Installation Instructions

DH and DHOC Electric Duct Heaters

CHROMALOX
Advanced Thermal Technologies

PF503
161-562766-001
February 2015

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DH and DHOC Electric Duct Heaters

General

⚠WARNING

Read and understand all instructions before installing, servicing or operating product. Failure to do so could result in personal injury or property damage.

These heaters are designed to be installed in either a horizontal or vertical duct in one of the six positions shown in figure 12. The heater is constructed with individual metal sheath fintube elements mounted to a heavy gauge metal terminal box.

Due to the various options and materials available, check the nameplate attached to the heater terminal box with the catalog number designation system before installing to insure the heater you received conforms to your specification.

Please read these directions carefully to insure all limitations are properly observed and all wiring and controls are properly installed and connected.

IMPORTANT - Observe at least one complete heating cycle operation before leaving the installation.

⚠WARNING

FIRE/EXPLOSION HAZARD. This heater is not intended for use in hazardous atmospheres where flammable vapors, gases, liquids or other combustible atmospheres are present as defined in the National Electrical Code. Failure to comply can result in personal injury or property damage.

⚠WARNING

ELECTRIC SHOCK HAZARD. Any installation involving electric heaters must be performed by a qualified person and must be effectively grounded in accordance with the National Electrical Code to eliminate shock hazard.

⚠WARNING

ELECTRIC SHOCK HAZARD. Disconnect all power before installing or servicing heater. Failure to do so could result in personal injury or property damage. Heater must be installed or serviced by a qualified person in accordance with the National Electrical Code, NFPA 70.

Installation

Limitations: Must be in accordance with one of the following: Standards of the National Fire Protection Association for the installation of Air Conditioning and Ventilating Systems of other than Resident Type (Pamphlet 90A) or Residential Type Warm Air Heating and Air Conditioning Systems (Pamphlet 90B).

NOTE: The minimum distances shown are limitations. Wherever possible, locate as far away from these limits as practical. In any case, this distance with any required airflow correction must be sufficient to accomplish even air flow at a velocity equal to, at least, the minimum stated on the heater nameplate.

1. Installation near heat pump, central air conditioner, filters or humidifier. (Refer to Figure 1).

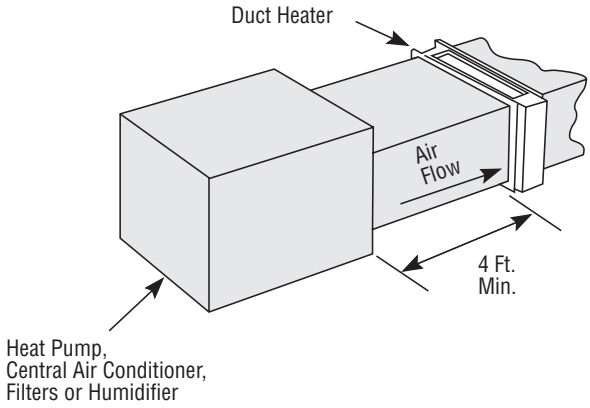


Figure 1

2. Installation near air handler discharge. (Refer to Fig. 2).

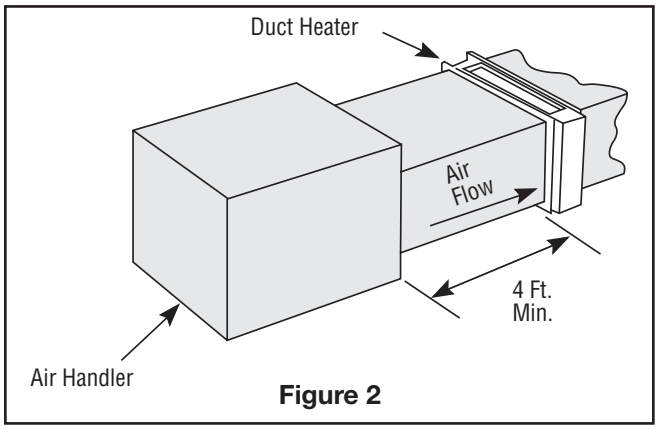


Figure 2

3. Installation in branch duct take-off. (Refer to Fig. 3).

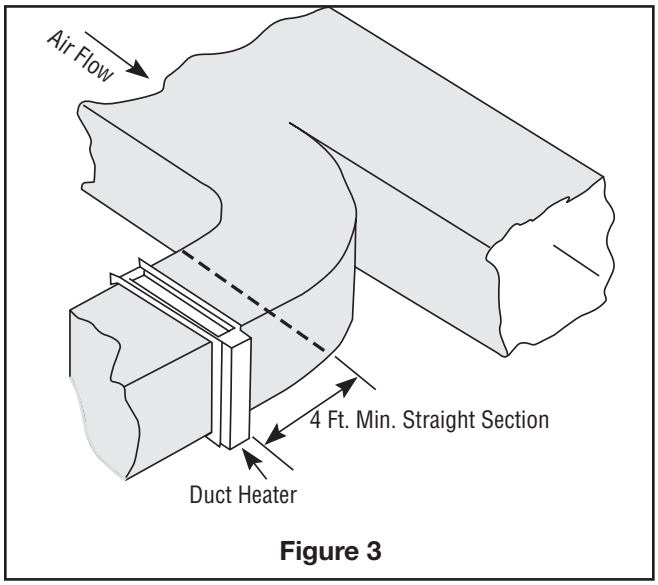


Figure 3

4. Installation near turns. (Refer to Fig. 4). If heater must be installed closer than 4 feet from the downstream side of a turn, turning vanes must be installed in the turn. The turning vanes will straighten out the air flow so it will be uniform over the face of the heater.

