BUILDING AND USING A CONTROLLED-TEMPERATURE BOX---A CASE STUDY

by Francis Chao
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Web location for this presentation:
http://aztcs.org
Click on “Meeting Notes”
SUMMARY
Off-the-shelf thermostats are good at maintaining building HVAC (heating-ventilating & air conditioning) systems at a controlled ambient temperature of between 50 and 90 degrees Fahrenheit. Portable cooler/warmer devices generally either cool or heat to about 40 degrees below or above the ambient temperature. Interconnecting these two devices results in a reliable, energy-efficient means of storing medications and cosmetics that are temperature-sensitive.
TOPICS

• TEMPERATURE CONTROL PROBLEM

• EXAMPLE OF A TEMPERATURE SENSITIVE PHARMACEUTICAL

• USING SEPARATE THERMOSTATS TO CONTROL A PORTABLE COOLER/WARMER

• DETAILED PARTS LIST FOR BUILDING A CONTROLLED-TEMPERATURE BOX
TOPICS (continued)

• INTERCONNECTING THE TWO THERMOSTATS WITH THE "KOOLATRON" COOLER/HEATER
• WIRING CONFIGURATION DETAILS
• "INSTALLER OPTIONS" MENU OF THE HONEYWELL THERMOSTAT
• EXPENDABLE REPLACEMENT BATTERIES
TOPICS (continued)

• "INTERNET OF THINGS" (IoT) ADD-ON
• MULTIPLE ROUTER DMZ FOR MAKING YOUR NETWORK SAFER FOR IoT
TEMPERATURE CONTROL CHALLENGES

- Many expensive prescription medications require a temperature range in the 68 degrees to 77 degree Farenheit range.

- If you read the specifications for portable cooler/heater devices, small refrigeratures, wine coolers, and high-end cigar thermidor devices and you will find no devices that work in this "room temperature" range.
TEMPERATURE CONTROL CHALLENGES (continued)

- Our attempts to retrofit or "jury rig" the previously-mentioned devices to operate at the 69 degree to 77 degree Fahrenheit range have all ended up in wide temperature fluctuations with unacceptable amounts of water condensation. These sorts of conditions would ruin many expensive cosmetics and prescription medications.
EXAMPLE OF A TEMPERATURE-SENSITIVE PRESCRIPTION MEDICATION

- Synthroid (=levothyroxine sodium tablets)

See https://www.drugs.com/cdi/synthroid.html
Proper storage of Synthroid:
Store Synthroid between 68 and 77 degrees F (20 and 25 degrees C). Brief storage at temperatures between 59 and 86 degrees F (15 and 30 degrees C) is permitted. Protect from heat, light, and moisture. Do not store in the bathroom. Keep Synthroid out of the reach of children and away from pets.
Store Synthroid between 68 and 77 degrees F
EXAMPLE OF A TEMPERATURE-SENSITIVE PRESCRIPTION MEDICATION (continued)

- Synthroid costs about $86 for 90 tablets. See https://www.drugs.com/price-guide/synthroid
Synthroid Prices

This Synthroid price guide is based on using the Drugs.com discount card which is accepted at most U.S. pharmacies. The cost for Synthroid tablet (25 mcg (0.025 mg)) is around $86 for a supply of 90 tablets, depending on the pharmacy you visit. Prices are for cash paying customers only and are not valid with insurance plans.
USING SEPARATE THERMOSTATS TO CONTROL A PORTABLE COOLER/HEATER

- By itself, a Koolatron P9 will either automatically cool or heat (but not both) its interior to about 35 degrees below or above the ambient temperature. The resulting temperature would be out of the acceptable range for many pharmaceutical medications.
USING SEPARATE THERMOSTATS TO CONTROL A PORTABLE COOLER/HEATER (continued)

- If you control the 12-volt power that goes into a Koolatron P9 cooler/heater with both a Honeywell thermostat that monitors the interior temperature of the Koolatron P9 and a Lux thermostat that monitors the ambient temperature, you can keep the inside of the Koolatron P9 at any temperature from 50 to 90 degrees Fahrenheit.
BY USING BOTH A HONEYWELL THERMOSTAT AND A LUX THERMOSTAT, YOU GET TOO的好处:

**Benefit 1:**
The redundant temperature controls greatly reduce your likelihood of ruining the contents in the event that one of the two thermostats fails and
USING SEPARATE THERMOSTATS TO CONTROL A PORTABLE COOLER/HEATER (continued)

