



# Comprehensive Energy Audit For

## Mountain Village City Office



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Prepared For  
**City of Mountain Village**

**August 11, 2017**

**Prepared By:** Kevin Ulrich, CEM

**ANTHC-DEHE  
4500 Diplomacy Drive  
Anchorage, AK 99508**

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## PREFACE

The purpose of this report is to provide guidance in reducing facility operating costs and enhance the sustainability of this community. The report assesses the current energy usage of the facility, provide options for reducing the amount of energy used, and evaluate the cost vs. benefit of each option.

Discussions of site specific concerns, financing options, general facility information, and an Energy Efficiency Action Plan are also included in this report.

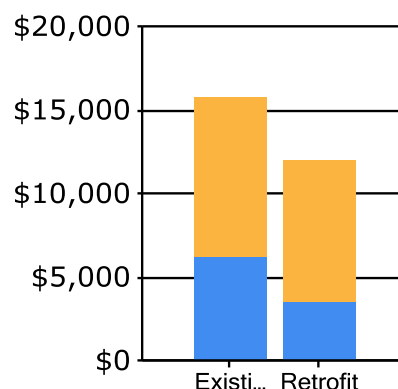
## ACKNOWLEDGMENTS

The Rural Energy Initiative gratefully acknowledges the assistance of Mountain Village City Manager Robert Joe and City Clerk Janelle Amos.

## OVERVIEW

This report was prepared for the City of Mountain Village. The scope of the audit focused on the Mountain Village City Office and includes an analysis of building occupancy schedules, building shell, heating systems, heating and ventilations systems, domestic hot water, lighting, and other electrical loads. The Mountain Village City Office is a wood-framed building built on an elevated pile foundation and is approximately 3,564 square feet in area. The building serves as office space for the City of Mountain Village and also has a large common room used for council meetings.

**Annual Energy Costs by Fuel Type**



## ENERGY BASELINE

Based on unsubsidized electricity and fuel oil prices in effect at the time of the audit, the total predicted energy costs are \$15,859 per year. This includes \$6,197 for unsubsidized electricity and \$9,662 for #1 fuel oil.

The State of Alaska Power Cost Equalization (PCE) program provides a subsidy to rural communities across the state to lower electricity costs and make energy affordable in rural Alaska. In Mountain Village the cost of electricity without PCE is \$0.49/kWh and the cost of electricity with PCE is \$0.28/kWh. With the PCE subsidy, the electric utility cost to the City of Mountain Village is \$3,541 and the cost to the State of Alaska is \$2,656.

Table 1 lists the predicted annual energy usage before and after the proposed retrofits for the Mountain Village City Office.

**Table 1: Predicted Annual Energy Use for the Mountain Village City Office**

Predicted Annual Fuel Use				
Fuel Use	Existing Building	With Proposed Retrofits	Total Energy Savings	Total Cost Savings (Subsidized)
Electricity	15,890 kWh	9,253 kWh	6,636 kWh	\$1,858
#1 Oil	1,526 gallons	1,327 gallons	199 gallons	\$1,260

## PROPOSED ENERGY EFFICIENCY MEASURES (EEM)

Table 2 below summarizes the energy efficiency measures analyzed for the Mountain Village City Office. Listed are the estimates of the annual savings, installed costs, and two different financial measures of investment return. All costs assume that local labor will be used with no additional cost associated for travel or administrative tasks.

**Table 2: Priority List – Energy Efficiency Measures**

Priority	Feature	Improvement Description	Annual Energy Savings	Installed Cost	Savings to Investment Ratio, SIR <sup>1</sup>	Simple Payback (Years) <sup>2</sup>	CO <sub>2</sub> Savings
High	Other Electrical: Coffee Pot	Unplug Coffee Maker at the end of the day when not in use.	\$260	\$200	13.43	0.8	1,461.1
High	Setback Thermostat: City Office	Install a new programmable thermostat and implement an unoccupied setback of 60 deg. F.	\$1,928	\$3,000	8.72	1.6	6,442.0
High	Lighting: Other Offices	Replace with new direct-wire, LED equivalent light bulbs.	\$123	\$160	6.06	1.3	657.7
High	Lighting: City Admin. Offices - T12	Replace with new direct-wire, LED equivalent light bulbs.	\$241	\$320	5.94	1.3	1,301.7
High	Lighting: Hall - T5	Replace with new direct-wire, LED equivalent light bulbs.	\$50	\$80	4.87	1.6	268.7
High	Lighting: City Council Meeting Room	Replace with new direct-wire, LED equivalent light bulbs.	\$177	\$320	4.35	1.8	967.6
High	Lighting: Hall - T8	Replace with new direct-wire, LED equivalent light bulbs.	\$41	\$80	3.96	2.0	221.9
High	Lighting: City Admin. Offices - T8	Replace with new direct-wire, LED equivalent light bulbs.	\$120	\$240	3.92	2.0	662.2
High	Lighting: City Manager Office	Replace with new direct-wire, LED equivalent light bulbs.	\$74	\$160	3.61	2.2	409.6
Medium	Heating Systems	Insulate Pipes, clean and tune boiler, Replace boiler pumps with Grundfos Alphas	\$623	\$4,000	2.29	6.4	2,838.3
Medium	Lighting: VPSO	Replace with new direct-wire, LED equivalent light bulbs.	\$17	\$80	1.67	4.7	95.2
Medium	Lighting: Hall - T12	Replace with new direct-wire, LED equivalent light bulbs.	\$51	\$240	1.66	4.7	284.8
Medium	Air Tightening	Add weather stripping and door sweeps around entrance doors to prevent air leakage.	\$116	\$1,000	1.08	8.6	389.4
Low	Lighting: Prison	Replace with new direct-wire, LED equivalent light bulbs.	\$25	\$320	0.81	12.7	142.8
Low	Lighting: Closet	Replace with new direct-wire, LED equivalent light bulbs.	\$2	\$80	0.21	37.7	11.7
TOTAL			\$3,850	\$10,280	4.51	2.7	16,154.6

## FACILITY DESCRIPTION

### Building Occupancy Schedules

The building is occupied from 9:00 AM – 5:00 PM for five days per week during standard office hours for use by the city. There is a large gathering area that is used for city council meetings and similar events periodically in the evenings..

### **Building Shell**

The building is a wood-framed lumber construction that is built on an elevated pile foundation. The roof has 2x6 lumber construction with attic space available.

There are 10 total windows in the building. Each window has double-pane glass with wood framing and is approximately 46" x 46" in dimension. One of the windows has been boarded up because of broken glass and one of the windows is facing in the southern direction.

There are three total entrances to the building. All of the entrances are single insulated metal doors with no windows and an arctic entrance.

