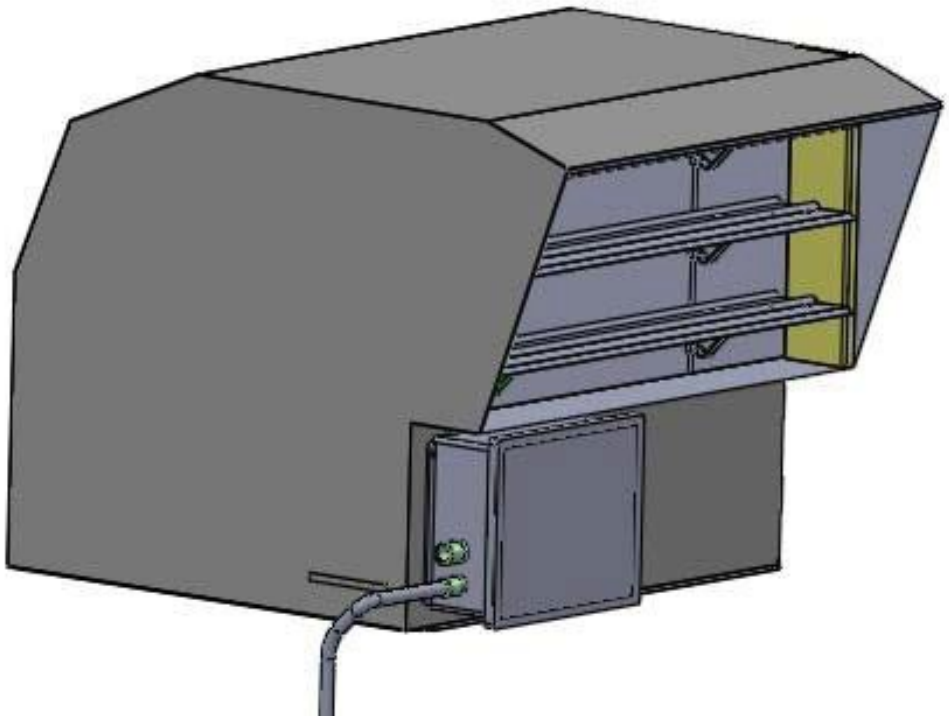
TECHNICAL & SERVICE MANUAL

Model LAHK-1 Low Ambient Hood

For use with CITY MULTI® PUHY-P-T/Y/*Z*(S)K(L)MU, PURY-P-T/Y/*Z*(S)K(L)MU, Series outdoor units



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Intertek
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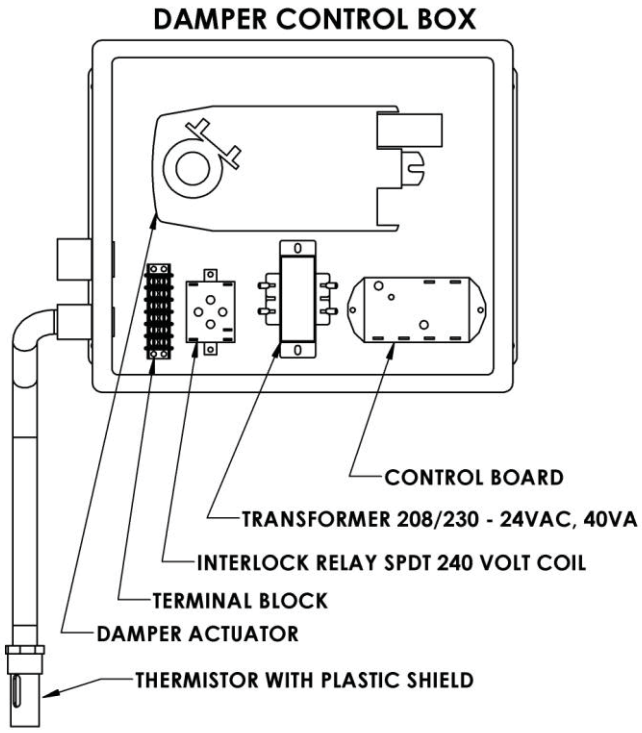
LAHK-1 Control Box Component Identification



Operating Sequence

Outdoor Unit in Cooling Mode
The LAHK-1 low ambient hood is designed to reduce the airflow through the outdoor units as the ambient temperature drops. This maintains the head pressure at a level that will allow the system to perform at 100% capacity down to -10°F outdoor temperature.

