

## Asian Warner 55-50SN Seminar

### General Description

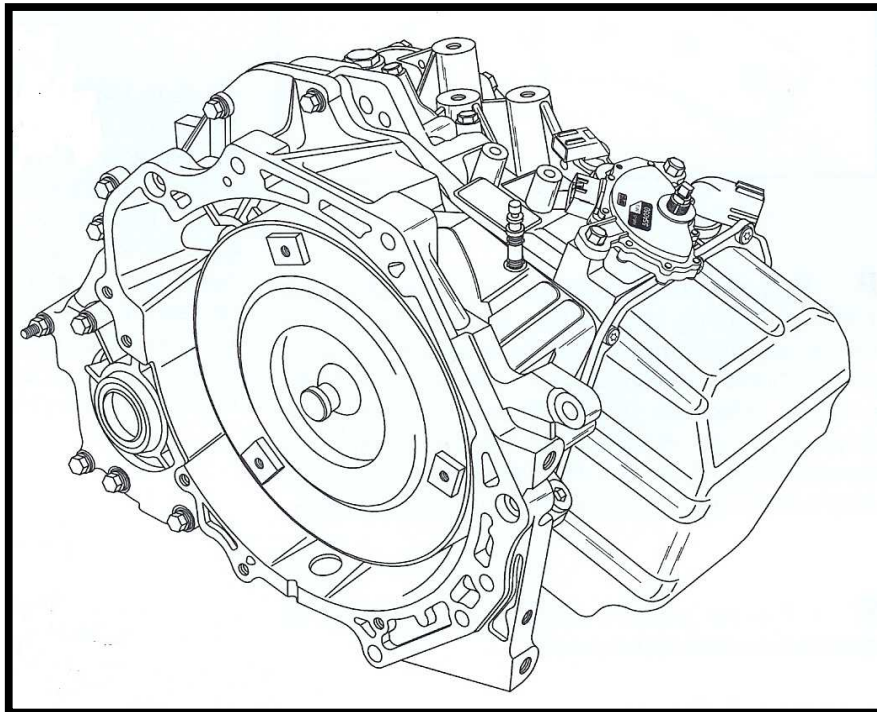
This transmission is manufactured by Asian Warner. It can be found in many different vehicles such as General Motors, Volvo, Saab, Renault and Fiat. Although it looks the same, there are subtle differences. We will look at some of them later but it is important to note that not all parts are interchangeable.

The 55-50SN is also referred to as the AF23/33-5 transmission by some manufacturers such as GM.

This transmission incorporates the final drive unit and therefore it is known as a Transaxle. It is a fully operational automatic transmission which has five forward gears and is electronically Controlled.

There is a four element torque converter in this transmission. It incorporates a, Pump. b, Turbine. c, pressure plate which is located by the spline on the shaft of the turbine, and d, the stator assembly.

The TCM (Transmission Control Module) commands the solenoids to obtain the required ratio. It also controls the line pressure and the apply and release pressure for the torque converter clutch. The input signals from the sensors act to feed information to the TCM so that it can obtain the best ratio to give maximum fuel efficiency.



## **General Description *continued***

The hydraulic system follows the normal transmission requirements utilizing a pump along with the valve body case cover and converter housing. The pump produces a variable pressure dependent on engine speed. This is then regulated to produce the working pressure. This pressure works to apply the servo and pistons that apply and release the friction components.

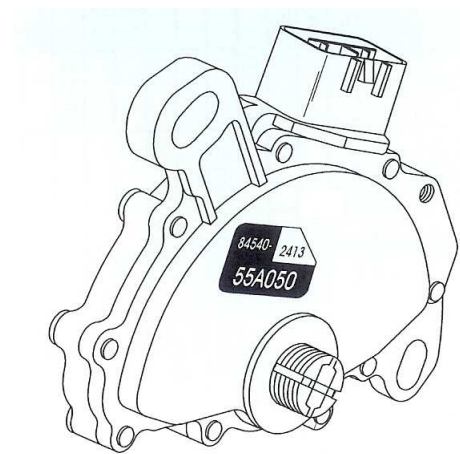
## **Model Differences**

As we have seen, this transmission is fitted to vehicles of many different manufacturers. Although there are similarities with this transmission, it should be noted that there are distinct operational differences. The control strategy for solenoid operation varies from manufacturer to manufacturer. Even when a valve body looks the same, it differs considerably so be careful when changing parts that you do not introduce a fault that you will never fix.

