GAINING TRACTION
WITH 2018 F-SERIES PICKUPS

BUILT Ford TOUGH

LIMITED-SLIP AND LOCKING DIFFERENTIALS, ADVANCETRAC® WITH RSC®(1) AND CURVE CONTROL

Refer to the latest F-150 and Super Duty® Pickup Ordering Guides for feature availability.

/// Helping drivers maintain vehicle control, and helping avoid accidents, is why traction control and electronic stability control systems are so important.

Serious truck buyers have long opted for limited-slip and locking differentials to help them "get a grip" in less-than-ideal conditions. That's especially true when it comes to the 2018 Raptor, which relies on advanced traction management systems to conquer tough off-road terrain. Refer to the last section of this job aid for all the details on Raptor.

F-Series Pickups offer technologies to maximize traction and vehicle performance. Understanding these different systems — and being able to explain how they work — is important to your customers and will give them increased confidence when traction is needed most.

WHAT IS TRACTION? »

Traction is defined as adhesive friction. In general, it refers to the maximum friction that can be produced between two surfaces without slipping.

When discussing trucks, traction refers to the truck's ability to maintain adhesion (or contact) between the tires and the road surface.

(1) Remember that even advanced technology cannot overcome the laws of physics. It's always possible to lose control of a vehicle due to inappropriate driver input for the conditions.

DIFFERENTIALS — WHAT'S THE DIFFERENCE?

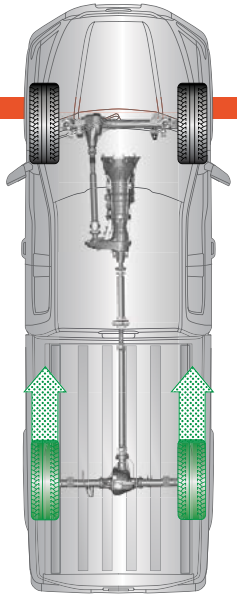
THE BASICS: Open, Limited-slip and Locking Differentials

/// Let's look at how differentials operate without the assistance of an electronic traction control system. This is what most traditional truck buyers are familiar with. In the illustrations below, the green-dotted areas represent the wheels that are receiving turning force, or torque. The longer the arrows, the more torque that is applied to that wheel.

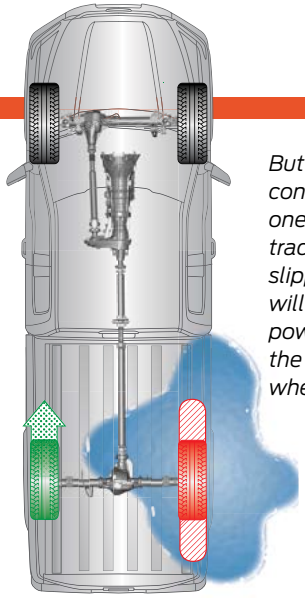
OPEN DIFFERENTIALS

Most vehicles on the road today come with a **non-limited-slip or "open" differential** as standard equipment.

- An open differential lacks the ability to manage the torque between the two sides of the drive axle
- With an open differential, the torque flows to the path of least resistance



Open differentials work just fine on dry pavement or in conditions where both wheels have adequate traction.

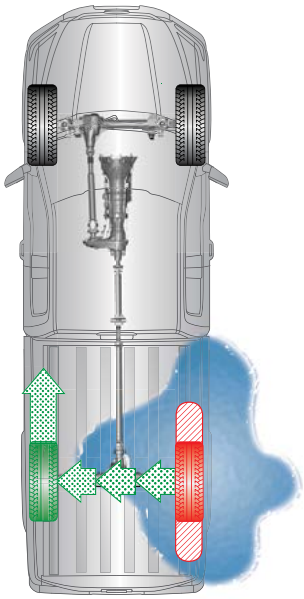


But in slippery conditions, once one wheel breaks traction, the slipping wheel will spin and take power away from the other drive wheel.

LIMITED-SLIP DIFFERENTIALS

Unlike open differentials, limited-slip differentials have the ability to manage torque between the two sides of the drive axle.

- When a wheel on one side of a limited-slip differential begins to slip, clutches, gears or other friction elements within the differential engage and start to transfer some of the torque from the slipping wheel to the non-slipping wheel

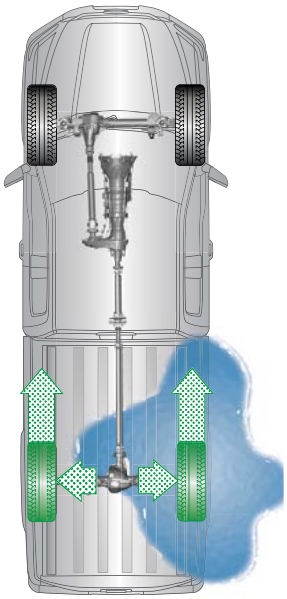


Limited-slip differentials can transfer approximately 50 percent more torque to the non-slipping wheel than an open differential can.

