



3-Pt. Rotary Tiller

Owner's Manual



⚠ WARNING: Read carefully and understand all ASSEMBLY AND OPERATION INSTRUCTIONS before operating. Failure to follow the safety rules and other basic safety precautions may result in serious personal injury.

Item #51460

SAVE THESE INSTRUCTIONS

Thank you very much for choosing a Nortrac™ product!

For future reference, please complete the owner's record below:

Serial Number/Lot Date Code: _____

Purchase Date: _____

Save the receipt, warranty, and this manual. It is important that you read the entire manual to become familiar with this product before you begin using it.

This 3-Pt. Rotary Tiller is designed for certain applications only. Northern Tool & Equipment is not responsible for issues arising from modification or improper use of this product such as an application for which it was not designed. We strongly recommend that this product not be modified and/or used for any application other than that for which it was designed.

For technical questions, please call **1-800-222-5381**.

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Intended Use

The NorTrac 3-Pt, 71 inch PTO 3-Pt. Rotary Tiller turns up hard ground quickly and easily. The middle gearbox driving system makes working more effective. This tiller is a must-have for vegetable and hobby farmers, landscape contractors, nurseries, and much more.

Technical Specifications

1	Model	1GQN-180		
2	Power (HP)	40-55		
3	Plough width (in)	71		
4	Plough depth (in)	plough in dry fields 3~6.3; plough in paddy fields 4~7		
5	Mode of blades	JF1801		
6	Quantity of blades (piece)	40		
7	Forward speed (mph)	1~3		
8	Production coefficient (sq.hm /h)	0.24~0.6		
9	Oil consumption (gallon/sq.hm)	furrowing 4~4.8; tilling 3~4		
10	Coupling mode	standard 3-point suspension		
11	External size (L x W x H)	3ft 4" x 6ft 8" x 4ft		
12	Weight of machine (lb)	793		
13	Filling quantity of gear oil (lb)	13		
14	Range applicable	paddy field cultivation, dry field cultivation, shallow-layer cultivation for covering soil, weeding, soil turning, covering green manure, and soil preparation for growing vegetables.		
Speed of blade arbor	Speed of PTO shaft (r/min)	1000	720	540
	Trans. ratio of bevel gears	17:40		
	Speed of cutter shaft (r/min)	291	209	200

Note: Unless specifically stated, the tractor's PTO shaft has a speed of 1000r/min or 540r/min. Productivity is estimated as 70% of theoretic value.

Important Safety Information

⚠ WARNING

- Read and understand all instructions. Failure to follow all instructions may result in serious injury or property damage.
- The warnings, cautions, and instructions in this manual cannot cover all possible conditions or situations that could occur. Exercise common sense and caution when using this tiller. Always be aware of the environment and ensure that the tiller is used in a safe and responsible manner.
- Do not allow persons to operate or assemble the tiller until they have read this manual and have developed a thorough understanding of how it works.
- Do not modify this tiller in any way. Unauthorized modification may impair the function and/or safety and could affect the life of the tiller. There are specific applications for which the tiller was designed.
- Use the right tool for the job. DO NOT attempt to force small equipment to do the work of larger industrial equipment. There are certain applications for which this equipment was designed. It will be safer and do a better job at the capacity for which it was intended. DO NOT use this equipment for a purpose for which it was not intended.
- Industrial or commercial applications must follow OSHA requirements.

⚠ WARNING

WORK AREA SAFETY

- Inspect the work area before each use. Keep work area clean, dry, free of clutter, and well lit. Cluttered, wet, or dark work areas can result in injury. Using the tiller in confined work areas may put you dangerously close to other cutting tools and rotating parts.
- Do not allow the tiller to come into contact with an electrical source. The tiller is not insulated and contact will cause electrical shock.
- Keep children and bystanders away from the work area while operating the tiller. Do not allow children to handle the tiller.
- Be aware of all power lines, electrical circuits, water pipes, and other mechanical hazards in your work area. Some of these hazards may be hidden from your view and may cause personal injury and/or property damage if contacted.

⚠ WARNING

PERSONAL SAFETY

- Stay alert, watch what you are doing, and use common sense when operating the tiller. Do not use it while you are tired or under the influence of drugs, alcohol, or medication. A moment of inattention while operating the tiller may result in serious personal injury.
- Dress properly. Do not wear loose clothing, dangling objects, or jewelry. Keep your hair, clothing and gloves away from moving parts. Loose clothes, jewelry, or long hair can be caught in moving parts. Air vents on the tiller often cover moving parts and should be avoided.
- Wear the proper personal protective equipment when necessary. Use ANSI Z87.1 compliant safety goggles (not safety glasses) with side shields, or when needed, a face shield. Use a dust

mask in dusty work conditions. Also use non-skid safety shoes, hardhat, gloves, dust collection systems, and hearing protection when appropriate. This applies to all persons in the work area.

- Do not overreach. Keep proper footing and balance at all times.
- Remove keys or wrenches before connecting the tiller to an air supply, power supply, or turning on the tiller. A wrench or key that is left attached to a rotating part of the tiller may cause personal injury.
- Secure the work with clamps or a vise instead of your hand when practical. This safety precaution allows for proper tool operation using both hands.

⚠ CAUTION

PRODUCT USE AND CARE

- Do not force the tiller. Products are safer and do a better when used in the manner for which they are designed. Plan your work, and use the correct product for the job.
- Check for damaged parts before each use. Carefully check that the tiller will operate properly and perform its intended function. Replace damaged or worn parts immediately. Never operate the tiller with a damaged part.
- Store the tiller when it is not in use. Store it in a dry, secure place out of the reach of children. Inspect the tiller for good working condition prior to storage and before re-use.
- Use only accessories that are recommended by the manufacturer for use with your tiller. Accessories that may be suitable for one product may create a risk of injury when used with another tool. Never use an accessory that has a lower operating speed or operating pressure than the tool itself.
- Keep guards in place and in working order. Never operate the tiller without the guards in place.

