# TRANSMISSION CONTROL MODULE (TCM) ADAPTATION

The TCM or Transmission Control Module Assembly (TCMA) controls the fluid pressure and fill time of each clutch pack to give optimal shift quality. As the clutches wear, the TCM or TCMA will adapt and make adjustments to keep the shift quality consistent over the life of the vehicle. The initial clutch filling pressure and fill times are set at the factory. When a transmission assembly or transmission component is replaced, or when the adaptation values are reset, the adaptation values must be relearned. This procedure should also be followed when it is suspected that a vehicle has not been driven in a manner that encourages clutch adaptation learning in highway or city driving conditions.

**NOTE: The scan tool, for many 8-Speed Transmissions now has a QUICK LEARN or STATIC ADAPTATION (STADA) routine that should be performed if the customer has any shift quality concerns or after any internal repairs are performed on the transmission. If the QUICK LEARN or STATIC ADAPTATION routine is not available on the scan tool for the application you are working on or the shift quality concern is not corrected by performing the QUICK LEARN or STATIC ADAPTATION routine then the TCM ADAPTATION PROCEDURES below need to be performed.**

## QUICK LEARN PROCEDURE

**NOTE: 2015 model year vehicles equipped with the 845RE (Sales Code DFL) already contain software in the TCM to enable the Quick Learn procedure. However, 2014 model year vehicles with the 845RE require the Transmission Control Module to be updated to the latest software level.**

**NOTE: The scan tool software must be at the newest revision to perform this procedure.**

**NOTE: The QUICK LEARN PROCEDURE requires that the Transmission fluid temperature be at least 55°C (131°F).**

1. Drive the vehicle briefly to ensure all clutches have been engaged at least twice. Keep the engine running throughout the remainder of this procedure.
2. With the scan tool, activate the RESET ADAPTIVE VALUES routine.
3. With the scan tool, activate the QUICK LEARN routine and follow the on-screen instructions. This procedure requires about 2-5 minutes to complete.

## TCM ADAPTATION PROCEDURES

The two procedures to relearn these values are called Fast Filling Adaptation and Standard Clutch Filling Adaptation. Depending on the repair or complaint, one or both procedures must be performed as described below.

**NOTE:**

**Performing a reset of the Transmission Adaptation values does not automatically trigger the TCM to relearn the Adaptation values. If a reset is performed, both procedures must be performed to restore optimal shift quality. Do not reset these values unless specifically instructed to do so.**

**NOTE:**

**This procedure does not need to be performed if the existing TCM or TCMA is re-flashed and that was the only repair performed.**

One or both TCM Adaptation procedures should be performed depending on the situation. Failure to perform these procedures when required could cause shift quality issues.

**Fast Filling Adaptation Procedure**

Perform the following procedure when the TCM or TCMA, or Transmission assembly (with TCMA) has been replaced, or when the adaptation values have been reset. This procedure should be performed before performing the Standard Clutch Filling Adaptation Procedure when these components are replaced.

**NOTE:**

**Perform this procedure on a smooth road surface. The TCM or TCMA will abort the adaptation process if it senses rough road conditions. The road should be clear of traffic due to the start, stop, and slow vehicle speeds required during this procedure.**

1. With the Scan Tool, erase Diagnostic Trouble Codes (DTCs).
2. Setup the scan tool to display the Transmission Oil Temperature, Torque, Turbine (Input) Speed Sensor rpm, and Clutch 'X' - Filling Counter for each clutch.
3. Drive the vehicle until the Transmission Oil Temperature is above 30° C (86° F).
4. Stop the vehicle.
5. Drive the vehicle to perform upshifts for all gears under the following conditions:
   - Light to medium throttle position
   - Turbine (Input) Speed between 1,250 - 2,000 rpm
   - Torque between 100 N·m and 150 N·m (74 ft. lbs. and 111 ft. lbs.)
6. Release the throttle (0% position) to coast and allow a 6-5 down-shift.
7. Perform steps 4-6 until the Filling Counters for each clutch displays 10 counts.

   The tables below may be used as an alternate reference for the optimal conditions required to learn the Fast Filling Adaptations.