LOCKING DIFFERENTIALS

Locking differentials, as the name implies, mechanically lock the differential.

- They can provide up to 100 percent of available axle input torque to the wheel that needs it most
- The electronic-locking rear differential is activated by the driver using a control switch inside the vehicle
  - With the flip of a switch, a heavy-duty dog-clutch gear locks the differential, allowing both axle shafts to turn at the same speed, providing up to 100 percent of available axle input torque to the wheel that needs it most



Locking differentials are designed to be used at low speeds on low-traction surfaces. They provide excellent off-road performance in mud, snow, sand or gravel, and they also excel on steep grades or slippery boat ramps.

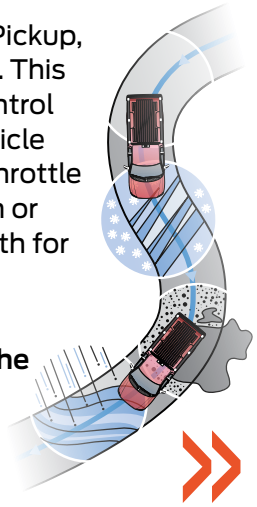
THE FORD APPROACH TO TRACTION CONTROL

/// Improved Capability with AdvanceTrac® with RSC® (Roll Stability Control™) and Curve Control

AdvanceTrac with RSC is standard on every F-Series Pickup, including Super Duty® dual rear wheel (DRW) models. This system combines AdvanceTrac electronic stability control and Roll Stability Control technologies to monitor vehicle cornering behavior, automatically making brake and throttle adjustments when it senses wheelslip, loss of traction or roll motion to help keep the vehicle on its intended path for enhanced driver control.

This means added traction performance, regardless of which differential (open, limited-slip or locking) the vehicle is equipped with.

In addition, every F-150 has AdvanceTrac with RSC, plus **Curve Control** standard.



TRAILER SWAY CONTROL

Trailer sway control works in conjunction with AdvanceTrac with RSC to detect trailer sway. When sway is detected, the system works to apply selected brakes and/or reduce engine power to help the driver regain control. The AdvanceTrac control module incorporates additional software to monitor the vehicle's performance while towing.

In fact, trailer sway control is standard on all F-150 and Super Duty Pickups.

Curve Control on F-150 works in conjunction with AdvanceTrac with RSC to help drivers maintain control of their vehicle if taking a curve too quickly. It uses sensors to measure roll rate, yaw rate, lateral acceleration, wheel speed and steering wheel angle, and runs calculations based on those inputs 100 times every second.

If the vehicle enters a curve too fast or the vehicle is not turning as much as the driver is steering, Curve Control responds by rapidly reducing torque and increasing brake pressure to help keep the vehicle under control and help the driver follow their intended path.

OPEN DIFFERENTIAL + AdvanceTrac with RSC

Since open differentials by themselves provide no capability to manage torque between the drive wheels, customers will notice a significant improvement in traction performance when AdvanceTrac with RSC is added.

OPERATION

- As soon as wheelslip reaches optimum adhesion, the system reacts by matching engine power (holding back the throttle, fuel and spark) and applying the brake to the individual slipping wheel as needed
- By preventing the slipping wheel from taking power away from the other drive wheel, the system can send as much as 50 percent of the available engine torque to the non-slipping wheel

APPLICATION

- Good performance when accelerating from a stop on level pavement that is wet or snow-covered
- Not well-suited for off-road use in base RSC mode. In deeper snow, mud or sand, customers may experience a reduction in forward momentum as engine power is reduced, possibly resulting in getting stuck. Traction control Off or Sport Mode is recommended

THE FORD APPROACH TO TRACTION CONTROL
CONTINUED

/// Improved Capability with AdvanceTrac® with RSC® (Roll Stability Control™)

LIMITED-SLIP DIFFERENTIAL + ADVANCETRAC WITH RSC

Combining AdvanceTrac with RSC with a limited-slip differential results in better performance than either technology can offer alone.

OPERATION

- When wheelslip occurs at lower speeds, the limited-slip differential helps reduce the amount of braking that AdvanceTrac with RSC applies to the slipping wheel and helps transfer some of the torque to the non-slipping wheel
- Customers will also experience less hesitation and a smooth response when accelerating on slippery surfaces

APPLICATION

- Improved performance when accelerating on wet, snowy or loose road surfaces
- Less likely to get stuck in moderate snowfall
- Light to moderate off-road use

ELECTRONIC-LOCKING REAR DIFFERENTIAL + ADVANCETRAC WITH RSC

This combination provides superior performance in low-speed conditions where traction is limited.

