

Residential Mod/Con Boilers

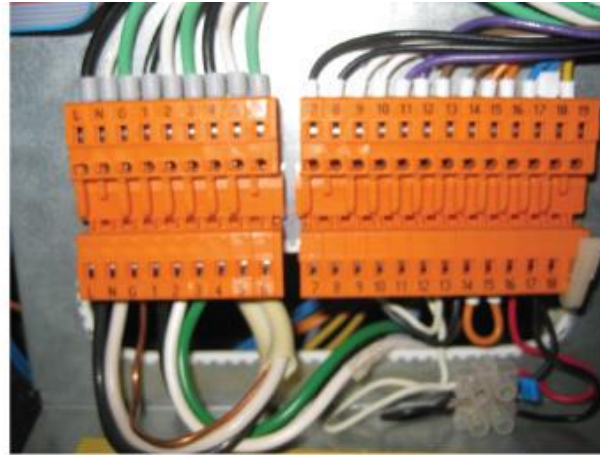
Equipment Operation

Modulating Condensing Boilers

What can your boiler do for you?



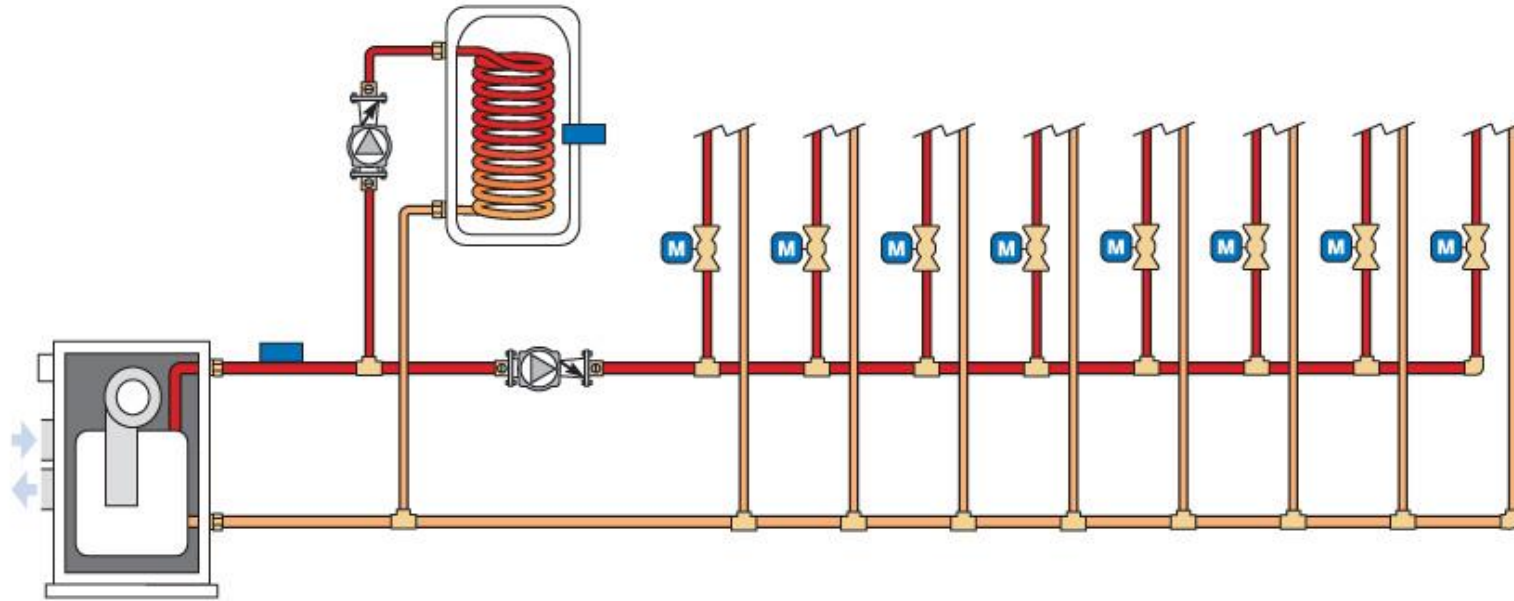
Internal Controls



Typical Functions

- Outdoor Temperature Reset (limited)
- DHW Operation (limited)

