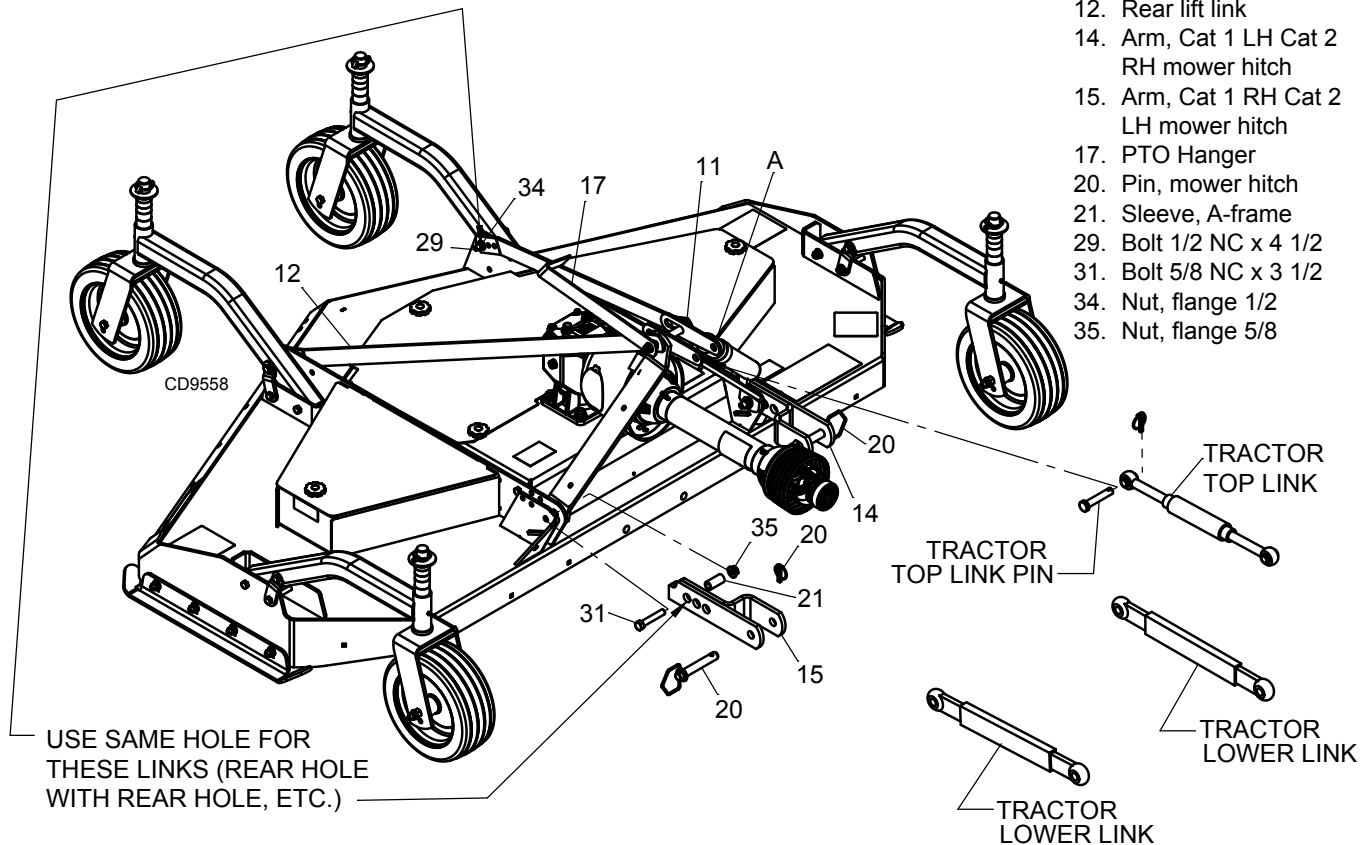
- Make sure spring-activated locking pin or collar slides freely and is seated firmly in tractor PTO spline groove.
- Do not stand between tractor and implement when tractor is in gear.

CAUTION

- Make sure driveline will not bottom out at the shortest length and that it has at least 4" overlap at the longest length.
- If driveline is too short, please call your Woods dealer for a longer driveline.
- If driveline is too long, follow the instructions for shortening the driveline.

(continued on page 13)

CATEGORY 1 HITCH ATTACHMENT POINTS



CATEGORY 2 ATTACHMENT POINTS

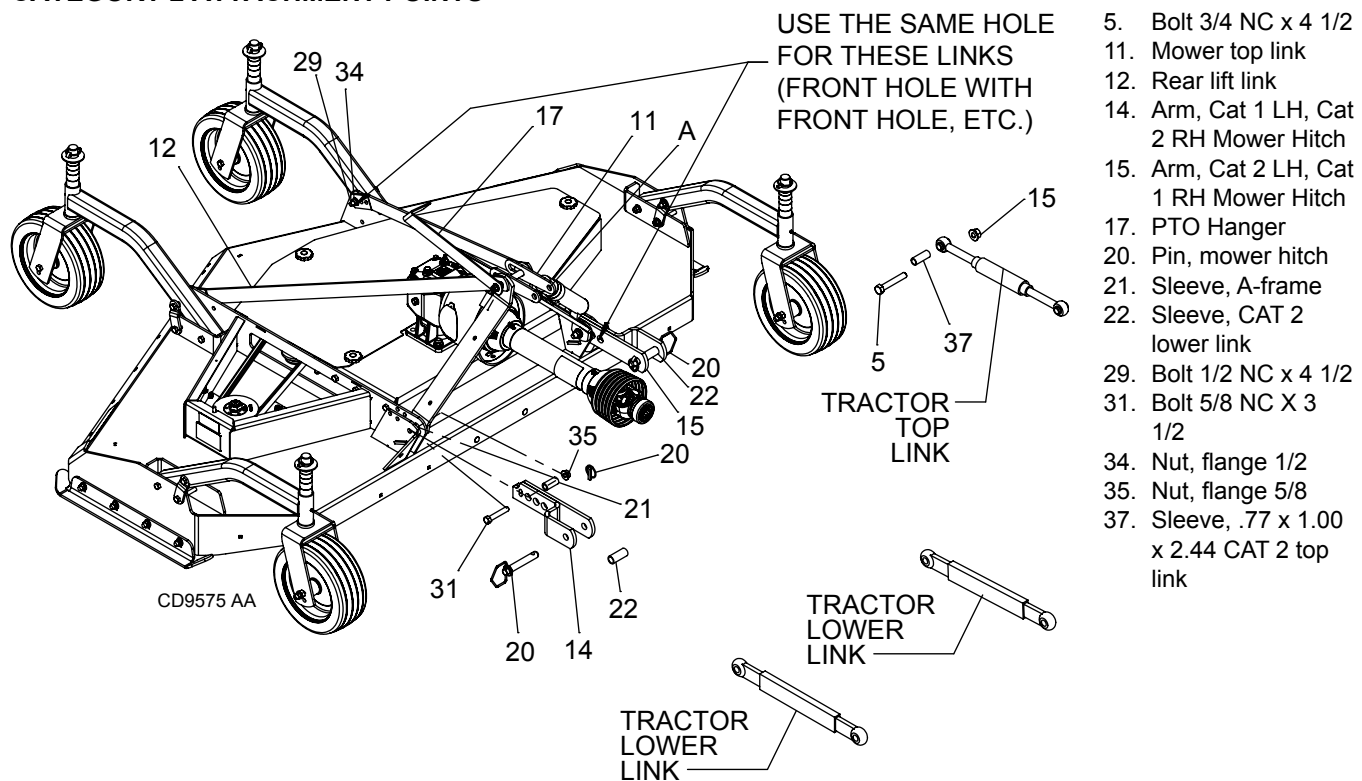


Figure 2. Attachment Points

12 Operation

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(09/03/2026)

Refer to Figure 2

1. For Category 1 hitch, position lower hitch arms (14 & 15) with offset toward center of mower. For Category 2 hitch, position lower hitch arms (14 & 15) with offset toward outside of mower. Place hardware in the same hole for the rear lift links (12) as the lower hitch arm weldments (14 & 15).
2. Attach the mower hitch pins (20) to lower tractor lift arms and secure. For Category 2 tractors use sleeve 22.
3. Remove the driveline from the holder (17) and connect to the tractor PTO shaft. Be sure the QD is seated firmly in the tractor PTO spline groove.
4. If your driveline was equipped with tether chains, be sure to connect the tractor end chain to the tractor PTO master shield.
5. Swing the driveline holder up into the storage position
6. For Category 1 tractors, attach tractor top link to mower top link brackets (11) attachment point A with CAT 1 top link pin. For Category 2 tractors, use sleeve (37) over CAT 1 top link pin. You can use bolt (5) and lock nut (15) instead of CAT 1 top link pin.
7. Adjust the tractor lower 3-point arm anti-sway devices to prevent mower from swinging side to side during transport. See Figure 3.

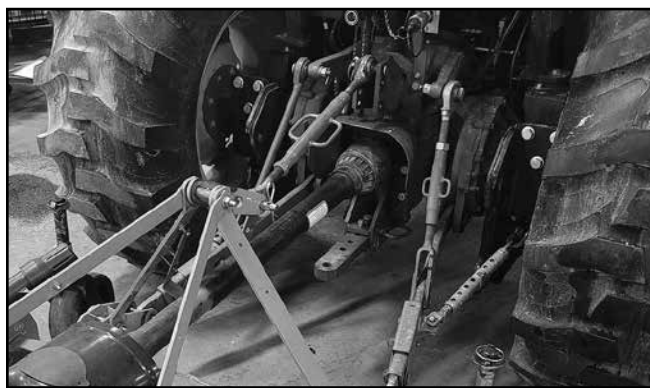


Figure 3. Attach Mower to Tractor

ATTACHING MOWER TO TRACTOR - QUICK HITCH

(Figure 4)

1. Install appropriate quick hitch on tractor - Category 1 or Category 2.
2. The quick hitch must be oriented vertically relative to the ground. Shorten or lengthen the tractor top link until the quick hitch is vertical.

NOTE: Category 1 and 2 quick hitch sleeves, hardware, and linkage parts come with the mower. Category 2 tractors tend to have taller PTO shafts than Category 1 tractors. This can result in less driveline overlap and interference between quick hitch and driveline. It is recommended to use kit 652727 with Category 2 tractors to shift mower

connection points up and back. The kit includes two welded hitch adapters and hardware.

3. The lower hitch clevises on the TW990X have 3 holes to adjust the distance between the mower and tractor. The longer arm positions will create more clearance between rear tractor tires and the mower. It is recommended to use the shortest and middle installed positions with Category 1 quick hitches.
4. Install lower hitch arms. For Category 1 hitch, position the lower hitch arms (14 & 15) with the offset toward the center of the mower. For Category 2 hitch, position the lower hitch arms (14 & 15) with the offset toward the outside of the mower.
5. Adjust rear lift link (12) attachments at rear of mower to use the mounting hole corresponding to the lower hitch arms (14 & 15).
6. See Quick Hitch Cat 1 Installation on page 14 and Quick Hitch Cat 2 Installation on page 40 for assembly of QH components.
7. The mower driveline should be resting on the driveline holder (8).
8. Ascend the tractor, sit in the seat, start the engine, and release the parking brake.
9. Center the tractor relative to the mower, aligning the 3-point quick hitch hooks with the mower hitch points. Back the tractor up until the quick hitch contacts the mower hitch, raise the tractor 3-point until the mower rests firmly in the bottom of all the quick hitch hooks.
10. Swing the quick hitch lock levers inward to lock the lower hooks onto the mower clevis hitch pins and sleeves. Lower the tractor 3-point control to set the mower on the ground. Be careful not to rest the quick hitch on the driveline. Set 3-point down stop on the tractor. (See tractor manual.)
11. Put the tractor transmission in neutral, set the parking brake, and turn off the engine. Descend the tractor and move to the mower.
12. Remove the mower driveline from the holder (8) and connect to the tractor PTO shaft. Be sure the driveline QD is seated firmly in the tractor PTO spine groove.
13. If your driveline was quipped with tether chains, be sure to connect the tractor end chain to the tractor PTO master shield.

CAUTION

- **Make sure driveline will not bottom out at the shortest length and that it has at least 1/3 overlap at the longest length.**
 - **If driveline is too short, please call your Woods dealer for a longer driveline.**
 - **If driveline is too long, follow the instructions for shortening the driveline.**
14. Remove the safety pin (7) from the left QH bar (9) and swing the driveline hangar (8) in the storage position. Reinsert safety pin through QH bar and driveline holder to secure in place. (See Figure 4.)

TW990X QH CAT 1 INSTALLATION

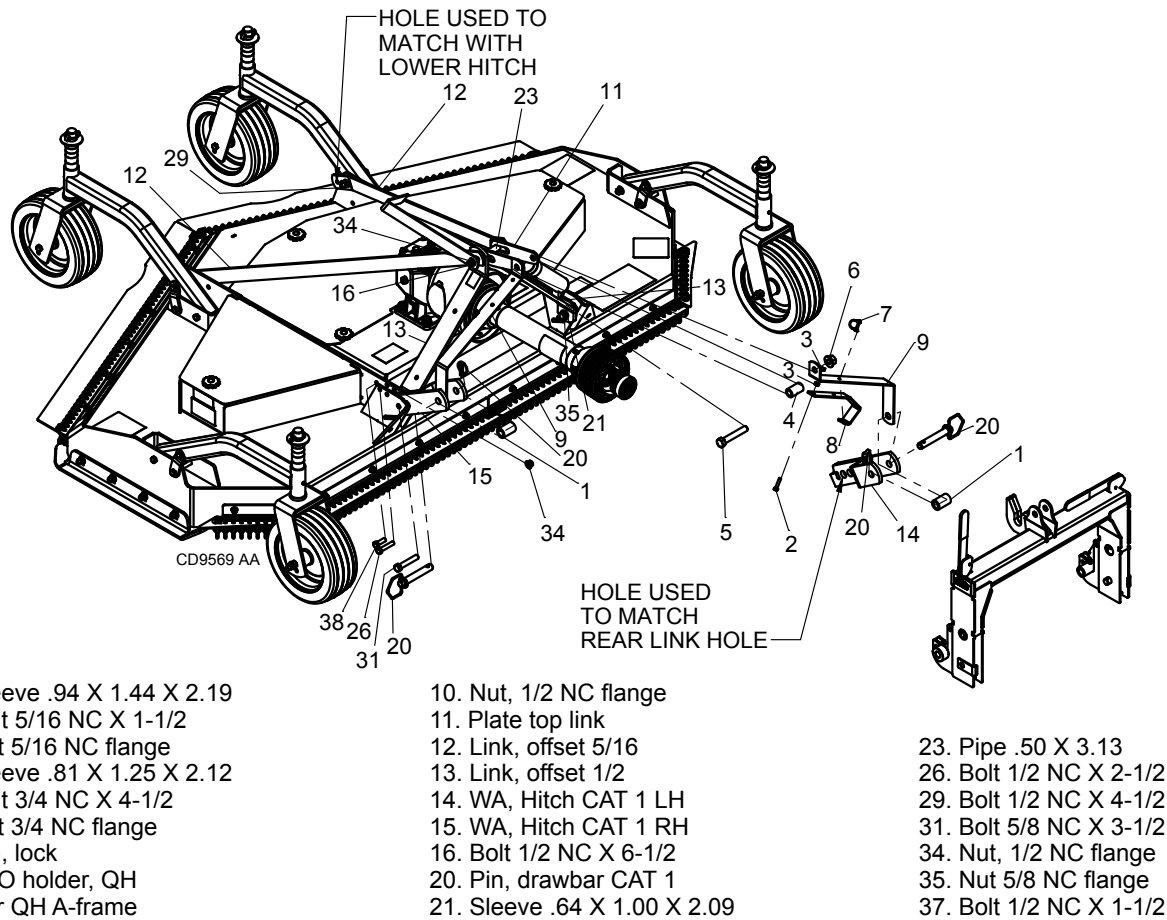


Figure 4. Quick Hitch Attachment (For CAT 2 see page 40 Figure 42)

ADJUSTING CUTTING HEIGHT

⚠ 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.

- Verify that the same amount of spacers are under all caster arms. All 4 wheels should be bolted into the same hole (A or B) on caster fork. See Figure 7.
- Loosen cap screws that attach caster arm assembly to deck.
- Set mower on the ground.
- Level mower from side to side. Check by measuring from mower frame to the ground at each deck rail.
- Retighten cap screws. This equalizes the clearance in the bolt holes.

- Adjust front of mower level with or slightly lower than the rear to obtain best mowing results. See Figure 5.
- Control cutting height by adjusting front and rear caster wheels.
- To raise rear of mower, move caster adjustment spacers under rear caster arms. See Figure 7.
- To raise front of mower, move spacers under front caster wheel arms.

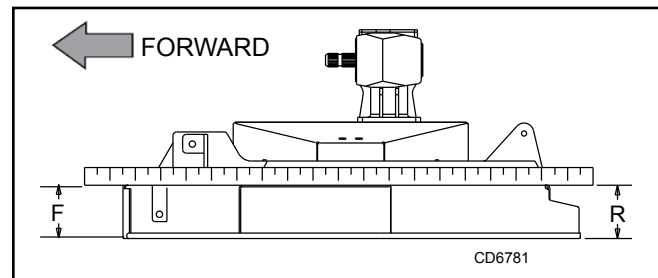


Figure 5. Cutting Height Adjustment

Remember, measurement at location R (Figure 5) should not be less than location F and should not be over 1/2" greater than location F.

14 Operation

MAN1415
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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 6. Cutting Height Chart

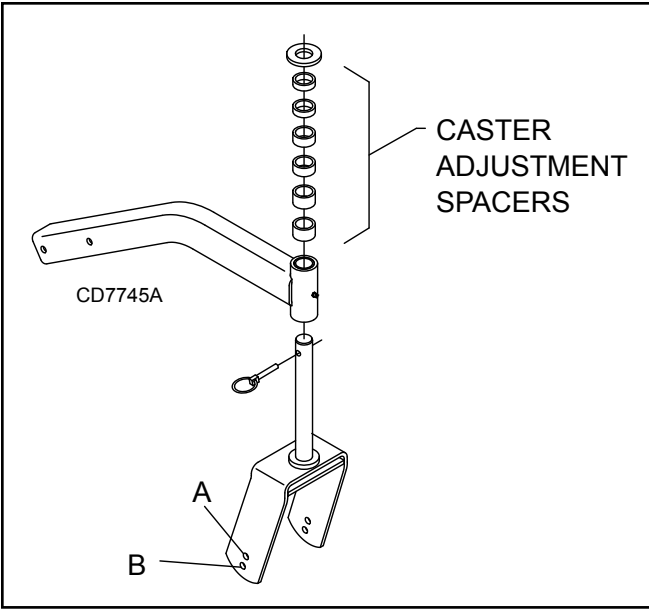


Figure 7. Height Adjustment with Caster Arm Spacers



Figure 8. Top Link Adjustment

- | | | |
|---------------------------------|------------------------------------|------------------------------------|
| 5. Bolt 3/4 NC X 4-1/2 | 15. WA, Hitch CAT 1 RH CAT 2 LH | 31. Bolt 5/8 NC X 3-1/2 |
| 6. Nut 3/4 NC flange | 17. PTO Hanger | 34. Nut 1/2 NC |
| 11. Mower top link | 20. Pin, drawbar CAT 1 | 35. Nut 5/8 NC flange |
| 12. Link, offset 5/16 | 21. Sleeve .64 X 1.00 X 2.09 | 37. Sleeve .77 X 1.00 X 2.44 cat 2 |
| 13. Link, offset 1/2 | 22. Sleeve .89 X 1.12 X 2.62 cat 2 | |
| 14. WA, Hitch CAT 2 RH CAT 1 LH | 29. Bolt 1/2 NC X 4-1/2 | |

TRACTOR TOP LINK ADJUSTMENT

For transport, adjust tractor top link so mower is level between caster wheel and ground (dimension C). Figure 10.

FRONT CASTER WHEEL INTERFERENCE CHECK

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

1. Raise the mower slowly with the tractor hydraulics to 16" at dimension C, Figure 10, 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 the top link to be shorter to create clearance between the tractor tire and front caster wheels.
4. If there is still interference the lower hitch may be adjusted to a different hole. Make sure the driveline has at least 1/3 overlap. Also check or adjust the rear lift link holes to match the lower hitch holes. Additional adjustments may be made with the tractor 3-pt top link base position and/or tractor wheel position. See tractor operator's manual for instructions. The tractor's 3-point lift arm lever up stop may need to be adjusted to prevent contact between the tractor tires and mower or in the case of a quick hitch mounted unit, the driveline and quick hitch.