Specific Operation Warnings

⚠ WARNING

ENTANGLEMENT HAZARD

To prevent serious injury or death from rotating driveline:

- DO NOT operate without guards in place.
- DO NOT operate higher than 540 RPM.
- Keep hands, feet, clothing, and hair away from moving parts.
- DO NOT operate without driveline securely attached at both ends.
- DO NOT operate without driveline shields that turn freely on driveline.

CRUSHING AND PINCHING HAZARD

- This implement is heavy. Use extreme caution when handling various parts of the machine. Hands, fingers, and other body parts could be crushed or pinched between the tractor and the implement.
- DO NOT stand between the tractor and the implement when the tractor is in gear.
- Make sure the parking brake is engaged before getting between the tractor and the implement.
- DO NOT service the equipment while it is attached to the tractor.

To prevent serious injury or death:

- Read and understand this Owner's Manual before operating, servicing, or repairing the equipment.
- Stop the engine, remove the key, and set the brake before dismounting the tractor.
- DO NOT operate without the guards in place and ensuring that the equipment is in good, working condition.
- Never allow riders on the equipment.
- Keep bystanders at least 50 feet away while operating.
- DO NOT operate or transport on steep inclines.
- DO NOT service or go under the implement when the blades are in the up position.
- DO NOT exceed this implement's maximum speed of 5 MPH. Exceeding this speed may result in loss of control during transport or braking.
- DO NOT exceed load capacity
- To prevent property damage, watch for and avoid catching the blades on stumps, large rocks, and other immovable objects.
- DO NOT use if the implement is damaged; repair it before continuing use.
- Park and store the unit on a hard, level surface.
- Store out of reach of children. Not for use by or around children.

FALLING OFF CAN RESULT IN IMPALEMENT OR BEING RUN OVER.

- Tractor must be equipped with a Roll Over Protection Structure (or ROPS CAB) and seat belt. Keep foldable ROPS system in "locked up" position at all times.
- Keep the seat belt securely fastened.
- Never allow riders on equipment.

RAISED EQUIPMENT CAN DROP AND CRUSH.

- Before servicing, follow all instructions and safety rules in owner's manual and securely block all corners of equipment with jack stands.
- Securely blocking prevents equipment dropping from mechanical component failures.

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

Assembly Instructions

Tractor Requirements

The tractor horsepower and the hitch category should be within the range noted below. Tractors outside the horsepower range must not be used.

Tractor Horsepower Rating Up to 40-55 HP

3-Point Hitch Category Category 2

Structure of Tiller and Adjustment

The tiller is a farming implement driven by the tractor's PTO shaft. The power of the tractor passes through the PTO shaft and the gimbals' assembly to the first axis of the middle gear case of the tiller. It is decelerated and veered by a pair of bevel gears. It then is decelerated again by passing through a pair of cylindrical gears (with two idle gears inside). After that, the power is transmitted to the blade arbor through a coupling to the blade arbor spline shaft to drive the blades. Mid-way power transmission is indicated in Figure 1.

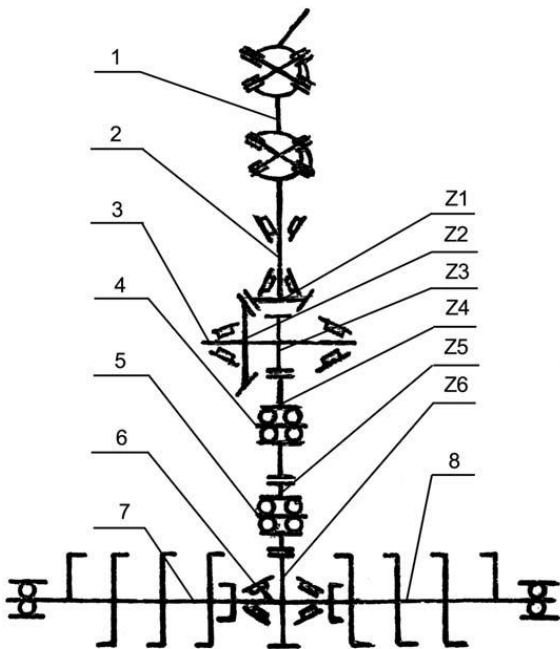


Figure 1 – Structure of the Tiller

Table 1 – Tiller Parts List

1	Gimbals	Z1	bevel
2	First shaft	Z2	gear
3	Second shaft	Z3	cylindrical
4	Third shaft	Z4	
5	Fourth shaft	Z5	gear
6	Blade arbor spline shaft	Z6	
7	Left blade arbor		
8	Right blade arbor		

The tiller has a completely metal structure consisting of three parts: the transmission mechanism, the working mechanism, and the auxiliary mechanism. The transmission mount mainly consists of the gimbals, the assembly, and a gear box. The working unit consists of the blade arbor assembly and the middle plough body unit. The auxiliary demount consists of the machine cover, the drag tiller, and the frame suspending mount.

The gimbals assembly (see Figure 2 and Table 2) and grease nipple are installed on the cross shaft in order to fill grease for lubrication of the needle bearings inside the cross shaft.

