



Investigative Energy Audit For

Circle Tribal Hall



Prepared For
Circle Native Community

May 31, 2017

Prepared By: Kevin Ulrich, CEM

**ANTHC-DEHE
4500 Diplomacy Dr.
Anchorage, AK 99508**

Table of Contents

PREFACE	2
ACKNOWLEDGMENTS.....	2
OVERVIEW.....	3
ENERGY BASELINE	3
Table 1: Predicted Annual Energy Use for the Circle Tribal Hall.....	3
PROPOSED ENERGY EFFICIENCY MEASURES (EEM)	3
FACILITY DESCRIPTION	4
PROJECT FINANCING.....	7
MEASUREMENT AND VERIFICATION	7
Appendix A –Energy Billing Data.....	8
Appendix B – Energy Audit Report – Project Summary	10
Appendix C – Actual Fuel Use versus Modeled Fuel Use	11
Appendix D - EUI Calculation Details	13
Appendix E – Materials List and Labor Estimation.....	14
Appendix F – Materials Specifications	15

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 Circle Tribal Chief Jessica Fields and Circle Tribal Administrator Angela Ludwick.

OVERVIEW

This report was prepared for the Circle Tribal Council. The scope of the audit focused on the Circle Tribal Hall 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 Circle Tribal Hall was constructed in 1990 and is approximately 1,980 square feet. The building serves as a common area for large community events and also features a kitchen with a daily meal service as well as an apartment for guests of the tribe.

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 \$8,133 per year. This includes \$5,380 for unsubsidized electricity, \$1,817 for #1 fuel oil, and \$936 for cordwood.

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 Circle, the cost of electricity without PCE is \$0.71/kWh and the cost of electricity with PCE is \$0.40/kWh. With the PCE subsidy, the electric utility cost to the Circle Native Community is \$3,031 and the cost to the State of Alaska is \$2,349.

Table 1 lists the predicted annual energy usage before and after the proposed retrofits for the Circle Tribal Hall.

Table 1: Predicted Annual Energy Use for the Circle Tribal Hall

Predicted Annual Fuel Use				
Fuel Use	Existing Building	With Proposed Retrofits	Total Energy Savings	Total Cost Savings (subsidized)
Electricity	9,218 kWh	7,918 kWh	1,300 kWh	\$520
#1 Oil	686 gallons	548 gallons	138 gallons	\$366
Spruce Wood	3.12 cords	2.49 cords	0.63 cords	\$189

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)

Table 2 below summarizes the energy efficiency measures analyzed for the Circle Tribal Hall. 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 ¹	Simple Payback (Years) ²	CO ₂ Savings
High	Setback Thermostat: Community Hall	Program the Toyo stove to implement an unoccupied setback of 60.0 deg F for the Community Hall space.	\$515	\$500	13.03	1.0	2,484.3
High	Lighting: Apartment Living Room (Fluorescent)	Replace with new, direct-wire LED equivalent lighting.	\$225	\$250	10.40	1.1	797.6
High	Setback Thermostat: Apartment	Program the Toyo stove to implement an unoccupied setback of 60.0 deg F for the Apartment space.	\$357	\$500	9.04	1.4	1,723.4
High	Lighting: Apartment Bedrooms (3)	Replace with new, direct-wire LED equivalent lighting.	\$52	\$150	4.04	2.9	186.4
Medium	Lighting: Apartment Living Room	Replace with new, direct-wire LED equivalent lighting.	\$20	\$80	2.95	3.9	72.6
Medium	Lighting: Main Hall T12	Replace with new, direct-wire LED equivalent lighting.	\$81	\$320	2.93	3.9	288.4
Low	Lighting: Main Hall U bulbs	Replace with new, direct-wire LED equivalent lighting.	\$48	\$600	0.92	12.6	169.8
Low	Lighting: Hall Restroom	Replace with new, direct-wire LED equivalent lighting.	\$3	\$50	0.65	17.8	10.0
Low	Lighting: Kitchen	Replace with new, direct-wire LED equivalent lighting.	\$7	\$160	0.51	22.5	25.3
Low	Lighting: Kitchen Storage	Replace with new, direct-wire LED equivalent lighting.	\$1	\$50	0.32	35.6	5.0
TOTAL			\$1,311	\$2,660	6.05	2.0	5,762.8

FACILITY DESCRIPTION

Building Occupancy Schedules

The building is occupied from 8:30 AM – 1:30 PM for four days per week when the kitchen is used to provide meals to members of the community. The apartment is used about twice per week on average for the various guests that come into the community for work or tourism.

