



 **RICHMOND**™

POWERTRAX®

No-Slip Traction System™



USER MANUAL



User Manual

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Introduction

Thank you for selecting a Powertrax® No-slip Traction System By Richmond to upgrade the performance of your vehicle. Our continuing success depends on satisfying our customers with exceptional products and service. We trust that you will find this finely engineered and manufactured product, and the support network which stands behind it, to be of the highest quality.

Powertrax traction systems were born and raised in the world of extreme off-roading and performance racing. Used worldwide in the most demanding applications, Powertrax products have established a proven history of superior operation and excellent durability. Today, the Powertrax No-Slip Traction System redefines power and performance yet again - for a whole new level of freedom, reliability, safety and fun.

The Powertrax No-Slip Traction System gives your vehicle the ability to get you just about anywhere. It gives two-wheel drive vehicles the traction power of most 4x4's, and delivers maximum power to four-wheel drives. Designed to handle severe on-road and extreme off-road conditions, it also unleashes the power of performance vehicles by delivering ultimate traction for maximum acceleration. Unwanted tire spin is eliminated. Operation is smooth, quiet, and fully automatic. And it uses space saving Zytranium® construction for highest strength and durability.

This manual contains important safety information, special instructions, and noteworthy recommendations intended to help provide trouble-free operation. Thoroughly read the manual before installation and be sure to understand all precautions. Traction output and resulting handling characteristics of your vehicle will be modified by installation. Install the Powertrax No-Slip Traction System only if you accept all the characteristics of this product; otherwise return it to your point of purchase for a refund.

Always keep this manual within the vehicle and readily available to all drivers. Ensure that they read this manual before operating the vehicle. Drive carefully and use caution under all on-road and off-road conditions.

For support assistance contact Powertrax By Richmond at 864-843-9275; by email at switchboard@richmondgear.com; fax to 864-843-1276; or write to Powertrax By Richmond 1208 Old Norris Road, P.O. Box 238, Liberty, SC 29657, Attention customer Support. We also invite you to visit our website at www.powertrax.com.



Description

The Powertrax No-Slip Traction System automatically distributes engine power to the drive wheels for maximum traction output while allowing full differentiation for turning. It eliminates the affliction of standard “open” differentials that direct all engine power to a slipping wheel. It also provides superior traction output over “limited-slip” types of traction adding differentials that still direct most of the engine power to a slipping wheel, the dreaded result of becoming stuck often occurs. For high performance applications that constantly strive to gain horsepower, losing precious power to a slipping wheel is unacceptable. The Powertrax No-Slip Traction System gets rid of unwanted tire spin and delivers optimum traction performance.

The Powertrax No-Slip Traction System is ideal for rear axle installations in 2-wheel or 4-wheel drive vehicles, or in rear-wheel drive cars and vans. The Powertrax No-Slip Traction system is not recommended for installation in front wheel (only) drive vehicles. Front axle installation in full-time 4-wheel drive vehicles is also discouraged. See the Application section for more information.

The Powertrax No-Slip Traction System can be easily installed in your existing differential case without requiring special tools or setup equipment. Only basic mechanical skills are required. The Installation Guide accompanying this User Manual provides easy to follow, step-by-step, graphic instructions to help make the installation straightforward. Be sure to follow all instructions and heed all precautions. The ease of installation will vary depending on your differential type. The level of complexity is noted on the bottom of the box. Review the Installation Guide before starting to become comfortable with the procedure.

Note: There are many different models of the Powertrax No-Slip Traction System and each model is designed to fit a particular make and type of differential. On the front of the box there is a label that identifies the specific type of differential it will fit. Because vehicles are manufactured using different differentials, it is important that you check to be sure you have the correct Powertrax No-Slip Traction System model before beginning the installation. If you are unsure, your dealership or independent mechanic should be able to help confirm the exact differential in your vehicle, or call Richmond for application assistance.

The Powertrax No-Slip Traction System is designed to be compatible with your vehicle's systems including Anti-lock Brake Systems (ABS). It works at all vehicle speeds and turning radii, is transparent to your differential's specific gear ratio, and uses standard differential lubricant recommended by the manufacturer of your vehicle. No additives are necessary and no special maintenance is required.

Gas mileage with the Powertrax No-Slip Traction System is also attractive. It improves when the Powertrax No-Slip Traction System upgrades a "limited slip" differential, and remains virtually unchanged upon upgrading an "open" differential. For those who install a Powertrax No-Slip Traction System in a 2-wheel drive vehicle to achieve the traction of a 4-wheel drive vehicle, they avoid the maintenance costs of 4x4 ownership, save with lower insurance rates and enjoy significantly better gas mileage.

How It Works

Page 2 of the Installation Guide illustrates your type of existing differential and identifies its relevant parts. Page 3 of the Installation Guide shows an exploded view of the Powertrax No-Slip Traction System and identifies its components. It is designed to fit exactly into your existing differential without any machining of parts. If, for whatever reason, you wish to return the differential back to its original configuration, the Powertrax No-Slip Traction System can be easily removed and the original parts reinstalled. Therefore, we recommend that you retain all original differential parts.

