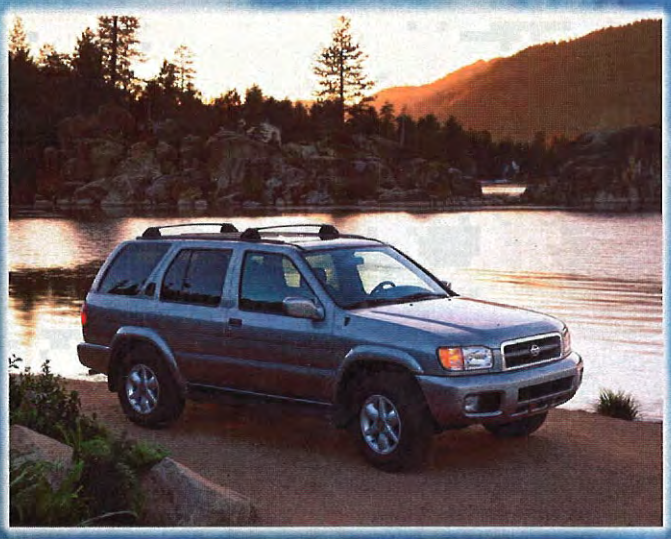
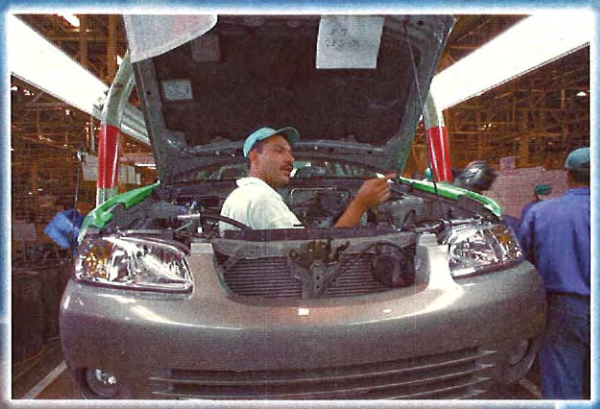
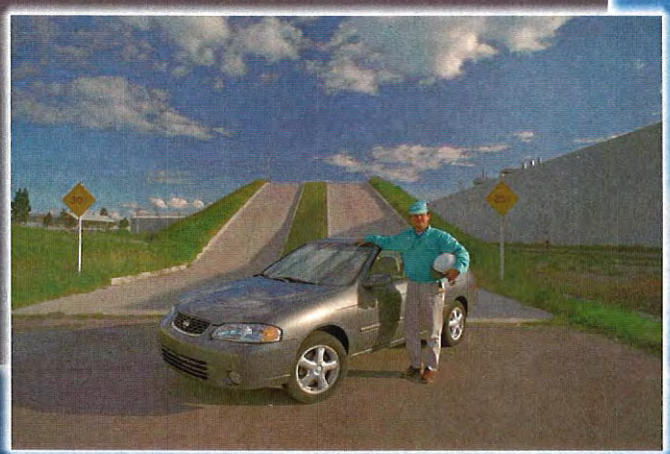


NISSAN



MODEL YEAR
2001 PATHFINDER

MODEL YEAR
2000 SENTRA

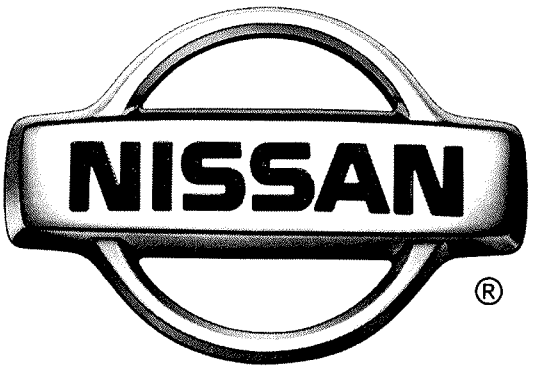


NEW MODEL TRAINING

GITN2001A

SENTRA 2000/PATHFINDER 2001 NEW MODEL

Technician's Guide



REVISED-MAY, 2000

This book is designed for instructional use only for authorized Nissan North America, Inc. and Nissan dealer personnel. For additional information contact:

Nissan North America, Inc.
Corporate Training Office
Technical Training
18501 S. Figueroa St.
Gardena, CA 90248-4500

Nissan North America, Inc.
Corporate Training Office
Technical Training

Printed in U.S.A. V.2.1

First Printing: February, 2000
Revised: April, 2000
Revised: May, 2000

WE ENCOURAGE PROFESSIONALISM
THROUGH TECHNICIAN CERTIFICATION

NATEF

This manual uses post consumer recycled fibers

Corporate Training Office

Technical Training

Nissan North America, Inc. reserves the right to alter specifications or methods at any time.

SENTRA 2000/PATHFINDER 2001
NEW MODEL

Table of Contents

SECTION 1: TEXT

Table of Contents (Continued)

SECTION 2: EXERCISES

SENTRA 2000/PATHFINDER 2001
NEW MODEL OBJECTIVES

BASIC INSPECTION AND ADJUSTMENT
Given a 2000 1.8 liter Sentra, perform a Basic Inspection and Adjustment.

TIMING CHAIN REMOVAL AND REPLACEMENT ON THE QG18DE ENGINE
Given a QG18DE engine and Electronic Service Manual, remove and replace the timing chain.

A/T FIELD TEST USING CONSULT-II
Given a vehicle equipped with an automatic transmission, perform the A/T field test using CONSULT-II.

HEATED OXYGEN SENSOR TEST USING CONSULT-II
Given a 2000 Sentra with the QG18DE engine, locate, identify, and test each of four Heated Oxygen Sensors using CONSULT-II.

ABS ACTIVE TEST USING CONSULT-II
Given a vehicle with ABS, diagnose malfunctions in the anti-lock system using CONSULT-II.

NATS KEY REGISTRATION USING CONSULT-II
Given a Vehicle equipped with the Nissan Anti-Theft System (NATS), properly register ignition keys using CONSULT-II.

TESTING BATTERIES, STARTERS, AND CHARGING SYSTEMS WITH THE MODEL 620 TESTER
Given a vehicle, properly perform a battery, starter, and charging system test using the Kent-Moore J-44373, Model 620.

DIAGNOSING EMISSION SYSTEM PROBLEMS USINGCONSULT-II
Given a vehicle with an emission system concern, verify the concern and record test data using CONSULT-II.

USING THE ELECTRONIC SERVICE MANUAL (ESM)
Given an ESM workstation, familiarize yourself with the basic controls of this system.

INSPECTING THE NISSAN CONTINUOUSLY VARIABLE VALVE TIMING CONTROL SYSTEM (NCVCS) USING CONSULT-II
Given a Pathfinder equipped with the VQ35DE engine, perform basic function test of NCVCS using CONSULT-II.

NOTES

NISSAN

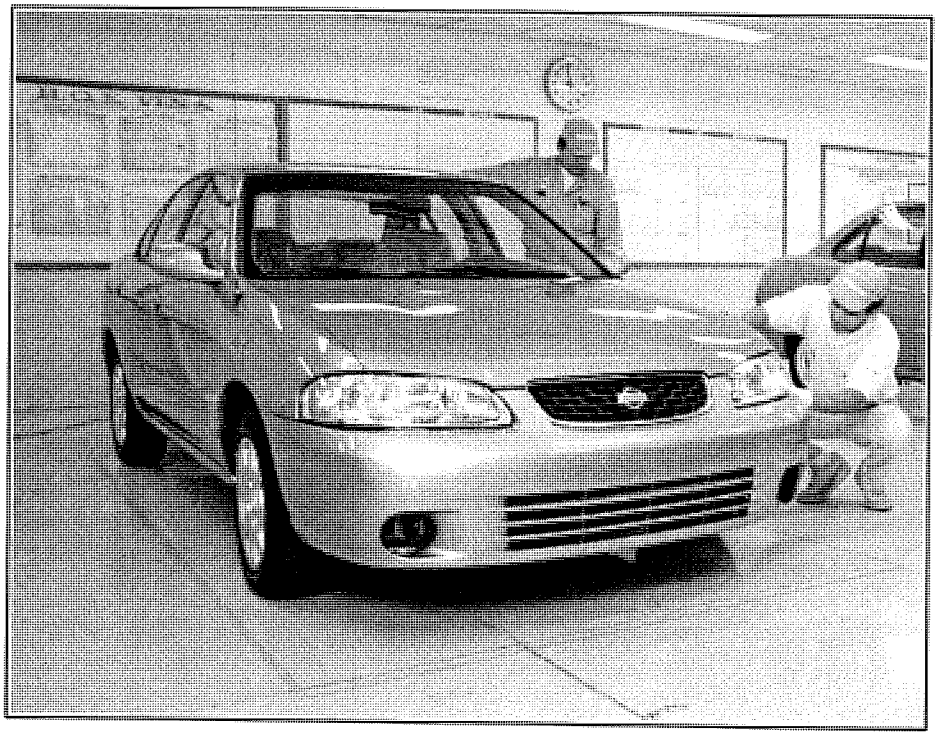
TEXT

NISSAN

2000 SENTRA
OVERVIEW

New Model Changes

The 2000 Sentra has been completely redesigned to meet the challenges of today's market. This reflects a major change in body style and design, along with improved performance and serviceability.



Improvements have been made in the following areas:

- New styling
- Enhanced performance
- Improved manual and automatic transmissions
- Improved suspension and steering
- New safety and security features
- Improved luxury and convenience features

100k Tune-up

The tuneup interval for the 2000 Sentra is 100,000 miles. This is made possible by the use of:

- Dual tipped platinum spark plugs
- NDIS (Nissan Direct Ignition System-1.8L only)

Engine

Both 1.8L and 2.0L engines use swirl control valves. These valves, located inside the intake manifold passage for each cylinder, change the velocity of air in the intake to optimize performance across the engine's entire rpm range.

Cooling System

- New standardized aluminum core radiator and no-reusable spring-type hose clamps
- Vehicles equipped with A/C come with two cooling fans. Vehicles without A/C come with a single fan. The cooling fans are controlled by the ECM (HI/LOW/OFF) based on:
  - Vehicle speed
  - Coolant temperature
  - A/C signal
  - A/C compressor discharge pressure

Lubrication

- Lubrication shower rail deleted from the 2.0L engine

Accelerator Control

- New accelerator cable routing (Refer to the ESM for adjustment specifications)
- Cable adjustment specifications changed

Fuel System

- New quick-release style connectors are added to the fuel system
- Lifetime fuel filter, housed in fuel pump module in the tank
- Fuel pump is mounted inside fuel filter to reduce noise
    - Accessed through a panel under the rear seat

Transmission and Clutch

Automatic Transmission

The RE4F03B automatic transaxle has the following improvements:

- The case and gears are strengthened to accept increased engine power
- The shift schedule is modified to improve acceleration after a turn
- A more efficient torque converter is used
- The torque converter lockup range is increased
- Adaptive TCM (transmission control module) is added to improve shifting
- ECM and TCM functions are integrated into PCM (Powertrain Control Module) for 1.8L engine with A/T

Manual Transmission

The manual transaxle has the following improvements:

- Double-cone synchronizers are added to first and second gears
- The 2.0L SE models with the optional performance package include VLSD (Viscous Limited Slip Differential)
- Hydraulic clutch control replaces clutch cable on the previous models

Brakes

The braking system has been updated for improved braking performance. Changes include:

- Larger brake drums and rotors
- Improved brake pads

ABS

The ABS has been redesigned to improve system performance. A new 4-channel, 4-sensor system replaces the older 3-channel, 4-sensor system. Also, the ABS combines the following into one unit:

- The ABS actuator
- Electronic control unit
- Relays

Steering and Suspension

The steering and suspension system has been improved to enhance steering stability, ride, and NVH:

- Improved steering gear mounting
- Modified front spring offset
- Modified strut damping force
- Modified bushing characteristics
- Added front strut tower bar (on SE models)
- Stiffer front suspension subframe and mounts
- Larger diameter rear stabilizer
- Stiffer rear suspension lateral link

Electrical

- A pigtail has been added to the starter to enhance serviceability
- The alternator amperage is increased by 20 Amperes to 100 Amperes

INTERIOR

Seat Construction

- Stronger seat frame
- Optional side air bags
- Rear seat release levers are moved into the trunk for more convenient access and better security

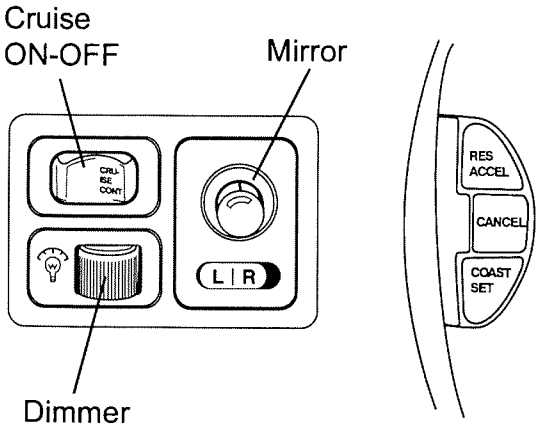
Restraint System

- Pretensioners with load limiters on both front seats
- Operates simultaneously with the air bag system
- Child seat tether anchors are now factory installed

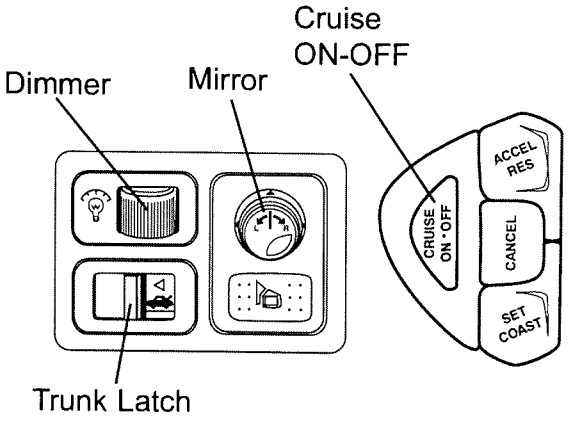
In case of a frontal collision with sufficient force, seat belt slack is immediately taken up by the pretensioner to ensure that vehicle passengers are securely restrained. The load limiter prevents the overtightening of the seat belt and a relaxing of the chest area seat belt web. Pretensioners **must be replaced** after deployment.

Cruise Control

- All buttons now located on the steering wheel
- Button located on the lower-left side of the dash
- Self-contained, electronically-controlled servo unit



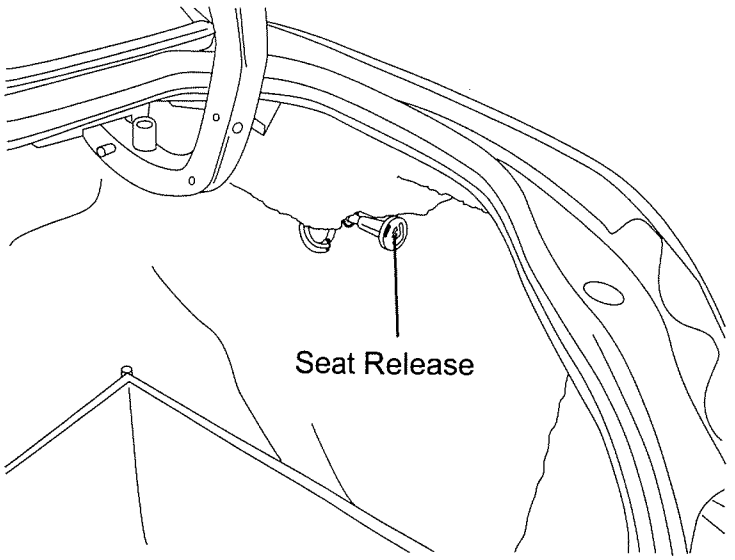
MY '99 Control Switches



MY '00 Control Switches

Trunk

- Rear seat release buttons located in the trunk above the wheel wells
- Valet lock-out lever located on the trunk latch



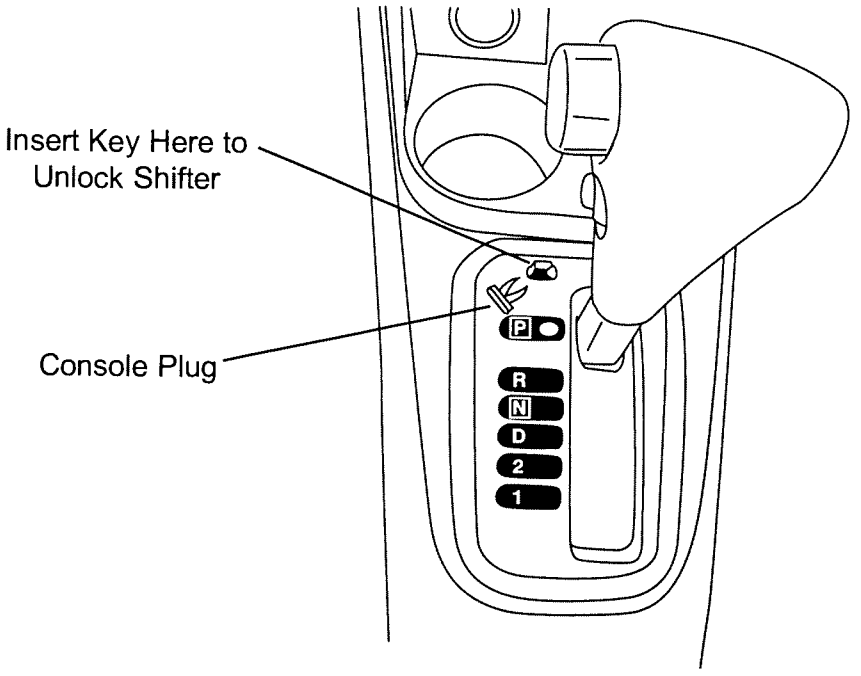
A/T Shift Lock Control

The shift lock release system is changed from a "powered lock" to a "powered unlock" system. This simplifies the shift lock system and prevents "quick-button lock-up". In this new system, the shift lock solenoid remains in the locked position when the ignition is OFF.

To shift out of PARK, turn the ignition ON and press the brake pedal. This applies power to the shift lock solenoid to unlock the shifter.

You will not be able to shift the transmission out of park if the battery goes dead or is disconnected. To unlock the shifter manually, remove the console plug with a flat screwdriver, insert an ignition key into the shift lock release hole at the base of the shift lever, then move the shift lever out of PARK. This prepares the vehicle for towing.

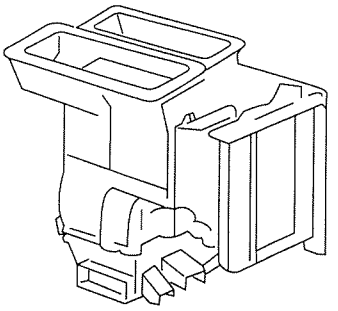
Note: The steering wheel remains locked unless the ignition switch is also turned ON.



HVAC

The HVAC Module combines the following components:

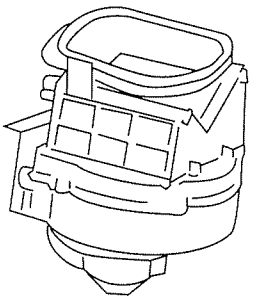
- Heater core
- A/C Evaporator core
- Block TXV
- Thermo Amp
- Door System



HVAC Module

The Intake Assembly includes:

- Thermo Resistor
- Low-Wattage Blower Motor

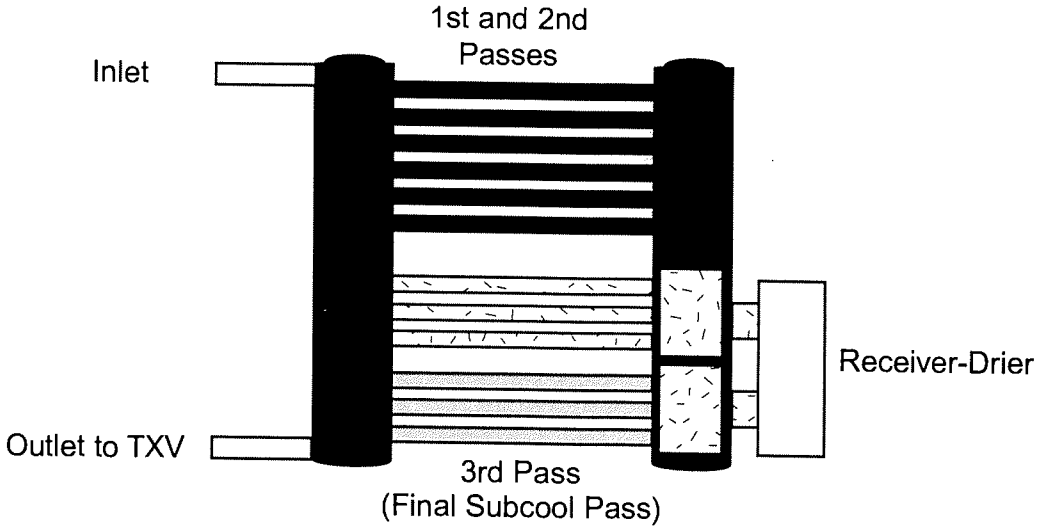


Intake Assembly

Revised, multi-pass condenser unit:

The air conditioning system now incorporates a subcooling condenser to increase cooling efficiency. The final pass through the lower third provides additional cooling of the refrigerant coming from the receiver-drier.

Subcooling Condenser



Smart Entrance Control System

New to Sentra.

Battery Saver: The cabin lamp and map lamp go OFF within a few minutes after the ignition switch is turned OFF.

Key Fob:

- Panic button function added (flashes headlights and sounds the horn)
- Remote trunk release button added

Theft Warning Alarm: The alarm system is armed if the door is locked using the remote or key when the door, trunk, and hood is closed.

- The headlamps flash and the horn sounds if the door, hood, or trunk is opened when the alarm system is armed.
- The alarm system is disarmed if the doors are unlocked or the trunk is opened with the remote or key when the door, trunk, and hood is closed.

Seat Belt Alarm: A warning buzzer sounds when the ignition switch is ON and the seat-belt buckle switch is ON (seatbelt unfastened).

Rear Defogger: The rear defogger switch is now located in the A/C control head. A timer initiates with both ignition and rear defogger ON.

Sunroof Memory Procedure: The electronic sunroof memory (which tracks sunroof position) is erased whenever the battery is dead or has been disconnected. The memory must be reset when battery power is restored. To reset the memory:

1. Turn the ignition switch ON
2. Close the sunroof (if open)
3. Open the sunroof to the vent position. Hold the switch ON until a "bump" is felt in the sunroof motor. This action resets the sunroof memory.
4. The sunroof is now ready for normal operation.

NISSAN ANTI-THEFT SYSTEM (NATS)

Description

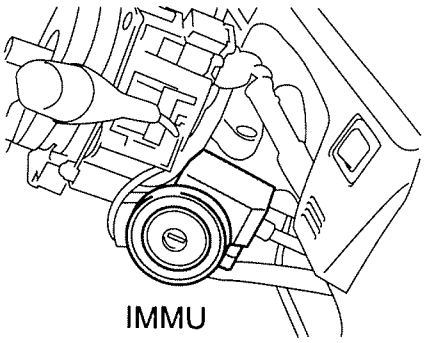
The Nissan Anti-Theft System (NATS) consists of the following components:

- Immobilizer control unit (IMMU) with antenna, located at the ignition switch
- ECM, located in the engine compartment
- NATS keys (up to five, including valet key), with transponder chip.

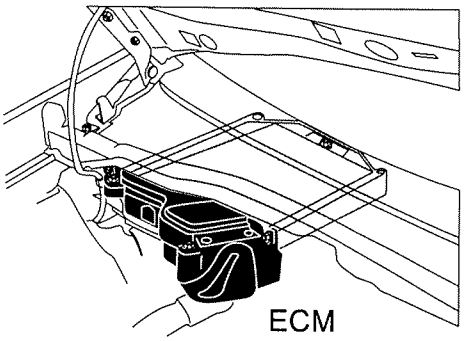
Note: These keys do not use batteries and do not have any memory.

- Security light, located on the top passenger side of the dashboard

To prevent vehicle theft, this system immobilizes the engine if an attempt is made to start it by using a key not registered to the system. Each key has a permanent ID code embedded in a transponder chip. This code is stored in the immobilizer control unit (IMMU) memory at the time when keys are registered to the system.



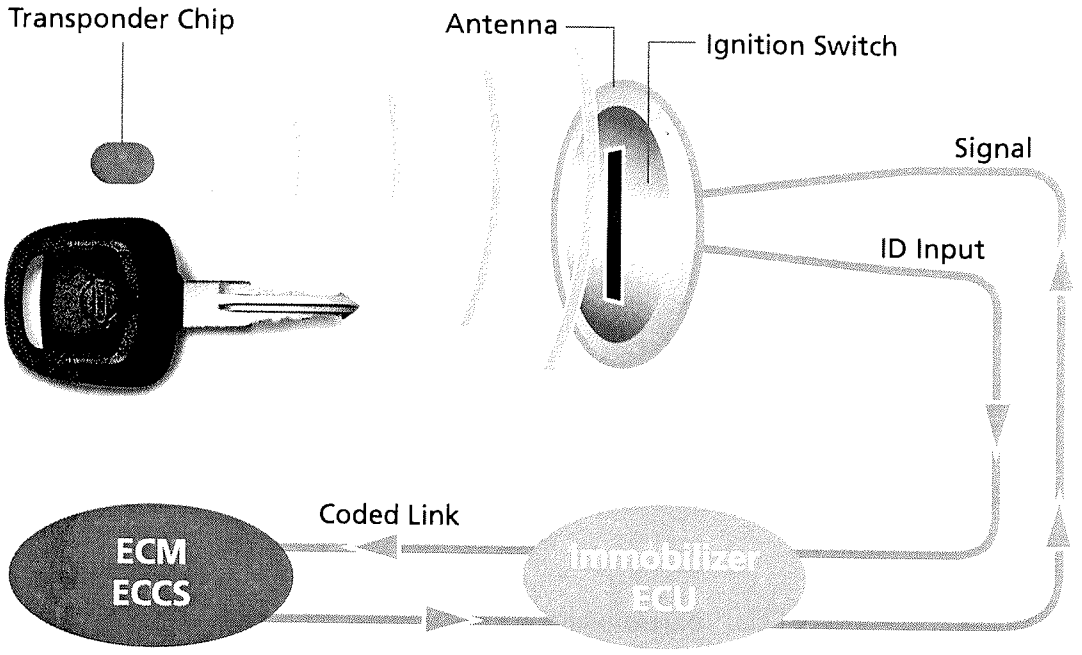
IMMU



ECM

When the ignition is turned ON, the IMMU sends a signal through the antenna to the transponder on the key, which "echoes " its permanent ID code back through the antenna to the IMMU. If the code is "recognized", the IMMU communicates to the ECM an "okay to start" command. However, if the key is not "recognized", the IMMU issues an "immobilize" command, illuminating the security lamp and preventing the engine from starting.

Note: The security light blinks when the ignition switch is OFF (immobilizer armed). If you turn the ignition switch ON with a *registered* key, the security light will turn OFF (immobilizer disarmed). If you turn the ignition switch ON with an *unregistered* key, the security light comes on "steady", (immobilizer activated). This may also be caused by more serious conditions, such as faulty components or wiring.



Control Unit Initialization

The Control Unit initialization procedure is performed using CONSULT-II and the NATS card. This procedure clears the memory of the IMMU and resets the rolling codes in both the IMMU and the ECM. This procedure must be performed when you:

- Replace any ignition key
- Add ignition keys
- Replace the IMMU
- Replace the ECM

After the initialization process is complete, the keys can then be registered to the system. No more than 5 keys can be registered to the system at a time.

Note: When the C/U initialization is performed, all IDs previously registered are erased. All keys belonging to this vehicle must be registered together or they will no longer be recognized by the IMMU at engine start-up. The engine cannot be started using an unregistered key.

Interference

Multiple transponder signals can cause interference with the system, causing the IMMU to send an immobilize command to the ECM to prevent engine start. To prevent problems such as this, keep all other transponder-equipped devices away from the ignition switch while attempting to start the engine or when registering keys.

Examples of other transponder-equipped devices:

- Another NATS key
- Mobil Speedpass®
- Keys belonging to other vehicles equipped with anti-theft systems, including other Nissan keys
- Certain security ID badges

Lock Mode

A series of attempts to start the vehicle using an unregistered key will cause the vehicle to go into Lock Mode.

Note: Lock Mode sets a Diagnostic Trouble Code (P-1610) in the ECM.

To bring the vehicle out of Lock Mode:

1. Insert a registered key and turn ON the ignition switch. Wait 10 seconds.
2. Remove the key and wait 10 seconds.
3. Insert the same key again and turn ON the ignition switch. Wait 10 seconds.
4. Remove the key and wait 10 seconds.
5. Insert the key and start the vehicle.

Keys

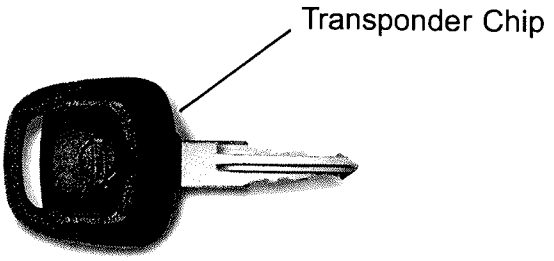
Master keys have a texture across the top band of the key. The upper part of the key is plastic. They can be used to unlock doors, open the trunk, open the glove box lock, and start the engine.

Valet keys have no texture across the top band of the key. The valet key can be used to unlock doors and start the engine, but they will not fit either the trunk or the glove box locks. Use of the valet key ensures security of valuables in the trunk and glove box.

A **Valet switch** is provided to disable the remote trunk release. Prior to handing the vehicle over to the valet driver, the owner of the car must reposition the lever on the trunk latch.

Note: Keys with different colored transponder chips are not interchangeable. Each transponder chip color refers to a specific version of NATS. Also, keys made to work with different versions are of different length and are not interchangeable. Always refer to the part number to ensure that you have the proper key.

NATS Key



New Diagnostic Trouble Codes For NATS

Code	CONSULT-II Display	Possible Causes
P1610	Lock Mode	Five consecutive 'start' attempts with either an unregistered key or a faulty ECM or IMMU
P1611	ID Discord	Verification between IMMU and ECM is NG
P1612	Chain of ECM-IMMU	Communication between ECM and IMMU is not possible
P1613	ECM INT CIRC-IMMU	Internal circuit fault in ECM at communication line to IMMU
P1614	Chain of IMMU-Key	IMMU cannot receive the key ID signal
P1615	Difference of Key	IMMU does not recognize key ID code (unregistered key)

Summary

During system operation or service, the following points are essential to know:

- The transponder chip contains no erasable memory.
- There is no battery in the key to go dead; It has no power supply at all.
- Magnetic fields, microwaves, or X-rays cannot harm the key.
- All keys belonging with a particular vehicle must be registered any time there is a need to register even one key. This is essential, even if all of the keys were previously registered.
- Confirm that all registered keys will start the engine after the registration process is complete. If one or more keys cause the security light to come on solid, the entire process must be redone with all keys.
- If a key known to be registered will not start the vehicle, then the vehicle may have gone into Lock Mode.
- Finally, do not rush through the key registration procedure. The procedure covered in this workbook and in the job aid is the ONLY correct procedure. Any attempts to short-cut this procedure will result in some keys not being registered every time!

1.8 LITER ENGINE (QG18DE)

The QG18DE engine is new to the North American market. It replaces the GA16DE.

There are three emission levels available:

- FED/CAN (LEV)
- CAL (ULEV)
- CA (Clean air; California only-requires low sulfur fuel.)

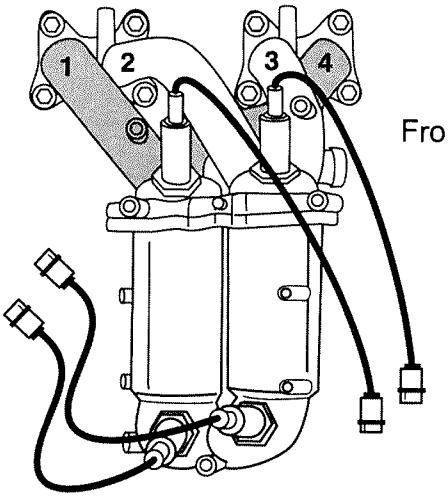
Electronic Controls—Calibrations

Boost Switch

A Boost Switch is used to detect negative pressure (vacuum) at the swirl control valve actuator and provides a feedback signal to the ECM. It is used for on-board diagnosis and improves serviceability of the system.

