
MILLER PRO

MODEL 900

ROTARY RAKE OPERATOR'S MANUAL

DO NOT OPERATE THIS EQUIPMENT UNTIL THIS
MANUAL HAS BEEN READ AND UNDERSTOOD.

Part Number: 17.00652C
June 2005



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INTRODUCTION

This Operator's Manual is provided to acquaint the operator with the safety and operation of the Miller Pro 900 Rotary Rake. Complete Assembly, Operation, Lubrication and Maintenance procedures are provided. Following the recommended procedures will help you achieve many years of dependable service.

This manual is considered part of your machine and should remain with the machine at all times.

Make sure the operator reads and understands the manual before placing the rake into operation.

Failure to follow the recommended procedures may result in injury and equipment damage, and could void the warranty.

MACHINE SERIAL NUMBER

The machine serial number is located on the side of the rake frame near the hitch. For your convenience refer to this number and your product model number when requiring service or parts information. Record the machine serial number, model number, date of purchase and dealership name in the space provided below.

Date Purchased _____	
Model No. _____	Serial No. _____
Dealership _____	

Right and Left Hand sides are determined from a position standing at the rear of the rake looking toward the direction of travel.

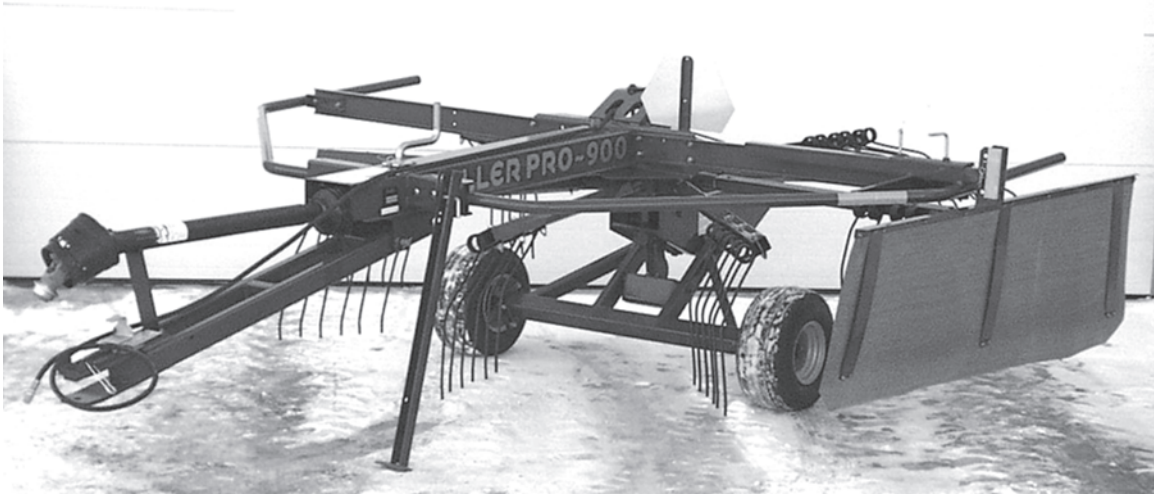
The Delivery and Warranty Registration Card found in the front of this manual must be completed and signed to validate your warranty protection. You must read and understand the places where you attest to having received instructions as to care, adjustments, safe operation and applicable warranty policy. The terms and conditions of the warranty are specified on the rear cover of this manual.



WARNING

SOME PHOTOGRAPHS USED HEREIN MAY SHOW DOORS, GUARDS AND SHIELDS OPENED OR REMOVED. BE SURE THAT ALL DOORS, GUARDS AND SHIELDS ARE FASTENED IN THEIR PROPER POSITION BEFORE MACHINE IS OPERATED!

OVER ALL MODEL VIEW



Fully assembled rake.

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TABLE OF CONTENTS

ROTARY RAKE	
Pre-Delivery Check List , Dealer Copy	4
SAFETY PRECAUTIONS	5-6
Power Source Shutdown Procedure	5
SAFETY DECALS	7-9
CONTROLS & SAFETY EQUIPMENT	10-11
TRACTOR/RAKE PREPARATION	
Tractor/PTO Setup	12
Swath Screen Adjustments	13
Parking Stand	13
Rake Height/Leveling Adjustment	14
TRANSPORTING	15
OPERATION	
Pre-operation Checklist	16
General	16
PTO Operation	17
LUBRICATION & MAINTENANCE	
Gearbox	18
PTO	18
Frame	19
Tires and Wheels	19
General Maintenance	20
Storage	20
ASSEMBLY	21-24
OPTIONS & ACCESSORIES/SPECIFICATIONS	25
TORQUE SPECIFICATIONS	
Fasteners	26
O-Ring Fittings	27
Flare Fittings	27
WARRANTY	Inside Back Cover

900 ROTARY RAKE

PRE-DELIVERY CHECK LIST

After the Rake has been completely set-up, the following inspections **MUST** be made before delivering it to the customer. Check off each item after prescribed action is taken.

- ☐ NO parts of the unit have been damaged in shipment. Check for such things as dents and loose or missing parts; correct or replace components as required.
- ☐ All bolts and fasteners are in place and tightly secured.
- ☐ As applicable, the Cylinders, Hoses and Fittings are NOT damaged, leaking or loosely connected.
- ☐ The Gearbox is filled to proper oil level; All Grease Fittings have been properly lubricated; see Lubrication chapter of this manual.
- ☐ Wheels are properly mounted and securely attached and Tires are properly mounted and inflated to the appropriate pressure.
- ☐ All Guards, Shields and Decals are in place and securely attached.
- ☐ Model and Serial Numbers for this unit are recorded in space provided on this page and inside the front cover.

Hook the rake to the appropriate (540) RPM tractor and test run it while checking that proper operation is exhibited by all components.

Check that:

- ☐ Rotating PTO Shields turn freely.
- ☐ All Drives and Mechanisms are operating smoothly and properly adjusted.
- ☐ Hydraulic lift system operates properly.

I acknowledge that pre-delivery service was performed on this unit as outlined.

Dealership's Name

Dealer Representative's Name

Date Checklist Filled Out

Model Number

Serial Number

DELIVERY CHECK LIST

The following check list is an important reminder of valuable information that **MUST** be passed on to the customer at the time the unit is delivered. Check off each item as you explain it to the customer.

