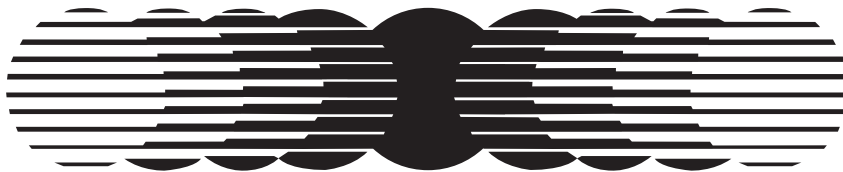


# OPERATING MANUAL

2009  
WIC DEFOLIATOR

Amity  
TECHNOLOGY



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Fargo, ND 58102

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## **MANUFACTURER'S GUARANTEE POLICY**

AMITY TECHNOLOGY, LLC, warrants to its authorized Dealer or Distributor each new and unused WIC machine, when properly assembled, adjusted and operated, to be free of defects in material and workmanship, in normal use and properly serviced, for a period of twelve (12) months after date of delivery by the Dealer to the original retail purchaser. AMITY TECHNOLOGY, LLC, shall repair, or at its option, replace f.o.b. its designated location, any part or parts of such new and unused machine which shall have been reported in writing to AMITY TECHNOLOGY, LLC, within forty-five days from date of failure thereof and which AMITY TECHNOLOGY, LLC's inspection shall disclose to have been thus defective. This warranty is void if any part not supplied by AMITY TECHNOLOGY, LLC, is used in assembly or repair, or if the machine has been altered, abused or neglected. AMITY TECHNOLOGY, LLC, makes no warranty whatever as to motors, tires and other trade accessories in as much as such items are warranted by the manufacturer thereof. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESSED, IMPLIED OR STATUTORY (INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE) AND AMITY TECHNOLOGY, LLC, SHALL NOT BE LIABLE FOR SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND ON ACCOUNT OF ANY AMITY TECHNOLOGY, LLC, PRODUCT.

AMITY TECHNOLOGY, LLC, recommends that if ownership of this machine is transferred, this manual should accompany the machine.

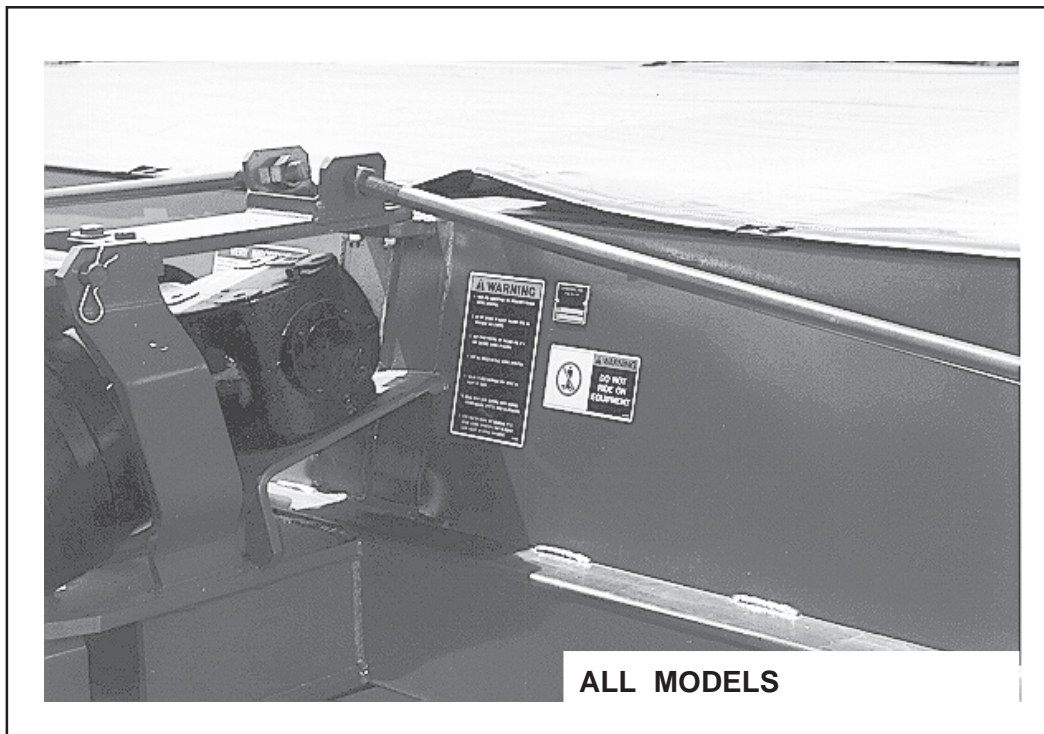
# SERIAL NUMBER LOCATION

Always give your dealer the Model and Serial Number of the machine when ordering parts or requesting service information.

The Serial Number Plate is located where indicated. Please mark the Model and Serial Numbers in the space provided for easy reference.

**SERIAL NUMBER** \_\_\_\_\_

**MODEL NUMBER** \_\_\_\_\_



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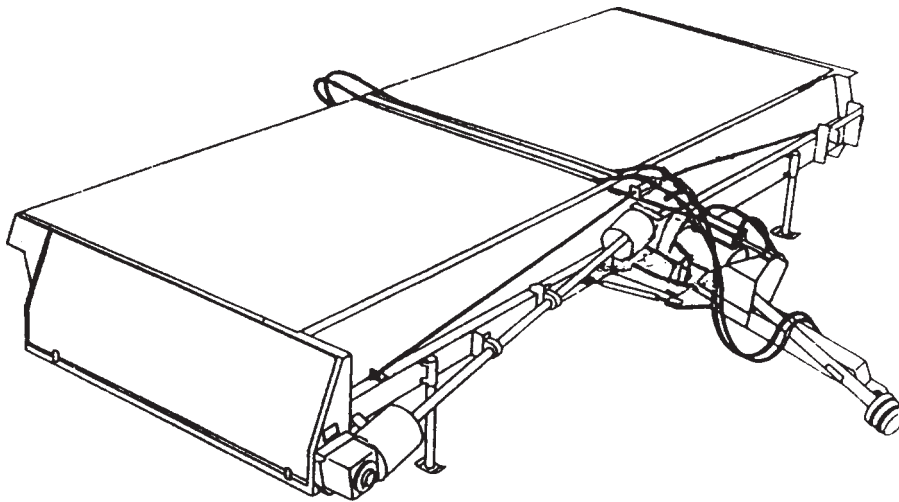
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# 1. INTRODUCTION

Safe, efficient, and trouble-free operation of your Defoliator requires that you and anyone else who will be operating or maintaining the Defoliator read and understand ALL of the SAFETY, OPERATION, MAINTENANCE, and TROUBLE SHOOTING Defoliator information contained within this Operator's Manual.

## OPERATOR ORIENTATION

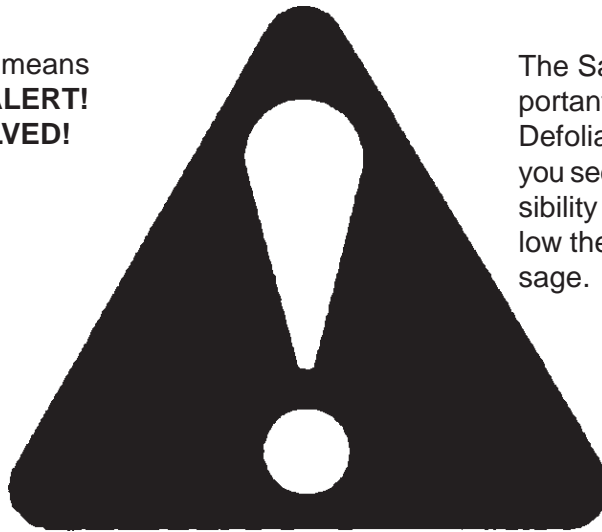


The directions LEFT, RIGHT, FRONT, and REAR as mentioned throughout this manual, are as seen from the tractor driver's seat and facing in the normal direction of travel.

## 2. SAFETY

### SAFETY ALERT SYMBOL

This Safety Alert symbol means  
**ATTENTION! BECOME ALERT!**  
**YOUR SAFETY IS INVOLVED!**



The Safety Alert symbol identifies important safety messages on the WIC Defoliator and in the manual. When you see this symbol, be alert of the possibility of personal injury or death. Follow the instructions in the safety message.

Why is SAFETY important to you?

#### 3 Big Reasons

**Accidents Disable and Kill**  
**Accidents Cost**  
**Accidents Can Be Avoided**

#### SIGNAL WORDS:

Note the use of the signal words **DANGER**, **WARNING**, and **CAUTION** with the safety messages. The appropriate signal word for each message has been selected using the following guidelines:

**DANGER --** An immediate and specific potential hazard which **WILL** result in severe personal injury or death if the proper precautions are not taken.

**WARNING --** A specific potential hazard or unsafe practice which **COULD** result in severe personal injury or death if proper precautions are not taken.

**CAUTION --** Unsafe practices which could result in personal injury if proper practices are not taken, or as reminder of good safety practices.



# SAFETY

**YOU** are responsible for the SAFE operation and maintenance of your WIC Defoliator. **You** must ensure that you and anyone else who is going to operate, maintain or work around the Defoliator be familiar with the operating and maintenance procedures and related **SAFETY** information contained in this manual. This manual will take you step-by-step through your working day and alerts you to all good safety practices that should be adhered to while operating this equipment.

Remember, **YOU** are the key to safety. Good safety practices not only protect you but also the people around you. Make these practices a working part of your safety program. Be certain that **EVERYONE** operating this equipment is familiar with the recommended operating and maintenance procedures and follows all the safety precautions. Most accidents can be prevented. Do not risk injury or death by ignoring good safety practices.




Defoliator owners must give operating instructions to operators or employees before allowing them to operate Defoliator and at least annually thereafter according to OSHA regulation 1928.57.

The most important safety device on this equipment is a SAFE operator. It is the operator's responsibility to read and understand ALL Safety and Operating instructions in the manual and to follow these. All accidents can be avoided.

A person who has not read and understood all operating and safety instructions is not qualified to operate the machine. An untrained operator exposes him- or herself and bystanders to possible serious injury or death.

Do not modify the equipment in any way. Unauthorized modification may impair the function and/or safety and could alter the life of equipment.

## 2.1. GENERAL SAFETY

1. Read and understand the Operator's Manual and all safety signs before operating, maintaining, or adjusting the Defoliator. 
2. Install and properly secure all shields and guards before operating.
3. Have a first-aid kit available and know how to use it. 
4. Have a fire extinguisher available and know how to use it. 
5. Clear the area of people and remove foreign objects from the machine before starting and operating.
6. Stop tractor engine, disengage PTO clutch, set parking brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing, or unplugging.
7. Review safety related items with all operators annually.
8. Wear suitable ear protection for prolonged exposure to excessive noise.


Think SAFETY! Work SAFELY!

**REMEMBER** -- If Safety Decals have been damaged, removed, become illegible, or parts have been replaced without decals, new decals must be applied. New decals are available from your authorized dealer.

## 2.2. OPERATING SAFETY

1. Read and understand the Operator's Manual and all safety signs before operating, servicing, adjusting, or unplugging.
2. Do not allow riders on the Defoliator or tractor during field operation or transport.
3. Install and secure all guards and shields before starting or operating.
4. Do not operate a PTO driveline system unless the required guards and shields are in place and secured.
5. Never wear ill-fitting, baggy, or frayed clothing when working around or on any of the drive system components.
6. Keep hands, feet, hair, and clothing away from all moving and/or rotating parts.
7. Never operate the Defoliator without the canvas cover.
8. Stop tractor engine, disengage PTO clutch, set parking brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing, or unplugging.
9. Ensure that all tractor controls are in neutral before starting.
10. Clear the area of all bystanders, especially children, before starting.
11. Be careful when working around or maintaining a high-pressure hydraulic system. Wear proper eye and hand protection when searching for a high-pressure leak. Use a piece of wood or cardboard as a backstop when searching for a pin hole leak in a hose or line.
12. Before applying pressure to the hydraulic system, make sure all components are tight and that steel lines, hoses and couplings are not damaged.
13. Review all safety instructions annually.

## 2.3. MAINTENANCE SAFETY

1. Read and understand ALL the information contained in the Operator's Manual regarding Maintenance, Adjusting, and Operating the Defoliator.
2. Stop tractor engine, disengage PTO clutch, set parking brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing, or unplugging.
3. Be careful when working around or maintaining a high-pressure hydraulic leak. Use a piece of wood or cardboard as a backstop when searching for a pin hole leak in a hose or line.
4. Before applying pressure to a hydraulic system, make sure all components are tight and that steel lines, hoses, and couplings are not damaged.
5. Seek immediate medical attention if a high-pressure concentrated stream of hydraulic fluid pierces the skin, since toxic reaction and infection could develop.
6. Keep hands, feet, clothing, and hair away from all moving and/or rotating parts.
7. Never wear ill-fitting, baggy, or frayed clothing when working around or on any of the drive system components.
8. Make sure that all guards and shields are properly installed and secured before operating the Defoliator.
9. Clear the area of all bystanders, especially children, when carrying out any maintenance or making adjustments on the systems or components.
10. Review the Operator's Manual and all related Maintenance, Operating, and SAFETY information annually with all personnel who will be working with, maintaining, or operating the Defoliator.

Think SAFETY! Work SAFELY!

## 2.4. HYDRAULIC SAFETY

1. Make sure that all components in the hydraulic system are kept in good condition and are clean and tight.
2. Replace any worn, cut, abraded, flattened, or crimped hoses and metal lines.
3. Do not attempt any makeshift repairs to the hydraulic lines, fittings, or hoses by using tape, clamps, or cements. The hydraulic system operates under extremely high-pressure. Such repairs will fail suddenly and create a hazardous and unsafe condition.
4. Wear proper hand and eye protection when searching for a high-pressure hydraulic leak. Use a piece of wood or cardboard as a back-stop instead of hands to isolate and identify a leak.
5. If injured by a concentrated high-pressure stream of hydraulic fluid, seek medical attention immediately. Serious infection or toxic reaction can develop from hydraulic fluid piercing the skin surface.

Think SAFETY! Work SAFELY!

## 2.5. TRANSPORT SAFETY

1. Read and understand ALL the information in the Operator's Manual regarding procedures and SAFETY when operating the Defoliator in the field or on the road.
2. Make sure the SMV (Slow Moving Vehicle) emblem and all the lights and reflectors that are required by the local highway and transport authorities are in place, are clean, and can be seen clearly by all overtaking and oncoming traffic.
3. Do not allow riders on any part of the Defoliator during either field operation or road and highway travel.
4. Attach to the tractor using only a drawbar pin with provisions for a mechanical retainer. Always install a retainer such as a Klik pin.
5. Always attach safety chain when transporting.
6. Always use hazard warning flashers on tractor when transporting unless prohibited by law.

## 2.6. STORAGE SAFETY

1. Store the Defoliator in a shed or garage during the off season, if possible.
2. Store the unit in an area away from human activity.
3. Do not permit children to play around the stored unit.
4. Make sure the hitch jacks are firmly supported. Use blocks of wood to provide a secure base.

## 2.7. TIRE SAFETY

1. Failure to follow proper procedures when mounting a tire on a wheel or rim can produce an explosion which may result in serious injury or death.
2. Do not attempt to mount a tire unless you have the proper equipment and experience to do the job.
3. Have a qualified tire dealer or repair service perform required tire maintenance.

## 2.8. SAFETY DECALS

1. Keep safety decals and signs clean and legible at all times.
2. Replace safety decals and signs that are missing or have become illegible.
3. Replacement parts that displayed a safety sign should also display the current sign.
4. Safety decals or signs are available from your Dealer Parts Department.

### How to Install Safety Decals:

Be sure that the installation area is clean and dry.

Decide on the exact position before you remove the backing paper.

Remove the smallest portion of the split backing paper.

Align the decal over the specified area and carefully press the small portion with the exposed sticky backing in place.

Slowly peel back the remaining paper and carefully smooth the remaining portion of the decal in place.

