

**LET'S PLAY BALL**

# EDUCATING the AF33-5



by Lance Wiggins



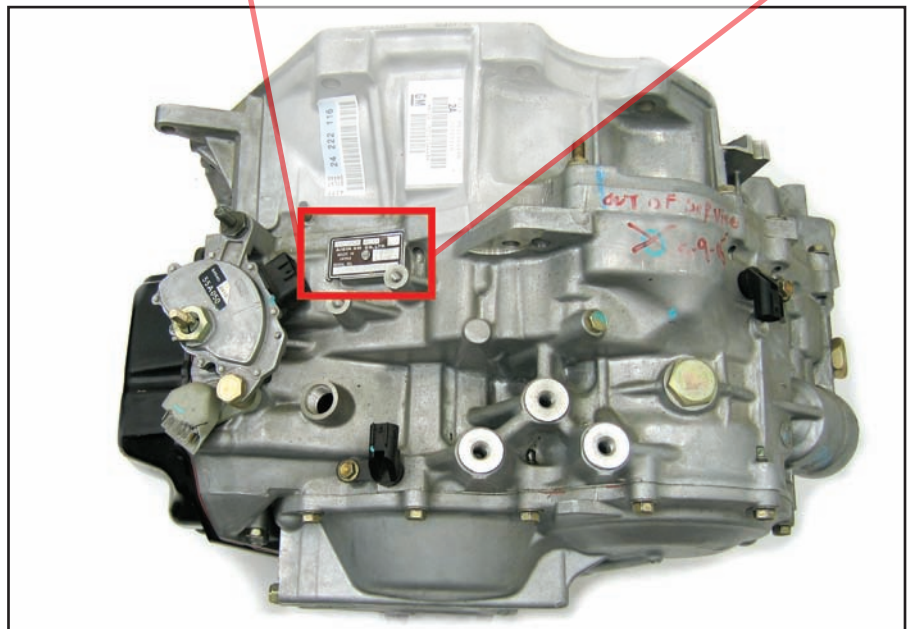
**A**s 2007 quickly approaches its end and 2008 is in sight, it occurred to me that my 20th high school reunion is coming up next year. 20 years since completing my high school education... a lot has changed since 1988; for one thing, today's technicians aren't the only ones in the shop who need an education: the cars need it, too! You'll see what I mean in a minute.

In this article, we're going to look at a new transmission from GM: the AF33-5, or AW55-50SN as the folks from Aisin Warner call it (Figure 1).

The AF33-5 is a fully-automatic, five-speed, electronically-controlled transaxle. It's used in the Chevrolet Equinox, but mainly appears in the Saturn Ion sedan and the Vue.

Before we get into the transmission control system and the idea of educating it, let's take a closer look at the TCM operation. The TCM controls most transmission functions:

1. It commands shift solenoids in the transmission on and off to control shift timing.
2. It controls shift feel through the line pressure control solenoid valve.
3. And it controls torque converter clutch operation.



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Figure 1: the AF33-5, or AW55-50SN as the folks from Aisin Warner call it.



