NAVISTAR®

2015 N13 ENGINE OVERVIEW FOR TECHNICIANS

Study Guide



Course Code: 8520

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INTRODUCTION

Welcome to the Navistar® training course overviewing the 2015 N13 Engine. This course is intended to introduce technicians to the 2015 N13 engine.

If you have questions or concerns regarding the playback of this program, please contact Navistar Service Education by submitting a case file (Dealer Personnel); or by calling 1-800-365-0088.

NOTE

THE INFORMATION PROVIDED WITHIN THIS COURSE IS FOR TRAINING PURPOSES ONLY. ALWAYS CONSULT THE LATEST SERVICE, DIAGNOSTIC, AND TOOL INFORMATION, LOCATED ON NAVISTAR'S SERVICE PORTAL, PRIOR TO PERFORMING SERVICE ON NAVISTAR ENGINES, VEHICLES, AND EQUIPMENT.

Course Navigation

To skip the navigation instructions and continue with the course, click on the "SKIP" button near the upper right-hand corner of the screen.

Navigation of this course may be performed in several ways. At the bottom of the screen are the "NEXT," "PREVIOUS," and "REPLAY" buttons. Clicking either the "NEXT" or "PREVIOUS" buttons will take you to the next or previously viewed course topic. After all information on a topic has been covered, the arrow on the "NEXT" button will pulse red to indicate you are ready to continue.

Clicking the "REPLAY" button will replay the topic you are currently viewing.

Near the bottom right-hand corner of the screen are the "PAUSE/PLAY" and "NOTES" buttons. Clicking the "PAUSE/PLAY" button allows you to pause the course and resume when you're ready to continue.

Clicking the "NOTES" button will bring up a small window containing the narrated text for the currently viewed topic. Click the "NOTES" button again to hide this window. That's all for course navigation.

Objectives

Upon completion of this course, you will be able to

- Identify the 2015 N13 engine
- Identify and locate engine sensors
- Identify and locate engine components

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ENGINE IDENTIFICATION

There are several ways you can identify the 2015 N13 engine. Two of the most common ways are the Emissions Label, and the Engine Serial Number (ESN) Engraving.

ESN

The ESN is engraved into the upper left side of the crankcase, just above the high pressure fuel pump and below the cylinder head.

The fourteen digit ESN consists of codes that describe the engine.

Emissions Label

The **Emissions Label**, located on the upper valve cover, contains engine information including the ESN, model year, horsepower rating, engine displacement, engine family, valve lash specifications, and engine emissions information.


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IMPORTANT ENGINE INFORMATION
ENGINE MANUFACTURED BY:
NAVISTAR, INC.

MODEL YEAR	2015
ADV BHP@ RPM	475@1700
LB-FT TORQ. @ RPM	1700@1000
DISPLACEMENT	12.4 L
ENGINE S/N	124KM2Y0000000
MODEL	A475
ENGINE TYPE	N13
ENGINE FAMILY	DNVXH07570SB
LABEL NUMBER	3017980C2
VALVE LASH-COLD-	0.500mm(.020in)INT 0.800mm(.031in)EXH
EMISSIONS CONTROL SYSTEMS	DFI, TC(2), ECM, CAC(2), EGR, OC, PTOX, SCR-U
FAMILY EMISSION LIMITS (g/bHp-hr.)	

THIS ENGINE HAS A PRIMARY INTENDED SERVICE APPLICATION AS A HEAVY HEAVY-DUTY DIESEL ENGINE AND CONFORMS TO U.S. EPA, CALIFORNIA AND CANADIAN REGULATIONS APPLICABLE FOR 2015 MODEL YEAR AND IS CERTIFIED TO OPERATE ON ULTRA LOW SULFUR DIESEL FUEL.

THIS ENGINE IS CERTIFIED CLEAN IDLE IN ACCORDANCE WITH TITLE 13 CALIFORNIA CODE OF REGULATIONS SECTION 1956.8(a)(6)(C)

FUEL RATE @ ADV. POWER AND INJECTION TIMING ARE NON-ADJUSTABLE

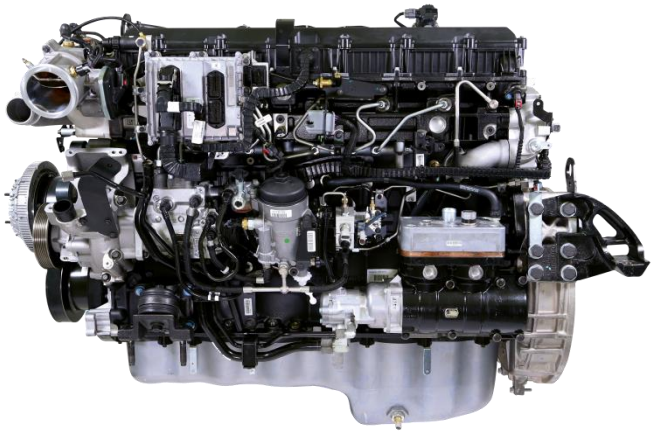
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ENGINE SENSOR IDENTIFICATION