OPERATION

- In demanding off-road conditions, customers will likely engage the electronic-locking rear differential and use AdvanceTrac Sport Mode
- AdvanceTrac Sport Mode is optimized for off-road conditions, transparently enhancing driver control and vehicle performance

APPLICATION

- An electronic-locking rear differential is best suited for low-speed use on low-traction surfaces, such as slippery boat ramps, or during demanding off-road use, but can be used at higher speeds as well
- AdvanceTrac with RSC helps drivers maintain vehicle stability in adverse driving situations
- Not all F-Series customers require the off-road capability of a Four-Wheel-Drive System, but the capability of their two-wheel-drive truck can be enhanced by adding the optional electronic-locking rear differential to provide an added level of capability on those occasional low-traction surface conditions

ELECTRONIC-LOCKING REAR DIFFERENTIAL OPERATION

DRIVE	2018 F-150	2018 SUPER DUTY®
2WD	Will not engage if vehicle speed is above 20 mph (31 km/h) Will disengage at speeds above 25 mph (42 km/h) and automatically reengage at speeds below 20 mph (31 km/h)	Will not engage if vehicle speed is above 20 mph (31 km/h) Will disengage at speeds above 25 mph (42 km/h) and automatically reengage at speeds below 20 mph (31 km/h)
4WD – 2H (4x2 HIGH)	Will not engage if vehicle speed is above 20 mph (31 km/h) Will disengage at speeds above 25 mph (42 km/h) and automatically reengage at speeds below 20 mph (31 km/h)	Will not engage if vehicle speed is above 20 mph (31 km/h) Will disengage at speeds above 25 mph (42 km/h) and automatically reengage at speeds below 20 mph (31 km/h)
4WD – 4A (4x4 AUTOMATIC)	Will not engage if vehicle speed is above 20 mph (31 km/h) Will disengage at speeds above 25 mph (42 km/h) and automatically reengage at speeds below 20 mph (31 km/h)	System not available on Super Duty
4WD – 4L (4x4 LOW)	Will not engage if vehicle speed is above 55 mph (90 km/h) Will disengage at speeds above 62 mph (100 km/h) and automatically reengage at speeds below 55 mph (90 km/h)	Will not engage if vehicle speed is above 55 mph (90 km/h) Will disengage at speeds above 62 mph (100 km/h) and automatically reengage at speeds below 55 mph (90 km/h)
4WD – 4H (4x4 HIGH)	Will not engage if vehicle speed is above 20 mph (31 km/h) Will disengage at speeds above 25 mph (42 km/h) and automatically reengage at speeds below 20 mph (31 km/h)	Will not engage if vehicle speed is above 20 mph (31 km/h) Will disengage at speeds above 25 mph (42 km/h) and automatically reengage at speeds below 20 mph (31 km/h)

THE F-SERIES PICKUPS COMPETITIVE COMPARISON

Here's a glance at the competition's full-size pickups and what they offer in terms of traction control and rear differential choices.

ELECTRONIC STABILITY CONTROL/TRACTION CONTROL SYSTEMS

2018 FORD F-SERIES PICKUPS F-150/F-250/F-350/F-450	2018 CHEVROLET SILVERADO PICKUPS 1500/2500HD/3500HD	2018 RAM 1500/2500/3500 PICKUPS	2018 TOYOTA TUNDRA
WHAT'S STANDARD			
F-150 – AdvanceTrac® with RSC® (Roll Stability Control™) and Curve Control **F-250/F-350/F-450** – AdvanceTrac with RSC	StabiliTrak Electronic Stability Control System with Proactive Roll Avoidance (single rear wheel [SRW] models only)	Electronic Stability Control (ESC) System with Electronic-roll Mitigation (ERM)	Vehicle Stability Control (VSC)
HOW THEY COMPARE			
AdvanceTrac with RSC includes a roll motion sensor. Sensor monitors vehicle body roll angle at least 100 times per second and automatically reacts to help the driver keep the vehicle upright and all four tires on the ground	Traction and yaw control similar to AdvanceTrac. Curve Control is not available	Traction and yaw control similar to AdvanceTrac but does not include information from vehicle roll rate sensors; relies on algorithms based on inputs from Electronic Stability Program sensors. Curve Control is not available	Traction and yaw control similar to AdvanceTrac but does not include information from vehicle roll rate sensors. Curve Control is not available

