



# TechNews

Summer 2013 | Volume 6 | Issue 1



| **Suspension Struts**

| **Creature Comforts**

| **Power Door Locks**

| **CVTCS**

| **Collision Repair Network**

| **Dealer Listing**



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Caution: Vehicle servicing performed by untrained persons could result in serious injury to those persons or others. Information contained in this publication is intended for use by trained, professional auto repair technicians ONLY. This information is provided to inform these technicians of conditions which may occur in some vehicles or to provide information which could assist them in proper servicing of these vehicles.

Properly trained technicians have the equipment, tools, safety instructions, and know-how to perform repairs correctly and safely. If a condition is described, DO NOT assume that a topic covered in these pages automatically applies to your vehicle or that your vehicle has that condition.

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# | Back to Basics: **Suspension Struts**

Struts are integral to most Nissan suspension designs. Let's explore the basic methods of testing and inspecting their operation on the road and in the bay, and what to tell your customers.



Aftermarket struts are often used in place of Genuine Nissan parts because some people believe they offer equal performance, better availability, and lower cost. The fact is that aftermarket units are reverse-engineered from factory struts. The aftermarket manufacturers focus on fitment, but lack the resources to put in the internal testing hours to produce an identically-performing shock absorber. It is likely that the internals of an aftermarket strut are based on vehicle weight and target dampening, but not on rigorous lab and track testing with original Nissan equipment. Can you imagine an aftermarket strut companies seriously testing their products on every single vehicle they claim to support?

You will find that the cost of Genuine Nissan struts is not prohibitive, and they are well-stocked at most local Nissan dealerships. We'll discuss the importance of choosing the right part for the job, as well as how to test and inspect for different types of strut wear.

## Shocks - Struts – What's the Difference?

Frequently, people refer to shocks and struts interchangeably, but this is not really accurate. It's one of those situations where all struts are shock absorbers, but not all shocks are struts. To be clear, let's compare similarities. Both shocks and struts are functionally for ride quality and safety. When driving over dips or rough terrain, all vehicles' springs will want to expand and con-

tract until they run out of energy. A shock absorber's compression and rebound behavior will slow the spring oscillation down, allowing the vehicle to come to rest faster after a bump. Also, when a shock absorber compresses, it resists the vehicle's downward motion and effectively cushions the cabin. From a safety perspective, properly functioning shocks will keep the tires in constant contact with the road when cornering or on uneven surfaces.

The difference between shocks and struts is the hardware. A strut cannot be removed from the vehicle without affecting the suspension geometry. It is literally part of the structure of the car. If you remove a strut, the body will rest on the wheel. The strut is also part of an assembly where the shock absorbing portion is within a metal housing that also serves as the spring seat. The spring is partially compressed (pre-loaded) and held in place by a top mount that is secured to the top of the shock piston. A firm stopper, often called a "bump stop," is used to protect the shock portion from over-traveling and becoming stressed. The bump stop and piston are protected from road debris with a flexible rubber or plastic boot.

When doing the repair, it's important to use Genuine Nissan parts for accurate fitment, performance specifications, and the highest quality available.

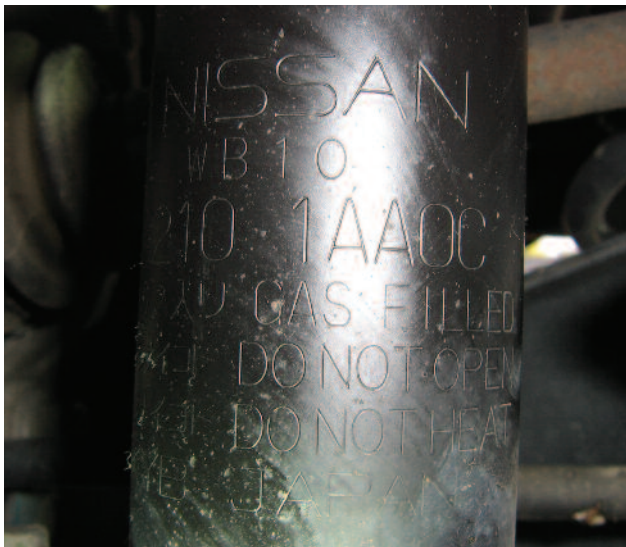
## The Phone Call

More often than not, the customer phone call will begin with, "How much for struts on my Nissan?" Many suspension and alignment shops will recommend replacement struts on nearly every vehicle that arrives. As a Nissan specialist, you need to identify your customers' original concern, and steer them towards the decision that is best for their car. Replacing Genuine Nissan struts with aftermarket replacements at 50,000 miles would be a mistake, but one that happens all too often. There are marketing campaigns out there from major aftermarket strut manufacturers that promote unnecessary "preventive" strut replacement. A Genuine Nissan strut with 50k on it is likely to perform better than a new aftermarket replacement, so judge each vehicle through functional testing.

First, find out whether something caused the customer to head to the tire shop for service, or whether the tire shop suggested strut replacement after an inspection. You can find out quickly if the customer is bothered by a clattering or clunking noise over bumps: common



## Nissan Suspension Struts



**Every Genuine Nissan strut is marked from the factory with the part number and the Nissan logo. Do right by your customer, and install a replacement Genuine Nissan strut to restore ride quality.**

descriptions you'll hear that suggest worn-out strut components. What about a "teeter-totter" feeling when going over a sloped speed bump? Does the stuff in a customer's trunk seem to jump up and crash around? Ask if the car seems like a boat, because many people associate a boat with a soft, wallowing ride. A little time on the phone will get the customer into your shop for the next step of the process.

### The Initial Inspection

If you have the time, a road test with the customer aboard will put the two of you on the same page regarding the problem. At five mph, brake quickly and observe the nose dip, then watch for continued bouncing. During the drive, you should listen for knocking noises in both turning directions, and when the wheel and suspension is traveling over gentle dips or bumps.

Once back from the road test, jounce the customer's Nissan by pressing down with all your weight on one of the bumpers. Observe the rebound behavior of the vehicle. Good quality struts that are not worn out will dip once, rebound, and stabilize after that single bump. You should not be able to easily "rock" the car into a wavy



**A visual inspection might reveal the presence of an aftermarket "spring saver." Do you suspect Nissan has an equivalent part? Not likely. Replace worn out springs as necessary during strut work.**

motion. The more the car moves as though it were on top of bed springs, the more worn out the actual shock absorber components are.

These basic checks can be performed without committing the customer to the repair, and can provide an informed opinion about whether strut performance is degraded. However, it may be necessary to recommend further investigation to evaluate the condition of the other components of the strut assembly, or to pinpoint a noise.

## Further In-Depth Inspection and Road Testing

The strut top mount can wear out. Check if the strut top's bearing is seizing, which you may feel as binding, stiffness, or a "notchy" steering sensation. You may also hear a chirp or similar noise. By design, the strut assembly must rotate with the turning of the suspension, and the strut top bearing allows the strut, spring and seat to rotate without moving the entirety of the metal top mount. If you suspect the noise is coming from the strut, confirm this by feeling the top mount for vibration while a helper turns the steering wheel.

Second, the rubber portion of the strut top mount will weaken, just like a motor mount. When this happens, the top of the strut piston can clatter against the metal of the surrounding mount. Inspect for cracking and tearing near the bearing. It is just as easy to replace the strut top mount during strut reassembly, so pay close attention to the condition of the top mount when determining a strut repair.

When it comes time for repair, use Genuine Nissan parts. Because you wouldn't choose the cheapest, low-quality parts for the customer's Nissan wheel bearings, for example, you also shouldn't choose the lowest quality strut top mount. Aftermarket strut top mounts will often use inferior materials in the rubber that will tear again.

If the vehicle is on a lift, you can inspect the struts for evidence of fluid leaks. Hydraulic fluid within the shock or strut is necessary for generating dampening force. At first, small amounts of seepage may not have any noticeable effect on the ride quality or strut performance. However, when a substantial amount has leaked out, the customer's car will have an uncomfortable ride. For example, if the left strut is firm and working properly, but the right strut has leaked, unequal dampening force occurs. This means the vehicle will rebound at different rates from left to right, creating a "sea sickening boat ride" experience.



**A careful visual examination will tell you a lot, such as how excessive motion has worn a "clean" spot on this strut top, which can be identified from under the hood.**

If the strut boots have torn, dirt and debris can enter the piston area, damaging the seal and causing the strut to leak prematurely. This is no different than steering rack boots that tear, causing premature inner tie rod end failure. When replacing the struts, inspect the condition of the dust boots at the same time. Using a good quality boot from Nissan will guarantee secure fitment and long life. Most aftermarket boot kits are "one size fits all" and will require more labor on your part to get the boot to cooperate with the strut.

Squeeze the boots to find out if the bump stops are broken. A broken stop can be caused by repeated bottoming-out, which is an indicator that the strut or spring is worn out. The bump stop is designed for when the suspension travel is greater than the normal operational range of the strut. This may occur when the customer hits a pothole or other major drop that puts the full weight of the vehicle downwards against the strut piston. A missing or broken bump stop is likely to cause a new replacement strut to fail prematurely.

