NAVISTAR®

HVAC 2010 Update

Study Guide
TMT-191101

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Introduction

Welcome to the Navistar® 2010 Air Conditioning Update program. This program covers the components and unique diagnostics for the 2010 Heating Ventilation and Air Conditioning system.

Upon completion of this program you will be able to identify system components, identify proper operation, and perform diagnostics on the 2010 Air Conditioning System.

This program is divided into this introduction and the following four modules: Components, Electrical, Modes of Operation, and Diagnostics.

Objectives

Upon completion of this course, you will be able to:

- **Identify system components**
- **Identify proper operation**
- **Perform diagnostics on the 2010 Air Conditioning System**

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Components Module 1

Engine Side Components

The 2010 Heating Ventilation and Air Conditioning, or HVAC, system is located within both the cab and the engine compartment.

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The components in the engine compartment include the:

- Compressor
- Refrigerant lines
- Expansion valve
- Filter-drier
- Low-pressure switch
- Pressure transducer
- Fresh Air Module containing the system air filter

Interior Components

The components in the cab are the HVAC Control Panel and the Interior Module.

The Control Panel is mounted on the Instrument Panel and has three rotary switches. The switches allow the operator to control blower speed, temperature, and air flow. The Control Panel is an input to the Body Controller, Linear Power Module, and the Interior Module door actuators.

"The Interior Module is located beneath the dash board on the passenger side."

The Interior Module is located beneath the dash board on the passenger side. The module contains the:

- Evaporator
- Heater core
- Control doors
- Blower motor
- Freeze probe

Mounted to the module housing are three actuators and the Linear Power Module.

Interior Module Doors

Airflow in the cab is controlled by five doors within the Interior Module.

"Three electric actuator motors adjust the position of the doors according to input signals from the HVAC Control Panel."

Three electric actuator motors adjust the position of the doors according to input signals from the HVAC Control Panel.

The five doors can be identified as:

- Fresh Air/Re-circulation
- Temperature Blend
- Heater Scrub
- Instrument Panel Vent/Floor
- Defrost/Floor

The Fresh Air/Recirculation Door determines if outside air is drawn into the cab, or if air inside the cab is re-circulated. This door is controlled by its own actuator.

Both the Temperature Blend Door and the Heater Scrub Door control the blend of air from the evaporator and the heater core. These two doors are linked together and controlled by one actuator. The position of the two doors is controlled by the HVAC control panel mode knob.

The Instrument Panel Vent/Floor and Defrost/Floor doors are referred to as 'mode doors'. The mode doors determine the flow of air through interior vents and ducts. These doors are controlled by a gear assembly and a single electric actuator.

"The Instrument Panel Vent/Floor and Defrost/ Floor doors are referred to as 'mode doors'."

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Electrical Sensors Module 2

There are three sensors in the 2010 A/C system. They are the Freeze Probe, Low-Pressure Switch, and the Pressure Transducer.

The freeze probe is located in the interior module. This sensor is an input to the body controller and monitors evaporator temperature. The body controller cycles the compressor clutch to prevent evaporator freeze up.

"The freeze probe is located in the interior module."

The low-pressure switch is an input to the Body Controller. This allows the controller to disengage the compressor if the refrigerant level drops below a set level.

The pressure transducer is a pressure-sensing device threaded into the condenser refrigerant output line. The transducer provides an electrical signal to the Body Controller, which monitors and controls the operation of the A/C system. The refrigerant system does not have to be discharged to replace the pressure transducer.

"The refrigerant system does not have to be discharged to replace the pressure transducer."

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Modes of Operation Module 3

Air Flow

Now that we're familiar with the system components, let's look at the flow of air through the system.

In total, there are seven modes of operation determined by the HVAC control and interior module door positions. These modes are:

"There are seven modes of operation determined by the HVAC control and interior module door positions."

- Normal A/C
- Max A/C
- Bi-level A/C
- Heat and Ventilation Vent
- Heat and Ventilation Floor
- Defrost
- Bi-level Defrost/Heat

Normal A/C Mode

Selecting the Normal A/C mode engages the compressor, moves the Fresh-Air/Recirculation door to the fresh air position, and moves the mode doors to the Instrument Panel, or IP, vent position. This allows outside air to be drawn through the evaporator before entering the blower.

"Normal A/C mode allows outside air to be drawn through the evaporator before entering the blower."

After the blower, the Temperature Blend Door diverts air either through or past the heater core, depending on

the position of the TEMP knob on the HVAC Control Panel.

