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SUBARU

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4EAT Transmission Diagnosis & Service

SUBARU
GENUINE PARTS
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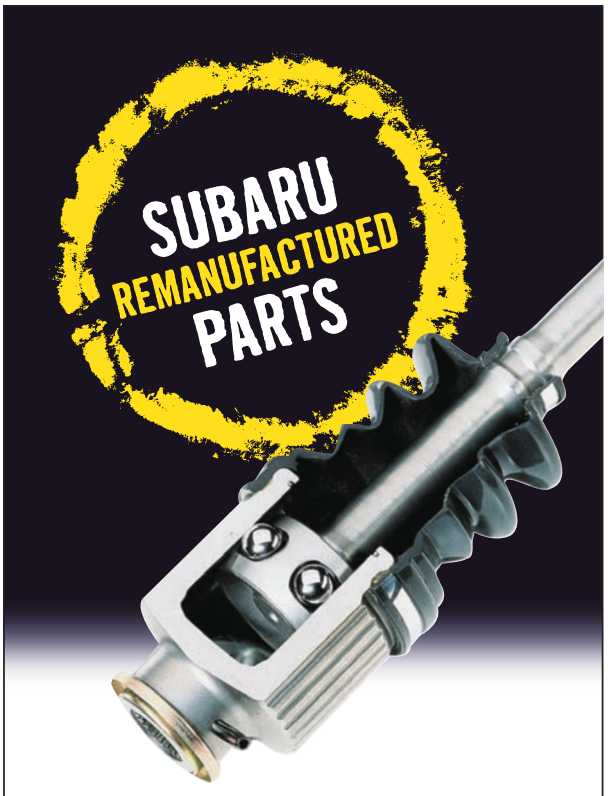

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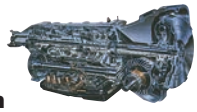

SUBARU
GENUINE PARTS

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What's the difference between Genuine Subaru Remanufactured Parts and rebuilt aftermarket parts? In a word: quality. Unlike rebuilt parts that may be little more than recycled parts that have been cleaned up and repainted with only the most obvious faults brought back to working order, every Subaru Remanufactured Part meets the same specifications as the new straight-from-the-factory part it's designed to replace.

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Brake Calipers	Includes front and rear calipers
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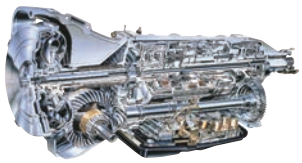
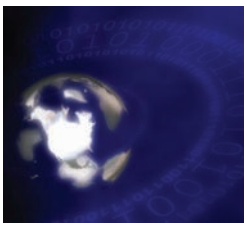
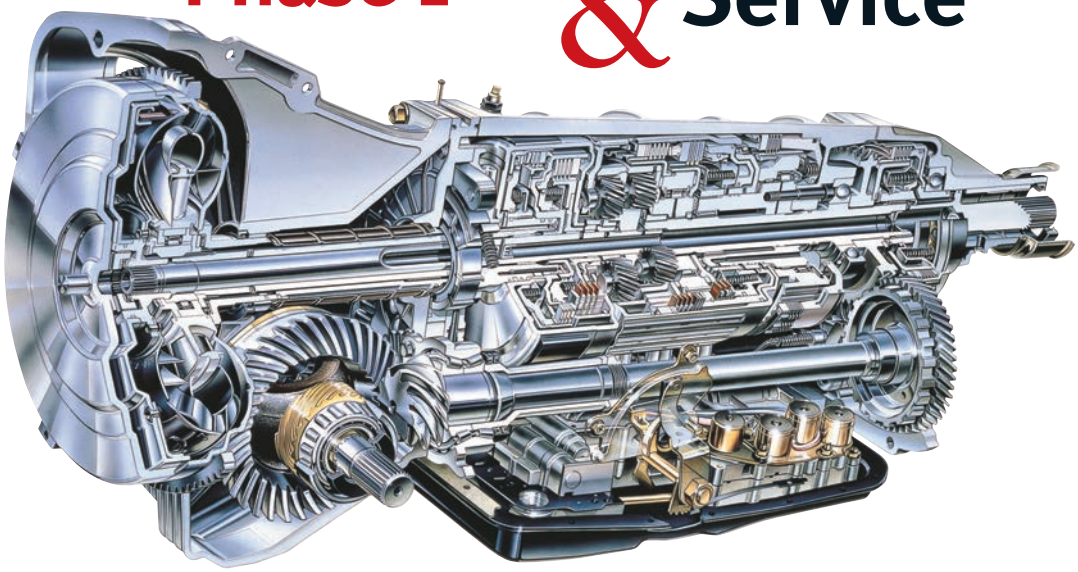
inside

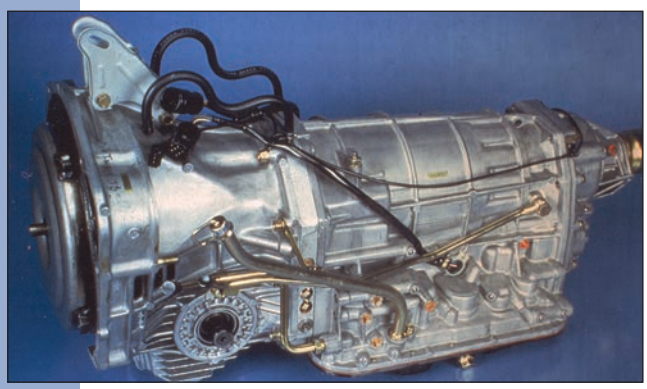




4EAT Phase 1 Transmission Diagnosis & Service



The Subaru 4EAT is a four speed microprocessor-controlled transmission that was installed in many 1987.5-98 Subaru vehicles. It is not a three speed transmission with overdrive. It features a lock-up torque converter, which locks up in all forward gears except 1st.



4EAT assembly

The shift quadrant has been designed in accordance with the four forward speeds. In P, R, or N, there aren't any special features. With the selector in D, the transmission shifts through all four gears. With the selector in 3, the transmission shifts 1, 2, 3. When the selector is in the 2 position, the transmission shifts through 1st and 2nd. If necessary, 3rd gear is computer selected to prevent the engine from over-revving.

Manual 1st gear is only activated when the 1-HOLD button is depressed and the shifter is in manually selected 2. This will provide engine braking. The transmission will upshift through 2nd and 3rd if necessary, in order to prevent the engine from over-revving.

The 1-HOLD indicator is displayed on the combination meter when the button is activated. When the computer overrides the 1-HOLD gear selection the display will change.

An enhanced version of the 4EAT was introduced with the 1990 Legacy. Although similar in design to the earlier 4EAT, the shift quadrant is different. The Legacy 4EAT has a seven-position quadrant: P-R-N-D-3-2-1. The 1-HOLD button has been deleted and a manual button has been added.

XT Selector Lever

When the selector is in 3rd range, manual switch ON, the transmission will start in 2nd gear and shift to 3rd. In 2nd range

manual, the transmission starts and stays in 2nd gear, but will upshift to 3rd gear at 6500 RPM to prevent damage to the engine. In 1st range manual the transmission stays in 1st gear and also will upshift to second at 6100 RPM to prevent damage to the engine. Additionally, on all wheel drive (AWD) vehicles, the TCU applies a more aggressive AWD map when the selector is in the 1st position, manual switch ON or OFF. These changes result in improved driveability on low traction road surfaces.

In 1995 the manual button was deleted. When 3 is selected, the transmission shifts through1st, 2nd, and 3rd. When 2 is selected, the transmission shifts 1st and 2nd. When 1st is selected, the transmission stays in 1st. On 1995 through 1998 model year vehicles, the TCU controlled upshift logic was replaced by a fuel cut logic.

The 1993 Impreza was introduced with fuel cut logic, never having an auto up shift logic.

1992 through 1997 SVX used the same shift logic as the 1990-94 Legacy. The Manual button was retained until production of the vehicle was discontinued in 1997.

The TCU monitors various engine and vehicle inputs, i.e., throttle position and vehicle speed, etc. It also controls the electronic shift solenoids in the transmission.

GEAR RATIOS

1st	2.785
2nd	1.545
3rd	1.000
4th	0.694
REV	2.272
Final Drive: 3.70:1 or 3.90:1	
Legacy Final Drive: 4.11:1	4WD
3.70:1	FWD

Refer to Service Manual for specific model gear ratios.

TCU

Electronic Control System Overview

The electronic control system consists of various inputs (sensors) and outputs (lights and solenoids) in addition to the Transmission Control Unit (TCU).

This is the second generation of Subaru automatic transmission. In addition to being smoother and quieter, it is designed to help maximize fuel economy while providing performance.

It monitors the engine and transmission performance conditions, the driver's demands and the vehicle speed.

Transmission Control Unit

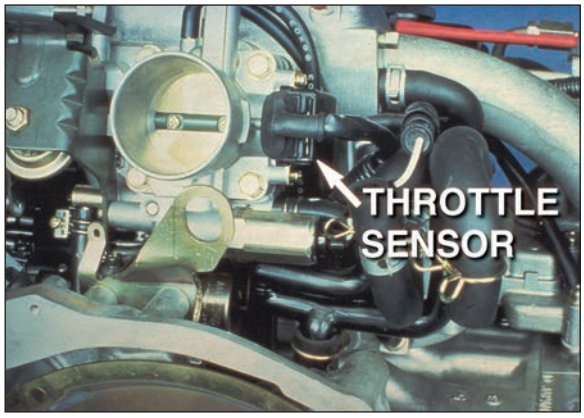
The TCU is a highly sophisticated microprocessor with a self-diagnostic long-term memory. It also has a failsafe function, which maintains driveability in case of a major electrical component failure.

