2001

Technical Seminar 2001

ATRA
AUTOMATIC TRANSMISSION REBUILDERS ASSOCIATION

2001

Automatic Transmission Rebuilders Association

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Evelyn Marlow, who took great pains to make sure our line art was as clean as possible, against sometimes overwhelming odds.

Cliff McCormick, whose skill with our digital camera provided us with a crisp and unique collection of images.

Steve Garrett, who was instrumental in collecting the very latest information for our GM section.

My personal thanks to all of you; we couldn't have done it without you.

Lance Wiggins
Technical Director

Import Updates and Changes

Contents

Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure

It isn't uncommon for electronically-controlled Nissan transmissions to have problems with line pressure. Whether it's low mainline at idle, not enough line rise, or no line rise at all, the result will be soft shifts or burnt clutches and bands. It's a good idea to check pressures before any work is performed on the vehicle. But it's absolutely necessary to check pressures when you reinstall the unit, even if it seems to work great.

Most of these transmissions don't have a true line pressure tap. Instead, you can check line pressure by checking the forward clutch pressure when the unit's in D, S and L, and reverse clutch pressure when it's in reverse. But remember, if forward clutch pressure is 20 PSI at idle, it could be a mainline pressure problem... *or* it could be a leak in the forward clutch circuit. The point is, don't assume there's a problem with mainline pressure just because forward clutch pressure is low.

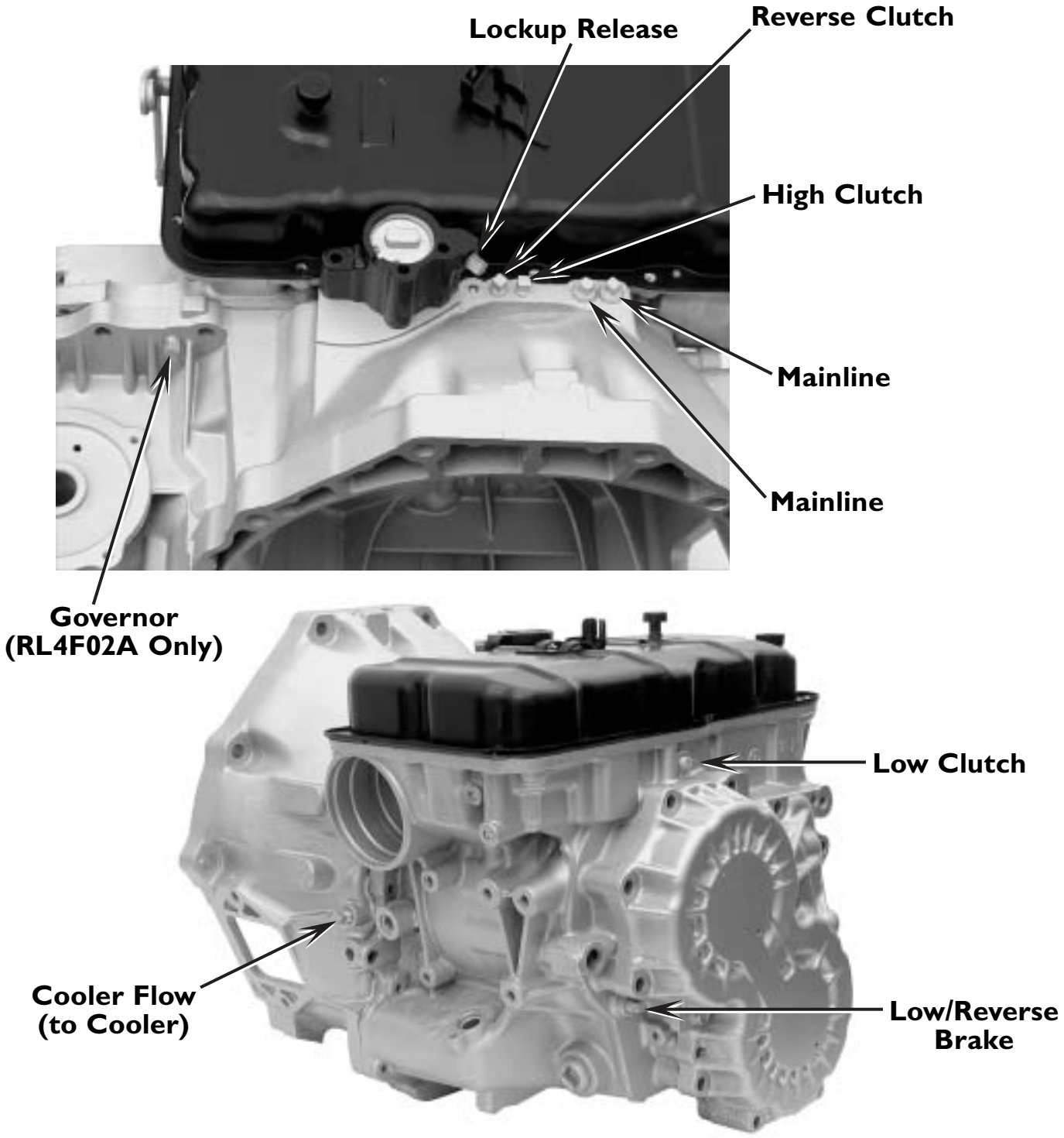
Mainline Pressure Specifications

Transmission	Vehicle	Pressure in Drive (PSI)		Pressure in Reverse (PSI)	
		Idle	Full	Idle	Full
RL4F02A	All	54–64	175–200	54–64	175–200
RE4F02A	All	55–61	186–198	55–61	186–198
RL4F03A	All	75–80	155–160	125–130	250–260
RE4F03A	All	70–75	155–160	120–125	265–275
RE4F04A / 4F20E	Quest / Villager	70–75	170–180	120–130	260–270
	All Others	70–75	155–165	120–130	245–260
RL4R01A	All	61–67	128–139	97–102	202–213
RE4R01A / RE4R03A	2WD	64–70	128–139	102–108	201–212
	4WD	68–74	148–159	95–101	206–218
R4A-EL / R4AX-EL	2WD	68–74	175–186	88–94	219–230
	4WD	57–74	148–159	102–108	206–218
Subaru 4-Spd	2WD / 4WD	64–82	164–182	85–100	206–230

Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

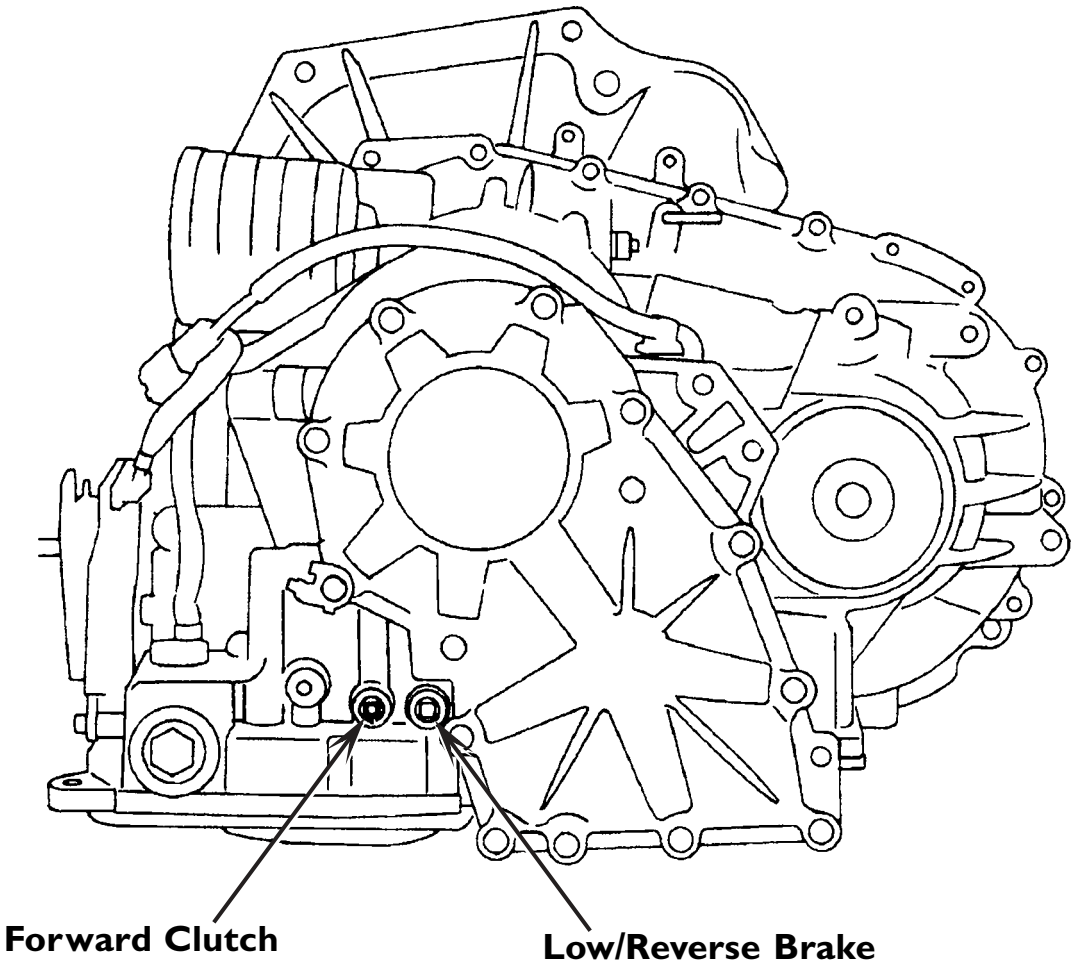
RE4F02A and RL4F02A



Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

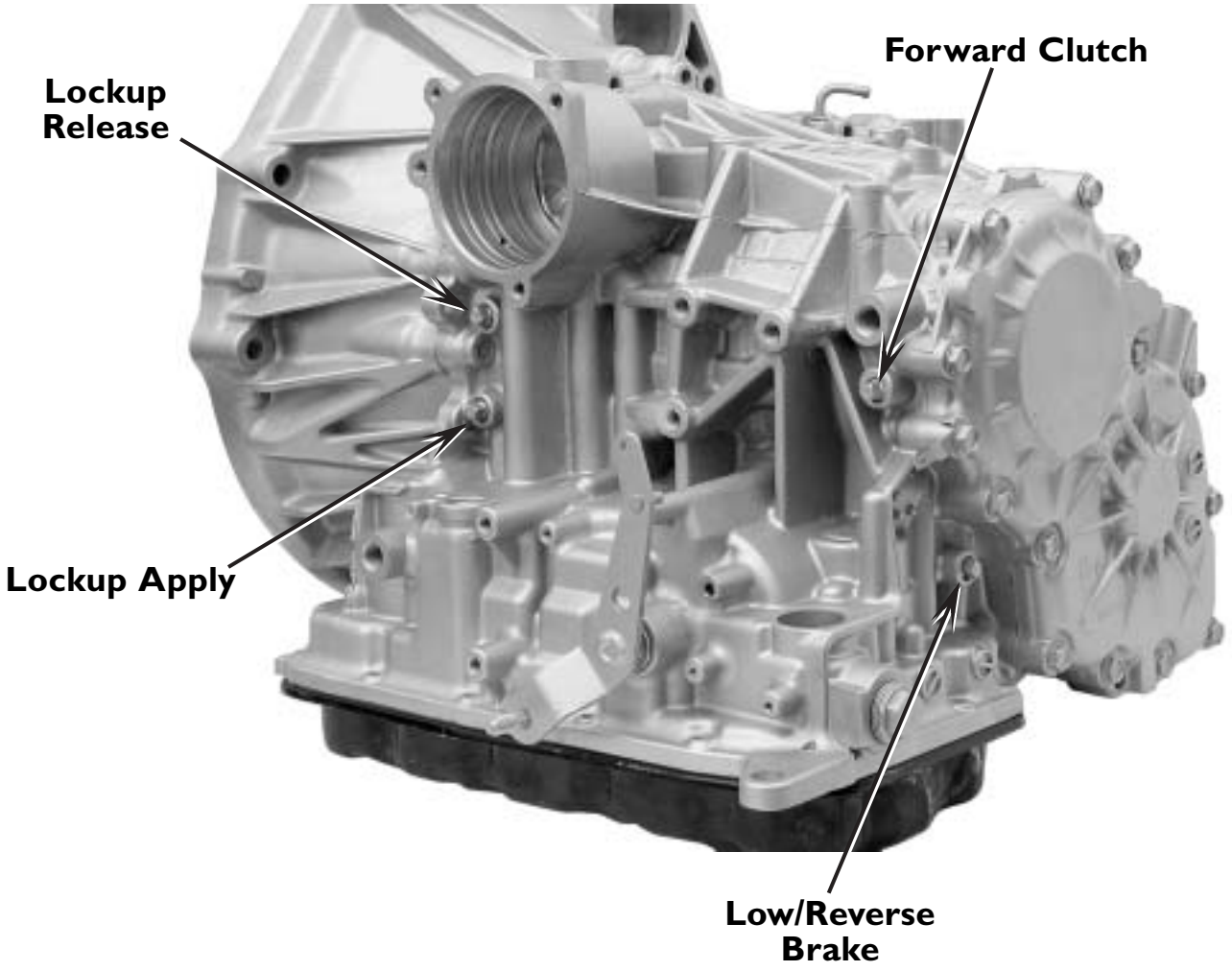
RE4F03A



Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

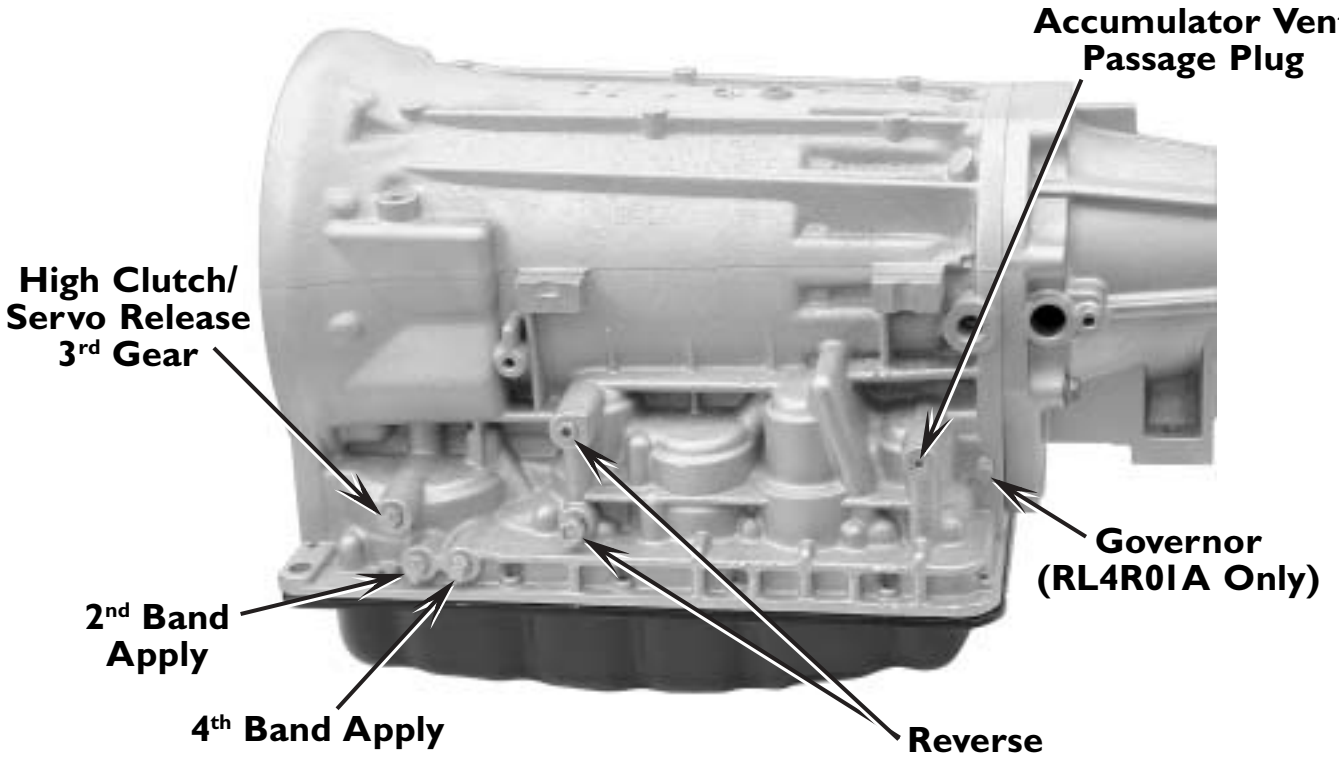
RE4F04A and 4F20E

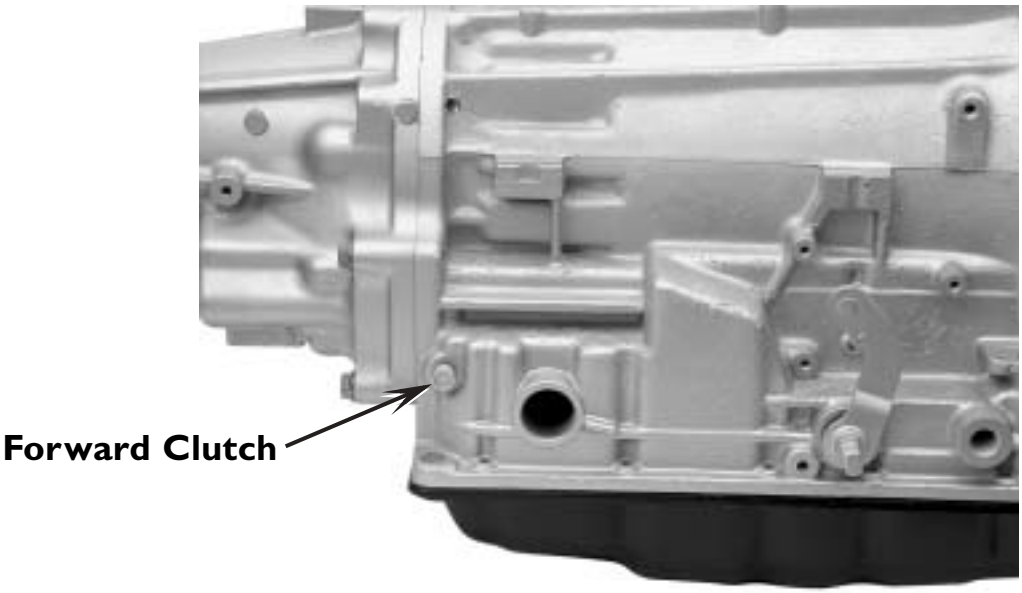


Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

RL4R01A, RE4R01A, R4A-EL and R4AX-EL

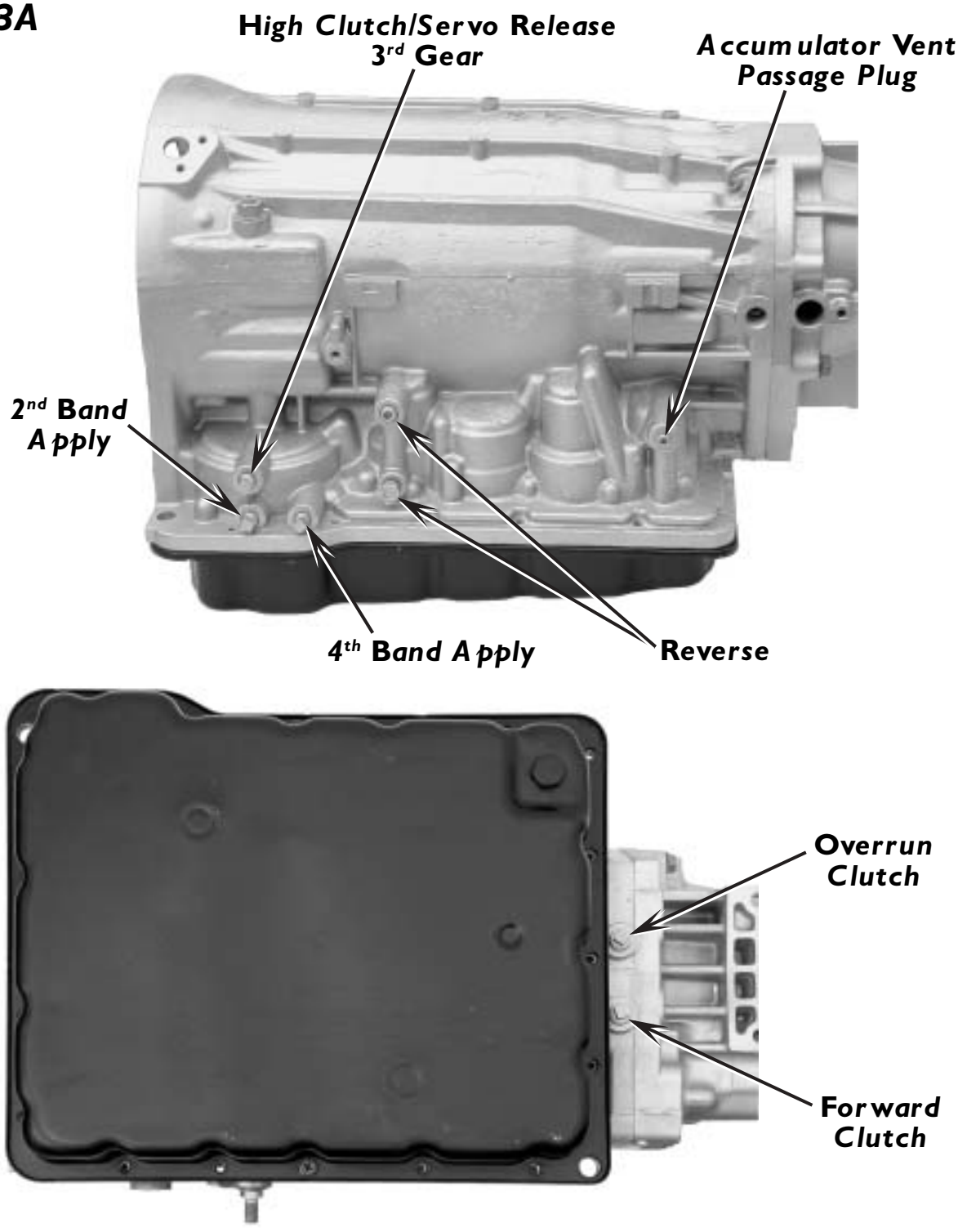




Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

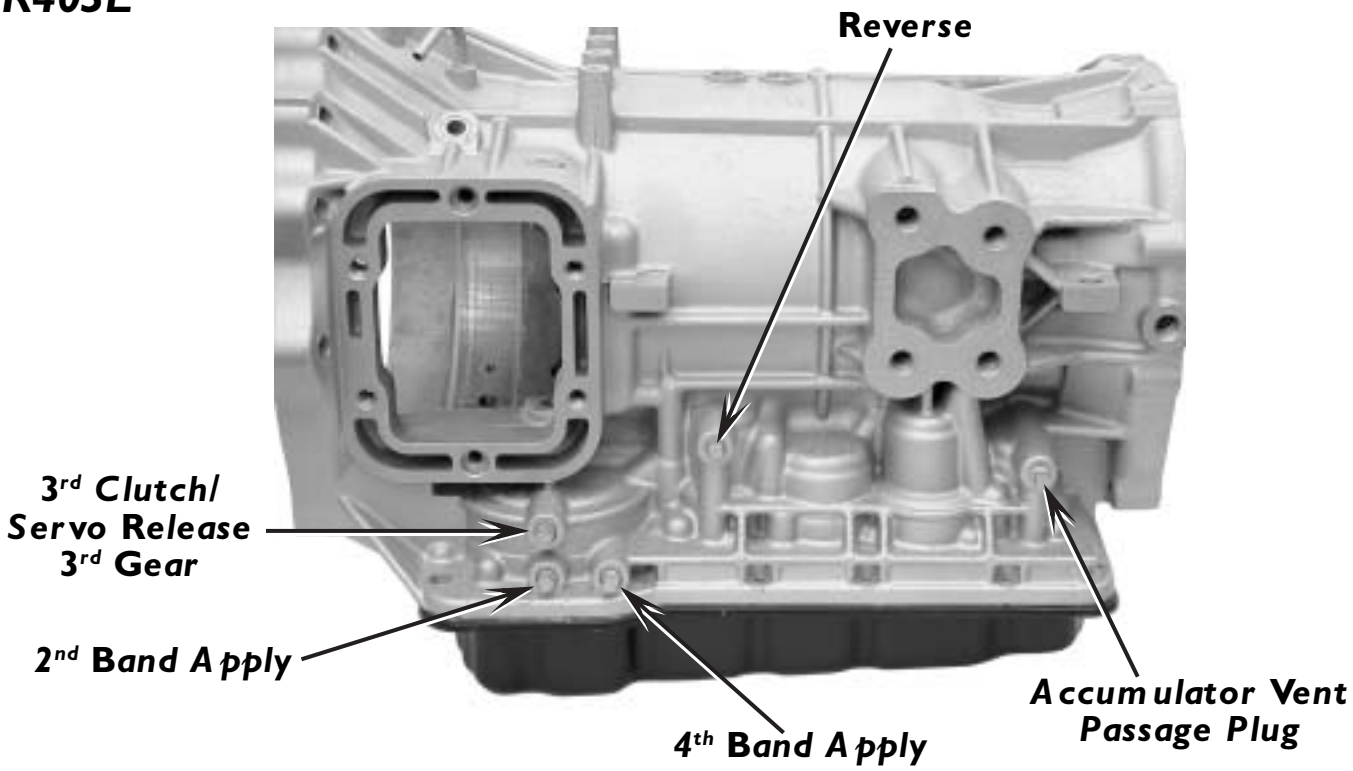
RE4R03A

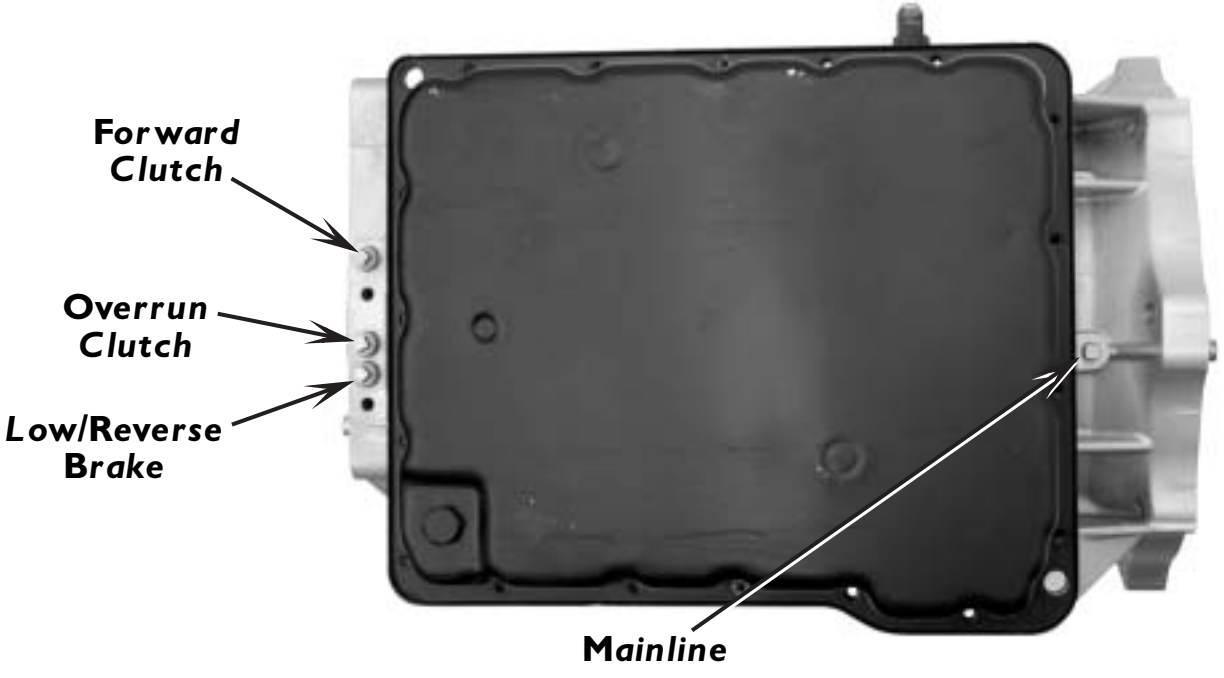


Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

JR403E

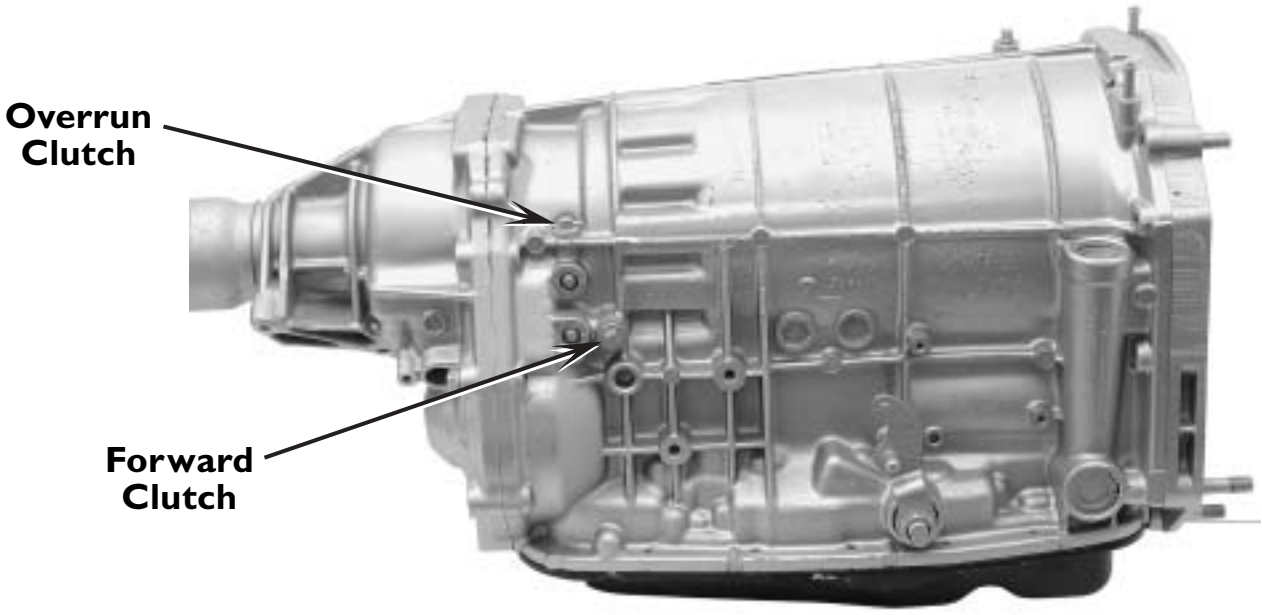




Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

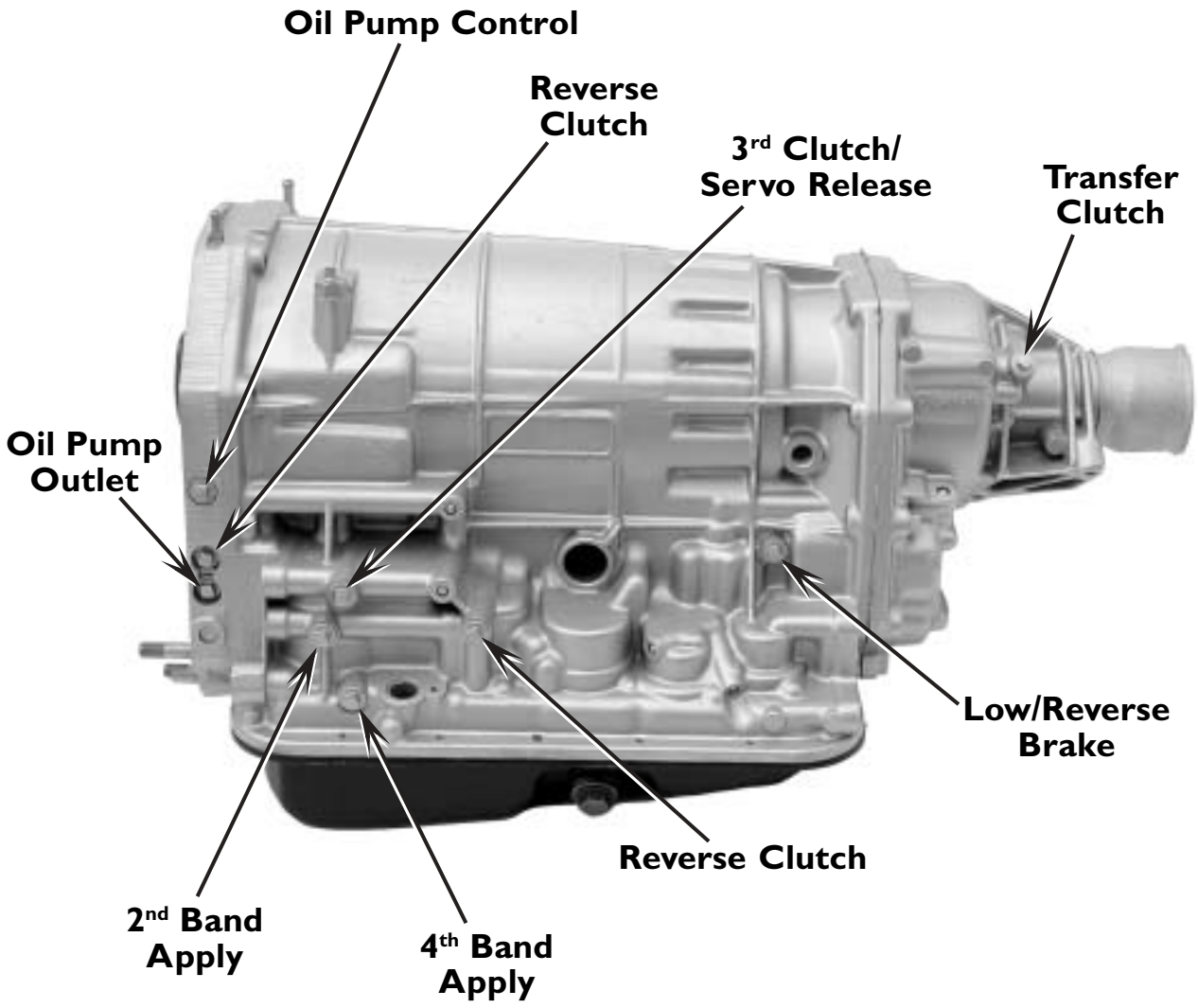
Subaru 4-Speed



Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

Subaru 4-Speed (continued)



Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

The most common reason for no line rise in Nissan transmissions with electronic pressure control is a bad line pressure control solenoid. The only way to purchase one of these solenoids separately is to order one for the RE4R01A, part # 31940-41X01. All Nissan line pressure control solenoids are the same, except for the bracket and wiring.