- ☐ Give the customer their Operator's Manual. Instruct them to be sure to read and completely understand its contents **BEFORE** attempting to operate the unit.
- ☐ Explain the warranty.
- ☐ Direct customer on how to use the Table of Contents of this manual as a quick page number locating guide.
- ☐ Explain and review with customer the Safety information in this manual.
- ☐ Explain and review with customer the Controls and Safety Equipment chapter of this manual.
- ☐ Explain that regular lubrication and proper adjustments are required for continued proper operation and long life. Review with the customer the Lubrication and Maintenance sections of this manual.
- ☐ Explain and review with customer the Tractor/Rake preparation and Operation sections of this manual.
- ☐ Explain and review with customer the PTO Driveline information in the separate manual provided.
- ☐ Completely fill out Owner's Registrations, including customer's signature, and return them to the Company.

I acknowledge that above points were reviewed with me at the time of delivery.

Customer's Signature

Date Delivered

(Customer Copy)

900 ROTARY RAKE

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SAFETY PRECAUTIONS



This symbol is used to call your attention to instructions concerning your personal safety. Be sure to observe and follow these instructions. Take time to be careful!



DANGER

“DANGER” indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

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



CAUTION

“CAUTION” indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also alert against unsafe practices.

BEFORE you attempt to operate this machine, read and study the following safety information. In addition, **MAKE SURE** that every individual who operates or works with this equipment, whether family member or employee, is familiar with these safety precautions. Miller-St. Nazianz provides guards for exposed moving parts for the operator’s protection; however, some areas cannot be guarded or shielded in order to assure proper operation. The **OPERATOR’S MANUAL AND DECALS** on the machine itself warn you of dangers and **SHOULD BE READ AND OBSERVED CLOSELY**.

POWER SOURCE SHUTDOWN PROCEDURE

Before cleaning, unclogging, adjusting, lubricating or servicing this machine:

1. Disengage the tractor PTO.
2. Deactivate tractor hydraulic controls.
3. Shut off the tractor engine, remove the starter key and take it with you.
4. Wait for all machine motion to stop.
5. Remove the telescoping PTO driveline and **ALL** power connections from the tractor.

Failure to follow these precautions could result in death or serious injury.



SAFETY PRECAUTIONS, continued

Some photographs used herein may show doors, guards and shields opened or removed. **BE SURE** that all doors, guards and shields are fastened in their proper position before machine is operated.

Know how to stop rake operation **BEFORE** starting it.

BE ALERT for people and/or animals in front of or around machine, when about to start machine.

KEEP hands, feet and clothing away from tine arms and PTO when they are moving!

DO NOT wear loose or baggy clothing when operating this unit!

DO NOT allow people other than a qualified operator near the unit!

DO NOT allow minors to be near the machine unless properly supervised.

KEEP riders off rake.

DO NOT unclog, adjust, lubricate or service your rake until you disengage the tractor PTO and shut off the tractor engine. Failure to follow this procedure may result in serious bodily injury!

AVOID high pressure fluids. Escaping fluid under pressure can penetrate skin causing serious injury.

DO NOT exceed a maximum towing speed of 20 MPH (32 KPH) while transporting the rake.

REDUCE speed on rough or hilly ground.

BE EXTRA careful when going through fence gates or nearing confined quarters.

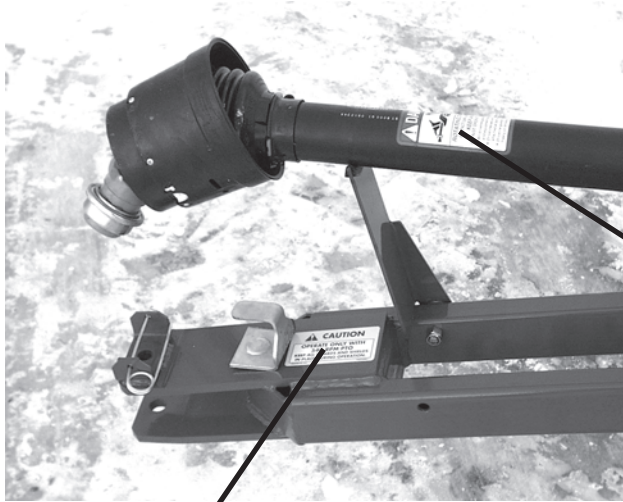
ALWAYS follow state and local regulations regarding use of a safety chain, slow moving vehicle signs and transport lighting when towing farm equipment on public highways.

ALWAYS engage the tractor parking brake before dismounting.

BE SURE the hitchjack locking pin is completely engaged and that the machine is properly blocked and prevented from rolling **BEFORE** disconnecting the rake from the tractor.

! SAFETY DECALS

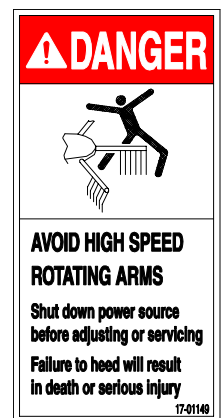
THE DECALS ARE FOR YOUR PROTECTION. IF YOUR SAFETY DECALS ARE NOT READABLE OR ARE MISSING, CONTACT YOUR DEALER FOR REPLACEMENTS.



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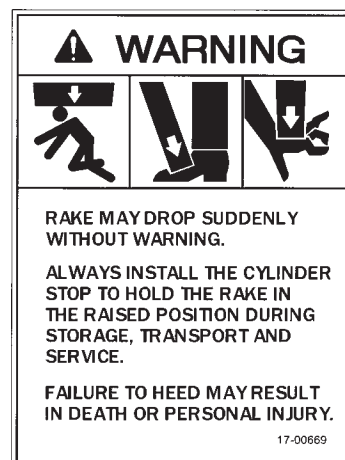
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Both Sides



17.01155



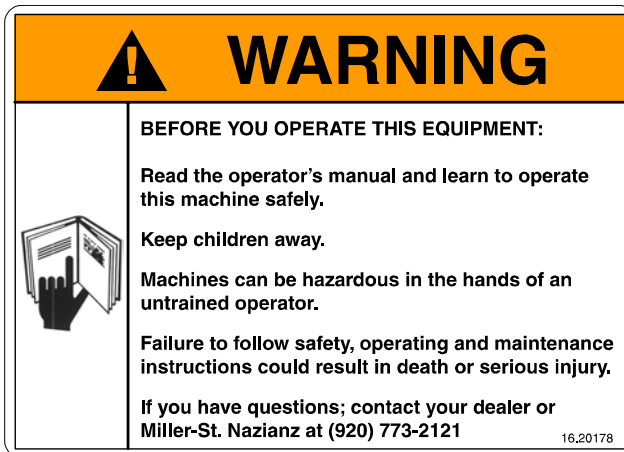
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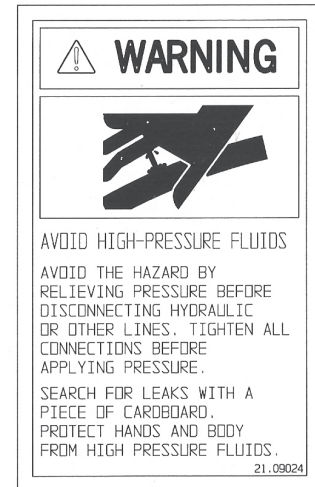
SAFETY DECALS