Installation of the Powertrax No-Slip Traction system should proceed easily. If parts appear not to fit properly, do not force or modify them in any way. Check again that you have the right Powertrax No-Slip Traction System model for your differential and be sure that you are following the installation instructions correctly. If necessary, call Richmond for assistance. Do not attempt to drive your vehicle if the entire installation process did not proceed as described. By replacing the existing parts in your “differential case” with the Powertrax No-Slip Traction System, your differential’s power distribution characteristics will be upgraded for maximum traction output. The affliction caused by “spider” and “side gears” that direct power to a slipping wheel is totally eliminated.

The “pinion gear” carries the engine power to the “ring gear” which is attached to the differential case. The rotating differential case transfers the power to the “axle shafts” through the components within the differential case. The existing “pinion shaft” is replaced with a high strength Zytanium® pinion shaft. It transfers the power from the differential case to the “drivers.” The drivers eliminate the existing “spider gears.” Both drivers are connected to mating “couplers” which join onto the axle shaft splines. The couplers replace the existing “side gears.” The Powertrax No-Slip Traction System obsoletes any friction clutches and related parts that may also accompany the spider and side gears.

“Saddle springs” inserted in the driver saddles press upon the pinion shaft and give the drivers an outward pressure onto the couplers. “Active Spacers” snug the pinion shaft and communicate its position to the “synchro ring” mechanisms assembled within the couplers. The active spacers fit within the drivers and onto the couplers providing on-axis positioning.

The saddle springs act to keep the driver saddles centered on the pinion shaft and provide damping as power is applied through the pinion shaft onto the drivers. As the differential case rotates, the pinion shaft advances with it, compressing the saddle springs until the pinion shaft contacts the drivers saddles at a positive power transfer angle. Power is then directed from the drivers to the couplers through positive engagement tooth profiles on the driver and coupler faces that mesh to transfer full power to the drive wheels. When the vehicle is driven straight, all the power is delivered to both wheels through both sets of drivers and couplers.

In a turn, the outside wheel in effect “accelerates” ahead of the inside wheel to compensate for the difference in the turning radius distance of the inner versus the outer wheels. As the outer wheel rotates faster, because it must travel farther than the inner wheel, it advances the coupler from the driver and relaxes the power distributed to the outside wheel. As the coupler continues to advance, it ramps the driver to disengage from the coupler. The synchro ring continues to turn with the coupler until it is stopped by the active spacer “paddle.” the synchro ring is then positioned to prevent re-engagement of the driver and coupler until the turn is complete. The outside wheel in the turn continues to rotate freely with power being delivered to the inside wheel. When turning concludes, the synchro mechanism is reset and power is reapplied to both driving wheels. Full wheel differentiation is thereby provided automatically and identically for right and left turns. Operation is precise, smooth and quiet.

How It Works (continued)

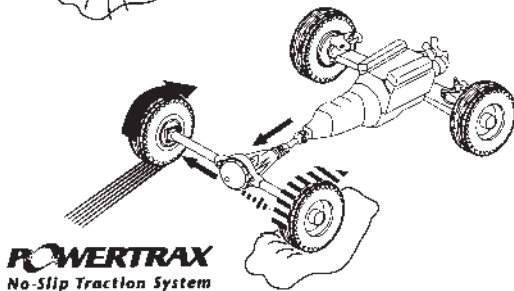
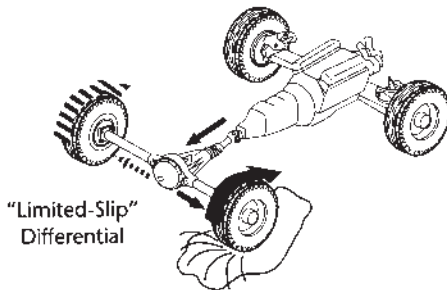
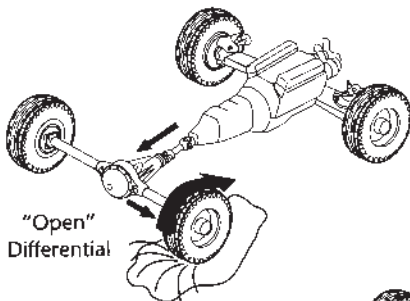
When alternating from drive — to coast — to drive while turning, power is redirected from the inner wheel (drive) to the outer wheel (coast), and back again. When alternating from drive — to coast — to drive while driving straight, power remains directed to both wheels. Engine braking is provided through both wheels when the vehicle is proceeding straight, and through the engaged wheel when turning. The Powertrax No-Slip Traction System is bi-directional and operates identically while driving either forward or in reverse.

Should a wheel lose traction, the Powertrax No-Slip Traction System engages both sets of drivers and couplers to transfer power to both axles. This eliminates unwanted wheel spin and provides optimum traction performance.