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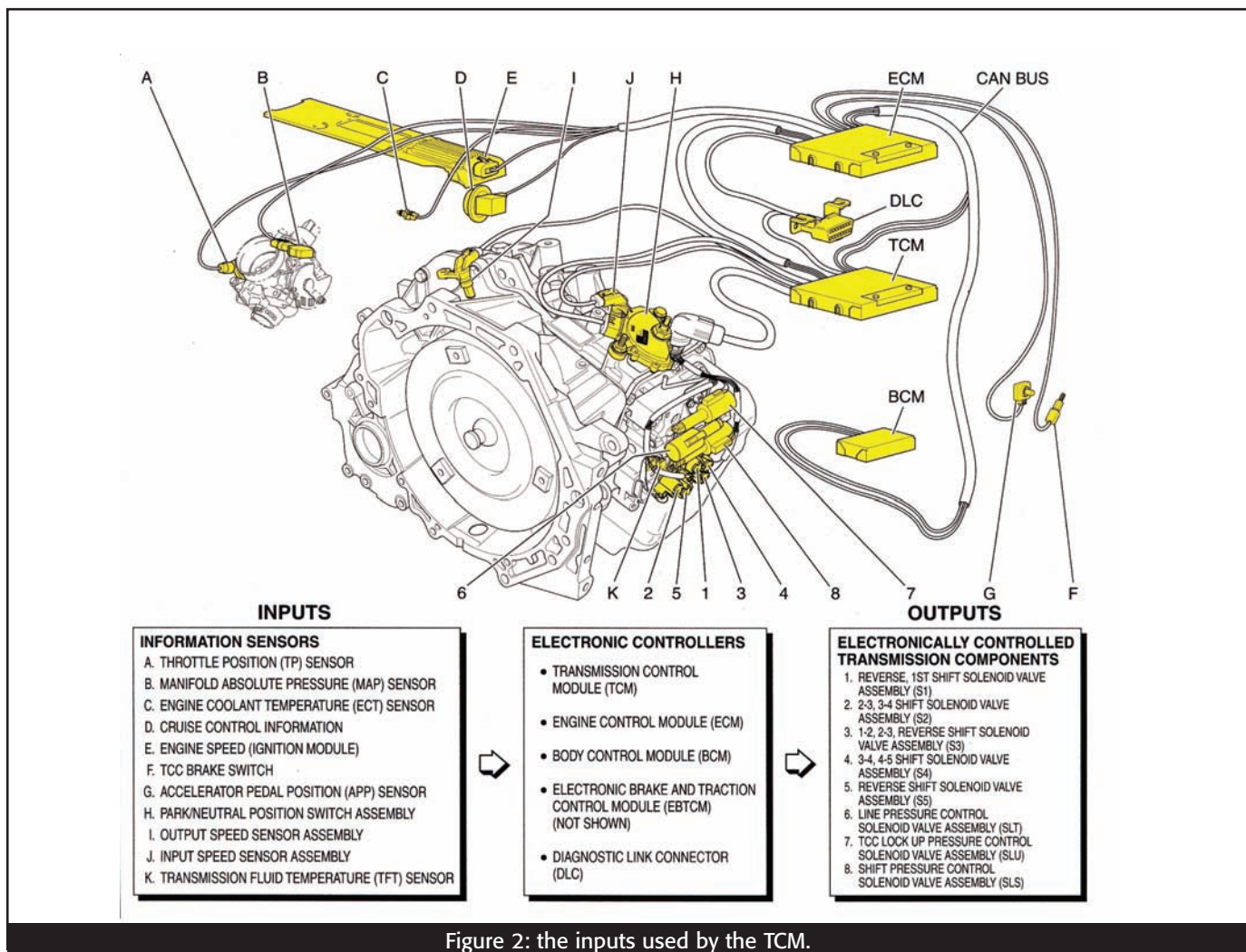


Figure 2: the inputs used by the TCM.

Take a look at the inputs used by the TCM (Figure 2):

The AF33-5 uses a line pressure control system which can adapt system line pressure to compensate for normal wear of clutch plates, seals, springs, etc. In effect, it learns the condition of the transmission, and adapts to that condition to provide the best possible operation.

The AF33-5 transmission uses the adapt function for garage shifts, upshifts, and TCC application. The TCM monitors the input shaft speed sensor and the output shaft speed sensor (Figure 3) to determine the shift duration, and adjusts the pressure control solenoid to maintain the correct shift feel.

Of course, repairs can alter the condition of the transmission, so it's important to perform a Transmission Adaptive Learn after any of the following repairs:

- Transmission Control Module (TCM) replacement

- TCM calibration change
- Valve body replacement
- Transaxle overhaul
- Transaxle replacement

In effect, an adaptive learn procedure lets you educate the transmission computer, to make it aware of the new conditions, and allow it to adjust its operation to compensate for them.

## Adaptive Learn Procedure

To perform the adaptive learn procedure, follow these steps carefully:

- Vehicle in park, key off.
- Set the parking brake.
- Turn the Key to the ACC position.
- Release the shift lock and place the transmission shift lever in neutral.
- Turn the Key to the off position.
- Remove the shift cable from the transaxle range switch lever.
- Verify the two arrows on the TCM are aligned.
- Reinstall the shift cable on the

transaxle range switch lever.

- Turn Key to the on position, engine off.
- Use a scan tool to implement the N-position adaptive learn.
  - If N-position adaptation is okay, skip to step 11.
  - If the TCM doesn't learn the N-position adaptation, go back to step 5.
  - If N-position adaptation sets a DTC, clear DTC and go back to step 5.
  - If the TCM can't learn N-position after three attempts, replace the TCM.
- Shift the transmission to park.
- Turn the Key to the off position.
- Wait 10 seconds.
- Turn the Key to the on position, engine off.
- Verify the shift lever indicator aligns in all gear positions. If they don't align, check for DTCs.
- Road test the vehicle to confirm gear shift positions.

