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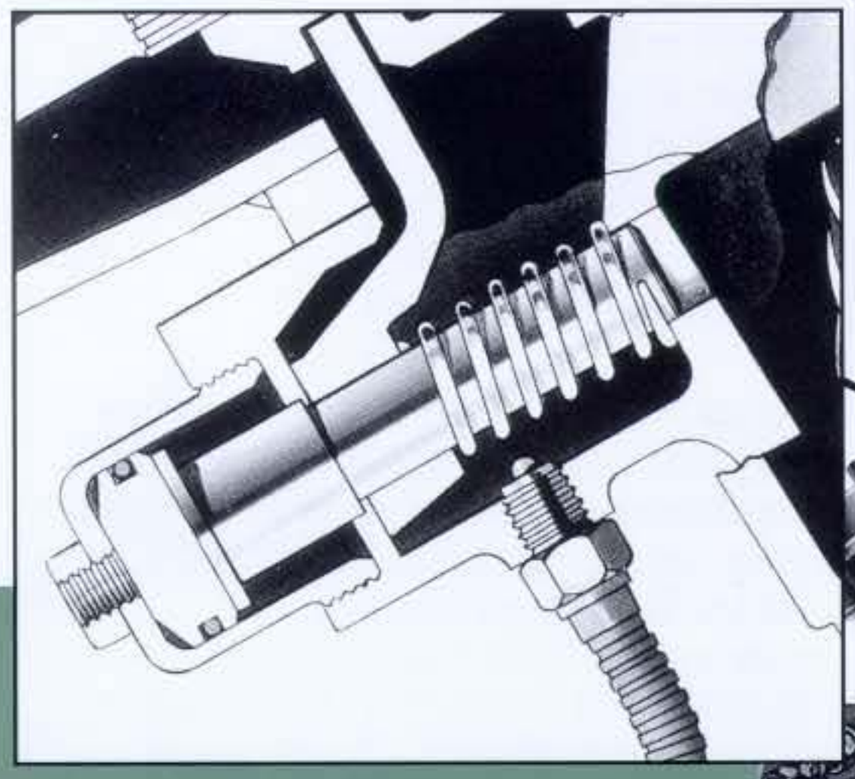
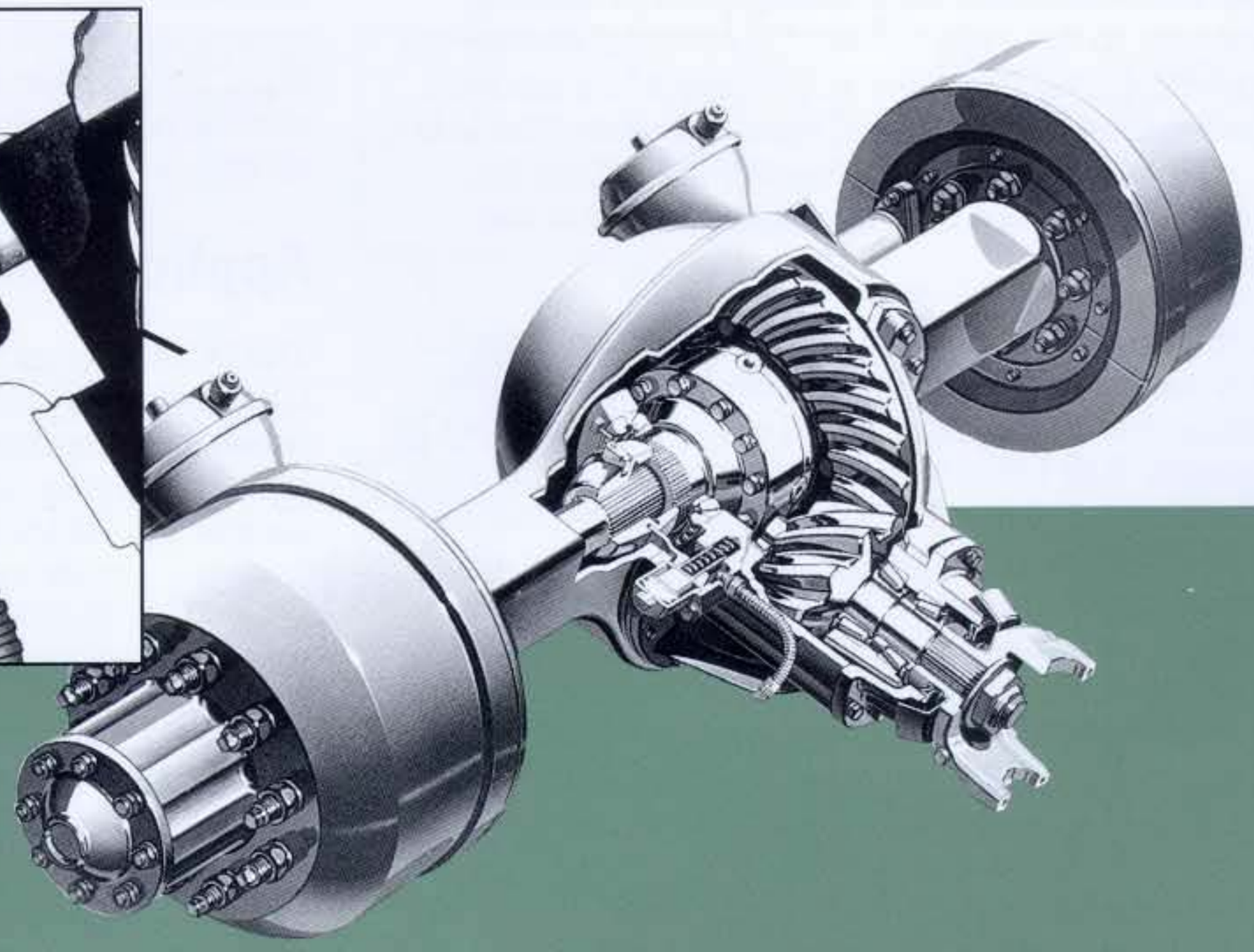
Driver-Controlled Differential Lock (DCDL)