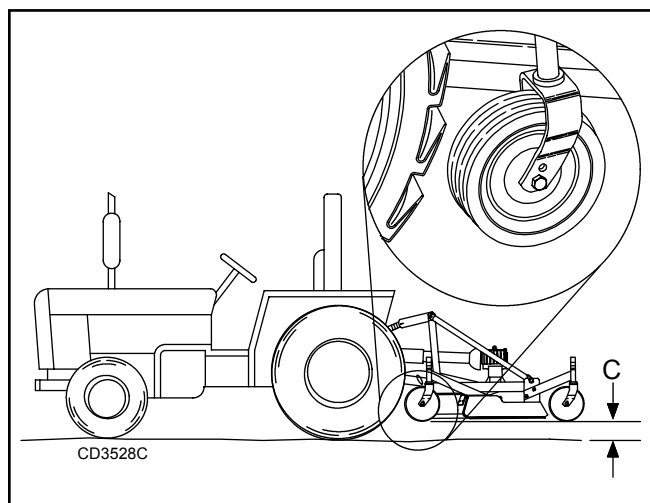


Figure 10. Front Caster Wheel Interference Check

INSTALLATION AND REMOVAL OF DRIVELINE (TRACTOR PTO)

⚠ WARNING

- Connect PTO driveline directly to power unit PTO shaft. Never use adapter sleeves or adapter shafts. Adapters can cause driveline failures due to incorrect spline or incorrect operating length and can result in personal injury or death.

⚠ CAUTION

- To avoid damage to cutter or driveline, make sure driveline holder is properly stored before operation.

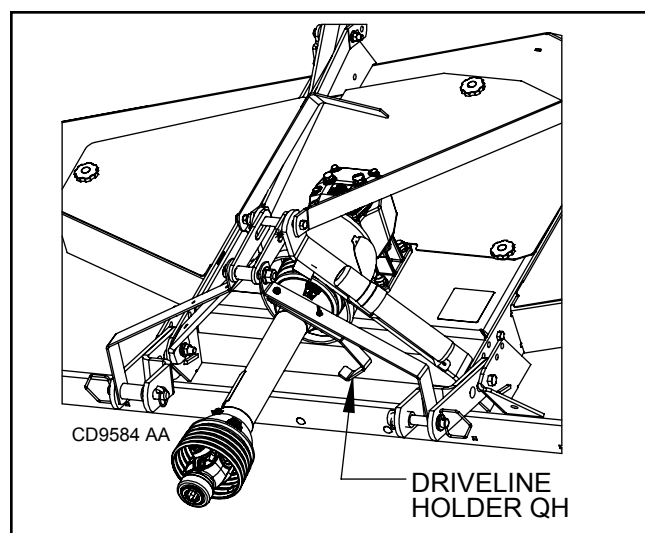


Figure 11A. Quick Hitch Driveline Holder Storage Position

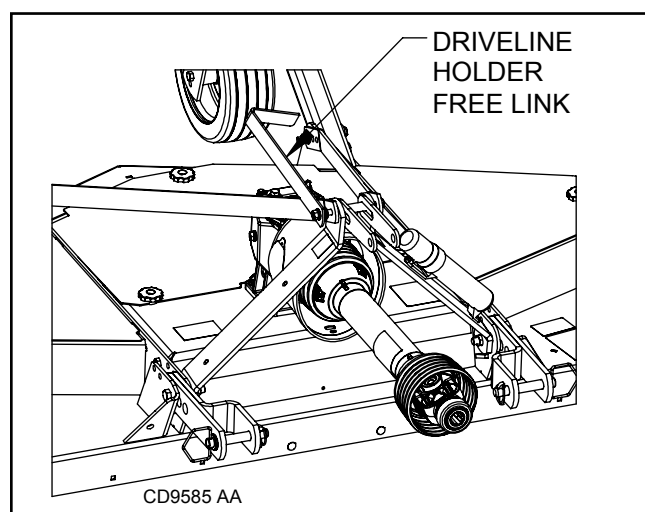


Figure 11B. Free Link Driveline Holder Storage Position

To Install

Pull locking collar back, and at the same time, push driveline onto tractor PTO shaft until locking device engages.

To Remove

Hold driveline into position, pull locking collar back, and slide driveline off tractor PTO shaft.

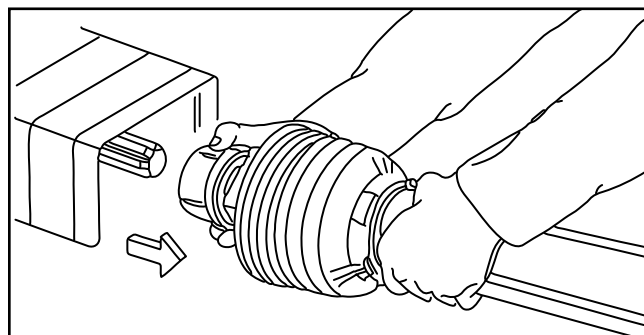


Figure 12. Lock Collar

SHORTENING DRIVELINE

1. Move mower up and down to measure the shortest possible distance between tractor PTO shaft and gearbox input shaft.
2. Separate driveline into two halves. The driveline female profile tube is covered by the smaller profile shield. Connect this half to the mower gearbox.
3. Connect the other half of the driveline to the tractor PTO shaft. This half contains the male profile tube which is covered by the larger profile shield.
4. Place driveline halves parallel to one another to determine how much to shorten the driveline.



Figure 13. Drive Halves Placed Parallel

5. Measure from end of the upper shield to the base of the bell on the lower shield (A). Add 1-9/16" to dimension (A). See Figure 14.

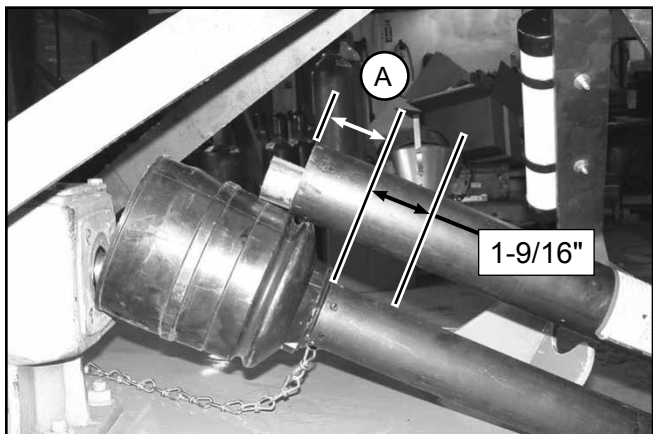


Figure 14. Determine Shield Length

6. Cut the shield to the overall dimension.

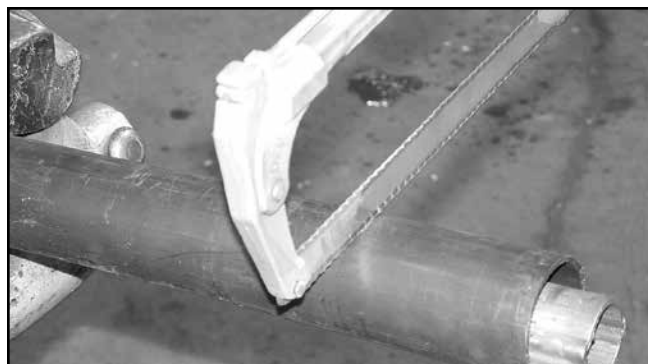


Figure 15. Cut Shield

7. Place the cut-off portion of the shield against the end of the shaft and use as a guide. Mark and cut the shaft.



Figure 16. Cut Shaft to Length

8. Repeat step 6 for the other half of the drive.
9. File and clean cut ends of both drive halves. Do not use tractor if proper driveline engagement cannot be attained through these methods. Connect driveline to tractor PTO shaft, making sure the spring-activated locking collar slides freely and locks driveline to PTO shaft.

IMPORTANT: If attaching with quick hitch, the distance between the tractor PTO and gearbox input shaft will increase. Follow the steps as you would for a 3-point hitch to ensure proper engagement.

DRIVELINE INTERFERENCE CHECK

1. Check for proper clearance between driveline and mower deck. If using a quick hitch, check clearances between quick hitch and driveline.
2. Slowly lift mower and observe driveline. If clearance between driveline and mower deck is less than 1 inch, shorten top link or limit upper travel of lower hitch arms. Refer to tractor operator's manual for instructions.

FRONT ROLLER (OPTIONAL)

The caster wheels effectively reduce scalping in most cases. However, you may encounter areas where the caster wheels and/or frame sides 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 38.

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.

Starting and Stopping

1. Power for operating the mower is supplied by the tractor PTO. Operate PTO at 540 RPM. Know how to stop the tractor and mower quickly in an emergency.
2. Engage PTO at a low engine RPM to minimize stress on the drive system and gearbox. With PTO engaged, raise PTO speed to 540 RPM and maintain throughout cutting operation.

Gearbox protection is provided by the belt drive. The belt is designed to slip when excessive loads occur.

Operation

1. Move slowly into material. Adjust tractor ground speed to provide a clean cut without lugging the tractor engine.

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.

2. Always operate tractor PTO at 540 RPM to maintain proper blade speed and to produce a clean cut.
3. 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.
4. 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.

Clearing Blockages

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 when in contact with a very hot pulley will bake and ruin belt.

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. Make turns slowly and gradually.
- 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.

REMOVING MOWER FROM TRACTOR (STORAGE)

Follow cleaning procedure on page 25.

Quick Hitch Attached Mower

1. Disengage tractor PTO and raise mower with 3-point hitch.
2. Remove pin from driveline holder and let it swing down. Replace pin in a-frame bar. Disconnect mower driveline from tractor PTO shaft. Fully collapse driveline and place in holder.
3. Place blocks under mower side skids. Lower mower onto blocks.
4. Disconnect mower from tractor 3-point hitch, and carefully drive tractor away from mower. See Figure 17A.

Free Link Attached Mower

1. Disengage tractor PTO and raise mower with 3-point hitch.
2. Place blocks under mower side skids. Lower mower onto blocks.
3. Disconnect top link from mower. Disconnect driveline from tractor and swing free link driveline holder down underneath driveline and place in holder. Fully collapse driveline on holder.
4. Disconnect lower 3-point hitches from tractor. Carefully drive tractor away from mower. See Figure 17B.

CAUTION

- **Pinch Hazard.** Hands or fingers could be pinched between quick hitch a-frame bars and rigid a frame bars on mower. Do not push on quick hitch a frame bars when mower is disconnected from tractor.

WARNING

- **Keep bystanders, children, and animals away from storage area.**

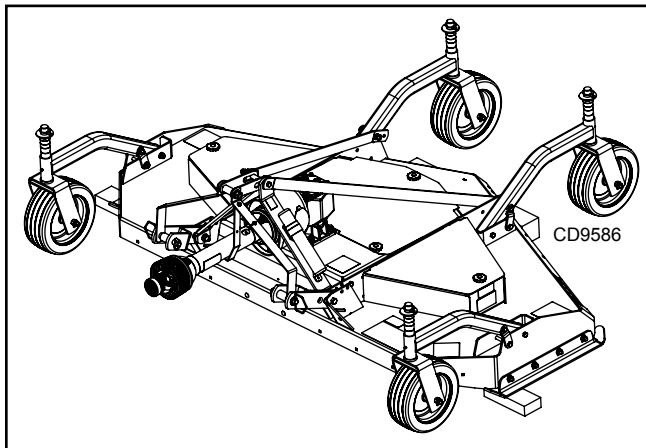


Figure 17A. Mower Storage Position - Quick Hitch

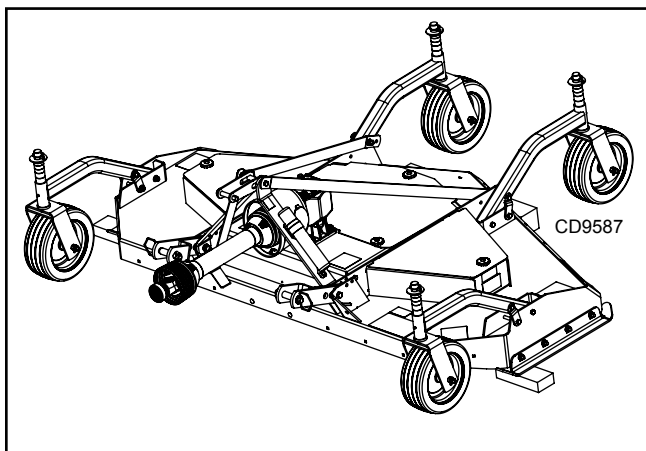


Figure 17B. Mower Storage Position - Free Link

TRANSPORTATION

DANGER

- **Raised deck exposes blade and increases thrown object hazard.**
 - **Rotating blades.** Contact with rotating blades could cause serious injury death.
1. Disengage the PTO and wait for all moving parts to come to a complete stop. Raise the tractor 3-point arms to bring the mower into transport position
 2. With mower adjusted to transport position, set upper stop on tractor 3pt lift to prevent front of mower deck from contacting the driveline when fully raised.

PRE-OPERATION CHECKLIST

(OWNER'S RESPONSIBILITY)

- Review and follow all safety rules and safety decal instructions on page 5 through page 10.
- 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 and guards are in good condition. Driveline guards must rotate freely. If equipped, driveline tether chains should also be in good condition. Fasten the tether chains to the tractor and implement 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 21. 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. ROPS must be in the upright position and 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

- Keep machine in good working order. Replace worn or damaged parts.
- Never allow children or untrained persons to operate equipment.
- Keep bystanders, children, and animals 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.
- Make sure spring-activated locking pin or collar

⚠ CAUTION

slides freely and is seated firmly in tractor PTO spline groove.

- Operate tractor PTO at 540 RPM. Do not exceed.
- 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 devices for this mower are jackstands 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 this unit. See Figure 18.

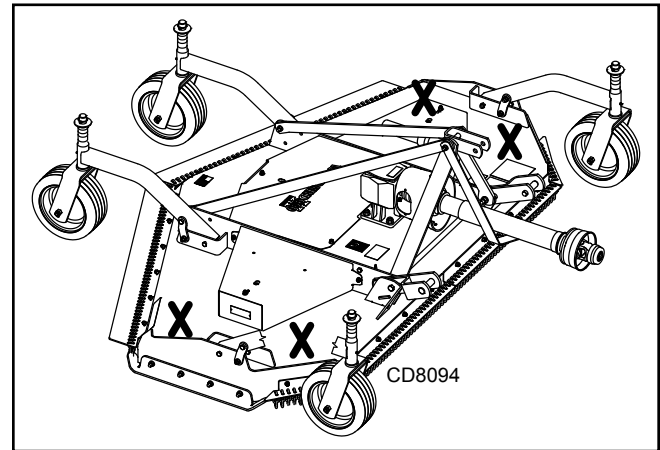


Figure 18. Blocking Method

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 jackstand stability before working under any portion of the mower.

LUBRICATION INFORMATION

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

Figure 19 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 80W or 90W API GL-4 or GL-5 gear lube in the gearbox. Fill to plug on side of gearbox. See **Fill Gearbox** on page 38.

Check gearbox daily for evidence of leakage at both seals and the gasket between the housing and cover. If leakage is noted, repair immediately. The oil level should be between the two lines on the dipstick, which is at the half full level for the gearbox housing. There may be a small amount of lube emitted from the vent plug; this is not considered leakage.

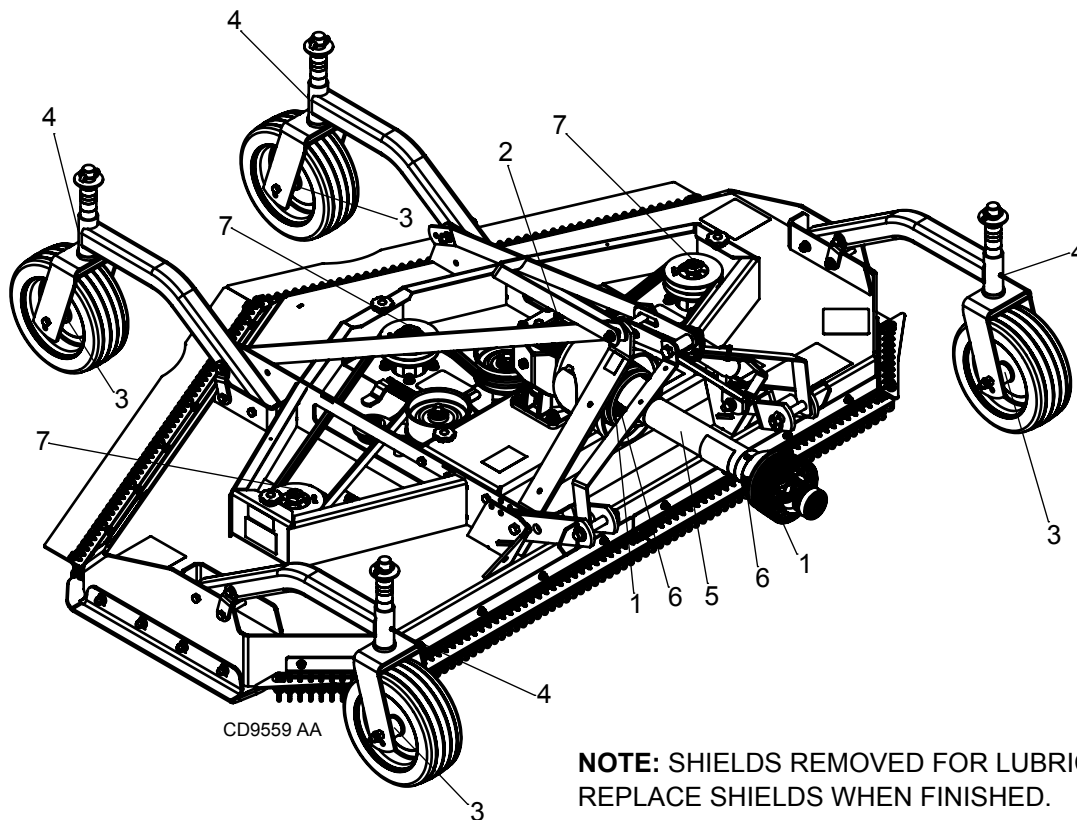
IMPORTANT: Overfilling the gearbox will cause the excess gear lube to blow out vent plug and possibly ruin the belt.

IMPORTANT: Over-greasing the caster wheels can push oil seals out of wheel. This will lead to premature failure of the bearings or wheel.

Driveshaft Lubrication

Lubricate the driveshaft slip joint every 40 operating hours. Failure to maintain proper lubrication could result in damage to U-joints, gearbox, and driveshaft.

1. Lower mower to the ground, set parking brake, stop engine, and remove key.
2. Disconnect driveline from tractor PTO shaft. Collapse telescoping section completely and hang on driveline holder.
3. Locate outer profile shield grease access hole. Rotate outer shield until it aligns with lubrication hole in inner profile shield. Rotate both profile shields until the openings are over the grease fitting in the telescoping section of the driveline.
4. Insert grease gun and give 2 to 3 full pumps of grease.
5. Locate grease access holes in the tractor end joint bellows. Rotate driveline to align access hole with grease fitting in the tractor cross end cap. Apply 2 full pumps of grease.
6. Locate plastic grease fitting at the base of the tractor end joint bellows. Apply 2 full pumps of grease to lubricate the safety shield bearings.
7. Repeat steps 5 and 6 for implement end of driveline.
8. Reconnect driveline to tractor PTO shaft.
9. Raise and lower mower several times before mowing to distribute grease along telescoping section of driveline.



REF	DESCRIPTION	FREQUENCY
1	Driveline U-Joints	8 Hours
2	Gearbox (Fill to center of horizontal shaft with SAE 90W gear lube)	Check Daily For Leakage
3	Caster Wheel (Four Wheels)	8 Hours
4	Caster Pivot (Four Yokes)	8 Hours
5	Slip Joint	40 Hours
6	Shield Bearing	8 Hours
7	Blade Spindles	40 Hours

Figure 19. Lubrication Points & Chart

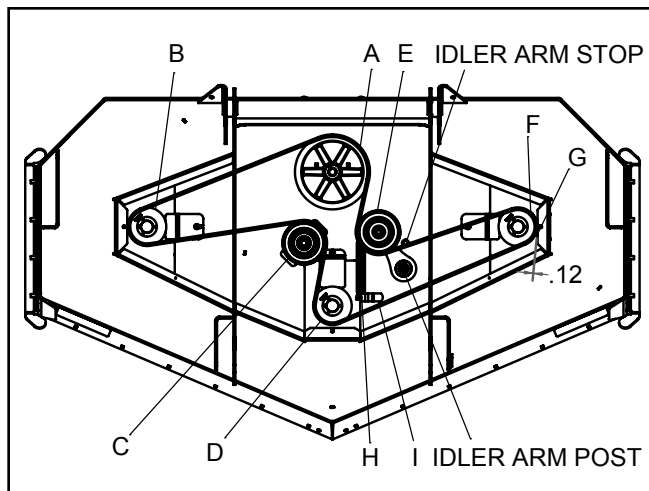


Figure 20. Belt Routing

BELT SERVICING

Inspect Belt Drive

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

1. Remove thumb screws and remove belt shields. Set shields aside. Replace thumb screws on studs to prevent loss.
2. Check spindle shafts and bearings for wear. Spindles should not have endplay.
3. Check pulley grooves for cleanliness. If grooves require cleaning, moisten a cloth with a nonflammable, non toxic degreasing agent or commercial detergent and water.
4. Make sure spindles turn freely and without pulley or blade wobble.

