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Spicer® Drive Axles

Roadranger® More time on the road

Driver Instructions

Spicer Drive Axles

AXDR0134

October 2007

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Introduction

General Information

The Dana Spicer 2-speed axle allows the vehicle operator to select “Low Range” (Button Down) for good starting torque and pulling power. By selecting “High Range” (Button Up), the axle is shifted to a gear ratio which allows greater road speed and economy.

In addition, High or Low range can be used to provide additional “steps” between transmission gear ratios where desired for gradeability or economy.

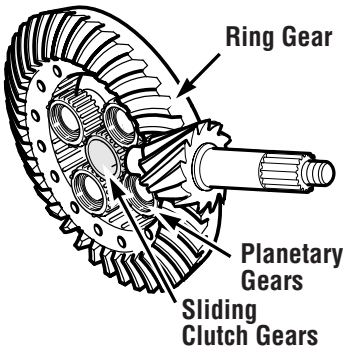
Planetary Unit

In “High Range,” the axle functions like a single speed axle. In “Low Range” a planetary gearset is used to provide additional reduction.

A movable sliding clutch gear engages or disengages the reduction provided by the planetary gearset, and is controlled by the driver through the cab shift control — either air or electric — usually mounted on the transmission gear shift lever.

When low range is selected, the planetary gearset provides about 1/3 greater gear reduction by:

- Locking the sliding clutch gear in place, which . . .
- Causes the planetary gears to “walk around” the sliding clutch gear . . .
- Delivering torque to the wheels at 1/3 slower speed than the ring gear.

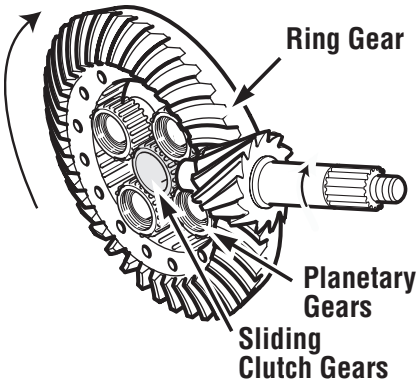


Axle in High Range

- Numeric reduction is determined by the ring gear and pinion.
- Planetary unit rotates with the ring gear, but the planetary gears do not spin.
- Wheel speed is the same as ring gear speed.

Axle in Low Range

- Numeric reduction is determined by inner ring gear teeth and planetary gears.
- Sliding clutch gear is fixed and cannot rotate.
- Planetaries are “rolled” between ring gear and sliding clutch gear teeth.
- Planetaries spin while revolving at one-third less than ring gear speed.
- Torque is taken from center pins of planetaries — driving wheels slower.



Axle Upshift

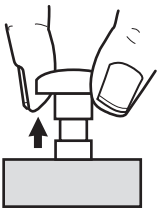
Breaking Torque

In all types of shifts, as shown in the section labeled “Split Shifting Conventional” on page 12, you must “break torque” by releasing the accelerator because torque creates a binding action on the sliding clutch gear. This binding must be relieved for the shift to take place.

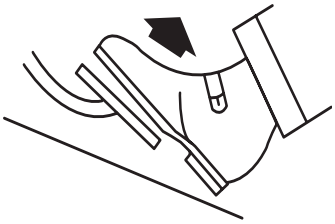
Axle upshifts transmission gears may be abrupt, causing the truck to jerk. Using the clutch with the accelerator will smooth the shift.

The shift from LOW to HIGH range is made as follows…

1. Shift Needed
2. Lift Button



3. Release Accelerator



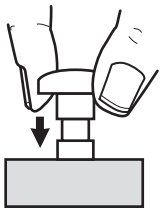
4. Axle Shifts

Axle Downshift

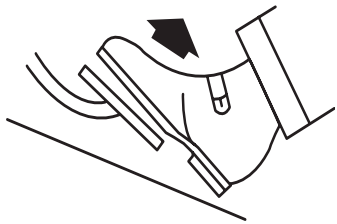
The shift from HIGH to LOW range is made as follows….

Note: The ring gear must speed up to one-third more than wheel speed.

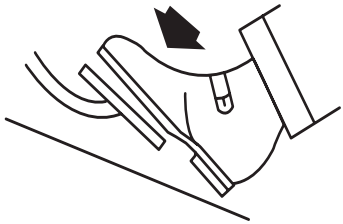
1. Shift Needed
2. Depress Button



3. Release Accelerator



4. Depress Accelerator



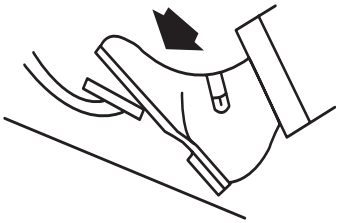
5. Axle Shifts

Split Upshift

An axle downshift with a transmission upshift — called a split upshift — is made as follows….

