Investigative Energy Audit
For

Shageluk City Office

Prepared For

City of Shageluk

June 15, 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.

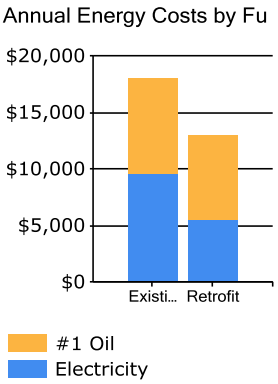
Discussions of site specific concerns, financing options, general facility information, and an Energy Efficiency Action Plan are also included in this report.

ACKNOWLEDGMENTS

The Rural Energy Initiative gratefully acknowledges the assistance of Shageluk Mayor Chevie Roach and Shageluk City Clerk Scott Wolfersheim.

OVERVIEW

This report was prepared for the City of Shageluk. The scope of the audit focused on the Shageluk 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 Shageluk City Office was constructed in the 1980's and is approximately 3,840 square feet. The building serves as office space for the City of Shageluk on the first floor and office space for the Shageluk Native Village on the second floor. The entire building is owned by the City of Shageluk.



ENERGY BASELINE

Based on unsubsidized electricity and fuel oil prices in effect at the time of the audit, the total predicted energy costs are $18,039 per year. This includes $9,607 for unsubsidized electricity and $8,432 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 Shageluk, the cost of electricity without PCE is $0.45/kWh and the cost of electricity with PCE is $0.22/kWh. With the PCE subsidy, the electric utility cost to the City of Shageluk is $4,697 and the cost to the State of Alaska is $4,910.

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

Table 1: Predicted Annual Energy Use for the Shageluk City Office

Predicted Annual Fuel Use				
Fuel Use	**Existing Building**	**With Proposed Retrofits**	**Total Energy Savings**	**Total Cost Savings (Subsidized)**
Electricity	18,303 kWh	9,742 kWh	7,939 kWh	$1,747
#1 Oil	1,405 gallons	1,252 gallons	153 gallons	$918

PROPOSED ENERGY EFFICIENCY MEASURES (EEM)

Table 2 below summarizes the energy efficiency measures analyzed for the Shageluk 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[1]	Simple Payback (Years)[2]	CO_2 Savings
High	Setback Thermostat: Floor 2	Install a programmable thermostat and implement an unoccupied set point of 60 deg. F for the second floor.	$788	$500	21.34	0.6	2,776.2
High	Refrigeration - Power Retrofit: Freezers (2)	Combine all the freezer contents into one freezer and unplug the second freezer to use as a back-up option.	$853	$500	13.78	0.6	3,314.2
High	Setback Thermostat: Floor 1	Install a programmable thermostat and implement an unoccupied set point of 60 deg. F for the first floor.	$406	$500	10.99	1.2	1,429.2
High	Lighting: Bedrooms 1+2	Replace with new, direct-wire LED equivalent lighting.	$818	$960	9.50	1.2	3,168.5
High	Lighting: Exterior	Replace with new, direct-wire LED equivalent lighting.	$548	$600	7.69	1.1	2,073.5
High	Lighting: Tribal Office Stairwell	Replace with new, direct-wire LED equivalent lighting.	$46	$100	3.90	2.2	175.0
High	Lighting: Entry	Replace with new, direct-wire LED equivalent lighting.	$71	$160	3.56	2.2	278.8
High	Lighting: City Office - 4 bulb	Replace with new, direct-wire LED equivalent lighting.	$71	$160	3.55	2.3	278.3
High	Lighting: Lobby	Replace with new, direct-wire LED equivalent lighting.	$142	$320	3.54	2.3	555.2
High	Air Tightening	Add weather stripping to doors, caulk windows, add window film	$744	$2,000	3.46	2.7	2,622.3
Medium	Lighting: Lodging Hallway	Replace with new, direct-wire LED equivalent lighting.	$94	$480	2.16	5.1	363.1
Medium	Lighting: Tribal Office (2nd Floor)	Replace with new, direct-wire LED equivalent lighting.	$306	$1,160	2.11	3.8	1,194.3
Medium	Lighting: 1st Floor Office Storage	Replace with new, direct-wire LED equivalent lighting.	$18	$160	1.19	9.1	68.7
Medium	Lighting: 1st Floor Storage	Replace with new, direct-wire LED equivalent lighting.	$44	$400	1.19	9.1	171.5
Low	Lighting: City Office - 2 bulbs	Replace with new, direct-wire LED equivalent lighting.	$8	$80	0.82	9.7	32.2
Low	Lighting: Tribal Office Storage (2nd Floor)	Replace with new, direct-wire LED equivalent lighting.	$33	$320	0.82	9.7	128.3
Low	Lighting: 2nd Floor Restroom	Replace with new, direct-wire LED equivalent lighting.	$3	$40	0.79	14.1	10.8

Priority	Feature	Improvement Description	Annual Energy Savings	Installed Cost	Savings to Investment Ratio, SIR[1]	Simple Payback (Years)[2]	CO_2 Savings
Low	Lighting: 1st Floor Restroom	Replace with new, direct-wire LED equivalent lighting.	$1	$40	0.27	41.0	3.7
Low	Lighting: Trooper Office - 4 bulbs	Replace with new, direct-wire LED equivalent lighting.	$3	$160	0.18	60.3	9.9
Low	Lighting: Trooper Office - 2 bulbs	Replace with new, direct-wire LED equivalent lighting.	$1	$160	0.04	252.1	2.4
		TOTAL	**$4,997**	**$8,800**	**5.79**	**1.8**	**18,655.9**

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 and tribe. There are guest rooms that are used periodically by visiting guests of the community during the evenings.

Building Shell

The building is a wood-framed lumber construction with an outer façade of logs. The building is built on grade on a gravel pad foundation. The roof has 2x6 lumber construction with attic space available.

There are 16 total windows in the building. Each window has double-pane glass with wood framing. Five of the windows are 29” x 37” and 11 of the windows are 17” x 36”.

There are four total entrances to the building. All of the entrances are single insulated metal doors with no windows.

Heating Systems

The heating systems used in the building are:

Oil-fired Furnace

Fuel Type: #1 Oil
Input Rating: 142,000 BTU/hr
Steady State Efficiency: 80 %
Idle Loss: 0.5 %
Heat Distribution Type: Air

Space Heating Distribution Systems

Space heating is achieved through a forced-air heating system that is heated by the oil-fired furnace. The building set points were at 65 deg. F for each floor at the time of the site visit.

Lighting

Table 3: Lighting Information in the Shageluk City Office

Room	Bulb Type	Fixtures	Bulbs per Fixture	Annual Usage (kWh)
Entry	Fluorescent T8 4ft.	2	4	351
Lobby	Fluorescent T8 4ft.	4	4	703
1st Floor Storage	Fluorescent T8 4ft.	5	4	220
City Office Room (4-bulb)	Fluorescent T8 4ft.	2	4	351
City Office Room (2-bulb)	Fluorescent T8 4ft.	1	2	90
1st Floor Office Storage	Fluorescent T8 4ft.	2	4	88
1st Floor Restroom	Fluorescent T12 4ft.	1	1	7
Lodging Hallway	Fluorescent T8 4ft.	6	2	919
Bedrooms 1+2	Fluorescent T8 4ft.	12	4	3,597
Trooper Office (4-bulbs)	Fluorescent T8 4ft.	2	4	12
Trooper Office (2-bulbs)	Fluorescent T8 4ft.	2	2	6
Tribal Office	Fluorescent T8 4ft.	14	3	1,858
Tribal Office Stairwell	CFL Spiral 42 W	3	1	197
Tribal Office Storage	Fluorescent T8 4ft.	4	2	359
2nd Floor Restroom	Incandescent A-Lamp 60W	1	1	11
Exterior	High Pressure Sodium 100W	2	1	1,986