Small air pockets can be pierced with a pin and smoothed out using the piece of decal backing paper.

## 2.9. SIGN-OFF FORM

Amity Technology, LLC, follows the general standards specified by the American Society of Agricultural Engineers (ASAE) and the Occupational Safety and Health Administration (OSHA). Anyone who will be operating and/or maintaining the Defoliator must read and clearly understand ALL Safety, Operating, and Maintenance information presented in this manual.

Do not operate or allow anyone else to operate this equipment until such information has been reviewed. Annually review this information before the new season start-up.

Make these periodic reviews of Safety and Operation a standard practice for all of your equipment.

A sign-off sheet is provided for your record keeping to show that all personnel who will be working with the equipment have read and understand the information in the Operator's Manual and have been instructed in the operation of the equipment.

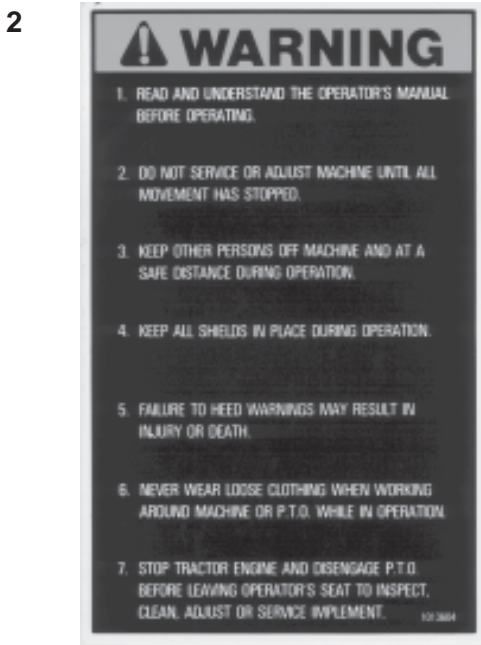
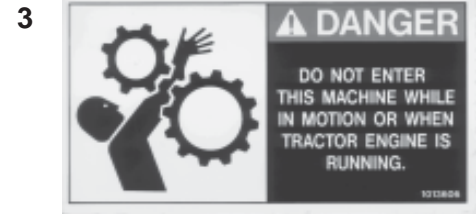
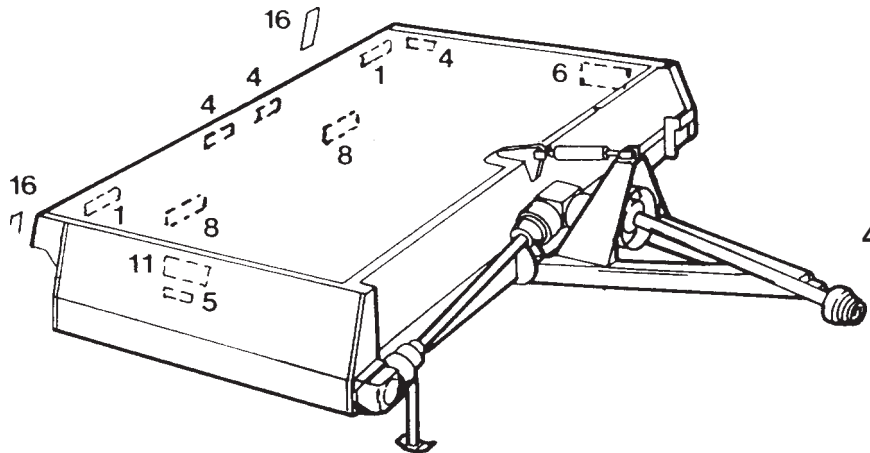
## SIGN-OFF SHEET

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### 3. SAFETY DECAL LOCATION MODELS DEF-0624, DEF-0630

The types of decals and locations on the equipment are shown in the illustration below. Good safety requires that you familiarize yourself with the various Safety Decals, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

Think SAFETY! Work SAFELY!



REMEMBER -- If Safety Decals have been damaged, removed, become illegible, or parts have been replaced without decals, new decals must be applied. New decals are available from your authorized dealer.



The types of decals and locations on the equipment are shown in the illustration below. Good safety requires that you familiarize yourself with the various Safety Decals, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

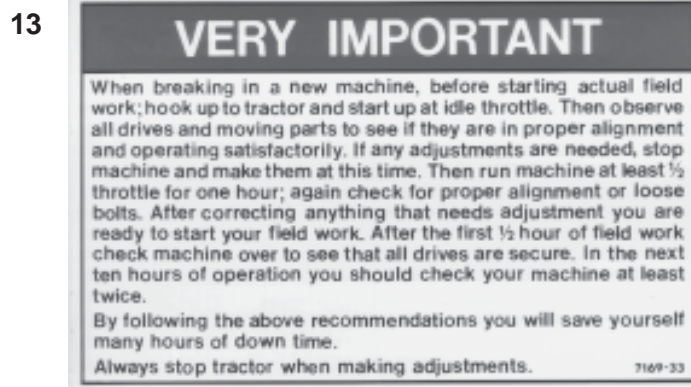
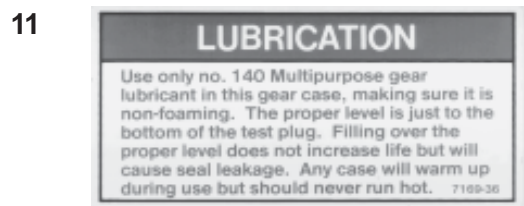
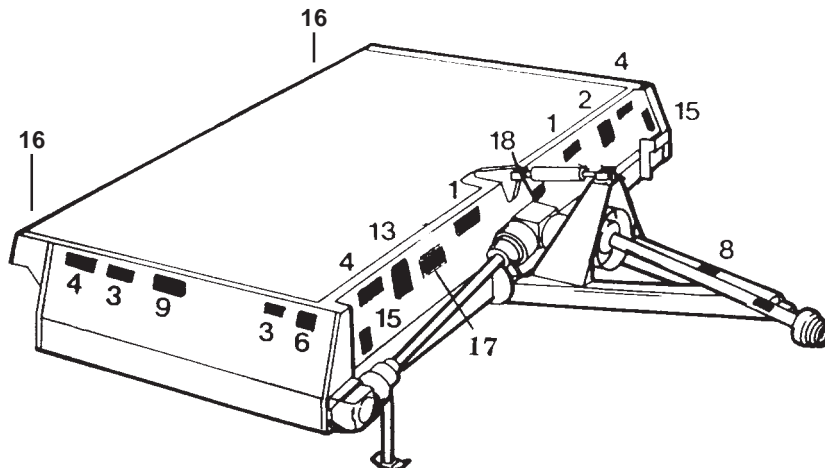
Think SAFETY! Work SAFELY!

15 **AMBER REFLECTOR**

16 **RED REFLECTOR**



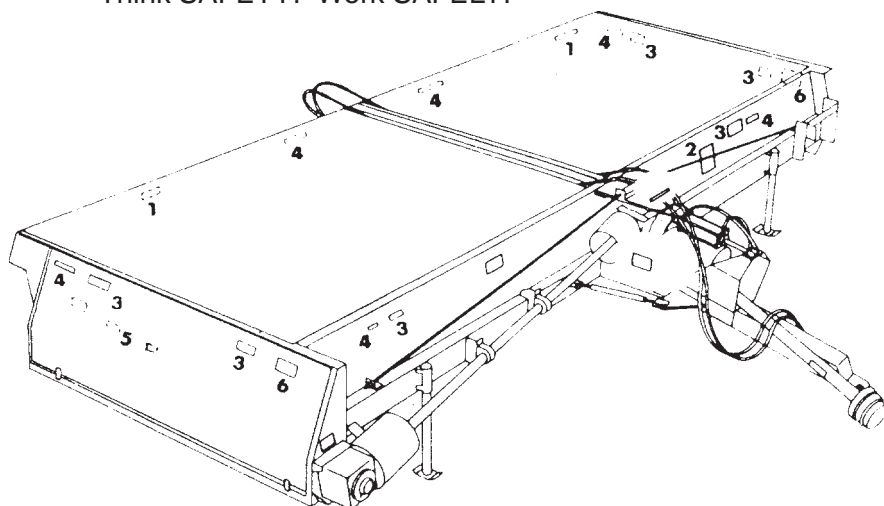
18 **SERIAL NO.**



### 3. SAFETY DECAL LOCATION MODELS DEF-0924, DEF-1222, DEF-1224

The types of decals and locations on the equipment are shown in the illustration below. Good safety requires that you familiarize yourself with the various Safety Decals, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

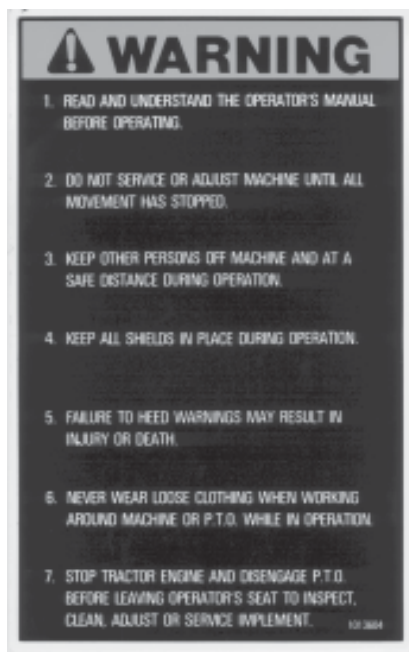
Think SAFETY! Work SAFELY!



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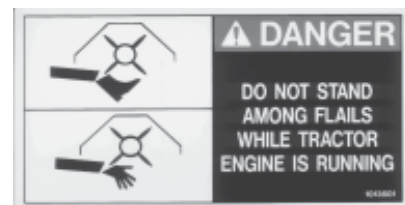
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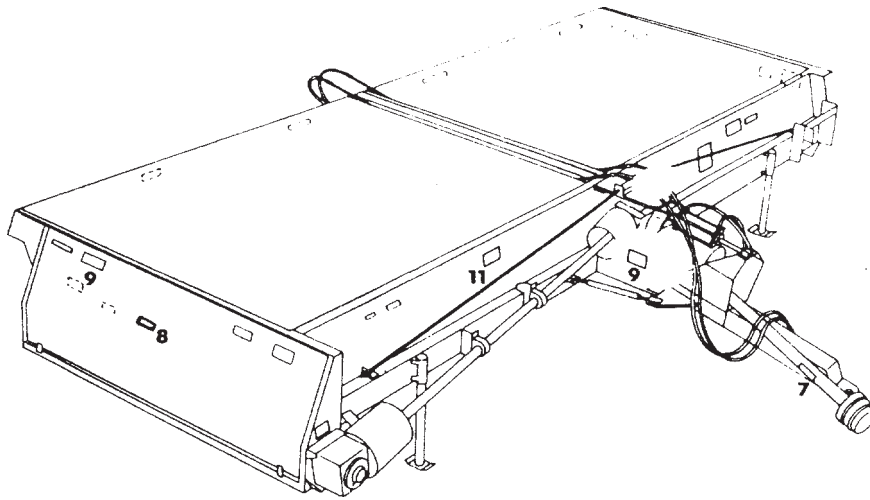


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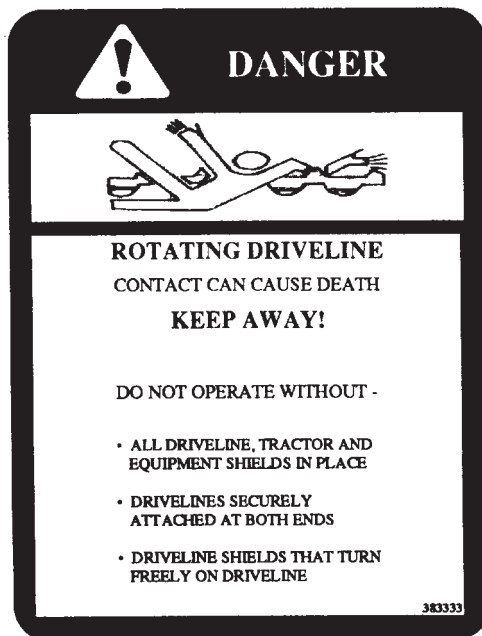


The types of decals and locations on the equipment are shown in the illustration below. Good safety requires that you familiarize yourself with the various Safety Decals, the type of warning and the area, or particular function related to that area, that requires your SAFETY AWARENESS.

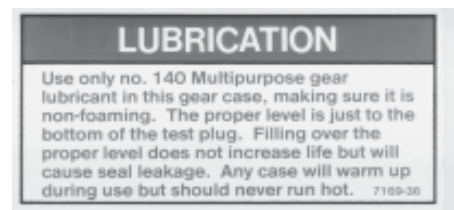
Think SAFETY! Work SAFELY!



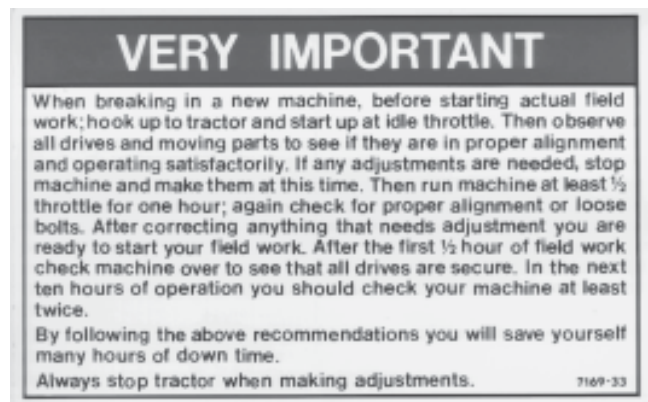
7



11



13



8



REMEMBER -- If Safety Decals have been damaged, removed, become illegible, or parts have been replaced without decals, new decals must be applied. New decals are available from your authorized dealer.

## 4. OPERATION

### 4.1. To the New Owner or Operator

WIC Defoliators are designed to remove the tops from sugar beets immediately prior to harvesting. Defoliating prior to harvesting permits faster, cleaner harvesting of crops because all of the cover, including weed, is removed from the field leaving only the exposed beets for harvesting. The Defoliator can also be adapted for use with other crops.