Struts keep the tires in contact with the road. Imbalanced tires coupled with bad or weak struts can cause erratic tread patterns. Typically, a tread pattern



## Nissan Suspension Struts



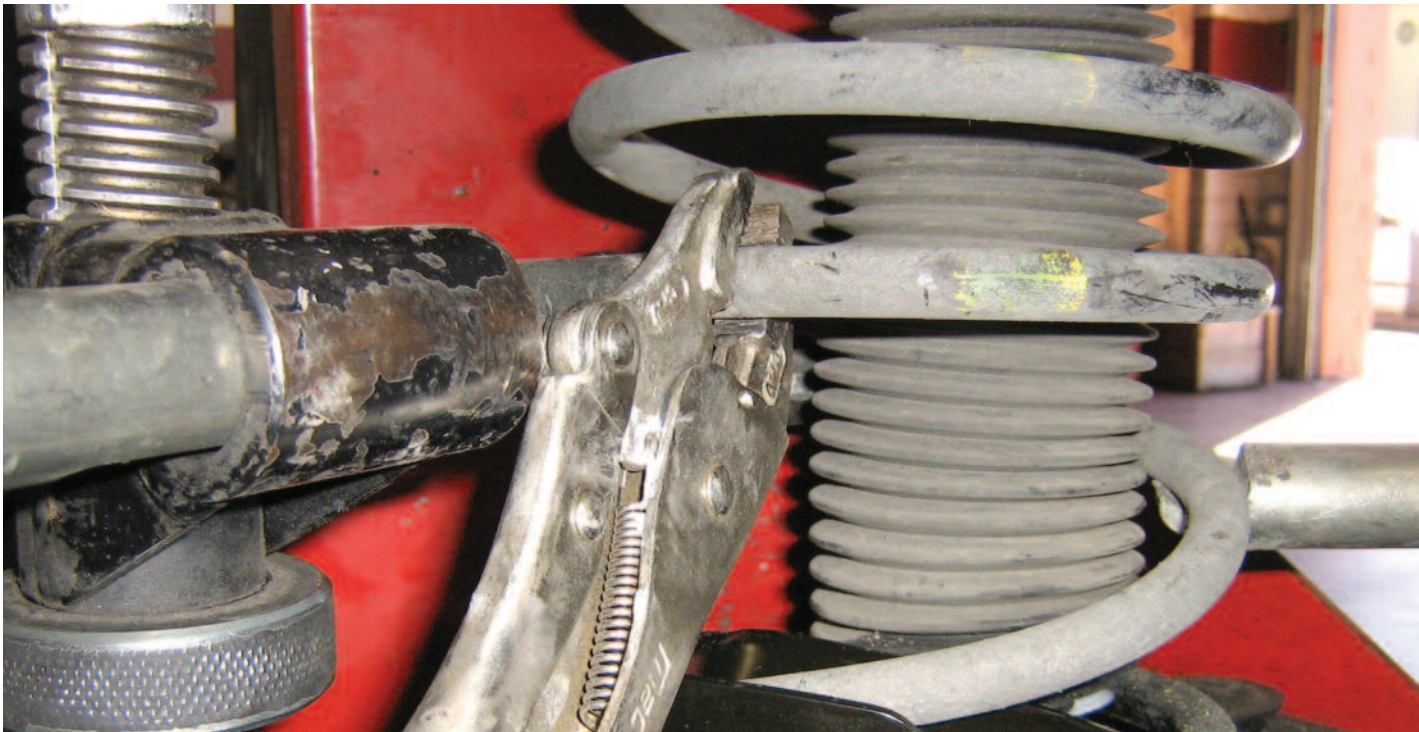
**Avoid having to use zip-ties and other poor methods to secure a replacement boot by getting a Genuine Nissan boot and bump stop.**

called “cupping” will develop, and can be felt by running your palm across the surface of the tire. A cupped tire will have a “hedgehog” looking profile. There are no real safety concerns regarding cupped tires, but they will cause a high degree of road noise and may introduce wander or drift.

### Struts and Alignment Considerations

Because struts are integral to the suspension, they can create adverse alignment issues. On all Nissan vehicles with suspension struts, those struts serve as the structure for the wheels’ camber angle and typically cannot be adjusted. This is another reason to utilize Genuine Nissan struts, as they are perfectly matched to the rest of the suspension geometry, you will not affect the vehicle’s original engineering by installing an aftermarket strut company’s attempt at duplication.

Some technicians may argue that an alignment is unnecessary after strut replacement, but let’s explore why you should recommend one for your Nissan cus-



**A pair of locking pliers can keep the spring from sliding when compressed.**





**On this spring compressing tool, a socket can provide an additional level of safety. It can act as a catch to prevent the winch from unwinding too quickly.**

tomers. The first angle that must be adjusted during a routine alignment is camber, specifically at the rear. If you replace front or rear struts, you will necessarily change the camber, and by changing the camber you will likewise change the toe. Errors or variations can occur when reinstalling the eccentric bolts, even if you attempt to mark the original location. Like many things in the automotive repair industry, it's better to do the job right than to do the job over again.

## Make a Difference for the Customer

There is a typically a dramatic and noticeable change in the ride and handling of vehicles that receive new Genuine Nissan struts. Customers will feel like their cars just came off the showroom floor again! Nothing from the aftermarket can restore that same feeling, despite all the marketing. By the same token, save yourself the hassle and installation headaches by using the correct parts to save time and provide reassurance that the job has been done properly. |



**This Nissan has premature wear from bad camber and weak rebound from an old, bent strut. You can see the shadow of the cupped tread pattern.**

# Creature Comforts



Time-saving techniques for technicians whose customers ask for help with Bluetooth pairing of their phones, GPS map updates, using the on-board screen maintenance reminders, creating special key remote behaviors, and more.





For many car buyers, there is more to consider than the mechanical specifications of the vehicle they're considering. Nissan vehicles can be equipped with many options that make living with the vehicle more comfortable and convenient.

When it comes time for maintenance, customers may ask for "just one more thing" at the service counter. These requests usually involve small tweaks that they believe they themselves can perform, but don't have the time. As a technician, you'll often consider these requests as something to be done as a courtesy. Let's cover some of the most common requests, and outline speedy ways to finish the task without spending more time than necessary.

## The Different Types of Creature Comforts

The optional equipment features of Nissan vehicles usually fall into two categories:

- Features that must be configured by the user in order to operate at all. Examples of this type include: Bluetooth phone pairing, and seat or steering wheel position memory recall. Without configuration, the feature will do nothing.
- Features that work "out of the box" when a vehicle is delivered to the customer, but may allow for special behaviors, or require periodic updates. This category includes GPS map file updates, keyless entry remote behaviors, and specialized maintenance reminders.

Don't be too quick to dismiss customers' requests for help in setting up the optional features mentioned in the first category above. When you think about it from your customers' perspective, they assume your shop is working on Nissan all the time and the setup would be quick and simple for you. Therefore, it would be easier for them to ask for your expert help than to read the owner's manual and try to figure it all out. These features are designed to be completed by the customer. Nevertheless, it gives your shop a professional appearance without really requiring much additional energy to be expended.

## "I just got a new phone, but it won't connect."

Bluetooth pairing of phones with the Nissan standard hands-free navigation unit can sometimes

be frustrating. The reason is not because of Nissan's design, but rather the fact that each phone may be different. All Nissan vehicles that have Bluetooth capabilities will include details on the exact pairing process in the owner's manual. This section should help you understand the basics of pairing, as well as shed light on common problems seen in the field. Bluetooth devices create limited-range "Personal Area Networks" that use a similar method of secure connectivity to that of a coffee shop's WiFi. The Bluetooth icon is actually a Viking rune word for a medieval Norse king, Harald Bluetooth, who unified Scandinavian tribes against the Danish. In modern times, the idea behind Bluetooth is to unify wireless communications among various types of small devices with a single standard.

The most common failure encountered in adding a new phone is when a customer has multiple phones associated with his or her Nissan. This is usually when there are two or more drivers, each with their own phone. Multiple phones may also be found when a previous phone was saved, but the customer has since replaced it with a new model. Properly set up, Nissan vehicles should be able to accommodate up to five different phones. Yet, complications still can develop. If the customer is having a pairing problem, first check the Nissan navigation unit to determine how many phones are currently paired. You should reference the owner's manual at this point, because the process can be different on a model-year basis. For example, the 2006 Murano will retain information about paired phones on the multi-function display (MFD), but the 2012 Rogue requires voice-command inputs to view/add/remove phones. Delete inactive phones and reattempt pairing. In some cases, it may be necessary to delete all saved phones, then begin the pairing process anew.

Other complications may come from the phone itself. Because the customer is not likely to carry around the phone's owner's manual, it helps to know the basics of how Bluetooth works so that you know what to look for. First, not all phones have their Bluetooth transmitters enabled by default. Confirm that Bluetooth is turned on by navigating the phone's menu or screens until you find a dedicated "Bluetooth" section, or the general "Settings" section. You can also ask your customers because they may know their phone, but not their Nissan. With Bluetooth enabled, you must make the phone "discoverable." If the phone is discoverable,



With many phones, check the **SETTINGS** menu for **BLUETOOTH** and then set the phone to discoverable mode.



The easiest navigation update location for **DVD-ROM**.

then any other Bluetooth device can initialize connection. Refer back to the vehicle's Bluetooth controls in the owner's manual. You should now be able to find the phone's Bluetooth Identifier displayed or spoken through the vehicle. At this point, the final step is to give the phone the passcode of the vehicle that ensures a secure connection.

According to most Nissan owner's manuals, the code is "1234." Note that none of the above can be done with the vehicle moving. Some phones are simply not supported. Additional reference material is available online from Nissan at: [www.nissanusa.com/bluetooth/](http://www.nissanusa.com/bluetooth/).

### **"Can you turn off (or on) the beep when I use my remote?"**

By default, the Intelligent Key system will flash the hazard lights and sound the horn when the customer locks or unlocks the vehicle. If the customer doesn't want to make noise when getting home at night, he or she may request that you turn the horn function off. This is a very simple adjustment. Using the Intelligent Key, press the LOCK and UNLOCK buttons simultaneously on the remote for more than two seconds. The same procedure will reverse the behavior. When turning off the horn, the hazard lights will flash three times to indicate the change. When turning the horn back on, the hazard lights will flash and the horn chirps once. You may also be able to add value to your services by taking note of the keyless entry behavior. The customer may be wondering why the horn stopped chirping, but might think the change will be expensive to diagnose and repair. Let him or her know it's an easy fix. Remember, it's the little things that keep customers coming back.