Option Summary

The Meritor® driver-controlled differential lock (DCDL) option, available on many Meritor® drive axle models, allows vehicles to obtain maximum traction in unfavorable driving conditions. When a vehicle encounters a condition where all available tractive effort is required, the DCDL allows each driving wheel to use all of the tractive effort available to the wheel. The DCDL can be operated at speeds up to 25 mph.

Terms

- Main Differential: Divides the power equally between the two wheel ends of an axle. Does not allow the total torque of both wheel ends to exceed twice the torque of the wheel end with the least amount of tractive effort.
- Driver-Controlled Differential Lock (DCDL): Mechanically deactivates the main differential thereby providing maximum traction potential from each wheel end of the axle.
- Inter-Axle Differential (IAD): Divides the power equally between the two axles of a tandem. Does not allow the total torque of both axles to exceed twice the torque of the axle with the least amount of tractive effort.
- Inter-Axle Differential Lock (IAD lock): Mechanically deactivates the inter-axle differential thereby providing maximum traction potential from both the forward and rear drive axles of a tandem.
- Power Divider: Another phrase for IAD.

Components and Functions

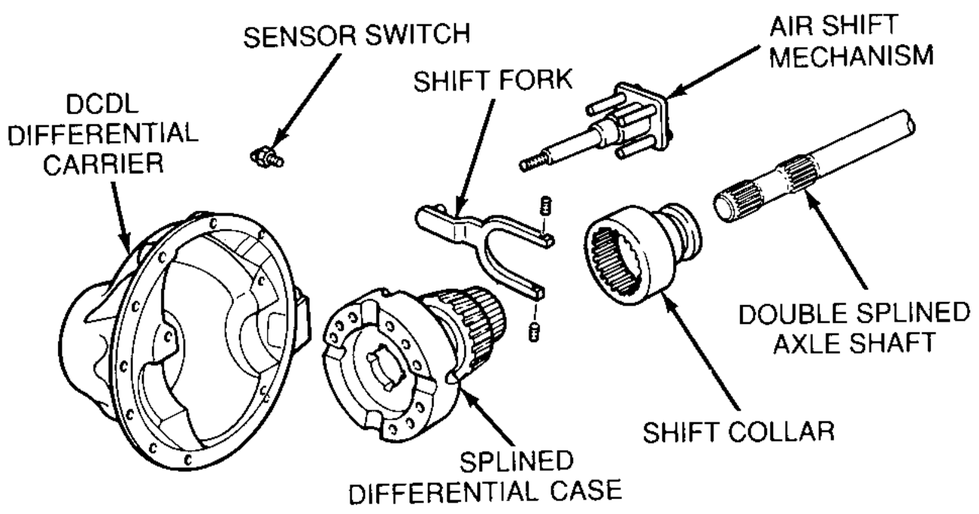
A main differential has two functions:

