

Equipment Cooling Air System

Screen 1:

Welcome Screen:

Welcome to the Equipment Cooling Air System module of the ES44AC/DC Mechanical Systems Advanced course.

Screen 2:

Introduction to Equipment Cooling Air System:

In this module, you will learn how to inspect and maintain the components of the equipment cooling air system on an ES44AC/DC locomotive in a running repair environment.

At the end of this module, you will be able to:

- State the purpose and location of the equipment cooling air system.
- State the purpose and location of the major components of the equipment cooling air system.
- State the purpose and location of the instrumentation devices of the equipment cooling air system.
- Describe how the equipment cooling air system operates.
- Describe how to perform running maintenance related to the equipment cooling air system.

Screen 3:

Disclaimer:

Please note that this module is for training use only. For complete details of inspecting and maintaining the components of the equipment cooling air system on an ES44AC/DC locomotive in a running repair environment, refer to customer-specific drawings, manuals, and procedures.

Screen 4:

Overview of the Equipment Cooling Air System:

The primary purpose of the equipment cooling air system is to provide cooling air for critical components, including the alternator, the propulsion circuits, and the traction motors. A secondary purpose is to pressurize key areas of the locomotive to help keep out contamination. The equipment cooling air system contains two separate forced-air ventilation subsystems: the Traction Motor Cooling Air System and the Alternator and Auxiliary Cooling Air System. The major components of the traction motor cooling air system are located in the radiator cab. The major components of the alternator and auxiliary cooling air system are located in the blower cab.

Screen 5:**Major Components of the Traction Motor Cooling Air System:**

Components of the traction motor cooling air system include the V-screens, plastic air cleaner panels, traction motor blower and exhaustor blower.

Screen 6:**V-Screens:**

Located on both sides of the radiator cab, the V-screens provide the entry point for the air-to-traction motor cooling air system while blocking debris, such as leaves, twigs, and trash, from entering the system.

Screen 7:**Plastic Air Cleaner Panels:**

Located directly behind the V-screens in the radiator cab, the plastic air cleaner panels, also referred to as spin cleaner panels, clean the air entering the traction motor cooling air system. Vortex tubes in the spin cleaner panels contain spiral vanes that cause the air to swirl like a tornado as it passes through the tube. The swirling action forces heavier dirt particles to the outside of the air stream. This “dirty” air is separated at the output of the tubes and discharged from the air cleaner panels into a bleed air duct.

Screen 8:**Traction Motor Blower:**

Located in the radiator cab on the Helper’s side, the traction motor blower or the equipment blower provides cooling air for all the traction motors on the locomotive.

Screen 9:**Exhaustor Blower:**

Located in the radiator cab on the Engineer’s side of the locomotive, the exhaustor blower removes the dirty air from the spin cleaner panel bleed air duct, continuously discharging the bleed air and dirt out the top of the unit and into the radiator cab. From the radiator cab, the radiator fans pull the air out, discharging the dirty air through the top of the locomotive.

Screen 10:**Major Components of the Alternator and Auxiliary Cooling Air System:**

The components of the alternator and auxiliary cooling air system are the V-screens, plastic air cleaner panels, alternator blower with exhaustor, auxiliary cab air filters and corner air duct.

Screen 11:**V-Screens:**

Located on both sides of the blower cab, the V-screens provide the entry point for the air to the alternator and auxiliary cooling air system while blocking debris, such as leaves, twigs, and trash, from entering the system.

Screen 12:**Plastic Air Cleaner Panels:**

Located directly behind the V-screens in the blower cab, the plastic air cleaner panels clean the air entering the alternator and auxiliary cooling air system. Vortex tubes in the spin cleaner panels force heavier dirt particles to the outside of the air stream. This “dirty” air is separated at the output of the tubes and discharged from the air cleaner panels into a bleed air duct.