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 Removal

(Figure 20)

CAUTION

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

IMPORTANT: Avoid excessive force during installation. Do not use tools to pry belt into sheave groove. Do not roll belt over sheaves to install. This can cause hidden damage or premature belt failure.

1. Remove belt guide located on right (G) spindle.
2. Place a breaker bar and 15/16" socket on the nut of the spring loaded idler. Rotate the idler arm clockwise to remove tension on the belt until belt slips over spindle sheave G, then slowly rotate idler arm counter clockwise to release tension on the spring.
3. Check that spring-loaded idler pivots freely. Clean and lubricate as necessary.
4. Remove belt from remaining sheave grooves and then from mower. Inspect belt for damage. A belt that will not lay flat on the ground indicates broken cords.

Belt Installation

(Figure 20)

CAUTION

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

IMPORTANT: Spring hooks open end must be pointed up and inserted in the hole of the idler arm and the notch of the spring ground lug.

1. Route belt underneath and into the grooves of drive sheave A. Route belt through left deck rail hole and around the grooves of spindle sheave B.
2. Route belt around backside idler C, grooves of sheave D, and over spring loaded backside idler E with extra belt length going through the deck rail towards sheave F.
3. Using a breaker bar and 15/16" socket on the spring loaded idler nut, rotate the idler arm clockwise to obtain enough belt length to route around sheave F. Slowly rotate idler arm counterclockwise to reduce tension on the spring.
4. Install belt guide 1/8 to 3/16" on right side of sheave F using the front right spindle hardware.
5. Remove thumb screws from studs. Replace belt shields. Ensure tabs on end shields are fitted into slots in deck rails. Thumb screws to be secured tightly to prevent loss.

BLADE SERVICING

⚠ 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.

⚠ CAUTION

- Frequently check blades. They should be sharp, free of nicks and cracks, and securely fastened.

1. Inspect blades before each use to determine that they are mounted securely and are in good condition.
2. Replace any blade that is bent, excessively nicked, worn, or has any other damage. Do not repair.

IMPORTANT: Blade replacement must be done in pairs. Unbalanced blade sets can cause severe vibration and structural damage to the mower.

3. Small nicks can be ground out when sharpening.

Blade Removal

(Figure 21)

⚠ CAUTION

- Do not handle blades with bare hands. Wear gloves. Careless or improper handling may result in injury.

1. Remove belt shields and replace plastic knobs on studs.
2. Remove 3/8 bolt (16), lock washer, (33) and access cover (6). See Figure 21.
3. Using 3/4 socket and 8" extension, remove Nylock bolt (14).
4. Remove blade lock (11) from groove in blade pin.
5. Remove blade (9) and pin (10) from spindle assembly (2).

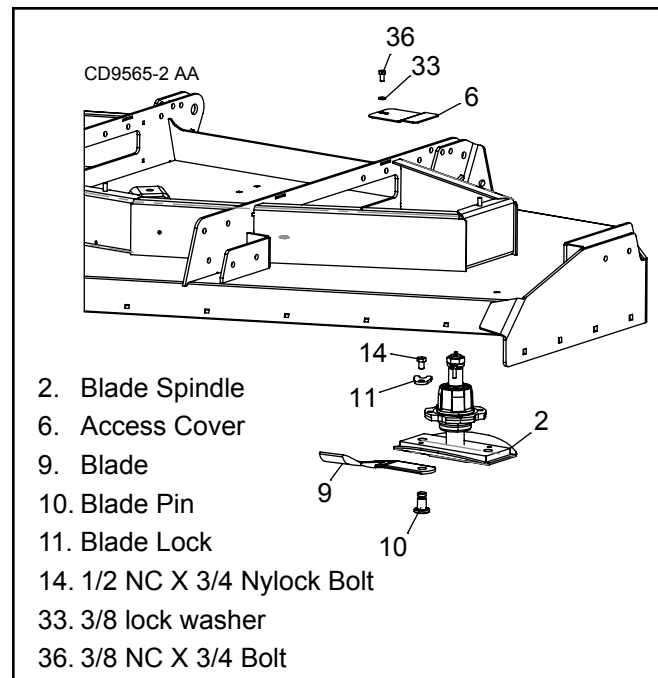


Figure 21. Blade Removal

Blade Installation

(Figure 22)

⚠ CAUTION

- Your dealer can supply genuine replacement blades. Substitute blades, blade pins, blade bolts may not meet original equipment specifications and may be dangerous.

NOTICE: When installing blade, the lift of the blade must be toward the spindle blade housing as shown in Figure 22. Torque bolt (14) to 85 lbs-ft.

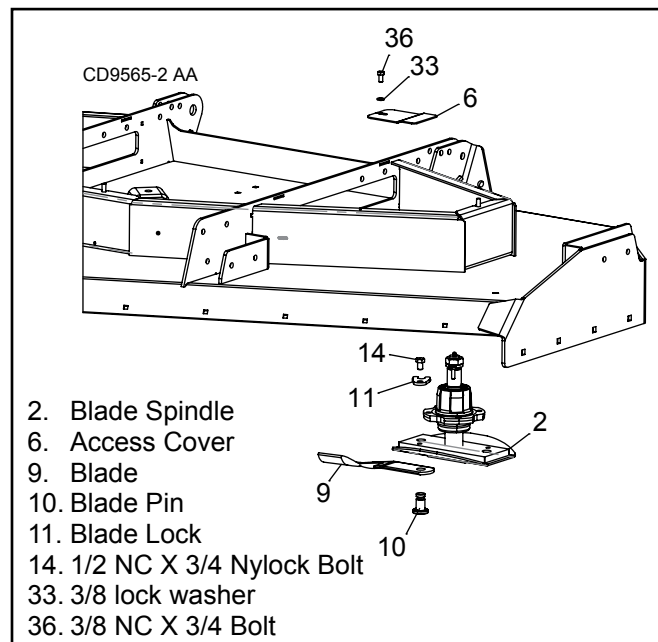


Figure 22. Blade Assembly

1. Install blade pin (10) thru blade (9) and blade cross-bar (2). See Figure 22.
2. Make sure blade cutting edge is positioned to lead in a clockwise rotation, as viewed from top of mower.
3. Insert blade lock (11) into groove of blade pin (10).
4. Secure lock (11) with Nylock bolt (14) Torque to 85 lbs/ft.
5. Replace access cover (6), Nylock bolt (36), and lock washer (33).
6. Replace belt shields and plastic knob.

Blade Sharpening

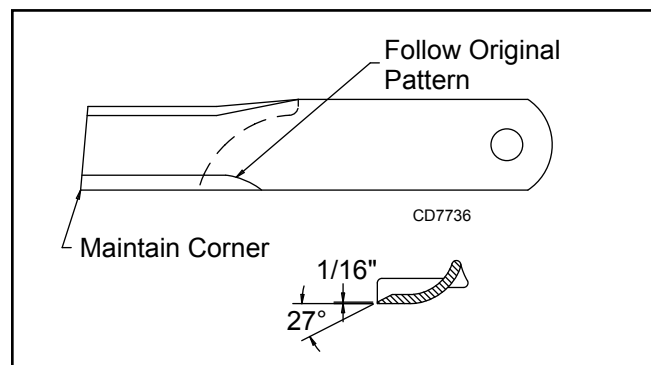


Figure 23. Blade Sharpening

IMPORTANT: When sharpening blades, grind the same amount on each blade to maintain balance. Replace blades in pairs. Unbalanced blades will cause excessive vibration, that can damage spindle bearings. Vibration may also cause structural cracks in mower housing.

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.
4. Sharpen both blades equally to keep spindle assembly balanced.

CHAIN SHIELDING



- 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 (supplied free by your Woods dealer).

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 & Instructional Decals section for location drawing.

TROUBLESHOOTING

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 14.
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 14.
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 90degrees to first pass. Raise rear of mower high enough to permit material discharge, but not so high that conditions listed above occur.
	Grass is 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. See instructions on page 14.

TROUBLESHOOTING

BELT CONDITIONS

PROBLEM	POSSIBLE CAUSE	SOLUTION
Belt squealing	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 90-degrees to first pass.
	Oil on belt from over lubricating	Be careful not to over lubricate. Clean lubricant from belt and sheave with clean rag. Replace oil-soaked belt.
	Belt hung up or rubbing	Check belt position in sheave and idlers. Check belt for free travel in sheave. Check under mower and around blade spindle shaft for wire, rags, or other foreign material. Clean all material from under mower.
	Bearing failure	Check that spindles turn freely. Replace any spindle that does not.
Frayed edges on belt cover	Belt rubbing component	Be sure belt does not rub any other part while running. Adjust as necessary.
	Sheave is misaligned	Inspect to ensure belt is running in center of backside idler. Shim idler as necessary to align.
	Belt rubbing guide	Reposition belt guide to have 1/16" - 1/8" clearance to belt.
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 sheave for foreign material in grooves. Avoid hitting solid objects or ground. Check belt for cuts and gouges. Replace if needed.

* 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.

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 21.

BLADE SPINDLE REPAIR

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 belt shields from deck page 23.
2. Remove blade (9) from spindle (2). See Blade Removal on page 24.
3. Remove belt from sheave. See Belt Removal on page 23.
4. Remove jam nut (20) and washer (16) from top of spindle shaft. See Figure 24.

5. Disassemble split taper bushing (7) located at the top of the sheave by removing the three 5/16 NC bolts (17) and key (13).
6. Insert 5/16 NC bolts (17) into the threaded holes of bushing flange.
7. Tighten bolts (17) alternatively to remove split taper bushing (7).
8. Remove sheave (12).
9. Remove 1/2 NC bolts (18) and flanged lock nuts (19) that attach spindle to mower frame and remove spindle.
10. Remove grease fitting (15) from top of shaft.

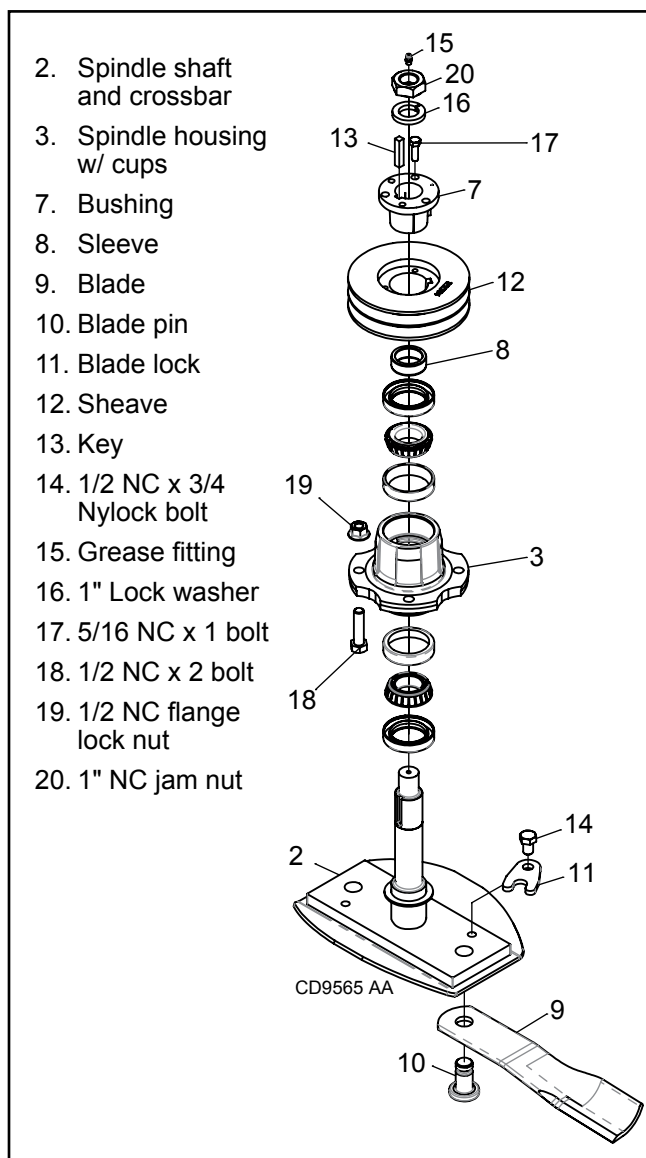


Figure 24. Sheave and Blade Assembly

Spindle Disassembly

1. Place spindle assembly in press and use bearing splitter to support on bottom of flange housing. Alternately housing can be supported on flange. Press shaft down through housing.
2. Remove from housing top and bottom oil seals (4). Remove bearing cones (6) from housing and/or spindle shaft.
3. Remove bearing cups (5) from housing by placing a punch in the slots provided in housing bore and driving them out. Alternate punch positions from side to side after each hammer blow. Take care to prevent housing damage.

Spindle Assembly

Refer to Figure 25.

1. Place the spindle housing (3) on your work surface so that long portion of hub is up and short portion is down. Place the spindle shaft (2) on your work surface with the blade crossbar down and the shaft sticking up. This represents up and down relative to installation in the mower.
2. Lubricate new bearing cups (5) with a light oil. Pack bearing cones (6) with EP2 lithium grease. Tapered roller bearing cups (5) and cones (6) have a press fit to minimize wear.
3. Seat cups (5) securely with a press or place a large drift on the narrower flat lip and drive them into the housing (3). The wide lip of the cups (5) should be installed against the machined shoulder of the housing (3) bores.
4. Turn spindle housing (3) upside down and install one bearing cone (6) in lower bearing cup (5).
5. Identify the open side of the seal (4) containing the spring. Lightly oil the seal lip. Apply a thin coat of Permatex® RTV to the outer surface of the seal (4).
6. Place seal squarely in bottom bearing bore of spindle housing (3) with spring facing toward the inside of the housing. Select a piece of pipe/tubing or socket that matches the OD of the seal. Press the seal (4) into the spindle housing (3). Be careful not to distort the metal seal cage.
7. Flip spindle housing (3) back over and install over spindle shaft (2). Carefully press bearing housing down onto the spindle shaft until the lower bearing (6) seats against the shoulder on the lower portion of the spindle shaft (2). Release pressure on housing and turn it via the mounting flange to ensure the bearing turns freely.
8. If the lower bearing is very tight, support the bearing housing (3) by the flange and give the end of the spindle shaft a light/medium strike with a deadblow hammer. Recheck that the bearing turns freely.

9. Fill the spindle cavity with EP2 lithium grease.
10. Install one bearing cone (6) in the upper bearing cup of the spindle housing (3). This requires sliding the bearing (6) onto the spindle shaft (2) with the taper oriented toward the bearing cup (5).
11. Select a piece of pipe/tubing that matches the ID of the tapered roller bearing (6). Press the bearing (6) into the spindle housing (3) until it contacts the bearing cup (5). Release pressure on housing and turn it via the mounting flange to ensure both bearings turn freely.
12. If the bearings are very tight, support the bearing housing (3) by the flange and give the end of the spindle shaft (2) a light/medium strike with a deadblow hammer. Recheck that the bearings turn freely.
13. Identify the open side of the seal (4) containing the spring. Lightly oil the seal lip. Apply a thin coat of Permatex® RTV to the outer surface of the lower seal (4).
14. Place seal over the spindle shaft (2) and squarely in the top bearing bore of the spindle housing (3) with spring facing away from the inside of the housing. Select a piece of pipe/tubing or socket that matches the OD of the seal. Press the seal (4) into the spindle housing (3). Be careful not to distort the metal seal cage. This seal orientation prevents the seal (4) from pushing out if the spindle is over-greased.

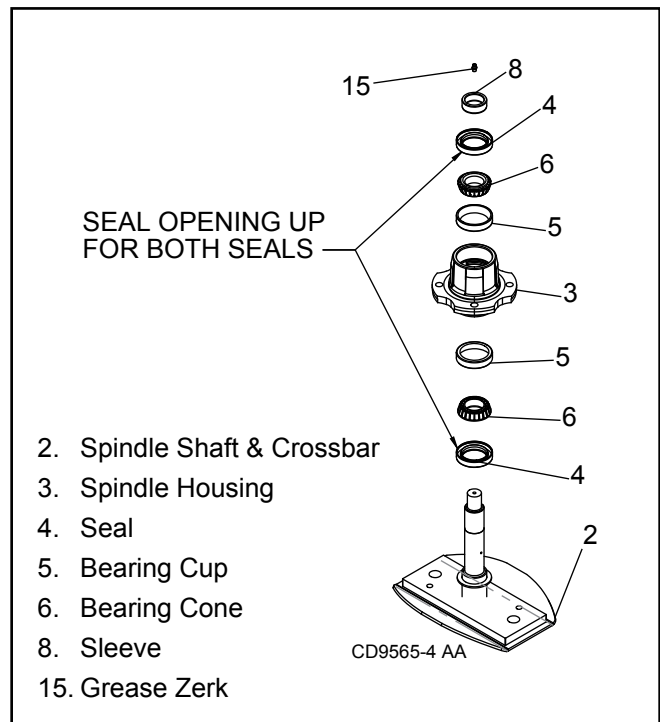


Figure 25. Spindle and Shaft Assembly

Spindle Installation

IMPORTANT: Sheave 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 and flange lock nuts (18 & 19). See Figure 24.
2. Install sleeve (8), sheave (12) and split taper bushing (7) with integral key (13) on spindle shaft. Make sure spindle groove measures the same height from the deck plate as the gearbox sheave. See Figure 24 & 25.
3. Insert 5/16 NC cap screws thru taper bushing holes and thread into sheave. Alternately tighten split taper bushing cap screws to 20 lbs-ft.
4. Install lock washer (16) and nut (20) on spindle shaft. Tighten nut to 120 lbs-ft. **Do not over tighten.** Check shaft to make sure it spins freely. Make sure spindle groove still measures same height from the deck plate as the gearbox sheave.

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 API GL-4 or GL-5 gear lube until it runs out the side level plug. Gearbox capacity is almost 4 pints.

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.

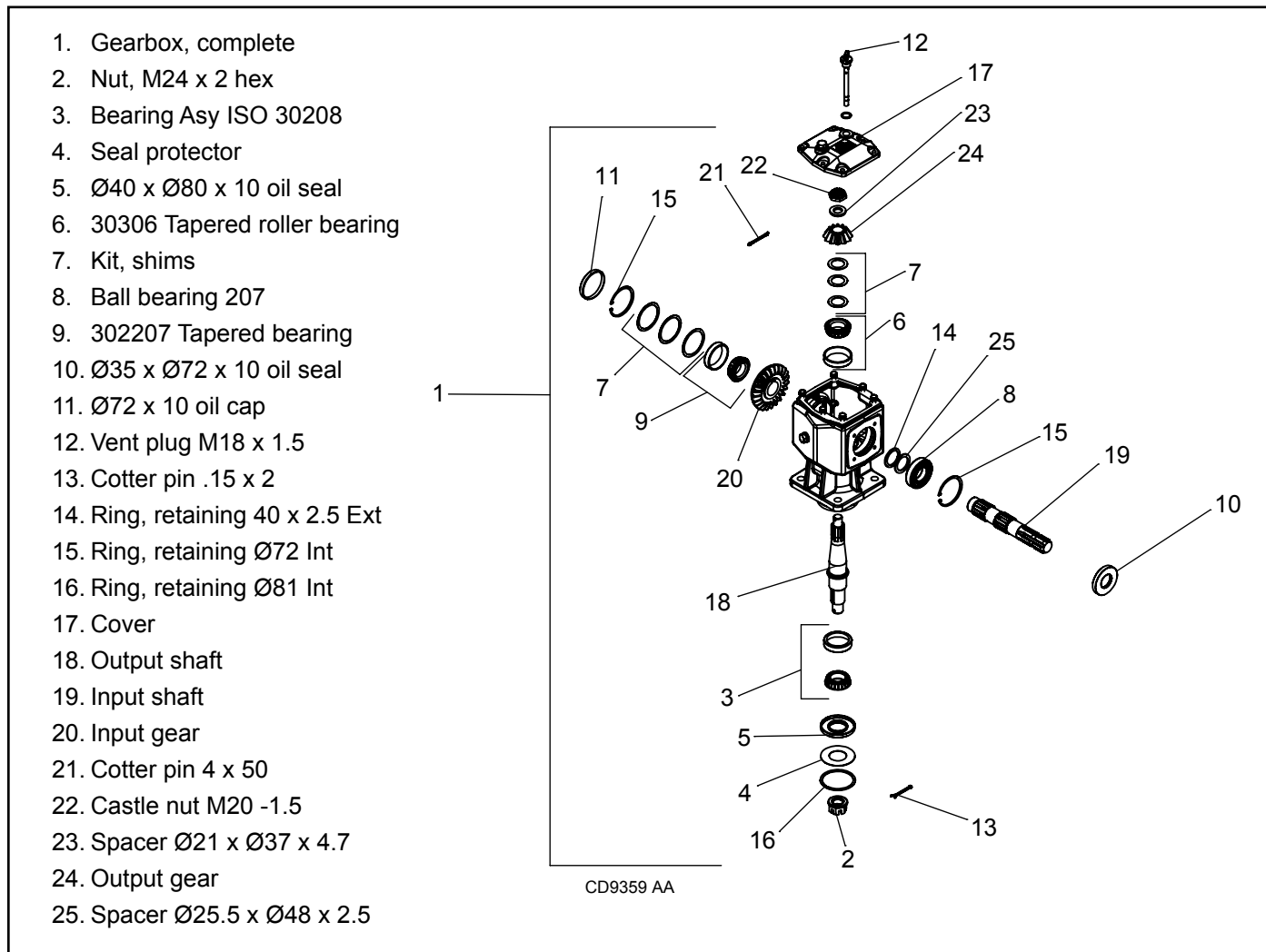


Figure 26. Gearbox Assembly

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 shaft gasket or seal can be repaired without removing the gearbox from the mower.