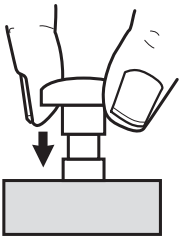
Note: When split shifting, the button stays UP in HIGH range until AFTER any transmission lever movement.

1. Shift Needed
2. Depress Clutch



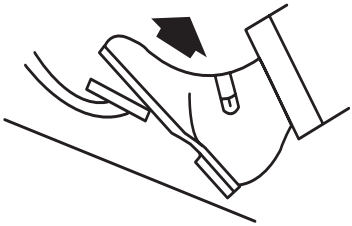
3. Shift Transmission

4. Depress Button

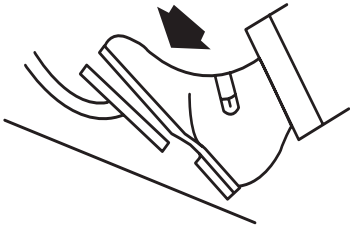


Shifting

5. Release Clutch



6. Depress Accelerator



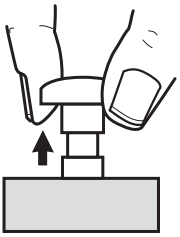
7. Axle Shifts

Split Downshift

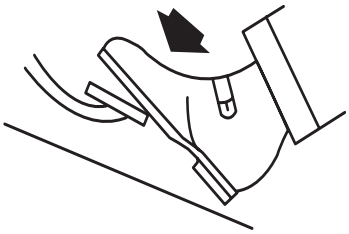
An axle upshift with a transmission downshift — called a split downshift — is made as follows….

Note: When split shifting, the button stays UP in HIGH range until AFTER any transmission lever movement.

1. Shift Needed
2. Lift Button



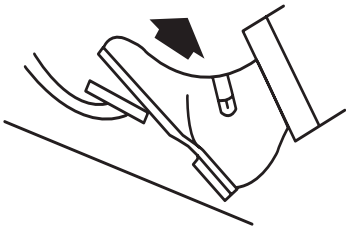
3. Depress Clutch



4. Shift Transmission

Shifting

5. Release Clutch



6. Axle Shifts

Downgrade Warning

A Dana 2-speed axle should NEVER be shifted on a downgrade. The reason will be apparent if you think a moment about what is happening when you shift.

To downshift the axle from HIGH to LOW range, either the ring gear has to speed up by one-third, or the wheels have to slow down by one-third to allow synchronization. When you are on a downgrade, the wheels will not slow down, but will tend to speed up. As a result, the ring gear must be accelerated to synchronize speeds. But, you are limited in doing so by your engine governed speed, and may not be able to reach synchronization to allow the shift to take place. If the shift is not completed, the axle will be in neither HIGH nor LOW range and all driveline retardation will be lost.

Ratio Extender Use

Low End

A Dana 2-speed axle can be used as a ratio-extender when split shifting is not necessary. For low end use, just shift the axle into LOW range to start out, and shift to HIGH when the extra torque is no longer needed.

Transmission (5-Speed)	1st	1st	2nd	3rd	4th	5th
Dana 2-Speed Axle	Axle Low	Axle High				

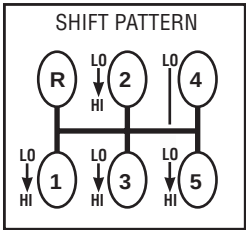
High End

To use the 2-speed as a high end ratio-extender, stay in LOW range for normal upshifts and only shift to axle HIGH on the freeway for greater road speed.

Transmission (5-Speed)	1st	2nd	3rd	4th	5th	6th Speed Axle High
Dana 2-Speed Axle	Low for Gradeability					

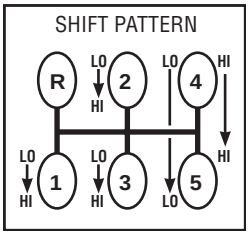
Split Shifting Conventional

With a conventional transmission, split shifting is performed in the following sequence: first gear LOW, first gear HIGH, second gear LOW, second gear HIGH, and so on.



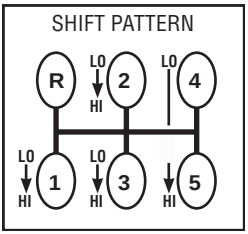
Split Shifting Short Fourth

Some 5-speed transmissions have what is called a SHORT FOURTH gear, with more gear reduction in fifth gear LOW range than fourth gear HIGH range. To split with a short fourth, shift the transmission normally until fourth LOW. From fourth LOW, shift to fifth LOW, then to fourth HIGH and finally to fifth HIGH.



Split Shifting Soft Fourth

5-speed transmissions with what is called a SOFT FOURTH gear have little or no difference between fourth HIGH and fifth LOW ratios. From fourth LOW, the next shift can be to either fourth HIGH or fifth LOW. The final shift is to fifth HIGH.



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