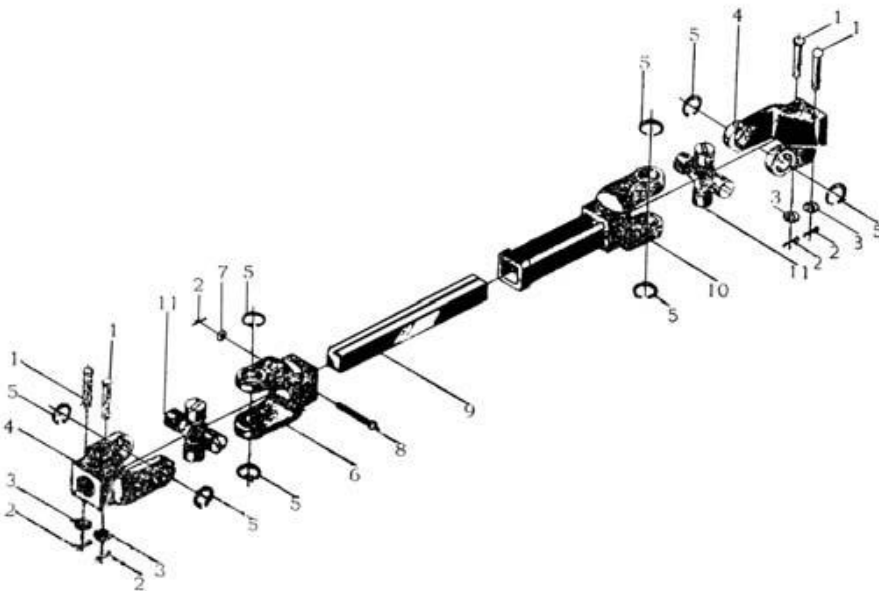


Figure 2 - Gimbals Assembly

Table 2 - Gimbals Assembly Parts List

Ref	Name	Part Number	Quantity
1	hinged bolt	ZT-02	4
2	split pin 3 × 25	GB/T91-2000	5
3	washer 14	GB/95-2002	4
4	hinged clamp	ZT-01	2

Ref	Name	Part Number	Quantity
5	elastic collar for holes 40	GB/T893-1986	8
6	square shaft clamp	ZT-03	1
7	washer 10	GB/T95-2002	1
8	square shaft bolt	ZT-04	1
9	square shaft	ZT-05	1
10	square axial sleeve clamp	ZT-06.00	1
11	crossed shaft CA-10	JB/T524-1986	2

The refueling plug is installed on the case cover for oil filling and air breathing. The test plug is installed on the right side of the second shaft for oil inspection. The thread plug for draining oil is located at the bottom of the case body.

The big bevel gear and the second shaft spur gear are connected to the second shaft which is meshed with the spline. Spacers are installed in the middle and the two sides. See figure 3 and Table 3.

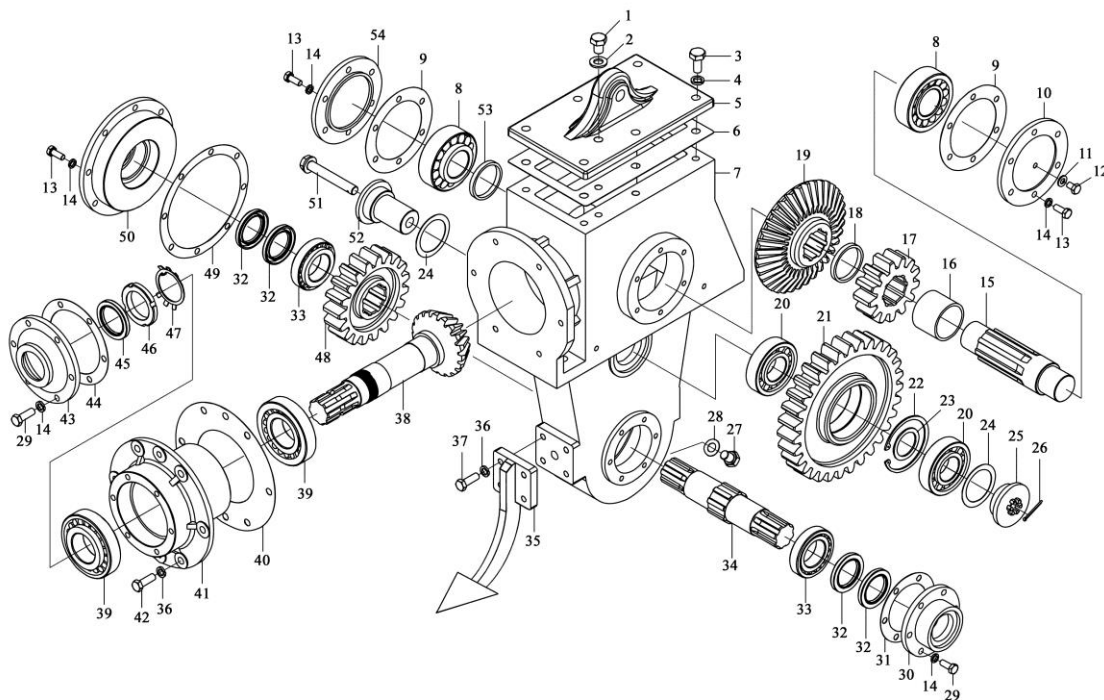


Figure 3 - Gearbox Assembly

Table 3 - Gearbox Assembly Parts List

Ref.	Part No.	Name	Qty.
1	1GQN-180.105	Bolt	1
2	1GQN-180.106	Washer	1
3	GB/T5783	Bolt M14x30	6
4	GB/T93	Spring washer 14	6
5	1GQN-180.103	Upper cover	1
6	1GQN-180.104	Gasket	1
7	1GQN-180.102	Gearbox	1
8	GB/T297-1994	Bearing 32310	2
9	1GQN-180.135	Gasket	2
10	1GQN-180.125	Right bearing cover for 2nd shaft	1
11		Combine washer 12	1
12	1GQN-180.134	Oil check plug	1
13	GB/T93	Spring washer 10	32
14	GB/T5783	Bolt M10x30	20
15	1GQN-180.123	2nd shaft	1
16	1GQN-180.132	2nd shaft spacer bush	1
17	1GQN-180.120	Gear	1
18	1GQN-180.136	Small spacer bush	1
19	1GQN-180.126	Bevel gear	1
20	GB/T283-1994	Bearing NJ309	4
21	1GQN-180.115	Middle gear	2
22	GB/T893.1	Circlip 100	2
23	1GQN-180.137	Short spacer bush	2
24	1GQN-180.116	Gasket	4
25	1GQN-180.118	Cover	2
26	GB/T91	Pin 4x30	2
27	1GQN-180.101	Drain plug	1
28		Combine washer 20	1
29	GB/T5783	Bolt M10x25	12
30	1GQN-180.111	Right cover	1
31	1GQN-180.112	Gasket	1

