ULTRA-FIN™
Radiant Floor Heating System

★★★★ INSTALLATION GUIDE ★★★★

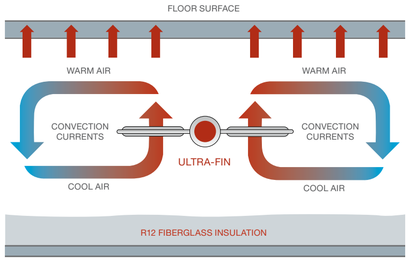
ULTRA-FIN: RADIANT HEATING

Welcome to Ultra-Fin

Ultra-Fin is the leader in cost efficient and high comfort radiant floor heating. Ultra-Fin is a hydronic system designed specifically for wood-frame housing that is simple to install, and is compatible with all floor coverings including carpet, tile, slate and hardwood.

How Ultra-Fin Works

The Ultra-fin system uses ½" (5/8" O.D.) tubing to circulate hot water through the under-floor joist spaces, where heat is conducted to louvered aluminum Ultra-Fins attached to the tubing. The Ultra-Fins radiate the heat and warm the air in the joist spaces, creating hot air convection. The heated air warms the floor uniformly and the floor radiates gentle heat throughout the living space above.



The science behind the Ultra-Fin™ system

What Makes Ultra-Fin Different?

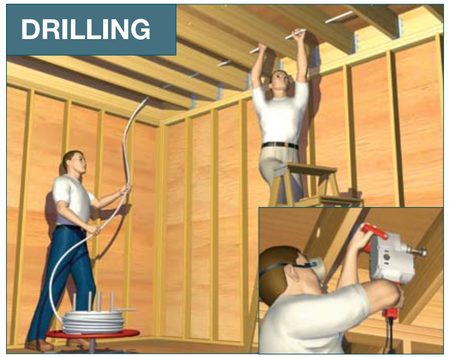
Traditional radiant floor systems are based on heat contact transfer technology where hot water tubing makes direct contact with floor layers. Compared to Ultra-Fin, these systems are overly complicated, time-consuming to install, provide lethargic heat response, and require complicated construction measures such as extra floor layers or concrete.

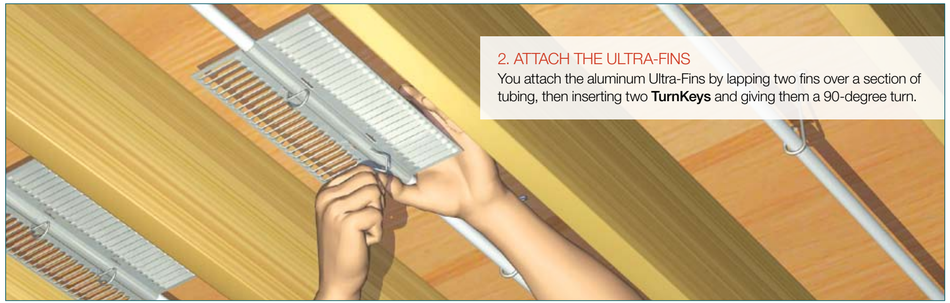
Ultra-Fin creates new efficiency by generating hot air convection inside regular wood-frame floor systems. By converting the entire floor system into a giant heat radiator, Ultra-Fin generates uniform warmth and comfort at unprecedented cost savings and convenience.

GREAT PERFORMANCE WITH SIMPLE INSTALLATION

1. HANG THE TUBING

When you install Ultra-Fin, you start by installing the tubing. You can either run the tubing **parallel** to the joists using *SnakeHangers*™ or you can drill the joists and run the tubing **through** the holes.





2. ATTACH THE ULTRA-FINS

You attach the aluminum Ultra-Fins by lapping two fins over a section of tubing, then inserting two **TurnKeys** and giving them a 90-degree turn.

3. READY FOR INSULATION

Simply connect your tubing to the supply and return manifold, and you're ready to insulate the system. Yes, it's just that easy!

TWO WAYS TO INSTALL ULTRA-FIN

You can install your Ultra-Fin system one of two ways de-pending on what type of boiler or heat source you are using:

1. Ultra-Fin HIGH TEMP
   Using a high-temperature boiler.
2. Ultra-Fin MODULATING
   Using a modulating boiler.

Whichever you choose, you will design your system layout as follows:

Calculate BTUs and Materials

Whenever you install the tubing for the Ultra-Fin system, you need an installation layout that fits the home and the surrounding climate. Use Ultra-Fin's Ultra-Calc software to calculate the BTUs and materials required for your installation.