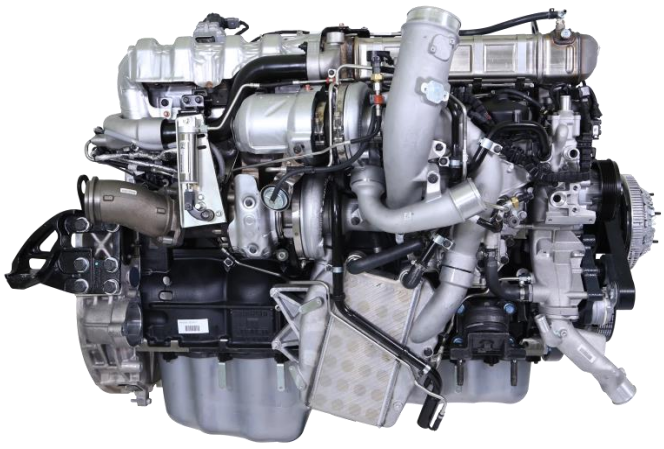
Left Side of Engine

- The Intake Manifold Pressure, or IMP, sensor is located on the Air Intake Throttle Duct.
- The Charge Air Cooler Outlet Temperature, or CACOT, sensor is located on the Engine Throttle Valve (or ETV).
- The Fuel Delivery Pressure, or FDP, sensor is threaded into an adapter on the Secondary Fuel Filter Module.
- The Fuel Rail Pressure, or FRP, sensor is located on the front end of the fuel rail.
- The Intake Manifold Temperature, or IMT, sensor is installed in the left side of the cylinder head.
- The Engine Oil Level, or EOL, sensor is an optional sensor that is installed on the lower left side of the crankcase.
- The Camshaft Position, or CMP, sensor is located on the left rear of the cylinder head.



Right Side of Engine

- The Turbocharger 2 Compressor Intake Sensor, or TC2CIS, is located on the High-Pressure (HP) Turbocharger air supply duct.
- The Crankcase Oil Separator Speed, or CCOSS, sensor is mounted on the Crankcase Oil Separator, or CCOS.
- The Engine Coolant Temperature 2, or ECT2, sensor is located on the Low Temperature Thermostat housing.
- The Turbocharger 1 Turbine Outlet Pressure, or TC1TOP, sensor is located on the sensing tube connected to the turbine outlet of the Low-Pressure (LP) Turbocharger.
- The Engine Oil Pressure, or EOP, sensor is located on the turbocharger oil supply tube T-fitting, which attaches to the Oil Filter Module.
- The Oxygen Sensor, or O2S, monitors oxygen levels in the exhaust. The O2S is located in the Exhaust Back Pressure Valve (EBPV) assembly just in front of the Aftertreatment Fuel Injector or AFI.



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Front of Engine



- The Exhaust Gas Recirculation Cooler Gas Temperature, or EGRGT, sensor is installed in the Exhaust Gas Recirculation, or EGR, Outlet Manifold.
- The Engine Coolant Temperature 1, or ECT1, sensor is located on the EGR Coolant Return Manifold.
- The Engine Oil Temperature, or EOT, sensor is located on the Oil Filter Module flange elbow.

Rear of Engine



- The Crankshaft Position, or CKP, sensor is located on the top left of the flywheel housing.

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AIR MANAGEMENT SYSTEM

Air Induction

The Low-Pressure (LP) Turbocharger increases the pressure, temperature and density coming from the air filter assembly. The LP Turbocharger is also known as TC1. The Interstage Charge Air Cooler, or ISCAC, uses engine coolant to remove heat from the charge air leaving the low pressure turbocharger.

NOTE

NOTE: The 2015 N13's Turbocharger is not compatible with the 2013 N13. Check the Parts Catalog for proper replacement parts.

The cooled air leaving the ISCAC is sent to the High-Pressure (HP) Turbocharger, also known as TC2. The TC2CIS monitors the temperature and pressure of the air entering the HP turbocharger. The HP turbocharger further increases the pressure, temperature and density of the charge air. Air leaving the HP turbocharger is sent to the High-Pressure Charge Air Cooler, or HPCAC, located in front of the cooling module.

Air leaving the HPCAC enters the **ETV**, which is bolted to the Air Intake Throttle Duct. The **ETV** controls the amount of charge air entering the Intake Throttle Duct.