A thermistor mounted on the side of the unit senses the outdoor temperature. As the outdoor temperature drops, the resistance of the thermistor increases. The thermistor is connected to the specially designed circuit board and the resistance value from the thermistor is converted to a DC voltage output within the circuit board. This DC voltage output drives the damper actuator to a predetermined position based on the outdoor temperature.
The inverter driven fan motor will adjust the discharge pressure based on system capacity demand. The motor will speed up and force more air through the damper if there is a higher system capacity demand, or slow down if system capacity demand decreases.

Outdoor Unit in Heating Mode
Heating mode requires the damper be in the fully open position to allow full airflow and maximum heating capacity.
Heating mode automatically deactivates the kit through an interlock relay. The coil for this relay is tied into the reversing valve connection on the outdoor unit. When the unit switches to heating mode, the reversing valve is energized. This in-turn energizes the interlock relay. When the relay is energized, the normally closed contact opens. By opening this contact, the power to the transformer and control board is interrupted, this allows the damper to spring to the full open position.

Outdoor Unit in Defrost Mode
If the outdoor unit will be running in heating mode, a defrost period is inevitable. During defrost the low ambient controls see this as the unit operating in cooling mode. If the outdoor temperature is below 50 F, the damper will close to a position equal to that required during the cooling cycle. Once the unit comes back out of defrost and into heating mode, the damper will again spring wide open for full airflow.

Operation Test

Outdoor unit must be in cooling mode

All hoods and damper controls are tested at the factory before shipping. To perform an operational test once the installation has been completed, follow the steps below.

Operation testing when the outdoor ambient is ABOVE 50°F

1. Turn on power to the outdoor unit.
2. Make sure the outdoor unit is in **cooling** mode.
3. Locate the outdoor temperature sensing thermistor at the end of the short conduit coming out the side of the control panel, it can be seen inside the plastic shield.
4. Using an aerosol dusting sprayer, invert the can and spray the thermistor with very short bursts of the cold liquid. ***Caution! Do Not overspray the thermistor as it could be damaged. It may take 10 – 20 seconds for the internal thermistor temperature to drop.*** The damper will start to move toward the closed position after the thermistor drops below 50°F
5. Once the thermistor warms above 50°F, it will move back to the full open position indicating the low ambient kit is working as designed.

Operation testing when the outdoor ambient is BELOW 50°F

1. Turn on power to the outdoor unit.
2. Make sure the outdoor unit is in **cooling** mode.
3. The damper will move toward the closed position to a predetermined position based on the outdoor ambient temperature, indicating the low ambient kit is working as designed.

If neither of these tests work. Proceed with the component troubleshooting instructions.

Component Troubleshooting

Thermistor

The thermistor is a 10,000 **Ω** , NTC Type.
The circuit board has a blinking indicator light built in to reference what the thermistor is sensing. The chart below shows what the blinking light sequence means.

Blink(s)	Thermistor Temperature
✲ 1	Above 50F
✲✲ 2	50F to 20F
✲✲✲ 3	Below 20F
Constant ON	Thermistor is open or shorted

If the light is on constantly, the thermistor is open or shorted and needs to be replaced. If the blinking light sequence doesn't fall within the range given in the chart, the thermistor needs to be replaced. If it's suspected that the thermistor is operating inaccurately, check the tolerance in the following instructions.
Disconnect the thermistor from the control board. Measure the resistance across the two leads. Measure the temperature of the thermistor. (Accuracy on the temperature reading is important to prevent a good thermistor from being replaced).
Compare the ohm reading with the temperature on the chart below. Based on the thermistor temperature the ohm reading should be within 1-2% of the number shown below. If not, and the thermistor connections are not corroded, the thermistor should be replaced.