- By using **both** a Honeywell thermostat and a Lux thermostat, you get too benefits (continued):
  
  **Benefit 2:**
  
  You can maintain a narrower temperature range relative to the temperature range that would be provided by using a single thermostat.
In the resulting configuration, both the Lux thermostat and the Honeywell thermostat have to be activated before the Koolatron powers up into it's cooling mode, with the Lux thermostat set to trigger when the ambient temperature exceeds the top of the desired temperature range and with the Honeywell thermostat set to trigger when the internal temperature of the Koolatron exceeds the bottom of the desired temperature range.
DETAILED PARTS LIST FOR BUILDING A CONTROLLED-TEMPERATURE BOX

- The following is a detailed description of all of the parts and supplies that were used to build a controlled-temperature box in June of 2016 and then again in August of 2016:
Koolatron P9 Traveler III 9.8-Quart Electric Cooler/Warmer, Grey
by Koolatron

85 customer reviews | 10 answered questions

Price: See price in cart
& FREE Shipping

In stock.
Estimated Delivery Date: Sept. 23 - 28 when you choose Standard Shipping at checkout.
Ships from and sold by OJ Commerce.

- Electric cooler/warmer with 12 volt car plug-in for DC use on the road
- Cools and warms food, medicines, photographic materials, beverages
- Cools to 22°C (40°F) below ambient temp; heats to 57°C (135°F)
- Holds up to 9.8-Quarts; measures 9 by 17-1/2 by 15 inches
- Ideally suited to the individual traveler
Price from OJ Commerce

Price: **$76.80** & **FREE Shipping**

Because our price on this item is lower than the manufacturer's suggested retail price, the manufacturer does not allow us to show you our price until you place the item in your shopping cart. Retailers like Amazon have the legal right to set their own prices independently. Adding the item to your cart allows Amazon to show you our price consistent with our goal of always offering you the lowest possible prices on the widest selection of products. Adding this item won't require you to purchase the product. You can easily remove it from your cart if you decide not to buy it.

We realize that this is an inconvenience and are regularly working to educate manufacturers on how their policies impact our customers. We welcome your comments and suggestions in our forum on this topic.

[Close & remove] [Proceed to Checkout]
Koolatron P9 Traveler III 9.8-Quart Electric Cooler/Warmer, Grey

by Koolatron

85 customer reviews | 10 answered questions

Price: See price in cart

& FREE Shipping

In stock.

Estimated Delivery Date: Sept. 23 - 28 when you choose Standard Shipping at checkout.
Ships from and sold by OJ Commerce.

- Electric cooler/warmer with 12 volt car plug-in for DC use on the road
- Cools and warms food, medicines, photographic materials, beverages
- Cools to 22°C (40°F) below ambient temp; heats to 57°C (135°F)
- Holds up to 9.8-quarts; measures 9 by 17-1/2 by 15 inches
Koolatron's warranty-required 12-volt power supply must be purchased separately:
AC Power Adapter
by Koolatron
Be the first to review this item

Price: **$68.74** & FREE Shipping

**In stock.**

**Estimated Delivery Date:** Wednesday, Sept. 21 when you choose Two-Day Shipping at checkout.
Ships from and sold by DEALS#1.

- Converts Standard 110V AC to 12V DC
- 5 Amp Maximum Capacity
- Works With Koolatron & Most 12V Powered Units
AC Power Adapter
by Koolatron
Be the first to review this item

Price: $68.74 & FREE Shipping

In stock.
Estimated Delivery Date: Wednesday, Sept. 21 when you choose Two-Day Shipping at checkout.
Ships from and sold by DEALS#1.

- Converts Standard 110V AC to 12V DC
- 5 Amp Maximum Capacity
- Works With Koolatron & Most 12V Powered Units
Comment:
Even though it is mandated by the manufacturer's 1 year warranty for the Koolatron P9 box, it is over-priced relative to similar and better quality 12-volt power supplies and it has to be purchased separately from the purchase of the Koolatron P9 box.
Comment (continued):
The following competitive product has been used successfully by many owners of Koolatron P9 boxes:
Schumacher PC-6 120AC to 6A 12V DC Power Converter
by Schumacher

⭐⭐⭐⭐⭐ 618 customer reviews  |  97 answered questions

List Price: $39.99
Price: $20.00 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime
You Save: $19.99 (50%)

In Stock.
Want it Monday, Sept. 19? Order within 3 hrs 44 mins and choose Two-Day Shipping at checkout. Details

Ships from and sold by Amazon.com.

