INSTALLATION, OPERATION and MAINTENANCE INSTRUCTIONS for INDEECO ULTRA-SAFE AIR HEATER SERIES T3C

I. GENERAL

The INDEECO ULTR-SAFE SERIES T3C, Explosion-proof Electric Air Heaters for Hazardous Locations are FM and CSA Approved for use only in areas classified as:

Class I, Divisions 1 & 2, Groups. C & D
Class II, Divisions 1 & 2, Groups. F & G
or for
Class I, Divisions 1 & 2, Group. D
Class II, Divisions 1 & 2 Groups E, F & G.

See Data Plate for Specific Area Classification

The ULTRA-SAFE unit is rated for the following temperatures:

Type	Operating		Storage	
	Minimum	Maximum	Minimum	Maximum
Standard	-25°C (-14°F)	40°C (104°F)	-45°C (-49°F)	70°C (158°F)
Arctic Duty	-40°C (-40°F)	40°C (104°F)	-45°C (-49°F)	70°C (158°F)

For details on the particular hazardous environments having the potential for explosion, refer to Articles 500 through 516 of the National Electrical Code, or Section 18 of the Canadian Electrical Code, Part I.

A. The INDEECO ULTRA-SAFE heaters use a sealed, liquid-to-air heat exchanger with a side tank containing immersion type heating elements. A mixture of nontoxic propylene glycol and water is placed in the heater core to act as the heat transfer fluid. The propylene glycol provides freeze damage protection to -45°C (-49°F). The heater terminal box is permanently sealed and the fan motor is a totally enclosed fan-cooled explosion-proof motor. The unit is designed to give years of safe, trouble-free operation when properly installed and maintained.

B. Disassembly of the unit for installation is not required or authorized. When installing:

1. Observe all heater nameplate ratings.
2. Keep all electrical connections tight.
3. Keep the heat exchanger coil and fan clean.
4. Carefully read and comply with all warnings and cautions.

All of the WARNINGS and CAUTIONS are stated in the following Safety Summary and are repeated through these instructions.

II. SAFETY SUMMARY

The following WARNINGS appear in the text of these instructions and are stated here for emphasis. Installation and maintenance personnel should familiarize themselves with the installation and maintenance requirements and all WARNINGS and CAUTIONS before installing or working on this heater to avoid potential hazardous conditions or lethal injury.

=WARNING=
INDEECO strongly recommends this heater be installed by qualified personnel familiar with the National Electrical Code and/or the Canadian Electrical Code requirements for hazardous locations. It is the responsibility of the installer to verify the safety and suitability of the installation.

=WARNING=
Disassembly of the unit, for installation, is not required or authorized.

=WARNING=
Potentially lethal voltages are present. Be sure to lock the branch circuit disconnect switch in the off position and tag the circuit "Out for Maintenance" before working on this equipment.

=WARNING=
When connecting the room thermostat, be sure that the thermal high limit cutouts remain connected in series with the control contactor and the optional room thermostat. The unit must not be operated without the thermal high limit cutouts properly connected in the circuit.

=WARNING=
The unit heater must have been ordered for this option to have the necessary internal controls. Do not attempt to install a Remote Fan Only switch on a standard unit heater and do not try to field modify a standard unit for this option.

=WARNING=
Replacement of electrical components should only be done by authorized personnel familiar with the requirements of maintaining electrical equipment in an explosion-hazard area.

=WARNING=
Replacement electrical components must be obtained from the factory to maintain the hazardous location rating.

=WARNING=
The heat exchanger is a factory vacuum-sealed unit. Do not attempt to loosen or tighten any of the fill or drain plugs or attempt to operate the pressure relief valve. A loss of vacuum could cause nuisance tripping of the thermal cutouts or high pressures which will cause the relief valve to actuate with an accompanying loss of liquid.

-CAUTION-
The heat exchanger is filled with a mixture of water and inhibited propylene glycol. Contact with the fluid at operating temperatures may produce a burn hazard. The Material Safety Data sheets indicate that there is not a health hazard from coming in contact with the inhibited propylene glycol. Suggested first aid consists of flushing eyes with plenty of water and to wash off skin in flowing water or a shower.