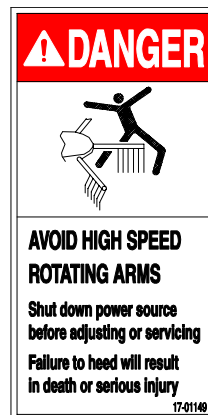
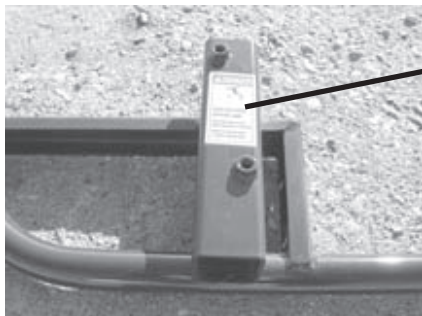
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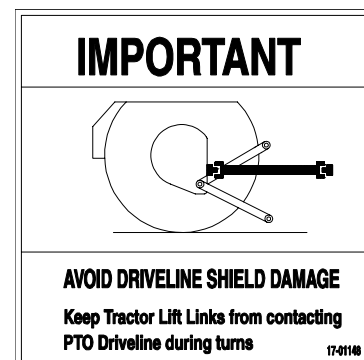
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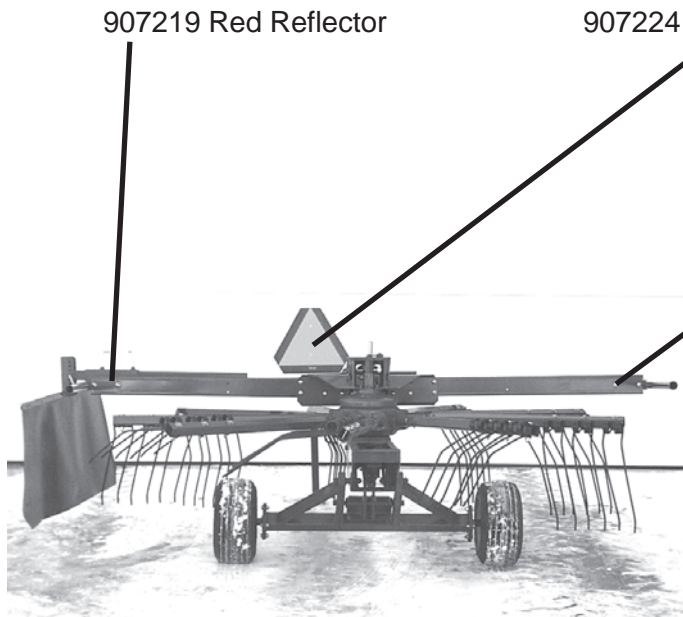
SAFETY DECALS

REFLECTIVE DECALS

NOTE: **Yellow** reflective decals must face toward the front of the machine and the **red** reflective decals must face toward the rear of the machine.

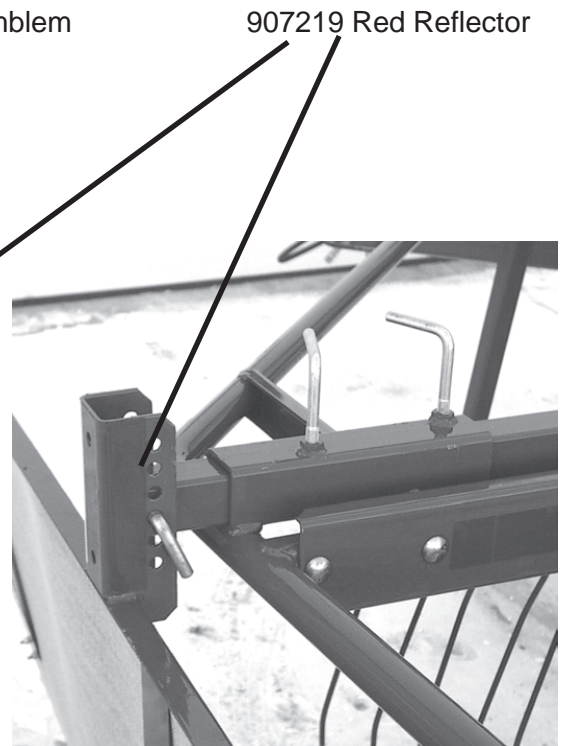


907220 Yellow Reflector



907219 Red Reflector

907224 SMV Emblem



907219 Red Reflector

CONTROLS AND SAFETY EQUIPMENT



CAUTION

Become familiar with and know how to use all **SAFETY DEVICES** and controls **BEFORE** attempting to operate this equipment. Know how to stop the unit **BEFORE** starting it!



WARNING

DO NOT operate this equipment unless **ALL** shields and guards are properly secured in place!

DO NOT lubricate, adjust and/or service unless **POWER SOURCE SHUT DOWN PROCEDURE** (page 5) has been exercised.

Wherever possible and without affecting machine operation, shields and guards have been used on this machine to protect potentially hazardous areas. In many places, decals are also provided to warn of potential dangers as well as to display special operating procedures.

Rotating PTO Guard

The telescoping PTO shaft, between the rake and the tractor, is equipped with rotating shields. If the rotating shield nearest the rake is equipped with a chain, make sure the chain is clipped into the hole in the rake frame.



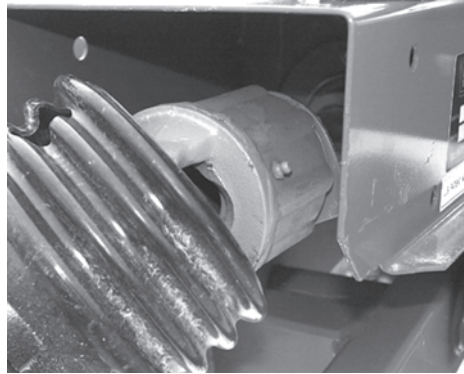
WARNING

Be SURE the rotating PTO shield turns freely **BEFORE** starting the tractor engine!



