

**By Mike Weinberg**  
**Contributing Editor**

We deal on an everyday basis with shift problems, transmission noises, clutch complaints and the like. The main area of focus always is inside the transmission where the major damage has occurred. The unit is inspected, customers are sold work, parts are ordered, the unit is rebuilt and installed in the vehicle – and then the fun begins.

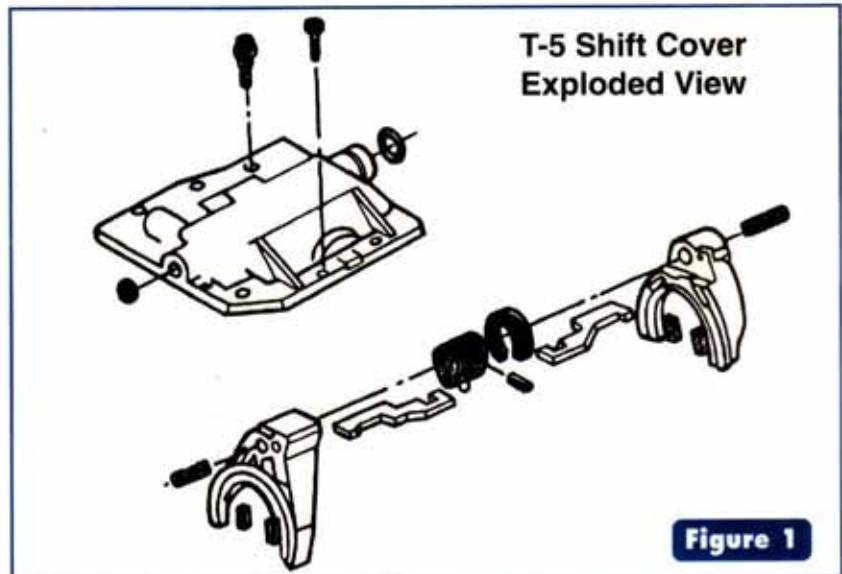
Besides the usual internal problems (endplay, preload, synchronizer problems, overlooked gear damage or assembly mistake), some common areas are overlooked routinely or taken for granted during the repair process. One of these is the shift-control mechanism, which includes the shift rails, forks, shift cover, detents, springs, interlocks, shift gates and the stick itself.

Understanding the shift mechanism in all its different designs is very important to successful repair and correct diagnosis. The designs vary from unit to unit, but the functions are the same. The shift mechanism is designed to select and move an appropriate shift fork into the precise position to lock the synchro slider to the speed gear selected.

Another function of the shift mechanism is to give the driver “shift feel,” or positive position of the stick for each gear range. This is achieved by having a shift “restrict” system to position the stick in a neutral position in line with the 3-4 shift rail and to provide some resistance when moving the stick to either side to select 1-2 or 5th-reverse. The usual practice is to provide more resistance on the reverse side, so that the driver does not select reverse when moving forward. There also will be some form of reverse restriction to prevent an accidental selection of reverse while at speed.

To position the stick precisely in the chosen gear, we have a detent system that uses spring-loaded detent

# Detents, Poppets, Interlocks, And Things That Go Bump In The Night



balls or bullets and a matching set of grooves in the shift rails. An old wives tale or myth that won't die: The detents hold the trans in gear. Absolutely untrue. The back taper on the coupling teeth of the speed gear and the inner splines of the synchro slider hold the unit in gear as the driver changes throttle position while driving. Adding a stiffer spring to a detent does nothing except require the driver to make more physical effort to complete a shift.

Care should be taken on every repair to inspect the detents thoroughly for wear, weak or broken springs, burrs, grooves or flats on the shift rails. This includes the detents and springs contained in shift covers that are rarely disassembled if they seem to be functioning properly.

The next item for consideration is the interlock system. All standard transmissions are designed with a system of interlocks, which can be balls, bullets, pins or any combination thereof, between the shift rails to prevent the unit from being in more than one gear at a time. Obviously getting into two gears at a time at speed will result in catastrophic damage to the gearbox and, at a minimum, a change of the drivers' shorts when they stop doing 360s. If the trans achieves two gears at once at rest, the engine will stall when the clutch is engaged.

On single-rail shift systems, such as the T-5 transmission, the interlock is a C-shaped steel piece

*continues page 70*

## Up To Standards

that rides in a slot cast into the shift cover (See Figures 1 and 2). It is very common to find the slot in the aluminum cover worn oversize, which permits the interlock to cock at an angle, binding up the shift rail. The fix for this is a replacement shift cover.

Many mysterious comebacks and complaints are caused by worn, broken, missing or misassembled interlock components. A typical example of this is found in the Nissan Maxima 5-speed transaxle (See Figure 3). The interlock system uses springs, balls, bullets and a thin cylindrical pin that rides in a bore in the 3-4 rail interacting with the other interlock on either side of the rail. This relatively small pin is known to migrate frequently to parts unknown during teardown. If the unit is assembled without it, the interlock system no longer works and the unit will get two gears at once, usually after a shift into reverse. This results in a less-than-thrilled customer with a vehicle on the end of a tow hook.

Inspecting the shift lever (stick) itself carefully and how it fits the shift tower is a must. If the tower is worn, or some component does not permit the stick to operate in its proper geometry, shift problems will occur.

