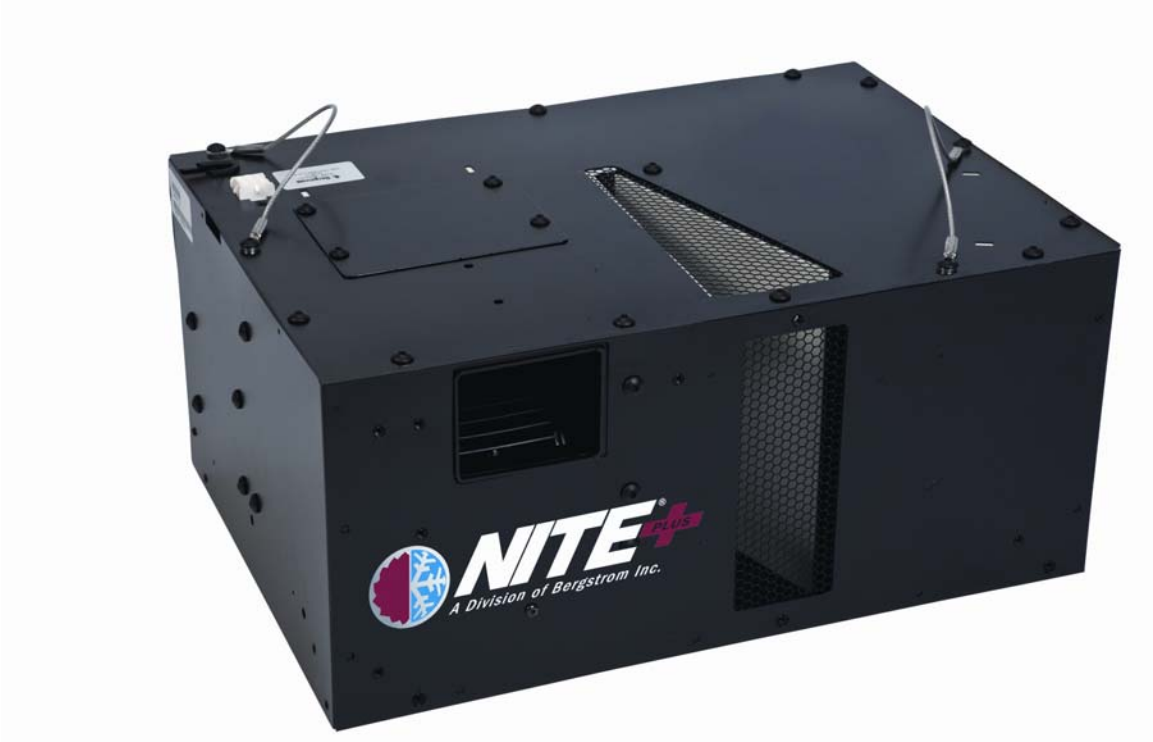
Technical Information and Diagnostic Guide

FOR

Freightliner P2 Nite and Nite Plus Systems

This guide will assist you in becoming more familiar with the working components of the **NITE** System and the proper steps and procedures to completely diagnose the **NITE** unit.



!! Attention !!

Before proceeding with any diagnostics please call the Nite line for authorization. Opening the Nite Unit without authorization could void your warranty!

Technicians are responsible for verifying all truck batteries and Nite System batteries are in good condition and are properly charged. Do not proceed with any diagnostics without checking batteries and connections!

Links:

Current Approved Manufacturers and Websites for Additional Information;

- Exide Technologies / www.exide.com
- East Penn Manufacturing (DEKA) / www.eastpenn-deka.com
- Concorde (Chairman series) / www.concordebattery.com/chairpdf/agm-622ot
- **Interstate Batteries** / www.interstatebatteries.com **(Currently being tested, not yet approved)**

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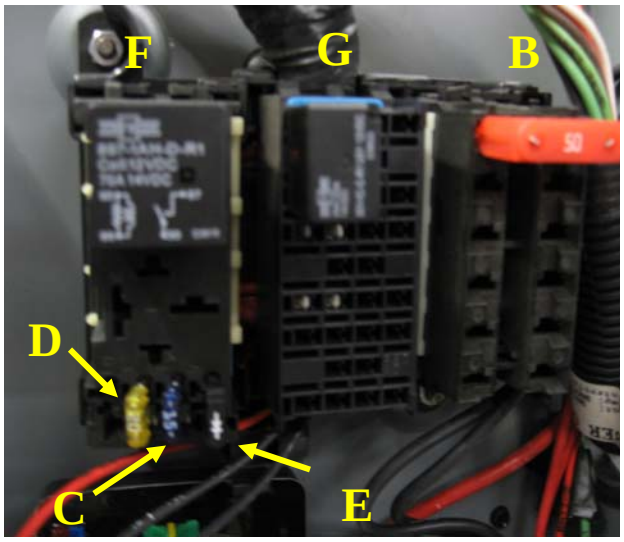
Appendix