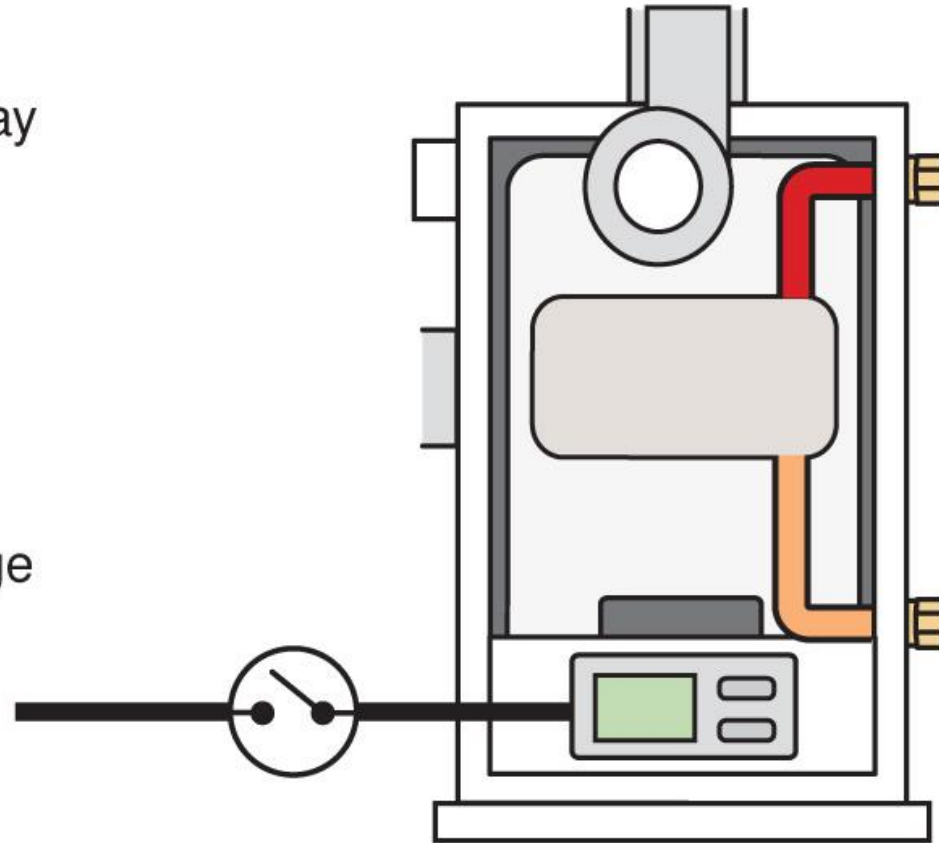
Applications



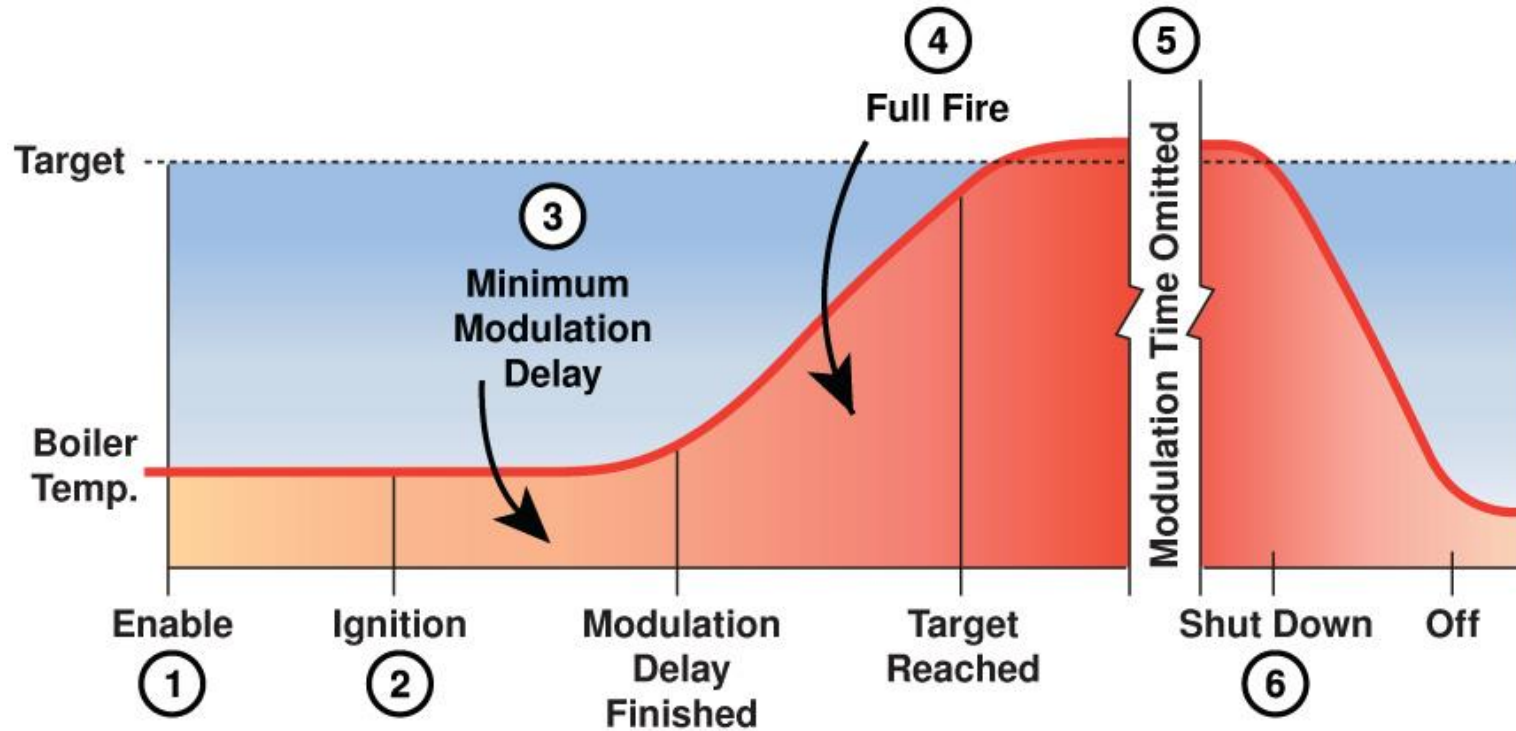
Sequence of Operation

Boiler Cycle

1. Enable and Fire Delay
2. Ignition
3. Min Mod Delay
4. Full Fire
5. Modulation
6. Shut Down and Purge



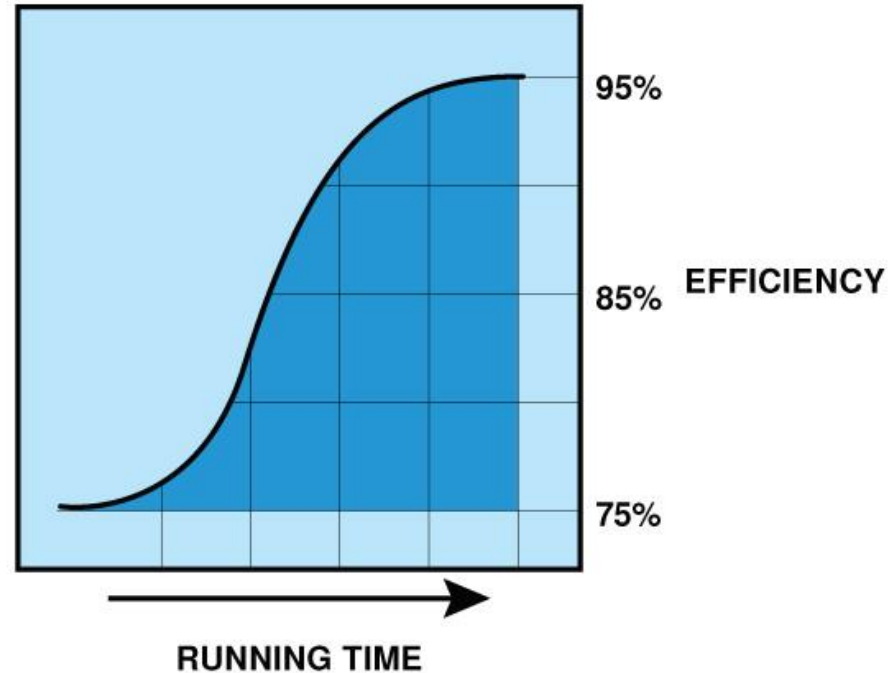
Condensing Boiler Cycle



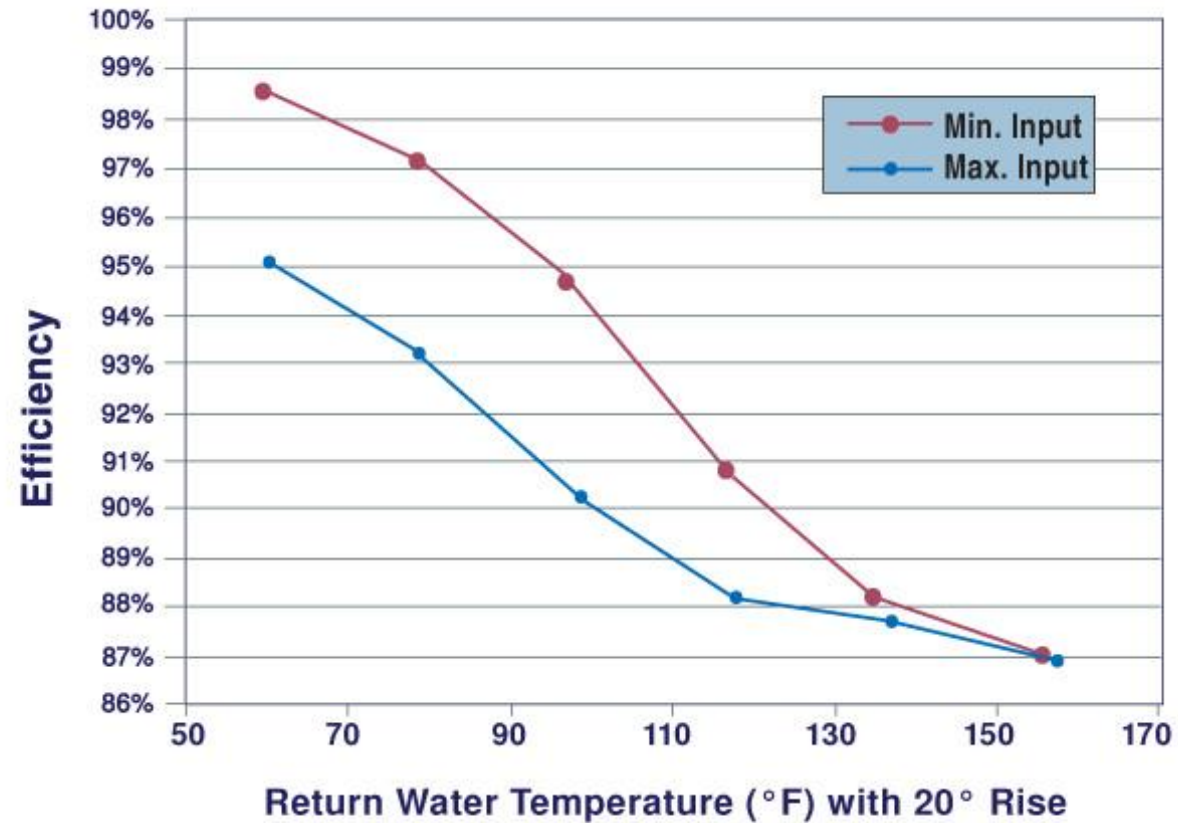
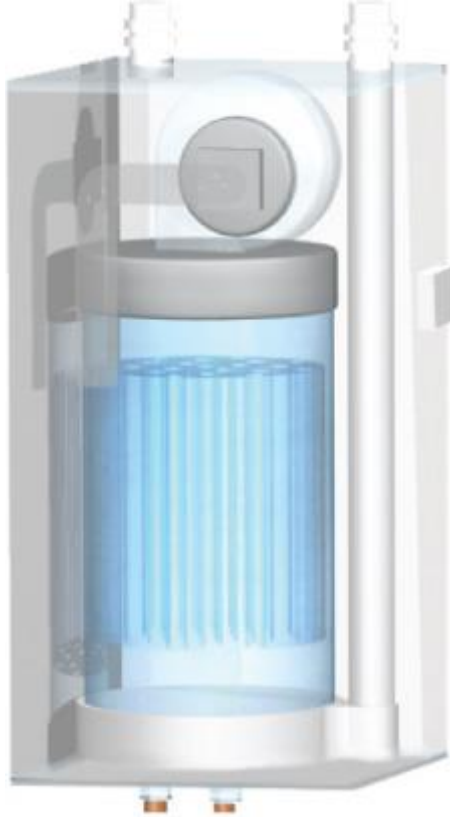
- Start and Stop portions of the cycle can be significant
- Typically between 2 and 5 minutes

Cycle Efficiency

- Start and stop portions of a cycle can account for a significant amount of run time.
- Short cycling can result in repeated, inefficient start and stop sequences.

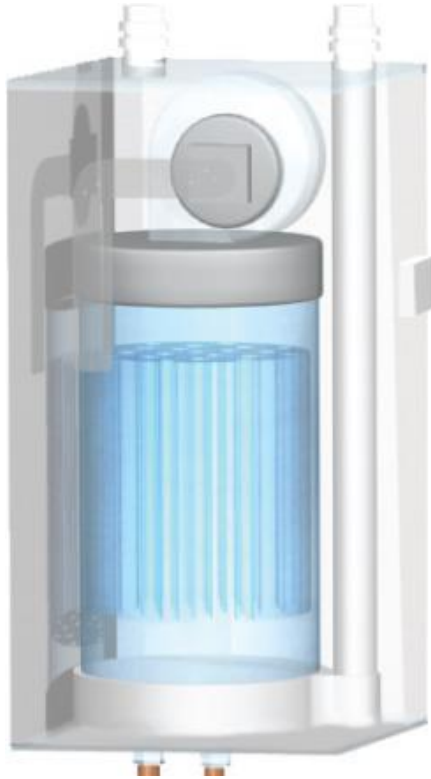


Thermal Efficiency



Low water temperatures = high efficiencies

Condensing Boiler Limits

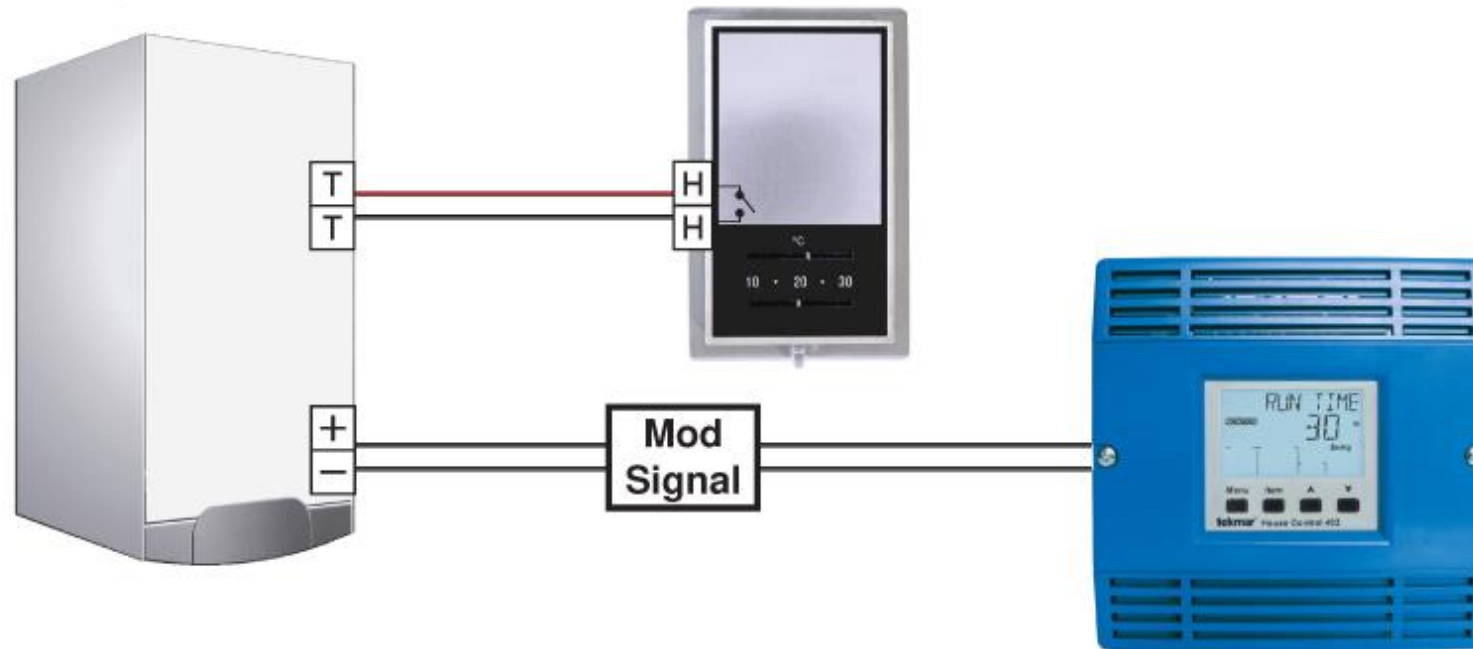


Operating Limits

- Condensation typically occurs at return water temperatures of 130°F and less
- Maximum temperatures are typically 160°F to 180°F depending on the boiler
- Control solutions must ensure that boilers are within these limits