### **"My Nissan's GPS maps need to be updated."**

GPS navigation is very important to many customers. Nissan navigation systems are true GPSs that use satellite positioning, and an offline map database. This has its advantages over other GPSs found on smart phones. Nissan Navigation will work without internet or cellular data connectivity unlike the smart phones. This means that the vehicle can be off the beaten path and still provide useful map information even when the customer cannot call for directions. Additionally, dedicated GPS navigation displayed on the dash does not require



**This matrix shows what's necessary to update Nissan navigation systems.**

MODEL	2003	2004	2005	2006	2007	2008	2009	2010	2011
350Z / 370Z Coupe	A	A	A	A	A	A	B	C	C
350Z / 370Z Roadster		A	A	A	A	A	A	C	C
Altima			A	A	A	A	A	C	C
Armada		A	A	A	A	B	B	B	B
Cube									D
GT-R							B	B	C
Juke									D
Maxima	A	A	A	A	A	A	B	C	C
Murano	A	A	A	A	A		B	B	C
Pathfinder			A	A	A	B	B	B	B
Quest		A	A	A	A	A	A		C
Rogue									D
Sentra								D	D
Titan		A	A	A	A	A	A	A	A
Versa								D	D

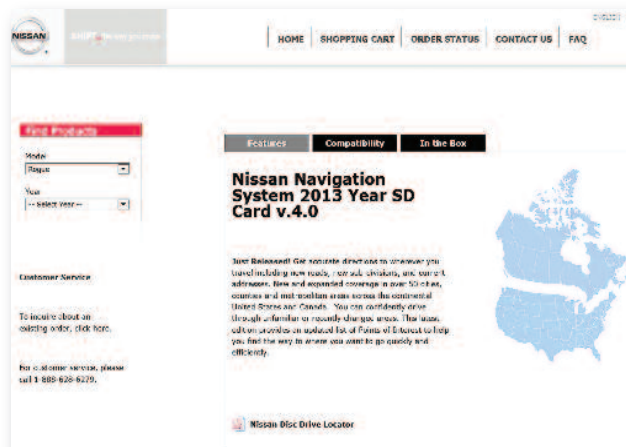
### Map Data Update Method

<b>A</b>	<b>DVD</b> – Customer is mailed update disc(s) and can install data; disc(s) left in drive. Refer to NTB05-076.
<b>B</b>	<b>HDD</b> – Dealership is mailed update disc(s); customer visits dealership to have data installed. Refer to NTB08-106.
<b>C*</b>	<b>HDD - DVD</b> – Customer is mailed update disc(s) and can install data; disc(s) <u>not</u> left in drive.
<b>D*</b>	<b>SD Card</b> – Customer is mailed update SD Card and can install data via port in vehicle.

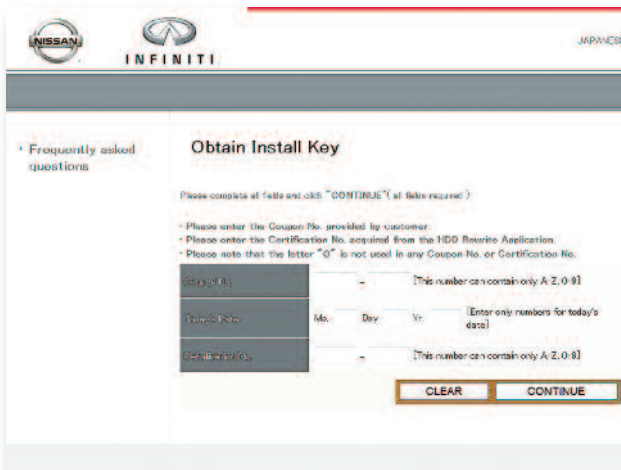
\*Check [www.nissannavigation.com](http://www.nissannavigation.com) for availability.

the driver to look down at his or her cell phone while driving, potentially taking eyes off the road, and a hand off the wheel. However, on-board GPSs do not benefit from constant online connection, which means that map data may become obsolete.

Nissan releases yearly map updates every fall for vehicles equipped with GPS navigation. In most cases, the updating process is as simple as changing a DVDROM or SD card. Nevertheless, customers may still seek help in locating the DVD drive or card port inside their vehicles, or they may prefer that your shop handle the entire procurement and installation process. On some vehicles, it is even necessary to use the CONSULT scan tool to install map updates. Starting in 2002, early versions of the Nissan navigation system use a CD-ROM or DVD-ROM for map data. For updating, the new disc is installed in the drive and left in place.



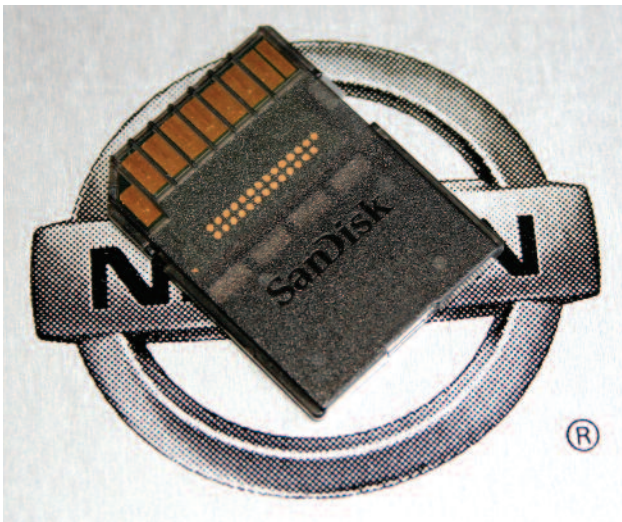
**This website will allow you or your customer to purchase any necessary CD, DVD, SD card, or activation coupon for GPS map updates.**



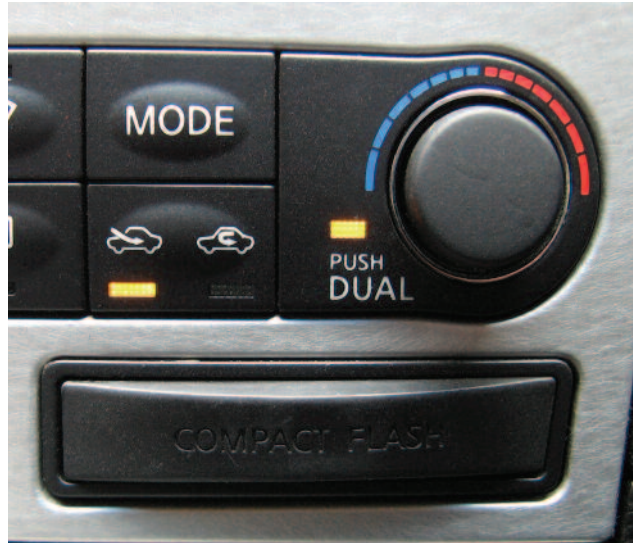
The screenshot shows a web form titled "Obtain Install Key" with the Nissan and Infiniti logos at the top. It includes instructions for users to enter a Coupon No., Certification No., and a date. There are input fields for these details and "CLEAR" and "CONTINUE" buttons at the bottom.

**Be sure to gather all the necessary information to fill out this form.**

In MY 2008, the HDD (Hard-Disc Drive) system appeared in certain models. This amounts to permanent storage for map updates as well as recorded music through the Music Box system. To update the map data, a Nav update DVD set is mailed to dealers. Technicians install the map data on the CONSULT. The customer then must visit the dealership, where a tech will use a procedure involving the CONSULT and the navigational reprogram adapter kit for installation, for which a fee is typically charged. Bulletins NTB08-106 explains the situation in detail.



**Small and fast, the SD card is a great way to store data.**



**Vehicles equipped with the HDD will have a compact flash port somewhere on the dash that looks like this. It cannot be opened with the vehicle on.**

Starting in MY 2010 for 350Z/370Z, Altima, and Maxima models, the system becomes HDD-DVD. This advance allows customers to order and install update discs themselves, which are then removed from the drive.

For entry-level Nissans MY 2010 and up, updates are on Secure Digital (SD) cards, which look like very small floppy disks. The SD card slot is located on the face of the navigation unit under the tip-up cover. The cards are fully programmed; simply swapping them out is all that's necessary. Recently, Nissan has established a very useful resource website for all things navigation at [www.nissannavigation.com](http://www.nissannavigation.com). You will be able to find a quick-reference sheet for the types of update media necessary for various vehicle models, the location of the data drives (look for the Adobe pdf icon and "Nissan Disc Drive Locator" -- drives may be in the trunk, under the center console or passenger seat, etc.), as well as an ordering system for purchasing the disc or activation code.

### Keeping Your Customers Happy

There are many little things that hold value for customers, and it's up to your shop to be able to accommodate their wishes. Taking the extra time to perform courtesy customizations will reinforce the professionalism of your shop and keep Nissan customers loyal. |





## Genuine Nissan Parts. Just a Click Away.



Ordering OE parts is just a click away with the Nissan eSTORE. Genuine Nissan OE replacement parts always deliver model-specific engineering, perfect fit and like-new performance. And now, with our new Wholesale Accounts portal it's even easier to order.

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**When you are unsure how to fix it, call the Nissan Installer Repair Hotline powered by Identifix: 1.855.828.4018**

## Ordering Made Easy

- A** Order by Make, Model, Year, or VIN, or Part Type.
- B** Quick Order if you know the Part Numbers or VIN.
- C** See recently searched vehicles.
- D** Check order status.

## Confirm Parts Selection. Fast.

- Parts diagrams and VIN-verified part numbers for every vehicle system and sub-system.
- Current parts availability shown.

## New Streamlined Check Out Process

Ordered Items	Price	Core	Qty	Total
Replacement Catalog - 2006 - Nissan - Sentra	\$48.57	\$0.00	1	\$48.57
Part Number: 216503102				
RAID ASSURANCE				
Replacement Catalog - 2006 - Nissan - Sentra	\$66.92	\$0.00	1	\$66.92
Part Number: 216452309				
PISTON/LOW & REVERSE BRAKE				
Replacement Catalog - 2006 - Nissan - Sentra	\$29.58	\$0.00	1	\$29.58
Part Number: 216503102				
NETTING ASSY/PISTON/LOW & REVERSE BRAKE				
<b>Sub Total:</b>				<b>\$145.07</b>
<b>Shipping:</b>				<b>14.51</b>
<b>Tax:</b>				<b>0.00</b>
<b>Total:</b>				<b>\$159.58</b>

- Your pricing and discounts are readily visible.
- Purchase and delivery preferences are always saved for your next order.
- Make payments or set up billing quickly and easily.



# Nissan Continuous Valve Timing Control Systems

**Before Continuous Valve Timing Systems, engineers had to make a choice – optimize valve timing for a smooth efficient idle; optimize for top end power; or, most often, compromise somewhere in the middle, losing some efficiency on both ends.**

The Continuous Valve Timing System (CVTCS) helps engines breathe easy, regardless of rpm and load. It's one of the many ways Nissan engineers are still squeezing additional performance from four-cycle internal combustion engines, a design that has been continuously improved upon for over 140 years.

When speaking about camshaft design, there are three primary variables: valve timing, duration, and lift. Valve tim-

ing, simply put, is when a valve begins to open. Duration is how long a valve stays open, and Lift is how much a valve opens. Duration and lift are affected only by the shape of the cam lobe in most engine designs. Timing is affected by the synchronization of the camshaft and crankshaft. In other words, the rotational position of the cam in relation to that of the crank.