In a transmission equipped for AWD the TCU utilizes a program which continually changes the degree of AWD based upon vehicle operating condition(s).

The TCU controls shifting and line pressure in addition to the lock-up torque converter and the MPT clutch.

TCU Inputs

- Throttle sensor/idle switch
- Vehicle speed sensor #1
- Vehicle speed sensor #2
- Tachometer signal
- Inhibitor switch
- Cruise control signal
- ATF temperature sensor
- Ignition/battery voltage
- 1-HOLD switch
- Forced front wheel drive (FWD)



Throttle Sensor

The throttle sensor/idle switch is basically electrical throttle pressure. The load signal affects: shifting, line pressure and lock-up. The closed throttle input affects the lock-up release mode as well as smooth downshifting into 2nd gear. It also causes a reduction in the pressure.

Vehicle speed sensor #1 is mounted to the transmission and is basically electrical governor pressure. It is used to detect vehicle speed and it affects shift points, lock-up and line pressure.

In FWD transmissions, the speed sensor reads parking gear rotation at the front output shaft. In AWD transmissions, it senses the transfer clutch drum rotation at the rear output shaft.

Vehicle speed sensor #2 is built into the combination meter. In FWD units, it is used as a back up for speed sensor #1. In AWD units, it is used as the front output shaft speed sensor.

An electric speedometer system was first introduced on the SVX in 1992. It was later added to the1995 Legacy, 1996 Impreza and 1998 Forester. The system uses a Magnetic

Driven By What's Inside – Genuine Subaru Replacement Parts

With Subaru's national advertising campaign linking the inner strength of Lance Armstrong to Subaru vehicles, original equipment parts take center stage at your shop.

Capturing the vitality and durability of both Mr. Armstrong and Subaru cars, the campaign stresses that what's inside is what drives one to succeed. For people, it's a combination of intense motivation and inner strength. For every Subaru, it's excellent engineering design and high quality Genuine Subaru Parts.

There's a great deal of truth in this ad campaign. World-renown bicyclist and five-time winner of the Tour de France, Lance Armstrong has overcome tremendous odds to capture the imagination and heart of the entire world. Subaru is proud to be associated with him and the values he embodies. We are equally proud of the determination of our people who produce Subaru automobiles. Subaru has become synonymous with rugged reliability, responsive traction, safety and value. The Genuine Subaru Parts that are inside every Subaru help to maintain and build on that reputation.

You, the independent repair technician, are a vital part of the Subaru equation. When you install Genuine Subaru Parts, you help keep Subaru vehicles operating at their best. You're the one who provides your Subaru customers with safe vehicles that perform up to expectations even in dangerous driving conditions and you deliver satisfaction, value and peace of mind that is backed by the Genuine Subaru Parts Limited Warranty.

When you consider the fact that you can offer all these assurances while making a good profit based on competitively priced Subaru parts, you have to admit that 2004 looks like it can be a very successful and rewarding year to be a Subaru repair facility!

LOW PARTS PRICING CONTINUES

Our commitment to keeping Genuine Subaru Parts competitively priced remains rock solid! One example of that is the remarkable price reduction on heated windshields announced in time for winter repairs. Applications include 1998-99 Legacy models and 1999-2002 Foresters. Contact your Subaru dealer for these warranty-backed windshields.

PLANNING TIPS FOR CAR CARE MONTH

With April just around the corner it's not too early to begin planning for this year's National Car Care Month. With billions of dollars spent on vehicle maintenance every year, zero in on your share of it when the spotlight is trained on car repairs this April.

For a wide range of ways and ideas for getting involved in National Car Care Month, be sure to check out the Car Care Council's official Web site, www.carecare.org. However, to get you started, here are a few planning tips for running an "April Car Care Check-up Sale:"

- Start planning for your special car care service special at least a month ahead of time to give you and your people time to handle the extra jobs involved in holding a two or three week promotion.
- Be sure you arrange for your advertising to break in a carefully planned sequence over the course of your special to keep customers coming in at an even rate.
- Confirm that you have plenty of quick-turnover parts in stock including coolant, brake fluid and other automotive chemicals, wipers and filters, belts, hoses and batteries. That way you won't run short when customers come in.
- Consider your staff's schedule to ensure you have enough technicians available to handle the extra work.

SPT PARTS CAN MEAN HIGHER PROFITS FOR YOUR SHOP

Winter is the time when Subaru performance enthusiasts love to hunker down in their garages and upgrade their vehicles. Some may plan new ways to add extra performance features to their cars while others bring out the tool sets and get right to it.

Either way, now's the time to catch their attention and draw them to your shop for the performance parts of their dreams using special offers and sales on Genuine Subaru Performance Tuning (SPT) Components and Accessories.

For example, the new six-speed short throw shifter for the STi model or "Cat Back" exhaust system for the WRX will surely get those owners thinking. Or consider promoting specials on performance packages that now can include an array of high performance bushings and mounts for the WRX and STi. Certainly throwing in installation on a set of hot aluminum wheels is a no-brainer. Or you could add another SPT or STI performance part to the package at no extra cost to them.

However you choose to combine these SPT specials, be sure to promote them to your customers every way possible. Use postcards, telephone marketing, and email with your customer contact list. Try placing ads in the media your customers are likely to see. You should even think about cross-promoting your performance work with your car care work during Car Care Month to take advantage of the extra customers coming through your service bays. Plus, don't forget to use eye-catching signs in your shop's waiting area or as outdoor signs. Winter can be a hot season for performance sales if you play it cool!

This 3-inch "Cat-Back" muffler system is one of the most popular items in the line of Genuine Subaru SPT and STI Performance Parts. Be sure to let your WRX customers know all about it!

CATCH THE WAVE! SURF THESE 3 HELPFUL SUBARU WEB SITES

With the New Year well under way and the winter repair and maintenance work coming in, tricky situations can often arise working on older Subaru vehicles that you may not see very often.

When these problems come up, you've got help that's a quick mouse click away. Three different Subaru Web sites are ready to provide the answers you need.

For technical advice, you can look up specific repair and maintenance procedures on the *End Wrench* Magazine site, www.endwrench.com or visit the Subaru Technical information site, http://techinfo.subaru.com. Between the archives of articles on the End Wrench site and the huge array of technical manuals available on the Technical Info site, you won't find two better sources to help you in your Subaru repair work anywhere.

www.endwrench.com

www.technoinfo.subaru.com

www.spt.subaru.com

For on-the-spot information on performance parts, head over to the Subaru Performance Parts Web site www.spt.subaru.com. It breaks it all down for you with pictures and part numbers.

Whatever time of day or night you need information from Subaru, these three sites offer the answers you're looking for 24/7.

Resistance Effect (MRE) speed sensor driven by a conventional speedometer drive gear system. The speed sensor, which generates four pulses per revolution, is located on the front differential housing.

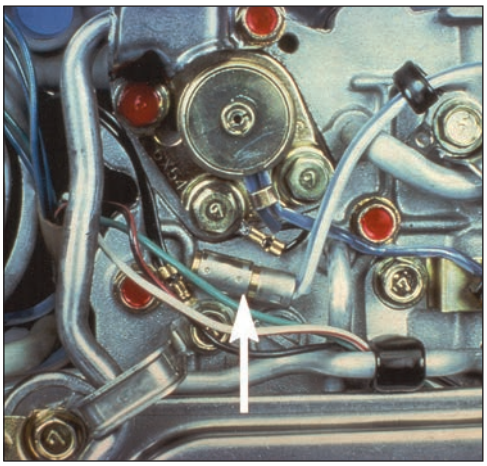
The Speedometer Driving Unit (SDU) receiving pulses from the MRE sensor processes the signal sending the information to the transmission control unit.

The TCU compares the speed signal from the front output shaft with the signal from the rear output shaft (sensor #1). The speed differential helps the TCU determine the degree of AWD (along with other inputs).

The tachometer signal affects the shift points at kickdown. The TCU uses the signal to prevent the engine from over-revving.

Note: The TCU will override the inhibitor switch, if necessary, to prevent the engine from over-revving.

The cruise control signal tells the TCU of cruise control activation. This allows for a wider operating range in 4th gear unless a large speed differential exists from the set speed in which case the transmission may downshift. This improves fuel economy.



ATF Temperature Sensor

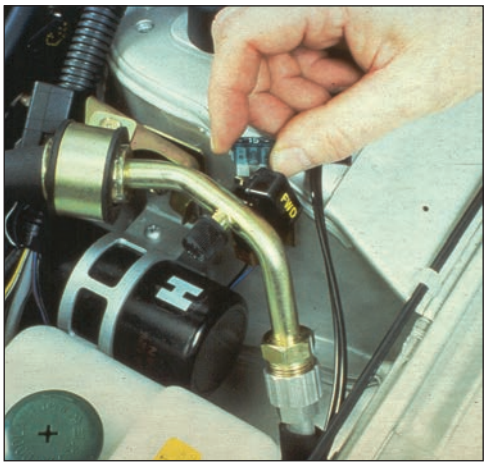
The ATF temperature sensor is located on the lower valve body next to duty solenoid B. When the ATF is cold, the TCU won't allow an upshift into 4th gear. The object is to warm the engine quickly for lower emissions. It is more sophisticated than the KDLH system and less objectionable for the consumer.

When the ATF is hot (AWD only), the TCU shifts the transmission as if in the POWER mode. This pushes the shift points higher which allows the engine to run faster. The oil pump then circulates ATF through the oil cooler more quickly so as not to overheat the engine coolant.

The TCU also monitors system voltage in order to correctly interpret the inputs and alter the control of the outputs. For example, the system is designed for 12-volt operation. When running, however, most vehicles have other than 12 volts available.