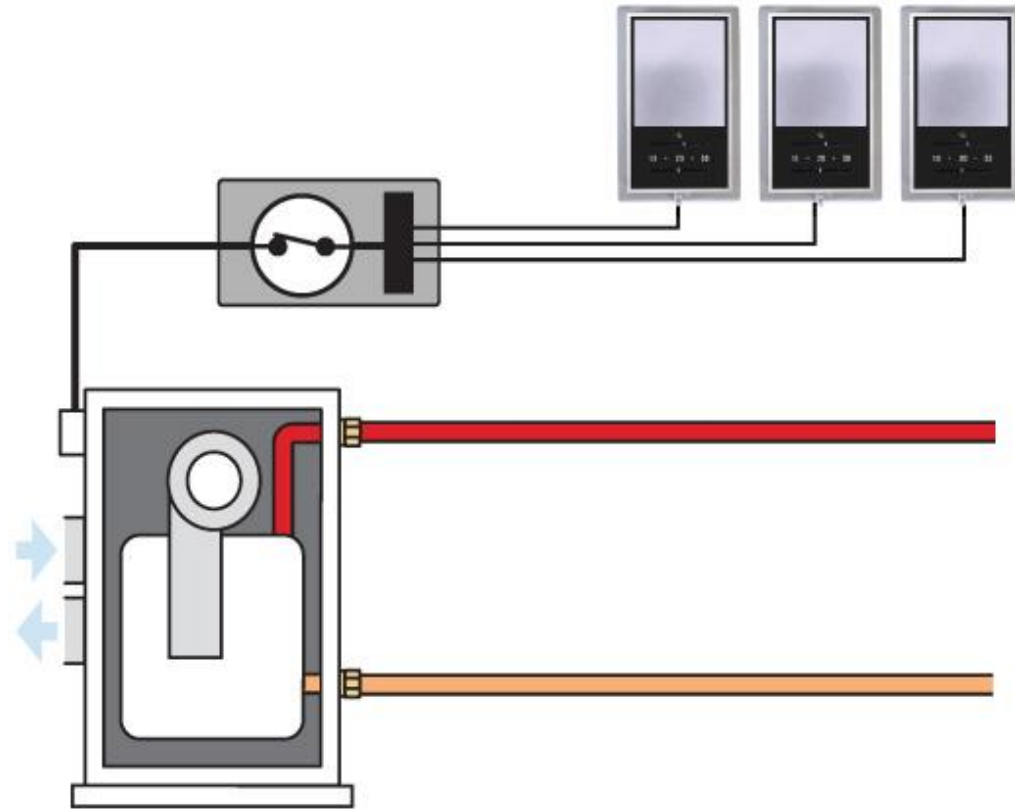
Control of Condensing Boilers

2 Ways to Control:



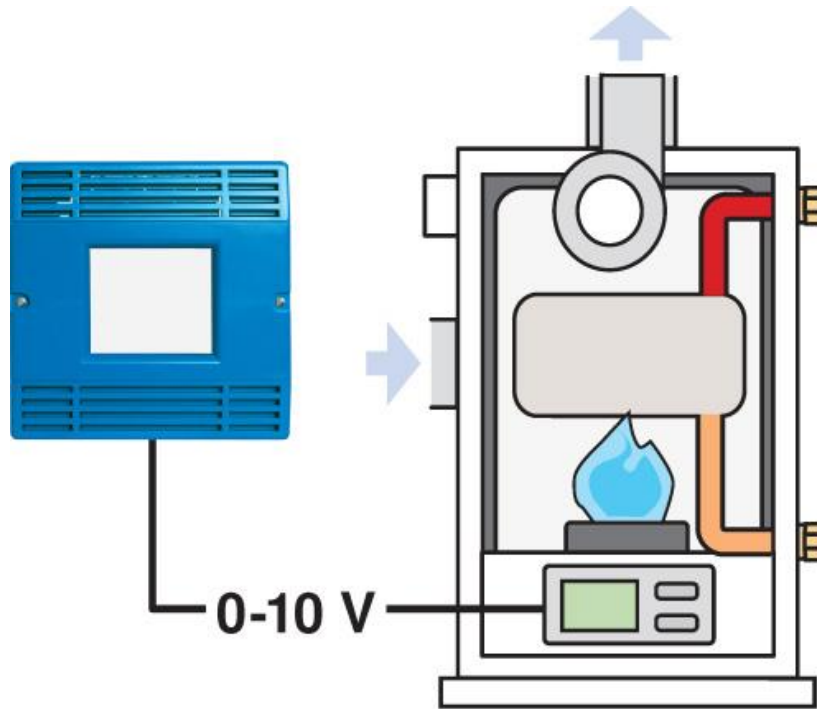
- Thermostat enable OR
- External, modulated signal

On/Off Control



- With thermostat on/off control, the boiler is at the mercy of the thermostats

Modulating Control



Benefits:

- Load matching with modulation
- Fewer cycles
- Constant circulation
- Low water temperatures with Outdoor Temperatures Reset and Indoor Temperature Feedback

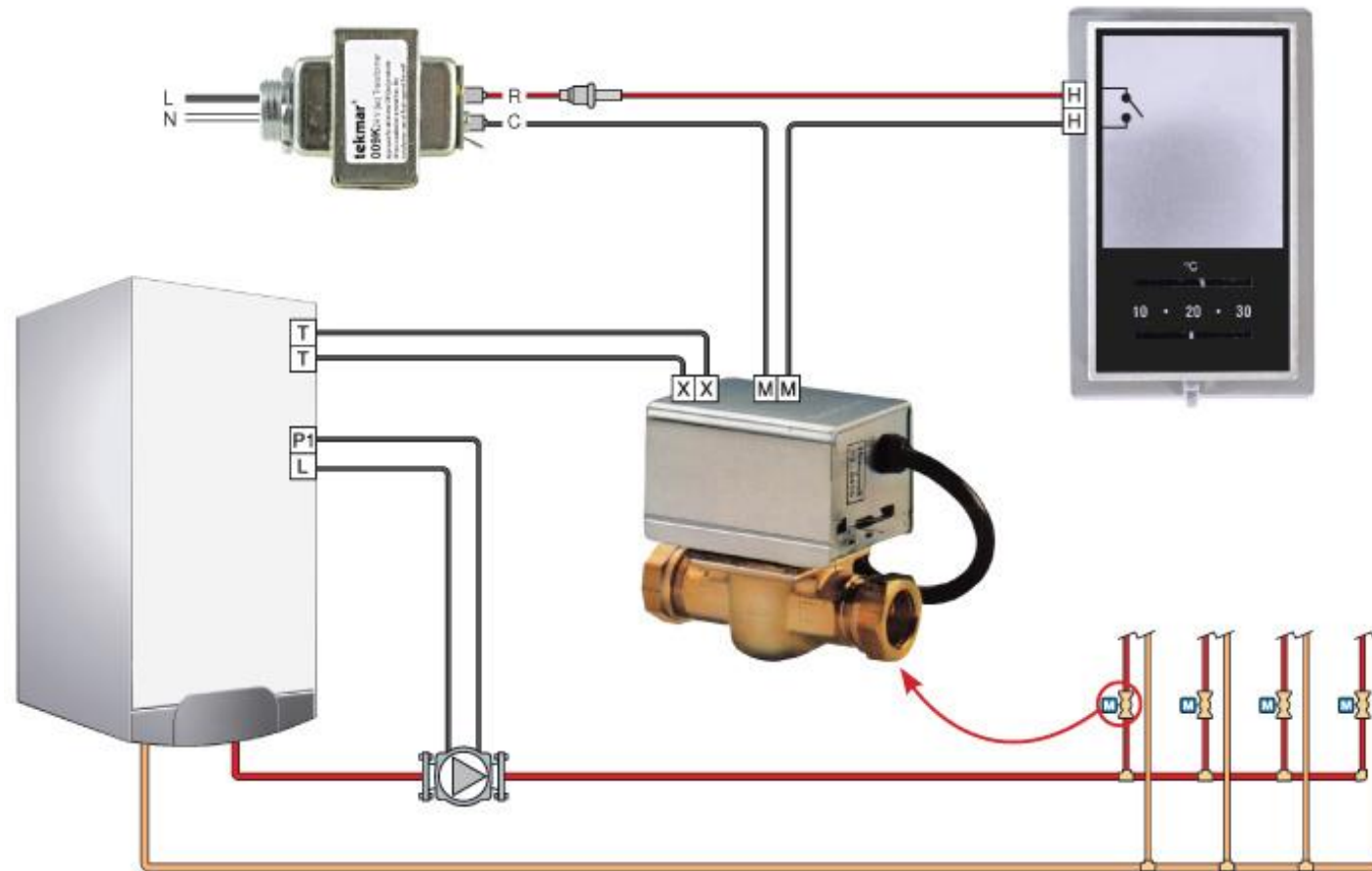
Zone Synchronization

Feature

Outline

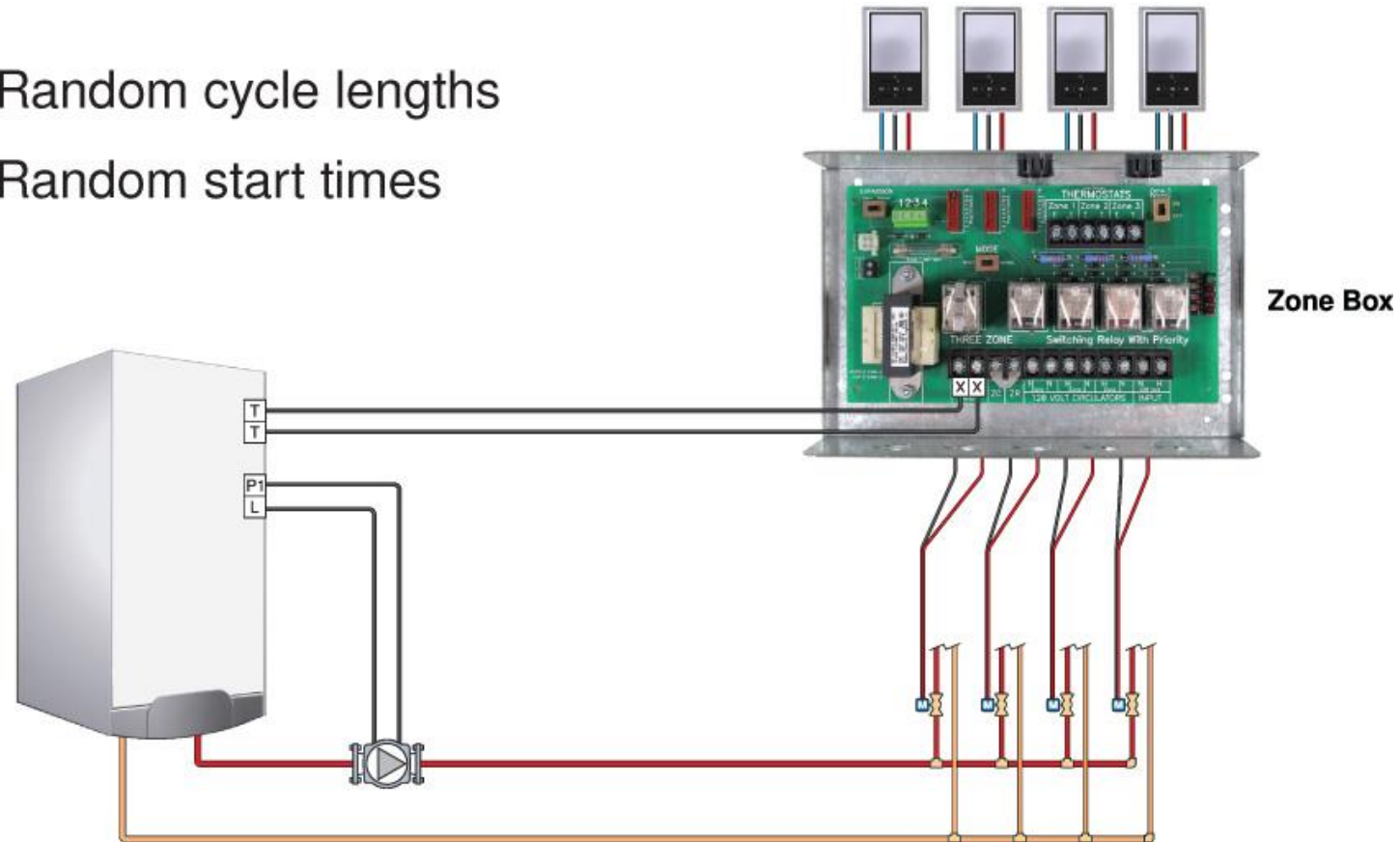
- Benefits of Zoning
- Traditional Zoning Control
- Zoning Control with tekmarNet®