The crankshaft and camshaft are typically connected to



each other using a timing chain or cogged belt so their positional relationship is always maintained. The camshaft sprockets are twice the size of the crankshaft sprocket, so they turn at half the crankshaft's speed. The camshaft will spin 360 degrees (one revolution) for every 720 degrees (two revolutions) the crankshaft spins. Therefore, each valve will open only once during two crankshaft rotations.

The crankshaft's role is to convert the reciprocating (up and down) motion of the pistons traveling in the cylinders to rotational (circular) motion that eventually will be used to power the wheels and move the car down the road. In a four-stroke engine, the piston is not performing the same function on every run up and down the cylinder.

Typically, the four-stroke cycle is described as starting with the intake stroke, but when speaking about valve timing, it's much easier to start with the power stroke. The reason is that valve overlap, a key event we'll discuss in detail later, is moved to the center of the cycle. Let's review the four-stroke cycle:

### **Combustion/Power Stroke**

0-180 degrees crankshaft rotation – the burning and rapid expansion of air and fuel pushes the piston from TDC to BDC.

0-90 degrees camshaft rotation – the camshaft lobes are facing away from the lifter and the valve springs hold the valves closed; the combustion chamber is sealed.

### **Exhaust Stroke**

180-360 degrees crankshaft rotation – the piston travels front BDC to TDC.

90-180 degrees camshaft rotation – the exhaust valve is opened, allowing the spent charge to escape from the combustion chamber.

### **Intake Stroke**

360-540 degrees crankshaft rotation – the piston travels from TDC to BDC.

180-270 degrees camshaft rotation – the intake valve opens, allowing a fresh charge of air and fuel to fill the cylinder.

### **Compression Stroke**

540-720 degrees crankshaft rotation – the piston travels from BDC to TDC.

270-360 degrees camshaft rotation – the valves are closed and the air/fuel mixture is compressed.

Some of you may be thinking the camshaft timing doesn't sound quite right, and you are correct. The valves do not open and close exactly at TDC and BDC. The exhaust opens a little before BDC on the compression stroke, and closes a little after TDC on the exhaust stroke. The intake opens a little before TDC on the exhaust stroke and closes

a little after TDC on the compression stroke.

Inertia is the reason engines are not designed with the valve timing square with the piston movement. Once in motion, even light stuff like gasses and vapors tend to stay in motion. Good valve timing design seeks to "go with the flow." Here's the tricky part: the weight and velocity of the flow will change with rpm and throttle opening, as will the event time available within a cycle.

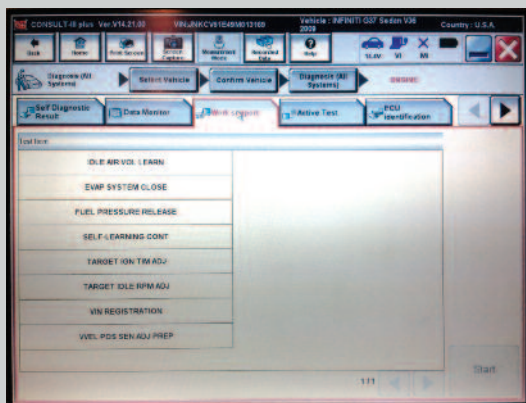
Valve overlap is the period when both the intake and exhaust valves are open at the same time. Valve overlap should be tailored to accommodate the velocity and weight of the intake and exhaust charges. If an engine is spinning at 700 rpm, the intake stroke will last about .021 seconds. If an engine is spinning at 7,000 rpm, the intake stroke will last about .0085 seconds, less than half as long. The volume of air that can flow through the valves is fixed, so to add more charge, the valve must be opened for a longer time. Therefore, the intake valve should open earlier for efficient cylinder filling at higher rpm.

But if the intake valve is opened earlier, won't the piston still be coming up and cause flow in the wrong direction? Yes, the piston is still coming up. However, due to the inertia of charge, the piston's push-back will not halt the momentum of the flow and the earlier valve opening will result in a larger charge and better efficiency. The optimal valve timing for an engine idling at 700 rpm will be very different from that for the same engine screaming down the freeway at WOT and 7,000 rpm.

CVTCS changes the relationship between the cam sprocket and the camshaft. To advance the cam timing, the sprocket rotates the camshaft in the same direction as the cam is turning. To retard the cam timing, the sprocket rotates the camshaft in the opposite the direction.

CVTCS most often uses hydraulic control to operate the sprocket, although some engines use an electromagnetic retarder on the exhaust cam. Before an engine is started, there is no oil pressure available. Therefore, all hydraulically actuated cam sprockets use a spring activated locking pin to hold the cam in the fully retarded position when there is no oil pressure. This can be useful to remember when diagnosing CVTCS systems. Oil pressure is necessary to advance the cam timing. If there is no oil pressure, the intake camshaft will not advance.

Hydraulically-actuated sprockets use vanes and oil chambers to control the cam timing. The outer portion of the sprocket has chambers. The inner portion of the sprocket has vanes with wipers sealing it to the outer sprocket's chambers. The inner portion of the sprocket will rotate as oil pressure is applied on one side of the vane and is released on the other.



### Magnet retarder advance must be learned if the ECM is replaced.

Most engines employ CVTCS on the intake cam only. Changing intake valve timing has the most benefit for efficiency -- the biggest bang for the buck. However, some newer engines such as the VK50VE, VQ35HR, and VQ35DE, also have variable exhaust valve timing. It's important to note that the exhaust valve timing control must be learned, so if the ECM is replaced or the magnet retarder is disconnected, check the service manual for the procedure. Using the CONSULT, there is a simple "wizard" style interface in the Work Support section.

The IVT (Intake Valve Control) solenoid controls the application of pressure to the chambers in the sprocket. The solenoid valve is duty-cycle controlled by the ECM. By varying the duty-cycle and thus the position of the IVT solenoid spool valve, the timing can be advanced or retarded by applying and releasing pressure on opposite sides of the vane, or locked in place by centering the solenoid valve with approximately a 50% duty-cycle and blocking off the inlet and outlet ports.

The crankshaft position is monitored by the CKP (Crankshaft Position) sensor, also referred to as POS. The camshaft is monitored by the CMP (Camshaft Position) sensor, also referred to as PHASE. Both sensors are typically magnetic Hall Effect type, and generate a square wave as reluctor teeth spinning with the cam and crank pass the sensor. The CKP sensor indicates crank speed with pulses at regular intervals, and position with an irregular pulse at TDC. The CMP sensor indicates camshaft position using a unique pattern to identify each cylinder's valve events. It's important to note that the PHASE is based on actual cam position after timing modification, not sprocket position. Information from the CKP and CMP is reported to the ECM, creating a feedback loop. The ECM adjusts, checks position, and adjusts again, thus: Continuous Valve Timing Control System.

In order to determine the most appropriate intake valve timing, the ECM will typically monitor the following inputs:

- Engine Speed
- Throttle position
- Coolant and/or oil temperature
- Vehicle Speed

That about covers the basics of how CVTCS works, now let's take a look at why it can stop working.

The Number One cause of CVTCS failure is lack of oil maintenance. Low oil, oil contamination, oil degradation – almost all CVTCS failures are related to motor oil, or lack thereof. Obviously, if the oil pump is spewing compressible oil foam instead of liquid oil, hydraulic control

cannot function, so oil level is very important. The IVT control valves have very little clearance and it doesn't take much debris or grit to cause them to bind. Even severely degraded motor oil can cause sticking.

### P0011 and P0021 Codes

Luckily, most Nissan vehicles with CVTCS have both circuit and rational self-tests to aid in diagnosis. P0011 and P0021 are codes based on rational testing. The CKP and CMP sensor output is compared to the IVT solenoid command. Based on the comparison, the ECM determines whether or not the CVTCS is working, and can set a P0011 if BANK 1 performance is poor or a P0021 if BANK 2 performance is poor.

Start by looking at things through the ECM's eyes: the data list. Take a look at what the ECM is commanding and seeing. The INT/V TIM B1 & B2 PIDs indicate the calculated camshaft phase angle based on the CKP and CMP sensors. The INT/V SOL % is an indication of the IVT solenoid duty-cycle. You may or may not be able to find a cam angle request PID, but you can get an idea of what's happening by comparing the CA° with the SOL%. Sadly, the SOL% will not be exactly 50% when holding, but you should find that it rests at a fixed number when the cam angle is not changing. If the INT/V SOL % is less than this angle, it's a retarding command, if more, it's an advancing command.

### P0075 and P0081 IVT Solenoid Circuit Fault Codes.

The ECM monitors voltage on the IVT solenoid control wire, then using the known resistance of the IVT solenoid, engages Ohm's Law to infer circuit amperage while operating the solenoid. The most common cause of these codes is unplugged connectors, so start by looking up locations (if necessary) and visually inspecting. If there are no obviously disconnected components, there



are numerous ways to test the circuit, including the easy tests outlined in the service manual. However, checking circuit voltage and amperage with an oscilloscope will yield the most information in the quickest possible way. Note: If the ECM is not commanding the solenoid, be sure to clear the codes and check solenoid resistance before jumping to any conclusions. The ECM may stop attempting to command a solenoid when there is a known problem. Overload the driver once, shame on the solenoid. Overload the driver twice, shame on the ECU.

## CVTCS-Related Problems

We've now covered what CVTCS does, the theory behind it, the electrical, hydraulic, and mechanical components involved with CVTCS and their functions, and a bit of the self-diagnostic logic that monitors the system function. Now let's take a look at a few CVTCS-related problems that might roll through your shop's door:

### The idle is smooth, but power over 3,500 rpm is poor

This is the most common symptom when the cam timing is fixed in the retarded position. Valve overlap is minimal, which is great for a smooth idle, but awful for higher rpm output. There could be a problem with the IVT solenoid winding or wiring, coupled with a MIL and P0075 or P0081 (IVT solenoid codes). Or, there could be a mechanical problem with the IVT solenoid or the camshaft sprocket coupled with a P0011 or P0012.