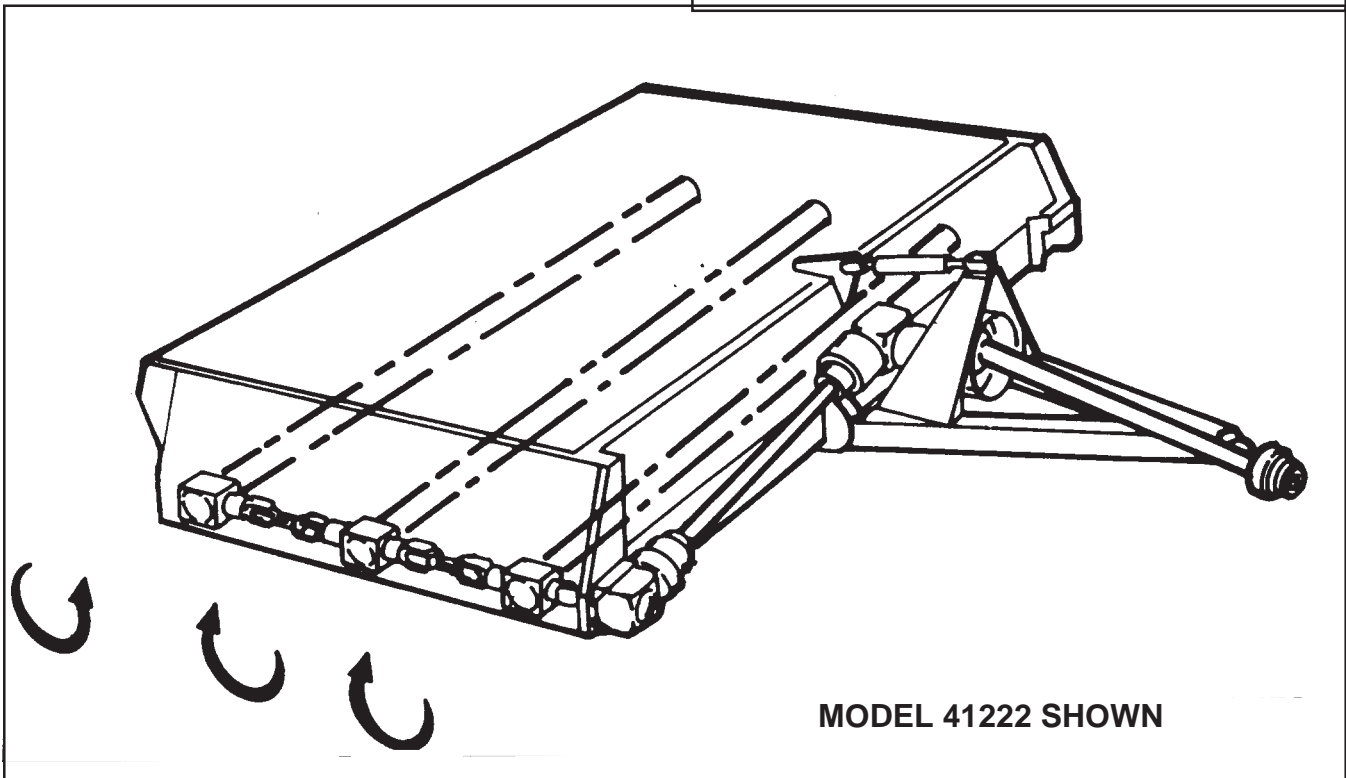
### 4.2. How the Machine Works

A Defoliator is equipped with rotating polyurethane flails that completely remove foliage. All rotors rotate at 400 RPM when the PTO input speed is maintained at 1000 RPM. The front rotor has flails mounted on 4 spools for each row while the center and rear rotors have 6 spools for each row. The length of the flails on the front 2 rotors are cut parallel to the ground to give maximum cleaning action to the beet tops. The last rotor uses longer outside flails to extend down the side of the beet and remove tailings and weeds from the rows.



### OPERATING SAFETY

1. Read and understand the Operator's Manual and all safety signs before operating.
2. Do not allow riders on the tractor or defoliator.
3. Install and secure all shields before operating.
4. Keep hands, feet, hair and clothing away from moving parts.
5. Stop tractor engine, disengage PTO clutch, set park brake, remove ignition key and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.
6. Clear the area of all bystanders, especially children, before starting or operating.
7. Do not stand or walk behind the machine when it is operating. Keep others away.
8. Review all safety instructions annually.



MODEL 41222 SHOWN

**Fig. 1 PRINCIPLES OF OPERATION**

The two front rotors rotate in a clockwise orientation while the rear rotor moves counter clockwise.

### 4.3. PRE-OPERATION CHECKLIST

Before operating the Defoliator and each time thereafter, you should check the following areas:

1. Lubricate the machine according to the schedule outlined in the "Maintenance Section."
2. Check the oil level in the gearboxes. Fill to the specified level.
3. Use only a tractor of adequate power and weight to properly operate the Defoliator.
4. Make sure that the machine is properly attached to the tractor using a drawbar pin that has provisions for a mechanical retainer. Make sure that a retainer such as a Klik pin is installed.
5. Make sure that the PTO driveline is securely attached on both ends and that the PTO driveline shield turns freely and is secured in place using the anchor chain.
6. Check that all flails are in position and that they swing freely on their mounts.
7. Inspect all hydraulic lines, hoses, fittings, and couplers. Tighten, repair, or replace any leaking or damaged components.
8. Close or install and secure all covers, doors, or shields before starting and operating.
9. Make sure that the scalpels can move freely on their mounts.
10. Make sure that the canvas cover is securely fastened in position.

### 4.4. BREAK-IN

A Defoliator that has been run for only a short time cannot be considered broken-in. To ensure long, trouble-free operation, the machine should be properly broken-in by the operator when it is new or after it has had major repairs. Follow this procedure:

1. Attach to the tractor (see Section 4.5).
2. Clear area of bystanders and remove all foreign objects from machine and working area.
3. Raise the machine to its maximum height to ensure that the flails do not touch the ground.
4. Start the tractor and idle a while at low speed. Slowly engage the PTO.
5. Observe the drives and various moving parts to see that they are in alignment and functioning properly.
6. If adjustments are required, stop tractor engine, disengage PTO, remove ignition key, and wait for all moving parts to stop. Adjust or align as required.
7. Restart machine and run for one hour at 1/2 throttle.
8. Again check all drives and moving parts for alignment and proper function.
9. Stop and align or adjust as required. Tighten all loose hardware.
10. After 1/2 hour of field operation, check all drives and moving parts for alignment and function. Adjust as required. Tighten all loose hardware.
11. The machine should be checked twice during the next 10 hours per step number 10.
12. After completing this special procedure, go to the regular maintenance schedule.

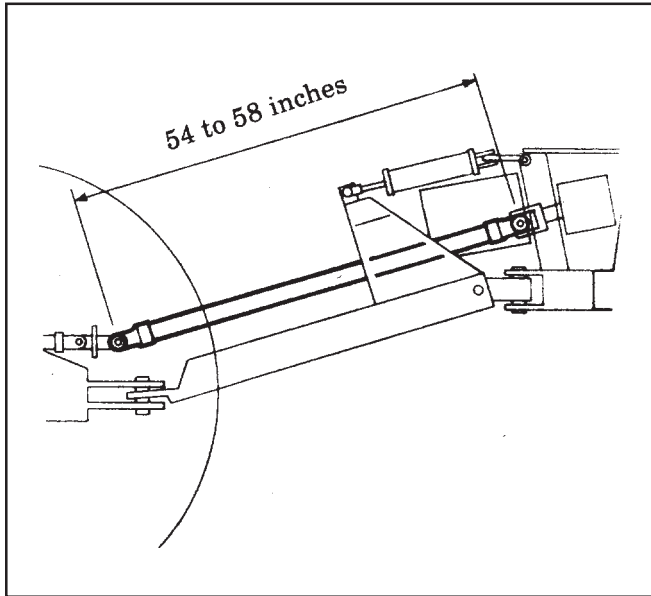


#### WARNING

- \* Keep hands, feet, clothing, and hair away from moving parts.
- \* Never operate machine with shields, covers, or doors open.

## 4.5. EQUIPMENT MATCHING

WIC Defoliators are designed to be used on tractors with (100 plus 4-8 row and 125 plus 9-12 row) horsepower with 1-3/4" 20 spline or 1-3/8" 21 spline 1000 RPM PTO and standard ASAE drawbar.



**Fig. 2 PTO DRIVELINE DIMENSIONS**

If your tractor does not have a drawbar with standard ASAE dimensions, it could affect the dimensional integrity of the PTO and attachment system. To insure the free action of all parts, the following conditions must be met:

1. With the tractor and defoliator on level ground, the correct PTO driveline dimensions should be 54 inches as measured from the centers of the end crosses (See Fig. 2).
2. The PTO driveline must be free to telescope when going over hills or through ditches and while making turns. At no time should it contact any other part while making these maneuvers.
3. There must be a minimum of 5 inches of spline engagement of the telescope portion of the driveline when extended to its maximum.

If the PTO driveline is too long or short to telescope properly, the drawbar must be adjusted. The draw-

bars of many tractors can be adjusted by repinning (refer to your tractor manual for details) to achieve the required dimensions.

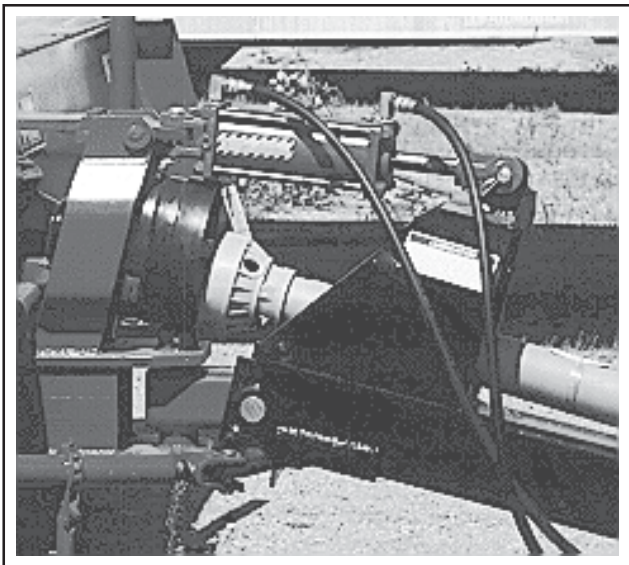
### NOTE

If the driveline is too long, it can break the gearbox, PTO housing on the tractor, or U-joint crosses, or it could push the bearings out of the shields.

## 4.6. ATTACHMENT TO TRACTOR

The Defoliator should always be parked on a level, dry area that is clear of debris and foreign objects. Follow this procedure when attaching:

1. Make sure there is enough room to back the tractor up to the hitch point.
2. Clear the area of bystanders and remove foreign objects from the machine and working area.
3. Start the tractor and slowly back it up to the hitch point.
4. Stop tractor engine, set park brake and remove ignition key before dismounting.
5. Adjust the height of the tongue using the hydraulic cylinder on top of the hitch.
6. Attach the hydraulic system using this procedure.



**Fig. 3 HYDRAULIC CYLINDER**

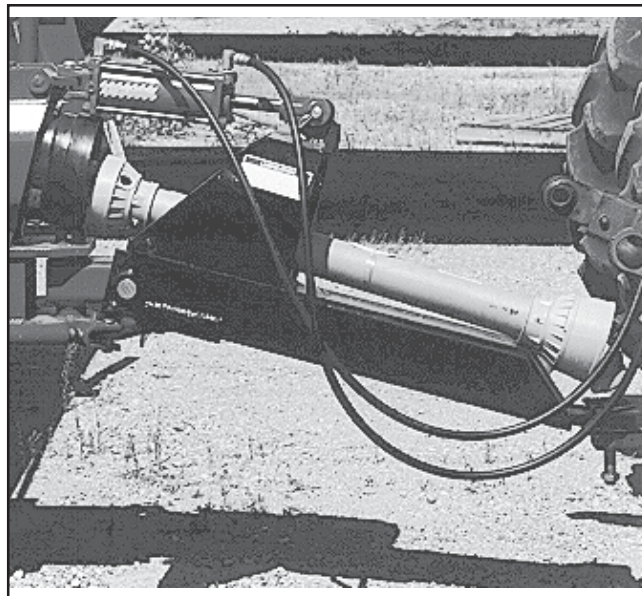
If your machine is equipped with the optional hydraulic cylinder, use this procedure:

- a. Use a clean rag and wipe clean the area around the couplers.
- b. Connect the high-pressure side of the cylinder to the high-pressure outlet and the return to the low-pressure side.

#### **NOTE**

If the action of the cylinder is opposite that of the control lever direction, operate the lever in the opposite direction or reverse the couplers.

- c. Start the tractor and operate the hydraulics until the tongue is at the required height.
- d. Stop tractor engine, set parking brake, and remove ignition key before dismounting.
7. Attach to tractor using a drawbar pin with provisions for a mechanical retainer such as a Klik pin. Install the retainer.
8. Attach the safety chain.
9. Install the PTO driveline in this way:
  - a. If the driveline has been separated, insert the end into the telescoping splines. Make sure that the splines are clean and well lubricated so that the driveline can collapse or extend easily.



**Fig. 5 ATTACHMENT**

- b. Compress the collar around the U-joint yoke to retract the locking pin.
- c. Align the splines in the yoke to the splines on the tractor PTO shaft.
- d. Slide the yoke over the shaft and release the collar.
- e. Ensure that the locking pin goes into the locking groove to prevent unexpected separation.
10. Ensure that the driveline shield rotates freely on the shaft.
11. Attach the chain on the driveline shield to the hook on gear box shield to prevent rotation.
12. Route the hydraulic hoses along the hitch and secure them in position to prevent interference with rotating parts.
13. Before operating, check that there is adequate clearance for the driveline when turning and maneuvering. Make sure that the driveline can telescope freely during all operating conditions.
14. Lower the tongue onto the tractor drawbar to transfer the weight off the two front storage stands. Use the hydraulic cylinder to raise the front of the machine.





**Fig. 7 FRAME STAND**

15. Remove the stand anchor bolt and raise the stand into its stowed position. Reinstall and secure the anchor bolt.

## 4.7. SETTING FOR FIELD USE

When the Defoliator is properly attached to the tractor, it must then be set to operate in the field and crop conditions where it will be used. All WIC Defoliators are designed with the flexibility to be used with a variety of row spacings from 22 inches to 30 inches. To obtain the desired quality of the job, the flail spacing must match the row spacing exactly (see Maintenance Section on adjustment procedure). Normally, once the row spacing is set, it will never have to be reset unless the row dimensions are changed.

Sugar beets grow in a variety of soil and terrain conditions and are exposed to a variety of weather, moisture, and cultivation conditions. Each can contribute to the beet growing in a different manner, ranging from being entirely in the ground to being partially above ground. Moisture and soil conditions affect how solid the beet is anchored in the ground.

By properly setting, adjusting, and operating the Defoliator, the customer can completely remove all foliage, tailings, and weeds from the beets and rows without disturbing the beets. To set the machine for field use, proceed as follows:

1. Make sure that the flail and row spacings match. Adjust if required.

2. Make sure that the wheel location and spacing match row spacing (see Maintenance for adjustment procedure).

3. Side-to-Side leveling:  
The frame should always be set level from side-to-side to ensure a quality job. With the machine on a firm, flat, even surface, place a level on the top of the frame. If the does not read on center, adjustments are needed.

Adjust the wheel ratchets to level the machine. An alternate method is to measure the distance between the bottom of the frame and the ground. Adjust the wheel ratchets until the same dimensions are on the left- and the right-hand sides.

4. Forward and rearward leveling:

The machine should be set level in the forward and rearward directions. Use a level on the frame or measure the dimension between the frame and the ground to set the frame. Use the hydraulic cylinder on the hitch to adjust the level of the machine.

5. Install the cylinder rod stops on the cylinder to maintain a level frame. Secure the stops in position so that the hitch will always return to the same position should the hitch be raised or lowered.

If the machine needs to be raised or lowered to adjust to crop or seasonal variations, adjust the wheel ratchets the same amount to retain frame levelness.

Suitcase weights must normally be installed on the bracket provided on the left front corner of the machine to balance the weight of the gearboxes on the right side. Approximately 400 lbs. of weight will be required. Be sure the weight package is securely bolted in position.

## 4.8. FIELD OPERATION

Follow this procedure when starting to use the Defoliator:

1. Lubricate the machine per the schedule outlined in the Maintenance section.
2. Inspect the machine using the Pre-Operation checklist of section 4.3.
3. Align the tractor and defoliator with the first set of rows to be worked.
4. On the hydraulic cylinder on the hitch, secure the rod stop to give the desired height.
5. If the machine has a scalper, lower the scalper into working position at this time.
6. With tractor engine at low idle, slowly engage the PTO clutch.

### IMPORTANT

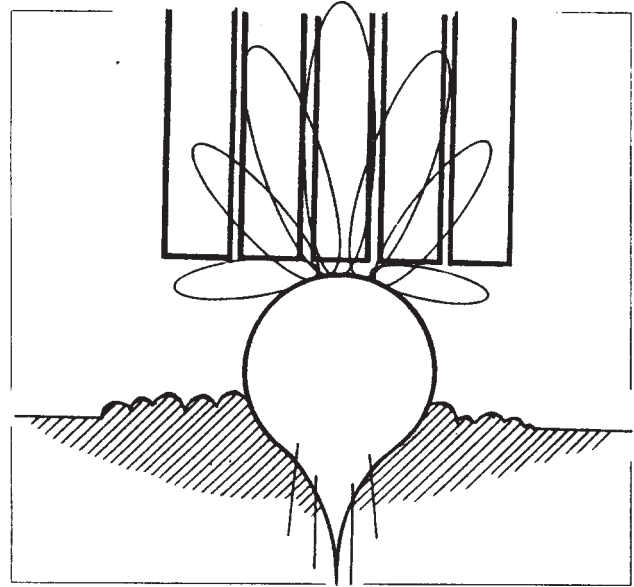
Never engage PTO unless engine is at low idle. Faster engagement speeds will overload drive train components or break the shear pin.

