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# NISSAN TechNews INFINITI

- Super Steels
- SRS Diagnosis & Repair
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# Paradigm Shift: Coming to Grips with Super Steels

## New steels, alloys and materials are forcing a collision repair reboot.

The collision industry continues to be under the gun. According to the American Iron and Steel Association, 60 percent of the steels and alloys used in manufacturing cars today did not exist a scant 15 years ago. Since then, the use of new steels and metal alloys by Nissan and other automakers has grown quickly; it is also expected to accelerate over the next two decades.

These new metals must be identified early, as their higher costs impact estimates. Moreover, because they require radically different repair procedures than conventional mild steel, this trend presents a variety of dynamic challenges for collision repair facilities.

## The New Mantra: Higher Strength, Lighter Weight, Improved Occupant Safety

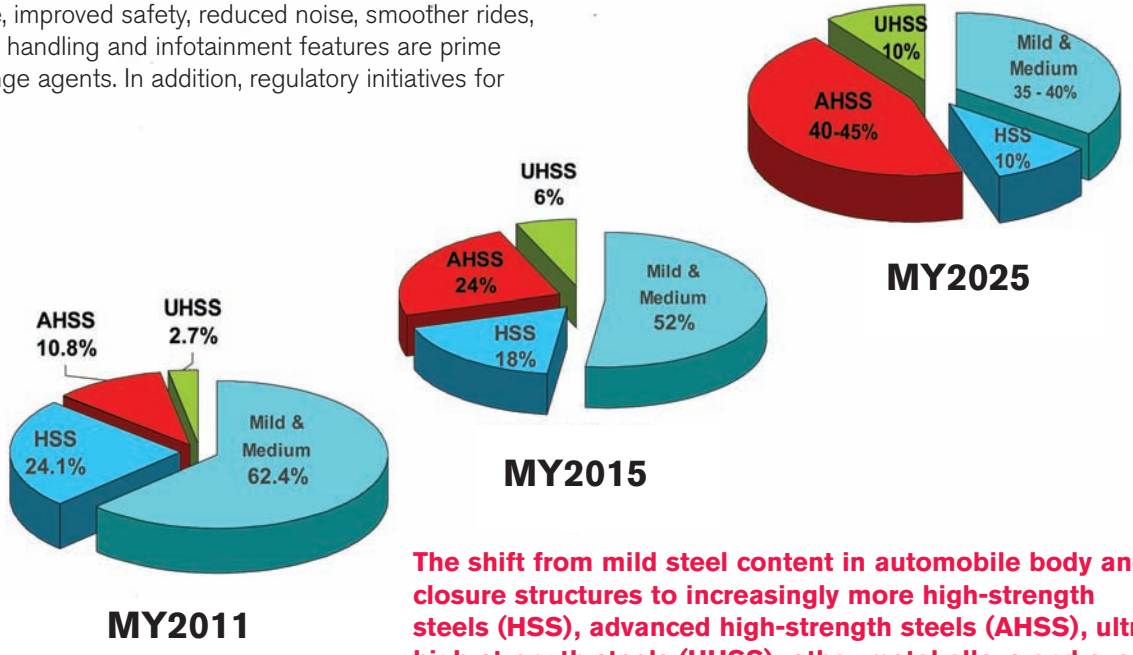
In the 1990s, Mild Steel (MS) accounted for nearly all of the steel used in vehicle manufacture. MS offered adequate strength and enabled easier collision repair because of a more stable collision repair knowledge base, somewhat stable manufacturing materials, and simpler repair procedures and skills.

Increasing consumer demand for better performance, improved safety, reduced noise, smoother rides, solid handling and infotainment features are prime change agents. In addition, regulatory initiatives for better crash safety and roof crush standards, improved fuel economy and lower CO2 emissions have also spurred the OEMs to move away from MS. Also, the advent of heavier, alternate hybrid and all-electric propulsion systems have made the use of higher-strength steels a cost-effective, practical solution.

Over the past decade, innovative new steels, aluminum, magnesium and titanium have been increasingly used by automakers to meet new and inbound regulatory statues for improved fuel economy, emissions, safety and environmental responsibility. In addition, other new nonmetal materials, such as carbon fiber, polyurethanes and adhesives are being used increasingly.

Compared to mild steel, the newer steel classes (listed in order of increasing strength and formability) include:

- High Strength Steels (HSS), such as bake-hardenable and some dual-phase steels, handle more stress, provide better resistance to fatigue, improve crash energy management, and allow overall vehicle weight reduction and associated cost savings. Better suited for any structural and crash-sensitive parts, HSS are often found in rocker panels, B- and C-pillar reinforcements and cross members.




**The shift from mild steel content in automobile body and closure structures to increasingly more high-strength steels (HSS), advanced high-strength steels (AHSS), ultra high-strength steels (UHSS), other metal alloys and even nonmetal materials is forcing a shift in collision repair.**

▪ Advanced High-Strength Steels (AHSS), which include more advanced Dual-Phase Steels (DPS) and Transformation-Induced Plasticity steels (TRIP), have similar initial yield strengths as HSS, but also have much higher final part strength and provide higher energy absorption at a lower overall cost than both MS or HSS parts. AHSS content is typically found in roof panels, front rails, crush cans, and reinforcing inner rockers and pillars.

▪ Ultra-High-Strength Steels (UHSS), such as boron steel, incorporate molybdenum to create steel with benefits that only higher-priced aluminum or titanium could offer in the past, but at a lower cost. Applications include door beams and bumper beams.

For Nissan and Infiniti vehicles, these benefits translate into increased strength, lightweight composition, improved energy absorption at impact and safer energy transfer around the passenger cabin during a collision. It is not unusual today for 40 percent of a new vehicle's composition to be AHSS or other high-strength metals; in a number of cases, such as the Nissan GT-R, that percentage can be much higher.

## Rethinking Collision Repair

"Increasing vehicle structure complexity has the potential to put us all out of business," says Jeffery Poole, performance training coordinator for the Inter-Industry Conference on Auto Collision Repair (I-CAR). "But maximizing survivability has been the driver in automobile design, not repairability." By incorporating stronger steels in key areas — such as B-pillars, rails, cross members and fuel tank reinforcements — collision energy forces can be controlled and transferred away from occupants.

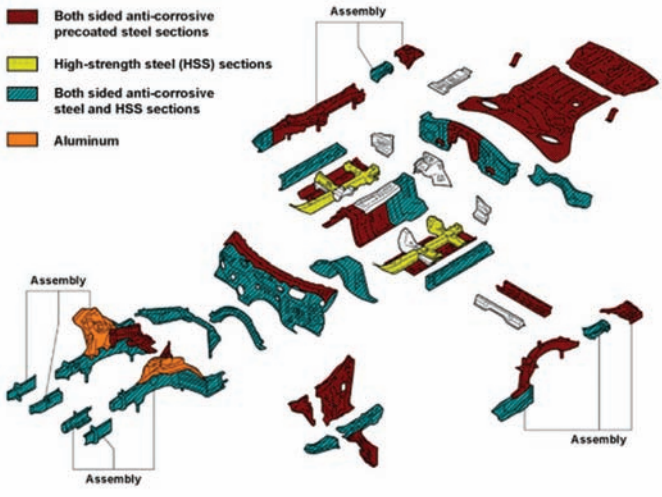
Looking forward, collision shops must adapt their repair knowledge, procedures and skills at an accelerating rate to keep pace with technological changes being made to vehicle structures. While some shops may find the task overwhelming, others will seize the opportunity. Either way, a facility's survival will hinge on replacing old repair paradigms with a thorough understanding of these new materials.

The shift from mild towards increased higher-strength metals has fostered a number of wide-ranging challenges for collision professionals, including the ability to:

▪ Source accurate service information for collision repair, with specific access to locations of various steels in a vehicle structure. For example, some structures may require partial disassembly before you are able to prepare an accurate estimate for repair. Nissan's www.nissan-techinfo.com and Infiniti's www.infiniti-techinfo.com websites provide the most current and accurate information available.

▪ Identify the type of steel in an assembly to then determine whether to repair or replace. While automakers provide guidance specific to each type of steel present in their vehicle structures, repair professionals should be aware that Nissan and Infiniti recommendations for steel classifications may differ from those of other automakers. Don't assume that what works for one manufacturer works for all.

▪ Determine whether or not there are multiple steel types within damaged assemblies. B-pillars, for instance, can be made from a combination of MS, HSS and AHSS; repair procedures may vary according to each steel type. Both service information and industry-recognized training are resources to help you determine the appropriate repair procedures for each Nissan and Infiniti model and year.




**Nissan provides color-coded diagrams of its vehicles that denote the location of various types of steels and other metals in its vehicles, such as this one for the GT-R. Used in conjunction with Nissan service information, recommended repair procedures and proper equipment, these resources help facilitate complete, safe repairs.**

**I-CAR offers several collision repair courses focused on higher-strength metals. For example, Nissan and I-CAR partnered in developing a GT-R course, available to professionals, that Nissan recommends.**

▪ Learn the specific and appropriate repair procedures that must be used to restore a vehicle to its pre-collision state. Repairers must know, based on steel type, whether heat or cold straightening is appropriate, whether sectioning or replacement is needed, what type of welding is required and more. I-CAR, for example, offers a one-day course focused entirely on collision repair for the GT-R supercar. In addition, I-CAR has just successfully piloted a new course titled "Best Practices for High Strength Steel Repairs" that addresses the challenges of working with HSS, AHSS, UHSS and some of the identified best practices that a shop should utilize whenever working with these materials. Expect this course to be available to the industry shortly.

▪ Equip facilities with Nissan and Infinfiti-approved collision repair equipment. Visit Nissan Tech-Mate at www.nissantechmate.com to seek advice or lists of required/recommended collision repair equipment that has been approved by the automaker. For example, Nissan recommends the use of a Celette dedicated fixture system for GT-Rs to help restore the original accuracy to the vehicle.

Customers should also be informed that they can insist that only genuine Nissan collision parts be used to complete repairs. Nissan provides a form that facilities can provide to customers for this purpose. Insisting on genuine parts meets Nissan design specifications maintains vehicle and corrosion warranty protection, provides time-saving form and fit and avoids compromising post-repair occupant safety, should a repaired vehicle be involved in a future collision. For example, the hood on an electric LEAF is designed with hood buckling creases to help prevent the hood from penetrating the cabin interior; non-genuine aftermarket hoods may not provide such built-in safeguards.