Oxygen Sensors

- Four sensors: Two front ("upstream") and two rear ("downstream")



Front Sensors

Rear Sensors

CONSULT-II Terms For Oxygen Sensors		
Wire Sheath Color	Cylinder/Sensor Position	CONSULT-II Reference
Black	1-4/Front	HO2S1(B1); HO2S1 MNTR (B1)
Blue	2-3/Front	HO2S1 (B2); HO2S1 MNTR (B2)
Gray	1-4/Rear	HO2S2 (B1); HO2S2 MNTR (B1)
Red	2-3/Rear	HO2S2 (B2); HO2S2 MNTR (B2)

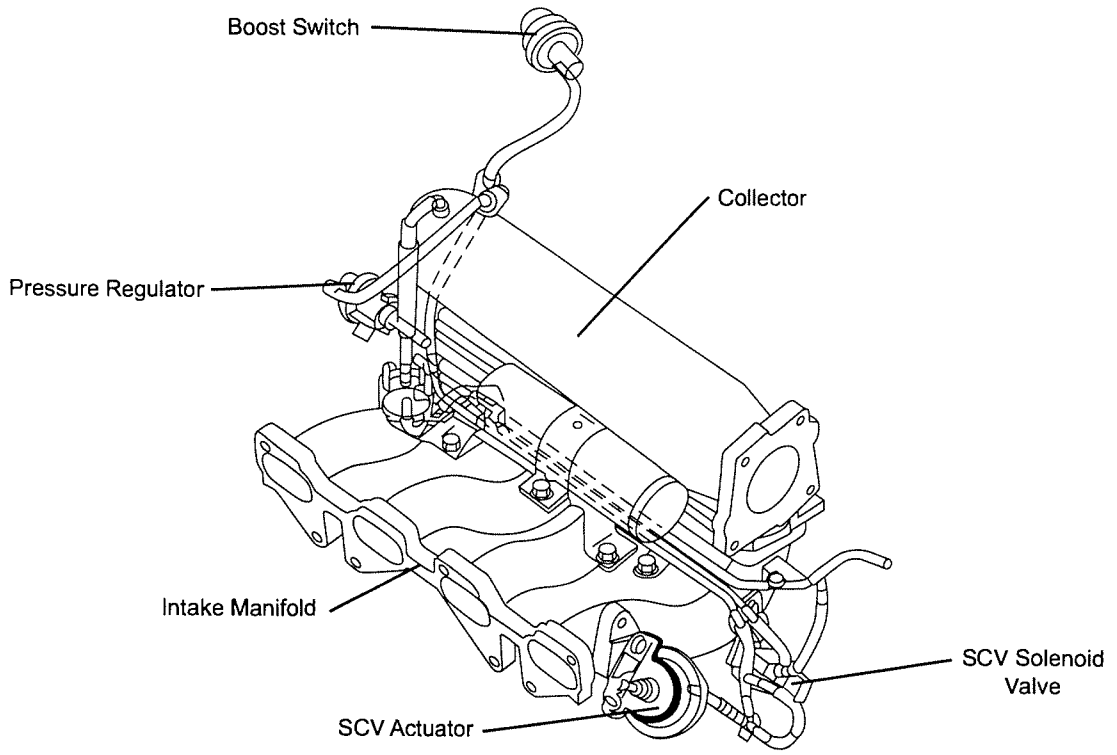
Swirl Control Valve

- Uses an ECM-controlled vacuum-operated actuator
- Controls intake manifold air velocity through all rpm ranges for improved performance and emissions

During low speed operation, the valve closes to increase the velocity of air in the intake passages, producing a swirl in the combustion chamber. This results in the following improvements:

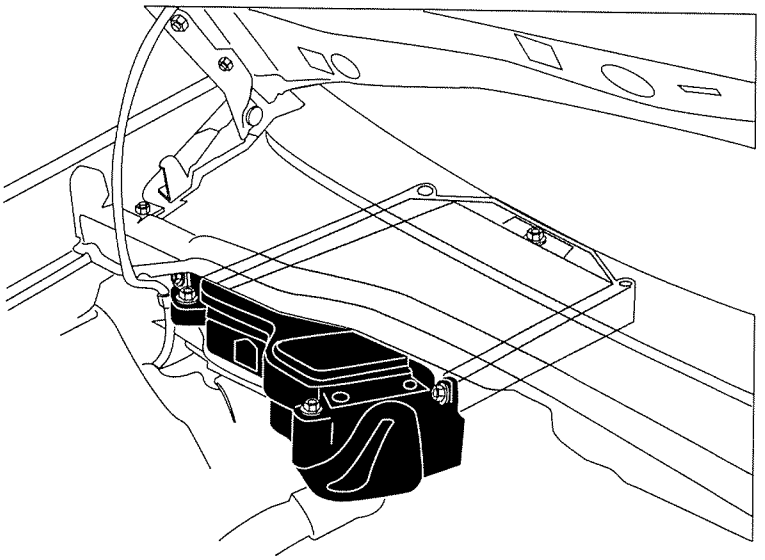
- Increased burning speed of the gas mixture
- More complete combustion
- Lower emission levels
- Improved fuel consumption
- Better idle quality

At higher engine speeds, the swirl control valve opens to improve performance.



Electronic Control Module (ECM)

- Relocated to bulkhead top right-hand side
- Now housed in a weatherproof case
- 1.8L with A/T features a new Powertrain Control Module (PCM) which combines the functions of the ECM and TCM



Throttle Chamber

Throttle chamber is integrated with a larger air flow AAC valve position sensor and a closed throttle switch.

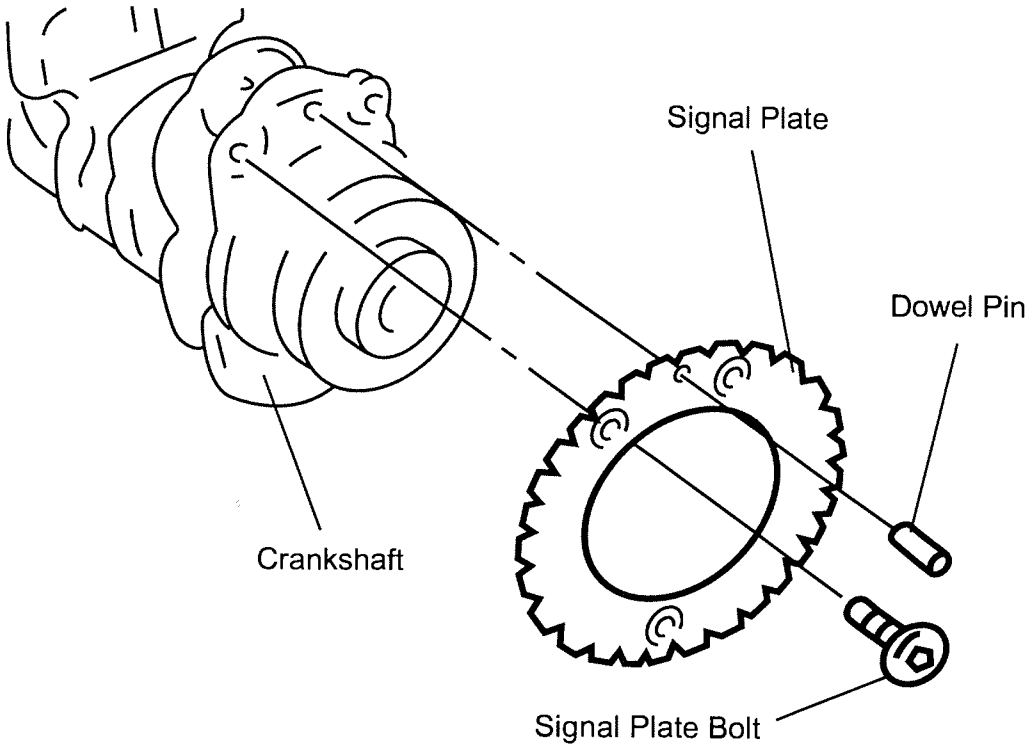
- TP sensor and closed throttle switch monitor and adjust throttle position
- Fast Idle cam is eliminated
- Air flow cut-valve reduces air flow after warm-up
- Throttle opener prevents throttle sticking after engine shutdown

Nissan Direct Ignition System (NDIS)

NDIS uses a hall-effect sensor to provide crankshaft position (POS) and camshaft position (PHASE) information to the ECM.

An ignition signal is sent from the ECM to the power transistor which turns the primary circuit ON and OFF. This on and off operation induces a high voltage in the secondary circuit of the coil.

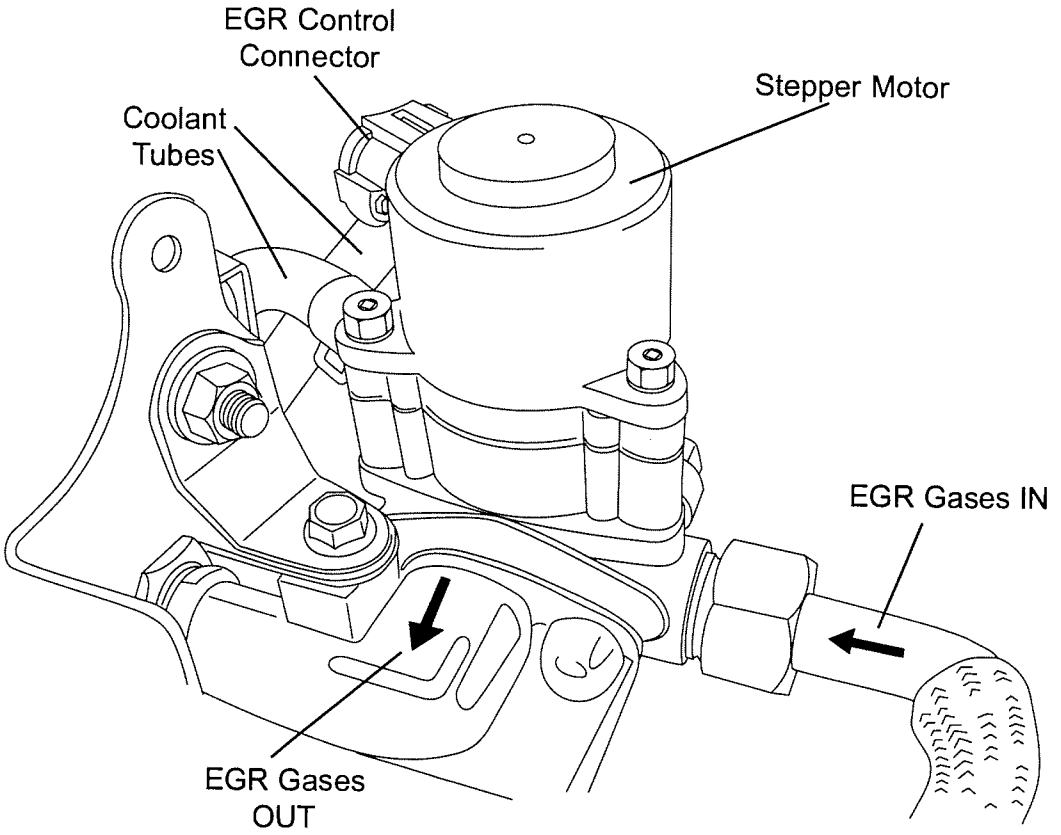
- Individual ignition coils (power transistors) are now used on each cylinder
- A crankshaft position sensor signal plate is added to the rear of the crankshaft



Electronic EGR Volume Control Valve

EGR valve opening is varied by a stepper motor controlled by the ECM. The stepper motor is kept cool by a coolant passage between the motor and exhaust gas passage. The ECM uses the following inputs to determine how much the EGR valve should be opened (or closed):

- Ignition switch
- Throttle position sensor
- Cam position sensor
- Coolant temp sensor
- Mass air flow sensor



New Diagnostic Trouble Codes

The chart below lists new Diagnostic Trouble Codes for this engine:

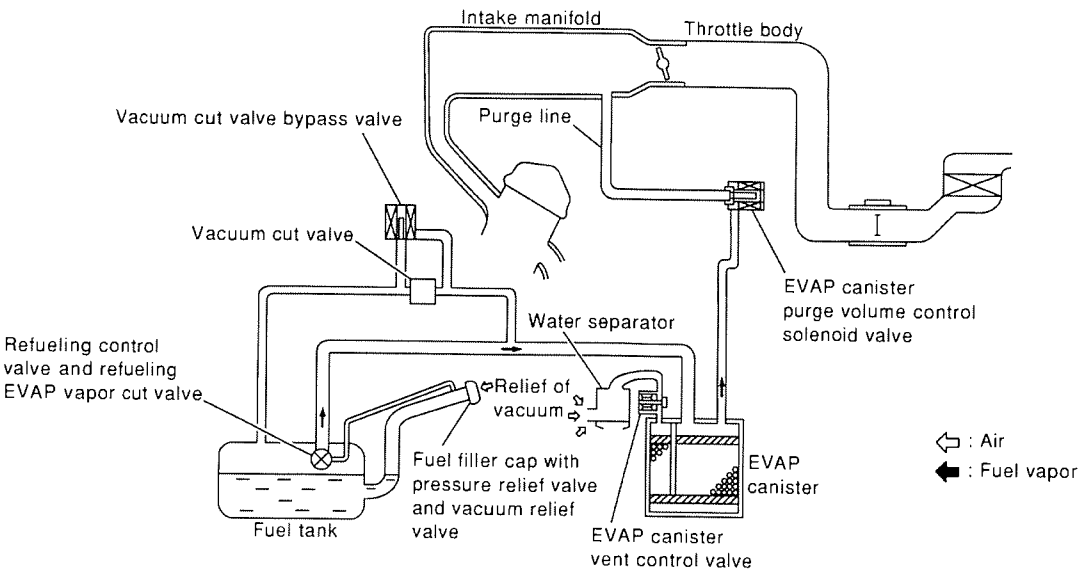
New Diagnostic Trouble Codes		
System	DTC	Description
O2 Sensor-Bank 2	P0150-P0154	Front O2 sensor B2
	P0155	Front O2 SE heater B2
	P0157-P0160	Rear O2 sensor B2
	P0161	Rear O2 SE heater B2
	P0174	Fuel Sys-Lean B2
	P0175	Fuel Sys-Rich B2
EGR Volume Control	P0403	EGR vol control/vcir
TWC-Bank 2	P0430	TW Catalyst Sys-B2
Swirl Control Valve (multiple)	P1165	Swirl Control VO SV/Circ B2
	P1130-1131	Swirl Cont Sol/T
Intake Valve Timing Control Circuit	P1111	Int V Timing V/Cir
	P1140	Intk Tim S/Circ -B1
EVAP System Leak (multiple)	P0455	Evap Gross Leak
	P1441	Evap V/S Leak
Fuel Level (multiple)	P0460	Fuel LV Se (Slosh)
	P0461	Fuel Level Sensor
	P0464	Fuel Levl sen/Circ
A/T Comm Line	P0600	A/T Comm Line
Thermostat Function	P1126	Thermostat Fnctn
Engine Over-Temp	P1217	Eng Over Temp
Evap	P0460	Fuel Level Sensor Fault
	P1441	EVAP System Small Leak

EVAP System

The EVAP system now detects leaks as small as 0.02 in. To accomodate this change:

- Absolute pressure sensor output sensitivity is improved
- EVAP canister vent control valve seal is improved
- Vacuum cut bypass valve flow-rate is increased
- EVAP canister Purge Volume Control valve is changed from a stepper motor type to an ON/OFF duty solenoid type

EVAP Diagram



Engine Mechanical

The QG18DE has the following features:

A new cylinder head design with variable valve timing control (VTC)

- A cam angle sensor mounted to the head

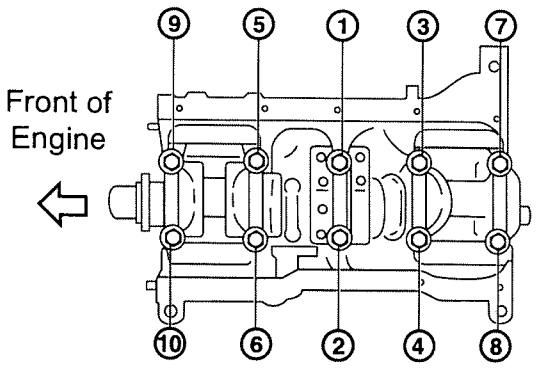
Changes to the upper engine include:

- Intake port redesigned to accomodate the swirl control valve
- Lead removed from valve seats to address environmental concerns
- Exhaust valve changed to improve exhaust gas flow

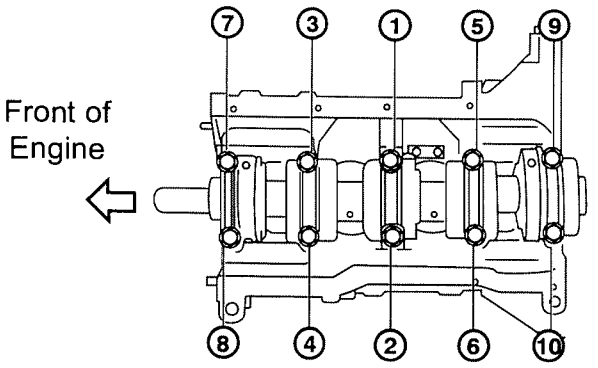
Changes to the lower engine include:

- Crankshaft with six counterweights reduces NVH
- Rod and main journals micro-finished to decrease wear and drag
- Crankshaft pulley and dampener redesigned for a multi-ribbed v-belt
- Connecting rods more compact to improve clearance
- Stronger, more durable connecting rods

Tighten Main Bearings in Numerical Order

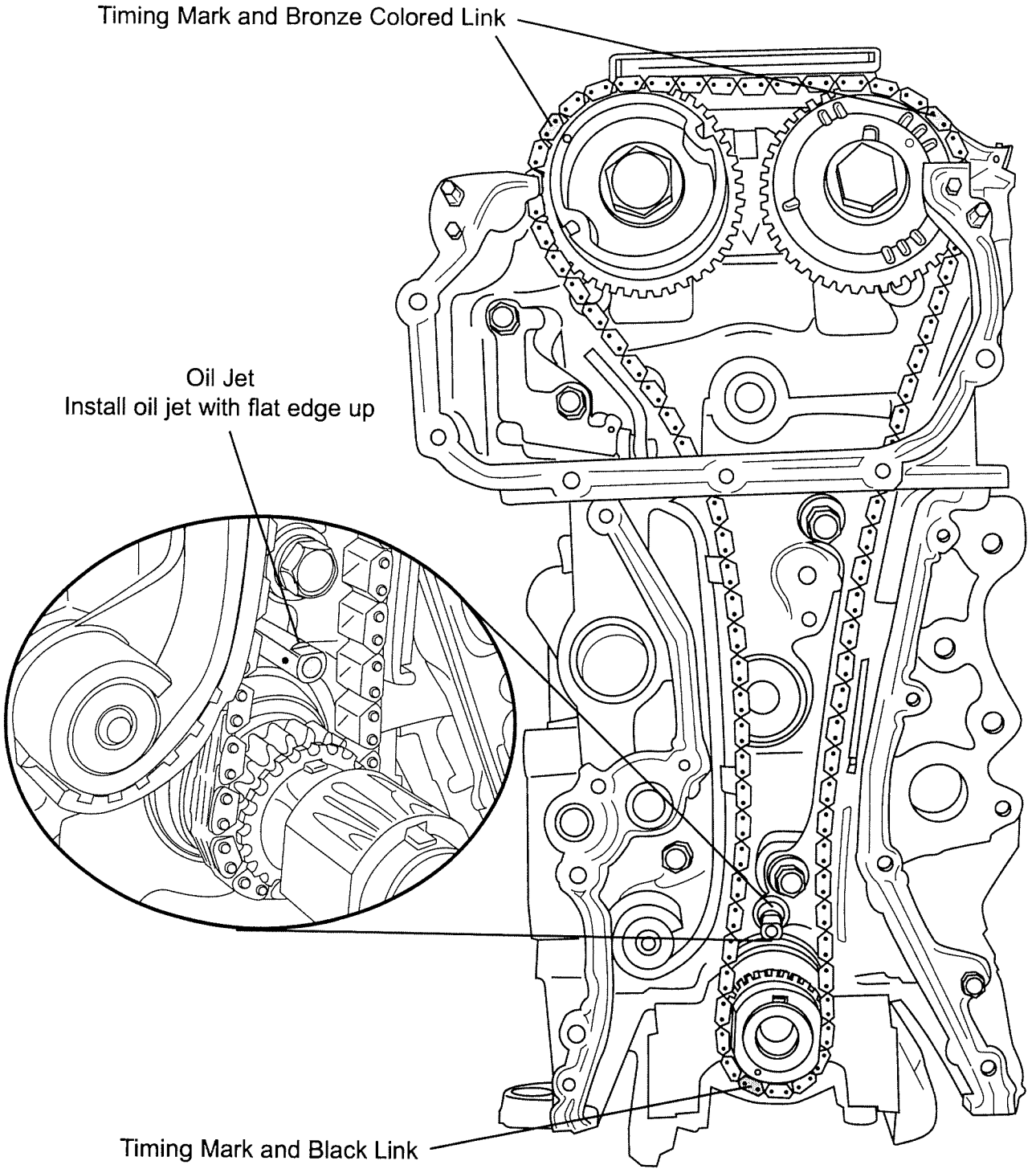


MY '99 - 1.6L



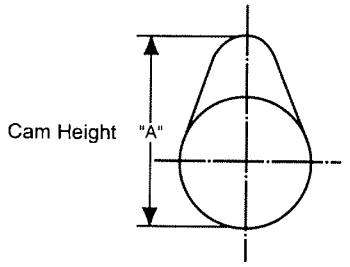
MY '00 - 1.8L

Timing Chain



Camshaft Profiles

- Intake valve overlap increased in comparison with 1.6L engine to increase engine torque.
- Valve timing control changed:

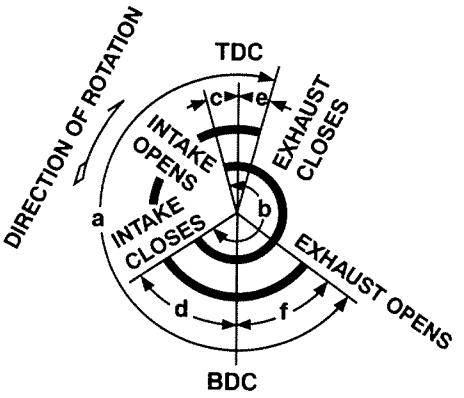


Valve Timing Control

	Valve Overlap	
	VTC OFF	VTC ON
1.8L	3°	23°

		MY '99 (1.6L)	MY '00 (1.8L)
Cam Height "A"	Intake	40.610-40.800 mm (1.5988-1.6063 in.)	40.610-40.800 mm (1.5988-1.6063 in.)
	Exhaust	40.056-40.246 mm (1.5770-1.5845 in.)	39.910-40.100 mm (1.5713-1.5787 in.)
Wear Limit of Cam Height		0.2 mm (0.0079 in.)	0.2 mm (0.0079 in.)

Valve Timing

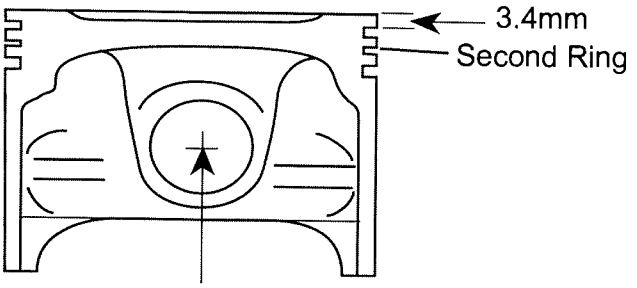


	a	b	c	d	e	f
MY '99 (1.6L)	222°	236°	-12° (8°)	68° (48°)	0°	42°
MY '00 (1.8L)	222°	236°	-1° (20°)	57° (36°)	4°	38°

Note: • Shading denotes changes for MY' 00
• ( ) denotes VTC ON

Pistons and Rings

- Top ring land raised to reduce emissions
- Full floating pin replaces press-fit pin to reduce engine noise
- The surface treatment of the top piston ring is changed
- A second compression ring is added to the piston

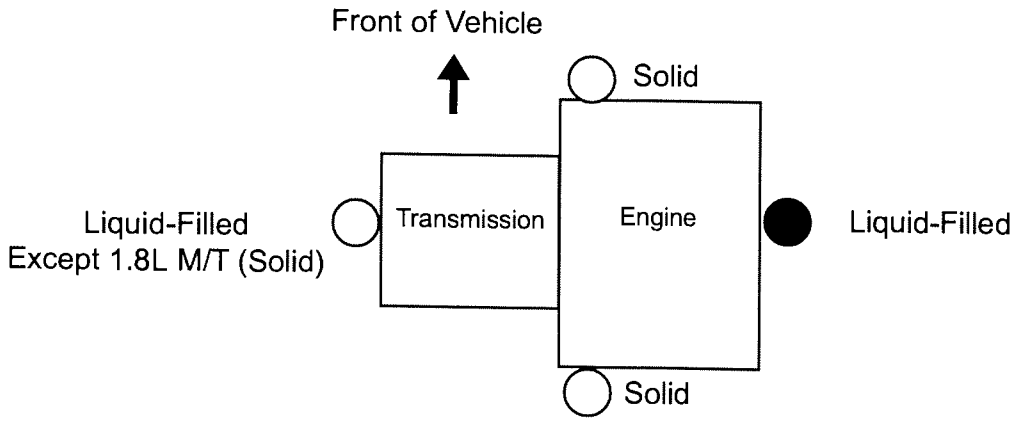


Intake Manifold

- 2- piece manifold
- Intake port is lengthened to improve power and torque

Engine Mounts

- 4 engine mounts to improve NVH, 3 solid mounts and 1 liquid-filled (hydraulic)

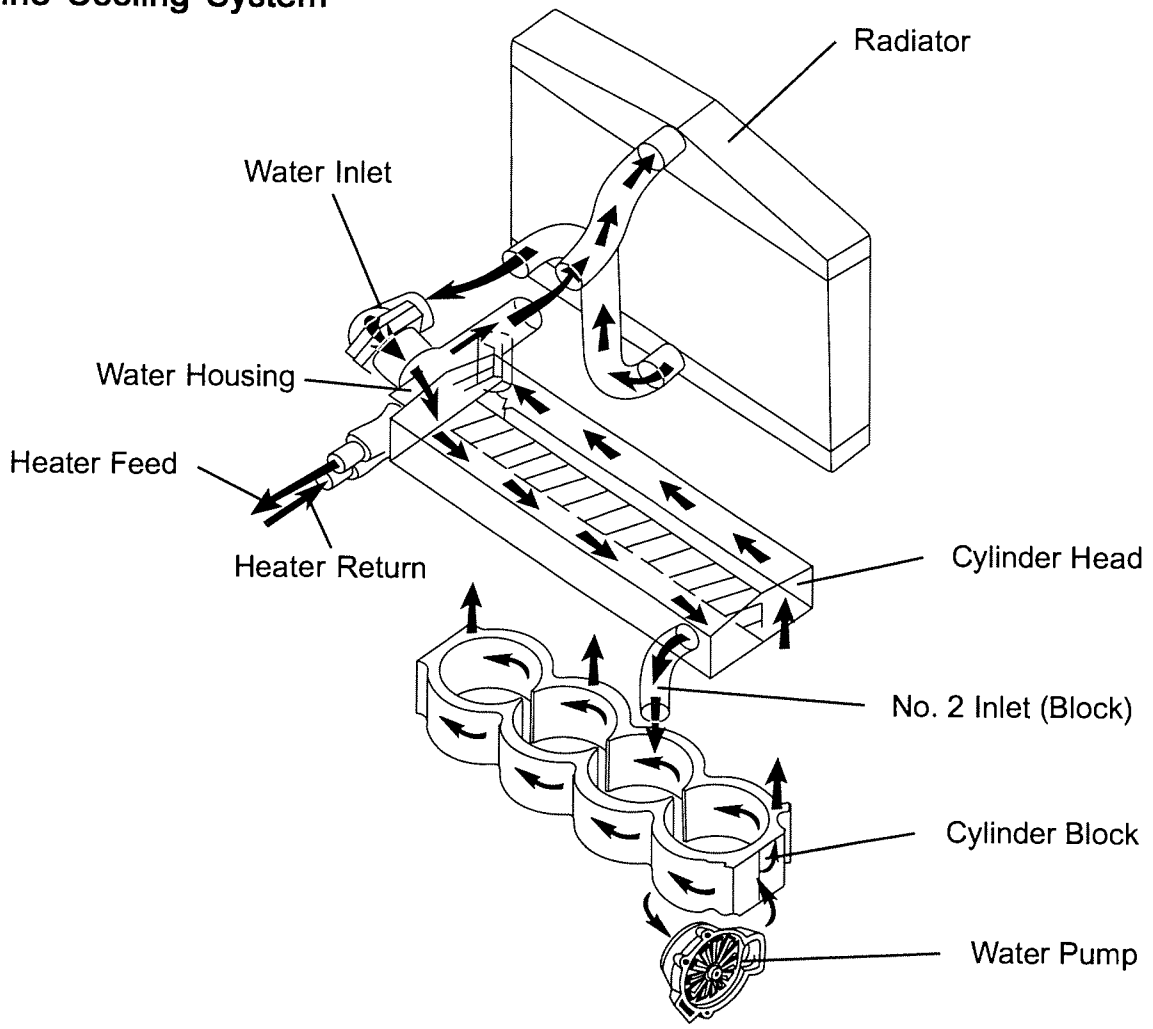


Engine Mounts

Lubrication and Cooling System

- Coolant circuit and flow is changed to improve cooling
- Water pump has been moved from the beginning of the circuit at the water inlet to the middle of the engine
- Improved coolant flow around the spark plugs to reduce engine knock

Engine Cooling System



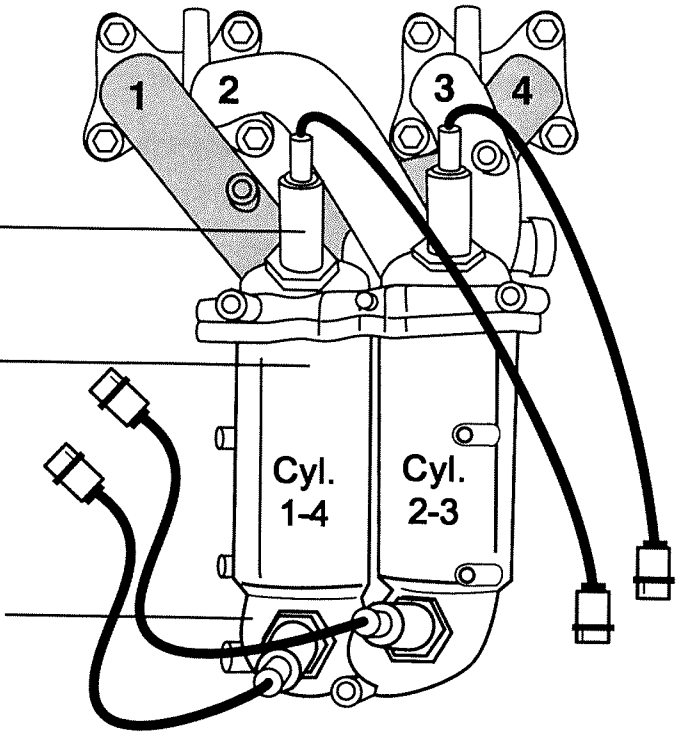
Exhaust System Features

Split Exhaust Manifold

Bank 1: Cylinders 1 and 4 dump exhaust into a single collector.

Bank 2: Cylinders 2 and 3 dump exhaust into a separate collector.

- Each collector houses an Oxygen sensor (Front HO2S)
- Each exhaust collector feeds into a catalytic converter
- Each catalytic converter feeds into a separate output chamber, each equipped with an oxygen sensor (Rear HO2S)



CA Models (EZEV)

1.8L Sentra CA (meaning Clean Air): This engine, which meets the California EZEV (Equivalent Zero Emission Vehicle) standard is available in limited quantities for the California market only. Sales will be limited to commercial fleets and government agencies.

