



INTRODUCTION

MITSUBISHI F5A5A (F5A51) & HYUNDIA/KIA A5GF1, A5HF1 (F5A51)

This is a five speed, Front Wheel Drive transaxle, with fully electronic controls for the upshifts and downshifts, with 5th gear being overdrive. The individual gear ratios are achieved through three planetary gear sets. The components of the planetary gear sets are driven or held by means of four multi-plate drive clutch packs, two multi-plate brake clutch packs, one reduction brake band and two one way clutches.

To minimize fuel consumption, the torque converter clutch is applied by the PCM, depending on throttle position and vehicle speed. These units are currently found in several Mitsubishi models, some Hyundai models and some Kia models, as shown in Figure 1 and 2. The 2007 and later Hyundai models and the 2006 and later Kia models have an added line pressure control solenoid, along with a revised shift solenoid application.

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IDENTIFICATION CODE STAMPING LOCATION

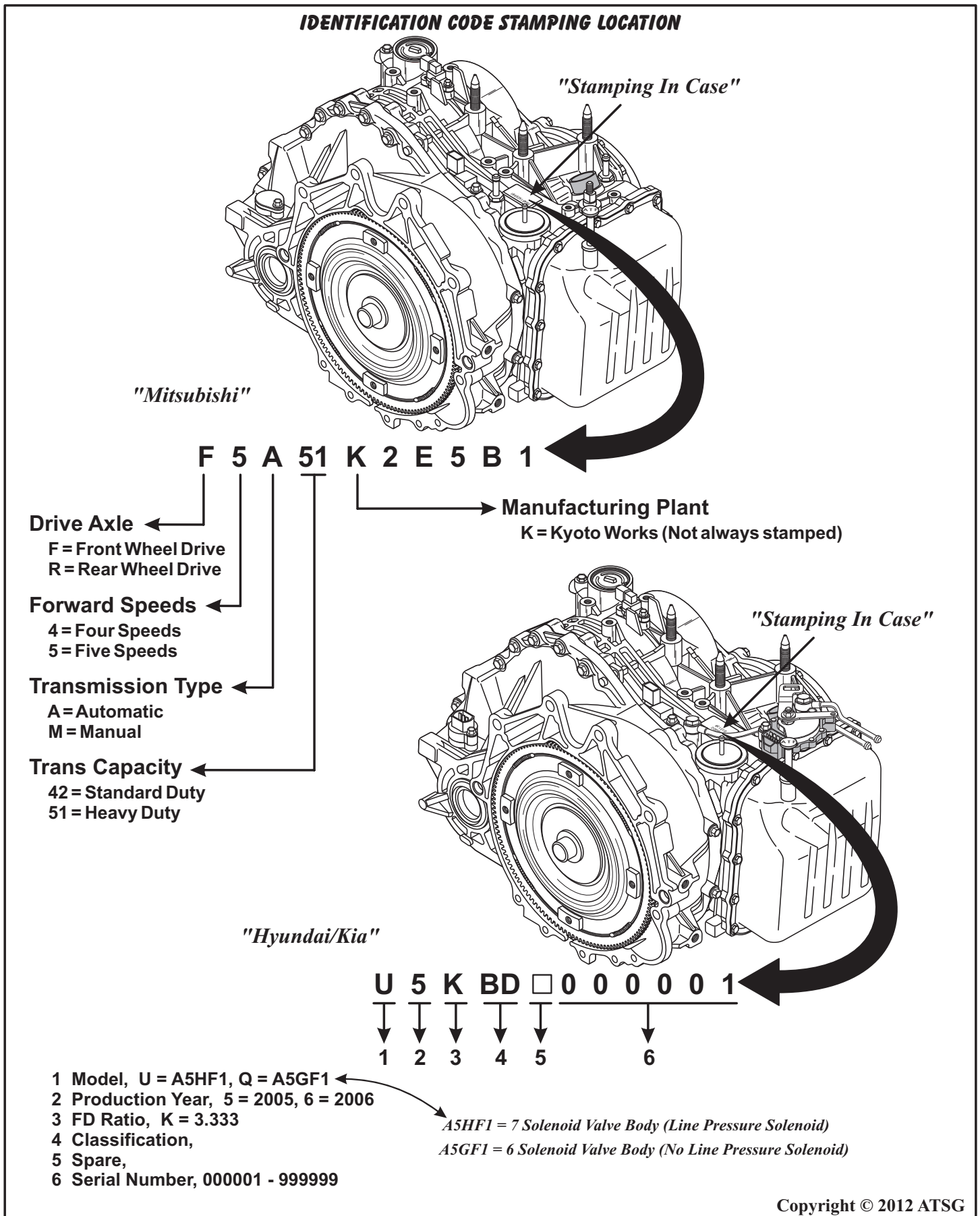


Figure 1



Technical Service Information

GENERAL DESCRIPTION

This is a five speed, Front Wheel Drive transaxle, with fully electronic controls for the upshifts and downshifts, and is a re-designed F4A51 with an added planetary, reduction sprag, direct clutch pack, and reduction brake band.

The individual gear ratios are now achieved through three planetary gear sets, and there are three different planetary gear ratios. Refer to the individual component application charts (Figure 4 and 5) for the gear ratios. The components of the planetary gear sets are driven or held by means of four multi-plate drive clutch packs, two multi-plate brake clutch packs, one reduction brake band and two one way clutches (sprags). Refer to Figure 3 for the internal component locations.

To minimize fuel consumption, the torque converter clutch is applied by the Powertrain Control Module (PCM), depending on throttle position, transaxle temperature, and vehicle speed. These units are currently found in several Mitsubishi models, and referred to as the "F5A5A" in Mitsubishi.