III. INSTALLATION

A. Site Selection. The INDEECO ULTRA-SAFE Heaters are designed for use only while permanently mounted in an upright position as defined below. They should not be mounted close to drapery or similar materials which could lay on the cabinet, or block the inlet or outlet of the heater. The heaters are intended for elevated mounting locations so that they blow warm air down to the floor area. A mounting height should be selected so that the heater is out of the way of possible moving equipment or personnel, yet low enough to deliver warm air to the selected area. The mounting supports (ceiling, wall or pipe mounting) must be sufficient to keep the heater in its proper upright operating position. The maximum tilt should not exceed the values indicated in the following sketch.

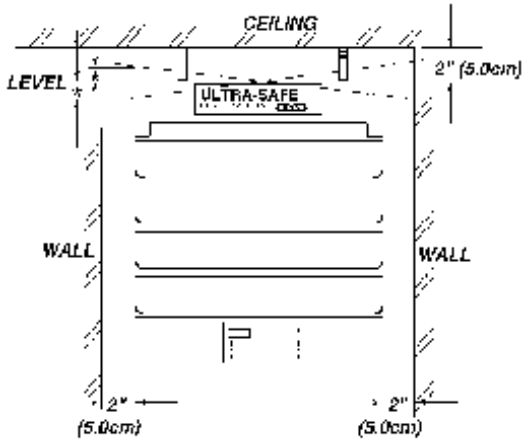
=WARNING=

INDEECO strongly recommends this heater be installed by qualified personnel familiar with the National Electrical Code and/or the Canadian Electrical Code requirements for hazardous locations as well as any local codes. It is the responsibility of the installer to verify the safety and suitability of the installation.

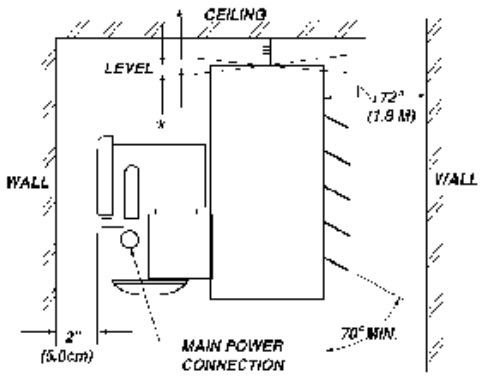
B. Mechanical Installation. Once an acceptable location has been determined, follow these instructions to complete the mechanical installation.

=WARNING=

Disassembly of the unit for installation is not required or authorized.



* THE UNIT SHOULD NOT BE MORE THAN 1° OFF FROM LEVEL WHEN MEASURED FROM THE CENTER OF THE UNIT TO THE EDGE OF THE UNIT.



* THE UNIT SHOULD NOT BE MORE THAN 1° OFF FROM LEVEL WHEN MEASURED FROM THE CENTER OF THE UNIT TO THE EDGE OF THE UNIT.

1. To ensure proper heating of floor surfaces, observe the following recommended maximum mounting heights (to bottom of heater):

Maximum Mounting Height from Floor:		
237-F24U	237-F24V	237-F24W
8 ft. (2.5M)	10 ft. (3.0M)	13 ft. (4.0M)

2. The heaters should be installed to allow clearances for service access and air circulation as follows:

Back	2" (50.8mm) from motor
Front	72" (1.8M)
Right Side	2" (50.8mm)
Left Side	2" (50.8mm)
Top	0" (0.mm)
Bottom	Unit Height +36" (+914mm)

3. The supporting structure that the heater is attached to must have adequate strength and stiffness to safely support the heater. The maximum unit weights are:

MODEL	(lbs)	(kgs)
237-F24U	170	77
237-F24V	210	95
237-F24W	265	120

4. The heater may be suspended from overhead beams or mounted to a side wall or a 4" pipe using one of the approved mounting kits. Use of non-approved mounting kits voids all warranties, expressed or implied.

5. Wall mounting should be to structural steel. If the wall construction is plasterboard with wooden 2 X 4 framing or similar, it must be reinforced with angle iron or wooden cross braces.

6. Lock washers should be used on all mounting nuts and bolts to ensure they don't vibrate or work loose due to fan vibration or other vibration transmitted to the heater or

C. Electrical Installation. Follow these instructions to complete the electrical installation:

=WARNING=

Potentially lethal voltages are present. Be sure to lock the branch circuit disconnect switch in the off position and tag the circuit "Out for Maintenance" before working on this equipment.

1. External branch circuit protection is required. See nameplate ratings and follow Code recommendations.

2. Use only an approved explosion-proof means of wiring, such as mineral insulated cable or copper conductors in rigid conduit with conduit seals as required to make connection to the heater.