Emission features include:

- Electric swirl control valve
- Swirl control valve position sensor
- Absolute pressure sensor and bracket is used for EGR diagnostics
- EVAP canister assembly is improved to increase purge characteristics
- Purge volume control valve
- Evap hose material is double-layered to decrease vapor leakage
- Catalytic converters use a triple catalyst system to reduce HC during startup
  - Thin wall substrate
  - HC trap catalysts
- Special Prem Air™ coating applied to the radiator
  - Converts ozone to oxygen as air passes over the radiator through a passive catalytic reaction.

In addition to emission differences, the EZEV has some option differences:

- Automatic transmission only
  - Uses separate ECM and TCM
- Reduced washer tank capacity
- Reduced spare tire size
- Two-layer rubber hose (EZEV only)

2.0 LITER ENGINE (SR20DE)

New Engine Features

- Calibrated to meet the 50 state low emission vehicle (LEV) emission specification
- Horsepower increased from 140 -145
- Torque increased to 19.3 Kgm @ 4400 rpm

Catalytic Converters

- 2 Catalytic converters

Electronic Controls—Calibrations

Throttle Chamber

- Integrated type throttle chamber with a larger air flow AAC/V
- Throttle position sensor and closed throttle switch measure and adjust throttle position
- No fast idle cam
- Air flow cut valve is added to restrict air flow after the engine is warmed up
- Throttle opener to keep the throttle slightly open when the engine is stopped to prevent the throttle valve from sticking

Electronic Control Module

- Relocated to the bulkhead on the top right-hand side
- Now housed in a weatherproof case

Electronic EGR

- The 2.0 uses the same system found on the 1.8L engine

Boost Switch

- This is the same system used on the 1.8L engine

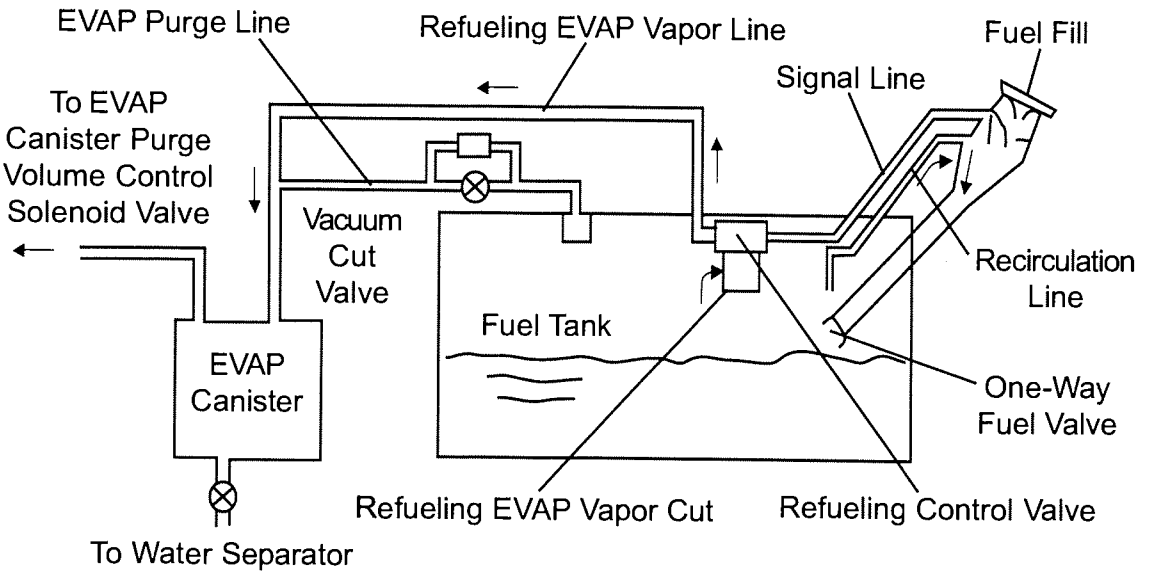
EVAP System

- This is the same system used on the 1.8L engine
- ORVR system added

On Board Refueling Vapor Recovery System (ORVR)

ORVR is designed to recover vapors emitted during the refueling process.

While refueling, the fuel tank pressure goes up. When tank pressure equals the pressure required to open the refueling control valve (RCV), the RCV opens, releasing the vapor to the EVAP canister and then to the atmosphere.



Engine Mechanical

Main Bearings

- Crankshaft counterweights have been reduced from eight to four improving fuel efficiency

2-Piece Intake Manifold

- Intake manifold adapter is added between cylinder head and intake. Longer intake manifold runners improve engine power

Roller Rocker Arms

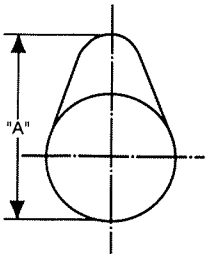
- Roller rocker arms have been added to the valve train to reduce friction and improve fuel economy

Lubrication and Cooling

- Camshaft oil tubes (shower rails) replaced by drilled cam bearing retaining caps

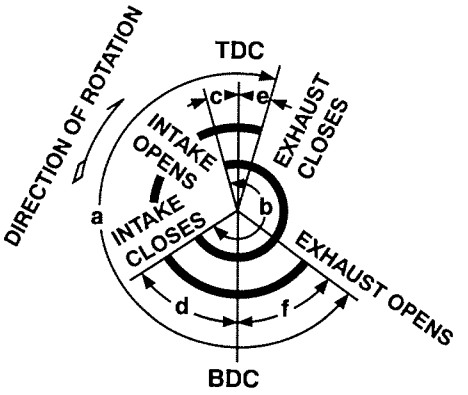
Camshaft Profile

		MY '99	MY '00
Cam Height	Intake	37.550-37.740 mm (1.4783-1.4858 in.)	37.680-37.870 mm (1.4835-1.4909 in.)
	Exhaust	37.920-37.110 mm (1.4929-1.5004 in.)	37.309-37.499 mm (1.4689-1.4763 in.)
Wear Limit of Cam Height		0.2 mm (0.008 in.)	0.2 mm (0.008 in.)



Cam Height

Valve Timing



	a	b	c	d	e	f
MY '99	240°	232°	5°	47°	3°	57°
MY '00	232°	240°	6°	54°	3°	49°

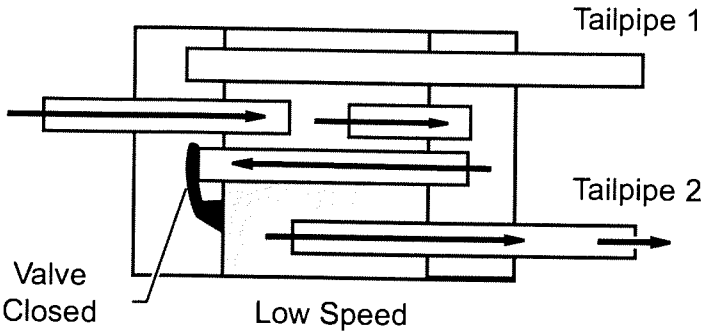
Note: Shading denotes changes for MY '00

Exhaust System Features

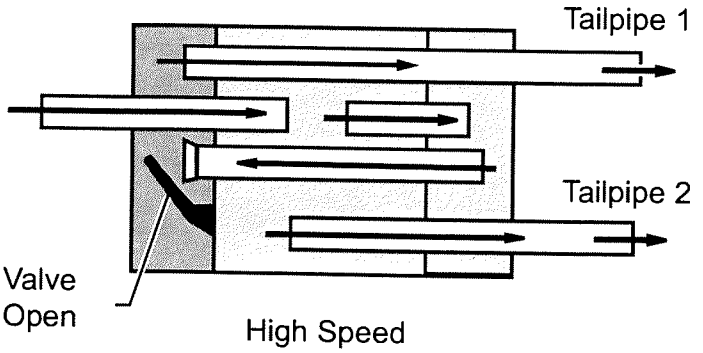
Dual Tip Muffler

- Variable capacity muffler with dual tips
- Provides low-end torque and high-end horsepower
- The main muffler contains an internal control valve and short and long exhaust passages

- At low pressure (idle or low speed), valve is closed



- At high pressure (during acceleration), valve opens



DRIVETRAIN

Manual Transaxle/Clutch

- RS5F70A manual transaxle is used with both 1.8L and 2.0L engines
- A Viscous Limited Slip Differential (VLSD) is available for the 2.0L SE with the Optimal Performance Package
- Case and seals improved to reduce leakage
- Hydraulically actuated clutch system replaces the cable actuated system on last years model
- New gear specifications:

Gear Specifications

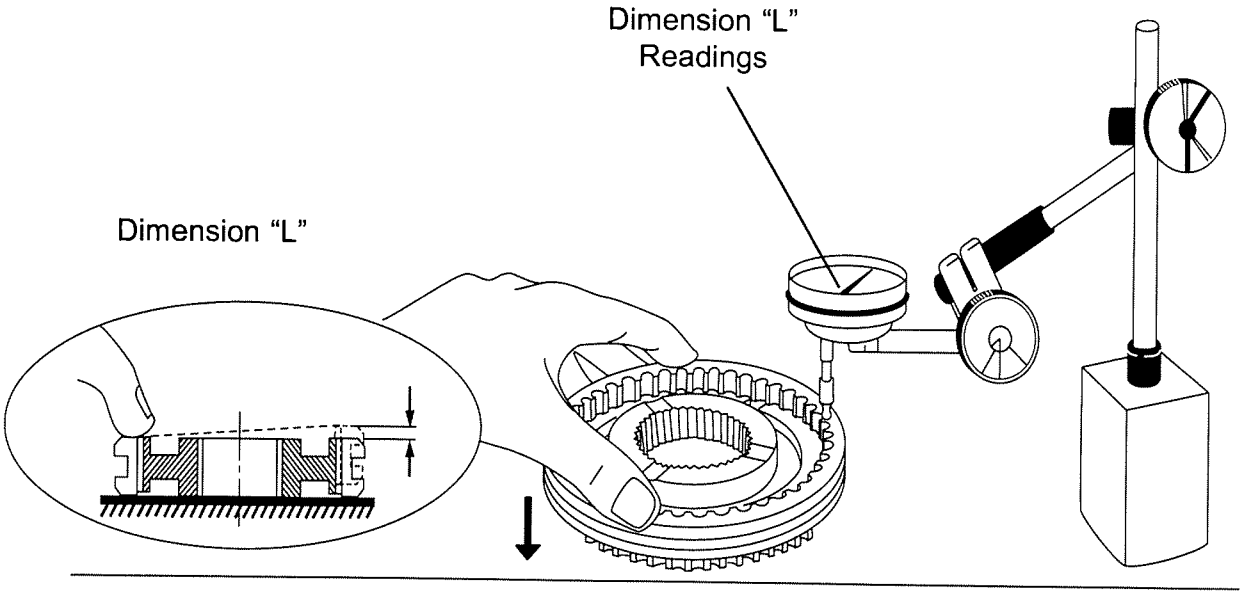
Gear	Ratio
1st Gear	3.333
2nd Gear	1.955
3rd Gear	1.286
4th Gear	0.926
5th Gear	0.756
Reverse	3.214

Differential Gear Ratio

- 3.827 with the QG18DE engine
- 4.072 with the SR20DE engine

Synchronizers

- Improved reverse synchronizer
- Double-cone synchronizers are added to the first and second gear
- Each synchronizer has a specific number of spline teeth to prevent installing a synchronizer in an incorrect location
- Synchronizer coupling sleeves can be checked for wear in the manner shown in the figure below. See the Service Manual for details:



Automatic Transaxle

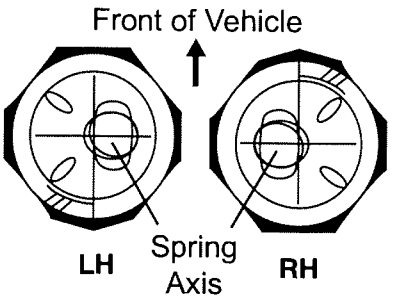
- Shift pattern is optimized to reduce "hunting" on hills
- Improved shift schedule
- Adaptive TCM improves driveability and shift performance
- More efficient torque converter improves fuel economy

STEERING AND SUSPENSION

The following changes are made to the front suspension and steering to improve stability, ride, and NVH:

Struts and Springs

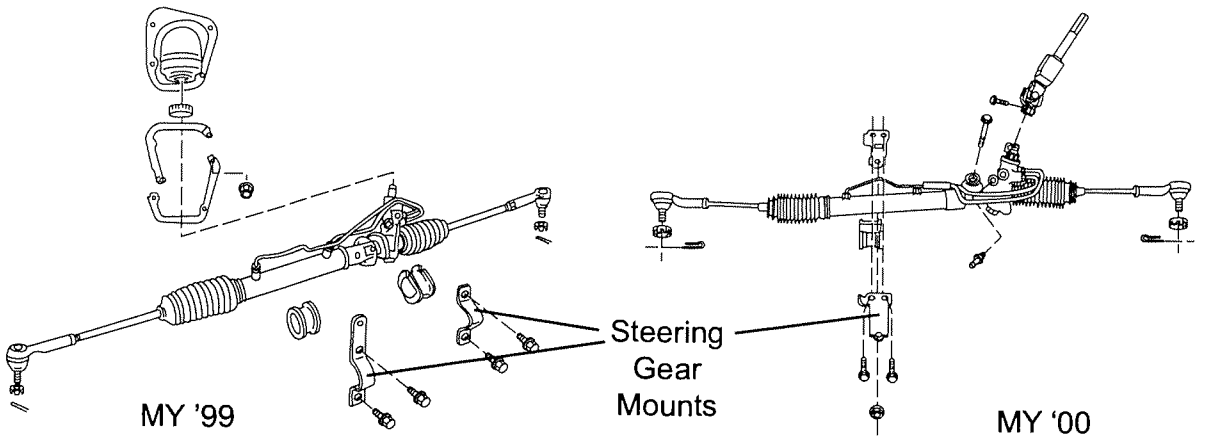
- Front springs offset 4° relative to strut axis to reduce side force on the tip of each strut and to reduce friction load on struts. Steering stability and ride are also improved.
- Left and right springs are not interchangeable due to offset angles



- Strut dampening force increased
- Stronger, more durable suspension
- Strut tower cross-support added to SE

Steering

- Steering gear mounts are improved for greater steering feedback and control.



BRAKES AND ABS

Brakes

- Larger diameter brake rotors and drums for all models
- Improved brake pads

Brakes Comparison				
	'99-1.6L	'00-1.8L	'99-2.0L	'00-2.0L
Front Rotor Outer Diameter X Thickness	232 X 18 (9.13"X.71") or 247 X 18 (9.72" X.71")	257 X 22 (10.1" X .87")	247 X 18 (9.72" X .71")	280 X 22 (10.9" X .87")
Rear Drum I/D or Rear Rotor O/D X Thickness	Drum 180 (7.09")	Drum 203.2 (8")	Rotor 234 X 7 (9.21" X .28")	Rotor 258 X 10 (10.16" X .39")

Anti-Lock Brake System (ABS)

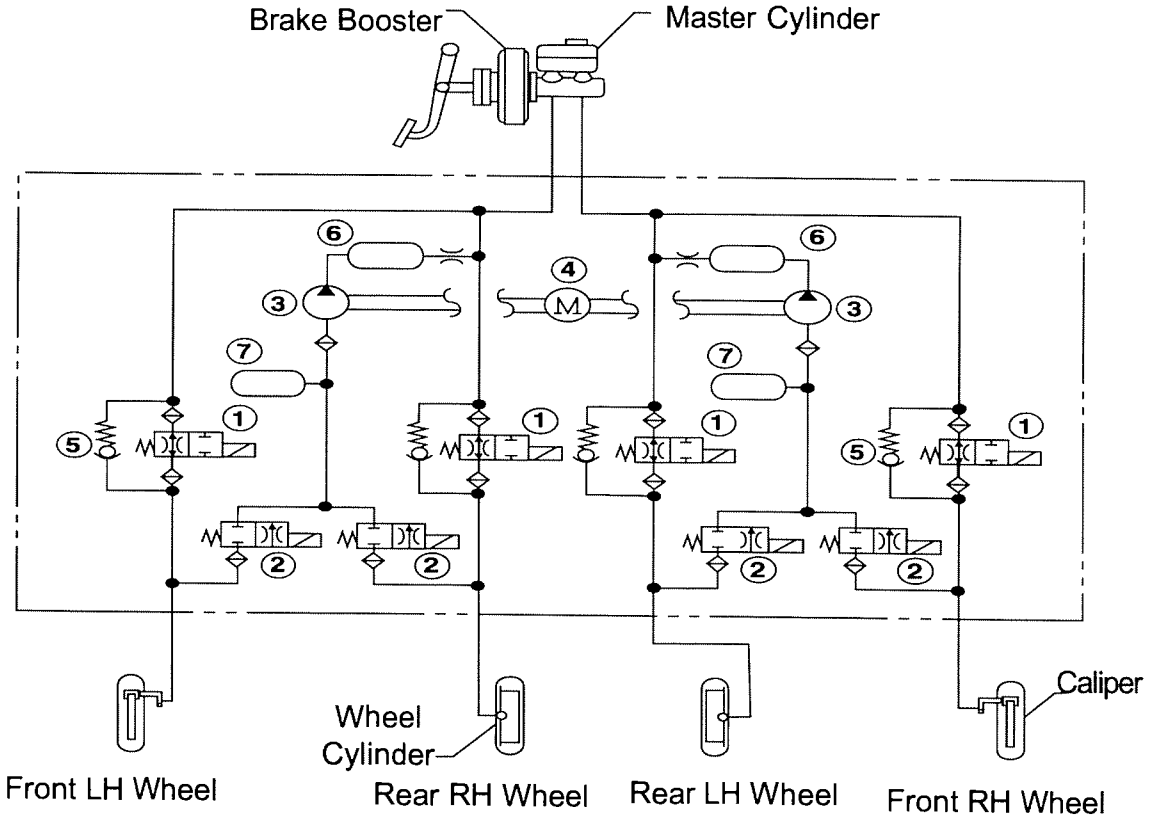
The ABS actuator and electric unit contain:

- An electric motor and pump
- Two relays
- Eight solenoid valves
- ABS control unit

The ABS control unit controls the hydraulic circuit and increases, holds, or decreases pressure to the wheels. The entire assembly is serviced together as one unit.

- Located on right side of bulkhead
- 4-channel/4-sensor system

ABS Hydraulic Circuit



1. Inlet Solenoid Valve
2. Outlet Solenoid Valve
3. Pump
4. Motor
5. Bypass Check Valve
6. Damper
7. Solenoid Valve Relay Actuator

ABS Active Test Capability

- CONSULT-II Active Test turns actuator ON or OFF
- Active Test can be used to determine solenoid performance

Active Test Mode

TEST ITEM	CONDITION	JUDGEMENT		
			Brake fluid pressure control operation	
FR RH SOL FR LH SOL RR RH SOL RR LH SOL	Engine is running		IN SOL	OUT SOL
		UP (Increase)	OFF	OFF
		KEEP (Hold)	ON	OFF
		DOWN (Decrease)	ON	ON
ABS MOTOR		ABS actuator motor ON: Motor runs (ABS motor relay ON) Off: Motor stops (ABS motor relay OFF)		

Note: Active test will automatically stop ten seconds after the test starts. (TEST IS STOPPED monitor shows ON.)

ABS Actuator Operation

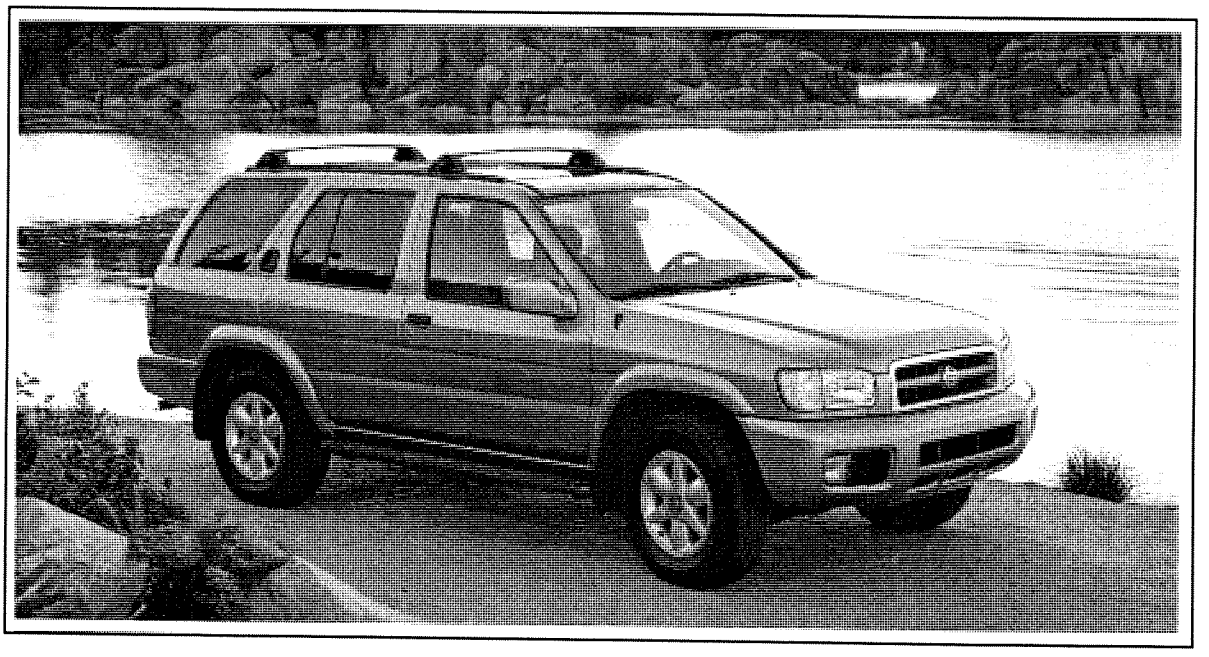
		Inlet Solenoid Valve	Outlet Solenoid Valve	Description
Normal Brake Operation		OFF (Open)	OFF (Closed)	Master cylinder brake fluid pressure is directly transmitted to caliper via inlet soleniod valve.
ABS Operation	Pressure Hold	ON (Closed	OFF (Closed)	Hydraulic circuit is shut OFF to hold the caliper brake fluid pressure.
	Pressure Decrease	ON (Closed)	ON (Open)	Caliper brake fluid sent to the reservoir via outlet solenoid valve then pushed up to the master cylinder by pump.
	Pressure Increase	OFF (Open)	OFF (Closed)	Master cylinder brake fluid pressure is transmitted to caliper.

NOTES

2001 PATHFINDER
OVERVIEW

Exterior

- Body color bumpers (XE & LE)
- Larger exhaust pipe is now rear facing and made of stainless steel
- Black wrapped mast antenna replaces power antenna
- Black non-heated dual mirrors (XE & SE); body-colored heated dual mirrors (LE)
- Body-colored bumpers (XE & LE); titanium (SE)
- Key cylinder removed from passenger side door
- Roofrack standard (SE & LE only)



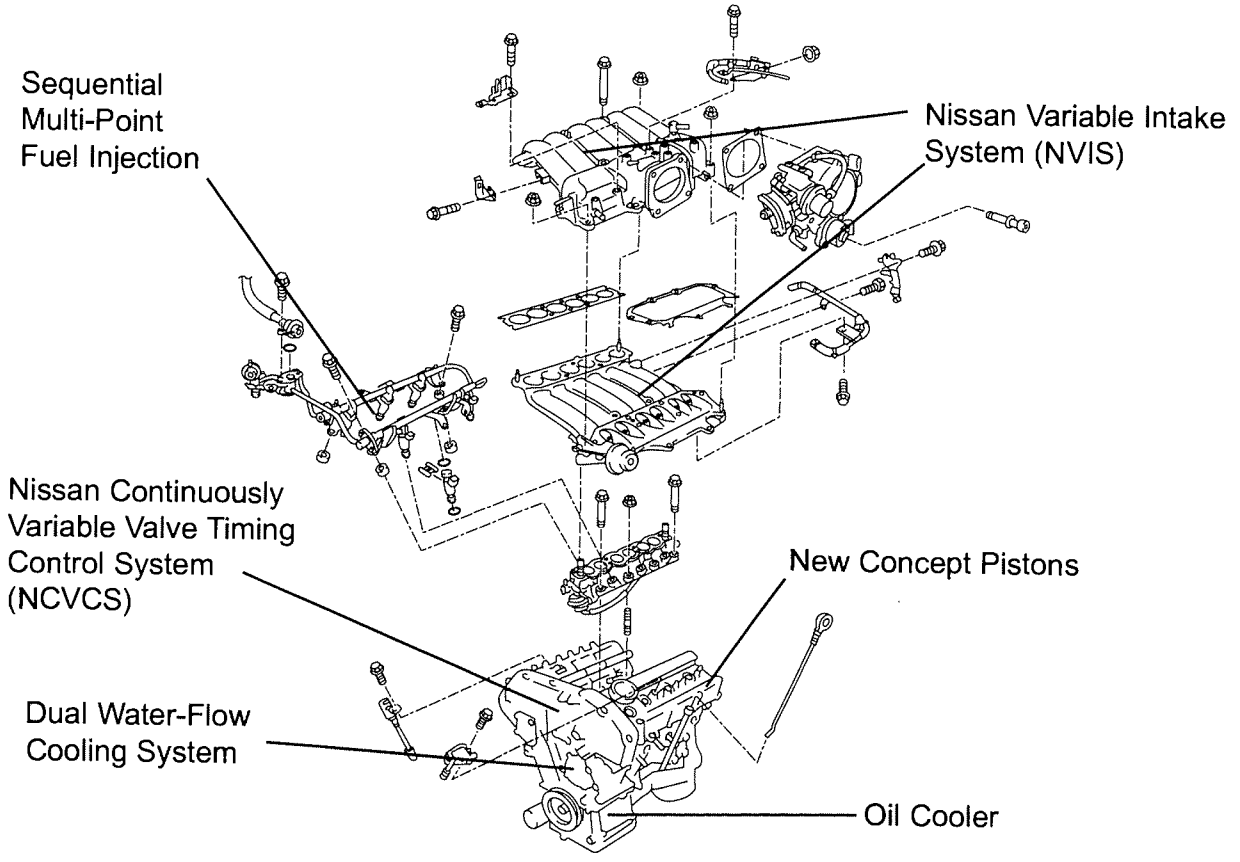
Interior

- 12V plug located in cargo area
- Maxima-style titanium gauges (SE)
- BOSE® audio system w/ 6-disc in-dash CD and steering wheel mounted audio controls (optional for SE; standard for LE)
- Separate digital clock
- One-touch open/close sunroof option (SE & LE only) with obstruction protection
- One-touch auto up/down front windows
- Power window lockout button standard
- Lighted power window switches
- Memory driver's seat (LE)
- Adjustable driver's side lumbar (leather seats only)
- Active headrest (assists in minimizing injury during rear-end collision)
- Standard side-impact airbags & second generation front airbags
- Seat belt pre-tensioner with load limiter
- UGDO (Universal Garage Door Opener/Homelink™) optional on SE; standard on LE
- Nissan Anti-Theft System (NATS)

ALL NEW VQ35DE ENGINE

The VQ35DE is a second generation 3.5L V6 engine with numerous technology advantages over the VG33 engine, including:

- 240 hp (AT); 250hp (MT)
- 265 ft-lb of torque
- Higher compression ratio
- Engine cover maintains a clean engine compartment
- NCVCS: Nissan Continuously Variable Valve Timing Control System increases engine torque up to 9%



NVH improvements include:

- Liquid-filled front engine/transaxle mounts
- Double-cushion rear engine/transaxle mounts

Key Specifications for the VQ35DE Engine

Engine Family	VG33E (MY'00)	VQ35DE (MY'01)	VQ30DE (MY'00)
Transmission Options	5 SPD MT or 4 SPD AT		
Engine Type	60° V-6 Cast Iron Block	60° V-6 Aluminum Block	60° V-6 Aluminum Block
Valve Train Configuration	SOHC 2 Valve/Cylinder	DOHC 4 Valve/Cylinder	DOHC 4 Valve/Cylinder
Bore X Stroke (mm)	91.5 x 83.0	95.5 x 81.4	93 x 73.3
Displacement (cc)	3275	3498	2988
Compression Ratio	8.9:1	10:1	10:1
Recommended Fuel	Regular Unleaded	Premium Unleaded	Premium Unleaded
Max Horsepower (HP@RPM)	170 @ 4800	240 (250) @ 6000	222 @ 6400
Max Torque (Lb/Ft@RPM)	200 @ 3600	263 (240) @ 3200	217 @ 4000
EPA Fuel Rating (Comb MPG)	19.3	19.5	20*
Engine Weight	225	209	N/A

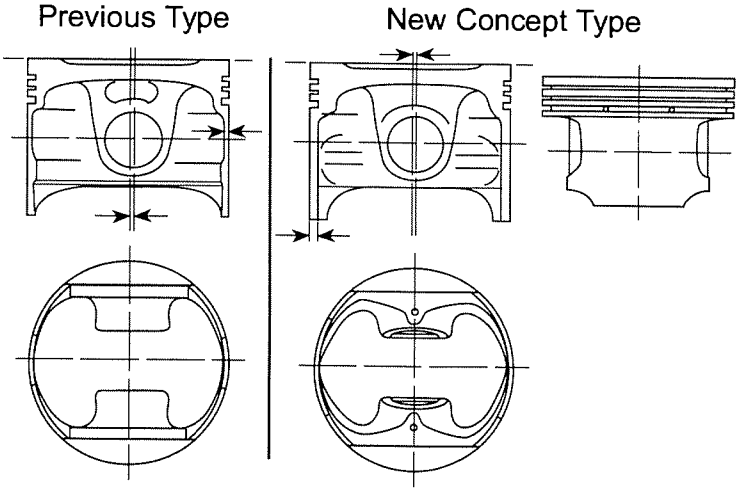
* Denotes EPA mileage estimate for 2000 Maxima w/auto transmission during city driving

Fuel Injection

- Sequential multi-point electronic fuel injection

Pistons

- New concept piston reduces weight and friction



Other Engine Features

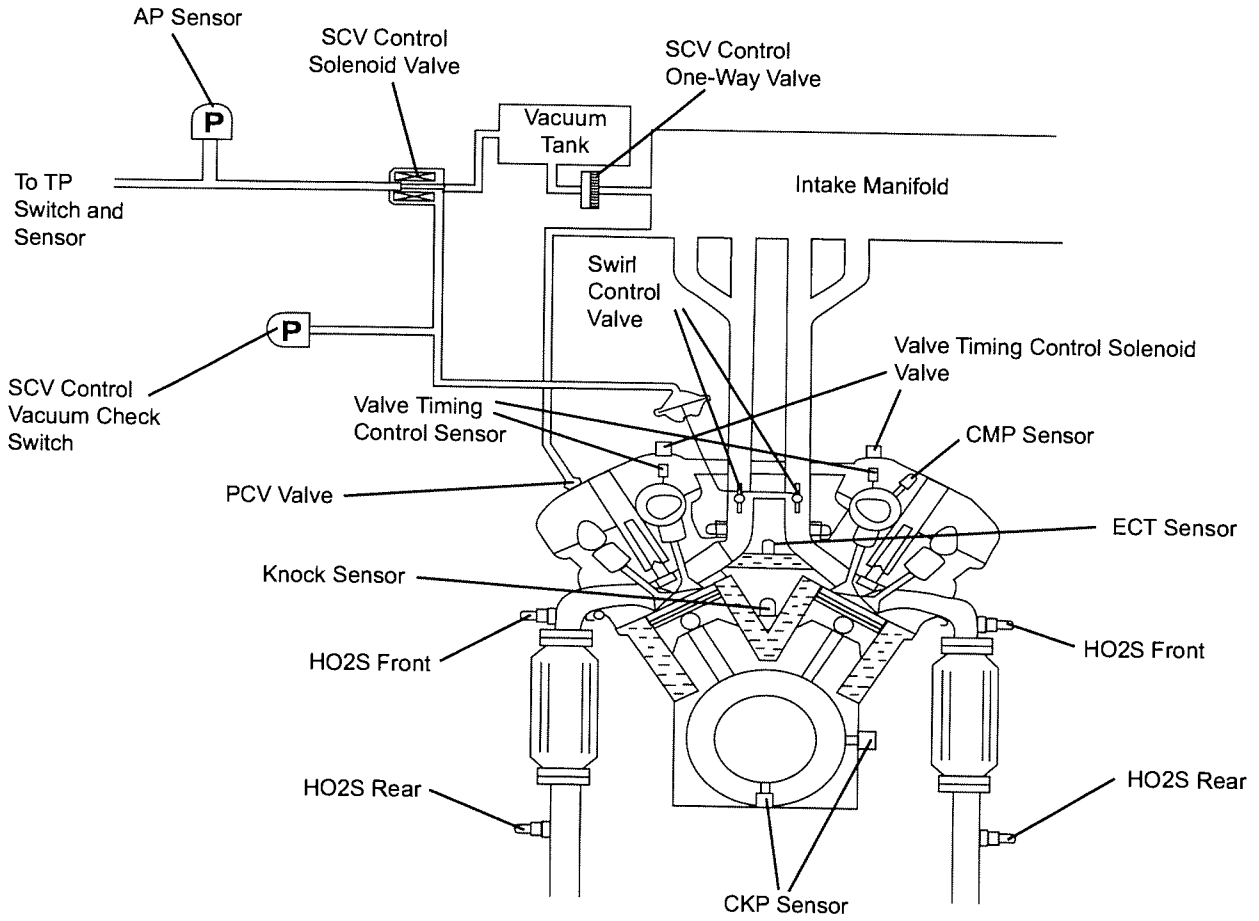
- Double Overhead Camshafts (DOHC)
- Lighter aluminum block and cylinder heads
- Double-tipped long reach Platinum spark plugs increase service life to 105K miles