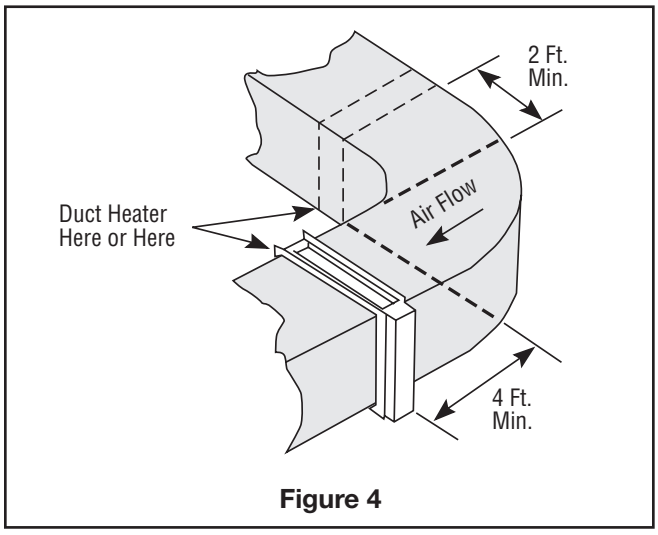


Figure 4

5. Installation with duct transitions in some air distribution systems, the duct heater may be considerably larger than the ductwork and the duct area must be increased by a sheet metal transition. The slope of the transformation piece on the upstream side of the equipment is limited to 30° as indicated in Fig. 5. On the leaving side, the slope should not be more than 45°.

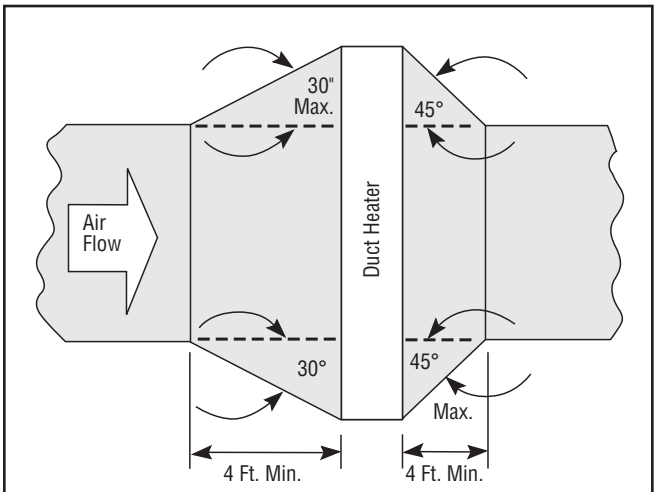


Figure 5

6. Do not insulate control or terminal box. (Refer to Fig. 6).

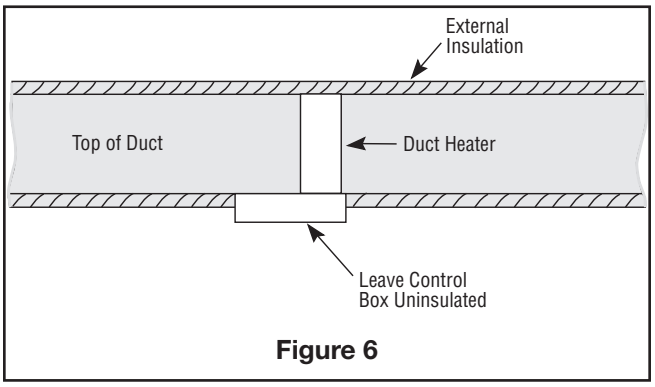


Figure 6

7. Installation in duct larger than heater. For installation where the duct dimensions exceed the insert type heater dimensions, the area beyond the heater dimensions must be filled with wire mesh, expanded or perforated sheet metal of 50% open area as shown in Figure 7. This will maintain a uniform air velocity across the face of the duct.

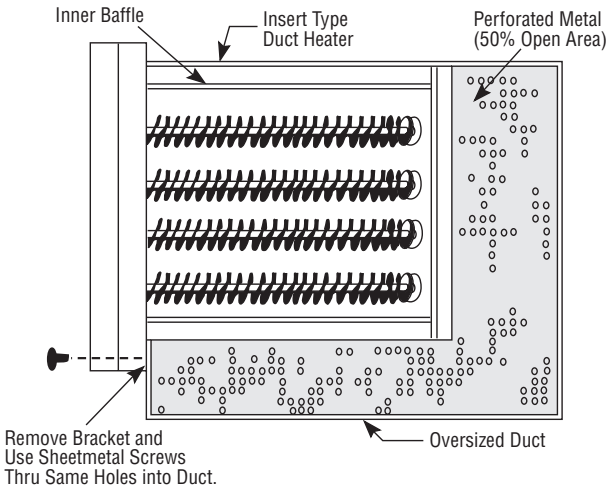


Figure 7

8. Installation with flexible duct. Where a duct heater must be installed near a flexible duct connection, be certain that a 4' minimum distance between the duct heater and the flexible connector exists and that the connector is suitable for 195°F temperature. (Refer to Fig. 8).

9. Do not install duct heater outdoors. Duct heaters cannot be installed with rooftop equipment where they are exposed to the weather.

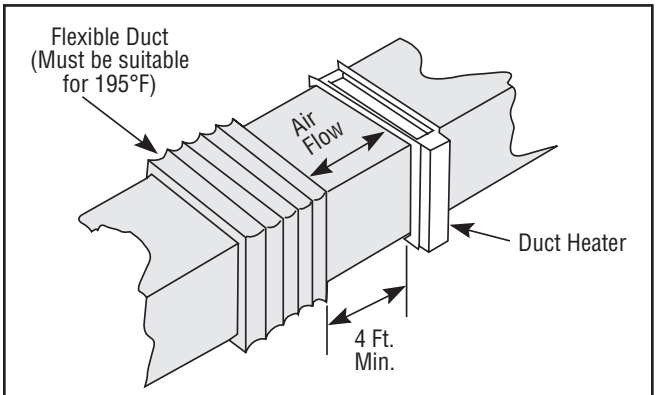


Figure 8

10. Installation with dampers or filters. Maintain at least 4' distance between duct heater and damper, filter frames, or other similar obstructions. (Refer to Fig. 9).

