SECTION 3A2

BTRA 4 AUTO TRANSMISSION

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DESCRIPTION AND OPERATION

BTRA M74 4WD AUTOMATIC TRANSMISSION

The BTR Automotive Model 74 Four Speed Automatic Transmission is an electronically controlled overdrive four speed unit with a lock-up torque converter. The lock-up torque converter results in lower engine speeds at cruise and eliminates unnecessary slippage. These features benefit the customer through improved fuel economy and noise reduction.

Of primary significance is the Transmission Control Module (TCM) which is a microprocessor based control system.

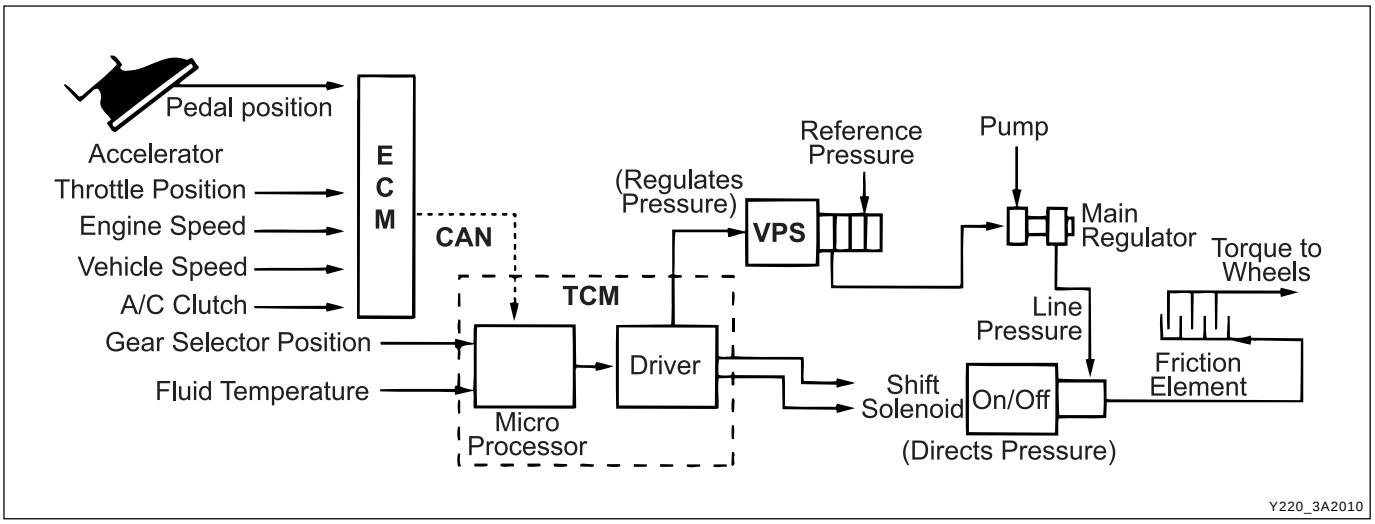
	Max. Power (kW)	Configuration
320	160	260 mm Torque Converter-Wide Ratio Gear Set Splined Output for Transfer Case

The TCM utilizes throttle position, rate of throttle opening, engine speed, vehicle speed, transmission fluid temperature, gear selector position and mode selector inputs, and in some applications a Kickdown Switch to control all shift feel and shift schedule aspects.

The TCM drives a single proportional solenoid multi-plexed to three regulator valves to control all shift feel aspects. The output pressure of this solenoid is con-trolled as a function of transmission fluid temperature to maintain consistent shift feel throughout the operating range.

Shift scheduling is highly flexible, and several independent schedules are programmed depending on the ve-hicle.

Typically the NORMAL schedule is used to maximize fuel economy and driveability, and a POWER schedule is used to maximize performance. WINTER schedule is used to facilitate starting in second gear.



OPERATORS INTERFACES

There are three operator interfaces as the following;

- Gear Shift Control Lever
- Driving Mode Selector
- Indicator Light

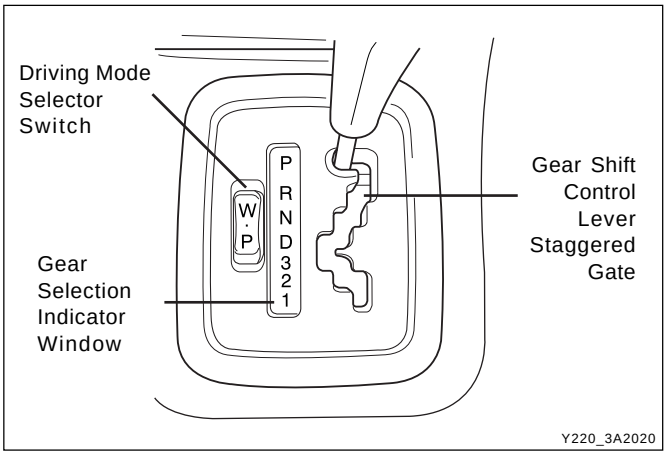
▶ Gear Shift Control Lever

The transmission uses a conventional shift control lever. The gear shift control lever can be moved from one position to another within the staggered configuration of the shift control lever gate to positively indicate the gear selection.

- P - Park position prevents the vehicle from rolling either forward or backward by locking the transmission output shaft. The inhibitor switch allows the engine to be started. For safety reasons, the parking should be used in addition to the park position. Do not select the Park position until the vehicle comes to a complete stop because it mechanically locks the output shaft.
- R - Reverse allows the vehicle to be operated in a rearward direction. The inhibitor switch enables re-verse lamp operation.
- N - Neutral allows the engine to be started and operated while driving the vehicle. The inhibitor switch allows the engine to be started. There is no power transferred through the transmission in Neutral. But the final drive is not locked by the parking pawl, so thewheels are free to rotate.
- D - Overdrive range is used for all normal driving conditions. 4th gear (overdrive gear) reduces the fuel consumption and the engine noise. Engine braking is applied with reduced throttle.

  First to second (1 →2), first to third (1 →3), second to third (2 →3), second to fourth (2 →4), third to fourth (3 →4), fourth to third (4 →3), fourth to second (4 →2), third to second (3 →2), third to first (3 →1) and second to first (2 →1) shifts are all available as a function of vehicle speed, throttle position and the time change rate of the throttle position.

  Downshifts are available for safe passing by depressing the accelerator. Lockup clutch may be enabled in 3rd and 4th gears depending on vehicle type.
- 3 - Manual 3 provides three gear ratios (first through third) and prevents the transmission from operating in 4th gear. 3rd gear is used when driving on long hill roads or in heavy city traffic. Downshifts are available by depressing the accelerator.
- 2 - Manual 2 provides two gear ratios (first and second). It is used to provide more power when climbing hills or engine braking when driving down a steep hill or starting off on slippery roads.
- 1 - Manual 1 is used to provide the maximum engine braking when driving down the severe gradients.



▶ Driving Mode Selector

The driving mode selector consists of a driving mode selector switch and indicator light. The driving mode selector is located on the center console and allows the driver to select the driving mode.

The driving modes available to be selected vary with vehicle types. Typically the driver should have the option to select among NORMAL, POWER and WINTER modes.

When NORMAL mode is selected upshifts will occur to maximize fuel economy. When POWER mode is se-lected, upshifts will occur to give maximum performance and the POWER mode indicator light is switched ON.

When WINTER mode is selected, starting in second gear is facilitated, the WINTER mode indicator light is switched ON and the POWER mode indicator light is switched OFF.

▶ Indicator Light

The indicator light is located on the instrument panel.

- Auto shift indicator light comes ON when the ignition switch ON and shows the gear shift control lever position.
- POWER mode indicator light comes ON when the POWER mode is selected and when the kickdown switch is depressed.
- WINTER mode indicator light comes ON when the WINTER mode is selected.

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CONTROL SYSTEMS

BTRA M74 4WD automatic transmission consists of two control systems. One is the electronic control system that monitors vehicle parameters and adjusts the transmission performance. Another is the hydraulic control system that implements the commands of the electronic control system commands.

ELECTRONIC CONTROL SYSTEM

The electronic control system comprises of sensors, a TCM and seven solenoids. The TCM reads the inputs and activates the outputs according to values stored in Read Only Memory (ROM).

The TCM controls the hydraulic control system. This control is via the hydraulic valve body, which contains seven electromagnetic solenoids. Six of the seven solenoids are used to control the line pressure, operate the shift valves and the torque converter lock-up clutch, and to turn ON and OFF the two regulator valves that control the shift feel.

The seventh solenoid is the proportional or Variable Pressure Solenoid (VPS) which works with the two regu-lator valves to control shift feel.

Transmission Control Module (TCM)

The TCM is an in-vehicle micro-processor based trans-mission management system. It is mounted under the driver's side front seat in the vehicle cabin.

The TCM contains:

- Processing logic circuits which include a central microprocessor controller and a back-up memory system.
- Input circuits.
- Output circuits which control external devices such as the Variable Pressure Solenoid (VPS) driver, On/Off solenoid drivers, a diagnostics output and the driving mode indicator light.

Processing logic

Shift schedule and calibration information is stored in an Erasable Programmable Read Only Memory (EPROM).

Throttle input calibration constants and the diagnostics information are stored in Electrically Erasable Programmable Read Only Memory (EEPROM) that retains the memory even when power to the TCM is disconnected. TCM continuously monitors the input values and uses these, via the shift schedule, to determine the required gear state. At the same time it monitors, via the solenoid outputs, the current gear state, whenever the input conditions change such that the required gear state is different to the current gear state, the TCM initiates a gear shift to bring the two states back into line.

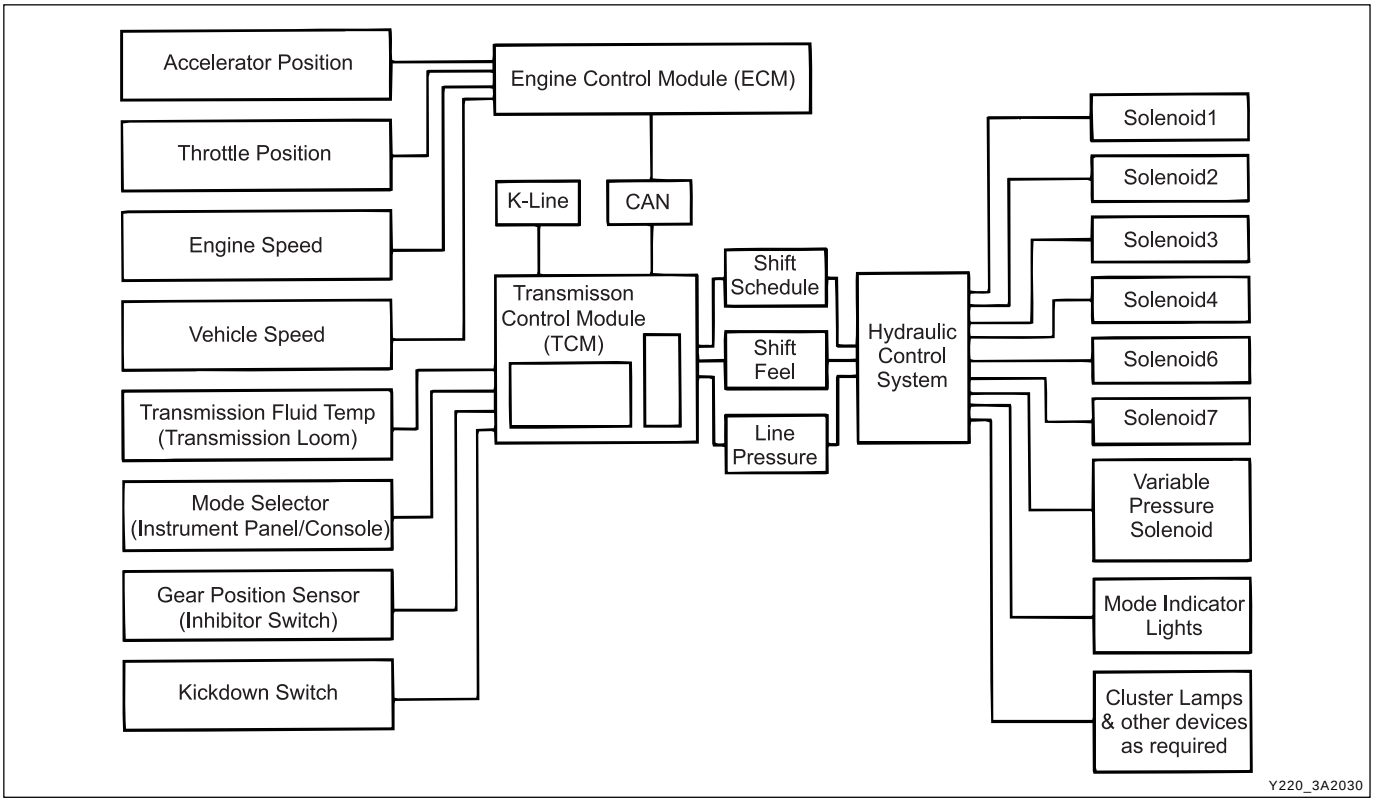
Once the TCM has determined the type of gearshift required the TCM accesses the shift logic, estimates the engine torque output, adjusts the variable pressure solenoid ramp pressure then executes the shift.

The TCM continuously monitors every input and output circuit for short or open circuits and operating range.

When a failure or abnormal operation is detected the TCM records the condition code in the diagnostics memory and implements a Limp Home Mode (LHM).

The actual limp home mode used depends upon the failure detected with the object to maintain maximum driveability without damaging the transmission. In general input failures are handled by providing a default value. Output failures, which are capable of damaging the transmission, result in full limp mode giving only third or fourth gear and reverse. For further details of limp modes and memory retention refer to the Diagnostic Trouble Code Diagnosis Section.

The TCM is designed to operate at ambient temperatures between - 40 and 85°C (- 40 and 185°F). It is also protected against electrical noise and voltage spikes, however all the usual precautions should be observed, for example when arc welding or jump starting.



TCM inputs

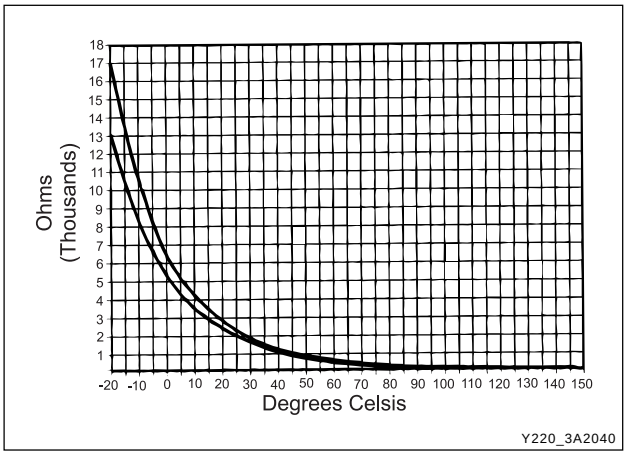
To function correctly, the TCM requires engine speed, vehicle speed, transmission fluid temperature, throttle position, gear position and Kickdown Switch inputs to determine the variable pressure solenoid current ramp and on/off solenoid states. This ensures the correct gear selection and shift feel for all driving conditions.

The inputs required by the TCM are as follows;

- Engine Speed
  The engine speed signal is derived from the Control- ler Area Network (CAN) via Engine Control Module (ECM).
- Vehicle Speed
  The vehicle speed sensor, which is located in the transfer case, sends the output shaft speed signal to the Engine Control Module (ECM). The information is then transferred to the TCM via the CAN.
- Transmission Fluid Temperature
  The transmission fluid temperature sensor is a thermistor located in the solenoid wiring loom within the valve body of the transmission. This sensor is a typical Negative Temperature Coefficient (NTC) resistor with low temperatures producing a high resistance and high temperatures producing a low resistance.

  If the transmission fluid temperature exceeds 135°C (275°F), the TCM will impose converter lock-up at lower vehicle speeds and in some vehicles flashes the mode indicator light. This results in maximum oil flow through the external oil cooler and eliminates slippage in the torque converter. Both these actions combine to reduce the oil temperature in the transmission.

Temperature (°C)	Resistance (Ohms)	
	Minimum	Maximum
-20	13,638	17,287
0	5,177	6,616
20	2,278	2, 723
100	117	196
135 (Overheat Mode Threshold)	75	85



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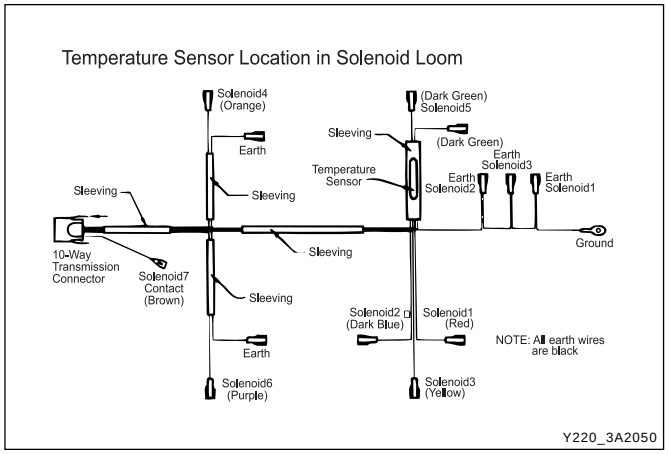
Pin No. Codes and colors in Solenoid Loom

Pin No.	Wire Color	Connects to
1	Red	Solenoid 1
2	Blue	Solenoid 2
3	Yellow	Solenoid 3
4	Orange	Solenoid 4
5	Green	Solenoid 5
6	Violet	Solenoid 6
7	Brown	Solenoid 7
8	Green	Solenoid 5
9	White	Temperature Sensor
10	Red	Temperature Sensor



Throttle position sensor

Gasoline engine:

The throttle position signal is sent from the ECM to the TCM via the CAN. Refer to Engine Section for further details.

Diesel engine:

The throttle position sensor (TPS) is a resistance potentiometer which is installed on the injection pump.

It transmits a signal to the TCU proportional to the throttle plate opening.

The potentiometer is connected to the TCU by three wires: 5 volts positive supply, earth and variable wiper voltage.

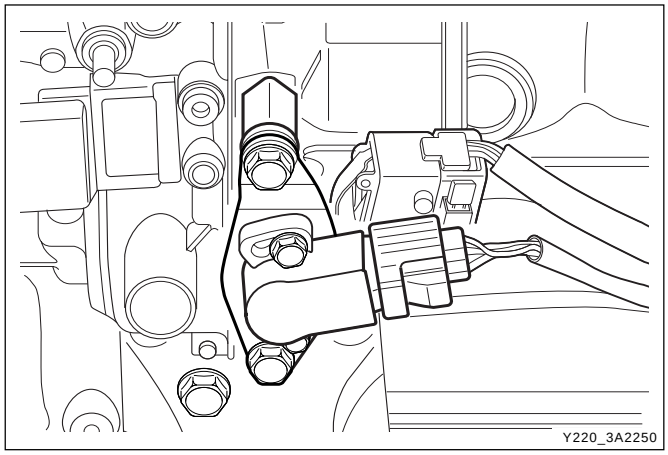
Throttle voltage adjustments are as follows:

- Closed throttle voltage is 0.2 V to 1.0 V.
- Wide open throttle voltage is 3 V to 4.5 V.

These measurements are taken between pins 1 and 3 of the TPS connentor.

Maintaining good shift feel through the transmission life span is dependant on having an accurate measure of the engine throttle position. To achieve this the TCU continuously monitors the maximum and minimum throttle potentiometer voltages and, if a change occurs, stores the new voltage values.

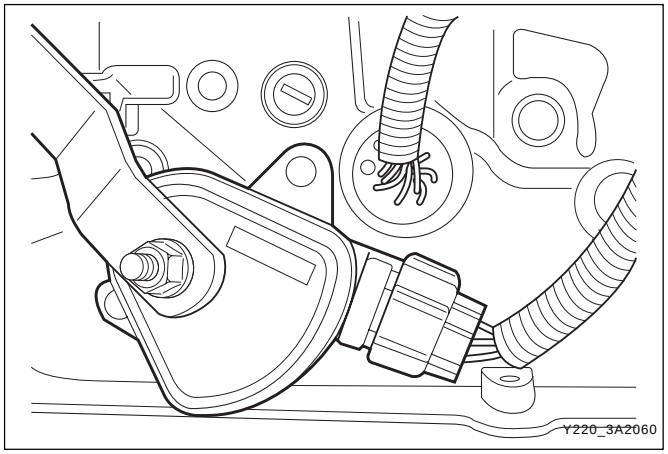
However these limits will be lost and will require relearning should a new TCU be installed, or the throttle calibration data is cleared by the execution of a particular sequence. This last instance depends on the installation, and reference should be made to the Diagnostics Section of this manual. The relearning will happen automatically.



Gear position sensor

The gear position sensor is incorporated in the inhibitor switch mounted on the side of the transmission case.

The gear position sensor is a multi-function switch providing three functions;



- Inhibit starting of the vehicle when the shift lever is in a position other than Park or Neutral
- Illuminate the reverse lamps when Reverse is se-lected
- Indicate to the TCM which lever position has been selected by way of a varying resistance.

Readings for Resistance / Shift Lever Positions

Shift Lever Position	Resistance (kΩ)
Manual 1	1 ~ 1.4
Manual 2	21.8 ~ 2.2
Manual 3	3 3 ~ 3.4
Drive	4.5 ~ 4.9
Neutral	6.8 ~ 7.2
Reverse	10.8 ~ 11.2
Park	18.6 ~ 19

Kickdown switch

The Kickdown Switch is used to signal the TCM that the driver has pressed the acclerator to the floor and requires a kickdown shift. When this switch is used, the POWER light comes ON and the POWER shift pattern is used.

Diagnostic inputs

The diagnostic control input or K-line is used to initiate the outputting of diagnostic data from the TCM to a diagnostic test instrument. This input may also be used to clear the stored fault history data from the TCM's retentive memory. Connection to the diagnostic input of the TCM is via a connector included in the vehicle's wiring harness or computer interface.

Battery voltage monitoring input

The battery voltage monitoring input is connected to the positive side of the battery. This signal is taken from the main supply to the TCM.

If the battery voltage at the TCM falls below 11.3 V, the transmission will adopt a low voltage mode of operating in which shifts into first gear are inhibited. All other shifts are allowed but may not occur because of the reduced voltage. This condition normally occurs only when the battery is in poor condition.

If the battery voltage is greater than 16.5 V, the transmission will adopt limp home mode and all solenoids are turned OFF.

When system voltage recovers, the TCM will resume normal operation after a 30 seconds delay period.

TCM outputs

The outputs from the TCM are supplied to the compo-nents described below;

- Solenoids
- Mode Indicator Light

Solenoids

The TCM controls seven solenoids. Solenoids 1 to 6 (S1 to S6) are mounted in the valve body, while Solenoid 7 (S7) is mounted in the pump cover.

- Solenoid 1 and 2: S1 and S2 are normally open ON/OFF solenoids that set the selected gear. These solenoids determine static gear position by operating the shift valves. Note that S1 and S2 solenoids also send signal pressure to allow or prohibit rear band engagement.
- Solenoid 3 and 4: S3 and S4 are normally open ON/OFF solenoids that combine to control shift quality and sequencing. S3 switches the clutch regulator valve OFF or ON. S4 switches the front band regula-tor valve OFF or ON. S5 also provides the signal pressure for the converter clutch regulator valve.
- Solenoid 5: S5 is a variable pressure solenoid that ramps the pressure during gear changes. This solenoid provides the signal pressure to the clutch and band regulator, thereby controlling the shift pres-sures. S5 also provides the signal pressure for the converter clutch regulator valve.
- Solenoid 6: S6 is a normally open ON/OFF solenoid that sets the high/low level of line pressure. Solenoid OFF gives high pressure.
- Solenoid 7: S7 is a normally open ON/OFF solenoid that controls the application of the converter clutch. Solenoid ON activates the clutch.

Solenoid Logic for Static Gear States

Gear	S1	S2
1st	ON	ON
2nd	OFF	ON
3rd	OFF	OFF
4th	ON	OFF
Reverse	OFF	OFF
Neutral	OFF	OFF
Park	OFF	OFF

Solenoid Operation during Gearshifts

Shift	To Initiate Shift	Typical S5 Current Ramp	To Complete Shift
1-2	S1 OFF S4 ON	750 mA to 600 mA	S4 OFF
1-3	S1 OFF S2 OFF S3 ON S4 ON	850 mA to 750 mA	S3 OFF S4 OFF
1-4	S2 OFF S3 ON S4 ON	850 mA to 750 mA	S3 OFF S4 OFF
2-3	S2 OFF S3 ON S4 ON	700 mA to 500 mA	S3 OFF S4 OFF
3-4	S1 ON S4 ON	750 mA to 600 mA	S4 OFF
4-3	S4 ON	750 mA to 900 mA	S1 OFF S4 OFF
4-2	S3 ON	750 mA to 950 mA	S1 OFF S2 ON S3 OFF
4-1	S3 ON S4 ON	600 mA to 1000 mA	S2 ON S3 OFF S4 OFF
3-2	S2 ON S4 ON	600 mA to 450 mA @ 20 kph. 550 mA to 400 mA @ 60 kph. 800 mA to 650 mA @ 100 kph.	S4 OFF
3-1	S3 ON S4 ON		S1 ON S2 ON S3 OFF
2-1	S4 ON	700 mA to 950 mA 800 mA to 950 mA	S4 OFF S1 ON S4 OFF
Conv. Clutch			
ON	S7 ON	700 mA to 400 mA	S7 OFF
OFF		600 mA to 100 mA	

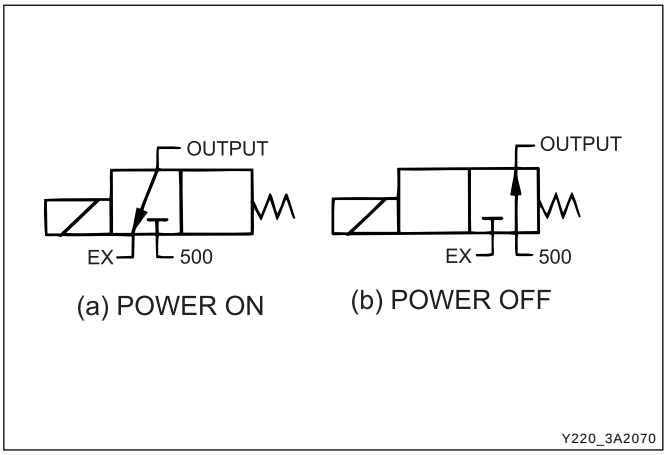
Solenoid valve symbols (ON/OFF solenoids)

The solenoid symbol shown adjacent to each solenoid on the hydraulic system schematics indicates the state of the oil flow through the solenoid valve with the power ON or OFF.

Normally open (NO) solenoid

POWER ON: Line 500 port is closed. The output port is open to exhaust at the solenoid valve.

POWER OFF: The exhaust port is closed. The output port is open to line 500.



Variable pressure solenoid multiplexing system

Friction element shifting pressures are controlled by the Variable Pressure Solenoid (VPS).

Line pressure is completely independent of shift pres-sure and is a function of throttle position, gear state and engine speed.

S5 is a proportional or variable pressure solenoid that provides the signal pressure to the clutch and band regulator valves thereby controlling shift pressures.

VPS pressure is multiplexed to the clutch regulator valve, the band regulator valve and the converter clutch regulator valve during automatic gearshifts.

A variable pressure solenoid produces a hydraulic pressure inversely proportional to the current applied. During a gearshift the TCM applies a progressively increasing or decreasing (ramped) current to the solenoid. Current applied will vary between a minimum oaf 200 mA and a maximum of 1000 mA. Increasing current decreases output (S5) pressure. Decreasing current increases output (S5) pressure.

Line 500 pressure, (approximately 440 to 560 kPa), is the reference pressure for the VPS, and the VPS output pressure is always below line 500 pressure.

When the VPS is at standby, that is no gearshift is taking place, the VPS current is set to 200 mA giving maximum output pressure.

Under steady state conditions the band and clutch regulator valve solenoids are switched OFF.

This applies full Line 500 pressure to the plunger and because Line 500 pressure is always greater than S5 pressure it squeezes the S5 oil out between the regulator valve and the plunger. The friction elements are then fed oil pressure equal to Line 500 multiplied by the amplification ratio.

When a shift is initiated the required ON/OFF solenoid is switched ON cutting the supply of Line 500 to the plunger.

At the same time the VPS pressure is reduced to the ramp start value and assumes control of the regulator valve by pushing the plunger away from the valve. The VPS then carries out the required pressure ramp and the timed shift is completed by switching OFF the ON/ OFF solenoid and returning the VPS to the standby pressure.

This system enables either the band or clutch or both to be electrically controlled for each gearshift.

Mode indicator light

Depending on the application, the mode indicator light may be used to indicate the mode that has been se-lected or if an overheat condition exists. The mode indicator light is usually located on the instrument cluster.

Communication systems

CAN

The Controller Area Network (CAN) connects various control modules by using a twisted pair of wires, to share common information. This results in a reduction of sensors and wiring. TCM obtains the actual engine speed and throttle position, vehicle speed and accelerator position etc. from ECM via CAN without any additional sensors.

K-Line

The K-line is typically used for obtaining diagnostic information from the TCM. A scan tool with a special interface is connected to the TCM via Data Link Connector (DLC) and all current faults, stored faults, runtime parameters are then available. The stored trouble codes can also be cleared by scan tool.

The K-line can be used for vehicle coding at the manufacturer's plant or in the workshop. This allows for one TCM design to be used over different vehicle mod-els.

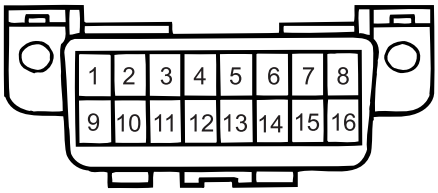
The particular code is sent to the microprocessor via the K-line and this results in the software selecting the correct shift and VPS ramp parameters.

Data Link Connector (DLC)

The Data Link Connector (DLC) is a multiple cavity connector. The DLC provides the means to access the serial data from the TCM.

The DLC allows the technician to use a scan tool to monitor the various systems and display the Diagnostic Trouble Codes (DTCs).

The DLC connector is located within the driver's compartment, directly below the instrument panel on the driver's side.



DATA LINK
CONNECTOR
(DLC)

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HYDRAULIC CONTROL SYSTEM

The hydraulic controls are located in the valve body, pump body and main case.

The valve body contains the following;

- Manual valve
- Three shift valves
- Sequence valve
- Solenoid supply pressure regulator valve
- Line pressure control valve
- Clutch apply feed regulator valve
- Band apply feed regulator valve
- Solenoid S1 to S6
- Reverse lockout valve

The pump cover contains the following;

- Primary regulator valve for line pressure
- Converter clutch regulator valve
- Converter clutch control valve
- Solenoid S7

The main case contains the following;

- B1R exhaust valve

All upshifts are accomplished by simultaneously switching on a shift valve(s), switching VPS pressure to the band and/or clutch regulator valve, and then sending the VPS a ramped current. The shift is completed by switching the regulators OFF and at the same time causing the VPS to reach maximum pressure.

All downshifts are accomplished by switching VPS pressure to the band and/or clutch regulator valve and sending a ramped current to the VPS. The shift is completed by simultaneously switching the regulators OFF, switching the shift valves and at the same time causing the VPS to return to stand-by pressure.

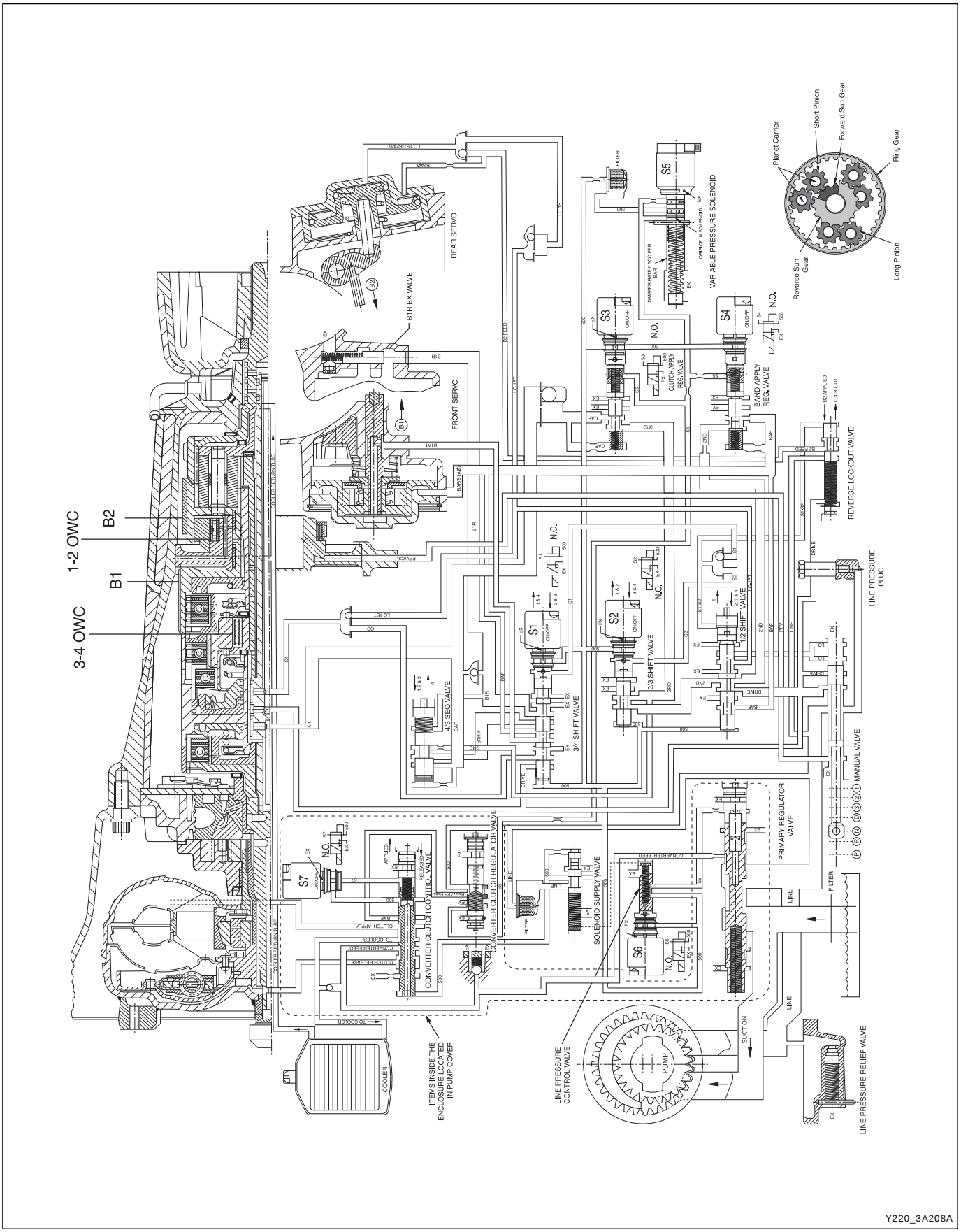
The primary regulator valve is located in the pump cover and supplies four line pressures; high and low for forward gears, and high and low for reverse. This pressure has no effect on shift quality and merely provides static clutch capacity during steady state operation. Low pressure can be obtained by activating an ON/OFF solenoid with high line pressure being the default mode.

Torque converter lock-up is initiated by toggling the converter clutch control valve with an ON/OFF solenoid.

The actual apply and release of the clutch is regulated by the VPS via the converter clutch regulator valve.

The solenoid supply pressure regulator valve provides reference pressure for all the solenoids.

HYDRAULIC CONTROL CIRCUIT



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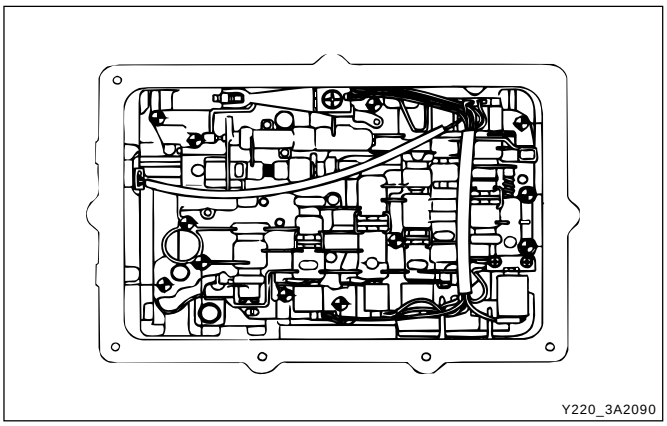
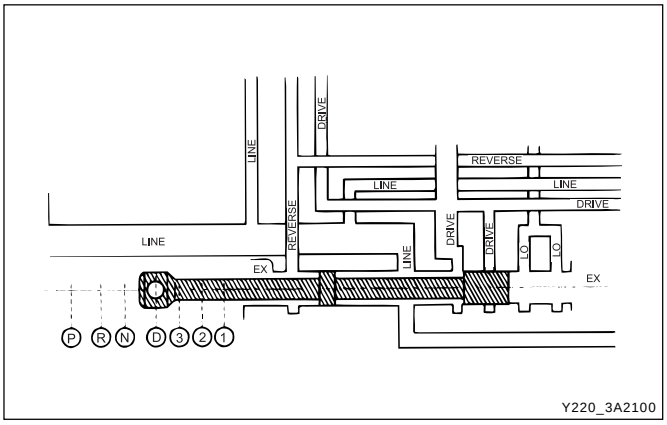
▶ Valve Body



Manual valve

The manual valve is connected to the vehicle selector mechanism and controls the flow of oil to the forward and reverse circuits. The manual valve function is identical in all forward gear positions except that in the Manual 1 position an additional supply of oil is directed to the 1-2 shift valve for application of the rear band and the C4 overrun clutch. The manual valve directs the line pressure into the PRND fluid circuits.



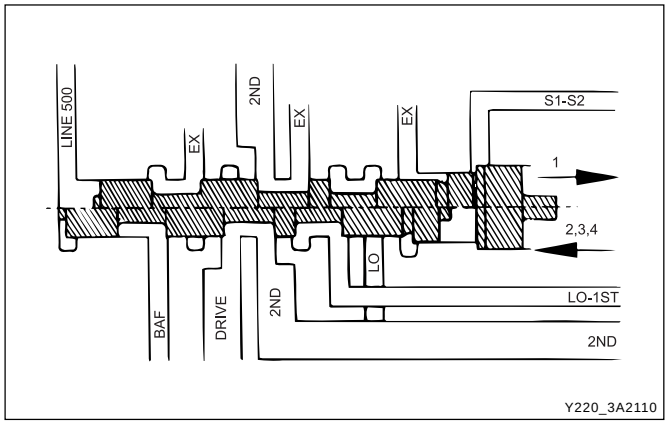
1-2 shift valve

The 1-2 shift valve is a two position valve that must be switched to the 2, 3 and 4 position in order to get any forward gear other than first gear. It is used for all 1-2 and 2-1 gearshifts.

The switching of this valve is achieved by using S1 and/ or S2.

During a 1-2 gearshift drive oil from the manual valve passes through to the second gear circuit. During a 2-1 gearshift the band apply feed oil is allowed to exhaust via the 1-2 shift valve.

The 1-2 shift valve works in conjunction with the 3-4 shift valve to disengage the C4 clutch in first gear, and engage C4 in second gear. When Manual 1 is selected the C4 clutch and rear band (B2) are engaged.



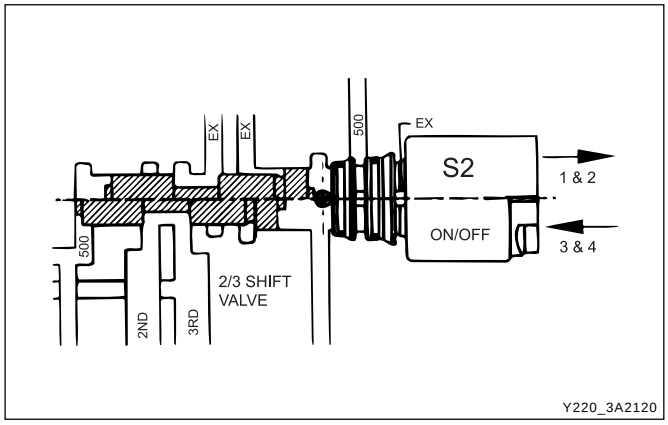
2-3 shift valve

The 2-3 shift valve is a two position valve. It is used on all 2-3 and 3-2 gearshifts.

The switching of this valve is achieved by S2 which is located at the end of the valve spool.

In the 1, 2 position, second gear oil from the 1-2 shift valve is prevented from entering the third gear circuit.

When the valve is moved to the 3, 4 position, oil from the second gear circuit is routed to the third gear circuit and the transmission is changed to third gear.



3-4 shift valve

The 3-4 shift valve is a two position valve. It is used for all 3-4 and 4-3 gearshifts.

The switching of this valve is achieved by S1 which is located at the end of the valve spool.

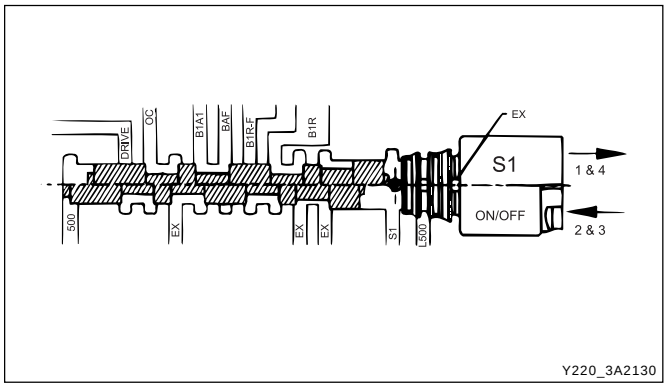
During a 3-4 gearshift the 3-4 shift valve:

- Exhausts the front band release (B1R) circuit thereby allowing the application of the front band (B1).
- Connects the inner apply area of the front servo (B1AI) to the Band Apply Feed (BAF) circuit thus allowing greater apply forces to the front band.
- Exhausts the Overrun Clutch (OC) circuit which allows the C4 clutch to disengage.

During a 4-3 gearshift, the C4 clutch is engaged and the front band (B1) is released. These actions are se-quenced by the 4-3 sequence valve.

The 3-4 shift valve also switches during 1-2 and 2-1 gearshifts where its function is to apply the overrun clutch (C4) in second gear but to release it in first gear.

Note that the C4 clutch is applied in Manual 1 by virtue of the manual valve and the 1-2 shift valve. Refer to “1-2 Shift Valve” in this section.



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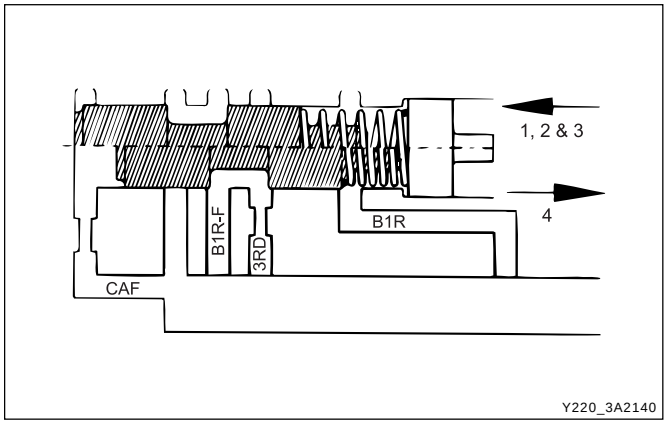
4-3 sequence valve

The 4-3 sequence valve is a two position spring loaded valve. It switches during 3-4 and 4-3 gearshifts although it performs no function during the 3-4 shift.

During the 4-3 shift the 4-3 sequence valve delays the connection of the Clutch Apply Feed (CAF) circuit to the B1R circuit until the B1R circuit has been fully pressurized by using the third gear circuit. This prevents objectionable engine flare on completion of the 4-3 gearshift.



Y220_3A2140

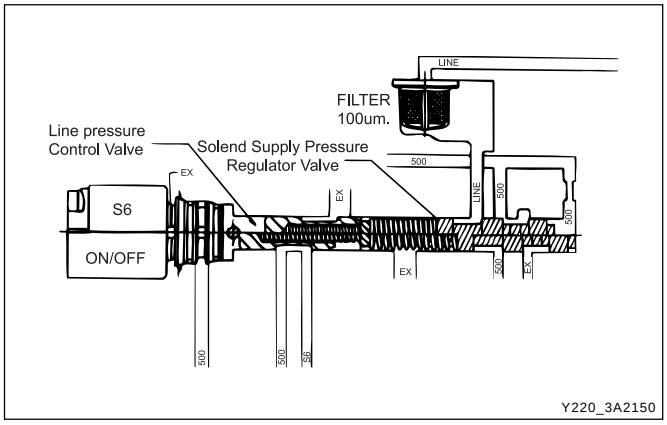
Solenoid supply pressure regulator valve

The solenoid supply pressure regulator valve supplies a constant pressure to all solenoids (S1 to S7). Line pressure is used as the feeding oil to this regulator and the output is termed line 500.

Line pressure control valve

Line pressure is controlled by S6, which acts as the line pressure control valve. When S6 pressure is applied to the end of the Primary Regulator Valve (PRV), it is opposed by spring force and causes LOW line pressure for light throttle application and cruising.

Heavy throttle application causes the normally open S6 to open (switch Off) thus closing line 500 and opening S6 to exhaust. Removal of S6 pressure from the PRV results in HIGH line pressure.

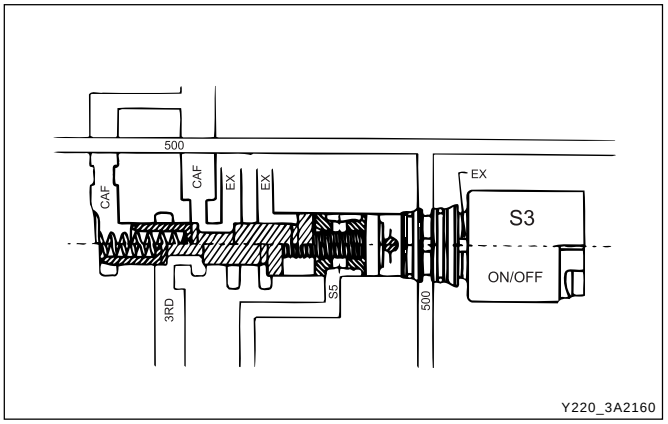


Y220_3A2150

Clutch apply feed regulator valve

The clutch apply feed regulator valve is a fixed ratio (2.25: 1) valve. This valve provides a regulated pressure to the C1 clutch and controls the change rate of the clutch state to give the desired shift quality.

Third gear oil supplied to the valve is regulated to pro-vide an output pressure, Clutch Apply Feed (CAF) pres-sure, of 2.25 times the S5 signal pressure when S3 is ON. When S3 is OFF, the output pressure is 2.25 times the line 500 pressure.



Y220_3A2160

Band apply feed regulator valve

The band apply feed regulator valve is a fixed ratio (1.4:1) valve. It provides a regulated pressure to the front servo, and controls the change rate of the front band (B1) state to give the desired shift quality.

Second gear oil supplied to the valve is regulated to provide an output pressure, Band Apply Feed (BAF) pressure, of 1.4 times the S5 signal pressure when S4 is ON. When S4 is OFF the output pressure is 1.4 times the line 500 pressure.

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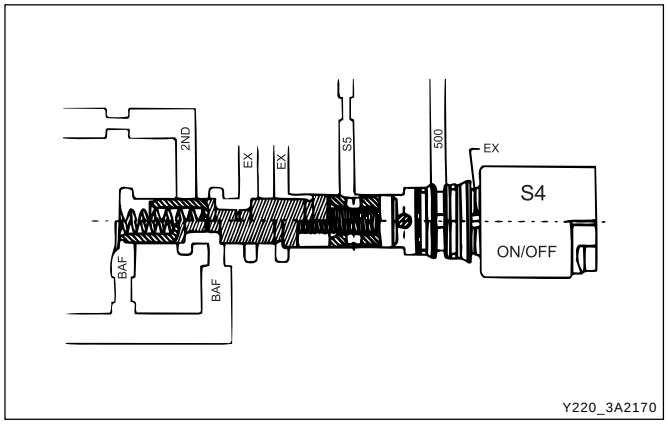
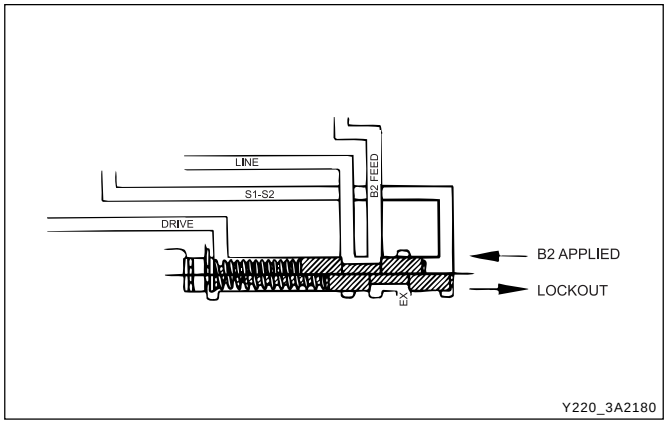


Reverse lockout valve

The reverse lockout valve is a two position valve con-tained in the upper valve body. This valve uses S1-S2 pressure as a signal pressure and controls the applica-tion of the rear band (B2).

While the manual valve is in D, 3, 2 or 1 positions, drive oil is applied to the spring end of the valve, overriding any signal pressures and holding the valve in the lockout position. This prevents the application of B2 in any of the forward driving gears except M1.



When the manual valve is in P, R or N positions, drive oil is exhausted and the reverse lockout valve may be toggled by S1-S2 pressure.

B2 is applied in P, R, and N if the following conditions are satisfied;

- In P or N, vehicle speed = 3 km/h.
- In R, vehicle speed = 10 km/h.
- Engine speed = 1600 rpm.
- Throttle position = 12 %.

Under these conditions, the TCM switches solenoids S1 and S2 to OFF. The reverse lockout valve toggles under the influence of the S1-S2 pressure, to connect the line pressure to the B2 feed. Oil is fed to both the inner and outer apply areas of the rear servo piston, applying B2.

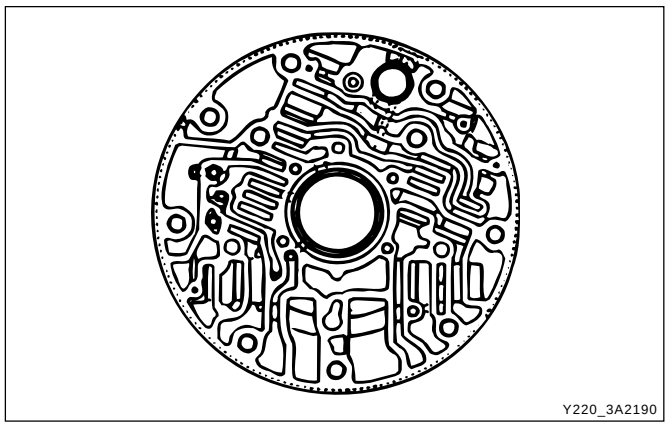
If any of the above conditions are not satisfied, the TCM switches solenoids S1 and S2 to ON.

S1- S2 pressure is exhausted and the valve is held in the lockout position by the spring. In this position, engagement of B2 is prohibited.

This feature protects the transmission from abuse by preventing the undesirable application of B2 at high speed, and by providing a reverse lockout function.

Note that if the transmission is in failure mode, the rear band will be applied at all times in P, R and N.

Pump cover



Primary regulator valve

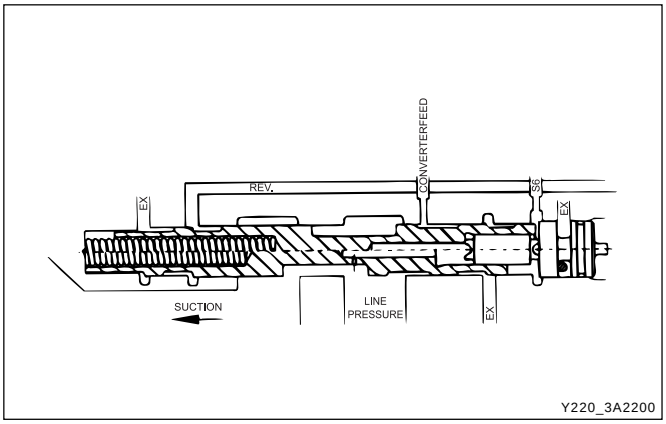
The Primary Regulator Valve (PRV) regulates the trans-mission line pressure (or pump output pressure). This valve gives either high or low line pressure depending on whether S6 is switched OFF or ON. When S6 is switched ON, S6 pressure is applied to the PRV moving it against spring pressure and opening the line pressure circuit to the pump suction port resulting in reduced line pressure.

Low line pressure is used during light throttle applica-tions and cruising. Heavy throttle will cause S6 to switch OFF and thereby cause high line pressure.

This stepped line pressure control has no detrimental effect on shift feel because all shifting pressures are controlled by separate band and clutch regulator valves, and the output of S5.

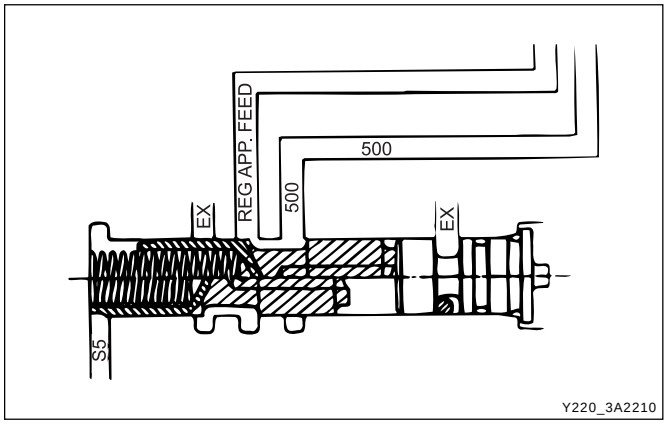
When reverse gear is selected, both the low and high line pressure values are boosted to guard against slip-page. This is achieved by applying reverse oil line pressure to the PRV to assist the spring load. The other end of the valve contains ports for line pressure feedback and S6 pressure.

The PRV also regulates the supply of oil to the converter via the converter feed port. The cascade effect of the PRV ensures the first priority of the valve is to maintain line pressure at very low engine speeds. When the engine speed increases and the pump supplies an excess of oil the PRV moves to uncover the converter feed port thereby pressurizing the converter. If there is an excess of oil for the transmission's needs then the PRV moves further to allow oil to return to the suction port.



Converter clutch regulator valve

The converter clutch regulator valve regulates the pressure of the oil which applies the converter clutch. Input oil from the line 500 circuit is regulated within the valve, with the output pressure being variable according to the signal pressure from the S5 circuit. Converter clutch apply and release application is smoothed by electronically varying the S5 circuit pressure.



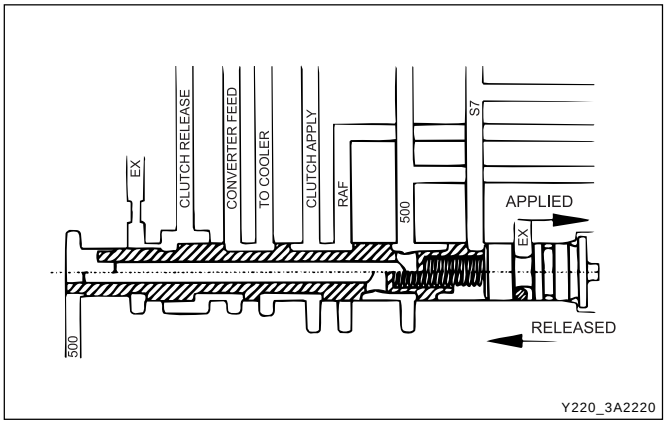
Converter clutch control valve

The converter clutch control valve is a two position valve which applies or releases the converter clutch.

The switching of this valve is governed by the signal pressure from S7.

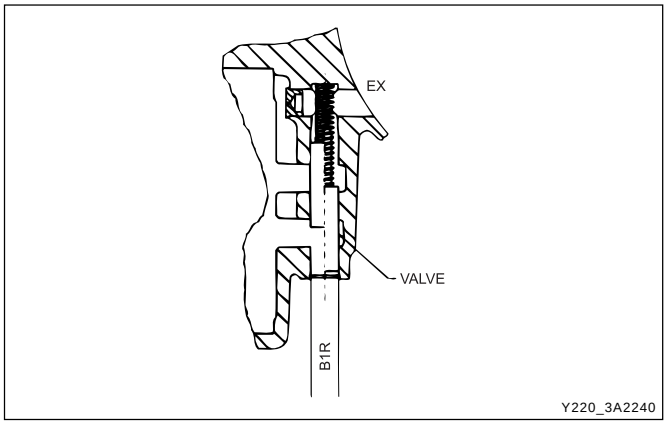
When the valve is in the OFF or released position, converter feed oil from the PRV is directed to the release side of the converter clutch. After flowing through the converter, oil returns to the converter clutch control valve and is then directed to the oil cooler.

When the valve is in the ON or applied position, regu-lated oil from the converter clutch regulator valve is directed to the apply side of the converter clutch. This oil remains within the converter because the converter clutch piston is sealed against the flat friction surface of the converter cover. To provide oil flow to the cooler the converter clutch control valve directs converter feed oil from the PRV directly to the cooler circuit.



B1R exhaust valve

The B1R exhaust valve is a two position spring loaded valve located in the transmission case directly adjacent to the front servo. It permits the servo release oil to be rapidly exhausted into the transmission case during application of the front band (B1). This prevents the need to force the oil back from the front servo through the valve body and through the 3-4 shift valve. The spring positions the valve to prevent oil entering the release area of the servo until the B1R circuit oil pressure reaches approximately 100 kPa.



POWER TRAIN SYSTEM

The Power Train System consists of;

- A torque converter with single face lock-up clutch
- Four multi-plate clutch assemblies
- Two brake bands
- Two one-way clutches
- Planetary gear set
- Parking mechanism

A conventional six pinion Ravigneaux compound planetary gear set is used with overdrive (fourth gear) being obtained by driving the carrier.

The cross-sectional arrangement is very modular in nature.

Four main sub-assemblies are installed within the case to complete the build. These subassemblies are;

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- Gear set-sprag-centre support
- C1 -C2 -C3 -C4 clutch sub-assembly
- Pump assembly
- Valve body assembly

One, or a combination of selective washers are used between the input shaft flange and the number 4 bearing to control the transmission end float. This arrangement allows for extensive subassembly testing and simplistic final assembly during production.

A general description of the operation of the Power Train System is detailed below.

First gear is engaged by applying the C2 clutch and locking the 1-2 One Way Clutch (1-2 OWC). The 1-2 shift is accomplished by applying the B1 band and overrunning the 1-2 OWC. The 2-3 shift is accomplished by applying the C1 clutch and releasing the B1 band. The 3-4 shift is accomplished by re-applying the B1 band and overrunning the 3-4 OWC. Reverse gear is engaged by applying the C3 clutch and the B2 band.

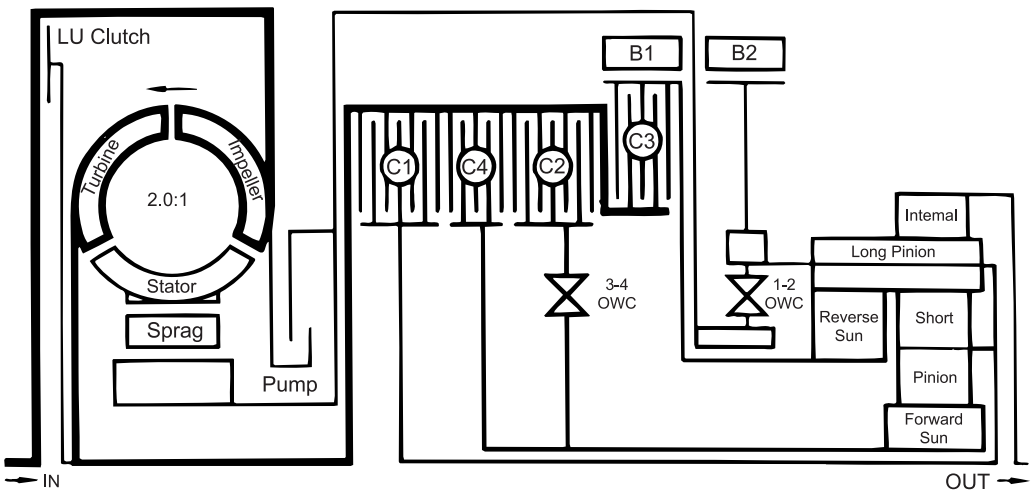
The C4 clutch is applied in the Manual 1, 2 and 3 ranges to provide engine braking. In addition, the C4 clutch is also applied in the Drive range for second and third gears to eliminate objectionable freewheel coasting.

The B2 band is also applied in the Manual 1 range to accomplish the low-overrun shift.

Both the front and rear servos are dual area designs to allow accurate friction element matching without the need for secondary regulator valves. All the friction elements have been designed to provide low shift energies and high static capacities when used with the new low static coefficient transmission fluids. Non-asbestos friction materials are used throughout.

		ELEMENTS ENGAGED								
Gear	**Gear Ratio**	**C1**	**C2**	**C3**	**C4**	**B1**	**B2**	**1-2 OWC**	**3-4 OWC**	**LU CLUTCH**
First	2.741		X					X	X	
Second	1.508		X			X			X	
Third	1.000	X	X		X	X			X	X *
Fourth	0.708	X	X		X				X	X
Reverse	2.428			X			X			
Manual 1	2.741		X		X		X		X	

* For Certain Vehicle Applications, Refer to the Owner's Manual.

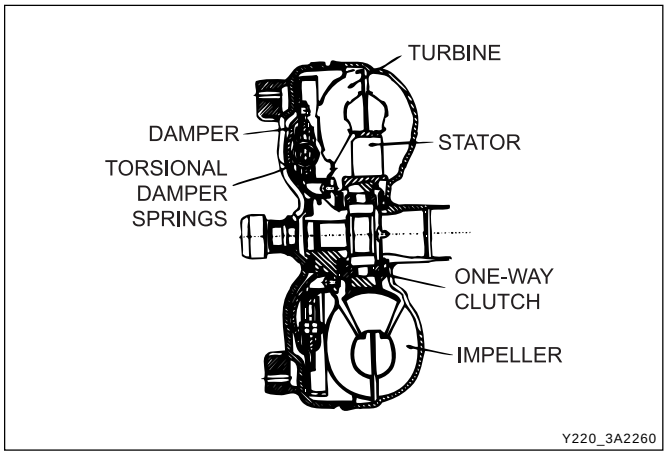


Torque converter

The torque converter consists of a turbine, stator pump, impeller and a lock-up damper and piston assembly. As in conventional torque converters, the impeller is attached to the converter cover, the turbine is splined to the input shaft and the stator is mounted on the pump housing via a one way clutch (sprag).

The addition of the damper and piston assembly en-ables the torque converter to lock-up under favorable conditions. Lock-up is only permitted to occur in third and fourth gears under specified throttle and vehicle speed conditions.

Lock-up is achieved by applying hydraulic pressure to the damper and piston assembly which couples the turbine to the converter cover, locking-up the converter and eliminating unwanted slippage. Whenever lock-up occurs, improved fuel consumption is achieved. Torsional damper springs are provided in the damper and piston assembly to absorb any engine torque fluctuations during lock-up.



Clutch packs

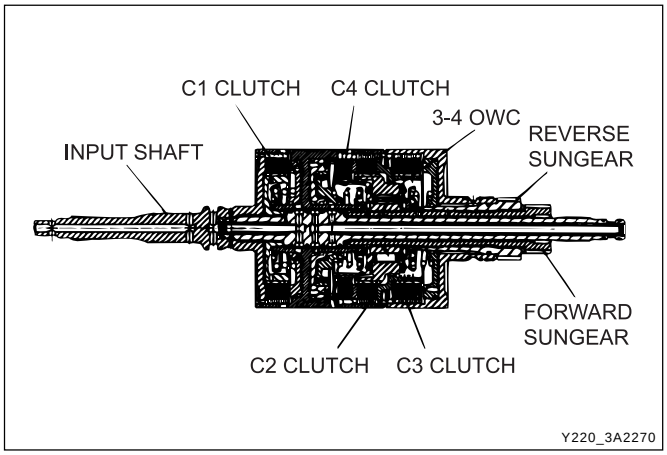
There are four clutch packs. All clutch packs are composed of multiple steel and friction plates.

C1 CLUTCH: When applied, this clutch pack allows the input shaft to drive the planet carrier. This occurs in third and fourth gears.

C2 CLUTCH: When applied this clutch pack allows the input shaft to drive the forward sun gear via the 3-4 OWC. This occurs in all forward gears.

C3 CLUTCH: When applied this clutch pack allows the input shaft to drive the reverse sun gear. This only occurs in reverse gear.

C4 CLUTCH: When applied this clutch provides engine braking on overrun. This occurs in Manual 1, 2 and 3 and also Drive 2 and Drive 3 to prevent objectionable free wheel coasting.



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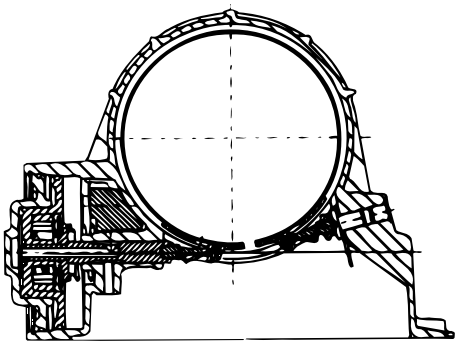
Bands

The transmission utilizes two bands, the B1 band (sometimes known as the 2-4 band), and the B2 band (sometimes known as the low-reverse band).

The B1 band is a flexible band which is engaged by the front servo piston. B1 is activated in second and fourth gear. When activated B1 prevents the reverse sun gear from rotating by holding the C3 clutch assembly stationary. In second gear only the outer area of the apply piston is utilized. In fourth gear both areas are utilized for greater clamping force.



FRONT SERVO AND BAND

Y220_3A2280

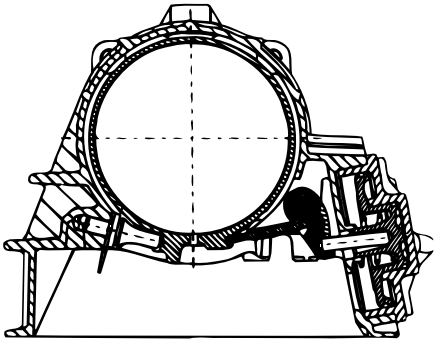
One way clutches

The transmission uses two OWCs, the 1-2 OWC and the 3-4 OWC. (Note that a third OWC is located in the torque converter, also known as a sprag.)

The 1-2 OWC is located between the planetary carrier assembly and the center support. This allows the carrier to rotate around the center support in one direction only. The one way clutch is engaged only in Drive 1.

This 3-4 OWC is located between the C4 and the C2 clutch assemblies. This allows the C2 clutch to drive the forward sun gear in first, second and third gears but unlocks in fourth gear and during overrun.

The B2 band is a solid band which is engaged by the rear servo piston. B2 is activated in Park, Reverse, Neutral and Manual 1. When activated B2 prevents the planet carrier assembly from rotating. In Manual 1 only the inner area of the apply piston is utilized. In Park, Reverse and Neutral, both areas are utilized for greater clamping force.



REAR SERVO AND BAND

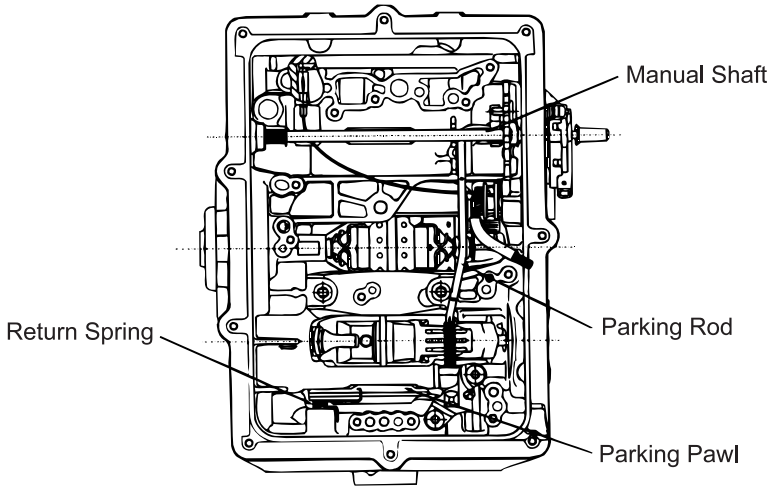
Y220_3A2290

Planetary gear set

The planetary gear set used in the transmission is a conventional six pinion Ravigneaux compound gear set.

Parking mechanism

When Park is selected the manual lever extends the park rod rearwards to engage the parking pawl. The pawl will engage the external teeth on the ring gear thus locking the output shaft to the transmission case. When Park is not selected a return spring holds the parking pawl clear of the output shaft, preventing accidental engagement of Park.



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POWER FLOWS

The power flows for the various transmission selections are listed below;

- Power Flow - Neutral and Park
- Power Flow - Reverse
- Power Flow - Manual 1
- Power Flow - Drive 1
- Power Flow - Drive 2
- Power Flow - Drive 3
- Power Flow - Drive 3 Lock Up
- Power Flow - Drive 4 (Overdrive)
- Power Flow - Drive 4 Lock Up

The following table details the engaged elements versus the gear selected for all transmission selections.