Screen 13:**Alternator Blower with Exhauster:**

Located in the blower cab, the alternator blower provides cooling air to the alternator and to the equipment in the auxiliary cab, Control Area 1 (CA1), and CA8. The exhauster portion of the alternator blower draws the dirty air from the spin cleaner panel bleed air duct and from the top of CA1 and the toilet compartment, and exhausts the air to the roof of the blower cab.

Screen 14:**Auxiliary Cab Air Filters:**

Located in a compartment directly above the alternator on the Helper’s side of the locomotive, the auxiliary cab air filters filter contaminants from the air that cools the equipment in the auxiliary cab.

Screen 15:**Corner Air Duct:**

Located on the Helper’s side of the locomotive and attached to the auxiliary cab, the corner air duct forms a conduit for the cooling air flowing in and out of CA3 in the auxiliary cab.

Screen 16:**Instrumentation Devices of the Equipment Cooling Air System:**

The instrumentation devices of the traction motor cooling air system include the Barometric Air Pressure (BAP) sensor and the Ambient Temperature (AT) sensor.

Screen 17:**Barometric Air Pressure Sensor:**

Located on the wall of CA4 in the auxiliary cab, the BAP sensor measures the pressure of the atmosphere and provides the pressure information to the Engine Control Unit (ECU).

Screen 18:**Ambient Temperature Sensor:**

Located in CA3, the AT sensor measures the temperature of the air flowing through CA3. That is, the sensor measures the ambient temperature, and provides the temperature information to the Smart Displays by way of the Consolidated Input/Output (CIO) panel.

Screen 25:

Operation of the Traction Motor Cooling Air System:

The traction motor cooling air system supplies cooling air to the traction motors. The vacuum created by the traction motor blower first draws outside air in through the V-screens, where large items, such as leaves, paper, etc., are blocked from entering the system. Passing through the V-screens, the air and dirt are separated by 12 plastic air cleaner panels. Each air cleaner panel contains 54 individual vortex tubes. These tubes contain spiral vanes that cause the air to swirl like a tornado as it passes through the tube. The swirling action forces the heavier dirt particles to the outside of the air stream. This "dirty" air is separated at the output of the tubes and is discharged from the air cleaner panels into a bleed air duct.

Screen 26:

Operation of the Traction Motor Cooling Air System (Cont'd):

An exhaustor blower, connected to the bleed air duct, provides a drawing force to discharge the dirty air into the radiator cab. The clean air in the middle of the air stream exits each tube and enters the traction motor blower. The traction motor blower forces the clean, cooling air into an air plenum. The air plenum, constructed by welding a top and bottom plate to two I-beams that form the platform structure, runs the length of the locomotive. Baffles built into the air plenum help to equalize airflow from one end of the plenum to the other. The cooling air exits the platform air plenum through flexible air ducts. These flexible air ducts run from the platform down to each traction motor on both trucks. After cooling the traction motors, the air exhausts to the atmosphere through vents built into one end of each traction motor.

Screen 27:

Operation of the Alternator and Auxiliary Cooling Air System:

The alternator and auxiliary cooling air system is responsible for cooling the alternator and auxiliary cab. The alternator blower draws air into the blower cab through two V-screens and then through six plastic air cleaner panels. The V-screens, which are located on both sides of the blower cab, block large items such as leaves and paper from entering the system. The plastic air cleaner panels are identical to those used in the traction motor cooling air system. The clean air passes through the panels to the alternator blower, and dirty air is sent to the exhaustor blower, which is physically mounted on a common shaft with the alternator blower. A single AC motor powers both the alternator blower and the exhaustor blower through the common shaft arrangement. The exhaustor blower draws in the dirty air from the air cleaner panels and ejects it through the roof of the blower cab. The alternator blower receives the clean air and forces it down two paths.

Screen 28:

Operation of the Alternator and Auxiliary Cooling Air System – First Path:

The first path is through a corner duct to the main propulsion system electrical components located in the auxiliary (aux) cab. For the AC locomotives, these main

components include the nine rectifiers and six inverter stacks and, for the DC locomotives, the nine rectifiers and DC link. In this path, the air cools the main propulsion system electrical components and then flows back through another channel in the corner duct to the alternator. Next, the internal components of the alternator are cooled. The air exits one end of the alternator into the engine cab. As long as the engine cab doors are closed, the air pressurizes the area and helps keep contaminants out.