A: Battery Separator

The battery separator is used for separating the trucks main starting batteries from the **NITE** unit batteries. It also allows the charging of the **NITE** batteries after the main truck batteries are charged above 13.2 Volts. Mounting can be inside or outside the truck.
This device should be protected from the elements due to corrosion and exposure to short circuits.

B: Fuse 50 Amp (Maxi)



This fuse provides short circuit protection for the **compressor**.
Location: inside the control section.

C: Fuse 15 Amp

This fuse provides short circuit protection for the unit controls.
Location: inside the control section.

D: Fuse 20 amp

This fuse provides protection for the optional Fuel fired heater.
Location: **Inside** or **outside** the **NITE** unit.

E: Diode Plug

Provides compressor relay circuit protection.

F: Relay for Compressor

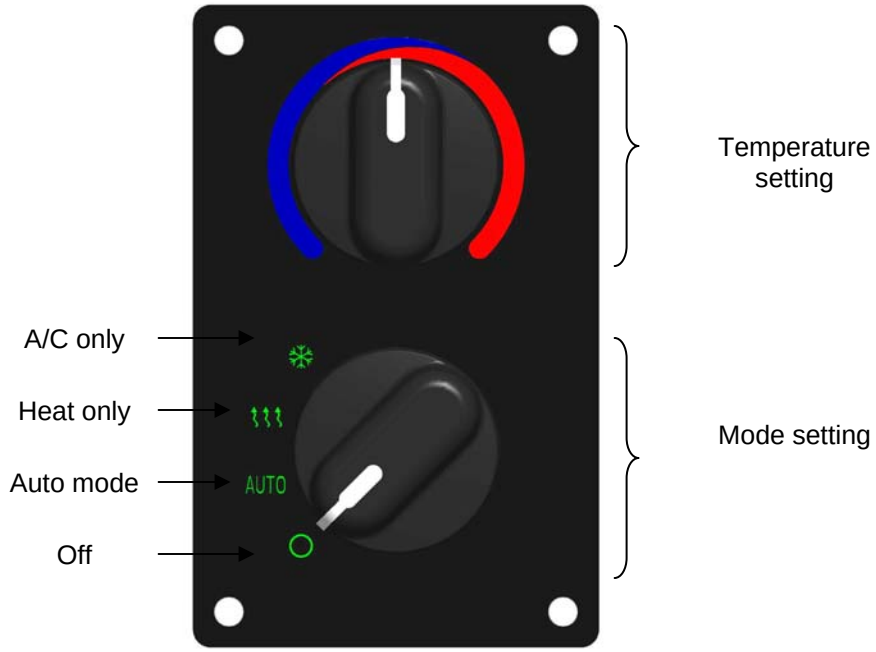
Provides power to compressor controller.

G: Relay for Park enable

Relay activates when brakes are released and disables Nite unit while driving.

H: Nite System Controller

FREIGHTLINER P2 NITE USER INTERFACE



Mode setting:

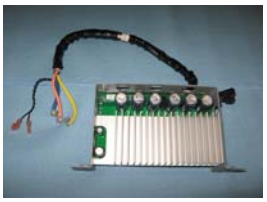
A/C only	Allows only the A/C portion of the system to run. Adjusts compressor and fans only to keep temperature (no heater)
HEAT only	Allows only the heat portion of the system to run. Adjusts heater only to keep temperature (no compressor or fans)
AUTO	Allows the unit to automatically heat or cool the sleeper, depending on the temperature setting and the sleeper temperature. Adjusts compressor, heater, and fans to keep temperature
OFF	Turns the unit off.

A: Nite Main Controller

This device stores the operating program and controls the **NITE** Unit.

B: Compressor Controller

This device provides power and control to the compressor.

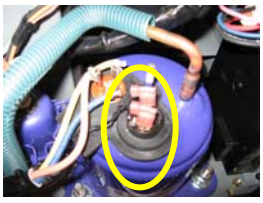


C: Compressor

This unit is part of the hermetically sealed refrigeration system.

D: Thermal Limit Switch on Compressor

This is a normally closed switch to protect the compressor from high temperature.



E: Evaporator Blower

This blower pulls air through the evaporator coil to cool the interior of the sleeper.