## Implementing New Repair Procedures

Technological change has impacted the mechanical side of the service and repair industry for a longer period than the more recent innovations now affecting the collision side. As a result, mechanical service information is abundant and service information gaps are few. However, the recent and very rapid influx of newer steels, metals and other advanced materials requires ongoing collaboration among Nissan, the collision industry, trainers and regulators to ensure that vehicles are repaired safely and completely.

"We must employ better repair planning right from the start," says Bob Keith, senior director of Education and Training, CARSTAR Franchise Systems. "We need to be

**Having a sound repair plan right from the beginning is critical for the collision repair of newer steels, aluminum and other metals. Follow Nissan recommendations and resources regarding the use of heat, sectioning, replacement, welding, documentation and other procedures to ensure that repairs are cosmetically pleasing, maintain the crash-safety rating and protect the facility and staff from future legal repercussions.**

better researchers in order to find the correct repair information to ensure we're on the right repair track."

Once an accident occurs, it is essential that a facility determine what is wrong through proper identification and accurate measurement. Research may be necessary to discern what metals are present and the associated repair procedures and proper equipment required to return the vehicle to pre-crash condition. Then they must thoroughly document and present this information to both insurers and customers.

Access to repair information can be another hurdle. "We need to continue to work with Nissan to get collision repair service information," says Keith. "I don't think repairers are aware how much information is out there and where to find it."

Nissan makes collision repair information available through its aforementioned websites. While most information is available, occasionally "time-lags" occur — instances where new vehicles are sold and then involved in an accident before collision repair information and procedures are developed and posted on service information websites. Fortunately, the automaker has signed the National Automotive Service Task Force (NASTF) agreement, which requires that any genuine gap identified by a dealer or independent facility, including collision repair issues, be addressed, responded to and resolved.

Most collision facilities, however, are unaware that they can electronically file a collision-related NASTF Information Request should they have a bona fide information gap that needs to be closed. While not one Nissan collision information request has been filed with NASTF to date, it is important to know the option is there. To file a request, visit www.nastf.org/i4a/pages/index.cfm?pageid=3290 at the NASTF website.

"Automakers, such as Nissan, have gradually evolved repair procedure policies because they don't want repairers re-engineering vehicles," Poole points out. "The information is out there, but some of it isn't easy to get to. Should no repair procedure exist for a part made with these new steels, collision facilities must err on the side of safety, even though more costly, and choose replacement rather than repair. Ensuring the insurer and customer are aware of this, and why, before a repair is essential."

## No More Repair Shortcuts

Knowing where new metals and materials are located is a good first step. But facilities must also be able to complete a proper repair. Traditional repair procedures often cannot be used, as they can damage or destroy the attributes and performance of new steels. Instead, radically different repair procedures specific to new steel types must be implemented. To be fully competent and do no harm to a vehicle structure, professionals should ensure they attend Nissan training (visit the Nissan-Infiniti service information websites) and recognized industry training such as the several courses facilitated by I-CAR (www.i-car.com) that address the identification, estimate preparation and repair of these new materials.

The newer higher-strength steels, for example, must be handled differently from the MS repairers are long familiar with. For instance, as steel strength is increased, it typically becomes harder, more brittle and more sensitive to heat. HSS is generally cold straightened, while AHSS/UHSS is typically not straightened at all. In addition, when MS steel is heated, it is generally strengthened. However, under that same heat, HSS is weakened and AHSS/UHSS can crack, break or be destroyed.

"The investment in more expensive, specialized equipment and acquiring new repair skills on a continual basis compound the challenge for collision facilities," adds Keith. "Facilities must invest in specialized equipment and be adept at using more complex welders such as squeeze-type resistance welders that can cost up to $40,000, plasma cutters and specialized tungsten-carbide drill bits."

In the case of Nissan and Infiniti vehicles, heat should only be used when recommended. Even when welding, follow Nissan and Infiniti recommended welding methods and techniques to minimize the "heat-affect zone," maintain warranties and avoid litigation. Increasingly, recommendations are trending towards complete part replacement rather than partial repair using heat.

The days of shortcuts and just repairing vehicles so they "look right" are over. Repairers should be aware that even if an improper heated repair of AHSS looks cosmetically correct, in the event of a future collision it will be unable to absorb or deflect energy as originally designed. Should that occur, collision energy is then transferred into the passenger compartment, which creates a potentially catastrophic liability situation for the facility.

## Responsibility and Liability Go Hand-in-Hand

"As an industry, we need to know how to repair a vehicle and how to represent that repair to consumers, insurers and others," Poole explains. "Keeping thorough and complete files for documentation purposes, as well as developing sound communication skills to convey concerns and needs to insurers and customers is no longer an option. Rather, it is a best practice and part of doing business today."

Poole notes that crash investigation experts, when surveying a vehicle damaged in an accident, review the "prior loss history" of a vehicle. In particular, they review the following:

- Was any prior improper repair in the vehicle's history a contributing factor?
- Were incorrect repair techniques used that were cosmetic but undermined the vehicle's safety?
- Were there prior loss issues that were neglected and/or simply not addressed by the last repairer/insurer?
- If a vehicle has had multiple collisions, which facility is responsible for the improper repair?

"The answers to these questions in court can make for an interesting day at the office," Poole cautions. "Failure to provide a correct and ethical repair, document and communicate it can result in devastating liability claims, whether caused by a facility's ignorance or its negligence. Neither is a valid excuse."

The challenges that collision shops face today — especially with new steels and materials being integrated into vehicles — have the potential to overwhelm or empower success. A commitment to detail is essential. This includes being aware of inbound change; staying current with new technology, equipment and tools; embracing ongoing training as an enabler rather than a burden; identifying and implementing correct associated repair methods; acquiring and maintaining skill fluency; and documenting and presenting concerns to all vested parties. Clearly, the collision repair learning curve has gone vertical. The question is: Are you ready and engaged in the climb?

# SRS Diagnosis and Repair

**With a CONSULT, a Techinfo subscription, and good reading comprehension, SRS diagnosis and repair can be a profitable addition to your shop's repertoire.**

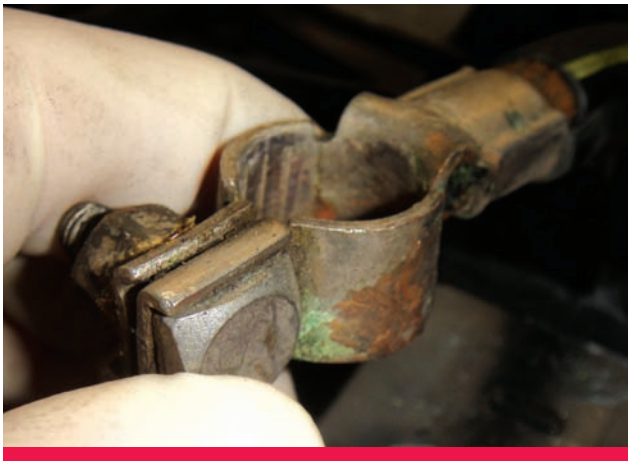
The safety information preceding diagnostic or repair information is pretty boring, or, even worse, it's sometimes so obvious it's almost insulting. For instance, even someone completely unfamiliar with auto repair would probably know to turn off the engine before beginning drive belt service, yet warnings similar to this still appear in service manuals. To save time, techs will typically skip over sections marked "WARNING" and jump right to the meat of the procedure.

## Don't Skip Over the Safety Information

You shouldn't do this in general, but with SRS, the consequences can be severe, even fatal. An air bag can save your life if you're buckled into the seat, but it can also snap your neck if it deploys when you're out of position while working on the car. Even highly-skilled techs have accidentally deployed air bags. The best way to avoid this is to follow the diagnostic flow chart after reading very carefully, including the warnings. If you deviate from the plan, you're on your own.

## Rules of SRS Safety:

Always disconnect the battery before working on or around SRS components. Contact with voltage, even for a millisecond, can cause the squib to fire and the airbag to deploy. Disconnecting the 12V battery and waiting three minutes for capacitors to discharge will eliminate many potential sources of stray voltage while the repair is in progress. Remember, even if you are not working on the SRS system you should be mindful of its presence and follow appropriate safety precautions.



**Remove the negative battery cable and wait three minutes before working near SRS components.**

**Touch a bare metal component to discharge static electricity from yourself.**

Static electricity can cause an air bag to deploy, even when the 12V battery has been disconnected. Shorting bars built into SRS connectors help reduce the risk, but there's always the possibility of tampering or a malfunction. Therefore, it's a good practice to ground yourself before touching SRS components.

Do not use an ohmmeter to check squib resistance. An ohmmeter passes current between the probes and measures voltage drop to determine resistance. This current can cause the squb to fire. Resistance testing of air bags is always done indirectly, either by substituting a known good air bag module or a special service tool, then clearing codes and rechecking. The service manual may call for the use of an ohmmeter, but only on the wiring, and never on components. Make sure you understand what the flow chart is asking for before starting to test.

If you remove an airbag, store it with the metal side down; bag side up. If it goes off for some reason, you'll have a loud pop and you may need to take a tranquillizer, but the airbag will likely stay in the same position. If it's stored with the bag side down and goes off, it will launch and is more likely to cause damage or injury.

Impact sensors can be tripped by vibration and shock during repair; impact wrenches and hammers should not be used near SRS sensors with the key on. Redundant safety systems will probably prevent airbag activation, but do you really want to gamble on it?


**An ohmmeter is sometimes used in SRS diagnosis, but ONLY when the service manual calls for it and ONLY in the manner described in the service manual.**

**Store air bags properly to avoid injury.**

## SRS Cast of Players

SRS systems have come a long way since the single driver's side air bag found in vehicles of the late '80s. Older SRS ECUs had only one sensor and two output choices: to deploy the driver's air bag or not. Modern systems have a myriad of sensors and a variety of output choices. The system tailors its response to match the requirements of both the occupants and the collision, analyzing sensor data, making decisions, and taking action in thousandths of a second. Here are some of the players found in the modern SRS system:

## Outputs

The driver's front air bag will deploy when the front of the car hits something (or something hits it) hard enough to cause sufficiently rapid deceleration. The driver's air bag module is located in the center of the steering wheel. Modern units are dual-stage, so they can better match the force of inflation to the force of the collision.