### **Heating Systems**

#### Fuel Oil Boiler

Nameplate Information:	Weil McLain, No other name plate information available
Fuel Type:	#1 Oil
Input Rating:	184,000 BTU/hr
Steady State Efficiency:	82 %
Idle Loss:	0.75 %
Heat Distribution Type:	Glycol
Boiler Operation:	All Year

There was no available nameplate on the boiler and the heat rating was estimated based on comparison to other boilers in various facilities in the community.

### **Space Heating Distribution Systems**

Space heating is achieved through a baseboard distribution system that transports heated glycol throughout the building to disperse the heat through baseboard units. There are three heat loops; one each for the VPSO/Jail, the western offices of the facility, and the eastern offices of the facility.

### **Lighting**

**Table 3: Lighting Information in the Mountain Village City Office**

Room	Bulb Type	Fixtures	Bulbs per Fixture	Annual Usage (kWh)
Hall	Fluorescent T12 4ft.	3	2	524
Hall	Fluorescent T8 4ft.	1	4	273

Hall	Fluorescent T5 4ft.	1	4	306
City Admin. Offices	Fluorescent T12 4ft.	4	4	1,391
City Admin. Offices	Fluorescent T8 4ft.	3	4	818
City Manager Office	Fluorescent T12 4ft.	2	3	523
VPSO Office	Fluorescent T12 4ft.	4	2	175
Prison	Fluorescent T8 4ft.	4	2	404
City Council Meeting Room	Fluorescent T8 4ft.	4	4	1,180
Offices	Fluorescent T12 4ft.	2	4	696
Closet	Fluorescent T8 4ft.	1	4	15

### **Other Electrical Loads**

There is a variety of office equipment and phones that are used during the day that use a small amount of energy throughout the year.

### **Major Equipment**

**Table 4: Major Electrical Equipment in the Mountain Village City Office**

<b>Equipment</b>	<b>Rating (Watts)</b>	<b>Annual Usage (kWh)</b>
Desktop Computers (9)	~ 75 each	1,409
Coffee Pot (2)	1,575 each	2,423
VHF Transmitter	20	175
Microwaves (2)	~1,500 each	196
Security System	55	482
Small Printers (2)	75	20
Big Office Printer	300	169
Fax Machine	300	13
Refrigerator	~342	3,000

## **PROJECT FINANCING**

The total estimated cost of the recommended EEM's \$10,280. The payback for the implemented EEM's is approximately 2.7 years. ANTHC is willing to assist the community with acquiring funds to complete the scope of work recommended in this energy audit.

There are several options for financing energy efficiency projects within the State of Alaska. These include the use of grants, loans, and other funding opportunities. Below is some information on potential funding opportunities.

**Energy Efficiency Revolving Loan Program** – This is a loan administered by the Alaska Housing Finance Corporation (AHFC) for use by any applicant who is also the owner of the building where the work will take place. It provides a loan for permanent energy-efficiency projects with a completion window of one year.

**Sustainable Energy Transmission and Supply Program** – This is a loan administered by the Alaska Energy Authority (AEA) for a government, business, or other organized body of people. It provides a loan for energy-efficiency or power transmission or distribution projects.

**USDA-RD Communities Facilities Direct Loan & Grant Program** - This is a loan or grant provided by the US Department of Agriculture – Rural Development (USDA-RD) for any essential community facility in a rural area. It provides a loan or grant to develop essential community facilities with upgrades or equipment for improvement.

## **MEASUREMENT AND VERIFICATION**

The results of these recommended measures can be measured through the collection of energy use data through the monthly bills provided by the local electric utility and the local fuel oil supplier. Collecting data and performing a historical comparison is the simplest method of validating the energy and cost savings seen by the measures. Additionally, active remote monitoring systems are available that can collect and store data regarding energy and fuel usage. These systems allow the user to track the usage in real time and can be shared more easily with partners across the state.

## APPENDICES

### Appendix A –Energy Billing Data

The table below shows the fuel and electricity data used during the energy modeling process to confirm the accuracy of the energy distribution. The fuel use distribution was estimated based on the times of each fuel delivery, which were not in a precisely monthly basis.

Month	Fuel Oil Use (gallons)	Electricity Use (kWh)
January	250	1,711
February	225	1,416
March	175	1,486
April	125	1,512
May	75	1,435
June	20	1,426
July	20	1,345
August	35	1,475
September	57	1,448
October	125	1,323
November	200	1,533
December	250	1,747