8. Slowly bring the PTO speed up to 1000 RPM.
9. After checking to see that there are no bystanders in the way, place the tractor transmission in the gear to give the desired ground speed and proceed down the field.
10. If this is a new field or the conditions have changed, stop the machine after traveling for 25 feet and check the type of job being done. If required, adjust the machine to give the desired job.
11. Proceed with the work.

Once the machine is set, it is not necessary to raise or lower the unit when cornering at the ends of the field. Defoliators equipped with a Constant Velocity (CV) joint on the front universal of PTO drivelines allow the operator to turn sharply without disengaging the PTO. Although the driveline can run at sharp angles, it is not recommended that the machine be run in this way for long periods of time.

The scalper has flotation shoes ahead of the knives that allow it to float along the surface. These will provide flotation when turning and the scalper does not have to be lifted for turning.

The following operational hints will assist the operator:



**Fig. 10 FLAIL ACTION**

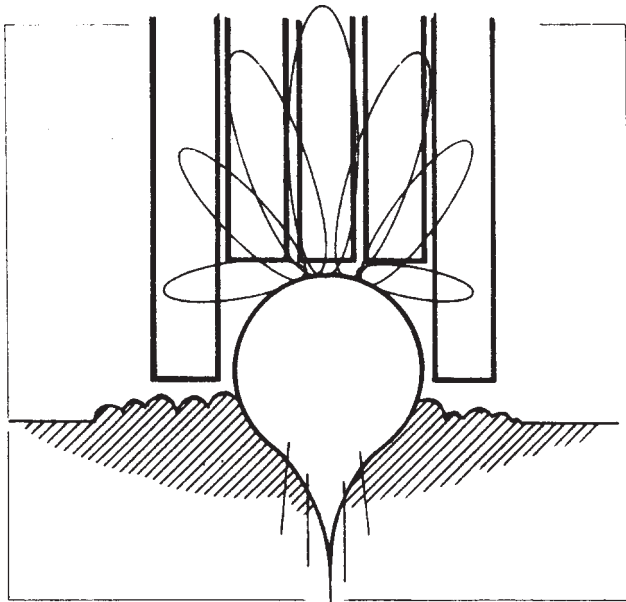
### 1. Leveling:

The following illustration shows the importance of maintaining a level machine to obtain effectiveness of the flails.

The flails on the front two rotors have metal studs in them and are cut parallel to the surface of the ground to cleanly and efficiently remove all foliage from the crown of the beet. The outside flails on the rear rotor are longer than the center flails and extend down around the sides of the beet to the surface of the ground. These extended flails will remove all the tailings from the beet and the weeds and trash along the row.

### 2. Height:

The ideal operating condition for the machine is to set the front flails to strike the crown of the beet approximately 1/2 inch below its top. This will ensure that all foliage is removed.



**Fig. 11 FLAIL CLEANING**

In soft or wet soil conditions, the flail height must be higher to compensate for the tractor and machine sinking into the ground. The polyurethane flails will also be damaged in a short time if they are allowed to hit the ground. Sticks, stones, and other debris are more likely to be picked up by the flails and forced out the rear of the machine if it is set too low.

One of the most important considerations is when the beets easily break loose from the ground. When the beets are vulnerable to breaking loose, adjust the height of the machine so the front flails just skim the crown. Operate the unit at a slower ground speed to allow the flails a few extra swipes at the beet to remove the greens. The operator is responsible to monitor these variables.

#### **IMPORTANT**

Never allow the flails to hit the ground. Ground contact will damage flails. Flails can pick up sticks, stones, and other debris and expel them out the rear of the machine with enough speed to injure a person. When the flails are allowed to strike the ground, more debris can and will be picked up.

#### **3. Ground Speed:**

Ground speed for the Defoliator can range from 2.5 to 5.5 mph depending on the conditions. Slower speeds are generally required when the foliage is tough and the beets are prone to being knocked loose from the ground. Less aggressive impacts, but more of them, are then required to remove the greens. Faster speeds can be used when the beets are deeper and more secure in the ground and,

therefore, more aggressive impacts can be used to remove the tops. The operator is responsible to monitor these variables and set the ground speed according to the conditions.

## **4.9. MACHINE SHUTDOWN**

When stopping for any reason or shutting-down, always slowly throttle the tractor down to low idle and then slowly disengage the PTO clutch. This is particularly important with newer tractors which have a very aggressive PTO brake. Disengaging the PTO at high engine RPM could break drive-train components or lead to premature failure of the PTO brake. These brakes are applied automatically when the clutch is disengaged and will stop the shaft in less than one revolution.

#### **IMPORTANT**

Engage and disengage PTO clutch at low idle engine RPM.



#### **WARNING**

- \* Do not stand or walk behind machine when it is operating.
- \* Keep others away, especially children.

## **4.10. TRANSPORTING**

When it becomes necessary to move the Defoliator on a public road, take special care to ensure that oncoming and overtaking vehicles can easily see the unit. During times of limited visibility such as rain, fog, nighttime, etc, we recommend that the machine not be moved. If it is absolutely necessary to transport or move it in these conditions, we recommend that pilot vehicles be used in both front and rear. Always use the tractor hazard warning flash when on a public road.



To prepare the machine for transport:

1. Raise the hydraulic cylinder to its maximum height.
2. If your machine is equipped with a scalper, raise the scalper to its maximum height.
3. Clean all reflectors and the SMV emblem.
4. Check the tires to determine if they are at the specified pressures. Add air if required.
5. Proceed to your next destination, but never exceed 15 miles per hour. Pull off to the side of the road and stop if vehicles are meeting or passing you.



## TRANSPORT SAFETY

1. Clean the SMV and reflectors before transporting on a public road.
2. Do not allow riders.
3. Attach to tractor using a pin with provisions for a mechanical retainer. Use a retainer.
4. Always attach the safety chain.
5. Use hazard warning flashers unless prohibited by law in your area.
6. Use pilot vehicles front and rear when transporting.

## 4.11. STORAGE

After the season's use, completely inspect all major systems of the Defoliator. Repair or replace any worn or damaged components.

1. Remove the canvas covers and open the side access doors.
2. Thoroughly wash all parts using a hose or pressure washer to remove all mud, debris, or residue.

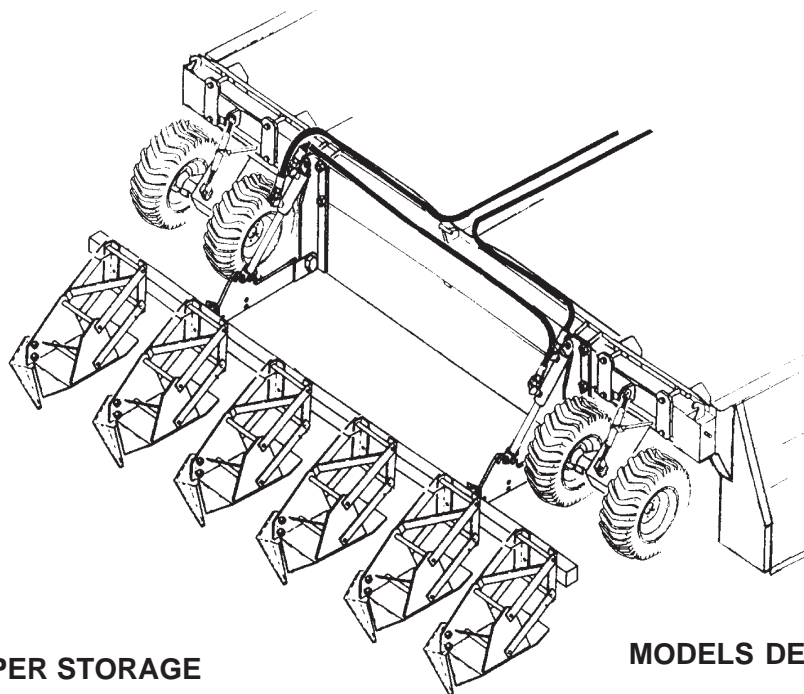
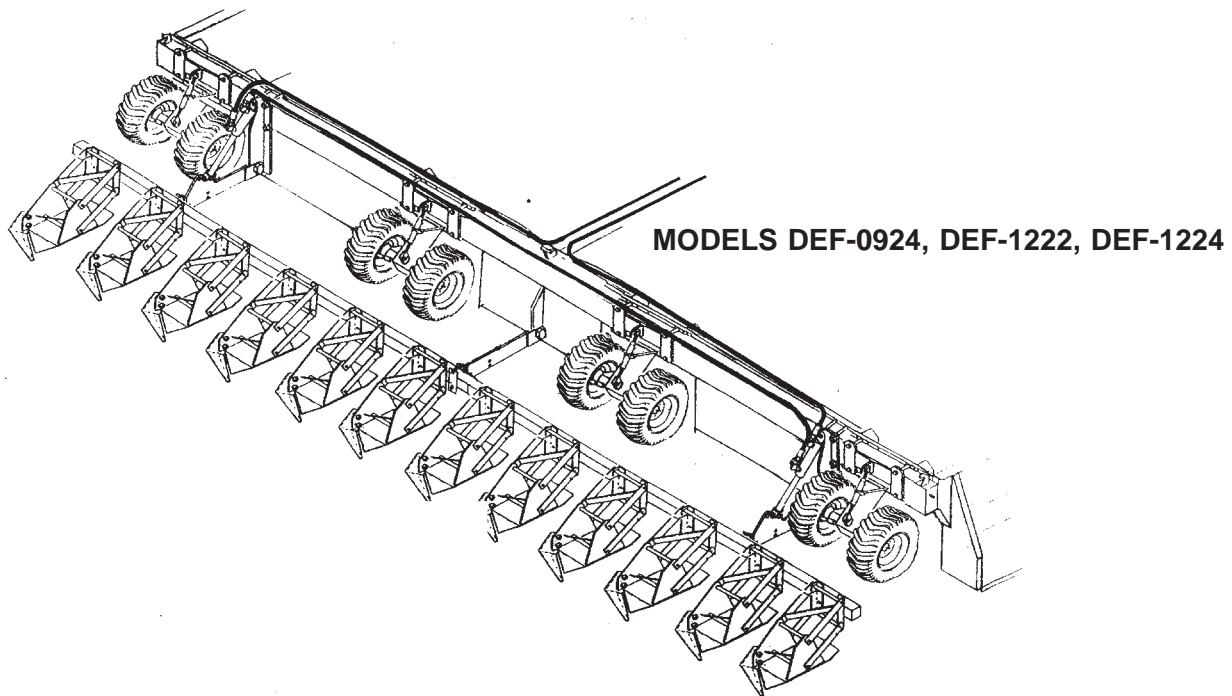
3. Inspect the flails to determine their condition. Replace any that are missing, damaged, or worn.
4. If your machine is equipped with a scalper or a hitch hydraulic cylinder, thoroughly inspect all the hydraulic hoses, fittings, and couplers. Use a clean cloth and wipe any accumulated fluid and dirt from around the components and couplers. Tighten any loose fittings. Replace any hose that is badly cut, nicked, abraded, or is separating from the crimped end of a fitting.
5. Drain the oil from the gear box and replace with fresh oil (See Maintenance section).
6. Lubricate all grease fittings (See Maintenance section).
7. Touch up all paint nicks and scratches to prevent rust.
8. Close and secure all shields, guards, doors, and covers and run the machine at low idle engine speed for 15 minutes to distribute lubricant to all surfaces.
9. Move the machine to the storage location. The storage site should be dry and level and free of debris. Inside a building is ideal.
10. If your unit is equipped with a hydraulic cylinder on the hitch raised the hitch to its highest level.
11. If equipped with a scalper, place scalper in its storage position with cylinder rod retracted to prevent rusting.



## STORAGE SAFETY

1. Store the machine in an area away from human activity.
2. Do not allow children to play around the stored unit.
3. Make sure the hitch jacks are firmly supported. Use blocks of wood to provide secure base.

12. Stop tractor engine, set park brake and remove ignition key before dismounting.
13. Remove the stand anchor bolts and drop the stands into their support position. Use blocks of wood or planks under the stands to provide a firm secure base. Secure anchor bolts in each stand.
14. Raise the hitch to transfer the weight to the stands.
15. Remove the hydraulic couplers (if applicable) and stow the lines to one side.
16. Compress the collar on the front PTO drive-line yoke and slide the yoke off the PTO shaft. Stow the driveline to the side.
17. Remove the safety chain and stow it on the tongue.
18. Remove the drawbar pin retainer and then the drawbar pin.



**Fig. 12 SCALPER STORAGE**

## REMOVING FROM STORAGE

1. Follow the Pre-Operation Checklist instruction.
2. Attach the tractor (see Section 4.6).
3. Lubricate all the grease points.
4. Check gearbox oil.
5. Close and secure all shields, doors, and covers before starting tractor.
6. Run defoliator at low idle engine speed for 15 minutes to ensure that all water or condensation is removed from the bearings.



### MAINTENANCE SAFETY

1. Stop tractor engine, disengage PTO clutch, set parking brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, or repairing.
2. Be careful when working around a high-pressure hydraulic system. Wear the proper eye and hand protection when searching for leaks. Use a piece of wood or cardboard as a backstop.
3. Seek immediate medical attention if hydraulic fluid pierces the skin, since toxic reaction and infection could develop.
4. Keep hands, feet, clothing, and hair away from all moving or rotating parts.
5. Make sure that all shields, guards, or covers are installed and secured before operating.
6. Clear the area of bystanders, especially children, when carrying out any maintenance or making adjustments on the systems or components.

## 5. SERVICE AND MAINTENANCE

### 5.1. SERVICE

#### 5.1.1. FLUID AND LUBRICANTS

1. **Grease:**  
Use an SAE multi-purpose high temperature grease with extreme pressure (EP) performance and containing at least 1.5% molybdenum disulfide. Also acceptable is an SAE multi-purpose lithium base grease.
2. **Gear Box Reservoir:**  
Use an SAE 80/90 EP weight non-foaming gear oil for all working conditions. Capacity = 2 quarts.
3. **Storing Lubricants:**  
Your machine can operate at top efficiency only if clean lubricants are used. Use clean containers to handle all lubricants. Store them in an area protected from dust, moisture, and other contaminants.

#### 5.1.2. GREASING

Refer to Section 5.1 for recommended grease. Use the Maintenance Checklist provided to keep a record of all scheduled maintenance.

1. Use only a hand-held grease gun for greasing. Air-powered greasing system can damage the seals on bearings and lead to early failure.

#### IMPORTANT

Over greasing may damage bearing seals. If seals are damaged, replace the bearing immediately.

2. Wipe grease fittings with a clean cloth before greasing to avoid injecting dirt and grit.
3. Replace or repair broken fittings immediately.
4. If fittings will not take grease, remove and clean them thoroughly. Also clean lubricant passageways. Replace fittings if necessary.

#### DRIVELINES

Universal joints should be greased daily (8-10 hrs). Lubricate with a good quality NLGI #2 lithium base grease. Lubricate cross until grease surges from underneath bearing caps; generally 4-6 shots from hand-held grease gun will be required.

The middle zerk on the constant velocity joint should be greased with at least 1.3 ounces of grease (30 pumps from a standard hand-held gun).

Driveshafts should be greased daily (8-10 hrs). Beginning the season, the P.T.O. shaft should be pulled apart and cleaned. Before reassembly, spread grease on the male drivetube so that the two half shafts slide smoothly. Redo this whenever it becomes difficult to slide these by hand.

The shield has 2 plastic zerks where the cones join the shield tubes. One pump of grease daily will lubricate their plastic bearings.

## GEARBOXES

Use a high quality SAE 80/90 EP Gear Oil. Oil should be changed in all gearboxes seasonally (50-100 hrs. per year). If used more than 100 hours per year, change oil twice per season, especially during the first year of operation.