Seal Installation

IMPORTANT: 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. See Figure 27.
5. Carefully press seal into housing, avoiding distortion to the metal seal cage.

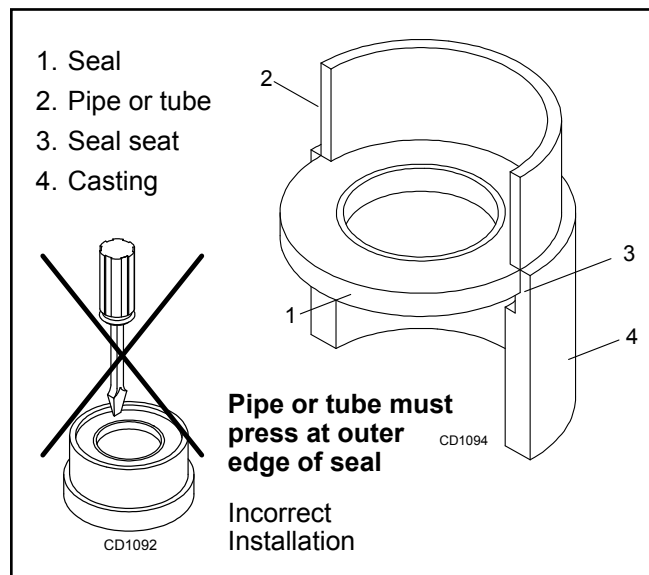


Figure 27. Seal Installation

Vertical Shaft Seal Replacement

1. Disconnect and remove the driveline from the gearbox. Remove the clutch shield (3) and M8 bolts (11) and 5/16 washers (7). See Figure 28.
2. Remove vent plug (12). Figure 26, and siphon gear lube from housing through this opening.

3. Remove gearbox stand from mower deck. See Gearbox Removal from Mower on page 31.
4. Remove gearbox and sheave from gearbox stand.
5. Remove vertical shaft seal (5). Replace with new seal (see Seal Replacement, page 31).

Vertical seal should be recessed in housing.

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

6. Assemble gearbox and sheave to gearbox stand. Attach gearbox stand to mower deck.
7. Fill gearbox with SAE 80W or 90W API GL-4 or GL-5 gear lube until it runs out the level plug. Gearbox capacity is almost 4 pints.

Horizontal Shaft Seal Replacement

1. Disconnect and remove the driveline from the gearbox.
2. Remove vent plug (12), Figure 26, and siphon gear lube from housing through this opening.
3. If the leak occurred at either end of horizontal shaft, remove sealing plug (11) and/or oil seal (10). Replace with new one (see Seal Replacement, page 31).

Horizontal seal should be pressed flush with outside of housing.

4. Fill gearbox with SAE 80W or 90W API GL-4 or GL-5 gear lube until it runs out the level plug. Gearbox capacity is almost 4 pints.

Gearbox Removal from Mower

(Figure 28)

IMPORTANT: Gearbox is heavy; do not attempt to move without mechanical assistance.

1. Disconnect and remove the driveline from the gearbox (1).
2. Remove vent plug (15) and siphon gear lube from housing through this opening. See Figure 28.
3. Remove belt from sheaves and idlers. See Belt Removal on page 23.
4. Remove gearbox stand (2) from mower deck rails by removing six cap screws (9). See Figure 28.
5. Remove cotter pin (14), castle nut (13), and hardware and washer from output shaft of gearbox. See Figure 28.
6. Remove sheave (6) from gearbox.
7. Remove four 5/8 NC bolts (10) and 5/8 NC nuts (12) that attach gearbox to gearbox stand and remove gearbox.

Gearbox Disassembly

(Figure 26)

1. Remove top cover (17) from housing. Turn gearbox upside down and pour out remaining gear oil from gearbox.
2. Remove oil cap (11). (to be replaced).
3. From the back of the gearbox, remove internal snap ring (15) and shims (7) from input shaft. From the top of the gearbox, slide external gear retaining ring (14) towards the front of the gearbox.
4. Support gearbox in arbor press on back side. Push input shaft towards the back, making sure to watch for the loose retaining ring (14) and moving it as necessary. The rear tapered bearing cup will come out. If the front ball bearing (8) comes out of the housing with the shaft, it may get damaged while driving the shaft all the way out. The input gear will slide on the splines. Make sure the gear aligns with splines on front half of shaft as it comes out. Press the bearing cone from the shaft with a proper sized sleeve pushing on the inside race.
5. Remove gear (20) from inside housing.
6. Remove oil seal (10) from front of housing (to be replaced).
7. Remove internal snap ring (15) from front of housing.
8. Remove input bearing (8) by using a punch and hammer to drive it into the center of the housing.
9. Support housing in vise in a horizontal position.
10. The castle nut and cotter pin were already removed from the output shaft with the drive sheave. Remove internal snap ring (16), seal protector (4), and seal (5).
11. Remove the upper cotter pin (21), castle nut (22), and spacer (23) from output shaft (18).
12. Remove gear (24) and shims (7) from inside housing.
13. Remove output shaft by using a punch and hammer from the top to drive it out the bottom of the gearbox housing.
14. Remove lower bearing cup (3) by using a punch and hammer from the top of the housing to drive it down and out.
15. Support housing upside down (top cover surface) and remove upper bearing cup (6) by using a punch and hammer from the bottom side of the housing to drive it into the center of the gearbox housing.
16. Inspect gears for broken teeth and wear. Some wear is normal and will show on loaded side. Forged 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 seal. Resurface any damage with emery cloth. Remove bearing cones/bearings from shafts with an arbor press. Press bearing cone (3) from shaft by supporting bearing inner race and pressing shaft out.
18. Inspect housing and caps for cracks or other damage.

Gearbox Reassembly

(Figure 26)

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 and seals 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 cups (6 & 3) in the housing, using a round tube of the correct diameter and a arbor press. Place shaft onto arbor press bed ensuring the base is stable and square. Slide the bearing cone, correctly oriented for the cup, onto the shaft by hand until it reaches the press fit area. Using a hollow driving sleeve or tubing that matches the inner race diameter, press the cone onto the shaft to the shaft shoulder.
4. Slide output shaft (18) in from the housing bottom and set gearbox up in arbor press balancing on output shaft in a stable position on the press bed.
5. Place upper bearing cone (6) onto the shaft and press it into the bearing cup (6) using a hollow driving sleeve or tubing that matches the inner race diameter.
6. Slide shim(s) (7) over output shaft (18). Place gear (24), spacer (23), and castle nut (22) onto output shaft and secure with cotter pin (21) with proper pre-load on bearings. [Tighten the adjusting nut to 50 lbs - ft to seat the rollers, back it off one full turn, and retorque (10-15 lbs-ft) for zero endplay. Rotate the shaft to check for acceptable torque to turn.]
7. From the rear, place the retaining ring (15) into housing. Place housing in arbor press with the front opening facing up. Place shims (7) on retaining ring (15).
8. Press bearing cup with and appropriately sized sleeve on the front edge against the shims (7) and retaining ring (15).
9. Place gear retaining ring (14) on shaft (19).
10. While holding horizontal gear (20) and bearing cone (9) in place, align input shaft (19) with gear splines and slide shaft through gear. Drive shaft through bearing cone until bearing cone is seated in cup (9) and retaining ring (14) is against the gear.
11. Slide spacer (25) onto shaft against splined front shoulder.
12. Press bearing (8) into the housing, using a round tube of the correct diameter and a hand press. Secure with snap ring (15).

13. Check input shaft end float by moving the input shaft by hand. If end float is higher than 0.012" insert shim between input shaft and rear bearing (9). Repeat until end float is less than 0.012". Check rotational torque by hand. The torque should be less than 2.2 lbs-inch.
14. Check that the gear backlash is 0.016". You should not have to adjust the backlash.
15. Press in input oil seal (10) using tube of correct diameter. Be careful not to damage seal lip.
16. Press oil cap (11) into rear of housing using a tube of correct size.
17. Apply grease to lower seal lips (5) and press seal over output shaft, using a tube of the correct diameter. Be sure not to damage the seal lip. Press in housing so that seal is recessed.
18. Insert protective washer (4) by hand. Install snap ring (16) by pressing into position. Verify that snap ring is seated correctly.
19. Install cover (17) with Permatex® and hardware. Reinstall dipstick (12).

20. 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.
21. 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 pugs.

Gearbox Installation

(Figure 28)

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

1. Set gearbox on gearbox stand and fasten with 5/8" bolts (10) and nuts (12). Torque bolts to 175 lbs-ft.
2. Attach drive sheave to output shaft. Install washer (8) and castle nut (13). Torque castle nut to 170 lbs-ft aligning hole for cotter pin between castle nut prongs. Install cotter pin (13) through castle nut and gearbox output shaft.
3. Attach gearbox stand to mower using six 1/2" cap screws (9).

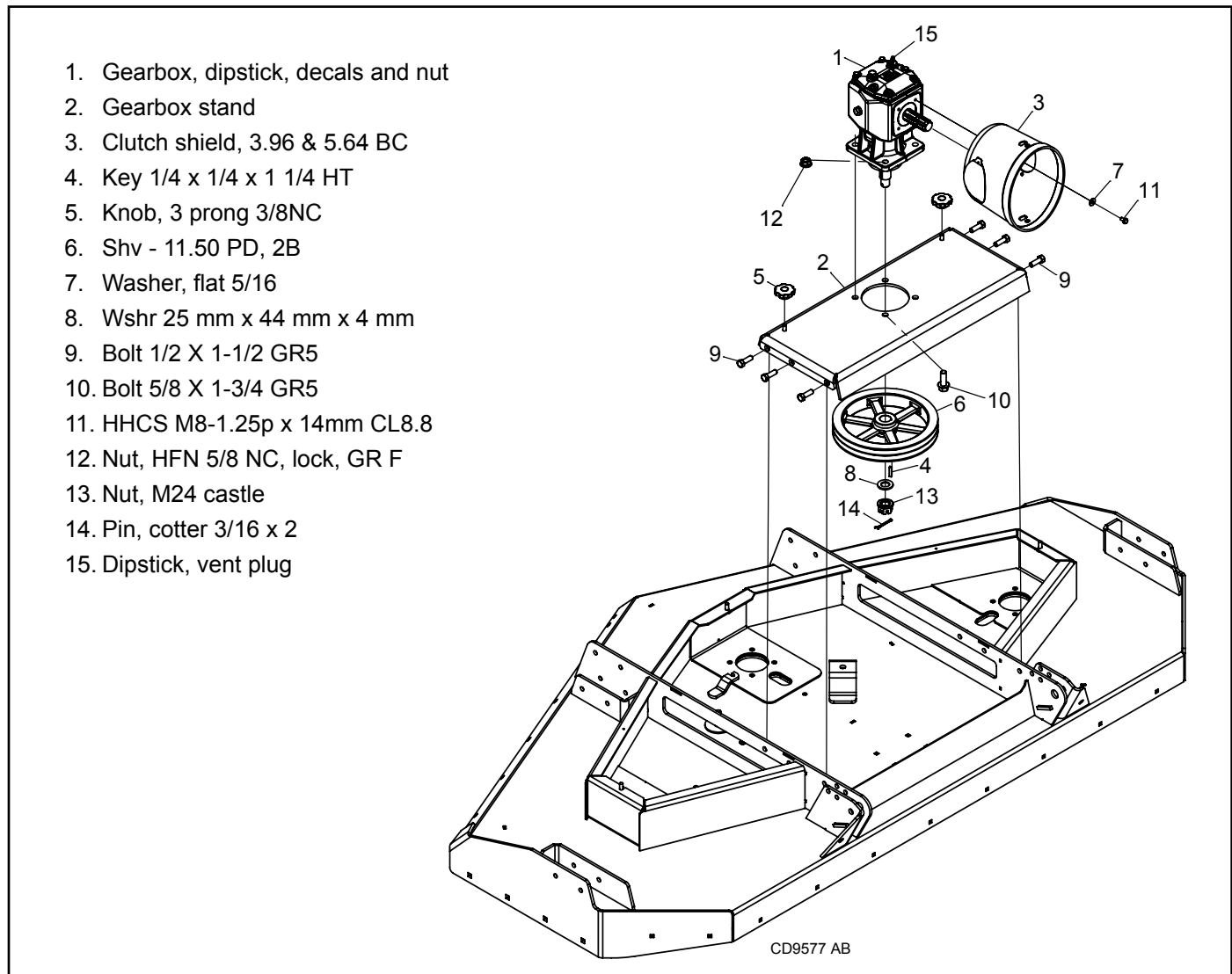


Figure 28. Gearbox Stand Assembly

Drive Sheave Installation

(Figure 29)

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 sheave should be $2-11/16 \pm 1/32$. This is a critical dimension and must be carefully adjusted for proper belt life.
2. Tighten gear stand hardware. Torque to 85 lbs-ft.
3. Fill gearbox with SAE 80W or 90W API GL-4 or GL5 gear lube until it runs out of plug on side of gearbox.
4. Check level after waiting five minutes to permit lube to work through bearings. Add lube, if necessary, until gearbox dipstick shows full. The oil should be between the two lines on the dipstick. Replace driveline shield using M8 screw (11) and washer (7). See Figure 28.
5. Attach driveline to gearbox.

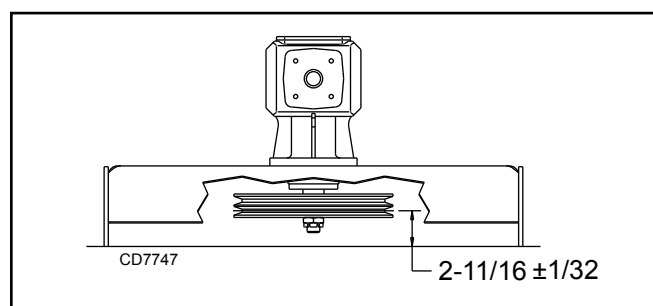


Figure 29. Drive Sheave Installation

UNIVERSAL JOINT REPAIR

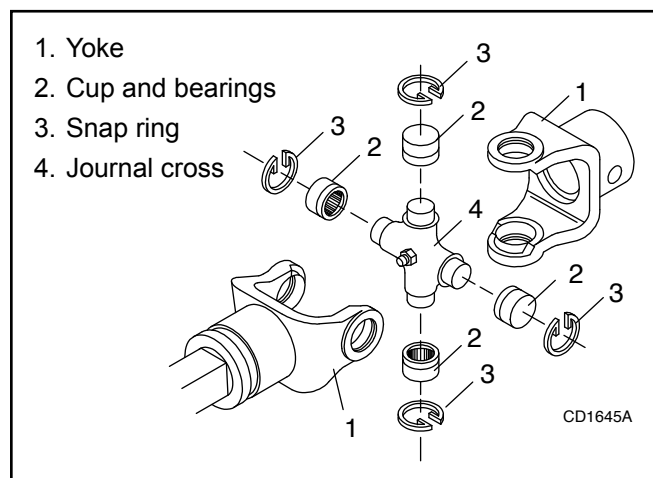


Figure 30. U-Joint Exploded View

U-Joint Disassembly

1. Remove external snap rings from yokes in four locations as shown in Figure 31.

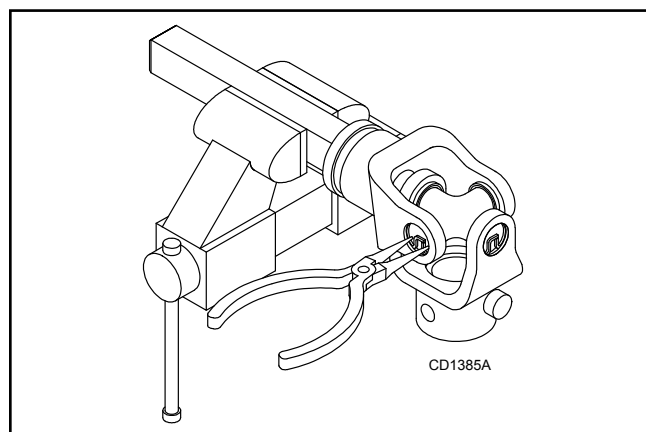


Figure 31. Remove Snap Ring

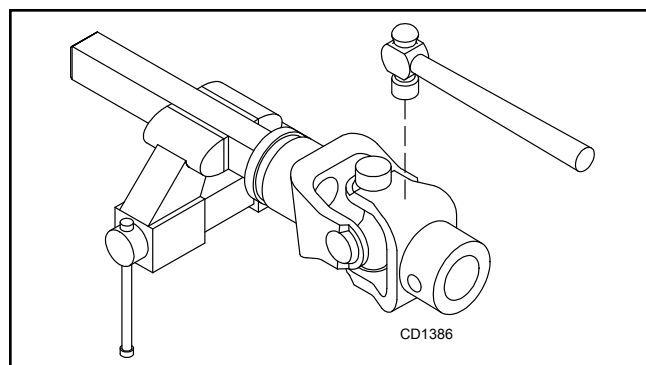


Figure 32. Remove Bearing Cups

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 32.
3. Clamp cup in vise as shown in Figure 33 and tap on yoke to completely remove cup from yoke. Repeat Step 2 and Step 3 for opposite cup.

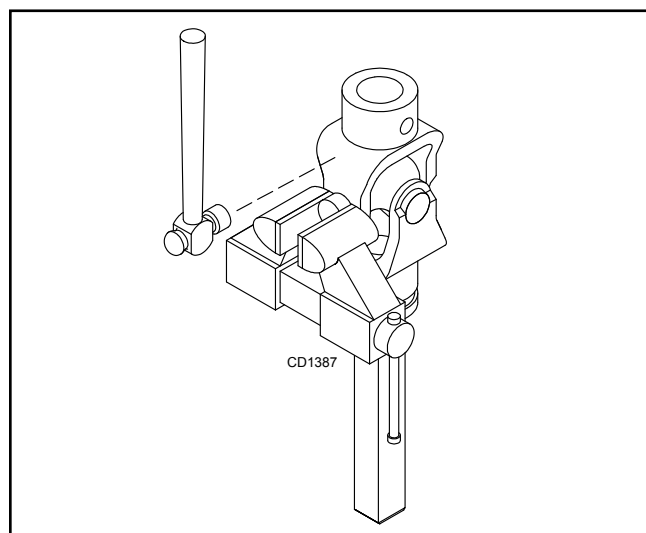


Figure 33. Remove Bearing Cups

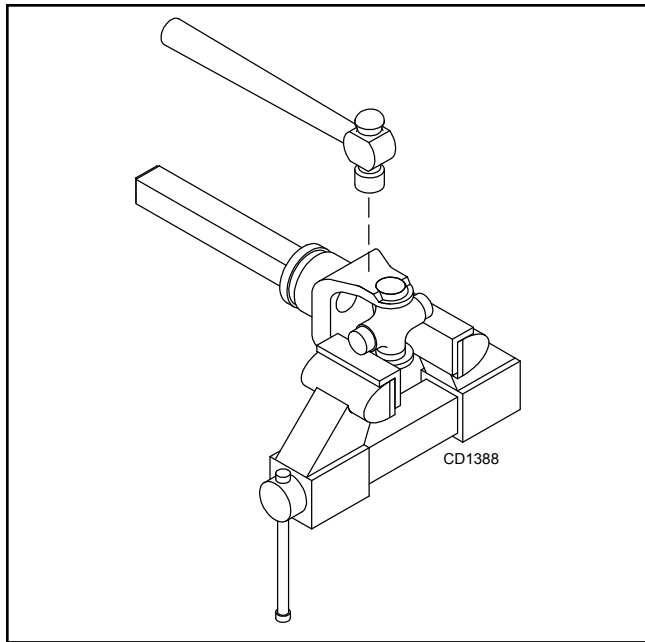


Figure 34. Remove Bearing Cups

4. Place universal cross in vise as shown in Figure 34 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 35. 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.