The 1-HOLD switch is located aft of the shift quadrant. When activated, it creates a forced 1st gear.

Note: The TCU will shift 2nd to 3rd, if necessary, to prevent the engine from over-revving.



FWD Fuse

The FWD fuse changes the driving mode from AWD to FWD. The FWD fuse is located on the left front shock tower. It is activated by inserting the spare fuse into the under hood connector. The FWD light on the combination meter verifies that the vehicle is in FWD.

The Legacy FWD fuse is located on the right strut tower. The SVX and Forester fuse is located in the main fuse box.

Legacy TCU Inputs

The Legacy fuel system ECM, beginning with the 1990 model year, sends new inputs to the TCU for line pressure control. It networks the MPFI ECU RPM signal and altitude compensation inputs. This provides additional line pressure control for high altitude compensation to reduce shift shock. ABS system inputs turn OFF the over-running clutch when ABS is active and fixes the duty ratio of the MPT to mostly FWD.

Maintenance Precautions

Before jacking up one or two wheels for maintenance with the engine running or before running the vehicle on a chassis dynamometer, the electronic AWD engagement system must be disengaged by installing the spare fuse (15A) of the fuse box into the FWD connector located under the hood. Failure to do so could result in movement of vehicle.

TCU Outputs

There are two types of outputs: solenoid controls and light controls. The solenoids control shifting, line pressure, lock-up and AWD.

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For part applications and prices, visit www.endwrench.com and contact your authorized Subaru dealer.

Genuine Subaru Maintenance Parts Mean Business

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Brake Pads and Shoes	Includes front and rear plus repair kits
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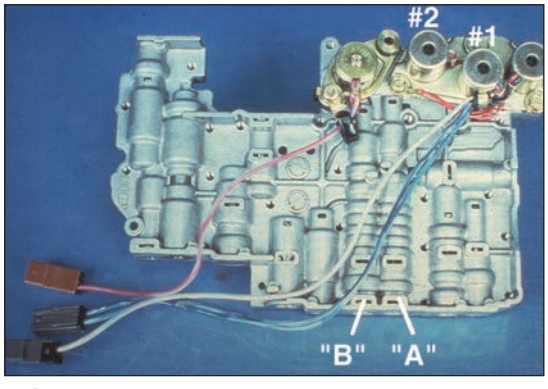


Shift Solenoids and Valves

The light controls indicate operating conditions to the driver. They indicate the POWER mode, manually selected 1st or 2nd gear, or hot ATF (AWD only).

On 1990 and later Legacy models, the light controls indicate hot ATF (FWD and AWD), gears 3 -2 - 1, MANUAL mode and POWER mode.

Shift solenoids #1 and #2 are located on the upper valve body. The TCU induces ON/OFF conditions, which regulate the shifting of the forward gears.

When a shift solenoid is ON, it passes pilot pressure to shift valve A and/or shift valve B. The valve(s) will then shift, feeding the appropriate controlling member circuits (high clutch, band, etc.).

Note: Pilot pressure is nothing more than a pressure held at a constant value.

When a shift solenoid is OFF, the affected shift valve will move to its static position due to spring pressure. The appropriate controlling member circuit will than be fed (high clutch, band, etc.).

COMPONENT APPLICATION

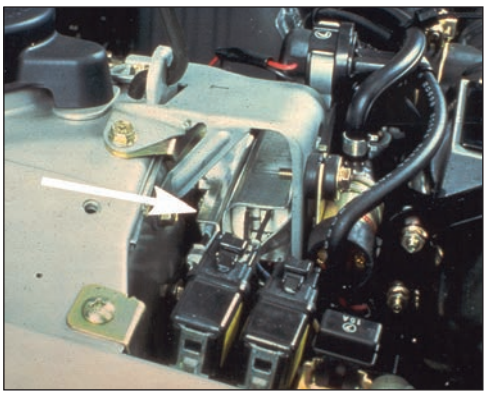
		REV./C	B/B	HIGH/C	FWD./C	OWC (3-4)	OVR/C	Lo/ REV./B	OWC (1-2)	Sol 1	Sol 2
P/N										X	X
R		●				○		●		X	X
D	1st				●	●			●	●	●
	2nd		●		●	●				X	
	3rd			●	●	●				X	X
	4th		●	●	●						X

Shift Modes

Shift solenoid #3 is located on the upper valve body. It is used to control downshifts. It quickly releases the 3-Release pressure during low speed, heavy load situation in order to provide smooth 3-2 downshifts. It operates the overrunning clutch in order to provide engine braking during deceleration. It is also used to cancel the overrunning clutch momentarily during light throttle 3-2 downshifts, or closed throttle 2-1 downshifts. This reduces the shift shock.

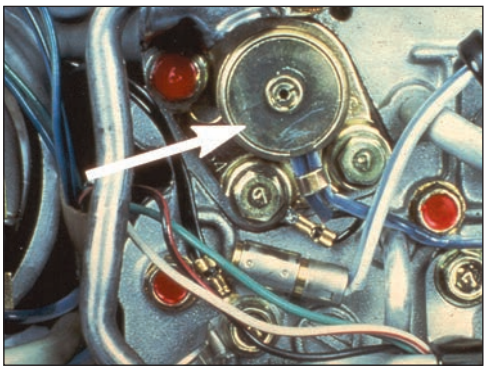
Duty Solenoid A is located on the upper valve body. It regulates line pressure at 3 levels:

- Basic: Altered with load, vehicle speed and range signal.
- Shifting: Lower line pressure in between shifts to minimize shift shock.
- Start up: With low ATF temperature or a low tachometer signal (cranking speed), it sets line pressure to a minimum.



Dropping Resistor

The dropping resistor is wired in parallel with duty solenoid A, and is used to regulate line pressure. It is located on the right front shock tower behind the MPI fuel system-dropping resistor. It takes over line pressure control during the OFF portion of the duty cycle for the duty solenoid. In other words, the duty solenoid is never fully OFF.



Duty Solenoid B

Duty Solenoid B is located on the lower valve body next to the ATF temperature sensor. It operates the lock-up clutch in 3 modes: ON, OFF and a gradual ON/OFF control of the lock-up clutch during gear shifting in order to reduce shift shock.

Duty Solenoid C is located in the extension housing. It is also controlled by the TCU. It varies the degree of AWD.

Combination Meter Light Operation XT-6 and L-Series

The XT-6 and L-Series gear indicator bar is located in the combination meter shift position indicator. Controlled by the TCU, other quadrant indicators are controlled by the inhibitor switch, both providing a path to ground. 2nd indicator bar is affected by the 1-HOLD switch input. With the 1-HOLD button switched OFF & the shift selector in the 2nd Select position, the TCU grounds the 2nd indicator light circuit illuminating the 2nd gear indicator.

The 1-HOLD indicator light (L and XT only) is located near the shift position indicator. It is activated by the TCU whenever the 1-HOLD button is depressed with the shift lever in 2. It changes the display and cancels the 2 indicator.

The vehicle stays in 1-HOLD unless the TCU determines a potential engine over-rev condition, at which point, the transmission will then upshift.

Note:When 1-HOLD is activated, all other shifting inputs are ignored.

ATF temperature warning light was used on AWD vehicles only indicates overheating ATF. See description of TCU inputs for control unit logic in response of hot ATF.

The Power indicator was a frame that illuminates around the word POWER on the combination meter. Activation logic of the power mode is the same as later models.

Late Model Combination Meter

Legacy, SVX, Impreza & Forester

The manual light is activated when the manual button is depressed. On the 1990-91 model year, the 3 - 2 - 1 light box changed color from green to yellow. This feature was discontinued in the 1992 model year. The Manual Light and Switch were discontinued in all models but the SVX in 1995.

The POWER light is activated momentarily whenever the vehicle is started. The computer, monitoring how quickly the gas pedal is depressed selects the POWER mode. This changes the performance characteristics of the transmission. It delays upshifts and may downshift if necessary. When selected, the computer turns the POWER light ON. The POWER light was eliminated on Legacy beginning with the 1995 model year, but the TCU logic is the same.

Note: There are a number of predetermined rates based on the relationship between vehicle speed and throttle angle. These determine ease of access to the power mode. As a general rule, it is easier to activate power mode at lower speeds from a light throttle than it is at higher speeds from a light throttle.

Power Pattern Mode increases up and down shift points. It is deactivated by vehicle speed and throttle angle. For example, if speed is equal to or greater than (approximately) 40 MPH with a light throttle deactivation is immediate. Conversely, if the speed is less than (approximately) 40 MPH a time lag up to 3 seconds will occur before resuming normal shift pattern.

ATF temperature warning light is provided on both FWD and AWD vehicles. It is activated by the TCU indicating overheated ATF. The TCU logic will shift the transaxle as if in the power mode, moving more ATF volume through the cooler.

The indicator light was discontinued in the 1993 model year, but the logic for controlling hot ATF remained.

Starting in the 1995 model year, the HOT ATF indicator light was reintroduced. It performs the same as in the past, with an added function. When the vehicle is started, it is lit momentarily. If it is flashing when the vehicle is started, this indicates the TCU has detected an electrical failure. When the TCU is programmed to do so, it will flash a trouble code to assist in diagnostics.

Fail Safe System

Note: The 4EAT is a highly reliable transmission. Should an electrical component malfunction, it will enter failsafe mode.

Fail Safe Components and Failure Results

If a speed sensor fails, the remaining sensor signal will be used.

In case of throttle sensor failure, the idle contacts will signal the throttle opening. Line pressure will go to maximum at open throttle and it will go to minimum at closed throttle.

Although the inhibitor switch may fail, the manual valve will still be in the correct position for all selected ranges. In P and N however, it may affect start-up, therefore, there is a potential for a no-start condition. In Reverse, the TCU is passive. Therefore, an inhibitor switch failure has no effect. If multiple signals are seen in the forward ranges the inhibitor switch is ignored and there is no fourth gear.