Ref.	Part No.	Name	Qty.
32	GB/T9877.1	Oil seal 50x72x12	4
33	GB/T297-1994	Bearing 32210	2
34	1GQN-180.109	Spline shaft	1
35	1GQN-180.060	Small plough assy	1
36	GB/T93	Spring washer 12	10
37	GB/T5783	Bolt M12x30	4
38	1GQN-180.129	Bevel gear shaft	1
39	GB/T297-1994	Bearing 330311	2
40	1GQN-180.128	Gasket	1
41	1GQN-180.127	Sleeve ring	1
42	GB/T5783	Bolt M12x35	6
43	1GQN-180.130	Cover for 1st shaft	1
44	1GQN-180.131	Gasket	1
45	GB/T9877.1	Oil seal 40x65x12	1
46	GB/T812	Round nut M45x1.5	1
47	GB/T858	Stop washer 45	1
48	1GQN-180.108	Blade shaft gear	1
49	1GQN-180.114	Gasket	1
50	1GQN-180.113	Cover for left blade shaft	1
51	1GQN-180.119	Bolt	2
52	1GQN-180.117	Idle shaft	2
53	1GQN-180.107	Short spacer bush	1
54	1GQN-180.124	Left bearing cover	1

Refilling Oil

Before operating, always check the oil in the gearbox with the unit on level ground. If the unit has more than one gearbox, make sure both are halfway full using GL5-85W 140 oil. DO NOT OVERFILL OR DAMAGE WILL OCCUR TO THE GEARBOX.

1. Remove the top plug and the overflow plug from the side gearbox. Fill the side gearbox (using the recommended gear oil) until the oil begins to flow out from the overflow plug hole.
2. Replace the top plug and the overflow plug and wipe away any excess oil.
3. Grease all zerks.
4. With the tiller positioned on level ground, adjust the tractor lift arms so that when they are lifted, the rotor bar remains parallel to the ground.
5. With the tiller attached to the tractor, raise and support the tiller with secure blocking. Adjust the

skids located on the sides of the tiller. The adjustment bolts for both the right and left sides should be positioned in the same adjustment hole. This allows the tiller to till the same depth on each side.

6. Raise the tiller and remove the blocking.

Slip Clutch Adjustment (when supplied)

The Slip Clutch is designed to slip so that the gearbox and driveline are protected if the implement strikes an obstruction.

A new slip clutch or one that has been in storage over the winter may seize. Before operating the implement, make sure it will slip by performing the following:

1. Turn off tractor engine and remove key.
2. Remove driveline from tractor PTO.
3. Loosen the cap screws to remove all tension from the spring plate.
4. Hold clutch hub solid and turn shaft to make sure clutch slips.
5. If clutch does not slip freely, disassemble and clean the thrust plate faces, flange yoke, and clutch hub.
6. Reassemble clutch.
7. Finger tighten spring until it is against the thrust plate of the clutch and then tighten each of the nuts by 1½ - 2 full rotations. Try the implement and watch for clutch to slip. Adjust nuts another ½ turn as needed until clutch stops slipping.
8. If clutch continues to slip when the spring is compressed, check friction disc for excessive wear. Discs are 1/8" thick when new. Replace discs after 1/16" wear. Minimum disc thickness is 1/16".

During Adjustment

During the adjustment, in case the gear side clearance conflicts with the meshing imprint (meshing imprint is suitable while gear side clearance is not suitable), the meshing imprint should be followed without guaranteeing the gear side clearance (gear side clearance should not be less than 0.2mm).

When disassembling and maintaining the unit, the quantity of shims should not be increased or decreased and its thickness should not be changed.

Bearing Clearance: Adjusting the Blade Arbor Spline Shaft

If the symmetry plane of the blade arbor gear is overlapped with the symmetry plane of the gear box body after the bearing clearance has been adjusted, it will still need to be adjusted. This can be done by adding or removing the shims between the right or left bearing cover and box body. To prevent the adjusted bearing clearance from being destroyed, the total quantity of shims should not be changed. The number of shims being increased on the left side should be decreased on the right side, and vice versa.