## Appendix B – Energy Audit Report – Project Summary

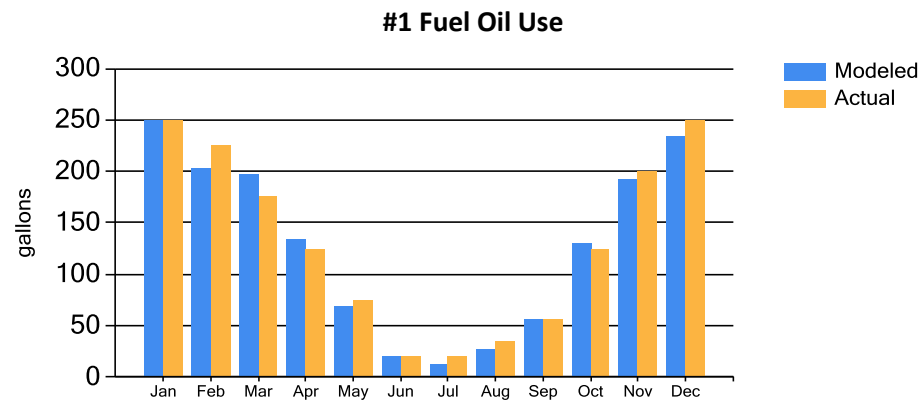
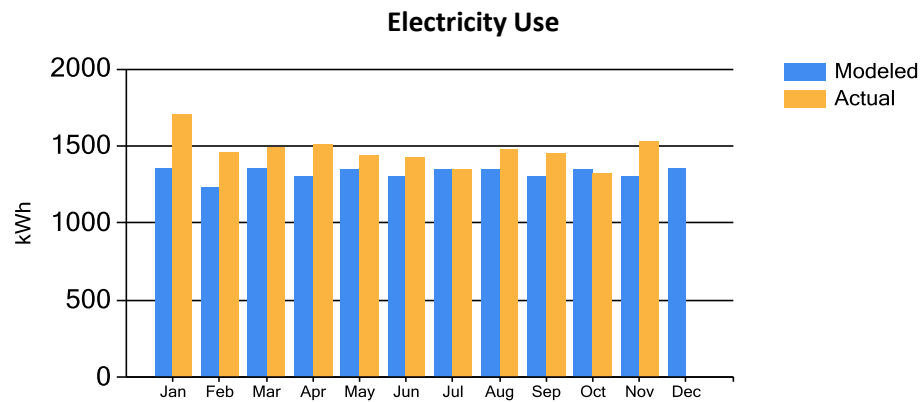
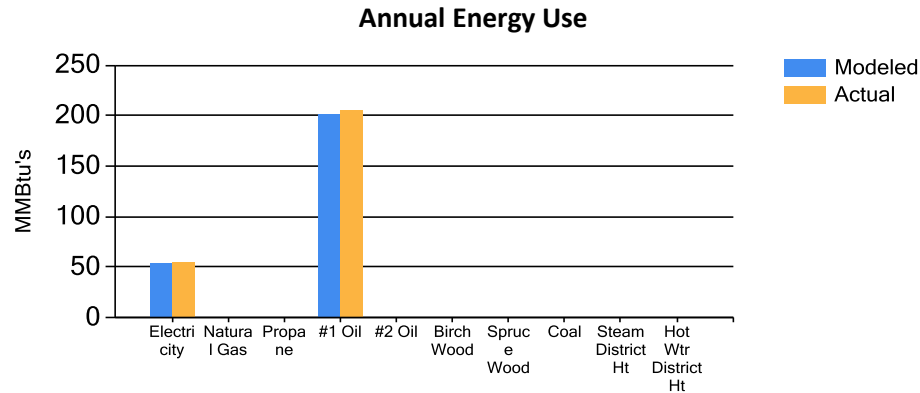
ENERGY AUDIT REPORT – PROJECT SUMMARY	
General Project Information	
PROJECT INFORMATION	AUDITOR INFORMATION
<b>Building:</b> Mountain Village City Office	<b>Auditor Company:</b> ANTHC-DEHE
<b>Address:</b> PO Box 32085	<b>Auditor Name:</b> Kevin Ulrich & Bailey Gamble
<b>City:</b> Mountain Village	<b>Auditor Address:</b> 4500 Diplomacy Drive
<b>Client Name:</b> Robert Joe	Anchorage, AK 99508
<b>Client Address:</b> PO Box 32085 Mountain Village, AK 99632	<b>Auditor Phone:</b> (907) 729-3237
<b>Client Phone:</b> (907) 591-2929	<b>Auditor FAX:</b>
<b>Client FAX:</b>	<b>Auditor Comment:</b>
Design Data	
<b>Building Area:</b> 3,564 square feet	<b>Design Space Heating Load:</b> Design Loss at Space: 49,844 Btu/hour with Distribution Losses: 49,844 Btu/hour Plant Input Rating assuming 82.0% Plant Efficiency and 25% Safety Margin: 75,981 Btu/hour Note: Additional Capacity should be added for DHW and other plant loads, if served.
<b>Typical Occupancy:</b> 0 people	<b>Design Indoor Temperature:</b> 70 deg F (building average)
<b>Actual City:</b> Mountain Village	<b>Design Outdoor Temperature:</b> -24.3 deg F
<b>Weather/Fuel City:</b> Mountain Village	<b>Heating Degree Days:</b> 12,947 deg F-days
Utility Information	
<b>Electric Utility:</b> Alaska Village Electric Cooperative	<b>Average Annual Cost/kWh:</b> \$0.49/kWh

Annual Energy Cost Estimate					
Description	Space Heating	Lighting	Refrigeration	Other Electrical	Total Cost
<b>Existing Building</b>	\$10,325	\$2,458	\$1,170	\$1,905	<b>\$15,859</b>
<b>With Proposed Retrofits</b>	\$8,465	\$932	\$1,170	\$1,441	<b>\$12,009</b>
<b>Savings</b>	\$1,860	\$1,526	\$0	\$464	<b>\$3,850</b>

Building Benchmarks			
Description	EUI (kBtu/Sq.Ft.)	EUI/HDD (Btu/Sq.Ft./HDD)	ECI (\$/Sq.Ft.)
<b>Existing Building</b>	71.7	5.54	\$4.45
<b>With Proposed Retrofits</b>	58.0	4.48	\$3.37
<p>EUI: Energy Use Intensity - The annual site energy consumption divided by the structure's conditioned area.  EUI/HDD: Energy Use Intensity per Heating Degree Day.  ECI: Energy Cost Index - The total annual cost of energy divided by the square footage of the conditioned space in the building.</p>			

## Appendix C – Actual Fuel Use versus Modeled Fuel Use

The graphs below show the modeled energy usage results of the energy audit process compared to the actual energy usage report data. The model was completed using AkWarm modeling software. The orange bars show actual fuel use, and the blue bars are AkWarm's prediction of fuel use.



## Appendix D - EUI Calculation Details

The Alaska Village Electric Cooperative owns and operates the utility that provides electricity to the residents of the community as well as to all the commercial and public facilities.

The average cost for each type of fuel used in this building is shown below in Table 5. This figure includes all surcharges, subsidies, and utility customer charges:

**Table 5: Energy Cost Rates for each Fuel Type.**

Average Energy Cost	
Description	Average Energy Cost
Electricity	\$ 0.49/kWh
#1 Oil	\$ 6.33/gallons

Table 6 shows the calculated results for the building Energy Use Index (EUI), which determines the total energy usage for a type of building for comparison with other buildings of the same type. This allows the user to determine the relative energy use of a building in relation to others of the same type or use.

**Table 6: EUI Building Calculations for the Mountain Village City Office**

Energy Type	Building Fuel Use per Year	Site Energy Use per Year, kBTU	Source/Site Ratio	Source Energy Use per Year, kBTU
Electricity	15,890 kWh	54,232	3.340	181,136
#1 Oil	1,526 gallons	201,477	1.010	203,492
Total		255,709		384,628
BUILDING AREA		3,564	Square Feet	
BUILDING SITE EUI		72	kBTU/Ft²/Yr	
BUILDING SOURCE EUI		108	kBTU/Ft²/Yr	
* Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued March 2011.				

Table 7 shows information on common energy use benchmarks used to characterize the efficiency of a building.

**Table 7: Building Benchmarks for the Mountain Village City Office**

Building Benchmarks			
Description	EUI (kBtu/Sq.Ft.)	EUI/HDD (Btu/Sq.Ft./HDD)	ECI (\$/Sq.Ft.)
Existing Building	71.7	5.54	\$4.45
With Proposed Retrofits	58.0	4.48	\$3.37
EUI: Energy Use Intensity - The annual site energy consumption divided by the structure's conditioned area. EUI/HDD: Energy Use Intensity per Heating Degree Day. ECI: Energy Cost Index - The total annual cost of energy divided by the square footage of the conditioned space in the building.			