Traditional Zone Control



Traditional Multi Zone Control

- Random cycle lengths
- Random start times



Effect of Traditional Zoning

No Synchronization

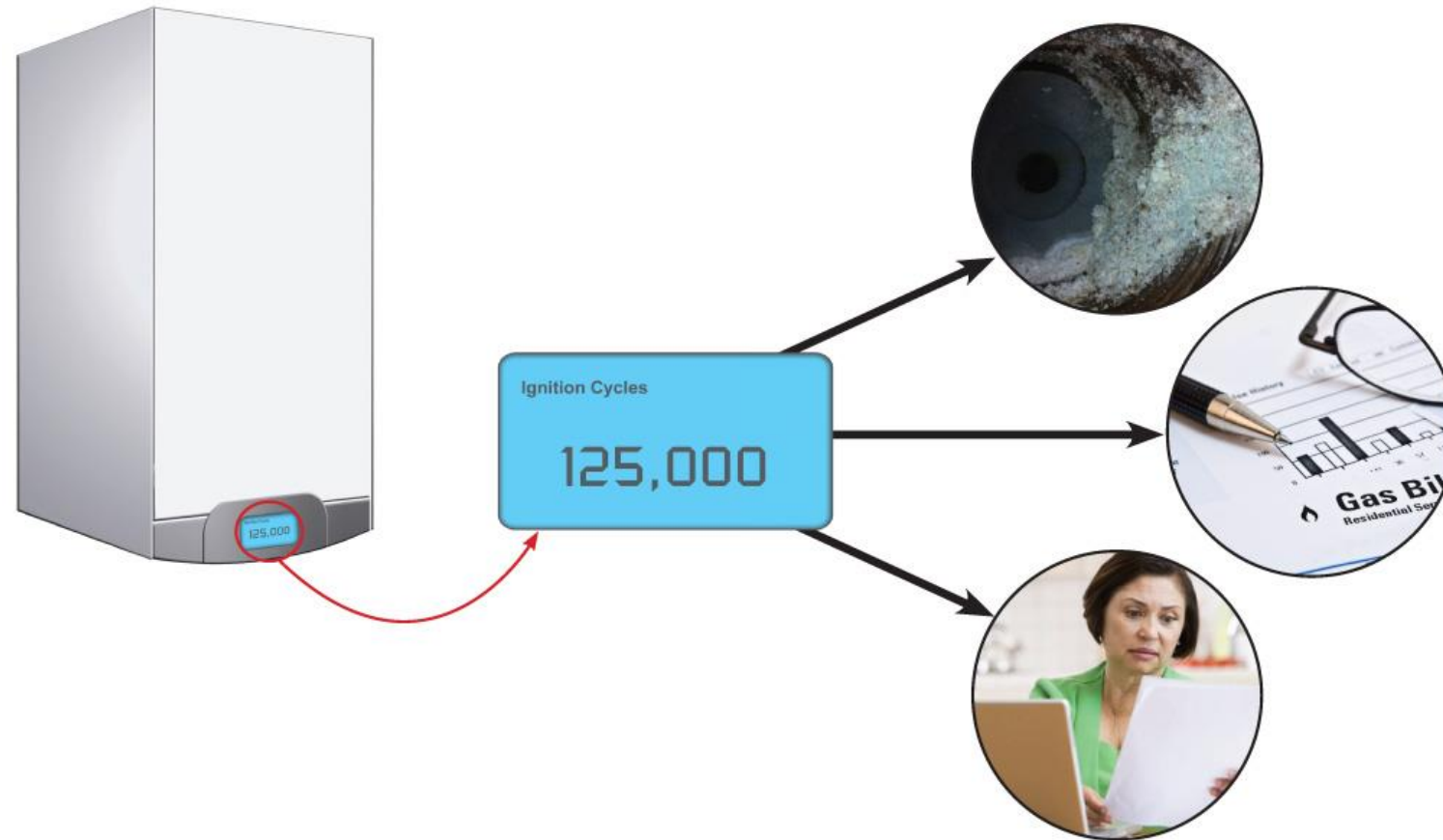
Thermostat “On” Times



Boiler “On” Times



Impact on Customer



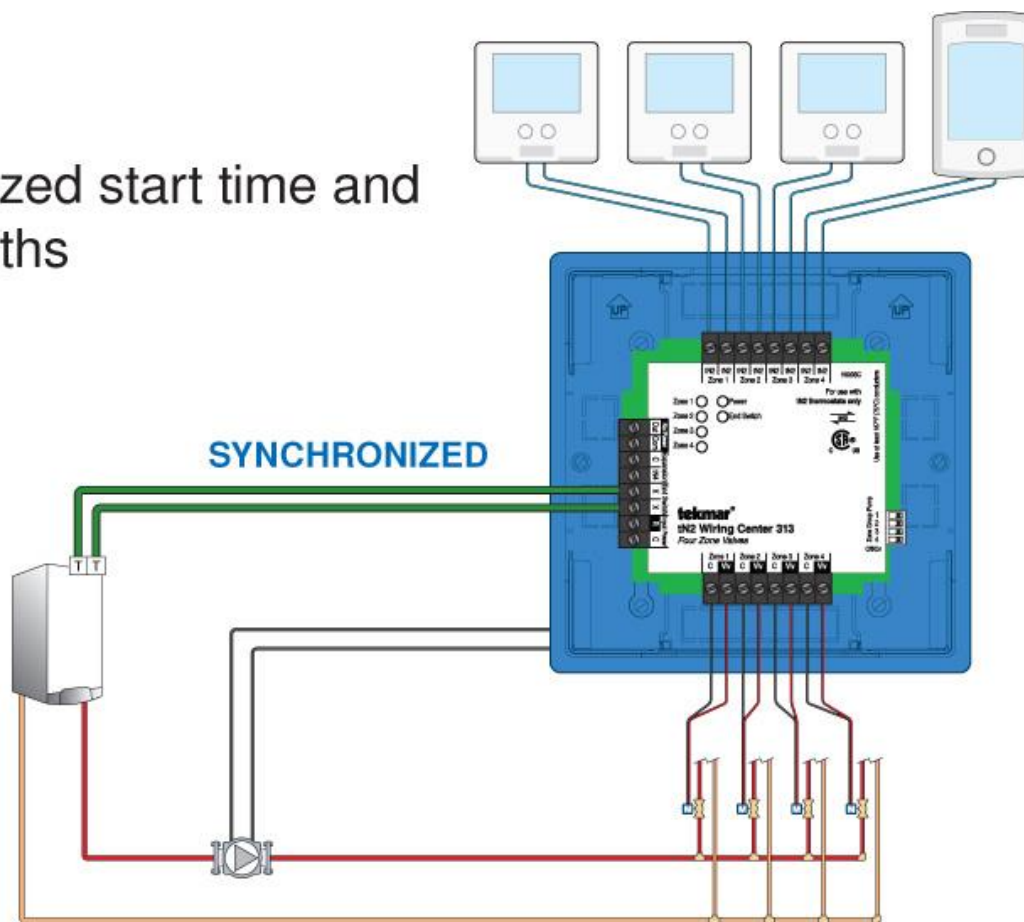
The tekmarNet[®] Solution



tekmarNet[®] can make a difference

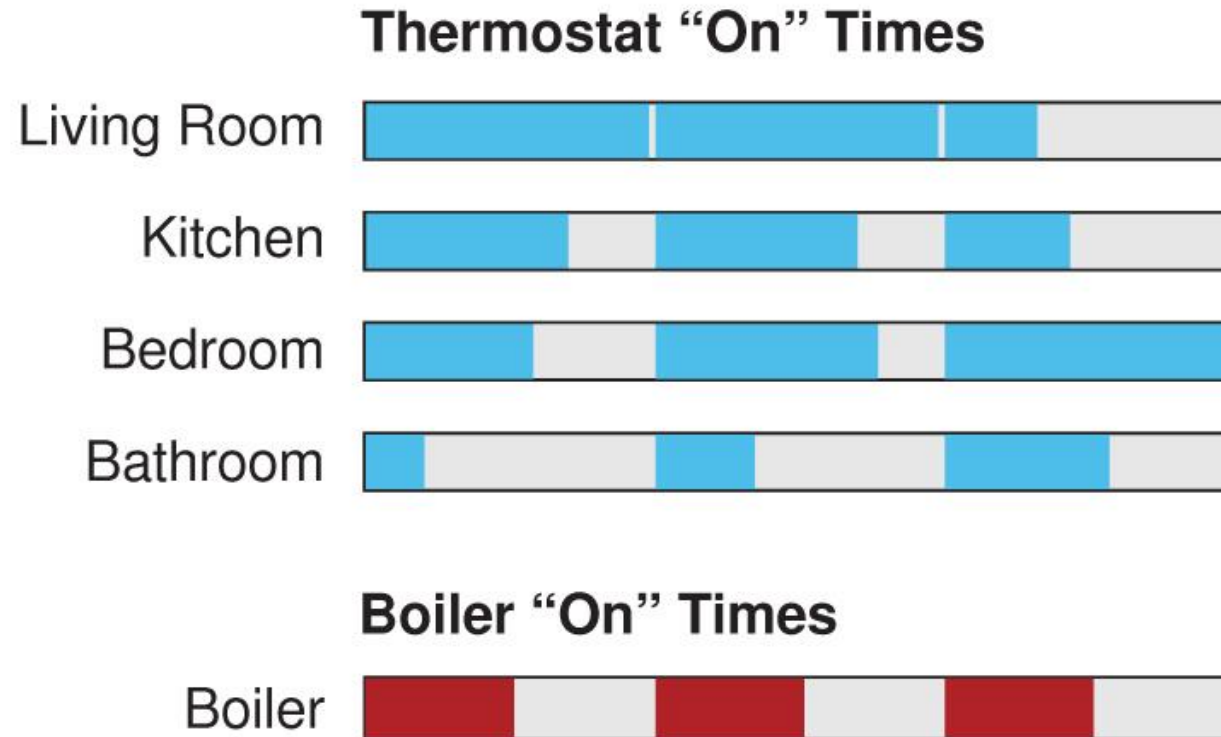
tekmarNet[®] Zoning

Synchronized start time and
cycle lengths



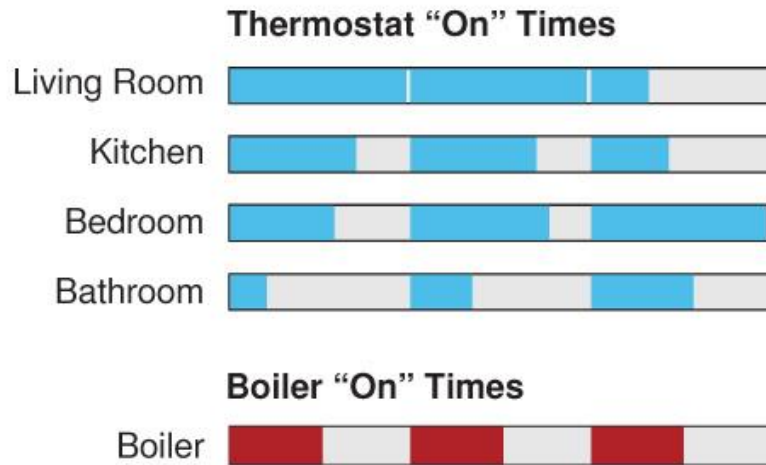
Effect of Zone Synchronization

Zoning With Synchronization



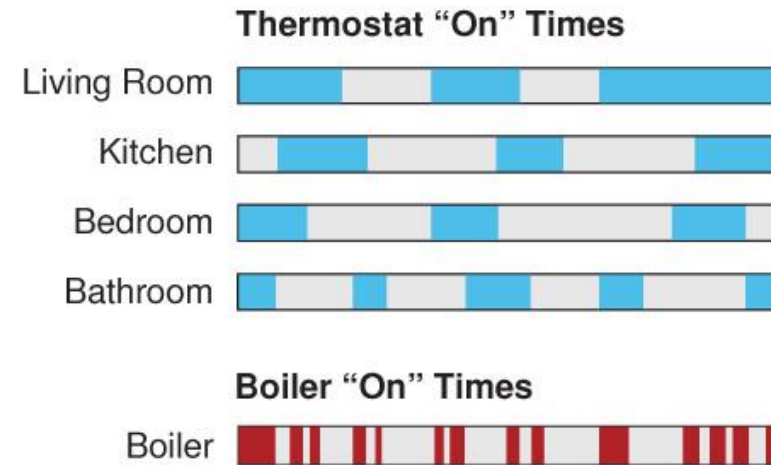
Summary

Zoning With Synchronization