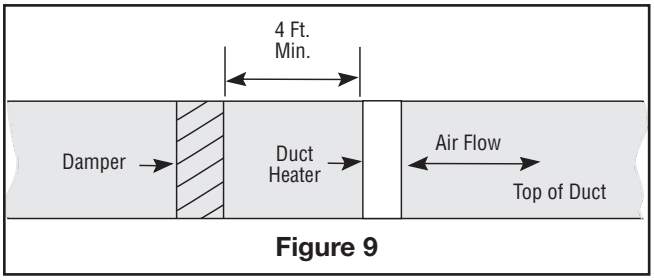


Figure 9

Clearance: Zero clearance between duct heater and combustible materials such as wood is permissible. However, adequate clearance must be provided around terminal box for proper ventilation and future service accessibility.

Air Flow

Flow through duct heater must never drop below the minimum air velocity shown on duct heater nameplate. If the air handling system includes filters, they must be cleaned whenever necessary in order to maintain air flow above the minimum, otherwise poor temperature control and discomfort will result.

If air flow is poorly distributed within the duct, deflector vanes must be added to provide correction.

The minimum air velocities shown on the nameplate are not to be considered average readings. Do not add various velocities taken across the face of the duct, find an average value, and compare it to the minimum velocity shown on the heater nameplate.

The minimum air velocity refers to any point along the face of the duct heater when checking duct velocities, no velocity can be below that sown on the heater nameplate (remembering inlet air temperature). Velocities are best checked with an anemometer, taking numerous readings along the horizontal and vertical centerline of the duct heater at the location prior to installation or slightly up stream from the heater after installation. (Refer to Figure 10). Large ducts will require additional readings taken at locations in addition to the centerline.

Example: 500 FT./MIN. Minimum Air Velocity on Heater Nameplate.			
Velocity Profile Ft./Min.	600 500 700 600 900 700 600 500	Velocity Profile Ft./Min.	200x 400x 800 900 600 700 200x 300x 400x
RIGHT:	500 Ft./Min. Minimum	**WRONG:**	$9\sqrt{4500}$ = 500 Ft./Min Average

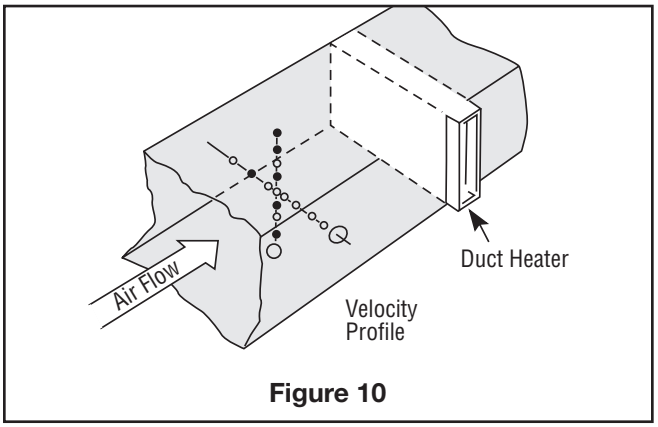
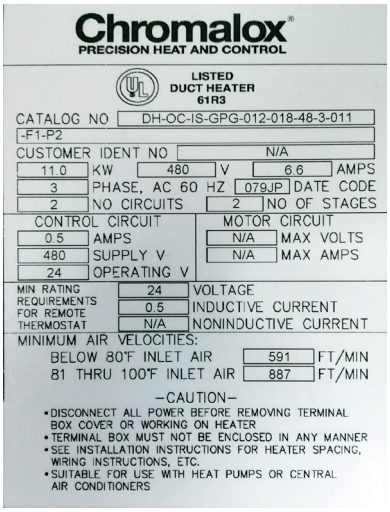


Figure 10

Incoming Air Temperature: Incoming air temperature entering the duct heater must not exceed 100°F.



Mounting

Multiple Duct Heaters: Up to six duct heaters may be combined into a heating bank as shown in Figure 11. When called for on order, brackets will be furnished for fastening flange type duct heaters together to form a bank. Heater will be coded for proper assembly in the field.

Two to six duct heaters (with flange) may be installed in a horizontal or vertical duct.

Heaters must be mounted in the position designated by arrows on the heater frame. (Refer to Figure 12).

The heater terminal box on vertical duct installations can be located on any side of the duct but for horizontal duct installation the terminal box must be on the side of the duct.