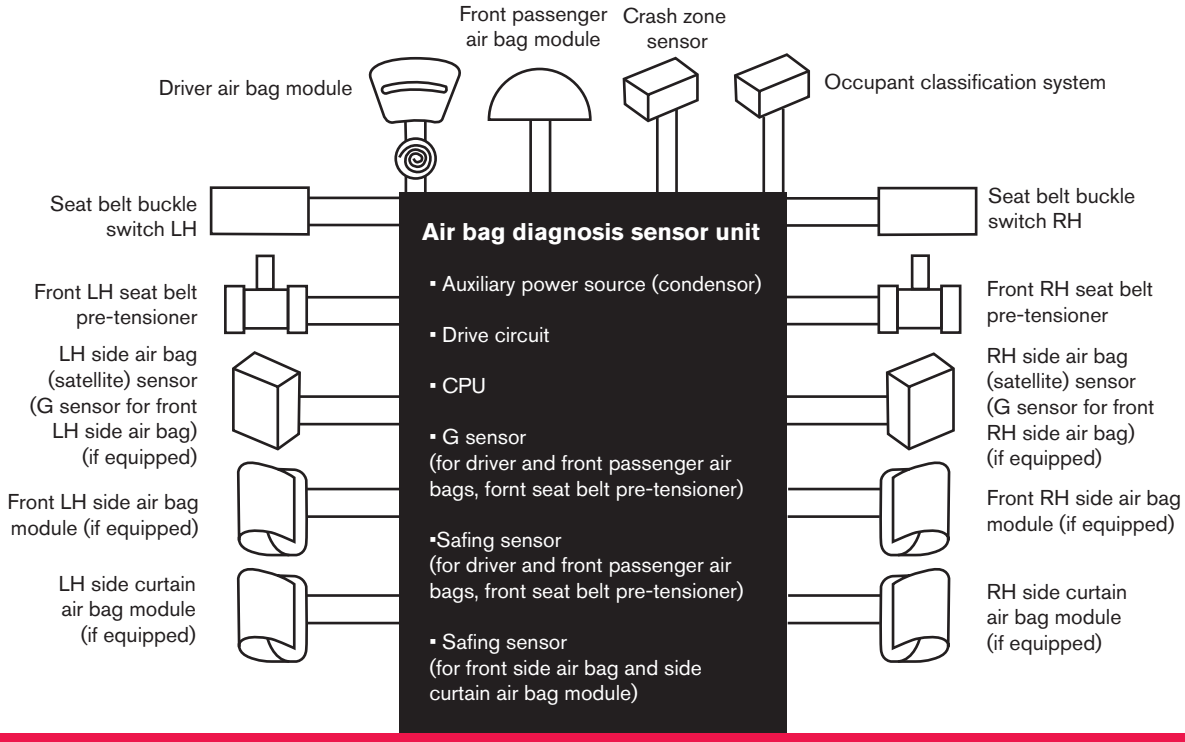
The passenger's front air bag is also designed to protect against injury during a head-on collision. The front passenger air bag module is located in the dash on the right side of the car. These too are dual-stage on newer Nissan vehicles.

The side air bag modules are located in the outer edge of the front seat backs, one in the left seat and one in the right seat. The side air bags will deploy only when the vehicle is struck (or strikes something) from the side. Don't be confused by the naming conventions found in the CONSULT and in the service manual. They are sometimes listed as the "Front LH side air bag" and "Front RH side air bag", which sometimes leads technicians to mistakenly believe that side air bag trouble codes were caused by the front air bags. The front air bag modules are almost always referred to as "driver's" and "passenger's".

Side curtain airbags are usually found running above the doors in the outer edges of the headliner on either side. They are designed to protect the occupant's head during a collision, whereas the side air bag modules protect the occupant's torso. The side curtain (head) airbags are deployed whenever the side (torso) airbags are activated.

Seatbelts are also SRS outputs. In the event of a collision, the Air Bag Diagnosis Unit (SRS control unit) will activate seat belt pre-tensioners to remove the slack from the seat belts. Once the occupant's weight is thrown against the seat belt, a load limiter built into the seat belt will release some of the belt tension if it exceeds a specified level.

The seat belt and SRS warning lights are also important outputs. If either light is on while driving, the restraint system may not offer the protection it's capable of delivering.




## SRS Configuration

### Inputs

The SRS Diagnosis Sensor Unit is both an input and a control unit. It monitors sensors and activates outputs, but it also contains several built-in sensors and has other functions:

- A "G" sensor to measure the intensity of deceleration/acceleration.
- Safing sensors. Safing sensors are on/off “weight and spring” switches added as secondary confirmation of a collision to prevent inappropriate deployment. There is usually one safing sensor for the front air bags and pre-tensioner and another for the side air bags and curtain air bags.
- An auxiliary power source in case of power failure during a crash. The power stored in the capacitors is why waiting for three minutes after disconnecting the battery prior to working on the system is necessary.

The seat belt buckle switch is actually two redundant switches. With the seatbelt connected, the SRS Diagnosis Sensor Unit expects to see one switch open and the other closed. When the seatbelt is disconnected, the switch positions reverse. This way, if a switch fails, the SRS unit will be able to tell and will set a code. The SRS system will activate the front air bag if the seatbelt is not latched, so these are important inputs. Currently, most cars only monitor the front seatbelts.

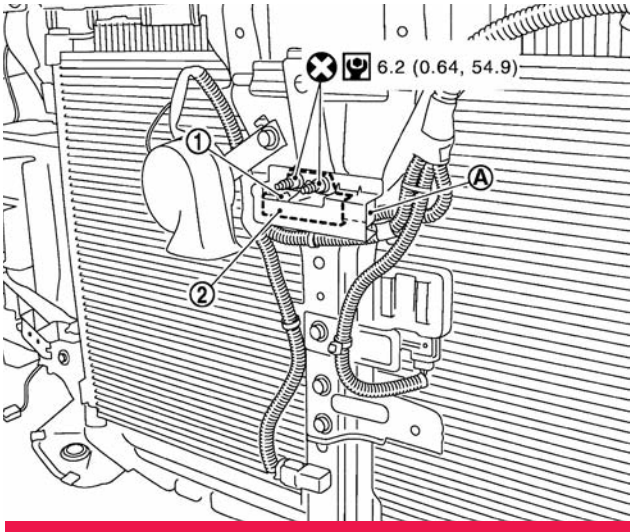
### Crash Zone Sensor

The Crash Zone Sensor is the first to report a frontal collision. It’s typically located near the front bumper and provides early warning to the SRS Unit. Its electrical impulse will reach the centrally-located SRS Unit before the force of the shock wave.

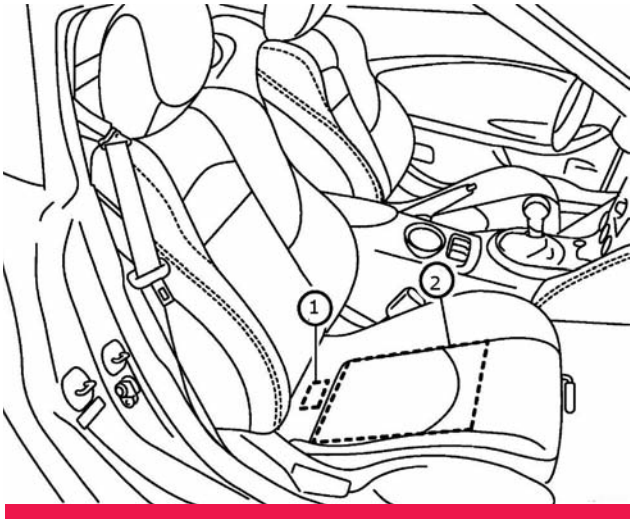
The left or right satellite sensor will be the first to report a side impact. They are usually located in the lower “B” pillar area (behind the front doors) and will provide early warning of a side impact to the SRS Unit.

### Occupant Classification System

The Occupant Classification System (OCS) is basically a scale in the right front seat. It consists of a




**The Crash Zone Sensor is mounted in the front of the car so it's able to report head-on collisions before the shockwave can reach the occupants.**



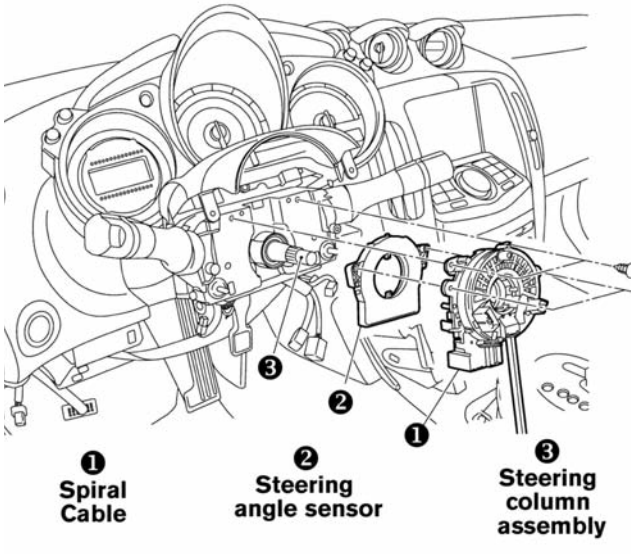

**The Occupant Classification System: 1. OCS control unit, 2. OCS sensor mat.**

sealed mat filled with goo, a pressure transducer, and a control unit. When a passenger sits on the seat, his weight increases the pressure of the goo in the mat. The pressure transducer measures the increase in pressure, and the control unit calculates the weight of the passenger. The OCS unit sends the weight information to the SRS unit, where it is used to determine appropriate activation of the passenger air bag during a collision.

## Harness and Connectors

The spiral cable is one the few moving parts (the seat belt switches being another) in the SRS system. The spiral cable sits behind the steering wheel and allows a continuous electrical connection between the driver's air bag module and the SRS unit as the steering wheel is turned.

SRS harnesses are color-coded in yellow to make them easier to identify. The wiring and connectors are top quality, and design and layout are always very well thought-out. Harness failure is rare unless it has been changed from its original configuration. Always reinstall retaining clips and preserve the original routing when disturbing SRS harnesses for any reason. Never attempt to repair an SRS harness unless the manual or TSB specifically call for it, and then only in the exact manner described.