The following changes improve engine cooling and increase knock resistance:

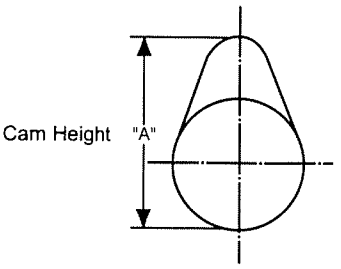
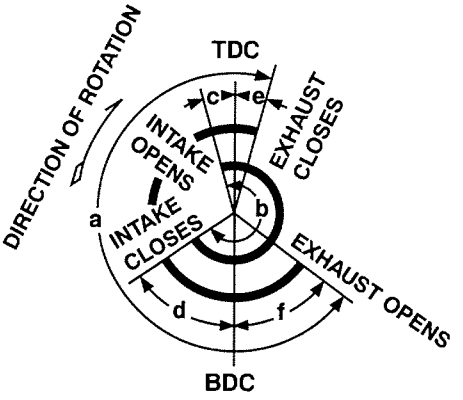
- The water jacket around the plug is expanded to increase cooling efficiency
- Due to increased cooling, ignition timing is advanced
- Exhaust port shape is modified to reduce exhaust gas flow resistance

Emission Controls

The drawing below shows the locations of various emission control items for the VQ35DE:



Camshaft Profiles

		MY '00 VG33	MY '01 VQ35*
Cam Height "A"	Intake	38.943-39.133 mm (1.5332-1.5407 in.)	43.940-44.130 mm (1.7299-1.7374 in.)
	Exhaust	38.943-39.133 mm (1.5332-1.5407 in.)	44.465-44.655 mm (1.7506-1.7581 in.)
Wear Limit of Cam Height		0.15 mm (0.0059 in.)	0.2 mm (0.008 in.)
Valve Timing			

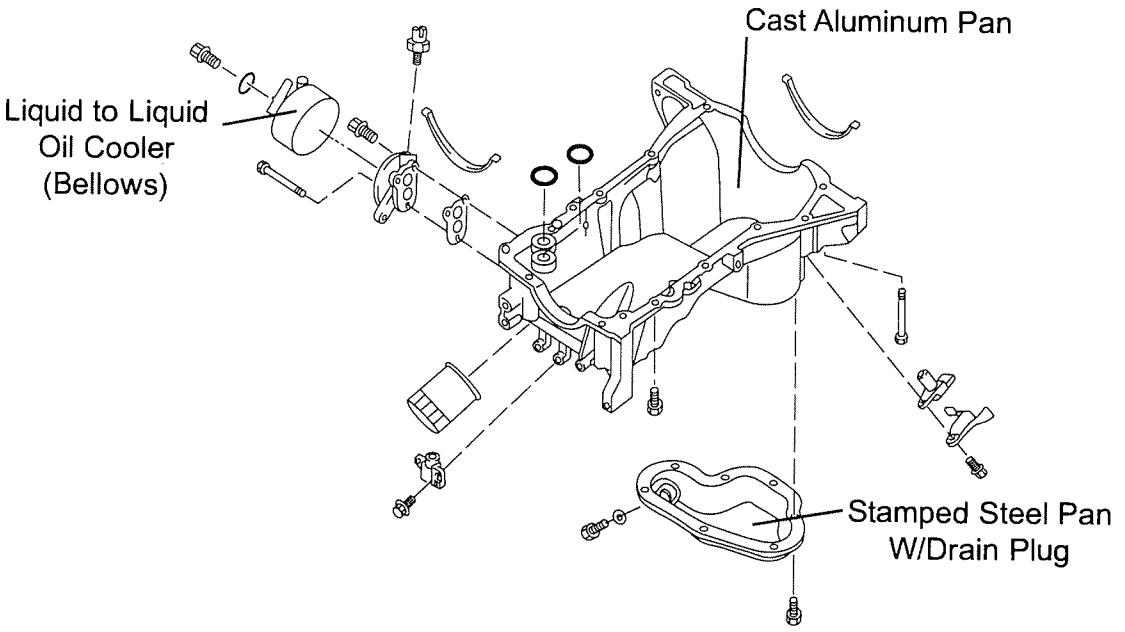
	a	b	c	d	e	f
MY '00 VG33	240°	244°	4°	60°	9°	51°
MY '01 VQ35*	232°	224°	3°	41°	3°	49°

*All VQ35 cam specs are same as MY'00 VQ30 engine

Note: Shading denotes changes for MY'01 compared with VG33E

Oil Cooler

- Coolant circulation oil cooler added to engine block

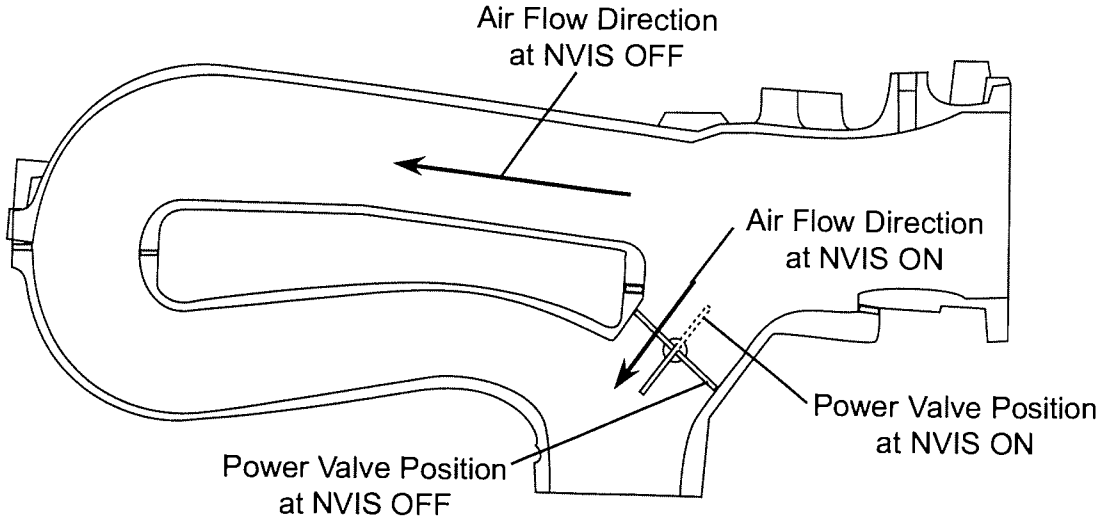


Cooling System

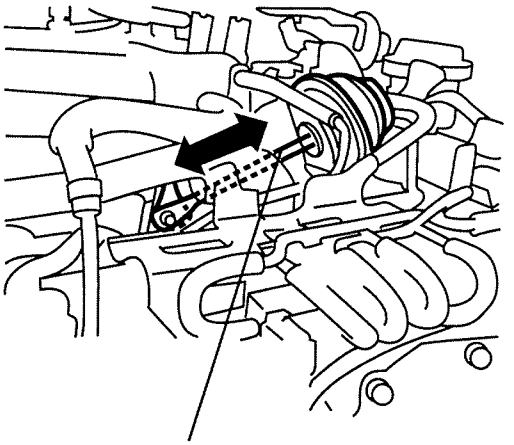
- Dual water-flow cooling system (2 thermostats)
- Low temperature thermostats

Nissan Variable Intake Air Control System (VIAS)

- VIAS: Nissan Variable Intake System increases engine torque up to 11%
  - During low speed operation (high vacuum), VIAS is OFF (power valve closed). Engine receives air through long intake passage, resulting in increased torque.
  - During high speed operation (low vacuum), VIAS is ON (power valve open). Engine receives air through short intake passage, resulting in improved performance and fuel economy.



- Diagnosis performed with or without CONSULT-II Active Test feature
  - With CONSULT-II use VIAS SOL VALVE monitor
  - Without CONSULT-II rev warm engine and verify that power valve actuator moves

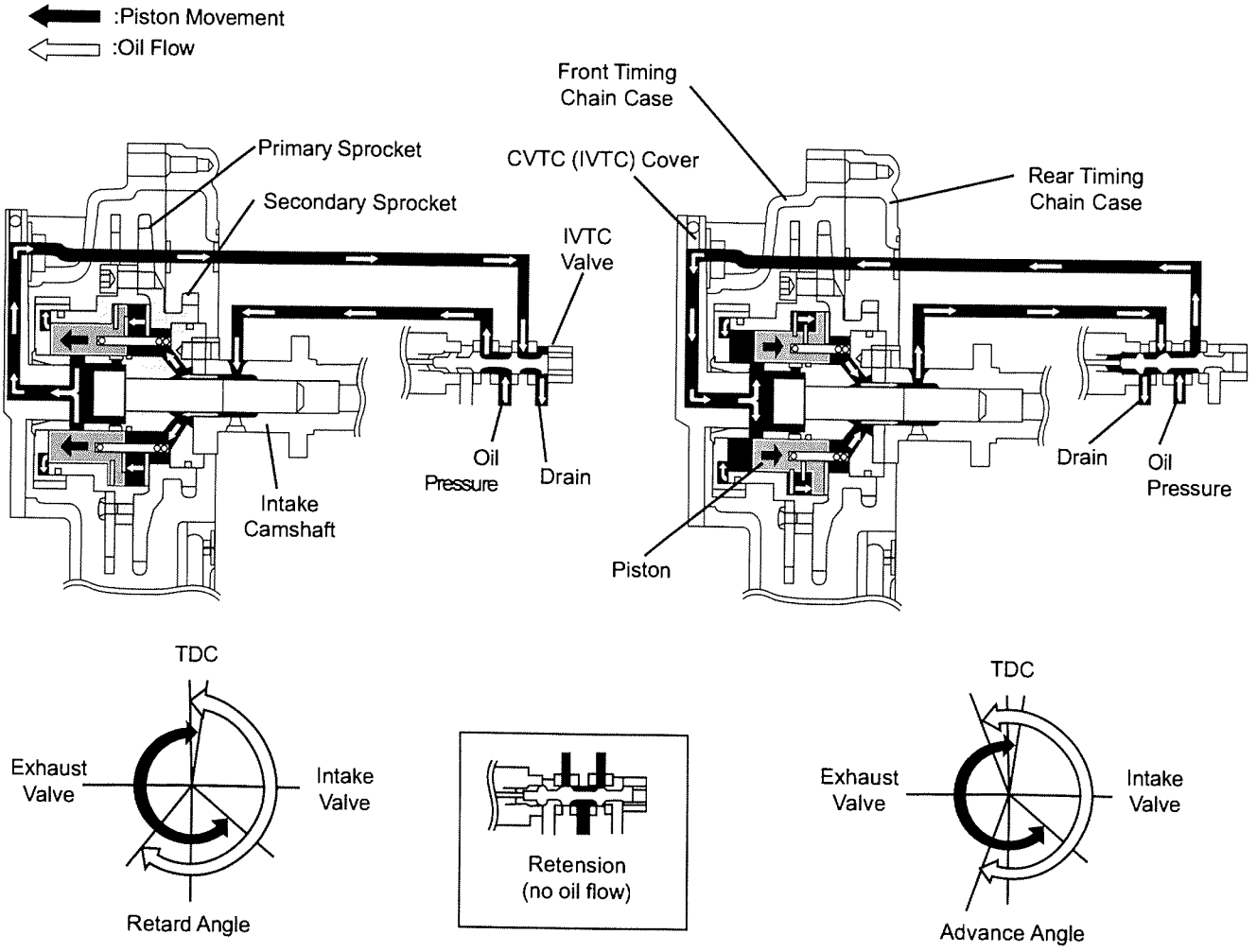


Nissan Continuously Variable Valve Timing Control System (NCVCS)

System Description

This system increases engine torque in low and mid rpm range. At high rpm, horsepower and fuel efficiency are both improved.

- ECM input signals are collected from crankshaft position (POS), crankshaft position (REF), camshaft position, engine speed, and engine coolant temperature.
- ECM sends a variable duty cycle to the Intake Valve Timing Control (IVTC) Solenoid valve.
- IVTC valve directs oil pressure through both intake valve timing control units (intake cam sprockets) in two possible directions, causing advance or retard of intake cam.



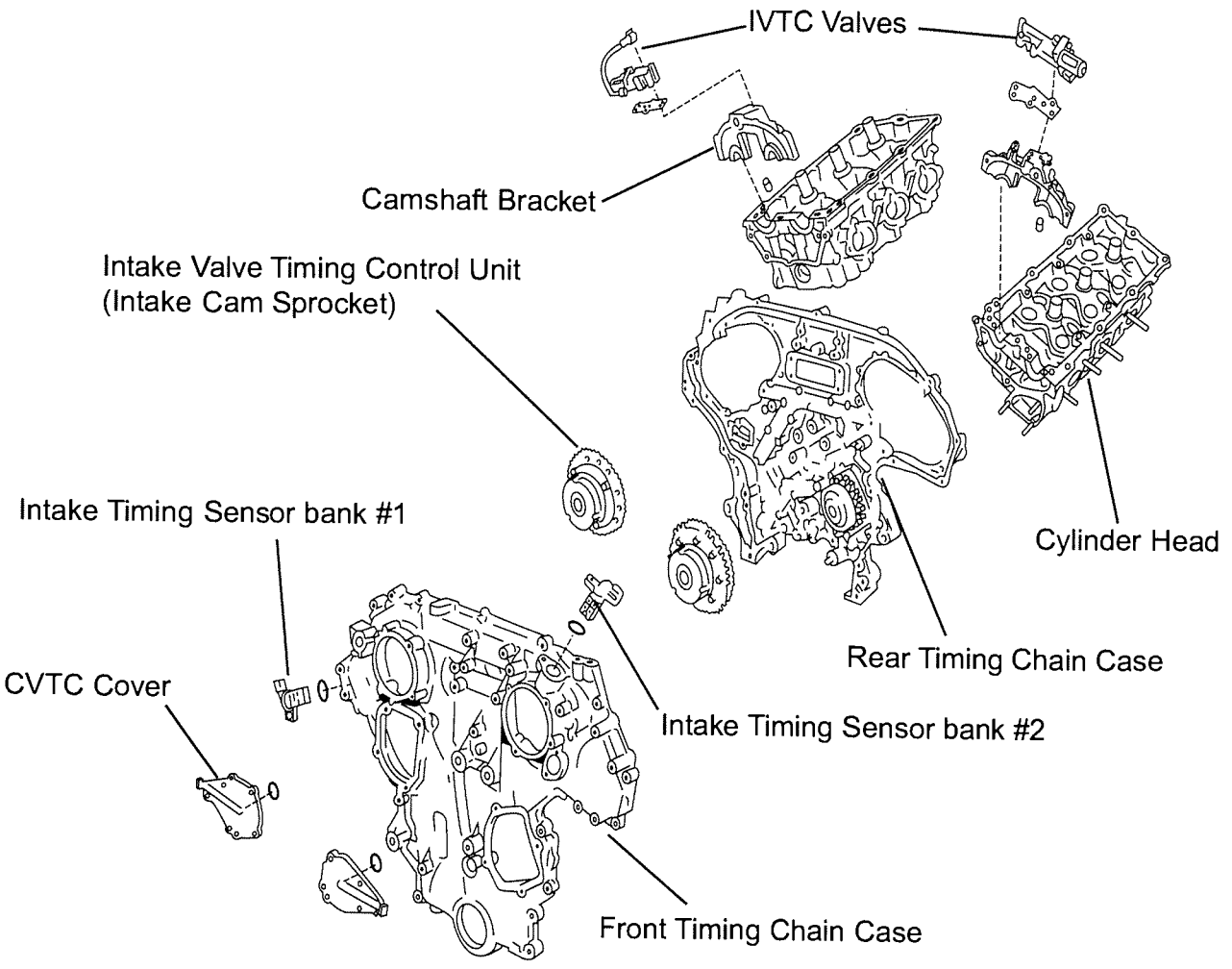
- IVTC Valve is activated by signals from the ECM.
  - Longer pulse width (high duty cycle) increases pressure in the system, advancing intake cam timing
  - Shorter pulse width (low duty cycle) reduces pressure in the system, retarding intake cam timing.
  - Equal pulse width stops oil flow, fixing the timing at 0° advance

Component Description

- NCVCS components include:

  -Intake Valve Timing Control (IVTC) Solenoid valve
  -Intake Timing Sensor (senses cam advance)
  -Intake Valve Timing Control Unit (intake cam sprocket)

Note: In the ESM, IVTC is also referred to as CVTC.



New Diagnostic Trouble Codes

With the NCVCS, there are diagnostic trouble codes. The following chart indicates the new codes:

New Diagnostic Trouble Codes

DTC	Description	CONSULT-II Terminology
P1111	Solenoid - Bank 1	INT/V SOL (B1)
P1136	Solenoid - Bank 2	INT/V SOL (B2)
P1140	Sensor - Bank 1	INT/V TIM (B1)
P1145	Sensor - Bank 2	INT/V TIM (B2)

Specification Data

The following specification data are used with CONSULT-II:

CONSULT-II Reference Value in Data Monitor Mode

Monitor Item	Condition		Specification
INT/V TIM (B1) INT/V TIM (B2)	• After warming up engine • Shift Lever to NEUTRAL • Quickly depressed accelerator pedal • No load	Idle	0° CA
		2,000 rpm	Approximately 12-18° CA
INT/V SOL (B1) INT/V SOL (B2)	• After warming up engine • Shift Lever to NEUTRAL • Quickly depressed accelerator pedal • No load	Idle	0%
		2,000 rpm	*Approximately 40%

*This represents a duty cycle in relation to the solenoid ON time.

On Board Diagnosis Logic

OBD malfunction is detected when:

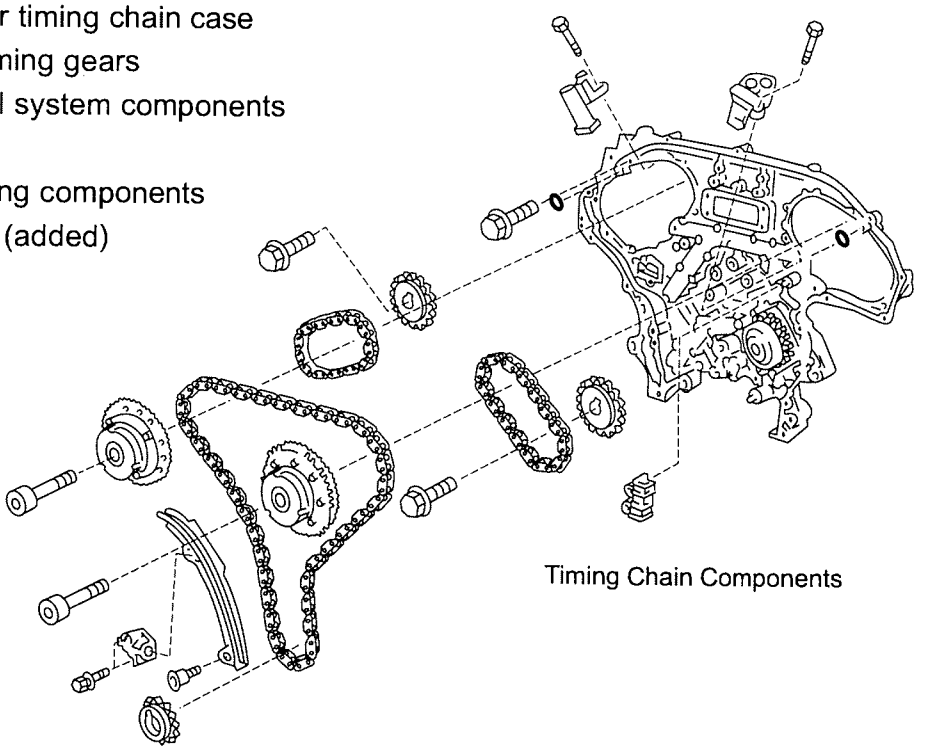
- Malfunction A-The alignment of the intake valve timing control has been misregistered
- Malfunction B-There is a difference between angle of target and angle of phase-control

When malfunction A or B is detected, the ECM enters fail safe mode and the MIL lights up. In fail-safe mode, the IVTC valve does not function.

Timing Chain

Because the VQ35DE engine has the new Nissan Continuously Variable Valve Timing Control System (NCVCS), the following timing related components have changed:

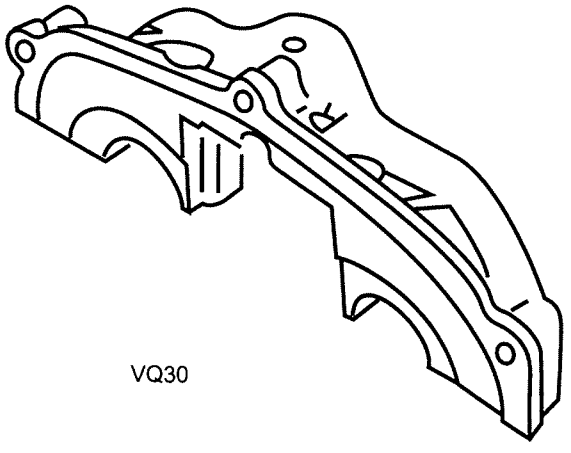
- Front and rear timing chain case
- Intake cam timing gears
- Timing control system components
- Timing chain
- Marks on timing components
- CVTC covers (added)



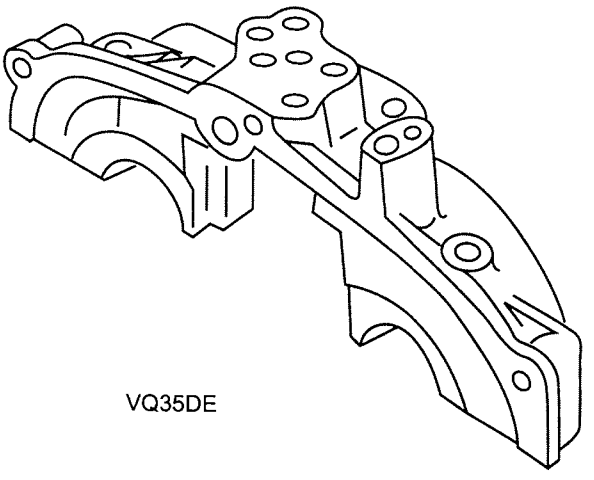
Timing Chain Components

Camshaft Mounting Brackets

The camshaft mounting brackets are different as seen in the illustration below. This is necessary to provide a mounting location for the IVTC (CVTC) valves:



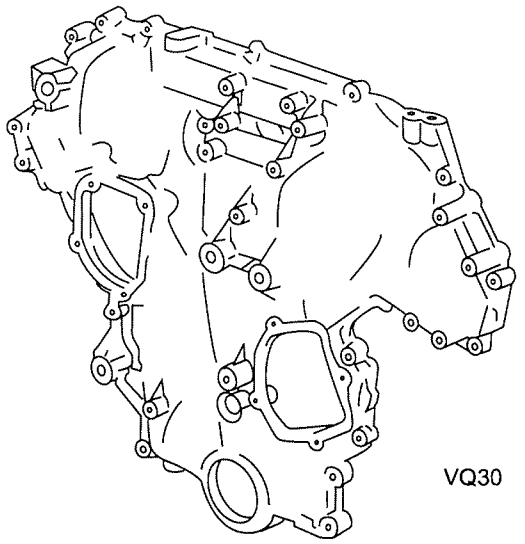
VQ30



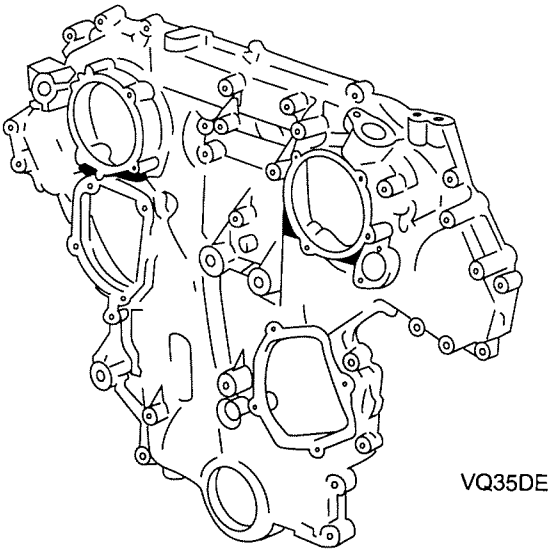
VQ35DE

Timing Chain Case

The front timing chain case is redesigned to accommodate the two CVTC covers.



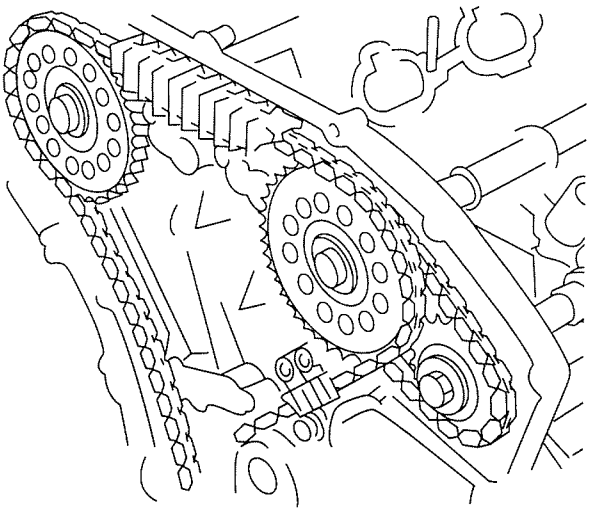
VQ30



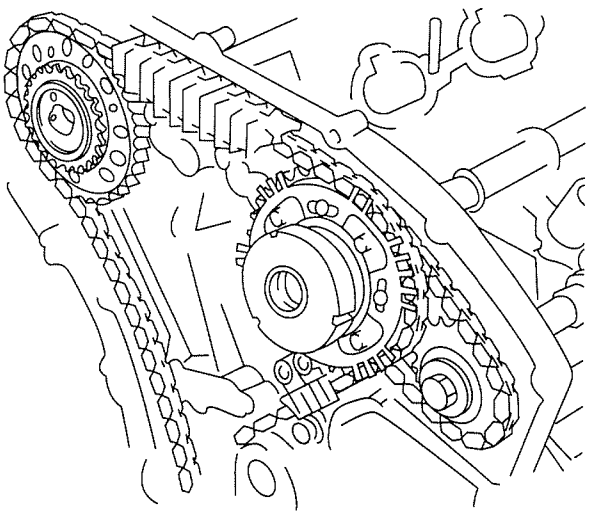
VQ35DE

Timing Chain Intake Sprockets

The intake sprockets are redesigned to accommodate NCVCS.



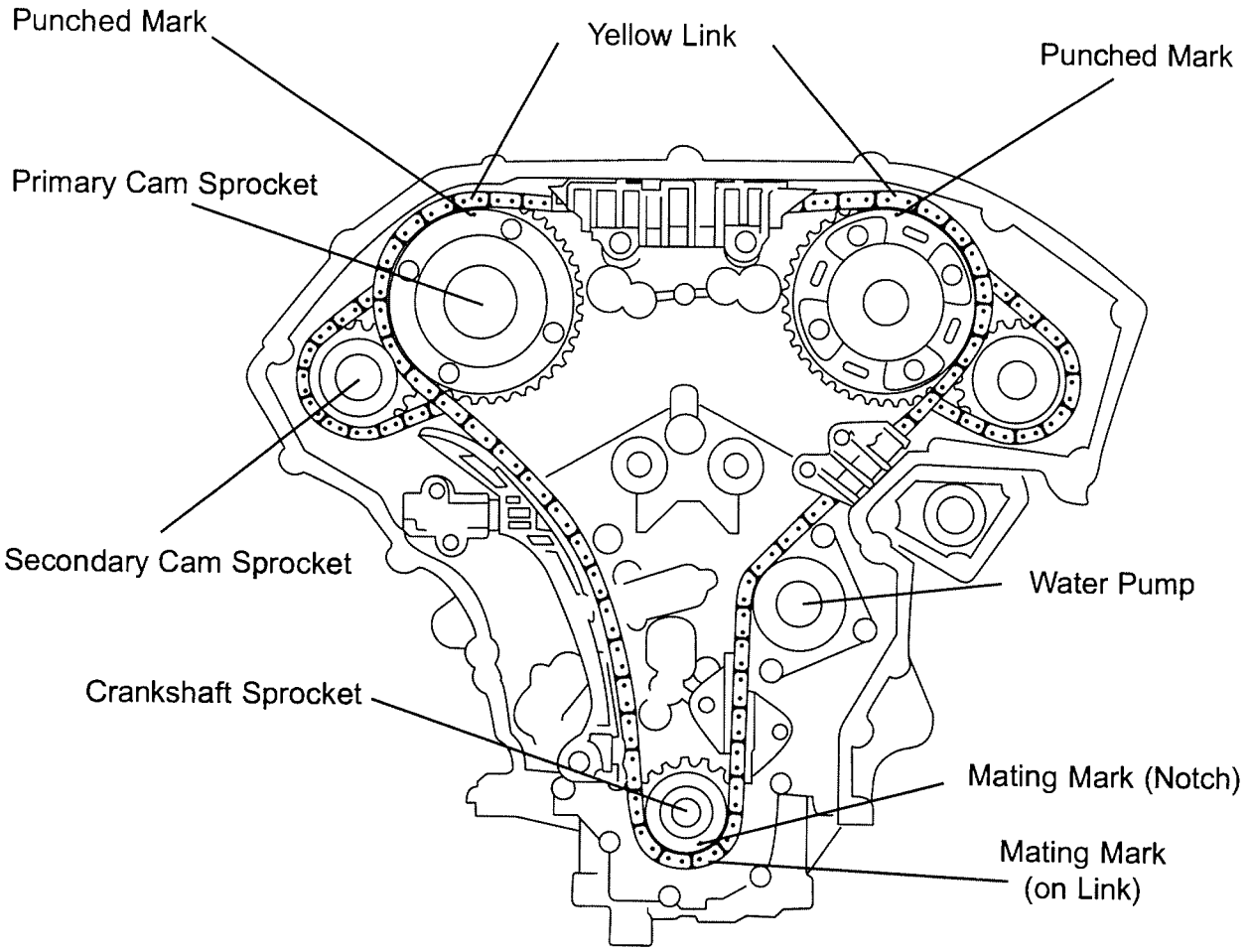
VQ30



VQ35DE

Primary Timing Chain Markings

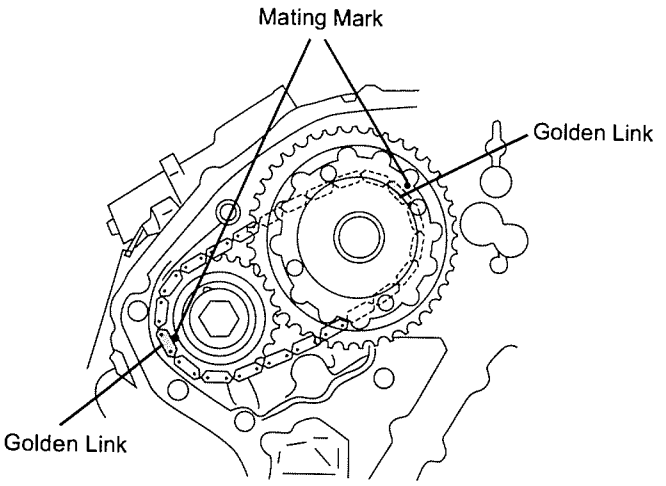
During reassembly, the primary timing chain should be installed so that the mating marks align as shown in the illustration below.