When the TEMP knob is set at the coolest position, the air will bypass the heater core.

Air then flows through the mode doors to the IP vents.

Max A/C Mode

"Max A/C mode moves the Fresh Air/Recirculation door to prevent outside air from entering the module."

Selecting the Max-A/C mode moves the Fresh Air/Recirculation door to the re-circulate position. This prevents outside air from entering the module.

Air is pulled from within the cab, passes through the evaporator, and enters the blower.

After the blower, the Temperature Blend Door diverts air either through, or past, the heater core, depending upon the position of the TEMP knob.

Air then flows to the mode doors, and is directed to the IP vents.

Bi-Level A/C Mode

In the Bi-level A/C mode, the Fresh Air/ Recirculation door moves to the fresh air position.

The Temperature Blend Door controls air temperature.

The HVAC Control Panel now positions the mode doors to direct the flow of air to both the floor ducts and the IP vents.

Heat and Ventilation IP Vent Mode

In the Heat and Ventilation Vent mode, the HVAC control panel disengages the compressor and commands the Fresh Air/Re-circulate door to the fresh air position.

Outside air enters the interior module, passes through the evaporator core, and enters the blower.

The Temperature Blend Door controls the flow of air either through or past the heater core.

The HVAC Control Panel positions the mode doors to direct all of the blended air to the instrument panel vents.

"The HVAC Control Panel positions the mode doors to direct all of the blended air to the instrument panel vents."

Heat and Ventilation Floor Mode

Selecting the Heat and Ventilation Floor mode, the fresh Air/Re-circulate door moves to the fresh air position.

The Temperature Blend Door controls the temperature.

The HVAC control panel positions the mode doors so that all of the air is directed to the floor ducts.

Bi-Level Defrost / Heat Mode

In the Bi-level Defrost/Heat mode, the compressor is engaged and the Fresh Air/Re-circulate door is in the fresh air position.

Outside air enters the interior module through the evaporator core and enters the blower.

Air is then directed past the blend door, and either through or around the heater core, depending on the temperature selected.

"The blended air proceeds to the mode doors where it is directed to both the defrost ducts and the floor ducts."

The blended air proceeds to the mode doors where it is directed to both the defrost ducts and the floor ducts.

Defrost Mode

In the Defrost mode, airflow is similar to the Bi-Level Defrost/Heat mode except that all of the blended air is directed to the defrost ducts.

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Diagnostics Module 4

Preliminary Checks

To diagnose an issue with the A/C system, first verify the complaint. Perform a visual check and complete the physical check procedure.

Visual Check

With the engine off, inspect the compressor and clutch mounting, compressor clutch electrical connector, and the compressor drive belt.

Check the A/C lines and other refrigerant carrying components for signs of leakage.

“Check the A/C lines and other refrigerant carrying components for signs of leakage.”

Verify the condenser is free of debris.

Check the fresh air module filter and drain ports.

Inspect the electrical connections on the transducer, low pressure switch, door actuators, and the linear power module.

If any problem was detected during these checks, correct the issue and test the A/C system.

⚠ CAUTION

Before connecting any service equipment to the refrigerant system, the refrigerant in the system must be identified. Failure to identify the refrigerant before connecting equipment could result in contamination of the service equipment and any refrigerant stored in the equipment.

Checking for Contamination

Attach a Navistar® recommended A/C service machine and check the system for air or other non-condensable gas. If the recommended A/C machine is not available, use a refrigerant identifier.

If the refrigerant identifier is not available, system pressure readings can be used to check for non-compressible gases and an undercharged system.

Check for the proper refrigerant charge with the engine off and the A/C system at ambient temperature. Record the system pressures.

Using a temperature probe, determine the ambient temperature. Compare the gauge readings to the Temperature and Pressure Table.

If the gauge readings are more than 10 psig higher than the table listings, then the system contains air or some non-condensable gas and should be discharged, evacuated, and recharged.

"If the gauge readings are more than 10 psig lower than the table listings, the system is undercharged."

If the gauge readings are more than 10 psig lower than the table listings, the system is undercharged. Use a leak detector to test all joints, seals, and parts of the system that are exposed to debris and road hazards.

Physical Check Procedure

In this section you will set up and perform the Physical Check Procedure. To do so, perform the steps as they are written.

Begin the Physical Check Procedure by starting the engine .

Cycle the blower speed control through each setting to verify correct blower operation, and then leave it set on high.