**Spiral Cable**

SRS connectors are easy to work with, if you know how they work. They all come apart easily, with almost no force. If a connector seems difficult to disconnect, you haven't found its secret yet. Resist the urge to indiscriminately pry on connectors with a pocket screwdriver; check for the connector operation in the manual instead.

Many SRS connectors contain shorting bars that will short its pins together to prevent accidental deployment due to static electricity or improper testing procedures, but don't take this for granted. Also, keep it in mind when testing, especially when a flow chart test procedure doesn't seem to make sense at first glance. The presence of shorting bars is often considered in the design of diagnostic procedures, but not explained in the procedure. Before deciding there must be a misprint, remember to allow for the existence of shorting bars.

## SRS Diagnosis

The first step for diagnosis is observation of the SRS light. When the key is turned to the ON position, it should light for about seven seconds, then go out. This indicates everything is OK. If the light stays on, the airbags or pre-tensioners may have deployed. If the light blinks, there is a current problem. If the light does not come on, there is a problem with the control unit or warning light circuit. This non-intrusive observation is referred to as "User Mode" in the manual, and is designed to inform the vehicle operator (and the technician).

Before diving into diagnosis, test the battery. Low voltage caused by a weak battery will cause all sorts of havoc and will lead to a misdiagnosis if you follow the flow chart without checking this basic element first.

After confirming an SRS malfunction with the warning lamp, use the Nissan CONSULT scan tool to check for current or past trouble codes. If you find codes, check for TSBs before proceeding. You can read through the TSB abstracts on www.nissan-techinfo.com or www.infiniti-techinfo.com, even if you don't have a subscription yet. This way, you'll have access to the most current information, which is especially important if you're working on a late model car.

Nissan usually provides a procedure for diagnosis and repair without using the CONSULT, which can be found in the manual in sections labeled "without CONSULT." However, it almost always takes more time and often provides far less information. A CONSULT will pay for itself quickly in time saved.

You may notice that many of the diagnostic solutions may at first appear to be a bit heavy-handed. Be sure to read carefully! The diagnostic information and flow charts found in the manual do not lend themselves to jumping around while reading. Be sure to start at the beginning of the section and read all the text in order. Don't just jump to the beginning of the trouble code flow chart or scan through text looking for information that seems relevant to the problem at hand.

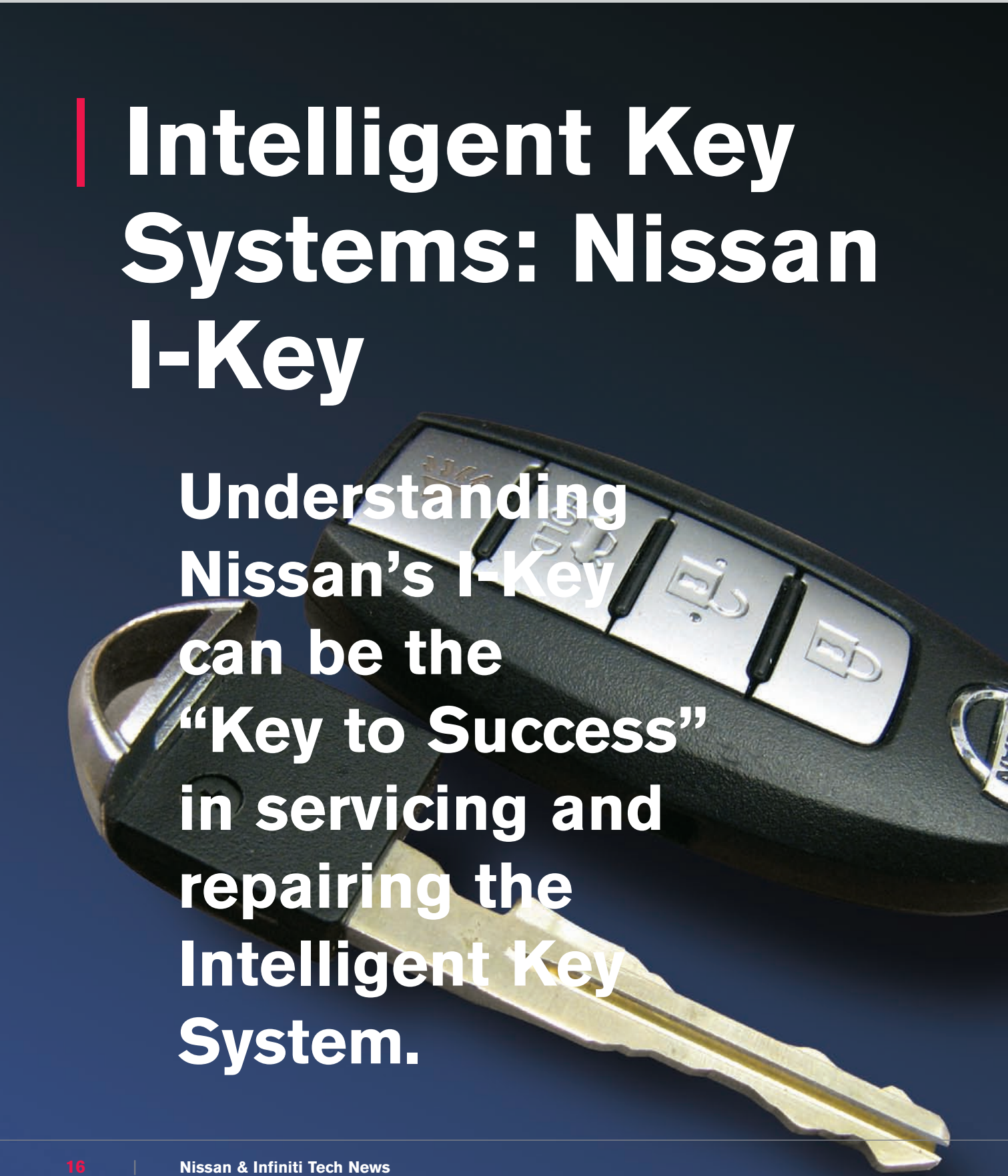
For instance, if you look at a typical driver's air bag module trouble tree, it may seem at first that the procedure is to test the clock spring with an ohmmeter, then replace the airbag, harness, and control unit. However, if you read carefully, you'll find the intent was to recheck for trouble codes at the end of each step. Don't assume important information will be repeated with each step. Read from top to bottom and pay close attention.

## Post Collision Repair

Non-specializing body shops often need help with SRS repairs. You may get calls asking if you "have the special tool to turn off the SRS light." After a collision with airbag activation, several components will need to be replaced to restore system function. You'll find a list of which components to replace in the SRS Airbag section of the manual. The list will vary, depending on the type of impact. Permanent codes will set and cannot be reset with the scan tool or by removing power; the component must be replaced to clear the fault.

Used or "remanufactured" components should never be used. Just because it may be possible to clear permanent codes with a bit of hacking, does not make it a good idea. The idea behind permanent codes is to protect the user from driving with an unreliable component. Erasing the warning and sending the car out in an unsafe condition is unethical, probably illegal, and certainly a liability.

# Intelligent Key Systems: Nissan I-Key



## Understanding Nissan's I-Key can be the "Key to Success" in servicing and repairing the Intelligent Key System.

Intelligent Key (I-Key) systems are becoming a very popular option, but when they stop working, vehicle owners can't help but notice. The ability to diagnose and repair Intelligent Key systems provides an opportunity to showcase your high-tech proficiency to customers.

## A Battle of Wits: Intelligent Technicians vs. Intelligent Key Systems

One of the chief impediments to good technician productivity is overcoming the knowledge gap when encountering a new system. A diagnosis may very well be "simple" if you already know the players involved and their modus operandi, but if you don't know what should be happening, diagnosing the simplest of customer concerns can suck up a lot of time. This article will provide an overview of I-Key systems to help build familiarity and offer a leg-up on your next I-Key encounter.

When an artist begins a painting, he starts with a rough outline of the whole scene. Once the positions of all the elements are roughed in, he can start filling in the details. If instead, he were to start by drawing a single element in detail, he might find that it's too large or small or in the wrong position as work continues, and all the work he put into it would be wasted.

The same approach should be taken when diagnosing a system: First, look at the system as a whole to determine where to focus effort. Start with broad brush strokes: What components are involved? What are their roles? How do they interact? Knowledge of the overall function allows you to focus detailed testing in the appropriate area. Testing components without a logical reason will likely lead to a lot of unnecessary and time-consuming testing.

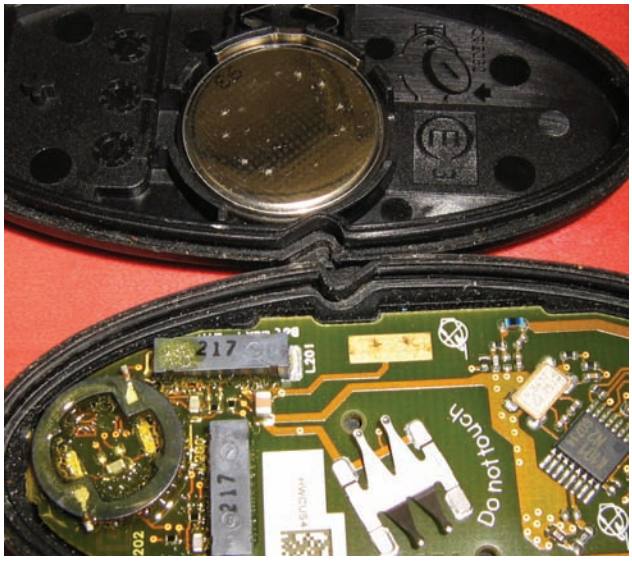
## What is an I-Key System?

An I-Key system is a passive entry, starting, and vehicle customization system. A driver can unlock the doors and trunk, start the car, and restore memorized seat and mirror adjustments without ever removing the I-Key from his pocket. Typically, each registered key can have a separate set of user preferences stored in the BCM, which can either be memorized during use or programmed via the CONSULT.

## Components of an I-Key System

### I-Key

The I-Key looks similar to a standard keyless entry remote. It typically will have lock, unlock, and trunk buttons. However, unlike a standard keyless entry system, the user does not need to press these buttons to enter the car. The I-Key responds to ID requests issued by interior or exterior key antennas. Each I-Key stores its unique ID number and a vehicle ID number.