### 5.1.3. SERVICING INTERVALS

#### **DAILY or 10 HOURS:**

Grease all universal joints every 10 hours.

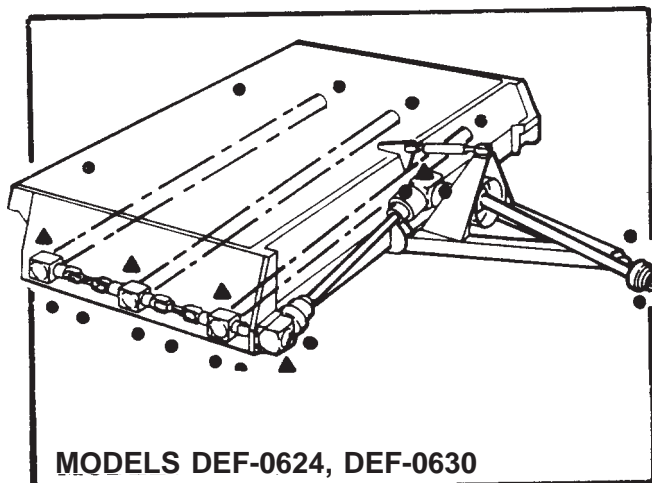


Fig. 13 GREASE POINTS

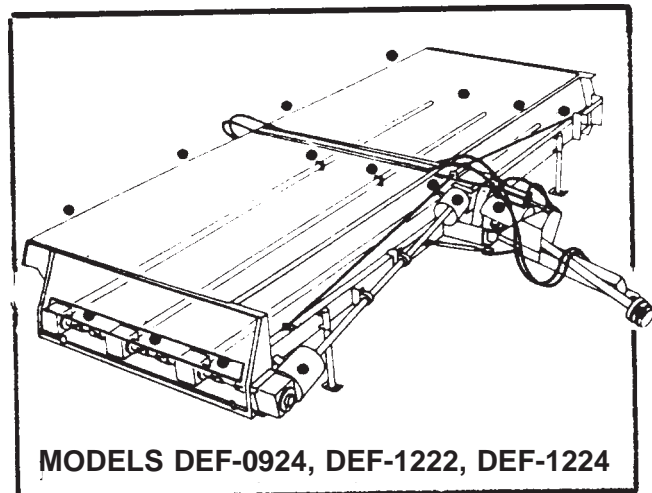


Fig. 13 GREASE POINTS

#### **IMPORTANT**

Use only a hand-held grease gun. Be careful not to damage seals on bearings. If seals are damaged, replace the bearing immediately. Overgreasing is worse than undergreasing.

Check sharpness of scalper knives.  
Check condition of flails.

#### **20 HOURS:**

Gear box oil reservoir

The oil level in the gear box should be checked every 20 hours, more often if leaks are noticed. To check the oil level, remove the level plug. If oil fills the threads or seeps out, the level is correct. Overfilling causes heating due to the churning action of the oil and working components. Underfilling causes heating due to lack of lubrication.

Check bearing pre-load on the input shaft. (See 5.3.1)

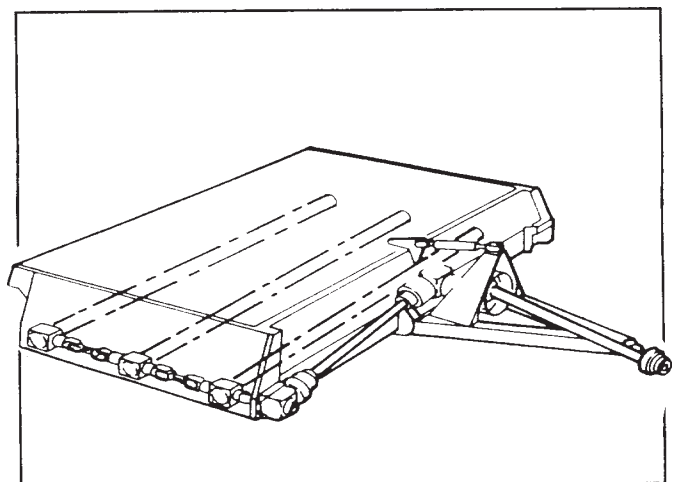


Fig. 14 GEAR BOX

## 5.1.4 . SERVICE RECORD

See Lubrication and Maintenance sections for details of service. Copy this page to continue your record.

ACTION CODE:    ✓ CHECK                    C CHANGE                    CL CLEAN  
                          L LUBRICATE                    R REPLACE

MAINTENANCE	HOURS																		
	SERVICED BY																		
<b>DAILY (10 HOURS)</b>																			
✓ Sharpness of Scalper Knives																			
✓ Condition of Flails																			
L All Universal Joints																			
<b>20 HOURS</b>																			
✓ Oil Level - SAE 90 EP																			
✓ Bearing Pre-Load On Input Shaft																			
<b>40 HOURS</b>																			
L Ratchet Jacks																			
L Rotor Bearings																			
L Shaft Bearings																			
L Scalper Pivot Points																			
<b>250 HOURS OR ANNUALLY</b>																			
CL Gearbox Breather																			
C Oil in Gear Box - SAE 90 EP																			
L Wheel Bearings																			
CL Machine																			
L Wheel Assembly Pivots																			
L Hitch Ball																			

#### **40 HOURS:**

Grease ratchet jacks.  
Grease scalper points.  
Grease all shaft bearings.  
Grease rotor bearings.

#### **ANNUALLY or 250 HOURS:**

Repack wheel bearings.  
Change oil in gearbox.  
Clean gearbox breather.  
Wash machine.  
Grease wheel assembly pivots.  
Grease hitch ball.

## **5.2. MAINTENANCE**

### **NOTE**

Special locknuts are used on WIC Defoliators. When a nut is removed, always replace with a new one to ensure correct locking characteristics.

#### **5.2.1. GEARBOX**

Although the oil in a gearbox never wears out, dust, dirt, and moisture can enter through the breather when the oil warms and cools during operation. These contaminants must be removed on a regular basis to ensure a long life for the working components. In very dusty or dirty conditions, change the oil more frequently.

1. Changing oil:
  - a. Stop tractor engine, disengage PTO
  - b. Place a pan (4 quart capacity) under the right front gearbox. Remove the drain, level, and fill plugs.
  - c. Remove the four base mounting bolts on the front gearbox. Raise the gear box and insert a drain pan (4 quart capacity) under the case. Remove the drain, level, and fill plugs.
  - d. Open the right access door and pin it open.
  - e. Mark each gearbox for location and orientation to help during installation.
  - f. Remove each gearbox from its mount and remove them from their rotor shafts.

- g. Place drain pans under each gearbox and remove the drain, level and fill plugs.
- h. Allow each one to drain for 10 minutes.
- i. Install the drain plugs and dispose of the used oil in an approved container.
- j. Secure the front gearbox to its mounting plate.
- k. Install the three rotor gearboxes noting their previous location. Secure in positions.
- l. Fill the SAE 90 EP weight non-foaming gear oil until the oil just starts to seep out the level plug hole.
- m. Install the level and fill plug.
- n. Close access door and make sure the shields are secured in position.

2. Breather Cleaning:

The breather must be able to vent to atmosphere conditions during the heating and cooling cycles while in operation. If it cannot, oil will seep out the seals and run low on oil. Prolonged operation with low oil levels will damage the internal working components.

To clean:

- a. Remove the breather.
- b. Stop up the breather opening using a plastic plug or a clean rag to prevent contaminants from entering the gearbox.
- c. Soak the breather in solvent for one hour.
- d. Use a pointed instrument or a wire to remove any residue from the breather passages.
- e. Blow out using high-pressure air.
- f. Blow through the breather to ensure that the passages are clear.
- g. Install and tighten in the gearbox.



3. **Input Shaft End Play:**  
The front gearbox input shaft bearing preload can disappear after prolonged use or after repeated end loading caused by driveline telescoping loads. To monitor this, check the shaft end play every 20 hours by lifting on the end of the input shaft. Any adjustment can be made by adding or removing shims on input shaft. Contact your authorized WIC dealer or representative for details.

## 5.2.2. PTO MAINTENANCE

### PTO SAFETY SHIELD

It is important that the shield components rotate freely over the PTO shaft. Lubricating both halves of the shield bearing, along with periodic cleaning, will ensure safe operation of the rotating shields. Disassembly, cleaning, and lubrication should be done annually or when these parts no longer rotate freely. Follow this procedure:

1. Press the cone down and release the collar catches with a screw driver.
2. Spread the collar bearing and remove them from the tube. Clean the collar and the yoke bearing groove. After cleaning thoroughly, apply a good coat of grease to the bearing groove.
3. Fit the collar bearing into the groove and the tube ensuring that the collar catches are centered over the matching holes. The tube and bearing must rotate freely in the bearing groove.

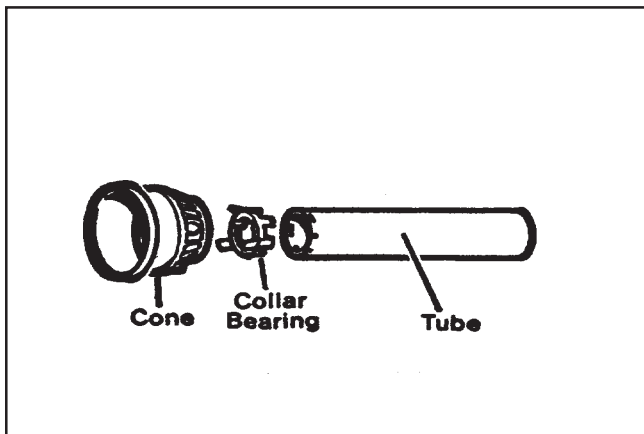


Fig. 15 SAFETY SHIELD COMPONENTS

- d. Fasten the cone by lining up the cone grease fitting over the grease filling hole on the collar bearing. Make sure that all catches are fastened and that the shield turns freely over the shaft.

### CV PTO SHAFT

(according to PTO manufacturer)

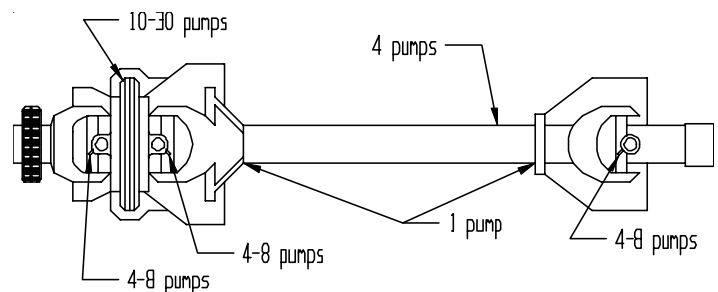
All points should be lubricated every 8 hours of use.

For maximum life and performance, the CV body **MUST** be greased regularly. Lubricate with the driveline in a straight position--up to 30 pumps of grease may be required. (See diagram below)

The metal drive tubes **MUST** be greased to operate properly.

Shielding is subject to damage from abuse and weathering. Replace **ALL** damaged components and **ALL** shielding removed during maintenance.

**DO NOT** use P.T.O. adapters with CV drivelines. Replace special Taper Pin bolts only with genuine O.E.M. parts, periodically check tightness of nuts.



### 5.2.3. WHEEL SPACING

The wheel struts are set at the factory but are designed to be adjustable to fit 20, 22, 23, 24, 26, 28, or 30 inch row spacing. Minimum row and crop damage will be done if the tires are set to track in the center of the rows. Adjustments are available on the wheel axles to set tire spacing and on the strut to space the assembly from the center. Always space the tires first.

Set as follows:

1. Measure the row spacing.
2. Jack up corner of frame to remove the load from the strut assembly and the tires. Securely block the frame with suitable jack stands or wooden blocks.
3. Loosen and remove wheel axle bolts.
4. Slide the outer axle tube along the axle shaft to match the row spacing. Install and tighten the bolts.
5. Measure the distance from the center of the machine to the row center for the inner tire.
6. Loosen the bolts attaching the strut assembly clamps to the rear frame tubing.
7. Slide the assembly along the frame until the correct tire spacing is achieved.
8. Tighten the mounting bolts.
9. Lower and remove the jack.
10. Repeat on the other wheels if necessary.
11. Retorque the wheel lug bolts to 90 foot pounds after the machine has been in field operation. The lug bolts should be checked periodically and tightened if needed.

### 5.2.4. FLAILS

The position and condition of the rotating flails is crucial to the quality of the defoliating job done by the machine. The flails must be positioned exactly over the rows to properly clean the foliage and tailings from the beets. All flails must be in good condition. Any missing flails could affect the balance of the rotor and lead to severe vibration.

#### 1. Row Spacing:

Normally the row spacing is set once and will not need to be changed unless the customer changes crop spacings.

To set spacing:

- a. Stop tractor engine, disengage PTO clutch, set parking brake, remove ignition key, and wait for all moving parts to stop before dismounting.
- b. Remove the canvas cover.
- c. Determine the required flail position by measuring from the row in the center of the machine.
- d. Mark the position required on each rotor.
- e. Loosen the flail head mounting clamps to free the head on the rotor.
- f. Slide the assembly to the desired position on the rotor. For best results, always leave at least 3 inches between the flails and the frame.
- g. Tighten the head clamps and secure the head to the rotor.
- h. Repeat with all flail head assemblies.
- i. Reinstall canvas cover before starting.



#### CAUTION

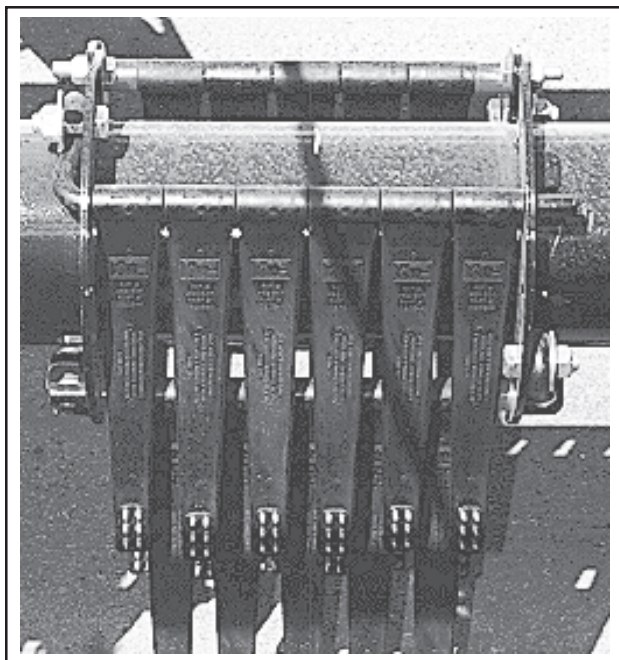
Only use a jack with sufficient capacity and adequate safety factor.



## 2. Flail Replacement:

To replace flails:

- a. Stop tractor engine, disengage PTO clutch, set parking brake, remove ignition key, and wait for all moving parts to stop before dismounting.
- b. Open canvas cover.
- c. Remove flail hinge rod mounting bolt.
- d. Remove flail rod.
- e. Replace missing or damaged flail using only genuine WIC parts. Refer to the Parts Section for correct components. Be sure to install plastic spacers where required.
- f. Reinstall hinge rod while threading spacers and flails in the appropriate sequence.
- g. Tighten flail hinge rod mounting bolt.
- h. Replace other missing or damaged flails as required.
- i. Close canvas cover before starting machine.



**Fig. 23 FLAIL HEADS**

## 6. TROUBLE SHOOTING

<b>PROBLEM</b>	<b>CAUSE</b>	<b>SOLUTION</b>
Machine vibrates.	Unbalanced rotor.	Inspect flails. Replace any damaged or missing flails.
	Sticking driveline.	Remove PTO driveline. Clean and lubricate telescoping segment
Does not clean beet crown properly.	Missing beet crown.	Adjust machine height to slightly hit crown.
	Missing flails.	Replace missing or damaged flails.
	Ground speed too fast.	Shift down to slower ground speed.
	Wrong rotor speed.	Make sure PTO speed is running at 1000 RPM.
Beets being pulled	Flails pulling beet out	Raise machine so flails slightly hit beet crown.
		Increase ground speed if all greens are removed.
		Cut down tractor RPM to cut down speed of Flail Tube.
Scalpers do not properly top beets	Dull knives.	Sharpen knives.
	Wrong knife setting.	Adjust knife to proper setting.  Adjust knife shoe to run level on the ground.