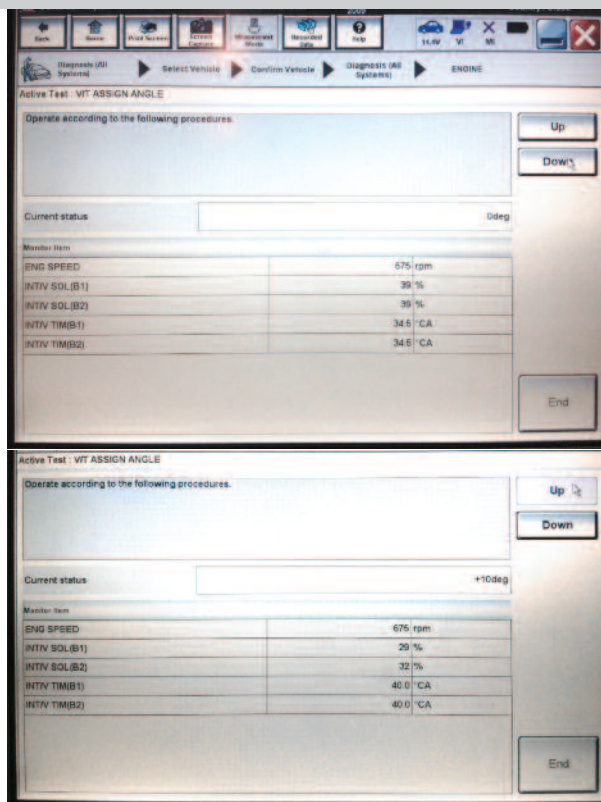
### The idle is rough but the engine runs great at higher rpm

As you might have guessed, the cam timing may be advanced all the time. Valve overlap is too high at idle and there is not much inertia to the slow-moving intake and exhaust charges to keep things flowing in the right direction while both valves are open. Poor cylinder filling and charge dilution prevent efficient combustion at idle. You might find P0011 or P0012 codes, or misfire codes.

### Misfire codes on cylinders 1, 3, and 5 (BANK 1)

There are only so many things that will affect all of the cylinders on one bank but not the other, and most of them are pretty exotic. Poorly cast aftermarket exhaust manifolds (it happens!), an unusual vacuum leak, maybe wiring for an injector rail. However, before looking to the exotic causes, check the basics.

In this case, cam timing would be Suspect #1. Remember that on vehicles with CVTCS, the timing marks may line up, even though the actual intake cam timing is

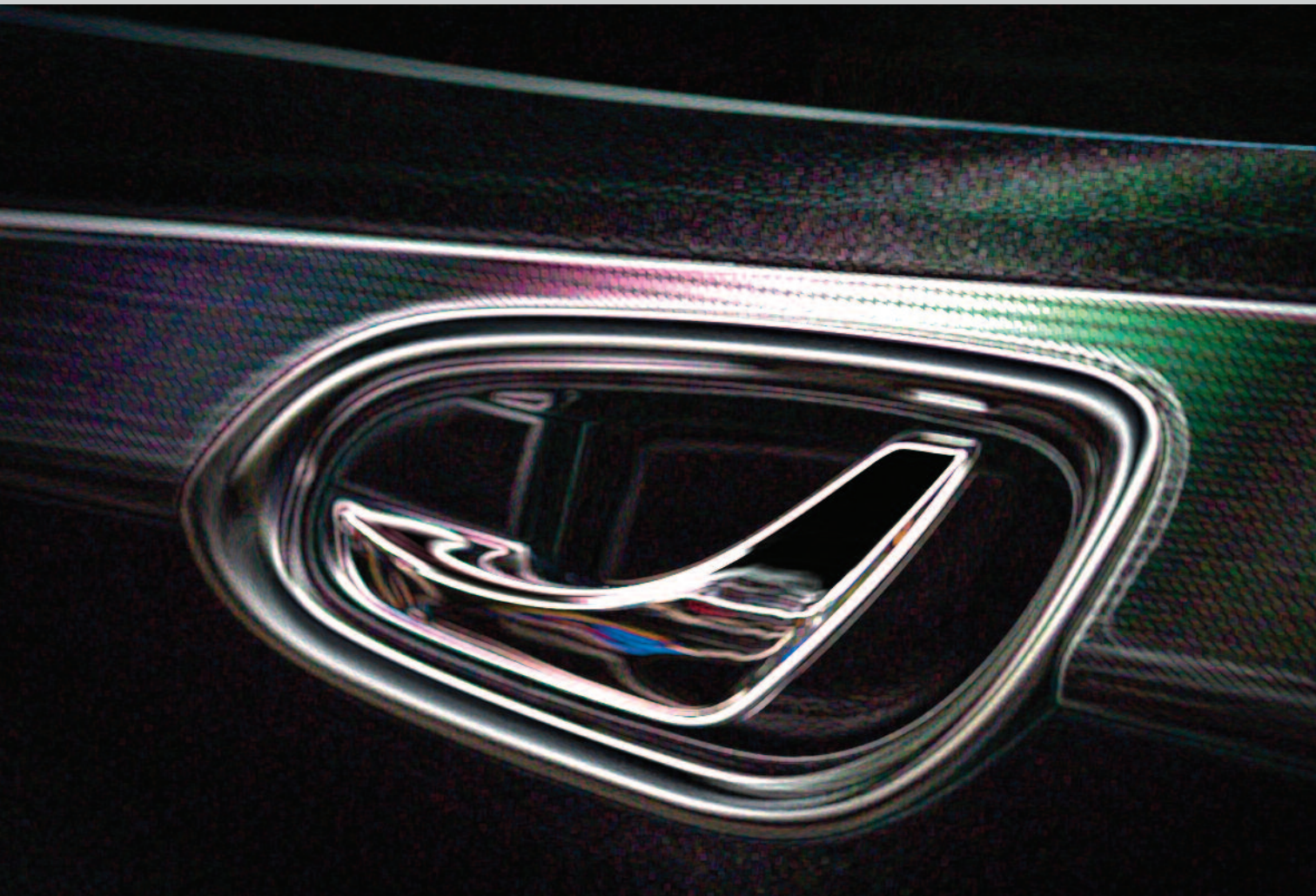


**There is also a CONSULT Active Test available on some models that allows you to change the cam angle command while watching the INT/V TIM PIDs.**

30° off. The CONSULT is usually the quickest way to check cam timing, followed by using an oscilloscope to check timing with the CMP sensors and CKP sensor. If you're old-school, and want to reach for your degree wheel and dial indicators, remember that the CVTCS needs oil pressure to operate, and there will be no pressure when the engine isn't running.

### The engine seems to run fine, but there are CVTCS codes stored in the ECM

Check the oil first! You'll notice that one of the first steps in the service manual diagnostic tree is to check the oil pressure warning light. As you likely know, low oil level usually doesn't cause a solid dash indicator, at least not at first. The oil light will momentarily flash on while braking or cornering as the oil in the pan sloshes away from the pickup in the bottom of the pan. A test drive to a curving freeway on-ramp might duplicate the conditions that caused the code, but recommending an oil change might be a quicker way to deal with the situation. There is no need for diagnostic heroics until the basics, like having oil in the engine, are addressed and eliminated as a possible source of the issue. |



# | Power Door Lock Diagnosis

*Diagnosing and servicing power door lock problems is not an everyday task, but knowing how to handle such issues when they arise will make your life a lot easier.*



There are many features in today's door lock systems. It's rare indeed to see a simple system with only switches and actuators. Most modern cars have key-less entry at minimum, but more often than not there are also programmable features such as allowing the user to select how the lock system responds to commands from the remote, or shifter range selection. Some even have the Intelligent Key System (IKS), a hyper-functional vehicle entry and security system that requires virtually no extraneous input from the driver.

All this automation is made possible with electronic control units bantering in binary, a language you can "listen to" with an oscilloscope, but can't understand without the help of a CONSULT to translate. Some 1s and 0s travel over copper, and others fly through the air in wireless bursts. Diagnosing a power door lock problem may seem daunting due to the level of system complexity, but not to worry, basic electrical and electronic skills and the ability to find information on the Nissan Techinfo websites ([www.nissan-techinfo.com](http://www.nissan-techinfo.com)) is all that's necessary for success.

The "key" to door lock diagnosis is focusing your efforts on only one small section of the system. The system is too large to test every component and wire. It would take too much time and be very inefficient. However, if the system is broken down into manageable segments, it's easier to have a full understanding of the segment under test, and it's less likely you'll get confused. A complex electronic system is made up of simple circuits, and simple circuits are easy to diagnose with basic electrical skills. Any electrical system, no matter how complex, can be diagnosed with fundamental electrical knowledge, provided it's broken down into bite-sized chunks.

So, where should testing start? Where the problem is, of course! But, where's the problem? Start with a broad investigation before reaching for tools or test equipment. This process can be broken into five sections:

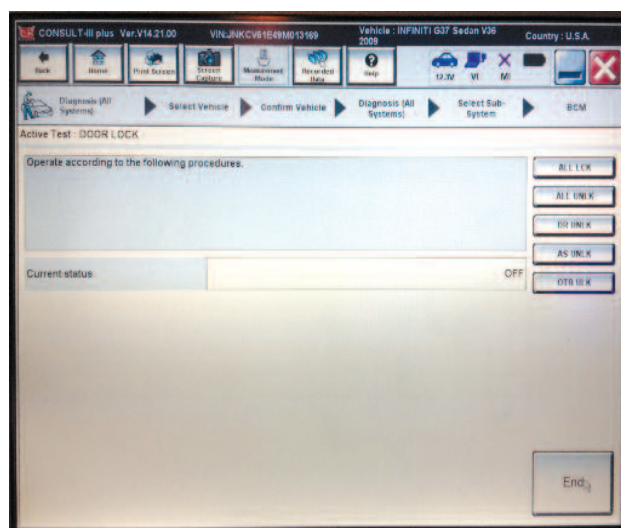
1. Find out how the system is supposed to work.
2. See which parts of the system are working, and which are not.
3. Search for TSBs.

4. Look for segments of the system that might cause all of the symptoms and eliminate those that cannot account for the symptoms or can be verified to work based on other functionality.

5. Check the wiring diagram and component locations, then plan your attack.

Find out how the system is supposed to work. That owner's manual in the glove box is a great resource for a technician. No one can be expected to know every feature on every model. It's too much information to retain. However, a good technician should be able to find information quickly. Learning the formatting used in owner's and service manuals is a valuable skill. There's no reason to paw the car owner's copy with your greasy mitts; the owner's manual is available online, in a searchable PDF format.