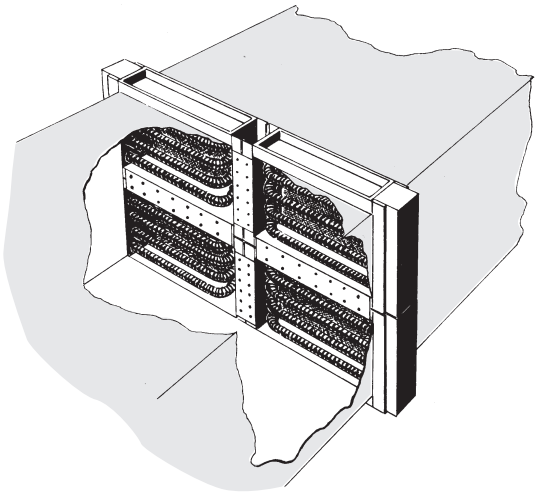
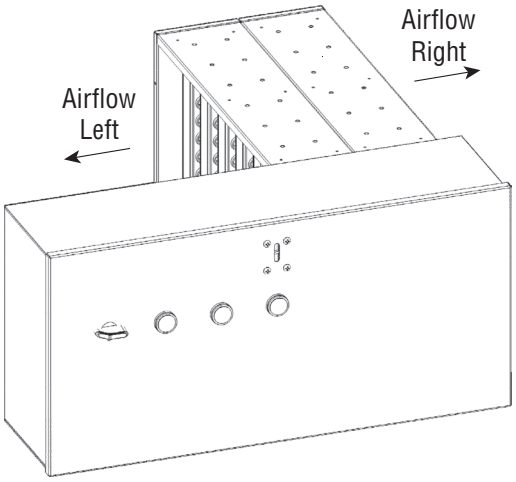
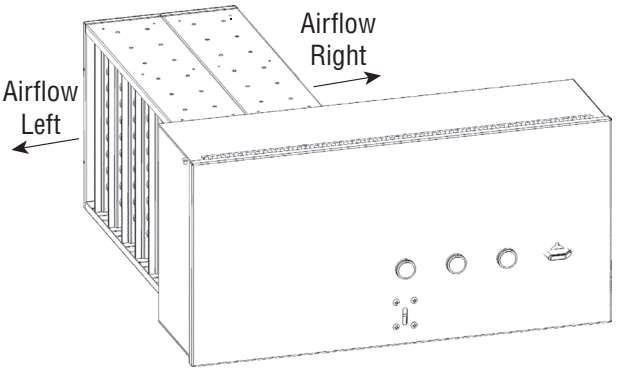


Figure 11

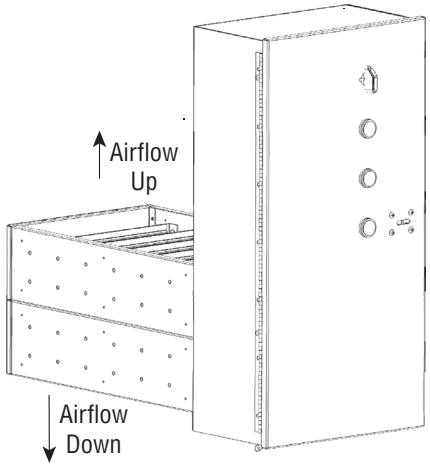
Figure 12



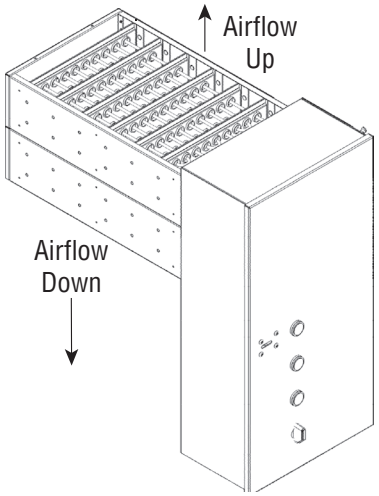
Horizontal duct with panel extended in left direction



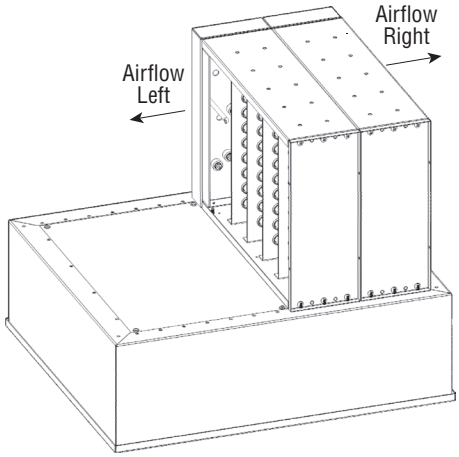
Horizontal duct with panel extended in RIGHT direction



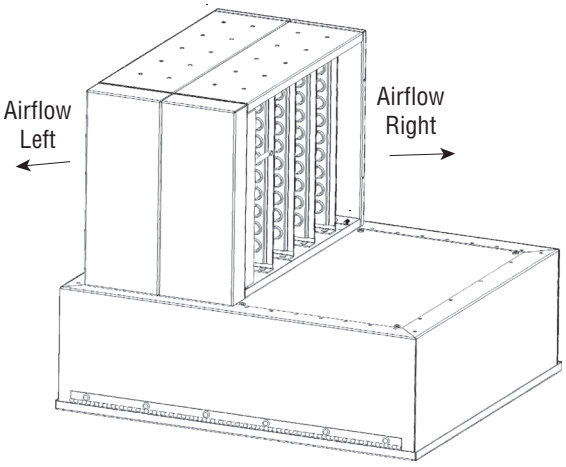
Vertical duct with panel extended in Upward direction



Vertical duct with panel extended in DOWNWARD direction



Bottom mount in horizontal duct with panel extended in LEFT direction



Bottom mount in horizontal duct with panel extended in RIGHT direction

Mounting

Mounting Procedure
(Flanged heaters with control box)

1. At heater location, cut out a section of duct, or a new construction lay out duct work to accommodate dimensions of heater.
2. Form mounting flanges on cut edges of duct as shown in Figure 13. Omit flange in side when terminal box overhangs.
3. Position heater in duct and attach duct lip to heater flanges with sheet metal screws.
4. Attach control box to duct with sheet metal screws through the mounting holes provided inside the control box.

NOTE: Where necessary, make provision to support weight of heater. Any part of heater flange may be drilled for attaching hanger straps or duct.

