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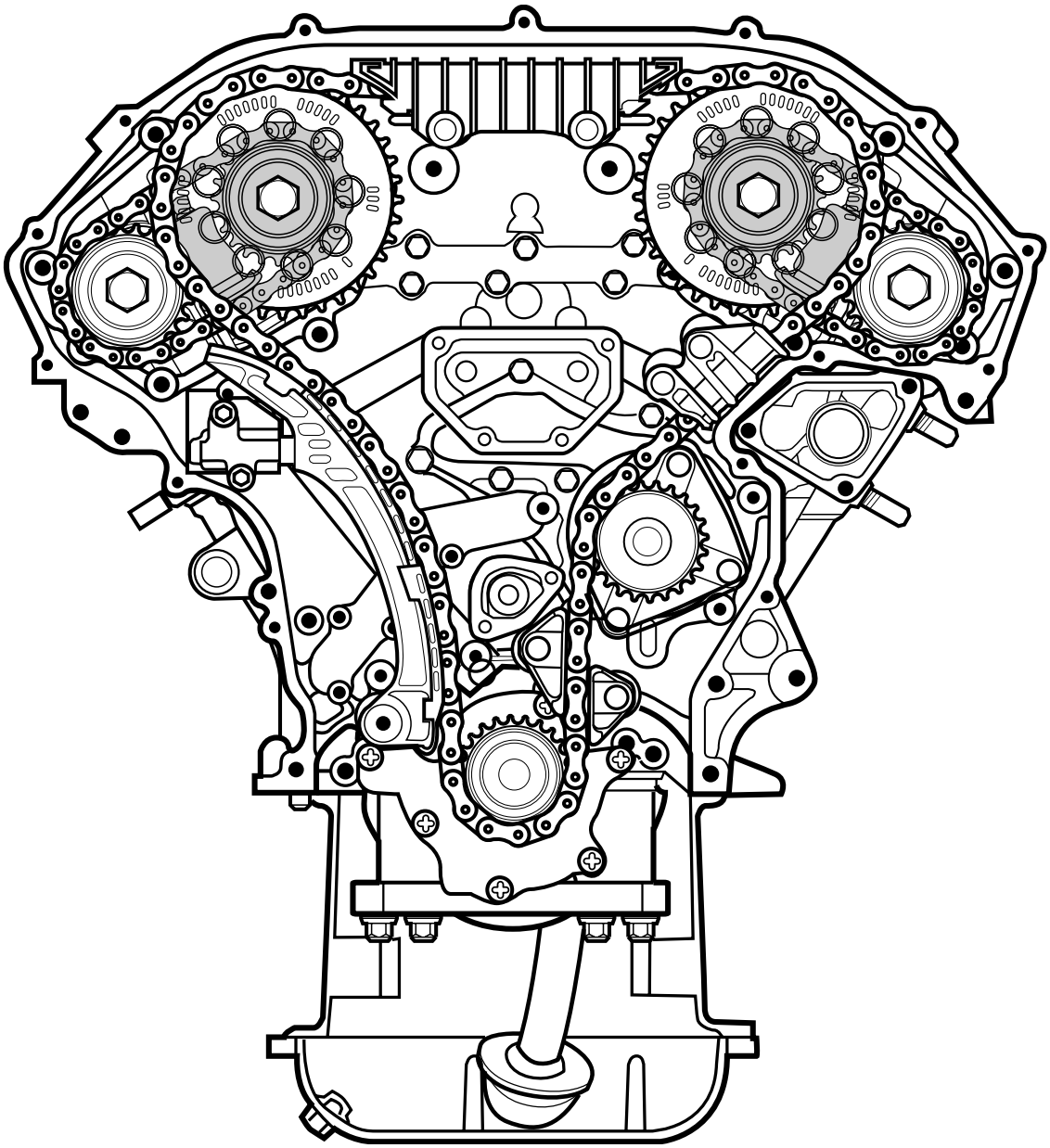
ENGINE MECHANICAL SERVICE



JUNE, 2003

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

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THROUGH TECHNICIAN CERTIFICATION

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ENGINE MECHANICAL SERVICE
COURSE OBJECTIVES

Upon completion of this training program, you will be able to:

- Properly bleed all air from hydraulic valve lash adjusters.
- Correctly adjust the valves of the SR20DE engine using special service tool No. J38957-N.
- Identify common engine noises and describe the most likely causes of each noise.
- Use an ASIST terminal with Electronic Service Manual (ESM) to correctly identify an engine assembly based on the Engine Identification Code and locate the proper diagnosis/repair sections, specifications and procedures applicable to the vehicle being serviced.
- Perform a cooling system check for evidence of leaks, damage, or deterioration to assure proper cooling system performance.
- Perform an oil pressure test using a pressure gauge and interpret the results.
- Use the CONSULT-II scan tool to verify proper operation of electronically-controlled, liquid-filled engine mounts.
- Use the CONSULT-II scan tool to perform basic function tests of the NCVCS on a vehicle equipped with a VQ35DE engine.
- Use a cylinder compression gauge, a cylinder leakage tester, a CONSULT-II scan tool and the applicable Service Manual to perform an engine compression test and cylinder leakage test to determine the condition of the piston rings, valves and head gasket based on specifications in the Service Manual.
- Remove and correctly install both left and right bank timing chains on a VK45DE engine (Infiniti technicians only).
- Remove and install the Primary and Secondary timing chains, chain guides and chain tensioners for the VQ35DE engine to assure the proper timing of the vehicle.
- Remove and install the cylinder head bolts using proper tools and procedures from the Service Manual.
- Remove and install the water pump on a VQ35DE engine using proper tools and Service Manual procedures.
- Correctly perform the valve inspection and adjustment on a QR25DE engine.
- Review and understand the fundamentals of basic engine operation.
- Perform a power balance test and use the results to determine if one or more cylinders is misfiring.
- Demonstrate the skills necessary to properly measure valve clearance, determine correct specifications and adjust valve clearance on a QG18DE engine.
- Demonstrate the skills necessary to properly remove and install the timing chains on a QR25DE engine (Nissan technicians only).