Performance

The Powertrax No-Slip Traction System will upgrade your vehicle for maximum traction output under all conditions. The exceptional traction performance you will enjoy does require adaptation to its overall characteristics. Be sure that you accept all operating and driving characteristics before installing the Powertrax No-Slip Traction System.

Should a wheel begin to slip due to poor tire-surface contact, the Powertrax No-Slip traction system will immediately transfer more torque to the other wheel to maintain optimum traction. The drawings below illustrate the superior output of the Powertrax No-Slip Traction System compared to typical "open" differentials and "limited-slip" types of traction adding differentials.




Performance (continued)

As shown on the previous page, when a wheel loses traction, an “open” differential directs all engine power to the slipping wheel, and virtually no power is applied to the non-slipping wheel. The “limited-slip” differential also directs most of the engine power to the slipping wheel, but does apply a minimal amount of power to the non-slipping wheel. The amount of torque transferred decays as the friction clutches inside the “limited-slip” differential burn up or wear out. Both the “open” and “limited-slip” differentials can cause the slipping wheel to spin up wildly, worsening the vehicle’s condition and making it more difficult to gain traction. The Powertrax No-Slip Traction System directs engine power to the non-slipping wheel to provide the vehicle with the traction required. It transfers minimal power to the slipping wheel and eliminates unwanted wheel spin-up. Traction output is optimized.

Wheel spin-up and abrupt stoppage can cause severe driveline trauma. This occurs easily with “open” and “limited-slip” differentials the rush power to a wheel that is slipping or becomes suspended in mid air, even momentarily. When abruptly stopped by the wheel re-connecting with a high traction surface, the driveline attempts to absorb the extreme shock. Damage to driveline components can occur. Axle shafts may flex, bend or break. It is not uncommon for vehicles with bent axles or damaged gears to continue to be operated by unknowing drivers. Breakage of axles, gears or other driveline components is extremely dangerous, and the vehicle should not be driven. The Powertrax No-Slip Traction System gets rid of troublesome wheel spin-up and improves driveline durability and reliability.

Be aware that excessive power can break any driveline component. Vehicle owners that choose to increase engine horsepower, install larger diameter tires or make other vehicle modifications without increasing driveline capability are especially subject to driveline failure. The Powertrax No-Slip Traction System is designed for reliable and durable use within the specifications intended for the specific size and

make of the vehicle's original differential. Vehicle modifications that tax the driveline may adversely affect the proper operation of the Powertrax No-Slip Traction System. This would determine that the Powertrax No-Slip Traction System is not being operated under normal use and service, and it should not be utilized in this manner. Be sure to read the Warranty section of this User Manual. If an axle or associated component breaks in a vehicle equipped with a Powertrax No-Slip Traction System, all torque will be transferred to the other wheel. This could cause the vehicle to quickly pull toward the side of the break. Should this occur, extreme  should be exercised! **DO NOT continue operation of the vehicle with any broken or damaged driveline components.**

As previously discussed in the How It Works section, either drive wheel or both wheels will be powered while driving. This depends on whether the vehicle is being driven straight, cornering or slightly turning. Small turning movements will cause the appropriate side of the Powertrax No-Slip Traction System to disengage and re-engage. Should you make sudden throttle changes or shift gears, you may feel a slight transfer of torque from one wheel to the other until the torque equalizes. Unequal tire diameters may cause the Powertrax No-Slip Traction System to equate the resulting difference in wheel rotation to a slight turning condition. Be sure both tires are the same diameter and are properly inflated. Do not use any "mini-spare tires" with the Powertrax No-Slip Traction System, even temporarily.

As is also the case with other types of traction adding differentials, driving characteristics with the Powertrax No-Slip Traction System will differ from conventional differentials and will vary based on your specific vehicle type and driveline configuration. You may feel torque transfer from both rear wheels to one, and back again. Should you wish to minimize the effects of torque transfer, take turns under less throttle, and make throttle changes more gradually to allow for the smoothest possible operation.

Performance (continued)

When you power through a turn, you may feel a degree of “under-steer,” the tendency to straighten the vehicle’s path of travel due to torque transfer to the inner wheel. Sudden throttle changes during turns will accentuate “under-steer,” especially on slippery or unstable surfaces. Be sure to maintain caution and drive carefully under all conditions.

Should a slippery or unstable surface be encountered, it will help to decelerate by slowing the vehicle with the engine and only applying the brakes very carefully and only if necessary. Maintain driving at a slow and safe speed. Smoother throttle operation, especially while cornering, will help minimize any adverse handling characteristics. Avoid unnecessary sharp turns or other abrupt maneuvers that could cause loss of control. Operate in low gear when coasting downhill, especially into a turn since braking capacity is usually diminished under this condition. When parking, be sure to always use the emergency (parking) brake and lock the transmission in “Park” if an automatic or 1st gear in the case of manual standard shift.