5. Where necessary, joint between duct and heater flange may be sealed with silicone gaskets or silicone sealant.

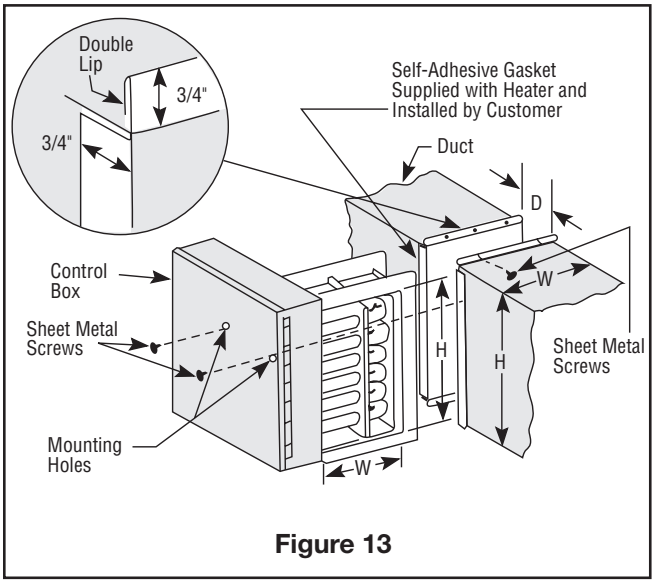


Figure 13

Mounting Procedure
(Insert heaters with control box)

NOTE: Insert or slip-in type duct heaters are designed to be inserted into existing duct and require a rectangular hole of proper size to be cut. The heater frame is manufactured with a specified duct height (H in figure 14) and a standard depth (D in figure 14). If the frame does not match the specified dimensions contact a Chromalox representative.

1. Measure the height and width of the heater frame and note (H and D per figure 14).
2. The next step is to cut out the rough opening. Cut a rectangle in the duct with dimensions H x (D - 1.5”). Remove the sheet metal. (See figure 14A)
3. With the rough opening cut and the sheet metal removed, cut the remaining 3/4 and fold over sides to create support tabs. (See figure 14A).
4. Attach control box to duct with sheet metal screws through the mounting holes provided inside the control box and through the brackets on the top and bottom of heater.
5. Where necessary, make provision to support weight of heater and terminal box.

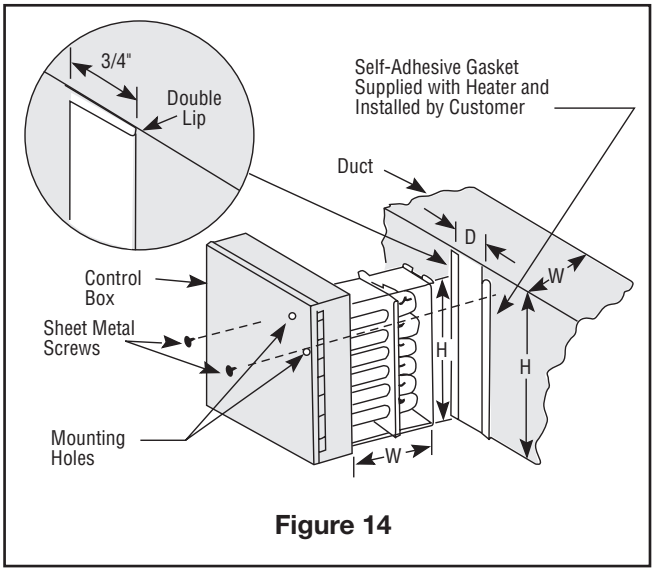


Figure 14

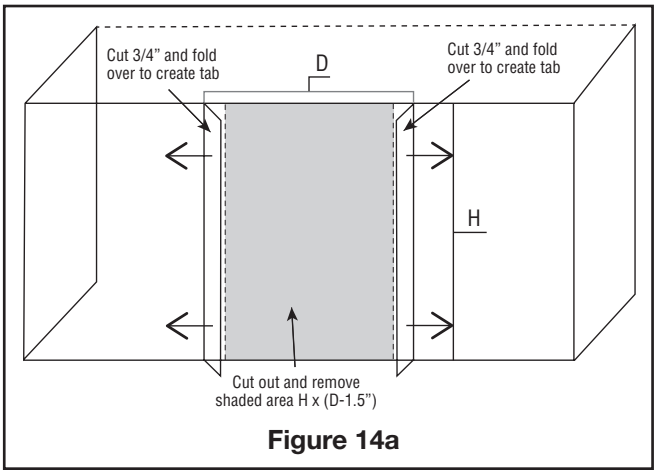


Figure 14a

Mounting Procedure
(Flanged heaters with compact terminal box)

1. At heater location, cut out a section of duct, or on new construction lay out duct work to accommodate dimensions of heater.
2. Form mounting flanges on cut edges of duct as shown in Figure 15.
3. Position heater in duct and attach duct lip to heater flanges with sheet metal screws.

NOTE: Where necessary, make provision to support weight of heater. Any part of heater flange may be drilled for attaching hanger straps or duct.

4. Attach control box to duct with sheet metal screws through the mounting holes provided inside the control box.
5. Where necessary, joint between duct and heater flange may be sealed with silicone gasket or sealant.