°F	Ohms	°F	Ohms	°F	Ohms	°F	Ohms
86	8,056	**59**	15,714	**32**	32,650	**5**	72,906
84	8,448	**57**	16,551	**30**	34,562	**3**	77,620
82	8,862	**55**	17,438	**28**	36,601	**1**	82,676
81	9,077	**54**	17,902	**27**	37,671	**0**	85,340
79	9,526	**52**	18,873	**26**	38,776	**-2**	90,962
77	10,000	**50**	19,903	**23**	42,315	**-4**	96,999
75	10,501	**48**	20,997	**21**	44,875	**-6**	103,486
73	11,031	**46**	22,159	**19**	47,610	**-8**	110,460
72	11,307	**45**	22,767	**18**	49,047	**-9**	114,141
70	11,884	**43**	24,040	**16**	52,069	**-11**	121,921
68	12,493	**41**	25,394	**14**	55,301	**-13**	130,295
66	13,139	**39**	26,835	**12**	58,759	**-15**	139,313
64	13,822	**37**	28,368	**10**	62,460	**-17**	149,030
63	14,179	**36**	29,171	**9**	64,408	**-18**	154,169
61	14,924	**34**	30,856	**7**	68,510	**-20**	165,048

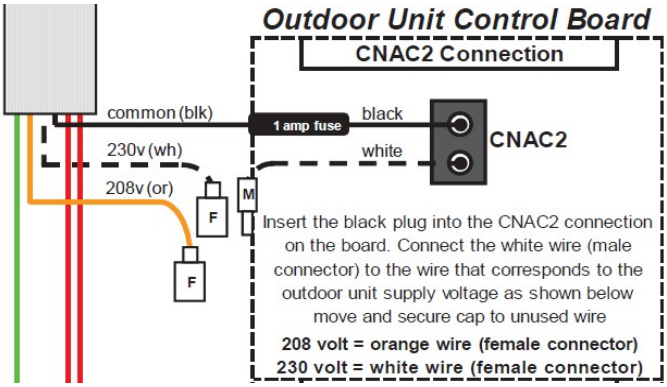
Circuit Board

Confirm the thermistor is operating properly before troubleshooting the circuit board.
Make sure the control board has 24 Volts AC when measured at the ***24 VAC*** and the ***com*** terminals. If not, find the cause of voltage failure.
The circuit board is designed to convert the thermistor ohm input to a 2 - 9.16 VDC output to control the position of the damper actuator. Above 2 VDC output the actuator will start to move the damper toward the closed position. At 9.16 VDC, the actuator will have moved 85 degrees and the damper will be approximately 95% closed. ***The damper should never be 100% closed.*** The chart below includes the various damper angles based on the different outdoor temperatures. Measure the DC voltage output on the circuit board at ***com (-)*** and the ***out (+)*** terminals. If the output doesn't match the thermistor input ohms as shown below, replace the circuit board.

Outdoor Temperature	Thermistor Ohms	Control board DC volts output	Damper Angle
Above 52°F	N/A	2.00	0° full open
52	18,873	2.00	0°
50	19,903	3.25	15°
45	22,767	4.50	30°
40	26,104	5.80	45°
35	30,000	7.04	60°
30	34,562	7.90	70°
25	39,917	8.75	80°
20	46,220	9.16	85°
Below 20°F	N/A	9.16	85°

Transformer

The transformer is 208/230 – 24volt AC. For proper connections to the outdoor unit, the following diagram and instructions should be referred to.