You may notice that your vehicle’s driveline “backlash” may increase slightly with the Powertrax No-Slip Traction System. The minor delay you experience in your vehicle’s response due to driveline “backlash,” especially when coasting and quickly depressing the throttle, may also increase slightly. The additional “backlash” is softened by damping springs within the Powertrax No-Slip Traction System and the overall effect may be minimal.

Performance (continued)

Over one-hundred Powertrax No-Slip Traction System models are available or planned to be released to fit differentials used in a myriad of vehicles totaling several hundreds of makes and models. Powertrax publishes an Application Guide to assist in the selection of the correct Powertrax No-Slip Traction System for your vehicle. Powertrax offers telephone and on-line applications assistance. Contact Powertrax, an authorized sales distributor, or visit our web site www.powertrax.com for up to date applications, availability and ordering information.

The Powertrax No-Slip Traction System is ideal for rear axle installations in 2-wheel or 4-wheel drive vehicles, or in rear-wheel drive cars and vans. It is not recommended that the Powertrax No-Slip Traction System be installed in front wheel (only) drive vehicles. Front axle installation in full-time 4-wheel drive vehicles is also discouraged. Front axle installation in user selectable “part-time” 4-wheel drive vehicles is fine, but special vehicle configurations and usage limitations must be adhered to without exception. The Powertrax No-Slip Traction System must only be installed in the front axle of 4-wheel drive vehicles that are equipped with front axle disconnect or with unlocking hubs on the front axles. A Powertrax No-Slip Traction System installed in the front axle should not be operated on the highway with the front hubs locked and 4-wheel drive engaged. We recommend that a Powertrax No-Slip Traction System always be installed in the rear axle first before adding one to the front axle. To summarize, the Powertrax No-Slip Traction System is ideal for all rear axle installations for superior traction, and will deliver awesome traction when installed in the rear and front axles of 4-wheel drive vehicles equipped with front axle disconnect or unlocking hubs on the front axles.

When considering the use of the Powertrax No-Slip Traction System it is important to consider and apply key vehicle parameters such as loading power requirements, and other factors.

Application (continued)

The Powertrax No-Slip Traction System does not increase the load carrying capacity or payload rating of a vehicle. Any increase in the vehicle's engine, tire size, weight, customized suspension or other modifications may disallow use of a Powertrax No-Slip Traction System. Please read the Warranty section. For questions contact Powertrax for assistance. Applications not specifically listed in our published Application Guide of unmodified vehicles requires Powertrax to confirm and approve the application for installation.

Properly installed in the correct application, the Powertrax No-Slip Traction System is designed to provide superior traction performance with excellent durability and reliability.

Considerations

The Powertrax No-Slip Traction System is an advanced, state-of-the-art multi-function traction system that provides continuous and automatic uninterrupted torque output, torque biasing and differentiation. Its ability to automatically respond to variable driving conditions not only provides better traction, it also enhances the general performance and safety of the vehicle. The Powertrax No-Slip Traction System is designed to provide excellent traction output under all conditions.


Traction, the friction between the driven tires and the road or terrain surface, converts the engine's horsepower into forward motion. Efficient use of traction is achieved when 100% of the engine's power is utilized to propel the vehicle. The Powertrax No-Slip Traction System effectively manages the engine's output, throughout the power curve, to continuously deliver the most horsepower to the road, maintaining the ideal balance between power and traction. The system provides a marked improvement in total tractive effort as compared to "open" or conventional "limited-slip" differentials.

If either wheel begins to slip, due to poor tire-surface contact, the Powertrax No-Slip Traction System will immediately transfer more torque to the other wheel, thereby maintaining optimum traction and providing better handling, increased acceleration and an improved margin of safety.

Some items of special consideration:

- Payload - the Powertrax No-Slip Traction System increases the effective tractive ability of the vehicle, but does not increase the load carrying capacity or payload rating of the vehicle. Be sure to distribute the payload evenly side-to-side without exceeding the vehicle's rated payload capacity
- Steering - The affect on steering produced by a Powertrax No-Slip Traction System may contribute to a degree of "under-steer" when turning under power. Sudden throttle changes during turns will accentuate "under-steer," especially on slippery or unstable surfaces. Be sure to maintain caution and drive carefully under all conditions.
- Tire Chirp - During cornering, the faster outside wheel is freewheeling and the slower inside wheel is receiving engine power. The vehicle will tend to lean towards the outside of the turn thereby lessening the effective vehicle weight on the inner wheel. Under excessive throttle, the inside wheel may "Chirp" on the pavement if it momentarily loses traction and spins to catch up with the outside wheel to regain traction. This action may repeat in the course of a powered turn if excessive throttle is maintained. This condition does not result from tire scuffing, due to dragging, as with some traction adding differentials. Applying less throttle will reduce or eliminate this symptom.