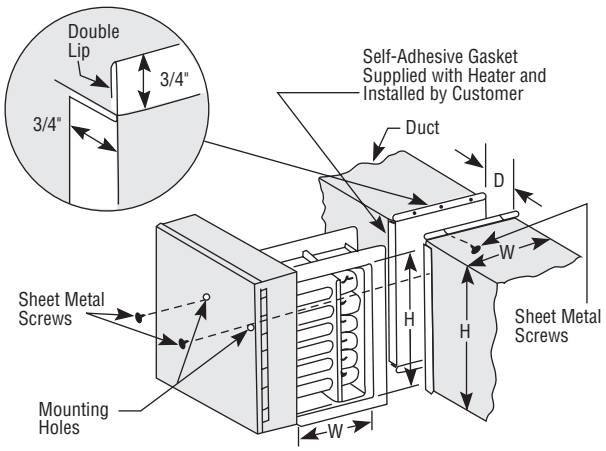


Figure 15

Mounting Procedure
(Insert heaters with compact terminal box)

NOTE: Insert or slip-in type duct heaters are designed to be inserted into existing duct and require a rectangular hole of proper size to be cut. The heater frame is manufactured with a specified duct height (H in figure 16) and a standard depth (D in figure 16). If the frame does not match the specified dimensions contact a Chromalox representative.

1. Measure the height and width of the heater frame and note (H and D per figure 16).
2. The next step is to cut out the rough opening. Cut a rectangle in the duct with dimensions H x (D - 1.5”). Remove the sheet metal. (See figure 16A)
3. With the rough opening cut and the sheet metal removed, cut the remaining 3/4 and fold over sides to create support tabs. (See figure 16A).
4. Attach control box to duct with sheet metal screws through the mounting holes provided inside the control box and through the brackets on the top and bottom of heater.
5. Where necessary, make provision to support weight of heater and terminal box.

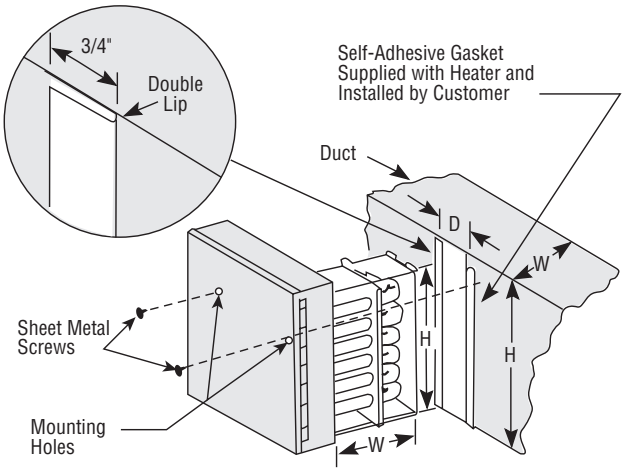


Figure 16

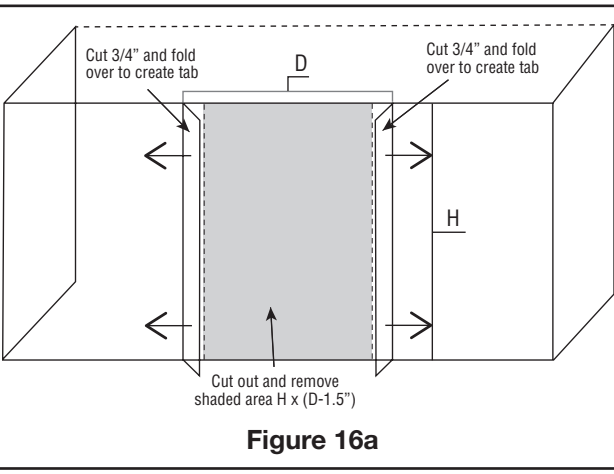


Figure 16a

Wiring

⚠WARNING

ELECTRIC SHOCK HAZARD. Disconnect all power before installing or servicing heater. Failure to do so could result in personal injury or property damage. Heater must be installed or serviced by a qualified person in accordance with the National Electrical Code, NFPA 70.

⚠WARNING

ELECTRIC SHOCK HAZARD. Any installation involving electric heaters must be performed by a qualified person and must be effectively grounded in accordance with the National Electrical Code to eliminate shock hazard.

1. Connect heater only to the voltage, frequency and phase specified on the nameplate.
2. All wiring should be done according to local and National Electric Codes.
3. Make supply connections to marked heater terminals using wire suitable for 75°C. (Type RH-RW or equivalent). In addition, the supply wires must be rated to supply a minimum of 125% of the total amperage load required by the Duct Heater.
4. Connect field wiring to the Duct Heater using the Wiring Diagram provided with the heater.
5. Conduit attachment to heater:
   a. Ensure that conduit size used matches the knock-out size(s) provided on Duct Heater
   b. Run conduit(s) to conduit knock-out(s) on Duct Heater
   c. Remove knock-out(s) with a punch and hammer.
   d. Install conduit to knock-out hole.
6. If the heater does not include a main circuit breaker or a disconnect switch, a remote disconnect must be provided (see N.E.C. 424.65).
7. Any wiring that is connected to the secondary (control) wiring of the Duct Heater is required to be N.E.C. class 1 (see National Electric Code, Article 725).

Wiring Diagram

The appropriate wiring diagram will be supplied with each heater.

Field Wire/Conduit Sizing (based on 125% of total heater amperage)