- Converts 120 volt AC household current to 12 volt DC power
- Use for 12 volt coolers, 12 volt lights and other 12 volt accessories.
- One 6 amp 12 volt socket
Schumacher PC-6 120AC to 6A 12V DC Power Converter

by Schumacher

618 customer reviews | 97 answered questions

List Price: $39.99

Price: $20.00 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime

You Save: $19.99 (50%)

In Stock.

Want it Monday, Sept. 19? Order within 3 hrs 42 mins and choose Two-Day Shipping at checkout. Details

Ships from and sold by Amazon.com.

- Converts 120 volt AC household current to 12 volt DC power
- Use for 12 volt coolers, 12 volt lights and other 12 volt accessories.
- One 6 amp 12 volt socket
Use a Lux model WIN100 "Outlet Thermostat" to monitor the ambient temperature and to control the 110-volt side of the Koolatron 12-volt power supply:
Lux WIN100 Heating & Cooling Programmable Outlet Thermostat

by LUX-PRO

1,637 customer reviews

| 200 answered questions

Price: $36.00 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime

In Stock.

Want it Monday, Sept. 19? Order within 12 hrs and choose Two-Day Shipping at checkout. Details

Ships from and sold by Amazon.com. Gift-wrap available.

Item Package Quantity: 1

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Lux WIN100 Heating & Cooling Programmable Outlet Thermostat
by LUX-PRO

1,637 customer reviews
200 answered questions

Price: $36.00 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime

In Stock.
Want it Monday, Sept. 19? Order within 11 hrs 59 mins and choose Two-Day Shipping at checkout. Details
Ships from and sold by Amazon.com. Gift-wrap available.

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For details about the Lux model WIN100 "Outlet Thermostat", see http://luxproducts.com/WIN100.html and http://luxproducts.com/IMG/pdf/win100_manual_en.pdf
Use a Honeywell model TH8110R1008 "Vision Pro 8000" thermostat to monitor the temperature of the interior of the Koolatron 12-volt power supply:
Honeywell TH8110R1008 Vision Pro 8000 Touch Screen Single Stage Thermostat with Red Link Technology

by Honeywell

53 customer reviews | 59 answered questions

List Price: $199.99

Price: **$78.58** & FREE Shipping. Details

You Save: $121.41 (61%)

Only 17 left in stock.

Sold by acr4sale and Fulfilled by Amazon.

Size: **Single Unit**

- Pro8000 + 1 Sensor: **$159.99**
- Pro8000 + 2 Sensors: **$175.51**

**Single Unit**

**$78.58**

Click to open expanded view
Honeywell TH8110R1008 Vision Pro 8000 Touch Screen Single Stage Thermostat with Red Link Technology

by Honeywell

⭐⭐⭐⭐⭐ 53 customer reviews  |  59 answered questions

List Price: $199.99
Price: $78.58 & FREE Shipping. Details
You Save: $121.41 (61%)

Only 17 left in stock.
Sold by acr4sale and Fulfilled by Amazon.

Size: Single Unit
For details about the Honeywell model TH8110R1008 "Vision Pro 8000" thermostat, see https://forwardthinking.honeywell.com/new/68-0312.pdf
Provide a Honeywell model C7189R1004 "Wireless Indoor Sensor" so that the Honeywell thermostat can monitor the internal temperature of the Koolatron P9 cooler/warmer:
Honeywell C7189R1004 Wireless Indoor Sensor

by Honeywell

82 customer reviews | 65 answered questions

List Price: $39.66
Price: $35.49 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime
You Save: $4.17 (11%)

In Stock.
Want it Monday, Sept. 19? Order within 11 hrs 48 mins and choose Two-Day Shipping at checkout. Details
Sold by World Of Deals and Fulfilled by Amazon.