## Appendix E – Materials List and Labor Estimation

**Table 8 & 9: Materials List and Cost Estimation for Mountain Village City Office EEM's**

Energy Retrofit	Required Materials	Quantity	Cost per Item	Total Materials Cost
LED Lighting	T8 Fluorescent 4ft. equivalents	52	15	780
Air Tightening	Weather Stripping, Window Film, Door Sweeps	1	75	75
Boilers	Burner, Aquastat, High Temp. Cutoff,	1	800	800
Boilers	Grundfos Alpha Pumps (2)	2	150	300
Setback Thermostats	Programmable Thermostats (3)	3	200	600

Category	Cost (\$)
Labor	3,993
Travel	2,690
Materials	2,555
Freight	383
Indirect	962
<b>Total</b>	<b>\$10,583</b>

This energy audit cost information assumes that all work will be completed by an employee from outside of the community. If local labor is used for the retrofits, the travel and indirect costs may be removed from the total estimated cost. The boiler cleaning and setback thermostat retrofits will likely require outside labor.

## **Appendix F – Materials Specifications**

# Robertshaw®

# 9701i2

**DELUXE  
PROGRAMMABLE  
THERMOSTAT**



GAS



ELECTRIC

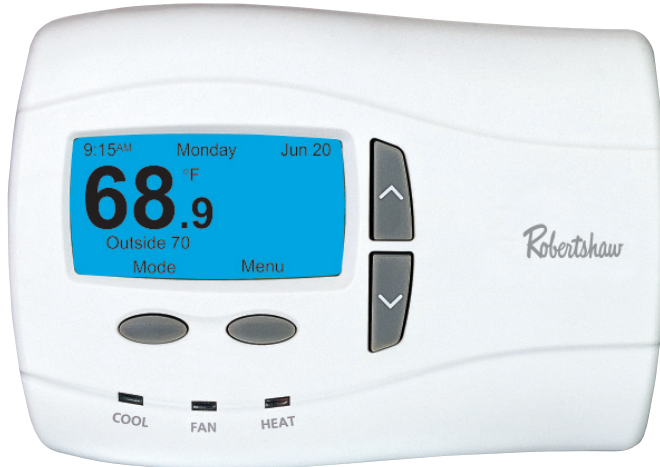


OIL



HEAT PUMP

**Menu Driven Display 1 Heat / 1 Cool**



## Programming Made Even Easier

**Do you want to spend less time installing and setting up thermostats?**

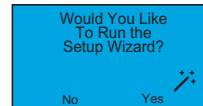
The new 9701i2 makes installation even easier with our new Setup Wizard. The Setup Wizard allows you to spend 50% less time setting up the thermostat over competitive models. Plus everything is in plain language so there are no complicated codes or button combinations to memorize.

We've also made programming even easier for your customers. Menus are easier to navigate. We've even added additional convenience features such as Automated Time adjustment for Daylight Saving Time, along with new indoor air quality reminders.

The new 9701i2 is so user friendly, it sets a higher standard in efficiency and simplicity for programmable thermostats. It is truly programming made even easier.

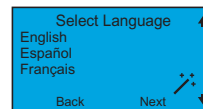
Robertshaw - *Simply the Right Choice™*

## Features and Benefits



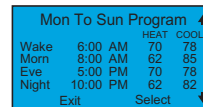
### Set-up Wizard

Helps speed through the installation process with step-by-step setup and programming instructions.



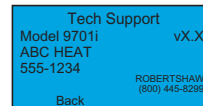
### Trilingual Display Option

Set to your customers' language of choice – English, Spanish or French



### Convenient Displays

View a full day of programming at once for quick review or easy adjustment.



### Contractor ID Feature

Set it yourself or custom order with your information pre loaded. Your name and phone number remind your customers when service is needed.

### Daylight Saving Time Adjustment

Automatically adjusts to correct time regardless of seasonal changes.

### Adjustable Backlighting

Choose to have backlighting on at all times or only when programming. You can also adjust the brightness and contrast for improved readability.

### Time of Day Zoning

When coupled with a remote sensor (part #9020i), you can control the temperature in remote locations given different scheduled events.

### Three Levels of Security

Secure protection against unwanted changes to the programming menus, temperature or set-up functions with your own 4-digit PIN.

### Auto Changeover

Automatically adjusts between heating and cooling cycles to maintain optimal comfort.

### Worry-Free Memory Storage

Even during power outages, the thermostat maintains set point and programmed parameters.

### Adjustable Temperature Offset

Change the displayed temperature from the actual sensed temperature.

### Adjustable Temperature Differential

Maintains optimal customer comfort.

### Intermittent Fan

Maintains optimal air filtration and circulation with minimal energy use.

An ISO 9001 – 2008 Certified Company

California Title 24 Compliant



**5 Year  
Limited  
Warranty**

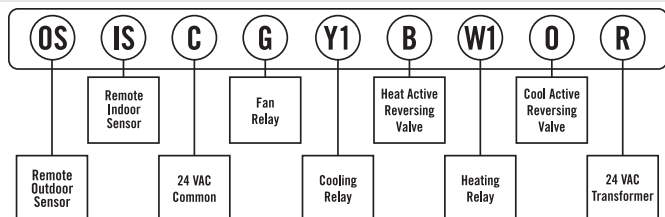


# Robertshaw®

# 9701i2

## DELUXE PROGRAMMABLE THERMOSTAT

## Terminal Designations



## Technical Specifications

<b>Electrical Rating</b>	24 Volt AC (18-30 VAC) 1 amp maximum load per terminal (relay outputs) 3 amp total maximum load (all terminals combined)
<b>Temperature Control Range</b>	45°- 90°F (7°- 32°C)
<b>Accuracy</b>	+/-1.0°F (+/-0.5°C)
<b>Power Source</b>	24 VAC
<b>Auto Changeover Deadband</b>	Selectable 2° to 8°F
<b>Temporary Temperature Override</b>	3 hour maximum or next setpoint
<b>Remote Sensor Capable</b>	1 indoor and 1 outdoor sensor
<b>System Configurations</b>	Single-stage gas, oil or electric heating/cooling systems and single stage heat pump
<b>Terminations</b>	R, W1, Y1, B, O, G, C, IS, OS

## Shipping Specifications

Indiv. Ctn. Dim.: 6.625" x 4.25" x 1.625"	<b>Item 9020i and 9025i Remote Sensors</b>
Master Ctn. Qty.: 6	Indiv. Ctn. Dim.: 2.625" x 1.5625" x 4.4375"
Master Ctn. Dim.: 9.25" x 5.625 x 7.5"	Master Ctn. Qty.: 6
Master Ctn. Cu. Ft.: .23	Master Ctn. Dim.: 5.625" x 5.125" x 5.125"
Master Ctn. Wt.: 3.5 lbs.	Master Ctn. Cu. Ft.: .09
Max. Pallet Qty.: 1260	Master Ctn. Wt.: .78 lbs.
Max. Pallet Wt.: 785 lbs.	

## Replacement Chart

9701i2	
Braeburn®	5000
Honeywell	TH8110U1003
White-Rodgers	1F95-1271, 1F90-51, 1F90-71, 1F90-371, 1F97-51, 1F97-71, 1F97-371
Carrier	TC-PAC, TC-PHP, P274-1100, P374-1100, P474-1100
Lux	PSPA711

Verify specific application requirements before substitution.