**The I Key will not work without a good battery.**

The I-Key is powered with an internal 3V battery, and cannot receive or transmit without power. The most common "failure" of the I-Key is the battery. Many Nissan and Infiniti cars have a handy low battery warning indicator on the dash to alert the driver (or technician) that the battery needs to be replaced. If either the I-Key battery or the vehicle's 12V battery goes dead, there is a mechanical key insert in the I-Key that will allow emergency entry. Typically, up to four I-Keys

can be registered to a vehicle, and once an I-Key has been registered to a particular vehicle, it cannot be registered to another, just as once a conventional key is cut, it cannot be cut again.

## Exterior Key Antenna

There are typically three exterior key antennas: one for the driver's door, one for the passenger front door, and one for the trunk/hatch area. Each has a range of about three feet. The key antennas broadcast a request periodically. It asks something like, "Is there an I-Key within my detection zone?" The antennas will continue this request over and over. If a key is detected, the antenna will ask, "What is your ID number?" If the ID matches, access will be granted. If no keys are detected for a while, the request will become less frequent to save power. If no keys respond for a very long time, the key antenna will go to sleep until the door handle is touched.

## Touch Sensors

Touch sensors are built into the driver's and passenger's front door handles, and sometimes the hatch handle, although usually the hatch handle is a push switch instead. The reason for the touch sensor is to alert the car that the driver wants to get in, and isn't just passing by (you wouldn't want your car to unlock every time you walked past, would you?). If the key antennas aren't asleep, the door lock actuator will typically unlock the door before the handle can be pulled, so the passive entry is pretty seamless. On cars with a rear hatch switch, the experience is a little different. The handle must be pulled twice to open the hatch, once to alert the BCM that the driver wants to get in, and again to pull the hatch up.

## Interior Key Antennas

Interior key antennas work just like the exterior key antennas. There are usually three detection zones: the driver's seat, the front passenger's seat, and the trunk/hatch area. The interior antennas don't start to cycle until they either receive a signal from the door switch, or a key is authenticated after communicating with the exterior key antenna (depending on the vehicle).

There's no point in using battery power to cycle the interior antennas until they are needed. If a driver enters the car, but does not try to start it for quite some time, the interior antennas will stop cycling to save power, but once the Push Button Ignition Switch is pressed, the antennas will resume cycling again.

## Push Button Ignition Switch

The Push Button Ignition Switch (Start Button) and brake pedal switch are used to select the power mode, just like the ignition switch did (and does) on vehicles without I-Key systems. Like ignition switch-equipped vehicles, there are four modes of power:

1. **OFF/LOCK**
2. **ACCESSORY**
3. **ON**
4. **RUN/READY**


The Start Button is a redundant switch, capable of setting a code if one of its switches changes and the other does not. The Start Button is also an output, and indicates the power mode through the familiar ignition switch markings: LOCK, ACC and ON.

Assuming a registered key has been detected in the vehicle, a single press of the Start Button without stepping on the brake will switch the power mode to ACC. If the button is pressed again, the power mode will change to ON. If the brake pedal is pressed and the Start Button is pressed again, the engine will start up (or READY on hybrid vehicles). It is possible (and typical) to bypass ACC and ON, and go straight from OFF to RUN/READY by stepping on the brake and pressing the Start Button after entering the vehicle.


**It may be hard to tell when hybrid vehicles "start". Check the Ready light to determine whether the power mode has changed and the car is "running."**


**The key slot is not just a "holder".**

## Key Slot

The key slot is not just a "holder" for the I-Key. The slot has a switch so the BCM can tell whether or not the key is inserted into the slot, and it also has an antenna/amp that can communicate with I-Key, even if the I-Key battery is dead or missing. This provides a way for the owner to get home should his I-Key battery go dead. Knowing this type of information can make you a hero to call-in customers.

## Brake Switch

You may have already realized this, but a bad brake switch will cause a no-start. It is an important input for the I-Key system. Usually the same switch is used for both the brake lights and the I-Key system, so it's easy enough to check quickly.

## Door Switches

The door switches are not just for courtesy lights anymore, they are also an important input for the I-Key system. On some vehicles, the door switch signal alerts the BCM to begin cycling the internal key antennas. The door switch also alerts the BCM if the driver is exiting the car, which allows for warnings, if necessary, and passive door locking.

**Door switches are important inputs on modern cars.**

## Transmission Range Switch (or Parking Pawl Position Learn on Hybrid Vehicles)

The engine will not start (or READY on hybrid vehicles) if the parking pawl is not engaged. The shift position switch and circuit must be functional (and the vehicle must be in Park) in order to start the car. This is usually easily checked by looking at the dashboard indicator, and most vehicles with the I-Key system will display a warning message indicating Park should be engaged before trying to start. A low 12V battery can cause an incomplete cycle of the parking pawl servo on hybrid


**The transaxle must be in park to start the engine or Ready.**

vehicles, and then a no-start after 12V power is restored. Cycling in and out of park will allow the parking pawl position to be re-learned, and the car will then READY.

## BCM

The Body Control Module is typically the primary controller for the I-Key system. It communicates with the I-Key through the antennas, monitors I-Key inputs, requests the Intelligent Power Distribution Module (IDPM) to change power mode among OFF, ACC, and ON, and performs mutual NVIS/IMMOBILIZER authentication with the ECM (or HV ECU on hybrid vehicles) to allow RUN or READY.

## IPDM

The IPDM is a multi-function device, but as it relates the I-Key system, it is a control unit that contains integral relays that supplant the need for a traditional ignition switch. Think of it as the ignition switch with a "brain" that follows orders issued by the BCM.

## ECM/HV ECU

The BCM and IPDM work together to control the power mode, but in order to start the engine or READY, the ECM or HV ECU must approve. Typically, the BCM holds one ID code for the I-Key, and the ECM or HV ECU hold the other ID code for the Nissan Vehicle Immobilizer System (NVIS). If an I-Key, BCM, or ECM/HV ECU is replaced, the other components must be "told" about it with the CONSULT. If not, the car will not start after the replacement.

## Behaviors

If the I-Key is removed from the vehicle, the power mode will not change. So, if the driver exits the vehicle with the power mode in ACC or ON, the 12V battery may be dead upon his return, although some vehicles have an ACC time-out that may save the battery from complete discharge. If the I-Key is taken from the car after starting, the car will continue to run and drive, but will not restart unless the I-Key is returned to the cabin.

Power mode is also retained if the 12V battery is disconnected, or if it discharges. If you find a vehicle that is in ACC or ON after connecting a jumper pack, you have probably also found the reason for the discharged battery.

Warning beepers sound to alert the user of bad choices, such as exiting the vehicle with the I-Key while in ACC or ON, trying to lock the key in the car, or failing to engage Park before getting out of the car. But not all poor choices result in a warning. For instance, it's possible to pass the key through the window to a friend and then drive away without the key. All of this type of information can be found in the owner's manual, and may not seem appropriate for a technical article. However, you'll likely find the majority of I-Key customer complaints, such as, "It was making a beeping noise as I left, and when I came back it wouldn't start," can be solved with information found in the owner's manual.

## Putting Your I-Key Knowledge to Work

Once you've verified the customer complaint as described (hopefully accurately and in good detail), the first step is to determine whether or not the condition is abnormal. If it is, take inventory of which functions are working and which are not. For instance, if the customer states that he cannot enter the driver's door with the I-Key in his pocket, don't just verify that the complaint is accurate; check other functions as well. Can you enter through the passenger side? Does the unlock button on the I-Key work? Does the trunk open? Does the driver's actuator cycle with the interior lock button? You get the idea -- by finding out what's working and what's not, you can overlay your knowledge of the I-Key system players and their roles, and focus your attention accordingly.

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SHIFT_the way you move

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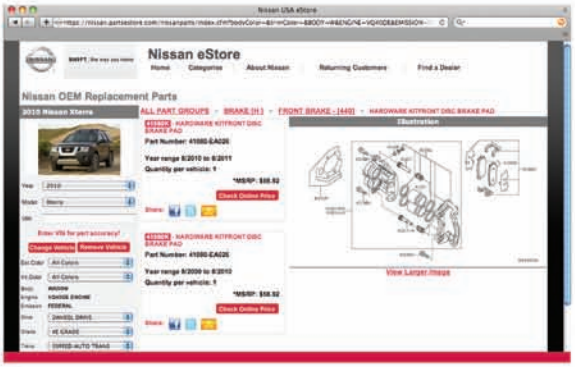
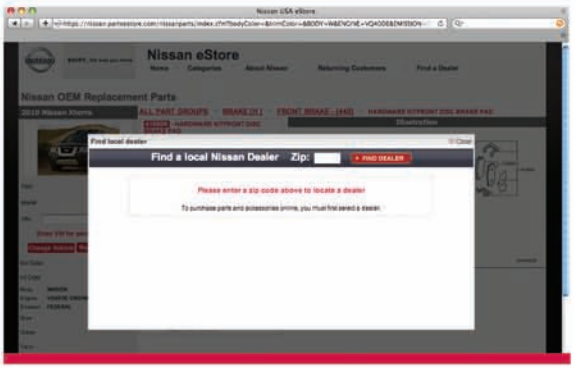


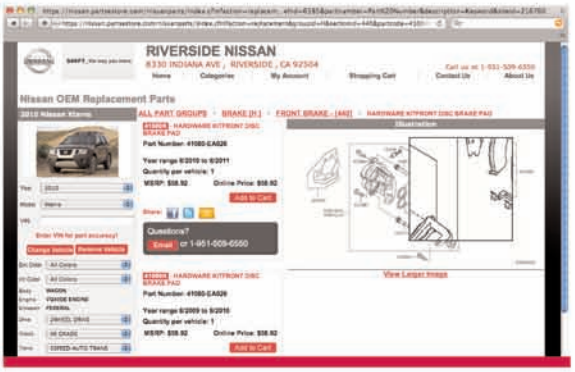

### Ready.

Enter your vehicle model and year. Select the specific category for the part you need. This is also a great time to identify other possible components you may need to properly complete the job. Choose your specific parts required. Add these parts to your shopping cart.




### Set.

If you are new customer, enter your Zip code to see the closest dealers to you. Choose a dealer, submit your account information, then the dealer will set custom pricing for your shop and e-mail you a confirmation. As a returning customer you'll be able to immediately access your dealer specific webpage and custom pricing.