Size: 1 Pack

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Honeywell C7189R1004 Wireless Indoor Sensor
by Honeywell

82 customer reviews  |  65 answered questions

List Price: $39.66
Price: $35.49 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime
You Save: $4.17 (11%)

In Stock.
Want it Monday, Sept. 19? Order within 11 hrs 31 mins and choose Two-Day Shipping at checkout. Details
Sold by World Of Deals and Fulfilled by Amazon.
DETAILED PARTS LIST FOR BUILDING A CONTROLLED-TEMPERATURE BOX

(continued)

• Factory calibrated, no field calibration needed
• Installation is quick and simple
• Operating Temperature Range; 35-114 Degrees
• Small remote sensor matches any room decor
• Includes 2 AAA alkaline batteries and mounting hardware
Provide a Honeywell model THM5421R1021 "Equipment Control Module" so that the Honeywell thermostat can control the 12-volt power side of the Koolatron 12-volt power supply that feeds 12-volt DC power to the Koolatron P9 cooler/warmer:
Honeywell THM5421R1021 IAQ Equipment Interface Module

by Honeywell

8 customer reviews

Price: $58.32 & FREE Shipping or choose faster FREE Shipping with Amazon Prime

In Stock.

Want it Monday, Sept. 19? Order within 11 hrs 25 mins and choose Two-Day Shipping at checkout. Details

Ships from and sold by Amazon.com. Gift-wrap available.
Honeywell THM5421R1021 IAQ Equipment Interface Module
by Honeywell

8 customer reviews

Price: $58.32 & FREE Shipping or choose faster FREE Shipping with Amazon Prime

In Stock.
Want it Monday, Sept. 19? Order within 11 hrs 23 mins and choose Two-Day Shipping at checkout. Details
Ships from and sold by Amazon.com. Gift-wrap available.
Provide a mandatory 24VAC transformer for the Honeywell "Equipment Interface Module"

Optionally, provide a second 24VAC transformer to make the Honeywell thermostat display brighter and easier to read:
Elk TRG2440 24VAC, 40 VA AC Transformer with PTC Fuse

by Elk

⭐⭐⭐⭐⭐ 137 customer reviews | 28 answered questions

Price: $16.50 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime

Only 6 left in stock.

Want it Monday, Sept. 19? Order within 11 hrs 8 mins and choose Two-Day Shipping at checkout. Details

Sold by TRI-SECURE CITY and Fulfilled by Amazon. Gift-wrap available.

- Input Voltage: 120 VAC, 60Hz, .43A, Output Voltage: 24 Volts A.C.
- Auto-Resetting (PTC) Fused Secondary
- Green Power On LED, Grounding Prong & Terminal
- Electrical outlet mounting tab
- H = 4.14-Inch, W=2.74-Inch, D = 2.2-Inch.
Elk TRG2440 24VAC, 40 VA AC Transformer with PTC Fuse
by Elk

137 customer reviews | 28 answered questions

Price: $16.50 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime

Only 6 left in stock.
Want it Monday, Sept. 19? Order within 11 hrs 2 mins and choose Two-Day Shipping at checkout. Details
Sold by TRI-SECURE CITY and Fulfilled by Amazon. Gift-wrap available.

- Input Voltage: 120 VAC, 60Hz, .43A, Output Voltage: 24 Volts A.C.
- Auto-Resetting (PTC) Fused Secondary
- Green Power On LED, Grounding Prong & Terminal
- Electrical outlet mounting tab
- H = 4.14-Inch, W=2.74-Inch, D = 2.2-Inch.
Procure a 12-volt automotive "cigarette lighter outlet extension" for interconnecting the "dry contacts" in the Honeywell "Equipment Interface Module" with the 12-volt output of the Koolatron 12-volt power supply AND the 12-volt power cord of the Koolatron P9 cooler/warmer.
Victor 22-5-05103-8 12V 10' Extension Cord
by Victor

Price: $6.78 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime

In Stock.
Want it Monday, Sept. 19? Order within 10 hrs 54 mins and choose Two-Day Shipping at checkout. Details

Ships from and sold by Amazon.com. Gift-wrap available.

- Use as a replacement for broken plugs on old 12 Volt appliances
- Use to extend cord length on a 12 Volt item
- 10 foot wire length
- Non-fused male plug
- Flexible leads
Victor 22-5-05103-8 12V 10' Extension Cord
by Victor

Price: $6.78 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime

In Stock.
Want it Monday, Sept. 19? Order within 10 hrs 52 mins and choose Two-Day Shipping at checkout. Details

Ships from and sold by Amazon.com. Gift-wrap available.