A close study of the component and solenoid application will show that there are distinct differences.

## **Park, Neutral position switch**

The park neutral switch is of a sliding contact type that is connected directly to the manual shift lever. It is fitted externally on the transmission and it is adjustable. There are four positions in the switch that inform the TCM which position the gear lever is in. The information is used for control of the engines as well as the transmission. If you are using a scanner, you will see the positions displayed as Modes, A, B, C and PA. The switches on each vehicle look the same but are not. Make sure that you have the correct one fitted.

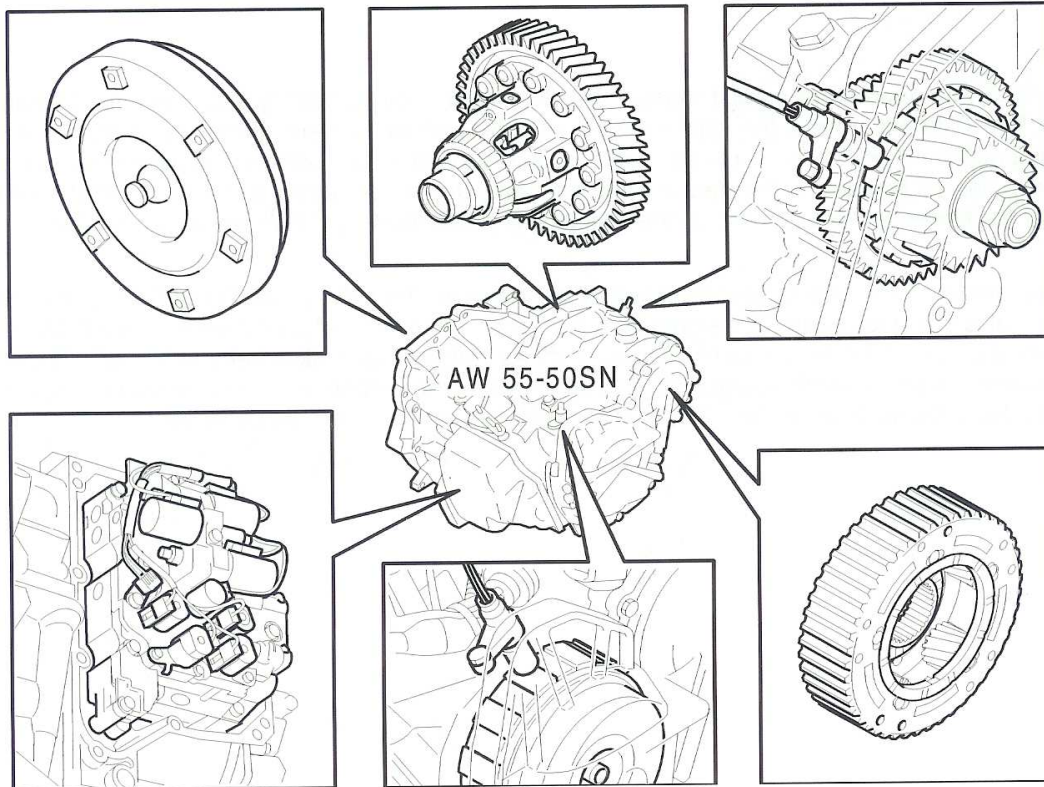


### **Neutral control**

Volvo vehicles using the 5 cylinder engine since 2001 have a neutral control circuit fitted to reduce emissions and fuel consumption. The TCM will operate the appropriate solenoids to place the transmission in neutral when the car is standing with the brakes applied in the “D” position. Transmission fluid temperature must be in the normal operating

range for this feature to be active. The gas pedal must not be depressed as the accelerator pedal module (APM) will tell the PCM that the vehicle should be moving.

Re-engagement of first gear is done as the brake pedal sensor indicates that the brake is no longer depressed.



### **AW 55-50 SN with Modulated lock-up**

This transmission is an electronically controlled five speed automatic transmission. In Volvo it is fitted to the X70 series. It is derived from the AW 50-42 transmission with the following differences.