It is also found in some Hyundai and Kia models, and they both refer to it as the "A5HF1", and this version operates much differently than the Mitsubishi models.

Refer to Figure 1 for identification tag information and Figure 2 for vehicle application chart.

GENERAL OPERATION

Mitsubishi, Pre-07 Hyundai, Pre-2006 Kia Operation

The Mitsubishi version uses the basic 4 speed valve body with an added solenoid to control the reduction band, so it now has six solenoids instead of five. The Low/Reverse solenoid is now a double duty solenoid and is used to also apply the added direct clutch pack, based on position of the switch valve in valve body.

The valve body has an added control valve for the reduction band and an added Fail-safe "C" valve.

The component and the solenoid application charts for Mitsubishi, Pre-07 Hyundai and Pre-06 Kia models are found in Figure 4.

2007-Up Hyundai, 2006-Up Kia Operation

The later Hyundai and Kia version uses the same six solenoid valve body as the earlier models *except*, it has an additional solenoid, (Total of 7), used strictly to control line pressure. The Low/Reverse solenoid is still a double duty solenoid and is used to apply the added direct clutch pack, based on the position of the switch valve in the valve body.

However, the 2007-Up Hyundai and 2006-Up Kia internal component and solenoid applications are different than the earlier version. The component and solenoid application charts for the 2007-Up Hyundai and 2006-Up Kia are found in Figure 5.

MITSUBISHI VEHICLE APPLICATION CHART			
YEAR	MODEL	ENGINE	TRANSAXLE
2000-2001	<i>Diamante</i>	V6-2.5L	F5A5A (F5A51)
2006-2008	<i>Eclipse</i>	V6-3.8L	F5A5A (F5A51)
2006-2009	<i>Galant</i>	V6-3.8L	F5A5A (F5A51)
HYUNDAI VEHICLE APPLICATION CHART			
2007-2010	<i>Sonata</i>	V6-3.3L,	A5HF1 (F5A51)
2007-2010	<i>Santa Fe</i>	V6-3.3L, 3.5L	A5HF1 (F5A51)
2007-2011	<i>Azera</i>	V6-3.3L, 3.5L	A5HF1 (F5A51)
2007-2011	<i>Entourage</i>	V6-3.3L, 3.5L	A5HF1 (F5A51)
KIA VEHICLE APPLICATION CHART			
2006-2009	<i>Amanti</i>	V6-3.5L, 3.8L	A5HF1 (F5A51)
2006-2011	<i>Sedona</i>	V6-3.5L, 3.8L	A5HF1 (F5A51)
2009-2011	<i>Sorento</i>	L4-2.2L	A5HF1 (F5A51)