## 7. OPTIONS

### 7.1. SCALPER

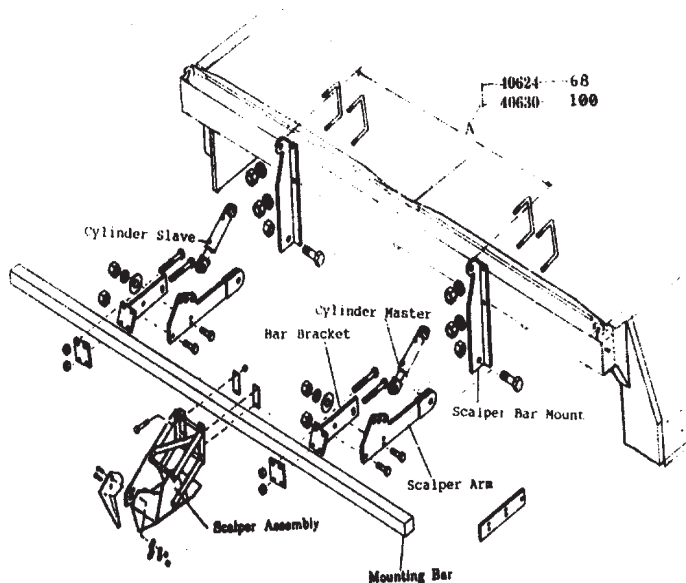
#### 7.1.1. OPERATION

The scalper is attached to the rear of the machine and removes the crown of the beet as it passes along the row. It is pinned to the frame and can be raised for turning, transport, or storage. Skid plates follow the contour of the ground and beets to provide a constant cutting level for the knife. It is necessary to line up the skid plates with the crop rows in order for them to function properly.

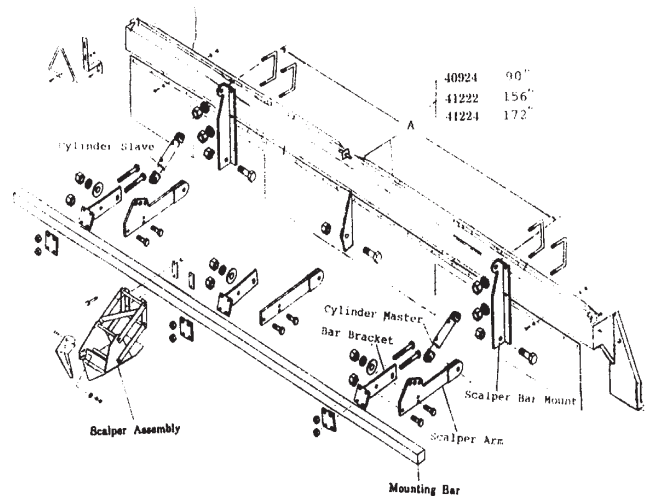
Suggestions for Operating:

1. Keep scalper knives sharp to cut the beets cleanly.
2. Set skid plates to run level on the ground.
3. Ensure that the scalpings line up with rows.
4. Adjust knife angle to cut parallel to the ground.

#### 7.1.2 SCALPER ASSEMBLY



**MODELS DEF-0624, DEF-0630**



**MODELS DEF-0924, DEF-1222, DEF-1224**

Follow the above diagram when assembling the scalper.

1. Attach scalper bar mounts to frame.
2. Attach scalper arm to bar mounts.
3. Attach bar bracket to the arm; do not tighten bolts until assembly is completed.
4. Install cylinder master and slave to scalper bar mounts. Install hydraulic hoses.

#### Note

To charge the system, the cylinders need to stand in a vertical position. Cycle them several times until both cylinders cycle together.

Extend cylinders and attach them to arm.

5. Bolt scalper assembly to mounting bar. Make sure each assembly is aligned with its respective row.
6. Tighten each assembly.
7. Lubricate each grease fitting to insure free movement of the pivot points.
8. When the unit is on a level, solid surface, adjust each scalper assembly, making sure that the skid plate is flat on the ground when in working position. Adjustments can be made at the scalper arm and bar bracket.
9. Knife adjustment can be made at the knife attachment point.

## 8. MODELS

All of Amity Technology's WIC Defoliators are designed to provide a flexible machine platform to allow the customer to set the unit to work in any spacing combination. Each machine has these general guidelines:

DEF-0624 = 6 rows from 20 inch to 24 inch spacing.  
4 wheels are standard.

DEF-0630 = 6 rows from 28 inch to 30 inch spacing.  
8 rows from 20 inch to 22 inch spacing.  
4 wheels are standard.

DEF-1222 = 8 rows of 30 inch spacing.  
12 rows of 20 inch or 22 inch spacing.  
8 wheels are standard.  
It will allow two 26 inch rows for tractor tires.  
It will allow 23 inch rows, but the outer rows will have poor efficiency.

DEF-1224 = 12 rows of up to 24 inch spacing.  
8 wheels are standard.

DEF-0924 = 9 rows with 22 inch spacing.  
4 wheels are standard.  
The machine must be set to handle 5 rows on one side and 4 rows on the other.  
Remember to leave at least 3 inches between the flails and the frame.

When setting the machine for the field, always have at least 3 inches between the frame and the flails to obtain full flail action and minimize mud build up on the frame. A closer dimension will seriously reduce the efficiency of the machine.

## 9. SPECIFICATIONS

<b>MODELS:</b>	<b>DEF-0624</b>	<b>DEF-0630</b>	<b>DEF-0924</b>	<b>DEF-1222</b>	<b>DEF-1224</b>
Length:	238"	238"	238"	238"	238"
Width:	156"	188"	222"	285"	307"
Height:	46"	46"	46"	46"	46"
Weight:	5100 lbs	6900 lbs	8575 lbs	7600 lbs	8375 lbs

Tires: 7.60 x 15 six-ply rating  
Self-cleaning tractor lug style  
20 psi field; 35 psi transport; 40 psi shipping

Input speed: 1000 RPM

Rotor speeds: 400 RPM on standard forward and reverse front tubes.  
400 RPM on middle and rear tubes.  
1000 RPM on steel flail front tubes.

Rotor design

Front: 4 Flail rods per assembly

Center: 6 Flail rods per assembly

Rear: 6 Flail rods per assembly

## TRANTORQUE INSTALLATION PROCEDURES

Shaft and bore diameters along with surface finish are extremely critical for the proper installation of a Trantorque bushing. These specifications are held at the factory during manufacturing. If it is necessary to disassemble and reassemble a Trantorque application that is undamaged and intact the follow

ing procedures will insure a positive installation. If it is necessary to replace a unit in which the Trantorque or shaft may have come loose, rotated or been damaged, a thorough inspection of the components is necessary to insure the failure will not reoccur.

**Warning: Use no lubricants in this installation.**

1. Both shaft and component bore must be completely free of paint, grease, oil, dirt and burrs. If necessary clean the surfaces with a non-petroleum based solvent, such as isopropyl alcohol.

**Warning: Do not lubricate the Trantorque bushing, shaft or bore. The use of any lubricant on the contact surfaces can result in bushing failure and will void all warranties.**

2. Insert the Trantorque into the bore making sure the mating hub is flush against the shoulder at the hex flats.

3. Insert the shaft fully and hand-tighten the nut until the assembly becomes snug on the shaft.

**Warning: The shaft must fully engage the shaft gripping area of the Trantorque.**

4. Using a torque wrench, tighten the nut to the proper torque as listed below.

**Warning: A torque wrench must be used! An impact wrench will not yield the proper torque and the installation will fail. Minimal under-tightening will allow the Trantorque or shaft to spin in the bore. Over-tightening will damage or crack the Trantorque.**

Part Number	Deccription	Torque	Bore Diameter	Surface Finish
53459	Hub-Trantorque 1.75"	2800 in-lb. (234 ft-lb.)	2.622-2.628	32-125 Ra
58460	Hub-Trantorque 2.00"	4900 in-lb. (408 ft-lb.)	2.872-2.878	32-125 Ra
59259	Hub-Trantorque 2.25"	5300 in-lb. (442 ft-lb.)	3.122-3.128	32-125 Ra

## 11. APPENDIX

### 11.1 PTO OUTPUT

1000 RPM is required with one of the following shaft options:

38mm-8 Spline  
1-3/4in-20 Spline  
1-3/8in-21 Spline

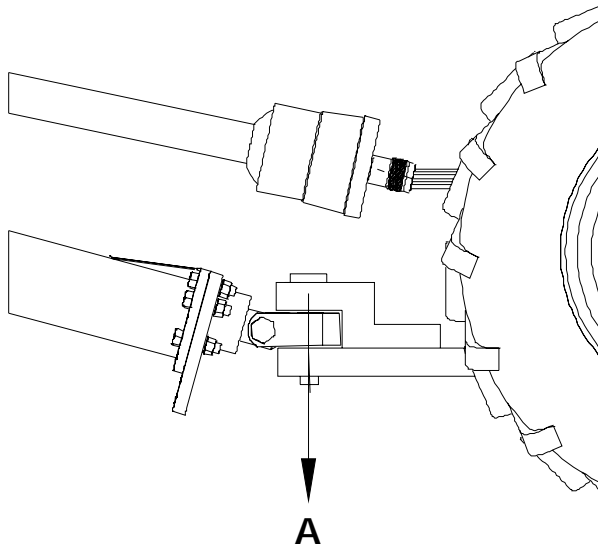
### 11.2 PTO RPM SETTING

Tractors equipped with 2 speed PTO's must be set to 1000 rpm.



### 11.3 DRAWBAR WEIGHT CAPACITY

Drawbar must be able to support a vertical load of  
3000lbs (1400kg) 6Row  
5000lbs (2300kg) 12Row (A)

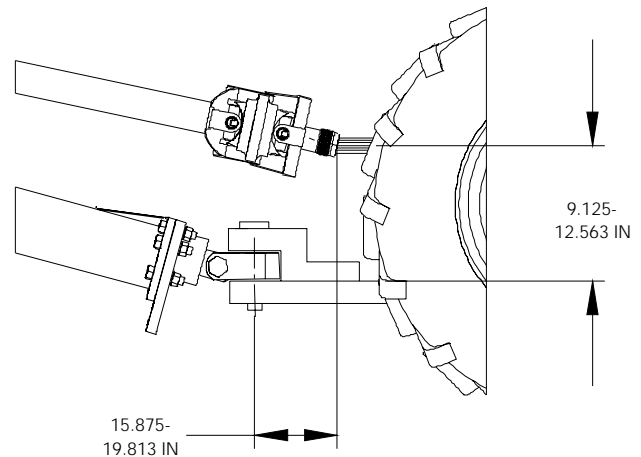


### 11.4 ADJUSTING THE DRAWBAR

The tractor drawbar must be set within the given range to maintain the integrity of the drive system.

#### **IMPORTANT:**

Ensure driveline remains within operating range under all conditions.



### 11.5 THREE-POINT HITCH POSITION

Three-Point Hitch not connected to hitch must be fully raised or removed.

#### **CAUTION:**

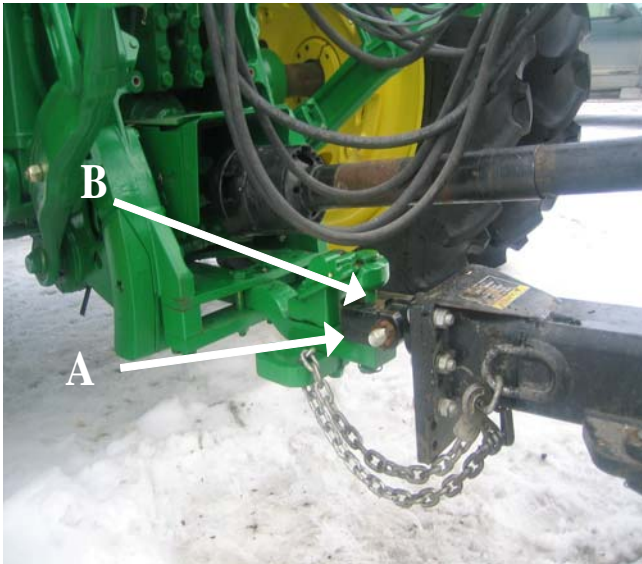
Ensure receiver and drawbar support arms clear PTO driveline under all conditions.





## 11.6 ATTACHING DEFOLIATOR TO TRACTOR DRAWBAR

1. Adjust tractor drawbar (see 11.3).
2. Remove tractor hitch pin.
3. Install required bushings into pull plate.
4. Adjust hitch height.
5. Shift into park, shut off engine, and remove ignition key before getting out of tractor.
6. Line up pull plate with drawbar.
7. Place hardened washer A between drawbar and pull plate, and install shims as necessary B.
8. Reinstall hitch pin.
9. Connect safety chain to drawbar supporting structure.



### IMPORTANT:

1. The tractor drawbar clevis must be level, tight, securely supported and must be capable of handling all vertical and horizontal loads.
2. The drawbar clevis, drawbar pin and hitch pull plate diameters must match within 1/32" (0.8mm) each. Bushings for Category II and III hitch pins are provided for the pull plate. The total horizontal free-play between the

tractor and defoliator must not exceed 1/8" (3mm). The pull plate must also be shimmed vertically to within 1/16" (1.6mm) of the clevis opening. Excessive free-play in either plane will cause the driveline to continually telescope while under load and will cause damage to the driveline and the gearbox it attaches to.

3. Ensure there is no interference between the driveline and any tractor and/or hitch components under all conditions (raised, lowered and turning). Any visible damage of the driveline shielding may indicate damage to the driveline itself, may pose a safety hazard and may cause gearbox damage.

Excessive hitch free-play and/or visible damage to the driveline shielding will void all warranties on the driveline and associated gearbox.



No.	Date	Description	Related No.	Page
183	4/26/06	S2100 with Overrunning Clutch R&R		1 of 9

**Description:** This is a description of the steps required to completely disassemble and reassemble gearbox code S2100100033, which is a three-way S2100 with overrunning clutch on the Z-axis. Other S2000 gearboxes, with or without overrunning clutches, will use a similar procedure.