The bracket is held on to the solenoid by a snap ring. To use this solenoid on other units, simply use the original connector and bracket from the unit you're working on, and splice the wires to the original connector.

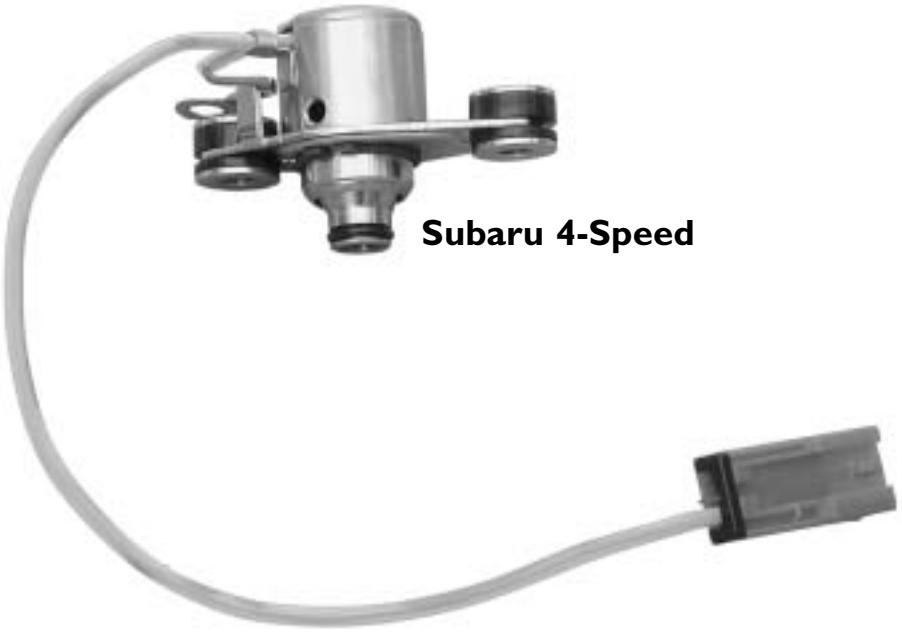
RE4R01A, RE4R03A, R4AEL, Subaru and JR403E Line Pressure Control Solenoid

RE4F02A Line Pressure Control Solenoid

Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

RE4F03A, RE4F04A and 4F20E Line Pressure Control Solenoid



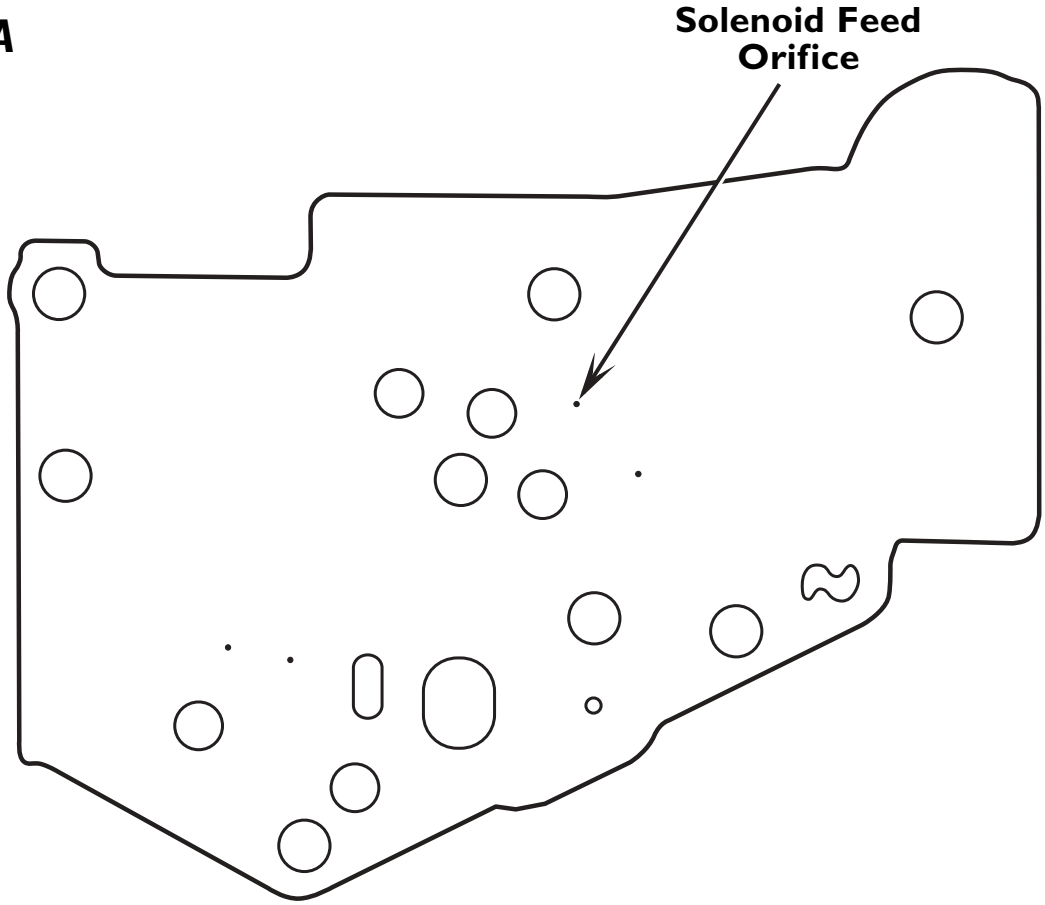
Subaru 4-Speed

Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

Another common reason for no line rise is insufficient feed to the line pressure control solenoid. Always enlarge the line pressure control solenoid feed orifice to 0.042", on every Nissan transmission you rebuild.

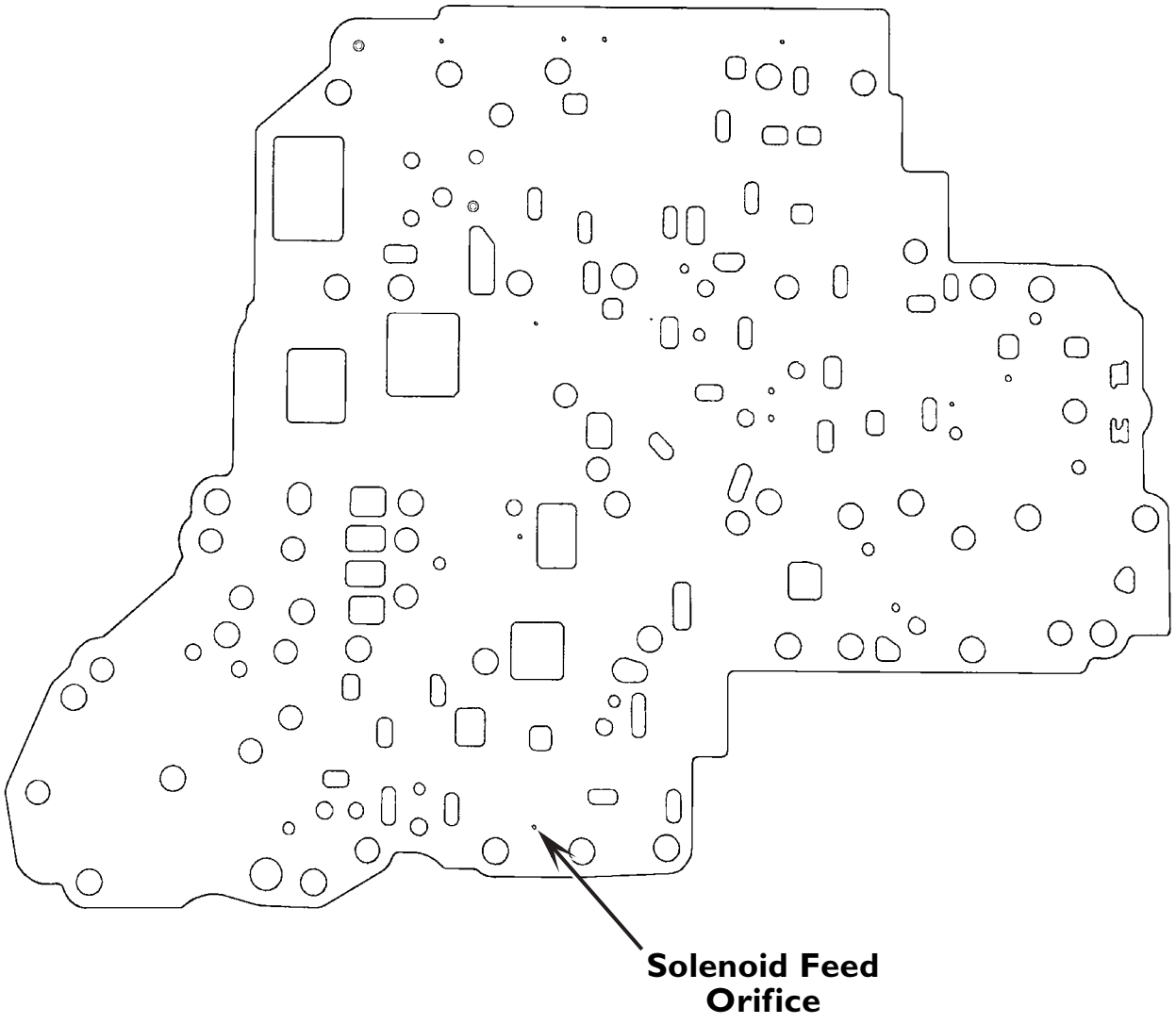
RE4F02A



Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

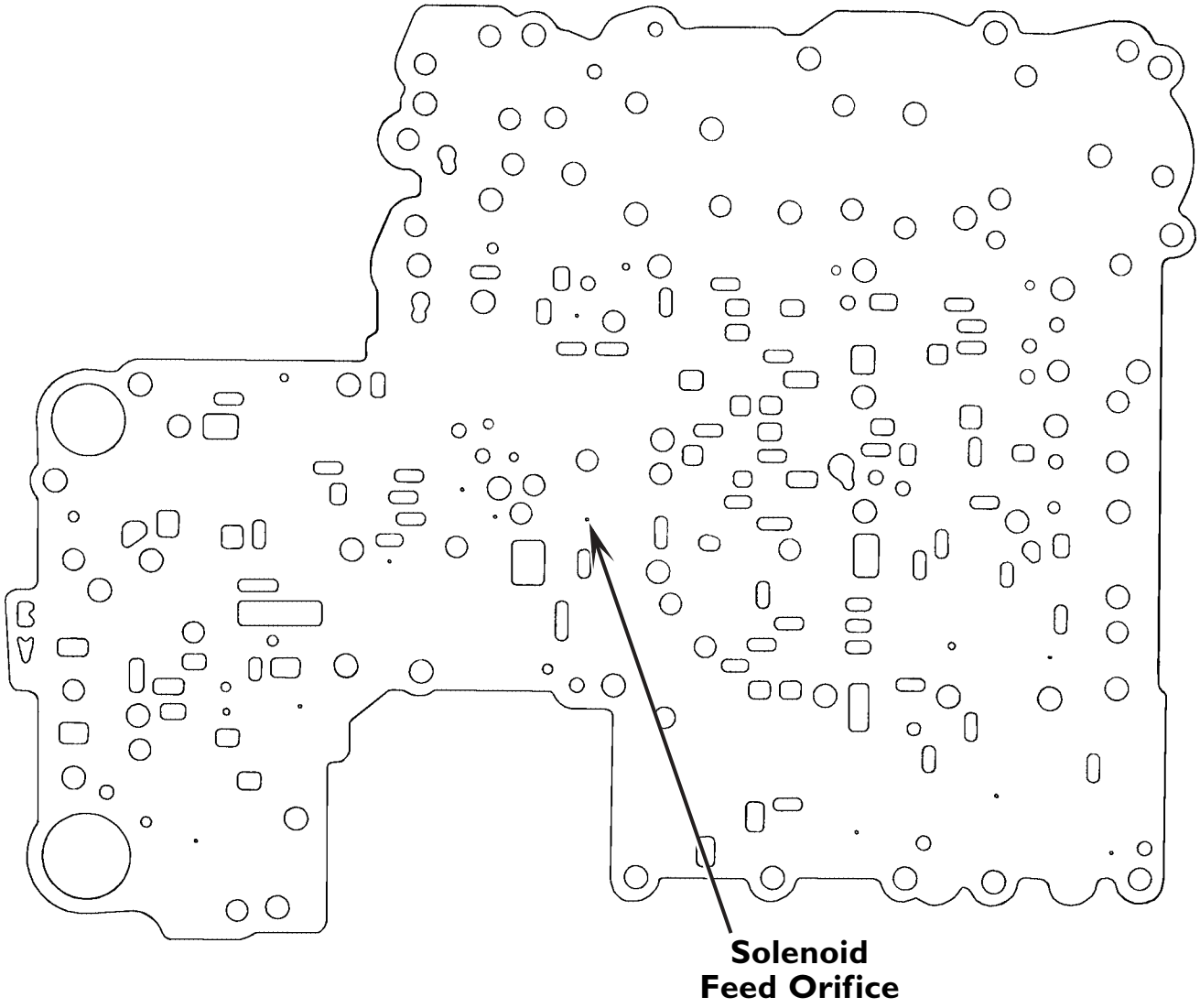
RE4F03A, RE4F04A and 4F20E



Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

RE4R01A, RE4R03A, R4A-EL, R4AX-EL, JR403E and Subaru 4-Speed

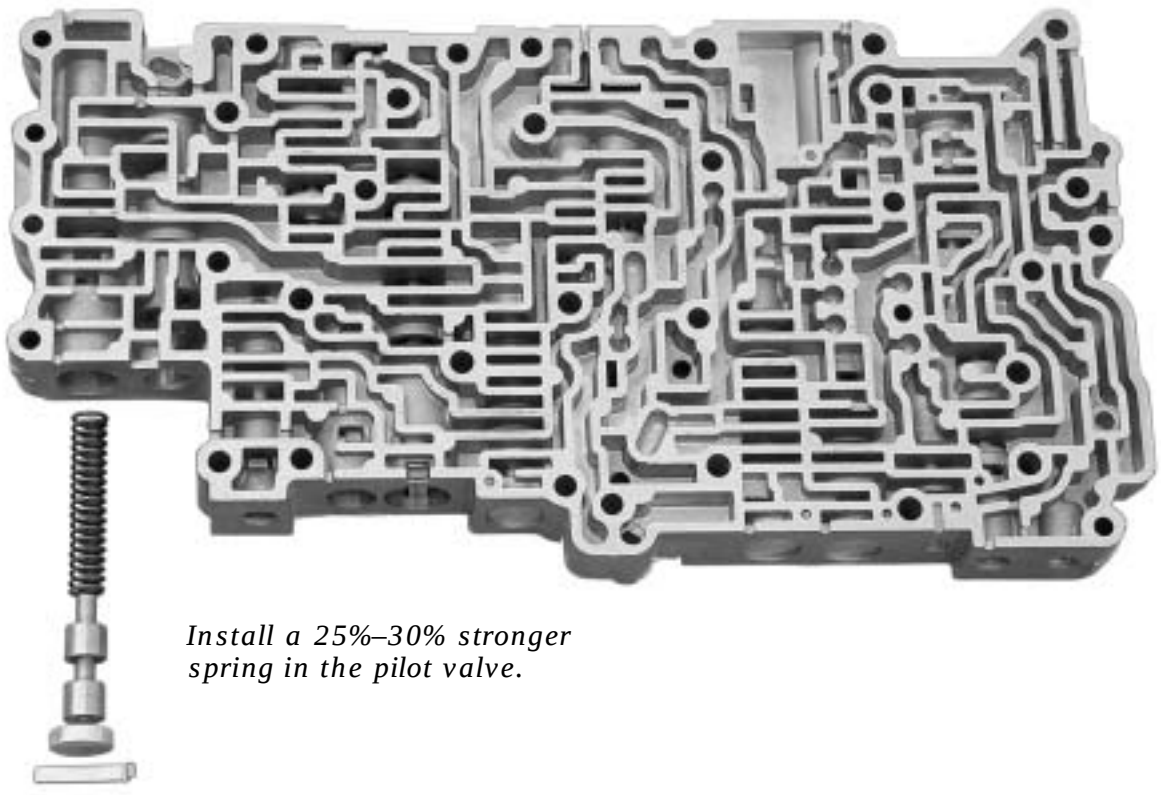


Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

If you are getting line rise — but not enough — on all Nissans except RE4F02A, install a 25%–30% stronger spring in the pilot valve and a 40%–45% stronger spring in the pressure modifier valve. The RE4F02A doesn't use a pressure modifier valve, but you can still add a 25%–30% stronger spring in the pilot valve. These modifications will greatly improve line rise and can be used as a normal rebuild procedure.