### Click.

Once you're logged in, the chosen part(s) are still in your in box, but now the custom pricing of that dealer is shown. Once added to the shopping cart you can continue to checkout.

NISSAN INFINITI

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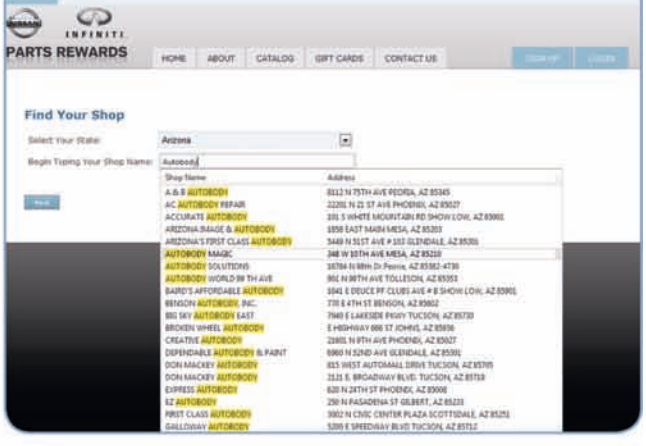
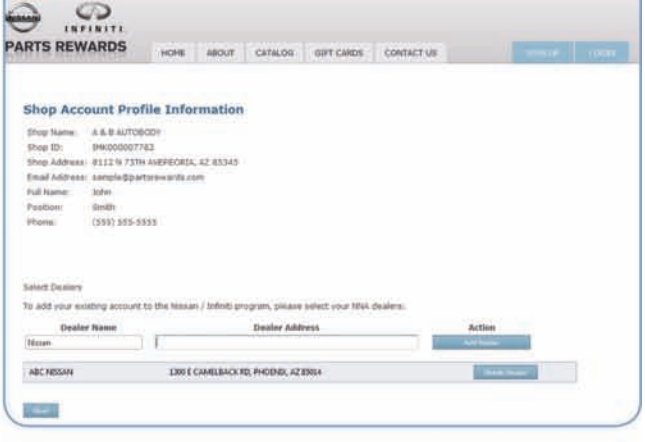
**1 Select "SIGN UP HERE"**


**2 Find Your Shop**
Select your State and begin typing your shop name



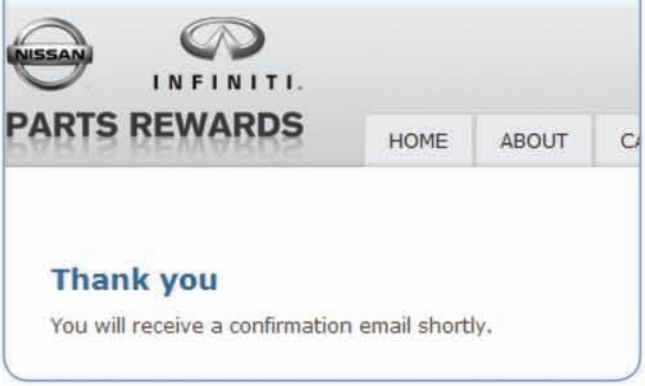

**3 Enter your contact information**


**4 Select the Nissan and Infiniti dealers you work with.**
Begin typing a dealers name and select "Add Dealer"




Want to learn more? Send us an email at: **info@NissanPartsRewards.com or info@InfinitiPartsRewards.com** Or call us at: 866.888.1077 (toll free)

**5** **You will receive an e-mail with your account details**




**6** **If you are unable to find your Shop**

- Finish typing your business name and select "NEXT"
- Enter your Shop address and Contact information and select your Nissan and Infiniti dealers
- We will telephone you to complete your enrollment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# TPMS Updates


**Tire Pressure Monitor Systems (TPMS) can be a confusing issue for technicians. Here are some recent updates and clarifications from Nissan to help you better understand and service Nissan and Infiniti vehicles.**

## Inflating Tires Equipped with TPMS

Improper use of tire inflator tools can break the stem of a TPMS sensor. Broken sensor stems are not covered by the vehicle warranty. Nissan does not recommend the use of the following tools for inflating tires with a TPMS sensor because they can cause damage to or break sensor stems:

- Long heavy hoses with a lock-on air chuck.
- Deep well or dual head air chucks.
- Air chucks with handles or extensions.

***These air inflation tools are recommended:***

- Shallow well air chucks.
- Air chucks with flexible hoses (no extensions).

## Aftermarket Tire Sealants

Aftermarket tire sealants and/or aerosol repair kits should not be used (refer to the vehicle's Owner's Manual) because they contain chemicals and propellants that can cause damage to the sensor system.

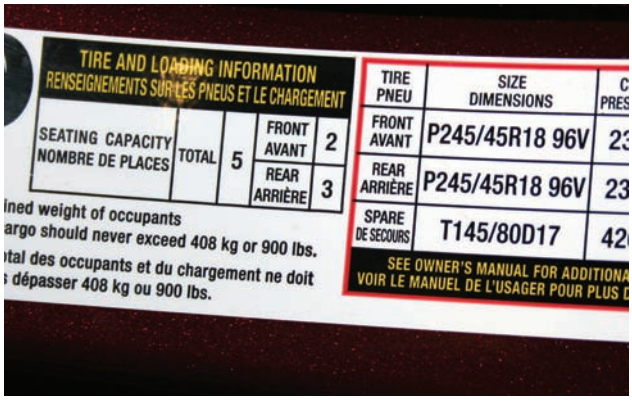
Damage caused by the use of aftermarket tire sealants contrary to recommendations in the vehicle's Owner's Manual is not covered by the Nissan New Vehicle Limited Warranty.

Refer to Nissan Service Bulletin NTB10-114a for more information.

## Tire Pressure Information for Vehicles with TPMS

The Low Tire Pressure Warning Lamp will illuminate continuously (not flashing) if the tire pressure is low in any of the four tires. This is not an indication of a malfunction. Rather, it is a signal to the driver that the tire pressure must be adjusted. The tire pressure must be adjusted/corrected to or above the pressure shown on the TIRE AND LOADING INFORMATION label before the Low Tire Pressure Warning Lamp will go off.

The TIRE PRESSURE AND LOADING INFORMATION label lists the COLD tire pressure setting for the original tires on the specific vehicle. NOTE: Tires are




**The TIRE PRESSURE AND LOADING INFORMATION label is located on the driver's door frame.**

considered COLD after the vehicle has been parked for three or more hours or driven less than one mile at moderate speeds.

When setting or adjusting tire pressure, make sure to use an accurate tire pressure gauge. Use the following information for reference:

## Temperature

- Tire pressure changes approximately 0.8 psi for every 10°F of temperature change. As temperature decreases, pressure decreases.
- Tire pressure may change 3-5 psi between a COLD reading and a reading taken just after the vehicle has been driven for several miles.
- Seasonal temperature change can result in tire pressure that is low enough to turn on the Low Tire Pressure Warning Lamp.

***Example 1 – Seasonal Temperature Changes***

- The temperature of the vehicle is 70°F after sitting in the shop.
- Ambient temperature outside the shop is 30°F due to seasonal change.
- Recommended pressure on the TIRE AND LOADING INFORMATION label is 35 psi.

The tire pressure should be compensated an additional +3 psi and adjusted to 38 psi to avoid dropping below the label value when the vehicle experiences cooler ambient air temperature.

***Example 2 – WARM Tires***

- A vehicle arrives at the shop after being driven across town.
- The WARM tire pressure reading is 32 psi.
- Recommended COLD pressure on the TIRE AND LOADING INFORMATION label is 35 psi.

The tire pressure should be compensated an additional +3 psi and adjusted to 38 psi to avoid dropping below the label value when the tires cool.

## Natural Tire Pressure Loss over Time

Vehicle tire pressure can naturally decrease by 1.0 – 1.5 psi per month. This will vary due to seasonal temperature change. After six to eight months, tire pressure may be low enough to turn on the Low Tire Pressure Warning Lamp.

## High Altitude

At high altitude locations, a standard tire pressure gauge may show the tire pressure higher than the TPMS system. If the gauge reading is not accounted for, it could result in turning on the Low Tire Pressure Warning Lamp. Standard tire pressure gauge readings increase about 1.0 psi for every 2,200 ft. of altitude increase above sea level (up to 10,000 ft.).

For example, if the TIRE AND LOADING INFORMATION label reads 33 psi, then at an elevation of 5,280 ft., the COLD inflation pressure using a gauge should be increased 2.5 psi to 35.5 psi.

**NOTE: After correcting the tire pressure, the vehicle may need to be driven at speeds above 16 mph to activate the TPMS and turn off the Low Tire Pressure Warning Lamp. If pressure compensation for temperature is used, the pressure should be re-checked and adjusted at a later time when the tires are COLD.**

Refer to Nissan Service Bulletin NTB08-033c for more information.

## TPMS Sensor Seal Leaks

When repairing a TPMS stem seal leak, you can replace just the seal, rather than the entire sensor. Do not replace the entire sensor when only a seal is needed. Please refer to the chart below when ordering the proper seal.

Refer to Nissan Service Bulletin NTB08-032 for more information.

As always, for the latest complete service information on the specific vehicle you are servicing, visit the Nissan Tech Info website at www.nissan-techinfo.com or the Infiniti Tech Info website at www.infiniti-techinfo.com.

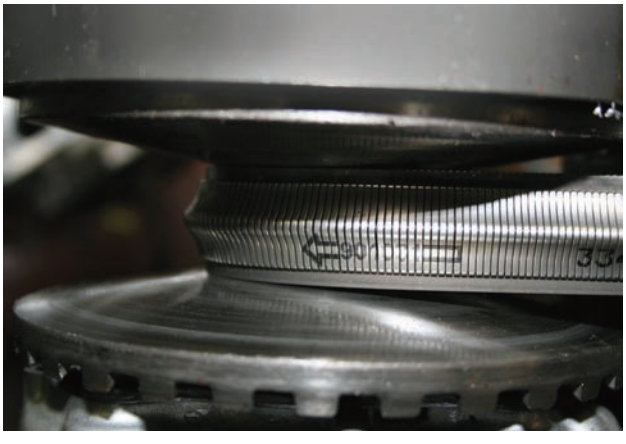
# Continuously Variable Technologies

**Let's take a look at Nissan's Continuously Variable Transmission, including a basic overview of its design, and focus on the independent repair shop's role in servicing, diagnosing, and repairing this different means of applying twisting power.**

The Continuously Variable Transmission has been around since Leonardo Da Vinci conceived it during the Renaissance. Of course, then there were no machine tools to manufacture it, and no possible applications if you could. Nissan has taken the concept and implemented it to a greater degree than any other vehicle manufacturer. With nearly infinite gear ratios, Nissan is capitalizing on what no other type of transmission can do. The CVT eliminates the primary problem with the internal combustion engine: the fact that peak power and efficiency only occur at a certain RPM ranges. With today's heightened concern over mpg and emissions, there's no wonder why Nissan is using the CVT in many of its new vehicle applications. Will you be prepared to service and repair this next generation of transmission technology?