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 Shageluk City Office

Equipment	Rating (Watts)	Annual Usage (kWh)
Freezers (2)	285	5000
1st Floor Office Computers (2)	75	313
Office Printer/Fax Machine	300	184
1st Floor Fan	25	26
1st Floor Minifridge	40	351
Coffee Pot	75	157
2nd Floor Computers (3)	75	470
2nd Floor Printers (3)	13	41
2nd Floor Coffee Pot	75	157
2nd Floor Minifridge	40	351
VHF Transmitter	20	175

PROJECT FINANCING

The total estimated cost of the recommended EEM's $8,800. The payback for the implemented EEM's is approximately 1.8 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	1757
February	200	1696
March	150	1687
April	90	1522
May	20	1318
June	10	1155
July	10	1223
August	20	1088
September	50	1642
October	150	1726
November	200	1644
December	250	1788

Appendix B – Energy Audit Report – Project Summary

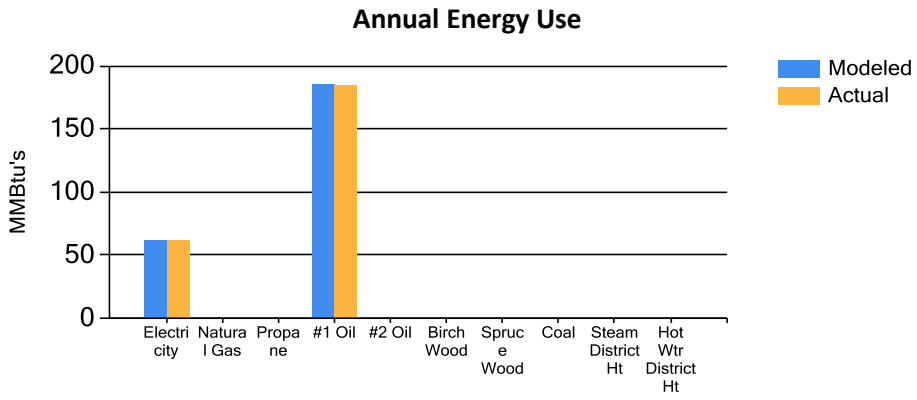
ENERGY AUDIT REPORT – PROJECT SUMMARY	
General Project Information	
PROJECT INFORMATION	**AUDITOR INFORMATION**
Building: Shageluk City Office	**Auditor Company:** ANTHC-DEHE
Address: P.O. Box 110	**Auditor Name:** Kevin Ulrich, Kameron Hartvigson
City: Shageluk	**Auditor Address:** 4500 Diplomacy Drive, Anchorage, AK 99508
Client Name: Chevie Roach	
Client Address: P.O. Box 110 Shageluk, AK 99665	**Auditor Phone:** (907) 729-3237
	Auditor FAX:
Client Phone: (907) 473-8221	**Auditor Comment:**
Client FAX:	
Design Data	
Building Area: 3,840 square feet	**Design Space Heating Load:** Design Loss at Space: 49,348 Btu/hour with Distribution Losses: 49,348 Btu/hour Plant Input Rating assuming 82.0% Plant Efficiency and 25% Safety Margin: 75,225 Btu/hour Note: Additional Capacity should be added for DHW and other plant loads, if served.
Typical Occupancy: 0 people	**Design Indoor Temperature:** 67.5 deg F (building average)
Actual City: Shageluk	**Design Outdoor Temperature:** -39.2 deg F
Weather/Fuel City: Shageluk	**Heating Degree Days:** 13,462 deg F-days
Utility Information	
Electric Utility: Alaska Village Electric Cooperative	**Average Annual Cost/kWh:** $0.45/kWh

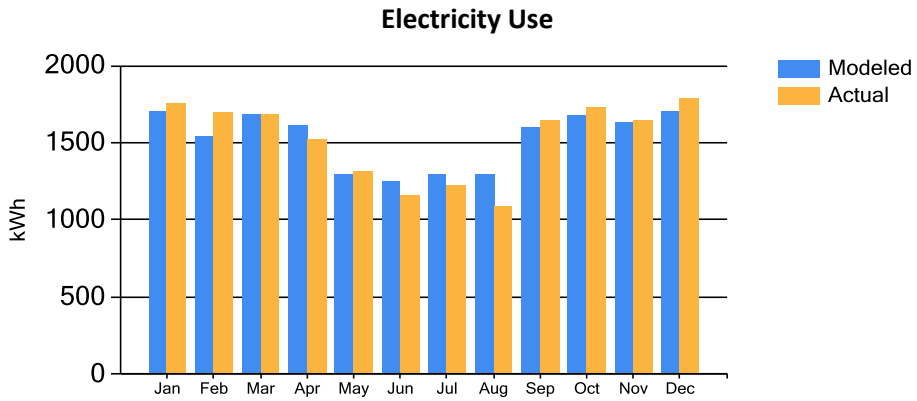
Annual Energy Cost Estimate					
Description	**Space Heating**	**Lighting**	**Refrigeration**	**Other Electrical**	**Total Cost**
Existing Building	$8,561	$5,605	$2,611	$1,202	**$18,039**
With Proposed Retrofits	$7,632	$2,648	$1,407	$1,295	**$13,042**
Savings	$929	$2,957	$1,205	-$93	**$4,997**

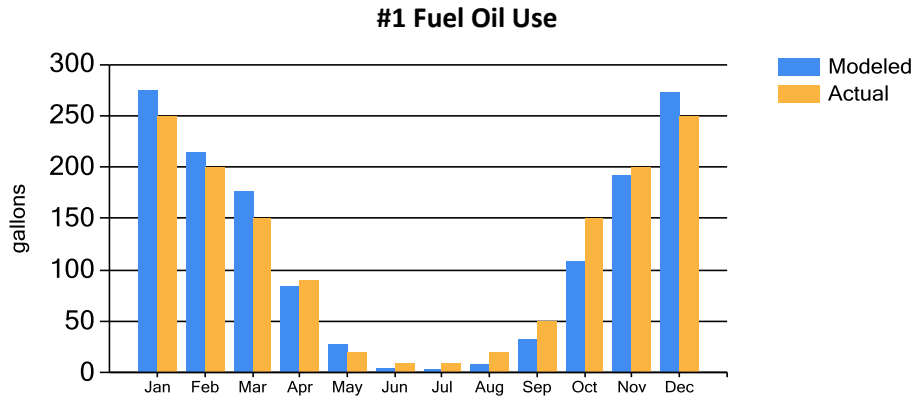
Building Benchmarks			
Description	**EUI (kBtu/Sq.Ft.)**	**EUI/HDD (Btu/Sq.Ft./HDD)**	**ECI ($/Sq.Ft.)**
Existing Building	64.6	4.80	$4.70
With Proposed Retrofits	51.7	3.84	$3.40
EUI: Energy Use Intensity - The annual site energy consumption divided by the structure's conditioned area. EUI/HDD: Energy 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.