Building Shell

The building is a log structure that is elevated on piles. The roof has 2x6 lumber construction with attic space available.

There are six total windows in the building. Each window has double-pane glass with wood framing and four of the windows have plastic film across the frame for added protection against air leakage.

There are four total entrances to the building. The main entrance, back entrance, and apartment entrance all have single wood doors with metal skin and no windows. The patio entrance has decorative glass in the wood door that covers the approximate area of a half-lite window.

Heating Systems

The heating systems used in the building are:

Main Hall Toyo 73

Fuel Type:	#1 Oil
Input Rating:	40,000 BTU/hr
Steady State Efficiency:	80 %
Idle Loss:	0 %
Heat Distribution Type:	Air

Apartment Toyo 73

Fuel Type:	#1 Oil
Input Rating:	40,000 BTU/hr
Steady State Efficiency:	80 %
Idle Loss:	0 %
Heat Distribution Type:	Air

Blaze King KEJ 1107 Wood Stove

Fuel Type:	Spruce Wood
Input Rating:	47,000 BTU/hr
Steady State Efficiency:	75 %
Idle Loss:	0 %
Heat Distribution Type:	Air

Hot Water Heater

Nameplate Information:	Bradford White Model No. M24056DS-1NCWW
Fuel Type:	Electricity
Input Rating:	0 BTU/hr
Steady State Efficiency:	90 %
Idle Loss:	0 %
Heat Distribution Type:	Water
Boiler Operation:	All Year

Main Hall Plug-in Heater

Nameplate Information:	Lasko Model CC24842
Fuel Type:	Electricity
Input Rating:	0 BTU/hr
Steady State Efficiency:	90 %
Idle Loss:	0 %
Heat Distribution Type:	Air

Space Heating Distribution Systems

Space heating is achieved through the use of two Toyotomi Laser 73 oil-fired stoves and a Blaze King wood stove in the main hall area. The oil-fired stove in the main hall was set for 72 deg. F and the oil-fired stove in the apartment was set for 77 deg. F. There is also a Lasko plug-in electric space heater for emergency use during extreme cold seasons.

Domestic Hot Water System

There is a Bradford White model electric hot water heater that is used for the kitchen and restrooms. The unit is rated for 4500 Watts and has approximately 40 gallons of storage.

Lighting

Table 3: Lighting Information in the Circle Tribal Hall

Room	Bulb Type	Fixtures	Bulbs per Fixture	Annual Usage (kWh)
Main Hall	Fluorescent T12	4	4	252
Main Hall	Fluorescent U-Bulb 40W	6	2	226
Kitchen	Fluorescent T12	2	2	44
Kitchen Storage	Incandescent 60W	1	1	4
Hall Restroom	Incandescent 60W	1	1	8
Apartment Living Room	Fluorescent T12	1	2	127
Apartment Living Room	Incandescent 60W	5	1	629
Apartment Bedrooms (3)	Fluorescent CFL Spiral 42W	3	1	171

Other Electrical Loads

There is a variety of kitchen 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 Circle Tribal Hall

Equipment	Rating (Watts)	Annual Usage (kWh)
Chest Freezers (2)	60 each	526
Coffee Pot	800	70
Electric Range	2000	261
Microwave	1,250	41
Dishwasher	330	43

PROJECT FINANCING

The total estimated cost of the recommended EEM's \$2,660. The payback for the implemented EEM's is approximately 2.0 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. For the Circle Tribal Hall, complete electricity records were not available and there was data for five months.