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Figure 2

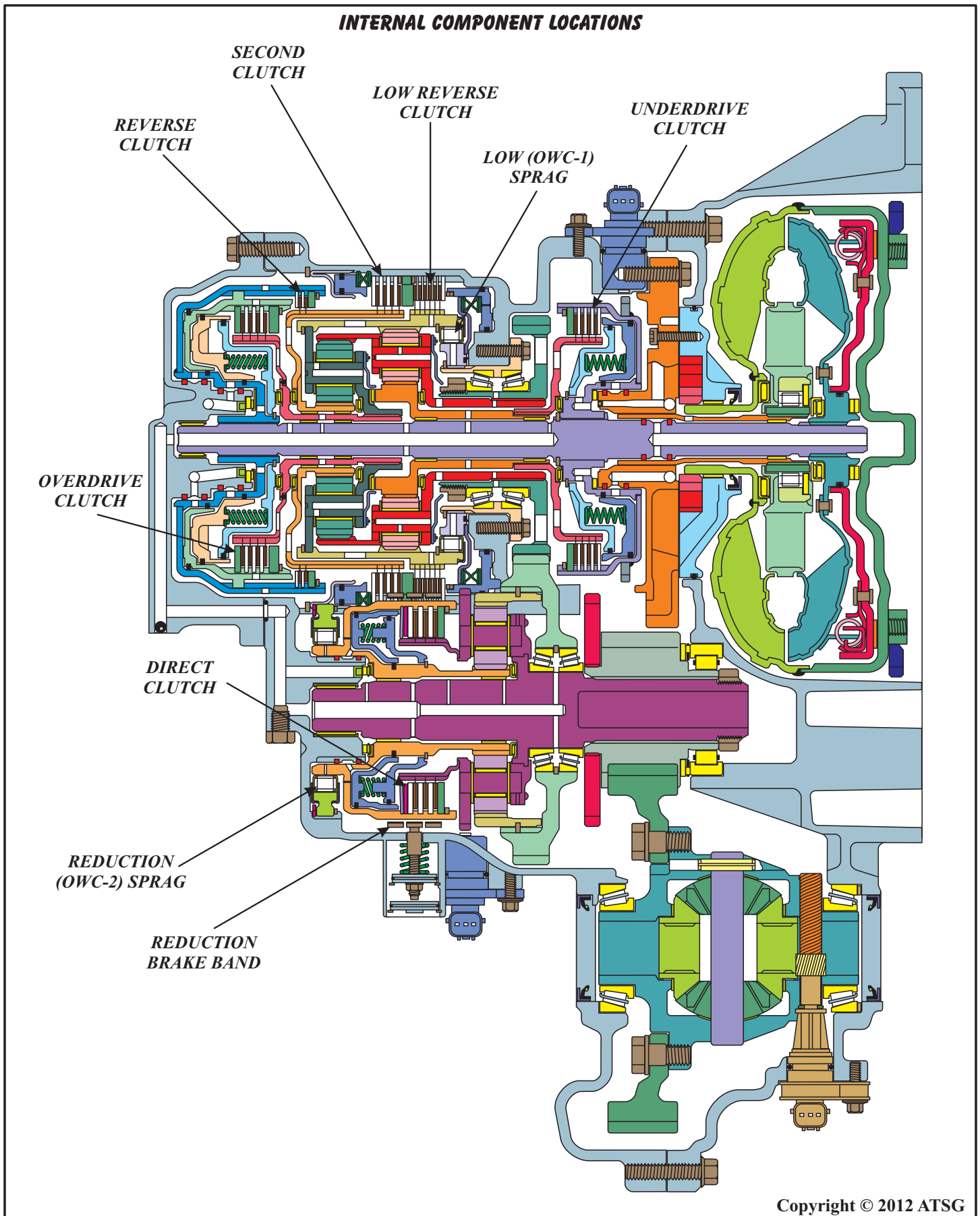


Figure 3



Technical Service Information

"MITSUBISHI, PRE-2007 HYUNDAI, PRE-2006 KIA ONLY" INTERNAL COMPONENT APPLICATION CHART

Gear Range	Reverse Clutch	Underdrive Clutch	2nd Clutch	Overdrive Clutch	Low/Rev Clutch	Direct Clutch	Reduct Band	Low (OWC-1) Sprag	Reduct (OWC-2) Sprag	TCC	Gear Ratio
											Mitsubishi
Park					ON		ON				
Reverse	ON				ON		ON				3.117
Neutral					ON		ON				
Dr-1st		ON			ON*		ON	HOLD	HOLD		3.789
Dr-2nd		ON	ON				ON		HOLD		2.162
Dr-3rd		ON		ON			ON		HOLD		1.421
Dr-4th		ON		ON		ON				ON**	1.000
Dr-5th			ON	ON		ON				ON**	0.686

* Low/Reverse clutch is applied below 6 mph, released above 6 mph.