RE4F02A

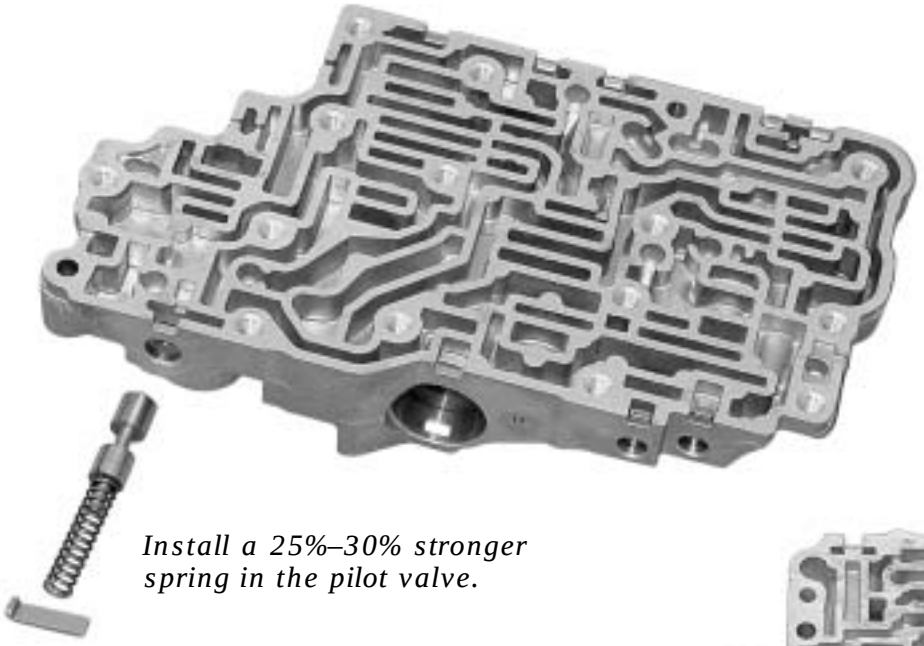


Install a 25%–30% stronger spring in the pilot valve.

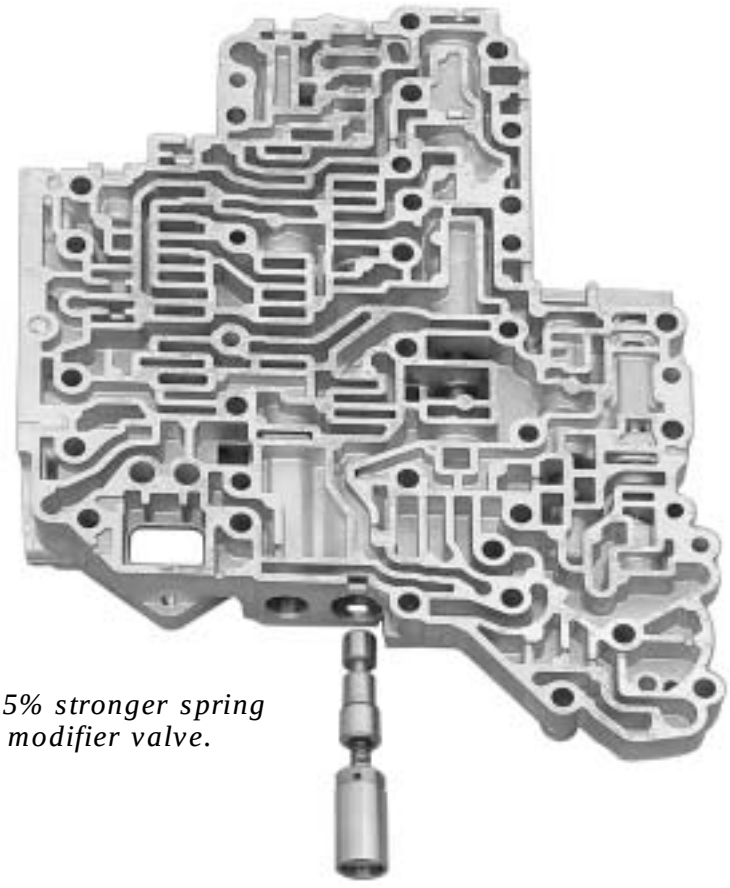
Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

RE4F03A, RE4F04A and 4F20E



Install a 25%–30% stronger spring in the pilot valve.

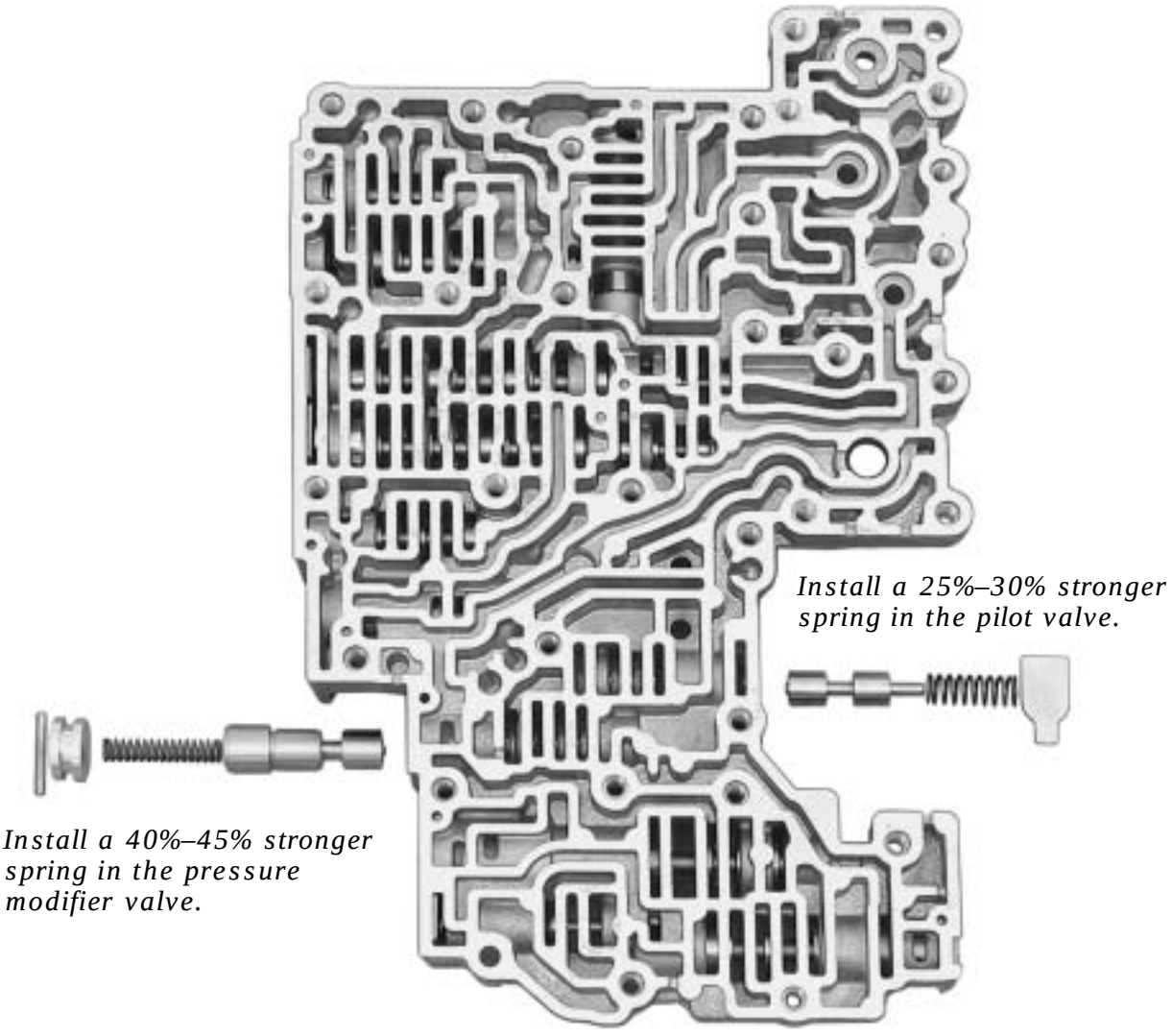


Install a 40%–45% stronger spring in the pressure modifier valve.

Nissan

Soft Shifts, Burnt Clutches and Bands, Poor Line Pressure (continued)

RE4R01A, RE4R03A, R4A-EL, R4AX-EL, JR403E and Subaru 4-Speed

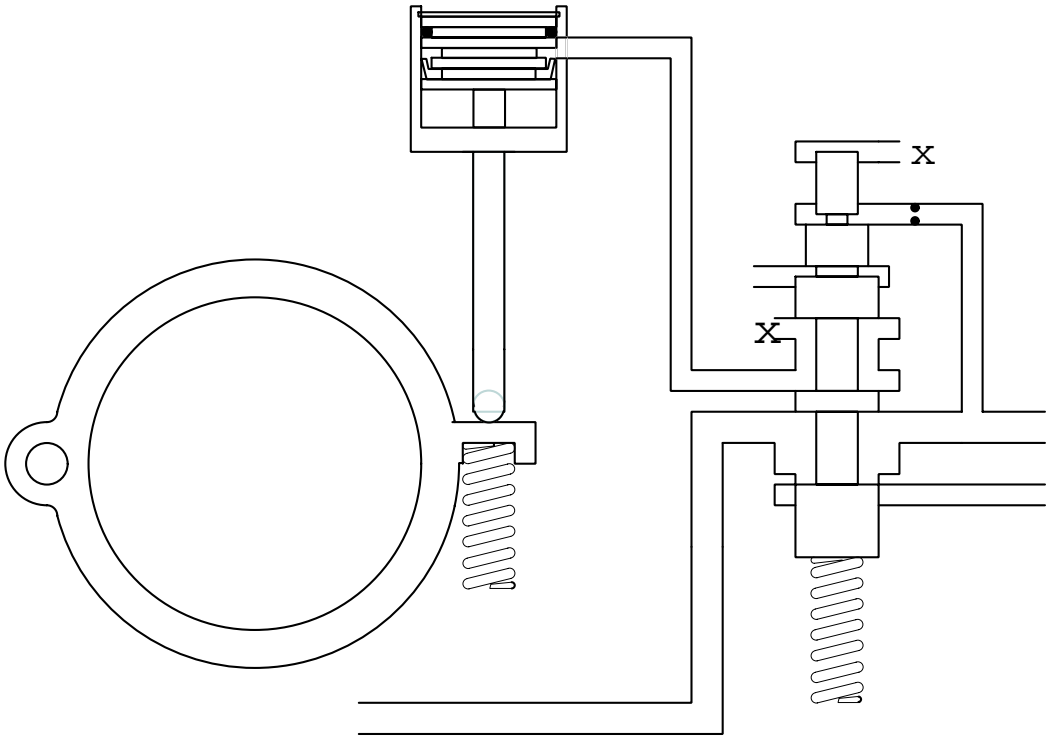


Nissan RE4F02A

Low Pressure at Idle

The RE4F02A has a unique way of controlling the pump slide.

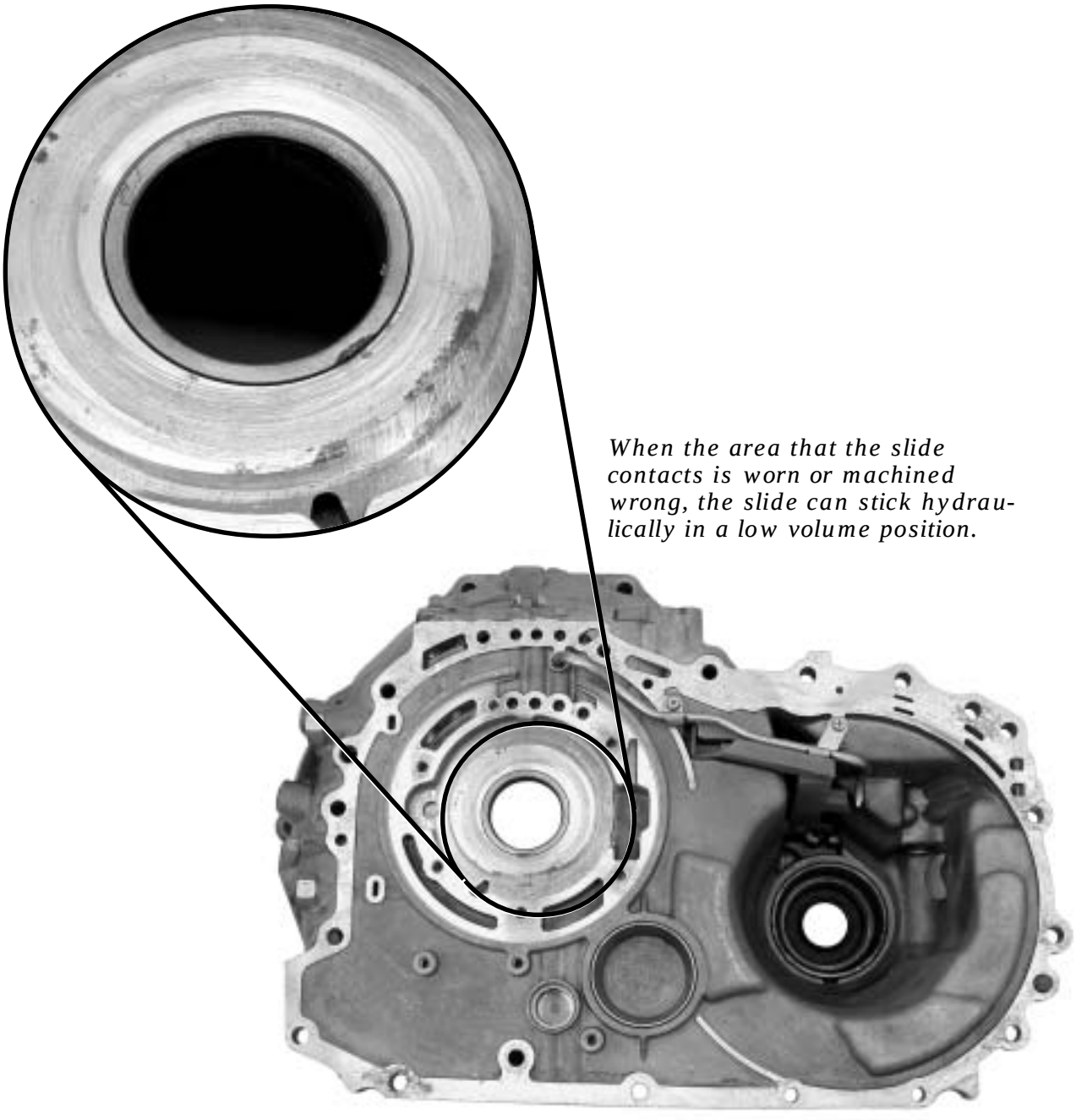
The job of the mainline regulator valve is to control pressure by dumping pump volume when mainline pressure is too high. When the mainline pressure is too high, the valve moves toward the spring and opens a passage that sends the excess oil through the converter relief valve to the converter. If this isn't enough to regulate mainline pressure, the valve moves farther toward the spring, sending pressure to the control cylinder. The control cylinder pushes the pump slide to lower the output volume.



Nissan RE4F02A

Low Pressure at Idle (continued)

The problem occurs when the area where the pump slide contacts the pump is either worn or machined wrong. When this happens, the first time the control cylinder moves the slide, the slide sticks hydraulically in a low volume position. This will cause low line pressure at idle.

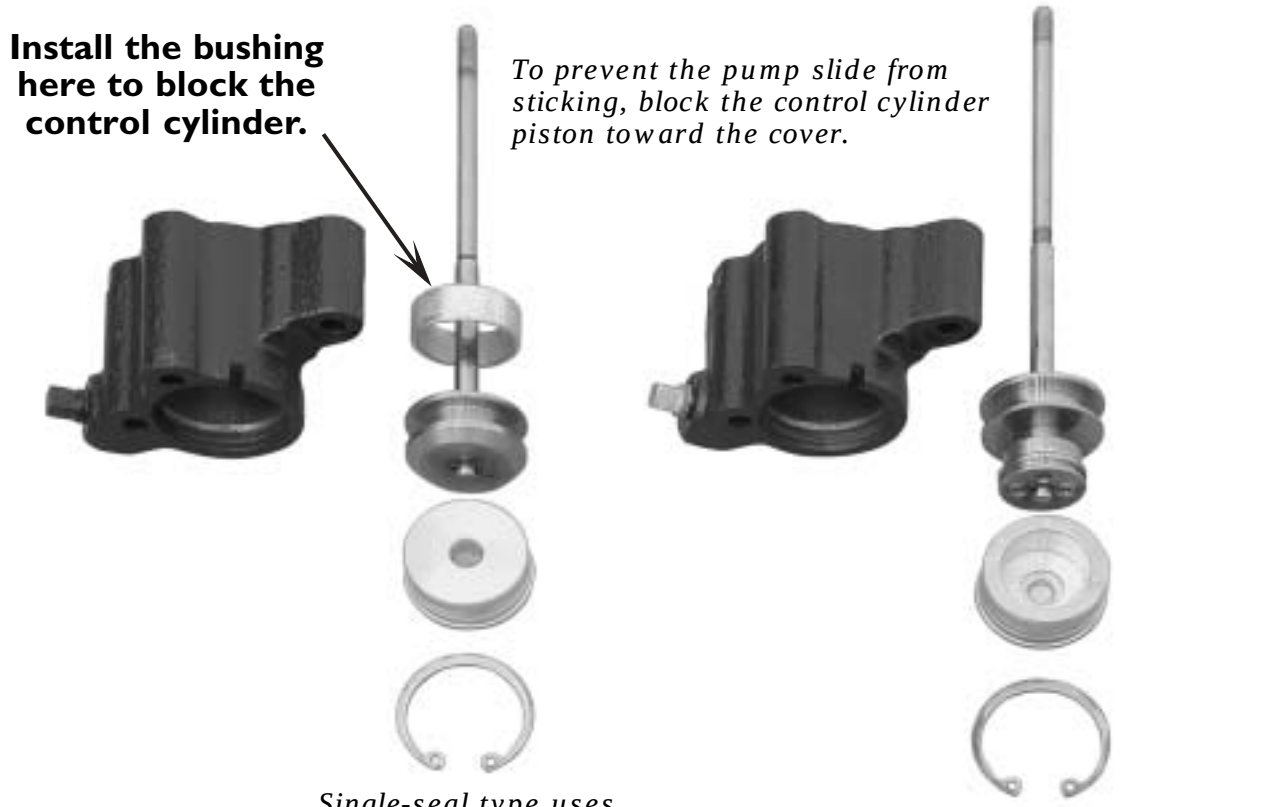


When the area that the slide contacts is worn or machined wrong, the slide can stick hydraulically in a low volume position.