- Allows both wheel ends of an axle to receive equal torque from the driveline by "splitting" the power between the two wheel ends.
- Compensates for any speed difference between wheel ends that occurs when the vehicle is turning and the outside wheel rotates faster than the inside wheel, when tires are slightly mismatched, or when uneven road conditions are encountered.

An inter-axle differential (IAD) works in a similar manner to the main differential except it divides the power equally between the two axles of a tandem, rather than the two wheel ends of an axle. The IAD lock is driver-controlled. The IAD also allows for speed differences between the two axles of the tandem.

On unfavorable driving surfaces, the main differential can work against the vehicle because the amount of torque both wheel ends receive cannot be greater than twice the torque of the wheel end with the least tractive effort available. Likewise, the inter-axle differential can work against the vehicle because the amount of torque both axles receive cannot be greater than twice the torque of the axle with the least tractive effort available. This total tractive effort may not be enough to move the vehicle. By using the IAD lock and the DCDL, the driver can "lock out" inter-axle differential action as well as main differential action, thereby delivering as much tractive effort to each wheel end of each axle as each can apply to the ground. The tractive effort delivered is not dependent on the wheel end or axle with the least amount of traction available.

The DCDL consists of 7 unique components:



Why Use DCDL in Addition to IAD Lock?

The DCDL works along with the IAD lock to provide maximum possible traction when the vehicle requires it. The IAD lock ensures there is maximum traction potential for both the forward and rear drive axles of the tandem. Locking the main differentials on each axle ensures maximum traction at each wheel end of each axle.

The DCDL has an advantage over some automatic traction devices because it allows the driver to select optimum traction only when needed while providing normal differential action for favorable traction conditions. Some automatic traction enhancement devices only provide traction to the inside wheel of an axle during a turn.

Application Summary

The DCDL is used in on- and off-highway applications that encounter slippery road conditions and/or uneven terrain. It is used at low speeds while traveling through poor conditions and is deactivated as soon as the vehicle is through the area.

Depending on the user's needs, the DCDL may be installed on the following axles:

- Forward rear axle of a tandem
- Rear rear axle of a tandem
- Both axles of a tandem
- Single rear drive axles
- Front drive axles

For specific models offering the DCDL option, refer to Meritor® technical bulletin TP-7824.

The IAD lock may be used at all speeds and for longer time periods depending on weather conditions such as rain or snow. IAD locks are standard on all Meritor® tandem drive axles.

Features & Benefits of DCDL

- The DCDL has fewer parts compared to other traction devices which means:
  - Improved serviceability
  - Less maintenance
  - Lower cost
- The DCDL does not require any special lubricants like some clutch pack traction devices and does not generate wear particles.
- "Driver-controlled" means the DCDL is used only when needed. Therefore, normal differential action, with all of the associated benefits, is provided under favorable traction conditions.