** TCC dependant on throttle position, temperature and vehicle speed.

Note: Reverse Clutch is applied with fluid pressure from the manual valve.

Note: (OWC = One Way Clutch)..

Final Drive Ratio 3.325

FLUID REQUIREMENTS Mitsubishi Diamond SP III

"MITSUBISHI, PRE-2007 HYUNDAI, PRE-2006 KIA ONLY" SOLENOID APPLICATION CHART

Gear Range	U.D. Sol	2nd Sol	O.D. Sol	TCC Sol	L/R-Dir. Sol***	RED. Sol
Park	ON	ON	ON	OFF	OFF	OFF
Reverse	ON	ON	ON	OFF	OFF	OFF
Neutral	ON	ON	ON	OFF	OFF	OFF
Dr-1st	OFF	ON	ON	OFF	OFF*	OFF
Dr-2nd	OFF	OFF	ON	OFF	ON	OFF
Dr-3rd	OFF	ON	OFF	OFF	ON	OFF
Dr-4th	OFF	ON	OFF	ON**	OFF	ON
Dr-5th	ON	OFF	OFF	ON**	OFF	ON

* Low/Reverse clutch is applied below 6 mph, and released above 6 mph.

** Torque Converter Clutch (TCC) dependant on throttle position, temperature and vehicle speed.

*** Low/Reverse Clutch or Direct Clutch depending on switch valve position.

Solenoid ON = Energized

Solenoid OFF = De-Energized

Failsafe: Two failsafe strategies are available, 2nd gear and 3rd gear.

Should all solenoids be turned Off (i.e. electrical failure), 3rd gear will be the result.

2nd gear failsafe "may" be commanded by the TCM, energizing the appropriate solenoids. Reverse always available.

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Figure 4



Technical Service Information

"2007-UP HYUNDAI, 2006-UP KIA ONLY" INTERNAL COMPONENT APPLICATION CHART

Gear Range	Reverse Clutch	Underdrive Clutch	2nd Clutch	Overdrive Clutch	Low/Rev Clutch	Direct Clutch	Reduct Band	Low (OWC-1) Sprag	Reduct (OWC-2) Sprag	DCC	Gear Ratio	
											Hyundai	Kia
Park					ON		ON					
Reverse	ON				ON		ON				3.859	4.586
Neutral					ON		ON					
Dr-1st		ON			ON*		ON	HOLD	HOLD		3.840	4.457
Dr-2nd		ON	ON				ON		HOLD		2.092	2.442
Dr-3rd		ON		ON			ON		HOLD		1.440	1.686
Dr-4th		ON	ON	ON			ON		HOLD	ON**	1.048	1.233
Dr-5th			ON	ON		ON				ON**	0.728	0.868

* Low/Reverse clutch is applied below 6 mph, released above 6 mph.

** Damper Converter Clutch (DCC) dependant on throttle position, temperature and vehicle speed.

Note: Reverse Clutch is applied with fluid pressure from the manual valve.

Note: (OWC = One Way Clutch)..

Final Drive Ratio 3.333

FLUID REQUIREMENTS Hyundai/Kia Diamond SP III

"2007-UP HYUNDAI, 2006-UP KIA ONLY" SOLENOID APPLICATION CHART

Gear Range	U.D. Sol	2nd Sol	O.D. Sol	DCC Sol	L/R-Dir. Sol***	RED. Sol	Line VFS Sol
Park	ON	ON	ON	OFF	OFF	OFF	****
Reverse	ON	ON	ON	OFF	OFF	OFF	****
Neutral	ON	ON	ON	OFF	OFF	OFF	****
Dr-1st	OFF	ON	ON	OFF	OFF*	OFF	****
Dr-2nd	OFF	OFF	ON	OFF	ON	OFF	****
Dr-3rd	OFF	ON	OFF	OFF	ON	OFF	****
Dr-4th	OFF	OFF	OFF	ON**	ON	OFF	****
Dr-5th	ON	OFF	OFF	ON**	OFF	ON	****

* Low/Reverse clutch is applied below 6 mph, and released above 6 mph.