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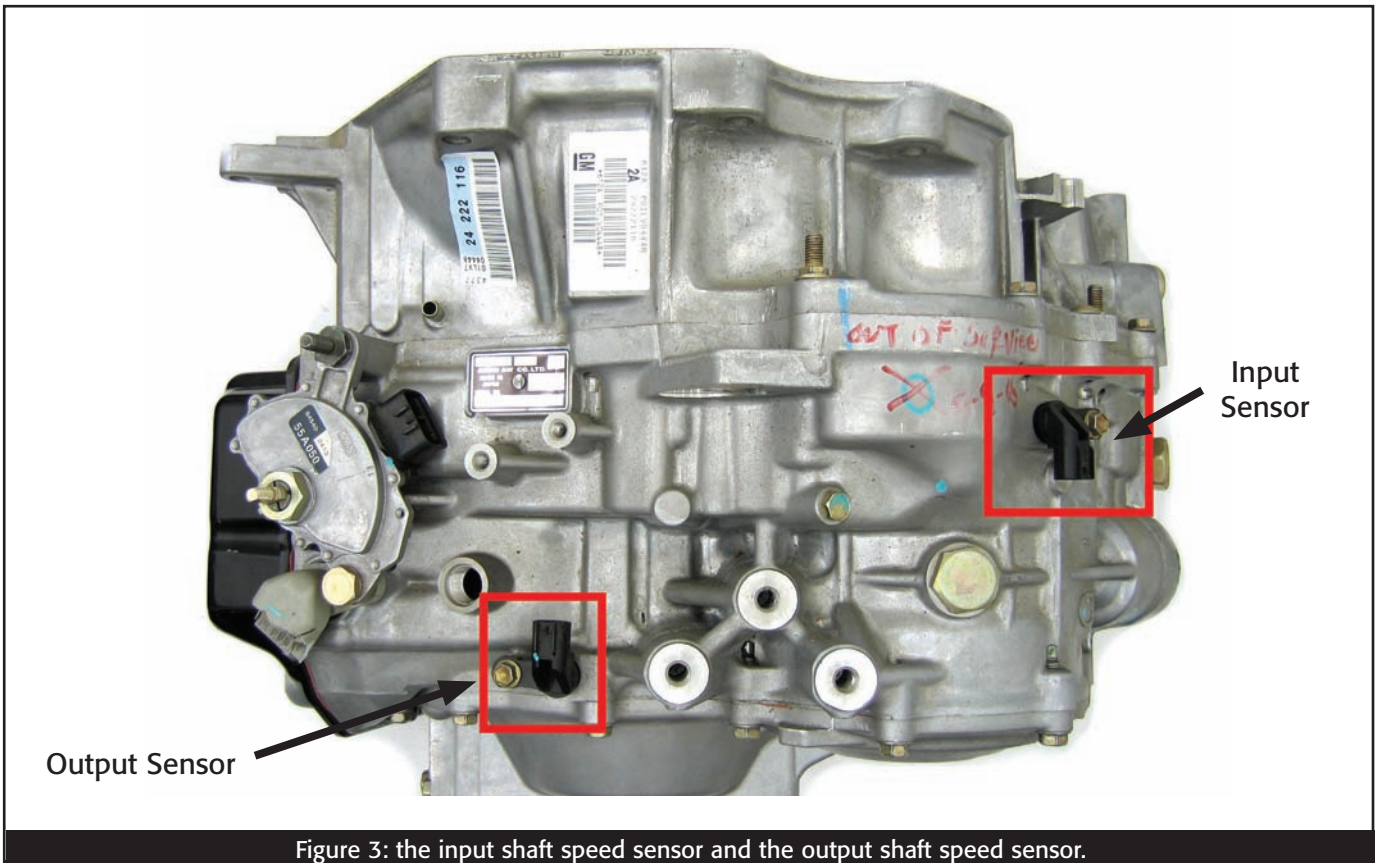


Figure 3: the input shaft speed sensor and the output shaft speed sensor.

Important: Perform all steps of the adaptive learn procedure. The engine will flare during shifting and/or harsh shifts will occur if not done correctly. When performing the up/down shifting during 2-3 and 3-4 upshifts, a small shift flare may occur the first or second time, depending on transaxle internal tolerances.

17. Drive the vehicle to warm the transaxle fluid to 65°–110°C (150°–230°F). The adaptive learn procedure won't work unless transaxle fluid is the correct temperature.
18. Reset the transaxle adaptive learn using a scan tool. Go to the Transmission Special Functions, then Trans Output Controls menu and select Reset Transmission Adapts.
19. Perform the following steps for the garage shifts adaptive learn:
  - a. Apply the parking brake and the foot brake.
  - b. Shift from neutral to reverse, and keep in reverse for 3 seconds.
  - c. Shift from reverse to neutral.
  - d. Repeat the above two steps five times.

- e. Shift from neutral to drive and keep in drive for 3 seconds.
  - f. Shift from drive to neutral.
  - g. Repeat the above two steps five times.
20. Perform the following steps for the up/down shifting adaptive learn:
    - a. Drive the vehicle in drive with light (15-20 percent) throttle until above 50 km/h (31 MPH) in 4th gear.
    - b. If the vehicle isn't connected to a scan tool and you can't monitor throttle position, take 30 seconds for reaching the 50 km/h (31 MPH).
    - c. Decelerate and apply the brakes until vehicle comes to a stop. Brake slowly, so it takes at least 14 seconds to come to a complete stop.
    - d. Repeat the above steps five times.
  21. Perform the following steps for 2-1 manual downshift adaptive learn:
    - a. Drive the vehicle in 1st until over 25 km/h (16 MPH) in 2nd, with any throttle position.