Screen 29:

Operation of the Alternator and Auxiliary Cooling Air System – Second Path:

In the second path, air passes to the aux cab through the six auxiliary cab air filters. The filtered air is sent in two directions in the aux cab. One direction is into CA1, and the other is through the electronic panels in the aux cab. The air cools the electronic panels and then flows into the aux cab and CA8. This pressurizes the two areas to help keep contaminants out. In addition to discharging dirty air, the exhauster blower draws air from the top of CA1 and the toilet compartment and exhausts it through the roof of the blower.

Screen 32:

Self-Test 406:

Self-Test 406, initiated through a Smart Display, can be used to test the half and full speeds of the traction motor blower. The self-test causes the Traction Blower Controller to drive the traction motor blower at the speed selected on the Smart Display.

Screen 33:

Monitor Parameters:

This table displays the monitor parameters available on the Smart Display in Level 3 access that aid maintenance personnel in monitoring the equipment cooling air system. Scroll down to view the complete table.

Screen 34:

Running Maintenance:

This table displays the recommended running maintenance schedule for the equipment cooling air system and its major components.

Screen 36:

Safety Precautions:

To prevent personal injury and potential equipment damage when performing maintenance on cooling air system components, ensure the engine cannot be started. Place the Locomotive Battery Switch (LBS) in the OFF position. Place the Fuel Pump Circuit Breaker (FCB) and the Local Control Circuit Breaker (LCCB) in the OFF position. Apply a warning tag to the Engine Control (EC) switch.

Screen 37:**Plastic Air Cleaner Panels:**

The plastic air cleaner panels, referred to as spin cleaner panels, provide the initial filtration for the traction motor cooling air system and the alternator and auxiliary cooling air system. After passing through the V-screens, air is drawn into the plastic air cleaner panels. The traction motor cooling air system uses 12 air cleaner panels, six on each side of the radiator cab. The alternator and auxiliary cooling air system uses six air cleaner panels, two on the Helper's side of the blower cab and four on the Engineer's side of the blower cab. The air cleaner panels require no routine running maintenance other than a visual inspection to check if the panels are intact and free of debris. If the panels are cracked or broken, they must be replaced. If they are plugged with debris, remove the panels and clean and return them to the locomotive.

Screen 38:**Traction Motor Blower:**

The traction motor blower is an 83-horsepower, AC motor-driven blower that provides cooling air of 18,600 to 20,000 CFM at Notch 8 engine speed for all the traction motors on the locomotive. A minimum flow of 2,775 CFM at Notch 8 engine speed is provided to each traction motor. Some of the cooling air also flows across the AC motor on the traction motor blower to keep it cool. Whenever the engine and the auxiliary alternator are operational, the traction motor blower runs to maintain positive pressure in the traction motors. This prevents dirt and moisture from contaminating the traction motors. The Traction Blower Controller determines the speed of the traction motor blower based on calculated motor temperatures and motor currents. Motor speed is either half or full engine speed.

Screen 39:**Traction Motor Blower Removal:**

Typical steps to remove the traction motor blower are as follows:

Warning: To prevent personal injury and potential equipment damage, ensure that the engine cannot be started before removing, installing, or adjusting any components. Open the Battery Switch to prevent starting attempts. Also, open the Fuel Pump Circuit Breaker (FCB) and the Local Control Circuit Breaker (LCCB) in the OFF position. Apply a warning tag to the Engine Control (EC) switch.

Warning: If the locomotive is equipped with Auto Engine Start/Stop (AESS), the diesel engine may start without operator action. Exercise caution when working around the radiator cab. Ensure that AESS is disabled before performing any maintenance on the locomotive. Failure to do so may result in death or serious personal injury.