If the 1-HOLD switch is defective, the system operates in the same manner as an inhibitor switch failure in the forward ranges.

If the MANUAL switch is defective (Legacy only), the transmission will shift normally in D position. It will operate the same as an inhibitor switch failure when the selector position 3 - 2 - 1.

If shift solenoids #1 or #2 malfunction, the TCU deactivates the other. This results in either 3rd gear or Reverse (when selected).

If duty solenoid A fails, line pressure goes to maximum.

If duty solenoid B fails, the torque converter lock-up will not occur.

If shift solenoid #3 malfunctions, the overrunning clutch is always ON and there will be engine braking during deceleration.

If duty solenoid C should fail, the AWD control will be set to maximum and the rear wheels will always be powered.

Self Diagnostic System

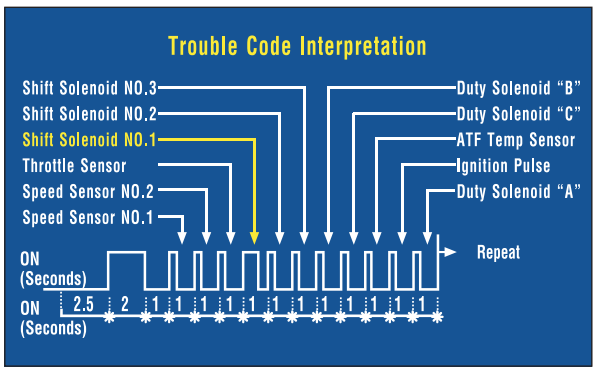
The 4EAT self-diagnostic system has three modes: a user mode and two dealer modes. In the first instance, the user is notified through the POWER light when a malfunction occurs. The failure is communicated after the next ignition OFF/ON cycle. For a more detailed description of the user mode, see the appropriate troubleshooting section of the service manual.

Note: The system will fail safe for "limp home" when a component fails. The light will not illuminate until the ignition is switched OFF and then switched to ON again.

For specific information on the self-diagnostics dealer modes, see the appropriate trouble shooting section of the service manual.

XT and L-Series Diagnostics

To enter into the dealer mode to retrieve trouble codes it is necessary to operate the inhibitor switch in a specific sequence as outlined in the service manual. Once this has been performed the POWER light will flash a code sequence.



The TCU checks 11 components and displays the codes differently than other on board diagnostic functions. When activated, the POWER light flashes OFF for 2.5 seconds, ON for 2.5 seconds then 11 flashes. This sequence will repeat after the 11th flash.

Each component is assigned a position in the sequence (i.e. ignition pulse is position #10 and each position has a duty cycle of one second. Normal functioning components Flash on at a 10% duty, light ON for 0.1 second, light OFF for 0.9 second. Malfunctioning components flash on at a 60% duty, light ON for 0.6 second, light OFF for 0.4 second.

Example: TCU programmed for self-diagnostics, Shift Solenoid #1 defective position #4 in sequence. POWER light OFF for 25 seconds light ON for 2 seconds 3 flashes at 10% duty (0.1 second) 4th flash at 60% duty (0.6 seconds) 7 flashes at 10% duty cycle repeats.

1990-94 Legacy, 1992-95 SVX, 1993-95 Impreza Diagnostics

The procedure to retrieve trouble codes is similar to previous years. The manual button replaces the 1-HOLD button function. Three modes are available:

- Current trouble codes
- Past trouble codes (Long-term memory)
- Clear memory

The codes are communicated on the POWER light. There are 12 codes for the AWD and 11 codes for the FWD vehicles. They are displayed similar to fuel system codes, one long flash = 10 (1.2 seconds), one short flash = 1 (0.3 seconds). For example - one long, two short = Code 12.

Select Monitor Analysis

The Select Monitor is a powerful tool for analysis of an electrical condition.

This form of analysis is the preferred troubleshooting self-diagnostic method. The Select Monitor identifies current problems, past problems (through long-term memory) and indicated actual circuit and component performance. Other functions that can be useful diagnostic aids are graphing; LED display of switched components, Max. & Min. readings and save data and play back.

Also the Select Monitor Oscilloscope function serves to assist in finding intermittent electrical conditions using the trigger function.

Depending on the model and year vehicle, the data list displayed can be extensive. OBD-II functions also have freeze frame data on 1995 and newer Subaru vehicles.

1995-98 Legacy, 1996-98 Impreza, 1996-97 SVX, 1998 Forester, Diagnostics (OBD -II Vehicles)

The AT Oil Temperature light operates under the following conditions: Ignition switch ON/engine OFF is the bulb check mode, the light remains ON. Normal: Ignition switch ON/ Engine ON, light remains on for two seconds from engine start.

AUTOMOTIVE CHEMICALS

...provide protection and enhance performance.

When it comes to fluids and other chemicals you put in a car, there's only one way to be sure you're meeting the same high standards of original Subaru equipment: Use Genuine Subaru Automotive Chemicals. You've got a full line of essential service chemicals to choose from, including aerosols, fluids and refrigerant. In fact, Subaru approves all of these premium chemicals for use in Subaru vehicles.

Each automotive chemical is engineered to help assure maximum performance and trouble-free driving. Even the refrigerant is meticulously controlled for contaminants that can harm compressors. What's more, because Subaru Automotive Chemicals are competitively priced, you can use them regularly on all your service work.

Genuine Subaru Automotive Chemicals Mean Business

Aerosols	Includes chlorinated and non-chlorinated brake and carburetor cleaners, aerosol and pour fuel injector cleaners, top engine cleaner, application tools and adapters, glass cleaner, throttle plate cleaner and silicone lubricant
Fluids	Includes factory fill coolant, brake fluid, factory fill windshield washer concentrate and automatic transmission fluid/power steering fluid
Refrigerant	Packaged to the ARI 700 Standard

Note: A failure is never reported via the AT oil temp light during current operation. The TCU waits until the next ignition cycle to display the following AT oil temp light condition. Therefore the driver may detect an abnormal driveability condition (fail safe operation) with no AT oil temp light indicating a failure.

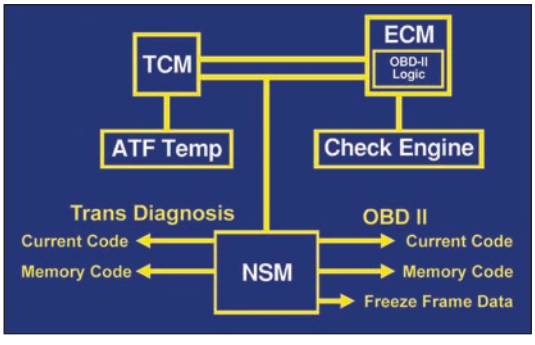
Abnormal - With the ignition switch ON and the engine running, the light remains ON for 2 seconds from engine start. OFF for 0.25 seconds, ON for 0.25 seconds 4 times, then OFF for 2 seconds. Cycle repeats 4 times for a total of 16 Blinks.

Abnormal - ATF Temperature is too high The AT temp light comes ON and stays ON until the ATF temperature returns to normal.

Trouble Codes

Trouble code retrieval is similar to previous models, except for grounding terminal # 5 of connector B82 a 6 pole black, right side of steering column. Trouble codes will be displayed through AT Temp light with the following differences. There are 14 possible trouble codes communicated from the TCU. They are displayed in the same format as old fuel system trouble codes, long Flash = 10, short flash = 1. For example: 2 long and 4 short = code 24, Duty Solenoid C.

The clear memory procedure is simple and quick, just remove fuse No. 14 for at least one minute.



OBD-II Logic Tree

OBD-II Operation Overview

The system monitors components and their operation, conducting continuity and performance checks. The check engine light or MIL illuminates when a code is set into ECU memory. Problems with the 4EAT are communicated from the TCU to the ECU.

There are 2 trouble codes that are generated as soon as a problem occurs, turning on the MIL. With 22 others requiring a fault or error during two consecutive trips, before turning on the MIL. A trip is defined as a driving pattern in which test parameters are reached for a given time. A failed trip will be erased if the next trip is a good one.

Transmission codes generated in OBD-II have freeze frame information available on the Select Monitor in the fuel system section of data display.

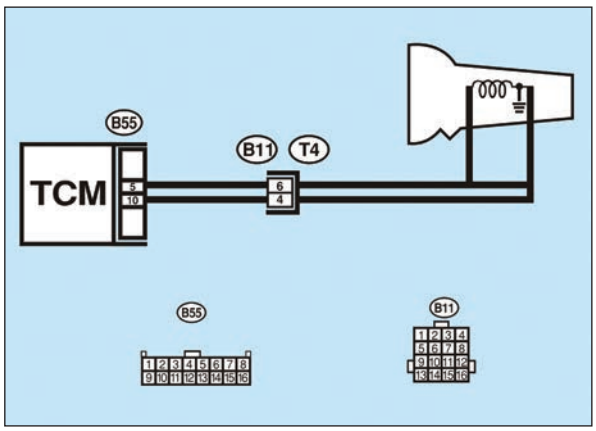
OBD-II Purpose

The Society of Automotive Engineers (SAE), in cooperation with the EPA have, in accordance with regulation J2012 of the 1990 Clean Air Act, established DTCs that are to be used by the automobile industry, beginning with the 1996 model year. DTCs that use a P0 prefix are SAE assigned. DTCs that use a P1 prefix are categorized by SAE but are assigned by a vehicle manufacturer.

OBD-II checks a component and its operation similar to OBD-1, which is used on pre 1995 model vehicles. OBD-l for example, checks the Torque Converter Clutch System Electrical by monitoring for minimum and maximum voltage signals. OBD-II also performs this function. For example examine DTC P0743.