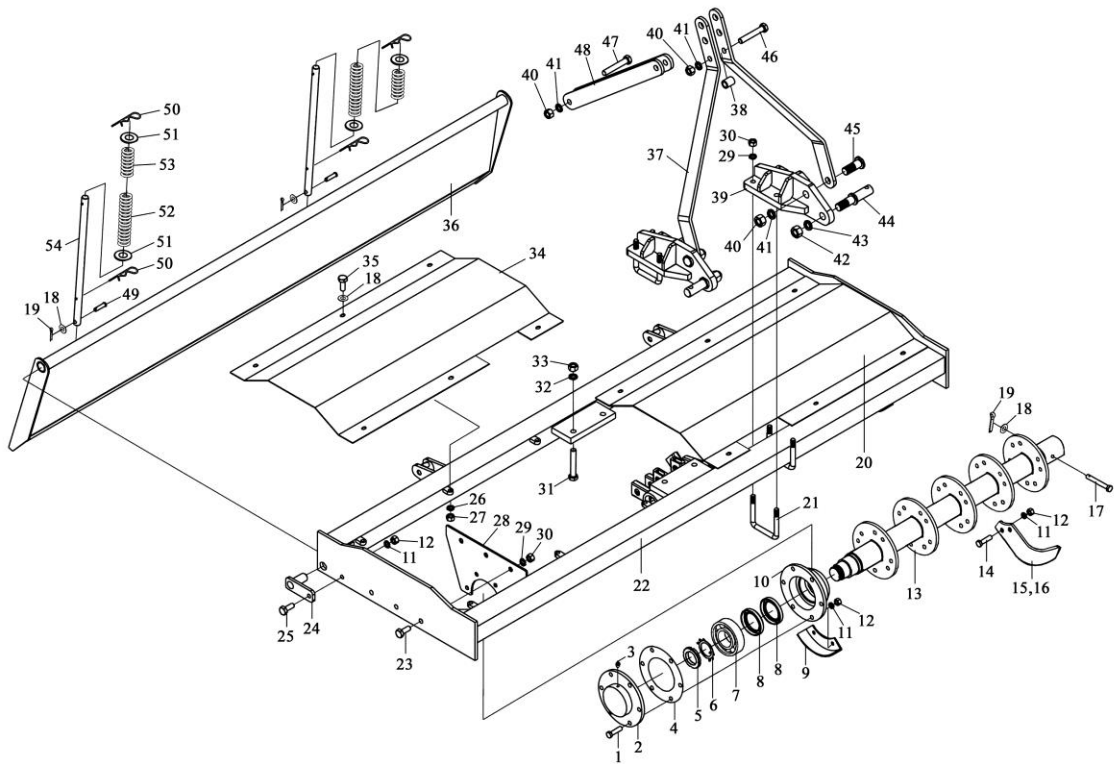


Figure 4 - Main Beam, Blade Shaft & Suspension Assembly

Table 4 - Main Beam, Blade Shaft, and Suspension Assembly Parts List

Reference Number	Part Number	Name	Qty.
1	GB/T5783	Bolt M12x45	12
2	1GQN-180.202	Bearing cover II	2
3	GB/T7940.1	Grease nipple M10x1	2
4	1GQN-180.203	Gasket	2
5	GB/T812	Round nut M45x1.5	2
6	GB/T858	Stop washer 45	2
7	GB/T276	Bearing 6210	2
8	GB/T9877.1	Oil seal FB80x60x12	4
9	1GQN-180.021	Antifriction plate	2
10	1GQN-180.201	Bearing cover I	2
11	GB/T93	Spring washer 12	64
12	GB/T6170	Nut M12	64
13	1GQN-180.205N	Blade shaft	2

Reference Number	Part Number	Name	Qty.
14	GB/T5783	Bolt M12x30	40
15	GB/T5669-1995	Left JF1801 Tilling Blade	20
16	GB/T5669-1995	Right JF1801 tiller blade	20
17	1GQN-180.314	Cotter pin	2
18	GB/T97.1	Washer 10	16
19	GB/T91	Pin 3x30	4
20	1GQN-180.315B	Hood(right)	1
21	1GQN-180.408	U type bolt	4
22	1GQN-180.032	Main beam	1
23	GB/T5783	Bolt M14x35	6
24	1GQN-180.031	Tail connecting plate	2
25	GB/T5783	Bolt M12x40	2
26	GB/T93	Spring washer 10	12
27	GB/T6170	Nut M10	12
28	1GQN-180.313	Side cover	2
29	GB/T93	Spring washer 14	6
30	GB/T6170	Nut M14	6
31	GB/T5782	Bolt M18x65	4
32	GB/T93	Spring washer 18	4
33	GB/T6170	Nut M18	4
34	1GQN-180.315A	Cover (left)	1
35	GB/T5783	Bolt M10x20	12
36	1GQN-180.030	Tail plate	1
37	1GQN-180.401	Support plate	2
38	1GQN-180.409	Spacer bush	1
39	1GQN-180.041	Suspension plate	2
40	GB/T6170	Nut M20	4
41	GB/T93	Spring washer 20	4
42	GB/T6170	Nut M24	2
43	GB/T93	Spring washer 24	2
44	1GQN-180.403	Lower suspension pin	2
45	GB/T5783	Bolt M20x60	2
46	GB/T5782	Bolt M20x120	1

Reference Number	Part Number	Name	Qty.
47	GB/T5782	Bolt M20×100	1
48	1GQN-180.402	Pull rod	2
49	1GQN-180.301	Axis pin	2
50	1GQN-180.330	Pin	4
51	GB/T97.1	Washer 20	4
52	1GQN-180.303	Spring II	2
53	1GQN-180.304	Spring I	2
54	1GQN-180.302	Adjusting pull rod	2

Before Each Use

⚠ CAUTION

Oil is NOT included. Before using, add oil to the central gear box. Consult owner's manual for lubricating and operating instructions.

Operating Checklist

Hazard control and accident prevention are dependent upon the awareness, concern, prudence, and proper training involved in the operation, transport, storage, and maintenance of the Rotary Tiller. Therefore, it is absolutely essential that no one operates the Rotary Tiller without first having read, fully understood, and become totally familiar with this Owner's Manual.

Make sure the operator has paid particular attention to:

- Important Safety Information
- Assembly Instructions
- Adjustments
- Operating Instructions
- Maintenance

Pre-Field Inspection

Make the following inspections with the tiller attached to a tractor:

1. Fully inspect the tractor safety equipment to make sure it is in good working condition.
2. Inspect the tiller for loose bolts and nuts. Tighten all loose bolts and nuts.
3. Carefully raise and lower the implement to ensure the drawbar, tires, and other equipment on the tractor do not contact the tiller frame.
4. Check for and remove foreign objects wrapped around the spike teeth and frame. Block the tiller up before removing any objects.
5. Check for missing, bent, broken, and worn spike teeth. Replace any spike teeth as necessary.
6. Verify that the tiller is level from left to right and front to back.

Field Inspection

Do not use the tiller in wet conditions. Wet material will build up causing the tiller to lose effectiveness.

1. Thoroughly inspect the area to be tilled for ditches, drop-offs, stumps, post, rocks, and other unforeseen objects that the tiller or the tractor can snag on or hit. Mark all potential hazards before working the area.
2. Verify the tiller is set at the correct working height.
3. After the first 50 feet, stop and check to see that the tiller is adjusted properly.
4. Periodically turn the tractor off, remove the switch key, and check for foreign objects wrapped around the spike teeth and frame. Block the tiller up before removing objects.
5. Frequently inspect the tiller and tighten all loose bolts and nuts.

Operating Instructions

The structure, performance, and operation of a rotary tiller is different from that of a plough and tiller, so users should be familiar with its mechanism, structure characteristic, working principle, capability, and operate it correctly. To promote the highest efficiency of the rotary tiller, prevent the damage of the unit, and avoid personal injury, careful attention is needed.