## Patent Information

This product is covered by one or more of the following U.S. patents. Foreign patent rights may be pending. 4967382, 5803357, 6502758, 7000849, D301207, D462940

**inven·s·y·s**  
Controls

191 E. North Avenue  
Carol Stream, Illinois 60188 USA  
Customer Service Telephone 1.800.304.6563  
Customer Service Facsimile 1.800.426.0804  
HVACustomerService@InvensysControls.com

For Technical Service  
Telephone 1.800.445.8299  
Facsimile 1.630.260.7294  
TechnicalService@InvensysContrtols.com



### Optional Sensors:

9020i: REMOTE INDOOR

9025i: REMOTE OUTDOOR

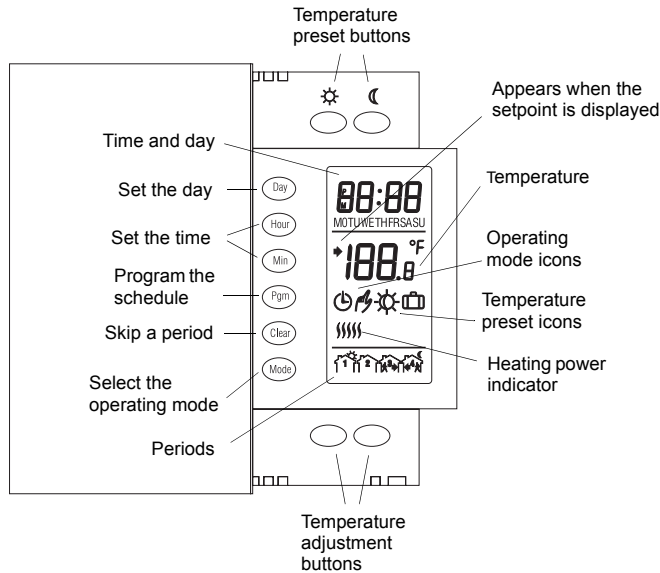
## Feature Comparison

	Invensys i2-Series	Honeywell Vision Pro	Carrier Infinity	White-Rodgers 1F97-371
Menu Driven (Ease of Programming)	X			
Installation Wizard	X			
Displays Complete Program	X			
Adjustable Backlighting	X			
Cooling System Monitor	X			
Heating System Monitor	X			
Multi-Language	X			
1/2 Degree Resolution	X			
Time of Day Zoning	X			
5/2 Program	X			X
24 Hour Programming	X			X
7-Day Programming	X	X	X	
Large Display	X	X	X	
Adjustable Timed Override/Hold	X	X		
Automatic Daylight Saving Time Adjustment	X	X		
Adjustable Temperature Limits	X	X		
High/Low Balance Points	X	X		
LED Status Indicators	X	X		
Adjustable Differential	X	X		
Adjustable Compressor Short Cycle Protection	X	X		
Adjustable Residual Cooling	X	X		
Fossil Fuel Kit required on HP units	No	No	Yes	Yes
Battery Free Memory Retention	X		X	
Manual Override	X	X	X	X
Resume	X	X	X	X
Auto Changeover	X	X	X	X
Gas/Electric	X	X	X	X
Single Stage Heat Pump Compatible	X	X	X	X
Line Powered	X	X	X	X
Programmable Fan	X	X	X	X
Intermittent Fan	X		X	
°F and °C	X	X	X	X
12 or 24 Hour	X	X		X
Air Filter Monitor	X	X	X	X
Humidifier Pad Monitor	X	X	X	
UV Light Monitor	X	X	X	
Vacation Setting	X	X	X	X
O & B Terminals	X	X	Partial	X
Events per day	2, 4, 6	4	4	2, 4
Remote Outdoor Sensor	X	Combo	X	X
Remote Indoor Sensor	X		X	X
Energy Efficient Recovery	X	X	X	X
Pre-set Program	X	X	X	X
Hidden Service Level	X	X	X	
Security Key Pad	X			X
Temperature Recalibration	X	X	X	
Customizable Contractor ID	X			Factory Only

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**NOTE:** Always keep the thermostat's vents clean and unobstructed.



## 1 Description

This programmable thermostat can be used to control an electric heating system such as an electric baseboard heater, a radiant ceiling, a radiant floor, a convector, etc.

The thermostat cannot be used under the following conditions:

- The resistive load is greater than 16.7 A
- The resistive load is less than 2 A
- The system is driven by a contactor or relay (inductive load)
- The system is a central heating system

### SUPPLIED PARTS:

- One (1) thermostat
- Two (2) 6-32 screws
- Two (2) solderless connectors

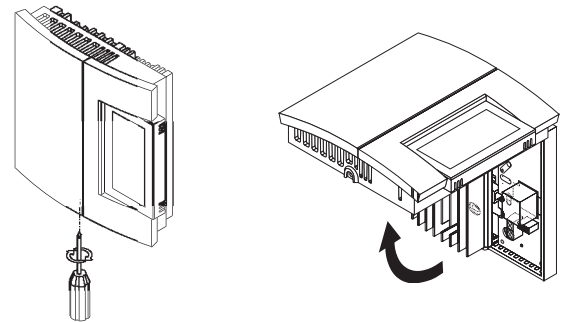
## 2 Installation

**TURN OFF POWER TO THE HEATING SYSTEM AT THE MAIN POWER PANEL TO AVOID ELECTRICAL SHOCK.**

**THE INSTALLATION MUST BE PERFORMED BY AN ELECTRICIAN.**

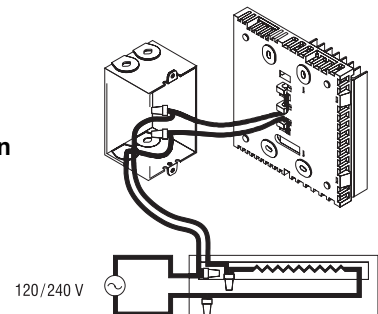
- ▶ All cables and connections must conform to the local electrical code.
- ▶ Special CO/ALR solderless connectors must be used when connecting with aluminum conductors.
- ▶ Install the thermostat onto an electrical box.
- ▶ Install the thermostat about 5 feet high, on an inside wall facing the heater.
- ▶ Avoid locations where there are air drafts (such as the top of a staircase or an air outlet), dead air spots (such as behind a door), or direct sunlight.
- ▶ Do not install the thermostat on a wall that conceals chimney or stove pipes.
- ▶ The thermostat wires are not polarized; either wire can be connected to the load or to the power supply.