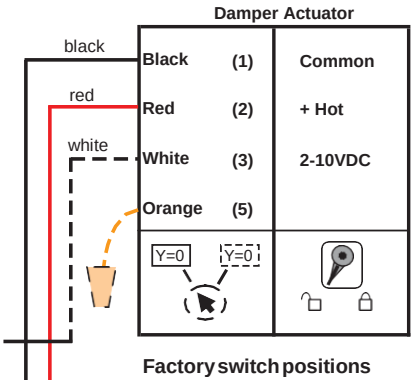
The low ambient kit is designed to function with 208/230v, 460v and 575v outdoor units.
On 208 volt units the CNAC2 connector will provide 208 volts to the control transformer.
On 230 volt units the CNAC2 connector will provide 230 volts to the control transformer.
For the 460v and 575v units measure the voltage on CNAC1 and based on that measurement you will use either the 208v connector or the 230v connector. Once the proper connection is confirmed, measure voltage on the primary side of the transformer. It should be 208 or 230 +- 10% depending on the supply voltage at the outdoor unit. If there is no voltage on the primary side of the transformer check the fuse that is located in the fuse holder inside the outdoor unit. See wiring diagram for fuse location. Once power has been confirmed at the primary side of the transformer, check the secondary/low voltage side of the transformer it should be approximately 27 volts. If no voltage is present, replace transformer.

Interlock Relay

The interlock relay uses a normally closed contact to allow power to flow to the transformer energizing the low ambient kit control circuitry. Any time the outdoor unit is in cooling mode, this contact will be in closed. When the outdoor unit reversing valves energizes (switches to heating mode) the coil of the relay is energized, opening this contact. This in-turn de-energizes the transformer, disconnecting power to the low ambient kit control circuitry. This allows the damper to spring return to the full open position during heating mode.
To check, make sure the contact is closed when the outdoor unit is in cooling mode (coil de-energized) and the contact is open when the outdoor unit is in the heating mode (coil energized).

Damper Actuator

Before trouble shooting the damper motor, verify the two factory switches are in the position shown below.



Make sure the motor has 24 volts on the ***(1) Common*** and ***(2) +Hot*** connections. If not, find the cause of the voltage failure and correct.
The damper actuator receives a DC voltage signal from the circuit board. This voltage can be measured between ***(1) Common*** and ***(3) 2-10VDC*** connections.
The damper actuator has an angle indicator where it clamps onto the damper shaft linkage.
Compare the DC voltage supply to the damper angle indicator position in the chart below. The angle should be within 2% of the chart shown below. If not, check to make sure the damper started off in the correct position. ***0 Degrees***

IMPORTANT!
It's possible that during shipping , the damper shaft may have moved in the actuator shaft clamp assembly. With power off, make sure the damper is in the full open position. 0 degrees If necessary, loosen the shaft clamp on the actuator, move the damper to the 100% open position, and re-clamp tightly.

If the damper actuator angle doesn't match within 2%, with the corresponding control board voltage supplied as shown below, the damper actuator should be replaced.

Damper Actuator Manual Override

IMPORTANT! Never manually override the damper position if the outdoor unit could switch to heating mode during the override period. Heating mode requires the damper to be fully open for full capacity.

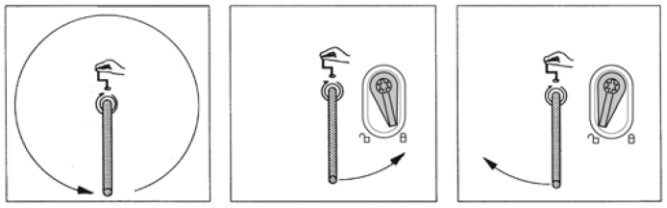
It may be desirable to manually override the damper position and lock it into position until repairs can be completed. If so, select an average temperature typical for the outside environment during the override period, and then use that average temperature to find the desired damper angle in the chart below.

Follow the instructions below for manually positioning and locking the damper in place.

IMPORTANT! Disconnect power to the damper motor before locking in place.

The damper actuator comes with a crank handle attached, to manually move the damper position. The crank handle is removable and if it's missing, a 3/16" allen wrench will work just as well.

Use the following diagrams and instructions for this procedure.