Installing the Blades

To meet the agro technical need, different kinds of blade installation methods can result in different cultivation effects.

1. **Blade installation method.** One blade is on the left side and one is on the right side and are installed in the same section of the blade arbor. Blades installed on the same spire line have the same directions (all left side or all right side). Blades on the ends of the cutter shafts are bent toward the center of the shaft. Special attention needs to be given to the rotation direction of the plough cutter shaft to avoid the mis-installation of the blades. The edge of the blades should plough into the earth first or the parts of the machine will be damaged.
2. **Installation method for row cultivation.** When cultivating on the farmland with the same ploughing width and farmland width, the right bent blades should be installed on the left cutter arbor, and the left bent blades should be installed on right cutter arbor

Suspending the Tractor

The tiller is connected to the hydraulic hitch equipment of the tractor by a three-point suspension method:

1. Remove the tractor hook of the tractor and demount the shaft cover of the PTO.
2. Reverse the tractor aiming at the middle of the hitch frame, raise the draught link to a proper height, then reverse the tractor to the place where it is easy to be connected to left-right suspending pin of the tiller.
3. Install the left-side draught link first and the right-side draught link second (the diagonal draw bar on the right side has the length regulating mount to regulate the height of the right draught link). Insert the bolt.
4. Install the top link and insert the bolt.
5. Install the gimbals assembly and be aware of placing the two clamps in the middle at the same plane as illustrated in Figures 2-4. Once it is incorrectly installed, noises will be generated during operation, causing the subsequent damage of the cross shaft. After

successful installation of the gimbals assembly, the bolt should be inserted and the splint pin should be installed.

Starting the Tiller

1. Start the tractor and set at an idle RPM.
2. With the tiller lifted off the ground, engage the PTO, and slowly advance the throttle to 540 RPM. NOTE: The tiller is designed to run at 540 RPM ONLY.
3. Select a low gear on the tractor and begin to move forward. The tractor ground speed is to be controlled by the gear selector ONLY and not the engine's speed. Travelling at a fast ground speed while using the tiller could damage the unit. As the tractor moves forward, slowly lower the tiller. Allow the tiller tines to gradually engage the ground.
4. The tiller is designed to be operated in a forward direction ONLY. Running in reverse could damage it and the tractor, which will void the tiller's warranty. Adjust the back plate with the regulating chain until the desired mulching effect is achieved. NOTE: NEVER ATTEMPT TO ADJUST THE TILLER WHILE THE TRACTOR IS RUNNING.
5. Do NOT allow the tractor's engine or the tiller to bog down or stall. This causes undue wear and tear on the tiller and the tractor. If this continues to happen, reduce the ground speed and raise the tilling depth of the tiller. Never attempt to remove objects from the rotary bar until the tractor has been shut down and the tiller tines have completely stopped.

Adjusting the Tiller Before Field Use

Several adjustments should be taken before the tiller is used in the field:

1. Left / right horizontal adjustment of the tiller. With the tractor parked on flat land, lower the tiller until the blade edges are off the ground. Check that all the blades are the same distance off the ground. If they are not, adjust the height using your tractor's hitch draught link adjustment so the left/right sides are the same distance from the ground.
2. Adjustment of gimbals assembly - front and back angle. Adjust the tiller to the required ploughing depth, and check the gimbals to make sure the drive shaft angles (gimbals) in the front and back are as straight as possible. Use the top link to adjust the angle of the drive shaft (gimbal) to be as straight as possible. The length of the sheath for the square shaft should be kept properly or it will damage the machine. Smaller angles are best. Adjust the tiller to the required ploughing depth.
3. Make sure the drive shafts are equal for proper operation. Smaller angles are best.
4. Adjusting the ploughing depth. (Suspending to the Tractor section.)
5. Raising height adjustment of the tiller. The drive shaft/gimbals are not suitable for working under large angles for extended periods of time. Make sure the drive shaft (gimbals) does not bind with the tiller in the raised position. Normally, an 8-inch raised angle (from the blade edge to the ground) is enough when turning the corner on a working field. Make sure it can turn the corner with the PTO on. When passing through channels and ditches, or needing to rise to a higher level on the road, turn the PTO off.

Using Advanced Speed

When using advanced speed, be sure to meet the needs of the broken soil and the flat, ditch bottom. This will ensure a higher cultivation quality and it will also aid in high-efficiency, high-quality, and lower-costs.

Under normal circumstances, the appropriate speed should be between 0.6-3 MPH. For compact or hardened soil conditions, use 0.6-1.5 MPH. For loose soil conditions, higher speeds of 1.5 – 3 MPH may be used.

Changing Direction and Reversing the Tiller

When turning or backing off, the tiller should be lifted up and the PTO should be shut off. Do not turn during cultivating, or it could cause damage to the blades and possible damage to the tiller.

Maintenance

Proper maintenance is important for keeping the tiller in good, working condition and to maintain a long service life.

Maintaining the Tiller

1. Provide maintenance after every 10 hours of operation.
2. Check and tighten all connecting nuts and bolts. Check whether the oil draining thread plug is loosening.
3. Check if there are missing or defective plug pins. Split pins in all positions and supplement them or replace with new ones, if necessary. Split pins should only be replaced with new split pins.
4. Check the gear oil level in the gear box. The gear oil should be filled to the level just overflowing the inspection hole. Tighten the oil inspection plug.
5. Check whether there are missing or defects of blades, or if loosened bolts need tightening. Supplement and tighten if necessary.
6. Check for an oil leak. Replace the oil sealing and paper gasket, if necessary.

First-Class Maintenance (after one working season)

1. Follow maintenance instructions.
2. Change the gear oil.
3. After each use, clean the debris from the tiller tines. Inspect for any damaged or worn parts and replace before the next use.
4. Check whether the blade is worn excessively. Replace it when necessary.
5. Check each bearing clearance and bevel gear clearance, and adjust when necessary (as above).