Considerations (continued)

- Clunk - Most drivelines may produce a “clunk” due to the driveline’s inherent backlash when stepping on and off the gas. The Powertrax No-Slip Traction System may make this characteristic more prominent in some vehicles. Standard shift vehicles usually exhibit this condition more than automatic shift vehicles.
- Side-Slip - Use extreme caution when accelerating or decelerating on slippery or unstable surfaces. Vehicles equipped with traction adding differentials are inherently more sensitive to sideslip than vehicles equipped with conventional differentials. Stability can be improved if sideslip occurs by decelerating. : Do not apply the brake or brake very carefully if necessary using extreme caution. Loss of vehicle control may result.
- Driveline Windup - When a vehicle turns, each wheel follows a slightly different path causing each wheel to turn at a slightly different rate. In many “selectable” 4-wheel drive vehicles that have no compensating “center transfer cases,” engaging the front axles will cause the wheels to try to “slip” a little as the vehicle is turning to equalize differences in wheel rotations. On poor traction surfaces, such as dirt, etc., this action occurs relatively unnoticed. However, hard traction surfaces fights the driveline’s attempt to equalize. As a result, the driveline can become highly stressed and may bind up or even break. Manufacturers of these type of vehicles require that the vehicle not be driven on hard surfaces in 4-wheel drive mode with the front axles engaged. Full-time 4-wheel drive vehicles and “selectable” 4-wheel drive vehicles with compensating “center differentials” mitigate this condition. Using the Powertrax No-Slip Traction System in these vehicles will not reduce driveline windup. The vehicle owner must conform to the operation recommendations of the vehicle manufacturer.

- Off-road Operation - Should you operate your vehicle off-road, be sure to become familiar with the extreme traction capabilities of the Powertrax No-Slip Traction System. Take it to an off-road area in which several types of terrain are present and try each one carefully to acquaint yourself with how well your vehicle performs. Drive slowly. Do not attempt to put it through its paces prior to becoming thoroughly familiar with its capabilities and overall characteristics. Be sure to exercise caution at all times.

Safety in the automotive industry is paramount and of utmost focus and attention. You have purchased a Powertrax No-Slip Traction System that is state-of-the-art in design, engineering and manufacturing. If used properly, it will provide exceptional traction and added performance to your vehicle. All drivers of your vehicle should read this User Manual and be familiar with the characteristics of the Powertrax No-Slip Traction System before operating the vehicle. The extra power delivery and improved acceleration can make an important difference in vehicle maneuvers, especially when excellent traction control and maximum horsepower are required. The Powertrax No-Slip Traction System is designed to provide automatic response to increase the margin of safety under poor traction situations. It should provide a more stable and controllable driving platform under most conditions. Always be careful, use good judgment, and drive safely.

Maintenance

Note: Optimum operation of the Powertrax No-Slip Traction System is achieved after a nominal 50-mile break in period. The engagement and disengagement characteristics of the Powertrax No-Slip Traction System may exhibit slight roughness immediately after installation. Normal use of the vehicle is recommended during the break in period, after which operation of the Powertrax No-Slip Traction System will be even smoother and quieter.

Your Powertrax No-Slip Traction System is engineered to provide you with trouble-free operation. Follow the lubrication, service and inspection procedures recommended by your vehicle manufacturer. The Powertrax No-Slip Traction System is designed to operate with those lubricants recommended by the vehicle and/or axle manufacturer. No special lubricant is needed. Use the gear lubricant specified, either synthetic or non-synthetic, which is necessary for proper lubrication of all other differential components. As a general guideline, in warmer climates consider lubrication weights ranging from 85 to 140. In colder climates, consider lubrication weights ranging from 75 to 90. For very cold weather applications, use the lightest oil the axle manufacturer will allow. Lower viscosities may slightly increase the audibility of operation. Very high viscosity lubricants or very cold lubricants can cause the parts to move more slowly than normal and result in sluggish engagement and disengagement. When the lubricant is very cold, we suggest that you drive the vehicle slowly for a few miles to warm up the oil, especially before subjecting it to difficult off-road maneuvers.

Should you suspect any difficulty with the Powertrax No-Slip Traction System or other driveline component, especially if any unusual noises or jerking motions begin to occur, do not continue to operate the vehicle. Refer to this User Manual and review the Troubleshooting section. It may be necessary to remove the Powertrax No-Slip Traction System and inspect it for excessively worn, loose or broken components.

Disassemble the Powertrax No-Slip Traction System for inspection by reversing the installation procedure in the Installation Guide. Be sure not to use heat to disassemble any axle components. To do so can adversely effect the properties of materials and weaken or distort components.

Bent axles, more easily damaged prior to installation of the Powertrax No-Slip Traction System, are not uncommon and may be difficult to visually detect. The Powertrax No-Slip Traction System is less forgiving of a bent axle. It is advisable to closely inspect the straightness of the axles during installation. A bent axle may cause excessive wear of the Powertrax No-Slip Traction System components which could lead to a malfunction.