You need the following information:

- The type of heat source your system will use (e.g. boiler, heat pump, etc).
- The anticipated operating temperature of your heat source.
- The average mean temperature for your area or location (referred to as **design temperature** in the Ultra-Calc program; click the "DESIGN TEMP" tab).
- The length and width of each room in the home.
- The ceiling heights of each room.
- The size and R-factor of every window, and whether or not they are single or double-paned.
- The R-factor of the insulation in the walls and ceilings (or at least the insulation type and thickness).

Enter these numbers into the Ultra-Calc program on your computer. Ultra-Calc will tell you:

- Amount of tubing you need.
- Number of Ultra-Fins you require.
- BTU requirements for the boiler/hot water source.

You can download the Ultra-Calc program for free on our website **www.ultra-fin.com**

ULTRA-FIN **HIGH TEMP** 140° - 180°F

If you plan to use a high temperature boiler, you want to design your system according to **Ultra-Fin High Temp**. In this configuration, your system will require the fewest number of Ultra-Fins and potentially less tubing.

Install the Tubing

You can either run the tubing **parallel** to the joists using *SnakeHanger*™ tubing hangers or run it **laterally** through the joists by drilling them.

TUBING PARALLEL TO JOISTS

- Drill each joist 6" from the outside header and 8" from inside heat zone boundaries – this is where you will make the turns on your runs for each heat zone. (Refer overleaf to **Drilling Joists**).
- Attach *SnakeHangers*™ every 24" to floor sheathing of joist space center.
- Hang tubing.
- Maximum tubing length is **300ft**.

Tubing through joists - refer overleaf to **pulling tubing**

THIRD PARTY TESTED BY WARNOCK HERSEY

ROOM TEMPERATURE	WATER TEMPERATURE	MEASURED BTU OUTPUT	INSIDE JOIST TEMPERATURE	FLOOR TEMPERATURE
72°	150°	27.3 BTU/SQFT	96°	81°
72°	180°	41.6 BTU/SQFT	105°	85°
60°	150°	33.4 BTU/SQFT	85°	67°
60°	180°	46.5 BTU/SQFT	96°	71°

ULTRA-FIN **MODULATING** 100° - 145°F

If you plan to use a modulating boiler, your system will need a few more Ultra-Fins to distribute the heat with the lower operating temperature.

Your best option is to install your tubing parallel to the joists using tubing hangers. Depending on your joist spacing, you will need Ultra-Fins installed at 12-22" centers.

Install the Tubing

You can either run your tubing **parallel** to the joists using *SnakeHanger*™ tubing hangers or run **laterally** through the joists by drilling them.

TUBING PARALLEL TO JOISTS

- Drill each joist 6" from the outside header and 8" from inside heat zone boundaries – this is where you will make the turns on your runs for each heat zone. (Refer overleaf to **Drilling Joists**).
- Attach *SnakeHangers*™ every 24" to floor sheathing in joist space center.
- Hang the tubing.
- Maximum tubing length is **300ft**.

Tubing parallel to joists

WARNOCK HERSEY CERTIFICATION

THIRD PARTY TESTED BY WARNOCK HERSEY — TESTED WITH 3/4" PLYWOOD & 3/4" SOLID OAK FLOORING

ROOM TEMPERATURE	WATER TEMPERATURE	MEASURED BTU OUTPUT	INSIDE JOIST TEMPERATURE	FLOOR TEMPERATURE
70°	100°	7 BTU/SQFT	84°	72°
60°	100°	10 BTU/SQFT	76°	63°
70°	110°	9 BTU/SQFT	89°	73°
60°	110°	13.4 BTU/SQFT	81°	64°
70°	120°	11.5 BTU/SQFT	93°	74°
60°	120°	16.4 BTU/SQFT	85°	64°
70°	130°	16 BTU/SQFT	96°	74°
60°	130°	20.2 BTU/SQFT	89°	65°
70°	140°	20 BTU/SQFT	98°	75°
60°	140°	23.7 BTU/SQFT	94°	66°
70°	145°	23 BTU/SQFT	99°	75°
60°	145°	26 BTU/SQFT	97°	66°

ULTRA-FIN WORKS GREAT WITH HARDWOOD FLOORS!