The TCM continuously monitors duty solenoid B Circuit. A fault will register if the following conditions are met:

1. When the TCM supplies an ON signal to the coil of the solenoid, the voltage from the coil is lower than pre-established parameters.
2. When the TCM supplies an OFF signal to the coil of the solenoid, the voltage from the coil is higher than pre-established parameters.



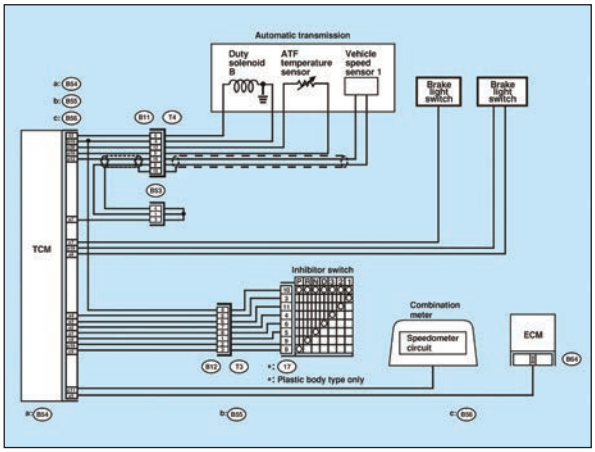
TCM Monitor

Condition (a) or (b) will cause the DTC to register in the ECM memory on OBD-I or OBD-II systems.

OBD-II in addition to the previous will monitor for performance of the Torque Converter Clutch System. For example examine DTC P0740.

The detecting condition: Slipped wheel RPM (absolute value of difference from transmission input RPM computed from engine speed and vehicle speed) continues greater than (40 + vehicle speed / 2) for 10.2 seconds. When the lockup duty ratio is greater then 90% in lock up control mode detected by the TCM.

The TCM continuously monitors the torque converter clutch system. A fault will register if the following condition is present:



Torque Converter Clutch Monitor

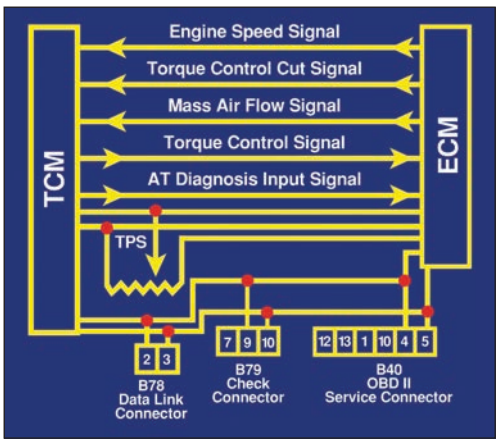
Engine speed is equal to or greater than output shaft speed (speed sensor 1) multiplied 4th gear ratio multiplied by 9/8.

The following conditions must be met before the test is performed.

1. The transmission is in 4th gear.
2. The duty ratio for lockup duty solenoid is equal to or greater than 90%.

The DTC will set and the MIL will illuminate if a fault is registered during two consecutive trips.

Control Unit Networking



Both the Fuel Injection control unit and the Transmission control unit share processed information and sensor input by shared signals.

Engine speed signal is sent to the TCM from the ECM, influencing Torque Converter lock-up.

Torque Control Cut signal is sent to the TCM from the ECM preventing fuel cut under certain conditions. Diagnostics are provided by the TCM as code 16, signal diagnostics are not provided in OBD-II.

Torque control signal (unique from the Torque Control Cut signal) is created in the TCM logic to communicate to the ECM that torque reduction (fuel cut) is required to reduce shift shock during a wide-open throttle upshift. Diagnostics are provided by the TCM as code 25 and also in OBD –II logic as DTC P1103.

The Mass Airflow signal is sent to the TCM from the ECM as a back up for influencing the shift points in the event of a throttle position signal loss. Line pressure is also affected by the Mass Airflow sensor input, lowering the line pressure during up shifts, reducing shock. There are no corresponding onboard diagnostic codes for this signal in the TCM.

Automatic Transmission Diagnosis Input Signals represent an electrical check for the circuit that networks the TCM and ECM, communicating diagnostic information to the ECM. This signal has no corresponding 4EAT code.

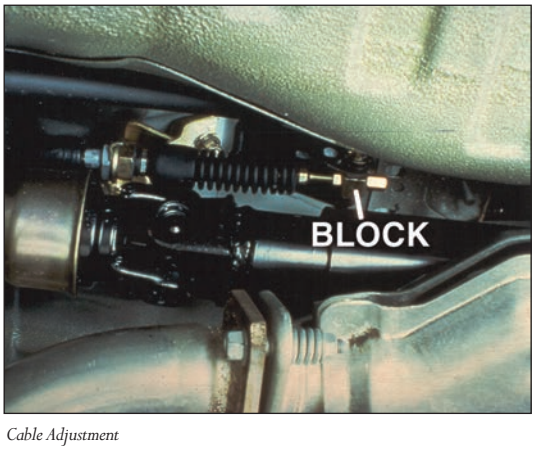
Troubleshooting and Adjustments

Preliminary Inspection

Check the following:

1. Fluid level
2. ATF leaks
3. Road Test:
   - Check proper shift points
   - Engine performance
4. Correctly adjusted throttle sensor
5. Gearshift cable adjustment
6. Correct stall test results
7. Inhibitor switch connections
8. Correct pressure test results

Gearshift Cable Adjustment

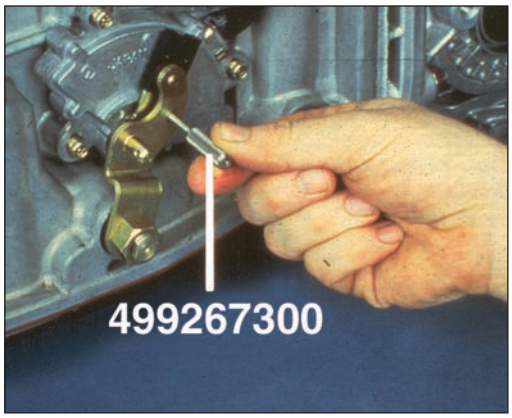


Cable Adjustment

Place the transmission in neutral with the engine OFF. Then loosen the locking nut and the adjusting nut. Push the shift lever arm rearward and tighten the adjusting nut until it contacts the connecting block. Finally, secure the cable with the locking nut and double check the operation.

After adjusting the gearshift cable, verify the correct inhibitor switch position. Remove the cable from the inhibitor switch in order to perform the adjustment. The switch must be in neutral.

Then insert the special tool #499267300 Stopper Pin (available from Kent-Moore by calling 800.345.2233) through the two levers of the switch into the depression in the switch body. Next, loosen the three retaining bolts and rotate the inhibitor to adjust. Finally, reinstall the cable and reconfirm the cable adjustment.



Inhibitor Switch / Adjustment

Stall Test

The stall test checks the operating condition of the AT clutches the torque converter and the engine. Perform these checks in D, 3, 2 and Reverse.

Stall Test Results

Higher than normal RPM indicates one or more of the following:

- Slippage of the forward clutch
- One way clutch (OWC) not holding
- Low/Rev, brake slipping
- Overall low line pressure

Lower than normal RPM indicates one or more of the following:

- Incorrect throttle adjustment
- Poor engine operation
- Torque converter stator slippage

Time Lag Test

The time lag test checks the operation of the forward clutch, the reverse clutch, the low/reverse brake, OWC 3-4 and OWC 1-2.

Perform this test at operating temperature. Idle the engine with the NC OFF. Confirm the proper idle speed in N and correct if necessary. Then shift into D and measure the time (seconds) to full engagement. It should take less than 1.2 seconds. Then shift into R and measure the time. It should take less than 1.5 seconds.

Time Lag Results:

If the time takes longer from N to D, it may indicate one or more of the following:

- Low line pressure
- Worn forward clutch
- OWC problem

If the time takes longer from N to R, it may indicate one or more of the following:

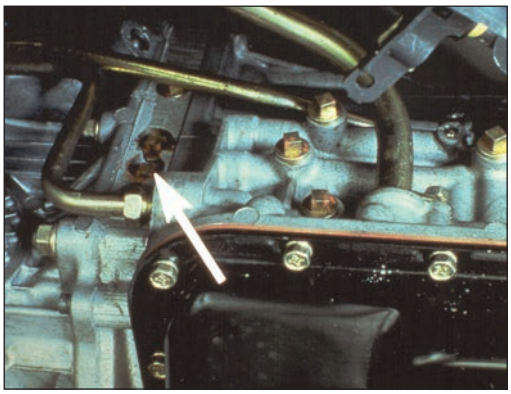
- Low line pressure
- Worn reverse clutch
- Worn low/rev brake

Pressure Test

Perform a pressure test when all the circuits show evidence of slippage or when the circuits show negative results from the time lag test.

This test should also be performed if there is excessive shift shock, delayed shifting, or it the vehicle is immobile.

Perform this test by connecting the pressure gauge to the oil pump outlet test port in order to determine the overall line pressure. Should a particular component be suspected, perform pressure tests at its unique test port. Check for minimum and maximum values at each port.



Transmission Pressure Test Port

On Car Service/Adjustments

The following can be performed on the vehicle:

- Checking/changing fluids
- Band adjustment
- Valve body servicing
- Shift Linkage adjustment/replacement
- Inhibitor switch adjustment/replacement
- Harness repair/replacement
- Transfer clutch assembly (servicing/replacement)
- Speed sensors replacement

4EAT
Phase 2 Overview

The 4EAT Phase 2 (introduced on 1999 model year Subaru vehicles) provides the same type of electronic control used by prior model year vehicles and shares many of the same diagnostic procedures. However, there have been internal and external changes that require this 4EAT to be viewed as an entirely new automatic transmission. Additionally, beginning with the 2001 model year, an enhancement to the all wheel drive transfer section was introduced. This enhancement, called Variable Torque Distribution (VTD), is included on all Subaru vehicles with Vehicle Dynamic Control (VDC). VTD is designed to smoothly transfer and divide the power from the engine to the wheels.