Once you know how the locks should work, test every function. Mentally note what works and what doesn't. Spending a few minutes pretending to be the owner and trying every possible combination of things he or she might do is often the most productive step in diagnosis.



**CONSULT Active Tests can be used to command door lock functions.**

Use the CONSULT to help narrow your focus. You may be surprised at the level of body control data and bi-directional control available in the CONSULT, even on older vehicles. The ability to check every door switch, lock button switch, remote command, latch switch, without pinning out the body control module saves hours. Save component and circuit testing for confirming an illogical signal with the CONSULT.

### Search for TSBs

Some of you are proud technicians, with a long track record of accurate diagnosis of challenging problems. However, don't let pride prevent you from using ALL available resources. TSBs can lead you right to the necessary tests and this can save hours of diagnostic time. Look at the answers before doing the work. Reserve your diagnostic prowess for occasions when there isn't a ready-made solution.

If there isn't a TSB, then it's time to put on your thinking cap. Start with the missing output(s). For instance, if the right rear door lock does not cycle with the others on a 2005 Altima, all of the other door lock functions are normal, and there are no seemingly abnormal inputs to the BCM, the next step is to do some research in the service manual.

The door lock section starts with component locations, including fuses. This is good information that will save time during testing, but we're not ready for testing yet. Next, is a system description and simplified schematic. If you read the description while looking at the schematic, you'll quickly be able to learn how the system should work.

The driver's door lock cylinder can be unlocked separately from the other three doors. The BCM uses three terminals to power the door lock actuators. One terminal is connected to all four actuators in parallel. The next is connected to just the driver's actuator. And the final is connected to the three other actuators in parallel. In other words, the BCM is capable of locking all four doors, unlocking just the driver's door, and unlocking the other three doors.

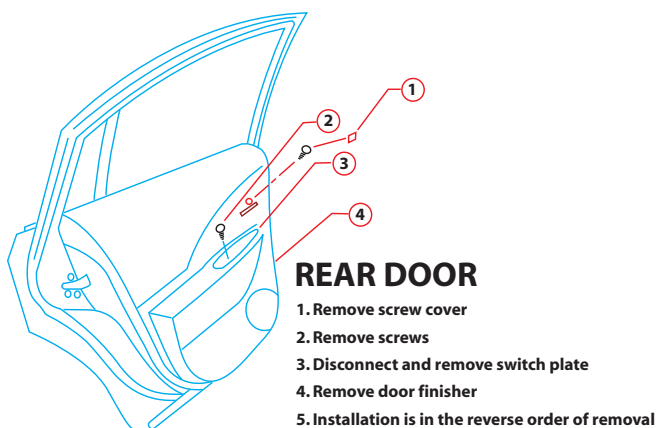
In the 2005 Altima example car, only the right rear door lock actuator does not work, therefore we can eliminate the BCM as a possible cause because a problem with the BCM could only affect all actuators, or just the driver's, or all three of the passenger actuators. There is no separate fuse for the RR door

actuator, so there's no point in checking fuses. In this case, the best place to start testing is the right rear door.

Back to the manual for more information: First, find out how to remove the right rear door panel if you're not familiar with the procedure. It's better to spend a couple minutes to review the procedure than couple days waiting for a replacement for something broken during disassembly. Next, the schematic was a good source for an overview of the system, but the wiring diagram contains the detailed information you need, like wire colors, and connector information.

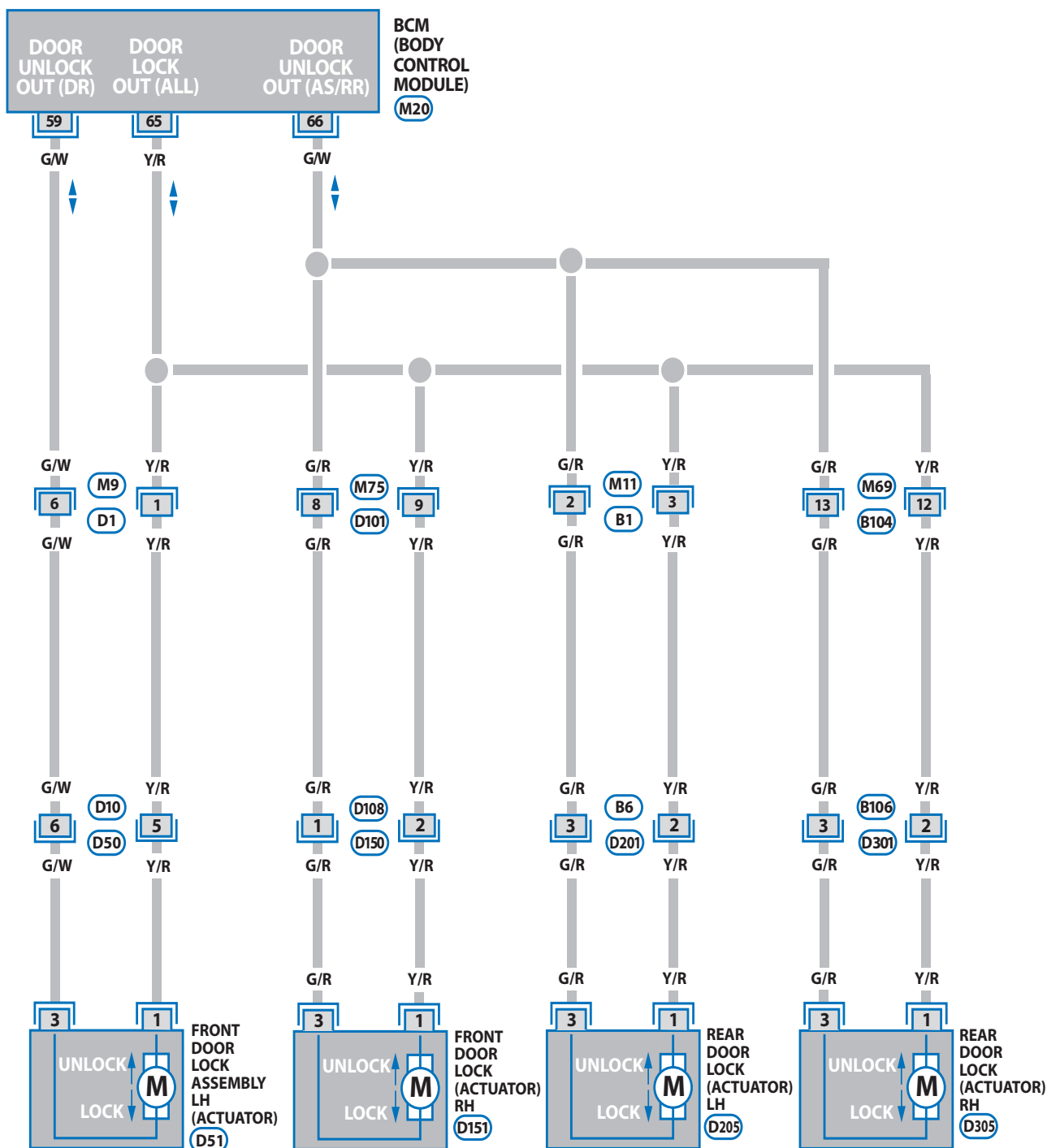
In the case of our 2005 Altima (and most cars), each of the door lock actuators has a two-pin connector and the actuator is not grounded to the chassis. When power and ground are applied to an actuator, current flows through a winding and a magnetic field is created. The magnetic field will push or pull an armature to move linkage and either lock or unlock the door. The polarity of the current flow determines the direction of the armature movement. In other words, if you check voltage between the two actuator pins while using the door lock switch, you'd expect to see momentary voltage in both switch positions, but there should be negative voltage in one direction and positive in the other.

Because the actuator is not grounded to the chassis, power should always be checked between the two pins, not between one of the pins and chassis ground. It is of course possible to use a chassis ground for



**Use the manual to find hidden screws to avoid breaking something.**





Wiring diagrams contain more detail than schematics. Schematics provide a quick conceptual overview, whereas diagrams include information like wire color, connectors, and terminal numbers.



**Jumpers and power probes are unnecessary and can cause damage.**



**Using the correct tool saves time, aggravation, and prevents damage.**

testing, but it would require two separate test lead configurations and four tests, whereas checking the between the two pins requires only one lead configuration and two tests. Every lead change and retest introduces the possibility of a testing error or a change in circuit performance. It makes sense to “see” as much as you can with every setup and test.

The best way to test a circuit or its components is almost always as a complete live circuit using a voltmeter or oscilloscope. In other words, nothing should be disconnected or unplugged from the circuit and the circuit should be energized during the testing. Voltage readings without a load on the circuit are meaningless, since voltage drop only exists when current is flowing, and current cannot flow with circuit segments disconnected. The best results will be obtained by leaving everything plugged in while testing an active circuit.

An ohmmeter is also a poor diagnostic choice. A circuit problem might be found with an ohmmeter, but then again, it might not. An ohmmeter produces such a small amount of current that even a tenuous connection might easily pass a resistance test. A poor connection, bad switches, failing windings, or mechanical problems may all look rosy through the eyes of an ohmmeter, but fail in operation under normal load.

Powering the actuator with jumpers or a power probe is also a bad technique. The circuit is built to provide power and ground to the actuator, adding your own power source is superfluous and could potentially damage the car if done incorrectly.

If we remove the right rear door panel and check for power and ground at the two pin actuator connector while operating the lock switch or remote, there are only a few possible outcomes:

1. The actuator is receiving sufficient power, but is not operating – the actuator is bad.
2. The actuator is not receiving sufficient power – there is a break in the wiring.
3. The actuator is being powered, and is operating, but the linkage is either bound or disconnected – the linkage needs to be repaired.

### Intermittent Irritations

Sadly, cars do not always cooperate when they come to the shop. A customer may complain of a door lock not cycling, but it works fine when you try it. It can be



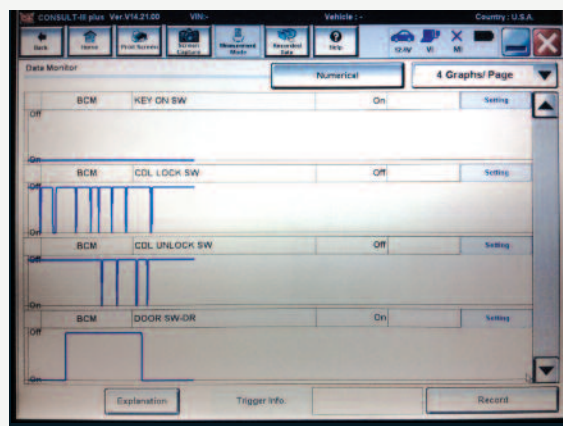
frustrating, but with a few tricks, you will probably be able to recreate the symptom and diagnose the problem. There are a couple of common failures that are easy to induce.