** Damper Converter Clutch (DCC) dependant on throttle position, temperature and vehicle speed.

*** Low/Reverse Clutch or Direct Clutch depending on switch valve position.

**** VFS is constantly modulating to control Line Pressure depending on throttle opening, engine load and vehicle speed.

Solenoid ON = Energized

Solenoid OFF = De-Energized

Failsafe: Two failsafe strategies are available, 2nd gear and 3rd gear.

Should all solenoids be turned Off (i.e. electrical failure), 3rd gear will be the result.

2nd gear failsafe "may" be commanded by the TCM, energizing the appropriate solenoids. Reverse always available.

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Figure 5

ELECTRONIC COMPONENTS

Shift Solenoid Application

The Mitsubishi, Hyundai and Kia all use 6 solenoids mounted on the valve body, to upshift and downshift the transaxle, as well as the apply and release of the TCC/DCC.

However, two different shift solenoid application patterns are used, as shown on Page 6 and 7.

Refer to Page 6 for internal component and solenoid application charts for "Mitsubishi" and the earlier "Hyundai/Kia" models.

Refer to Page 7 for internal component and solenoid application charts for later "Hyundai/Kia" models.

The individual shift solenoid locations are the same between the two and are shown in Figure 6. Function of each solenoid is described in detail on Page 9.

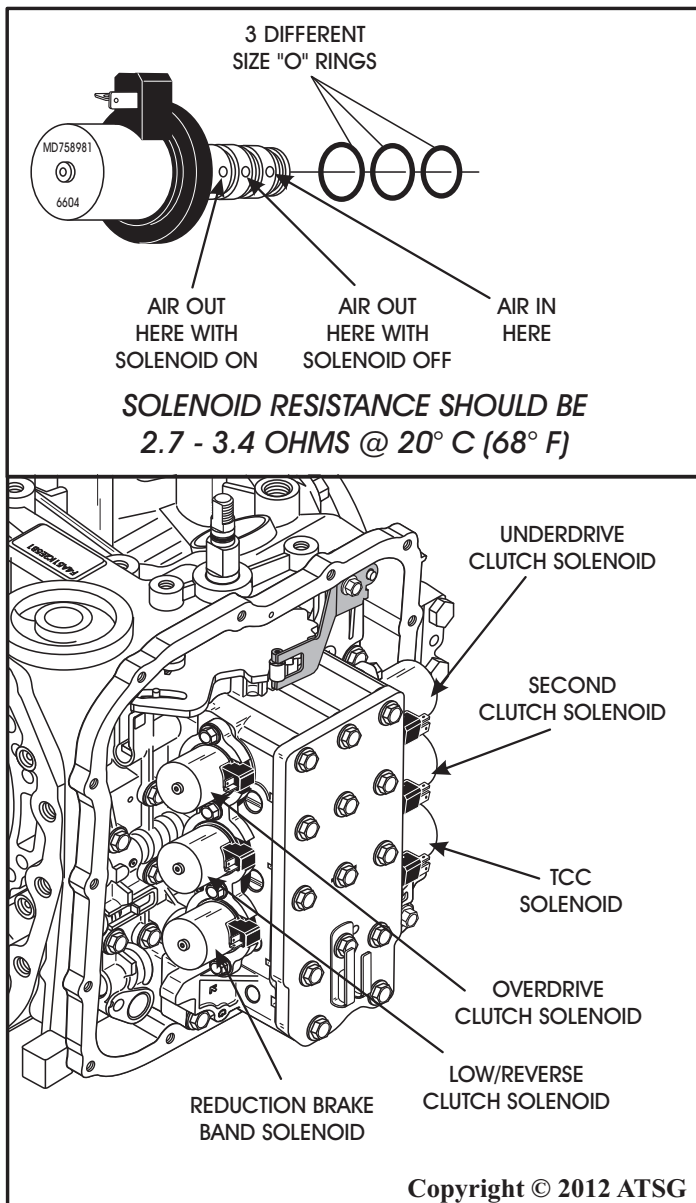


Figure 6

Line Pressure Control

The 2007-Up Hyundai and 2006-Up Kia vehicles *only*, use an added VFS Solenoid to control line pressure on all of their models that use the A5HF1 transaxle, and the location on valve body is shown in Figure 7.