Month	Fuel Oil Use (gallons)	Electricity Use (kWh)
January	100	773
February	80	588
March	75	648
April	50	619
May	25	Not Available
June	0	Not Available
July	0	Not Available
August	0	Not Available
September	50	Not Available
October	50	Not Available
November	80	Not Available
December	100	1066

Appendix B – Energy Audit Report – Project Summary

ENERGY AUDIT REPORT – PROJECT SUMMARY	
General Project Information	
PROJECT INFORMATION	AUDITOR INFORMATION
Building: Circle Tribal Hall	Auditor Company: ANTHC-DEHE
Address: PO Box 89	Auditor Name: Kevin Ulrich
City: Circle	Auditor Address: 4500 Diplomacy Dr.
Client Name: Jessica Fields	Anchorage, AK 99508
Client Address:	Auditor Phone: (907) 729-3237
	Auditor FAX:
Client Phone: (907) 773-2822	Auditor Comment:
Client FAX:	
Design Data	
Building Area: 1,980 square feet	Design Space Heating Load: Design Loss at Space: 40,052 Btu/hour with Distribution Losses: 40,052 Btu/hour Plant Input Rating assuming 82.0% Plant Efficiency and 25% Safety Margin: 61,054 Btu/hour Note: Additional Capacity should be added for DHW and other plant loads, if served.
Typical Occupancy: 0 people	Design Indoor Temperature: 73.7 deg F (building average)
Actual City: Circle	Design Outdoor Temperature: -58.3 deg F
Weather/Fuel City: Circle	Heating Degree Days: 16,349 deg F-days
Utility Information	
Electric Utility: Circle Native Community	Average Annual Cost/kWh: \$0.58/kWh

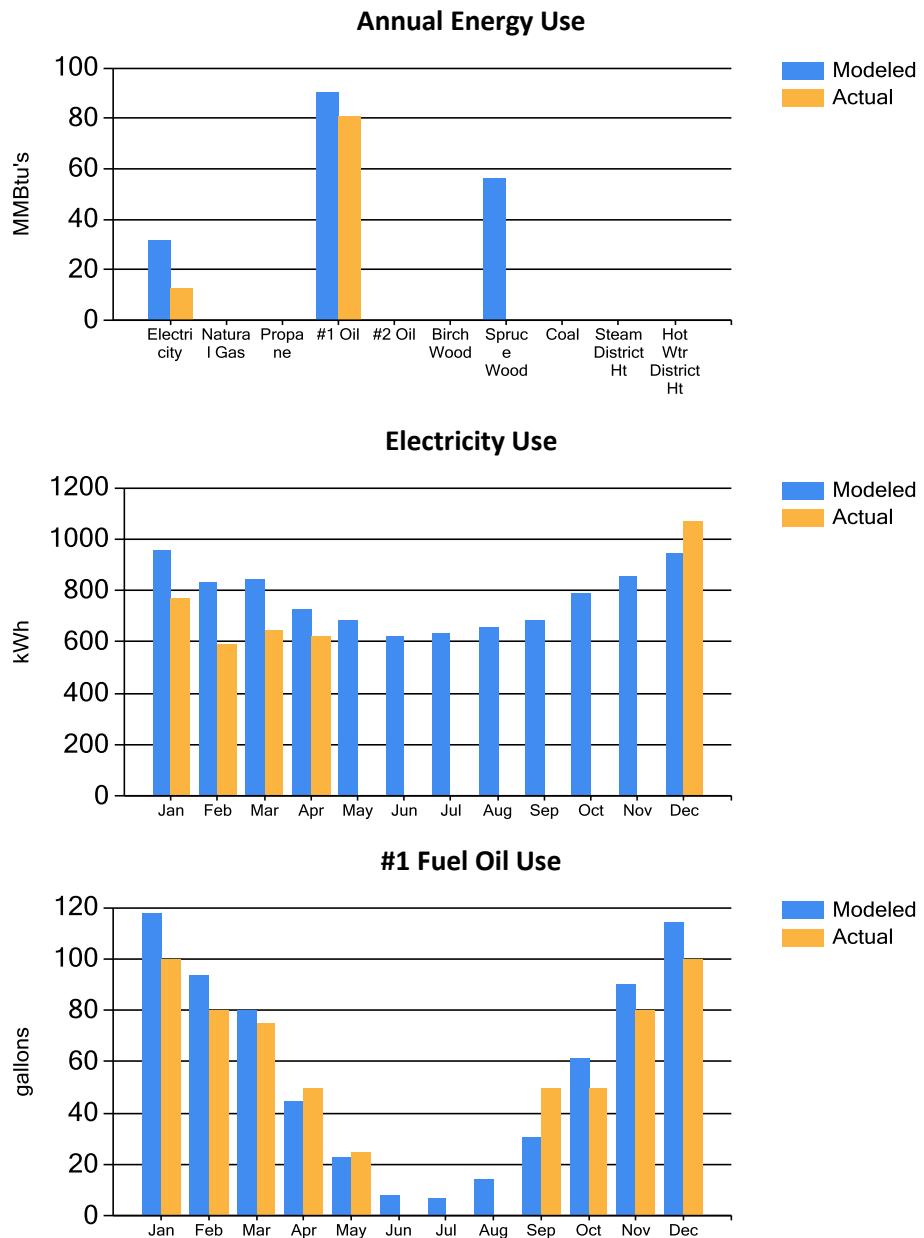
Annual Energy Cost Estimate						
Description	Space Heating	Water Heating	Lighting	Refrigeration	Other Electrical	Total Cost
Existing Building	\$3,901	\$1,954	\$853	\$876	\$549	\$8,133
With Proposed Retrofits	\$3,119	\$1,954	\$325	\$876	\$549	\$6,822
Savings	\$782	\$0	\$529	\$0	\$0	\$1,311