3. Follow the NEC and/or CEC and any local electrical and building codes related to the installation and intended use of the heater in an explosion-hazard area.

4. When doing any work on a heater, including the initial electrical connection, disconnect the electrical current at the main branch circuit switch, and lock the switch in the off (open) position and tag the circuit "Out for Maintenance" to prevent potential lethal shock hazards.

5. Confirm that the electrical power supply matches the nameplate voltage, phase, amperage and frequency rating of the heater to be connected.

6. Ensure conductors are of appropriate gauge size. The minimum gauge is stamped on the nameplate. Size all input conductors according to accepted standards consistent with the temperature rating of the wire being used. Use minimum 75°C rated wire.

7. Proper installation of the heater requires that an adequate grounding conductor be connected to the ground terminal. This terminal is painted green or marked with the letter "G" and is located on the inside of the control enclosure next to the power input opening.

8. Refer to the wiring diagram to ensure that all connections are as required.

9. Check and confirm all connections are securely fastened.

10. Ensure that input conductors and conduit have adequate strain relief at installation.

11. Before application of electrical power, recheck all connections to ensure compliance with the wiring diagram and any code requirements. Remove any foreign objects from the control box. Reinstall cover tightly.

12. On all 3-phase heaters, it is necessary to verify that the fan is rotating in the proper direction. If air delivery is not from the front of the heater, exchange any 2 input wires at the main power terminal block located in the control enclosure.

13. Before application of electrical power, recheck all connections for tightness. Remove any foreign objects from the control box. Reinstall cover tightly.

14. The explosion-proof control box is designed with threaded joints and metal-to-metal contact at the lid or cover joint to prevent an explosion. Do not attempt to install gasket material of any type at these joints. A light coating of anti-seize compound is applied to the threads to prevent seizing.

15. See operating instructions, Section V, before operating the heater.

IV. FIELD INSTALLED OPTIONAL CONTROLS

=WARNING=

Potentially lethal voltages are present. Be sure to lock the branch circuit disconnect switch in the off position and tag the circuit "Out for Maintenance" before working on this equipment.

1. Power Disconnect Switch. The NEC requires that a power disconnect switch be mounted within sight of the heater. The CEC or local codes may require a disconnect switch within sight of the heater. Refer to the electrical diagram and follow these steps.
a.) The remote power disconnect switch must be an explosion-proof disconnect switch rated for the area classification.
b.) The switch must be indicating and have a locked off position.
c.) The switch must be rated for the nameplate voltage and current per the NEC, CEC and any local codes.
d.) Follow steps 6 through 15 of the electrical installation instructions to complete the installation.

2. Room Thermostat. Refer to the electrical wiring diagram and follow these steps.

=WARNING=

When connecting the room thermostat, be sure that the thermal high limit cutouts remain connected in series with the control contactor and the optional room thermostat. The unit must not be operated without the thermal high limit cutouts properly connected in the circuit.

a.) Remove the jumper wire from the small terminal block with terminals marked "C" and "C1". Connect the external thermostat to these terminals. The external thermostat will then be in series with the heater thermal high-limit switches and correct operation of the heater will result.
b.) The wiring to the remote thermostat must be copper wire, 16 gauge minimum (for Class II) or 14 gauge minimum (Class I) and run in explosion-proof conduit with appropriate conduit seals installed per the NEC, CEC and any local codes.
c.) Any room thermostat used with this heater must be of an explosion-proof type rated for the area classification, open on temperature rise, rated 250VAC, 75VA inductive capacity.

3. Remote Temperature Control With Fan Switch. Refer to the electrical wiring diagram and follow these steps.

=WARNING=

The unit heater must have been ordered for this option to have the necessary internal controls. Do not attempt to install a Remote Fan Only switch on a standard unit heater and do not try to field modify a standard unit for this option.

a.) Connect the remote thermostat to the terminal block with terminals marked "C" and "C1". The remote thermostat will then be in series with the heater thermal high-limit switches and correct operation of the heater will result.
b.) Connect the remote fan only selector switch to the terminal block with terminals marked "C" and "F".
c.) The wiring to the remote thermostat and selector switch must be copper wire, 16 gauge minimum (for Class II) or 14 gauge minimum (for Class I) and run in explosion-proof conduit with appropriate conduit seals installed per the NEC, CEC and any local codes.
d.) Any room thermostat used with this heater must be of an explosion-proof type rated for the area classification, open on temperature rise, rated 250VAC, 75VA inductive capacity.
e.) Any selector switch used with this heater must be an explosion-proof switch rated for the area classification, maintained position, 2 position selector switch rated for 250 VAC, 75 VA inductive.

