Lexin Energy Systems

Lexin Comfort Heating

Technical Documentation
North America

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Introduction

Lexin's Comfort Heating is a far infrared-based primary heating system; typical applications are:

1. Residential heating
2. Office heating
3. Heating of the workplace
4. Heating of sunrooms, patios, covered porches
5. Heating of room additions
6. Heating of basements

Lexin also produces various other heating products; the following is a listing for reference only (some products are under development and/or awaiting approvals):

Lexin Sauna Heating

1. Sauna heating
2. De-acidifying of the body
3. Assist in burning body fat

Lexin Agricultural and Livestock Heating

1. Heating stables.
2. Heating Greenhouses
3. Heating Barns
4. Heating birthing and nursery buildings (cattle, poultry, hogs, etc.)
5. Drying feed/grain
6. Minimizing moisture, ground pollution, bacteria and mold

Lexin Industrial Heating

1. Heating of car wash; allowing operation in subzero temperatures
2. Drying of wood, paint, stucco, concrete, etc.
3. Drying, drying paint, regulating relative air humidity etc.
4. Commercial grills
5. Water heating
6. Water purification
7. Desalinization

Lexin Medical Heating (utilizing the beneficial aspects inherent to biogenetic infrared):

1. Physiotherapy.
2. Body fat reduction
3. Skin therapy
4. De-acidifying of the body etc,

For further information, please contact your Lexin representative, or Lexin USA.

Infrared heat

What is infrared heat?

Lexin's infrared is best compared to the warmth of the sun. The vast amount of energy emitted by the sun is transported to the surface via electromagnetic beams that are divided into different wavelengths. The unit for this subdivision is nanometer. (1 nm= 1 millionth of a millimeter)

Each wavelength transports a certain amount of energy. The higher the frequency of these waves, the shorter the wavelength and the shorter the wavelength the more energy it can carry, in other words: the higher the frequency, the shorter the wavelength, and the higher the energy level.

The radiation emitted by the sun is partly absorbed by the atmosphere only a small portion reaches earth.

Beams that do reach the surface contain a number of wavelengths ranging from Ultraviolet light (UV) via the visible light to Infrared Radiation (IR).

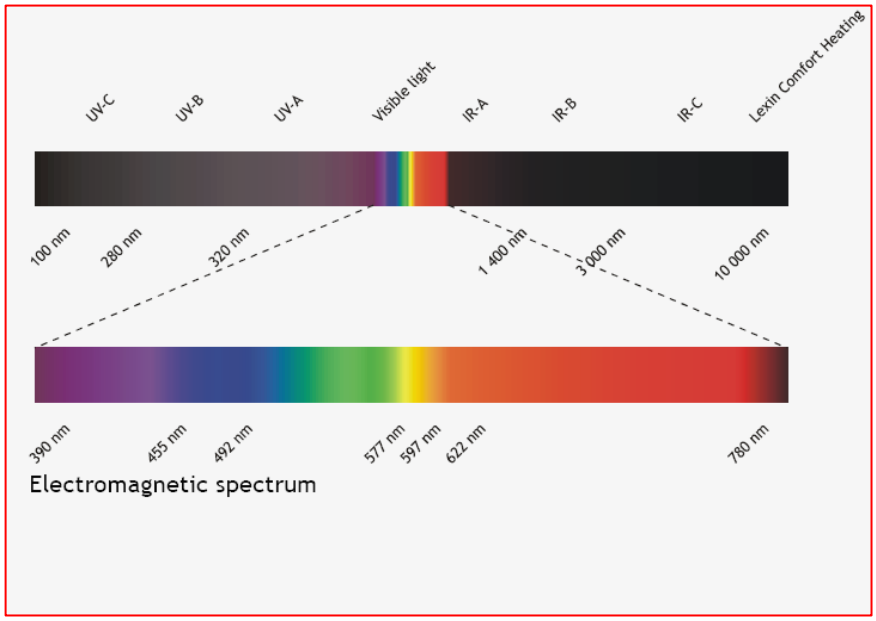
Ultraviolet light has a high frequency and thus a short wavelength that possesses a large amount of energy. This energy can cause our skin to burn or even develop cancer after prolonged exposure.

Visible light has a lower frequency containing less energy.

Infrared light has the lowest frequency of all and therefore also the lowest energy level.

Wavelengths are classified as follows:

Light	Wavelength
UV-C	100 – 280 nm
UV-B	280 – 320 nm
UV-A	320 – 390 nm
Violet	390 – 455 nm
Blue	455 – 492 nm
Green	492 – 577 nm
Yellow	577 – 597 nm
Orange	597 – 627 nm
Red	627 – 780 nm
IR-A	780 – 1,400 mm
IR-B	1,400 – 3,000 nm
IR-C	3,000 – 10,000 nm



Note: 1,000 nm is 1 micrometer
10,000 nm is 10 micrometer

Lexin Infrared Heat

The Lexin flat-screen heating panels emit "far or biogenetic infrared", which is infrared (invisible) light with a wavelength of 10,000 nm, or 10 micrometer, that has medically recognized beneficial effects on the human body.

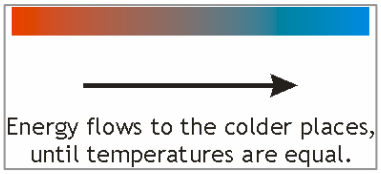
In contrast to other infrared appliances, such as infrared lamps that can reach temperatures up to 4,000 ºF (2,200 °C), Lexin's panels have a relatively low film temperature of less than 300 ºF (150 °C); during normal operation, the surface temperature is typically less than 212 ºF (100 °C)

Conduction, Convection or Infrared Heating

There are several ways to transport heat:

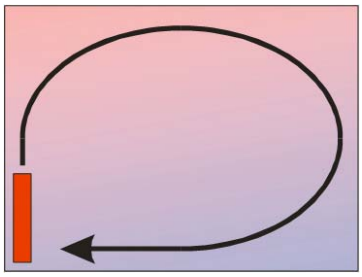
Conduction

Material is used as the transport medium. For instance the cooking pan: The bottom of the pan is heated by a gas flame, or electric element, and the heat is then conducted to the inside of the pan.



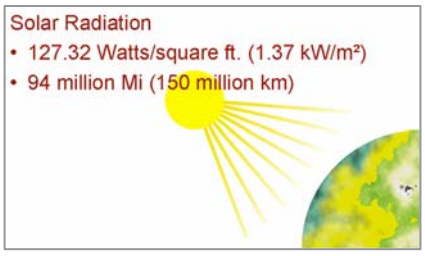
Convection

In most cases of convection the air is used as a medium for heat transport. This particular way of heating is widely used in residential and commercial applications worldwide. This can be a hot air/forced air system, such as used throughout North America, or a water/steam-based system whereby a radiator heats the air - - warm air that rises to the ceiling and cold air pulled through the return ducting or radiator base, where it is heated, creating an airflow which heats the entire space.



Infrared

Infrared Heating requires no medium to transport warmth. When the invisible light collides with (or is absorbed by) surfaces, including the human body, warmth is generated. This is also known as "direct" heating or the same sort of heating we experience through the sun.



When an object has a higher temperature than its surroundings it will generate the same infrared light heating other objects in turn. This is also called "indirect" heating.

Lexin Comfort Heating

Introduction

This chapter describes the properties of the Lexin Comfort Heating and its impact on energy consumption and health.

Some of the advantages with respect to convection heating

The following table identifies the advantages of the Lexin's Comfort Heating over conventional convection heating:

Lexin Comfort Heating	Convection Heating
Objects are heated directly IR.	Objects are heated through surrounding air.
Air is NOT heated causing NO airflow and therefore NO dust circulation.	Air is heated causing airflow and causing dust to circulate.
Surrounding air makes for a good insulator, which allows the surrounding temperature to be lower.	The surrounding air is constantly circulating making it a poor insulator.
The difference between floor and ceiling temperature is negligible (usually only less than a few degrees).	The difference between floor and ceiling temperature is significant (generally 10 degrees or more) because hot air rises.

Health aspects

Internationally accepted scientific research recognizes that infrared warmth with a wavelength of 10 micrometer (10,000 nm), also known as biogenetic or far infrared, stimulates the growth and health of cells. Biogenetic infrared does more than activate water molecules in your body; it also causes them to resonate and ionizes them. This in turn stimulates and improves not only your blood circulation but also your metabolism.

Beneficial effects:

1. Improves oxygen content in blood
2. Disintegrates body fat, cholesterol, chemicals and waste products
3. Removes heavy metals from bloodstream
4. Reduces the pH value (milk acid)
5. Improves the perspiration system
6. Prevents bacteria from growing
7. Reduces muscular pain
8. Accelerates cell regeneration

Based on the benefits outlined above, Lexin's heaters can be used for the following applications:

1. Controlling pains caused by rheumatism
2. Reducing body fat and cholesterol levels
3. Diminishing lactic acid during the cooling down period (infrared sauna)
4. Physiotherapy, and sports applications; heating and loosening muscles
5. Removing waste products through infrared sauna sessions; far infrared saunas remove up to 25 % of waste products through perspiration, perspiration caused by hot air saunas consists of 95 to 97 % water

Furthermore, people suffering from rheumatism are very sensitive to particles stirred up by air circulation as well as relative air humidity fluctuations. The Lexin Comfort Heating offers relief for people suffering from asthma and rheumatism by keeping the air balanced and stable.

Objects are heated directly, so there is no dust circulation. Dust circulation caused by traditional heating can cause irritation to a person's airways or eyes (contact wearers).

Lexin's Comfort Heating runs silently because there are no moving parts or flowing air masses.

Negative affects:
Lexin's infrared heat is deemed safe and has no harmful influence on the human body. Please see a copy of the TAUW report. The TAUW laboratory evaluated the Lexin panels for possible health risks; their conclusion was that Lexin is much safer than a fluorescent light.

Besides human benefits, the Lexin technology is also used extensively in the poultry, cattle, hog, and equestrian industries. Lexin's infrared energy reduces or eliminates the need for antibiotics and other harmful medicines, improving the quality of meat, eggs and other animal products.

The Lexin System (key components)

The Lexin Comfort Heating System is comprised of a number of interactive components, all of which contribute to both the comfort levels and energy savings:

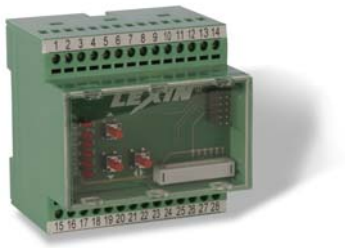
The Lexin Flat-screen Heating Panel:

The Heating Panels are responsible for producing Far-Infrared Light.

Heating Panels shown in the two standard US sizes.
The CH4824 and the CH2424 are designed to be surface-mounted, suspended by chains, or “drop-in” fit in a standard North American suspended ceiling grid (4’x 2’or 2’x 2’)

Controls (LHC-6 Controller and SR-20 Hybrid Relay)

In the Lexin system, the LHC-6 controller acts as the systems’ brain; it controls the heating panels by regulating their power cycle and intensity. It measures the panel’s film temperature (internal operating temperature) via a built-in panel sensor. It also receives room temperature data from the room thermostat and controls the room’s temperature.



The Hybrid Relay (SR-20) switches the heating panels’ AC power on and off. It boosts the low current switching information it receives from the LHC-6. One LHC-6 can drive many SR-20 relays (see installation section for more details).

Thermostats:

The thermostat measures the room temperature and sends this information back to the control system. The standard US thermostat is the Lexin TH141 series smart thermostat. This thermostat is capable of controlling a 28 Volt AC system as well as the 5 Volt loop used in the Lexin system.

Picture may not be representative of thermostats offered in North America

Safety

1. Heated screens have a higher surface temperature than radiators; however the surface is not dangerous to the touch. Glass is a poor conductor that isolates the film (internal) temperature from the surface temperature by 25 to 40 degrees, which brings the surface temperature to an acceptable level.
2. The maximum film temperature is limited by design (approx. 350º F, or 180º C). The heaters also feature redundant safety switches that interrupt the AC current when these reach 300º F (150º C), ruling out overheating or fire hazard. Please note, that in a properly installed and programmed system, these temperatures cannot be reached.
3. The screens have been tested and deemed save by TAUW, an independent safety testing laboratory.
4. Biogenetic infrared is known only to have a positive affect on the human body.

Maintenance

Maintenance is negligible.

The Lexin Comfort Heating has no moving parts, except for the thermal safety switches. In a properly installed and programmed system, these never would reach their switching temperature; the life expectancy of a properly installed panel is 20+ years.

Note: If the system is installed without a Lexin controller, the safety switch would become the "controller", limiting the internal temperature to 300º F (150º C), under these conditions it is expected to have a three-year lifespan.

Cleaning the glass:

Over time, it may be necessary to clean the glass. Switch off the system and wait for 30 minutes to allow the panels to cool down to room temperature. The panels may be cleaned with a damp towel with some liquid dish soap or glass cleaner; wipe the panels dry and wait 20 minutes before reactivating the system. Avoid using aggressive cleaning products that can harm the screen's frames.

Energy consumption

Ways Lexin's Comfort Heating Systems save energy:

1. Electricity is converted into invisible light (photons) at a rate of 10,000 BTU/KW (approximately three times the heating energy of traditional electric heat).
2. One panel (CH4824) can easily heat an entire 225-268 square foot room (20 to 25 m²) when used as primary heat source.
3. Installed as a properly controlled system, including LHC-6 controller and room thermostat, the Lexin panels will only consume 33 to 60 % of its installed capacity (depending on wall and floor temperatures within the space).
4. There is no heat-loss through transport.
5. Compared with convection system the infrared system has generally requires a lower thermostat setting/room temperature.
6. There is no need for a secondary distribution system.

7. The air is not heated keeping ventilation requirements and thus ventilation losses at a minimum.
8. Walls and window surfaces are kept free of undesirable hot airflows.
9. The Lexin system can be used to easily “zone” heating areas within one room.

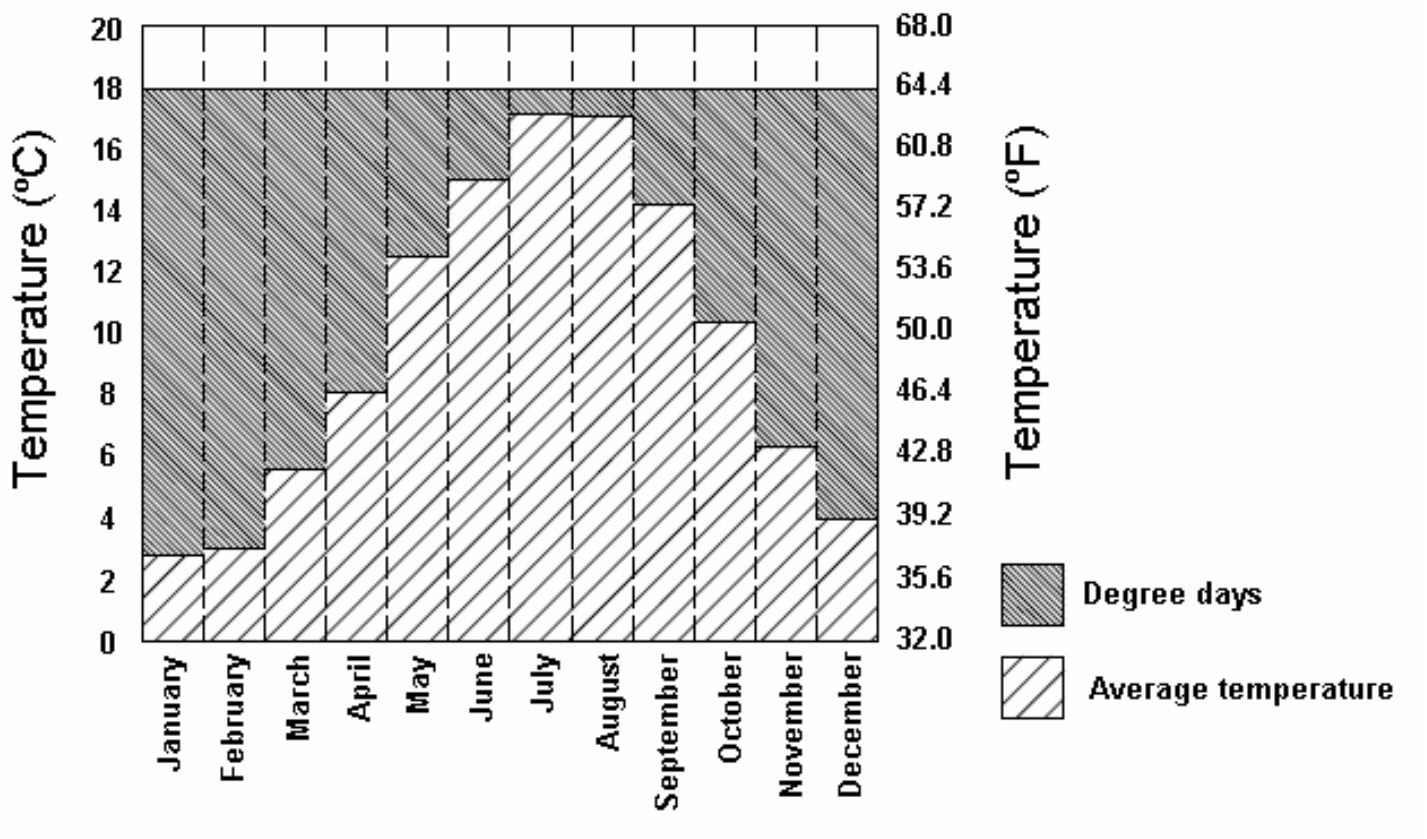
“Degree days” calculation

Degree days allow us to calculate the energy consumption. Keep in mind however that it is a mere estimate as it is subject to variables that can influence the actual consumption both in a positive and a negative way.

The calculation is based on the average day temperature measured by different national weather stations. The reference temperature is 64.4 °F (18 °C). The weighed degree day value equals 0 when the average day temperature for the entire month matches the reference temperature. This is greater than 0 when the average temperature is lower (see table on page 14).

Degree days link the external temperature to energy consumption. However, these do not take into account other weather influences, such as wind, and the direct warmth of the sun. To compensate for this, we multiply degree days with a weight coefficient dependent on the season.

Period	Weighing coefficient
Apr – Sep	0.8
Mar, Oct	1.0
Nov – Feb	1.1



Degree days calculated according to the average month temperature. This example is representative of an area like Western Washington, other regions may vary.

Month	Average temperature in - -°F (- - °C)	Difference to 64.4 °F (18 °C)	Number of days per month	Degree days - -°F (- - °C)	Weighing coefficient	Weighed degree days - -°F (- - °C)
January	37.0 (2.8)	27.4 (15.2)	31	849.4 (471.2)	1.1	934.3 (518.3)
February	37.4 (3.0)	27.0 (15.0)	28	756.0 (422.8)	1.1	831.6 (465.1)
March	42.1 (5.6)	22.3 12.4)	31	691.1 (384.4)	1.0	691.1 (384.4)
April	46.5 (8.1)	17.9 (9.9)	30	537.0 (297.0)	0.8	429.6 (237.6)
May	54.5 (12.5)	9.9 (5.5)	31	306.9 (170.4)	0.8	245.2 (136.3)
June	59.0 (15.0)	5.4 (3.0)	30	162.0 (90.0)	0.8	129.6 (72.0)
July	63.0 (17.2)	1.4 (0.8)	30	42.0 (24.8)	0.8	33.6 (19.8)
August	62.8 (17.1)	1.6 (0.9)	31	49.6 (27.9)	0.8	39.7 (22.3)
September	57.6 (14.2)	6.8 (3.8)	30	204.0 114.0)	0.8	163.2 (91.3)
October	50.7 (10.4)	13.7 (7.6)	31	424.7 (235.6)	1.0	424.7 (235.6)
November	43.3 (6.3)	21.1 (11.7)	30	633.0 (351.0)	1.1	696.3 (386.1)
December	39.2 (4.0)	25.2 (14.0)	31	781.2 (434.0)	1.1	859.3 (477.4)
Total						5483.2 (3 046.1)

Ask for your local degree days at the national meteorological weather centers to calculate your approximate energy consumption.

$$\text{Energy Consumption} = \text{Installed Capacity X } \frac{\text{Weighed Fahrenheit degree days X } 0.55556}{3.125}$$

$$\text{Energy Consumption} = \text{Installed Capacity X } \frac{\text{Weighed Centigrade degree days}}{3.125}$$

Energy consumption: Estimated energy consumption in kWh.
Installed capacity Installed total panel power in kW.
Weighed degree days Number of annually weighed degree days; Fahrenheit, or (Centigrade).