Building Benchmarks			
Description	EUI (kBtu/Sq.Ft.)	EUI/HDD (Btu/Sq.Ft./HDD)	ECI (\$/Sq.Ft.)
Existing Building	90.1	5.51	\$4.11
With Proposed Retrofits	73.0	4.46	\$3.45

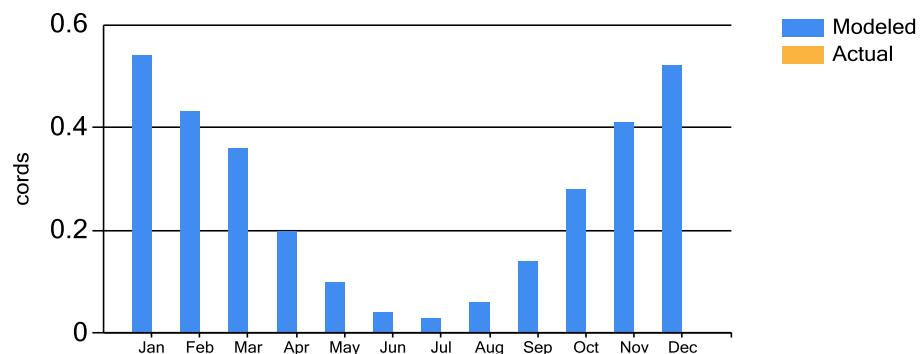
EUI: Energy Use Intensity - The annual site energy consumption divided by the structure's conditioned area.
 EUI/HDD: Energy Use Intensity per Heating Degree Day.
 ECI: Energy Cost Index - The total annual cost of energy divided by the square footage of the conditioned space in the building.

Appendix 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.



Spruce Wood Use



Appendix D - EUI Calculation Details

The Circle Native Community owns a utility that provides electricity to the residents of Circle as well as to all 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	\$ 0.58/kWh
#1 Oil	\$ 2.65/gallons
Spruce Wood	\$ 300/cords

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 Circle Tribal Hall

Energy Type	Building Fuel Use per Year	Site Energy Use per Year, kBtu	Source/Site Ratio	Source Energy Use per Year, kBtu
Electricity	9,218 kWh	31,461	3.340	105,079
#1 Oil	686 gallons	90,487	1.010	91,392
Spruce Wood	3.12 cords	56,461	1.000	56,461
Total		178,409		252,932
<hr/>				
BUILDING AREA		1,980	Square Feet	
BUILDING SITE EUI		90	kBTU/Ft ² /Yr	
BUILDING SOURCE EUI		128	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 Circle Tribal Hall

Building Benchmarks			
Description	EUI (kBtu/Sq.Ft.)	EUI/HDD (Btu/Sq.Ft./HDD)	ECI (\$/Sq.Ft.)
Existing Building	90.1	5.51	\$4.11
With Proposed Retrofits	73.0	4.46	\$3.45
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