- Use as a replacement for broken plugs on old 12 Volt appliances
- Use to extend cord length on a 12 Volt item
- 10 foot wire length
- Non-fused male plug
- Flexible leads
DETAILED PARTS LIST FOR BUILDING A CONTROLLED-TEMPERATURE BOX (continued)

- Use "thermostat 2-conductor wire" for:
  1) interconnecting the Honeywell "Equipment Interface Module" with the automotive "cigarette lighter outlet extension cable"
  and for
  2) connecting the 12VAC transformer(s) to the Honeywell "Equipment Interface Module" and, optionally, to the Honeywell thermostat
Coleman Cable 09630 CL2 Bulk Thermostat Cable, 18-Gauge 2-Conductor 25-Feet
by Coleman Cable

Price: $12.04 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime

Only 2 left in stock.
Ships from and sold by Amazon.com. Gift-wrap available.

Size: 25-Feet

- Designed for your heating system
- Works with wired thermostats
- Sized as 18 gauge
- 2 conductors
- Industrial grade quality
Use crimp-type butt splice connectors to connect the thermostat 2-conductor cable to the automotive "12-volt cigarette lighter extension cable":

DETAILED PARTS LIST FOR BUILDING A CONTROLLED-TEMPERATURE BOX (continued)
Glarks 100pcs 22-16 Gauge Butt Electrical Insulated Quick Splice Crimp Terminals Connectors

by Glarks
Be the first to review this item

Price: $7.93 & FREE Shipping

In Stock.
Estimated Delivery Date: Oct. 13 - 31 when you choose Standard at checkout.
Ships from and sold by Connectors & Wire & Tools.

- 100% Brand new high quality insulated crimp terminals connectors
- Package includes: butt quick splice wire crimp terminals connectors
- Package quantity: 100pcs
- A.W.G: 22-16, Wire range: 0.5-1.5mm², Max current=10A
- Selection of - quality copper and PVC materials processing, Comply with UL and RoHS standards
Glarks 100pcs 22-16 Gauge Butt Electrical Insulated Quick Splice Crimp Terminals Connectors

by Glarks

Be the first to review this item

Price: $7.93 & FREE Shipping

In Stock.

Estimated Delivery Date: Oct. 13 - 31 when you choose Standard at checkout.

Ships from and sold by Connectors & Wire & Tools.

- 100% Brand new high quality insulated crimp terminals connectors
- Package includes: butt quick splice wire crimp terminals connectors
- Package quantity: 100pcs
- A.W.G: 22-16, Wire range: 0.5-1.5mm2 , Max current=10A
- Selection of - quality copper and PVC materials processing, Comply with UL and RoHS standards
Use a good crimping tool and do not over- or under-crimp to make sure that the connections are safe and durable:
GB GS-388 8-Inch Crimping Electrical Plier
by GB Electrical

⭐⭐⭐⭐⭐  
401 customer reviews  |  11 answered questions

List Price: $42.04
Price: **$8.19** & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime

You Save: **$3.85 (32%)**

In Stock.
Want it Monday, Sept. 19? Order within **9 hrs 37 mins** and choose Two-Day Shipping at checkout. Details
Ships from and sold by Amazon.com. Gift-wrap available.

Size: EA

• Crimping Pliers with 8-inch high leverage design
• Crimp insulated or non-insulated terminals and Cut copper and aluminum wire
• Tapered nose for cutting in tight locations
• Drop forged steel construction with Non-Slip comfort grips
• 8-by-2-by-0.5-inches; ships at 11.2-ounces
GB GS-388 8-Inch Crimping Electrical Plier
by GB Electrical

401 customer reviews | 11 answered questions

List Price: $12.04
Price: $8.19 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime
You Save: $3.85 (32%)

In Stock.
Want it Monday, Sept. 19? Order within 9 hrs 36 mins and choose Two-Day Shipping at checkout. Details
Ships from and sold by Amazon.com. Gift-wrap available.

Size: EA

- Crimping Pliers with 8-inch high leverage design
- Crimp insulated or non-insulated terminals and Cut copper and aluminum wire
- Tapered nose for cutting in tight locations
- Drop forged steel construction with Non-Slip comfort grips
- 8-by-2-by-0.5-inches; ships at 11.2-ounces
Provide an AcuRite thermometer outside the Koolatron P9 box and place the AcuRite "outdoor sensor" inside the Koolatron P9 box to independently monitor the temperature of the inside of the Koolatron P9 box:
AcuRite 00831A2 Digital Thermometer with Indoor / Outdoor Temperature
by AcuRite

List Price: $17.99
Price: $16.83 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime
You Save: $1.16 (6%)

Only 9 left in stock (more on the way).
Want it Monday, Sept. 19? Order within 11 hrs 14 mins and choose Two-Day Shipping at checkout. Details
Ships from and sold by Amazon.com. Gift-wrap available.