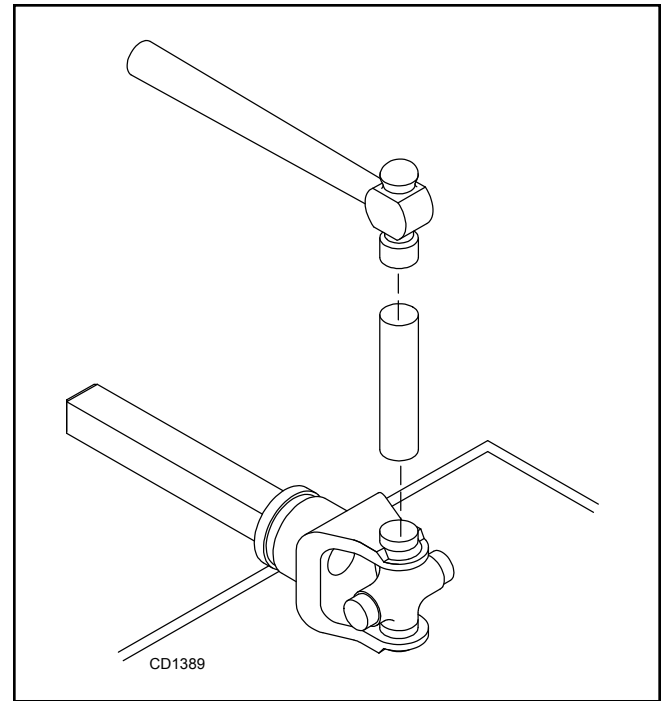


Figure 35. Install Bearing Cups

DRIVESHAFT GUARD REPLACEMENT

1. Remove driveshaft from power unit and mower.
2. On a table or workbench, slide driveshaft halves apart.
3. Using a medium-sized straight screwdriver, push in the white tabs inside the rectangular openings of the u-joint guard. Pulling back slightly on the u-joint guard will keep the tabs depressed.
4. Once all three tabs are depressed, slide the guard assembly over the telescoping assembly of the driveshaft.
5. Remove the plastic guard bearing from the driveshaft yoke.
6. Install new plastic guard bearing onto the driveshaft yoke.
7. Slide new plastic guard assembly over driveshaft telescoping assembly, aligning the white locking tabs with the rectangular openings in the u-joint guard.
8. The three white locking tabs should click into place.
9. Repeat steps 3 through 8 for the other half of the driveshaft.
10. Install new plastic driveshaft guard carrier bearing assembly over outer telescoping tube and align flush with end of female guard tube.
11. Apply grease to the telescoping members of the driveshaft and slide halves back together.

ASSEMBLY

DEALER SET-UP INSTRUCTIONS

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

Complete Dealer Check Lists on page 41 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 58.

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.

Disassemble Shipping Unit

(Figure 36)

1. Remove all parts that are wired and strapped to mower. Some items are underneath belt shield.
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. Loosen cap screw (14) and lock nuts (15) from front shipping bracket (4). Slide bracket out and tighten hardware. Do not over tighten lock nut against the PTO hanger. PTO hanger should rotate freely.

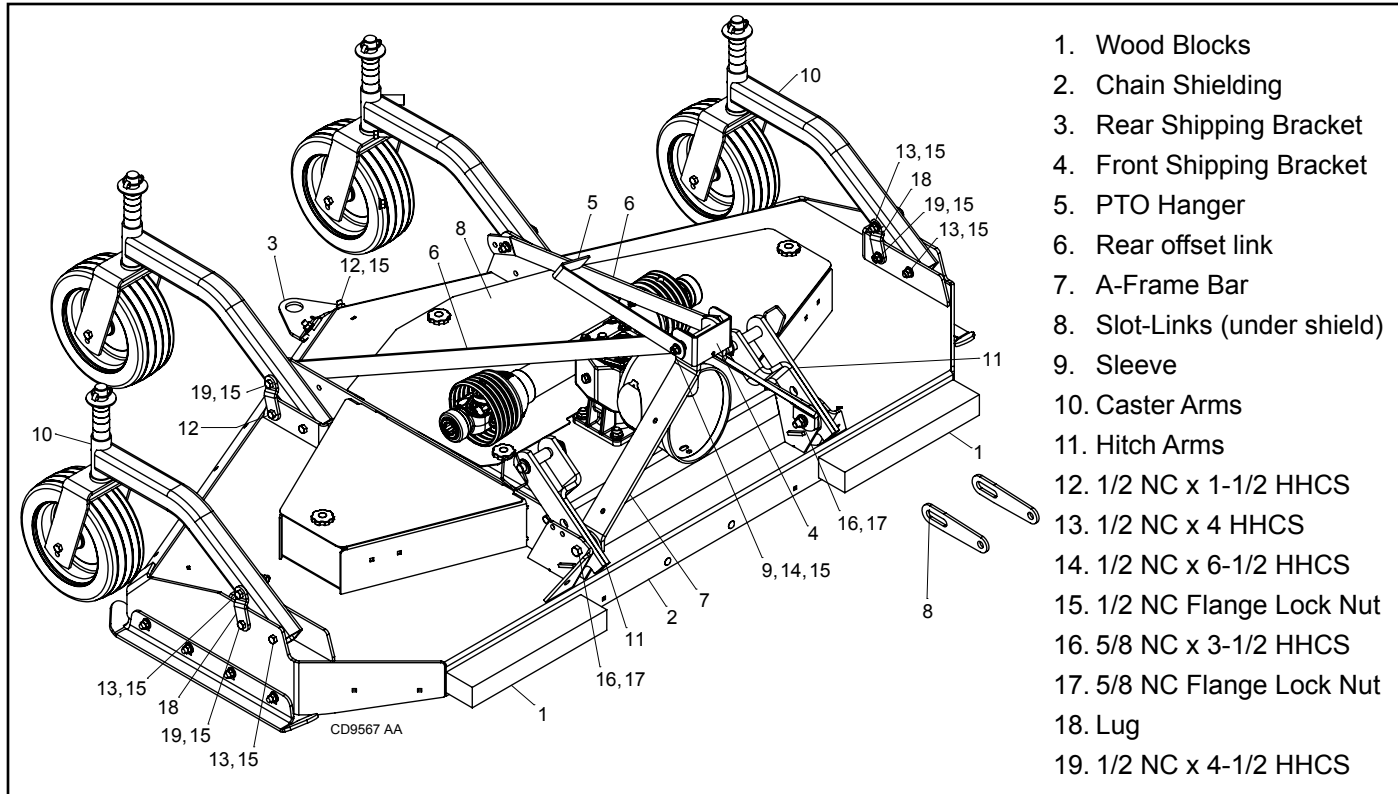


Figure 36. Shipping Unit

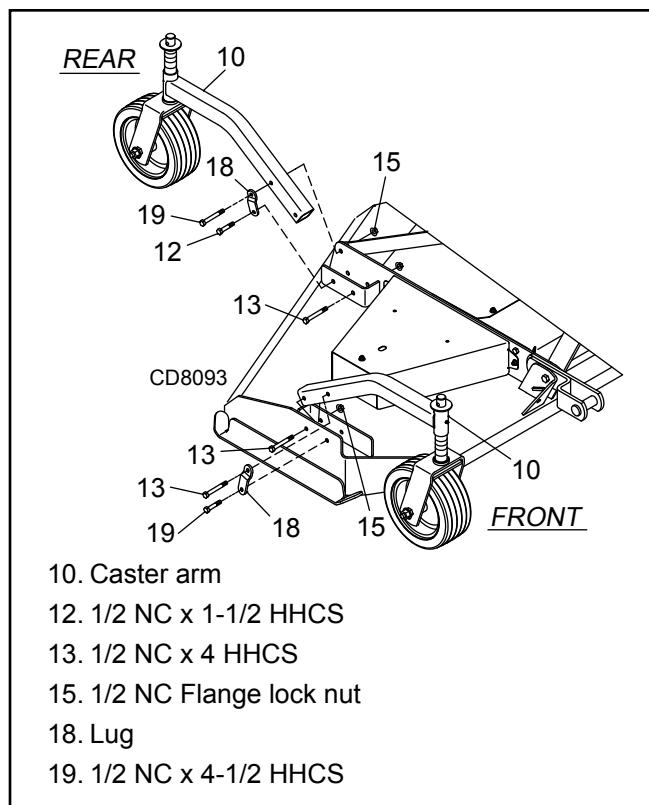


Figure 37. Caster Arm Assembly

Install Front Casters

(Figure 36 & 37)

1. Remove 1/2 NC cap screws (19 & 13) and lock nuts (15) from outer caster arms.
2. Remove outer caster arms from pockets in front corners of the deck and rotate arms, yokes, and wheels 180 degrees. Reinstall 1/2 NC cap screw (13) through outer pocket, rear hole in caster arm (10) and inside pocket wall. Bolt head should face towards the outside of the deck. Secure with 1/2 NC nut (15). Install lug (18) with 1/2 NC cap screws (19) and (13) as shown in Figure 37. Secure with 1/2 NC nuts (15). (Leave hardware loose.)

Torque Caster Arms

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

Install Hitch Arms

(Figure 2)

CAUTION

- Pinch Hazard, Hands or fingers could be pinched between lower hitch arms and rigid a-frame bars on mower.

1. Remove cap screws (31), sleeve (21), lock nuts (35), and hitch arms (14 & 15) from the lower hitch arm attachment point.
2. Position arms for Category 1 or 2 tractor. Category 1 hitch arms have the formed lug facing inward while Category 2 hitch arms have the formed lug facing outward. The notch in the rear of the hitch arm should face up. If the hitch arms do not have the correct orientation, then switch them and use Figure 38 as a guide for correct orientation and position. Reinstall cap screws (31), sleeve (21), hitch arms (14 & 15), and lock nuts (35).

See Attaching Mower to Tractor on page 11.

Install Driveshaft

(Figure 38)

WARNING

- Connect PTO driveline directly to power unit PTO shaft. Never use adapter sleeves or adapter shafts. Adapters can cause driveline failures due to incorrect spline or incorrect operating length and can result in personal injury or death.
1. Orient the driveline with the implement end towards the mower gearbox. (There is a stamp on the driveline indicating the tractor end.) Slide the QD collar back and push the drive yoke onto the gearbox input shaft. Make sure the QD is seated securely in the groove of the gearbox shaft.
 2. Slide the QD collar back to ensure it operates smoothly. Lubricate if necessary.
 3. Hang the driveline on the driveline holder.
 4. If your driveline came with tether chains, attach the implement end chain to the gearbox input shield.

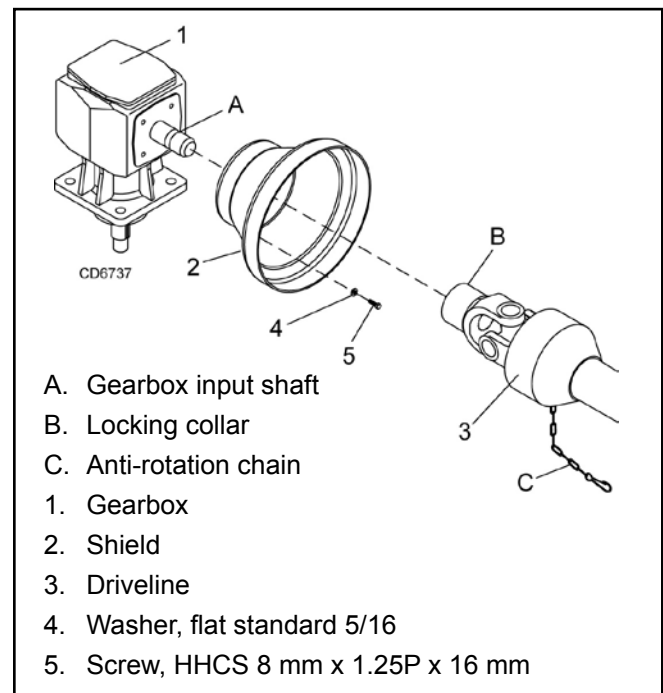


Figure 38. Driveshaft Installation

Fill Gearbox

NOTICE: Gearbox is 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. Remove vent plug/dipstick from manual tube and replace plug on top of the gearbox.
2. Check that gearbox is half-full. For service, use high quality gear oil that has a viscosity index of 80W or 90W and an API service rating of GL-4 or GL-5.
3. When filling gearbox, add oil until it runs out the side plug of the gearbox.
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/dipstick.

Install Chain Shielding

(Figure 39)



- **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.
1. Place unit on a level hard surface.
 2. Remove chain shielding and hardware bag from mower.
 3. Install front chain shield brackets (1) with 3/8 NC carriage bolts (11) and 3/8 NC nuts (12). Leave hardware loose.
 4. Install right and left corner chain shield brackets (2 & 3) with 3/8 NC carriage bolts (11) and 3/8 NC nuts (12). Leave hardware loose.
 5. Install right and left rear chain shield brackets (4 & 5) with 3/8 NC carriage bolts (11) and 3/8 NC nuts (12). Leave hardware loose.
 6. Tighten all hardware to 35 lbs-ft.

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 41.
5. Insert cap screw (5) through bracket and roller.
6. Secure with flanged lock nut (7). Do not overtighten, roller must spin freely.

Install Quick Hitch

(Figures 4 & 40)

NOTE: Category 1 and 2 quick hitch sleeves, hardware, and linkage parts come with the mower. Category 2 tractors tend to have taller PTO shafts than Category 1. This can lead to less driveline overlap and interference between the quick hitch and the driveline. It is recommended to use kit 652727 with Category 2 tractors and quick hitches. The kit includes two welded adapters and hardware.

For Category 1 tractors, the 1st hole or 2nd hole of the lower hitch arms or generally used with quick hitches depending on driveline overlap and clearance between the front caster tire and the tractor's rear tire. The closer the mower is coupled to the tractor the better it can handle the mower with less stress on the linkages. The 3rd hole of the lower hitch arms is used for larger Category 1 tractors with the free linkage hitch.

For Category 2 tractors, use the 1st or 2nd hole of the lower hitch with the hitch kit when using a quick hitch. Select the hole that maintains at least 1/3 driveline overlap, clearance between the front caster tire and the rear tractor tire, and coupled as closely to the tractor as possible.

1. Determine lower hitch arm hole location and attach to mower.
2. When using a Category 1 quick hitch the lower hitch arms should be positioned with the offset toward the inside of the mower. When using a Category 2 quick hitch the lower hitch arm should be positioned with the offset toward the outside of the mower.
3. For Category 2 quick hitch with adapter kit remove the front gearbox mount bolts (26 - 1/2 NC x 1-1/2) from the deck rail and discard. Install adapter (24 & 25) to mower deck frame using bolt (27) and nut (19) and 1/2 bolt (26 - 1/2 NC X 2-1/2) included in kit.
4. Attach A-frame arms (13) and sleeve (21) to lower hitch arms and mower deck (Category 1) or adapter weldments (Category 2) using cap screws (31), sleeve (21), and hex nut (35). Orientation of QH bar A-frame is different between Category 1 & 2. See Figures 4 & 40.