1. Open the traction motor blower electrical connection box and disconnect the three motor leads.

Note: Lash the three motor leads to the motor cowl to prevent damage during handling, keeping in mind the arrangement for later reconnection.

2. Remove the bolts and lockwashers securing the connection box and support assembly to the platform, then move the assembly out of the way to facilitate later removal of the traction motor blower.
3. Remove the section of the handrail adjacent to the traction motor blower on the Helper's side of the locomotive, then remove the two criss-cross structural braces. Save all hardware.
4. Remove the eight traction motor blower mounting bolts and hardened washers.

Screen 40:

Traction Motor Blower Removal (Cont'd):

5. Loosen the two "push" bolts near the base of the traction motor blower and use the two "J" bolts to pull the traction motor blower away from the air filter assembly.

Warning: The traction blower weighs approximately 1,350 lbs. (613 kg) and the traction blower motor weighs approximately 872 lbs. (396 kg). Ensure the lifting device is adequate. Failure to do so may result in personal injury or death.

6. Attach a come-along to the blower housing removal lug and carefully line up a forklift with the mounting base with the forks extended under the base, then pull the blower from the radiator cab onto the forks.
7. Carefully set the traction motor blower on a skid in a level position.

Screen 41:

Traction Motor Blower Installation:

Typical steps to install the traction motor blower are as follows:

Warning: To prevent personal injury and potential equipment damage, ensure that the engine cannot be started before removing, installing, or adjusting any components. Open the Battery Switch to prevent starting attempts. Also, open the Fuel Pump Circuit Breaker (FCB) and the Local Control Circuit Breaker (LCCB) in the OFF position. Apply a warning tag to the Engine Control (EC) switch.

1. Clean the blower-mounting base in the radiator cab if needed.
2. Install a new gasket and seal on the bulkhead of the filter box assembly.

Warning: The traction blower weighs approximately 1,350 lbs. (613 kg) and the traction blower motor weighs approximately 872 lbs. (396 kg). Ensure the lifting device is adequate. Failure to do so may result in personal injury or death.

3. Place the traction motor blower into position on the mounting base using a forklift, then carefully slide the blower into position with a come-along attached to the pulling lug while aligning the blower with the opening in the air filter assembly.

Note: Ensure that the circular knife edge of the blower crushes the gasket in the filter box assembly bulkhead and a proper air sealing is achieved.

4. Near the base of the traction motor blower, use the two "push" bolts and "J" bolts to align the holes in the traction motor blower base with the holes in the radiator cab floor.

Screen 42:

Traction Motor Blower Installation (Cont'd):

5. Install the traction motor blower mounting hardware and torque the bolts to 280 to 300 lb.-ft. (380 to 407 Nm).
6. Install the electrical connection box and support assembly to the platform, then secure with bolts and lockwashers.
7. Connect the three motor leads to the traction motor blower electrical connection box terminals, ensuring that each lead is connected to the proper terminal, then tie-wrap the lead bundle to the tape rail.

Caution: When the power leads to the equipment blower motor or the equipment blower motor drive regulator (EBP), which controls the motor, have been disconnected at either end for any reason, it is possible to incorrectly connect the leads at reinstallation. If any two power leads are swapped at either end, the blower may still operate; but it will rotate backwards. Backward running of the equipment blower will greatly decrease the air flow. This reduced ventilation can shorten the life and/or do serious damage to the traction motors.

Note: The speed sensor gap should be 0.020 to 0.030 inches (0.51 to 0.76 mm). This gap is set at the factory and normally does not need to be readjusted.

8. Install the criss-cross structural braces, and torque bolts to 329 lb.-ft. (446 Nm).
9. Install the previously removed section of handrail.
10. Verify correct blower air output by checking the exhaust port of the blower to ensure correct blower motor wiring, and ensure the proper air flow direction.

Screen 43:

Checking Traction Motor Blower Operation:

Because the location of the traction motor blower makes visual inspection of the blower rotation difficult, you should perform the following test each time the equipment blower power leads are disconnected. Using a manometer with a hand-held, non-metallic probe, measure the air pressure at the Long-Hood Truck traction motor drain holes. The drain holes are located at the bottom of the traction motor, when mounted in the truck.