- Reduced equipment cycles
- Longer equipment life
- Higher operating efficiency

Without Synchronization



- Excessive equipment cycles
- Reduced equipment life
- Inefficient operation

Indoor Temperature Feedback

Feature

Outline

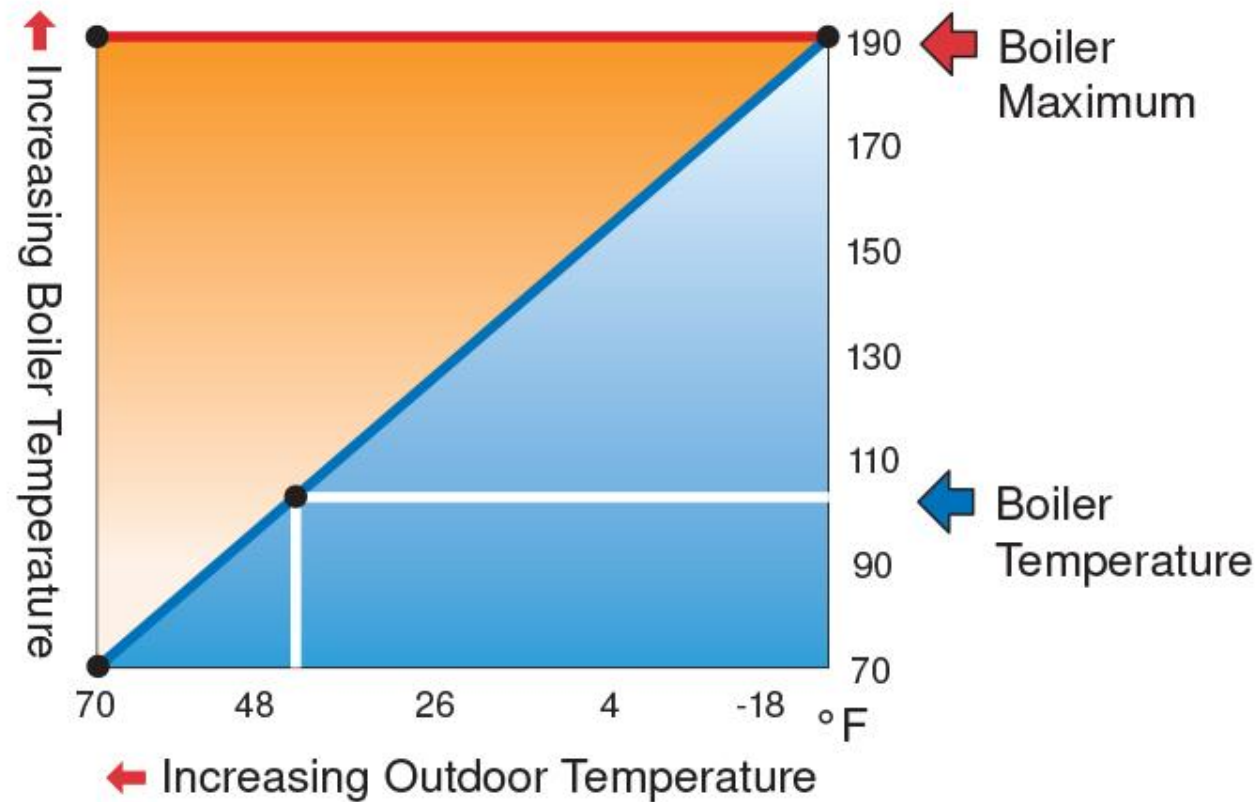
- Limitations of Outdoor Temperature Reset
- Indoor Temperature Feedback

Indoor Temperature Feedback



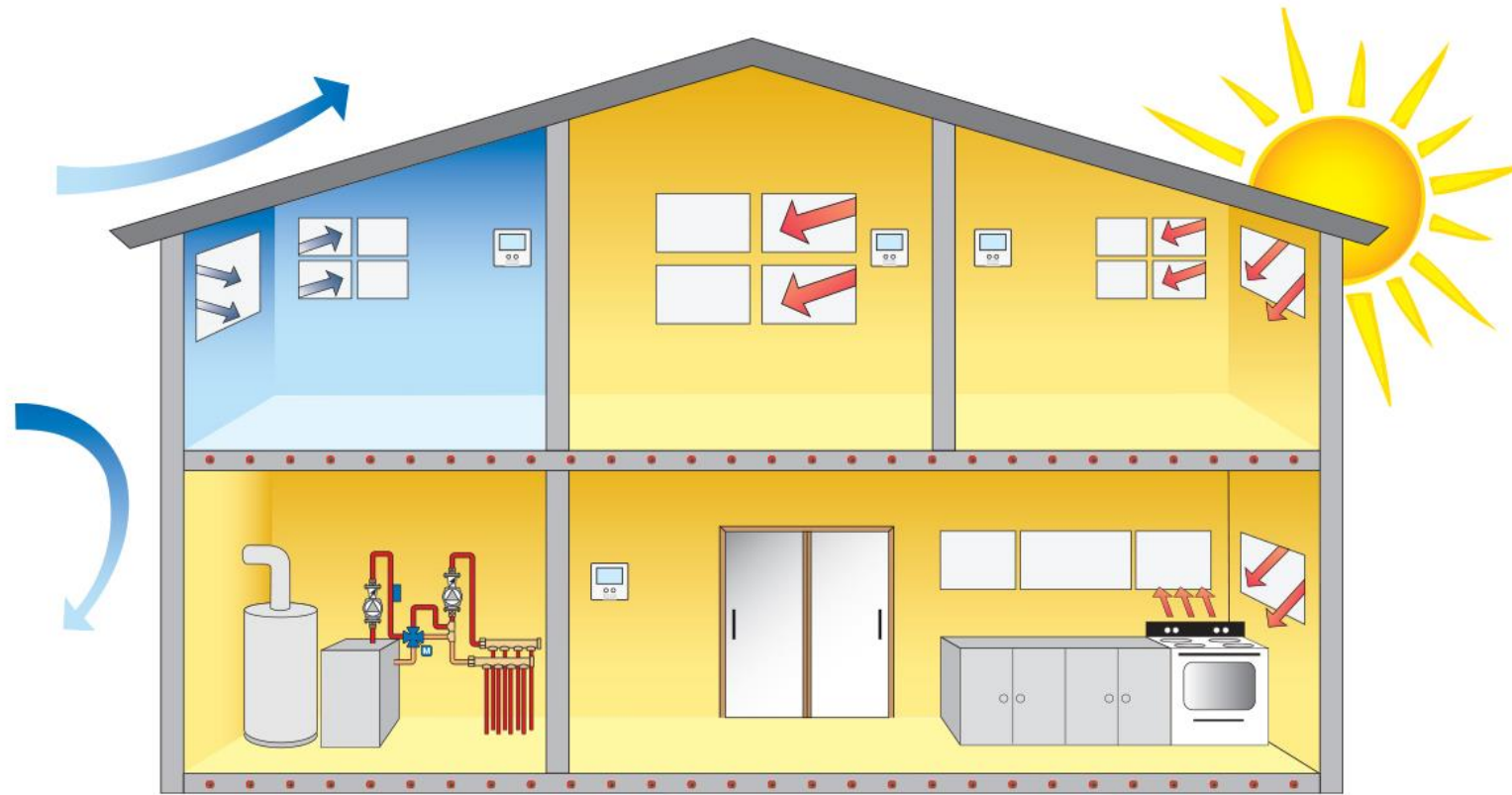
Indoor Temperature Feedback uses outdoor & indoor temperature information to adjust the heating curve

Outdoor Temperature Reset - Review



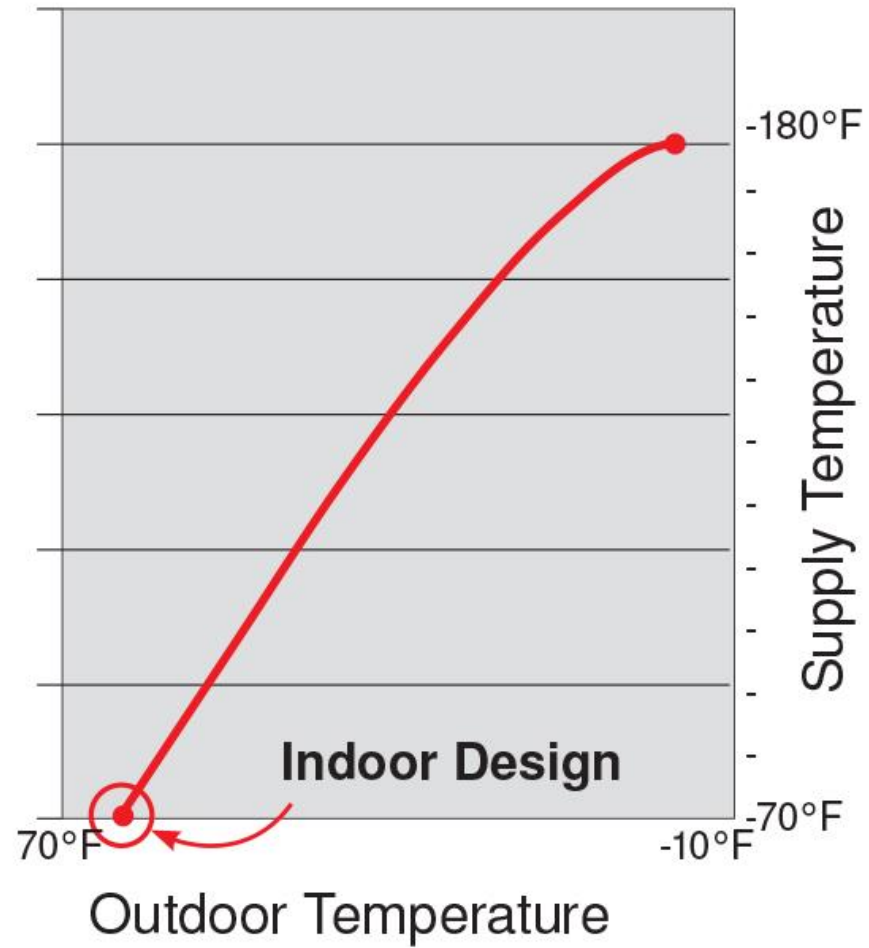
Saves energy every time the boiler operates below it's maximum temperature