All of the Mitsubishi and pre-2006 Hyundai/Kia vehicles use only the pressure regulator valve in the valve body for line pressure control. Both versions have the capability of adjusting line pressure mechanically.

OEM Solenoid Part Numbers (At time of printing)

Mitsubishi Shift Solenoid	MD758981
Hyundai & Kia Shift Solenoid	46313-39051
Hyundai & Kia VFS Solenoid	46313-3A060

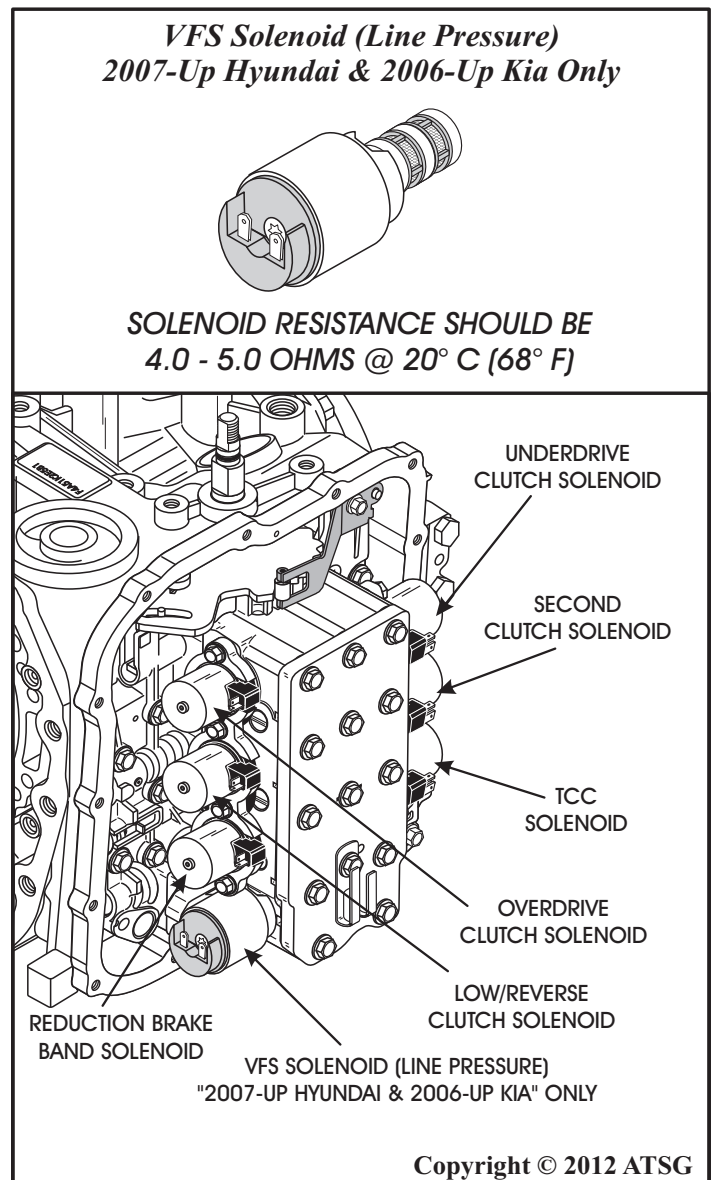


Figure 7



Technical Service Information

ELECTRONIC COMPONENTS (CONT'D)

Solenoid Operation

The F5A51 transaxle uses six solenoids for all of the upshifts, downshifts and apply & release of the TCC/DCC. All six of the shift solenoids are "Normally Applied" Pulse Width Modulated style and will interchange in any of their positions.

The Low/Reverse solenoid is a double duty solenoid and will apply the Low/Reverse Clutch or will apply the Direct Clutch, depending on the position of the switch valve in the valve body.

All shift solenoids can be air checked using the procedure shown in Figure 6, and solenoid resistance is checked across the 2 terminals. Solenoid locations on the valve body are also shown in Figure 6 and 7.