One of Ultra-Fin's most popular features is its compatibility with hardwood floors. However, any hardwood floor can suffer shrinkage or other damage if it is not installed correctly. Make sure your flooring installer follows the manufacturer's instructions for your hardwood product, and review the checklist below.

Hardwood Checklist

Hardwood reacts to relative changes in humidity by expanding and shrinking. To maintain the integrity of your hardwood floor, here are some of the steps to consider in your floor installation:

- ☑ Before your hardwood floors are installed, make sure that all plastering and concrete work is completely dry.
- ☑ Make sure the home heating system is operating.
- ☑ Make sure the home has been heated at 72° F (22° C) for at least five days before flooring delivery.
- ☑ Allow concrete to cure for a minimum of 30 days before hardwood floors are installed.
- ☑ Climatize flooring materials at room temperature for at least 10 - 14 days prior to installation.
- ☑ Use a moisture meter to measure the moisture content in the sub floor. Moisture content should be between 6% and 12%. If the moisture content exceeds 12%, turn up the heat and open the basement windows ¾".
- ☑ Use a moisture meter to measure the moisture content of the hardwood flooring to be installed. For flooring less that 3" wide, the difference in humidity between the sub floor and the hardwood must be less than 4%. For flooring greater than 3" wide, the difference in humidity between the sub floor and the hardwood must be less than 2%.

+ NOTE +
This checklist is for general consultation only. It is not intended to replace the guidelines and instructions of your flooring manufacturer.

Contact Information

Email us: **info@ultra-fin.com**
Call us toll-free: **1 888 565 2267** (office hours: 7:00 - 4:00 PST)
Fax us toll-free: **1 888 565 2228**

WWW.ULTRA-FIN.COM

MACDUFF CO MANUFACTURING

Design a Tubing & Fin Layout

After you know how much material you need, you are ready to design an installation layout for the tubing and aluminum Ultra-Fins.

NOTE: Some sample layouts for High Temp installation are shown on the back of this brochure.

A. Calculate the Number of Heating Zones

Look at the overall square footage of the home and the total number of rooms. How many rooms does the home have? With the exception of small interior spaces such as hallways and powder rooms, this is the number of heating zones you will want to install.

B. Sketch the Floor Plan

Sketch the floor plan and mark out the heating zones you intend to install, complete with length and width measurements for each zone.

+ NOTE +
Ultra-Fin highly recommends having separate heating zones (tubing circuits) for each room in the house.

C. Measure the Joist Spacing

The joist spacing in the floor system will usually be 12", 16" or 19". In rare instances, it could be 24". When you have determined the joist spacing, you are ready to calculate the tubing spacing for each zone.

D. Decide if you will run the tubing parallel to the joists or perpendicular across the joists.

You have **two options** when you hang the tubing. You can either run the tubing **parallel** to the joists using *SnakeHangers*™ or you can drill the joists and run the tubing **laterally** through the joists.

Read the following sections for Ultra-Fin **HIGH TEMP** or **MODULATING** to see which way is right for you.

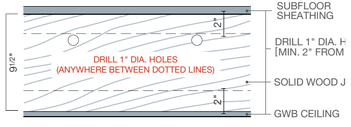
Drilling Joists

For standard installation, joists should be drilled 3" below floor sheathing, spaced according to the calculations you made.

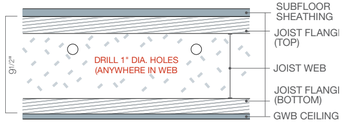
However, there are some exceptions to this rule:

- When the joists are manufactured "truss joists," refer to the joist manufacturer's instructions regarding drilling in the joist web before automatically drilling 3" below sheathing, or 8" from each end of the joist span.
- When the joists are 8" or less in depth, you may still drill 3" below floor sheathing, but you must use a thinner, special insulation product. This ensures the insulation does not touch the tubing and the Ultra-Fins.