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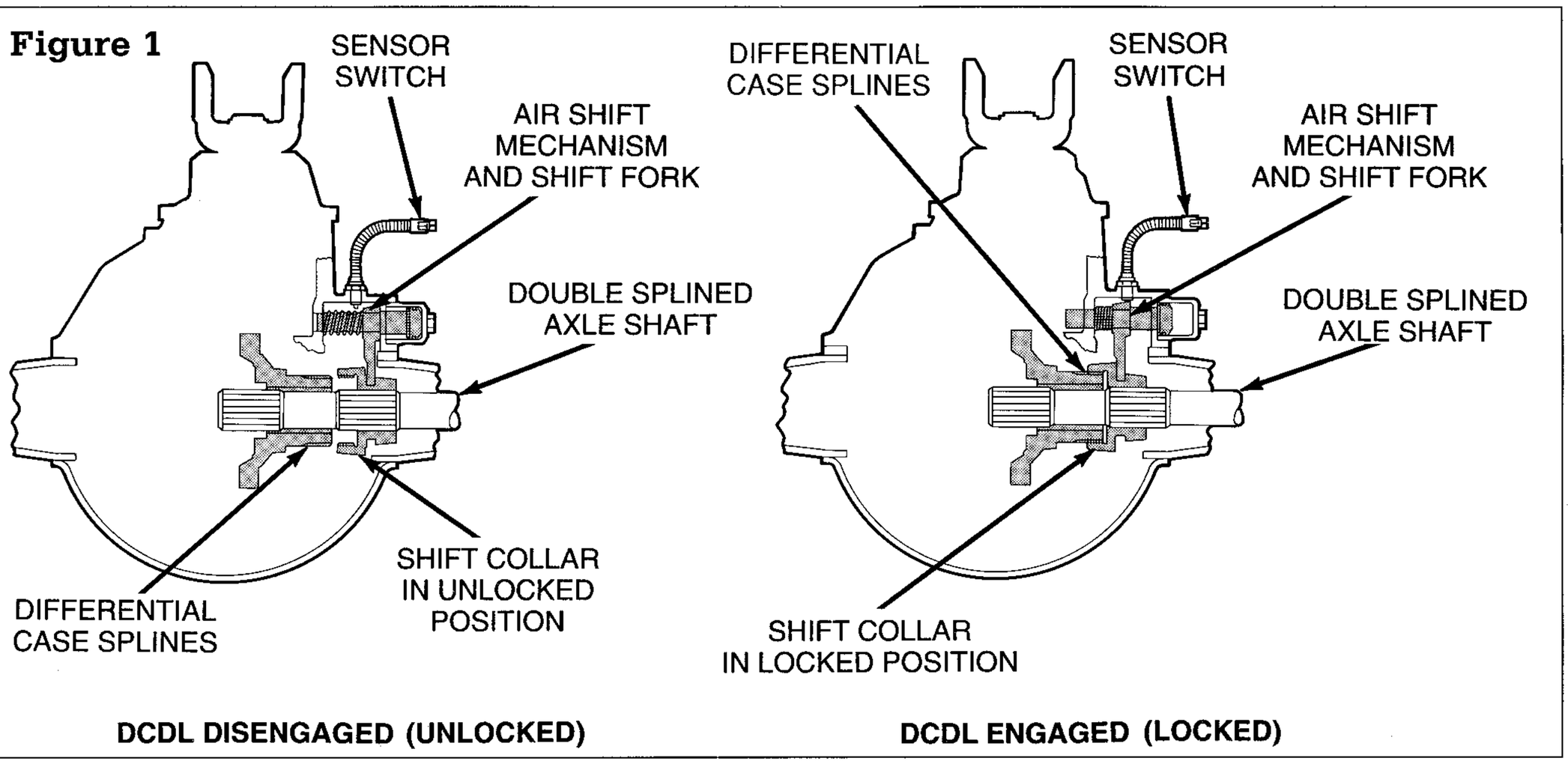
Tandem and Single Axle DCDL Operation

The DCDL shown in **Figure 1** is operated by an air-actuated shift assembly that is mounted on the carrier. When the differential lock is actuated, the shift collar is moved along the splines of the axle shaft toward the main differential case. When the splines on the shift collar are engaged with the splines on the differential case, the axle shafts and differential assembly are locked together and main differential action is eliminated.