Solenoid Function

The Underdrive Clutch Solenoid, is used to apply and release the underdrive clutch. When solenoid is de-energized (OFF), the underdrive clutch is ON. When solenoid is energized (ON), the underdrive clutch is OFF.

The Overdrive Clutch Solenoid, is used to apply and release the overdrive clutch. When solenoid is de-energized (OFF), the overdrive clutch is ON. When solenoid is energized (ON), the overdrive clutch is OFF.

The Second Clutch Solenoid, is used to apply and release the second brake clutch. When solenoid is de-energized (OFF), the second brake clutch is ON. When solenoid is energized (ON), the second brake clutch is OFF.

The Reduction Solenoid, is used to apply and release the reduction brake band. When solenoid is de-energized (OFF), the reduction brake band is ON. When solenoid is energized (ON), the reduction brake band is OFF.

The TCC/DCC Solenoid, is used to apply and release the Torque Converter Clutch. When the solenoid is de-energized (OFF), the converter clutch is OFF, as it routes fluid to the spring side of the converter clutch control valve in the valve body. When solenoid is energized (ON), the converter clutch is ON, as it now exhausts fluid from the spring side of control valve, allowing it to stroke.

The Low/Reverse Solenoid, is used to apply and release the low/reverse clutch. When solenoid is de-energized (OFF), the low/reverse clutch is ON. When solenoid is energized (ON), low/reverse clutch is OFF. This function occurs with the switch valve in the valve body in the *downshifted* position.

When the switch valve is *upshifted*, by overdrive clutch fluid, a different sequence of events occur still using the same solenoid. In this configuration, **The Low/Reverse Solenoid**, is used to apply and release the Direct Clutch. When the solenoid is de-energized (OFF), the direct clutch is ON. When the solenoid is energized (ON), the direct clutch is OFF.

The VFS Solenoid, (7th solenoid) used on the 2007-Up Hyundai and 2006-Up Kia models only, to more precisely control line pressure according to current vehicle driving conditions. It is a Variable Force Solenoid with duty control that uses a higher frequency of (600 Hz), instead of the existing PWM style that uses a lower frequency (60 Hz) to control all other solenoids.

In PWM control, amount of oil flow is determined by the duration of ON signal with repeated ON/OFF pulses.

In VFS control, amount of oil flow is determined by the width of the oil passage opening.

2007-Up Hyundai and 2006-Up Kia models are also equipped with an orificed tube that provides a constant stream of cooler fluid spraying on the VFS Solenoid for cooling the solenoid, which provides increased durability.

**Electronic Components
Continued on Page 10**



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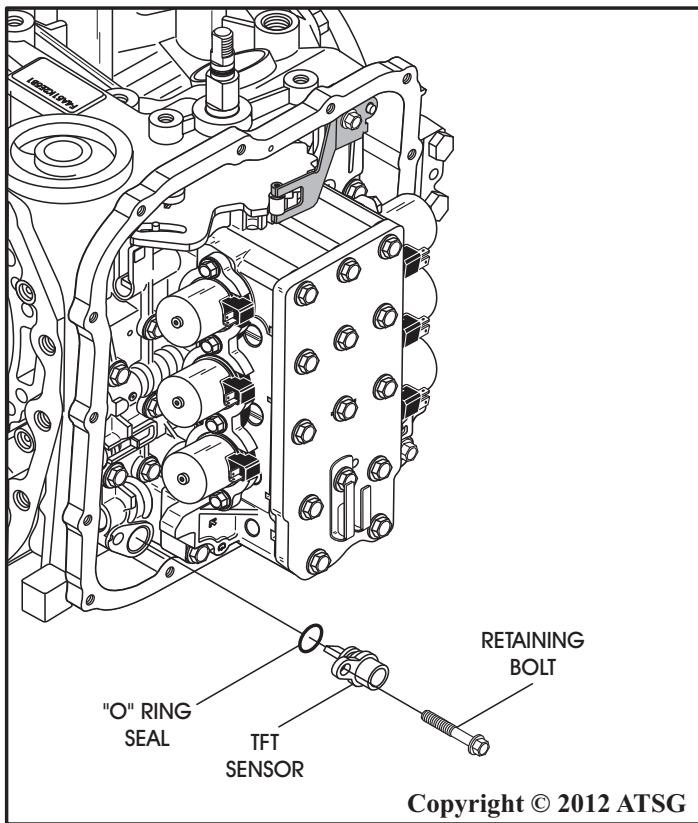


Figure 8

Transaxle Fluid Temperature (TFT) Sensor

The Transaxle Fluid Temperature (TFT) sensor is located in the valve body, mounted into a fluid passage with a valve body to case bolt and requires an "O" ring seal, as shown in Figure 8.