V. OPERATION

The ULTRA-SAFE unit heater may be operated normally at ambient temperatures of 104°F (40°C) or less and at altitudes of 3,300 feet (1000m) or less in atmospheres containing less than 21% oxygen by volume, and as classified on the nameplate. All of these conditions must be met before attempting to operate the heater. The heater should never be operated in an oxygen-enriched atmosphere or at ambient temperatures above 104°F, (40°C). The heater

may be operated at higher altitudes if the ambient temperatures are below 104°F, (40°C). At higher altitudes the high temperature cutouts in the motor or heater may operate in high ambient conditions. If this occurs, the installation should include some means to de-energize the heater during high ambient conditions, such as an automatic temperature control thermostat or a manually operated disconnect switch, to prevent excessive cycling of the controls.

A. Initial Operation. Check to make sure the mechanical and electrical installation is complete and that it is safe to operate the heater.

1.) Heater without built on or remotely mounted temperature control thermostat or fan switch.
a.) Energize the heater electrical supply circuit.
b.) The heater and fan should come on and in 5 to 15 minutes reach a stable operating temperature. If the room temperature is high and the installation is above 3,300 feet, the unit heater may cycle on the thermal high limits of the motor or the heater.
c.) Check out and report any unusual or questionable operating characteristics, such as noise, vibration, loss of fluid, etc.
d.) De-energize the heater electrical supply circuit until heater operation is required.

2.) Heater with built on or remotely mounted temperature control thermostat.
a.) Energize the heater electrical supply circuit.
b.) Set the temperature control thermostat above the room temperature.
c.) The heater and fan should come on and in 5 to 15 minutes reach a stable operating temperature. If the room temperature is high and the installation is above 3,300 feet, the unit heater may cycle on the thermal high limit cutouts of the motor or the heater.
d.) Check out and report any unusual or questionable operating characteristics, such as noise, vibration, loss of fluid, etc.
e.) Set the temperature control thermostat to the desired operating temperature.

3.) Heater with built on or remotely mounted fan switch, with temperature control thermostat.
a.) Place the fan switch in the fan position.
b.) Set the thermostat to a setting below the room temperature.
c.) Energize the heater electrical supply circuit.
d.) The heater fan should come on but the heater should remain off. If the room temperature is high and the installation is above 3,300 feet, the fan motor may cycle on the thermal high limit cutout. Reduced motor life could result from prolonged operation of the fan under these conditions.
e.) Place the switch in the auto position.
f.) The fan should go off.
g.) Set the thermostat to a setting above the room temperature.
h.) The fan and heater should operate. If the room temperature is high and the installation is above 3,300 feet (1000m), the unit heater may cycle on the thermal high limit cutouts of the motor or the heater.
i.) Check out and report any unusual or questionable operating characteristics, such as noise, vibration, loss of fluid, etc.
j.) Set the fan switch and temperature control thermostat to the desired operating positions.

B. Normal Operation. Prior to the start of the heating season, perform the electrical and mechanical annual maintenance steps.
a.) Perform the Initial Operation steps for the applicable temperature control option.
b.) Place all switches in their normal operating position and place the unit heater in service.

C. Manual Reset Thermal Cutout Operation. For all unit heaters with built-in manual reset thermal cutout with or without backup contactor.
a.) The only difference in heater operation from that described above for the applicable temperature control option on the heater is that if the manual reset thermal cutout trips. If it does, the cutout must be reset as follows.

=WARNING=
Potentially lethal voltages are present. Be sure to lock the branch circuit disconnect switch in the off position and tag the circuit "Out for Maintenance" before working on this equipment.

b.) De-energize the heater electrical supply circuit.
c.) Determine the reason for the manual reset thermal cutout actuating and rectify the situation.
d.) Remove the control enclosure cover.
e.) Reset the manual reset thermal cutout by pressing on the red stem in the center of the control.
f.) Replace the control enclosure cover securely.
g.) Energize the heater electrical supply circuit.
h.) The heater and fan should come on and in 5 to 15 minutes reach a stable operating temperature.
i.) Check out and report any unusual or questionable operating characteristics, such as noise, vibration, loss of fluid, etc.
j.) If heater operation appears normal, place the unit into normal operation.