During installation, be sure to inspect the “differential case” (sometimes referred to as the “carrier”), the “ring” and “pinion gears” and the “side gear” “thrust washers.” It is unusual for these to be excessively worn or damaged, however, a thorough inspection is highly recommended to ensure the overall integrity of the differential. Any worn or damaged component should be replaced. Do not drive the vehicle with any damaged driveline components.

Thoroughly test your new Powertrax No-Slip Traction System after installation by following the test procedures in the Installation Guide. Should you wish to periodically check for proper operation, test to verify that both wheels are driving properly and differentiating as required. Make this test under load, so that engine torque is applied through the Powertrax No-Slip Traction System with the wheels on the ground. Select a flat surface with good traction and drive the vehicle in right and left circles making sure that the outside wheel is free to overrun and that the outside tire does not scuff. Drive safely! Perform this test in forward and reverse. You may wish to periodically repeat the test instructions in the Installation Guide. Any anomaly in the test should be thoroughly investigated and corrected prior to placing the vehicle back into serv-

Maintenance (continued)

After proper installation, your Powertrax No-Slip traction System should not require any special ongoing service, other than that which is normally performed on the differential as recommended by the manufacturer. Use the recommended lubricant and replace it at the proper intervals.

The following comment involves the whole power train and we offer it to help assure excellent operation of your vehicle equipped with the Powertrax No-Slip Traction System.

- Sustained driving substantially increases the temperature of the axle housing, transmission, transfer case, and other driveline related components. If suddenly plunged into cold water, like when crossing a stream, rapid cooling can produce a vacuum. If the unit, such as the axle housing, remains submerged, water can be sucked in past the oil seals, and into the gear oil. To prevent rust and corrosion, it is important to drain the unit and remove the water as soon as possible. The water may separate from the oil and settle on the bottom. If the oil and water have emulsified (mixed on a microscopic level), high temperatures may not drive the water out as readily as before mixing. Also, the oil-and-water mixture will not lubricate well, causing corrosion and accelerating wear. Replace with fresh lubricant as soon as possible. A similar high-temperature-then-vacuum situation can occur with U-joints. After submersion, purge out any water as soon as possible and re-grease.

Adjustment or alterations are not needed and should not be made to the Powertrax No-Slip Traction System. Refer to the vehicle and/or axle manufacturer's instructions to make adjustments to other components. If making brake adjustments, both wheels connected to the Powertrax No-Slip Traction System will need to be free to rotate.

Note: Axles equipped with the Powertrax No-Slip Traction System deliver power to both wheels, even when only one wheel is on the ground. A non-raised wheel will receive power and propel the vehicle. Do not apply power during servicing or changing tires. Before attempting to raise any wheels, be sure to safely block the vehicle first. Only then, and only when necessary, should the transmission be placed in neutral and the emergency brake released.

Troubleshooting


This section is intended to serve as a helpful guide to identify potential problem sources and possible causes. It may assist owners, if and when the need to troubleshoot arises. It is not a complete listing of all possibilities and should not be relied upon as such.

SYMPTOM	POSSIBLE CAUSES															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Driveline noise excessive	√	√		√	√	√	√		√				√	√		
Grinding or other noises	√	√	√		√	√								√		
Tire wear excessive		√					√	√	√	√						√
"Clicking" sound while driving straight				√					√					√		
Will not differentiate in turns or binding action occurs.	√	√	√				√							√		
Axle shaft breakage; tire scuffing; studs shearing			√		√											√
Annoying "cycling" of driveline with standard shift vehicles in short radius turns								√					√			
Steering difficulty experienced; vehicle exhibits tendency to go straight when turning or pulls in either direction when going straight			√	√	√		√	√	√							√
Difficult turning vehicle from standing start												√				
Vehicle tendency to "fishtale" or sideslip on icy or slippery surfaces											√					√
Backlash in driveline excessive; vehicle surges during turns or engine lugs	√	√			√	√							√			
Erratic operation, failure or premature wear of drive line components	√	√		√	√	√								√	√	
Sluggish engagement and reengagement operation of Powertrax No-Slip Traction System																√

Possible causes:

1. Incorrect or improper application. Check that Powertrax No-Slip Traction System model is correct. Review application guidelines. Verify that application conforms to all recommendations and precautions. If required, obtain assistance to confirm. Correct any application error before placing vehicle in service.
2. Improper installation; defective differential. Correctly follow installation and test procedures. Repair or replace any defective components as necessary. Do not operate your vehicle if the Powertrax No-Slip Traction System installation does not proceed as specified or fails the test procedures.
3. Broken axle shaft. Replace immediately! Although it may be possible to apply power to the wheel with the non-broken axle, this is absolutely not recommended. Driving conditions are unsafe and serious damage can occur. Do not drive your vehicle!
4. Axle centerlines misaligned or axle housing bent. Replace or straighten bent axle housing; realign if off center.
5. Axle driveline components worn or defective. Check the condition of all driveline or axle components, including seals, bearings, ring & pinion gears, axle shafts, and other components. Replace if worn or defective and repair any condition that may have contributed to premature component failure.
6. Ring & pinion adjustments incorrect. Ensure ring and pinion gears are adjusted properly. Note: Special calibration equipment and expertise is usually required for the precise adjustments of ring and pinion gears to be made correctly. Inspect and replace any worn components.