Real Environments

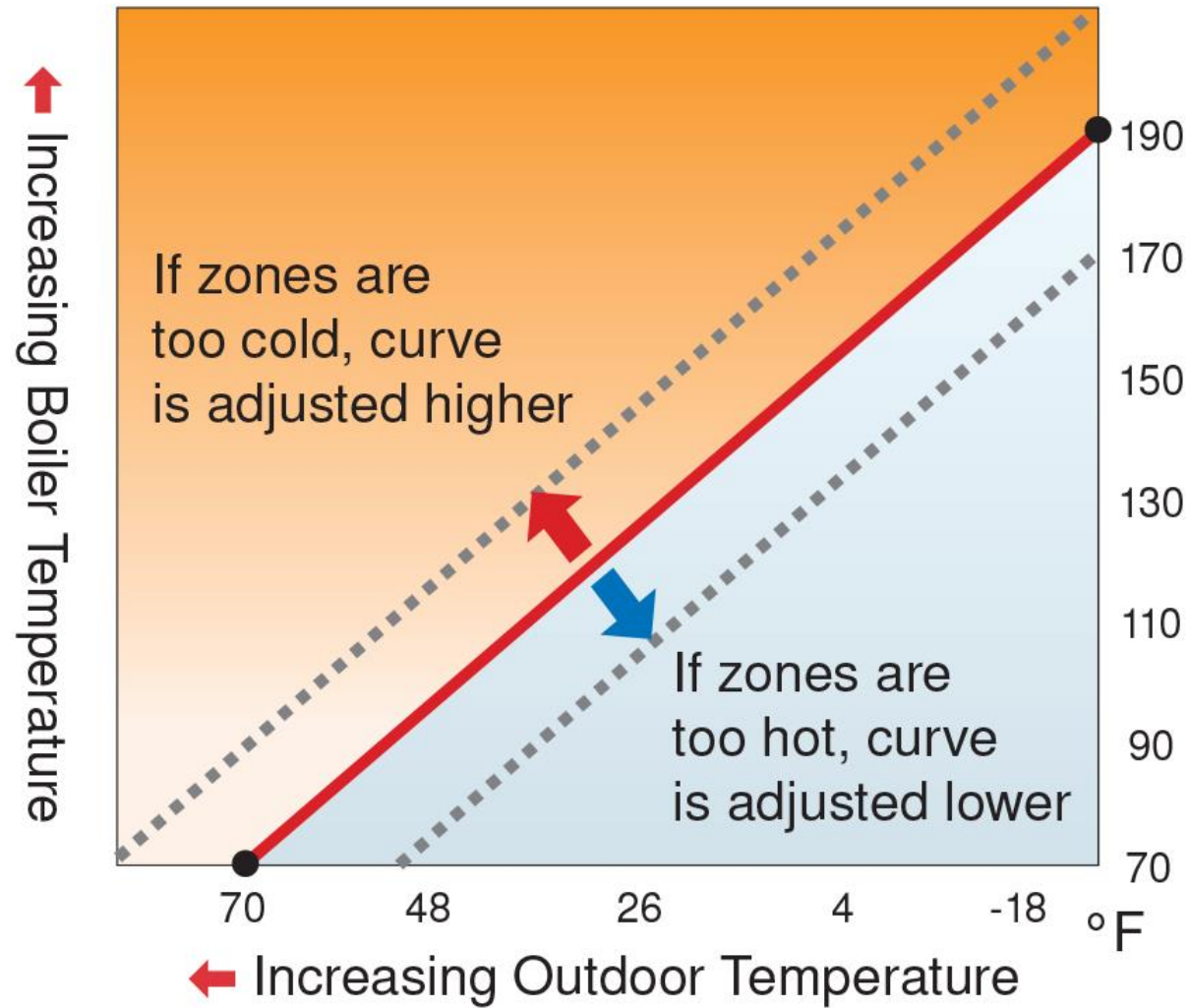


Environmental changes cause significant variation in required heat input.