**1**

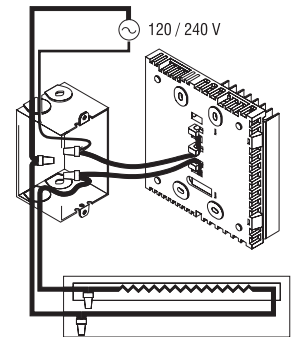


- 2** Connect the thermostat wires to the line wires and to the load wires using solderless connectors for copper wires.

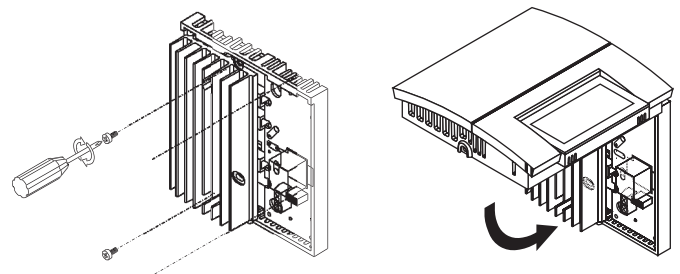
### 2-wire installation



### 4-wire installation



- 3** Push any excess wire back into the electrical box.



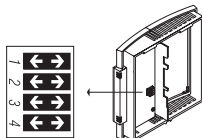
**NOTE:** If necessary, before re-installing the front component, configure the thermostat (see section 3).

- 4** Return power to heating system.



### 3 Configuration

The configuration switches are on the back of the thermostat. The factory settings are indicated by the gray cells in the following table.



SW1	Early Start <sup>a</sup>	Off	On
SW2	Temperature / time format <sup>b</sup>	°C / 24-hour	°F / 12-hour
SW3	Cycle length <sup>c</sup>	15 seconds	15 minutes
SW4	Not used	-	-

- Early Start can be used in Automatic mode only. When this function is enabled, the thermostat calculates the optimal time to start heating in order to obtain the desired temperature by the set time. The thermostat re-assesses the start time daily based on the previous day's performance.
- If you change the temperature display format, the preset temperatures (☼, ☾ and ☐) will return to their default settings.
- 15-second cycles should be selected in most cases as it provides better temperature control. 15-minute cycles must be selected if you have a fan-equipped heater or if 15-second cycles causes light flickering (especially in rural regions).

### 4 Power-up

Upon power-up, the thermostat is in manual mode (⚡) and displays the actual (ambient) temperature.

- Press the **Hour** and **Min** buttons to set the thermostat's clock.
- Press the **Day** button to set the day.

### 5 Temperature Setting

#### Setpoint

The thermostat normally displays the actual temperature. To view the setpoint, press the ▲ or ▼ button briefly. The setpoint will appear for the next 5 seconds.

To change the setpoint, press the ▲ or ▼ button until the desired temperature is displayed. To scroll faster, hold the button.

#### Using a preset temperature

The thermostat has 3 preset temperatures:

- Comfort temperature ☼
- Economy temperature ☾
- Vacation temperature ☐

Icon	Intended use	Factory setting
☼	Comfort (when at home)	21°C (70°F)
☾	Economy (when asleep or away from home)	16.5°C (62°F)
☐	Vacation (during prolonged absence)	10°C (50°F)

- To use the Comfort or Economy temperature, press the ☼ or ☾ button respectively. The corresponding icon will be displayed.
- To use the Vacation temperature, press both ☼ and ☾ buttons simultaneously. The ☐ icon will be displayed.

#### Storing a preset temperature

To store the Comfort or Economy temperature:

Set the desired temperature using the ▲ or ▼ button. Press and hold the appropriate button (☼ or ☾) for approximately 3 seconds until the corresponding icon is displayed. Press the **Mode** button.

To store the Vacation temperature:

Set the desired temperature using the ▲ or ▼ button. Press and hold both ☼ and ☾ buttons simultaneously for approximately 3 seconds until the ☐ icon is displayed. Press the **Mode** button.

### 6 Operating Modes

⌚ **Automatic** - The temperature is set according to the programmed schedule. To place the thermostat in this mode, press **Mode** until ⌚ is displayed. The icons of the current period and preset temperature are also displayed.

**Temporary Bypass:** If you modify the setpoint (by pressing the ▲, ▼, ☼ or ☾ button) when the thermostat is in automatic mode, the new setpoint will be used until the end of the current period. When the next period starts, the temperature set for that period becomes the new setpoint.

⚡ **Manual** - The programmed schedule is not used. The temperature must be set manually. To place the thermostat in this mode:

- Press **Mode** until ⚡ is displayed.
- Set the temperature using the ▲, ▼, ☼ or ☾ button.

### 7 Schedule

The schedule consists of 4 periods per day which represents a typical weekday. You can program the thermostat to skip the periods that do not apply to your situation. For example, you can skip periods 2 and 3 for the weekend.

Period	Description	Associated temperature preset
☼	Wake	☼
☐	Leave	☾
☐	Return	☼
☐	Sleep	☾

The Comfort (☼) temperature is used in periods 1 and 3 and the Economy (☾) temperature is used in periods 2 and 4. For example, when the period changes from 1 to 2, the setpoint automatically changes from Comfort setting (☼) to Economy setting (☾).

You can have a different program for each day of the week; i.e., each period can start at different time for each day of the week. The thermostat has been programmed with the following schedule.

Period	Setting	MO	TU	WE	TH	FR	SA	SU
☼	☼	6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM	6:00 AM
☐	☾	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	--:--	--:--
☐	☼	6:00 PM	6:00 PM	6:00 PM	6:00 PM	6:00 PM	--:--	--:--
☐	☾	10:00 PM	10:00 PM	10:00 PM	10:00 PM	10:00 PM	10:00 PM	10:00 PM

To modify the schedule:

- Press **Pgm** to access the programming mode. Period 1 is selected.
- Press **Day** to select the day to program (hold for 3 seconds to select the entire week).
- Press **Hour** and **Min** to set the start time of the selected period, or press **Clear** if you want to skip the period (--:-- is displayed).
- Press **Pgm** to select another period, or press **Day** to select another day. Then repeat step 3.

5 Press **Mode** to exit the programming mode.

**NOTE:** If no button is pressed for 60 seconds, the thermostat will automatically exit the programming mode.

## 8 Power Outage

During a power outage, the settings are stored in memory. However, only the thermostat's clock must be re-adjusted if the power failure lasts more than 2 hours. When power comes back, the thermostat will return to the operating mode that was active prior to the power failure.

## 9 Troubleshooting

PROBLEM	SOLUTIONS
Thermostat is hot.	This condition is normal. Under normal operation, the thermostat housing can reach a temperature between 35°C (95°F) and 40°C (104°F).
Heater is always On.	The thermostat has not been correctly wired.
Thermostat indicates that heating is On, but the heater is not On.	The thermostat has not been correctly wired.
Wrong temperature is displayed.	The thermostat is exposed to air draft. Eliminate the draft. The sticker on the thermostat's screen has not been removed.
Wrong time is displayed.	The thermostat was without power for more than 2 hours.
Temperature does not change according to the programmed schedule.	Check that the thermostat is in Automatic mode. Check the schedule and clock settings.
Display disappears and reappears after a few minutes.	The thermal protection device on the heater is open. This can happen after a power failure or if the heater is obstructed by furniture or curtains.
Display looks faded when heating is activated	The heating system is less than the required minimum load. This thermostat cannot be used below that rating.

