



## FORD CFT30 CVT INTERMITTENT HARSH SHIFTS

**COMPLAINT:** A Ford vehicle with the CFT30 CVT may have an after overhaul complaint of Erratic and intermittent harsh shifts. DTCs P0701 - Transmission Performance Fault, P0716 - Turbine Speed Sensor Circuit Range/Performance and P0811 - Excessive Clutch Slippage.

**CAUSE:** A reverse planetary with a bent turbine speed sensor tone ring was installed, Refer to Figure 1. This created a pulley speed ratio error yet no gear ratio codes were ever set.

**CORRECTION:** Replace reverse planetary.

**SUMMARY:** The Turbine Speed Sensor and the Primary Variator Speed Sensor are Hall Effect speed sensors housed in the Mechatronic unit and are not serviceable. The Primary Variator Speed Sensor reads the toothed part of the primary pulley and therefore measures primary pulley speed. The Turbine Speed Sensor reads the tone ring on the reverse planetary and measures rotational speed of the primary pulley. The Output Speed Sensor is actually two sensors in one and is mounted to the transmission case next to the valve body. Output Speed Sensor "A" is reading the spur gear mounted on the secondary variator and measures actual output RPM. Output Speed Sensor "B" is reading the differential gear teeth and measures directional rotation for forward and reverse motion. The signals from these speed sensors is what the TCM is using to calculate gear ratio.

Comparing the two waveforms in Figure 2 and 3, notice where the cursors are parked, in Figure 2 the cursor is parked on a damaged area of the turbine speed sensor tone ring. The waveform also shows that the measured and commanded pulley speed are not the same using the VAR\_CMD and VAR\_MES parameters. These parameters represent commanded ratio and measured ratio which are incorrect. The correct ratio should be 1.9 but is indicating a 3.1 to 2.3 ratio.