The Air Control Valve, or ACV, controls the air pressure supplied to the high-pressure turbocharger wastegate, or TC2W, and to the Exhaust Back Pressure Valve, or EBPV, actuators. It is installed on the water distribution housing at the front of the engine, above the water pump.

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Exhaust Gas Recirculation (EGR)



The **EGR Valve**, or EGRV, is a single butterfly-type valve that regulates the amount of exhaust flowing through the EGR Cooler.

The front and rear bellows tubes connect the EGR Valve to the rear section of the exhaust manifold and the EGR cooler. A Single-Stage EGR cooler uses engine coolant to remove heat from exhaust gasses that pass through it.

The rear section of the exhaust manifold routes a portion of exhaust gasses exiting the engine to the EGR Valve. The EGR Valve remains closed until EGR flow is commanded by the ECM. When EGR flow is commanded, the EGR Valve opens, allowing exhaust gas to pass through the EGR cooler.

The EGR Outlet Manifold directs gases leaving the EGR Cooler into the Air Intake Throttle Duct. The EGR Cooler Gas Temperature, or EGRGT, sensor measures the temperature of the Cooled EGR gasses as they pass through the EGR outlet manifold and enter the intake throttle duct. The recirculated exhaust gas and the charge air leaving the HPCAC are mixed in the Air Intake Throttle Duct before entering the engine.

COOLING MANAGEMENT SYSTEM

Cooling System Components

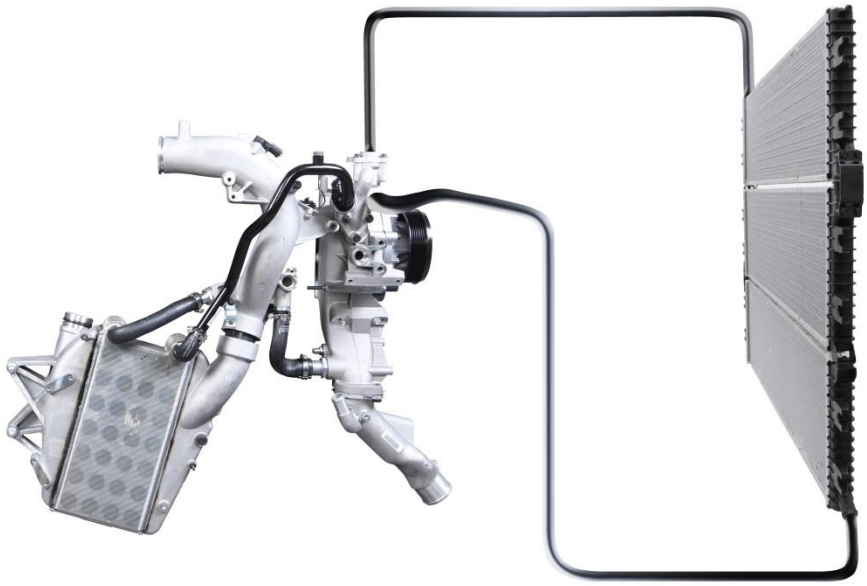


- The **Water Distribution Housing** supplies coolant to the water pump and receives coolant from the radiator, thermostat housing, and ISCAC.
- The water pump is mounted to the water distribution housing and is driven by the accessory drive belt.
- The coolant manifold, located at the rear of the engine, collects coolant from the cylinder head and the crankcase.
- The Coolant Supply Tube routes coolant to the EGR Cooler.
- The EGR Cooler Return Manifold connects the EGR Cooler to the Thermostat Housing.

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- The Low-Temperature, or LT, Thermostat controls coolant flow to the ISCAC and the Low Temperature Radiator (LTR).
- Dual thermostats are located in the thermostat housing. When the coolant temperature is below operating temperature, the thermostats direct coolant back to the water pump to be recirculated through the engine. When the coolant temperature is at or above operating temperature, the thermostats will direct coolant through the Coolant Outlet Manifold to the radiator.

Low Temperature Thermostat/LTR Flow



During cold engine operation (thermostat closed), coolant from the water pump flows through the bypass port of the Low Temperature Thermostat and is routed to the Interstage Charge Air Cooler. This coolant flows through the ISCAC to regulate charge air temperature. After exiting the ISCAC, this coolant is directed back to the water distribution housing.

When the engine is at or above normal operating temperature (thermostat open), the Low Temperature Thermostat allows coolant to flow to the LTR. Coolant flows to the LTR, to further reduce the temperature of the coolant, then flows back to the low temperature thermostat and continues to the ISCAC.