- Indoor and outdoor temperature (degrees Fahrenheit and Celsius) with trend arrow
- Displays indoor and outdoor temperature
- Daily minimum/maximum record
- Small outdoor sensor is easy to place
- Trend arrows allow quick reading, Strong signal penetration (enhanced 433 MHz)
AcuRite 00831A2 Digital Thermometer with Indoor / Outdoor Temperature
by AcuRite

82 customer reviews | 4 answered questions

List Price: $47.99
Price: $16.83 & FREE Shipping on orders over $49 or choose faster FREE Shipping with Amazon Prime
You Save: $1.16 (6%)

Only 9 left in stock (more on the way).
Want it Monday, Sept. 19? Order within 11 hrs 12 mins and choose Two-Day Shipping at checkout. Details

Ships from and sold by Amazon.com. Gift-wrap available.

- Indoor and outdoor temperature (degrees Fahrenheit and Celsius) with trend arrow
- Displays indoor and outdoor temperature
- Daily minimum/maximum record
- Small outdoor sensor is easy to place
- Trend arrows allow quick reading, Strong signal penetration (enhanced 433 MHz)
The "Outdoor" temperature that is displayed by the AcuRite thermometer will actually be the temperature inside the Koolatron P9 cooler/warmer box:
The "Indoor" temperature that is displayed by the AcuRite thermometer will actually be ambient air temperature outside of the Koolatron P9 cooler/warmer box:
DETAILED PARTS LIST FOR BUILDING A CONTROLLED-TEMPERATURE BOX (continued)

- For more information about the AcuRite thermometer, see https://www.acurite.com/media/manuals/00822-00831-instructions.pdf
Use an UPS unit to provide uninterruptible 110-volt power to all of the other devices:
CyberPower CP1500AVRLCD Intelligent LCD UPS 1500VA 900W AVR Mini-Tower
by CyberPower

Price: $139.95 & FREE Shipping. Details

In Stock.
Want it Tuesday, Sept. 20? Order within 7 hrs 10 mins and choose Two-Day Shipping at checkout. Details
Ships from and sold by Amazon.com.

Style: 1500VA AVR

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CyberPower CP1500AVRLCD Intelligent LCD UPS 1500VA 900W AVR Mini-Tower
by CyberPower

2,936 customer reviews
527 answered questions

Price: $139.95 & FREE Shipping. Details

In Stock.
Want it Tuesday, Sept. 20? Order within 7 hrs 8 mins and choose Two-Day Shipping at checkout. Details
Ships from and sold by Amazon.com.
For more information about the Cyberpower model CP1500AVRLCD UPS unit, see https://www.cyberpowersystems.com/products/ups/intelligent-lcd/cp1500avrlcd
INTERCONNECTING THE TWO THERMOSTATS WITH THE KOOLATRON COOLER/HEATER

- 110-volt power from a UPS unit provides power to a Lux thermostat.
- The Lux thermostat monitors the ambient temperature and it controls the 110-volt power that goes to the 110-volt side of the Koolatron 12-volt power supply.
The Honeywell thermostat monitors the internal temperature of the Koolatron box:
INTERCONNECTING THE TWO THERMOSTATS WITH THE KOOLATRON COOLER/HEATER (continued)

○ The Honeywell thermostat controls a Honeywell "Equipment Interface Module" which controls the 12-volt side of the Koolatron 12-volt power supply which provides 12-volt power to the Koolatron P9 cooler/warmer box.
The following is a pictorial diagram of the entire system:
INTERCONNECTING THE TWO THERMOSTATS WITH THE KOOLATRON COOLER/HEATER (continued)

- "Redlink" wireless radio signals are shown in blue:

- Electrical AC power and DC power 2-conductors are shown in red:

- A green box denotes the equipment that is described in the previous slide:
The UPS unit provides uninterruptible power to all other devices such as the 24VAC transformer(s) and the Honeywell "Equipment Interface Module":

INTERCONNECTING THE TWO THERMOSTATS WITH THE KOOLATRON COOLER/HEATER (continued)

- A 24VAC transformer(s) provides 24Volts AC power which is mandatory for the Honeywell "Equipment Interface Module"
- A 24VAC transformer(s) provides optional 24Volts AC power to the Honeywell thermostat
INTERCONNECTING THE TWO THERMOSTATS WITH THE KOOLATRON COOLER/HEATER (continued)