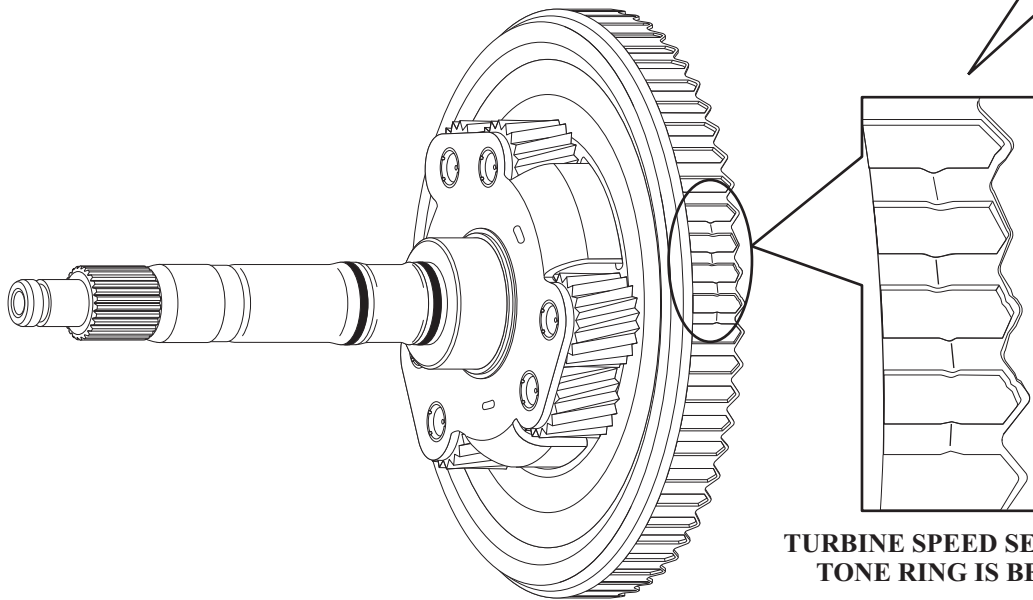
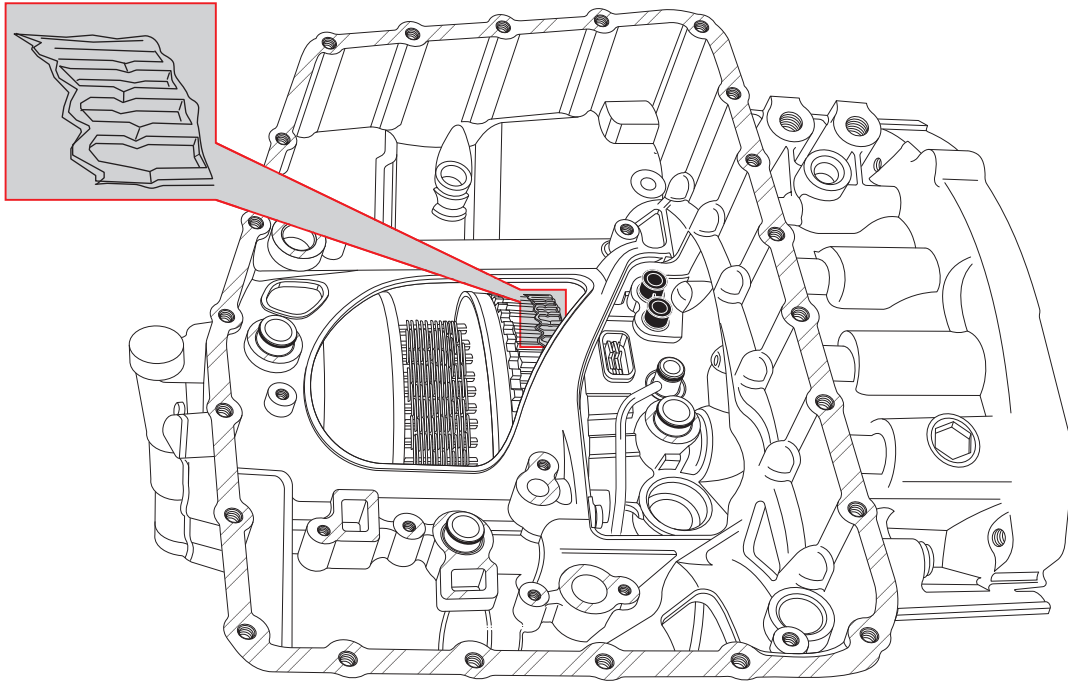
In Figure 3 the cursor is parked over an undamaged area of the turbine speed sensor tone ring. The VAR\_CMD and the VAR\_MES parameters indicated approximately the same gear ratio but using the formula of Speed Pulley "A" divided by Speed Pulley "B", the gear ratio should read 0.86 but is indicating a 1.4 ratio. This means that even though the cursor is on an undamaged area of the tone ring, the TCM has not been able to calculate the correct gear ratio before the turbine speed sensor reads the damaged area of the turbine speed sensor tone ring again.

The chart in Figure 4 identifies the data parameters used in this bulletin.

*A very special thanks to John Thornton for allowing ATSG to use this case study for the production of this bulletin.*