	ELEMENTS ENGAGED								
Gear State	**C1**	**C2**	**C3**	**C4**	**B1**	**B2**	**1-2 OWC**	**3-4 OWC**	**LU CLUTCH**
Park and Neutral	-	-	-	-	-	X	-	-	-
Reverse	-	-	X	-	-	X	-	-	-
Manual 1	-	X	-	X	-	X	-	X	-
Drive 1	-	X	-	-	-	-	X	X	-
Drive 2 and Manual 2	-	X	-	X	X	-	-	X	-
Drive 3 and Manual 3	X	X	-	X	-	-	-	X	-
Drive 3 Lock Up and Manual 3 Lock Up	X	X	-	X	-	-	-	X	X
Drive 4 Overdrive	X	X	-	-	X	-	-	X	-
Drive 4 Lock Up	X	X	-	-	X	-	-	X	X

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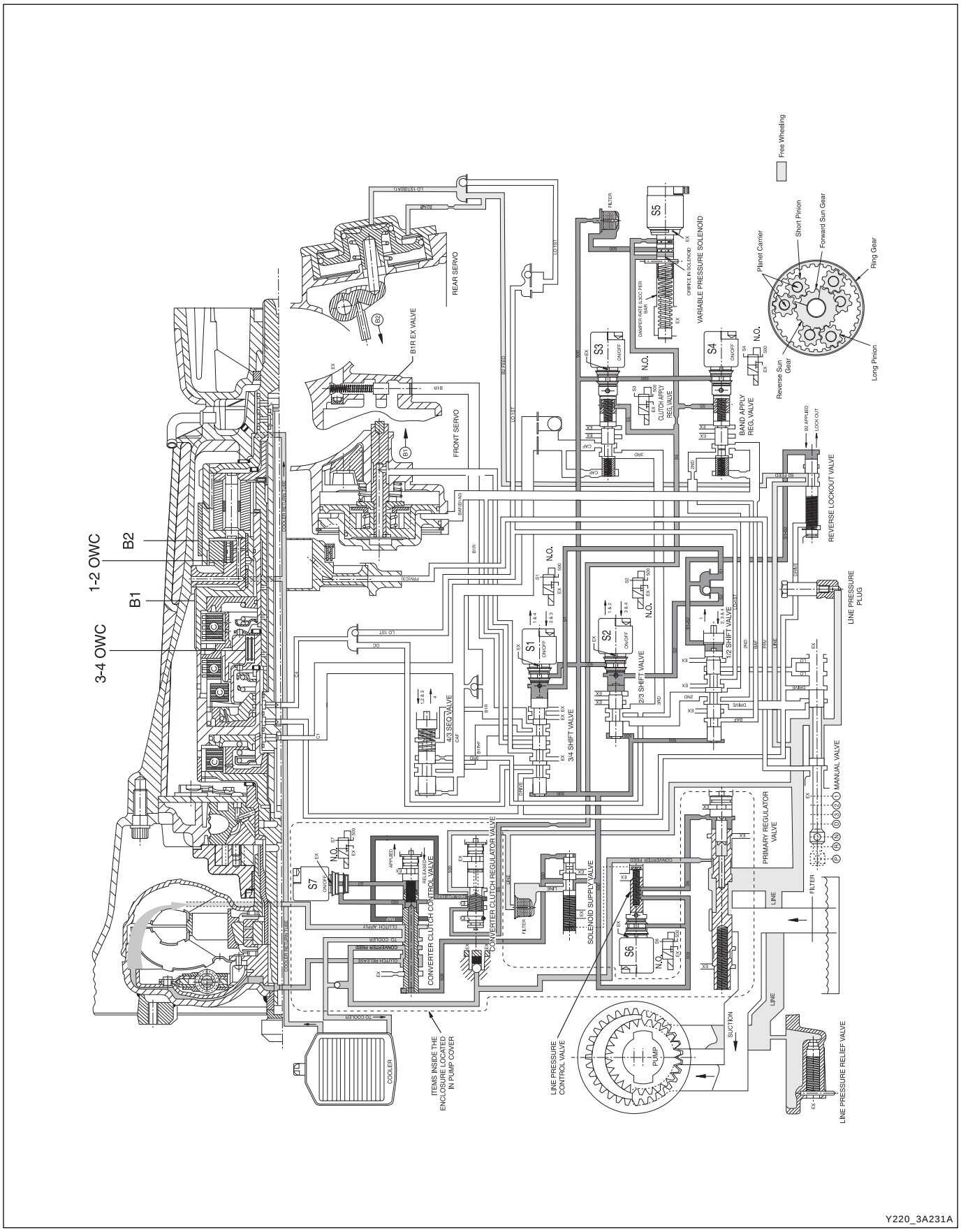
PARK AND NEUTRAL



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Power flow - Park and neutral

In Park and Neutral, there is no drive to the planetary gear set. The rear band is applied to eliminate 'clunk' on engagement of the reverse gear, and to improve the low range engagement for 4WD applications. No other clutches or bands are applied.

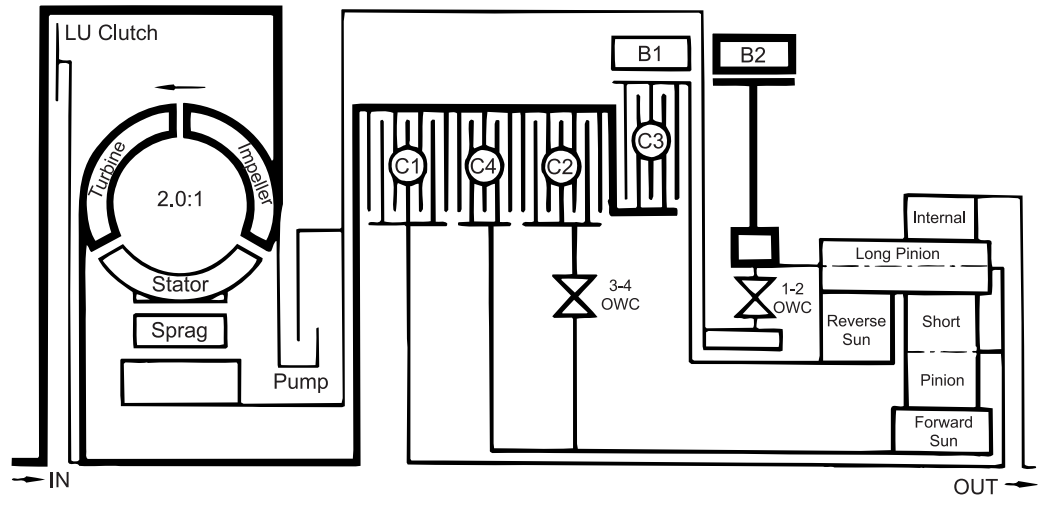
In Park the transmission is mechanically locked by engaging a case mounted pawl with teeth on the output shaft ring gear.

Control

To maintain this arrangement in the steady state solenoids and valves are activated as follows:

- Solenoids S1 and S2 are switched OFF.
- Line (pump) pressure is applied to the Primary Regulator Valve (PRV) and to the solenoid supply pressure regulator valve.
- The converter, oil cooler, and lubrication circuits are charged from the primary regulator valve.
- The line 500 circuit is charged by the solenoid supply pressure regulator valve.
- The S5 circuit is charged by the variable pressure solenoid (S5).
- Line pressure is prevented from entering the drive circuit by the manual valve.
- The B1 circuit and all clutch circuits are open to exhaust.

	ELEMENTS ENGAGED								
Gear State	**C1**	**C2**	**C3**	**C4**	**B1**	**B2**	**1-2 OWC**	**3-4 OWC**	**LU CLUTCH**
Park and Neutral	-	-	-	-	-	X	-	-	-



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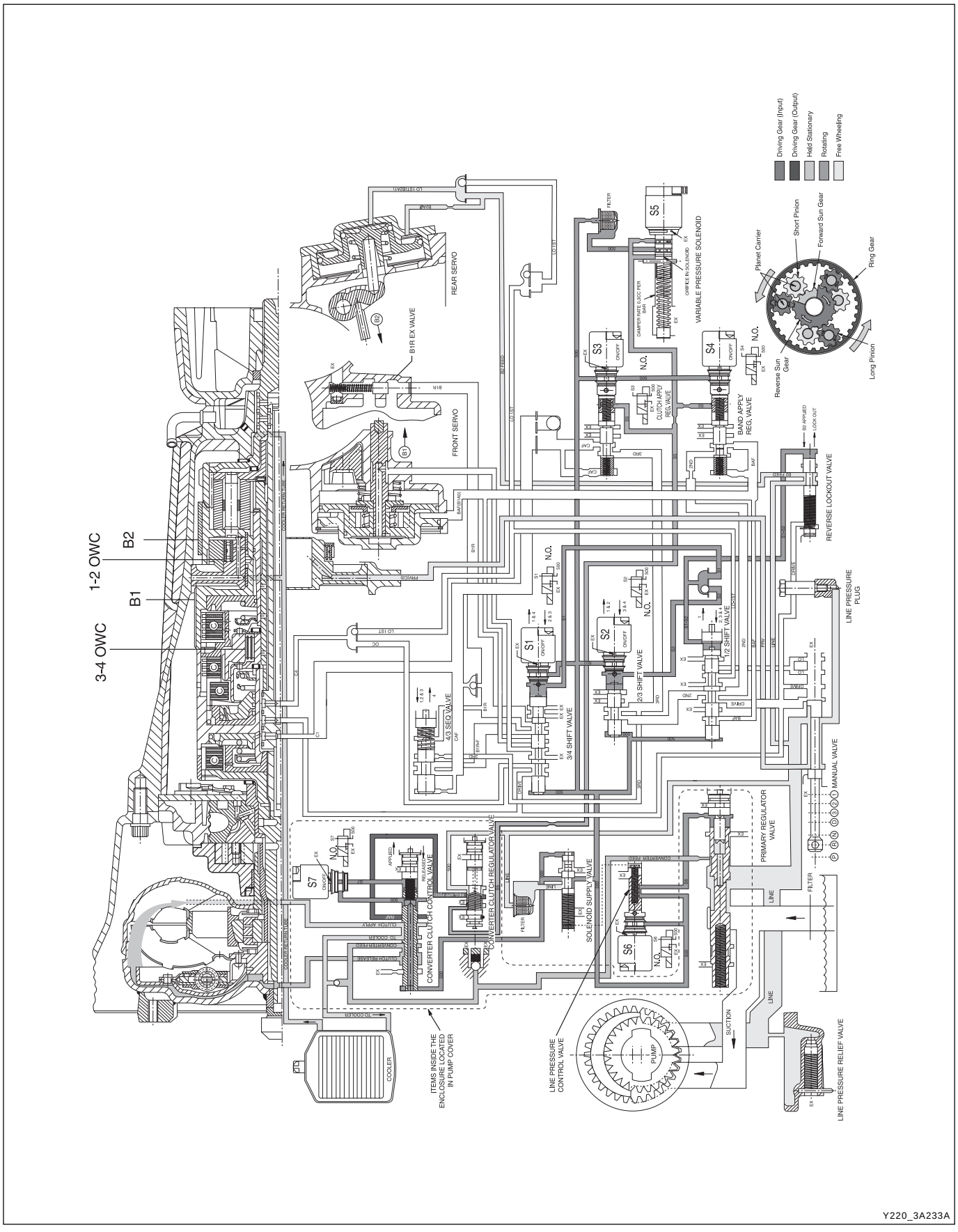
REVERSE


Driving Gear (Input)
Driving Gear (Output)
Hold Stationary
Rotating
Free Wheeling
Planet Carrier
Short Pinion
Forward Sun Gear
Ring Gear
Reverse Sun Gear
Long Pinion
1-2 OWC
B2
B1
3-4 OWC
REAR SERVO
B1R EX VALVE
FRONT SERVO
VARIABLE PRESSURE SOLENOID
CLUTCH APPLY REG. VALVE
BAND APPLY REG. VALVE
REVERSE LOCKOUT VALVE
LINE PRESSURE PLUG
1/2 SHIFT VALVE
2/3 SHIFT VALVE
3/4 SHIFT VALVE
4/3 SEQ VALVE
MANUAL VALVE
PRIMARY REGULATOR VALVE
CONVERTER CLUTCH CONTROL VALVE
CONVERTER CLUTCH REGULATOR VALVE
SOLENOID SUPPLY VALVE
LINE PRESSURE CONTROL VALVE
LINE PRESSURE RELIEF VALVE
PUMP
SUCTION
LINE
FILTER
COOLER
ITEMS INSIDE THE ENCLOSURE LOCATED IN PUMP COVER
S1
S2
S3
S4
S5
S6
S7
N.O.
ON/OFF
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Power flow - Reverse

In Reverse, transmission drive is via the input shaft and the forward clutch cylinder to the hub of the C3 clutch. The elements of the transmission function as follows;

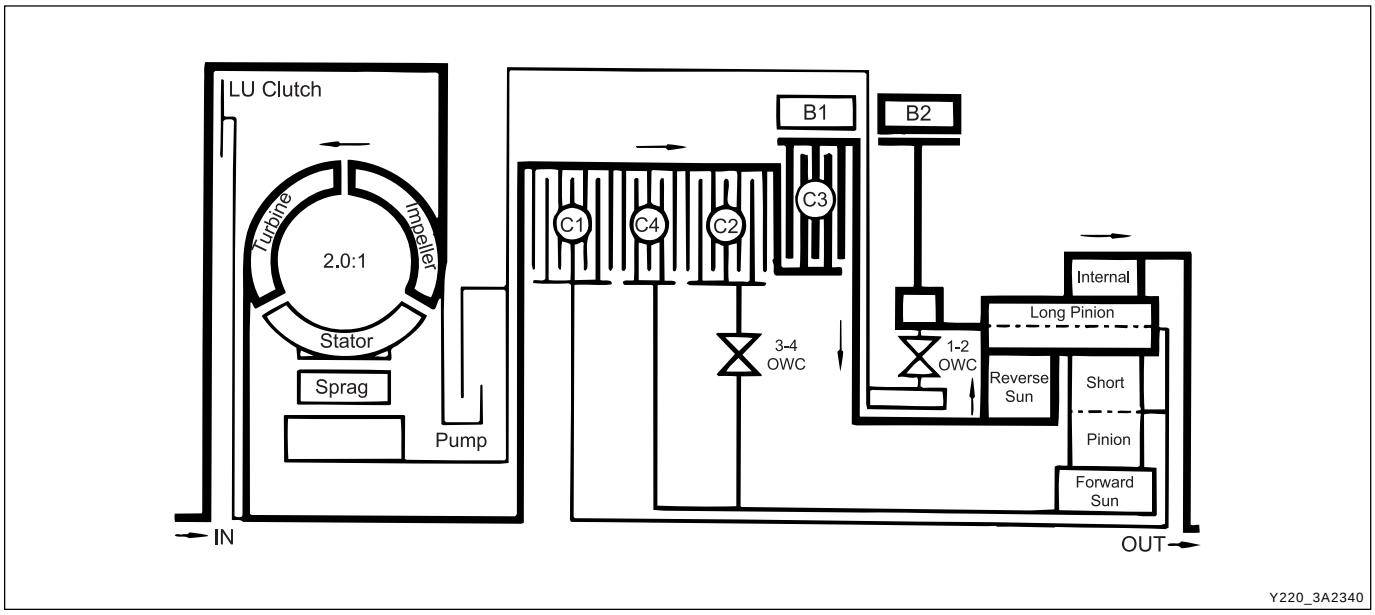
- The C3 clutch is engaged and drives the reverse sun gear in a clock-wise direction.
- The B2 band is engaged and holds the planetary gear carrier stationary causing the long pinion to rotate anti-clockwise about its axis on the pinion shaft.
- The long pinion drives the internal ring gear in the same direction.
- The internal ring being splined to the output shaft drives it in an anti-clockwise or reverse direction.

Control

To maintain this arrangement in the steady state solenoids and valves are activated as follows;

- Solenoids S1 and S2 are switched OFF.
- Line pressure is directed through the reverse lockout valve to both the inner and outer apply areas of the rear servo piston for B2 band application.
- Line pressure feeds the reverse oil circuit via the manual valve.
- Reverse oil is routed from the manual valve to the C3 clutch.
- Reverse oil is also applied to the spring end of the primary regulator valve to assist the spring and to boost the line pressure value.
- All other clutch and band apply circuits are open to exhaust.

	ELEMENTS ENGAGED								
Gear State	**C1**	**C2**	**C3**	**C4**	**B1**	**B2**	**1-2 OWC**	**3-4 OWC**	**LU CLUTCH**
Reverse	-	-	X	-	-	X	-	-	-



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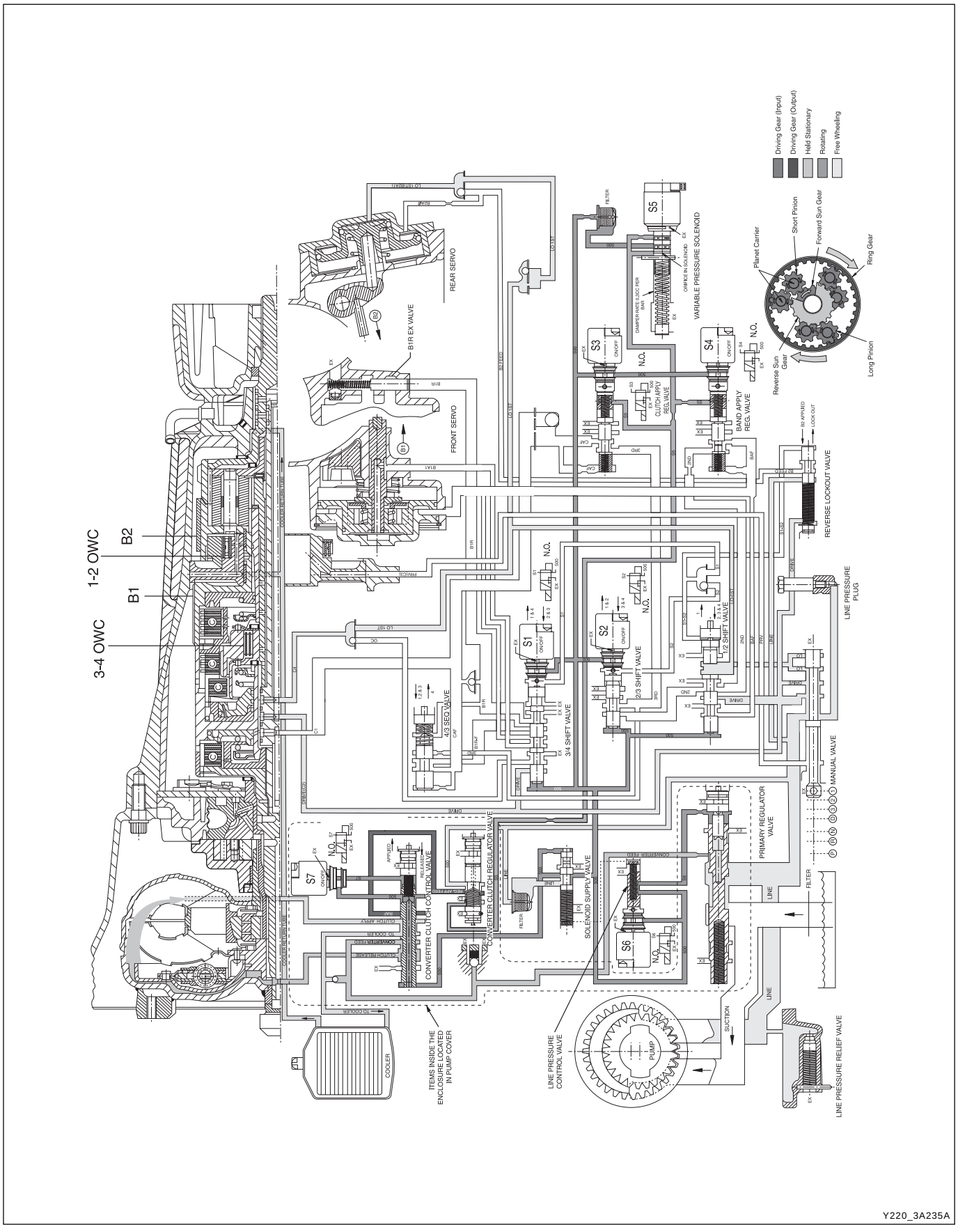
MANUAL 1



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Power flow - Manual 1

In Manual 1, transmission drive is via the input shaft to the forward clutch cylinder. The elements of the trans-mission function as follows;

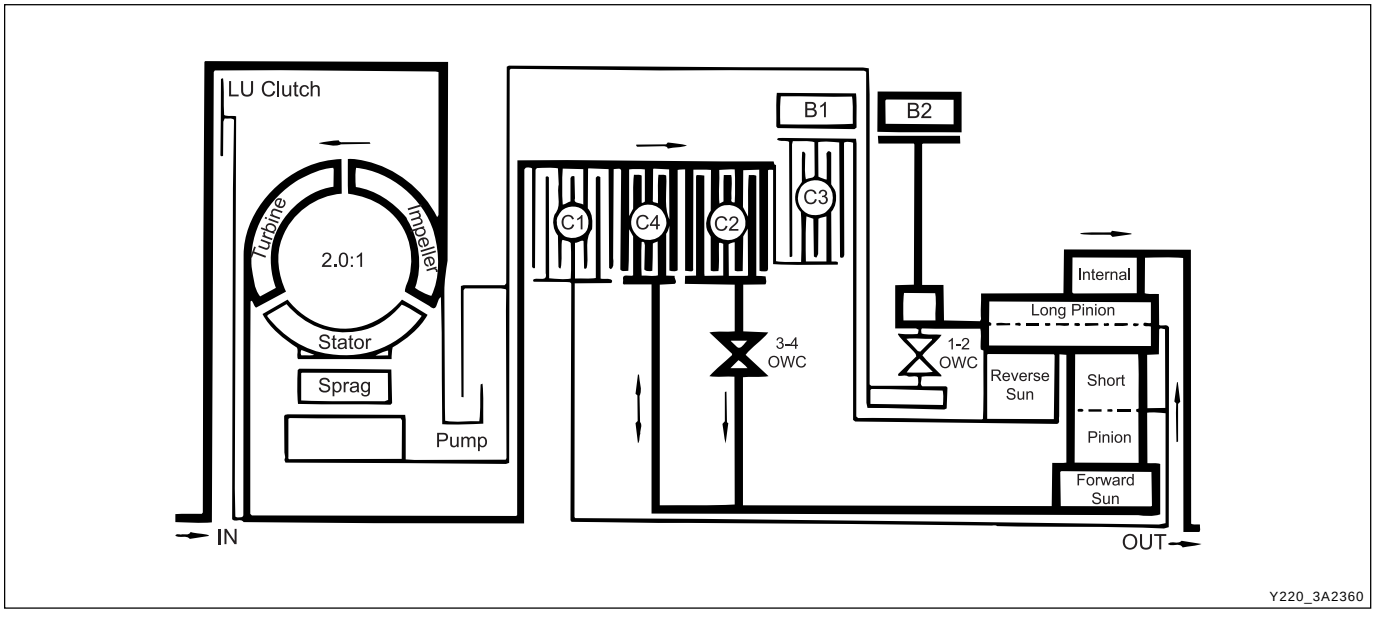
- The C2 clutch is engaged to drive the forward sun gear, via the 3-4 OWC.
- The B2 band is engaged to hold the planetary gear carrier stationary.
- The forward sun gear drives the short pinion anti-clockwise.
- The short pinion drives the long pinion clockwise.
- The long pinion rotating about its axis drives the internal ring gear and the output shaft in a clockwise or forward direction.
- The C4 clutch provides engine braking through the 3-4 OWC on overrun.

Control

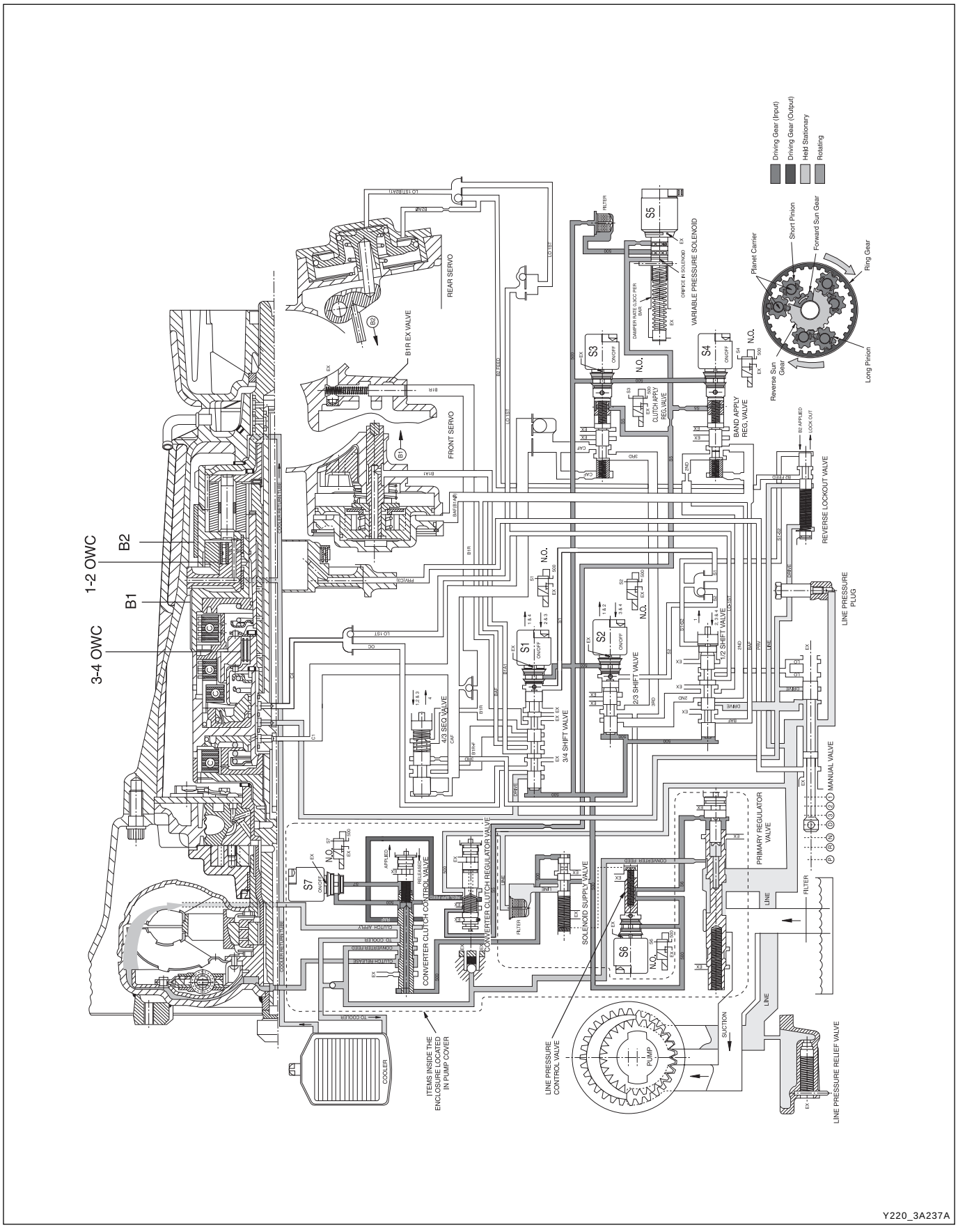
To maintain this arrangement in the steady state solenoids and valves are activated as follows;

- Solenoids S1 and S2 are switched ON.
- The 1-2, 2-3, and 3-4 shift valves are held in their first gear positions by line 500 pressure.
- Drive (line pressure) oil from the manual valve en-gages the C2 clutch.
- Lo-1st (line pressure) oil is routed through the 1-2 shift valve to the C4 clutch, and to the inner apply area of the rear servo piston for B2 band application.

	ELEMENTS ENGAGED								
Gear State		**C2**	**C3**	**C4**	**B1**	**B2**	**1-2 OWC**	**3-4 OWC**	**LU CLUTCH**
Manual 1		X	-	X	-	X	-	X	-



DRIVE 1



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Power flow - Drive 1

In Drive 1, transmission drive is via the input shaft to the forward clutch cylinder. The elements of the transmission function as follows:

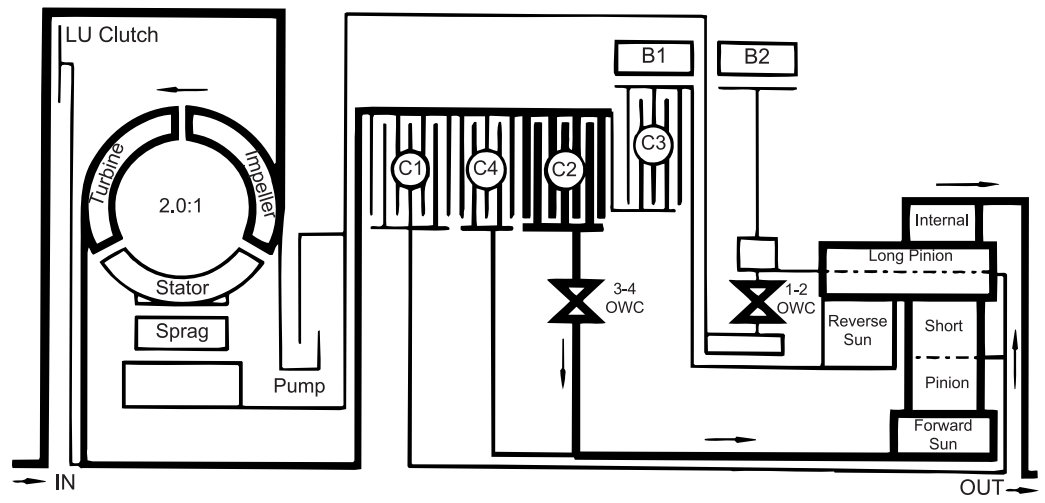
- The C2 clutch is engaged to drive the forward sun gear via the 3-4 OWC.
- The forward sun gear drives the short pinion anti-clockwise.
- The short pinion drives the long pinion clockwise.
- The 1-2 OWC prevents the planetary gear carrier from rotating under reaction force and the long pinion rotates on its axis driving the internal ring gear and output shaft in a clockwise or forward direction.
- There is no engine braking on overrun.

Control

To maintain this arrangement in the steady state solenoids and valves are activated as follows:

- Solenoids S1 and S2 are switched ON.
- The 1-2, 2-3, and 3-4 shift valves are held in their first gear positions by line 500 pressure.
- Drive (line pressure) oil from the manual valve en-gages the C2 clutch.

	ELEMENTS ENGAGED								
Gear State	**C1**	**C2**	**C3**	**C4**	**B1**	**B2**	**1-2 OWC**	**3-4 OWC**	**LU CLUTCH**
Drive 1	-	X	-	-	-	-	X	X	-



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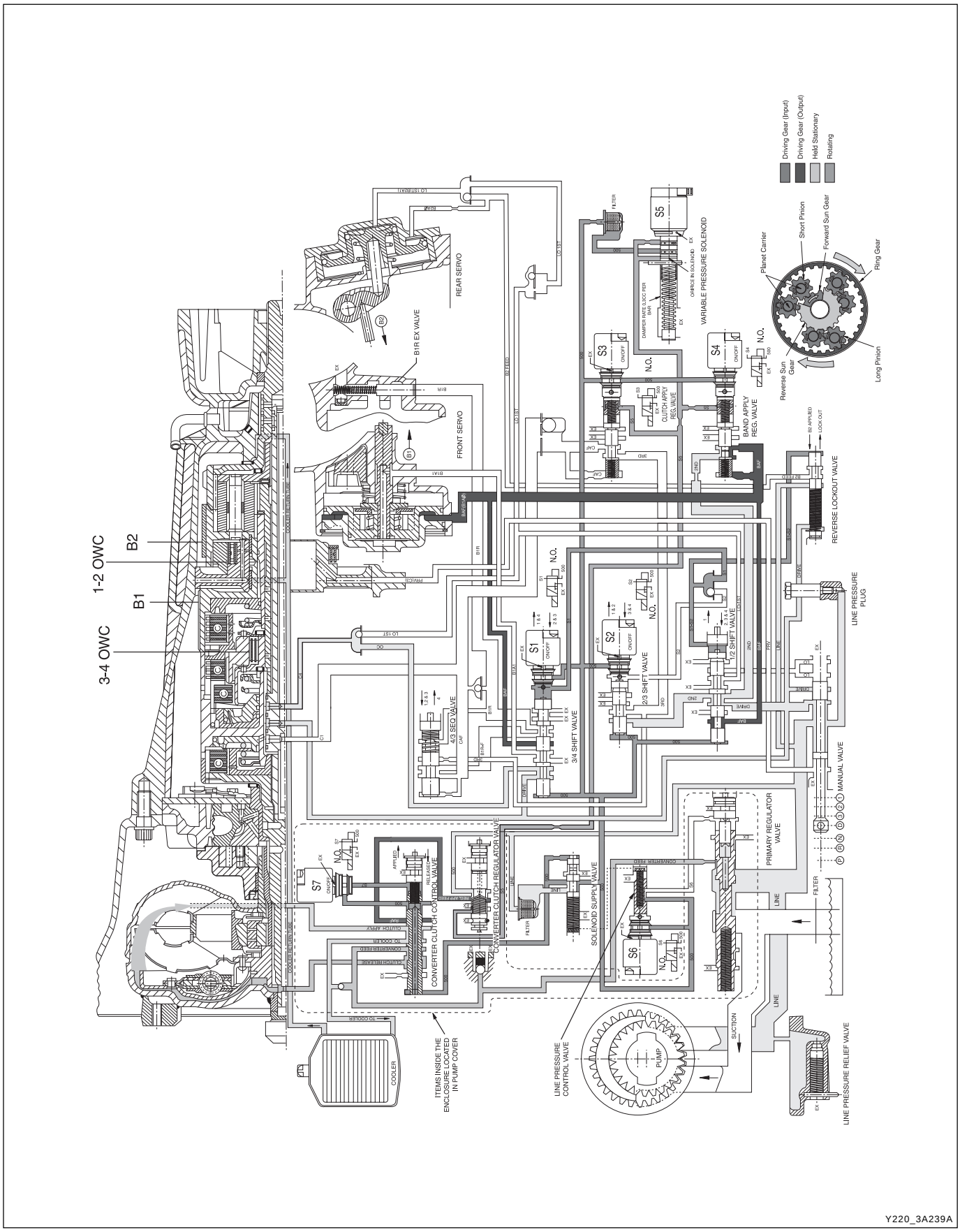
DRIVE 2 AND MANUAL 2



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Power flow - Drive 2 and manual 2

In Drive 2 and Manual 2, transmission drive is via the input shaft and forward clutch cylinder. The elements of the transmission function as follows;

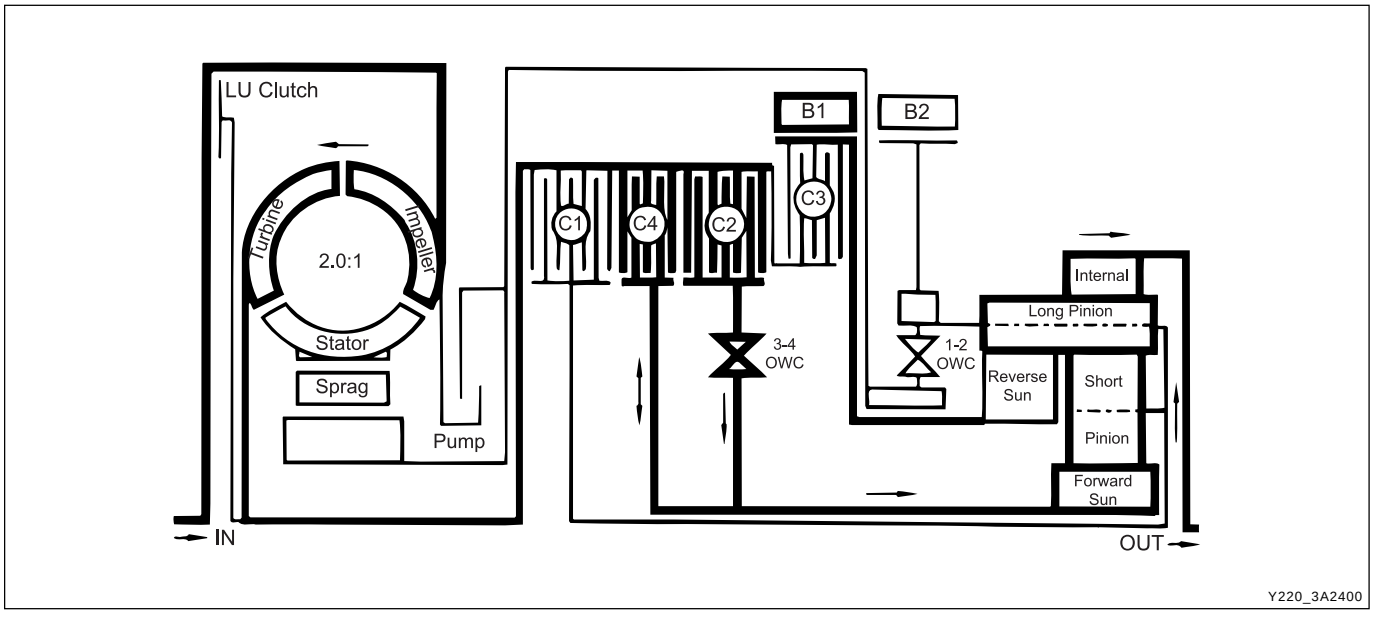
- The C2 clutch is applied to drive the forward sun gear.
- The forward sun gear drives the short pinion anti-clockwise.
- The short pinion drives the long pinion clockwise.
- The B1 band is applied holding the reverse sun gear stationary therefore the long pinion walks around the reverse sun gear taking the internal ring gear and output shaft with it in a clockwise or forward direction.
- The C4 clutch is applied to bypass the 3-4 OWC and provide engine braking on overrun.

Control

To maintain this arrangement in the steady state solenoids and valves are activated as follows;

- Solenoid S1 is switched OFF. S2 is switched ON.
- Drive (line pressure) oil from the manual valve en-gages the C2 clutch.
- When S1 switches OFF, S1 oil pressure, which is derived from line 500 pressure, moves the 3-4 shift valve to the left. At the same time S1 oil is directed to the 1-2 shift valve which moves the valve to the second gear position.
- 2nd oil (line pressure) from the 1-2 shift valve is directed to the band apply regulator valve, and to the 2-3 shift valve.
- The band apply feed regulator valve supplies 2nd oil (regulated to line pressure multiplied by the valve ratio) to the Band Apply Feed (BAF) circuit.
- Band apply feed oil is directed to;
  - The outer apply area of the front servo
  - The 1-2 shift valve to provide an exhaust port when the transmission is shifted to first gear
  - The 3-4 shift valve for use when the transmission is shifted into fourth gear
- Drive (line pressure) is routed through the 3-4 shift valve to apply the C4 clutch.

	ELEMENTS ENGAGED								
Gear State	**C1**	**C2**	**C3**	**C4**	**B1**	**B2**	**1-2 OWC**	**3-4 OWC**	**LU CLUTCH**
Drive 2 and Manual 2	-	X	-	X	X	-	-	X	-



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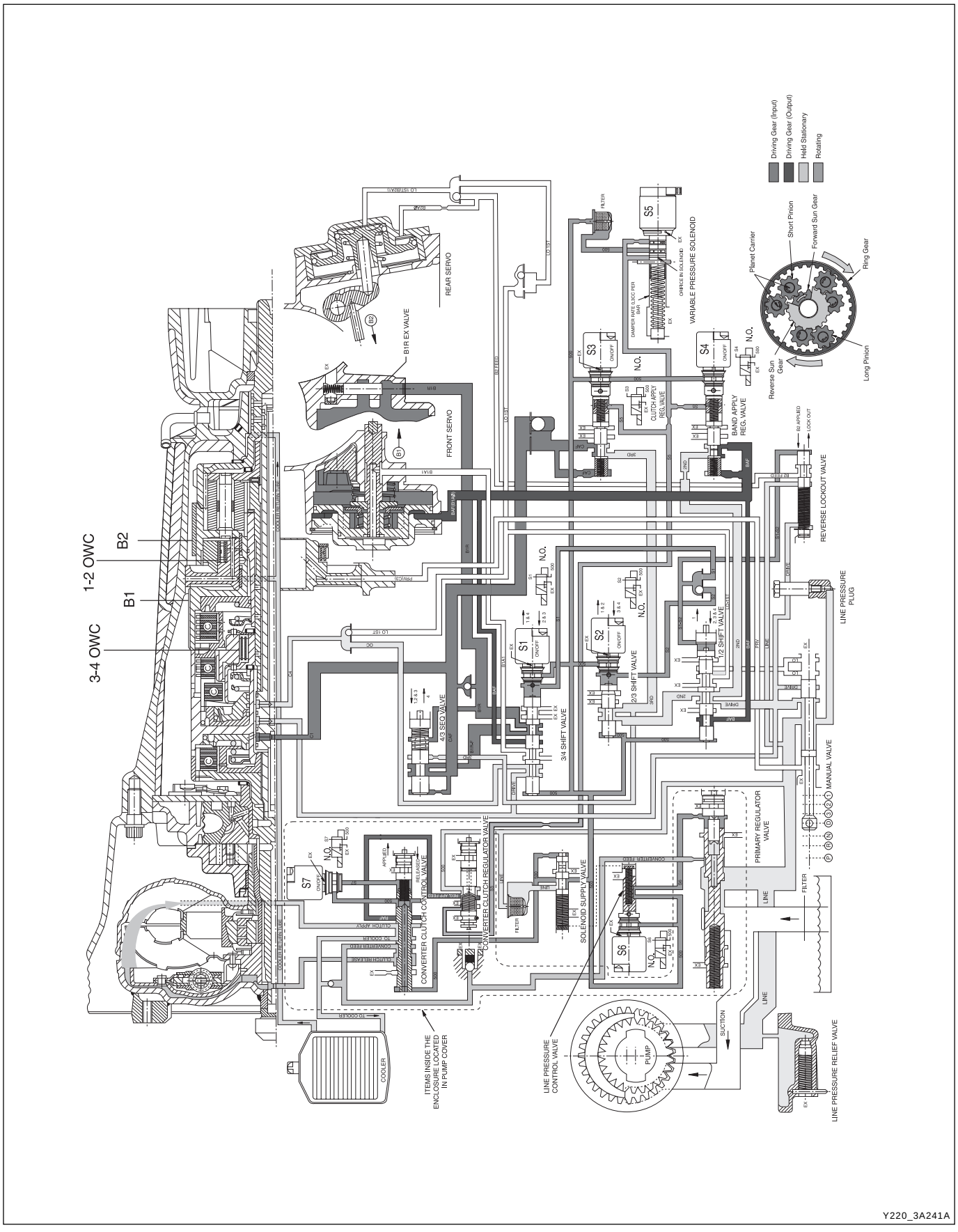
DRIVE 3 AND MANUAL 3



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Power flow - Drive 3 and manual 3

In Drive 2 and Manual 2, transmission drive is via the input shaft and forward clutch cylinder. The elements of the transmission function as follows;

- The C2 clutch is engaged to drive the forward sun gear.
- The C1 clutch is engaged to drive the planet carrier.
- The short pinion drives the long pinion clockwise.
- The forward sun gear and the planet carrier are driv-en clockwise at the same speed therefore there is no relative motion between the sun gear and the pinions.
- The ring gear and output shaft are driven in a clockwise or forward direction at input shaft speed.
- The C4 clutch is applied to bypass the 3-4 OWC and provide engine braking on overrun.

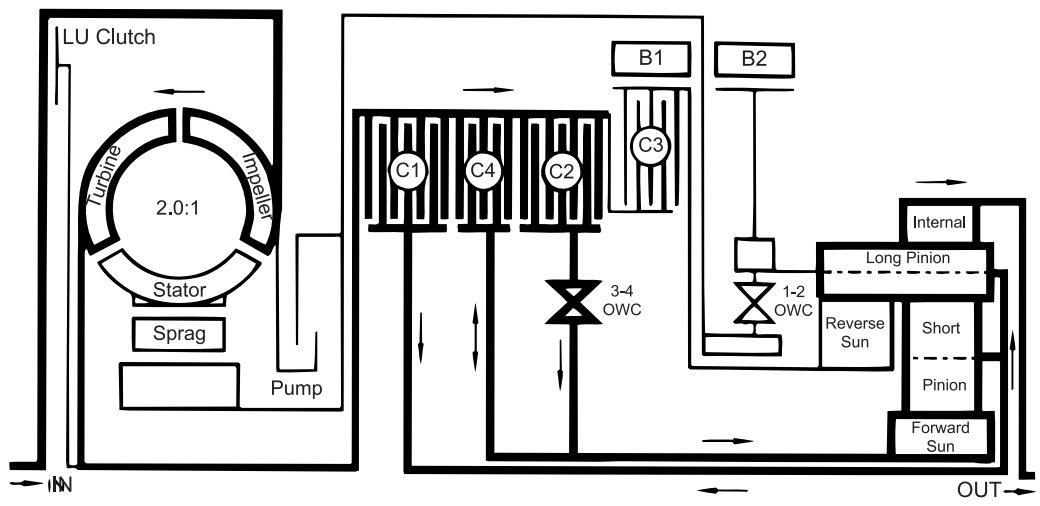
Control

To maintain this arrangement in the steady state solenoids and valves are activated as follows:

- Solenoid S1 is switched OFF. S2 is switched OFF.
- With S1 and S2 switched OFF, the 2-3 and 3-4 shift valves are held in the third gear position by line 500 pressure.
- The 1-2 shift valve is held in the third gear position by S1-S2 oil pressure.
- 2nd oil (line pressure) from the 1-2 shift valve is directed to the band apply feed regulator valve and to the 2-3 shift valve.
- The band apply feed regulator valve supplies 2nd oil (regulated to line pressure multiplied by the valve ratio) to the Band Apply Feed (BAF) circuit.
- Band apply feed oil is directed to;
  - The outer apply area of the front servo
  - The 1-2 shift valve to provide an exhaust port when the transmission is shifted to first gear
  - The 3-4 shift valve for use when the transmission is shifted into fourth gear
- 2nd oil at the 2-3 shift valve is directed to the 3rd oil circuit.
- 3rd oil from the 2-3 shift valve is directed to the clutch apply regulator valve, and to the 4-3 sequence valve.
- The clutch apply regulator valve supplies oil (regu-lated to line 500 pressure multiplied by the valve ratio) to the Clutch Apply Feed (CAF) circuit.

  The CAF oil is directed to;
  - The C1clutch
  - The 4-3 sequence valve
- At the 4-3 sequence valve the CAF oil becomes Band 1 Release Feed (B1R-F) oil, and is directed through the 3-4 shift valve to the spring end of the 4-3 sequence valve, and to the release side of the front servo piston to hold band 1 OFF.
- Drive (line pressure) is routed through the 3-4 shift valve to apply the C4 clutch.

	ELEMENTS ENGAGED								
Gear State	**C1**	**C2**	**C3**	**C4**	**B1**	**B2**	**1-2 OWC**	**3-4 OWC**	**LU CLUTCH**
Drive 3 and Manual 3	X	X	-	X	-	-	-	X	-



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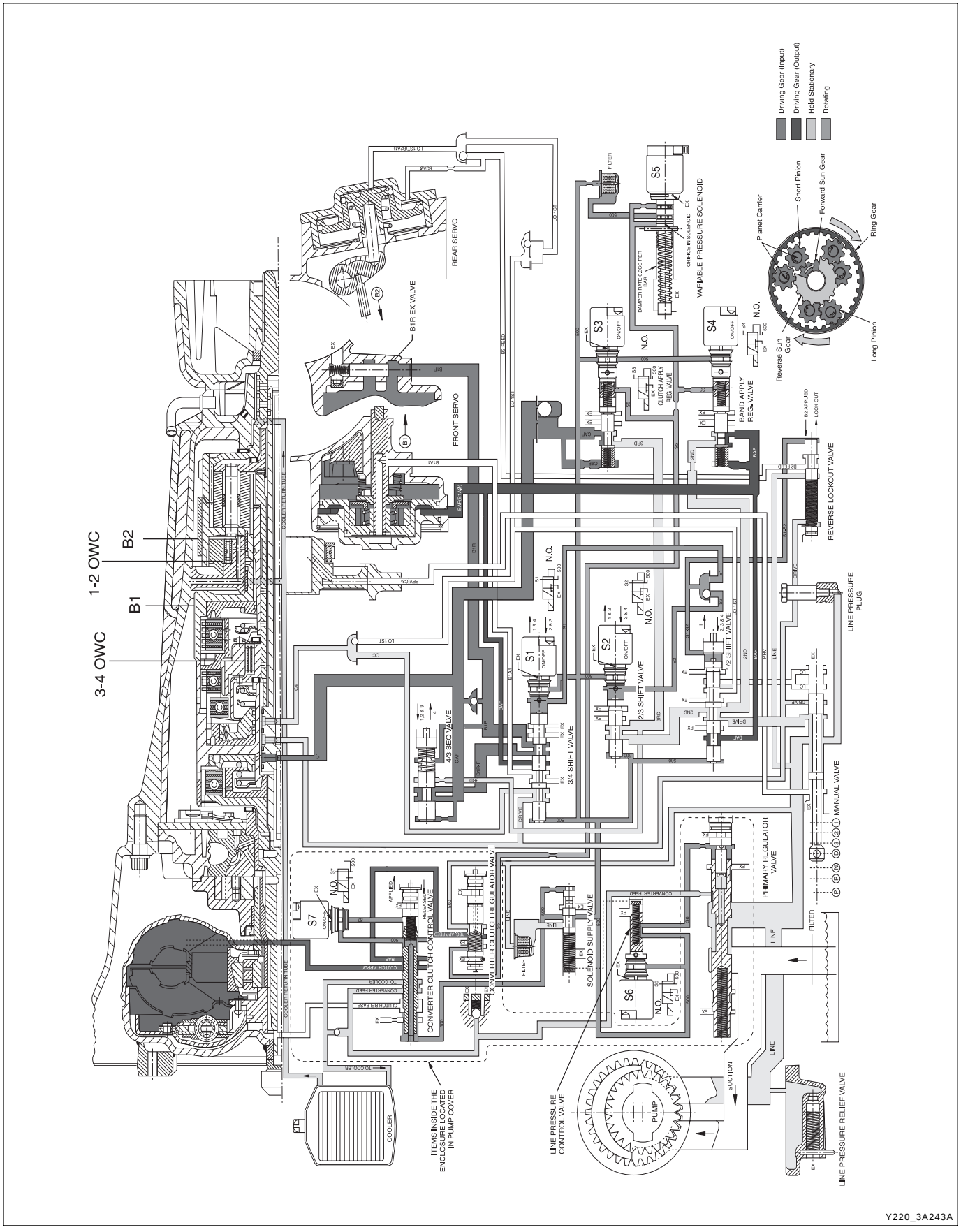
DRIVE 3 LOCK UP AND MANUAL 3 LOCK UP



Power flow - Drive 3 lock up and manual 3 lock up

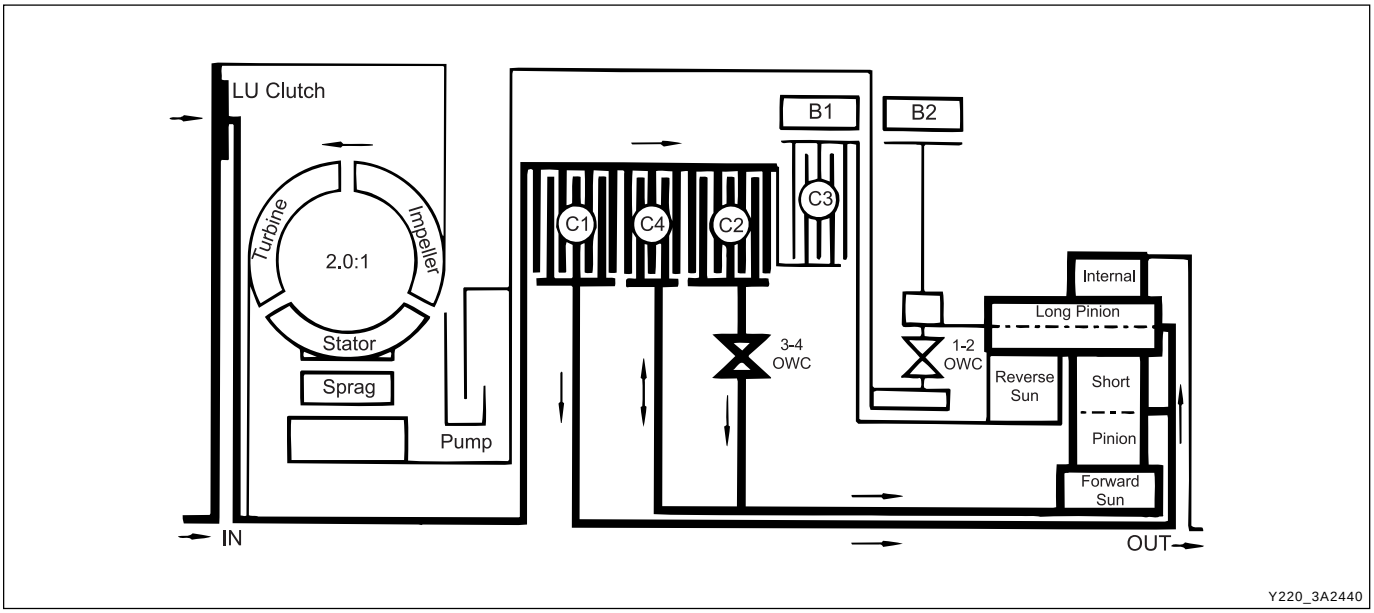
In Drive 3 Lock Up and Manual 3 Lock Up, transmission drive is the same as for Drive 3 but with the application of the converter lock up clutch to provide positive no-slip converter drive.

Control

Control for Drive 3 Lock Up and Manual 3 Lock Up is the same as for Drive 3 with the addition of the converter clutch circuit activated by solenoid S7.

- When S7 is switched ON, S7 feed oil to the converter clutch control valve is switched OFF and allowed to exhaust through the S7 solenoid. This allows the valve to move to the clutch engage position.
- Regulated apply feed oil, drive oil at the converter clutch regulator valve, is directed by the converter clutch control valve to the engage side of the converter clutch.
- Converter clutch release oil is exhausted at the converter clutch control valve.
- Converter feed oil is re-routed by the converter clutch control valve directly to the oil cooler and lubrication circuit.

	ELEMENTS ENGAGED								
Gear State	**C1**	**C2**	**C3**	**C4**	**B1**	**B2**	**1-2 OWC**	**3-4 OWC**	**LU CLUTCH**
Drive 3 Lock Up and Manual 3 Lock Up	X	X	-	X	-	-	-	X	X



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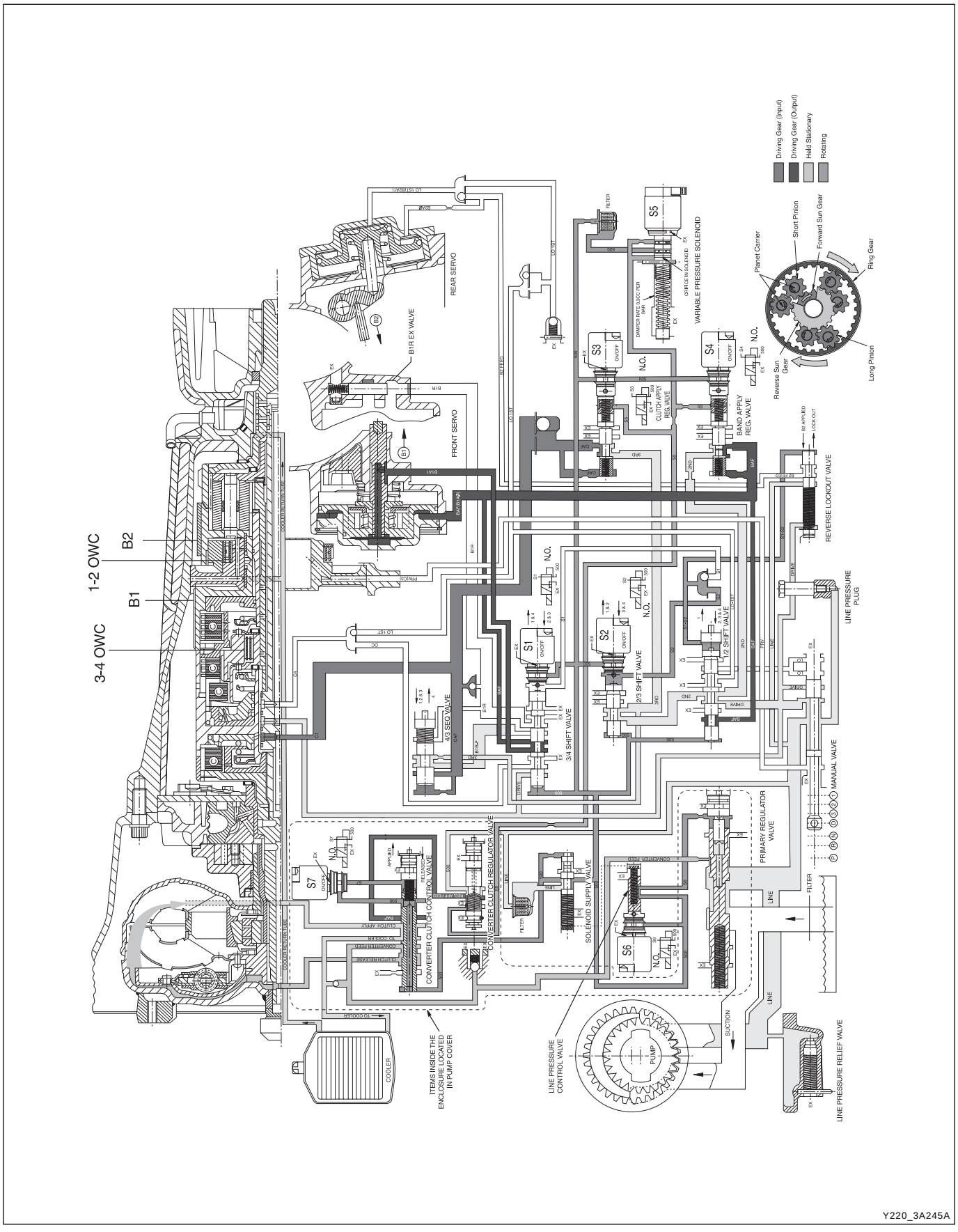
DRIVE 4 (OVERDRIVE)



Power flow - Drive 4 (Overdrive)

In Drive 4 (Overdrive), transmission drive is via the input shaft to the forward clutch cylinder.

The elements of the transmission function as follows;

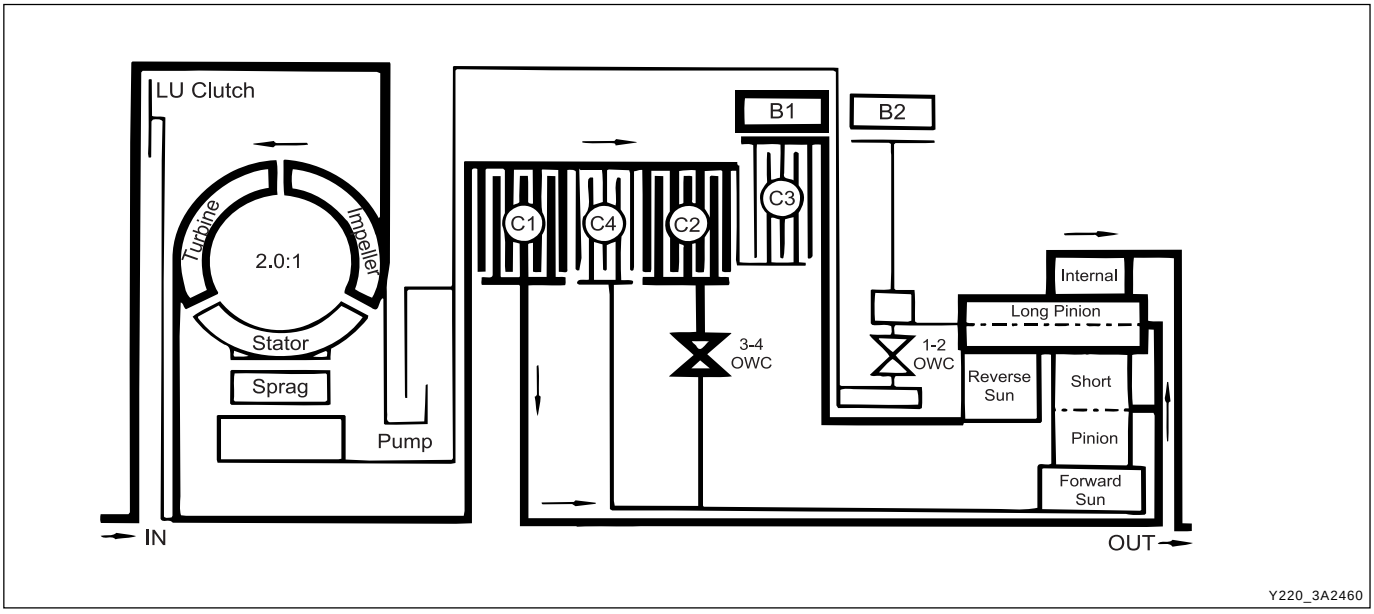
- The C1 clutch is applied to drive the planet carrier clockwise.
- The B1 band is applied to hold the reverse sun gear stationary.
- As the planet carrier tuns, the long pinion walks around the stationary reverse sun gear and rotates around its axis driving the internal ring gear and output shaft in a clockwise or forward direction at a speed faster than the input shaft i.e. in overdrive ratio.
- The forward sun gear is also driven faster than the input shaft and overruns the 3-4 OWC.
- The C2 clutch is engaged to reduce the speed differential across the 3-4 OWC.

Control

To maintain this arrangement in the steady state solenoids and valves are activated as follows;

- Solenoid S1 is switched ON. S2 is switched OFF.
- With S1 switched ON, the 3-4 shift valve is held in the fourth gear position by line 500 pressure on the small end of the valve.
- With S2 switched OFF, the 2-3 shift valve is held in the fourth gear position by line 500 pressure on the large end of the valve.
- The 1-2 shift valve is held in the fourth gear position by S2 oil pressure.
- 2nd oil (line pressure) from the 1-2 shift valve is directed to the band apply feed regulator valve, and to the 2-3 shift valve.
- The band apply feed regulator valve supplies 2nd oil (regulated to line pressure multiplied by the valve ratio) to the Band Apply Feed (BAF) circuit.
- Band apply feed oil is directed to;
  - the outer apply area of the front servo
  - the inner apply area of the front servo piston via the 3-4 shift valve
  - the 1-2 shift valve to provide an exhaust port when the transmission is shifted to first gear
- 2nd oil at the 2-3 shift valve is directed to the 3rd oil circuit.
- 3rd oil from the 2-3 shift valve is directed to the clutch apply regulator valve, and to the 4-3 sequence valve.
- The clutch apply regulator valve supplies oil (regu-lated to line 500 pressure multiplied by the valve ratio) to the Clutch Apply Feed (CAF) circuit.
- The CAF oil is directed to;
  - the C1 clutch
  - the 4-3 sequence valve
- Drive oil (line pressure) from the manual valve en-gages the C2 clutch.

Gear State	ELEMENTS ENGAGED								
	C1	C2	C3	C4	B1	B2	1-2 OWC	3-4 OWC	LU CLUTCH
Drive 4 Overdrive	X	X	-	-	X	-	-	-	-



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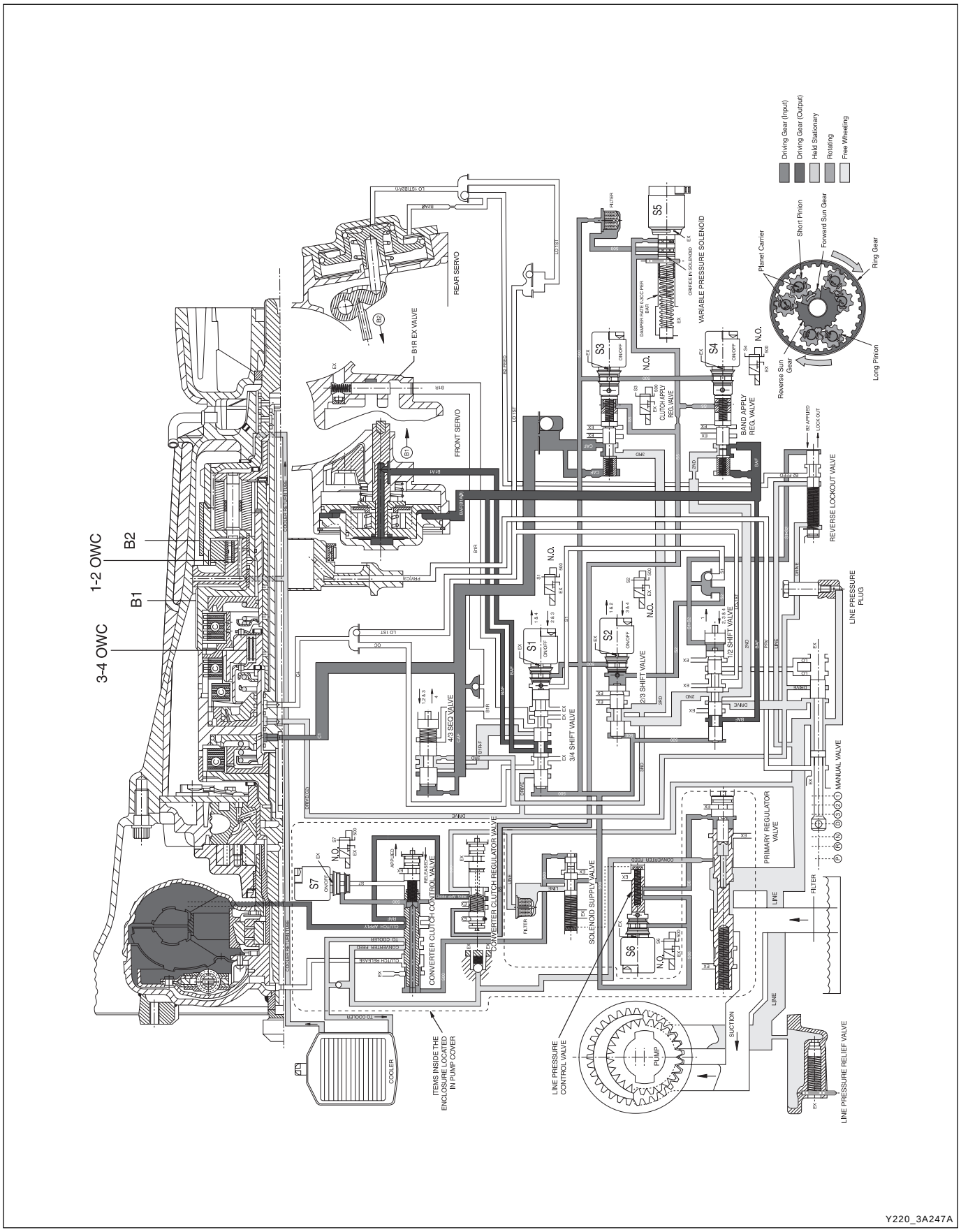
DRIVE 4 LOCK UP



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Power flow - Drive 4 lock up

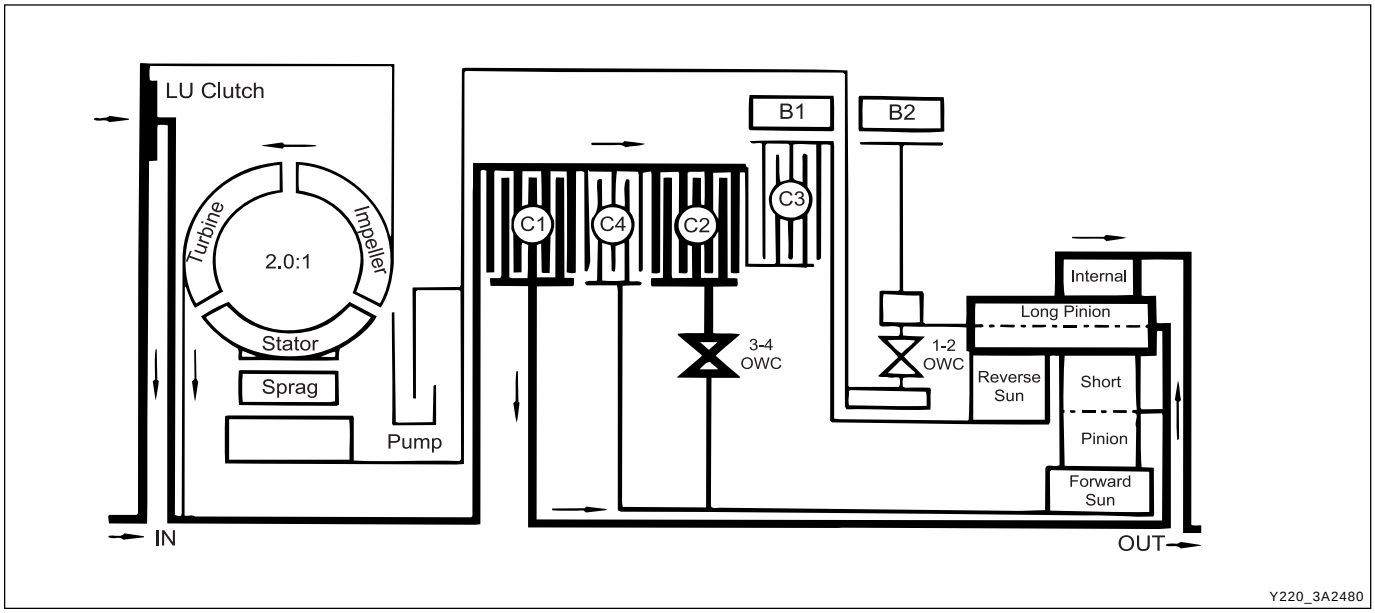
In Drive 4 Lock Up, transmission drive is the same as for Drive 4 but with the application of the converter lock up clutch to provide positive no-slip converter drive.

Control

To maintain this arrangement in the steady state solenoids and valves are activated as follows;

- When S7 is switched ON, S7 feed oil to the converter clutch control valve is switched OFF and allowed to exhaust through the S7 solenoid. This allows the valve to move to the clutch engage position.
- Regulated apply feed oil, drived from drive oil at the converter clutch regulator valve, is directed by the converter clutch control valve to the engage side of the converter clutch.
- Converter clutch release oil is exhausted at the converter clutch control valve.
- Converter feed oil is re-routed by the converter clutch control valve directly to the oil cooler and lubrication circuit.

	ELEMENTS ENGAGED								
Gear State	**C1**	**C2**	**C3**	**C4**	**B1**	**B2**	**1-2 OWC**	**3-4 OWC**	**LU CLUTCH**
Drive 4 Lock Up	X	X	-	-	X	-	-	-	-



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DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSIS

BASIC KNOWLEDGE REQUIRED

You must be famillíar with some basic electronics to use this section of the Service Manual. They will help you to follow diagnostic procedures.

Notice

Lack of the basic knowledge of this transmis-sion when performing diagnostic procedures could re-sult in incorrect diagnostic performance or damage to transmission components. Do not, under any circum-stances, attempt to diagnose a transmission problem without this basic knowledge.

Notice

If a wire is probed with a sharp instrument and not properly sealed afterward, the wire will corrode and an open circuit will result.

Diagnostic test probes are now available that allow you to probe individual wires without leaving the wire open to the environment. These probe devices are inexpensive and easy to install, and they permanently seal the wire from corrosion.

▶ Special Tools

You should be able to use a Digital Volt Meter (DVM), a circuit tester, jumper wires or leads and a line pressure gauge set. The functional check procedure is designed to verify the correct operation of electronic components in the transmission. This will eliminate the unnecessary re-moval of transmission components.

FUNCTIONAL CHECK PROCE-DURE

Begin with the Functional Check Procedure which pro-vides a general outline of how to diagnose automatic transmission. The following functional check procedure will indicate the proper path of diagnosing the transmis-sion by describing the basic checks and then referenc-ing the locations of the specific checks.

- Check the fluid level according to the Fluid Level Service Procedure.
- Check the transmission fluid leak.
- Check if the transmission fluid is not burnt by smell.

Notice

The specific fluid used in this transmission turns brown during normal operation. Brown fluid does not indicate a transmission fault.

- Ensure that the transmission is not in Limp Home Mode (LHM).
- Check the battery terminals and the earth connec-tions for corrosion or looseness.
- Check that the cooler flow is not restricted.
- Check all electrical plug connections for tightness.
- Use on-board diagnostic tool or a scan tool to see if any transmission trouble codes have been set. Refer to the appropriate “Diagnostic Trouble Code (DTC)” information and repair the vehicle as directed. After repairing the vehicle, perform the road test and verify that the code has not set again.
- Perform the Electrical/Garage Shift Tests.
- Perform the Road Test Procedure in this section.
- Inspect the oil and check for metal or other contami-nants in the oil pan.

TRANSMISSION FLUID LEVEL SERVICE PROCEDURE

This procedure is to be used when checking a concern with the fluid level in a vehicle. A low fluid level will result in slipping and loss of drive/ reverse or delay on engagement of drive/ reverse when the vehicle is cold.

The vehicle is first checked for transmission diagnostic messages on the scan tool. If the oil level is low, it is possible to register a vehicle speed signal fault.