The TFT is a negative temperature coefficient sensor, which means that as temperature increases the resistance decreases, as shown in Figure 9.

Electronic Components Continued on Page 11

TFT SENSOR RESISTANCE CHART	
<i>Fluid Temp C° (F°)</i>	<i>Resistance</i>
0° C (32° F)	16.7k - 20.5k
20° C (68° F)	7.3k - 8.9k
40° C (104° F)	3.4k - 4.2k
60° C (140° F)	1.9k - 2.2k
80° C (176° F)	1.0k - 1.2k
100° C (212° F)	0.57k - 0.69k

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Figure 9

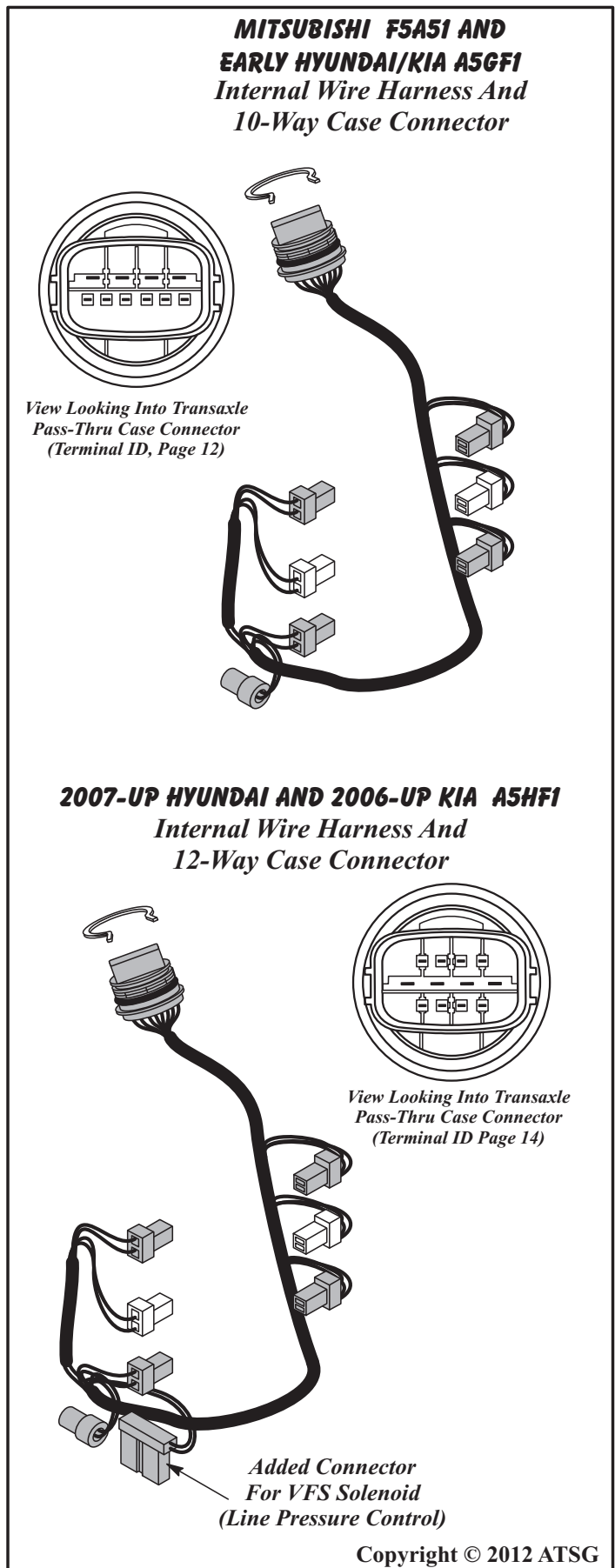


Figure 10