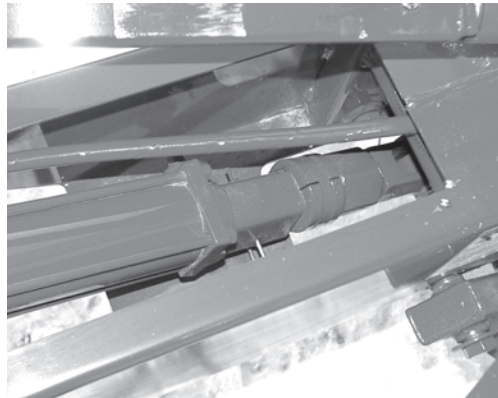
Overload Clutch

The PTO Driveline is equipped with a radial pin overload clutch to protect the drive components should the rake become clogged or obstructed, or if the tractor PTO is engaged or disengaged at too high a RPM. Clutch slippage can be identified by a clicking sound.



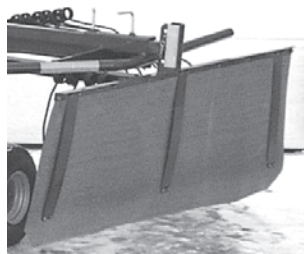
Hydraulic Lift System

The hydraulic lift system consists of a single-acting hydraulic cylinder operated by one tractor remote hydraulic valve. The cylinder is equipped with an adjustable stop which is used to control the working height.



Swath Screen

The swath screen acts as a "back stop" for the window. Adjusting the swath screen outward will create wider windrows and adjusting it inward will create narrower (and taller) windrows. The swath screen can also be adjusting forward if the raked crop is being thrown in front of the swath screen. (This can occur when rotor speed is high and ground speed is low).



TRACTOR/RAKE PREPARATION

Tractor Set-Up



CAUTION

**Use ONLY a 540 RPM tractor PTO shaft.
DO NOT use a 1000 RPM tractor PTO shaft!**

The following tractor hookup provisions should be made:

- The hitch point of the tractor drawbar should be 14" behind the end of the PTO shaft.
- The hitch point of the tractor drawbar should be set at least 8" but not more than 14" below the tractor PTO shaft.
- The hitch point of the tractor drawbar should be at least 13" but not more than 22" above the ground.
- Looking from the rear of the tractor, the hitch point of the tractor drawbar and PTO should be in a vertical line with each other.



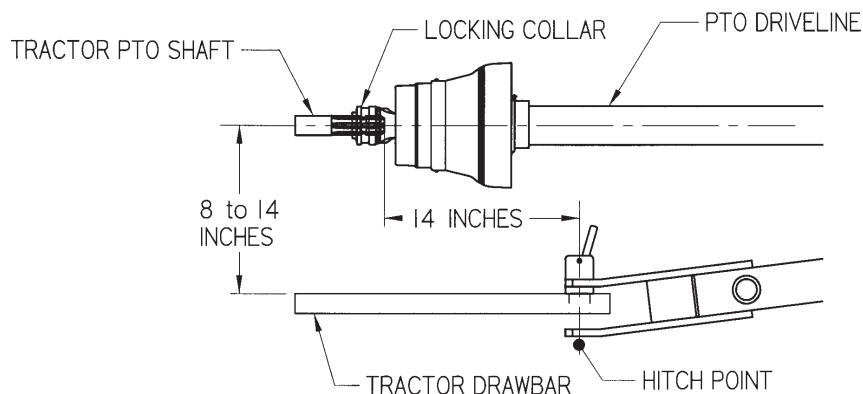
WARNING

The front PTO joint must be guarded by the tractor master PTO shield provided by the tractor manufacturer. To avoid injury BE SURE to have it installed BEFORE operation!



WARNING

BE SURE the telescoping PTO drive shaft locking device is positively engaged into the tractor PTO shaft BEFORE starting tractor engine!



PTO Attachment Procedure

Pull the locking collar on the tractor end (CV end) of the PTO driveline rearward (away from the tractor) and slide the driveline on to the tractor PTO output shaft as far as possible. Release the locking collar. Pull the PTO driveline rearward until the locking collar snaps into the locked position and the PTO driveline cannot be moved forward or rearward. Be sure PTO storage bracket is rotated away from PTO.

Hydraulic Lift Hook-up

Connect the hose for the hydraulic lift system to the appropriate remote hydraulic valve on the tractor. See tractor Operator's Manual for recommended circuit hook-up for single-acting cylinder.

IMPORTANT: If the hydraulic system has not been charged with oil, charge the system with oil BEFORE removing the cylinder locking channel.

Parking Stand Storage

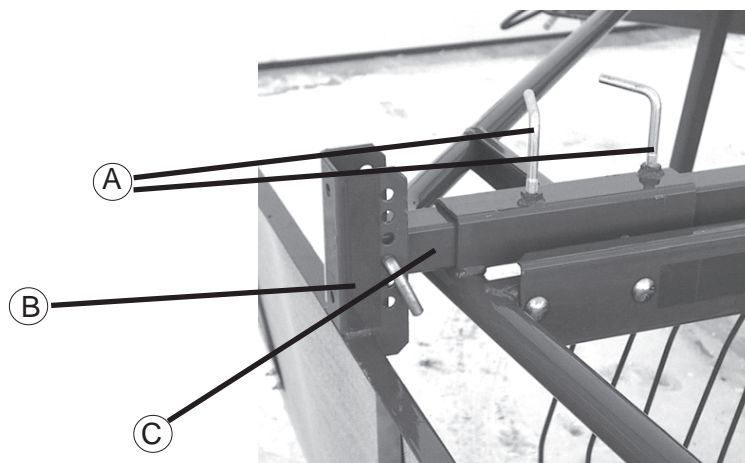
After rake is attached to tractor, rotate the leveling crank clockwise until the parking stand is no longer touching the ground. Remove the pin and clip from the parking stand. Raise the parking stand up and insert pin through parking stand bracket and lower hole in parking stand.



Swath Screen Adjustments

There are two adjustments that can be made on the swath screen.

1. Width - Adjusting the swath screen inward or outward controls the width of the windrow. Lock the swath screen in the desired location by tightening the threaded pins (A).
2. Height - Adjust the height of the swath screen by aligning a different hole in the swath screen support (B) with the hole in the adjuster tube (C). With the rake in operating position the bottom of the swath screen should just touch the top of the crop stubble.



Rake Height/Level Adjustment

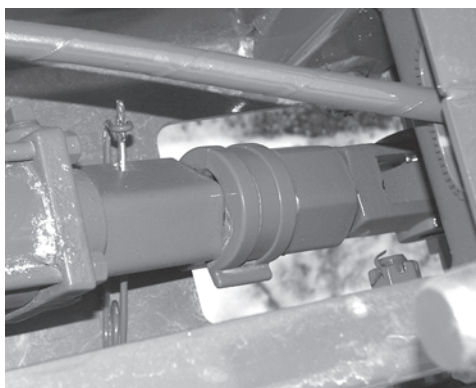
Working height and leveling the rake is controlled by the adjustable stop on the hydraulic lift cylinder.