The vehicle is to be test driven to determine if there is an abnormal delay when selecting drive or reverse, or loss of drive. One symptom of low fluid level is a momentary loss of drive when driving the vehicle around a corner. Also when the transmission fluid level is low, a loss of drive may occur when the transmission fluid temperature is low.

If there is no loss of drive when the vehicle is driven warm and a vehicle speed signal fault is registered, then fluid should be added to the transmission.

When adding or changing transmission fluid use only Castrol TQ 95 automatic transmission fluid. The use of incorrect fluid will cause the performance and durability of the transmission to be severely degraded.

▶ Fluid Level Diagnosis procedure

1. If the vehicle is at operating temperature allow the vehicle to cool down for two hours, but no greater than four hours. Or if the vehicle is at cool status, start the engine and allow the engine to idle for approximately 5 minutes or, if possible, drive the vehicle for a few kilometers. This will allow the transmission to be within the correct temperature range. Transmission fluid level should be checked at temperature 50 - 60°C (82 - 140°F).

   Caution

   Removal of the fluid filler plug when the transmission fluid is hot may cause injury if fluid drains from the filler hole.

2. With the brake pedal pressed, move the gear shift control lever through the gear ranges, pausing a few seconds in each range. Return the gear shift control lever to P (Park). Turn the engine OFF.
3. Park the vehicle on a hoist, inspection pit or similar raised level surface. The vehicle must be control level to obtain a correct fluid level measurement.
4. Place a fluid container below the fluid filler plug.
5. Clean all dirt from around the fluid filler plug. Remove the fluid filler plug. Clean the filler plug and check that there is no damage to the 'O' ring.
   - If fluid drains through the filler hole the transmission may have been overfilled. When the fluid stops draining the fluid level is correct. Install the fluid filler plug and tighten it to 33 Nm (24 lb-ft).
   - If fluid does not drain through the filler hole, the transmission fluid level may be low. Install the filler pump into the filler hole. Lower the vehicle with the filler pump still connected and partially fill the fluid through the filler hole.

     Start the vehicle in P (Park) with the parking brake and the brake applied. With the engine idling, move the gear shift. control lever through the gear ranges, pausing a few seconds in each range and adding the fluid until gear application is felt.

     Return the gear shift lever to P (Park).

     Turn the engine OFF and raise the vehicle. When the three minutes passed after the engine stopped, remove the filler pump.

     Check if the fluid level is aligned with the bottom of the filler hole. If not, add a small quantity of fluid to the correct level. Install the fluid filler plug and tighten it to 33 Nm (24 lb-ft).
   - If fluid does not drain through the filler hole although adding a total of 1.5 liters, the transmission should be inspected for fluid leaks and any leaks should be fixed before setting the transmission fluid level.
6. When the fluid level checking procedure is completed, wipe any fluid around the filler plug with a rag or shop towel.

▶ Fluid Level Set After Service

1. Depending on the service procedure performed, add the following amounts of fluid through the filler plug hole prior to adjusting the fluid level:

Converter empty	8.0 liters	(8.5 quarts)
Converter full	3.8 liters	(4.0 quarts)

2. Follow steps 1 through 4 of the Fluid Level Diagnosis Procedure.
3. Clean all dirt from around the fluid filler plug. Remove the fluid filler plug. Clean the filler plug and check that there is no damage to the 'O' ring.

4. Lower the vehicle with the filler pump still connected and start the vehicle in P (Park) with the parking brake and the brake applied. With the engine idling, move the gear shift control lever through the gear ranges, pausing a few seconds in each range and adding the fluid until gear application is felt.

   Then add an additional 0.5 litres of fluid. Return the gear shift lever to P (Park). Turn the engine OFF and raise the vehicle. Install the fluid filler plug and tighten it to 33 N•m (24 lb-ft).
5. Drive the vehicle at 3.5 to 4.5 kilometers with light throttle so that the engine does not exceed 2500 rpm.

   This should result in the transmission temperature being in the range 50 - 60°C (82 - 140°F). With the brake applied, move the shift lever through the gear ranges, pausing a few seconds in each range at the engine idling.
6. Return the gear shift lever to P (Park).

   Turn the en-gine OFF and raise the vehicle on the hoist, if applicable, ensuring the vehicle is level. When the three minutes passed after the engine stopped, remove the filler plug.

   Check if the fluid level is aligned with the bottom of the filler hole. If not, add a small quantity of fluid to the correct level. Install the fluid filler plug and tighten it to 33 N•m (24 lb-ft).
7. Wipe any fluid around the filler plug with a rag or shop towel.

FLUID LEAK DIAGNOSIS AND REPAIR

The cause of most external leaks can generally be lo-cated and repaired with the transmission in the vehicle.

▶Methods for Locating Leaks

General method

1. Verify that the leak is transmission fluid.
2. Thoroughly clean the suspected leak area.
3. Drive the vehicle for approximately 25 km (15 miles) or until the transmission reaches normal operating temperature (88°C, 190°F).
4. Park the vehicle over clean paper or cardboard.
5. Turn the engine OFF and look for fluid spots on the paper.
6. Make the necessary repairs to correct the leak.

Powder method

1. Thoroughly clean the suspected leak area.
2. Apply an aerosol type powder (foot powder) to the suspected leak area.
3. Drive the vehicle for approximately 25 km (15 miles) or until the transmission reaches normal operating temperature (88°C, 190°F).
4. Turn the engine OFF.
5. Inspect the suspected leak area and trace the leak path through the powder to find the source of the leak.
6. Make the necessary repairs.

Dye and black light method

1. Add dye to the transmission through the transmission fluid filler plug. Follow the manufacturer's recommendation for the amount of dye to be used.
2. Use the black light to find the fluid leak.
3. Make the necessary repairs.

Repairing the fluid leak

Once the leak point is found the source of the leak must be determined. The following list describes the potential causes for the leak:

- Fasteners are not torqued to specification.
- Fastener threads and fastener holes are dirty or corroded.
- Gaskets, seals or sleeves are misaligned, damaged or worn.
- Damaged, warped or scratched seal bore or gasket surface.
- Loose or worn bearing causing excess seal or sleeve wear.
- Case or component porosity.
- Fluid level is too high.
- Plugged vent or damaged vent tube.
- Water or coolant in fluid.
- Fluid drain back holes plugged.

ELECTRICAL / GARAGE SHIFT TEST

This preliminary test should be performed before a hoist or road test to make sure electronic control inputs are connected and operating. If the inputs are not checked before operating the transmission, a simple electrical condition could be misdiagnosed as a major transmission condition.

A scan tool provides valuable information and must be used on the automatic transmission for accurate diagnosis.

1. Move gear shift control lever to P (Park) and set the parking brake.
2. Connect scan tool to Data Link Connector (DLC) terminal.
3. Start engine.
4. Turn the scan tool ON.
5. Verify that the appropriate signals are present. These signals may include:
   - ENGINE SPEED
   - VEHICLE SPEED
   - THROTTLE POSITION
   - ACCEL. PEDAL POSITION
   - TRANSMISSION GEAR STATE
   - GEAR SHIFT LEVER POSITION
   - TRANSMISSION FLUID TEMPERATURE
   - CLOSED THROTTLE POSITION LEARN
   - OPEN THROTTLE POSITION LEARNT
   - CLOSED ACCEL. PEDAL POSITION LEARNT
   - OPEN ACCEL. PEDAL POSITION LEARNT
   - A/C COMPRESSOR STATUS
   - KICKDOWN SWITCH STATUS
   - 4WD STATUS
   - MODE SWITCH
   - THROTTLE POSITION VOLTAGE
   - GEAR SHIFT LEVER POSITION VOLTAGE
   - TRANS. FLUID TEMPERATURE VOLTAGE
   - A/C SWITCH
   - KICKDOWN SWITCH VOLTAGE
   - 4WD LAMP LOW VOLTAGE
   - 4WD LAMP HIGH VOLTAGE
   - MODE SWITCH VOLTAGE
   - BATTERY VOLTAGE
6. Monitor the A/C COMPRESSOR STATUS signal while pushing the A/C switch.
   - The A/C COMPRESSOR STATUS should come ON when the A/C switch is pressed, and turn OFF when the A/C switch is repushed.
7. Monitor the GEAR SHIFT LEVER POSITION signal and move the gear shift control lever through all the ranges.
   - Verify that the GEAR SHIFT LEVER POSITION value matches the gear range indicated on the instrument panel or console.
   - Gear selections should be immediate and not harsh.
8. Move gear shift control lever to neutral and monitor the THROTTLE POSITION signal while increasing and decreasing engine speed with the accelerator pedal.
   - THROTTLE POSITION should increase with engine speed.

ROAD TEST PROCEDURE

- Perform the road test using a scan tool.
- This test should be performed when traffic and road conditions permit.
- Observe all traffic regulations.

ELECTRONIC ADJUSTMENTS

Idle speed adjustments

Carry out the adjustments to the idle speed as detailed in the workshop manual.

Vehicle coding

The vehicle coding is integrated as part of the diagnostic software. A scan tool has the function to code the ve-hicle through the K-line.

Throttle clearing

The leant throttle clearing routine uses the mode switch and gear lever. Carry out the following steps to complete the automated throttle clearing procedure:

1. Switch ignition “ON” with handbrake applied and engine “OFF”.
2. Select the selector lever to 1st gear and “WINTER” mode.
3. Move the selector lever to 2nd gear and “ECONO” or “POWER” mode.
4. Move the selector lever to 3rd gear and “WINTER” mode.

Throttle position calibration

Should the throttle position data stored in the TCU be lost or be out of specification, as indicated by a diagnostic trouble message, it may be re-established by the following procedure.

- Check that the hot engine idle speed is within specfication.
- Allow the engine to idle in “Drive” for 60 seconds with the air conditioner (if fitted) turned off. The closed throttle reference point in the TCU has now been set.
- Switch the engine off but leave the ignition on. Hold the accelerator pedal on the floor for 60 seconds. The wide open throttle reference point in the TCU has now been set.

SYMPTOM DIAGNOSIS

DRIVE FAULTS

Condition	Possible Causes	Action
No Drive in D	• Insufficient auto transmission fluid.	• Check the fluid level. Top up as necessary.
	• Blocked feed in C1/C2 cylinder.	• Inspect and clean C1/C2 feed.
	• "Z" link displaced.	• Reinstall/renew the 'z' link.
	• Primary Regulator Valve (PRV) jammed open.	• Remove, clean and re-install the PRV.
	• Overdrive shaft or input shaft seal rings failed.	• Inspect and replace as necessary.
	• 3-4 or 1-2 One Way Clutch (OWC) installed backwards or failed.	• Inspect and replace as necessary.
	• C2 piston broken or cracked.	• Inspect and replace as necessary.
No Drive in Reverse	• Damaged input shaft sealing rings.	• Inspect and replace as necessary.
- No engine braking in Manual 1	- Rear band or servo faulty.	- Check servo adjustment or replace rear band as necessary.
- Engine braking in Manual 1 is OK	- Failure in C3, C3 hub or C1/C2 cylinder.	- Check for failure in C3, C3 hub or C1/C2 cylinder. Repair as necessary.
No drive in Drive and Reverse	• Jammed Primary Regulator Valve (PRV).	• Inspect and clean PRV.
	• Damaged/broken pump gears.	• Inspect and replace pump gears as necessary.
	• Dislodged output shaft snap ring.	• Inspect and repair as necessary.

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FAULTY SHIFT PATTERN

Condition	Possible Causes	Action
2-3 shift only (no 4th or 1st)	• S1 always OFF.	• Inspect S1. Repair or replace as necessary. • Check for 12 Volts applied to S1 at all times or for wiring fault.
1-4 shift only1-3-4 (Delayed 1-2 shift)	• S1 always ON.	• Inspect S1. Repair or replace as necessary. • Check for 12 Volts applied to S1 at all times or for wiring fault.
4-3 shift only	• S2 always OFF.	• Inspect S2. Repair or replace as necessary. • Check for open circuit or wiring fault.
1-2-Neutral (1st over run)	• S2 always ON.	• Inspect S2. Repair or replace as necessary. • Check for open circuit or wiring fault.
1-3 shift only	• B1 failed. • Loose band adjustment. • Front servo piston or seal failed. • S1/S2 ball misplaced,	• Inspect and repair as necessary. • Inspect and adjust as necessary. • Inspect and repair as necessary. • Inspect and replace or refit as necessary
1-3-4 only	• Smaller “O” ring on front servo piston failed or missing. • 2-3 shift valve jammed.	• Inspect “O” ring. Refit or replace as necessary. • Inspect the 2-3 shift valve. Repair or replace as necessary.
1-2-1 only	• C1 clutch failed or slipping in 3rd and 4th. (Gives 1st in 3rd and 2nd in 4th.)	• Inspect C1 clutch. Repair or replace as necessary.
No manual 4-3, 3-2 or 2-1	• Over-run Clutch (OC) /low ball misplaced.	• Inspect ball. Refit or replace as necessary.
No manual 1st	• Rear band slipping when hot. • Reverse/Low-1st ball misplaced. • Rear servo inner “O” ring missing.	• Inspect rear band adjustment. Adjust as necessary. • Inspect ball. Refit or replace as necessary. • Inspect “O” ring. Refit or replace as necessary.
1st gear only or 2nd,3rd, and 4th only	• 1-2 shift valve jammed.	• Inspect the 1-2 shift valve. Repair or replace as necessary.
1st and 2nd only or 1st, 3rd and 4th only	• 2-3 shift valve jammed.	• Inspect the 2-3 shift valve. Repair or replace as necessary.
1st, 2nd and 4th only or 1st, 2nd, and 3rd (tied up in 3rd)	• Inhibitor switch fault, 1-2-3 only. • 3-4 shift valve jammed.	• Inspect inhibitor switch. Repair or replace as necessary. • Inspect the 3-4 shift valve. Repair or replace as necessary.

Condition	Possible Causes	Action
Harsh 2-3 shift	• Jammed band 1 release valve.	• Inspect the release valve. Repair or replace as necessary.
	• Faulty S3 or S2 solenoid.	• Inspect S3 or S2. Repair or replace as necessary.
	• Faulty clutch apply regulator valve.	• Inspect the regulator valve. Repair or replace as necessary.
	• Missing or damaged clutch apply feed ball.	• Inspect the ball. Refit or replace as necessary.
	• Damaged input shaft sealing rings.	• Inspect the sealing rings. Refit or replace as necessary.
	• Damaged C1 piston “O” rings.	• Inspect the “O” rings. Refit or replace as necessary.
	• Damaged or dislodged C1 piston bleedball.	• Inspect the bleed ball. Refit or replace as necessary.
	• Faulty S1 or S4 solenoid.	
Harsh 3-4 shift	• Jammed band 1 release valve.	• Inspect S1 or S4. Repair or replace as necessary.
	• Incorrect front band adjustment.	• Inspect the release valve. Repair or replace as necessary.
	• Damaged front servo piston “O” rings.	• Inspect the band. Adjust as necessary.
	• Faulty or damaged variable pressure solenoid (S5).	• Inspect the “O” rings. Refit or replace as necessary.
	• Faulty band apply regulator valve.	• Inspect S5. Repair or replace as necessary.
		• Inspect the regulator valve. Repair or replace as necessary.

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SHIFT QUALITY FAULTS

Condition	Possible Causes	Action
All Shifts Firm	• Incorrect auto transmission fluid (ATF).	• Drain and fill with specified ATF.
	• S5 faulty won, or incorrectly fitted.	• Check that S5 is fitted correctly, or replace S5.
	• Band apply and clutch apply regulator springs misplaced.	• Inspect band apply and clutch apply regulator springs. Refit or replace as necessary
Manual 4-3-2-1 is soft delayed or missing	• Over-run Clutch (OC) /Low-1st ball misplaced.	• Inspect the ball. Refit or replace as necessary.
	• C4 clutch worn or burnt.	• Inspect C4 clutch. Replace or repair as necessary.
	• C4 wave plate not lined up with the holes in the piston.	• Check the alignment. Realign as necessary.
Firm 1-2 Hot	• S5 worn.	• Inspect S5 and replace as necessary.
4th Tied up	• Incorrect C4 pack clearance.	• Check the clearance and adjust as necessary.
	• Damaged C4 clutch.	• Inspect C4. Repair or replace as necessary.
	• Cracked C2 piston (leaking into C4).	• Inspect piston. Repair or replace as necessary.
Tied up on 2-3	• Incorrect band adjustment	• Inspect and adjust band as necessary.
	• Front servo plastic plug missing	• Replace the plug.
	• B1R spring broken.	• Replace the spring.
Flare on 2-3	• B1R spring/plug left out.	• Replace the spring/plug.
	• C1/B1R ball misplaced.	• Refit the ball.
	• C1 clutch damaged.	• Inspect the clutch. Repair the clutch as necessary.
	• Restriction in C1 feed.	• Inspect and clean C1 feed.
	• C1 piston check ball jammed.	• Replace the piston.
	• Overdrive or input shaft sealing rings damaged.	• Inspect and replace the sealing rings and/or shaft as necessary.
Slips in 4th	• C1/B1R ball misplaced.	• Inspect and replace the ball.
	• Overdrive or input shaft sealing rings damaged.	• Inspect and replace the sealing rings and/or shaft as necessary.
	• C1 clutch damaged.	• Inspect and repair the C1 clutch as necessary.
Slips in reverse, no manual 1st	• Rear band incorrectly adjusted or damage	• Inspect and adjust or replace rear band.
	• Low-1st check ball misplaced.	• Inspect and re-fit the ball.
Flare on 4-3, Flare on 3-2	• 4-3 sequence valve in backwards.	• Refit the valve.
Firm Manual low shift-high line press.	• Low-1st check ball misplaced.	• Replace the ball.

Condition	Possible Causes	Action
Harsh 1-2 shift	• Faulty inhibitor switch.	• Check the resistance. Replace the inhibitor switch as necessary.
	• Faulty throttle position sensor.	• Inspect and replace the sensor as necessary.
	• Incorrect front band adjustment.	• Inspect and adjust the band as necessary.
	• Damaged front servo piston “O” rings.	• Inspect and replace the “O” rings as necessary.
	• Faulty or damaged variable pressure solenoid (S5).	• Inspect, repair or replace S5 as necessary.
	• Faulty S1 or S4 solenoid.	• Inspect, repair or replace S1 or S4 as necessary.
	• Faulty Band Apply Regulator (BAR) valve.	• Inspect, repair or replace the BAR as necessary.
	• Misassembled front servo return spring.	• Inspect and repair as necessary.
Stalls when Drive or Reverse	• Jammed Converter Clutch Control Valve (CCCV).	• Inspect and clean CCCV.
Selected Shudder on Rolldown	• Faulty solenoid 7.	• Inspect, repair or replace as necessary.

AFTER TEARDOWN FAULTS

Condition	Possible Causes	Action
C2 burnt	• Gear shift lever linkage out of adjustment.	• Inspect, repair C2 and adjust the linkage as necessary.
	• S6 foiled - stuck low.	• Repair C2. Inspect, repair or replace S6 as necessary.
	• Overdrive/output shaft sealing rings damaged.	• Repair C2. Inspect, replace the sealing rings and/or shaft as necessary.
	• C2 piston cracked.	• Repair C2. Inspect, repair or replace the C2 piston as necessary.
C4 burnt	• Incorrect C4 pack clearance.	• Inspect C4 and repair as necessary.
		• Inspect and adjust the C4 pack clearance as necessary.
	• C4 wave plate not lined up properly.	• Repair C4. Inspect and realign the wave plate as necessary.
	• Overdrive or output shaft sealing rings damaged.	• Repair C4. Inspect and realign the sealing rings and/or shaft as necessary.
	• C2 piston cracked.	• Repair C4. Inspect and replace the C2 piston as necessary.
	• Over-run Clutch (OC) /low-1st ball misplaced.	• Repair C4. Inspect and refit the ball as necessary.
B1 burnt	• B1R spring broken.	• Inspect and repair B1 and replace the spring as necessary.
	• Input shaft sealing ring cut.	• Replace sealing ring.
	• C1/B1R ball misplaced.	• Repair B1. Refit the ball as necessary.
C1 burnt	• B1R spring left out.	• Inspect and repair C1 and replace the spring.
	• Overdrive or input shaft sealing rings damaged.	• Repair C1. Inspect and replace the sealing tongs and/or shaft as necessary.
	• C1 piston cracked.	• Repair C1. Inspect and replace the C1 piston as necessary.
	• Ball capsule jammed.	• Repair C1. Inspect and refit the capsule as necessary.
	• 4-3 sequence valve in backwards.	• Repair C1. Inspect and refit the valve as necessary.
	• Clutch Apply Feed (CAF) /B1R ball left out.	• Repair C1. Inspect and replace the ball as necessary.
B2 burnt (Slips in reverse - no manual 1st)	• Rear band incorrectly adjusted or damaged.	• Inspect and adjust the band as necessary.
	• Reverse-low/first ball misplaced.	• Inspect and refit the ball as necessary.

Condition	Possible Causes	Action
Firm converter lock or unlock	• Input shaft “O” ring missing or damaged. • Converter clutch regulator valve in backwards.	• Inspect and replace the “O” ring as necessary. • Inspect and refit the valve as necessary.
No lock up at light throttle	• Input shaft “O” ring missing or damaged. • C1 bias valve in backwards.	• Inspect and replace the “O” ring as necessary. • Inspect and refit the valve as necessary.

TROUBLE CODE DIAGNOSIS - GASOLINE VEHICLE

TCU DIAGNOSTIC SYSTEM OVERVIEW

Notice

To prevent Transmission Control Module (TCM) damage. The ignition key must be OFF when disconnection or reconnection the power to the TCM (for example bttery cable, TCM pigtail connector, TCM fuse, jumper cables, etc.).

When the TCM detects a system fault, a Diagnostic Trouble Code (DTC) is set in the TCM. This code is present while the fault conditions are met and is stored as a 'History DTC' until cleared. Condition for setting and clearing each TCM DTC are provided in the relevant sections.

In the case where the vehicle type is certified for Eure On-Board Diagnostic (EOBD) compliance, the Engine Control Module (ECM) provides the communication link to the EOBD scan tool to pass on any EOBD relevant codes from the TCM. The table below contains a list of all supported DTCs and the classification of each for EOBD purposes. Where a type B DTC has been set in an EOBD vehicle, the response to the fault may include action by the ECM, including the illumination of the Malfunction Indicator Lamp (MIL). Refer to Engine Control, for details on EOBD system function, checks and fault clearing.

CLEARING TROUBLE CODES

TCM DTCs should be cleared after repairs have been completed. Some diagnostic tables will tell you to clear the codes before using the chart, which will help to find the cause of the problem more quickly. Always note the DTCs present before clearing - this information may be helpful in the diagnostic process.

DIAGNOSTIC TROUBLE CODES

DTC	Description	Type
P0706	Transmission Range Sensor Circuit Range/Performance	B
P0707	Transmission Range Sensor Circuit Low input	B
P0708	Transmission Range Sensor Circuit High input	B
P0710	Transmission Fluid Temperature Sensor Circuit Malfunction	D
P0790	Normal/Performance Switch Circuit Malfunction	D
P1703	Engine Speed Signal Error	D
P1704	Shaft Speed Signal Error	D
P1708	TCM Supply Voltage Low	D
P1709	TCM Supply Voltage High	D
P1712	Kickdown Switch Circuit Malfunction	D
P1713	Pedal Signal Error	D
P1714	EEPROM Vehicle Code Error	D
P1715	VPS Offset Error	D
P1717	RAM Error	D
P1718	ROM Error	D
P1719	CAN Bus Error	D
P1720	EEPROM Error	D
P1721	Throttle Signal Error	D
P1722	Vehicle Type Determination Error	D
P1733	Solenoid 1 Circuit Open	D

DIAGNOSTIC TROUBLE CODES (Cont'd)

DTC	Description	Type
P1734	Solenoid 2 Circuit Open	D
P1735	Solenoid 3 Circuit Open	D
P1736	Solenoid 4 Circuit Open	D
P1737	Solenoid 5 Circuit Open	D
P1738	Solenoid 6 Circuit Open	D
P1739	Solenoid 7 Circuit Open	D
P1741	Solenoid 1 Circuit Short	D
P1742	Solenoid 2 Circuit Short	D
P1743	Solenoid 3 Circuit Short	D
P1744	Solenoid 4 Circuit Short	D
P1745	Solenoid 5 Circuit Short	D
P1746	Solenoid 6 Circuit Short	D
P1747	Solenoid 7 Circuit Short	D

▶ DTC Types

Each DTC is directly related to a diagnostic test. The Diagnostic management system sets DTCs based on the failure of the tests during a driving cycle or cycles. The following are the two types of DTCs and the charac-teristics of those codes;

Type B

- Emissions related.
- EOBD system "Armed" after one driving cycle with a fail.
- EOBD system "Disarmed" after one driving cycle with a pass.
- Illuminates the MIL on the second con-secutive driving cycle with a fail.
- TCM stores a history DTC on the first driving cycle with a fail.
- EOBD system stores a history DTC on the second consecutive driving cycle with a fail, (the DTC will be armed after the first fail).
- EOBD system stores a freeze frame on the second consecutive driving cycle with a fail, (if empty).

Type D

- Non-Emissions related.
- Does not request illumination of any lamp.
- Stores a history DTC on the first driving cycle with a fail.
- EOBD system does not store a freeze frame.

TROUBLE CODE DIAGNOSIS - DIESEL VEHICLE

TCM DIAGNOSTIC SYSTEM OVERVIEW

Notice

To prevent Transmission Control Module (TCM) damage. The ignition key must be OFF when disconnection or reconnection the power to the TCM (for example bttery cable, TCM pigtail connector, TCM fuse, jumper cables, etc.).

When the TCM detects a system fault, a Diagnostic Trouble Code (DTC) is set in the TCM. This code is present while the fault conditions are met and is stored as a 'History DTC' until cleared. Condition for setting and clearing each TCM DTC are provided in the relevant sections.

CLEARING TROUBLE CODES

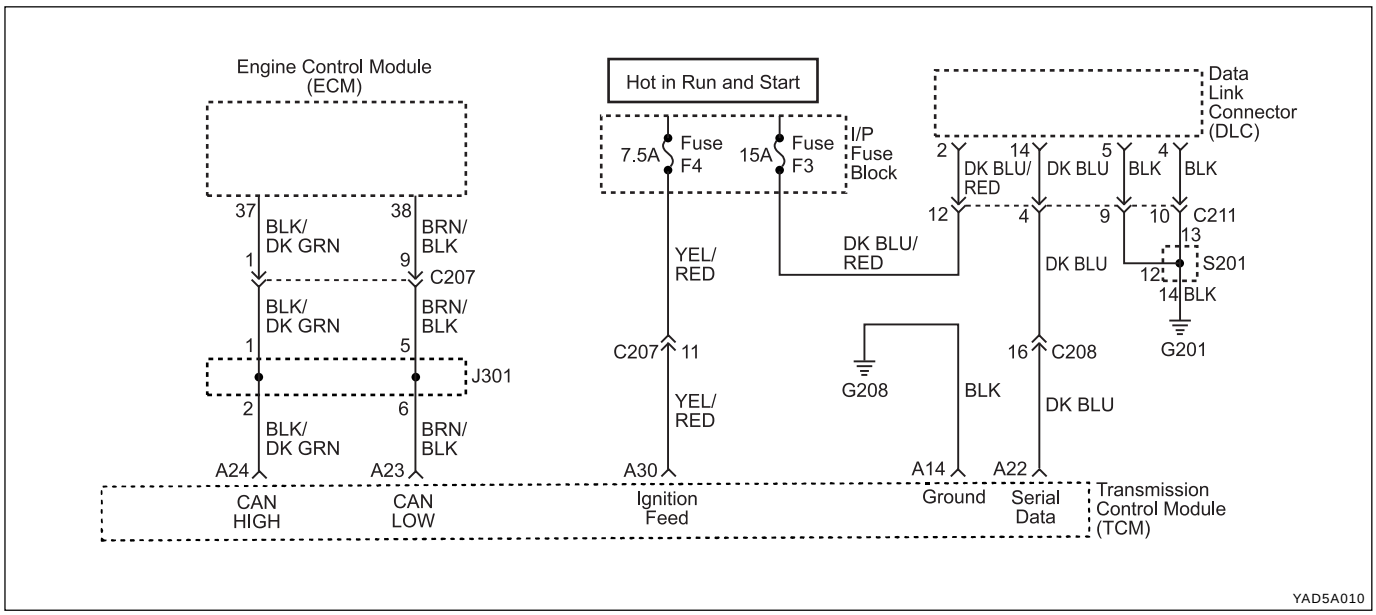
TCM DTCs should be cleared after repairs have been completed. Some diagnostic tables will tell you to clear the codes before using the chart, which will help to find the cause of the problem more quickly. Always note the DTCs present before clearing - this information may be helpful in the diagnostic process.

DIAGNOSTIC TROUBLE CODES

DTC	Description
P0707	Transmission Range Sensor Circuit Low Input
P0708	Transmission Range Sensor Circuit High Input
P0710	Transmission Fluid Temperature Sensor Circuit Malfunction
P0790	Normal/Performance Switch Circuit Malfunction
P1703	Engine Speed Signal Error
P1704	Shaft Speed Signal Error
P1708	TCM Supply Voltage Low
P1709	TCM Supply Voltage High
P1710	Air Conditioning Switch Circuit Malfunction
P1712	Kickdown Switch Circuit Malfunction
P1714	EEPROM Vehicle Code Error
P1715	VPS Offset Error
P1716	Throttle Not Learnt Error
P1717	RAM Error
P1718	ROM Error
P1720	EEPROM Error
P1721	Throttle Signal Error
P1722	Vehicle Type Determination Error
P1733	Solenoid 1 Circuit Open
P1734	Solenoid 2 Circuit Open
P1735	Solenoid 3 Circuit Open
P1736	Solenoid 4 Circuit Open

DIAGNOSTIC TROUBLE CODES (Cont'd)

DTC	Description
P1737	Solenoid 5 Circuit Open
P1738	Solenoid 6 Circuit Open
P1739	Solenoid 7 Circuit Open
P1741	Solenoid 1 Circuit Short
P1742	Solenoid 2 Circuit Short
P1743	Solenoid 3 Circuit Short
P1744	Solenoid 4 Circuit Short
P1745	Solenoid 5 Circuit Short
P1746	Solenoid 6 Circuit Short
P1747	Solenoid 7 Circuit Short



▶ TCM DIAGNOSTIC SYSTEM CHECK

Circuit Description

The Transmission Control Module (TCM) Diagnistic System Check is the starting point for any driveability complaint diagnosis. Before using this procedure, perform a careful visual/ physical check of the Transmission Control Module (TCM) and the transmission grounds for cleanliness and tightness.

The TCM Diagnostic System Check is an organized approach to identifying a problem created by an electronic transmission control system malfunction.

Diagnostic Aids

An intermittent fault may be caused by a poor connection, rubbed-through wire insulation or a wire broken inside the insulation. Check for poor connections or a damaged harness. Inspect the TCM harness and con-nections for improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wire connection, and damaged harness.

TCM Diagnostic System Check

Step	Action	Value(s)	Yes	No
1	1 Turn the ignition OFF. 2. Install the scan tool. 3. Turn the ignition ON, with the engine OFF. 4. Attempt to display the Transmission Control Module (TCM) Data List with the scan tool. Does the scan tool display the TCM data?	-	Go to Step 2	Go to Step 3
2	Select the Trouble Code with the scan tool. Are any Diagnostic Trouble Codes (DTCs) tored?	-	Go to applicable DTC table	System OK, Check Complete

TCM Diagnostic System Check (Cont'd)

Step	Action	Value(s)	Yes	No
3	1. Turn the ignition OFF. 2. Disconnect the TCM connector B. 3. Turn the ignition ON. 4. Check the serial data line from TCM connector terminal A22 to Data Link Connector (DLC) connector terminal 14 for an open, short to ground, or short to voltage. Also, check the DLC ignition feed circuit for an open or short to ground and the DLC ground circuit for an open. Is a problem found?	-	Go to Step 4	Go to Step 5
4	Repair the open, short to ground or short to voltage in the serial data circuit or the DLC ignition feed circuit or the DLC ground circuit. Is a repair complete?	-	Go to Step 1	-
5	Check the TCM ignition feed circuit for an open or short to ground and the TCM ground circuit for an open.	-	Go to Step 6	Go to Step 7
6	Is a problem found? Repair the open or short to ground in the TCM ignition feed circuit or the TCM ground circuit.	-	Go to Step 1	-
7	Is a repair complete? 1. Turn the ignition OFF. 2. Disconnect the TCM connector.	-	Go to Step 1	-

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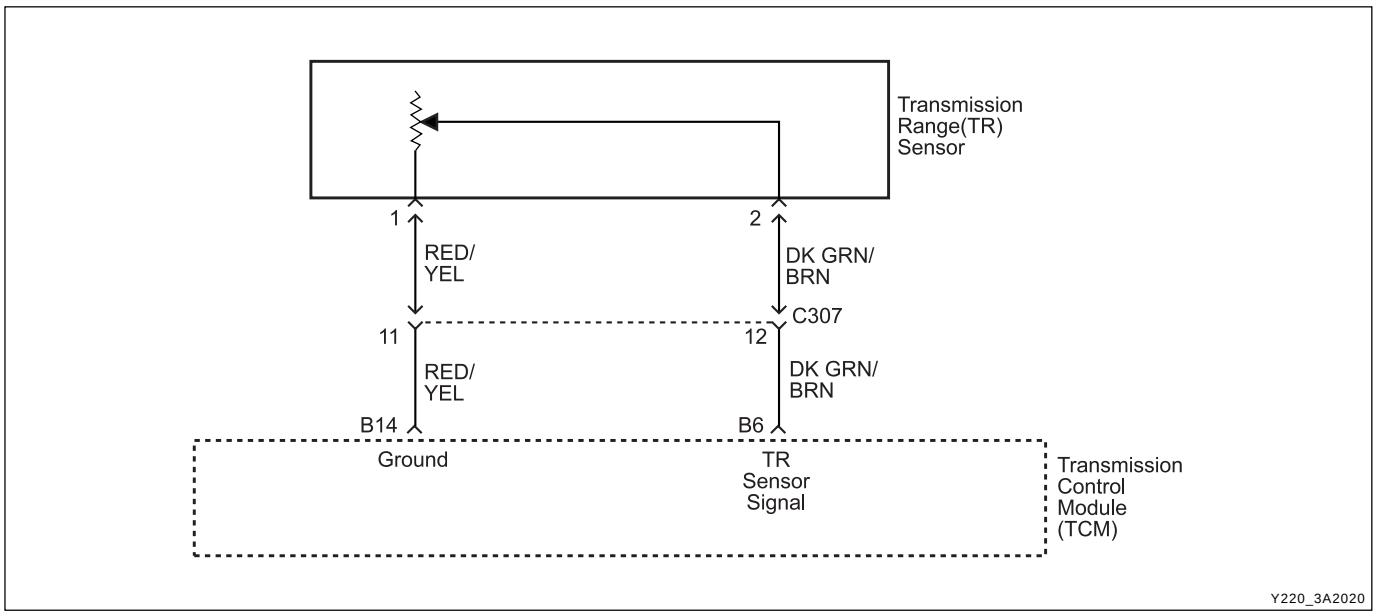


▶ DIAGNOSTIC TROUBLE CODE (DTC) P0706 TRANSMISSION RANGE SENSOR CIRCUIT RANGE/PERFORMANCE

Circuit Description

The Transmission Range (TR) sensor is incorporated in the inhibitor switch mounted on the side of the transmission case. The TR sensor Indicates to the TCM which gear position has been selected by way of a varying resistance.

The TR sensor signal has discrete values indicating the positions selected by the gear shift control lever (PRND321). The Transmission Control Module (TCM) receives that signal with a voltage varying from 0 V to 5 V. DTC P0706 sets when the TR sensor signal is not feasi ble.

Conditions for Setting the DTC

- The engine temperature is greater than 60°C (140°F).
- The engine speed is greater than 2000 RPM and less than 4000 RPM.
- Engine load is greater than 60 %.
- DTCs P0707, P0708, P1703 and P1719 are not set.
- Transmission temperature is greater than 0°C (32°F) or if P0710 is present the engine coolant temperature is greater than 60°C (140°F).
- The TR sensor indicates that the transmission is in a neutral state, however the engine output torque indicates that a drive gear load is present. This condition must be continuously present for 5 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate on the second consecutive driving cycle with the DTC present.
- The EOBD system will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffer.
- TR signal is assumed to be in the Drive position.
- The transmission is limited to 2nd and R gears only. Namely 1st, 3rd and 4th gears are inhibited.
- Torque Converter Clutch (TCC) is disabled.

Conditions for Clearing the DTC

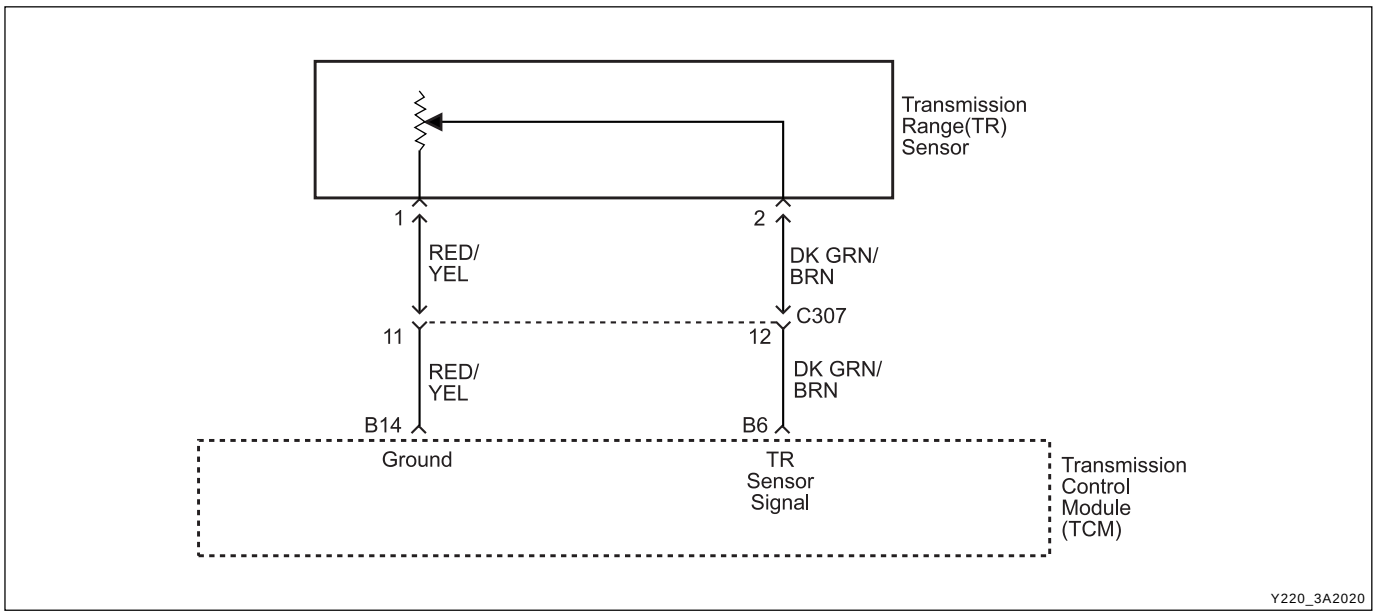
- The DTC will clear when the malfunction has not occurred for 30 seconds and TR is in P, R, N or D.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and at the TR sensor connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also, check for chafed wires that could short to bare metal or other wiring. Inspect for broken wires inside the insulation.

DTC P0706 Transmission Range Sensor Circuit Range/Performance

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P0706?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Select Gear Lever Position on scan tool Data List. 2. Move the gear shift control lever through all of the gear ranges (P, R, N, D, 3, 2, 1). Does the scan tool display the correct gear lever positions?	-	Go to Step 6	Go to Step 4
4	1. Inspect the TR sensor for damage to its rotating part or its mountings. 2. Inspect the shaft driving the TR sensor for damage. Is a repair necessary?	-	Go to Step 5	Go to Step 6
5	Replace the TR sensor or driving shaft as appropriate. Is the acting complete?	-	Go to Step 7	-
6	Check for damage to the z-link within the transmission and repair as necessary. Is a repair necessary?	-	Go to Step 7	-
7	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 8	Go to Step 2
8	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete



▶ DIAGNOSTIC TROUBLE CODE (DTC) P0707 TRANSMISSION RANGE SENSOR CIRCUIT LOW INPUT

Circuit Description

The Transmission Range (TR) sensor is incorporated in the inhibitor switch mounted on the side of the transmis sion case. The TR sensor Indicates to the TCM which gear position has been selected by way of a varying resistance.

The TR sensor signal has discrete values indicating the positions selected by the gear shift control lever (PRND321). The Transmission Control Module (TCM) receives that signal with a voltage varying from 0 V to 5 V. DTC P0707 sets when the TR sensor signal is faulty, causing the gear lever position signal to be less than 0.87 V.

Conditions for Setting the DTC

- TR sensor signal is less than 0.87 V.
- The above condition must be continuously present for 100 milliseconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate on the second consecutive driving cycle with the DTC present.
- The EOBD system will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffer.
- Transmission range is assumed to be in the Drive position.
- The transmission is limited to 2nd and R gears only. Namely 1st,3rd and 4th gears are inhibited.
- Torque Converter Clutch (TCC) is disabled.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred for 3 seconds.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- The voltage measured by the TCM across the TR sensor input terminals has been below on acceptable level for a significant length of time.
- This would typically be caused by a short to ground in the wiring to, or within, the inhibitor switch which has caused the signal at the TCM to read about 0 V.
- Inspect the wiring for poor electrical connections at the TCM and at the TR sensor connector. Look for possible bent, deformed or damaged terminals. Also, check for chafed wires that could short to bare metal or other wiring.
- In searching for a possible intermittent short or open condition, move or massage the wiring harness while observing the test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. This step simulates a DTC P0708 condition. If the scan tool displays the specified value, the TR sensor signal circuit and the TCM are OK.

DTC P0707 Transmission Range Sensor Circuit Low Input

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to “TCM Diagnostic System Check”
2	1. Turn the ignition ON, with the engine OFF. 2. Install a scan tool. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. 5. Review the TR Sensor value on the scan tool. Is the TR Sensor value less than the specified value?	0.87 V	Go to Step 3	Go to “Diagnostic Aids”
3	1. Turn the ignition OFF. 2. Disconnect the Transmission Range (TR) sensor connector. 3. Turn the ignition ON. Is the TR Sensor value greater than specified value?	4.12 V	Go to Step 4	Go to Step 5
4	Replace the TR sensor. Is the action complete?	-	Go to Step 10	-
5	With a test light connected to B+, probe the TR sensor signal circuit at terminal 2. Does the test light illuminate?	-	Go to Step 6	Go to Step 8
6	1. Turn the ignition OFF. 2. Disconnect the Transmission Control Module (TCM) connector B. 3. Turn the ignition ON. 4. With a test light connected to B+, probe the TR sensor signal circuit at terminal 2. Does the test light illuminate?	-	Go to Step 7	Go to Step 9
7	Repair the short to ground in the TR sensor signal circuit. Is a repair complete?	-	Go to Step 10	-
8	Check for a poor connection at the TR sensor connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 10	-
9	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 10	-
10	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 11	-
11	Check if any DTCs are set. Are there any DTCs displayed or DTC previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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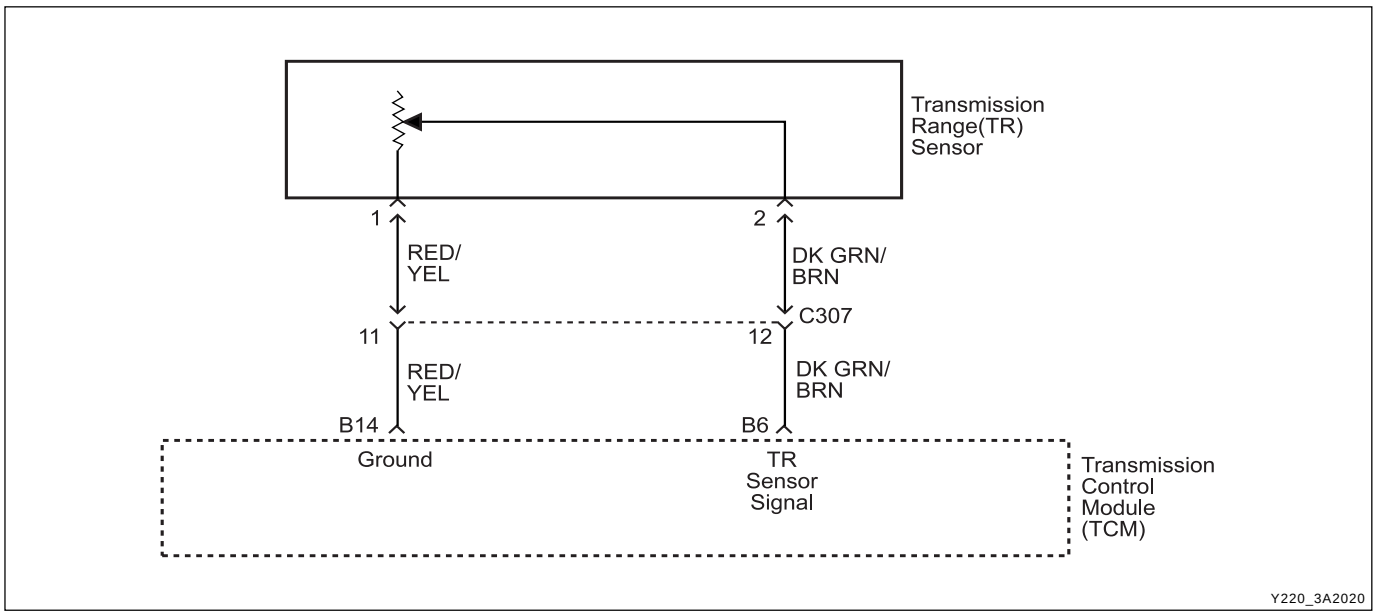

▶ DIAGNOSTIC TROUBLE CODE (DTC) P0708 TRANSMISSION RANGE SENSOR CIRCUIT HIGH INPUT

Circuit Description

The Transmission Range (TR) sensor is incorporated in the inhibitor switch mounted on the side of the transmission case. The TR sensor Indicates to the TCM which gear position has been selected by way of a varying resistance.

The TR sensor signal has discrete values indicating the positions selected by the gear shift control lever (PRND321). The Transmission Control Module (TCM) receives that signal with a voltage varying from 0 V to 5 V.

The transmission range sensor is faulty, causing the gear lever position signal to be greater than 4.12 V.

Conditions for Setting the DTC

- TR sensor signal is greater than 4.12 V.
- The above condition must be continuously present for 100 milliseconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate on the second consecutive driving cycle with the DTC present.
- The EOBD system will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffer.
- Transmission range (gear lever) is assumed to be in the Drive position.
- The transmission is limited to 2nd and R gears only. Namely 1st, 3rd and 4th gears are inhibited.
- Torque Converter Clutch (TCC) is disabled.
- Manually initiated downshifts will not be available.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred for 3 seconds.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- The voltage measured by the TCM across the shift lever input terminals has been above an acceptable level for a significant length of time.
- This would typically be caused by a loose connection or an open or short to B+ in the wiring to, or within, the inhibitor switch which has caused the signal at the TCM to read 5 V.
- If the DTC sets when an accessory is operated, check for a poor connection or excessive current draw.
- Inspect the wiring for poor electrical connections at the TCM and at the TR sensor connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also, check for chafed wires that could short to other wiring. Inspect for broken wires inside the insulation.
- In searching for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

4. This step simulates a DTC P0707 condition. If the scan tool displays the specified value, the TR sensor signal circuit and the TCM are OK.

DTC P0707 Transmission Range Sensor Circuit High Input

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to “TCM Diagnostic System Check”
2	1. Turn the ignition ON, with the engine OFF. 2. Install a scan tool. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. 5. Review the TR Sensor value on the scan tool. Is the TR Sensor value greater than the specified value?	4.12 V	Go to Step 3	Go to “Diagnostic Aids”
3	1. Turn the ignition OFF. 2. Disconnect the Transmission Range (TR) sensor connector. 3. Turn the ignition ON. 4. With a test light connected to ground, probe the TR sensor signal circuit at terminal 2. Is the TR sensor value less than specified value?	0.87 V	Go to Step 4	Go to Step 7
4	With a test light connected to B+, probe the TR sensor ground circuit at terminal 1. Does the test light illuminate?	-	Go to Step 5	Go to Step 8
5	Check for a poor connection at the TR sensor connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 6
6	Replace the TR sensor. Is the action complete?	-	Go to Step 11	-
7	1. Turn the ignition OFF. 2. Disconnect the Transmission Control Module (TCM) connector B. 3. Check the TR sensor signal circuit at terminal 1 for an open or short to voltage and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 9
8	Check the TR sensor ground circuit at terminal 1 for an open and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 9
9	Check for a poor connection at the TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-

DTC P0707 Transmission Range Sensor Circuit High Input (Cont'd)

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or DTCs previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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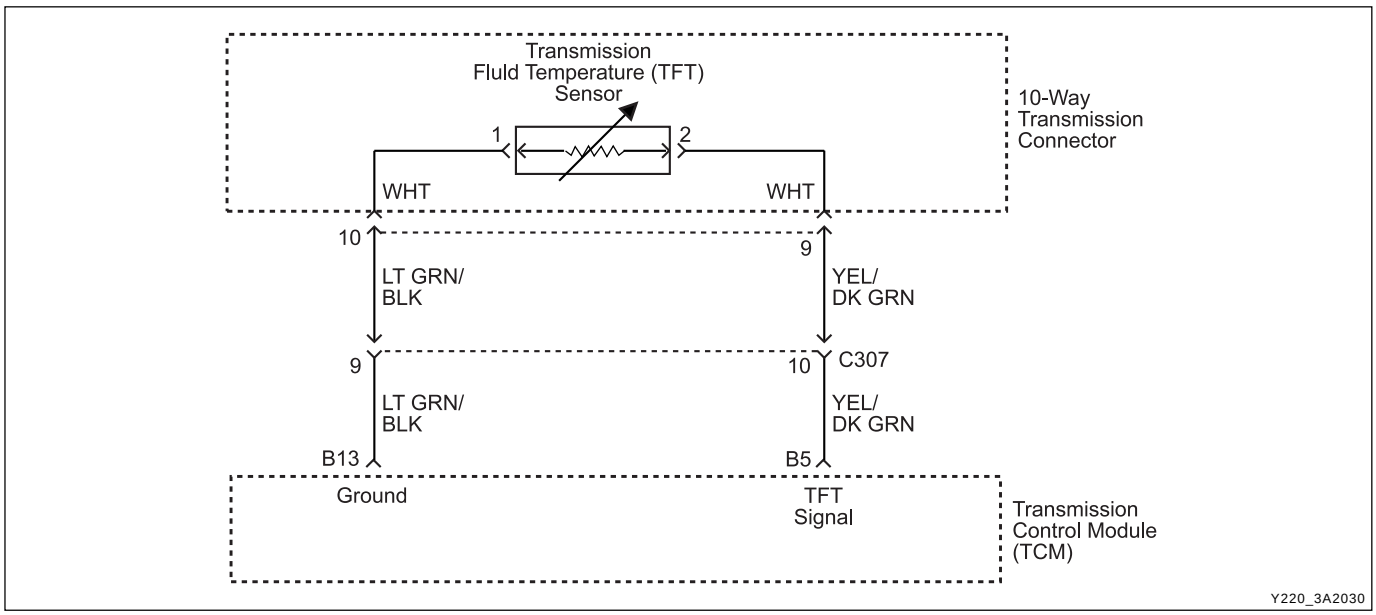

▶ DIAGNOSTIC TROUBLE CODE (DTC) P0710 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT MALFUNCTION

Circuit Description

The Transmission Fluid Temperature (TFT) sensor is a thermistor located in the solenoid wiring loom within the valve body of the transmission. This sensor is a typical Negative Temperature Coefficient (NTC) resistor with low temperatures producing a high resistance and high temperatures producing a low resistance.

If the transmission fluid temperature exceeds 135 °C (275 °F), the TCM will impose converter lock-up at lower vehicle speeds. Favour a lower gear to increase engine speed, and in some vehicles flashes the mode indicator lamp. This results in maximum oil flow through the exter-nal oil cooler and eliminates slippage in the torque converter. Both these actions combine to reduce the oil temperature in the transmission.

The DTC P0710 sets when the TFT sensor signal is not feasible.

Conditions for Setting the DTC

- Transmission fluid temperature sensor signal is greater than 4.88 volts (immediate detection).
- Transmission fluid temperature sensor signal is less than 0.21 volts (immediate detection).
- Transmission temperature has not changed by 2°C in 15 minutes since ignition on and temperature is less than 20°C or greater than 125°C.

Action Taken When the DTC Sets

- Transmission fluid temperature is assumed to be 120°C (248°F).
- All shifts will be firm until the transmission has warmed up because a high transmission fluid temperature is assumed.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred for 3 seconds.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- The voltage measured by the TCM across the transmission fluid temperature input terminals has been outside acceptable levels.
- If the DTC sets when an accessory is operated, check for a poor connection or excessive current draw.
- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also, check for chafed wires that could short to bare metal or other wiring. Inspect for broken wires inside the insulation.
- In searching for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

5. This step simulates a DTC P0710 condition. If the scan tool displays the specified value, the TFT sensor signal circuit and the TCM are OK.

DTC P0710 Transmission Fluid Temperature Sensor Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to “TCM Diagnostic System Check”
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Select T/M Fluid Temperature on scan tool Data List. Is the TFT sensor value less than specified value?	0.21 V	Go to Step 4	Go to Step 3
3	Is the TFT sensor value greater than specified value?	4.88 V	Go to Step 7	Go to “Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector (additional DTCs will set). 3. Turn the ignition ON. Is the TFT sensor value greater than the specified value?	4.88 V	Go to Step 6	Go to Step 5
5	1. Turn the ignition OFF. 2. Disconnect the TCM connector B. 3. Turn the ignition ON. 4. With a test light connected to B+, probe the TFT sensor signal circuit, terminal 9 at the 10-way transmission connector. Does the test light illuminate?	-	Go to Step 8	Go to Step 14
6	Replace the TFT sensor. Is the action complete?	-	Go to Step 16	-
7	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector (additional DTCs will set). 3. Turn the ignition ON. 4. Jumper the TFT ground circuit terminal 10 to the TFT sensor signal circuit terminal 9 at the 10-way transmission connector. Is the TFT sensor value less than specified value?	0.21 V	Go to Step 6	Go to Step 9
8	Repair the short to ground in the TFT sensor signal circuit as necessary. Is the repair complete?	-	Go to Step 16	-
9	With a test light connected to B+, probe the TFT sensor ground circuit at terminal 10 at the 10-way transmission connector. Does the test light illuminate?	-	Go to Step 10	Go to Step 11
10	1. Turn the ignition OFF. 2. Disconnect the TCM connector B. 3. Turn the ignition ON. 4. Check the TFT sensor signal circuit, terminal 9 at the 10-way transmission connector for an open or short to voltage. Is a problem found?	-	Go to Step 13	Go to Step 14

DTC P0710 Transmission Fluid Temperature Sensor Circuit Malfunction (Cont'd)

Step	Action	Value(s)	Yes	No
11	1. Turn the ignition OFF. 2. Disconnect the TCM connector B. 3. Turn the ignition ON. 4. Check the TFT sensor ground circuit for an open. Is a problem found?	-	Go to Step 12	Go to Step 14
12	Repair the TFT ground circuit for an open. Is a repair complete?	-	Go to Step 16	-
13	Repair an open or short to voltage in the TFT sensor signal circuit as necessary. Is the repair complete?	-	Go to Step 16	-
14	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 16	Go to Step 15
15	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 16	-
16	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 17	Go to Step 2
17	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 3 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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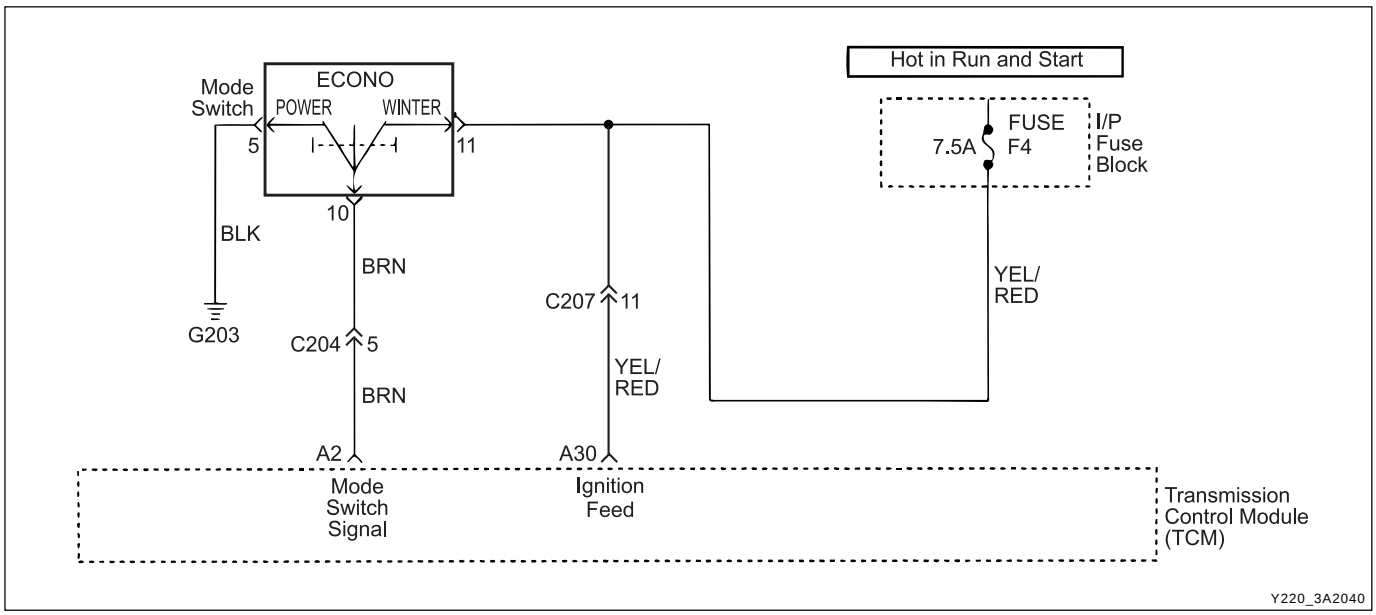

▶ DIAGNOSTIC TROUBLE CODE (DTC) P0790 NORMAL/PERFORMANCE SWITCH CIRCUIT MALFUNCTION

Circuit Description

The driving mode selector switch is located on the center console and allows the driver to select the driving mode.

When NORMAL mode is selected upshifts will occur to maximize fuel economy. When POWER mode is se-lected, upshifts will occur to give maximum performance and the POWER mode indicator light is switched ON.

When WINTER mode is selected, starting in second gear is facilitated, the WINTER mode indicator light is switched ON and the POWER mode indicator light is switched OFF.

The DTC P0790 sets when an intermittent connection in the mode selector switch (mode switch) circuit has been detected. The mode switch input is rapidly changing states. The switching frequency is greater than 8.3 Hz.

Conditions for Setting the DTC

- The mode switching frequency is greater than 8.3 Hz.
- The above condition must be continuously present for 4 state changes.

Action Taken When the DTC Sets

- All shifts will occur as if the mode is set to NORMAL.
- The mode indicator will always be OFF indicating that NORMAL mode is selected.
- The mode indicator will not respond to the changes in switch setting.

Conditions for Clearing the DTC

- The DTC will clear after 3 seconds without the fault.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- This fault is caused by too many changes in the mode input signal over a period of time.
- Typical causes would be an intermittent connection in the switch or wiring or an intermittent short to ground in the wiring.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Check mode switch signal circuit for an intermittent open / short
5. Check mode switch ground circuit for an intermittent open / short
8. Check mode switch feed circuit for an intermittent open / short

DTC P0790 Normal/Performance Switch Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P0790?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the mode switch connector. Refer to Shift Control Lever in this section. 3. Turn the ignition ON. 4. Select Mode Switch on scan tool Data List. Is the Mode Switch value frequently changing?	-	Go to Step 4	Go to Step 5
4	1. Turn the ignition OFF. 2. Disconnect the TCM connector A. 3. Check the mode switch signal circuit for an intermittent open or short and repair as necessary. Is a repair necessary?	-	Go to Step 13	Go to Step 10
5	Jumper the mode switch ground terminal 5 to the signal terminal 10. Is the Mode Switch value frequently changing?	-	Go to Step 6	Go to Step 7
6	1. Turn the ignition OFF. 2. Disconnect the TCM connector A. 3. Check the mode switch ground circuit for an intermittent open and repair as necessary. Is a repair complete?	-	Go to Step 13	-
7	Check the fuse F4 for a malfunctioning and replace as necessary? Is a repair necessary?	-	Go to Step 13	Go to Step 8
8	Jumper the mode switch feed terminal 11 to the signal terminal 10. Is the Mode Switch value frequently changed?	-	Go to Step 9	Go to Step 11
9	1. Turn the ignition OFF. 2. Disconnect the TCM connector A. 3. Check the mode switch feed circuit for an intermittent open and repair as necessary. Is a repair complete?	-	Go to Step 13	-

DTC P0790 Normal/Performance Switch Circuit Malfunction (Cont'd)

Step	Action	Value(s)	Yes	No
10	Check for a poor connection at the mode switch and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 13	Go to Step 12
11	Replace the mode switch. Refer to Shift Control Lever in this section. Is the action complete?	-	Go to Step 13	-
12	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 13	-
13	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 14	Go to Step 2
14	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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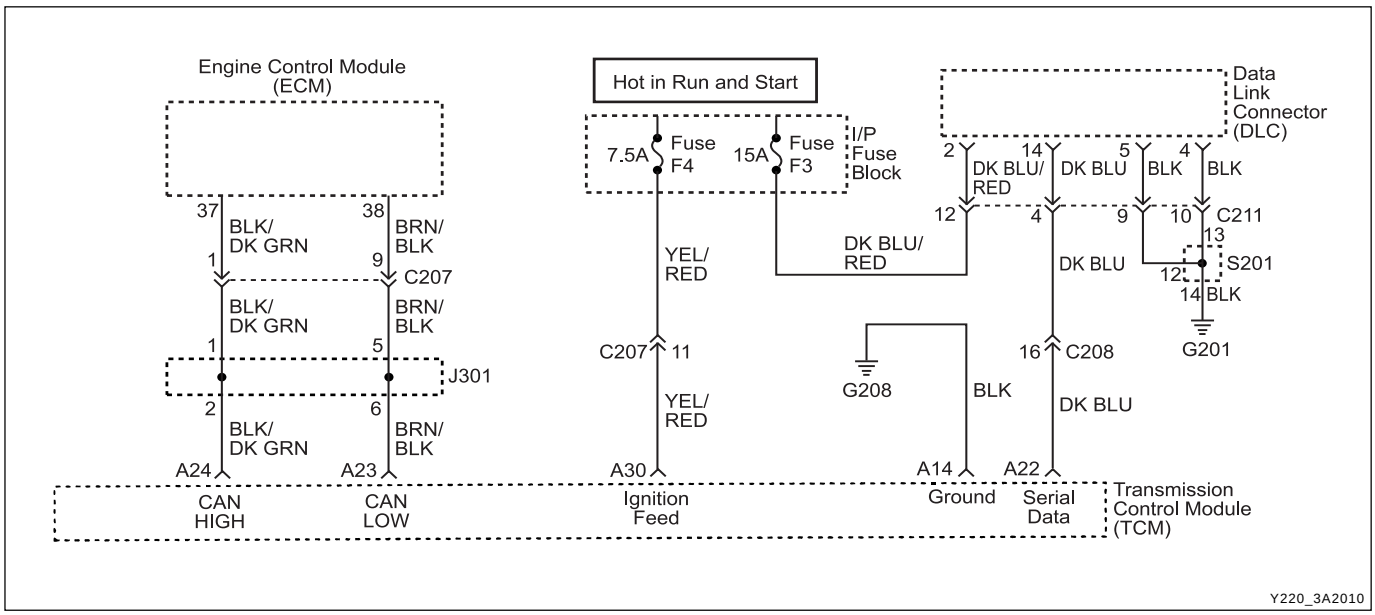


▶ DIAGNOSTIC TROUBLE CODE (DTC) P1703 ENGINE SPEED SIGNAL ERROR

Circuit Description

The Controller Area Network (CAN) connects various control modules by using a twisted pair of wires, to share common information. This results in a reduction of sensors and wiring. TCM obtains the actual engine speed and throttle position, vehicle speed and accelerator position etc. from ECM via CAN without any additional sensors.

The DTC P1703 sets when the engine speed signal via CAN is out of range or not feasible: The engine speed signal is greater than 7000 rpm or less than 0 rpm, or the indicated engine speed is low while other signals indicate the car is moving (i.e. the vehicle speed has increased more than 125 rpm).

Conditions for Setting the DTC

- Immediately upon the test indicating malfunction as follows.
- The engine speed signal is greater than 7000 rpm or less than 0 rpm under the precondition that DTC P1719 is not set.
- The indicated engine speed is low while other signals indicate the car is moving, i.e. the vehicle speed has increased more than 125 rpm under the following precondition;
  - Driving gear is selected.
  - The applied throttle is greater than 5 %.
  - The engine speed is less than 550 rpm.
  - DTCs P0706, P0707, P0708, P1704, P1719 and 1721 are not set.

Action Taken When the DTC Sets

- Fault detection of some other signals will not possible.

Conditions for Clearing the DTC

- The DTC will clear after 30 seconds without the fault.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and ECM connectors. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.
- When ECM finds a fault on the engine speed signals, ECM will adopt a default mode and send the default value and trouble message to TCM via CAN.

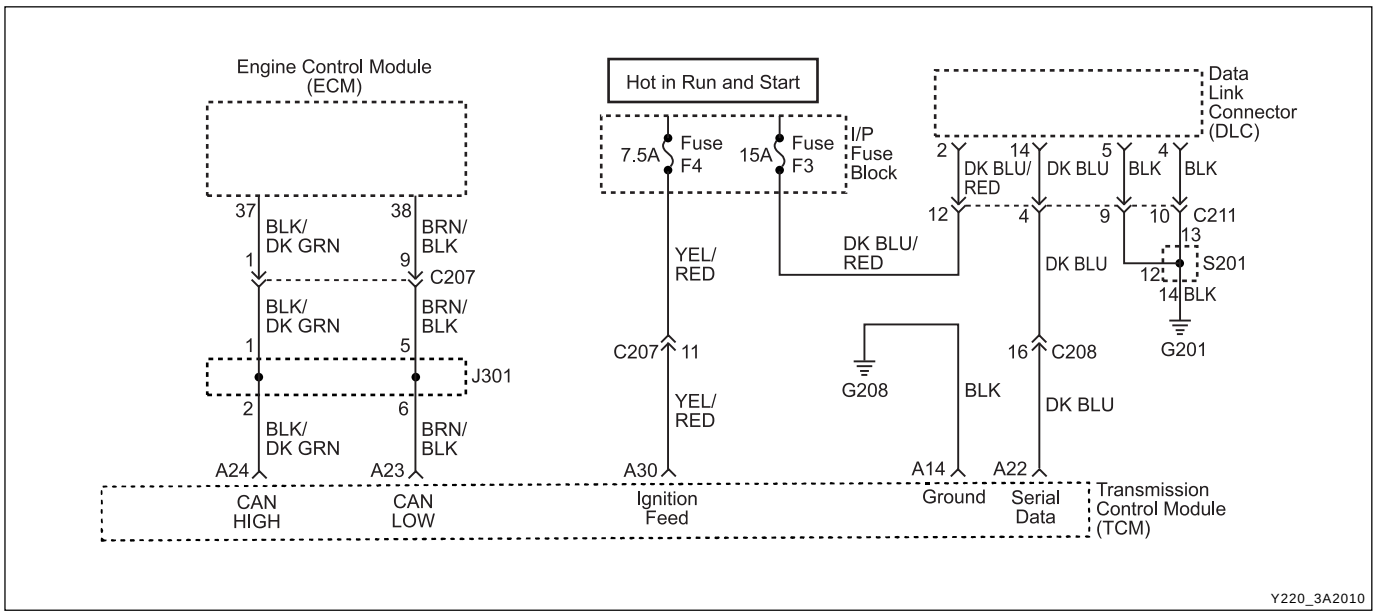
Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Check if there are any DTCs related to the engine speed sensor on the ECM side.
4. Check for a poor connection at the ECM and TCM connectors.

DTC P1703 Engine Speed Signal Error

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to “TCM Diagnostic System Check”
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1703?	-	Go to Step 3	Go to “Diagnostic Aids”
3	Check if there are any DTCs related to the engine speed sensor on the ECM side. Are any DTCs related to engine speed sensor found?	-	Go to Section Engine Controls	Go to Step 4
4	Check for a poor connection at the ECM connector or TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 6	Go to Step 5
5	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 6	-
6	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 7	Go to Step 2
7	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete



▶ DIAGNOSTIC TROUBLE CODE (DTC) P1704 SHAFT SPEED SIGNAL ERROR

Circuit Description

The Controller Area Network (CAN) connects various control modules by using a twisted pair of wires, to share common information. This results in a reduction of sensors and wiring. TCM obtains the actual engine speed and throttle position, vehicle speed and accelerator position etc. from ECM via CAN without any additional sensors.

The DTC P1704 sets when the indicated drive shaft speed signal via CAN is out of range or not feasible or a shaft speed of 0 is present while other signals indicate the vehicle is being driven.

Conditions for Setting the DTC

- Immediately upon the test indicating malfunction as follows.
- The shaft speed signal is greater than 9000 rpm or less than 0 rpm under the precondition that DTC P1719 is not set.
- The shaft speed indicates 0 rpm while all other signals indicate the car is moving under the following precondition;
  - Driving gear is selected.
  - The transmission range sensor has not recently changed state.
  - The engine speed is greater than 2800 rpm.
  - DTCs P0706, P0707, P0708, P1703 and P1719 are not set.
- The shaft speed has dropped from above 2100 rpm to 0 rpm within 20ms.

Action Taken When the DTC Sets

- All skip downshifts disabled and fourth gear will be inhibited.
- The torque converter will be unlocked at all times.
- Gears are selected by the shift control lever but all downshifts are inhibited by engine speed limits to prevent over-revving.
- D position selects 3rd gear.
- 1st and 2nd gears can be manually selected.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred for 30 seconds and a non-zero speed is detected.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and ECM connectors. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.

- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.
- When ECM finds a fault on the vehicle speed signals, ECM will adopt a default mode and send the default value and trouble message to TCM via CAN.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Check if there are any DTCs related to the vehicle speed sensor on the ECM side.
4. Check a poor connection at the ECM and TCM connectors.