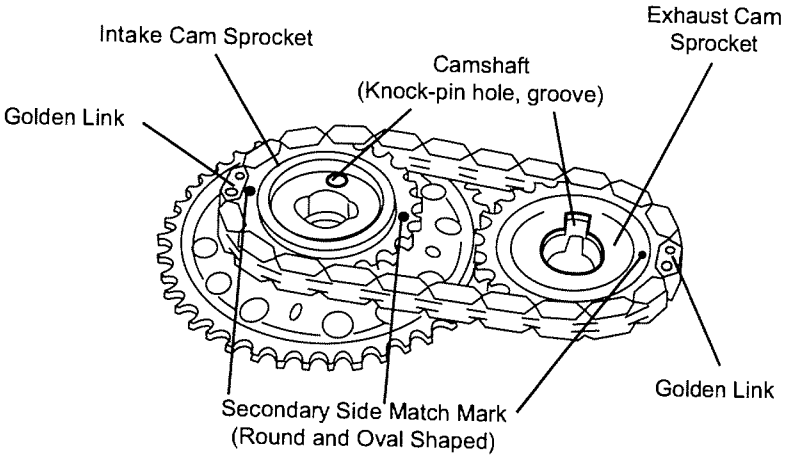
Note: Because the cam sprockets are different on the VQ35DE, it is essential to pay attention to all match markings.

Secondary Timing Chain Markings

- Matching marks of the intake sprocket are on the back side of the secondary sprockets. The two types of marks should be used in this manner.
  - Right Bank: Round
  - Left Bank: Oval



Front View



Rear View

Note: It may be difficult to visually check the dislocation of mating marks during and after installation. To make the matching easier, make a mating mark on the sprocket teeth in advance, using paint.

DRIVE TRAIN

Transmission

- New transmission with increased torque-handling capability (details TBD)
- 5-speed MT standard on the SE model
- 4-speed AT w/overdrive standard on the XE and LE model
- Grade Logic for automatic transmission (optional on the SE model). This system uses electronic control/shift mapping enhancements to reduce "hunting" while going up hills.

Transmission Gear Ratios

	Transmission	
	MT	AT
1st	3.580	2.785
2nd	2.077	1.545
3rd	1.360	1.000
4th	1.000	0.694
5th	0.811	N/A
Reverse	3.636	2.272
Final Drive (XE)	4.363	4.363
Final Drive (SE/LE)	4.636	4.636
Transfer Gear Ratio	2.020	2.596

NEW TEST EQUIPMENT

Kent-Moore J-44373 model 620 Tester

Tests batteries, starters, and charging systems.

Battery test results:

- Good battery
- Good but needs a recharge
- Fully charge battery and retest
- Replace battery and retest
- Bad cell detected

Starter test results:

- Cranking voltage normal
- Cranking voltage low (starter suspect)
- Charge battery (insufficient charge for test)
- Replace battery

Charging system test results:

- Charging system normal/diode ripple normal
- Charging system incident

Potential causes of charging system incidents:

- No charging voltage
- Low charging voltage
- High charging voltage
- Excess ripple detected

Note:

- Output codes for each test must be recorded on the work order
- Date and time must be set prior to performing tests

GLOSSARY OF TERMS

DATA MONITOR (SPEC)- A new feature of CONSULT-II which allows the user to monitor certain sensor parameters in comparison to the actual specifications for those sensors. The specification for these sensors is for idle speed only and it will display as a shaded background on the CONSULT-II screen. The actual "at idle" value of that sensor will show up numerically as an overlay, allowing one to determine if sensor operation is normal. Currently the sensors which can be monitored in this fashion are MAS A/F SE B1, A/F ALPHA B1, and A/F ALPHA B2.

Electronic EGR Volume Control Valve- A new stepper-motor type EGR valve which can be commanded in "steps" to open or close the EGR passageway. This provides a much more precise control of EGR gas flow than the previously used vacuum type EGR. A temperature sensor is used to monitor output flow of the exhaust gas for diagnostic purposes.

EZEV (Equivalent Zero Emission Vehicle)- A term associated with certain 1.8 liter equipped cars destined for the California market. In effect, the emissions produced by the engine having this calibration are equivalent to zero as they pass through the tailpipe. This calibration is also referred to as CA for Clean Air. Only a limited number of these vehicles will be produced for this market.

HO2S1 (B1)- The term used to identify the front, bank-one oxygen sensor as displayed on CONSULT-II. For effective catalyst "light-off", the converter is placed near the exhaust manifold and these sensors must be positioned upstream (ahead of) the catalyst. The front, bank-one sensor monitors fuel trim control for #1 and #4 cylinders, which when combined with the bank-two sensor input allows for more precise corrections of short-term fuel trim.

HO2S1 (B2)- The term used to identify the front, bank-two oxygen sensor as displayed on CONSULT-II. As with the front, bank-one sensor, placement in the exhaust stream is critical. The front, bank-two sensor monitors fuel trim control for #2 and #3 cylinders, which when combined with the bank-one sensor input allows for more precise corrections of short-term fuel trim.

HO2S2 MNTR (B1)- The term used to identify the rear, bank-one oxygen sensor as displayed on CONSULT-II. The rear, bank-one sensor monitors the effectiveness of the pre-catalyst for bank one, cylinders #1 and #4.

HO2S2 MNTR (B2)- The term used to identify the rear bank-two oxygen sensor as displayed on CONSULT-II. The rear, bank-two sensor monitors the effectiveness of the pre-catalyst for bank two, cylinders #2 and #3.

Nissan Anti-Theft System (NATS)- The anti-theft system used on all Nissan vehicles equipped with this option. If someone attempts to start the engine of one of these vehicles with an "unregistered" key, the immobilizer control unit (IMMU) sends a "no-start" command to the ECM, thus preventing engine start. Keys are registered to the system using CONSULT-II.

Nissan Continuously Variable Valve Timing Control System (NCVCS)- This system, which is being introduced on the new Pathfinder VQ35DE engine provides constant valve timing control under all operating conditions to improve overall engine performance. Electronically-controlled solenoids are pulsed on and off to meter the flow of oil entering the control valve assembly to advance intake cam timing.

Nissan Direct Ignition System (NDIS)-The ignition system provides the spark that ignites the mixture in the engine's combustion chamber. A traditional system includes a single coil and a mechanical distributor that distributes power to the spark plugs through high-tension wires. The Nissan Direct Ignition System (NDIS) places a separate coil for each cylinder directly over the spark plug. This eliminates the need for the traditional distributor and high-tension wires. Controlled by Nissan's electronic engine management system, the ignition enhances fuel economy, reduces exhaust emissions, and increases performance, driveability, and control.

Nissan Variable Intake System (NVIS)- A new intake manifold system which improves engine performance and torque development by varying the effective length of the intake runner. To accomplish this, a vacuum-operated power valve, located in the intake runner, is opened or closed to change the length of the runner. At low engine operation, when engine vacuum and torque demand are both high, the power valve remains closed. This lengthens the passageway and helps the engine build maximum torque and horsepower. At high rpm, when engine vacuum and the need for high torque both decrease, the power valve opens, thus shortening the length of the passageway.

Powertrain Control Module (PCM)- A new style control module which combines both the engine control module (ECM) and transmission control module (TCM) into a single unit. This application is currently only used on the 2000 Sentra XE or GXE equipped with the QG18DE engine and automatic transmission.

Signal Plate- A bolt-on plate attached to the rear of the crankshaft which is used as a reference for crankshaft position. While the crankshaft is spinning, the ECM uses the input picked up by the crankshaft position sensor from this signal plate to determine firing order and engine speed. The plate must be indexed with a locating dowel pin during installation.

Sub-cooling Condenser- A term used to identify the new air conditioner condenser used on 2000 model Sentras with the air conditioning option. In effect, the refrigerant makes three passes through this condenser. On the third pass, refrigerant flows through the lower section (the sub-cooling section) of the condenser. This last pass results in more efficient cooling of the refrigerant as it leaves the condenser, thus improving the cooling capability of the air conditioner. The receiver-drier inlet and outlet tubes are brazed to the condenser.

Swirl Control Valve- A vacuum-operated valve assembly, mounted in the passageway of the intake manifold for each cylinder. During low speed engine operation, the swirl control valve is closed, increasing the velocity of air entering the intake. This promotes better fuel vaporization and causes a swirling effect in the combustion chamber. Because of this swirl effect, combustion occurs more quickly and fuel consumption is improved, resulting in more stable engine operation. At higher engine rpm, the swirl control valve opens, reducing intake flow resistance and increasing power.

Variable Capacity Muffler- A term used to describe the new style muffler used on the Sentra SE, which is equipped with the SR20DE engine. This muffler has a spring-loaded valve which opens and closes relative to pressure inside the muffler. At approximately 2000 rpm, the valve opens, resulting in a significant increase in performance.

NISSAN

EXERCISES

NISSAN

SIGN-OFF SHEET

SENTRA 2000/PATHFINDER 2001 NEW MODEL

Date of Class _____

SENTRA 2000/PATHFINDER 2001 NEW MODEL SIGN-OFF SHEET

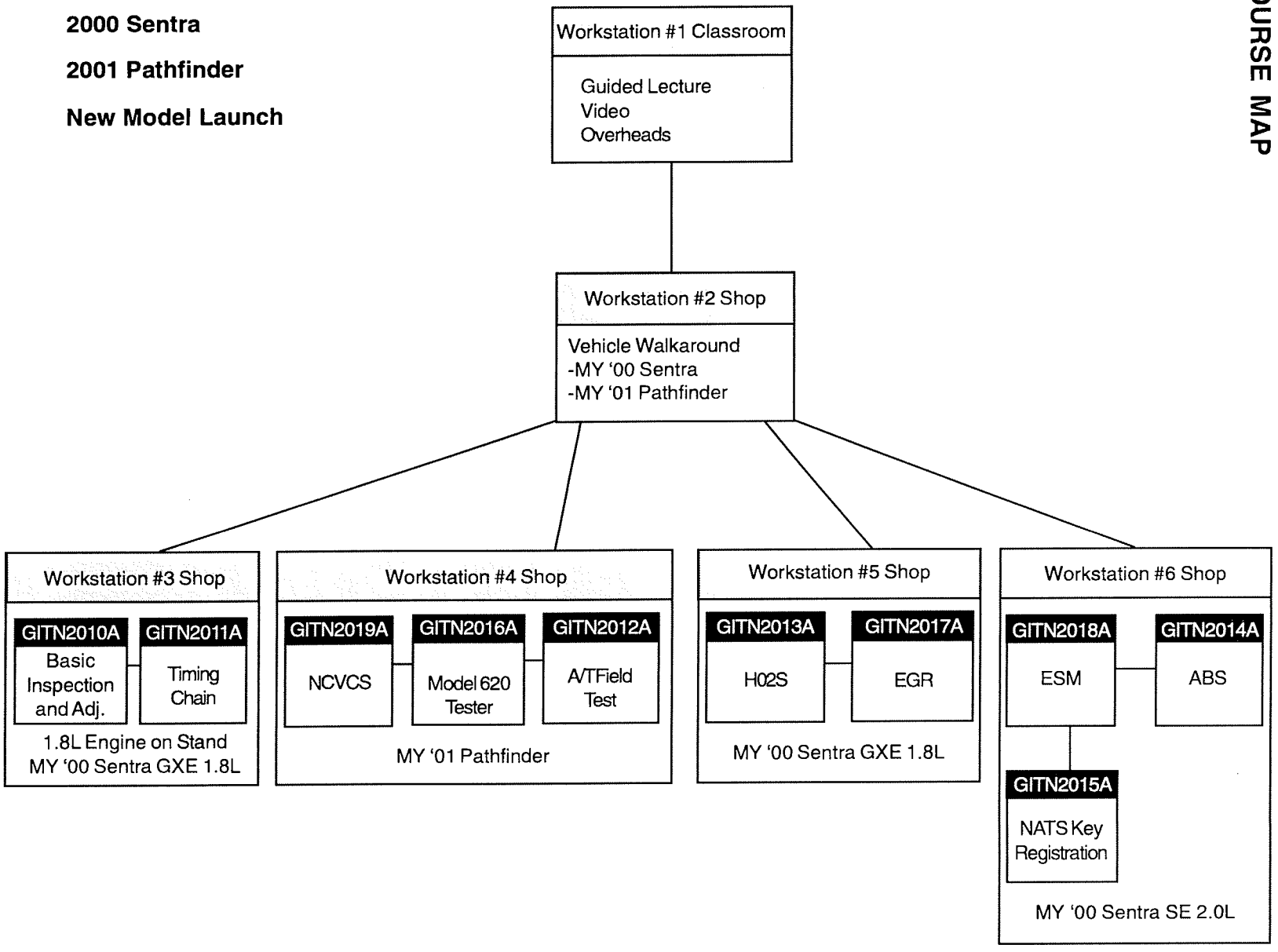
WORKSHEET	TITLE	INSTRUCTOR
GITN2010A	Basic Inspection and Adjustment	
GITN2011A	Timing Chain R&R on the QG18DE Engine	
GITN2012A	A/T Field Test Using CONSULT-II	
GITN2013A	H02S Test Using CONSULT-II	
GITN2014A	ABS Active Test Using CONSULT-II	
GITN2015A	NATS Key Registration Using CONSULT-II	
GITN2016A	Testing Batteries, Starters, & Charging Systems with the Model 620 Tester	
GITN2017A	Diagnosing Emission System Problems Using CONSULT-II	
GITN2018A	Using the Electronic Service Manual (ESM)	
GITN2019A	Inspecting the Nissan Continuously Variable Valve Timing Control System (NCVCS) Using CONSULT-II	

COURSE MAP

2000 Sentra

2001 Pathfinder

New Model Launch



BASIC INSPECTION AND ADJUSTMENT

GITN 2010A

Objective: Given a 2000 1.8 liter Sentra, perform a Basic Inspection and Adjustment.

Relevance: This procedure is new to Sentra and is similar to the procedure for the 2000 Maxima. Also, important CONSULT-II procedures, such as TPS Idle Memory Reset are described.

Resources:

- 2000 Sentra with QG18DE engine
- CONSULT-II
- Feeler gauge set
- Timing Light
- Vacuum pump
- Electronic Service Manual (ESM)

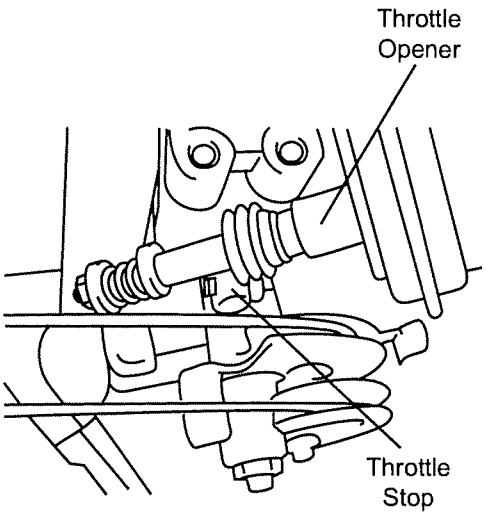
Skill Check: After performing the procedures in this module, verify the following are properly adjusted:

- Throttle Position Switch (TPS)
- Throttle opener
- Ignition timing
- Target idle speed

1. Turn off all accessory electrical loads before starting this procedure. No loads should be on during the entire procedure.
2. Open the Service Manual and find Trouble Diagnosis-Basic Inspection.
3. Record the section and page number where it begins.

_____

Throttle Opener Inspection



4. Check clearance between the throttle drum and the throttle stop when the engine is not running.
5. Is there clearance?

   YES/ NO *(Circle One)*

6. According to the Service Manual, how should a clearance problem be corrected?

_____

_____

_____

7. Start the engine and allow it to idle. The throttle opener rod should move away from the throttle drum once the engine is started.
8. Is there clearance between the throttle opener rod and the throttle drum?

   YES/ NO *(Circle One)*

Closed TPS Inspection

9. Shut off the engine.

10. Connect a vacuum pump to the throttle opener vacuum hose.

11. Apply vacuum until the throttle opener rod no longer touches the throttle drum.

12. Explain why it is necessary to apply vacuum to the throttle opener prior to checking the closed-throttle position switch.

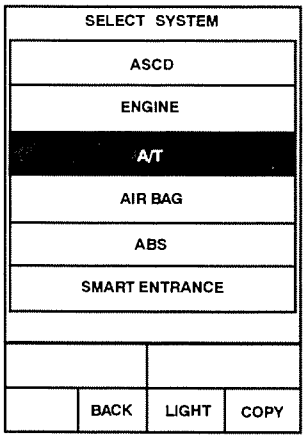
_____

_____

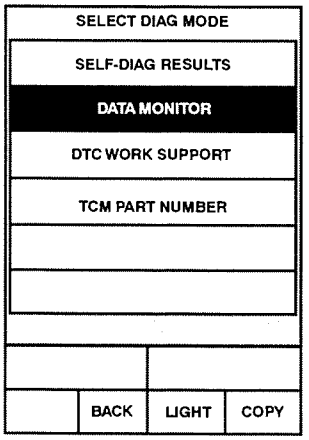
_____

Note: Do not adjust the throttle stop. It has been preset at the factory.

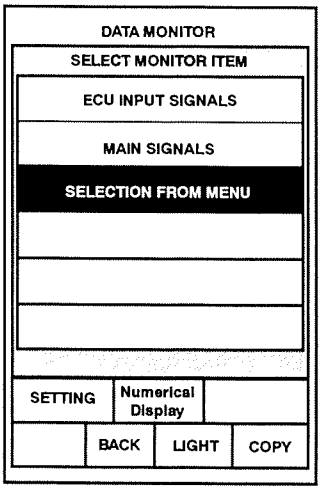
13. Connect CONSULT-II to the DLC-II connector and turn the ignition switch ON, but do not start the engine.



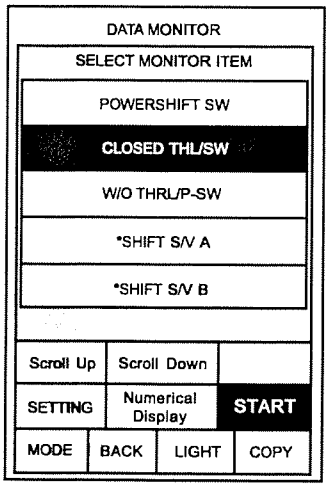
14. Touch **START**, then touch **A/T** to select the automatic transmission.



15. Touch **DATA MONITOR** to select the diagnostic mode to be used in this exercise.

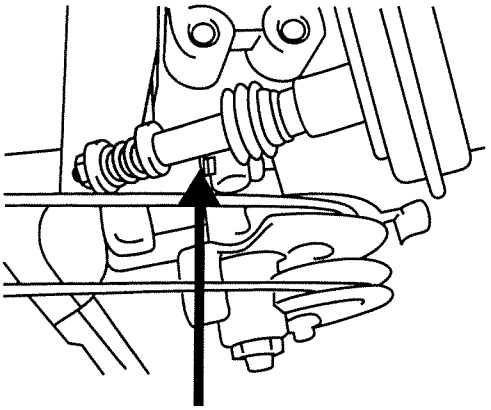


16. Touch **SELECTION FROM MENU**.
17. Touch **PAGE DOWN** until **CLOSED THL/SW** appears on the display.



18. Touch **CLOSED THL/SW** to select it, then select **THRTL POS SEN**. Touch **START** to begin monitoring the status of this switch.

GITN 2010A



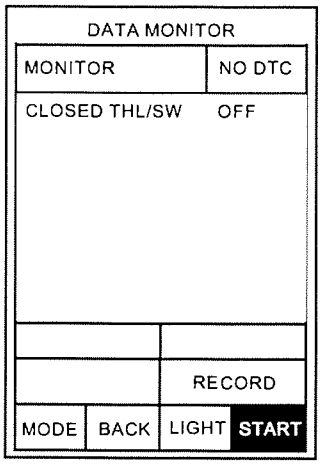
Insert Feeler Gauge

19. While still applying vacuum to the throttle opener, insert a 0.05 mm (0.0020 in.) feeler gauge between the throttle stop and the throttle drum. The CLOSED THL/SW should read ON at this time.

Note: Specifications vary for different engine/ vehicle combinations. Always refer to the Service Manual or relevant bulletins for correct specifications.

20. Is the CLOSED THL/SW ON?

YES/ NO *(Circle One)*



21. Insert a 0.15 mm (0.0059 in.) feeler gauge between the throttle stop and the throttle drum. The CLOSED THL/SW should now be OFF.

22. Is the CLOSED THL/SW OFF?

    YES/ NO *(Circle One)*

23. Based on your answers in the last two steps, is the closed throttle position switch operating correctly?

    YES/ NO *(Circle One)*

24. If not, what needs to be done to correct its operation?

    _____

Closed TPS Adjustment

GITN 2010A

Note: Always adjust the throttle position sensor (TPS) using the following method. Measuring voltage is not a reliable indicator of proper TPS adjustment.

25. With vacuum still applied, verify that the throttle opener rod is not contacting the throttle drum, then loosen the throttle position sensor holding screws.
26. Insert a 0.05 mm (0.0020 in.) feeler gauge between the throttle drum and the throttle stop.
27. Rotate the throttle position sensor until CONSULT-II indicates that the CLOSED THL/SW is OFF.
28. Slowly and gradually rotate the throttle position sensor until the CLOSED THL/SW reads ON.
29. Tighten the throttle position sensor holding screws.
30. Open and close the throttle 2-3 times using the throttle drum and verify that the CLOSED THL/SW is ON with the gauge inserted and the throttle closed.
31. Touch **COPY** to Print the CONSULT-II screen displaying the CLOSED THL/SW in the ON position and attach it at left.

Attach Printout Here

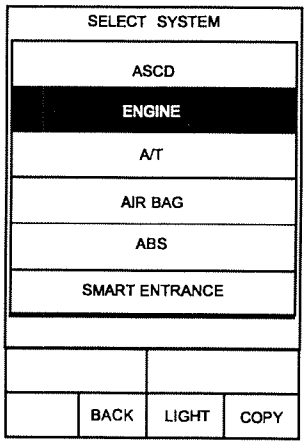
32. Remove the 0.05 mm (0.0020 in.) feeler gauge and insert a 0.15 mm (0.0059 in.) feeler gauge between the throttle drum and the throttle stop.
33. Open and close the throttle 2-3 times and verify that the CLOSED THL/SW is OFF whenever the throttle is closed.
34. Print the CONSULT-II screen displaying the CLOSED THL/SW in the OFF position and attach it at left.

Attach Printout Here

Note: The process of tightening the holding screws may throw the adjustment off. Recheck the adjustment after tightening the screws and repeat the adjustment procedure if necessary.

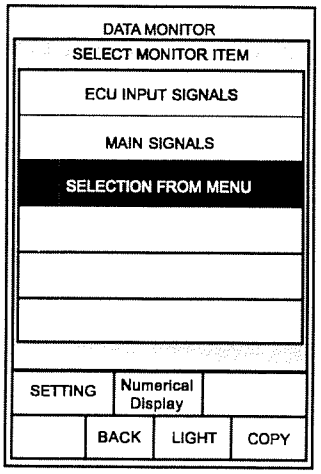
35. Touch **BACK** until you return to the SELECT SYSTEM screen.

TPS Idle Position Memory Reset

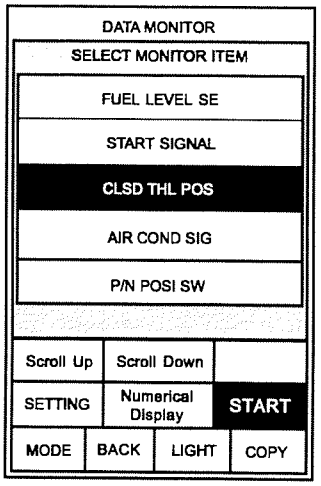


Note: Reset the TPS idle position memory after closed TPS adjustment to maintain correct idle speed.

36. While vacuum is still applied to the throttle opener, turn the ignition ON.
37. Touch **ENGINE** to select that system, then touch **DATA MONITOR**.



38. Touch **SELECTION FROM MENU** to select system inputs to monitor.



39. Touch **CLSD THL POS** to select it from the list of inputs to monitor.
40. Touch **START**.

Attach Printout Here

41. Touch **PRINT** to print the screen showing the current status of the switch and attach the printout at left.

42. If the CLSD THL POS signal reads OFF, Turn the ignition switch OFF for 10 seconds.
43. Continue to cycle the ignition ON and OFF in 10-second intervals until the CLSD THL POS signal changes to ON.
44. Disconnect the vacuum pump from the throttle opener and reconnect the vacuum hose to the throttle opener.

Basic Service Procedure

45. Make sure the engine is at normal operating temperature.

46. Check the ignition timing at idle using a timing light.

Note: Clamp the timing light pick-up around the harness at the #1 ignition coil. Do not use the loop in the main engine harness because it does not always provide an accurate signal.

47. Verify target idle speed is correct.
Target idle:
M/T 650±50rpm
A/T 800 ±50rpm ("P" or "N")

48. What is the specification for ignition timing at idle?

_____

_____

49. Is the measured timing within the specification listed in the Service Manual?

YES/ NO *(Circle One)*

50. According to the Service Manual, which of the following sensors could cause the ignition timing to be incorrect if they were malfunctioning?
(Check all that apply)

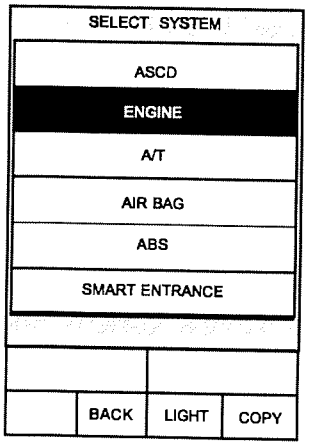
____ Throttle Position Sensor

____ EGR Temperature Sensor

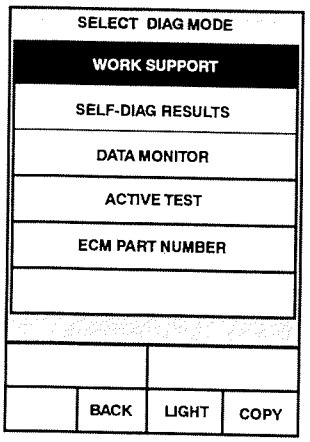
____ Crankshaft Position Sensor

____ Camshaft Position Sensor

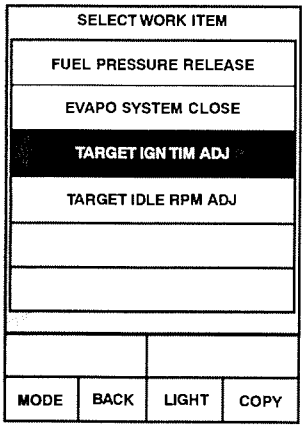
Note: The following procedure is not covered in the Service Manual, but it allows you to change ignition timing with CONSULT-II for diagnostic purposes only.



51. Touch **ENGINE** to select the system to be monitored.

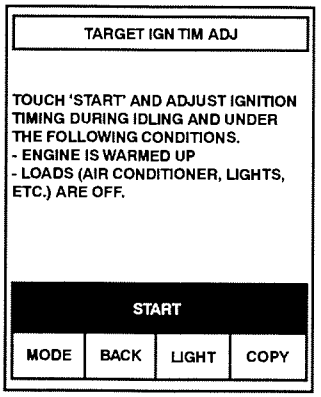


52. Touch **WORK SUPPORT** to change the diagnostic mode.



53. Touch **TARGET IGN TIM ADJ** to select it as the work item.

Note: Before adjusting target ignition timing, make sure all loads are off and engine is at normal operating temperature.



54. Touch **START** to monitor and adjust target ignition timing.

55. What is the ignition timing value displayed on the CONSULT-II screen prior to adjustment ?

_____

56. Does the CONSULT-II display for IGN TIM match what you obtained with the timing light?

YES/ NO *(Circle One)*

Attach Printout Here

57. According to CONSULT-II, is the timing currently being corrected?

    YES/ NO *(Circle One)*

58. Touch **COPY** to Print a copy of the CONSULT-II screen and attach it at left.

Note: CONSULT-II enables you to advance the ignition timing a maximum of 2° and retard it a maximum of 2°.

59. Touch **UP** or **DOWN** to adjust the correction specification to zero on CONSULT-II, then touch **UPDATE**.

    The new ignition timing correction is now saved into the ECM's memory.

Note: Even though CONSULT-II will allow you to adjust ignition timing beyond the ±2° range, it will not update the ECM with a corrected value that exceeds that range. Also, if you encounter difficulties related to setting ignition timing and you believe that the ECM is the cause, check for an ignition timing correction before replacing the ECM. This capability is found in CONSULT-II under WORK SUPPORT.

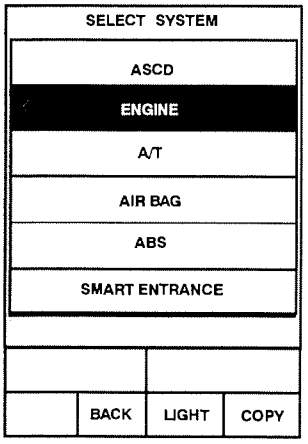
Attach Printout Here

60. Print a copy of the CONSULT-II screen showing the timing correction at 0° and attach it at left.

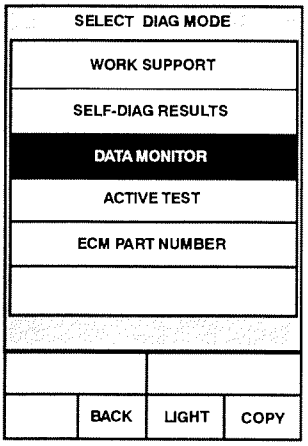
61. Return to the SELECT SYSTEM menu.

Target Idle Speed Inspection

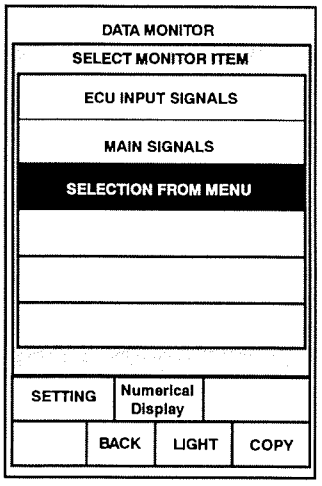
62. Allow the engine to idle.
63. Touch **ENGINE** to select that system.

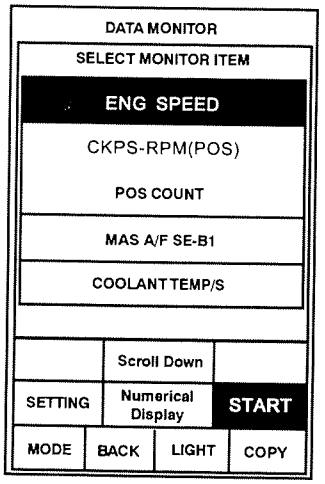


64. Touch **DATA MONITOR** to select the diagnostic mode to be used.



65. Touch **SELECTION FROM MENU**.





66. Touch **ENG SPEED**, then touch **START**.

67. What is the ENG SPEED displayed on the CONSULT-II screen?

_____

68. According to the Service Manual, what is the specification for target idle speed?

_____

69. Is the vehicle's ENG SPEED within specifications?

YES/ NO *(Circle One)*

70. If you circled no, what does the Service Manual tell you to do in order to correct the target idle speed?

_____

_____

Note: You may notice that attempts to change idle speed with CONSULT-II were not successful. This is normal for this vehicle.