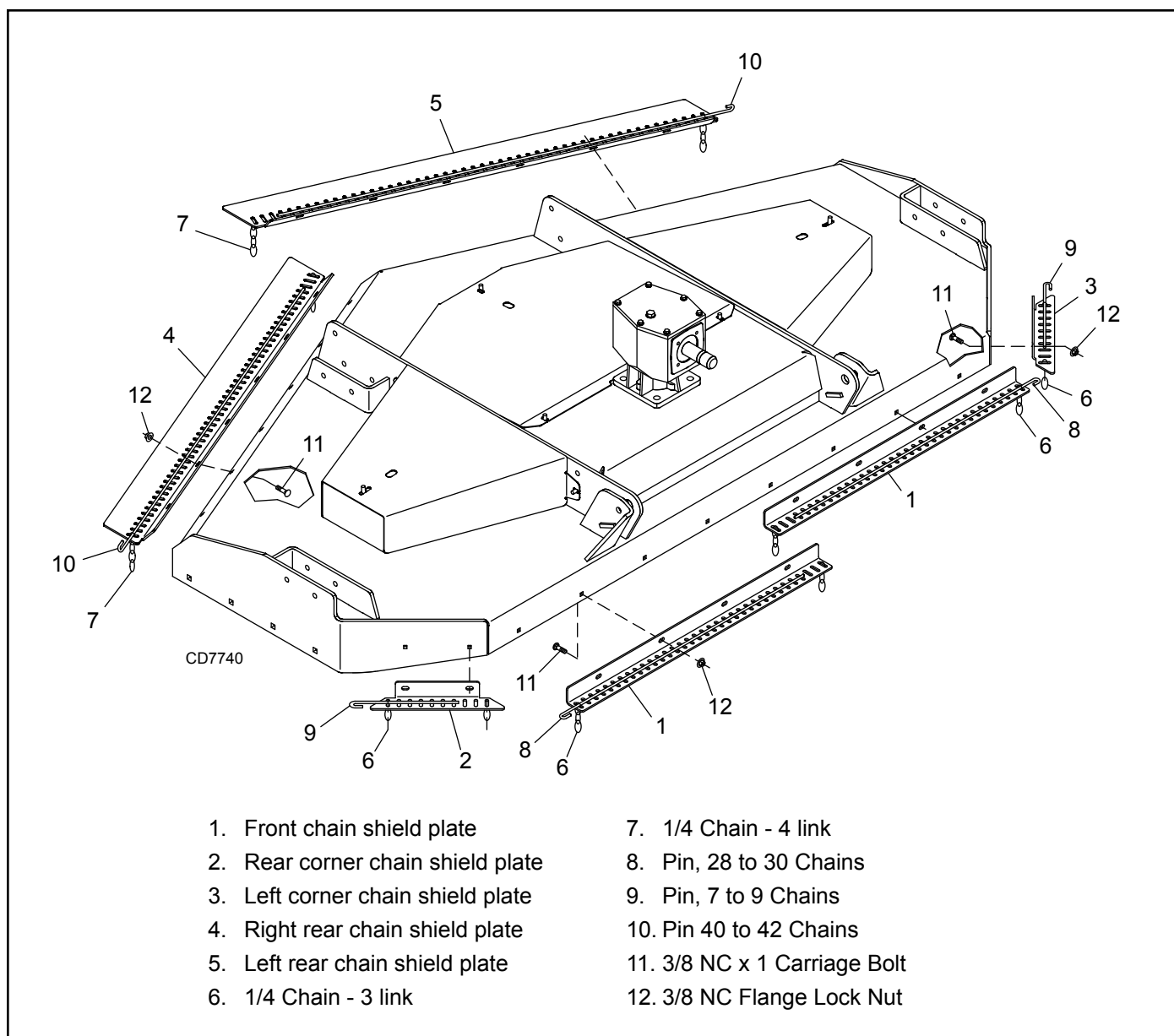


Figure 39. Chain Shield Installation

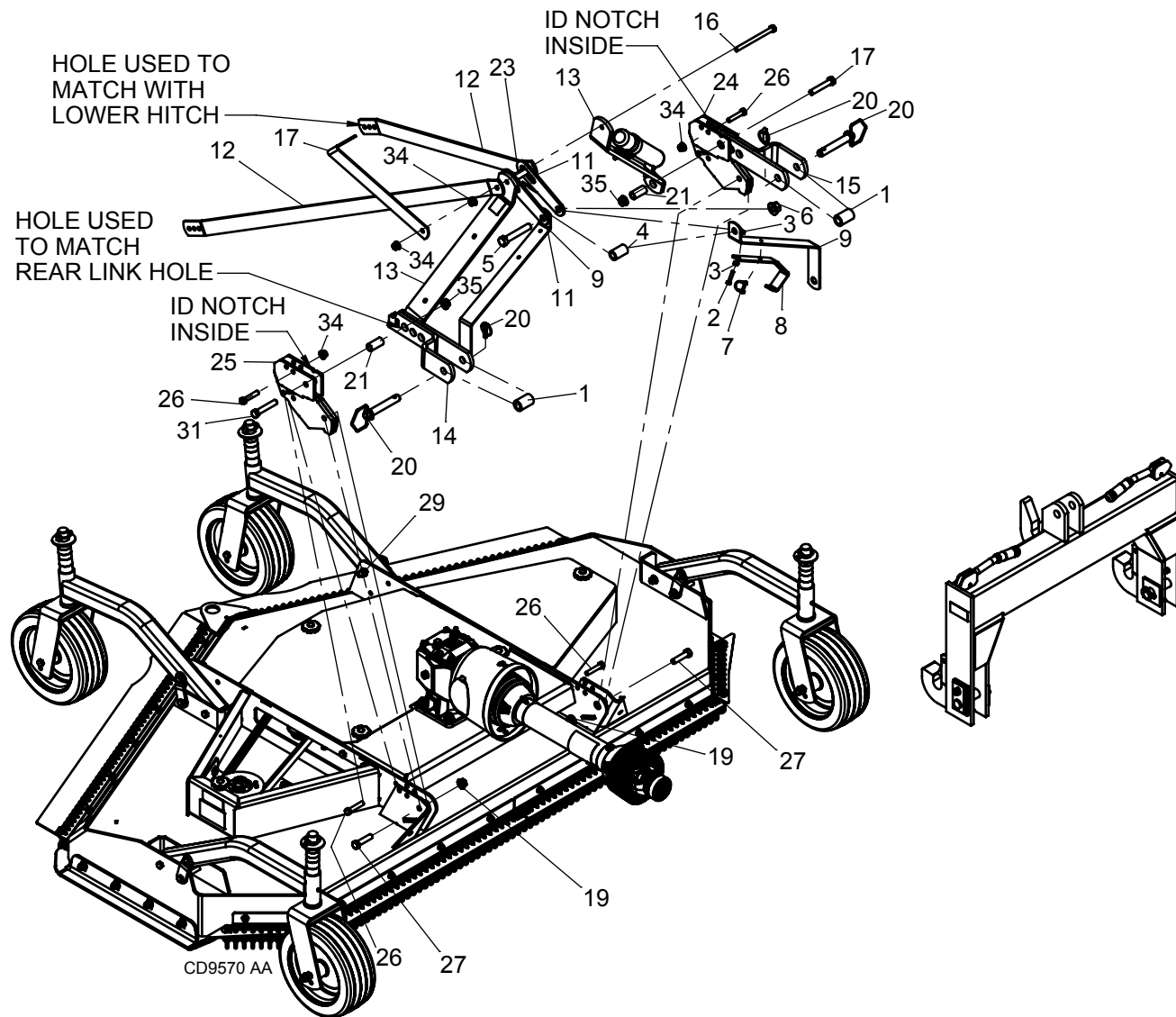
5. Attach upper end of A-frame arms (13) and sleeve (23) to mower top links (11) and rear offset links (12) using cap screw (16), sleeve (23), and flange nut (34). Retain driveline holder for free link hitch with second flange nut (34). See Figures 4 & 40 for order of linkages.
6. Attach drawbar pin (20) and sleeve (1) to lower hitch weldments (14 & 15).
7. Move mower offset links (12) to the rear hole that matches with the lower hitch weldment holes (14 & 15).
8. Attach upper end QH bar A-frame (9) to mower top links using cap screw (5), sleeve (4), and nut (6) as shown. QH bar A-frame orientation is different between Category 1 & 2. See Figures 4 & 40.

9. Attach PTO hanger (8) to right hand QH bar A-frame as shown using cap screw (2), nuts (3), and lock pin (7).
10. Attach 1/2" bolt (26) and nut (34) in proper stop location to prevent lower hitch mounts from going down too far.
11. Tighten all hardware.

⚠ CAUTION

- **Pinch Hazard.** Hands or fingers could be pinched between quick hitch a-frame bars and rigid a-frame bars on mower. Do not push on quick hitch a-frame bars when mower is disconnected from tractor.

TW990X QH CAT 2 INSTALLATION



- | | | |
|-----------------------------|------------------------------------|-----------------------------|
| 1. Sleeve .94 X 1.44 X 2.19 | 12. Lift link 5/16" | 25. WA, adapter CAT 2 QH RH |
| 2. Bolt 5/16 NC X 1-1/2 | 13. A-Frame Link 1/2" | 26. Bolt 1/2 NC X 2-1/2 |
| 3. Nut 5/16 NC flange | 14. WA, hitch CAT 2 RH | 27. Bolt 5/8 NC X 2-1/2 |
| 4. Sleeve .81 X 1.25 X 2.12 | 15. WA, hitch CAT 2 LH | 29. Bolt 1/2 NC X 4-1/2 |
| 5. Bolt 3/4 NC X 4-1/2 | 16. Bolt 1/2 NC X 6-1/2 | 31. Bolt 5/8 NC x 3-1/2 |
| 6. Nut 3/4 NC flange | 17. PTO hanger | 34. Nut, 1/2 NC flange |
| 7. Pin lock | 20. Pin CAT 1 drawbar w/ lynch pin | 35. Nut 5/8 NC flange |
| 8. PTO hanger | 21. Sleeve .64 x 1.00 x 2.09 | 37. Bolt 1/2 NC X 1-1/2 |
| 9. Bar, QH a-frame | 23. Pipe .50 X 3.13 | |
| 11. Plate top link | 24. WA, adapter CAT 2 QH LH | |

Figure 40. Quick Hitch Category 2 Installation
(Optional, For CAT 1. See page 14 Figure 4.)

DEALER CHECKLISTS

DEALER PRE-DELIVERY CHECKLIST (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 21.
- _____ Gearboxes are filled at the factory. Prior to delivery, fill as specified in the "Service, Lubrication Information" on page 21 and check to see that there are no leaking seals.
- _____ Check that blades have been properly installed.

DEALER DELIVERY CHECKLIST (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 jackstands and to follow all instructions in the "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

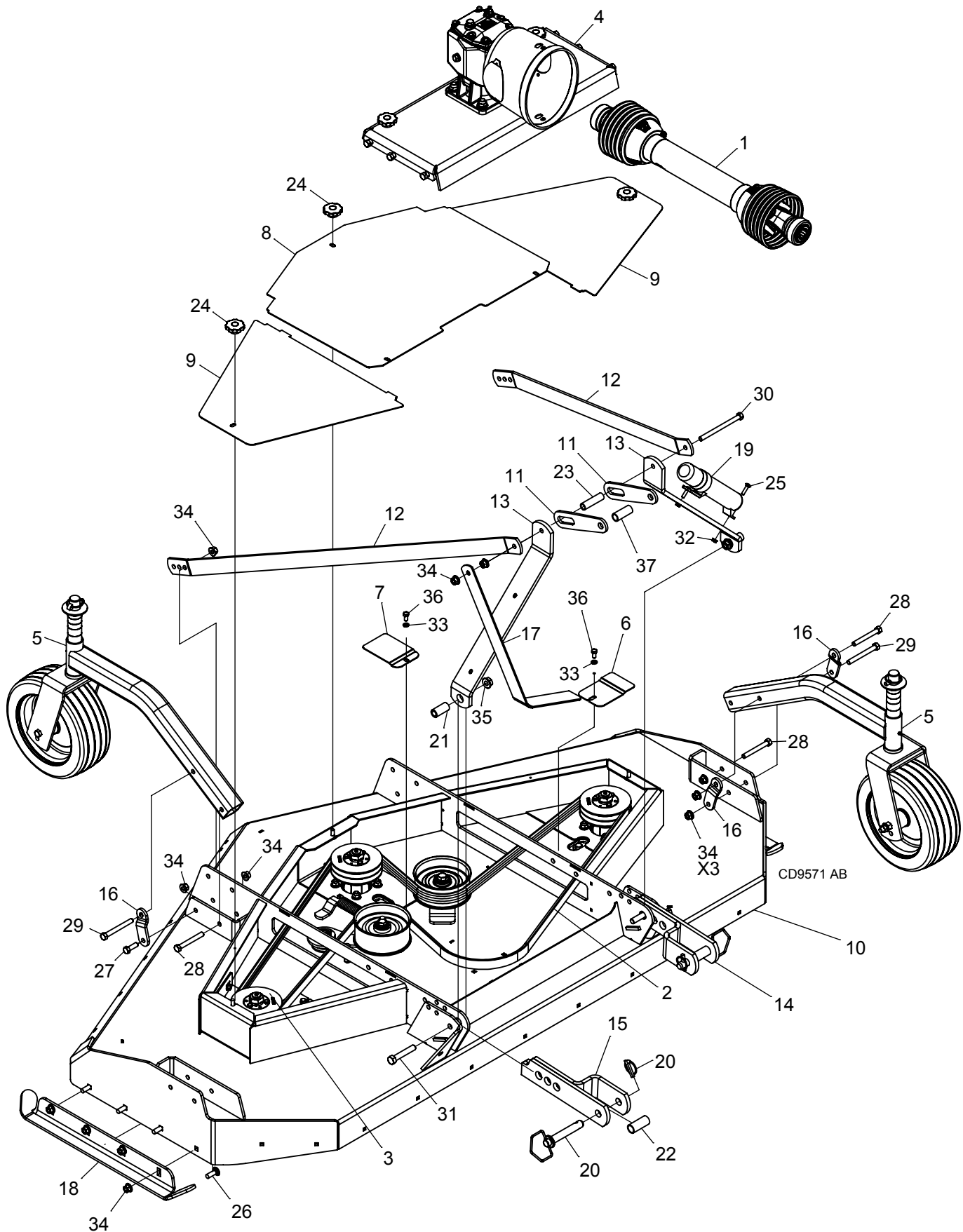


PARTS INDEX

Rearmount Mower: TW990X

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TW990X MAIN FRAME ASSEMBLY



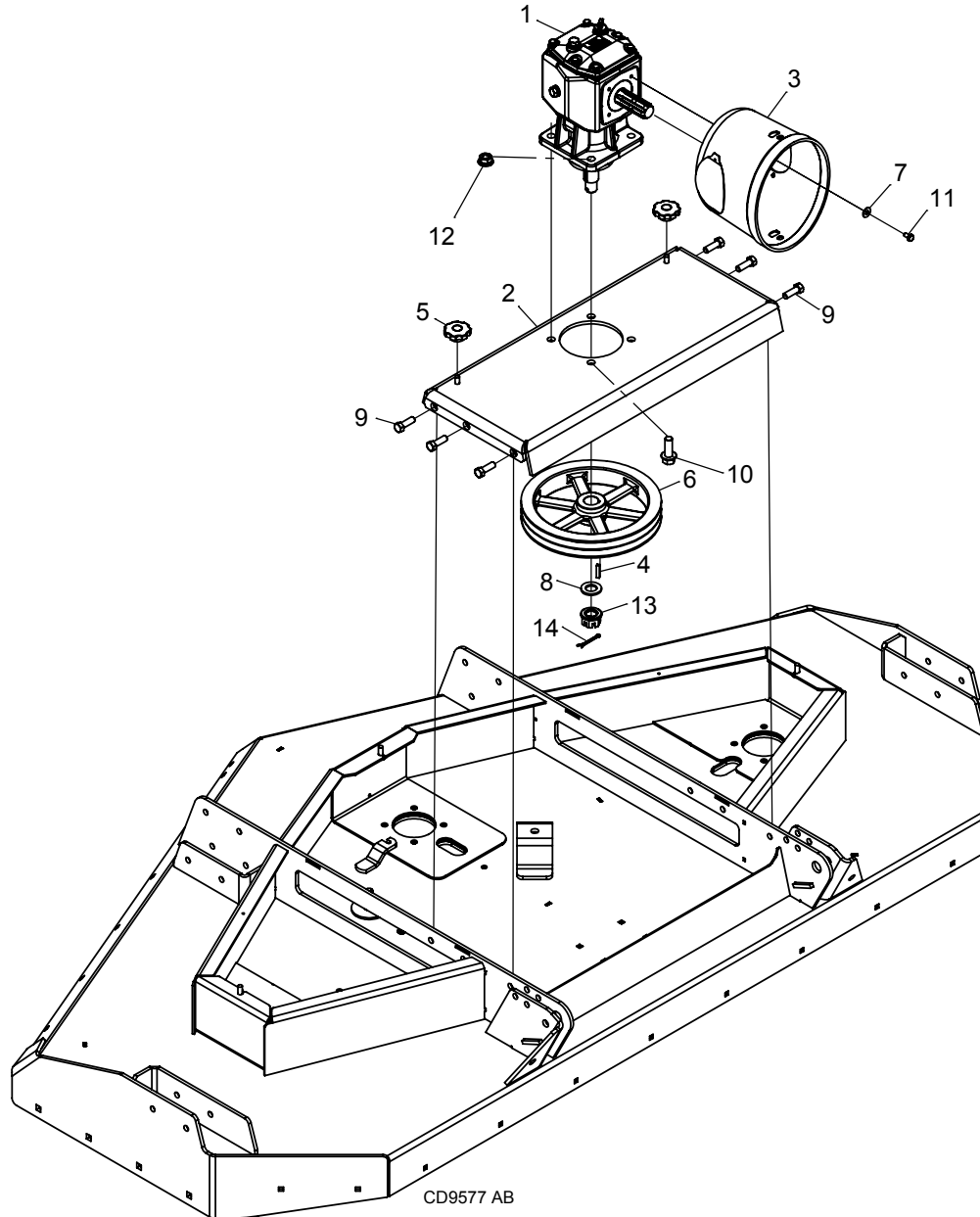
44 Parts

MAN1415
(09/03/2026)

TW990X MAIN FRAME ASSEMBLY

REF	PART	QTY	DESCRIPTION	OBTAIN LOCALLY:			
1	601753	1	DRIVELINE, CMPL (SEE PAGE 49)	REF	PART	QTY	DESCRIPTION
2	659116	1	ASY, BELT DRIVE (SEE PAGE 52)	25	14458	2	BOLT CRG 5/16 NC X 1-1/4
3	659117	1	ASY, SPINDLE (SEE PAGE 50)	26	29893	8	BOLT CRG 1/2 NC X 1-1/2 HT
4	659121	1	ASY, GEARBOX (SEE PAGE 48)	27	3379	2	BOLT, HEX 1/2 NC X 1.50 GR5
5	659122	4	ASY, CASTER WHEEL, ARM (SEE PAGE 47)	28	10380	6	HHCS 1/2 NC X 4 GR5 ZP
6	657339RP	2	BLADE ACCESS COVER, END	29	3508	4	HHCS 1/2 NC X 4-1/2 GR5 ZP
7	658920RP	1	BLADE ACCESS COVER, CENTER	30	22205	1	HHCS 1/2 NC X 6-1/2 GR5
8	657343RP	1	SHIELD, CENTER	31	23141	2	HHCS 5/8 NC X 3-1/2 HT
9	659124RP	2	SHIELD, SIDE	32	W73163	2	NUT, WHIZ, 5/16 NC FLNG ZP
10	657350RP	1	DECK WELDMENT	33	838	3	WASHER, LOCK 3/8
11	657347RP	2	PLATE, TOP LINK TW990X	34	11900	1	NUT, HFN 3/8 NC, LOCK, GR G
12	658913RP	2	LINK, OFFSET	35	19025	22	NUT, HFN 1/2 NC, LOCK, GR G
13	658914RP	2	LINK, A-FRAME	36	1686	3	HHCS 3/8 NC X 3/4 GR5 ZP
14	658925RP	1	HITCH, CAT 1 LH, CAT 2 RH	38	19025	2	NUT, HFN 5/8 NC, LOCK, GR F
15	658930RP	1	HITCH CAT 2 LH, CAT 1 RH		HHCS		HEX HEAD CAP SCREW
16	1037959RP	6	LUG, OFFSET				
17	1032811RP	1	PTO HANGER				
18	1032812RP	2	SKID, RIGHT AND LEFT				
19	1026530	1	MANUAL TUBE				
20	SU105	2	CAT 1 DRAWBAR PIN W/ LYNCH PIN				
21	19524	2	SLV .64 X 1.00 X 2.09 HT				
22	56598	2	SLV .885 X 1.12 X 2.62				
23	1032798	1	PIPE, .50 X SCH 40 X 3.13				
24	66840	3	KNOB, 3 PRONG 3/8NC				
37	661197	1	SLV, .765 X 1.000 X 2.44				

TW990X GEARBOX STAND ASSEMBLY



CD9577 AB

REF	PART	QTY	DESCRIPTION
1	631405RP	1	GEARBOX, DIPSTICK, DECALS AND NUT
2	658918RP	1	GEARBOX STAND
3	1002048	1	CLUTCH SHIELD, 3.96 & 5.64 BC
4	29792	1	KEY 1/4 X 1/4 X 1 1/4 HT
5	66840	2	KNOB, 3 PRONG 3/8NC
6	1032751	1	SHV - 11.50 PD, 2B

OBTAIN LOCALLY:

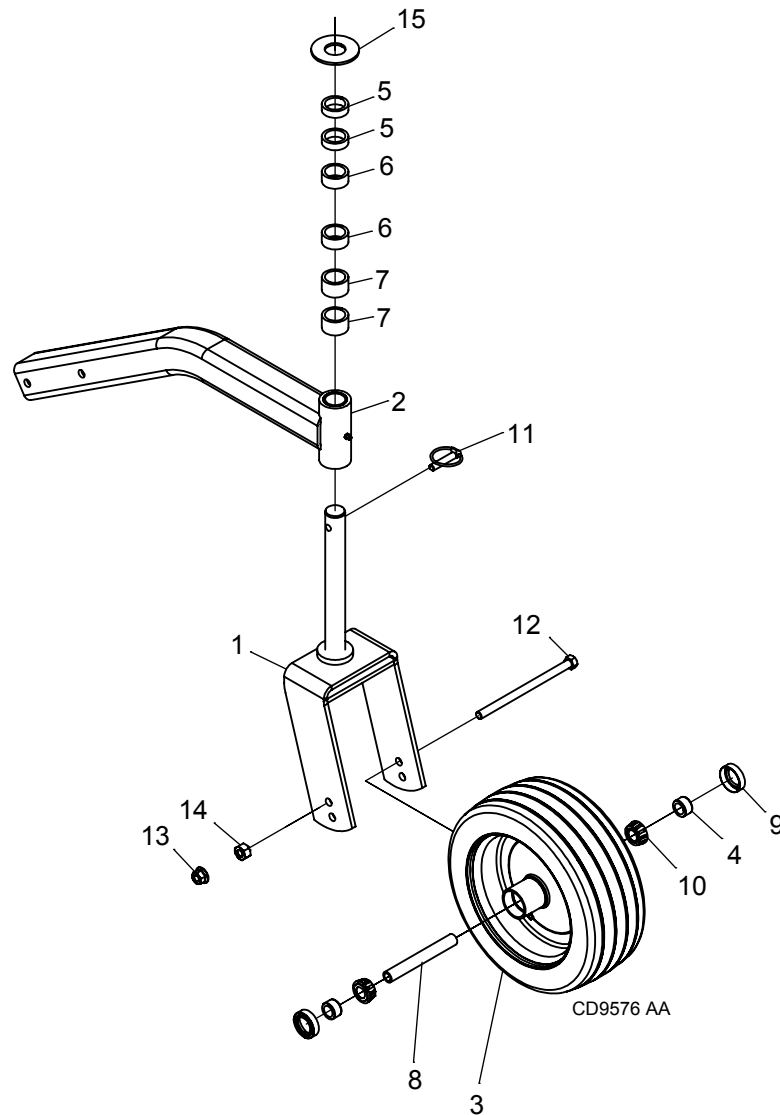
REF	PART	QTY	DESCRIPTION
7	4378	4	WASHER, FLAT 5/16
8	20893	1	WSHR 25MM X 44MM X 4MM
9	3379	6	BOLT, HEX 1/2 NC X 1.50 GR5
10	19024	4	BOLT, HEX FLNG 5/8 NC X 1.75 GR5
11	39254	4	HHCS M8-1.25P X 14MM CL8.8
12	19025	4	NUT, HFN 5/8 NC, LOCK, GR F
13	618208	1	NUT, M24 X 2 CASTLE
14	*	1	PIN, COTTER .15 X 2

HHCS HEX HEAD CAP SCREW

46 Parts

MAN1415
(09/03/2026)