DTC P1704 Shaft Speed Signal Error

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1704?	-	Go to Step 3	Go to "Diagnostic Aids"
3	Check if there are any DTCs related to the vehicle speed sensor on the ECM side. Are any DTCs related to vehicle speed sensor found?	-	Go to Section *Engine Controls*	Go to Step 4
4	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 5	-
5	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 6	Go to Step 2
6	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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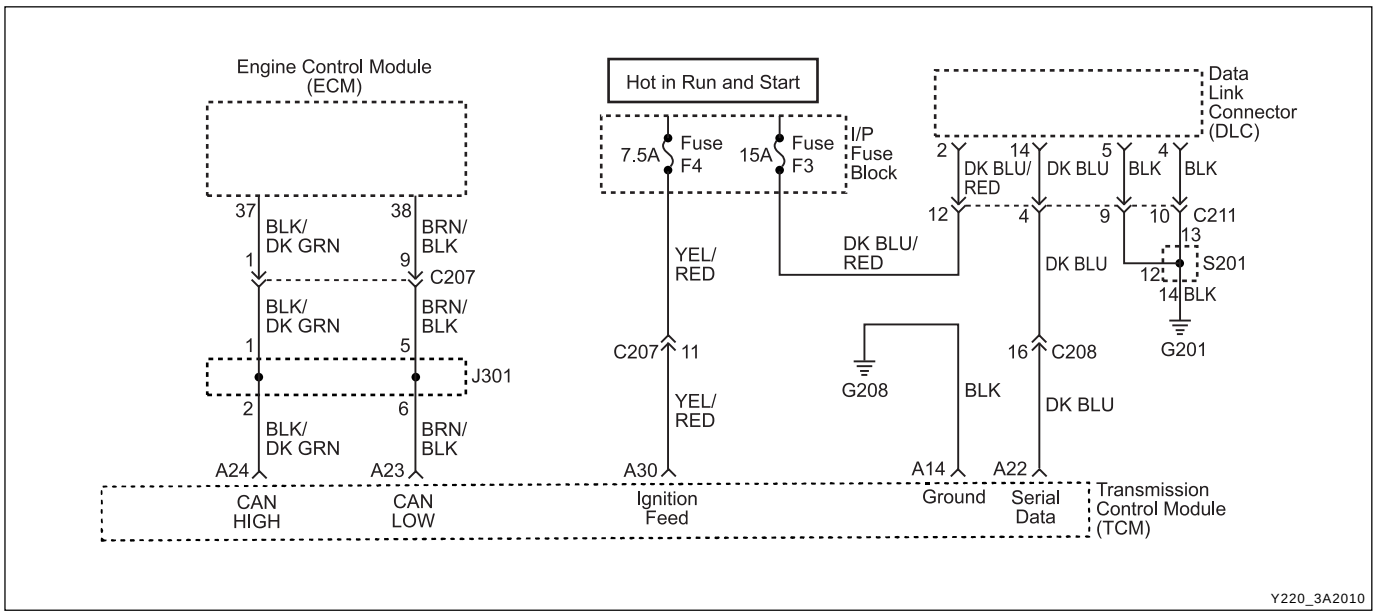


▶ DIAGNOSTIC TROUBLE CODE (DTC) P1708 TCM SUPPLY VOLTAGE LOW

Circuit Description

The battery voltage monitoring input is connected to the positive side of the battery. This signal is taken from the main supply to the TCM.

If the battery voltage at the TCM falls below the thresh-old value, DTC P1708 will be set and the transmission will adopt a low voltage mode of operating in which shifts into first gear are inhibited. All other shifts are attempted but may not occur because of the reduced voltage. This condition normally occurs only when the battery is in poor condition.

When system voltage recovers, the TCM will resume normal operation after a 30 seconds delay period.

Conditions for Setting the DTC

- The engine speed is greater than 550 RPM.
- A driving gear is selected or one of DTCs P0706, P0707 and P0708 is set.
- The indicated supply voltage falls below a linear temperature characteristic threshold or below that required to operate the CPU. If the TCM measures the supply voltage at less than that required for it to be operating, the DTC sets immediately.

Action Taken When the DTC Sets

- 1st gear is inhibited.
- S6 is inhibited.
- S5 standby current is zero.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred for 30 seconds.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- The minimum operating voltage depends on the transmission temperature but is typically between 8 ~ 9 V for a warm transmission.
- If the DTC sets when an accessory is operated, check for a poor connection.
- Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also, check for chafed wires that could short to bare metal or other wiring. Inspect for broken wires inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

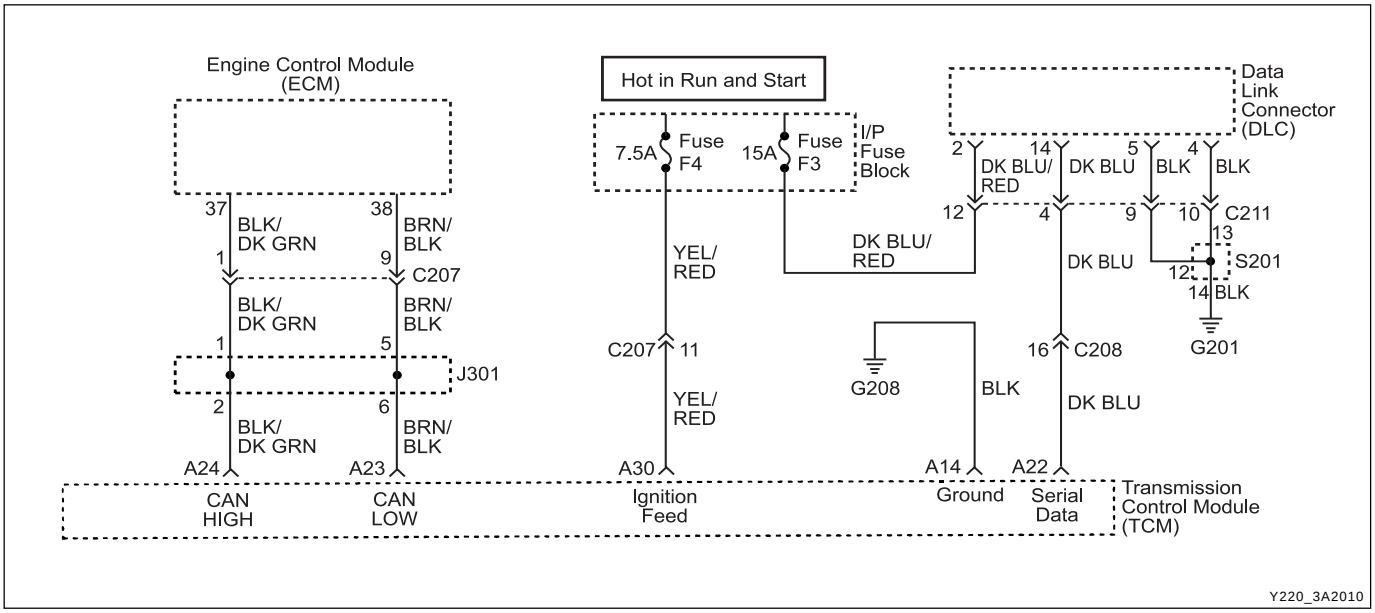
Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

4. Check if the generator is malfunctioning under load condition.
8. Check the ignition feed circuit for excessive resistance.

DTC P1708 TCM Supply Voltage Low

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to “TCM Diagnostic System Check”
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1708?	-	Go to Step 3	Go to “Diagnostic Aids”
3	1. Isolate the driven wheels from the ground and apply the hand brake. 2. Start the engine and allow it to idle. 3. Move the gear lever to Drive. 4. Select the Ignition Voltage on the scan tool Data List. Is the Ignition Voltage less than the specified value?	10 V	Go to Step 4	Go to Step 10
4	While running the engine at the specified value, measure the battery voltage at the battery using a DVM. Is the battery voltage greater than the specified value?	Idle in Drive 12 V	Go to Step 5	Go to Section *Engine Electrical*
5	Check the fuse F4 for a malfunction and replace as necessary? Is a repair necessary?	-	Go to Step 10	Go to Step 6
6	1. Turn the ignition OFF. 2. Disconnect the TCM connector A. 3. Start the engine and raise the engine speed to specified value. 4. While running the engine at the specified value, measure the ignition voltage at the ignition feed circuit terminal A30 using a DVM. Is the ignition voltage greater than the specified value?	Idle in Drive 10 V	Go to Step 7	Go to Step 8
7	Check for a malfunctioning connection at the TCM harness terminals and repair as necessary. Is a repair necessary?	-	Go to Step 10	Go to Step 9
8	Repair the poor connection (high resistance) at the ignition feed circuit. Is the action complete?	-	Go to Step 10	-
9	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 10	-
10	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 11	Go to Step 2
11	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete



▶ DIAGNOSTIC TROUBLE CODE (DTC) P1709 TCM SUPPLY VOLTAGE HIGH

Circuit Description

The battery voltage monitoring input is connected to the positive side of the battery. This signal is taken from the main supply to the TCM.

If the battery voltage is greater than 16.5 V, DTC P1709 will be set and the transmission will adopt limp home mode and all solenoids are turned OFF.

Conditions for Setting the DTC

- The indicated supply voltage is greater than 16.5 V.
- The malfunction triggers immediately after this condition exists.

Action Taken When the DTC Sets

- All solenoids are turned OFF while the high battery voltage condition is detected.
- The transmission goes into Limp Home Mode (LHM).

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred for 30 seconds.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- The voltage measured by the TCM corresponding to the battery supply voltage has been outside the range of the maximum operating voltage of 16.5 V.
- Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also, check for chafed wires that could short to bare metal or other wiring. Inspect for broken wires inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

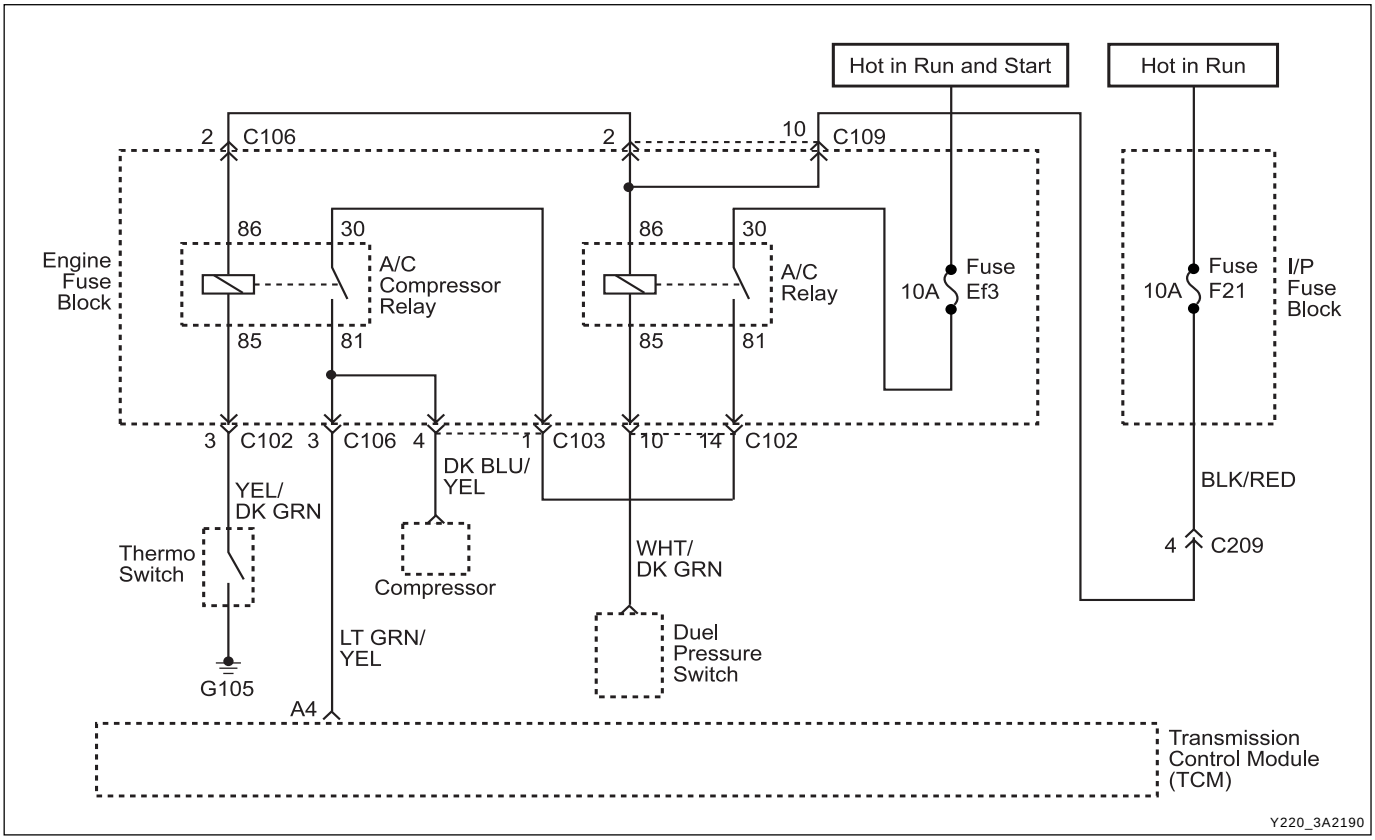
Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

4. Checks if the generator is malfunctioning under load conditions.
5. Check connection of other connectors.

DTC P1709 TCM Supply Voltage High

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1709?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Start the engine and raise the engine speed to the specified value. 2. Select the Ignition Voltage on the scan tool Data List. Is the Ignition Voltage greater than the specified value?	1500 rpm 16.5 V	Go to Step 4	Go to Step 8
4	While running the engine at the specified value, measure the battery voltage at the battery using a DVM. Is the battery voltage less than the specified value?	2000 rpm 16.5 V	Go to Step 5	Go to Section *Engine Electrical*
5	1. Turn the ignition OFF. 2. Disconnect the TCM connector A. 3. Start the engine and raise the engine speed to the specified vale. 4. While running the engine at the specified value, measure the ignition voltage at the ignition feed circuit terminal A30 with respect to the ground terminal A14. Is the ignition voltage greater than the specified value?	1500 rpm 16.5 V	Go to Step 6	Go to Step 7
6	Check the wiring harness from the fuse F4 to TCM terminal A30 and from the ground G208 to TCM terminal A14 for damage.	-	Go to Step 8	-
7	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 8	-
8	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 9	Go to Step 2
9	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete



▶ DIAGNOSTIC TROUBLE CODE (DTC) P1710 AIR CONDITIONING SWITCH CIRCUIT MALFUNCTION

Circuit Description

The Air Conditioning Switch circuit indicates the state of the air conditioning compressor clutch (on or off). This signal is available to the TCM only on vehicles fitted with air conditioning.

The DTC 1710 sets when an intermittent connection in the air conditioning switch circuit has been detected. The switch input is rapidly changing states and the switching frequency is greater than 8.3 Hz.

Conditions for Setting the DTC

- The mode switching frequency is greater than 8.3 Hz.
- The above condition must be continuously present for 4 state changes.

Action Taken When the DTC Sets

- The TCM does not compensate for torque variation due to air conditioning compressor clutch activation.

Conditions for Clearing the DTC

- The DTC will clear after 3 seconds without the fault.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- This fault is caused by too many changes in the mode input signal over a period of time.
- Typical causes would be an intermittent connection in the switch or wiring or an intermittent short to ground in the wiring.

DTC P1710 Air Conditioning Switch Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	Perform a TCM Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1710.	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the air conditioning compressor relay connector. 3. Turn the ignition ON. 4. Select Air Conditioning Compressor Switch on scan tool Data List. Is the value frequently changing?	-	Go to Step 4	Go to Step 5
4	1. Turn the ignition OFF. 2. Disconnect the TCM connector A. 3. Check the air conditioning compressor signal circuit for an intermittent open or short and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 8
5	1. Jumper the air conditioning compressor relay connector terminal 30 and 87. 2. Turn the air conditioning switch ON. Is the air conditioning compressor switch value frequently changing?	-	Go to Step 6	Go to Step 7
6	1. Turn the ignition OFF. 2. Disconnect the TCM connector B. 3. Check the air conditioning compressor signal circuit for an intermittent open and repair as necessary. Is a repair complete?	-	Go to Step 11	-
7	Check the fuse Ef3 for a malfunctioning and replace as necessary? Is a repair necessary	-	Go to Step 11	Go to Step 9
8	Check for a poor connection at the air conditioning compressor relay and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10
9	Replace the air conditioning compressor relay. Is the action complete?	-	Go to Step 11	-
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-

DTC P1710 Air Conditioning Switch Circuit Malfunction (Cont'd)

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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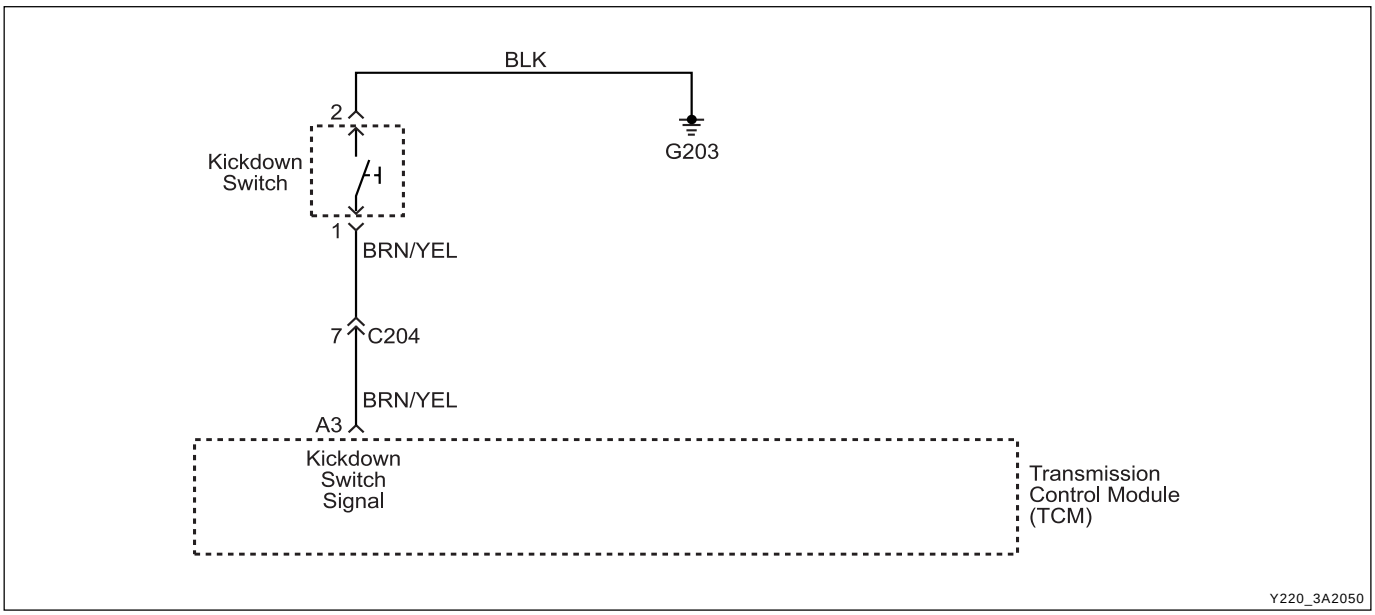

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1712 KICKDOWN SWITCH CIRCUIT MALFUNCTION

Circuit Description

The Kickdown Switch is used to signal the TCM that the driver requires kickdown indicating the driver pressed the accelerator to the floor. When this switch is used in high range non-winter mode driving, the POWER light comes ON.

The DTC sets when the kickdown switch has an intermittent connection or is stuck ON. Kickdown Switch is closed when other signals indicate otherwise, i.e. the accelerator pedal is released and the engine is running. Or the switch is cycling open/closed more rapidly than the normal operation allows.

Conditions for Setting the DTC

- DTCs P1703, P1713 and P1719 are not set.
- Kickdown Switch is closed when other signals indicate otherwise, i.e. the accelerator pedal is released and the engine is running.
- The switch is cycling open/closed more rapidly than normal operation allows : 10 state changes in less than 30 milliseconds.

Action Taken When the DTC Sets

- Kickdown Switch feature is disabled while the fault exists.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred for 30 seconds.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- Typical causes would be an short circuit within the switch, or a short circuit to ground in the wiring to the switch.
- Inspect the wiring for poor electrical connections at the TCM and at the Kickdown Switch connector. Look for possible bent, backed out, deformed or damagednterminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

4. Checks if the kickdown signal circuit is malfunctioning.
7. Checks if the kickdown ground circuit is malfunctioning.
8. Check resistance between Kickdown Switch terminal 4 and 2.
12. Check connections of other connectors.

DTC P1712 Kickdown Switch Circult Malfunction

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Select the Kickdown Switch on the scan tool. Is the Kickdown Switch value frequently changed ON/ OFF or continuously ON?	-	Go to Step 4	Go to Step 3
3	Push the accelerator pedal fully to the Kickdown Switch. Is the Kickdown Switch value frequently changed OFF/ON?	-	Go to Step 7	Go to "Diagnostic Aids"
4	1. Turn the ignition OFF. 2. Disconnect the Kickdown Switch connector. Refer to the Kickdown Switch in this section. 3. Turn the ignition ON, with the engine OFF. Is the Kickdown Switch value frequently changed ON/ OFF or continuously ON?	-	Go to Step 5	Go to Step 8
5	1. Turn the ignition OFF. 2. Disconnect the TCM connector A. 3. Check the Kickdown Switch signal circuit from Kickdown Switch connector terminal 1 to TCM terminal A3 for a short to ground. Is a short to ground found?	-	Go to Step 6	Go to Step 14
6	Repair the short to ground or an open in the Kickdown Switch signal circuit. Is the action complete?	-	Go to Step 15	-
7	1. Turn the ignition OFF. 2. Disconnect the Kickdown Switch connector. Refer to the Kickdown Switch in this section. 3. With a test light connected to B+, probe the Kickdown Switch ground circuit, terminal 2. Does the test light illuminate?	-	Go to Step 10	Go to Step 11
8	Check the resistance between Kickdown Switch terminal 1 and 2 when pushing the switch and not pushing. Is the resistance within the specified value?	Push: less than 5 Ω No push: Open Loop	Go to "Diagnostic Aids"	Go to Step 9
9	Replace the Kickdown Switch. Is the action complete?	-	Go to Step 15	-
10	1. Turn the ignition OFF. 2. Disconnect the TCM connector A. 3. Check the Kickdown Switch signal circuit from Kickdown Switch connector terminal 1 to TCM terminal A3 for an open. Is an open founded?	-	Go to Step 6	Go to Step 12
11	Repair the open in the Kickdown Switch ground circuit. Is the action complete?	-	Go to Step 15	-

DTC P1712 Kickdown Switch Circult Malfunction (Cont'd)

Step	Action	Value(s)	Yes	No
12	Check for a poor connection at the Kickdown Switch connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 15	Go to Step 13
13	Check the resistance between kickdown switch terminal 1 and 2 when pushing the switch. Is the resistance within the specified value and steady?	less than 5 Ω	Go to Step 14	Go to Step 9
14	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 15	-
15	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 16	Go to Step 2
16	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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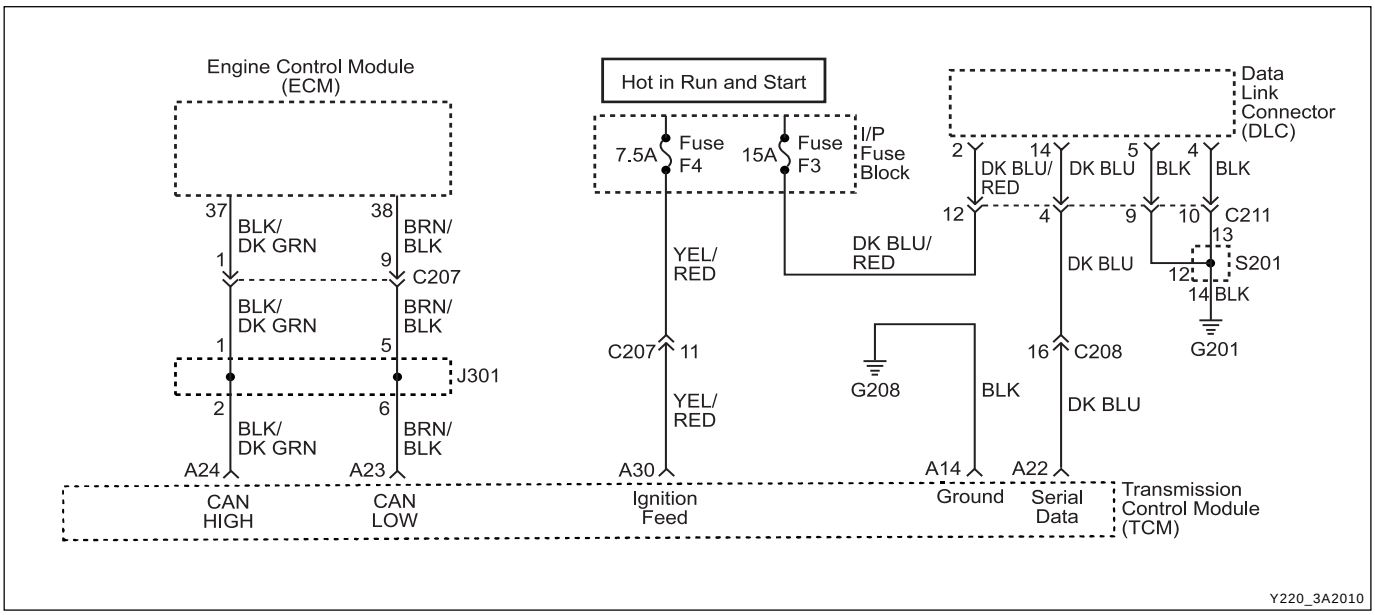

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1713 PEDAL SIGNAL ERROR

Circuit Description

The Controller Area Network (CAN) connects various control modules by using a twisted pair of wires, to share common information. This results in a reduction of sensors and wiring. TCM obtains the actual engine speed and throttle position, vehicle speed and accelerator pedal position etc. from ECM via CAN without any additional sensors.

The DTC P1713 sets when the accelerator pedal signal via CAN is out of range. The accelerator pedal signal is greater than 254 steps.

Conditions for Setting the DTC

- DTCs P1719 is not set.
- The accelerator pedal signal is greater than 254 steps. The malfunction is triggered immediately after this condition exists.

Action Taken When the DTC Sets

- 4th gear is inhibited.
- Torque Converter Clutch (TCC) is inhibited.
- Default value is adopted for shift point decisions.
- Accelerator pedal is not used for P, R, or N B2 activation decisions.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred for 30 seconds.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and ECM connectors. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.
- When ECM finds a fault on the accelerator pedal signals, ECM will adopt a default mode and send the default value and trouble message to TCM via CAN.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Check if there are any DTCs related to the accelerator pedal sensor on the ECM side.
4. Check for a poor connection at the ECM and TCM connectors.

DTC P1713 Pedal Signal Error

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1713?	-	Go to Step 3	Go to "Diagnostic Aids"
3	Check if there are any DTCs related to the accelerator pedal sensor on the ECM side. Are any DTCs related to accelerator pedal sensor found?	-	Go to *Section Engine Controls*	Go to Step 4
4	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 5	-
5	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 6	Go to Step 2
6	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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▶ DIAGNOSTIC TROUBLE CODE (DTC) P1714 EEPROM VEHICLE CODE ERROR

System Description

The Electrically Erasable Programmable Read-Only Memory (EEPROM) is a permanent memory chip that is physically soldered within the Transmission Control Module (TCM) The EEPROM contains the program and the calibration information required for transmission and transmission diagnostics operation.

The DTC P1714 sets when the vehicle ID stored in EEPROM is out of range when checked on initialization. The EEPROM Vehicle identification Number (VIN) value does not lie within the range 0-13.

Conditions for Setting the DTC

- DTC P1720 is not set.
- The vehicle type is not recognized. The EEPROM Vehicle Identification Number (VIN) value does not lie within the range 0-13. The malfunction is triggered immediately after this condition exists.

Action Taken When the DTC Sets

- If CAN is detected, OBD N32D VIN is selected. Or If CAN is not detected, P29 STi VIN is selected.
- Shift quality may by degraded.

Conditions for Clearing the DTC

- This DTC can only be cleared by reprogramming the EEPROM with the correct vehicle code and than cycling power to the TCM. This is a factor procedure.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Perform the vehicle coding.

DTC P1714 EEPROM Vehicle Code Error

Step	Action	Value(s)		No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1714?	-	Go to Step 3	Go to Step 6
3	1. Select the required VIN on TCM Coding of scan tool. 2. Perform the vehicle coding. 3. Turn the ignition OFF. 4. Turn the ignition ON, with the engine OFF. Does the scan tool display P1714?	-	Go to Step 4	Go to Step 5
4	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 5	-
5	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 6	Go to Step 2
6	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1715 VPS OFFSET ERROR

Circuit Description

The VPS is used to regulate the clutch and band pressures during a shift. The TCM compares TP voltage, engine rpm and other inputs to determine the pressure appropriate for a given shift. The TCM will regulate pressure by applying a varying amperage to the Variable Pressure Solenoid (VPS) valve. The applied amperage can vary from 0 to 1. 275 amps. The TCM then monitors the amperage at the return line.

This VPS offsets calibrate the accuracy between actual and expected VPS current.

The DTC P1715 sets when the VPS offset value stored in EEPROM is out of range when checked on initialization. The VPS offset is greater than 120 mA from nominal.

Conditions for Setting the DTC

- DTC P1720 is not set.
- The VPS offset is greater than 120 mA from nominal. The malfunction is triggered immediately after this condition exists.

Action Taken When the DTC Sets

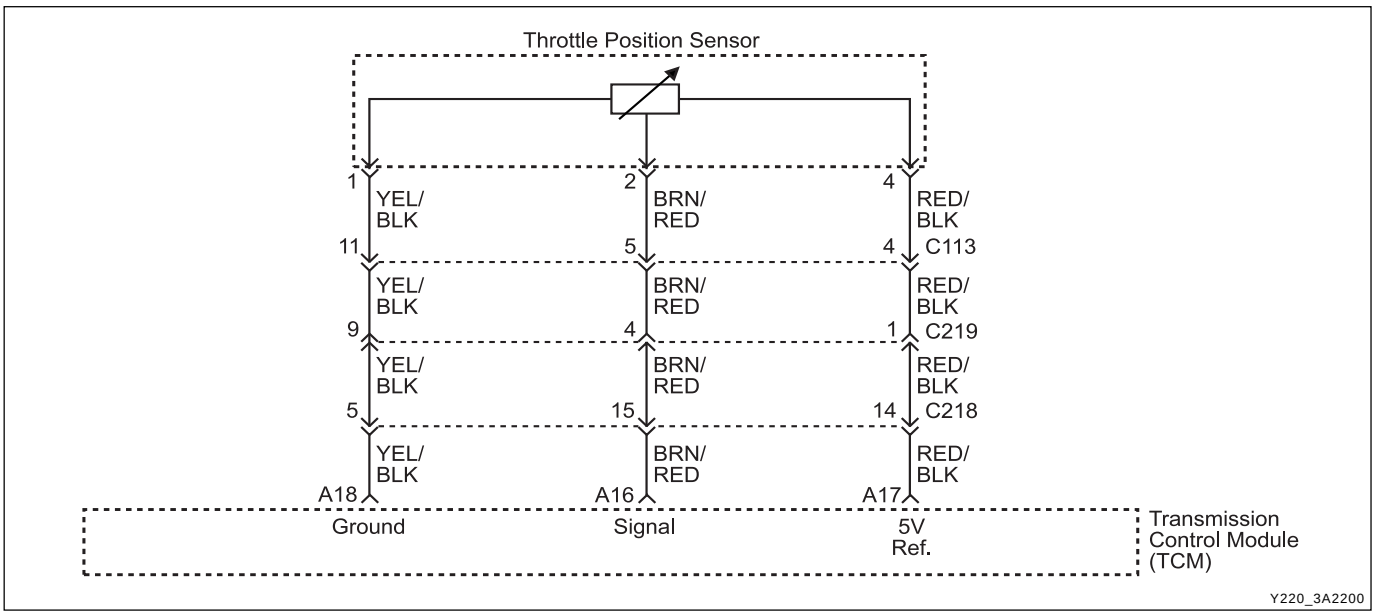
- Default values are used which are typical of the calibrated values.
- Shift quality may be degraded.

Conditions for Clearing the DTC

- This DTC can only be cleared by recalibrating the VPS and then cycling power to the TCM. This is a factory procedure.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

DTC P1715 VPS Offset Error

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1715?	-	Go to Step 3	Go to Step 5
3	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 4	-
4	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 5	Go to Step 2
5	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete



▶ DIAGNOSTIC TABLE CODE (DTC) 1716 THROTTLE NOT LEARNT ERROR

Circuit Description

The Controller Area Network (CAN) connects various control modules by using a twisted pair of wires, to share common information. This results in a reduction of sensors and wiring. TCM obtains the actual engine speed and throttle position, vehicle speed and accelerator etc. from ECM via CAN without any additional sensors.

The DTC P1716 sets when the throttle signal via CAN is out of range. The throttle is greater than 254 steps.

Conditions for Setting the DTC

- The minimum & maximum throttle positions have not been learnt by the TCU.

Action Taken When the DTC Sets

- The minimum & maximum throttle positions are set to their factory default values.
- Incorrect sensitivity to driver demand.
- Incorrect gear shift points.

Conditions for Clearing the DTC

- Throttle learns 0 % position. This value must be greater than 0.2 V.

Diagnostic Aids

- This fault indicates that the TCU has not learnt the throttle position correctly since installation in the vehicle or that the throttle setting have been cleared by a diagnostic tool.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

4. The “Throttle Position Calibration Procedure” needs to be carried out. This is given in this section.

DTC P1716 Throttle Not Learnt Error

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1716?	-	Go to Step 3	Go to "Diagnostic Aids"
3	Check if there are any DTCs related to the throttle position sensor. Are any DTCs related to throttle position sensor found?	-	Go to applicable DTC table	Go to Step 4
4	Fulfill the Throttle Clearing and Throttle Position Calibration. Is the repair complete?	-	Go to Step 6	Go to Step 5
5	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 6	-
6	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 7	Go to Step 2
7	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1717 RAM ERROR

Circuit Description

A normal function of the Transmission Control Module (TCM) programming is to perform an internal check that verifies the integrity of the RAM memory allocations.

The DTC P1717 sets when the Random Access Memo-ry (RAM) is not operating correctly when checked on initialization. An area of RAM has failed a read/ write test.

Conditions for Setting the DTC

- An area of RAM has failed a read/ write test.
- Immediately after the above condition occurs.

Action Taken When the DTC Sets

- Adopt Limp Home Mode (LHM)
- Outputs are disabled.
- The transmission adopts the third gear LHM strategy of operation, independent of the vehicle speed. The operation of TCM under this condition is difficult to predict. Its operation may be erratic.

Conditions for Clearing the DTC

- The DTC will clear if the malfunction is not present after cycling the ignition.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- When DTC P1717 sets, the replacement of TCM is recommended.

DTC P1717 RAM Error

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to “TCM Diagnostic System Check”
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. Does the scan tool display P1717?	-	Go to Step 3	Go to “Diagnostic Aids”
3	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 4	-
4	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 5	Go to Step 2
5	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1718 ROM ERROR

Circuit Description

A normal function of the Transmission Control Module (TCM) programming is to perform an internal check that verifies the integrity of the ROM memory allocations. This function is called a checksum.

The DTC P1718 sets when the Read Only Memory (ROM), program memory, is corrupted when checked on initialization. The calculated checksum disagrees with the stored checksum.

Conditions for Setting the DTC

- TCM has been powered ON for greater than 7 seconds.
- The calculated checksum disagrees with the stored checksum. The malfunction is triggered immediately after this condition exists.

Action Taken When the DTC Sets

- Adopt Limp Home Mode (LHM)
- The transmission adopts the third gear LHM strategy of operation, independent of the vehicle speed. The operation of TCM under this condition cannot be predicted. Its operation may be erratic.

Conditions for Clearing the DTC

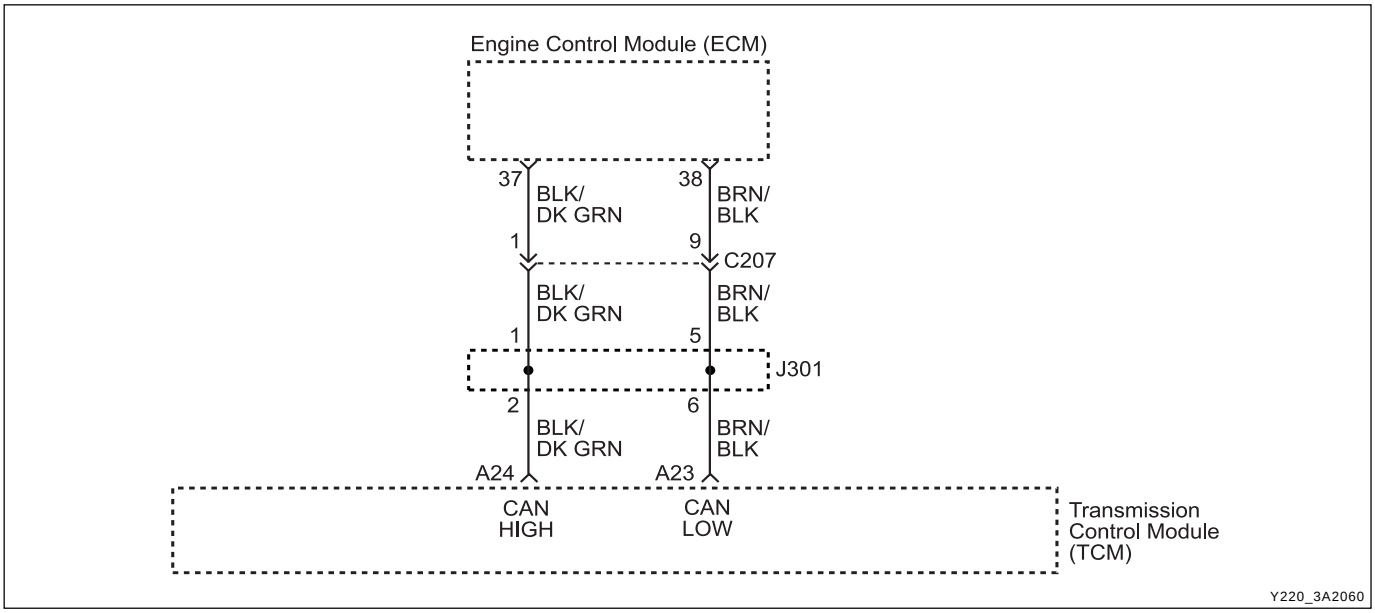
- The DTC will clear if the malfunction is not present after cycling the ignition.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- When DTC P1718 sets, the replacement of TCM is recommended.

DTC P1718 ROM Error

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. Does the scan tool display P1718?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 4	-
4	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 5	Go to Step 2
5	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete



▶ DIAGNOSTIC TROUBLE CODE (DTC) P1719 CAN BUS ERROR

Circuit Description

The Controller Area Network (CAN) connects various control modules by using a twisted pair of wires, to share common information. This results in a reduction of sensors and wiring. TCM obtains the actual engine speed and throttle position, vehicle speed and accelerator position etc. from ECM via CAN without any additional sensors.

The DTC P1719 sets when the information required by TCM is not available on the CAN. One or more CAN messages used by the TCM is timed out, i.e. not re-freshed for 1 second.

Conditions for Setting the DTC

- One or more CAN messages used by the TCM are timed out, i.e. not refreshed for 1 second.

Action Taken When the DTC Sets

- TCM uses default values for all CAN dependent signals.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred for 30 seconds.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and ECM connectors. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

6. Check for a poor connection at the ECM and TCM connectors.

DTC P1719 CAN Bus Error

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1719?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the TCM connector A. 3. Disconnect the Engine Control Module (ECM) connector. 4. Check the wiring harness from ECM connector terminal 38 to TCM connector terminal A23 for an open or a short. Is a problem found?	-	Go to Step 4	Go to Step 5
4	Repair the malfunctioning wiring harness. Is a repair complete?	-	Go to Step 10	-
5	Check the wiring harness from ECM connector terminal 37 to TCM connector terminal A24 for an open or a short. Is a problem found?	-	Go to Step 4	Go to Step 6
6	Check for a poor connection at the ECM connector or TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 10	Go to Step 7
7	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 8	-
8	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 10	Go to Step 9
9	1. Turn the ignition OFF. 2. Replace the TCM with the original.	-	Go to *Section Engine Control*	-
10	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 11	Go to Step 2
11	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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DIAGNOSTIC TROUBLE CODE (DTC) P1720 EEPROM ERROR

System Description

The Electrically Erasable Programmable Read-Only Memory (EEPROM) is a permanent memory chip that is physically soldered within the Transmission Control Module (TCM) The EEPROM contains the calibration information required for transmission and transmission diagnostics operation. When the EEPROM malfunc-tions, DTC P1720 will set. The EEPROM memory is corrupted and the calculated checksum disagrees with the stored checksum or an EEPROM communication failure has occurred when checked on initialization.

Conditions for Setting the DTC

- The calculated checksum disagrees with the stored checksum or an EEPROM communication failure has occurred when checked on initialization.
- Immediately after the above condition occurs.

Action Taken When the DTC Sets

- If CAN is detected, OBD N32D VIN is selected. Or If CAN is not detected, P29 STi VIN is selected.
- Default values are used which are typical of calibrated values.
- Shift quality may be degraded.

Conditions for Clearing the DTC

- The DTC will only clear if the malfunction is not present after cycling the ignition.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- When DTC 1720 is set, it is likely the TCM will need replacing.

DTC P1720 EEPROM Error

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to “TCM Diagnostic System Check”
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1720?	-	Go to Step 3	Go to “Diagnostic Aids”
3	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 4	-
4	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 5	Go to Step 2
5	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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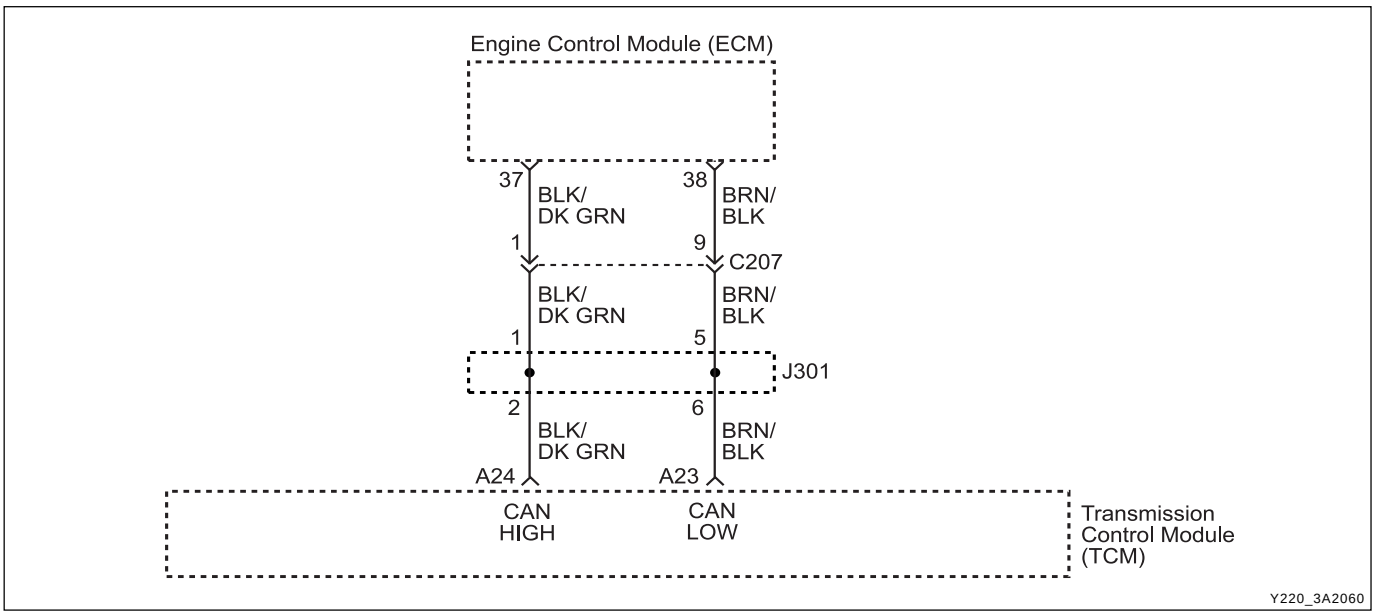


▶ DIAGNOSTIC TROUBLE CODE (DTC) P1721 THROTTLE SIGNAL ERROR

Circuit Description

The Controller Area Network (CAN) connects various control modules by using a twisted pair of wires, to share common information. This results in a reduction of sensors and wiring. TCM obtains the actual engine speed and throttle position, vehicle speed and accelerator etc. from ECM via CAN without any additional sensors.

The DTC P1721 sets when the throttle signal via CAN is out of range. The throttle is greater than 254 steps.

Conditions for Setting the DTC

- DTC P1719 is not set.
- The throttle is greater than 254 steps. The malfunction triggers immediately after the above condition occurs.

Action Taken When the DTC Sets

- The throttle signal is defaulted to 100 %.
- Shift quality is degraded.
- All shifts will be firm as full throttle and hence high engine torque is assumed.
- Line pressure will always stay high (S6 OFF) to cope with the assumed high throttle/ torque.
- Manual 1 gear selection is inhibited.

Conditions for Clearing the DTC

- The DTC will clear if the malfunction is not present for 30 seconds.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and ECM connectors. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.
- When ECM finds a fault on the throttle signals, ECM will adopt a default mode and send the default value and trouble message to TCM via CAN.

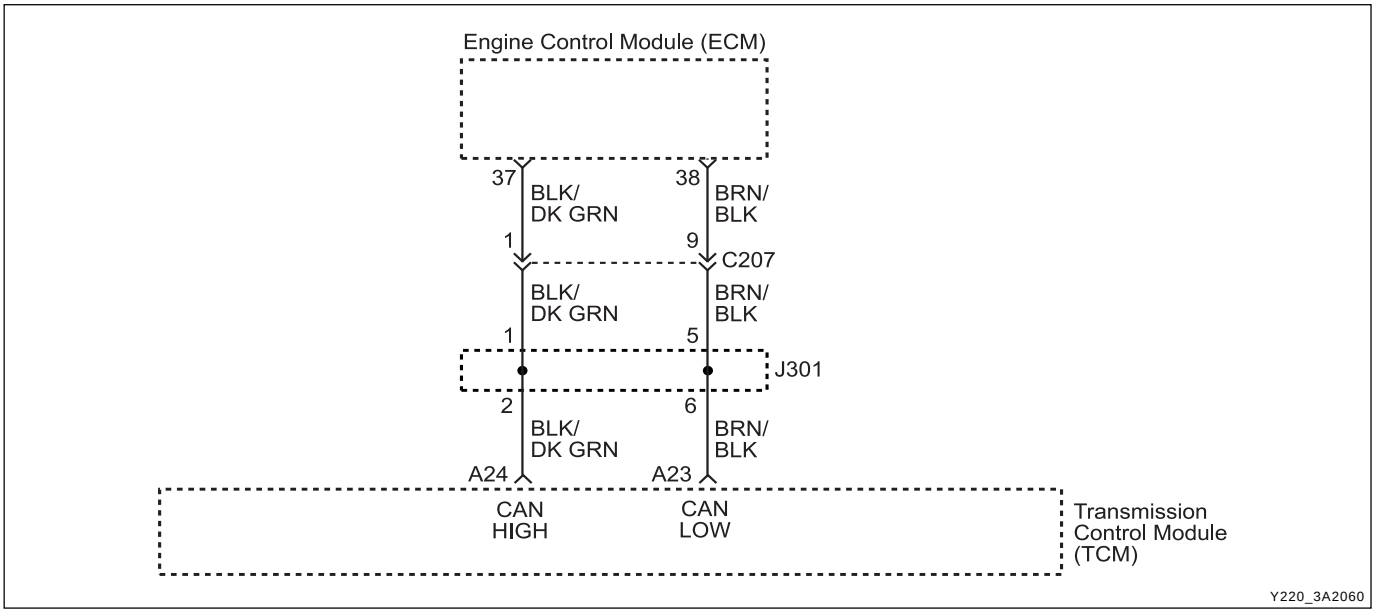
Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Check if there are any DTCs related to the throttle position sensor on the ECM side.
4. Check for a poor connection at the ECM and TCM connectors.

DTC P1721 Throttle Signal Error

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1721?	-	Go to Step 3	Go to "Diagnostic Aids"
3	Check if there are any DTCs related to the throttle position sensor on the ECM side. Are any DTCs related to throttle position sensor found?	-	Go to *Section Engine Controls*	Go to Step 4
4	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 5	-
5	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 6	Go to Step 2
6	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete



▶ DIAGNOSTIC TROUBLE CODE (DTC) P1722 VEHICLE TYPE DETERMINATION ERROR

Circuit Description

The Electrically Erasable Programmable Read-Only Memory (EEPROM) is a permanent memory chip that is physically soldered within the Transmission Control Module (TCM) The EEPROM contains the program and the calibration information required for the transmission and transmission diagnostics operation.

The DTC P1722 sets when TCM is unable to determine the vehicle type from EEPROM or CAN. CAN vehicle type information is in error or unavailable in time.

By definition, there must by on EEPROM fault (P1720) or an EEPROM vehicle code error (P1714) to cause the TCM to try and determine the vehicle code by other means.

The DTC P1722 is a reflection of the significance of the problem caused by the other error.

Conditions for Setting the DTC

- EEPROM information is in error or unreliable.
- Vehicle type information on the CAN is not present or in error.
- The above condition exists for 1 second after power up.

Action Taken When the DTC Sets

- If CAN is detected, OBD N32D VIN is selected. Or If CAN is not detected, P29 STi VIN is selected.
- Shift quality may be degraded.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change

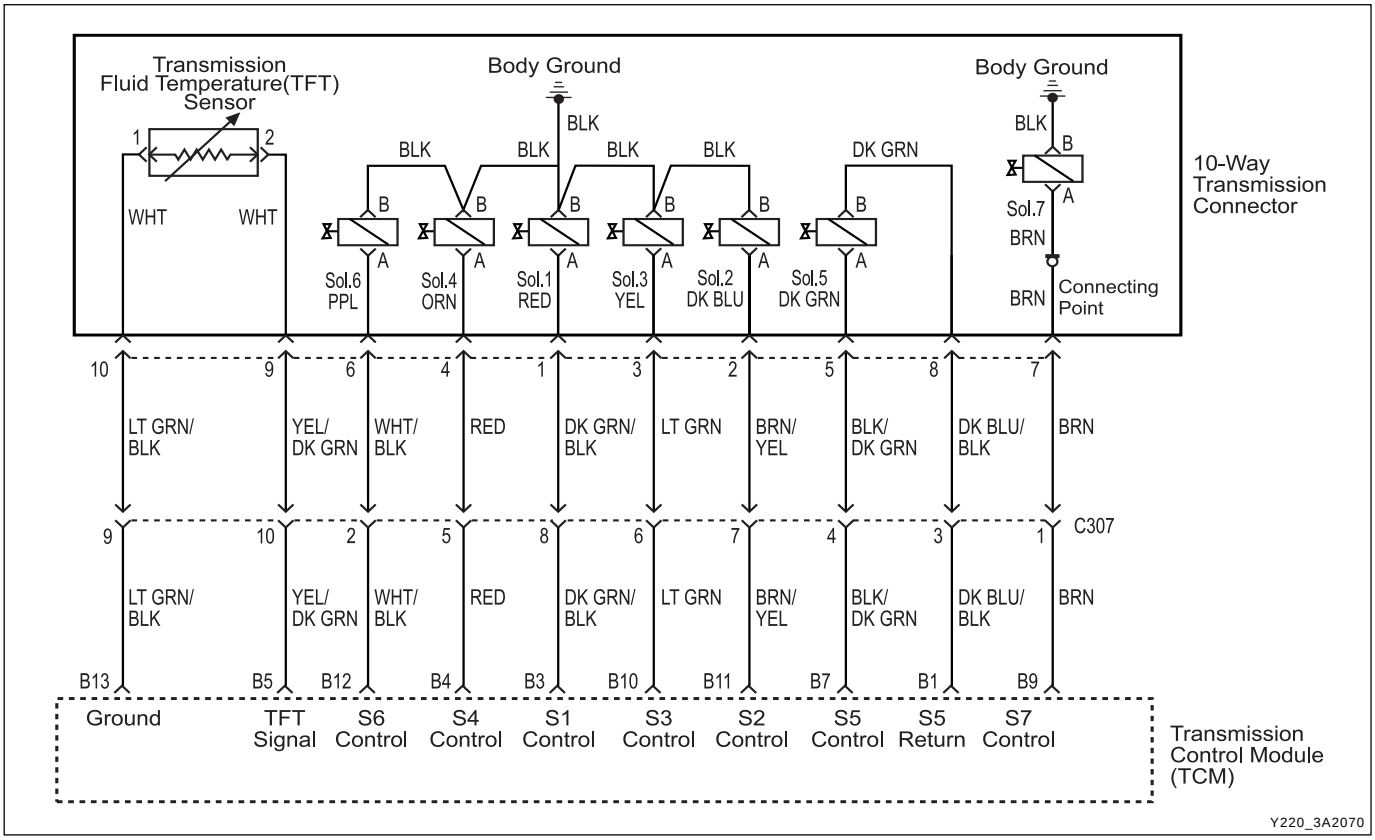
Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. If there are any other DTCs like P1714 or P1720, troubleshoot those prior to P1722.

DTC P1722 Vehicle Type Determination Error

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to “TCM Diagnostic System Check”
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. Does the scan tool display P1722?	-	Go to Step 3	Go to “Diagnostic Aids”
3	Does the scan tool display DTC P1714.	-	Go to applicable DTC table	Go to DTC P1720 table



▶ DIAGNOSTIC TROUBLE CODE (DTC) P1733 SOLENOID 1 CIRCUIT OPEN

Circuit Description

The solenoid 1 is used to control fluid flow acting on the 1-2 shift valve. The solenoid 1 is a normally open ON/ OFF type solenoid that is used in conjunction with the solenoid 2 to allow four different shifting combinations. Refer to Solenoid Logic for Static Gear States. The solenoid is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1733 sets when the Solenoid 1 (S1) circuit is open or the switched leg of the solenoid 1 is shorted to battery positive.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S1 is OFF.
- S2 is OFF.
- The solenoid 1's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- The solenoid 1 is always OFF.
- TCM adopts a Limp Home Mode (LHM) operation.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- During the TCM's testing, solenoid 1 is turned OFF/ ON by a very small (4 millisecond) pulse. This pulse is too short for the solenoid to react so the transmission operation is not affected.
- The solenoid feedback voltage is measured before the (4 millisecond) pulse and again during the pulse. If the difference is outside the acceptable limits the relevant fault is recorded.
- Typical causes would be an open circuit in the wiring to or within the solenoid, or a short circuit to power in the wiring to or within the solenoid.
- If several faults of solenoids are present, check the wiring or connectors that are common to the selected solenoids, especially the earth connections.

- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.
- Solenoid Logic for Static Gear States

Gear	S1	S2
1st	ON	ON
2nd	OFF	ON
3rd	OFF	OFF
4th	ON	OFF
Reverse	OFF	OFF
Neutral	OFF	OFF
Park	OFF	OFF

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S1 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for open / short.
6. Check resistance between S1 terminal A and B. Standard value is 22 ~ 30 Ω.
9. Check poor connections of other connectors.

DTC P1733 Solenoid 1 Circuit Open

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1733?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side and to the good ground. 4. Turn the mode knob of STET to 1 and push the red button. Does the bulb of open circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 8
4	1. Remove the valve cover. Refer to the Transmission in this section. 2. Check the wiring harness from 10-way transmission connector to Solenoid 1 (S1) on the valve body for an open or short to positive and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 5

DTC P1733 Solenoid 1 Circuit Open (Cont'd)

Step	Action	Value(s)	Yes	No
5	Check the S1 ground circuit for an open and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 6
6	Using a Digital Volt Meter (DVM), measure the resistance between S1 terminal A and B. Is the resistance within the specified value?	22 ~ 30 Ω	Go to "Diagnostic Aids"	Go to Step 7
7	Replace the S1. Is the action complete?	-	Go to Step 11	-
8	1. Disconnect the TCM connector B. 2. Check the wiring harness from 10-way transmission connector terminal 1 to TCM terminal B3 for an open or short to positive and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 9
9	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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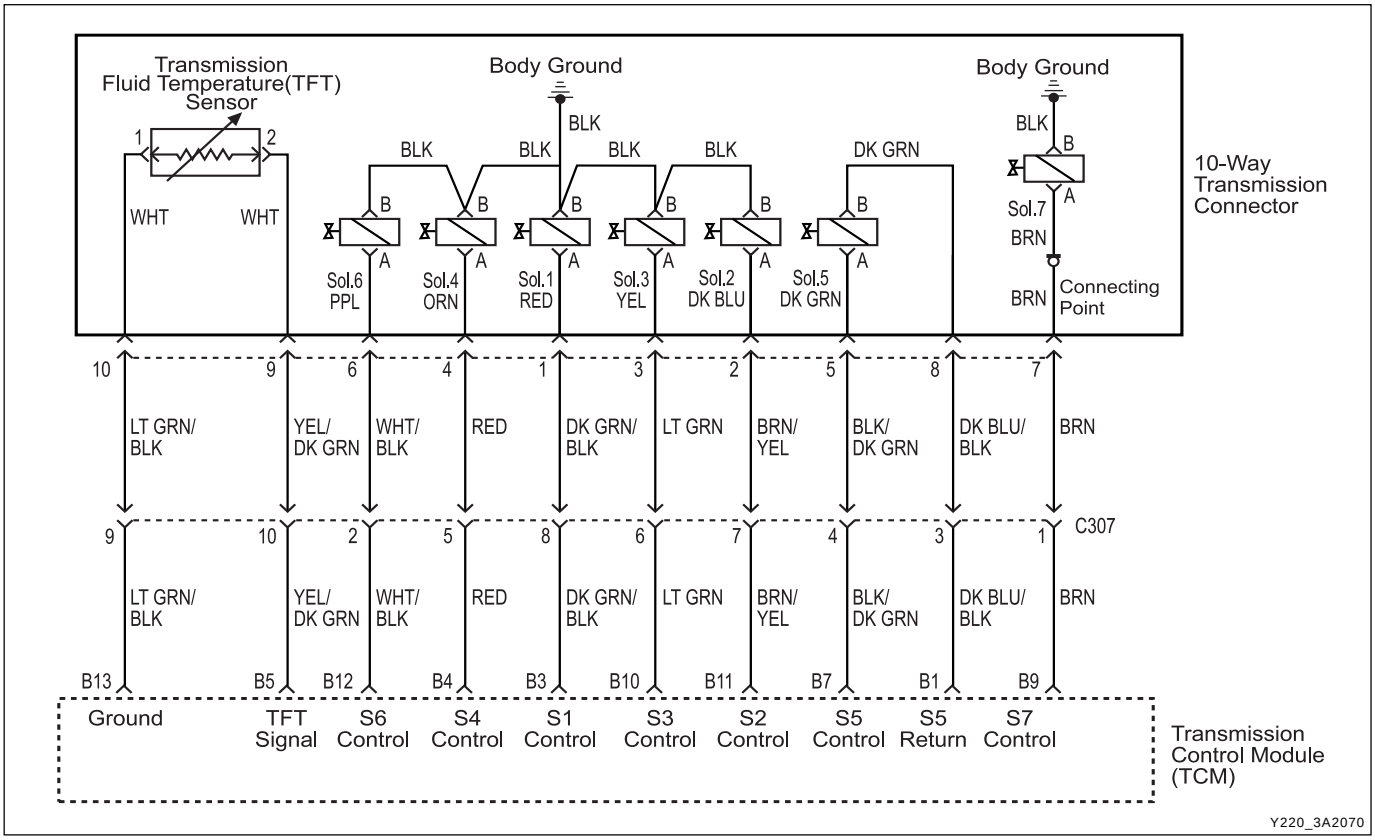

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1734 SOLENOID 2 CIRCUIT OPEN

Circuit Description

The solenoid 2 is used to control fluid flow acting on the 2-3 shift valve. The solenoid 2 is a normally open ON/ OFF type solenoid that is used in conjunction with the solenoid 1 to allow four different shifting combinations. Refer to Solenoid Logic for Static Gear States.

The solenoid is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1734 sets when the Solenoid 2 (S2) circuit is open or the switched leg of the solenoid 2 is shorted to battery positive.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S2 is OFF.
- S1 is OFF.
- The solenoid 2's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- The solenoid 2 is always OFF.
- TCM adopts a Limp Home Mode (LHM) operation.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- During the TCM's testing, solenoid 2 is turned OFF/ ON by a very small (4 millisecond) pulses. This pulse is too short for the solenoid to react so the transmission operation is not affected.
- The solenoid feedback voltage is measured before the (4 millisecond) pulse and again during the pulse. If the difference is outside the acceptable limits the relevant fault is recorded.
- Typical causes would be an open circuit in the wiring to or within the solenoid, or a short circuit to power in the wiring to or within the solenoid.
- If several faults of solenoids are present, check the wiring or connectors that are common to the selected solenoids, especially the earth connections.

- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.
- Solenoid Logic for Static Gear States

Gear	S1	S2
1st	ON	ON
2nd	OFF	ON
3rd	OFF	OFF
4th	ON	OFF
Reverse	OFF	OFF
Neutral	OFF	OFF
Park	OFF	OFF

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S2 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for open / short.
6. Check resistance between S2 terminal A and B. Standard value is 22 ~ 30 Ω.
9. Check connections of other connectors

DTC P1734 Solenoid 2 Circuit Open

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1734?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side and to the good ground. 4. Turn the mode knob of STET to 2 and push the red button. Does the bulb of open circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 8
4	1. Remove the valve cover. Refer to the Transmission in this section. 2. Check the wiring harness from 10-way transmission connector to Solenoid 2 (S2) on the valve body for an open or short to positive and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 5

DTC P1734 Solenoid 2 Circuit Open (Cont'd)

Step	Action	Value(s)	Yes	No
5	Check the S2 necessarycircuit for an open and repair as necessary. Is a repair complete?	-	Go to Step 11	Go to Step 6
6	Using a Digital Volt Meter (DVM), measure the resistance between S2 terminal A and B. Is the resistance within the specified value?	22 ~ 30 Ω	Go to "Diagnostic Aids"	Go to Step 7
7	Replace the S2. Is the action complete?	-	Go to Step 11	-
8	1. Disconnect the TCM connector B. 2. Check the wiring harness from 10-way transmission connector terminal 2 to TCM terminal B11 for an open or short to positive and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 9
9	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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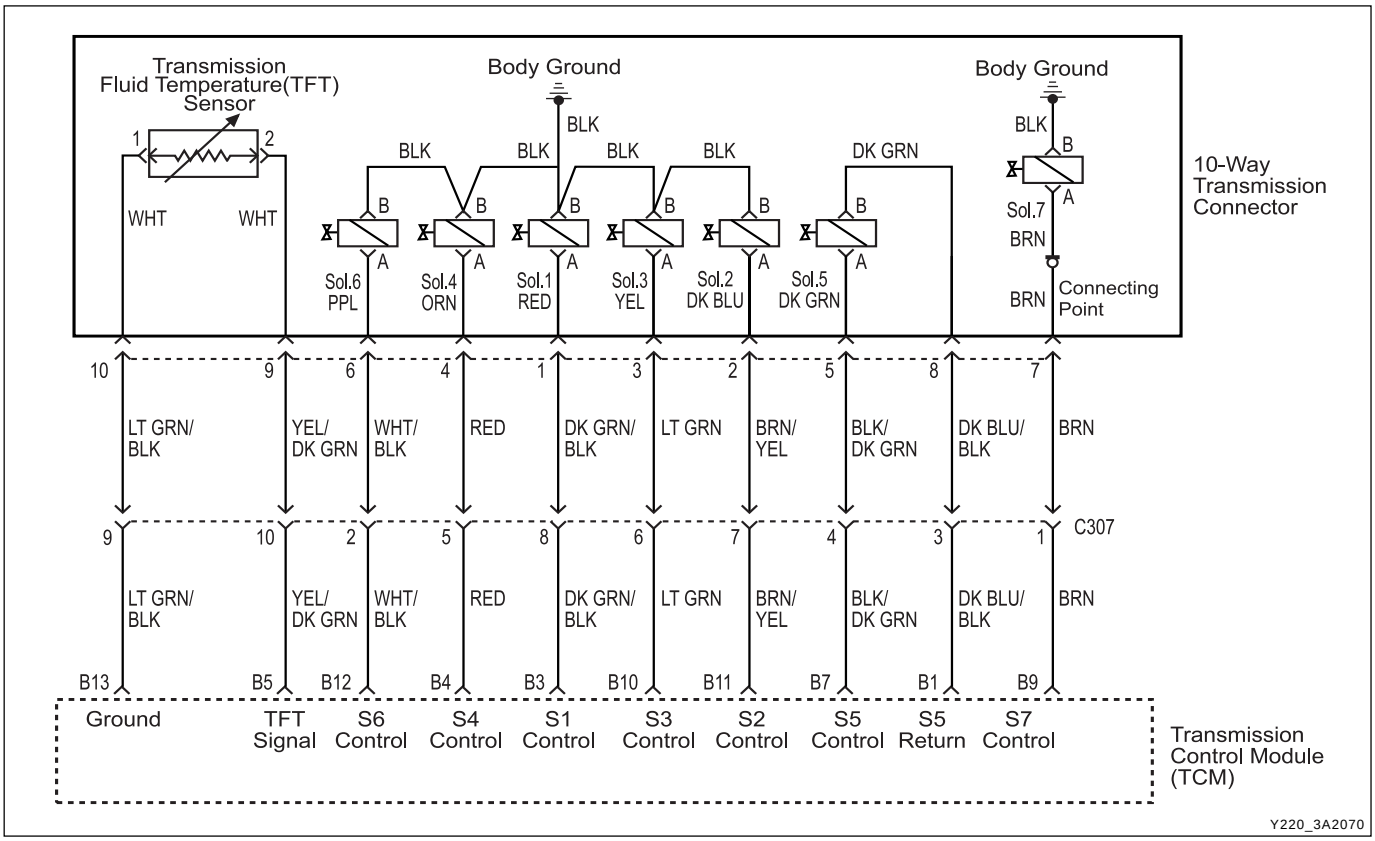

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1735 SOLENOID 3 CIRCUIT OPEN

Circuit Description

The solenoid 3 is a normally open ON/OFF type sole-noid that is used in conjunction with the solenoid 4 to control the shift quality and sequencing.

The solenoid 3 switches the clutch regulator valve OFF or ON and is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1735 sets when the Solenoid 3 (S3) circuit is open or the switched leg of the solenoid 3 is shorted to battery positive. The solenoid 3's driver Integrated Chip (IC) status indicates a faulty circuit.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S3 is OFF.
- S7 is OFF.
- The solenoid 3's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- The solenoid 3 is always OFF.
- The 1 →3, 1 →4, 2 →3, 2 →4, 3 →1, 3 →2, 4 →2 and 4 →1 shift quality is degraded.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- During the TCM's testing, solenoid 3 is turned OFF/ ON by a very small (4 millisecond) pulses. This pulse is too short for the solenoid to react so the transmis-sion operation is not affected.
- The solenoid feedback voltage is measured before the (4 millisecond) pulse and again during the pulse. If the difference is outside the acceptable limits the relevant fault is recorded.

- Typical causes would be an open circuit in the wiring to or within the solenoid, or a short circuit to power in the wiring to or within the solenoid.
- If several faults of solenoids are present, check the wiring or connectors that are common to the selected solenoids, especially the earth connections.
- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire in-side the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S3 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for open / short.
6. Check resistance between S3 terminal A and B. Standard value is 22 ~ 30 Ω
9. Check connections of other connectors

DTC P1735 Solenoid 3 Circuit Open

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1735?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side and to the good ground. 4. Turn the mode knob of STET to 3 and push the red button. Does the bulb of open circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 8
4	1. Remove the valve cover. Refer to the Transmission in this section. 2. Check the wiring harness from 10-way transmission connector to Solenoid 3 (S3) on the valve body for an open or short to positive and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 5
5	Check the S3 ground circuit for an open and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 6
6	Using a Digital Volt Meter (DVM), measure the resistance between S3 terminal A and B. Is the resistance within the specified value?	22 ~ 30 Ω	Go to "Diagnostic Aids"	Go to Step 7

DTC P1735 Solenoid 3 Circuit Open (Cont'd)

Step	Action	Value(s)	Yes	No
7	Replace the S3. Is the action necessary?	-	Go to Step 11	-
8	1. Disconnect the TCM connector B. 2. Check the wiring harness from 10-way transmission connector terminal 3 to TCM terminal B10 for an open or short to positive and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 9
9	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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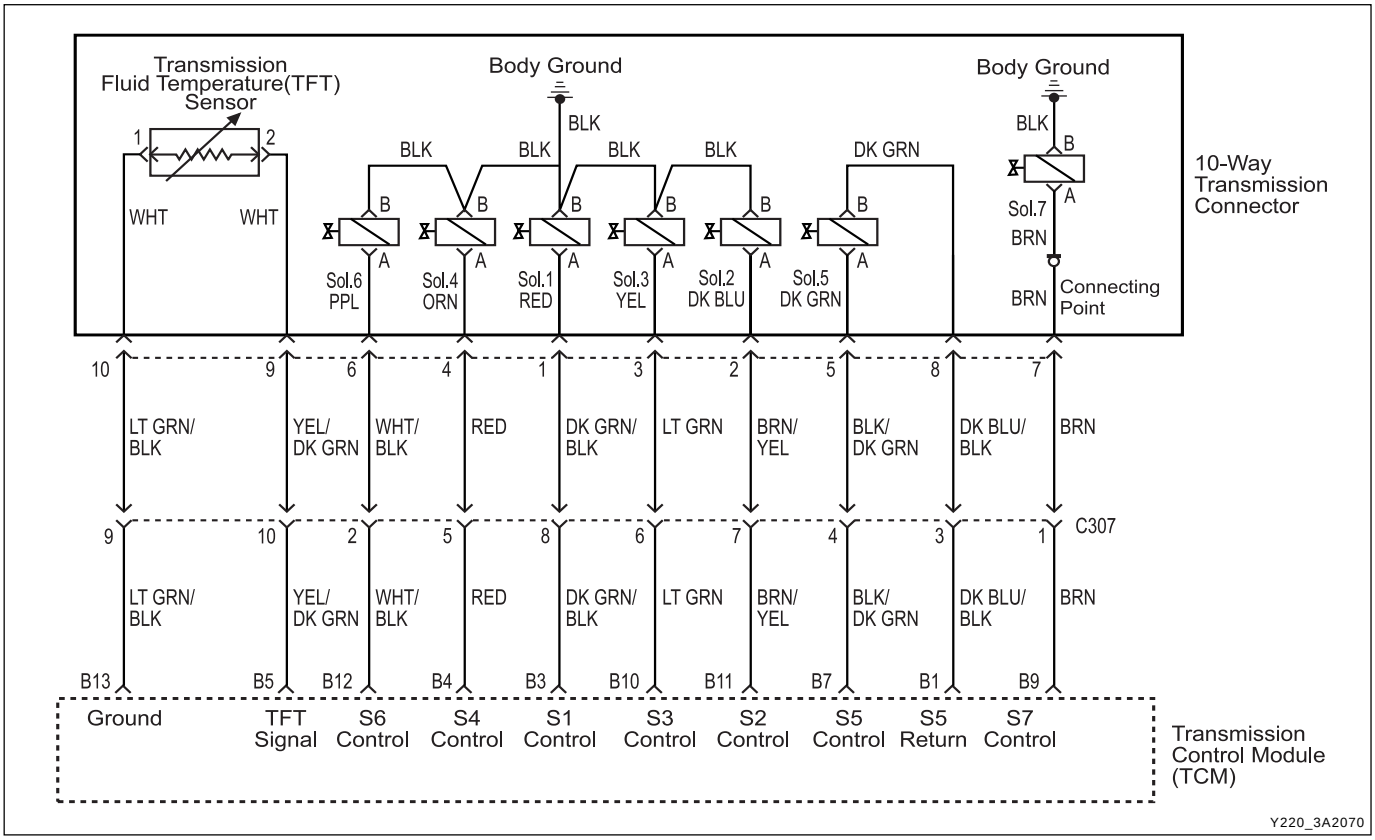

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1736 SOLENOID 4 CIRCUIT OPEN

Circuit Description

The solenoid 4 is a normally open ON/OFF type sole-noid that is used in conjunction with the solenoid 3 to control the shift quality and sequencing.