## Fast Filling Adaptation Conditions Table

| Conditions Where Fast Filling Adaptations Occur | | | |
|---|---|---|---|
| **Condition** | **Transmission Temperature** | **Torque N·m (ft. lbs.)** | **Input Speed (rpm)** |
| Upshifts | Between 30° C and 100° C (86° F and 212° F) | Between 100 N·m and 150 N·m (74 ft. lbs. and 111 ft. lbs.) | Between 1250 and 2000 rpm |
| 6-5 Downshifts for B Clutch | Between 30° C and 100° C (86° F and 212° F) | Between negative (-) 60 N·m and negative (-) 40 N·m (negative (-) 44 ft. lbs. and negative (-) 30 ft. lbs.) | Between 750 and 1100 rpm |

## Clutch vs Shift Table

| Shifts Where Each Clutch Will Fast Adapt | | | | | |
|---|---|---|---|---|---|
| | A Clutch | B Clutch | C Clutch | D Clutch | E Clutch |
| **Shift** | 6 - 7 | 6 - 5 | 2 - 3 and 4 - 5 | 3 - 4 | 1 - 2 and 5 - 6 |
| **Optimal conditions under which adaptation learning occurs.** | Best performed at highway speeds in excess of 80 km/h (50 mph). | Coasting with throttle at 0% position. | Best performed at light to medium-throttle - normal vehicle launch. | Best performed at light to medium-throttle - normal vehicle launch. | Best performed at light to medium-throttle - normal vehicle launch. |

8. Perform the Standard Clutch Filling Adaptation Procedure.

**Standard Clutch Filling Adaptation Procedure**

Perform the following procedure when a Transmission internal component, Torque Converter, TCM or TCMA, or Transmission has been replaced, or when the adaptation values have been reset. This procedure should also be performed if it is suspected that the vehicle has not been driven in a manner that encourages clutch adaptation learning in highway or city driving conditions.

**NOTE:**
**Perform this procedure on a smooth road surface. The TCM or TCMA will abort the adaptation process if it senses rough road conditions. The road should be clear of traffic due to the start, stop, and slow vehicle speeds required during the procedure.**

**NOTE:**
**The TCM learns the Standard Clutch Filling Adaptation values when the applicable clutch is not applied.**

1. With the Scan Tool, erase DTCs.

2. Setup the scan tool to display the Transmission Oil Temperature, Torque, Turbine (Input) Speed Sensor rpm, and Clutch 'X' - Fast Filling Counter for each clutch.

3. Drive the vehicle until the Transmission Oil Temperature is above 50° C (122° F).

   **NOTE:**
   **Adaptation learning will be aborted if the Transmission Oil Temperature is above 100° C (212° F).**

4. Stop the vehicle.

5. Drive the vehicle using the paddle shifters or Gear +/- buttons on steering wheel in order to hold the transmission in the desired gear.

   **NOTE:**

**First and second gears do not require a Standard Clutch Filling Adaptation procedure.**

**NOTE:**

**If attempting to resolve a specific shift quality issue, use the Gear vs Clutch Table below to see which clutches require further adaptation. For instance, if a rough 2-1 downshift is noted, note that clutch C and clutch E are applying and releasing. Then use the Clutch vs Shift Table above to note that clutch C and clutch E require the adaptation procedure performed in 4th and 7th gear.**

6. In 3rd gear, drive the vehicle within the following conditions until the Clutch D - Fast Filling Counter increments by one count:

    - Vehicle speed between 32-56 km/h (20-35 mph)
    - Turbine (Input) speed between 950 - 1750 rpm
    - Torque between 25 N·m - 180 N·m (18 ft. lbs. - 133 ft. lbs.)

7. In fourth gear, drive the vehicle within the following conditions until the Clutch C - Fast Filling Counter increments by one count:

    - Vehicle speed between 32-56 km/h (20-35 mph)
    - Turbine (Input) speed between 950 - 1750 rpm
    - Torque between 25 N·m - 120 N·m (18 ft. lbs. - 89ft. lbs.)

**NOTE:** Fifth gear does not require a Standard Clutch Filling Adaptation procedure.

8. In sixth gear, drive the vehicle within the following conditions until the Clutch A - Fast Filling Counter increments by one count:

    - Vehicle speed between 73-81 km/h (45-50 mph)
    - Turbine (Input) speed between 950 - 1750 rpm
    - Torque between 50 N·m - 120 N·m (37 ft. lbs. - 89ft. lbs.)

9. In seventh gear, drive the vehicle within the following conditions until the Clutch B- Filling Counter and Clutch E Fast Filling Counter each increment by one count:

    - Vehicle speed between 73-81 km/h (45-50 mph)
    - Turbine (Input) speed between 950-1750 rpm
    - Torque between 50 N·m-120 N·m (37 ft. lbs.-89ft. lbs.)

The **Standard Clutch Filling Adaptation Conditions Table** below may be used as an alternate reference for the optimal conditions required to learn the Standard Clutch Filling Adaptations.