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	$ 0.45/kWh
#1 Oil	$ 6.00/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 Shageluk 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	18,303 kWh	62,467	3.340	208,641
#1 Oil	1,405 gallons	185,509	1.010	187,364
Total		**247,976**		**396,005**
BUILDING AREA		3,840	Square Feet	
BUILDING SITE EUI		65	kBTU/Ft²/Yr	
BUILDING SOURCE EUI		103	**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 Shageluk City Office

Building Benchmarks			
Description	**EUI (kBtu/Sq.Ft.)**	**EUI/HDD (Btu/Sq.Ft./HDD)**	**ECI ($/Sq.Ft.)**
Existing Building	64.6	4.80	$4.70
With Proposed Retrofits	51.7	3.84	$3.40
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 Shageluk City Office EEM's

Energy Retrofit	Required Materials	Quantity	Cost per Item	Total Materials Cost
Setback Thermostat	Programmable Thermostat	2	150	300
LED Lighting	Incand. 60W Equivalent	6	25	150
LED Lighting	T8 LED Equivalent 4 ft.	112	15	1,725
LED Lighting	Exterior LED Wallpack	2	179	358
Air Tightening	Weather Stripping, Caulking, Window Film	2	75	150

Category	Cost ($)
Labor	4,986
Travel	2,680
Materials	3,095
Freight	456
Indirect	1,116
Total	**$12,332**

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

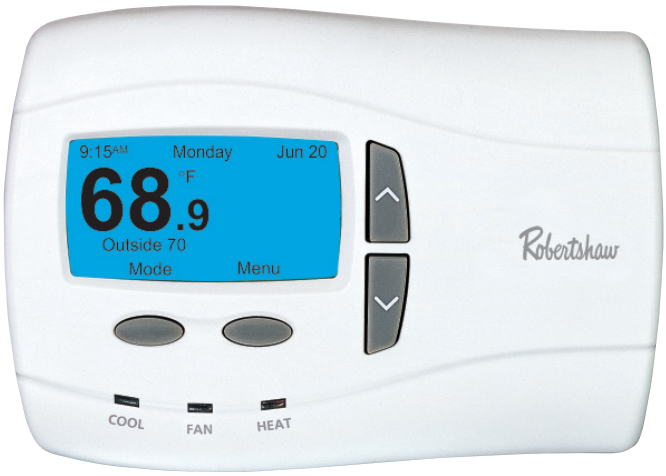
Robertshaw®

9701i2 DELUXE PROGRAMMABLE THERMOSTAT

G E O H

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.

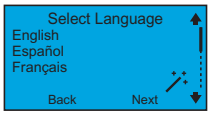
We've also made programming even easier for your customers. Menus are easier to navigate. We've even added additional convenience features such as Automated Time adjustment for Daylight Saving Time, along with new indoor air quality reminders.

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.

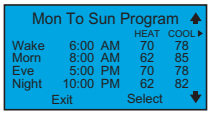
Robertshaw - *Simply the Right Choice™*

Features and Benefits

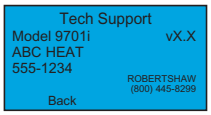
Set-up Wizard
Helps speed through the installation process with step-by-step setup and programming instructions.



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

ENERGY STAR

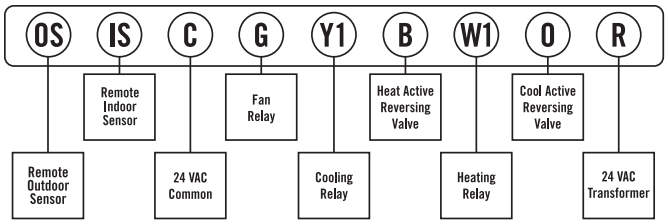
5 Year Limited Warranty

24V AC POWERED

Robertshaw®

9701i2 DELUXE PROGRAMMABLE THERMOSTAT

Terminal Designations



Optional Sensors:
9020i REMOTE INDOOR
9025i REMOTE OUTDOOR

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"
Master Ctn. Qty.: 6
Master Ctn. Dim.: 9.25" x 5.625 x 7.5"
Master Ctn. Cu. Ft.: .23
Master Ctn. Wt.: 3.5 lbs.
Max. Pallet Qty.: 1260
Max. Pallet Wt.: 785 lbs.

Item 9020i and 9025i Remote Sensors
Indiv. Ctn. Dim.: 2.625" x 1.5625" x 4.4375"
Master Ctn. Qty.: 6
Master Ctn. Dim.: 5.625" x 5.125" x 5.125"
Master Ctn. Cu. Ft.: .09
Master Ctn. Wt.: .78 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

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

invensys 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@InvensysContrtols.com

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www.InvensysControls.com

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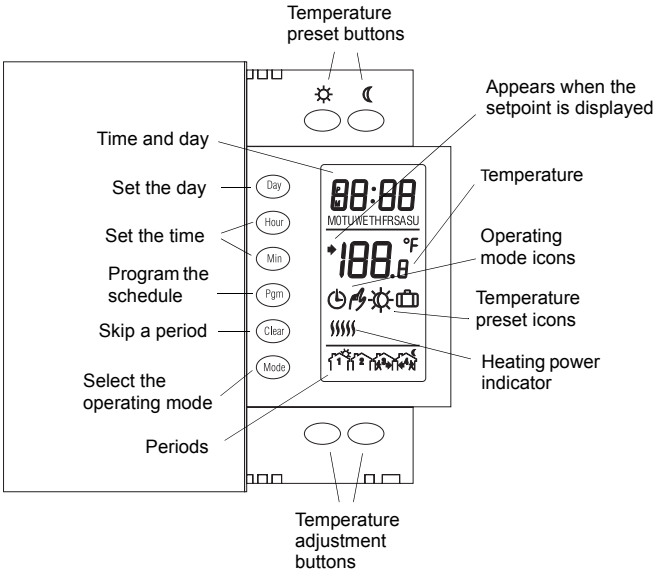
10/09 – 150-1978B

TH106

User Guide

Programmable Thermostat



❶ 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

❷ Installation

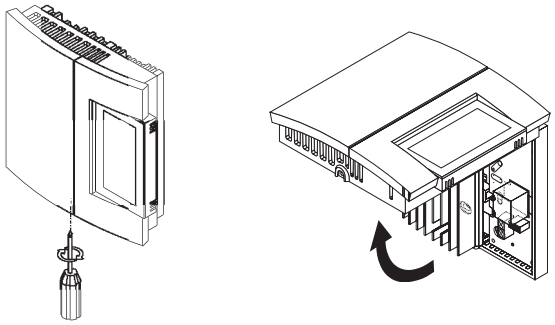
TURN OFF POWER TO THE HEATING SYSTEM AT THE MAIN POWER PANEL TO AVOID ELECTRICAL SHOCK.

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.

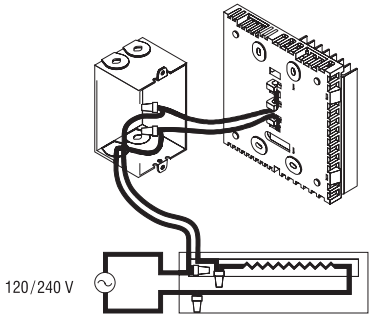
***NOTE:** Always keep the thermostat's vents clean and unobstructed.*

❶

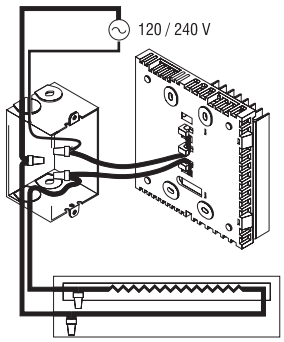


❷ Connect the thermostat wires to the line wires and to the load wires using solderless connectors for copper wires.

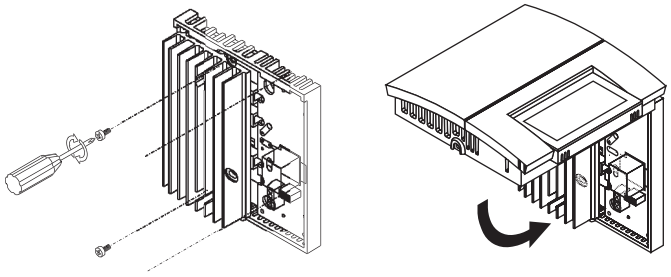
2-wire installation



4-wire installation



❸ Push any excess wire back into the electrical box.

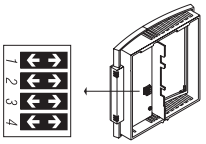


***NOTE:** If necessary, before re-installing the front component, configure the thermostat (see section 3).*

❹ 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 (☼, ☾ and 💼) 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 (✋) and displays the actual (ambient) temperature.

❶ Press the **Hour** and **Min** buttons to set the thermostat's clock.

❷ 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:

❶ Press **Mode** until ✋ is displayed.

❷ 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:

❶ Press **Pgm** to access the programming mode. Period 1 is selected.

❷ Press **Day** to select the day to program (hold for 3 seconds to select the entire week).

❸ 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).

