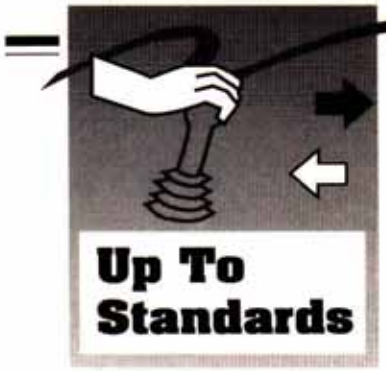


Mitsubishi Magic

The Final Chapter On The Mysteries Of The KM 160-180 Series Transaxles

By Mike Weinberg
Contributing Editor

Over the years we have done several articles on the Mitsubishi KM 160-180 5-speed transaxles. Although Mitsubishi has developed newer designs (the KM 200 series), a great many of these units still are in service in Chrysler, Mitsubishi and Hyundai vehicles. These units have generated a massive number of tech hotline calls and resulted in countless hours of wasted labor in units removed and torn down only to discover that the problems were external. Much of this is due to a lack of understanding of the theory of operations of this transaxle and a lack of adequate diagnostic information on the electronics involved. I promised that when good data became available we would publish it, and through the help of a friendly Mitsubishi dealer I am able to make good on my word.

Mechanical Review

The KM 160 series front-wheel-drive transaxles and the 180 series all-wheel-drive units actually are 4-speed transaxles with a 2-speed input shaft. To achieve a shift to 5th gear, an electronic/vacuum-operated control system moves the input-shaft synchronizer from the 1st-to-4th-gear side to the overdrive side, which changes the input ratio to achieve overdrive. Downshifting from 5th to a lower gear moves the input synchronizer back into the direct-drive input ratio (See Figure 1). The shift rail for the input synchronizer is operated by a two-sided vacuum diaphragm that extends or retracts the shift rail.

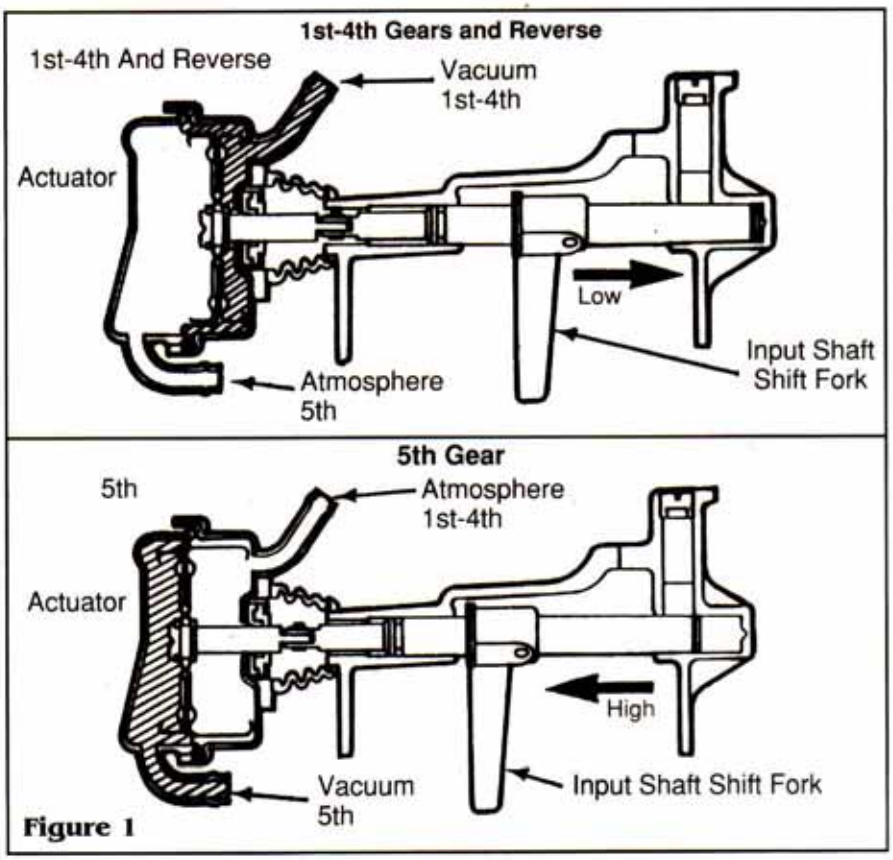


Figure 1

A loss of vacuum may cause the input synchronizer to remain in a neutral position and lead the uninitiated to believe the clutch had failed. Many of these units have been removed only to reveal the clutch to be in perfect working order. Rule No. 1 is never to pull one of these units until all external controls (vacuum and electric) have been tested.

Some obvious mechanical failures can cause improper operation. Check the pin and sleeve that connect the input shift rail to the vacuum diaphragm to make sure they are in place. We have seen vacuum diaphragms that are corroded and rusted so that they cannot work. If you have a unit that will get 5th but no 1st through 4th, it is likely that the seat for the input rail has flipped over, blocking rail travel for all forward gears except 5th. A unit that is noisy on the shifts and falls out of gear may have a loose input-shaft locknut, but never disassemble a unit until all external controls have been verified to be working correctly.