- A fourth planetary gear. (P4)
- Free wheel F3 has been eliminated
- The TCC has a slip strategy
- A fifth brake (B5) has been added
- Four more solenoids
- Four small differential pinions in the final drive
- Accumulators have been removed

## **Gear changes**

The gear changes and lock up functions are controlled by the activation of the solenoids as described in the patterns later. Be sure to remember that the valve bodies are not interchangeable between models as the shift patterns differ.

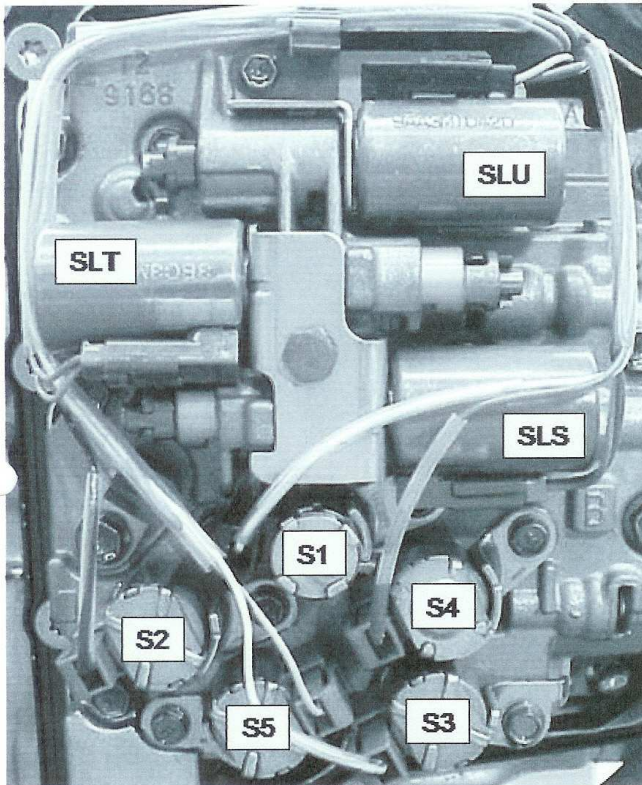
There are two change patterns available: **Normal** and **Winter** modes

In normal mode, shifts and lock-up take place relatively early to improve fuel consumption. If the throttle is moved rapidly, the TCM will engage a SPORT mode.

In the winter mode, the changes will be at lower engine speeds. 1<sup>st</sup> and 2<sup>nd</sup> gear will also be available for kick down.

Selector position D,4,3..... The car will start off in 3<sup>rd</sup> gear  
Selector position L.....The car will start off in 2<sup>nd</sup> gear.

Engine braking will be available in “L” by application of the B3 brake



Solenoid	Connector	Wire(s)
SLU	Black	Green Brown
SLT	Blue	Green Gray
SLS	Green	Blue Red
S1	Black	White
S2	Gray	Black
S3	Gray	Yellow
S4	Blue	Purple
S5	Green	Blue

- Do not replace a valve body to correct any other condition unless specifically instructed to do so.
- Remember that the 3 linear solenoids (SLT,SLS,SLU) are tuned to the valve body during manufacturing and should never be separated from it.

WARRANTY CLAIM INFORMATION		
LABOR OP	LABOR DESCRIPTION	LABOR TIME
43727-0	Solenoid, Control System, Replace	3.5 hr.
6004-2	Software Download	.3 hr.

Claims may be submitted under the New Car warranty when there is a documented customer complaint using claim type: 01