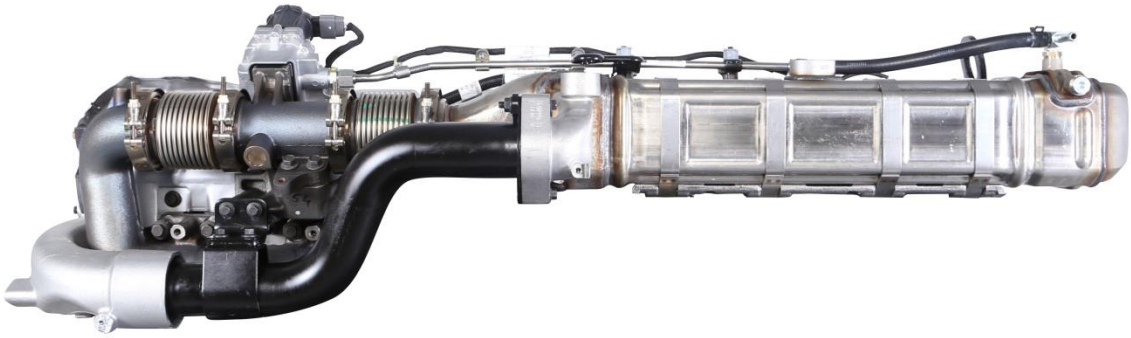
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Cylinder Head/Crankcase/EGR Component Flow

Coolant is directed to the cylinder head and crankcase through passages in the water distribution housing. This coolant flows through the cylinder head and crankcase from front to rear in parallel paths.

Coolant exiting the crankcase and cylinder head at the rear of the engine flows through the externally mounted Coolant Manifold into the EGR Cooler Supply Tube. Coolant also flows to emissions-related components from the Coolant Manifold.

The Coolant Manifold Pipe routes coolant to the EGR Cooler inlet. Heat is removed from the exhaust gasses flowing through the EGR Cooler by the circulating engine coolant. There are two small outlet ports on the EGR cooler, one on the inlet elbow, and the other on the body of the cooler. These ports supply coolant to the heater core and bunk heater.



After passing through the EGR Cooler, absorbing heat from exhaust gasses, the coolant flows through the EGR Coolant Return Manifold into the thermostat housing. Depending on the temperature of the coolant, dual thermostats in the thermostat housing will control whether coolant will flow to the radiator or back to the water pump.

When the engine is below operating temperature the dual thermostats are closed. Coolant from the EGR Cooler flows back to the Water Distribution Housing and is recirculated through the engine. If the coolant is at operating temperature, it will travel through the coolant outlet manifold to the radiator. After being cooled in the radiator, the coolant returns to the water distribution housing.

EGR Valve/AFI/Road Draft Tube Flow

Engine coolant is circulated through the EGR valve to increase the durability of the actuator by preventing overheating. This coolant flows to the EGR valve from an elbow on the top rear of the EGR cooler to the EGR Valve. Coolant exiting the EGR valve is channeled through a steel line running across the top of the cooler to the coolant vent fitting.

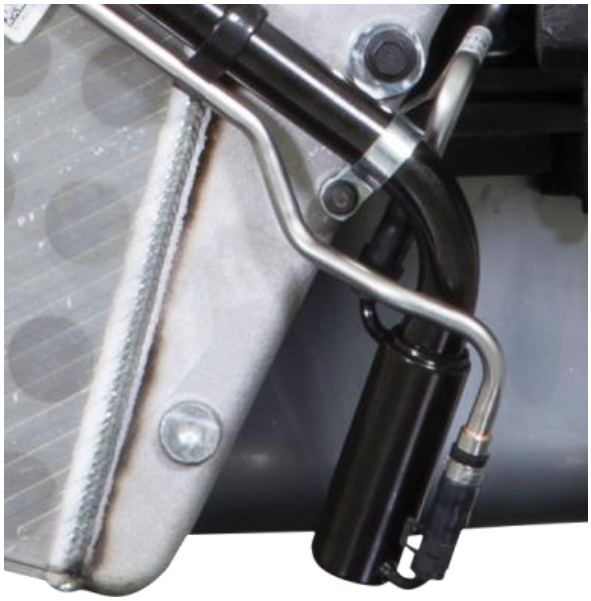
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To regulate temperature, coolant is supplied to the AFI, Road Draft Tube, and the Oil Cooler which is located in the Oil Filter Module. From the Coolant Manifold on the rear of the engine, a coolant line supplies coolant to the AFI.

This coolant is used to cool the AFI which is located on the exhaust pipe on the right side of the engine. The AFI is located on the exhaust pipe on the right side of the engine, and has supply and return coolant fittings.

Coolant exiting the AFI it is routed to the road draft tube through a steel line running along the right side of the engine. Coolant heats the road draft tube to prevent icing, and is then routed back to the water distribution housing.



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CONCLUSION

This concludes the 2015 N13 Engine Overview for Technicians. Thank you for your participation.

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