First, the winding in the door lock actuator may fail when hot. The hotter the winding gets, the higher its electrical resistance will become. If the winding's resistance is borderline high, it may fail to cycle once warm because the higher the resistance of the solenoid windings, the lower the current flow through the coil; the lower the current flow, the weaker the magnetic field. It's easy to heat an actuator up -- just cycle the locks repeatedly. If there's a weak actuator in the bunch, it will usually stop cycling fairly quickly.

The other common intermittent failure is a break in the door wiring at the flex joint. The driver's door is the most likely to develop this, or any problem really, because it is the most-often used door. The driver's door lock is always cycled when the power locks are used, and the driver's door is always opened when the car is used. The driver's door actuator and wiring get way more use than the other doors. This is considered during design, of course, but regular use causes wear, and anything, no matter how solidly (or flexibly) built, will wear out eventually.

A great way to test door wiring is to palpate it while cycling the locks. If you can cause the lock to stop and start cycling by manipulating the flex conduit at the hinge, find out what signal is being lost, then check for broken wiring. A voltage drop test can be used to find a wire with a break or a tenuous connection, but it's not as satisfying as grabbing the wire on either side of the suspected break and pulling hard. Unless you spend too much time at the gym, a good wire cannot be stretched, but a wire with a break will stretch and snap.

Once the problem has been found and repaired, put the car back together as well or better than it was when it came in. It's not uncommon to find butchered vapor barriers, broken trim clips, stripped screw holes, and broken connector clips and harness retainers. Be part of the solution, not part of the problem. Fix or replace all damaged components, whether the damage happened during your encounter with the car, or was caused by the last guy. Pretend someone will be disassembling the door and evaluating your work; let their praise for the quality of your work be your reward. A flat-rate attitude may result in short-term monetary gain. However, commitment to doing quality work pays in sense of pride and purpose, and in the long run, a good reputation and advancement. |



One problem with speedy communication and processing systems is, well, their speed. When viewing a list of body control PIDs on the CONSULT, switches may cycle so quickly that it's impossible to tell what happened when. If you are monitoring 12 body inputs and outputs, and they all change within a second, how can you tell what happened? Using the graphing function on the CONSULT will allow you to see what happened first, and evaluate what the BCM is evaluating at a speed a human eye and brain can handle. Older processing systems may have required a signal to go low for >500ms to count as a switch. A newer controller may only need to see >50ms to see a switch. Linkage adjustment, inertia, and "bounce" on switch monitored parts can create some really weird door lock symptoms. Using the CONSULT or a digital oscilloscope may be the only way to find out what's really happening.



# | Opportunity Knocks

Being a Nissan Certified Collision Repair Network facility can boost your business.



## Opportunity Knocks

Technological advances in modern vehicle construction require collision shops and technicians to stay up-to-date with the latest advances in evolving material mix, new repair procedures and parts awareness. The number of owners who are enjoying the dependability, comfort, engineering, safety and performance of Nissan vehicles every day is growing. This growth brings the associated opportunity of more body collision work, whether that work is derived from your existing customers or those who currently visit your competition.

The Nissan Certified Collision Repair Network was developed as a dynamic and competitive program to recognize and distinguish body shops that meet or exceed Nissan's standards for repair work, training, equipment, and delivery of customer service. From a shop perspective, this program offers a solid marketing opportunity

and a way for shops to differentiate themselves in the industry. Open to both Nissan dealer-owned and independent collision shops, the CCRN program provides body shops with a roadmap to successful certification and access to the resources necessary to enable the complete, safe repair of Nissan vehicles. The program also gives body shops the opportunity to generate additional business through direct towing to certified shops as well as a web-based shop locator for owners to identify a certified shop in their area.

In addition, the automaker has partnered with the Inter-Industry Conference on Auto Collision Repair (I-CAR). I-CAR has been designated as the provider for the backbone of Nissan's collision repair training. Certification requires the shop to be I-CAR Gold or be "on the road to Gold." Nissan's partnership with I-CAR





In addition to other Nissan certification standards, the automaker requires certified collision facilities achieve and maintain I-CAR Gold Class Professionals designation.

Visit [www.icar.com/html\\_pages/recognition/3\\_steps\\_gold.shtml](http://www.icar.com/html_pages/recognition/3_steps_gold.shtml) to learn more about attaining this designation.

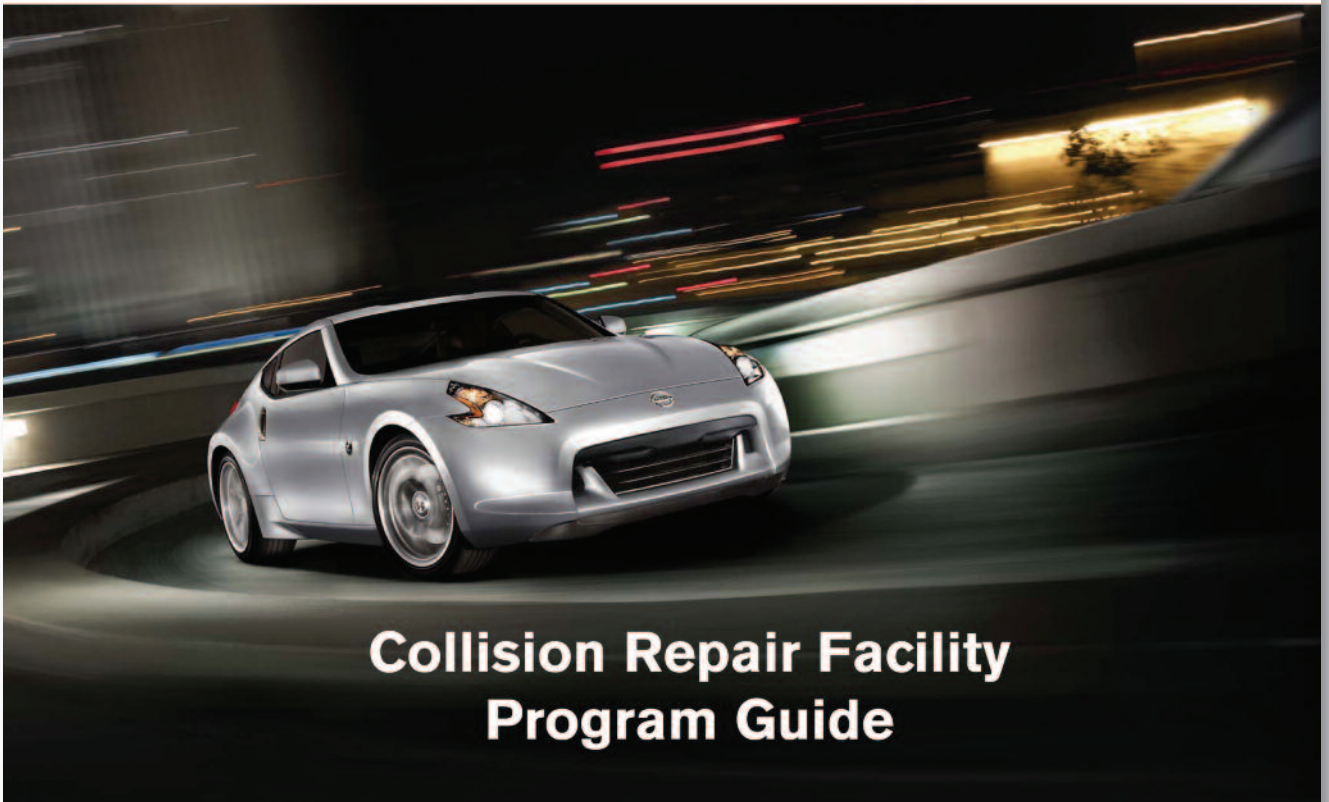
Alternately, copy and paste [www.youtube.com/user/icartraining](http://www.youtube.com/user/icartraining) into you web browser to watch an I-CAR video describing to process (courtesy I-CAR).

helps ensure that every participating shop will receive the guidance and training needed to offer the quality products, professional staff, and enhanced services that meet Nissan's exacting standards. For more information, please visit [www.i-car.com](http://www.i-car.com).