1PH				3PH			Wire Size (AWG or kcmil)	Conduit Size		Heater Amps
120	208	240	277	208	240	480		1ph	3ph	
1.4	2.5	2.9	3.3	4.3	5.0	10.0	14	1/2	1/2	12
1.8	3.1	3.6	4.2	5.4	6.2	12.5	12	1/2	1/2	15
2.5	4.4	5.0	5.8	7.6	8.7	17.5	10	1/2	1/2	21
3.8	6.7	7.7	8.9	11.5	13.3	26.6	8	1/2	3/4	32
4.7	8.1	9.4	10.8	14.1	16.2	32.4	6	3/4	3/4	39
6.1	10.6	12.2	14.1	18.4	21.2	42.4	4	3/4	1	51
7.2	12.5	14.4	16.6	21.6	24.9	49.9	3	1	1	60
8.3	14.4	16.6	19.1	24.9	28.7	57.4	2	1	1-1/4	69
9.4	16.2	18.7	21.6	28.1	32.4	64.8	1	1-1/4	1-1/4	78
10.8	18.7	21.6	24.9	32.4	37.4	74.8	1/0	1-1/4	1-1/2	90
12.6	21.8	25.2	29.1	37.8	43.6	87.3	2/0	1-1/4	1-1/2	105
14.4	25.0	28.8	33.2	43.2	49.9	99.8	3/0	1-1/2	2	120
16.6	28.7	33.1	38.2	49.7	57.4	114.7	4/0	2	2	138
18.4	31.8	36.7	42.4	55.1	63.6	127.2	250	2	2-1/2	153
20.5	35.6	41.0	47.4	61.6	71.1	142.2	300	2	2-1/2	171
22.3	38.7	44.6	51.5	67.0	77.3	154.6	350	2-1/2	2-1/2	186
24.1	41.8	48.2	55.7	72.4	83.6	167.1	400	2-1/2	3	201
27.4	47.4	54.7	63.2	82.1	94.8	189.6	500	2-1/2	3	228
30.2	52.4	60.5	69.8	90.8	104.8	209.5	600	3	3-1/2	252
33.1	57.4	66.2	76.5	99.4	114.7	229.5	700	3	3-1/2	276
35.3	61.2	70.6	81.4	105.9	122.2	244.4	800	3	3-1/2	294

Operating Instructions

Heater Start-up:

1. Close the duct heater's door and ensure that the latch has engaged by pulling on the door. The door should not open unless a tool is used to disengage the latch.
2. Turn on the blower or fan for the ductwork that contains the duct heater.
3. Ensure that the Air Velocity on the downstream side of the duct heater matches the Minimum Air Velocity stamped on the duct heater's nameplate. The minimum airflow requirement shall be met at any point over the face of the heater.
4. Turn Selector Handle on the duct heater to the "ON" position. -Note: A small amount of smoke will usually be emitted from the duct heater when first initialized. This is from dust that has built up on the elements and is normal and should only last for a few seconds.
5. Verify that adequate heat is coming from ductwork vents.

Heater Shut-Down:

1. With the blower or fan still running, turn the Selector handle on the duct heater to the "OFF" position.
2. Verify that the air coming out of the ductwork vents is not heated.
3. Do not turn off the blower or fan until at least 15 minutes after the heater has turned off.
4. Verify that the duct heater outer surfaces have cooled down to at least 110°F before touching.
5. Disconnect all power to the duct heater before opening the duct heater's door.

Maintenance

⚠WARNING

ELECTRIC SHOCK HAZARD. Disconnect all power before installing or servicing heater. Failure to do so could result in personal injury or property damage. Heater must be installed or serviced by a qualified person in accordance with the National Electrical Code, NFPA 70.

1. Periodically clean terminals and terminal covers of dust and corrosion to maintain good electrical connections and to permit rapid heat dissipation. Use airblast, and be careful to avoid damage to mica insulation.
2. At least once a year check for loose terminal connections. Tighten as necessary. Torque to 30 in-lbs.

Heater Bundle Removal & Replacement

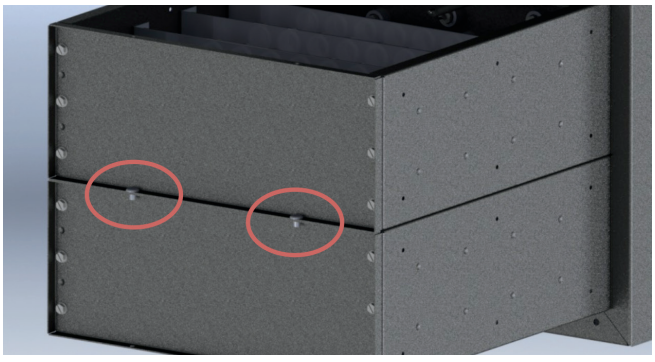
⚠WARNING

ELECTRIC SHOCK HAZARD. Disconnect all power before installing or servicing heater. Failure to do so could result in personal injury or property damage. Heater must be installed or serviced by a qualified person in accordance with the National Electrical Code, NFPA 70.

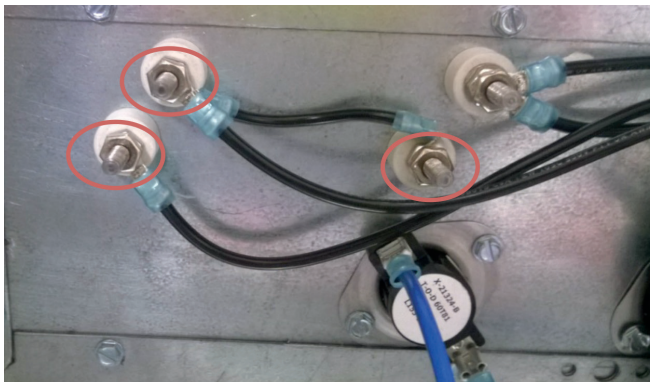
⚠WARNING

ELECTRIC SHOCK HAZARD. Any installation involving electric heaters must be performed by a qualified person and must be effectively grounded in accordance with the National Electrical Code to eliminate shock hazard.