JOIST HOLE DETAILS_SOLID WOOD JOIST



JOIST HOLE DETAILS_WEB JOIST

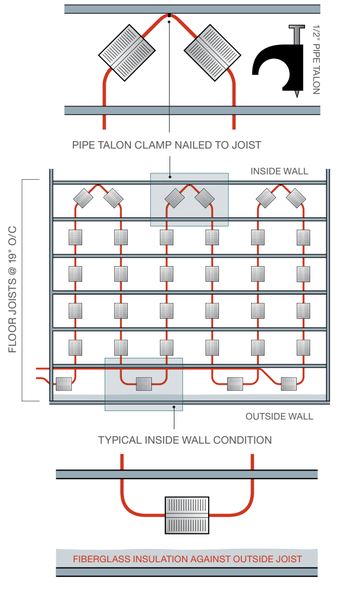


Pulling Tubing

If you choose to drill the joists and run the tubing through the joists (e.g. Ultra-Fin High Temp installation), use the following procedure to pull the tubing through the holes:

- For each heating zone, feed one continuous length of ½" tubing (5/8" O.D.) through the holes and back to the supply/return manifold.
- On turns against outside walls, bend tubing into a flat D-shape so that it can take one Ultra-Fin. Always allow 10" of straight tubing on the D-bend.
- On turns against inside walls, bend the tubing into a V-shape and clamp it to the side of the box joist, so it can take two Ultra-Fins. Make sure you allow 10" of straight tubing on each side of the V-bend.
- Connect the ends of the tubing circuit to the supply/return manifold.
- Test circuit with water under pressure.

INSIDE AND OUTSIDE WALL CONDITIONS_DETAILS

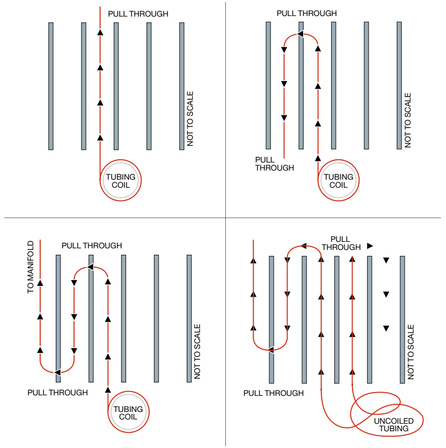


+ INSTALLATION TIP +
You can save time pulling tubing by starting to pull your coil from the middle of each zone/room. (See diagram below)

When you have finished pulling the tubing through one half of the zone and back to the supply/return manifold, measure the length of tubing you need to complete the remaining half of the zone and its return run to the manifold.

Roll that length off the tubing coil and cut it, allowing some extra length to be safe. (See diagram below)

INSERTING TUBING

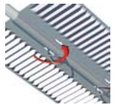


Attaching Ultra-Fins

Attaching the Ultra-fins is easy, just follow these steps:

1 **Lap two Ultra-Fins over a section of tubing and insert two TurnKeys.**

Fasten the Ultra-Fins together by twisting both TurnKeys 90°. **2**



3 **Done. Ultra-Fin installs 4X faster with our new TURNkey™**

Insulating the Ultra-Fin System

In all circumstances, the joist space below the Ultra-Fin System must be insulated.

The type and thickness of insulation material will vary according to two factors:

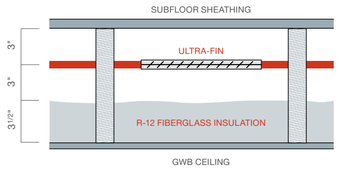
1) The depth of the joists.
There must be a minimum of 2" of dead air space between the Ultra-Fins and the insulation, and another minimum 2" between the Ultra-fins and the floor sheathing. (Minimum 4" total air space is required, and 6" is recommended wherever possible.)

2) Whether or not the room/space below the joists is classified as heated and enclosed (e.g. interior room) or unheated and exposed (e.g. garage or carport).

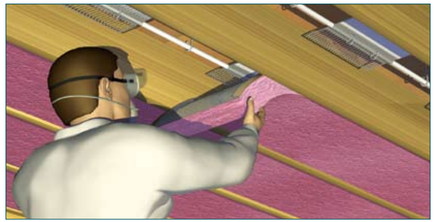
Refer to the following diagrams for specifications and instructions on insulating the Ultra-Fin System under a variety of circumstances.

Insulating Above Heated Areas

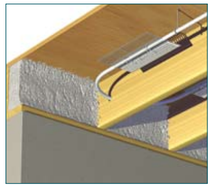
INSULATION OVER HEATED AREA_10" JOIST



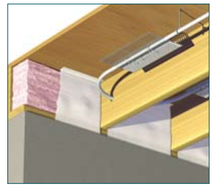
+NOTE +
For all Ultra-Fin installations, ensure the insulation rests flush with the bottom of the joists, and that a minimum 2" air space is always maintained between the Ultra-Fins and the insulation.
Refer to the insulation diagrams in this section to confirm that you have allowed sufficient air space.