Nissan RE4F02A

Low Pressure at Idle (continued)

To correct or prevent the pump slide from sticking, block the control cylinder piston toward the cover. This will prevent the control cylinder from moving the pump slide. It's okay to do this during every RE4F02A rebuild.



Single-seal type uses a THM 200-4R center support bushing.

Dual-seal type uses a THM 350 sun gear bushing.

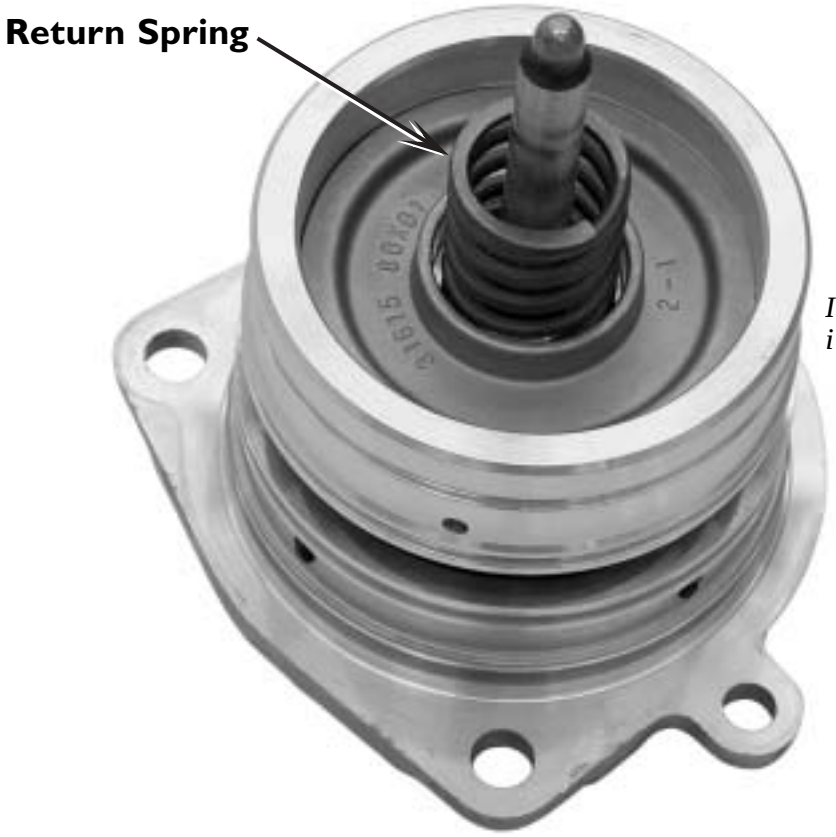
Nissan RE4F04A and 4F20E

Slides Through 2nd Gear, Upshifts 1–3–4

We haven't found a *consistent* fix for these symptoms. Instead, there are a few modifications to cure the problems. You can perform these modifications, one by one, until the problem goes away, or you can perform them all at once.

Step 1: Check mainline, and make sure it's operating properly (covered in the previous section.)

Step 2: Install a lighter spring in the 2–4 servo.

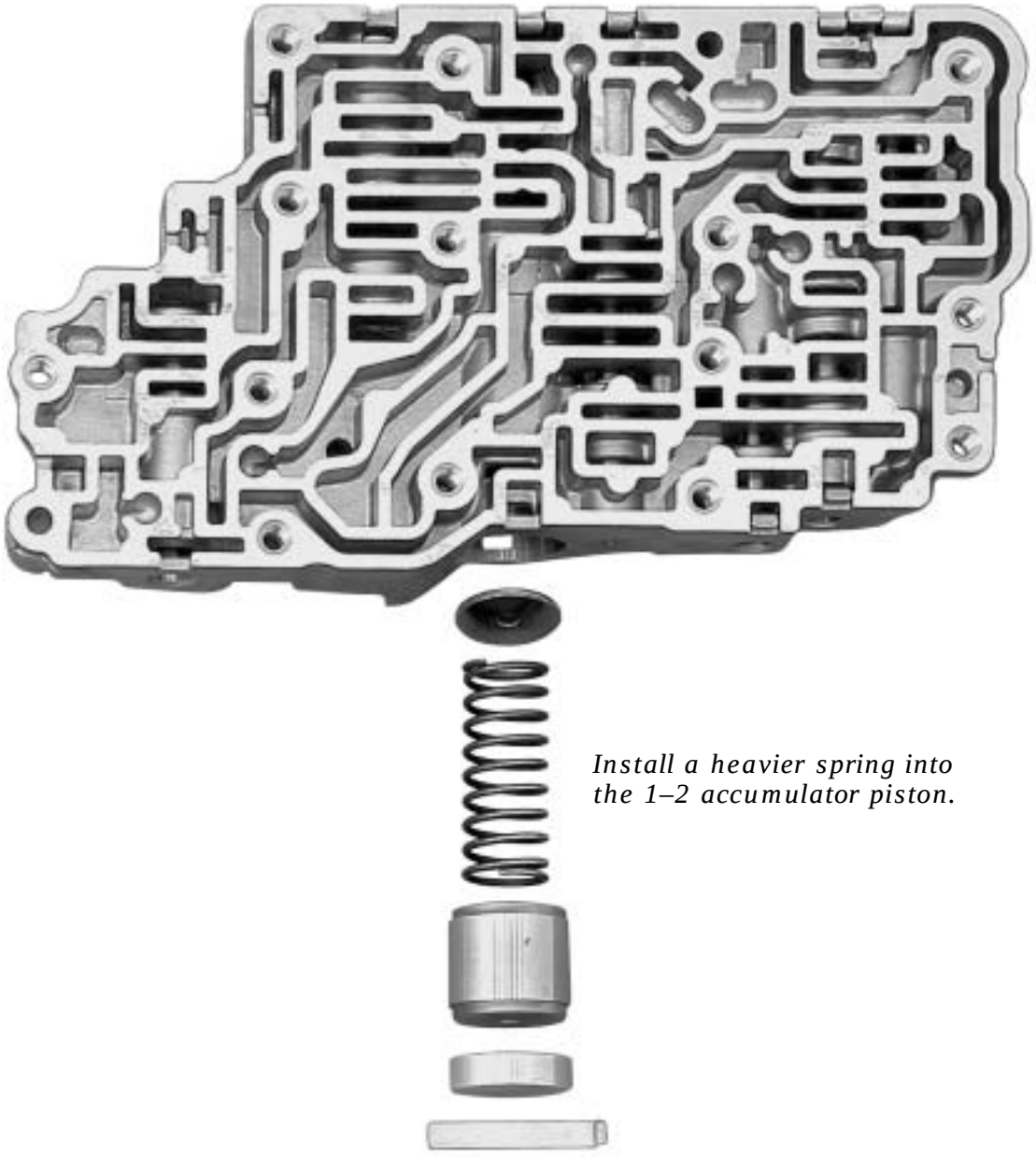


Install a lighter spring in the 2–4 servo

Nissan RE4F04A and 4F20E

Slides Through 2nd Gear, Upshifts 1–3–4 (continued)

Step 3: Install a heavier spring in the 1–2 accumulator *piston*.

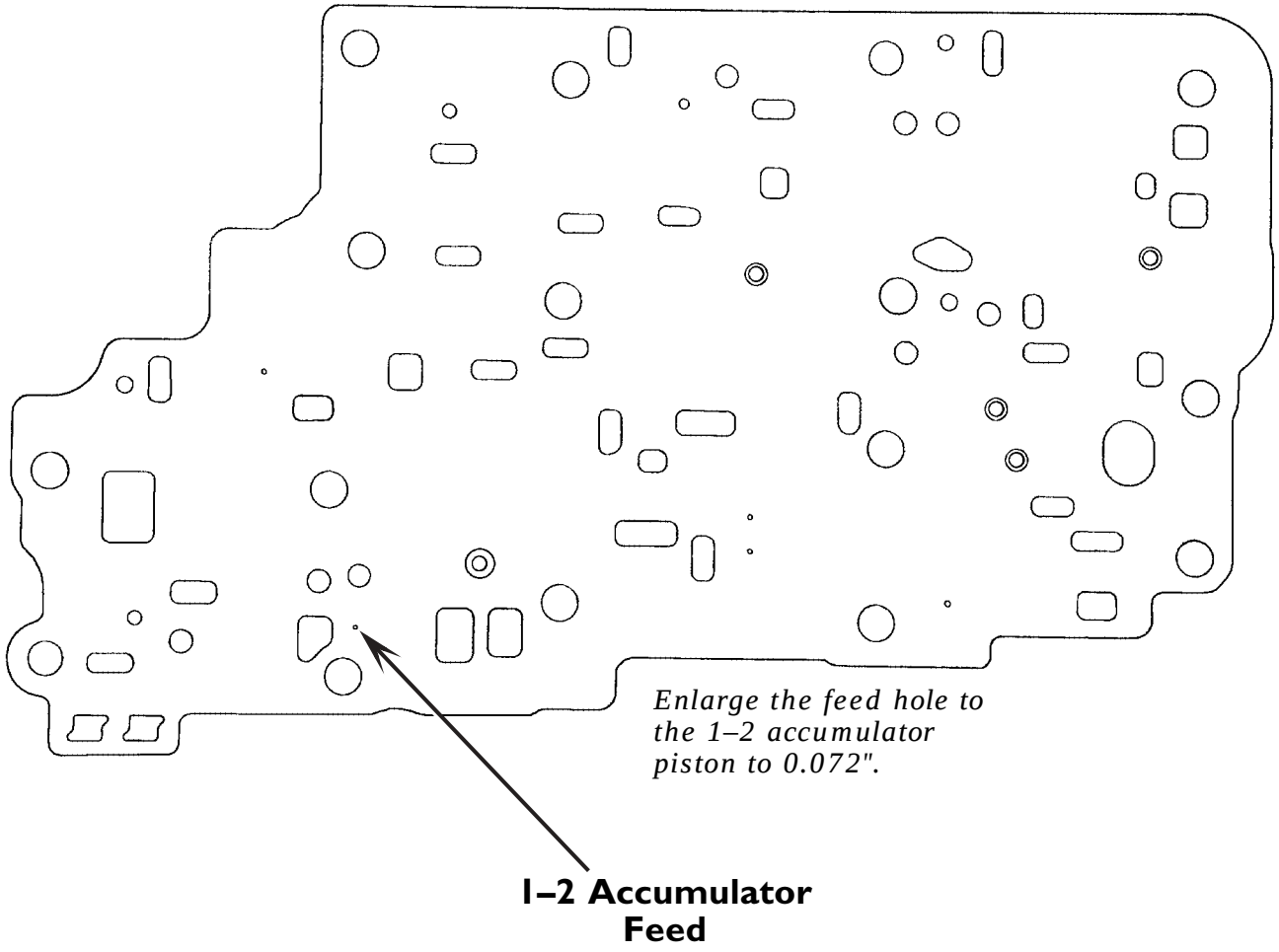


Install a heavier spring into the 1–2 accumulator piston.

Nissan RE4F04A and 4F20E

Slides Through 2nd Gear, Upshifts 1–3–4 (continued)

Step 4: Enlarge the feed hole to the 1–2 accumulator piston to 0.072".



Nissan Trouble Code Diagnosis

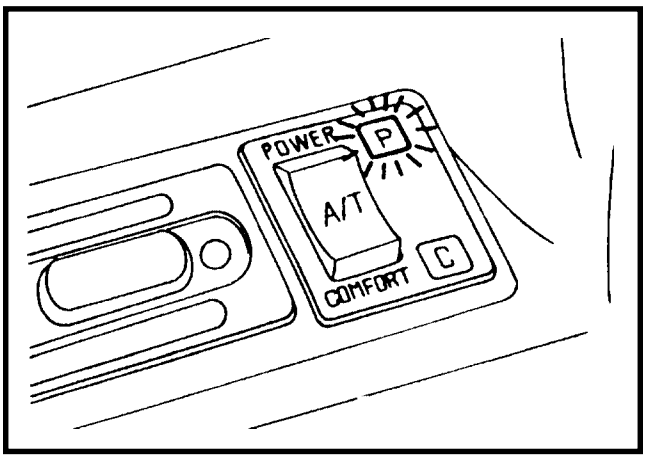
Code Retrieval Procedures

Nissan and Infinity provide diagnostic trouble codes through one of four ways:

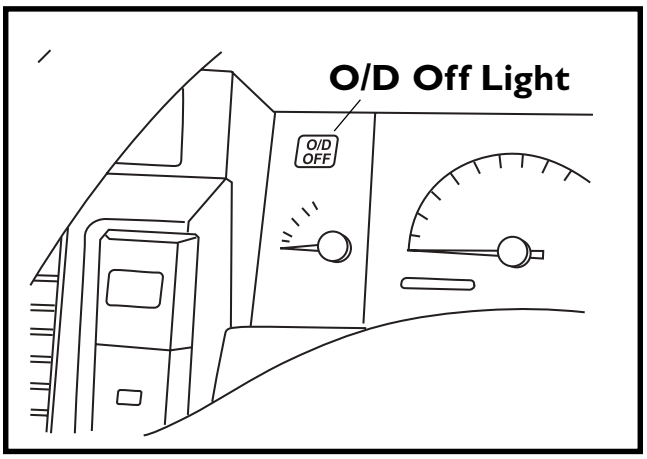
- Power (or Power Shift) Light
- O/D Off Light
- A/T Check Light
- Digital readout at the diagnostic information display

These systems indicate there are codes in memory by flashing the light 16 times every time you start the engine.

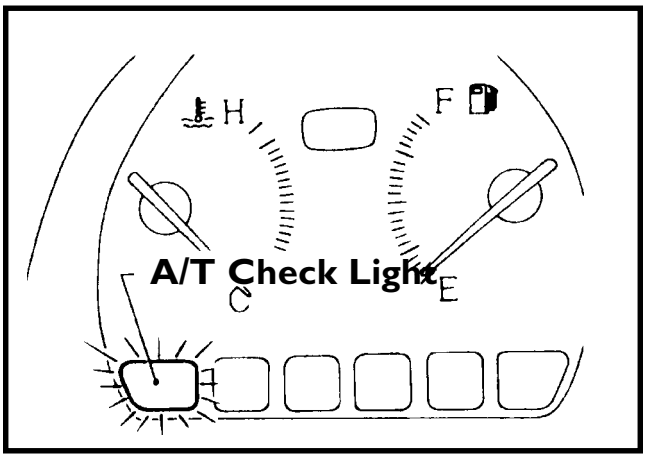
The light used to indicate and display codes depends on the specific vehicle you're working on.



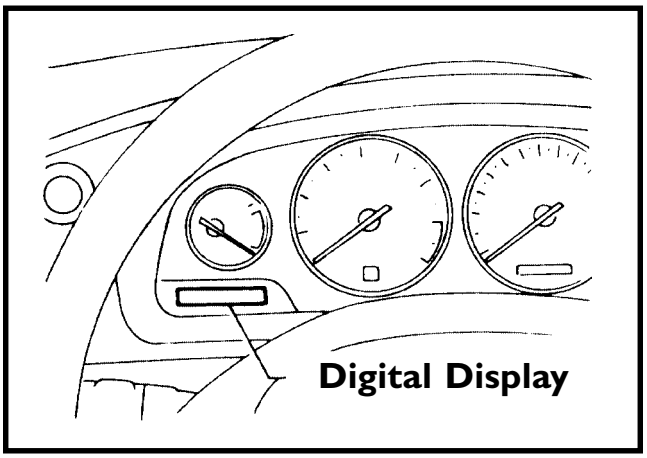
If the vehicle has a Mode switch, it indicates codes through the Power or Power Shift light.



Some Nissans and Infinities display trouble codes through the O/D Off light.



The 300 ZX and J30s display diagnostic trouble codes through the A/T Check light.



Q45s display diagnostic trouble codes through a digital display.

Nissan Trouble Code Diagnosis

Code Retrieval Procedures (continued)

Preliminary Check

To enable Nissans to display any diagnostic trouble codes stored in memory, you have to run through a specific procedure. This puts the system into the mode to display diagnostic trouble codes.

Before you can begin the code procedure, you must first run through a preliminary check, to prepare the vehicle for self-diagnosis, and to make sure the lights are working properly.

Here's how to prepare the system to deliver codes.

Step 1: Bring the engine to normal operating temperature.

Step 2: Turn the key off.

Step 3: Set the parking brake.

Step 4: Turn the key on, engine off.

Now you're ready to check the display light, to make sure it's capable of working. This applies to all vehicles except the Q45.

This procedure depends on what type of light and switches the vehicle uses:

Step 1: Put the switch in the proper position:

- If the vehicle has an O/D Off button, work the button to make sure the O/D Off light comes on. Then work the button again to turn the light off.
- If the vehicle has a Mode button, work the button to make sure the Power or Power Shift light comes on. Then work the button again to turn the light off.

Step 2: Turn the key off, and wait a few seconds.

Step 3: Turn the key on, engine off.