71. On what page of the Service Manual can you find the procedure referenced in your answer to the last question?

_____

Note: Any time target idle speed is adjusted during normal service procedures, the Idle Air Volume Learning procedure must also be performed. If at any time during diagnosis the Service Manual recommends replacing the ECM, reset ignition timing and target idle to specification (zero adjustment) using CONSULT-II. Repeat the Idle Air Volume Learning procedure, then continue your diagnosis.

72. Stop the engine and reconnect the throttle position sensor harness connector.

Idle Air Volume Learning Procedure

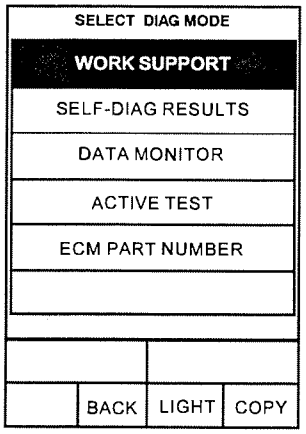
The following procedure must be performed:

- When IACV-AAV, throttle body, ECM, or PCM is replaced
- When idle speed or ignition timing is out of specification
- When the battery is disconnected or the ECM loses power
- When the ECM is reprogrammed

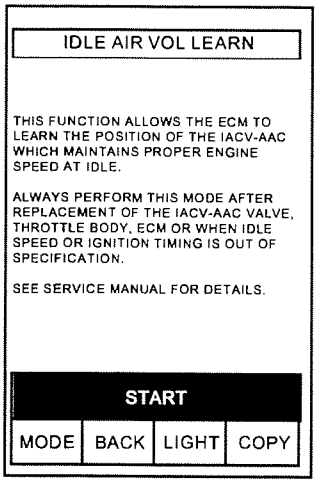
Note: Performing the Idle Air Volume Learning procedure is becoming an essential skill as more Nissan vehicles no longer have manual adjustments for timing and idle. This procedure should also be performed whenever related components, such as IACV/ACC valve, are replaced.

73. While the engine is running, verify that the following conditions are present:
    - Battery voltage is above 12.9 V at idle
    - Coolant temperature is above 158° F (70° C)
    - The Park/Neutral Position (P/N POSI SW) switch is ON (shift lever in PARK)
    - All electrical loads are OFF (A/C, headlamps, rear defogger, etc.)
    - Verify engine rpm

Note: Canadian vehicles must have the parking brake applied before starting the engine.

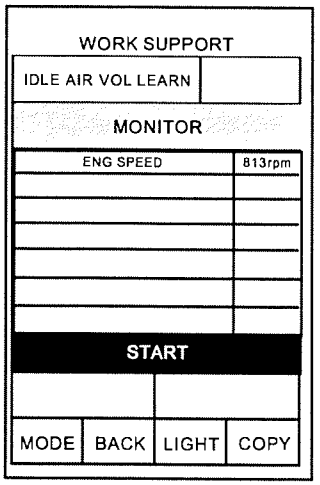


74. Touch **WORK SUPPORT** from the SELECT DIAG MODE screen.



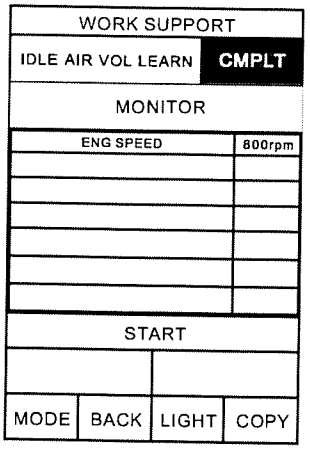
75. Touch **IDLE AIR VOL LEARN**.

By selecting this work support test, the ECM "learns" the position of the IACV-AAC valve. This is absolutely essential now that the idle speed and base timing have been corrected.



76. Touch **START**. The ECM begins the process of learning idle air volume.

77. Touch **START** again. During this process, engine rpm is monitored.



78. After approximately 20 seconds, CONSULT-II should display CMPLT on the screen. If INCMP is displayed instead, recheck idle and repeat the Idle Air Volume Learning procedure.

Note: If an adjustment was made to target idle speed during previous service or CONSULT-II does not display a CMPLT or INCMPLT message after about 20 seconds, check the TARGET IDLE RPM ADJ in WORK SUPPORT. If the value has been changed, reset to zero, then repeat the target idle learning procedure.

Attach Printout Here

79. Touch **COPY** to print the Idle Air Volume Learn results and attach them at left.

80. Snap the throttle to wide open and quickly release it. Make sure that idle speed and ignition timing are within specifications.

81. While performing a Basic Service procedure, it is possible that a DTC may be stored. Erase any DTCs stored in the ECM and TCM memory when you have completed the procedure.

82. If you had difficulty performing the Skill Check stated at the beginning of this module, ask your instructor for assistance.

83. If you can perform a basic inspection and adjustment procedure and determine that the following elements are set correctly:

    - Throttle opener
    - Closed throttle position switch
    - Ignition timing
    - Target idle speed

    Have the instructor verify your work, then reset the vehicle as outlined in the next section.

Instructor's Initials _____

Attach Printout Here

Attach Printout Here

Vehicle Setup

84. Reset the Target Ignition Timing to 2° correction. Print out the CONSULT-II screen indicating the corrected timing and attach it at left.

85. Adjust the TPS so that its voltage reads .2 -.3 V in Engine Data Monitor.

86. Print out the CONSULT-II screen indicating the TPS voltage and attach it at left.

87. Ask your instructor to review your printouts and sign off below.

Instructor's Initials _____

TIMING CHAIN REMOVAL AND REPLACEMENT ON THE QG18DE ENGINE

GITN 2011A

Objective: Given a QG18DE engine and Electronic Service Manual, remove and replace the timing chain.

Relevance: The QG18DE engine is new to the North American market. This module will familiarize you with the new procedure for removing and replacing the timing chain.

Resources:

- Electronic Service Manual (ESM)
- QG18DE engine with oil pan, timing cover and valve cover removed.

Skill Check: After installing the timing chain and guides, rotate the crankshaft clockwise 2 revolutions and verify that the timing marks are properly aligned.

NOTES

TIMING CHAIN REMOVAL AND REPLACEMENT ON THE QG18DE ENGINE

GITN 2011A

Objective: Given a QG18DE engine and Electronic Service Manual, remove and replace the timing chain.

Relevance: The QG18DE engine is new to the North American market. This module will familiarize you with the new procedure for removing and replacing the timing chain.

Resources:

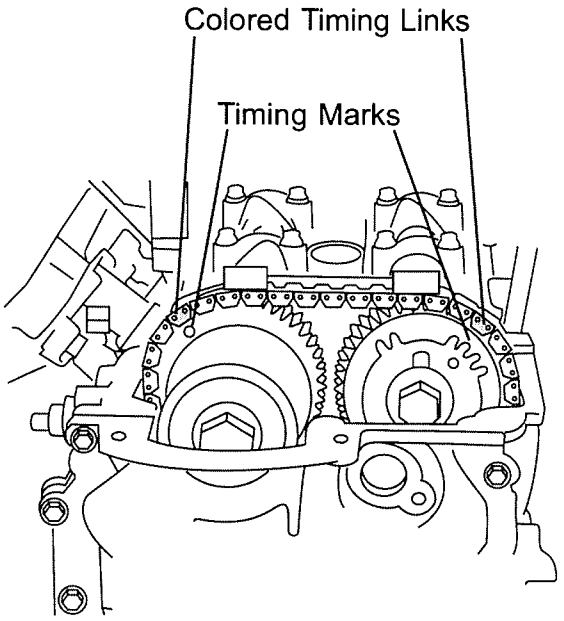
- Electronic Service Manual (ESM)
- QG18DE engine with oil pan, timing cover and valve cover removed.

Skill Check: After installing the timing chain and guides, rotate the crankshaft clockwise 2 revolutions and verify that the timing marks are properly aligned.

GITN 2011A

1. Open the Service Manual to the timing chain section for the QG18DE engine or refer to the copy provided.

Note: The engine provided for this exercise is mounted on an engine stand and therefore some of the steps outlined in the service manual procedure can be skipped because they are irrelevant. Read the entire procedure and cautions, however, because some steps are essential.



2. Set number 1 piston at TDC on its compression stroke. When it is properly set, the timing marks on the cam sprockets should be set according to the illustration at left.

3. Remove the upper timing chain guide.

4. Push the timing chain tensioner plunger back inside its bore, then insert a stop pin inside the access hole to hold it stationary.

5. Remove the chain tensioner.

6. One at a time, use a 21 mm. open-end wrench to hold each camshaft and break loose the sprocket retaining bolts.

7. Remove the camshaft sprocket retaining bolts. Before removing cam sprockets, note the location of all timing marks (both cam sprockets, timing chain, and crank sprocket).

8. Remove both cam sprockets and the timing chain.

9. Remove the oil pump drive spacer and the crank sprocket.

10. Remove both timing chain guides.

11. Visually inspect the timing chain, chain guides, and all sprockets for wear or damage. Pay especially close attention to the chain links, being sure no cracks or excessive wear are evident.

12. Lay the parts aside on the workbench.

13. Call the instructor over and notify him of your progress before continuing.

Instructor's Initials _____

14. Install the crankshaft sprocket on the crankshaft. Make sure the mating mark on the crankshaft sprocket faces away from the engine block. You should be able to see the mark with the sprocket properly installed

15. Position the crankshaft so that number 1 piston is at TDC and the crankshaft woodruff key is at 12 o'clock.

16. Install the slack side timing chain guide and the timing chain tension guide.

17. Install timing chain on crankshaft sprocket, aligning the black link of the chain with the timing mark on the sprocket. Both marks should be visible from the front of the engine.

18. Align the marks on both cam sprockets with each of the copper colored links, then install the sprockets to the camshafts. Pay close attention to the slack in the chain and make sure the chain slides easily into the grooves in the chain guides while installing the sprockets onto the camshafts.

19. Using the backup wrench used earlier, hold each camshaft and tighten the retaining bolt to the required torque.

20. Install the chain tensioner, then remove the pin used to hold the plunger in place.

21. Install the upper timing chain guide.

22. Rotate the crankshaft two complete revolutions and recheck the location of the timing marks on the sprockets. Are they correctly positioned?

    YES/ NO *(Circle One)*

23. Are the colored links on the timing chain aligned with these marks?

    YES/ NO *(Circle One)*

24. Should they be aligned?

    YES/ NO *(Circle One)*

25. Why or why not?

    _____

    _____

26. Install the oil pump spacer.

27. Rotate the engine block so that the crankshaft is facing up.

28. Find the signal plate (mounted close to the rear of the crankshaft).

29. Can the signal plate be removed from the crankshaft without removing other components?

    YES/ NO *(Circle One)*

30. If you answered no, which components must be removed to allow for removal of the signal plate?

    _____

31. Rotate the engine block back to its original position and find the oil jet at the front of the block, directly above the crankshaft. Which direction does the flat edge of the oil jet face? Refer to the text, pg.23 to verify your answer.

    _____

    Is it properly positioned?

    YES/ NO *(Circle One)*

32. If you had difficulty performing the Skill Check stated at the beginning of this module, ask your instructor for assistance.

33. When you have completed the Skill Check to your satisfaction, see your instructor for verification of your work.

    Instructor's Initials _____

NOTES

A/T FIELD TEST USING CONSULT-II

Objective: Given a vehicle equipped with an automatic transmission and a CONSULT-II, perform the A/T Field Test.

Relevance: This module provides practical experience in conducting a road test while using CONSULT-II to monitor specific automatic transmission functions. Configuring CONSULT-II for Manual Trigger or Auto Trigger, setting the Trigger Point, and other useful settings is described.

GITN 2012A

Resources:

- CONSULT-II
- Vehicle with automatic transmission

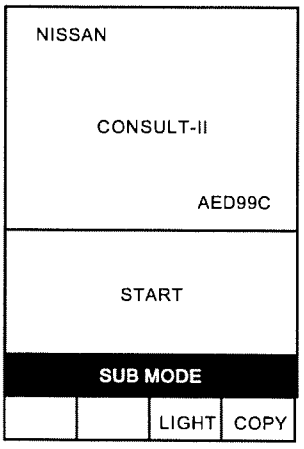
Skill Check: Your ability to properly configure CONSULT-II and record the data described in this module is verified by printing out and attaching specific CONSULT-II screens.

A/T Field Test Using CONSULT-II

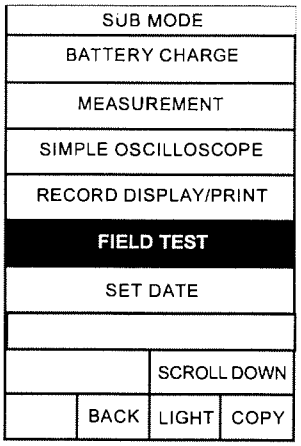
1. Using the assigned vehicle, connect CONSULT-II to the data link connector.
2. Start the engine and allow it to reach normal operating temperature.

GITN 2012A

Note: CONSULT-II automatically turns on and begins loading the diagnostic program card when the engine is started.



3. Touch **SUB MODE** from the MAIN MENU screen.

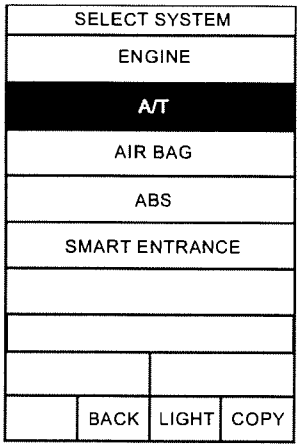


4. Touch **FIELD TEST** from the SUB MODE menu. Field Test is used to record a snapshot.

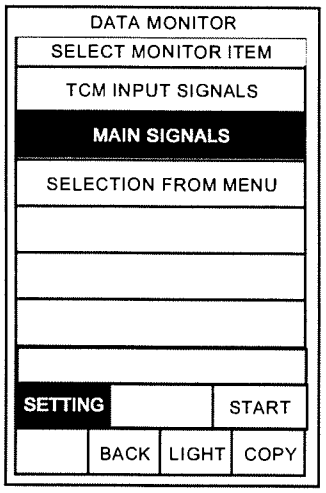
5. The CONSULT-II asks if you want to continue with a Field Test. Touch **YES** to continue.

   SYSTEM CALL appears. When Field Test is loaded, the SELECT SYSTEM menu appears.

GITN 2012A



6. Touch **A/T** on THE SELECT SYSTEM menu.



7. Touch **MAIN SIGNALS** from the DATA MONITOR/SELECT MONITOR ITEM menu.

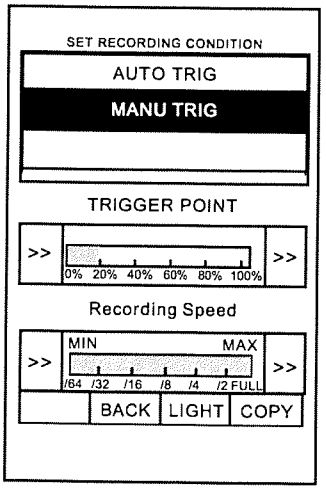
8. Touch **SETTING**.

GITN 2012A

9. To set recording condition, you have a choice of either AUTO TRIG or MANU TRIG.

Note:

- Auto Trigger while road testing to start recording data when a DTC is detected.
- Manual Trigger when you want to collect data during a road test under conditions described by a customer or when diagnosing a non-DTC fault.



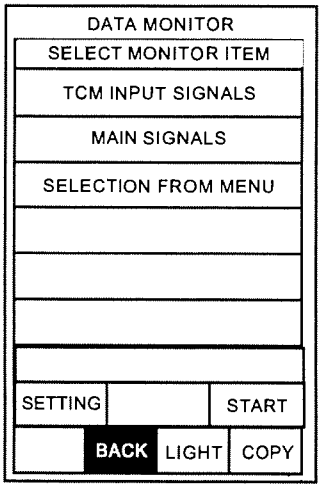
10. Touch **MANU TRIG**.

Note:

- Trigger Point allows you to adjust how much elapsed data is recorded prior to the trigger point or when a DTC is detected.
- CONSULT-II defaults to a 20% trigger point, meaning that 20% of the data collected occurs before the trigger is set. The remaining 80% of the data was collected after the trigger point.
- Trigger point can be adjusted higher or lower based on need.
- The CONSULT-II recording speed allows six different setting speeds from MIN to MAX. It defaults to MAX, the fastest recording speed.

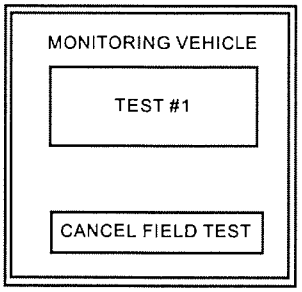
GITN 2012A

11. Use the default settings of 20% trigger point and MAX recording speed.
12. Touch **BACK** once to return to the DATA MONITOR menu.



GITN 2012A

Road Test



13. Begin the road test as outlined by the instructor.

14. Touch **START** with the vehicle running and in PARK. The screen should now read:

    TEST #1. (test takes about a minute)

15. Touch **TEST #1**, then accelerate normally through all gears while recording. The screen should now read: RECORDING TEST #1.

16. At the completion of the recording, the CONSULT-II screen display says "RECORDING COMPLETED, CONTINUE FIELD TEST?", touch **YES** and return to the training center.

17. What is now displayed on the screen?

    _____

    _____

18. Touch **CANCEL FIELD TEST**.

19. Touch **YES**.

Note: CONSULT-II is capable of making a second recording if you touch **YES** after the first recording is complete. CONSULT-II can only store two recordings.

20. Turn the ignition OFF, touch **OK**, and wait for 30 seconds. What is displayed on the screen?

_____

Note: CONSULT-II will not shut off until the ignition is turned OFF.

GITN 2012A

21. Turn the ignition back ON.

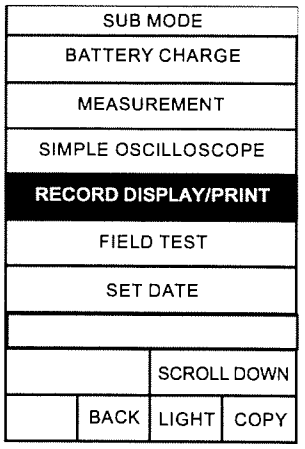
22. What is displayed on the screen?

_____

_____

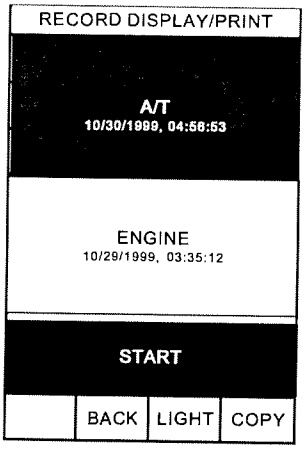
23. Touch **SUB MODE**.

Note: Field Test can be used in cases when an intermittent problem is difficult to track down. Every time you re-start the engine, CONSULT-II loads and is ready to begin recording when the problem appears.



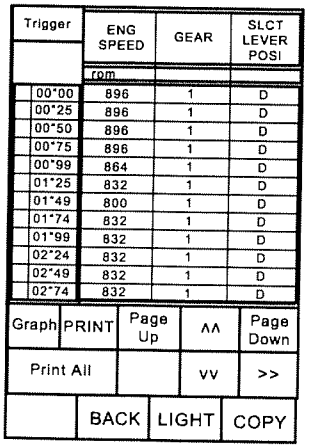
24. Touch **RECORD DISPLAY/PRINT**.

GITN 2012A



25. Use the time/date information to select your recording,

26. Touch **START**.



27. The display of your recording should look similar to the screen shown on the left.

    - The left-hand column shows the recording time.
    - The 00:00 frame indicates the trigger point frame.

28. Touch **PAGE UP** to scroll up as far as possible. How many seconds of elapsed time was recorded before the trigger?

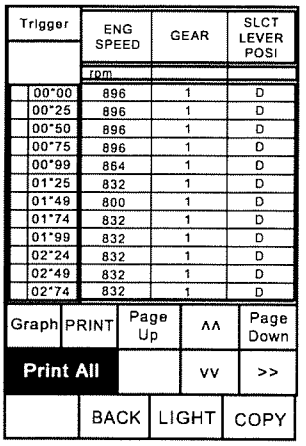
_____

29. Touch **TRIGGER** in the top-left corner of the screen. This returns the display to the trigger point frame.

30. Touch **PAGE DOWN** to scroll down as far as possible. How many seconds of elapsed time was recorded after the trigger?

_____

GITN 2012A



31. Touch **PRINT ALL** and PRINT GRAPH appears.

32. Touch **PRINT GRAPH** to show PRINT NUMERIC.

33. Touch **PRINT NUMERIC** to return to PRINT ALL. When PRINT ALL is selected, all previously recorded signals are printed out for review.

Note: Touch **COPY** to create a printout of the CONSULT-II screen. Touch **PRINT** to create a printout of the data. Either a graph, numeric list, or all data.

GITN 2012A

Attach Printout Here

34. Touch the **PRINT** button and attach the printout at left.

35. Touch **PAGE DOWN** or **PAGE UP** until a shift from 3rd to 4th gear is indicated on the screen.

36. At what vehicle speed did the 3-4 upshift occur?

_____

37. Which solenoid turned "ON" to cause the 3-4 upshift?

_____

	ON	OFF
Solenoid A		
Solenoid B		

38. Place a check mark to indictate the status of the solenoids shown in the table at left.

39. Touch **∧∧** or **∨∨** to scroll down and locate the first screen for the 4th gear position. What is the time signature when 4th gear was first engaged?

_____

40. Touch **GRAPH** and wait 5 seconds. What happens?

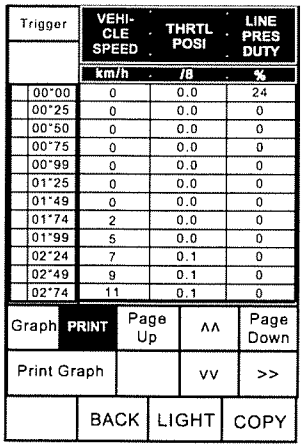
_____

GITN 2012A

Attach Printout Here

41. Touch **COPY** and attach the printout at left.
42. Touch **BACK**.

GITN 2012A



Trigger	VEHICLE SPEED	THRTL POSI	LINE PRES DUTY
	km/h	/8	%
00"00	0	0.0	24
00"25	0	0.0	0
00"50	0	0.0	0
00"75	0	0.0	0
00"99	0	0.0	0
01"25	0	0.0	0
01"49	0	0.0	0
01"74	2	0.0	0
01"99	5	0.0	0
02"24	7	0.1	0
02"49	9	0.1	0
02"74	11	0.1	0

43. Touch **PRINT ALL** so that PRINT GRAPH is displayed.

44. Locate, then touch each of the following items on the display:

    - VEHICLE SPEED
    - THRTL POSI
    - LINE PRES DUTY

    They should now be highlighted.

Attach Printout Here

45. Touch **PRINT** and attach the printout at left.

46. Using the Service Manual, find specifications comparing vehicle speed, TPS opening (voltage), and line pressure duty cycle. Print the transmission DATA page.

47. Does the line pressure solenoid % match the specification?

    YES/ NO *(Circle One)*

48. If you had difficulty performing the Skill Check stated at the beginning of this module, ask your instructor for assistance.

49. When you have completed the Skill Check to your satisfaction, see your instructor for verification of your work.

Instructor's Initials _____

NOTES

HEATED OXYGEN SENSOR TEST USING CONSULT-II

Objective: Given a 2000 Sentra with the QG18DE engine and a CONSULT-II, locate and test each O2 sensor to correctly identify its location.

Relevance: The exhaust manifold on the QG18DE engine is a new design. Understanding the exhaust flow through the manifold will avoid misdiagnosis and/or incorrect identification of any oxygen sensors being replaced.

GITN 2013A

Resources:

- Vehicle with QG18DE engine
- CONSULT-II
- A small common screwdriver
- Electronic Service Manual (ESM)

Skill Check: Verify the location of the heated oxygen sensors by referring to the text section and using CONSULT-II to confirm terms and diagnostic trouble codes.

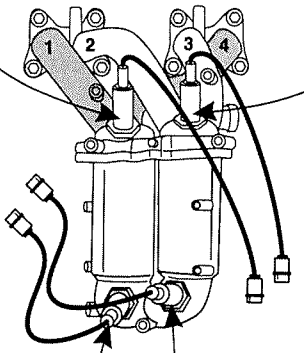
GITN
2013A

Oxygen Sensors Identification

1. Using the text section as a reference, identify the O2 sensors with the associated cylinders on the following graphic.

CONSULT-II ID _____
Engine Bank 1 2 (Circle One)
Harness Sheath Color _____
Cylinders Monitored _____
Location Front Rear (Circle One)
DTC _____

CONSULT-II ID _____
Engine Bank 1 2 (Circle One)
Harness Sheath Color _____
Cylinders Monitored _____
Location Front Rear (Circle One)
DTC _____



CONSULT-II ID _____
Engine Bank 1 2 (Circle One)
Harness Sheath Color _____
Cylinders Monitored _____
Location Front Rear (Circle One)
DTC _____

CONSULT-II ID _____
Engine Bank 1 2 (Circle One)
Harness Sheath Color _____
Cylinders Monitored _____
Location Front Rear (Circle One)
DTC _____

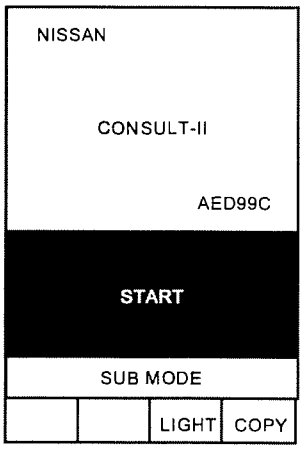
Oxygen Sensor Locations

Use of the Data Monitor Function

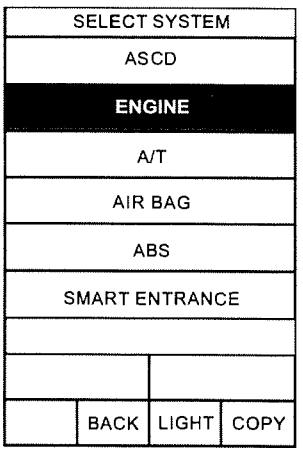
2. Connect CONSULT-II to the data link connector.
3. Start the engine and warm it up to normal operating temperature.

Note: CONSULT-II automatically turns on and begins loading the diagnostic program card when the engine is started.

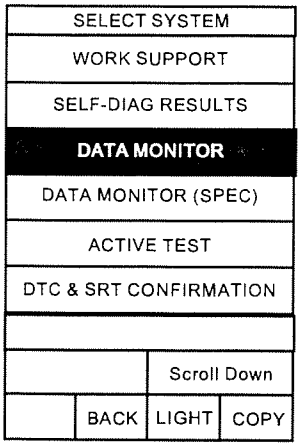
GITN 2013A



4. Touch **START** from the MAIN MENU screen.

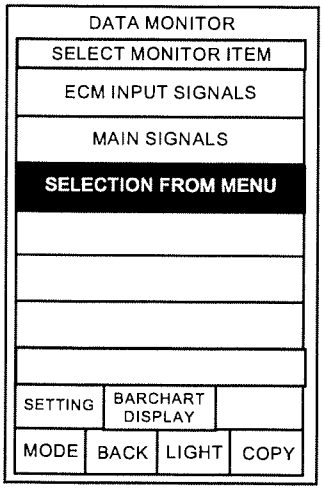


5. Touch **ENGINE** from the SELECT SYSTEM screen.



6. Touch **DATA MONITOR** from the SELECT DIAG MODE screen.

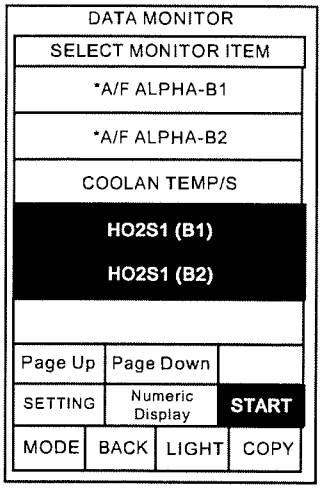
GITN 2013A



7. Touch **SELECTION FROM MENU** from the DATA MONITOR screen.

   After making this selection, notice that engine speed is automatically highlighted. CONSULT-II automatically defaults to display this input, no matter which others are selected.

Oxygen Sensor Identification



8. Touch each of the following items on the DATA MONITOR/SELECT MONITOR ITEM screen to select it. Touch **Page Down** if necessary. The display shows the term highlighted when it is selected:

   - **H02 S1 (B1)**
   - **H02 S1 (B2)**
   - **H02 S2 (B1)**
   - **H02 S2 (B2)**

9. Touch **SETTING** and change to Manual Trigger, verify that the screen is set to Numeric Display, then touch **START**.

10. Disconnect the sensor with the BLACK harness sheath.

11. Touch **RECORD**, then immediately snap the throttle open, then quickly release it. After the recording is complete, you should see a code stored for the fault created as a result of disconnecting the sensor. If no code is shown, repeat this step.

12. Touch **COPY** and attach the printout at left.

Attach Printout Here

GITN 2013A

GITN 2013A

13. According to the illustration shown on page 2 of this module, check the following statements that apply:

☐ This sensor monitors #1 and #4 cylinders

☐ This sensor monitors #2 and #3 cylinders

☐ This is a front sensor

☐ This is a rear sensor

☐ It monitors bank one

☐ It monitors bank two

14. Plug that sensor's connector back in.
15. Touch **BACK** once, then again touch **SELECTION FROM MENU**.
16. Again select the four sensors listed in step 8, then touch **START**.
17. Disconnect the sensor with the RED harness sheath.
18. Touch **RECORD**, then immediately snap the throttle open, then quickly release it. After the recording is complete, you should see a code stored for the fault created as a result of disconnecting the sensor. If no code is shown, repeat this step.
19. Touch **COPY** and attach the printout at left.

Attach Printout Here

20. According to the illustration shown on page 2 of this module, check the following statements that apply:

- ☐ This sensor monitors #1 and #4 cylinders
- ☐ This sensor monitors #2 and #3 cylinders
- ☐ This is a front sensor
- ☐ This is a rear sensor
- ☐ It monitors bank one
- ☐ It monitors bank two

GITN 2013A

21. Plug that sensor's connector back in.
22. Touch **BACK** once, then again touch **SELECTION FROM MENU**.
23. Again select the four sensors listed in step 8, then touch **START**.
24. Disconnect the sensor with the GRAY harness sheath.
25. Touch **RECORD**, then immediately snap the throttle open, then quickly release it. After the recording is complete, you should see a code stored for the fault created as a result of disconnecting the sensor. If no code is shown, repeat this step.
26. Touch **COPY** and attach the printout at left.

Attach Printout Here

GITN 2013A

27. According to the illustration shown on page 2 of this module, check the following statements that apply:

☐ This sensor monitors #1 and #4 cylinders

☐ This sensor monitors #2 and #3 cylinders

☐ This is a front sensor

☐ This is a rear sensor

☐ It monitors bank one

☐ It monitors bank two

28. Plug that sensor's connector back in.
29. Touch **BACK** once, then again touch **SELECTION FROM MENU**.
30. Again select the four sensors listed in step 8, then touch **START**.
31. Disconnect the sensor with the BLUE harness sheath.
32. Touch **RECORD**, then immediately snap the throttle open, then quickly release it. After the recording is complete, you should see a code stored for the fault created as a result of disconnecting the sensor. If no code is shown, repeat this step.
33. Touch **COPY** and attach the printout at left.

Attach Printout Here

34. According to the illustration shown on page 2 of this module, check the following statements that apply:

- ☐ This sensor monitors #1 and #4 cylinders
- ☐ This sensor monitors #2 and #3 cylinders
- ☐ This is a front sensor
- ☐ This is a rear sensor
- ☐ It monitors bank one
- ☐ It monitors bank two

35. Plug that sensor's connector back in.
36. Return to SELECT DIAG MODE screen, then touch **SELF-DIAG RESULTS**. You should see the results of these tests all grouped together now.
37. Touch **PRINT** to print the results and attach the printout at left.
38. Touch **ERASE**, then touch **YES** to clear all of these codes from memory.
39. If you had difficulty performing the Skill Check stated at the beginning of this module, ask your instructor for assistance.
40. When you have completed the Skill Check to your satisfaction, see your instructor for verification of your work.