The solenoid 4 switches the clutch regulator valve OFF or ON and is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1736 sets when the Solenoid 4 (S4) circuit is open or the switched leg of the solenoid 4 is shorted to battery positive. The solenoid 4's driver Integrated Chip (IC) status indicates a faulty circuit.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S4 is OFF.
- S6 is OFF.
- The solenoid 3's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- The solenoid 4 is always OFF.
- The 1 →2, 1 →4, 2 →3, 2 →4, 3 →2 (all including manual), 3 →4, 4 →1 and 4 →3 shift quality is degraded.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- During the TCM's testing, solenoid 4 is turned OFF/ ON by a very small (4 millisecond) pulses. This pulse is too short for the solenoid to react so the transmission operation is not affected.
- The solenoid feedback voltage is measured before the (4 millisecond) pulse and again during the pulse. If the difference is outside the acceptable limits the relevant fault is recorded.

- Typical causes would be an open circuit in the wiring to or within the solenoid, or a short circuit to power in the wiring to or within the solenoid.
- If several faults of solenoids are present, check the wiring or connectors that are common to the selected solenoids, especially the earth connections.
- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S4 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for open / short.
6. Check resistance between S4 terminal A and B. Standard value is 22 ~ 30 Ω.
9. Check connections of other connectors

DTC P1736 Solenoid 4 Circuit Open

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) Diagnostic System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1736?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side and to the good ground. 4. Turn the mode knob of STET to 4 and push the red button. Does the bulb of open circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 8
4	1. Remove the valve cover. Refer to the Transmission in this section. 2. Check the wiring harness from 10-way transmission connector to Solenoid 4 (S4) on the valve body for an open or short to positive and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 5
5	Check the S4 ground circuit for an open and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 6
6	Using a Digital Volt Meter (DVM), measure the resistance between S4 terminal A and B. Is the resistance within the specified value?	22 ~ 30 Ω	Go to "Diagnostic Aids"	Go to Step 7

DTC P1736 Solenoid 4 Circuit Open (Cont'd)

Step	Action	Value(s)	Yes	No
7	Replace the S4. Is the action necessary?	-	Go to Step 11	-
8	1. Disconnect the TCM connector B. 2. Check the wiring harness from 10-way transmission connector terminal 4 to TCM terminal B4 for an open or short to positive and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 9
9	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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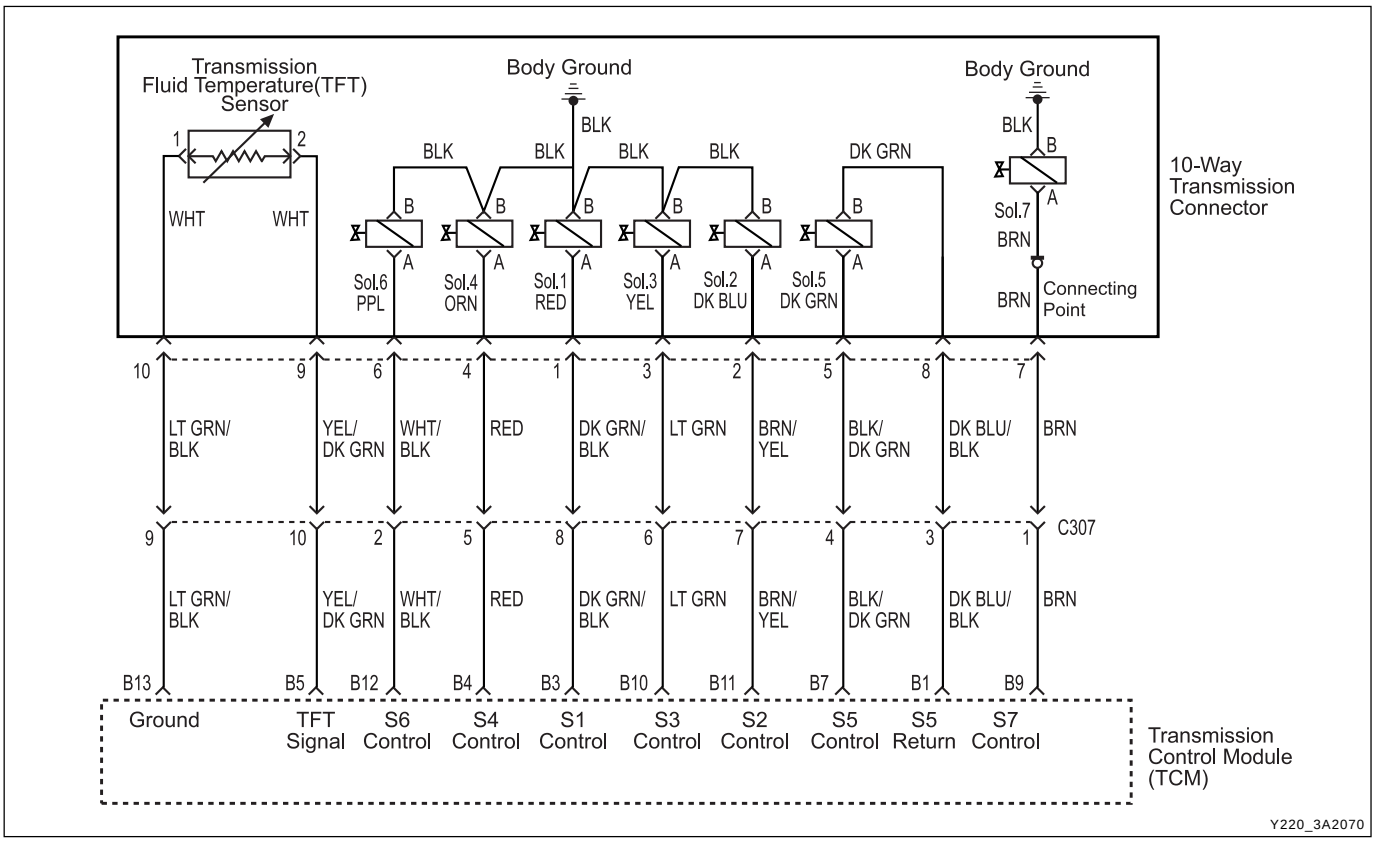

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1737 SOLENOID 5 CIRCUIT OPEN

Circuit Description

The solenoid 5 is a variable force solenoid that ramps the pressure during the gear changes and solenoid switching, to enhance the transmission shift quality. This solenoid provides the signal pressure to the clutch and band regulator, thereby controlling the shift pressure.

The solenoid 5 is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1737 sets when the solenoid 5 (S5) circuit is open or the switched leg of the solenoid 5 is shorted to battery positive. The solenoid 5's driver Integrated Chip (IC) status indicates a fauty circuit.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- The solenoid 5's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.
- The measured S5 current is greater than 100 mA below its expected lower limit.

Action Taken When the DTC Sets

- Solenoid 5 is disabled (always OFF).
- The shift quality is degraded.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- The current to solenoid 5 was outside acceptable limits.
- This fault results from a mismatch between the current set point for solenoid 5 and the current measured by the feedback within the TCM.
- Typical causes would be an open circuit or short circuit to power in the wiring to, from or within the solenoid.
- It is also possible that there has been a fault in the solenoid output circuit. But if this is the cause, the fault should be continually present.

- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire in-side the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S5 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for open / short.
6. Check resistance between S5 terminal A and B. Standard value is 3.6 ~ 5.5 Ω
9. Check connections of other connectors

DTC P1737 Solenoid 5 Circuit Open

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1737?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side. 4. Turn the mode knob of STET to 5 and push the red button. Does the bulb of open circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 7
4	1. Remove the valve cover. Refer to the Transmission in this section. 2. Check the wiring harnesses from 10-way trans mission connector to Solenoid 5 (S5) on the valve body for an open or short to positive and repair as necessary. Is a repair complete?	-	Go to Step 11	Go to Step 5
5	Using a Digital Volt Meter (DVM), measure the resistance between S5 terminal A and B. Is the resistance within the specified value?	3.6 ~ 5.5 Ω	Go to "Diagnostic Aids"	Go to Step 6
6	Replace the S5. Is the action complete?	-	Go to Step 11	-
7	1. Disconnect the TCM connector B. 2. Check the wiring harness from 10-way transmission connector terminal 5 to TCM terminal B7 for an open or short to battery and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 8

DTC P1737 Solenoid 5 Circuit Open (Cont'd)

Step	Action	Value(s)	Yes	No
8	Check the wiring harness from 10-way transmission connector terminal 8 to TCM terminal B1 for an open and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 9
9	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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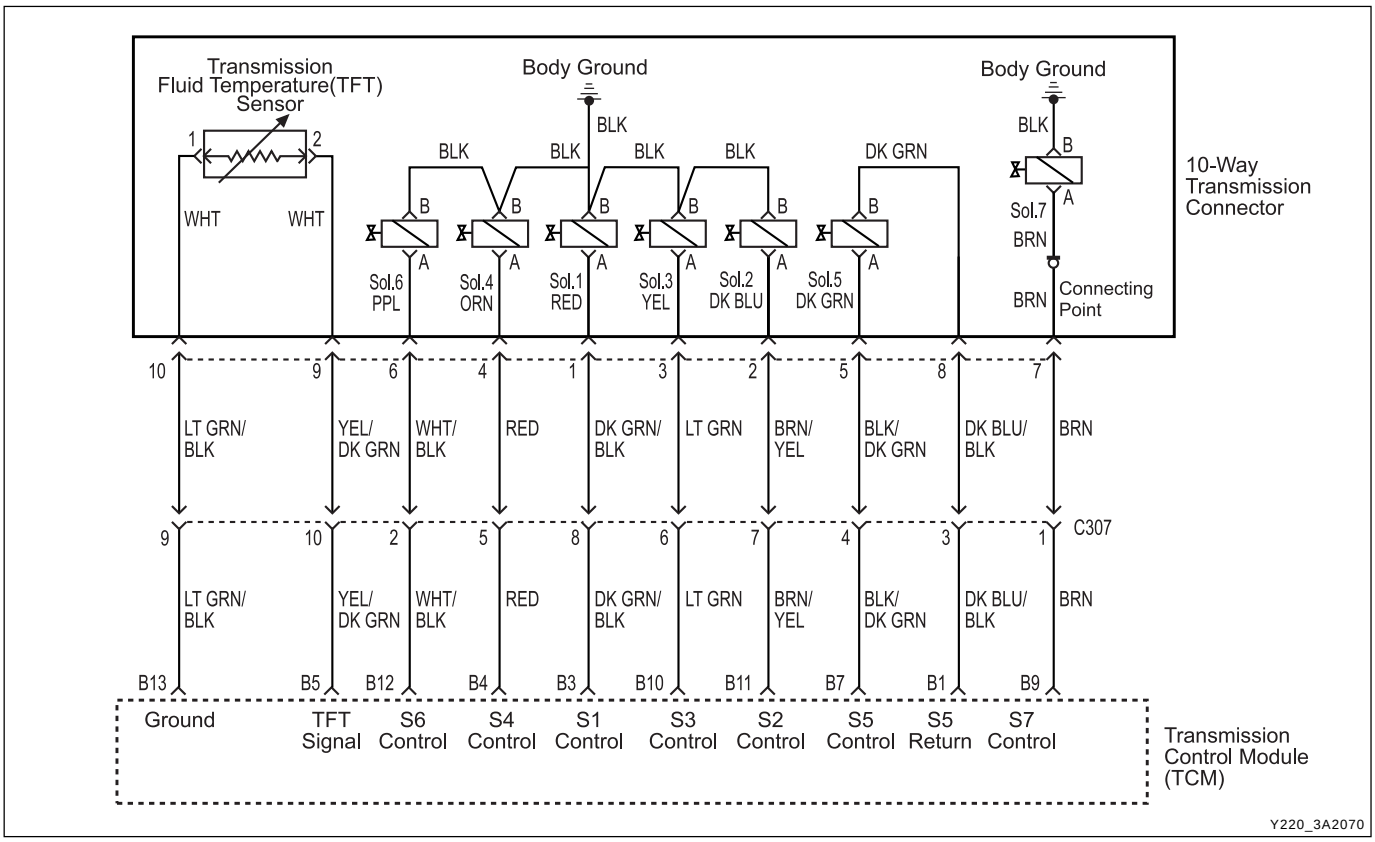

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1738 SOLENOID 6 CIRCUIT OPEN

Circuit Description

The solenoid 6 is a normally open ON/OFF type solenoid that is used to set the high/ low level of line pressure.

The Solenoid 6 (S6) OFF gives high pressure and the S6 is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1738 sets when the solenoid 6 circuit is open or the switched leg of the solenoid 6 is shorted to battery positive. The solenoid 6's driver Integrated Chip (IC) status indicates a faulty circuit.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S6 is OFF.
- S4 is OFF.
- The solenoid 6's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- The solenoid 6 is disabled (OFF) resulting in high line pressure being applied continuously.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- During the TCM's testing, solenoid 6 is turned OFF/ ON by a very small (4 millisecond) pulses. This pulse is too short for the solenoid to react so the transmission operation is not affected.
- The solenoid feedback voltage is measured before the (4 millisecond) pulse and again during the pulse. If the difference is outside the acceptable limits the relevant fault is recorded.
- Typical causes would be an open circuit in the wiring to or within the solenoid, or a short circuit to power in the wiring to or within the solenoid.
- If several faults of solenoids are present, check the wiring or connectors that are common to the selected solenoids, especially the earth connections.

- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S6 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for open / short.
6. Check resistance between S6 terminal A and B. Standard value is 22 ~ 30 Ω.
9. Check connections of other connectors

DTC P1738 Solenoid 6 Circuit Open

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1738?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side and to the good ground. 4. Turn the mode knob of STET to 6 and push the red button. Does the bulb of open circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 8
4	1. Remove the valve cover. Refer to the Transmission in this section. 2. Check the wiring harness from 10-way transmission connector to Solenoid 6 (S6) on the valve body for an open or short to positive and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 5
5	Check the S6 ground circuit for an open and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 6
6	Using a Digital Volt Meter (DVM), measure the resistance between S6 terminal A and B. Is the resistance within the specified value?	22 ~ 30 Ω	Go to "Diagnostic Aids"	Go to Step 7
7	Replace the S6. Is the action complete?	-	Go to Step 11	-
8	1. Disconnect the TCM connector B. 2. Check the wiring harness from 10-way transmission connector terminal 6 to TCM terminal B12 for an open and repair as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 9

DTC P1738 Solenoid 6 Circuit Open (Cont'd)

Step	Action	Value(s)	Yes	No
9	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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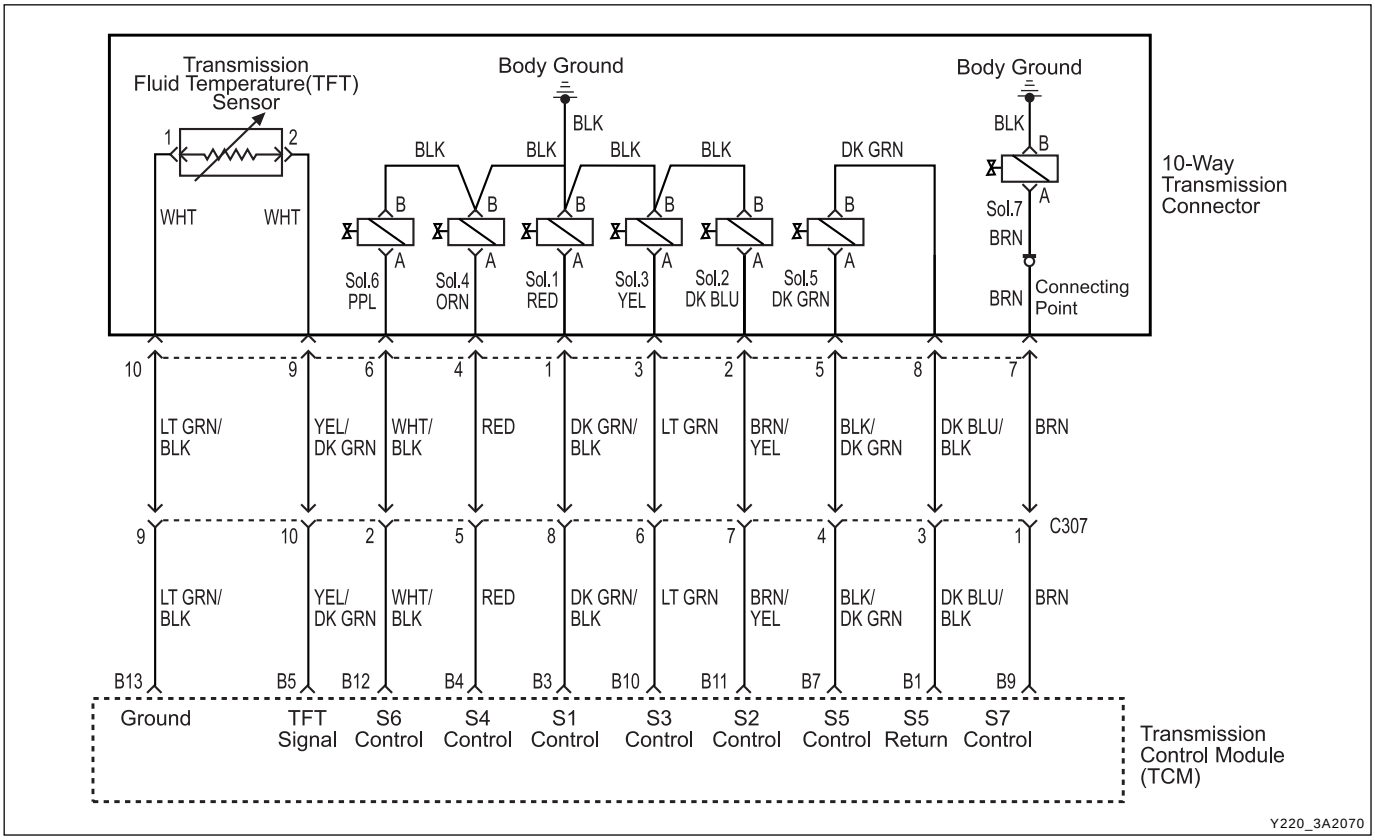

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1739 SOLENOID 7 CIRCUIT OPEN

Circuit Description

The solenoid 7 is a normally open ON/OFF type sole-noid that is used to control the application of the Torque Converter Clutch (TCC).

The Solenoid 7 (S7) ON activates the TCC and the S7 is attached to the pump body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1739 sets when the solenoid 7, Torque Converter Clutch Solenoid, circuit is open or the switched leg of the solenoid 7 is shorted to battery positive. The solenoid 7's driver Integrated Chip (IC) status indicates a faulty circuit.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S7 is OFF.
- S3 is OFF.
- The solenoid 7's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- The solenoid 7 is always disabled (OFF) resulting in the TCC being unlocked always.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- During the TCM's testing, solenoid 7 is turned OFF/ ON by a very small (4 millisecond) pulses. This pulse is too short for the solenoid to react so the transmission operation is not affected.
- The solenoid feedback voltage is measured before the (4 millisecond) pulse and again during the pulse. If the difference is outside the acceptable limits the relevant fault is recorede.
- Typical causes would be an open circuit in the wiring to or within the solenoid, or a short circuit to power in the wiring to or within the solenoid.
- If several faults of solenoids are present, check the wiring or connectors that are common to the selected solenoids, especially the earth connections.

- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S7 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for open / short. If the problem is found in the wiring harness from 10-way transmission connector to contact point attached onto the transmission case, repair it with removing the valve cover. Refer to the Transmission in this section.
7. Check resistance between S7 terminal A and B. Standard value is 22 ~ 30 Ω.
10. Check connections of other connectors.

DTC P1739 Solenoid 7 Circuit Open

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1739?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side and to the good ground. 4. Turn the mode knob of STET to 7 and push the red button. Does the bulb of open circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 9
4	1. Remove the pump assembly. Refer to the Pump in this section. 2. Check the wiring harness from 10-way transmission connector to contact point attached onto the transmission case for an open or short to positive and repair as necessary. Is a repair necessary?	-	Go to Step 12	Go to Step 5
5	Check the wiring harness from contact point attached onto the transmission case to S7 for an open or short to positive and repair as necessary. Is a repair necessary?	-	Go to Step 12	Go to Step 6
6	Check the S7 ground circuit for an open and repair as necessary. Is a repair necessary?	-	Go to Step 12	Go to Step 7

DTC P1739 Solenoid 7 Circuit Open (Cont'd)

Step	Action	Value(s)	Yes	No
7	Using a Digital Volt Meter (DVM), measure the resistance between S7 terminal A and B. Is the resistance within the specified value?	22 ~ 30 Ω	Go to "Diagnostic Aids"	Go to Step 8
8	Replace the S7. Is the action complete?	-	Go to Step 12	-
9	1. Disconnect the TCM connector B. 2. Check the wiring harness from 10-way transmission connector terminal 7 to TCM terminal B9 for an open or short to positive and repair as necessary. Is a repair necessary?	-	Go to Step 12	Go to Step 10
10	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 12	Go to Step 11
11	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 12	-
12	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 13	Go to Step 2
13	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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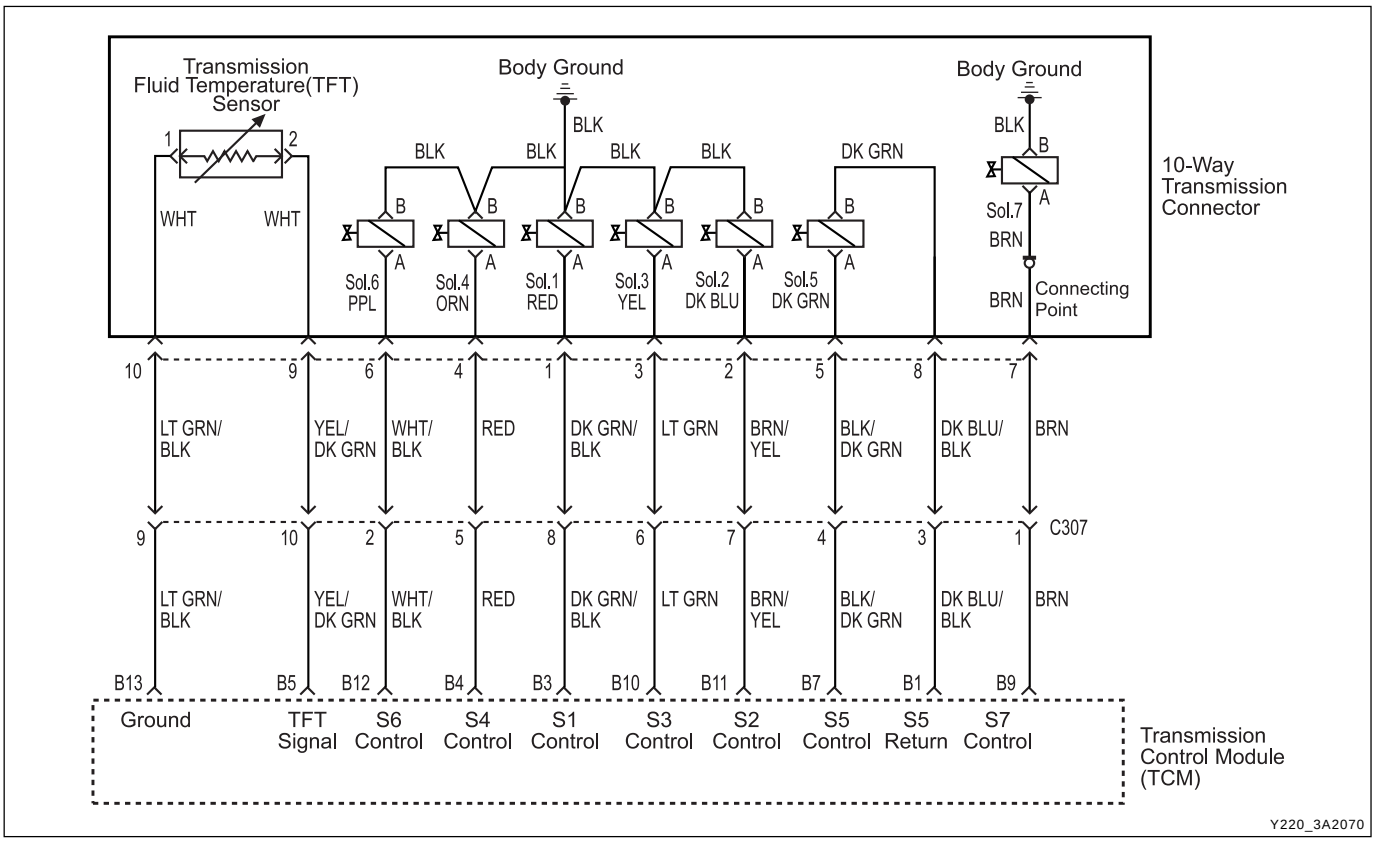

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1741 SOLENOID 1 CIRCUIT SHORT

Circuit Description

The solenoid 1 is used to control fluid flow acting on the 1-2 shift valve. The solenoid 1 is a normally open ON/ OFF type solenoid that is used in conjunction with the solenoid 2 to allow four different shifting combinations. Refer to Static Gear Status.

The solenoid is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1741 sets when the Solenoid 1 (S1) circuit is shorted to ground. The solenoid 1's driver Integrated Chip (IC) status indicates a faulty circuit.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S1 is ON.
- The solenoid 1's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- The solenoid 1 is always OFF.
- TCM adopts a Limp Home Mode (LHM) operation.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- During the TCM's testing, solenoid 1 is turned OFF/ ON by a very small (4 millisecond) pulses. This pulse is too short for the solenoid to react so the transmission operation is not affected.
- The solenoid feedback voltage is measured before the (4 millisecond) pulse and again during the pulse. If the difference is outside the acceptable limits the relevant fault is recorded.
- Typical causes would be a short circuit to ground in the wiring to or within the solenoid.
- If several faults of solenoids are present, check the wiring or connectors that are common to the selected solenoids, especially the earth connections.

- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire in-side the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.
- Solenoid Logic for Static Gear States

Gear	S1	S2
1st	ON	ON
2nd	OFF	ON
3rd	OFF	OFF
4th	ON	OFF
Reverse	OFF	OFF
Neutral	OFF	OFF
Park	OFF	OFF

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S1 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for short to ground.
6. Check resistance between S1 terminal A and B. Standard value is 22 ~ 30 Ω.
9. Check connections of other connectors.

DTC P1741 Solenoid 1 Circuit Short

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side and to the good ground. 4. Turn the mode knob of STET to 1 and push the red button. Does the bulb of close circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 8
4	1. Remove the valve cover. Refer to the Transmission in this section. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector to Solenoid 1 (S1) on the valve body. Does the test light illuminate?	-	Go to Step 5	Go to Step 6

DTC P1741 Solenoid 1 Circuit Short (Cont'd)

Step	Action	Value(s)	Yes	No
5	Repair the short to ground in the wiring harness. Is the repair complete?	-	Go to Step 11	-
6	Using a Digital Volt Meter (DVM), measure the resistance between S1 terminal A and B. Is the resistance within the specified value?	20 ~ 30 Ω	Go to "Diagnostic Aids"	Go to Step 7
7	Replace the S1. Is the action complete?	-	Go to Step 11	-
8	1. Disconnect the TCM connector B. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector terminal 1 to TCM terminal B3. Does the test light illuminate?	-	Go to Step 5	Go to Step 9
9	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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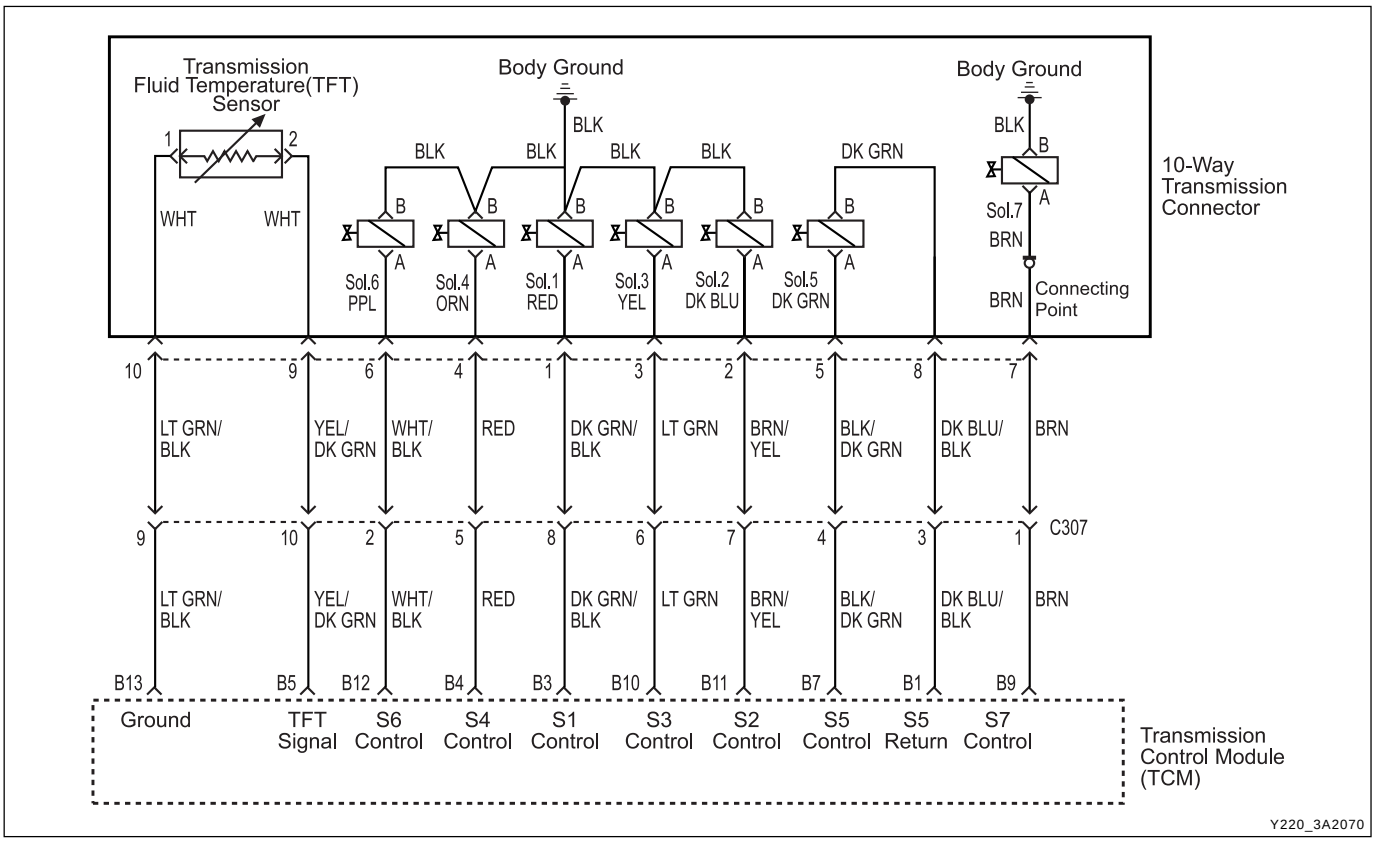

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1742 SOLENOID 2 CIRCUIT SHORT

Circuit Description

The solenoid 2 is used to control fluid flow acting on the 2-3 shift valve. The solenoid 2 is a normally open ON/ OFF type solenoid that is used in conjunction with the solenoid 1 to allow four different shifting combinations. Refer to Static Gear Status.

The solenoid is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1742 sets when the Solenoid 2 (S2) circuit is shorted to ground. The solenoid 2's driver Integrated Chip (IC) status indicates a faulty circuit.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S2 is ON.
- The solenoid 2's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- The solenoid 2 is always OFF.
- TCM adopts a Limp Home Mode (LHM) operation.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- During the TCM's testing, solenoid 2 is turned OFF/ ON by a very small (4 millisecond) pulses. This pulse is too short for the solenoid to react so the transmission operation is not affected.
- The solenoid feedback voltage is measured before the (4 millisecond) pulse and again during the pulse. If the difference is outside the acceptable limits the relevant fault is recorded.
- Typical causes would be a short circuit to ground in the wiring to or within the solenoid.
- If several faults of solenoids are present, check the wiring or connectors that are common to the selected solenoids, especially the earth connections.
- Inspect the wiring for poor electrical connections at the TCM and at the transmission 10-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.

- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.
- Solenoid Logic for Static Gear States

Gear	S1	S2
1st	ON	ON
2nd	OFF	ON
3rd	OFF	OFF
4th	ON	OFF
Reverse	OFF	OFF
Neutral	OFF	OFF
Park	OFF	OFF

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S2 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for short to ground.
6. Check resistance between S2 terminal A and B. Standard value is 22 ~ 30 Ω.
9. Check connections of other connectors.

DTC P1742 Solenoid 2 Circuit Short

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1742?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side and to the good ground. 4. Turn the mode knob of STET to 2 and push the red button. Does the bulb of close circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 8
4	1. Remove the valve cover. Refer to the Transmission in this section. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector to Solenoid 2 (S2) on the valve body. Does the test light illuminate?	-	Go to Step 5	Go to Step 6
5	Repair the short to ground in the wiring harness. Is the repair complete?	-	Go to Step 11	-
6	Using a Digital Volt Meter (DVM), measure the resistance between S2 terminal A and B. Is the resistance within the specified value?	20 ~ 30 Ω	Go to "Diagnostic Aids"	Go to Step 7
7	Replace the S2. Is the action complete?	-	Go to Step 11	-

DTC P1742 Solenoid 2 Circuit Short (Cont'd)

Step	Action	Value(s)	Yes	No
8	1. Disconnect the TCM connector B. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector terminal 2 to TCM terminal B11. Does the test light illuminate?	-	Go to Step 5	Go to Step 9
9	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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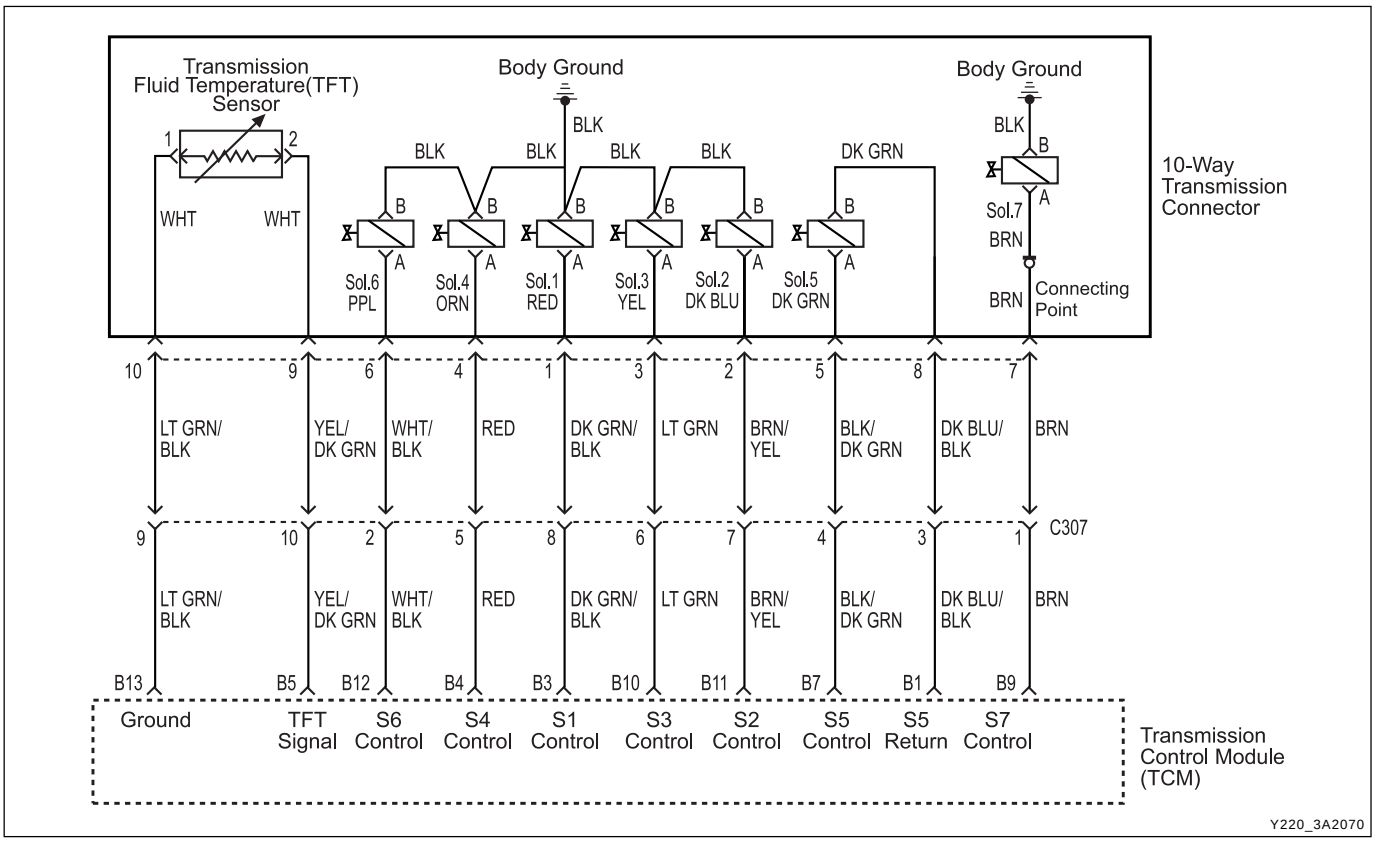

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1743 SOLENOID 3 CIRCUIT SHORT

Circuit Description

The solenoid 3 is a normally open ON/OFF type sole-noid that is used in conjunction with the solenoid 4 to control the shift quality and sequencing.

The solenoid 3 switches the clutch regulator valve OFF or ON and is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1743 sets when the Solenoid 3 (S3) circuit is shorted to ground. The solenoid 3's driver Integrated Chip (IC) status indicates a faulty circuit.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S3 is ON.
- The solenoid 3's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- The solenoid 3 is always OFF.
- The 1 →3, 1 →4, 2 →3, 2 →4, 3 →1, 3 →2, 4 →2 and 4 1 shift quality is degraded.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- During the TCM's testing, solenoid 3 is turned OFF/ ON by a very small (4 millisecond) pulses. This pulse is too short for the solenoid to react so the transmission operation is not affected.
- The solenoid feedback voltage is measured before the (4 millisecond) pulse and again during the pulse. If the difference is outside the acceptable limits the relevant fault is recorded.
- Typical causes would be a short circuit to ground in the wiring to or within the solenoid.
- If several faults of solenoids are present, check the wiring or connectors that are common to the selected solenoids, especially the earth connections.
- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.

- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S3 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for short to ground.
6. Check resistance between S3 terminal A and B. Standard value is 22 ~ 30 Ω.
9. Check connections of other connectors.

DTC P1743 Solenoid 3 Circuit Short

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1743?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side and to the good ground. 4. Turn the mode knob of STET to 3 and push the red button. Does the bulb of close circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 8
4	1. Remove the valve cover. Refer to the Transmission in this section. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector to Solenoid 3 (S3) on the valve body. Does the test light illuminate?	-	Go to Step 5	Go to Step 6
5	Repair the short to ground in the wiring harness. Is the repair complete?	-	Go to Step 11	-
6	Using a Digital Volt Meter (DVM), measure the resistance between S3 terminal A and B. Is the resistance within the specified value?	20 ~ 30 Ω	Go to "Diagnostic Aids"	Go to Step 7
7	Replace the S3. Is the action complete?	-	Go to Step 11	-
8	1. Disconnect the TCM connector B. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector terminal 3 to TCM terminal B10. Does the test light illuminate?	-	Go to Step 5	Go to Step 9
9	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10

DTC P1743 Solenoid 3 Circuit Short (Cont'd)

Step	Action	Value(s)	Yes	No
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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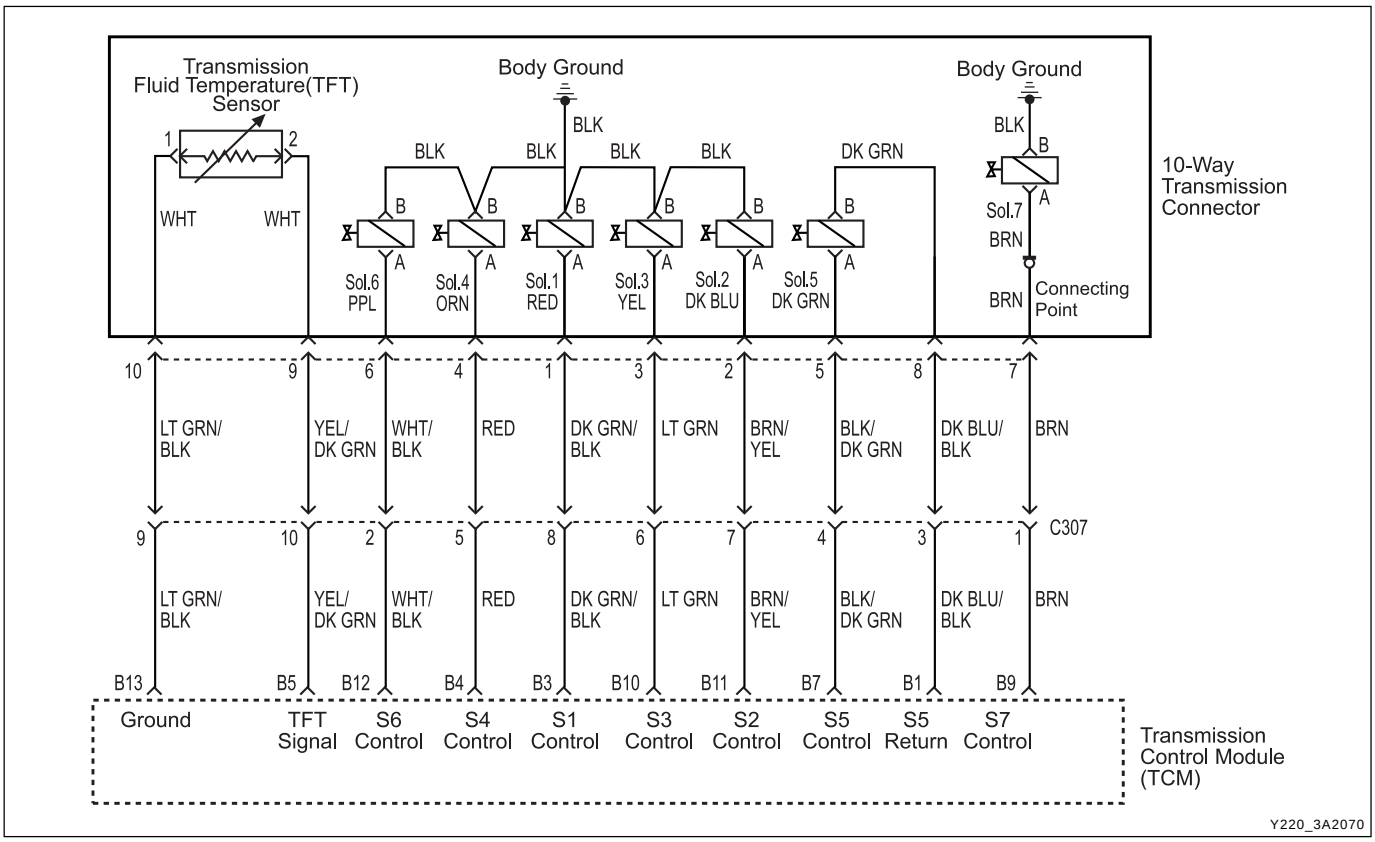

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1744 SOLENOID 4 CIRCUIT SHORT

Circuit Description

The solenoid 4 is a normally open ON/OFF type sole-noid that is used in conjunction with the solenoid 3 to control the shift quality and sequencing.

The solenoid 4 switches the band regulator valve OFF or ON and is attached to the valve body within the transmission.

Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1744 sets when the Solenoid 4 (S4) circuit is shorted to ground. The solenoid 4's driver Integrated Chip (IC) status indicates a faulty circuit.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S4 is ON.
- The solenoid 4's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- The solenoid 4 is always OFF.
- The 1 →2, 1 →4, 2 →3, 2 →4, 3 →1, 3 →2 (all including manual), 3 →4, 4 →1 and 4 →3 shift quality is degraded.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- During the TCM's testing, solenoid 4 is turned OFF/ ON by a very small (4 millisecond) pulses. This pulse is too short for the solenoid to react so the transmission operation is not affected.
- The solenoid feedback voltage is measured before the (4 millisecond) pulse and again during the pulse. If the difference is outside the acceptable limits the relevant fault is recorded.
- Typical causes would be a short circuit to ground in the wiring to or within the solenoid.
- If several faults of solenoids are present, check the wiring or connectors that are common to the selected solenoids, especially the earth connections.

- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S4 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for short to ground.
6. Check resistance between S4 terminal A and B. Standard value is 22 ~ 30 Ω.
9. Check connections of other connectors.

DTC P1744 Solenoid 4 Circuit Short

Step	Action	Value(s)	Yes	No
1	Perform Transmission Control Module (TCM) System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1744?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side and to the good ground. 4. Turn the mode knob of STET to 4 and push the red button. Does the bulb of close circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 8
4	1. Remove the valve cover. Refer to the Transmission in this section. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector to Solenoid 4 (S4) on the valve body. Does the test light illuminate?	-	Go to Step 5	Go to Step 6
5	Repair the short to ground in the wiring harness. Is the repair complete?	-	Go to Step 11	-
6	Using a Digital Volt Meter (DVM), measure the resistance between S4 terminal A and B. Is the resistance within the specified value?	20 ~ 30 Ω	Go to "Diagnostic Aids"	Go to Step 7
7	Replace the S4. Is the action complete?	-	Go to Step 11	-
8	1. Disconnect the TCM connector B. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector terminal 4 to TCM terminal B4. Does the test light illuminate?	-	Go to Step 5	Go to Step 9

DTC P1744 Solenoid 4 Circuit Short (Cont'd)

Step	Action	Value(s)	Yes	No
9	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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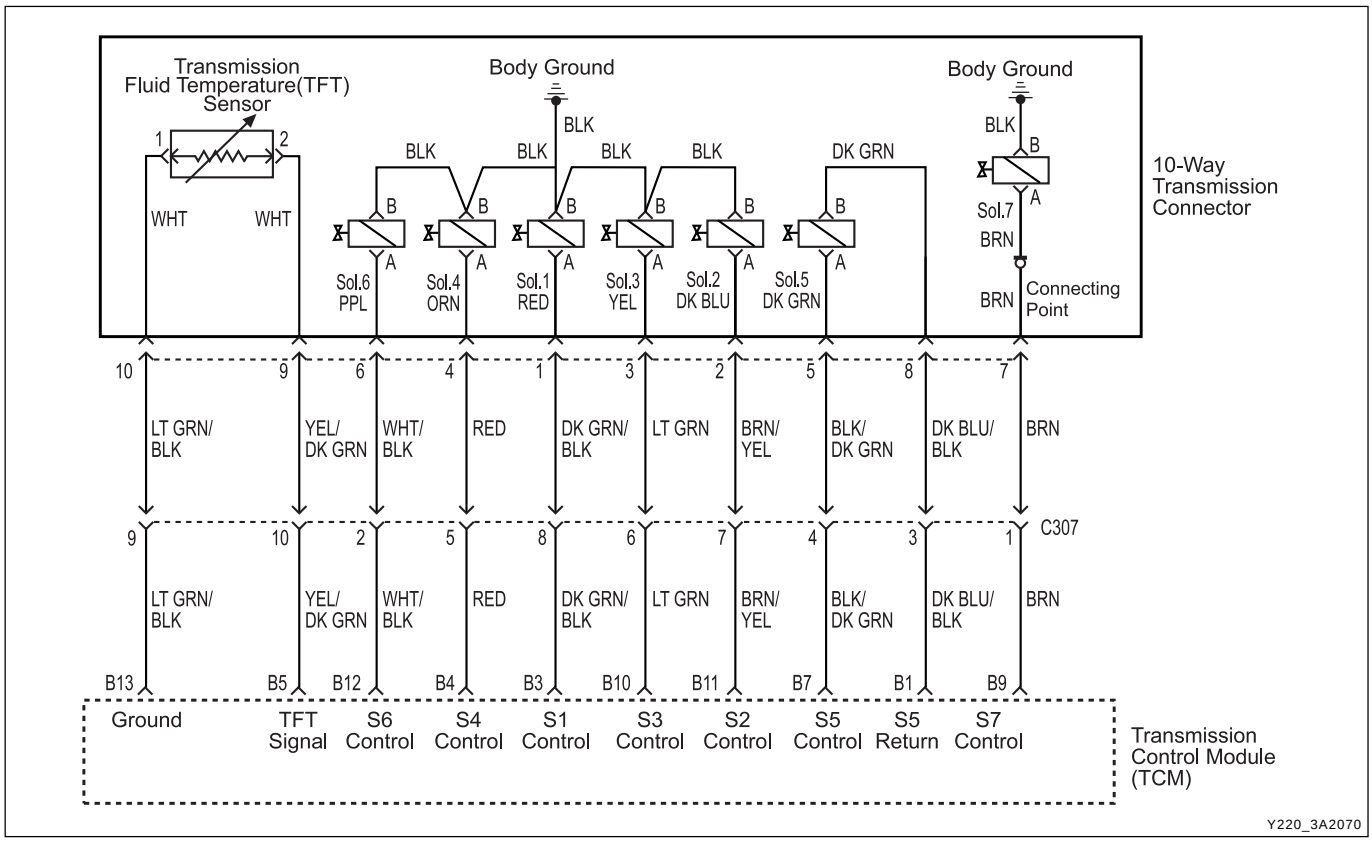

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1745 SOLENOID 5 CIRCUIT SHORT

Circuit Description

The solenoid 5 is a variable force solenoid that ramps the pressure during the gear changes and solenoid switching, to enhance the transmission shift quality. This solenoid provides the signal pressure to the clutch and band regulator, thereby controlling the shift pressure.

The solenoid 5 is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1745 sets when the Solenoid 5 (S5) circuit is shorted to ground. The solenoid 5's driver Integrated Chip (IC) status indicates a faulty circuit.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S5 is ON.
- The solenoid 5's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- Solenoid 5 is disabled (always OFF)
- The shift quality is degraded.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (> 50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- The current to solenoid 5 was outside acceptable limits.
- This fault results from a mismatch between the current set point for solenoid 5 and the current measured by the feedback within the TCM.
- Typical causes would be a short circuit to ground in the wiring to, from or within the solenoid.
- It is also possible that there has been a fault in the solenoid output circuit. But if this is the cause, the fault should be continually present.

- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S5 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for short to ground.
6. Check resistance between S5 terminal A and B. Standard value is 3.6 ~ 5.5 Ω
10. Check connections of other connectors.

DTC P1745 Solenoid 5 Circuit Short

Step	Action	Value(s)	Yes	No
1	Perform Transmission Control Module (TCM) System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1745?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side. 4. Turn the mode knob of STET to 5 and push the red button. Does the bulb of close circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 8
4	1. Remove the valve cover. Refer to the Transmission in this section. 2. With a test light connected to B+ probe the wiring harnesses from 10-way transmission connector to Solenoid 5 (S5) on the valve body. Does the test light illuminate?	-	Go to Step 5	Go to Step 6
5	Repair the short to ground in the wiring harness. Is the repair complete?	-	Go to Step 12	-
6	Using a Digital Volt Meter (DVM), measure the resistance between S5 terminal A and B. Is the resistance within the specified value?	3.6 ~ 5.5 Ω	Go to "Diagnostic Aids"	Go to Step 7
7	Replace the S5. Is the action complete?	-	Go to Step 12	-
8	1. Disconnect the TCM connector B. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector terminal 5 to TCM terminal. Does the test light illuminate?	-	Go to Step 5	Go to Step 9

DTC P1745 Solenoid 5 Circuit Short (Cont'd)

Step	Action	Value(s)	Yes	No
9	Probe the wiring harness from 10-way transmission connector terminal 8 to TCM terminal B1. Does the test light illuminate?	-	Go to Step 5	Go to Step 10
10	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 12	Go to Step 11
11	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 12	-
12	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 13	Go to Step 2
13	Check if any DTCs are set. Are any there DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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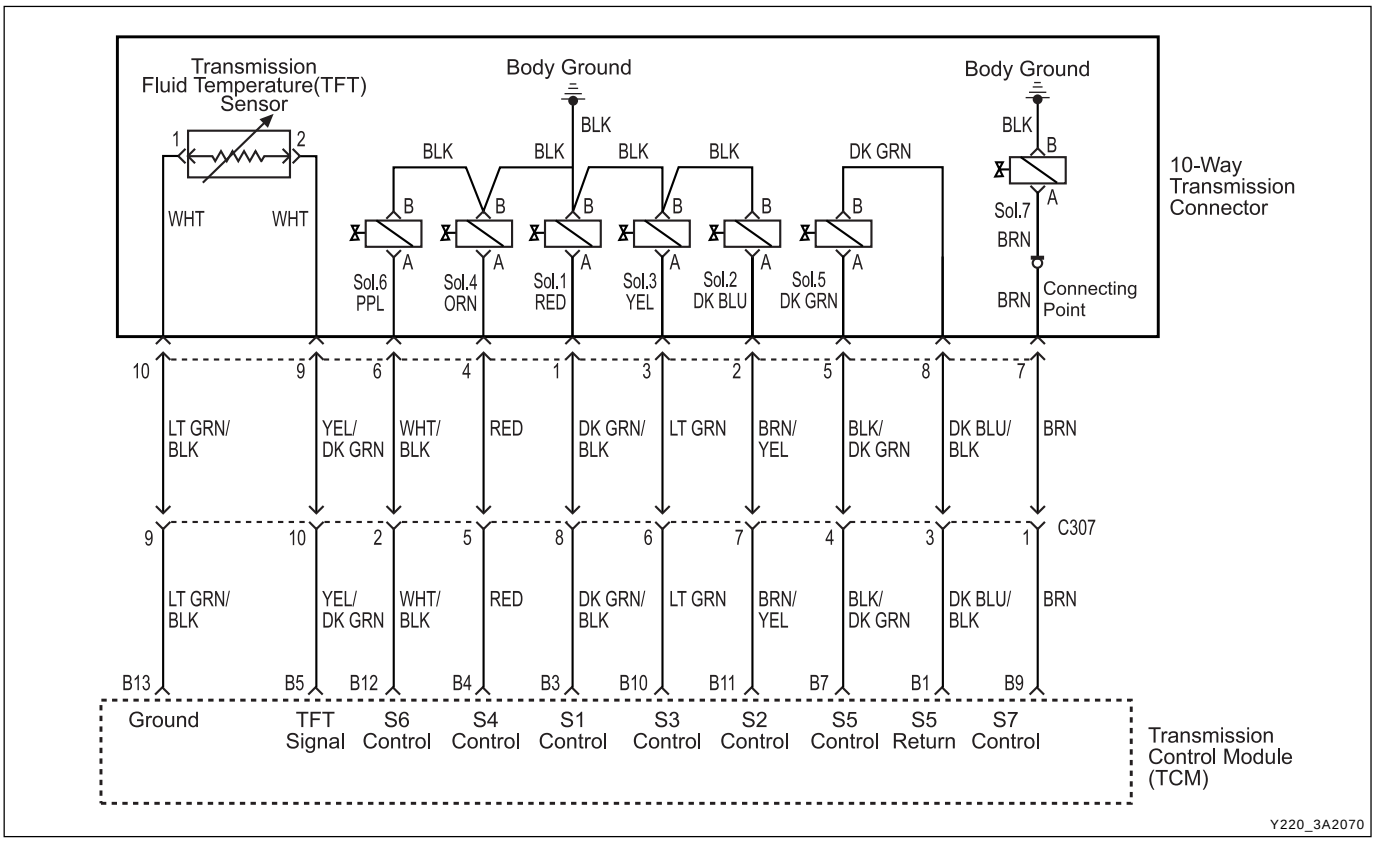

▶ DIAGNOSTIC TROUBLE CODE (DTC) P1746 SOLENOID 6 CIRCUIT SHORT

Circuit Description

The solenoid 6 is a normally open ON/OFF type sole-noid that is used to set the high/ low level of line pres-sure.

The solenoid 6 (S6) OFF gives high pressure and the S6 is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1746 sets when the Solenoid 6 (S6) circuit is shorted to ground. The solenoid 6's driver Integrated Chip (IC) status indicates a faulty circuit.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S6 is ON.
- The solenoid 6's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- The solenoid 6 is disabled (OFF) resulting in high line pressure being applied continuously.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- During the TCM's testing, solenoid 6 is turned OFF/ ON by a very small (4 millisecond) pulses. This pulse is too short for the solenoid to react so the transmission operation is not affected.
- The solenoid feedback voltage is measured before the (4 millisecond) pulse and again during the pulse. If the difference is outside the acceptable limits the relevant fault is recorded.
- Typical causes would be a short circuit to ground in the wiring to or within the solenoid.
- If several faults of solenoids are present, check the wiring or connectors that are common to the selected solenoids, especially the earth connections.

- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S6 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for short to ground.
6. Check resistance between S6 terminal A and B. Standard value is 22 ~ 30 Ω.
9. Check connections of other connectors.

DTC P1746 Solenoid 6 Circuit Short

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1746?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side and to the good ground. 4. Turn the mode knob of STET to 6 and push the red button. Does the bulb of close circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 8
4	1. Remove the valve cover. Refer to the Transmission in this section. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector to Solenoid 6 (S6) on the valve body. Does the test light illuminate?	-	Go to Step 5	Go to Step 6
5	Repair the short to ground in the wiring harness. Is the repair complete?	-	Go to Step 11	-
6	Using a Digital Volt Meter (DVM), measure the resistance between S6 terminal A and B. Is the resistance within the specified value?	20 ~ 30 Ω	Go to "Diagnostic Aids"	Go to Step 7
7	Replace the S6. Is the action complete?	-	Go to Step 11	-

DTC P1746 Solenoid 6 Circuit Short (Cont'd)

Step	Action	Value(s)	Yes	No
8	1. Disconnect the TCM connector B. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector terminal 6 to TCM terminal B12. Does the test light illuminate?	-	Go to Step 5	Go to Step 9
9	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 11	Go to Step 10
10	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 11	-
11	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 12	Go to Step 2
12	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

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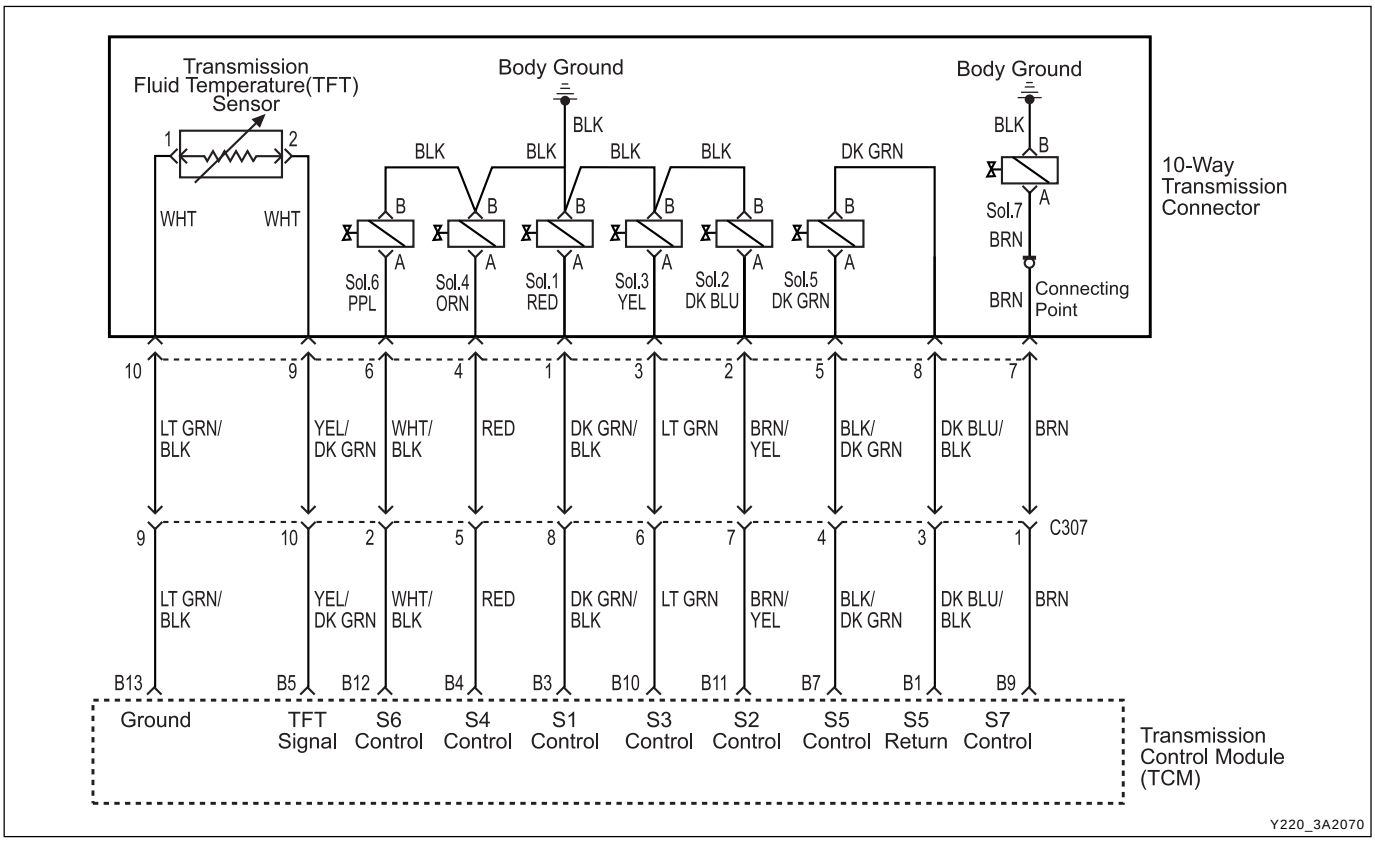


▶ DIAGNOSTIC TROUBLE CODE (DTC) P1747 SOLENOID 7 CIRCUIT SHORT

Circuit Description

The solenoid 7 is a normally open ON/OFF type sole-noid that is used to control the application of the Torque Converter Clutch (TCC).

The Solenoid 7 (S7) ON activates the TCC and is at-tached to the pump body within the transmission. Volt-age is supplied directly to the solenoid through the Transmission Control Module (TCM).

The DTC P1747 sets when the solenoid 7, Torque Converter Clutch Solenoid, circuit is shorted to ground. The solenoid 7's driver Integrated Chip (IC) status indicates a faulty circuit.

Conditions for Setting the DTC

- DTCs P1717 and P1718 are not set.
- S7 is ON.
- The solenoid 7's driver Integrated Chip (IC) status indicates a faulty circuit. This condition must be continuously present for 60 milliseconds.

Action Taken When the DTC Sets

- The solenoid 7 is always disabled (OFF) resulting in the TCC being unlocked continuously.

Conditions for Clearing the DTC

- The DTC will clear when the malfunction has not occurred after ignition cycle.
- A history DTC will clear after 40 TCM power-up cycles with a warm transmission (>50°C) and without a fault.
- History DTCs can be cleared by using a scan tool.

Diagnostic Aids

- During the TCM's testing, solenoid 7 is turned OFF/ ON by a very small (4 millisecond) pulses. This pulse is too short for the solenoid to react so the transmission operation is not affected.
- The solenoid feedback voltage is measured before the (4 millisecond) pulse and again during the pulse. If the difference is outside the acceptable limits the relevant fault is recorded.
- Typical causes would be a short circuit to ground in the wiring to or within the solenoid.
- If several faults of solenoids are present, check the wiring or connectors that are common to the selected solenoids, especially the earth connections.

- Inspect the wiring for poor electrical connections at the TCM and at the 10-way transmission connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short tobare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The number(s) below refer to the step number(s) on the Diagnostic Table.

3. Checks if the S7 circuit in the transmission is malfunctioning.
4. Check cable in the transmission for short to ground.
7. Check resistance between S7 terminal A and B. Standard value is 22 ~ 30 Ω.
10. Check connections of other connectors.

DTC P1747 Solenoid 7 Circuit Short

Step	Action	Value(s)	Yes	No
1	Perform a Transmission Control Module (TCM) System Check. Is the check performed?	-	Go to Step 2	Go to "TCM Diagnostic System Check"
2	1. Install the scan tool. 2. Turn the ignition ON, with the engine OFF. 3. Record and then clear DTCs. 4. Operate the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool display P1747?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Turn the ignition OFF. 2. Disconnect the 10-way transmission connector. (additional DTCs will set) 3. Connect Solenoid/Thermistor Electrical Tester (STET) to the 10-way transmission connector of transmission side and to the good ground. 4. Turn the mode knob of STET to 7 and push the red button. Does the bulb of close circuit on the solenoids side of STET illuminate?	-	Go to Step 4	Go to Step 8
4	1. Remove the pump assembly. Refer to the Pump in this section. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector to contact point attached onto the transmission case. Does the test light illuminate?	-	Go to Step 5	Go to Step 6
5	Repair the short to ground in the wiring harness. Is the repair complete?	-	Go to Step 12	-
6	With a test light connected to B+, probe the wiring harness from contact point attached onto the transmission case to S7. Does the test light illuminate?	-	Go to Step 15	Go to Step 7
7	Using a Digital Volt Meter (DVM), measure the resistance between S7 terminal A and B. Is the resistance within the specified value?	20 ~ 30 Ω	Go to "Diagnostic Aids"	Go to Step 8
8	Replace the S7. Is the action complete?	-	Go to Step 12	-

DTC P1747 Solenoid 7 Circuit Short (Cont'd)

Step	Action	Value(s)	Yes	No
9	1. Disconnect the TCM connector B. 2. With a test light connected to B+, probe the wiring harness from 10-way transmission connector terminal 7 to TCM terminal B9. Does the test light illuminate?	-	Go to Step 5	Go to Step 10
10	Check for a poor connection at the 10-way transmission connector and TCM connector and repair the malfunctioning terminals as necessary. Is a repair necessary?	-	Go to Step 12	Go to Step 11
11	1. Turn the ignition OFF. 2. Replace the TCM. Is the action complete?	-	Go to Step 12	-
12	1. Using the scan tool, clear the DTCs. 2. Road test the vehicle within the conditions for setting this DTC as specified in the text. Does the scan tool indicate that this diagnostic has run and passed?	-	Go to Step 13	Go to Step 2
13	Check if any DTCs are set. Are there any DTCs displayed or previously recorded at Step 2 that have not been diagnosed?	-	Go to applicable DTC table	System OK, Check Complete

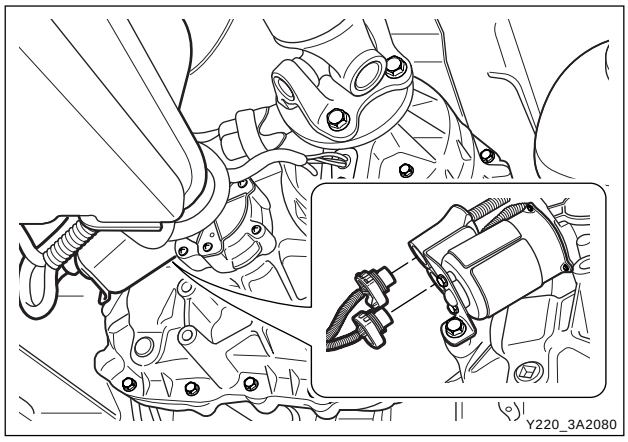
REPAIR INSTRUCTIONS

ON-VEHICLE SERVICE

TRANSMISSION

Removal and Installation Procedure

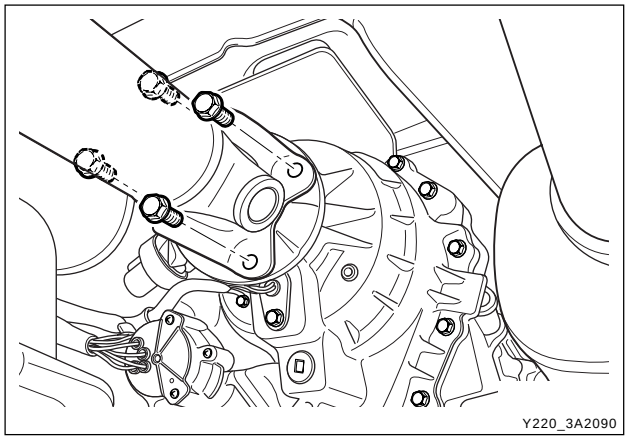
1. Disconnect the negative battery cable.
2. Disconnect the connectors from transfer case.
3. Disconnect the speedometer connector from transfer case.
4. Disconnect the inhibitor connector, gear position sensor connector and transmission case connector.