Common scenario: A Toyota 4 Runner arrives at the shop with an owner complaint of an incomplete shift

### T-5 Interlock And Selector Plates

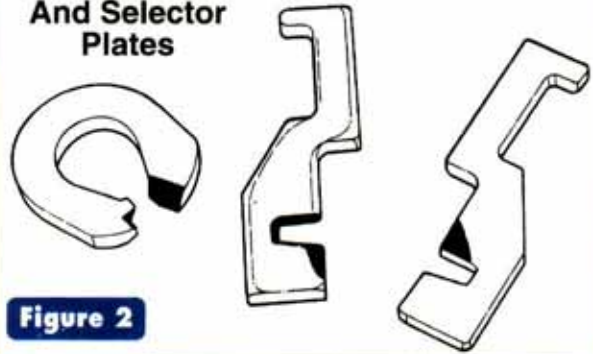


Figure 2

### Nissan Maxima 5-Speed Interlock System

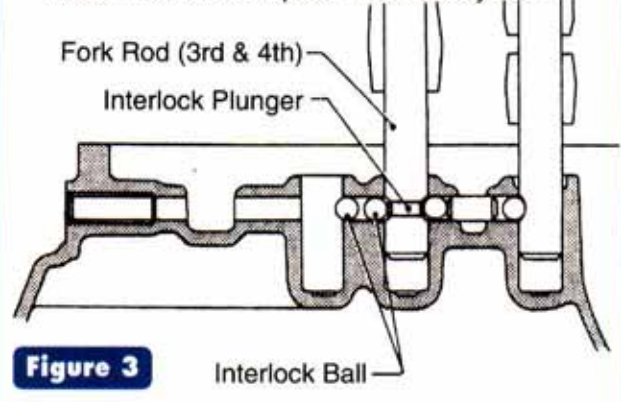


Figure 3

to 3rd gear and occasional falling out of 3rd gear. The service writer drives the vehicle and it works correctly, but the stick feels slightly sloppy and the shifts don't have a crisp, positive feel. The unit is inspected internally with no damage found. If the technician takes the time to remove the shift lever from the shift tower, he will find the green plastic seat for the shifter ball with the underlying black rubber washer disintegrated. This causes the shift lever to move independent of the shift tower, resulting in incomplete shifts.

This same problem happens commonly to the M5R1 and M5R2 Mazda-built transmissions used in Ford pickups and SUVs. The shifter ball rides on two blue plastic washers in the shift tower, and these are subject to wear and cracking.

There are endless war stories covering the whole spectrum of standard transmissions with detent and interlock problems. Keep in mind that every component in the trans needs to be looked at – there are no insignificant parts. A chain is only as strong as its weakest link. Making sure that all components of the shifter and its mechanism are in good working order will solve and prevent a lot of mysterious comebacks. **TD**

## Put an End to Transfer Case Failures For Good!

**Extreme HD • AWD-To-Part-Time Conversions**  
**Slip-Yoke Eliminator Kits • AWD Low-Range Lockups**  
**AWD Viscous Eliminators**



**Rockland Standard Gear Inc.**

**JEEP Transfer Cases**

All Jeep Transfer Cases are Remanufactured with the Latest G.E. Components

*\*Includes New Motor Chain*

**WRANGLER** - 4x4, 4x4S, 4x4S4  
**CHRYSLER** - 4x4, 4x4S, 4x4S4  
**LIBERTY** - 4x4, 4x4S, 4x4S4  
**GRAND CHEROKEE** - 4x4, 4x4S, 4x4S4  
**CHRYSLER WAGNERS** - 4x4, 4x4S, 4x4S4

*Rockland Standard Gear can custom fit all of these transfer cases to any 1.7L, 2L, 3.0L, 4.0L & 5.2L model!*

**2314 Command Trac w/ Slip-Yoke Eliminator**



**247J & 248J AWD**

*Non-Viscous - More MPG, Less Wear*  
*Perfect for warmer climates*  
*Factory Safety of AWD*



**FORD Transfer Cases**

All Ford Transfer Cases are Remanufactured with the Latest G.E. Components

*\*Includes New Motor Chain*

**EXPLORER** - 4x4, 4x4S, 4x4S4  
**EXPLORER** - 4x4, 4x4S, 4x4S4  
**EXPLORER** - 4x4, 4x4S, 4x4S4  
**EXPLORER** - 4x4, 4x4S, 4x4S4  
**EXPLORER** - 4x4, 4x4S, 4x4S4  
**EXPLORER** - 4x4, 4x4S, 4x4S4  
**EXPLORER** - 4x4, 4x4S, 4x4S4

**Dodge Transfer Cases**

All Dodge Transfer Cases are Remanufactured with G.E. Components

*\*Includes New Motor Chain*

**DURANGO** - 4x4, 4x4S, 4x4S4  
**DURANGO** - 4x4, 4x4S, 4x4S4  
**DURANGO** - 4x4, 4x4S, 4x4S4  
**DURANGO** - 4x4, 4x4S, 4x4S4  
**DURANGO** - 4x4, 4x4S, 4x4S4  
**DURANGO** - 4x4, 4x4S, 4x4S4

**GM Transfer Cases**

All GM Transfer Cases are Remanufactured with the Latest G.E. Components

*\*Includes New Motor Chain*

**BLAZER** - 4x4, 4x4S, 4x4S4  
**BLAZER** - 4x4, 4x4S, 4x4S4  
**BLAZER** - 4x4, 4x4S, 4x4S4  
**BLAZER** - 4x4, 4x4S, 4x4S4  
**BLAZER** - 4x4, 4x4S, 4x4S4  
**BLAZER** - 4x4, 4x4S, 4x4S4  
**BLAZER** - 4x4, 4x4S, 4x4S4

**Chatter-Free Transfer Case Lubricant**

*Prevent Costly T-Case Repairs*

- Eliminates driveline chatter and shudder in clutch-type transfer cases\*
- Prevents clutch failure from lubricant breakdown
- This is a lubricant not an additive

*\*Chatter-Free will not repair transfer cases that are already damaged!*



### THE BOTTOM LINE:

Tell us your opinion of this article:

Circle the corresponding number on the free information card.

- 87 Useful information.
- 88 Not useful information.
- 89 We need more information.