Attach Printout Here

Instructor's Initials _____

NOTES

ABS ACTIVE TEST USING CONSULT-II

Objective: Given a vehicle with ABS and a CONSULT-II, diagnose malfunctions in the anti-lock system.

Relevance: Understanding the different ways to diagnose vehicle concerns using CONSULT-II is important. This module will familiarize you with several techniques, including using the Simple Oscilloscope function in CONSULT-II.

GITN 2014A

Resources:

- Vehicle with ABS
- CONSULT-II
- Electronic Service Manual (ESM)

Skill Check: Properly using Self Diagnosis Results, Data Monitor, Active Test and Simple Oscilloscope in CONSULT-II is verified by recording and printing data and placing the printouts into your workbook. Also, accessing system data with the Service Manual is also verified.

Note: For more information about The ABS, refer to the text of this training guide.

GITN 2014A

ABS Self-Diagnosis Access

1. Ensure that the vehicle is positioned safely on a hoist.

2. Start the engine.

3. What is the status of the ABS light? *(Check one)*

   ☐ ON
   ☐ OFF
   ☐ Flashing

   If the ABS light is not ON, see your instructor.

4. Turn off the engine.

5. Open the Service Manual and find the CONSULT-II inspection procedure. On what page does it begin?

   _____

6. According to the Service Manual, the vehicle should be driven during the procedure. Why?

   _____

   _____

7. The road test should be performed at a speed of ____mph for a length of ____ minute(s).

Note: When diagnosing ABS faults, it is essential that you perform a road test to simulate the actual fault conditions.

8. Connect CONSULT-II and perform the self diagnosis.
9. Touch **PRINT** to print the results and attach the printout at left.
10. Using the Service Manual as a reference. What is the cause of this malfunction?

_____

11. Repair the ABS system fault. See your instructor for any parts that may be required.
12. Erase the DTC from the CONSULT-II code details screen.

GITN 2014A

Attach Printout Here

13. Print the screen showing no DTCs and attach the printout at left, then return to DATA MONITOR.

Attach Printout Here

Data Monitor

DATA MONITOR allows you to read input and output signals to the ABS control unit while the system is operating. This information is useful while diagnosing malfunctions that do not cause DTCs to be set.

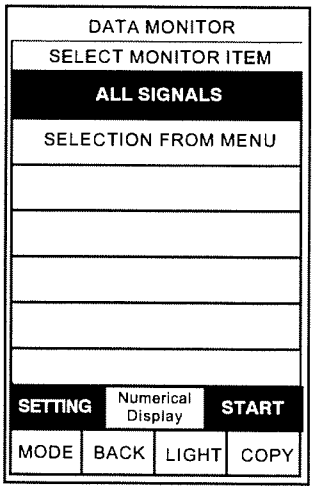
There is a chart in the Service Manual to help you interpret the information in the DATA MONITOR mode.

14. On which page does this chart appear?

_____

GITN 2014A

15. Touch **DATA MONITOR** on the Diagnostic Mode screen of CONSULT-II.



16. Touch **ALL SIGNALS**.

17. Touch **SETTING**, then touch **MANU TRIG**.

18. Touch **BACK** once, then touch **START**.

Warning:

Make sure that the wheels of the vehicle are safely off the ground before continuing.

19. Start the engine and shift the transmission into 2nd. Accelerate to approximately 20 mph (30 kph).

20. Monitor the CONSULT-II display but do **not** record a snapshot.

Attach Printout Here

21. Touch **COPY** to print the display showing all sensors and attach it at left.

GITN 2014A

22. Are both drive wheel sensors showing the same speed (± 1 mph or ± 1 kph)?

    YES / NO *(Circle One)*

23. Is the speedometer reading approximately the same as the wheel sensors?

    YES / NO *(Circle One)*

24. Can you determine whether the wheel sensors are operating properly?

    YES / NO *(Circle One)*

25. Apply the brakes and make certain that the wheels stop turning.

26. Shift the transmission into PARK or NEUTRAL.

27. While the brakes are still applied, find the STOP LAMP SW signal on the CONSULT-II screen.

28. What is the status of the STOP LAMP SW?

    ON / OFF *(Circle one)*

Attach Printout Here

29. Touch **COPY** and attach the CONSULT-II printout at left.

30. Release the brake pedal. What is the status of the STOP LAMP SW now ?

    ON / OFF *(Circle one)*

31. Is the STOP LAMP SW functioning properly?

    YES / NO *(Circle One)*

32. Did the ABS light come on during this test?

    YES / NO *(Circle One)*

Attach Printout Here

33. Display SELF-DIAG RESULTS. Touch **COPY** and attach the printout at left.

34. Were any DTCs stored?

    YES / **NO** *(Circle One)*

Note: The vehicle must be driven to erase diagnostic trouble codes.

GITN 2014A

Note: You must verify braking system faults with a road test. Simulating a road test on a hoist is an unnacceptable way to diagnose ABS faults because road test conditions cannot be duplicated.

35. Touch **ERASE** to clear the DTCs, then touch **BACK**.

36. Touch **PRINT** and attach the printout at left.

Attach Printout Here

GITN 2014A

Using Active Test to Check Actuator Solenoid Operation

Note:

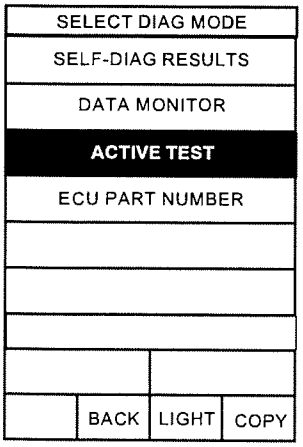
- The vehicle must be stationary when using ACTIVE TEST mode.
- Do not try to use ACTIVE TEST mode if the ABS warning lamp is ON.

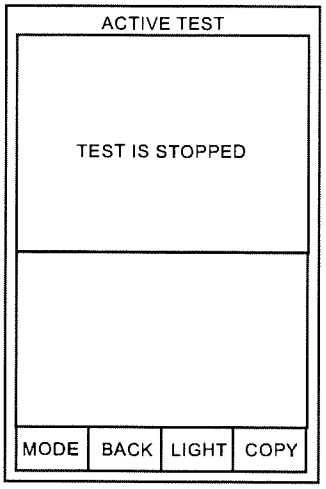
37. Turn the ignition key ON but do not start the engine.

38. Shift the transmission into NEUTRAL.

39. On the CONSULT-II screen, touch **START**, then touch **ABS**.

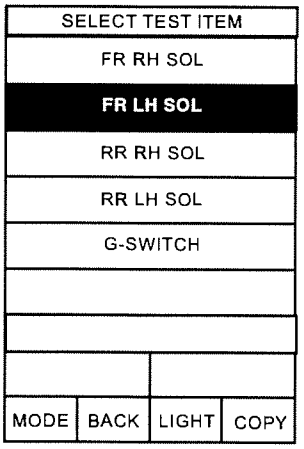
40. Touch **ACTIVE TEST** on the SELECT DIAG MODE screen.





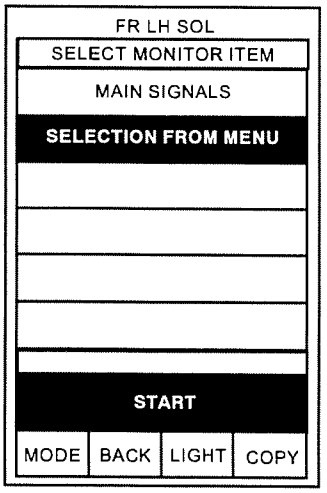
Note: You have a limited amount of time in Active Test mode. If the message "TEST IS STOPPED" appears on the screen at any point during this test, it must be reselected to continue. If TEST IS STOPPED appears:

1. Touch **BACK** twice.
2. Turn the ignition key OFF for five seconds and then back ON.
3. Touch **ACTIVE TEST** mode and start over.



41. Touch **FR LH SOL** (actuator front left solenoid).

GITN 2014A



42. Touch **SELECTION FROM MENU**, then touch **Scroll Up**, and touch to select each of the following items.

    - **MOTOR RELAY**
    - **FR LH OUT SOL**
    - **FR LH IN SOL**

43. Touch **START**.

Note: Apply the brakes for the duration of this test.

GITN 2014A

44. Initially, in which mode are the front left-hand solenoids? *(Check one)*

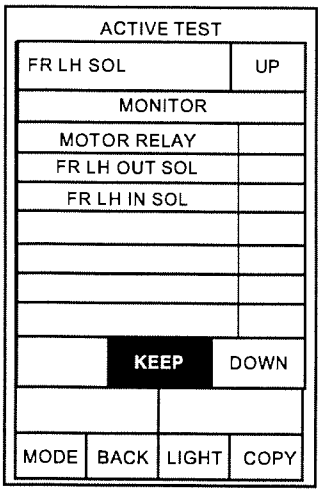
- ☐ UP
- ☐ DOWN
- ☐ KEEP

45. Check those items that are ON in this mode. *(Check any)*

- ☐ MOTOR RELAY
- ☐ FR LH OUT SOL
- ☐ FR LH IN SOL
- ☐ None of the above

Attach Printout Here

46. Touch **COPY** and attach the printout at left.



47. Touch **KEEP** in ACTIVE TEST and indicate the status of the following items:

	(Circle one)
MOTOR RELAY	**ON** / **OFF**
FR LH OUT SOL	**ON** / **OFF**
FR LH IN SOL	**ON** / **OFF**

Attach Printout Here

48. Touch **COPY** and attach the printout at left.
49. Touch **DOWN** on the ACTIVE TEST screen and indicate the status of the following items:

	(Circle one)
MOTOR RELAY	**ON** / **OFF**
FR LH OUT SOL	**ON** / **OFF**
FR LH IN SOL	**ON** / **OFF**

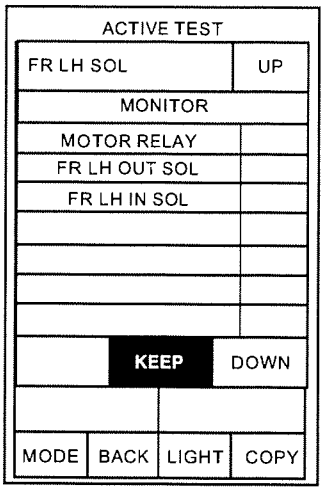
GITN 2014A

Attach Printout Here

50. Touch **COPY** and attach the printout at left.

GITN 2014A

Testing the Mechanical Function of the Actuator



51. Verify that you are in Active Test mode for the FR LH SOL. Your screen should look like the one at left.
52. Shift the transmission to NEUTRAL.
53. Touch **KEEP**, then touch **Up** and **Down** on the screen to operate the actuator solenoids and check mechanical operation.
54. With the brakes applied, perform the same inspection for the FR LH SOL in ACTIVE TEST.
55. Indicate what happens by checking the appropriate box in the table below.

MODE	Description	Wheel Turns	Wheel Doesn't Turn
UP	Pressure Increase		
DOWN	Pressure Decrease		

56. Based on your observations, are the actuator solenoids functioning properly?

    YES / NO *(Circle One)*

57. Which other items should be monitored to help diagnose this problem?

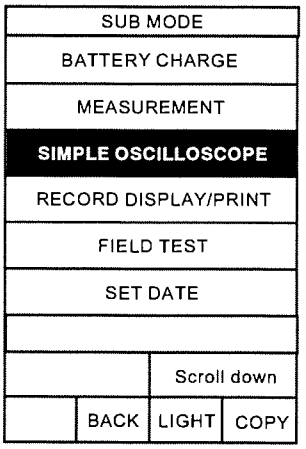
    _____

    _____

58. Return to SUB MODE.

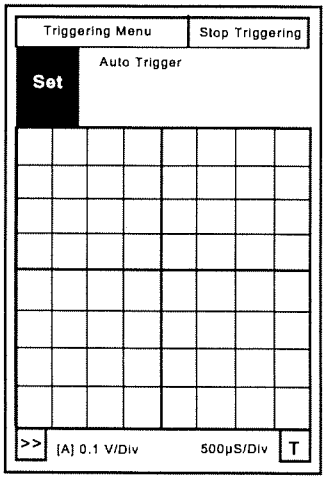
Using the CONSULT-II Simple Oscilliscope to Check Wheel Sensors

Note: The diagnostic procedures in the Service Manual instruct you to perform visual inspection and resistance tests on the wheel sensor components and circuits to isolate faults.



59. Touch **SIMPLE OSCILLOSCOPE**.

GITN 2014A



60. Touch **SET** on the Oscilloscope screen.
61. Touch **SET V/DIV** and then touch **AUTO SCALING ON**. It should now read AUTO SCALING OFF.
62. Set the voltage scale to 2.0. This sets the scale to 2.0V per division.
63. Touch **PRESS TO CONTINUE**.
64. Touch **SET** again, then touch **SET TIME/DIV**.
65. Set the time scale to 1ms/division.
66. Touch **PRESS TO CONTINUE**.

67. Plug the red and black leads to the CH1 and Ground ports on CONSULT-II.

68. Locate and disconnect the right-front wheel sensor connector under the hood. It may be necessary to use the Service Manual to locate the connector.

69. Connect the red and black leads to the two wires at the sensor connection.

70. Verify that the wheels are at least 12 inches (30 cm) off the ground.

71. Start the engine and shift the transmission to 2nd.

72. Accelerate to 19 mph (30 kph).

Warning: Keep a safe distance from spinning wheels.

73. What type of pattern appears on the oscilloscope? (Circle one below).

    A. A digital ON/OFF signal
    B. A sine wave
    C. An analog signal
    D. Both B and C

Attach Printout Here

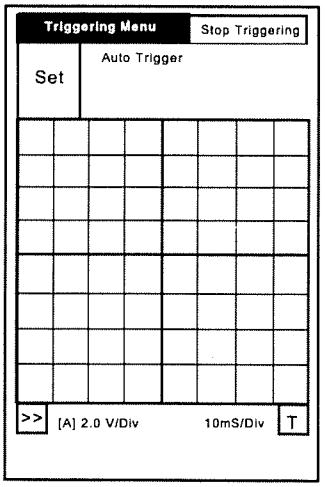
74. Touch **COPY** and attach the printout at left.
75. Accelerate to 30 mph (50 kph) and observe what happens to the pattern.
76. How does the pattern change?

_____

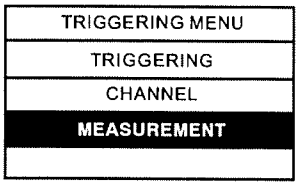
_____

_____

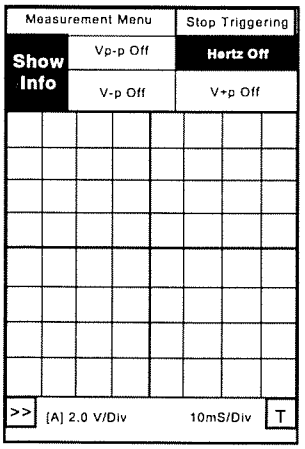
GITN 2014A



77. Touch **TRIGGERING MENU**.



78. Touch **MEASUREMENT**.



79. Touch **SET**.
80. Touch **SHOW INFO**.
81. How did the pattern change at 19 mph (30 kph)?

    _____

82. What changed as the vehicle speed increased? (*Check one*)

    ☐ Frequency
    ☐ Amplitude
    ☐ Voltage
    ☐ Signal Resistance

GITN 2014A

Note: Hertz could be used to measure and compare one speed sensor to another for diagnosis. There are no specifications; it is only used as a diagnostic tool for comparison.

83. Apply the brakes.
84. Shift the transmission into PARK after the wheels have stopped.
85. Is the ABS lamp ON?

    YES / NO *(Circle One)*

    If so, erase any DTCs. (The key must be cycled in order to erase DTCs).

86. Can the ABS trouble code be set with the vehicle not moving?

    YES / NO *(Circle One)*

    Explain: _____

    _____

Attach Printout Here

87. Why must the vehicle be driven 20 mph during ABS diagnosis?

_____

_____

88. If you had difficulty performing the Skill Check stated at the beginning of this module, ask your instructor for assistance.

89. When you have completed the Skill Check to your satisfaction, see your instructor for verification of your work.

Instructor's Initials _____

GITN 2014A

NOTES

NATS KEY REGISTRATION USING CONSULT-II

Objective: Given a Vehicle equipped with the Nissan Anti-Theft System (NATS) and CONSULT-II, properly register ignition keys.

Relevance: This procedure is very simple, but it can be done improperly if performed too quickly or with incomplete understanding of how the system works. Also, a simple technique for verifying proper key registration is described.

Resources:

GITN 2015A

- Vehicle equipped with NATS
- CONSULT-II
- 2 or more ignition keys

Skill Check: After registering all ignition keys provided, verify that all keys are properly registered by inserting each key into the ignition and observing the security lamp.

Troubleshooting Procedure

1. This worksheet is based upon the following customer scenario:

   - Engine will not start
   - Car was recently serviced
   - One ignition key was replaced

2. Using both keys provided, confirm the preliminary diagnosis by attempting to start the engine.

3. Did the engine start?

   Key #1: **YES/ NO** *(Circle one)*

   Key #2: **YES/ NO** *(Circle one)*

4. If you answered NO regarding both keys in the previous step, insert Key #1 back into the ignition and turn it ON, but do not start the engine.

5. With the ignition ON, observe the security lamp on the right side of the dash. Indicate lamp status below:

   ON /OFF *(Circle one)*

Note: The security lamp is located on top of the passenger side of the dashboard. If it is difficult to see the security light from the driver seat, place a rigid white card or paper under the windshield wiper arm, above the light.

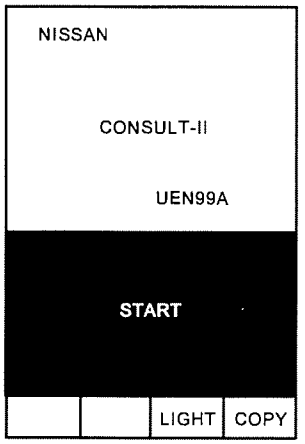
GITN 2015A

6. Remove key #1, and wit 10 seconds. Then use key #2 and repeat the last two steps. Indicate lamp status below:

   ON /OFF *(Circle one)*

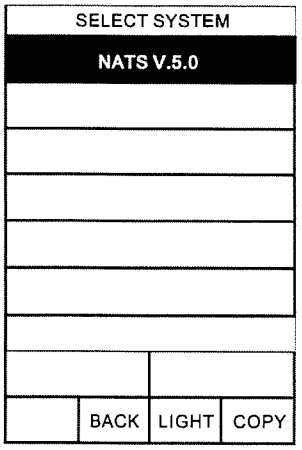
   Note: If the security lamp came on "steady" with either key and the engine will not start, the immobilizer system may be locked.

7. Verify that the NATS card is installed into the correct software slot of CONSULT-II, then connect CONSULT-II to the data link connector and turn it ON.

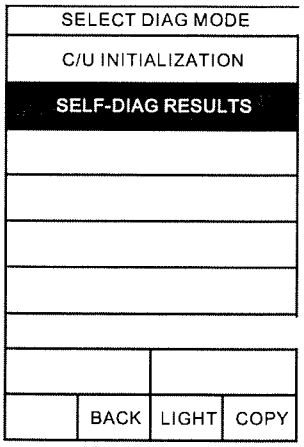


8. Touch **START**. System Call appears. Wait approximately 10 seconds for the system software to load. CONSULT-II beeps to indicate this.

GITN 2015A



9. On the SELECT SYSTEM screen, touch **NATS V.5.0**. The SELECT DIAG MODE screen appears.



10. On the SELECT DIAG MODE screen, touch **SELF DIAG RESULTS**.

Attach Printout Here

11. Touch **COPY** to print this screen and attach it at left.
12. Are there DTCs displayed?

    YES/ NO *(Circle one)*

13. Refer to the text and find the code definitions. What is the difference between P1610 and P1615?

    _____

14. Do not clear codes at this time, but rather turn the ignition OFF and wait until the security lamp flashes.

GITN 2015A

15. Insert Key #1 into the ignition and turn it ON.

16. Is the security lamp ON?

    YES/ NO *(Circle one)*

17. Remove the key from the ignition and hold the key in your hand until the security lamp flashes.

18. Using the same key, turn the ignition back ON. Is the security lamp off?

    YES/ NO *(Circle one)*

19. If the security lamp is ON, repeat the previous two steps.

20. Attempt to start the engine. If the engine starts, you have successfully unlocked the immobilizer system.

GITN 2015A

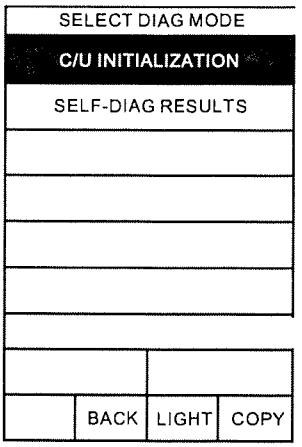
Note: If the engine did not start, see your instructor before continuing.

Attach Printout Here

21. Touch **ERASE** on the SELF DIAG RESULTS screen to clear the codes. Touch **YES** when the box appears confirming your decision to erase the codes.

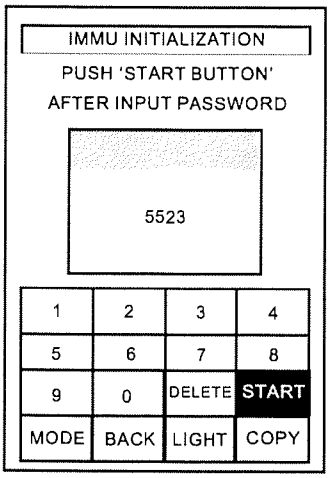
22. After the codes are cleared, touch **PRINT** and attach the printout at left.

23. Touch **BACK** once. You are now ready to reset the system and then register each of the keys.



C/U Initialization Procedure

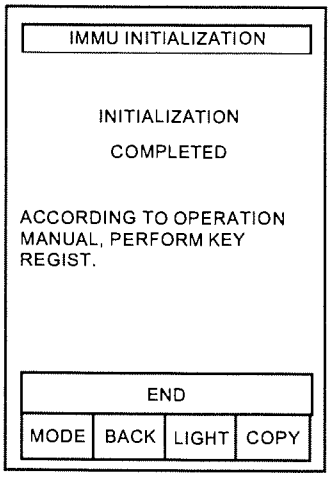
24. Touch **C/U INITIALIZATION** to begin system initialization.



25. Input the password (5523 for North America).

Note: The password is only required with NATS V5.0 initialization procedure.

26. Touch **START**. The system performs C/U Initialization. This clears system memory.



27. When the screen at left appears, C/U Initialization is complete. Turn the key to OFF/LOCK and remove it.
28. Wait 10 seconds, then proceed to *Key Registration*.

Note: On vehicles equipped with NATS V.5.0 operating system, the key that was just used is **not** yet registered. At this stage, IMMU memory has just been cleared and the rolling code is reset. Previously registered keys have also been cleared from memory. Now you are ready to register new keys.

GITN 2015A

Key Registration

29. Insert key #1 into the ignition and turn the ignition ON. **Do not start the engine**. Wait 10 seconds.

30. Turn the key to OFF/LOCK, remove it, and wait 10 seconds.

Note: If a key is cycled ON and OFF too quickly, key registration will not correctly complete.

31. This key is used later in this procedure. Keep it separate from all of the other keys.

Note: Do not mix "registered" keys with "unregistered" keys. Keep them separate during the process. Inserting a registered key back into the ignition terminates the registration procedure. If key registration is inadvertently terminated, the entire procedure must be redone, beginning with C/U initialization.

GITN 2015A

32. Insert key #2 into the ignition, turn the ignition ON. Wait 10 seconds, then turn the key to OFF/LOCK, remove it, and wait 10 seconds.

33. Repeat the previous step until all keys are registered.

34. After registering and removing the last key, re-insert key #1, and turn the ignition ON. This ends *Key Registration*.

35. Turn the key to OFF/LOCK and remove it.

36. Wait for the security lamp to blink twice. This indicates that the system has reset.

37. Proceed to *Key Confirmation*.

Key Confirmation

38. Confirm that the NATS security indicator is blinking. This verifies that key registration is complete and the security system has reset to normal operation.

39. One at a time, insert each registered key into the ignition and turn it ON without starting the engine. If the key is correctly registered, the security lamp will remain OFF with the ignition ON.

Note: You must wait 10 seconds before inserting the next key (the security lamp will flash twice). This allows enough time for the system to reset.

GITN 2015A

40. Check the remaining keys in this manner.

Note: If the NATS security indicator light comes on "steady" while confirming any key, that key is **not** registered and you must perform the entire procedure again.

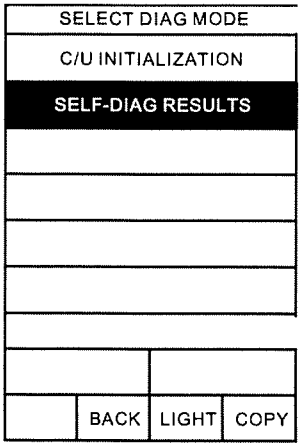
41. This completes *Key Confirmation.* Proceed to *DTC Check.*

DTC Check

42. Press **BACK** twice on the CONSULT-II screen.

43. Put any registered key into the ignition and turn it ON.

44. Touch **SELF-DIAG RESULTS** to check for DTCs.



GITN 2015A

Attach Printout Here

45. Touch **PRINT** and attach the printout at left.

46. Touch **ERASE** to clear any stored codes.

Note: In rare cases, the code "CHAIN OF ECM-IMMU" is stored during the key registration process. If it appears, touch **ERASE** in SELF DIAG RESULTS to clear this or any other DTCs prior to repairs.

47. See the instructor for another key. Take both registered keys to the instructor.

48. Using the key provided by the instructor, attempt to start the engine. The engine should not start.

49. Remove the key, hold it in your hand until the security lamp flashes, then try to restart the engine once again.

50. Repeat the last two steps for a total of 5 attempts. This should place the immobilizer system into LOCK MODE.

51. Verify this. Access SELF DIAG, print codes and attach the printout at left.

52. The CONSULT-II display should indicate that the vehicle is in Lock Mode. If it is not, see your instructor..

53. Return the keys to the instructor.

54. If you had difficulty performing the Skill Check stated at the beginning of this module, ask your instructor for assistance.

55. When you have completed the Skill Check to your satisfaction, see your instructor for verification of your work.

Attach Printout Here

Instructor's Initials _____

GITN 2015A

TESTING BATTERIES, STARTERS, & CHARGING SYSTEMS WITH THE MODEL 620 TESTER

Objective: Given a vehicle and Model 620 Tester, properly perform a battery, starter, and charging system test.

Relevance: The J-44373, Model 620 Tester is a new required tool. It displays test result codes which must be recorded on all work orders for reimbursement.

Resources:

- A vehicle
- CONSULT-II
- J-44373 Model 620 Tester

Skill Check: Properly set the date and time, then record all test results and test codes.

GITN 2016A

1. Locate the car with the suspected starting problem. Confirm this with the instructor.

2. Confirm that the engine is at normal operating temperature.

Note: When performing this procedure on a customer's vehicle, the engine temperature must be recorded on the repair order. Use CONSULT-II to find the actual engine temperature.

3. Confirm the engine oil level is correct and make sure that the recommended weight of engine oil is being used.

   Is the oil level full?

   YES / NO *(Circle one)*

   Is the oil viscosity correct?

   YES / NO *(Circle one)*

GITN 2016A

Note: Engine operating temperature and correct engine oil and oil level are both checked as a means of providing support data for the starter test. When performing the battery test on a customer's car, record the engine coolant temperature on the repair order.

4. Turn the ignition OFF.

5. Visually inspect the battery, battery terminals, and cable ends. Clean as necessary. If the battery case is cracked or the terminals are damaged, the battery must be replaced before performing the tests. Note the battery condition below:

_____

6. Before performing any tests, be certain to set the date and time on the tester. To do this, with the tester disconnected from the battery, press **MENU**.

7. Use the ▼ to scroll through the list until you find the "SET DATE & TIME" selection, then press **ENTER** to confirm the date and time. If the date or the time are not correct, press the ▼ to change the setting.

8. When the setting is correct, press **ENTER** to advance to the next "cell". When each of the cells has been changed so that the date and time are now correct, press **ENTER** to end this mode.

GITN 2016A

Note: Failure to set the correct time and date will result in improper claims coding and reimbursement for the repair will be denied. Be certain the date is correct before performing the test.

9. Using the Model 620 tester, attach the two alligator clip leads to the battery cables. Attach the red lead to the positive battery post (+), and the black lead to the negative battery post (-), also known as the ground cable (⏚). Each of the test leads must be securely connected or the tester will not operate.

CHOOSE TEST ??
OUT-OF-VEHICLE ?

10. With the tester leads attached to the battery cables, the tester automatically comes on. The display at left appears. If it did not start automatically, check both cable connections before proceeding.

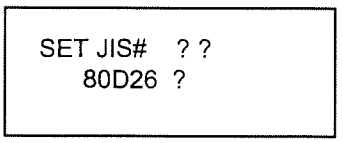
11. Make sure all accessory loads are turned off and that the ignition switch is OFF before performing the battery test.

12. Locate the IN-VEHICLE test. It may be necessary to scroll down the list to find this particular test. To do so, press ▼ until that test appears, then press **ENTER** to select it. This should bring up the screen at left.

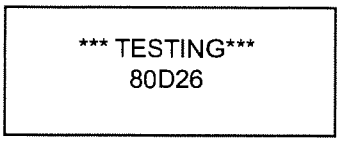
GITN
2016A

SELECT INPUT ??
TEST USING: CCA?

13. To perform battery tests, the tester must be programmed to know the battery's rating system. In order to test batteries on Nissan vehicles, choose **Cold Cranking Amps (CCA)** or **Japanese Industrial Standard (JIS)** for the rating type. Most new cars will come with batteries that have the JIS rating. This rating is located on the top of the battery case. An example JIS rating is 80D26L.



14. For this exercise, locate either the *JIS* or CCA rating. To do this, Press ▼ on the keypad to scroll down until the desired choice is showing, then Press **ENTER** to select it. The screen at left appears.

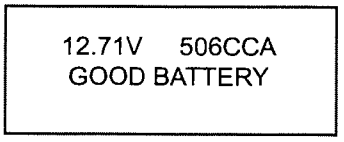


15. Press ▼ to scroll down the list until you find the correct battery rating for the battery you are testing, then press **ENTER** to select that choice. After choosing the battery rating, the tester automatically performs the battery test. While the test is being conducted, the screen at left appears.

Note: The tester may give an indication that the battery has a surface charge which must be removed prior to testing the battery. If this happens, follow the instructions on the tester, then continue with the test.

16. When the test is complete, the test result is displayed. The result will resemble the result shown at left. Notice that the tester display toggles between the 'TEST RESULTS' and "PRESS ENTER FOR BATTERY CODE".

GITN 2016A



Note: When performing this procedure on a vehicle, it is essential to record all 12 characters of the code on the repair order. Failure to do so will result in the claim being denied or suspended.

17. Press **ENTER** to find out the test code, then record both the test results and the test code below:

Record test results here.

_____

Record 12 character test code here.

_____

CRANKING VOLTAGE
NORMAL 10.74V

Note: A screen similar to the one at left should appear with the code. Notice once again that the screen display toggles. This feature is consistent with each of the remaining tests, so further mention is not necessary.

18. Press **ENTER** to advance to the starting system test. The prompt 'START ENGINE' appears. At this time, start the engine. While doing this, the tester will perform a starting system test. A screen similar to the one at left should appear at the end of the test. Record the test result below:

GITN
2016A

ALT VOLTS: 14.53V
ENTER TO CONT...

Starting System test result.

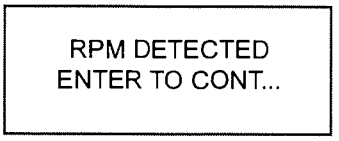
_____

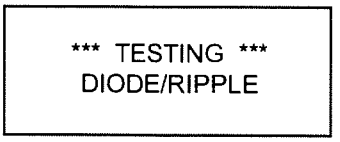
19. Press **ENTER** to advance to the Charging System test. A screen similar to the one at left appears, showing the charging system output voltage.