Total estimated energy cost:

To estimate the total energy cost, multiply the local energy cost per KWh with the energy consumption calculated above.

In some areas the operating cost may be lowered by applying for a multi-tier, or night tariff, and reprogramming the thermostat to take advantage of this. Simply elevate the thermostat's temperature during the cheaper night rate to accumulate warmth in walls and floors, and lower it during the day to benefit from the accumulated warmth.

Lexin's Flat-screen Heaters

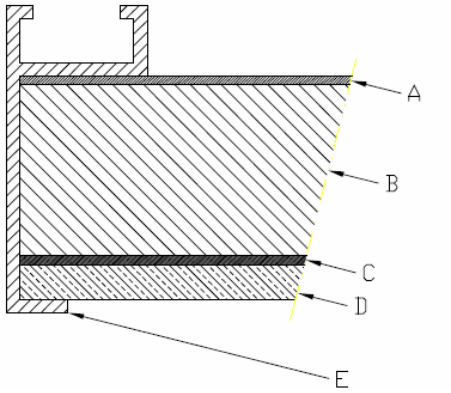
Product description

Lexin's state-of the art heating panels are UL listed devices; these are best described as flat, rectangular "lamps" that produce invisible light.

Glass panel:
Lexin starts with a piece of very pure hardened safety glass which has a colored backing (white textured is standard, black textured special order "standard", and float glass as options).

Silver Electrodes:
Imbedded are two silver electrodes that carry the electrical current to the semi-conductive patented blackbody paste.

Semi-conductive paste:
The paste is used to create the stimulated emission phenomenon. Electricity is used to excite photons present in the semiconductor; these keep speeding up until they "break free". Each photon and produce stimulates another and the photons multiply exponentially. The end result is Infrared light. This process is called "Stimulated Emission". Because Lexin's heat "energy" (photons) is generated in crystals, the wavelength is fixed. Lexin uses electricity to create stimulated emission at a fixed wavelength of 10,000 nm, or 10 micrometer, (Lexin's IR is emitted at an angle of 170°, all other IR has a temperature dependent wavelength and can only radiate at a 90 degree angle).



Cross section of Lexin Heater

A: Rear cover plate
B: Insulator (Glass Wool)
C: Patented paste (Blackbody with reflector)
D: Glass with Coloring and Electrodes
E: Aluminum Frame with mounting channel

Reflector:
Lexin employs a thin reflector layer at the back of the blackbody paste to direct the photons to the front of the glass.

Insulator:
To reduce the naturally occurring temperature losses, and hence maintain a desired film temperature at the lowest possible cost, the back of the glass is insulated by a layer of glass wool.

Housing:
The housing consists of an Aluminum frame and an Aluminum back plate.

Connections:
In North America, UL requires Aluminum encased (Flex) wiring; elsewhere, the panels are fitted with a thin, nonconductive cable.

Placement and Mounting:

Prior to installing the Lexin Systems, please read the following:
To ensure energy savings, the panels must be installed as a system (heater, controller, thermostat and relay). In properly installed and programmed heating systems the film only receives electrical energy when it needs it to maintain the stimulated emission; electrical power may be switched on and off many times before the thermostat tells the system it is warm enough. This is a form of "hysteresis.

The interaction of the room thermostat and the hysteresis result in a "modulation process", turning the heaters on and off. In contrast to other electrical heating systems, Lexin panels do not consume electricity all the time (when the room is still cool), but these cycle at regular intervals (40 to 60 % of the time). This means that when the room thermostat asks for more heat, the Lexin panels may be on or off, depending on their film temperature. During the time the thermostat asks for more heat, the Lexin panels are only using 40 to 60 % of their installed capacity. (The 20 % margin is due to variable factors such as: type of screen, control programming, and external conditions, such as weather, drafts, etc.)

North American standard sizes weigh between 14.3 to 26.4 lbs (6.5 to 12 kg) and are easy to handle. The dimensions are such that these can be placed in a 2 x2 or 2 x 4' grid suspended ceiling, 23.74" x 23.74" x 1.38" (603 x 603 x 35 mm), and 47.74" x 23.74" x 1.38" (121.6 x 603 x 35 mm). They can be located anywhere on, or in the ceiling to allow for optimal heat distribution.

Panels at operating temperature are not dangerous to the touch (glass is a notorious poor conductor that reduces high film temperatures to acceptable levels).
Although the panels are designed to be mounted in any direction, the primary locations are Ceiling or Wall.

1. Ceiling
   This is the ideal placement for the Lexin system as primary heating source. Suspend the panels if the ceiling is too high.

2. Wall
   Use the wall (flat at lower elevations, angled at higher elevations) when placement on the ceiling is not possible or as a decorative element (please note the 6' UL minimum height requirement).

3. Ceiling or Wall Comfort Zones
   Excellent for heating a specific area (or having different temperatures in these areas).

Ceiling-mount

There are 3 main reasons for placing the Lexin Heaters on the ceiling.
1) Ceiling placement ensures an optimal heat distribution.
2) There are fewer heat loss factors, so we need less energy for the film to maintain its operating temperature)
3) Ceiling placement is ideal for rooms (offices) where floors and walls are to be kept clear of heating units.

Wall-mount

If it is not possible to place the panels on the ceiling, these can easily be wall-mounted. Install the electrical hookup and just hang them on the wall like you would a painting. Lexin panels are all about being creative and about aesthetics. In addition to optional colors (if the film temperature is programmed at 110 degrees C or below), the panels may be painted or have them silk-screened with any picture or logo you desire, turning them into a decorative element. Please contact Lexin for approved paint types. There will be a slight loss of performance when the units are painted, in most cases 15-20%.

Comfort Zone(s); wall or ceiling:

The nature of infrared heat (heating objects not air) makes Lexin panels ideally suited for heating specific areas or zones. Make sure you place your panels in such a way that the IR-light covers the entire area you wish to heat.

Installation:

CH12261 series:
Models CH4824, CH4824S, CH2424, CH2424S

Technical information and Installation instructions for Lexin heaters:

This document covers the installation of the Lexin heaters; the control systems (LHC-6 controller, RY-120/SR20, Hybrid Relay, and TH-141 Thermostat) are covered in the LHC-6 controller manual and/or other respective accessory support documents.

Lexin heating panels may be installed in suspended ceilings, framed flush into traditional (joist/stud and plasterboard) ceilings/walls, or on the surface of ceilings or walls (UL requires that Lexin heaters are mounted 6' or higher above the floor).

Please use Lexin's sizing calculator and technical documentation to identify the correct locations for mounting the Lexin flat-screen heaters. A "rule of thumb" is 3.72 Watt of installed power per square foot (40 Watts/m²). A single heater should be mounted near the center of the ceiling; multiple units evenly distributed, but at least 3' from the walls. A CH4824 typically covers a 250 square foot room (24m²); a CH2424 a 125 square foot room (12m²).

<u>General:</u>

The Lexin heaters are shipped configured for surface mounting on a ceiling (preferred) or wall; these can also be dropped into a suspended ceiling, or may be free-air mounted on chains. The heater is considered a "zero clearance" device by UL, which means that the sides and back may be in contact with all normal building materials.

For a more astatically pleasing installation (standard walls or ceilings), the unit may be built-in utilizing "off the shelf" components available from local hardware stores. When the panels are completely enclosed, please make sure to leave 0.6" (1.5 cm) of open space behind the unit to ventilate at the rear. The clear space at the front should be 18" (50 cm).

If the installation requires cutting into the studs or joists, you may require the help of someone knowledgeable of local building codes and construction techniques. Optional new mounting arrangements are constantly being developed and, as part of Lexin's ongoing development program. Please check with your Lexin dealer for updates.

Make sure that the thermostat is not placed too close to the panels to avoid false temperature readings.

The maximum suspension height for the standard 3.72 Watt per square foot (40W per m²) is 8 to 10' (2.5 − 3.0 m). For a detailed description on panel placement, see "Transmission Calculation" section on page 36.

Wiring:
In the United States and Canada, UL requires hardwiring to a standard electrical box. To facilitate this, Lexin heaters are supplied with a 5/16" flex conduit fitted with a patented IBC snap-in connector. This connector fits into 0.6" knockouts. The wires within the conduit are Green (ground), White (neutral), and Black (line). One panel per zone must be equipped with an internal PT-1000 sensor; this sensor needs to be connected to the sensor input of the LHC-6 controller. For short runs (up to 50'), this can be a 22 AWG wire; for longer runs use 16 - 18 AWG. Details of the low voltage signaling wires can be found in the owner's/installation manuals of the LHC-6 controller.

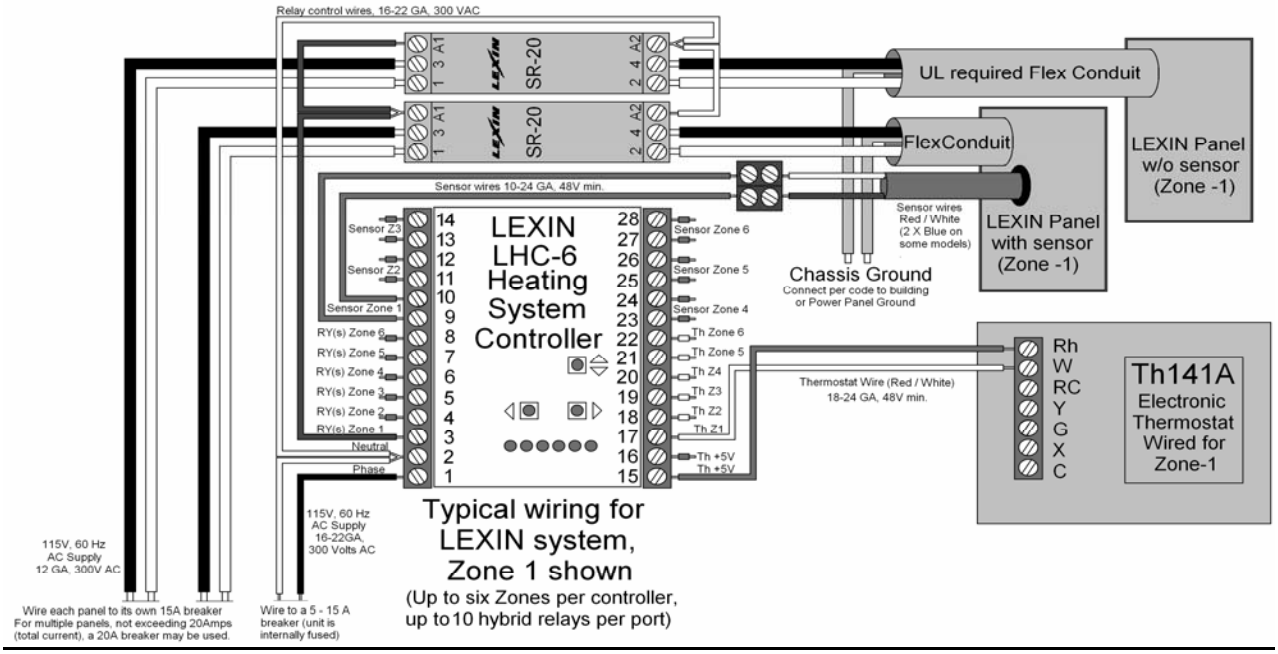
Saving Energy:
Lexin's heating system is designed to provide unparalleled energy savings. The Lexin LHC-6, six-zone smart controller receives data from both the Lexin TH-141 smart thermostat, and the heater's patented blackbody film; collectively these components save energy.

Power requirements:
A single CH4824, 1050 Watt heater must be connected to its own 15 Amp circuit breaker via 12 Gauge wire. One 20 Amp breaker can support a combination of one CH4824 and one CH2424, or three CH 2424 heating panels. Please note, the breakers must be clearly marked and there may not be any other devices connected to these!!

One RY-120/SR20 hybrid relay (controlled by the Lexin LHC-6 controller) can switch one CH4824, a combination of one CH4824 and one CH2424, or three CH 2424 heating panels. One LHC-6 "zone output" can drive up to ten RY-120/SR20 relays.

Typical Wiring:

The following diagram depicts the typical wiring for a Lexin System; more detailed wiring information can be found in the LHC-6 Energy Controller section



For 240 Volt heaters (specify with order), the quantity of panels per hybrid relay, or circuit breaker may be doubled as the current of these is half. For large installations, many heaters may be controlled by a single industrial relay that is driven by the controller or smaller relay. In these installations, each heater, or heater pair, must be protected by its own 15, or 20 Amp breakers respectively. In a 240 Volt system, the controller may be either 110 Volts, or 240 Volts (specify with order); the relays are full-range (90-260 Volts).

Alternative control (single panel installations and/or special applications):
For low-cost single panel CH4824 installations, a 110V, 60 Hz, 15 or 20 Amp UL listed or recognized thermostat may be used. For a single CH2424, a 6 to 20 Amp thermostat may be used. Please note that this increases energy consumption (in many cases significantly), and this reduces the warranty to three years.

In bathrooms, or for other short-use applications, a one - or two - hour timer, capable of supporting the total current, may be used in lieu of the LHC-6.

Please note that when alternative control devices are used in place of Lexin's controller, the warranty is limited to three years from date of purchase; it is five years for professionally installed systems with Lexin's LHC-6 controller.

I - Suspended Ceiling Installation (110 Volt panels shown):

Standard 4' x 2' and 2' x 2' panels:

1) Locate a suitable area and remove one or more of the ceiling panels.
2) Complying with local codes, install a code-compliant electrical box within reach of the panel(s); this is typically four feet or less from the short edge of the heater. The UL required 5/16" flex conduit requires an electrical box with a knockout (hole) of 0.6", or a 5/16" flex to 3/8 or ½-inch connector (not supplied). Do not connect more than one CH4824 heater per 15 Amp breaker, or a combination of one CH4824 and one CH2424, or three CH2424 heaters per 20 Amp breaker as this will void the warranty and could cause fires. For US/Canada, the wiring colors are: White for the neutral, black for the line (from the RY-120/SR20 hybrid relay), and green for the ground or earth. The sensor-equipped panel should be centrally located within the space.
3) To install the panel, ask a helper to hold the panel while the connections are being made; then insert the panel into the grid's opening and allow it to rest fully on the grid (see figure I-1). Alternately, remove two panels and lay the Lexin heating panel in one opening while connecting the wiring through the other.

Note: In regions prone to earthquakes and cities/counties where electrical/building codes require this, the 4 (supplied) hang-up clips must be attached to safety cables or wires (purchased from a local hardware store) which are firmly attached to both the Lexin heater and the ceiling joists above to comply.

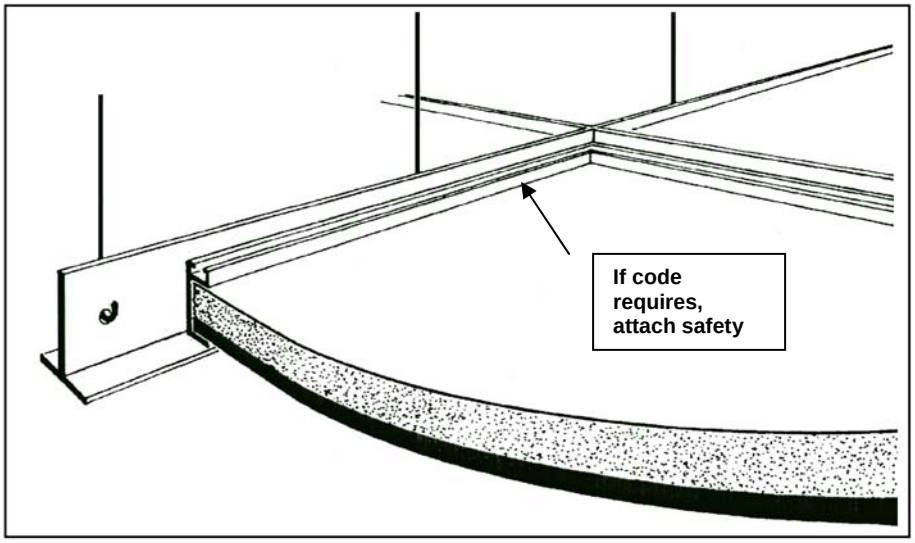


Figure I-1 Typical installation in suspended ceiling frame

Installation of CH4824 in Suspended Ceilings comprised of 2' square panels:

For installation of CH4824 (2' X 4') heaters in a ceiling comprised of 2' X 2' panels, the opening will need to be expanded to 2' X 4'; alternately, a two 2' X 2' heater(s) may be used.

Locate a suitable area and remove one of the 2' x 2' ceiling panels. Identify which rail is a

support rail and which is a cross member. Remove the panel on the opposite side of the cross member and remove one remaining cross member. Proceed as outlined above.

II - Free-air Suspended from Rafters or Joists

1. Locate a suitable area to attach the mounting chains (the weight per CH4824 plus its supply wiring is about 30 to 35 lbs, or 14 to 16 kg; one can generally use the same type and gauge normally used for suspended florescent lighting).
2. Complying with local codes, install a code-compliant electrical box within reach of the panel(s); this is typically four feet or less from the short edge of the heater. The UL required 5/16" flex conduit requires an electrical box with a knockout (hole) of 0.6", or a 5/16" flex to 3/8 or ½-inch connector (not supplied). Do not connect more than one CH4824 heater per 15 Amp breaker, or a combination of one CH4824 and one CH2424, or three CH2424 heaters per 20 Amp breaker as this will void the warranty and could cause fires. For US/Canada, the wiring colors are: White for the neutral, black for the line (from the RY-120/SR20 hybrid relay), and green for the ground or earth. The sensor-equipped panel should be centrally located within the space.
3. To install the panel, simply follow the procedures for hanging free-air suspended lighting.