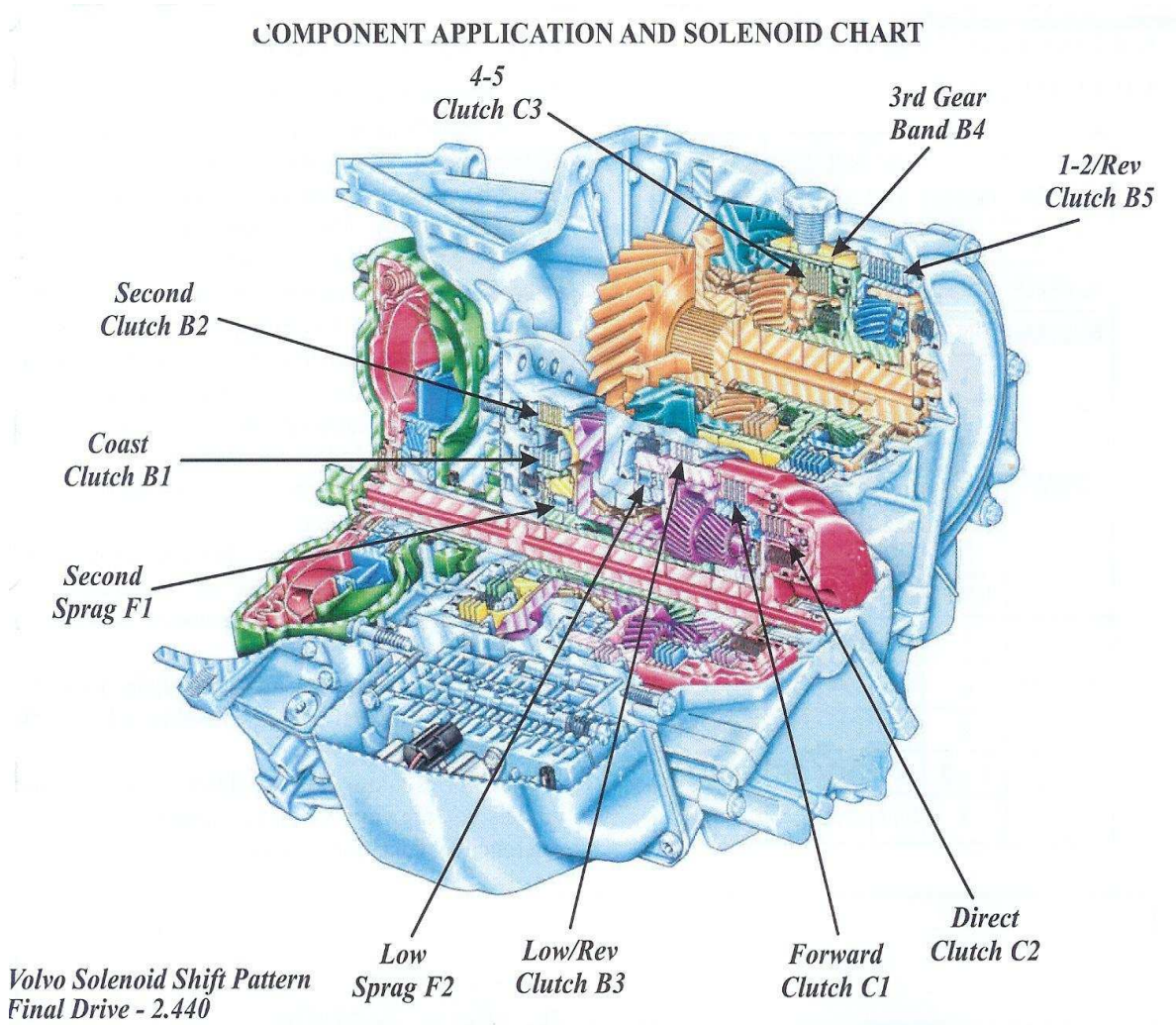
**VOLVO** for life,  
Volvo Cars of North America, LLC.  
Technical Service

Please read, initial and circulate: \_\_\_\_\_ Svc Mgr \_\_\_\_\_ Parts Mgr \_\_\_\_\_ Shop Foreman

\_\_\_\_\_ TECHS

\_\_\_\_\_ Wty Administrator \_\_\_\_\_ S. Advisors

## AW 55-50SN 23/33.5



**Volvo**

**Solenoid and component application chart**

Range	Gear	S1	S2	S3	S4	S5	C1	C2	C3	B1	B2	B3	B4	B5
Park	P	Off	Off	Off	Off	Off								On
Reverse	R	Off	Off	On	Off	On		On				On		On
Neutral	N	Off	Off	Off	Off	Off								On
Drive	1	On	On	On	Off	Off	On							On
	2	Off	Off	On	Off	Off	On			On	On			On
	3	Off	Off	On	On	Off	On			On	On		On	
	4	Off	Off	Off	On	Off	On		On	On	On			
	5	Off	On	Off	On	Off	On	On	On		On			
Limp Mode		Off	Off	Off	Off	Off	On	On	On		On			