Pressure should exceed 5.4 inches (137 mm) of water when the locomotive is operating in Self-Load, Notch 8. A lower pressure indicates that the power leads are connected incorrectly or that there is a problem with the blower or controller. If this happens, shut down the engine, inspect the terminals, and correct the faulty connections. Ensure that all traction motor flexible air ducts are in good condition and that they are properly bolted to the traction motors.

Screen 45:

Exhauster Blower:

The exhauster blower is an 8.5-horsepower, AC motor-driven exhauster that removes dirty air or bleed air from the spin cleaners and discharges it into the radiator cab. The AC motor is electrically connected through an Exhauster Motor Breaker (EMB) to the auxiliary alternator. If the auxiliary alternator is functioning, the exhauster blower is also functioning. The exhauster blower runs at engine speed. The EMB provides overload protection for the AC source to the exhauster motor, which is the auxiliary alternator. For removal and installation of the exhauster blower, refer to the Combustion Air System module of this course.

Screen 46:

Alternator Blower:

The main purpose of the alternator blower is to provide a minimum cooling airflow of 12,000 CFM at Notch 8 engine speed to the alternator and equipment in the auxiliary cab, CA1, and CA8. A secondary purpose is to draw bleed air from the spin cleaners and to exhaust the toilet compartment and CA1. The alternator blower consists of a 47-horsepower AC motor, a blower, and an exhauster. The AC motor drives the blower and exhauster, which are on the same shaft. The AC motor is electrically connected to the auxiliary alternator. As long as the auxiliary alternator is functioning, the alternator blower will also function. The alternator blower runs at engine speed.

Screen 47:

Alternator Blower Removal:

Typical steps to remove the alternator blower are as follows:

1. Remove the bolts securing the roof hatch on the blower cab roof, then lift off the hatch with a crane and set it aside.

Note: The alternator blower motor terminal block is mounted on the underside of the blower cab just below the alternator blower on the Engineer's side of the locomotive.

2. Disconnect the three motor leads from the terminal block, keeping in mind the arrangement for later reassembly, then install the hardware back onto the terminal block studs.
3. Remove the locknut from the motor lead flexible metal conduit near the terminal block.

4. Carefully pull the flexible metal conduit and three motor leads back inside the blower cab.

Screen 48:

Alternator Blower Removal (Cont'd):

5. Remove the two nuts securing the alternator blower grease fitting lines to the floor of the blower cab on the Engineer's side of the locomotive.
6. Remove the four alternator blower mounting bolts.

Note: An industrial-type putty strip is used between the blower and the mounting surface. A jacking bolt hole, located in one corner of the blower, may be used with one of the mounting bolts as a jacking bolt to break the seal between the alternator blower and the mounting surface.

Warning: The alternator blower weighs approximately 1090 lbs. (494 kg). Ensure that the lifting device is adequate.

7. Attach cable-lifting slings to the blower lifting lugs, and carefully lift the alternator blower out of the cab with a crane.
8. Set the blower upright on a skid in a level position.

Screen 49:

Alternator Blower Installation:

Warning – Falling Hazard: To prevent a falling hazard, comply with all Railroad safety procedures before proceeding to the top of the blower cab.

Typical steps to install the alternator blower are as follows:

1. Clean the old industrial-type putty strip from the alternator blower mounting surface in the blower cab, then apply a new strip to the mounting surface to ensure an airtight seal.
2. Lift the alternator blower with a crane and clean the bottom mounting surface of the blower.
3. Place the alternator blower into position in the blower cab ensuring that the dirty air exhaust inlet air flange engages the gasket on the cab duct.
4. Install the alternator blower mounting hardware and torque to 200 lb.-ft. (271 Nm).
5. Apply Mortite Sealant to the bottom of the connecting plate where the bolt holes are located and connect the grease fitting lines.
6. With the grease fitting lines reconnected, fill the grease lines with the recommended grease.