R-12 fiberglass insulation



Spray foam or styrofoam insulation

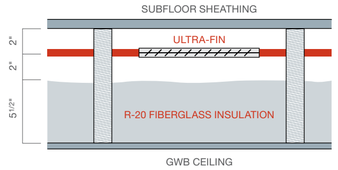


R-20 fiberglass with vapor barrier

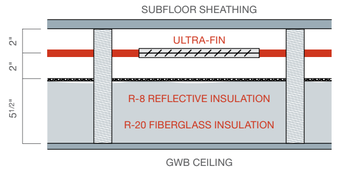
+ IMPORTANT NOTE +
Building codes prohibit you from drilling in certain parts of joist members. Before you drill, refer to Drilling Section in this manual for guidelines on where you are permitted to drill joists. Incorrect drilling may result in structural failure of joist members. Also check with your appropriate local building authority.

Insulating Above Unheated and Exposed Areas

HOLE LOCATION OVER UNHEATED AREA_10" JOIST



HOLE LOCATION OVER EXPOSED AREA_10" JOIST



+NOTE +
Care must be taken to ensure R-12 fiberglass insulation does not 'fluff up' more than 3.5" and R-20 fiberglass insulation does not 'fluff up' more than 5.5". The Ultra-Fin System will not function properly if the air flow below the Ultra-Fins is blocked.

Ultra-Fin SideKey

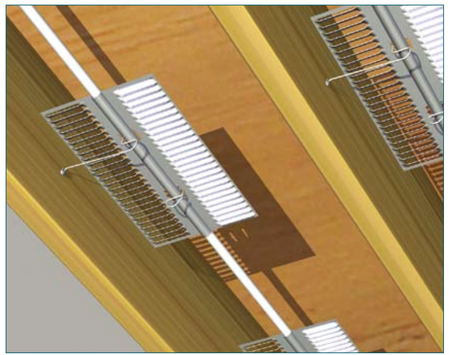
In new construction above small crawl spaces, you can choose to install Ultra-Fin from above, before the floor sheathing is installed.

Using the **SideKey** hanger, you can attach the Ultra-Fins and hang the tubing at the time, following these simple steps:

1 **Lap two Ultra-Fins over a section of tubing and insert one SideKey.**

Fasten the Ultra-Fins together by twisting the SideKey 90°. **2**

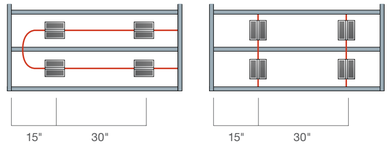
3 **Done. Finish by attaching the SideKey to the joist with a fastener.**



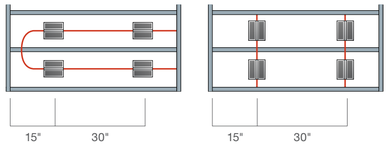
Ultra-fins installed with SideKeys

Sample Layouts: Ultra-Fin HIGH TEMP 140°-180°F

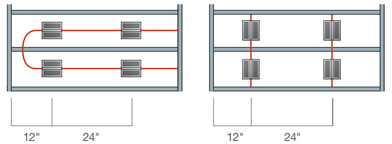
TUBING SPACING_12" JOIST SPACING



TUBING SPACING_16" JOIST SPACING



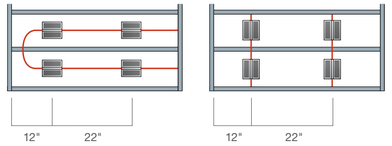
TUBING SPACING_19" JOIST SPACING



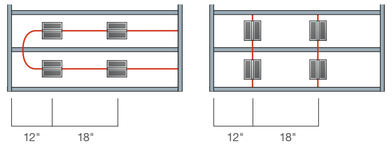
***QUICK-CALC* for Ultra-Fin HIGH TEMP:**
SQ FT X **0.3** = # FIN PAIRS

Sample Layouts: Ultra-Fin MODULATING 100°-140°F

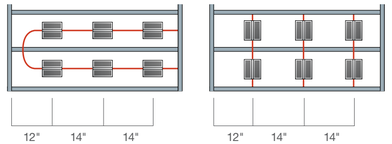
TUBING SPACING_12" JOIST SPACING



TUBING SPACING_16" JOIST SPACING



TUBING SPACING_19" JOIST SPACING



***QUICK-CALC* for Ultra-Fin MODULATING:**
SQ FT X **0.5** = # FIN PAIRS