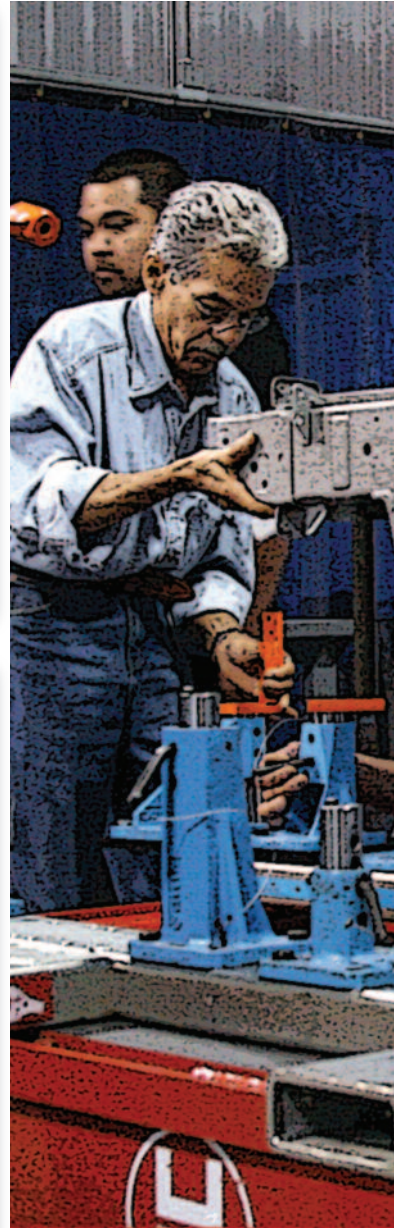
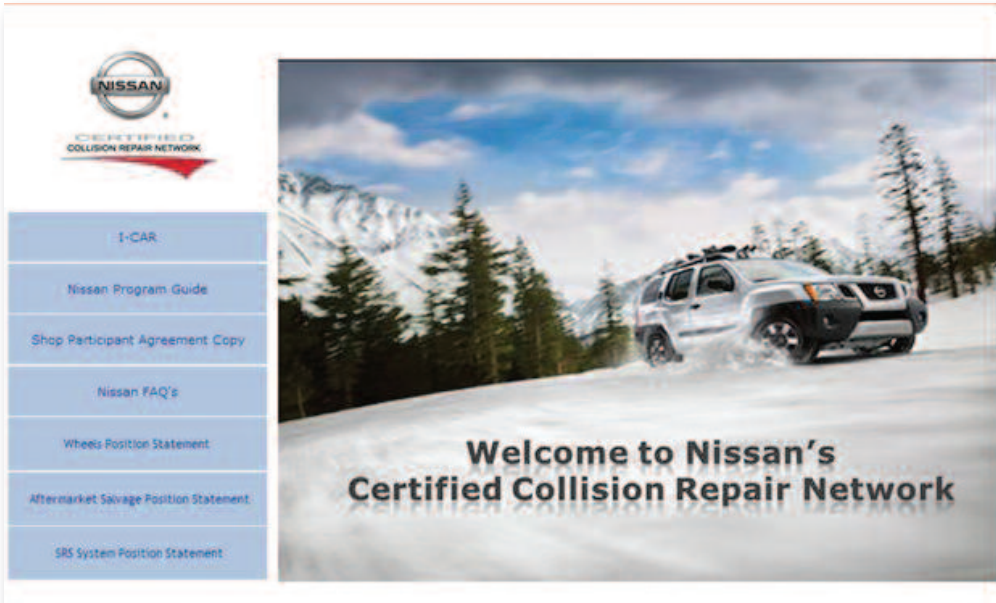
I-CAR technical director, Jason Bartenan, stated, "Nissan is one of the few automakers that has delegat-

ed all of its collision repair training to be provided by I-CAR. Nissan's relationship with I-CAR ensures that repair facilities and staff remain current with market changes, such as new materials that require the use of new repair equipment, tools, and procedures. The I-CAR Gold Class Professionals designation ensures that these quality-trained professionals have the knowledge

## Nissan Certified Collision Repair Network







and capabilities required to provide Nissan customers efficient, safe, and high-quality collision repairs.”

### **Standardization Aligns Customer, Body Shop and Automaker Satisfaction**

The purpose of the certification program is to provide tools and resources to ensure consistency when performing the complete, safe repair of Nissan and vehicles on a national basis. Facilities that have the willingness to participate in this program must also have the commitment to achieve higher standards than the rest of the collision repair industry. It should also be recognized that each time a vehicle owner comes into a CCRN body shop, it offers a face-to-face opportunity to reinforce the Nissan customer experience.

To achieve this, CCRN facilities must meet over 100 standards and requirements. This is readily achieved by collision facilities that have kept pace with current industry changes. The standards and requirements touch on the following areas:

- **General Management**
- **Facility**
- **Operations**
- **Training Requirements**
- **Tools and Equipment**
- **Warranty**

### **The Certification Process**

The CCRN program is a platform designed to satisfy all aspects of customers' automotive service needs – including metalwork, framework, painting and parts. For consistent implementation of the program as the industry evolves – from application through to certification – Nissan requires that a consistent process be followed. An interested collision facility must first successfully complete the application process, which begins with an online shop profile. Upon completion, an Axalta representative (the third party vendor currently working with Nissan) will contact the shop to schedule an onsite visit. During the first onsite visit, the shop auditor will work in conjunction with the owner/manager, or designated program coordinator. A comprehensive audit of the facility

will be conducted that will determine which standards are met, as well as those that still need to be met.

Approximately two to three weeks after the initial visit, the shop auditor will arrange and conduct a second visit with the facility. During this second visit, the shop auditor uses the initial audit results to determine a Gap Analysis Report for the shop. In addition, the representative will demonstrate and train the facility to use the Nissan OEM Performance Analysis Web tool, which is an internal tool used to provide key performance indicators (KPI) for the shop.

The shop auditor will then send a summary report to Nissan describing the facility's status, gaps, and implementation plan for completion of the CCRN program requirements. When all CCRN criteria are met, Nissan considers granting certification. However, should serious gaps be noted in the report, Nissan may request that the shop auditor conduct an optional third shop visit. The intent of this visit is to ensure compliance before final approval and certification is granted.

Annual recertification is necessary, which entails a validation audit to ensure that all standards (which can evolve with industry needs over time) continue to be met and that the facility action plan has been followed. The next year's action plan is then created, followed by a summary report being sent to Nissan for recertification consideration.

### **Program Updates**

As part of Nissan's long-term development plan to further expand the network, partnerships with collision shops will be strategically targeted to ensure that owners' collision repair needs are met. Through analysis of the Nissan insurance claims history and geography of units in operation, Nissan has identified key areas of opportunity and high priority for network shops needed across the country.

Nissan continues to promote the Certified Collision Repair Network to its owner base through a number of different methods. These marketing efforts include direct mail and electronic newsletters, which reach over 6.5 million Nissan owners. Also, on May 1, 2013, Nissan partnered with Cross Country to provide towing directly to Certified Shops. When customers call 1-800-NIS-SAN-1 to report that they have been in an accident,



Nissan will cover the expense to have their vehicles towed directly to a Certified Shop within 50 miles of the accident.

Becoming a member of the Nissan Certified Collision Repair Network allows shops to differentiate themselves in the marketplace. As awareness of the network builds, Nissan anticipates consumer preference of Certified Shops to grow.



(courtesy North Haven Auto Body)

Robert J. McSherry, is the owner of North Haven Auto Body located in North Haven, Conn. He shared his experiences in the Nissan certification process and since.

"The application progress was pretty easy and it took less than 45 days to get it all done, which is exceptional when compared to the two other OEM programs that our body shop is certified for. Our shop practices, and already being certified for

Nissan's desire is to put the vehicle owner first. Repairing the vehicle properly ensures future crash worthiness and allows the vehicle to perform to OE specifications. Nissan continues to see great interest from shops seeking to enroll in OEM programs, in which the top priority is the owner of the vehicle, rather than the insurance company. At the end of the day, it's all about the customer.

other OEMs, helped us, as we already met some of the Nissan audit requirements."

He advised that body shops considering getting Nissan-certified be realistic in their expectations. "First, realize that more work is not going to just magically appear at your shop. It is still our jobs as owners to figure out how to do that."

"Second, clearly understand how these certification program works. It does not in any way mean that every local Nissan dealership that does not have its own shop will start to use you. It is not part of any of these programs that the dealers have to utilize a certified collision shop.

"Finally, know that today's consumers expect and deserve our best every day. No certification program will make up for your own shop's deficiencies. Make sure you are ready to do it right in the customer service end of it as well as the repairs themselves.

"That said, I am a firm believer in OEM programs such as the Nissan CCRN. It helps make the difference between a consumer picking our shop over another. I use the Nissan certification to build my brand, especially in my advertising campaigns, which I feel I get the greatest value out of. When our advertisements are viewed with the Nissan so-called stamp of approval on it, customers and prospects are impressed and often cite the certification as a deciding factor in their choice of repairer."

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(205) 278-5904

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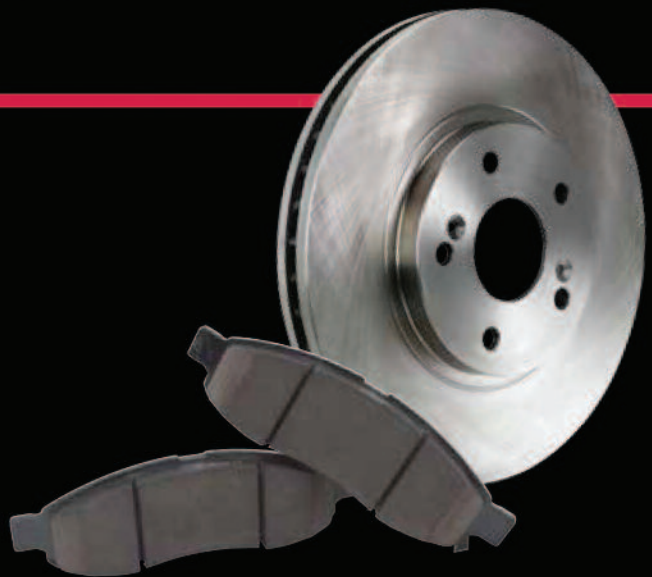
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# THE RIGHT PART FOR THE JOB

For newer vehicles and for customers who insist on using parts engineered for their exact vehicle, it's always recommended to use the original equipment (OE) part. OE parts from Nissan meet all Federal Motor Vehicle Safety Standards (FMVSS) to deliver optimal performance for each specific application. But for customers with older vehicles, or for customers who are very price conscious, an OE part may prove too costly. Fortunately, there is a high-quality solution.



Nissan's new high-quality line of brake parts can help retain this customer base and keep them from migrating to independent repair shops. Nissan Value Advantage brake parts can help increase retention, win customers back from the independent repair shops and increase profits at the dealership.

## **Tight Lateral Runout**

Rotor runout should be checked on the vehicle and not the brake lathe, as the rotor may run true on the lathe, but not the vehicle. A runout of .005" can result in pedal pulsation or brake noise, and many competitive Aftermarket rotors exceed .005". Nissan Value Advantage brake rotors are ready to install out of the box with no turning required because they have a lateral runout of .004" or less. Excessive runout can cause friction material transfer after 5,000–7,000 miles, which can adversely affect pulsation.

## **Proper Balance**

Excessive vibration in rotating rotors can cause unacceptable levels of noise and reduce the life of the rotor. 100% validation ensures proper balance and minimizes vibration. Nissan Value Advantage brake rotors meet OE requirements and are mill balanced to 2 inch-ounces. Many competitive Aftermarket rotors can exceed 5 inch-ounces.

## **Minimal Thickness Variation**

Brake pads must contact the rotor flatly during braking to avoid pedal pulsation. As little as 0.0005 inches of thickness variation can result in pedal pulsation and noise. Nissan Value Advantage brake rotors have a thickness variation of 0.0004 inches or less... helping the rotor turn as true as possible inside the caliper, resulting in fewer pulsation issues.

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## VALUE ADVANTAGE™