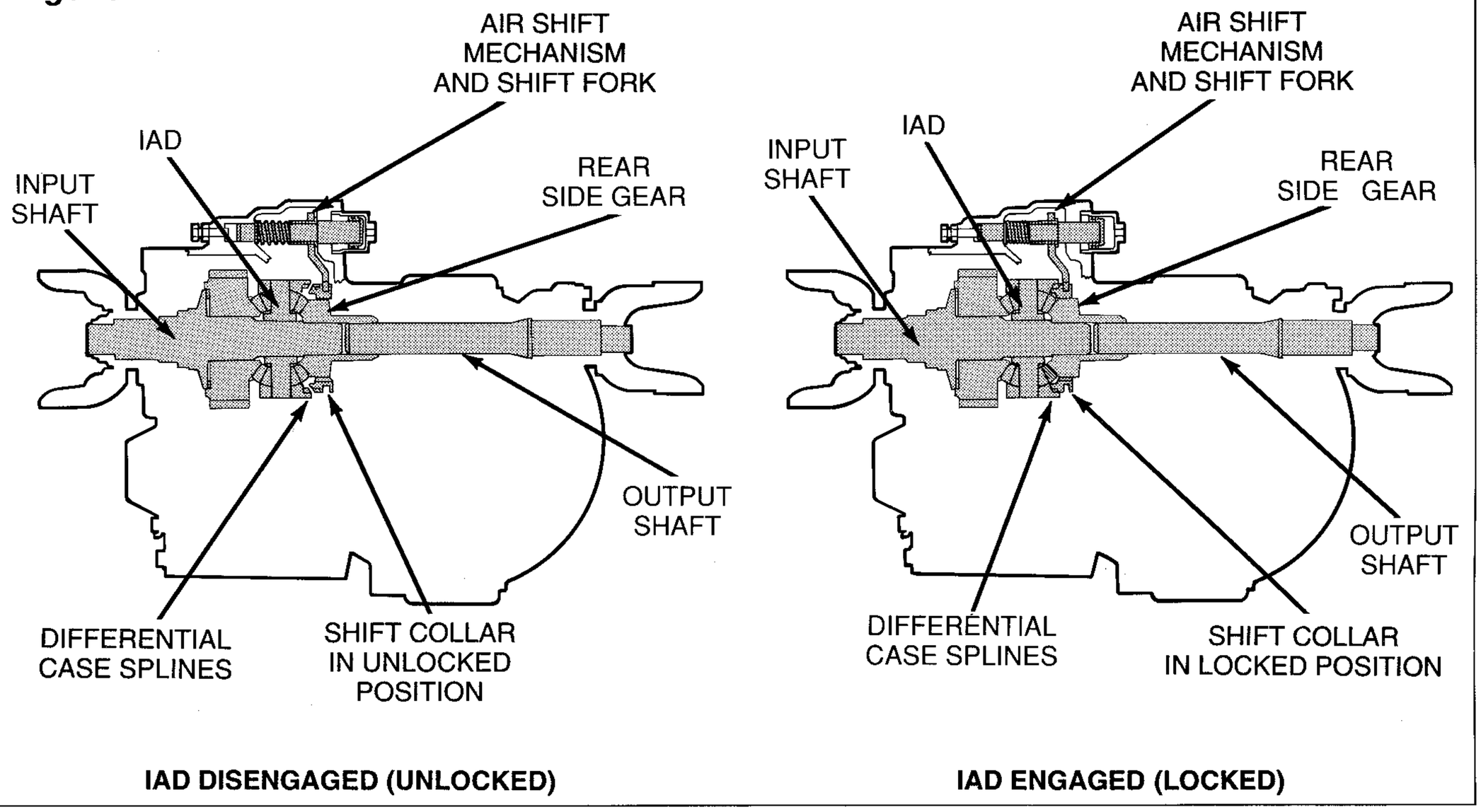
Figure 1



Tandem Axle IAD Operation

The IAD shown in **Figure 2** is operated by an air-actuated shift assembly that is mounted on the carrier. When the IAD lock is actuated, the shift collar is moved along the splines of the rear side gear toward the inter-axle differential case. When the splines on the shift collar are engaged with the splines on the differential case, the axle input and output shafts and differential assembly are locked together and inter-axle differential action is eliminated.

Figure 2



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IAD Lock/DCDL Comparison

The IAD lock is a standard feature of the forward axle of Meritor® tandems and is differentiated from the DCDL operation by the following:

IAD Lock	DCDL
Provides maximum traction potential to both the forward and rear drive axles of a tandem.	Provides maximum traction potential to each wheel end of an axle.
May be applied at speed (assuming both axles are rolling and that spinout has not started to occur) and/or remain engaged for long periods of time depending on weather conditions such as snow, sleet or rain.	To be applied for very short periods of time and at very low speeds due to the possible effects on handling characteristics of the vehicle with the lock engaged.
Manually turned on and off by a switch in the cab.	Manually turned on and off by a switch, but also set up to automatically shut off, in most instances, when a predetermined vehicle speed is obtained.

More information on Meritor® IAD and DCDL products is available in video format.
Call 800-535-5560 and request item number T-95125V (Traction Control Video Package).

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