## GM Vauxhall

### Solenoid and component application chart

Range	Gear	S1	S2	S3	S4	S5	C1	C2	C3	B1	B2	B3	B4	B5
Park	P	Off	Off	Off	Off	Off								On
Reverse	R	Off	Off	On	Off	On		On				On		On
Neutral	N	Off	Off	Off	Off	Off								On
Drive	1	On	Off	On	Off	Off	On							On
	2	Off	On	On	Off	Off	On			On	On			On
	3	Off	On	On	On	Off	On			On	On		On	
	4	Off	On	Off	On	Off	On		On	On	On			
	5	Off	Off	Off	On	Off	On	On	On		On			
Limp Mode		Off	Off	Off	Off	Off	On	On	On		On			

You will note that the solenoid shift pattern for these two transmissions is completely different although it will be seen that the clutch and brake components remain the same. It is therefore obvious that fitting the wrong valve body will cause the transmission to behave incorrectly.

solenoids Named. a, SLT, b, SLU and c, SLS. These solenoids are linear solenoids and work at variable states dependent on the gear and load required from the transmission.

As well as the five shift solenoids S1 through to S5, this transmissions also have three other

Solenoid resistances are as follows:-

S1 to S5. 11 to 16 ohms

SLT, SLU and SLS are 5 – 5.6 ohms. All readings are at 20C.

S1, S2 and S4 are normally Closed solenoids

S3 and S5 solenoids are normally open.

The SL solenoids are run at 300 hz.

### **Control of the solenoids**

The shift and lock-up function is controlled by activating the solenoids in a specific pattern according to the manufacturer. The solenoids S1 through to S5 determine which gear is to be selected and the SLS, SLU and ALT solenoids determine the engagement by adjusting the hydraulic pressure. The basic parameters for the different shift point are the accelerator pedal and the vehicle speed. The shift quality is decided by the control of torque through the transmission.

Pressurization of the clutches and brakes are adjusted by reading the

change of speed of the transmission input shaft during the shifting process and comparing the values calculated in the TCM.

Two shifting patterns can be commanded, Normal driving and Winter mode. This is done by the driver using a select switch or button by the gear select lever.

In normal mode, shifting and lock-up occur at a relatively low speed to reduce fuel consumption. In the event of rapid accelerator movements, the TCM automatically changes to a third, sport mode.

### **SL solenoid function**

#### **SLT**

This is the line pressure solenoid. It is a normally open three port type solenoid. The TCM controls this transmission using 300 hz commanding current from 0.0 to 1.1 amps. The TCM uses current measurement to determine pressure.

In the event of a serious electronic failure the solenoid is designed to give maximum line pressure. A DTC of P0962 or P0963 will be stored in the TCM memory.

**SLS**

This solenoid is the shift pressure solenoid. It is similar to the SLT solenoid in that it is a three way ported solenoid and runs at the same frequency and current characteristics. It is used to buffer the shift and is adjusted dependent on load requirements and driving conditions.

In the event of an electronic failure a DTC 0970 or 0971 will be stored in the TCM memory.

**SLU**

The SLU solenoid is the Torque converter lock-up pressure control solenoid. It is similar to the other two SL solenoids listed above except that it is a normally closed solenoid.

In the event of an electronic failure a DTC of P0966 or P0967 will be stored in the TCM memory.

**TFT**

The transmission fluid temperature sensor is an integral part of the transaxle internal wire harness assembly The TFT is a NTC thermister which changes its value based on the transmission oil temperature. The TFT has 5 volts

feed to it and due to variants of resistance caused by temperature, it feeds a variable voltage back to the TCM. When the oil temperature is cold, a high resistance is evident. As the oil heats up the resistance lowers. The TCM uses this resistance to calculate the oil temperature in the transmission. This signal is used by the TCM to modify the shift quality and the TCC operation.

Temperature in C	Ohms reading
-40	77,480
-30	44,000
-20	25,880
-10	15,730
0	9,846
10	6,445
20	4,184
30	2,829
40	1,955
50	1,379
60	992
70	726
80	541
90	409
100	314
110	247
120	192
130	153
140	124
150	101

**Output shaft speed sensor.**

The output shaft speed sensor is a Hall effect sensor. Hall effect sensors usually have three wires but in this case, the sensor only has two wires. The sensor is mounted in the case by the park gear by the front differential transfer gear assembly. The sensor is supplied with 0.6 volts to activate it. As the vehicle moves the toothed gear passes the sensor and produces a square wave or frequency. The TCM uses this signal to calculate the vehicle road speed.