## 10 Technical Specifications

**Power:** 120/240 VAC, 50/60 Hz

**Minimum load:** 2 A (resistive only)  
500 W @ 240 VAC  
250 W @ 120 VAC

**Maximum load:** 16.7 A (resistive only)  
2000 W @ 120 VAC  
4000 W @ 240 VAC

**Display range:** 0°C to 60°C (32°F to 140°F)

**Display resolution:** 0.5°C (1°F)

**Setpoint range:** 5°C to 30°C (40°F to 86°F)

**Setpoint interval:** 0.5°C (1°F)

**Storage:** -20°C to 50°C (-4°F to 120°F)

**Approval:** c UL us



## Warranty

Aube warrants this product, excluding battery, to be free from defects in the workmanship or materials, under normal use and service, for a period of three (3) years from the date of purchase by the consumer. If at any time during the warranty period the product is determined to be defective or malfunctions, Aube shall repair or replace it (at Aube's option).

If the product is defective,

- return it, with a bill of sale or other dated proof of purchase, to the place from which you purchased it, or
- contact Aube. Aube will make the determination whether the product should be returned, or whether a replacement product can be sent to you.

This warranty does not cover removal or reinstallation costs. This warranty shall not apply if it is shown by Aube that the defect or malfunction was caused by damage which occurred while the product was in the possession of a consumer.

Aube's sole responsibility shall be to repair or replace the product within the terms stated above. AUBE SHALL NOT BE LIABLE FOR ANY LOSS OR DAMAGE OF ANY KIND, INCLUDING ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING, DIRECTLY OR INDIRECTLY, FROM ANY BREACH OF ANY WARRANTY, EXPRESS OR IMPLIED, OR ANY OTHER FAILURE OF THIS PRODUCT. Some provinces and states do not allow the exclusion or limitation of incidental or consequential damages, so this limitation may not apply to you.

THIS WARRANTY IS THE ONLY EXPRESS WARRANTY AUBE MAKES ON THIS PRODUCT. THE DURATION OF ANY IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IS HEREBY LIMITED TO THE THREE-YEAR DURATION OF THIS WARRANTY. Some provinces and states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

This warranty gives you specific legal rights, and you may have other rights which vary from province or state to another.



## Customer Assistance

If you have any questions about the product installation or operation, or concerning the warranty, contact us at:

705 Montrichard  
Saint-Jean-sur-Richelieu, Quebec  
J2X 5K8  
Canada  
Tel.: (450) 358-4600  
Toll-free: 1-800-831-AUBE  
Fax: (450) 358-4650  
Email: aube.service@honeywell.com

For more information on our products, go to  
**[www.aubetech.com](http://www.aubetech.com)**



As an ENERGY STAR® partner, Aube Technologies has determined that this product meets the ENERGY STAR guidelines for energy efficiency.



# LED

## T8 | T12

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### DESCRIPTION

### SPECIFICATIONS

### REVIEWS

#### EarthLED Total Product Insight

##### PERFORMANCE SPECIFICATIONS

REPLACEMENT FOR:	T8 OR T12 4 FOOT FLUORESCENT TUBE
BRIGHTNESS (LUMENS):	2000
COLOR TEMPERATURE:	4000K   5000K
COLOR ACCURACY (CRI):	80
DIMENSIONS	1.02" X 47.2"
POWER CONSUMPTION:	18 WATTS
VOLTAGE:	120-277 VOLTS
DIMMABLE:	NO

##### DIMENSIONS / ADDITIONAL DATA

CERTIFICATIONS:	UL, DESIGNLIGHTS (DLC)
PRODUCT/ORDER CODE:	4000K - 18WT8P-4F-40K-BYP 5000K - 18WT8P-4F-50K-BYP

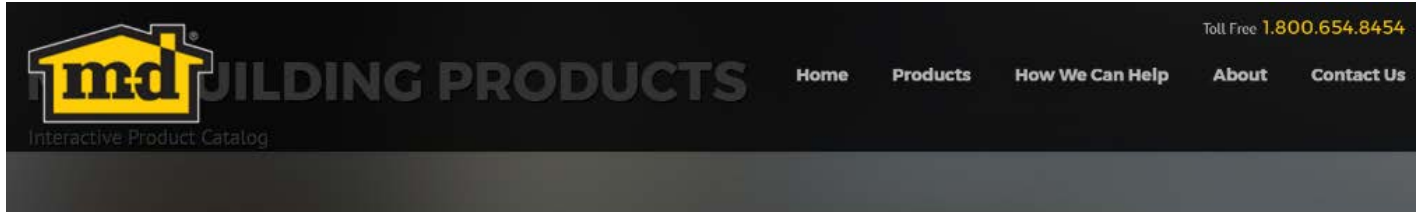
##### LIFESPAN / COST TO RUN

PROJECTED LIFE: @3 HRS/DAY	50,000 HRS
YEARLY ENERGY COST: 3 HRS/DAY @ .11 KWH	\$2.17

##### WARRANTY

5 YEAR THINKLUX LIGHTING LIMITED WARRANTY  
EARTHLED PRODUCT PROTECTION PLAN IS AVAILABLE

# Door Bottom Sweep (Replacement for Damaged Brush Sweep)



M-D Building Products, Inc. > Products > DB006 Commercial Grade Door Sweep - 1-1/4" EPDM - 36"

## Product Search

Search by name, model, or upc.



## DB006 Commercial Grade Door Sweep - 1- 1/4" EPDM - 36"

This heavy duty commercial grade door sweep provides years of service in high traffic applications. Heavy rubber seal stands up to the elements. Fasteners are included.

SKU: 68247 CATEGORIES: [DOOR SEALS, WEATHERIZATION & THRESHOLDS](#)

**WHERE TO BUY**

## Door Bottom Sweep

(For Doors w/ Very Large Gaps and/or Damaged Bottom Edges)



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[> DB054 Door Bottom - 1-3/4" Vinyl - 36"](#)

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## DB054 Door Bottom - 1-3/4" Vinyl - 36"

Energy loss through the bottom of doors can be minimized with the installation of a door bottom in conjunction with your smooth top threshold. This combination provides a weatherproof seal between the bottom of the door and the top of the threshold. Drip caps also provide your exposed entry ways protection by diverting water away from the door bottom and thresholds. M-D Building Products offers multiple combinations of new and replacement door bottoms and drip caps that will fit most entry doors.