❹ Press **Pgm** to select another period, or press **Day** to select another day. Then repeat step 3.

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

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

❽ 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.

❾ 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.

❿ 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.

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: @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

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

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	

FEATURES & SPECIFICATIONS

INTENDED USE

Provides years of maintenance-free general illumination for outdoor use in commercial applications such as retail, education, multi-unit housing and storage. Ideal for lighting building facades, parking areas, walkways, garages, loading areas and any other outdoor space requiring reliable safety and security.

CONSTRUCTION

Sturdy weather-resistant aluminum housing with a bronze finish, standard unless otherwise noted. A clear polycarbonate lens protects the optics from moisture, dirt and other contaminants.

OPTICS

8 high performance LEDs are powered by a multi-volt (120V-277V) LED driver that uses 18 input watts and provides 1,490 delivered lumens. 100,000 hour LED lifespan based on IESNA LM-80-08 results and calculated per IESNA TM-21-11 methodology.

ELECTRICAL

Rated for outdoor installations, -40°C minimum ambient.

Adjustable Dusk-to-dawn, multi-volt photocell standard automatically turns light on at dusk and off at dawn for convenience and energy savings.

Photocell can be disabled by rotating the photocell cover.

6KV

Surface or recessed mount. A universal junction box is included standard.

All mounting hardware included.

LISTINGS

UL Certified to US and Canadian safety standards. Wet location listed for mounting higher than 4 feet off the ground.

Tested in accordance with IESNA LM-79 and LM-80 standards.

WARRANTY

5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

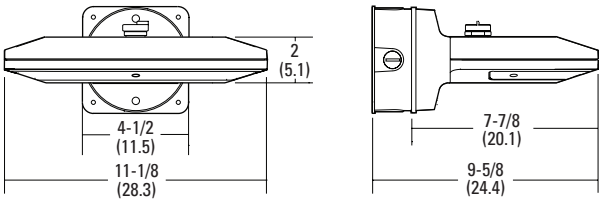
Actual performance may differ as a result of end-user environment and application.

Note: Specifications subject to change without notice.

Outdoor General Purpose

OLW14

LED WALL PACK



All dimensions are inches (centimeters) unless otherwise indicated.

ORDERING INFORMATION For shortest lead times, configure product using **bolded options.**

Example: OLW14

OLW14							
Series		**Color temperature (CCT)**[1]		**Voltage**		**Control**		**Finish**	
OLW14	1400 lumen LED wall pack	**(blank)**	5000K[1]	**(blank)**	MVOLT (120V-277V)	**(blank)**	MVOLT photocell included	**(blank)**	Bronze
								WH	White

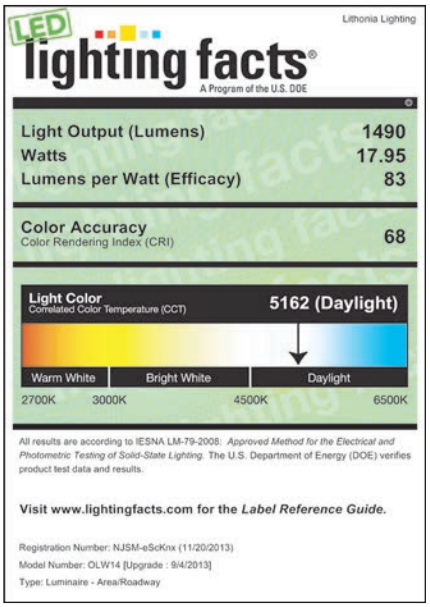
Accessories: *Order as separate catalog number.*	
FCOS M24	Full cutoff shield
FCOS WH M24	Full cutoff shield, white

Notes

1 Correlated Color Temperature (CCT) shown is nominal per ANSI C78,377-2008.

PHOTOMETRIC DIAGRAMS

Full photometric data report available within 2 weeks from request. Consult factory. Tested in accordance with IESNA LM-79 and LM-80 standards.



OUTDOOR: One Lithonia Way, Conyers, GA 30012 Phone: 800-279-8041 Fax: 770-860-3903 www.lithonia.com © 2011-2013 Acuity Brands Lighting, Inc. All rights reserved. Rev. 12/19/13

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	

FEATURES & SPECIFICATIONS

INTENDED USE — The OLFL provides years of maintenance-free general illumination for residential or commercial outdoor applications such as yards, driveways, patios, loading areas and warehouses.

CONSTRUCTION — Dusk-to-dawn photocell automatically turns on at dusk and off at dawn for convenience and energy savings.

Rugged cast-aluminum, corrosion-resistant housing in bronze finish.

Tempered glass lens is fully gasketed to protect LEDs and keep out moisture, dirt and bugs.

120V driver operates at 60 Hz, 0.258 amps, 25 watts.

Rated for outdoor installations, -40°C minimum ambient.

OPTICS — High-performance LEDs produce 1900 lumens and maintain 70% of light output at 50,000 hours of service. (LED lifespan based on IESNA LM-80-08 results and calculated per IESNA TM-21-11 methodology.)

Precision optics and reflector for maximum light output.

See Lighting Facts Labels for specific fixture performance.

INSTALLATION — Mounts easily to existing junction box on wall or under eave.

Adjustable head allows precise illumination.

LISTINGS — UL Listed to US and Canadian safety standards for wet locations. ENERGY STAR® certified product.

WARRANTY — 5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Actual performance may differ as a result of end-user environment and application.

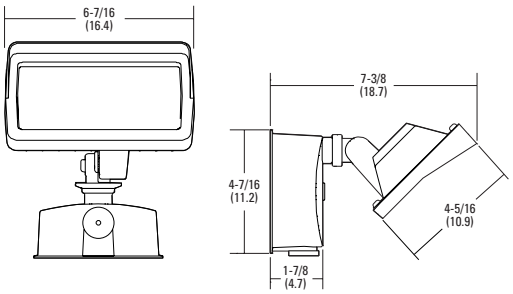
All values are design or typical values, measured under laboratory conditions at 25 °C.

Specifications subject to change without notice.

Outdoor General Purpose

OLFL

LED FLOODLIGHT



All dimensions are inches (centimeters) unless otherwise indicated.

ORDERING INFORMATION All configurations of this product are considered "standard" and have short lead times. **Example:** OLFL 14 PE BZ

OLFL	14		PE	BZ
Series	**Model / Color temperature (CCT)[1]**	**Voltage**	**Control**	**Finish**
OLFL	**14** 4000K	**(blank)** 120V	**PE** Button photocell	**BZ** Bronze

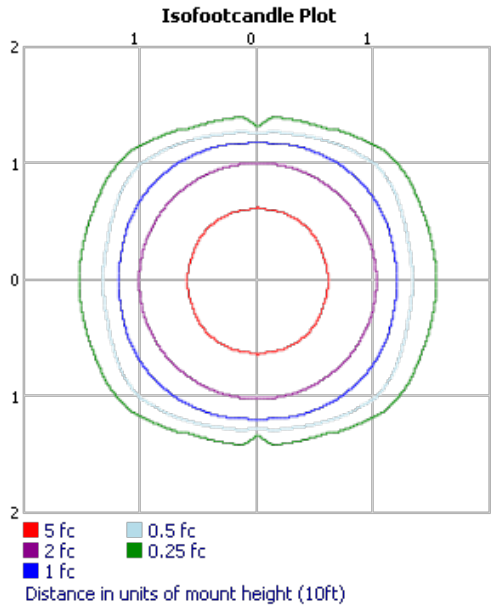
Notes

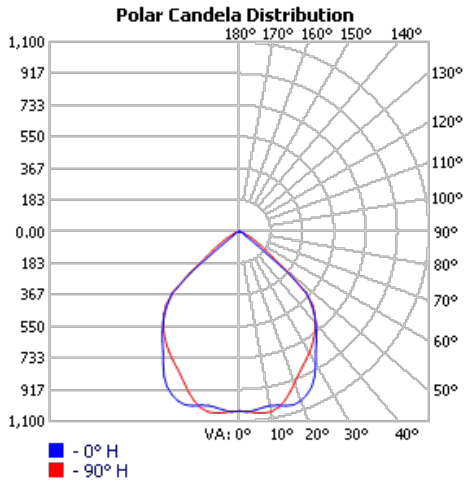
1 Nominal Correlated Color Temperature (CCT) per ANSI C78.377-2008.