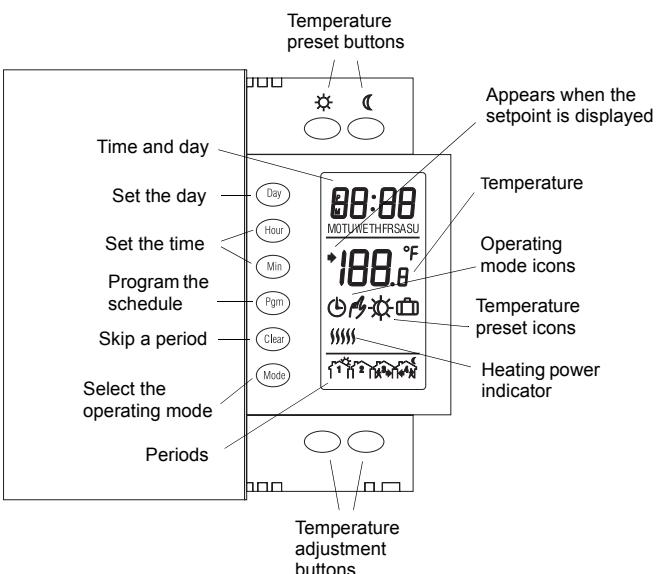
Table 8 & 9: Materials List and Cost Estimation for Circle Tribal Hall EEM's

Energy Retrofit	Required Materials	Quantity	Cost per Item	Total Materials Cost
Setback Thermostat	None, Toyo Programming	0	150	0
LED Lighting	Incand. 60W Equivalent	10	25	250
LED Lighting	T8 LED Equivalent 4 ft.	26	15	390

Category	Cost (\$)
Labor	2,492
Travel	2,560
Materials	640
Freight	96
Indirect	579
Total	\$6,366

It should be noted that the energy audit cost information in Table 2 does not consider travel or indirect costs. These would only be added if outside labor is used to perform the tasks.

Appendix F – Materials Specifications



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

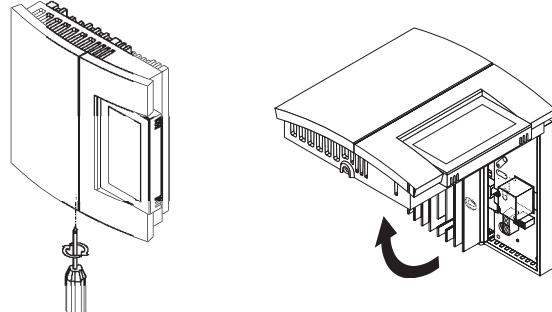
TURN OFF POWER TO THE HEATING SYSTEM AT THE MAIN POWER PANEL TO AVOID ELECTRICAL SHOCK.

THE INSTALLATION MUST BE PERFORMED BY AN ELECTRICIAN.

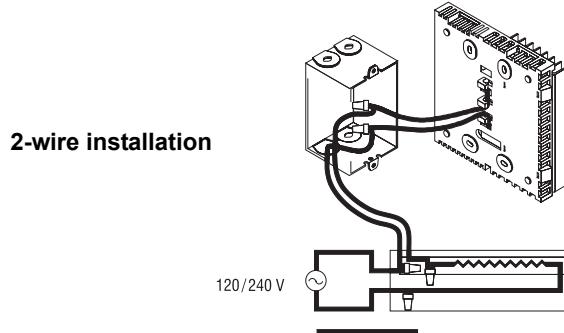
- ▶ All cables and connections must conform to the local electrical code.
- ▶ Special CO/ALR solderless connectors must be used when connecting with aluminum conductors.
- ▶ Install the thermostat onto an electrical box.
- ▶ Install the thermostat about 5 feet high, on an inside wall facing the heater.
- ▶ 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.

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

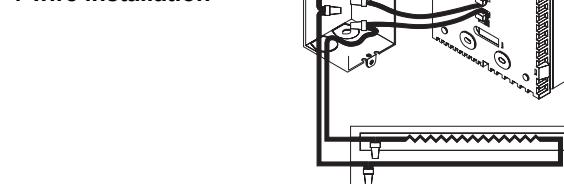
①



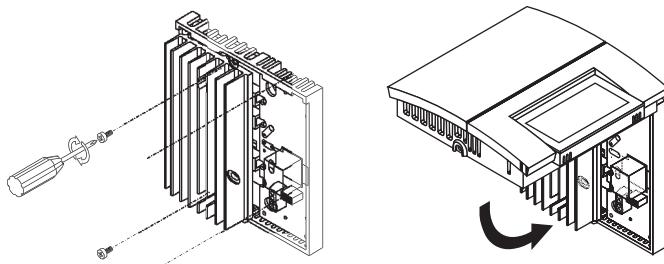
- ② Connect the thermostat wires to the line wires and to the load wires using solderless connectors for copper wires.