SKU: 68593 CATEGORIES: [DOOR SEALS, WEATHERIZATION &](#)

## Door Bottom Sweep

### (Lower Profile)

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### **DB002 U-Shaped Door Bottom w/Drip Cap - 1-3/8" x 36"**


Energy loss through the bottom of doors can be minimized with the installation of a door bottom in conjunction with your smooth top threshold. This combination provides a weatherproof seal between the bottom of the door and the top of the threshold. Drip caps also provide your exposed entry ways protection by diverting water away from the door bottom and thresholds. M-D Building Products offers multiple combinations of new and replacement door bottoms and drip caps that will fit most entry doors.

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# Door Top and Side Jambs

 catalog

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M-D Building Products, Inc. > Products > Cinch Door Seal Tops and Sides 42" Silver

### Product Search

Search by name, model, or upc.

Q



## Cinch Door Seal Tops and Sides 42" Silver

Cinch™ Door Seal Top & Sides is a fast and easy way to save money by sealing your doors against drafts and leaks. Say goodbye to drills, screws, screwdrivers or pilot holes. Simply measure, trim, peel and stick your way to energy savings in any season. Specially developed with 3M™ Adhesive Technology, Cinch installs in mere minutes and lasts for years.

SKU: 43303 CATEGORIES: DOOR SEALS, WEATHERIZATION & THRESHOLDS TAGS: AIR-TIGHT, CINCH, ENERGY SAVINGS

WHERE TO BUY



# High Efficiency Circulators

## GRUNDFOS ALPHA2

Grundfos ALPHA2 is versatile and efficient whether you use one of its seven speed or pressure control settings or simply leave it on the factory setting AUTOADAPT™. The ALPHA2 with its ECM motor design reduces energy consumption by 50%, and in AUTOADAPT mode, will automatically analyze the heating system, find the optimum setting, continue to adjust its operation to changes in demand, and reduce power consumption by up to 85% ensuring the lowest possible energy consumption without sacrificing comfort.

The Grundfos ALPHA2 circulator and AUTOADAPT are predicated on:

- 65 years of hydronic experience of how pumps work in countless applications and operating environments
- 15 years of ECM motor experience in the market
- ALPHA2 materials and design resist blockage from magnetite and iron oxide particles found in closed hydronic systems
- ALPHA2 is made at our Grundfos manufacturing plant in Fresno, California

## Key Features and Benefits

- Simple push button control enables the ALPHA2 to be programmed in one of 3-constant speed, 3-constant pressure, or AUTOADAPT control modes. The current operating mode is always visible on the ALPHA2's LED display
- The large LED display shows the current energy consumption in Watts and estimated flow in gallons per minute
- For installation, you have the flexibility to use either our unique ALPHA Plug with line cord or the ALPHA2 with terminal box for conduit connections
- ALPHA2 is complete with an integrated check-valve, foam insulation jacket, and nut captures for flanges. ALPHA2 comes in both cast iron and stainless steel models
- Robust startup enables the ALPHA2 to continuously attempt to restart – indefinitely – in blocked rotor conditions
- ALPHA2 can be used as a replacement for more than 30 competitor pump models



### APPLICATIONS

- Heating & cooling
- Hot water recirculation



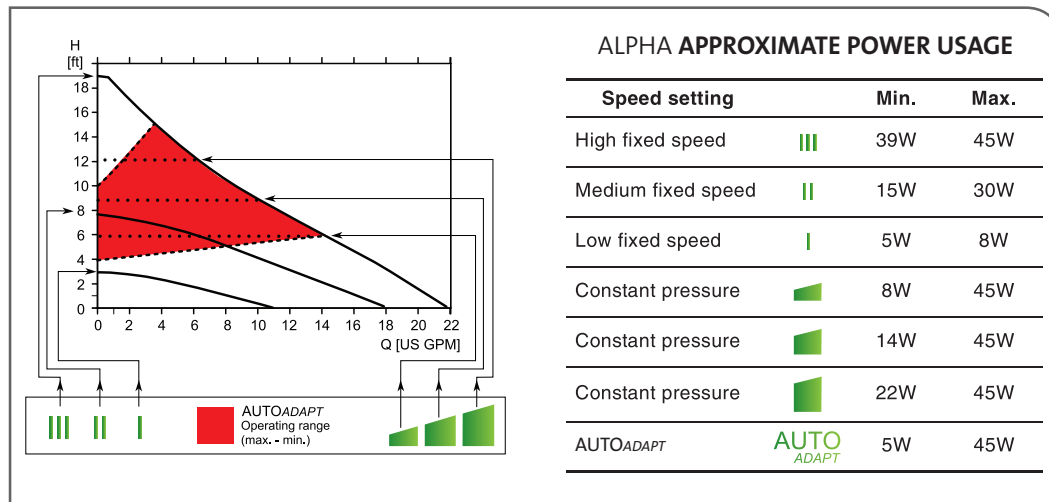
## ALPHA2 Technical Data

ALPHA2	
Flow, Q:	max. 21 gpm
Head, H:	max. 19 ft.
Motor:	1 x 115V
Liquid temp.:	36°F to 230°F
Working Pressure:	max. 150 PSI
Watts:	5-45W
Amps:	0.65A
Approvals:	ETL, NSF 61, NSF 372

## Product Offering

Model	Description
ALPHA2 15-55F	Cast iron flange with terminal box
ALPHA2 15-55FR	Cast iron rotated flange with terminal box
ALPHA2 15-55SF	Stainless flange with terminal box
ALPHA2 15-55F/LC	Cast iron flange with line cord
ALPHA2 15-55FR/LC	Cast iron rotated flange with line cord
ALPHA2 15-55SF/LC	Stainless flange with line cord

## Performance Data



## Cross Reference Chart

ALPHA2	GRUNDFOS	TACO	B&G	Armstrong	WILO
ALPHA2 15-55F (LC)	UP 15-10F UP 15-42F UPS 15-42F UPS 15-58FC ALPHA 15-55F	005-F2-3 006-F7 007-F5-5 008-F6-1 008-F6-3 00R-F6-1 0015-MSF3-1	NRF-25 NRF-9F/LW Ecocirc 19-14 vario Ecocirc 19-14 auto	Astro 230CI-R Astro 250CI-R Compass 20-20	Star S 16FX Star S 21FX Star S 21RFC Stratos ECO 16 RFC
ALPHA2 15-55FR (LC)	UP 15-10FR UP 15-42FR UPS15-58FRC ALPHA 15-55FR	005-F2-2 007-F5 008-F6 00R-MSF 0015-MSF3	NRF-22 NRF-9F/LW	Astro 230CI Astro 250CI Astro 20 Astro 25 Astro 30	Star S 16F Star S 21F Star S 21RFC Stratos ECO 16 RFC

[www.grundfos.us/alpha2](http://www.grundfos.us/alpha2)

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