TW990X CASTER ARM ASSEMBLY

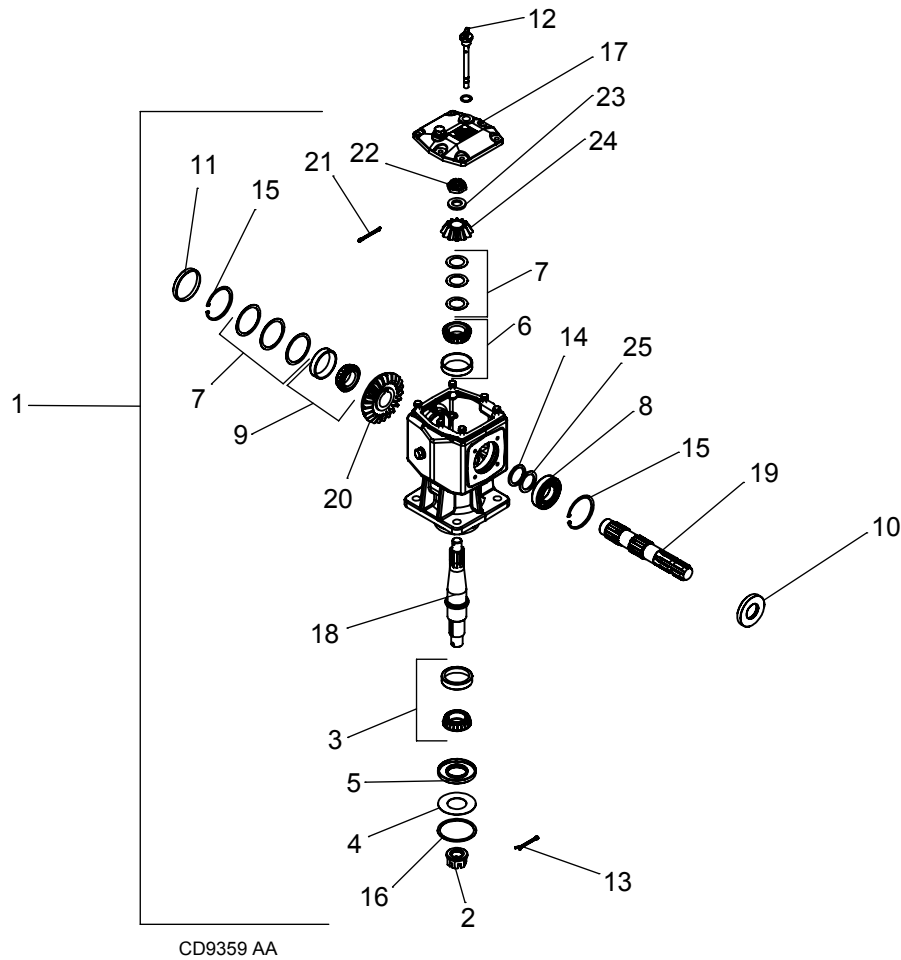


REF	PART	QTY	DESCRIPTION
1	1032782RP	1	WA, CASTER YOKE, TW990X
2	1037965RP	1	CASTER ARM
3	WP20718G	1	WHEEL, 13.00 X 5.00 X 10 GRAY
4	52744	2	BSHG .752 X 1.125 X .625 HT
5	52853	2	PIPE, 1-1/4 SCDL 80 X .50
6	52854	2	PIPE, 1-1/4 SCDL 80 X .75
7	52855	2	PIPE, 1-1/4 SCDL 80 X 1.00
8	20714	1	SLV .525 X .750 X 5.800 HT
9	5624	2	SEAL, 1.125 X 1.78 X .47
10	6839	2	BRG-CONE LM11949
11	27542	1	7/16 X 11/32 KLIK PIN HT

OBTAIN LOCALLY:

REF	PART	QTY	DESCRIPTION
12	29604	1	HHCS 1/2 NC X 8 GR5
13	11900	1	NUT, HFN 1/2 NC, LOCK, GR G
14	1093	1	NUT HEX 1/2 NC PLTD
15	7163	1	WSHR 1-1/4 STD FLAT

TW990X GEARBOX ASSEMBLY



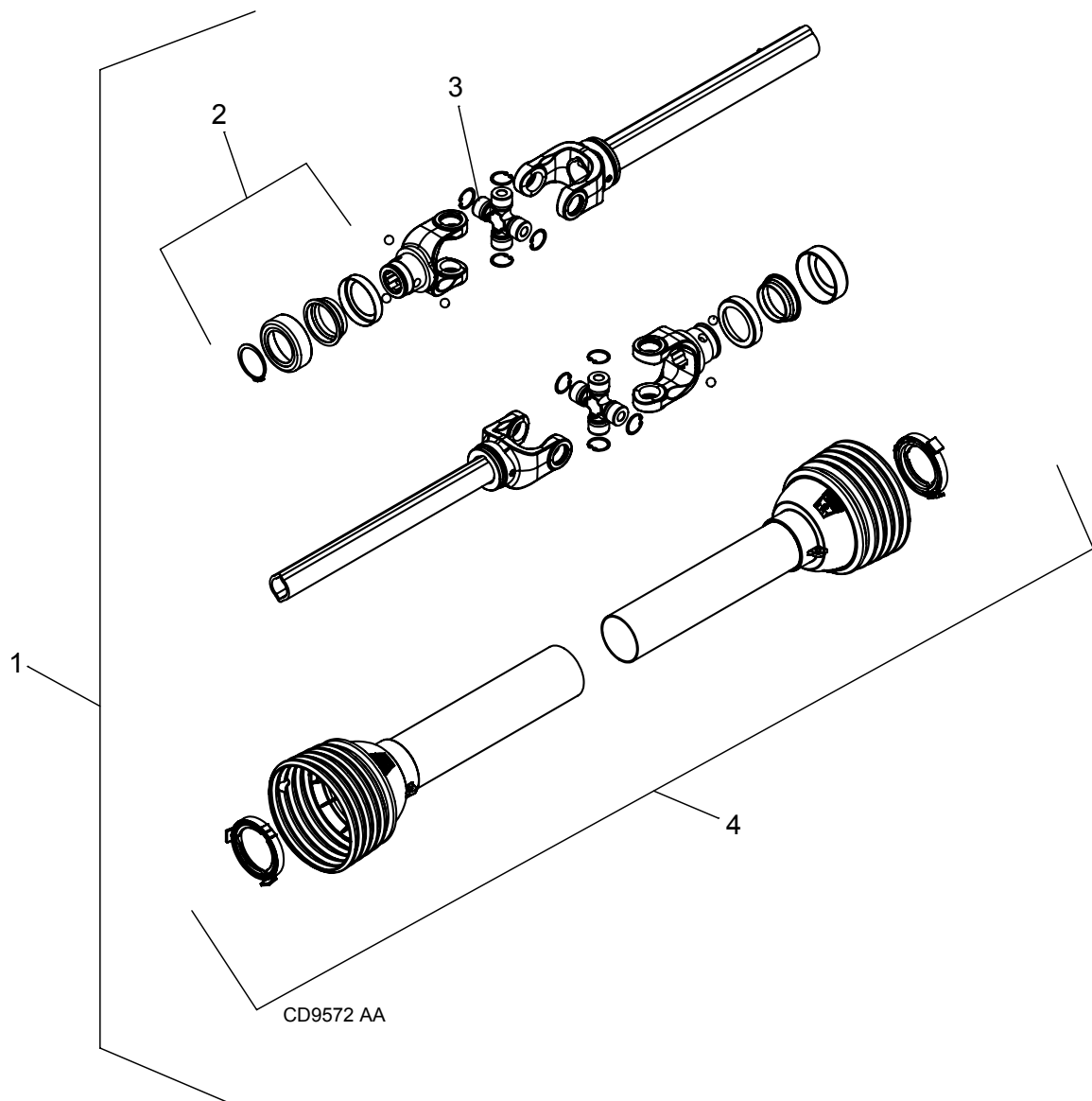
REF	PART	QTY	DESCRIPTION	REF	PART	QTY	DESCRIPTION
1	631405RP	1	GEARBOX, COMPLETE	17	NSS	1	COVER
2	618208	1	NUT, M24 X 2 HEX	18	NSS	1	OUTPUT SHAFT
3	58817	1	BEARING, ASY ISO 30208	19	NSS	1	INPUT SHAFT
4	637506	1	SEAL PROTECTOR	20	NSS	1	INPUT GEAR
5	637507	1	Ø40 X Ø80 X 10 OIL SEAL	21	NSS	1	COTTER PIN .15 X 2"
6	57476	1	30306 TAPERED BEARING	22	NSS	1	CASTLE NUT M20 -1.5
7	637512	1	SHIM KIT	23	NSS	1	SPACER Ø21 X Ø37 X 4.7
8	1018325	1	BALL BEARING 207	24	NSS	1	OUTPUT GEAR
9	637518	1	302207 TAPERED BEARING	25	NSS	1	SPACER Ø25.5 X Ø48 X 2.5
10	57463	1	Ø35 X Ø75 X 10 SEAL		*		STANDARD HARDWARE, OBTAIN LOCALLY
11	57374	1	Ø72 X 10 OIL CAP		NSS		NOT SOLD SEPARATELY
12	614309	1	VENT PLUG M18 X 1.5				
13	*	1	COTTER PIN .15 X 2				
14	*	1	RING RETAINING 40 X 2.5				
15	*	1	RING RETAINING Ø72				
16	*	1	RING RETAINING Ø81				

48 Parts

MAN1415
(09/03/2026)

TW990X DRIVE SHAFT ASSEMBLY

IDENTIFIED BY RIBBED SHIELDS AND GREASE FITTINGS IN CROSS BEARING CAPS



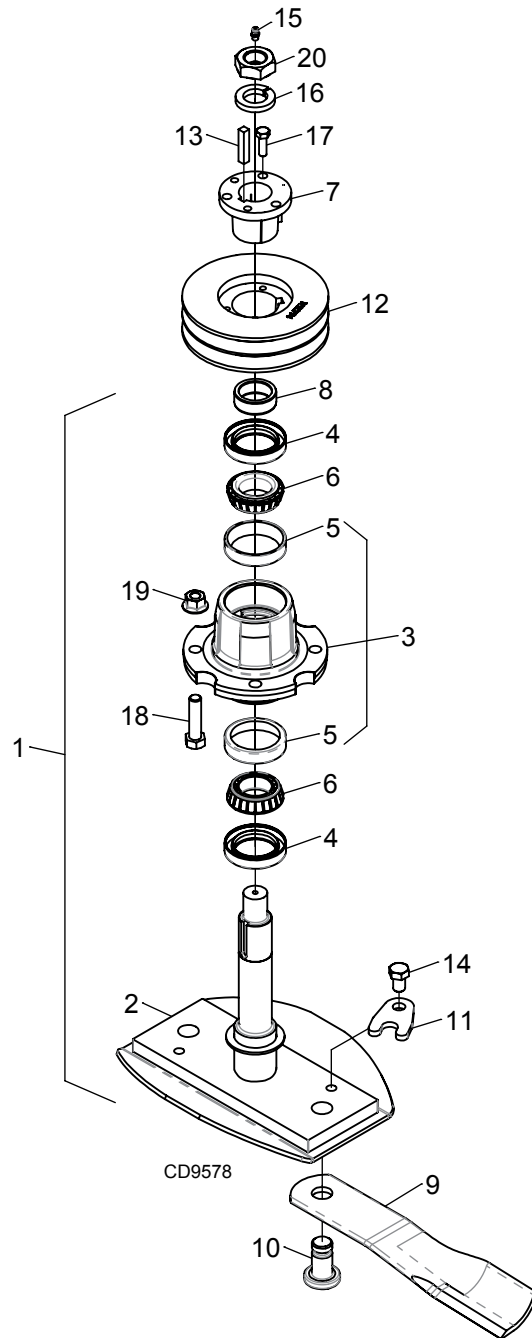
REF	PART	QTY	DESCRIPTION
1	601753	1	COMPLETE DRIVELINE
2	605289	1	LOCK COLLAR REPAIR KIT
3	605290	2	CROSS & BEARING KIT
4	661195	1	COMPLETE SHIELD

TW990X SPINDLE SHAFT ASSEMBLY

REF	PART	QTY	DESCRIPTION
1	657330RP	1	SPINDLE COMPLETE (EXCLUDE ITEMS 7, 9, 10, 11, 12, 13, 14, 16, 17, 20)
2	657331RP	1	SPINDLE SHAFT AND CROSSBAR
3	1032806	1	SPINDLE HOUSING, With CUPS
4	2715	2	SEAL, 1.75 X 2.56 X .5
5	2716	2	BEARING CUP
6	2717	2	BEARING CONE
7	13557	1	BSHG P1 1-3/8 STRT BORE
8	18359	1	SLV 1-3/8 X 1-3/4 X 5/8
9	29186	2	1/4X2-1/2X11-3/4CW BLADE
10	1032814	2	PIN/BLADE 1.25
11	1032815RP	2	BLADE LOCK
12	1032794	1	SHV 5.75 PD, 2B
13	W24549	1	5/16 X 5/16 X 1-5/8 KEY
14	13288	2	HHCS 1/2 NC X 3/4 NYLOK

OBTAIN LOCALLY:

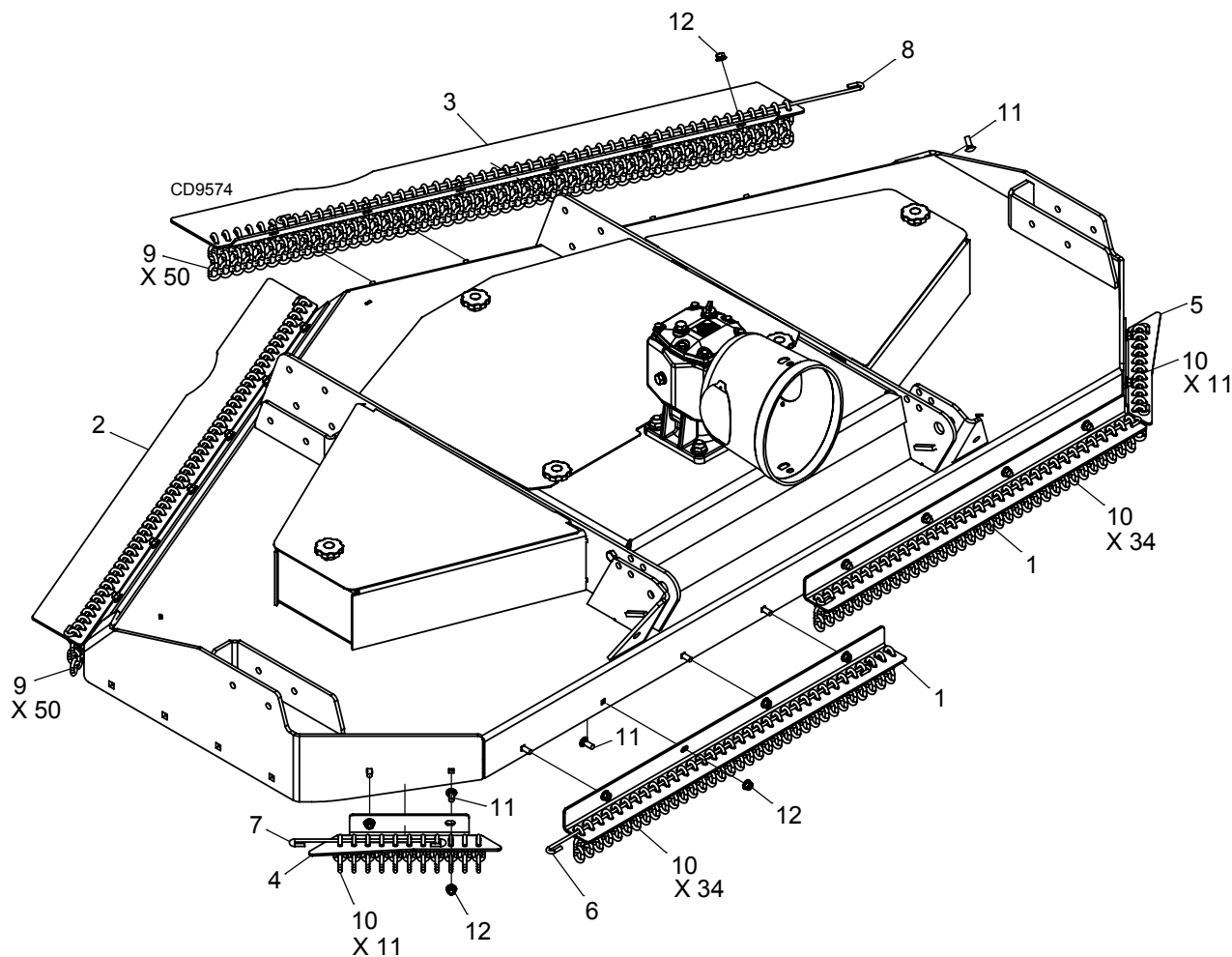
REF	PART	QTY	DESCRIPTION
15	1972	1	1/4-28 TAPR THRD GR FIT
16	3689	1	WSHR 1 STD D LOCK
17	14562	3	HHCS 5/16 NC X 1 GR5
18	3699	4	HHCS 1/2 NC X 2 GR5
19	11900	4	NUT, HFN 1/2 NC, LOCK, GR G
20	1386	1	NUT JAM 1 NC NP
	HHCS		HEX HEAD CAP SCREW



50 Parts

MAN1415
(09/03/2026)

TW990X CHAIN SHIELDING ASSEMBLY

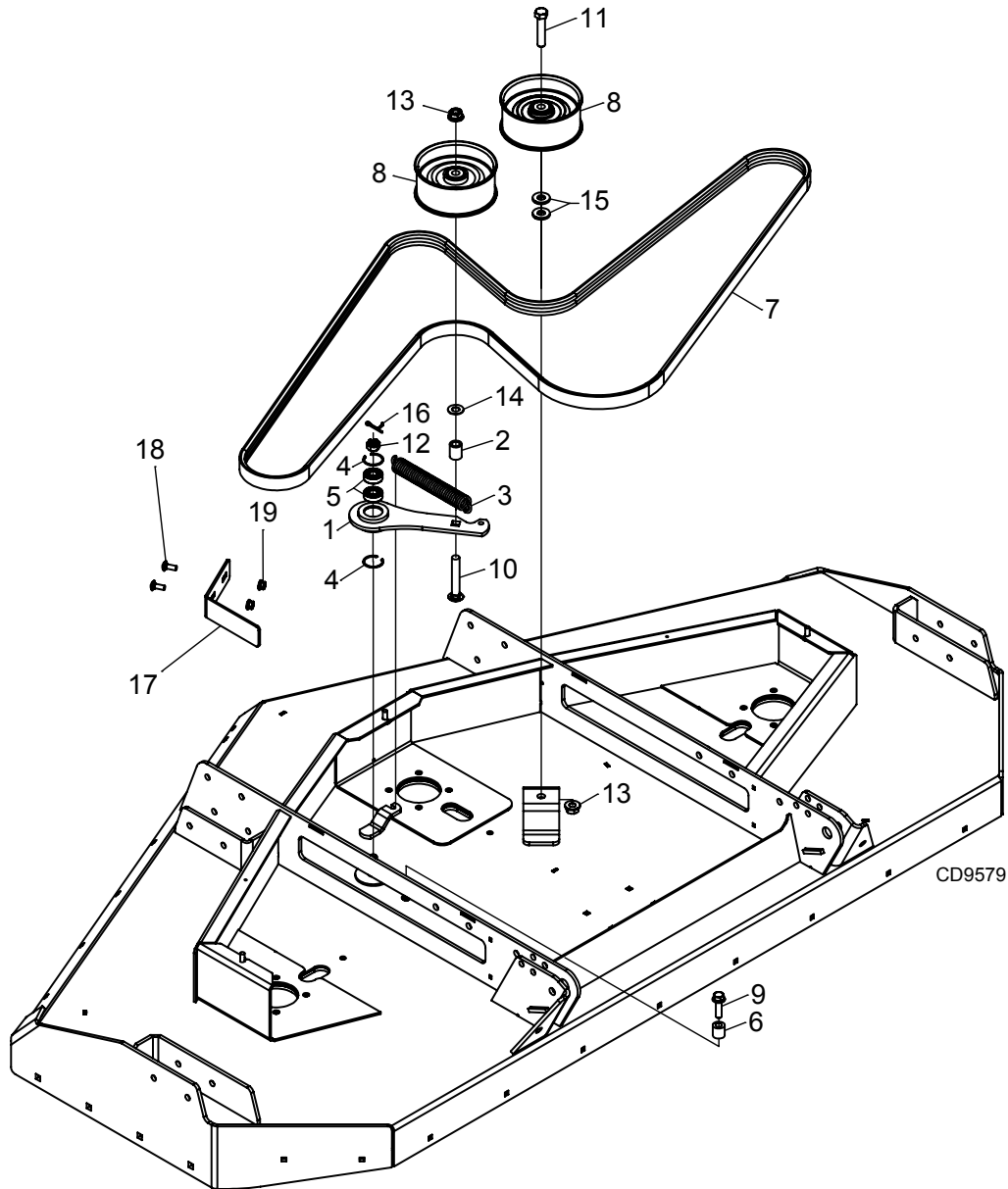


REF	PART	QTY	DESCRIPTION
1	1032821RP	2	FRONT CHAIN SHIELD PLATE, 34
2	1032822RP	1	RIGHT REAR CHAIN SHIELD PLATE, 50
3	1032823RP	1	LEFT REAR CHAIN SHIELD PLATE, 50
4	1032832RP	1	RIGHT CORNER CHAIN SHIELD PLATE, 11
5	1032833RP	1	LEFT CORNER CHAIN SHIELD PLATE, 11
6	1003646	2	PIN, CHAIN RETAINER
7	1007852	2	PIN, CHAIN RETAINER
8	1007854	2	PIN, CHAIN RETAINER
9	4765	100	4 LINK CHAIN 1/4 PROOF
10	4763	90	3 LINK CHAIN 1/4 PROOF