Second-Class Maintenance (after one year's cultivation)

1. Clean any oil, dirt, or grease off the tiller.
2. Drain the gear oil and disassemble to check. Pay special attention to the wearing of the idler gear bearing. The components need to be cleaned when assembling. New gearing oil should be filled to the specified level after assembling.
3. Disassemble and wash the blade arbor bearing and its chocks, replace the oil sealing, and fill grease when assembling.
4. Disassemble and wash the universal assembly joint. Clean and wash the needle of the cross shaft, replace it when worn.
5. Disassemble all blades for inspection. They must be replaced when worn or cracked.
6. Check if there is a crack on the blade holder of the blade arbor, if the hexagonal hole is damaged, or if the welding joint between blade holder and blade arbor pipe is cracked. Remove the damaged blade holder and weld a new blade holder when necessary.
7. Repair the machine case, drag the tiller, and recover to the original condition. If it's impossible to repair, replace it with a new one. If the tiller will be idle for long periods of time, the universal assembly joint should be disassembled and stored indoors. The tiller should be padded with the blade away from the ground. Machine oil should be painted on the blade to prevent rusting. If

the splined shaft is stored in open air, it should be painted with grease in order to prevent any rusting. Non-working surfaces with scratched paint should also be re-painted to prevent rust. The tiller should be parked inside or covered outdoors.

Important: Be sure to check and tighten any loose bolts on the gear box before every use.

Troubleshooting

Problems	Causes	Solutions
Gimbals flying off	1. Detachment of positioning pin.	Install positioning pin.
	2. Retaining ring flew out.	Install check ring.
Driven output shaft broken	1. Square shaft detached and clamping fork continued running and broke.	Check the reason and change new oil.
	2. Gimbals stretch out and draw back; blocked.	
	3. Excessive angle; cross shaft is broken.	
	4. Lowered to ground forcefully.	
	5. Overload due to bent blade touched with big stone.	
	1. Right side and left side of the tiller is not in the same level, and cultivating depth is different.	Adjust the right side and left side of tiller in the same level.
	2. Right and left limit chain of the tractor is not adjusted properly.	Adjust limit chain properly in order to prevent tiller from swinging left and right.
Cross shaft is burned	1. Lack of oil in long term.	Pay attention to maintenance.
	2. Excessive angle; blocked.	Pay attention to angles during operation, make sure it's not blocked.
	1. Foreign material fell inside during assembly.	Take out foreign material.
	2. Bevel gear meshed badly.	Adjust according to specification.
	3. Bearing damaged.	Replace bearing.
	4. Excessive wearing of gear.	Replace or repair.
Blade shaft cannot be turned	1. Gear damaged and blocked.	Replace gear.
	2. Bearing damaged and blocked.	Replace bearing.
	3. Bevel gear has no side clearance.	Adjust clearance.
	4. Deformation of side plate.	Fix or replace side plate.
	5. Bending and deformation of blade shaft.	Fix or replace blade shaft.
	6. Grass and mud wrapped on blade shaft.	Remove grass and mud.

Problems	Causes	Solutions
Welding detached of blade holder	1. Poor welding quality.	Re-weld.
	2. Bent blade struck a rocky area.	Tiller is not suitable for rocky and rooted areas.
	3. Bent blade is installed inversely, increasing its resistance.	Install bent blade properly.
	4. Tiller is dropped forcefully, bending blade received excessive force.	Tiller should be lowered slowly during operation.
Bent blade is over bent or broken	1. Hit rocks.	Replace bent blade.
	2. Still operating during turnaround.	Should be lifted without operating during turnaround.
	3. Cracking occurred during heat treatment.	Replace it.
	4. Dropped to hard ground fiercely	Drop slowly.
Welding detached of blade holder	1. Poor welding quality	Re-weld.
	2. Bent blade hit a rocky rooted area.	Tiller is not suitable for rocky and rooted land.
	3. Bent blade is installed inversely, increasing its resistance.	Install bent blade properly.
	4. Tiller was dropped forcefully, bending blade received excessive force.	Tiller should be lowered slowly during operation.
Bent blade is over bent or broken	1. Hit rocks.	Replace bent blade.
	2. Still operating during turnaround.	Should be lifted without operation during turnaround.
	3. Crack occurred during heat treatment.	Replace it.
	4. Dropped to the ground forcefully.	Drop slowly.