The indicator light on the dash should come on for a few second, then turn off. This is to check the light circuit, to make sure it's capable of indicating codes. If the light doesn't come on now, check the light circuit's operation before continuing the test procedure.

Step 4: Turn the key off.

Step 5: Move the shifter to D.

Step 6: Turn the O/D Off switch off.

Now you're ready to begin the specific procedure to retrieve codes. The procedure depends on which vehicle you're working on.

Nissan Trouble Code Diagnosis

Code Retrieval Procedures (continued)

All, Except J30, Q45 and Quest

Here's how to set the system to display diagnostic trouble codes, on all Nissans and Infinities, except the J30, Q45 and Quest:

Step 1: Turn the key on, engine off, and wait for a few seconds.

Step 2: Move the shifter to 2.

Step 3: Turn the O/D switch on (light off).

Step 4: Move the shifter to 1.

Step 5: Turn the O/D switch off (light on).

Step 6: Press the throttle to the floor and release it.

Step 7: On vehicles that display codes through the O/D Off light, turn the O/D switch on.

After performing this procedure, the computer system will display any diagnostic trouble codes by flashing the appropriate light on the dash.

Quest Only

Here's how to set the system to display diagnostic trouble codes on the Quest:

Step 1: Hold the O/D Off button in, and turn the key on, engine off. Then wait for a few seconds, and release the button; at this point, the O/D Off light should be lit.

Step 2: Move the shifter to 2.

Step 3: Press and release the O/D Off switch; the O/D Off light should go out.

Step 4: Move the shifter to 1.

Step 5: Press and release the O/D Off switch; the O/D Off light should come back on.

Step 6: Press the throttle to the floor and release it.

After performing this procedure, the computer system will display any diagnostic trouble codes by flashing the O/D Off light on the dash.

Nissan Trouble Code Diagnosis

Code Retrieval Procedures (continued)

J30 Only

Here's how to set the system to display diagnostic trouble codes on the J30:

Step 1: Turn the key on, engine off, and wait for a few seconds.

Step 2: Move the shifter to 3.

Step 3: Press the throttle to the floor, then release it.

Step 4: Move the shifter to 2.

Step 5: Press the throttle to the floor, then release it.

Step 4: Move the shifter to the right — this puts the shifter into Manual 1.

Step 5: Press the throttle to the floor, then release it.

After performing this procedure, the computer system will display any diagnostic trouble codes by flashing the A/T Check light on the dash.

Q45 Only

Here's how to set the system to display diagnostic trouble codes on the Q45:

Step 1: Turn the odometer reset counter knob counterclockwise, and hold it there for the next step.

Step 2: Turn the key on, engine off, and then release the odometer reset knob — the odometer display should display "AT CHECK."

Step 3: Move the shifter to 3.

Step 4: Press the throttle to the floor, then release it.

Step 5: Move the shifter to 2.

Step 6: Press the throttle to the floor, then release it.

Step 7: Move the shifter to the right — this puts the shifter into Manual 1.

Step 8: Press the throttle to the floor, then release it.

After performing this procedure, the computer system will display any diagnostic trouble codes on the digital odometer display.

Nissan Trouble Code Diagnosis

Code Retrieval Procedures (continued)

Reading Codes – Most Systems

Nissans and M30 Infinities display diagnostic trouble codes using an 11-flash sequence. The light flashes 11 times in a row; the sequence always starts with a long flash — about two seconds long. It's followed by 10 shorter flashes.

If there are no problems in the system, all ten flashes will be very short — about 0.2 seconds each.

Here's how Nissans and most Infinities indicate no diagnostic trouble codes in memory.

But if the computer identifies a problem in the system, one of those 10 flashes will be longer — nearly a full second long. Count the flashes: The long flash identifies the code in memory.

For example, if the first flash after the two second flash is the long one, you're looking at code 1.

Here's how Nissans and most Infinities display diagnostic trouble code 1.

If the fourth flash is the longer one, you're looking at code 4.

And here's how Nissans and most Infinities display diagnostic trouble code 4.

If there's more than one code in memory, the computer displays all of the codes in the same pass. Here's how a system would display codes 1, 4 and 8 at the same time:

This is how Nissans and some Infinities would display codes 1, 4 and 8 at the same time.

Nissan Trouble Code Diagnosis

Code Retrieval Procedures (continued)

Reading Codes – Most Systems (continued)

After the code displays, the light remains off for about 2 1/2 seconds. If there are no other codes in memory, the computer repeats the code; if there are additional codes stored, the computer displays the next code in the sequence.

If the light flashes on and off, in regular, one-second intervals, it indicates the battery is low or was disconnected long enough to interrupt the computer memory.

If the battery is low, or was disconnected long enough to affect the computer's memory, the light will flash on and off in regular, one-second intervals.

If the light remains on or off, try performing the sequence again: You may have missed one of the steps in the procedure.

If the light still remains off, look for a problem in one of these systems or circuits:

- shift lever position (inhibitor) switch
- 1-range switch
- kickdown switch
- idle switch (closed throttle position switch)
- overdrive switch
- display circuit system
- computer

Nissan Trouble Code Diagnosis

Code Retrieval Procedures (continued)

Reading J30 Codes

Infinity J30s display diagnostic trouble codes using a 13-flash sequence. The light flashes 13 times in a row; the sequence always starts with a long flash — about two seconds long. It's followed by 12 shorter flashes.

If there are no problems in the system, all twelve flashes will be very short — about 0.2 seconds each.

Here's how J30s indicate there are no diagnostic trouble codes in memory.

But if the computer identifies a problem in the system, one of those 12 flashes will be longer — nearly a full second long. Count the flashes: The long flash identifies the code in memory.

For example, if the first flash after the two second flash is the long one, you're looking at code 1.

Here's how J30s display diagnostic trouble code 1.

If the fourth flash is the longer one, you're looking at code 4.

And here's how J30s display diagnostic trouble code 4.

If there's more than one code in memory, the computer displays all of the codes in the same pass. Here's how a system would display codes 1, 4 and 8 at the same time:

This is how the J30 computer would display codes 1, 4 and 8 at the same time.

Nissan Trouble Code Diagnosis

Code Retrieval Procedures (continued)

Reading J30 Codes (continued)

After the code displays, the light remains off for about 2 1/2 seconds. If there are no other codes in memory, the computer repeats the code; if there are additional codes stored, the computer displays the next code in the sequence.

If the light flashes on and off, in regular, one-second intervals, it indicates the battery is low, or was disconnected long enough to affect the computer memory.

If the battery is low, or disconnected long enough to affect the computer memory, the light will flash on and off in regular, one-second intervals.

If the light remains on or off, try performing the sequence again: You may have missed one of the steps in the procedure.

If the light still remains off, look for a problem in one of these systems or circuits:

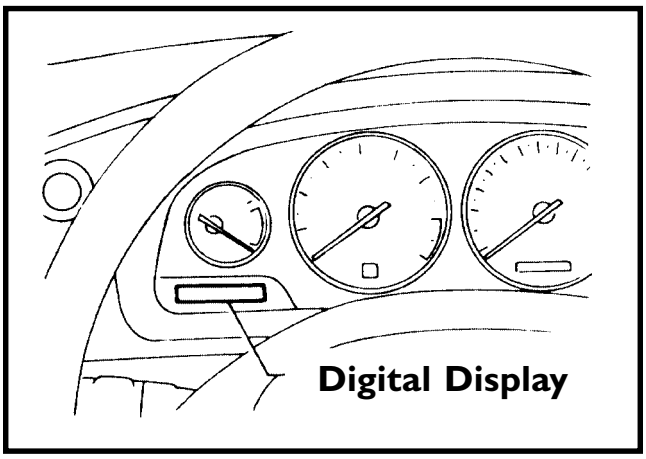
- shift lever position (inhibitor) switch
- 1-range switch
- kickdown switch
- idle switch (closed throttle position switch)
- display circuit system
- computer

Nissan Trouble Code Diagnosis

Code Retrieval Procedures (continued)

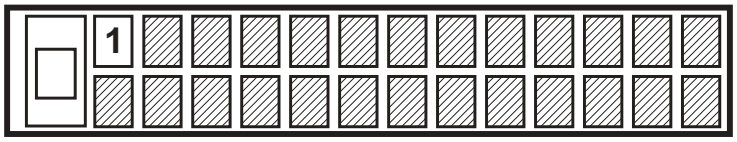
Reading Q45 Codes

The Infinity Q45 indicates diagnostic trouble codes through a digital display. This display doubles as the odometer display. During the diagnostic trouble code retrieval, you have to turn the odometer reset knob counterclockwise; this changes the odometer display to read "AT CHECK."



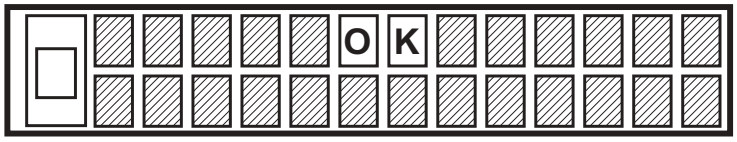
Q45s display diagnostic trouble codes through a digital display.

After you've gone through the diagnostic trouble code retrieval procedure, any codes in memory will display in a hexadecimal format; that is, it will display any codes as a 1 through 10, or as an A through D.



Here's how a Q45 would display diagnostic trouble code 1.

If there are no codes in memory, the odometer will display "OK."



Here's how a Q45 indicates there are no codes in memory.

Nissan Trouble Code Diagnosis

Code Retrieval Procedures (continued)

Diagnostic Trouble Codes

Here is a list of the diagnostic trouble codes that apply to Nissans. Remember, never condemn a component based solely on a code; always check the circuit and component before replacing any parts.

Diagnostic Trouble Codes			
All Except:	J30	Q45	Code Definition
1	1	1	Vehicle Speed Sensor (Revolution Sensor) — Transmission Circuit Open or Shorted
2	2	2	Vehicle Speed Sensor — speedometer circuit Open or Shorted
3	3	3	Throttle Position Sensor Circuit Open or Shorted
4	4	4	Shift Solenoid A Circuit Open or Shorted
5	5	5	Shift Solenoid B Circuit Open or Shorted
6	6	6	Timing Solenoid or Overrun Clutch Solenoid Circuit Open or Shorted
7	7	7	Lockup Solenoid Circuit Open or Shorted
8	8	8	ATF Temperature Sensor circuit is Open, or the Computer Power Source is Insufficient
9	9	9	Engine RPM Signal Circuit Open or Shorted
10	—	—	Line Pressure Solenoid Circuit Open or Shorted
—	10	A	Turbine Shaft Speed Sensor is Open or Shorted
—	11	B	Line Pressure Solenoid Circuit Open or Shorted
—	12	C	Engine Control Circuit between Engine and Transmission Computers is Open or Shorted
Regular Flashing On and Off		D	Battery is Low, or Power was Disconnected Long Enough to Affect Computer Memory
Light Stays Off		AT CHECK	Inhibitor Switch, 1 Range Switch, Kickdown Switch, Idle Switch, Overdrive Switch, Display Circuit System or Computer

Clearing Diagnostic Trouble Codes

Nissan clears any codes in memory automatically after you've repaired the problem, and started the engine twice.

Nissan Trouble Code Diagnosis

Code 1: Revolution Sensor

About the Sensor

The revolution sensor produces an AC signal that increases in voltage and frequency as output shaft speed increases. Typical voltage is about 0.5 VAC at a slow vehicle speed and can go as high as 15–20 VAC in some cases.

The sensor uses two wires, but the connector has three terminal cavities: terminal 3 is the ground wire for a shielded housing.

DIAGNOSTIC TIP While the computer uses the frequency to calculate vehicle speed, it won't recognize the signal if the voltage is below about 0.5 VAC. This is called the *threshold voltage.*

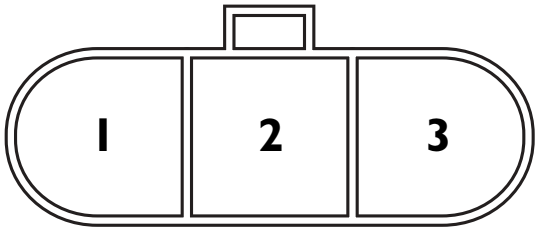
Nissan Trouble Code Diagnosis

Code 1: Revolution Sensor (continued)

Conditions to Set Code

The computer must see a signal from the VSS while receiving no signal from the revolution sensor.

Testing the Revolution Sensor



Shown from the sensor side of the connector.

Pulse Generator Pin ID	
Pin	**Function**
1	Pulse Generator +
2	Pulse Generator –
3	Shield Ground

Resistance Test

The resistance should be between 500 – 600 ohms at normal operating temperature, but checking the resistance of the revolution sensor isn't a complete test. If the resistance is out of range, the sensor is bad. But even if the resistance is within specs, the sensor could still create insufficient voltage or a variation in frequency. That's why you should always check sensor output too.

Revolution Sensor Output Test

With the sensor either connected or disconnected, probe the two wires with your digital meter or scope.

With the drive wheels rotating, the signal voltage should be above 0.5 VAC. The frequency should be zero with the vehicle stopped, and should increase smoothly with vehicle speed.

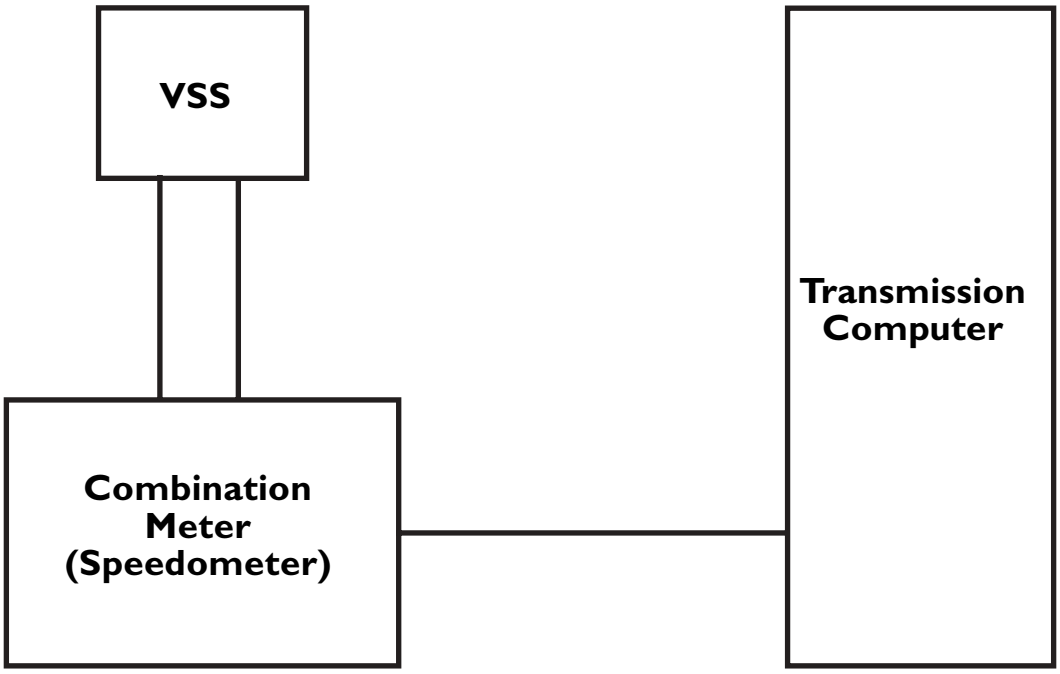
Nissan Trouble Code Diagnosis

Code 2: VSS (Vehicle Speed Sensor)

About the Sensor

The VSS produces an AC signal that increases in voltage and frequency with vehicle speed. Typical voltage is about 0.5 VAC at a slow vehicle speed and can go as high as 15–20 VAC in some cases.

The combination meter (speedometer) uses the AC signal to toggle a 5-volt DC reference, which the computer uses to calculate vehicle speed.



Conditions to Set Code

The computer must see a signal from the revolution sensor and receive no signal from the VSS.

Nissan Trouble Code Diagnosis

Code 2: VSS (continued)

Testing the Vehicle Speed Sensor

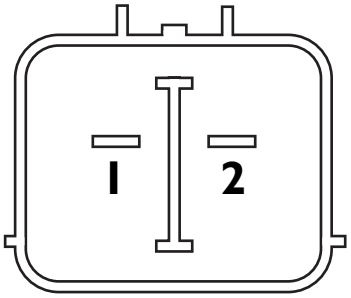
Resistance Test

The resistance should be about 200 ohms at normal operating temperature, but checking the resistance of the VSS isn't a complete test. If the resistance is out of range, the sensor is bad. But even if the resistance is within specs, the sensor could still create insufficient voltage or a variation in frequency. That's why you should always check sensor output too.

Sensor Output Test

With the VSS either connected or disconnected, probe the two wires with your digital meter or scope.

With the drive wheels rotating, the signal voltage should be above 0.5 VAC, and can rise as high as 15–20 VAC. The frequency should be zero with the vehicle stopped, and should increase smoothly with vehicle speed.



VSS connector shown from the sensor side of the connector

Nissan Trouble Code Diagnosis

Code 2: VSS (continued)

Testing the Vehicle Speed Sensor (continued)

VSS Signal to the Computer

While the VSS creates its own AC signal, the computer never actually receives that signal. Instead, the combination meter (speedometer) takes the AC signal, and creates a digital, 5-volt DC signal that varies in frequency; as the vehicle speed increases, the signal frequency increases with it. This is the signal that the TCM receives.

Testing the DC Signal

To check the DC signal at the TCM, you'll need a digital meter that reads DC frequency or an oscilloscope.