4-wire installation



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

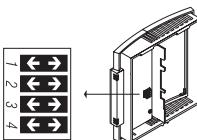


NOTE: If necessary, before re-installing the front component, configure the thermostat (see section 3).

- 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 ^a	Off	On
SW2	Temperature / time format ^b	°C / 24-hour	°F / 12-hour
SW3	Cycle length ^c	15 seconds	15 minutes
SW4	Not used	-	-

- a. 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.
- b. If you change the temperature display format, the preset temperatures (\odot , \odot and \square) will return to their default settings.
- c. 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 (flame) and displays the actual (ambient) temperature.

- 1 Press the **Hour** and **Min** buttons to set the thermostat's clock.
- 2 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 \uparrow or \downarrow button briefly. The setpoint will appear for the next 5 seconds.

To change the setpoint, press the \uparrow or \downarrow 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 \odot
- Economy temperature \odot
- Vacation temperature \square

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

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

Storing a preset temperature

To store the Comfort or Economy temperature:

Set the desired temperature using the \uparrow or \downarrow button. Press and hold the appropriate button (\odot or \odot) 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 \uparrow or \downarrow button. Press and hold both \odot and \odot buttons simultaneously for approximately 3 seconds until the \square icon is displayed. Press the **Mode** button.

6 Operating Modes

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

flame **Temporary Bypass**: If you modify the setpoint (by pressing the \uparrow , \downarrow , \odot or \odot 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.

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

- 1 Press **Mode** until flame is displayed.
- 2 Set the temperature using the \uparrow , \downarrow , \odot or \odot 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
$\odot\odot$	Wake	\odot
$\odot\odot\odot$	Leave	\odot
$\odot\odot\odot\odot$	Return	\odot
$\odot\odot\odot\odot\odot$	Sleep	\odot

The Comfort (\odot) temperature is used in periods 1 and 3 and the Economy (\odot) 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 (\odot) to Economy setting (\odot).

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
$\odot\odot$	\odot	6:00 AM						
$\odot\odot\odot$	\odot	8:00 AM	--:--	--:--				
$\odot\odot\odot\odot$	\odot	6:00 PM	--:--	--:--				
$\odot\odot\odot\odot\odot$	\odot	10:00 PM						

To modify the schedule:

- 1 Press **Pgm** to access the programming mode. Period 1 is selected.
- 2 Press **Day** to select the day to program (hold for 3 seconds to select the entire week).
- 3 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).
- 4 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,

(i) return it, with a bill of sale or other dated proof of purchase, to the place from which you purchased it, or