- The Honeywell thermostat will operate without any problems if it has the mandatory 4 AA batteries installed into it. However, when 24 VAC power is provided for it, it's display is better lit and easier to use:
INTERCONNECTING THE TWO THERMOSTATS WITH THE KOOLATRON COOLER/HEATER (continued)

- In cooling mode, the Lux thermostat provides 110VAC power to the Koolatron 12-volt power supply when the ambient temperature is at or above the highest allowable temperature range the inside of the Koolatron P9 unit:
INTERCONNECTING THE TWO THERMOSTATS WITH THE KOOLATRON COOLER/HEATER (continued)

- In Koolatron 12-volt power supply provides 12-volts DC power to the Koolatron P9 box when two conditions are met:
  Condition 1:
  The 110VAC side of the Koolatron power supply is receiving power from the Lux thermostat
  Condition 2:
  The dry contacts inside the Honeywell "Equipment Interface Module" are closed.
INTERCONNECTING THE TWO THERMOSTATS WITH THE KOOLATRON COOLER/HEATER (continued)

- The Honeywell "Wireless Indoor Sensor" (which is inside the Koolatron P9 box) reports the internal temperature of the Koolatron P9 box to the Honeywell thermostat by means of Honeywell's proprietary wireless "Redlink" technology:
The Honeywell thermostat uses it's "Redlink" wireless capability to communicate with the "Inside Temperature Sensor" inside the Koolatron P9 box.
INTERCONNECTING THE TWO THERMOSTATS WITH THE KOOLATRON COOLER/HEATER (continued)

- Whenever the internal temperature of the Koolatron P9 box exceeds the minimum acceptable temperature, the Honeywell thermostat uses its "Redlink wireless technology to close the dry contacts inside the "Equipment Interface Module"
The dry contacts inside the Honeywell "Equipment Interface Module" are closed whenever the Honeywell thermostat detects that the temperature inside the Koolatron box is at or above the lowest allowable temperature range.
INTERCONNECTING THE TWO THERMOSTATS WITH THE KOOLATRON COOLER/HEATER (continued)

- The "12 volt automotive cigarette lighter extension cable" provides an interconnection between the 12-volt output of the Koolatron power supply and the dry contacts of the "Equipment Interface Module" so that the "Equipment Interface Module" supplies 12-volt DC power to the Koolatron P9 box when both thermostats agree on turning on the Koolatron P9 box.
INTERCONNECTING THE TWO THERMOSTATS WITH THE KOOLATRON COOLER/HEATER (continued)

- A proprietary 12-volt power cord connects the jack ("female") side of the "12-volt automotive cigarette lighter extension cord" to the "heat/cold selector" pigtail cable that extends from the Koolatron P9 box:
INTERCONNECTING THE TWO THERMOSTATS WITH THE KOOLATRON COOLER/HEATER (continued)

- The "heat/cold selector" pigtail cable that extends from the Koolatron P9 box is where the installer (you) selects whether the Koolatron P9 is in cooler or heater mode:
WIRING CONFIGURATION DETAILS

• Use the 2-conductor thermostat cable for the following connections:

✓ 24VAC transformer to Honeywell thermostat (optional)

✓ 24VAC transformer to Honeywell "Equipment Interface Module" (mandatory)

✓ Dry contacts inside the Honeywell "Equipment Interface Module" to the "writing" wire of the "12-volt automotive cigarette lighter extension cable"
WIRING CONFIGURATION DETAILS (continued)

- Thermostat 2-conductor between the optional 24 VAC transformer and the Honeywell TH8110R1008 thermostat:
  At the thermostat end, connect the white strand to terminal C.
  At the thermostat end, connect the red strand to terminal RC.
  At the transformer side, connect the white strand to the left-most screw terminal.
  At the transformer side, connect the red strand to the right-most screw terminal.
TW8110R1008

C - WHITE
K
RC - RED

Xformer 1
24VAC
ON/OFF

WHT

O

RED

Thermostat 2-wire cable
When the Honeywell thermostat detects that the internal temperature of the Koolatron P9 cooler/warmer is above the set point of the Honeywell thermostat, it sends a wireless "Redlink" signal to the Equipment Interface Module which then provides continuity between terminals G and RC which then provides a closure between the two "halves" of the "writing" wire of the 12-volt automotive extension cable.
EIM Model THM5421R02

Xformer 2
24 VAC
O.N.C.