Several mechanical changes have been made for the 4EAT Phase 2 automatic transmission. These changes include: a new external oil filter, an additional speed sensor (for a total of three instead of just two), three new solenoids and the elimination of the 3-4 one-way clutch.

The external oil filter requires no scheduled maintenance, although it can be changed if necessary. The new filter is in addition to the metal valve body screen found on previous models. The screen is still present and can be flushed when the 4EAT is disassembled.

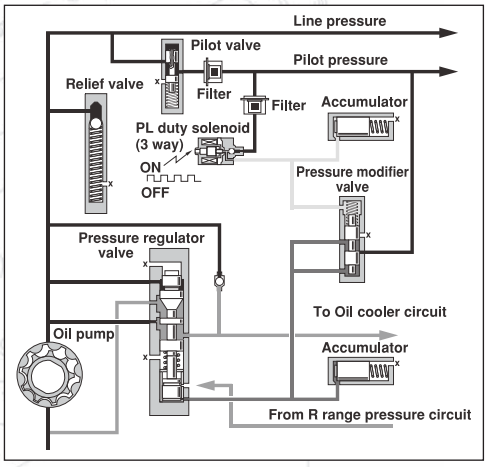
There are three speed sensors instead of the previous two: one for the front output shaft, one for the rear, and a new one that monitors the input speed of the torque converter turbine. All three speed sensors are now located on the outside surface of the transmission case, reading the rotational speeds of internal components and improving transmission characteristics.

The speed sensor for the torque converter turbine allows the Transmission Control Module (TCM) to calculate the actual gear ratio in real time, by dividing the turbine speed by the output speed. To avoid shift shock and sluggish shifting, the rate of change of the actual gear ratio needs to be kept within a certain range. The TCM controls the duty ratios for the 2-4 brake, the high clutch, and the low clutch so that the rate of change occurs within the target range.

Externally, the number of bolts in the 4EAT Phase 2 torque converter housing area have increased to match the increase in the number of bolts in the bell housing of the engine.

Internally the Brake Band and Servo Mechanism have been deleted and in its place an additional clutch pack is used as a holding member for 2nd and 4th gears. Also, the remaining clutch assemblies and the valve body have been redesigned, requiring new disassembly and assembly procedures.

Because it is unlikely that you will be disassembling and servicing a Phase 2 transmission, this article will concentrate on transmission principles of operation and failure diagnosis. Detailed transmission disassembly and assembly information can be found in the service manual.

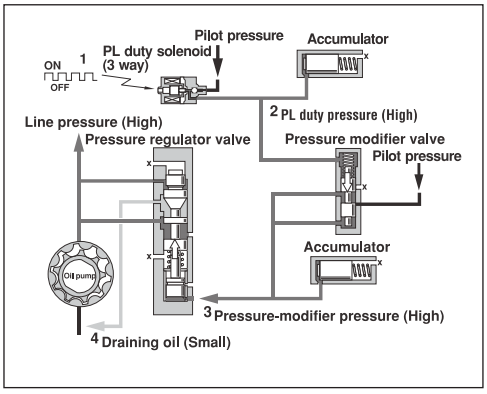


Line Pressure

Hydraulic Control Line Pressure

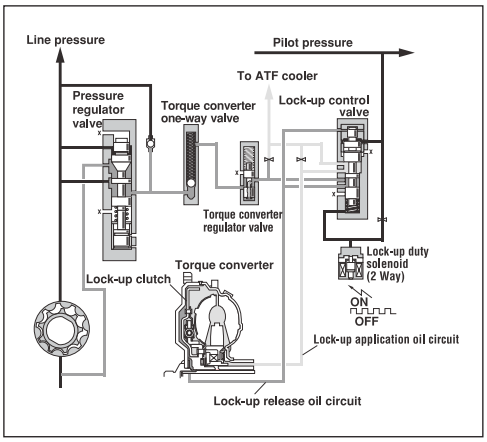
Line pressure provides the force necessary to engage driving and holding members as well as lubricate and cool the transmission. Adjusting the line pressure to various levels reduces the amount of load placed on the engine and minimizes wear on the transmission.

Line pressure is adjusted using data that indicates throttle opening, vehicle speed, and other input signals. Control of the pressure during low load conditions results in a duty ratio, or on verses off time that is large. This duty ratio results in the PL Duty Solenoid staying on more than it is off. Pilot pressure is drained away from the Pressure Modifier Valve. Resulting circuit action lowers the pressure in the lower side of the Pressure Regulator Valve allowing line pressure in the upper side of the valve to push the valve down increasing the amount of pressure drained from the line pressure circuit.



Line Pressure Detail

Control during high load conditions results in a low duty ratio increasing the pressure to the pressure modifier valve. This will result in an increase in pressure to the bottom of the pressure regulator valve, creating an upward movement of the pressure regulator valve and reducing the amount of line pressure drained. The amount of line pressure throughout the transmission will then increase.



Lockup Engagement

Lock up control engages the Lock Up Clutch inside the Torque Converter when traveling in 4th gear under uniform conditions, transmitting engine power directly to the Input Shaft.

Lock up Engagement

1. The TCM increases the duty ratio and the oil drainage rate increases in proportion to the duty ratio.
2. The lock up control valve is pushed down, connecting the torque converter regulator valve port and the lock up application port.
3. Oil pressure from the Torque Converter Regulator Valve is conducted through the application port to the torque converter and the Torque Converter Clutch. The lock up release port ATF is drained through the lockup control valve at this time.
4. The lock up clutch is engaged by the oil pressure from the lock up application port. After the clutch is engaged, the TCM lock up duty solenoid ratio is fixed in the on position.

Lockup Release

1. The Duty Ratio of the Lockup solenoid is adjusted to 5%. Drainage of the duty solenoid oil is stopped and the lock up duty pressure rises.
2. The lockup control valve spool is pushed up, connecting the torque converter regulator valve port and the torque converter release port.
3. Oil pressure from the Torque Converter Regulator Valve is conducted through the release port to the Torque Converter Clutch and the Torque Converter Application Circuit.
4. The Clutch Plate moves away from the Torque Converter Case and the Lock up Clutch is released.

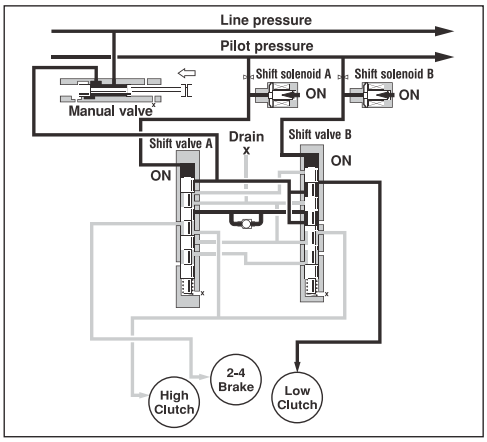
Gear Shift Control

The shift control operates the engagement and release of the Low Clutch, 2-4 Brake, and the High Clutch. TCM output signals control Shift Solenoid A and Shift Solenoid B based on input from vehicle speed and throttle opening.

The solenoids in turn supply or remove pilot pressure from Shift Valve A and Shift Valve B. The positioning of the shift valves route line pressure to the correct clutch and or brake assemblies.

1st Gear

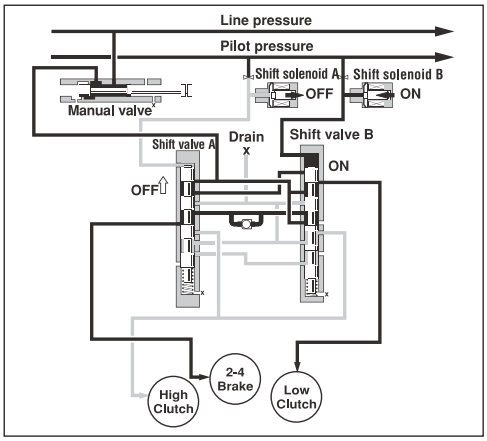
When the selector lever is placed in the D range, the manual valve opens the port to the shift valves A and B, supplying Line pressure. Shift solenoids A and B are turned on by the TCM and pilot pressure is applied to the top of both shift valves. The shift valves move to the bottom of their bores, providing a route for line pressure to the Low Clutch.



1st Gear

2nd Gear

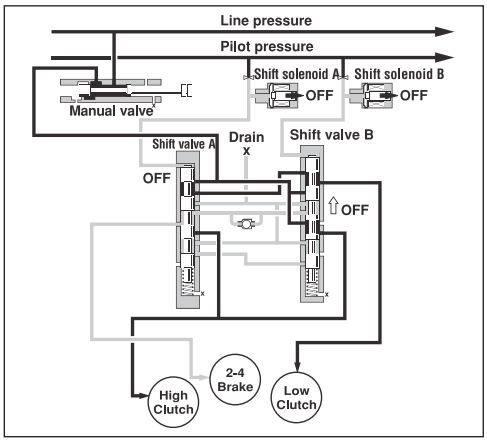
TCM output turns shift solenoid A OFF and shift solenoid B ON. Shift valve A moves upward and opens the 2-4-Brake port. The Low Clutch and 2-4 brake are now applied.