"Cycle the blower speed control through each setting to verify correct blower operation."

Now, cycle through the different modes to verify that the doors are actuating properly.

Next, set the mode control to MAX A/C for maximum cooling.

Now, using the cruise switches, raise the engine speed to 1500 RPM.

Run the air conditioning system for at least five minutes and verify that the air flowing from the vents is cold.

While the system is operating, check all A/C components and refrigerant lines for proper temperatures. In general, the discharge side of the compressor up to the filter-drier should be hot or warm to the touch. The filter-drier is normally near ambient temperature. The expansion valve and evaporator inlet should feel cold, and all the suction lines leading to the compressor should be cool to the touch.

"The filter-drier is normally near ambient temperature."

"Any deviation from the specified conditions may indicate a malfunction in the system."

Any deviation from the specified conditions may indicate a malfunction in the system.

Malfunctions or blockages may be indicated by extreme cold or frosted areas.

Verify that the engine is at operating temperature by checking the temperature gauge.

Now, set the mode control to Defrost.

Adjust the temperature control to maximum heat and verify that the air flowing from the vents is hot.

Next, verify that the compressor cycles within two minutes of operation.

Then, set the mode control to the Floor/ Defrost setting and verify that the compressor continues to cycle.

"Always resolve active DTCs before troubleshooting symptoms."

With the engine still running, check for DTCs. Always resolve active DTCs before troubleshooting symptoms. If a DTC is present, follow the instructions in the Electrical Troubleshooting section of the vehicle's service manual.

If the system is still not operating correctly, follow the Troubleshooting Tables in the Diagnostic Manual to find the fault.

If the system is operating correctly, Perform the A/C System Test Mode

using the Navistar® recommended A/C Service Machine.

A/C System Test Mode

The A/C System Test Mode is performed using the Navistar® recommended A/C service machine and Leak Detector.

Park the vehicle so there is no solar loading and no wind. Note the humidity and ambient temperature and consult the appropriate system pressure test chart for the vehicle being serviced.

"Note the humidity and ambient temperature and consult the appropriate system pressure test chart for the vehicle being serviced."

Position the sensing end of the T1 temperature probe approximately 12 to 24 inches in front of the vehicle grill to measure ambient air entering the condenser. Verify that the valves are closed at the quick-disconnect fittings by turning them fully counterclockwise.

Connect the red hose to the high pressure service portand the blue hose to the low pressure service port. Open the valves on the quick-disconnect fittings connected to the service ports on the vehicle.

If the vehicle has a solenoid controlled fan drive, engage it. Depending on the system, the fan can be operated with a jumper wire or by disconnecting the solenoid valve.

"Do not allow the temperature probe to touch the side of the duct."

Close the hood, being careful not to damage the test equipment connections. Insert a second temperature probe cable (T2) into the passenger side, left instrument panel vent. Do not allow the temperature probe to touch the side of the duct.

Insert the third temperature probe (T3) for testing the performance of the A/C system within the bunk area, if equipped.

In this section you will set up and perform the A/C System Test Mode Procedure. To do so, perform the steps as they are written.

Start the engine.

With both cab doors closed, open the windows.

Now, raise the engine speed to 1500 RPM.

Set the mode control to NORM A/C.

Next, set the blower control to high and the temperature to maximum cool.

"Operate the system for at least five minutes, or until the gauge readings settle."

Now operate the system for at least five minutes, or until the gauge readings settle.

Record the relevant pressure, ambient air temperature, relative humidity, and

cab air duct temperature readings from the LCD screen.

Compare the recorded readings to the pressures shown in the Table. If the pressure is more than 10 psig higher than the pressure listed in the chart, the refrigerant system contains air or some non-condensable gas and needs to be discharged, evacuated, and recharged.

If the pressure is more than 10 psig lower than the pressure listed in the chart, the system is undercharged and needs to be discharged, evacuated, and recharged. Undercharged systems should be inspected for a possible leak before being discharged.

"Undercharged systems should be inspected for a possible leak before being discharged."

If the system is operating properly, the high and low pressure readings will be within the listed ranges in the System Pressure Test Chart. If the gauge readings are not within range, refer to the Abnormal Readings section of the chart.

Any problems present in the HVAC system would have been identified after performing the previous checks. After properly identifying the issue you must follow the steps in the Troubleshooting Tables section diagnostic manual for proper repair.

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Conclusion

This concludes the Navistar® 2010 Air Conditioning Update program.

Thanks for your participation.

You are now required to take a post-test.

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