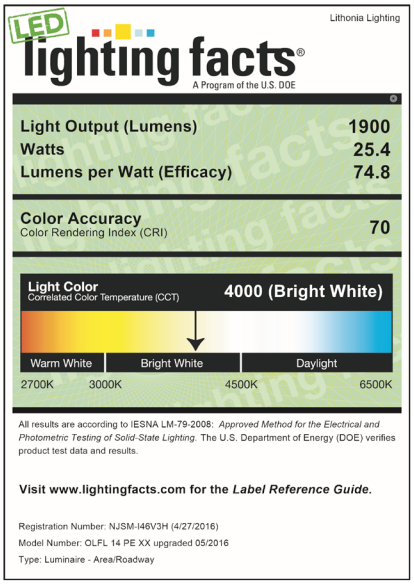
PHOTOMETRIC DIAGRAMS

To see complete photometric reports or download .ies files for this product,visit the OLFL home page on www.Lithonia.com. Tested in accordance with IESNA LM- 79 and LM- 80 standards. Actual wattage may differ by +/- 8% when operating between 120V +/- 10%.

OLFL 14







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LITHONIA LIGHTING®

LED Wall Pack
TWS LED

Value and versatility defined

Our new “traditional-style” LED luminaires offer the shapes you’ve grown accustomed to coupled with the high-powered, energy-efficient LEDs you want.

This fixture was designed to fit seamlessly — eliminating unwanted markings from the removal of older fixtures. **Replace one or replace them all, either case, with energy-savings of up to 80%, Lithonia has you covered!**

5 YEAR · c UL us LISTED · LED lighting facts · WET LOCATION™

TWS LED 1 replaces up to **70W HPS**

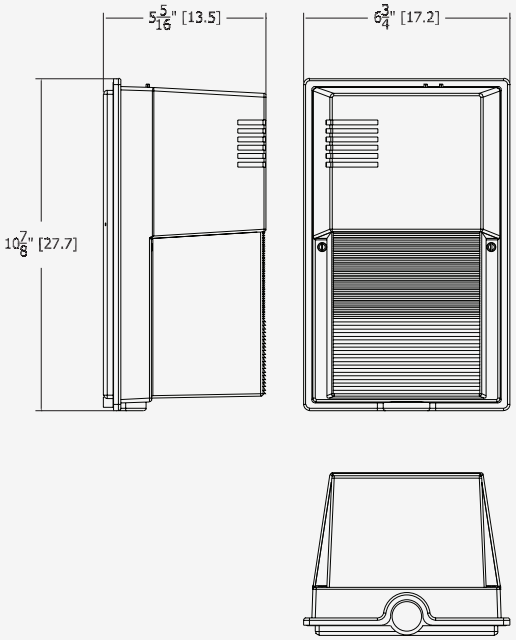
Value and versatility defined

Mounts to a recessed junction box — **lower mounting height, 7-10 feet**

- **Impact resistant polycarbonate lens** provides an **even light distribution** and protects electronics
- 100,000 hour LED life[1]
- Includes standard photo cell for dusk to dawn operation
- **Cast aluminum back plate** dissipates heat from LEDs to promote long life
- Highly efficient LEDs provide **54 lumens per watt**

[1] LED lifespan based on IESNA LM-80-08 results and calculated per IESNA TM-21-11 methodology.

Product Dimensions



YOU CHOOSE
TWS LED 1
19 Watts

YOU REPLACE
70W HPS
94 Watts

YOU SAVE
75 Watts

YOU WIN
You Save **$36.14 per year**[2]

[2] Based on 12 hours operation per day and energy costs of $.11 per kWh

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative.

Example: TWS LED 1 50K 120 PE

TWS LED

Series	Performance Package	Color Temperature (CCT)	Voltage	Control Options	Finish
TWS LED LED Wall Pack	1 1017 lumens	**50K** 5000K[3]	**120** 120 volts	**PE** Photoelectric Cell, Button Type	**(blank)** Dark Bronze

Notes

3 Correlated Color Temperature (CCT) shown is nominal per ANSI C78,377-2008.

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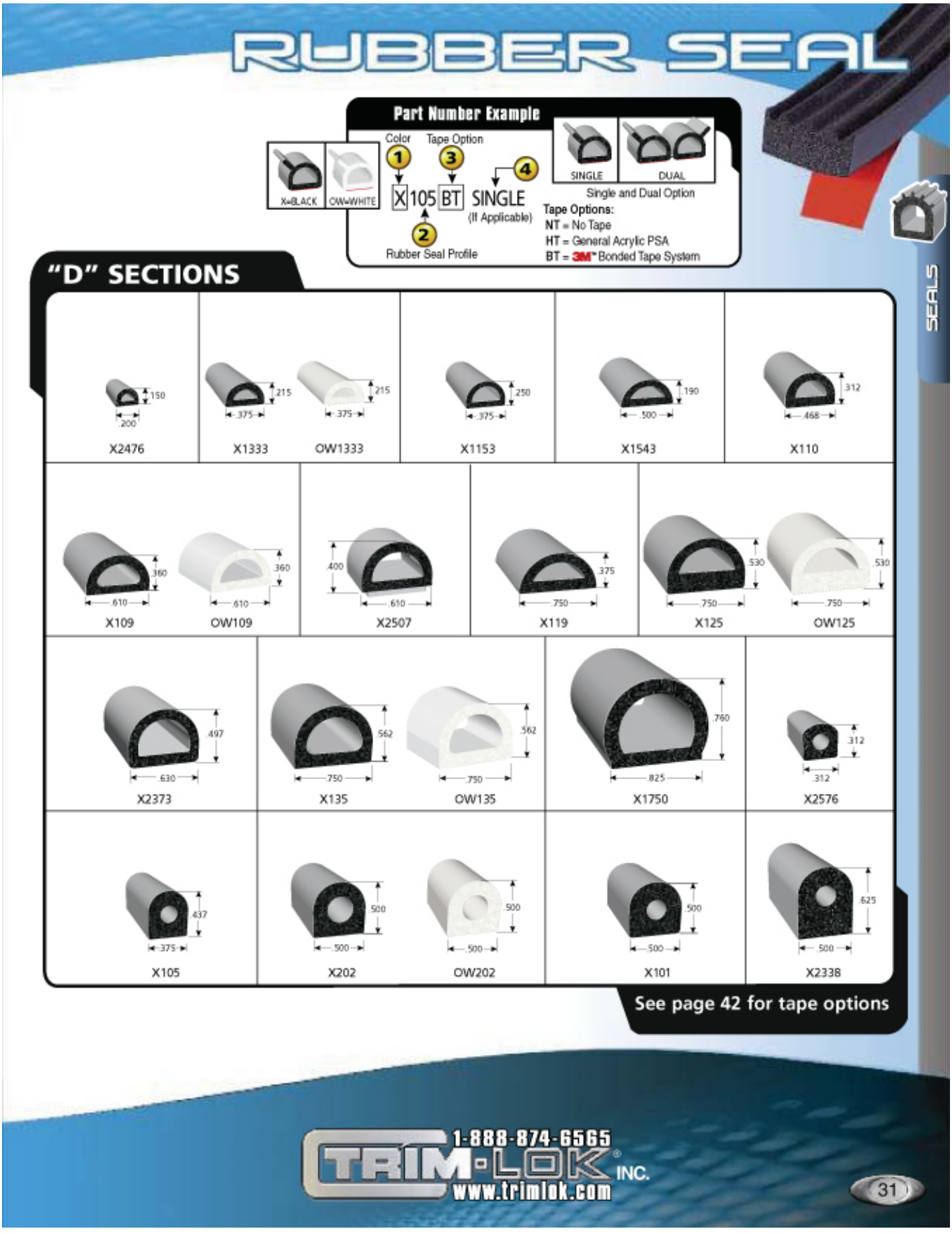
Window Jambs and Light-Duty Door Jambs