III - Surface-mount on ceilings:

1) Locate a suitable area; then locate the ceiling joists. Mark where the panel would fit (locating an area that allows for at least two of the mounting brackets to be attached to a joist is preferred, though not required).
2) Cut an opening where the power cable exits the Lexin heating panel.
3) Complying with local codes, install a code-compliant electrical box within reach of the panel(s); this is typically four feet or less from the short edge of the heater. The UL required 5/16" flex conduit requires an electrical box with a knockout (hole) of 0.6", or a 5/16" flex to 3/8 or ½-inch connector (not supplied). Do not connect more than one CH4824 heater per 15 Amp breaker, or a combination of one CH4824 and one CH2424, or three CH2424 heaters per 20 Amp breaker as this will void the warranty and could cause fires. For US/Canada, the wiring colors are: White for the neutral, black for the line (from the RY-120/SR20 hybrid relay), and green for the ground or earth. The sensor-equipped panel should be centrally located within the space.
4) The CH4824 comes with six mounting clips, the CH2424 with four. Pre-drill the mounting holes and install wall/ceiling board anchors at the locations where there are no ceiling joists. Lexin requires wall/ceiling anchors that can support at least 25 lbs each to provide a 4 to 6:1 weight to anchor safety factor. The screws should enter the joist by at least 1" (typically No 8 x 1½", or 8 x 1¾"). Install at least two screws on one side first, leaving the heads out by about 1/8" so the panel can be "hooked" onto these when it is time to install the heater. Ask a helper to hold the panel while the electrical connections are being made; then install hook the panel onto the first 2 or 3 screws - - this will support the one side while the second side is being mounted. Next, install the screws on the opposite side, when finished, go back to the first screws, and tighten the first two or three screws. Six (6) or four (4) installation brackets are supplied with each heater, more may be ordered if needed. The installation may be framed to hide the mounting hardware. (See figure II-1)

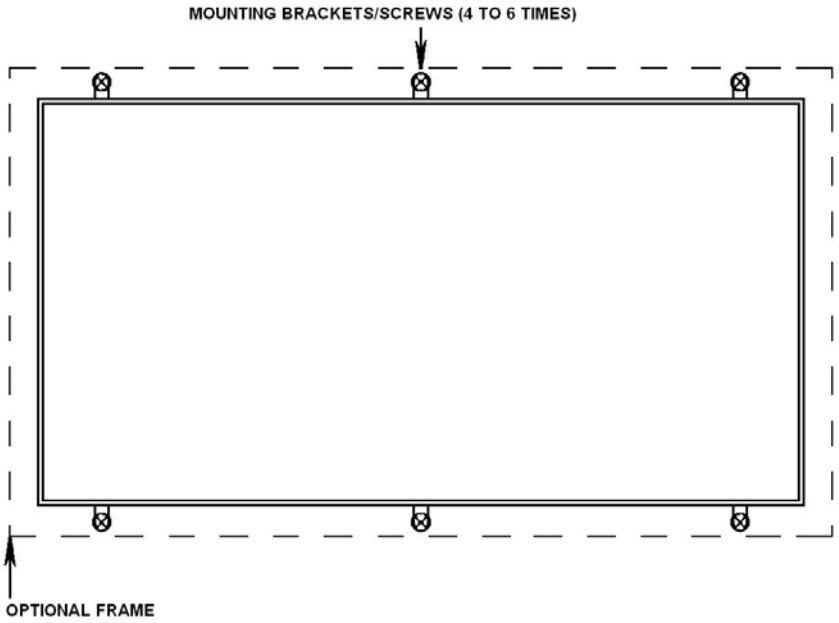


Figure II-1, ceiling surface mount

III - Surface-mount on walls:

The heaters may be installed permanently by locating 2 or more studs (typically 16" apart); then following the installation instructions for Traditional Ceiling installation, using the mounting brackets and optional frame as outlined above (see figure II-1). UL requires that Lexin heaters are mounted 6' or more above the floor!!

Optional Mounting brackets:

Lexin has introduced a new type of "snap-in" mounting bracket. Pre-production versions of this bracket are available in limited quantities. Full production is expected fall, 2007.

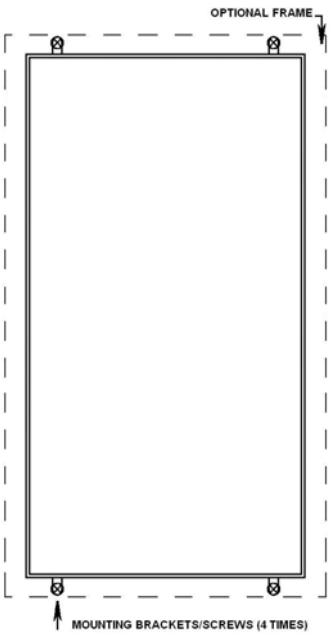


Figure III-1, fixed wall mounting

Note:

Because of Lexin's unique blackbody composition, when a heater is first installed (or after it has been switched off for a long time), it may take several hours before the unit reaches its rated power level. Hence, do not calculate the required breakers and relays based on the measured current when the heaters are first activated; use the product specifications instead. For a 20 Amp relay or breaker, the total installed current should be 18 Amps or less (1980Watts max. total); this would be one CH4824 and one CH2424, or three CH2424. For a 15 Amp breaker it is

13.5 Amps, do not install more than one CH4824, or two CH2424 units; do not exceed 1485 Watts total installed power. Local AC power fluctuations will affect the measured wattage; the product is designed to reach its rated power at 120 Volts AC.

High Moisture Areas

Regulations for heater placement in a wet room differ from location to location. If the insulation gets damp, it may take one or two hours for the panel to obtain its maximum power level. Please contact your Lexin representative for further information. Lexin's Comfort heaters are splash proof.

Colors

Standard colors are black and white (white textured is standard stock, black inquire).

Other RAL-colors, logos and pictures are optional.

The Lexin Control System: LHC-6 Energy Controller

Introduction

This section describes both operation and installation of the Lexin Energy Controller and associated Hybrid Relays.

The Energy Controller

The patented Lexin Comfort Heaters operate by "Stimulated Emission", produced by the application of quantum physics. The units only require electricity from time to time to maintain a certain "blackbody" film temperature. At this temperature, the units produce massive amounts of photons; these photons (invisible light) warm objects, people and animals as these collide with any non-reflective surfaces. This phenomenon continues without the application of electrical input until the film temperature drops below a certain level.

The Lexin Energy Controller ensures that just the right amount of energy is supplied to the film to keep the patented "Blackbody's" temperature in the operational range. Before the room thermostat indicates that the desired temperature has been reached, the controller may have switched the heater on and off hundreds of times, without any reduction in output. This produces energy savings impossible to obtain with traditional heating technologies.

The controllers are the key to Lexin's energy savings.

Theory of Operation

The Lexin Energy Controller contains six independent circuits, which provides for six independently definable comfort zones for the home or office. Per zone, one can control both the room temperature, and the heater's film temperature. A zone can be a living room, bathroom, or one or more bedrooms. In larger rooms, it is now possible to program several different comfort zones; now you can independently define each zone for optimal comfort and temperature.

Lexin's Energy Controller drives one or more hybrid relays, which are used to power the heaters; the controllers are 100% solid-state and contain six, low current line voltage drivers.

Each comfort zone requires at least one hybrid relay.

One hybrid relay can switch up to 20 A. This equals a maximum of 2.2 KW at 110 Volts. This can be one CH4824, three CH2424, or a combination of one CH4824 and one CH2424 per relay.

A comfort zone may be independently regulated in one of two ways:

- Regulated by temperature (greatest energy savings).
- Regulated by Pulse Width Modulation (PWM).

Systems Regulated by temperature

Programmed for temperature, the controller is able to accurately monitor the heater's film temperature, compare it with the pre-programmed temperature, and efficiently regulate its electricity supply. This requires an "S"-type heater. This is a heater with a built-in PT-1000 temperature sensor. The controller switches the hybrid relay on and off depending on the heater's current internal temperature. When the thermostat indicates that a large room temperature increase is required, the controller will automatically elevate the heater's film temperature to increase the heat intensity of the film. This means that temporarily the Infrared intensity will increase and the room will heat up faster. Once the new room temperature has been reached, the controller reverts to its normal setting.

The following table shows the typical programming for a residential installation:

Room	Room Temperature		Film Temperature	
Living room	71.6 ºF	22 ºC	230 ºF	110 ºC
Bedroom	64.4 ºF	18 ºC	194 ºF	90 ºC
Bathroom	75.2 ºF	24 ºC	257 ºF	125 ºC
Hallway	60.8 ºF	16 ºC	194 ºF	90 ºC
Kitchen	68.0 ºF	20 ºC	230 ºF	110 ºC

Systems Regulated by Pulse Width Modulation

In these systems, the controller cannot measure the actual film temperature. The PWM mode is based on standard predictions, and the heaters are being switched on and off with at predetermined intervals. During “cold starts”, the heaters are switched continuously until the room thermostat indicates that the room has reached its normal temperature.

Although the heaters are a little less expensive, and there is no need to wire the low-voltage sensors, the disadvantage is that there is no feedback from the film, and the controller does not know its actual temperature. This could cause situations whereby a room is not warm enough, or that the heaters in certain rooms use more energy than necessary.

The following table shows the typical PWM programming for a residential installation:

Room	**Room Temperature**			**PWM percentage**
Living room	71.6 ºF	22 ºC		60 %
Bedroom	64.4 ºF	18 ºC		40 %
Bathroom	75.2 ºF	24 ºC		75 %
Hallway	60.8 ºF	16 ºC		40 %
Kitchen	68.0 ºF	20 ºC		60 %

Operation

General

The Lexin Energy Controller features three buttons for programming, and six status "lights" (red LED indicators). The selection, or programming, is done by pushing the "UP" and "Down" buttons; the desired values are stored when the "double arrow" (right bottom) button is pushed. To access the programming controls, carefully lift the clear cover and follow the directions below:

"UP" Button

Used to select a "Zone" as well as for setting up the desired film temperature.

Indicator Lights (LED)

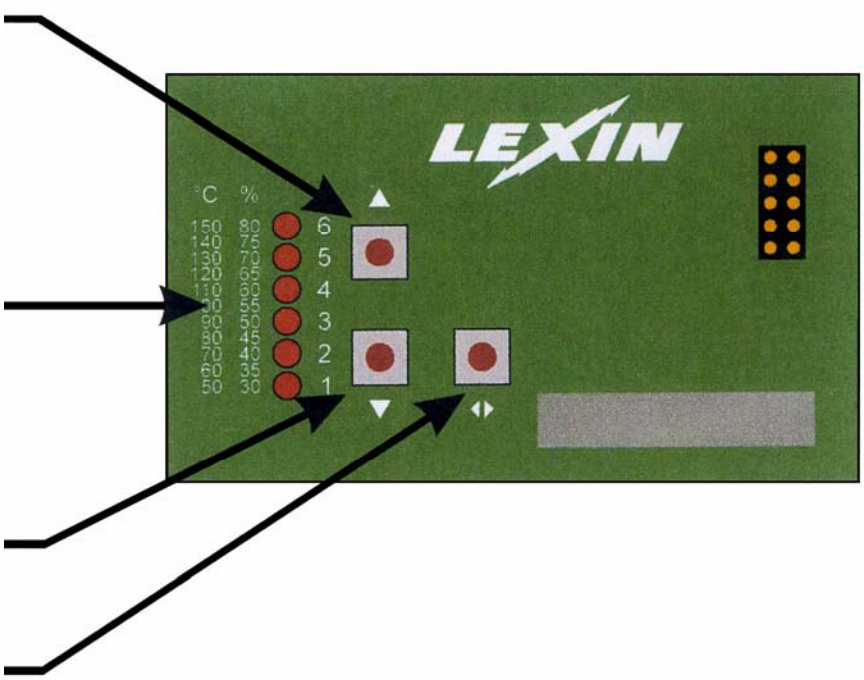
The LED indicators display the controller's status (zones active or inactive), and film temperature in the programming mode.

"Down" Button

Used to select a "Zone" as well as for setting up the desired film temperature.

"Enter" Button

Pushing the button will store the programmed data to the controller's memory.



During normal operation, the red lights indicate the state of the six independent temperature zones; it shows which are drawing current, and which are not. The number associated with each indicator depicts the relevant temperature, or "comfort" zone.

During programming, or during film temperature measurements, the indicators reflect the film temperature or PWM percentage. Various options are accessed via the push buttons.

The temperature and PWM percentages are listed to the left of the displays; specific illumination sequences are used to indicate eleven temperature/PWM percentages with only six indicators.

Temperature Controlled

Normal Operation

During normal operation, the status of each comfort zone is displayed through the respective the LED indicators. The following table shows the various operational states and what these mean:

Programming the desired heater film temperature

Each zone may be programmed to have its own independent film temperature.

State (single comfort zone referenced)	Light Pattern (single comfort zone)
Switched Off • The thermostat is switched off manually • The room has reached its preset temperature and the thermostat has switched the zone off • ***No energy is consumed by the heater***	**Switched "off" (LED dark)**
Room is cold, but film temperature has reached its operating level • The room temperature is still low; the thermostat is "on" • The film temperature is at its normal operating level, photons are generated, and the objects in the room are being heated. • ***No energy is consumed by the heater***	**LED flashes slowly, two seconds off and two seconds on**
Room is cold, and film temperature is too low • The room temperature is low, the thermostat is "on" • The Lexin heater is "on", electrical current flows to the film • ***The heater consumes energy***	**LED is switched on (steady bright red)**

- To program, first select the desired zone by pushing the up or down buttons repeatedly until the LED next to the desired zone flashes (0.5 seconds “on” and 0.5 seconds “off”).
- After selecting the desired zone, push the "ENTER" (double arrow) button. The film temperature can be read next to the LED that is not illuminated. When two adjacent indicators are off, the film temperature is the value between these
- To set a new film temperature, repeatedly push the up or down buttons until the LED next to the desired temperature is off.
- To store the new setting, and go back to the normal operating mode, push the “ENTER” (double arrow) button again.

Verifying the present film temperature

In the temperature-controlled mode, the controller offers the ability to measure the actual film temperature for every zone (provided it has a panel with a sensor connected to it). This feature is handy to verify the sensor's wiring, and the heater's operation upon completing the installation. To run this tests follow the following steps:

- First, enable the "measure" mode by pushing down o the "UP" or "DOWN" buttons for at least 5 seconds. When this state is reached, the indicators will flash very fast.
- Next, select the desired zone by pushing the up or down buttons repeatedly until the LED next to the desired zone flashes (0.5 seconds "on" and 0.5 seconds "off").
- Push the "ENTER" (double arrow) to display the current film temperature. The film temperature can be read next to the LED that is not illuminated. When two adjacent indicators are off, the film temperature is the value between these.
- When one or two indicators are switched off, the zone is temperature controlled, and the heater's built-in temperature sensor is connected correctly (please ensure that the correct sensor is connected, the controller verifies that a sensor is connected, it cannot detect if it is the correct or wrong sensor for this zone).
- When the temperature sensor is not connected, or is not connected correctly, the upper or lower indicators will flash on and off, indicating that the zone is operating in the PWM controlled mode.
- To return to the normal operating mode, press any of the three push buttons, or wait for 60 seconds; the controller will reset automatically after 60 seconds.

PWM Controlled

Normal operation

During normal operation, the status of each comfort zone is displayed through the respective LED indicators. The following table shows the various operational states and what these mean:

State (single comfort zone referenced)	Light Pattern (single comfort zone)
Switched Off • The thermostat is switched off manually • The room has reached its preset temperature and the thermostat has switched the zone off • ***No energy is consumed by the heater***	**Switched "off" (LED dark)**
Room is cold, but the PWM circuit has calculated that the film temperature should have reached its operating level • The room temperature is still low; the thermostat is "on" • The film temperature is assumed to be at its normal operating level, photons are generated, and the objects in the room are being heated. • No energy is consumed by the heater	**LED flashes slowly, two seconds off and two seconds on**
Room is cold, and film temperature is too low • The room temperature is low, the thermostat is "on" • The Lexin heater is "on", electrical current flows to the film • ***The heater consumes energy***	**LED is switched on (steady bright red)**

Programming the desired PWM percentage

Each zone may be programmed to have its own independent “film temperature”; in the PWM mode, this an estimated value based on a preset program (the controller cannot measure the actual film temperature, because there is no sensor connected).

- To program, first select the desired zone by pushing the up or down buttons repeatedly until the LED next to the desired zone flashes (0.5 seconds “on” and 0.5 seconds “off”).
- After selecting the desired zone, push the "ENTER" (double arrow) button. The PWM percentage can be read next to the LED that is not illuminated. When two adjacent indicators are off, the film temperature is the value between these
- To set a new PWM percentage, repeatedly push the up or down buttons until the LED next to the desired temperature is off.
- To store the new setting, and go back to the normal operating mode, push the “ENTER” (double arrow) button again.

Verifying the present film temperature

When the system operates in the PWM mode, the film temperature can be measured with an in infrared thermometer; alternately, it can be "read" by the controller following the steps outlined on page 6. Please keep in mind that the "film temperature" is a calculated value that may not be 100% accurate, but should suffice for most purposes.

Factory defaults

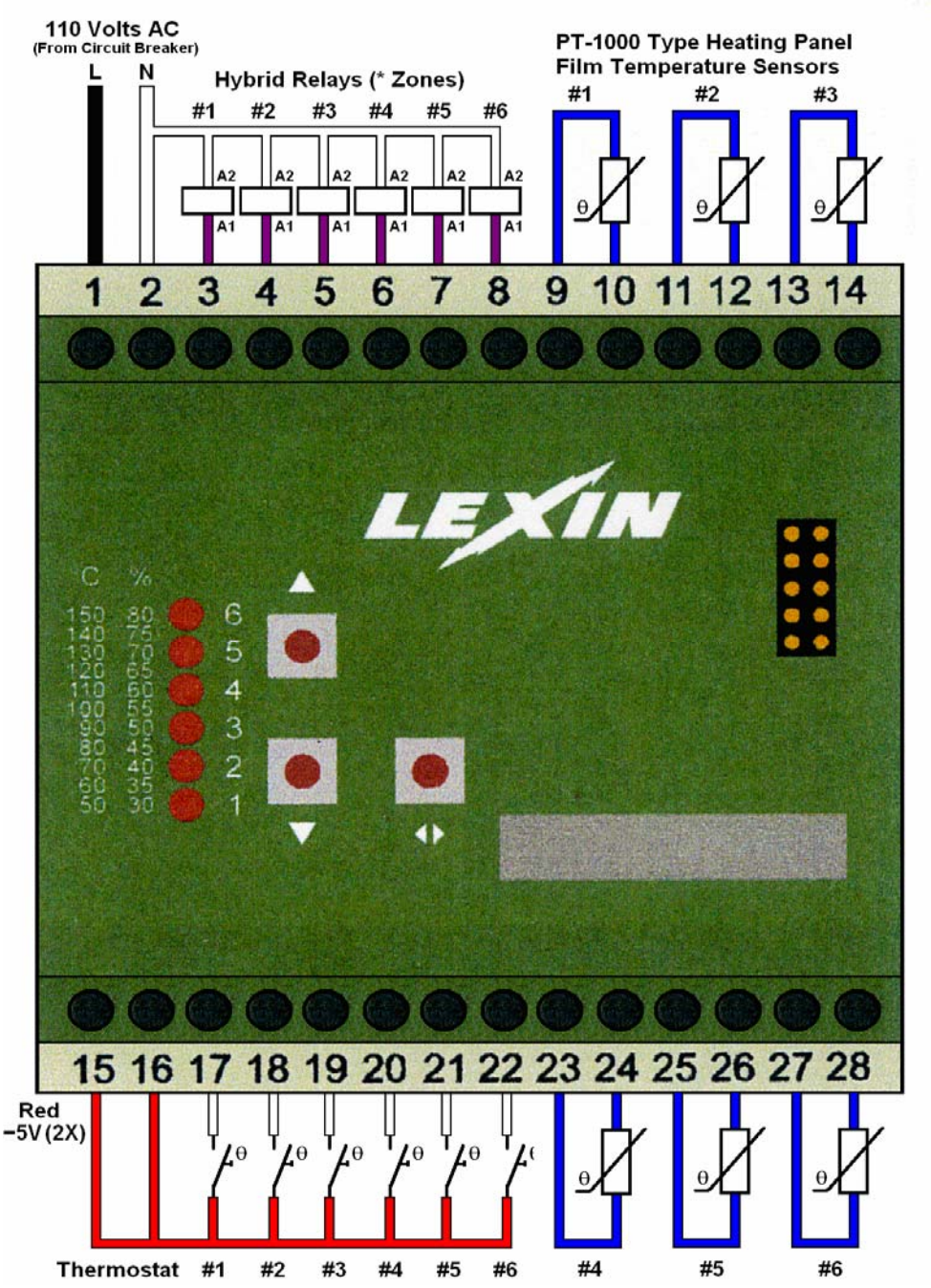
To restore the factory defaults, please follow the following steps:

- Switch off the controller's AC power supply.
- Press and hold both the "UP" and "DOWN" buttons.
- Switch the AC power back on while holding done these buttons.
- Do not switch off the power for at least 30 seconds; the controller needs this time to write the new settings to its memory.