(ii) 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

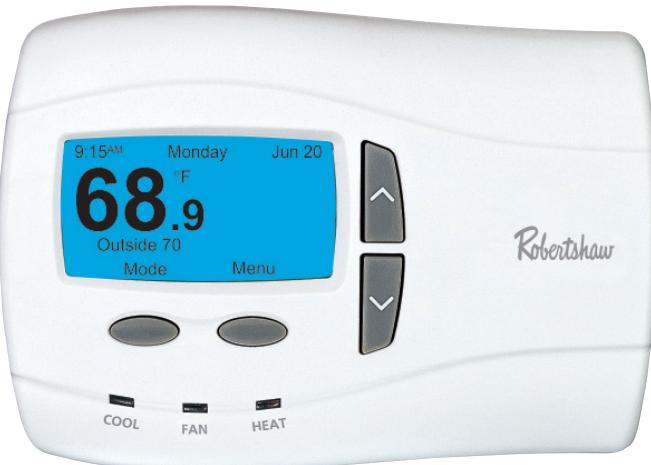
Email: aube.service@honeywell.com

For more information on our products, go to
www.aubetech.com



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

Robertshaw®



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™*

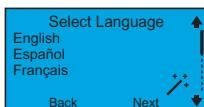
9701i2

**DELUXE
PROGRAMMABLE
THERMOSTAT**



Menu Driven Display 1 Heat / 1 Cool

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

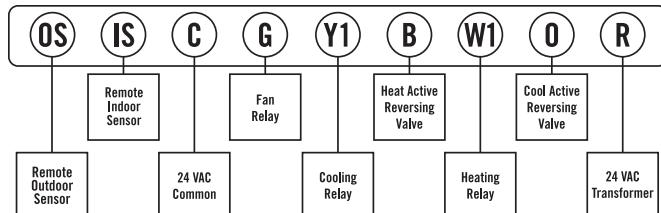
24V AC POWERED

Robertshaw®

9701i2

**DELUXE
PROGRAMMABLE
THERMOSTAT**

Terminal Designations



Technical Specifications

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

Shipping Specifications

Indiv. Ctn. Dim.: 6.625" x 4.25" x 1.625"	Item 9020i and 9025i Remote Sensors
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

i n v e n 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
HVACCustomerService@InvensysControls.com

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

Invensys™, Robertshaw® and Simply the Right Choice™ are trademarks of Invensys plc., its subsidiaries and/or affiliated companies. All other brands mentioned in this report may be the trademarks of their respective owners.



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

www.RobertshawTstats.com
www.InvensysControls.com
 ©2009 Invensys Controls 10/09 - 150-1978B



LED T8 | T12

[Notify Me when Available](#)

[Large Project? Click here to get a volume quote.](#)



[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:

50,000 HRS

@3 HRS/DAY

YEARLY ENERGY COST:

\$2.17

3 HRS/DAY @ .11 KWH

WARRANTY

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

EarthLED Total Product Insight

Performance Specifications

REPLACEMENT FOR: T8 U-BENT FLUORESCENT TUBE

BRIGHTNESS (LUMENS): 1900

COLOR TEMPERATURE: 4000K | 5000K

COLOR ACCURACY (CRI): 80

DIMENSIONS 7" X 22.44"

POWER CONSUMPTION: 17 WATTS

VOLTAGE: BALLAST DRIVEN

DIMMABLE: NO

Dimensions / Additional Data

CERTIFICATIONS: UL

PRODUCT/ORDER CODE: 4000K - T8UB-17W-40K-DIR
5000K - T8UB-17W-50K-DIR

Lifespan / Cost To Run

PROJECTED LIFE:
@3 HRS/DAY 50,000 HRS

YEARLY ENERGY COST:
3 HRS/DAY @ .11 KWH \$2.05

WARRANTY

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

THINKLUX
LIGHTING
U-BEND
Fluorescent Replacement



PLUG AND PLAY
T8 Ballast Required
LED
T8

EarthLED Total Product Insight	
Performance Specifications	
REPLACEMENT FOR:	E12 CANDELABRA
BRIGHTNESS (LUMENS):	500
COLOR TEMPERATURE:	3000K 5000K
COLOR ACCURACY (CRI):	>80
TRADITIONAL WATTAGE EQUIVALENT:	60 WATTS
POWER CONSUMPTION:	7 WATTS
VOLTAGE:	120 VOLTS
DIMMABLE:	YES
MOISTURE RATING:	DAMP
Fixture Rating:	OPEN FIXTURES
BASE TYPE:	E12
ENERGYSTAR QUALIFIED:	YES (TKUCA38S01-7W-D-830-E12)
Dimensions / Additional Data	
BULB DIAMETER:	1.6 IN
MAXIMUM OVERALL LENGTH:	4.9 IN
PRODUCT WEIGHT:	6.7 OUNCES
CERTIFICATIONS:	UL
PRODUCT/ORDER CODE:	3000K - TKUCA38S01-7W-D-830-E12 5000K - TKUCA38S01-7W-D-850-E12
Lifespan / Cost To Run	
PROJECTED LIFE: @3 HRS/DAY	25,000 HRS
YEARLY ENERGY COST: 3 HRS/DAY @ .11 KWH	\$0.84
WARRANTY	3 YEAR THINKLUX LIMITED WARRANTY EARTHLED PRODUCT PROTECTION PLAN IS AVAILABLE