5. Remove the rear propeller shaft bolts.

Installation Notice

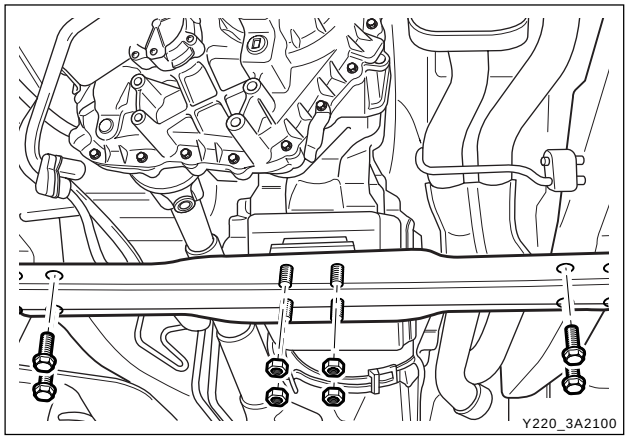
Tightening torque	70 ~ 80 Nm (52 ~ 59 lb-ft)

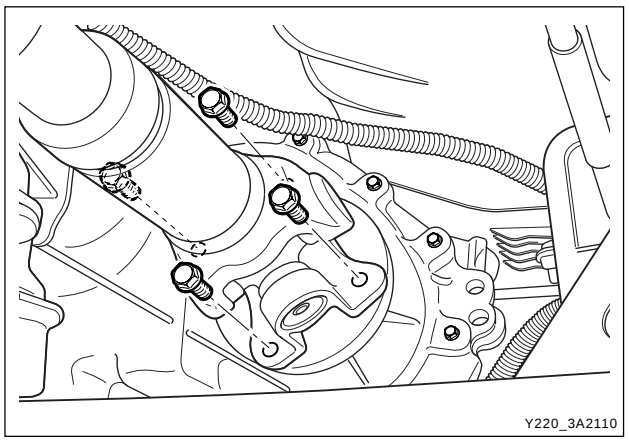


6. Remove the cross member bolts and nuts.

Installation Notice

Tightening torque	70 ~ 80 Nm (52 ~ 59 lb-ft)

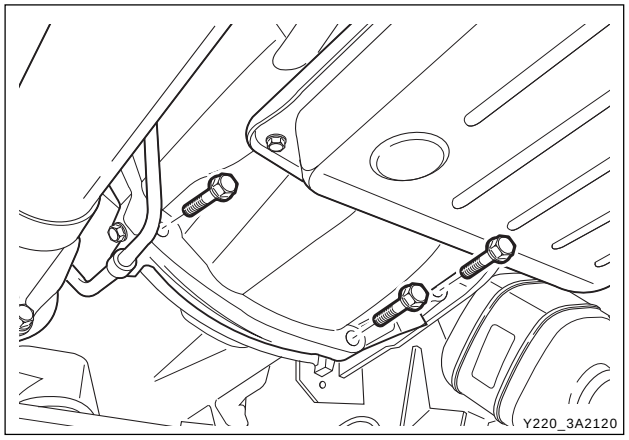




7. Remove the front propeller shaft bolts from transfer case.

Installation Notice

Tightening torque	70 ~ 80 Nm (52 ~ 59 lb-ft)

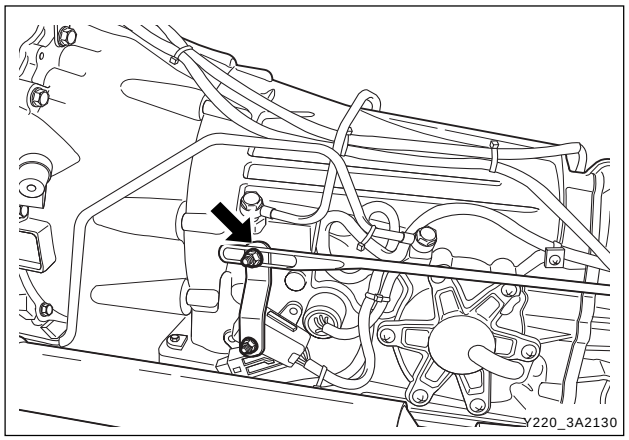


8. Remove the transfer case-to-transmission housing bolts and remove the transfer case.

Installation Notice

Tightening torque	44 Nm (33 lb-ft)

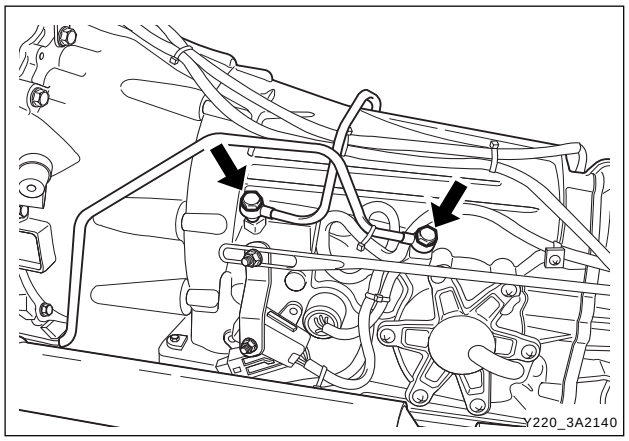
9. Disconnect the 10-Pins Plug connector from transmission.



10. Separate the locking clip on shift lever and remove the shift rod.

Notice

Removal and installation performed when the shift procedure should be lever is in 'D' range.



11. Remove the oil cooler pipes.

Installation Notice

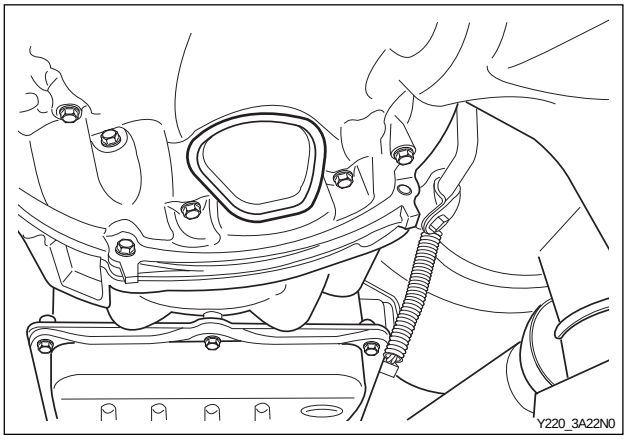
Tightening torque	25 ~ 35 Nm (18 ~ 26 lb-ft)

12. Remove the service hole cover in the engine block.
13. Put the alignment mark for installation, and remove the six mounting bolts for torque converter from drive plate through the service hole by rotating the engine and remove the torque converter.

    Installation Notice

Tightening torque	42 Nm (31 lb-ft)

    - Screw the six bolts mounting the torque converter through the service hole by using a mirror and rotating the engine.
14. Remover the starter. Refer to Section *Engine Electrical*.

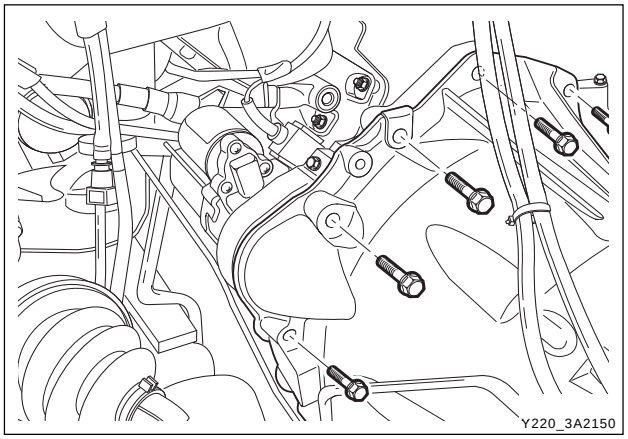


15. Remove the extension housing to case bolts and remove the transmission assembly.

    Installation Notice

Tightening torque	55 ~ 65 Nm (41 ~ 48 lb-ft)

    - Be careful not to drop the torque converter while removing the transmission.
16. Installation should follow the removal procedure in the reverse order.

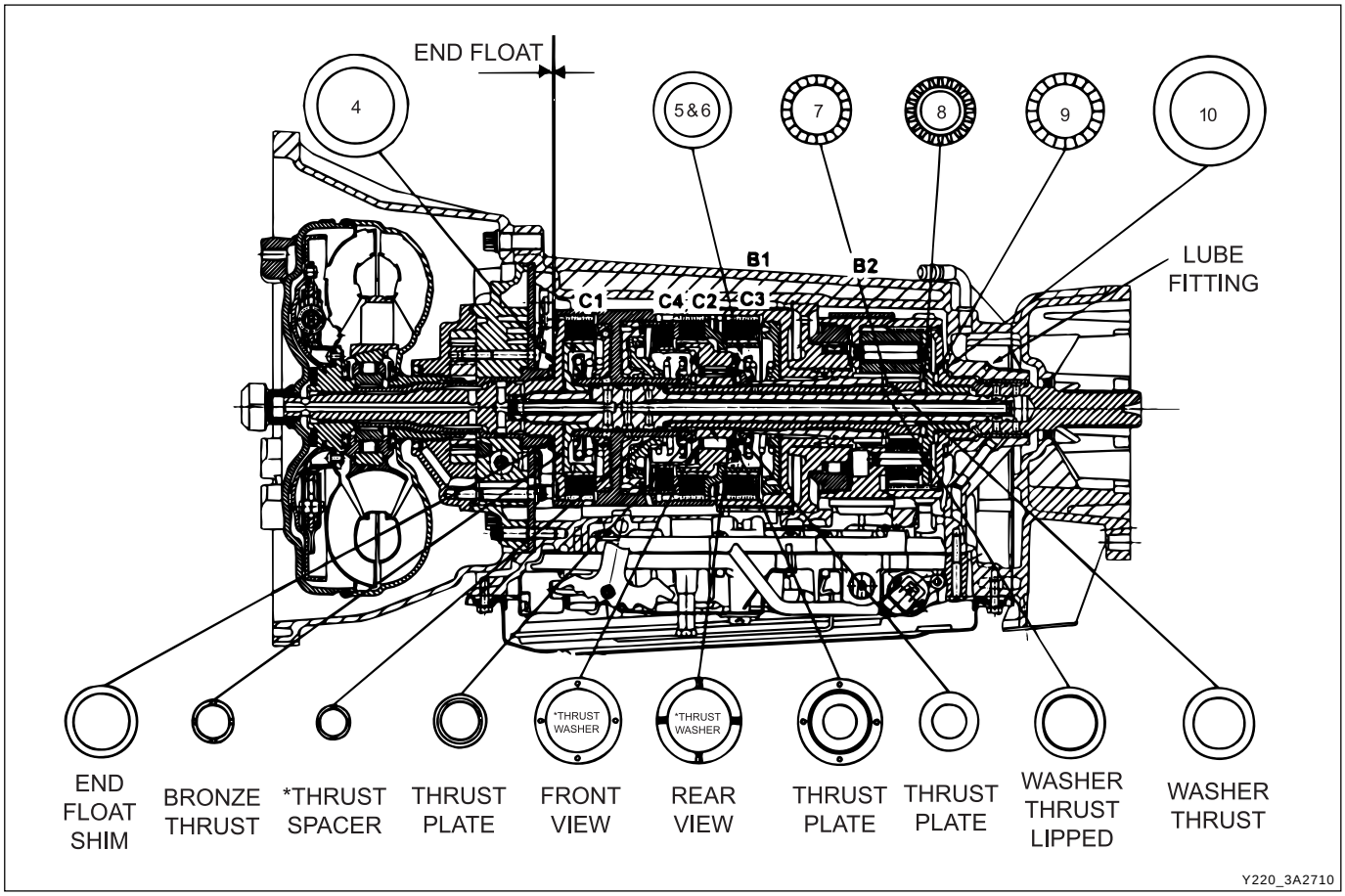


UNIT REPAIR

REBUILD WARNINGS

Prior to rebuilding a transmission system, the following warnings are to be noted.

- Ensure that, before replacing a transmission the cooler lines are flushed out to remove any debris. This can be done by applying compressed air to the rear cooler line forcing oil and any contaminants out of the front cooler line.
- The cooler flow should be checked after the transmission has been fitted. With the front cooler line connected and the rear line run into a suitable container, measure the flow over 15 seconds with the vehicle idling in park.
- The flow rate should exceed 1 liter in 15 seconds.
- Be wary of any situation where water enters the transmission. This may result in fluid foaming and leaking through the breather.
- Ensure that both earth straps (one at the battery terminal and one on the vehicle body) are connected in the vehicle before connecting the positive side of the battery.
- Follow the throttle position calibration procedure in this manual if the engine control module/ transmission control module (ECM/TCM) is swapped.



DISASSEMBLY PROCEDURE

Transmission

Tools Required

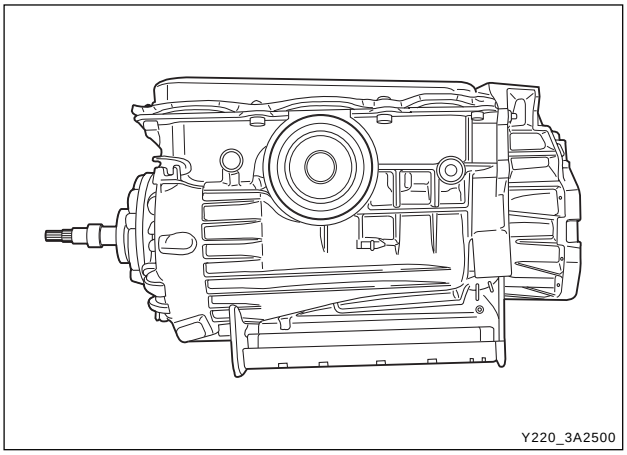
0555-336256 Transmission Bench Cradle

0555-336257 Pump Puller

Notice

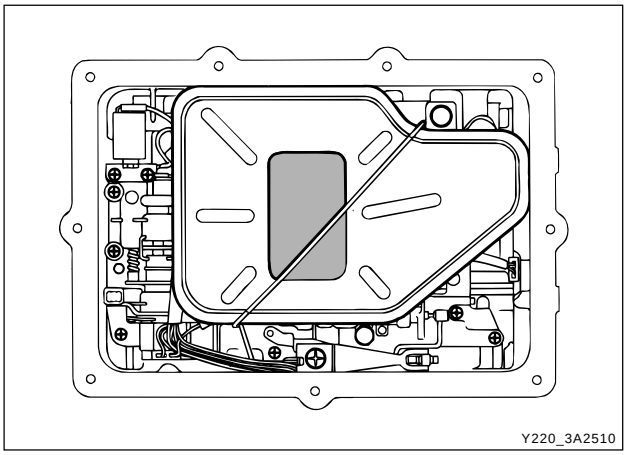
- ***Remove the inhibitor switch before washing the transmission in solvent or hot wash.***
- ***It is assumed that the transmission fluid has been drained when the transmission was removed from the vehicle and that the "special tools" quoted are available.***
- ***The transmission is dismantled in a modular fashion, and the details of disassembly for each module are given under the appropriate subject. Refer to Special Tools Table in this chapter for details of all special tools required when performing disassembly procedures.***
- ***Technicians overhauling these transmissions will also require a selection of good quality Torx bit sockets, in particular numbers 30, 40 and 50, and an 8mm, 10mm and 12 mm double hex socket.***

1. Remove the converter and the converter housing.
2. Mount the transmission on the transmission bench cradle 0555-336256.
3. Remove the oil pan and the oil pan seal.



Y220_3A2500

4. Remove each end of the filter retaining clip from the valve body and remove the filter.
5. Disconnect the wires from each solenoid and ground and lay the wiring to one side.
6. Remove the valve body securing screws and remove the valve body from the case.



Y220_3A2510

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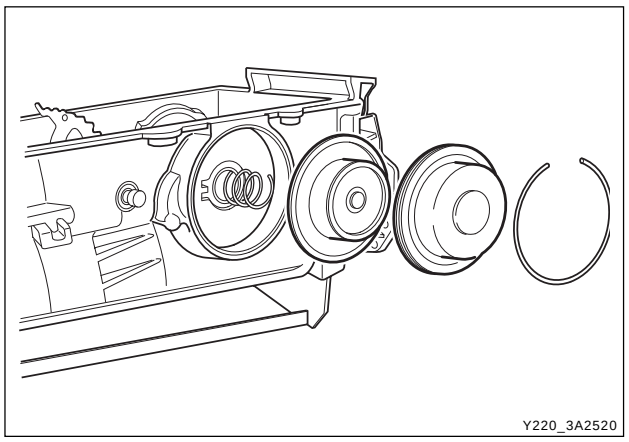
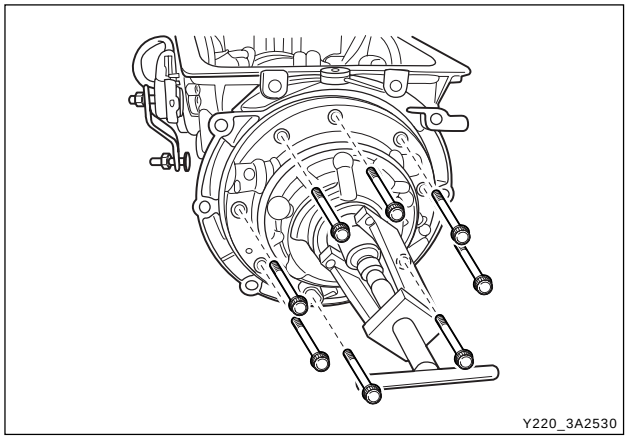

Y220_3A2520

7. Remove the front servo cover circlip.
8. Remove the front servo cover, piston and spring.

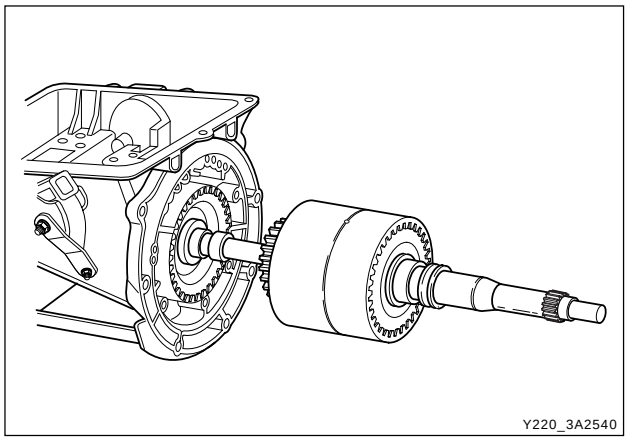
Notice

The plastic servo block is retained by the piston return spring only.

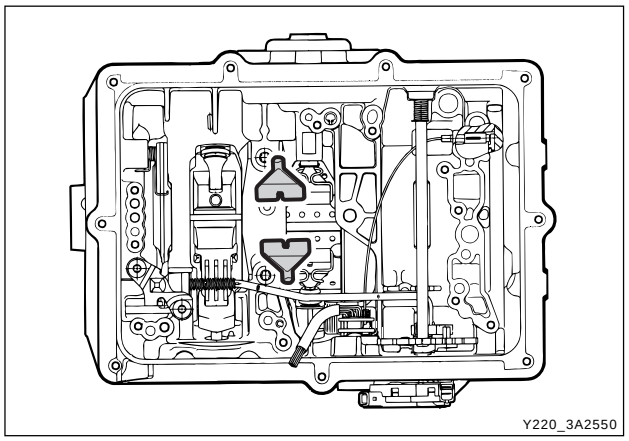
9. Remove the adaptor housing bolts and adaptor housing.


Y220_3A2530

10. Remove the pump to case bolts using a multi-hex 8 mm spanner.
11. Using the pump puller 0555-336257, remove the pump and pump cover.


Y220_3A2540

12. Remove the input shaft, forward clutch cylinder, and the overdrive shaft as an assembly, withdrawing them through the front of the case.
13. Remove the C3 clutch cylinder and sun gears.


Y220_3A2550

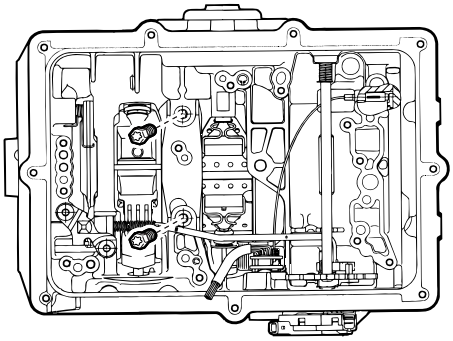
14. Remove the front band struts. Remove the front band.

15. Remove the two centre support retaining bolts using a T50 Torx bit.
16. Remove the centre support retaining circlip.

Notice

Do not hammer the output shaft to remove the centre support as this will cause permanent damage to the thrust bearing surfaces.

17. Remove the centre support, 1-2 one way clutch, and planetary gear set as an assembly.
18. Remove the parking rod cam plate using a T40 Torx bit.

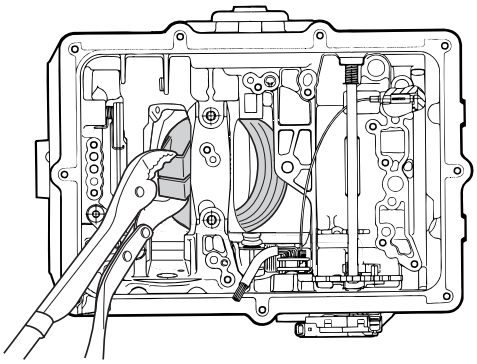

Y220_3A2560

19. Remove the rear band struts and remove the band.

Notice

Vise the both end of rear band using the plier and lean forward about 15 degrees

20. Remove the output shaft assembly.

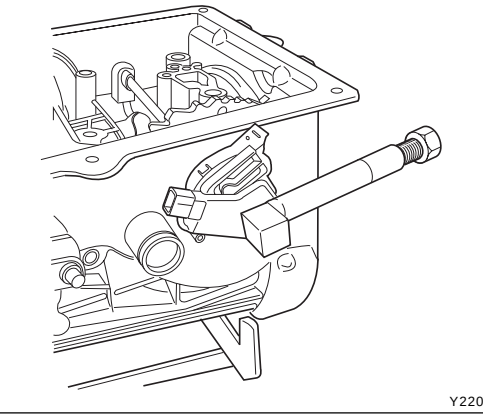

Y220_3A2570

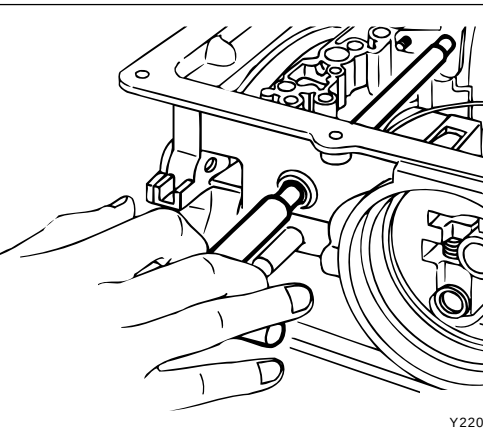
Transmission Case

Tools Required

0555-336258 Cross Shaft Pin Remover/Installer (Detent Lever)
0555-336261 Cross Shaft Seal Remover
0555-336265 Cross Shaft Pin Remover/Installer (Inhibitor Switch)

1. Remove the pin from the side of cross shaft inhibitor switch using cross shaft pin remover/installer (inhibitor switch) 0555-336265.
2. Remove the inhibitor switch bolts and inhibitor switch from the case.
3. Remove the cross shaft seals with cross shaft seal remover 0555-336261.
4. Remove the circlip from the cross shaft. Pull the shaft to release the drive pin from the selector quadrant.


Y220_3A2580


Y220_3A2590

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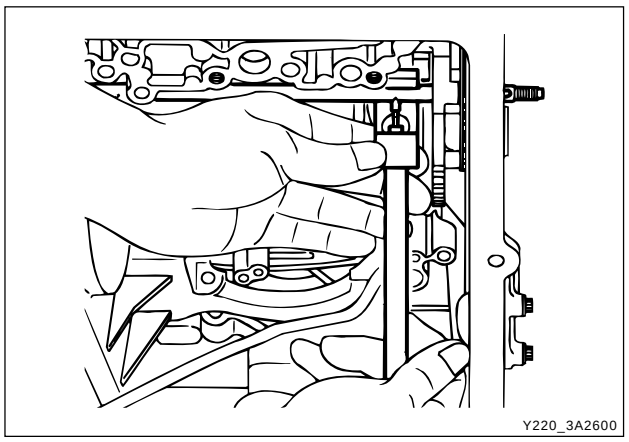
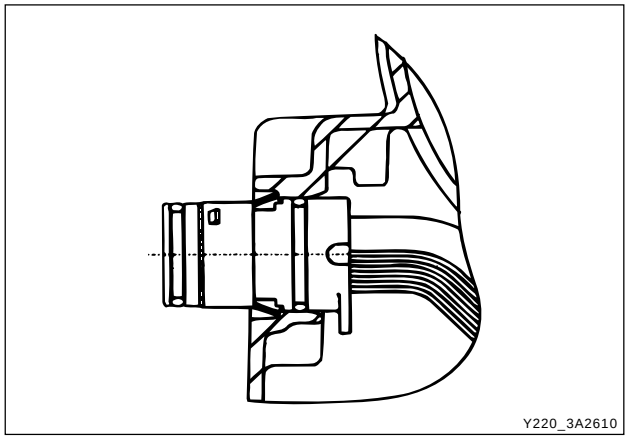
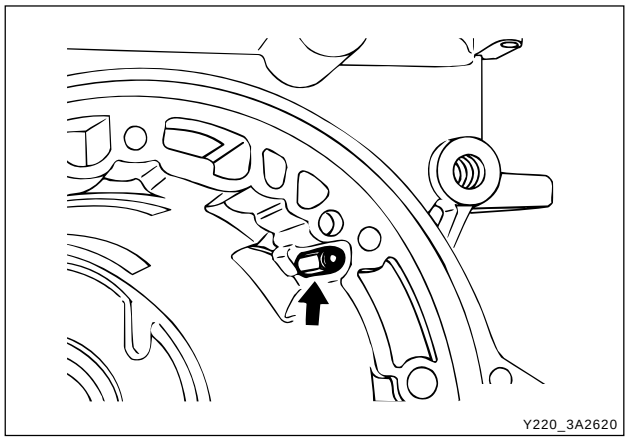


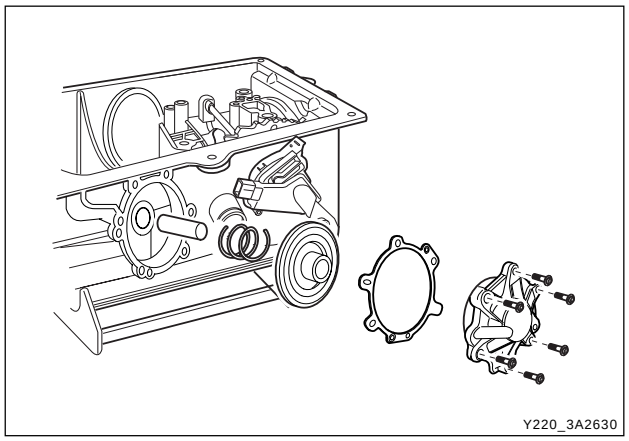
5. Using cross shaft pin remover/installer (detent le-ver) 0555-336258, press the pin from the cross shaft and withdraw the shaft from the case.
6. Remove the cross shaft pin and spring.
7. Remove the manual valve lever and the park rod.



8. Depress the tangs and withdraw the 10 pin connector into the case. Remove the wiring loom assembly.



9. Detach the No.7 solenoid wire from the front of the case.
10. Remove the parking pawl pivot pin and the pawl and spring from the case.
11. Remove the shaft and the rear servo lever.

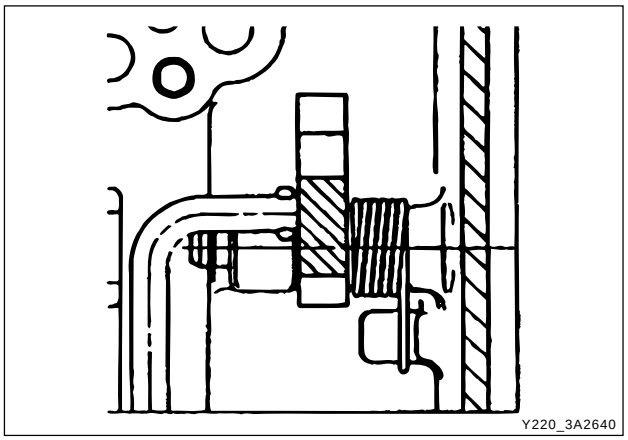


12. Remove the rear servo cover and piston assembly.
13. Remove the B1R circlip, valve and spring.
14. Remove both band adjustment shims.
15. Inspect the output shaft bushing in the case and replace if necessary.
16. Inspect cooler line fittings and replace as necessary.
17. Inspect the case for damage.

18. To remove the park rod lever: Remove the circlip from the inner end of the pivot shaft and tap the outer end of the shaft until it moves free from the case, then using a wide shallow tapered drift as a wedge, drive the pin out from the inside of the case and remove the lever and spring.

Notice

Do not remove the park rod lever unless absolutely necessary.

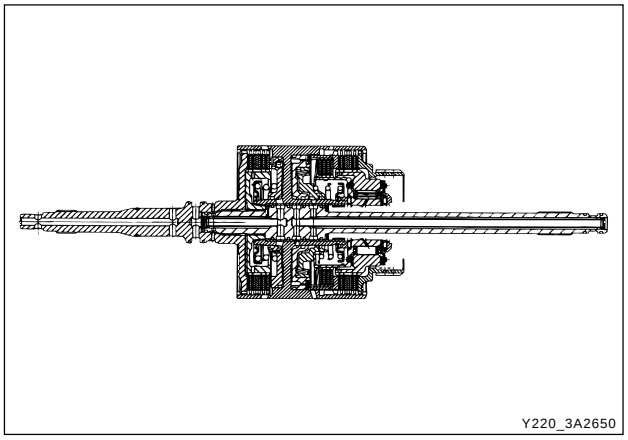

Y220_3A2640

Forward Clutch Cylinder

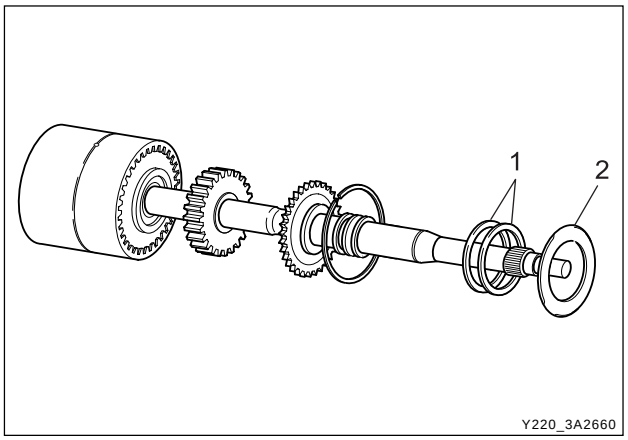
Tools Required

0555-336259 Clutch Spring Compressor

1. Place the assembly in a horizontal position.

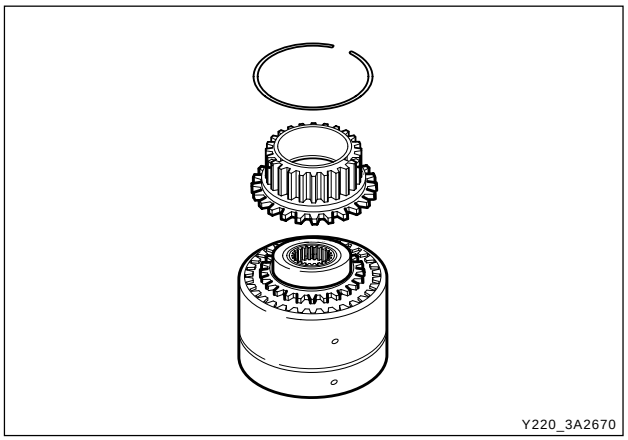

Y220_3A2650

2. Remove the No. 4 needle bearing (2) and adjust-ment shims (1) from the input shaft.
3. Remove the circlip from the front of the clutch cylinder and remove the input shaft.
4. Remove the overdrive shaft and the C1 clutch hub assembly from the clutch cylinder.
5. Remove the C1 clutch plates from the cylinder.



Y220_3A2660

6. Remove the circlip retaining the C3 clutch hub in the rear of the clutch cylinder and remove the hub.
7. Remove the C2/C4 clutch hub assembly and remove the No. 5 needle bearing from the C4 hub.
8. Removethe C2 clutch plates.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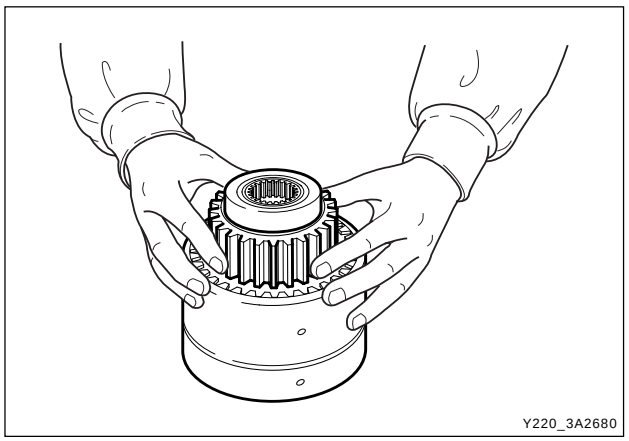
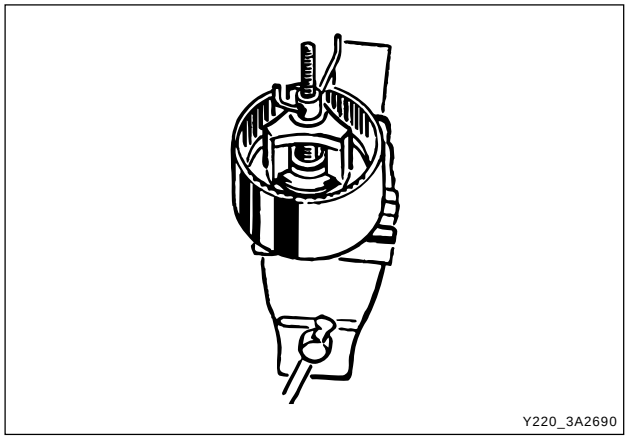

Y220_3A2680

9. Invert the clutch cylinder and remove the C4 clutch sleeve, clutch plates and the two wave washers. The 3-4 one way clutch is located between the C2 and C4 clutch hubs, and the hubs may be separated by rotating one hub clockwise and withdrawing it from the other.
10. Remove the thrust block from the C4 clutch cylinder hub.

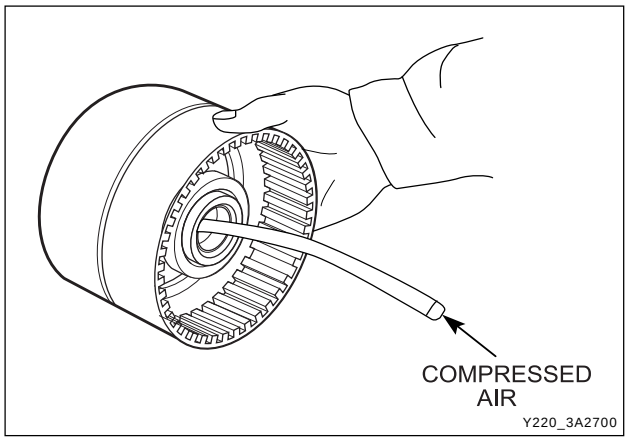

Y220_3A2690

11. Mount the clutch cylinder on clutch spring compressor 0555-336259 with the C2/C4 end uppermost and compress the piston return spring. Remove the spring retaining circlip. Release the tool and remove the circlip, keeper and spring.

Notice

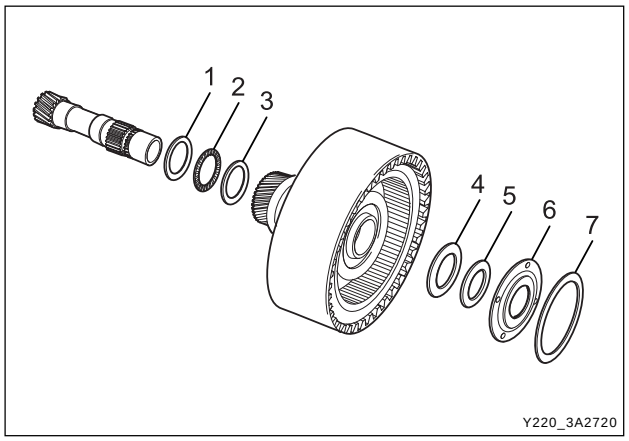
Make sure that the spring keeper is not caught in the circlip groove, and that all the spring pressure is released, before removing the tool.

12. Invert the clutch cylinder on the compressor tool and removethe C1 clutch piston return spring in asimilar manner.



Y220_3A2700

13. To remove the clutch pistons from the clutch cylinder, apply air pressure to the apply ports in the bore of the cylinder.



Y220_3A2720

C3 Clutch Cylinder

Tools Required

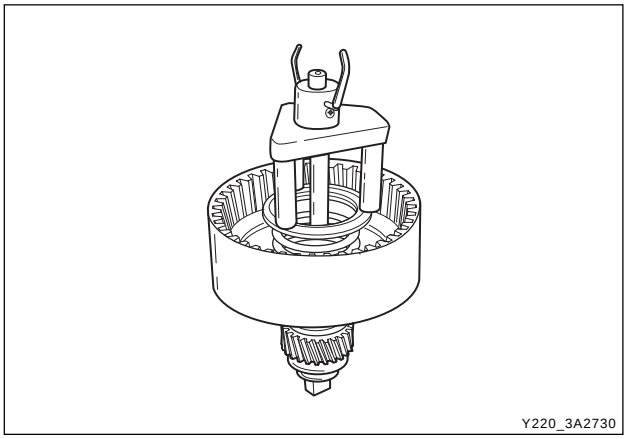
0555-336259 Clutch Spring Compressor

1. Remove the forward sun gear, No.7 needle bearing (2) thrust washer (1) and lipped thrust washer (3) from the C3 clutch cylinder.
2. Remove the thrust plate (4), No.6 needle bearing (5), thrust plate (6) and nylon thrust plate (7) from the clutch cylinder hub.
3. Remove the clutch plate retaining circlip and re-move the clutch plates.

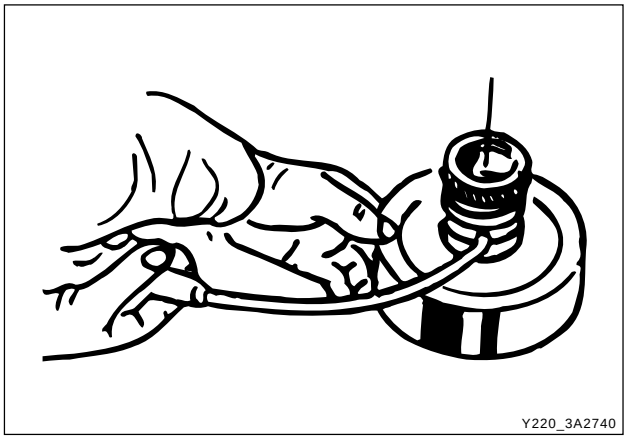
4. Mount the clutch assembly on clutch spring compressor 0555-336259 and compress the piston return spring.
5. Remove the circlip and release the spring.
6. Remove the tool, circlip, keeper and spring.

Notice

Make sure that the spring keeper has not been caught in the circlip groove, and that all spring pressure has been released, before removing the tool.

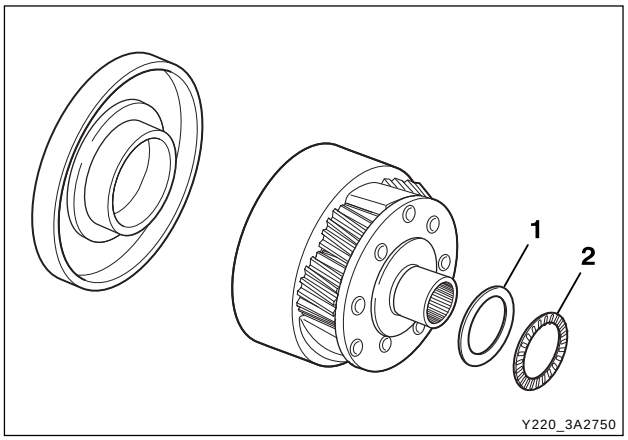

Y220_3A2730

7. Remove the sealing rings from the C3 clutch cylinder.
8. To remove the clutch piston from the clutch cylinder, apply air pressure to the port between the iron sealing rings on the bearing journals of the cylinder.
9. Remove the reverse sun gear and C3 washer from the cylinder.


Y220_3A2740

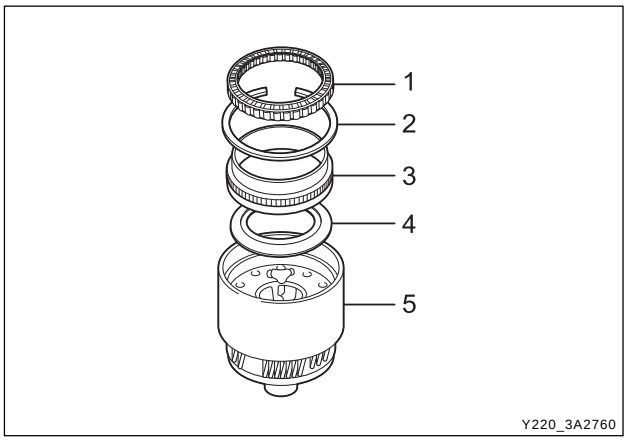
Planet Carrier Assembly and Centre Support

1. Remove the No. 9 (2) needle bearing and washer (1) from the output shaft and the planet carrier.
2. Separate the centre support from the planet carrier by rotating it anti-clockwise.



Y220_3A2750

3. Lift the one way clutch (1) from the planet carrier (5).
4. Remove the circlip (2) retaining the one way clutch outer race (3) in the planet carrier and remove the race.
5. Remove the one way clutch retainer (4) from the planet carrier.



Y220_3A2760

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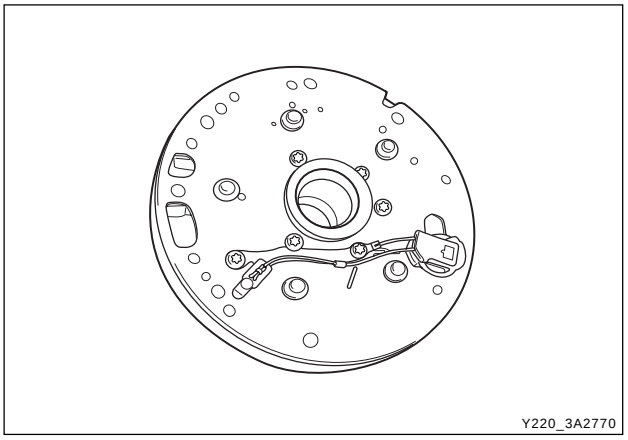
Pump

Notice

The following valves are housed in the pump cover:

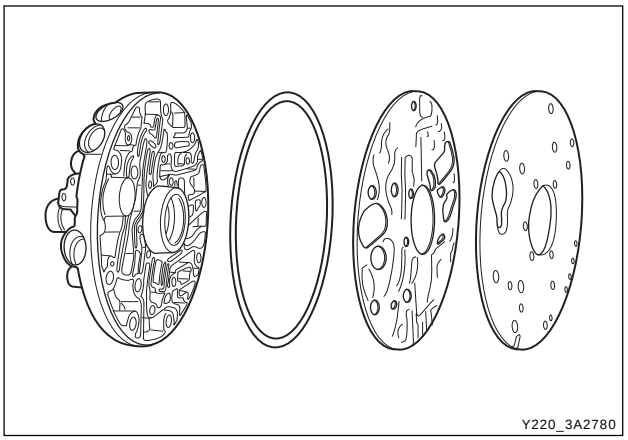
- ***Solenoid 7***
- ***Converter clutch control valve***
- ***Converter clutch regulator valve***
- ***Primary regulator valve***



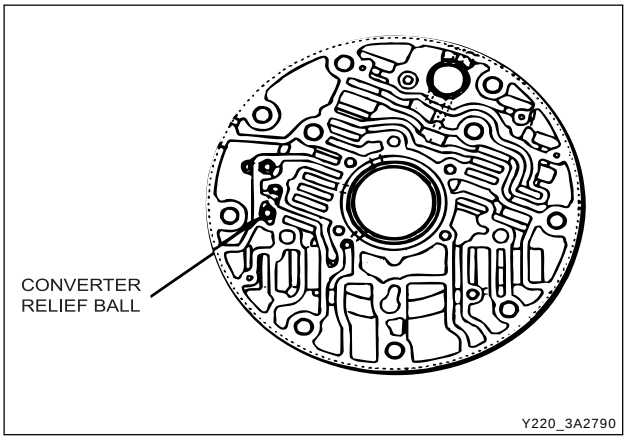
1. Remove the wiring loom retainer plate and remove solenoid 7 with a T30 Torx bit.
2. Remove the five washer head bolts from the cover plate using a multi-point 8 mm socket.
3. Remove the five Torx head screws from the cover plate with T30 Torx bit. Note that the long screw holds the pump body to the pump body cover.

Notice

Do not strike the converter support tube to loosen the pump body.



4. Separate the pump body from the pump cover.
5. Remove the cover plate, gasket and seal from the cover.



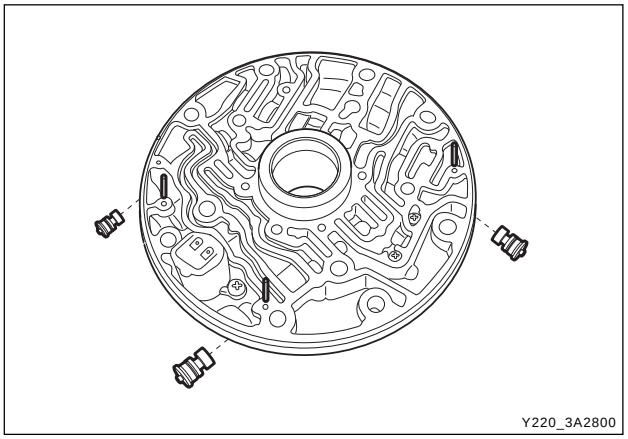
6. Remove the ball check valve and one spring from the pump cover.

7. Depress the plug inward and remove the retaining pin for each of the three valves.

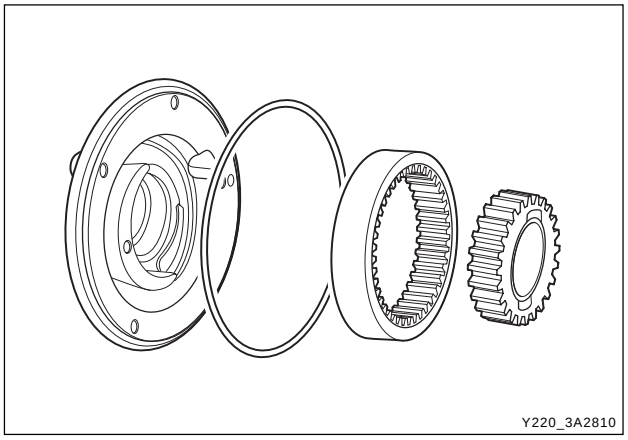
Notice

Some of the valves and plugs are preloaded by springs and may unexpectedly fall out of the cover when the pins are removed.

8. Remove the four valves, plugs and springs.


Y220_3A2800

9. Remove the pump gears from the pump body.
10. Remove the lip seal from the front of the pump body.


Y220_3A2810

Valve Body

1. Remove the manual valve detent spring and retainer plate using a T40 Torx bit.
2. Slide the manual valve out of the lower valve body.

Notice

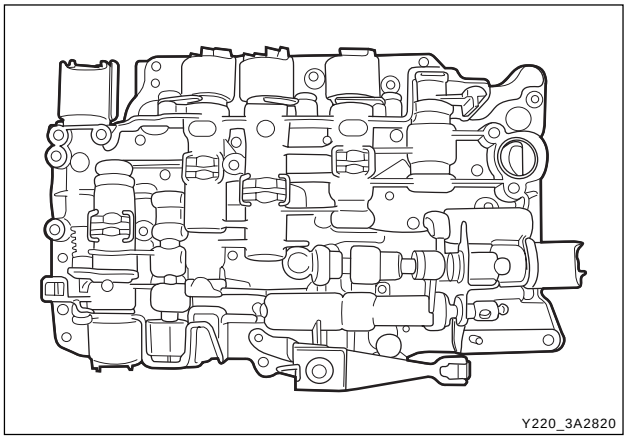
Be aware that the manual valve will fall out of the valve body.

3. Take note of the angular relationship of the solenoid terminals to the valve body and remove the solenoids 1, 2, 3, 4, 5, 6 and valve assemblies.

Notice

Take care that the bracket is not separated from the solenoid.

4. Place the valve body assembly on the bench with the upper body uppermost.
5. Remove the 24 clamping screws with a No. 30 Torx bit. Separate the upper and lower valve bodies by lifting the upper body and the separator plate together.
6. Turn the upper body over and place it on the bench with the separator plate uppermost.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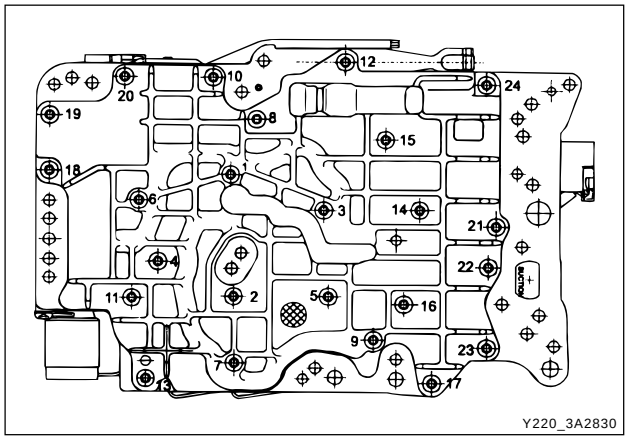

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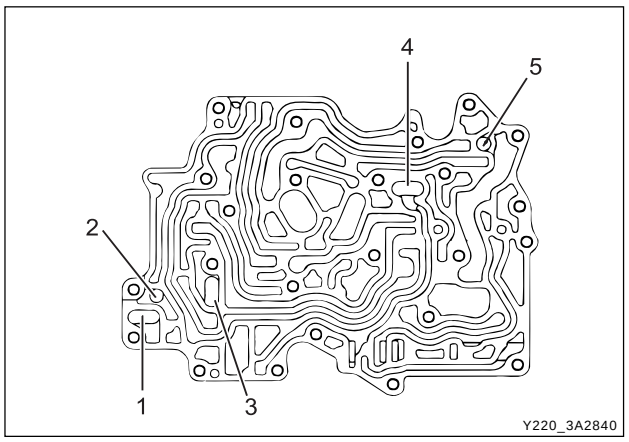
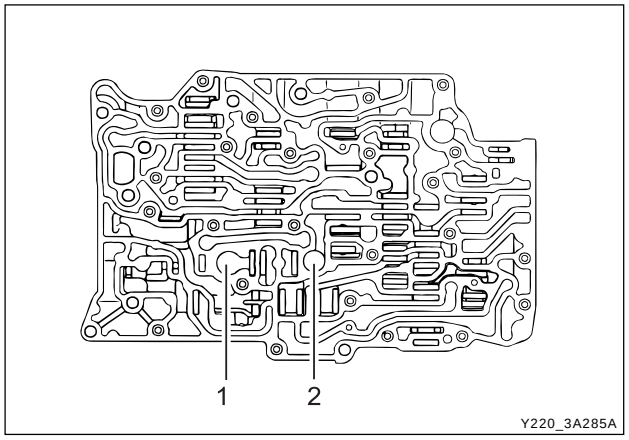


7. Lift the separator plate and gaskets from the upper valve body.
8. Remove the five nylon check balls exposed in the valve body.
9. Remove the retaining plate, plug, spring and re-verse lockout valve.

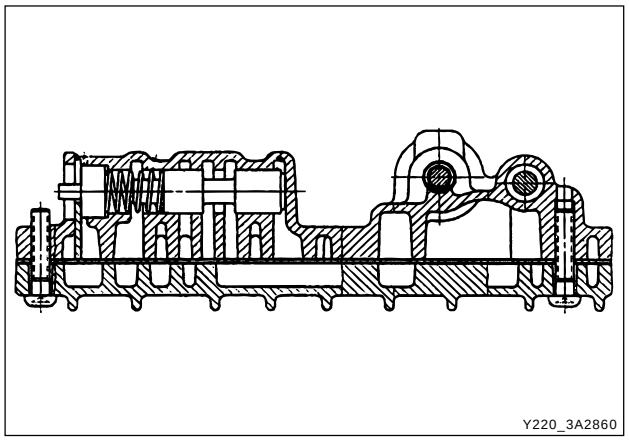


10. Remove the filter (1) and the large nylon check ball (2) from the lower valve body.
11. Remove the retaining plates and pins from the 1-2, 2-3, 3-4, BAR and CAR valves. The pins can be removed with a magnet.

Notice

Once the pins are removed, the plates are loose in the valve body and will drop out when the valve body is turned over.

12. Remove the 1-2, 2-3 and 3-4 shift valves.

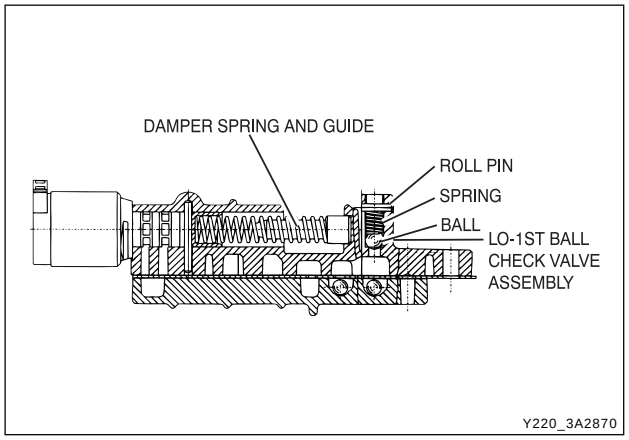


13. Depress the 4-3 sequence valve plug and remove the retaining plate.

Notice

The plug is preloaded by the spring and may unexpectedly fall out of the valve body.

14. Remove the plug, spring and valve



15. Depress the solenoid 5 valve. Remove the retaining in and remove the valve, damper guide and spring.

Notice

The valve is preloaded by the spring and may unexpectedly fall out of the valve body.

16. Depress the line pressure release valve, remove the retaining pin, disc (if fitted), spring and valve.
17. Drive out the retaining pin and remove the spring and ball check valve adjacent to the BAR valve.

ASSEMBLY PROCEDURE

Transmission

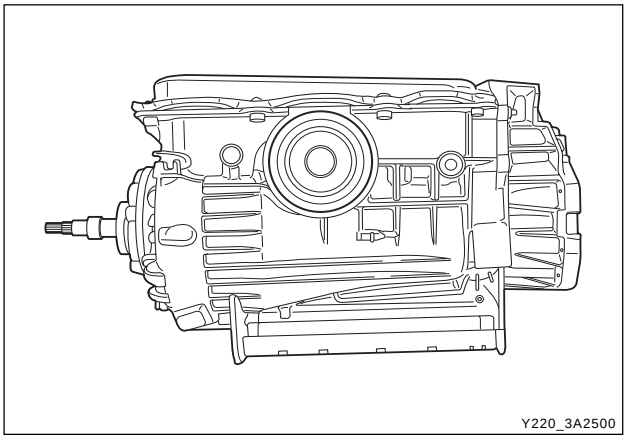
Tools Required

0555-336256 Transmission Bench Cradle
0555-336258 Cross Shaft Pin Remover/Installer (Detent Lever)
0555-336262 Cross Shaft Seal Installer
0555-336263 Cross Shaft bullet
0555-336265 Cross Shaft Pin Remover/Installer (Inhibitor Switch)

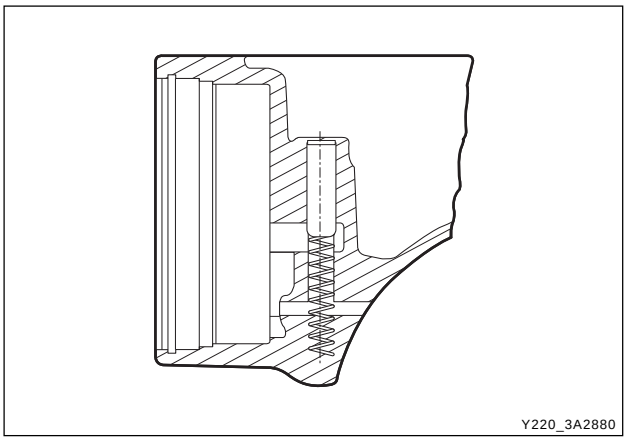
Notice

- ***The transmission is assembled in modular fashion and details of assembly for each module are given under the appropriate subject.***
- ***Technicians overhauling these transmissions will also require a selection of good quality Torx bit sockets, in particular numbers 30, 40 and 50, and an 8 mm, 10 mm and 12 mm double hex socket.***
- ***Ensure that the B1R circlip is fitted to the case. (If this is not fitted, the valve will peen its way into and through the separator plate)***
- ***Ensure that the 'E'clip is fitted to the cross shaft.***
- ***Ensure that all aspects of the parking mechanism are working.***

1. Turn the transmission case upside down on the bench and mount it to the transmission bench cradle 0555-336256.
2. Install all fittings, plugs and the breather, applying a sealant where applicable, Tighten the fittings to specifications. Ensurethatthebreatheris clear, andcheckthat the lube fitting in the rear of the case is fittedand clear of obstruction.


Y220_3A2500

3. Assemble the B1R valve and spring, and secure with the circlip. Ensure that the circlip is completely seated in its groove.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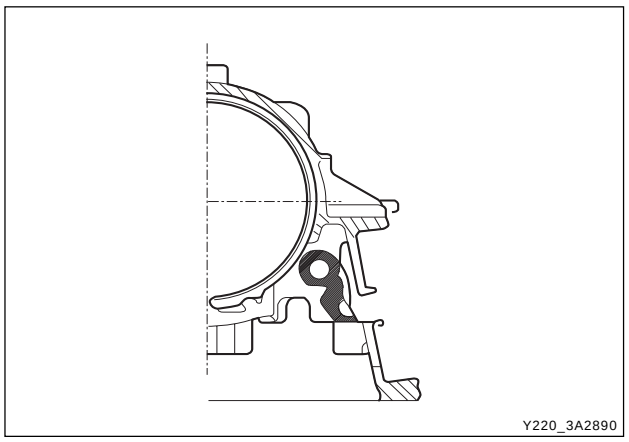
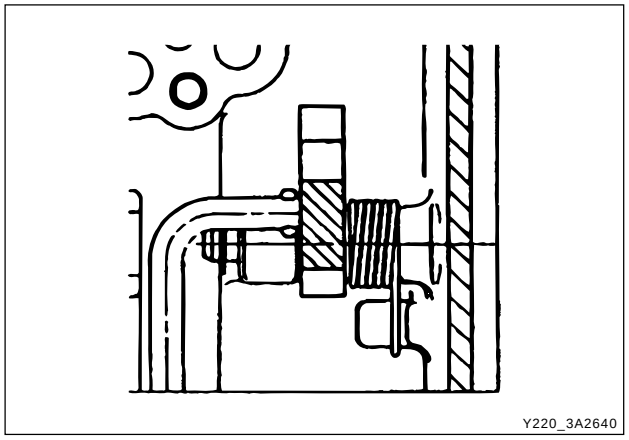


4. Install the rear servo lever and pivot pin.

Notice

The lever must pivot freely on its pin.



5. Assemble the park rod lever, complete with the return spring and pivot pin, applying a small amount of sealant to the outer end of the pivot pin.

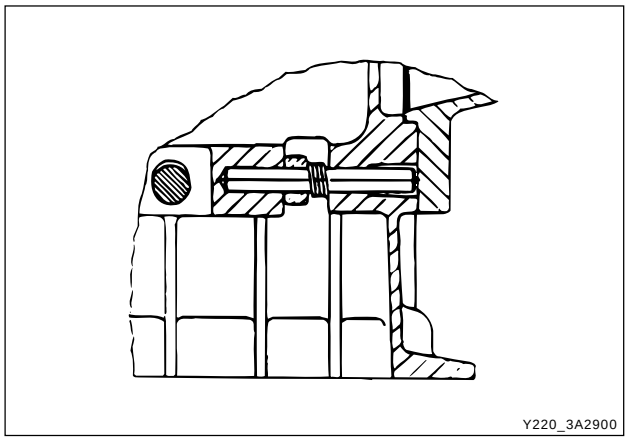
Notice

Care must be taken when applying sealant to ensure that it is not applied between the pin and the lever.

6. Secure the pivot pin with the circlip.

Notice

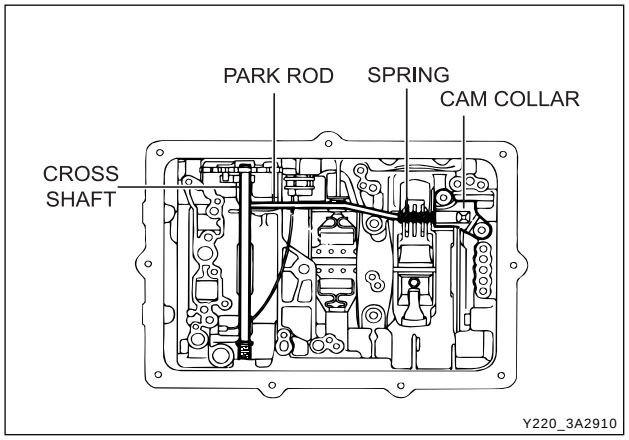
The lever must pivot freely on its pin and the spring must return the park rod lever to its correct location.



7. Install the parking pawl pivot pin and spring.

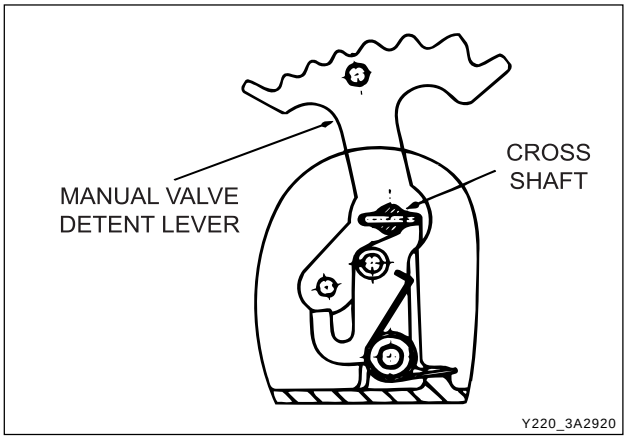
Notice

The pawl must pivot freely on its pin.

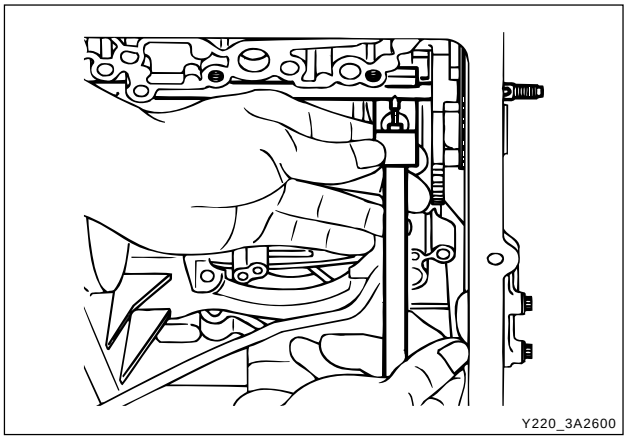


8. Connect the park rod to the manual valve detent lever. Ensure the spring and cam collar is firmly installed on the rod.
9. Check that the cam collar slides freely on the rod.
10. Insert the cross shaft into the case, from the side opposite to the inhibitor switch, then install the antirattle spring on the shaft.

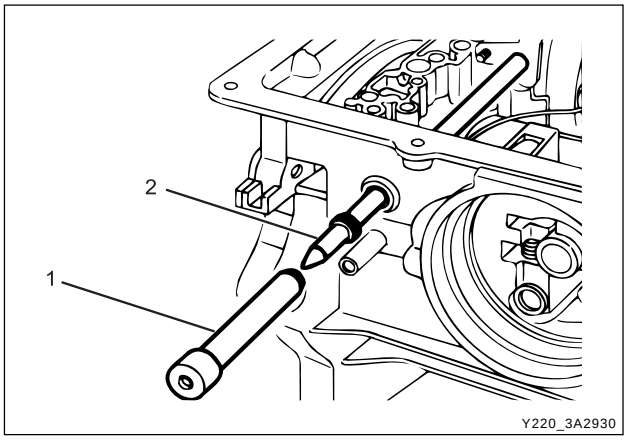
11. Poition the manual valve detent lever, aligning it with the cross-shaft bore in the case.
12. Push the shaft through the detent lever until it starts in the detent lever side of the case.



13. Install the detent lever drive pin in the shaft using cross shaft pin remover/installer (detent lever) 0555-336258 with the adaptor over the pin.
14. Press the pin into the shaft until the tool bottoms.
15. Remove the tool and fit the spring retaining circlip to the shaft.



16. Install the new cross shaft seals using cross shaft seal installer 0555-336262 (1) and cross shaft bullet 0555-336263 (2).

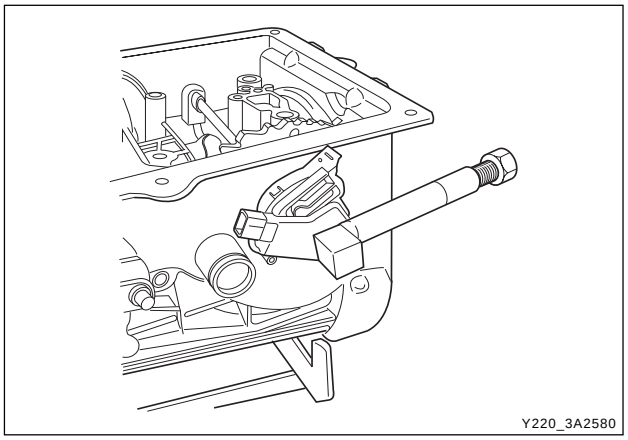


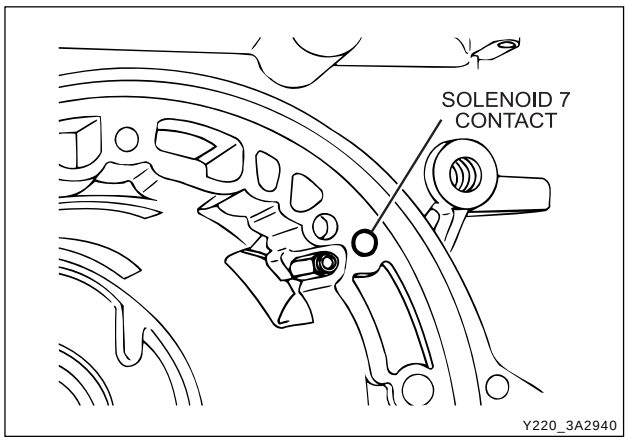
17. Install the inhibitor switch on the case. Torque the bolts as per specifications. Press the pin into the shaft until the tool bottoms using cross shaft pin installer/remover (inhibitor switch) 0555-336265.

Installation Notice

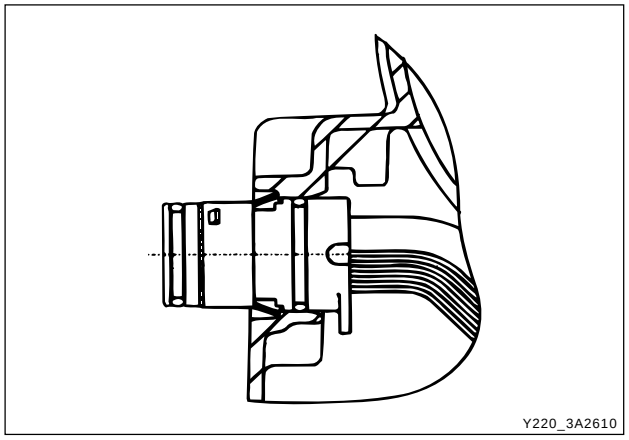
Tightening torque	4 ~ 6 Nm (35 ~ 53 lb-in)

18. Thoroughly check the terminal wiring loom for condition and continuity.

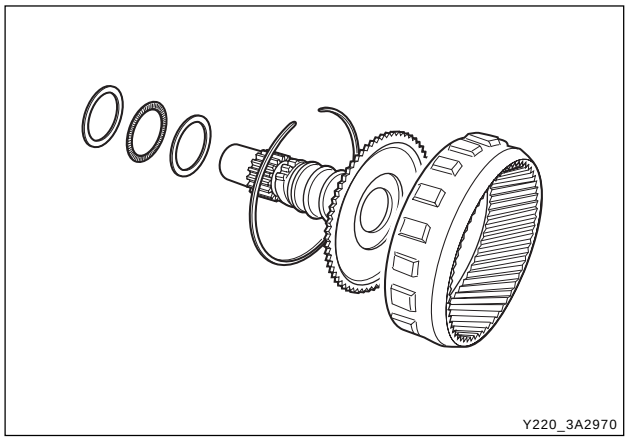




19. Position the wiring loom and locate the solenoid 7 contact and terminal in the pump mounting flange at the front of the case. The solenoid 7 wire is routed under the park rod and cross shaft in the case.

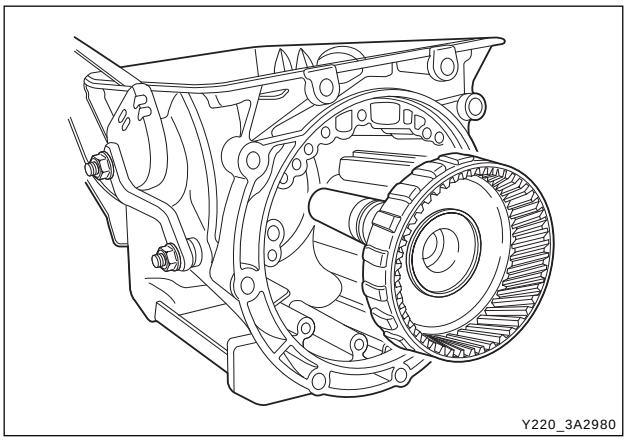


20. Install the 10 pin connector in the case engaging the tangs on the connector in the notches in case.



Output Shaft and Gear Assembly

1. Check that the output shaft bush is not worn or damaged. Replace if necessary.
2. Check for damage to parking pawl teeth on the ring gear. Replace if necessary.
3. Check that the sealing ring grooves have not been damaged.
4. Lubricate the sealing rings with automatic transmission fluid.
5. Assemble the sealing rings to the output shaft with the scarf cut uppermost.
6. If previously dismantled, assemble the ring gear to the output shaft and secure with circlip. Ensure that the circlip is firmly seated in its groove.
7. Install the No. 10 needle bearing assembly onto the output shaft using petroleum jelly.
8. Carefully install the output shaft assembly in the case to prevent damage to the sealing rings.



Rear Band Assembly

1. Check the rear band for any cracks or damage along the lining and metal backing.
2. Install the reaction anchor strut into the main case, without shims.
3. Carefully install the rear band into the transmission case and ensure that it is properly fitted in the case.

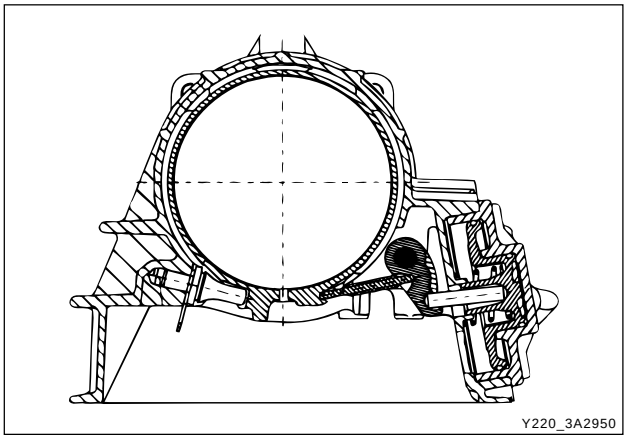
Notice

If fitting a new band, soak the new band in automatic transmission fluid for a minimum of five minutes prior to assembly.

4. Position the apply strut on the rear band then engage the apply strut in the servo lever.
5. Install the cam plate and tighten the screws to specification.