To adjust:

1. Remove locking channel from the hydraulic lift cylinder.
2. Lower rake until tines on left and right sides of the rake are just touching the top of the crop stubble.
3. Turn the large nut on the rear hydraulic cylinder until it is tight against the cylinder spacer.
4. Turn the leveling crank to adjust rake level with ground.

NOTE: Setting the working height near the top of the crop stubble will ensure optimum rake performance and highest quality crop. Some crops, however, will require a much lower working height to gather the windrow completely. Note that operating the rake with the tines continuously digging in the ground will reduce tine life, reduce gearbox life, reduce crop quality, and increase the potential for stones in the windrow.

TIP: When turning windrows which have been rained on or have new crop growing through them, adjust front of rake closer to the ground and straddle windrow with tractor. This will keep the tines out of the ground as much as possible while still picking up the windrow.



TRANSPORTING RAKE

SMV Emblem and Reflectors

Rakes are provided with reflective strips and a slow moving vehicle (SMV) emblem. Unless prohibited, always use a SMV emblem when transporting equipment on public highways.

Safety Chain (Order Part Number 329946B91)

Rakes can be equipped with a safety chain for travel on public highways. Contact your dealer to order. When attaching chain, be sure to allow enough slack for turning.

IMPORTANT: Never exceed a maximum towing speed of 20 MPH (32 KMH). Reduce speed when turning or traveling on rough or hilly terrain.

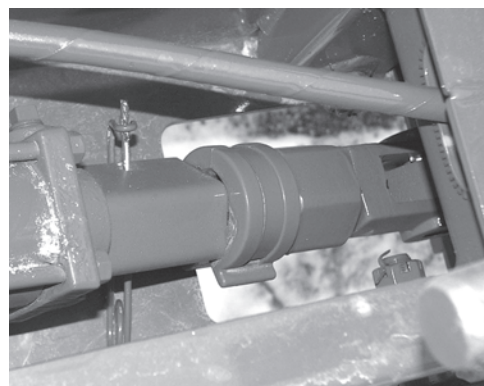
IMPORTANT: Before leaving the field:



WARNING

NEVER attempt to service the rake unless the POWER SOURCE SHUT DOWN PROCEDURE (page 5) has been exercised.

1. Raise the rake to the transport position by using the tractor hydraulics to fully extend the lift cylinder and install the cylinder locking channel.
2. Slide the swath screen assembly completely into the guard tube and tighten the threaded pins.



OPERATION



CAUTION

BEFORE operating the rake, review and understand the Safety Precautions section and the Controls and Safety Equipment section of this manual.

Pre-operation Checklist

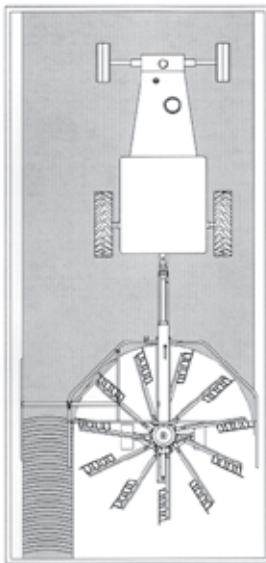
Make sure:

- All guards are in place.
- PTO Driveline shields rotate freely.
- There are no bystanders around rake .

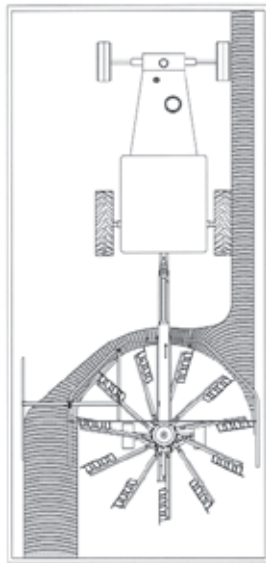
General

The Miller Pro rotary rake is designed to create fluffy windrows from the crop as it lays behind your cutting implement or a previously formed windrow. It can also be used to combine two or more windrows. The size and shape of the windrow is controlled by the ground speed, the PTO speed, and the swath screen setting.

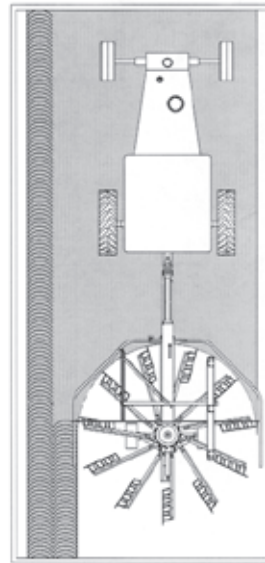
Ground speed and rake RPM should be selected to move the crop with minimal losses. In dry crops, begin raking with PTO speed at 250-300 RPM (approximately 1/2 tractor throttle) and increase ground speed as long as rake is clearing the crop. Ground speed may need to be reduced significantly and RPM slightly increased in areas where the crop is denser or higher in moisture content.



Raking A Single
Windrow



Turning A Windrow



Raking A Double Windrow

PTO Operation

Engage the PTO slowly at a low RPM and adjust rake to the desired PTO speed before proceeding forward. When making turns, do not create an angle of 80 degrees or more in the front CV-joint of the PTO driveline. **Angles greater than 80 degrees will damage the CV-joint.** When finished, reduce the PTO speed before disengaging the PTO.

NOTE: The PTO Driveline of the rake is equipped with an overload clutch to protect the drive components should the rake become clogged or obstructed, or if the PTO is engaged or disengaged at too high a RPM. Clutch slippage can be identified by a clicking sound.

IMPORTANT: Always engage PTO slowly at a low RPM to prevent driveline damage.



WARNING

If the rake becomes clogged or obstructed, stop operation IMMEDIATELY and exercise the POWER SOURCE SHUTDOWN PROCEDURE (Page 5) before removing the blockage.

LUBRICATION AND MAINTENANCE

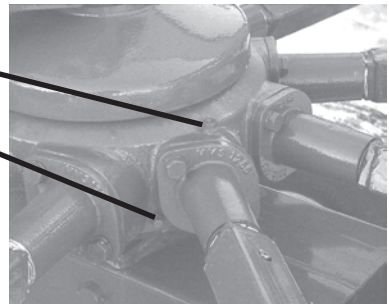


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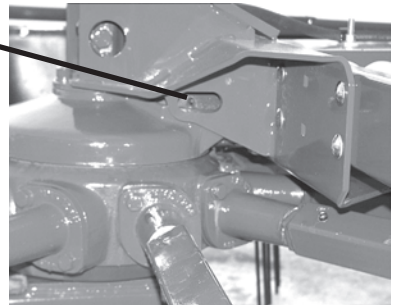
Gearbox

- Drain Interval: First oil change after first 50 hours (or first year) thereafter every 500 hours or annually.
- Fill level: Check plug on side of gearbox.
- Drain Plug: Plug on bottom of gearcase.
- Oil Type: EP80/90 Gear Lube
- Oil Capacity: 3 Qts (2.8L)
- Grease: Ring gear every 20 hours.