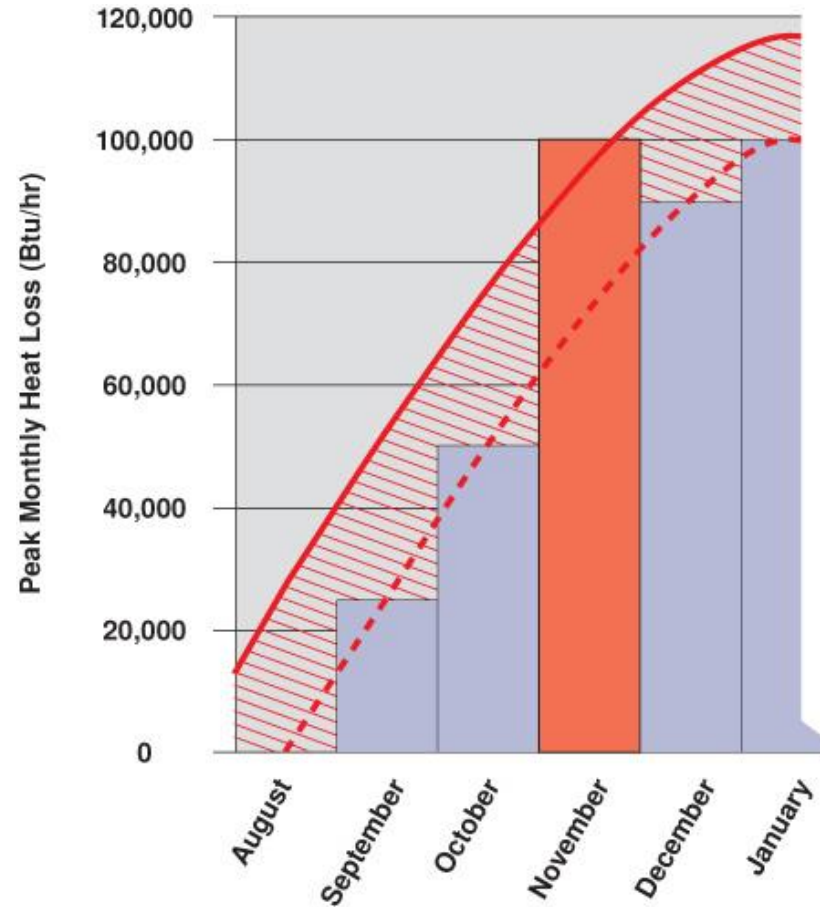
Real People



More Heat = Parallel Shift

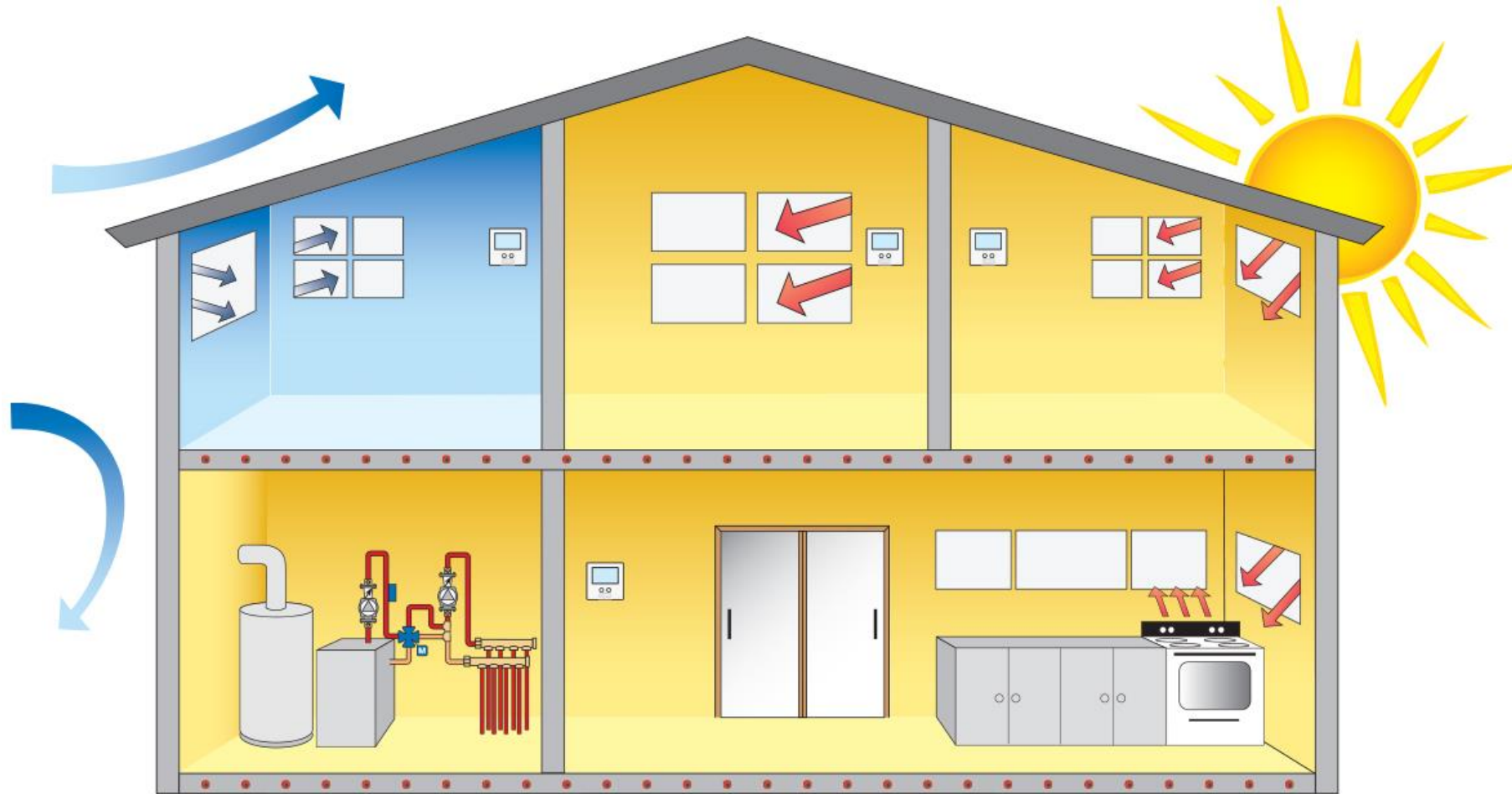


Results of Parallel Shift

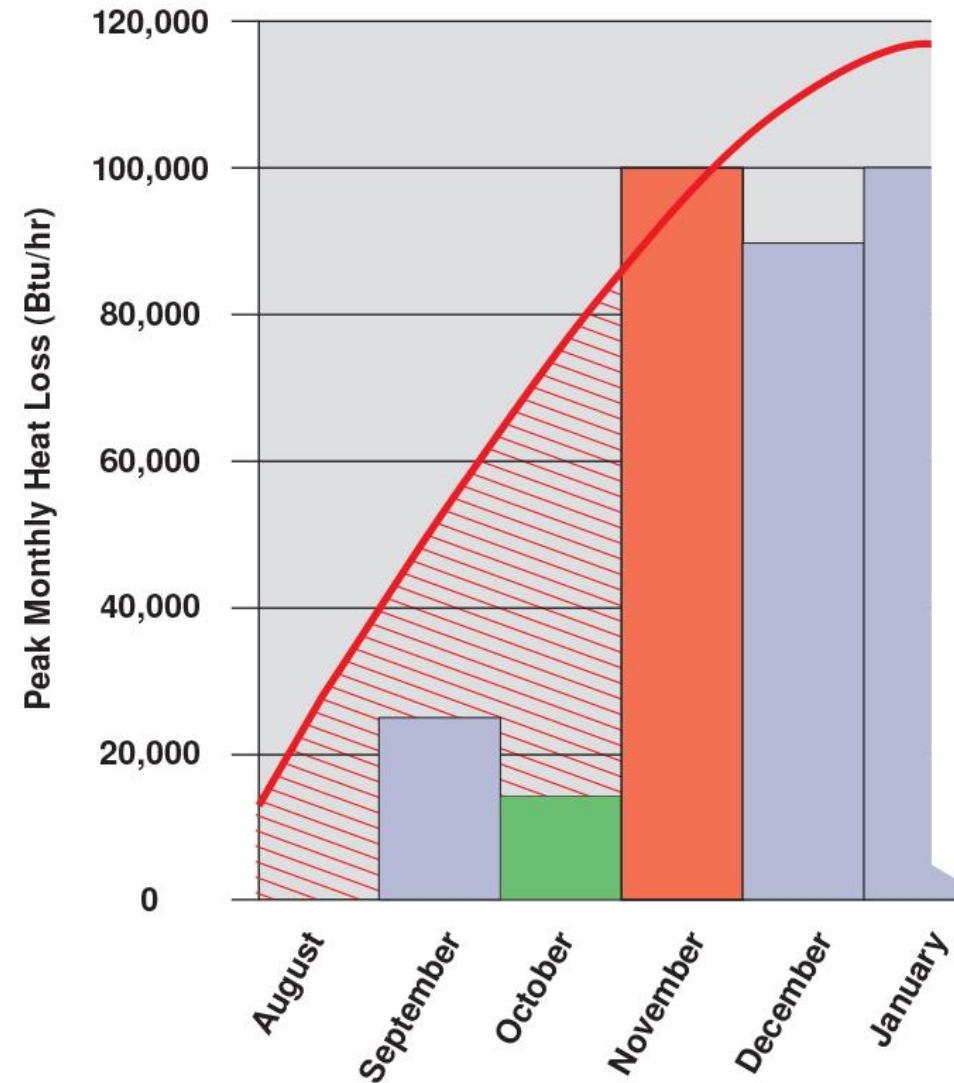


Energy is wasted by running the equipment at higher temperatures

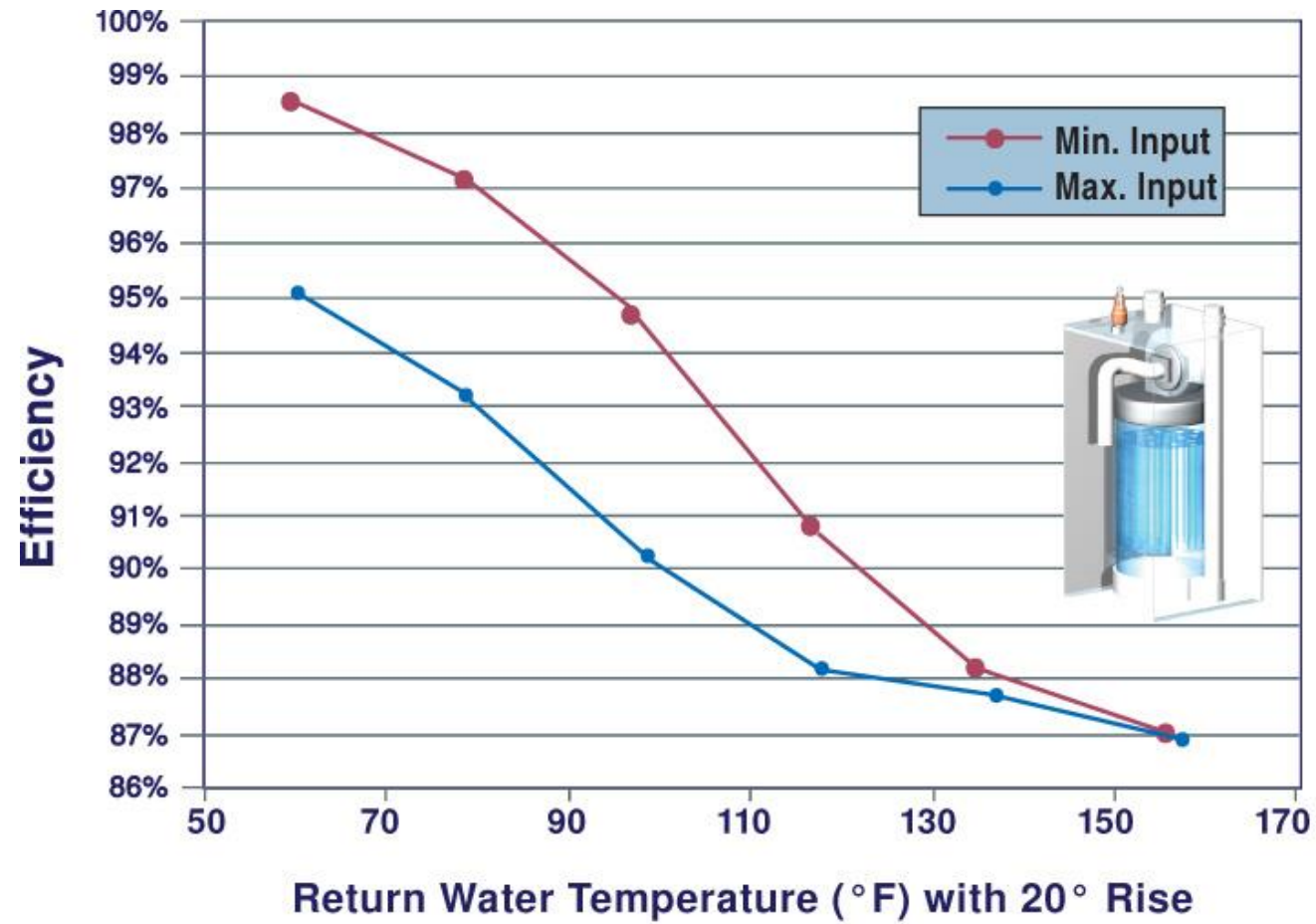
What About Solar Gains?



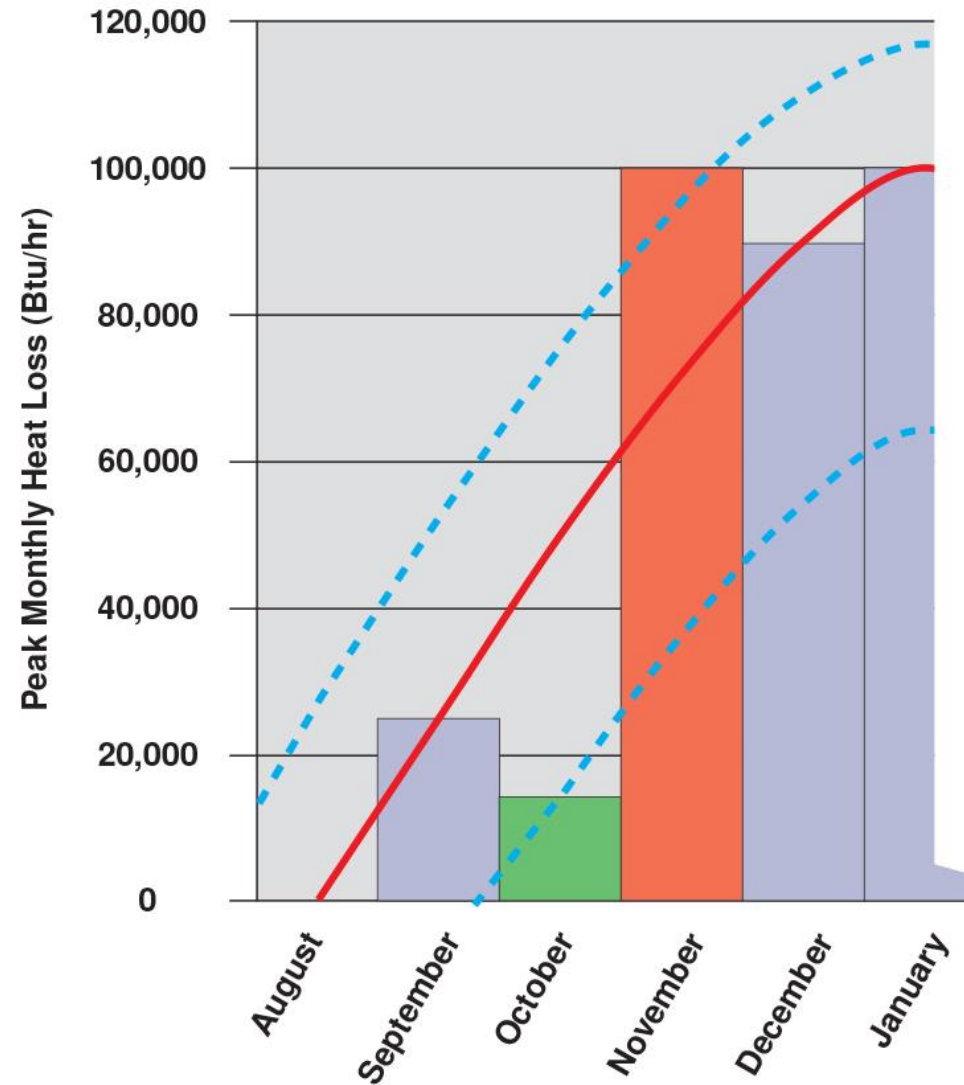
More Energy Wasted



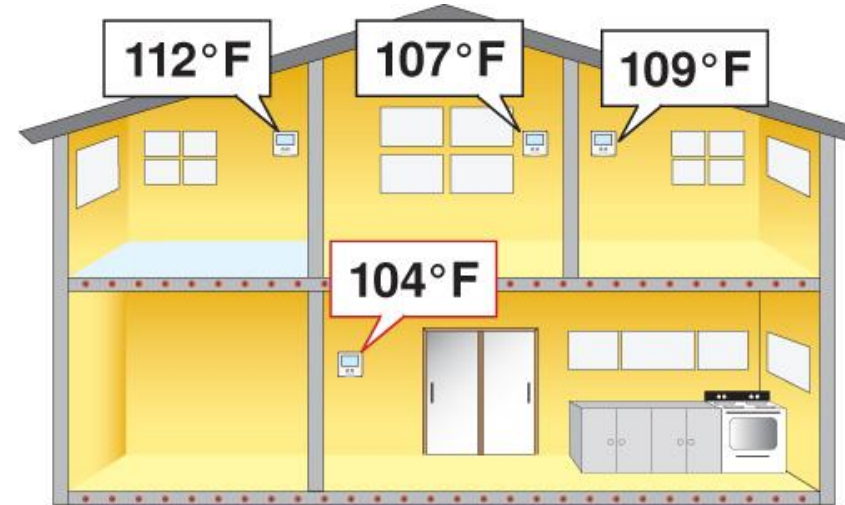
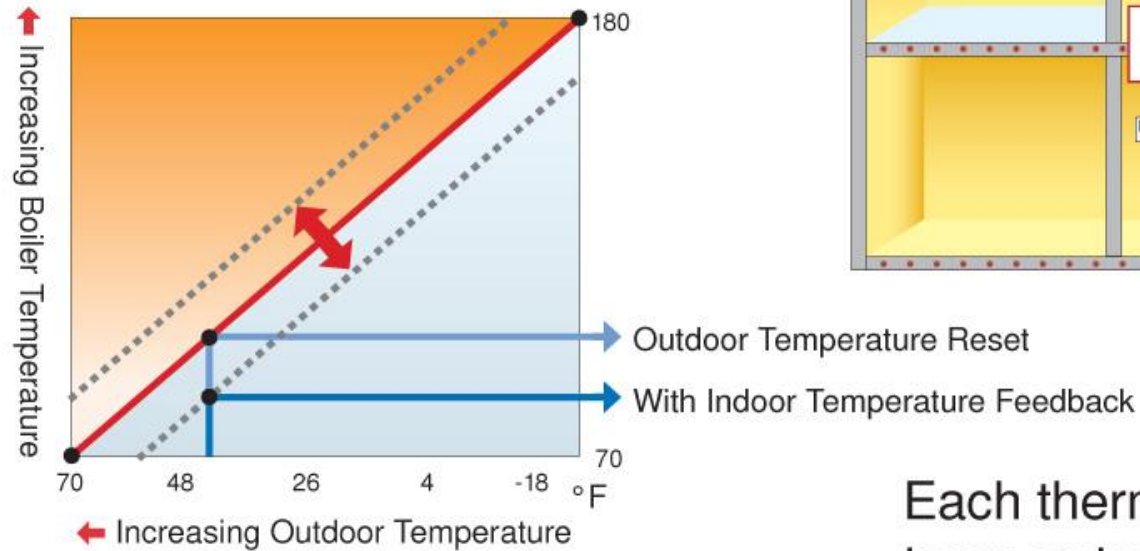
Sacrificed Efficiency