## Tools required:

Drain pan

Pry bar

Seal puller

Snap ring pliers (straight, internal and external or convertible)

Ball peen hammer

Soft face hammer (bronze, copper, brass or similar)

Steel tubes (to fit loosely inside bores of casting and/or outside shafts – see diagrams)

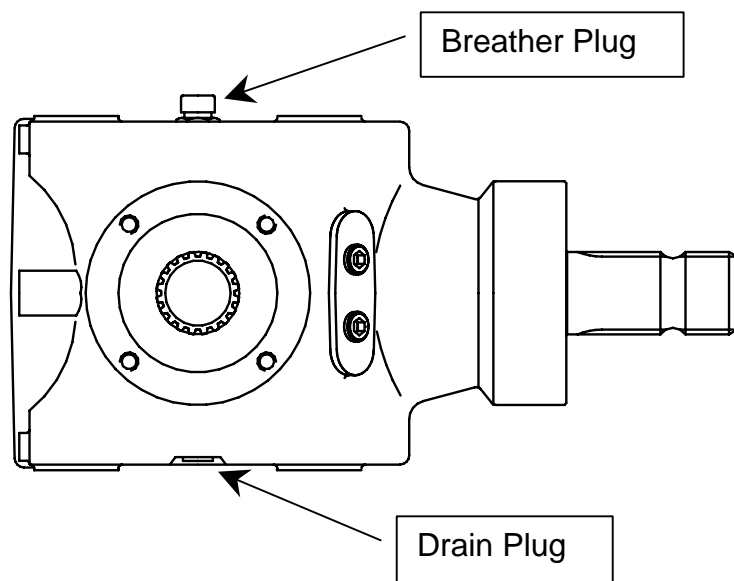
Small punch (Ø8 or Ø10 mm)

Gear oil (SAE 90 EP recommended)

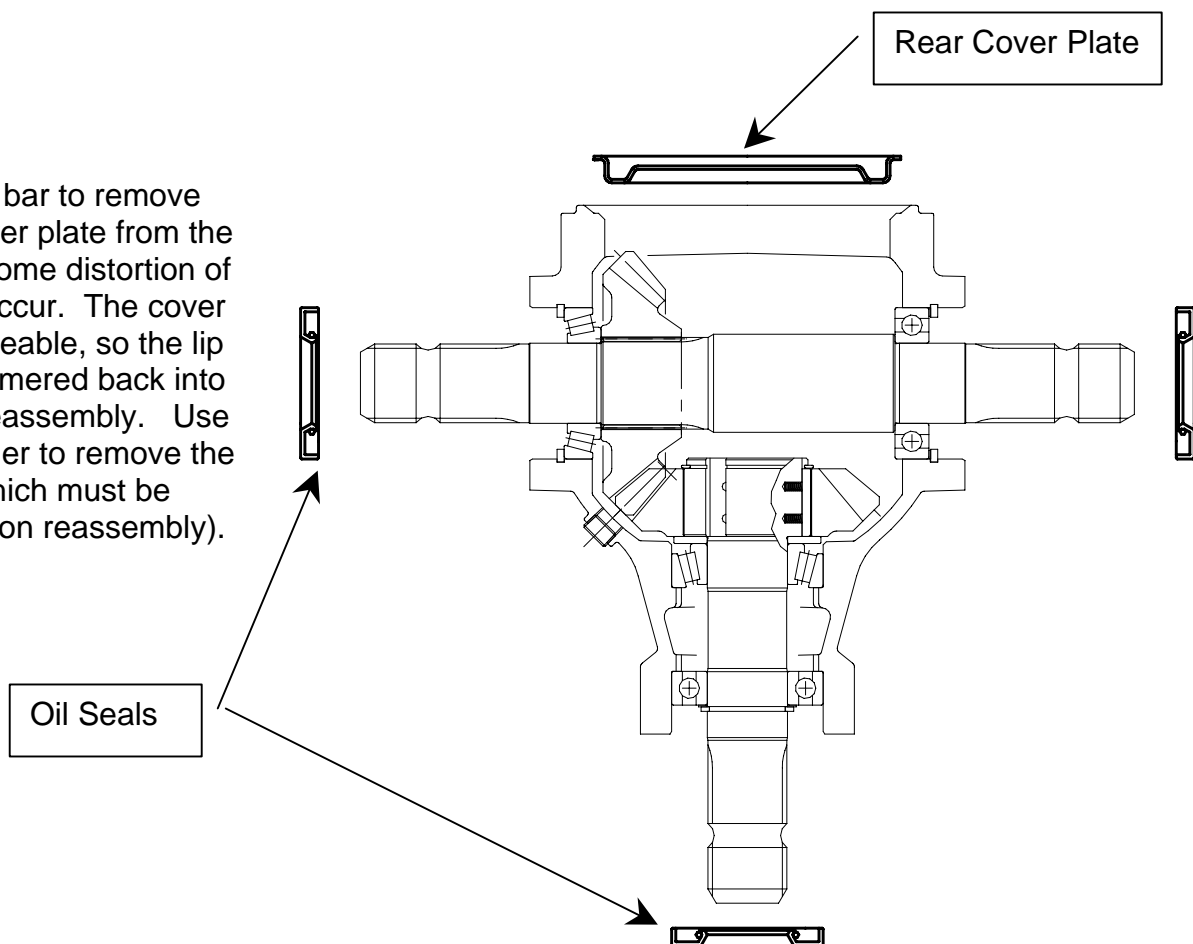
A press can be used for several steps of the disassembly / assembly process, but is not absolutely required.

## Disassembly

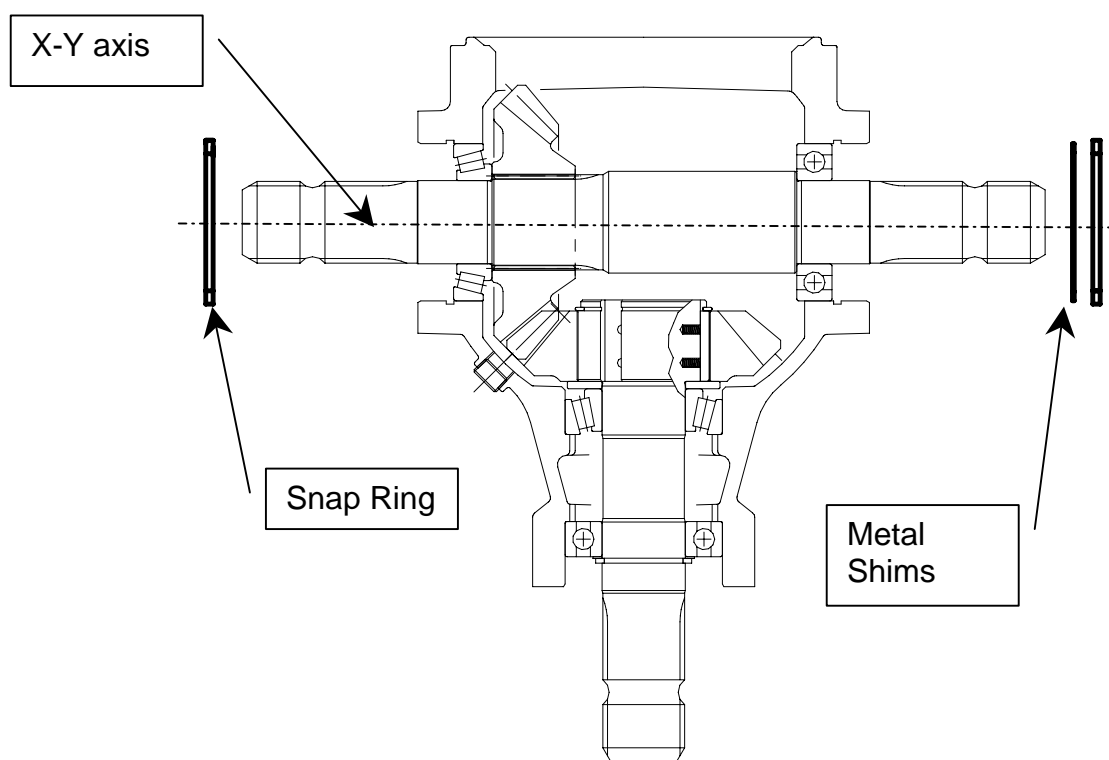
Position the drain pan under the drain plug. Remove the drain plug and let the oil flow into the pan (remove the breather plug to release vacuum and speed flow of oil). Dispose of used gear oil according to local regulations.



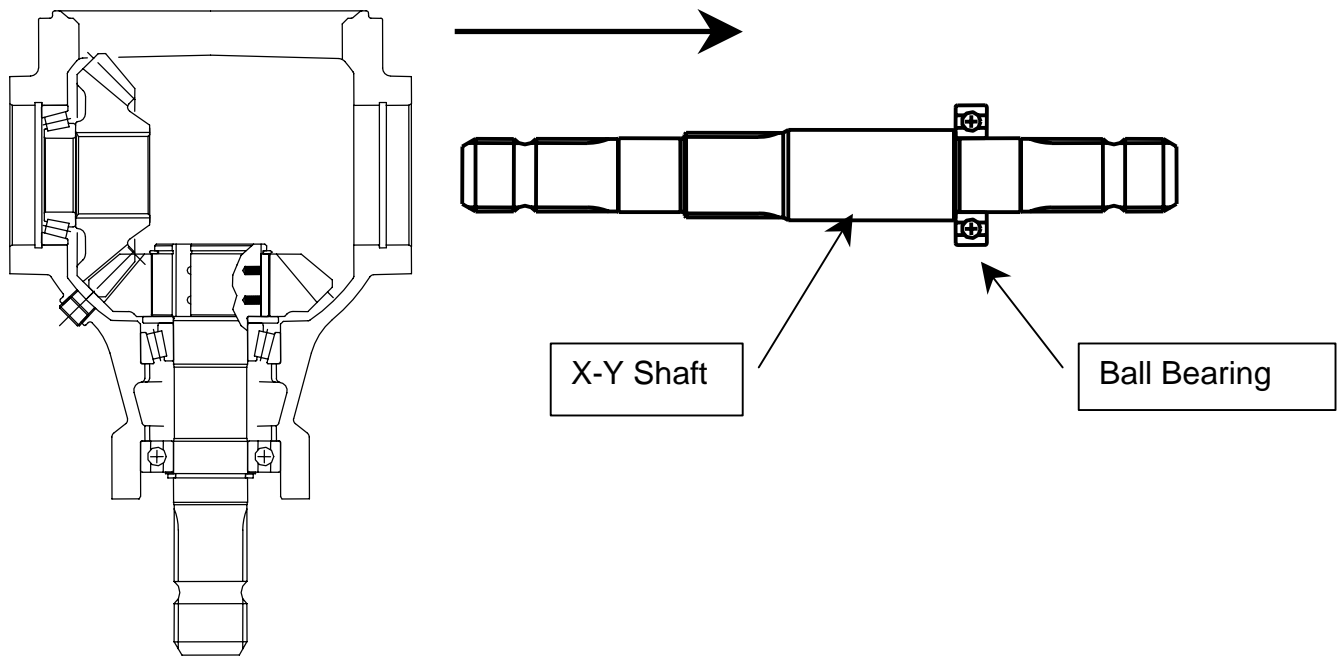
Use the pry bar to remove the rear cover plate from the gearbox. Some distortion of the lip will occur. The cover plate is malleable, so the lip can be hammered back into shape for reassembly. Use the seal puller to remove the oil seals (which must be replaced upon reassembly).



Remove the snap rings from the casting on the X-Y axis. Behind one of the snap rings, you should find one or more thin metal shims – remove these as well.



Press (or use soft face hammer if a press is unavailable) the X-Y shaft out of the gearbox, in the direction shown. This will also remove the ball bearing from the gearbox casting.



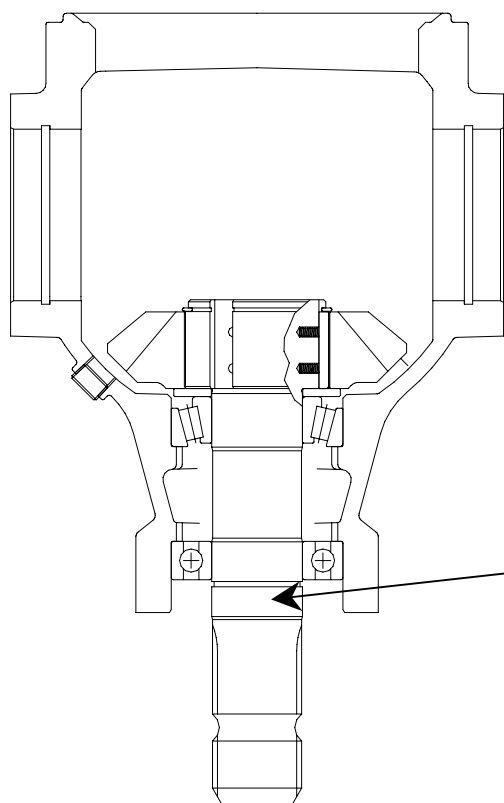
The ball bearing may be removed from the X-Y shaft in several different ways. Note that pressure applied to the outer race may damage the balls and raceways. The following methods are suggested:

- A metal tube that fits over the shaft and contacts the inner raceway may be used to press the bearing off the shaft.
- Hammer the end of the shaft against a soft surface (i.e. wood). The inertia will often dislodge the bearing from its seat.
- A bearing separator may be inserted under the bearing, and a 2-jaw puller used to press the separator and bearing from its seat.
- Deep groove ball bearing pullers designed for this specific task (if available).

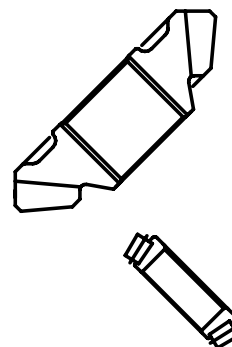
Remove the gear and inner race of the taper roller bearing. Press the outer race out of the casting, using a short piece of metal tube that fits loosely inside the bore.

Remove gear and inner race/rollers

Press inner bearing race from housing using a short piece of tube



Z-shaft



Remove the snap ring from the Z-shaft.

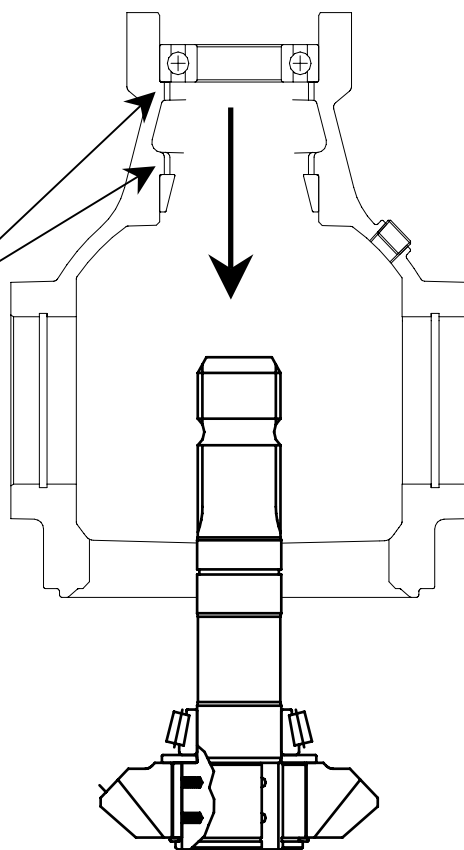


Press (or use soft face hammer if press is unavailable) the Z-shaft out of the back of the gearbox.

There are a couple of divots on either side of the casting. Use a punch to drive out the ball bearing and outer race of the taper roller bearing via these divots.

Clean any old oil, debris, or metal filings out of the inside of the casting.

Divots



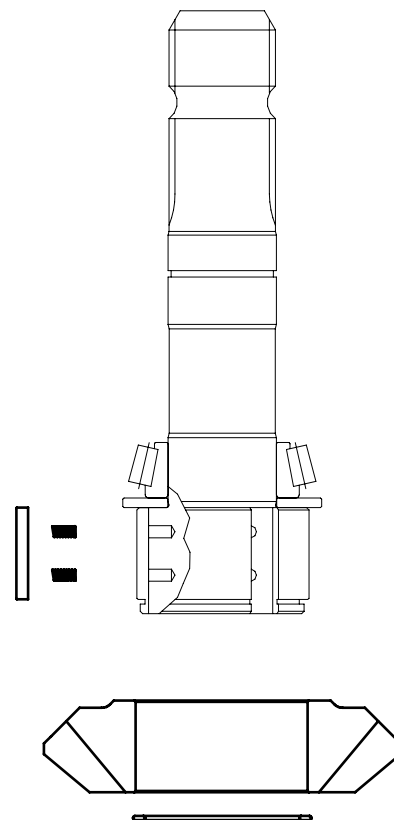
Remove the snap ring from the end of the Z shaft.

Slide the gear off the shaft.

Remove the three (3) pawls from the overrunning clutch mechanism. Remove the six (6) small springs located under the pawls (two per pawl).