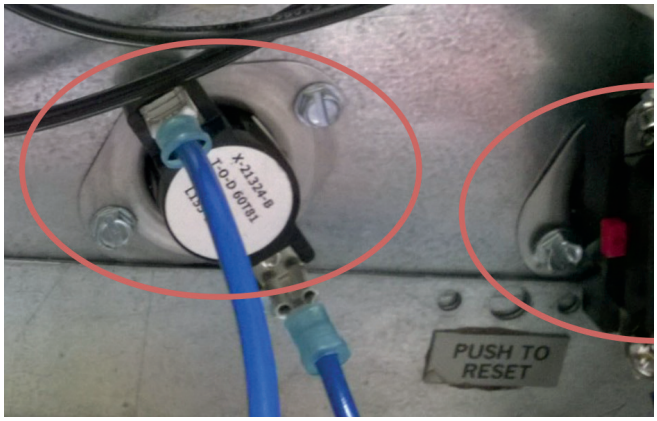
1. If there is more than one bank of elements on the heater, drill out rivets from the back side of the duct heater that are holding the heating bank that is to be replaced in place.



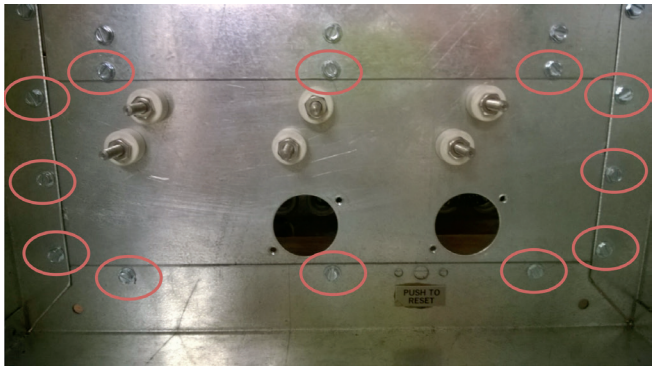
2. Remove wiring from terminal pins of heater bank.



3. Remove thermal cutouts if they are attached to the bank that needs to be replaced.



4. Remove screws around the outside of the heating bank that hold the heating bank to the housing.



Replacement Parts

Description	Part Number	Rating
Heating Element Bank	Contact sales	
Disconnect Switch	303472019	40 amps
	303472020	60 amps
	303472021	80 amps
	303472022	100 amps
Power Fusing	Contact sales	
Transformer Fusing	Contact sales	
Contactors	306110002	24 V
	306110008	120 V
Transformer	Contact sales	
Air flow switch	051947001	
Automatic Reset Thermal Cutout	306600007	
Manual Reset Thermal Cutout	306600008	
Pilot Light	304688001	24 V
	304688002	120 V

Duct Heater Troubleshooting Guide

Problem	Causes	Solution
Won't Power On (no heat)	Field power wires not connected properly	Connect wires per the Wiring section of the Installation & Operating Manual (IOM)
	Fuse(s) have blown or breaker has tripped	Check resistance of fuses using a Multimeter to ensure continuity. Replace any blown fuses.
	Automatic Reset Cutout has tripped	Wait for 30 minutes. The Automatic Cutout should reset and the heater should begin working again. If not, disconnect wires from the cutout and use a Multimeter to test for continuity across the cutout.
	Manual Reset Cutout has tripped	Shut down the heater per the Heater Shut Down section of the Installation & Operating Manual. Open the terminal box and push the reset button on the manual reset (near the label "PUSH TO RESET") and start up the heater per the Heater Startup section of the Installation & Operating Manual. If the heater still does not function, disconnect wires from the cutout and use a Multimeter to test for continuity across the cutout. If there is still no continuity after pushing the button, the cutout needs to be replaced.
	Air Flow Switch has tripped	Ensure that adequate flow is being provided to the heater per the Air Velocity requirements stamped on the Nameplate.
	Wires have shorted out	Shut down the heater per the Heater Shut Down section of the Installation & Operating Manual. Open the terminal box and check for each wire for continuity.
	Loose or unconnected internal wires	Shut down the heater per the Heater Shut Down section of the Installation & Operating Manual. Open the terminal box and check wire terminals for proper connection.
	Incorrect Voltage	Check the rated voltage for the heater provided on the nameplate. Check supply voltage & verify that it matches the nameplate.
Not Enough Heat	Fuse(s) have blown	Check resistance of fuses using a Multimeter to ensure continuity. Replace any blown fuses.
	Failed Element(s)	Shut down the heater per the Heater Shut Down section of the Installation & Operating Manual. Open the terminal box and use an ohmmeter to check for resistance across each element. All coils should have the same resistance. If the heating element is broken there will generally be either zero or infinite resistance. Replace any heating banks with broken coils.
	Loose or unconnected wire terminals	Shut down the heater per the Heater Shut Down section of the Installation & Operating Manual. Open the terminal box and check wire terminals for proper connection.
	Incorrect Voltage	Check the rated voltage for the heater provided on the nameplate. Check supply voltage & verify that it matches the nameplate.
	Improper sizing (kw)	Verify that the heater KW provided is adequate for the application. Ensure that the blower output, when measured downstream of the duct heater, matches the Air Velocity requirement that is stamped on the nameplate.
Too Much Heat	Incorrect Voltage	Check the rated voltage for the heater provided on the nameplate. Check supply voltage & verify that it matches the nameplate.

Problem	Causes	Solution
Contactor Chatter	Incorrect Control Voltage Input	Check the rated control circuit voltage for the heater provided on the nameplate. Check supply control voltage & verify that it matches the nameplate.
	Incorrect wire size to heater	Check supply wiring size. Wiring sizing should conform to N.E.C. 424.3(b).
Terminals Heating Up	Loose Wiring Connection	Tighten wire connections on all terminals.
Pilot Lights don't turn on	Light bulb burnt out	Replace pilot light
	Loose Wiring Connection	Check wire connections on all control circuit terminations.

Limited Warranty:
Please refer to the Chromalox limited warranty applicable to this product at http://www.chromalox.com/customer-service/policies/termsofsale.aspx.

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