- b. Decelerate, shift from 1st to L manually and stop the vehicle.
  - c. Repeat the above steps ten times.
22. Confirm shift quality.

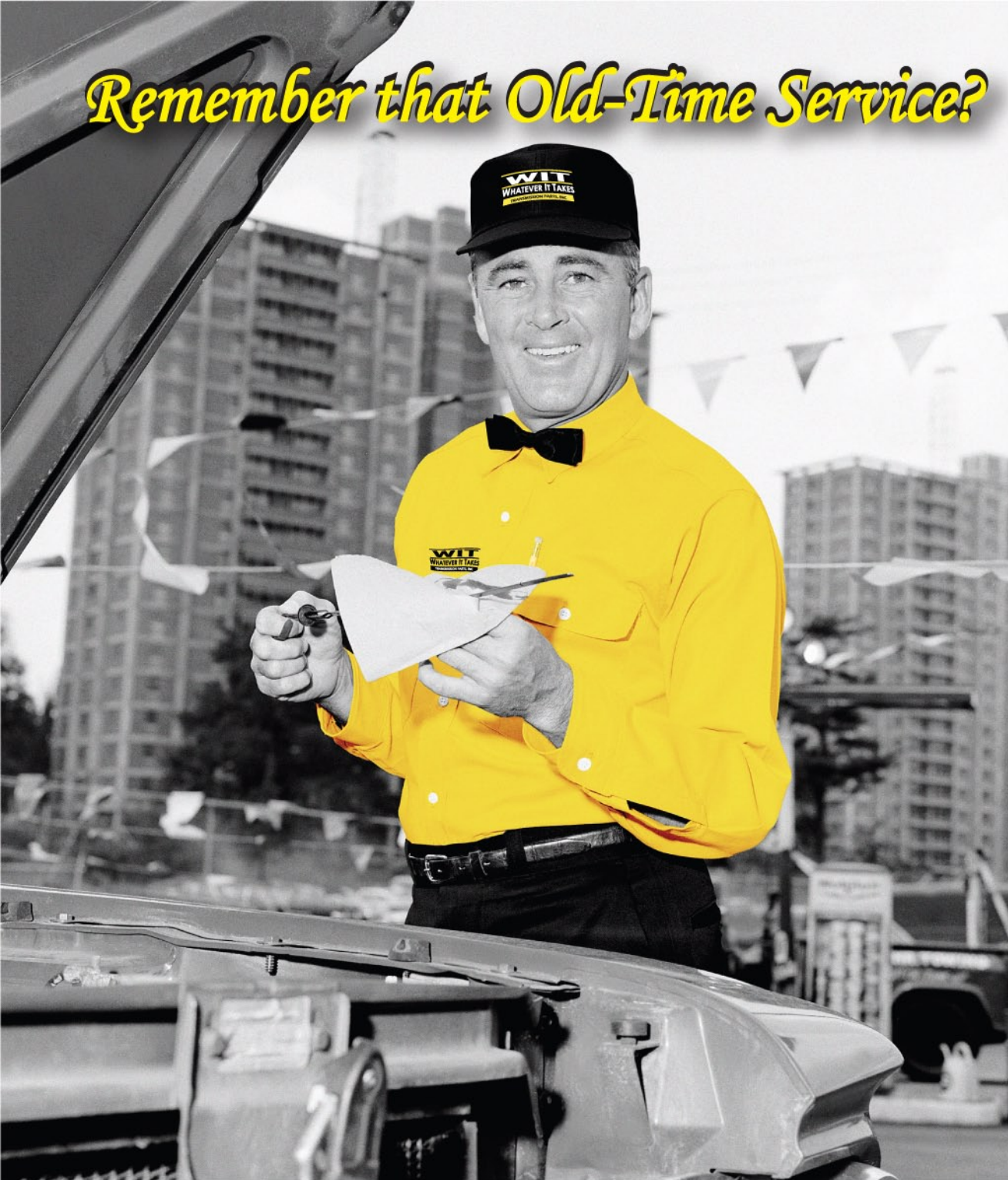
Important: If shift quality doesn't improve, make sure the TCM has the correct transmission calibration.

As you can see, there's a lot that goes into the education of today's AF33-5 transmission control system, and when it's done, it doesn't even get to wear a cap and gown, or get a graduation present. On the other hand, it will perform better, right out of the box.

In the next issue of *GEARS*, we're going to learn about the internal components and operation of the AF33-5 transmission... because transmissions aren't the only things that can always use a little more education!



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