OBTAIN LOCALLY:

REF	PART	QTY	DESCRIPTION
11	6697	24	BOLT CRG 3/8 NC X 1 GR5 ZP
12	14350	24	NUT, HFN 3/8 NC, LOCK, GR G

TW990X BELT DRIVE ASSEMBLY



REF	PART	QTY	DESCRIPTION
1	1032789RP	1	IDLER ARM
2	66661	1	SLV .626 X 1.00 X 1.26
3	28928	1	SPR/EXT1.30 .19 8.2 35
4	35141	2	RETAINING RING - INT.
5	35193	2	BRG-6203
6	613792	1	SLEEVE, .53 X 1.00 X 1.02
7	1032799	1	BELT, 2HB POWERBAND, 174.5
8	1042382	2	PULLEY W/BRGS 6.50 X .625
9	1028902	1	BOLT, HEX FLNG 1/2 NC X 1.75 GR8
17	659951RP	1	GUIDE, BELT

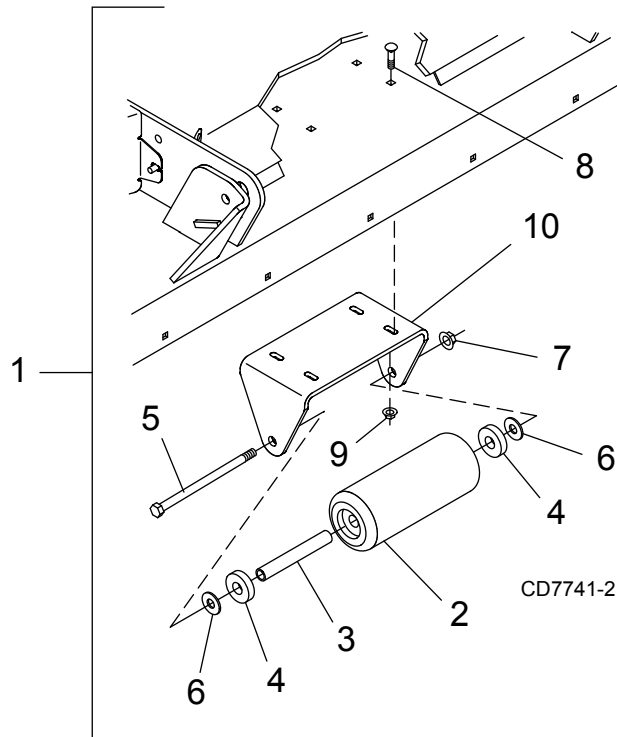
OBTAIN LOCALLY:

REF	PART	QTY	DESCRIPTION
10	W301147	1	BOLT CRG 5/8 NC X 4 GR5 ZP
11	34473	1	HHCS 5/8 NC X 3 GR5
12	302178	1	NUT 5/8 NF CASTLE
13	19025	2	NUT, HFN 5/8 NC, LOCK, GR F
14	3632	1	WSHR 5/8 STD SAE FLT
15	1517	2	.625 X 1.38 X 7 GA FLT WSHR
16	1266	1	3/16 X 1-1/2 COTTER PIN
18	6697	2	BOLT CRG 3/8 NC X 1 GR5 ZP
19	14350	2	NUT, HFN 3/8 NC, LOCK, GR G

52 Parts

MAN1415
(09/03/2026)

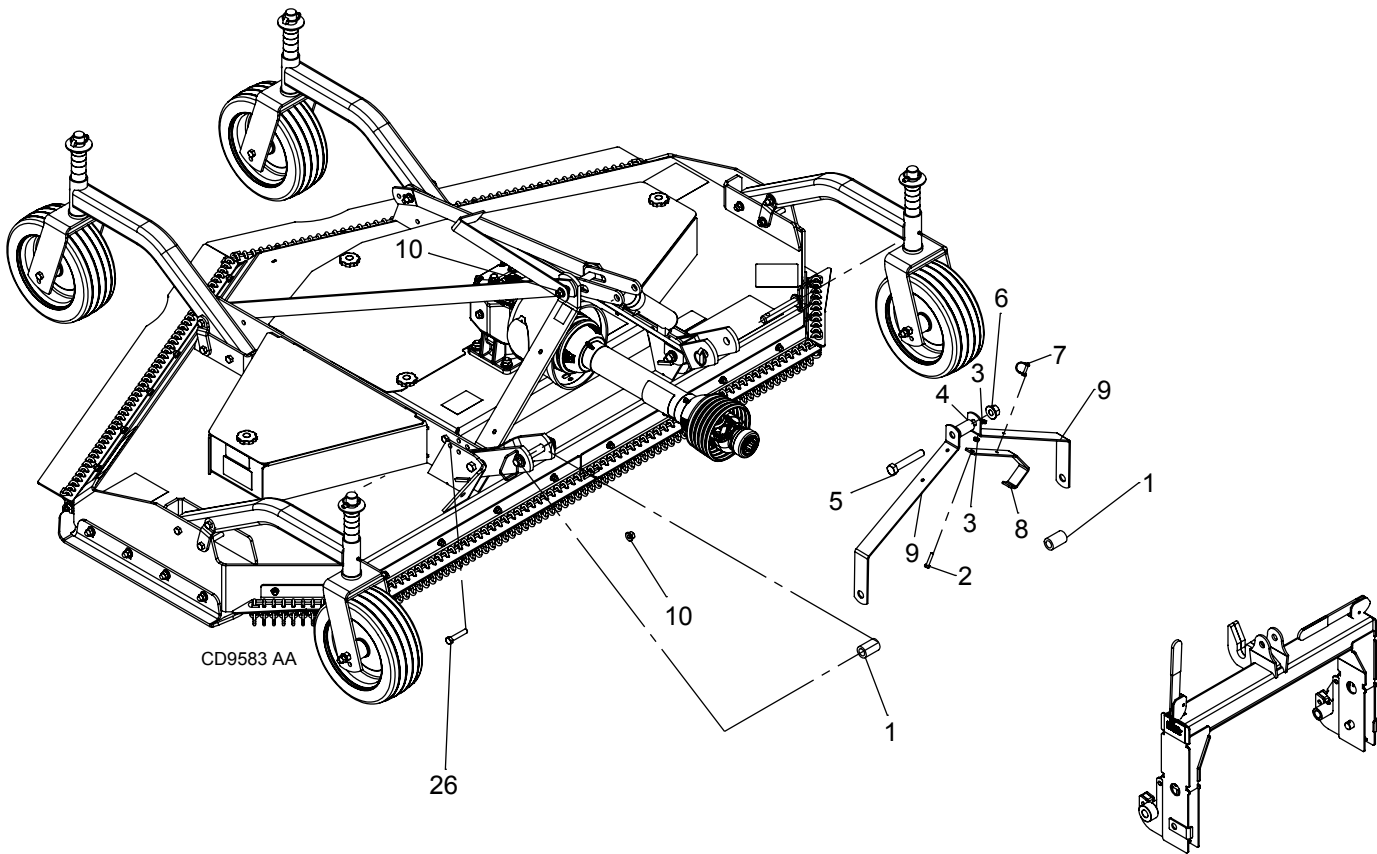
TW990X FRONT ROLLER ASSEMBLY (OPTIONAL)



REF	PART	QTY	DESCRIPTION
1	1032828	1	FRONT ROLLER KIT - COMPLETE
2	1006418	1	ROLLER, 4 X 7.38
3	1006420	1	SPACER, .75 X 7.27
4	35193	2	BEARING
5	38107	-	1/2 NC X 9 HHCS, GR5
6	3598 *	-	1/2 SAE FLAT WASHER
7	11900 *	-	1/2 NC FLANGE LOCK NUT
8	20973 *	-	3/8 NC X 1-1/4 CARRIAGE BOLT, GR5
9	14350 *	-	3/8 NC FLANGE LOCK NUT
10	1032829	1	ROLLER BRACKET

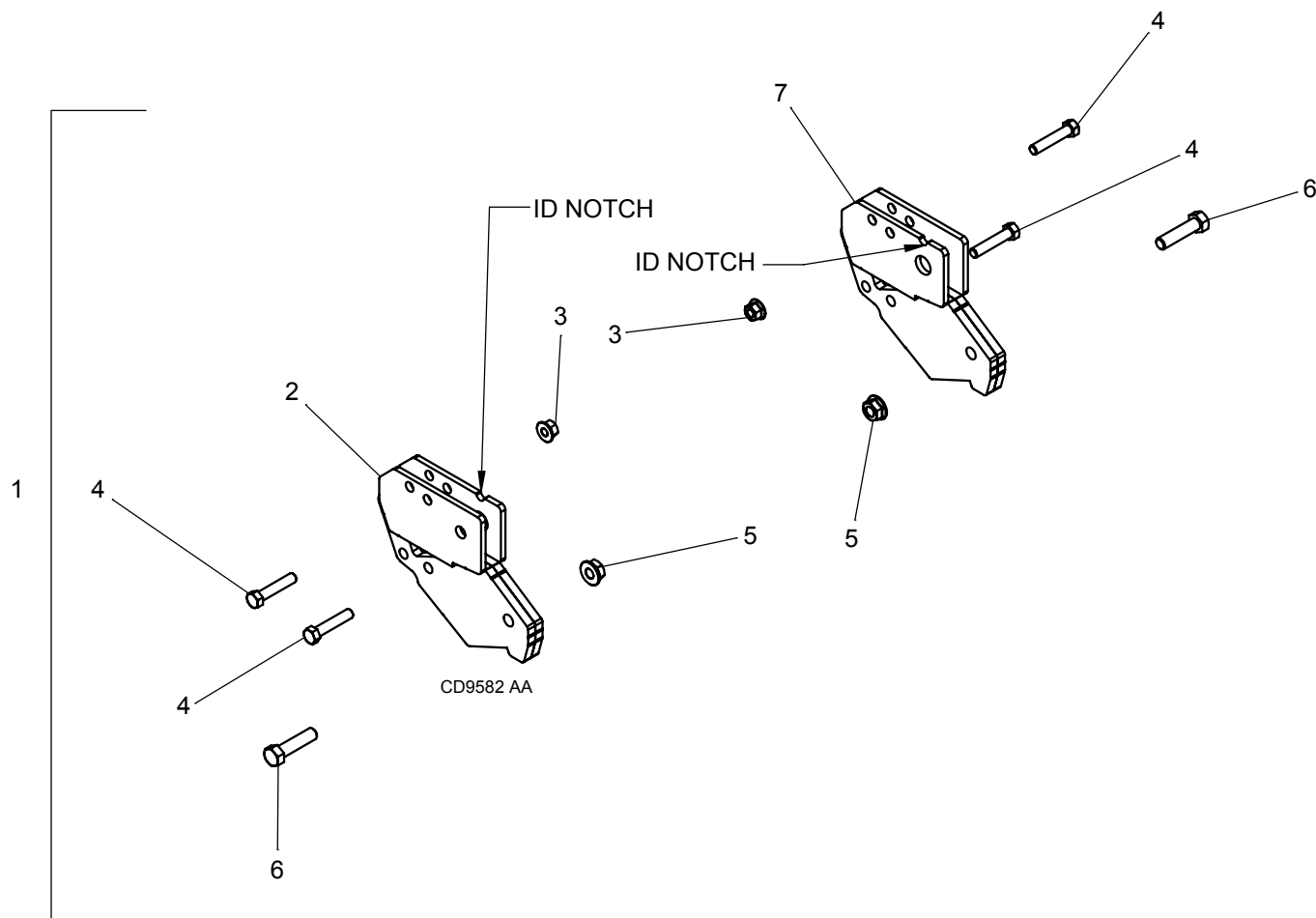
* STANDARD HARDWARE,
OBTAIN LOCALLY

QUICK HITCH COMPONENTS



REF	PART	QTY	DESCRIPTION
1	1002013	2	SLV .94 X1.44 X 2.19
2	24408	1	HHCS 5/16 NC X 1-1/2 GR5 ZP
3	W73163	2	NUT, WHIZ, 5/16 NC FLNG ZP
4	1002018	1	SLV .81 X 1.25 X 2.12
5	12558	1	HHCS 3/4 NC X 4-1/2
6	W302207	1	NUT, HFN 3/4 NC, LOCK, GR G
7	613811	1	LOCK PIN, 1/4 X 1.0 RND
8	659109	1	CHANNEL, DRIVELINE HOLDER TW990X
9	657349	2	BAR, QH A-FRAME TW990X
10	11900	3	NUT, HFN 1/2 NC, LOCK, GR G
26	639	1	HHCS 1/2 NC X 2-1/2 GR5 ZP

CAT 2 QUICK HITCH RELOCATION KIT (OPTIONAL)



REF	PART	QTY	DESCRIPTION
1	652727	1	KIT, QH ADAPTER CAT 2 COMPLETE
2	659102	1	ADAPTER, CAT 2 QH RH
3	11900	2	NUT, 1/2 NC FLANGE
4	639	4	HHCS 1/2 NC X 2-1/2 GR5
5	19025	2	NUT, 5/8 NC FLANGE
6	941	2	HHCS 5/8 NC X 2-1/2 GR5
7	659101	1	ADAPTER, CAT 2 QH LH

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BOLT TORQUE CHART

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

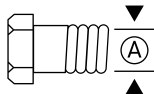
Fasteners must always be replaced with the same grade as specified in the manual parts list.

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 Bolt Head Identification



SAE Grade 2
(No Dashes)



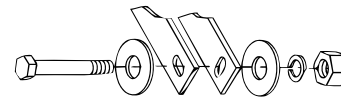
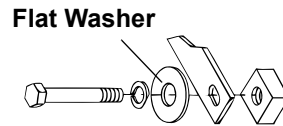
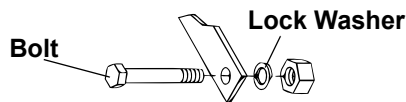
SAE Grade 5
(3 Radial Dashes)



SAE Grade 8
(6 Radial Dashes)

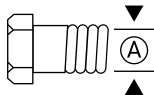
Ⓐ	Wrench Size	Marking on Head					
		SAE 2		SAE 5		SAE 8	
		lbs-ft	N-m	lbs-ft	N-m	lbs-ft	N-m
1/4"	7/16"	6	8	10	13	14	18
5/16"	1/2"	12	17	19	26	27	37
3/8"	9/16"	23	31	35	47	49	67
7/16"	5/8"	36	48	55	75	78	106
1/2"	3/4"	55	75	85	115	120	163
9/16"	13/16"	78	106	121	164	171	232
5/8"	15/16"	110	149	170	230	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

TYPICAL WASHER INSTALLATIONS



METRIC SERIES TORQUE CHART

Metric Bolt Head Identification



Metric
Grade 8.8



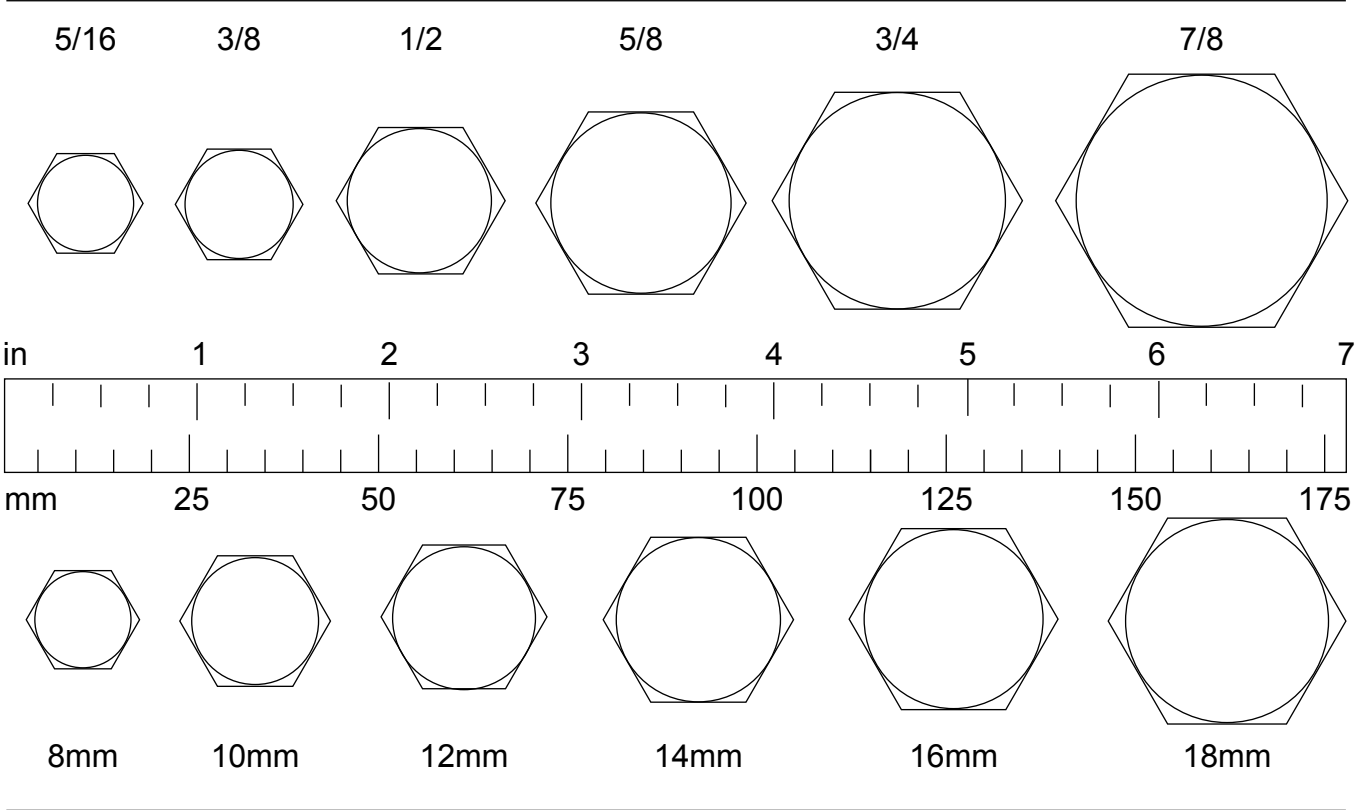
Metric
Grade 10.9

Ⓐ Diameter & Thread Pitch (Millimeters)	Wrench Size	Coarse Thread Marking on Head				Fine Thread Marking on Head				Ⓐ Diameter & Thread Pitch (Millimeters)
		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

BOLT SIZE CHART

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

SAE BOLT THREAD SIZES



METRIC BOLT THREAD SIZES

ABBREVIATIONS

AG Agriculture	HT Heat-Treated	ORBM O-Ring Boss - Male
ASABE American Society of Agricultural & Biological Engineers (formerly ASAE)	JIC Joint Industry Council 37° Degree Flare	P Pitch
ASAE American Society of Agricultural Engineers	LH Left Hand	PBY Power-Beyond
ATF Automatic Transmission Fluid	LT. Left	psi Pounds per Square Inch
BSPP British Standard Pipe Parallel	m Meter	PTO Power Take Off
BSPTM British Standard Pipe Tapered Male	mm Millimeter	QD Quick Disconnect
CV Constant Velocity	M Male	RH Right Hand
CCW Counter-Clockwise	MPa Mega Pascal	ROPS Roll-Over Protective Structure
CW Clockwise	N Newton	RPM Revolutions Per Minute
F Female	NC National Coarse	RT Right
FT Full Thread	NF National Fine	SAE Society of Automotive Engineers
GA Gauge	NPSM National Pipe Straight Mechanical	UNC Unified Coarse
GR (5, etc.) Grade (5, etc.)	NPT National Pipe Tapered	UNF Unified Fine
HHCS Hex Head Cap Screw	NPT SWF National Pipe Tapered Swivel Female	UNS Unified Special

PART NO.
MAN1415

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