Troubleshooting (continued)

7. Break in period; operation synchronization. Minor “metallic” sounds due to driveline “backlash” factors and meshing alignments of power carrying components might be emitted occasionally, but should not be excessive. More noises may be experienced during the first 50-miles of use after installation of Powertrax No-Slip Traction System (break-in-period). If frequent or excessive, a problem might exist that would require correction before operating the vehicle.
8. Short turning radius; large steering angle. During sharp turns, vehicles that have high turning angles may surge, causing steering difficulty and tire wear. Reduce turning angle and decelerate.
9. Drive wheel rolling-radii unequal. If the rolling-radii of the drive tires are unequal, the smaller rolling-radius tire will turn faster and will overrun the other tire, causing the other tire to be the primary driving wheel. Tires with equal rolling-radii will correct this condition. Either adjust tire pressures or replace tires as required.
10. Wheel alignment incorrect. Realign wheels to correct problem.
11. Poor traction surface; high crown in road. Vehicles have tendency to “fishtail” or sideslip on slippery and icy roads, especially sloping towards curve. This condition is normally more pronounced with a traction adding differential than with a conventional “open” differential. Stability can be better retained, if sideslip occurs, by decelerating.  :Do not apply the brake or brake very carefully only if necessary using extreme caution. Loss of vehicle control may result.
12. Steering cylinder undersized or inadequate pressure; angle of articulation excessive. Requires correction for safe driving.

13. Standard shift vehicle with “loose” driveline syndrome. Depressing clutch while making very narrow radius turns may, on occasion, induce an annoying driveline “cycling” condition in some standard shift vehicles that have drivelines with higher degrees of “play” (looseness). Slower turning speeds or clutching before the turn is made will reduce this symptom and shifting into neutral will usually stop this condition.
14. Improper assembly of axle components; foreign matter in axle housing. Check overall assembly of all axle components to be correct. Inspect for any contamination and determine cause. Correct any problems as required.
15. High viscosity lubricant. Gear lubricant can thicken and cause sluggish operation of the Powertrax No-Slip Traction System in very low temperatures. For very cold weather applications, use the lightest oil the axle manufacturer will allow. For extremely cold climates, use “heat control” devices, or garaging, and carefully drive the vehicle for a few miles on-road to warm up the oil before using the vehicle in more demanding off-road conditions.
16. Improper weight distribution or overloading. Redistribute weight or remove excess weight. Follow vehicle manufacturer’s recommendations and confirm to vehicle specifications.

Warranty

Your Powertrax No-Slip Traction System is made in the USA of the highest quality materials under exacting manufacturing standards. However, because we are unable to control the installation or use of the Powertrax No-Slip Traction System, or the condition of the differential case, or the other vehicle components, our warranty can relate only to the design and performance of our own parts.

The following replacement warranty is exclusive and in lieu of all other remedies, obligations, or warranties of Powertrax and/or sellers, express or implied, oral or written, and no person or dealer/distributor/reseller is authorized to make any representations to the contrary.

2 YEAR LIMITED WARRANTY

If this Powertrax No-Slip Traction System should fail UNDER NORMAL USE AND SERVICE within 2 years after original retail (user) purchase, due to defective materials or workmanship of any of the parts supplied by Powertrax, Powertrax will replace the defective part(s) provided the product, including all parts, is returned, freight prepaid, to Powertrax by Richmond 1208 Old Norris Road, Liberty, SC 29657, ATTN: Customer Service, together with proof of purchase date and supplier, an explanation of the installation and use made of the product and the circumstances of the failure.

REPLACEMENT OF DEFECTIVE PARTS, RETURNED AS STATED ABOVE, IS THE SOLE REMEDY FOR ANY PRODUCT DEFECTS UNDER ANY AND ALL POSSIBLE WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OR MERCHANTABILITY AND/OR FITNESS FOR INTENDED USE. POWERTRAX WILL HAVE NO LIABILITY FOR INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES, SUCH AS DAMAGES FOR PERSONAL INJURIES, OR

PROPERTY DAMAGE, OR AS A RESULT OF ANY POTENTIAL LIABILITY OF THE BUYER TO THIRD PARTIES. ALL OTHER REMEDIES, WARRANTIES, AND LIABILITIES OF POWERTRAX, EXPRESS OR IMPLIED, OTHER THAN THE LIMITED-PERIOD REPLACEMENT COMMITMENT SET FORTH ABOVE, ARE DISCLAIMED.