## FORD CFT30 CVT INTERMITTENT HARSH SHIFTS

**TURBINE SPEED SENSOR  
READS REVERSE PLANET  
TONE RING**



**TURBINE SPEED SENSOR  
TONE RING IS BENT**

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Figure 1

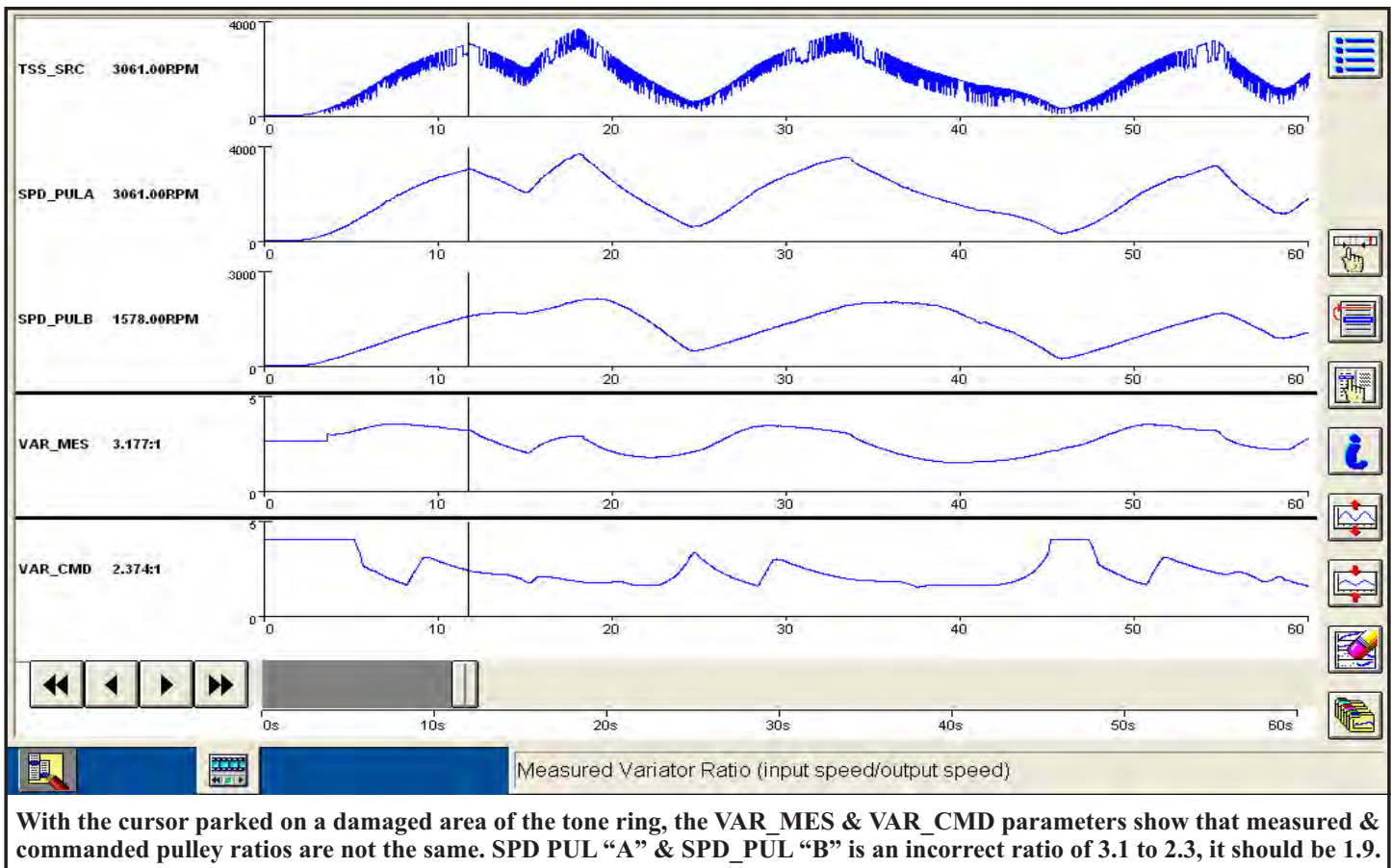


Figure 2

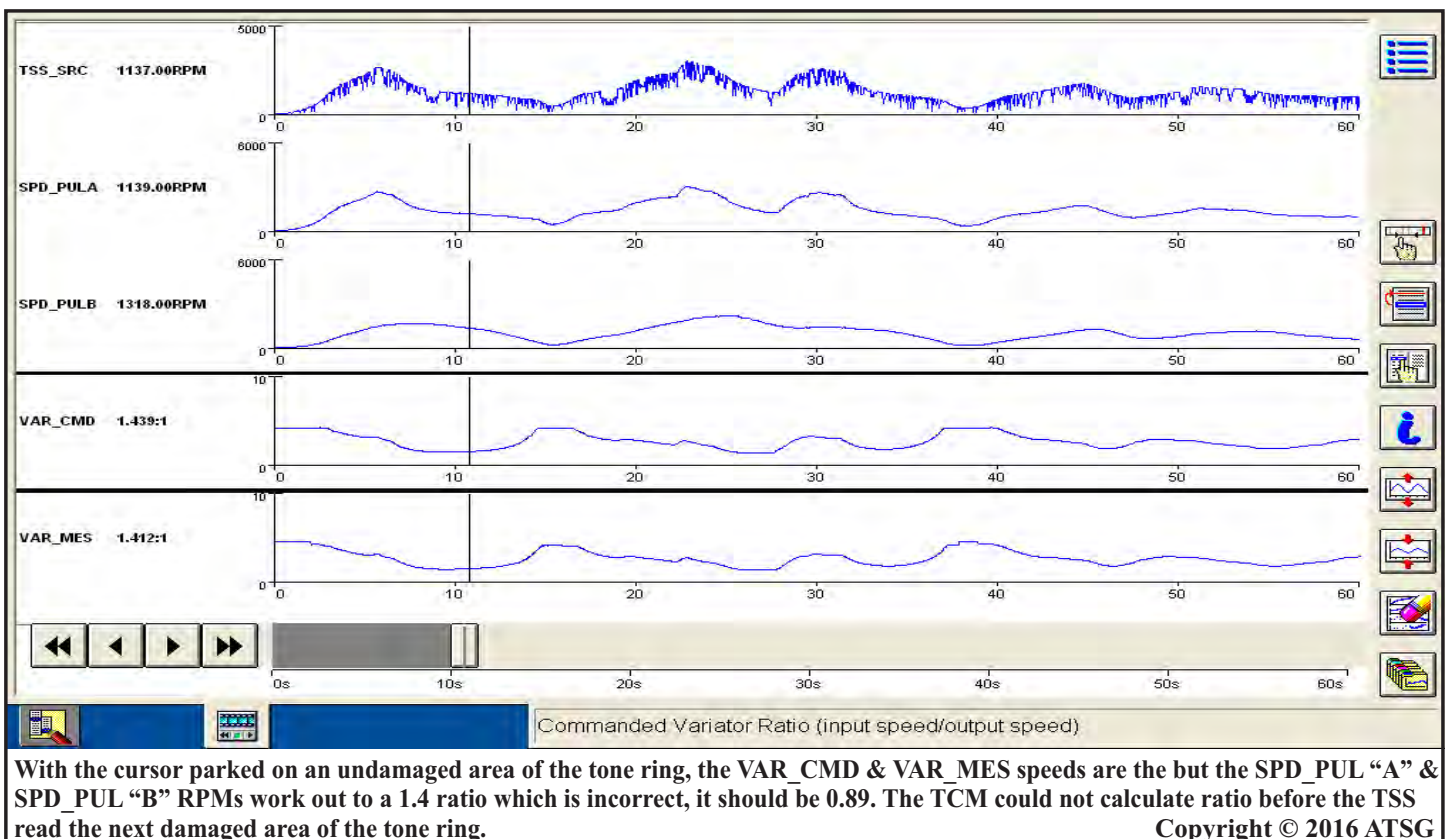


Figure 3



## Technical Service Information

### FORD CFT30 CVT INTERMITTENT HARSH SHIFTS

DATA PARAMETER IDENTIFICATION			
PID NAME	DESCRIPTION	UNITS	ADDITIONAL DESCRIPTION
VAR_CMD	Commanded Variator Ratio Input/Output Speed	RATIO	Desired Gear Ratio
VAR_MES	Measured Variator Ratio Input/Output Speed	RATIO	Actual Gear Ratio
OSS_A	Output Shaft Speed A	RPM	Actual Output Shaft Speed
OSS_B	Output Shaft Speed B	RPM	Directional Output Speed
RPM_TCM	Engine Revolutions Per Minute	RPM	Engine RPM
SPD_PUL A	Actual Pulley Speed A	RPM	Primary Pulley RPM
SPD_PUL B	Actual Pulley Speed B	RPM	Secondary Pulley RPM
TSS_SRC	Turbine Shaft Speed	RPM	Actual Turbine Shaft Speed

Figure 4