Installation

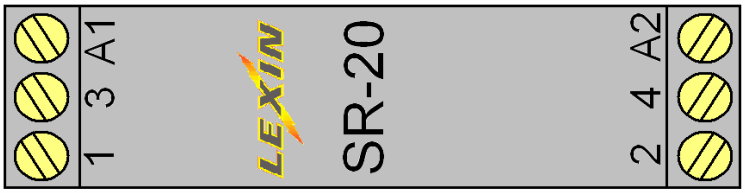
Lexin's Energy Controller and associated hybrid relays are mounted by simply snapping these on a 35 mm DIN rail. A typical system consists of a number of Lexin flat-screen Comfort Heating panels, one or more room thermostats, the Lexin Energy Controller, and the hybrid relays. (Should the size of your installation dictate the use of alternate relays, please contact your Lexin representative for additional information/specifications.) This section addresses the installation of the Energy Controllers and Hybrid relays.

Connections (pin-outs) Energy Controller 110 VAC



Pin	Function	Description
1	Line	Line Voltage in, 110 Volts, 60 Hz
2	Neutral	Neutral (controller and relay coil feed only)
3	Zone-1 Out	Switched AC line Voltage Output # 1
4	Zone-2 Out	Switched AC line Voltage Output # 2
5	Zone-3 Out	Switched AC line Voltage Output # 3
6	Zone-4 Out	Switched AC line Voltage Output # 4
7	Zone-5 Out	Switched AC line Voltage Output # 5
8	Zone-6 Out	Switched AC line Voltage Output # 6
9	Sensor -1A	Temperature Sensor Loop # 1A (5 VDC)
10	Sensor -1B	Temperature Sensor Loop # 1B (5 VDC)
11	Sensor -2A	Temperature Sensor Loop # 2A (5 VDC)
12	Sensor -2B	Temperature Sensor Loop # 2B (5 VDC)
13	Sensor -3A	Temperature Sensor Loop # 3A (5 VDC)
14	Sensor -3B	Temperature Sensor Loop # 3B (5 VDC)
15	Thermostat Main	Thermostat, common (-) 5 Volt supply
16	Thermostat Main	Thermostat, common (-) 5 Volt supply
17	Thermostat # 1	Thermostat, zone 1 (5 VDC)
18	Thermostat # 2	Thermostat, zone 2 (5 VDC)
19	Thermostat # 3	Thermostat, zone 3 (5 VDC)
20	Thermostat # 4	Thermostat, zone 4 (5 VDC)
21	Thermostat # 5	Thermostat, zone 5 (5 VDC)
22	Thermostat # 6	Thermostat, zone 6 (5 VDC)
23	Sensor -4A	Temperature Sensor Loop # 4A (5 VDC)
24	Sensor -4B	Temperature Sensor Loop # 4B (5 VDC)
25	Sensor -5A	Temperature Sensor Loop # 5A (5 VDC)
26	Sensor -5B	Temperature Sensor Loop # 5B (5 VDC)
27	Sensor -6A	Temperature Sensor Loop # 6A (5 VDC)
28	Sensor -6B	Temperature Sensor Loop # 6B (5 VDC)

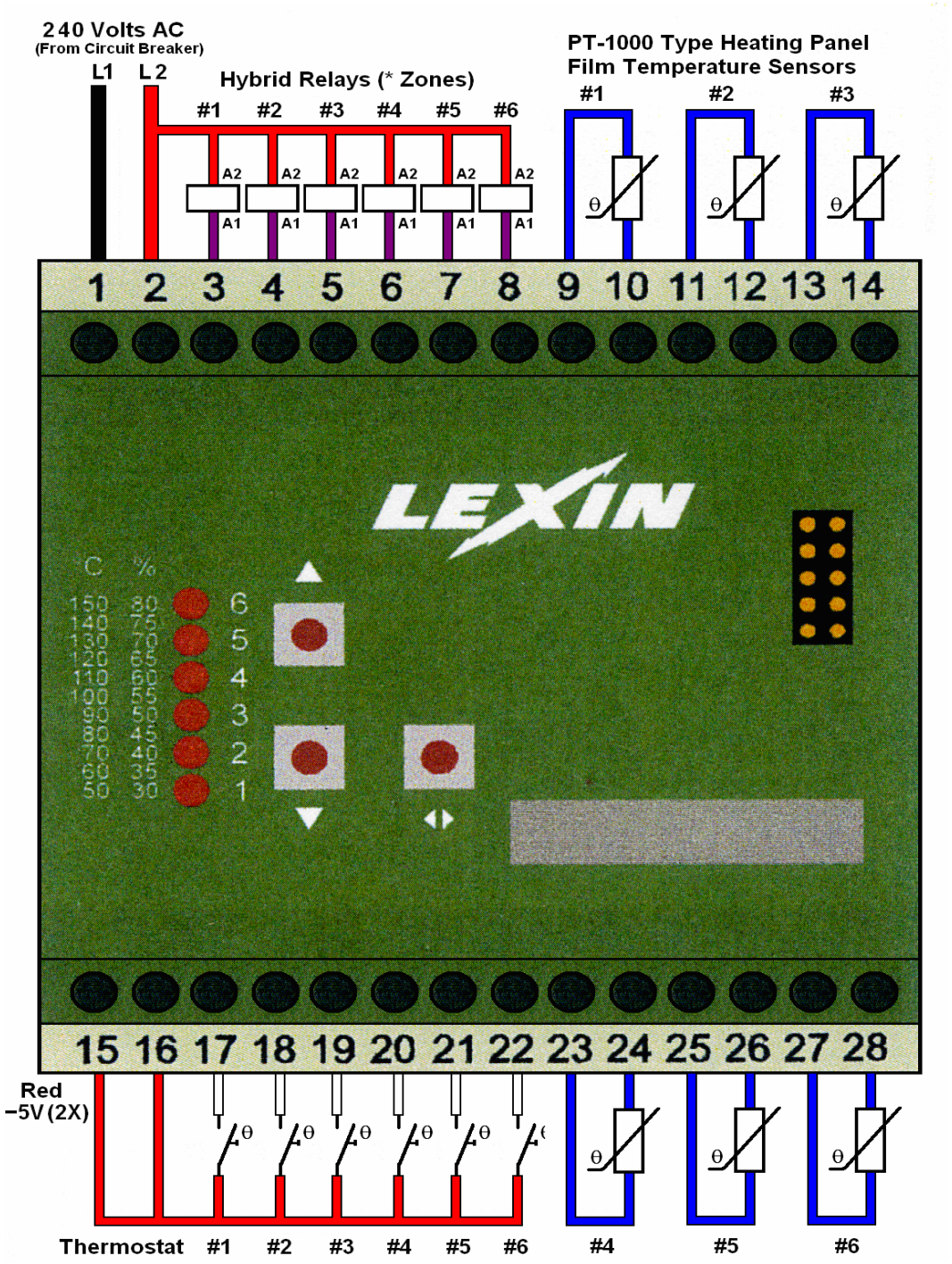
Connections (pin-outs) Hybrid relay, 110 Volts



Pin	Function	Description
1	Neutral	Neutral for relay and load (heaters)
2	Neutral Load	Neutral for load only, internally connected to pin-1
3	Line in	Line Voltage in, 110 Volts, 60 Hz (hybrid section of relay and load)
4	Load Line out	Switched AC line Voltage to load
A1	Relay Coil A1	Driven by controller's zone "n" switched line output
A2	Relay Coil A2	Relay neutral typically connects to controller, pin-2

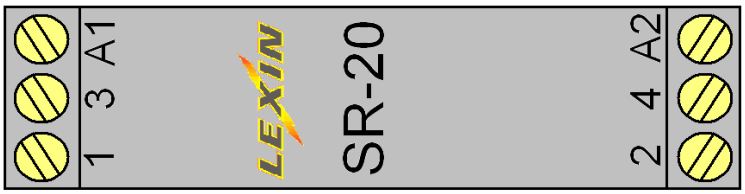
Connections (pin-outs) Energy Controller 240 or 277 VAC

For installations requiring 240 or 277Volt heating panels, the installer has the option of installing a 110 Volt, a 240 Volt, or a 277 Volt controller. Note: although the SR-20 Hybrid Relay can accept the control voltage from any of these three controllers, there is a physical difference between each of the controllers - - please specify the intended voltage when ordering 240 or 277 Volt controllers. Please see the information on the next page addressing the relay requirements for 277 Volt installations.



Pin	Function	Description
1	Line 1	Line 1 (phase 1) Voltage in, 240/277 Volts, 60 Hz between phases
2	Line 2	Line 2 (phase 2) Voltage return (controller and relay coil feed only)
3	Zone-1 Out	Switched AC line Voltage Output # 1
4	Zone-2 Out	Switched AC line Voltage Output # 2
5	Zone-3 Out	Switched AC line Voltage Output # 3
6	Zone-4 Out	Switched AC line Voltage Output # 4
7	Zone-5 Out	Switched AC line Voltage Output # 5
8	Zone-6 Out	Switched AC line Voltage Output # 6
9	Sensor -1A	Temperature Sensor Loop # 1A (5 VDC)
10	Sensor -1B	Temperature Sensor Loop # 1B (5 VDC)
11	Sensor -2A	Temperature Sensor Loop # 2A (5 VDC)
12	Sensor -2B	Temperature Sensor Loop # 2B (5 VDC)
13	Sensor -3A	Temperature Sensor Loop # 3A (5 VDC)
14	Sensor -3B	Temperature Sensor Loop # 3B (5 VDC)
15	Thermostat Main	Thermostat, common (-) 5 Volt supply
16	Thermostat Main	Thermostat, common (-) 5 Volt supply
17	Thermostat # 1	Thermostat, zone 1 (5 VDC)
18	Thermostat # 2	Thermostat, zone 2 (5 VDC)
19	Thermostat # 3	Thermostat, zone 3 (5 VDC)
20	Thermostat # 4	Thermostat, zone 4 (5 VDC)
21	Thermostat # 5	Thermostat, zone 5 (5 VDC)
22	Thermostat # 6	Thermostat, zone 6 (5 VDC)
23	Sensor -4A	Temperature Sensor Loop # 4A (5 VDC)
24	Sensor -4B	Temperature Sensor Loop # 4B (5 VDC)
25	Sensor -5A	Temperature Sensor Loop # 5A (5 VDC)
26	Sensor -5B	Temperature Sensor Loop # 5B (5 VDC)
27	Sensor -6A	Temperature Sensor Loop # 6A (5 VDC)
28	Sensor -6B	Temperature Sensor Loop # 6B (5 VDC)

Connections (pin-outs) Hybrid relay

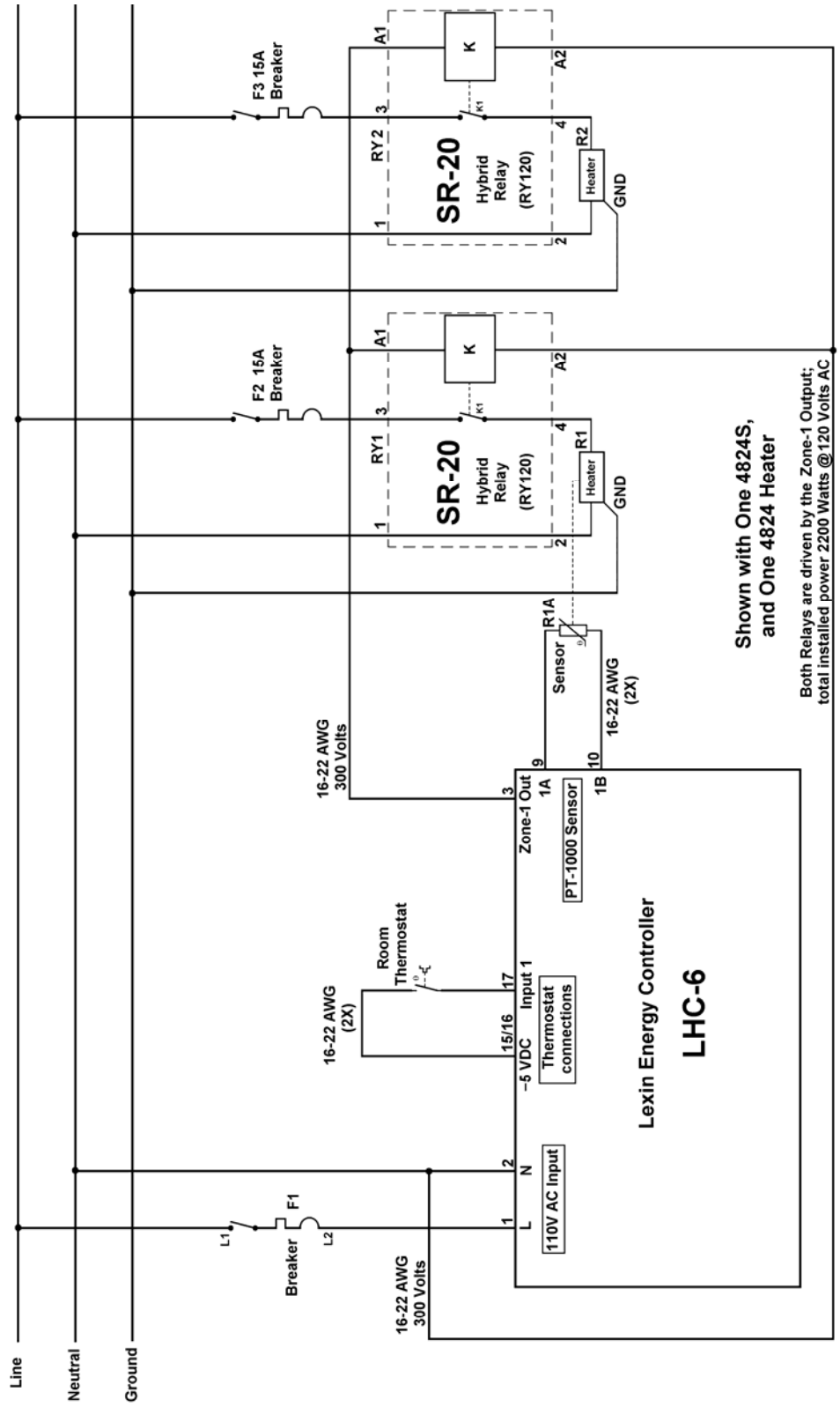


Note: the 277 Volt relay is internally modified to operate above 260 VAC

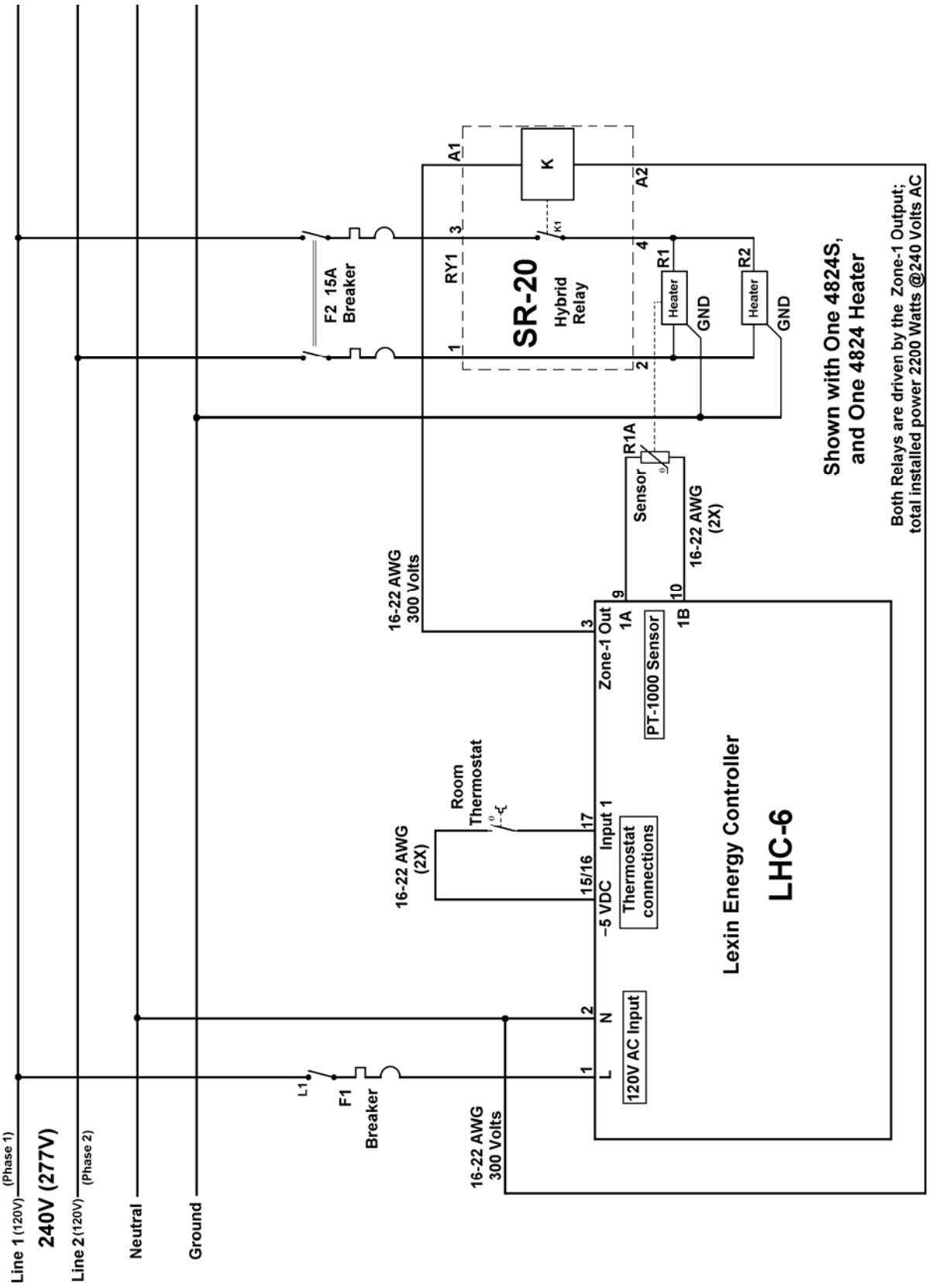
Pin	Function	Description
1	Line 2	Line 2 (phase 2) return for relay and load (heaters); 240/277V between phases
2	Line 2 Load	Line 2 (phase 2) return for load only), internally connected to pin-1
3	Line 1 in	Line 1 (phase 1) Voltage in, 240/277 Volts, 60 Hz (hybrid section of relay and load)
4	Load Line out	Switched AC line Voltage to load
A1	Relay Coil A1	Driven by controller's zone "n" switched line output (90-277V typical)
A2	Relay Coil A2	Relay return, typically connects to controller, pin-2