This warranty gives specific legal rights, and may have other rights that vary from state to state. Some states do not allow limitations on how long an implied warranty lasts, and some states do not allow the exclusion or limitation of liability for incidental or consequential damages, so the above limitations or exclusions may not apply.

Warranty and other information are available tool-free from Powertrax. If you should have a claim for repair or replacement of parts, due to defects in material or workmanship, call Powertrax at 864-843-9231. Returns must be made pursuant to receiving a Return Goods Authorization (RGA) number. Powertrax will issue the RGA number permitting shipment of the Powertrax No-Slip Traction System parts to Powertrax for processing your claim. The RGA number must be clearly marked on the shipping package for it to be received by Powertrax.

Warranty

In the unlikely event that you may have a claim for repair or replacement of parts due to defects in material or workmanship, follow the procedure described above by calling Powertrax Customer Service at 864-843-9231. After receiving a Return Goods Authorization (RGA) number, you must ship the defective product to Powertrax Customer Service at the address set forth above, freight prepaid. Powertrax will normally process the defective product within 48 hours of arrival at its facility.

IMPORTANT INFORMATION



Please Read Carefully



The following  and  information is supplied to you for your protection and to provide you with many years of trouble free and safe operation of your Richmond Gear product.

Read **ALL** instructions prior to operating transmission and/or ring and pinion. Injury to personnel, transmission or ring and pinion failure may be caused by improper installation, maintenance or operation.



- **It is dangerous to get under a jacked-up vehicle.** The vehicle could slip off the jack and fall on you. You could be crushed. Never place any part of your body under a vehicle that is on a jack. Never start or run the engine while the vehicle is on a jack. **If you need to get under a raised vehicle, take it to a service center where it can be raised on a lift.**



- Hot oil can cause severe burns. Use extreme care when removing lubrication plugs and when working close to a unit that has been in operation.
- Check lube level between scheduled lube changes to insure that proper lube level is maintained. Inspect vent plug to insure it is clean and operating. Inspect the tightness of mounting bolts, misalignment of connecting shafts, lube leakage, excessive heating, or any unusual noise or vibration.
- Serious personal injury may occur as a result of improperly performed maintenance, adjustments or repairs.
- Do not attempt any of the maintenance, checks or repairs described on the following pages if you are not fully familiar with these or other procedures with respect to the transmission, or are uncertain as to how to proceed. Have the necessary work done by a properly equipped and qualified workshop.
- Always be extremely careful when working on the transmission. Always follow commonly accepted safety practices and general common sense. Never risk personal injury.



- Do not operate the transmission or ring and pinion without proper lube and correct amount.

- For safe operation and to maintain the unit warranty, when changing a factory installed fastener for any reason, it becomes the responsibility of the person making the change to properly account for fastener grade, thread engagement, load, tightening torque and the means of torque retention.
- Mounting bolts should be periodically checked to ensure that the unit is firmly anchored for proper operation.
- These instructions are not intended to cover all details or variations in equipment, nor provide for every possible contingency to be met in connection with selection, installation, operation, and maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the Buyer's purpose, the matter should be referred to Richmond Gear.

In the event of the resale of any of the goods, in whatever form, Resellers/Buyers will include the following language in a conspicuous place and in a conspicuous manner in a written agreement covering such sale:

The manufacturer makes no warranties or representations, express or implied, by operation of law or otherwise, as to the merchantability or fitness for a particular purpose of the goods sold hereunder. Buyer acknowledges that it alone has determined that the goods purchased hereunder will suitably meet the requirements of their intended use. In no event will the manufacturer be liable for consequential, incidental or other damages. Even if the repair or replacement remedy shall be deemed to have failed of its essential purpose under Section 2-719 of the Uniform Commercial Code, the manufacturer shall have no liability to Buyer for consequential damages.

Resellers/Buyers agree to also include this entire document including the danger, warnings and cautions above in a conspicuous place and in a conspicuous manner in writing to instruct users on the safe usage of the product.

This information should be read together with all other printed information supplied by Richmond Gear.



HI-PERFORMANCE PRODUCTS...



RING & PINIONS



LIGHTENED GEARS



INSTALLATION KITS



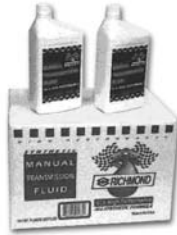
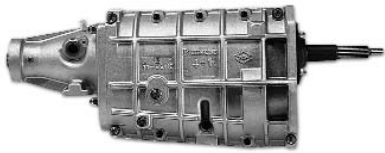
REAR END LUBE



INSTRUCTIONAL VIDEOS



SPOOLS & MINI-SPOOLS



TRANSMISSIONS

TRANSMISSION FLUID

QUICK CHANGE REAR ENDS



CORD REELS

SHOPLIGHTS

EXTREME TRACTION SYSTEMS

1208 Old Norris Road • P.O. Box 238 • Liberty, S.C. 29657

Phone: 864-843-9231 • Fax: 864-843-2964

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