## How it Works

Briefly described, the CVT transmission uses a belt and two pulleys to create different gear ratios. One pulley performs the "input shaft" function, and the other pulley behaves like the "output shaft" on a standard transmission. Each pulley is composed of two moveable conical discs that slide together or apart on an axle (traditionally, these were called "split sheaves"). The Transmission Control Module (TCM) commands one set of discs to move closer or farther away from each other, which will cause the belt to ride higher or lower on the pulley face effectively changing its working diameter. Both pulleys constantly resize, creating different transmission ratios at the whim of the TCM.



**The CVT belt rides between two actuated pully halves, one set show here.**

The computer uses various sensor inputs to calculate the necessary pulley positions.

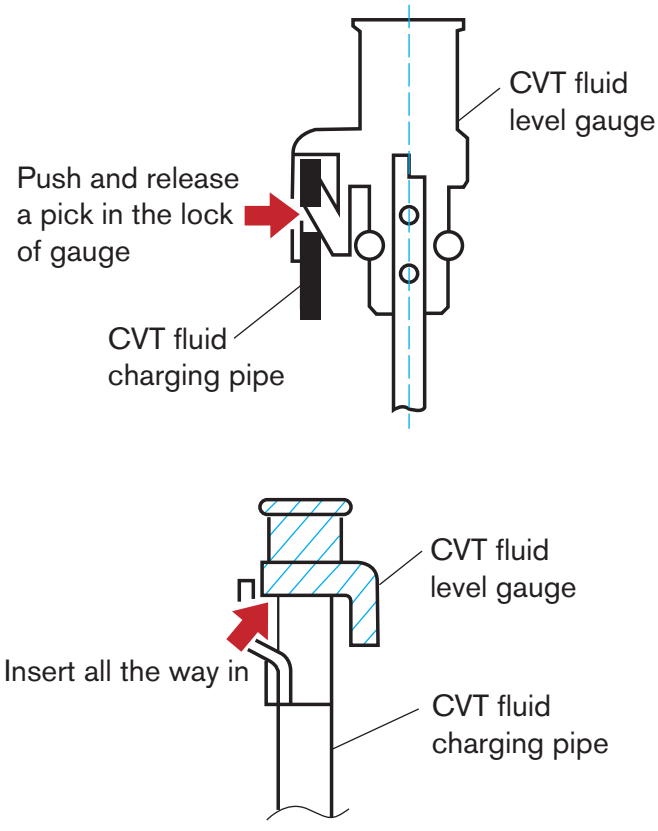
The belt is an impressive, snakeskin-looking band made up of hundreds of tiny metal plates conjoined with high-strength steel bands. The belt pushes against itself to transmit force, rather than the standard "pulling" behavior of an accessory drive belt. As a result, it lasts longer and should not ever require service or adjustment because of stretching. Wear is minimized by the specialty CVT fluid, which is formulated to prevent the metal of the belt from directly contacting and wearing away the pulley surfaces. Failure to use the genuine NS-2 fluid will damage the transmission, not to mention void your customer's warranty. It may be tempting to use a "multi-purpose" ATF in your customer's CVT transmission considering the cost of NS-2: **Don't do it!**

Considering the potential for error, most CVT-equipped Nissan vehicles do not have a standard dipstick for checking the fluid level and condition. This prevents vehicle owners from inadvertently damaging their transmissions by adding ordinary fluid, but it also requires the use of a shop tool to access the tube as a fill point for service.

## CVT Maintenance

Nissan uses three different types of CVTs depending upon the vehicle's requirements. The smallest unit, CVT1 (designated JF009E), is found on the Versa and Cube models. The middle unit, CVT2 (designated JF001E), is used for the mid-level Sentra, Rogue and Altima 2.5L models. The largest unit, CVT3 (designated JF010E), is strong enough to handle the power of Nissan's world-famous V6 in the Murano, Maxima, and Altima models.

To check the fluid level and condition of any of the CVT units, begin by warming up the transmission to operating temperature (between 122 and 176 deg. F.). As usual, park the vehicle on a level surface, but before turning off the engine you should move the shift selector lever throughout the entire shift range and return it to the "P" position. Locate the CVT fluid level gauge, which will have a locking mechanism that requires the use of a small pick to release the dipstick. Remove the dipstick, wipe it off, and rotate the stick 180 degrees prior to reinserting so it doesn't lock. Check the level and note the condition. Add fluid through this tube, which Nissan calls the "charging pipe," as necessary.




**The NIssan CVT dipstick is designed to lock in place to prevent an unfamiliar technician or operator from adding incorrect fluid**

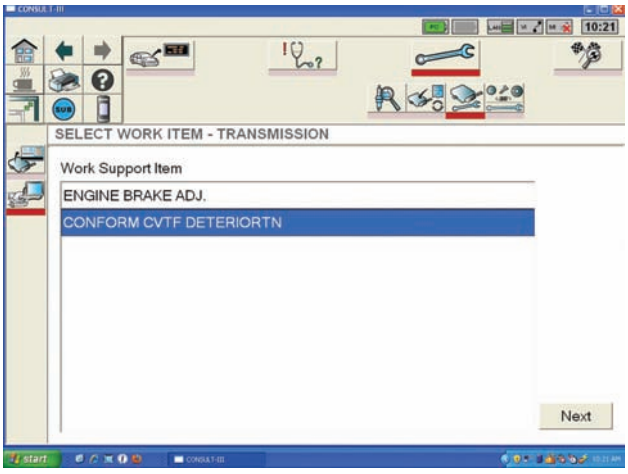
For any CVT unit, Nissan does not have an official drain and fill interval for service, even under severe operating conditions. The only printed requirement is a 15,000-mile inspection of the fluid level and condition. Consult the chart below to determine whether the fluid condition requires service. Some independent shops may adopt a preventive maintenance schedule, but be mindful that the drain procedure requires more labor than it would on a typical automatic transmission and that the fluid is much more expensive!

The CONSULT also includes a work-support function that will check the fluid condition as inferred by the TCM, based on drive cycles and history of calculated load. Connect the CONSULT, enter work-support mode, and check the value for CONFORM CVTF DETERIORTN. A value greater than 21000 requires fluid service.

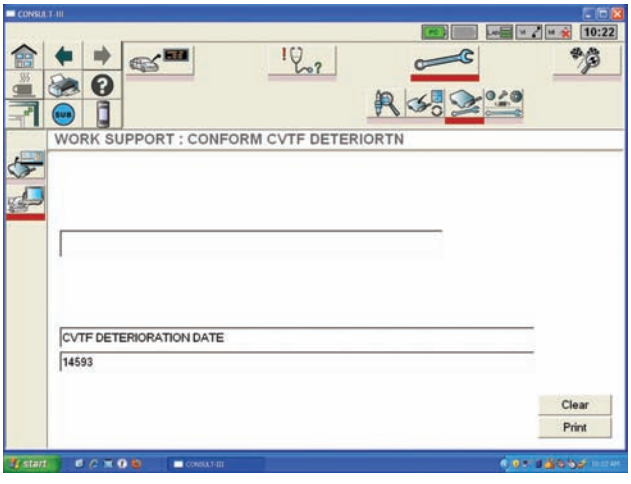
If the CVT requires service, ensure that the fluid is at operating temperature as mentioned earlier, and locate the outlet cooler line at the radiator. With the engine idling, remove the outlet cooler line and start draining the CVT fluid. At the same time, fill the charging pipe until new fluid comes through the cooler line. Use genuine Nissan NS-2 fluid ONLY! NOTE: About 30-50% extra fluid will be required for this procedure, so be certain to over-estimate the fluid parts cost when discussing the service with your customers. Reconnect the cooler lines, recheck the fluid level, then finish the CVT fluid service by using the CONSULT to clear the above-mentioned value for CVT fluid deterioration. Failure to clear this value may cause unneeded service in the future.

| Fluid status | Conceivable cause | Required operation |
|---|---|---|
| Varnished (viscous varnish state) | CVT fluid becomes degraded due to high temperatures | Replace the CVT fluid and check the CVT main unit and the vehicle for malfunctions (wire harnesses, cooler pipes, etc.) |
| Milky white or cloudy | Water in the fluid | Replace the CVT fluid and check for places where water is getting in |
| Large amount of metal powder mixed in | Unusual wear of sliding parts within CVT | Replace the CVT fluid and check for improper operation of the CVT |

**Nissan has published a chart to aid in determining whether or not a CVT requires fluid service**




**Use the CONSULT to check the health of the CVT fluid according to the transmission control module. Access work support, then find the value.**




**Even if the fluid looks okay, if the value of this field is greater than 21000, you should service the transmission. This transmission's fluid is still within the interval. Use the same window used to clear the fluid deterioration value after service.**

According to the Nissan service manual, repeat the above fluid service twice to perform an official CVT fluid flush. DO NOT use an aftermarket transmission flush machine or fluid exchanger, and do not use any transmission fluid additives. It will damage the CVT unit and void your customer's warranty.