RUBBER SEAL

SEALS

"D" SECTIONS

Part Number Example

Color (1) Tape Option (3)

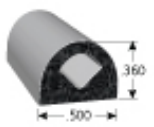
X105 BT SINGLE (4)

(2) Rubber Seal Profile

(If Applicable)

Single and Dual Option

Tape Options:
NT = No Tape
HT = General Acrylic PSA
BT = 3M™ Bonded Tape System



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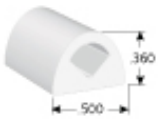

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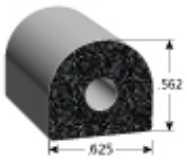

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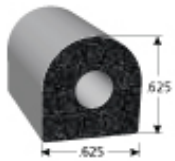

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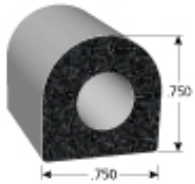

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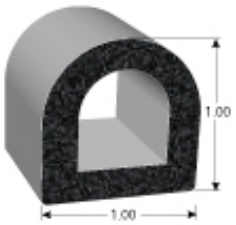

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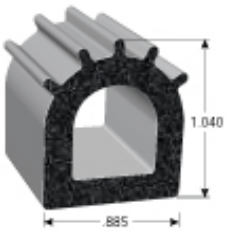

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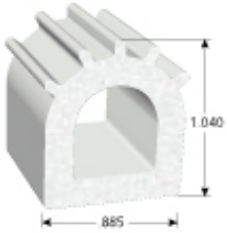

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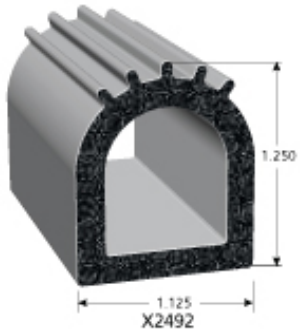

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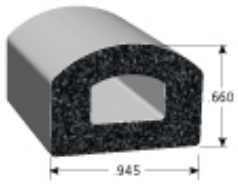

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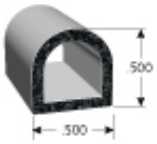

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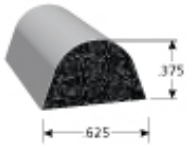

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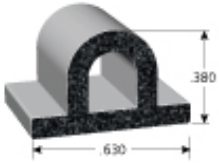

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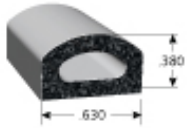

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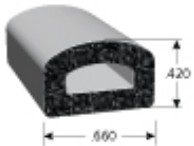

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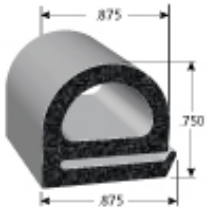

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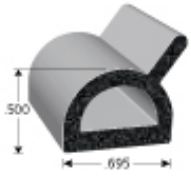

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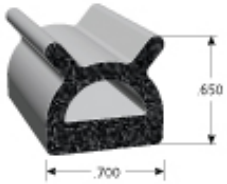

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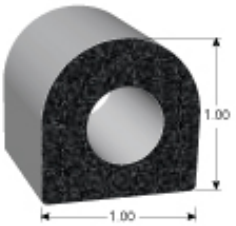
RUBBER SEAL



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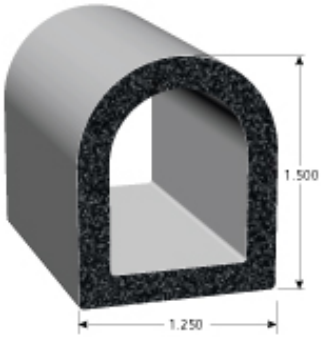

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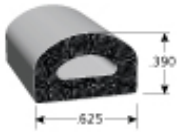

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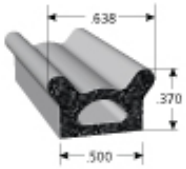

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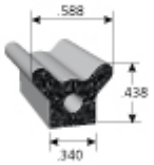
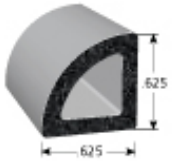


X2529

See page 42 for tape options

TRIANGLE SECTIONS



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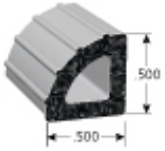

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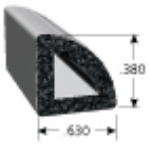

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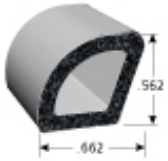

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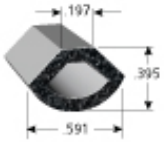


X1923

Adhesive Options –
Choose the tape that fits your needs

"HT" GENERAL PURPOSE PRESSURE SENSITIVE ADHESIVE

This acrylic based adhesive is best used to hold the rubber seal in place while installed in a static application or compressed between two stationary objects. May be used in some light duty dynamic applications against a variety of substrates. Good heat performance -20˚F. to +158˚F.
Please Note: During application ambient temperature must be above 60˚ F.

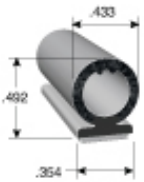
"BT" 3M™ HIGH STRENGTH TAPE SYSTEM

The ultimate bond between the rubber and substrate. Creates a moisture barrier and air tight seal between rubber and substrate. Highest peel and shear resistance, can be used under high loads of stress and force. Has low initial tack for easy re-positioning during installation and requires 72 hours of cure time for full bond strength. Good heat performance -20˚F. to +158˚F.