Wiring Diagrams

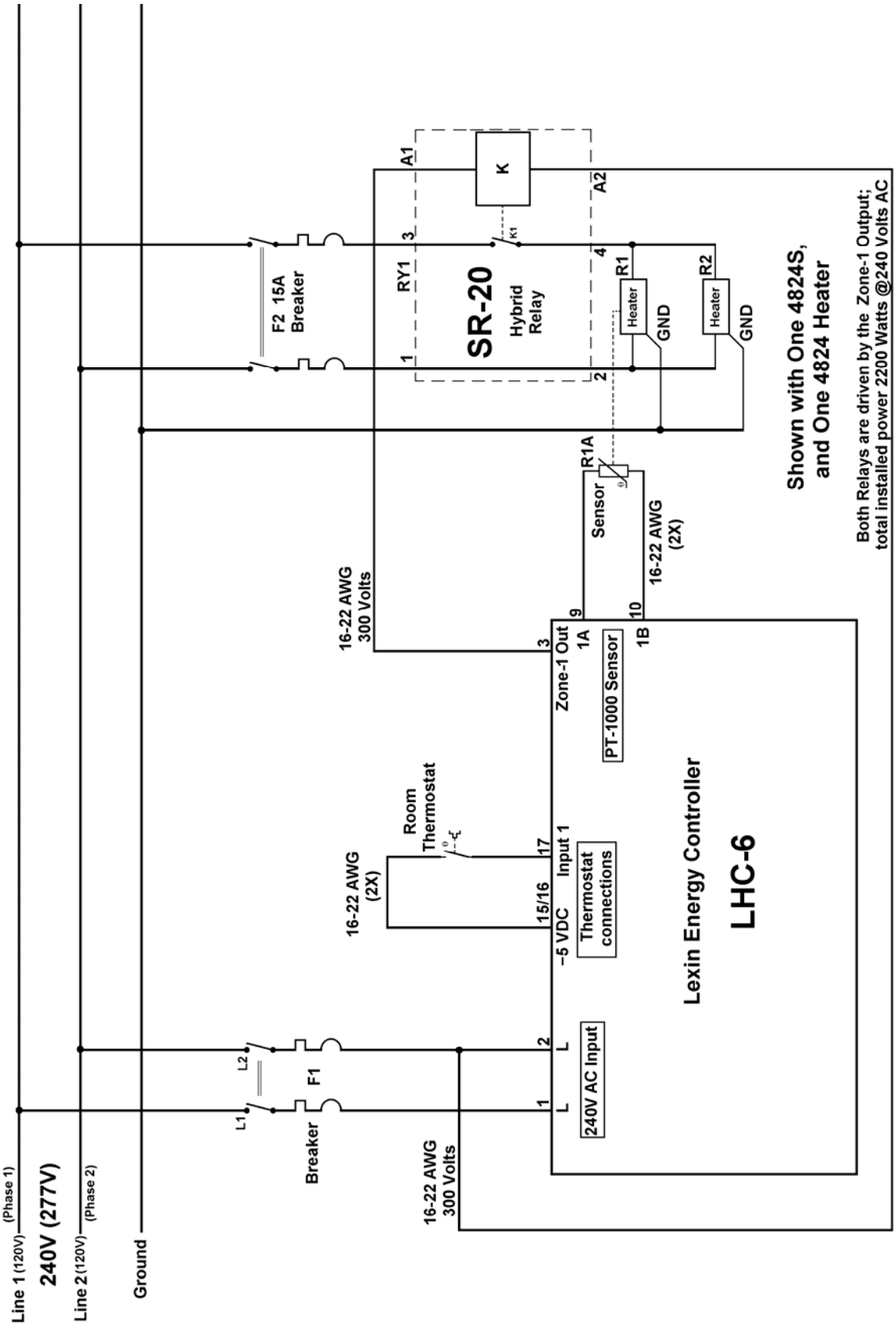
Wiring Sample, one Zone, and two CH4824 heaters; 110-120 Volts



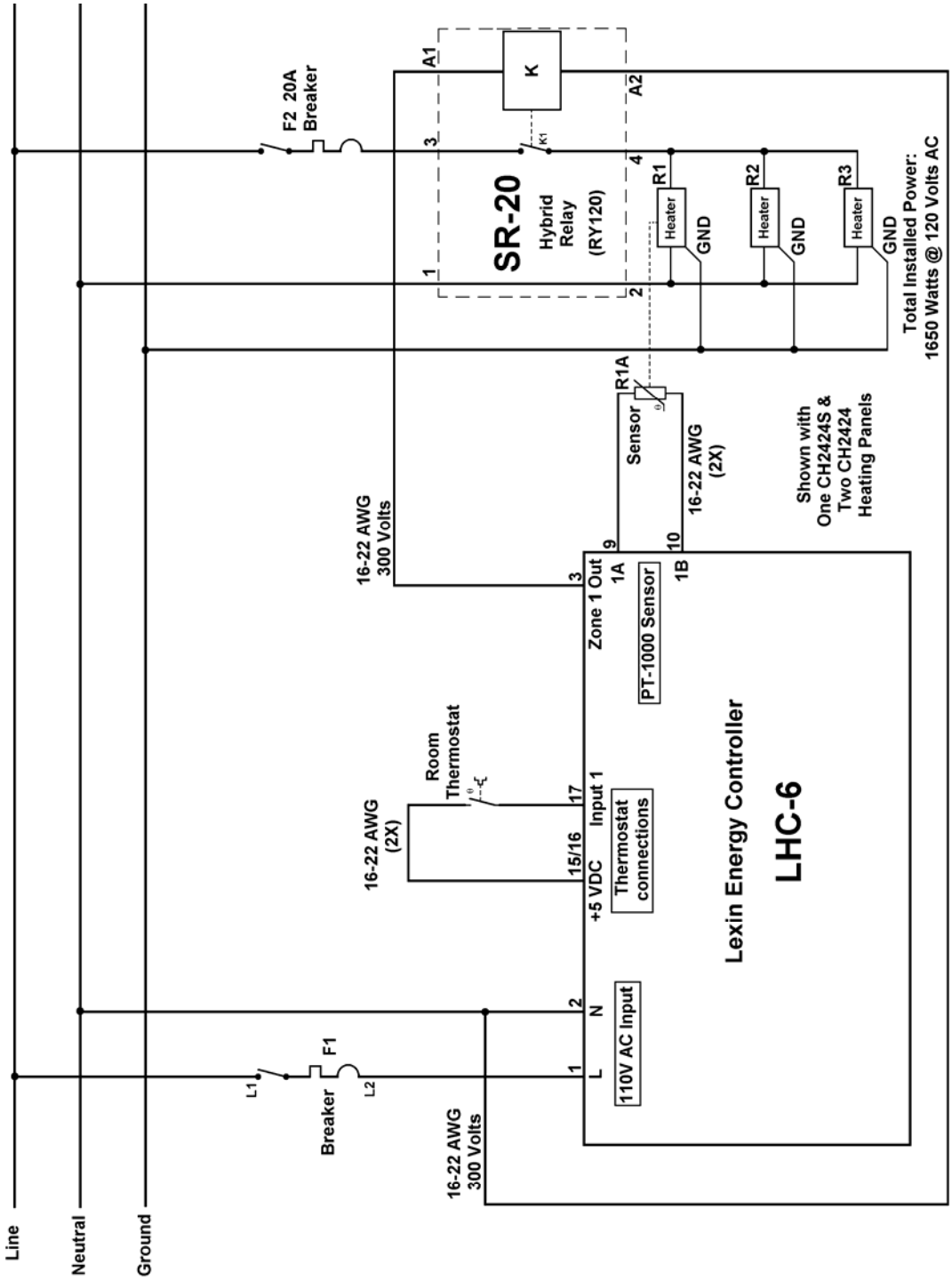
One Zone, and two CH4824 heaters; LHC-6 is 120 Volts, heaters 240 / 277Volts



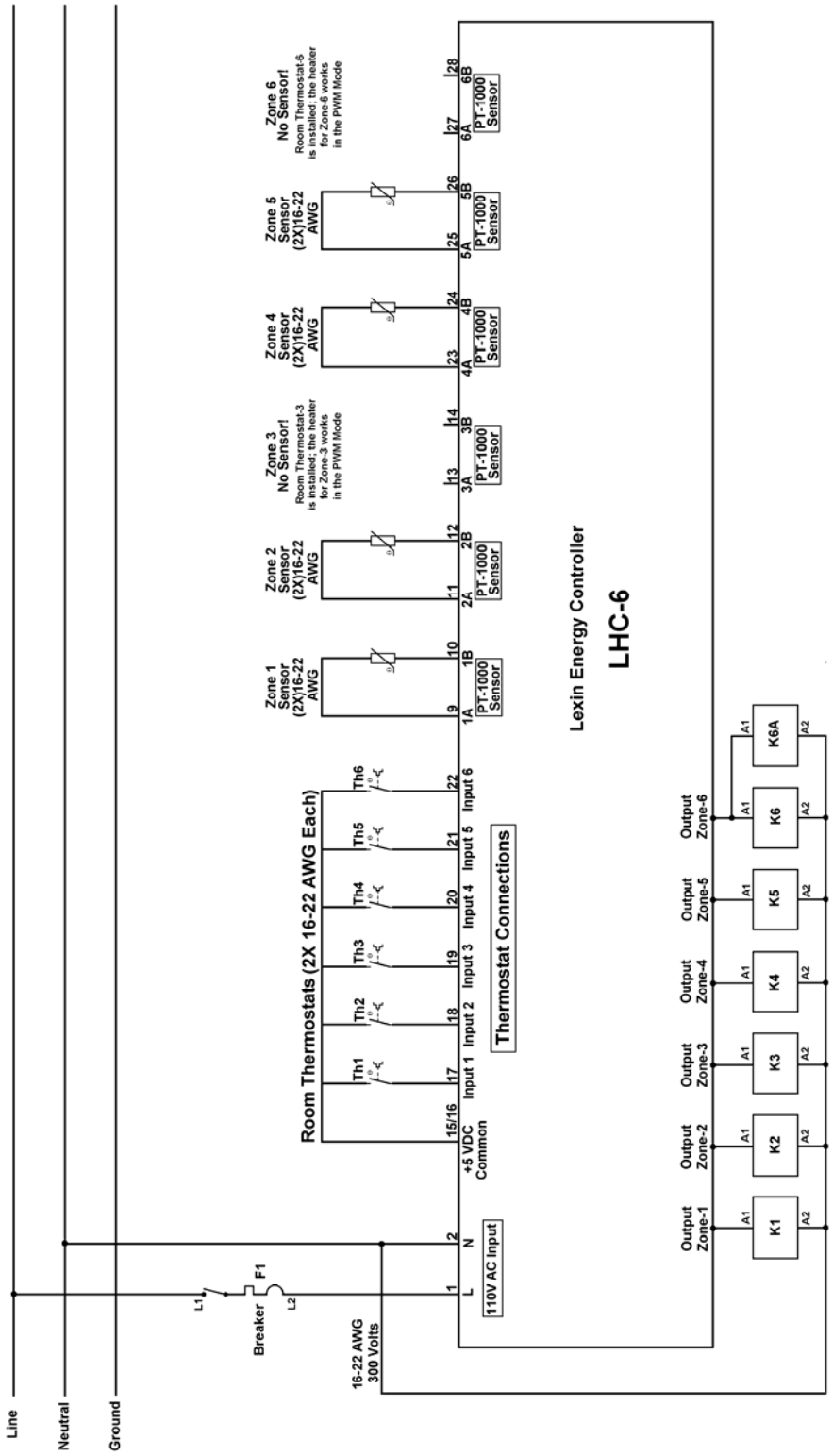
One Zone, and two CH4824 heaters; LHC-6 and heaters are 240 or 277 Volts



Wiring Sample, one Zone, and three CH2424 heaters; 110-120 Volts



Wiring Sample, six Zones, four are temperature, and two PWM controlled (No heaters shown)



Important Information: Hybrid Relays - - Read before installing!!

IMPORTANT!!

Lexin's hybrid relays require (minimal) convection cooling.

When installing the relays on the DIN rail, leave ¼" (5-6 mm) clear on both sides.

The relay for 277 Volts is different from the ones used for 110-240 Volts; order a 277V relay!!

The maximum number of Lexin hybrid relays that can be driven per zone by the controller is 8-10!! In large installations, one relay may be used to drive others.

Please note: the hybrid relays are designed to be connected as follows: Connect the AC power to terminals 1 and 3, Connect load to terminals 2 and 4. Not following these directions will void the warranty!!

Thermostat Placement

General installation rules

Where the thermostats are located is very important; care must be taken to make sure that these cannot be influenced by external factors.

Guidelines:

1. Keep a minimum distance of 6' (about 2 m), and maximum a distance of 16' (5 m) between the heaters and the thermostat.

2. Do not place a thermostat in the vicinity of windows; where possible, keep a minimum distance of 6' (about 2 m).

3. Make sure the thermostats cannot be influenced by the direct warmth of the sun.

Transmission calculation

Because Lexin's technology is based on warming surfaces, not the air, the transmission calculations are based on square feet, not cubic feet. As a "rule of thumb", Lexin produces approximately 10,000 BTU (British Thermal Units) in heat energy for every 1 KW of electrical energy it consumes. Traditional heating sources produce 3413 BTU per 1 KW, giving Lexin a C.O.P. (Conversion of Power) rating of 3.0, making it one of the most efficient heating sources in the world today.

The following transmission calculation was prepared for typical homes and offices, etc. These calculations are designed specifically for Lexin's stimulated emission, and will not work for any other heating product!! A Lexin Sizing Calculator is available in the down load section of Lexin's website (www.lexinusa.com); it may also be obtained from your local Lexin representative.

Introduction

The transmission calculations aid in calculating the number, size and location of the Lexin panels.

Temperature differences per room with an outside reference temperature of 14 ºF (-10 ºC)

Room	Room Temperature		Difference	
Living room	71.6 ºF	22 ºC	57.7 ºF	32 ºC
Bedroom	64.4 ºF	18 ºC	50.4 ºF	28 ºC
Bathroom	75.2 ºF	24 ºC	61.2 ºF	34 ºC
Hallway	60.8 ºF	16 ºC	46.8 ºF	26 ºC
Kitchen	68.0 ºF	20 ºC	54.0 ºF	30 ºC

These temperature differences are use to calculated the minimum required capacity when integrated with the "climate factor".

The steps to calculating the transmission (sizing) required

1. *Calculating the minimum required heating capacity.*

   The floor area, windows, doors and the climate factor are the determinant factors when calculating the minimum required heating capacity.

2. *Placement of Lexin Comfort Heating units.*

   The Lexin heaters have an inherent range; in some cases, depending on the shape of the room the minimum required capacity may not be sufficient. In these cases, we can compensate by adding additional panels.

Minimum required heating capacity

The floor and surface area of doors and windows are determining factors. Surface area of windows and doors are compensated for with a correction factor, the minimum required heating capacity is then corrected by a climate factor.

$$\text{Heating Capacity} = \text{Climate factor} \times \left\{ \begin{array}{l} \text{Floor Area} + \\ \sum \text{Correction factor} \times \text{Window surface area} + \\ \sum \text{Correction factor} \times \text{Door surface area} \end{array} \right\}$$

1. Floor Area

Calculate the floor area in square feet or square meters (do this without taking into account doors or windows, and do not compensate for large objects - - only the room size is important); this is the minimum required heating capacity.

2. $\sum$Correction factor x Window surface area

Add up the surface areas of the windows and multiply this with one of the factors mentioned below. The result of the calculation is the extra heating capacity needed to compensate for the relevant type of windows.

a. Single glazing: 2.8 (K-value = 5.8).

b. Double glazing: 1.8 (K-value = 1.4).

c. Triple glazing: 1.6 (K-value = 0.8)

d. Windows with other K-values:

K-value	Factor	K-value	Factor	K-value	Factor	K-value	Factor
7.0	2.91	2.5	2.19	1.6	1.88	1.1	1.69
6.0	2.82	2.0	2.02	1.5	1.84	1.0	1.66
5.0	2.70	1.9	1.99	1.4	1.80	0.9	1.63
4.0	2.54	1.8	1.95	1.3	1.76	0.8	1.60
3.0	2.33	1.7	1.91	1.2	1.73	0.7	1.58

3. $\sum$Correction factor x Door surface area

Add up the surface areas of the doors (separate interior and exterior doors as these have different k values) and multiply this with one of the factors mentioned below. The result of the calculation is the extra heating capacity needed to compensate for the relevant type of doors. Note: if the space on both sides of an interior door is controlled by the same thermostat, there is no need to compensate for this door as there is no additional heat loss.

a. Inner door: 1.0 (independently from the K-value).

b. Outside door: 2.5 (independently from the K-value).

$$\left\{ \begin{array}{l} \text{Floor Area} + \\ \sum \text{Correction factor x Window surface area} + \\ \sum \text{Correction factor x Door surface area} \end{array} \right\}$$

Use the total of the above to obtain the total required heating capacities

5. Heating Capacity = Climate factor x { …….. }

Multiply the total required capacity above with one of the climate factors mentioned below. After you've received the outside temperature statistics for your area from your national weather center you can calculate the weighted value and arrive at the total square area required to calculate your system.

Pease note that it may not be necessary to use a weighted climate factor if the space you are trying to heat is a modern, well insulated building. This weighted value is influenced by the type and quality of insulation used as well as the type of construction. In cold areas, one can generally use a factor of 1 (or 1.2 to add some safety margin) for modern, well insulated homes, regardless of temperature difference; for a very poorly insulated space (warehouse, barn, old building, etc., the climate factor becomes a more critical part of the equation - - here it should be selected per the table below.

Temperature difference between outside and inside temperatures	Climate factor
90 °F (50 °C)	1.40
81 °F (45 °C)	1.30
72 °F (40 °C)	1.20
63 °F (35 °C)	1.10
54 °F (30 °C)	1.00
45 °F (25 °C)	0.90
36 °F (20 °C)	0.85

6. Heating Panel Selection:

The following table lists the heating panels available for North America and their respective coverage in square feet. Please select the total number of desired sizes until the total capacity matches, or exceeds the calculated requirements.

a. Wherever practical, use the largest size (4' x 2').
b. Wherever practical, use the same type of panel for one room.
c. Always round up the number of panels required!!!

Panel type	Watts	Heating capacity 8' 6" ceiling @ 3.72 Watts/ft² (40W/m²)
CH4824 (CH12261 Series)	1050	280 square feet (28.0 m²)
CH2424 (CH12261 Series)	550	130 square feet (13.0 m²)

Placement of Heating Panels:

Every panel has a maximum range (the IR-intensity decreases as distance increases); this range can be compared to half a sphere fixed on to the front of the glass.

Where you place your panels can make the difference in performance and energy usage!!

Make sure that the panels cover every inch of the room; if the installed power is too low, it will take much longer to heat the space, and the use of electricity may be much higher than in a properly sized system.

Guidelines:

Follow these guidelines as closely as possible.

1. General guideline: distribute the panels evenly across the room.

2. Place the panels proportionally closer to doors and windows that need to be compensated for.

3. Compensate for large unheated areas by adding additional heaters in the targeted area.

4. Make sure the range of your panels also covers the walls so you can benefit from all of the accumulated warmth.

5. To reduce the possibility of interference by wireless devices, place the sensor panel as close to the controller as possible; in rare cases where there are excessive RF (radio frequency) levels, it may be necessary to install shielded control and or thermostat wires.

Ceiling or wall placement?

Ceiling or wall placement has no effect on heating range but there is a difference in energy consumption. Panels placed on the wall will consume more energy because their surface cools down more rapidly.

High spaces

Infrared heat has a usable heating range of 10 to 11.5 feet (3.0 − 3.5 m).
Keep this in mind when placing your panels.

My ceiling is higher than 10’ (3.0 m).

- Place your panels on the wall and not the ceiling, angle these whenever possible (or a greater number of panels is required; contact Lexin).

My ceiling is higher than 10’ (3.0 m) and I have no walls within range.

- Use chains or steel cables to lower your panels to where these would be within range.

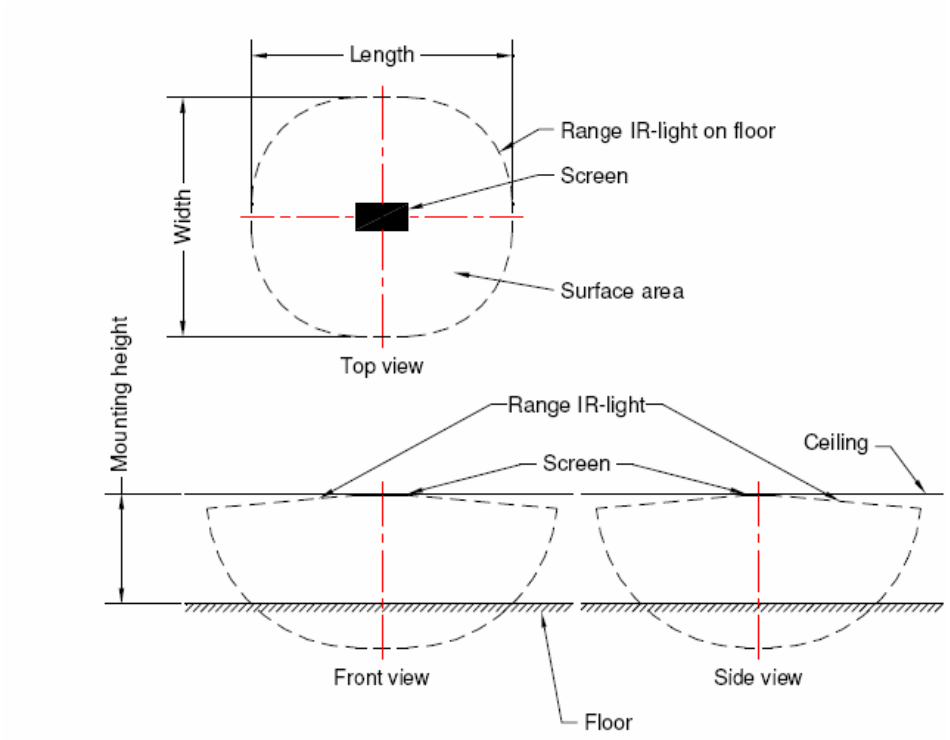
Wall placement

Make sure there is a distance of at least 1.7 feet (50 cm) between the panel and any object in front.