## Common CVT Problems and Their Diagnosis

Any major CVT malfunction will likely turn the MIL on with useful DTC information. First, check the fluid level and condition as discussed earlier. Then, connect the CONSULT to the vehicle and run an all-systems call to find relevant DTCs. According to Nissan TSBs, CVT failure typically occurs in one of the following manners: a control issue, a physical transmission defect, or both. Before we proceed with common scenarios, refer to TSB# NTB11-043, which applies to all CVT transmissions from 2007 up. It states that prior to any replacement of the TCM, even as recommended in the repair manual, the additional diagnostic steps of this TSB must be followed. For DTCs P1722 and P0725, there may be other sensor inputs causing problems that must be investigated and repaired prior to condemning the TCM. If P1722 is stored, there could be a malfunction with one of the ABS/VDC sensors or its wiring. If P0725 is stored, there could be a malfunction with the crankshaft position sensor or its wiring. In either case, if the code is accompanied by U1000, there is likely a problem with the CAN communication lines between the TCM and the ECU or ABS computers. Avoid costly and unnecessary repairs by staying up-to-date with the latest TSBs online at www.nissan-techinfo.com
CVT control malfunctions can occur when the TCM or the sensors it relies upon fail. Some failures of the TCM are software-related, and Nissan includes a procedure to reflash the computer without having to replace the transmission control unit. Sometimes, if the transaxle is replaced, TCM reprogramming or replacement may be necessary to complete the repair. Check for TSBs that apply to the vehicle you are currently working on, which will include instruction on how to perform the reflash. Refer also to the March 2011 issue of Nissan & Infiniti Tech News for in-depth information about reflash procedures.

Sometimes, TCM Initialization is required – which is different from reprogramming – and may be necessary after CVT replacement without replacing the TCM, or when using a TCM from another vehicle. First, park the car, and turn the key to engine OFF. Connect the CONSULT, navigate to transmission control, then to the special functions sub menu. For reference, select the TCM part number and calibration data and print a copy. Start the initialization procedure by doing the following:

1. Select Transmission Self-Diagnostic Results.

2. Press and hold the brake pedal.

3. Shift the selector lever to Reverse.

4. Press and hold the accelerator pedal down about one-third, but no more than halfway. The purpose of this step is to get both the wide open throttle and closed throttle position signals to read OFF at the same time.

5. Press Erase.

6. Shift the selector lever to Park. Observe the shift selector position display. There will be a delay for "P" to illuminate if the Initialization was successful. If there was no delay, perform steps 1-5 again. Turn off the ignition for at least five seconds, then verify success and clear all DTCs.

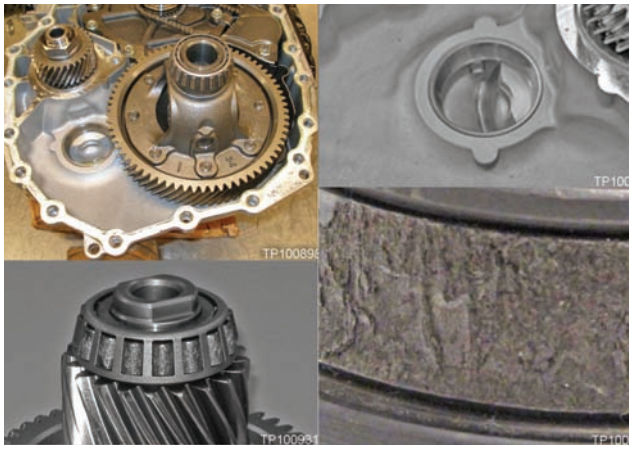
## Heavy Lifting: CVT Replacement and Overhaul

When does the transaxle have to be replaced? Usually the customer complaint will include a description of sluggishness or slow acceleration. Check for DTCs, even if the MIL is not on. For example, a sluggish Murano may have a bad CVT unit with P0868 stored, but this fault won't illuminate the MIL. In this particular instance, the valve body can be replaced with upgraded parts. If your shop is equipped to rebuild automatic transmissions, this procedure may be a viable alternative to total CVT replacement.

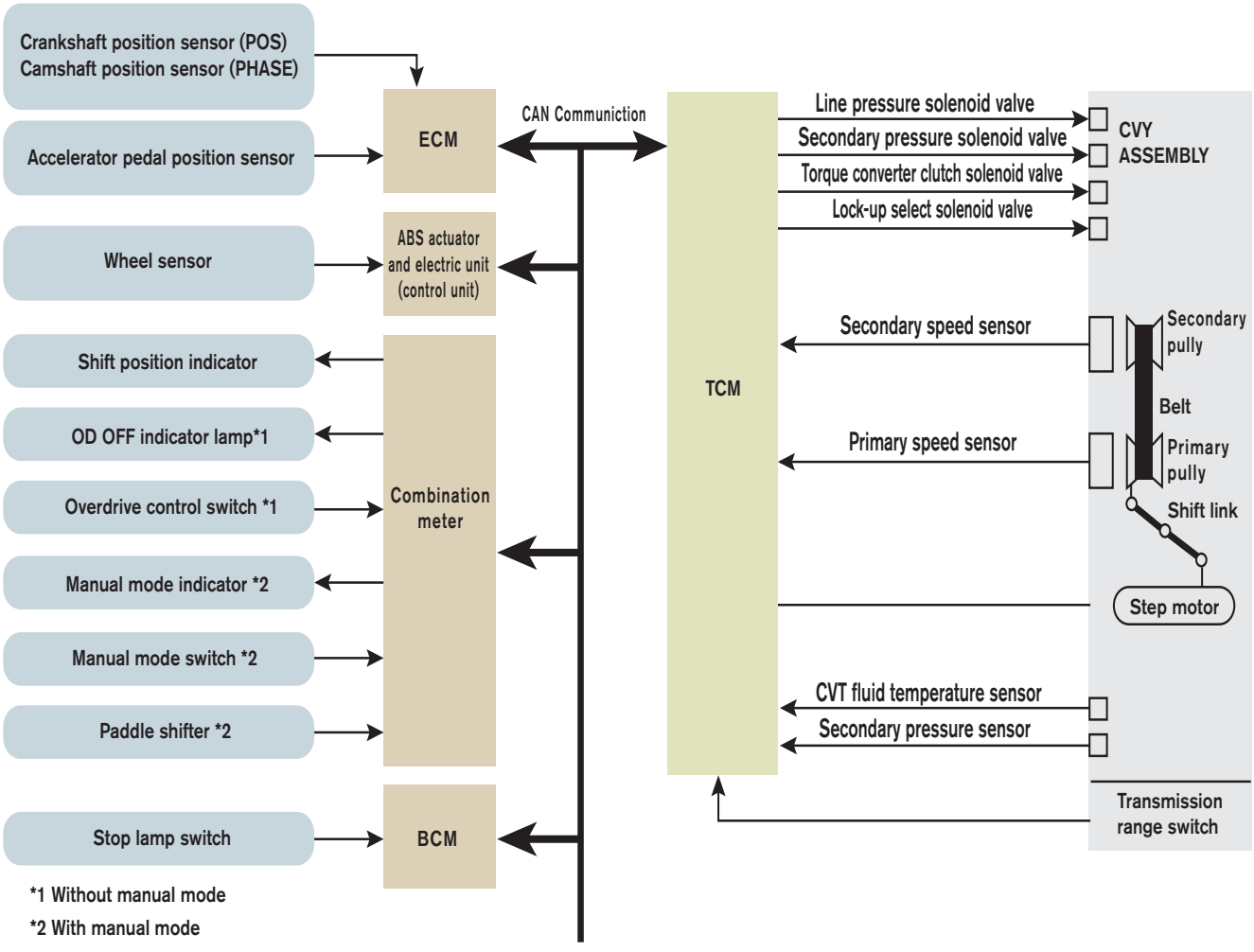
Some internal failures of the CVT2 found in the Sentra, for example, may result in a whine or grind noise that changes in pitch with acceleration, or persists at highway speeds. This failure is mechanical and won't set a fault. Again, if your shop is inclined to overhaul transmissions, follow the Nissan published procedures for complete CVT disassembly, inspection, and repair. Bear this in mind, however, that servicing the Nissan CVT requires special service tools in order to pull bearings or races. You will also need to calculate the size of the shims used in the overhaul, and the CONSULT-III includes an application for this. Without the special service tools and the CONSULT, your shop should replace the entire CVT unit instead.

Be certain to perform traditional diagnostic checks first. Access the ECU for faults and check for individual part failure. The customer's complaint may be caused by a bad wiring harness on that particular circuit, or the part itself. DTCs P0845 and P0840 correspond to the two pressure sensors that the TCM uses to make gear ratio decisions. Many times the TCM is at fault for interpreting the signals incorrectly, but be sure to verify that the sensors are operating within published specifications. It would be wasteful to replace the TCM or perform a recalibration before checking whether or not the sensor works in the first place.

The CVT also uses a torque converter, which can fail to lock up in the same manner as typical automatic transmission systems. If P0744 is stored, the transmission may indeed be slipping; however, there could also be the possibility that the TCM cannot perform the lock-up if the torque converter clutch (TCC) lock solenoid is bad. Perform simple checks to confirm that the solenoid actuates when commanded, and that the clutch locks. Be sure to clear the fault, too, if it's the first recorded incident of failure. Test drive the vehicle with the CONSULT, and monitor live data PIDs to see if DTC P0744 returns immediately under the right circumstances (accelerator pedal depressed at least one eighth, transmission in "D", constant speed greater than 25 mph). If the problem is very intermittent, you may be replacing the transmission unit or the lock-up solenoid prematurely on a "hunch."



**Inspecting the differential reduction gear roller bearing. Be warned! If there is similar damage on both the roller bearings and the inner race, and the outer race can be moved by hand within the CVT case, there is no overhaul possible. You must purchase a new CVT unit.**




**CVT operation depends on many inputs from CAN communications, as well as typical on-board control solenoids. Be sure to verify all systems are operational before condemning the transmission itself.**

The CVT may start leaking fluid eventually. The independent shop needs to be able to identify and repair possible external fluid leaks. Axle seals, case joints, switches or sensors can all leak the expensive NS-2 fluid. Nissan has actually released a special TSB about leak detection on CVTs, and that fluorescent dye should be used to distinguish between CVT fluid and factory lubricants used at the time of assembly, or corrosion prevention chemicals. The recommended dye is available from Nissan Tech-Mate in a six-pack. Contact Tech-Mate at 1-800-662-2001 and order part number J-28431-6.

## The Future of Transmissions?

Considering the advantages of the CVT, it is an excellent advance in Nissan's continual efforts to increase the power and efficiency of its vehicles. The CVT contributes to better fuel economy because engine RPM stays fairly constant. Likewise, with lower engine speeds, there are fewer harmful exhaust emissions. Furthermore, a CVT has fewer moving parts than standard gear-driven automatic transmissions. The simplicity means decreased expenses for both manufacture and repair. Nissan has invested heavily in its CVTs, and you should plan to invest time and effort in learning to service them.

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