The vacuum system is relatively simple. Vacuum runs from the intake manifold through a large, preformed hose to a one-way check valve, to a vacuum canister (to minimize vacuum fluctuations from changing throttle opening), to a Select Control valve that electrically ports vacuum from one side of the Vacuum Select Actuator (dual-port vacuum diaphragm) to operate the input synchronizer (See Figure 2). One of the most-common failures is loss of 5th gear when the engine reaches operating temperature. Start at the main vacuum line at

the one-way check valve and measure vacuum cold and hot. If there is a marked decrease in vacuum as the engine heats up, remove the main vacuum line and split it open the long way. These are double-laminated hoses, and the inner layer tends to melt from exposure to engine heat and restrict vacuum. Use a piece of Hayden cooler-line hose and a couple of clamps as a replacement. Mouth-blow the one-way check valve and make sure it permits vacuum flow to the manifold and blocks flow to the canister.

In cases where there is no 5th gear but vacuum is good to the Select Actuator, the next step is to separate vacuum and electronic concerns and make sure the unit is good mechanically. The quick way to do this is to swap hoses on the Select Actuator Diaphragm. If the unit will shift 1st through 4th gears and you swap hoses, you still will have 1st through 4th but acceleration will be sluggish because you are on the overdriven side of the input. We now know that the unit can function correctly mechanically and the problem is outside the trans.

The next steps are quick electrical checks to locate the cause of complaints of no shift to 5th (See Figure 3). Verify that the backup lights are working correctly when the unit is shifted into reverse. The reverse-light switch and its wiring may be at fault, or the checkball under the reverse-light switch may have been lost on a previous repair.

Next we move to the Select switch that is mounted on the transaxle case or on the shift linkage, depending on which model you are working on. Disconnect the switch at the harness and connect an ohmmeter to the two wires. Have someone sit in the car and hold the shift lever halfway between 4th and 5th gears on the neutral bar. The switch should close and provide continuity. If there is no continuity, loosen the two 10mm bolts that retain the switch and rotate the switch until continuity is achieved with the shifter held halfway between 4th and 5th gears on the neutral gate.

Figure 2 Vacuum Hose Routing

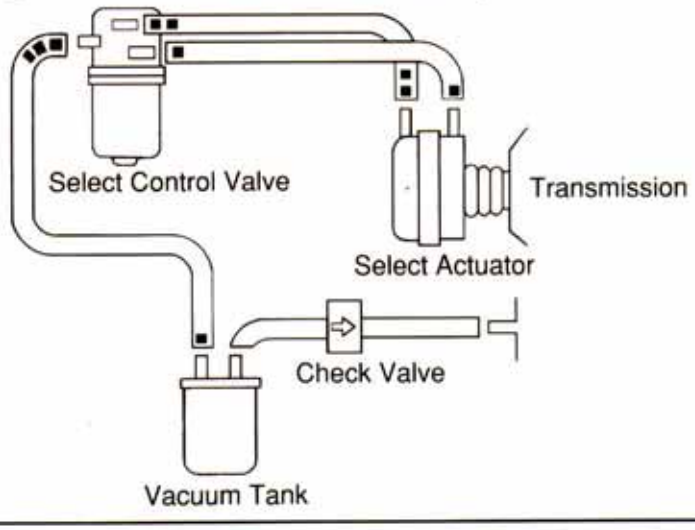
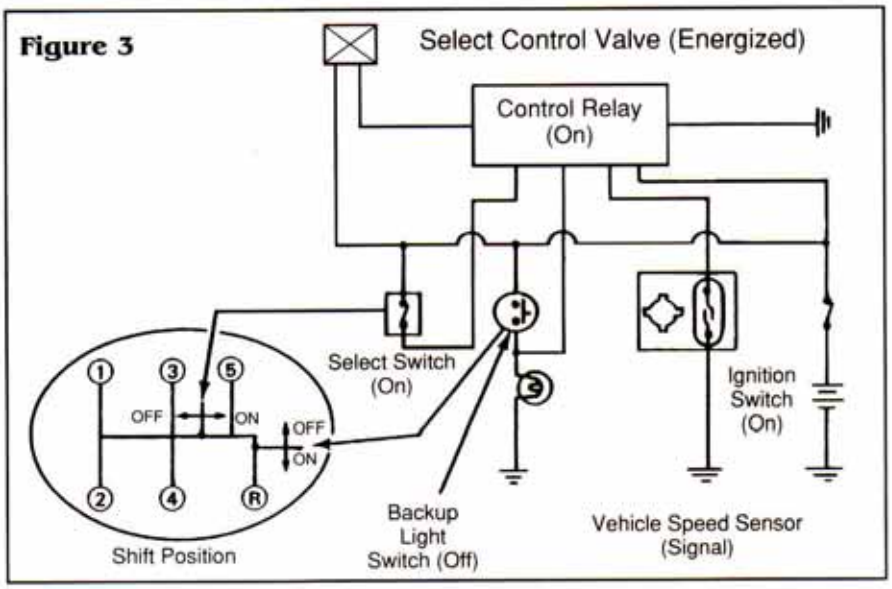


Figure 3



If continuity cannot be achieved, the switch is no good and should be replaced. When the driver moves the stick across the neutral gate to shift to 5th, it is the closing of the select switch that powers the Select Control Valve to port vacuum to move the input shift rail to the overdrive side. A misadjusted switch will cause a no-5th condition, a grinding shift to 5th or 5th-gear jump-out.