Screen 50:

Alternator Blower Installation (Cont'd):

7. Reconnect the metal plate to the bottom of the platform using the two bolts while ensuring the grease lines are not twisted, then torque the bolts to 100 lb.-ft. (136 Nm).
8. Carefully feed the three alternator blower motor leads and flexible metal conduit through the blower cab floor, then install the locknut to secure the motor lead conduit to the bottom of the blower cab.
9. Connect the motor leads to the terminal block, ensuring that each lead is connected to the correct terminal.

Caution: Be sure to connect the leads correctly. Improper connection may cause the blower to run backwards, which greatly decreases airflow. This can shorten the life of and seriously damage the alternator and control equipment.

10. Lift and set the roof hatch on the blower cab with a crane, then install the hardware to secure the hatch of the blower cab.

Screen 51:

Checking Alternator Blower Operation:

Because the location of the alternator blower makes visual inspection of blower rotation difficult, you should perform the following test each time the alternator blower power leads are disconnected. Connect a long hose and a water tube manometer, or equivalent, to the pressure tap located at the six o'clock position on the main alternator. Monitor the pressure from the walkway. The pressure should exceed 3.0 inches (76.2 mm) of water when the locomotive is operating in Self-Load, Notch 8. A lower pressure indicates that the power leads are connected incorrectly or that there is a problem with the blower. If this happens, shut down the engine, inspect the terminal block, and correct the faulty connections.

Screen 52:

Auxiliary Cab Air Filters:

The auxiliary cab air filters remove contaminants from the air that cools the equipment in the auxiliary cab. Six paper filters are located in a compartment directly above the alternator on the Helper's side of the locomotive. You can access the filters through a door on the blower cab. A wingnut, lockwasher, and washer hold each filter in place.

Screen 55:

Summary:

You have reached the end of this module!

In this module, you learned to:

- State the purpose and location of the equipment cooling air system.
 - The primary purpose of the equipment cooling air system is to provide cooling air for critical components, including the alternator, the propulsion circuits, and the traction motors. A secondary purpose is to pressurize key areas of the locomotive to help keep out contamination.
 - The equipment cooling air system contains two separate forced-air ventilation subsystems: the traction motor cooling air system and the alternator and auxiliary cooling air system.
 - The major components of the traction motor cooling air system are located in the radiator cab. The major components of the alternator and auxiliary cooling air system are located in the blower cab.
- State the purpose and location of the major components of the equipment cooling air system.
 - The purpose and location of the major components of the traction motor cooling air system are as follows:
 - V-Screens: Located on both sides of the radiator cab, the V-screens provide the entry point for the air-to-traction motor cooling air system while blocking debris.
 - Plastic Air Cleaner Panels: Located directly behind the V-screens in the radiator cab, the plastic air cleaner panels, also referred to as spin cleaner panels, clean the air entering the traction motor cooling air system. Vortex tubes in the spin cleaner panels contain spiral vanes that cause the air to swirl like a tornado as it passes through the tube. The swirling action forces heavier dirt particles to the outside of the air stream. This “dirty” air is separated at the output of the tubes and discharged from the air cleaner panels into a bleed air duct.
 - Traction Motor Blower: Located in the radiator cab on the Helper’s side, the traction motor blower or the equipment blower provides cooling air for all the traction motors on the locomotive.
 - Exhauster Blower: Located in the radiator cab on the Engineer’s side of the locomotive, the exhauster blower removes the dirty air from the spin cleaner panel bleed air duct, continuously discharging the bleed air and dirt out the top of the unit and into the radiator cab. From the radiator cab, the radiator fans pull the air out, discharging the dirty air through the top of the locomotive.
 - The purpose and location of the major components of the alternator and auxiliary cooling air system are as follows:

- V-Screens: Located on both sides of the blower cab, the V-screens provide the entry point for the air to the alternator and auxiliary cooling air system while blocking debris.
 - Plastic Air Cleaner Panels: Located directly behind the V-screens in the blower cab, the plastic air cleaner panels clean the air entering the alternator and auxiliary cooling air system. Vortex tubes in the spin cleaner panels force heavier dirt particles to the outside of the air stream. This “dirty” air is separated at the output of the tubes and discharged from the air cleaner panels into a bleed air duct.
 - Alternator Blower with Exhauster: Located in the blower cab, the alternator blower provides cooling air to the alternator and to the equipment in the auxiliary cab, CA1, and CA8. The exhauster portion of the alternator blower draws the dirty air from the spin cleaner panel bleed air duct and exhausts the air to the roof of the blower cab.
 - Auxiliary Cab Air Filters: Located in a compartment directly above the alternator on the Helper’s side of the locomotive, the auxiliary cab air filters filter contaminants from the air that cools the equipment in the auxiliary cab.
 - Corner Duct: Located on the Helper’s side of the locomotive and attached to the auxiliary cab, the corner air duct forms a conduit for the cooling air flowing in and out of CA3 in the auxiliary cab.
- State the purpose and location of the instrumentation devices of the equipment cooling air system.
 - Barometric Air Pressure (BAP) Sensor: Located on the wall of CA4 in the auxiliary cab, the BAP sensor measures the pressure of the atmosphere and provides the pressure information to the ECU.
 - Ambient Temperature (AT) Sensor: Located in CA3, the AT sensor measures the temperature of the air flowing through CA3 and provides this information to the Smart Displays by way of the CIO panel.
 - Describe how the equipment cooling air system operates.
 - Air flows through the following path in the traction motor cooling air system:
 - The vacuum created by the traction motor blower first draws outside air in through the V-screens, where large items are blocked from entering the system.
 - Passing through the V-screens, the air and dirt are separated by 12 plastic air cleaner panels.
 - An exhauster blower provides a drawing force to discharge the dirty air from the plastic air cleaner panels into the radiator cab.
 - The clean air in the middle of the air stream exits each tube and enters the traction motor blower.
 - The traction motor blower forces the clean, cooled air into an air plenum.

- The cooling air exits the platform air plenum through flexible air ducts and cools the traction motors.
- After cooling the traction motors, the air exhausts to the atmosphere through vents built into one end of each traction motor.
- Air flows through the following path in the alternator and auxiliary cooling air system:
 - The alternator blower draws air into the blower cab through two V-screens and then through six plastic air cleaner panels.
 - The clean air passes through the panels to the alternator blower, and dirty air is sent to the exhauster blower, which is physically mounted on a common shaft with the alternator blower.
 - The exhauster blower draws in the dirty air from the air cleaner panels and ejects it through the roof of the blower cab.
 - The alternator blower receives the clean air and forces it down two paths.
 - The first path is through a corner duct to the main propulsion system electrical components located in the aux cab. The air then flows back through another channel in the corner duct to the alternator and cools it. The air exits one end of the alternator into the engine cab. As long as the engine cab doors are closed, the air pressurizes the area and helps keep contaminants out.
 - In the second path, air passes to the aux cab through the six auxiliary cab air filters. The filtered air is sent in two directions in the aux cab. One direction is into CA1, and the other is through the electronic panels in the aux cab. The air cools the electronic panels and then flows into the aux cab and CA8. This pressurizes the two areas to help keep contaminants out. In addition to discharging dirty air, the exhauster blower draws air from the top of CA1 and the toilet compartment and exhausts it through the roof of the blower.

Screen 56:

Summary (Cont'd):

- Describe how to perform running maintenance related to the equipment cooling air system.
 - The air cleaner panels require no routine running maintenance other than a visual inspection to see if they are intact and free of debris.
 - Every 3 years, lubricate the bearings of the traction motor blower, the exhauster blower, and the alternator blower.
 - At 184 days, replace the six auxiliary cab air filters.
 - Traction Motor Blower Removal
 1. Open the traction motor blower electrical connection box and disconnect the three motor leads.
 2. Remove the bolts and lockwashers securing the connection box and support assembly to the platform, then move the assembly out of the way to facilitate later removal of the traction motor blower.