LIMITED-SLIP REAR DIFFERENTIAL

2018 FORD F-SERIES PICKUPS F-350/F-450	2018 CHEVROLET SILVERADO PICKUPS 1500/2500HD/3500HD	2018 RAM 1500/2500/3500 PICKUPS	2018 TOYOTA TUNDRA
WHAT'S STANDARD/AVAILABLE			
F-350 – optional on DRW models only **F-450** – standard	**Chevrolet Silverado** does not offer a limited-slip differential	**1500** – anti-spin differential standard on Rebel, Sport Reg. Cab 4x2; optional on all others (exc. HFE) **2500** – anti-spin differential optional (exc. Power Wagon) **3500** – anti-spin differential standard on all	**All** – standard automatic limited-slip differential (Auto LSD)
HOW THEY COMPARE			
Works with AdvanceTrac with RSC to enhance traction performance	Not applicable	Traction control properties similar to Ford limited-slip differential	Not limited-slip differential in operation; the system is a function of the VSC using electronic brake application to slow a slipping/spinning wheel

LOCKING REAR DIFFERENTIAL

2018 FORD F-SERIES PICKUPS F-150/F-250/F-350/F-450	2018 CHEVROLET SILVERADO PICKUPS 1500/2500HD/3500HD	2018 RAM 1500/2500/3500 PICKUPS	2018 TOYOTA TUNDRA
WHAT'S AVAILABLE			
F-150 – electronic-locking rear differential is available on all models **F-250/F-350** – electronic-locking rear differential is optional on SRW models only **F-450** – not available	**1500** – automatic-locking rear differential standard on LT with Z71 Package, Max Trailering Pkg., Texas Edition, All-Star Edition or Z82 Trailering Pkg., LT/2LT, LTZ and High Country models; available on all others **2500HD/3500HD** – standard on all	**1500** – not available **2500** – electronic-locking front and rear differentials standard on Power Wagon only **3500** – not available	**Toyota Tundra** does not offer a locking differential
HOW THEY COMPARE			
All – differential engagement is driver-controlled. When activated, both axle shafts are locked together, allowing them to turn at the same speed. Works in conjunction with AdvanceTrac with RSC to enhance driver performance and vehicle control over a wide range of operating and terrain conditions	**All** – mechanically locked differential is internally revolution speed-controlled, offering no driver control. Differential is limited by vehicle road speed and must experience slip before activating	**2500 Power Wagon only** – differential engagement is driver-controlled by push on/off buttons. Locks both axle shafts together	Not applicable

THE DIRT ON THE RAPTOR

/// When it comes to rugged capability, the 2018 F-150 Raptor is the most capable Ford truck for ultimate off-road performance. It starts with a lockable Torque-on-Demand® transfer case, available TORSEN® front differential and next-generation BFGoodrich® KO2 All-Terrain (T/A) tires work together seamlessly to take on virtually any environment.

OFF-ROAD CAPABLE FEATURES

TORQUE-ON-DEMAND TRANSFER CASE

To manage power distribution between front and rear wheels – and there's a lot to manage – Raptor includes a four-wheel-drive (4WD), lockable Torque-on-Demand transfer case. Combining the best attributes of clutch-driven, on-demand all-wheel drive with durable, mechanical-locking 4WD, this system helps make Raptor a real beast off road.

TERRAIN MANAGEMENT SYSTEM™ (TMS)

The Raptor TMS features six selectable preset drive modes. This allows the driver to enhance driving dynamics in a variety of environmental conditions. Mode selection is managed via the control pad on the right side of the steering wheel.

TMS MODES:

Normal — Everyday driving

Sport — Higher performance on-road driving

Weather — Snow or ice

Mud/Sand — Muddy and sandy trails and terrain

Baja — High-speed desert running

Rock/Crawl — Low-speed rock crawling

TORSEN FRONT DIFFERENTIAL

This available differential significantly increases grip for the front end, allowing Raptor to pull itself over obstacles and up steep grades. Features include:

- A parallel helical gear system to sense torque differences between the front axles/wheels and provide maximum torque to the wheel with the most traction
- Continuous management of power delivery between the front axles/wheels, helping to maximize available traction
- An excellent balance of power for improved overall vehicle acceleration, handling and traction

HIGH-TECH TIRES

Next-generation BFGoodrich K02 35-inch All-Terrain (T/A) tires feature the latest enhancement in tread and architecture to deliver better ride quality, off-road traction and reduced road noise. They're specifically designed and tuned for the F-150 Raptor. Featuring race-proven CoreGard™ Technology, they're built to take on the toughest off-road hazards with confidence.