When the driver shifts to reverse, the select switch will close as the shifter is moved across the neutral gate, but since an overdriven reverse would not be useful, the reverse-light switch interrupts the circuit and prevents the input shift rail from moving. This is why it is critical that the backup lights be functioning correctly. Be sure to reconnect the select switch after adjustments have been made (See Figure 4).

We now have eliminated the select switch and the reverse lights as possible causes of no 5th gear. The next items to check are the vehicle's speed sensor, which is in the speedometer head in the dash; the Select Control valve solenoid, and the 5th-speed control relay (See Figure 5). Don't panic; these are all simple to test. Disconnect the wire connector at the 5th-speed select-control-valve solenoid. Hook up a voltmeter be-

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Up To Standards

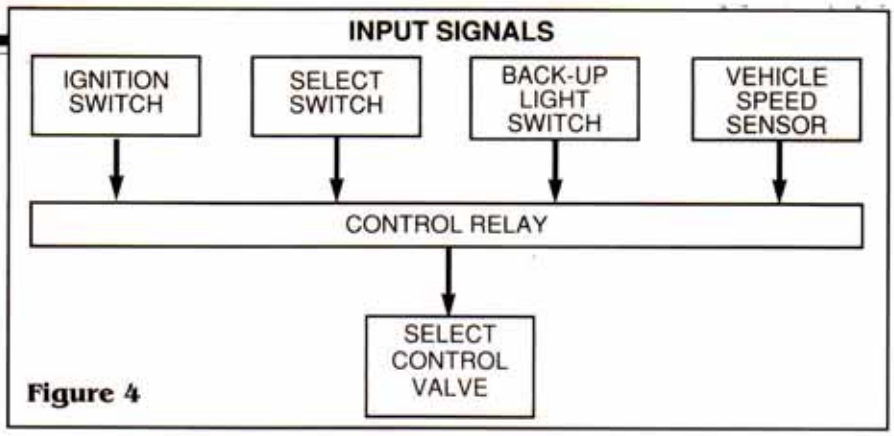


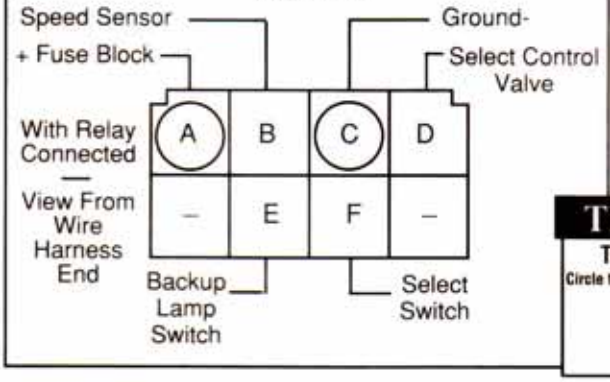
Figure 4

tween the red wire on the control-relay side of the connector and battery ground. Turning on the ignition should give you battery voltage. If battery voltage is not present, check the fuse or repair the open in the red wire. Locate the 5th-speed control relay on the driver's-side kick panel under the dash. It has an 8-pin connector with two black slots and 6 wires. With the relay connected, back-probe pins A and C with the voltmeter. A is battery voltage from the fuse block, and C is the ground circuit. With the ignition on, battery voltage should show between A and C. If there is no voltage, there probably is an open in C and the ground circuit must be repaired. To test the speed sensor (which will permit a shift to 5th only at road speeds above 6 mph), back-probe control-relay terminals B(+) and C(-) with an analog voltmeter. With the ignition on, hold one wheel and rotate the other slowly by hand. The meter should sweep from 0 to 5 volts, indicating the speed sensor to be working properly. If the needle does not sweep, check for an open or replace the speed sensor. Back-probe terminals F(+) and C(-) with the voltmeter. With the ignition on and the shift lever in 5th gear, battery voltage should be seen. We have tested and adjusted the select switch and are verifying that the wiring from the select switch to the control relay is good.

Back-probe terminals E(+) and C(-) with the ignition on and the shift lever in reverse; we should see battery voltage. This ensures that the signal from the backup lights is reaching the control relay. To test the control relay, back-probe terminals A(+) and D(-) with the voltmeter. With the engine running and the transmission shifted into 5th at a road speed above 6 mph, we should see battery voltage. If not, the control relay has seen better days and should be replaced. If the relay is functional but 5th cannot be achieved, there is an open between D(-) and the select control valve

As you may have noticed, the control relay is misnamed. It actually is a small computer capable of receiving inputs from five sources and must complete a ground to enable a shift to 5th. Please save this article for reference, as this information is not readily available. Knowing how to diagnose this unit quickly will make you the "go-to guy" for these gearbox problems and fatten up your checkbook at the same time. TD

Figure 5



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