Heating range

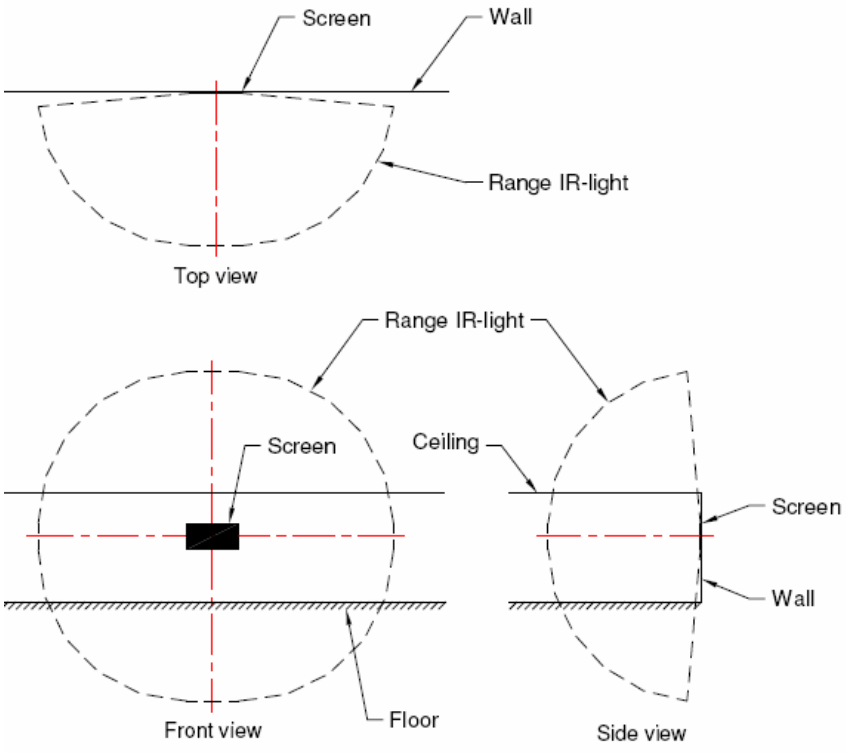
These next chapters describe both the heating range of the different panel models, and the projected heated floor area, at different elevations (suspension heights).

Heating range explained



The diagram on the left shows Lexin's typical heating range with the panels (screens) mounted to the ceiling. (The dashed lines depict the heating range)

In the tables following, the length, width and surface area are indicated as a function of the suspension height.



The diagram on the right shows the heating range when the panels (screens) are mounted on a wall.

The heating range depends on the panel type as indicated in the tables following.

CH 4824 (CH12261 Series)

Heating Range (minimum) 11’ 6”

(Note: Pattern does not have square corners)

Suspension height in feet	Length in feet	Width in feet	Surface area in square feet
5.74	23.95	21.98	435.94
6.56	22.64	20.67	398.26
7.38	21.65	19.69	355.21
8.20	20.01	18.04	305.70
9.02	18.04	16.08	249.72

CH2424 (CH12261 Series)

Heating Range (minimum) 10’

(Note: Pattern is not square)

Suspension height in feet	Length in feet	Width in feet	Surface area in square feet
5.74	18.04	18.04	268.02
6.56	16.73	16.73	230.35
7.38	15.09	15.09	188.37
8.20	12.80	12.80	139.93
9.02	9.84	9.84	83.96

CH 4824 (CH12261 Series)

Heating Range (minimum) 3.5 m

(Note: Pattern does not have square corners)

Suspension height	Length	Width	Surface area
1.75 m	7.3 m	6.7 m	40.5 m²
2.00 m	6.9 m	6.3 m	37.0 m²
2.25 m	6.6 m	6.0 m	33.0 m²
2.50 m	6.1 m	5.5 m	28.4 m²
2.75 m	5.5 m	4.9 m	23.2 m²

CH2424 (CH12261 Series)

Heating Range (minimum) 3.0 m

(Note: Pattern is not square)

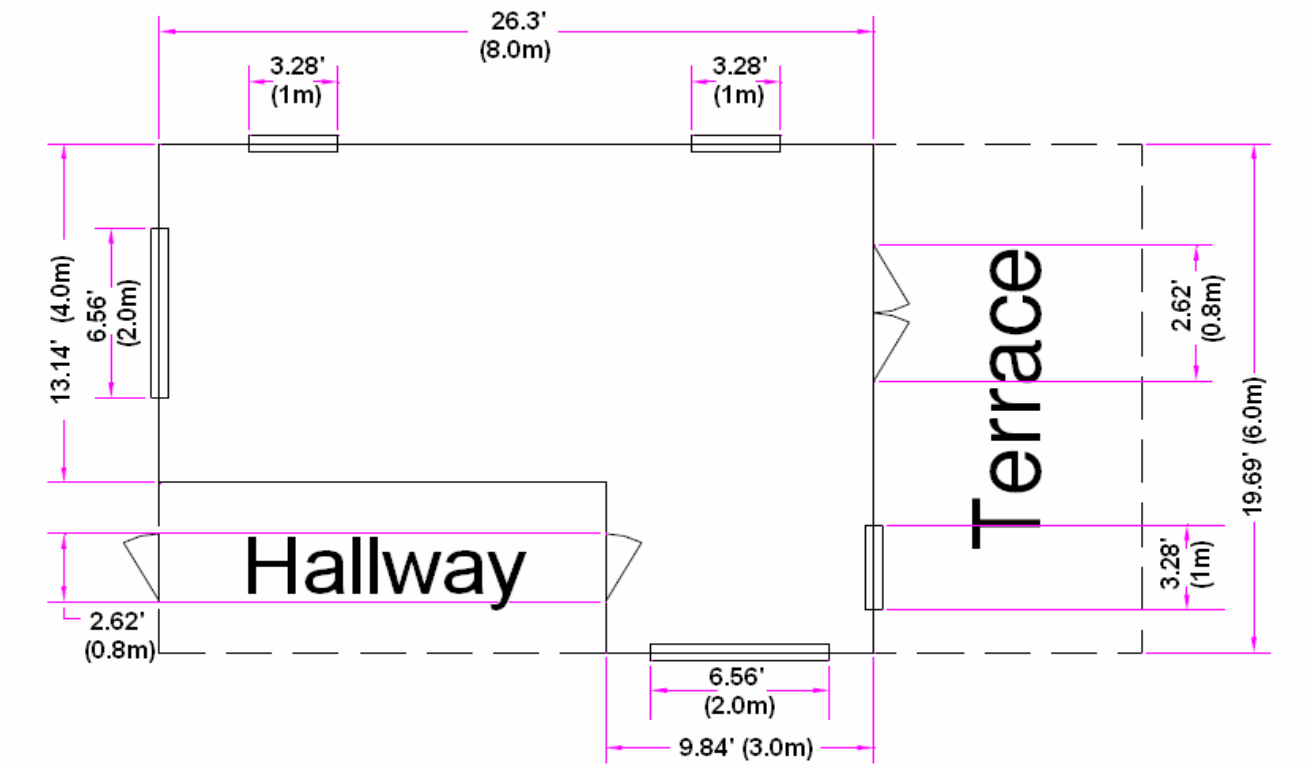
Suspension height	Length	Width	Surface area
1.75 m	5.5 m	5.5 m	24.9 m²
2.00 m	5.1 m	5.1 m	21.4 m²
2.25 m	4.6 m	4.6 m	17.5 m²
2.50 m	3.9 m	3.9 m	13.0 m²
2.75 m	3.0 m	3.0 m	7.8 m²

Sample Calculations:

The following examples were calculated with a climate factor of 1.0 (The Southwest, for instance).

Living room

The living room is L-shaped with two large and three smaller windows; there is a door to the hallway, and a double door to the terrace.



Minimum required coverage/capacity

Description	Length, feet (m)	Width, feet (m)	Correction factor	Capacity Sq.ft. (m^2)
Floor	26.3 (8.0)	13.1 (4.0)	1	344.53 (32.00)
Floor	9.84 (3.0)	6.56 (2.0)	1	64.55 (6.00)
Double glazing	6.56 (2.0)	5.25 (1.6)	1.8	61.99 (5.76)
Double glazing	3.28 (1.0)	5.25 (1.6)	1.8	31.00 (2.88)
Double glazing	3.28 (1.0)	5.25 (1.6)	1.8	31.00 (2.88)
Double glazing	3.28 (1.0)	5.25 (1.6)	1.8	31.00 (2.88)
Double glazing	6.56 (2.0)	2.62 (0.8)	1.8	30.94 (2.88)
Interior door	8.20 (2.5)	2.62 (0.8)	1	21.48 (2.00)
Exterior door	8.20 (2.5)	5.25 (1.6)	2.5	107.63 (10.00)
			Subtotal minimum required capacity	724.11 (67.28)
			Climate factor	1.00
			Minimum required coverage in square feet (square meters)	724.11 (67.28)

The interactive Sizing calculator explained on page 54 uses this example also (please see page 54)

Through the above exercise, we've established that the room is large enough for CH4824 panels. We'll continue using this size panel.

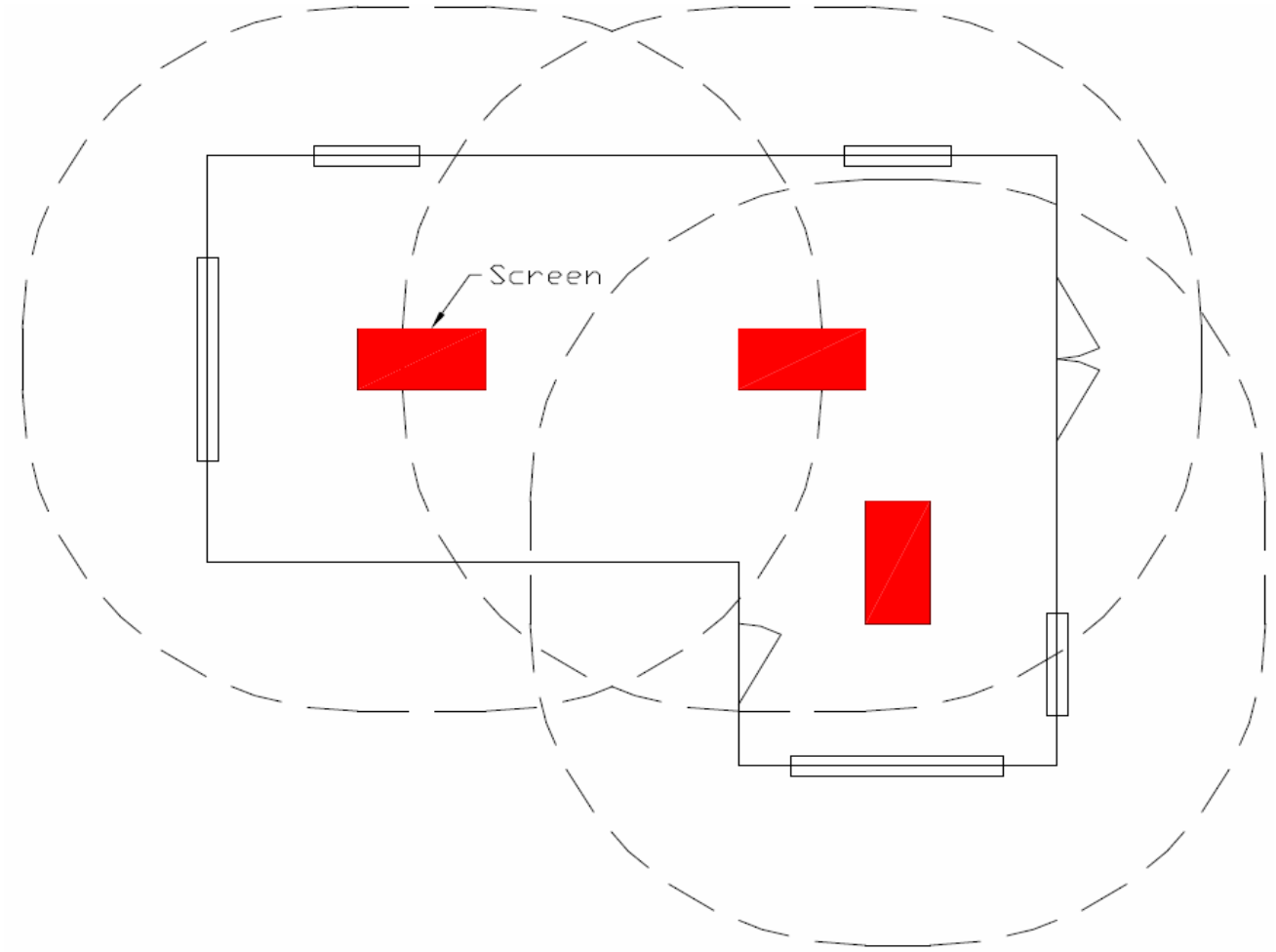
Rounded down, the heating capacity of the CH4824 mounted at 8 ½ feet is 270 square feet (25.0 m²), and our minimum required capacity is 724.2 square feet (67.28 m²).

This means we need 724.2/270 (67.28 /25.0) = 2.7 Heaters. We've figured out through this simple calculation that we need three 1050 watt heaters (always round your number of panels upwards).

Placement of Flat-screen Heaters

Lexin recommends using a graphic method to check your heating range.

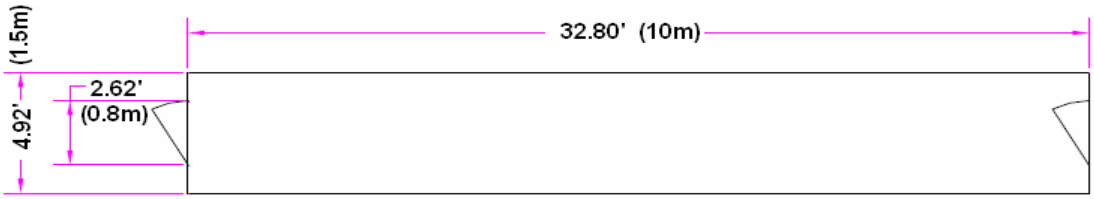
An accurate distribution with panels (Screens) installed at a height of 8.2 feet (2.5 m) would have the following result:



The panels (type CH4824) are represented by the rectangles; the dotted ovals show the directly heated floor area. The ovals overlap signifying that both floor and walls are being heated.

Long narrow corridor

A long narrow corridor with 2 doors; no windows.



Minimum required capacity

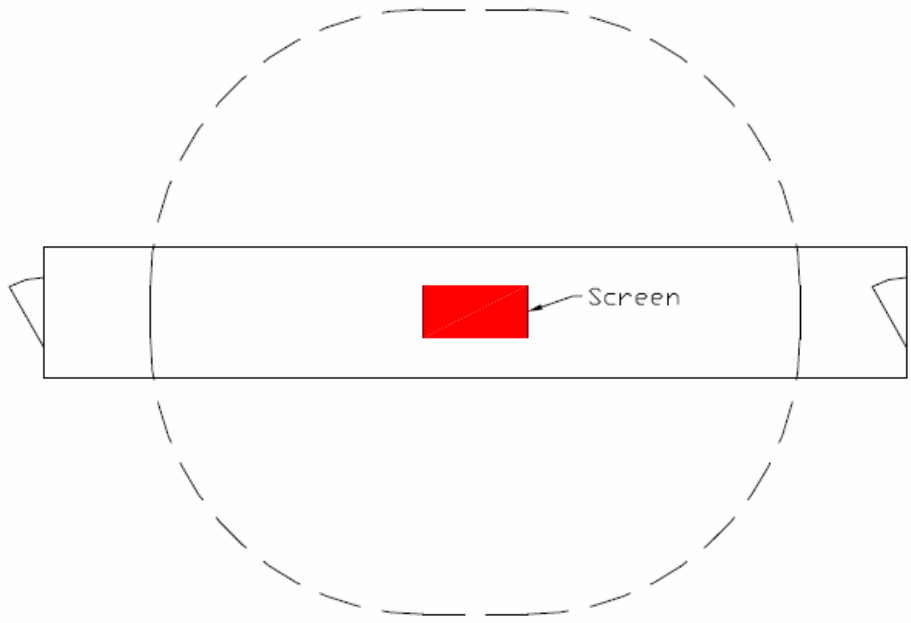
Description	Length in feet (m)	Width in feet (m)	Correction factor	Capacity
Floor	32.8 (10.0)	4.92 (1.5)	1.0	161.38 (15.00)
Interior door	8.20 (2.5)	2.62 (0.8)	1.0	21.53 (02.00)
Interior door	8.20 (2.5)	2.62 (0.8)	1.0	21.53 (02.00)
			Subtotal minimum required capacity	204.44 (19.00)
			Climate factor	1.00
			Minimum required capacity	204.44 (19.00)

Through the above exercise, we've established that the corridor is large enough for CH4824 panels. We'll continue using this size panel.

Rounded down, the heating capacity of the CH4824 is 270 square feet (25.0 m²), and our minimum required capacity is 204.44 square feet (19.00 m²).

➜ 204.44 / 270 (19.00 / 25.0) = 0.76 panels, or 1 panel.

Placement of Flat-screen Heater(s)



Single panel (screen) Heater placement would yield the following result:

The graphic method clearly shows that the outer ends of the long corridor cannot be heated.

There are two ways to correct this:

1. Place an additional CH4824 panel, or……
2. Heat the corridor with a different type of panel.

One CH4824 has more than enough heating capacity to cover the entire space, but it does not

reach far enough. If we were to place an additional CH4824 panel, or combine with another type panel size, we would be installing too much heating capacity.

This brings us to the 2nd possibility; a different type (size) of panel.