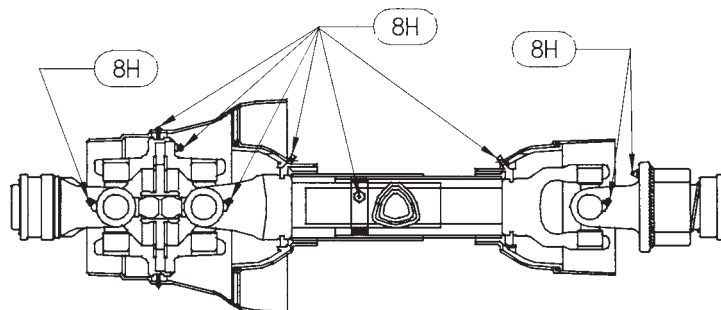
Greasing

- Use a good grade of lithium base grease.
- Wipe dirt from the grease fittings before greasing.
- Replace any missing or damaged fittings.
- DO NOT over grease flange type bearings. Overgreasing will force out the seals and damage the bearings.
- Lubricate all fittings daily for the first week of operation.



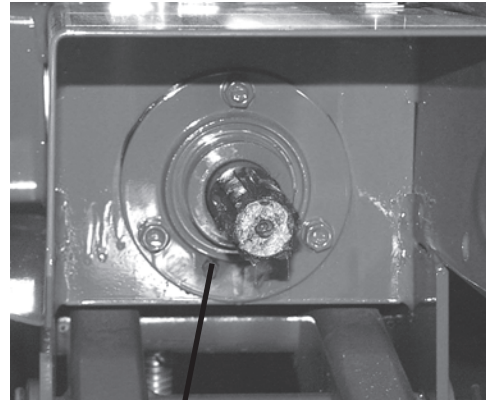
PTO Driveline

- Grease the 9 lubrication points on the PTO Driveline every 8 hours (or daily).



Drive Shaft Bearing

- Grease front driveshaft bearing every 8 hours (or daily).

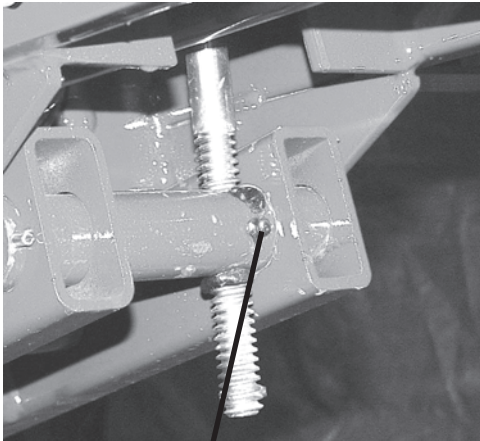


PTO Shaft Removed
For Clarity

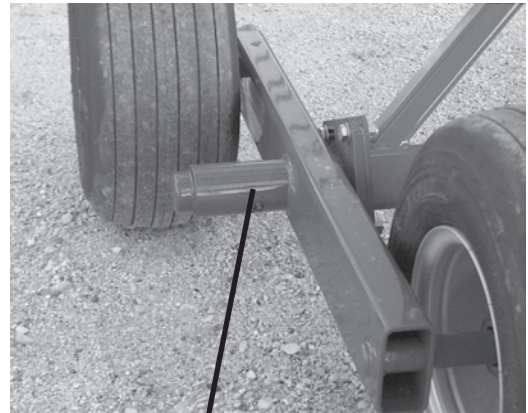
Drive Shaft Bearing

Rake Frame

- Lubricate every 20 hours



Crank Threads



Tandems

Tires and Wheels

- Clean and repack wheel bearings annually.
- Maintain Tire pressure at 15-20 psi.
- Tighten wheel lug bolts to 85 ft-lb.

General Maintenance

After the first hour of use check all fasteners and tighten any that are loose. Thereafter, check all fasteners every 20 hours of operation.

- Repair or replace any broken or damaged parts immediately.
- Replace missing safety and operating decals.

Storage

- Clean the rake of dirt and plant material.
- Apply a coating of oil or grease to the cylinder rod to prevent rusting.
- Repaint surfaces where paint has worn off.
- Store in the transport position.
- Store in a dry, protected place.
- If required for storage the overall size of the rake may be reduced as follows:
 - Remove the swath screen.
 - Remove the guards by unbolting them from the frame.
 - Remove the tine arms as required by driving out the roll pins attaching the tine arms to the gearbox. Use new roll pins when reinstalling tine arms.
 - 6 mm Roll Pin Part #09.72001 and 10 mm Roll Pin Part #09.72000. Refer to the Rake Assembly section of this manual.

RAKE ASSEMBLY

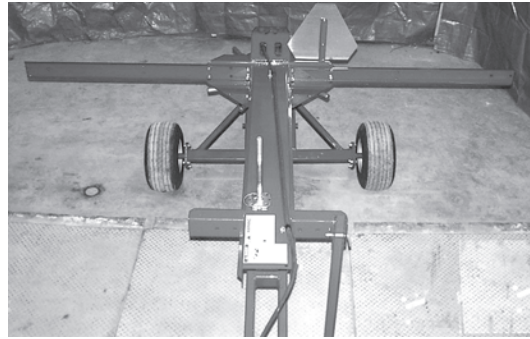
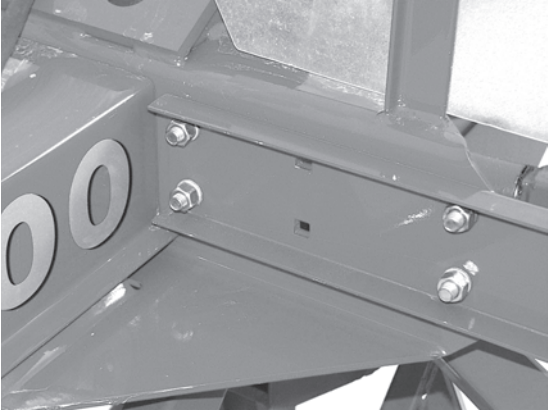


Fully assembled rake.