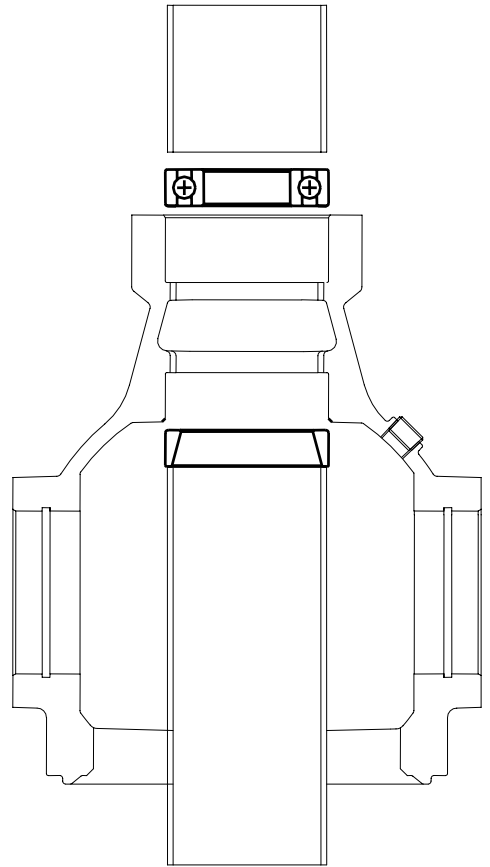
Remove the spacer (if included), and remove the inner race and rollers as described before for the X-Y shaft.

This completes the disassembly process. Thoroughly clean all components, and inspect for wear or damage. Replace any excessively worn or damaged components with genuine OEM components.



## Assembly

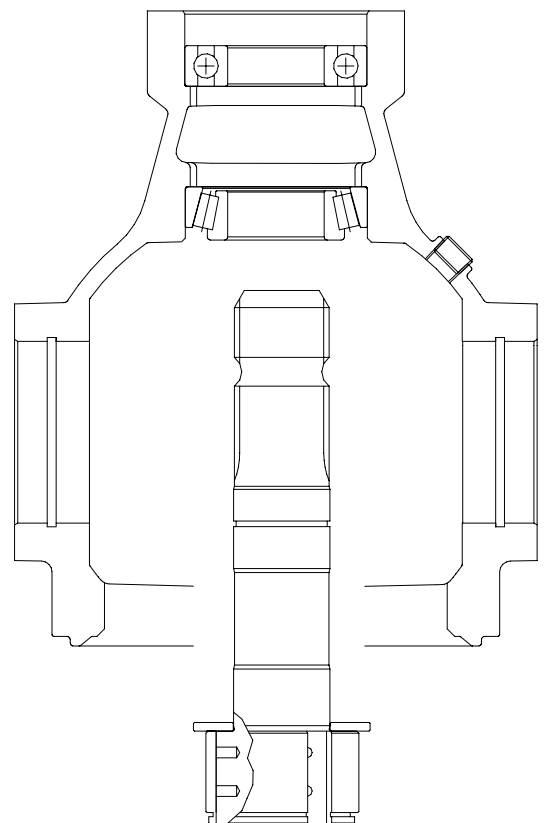
Press the ball bearing into place, using a piece of tube that contacts the outer race only (pressure on the inner race may damage the bearing). Press the outer race of the taper roller bearing through the back side of the casting. Note the orientation of the race.



Place the inner race and rollers of the taper roller bearing in position. Slide the spacer onto the Z-shaft (if equipped), and press the shaft into place.

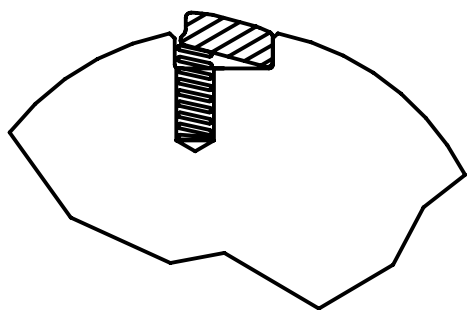
Adjust the preload on the bearings by adding or deducting shims under the Z-shaft snap ring. Proper adjustment is achieved when there is zero “play” in the shaft (i.e. no movement in or out), but the bearings rotate freely.

Make sure the snap ring is fully seated in its groove on the Z-shaft.



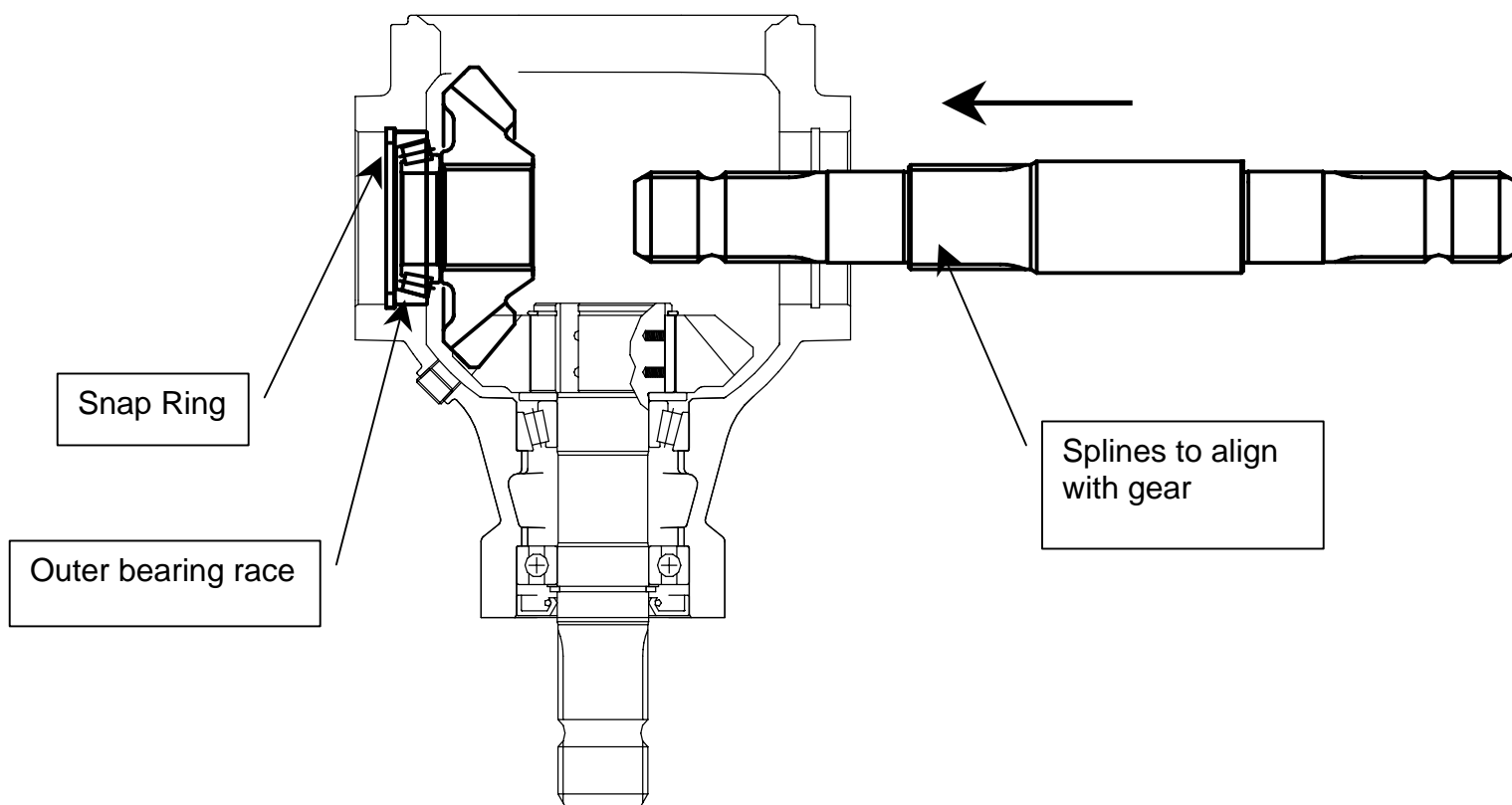


Insert one spring into each hole in the Z-shaft. Place the three (3) pawls into the grooves in the Z-shaft, with the shaped edge oriented as shown:

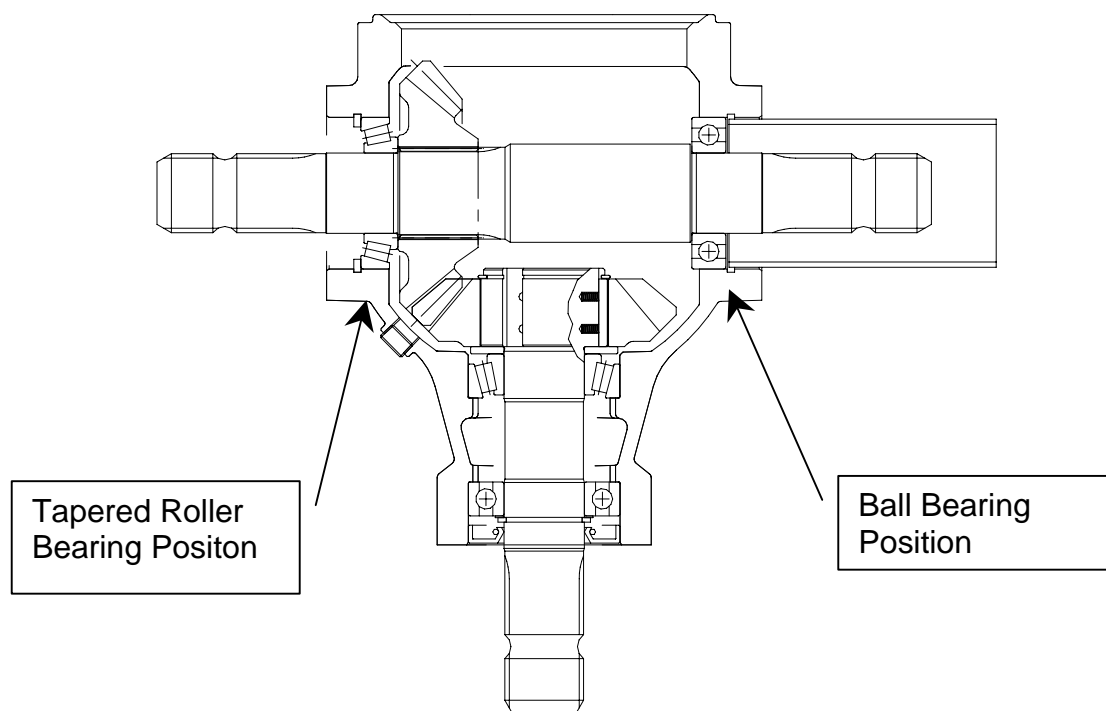


While holding the three pawls compressed on top of their springs, slide the pinion gear over the top of the shaft in position. Rotate forward and backward to check the function of the overrunning mechanism. Install snap ring.

Install the snap ring in the position shown below. Press the outer race of the tapered roller bearing into place until it seats against this snap ring (note orientation). Put the inner race and rollers in the proper position, and then position the gear on top of this bearing. Align the splines of the X-Y shaft with those in the gear, then press the X-Y shaft into place.



Press the ball bearing into position on the opposite side of the shaft.



## Adjusting Preload and Backlash

Add shims between the ball bearing and snap ring until there is no freeplay in the shaft (i.e. movement in or out), but the bearings rotate smoothly. This sets the proper preload on the bearings.

The backlash (clearance between gear teeth) must be adjusted to proper levels.

S2100 series, 1:1, 1.57:1, and 1:1.57 ratios – backlash 0.20 – 0.25 mm (0.008 – 0.010 in)  
S2125 series, 1:1.35, 1.35:1, and 1:1.93 ratios – backlash 0.20 – 0.25 mm (0.008 – 0.010 in)

The backlash can be measured with a dial indicator positioned on the pitch diameter of the gear (approximate center of contact patch), and measuring the free rotation of the crown gear (X-Y axis) as the pinion gear is held stationary (Z-axis).

To reduce backlash, take one of the shims from under the ball bearing position (above), and insert between the snap ring and bearing on the tapered roller bearing position. To increase backlash, reposition shims from the tapered roller side to the ball bearing side.

When adjusted properly, the shafts should rotate smoothly without binding, and a slight “click-clack” sound can be heard when one of the shafts is rotated one way and then the other. Operation without sufficient backlash will lead to excessive noise, rapid heat generation, and premature failure of the gearbox.

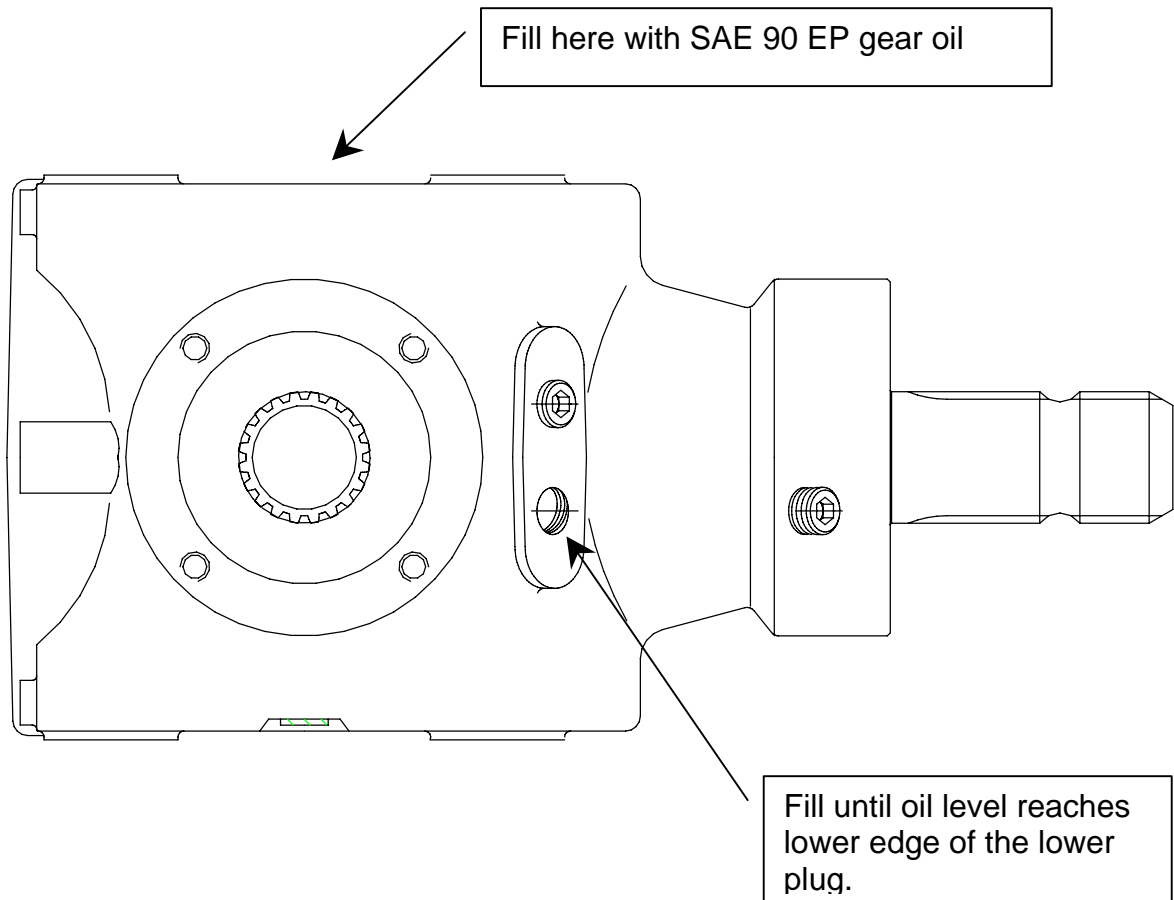
## Completing Assembly

Check that all snap rings are fully engaged in their grooves.

Clean the shafts and bores of the casting of any debris . Coat the inside lip of the oil seals with gear oil. Press the oil seals into their bores, paying attention to not damage the sealing lip while it passes over the shaft.

Hammer the back plate into the housing.

Wrap the drain plug threads with Teflon® tape or pipe dope and reinstall into the gearbox. Set the gearbox on a level surface, and remove the LOWER drain plug. Fill with good quality SAE 90 EP gear oil until it reaches the level of the lower plug hole. Wrap the level plug and breather plug threads with Teflon® tape or pipe dope and reinstall.



Check the operation of the gearbox on initial startup. Drain and refill with fresh lubricant after the first 50 hours of use, and every 500 hours of use thereafter.