Installation Notice

Tightening torque	16 ~ 22 Nm (12 ~ 16 lb-ft)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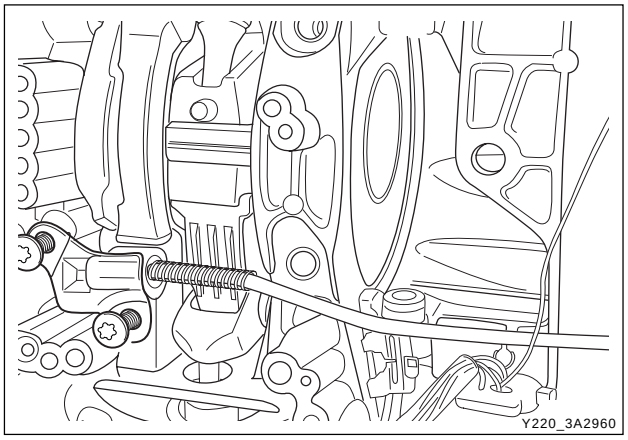
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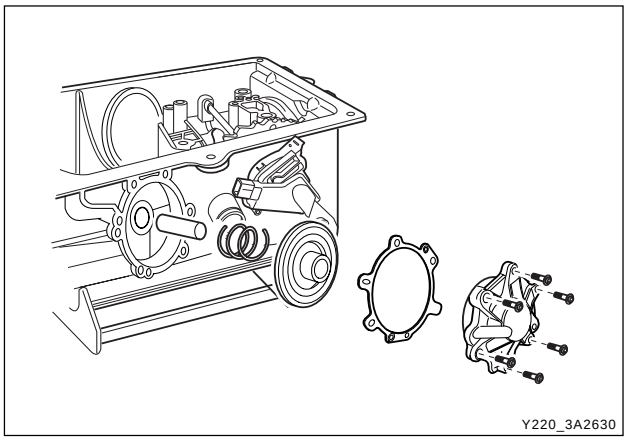
Rear Servo Assembly

1. Check the servo piston “O” rings and gasket for any damage.
2. Lubricate the servo piston “O” rings with automatic transmission fluid, and fit the “O” rings to the piston grooves.
3. Assembly the piston to the cover, ensuring that “O” ring compression is adequate but not excessive.
4. Align the spring on the piston spigot, then position the rear servo rod into the spigot.


Y220_3A2630

5. Assemble the gasket to the cover and fit the assem-bly to the case.

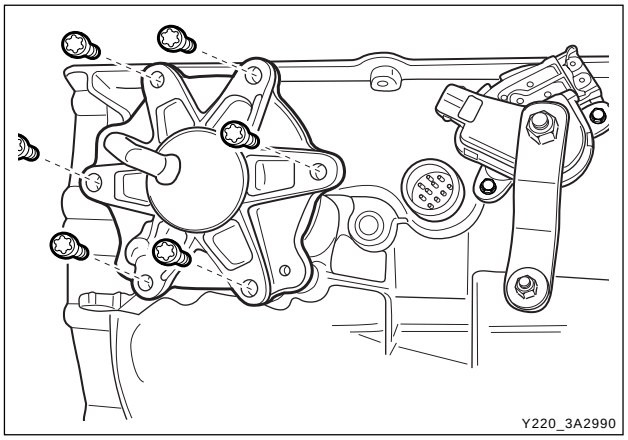
Notice

Do not use petroleum jelly on the gasket.

6. Apply additional Loctite 202 or equivalent as required to the rear servo to case bolts. Install the bolts and tighten to specification.

Installation Notice

Tightening torque	30 ~ 35 Nm (22 ~ 26 lb-ft)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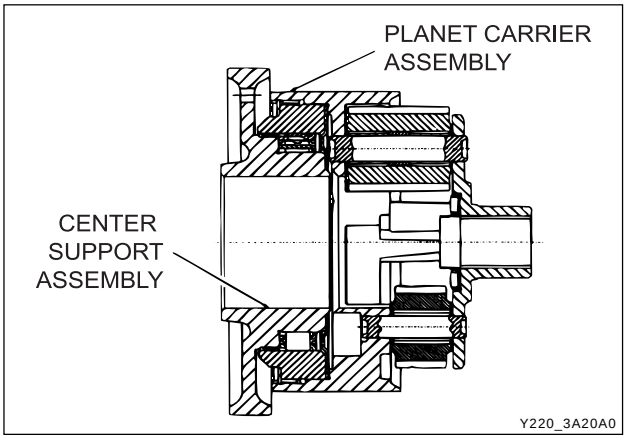
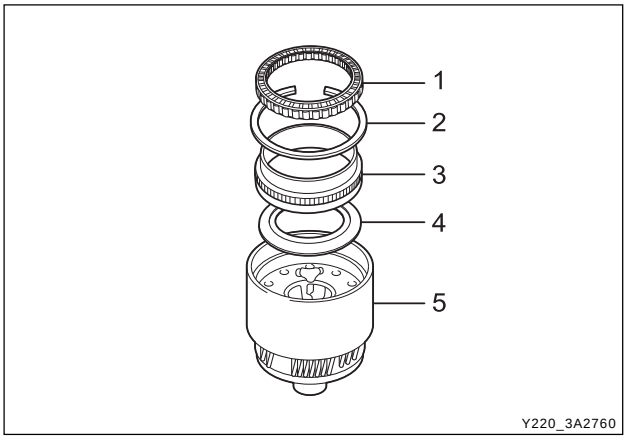
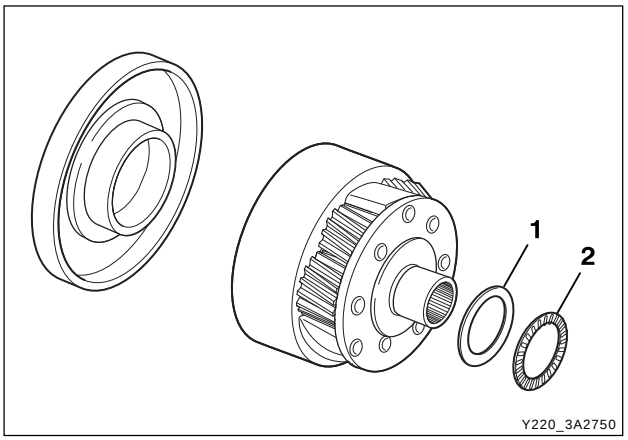


Planet Carrier Assembly and Centre Support

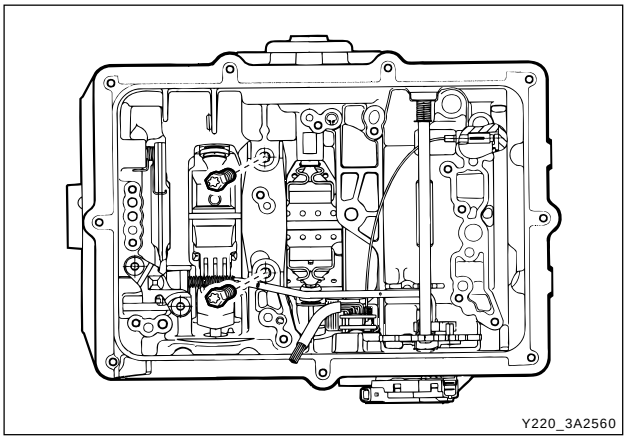
1. Check the carrier and planet assembly for any damage or irregularity and ensure that all pinions rotate freely and that the pinion end float is within 0.10 mm ~ 0.50 mm.



2. Install the One Way Clutch (OWC) retainer (1) to the planet carrier with the inner edge pointing down-wards. Inspect the OWC race and the sprag assemblies for wear or damage. Replace if necessary.
3. Install the outer (3) race in the drum. Press the race to the bottom of the drum and install the retaining circlip (2). Ensure the circlip is firmly seated in its groove.
4. Install the OWC (1) into the outer race with the lip edge uppermost. Lubricate the sprags with auto-matic transmission fluid.



5. Check that the plugs are fitted to the centre support, then assemble the centre support into the OWC, ensuring that the support will rotate in an anti-clock-wise direction only.
6. Lubricate the No. 9 needle bearing and washer with petroleum jelly and fit them to the rear face of the planet carrier.



7. Install the planet assembly and the centre support into the case, and align the centre support mounting bolt holes.
8. Install the centre support bolts finger tight.
9. Install the circlip retainer ensuring that the circlip is completely seated in the groove of the case.
10. Remove the centre support bolts and apply Loctite 222 or equivalent to the threads. Install the bolts and torque to specifications.

Installation Notice

Tightening torque	20 ~ 27 Nm (15 ~ 20 lb-ft)

Adaptor Housing Assembly

1. Install a new seal to the adaptor housing.
2. Position a new gasket onto the adaptor housing.

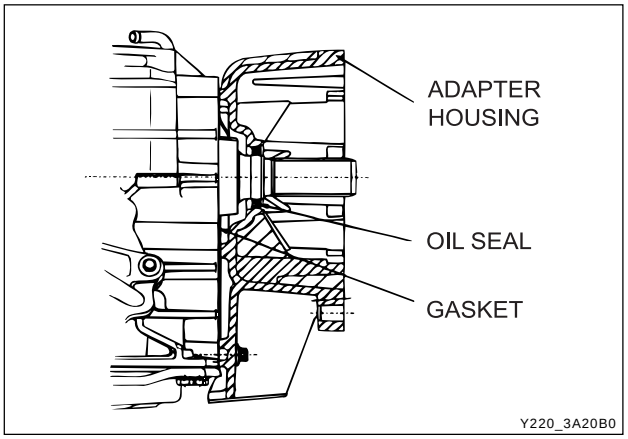
   Notice

   Do not use petroleum jelly to hold the gasket in position.

3. Apply additional Loctite 202 or equivalent as required to the adapter housing bolts. Install the adaptor housing and torque the bolts to specification.

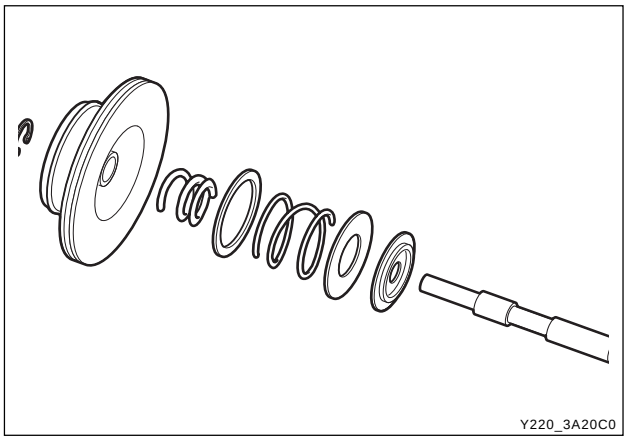
   Installation Notice

Tightening torque	30 ~ 35 Nm (22 ~ 26 lb-ft)

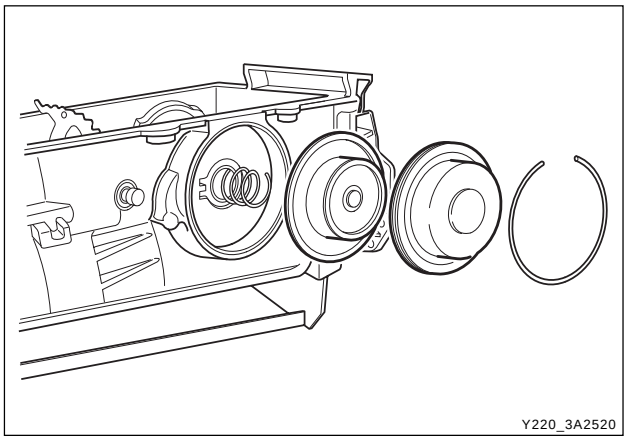


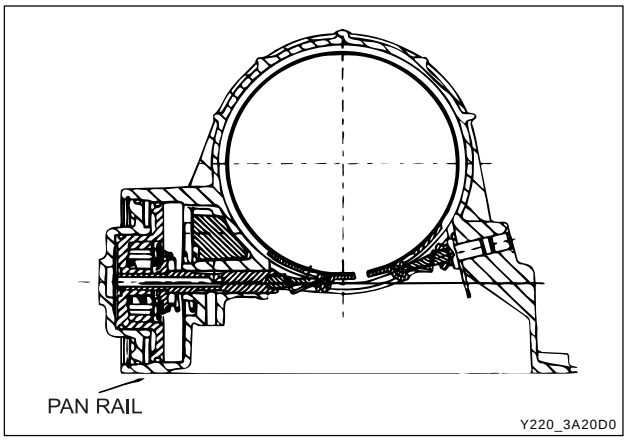
Front Servo Assembly

1. Lubricate the cover “O” ring with automatic transmission fluid and fit to the cover.
2. Lubricatethepiston “O” rings with automatic trans-mission fluid and fit to the piston.
3. Assemble the piston, push rod, spring, belleville washer, seat and retaining ring.
4. Fit the piston push rod assembly into the front servo cover.



5. Install the front servo block and spring into the case.
6. Install the front servo assembly into the case.

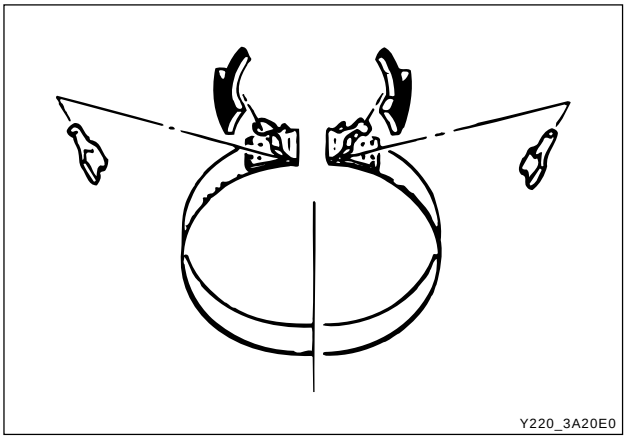




7. Compress the servo cover and fit the servo cover retaining circlip, aligning the gap with the pan rail, and ensuring that it is completely seated in its groove.

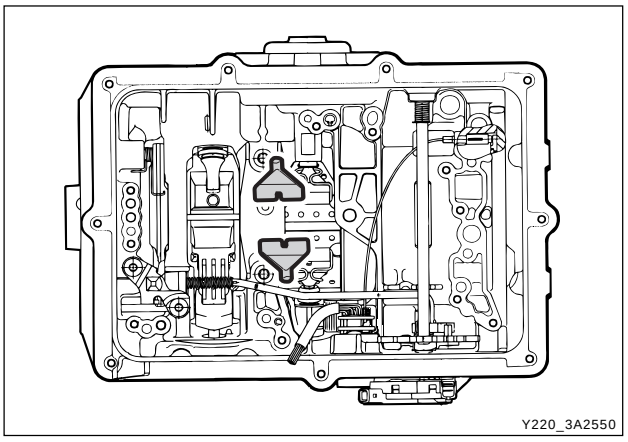
Notice

Ensure that the front servo snap ring is installed correctly. Orient the circlip with the gap at the bottom, near the pan rail.



Front Band Assembly

1. Install the reaction anchor strut to the case.
2. Check the band for all cracks or damage along its lining and metal backing.
3. Position the strut retainers on the band.



4. Install the front band into the transmission case, ensuring that it is properly seated in place.

Notice

If fitting a new band, soak the band in automatic transmission fluid for a minimum of 5 minutes prior to assembly.

5. Position the reaction strut in its retaining clip and engage it with the band and anchor strut.
6. Position the apply strut in its retaining clip and engage it with the band and the servo piston rod.

C2/C4 Clutch Assembly

Tools Required

0555-336259 Clutch Spring Compressor

0555-336260 Clutch Pack Clearance Kit

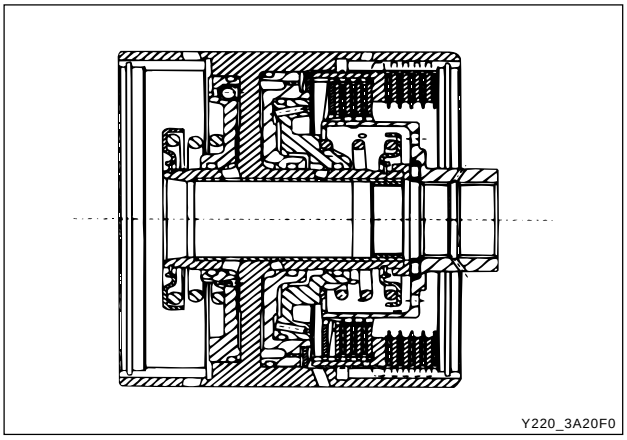
Notice

- ***Check pistons for cracks.***
- ***Do not mix the clutch piston return springs.***
- ***Ensure that the snap rings are fitted correctly.***

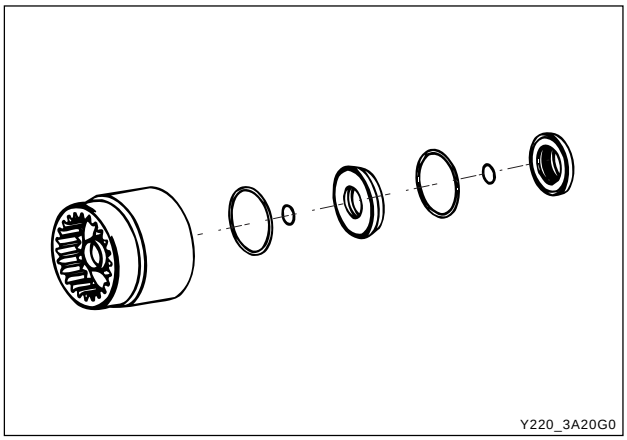
1. Check the feed orifices in the cylinder bore are clear of obstructions.
2. Check the C2 piston bleed orifices are clear of obstructions.
3. Lubricate the “O” rings with Automatic Transmission Fluid (ATF)
4. Fit the small “O” ring onto the inner groove, and the large “O” ring onto the outer groove of the piston.

   Notice

   “O” rings must not be twisted in the grooves.



5. Check the C4 piston bleed orifices are clear of obstructions.
6. Lubricate the “O” rings with ATF.
7. Fit the small “O” rings onto the inner groove and the large “O” rings onto the outer groove of the piston.
8. Position the clutch cylinder with the C2/C4 cavity facing upwards.
9. Fit the C4 piston into the C2 piston with the bleed orifices in alignment.
10. Install the C2/C4 piston assembly into the cylinder, with the piston bleed orifices aligned with the holes on the outside of the cylinder, until the outer diameter of the C2 piston enters the inner diameter of the cylinder.



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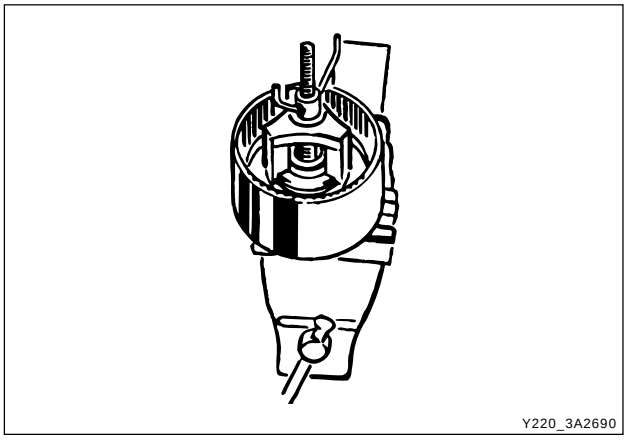


11. Assemble the piston return spring to the piston, and fit the spring retainer over the spring.
12. Using 0555-336259 clutch spring compressor, compress the spring sufficiently to enable the installation of the retaining circlip ensuring that the circlip is firmly seated in its groove, then remove the tool.

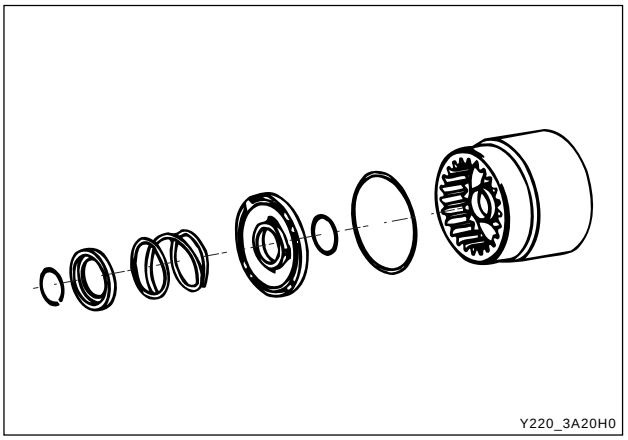
Notice

The wire diameter of this spring is 4.3 mm.

13. Check the C1 piston check valves are not damaged and are free to move, and that the cylinder feed orifices are clear of obstructions.
14. Lubricate the “O” rings with ATF and fit them to their respective grooves.

Notice

“O” rings must not be twisted in the grooves.

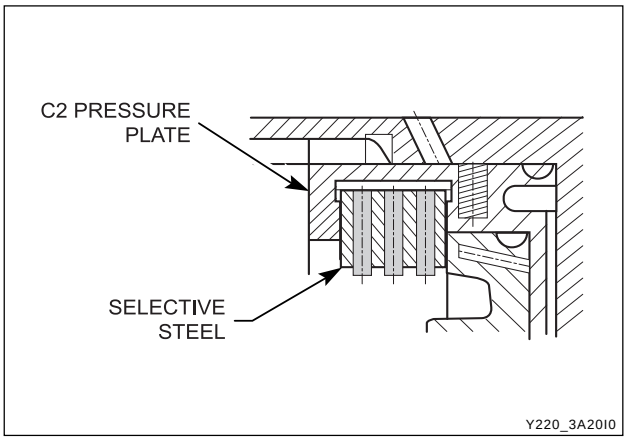


15. Position the cylinder with the C1 cavity upwards. Install the piston into the cylinder until the outer diameter of the piston enters the inner diameter of the cylinder.
16. Install the spring and spring retainer onto the piston.
17. Using 0555-336259 clutch spring compressor, compress the spring sufficiently to enable the installation of the retaining circlip ensuring that the circlip is firmly seated in its groove, then remove the tool.

Notice

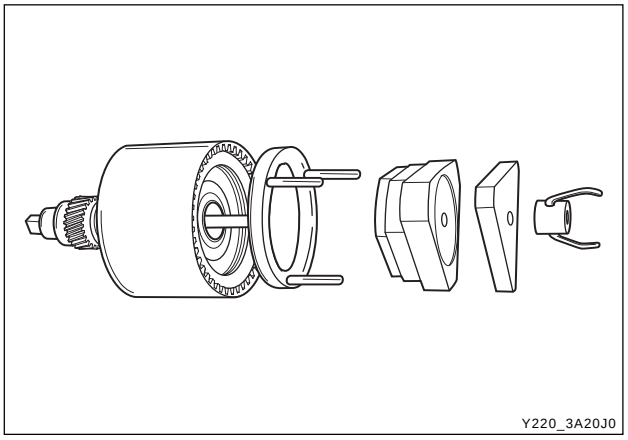
The wire diameter of this spring is 5.26 mm.

18. Install the C2 wave washer into the cylinder with the crest of one wave covering one of the bleed orifices inthe C2 piston.



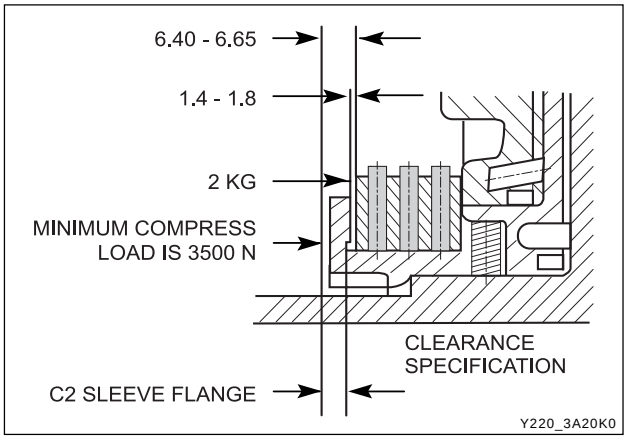
19. Measure and record the thickness of the flange of the C2 sleeve.
20. Install the C4 clutch plates and wave washer into the C2 actuating sleeve, with the rounded edge of the steel plates down, in the following sequence:
    - Steel plate (selective)
    - Friction disc
    - Steel plate
    - Friction disc
    - Steel plate
    - Friction disc
    - Steel plate
    - Wave washer

21. Holding the cylinder horizontal, install the sleeve and clutch plate assembly into the cylinder, with the crest of one wave of the washer in line with one of the holes in the outside of the cylinder, until the sleeve contacts the C2 wave washer.
22. Check the C4 clutch pack clearance using 0555-336260 clutch pack clearance kit.



Notice

With the C2 wave spring compressed, and the clutch Pack supporting a 2 kg weight, the dimension from the underside of the C2 pressure plate to the selective steel is to be between 1.4 ~ 1.8 mm. If the clutch is to be gauged from the top of the pressure plate, then the dimension is to be the actual thickness of the pressure plate plus 1.4 ~ 1.8 mm.

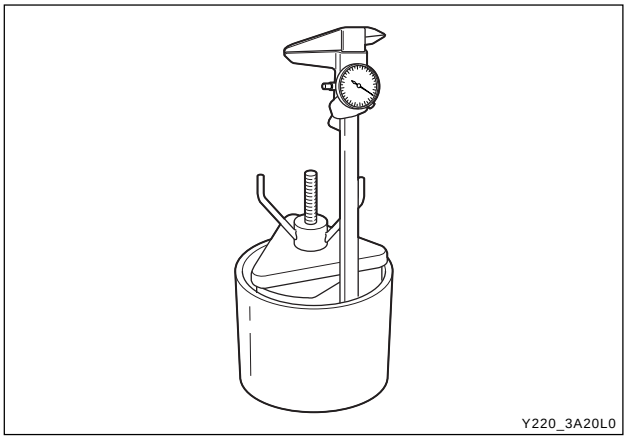


23. Use selective plates to achieve the correct specification. If new friction plates are being fitted, remove the clutch pack and soak the friction plates in ATF for a minimum of 5 minutes prior to reassembly.

Notice

The clutch pack clearance must be taken before the elements are soaked in ATF.

24. Reassemble the sleeve and clutch pack into the cylinder. Observe the alignment of the wave washer to the hole in the cylinder.
25. Install the C2 clutch plates in the cylinder in the following sequence:
    - Friction disc
    - Steel plate
    - Friction disc
    - Steel plate
    - Steel plate (0574-000013, `014, `015, `016, `019, `022), or Friction disc (0574-000012 & `017)
    - Steel plate (selective)
    - Friction disc
    - Steel plate (selective)
    - Friction disc



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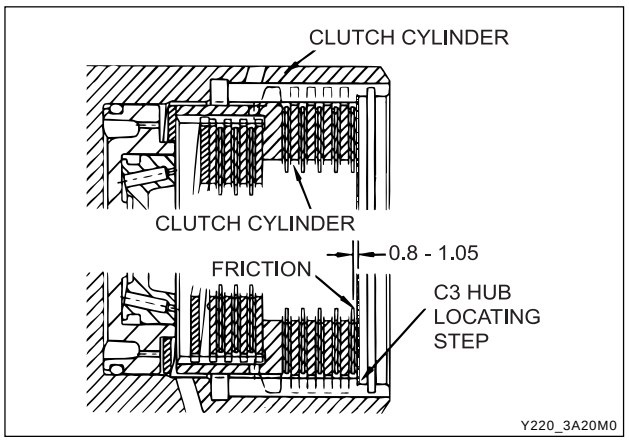


26. Check the clutch pack clearance using only the weight from 0555-336260 clutch pack clearance kit.

Notice

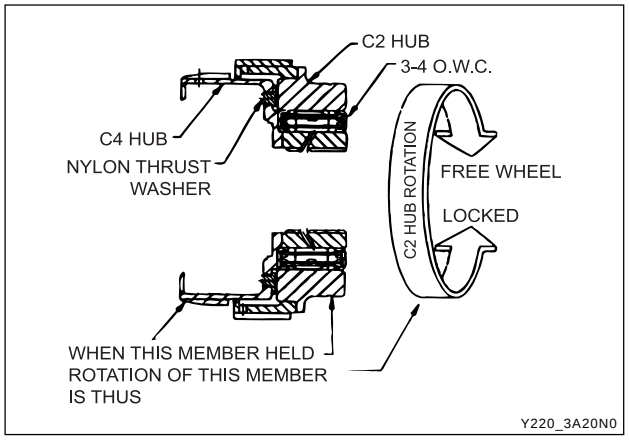
With the clutch pack supporting a 2 kgweight, the dimension from the C3 clutch hub locating step to the friction plate is to be between 0.80 ~ 1.05 mm.

27. Use selective plates to achieve the correct specifica-tion. If new friction plates are being fitted, remove the clutch pack and soak the friction plates in ATF for a minimum of 5 minutes prior to reassembly.

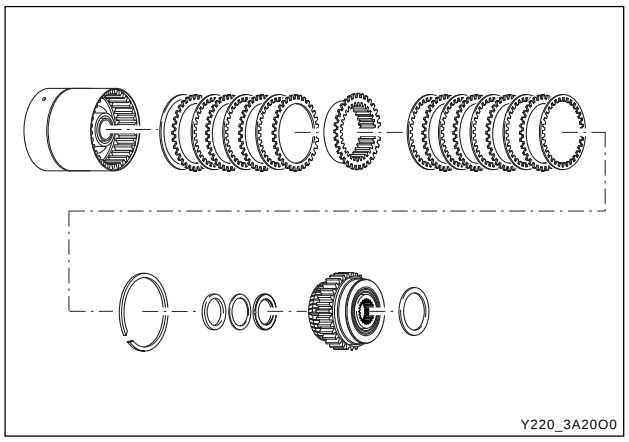
Notice

The clutch pack clearance must be taken before the elements are soaked in ATF.

28. Lubricate and fit the 3-4 OWC and end caps to the C2 hub.



29. Align the tangs and fit the nylon thrust washer onto the C4 hub.
30. Align and fit the C4 hub to the C2 clutch and the OWC assembly.
31. Check the rotation of the C2 hub. While holding the C4 hub, the C2 hub should rotate in the clockwise direction and lockup in the anti-clockwise direction when viewed from the C2 hub.



32. Apply petroleum jelly to the No. 5 needle bearing and fit it to the C4 hub.
33. Remove the C2 clutch plates from the clutch cylinder.
34. Fit the thrust plate over the cylinder inner hub.
35. Engage the C2/C4 clutch hub assembly in the C4 clutch plates.
36. Install the C2 clutch plates.
37. Install the C3 hub and secure it with the circlip, ensuring that the circlip is firmly seated in its groove.

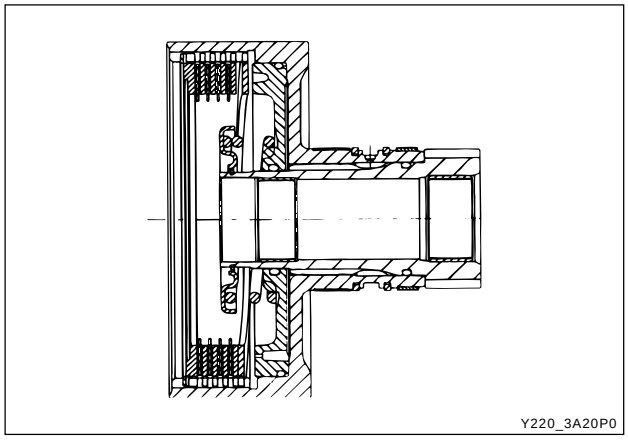
C3 Clutch and Reverse Sun Gear Assembly

Tools Required

0555-336259 Clutch Spring Compressor

0555-336260 Clutch Pack Clearance Kit

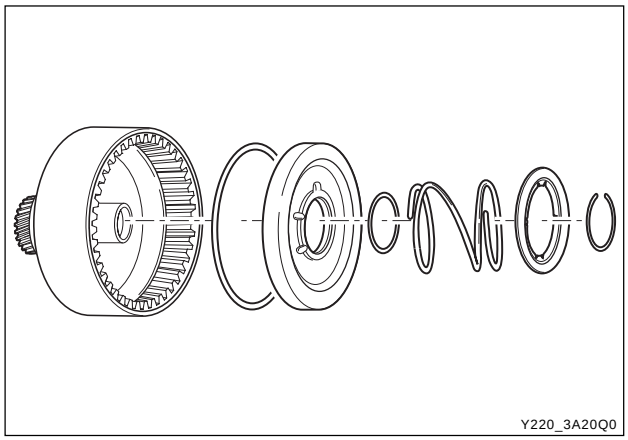
1. Check the orifices in the cylinder are clear of obstructions.
2. Check the C3 cylinder bush outside diameter and the centre support inside diameter are in good condition and not damaged. Coat the sealing rings with automatic transmission fluid and fit into the C3 cylinder grooves.
3. Check the reverse sun gear splines, grooves and thrust face for condition. Coat the “O” ring with automatic transmission fluid and fit it to the groove of the reverse sun gear.
4. Lubricate the C3 washer with petroleum jelly and fit to the inner face of the reverse sun gear.
5. Install the reverse sun gear in the C3 cylinder, en-suring that the “O” ring compression is adequate but not excessive.



Notice

“O” rings must not be twisted in the grooves.

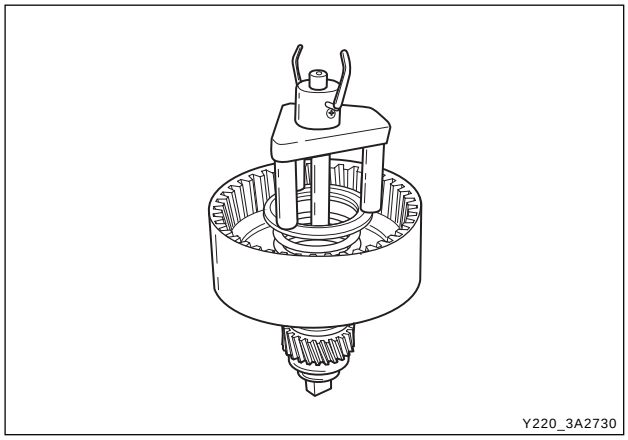
6. Coat the C3 piston “O” rings with automatic trans-mission fluid and fit the small “O” ring onto the inner ring and the large “O” ring onto the outer ring of the C3 piston.
7. Check that the bleed orifices of the piston are clean and clear of obstructions.
8. Install the C3 piston in the cylinder until the outside diameter of the piston enters the inside diameter of the cylinder.



Notice

Take care not to cut the “O” ring.

9. Assemble the spring and spring retainer on the piston. Using 0555-336259 clutch spring compressor compress the spring sufficiently to enable the installation of the retaining circlip, ensuring that the circlip is firmly seated in the groove, and remove the tool.
10. Fit the C3 wave plate to the C3 piston face, ensuring that one crest of the wave plate of the C3 piston face is aligned over one of the piston orifices.



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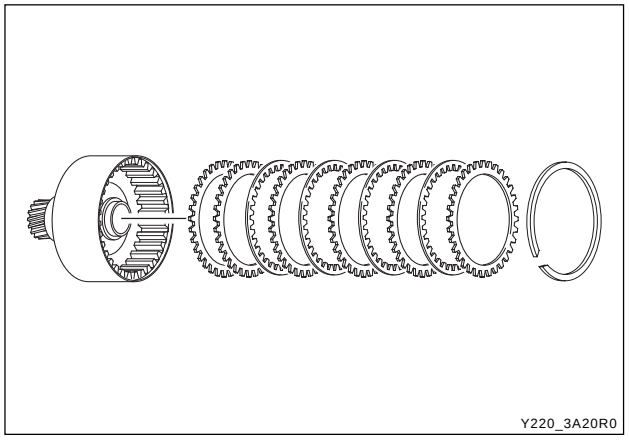
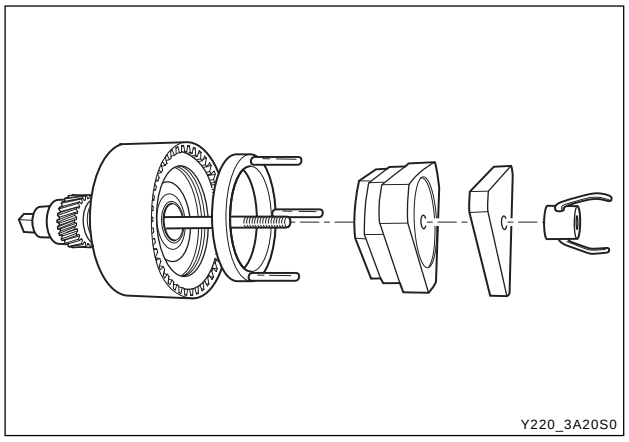
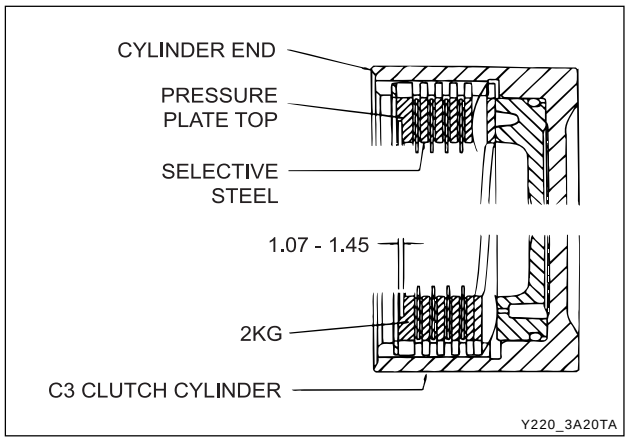


11. Assemble the clutch plates and discs into the cylinder in the following sequence :
    - Steel plate
    - Friction disc
    - Steel plate
    - Steel plate (0574-000013, `014, `015, `016, `019, `022), or Friction disc (0574-000012, `017)
    - Steel plate (selective)
    - Friction disc
    - Steel plate (selective)
    - Friction disc
12. Align and fit the pressure plate with the counterbore facing away from the clutch plates.



13. Install the circlip.
14. Check the C3 clutch clearance using 0555-336260 clutch pack clearance kit in the following manner (weight only).
    a. Place the weight on the pressure plate and measure the distance from the end of the cylinder to the top of the pressure plate.
    b. Record this figure.
    c. Remove the weight.
    d. Lift the pressure plate up against the circlip and measure the distance from the end of the cylinder to the top of the pressure plate.
    e. Record this figure.
    f. Subtract the second reading from the first reading to obtain the clutch pack clearance.



Notice

With the clutch pack supporting a weight of 2kg, the clearance between the snap ring and the top of the pressure plate is to be between 1.07 ~ 1.45 mm.

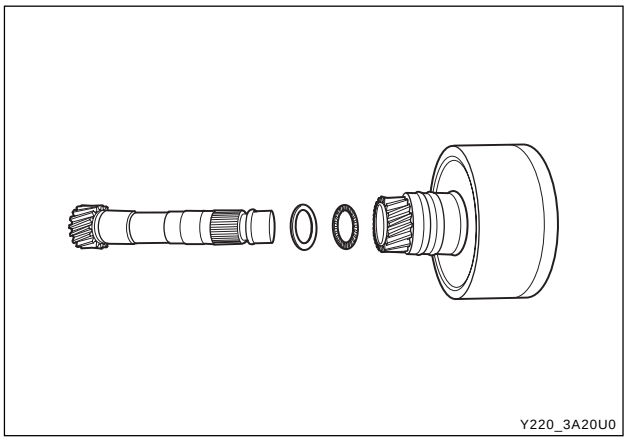
15. If new friction plates are being fitted, remove the clutch pack and soak the friction elements in auto-matic transmission fluid for a minimum of five min-utes prior to reassembly.

Notice

The clutch pack clearance must be taken before the elements are soaked in automatic transmission fluid.

Forward Sun Gear and C3 Clutch Pack Assembly

1. Fit the No.7 needle bearing assembly over the forward sun gear, ensuring that the thrust washer is between the bearing and the sun gear.
2. Lubricate the lipped thrust plate with petroleum jelly and fit the thrust plate onto the reverse sun gear.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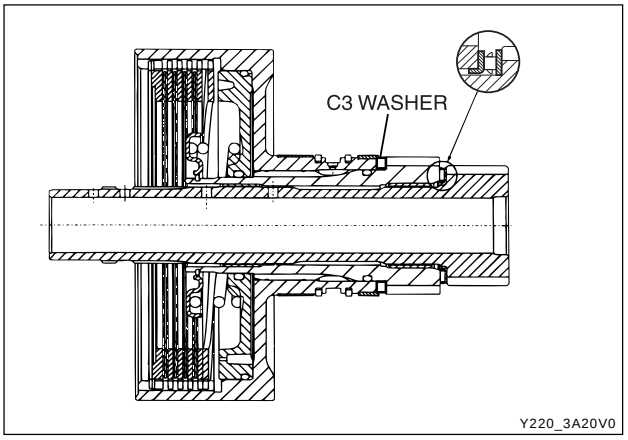
3. Align and fit the C3 clutch assembly over the forward sun gear.



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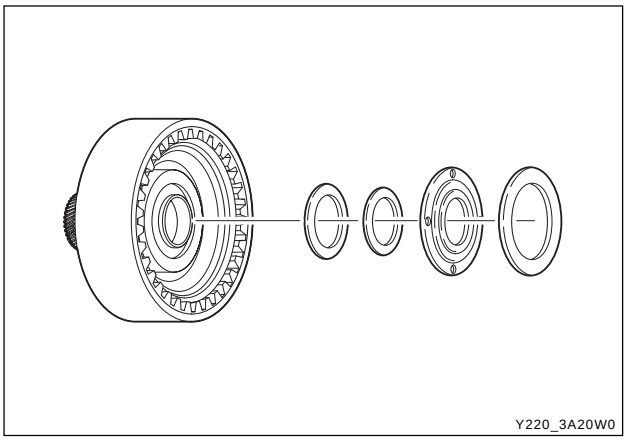
4. Lubricate the No.6 needle bearing with petroleum jelly and fit it to the thrust plate. Ensure the lugs on the outside diameter of the bearing fit in the thrust plate counterbore.
5. Align and fit the plastic thrust washer to the thrust plate with petroleum jelly.
6. Install the assembly over the forward sun gear shaft against the No. 6 needle bearing.
7. Place the assembly to one side.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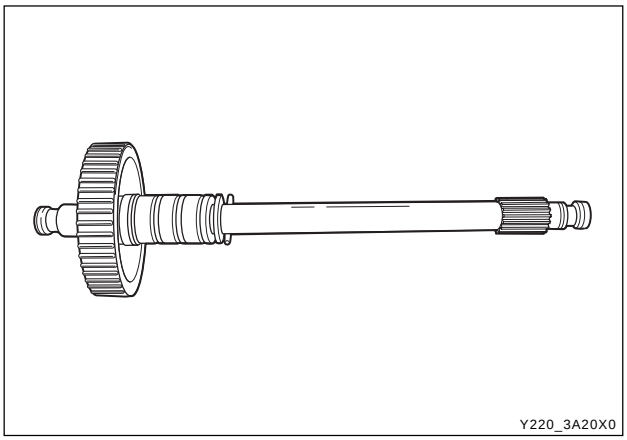
C1 Clutch Overdrive Shaft and Input Shaft Assembly

Tools Required

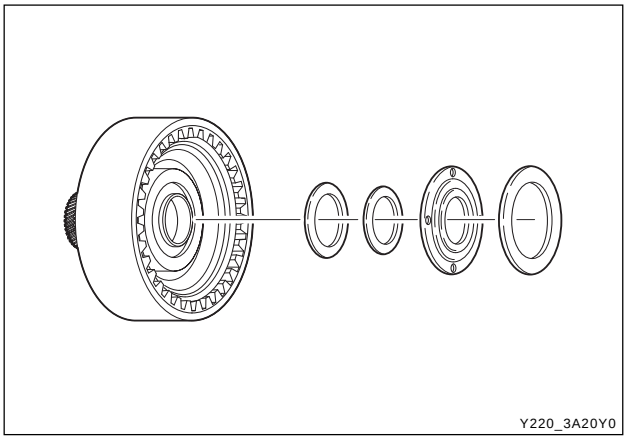
0555-336260 Clutch Pack Clearance Kit

Notice

- ***Ensure that the snap rings are fitted correctly.***
- ***Check pistons for cracks, especially the C1 piston.***
- ***Do not mix clutch piston return springs.***
- ***If the C1/C2 clutch packs separate from the C3 clutch pack, make sure the No. 6 bearing doesn't drop out of the bearing retainer.***



1. Check the overdrive shaft grooves for any defect.
2. Coat the sealing rings, large and small, with petro-leum jelly and fit them to the overdrive shaft. The sealing rings may be held in place with a small amount of petroleum jelly.



3. Assemble the clutch plate and disc into the cylinder in the following sequence:
   - Steel plate
   - Friction disc
   - Steel plate
   - Friction disc
   - Steel plate
   - Steel plate (0574-000013, `014, `015, `016, `019, `022), or friction disc (0574-000012 & `017)
   - Steel plate (selective)
   - Friction disc
   - Steel plate (selective)
   - Friction disc

4. Check the clutch pack clearance using 0555-336260 clutch pack clearance kit.
5. Use selective plates to achieve the correct specifi-cation.

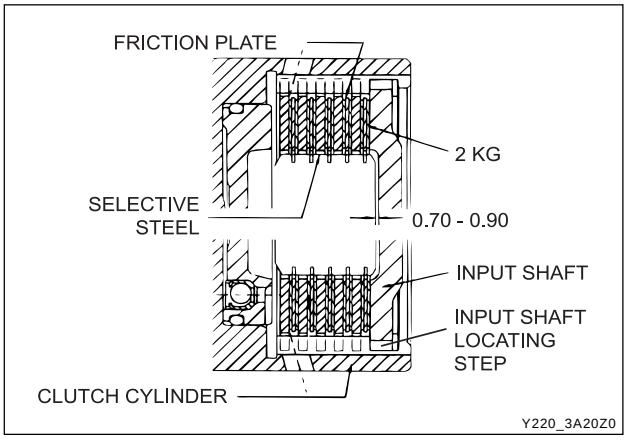
Notice

With the clutch pack supporting a 2 kg weight, the dimension from the input shaft locating stop to the friction disc must be 0.70 ~ 0.90 mm.

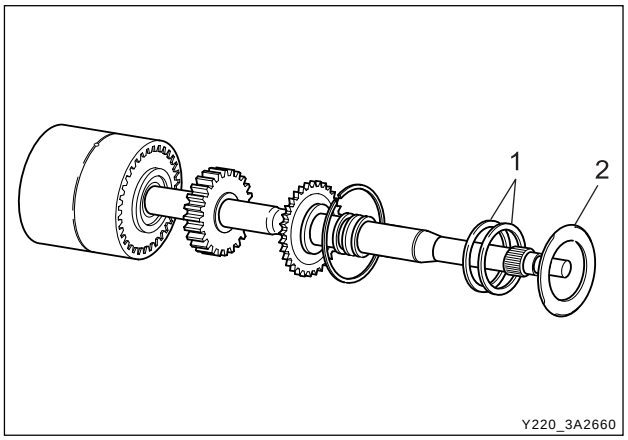
6. If new friction plates are being fitted, remove the clutch pack and soak the friction elements in auto-matic transmission fluid for a minimum of five minutes prior to assembly.

Notice

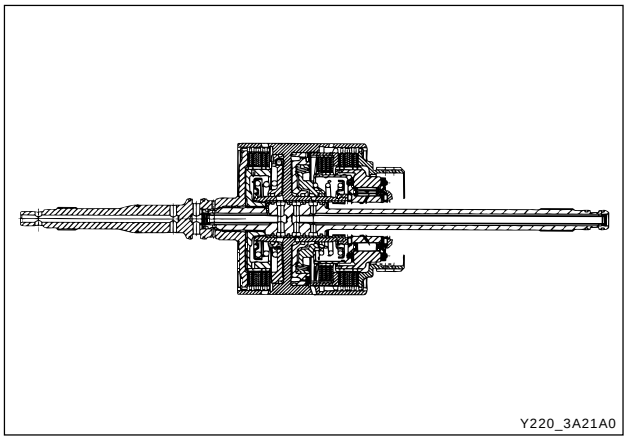
The clutch pack clearance must be taken before elements are soaked in automatic transmission fluid.

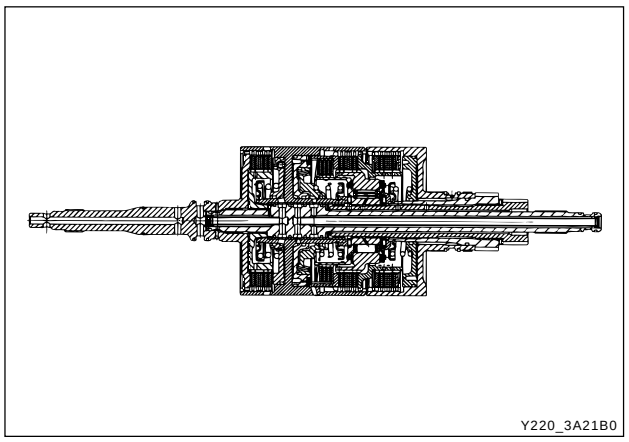


7. Check the fit of the C1 clutch hub on the overdrive shaft. If it is loose, the hub and shaft assembly must be replaced.
8. Coat the small nylon thrust spacer with petroleum jelly and install it over the overdrive shaft.
9. Carefully fit the overdrive shaft into the C1 cylinder so as not to damage the sealing ring.
10. Fit the small bronze C1 hub thrust washer in place with petroleum jelly.
11. Check the input shaft for any defect. Fit the input shaft into the cylinder and secure it with the circlip, ensuring that the circlip is completely seated in the groove.



12. Coat the sealing rings with petroleum jelly and fit onto the input shaft.



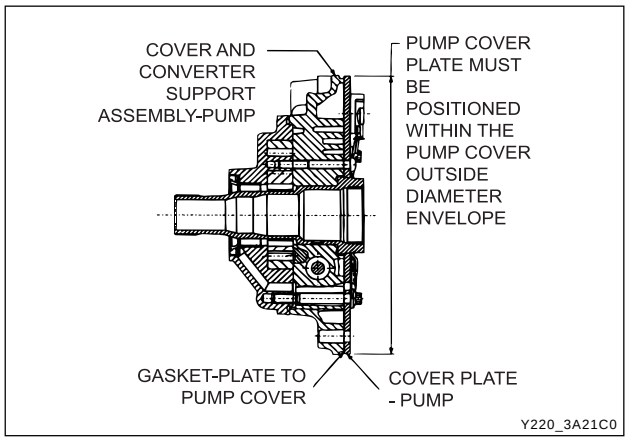


13. Assemble the C1/C2/C4 clutch assembly to the C3 clutch and sun gear assembly.
14. Install this assembly in the transmission case.

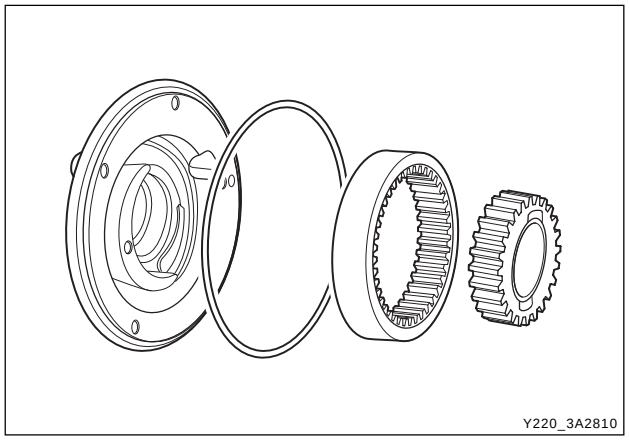
Pump Cover and Converter Support

Notice

- ***Do not wash the nose of solenoids in solvent.***
- ***Ensure that the correct "O" ring is fitted for the application.***
- ***Be careful not to damage the needle bearings on the assembly. Avoid any axial impact loads during assembly.***
- ***Check the transmission end float. This will help to detect any missing parts or incorrect assembly.***

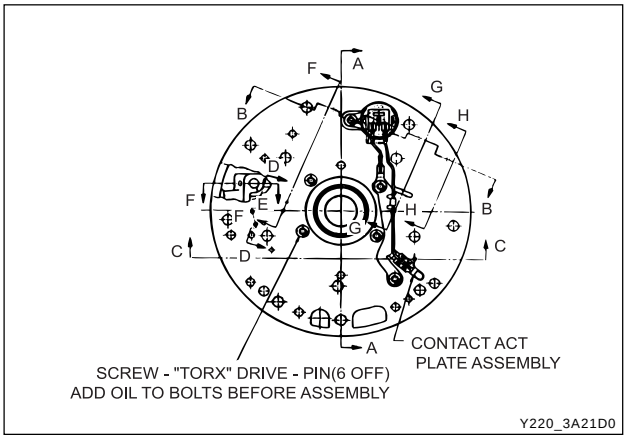


1. Check the pump body for any damage, chips or irregularity. Check that the bush is firmly staked in the drive gear.
2. Install the seal flush with the front face of the pump body.
3. Lubricate the pump bush, and the drive and driven gears, with automatic transmission fluid.

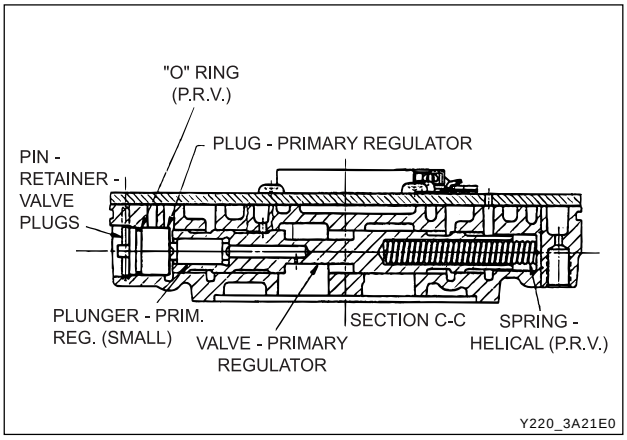


4. Install the pump driven gear and the pump drive gear into the pump body.
5. Using a straight edge and thickness gauge, check that the clearance between pump face and gears is 0.04 ~ 0. 018 mm.
6. Lubricate the pump body "O" ring with automatic transmission fluid and fit it to the pump body. Put the pump body to one side.

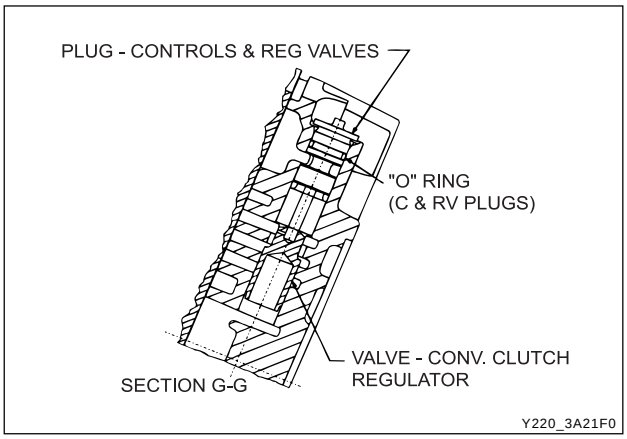
7. Ensure that the pump cover cavities, ports and holes are clean and free of any obstruction.
8. Lubricate all loose parts with automatic transmission fluid prior to assembly.



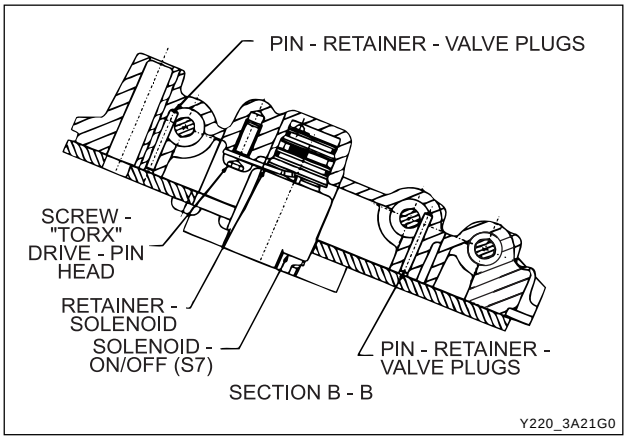
9. Assemble the primary regulator valve, spring and plunger to the pump cover, ensuring that the regulator valve slides freely, then fit the regulator valve plug and “O” ring.
10. Install the retaining pin.



11. Install the converter clutch regulator valve, plug, spring and “O” ring.



12. Install the retaining pin.



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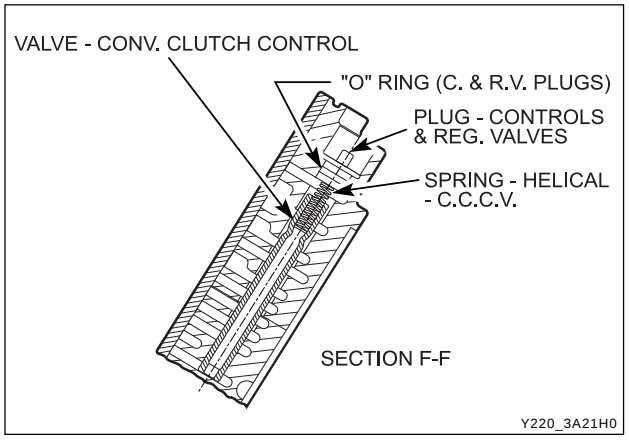
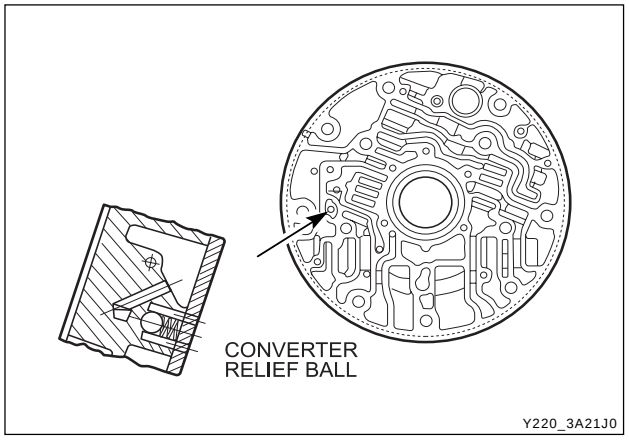
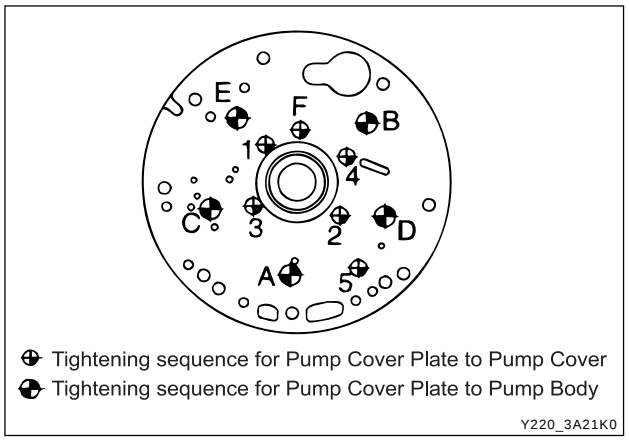


13. Install the converter clutch control valve, spring, plug, and “O” ring.
14. Install the retaining pin.



15. Install the converter release check ball and spring.
16. Install the gasket on the pump cover.



17. Install the cover plate, solenoid 7 with the retainer and the solenoid wiring retainer to the pump cover, ensuring that the periphery of the cover plate is flush with the periphery of the pump cover.
18. Tighten the screws to specification in the order. (1-5)

Installation Notice

Tightening torque	13 ~ 16 Nm (10 ~ 12 lb-ft)

19. Tighten the solenoid 7 screw.

Installation Notice

Tightening torque	13 ~ 16 Nm (10 ~ 12 lb-ft)

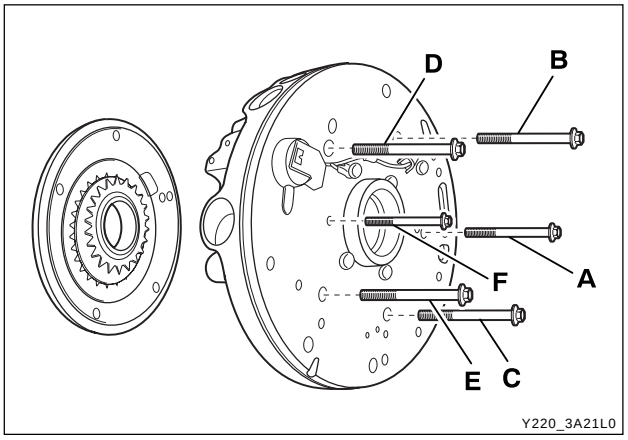
- Check that neither the wiring nor the connector protrudes excessively, in order that at assembly neither the wiring and the connector contacts or rubs on the input shaft or the C1/C2 clutch cylinder.

20. Assemble the pump to the pump cover.
21. Tighten all bolts and the crescent screw finger tight, ensuring that the pump is flush against the pump cover. Tighten the bolts and the screw to specification in the order. (A-F)

Installation Notice

Tightening torque	Bolt (A-E): 24 ~ 27 Nm (18 ~ 20 lb-ft)
	Screw (F): 13 ~ 16 Nm (10 ~ 12 lb-ft)

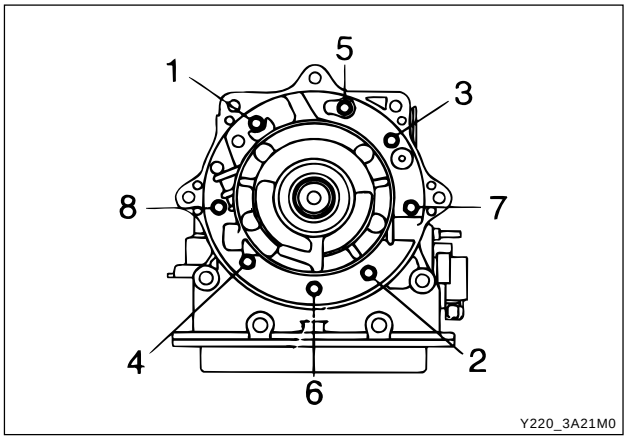
22. Install the pump to transmission case gasket onto the case.
23. Fit the “O” ring to the pump cover outer diameter.



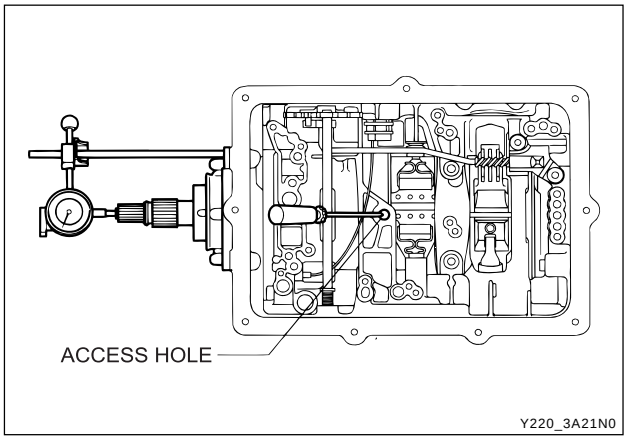
24. Install the pump and cover assembly over the input shaft being careful not to damage the sealing rings. Apply additional Loctite 202 or equivalent as required to the pump cover to case bolts. Install and tighten bolts to specification.

Installation Notice

Tightening torque	24 ~ 34 Nm (18 ~ 25 lb-ft)



25. Check that the transmission end float is 0.50 ~ 0.65 mm. If the unshimmed end float clearance is greater than specification, shims are to be placed between the No. 4 bearing and the input shaft bearing surface. If the end float clearance is less than 0.5 mm then the transmission has been assembled incorrectly or the parts are out of specification.
26. Perform the following steps to check the end float :
    a. Attach a dial indicator to the front of the trans-mission case with the stylus resting on the end of the input shaft.
    b. Apply a force of approximately 250 N or 25 kg to the input shaft.
    c. Zero the dial indicator.
    d. Place a small lever behind the forward clutch cylinder and lever the cylinder forward.
    e. The measurement recorded on the dial indicator is the transmission end float or clearance between the No.4 bearing and the converter support tube.
27. On completion of this procedure, adjust the front and rear bands to specifications. Refer to “Front and Rear Band Adjustment” in this section.



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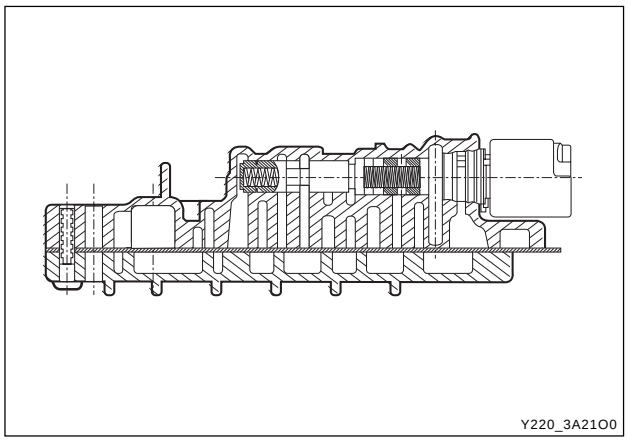
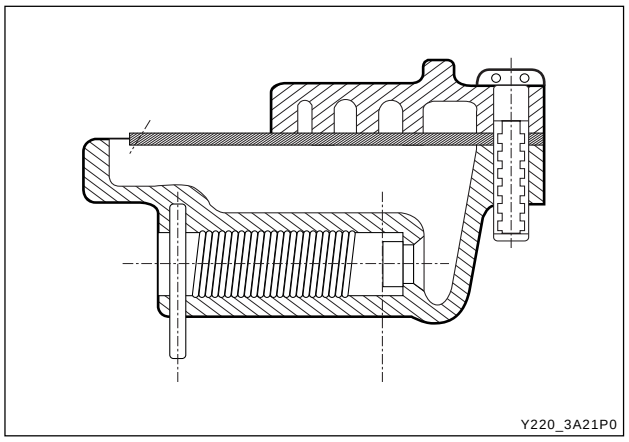
Valve Body

Notice

- ***Do not wash the nose of solenoids in solvent.***
- ***Be aware of ball positions in the upper valve body.***
- ***Be aware of 1-2 and 3-4 shift valve positions, they can be swapped.***
- ***Check the 4-3 sequence valve and spring orientation.***
- ***Check that the 12 mm ball is in the lower body.***
- ***Check the line pressure relief valve for swarf, and be aware of replacing the shims.***
- ***When servicing the transmission, ensure that the solenoid 5 damper spring is not broken.***
- ***Locate the detent spring central to the detent lever.***
- ***Wash the upper and lower valve bodies thoroughly with cleansing solvent and blow dry.***
- ***Check the valve body cavities, ports and holes for damage or obstructions.***
- ***The orifices in the valve body are for stability and safeguard. Do not drill them larger.***
- ***Thoroughly wash all loose components.***
- ***Check that all valves slide freely in their location.***

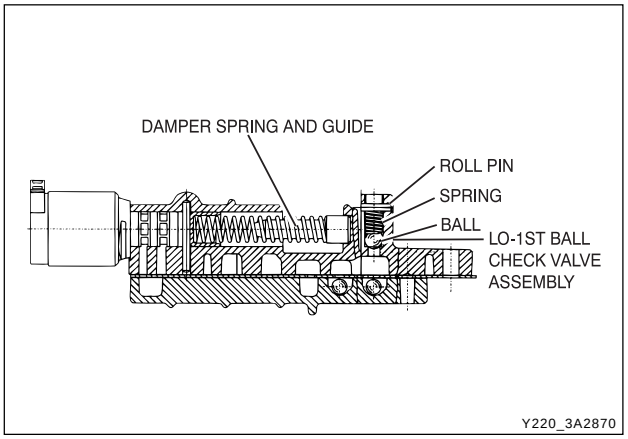


1. Install the detent lever locating pin
2. Install the Band Apply Regulator (BAR) valve, springs, plunger and retaining pin.

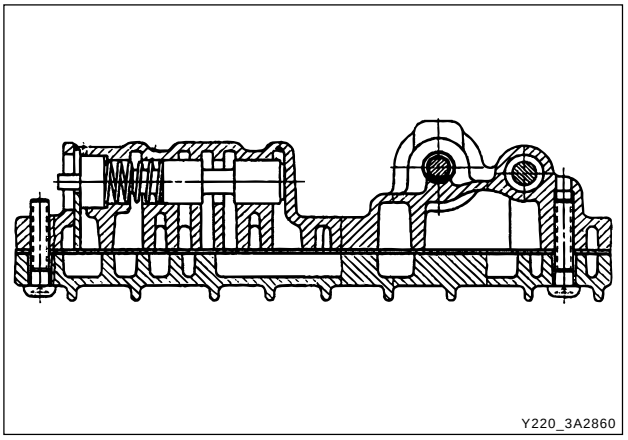


3. Install the line pressure relief valve, tapered end first, spring and disc. Secure with the retaining pin.

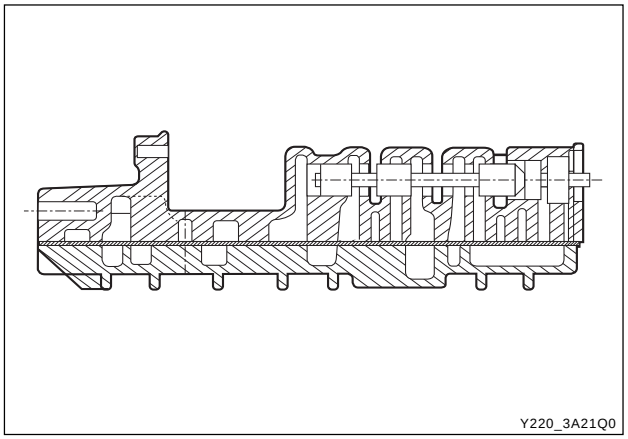
4. Install the solenoid 5 damper guide and spring, piston and retaining pin.



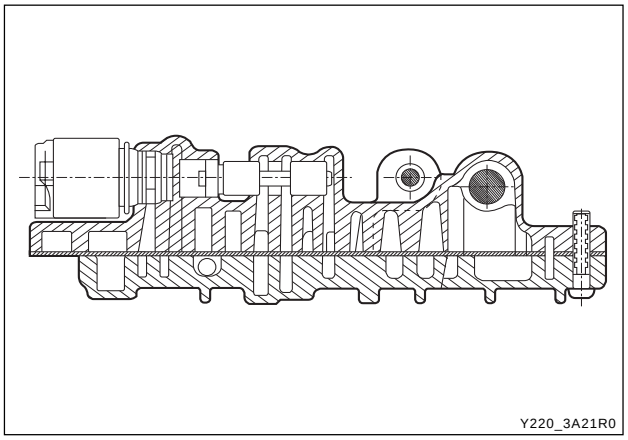
5. Install the 4-3 sequence valve, spring, plug and retaining plate.