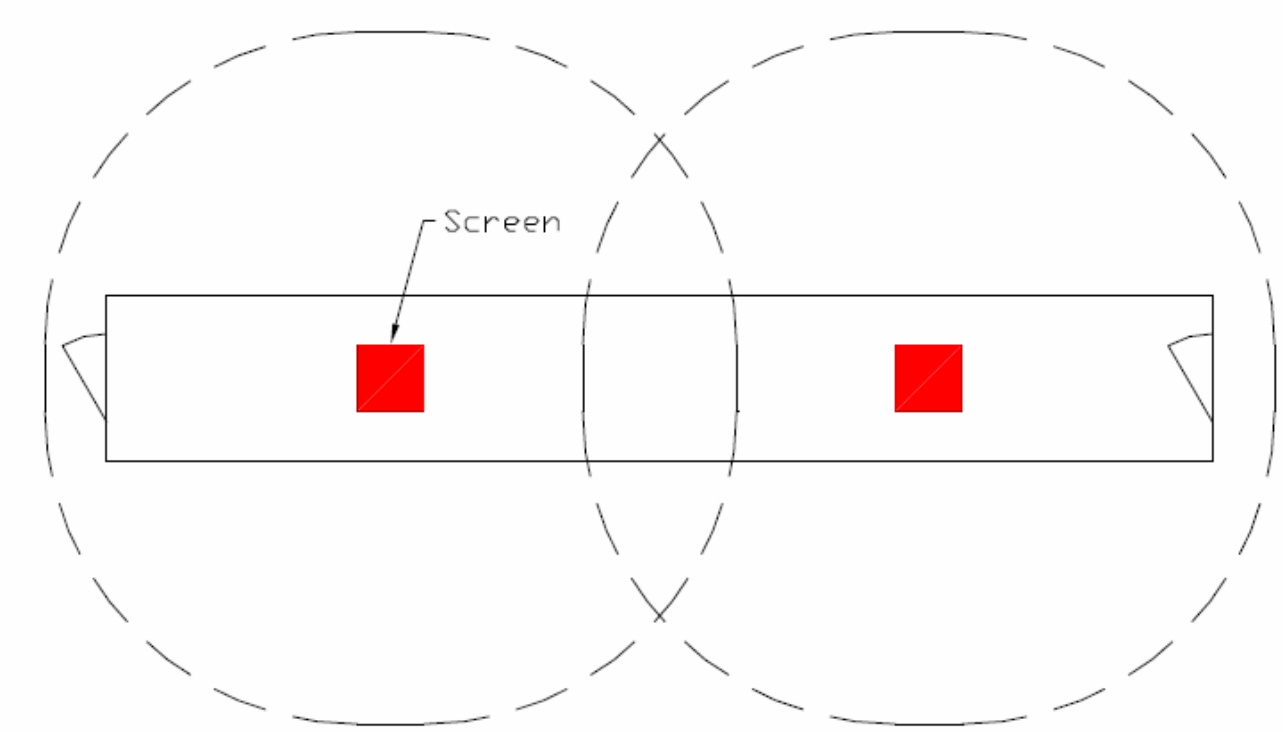
Selecting a different size heating panel:

The CH2424 has a heating capacity of about 110 square feet (10.0 square meters); our minimum required capacity is 204.44 sq. ft. (19.00 m²).

➜ 220 / 204.44 (19.00 / 10.0) = 1.9 panels, or two panels.

Placement of Flat-screen Heaters

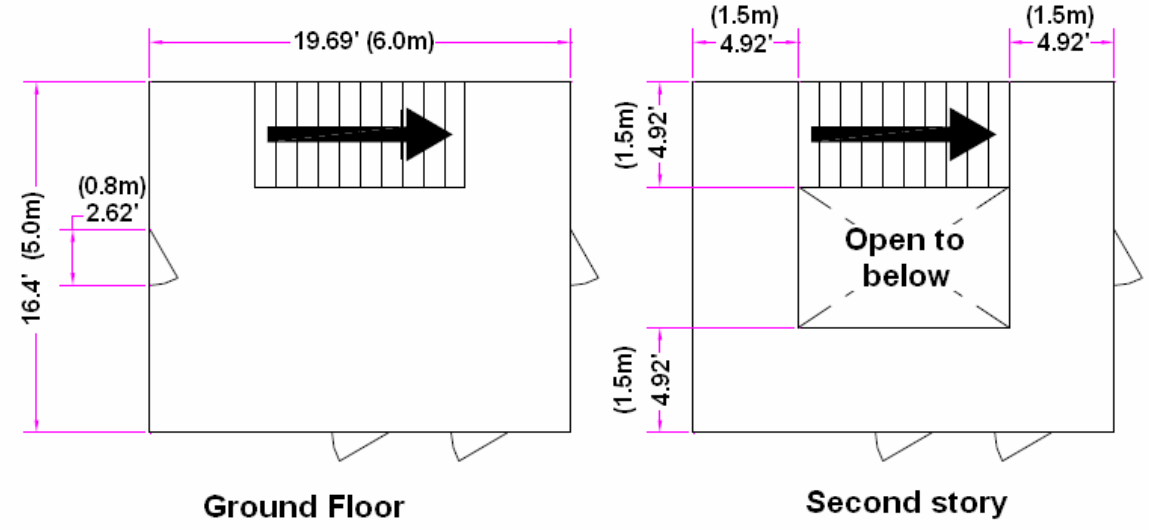
An accurate distribution with panels (Screens) installed at a height of 8.2 feet (2.5 m) would have the following result:



The CH2424's range easily covers every spot of the corridor.

Entry hall

The entry hall covers two stories. The ground floor has an exterior door and three interior doors. The second story floor is open to the ground floor; it has an open lot with three interior doors. Complying with the client's wishes, the panels are placed on the wall.



Minimum required capacity

You don't have to compensate for the open space on the second floor landing; Lexin heats objects and not the air. This type of application can be calculated per floor.

Ground floor				
Description	Length in ' (m)	Width in ' (m)	Correction factor	Capacity Sq.ft. (m²)
Floor	19.69 (6.0)	16.4 (5.0)	1.0	322.92 (30.00)
Exterior door	8.20 (2.5)	2.62 (0.8)	2.5	53.71 (05.00)
Interior door	8.20 (2.5)	2.62 (0.8)	1.0	21.48 (02.00)
Interior door	8.20 (2.5)	2.62 (0.8)	1.0	21.48 (02.00)
Interior door	8.20 (2.5)	2.62 (0.8)	1.0	21.48 (02.00)
			Subtotal minimum required capacity	441.07 (41.00)
			Climate factor	1.00
			Minimum required capacity	441.07 (41.00)

Through the above exercise, we've established that the corridor is large enough for CH4824 panels. We'll continue using this size panel.

Rounded down, the heating capacity of the CH4824 is 270 square feet (25.0 m²), and our minimum required capacity is 441.07 square feet (41.00 m²).

➜ 441.07 / 270 (41 / 25.0) = 1.6 panels, or two panels.

Second Story Floor				
Description	Length in ‘ (m)	Width in ‘ (m)	Correction factor	Capacity Sq.ft. (m²)
Floor	19.69 (6.0)	16.4 (5.0)	1.0	322.92 (30.00)
Interior door	8.20 (2.5)	2.62 (0.8)	1.0	21.48 (02.00)
Interior door	8.20 (2.5)	2.62 (0.8)	1.0	21.48 (02.00)
Interior door	8.20 (2.5)	2.62 (0.8)	1.0	21.48 (02.00)
			Subtotal minimum required capacity	387.36 (36.00)
			Climate factor	1.00
			Minimum required capacity	387.36 (36.00)

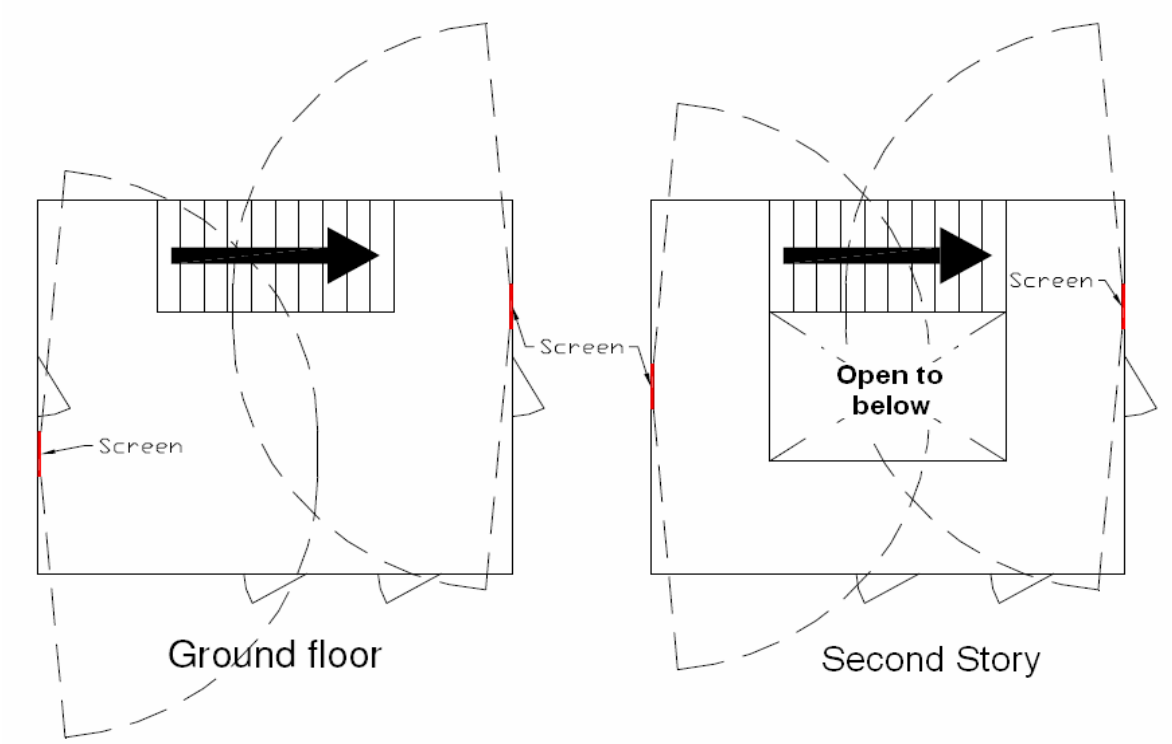
Through the above exercise, we've established that the corridor is large enough for CH4824 panels. We'll continue using this size panel.

Rounded down, the heating capacity of the CH4824 is 270 square feet (25.0 m²), and our minimum required capacity is 387.36 square feet (36.00 m²).

➜ 387.36 / 270 (36.00 / 25.0) = 1.4 panels, or two panels.

Placement of Flat-screen Heaters

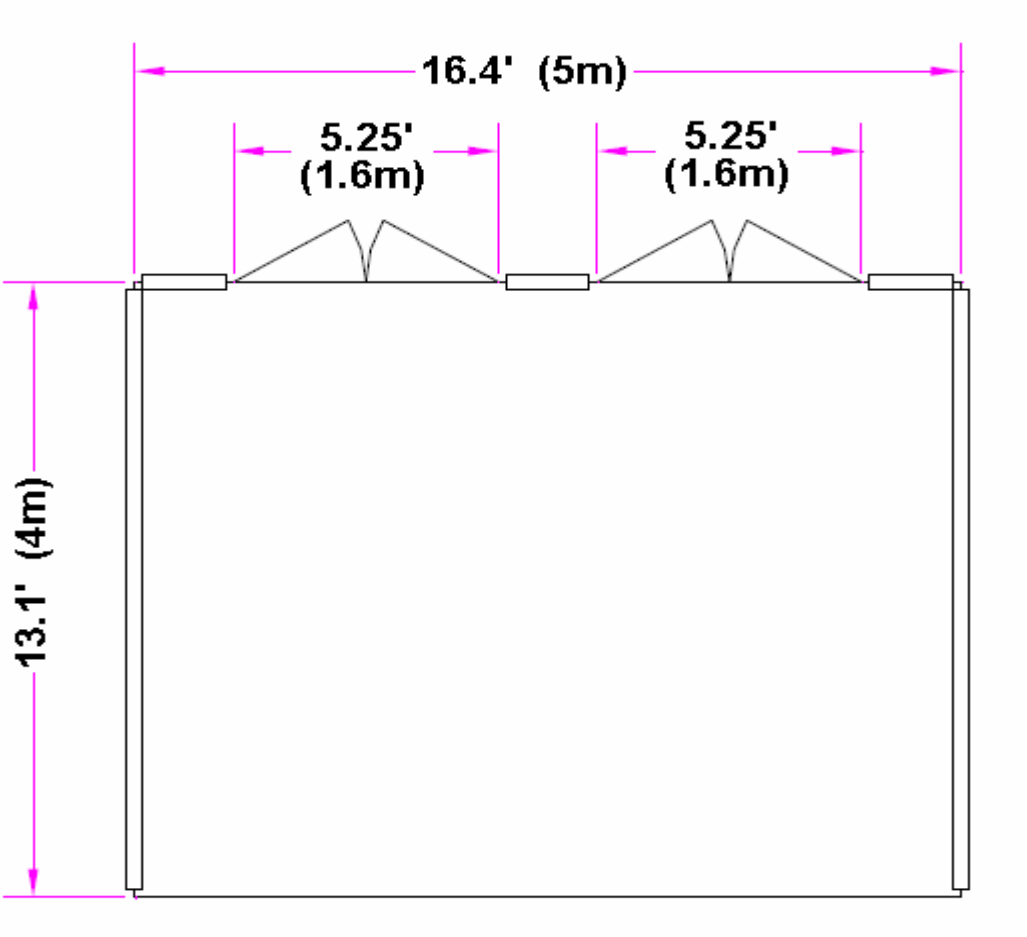
An accurate distribution with panels (Screens) installed at on the walls would have the following result:



The small areas that fall out of the IR-range will be heated through walls and floors, indirectly. Only install additional panels when there are large unheated areas.

Patio (Sunroom / Veranda)

A patio with glass on three sides and two large doors that open to the garden:



Minimum required capacity

Description	Length in ' (m)	Width in ' (m)	Correction factor	Capacity Sq.ft. (m²)
Floor	16.4 (5.0)	13.1 (4.0)	1.0	214.84 (20.00)
Double glazing	13.1 (4.0)	8.2 (2.5)	1.8	193.36 (18.00)
Double glazing	13.1 (4.0)	8.2 (2.5)	1.8	193.36 (18.00)
Double glazing	16.4 (5.0)	8.2 (2.5)	1.8	242.06 (22.00)
Door (Double glazed)	8.2 (2.5)	5.25 (1.6)	1.8	-77.49 (-7.00)
Door (Double glazed)	8.2 (2.5)	5.25 (1.6)	1.8	-77.49 (-7.00)
Exterior Door	8.2 (2.5)	5.25 (1.6)	2.5	107.63 (10.00)
Exterior Door	8.2 (2.5)	5.25 (1.6)	2.5	107.63 (10.00)
Subtotal minimum required capacity				903.90 (84.00)
			Climate factor	1.00
			Minimum required capacity	903.90 (84.00)

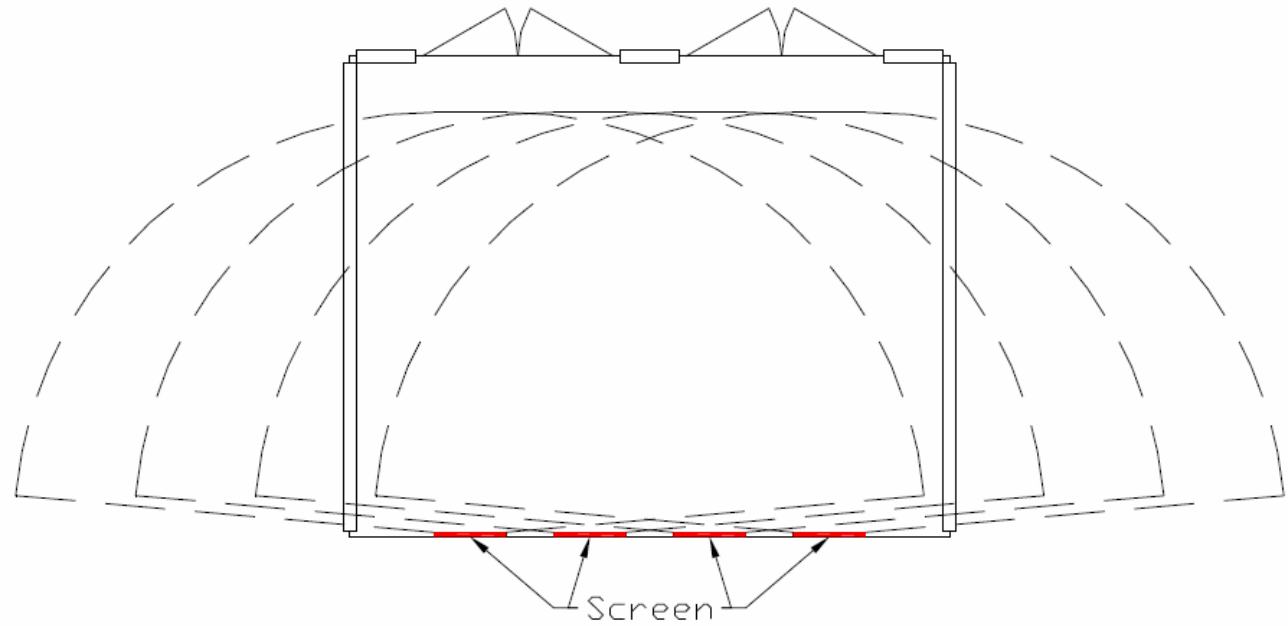
Through the above exercise, we've established that the patio is large enough for CH4824 panels. We'll continue using this size panel.

Rounded down, the heating capacity of the CH4824 is 270 square feet (25.0 m²), and our minimum required capacity is 903.9 square feet (84.10 m²).

➜ 903.9 / 270 (84 / 25.0) = 3.4 panels, or four panels.

Placement of Flat-screen Heaters

An accurate distribution with panels (Screens) installed at on the walls would have the following result:



Since the only practical place is on the back wall of the patio, and the IR-light has a maximum range of 11.48 feet (3.5 m) this leaves a narrow strip on the garden side of the patio unheated. The actual performance is better than shown as the overlap of the panels will cause a greater range than one panel would be able to cover.

Any remaining gaps can be compensated through indirect heating.

Lexin's interactive sizing calculator:

Lexin offers an interactive sizing calculator; this calculator can be found on Lexin's website (www.lexinusa.com) or it may be obtained from your local Lexin distributor, dealer, or representative.

The sample calculations below are based on the living room sample depicted on pages 46 and 47 of this manual.

1) This house is a well insulated home so we have entered 1.0 in the climate factor.

Climate Factor; well insulated buildings: For most well insulated buildings use 1.0 regardless of outside temperature; for a built-in safety margin in very cold areas, 1.1 or 1.2 may be used. For warm climates, use 0.9 to 0.85		
Climate Factor	**1.0**	

2) The next thing we did was to divide the living room into two rectangles. The program adds these rectangles to arrive at the total square footage; these rectangles are 26.3' x 13.1', and 9.84' x 6.56'

3) We entered the information into the program.

	Floor Surface		
	Length	Width	Area (ft²)
Living room	26.30	13.10	344.53
	9.84	6.56	64.55
	0.00	0.00	0.00

4) Now we look at the doors, there is one interior door (factor is 1), and one exterior door (factor is 2.5)

5) Next, we enter the height and width of both doors and their respective correction factors, 1 and 2.5

Door Surface			
Height	Width	Factor	Area (ft²)
8.20	2.62	1.00	21.48
8.20	5.25	2.50	107.63
0.00	0.00	1.00	0.00

6) The program will now include the heat-loss generated by these doors in the calculations.

7) The only thing left to count is the number of windows and their dimensions. There are three different size windows, all are double glazed (factor is 1.8).

   We have taken the 6.56' x 5.25' window, and the 6.56 x 2.62' window separately, while we combined the width of the three identical windows 3.28' x (3x) 5.25'.

You can use a calculator to find this sum (3x 5.25 = 15.75) and enter 15.75 in the width box, or you can have the program add the three widths together.

To have the program do this, go to the width box and enter: =3*5.25 then press “enter” (this represents 3 x 5.25, and the answer of 15.75’ should display).
.

Window Surface			
Height	Width	Factor	Area (ft²)
6.56	5.25	1.80	61.99
3.28	15.75	1.80	92.99
6.56	2.62	1.80	30.94

8) The next part of the program translates the various square footages, the climate factor, and the ceiling height into the required “installed power”.

Please be sure to check the ceiling height. The program is set up for a standard ceiling height of 8’ 6” (8.5’); if the ceiling height differs much, the new height should be programmed in under “mtg. height”

Please note that the installed power is the “worst case power” the system can use when the room is cold; the average “operating power” is much lower than the installed power as the heaters are being switched on and off many times before the thermostat says that the room is warm enough.