2nd Gear

3rd Gear

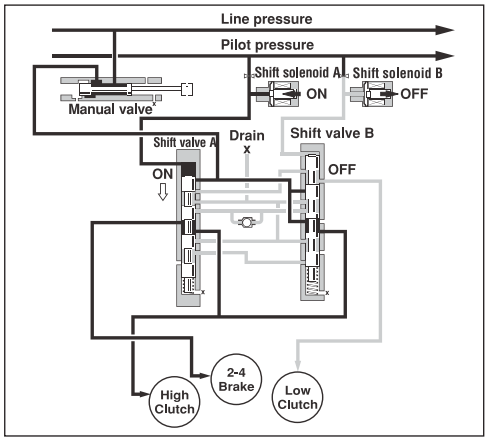
Both solenoids are turned off allowing the pilot pressure supplied to the shift valve to drain. The shift valves move upward allowing line pressure to the Low Clutch and the High Clutch.



3rd Gear

4th Gear

The TCM turns shift solenoid A ON and B OFF. Pilot pressure is supplied to the top of shift valve A which results in the valve moving downward closing the passage for the Low Clutch and opening the passage for the 2-4 brake. The High Clutch and 2-4 brake are now applied.

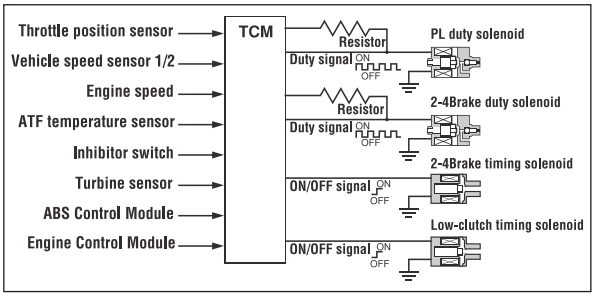


4th Gear

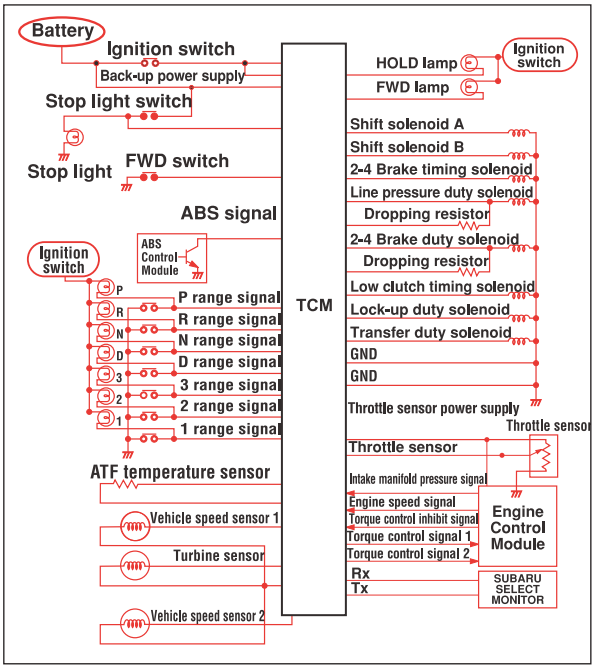
TCM Control

Normal Shifting

The logic for all gear ranges is stored in the TCM memory and is mainly influenced by throttle opening and vehicle speed. Monitoring of these signals enables the TCM to turn the shift solenoids ON or OFF, enabling up and down shifting.



Inputs/Ouputs #1



Inputs/Ouputs #2

Slope Control

This control regulates shifting up from 3rd to 4th gear when traveling uphill and forcefully downshifts from the 4th to 3rd gear when traveling downhill.

The TCM determines the driving force of the traveling vehicle from input of the speed sensor signals, throttle signal, turbine sensor signal, etc., and forcefully maintains 3rd gear.

Control at Low Temperature

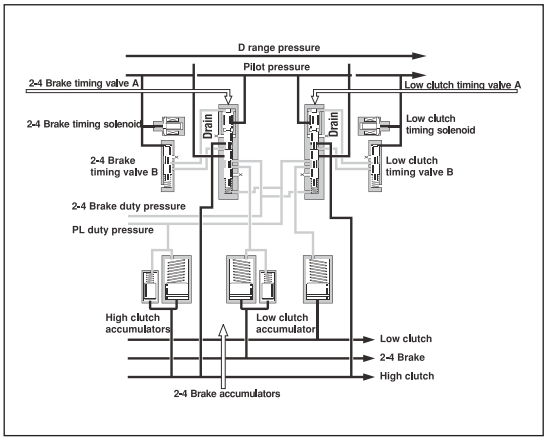
To prevent shift shock, shifting up to D range 4th gear is not performed when the ATF temperature is below approximately 12 degrees C.

Control During ABS Operation

During ABS operation the TCM forces the transmission to 3rd gear. This allows the ABS control to exhibit its maximum effect.

Engine Over Speed Prevention Control

Engine over speed is controlled by a fuel cut.



2-4 Brake Timing

Timing Control

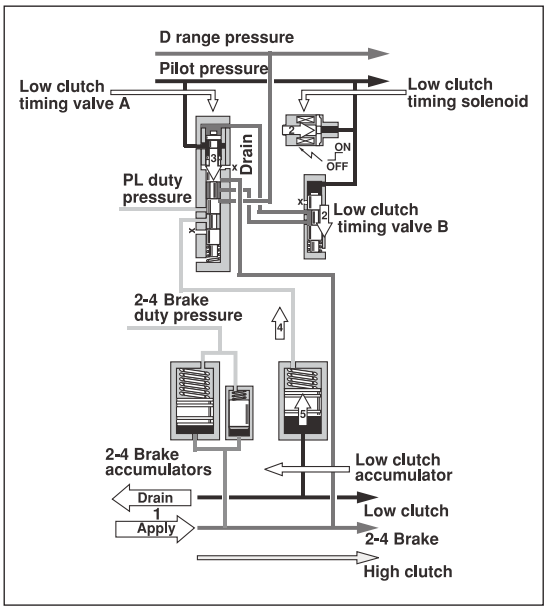
Timing control is designed to prevent shift shock and engine racing. Two types of timing control are used with the new EAT: 2-4 brake timing and Low Clutch Timing.

2-4 brake timing is utilized during the upshift from 2nd to 3rd gear. This control temporarily engages both the 2-4 brake and the high clutch, preventing shift shock and engine racing when upshifting from 3rd to 4th gear.

When the TCM turns the 2-4 brake timing solenoid ON, the 2-4 brake-timing valve A is acted upon by the high clutch pressure.

The 2-4-Brake Timing Valve Spool is pushed down as the high clutch pressure overcomes the set pressure.

The movement of the spool valve changes the draining characteristics of the 2-4 brake accumulators. The faster the back pressure of the accumulators drain, the faster the release of the 2-4 Brake Clutch.



Low Clutch Timing

Low Clutch Timing Control

Low Clutch Timing Control is designed to prevent shift shock and engine racing when the transmission is upshifting from 3rd to 4th gear.

During the upshift to 4th gear, the 2-4 Brake Clutch and the Low Clutch are temporarily engaged together. At the same time the Low Clutch Timing Solenoid is activated, controlling the pilot pressure applied to the top side of the Low Clutch Timing Valve B.

The movement of the Low Clutch Timing Valve B spool regulates the 2-4 brake apply pressure to the top of Low Clutch Timing Valve A. When this pressure overcomes the set pressure the spool valve moves down, changing the draining characteristics of the Low Clutch accumulator back pressure. The faster the back pressure of the accumulator drains, the faster the Low Clutch fully disengages.

Control Performed by the PL Duty Solenoid and the 2-4 Brake Duty Solenoid

The line pressure duty solenoid and the 2-4 brake duty solenoid are adjusted to set values determined from preexisting conditions of the vehicle just before an up shift or down shift occurs. This set value is lower than the applied value and is designed to prevent shift shock and improve shifting characteristics.

The drop in both duty pressures cause the accumulator control valve A and B spool valves to move up, and the low clutch and 2-4 brake accumulator back pressures to be reduced.

This allows the accumulators to absorb a larger shock when the clutches are applied.

The turbine sensor detection signal inputted to the TCM influences the rate in which the duty ratios are increased.

Downshifting from 4th to 3rd

The line pressure and 2-4 brake duty solenoid are adjusted to a lower set value just before the actual downshift.

This drops the back pressure in the high and 2-4 brake accumulators. The lowered back pressure allows the applied pressures to be lower, creating a slipping condition of the high and 2-4 brake. Higher engine speeds will then be obtained, generating a higher driving force to the rear internal gear.

The TCM gradually increases the duty ratios eliminating the slip.

Engine Torque Control

Engine torque control is performed by the engine control module, which lowers the engine torque by retarding the engine ignition timing and cutting the fuel supply, reducing shift shock.

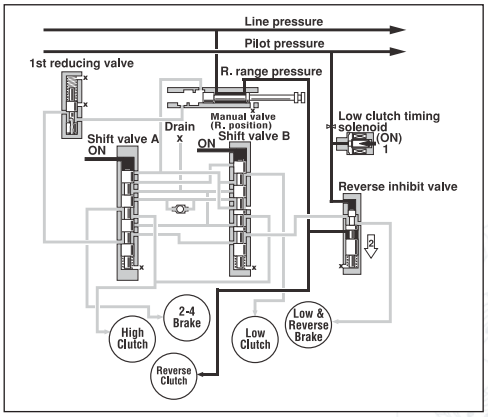
While shifting is in progress, the TCM detects the brake and clutch engagement and release conditions by comparing the turbine sensor signal and the speed sensor signals. The TCM outputs a signal to the ECM to reduce the torque when set conditions are reached.

Learning Control

Learning control is utilized to prevent shift shock that is created because of clutch and brake wear.