- Use the pin charts to find the VSS signal wire at the computer.
- Backprobe the VSS signal wire with your meter or scope's positive lead.
- Connect the negative lead to the computer signal ground.
- Rotate the drive wheels.

The signal from the speedometer should switch from zero to 5 volts. As you increase the wheel speed, the signal speed — or frequency of the pulses — should increase. On a meter, the signal voltage will average out to about 2.5 volts. The frequency of the signal should continue to increase with wheel speed.

If the signal isn't correct, check these three items before condemning the speedometer:

- Make sure the VSS signal to the speedometer is correct.
- Make sure you have a good 5-volt reference signal to the speedometer.
- Make sure you have a good ground to the speedometer.

If these three items check out okay, the speedometer is probably the source of the problem.

Nissan Trouble Code Diagnosis

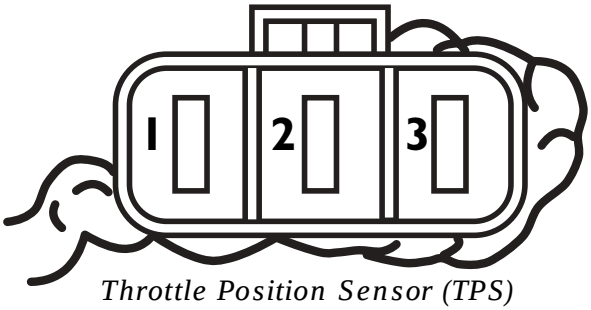
Code 3: TPS (Throttle Position Sensor)

About the Sensor

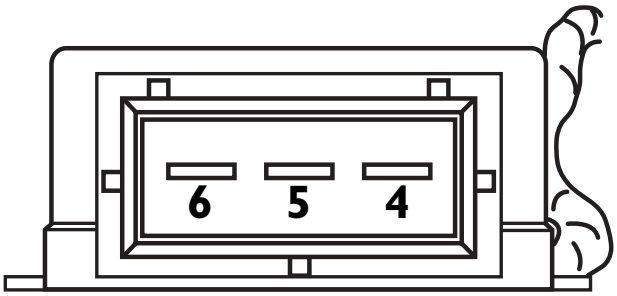
The TPS provides a varying voltage signal to the computer.

Inside the TPS are two additional switches: the idle switch and the full throttle switch. These switches supply the computer with a 12-volt signal, one at idle and the other at full throttle. But failure of the idle /full throttle switches will not set a code #3. The function and connector view is provided to avoid confusion while testing the TPS.

The TPS signal travels through the short harness attached to the side of the TPS; the idle/full throttle signals use the connector molded to the TPS housing.



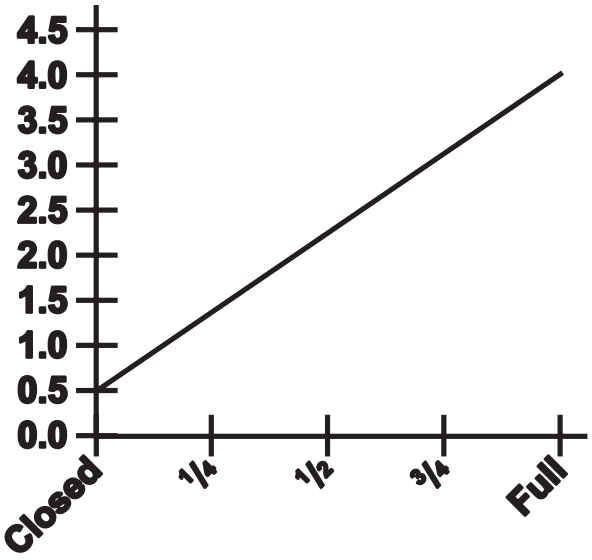
Throttle Position Sensor (TPS) harness connector shown from the switch side of the connector



Idle / Full Throttle Switch harness connector shown from the switch side of the connector

Conditions to Set Code

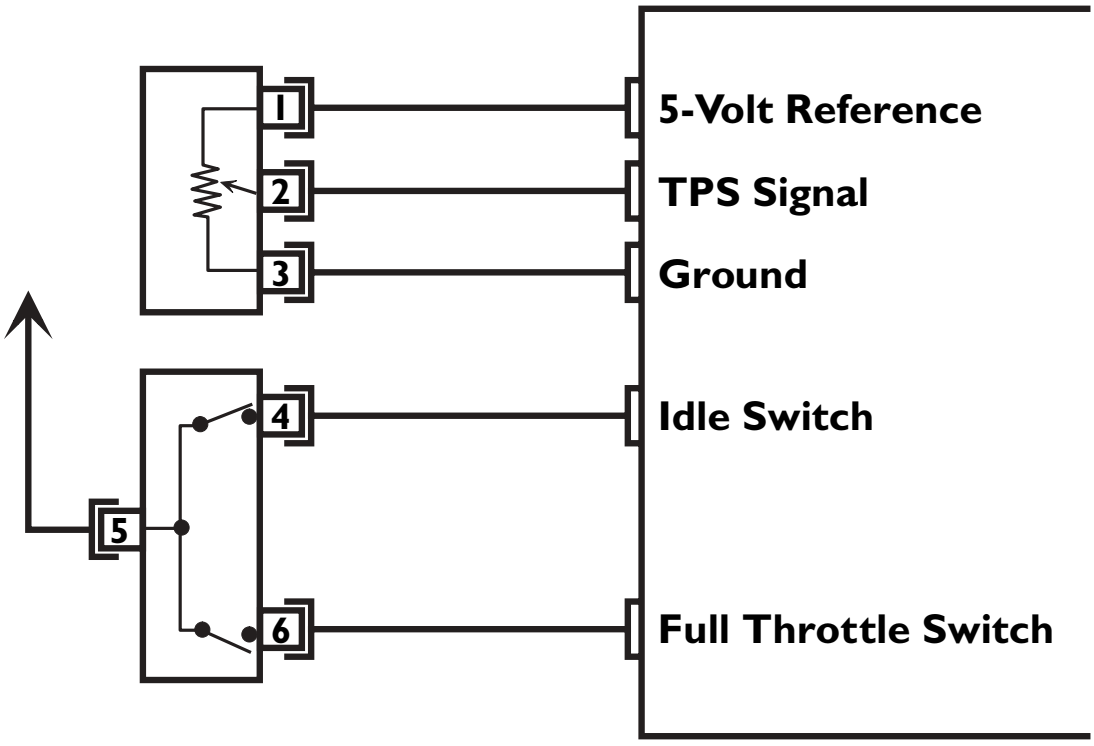
The computer must see a TPS signal below 0.2 volts or above 5 volts.



Nissan Trouble Code Diagnosis

Code 3: TPS (continued)

Testing the TPS



- Backprobe terminal #1 at the sensor.

  Reference voltage should be about 5 VDC. If incorrect most Nissans supply reference voltage to the TPS from the TCM and the ECM. One of the computers should be able to provide the correct voltage. Splice in a new wire from the correct voltage source to the sensor.

- Backprobe terminal #3 at the sensor.

  The ground circuit should have no more than 0.1 V. If incorrect, splice in a wire to the battery (–) terminal.

- Backprobe terminal #2 at the sensor.

  Signal voltage should increase steadily with throttle opening. Any sudden drop-outs or glitches in the signal can indicate a faulty sensor or wire returning to the ECM or TCM.

Nissan Trouble Code Diagnosis

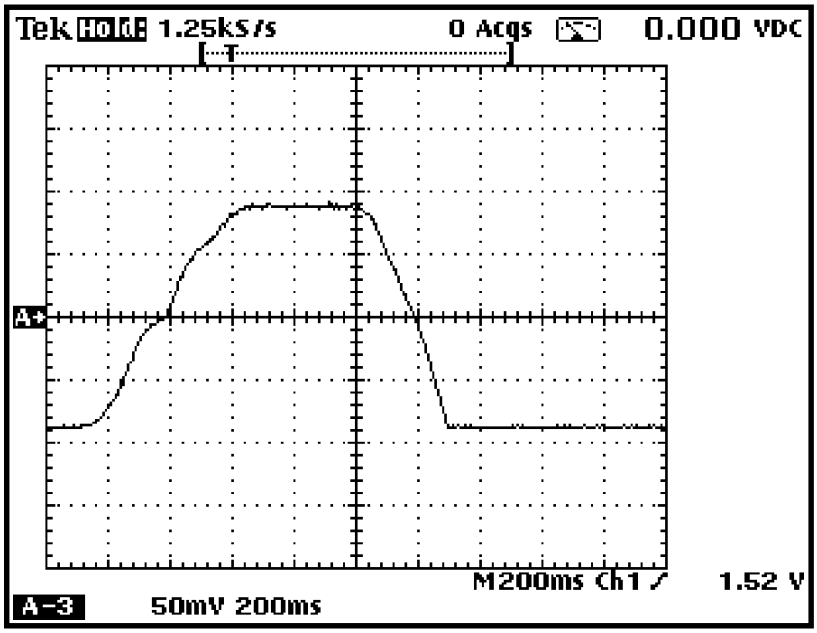
Code 3: TPS (continued)

Testing the TPS at the Computer

Testing the TPS signal return voltage at the TCM is a valid test. Knowing that the return circuit is typically wired to the ECM first, and then is an output to the TCM can shorten diagnostic time.

The circuit pin numbers and locations vary between vehicles at the computers.

Check the signal output from the ECM. If the signal is incorrect, splice in a new wire from the input at the PCM to the input at the TCM.



Nissan Trouble Code Diagnosis Solenoid Codes

About the Solenoids

All but one Nissan transmission use five solenoids: two shift solenoids, an overrun solenoid to control engine braking, a lockup solenoid, and a line pressure control solenoid.The R4AEL in a Mazda 929 uses a 6th solenoid together with a lockup PWM; this is an on-off solenoid.

The chart indicates the code that each solenoid will set, and the specs for testing that solenoid.

Transmission Solenoid Specifications

Solenoid	Normally	Resistance	Current @ 13.0 VDC	Code
A	Open	20–30 Ω	0.43–0.65 amps	4
B	Open	20–30 Ω	0.43–0.65 amps	5
Overrun Clutch	Open	20–30 Ω	0.43–0.65 amps	6
Lockup	Closed (PWM)	2.5–5.0 Ω	Varies with Duty Cycle	7
Line Pressure Control	Closed (PWM)	2.5–5.0 Ω	Varies with Duty Cycle	10
R4AEL Lockup Control	Open	20–30 Ω	0.43–0.65 amps	

Conditions to Set Code

As soon as the ignition turns on, the computer begins monitoring current flow through each of the solenoid circuits. The computer will identify a solenoid problem if the current is either too high or too low.

Solenoid Diagnostic Tips

Solenoid codes are easy to fix as long as you keep in mind that only one or more of the following items can cause a solenoid code to set:

Battery Voltage: Battery voltage directly affects current flow throughout all electrical circuits, including the solenoids. The system must maintain between 12.6 to 15.0 volts at all times.

Insufficient Ground: Make sure the transmission case is well grounded.

Poor Connections and Bad Wiring: Inspect the connectors first. If they're good, consider replacing the wire in question, from the computer to the solenoid.

Nissan Trouble Code Diagnosis

Solenoid Codes (continued)

Solenoid Diagnostic Tips (continued)

Bad Shift Solenoids: Shift solenoids don't go bad electrically that often. But if you suspect a bad solenoid, try connecting some known good solenoids to the harness, outside of the case, before pulling the pan.

Bad Computer: Before replacing the computer, try connecting a solenoid directly to the computer. Try to get as close to the computer connector as possible, cut the wire near the computer connector, and connect it directly to the known good solenoid (refer to pin chart).

Nissan Trouble Code Diagnosis

Code 8: Fluid Temperature Sensor Out of Range

About the Sensor

The fluid temperature sensor is a thermistor; a variable resistor that changes resistance based on temperature. The fluid temperature sensor is a Negative Temperature Coefficient (NTC) thermistor; that is, its resistance decreases as temperature increases.

The computer supplies a 5-volt reference to the sensor. When the sensor is cold, its resistance is high, so the signal voltage will be high. As the temperature increases, the resistance through the sensor to ground decreases, so the voltage also decreases.

Transmission Fluid Temperature Sensor Specifications			
Fluid Temperature		Resistance	Voltage
ºF	ºC		
68	20	2.5 kΩ	1.56 V
176	80	0.3 kΩ	0.45 V

Conditions to Set Code

The computer must read a signal that is out of range (open or shorted signal).

Nissan Trouble Code Diagnosis

Code 8: Fluid Temperature Sensor (continued)

Testing the Fluid Temperature Sensor

The best way to test the fluid temperature sensor operation is to start when the system is cold, and then continue to monitor it as the system warms up. Here's how to check the sensor signal:

- Backprobe the fluid temperature sensor wire with the positive lead from your scope or digital meter.
- Connect the negative lead to a good ground.
- Start the engine, and check the signal. It should be high, depending upon the temperature outside.

Let the vehicle run with your meter connected. If possible, drive the vehicle while monitoring the sensor signal. As the transmission fluid warms up, the sensor signal voltage should continue to drop off smoothly.

When the transmission temperature reaches normal operating temperature, the sensor signal should have dropped below about half a volt.

If the sensor voltage is out of range, make sure you have a good connection to the sensor. If the connections are okay, but the sensor voltage drops off to zero or jumps to 5 volts, the sensor's probably bad.

Nissan Trouble Code Diagnosis

Code 9: Engine Revolution Signal

About the Signal

The engine revolution signal isn't like other signals to the computer. Instead of coming from a dedicated sensor, the engine revolution signal is created by the engine control module (ECM) for the transmission computer. It's based on the signal the ECM receives from the crankshaft sensor.

This is a digital signal that switches from zero to five volts. It varies in frequency based on engine RPM.

Testing the Engine Revolution Signal

Since the engine starts and runs, we have to assume the crankshaft sensor is working properly. Without the reference signal from the crankshaft sensor, the engine won't start.

So with that in mind, you can narrow down the engine revolution signal failure to a few areas:

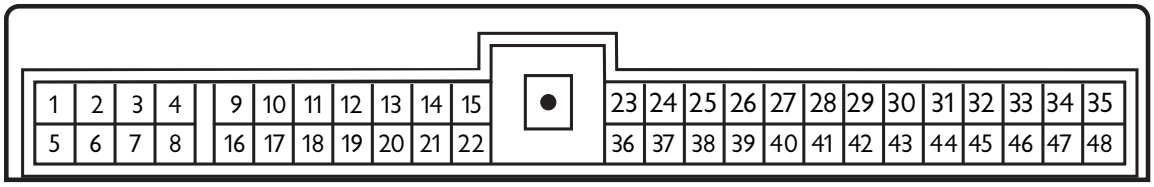
- The ECM isn't developing the proper signal.
- There's an open or short in the wiring between the ECM and the transmission computer.
- The transmission computer isn't acknowledging the signal properly.

Check the signal from the ECM at the transmission computer with the engine running, using a scope or digital meter.

- If you're getting a signal at the transmission computer, the TCM itself is most likely the problem.
- If you don't have a signal at the transmission computer, run a new wire from the ECM to the transmission computer.
- If you still don't get a signal, the problem is most likely in the ECM.