VI. MAINTENANCE

A. Electrical

=WARNING=
Potentially lethal voltages are present. Be sure to lock the branch circuit disconnect switch in the off position and tag the circuit "Out for Maintenance" before working on this equipment.

Replacement of electrical components should only be done by authorized personnel familiar with the requirements of maintaining electrical equipment in an explosion-hazard area.

Replacement electrical components must be obtained from the factory to maintain the hazardous location rating.

1. Annually inspect all terminal connections, contactor and visible insulation for damage, looseness, fraying, etc., as applicable. Tighten any loose terminals and replace or repair damaged or deteriorated insulation. If contactor contacts are badly pitted, welded together, or burned, replace the contactor. Check all explosion-proof conduit for visible damage and tightness.

2. If reduced heat output is suspected, perform the mechanical checks, specifically steps 3 and 4. If low heat output is still suspected after completing the mechanical checks, verify the condition of the heating elements by

using an amperage meter to check the current draw of each input line. All input lines should draw approximately equal current which should agree with nameplate rating. If they do not, one or more of the heating elements could be burned out and the heater/core assembly should be replaced.

3. The electric motor is permanently lubricated and thermally protected. Check for smooth and quiet running at all inspections. Replace motor if excessive bearing play is detected. Contact the factory for instructions.

B. Mechanical

=WARNING=

The heat exchanger is a factory vacuum-sealed unit. Do not attempt to loosen or tighten any of the fill or drain plugs or attempt to operate the pressure relief valve. A loss of vacuum could cause nuisance tripping of the thermal cutouts or high valve to actuate with an accompanying loss of liquid.

1. Never attempt to fill, drain or check the liquid level of the heat exchanger or check the action of the pressure relief valve. Contact the factory for instructions.

2. The explosion-proof control box is designed with threaded joints and metal-to-metal contact at the lid or cover joints to prevent an explosion. Do not attempt to install gasket material of any type at these joints. A light coating of anti-seize compound is applied to the threads to prevent seizing.

3. Annually check the tightness of all visible bolts and nuts, in particular the support structure bolts and nuts. Similarly check the electric motor mounting bolts and nuts.

4. Periodically, check the motor, fan and heater core fins for cleanliness. A dirty heat exchanger can cause the unit to over heat and cycle on the thermal cutouts.

-CAUTION-

Disconnect the heater before cleaning. Be sure to lock the branch circuit disconnect switch in the "off" position and tag the circuit "Out For Maintenance" before working on this equipment.

If the dirt is loose dust, clean with a vacuum or by air jet. If the dirt can't be vacuumed or blown off, use a warm water spray directed to the inlet side of the heat exchanger then to the outlet side. A soft bristled brush may be required to loosen stubborn deposits. Be careful not to bend the aluminum fins on the heat exchanger or the fan blade propeller. Allow unit to dry before re-energizing.

-CAUTION-

The heat exchanger is filled with a mixture of water and inhibited propylene glycol. Contact with the fluid at operating temperatures may produce a burn hazard. The Material Safety Data sheets indicate that there is not a health hazard from coming in contact with the inhibited propylene glycol. Suggested first aid consists of flushing eyes with plenty of water and to wash off skin in flowing water or a shower.

5. Check louvers for position tightness and equal angle settings. Check motor and fan for smooth running. Any unusual noise or vibration must be investigated and rectified.

6. Should there be any evidence of fluid leakage from the heater core, the heater should be repaired immediately. The heater will not operate properly with a low fluid level. Do not operate the heater. Contact the factory for instructions.

VII. REFERENCE DATA

A. Wiring Diagrams. For wiring recommendations refer to the wiring diagram. A copy is provided inside the heater terminal box.

B. Exploded View. The exploded view is provided to help identify the various components making up the ULTRA-SAFE unit heater. Please use this view if it becomes necessary to communicate with the factory about replacement parts.

C. Data Plate Information. The data plate, item 6 on the exploded view, contains the catalog number and rating information. Please copy this information down and have it available when communicating with the factory.

Keep these instructions for future reference.