Total				
Area (ft²)	Clim. Fact.	Mtg height	P/ft²	Ptot
428.01	1.00	8.50	3.72	1,592
265.16	1.00	8.50	3.72	986
30.94	1.00	8.50	3.72	115
				2,700

a) Area (ft²) is the total corrected square footage per line
b) The Climate factor is the number entered in the first step
c) The mounting height is pre-programmed; if the ceiling is over 9’, the new values should be entered here
d) P/ft² is the required installed Power per square foot at this installation height; it will vary with the entry of different ceiling height figures
e) Ptot is the total installed Power required; it is rounded up to the next 100 Watt mark.

At the end of all calculations, it should be rounded up to the next higher number of the panel size selected.

9) The step requires some double checking. If we select 3 CH4824 panels (2700 Watts rounded up), can we cover the entire space, or are there blind spots? Please review the sketch on page 48 to see what is meant by this and how to prevent dead spots.

If all is OK as far as the coverage is concerned, we can select the heating panels.

Since we will need a thermostat in this room, one of the panels will need to be a sensor panel, or an “S” type.

10) Since we selected three CH4824 panels (3000 Watts), we need to enter 1 under CH4824S, and 2 under CH4824.

Lexin Flat-screen Heaters							
CH4824S	CH4824	CH10050S	CH10050	CH07550S	CH07550	CH2424S	CH2424
Round up the bold figure on pg 1 to multiples of 1000 (0S + 0)		Round up the bold figure on pg 1 to multiples of 800 (0S + 0)		Round up the bold figure on pg 1 to multiples of 650 (0S + 0)		Round up the bold figure on pg 1 to multiples of 500 (0S + 0)	
1	2	0	0	0	0	0	0
1	**2**	**0**	**0**	**0**	**0**	**0**	**0**

The CH4824 and CH2424 are standard for the US, the others are available by special order; these are shown for illustration purposes only.

11) With the information entered, the program will now calculate the required controllers. One controller can facilitate 6 temperature zones, so the program will automatically add a second controller once the zone limit of one controller has been exceeded.

Controller and Thermostat			
LHC-6	SR-20	TH141	Other
Temp. zones	1 relay for 1 CH4824, 3 CH2424	Thermostats usually equal the No of "S" designated panels	
1	0	0	0
1	**0**	**0**	**0**

Because there are a number of panel/power options, we need to manually select the number of relays, based on the following rule of thumb:

One SR-20 Hybrid Relay for one CH4824, or one SR-20 for three CH2424, or one SR-20 for one Ch4824 plus one CH2424, provided that these are connected to the same comfort zone on the controller.

12) Since this a 110 Volt system, and we have selected three CH4824 panels, we need to use three SR-20 Relays. Next, we add 3 to the box that says “SR-20”

Controller and Thermostat			
LHC-6	SR-20	TH141	Other
Temp. zones	1 relay for 1 CH4824, 3 CH2424	Thermostats usually equal the No of "S" designated panels	
1	3	0	0
1	**3**	**0**	**0**

13) The only remaining item for the living room is the thermostat. Most rooms use only one thermostat. In this sample we are using one thermostat

However, with Lexin it is possible to create multiple comfort zones within one room. This requires one additional thermostat and one "S" panel (with separate relay) per additional comfort zone.

Controller and Thermostat			
LHC-6	**SR-20**	**TH141**	**Other**
Temp. zones	1 relay for 1 CH4824, 3 CH2424	Thermostats usually equal the No of "S" designated panels	
1	3	1	0
1	**3**	**1**	**0**

14) This concludes the calculations for the living room. Other rooms may be completed just as we did for the living room. When all of the information is entered, the program will automatically show a total per item (see below).

Area	Lexin Flat-screen Heaters							
	CH4824S	**CH4824**	**CH10050S**	**CH10050**	**CH07550S**	**CH07550**	**CH2424S**	**CH2424**
Living room	Round up the bold figure on pg 1 to multiples of 1000 (0S + 0)		Round up the bold figure on pg 1 to multiples of 800 (0S + 0)		Round up the bold figure on pg 1 to multiples of 650 (0S + 0)		Round up the bold figure on pg 1 to multiples of 500 (0S + 0)	
Total for Area	1	2	0	0	0	0	0	0
Total	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**0**
Grand Total	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**0**

Area	Controller and Thermostat			
	LHC-6	**SR-20**	**TH141**	**Other**
Living room	Temp. zones	1 relay for 1 CH4824, 3 CH2424	Thermostats usually equal the No of "S" designated panels	
Total for Area	1	3	1	0
Total	**1**	**3**	**1**	**0**
Grand Total	**1**	**3**	**1**	**0**

FAQ's

Miscellaneous

- *Are Lexin Panels durable products or will the intensity of the IR-light diminish after a certain time? Can the wavelength of the IR-light alter?*

  No, the theoretically the Panels should last for may generations; these have been tested extensively and are not subject to wear and tear even when used intensively. The IR is crystal controlled; its wavelength cannot change with age.

- *Do you test every Panel that leaves the production facility extensively?*

  Yes, we produce our Panels according to the "Quality at the source" concept; every panel is tested. We guarantee the quality of our product.

- *Have you encountered any technical difficulties so far? What sort of technical trouble can I expect?*

  The only known technical problems were due to poor installations. There should be no technical problems as long as the product is installed as a system (panel, controller, relay, and thermostat), and the transmission calculation is followed.

- *Can I decorate the Panels myself?*

  Yes, they can be decorated with heat-proof paint that doesn't block IR-light. However we cannot guarantee a self-decorated Panel. We recommend letting us take care of it so that it can be done in a safe and correct manner.

Comfort

- *What does "the Lexin Comfort Heating keeps conditions homogeneous" mean?*

  It means that Lexin, in addition to creating temperature stable surroundings (it doesn't use the air as a medium to transport warmth), also keeps the humidity in a room at a stable level.

- *What is the ideal air humidity?*

  A level of 40 to 50% air humidity is ideal for humans and animals.

- *Does IR-light shine right through windows? What about energy losses?*

  Yes, a certain amount of IR-light passes through windows and has to be compensated for by a correction factor. However this amount is limited because a heat bridge is created that will reflect most of the IR-light back into the room.

- *If I place my Panel on the ceiling will it mainly heat my head?*

  No, Panels emit IR-light in an angle of 170°, heat will be distributed equally through a room.

- *If Can I get burned touching a heated Panel?*

No, glass is too poor a conductor to transport enough energy (heat) to the surface to get burned; it will be hot to the touch, and you would naturally pull away after contact.

- *The cold period for my area only represents a very short period of time. Can I leave it out when calculating my climate factor?*

  No, the lowest temperature of the year is a defining element in your climate factor.

Energy consumption

- *According to the degree days a CH4824 consumes 975 kWh per year. Do these figures apply to a stand-alone system or to a panel in a controlled system?*

  These figures apply to a Lexin Comfort Heating System; this means Panels in a properly programmed and properly installed controlled system (panel, controller, room thermostat and hybrid relay).

- *I have installed the hybrid relays; it seems that they are not working. Are they defective?*

  Most likely, the relays are installed wrong. Make sure the power supply is connected to pins-1 and 3, and the heaters are connected to pins-2 and 4. (See pages 9 through 14 for more information.)

- *During cold winters, I cannot reach the desired room temperature. Is there a problem with the heaters?*

  Probably not; if the film temperature is programmed too low, it may take too long to heat a room during very cold weather. To resolve this reprogram the film temperature to a suitable higher level.

  In some cases, it may be desirable to program a winter setting late fall and a summer setting late spring. See LHC-6 Energy controller section for more information.

  Note:

  if the intensity (film temperature) is set too high, it may adversely affect the comfort level in a room; in a properly programmed system that has been operational for a few days, one should not be able to tell where the heat is coming from - - it should feel like it is coming from everywhere.

- *Is there a difference in energy consumption between a stand-alone Panel and the Lexin Comfort Heating System?*

  Yes, stand-alone Panels consume 1.7 to 2.5 times more than a regulated Panel (they will emit IR-light constantly and at their maximum level in colder periods).
  Your energy consumption will vary between 1,625 and 2,438 kWh per year depending on the desired room temperature, the exterior temperature and whether you use a room thermostat or not. Additionally, in an unregulated system, the safety switch becomes the “controller”. In a controlled system, this switch never operates, but in an uncontrolled system it works all the time. Unlike the panel, this switch does have a limited lifespan.

- *Is there a difference in energy consumption between ceiling and wall placement?*

  Yes, the difference occurs because the surface of Panels placed on the wall cools down more rapidly; electricity is required to overcome these losses, hence, the panel will consume more energy. Place the Panel on the ceiling wherever possible for an optimal heat distribution and lower energy consumption.

Installation

- *Will a standard electricity connection suffice to operate the Lexin Comfort Heating System?*

  This depends on the size of your installation. An average house would require an estimated equivalent of 5,500 Watts of installed power, requiring a maximum of 50 Amps.

- *Are the Lexin Panels compatible with my old thermostat?*

  The Lexin LHC-6 controller requires a thermostat that closes a loop when heat is needed. The system is based on a 5 Volt power supply and cannot be controlled by a thermostat with an integrated 24 Volt AC system. The heating and cooling circuits must be separate!! If a customer would like to retain an existing thermostat, this can generally be accomplished by adding a 24 Volt AC relay (and, if the entire old system was removed a doorbell transformer and a relay). The dry relay closure would then drive the thermostat input of the LHC-6.

  Most "heating only" thermostats are compatible with the LHC-6, but the use of a (Lexin provided) smart thermostat will increase the system's energy savings.

- *Is there a difference between heating a brick or stone, and a wood frame, or prefab house (timber frame); does this have an effect on my energy consumption?*

  Yes, there is a difference, wood will accumulate warmth more quickly than stone but stone has a vaster accumulating capacity. Over time, the 2 properties cancel each other out making the energy consumption difference negligible.

- *Can the IR-light interfere with the movement sensors of my alarm system?*

  No, the Panels emit infrared of a very long wave length that is undetectable by your infrared movement sensors ruling out any danger of false alarm.

- *I have a very large room that I need to heat. What do I do when I exceed the relay capacity on an output port of the LHC-6 controller? Do I need another controller?*

  No, simply use one relay to drive many others on the same "zone".

- *How long does it take to warm a house? Is there a difference between heating a house with a lot of moisture and a dry house?*

  Yes, residences that are moist will take longer to heat. How long exactly depends on the level of moisture in your residence. When moisture evaporates, it has the same effect as an evaporative cooler. When there is a newly poured concrete floor, the overall temperature will remain on the cool side until the floor is fully cured. On the positive side, the panels typically "cure" the concrete in 1/2 to 1/3 the normal time.

- *Can I place a curtain in front of a Panel?*

  Yes, you can place a curtain in front of your Panel. Many materials can be used without a significant affect on your heating capacity. The indirect heat will generally compensate for the loss of direct heat. However when placing your curtain make sure you keep a distance of at

least 1 ½ feet, or 50 cm between the front of the Panel and the curtain.

- *Can I heat a larger room; say 36 x 36' (11 x 11m), by placing my Panels on the wall? Will the Panels' heating range suffice?*

  In this particular case we place the Panels on the walls across of one another. We know IR-light is effective within a radius of 11.5' (3.5m) making our direct heating range 23' (7.0m). Indirect heating stretches that range to about 33' (10m) without there being any "colder areas".

  For rooms exceeding 33' (10m), the Lexin Comfort Heating should either be suspended from the ceiling, or used for "zone-heating" when placed on the walls.

- *Is it possible to set my temperature for each room separately with one thermostat?*

  The thermostat inputs on the LHC-6 controller can be connected in parallel, and the film temperature for each room programmed differently. This requires sensor panels in each room. The temperature in the main room would be controlled by the thermostat, and the temperature in the other rooms would follow the main room's pattern or cycle.

Glossary

GFI (Ground Fault Interrupt, or Earth leakage circuit breaker) - A switch that guarantees the safety of your electrical installation. If there is an electrical problem, this switch will switch off from the moment it a protected surface is touched preventing any possible injury.

Direct heating - A heat source that doesn't use the air as transport medium but heats objects directly.

Indirect heating - A directly heated object will accumulate warmth that will then use this accumulated warmth to warm another object in its vicinity.

Weighted degree days - Indicator for the average exterior temperature taking into account certain seasonal influences.

Main or Primary room - Where, in smaller systems, you would place the Panel with the built-in sensor as well as the room thermostat.

Main thermostat - Defines the thermostat that may control several rooms (See also FAQs).

Circuit breaker - Electrical device that can interrupt the flow of electrical current when it overloads.

Metabolism - The chemical processes in your body, especially those that cause food to be used for energy and growth.

Nanometer - One billionth of a meter.

Micrometer – One millionth of a meter

Secondary thermostat - A thermostat that controls a secondary zone within a room, or one that

controls Panels in another room that requires a different temperature; for example: bedroom, bathroom etc.

Transmission calculation - Defines the type and number of Panels needed in your home.

Emission angle - Angle of 170° at which the Panels emit their IR-light (traditional IR radiates at an angle of 90 degrees).

Heating range - The maximum distance from the Panel that can be directly heated.

Heating capacity - The area that can be heated by a single Panel.

Weighing factor - Used in the weighted degree days calculation to compensate for weather influences such as: wind and direct sunlight.

Electrical voltage (tension), current and resistance

Quantities such as electrical voltage and current can easily be explained by comparing them to a hose with water running through.

The water that runs through your hose is like electrical current in your wiring. The water pressure difference making the water flow in one direction is like the electrical voltage, pushing the current one way. The water will flow more rapidly if the pressure difference increases but when the hose is squeezed the resistance of the water builds up, decreasing the water flow. The same applies for the known electrical quantities.

The quantity for electrical voltage (U) is Volt or V, e.g.: U = 120 V.
The quantity for electrical current (I) is Ampere or A, e.g.: I = 8.33 A.
The quantity for electrical resistance (R) is Ohm or Ω, e.g.: R = 14 Ω.

The connection between these 3 quantities is known as Ohm's law:

Electric power

The electric power of an appliance equals the amount of energy it consumes. Most of this energy converts into heat.

The unit for Power (P) is Watt, or W.; e.g. P = 1 000 W.

This electric power is given by the formula:

We can also use this formula to calculate the amount of energy an appliance has absorbed.

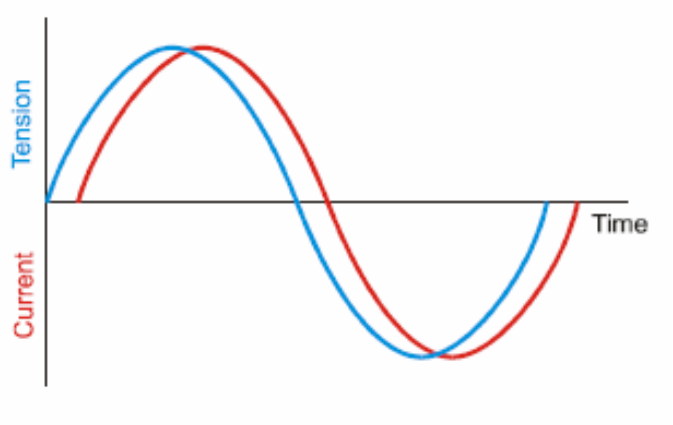
E.g. P = 1 000 W and U = 120 V. The absorbed power is 1 000 W / 120 = 8.33 A.

Finally this formula allows you to calculate the maximum power that can be connected to 1 breaker. In most cases this is 20 A. This means that with a voltage of 120 V your maximum power is 2,400 W per breaker (120 x 20 = 2,400 W). To prevent overheating and erroneous tripping of the breakers, we do not want to install more than 80% of its maximum capacity, or 1920 Watts. This is one CH4824, plus one CH2424 (1050 + 550 Watts), or three CH2424 (1750 watts).

Cos φ

Most AC outlets provide electrical current that alternates 60 times per second. This is called alternating current. This alternating current follows a sinusoidal pattern.

Various loads on this constantly alternating current can create phase shifting. Phase shifting in electricity can be defined as the absorbed alternating current running out of synchronization with the alternating voltage or ”tension” (see illustration).



The unit for this phenomenon is cos φ (or cosine Phi), its value can vary from 0.0 to 1.0 where 1.0 indicates that no phase shifting occurs and 0.0 shows that the maximum phase shift is -90° or 90°.

The most common cos φ for electrical appliances is 0.9 − 1.0 (= not purely resistive).

Electric potential and cos φ allow you to define your energy consumption.

Unlike most appliances, Lexin’s Panels have a pure resistive load (cos φ is 1.0).

Electric energy consumption

What you are eventually going to consume and pay for it is off course of great relevance.
Your energy supplier can determine exactly how much energy you've consumed with a kWh meter.

The unit for energy (E) is kWh; e.g. E = 25 kWh.

Put into practice this entails that a Panel of 1 000 W will consume 1 kWh per hour and a Panel of 500 W will consume 0.25 kWh per ½ h.

The price you pay for 1 kWh depends on several things: your location, your energy supplier and your subscription but will usually vary between $ 0.05 and $ 0.18.

If you have a multi-tier rate structure, use the lowest rate to warm the objects in the space; then when the rates go up, use the objects in the space to radiate the warmth. i.e. Let your Panels work hard only when you are paying the low tariff (increase the temperature during this time), and lower the temperature when the rates go up.

Usually, this mans raising the temperature of your Panel at night to allow you to accumulate warmth during the cheaper rate and benefit from it during the more expensive day rate. With the correct smart (set back) thermostat you can program this selective usage of your Panels.

North American Warranty

Thank you for purchasing this Lexin product. It is our intention that you experience many years of satisfaction. This product has been designed and manufactured to the highest quality standards.

Should unintentional failure of this equipment occur, Lexin will, at its sole discretion, either repair or replace the equipment at no expense to the user, provided it is returned to Lexin, freight prepaid. If Lexin determines that it is a valid warranty claim, Lexin will pay for the return shipping.

Validity:

Five (5) years from date of purchase on heaters installed by a LEXIN recognized installer.
Three (3) years from date of purchase on do-it-yourself installations.
One (1) year from date of purchase on thermostats, relays, and the control systems.

This Lexin warranty compliments the obligations of your independent Lexin dealer, and does not affect your statutory rights as a customer. You may have other rights, which vary by State.

The Lexin warranty applies provided the product is installed correctly and it is used for its intended use in accordance with its operating instructions. The claimant must present a copy of the original invoice or cash receipt, indicating the date of purchase, dealer's name, and model and production number of the product.

The warranty is void if:

- Documents have been altered in any way or made illegible
- The model or production number on the product has been altered, deleted, removed, or made illegible
- Repairs or product modifications and alterations have been executed by unauthorized service organizations or persons
- There is damage which is caused by accidents, including but not limited to, natural disasters, lightning, water or fire, acts of war, civil unrest, misuse or neglect
- Non-Lexin approved control units, relays, and/or thermostats are used.

Return procedure:

If your Lexin product is thought to be defective, please contact your local Lexin dealer.

In order to avoid unnecessary inconvenience, please check to make sure that your circuit breakers are not off, or tripped, your thermostat settings are correct (including on/off switch), and if necessary, re-read the operating instructions carefully before contacting your dealer.

In order to serve you better, Lexin requires that all returns for warranty are accompanied by a Return Authorization document (RA). Prior to shipping any product to Lexin, please contact your local dealer, or Lexin to obtain a RA number, and the correct “ship to” address for our regional customer service department. Product received without a RA may be returned (repaired or un-repaired) at the customer’s expense.

If you like additional information on Lexin products or have questions, which your dealer is not able to answer, please email us at info@lexinusa.com, or write to Lexin’s mailing address:

Lexin Energy Systems, Inc. 11856 Balboa Blvd #300 Granada Hills, CA 91344

Programming Logs *(to be completed by installer)*

Zone	Serial Number	Room (Living room, bedroom, etc.)	Temp (ºC)	PWM (%)
1				
2				
3				
4				
5				
6				

Lexin Energy Systems, Inc.
Toll free 866 LEXIN 06 (866-539-4606)
Direct (805) 532-1464 (phone and fax)

Dealer locator:
Please visit www.lexinusa.com