F: Condenser Fan

This blower draws air from outside underneath the truck and pushes it through the condenser coil to cool the refrigerant flowing through the system. The hot air is exhausted under the truck.

G: High Pressure Switch

This pressure switch will stop and prevent the operation of the compressor because of high internal pressure. Top photo shows early to present replaceable style. Middle photo represents later non replaceable style.

H: Freeze Switch

This switch stops and prevents the operation of the compressor if ice was to form on the evaporator coil.

NITE System Diagnostic Table

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION / SEE APPENDIX
Unit Will Not Run or Turn On	1. Loose connection 2. No power is available at the unit. 3. Blown fuse or fuses 4. Defective control switch. 5. Broken wire or defective wire harness 6. Main controller	1. Confirm all connections are tight, including ground lugs, and terminals crimped on wires and battery cables. 2. Check **NITE** batteries for Voltage. See appendix **A** Check main power wire spade connecter at **NITE** unit for Voltage before the fuse. 3. Check fuses for continuity and/or Voltage. See appendix **F** 4. Confirm power is available at terminal marked "B" (on switch body), and continuity of switch in general. See appendix **C** 5. Check for Voltage returning from the control switch to the controller. Check all positions. See appendix **C** 6. See checking main controller. See appendix **J**
Unit Runs - But Does Not Blow Cold Air	1. Airflow blockage. 2. Compressor Relay. 3. Compressor controller connections. 4. Compressor controller board. 5. High pressure switch 6. Freeze switch defective 7. Compressor thermal switch 8. Defective compressor 9. Loss of charge (refrigerant system not serviceable).	1. Clear any blockage from recirculation grill or louvers. Also check condenser inlet and outlet for restriction (under truck). 2. Check relay. See appendix **D** 3. Confirm all wire harness plugs are connected. 4. Check compressor controller. See appendix **I** 5. Check pressure switch. See appendix **E** 6. Check freeze switch. See appendix **G** 7. Check thermal switch. See appendix **H** 8. Check power to compressor. See appendix **I** 9. If all tests check OK a loss of charge may have occurred, please call **NITE LINE** 1-866-204-8570.
Unit Cycles On And Off	1. Poor electrical connection. 2. Condenser fan inoperative. 3. Air flow blockage causing high pressure or freeze condition.	1. Check all electrical connections. 2. Check condenser fan. See appendix **K** 3. Check for restricted airflow under truck at condenser inlet and outlet and at louvers and recirculation grill. Check pressure switch and/or freeze switch. See appendix **E & G**
Unit Blows Cold Air, But Low Airflow	1. Air flow restricted 2. Evaporator Blower motor inoperative.	1. Check for airflow at louvers and recirculation grill. 2. Check evaporator blower motor. See appendix **L**
Unit Runs Correctly, But Less Than Expected Run Time	1. Ground terminal(s) loose. 2. **NITE** batteries weak or not charged correctly. 3. Separator not functioning correctly. 4. Trucks main batteries poor condition 5. High amperage draw	1. Tighten ALL connections. 2. Check **NITE** batteries for condition and state of charge. See appendix **A** 3. Check separator connections and operation. See appendix **B** 4. Check Main truck batteries for condition and state of charge. See appendix **A** 5. Use DC ammeter to check amps when running.
Unit is Noisy or Vibrates	1. Evaporator Blower motor. 2. Condenser fan motor. 3. Compressor mounting. 4. Compressor internal.	1. Check evaporator blower. See appendix **L** 2. Check condenser fan. See appendix **K** 3. Check rubber compressor mounts. See appendix **M** 4. If rubber compressor mounts check out acceptable, and compressor vibrates excessively, call **NITE LINE** 1-866-204-8570.

Appendix

A. Battery Condition and Performance:

Battery Voltage is critical for system operation. Special attention should be given to both sets of batteries.

Attention: Poor quality truck batteries or an alternator that is too small will have a Negative impact on **NITE** unit run time. Always maintain the best possible batteries and charging system. **Standard 270 amp alternator**.

Load test and maintain batteries as required by the manufacturer. **SEE Page 2 for links.**

B. Separator:

Check for proper ground connection. These wires should go directly to a battery negative terminal.

Check the Voltage of the trucks main batteries on the separator (main) battery terminal. With the truck not running the truck battery Voltage should be under 13 Volts. Anytime the truck main battery Voltage is **below 13.2** the separator will be open.

Start the truck. When a Voltage of 13.2 on the truck batteries is reached, the separator will close, and allow power to begin charging the **NITE** System batteries. You should see a Voltage increase going into the **NITE** Batteries. Using a clamp on DC ammeter you will see the rate of charge going to the batteries.