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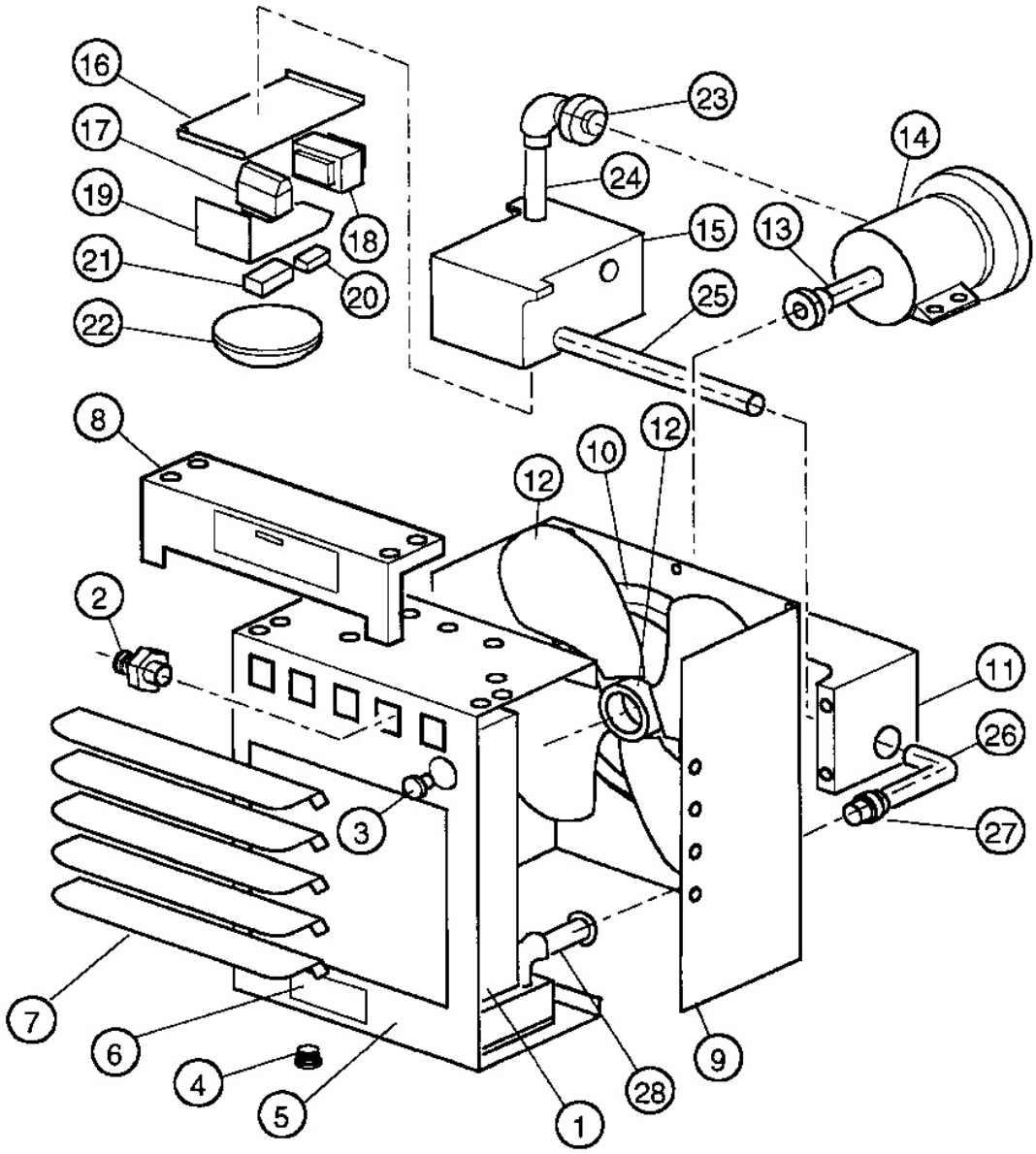

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	HEATER, HEAT EXCHANGE ASSEMBLY	15	EXPLOSION-PROOF CONTROL ENCLOSURE
2	PRESSURE RELIEF VALVE	16	MAIN MOUNTING PLATE
3	FILL PORT PLUG	17	CONTROL CONTACTOR
4	DRAIN PLUG	18	CONTROL TRANSFORMER
5	CABINET, FRONT	19	TERMINAL BLOCK MOUNTING PLATE
6	DATA PLATE	20	CONTROL TERMINAL BLOCK
7	OUTLET LOUVERS	21	POWER TERMINAL BLOCK
8	TOP CAP	22	CONTROL ENCLOSURE COVER
9	CABINET, BACK	23	MOTOR UNION
10	FAN INLET	24	MOTOR CONDUIT
11	MOTOR MOUNTING PAN	25	HEATER CONDUIT
12	FAN BLADE	26	ELBOW
13	FAN HUB	27	HEATER UNION
14	FAN MOTOR	28	HEATER NIPPLE