LOADS OFF
REV ENGINE FOR 5 SEC

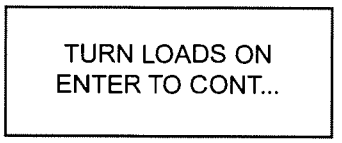
20. Press **ENTER** to continue. Confirm that all electrical loads are turned off before proceeding with the next step. The screen at left appears.

21. Rev the engine to about 1500-2000 RPM for 5 seconds. When the tester detects RPM, the screen at left appears. Release the throttle and let the engine idle.

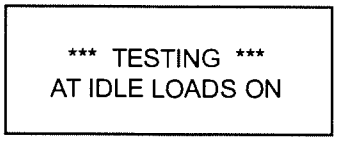




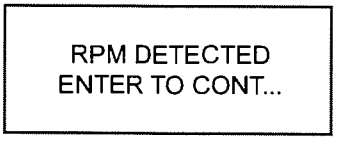
22. After releasing the throttle, press **ENTER**. At idle, the tester conducts a Diode Ripple test, then prompts you to apply loads.



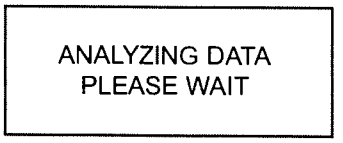
23. Turn ON the high beam headlamps, the rear window defogger, and the blower on high (heat). Do not use cyclical loads such as the air conditioner or windshield wipers as inaccurate results will occur.



GITN 2016A



24. Again, rev the engine to about 1500-2000 RPM for 5 seconds. When the tester detects rpm, the screen at left appears.



25. Press **ENTER** to continue. The screen at left appears while the test is being conducted.

CHARGING SYSTEM NORMAL

DIODE RIPPLE NORMAL

IDLE VOLTS: 14.00V
LOAD VOLTS: 14.08V

26. At the conclusion of the charging system test, the series of screens at left will toggle, indicating the overall condition of the charging system.

PRESS ENTER FOR CHARGING CODE

27. Press **ENTER** to find out the test code, then record both the test results and the test code below:

    Charging System voltage _____

    Diode Ripple _____

28. Record 12 character test code below:

    _____

GITN 2016A

CHARGING CODE
ALTST-2ST483T

Note: The 12 character test code that appears at the end of testing is the same code for starters and charging systems. This code must also be recorded on the repair order for both the Starter test and the Battery test.

29. Based on the results of these tests, what conclusions can you make about the condition of the battery, starter, and charging system? Look at the following list of options and check each one that matches your outcome:

Battery Condition:

☐ GOOD BATTERY—Return to service.

☐ GOOD-RECHARGE—Fully charge battery and return to service.

☐ CHARGE & RETEST—Fully charge the battery and retest it. Failure to fully charge the battery before retesting may cause false readings.

☐ REPLACE BATTERY—Replace the battery and retest to perform a complete charging system analysis. If this result appears, check battery cable connections and perform an out-of-vehicle test on the battery before replacing the battery. If it fails the out-of-vehicle test, it should be replaced.

GITN 2016A

☐ BAD CELL-REPLACE—Replace the battery and retest to perform a complete system analysis.

Note: If charge and retest result appears for the battery test, charge the battery, then perform the test again. Make certain that you select "After Charge" when you enter the type of test or the battery may again fail the test.

Starter Condition:

☐ CRANKING VOLTAGE NORMAL—The system shows normal starter draw.

☐ CRANKING VOLTAGE LOW—The cranking voltage is below normal limits, troubleshoot the starter. Refer to the service manual or bulletins associated with this vehicle for additional information relating to the starting system.

☐ CHARGE BATTERY—The battery state-of-charge was too low to perform a starting system test. Charge the battery, then continue with the starting system test.

☐ REPLACE BATTERY—The battery must be replaced before testing the starter. Replace it, then continue with the starting system test.

GITN
2016A

Charging System Condition:

- ☐ CHARGING SYSTEM NORMAL/DIODE RIPPLE NORMAL—The system is showing normal output from the alternator. No incident detected.
- ☐ NO CHARGING VOLTAGE—The alternator is not developing any charging voltage to keep the battery charged.
- ☐ LOW CHARGING VOLTAGE—The alternator is not providing sufficient current for the system's electrical loads and to keep the battery charged.
- ☐ HIGH CHARGING VOLTAGE—The voltage output from the alternator exceeds the normal limits of a functioning regulator.
- ☐ EXCESS RIPPLE DETECTED—One or more diodes are not functioning or there is stator damage.

Note: In the case of these incidents, refer to the appropriate service manual for general alternator diagnosis information. Search ASIST® for updated service bulletins for the vehicle in question.

GITN 2016A

30. If you had difficulty performing the Skill Check stated at the beginning of this module, ask your instructor for assistance.
31. When you have completed the Skill Check to your satisfaction, see your instructor for verification of your work.

Instructor's Initials _____

NOTES

DIAGNOSING EMISSION SYSTEM PROBLEMS USING CONSULT-II

Objective: Given a vehicle with an emission system concern, verify the concern and record test data using CONSULT-II.

Relevance: Emission system diagnosis can be very complex. Understanding various techniques for testing emission system component performance with CONSULT-II can help simplify diagnosis. This module will familiarize you with several data collection techniques.

Resources:

- Vehicle with an emission system problem
- CONSULT-II
- Electronic Service Manual (ESM)

Skill Check: Using CONSULT-II Active Test, SRT Work Support, and Data Monitor mode:

- Record all test data
- Diagnose the fault based on analysis derived from these tests
- Repair and retest the system

GITN 2017A

Getting Started:

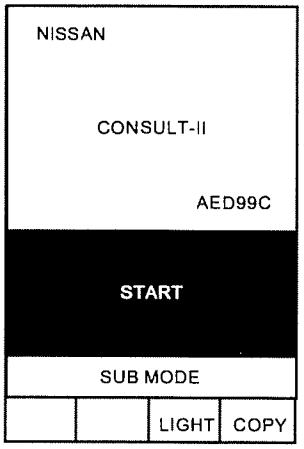
1. Locate the vehicle with the emission system fault. Confirm this with the instructor.

2. Start the engine. The "Service Engine Soon" ("SES") light will come on when you start the engine if a DTC is stored.

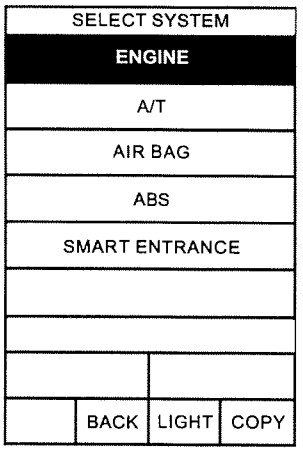
3. Locate CONSULT-II and be sure the diagnostics card is installed in the correct slot.

4. Plug CONSULT-II into the DLC.

5. Turn on CONSULT-II. After bootup, the Main Menu appears.



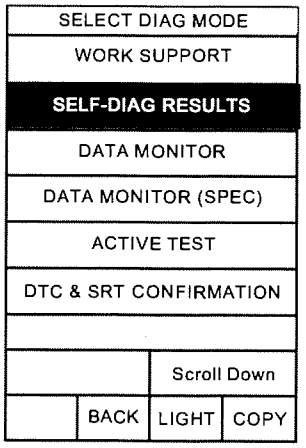
GITN 2017A



6. Touch **START**. 'System Call' is displayed for about 20 seconds, after which the Select System Menu at left appears.

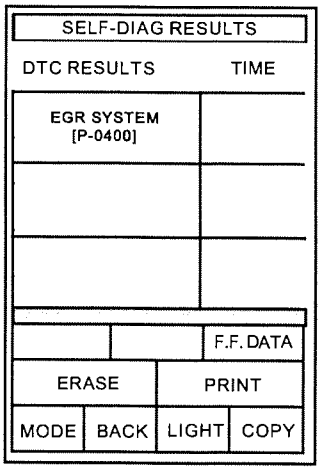
Retrieving Diagnostic Trouble Codes (DTCs)

Note: If the "SES" light was on at engine startup, the Engine Control Module (ECM) has stored a diagnostic trouble code. The next few steps review how to retrieve any stored codes. If, however, the "SES" light did not come on at engine start up, the fault may be intermittent. Even in the case of an intermittent fault, there may be a code stored from a previous fault.



7. From the Select System screen, touch **ENGINE**. The SELECT DIAG MODE menu appears.

GITN 2017A



8. Touch **SELF-DIAG RESULTS** to retrieve any stored trouble codes. You should see a screen similar to the one at left.

9. Are there any codes listed in the SELF-DIAG RESULTS?

   YES / NO *(Circle one)*

10. Touch **PRINT** to print the stored codes shown on the screen. Print this screen whether or not codes are displayed to verify you have seen these details.

11. Attach the printout at left.

Attach Printout Here

Note: If no codes are stored, see the instructor before proceeding to the next step.

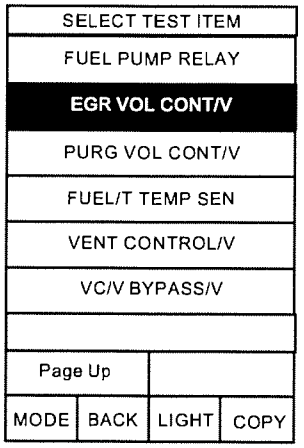
12. Touch **F.F. DATA**, then touch **PRINT** and attach the printout at left.

13. Touch **BACK** once. If there are any codes stored, do not clear the codes at this time.

Attach Printout Here

GITN 2017A

EGR Testing With CONSULT-II
Active Test



14. Touch **BACK** then touch **ACTIVE TEST**. From the SELECT TEST ITEM menu, touch **EGR VOL CONT/V**, then touch **SELECTION FROM MENU**. Select each of the following from the list by touching the box for each item:
    - **ENG SPEED**
    - **COOLAN TEMP/S**
    - **EGR TEMP SEN**
    - **ABSOL PRES/SE**
    - **CAL/LD VALUE**
    - **EGR VOL CON/V**
15. Touch **START**.
16. Touch **COPY** and attach the printout at left.

Attach Printout Here

Note: The screen indicates normal idle condition.

17. What is the EGR temp sensor voltage?

_____

GITN 2017A

18. Increase engine speed to 1500 rpm.

GITN 2017A

Note: Active test for EGR allows you to command the EGR valve open in steps.

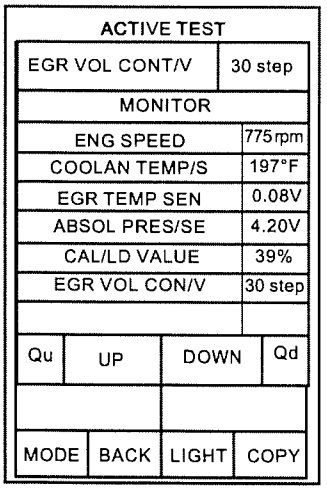
- 0 steps = Valve fully closed
- 55 steps = Valve fully open

Qu=Quick Up. Choose this option if you want to command the EGR valve open in increments of 10 steps at a time.

UP=Open. Choose this option if you want to command the EGR valve open in increments of 1 step at a time.

Qd=Quick Down. Choose this option to command the EGR valve closed in increments of 10 steps at a time.

DOWN=Close. Use this button to command the EGR valve closed in increments of 1 step at a time.



19. Using the **Qu** button, open the EGR valve to 30 steps.

20. With the EGR at 30 steps, quickly snap the throttle open and watch the EGR VOL CON/V steps value in the monitor chart.

21. How did the steps change?

_____

System Performance Testing with CONSULT-II

Note: If you suspect a fault with the EGR system and have been unable to confirm either the "SES" light is on, or a code is stored, test system performance. To do this, make sure the car is sitting still, then shift the transmission into PARK and turn the A/C off.

Method 1:

29. Fix the problem, retest the system, command the EGR to 30 steps for 10 seconds, then touch **COPY** and attach the printout at left.

30. Command the EGR to 0 steps.

31. Touch **BACK** three times to return to the SELECT DIAG MODE menu. The screen at left appears.

32. Touch **DTC & SRT CONF,** Then touch **SRT WORK SUPPORT**.

33. Touch **SELECTION FROM MENU**. Select all of the following parameters to monitor:
    - **ENGINE SPEED**
    - **COOLAN TEMP/S**
    - **EGR TEMP SEN**
    - **ABSOL PRES/SE**
    - **CAL/LD VALUE**
    - **EGR VOL CON/V**

34. Touch **START**.

SELECT WORK ITEM			
SRT STATUS			
SRT WORK SUPPORT			
DTC WORK SUPPORT			
MODE	BACK	LIGHT	COPY

GITN 2017A

40. What is the correlation between the commanded steps and the engine load?

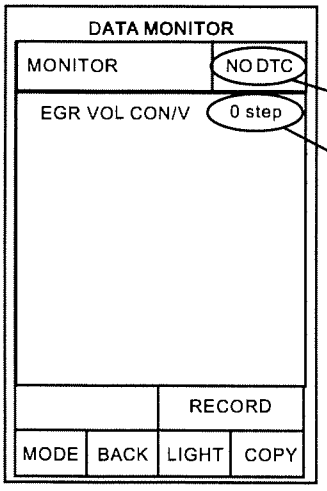
_____

_____

Method 2:

41. Another technique can be used to test the control functionality of the EGR Volume Control Valve, or in other words, to determine if the ECM commands the valve to open. Touch **BACK** 4 times, touch **DATA MONITOR**, then touch **SELECTION FROM MENU**.

42. Touch **Page Down** and locate EGR VOL CON/V and touch **EGR VOL CON/V** to select it.



43. Touch **START**. The screen at left appears.

44. In this mode, notice the following:

- A code for this system can be displayed if one is stored.
- At idle, no EGR steps are commanded by the ECM. This is normal operation for this system.

GITN 2017A

55. Did the ECM command the EGR valve to open in steps?

YES / NO *(Circle one)*

- If Yes: This means the ECM is in control of the circuit that opens the EGR valve. However, the circuit could be electrically functioning okay and yet the EGR valve could be faulty or blocked.
- If No: There is a fault somewhere that requires further diagnosis.

56. Based on the answer to the previous question, if a problem exists, do you have enough information to determine the cause of the problem?

YES / NO *(Circle one)*

GITN 2017A

58. If you had difficulty performing the Skill Check stated at the beginning of this module, ask your instructor for assistance.

59. When you have completed the Skill Check to your satisfaction, see your instructor for verification of your work.

Instructor's Initials _____

USING THE ELECTRONIC SERVICE MANUAL (ESM)

Objective: Given an ESM workstation, familiarize yourself with the basic controls of this system.

Relevance: Nissan is no longer printing paper Service Manuals. The ESM is the only source for vehicle service information.

Resources:

- ESM Workstation

Skill Check: Your understanding of how to use the ESM is demonstrated by answering questions in this module.

Note: This module was designed to work with Adobe Acrobat™ version 3.0. Your instructor may have installed the newer version of Acrobat on the ESM workstation you will be using. If "Version 4.0" appears whild the ESM is starting, skip steps 9-12, then see your instructor for a description of these changes.

GITN 2018A

1. Locate an ASIST workstation and make sure that the Main Menu screen is displayed.

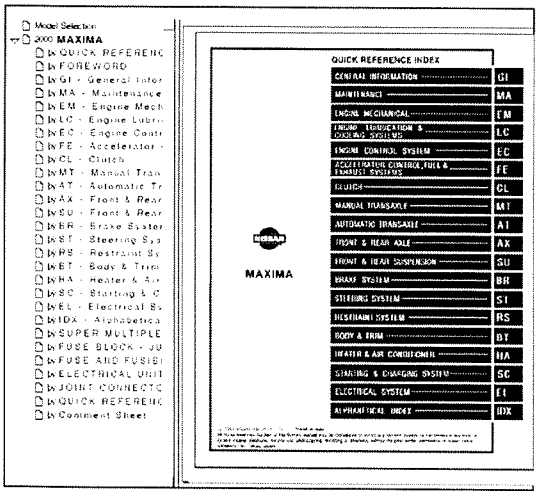
2. From the Main Menu, choose **Service Manual** to open the ESM.

3. The ESM menu page appears and presents a number of menu options from which to choose.

Note: An available option has a yellow colored dot inside of a blue circle or a hand pointer appears when the cursor is positioned over the chosen object.

4. List the available and unavailable menu options of this screen below:

Available	Unavailable
_____	_____
_____	_____
_____	_____



5. From the ESM menu, select **Maxima**. The Maxima menu screen appears.

6. From the menu, choose **Service Manual**. This displays the Quick Reference Index shown at left.

Service Tip:

The screen is split when this section initially opens. On the left side of the screen is a listing of all of the sections of the Service Manual, on the right is the Quick Reference Index page.

7. Move the mouse pointer over the icon at the top left of the screen but do not click it. The cursor should be an arrow pointing at the icon. What is stated in the box that appears?

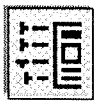
_____

_____

8. Click on the icon identified above. How did the screen display change?

_____

_____



9. Move the mouse pointer and hold it over the second icon but do not click it. What is stated in the box that appears?

_____

_____

10. Select the second icon identified above. How did the display change when you made that selection?

_____

_____

GITN 2018A

11. Move the mouse pointer and hold it over the third icon but do not click it. What is stated in the box that appears?

_____

_____

12. Click on the third icon. What changed with the display?

_____

_____

13. The next icon to the right is the hand pointer. This tool has two distinct functions. When it is selected, it will look like an open hand (see illustration at the left) or a finger pointer. The finger pointer symbol is used to select items connected to hyperlinks. Hyperlinks are quick jumps to other pages of the ESM.

14. Move the mouse pointer to the white part of the Service Manual page. With the pointer positioned in this area of the page, what does it look like?

_____

_____

15. Move the mouse pointer to the Engine Control System section. How did the mouse pointer change?

_____

_____

16. Using the hand pointer symbol, select the EC section. Notice that screen magnification has increased. Look in the lower left area of the screen and find the magnification percentage displayed along with a small magnifying glass symbol. This page is displayed at _____% magnification.

17. With the page at this magnification, move the mouse pointer onto the white portion of the Service Manual page. Click and hold the left mouse button, then move the mouse pointer to scroll the page up and down. According to the box in the lower left portion of the screen, this is page _____ of _____.

Service Tip:

When the page is not completely visible on the screen (larger than 100%), notice that when you click and hold the left mouse button over white space, the open hand changes to the appearance of a clenched fist. The clenched fist symbol allows you to pull the page up or down in this manner.

18. Using the illustration at left as a reference, move the mouse pointer to the first of the folded page icons (the one farthest left) and select it. The page magnification has changed to _____%.

19. Move the mouse pointer over the folded page symbol but do not click it. What is stated in the box that appears?

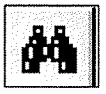
_____

_____

GITN 2018A

20. Click on that icon and note the change in magnification:

_____%

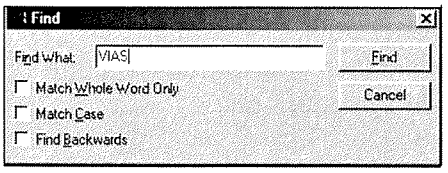


21. Move the cursor to the last folded page icon and select it. This changes the page magnification to _____%.

22. The last icon at the right is the Binocular Icon. This opens the Find function.

Service Tip:

This search looks only in the current section. To search another section, open the section you wish to search and select **Find Again**.



23. Click the **Binocular** icon to open the Find function. Type in the term *VIAS*, and click the **Find** button.

24. What is the page number next to the highlighted area in the table of contents?

_____

25. Select this page using the Hand pointer.

26. According to this section of the Service Manual, what is the position of the Power Valve when the engine is running at low or medium speed?

_____

27. Choose the **Binocular** icon again to perform another search. Click the **Find Again** button. To what page number does this search take you?

_____

Service Tip:

If you conduct searches for a specific term or component, you can repeat your search by clicking **Find Again**. Additional searches for a selected term refers you to the next place where related information is available.

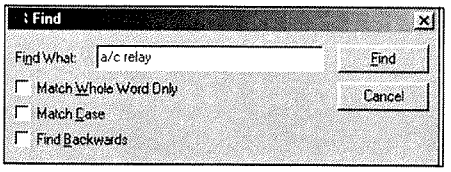
28. According to the Service Manual, the VIAS Control Solenoid Valve is:

    (Check one)
    ☐ Input (sensor)
    ☐ ECM function
    ☐ Output (actuator)

29. Return to the Quick Reference Index page by selecting it from the list at the top-left of the screen.

30. Click the **Alphabetical Index** selection.

31. Use the Find function to find the A/C Relay. To do this, type a/c relay in lower case, then click the **Find** button in the dialog box. What is the page number referred to in the alphabetical index?



_____

32. From the list on the left side of the screen, select the **HA-Heater & Air Conditioner** section.

GITN 2018A

33. Select the **Find** function again. The term a/c relay should still be shown in the dialog box. To search again for this same component, click **Find Again**.

34. The next reference to the a/c relay is located on which page?

_____

35. From the information shown on the page, what controls the a/c relay ON/OFF signal?

_____

Now that you have practiced using the various icons, you should be familiar with the function of the more commonly used features of ESM.

36. Using the browsing techniques of your choice, find answers to the remaining questions.

37. What is the recommended Schedule 1 maintenance interval for the Fuel Filter?

_____

Hint: When you locate the page with the maintenance interval chart, use the zoom tool (magnifying glass icon) to enlarge it, making it more readable.

38. What is the section/page number where you found this information?

_____

39. What special service tool should be used to remove tie-rod outer ends or lower ball joints?

_____

40. What is the section/page number where you found this information?

_____

41. How can you quickly determine if a battery is sulfated while it is being recharged?

_____

42. What is observed in the initial stage of charging sulfated batteries?

_____

_____

Hint: You may want to search the alphabetical index to find this topic.

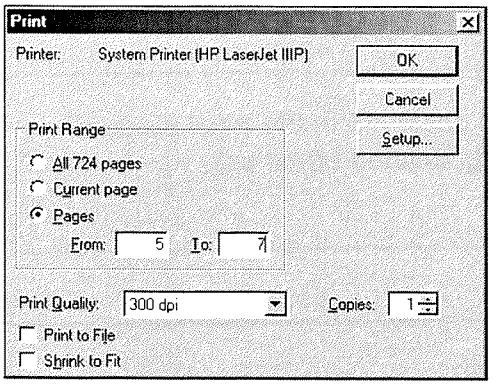
GITN 2018A

43. Locate the procedure for removing and installing Seat-Belt Pre-Tensioners.

44. Print the relevant pages and while the ESM is still open to this section, locate all of the hyperlinks contained in the pages that you have just printed and highlight them on the pages you printed.

Reminder:

Hyperlinks show up in the text within green outlined boxes.



Service Tip:

If you need to print any information from the Service Manual, verify that you choose only the selection of pages that you need, or you may inadvertently print an entire section of the Service Manual. Many service manual sections have page counts in excess of 100 pages. This could be very time-consuming and wasteful.

45. If you had difficulty performing the Skill Check stated at the beginning of this module, ask your instructor for assistance.

46. When you have completed the Skill Check to your satisfaction, see your instructor for verification of your work.

Instructor's Initials _____

GITN 2018A

INSPECTING THE NISSAN CONTINUOUSLY VARIABLE VALVE TIMING CONTROL SYSTEM (NCVCS) USING CONSULT-II

Objective: Given a Pathfinder equipped with the VQ35DE engine and a CONSULT-II, perform basic function test of NCVCS.

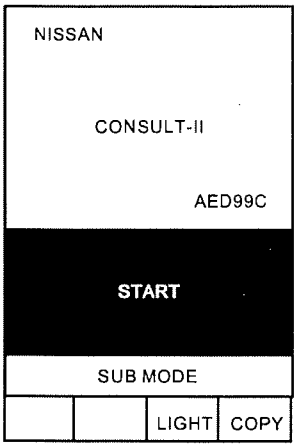
Relevance: The VQ35DE is an all-new engine. Although similar to the VQ30DE engine used in Maxima, there are several significant differences which may impact diagnosis.

Resources:

- Pathfinder with VQ35DE engine
- CONSULT-II
- Electronic Service Manual (ESM)

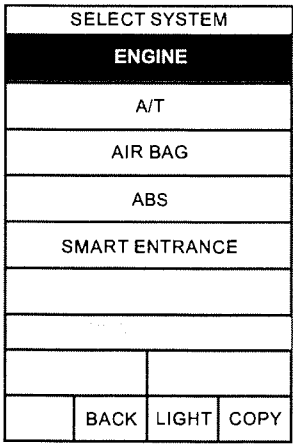
Skill Check: Your understanding of the operation of this system is verified by recording data with CONSULT-II and attaching printouts into this module.

GITN 2019A

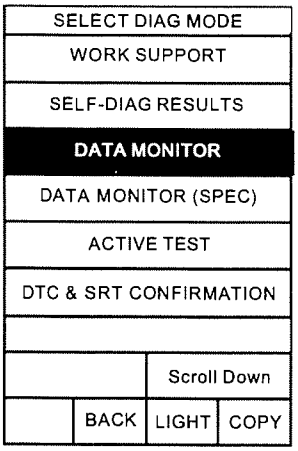


Monitoring Signals

1. Connect CONSULT-II to the DLC.
2. Start the engine and warm it up to normal operating temperature.
3. Touch **START** on the CONSULT-II Main Menu.

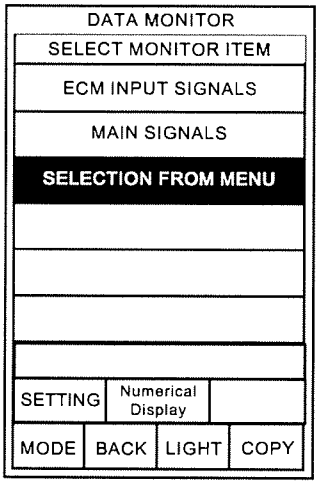


4. Touch **ENGINE**. The NCVCS system is one of the systems controlled by the ECM for engine operation.

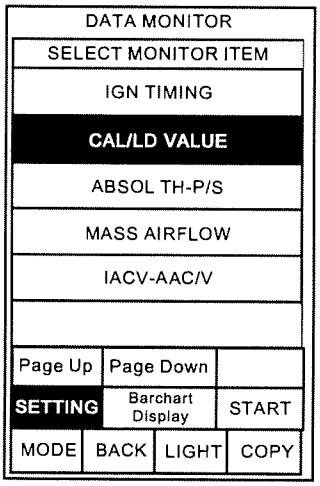


5. Touch **DATA MONITOR** to select the diagnostic mode.

GITN 2019A



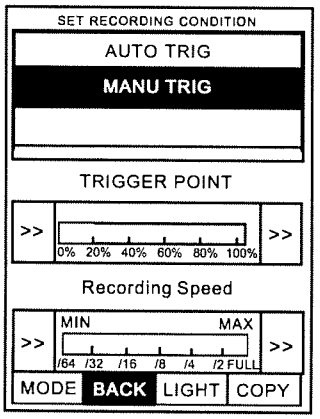
6. Touch **SELECTION FROM MENU** to choose inputs to include on the display.



7. Touch each of the following inputs to highlight them:

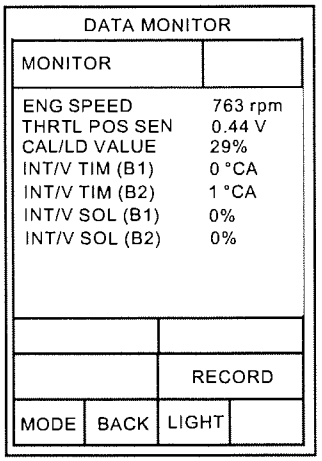
   - **ENG SPEED**
   - **THRTL POS SEN**
   - **CAL/LD VALUE**
   - **INT/V TIM (B1)**
   - **INT/V TIM (B2)**
   - **INT/V SOL (B1)**
   - **INT/V SOL (B2)**

8. Touch **SETTING** to set up the snapshot parameters that follow.



9. Touch **MANU TRIG** to set the snapshot recording condition. Leave the default conditions in place for both TRIGGER POINT and Recording Speed.

GITN 2019A



10. Touch **BACK**, then touch **START**. The screen should look similar to the image at left. Notice that each of the inputs selected in step 8 are now actively displayed on the CONSULT-II screen.

Attach Printout Here

11. Touch **COPY** and attach printout at left.

GITN 2019A

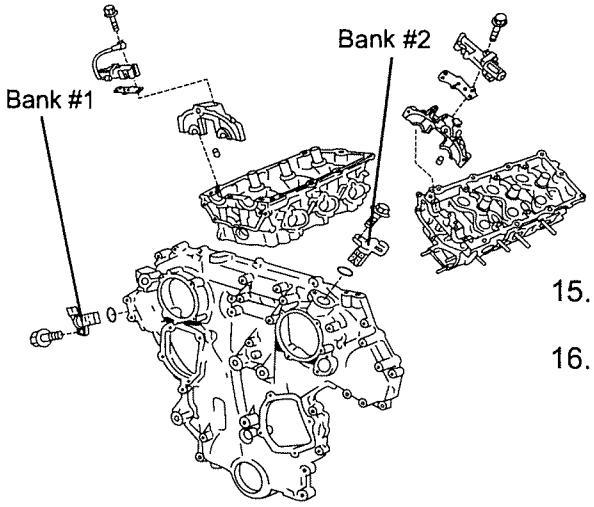
Attach Printout Here

12. Accelerate to 1,500 rpm and while holding the rpm steady, touch **COPY**. Attach printout at left.

13. Allow the engine to return to idle.

14. Based on the printout at left, what was the calculated load percentage?

    _____



Intake Timing Sensors

15. Shut off the engine.

16. Disconnect the intake timing sensor connector for Bank 1. See illustration at left for proper location.

GITN 2019A

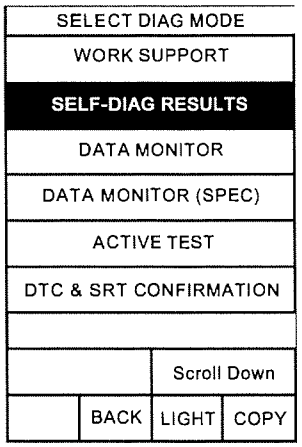
Attach Printout Here

17. Start the engine.
18. Accelerate the engine to 1,500 rpm.
19. Touch **COPY** and attach the printout at left.
20. Allow the engine to return to idle.
21. From your printout, are both camshaft sensors indicating the same amount of advance?

    YES/ NO *(Circle one)*

22. Did the value of B1 sensor change?

    YES/ NO *(Circle one)*



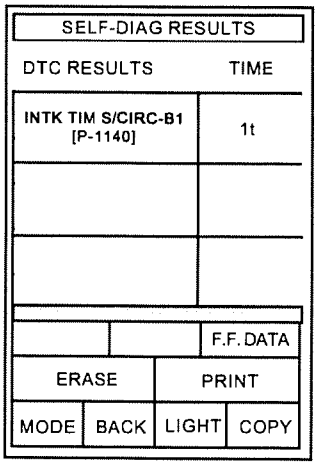
Note: A fixed reading indicates that the system is not functioning properly.

23. Touch **BACK** and return to the SELECT DIAG MODE, then touch **SELF-DIAG RESULTS**. Any stored DTCs should now be displayed on the screen.

GITN 2019A

Attach Printout Here

24. Touch **PRINT** to print all DTCs. Attach the printouts at left.



25. Touch the box of the first DTC displayed.

26. What information is now displayed?

_____

_____

Note: This system uses a 2-stage fault detection logic. The Malfunction Indicator Light (MIL) on the instrument panel will illuminate after the second time the engine is started with a fault in the system.

GITN 2019A

27. Touch **SCROLL DOWN** to read all information.

28. From the information given, determine the possible causes for this DTC and attach the printout at left.

Attach Printout Here

29. Shut off the engine and reconnect the sensor connections.

30. Turn ignition back ON and touch **ERASE** to clear all DTCs, then print the screen and attach at left.

Attach Printout Here

31. If you had difficulty performing the Skill Check stated at the beginning of this module, ask your instructor for assistance.

32. When you have completed the Skill Check to your satisfaction, see your instructor for verification of your work.

Instructor's Initials _____

GITN 2019A