Installation Position of Key Standard Parts and Lubricating Sites

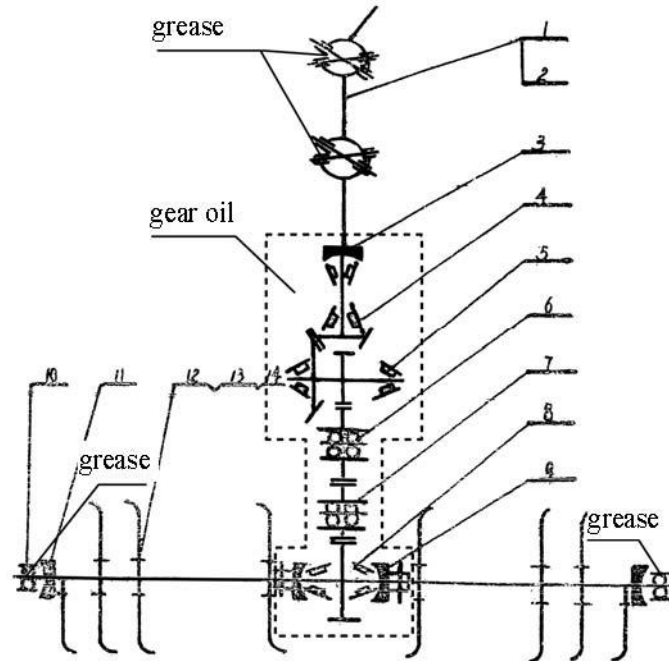


Figure 5 - Installation Positions of Key Standard Parts of Lubricating Positions

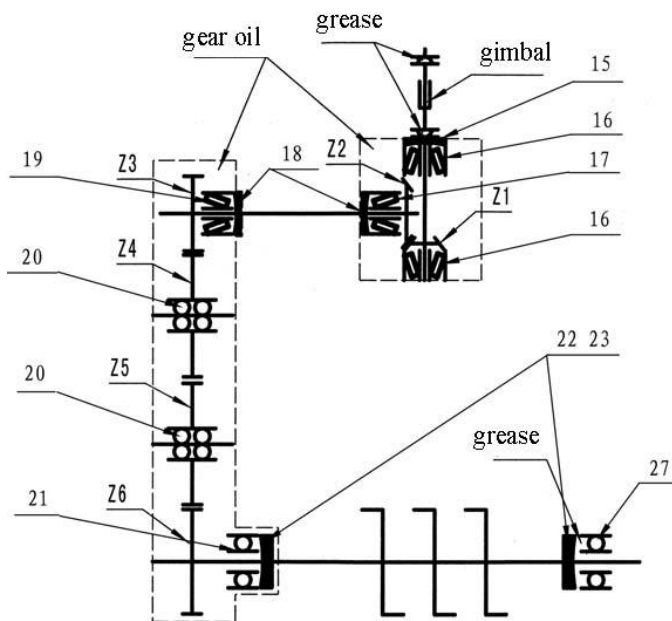


Figure 6 - Installation Positions of Key Standard Parts of Lubricating Positions

Installation Location of the Standard Parts

Ref.	Name	Specification	Installation location	Quantity
1	cross joint	131	gimbals assembly	2
2	check ring	GB/T893.1-1986	gimbals assembly	8
3	oil seal	FB62 x 40 x 12	the 1st shaft	1
4	bearing	30210	the 1st shaft	2
5	bearing	32208	the 2 nd shaft	2
6	bearing	4207	the 3rd shaft	2
7	bearing	4207	the 4th shaft	2
8	bearing	30210	cutter arbor spline shaft	2
9	oil seal	FB72 x 50 x 12	cutter arbor spline shaft	4
10	bearing	6210	shaft end of cutter arbor	2
11	oil seal	FB80 x 60 x 10	shaft end of cutter arbor	4
12	hexagonal bolt	M12 x30	tool post of cutter arbor	24
13	nut	M12	tool post of cutter arbor	24

Wearing Parts List

Ref.	Name	Specification	Installation location	Quantity
1	gimbals assembly	Set		1
2	oil seal	FB60 x 80 x 10	two ends of blade shaft	4
3	oil seal	FB35 x 55 x 12	transmission case	1
4	oil seal	FB40 x 62 x 5	transmission case	1
5	oil seal	FB45 x 65 x 12	left link arm end	1
6	oil seal	FB52 x 72 x 5	two ends of blade shaft	1
7	oil seal	FB50 x 72 x 12	two ends of blade shaft	4
8	O-ring	25 x 1.8	case body	2
9	bent blades (left, right)	JF1801		12 each
10	bearing	30210	1st shaft	2
11	bearing	32208	2nd shaft	2
12	bearing	4207	3rd shaft	2
13	bearing	4207	4th shaft	2
14	bearing	30210	blade arbor spline shaft	2
15	bearing	6210	end of blade arbor	2

Parts Shipped with Machine

Ref.	Name	Specification	Quantity
1	gimbals assembly	set	1
2	bolt	M12×30	24
3	nut	M12	24
4	plough body assembly	piece	1
5	left bent blade	JF1801	12
6	right bent blade	JF1801	12
7	manual		1
8	certificate of approval		1

Replacement Parts

- For replacement parts and technical questions, please call Customer Service at **1-800-222-5381**.
- Not all product components are available for replacement. The illustrations provided are a convenient reference to the location and position of parts in the assembly sequence.
- When ordering parts, the following information will be required: item description, item model number, item serial number/item lot date code, and the replacement part reference number.
- The distributor reserves the rights to make design changes and or improvements to product lines and manuals without notice.

Limited Warranty

Northern Tool and Equipment Company, Inc. ("We" or "Us") warrants to the original purchaser only ("You" or "Your") that the Nortrac product purchased will be free from material defects in both materials and workmanship, normal wear and tear excepted, for a period of one year from date of purchase. The foregoing warranty is valid only if the installation and use of the product is strictly in accordance with product instructions. There are no other warranties, express or implied, including the warranty of merchantability or fitness for a particular purpose. If the product does not comply with this limited warranty, Your sole and exclusive remedy is that We will, at our sole option and within a commercially reasonable time, either replace the product or product component without charge to You or refund the purchase price (less shipping). This limited warranty is not transferable.

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You must retain Your product purchase receipt to verify date of purchase and that You are the original purchaser. To make a warranty claim, contact Us at 1-800-222-5381, identify the product by make and model number, and follow the claim instructions that will be provided. The product and the purchase receipt must be provided to Us in order to process Your warranty claim. Any returned product that is replaced or refunded by Us becomes our property. You will be responsible for return shipping costs or costs related to Your return visit to a retail store.

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Product replacement or a refund of the purchase price is Your sole remedy under this limited warranty or any other warranty related to the product. We shall not be liable for: service or labor charges or damage to Your property incurred in removing or replacing the product; any damages, including, without limitation, damages to tangible personal property or personal injury, related to Your improper use, installation, or maintenance of the product or product component; or any indirect, incidental or consequential damages of any kind for any reason.

Assumption of Risk

You acknowledge and agree that any use of the product for any purpose other than the specified use(s) stated in the product instructions is at Your own risk.

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This limited warranty gives You specific legal rights, and You also may have other rights which vary from state to state. Some states do not allow limitations or exclusions on implied warranties or incidental or consequential damages, so the above limitations may not apply to You. This limited warranty is governed by the laws of the State of Minnesota, without regard to rules pertaining to conflicts of law. The state courts located in Dakota County, Minnesota shall have exclusive jurisdiction for any disputes relating to this warranty.



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