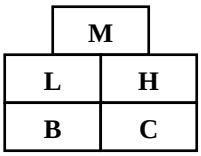
When this occurs, the separator is working correctly.

If the separator does not close or closes and does not allow charging to the **NITE** batteries, replace the separator.

Please note: It is normal for the separator to change back and forth between charging the truck bank of batteries and the **NITE** system bank of batteries, especially in the first two hours. As the truck batteries regain charge the separator will stay engaged for longer periods of time.

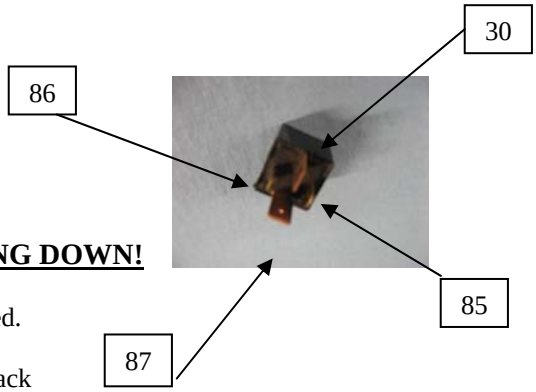
C. Control Switch Testing: You must remove switch from wire harness!

The diagram below shows which terminals should be 'electrically connected' (have continuity) at the given blower positions.



When switch is in **Off** position, there is continuity between contacts **L** & **H** only.
When switch is in **Low** position, there is continuity between contacts **L**, **B**, & **C**.
When switch is in **Med** position, there is continuity between contacts **M**, **B**, & **C**.
When switch is in **Hi** position, there is continuity between contacts **H**, **B**, & **C**.

Temperature Control is a 3 wire 10k potentiometer



D. Compressor Relay Testing:

RELAY IS INSIDE THE NITE CONTROL SECTION

MAKE SURE DIODE PLUG HAS ARROW POINTING DOWN!

Access to the terminals is available with the relay connected.

Confirm there is 12 VOLT on terminals 85 and 30. Use a black wire coming from the **NITE** batteries for the ground during testing. If you do not have 12 VOLT here check fuses and battery connections.

Now confirm there is 12 VOLT on terminal 86. If there is 12 VOLT on terminal 86, the coil inside the relay is good. If you do not have 12 VOLT, the coil is open and the relay is defective. Replace the relay.

With 12 VOLT on terminals 85, 86 and 30, turn the **NITE** system control switch on.

As soon as you turn the control switch on, terminal 86 becomes a ground connection internally in the controller. When this happens the relay will pull in the contacts and allow Voltage through the relay. You should now have 12 VOLT on terminal 87.

If you do not have 12 VOLT on terminal 87, check across terminals 85 (+) an 86 (-). You should have 12 VOLT. If you have 12 VOLT here and do not have 12 VOLT on terminal 87 your relay is defective. Replace the relay.
If you have 12 VOLT on terminal 87 and the compressor does not run you could have a defective compressor controller or compressor. See testing compressor controller appendix **I**.

E. Pressure Switch Testing: You must remove the top cover to access the switch.

The early style hex switch (see photo page 7) is **normally open**. When unit is off, check for continuity across the two terminals, it should show open or no continuity. If you have continuity, replace the switch. When replacing the switch be sure to also replace the o ring seal. Damage to the seal or unit by improper installation can result in loss of refrigerant causing low or no performance.

The later style brazed switch (see photo page 7) is not removable. This switch is **normally closed.** When the unit is off, check across the two terminals, you should always have continuity. If you do not, the unit will have to be replaced. Call the **NITE LINE** 1-866-204-8570

F. Check continuity across fuse body (fuse does not look blown but is)

Remove fuse from fuse holder. Using a meter, check for continuity across the fuse. You can check for voltage across the fuse using a dc volt meter.

G. Freeze Switch Testing: You must remove the top cover to access the switch.

The freeze switch is a normally closed switch. To verify the condition you will need a DC Volt meter.
There are three wires connected to the switch, Red, Black and Green.
Start by checking for 12 VOLT across the Red and Black. If you do not have 12 VOLT
The controller may be defective. If you have 12 VOLT, now check across Green and Black. If you have 12 VOLT the switch is ok. In a freeze or failed condition you loose 12 VOLT output on the Green wire.

If a freeze condition occurs, the unit will shut down the compressor and during a short time period it will attempt to restart the compressor three times. If during this time the freeze condition leaves, the compressor will restart and the **NITE** unit will continue to run. After three attempts the **NITE** unit will go into lockout. You must turn the control power off and on to restart the unit.