The input and output shaft speed sensors should give a reading of > than 10 M ohms at 20 C. (68 F).

**Input shaft speed sensor.**

The input shaft speed sensor is of the same construction as the Output shaft speed sensor. The reluctor for this sensor is the teeth on the forward / direct clutch housing. The output from this sensor is used by the TCM to adjust and determine transaxle shift patterns, line pressure TCC apply pressure and gear ratios. It is also used to determine TCC slippage.

### **Pressure relief valve**

The pressure relief valve and spring prevent the line pressure from exceeding 360 psi. (2520 kPa). Higher pressure moves the valve against the spring opening and exhaust.

*A stuck valve or broken spring would cause high or low line pressure.*

### **Solenoid modulator valve**

The line pressure solenoid valve (SLT), the shift pressure control solenoid valve (SLS) and the torque converter lock up valve solenoid (SLU) are only able to work with a given pressure. Pressure that exceeds this will overload the valve causing damage. The modulator valve spring produces the force to regulate the pressure. The pressure should equal line pressure.

*If the valve is stuck in the exhaust position, it would result in the transmission having only 5<sup>th</sup> gear and low line pressure.*

### **Forward clutch control valve.**

The forward clutch control valve responds directly to throttle signal. Depending on the gear selected, the valve regulates drive fluid onto

the forward clutch oil circuit to control the apply pressure to the forward clutch.

*A stuck forward clutch valve would cause harsh engagement from neutral to drive.*

### **Neutral relay valve.**

The neutral relay valve acts on the neutral relay valve spring force. The 1<sup>st</sup> SS valve state, the neutral relay valve controls the route of fluid into the forward clutch circuit.

*A stuck neutral relay valve cause no drive or serious slip conditions.*

### **Cooler by-pass valve.**

The cooler by-pass valve and spring prevent the cooler and lube pressure from exceeding 30 psi (210 kPa).

*A stuck cooler by-pass valve or damaged spring could cause high cooler and lube pressure.*

### **TCC check valve**

The TCC check valve and spring is to prevent the cooler fluid reversing directional flow.

*A stuck TCC check valve or damaged spring would cause incorrect TCC operation.*

## Volvo Tech notes

**Model & year:- 2001 S60, V70, V70 XC**

**Subject:- Adaptation procedure**

**Description:** This transmission relies on adaptive data to properly adjust the shift pressure. If the adaptation is not complete, it may result in one or more of the following:

- **Harsh flare.** Engine RPM will increase during a shift. This symptom feel like the transmission has lost drive. It usually happens during the 2-3 shift.
- **Harsh down shift.** Bumpy down shift when the gas pedal is odd (Zero).
- **Harsh Garage shift.** Sever bump when engaging forward or reverse from park or neutral.
- **Harsh engagement control.** After coming to a complete stop in drive, with the foot on the brake, the TCM waits for 2 seconds and then disengages drive to reduce emissions. This disengagement is not usually felt by the driver. If adaptation is not complete, then a “thud” will be felt. A harsh re-engagement will also be felt.

**Service.** The TCM can sometimes take many miles to fully adapt. If you do not have access to the factory tester or Volvo VADIS, then you might try the following.

1. Drive the car forward in the “D” range at about 5 mph (8kph) and bring to a gentle stop. Repeat this procedure at least 10 times.
2. With the engine at idle and your foot on the brake, shift from “N” to “D”. Wait for about 30 seconds. Release the brake. Repeat this procedure for 10 cycles.

If the above does not cure the fault, you will need to get access to a factory tester to reset the adaptation. Remember though that the TCM is constantly updating so not every shift will be the same.

<p><b>Model and Year: S60, V70, V70 XC</b> <b>Subject: Harsh or delayed P&lt;R&lt;or N to D shift</b></p>
---

This complaint is caused by a faulty valve body and, or solenoids. The factory recommend that you replacethe valve body and down load the new software number 30646691.

The two “O” rings and the suction cover gasket (Sealing kit # 274470) must be replaced as part of the repair. The SLT and SLS solenoids have been rotated 180 degrees on all new valve bodies. The S1 solenoid has also been rotated to accommodate the change. The new solenoids and bracket are available from your parts supplier and should get you out of trouble without the need to purchase a new valve body.

If youdo this modification you will need to fit a new internal wiring harness which is included in the kit.