Indoor Temperature Feedback

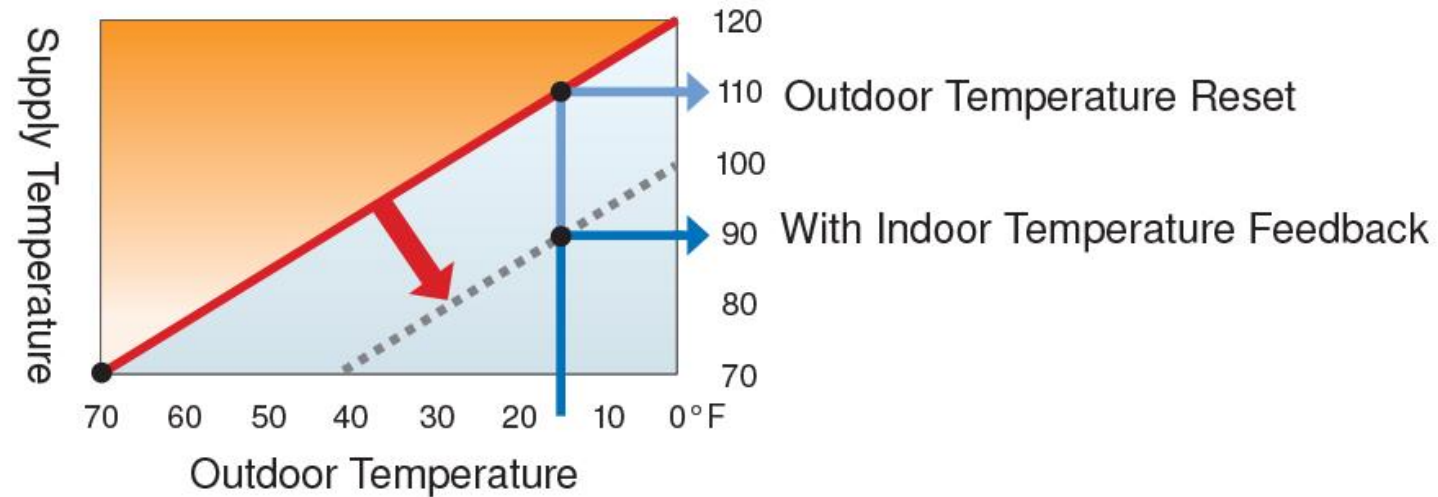


Indoor Temperature Feedback



Each thermostat decides what temperature it needs and the heating curve is adjusted accordingly

Indoor Temperature Feedback - Example



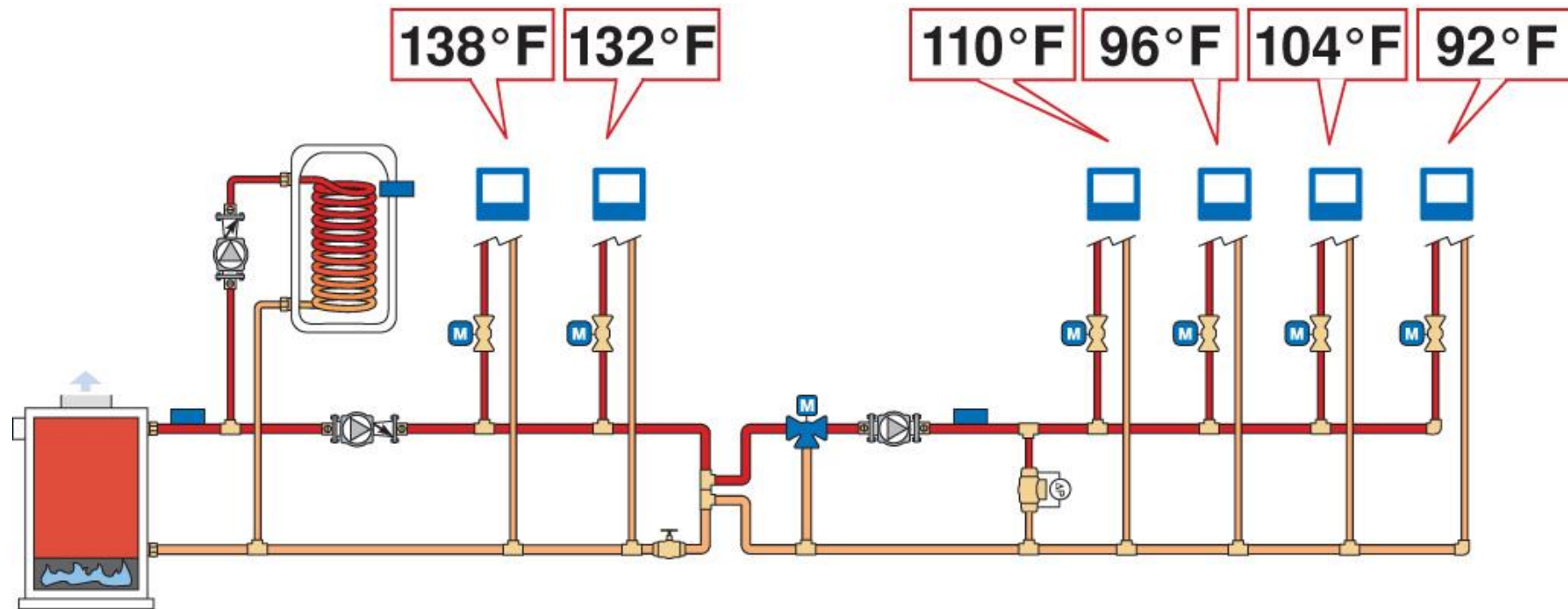
Case Study in Idaho

- Outdoor Design Temp. = 0°F
- Mix Design = 120°F
- Actual Outdoor Temp. = 15°F

Mix Targets

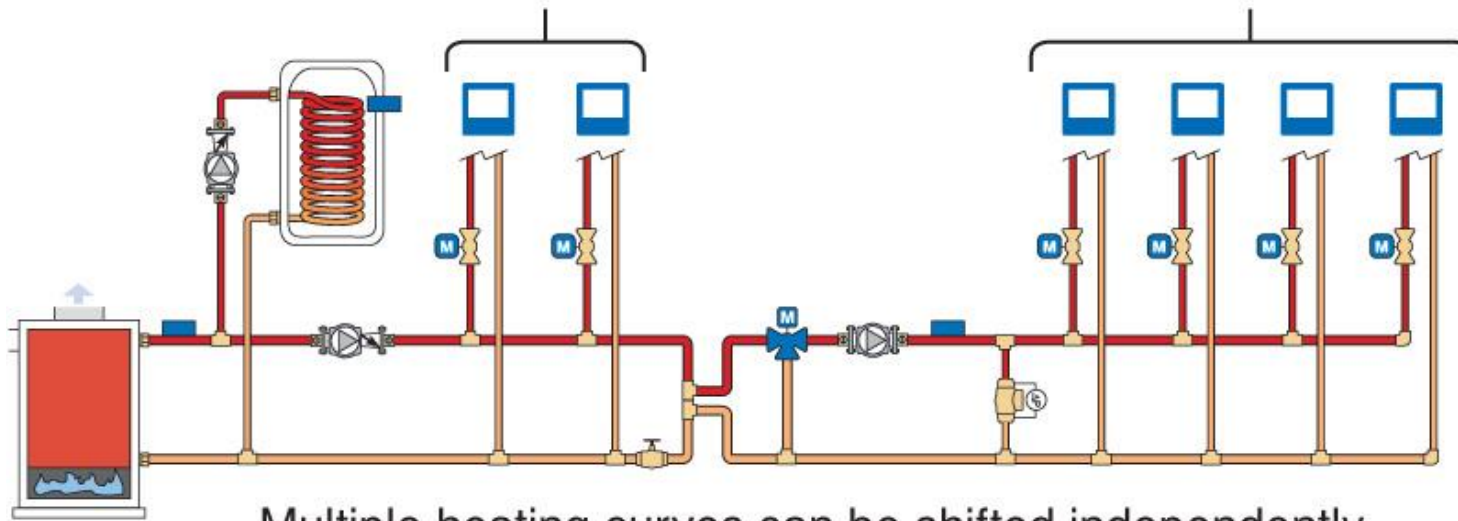
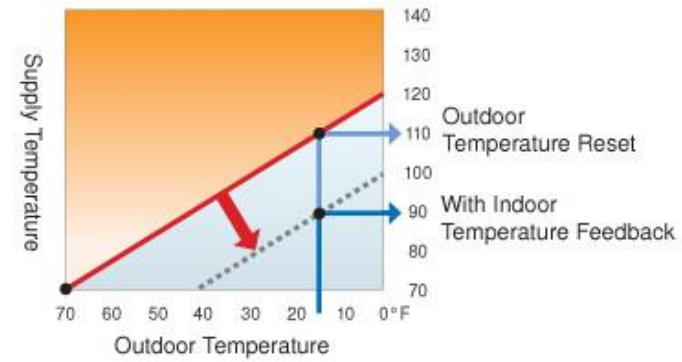
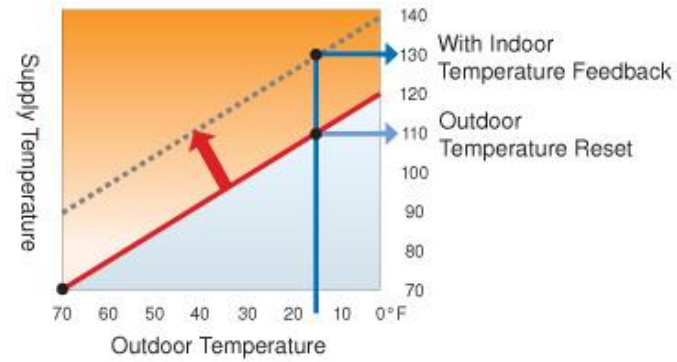
- Outdoor Reset: 109°F
- With Indoor Feedback: 90°F
- 40% LOWER supply temperature than Outdoor Reset

Indoor Temperature Feedback - Multiple Temperatures



Multiple water temperatures are supported

Indoor Temperature Feedback - Multiple Temperatures



Multiple heating curves can be shifted independently

Improve Comfort & Lower Your Heating Costs with a tekmar House Control System!



27% Average Savings

Below are the actual results of 12 homes retrofitted with tekmar House Controls.

Location	Fuel Type	Usage (Gallons / CCF)		After install Savings
		Before	After	
E Haven, CT	Oil	836	529	37%
N Haven, CT**	Oil	1419	1147	20%
N Haven, CT	Oil	1200	600	50%
N Haven, CT	Oil	1650	1327	20%
Cheshire, CT	Oil	1259	936	26%
Unionville, CT	Oil	715	542	24%
W. Hartford, CT	Oil	857	572	33%
Stafford Springs, CT	Oil	1000	600	40%
Avon, CT	Oil	970	790	19%
Avon, CT	N.G.	1403	1191	15%
Avon, CT	Oil	2540	2202	14%
Ridgefield, CT	Oil	1322	932	30%

**Residence had a 1000 ft² addition built at time of house control retrofit.

When the difference in yearly temperatures are factored in, savings were even higher.



HVAC Systems



Multi-Staging



Alternative Energy



Zoning



Snow Melting



Setpoint

tekmar[®]
Control Systems
A Watts Water Technologies Company

Summary

Indoor Temperature Feedback = Peace of Mind



No More Callbacks!