Rakes are shipped in various stages of assembly, ranging from palletized rakes to completely assembled. Be sure to read through each step of the assembly instructions to make sure your rake is properly assembled and ready for operation.

All hardware required to assemble rake is contained in the hardware bag shipped with each rake. Refer to Torque Specifications Section of this manual for proper fastener torques.

Step 1: **Install the guard supports** to the base of the front frame at the gearbox using 1/2 x 1 1/4 carriage bolts, lockwashers and nuts. Hold the outer end of the guard supports up so that they are level and tighten the nuts.

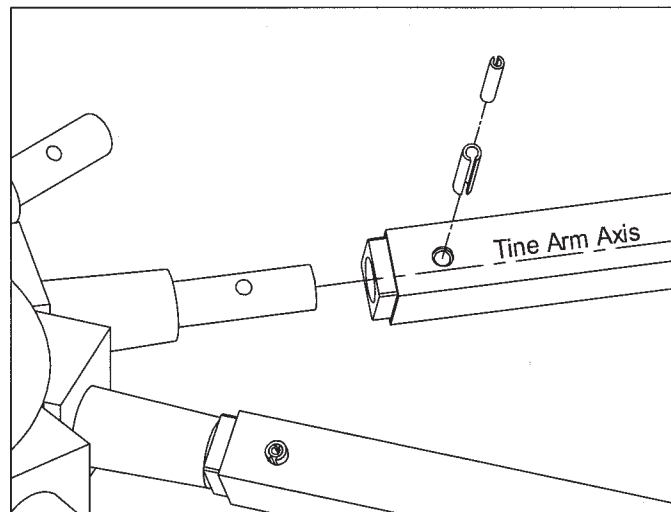


Step 2 : **Install the Left and Right Guards** to the sides of the front frame near the hitch and to the ends of the Guard Supports. Use 1/2 x 1 1/4 carriage bolts, lockwashers and nuts.



Step 4: **Install the tine arm assemblies onto the gearbox.** Lubricate tine arm shafts and tine arm bores with anti-seize. Slide tine arms onto tine arm shafts. Align the holes in the tine arm with the holes in the gearbox shaft. Insert the 10mm pin into the hole with the slot oriented as shown (90° to shaft centerline) and drive the 10mm pin approximately 1/2" into the hole. Drive the 6mm pin into the 10mm pin. (Orient the slots as shown -180° apart). Drive both pins through the tine arm together. The pins should protrude evenly on each side of the tine arm after installation. Note: Check fit between tine arm and tine arm shaft before applying anti-seize. If rust or paint are present, remove carefully. A loose fit will lead to roll pin failure.

DO NOT POUND TINE ARMS ONTO SHAFTS! This will damage internal gearbox components.

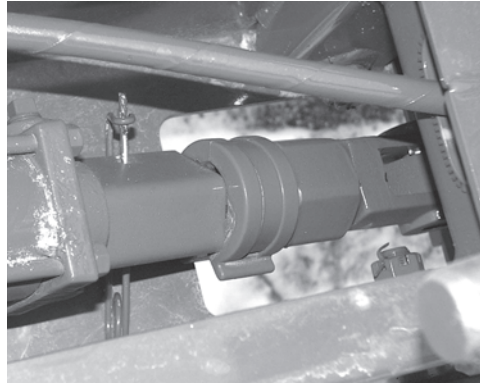


Step 5: **Install swath screen.** Slide the swath screen adjuster into the adjuster base. Lock in place with the bent threaded pins. Fasten the swath screen to the adjuster using the pin and clip provided.

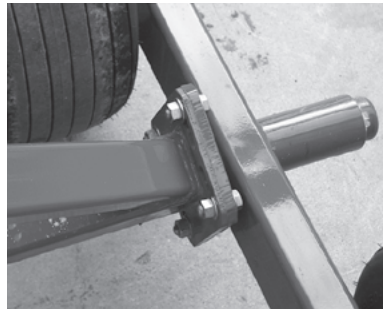


Step 6: **Install the reflective decals** as shown in the Safety Decals section of this manual.

Step 7: **Charge hydraulic system with oil.** The rake hydraulic system is NOT charged with oil at the factory. Charge the lift system with oil prior to removing cylinder lock channel.



Step 8: **Level Rake (side to side)** Park on level ground. Use tractor hydraulics to lower the rake to the field position. Measure distance from tine tip to ground on left & right side. Jack up one side of the rake & support it. (Place jack under rake axle). Loosen 4 fastening bolts and slide spindle mount half the difference in vertical distance of tine tip to ground between left & right side of rake. Tighten hardware.



Step 9: **Install PTO driveline** Attach the clutch end of the PTO driveline to the rake input shaft. Pull the locking collar on the clutch forward (away from rake) and slide the clutch onto the rake input shaft as far as possible. Release the collar, pull the clutch forward until the collar snaps into the locked position and the clutch will not move forward or rearward relative to the input shaft. Clip the chain into the hole in the top of the front frame. Rotate the PTO storage bracket upward and rest the PTO on top of the bracket.



Step 10: **Install hitch pin and clip.**

OPTIONS AND ACCESSORIES

ITEM NO.	DESCRIPTION
17.00942	Tine Saver Kit (27 Total)
17.00945	Tine Saver
17.00908	10 Ply Tire & Wheel Assembly
17.00940	10 Ply Tube & Tire - fit standard rims
17.00596	Tandem Axle Kit - includes wheel & tire assemblies
17.00628	Jack Kit - includes bolt -on mounting brackets

SPECIFICATIONS

Rake Specifications:	
Working Width	Up to 11 Ft - 6 inches
Raking Width	9 Ft - 6 inches
Transport Width	9 Ft - 10 in.
Gearbox Oil Capacity	3 Qts. (6.2L)
Number of Tine Arms	9
Number of Tines	27 Double Tooth
Weight with Std Axle	1020 Lbs.
Tires	18 x 9.5 x 8-Flotation







Tractor Requirements:	
Power Requirement	40 HP
PTO Speed	540 RPM
Hydraulic System Capacity	8 GPM@1000 PSI

Miller-St. Nazianz, Inc. reserves the right to change its products or this description at any time without notice or obligation.

TORQUE SPECIFICATIONS

NOTE: Use these torque values when tightening hardware (excluding: locknuts and self tapping, thread forming and sheet metal screws) unless specified otherwise.

All torque values are in lb-ft except those marked with an (*) which are lb-in (for metric torque value Nm, multiply lb-ft value by 1.355 or for lb-in multiply by 0.113).