The TCM always detects the turbine sensor signal after starting shift control. It measures the time from when this signal changes until the clutch or brake starts to engage and the time from that point until the clutch or brake fully engages.

The TCM compares these times to their respective target values and determines the clutch or brake status. Based on the results, it decides the operating characteristics of the line pressure control solenoid and the 2-4 brake duty solenoid. By controlling the line pressure control solenoid and the 2-4-Brake solenoid based on these operating characteristics, increased shift shock due to change with passage of time can be prevented.



Reverse Inhibit Control

Reverse Inhibit Control

Designed to prevent the accidental shift into reverse gear. This feature is only active above 6 mph. The Low Clutch Timing solenoid is turned on allowing pilot pressure to build up on the top side of the Reverse Inhibit valve. The valve spool is then pushed down blocking the passageway to the low and reverse brake.

Engine Brake Control

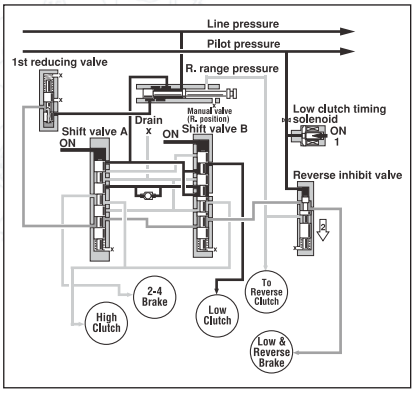
Engine brake operation will occur in the 1 range 1st gear. The TCM turns the Low Clutch Timing Solenoid

Self Diagnosis

The TCM detects trouble in the detection signals from the sensors and the signals output to the actuators. This function is referred to as the self diagnosis function. When either signal is faulty, the TCM indicates system trouble by flashing the ATF lamp in the combination meter. By counting the flashes of the lamp a trouble code can be specified.

Code	Item	Diagnosis	Trouble
11	Line pressure duty solenoid	Short or Disconnection in solenoid driving circuit	More severe shifting shock and faulty shifting
12	Lockup duty solenoid	Short or disconnection in solenoid driving circuit	Fails to lock up (after warm-up)
13	2-4 brake timing solenoid	Short or disconnection in solenoid driving circuit	Faulty shifting
14	Shift solenoid B	Short or disconnection in solenoid driving circuit	Fails to shift
15	Shift solenoid A	Short or disconnection in solenoid driving circuit	Fails to shift
16	2-4 brake duty solenoid	Short or disconnection in solenoid driving circuit	Faulty shifting
21	ATF temperature sensor	Short or disconnection in input circuit	Faulty shifting when cold
22	Pressure sensor	Short or disconnection in input circuit	More severe shifting shock
23	Engine speed signal	No signal input above 10km/h	Fails to lock up (after warm-up)
24	Transfer duty solenoid	Short or disconnection in solenoid driving circuit	Excessive tight corner braking phenomena
25	Engine torque control signal	Short or disconnection in engine torque control signal circuit	More severe shifting shock
31	Throttle sensor	Short or disconnection in input circuit	Faulty shifting and excessive shifting shock
32	Vehicle speed sensor 1	No signal input to speed sensor 1 above 20km/h	Speed sensor 1 malfunctions: more severe shifting shock
33	Vehicle speed sensor 2	No signal input to speed Sensor 2 above 20km/h	One or the other malfunctions: excessive tight corner braking phenomena Both malfunction: fails to shift
34	Turbine sensor	No signal input in ranges other than N range (vehicle speed sensors 1 and 2 are operating normally while vehicle is traveling)	More severe shifting shock
36	Low clutch timing solenoid	Short or disconnection in solenoid driving circuit	Faulty shifting

ON and supplies pilot pressure to the reverse inhibit valve. The pilot pressure causes the reverse inhibit valve spool to move downward, opening the port to the low and reverse brake. Pressure from the 1st reducing valve engages the low and reverse brake. The Low Clutch Drum is then fixed to the transmission case and the rotation of the wheels is transmitted to the engine side, operating the engine brake effect.



Reverse Inhibit Control

Failsafe Function

Failsafe function is a TCM controlled function that enables the vehicle to be driven in the event of malfunction of the vehicle speed sensors, throttle sensor, inhibitor switch or various solenoids. In the event of trouble the TCM executes the following control.

Item	Failsafe Function
Line pressure duty solenoid	TCM turns the solenoid off and sets the transmission so only 1st and 3rd are available. The line pressure is also set to maximum.
Lockup duty solenoid	TCM turns the solenoid off and torque converter lock up does not occur.
2-4 brake timing solenoid	TCM turns the solenoid off and sets the transmission so only 1st and 3rd are available.
Shift solenoid B	When either solenoid malfunctions the TCM turns both solenoids off and sets the transmission to 3rd gear.
Shift solenoid A	When either solenoid malfunctions the TCM turns both solenoids off and sets the transmission to 3rd gear.
2-4 brake duty solenoid	TCM turns the solenoid off and sets the transmission so only 1st and 3rd are available
Transfer (AWD) duty solenoid	TCM turns the solenoid off and adjusts the transfer clutch pressure to maximum.
Throttle sensor	TCM assumes the throttle opening of 3/8 open and continues at that level.
Vehicle speed sensor 1	Vehicle speed sensor 2
Vehicle speed sensor 2	Vehicle speed sensor 1 (If both sensors malfunction, the TCM sets the transmission to 3rd gear.)
Low Clutch Timing Solenoid	TCM turns the solenoid off and sets the transmission so only 1st and 3rd are available.

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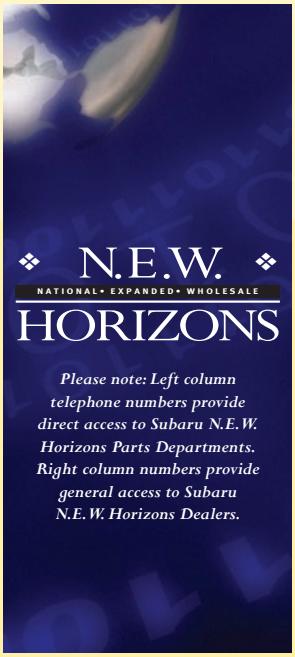
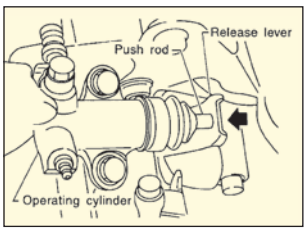


insider info

Clutch Pedal Sticking



If you encounter a customer complaint of the clutch pedal not returning completely after being engaged, or if there is a spongy or light pedal feel while shifting, the following repair method should be followed. This condition may affect certain manual transmission vehicles with a hydraulic clutch system under certain weather conditions. The affected manual transmission Subaru models are as follows:

1995-2002 Legacy
1997-2003 2.5L Impreza
1998-2003 Forester

To correct this condition you must replace the parts in the chart that match your vehicle using the following procedures:

Replacement Clutch Parts:

- 2002 WRX (5MT)
  Clutch Operating Cylinder: Do not replace
  Clutch Hose: 37251AA003
  Gaskets for Hose: 114130151 X 2
- Legacy (5MT)
  Clutch Operating Cylinder: 30620AA042
  Clutch Hose: 37251AC001
  Gaskets for Hose: 114130151 X 2
- Impreza (5MT)
  Clutch Operating Cylinder: 30620AA042
  Clutch Hose: 37251AC001
  Gaskets for Hose: 114130151 X 2
- Forester (5MT)
  Clutch Operating Cylinder: 30620AA042
  Clutch Hose: 37251AC001
  Gaskets for Hose: 114130151 X 2

For naturally-aspirated models with hydraulic clutches:

- Remove the intake chamber from the backside of the intake manifold.
- Remove the clutch hose and the clutch operating cylinder. In this procedure it is not necessary to remove the master cylinder, the clutch pipe bracket.
- Replace the clutch hose and the clutch operating cylinder with new parts as listed below. Note that two pieces of gasket (P/N 114130151) used on the connector of the operating cylinder must be replaced with new ones when replacing the clutch hose. Tightening torque of the bolt is: 37 ±3 Nm (27 ±2 ft. lbs).
- Bolt the operating cylinder onto the transmission.
- Add brake fluid.
- Bleed the air from the system.
- Bleed the air from he system.
- Install the intake chamber.

For turbo models:

- Remove the intercooler.
- Remove the clutch operating cylinder hose. In this procedure, the clutch master cylinder, clutch pipe and bracket are unnecessary to be removed.
- Replace the clutch hose that was removed with the new one listed below. Note that two pieces of gasket (P/N 114130151) used on the connector of the operating cylinder must be replaced with new ones when replacing the clutch hose. Tightening torque of the bolt is: 37 ±3 Nm (27 ±2 ft. lbs).
- Add brake fluid.
- Bleed the air from the system.
- Install the intercooler.
- Insure there is no leakage from the line, check whether fluid leakage occurs after the clutch pedal has been fully depressed.
- Check whether the clutch performs normally.

Transmission Jumps Out Of 3rd Gear

If you are rebuilding a WRX 5M/T and during the rebuild, it is necessary to replace the 3-4 gear set, consult Part Bulletin PT070302. Installation of the new part set mentioned in the bulletin should keep the transmission from popping out of 3rd gear.

Slope Control Logic Change

The TCM Slope Control logic has been changed on 2003-04 Subaru vehicles. It will activate on downhill slopes and grades greater than 12%, and vehicle speeds under 48.5 mph.

All Subaru Rear Differentials

Be advised that Subaru rear differentials are not serviceable. There is a rebuilding procedure in the applicable service manual, but if the rear differential has a problem, Subaru recommends that if be replaced with a remanufactured unit where available.

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