## Standard Clutch Filling Adaptation Conditions Table

| Steady State Gears And Conditions Where Each Clutch Will Adapt | | | | | |
|---|---|---|---|---|---|
| Clutch | Gear | Optimal Vehicle Speed | Input Speed (rpm) | Torque N·m (ft. lbs.) | Transmission Temperature |

| Steady State Gears And Conditions Where Each Clutch Will Adapt | | | | | |
|---|---|---|---|---|---|
| Clutch | Gear | Optimal Vehicle Speed | Input Speed (rpm) | Torque N·m (ft. lbs.) | Transmission Temperature |
| A Clutch | 6th | 73-81 km/h (45-50 mph). | Between 950 and 1750 rpm | Between 50 N·m and 120 N·m (37 ft. lbs. and 89 ft. lbs.) | Between 50° C and 100° C (122° F and 212° F) |
| B Clutch | 7th | 73-81 km/h (45-50 mph). | Between 950 and 1750 rpm | Between 50 N·m and 120 N·m (37 ft. lbs. and 89 ft. lbs.) | Between 50° C and 100° C (122° F and 212° F) |
| C Clutch | 4th | 32-56 km/h (20-35 mph). | Between 950 and 1750 rpm | Between 25 N·m and 120 N·m (18 ft. lbs. and 89 ft. lbs.) | Between 50° C and 100° C (122° F and 212° F) |
| D Clutch | 3rd | 32-56 km/h (20-35 mph). | Between 950 and 1750 rpm | Between 25 N·m and 180 N·m (18 ft. lbs. and 133 ft. lbs.) | Between 50° C and 100° C (122° F and 212° F) |
| E Clutch | 7th | 73-81 km/h (45-50 mph). | Between 950 and 1750 rpm | Between 50 N·m and 120 N·m (37 ft. lbs. and 89 ft. lbs.) | Between 50° C and 100° C (122° F and 212° F) |

10. Perform steps 4-9 until the Fast Filling Counters for each clutch has incriminated by at least five counts.

11. Evaluate shift performance for all gears. If the shift quality for any gear is insufficient, execute the appropriate driving conditions until shift quality improves. Incrementing the Fast Filling Counters by 12 counts for each clutch may be necessary to properly learn the adaptation values.

The following table Controller Area Network (CAN) be used to determine which clutches are involved in a specific up-shift or down-shift quality issue. 'X' indicates when a clutch is applied. The Standard Clutch Filling Adaptation learning occurs when the applicable clutch is not applied and the transmission is in a steady state (not shifting).

## Gear vs Clutch Table

| Gear | Clutch A | Clutch B | Clutch C | Clutch D | Clutch E |
|---|---|---|---|---|---|
| 1st | X | X | X | | |

| Gear | Clutch A | Clutch B | Clutch C | Clutch D | Clutch E |
|---|---|---|---|---|---|
| 2nd | X | X | | | X |
| 3rd | | X | X | | X |
| 4th | | X | | X | X |
| 5th | | X | X | X | |
| 6th | | | X | X | X |
| 7th | X | | X | X | |
| 8th | X | | | X | X |
| Reverse | X | X | | X | |

Read the information below for details regarding this procedure.

**Reading Clutch Adaptation Data**

The Clutch Packs will each have 4 scan tool data labels to observe under the TCM section. Using Clutch A as an example, the data labels are:

- **Clutch A- Fast Filling Counter:** This data label displays the number of Clutch Filling Pressure adaptations that have been performed. These adaptations are the first learned values on a new transmission or after clutch adaptation values are reset. You will need to allow 5 to 12 fast filling counts per clutch to properly learn the clutch adaptations. If the shift quality is sufficient after 5 counts, no further adaptation learns for that clutch are necessary.
- **Clutch A- Filling Counter:** This data label displays the number of Clutch Filling Time adaptations that have been performed. You will need to allow 5 to 12 filling counts per clutch to properly learn the clutch adaptations. If the shift quality is sufficient after 5 counts, no further adaptation learns for that clutch are necessary.
- **Clutch A- Filling Pressure:** This data label displays the clutch filling pressure value that is learned during the TCM Adaptation procedure. The TCM adaptation software will increase or decrease the clutch fluid filling pressure to improve shift performance. The clutch Filling Pressure value will change over the life of the transmission based first on initial transmission build variation and then due to normal clutch wear.
- **Clutch A- Filling Time:** This data label displays the clutch filling time value that is learned during the TCM Adaptation procedure. The TCM adaptation software will increase or decrease the Clutch Filling Time to improve shift performance. The clutch Filling Time value will change over the life of the transmission based first on initial transmission build variation and then due to normal clutch wear.