See our How to Install video at:
www.rubber-seal-install.info

PEDESTAL SEALS

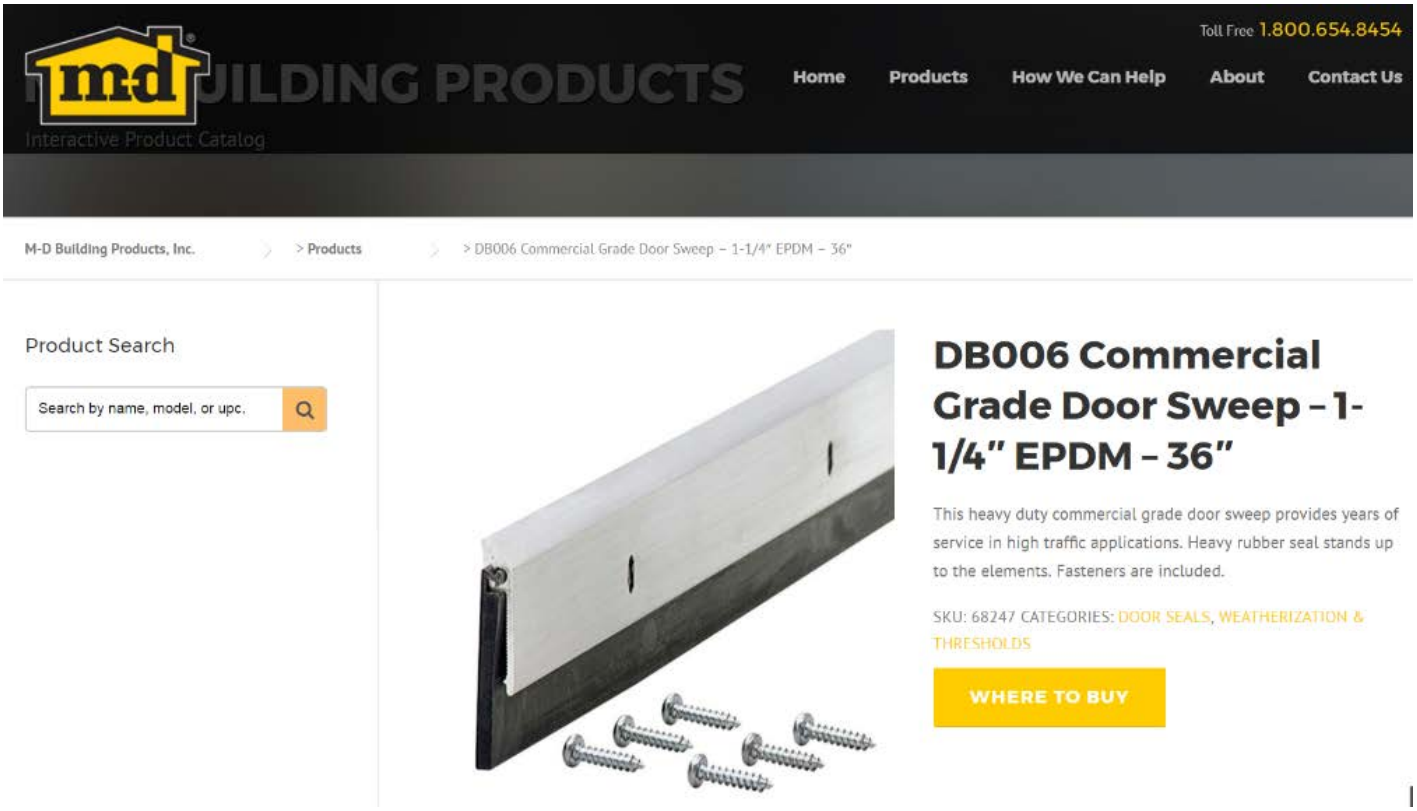
DD6109



DD1604

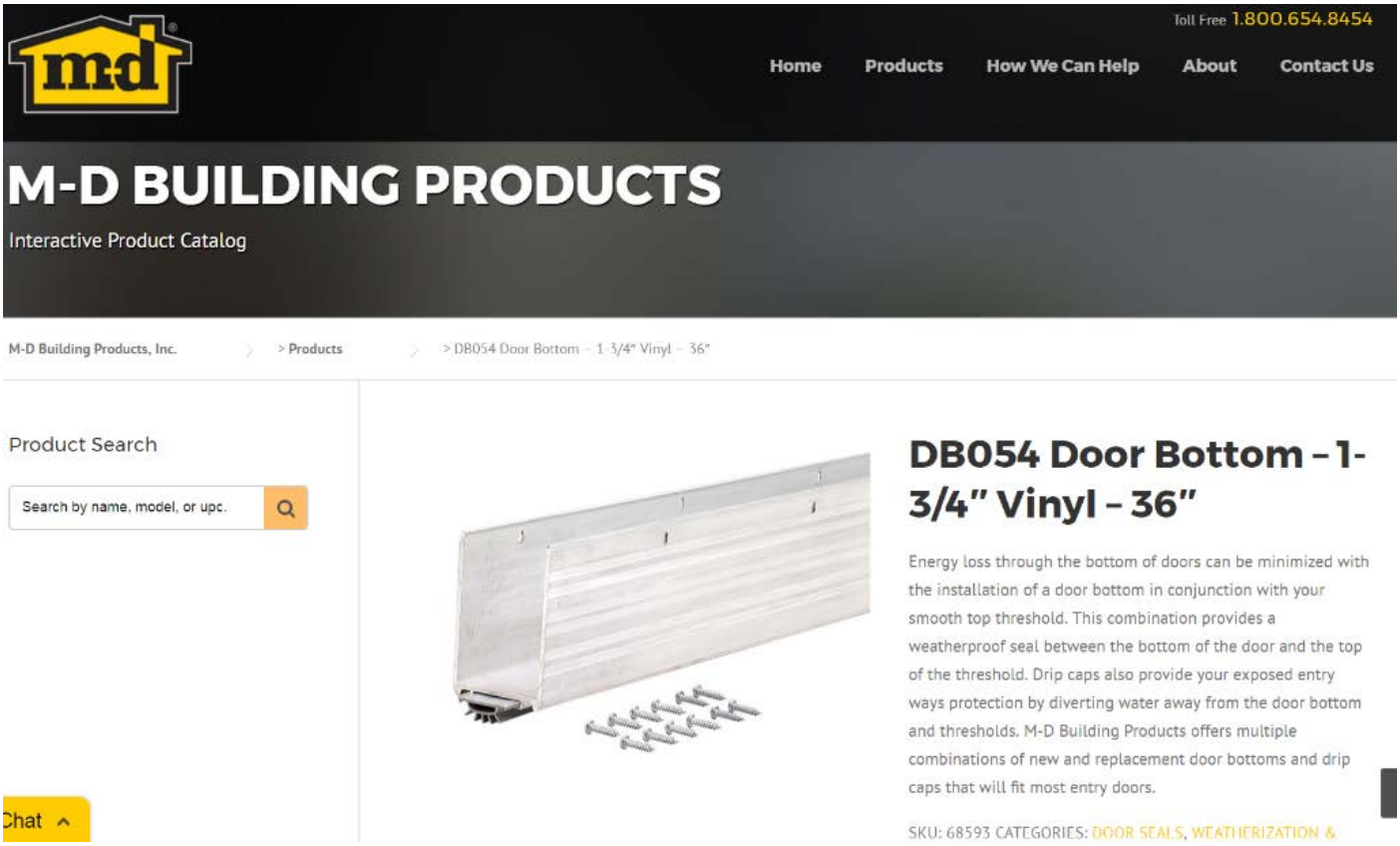
Door Bottom Sweep

(Replacement for Damaged Brush Sweep)