3. Remove the section of the handrail adjacent to the traction motor blower on the Helper's side of the locomotive, then remove the two criss-cross structural braces. Save all hardware.
4. Remove the eight traction motor blower mounting bolts and hardened washers.
5. Loosen the two "push" bolts near the base of the traction motor blower and use the two "J" bolts to pull the traction motor blower away from the air filter assembly.
6. Attach a come-along to the blower housing removal lug and carefully line up a forklift with the mounting base with the forks extended under the base, then pull the blower from the radiator cab onto the forks.
7. Carefully set the traction motor blower on a skid in a level position.
- Traction Motor Blower Installation
 1. Clean the blower-mounting base in the radiator cab if needed.
 2. Install a new gasket and seal on the bulkhead of the filter box assembly.
 3. Place the traction motor blower into position on the mounting base using a forklift, then carefully slide the blower into position with a come-along attached to the pulling lug while aligning the blower with the opening in the air filter assembly.
 4. Near the base of the traction motor blower, use the two "push" bolts and "J" bolts to align the holes in the traction motor blower base with the holes in the radiator cab floor.
 5. Install the traction motor blower mounting hardware and torque the bolts to 280 to 300 lb.-ft. (380 to 407 Nm).
 6. Install the electrical connection box and support assembly to the platform, then secure with bolts and lockwashers.
 7. Connect the three motor leads to the traction motor blower electrical connection box terminals, ensuring that each lead is connected to the proper terminal, then tie-wrap the lead bundle to the tape rail.
 8. Install the criss-cross structural braces, and torque bolts to 329 lb.-ft. (446 Nm).
 9. Install the previously removed section of handrail.
 10. Verify correct blower air output by checking the exhaust port of the blower to ensure correct blower motor wiring, and ensure the proper air flow direction.
- Alternator Blower Removal
 1. Remove the bolts securing the roof hatch on the blower cab roof, then lift off the hatch with a crane and set it aside.
 2. Disconnect the three motor leads from the terminal block, keeping in mind the arrangement for later reassembly, then install the hardware back onto the terminal block studs.
 3. Remove the locknut from the motor lead flexible metal conduit near the terminal block.

4. Carefully pull the flexible metal conduit and three motor leads back inside the blower cab.
5. Remove the two nuts securing the alternator blower grease fitting lines to the floor of the blower cab on the Engineer's side of the locomotive.
6. Remove the four alternator blower mounting bolts.
7. Attach cable-lifting slings to the blower lifting lugs, and carefully lift the alternator blower out of the cab with a crane.
8. Set the blower upright on a skid in a level position.
- Alternator Blower Installation
 1. Clean the old industrial-type putty strip from the alternator blower mounting surface in the blower cab, then apply a new strip to the mounting surface to ensure an airtight seal.
 2. Lift the alternator blower with a crane and clean the bottom mounting surface of the blower.
 3. Place the alternator blower into position in the blower cab ensuring that the dirty air exhaust inlet air flange engages the gasket on the cab duct.
 4. Install the alternator blower mounting hardware and torque to 200 lb.-ft. (271 Nm).
 5. Apply Mortite Sealant to the bottom of the connecting plate where the bolt holes are located and connect the grease fitting lines.
 6. With the grease fitting lines reconnected, fill the grease lines with the recommended grease.
 7. Reconnect the metal plate to the bottom of the platform using the two bolts while ensuring the grease lines are not twisted, then torque the bolts to 100 lb.-ft. (136 Nm).
 8. Carefully feed the three alternator blower motor leads and flexible metal conduit through the blower cab floor, then install the locknut to secure the motor lead conduit to the bottom of the blower cab.
 9. Connect the motor leads to the terminal block, ensuring that each lead is connected to the correct terminal.
 10. Lift and set the roof hatch on the blower cab with a crane, then install the hardware to secure the hatch of the blower cab.