Nissan Computer Pin Charts

All Up to 1998 Except RWD Vans and Wagons



Pin	Function	Conditions	Signal
1	Line Pressure Control Solenoid	Idle	1.5–2.5 VDC
		Full Throttle	<0.5 VDC
2	Line Pressure Control Solenoid w/Drop Resistor	Idle	5–14 VDC
		Full Throttle	<0.5 VDC
3	O/D Off Light Or Power Indicator Light	O/D Off or In Power Mode	<0.5 VDC
		O/D On	B+
4	Ignition	Key Off	0 VDC
		Key On	B+
5	TCC Solenoid	Solenoid Off	<1.0 VDC
		Solenoid On	8–15 VDC
6	Shift Solenoid A	Solenoid Off	<0.5 VDC
		Solenoid On	B+
7	Shift Solenoid B	Solenoid Off	<0.5 VDC
		Solenoid On	B+
8	Overrun Clutch / 3-2 Control Solenoid	Solenoid Off	<0.5 VDC
		Solenoid On	B+
9	Ignition	Key Off	0 VDC
		Key On	B+
13	Inhibitor Switch P/N (Some Models)	In Park or Neutral	<1.0 VDC
		All Other Ranges	5.0 VDC
14	Idle Switch	Idle	B+
		Above Idle	<1.0 VDC
15	Ground	Always	<0.1 VDC
16	Inhibitor Switch 1	In Manual Low	B+
		All Other Ranges	<0.5 VDC
17	Inhibitor Switch 2	In Manual 2	B+
		All Other Ranges	<0.5 VDC
18	Inhibitor Switch D	In Drive	B+
		All Other Ranges	<0.5 VDC
19	Inhibitor Switch P or N	In Neutral or Park	B+
		All Other Ranges	<0.5 VDC

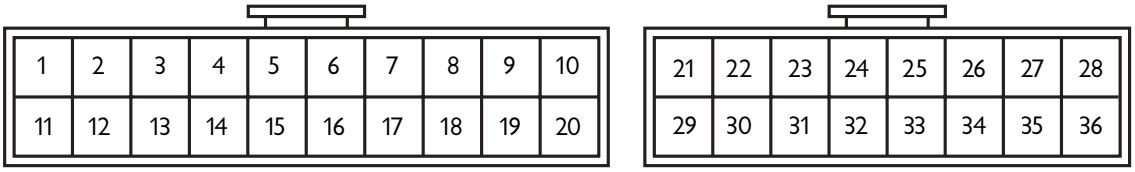
Nissan Computer Pin Charts

All Up to 1998 Except RWD Vans and Wagons (continued)

Pin	Function	Conditions	Signal
20	Inhibitor Switch R	In Reverse	B+
		All Other Ranges	<0.5 VDC
21	Full Throttle Switch	Full Throttle	B+
		All Other Throttle Openings	<0.5 VDC
23	Keep Alive Power	Key On	B+
		Key Off	B+
24	Engine Speed Signal	Engine Running: Voltage Should Rise with Engine RPM	0.6-2.5 VDC
25	Revolution Sensor	Wheels Rotating: Voltage Should Rise with Vehicle Speed	>0.5 VAC
27	Vehicle Speed Sensor	Vehicle Stopped	0 or 5 VDC
		Vehicle Moving	2.5 VDC
31	TPS Reference Voltage	Key Off	0 VDC
		Key On	5 VDC
33	Transmission Fluid Temperature Sensor	ATF @ 68º F (20º C)	1.56 VDC
		ATF @ 176º F (80º C)	0.45 VDC
34	TPS Signal	Idle	0.2–0.6 VDC
		Rises Gradually to Full Throttle	3.0–4.0 VDC
35	TPS Ground	Always	<0.1 VDC
36	A/T Power Switch (Some Models)	Switch in Power Position	B+
		Switch Not in Power Position	<1.0 VDC
37	Cruise Control Signal	ASCD Cruise Being Performed	B+
		ASCD Cruise Not Being Performed	<1.0 VDC
39	O/D Select Switch	O/D Switch On	5–14 VDC
		O/D Switch Off	<0.1 VDC
40	O/D Cut Signal from Cruise Control	ASCD Cruise Released	4.5-5.5 VDC
		ASCD Cruise Applied	<1.0 VDC
42	A/T Comfort Switch (Some Models)	Comfort Position On	B+
		Comfort Position Off	<1.0 VDC
48	Ground	Always	<0.1 VDC

Nissan Computer Pin Charts

All RWD Vans and Wagons Up to 1998



Pin	Function	Conditions	Signal
1	Inhibitor Switch 2	In Manual 2	B+
		All Other Ranges	<0.5 VDC
2	Inhibitor Switch 1	In Manual Low	B+
		All Other Ranges	<0.5 VDC
3	A/T Power Switch (Some Models)	Switch in Power Position	B+
		Switch Not in Power Position	<1.0 VDC
4	Idle Switch	Idle	B+
		Above Idle	<1.0 VDC
6	O/D Cut Signal from Cruise Control	ASCD Cruise Released	4.5–5.5 VDC
		ASCD Cruise Applied	<1.0 VDC
7	Full Throttle Switch	At Full Throttle	B+
		All Other Throttle Openings	<0.5 VDC
8	Cruise Control Signal	ASCD Cruise Being Performed	B+
		ASCD Cruise Not Being Performed	<1.0 VDC
9	O/D Select Switch	O/D Switch On	5–14 VDC
		O/D Switch Off	<0.1 VDC
10	TPS Reference Voltage	Key Off	0 VDC
		Key On	5 VDC
11	TPS Signal	Idle	0.2–0.6 VDC
		Rises Gradually to Full Throttle	3.0–4.0 VDC
12	Transmission Fluid Temperature Sensor	ATF @ 68º F (80º C)	1.56 VDC
		ATF @ 176º F (80º C)	0.45 VDC
15	TPS Ground	Always	<0.1 VDC
16	Revolution Sensor	Wheels Rotating: Voltage Should Rise with Vehicle Speed	>0.5 VAC
17	Full Throttle Switch	At Full Throttle	B+
		All Other Throttle Openings	<0.5 VDC
19	Inhibitor Switch N or P	In Neutral or Park	B+
		All Other Ranges	<0.5 VDC
20	Inhibitor Switch D	In Drive	B+
		All Other Ranges	<0.5 VDC

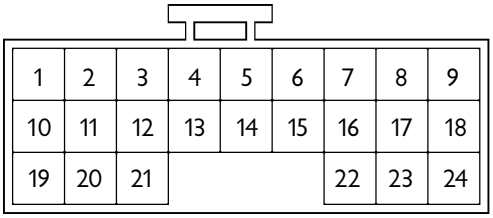
Nissan Computer Pin Charts

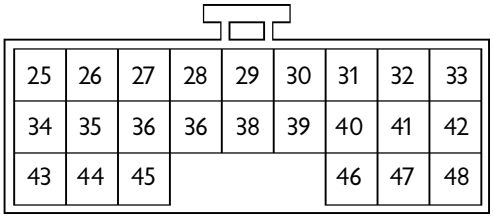
All RWD Vans and Wagons Up to 1998 (continued)

Pin	Function	Conditions	Signal
21	Overrun Clutch / 3-2 Control Solenoid	Solenoid Off	<0.5 VDC
		Solenoid On	B+
22	TCC Solenoid	Solenoid Off	<1.0 VDC
		Solenoid On	8–14 VDC
23	O/D Off Light or Power Indicator Light	O/D Off	<0.5
		O/D On or in Power Mode	B+
24	Vehicle Speed Sensor	Vehicle Stopped	0 or 5 VDC
		Vehicle Moving	2.5 VDC
25	Engine Speed Signal	Engine Running: Voltage Should Rise with Engine RPM	0.6–2.5 VAC
26	Inhibitor Switch R	In Reverse	B+
		All Other Ranges	<0.5 VDC
28	Keep Alive Power	Key On	B+
		Key Off	B+
29	Ignition	Key Off	0 VDC
		Key On	B+
30	Ignition	Key Off	0 VDC
		Key On	B+
31	Ground	Always	<0.1 VDC
32	Ground	Always	<0.1 VDC
33	Line Pressure Control Solenoid w/Drop Resistor	Idle	5–14 VDC
		Full Throttle	<0.5 VDC
34	Line Pressure Control Solenoid	Idle	1–1.5 VDC
		Full Throttle	<0.5 VDC
35	Shift Solenoid A	Solenoid Off	<0.5 VDC
		Solenoid On	B+
36	Shift Solenoid B	Solenoid Off	<0.5 VDC
		Solenoid On	B+

Nissan Computer Pin Charts

1999-On





Pin	Function	Conditions	Signal
1	Line Pressure Control Solenoid	Idle	1.5–2.5 VDC
		Full Throttle	<0.5 VDC
2	Line Pressure Control Solenoid w/Drop Resistor	Idle	5–14 VDC
		Full Throttle	<0.5 VDC
3	TCC Solenoid	Solenoid Off	<1.0 VDC
		Solenoid On	8–14 VDC
10	Ignition	Key Off	0 VDC
		Key On	B+
11	Shift Solenoid A	Solenoid Off	<0.5 VDC
		Solenoid On	B+
12	Shift Solenoid B	Solenoid Off	<0.5 VDC
		Solenoid On	B+
13	O/D Off Light	O/D Off	<0.5 VDC
		O/D On or In Power Mode	B+
16	Idle Switch	Idle	B+
		Above Idle	<1.0 VDC
17	Full Throttle Switch	Full Throttle	B+
		All Other Throttle Openings	<0.5 VDC
18	O/D Cut Signal from Cruise Control	ASCD Cruise is Released	4.5–5.5 VDC
		ASCD Cruise is Applied	<1.0 VDC
19	Ignition	Key Off	0
		Key On	B+
20	Overrun Clutch / 3–2 Sontrol Solenoid	Solenoid Off	<0.5 VDC
		Solenoid On	B+
22	O/D Select Switch	O/D Switch On	5–14 VDC
		O/D Switch Off	< 0.1 VDC
24	O/D Cut Signal from Cruise Control	ASCD Cruise is Released	4.5–5.5 VDC
		ASCD Cruise is Applied	<1.0 VDC
25	Ground	Always	<0.1 VDC

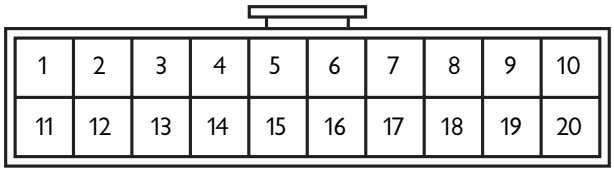
Nissan Computer Pin Charts

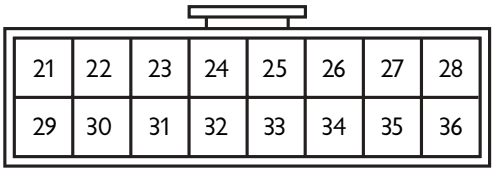
1999-On (continued)

Pin	Function	Conditions	Signal
26	Inhibitor Switch 1	In Manual Low	B+
		All Other Ranges	<0.5 VDC
27	Inhibitor Switch 2	In Manual 2	B+
		All other ranges	<0.5 VDC
28	Keep Alive Power	Key On	B+
		Key Off	B+
29	Revolution Sensor	Wheels Rotating: Frequency Should Rise with Vehicle Speed	>0.5 VAC
30	ECM		
31	ECM		
32	TPS Reference Voltage	Key Off	0 VDC
		Key On	5 VDC
33	ECM		
34	Inhibitor Switch D	In Drive	B+
		All Other Ranges	<0.5 VDC
35	Inhibitor Switch R	In Reverse	B+
		All Other Ranges	<0.5 VDC
36	Inhibitor Switch N or P	In N or P	B+
		All Other Ranges	<0.5 VDC
39	Engine Speed Signal	Engine Running: Frequency Should Rise with Engine RPM	0.6–2.5 VDC
40	VSS	Vehicle Stopped	0 or 5 VDC
		Vehicle at Speed (DC Frequency)	2.5 VDC
41	TPS Signal	Idle	0.2–0.6 VDC
		Rises Gradually to Full Throttle	3.0–4.0 VDC
42	TPS Ground	Always	<0.1 VDC
45	Brake Switch	Brake Pedal Applied	B+
		Brake Pedal Released	0 VDC
47	Transmission Fluid Temperature Sensor	ATF @ 68° F (20° C)	1.56 VDC
		ATF @ 176° F (80° C)	0.45 VDC
48	Ground	Always	<0.1 VDC

Subaru Computer Pin Charts

Early Models





Pin	Function	Conditions	Signal
1	Inhibitor Switch 3	In Manual 3	<0.1 VDC
		All Other Ranges	B+
2	Inhibitor Switch 2	In Manual 2	<0.1 VDC
		All Other Ranges	B+
3	Brake Switch	Brake Pedal Applied	B+
		Brake Pedal Released	<1.0 VDC
4	Idle Switch	Idle	B+
		Above Idle	<1.0 VDC
5	Speed Sensor 2	Drive Wheels Stopped	<0.1 or 5 VDC
		Drive Wheels Rotating	5.0 V Pulses
6	O/D Cut Signal from Cruise Control	ASCD Cruise Released	4.5–5.5 VDC
		ASCD Cruise Applied	< 1.0 VDC
8	Cruise Control Signal	ASCD Cruise Being Performed	B+
		ASCD Cruise Not Being Performed	<1.0 VDC
9	1st Gear Hold Switch	Switch On	5–14 VDC
		Switch Off	< 0.1 VDC
10	FWD Switch	FWD On	<0.1 VDC
		FWD Off	B+
11	TPS Signal	Idle	0.2–0.6 VDC
		Rises Gradually to Full Throttle	3.0–4.0 VDC
12	Transmission Fluid Temperature Sensor	ATF @ 68° F (20° C)	1.56 VDC
		ATF @ 176° F (80° C)	0.45 VDC
13	Manual 2 Indicator Light	In Manual 2	<0.1 VDC
		All Other Ranges	B+
14	Inhibitor Switch Park	In Park	<0.1 VDC
		All Other Ranges	B+
15	TPS Ground	Always	<0.1 VDC
16	Revolution Sensor	Wheels Rotating: Frequency Should Rise with Vehicle Speed	>0.5 VAC
18	Keep Alive Power	Key Off	B+
		Key On	B+

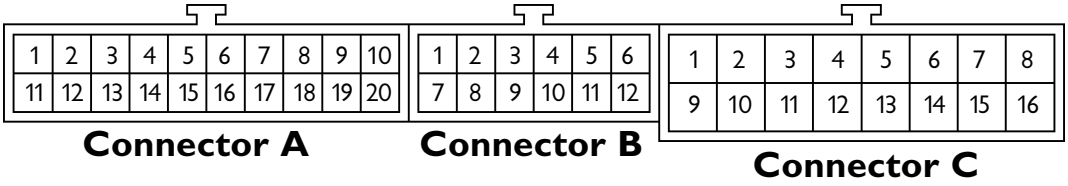
Subaru Computer Pin Charts

Early Models (continued)

Pin	Function	Conditions	Signal
19	Inhibitor Switch N	In Neutral	<0.1 VDC
		All Other Ranges	B+
20	Inhibitor Switch D	In Drive	<0.1 VDC
		All Other Ranges	B+
21	Overrun Clutch / 3–2 Control Solenoid	Solenoid Off	<0.5 VDC
		Solenoid On	B+
22	TCC Solenoid	Solenoid Off	<1.0 VDC
		Solenoid On	8–14 VDC
23	O/D Off Light or Power Indicator Light	Off	<0.5 VDC
		On or in Power Mode	B+
24	Transfer Clutch Solenoid	2WD Mode	<0.1 VDC
		4WD Mode	Varies
25	Engine Speed Signal	Engine Running: Frequency Should Rise with Engine RPM	0.6–2.5 VDC
26	Inhibitor Switch R	In Reverse	<0.1 VDC
		All Other Ranges	B+
28	Oil Temperature Light	Light On	<0.1 VDC
		Light Off	B+
29	Ignition	Key Off	0 VDC
		Key On	B+
30	Ignition	Key Off	0 VDC
		Key On	B+
31	Ground	Always	<0.1 VDC
32	Ground	Always	<0.1 VDC
33	Line Pressure Control Solenoid w/Drop Resistor	Idle	5–14 VDC
		Full Throttle	<0.5 VDC
34	Line Pressure Control Solenoid	Idle	5–14 VDC
		Full Throttle	<0.5 VDC
35	Shift Solenoid A	Solenoid Off	<0.5 VDC
		Solenoid On	B+
36	Shift Solenoid B	Solenoid Off	<0.5 VDC
		Solenoid On	B+

Subaru Computer Pin Charts

Late Models



Pin	Function	Conditions	Signal
A1	Ground	Always	<0.1 VDC
A2	FWD Switch	Fuse Removed	B+
		Fuse Installed	<0.1 VDC
A3	Cruise Control Signal	ASCD Cruise Being Performed	B+
		ASCD Cruise Not Being Performed	<1.0 VDC
A5	ABS Signal	Switch On	<0.1 VDC
		Switch Off	6–10 VDC
A6	Manual Switch	Switch On	<0.1 VDC
		Switch Off	B+
A7	Brake Switch	Brake Pedal Applied	B+
		Brake Pedal Released	<0.5 VDC
A8	Inhibitor Switch N	In Neutral	B+
		All Other Ranges	<0.5 VDC
A9	Inhibitor Switch P	In Park	B+
		All Other Ranges	<0.5 VDC
A10	Inhibitor Switch R	In Reverse	B+
		All Other Ranges	<0.5 VDC
A11	VSS	Vehicle Stopped	0 or 5 VDC
		Vehicle at Speed (DC Frequency)	2.5 VDC
A14	Keep Alive Power	Key On	B+
		Key Off	B+
A16	Idle Switch	Idle	<0.1 VDC
		Off Idle	3–6 VDC
A20	Ground	Always	<0.1 VDC

Subaru Computer Pin Charts

Late Models (continued)

Pin	Function	Conditions	Signal
B1	Inhibitor Switch D	In Drive	B+
		All Other Ranges	<0.5 VDC
B2	Inhibitor Switch 3	In Manual 3	B+
		All Other Ranges	<0.5 VDC
B3	Inhibitor Switch 2	In Manual 2	B+
		All Other Ranges	<0.5 VDC
B4	Inhibitor Switch 1	In Manual 1	B+
		All Other Ranges	<0.5 VDC
B6	Ignition	Key Off	0
		Key On	B+
B7	Ground	Always	<0.1 VDC
B8	TPS Signal	Idle	0.2–0.6 VDC
		Rises Gradually to Full Throttle	3.0–4.0 VDC
B10	Transmission Fluid Temperature Sensor	ATF @ 68° F (20° C)	1.56 VDC
		ATF @ 176° F (80° C)	0.45 VDC
B12	Pulse Generator	Wheels Stopped	0
		Wheel Rotating	0.5 AC
C1	Ignition	Key Off	0
		Key On	B+
C3	FWD Solenoid	FWD Fuse In	B+
		FWD Fuse Out	0.5 VDC
C5	TCC Solenoid	Solenoid Off	<1.0 VDC
		Solenoid On	8–14 VDC
C7	Line Pressure Control Solenoid w/Drop Resistor	Idle	2.5 VDC
		Full Throttle	<0.5 VDC
C8	Line Pressure Control Solenoid	Idle	5–14 VDC
		Full Throttle	<0.5 VDC
C10	Ground	Always	<0.1 VDC
C13	Shift Solenoid B	Solenoid Off	<0.5 VDC
		Solenoid On	B+
C14	Shift Solenoid A	Solenoid Off	<0.5 VDC
		Solenoid On	B+
C15	Overrun Clutch / 3–2 Control Solenoid	Solenoid Off	<0.5 VDC
		Solenoid On	B+