Winding the damper actuator

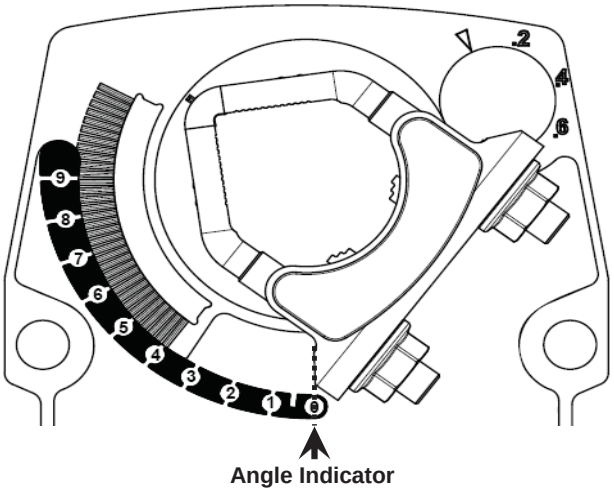
- insert crank handle
- turn handle in direction of arrow

Locking the damper actuator

- Flip the lock switch to the position pointing to the "locked" symbol

Unlocking the damper actuator
(2 options)

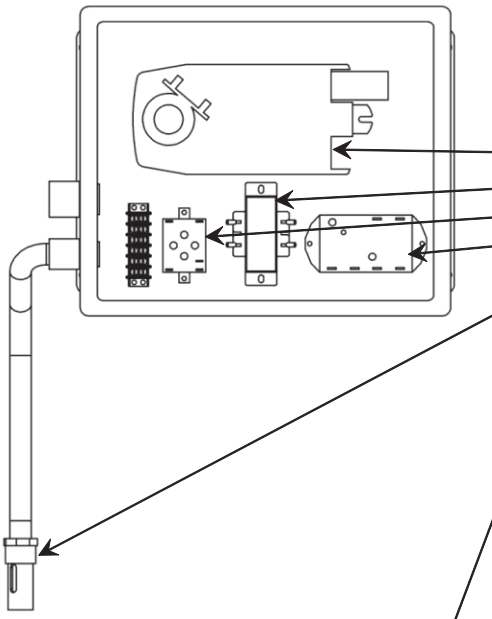
- Flip the lock switch to the position pointing to the "unlocked" symbol.
- Remote control by supplying power to the unit for > than 3 sec.



Angle Indicator

LAHK-1 Parts List

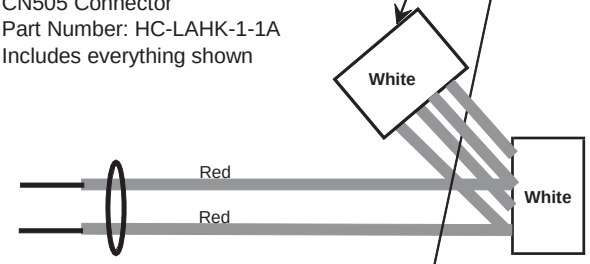
Damper Control Box



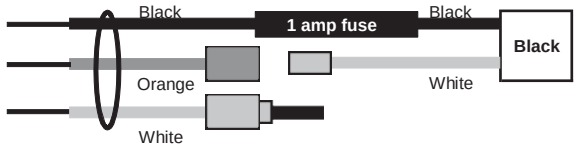
Part Description	Part Number
Damper Actuator	NFB24-SR
Transformer 208/230 - 24vac, 40VA	R68AA0005
Interlock Relay 240 volt coil	R68AB0006
Circuit Board	CB-LAHK-1-A
Thermistor harness assy	TH-LAHK-1-A
CN505 Connector	HC-LAHK-1-1A
CNAC2 Connector	HC-LAHK-1-2A

Wire Harness Components

CN505 Connector
Part Number: HC-LAHK-1-1A
Includes everything shown



CNAC2 Connector
Part Number: HC-LAHK-1-2A
Includes everything shown



Note:
Damper linkage parts can be purchased locally.
If damper blades or complete assembly needs replacing, order new LAHK-2 hood and damper assembly

Wiring Diagram