H. Compressor Thermal Limit Switch: You must remove the top cover to access the switch.

This device is a normally closed switch. If the compressor gets too hot, the thermal limit switch will open and the compressor will stop. Checking with a meter you should always have continuity between the two terminals when it is cool.

I. Compressor Controller / Compressor: You must remove the top cover.

Do not attempt to test the controller or compressor until you have completely eliminated all other possibilities.

When you turn the **NITE** unit on, the compressor relay will close sending 12 VOLT main power from terminal 87 to the compressor controller. At the same time, the main controller sends a 12 VOLT run signal to the compressor controller as well as a variable voltage for speed control. The variable voltage for early units will be about 3 volts on low to 4 volts on high, later units will range from about 4 volts on low to 5 volts on high. If all other conditions are ok, such as the high pressure switch, freeze switch and the compressor thermal limit switch, the compressor controller will then send 12 VOLT out to the compressor.

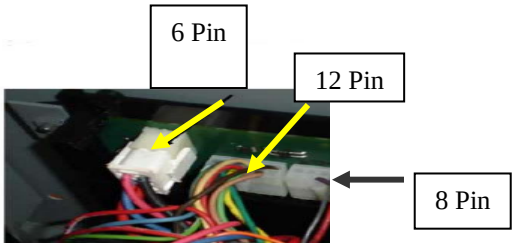
Check for 12 VOLT going to the controller on main red wire and the orange wire from the main controller. Also check for the speed voltage on the gray wire.

If you have the correct voltage in you should have voltage out on the three wires connected to the compressor. Disconnect the three wires from the compressor. You will have to remove plastic cap from the top of compressor.
Using a volt meter check each wire, positive on (blue, orange or yellow) negative to battery ground. If you do not have a 6 volt pulse voltage out on each wire, replace the controller. Pulse voltage means the controller will cycle to each colored wire. You should see the voltage appear and disappear continuously.

If you do have a 6 volt pulse voltage out and the compressor does not run you have a defective compressor. Call the **NITE LINE** 1-866-204-8570.

J. Checking Main Controller: You must remove the top cover.

First, check for 12 VOLT across terminals 4 red wire (+) & 3 black wire (-) on the 6 pin plug at the unit. This is power in from the 15 amp fuse. If you do not have power, check the 15 amp fuse and wiring.
If you **do** have 12 VOLT, turn the **NITE** unit on and check between terminals 1 red/white wire (+) at the 8 pin plug and #3 black wire (-) on the 6 pin plug.
If you have 12 VOLT here, from the control switch and the unit does not run, replace main controller. By checking for voltage out of the controller, going to each blower and the compressor controller you will make certain the main controller has failed.
If you do not have 12 VOLT across terminals 1 and 3 check the control switch and wiring. See testing switch, appendix C.



K. Condenser Fan Motor Testing: First do a visual inspection of all blower parts.

To check the condenser blower, remove the **NITE** unit cover. Clip the wire tie holding the condenser harness plugs together. Unplug the connectors.

Reconnect any wires or plugs you might have disconnected when removing the cover. Turn the **NITE** control on and check for 12 VOLT on the unit side of the wiring harness. If you do not have 12 VOLT your main controller may be defective. If you have 12VOLT, reconnect the plug, if fan does not run, it is defective, and needs to be replaced.
Using a DC ammeter you can check the amperage draw of the blower. Normal amps approx. 4.5

Caution: Do not attempt connecting blower to an outside power source, internal electronic components are sensitive to arcing or reverse polarity! Damage will occur!!

L. Evaporator Blower Motor Testing: First do a visual inspection of all blower parts.

To check the evaporator fan, remove the **NITE** unit cover. Clip the wire tie holding the harness plugs together. Unplug the connectors.

Reconnect any wires or plugs you might have disconnected when removing the cover. Turn the **NITE** control on and check for 12 VOLT at the unit side of the wiring harness. If you do not have 12 VOLT your main controller may be defective. If you have 12 VOLT, reconnect the plug, if fan does not run, it is defective, and needs to be replaced.

Using a DC ammeter you can check the amperage draw of the blower. Normal amps approx. 7.0

M. Compressor Rubber Mounts: You must remove the top cover.

Visual inspection of the compressor rubber mounts may be necessary if excessive vibration is present. Check for loose mounting nuts. If mounting nuts and captive studs are Ok, vibration could be from the internal part of the compressor. If so call the **NITE LINE** 1-866-204-8570