6. Install the 1-2 shift valve, plug and retaining pin.



7. Install the 2-3 shift valve and retaining pin.



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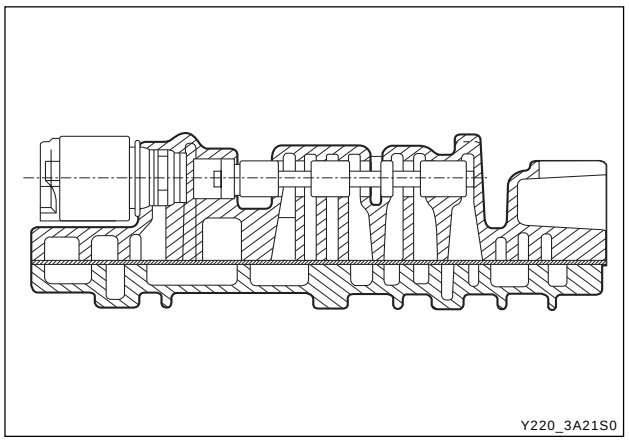
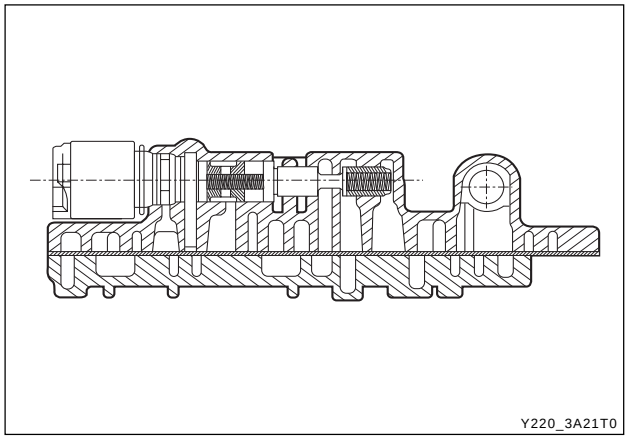
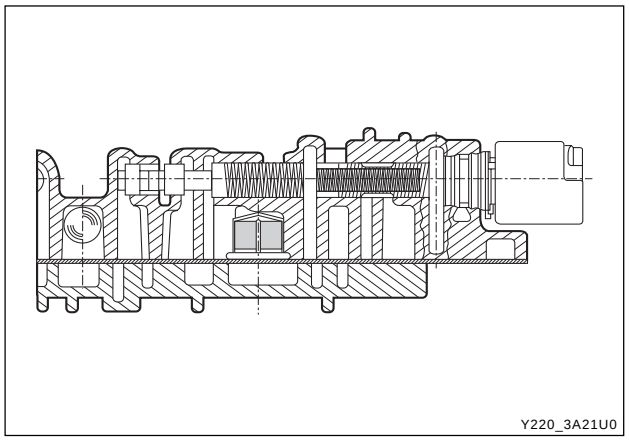


8. Install the 3-4 shift valve and retaining pin.



9. Install the Clutch Apply Regulator (CAR) valve, springs, plunger and retaining pin.

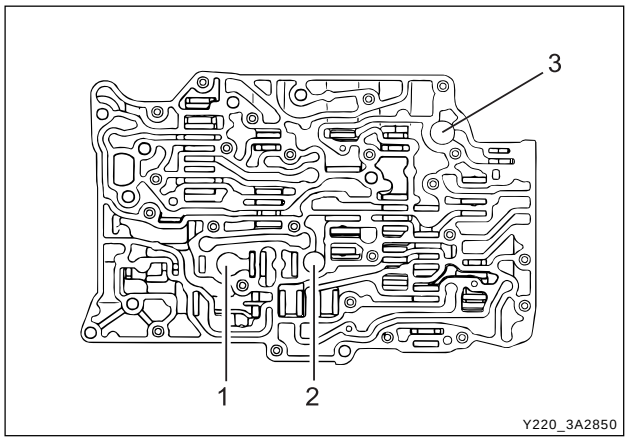


10. Install the solenoid supply valve, spring and retaining plate.

Notice

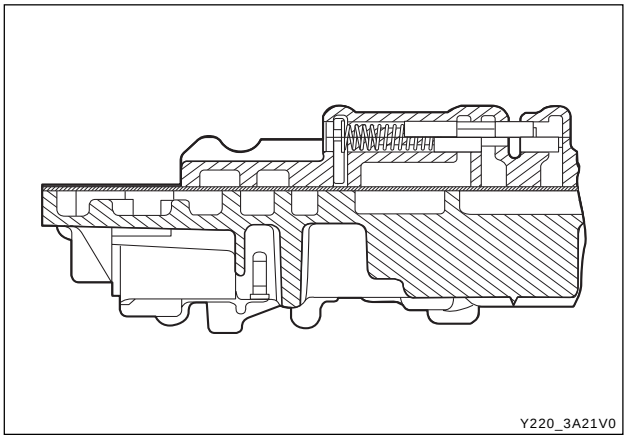
This aluminum valve is easily damaged.

11. Install solenoid 6 plunger, spring and retaining pin.

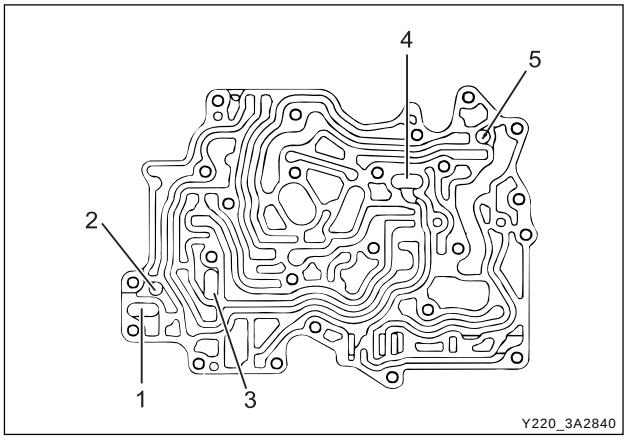


12. Position the third feed ball (large nylon) in the valve body and install the solenoid 6 filter.
13. Check the separator plate for burrs and damage. Repair or replace the separator plate as necessary.
14. Check the upper and lower valve body gaskets for damage. Replace the gaskets as necessary.
15. Install the lower valve body gasket on the lower valve body.

16. Install the reverse lockout valve, spring, plug and retaining plate. Ensure that the valve is correctly oriented.



17. Position the five nylon ball checks in the upper valve body.
18. Fit the upper valve body gasket. Install the separa-tor plate over the upper valve body.



19. Holding the separator plate to the upper valve body to prevent the check balls from falling out, install the upper valve body on the lower valve body. Install all screws finger tight then tighten the screws to specification in the prescribed sequence.

Installation Notice

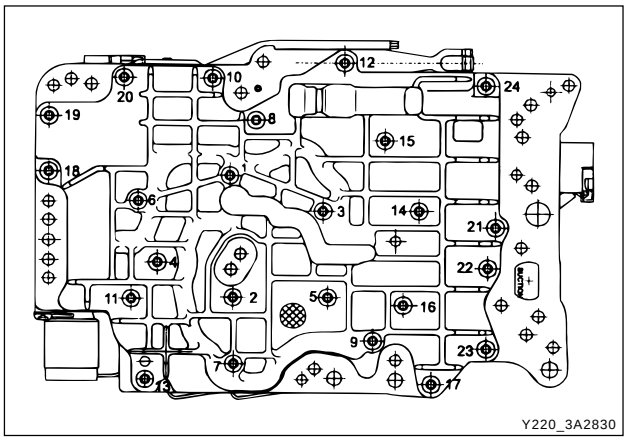
Tightening torque	11 ~ 16 Nm (8 ~ 12 lb-ft)

20. Install solenoids 1, 2, 3, 4 and 6. Ensure the solenoid is firmly secured by the retainer and that the screw is tightened to specification.

Installation Notice

Tightening torque	8 ~ 12 Nm (71 ~ 106 lb-in)

- The wiring loom ground wire eyelet terminal is secured beneath the solenoid 1 retainer.



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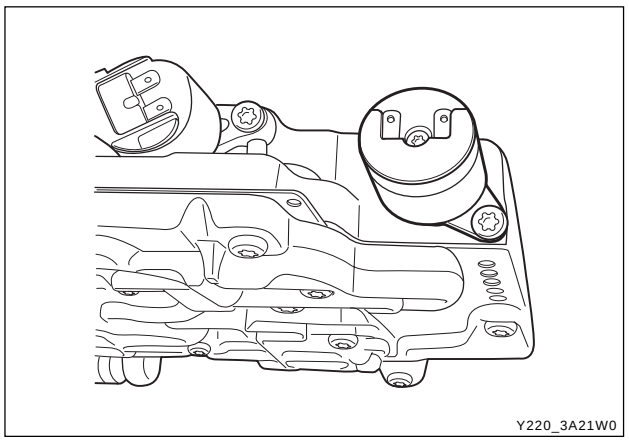
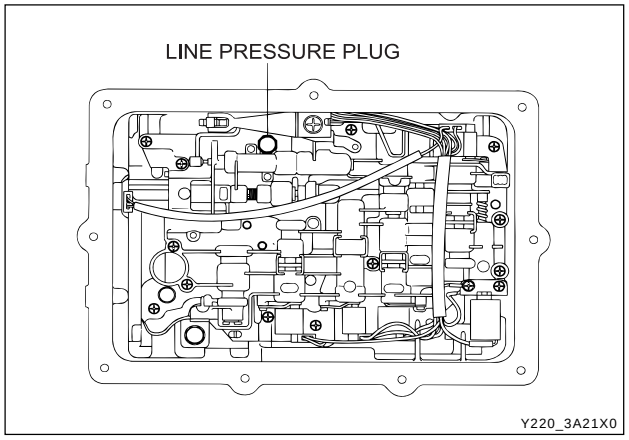


21. Install solenoid 5. Ensure that the solenoid is pushed firmly into the valve body by the retainer and that the screw is tightened to specification.

Installation Notice

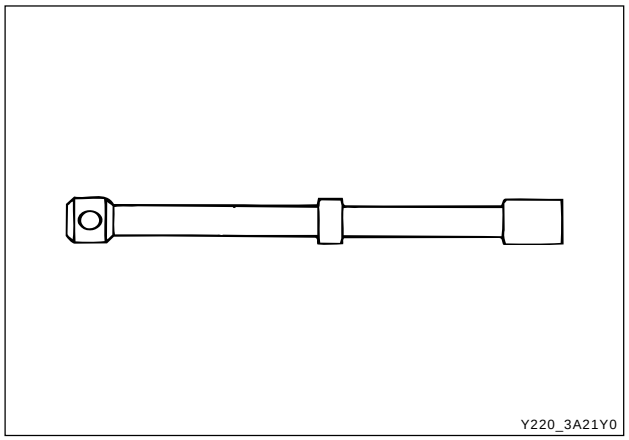
Tightening torque	8 ~ 12 Nm (71 ~ 106 lb-in)



22. Install the detent spring assembly (spring, support plate and screw), ensuring that the screw is tight-ened to specification. Check the spring for wear or damage.

Installation Notice

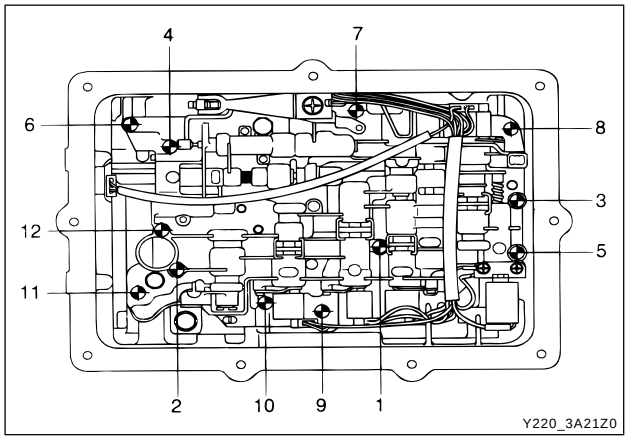
Tightening torque	20 ~ 22 Nm (15 ~ 16 lb-ft)



23. Install the manual shift valve.

Notice

Be aware that the manual valve will fall out of the valve body.



24. Align the valve body assembly on the transmission case and install the manual valve lever to manual valve link. Fit the long end of the link to the manual valve first. Install the securing bolts and tighten to specification in the specified sequence.

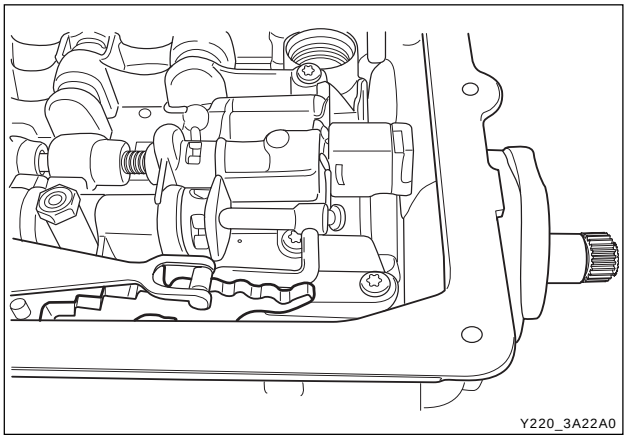
Installation Notice

Tightening torque	8 ~ 13 Nm (71 ~ 115 lb-in)

25. Check the alignment of the detent roller and the manual lever quadrant.
26. Connect the solenoid wiring as detailed below:
    Solenoid 1 - red
    Solenoid 2 - bIue
    Solenoid 3 - yellow
    Solenoid 4 - orange
    Solenoid 5 - green
    Solenoid 6 - violet

Notice

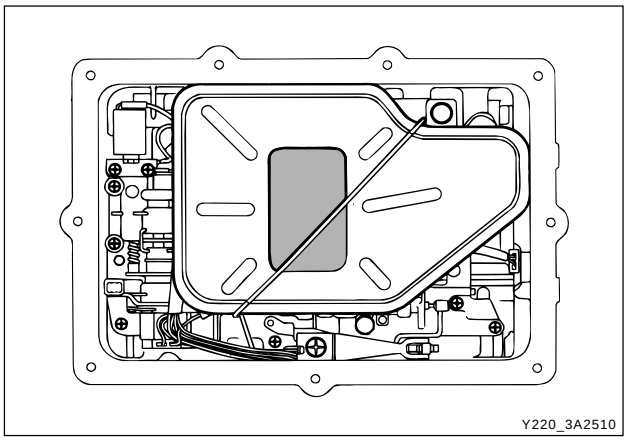
All hardware must be correctly installed and torqued to specification.



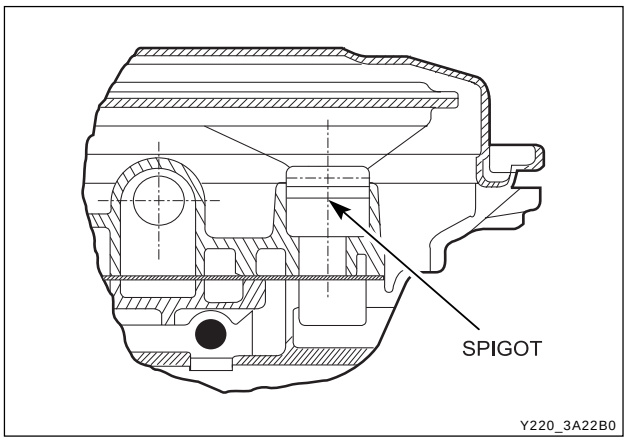
Oil Filter and Pan Assembly

Notice

- ***Replace the filter whenever rebuilding a transmission where a significant amount of mechanical damage has occurred.***
- ***To aid the assembly of the pan gasket, use a small amount of Vaseline at the pan/gasket interface. This ensures that the gasket remains on the pan ridge. Do not over torque pan bolts as this may distort the pan and cause leaks.***
- ***Ensure that the internal line pressure plus in the valve body is fitted.***



1. Lubricate the oil filter sealing ring with automatic transmission fluid.
2. Carefully assemble the oil filter to the valve body. The spigot must not lean on one side while being fitted.
3. Secure the oil filter assembly with the retainer.
4. Check that the magnet is located in the dimple in the corner of the oil pan.
5. Assemble the gasket on the pan lip. The gasket must be free of any distortion when installed.



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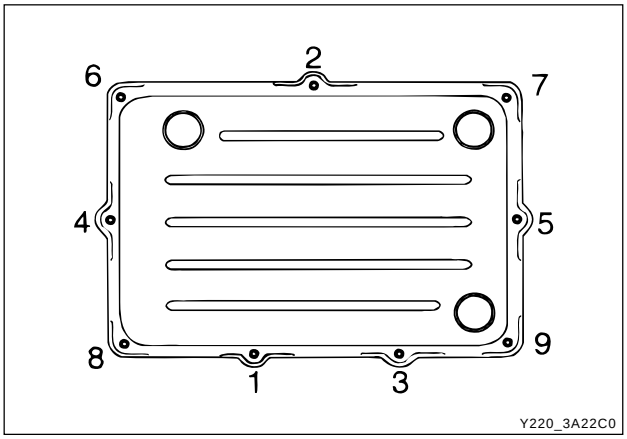
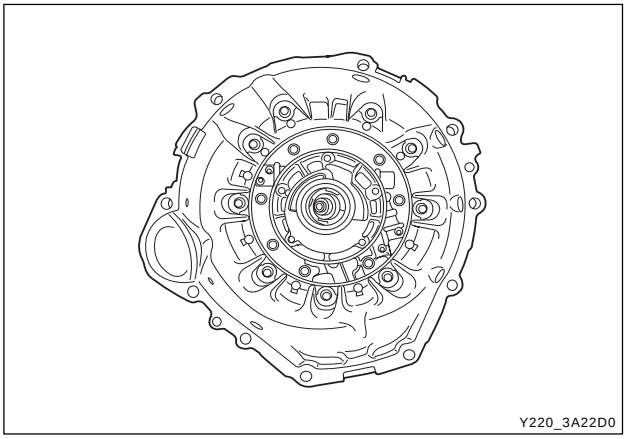


6. Fit the oil pan assembly to the transmission case and tighten the securing bolts to specification and sequence Do not over torque.

Installation Notice

Tightening torque	4 ~ 6 Nm (35 ~ 53 lb-in)



Torque Converter and Housing Assembly

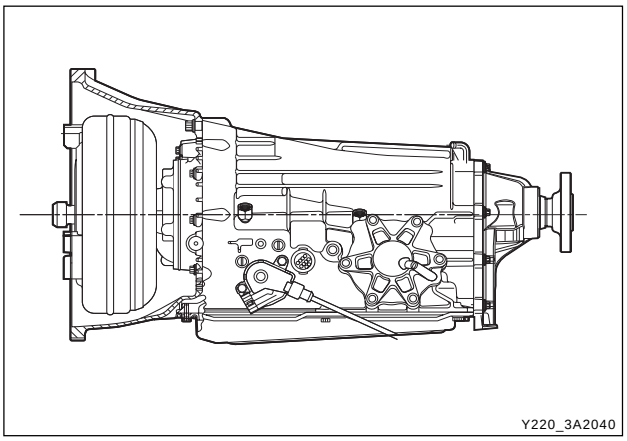
1. Locate the torque converter housing on the trans-mission main case.
2. Apply additional Loctite 202 or equivalent as required to the converter housing to case bolts. Install and tighten bolts to specification.

Installation Notice

Tightening torque	54 ~ 68 Nm (40 ~ 50 lb-ft)

- All the hardware must be correctly installed and torqued to specification.

3. Fit the converter ensuring that the tangs are engaged in the pump gear. Ensure that the tangs do not contact the pump seal.



Output Flange Assembly (2WD Mode)

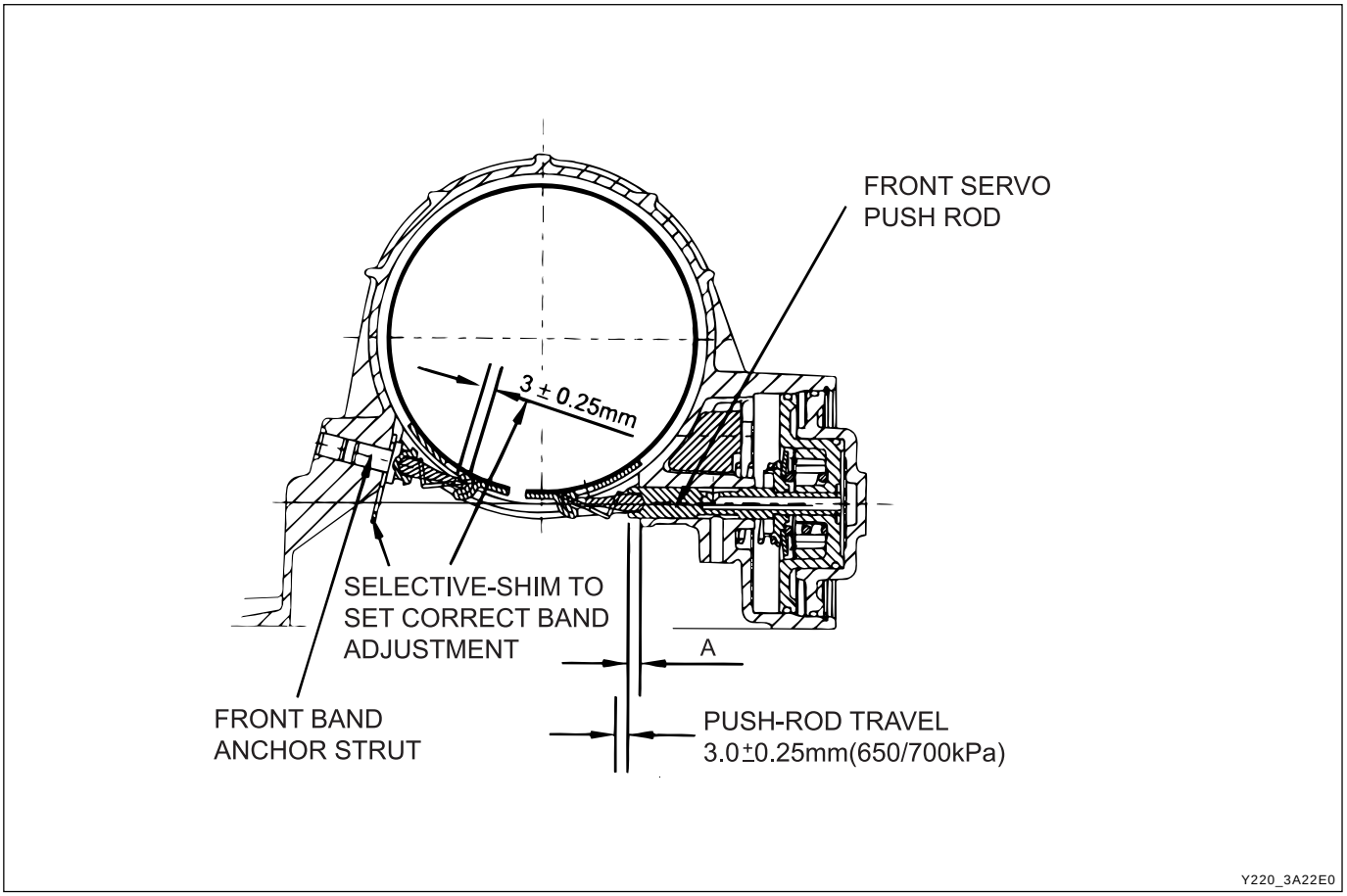
1. Position the transmission detent lever into the park position and lock the output shaft.
2. Clear the threads on the output shaft and apply Loctite 243 or equivalent as required to threads.
3. Install the flange, “O” ring and torque the nut to specification.

Installation Notice

Tightening torque	35 Nm (26 lb-ft)

FRONT AND REAR BAND ADJUSTMENT

▶ Front Band Setting Procedure



1. Measure the projection of the front servo push rod from the transmission case dimension 'A'.
   a. Apply air at 650/700 kPa to the front servo apply area (B1 outer)
   b. Measure the travel of the push rod and subtract 3 mm to find the shim size required.
   c. Release the air.

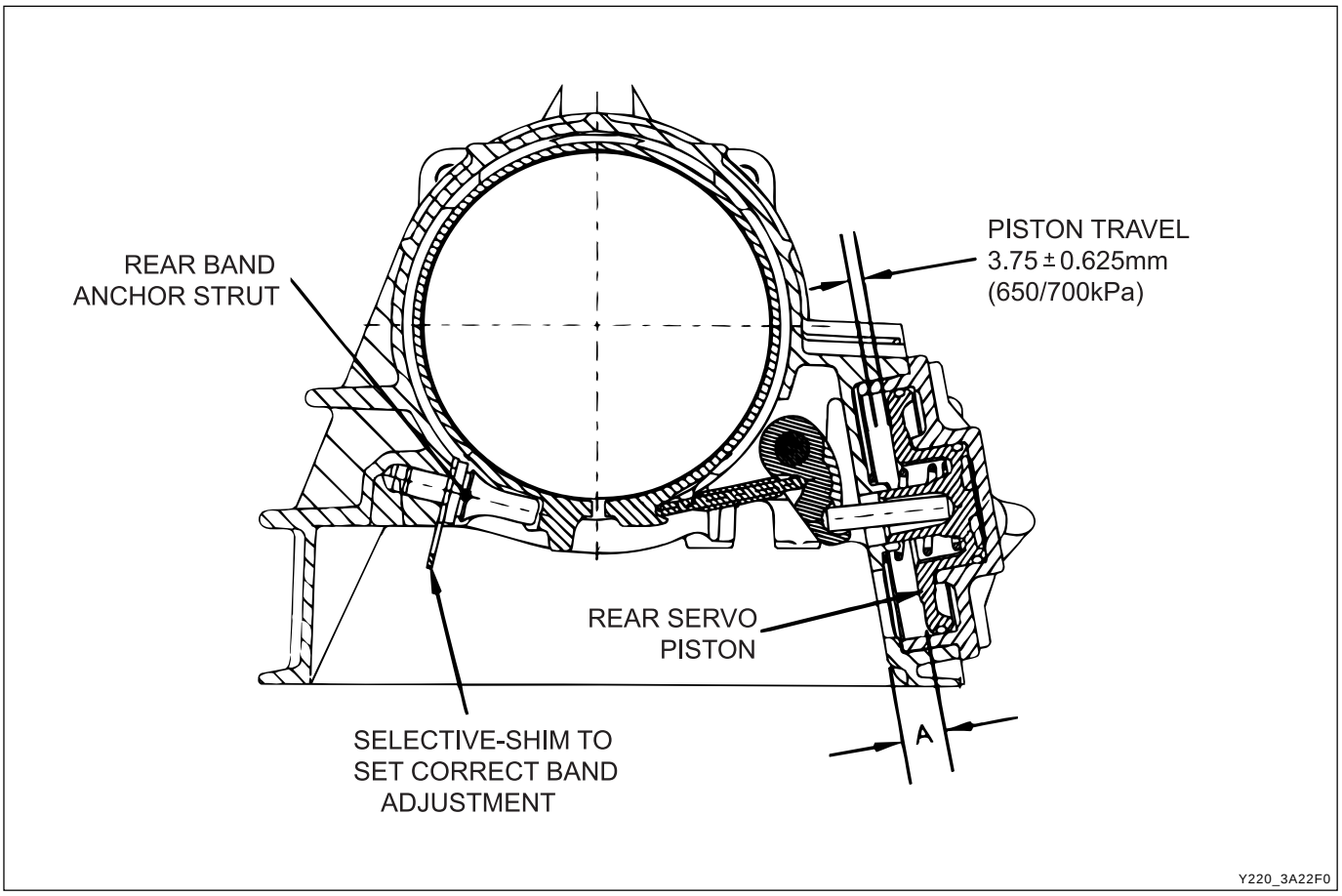
Thickness(mm)	Part Number
0.95/1.05	0574-037017
1.15/1.25	0574-037018
1.44/1.56	0574-037019
1.73/1.87	0574-037020
1.93/2.07	0574-037021
2.12/2.28	0574-037022
2.42/2.58	0574-037023
2.61/2.79	0574-037024

Notice

A minimum of one shim is required at all times - minimum shim size is 1 mm. The thickness of available shims are listed in the table below.

2. Fit the selected shim(s) to the shank of the anchor strut as follows:
   a. Inspect the shim(s) for damage, wear or corrosion. Replace as necessary.
   b. The shim(s) are to be installed between the case abutment face and the anchor strut flange.
   c. The shim(s) are to be fitted by hand and under no circumstances to be hammered or forced.
   d. Shim(s) are to be pressed on by hand until an audible click is heard. The click indicates that the shim is clipped home correctly.
3. Re-check that the push rod travel.
   (3mm ± 0.25mm)

▶ Rear Band Setting Procedure



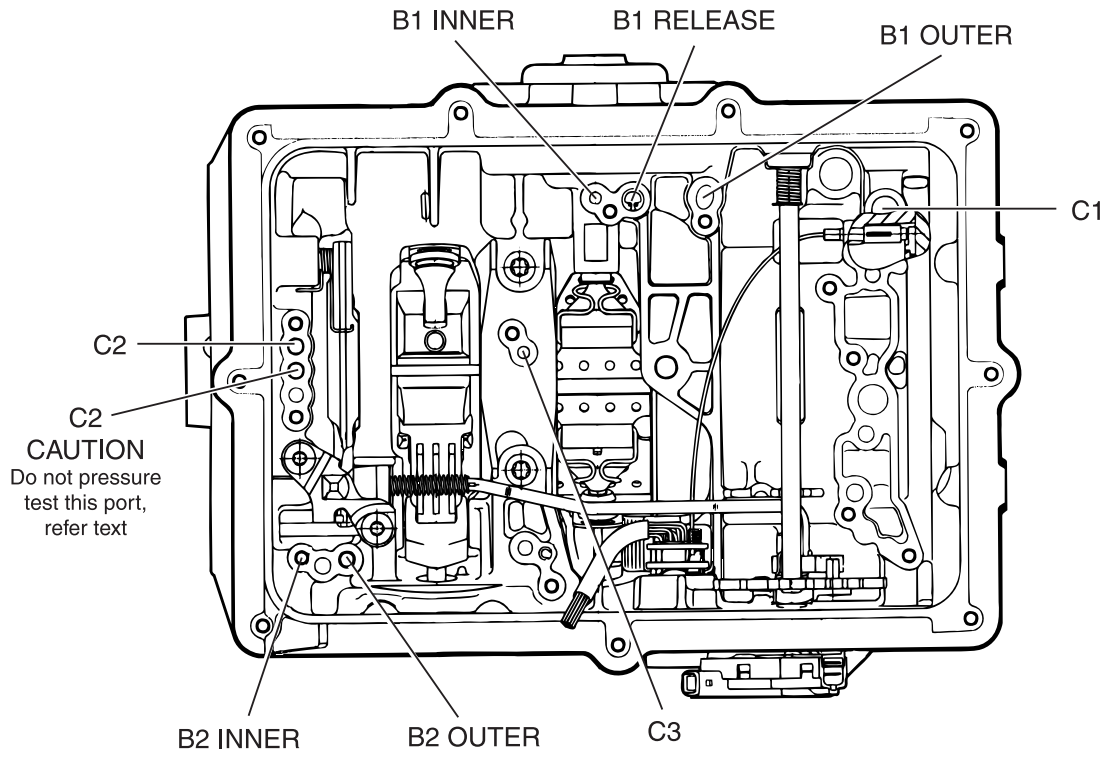
1. Measure distance “A” from the rear servo piston to the inner face of the transmission case using vernier calipers.
   a. Apply air at 650/700 kPa to the rear servo apply area (B2 outer)
   b. Measure the travel of the piston, subtract 3.75 mm and divide the remainder by 2.5 to find shim size.
   c. Release the air.

Thickness(mm)	Part Number
0.0.95/1.05	0574-037017
1.15/1.25	0574-037018
1.44/1.56	0574-037019
1.73/1.87	0574-037020
1.93/2.07	0574-037021
2.12/2.28	0574-037022
2.42/2.58	0574-037023
2.61/2.79	0574-037024

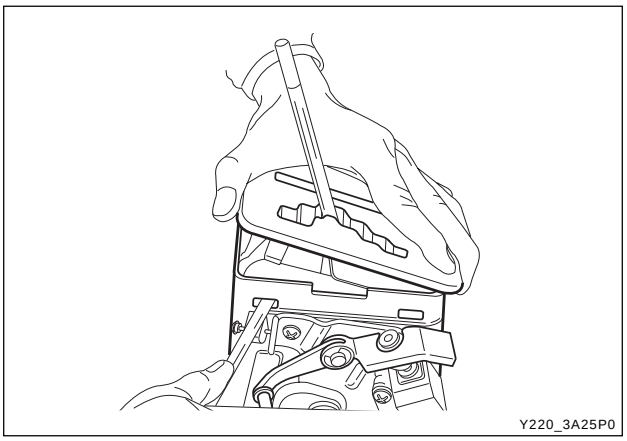
Notice

A minimum of one shim is required at all times - minimum shim size is 1 mm. The thickness of available shims are listed in the table below.

2. Fit the selected shim(s) to the shank of the anchor strut as follows.
   a. Inspect the shim(s) for damage, wear or corrosion and replace as necessary. The shim(s) are to be installed between the case abutment face and the anchor strut flange.
   b. The shim(s) are to be fitted by hand and under no circumstances to be hammered or forced
   c. The shim(s) are to be pressed on by hand until an audible click is heard. The click indicates that the shim is clipped home correctly.
3. Re-check that the piston travel.
   (3.75 mm ± 0.625 mm)

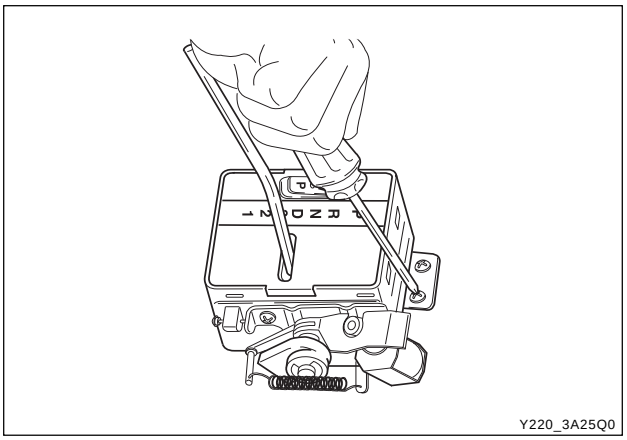

B1 INNER
B1 RELEASE
B1 OUTER
C1
C2
C2
CAUTION
Do not pressure test this port, refer text
B2 INNER
B2 OUTER
C3
Y220_3A22G0

GEAR SHIFT CONTROL LEVER



Disassembly and Assembly Procedure

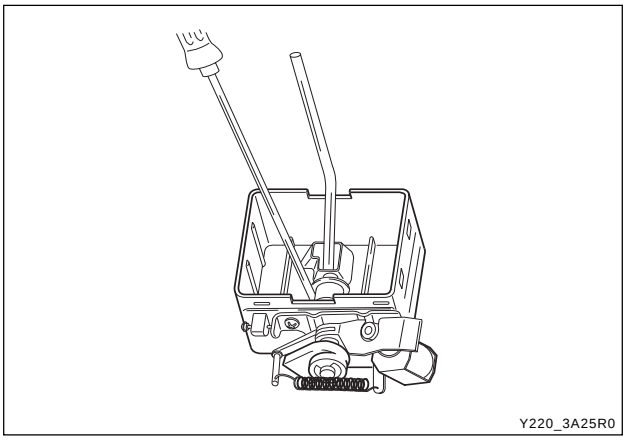
1. Disconnect the negative battery cable.
2. Remove the gear shift control lever assembly. Refer to *Section Interior Trim.*
3. Remove the gear shift control lever knob.
4. Separate the upper and middle housing from the gear shift control lever assembly by unlocking the lock.
5. Remove the upper housing.
6. Disconnect the P position lamp by turning it from the middle housing.



7. Remove the P position switches assembly bolts.
8. Remove the middle housing with the mode selector switch wiring harness from the gear shift control lever assembly.
9. Separate the P position switches assembly with the P position lamp wiring harness from the gear shift control lever assembly.

Notice

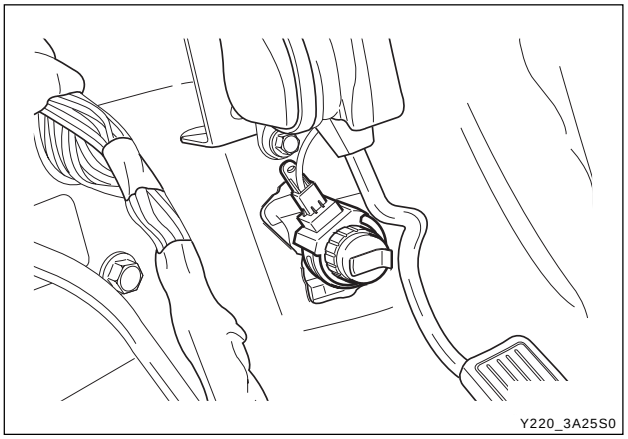
Adjust the brake transmission shift interlock ease the operation well.



10. Remove the clips supporting the springs and bushes from the pin of the pin of the gear shift control lever.
11. Remover the spring and bushes from the pin of the gear shift control lever.
12. Remove the gear shift control lever by pushing the pin.
13. Installation should follow the removal procedure in the reverse order.

KICKDOWN SWITCH

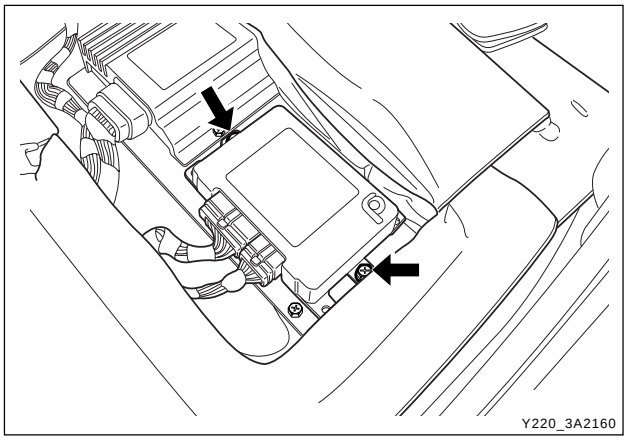
1. Separate the Kickdown Switch from the Kickdown Switch bracket by pushing the lock.
2. Disconnect the Kickdown Switch connector.
3. Installation should follow the removal procedure in the reverse order.



TRANSMISSION CONTROL MODULE

Removal and Installation Procedure

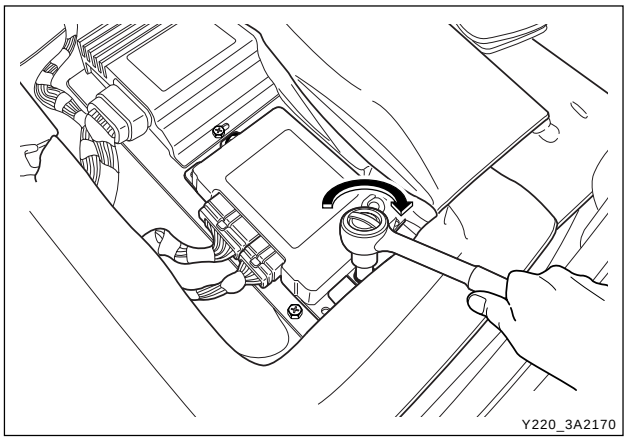
1. Disconnect the negative battery cable.
2. Push the driver's seat and disconnect the transmission control module connector.



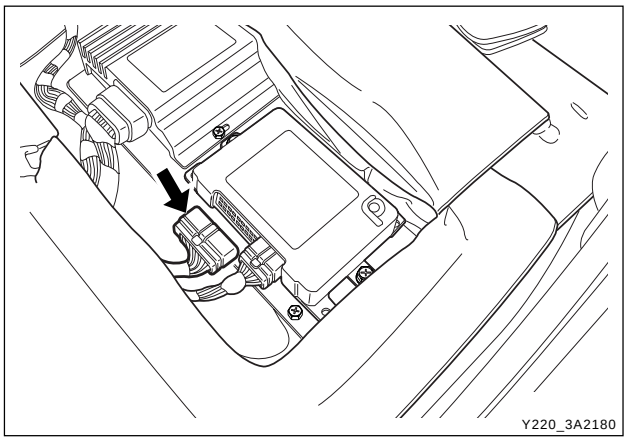
3. Removal the TCM mounting bolts and TCM.

   Installation Notice

Tightening torque	10 Nm (89 lb-ft)



4. Installation should follow the removal procedure in the reverse order.



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SPECIFICATIONS

GENERAL SPECIFICATION

▶ Model Part Numbers and Applications

SYMC P/NO	Transmission	Engine Version	Torque Converter
36100-05443	0574-000013	E23	179K
36100-05433	0574-000012	E32	150K
36100-05413	0574-000014	662LA	150K

▶ Model Specifications

Application	Descriprtion
Torque Converter	
Mean Diameter of Fluid Circuit Description	260 mm (10.2 in.)
Maximum Torque Multiplication	2.0 : 1
Gear Ratios	
First	2.741 : 1
Second	1.508 : 1
Third	1.000 : 1
Fourth	0.708 : 1
Reverse	2.429 : 1
Lubricant	
Type	Castrol TQ95
Capacity	
Dry System	9.0 Liters (approx.)
Service Refill	4.5 Liters (approx.)
Gear Train End Float	0.50 ~ 0.65 mm (0.020 ~ 0.026 in.)
Gear Set Pinion End Float	0.10 ~ 0.50 mm (0.004 ~ 0.020 in.)

▶ Clutch Pack Details

	0574-000012	0574-000013 (14)
C1		
Composition	5	4
Steel	5	6
C2		
Composition	5	4
Steel	4	5
C3		
Composition	4	3
Steel	4	5
C4		
Composition	3	3
Steel	4	4

▶ Model Part Numbers and Applications

E23 Gasoline Engine

MODE	THROTTLE OPENING	SHIFT (km/h)									
		1/2	2/3	3/4	4/3	3/2	2/1	UNL3	LCK3	UNL4	LCK4
NORMAL MODE	0 %	10.1	19.3	36.4	20.8	8.9	9.2	50.7	79.1	71.7	79.1
	16 %	10.1	19.3	36.4	20.8	8.9	9.2	50.7	79.1	71.7	79.1
	31 %	13.9	30.9	47.0	28.4	12.4	9.2	50.7	79.1	71.7	79.1
	49 %	22.3	46.1	70.5	41.8	18.9	9.3	50.7	90.3	74.2	90.3
	50 %	22.8	46.4	71.7	42	19.2	9.3	50.7	58.1	75.4	91.5
	58 %	27.2	53.2	89.0	52.7	24.7	10.9	59.4	66.8	81.6	100.2
	64 %	30.9	59.4	94.0	60	28.4	12.1	66.8	74.2	86.6	106.4
	71 %	34.1	66.5	103.3	69.3	32.6	18.6	71.7	76.7	95.8	115.0
	100 % (WOT)	47.4	91.9	147.2	98.9	45.5	34.6	81.6	95.1	134.3	147.2
	Kickdown	47.9	94.0	149.6	139.7	86.9	45.4	90.7	95.5	147.2	149.6
POWER MODE	0 %	11.9	22.8	42.0	20.8	8.9	9.2	73.0	75.4	73.0	75.4
	16 %	11.9	22.8	42.0	20.8	8.9	9.2	73.0	75.4	73.0	75.4
	31 %	22.5	42.0	70.0	33.4	17.3	9.2	73.0	79.1	73.0	79.1
	49 %	27.2	56.9	87.2	42.0	24.7	9.2	73.6	94.0	73.6	94.0
	50 %	30.7	64.3	96.5	49.5	29.7	10.4	76.2	103.9	76.2	103.9
	58 %	35.1	73.2	110.8	60.6	37.8	15.1	81.6	110.8	81.6	110.8
	64 %	37.6	77.4	116.3	68	42.5	18.1	86.6	116.3	87.8	116.3
	71 %	40.1	81.1	121.2	77.7	47.7	20.8	86.6	121.2	97.7	121.2
	100 % (WOT)	47.4	91.9	147.2	115.0	66.7	33.0	86.6	136.0	142.2	147.2
	Kickdown	47.9	94.0	149.6	139.7	86.9	45.4	90.7	95.5	147.2	149.6

E32 Gasoline Engine

MODE	THROTTLE OPENING	SHIFT (km/h)									
		1/2	2/3	3/4	4/3	3/2	2/1	UNL3	LCK3	UNL4	LCK4
NORMAL MODE	0 %	11.7	20.2	39.5	24.6	10.2	10.5	37.4	81.9	73.1	81.9
	15 %	11.7	22.8	39.5	24.6	10.2	10.5	37.4	81.9	73.1	81.9
	25 %	13.3	30.4	67.3	32.2	14.6	10.5	37.4	81.9	73.1	81.9
	32%	16.8	36.6	76.0	38.0	19.7	11.0	39.5	83.4	73.1	83.4
	35 %	18.6	40.1	80.4	40.9	21.9	11.7	40.9	62.9	74.6	86.3
	45 %	24.0	49.7	93.6	52.6	27.8	13.9	46.8	70.2	81.9	93.6
	55 %	31.9	66.1	114.1	70.2	32.2	17.3	54.1	79.0	102.4	114.1
	70 %	42.1	85.4	146.2	90.7	39.5	21.9	64.3	93.6	128.7	146.2
	100 % (WOT)	56.7	110.0	170.4	119.9	46.8	26	93.6	114.1	152.1	170.4
	Kickdown	57.0	110.6	175.5	163.8	104.7	50.3	116.4	119.3	166.7	175.5
POWER MODE	0 %	12.3	24.6	40.9	24.6	10.2	10.5	76.0	81.9	76.0	81.9
	15 %	14.0	27.8	43.9	29.2	10.2	10.5	76.0	81.9	76.0	81.9
	25 %	23.4	43.9	65.8	39.5	17.5	11.0	76.0	81.9	76.0	81.9
	32 %	24.6	49.1	76.6	46.1	24.9	11.6	81.9	90.7	81.9	90.7
	35 %	26.3	52.6	81.9	51.2	27.8	12.0	84.8	96.5	84.8	96.5
	45 %	32.2	65.8	105.3	67.3	37.3	15.4	102.4	117.0	102.4	117.0
	55 %	38.6	76.9	125.8	87.7	51.2	21.4	111.1	125.8	114.1	125.8
	70 %	46.7	90.8	146.2	113.3	66.5	28.7	111.1	146.2	128.7	146.2
	100 % (WOT)	56.7	110.0	170.4	148.4	89.9	42.4	111.1	170.4	152.1	170.4
	Kickdown	57.0	110.6	175.5	163.8	104.7	50.3	116.4	119.3	166.7	175.5

662LA Diesel Engine

MODE	THROTTLE OPENING	SHIFT (km/h)									
		1/2	2/3	3/4	4/3	3/2	2/1	UNL3	LCK3	UNL4	LCK4
NORMAL MODE	0 %	11.4	20.4	35.4	26.7	9.3	9.5	47.6	76.2	72.1	76.2
	25 %	11.4	20.4	35.4	27.2	9.3	9.5	47.6	76.2	72.1	76.2
	40 %	12.2	25.4	40.8	29.9	13.6	9.5	47.6	76.2	72.1	76.2
	60 %	14.7	36.5	61.8	38.1	21.8	9.5	47.6	76.2	72.1	76.2
	61 %	14.7	36.7	62.0	38.4	22.0	9.5	47.6	50.3	72.1	76.2
	70 %	16.6	40.0	70.7	43.5	25.9	12.2	47.6	51.7	72.1	77.0
	75 %	18.2	43.3	76.2	49.0	28.6	13.6	47.6	54.4	72.1	81.6
	80 %	21.8	51.7	84.4	54.4	31.3	15.0	49.0	57.7	75.1	89.0
	100 % (WOT)	28.6	62.6	104.5	69.4	38.1	19.6	57.1	62.6	92.5	104.5
	Kickdown	34.8	68.0	110.2	100.7	63.9	31.3	61.2	68.0	100.7	110.2
POWER MODE	0 %	11.7	21.8	38.1	26.7	9.3	9.5	61.2	76.2	72.1	76.2
	25 %	11.7	21.8	38.1	31.3	9.3	9.5	61.2	76.2	72.1	76.2
	40 %	14.1	27.5	43.5	32.7	16.3	10.2	61.2	76.2	72.1	76.2
	60 %	21.8	44.6	69.4	47.6	27.2	12.8	61.2	76.2	72.1	76.2
	61 %	28.0	57.1	88.7	54.4	35.4	14.4	61.2	88.7	72.1	88.7
	70 %	29.9	59.9	93.9	61.2	40.8	15.8	61.2	93.9	72.1	93.9
	75 %	31.3	61.8	96.6	65.3	46.3	17.4	61.2	96.6	75.1	96.6
	80 %	32.7	64.8	100.4	70.7	50.3	20.4	61.2	100.4	81.6	100.4
	100 % (WOT)	34.0	67.8	105.3	83.0	54.4	23.1	61.2	105.3	92.5	105.3
	Kickdown	34.8	68.0	110.2	100.7	63.9	31.3	61.2	68.0	100.7	110.2

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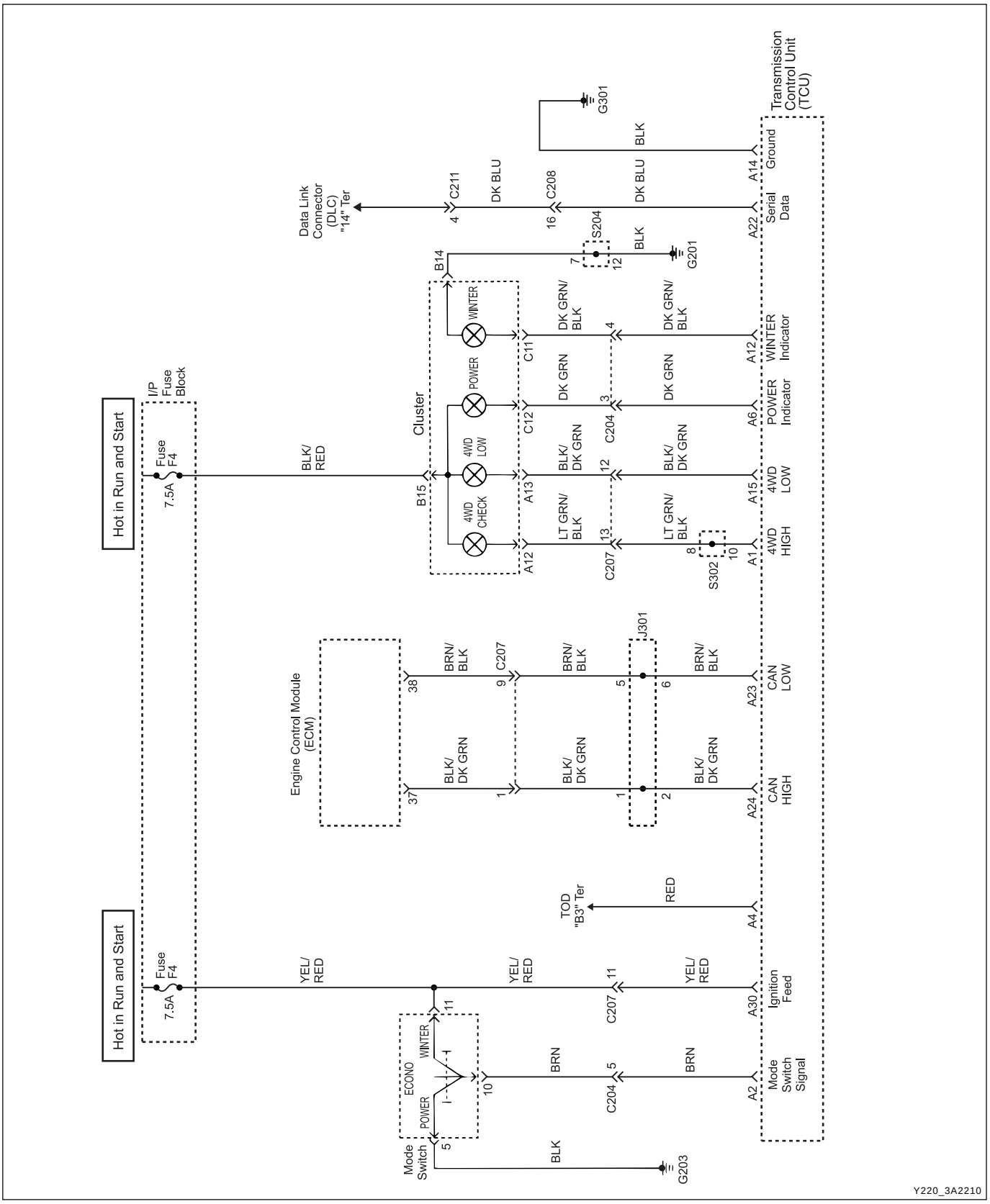
FASTENER TIGHTENING SPECIFICATIONS

Application	Nm	Lb-Ft	Lb-Ft
Adaptor Housing to Case Bolts	30 ~ 35	22 ~ 26	-
Cam Plate to Case (Parking Pawl) Screws	16 ~ 22	12 ~ 16	-
Centre Support to Case Bolts	20 ~ 27	15 ~ 20	-
Detent Spring Screw	20 ~ 22	15 ~ 16	-
Extension Housing to Case Bolts	54 ~ 68	40 ~ 50	-
Front Propeller Shaft Bolts	70 ~ 80	52 ~ 59	-
Inhibitor Switch to Case Bolts	4 ~ 6	-	35 ~ 53
Oil Cooler Pipes	40 ~ 45	29 ~ 33	-
Oil Pan to Case Bolts	4 ~ 6	-	35 ~ 53
On/Off Solenoid Retainer Screws	8 ~ 12	-	71 ~ 106
Output Flange Nuts	35	26	-
Pump Cover Plate to Crescent Screw	13 ~ 16	10 ~ 12	-
Pump Cover Plate to Pump Cover Screws	13 ~ 16	10 ~ 12	-
Pump Cover to Case Bolts	24 ~ 34	18 ~ 25	-
Pump to Pump Cover Bolts	24 ~ 27	18 ~ 20	-
Rear Propeller Shaft Bolts	70 ~ 80	52 ~ 59	-
Rear Servo Cover to Case Bolts	30 ~ 35	22 ~ 26	-
TCM Mounting Bolt	10	-	89
Torque Converter Housing to Case Bolts	54 ~ 68	40 ~ 50	-
Torque Converter Mounting Bolts	42	31	-
Transfer Case to Transmission Housing Bolts	35 ~ 60	26 ~ 44	-
Transmission Filler Plug	30 ~ 35	22 ~ 26	-
Upper Valve Body to Lower Valve Body Screws	11 ~ 16	8 ~ 12	-
Valve Body To Case Bolts	8 ~ 13	-	71 ~ 115
Variable Pressure Solenoid (S5) Retainer Screw	8 ~ 12	-	71 ~ 106

SCHEMATIC AND ROUTING DIAGRAMS

TCU WIRING DIAGRAM (GASOLINE ENGINE-1 OF 2)



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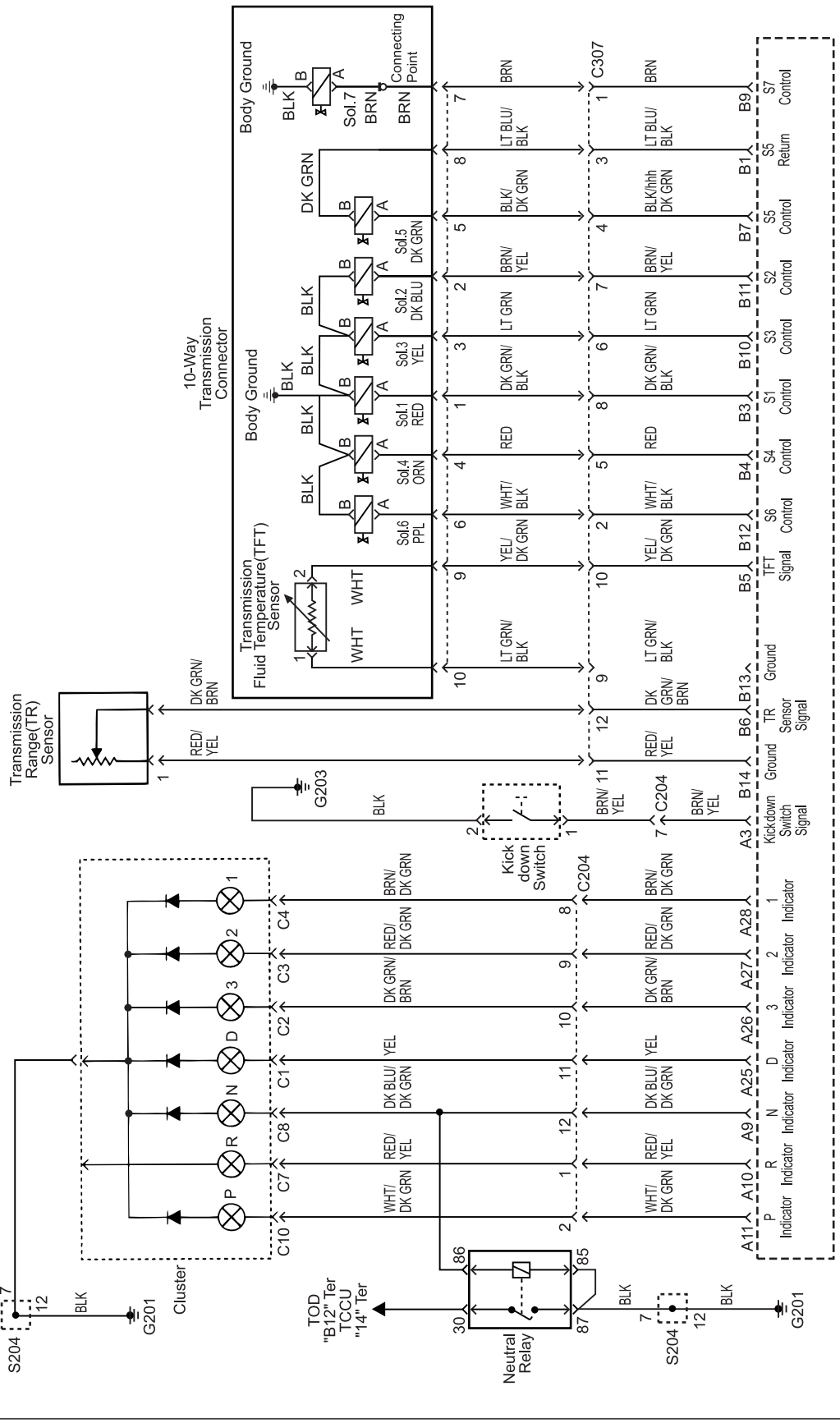
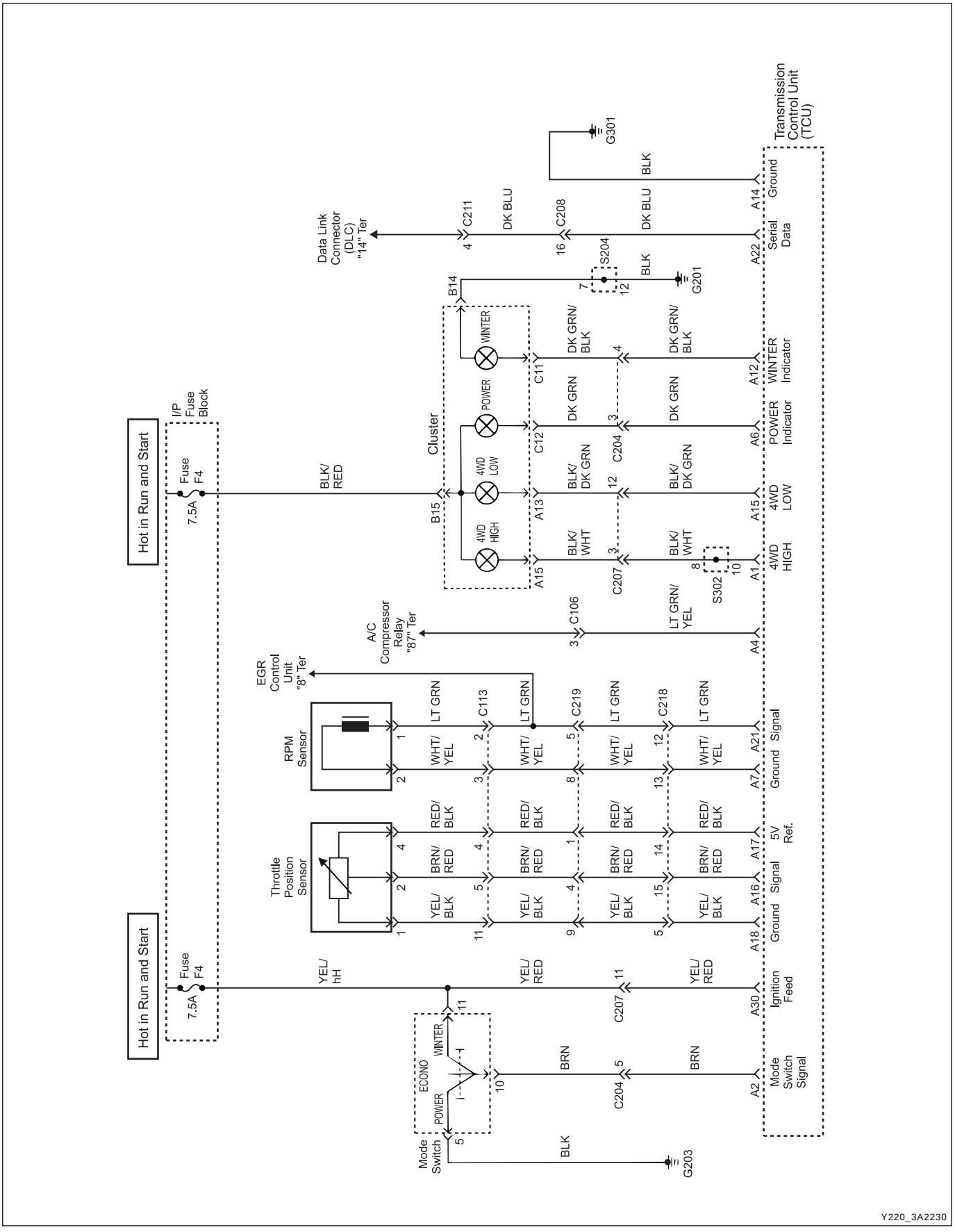
▶ TCU WIRING DIAGRAM (GASOLINE ENGINE-2 OF 2)



▶ TCU WIRING DIAGRAM (DIESEL ENGINE-1 OF 2)



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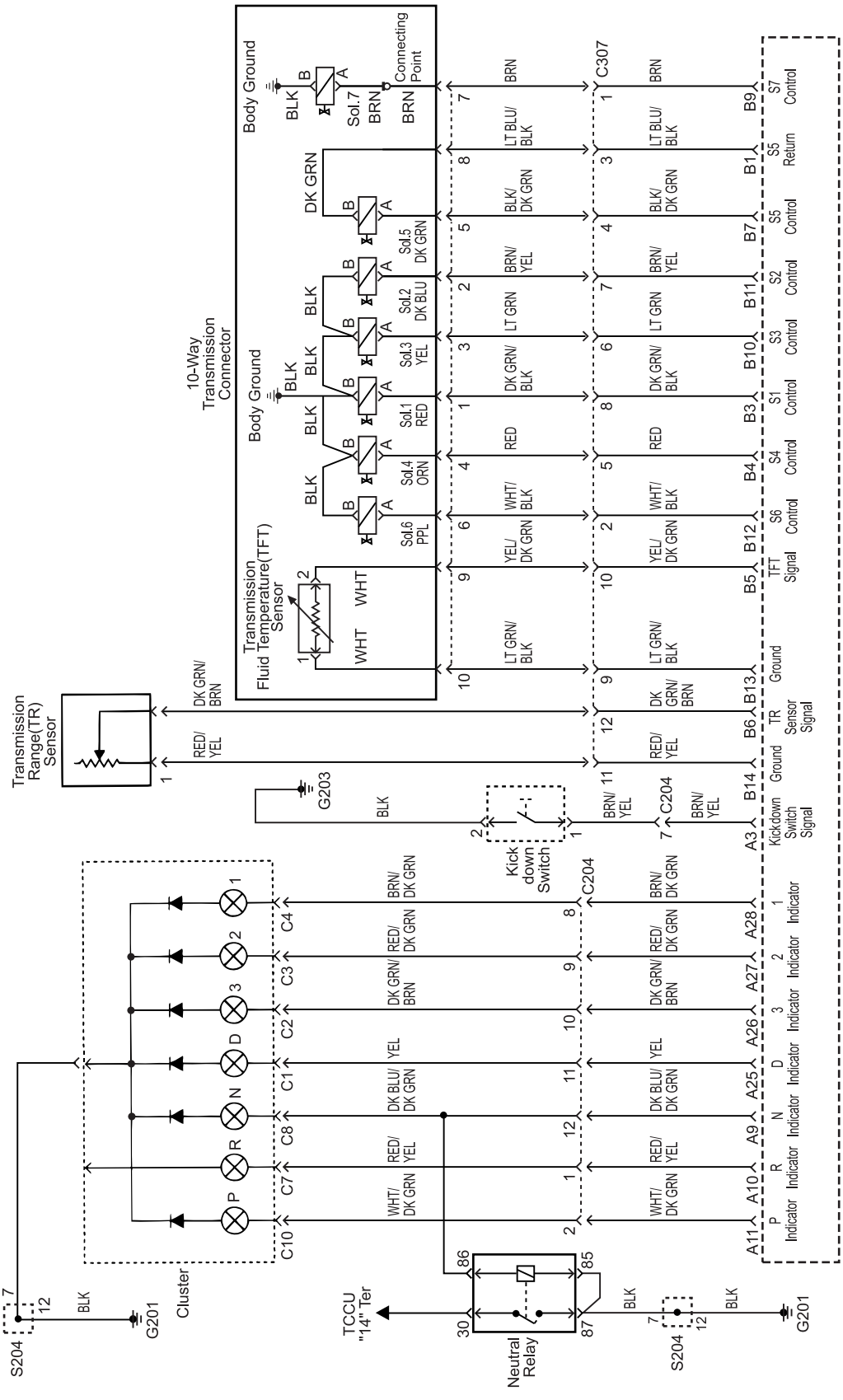
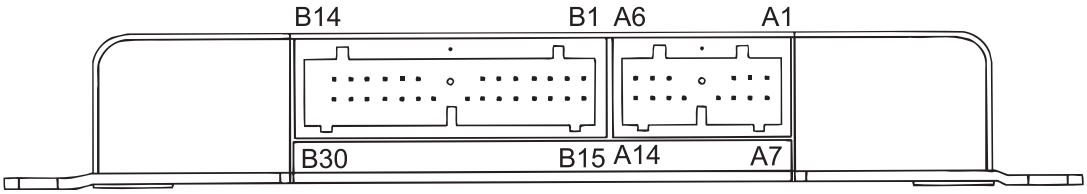
EFFECTIVE DATE	
AFFECTED VIN	

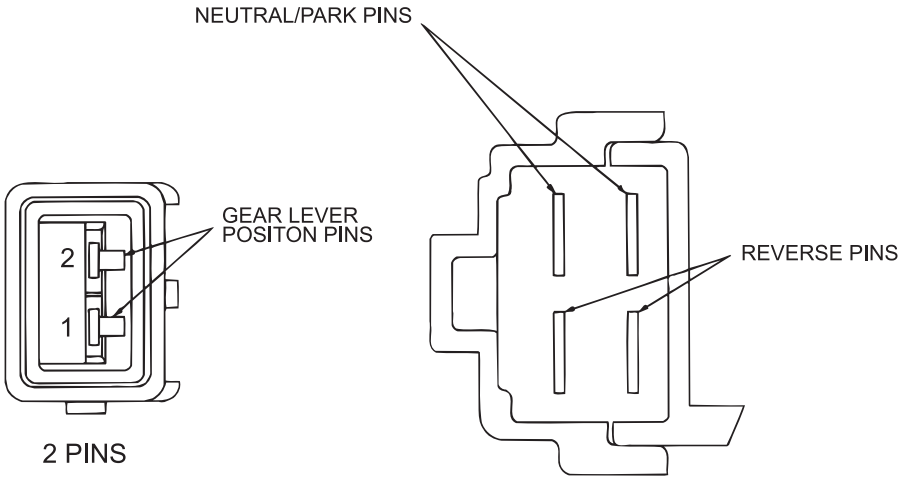
▶ TCU WIRING DIAGRAM (DIESEL ENGINE-2 OF 2)



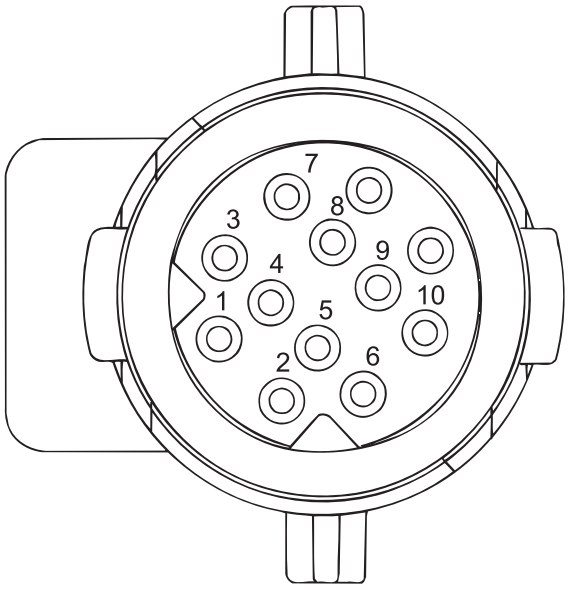
CONNECTOR END VIEW



Transmission Control Unit (TCU) Pin Numbers



Inhibitor Switch Pins



10-Way Transmission Connector

Y220_3A25O0

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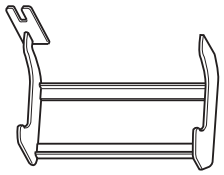
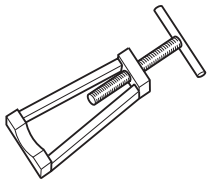
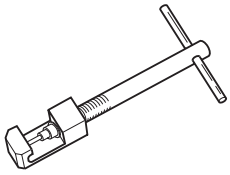
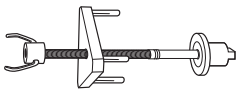
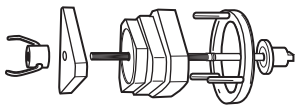
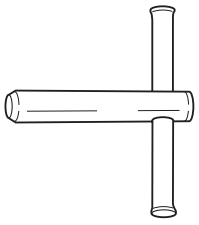
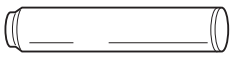
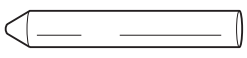
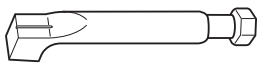
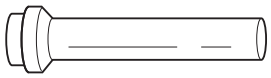
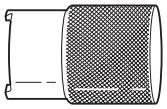
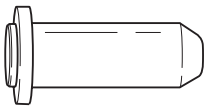
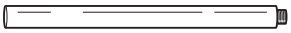
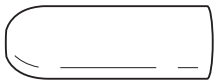
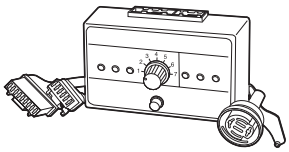
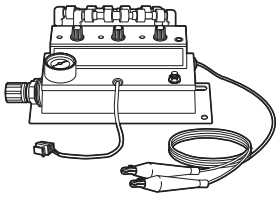
SPECIAL TOOLS AND EQUIPMENT

Name and Part Number	
0555 - 336256 **Transmission Bench Cradle**  Y220_3A22P0	**0555 - 336257** **Pump Puller**  Y220_3A22Q0
0555 - 336258 **Cross Shaft Pin Remover/Installer (Detent Lever)**  Y220_3A22R0	**0555 - 336259** **Clutch Spring Compressor**  Y220_3A22S0
0555 - 336260 **Clutch Pack Clearance Kit**  Y220_3A22T0	**0555 - 336261** **Cross Shaft Seal Remover**  Y220_3A22U0
0555 - 336262 **Cross Shaft Seal Installer**  Y220_3A22V0	**0555 - 336263** **Cross Shaft Bullet**  Y220_3A22W0

Name and Part Number
0555 - 336265 **Cross Shaft Pin Remover / Installer (Inhibitor Switch)**  Y220_3A22X0
0555 - 336266 **Adaptor Housing Seal Installer**  Y220_3A22Y0
0555 - 336267 **Pump Alignment Tool**  Y220_3A22Z0
0555 - 336268 **Pump Seal Installer**  Y220_3A23A0
0555 - 336269 **End Float Measuring Adaptor**  Y220_3A23B0
0555 - 336270 **End Float Measuring Shaft**  Y220_3A23C0
0555 - 336302 **Output Shaft Bullet**  Y220_3A23D0
0555 - 336045 **Solenoid Bench Tester**  KAC5A050
0555 - 332083 **Solenoid / Thermistor Electronic Tester**  KAC5A060

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