Unified National Thread	Grade 2 		Grade 5 		Grade 8 	
	Dry	Lubed	Dry	Lubed	Dry	Lubed
8-32	19*	14*	30*	22*	41*	31*
8-36	20*	15*	31*	23*	43*	32*
10-24	27*	21*	43*	32*	60*	45*
10-32	31*	23*	49*	36*	68*	51*
1/4-20	66*	50*	9	75*	12	9
1/4-28	76*	56*	10	86*	14	10
5/16-18	11	9	17	13	25	18
5/16-24	12	9	19	14	25	20
3/8-16	20	15	30	23	45	35
3/8-24	23	17	35	25	50	35
7/16-14	32	24	50	35	70	55
7/16-20	36	27	55	40	80	60
1/2-13	50	35	75	55	110	80
1/2-20	55	40	90	65	120	90
9/16-12	70	55	110	80	150	110
9/16-18	80	60	120	90	170	130
5/8-11	100	75	150	110	220	170
5/8-18	110	85	180	130	240	180
3/4-10	175	130	260	200	380	280
3/4-16	200	150	300	220	420	320
7/8-9	170	125	430	320	600	460
7/8-14	180	140	470	360	660	500
1-8	250	190	640	480	900	680
1-14	270	210	710	530	1000	740
Metric Course Thread	Grade 8.8 		Grade 10.9 		Grade 12.9 	
	Dry	Lubed	Dry	Lubed	Dry	Lubed
M6-1	8	6	11	8	13.5	10
M8-1.25	19	14	27	20	32.5	24
M10-1.5	37.5	28	53	39	64	47
M12-1.75	65	48	91.5	67.5	111.5	82
M14-2	103.5	76.5	145.5	108	176.5	131
M16-2	158.5	117.5	223.5	165.5	271	200

TIGHTENING HYDRAULIC FITTINGS



CAUTION: *Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.*

Tightening O-Ring Fittings*

1. Inspect O-ring and seat for dirt or obvious defects.
2. On angle fittings, back the locknut off until washer bottoms out at top of groove.
3. Hand tighten fitting until backup washer or washer face (if straight fitting) bottoms on face and O-ring is seated.
4. Position angle fittings by unscrewing no more than one turn.
5. Tighten straight fittings to torque shown.

* Torque values shown are based on lubricated connections as in reassembly.

Thread Size	Nut Size Across Flats	Torque Value*		Recommended Turns To Tighten (After Finger Tightening)	
		(Nm)	(lb-ft)	(Flats)	(Turns)
3/8	1/2	8	6	2	1/3
7/16	9/16	12	9	2	1/3
1/2	5/8	16	12	2	1/3
9/16	11/16	24	18	2	1/3
3/4	7/8	46	34	2	1/3
7/8	1	62	46	1-1/2	1/4
1-1/16	1-1/4	102	75	1	1/6
1-3/16	1-3/8	122	90	1	1/6
1-5/16	1-1/2	142	105	3/4	1/8
1-5/8	1-7/8	190	140	3/4	1/8
1-7/8	2-1/8	217	160	1/2	1/12

Tightening Flare Type Fittings*

1. Check flare and flare seat for defects that might cause leakage.
2. Align hose end with fitting before tightening.
3. Lubricate connection and hand tighten swivel nut until snug.
4. To prevent twisting the hose, use two wrenches. Place one wrench on the hose end body and with the second wrench, tighten the swivel nut to the torque shown in this chart.

* Torque values shown are based on lubricated connections as in reassembly.

Tube Size OD	Nut Size Across Flats	Torque Value*		Recommended Turns To Tighten (After Finger Tightening)	
		(Nm)	(lb-ft)	(Flats)	(Turns)
3/16	7/16	8	6	1	1/6
1/4	9/16	12	9	1	1/6
5/16	5/8	16	12	1	1/6
3/8	11/16	24	18	1	1/6
1/2	7/8	46	34	1	1/6
5/8	1	62	46	1	1/6
3/4	1-1/4	102	75	3/4	1/8
7/8	1-3/8	122	90	3/4	1/8

WARRANTY

MILLER-ST. NAZIANZ, INC. warrants each new Miller Rotary Rake to be free from defects in material and workmanship under recommended use and service, as stated in the Operator's Manual, as follows:

Warranty: Miller will replace, F.O.B. St. Nazianz, Wisconsin, or repair, as Miller elects, any part of a new Miller Rotary Rake which is defective in material or workmanship:

- (a) without charge for either parts or labor during the first year following delivery to the original retail customer; and
- (b) without charge for parts only (not labor) during the second year following delivery to the original retail customer.
- (c) Notwithstanding the above, Miller does not warrant teeth against wear and breakage as this item is expected to wear and extent of wear or breakage depends on field conditions and operating practices.

The warranty period for equipment used for commercial, industrial, lease, rental and custom operation or any non agricultural use is limited to 90 days from date of delivery to the first retail purchaser.

All warranties on the new Miller Rotary Rake shall apply only to the original retail purchaser from an authorized Miller dealer.

Repair Parts

Miller warrants that it will replace, F.O.B. St. Nazianz, Wisconsin, or repair, as Miller elects, without charge, any genuine Miller spare part purchased after the expiration of the new Rotary Rake warranty, or to any subsequent owners, that is defective in material or workmanship, within ninety (90) days of the installation date.

Misuse

The provisions of this warranty shall not apply to any Miller Rotary Rake which has been subject to misuse, negligence, alteration or accident, or which shall have been repaired with parts other than those obtainable through Miller.

Authorized Dealer

Repairs eligible for labor warranty must be made by Miller or an authorized Miller dealer. The purchaser is responsible for transportation of the equipment to the dealership for warranty service or for any service call expense.

Exclusive Effect of Warranty and Limitation of Liability

The remedies of the customer set forth herein are exclusive. Miller neither assumes nor authorizes any person to assume any other obligation or liability in connection with the sale of covered equipment. Correction of defects and malfunctions in the manner and for the applicable period of time provided above, shall constitute fulfillment of all responsibilities of Miller to the customer and Miller shall not be liable for negligence, under contract, or in any other manner with respect to such equipment. IN NO EVENT SHALL THE OWNER BE ENTITLED TO RECOVER FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES SUCH AS BUT NOT LIMITED TO: LOSS OF CROPS, LOSS OF PROFITS OR REVENUE, OTHER COMMERCIAL LOSSES, INCONVENIENCE OR COST OF RENTAL OF REPLACEMENT EQUIPMENT.

THIS WARRANTY IS IN LIEU OF ALL WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PURPOSE OR OTHER WARRANTIES, EXPRESS OR IMPLIED.

Warranty Requirements

To be covered by warranty, each machine must be properly registered with Miller within 30 days of date of original retail delivery.



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