NOTES

SECTION 1

TEXT

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ENGINE MECHANICAL SERVICE

INTRODUCTION

Welcome to Nissan North America's Engine Mechanical Service Training Course. In this course, you'll learn engine theory, the type of precision tools and specific procedures you'll need to properly diagnose and service Nissan/Ininiti engines.

ENGINE THEORY

Basic Components

A basic four-cycle engine consists of a cylinder block, cylinder head, crankshaft, connecting rod, piston, camshaft, lifter, push rod, rocker arm, valves, and valve springs.

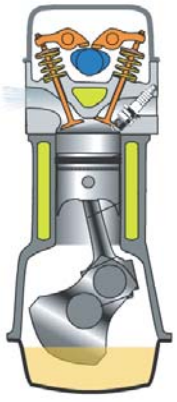
Crankshaft rotation moves the piston up and down in the cylinder. The camshaft opens the valves; valve springs close the valves.

Four-Stroke Engine Cycle

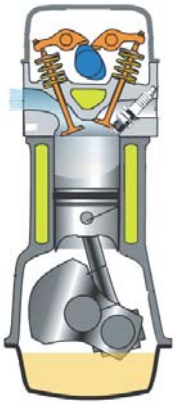
The intake, compression, power, and exhaust strokes define one complete four-stroke cycle. At the top of the intake stroke (1A), the cam and lifter arrangement opens the intake valve. As the piston moves down, a fresh air and fuel charge is drawn into the cylinder. At the bottom of the intake stroke (1B), the valve spring closes the intake valve to seal the chamber.

The crankshaft drives the piston upward to compress the air/fuel charge (2A). Near the top of the compression stroke, a spark jumps the spark plug gap, igniting the compressed charge (2B).

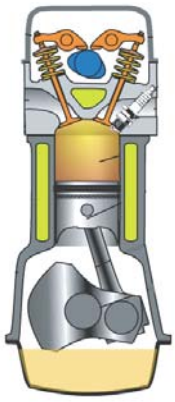
1A



1B

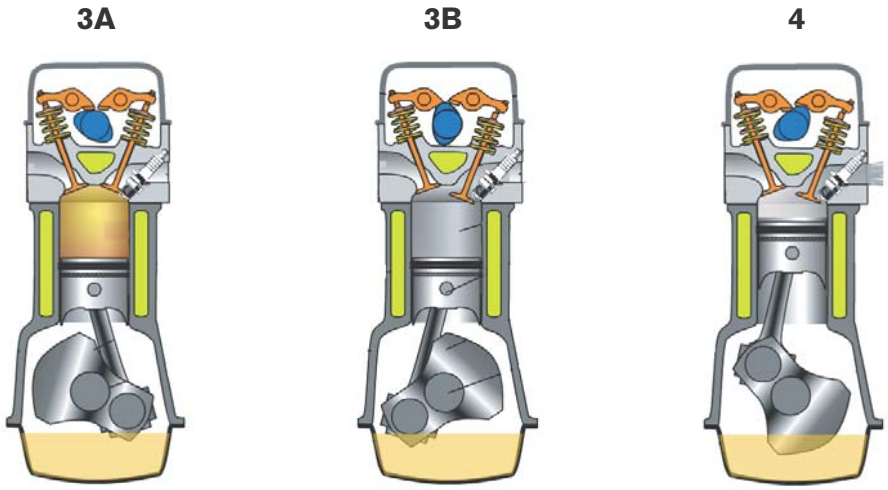


2A



2B

The fuel burns rapidly, driving the piston down the cylinder (3A). At the bottom of the power stroke, the exhaust valve opens (3B). The upward stroke of the piston pushes spent exhaust gases from the cylinder (4). When the exhaust valve closes, the cylinder is ready for another cycle.



Lower End

The cylinder block is the engine's foundation, allowing the crankshaft to rotate while the piston reciprocates. All components either move within, or attach to, the cylinder block.

The piston moves up and down in the cylinder. The connecting rod attaches to the piston and to the crank pin. Connecting rods must be light, yet very strong. The crankshaft rotates in the lowermost portion of the block, changing reciprocating piston movement into a rotational turning force that is used by the drive train and wheels.

Some engines have a camshaft mounted in the cylinder block. The camshaft has machined intake and exhaust lobes to move valve lifters and push rods. Push rods rotate a rocker arm to open the valve. Springs are used to close the valve.

During the power stroke, heat from combustion quickly increases gas pressure within the cylinder. Heated, expanding gas pressure is the force that actually moves the piston down the cylinder.

Sealing the Combustion Chamber

Although expanding gas forces the piston down the cylinder, some gas does escape between the piston and the cylinder wall. If enough gas escapes, a good portion of the usable pressure is no longer available to push the piston down the cylinder. The solution to this problem is to seal the chamber with compression rings. Plated rings fit in piston grooves. The edges of the rings ride along on the cylinder wall.