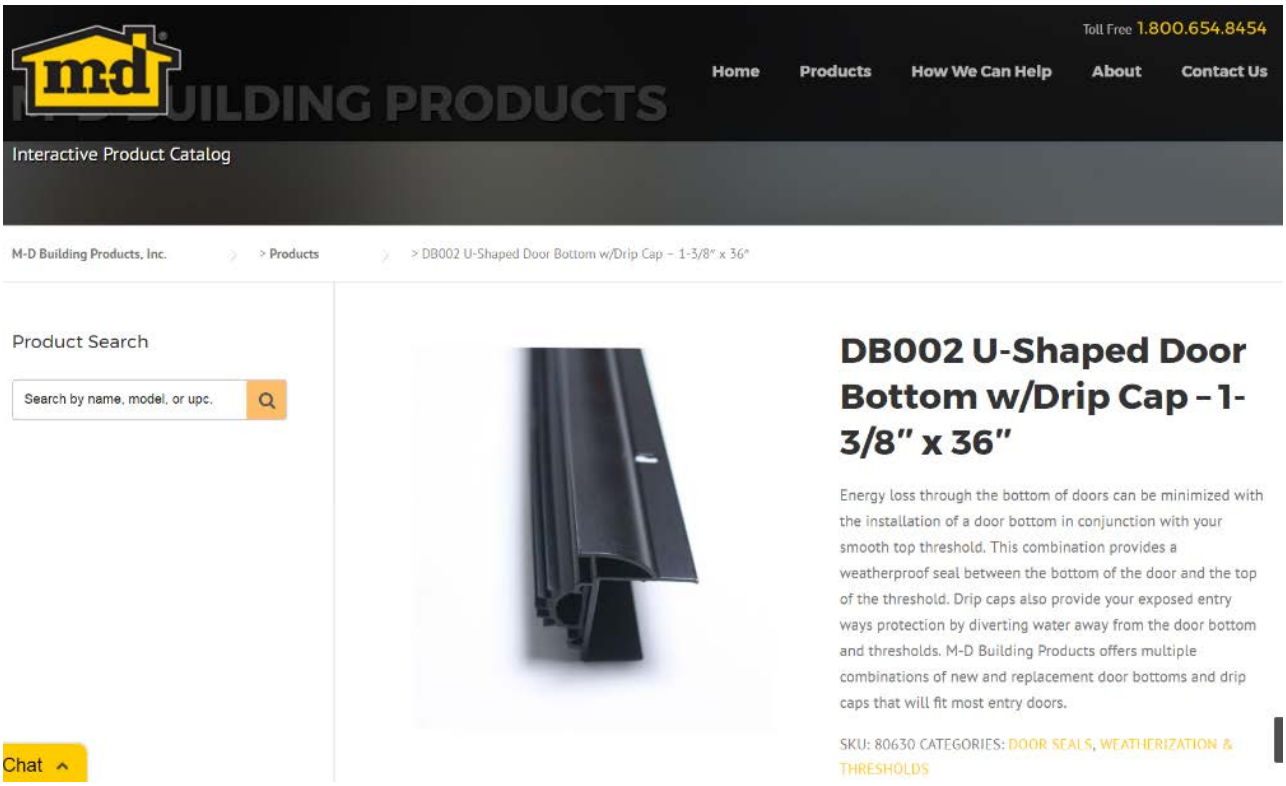
Door Bottom Sweep

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

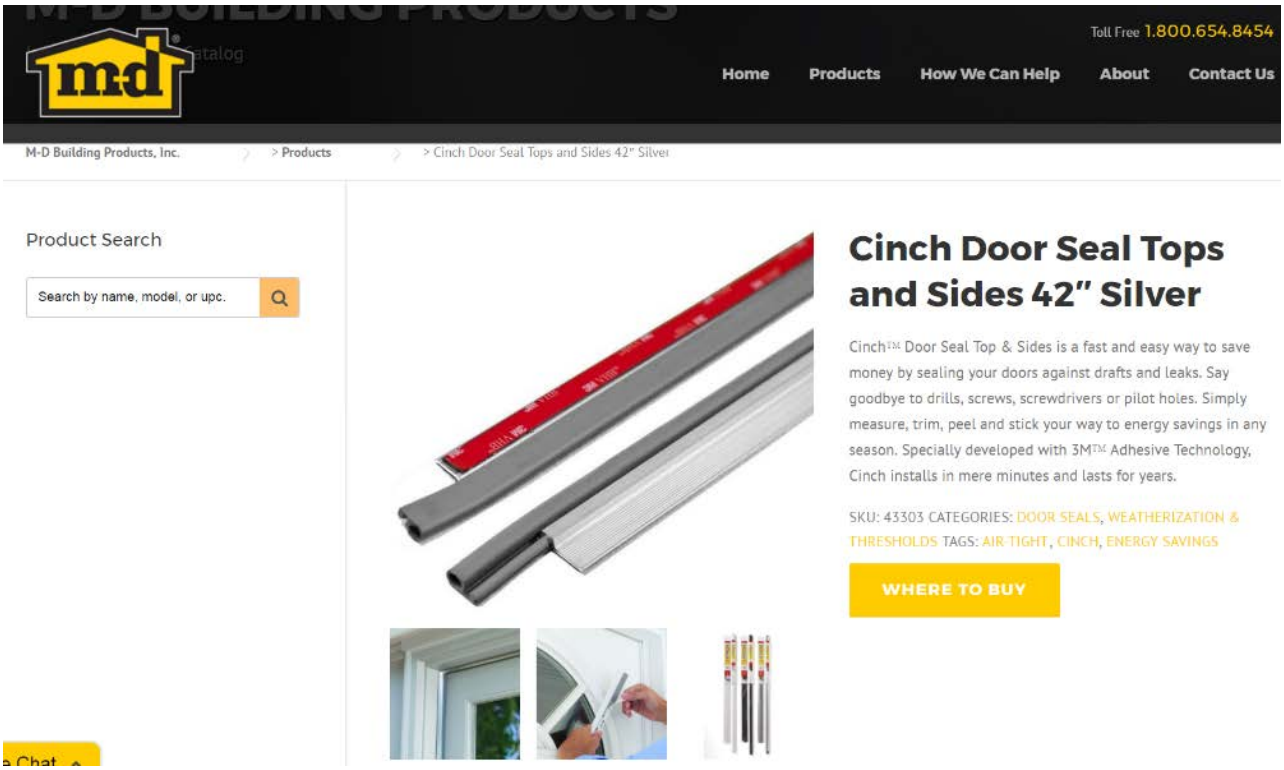


Door Bottom Sweep

(Lower Profile)



Door Top and Side Jambs



Bottom of Garage Doors

GARAGE PRO
A Division of Auto Care Products, Inc.

For Questions or Concerns, Please Call

(800) 992-2018

ProSeal™
U-shaped Garage Door Bottom Seal
Installation Instructions

1. Remove existing garage door bottom seal. Some garage door manufacturers will pinch the aluminum track to hold the bottom seal in place. To open a pinched track, insert a flathead screw driver, into the end of the track, and gently pry open the end, just enough to allow removal of the old door seal. Both ends of the track may need to be opened.

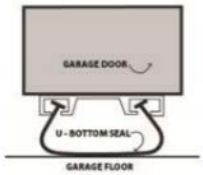
2. Make sure any debris in the track has been removed and that it is clean and dry. Straighten out any cramps in the track.

   Quick Tip: Mix a bucket of water with some liquid dish soap or liquid laundry detergent. Place the seal in the soapy water and pull it out as you install it into the track.

3. Starting at either end of the garage door, insert the ¼" T-ends, attached to the ProSeal™ Garage Door Bottom Seal, into the track. Next, slide the ProSeal™ into the track, until it reaches the opposite side. Continue to pull the seal until you have approximately 2" protruding beyond the end of the track.

4. Leave 2" protruding on both sides, then use scissors to trim off the excess ProSeal™. If your door seal track was pinched and you wish to pinch it back together, use pliers to gently pinch the track back into place. Now tuck the 2" of excess seal back into the U-shaped opening. This will lock the seal in place.

MADE IN THE USA



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Top and Sides of Garage Doors

Roll over image to zoom in

Pemko Brush Gasketing/Door Bottom, 45-degree, Clear Anodized Aluminum with 0.625" Gray Nylon Brush insert, 0.31" width, 0.25" Height, 72" Length

Be the first to review this item

Price: $23.35 & FREE Shipping on orders over $25—or get **FREE Two-Day Shipping** with prime

Usually ships within 1 to 2 months.
Ships from and sold by Amazon.com.

New (1) from $23.35 & FREE shipping on orders over $25.00. Details

Specifications for this item

Part Number	45061CNB72
Number of Items	1
UPC	086787113621
Brand Name	Pemko

Height	0.25 inches
Length	72 inches
Material	Aluminum
Model Number	45061CNB72
Width	0.31 inches

Product features

- All brush seals greatly reduce the infiltration of light, air, wind, rain, and snow; prevent heat loss; control the penetration of smoke and fumes.
- The dense nylon filaments conform to the contours of every sealing surface, providing a superior seal with extremely low closing force.
- Brush remains flexible down to -40°F and has a melting point above 400°F.
- UV stabilized, dependable, long-lasting, cost-effective.
- All clear anodized brush products are supplied with gray brush

Product description

Brush Perimeter seals are designed to seal the gap between the door and the door jamb. They are surface mounted to the frame and are usually supplied with an angled flange. The angled flange provides the best contact between the brush and the surface of the door.

Product details

Shipping Weight: 9.6 ounces (View shipping rates and policies)

Domestic Shipping: Currently, item can be shipped only within the U.S. and to APO/FPO addresses. For APO/FPO shipments, please check with the manufacturer regarding warranty and support issues.

International Shipping: This item is not eligible for international shipping. Learn More

ASIN: B00BU8TLNS

Item model number: 45061CNB72

Average Customer Review: Be the first to review this item

Amazon Best Sellers Rank: #754,396 in Industrial & Scientific (See Top 100 in Industrial & Scientific)
#144 in Industrial & Scientific > Commercial Door Products > Commercial Door Hardware > **Trims, Seals & Gaskets**

Manufacturer's warranty can be requested from customer service. Click here to make a request to customer service.