122

"WRITING" Wire of 12 Volt Automotive Extension Cable

"WRITING" Wire of 12 Volt Automotive Extension Cable

Towards Koolatron
12 Volt Power Supply

Male 12 Volt Plug

Crimp Connector Crimp Connector

Female 12 Volt Jack 2

Victor Automotive Extension Cable

"NoWriting" Strand is not Cut
WIRING CONFIGURATION DETAILS (continued)
• Thermostat 2-conductor between the mandatory 24 VAC transformer and the Honeywell THM5421R02 "Equipment Interface Module":
  At the "Equipment Interface Module" end, connect the red strand to terminal R.
  At the "Equipment Interface Module" end, connect the white strand to terminal C.
  At the transformer side, connect the white strand to the left-most screw terminal.
  At the transformer side, connect the red strand to the right-most screw terminal.
ETM Model THM5421R02

- **Red Wire**
- **White Wire**
- Thermostat 2-conductor cable

Xformer 2 24VAC

- **White Wire**
- Thermostat 2-conductor cable

"Writing" wire of 12v volt automotive extension cable

Male 12-volt plug

Towards Koolatron 12-volt power supply

Victor automotive extension cable

"No writing" strand is not cut

Towards Koolatron pg cooler/warmer

Female 12-volt jack 2
• Thermostat 2-conductor between the Honeywell THM5421R02 "Equipment Interface Module" and the "12-volt automotive extension cable": At the "Equipment Interface Module" end, connect the red strand to terminal G. At the "Equipment Interface Module" end, connect the white strand to terminal RC.
EIM Model THM5421R02

R

C

RC

RED WIRE

WHITE WIRE

RED WIRE

WHITE WIRE

Thermostat 2-conductor cable

"Writing" wire of 12-volt automotive extension cable

Towards Koolatron 12-volt power supply

Male 12-volt plug

"No writing" strand is not cut

Crimp connector crimp connector

Towards Koolatron pg cooler/warmer

Female 12-volt jack 2

Victor automotive extension cable

Xformer 2 24 VAC O.N.C.

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• Thermostat 2-conductor between the Honeywell THM5421R02 "Equipment Interface Module" and the "12-volt automotive extension cable" (continued):
  At the "12-volt automotive extension cable" end, do not cut the "writing" strand of the "12-volt automotive extension cable" with diagonal pliers. cable.
• Thermostat 2-conductor between the Honeywell THM5421R02 "Equipment Interface Module" and the "12-volt automotive extension cable" (continued): At the "12-volt automotive extension cable" end, cut the "writing" strand of the "12-volt automotive extension cable" with diagonal pliers
EIM Model THM5421R02

Xformer 2 24VAC O.N.C.

1. RED WIRE
2. WHITE WIRE

Thermostat 2-conductor cable

3. RED WIRE
4. WHITE WIRE

Thermostat 2-conductor cable

"Writing" Wire of 12 Volt Automotive Extension Cable

MALE 12-VOLT PLUG

TOWARDS KOOLATRON 12-VOLT POWER SUPPLY

CUT

"No writing" strand is not cut

VICTOR AUTOMOTIVE EXTENSION CABLE
WIRING CONFIGURATION DETAILS (continued)

- Thermostat 2-conductor between the Honeywell THM5421R02 "Equipment Interface Module" and the "12-volt automotive extension cable" (continued):

  Use a crimp connector to connect the red strand of the thermostat 2-conductor to the cut side of the "writing" strand of the automotive extension cable that connects to the jack (female) end of the automotive extension cable.
WIRING CONFIGURATION DETAILS (continued)

- Thermostat 2-conductor between the Honeywell THM5421R02 "Equipment Interface Module" and the "12-volt automotive extension cable" (continued):
  Use a crimp connector to connect the white strand of the thermostat 2-conductor to the cut side of the "writing" strand of the automotive extension cable that connects to the plug (male) end of the automotive extension cable.
EIM Model THM5421R02

134

R

RED WIRE

WHITE WIRE

Thermostat 2-conductor cable

Xformer 2
24 VAC
0 N.C.

C

RED WIRE

WHITE WIRE

thermostat 2-conductor cable

"WRITING" wire of 12 volt automotive extension cable

Male 12-volt plug

Towards Koolatron
12-volt power supply

Towards Koolatron
12-volt cooler/warmer

CRIMP CONNECTOR

"NO WRITING" STRAND IS NOT CUT

VICTOR AUTOMOTIVE EXTENSION CABLE
"INSTALLER OPTIONS" MENU OF THE HONEYWELL THERMOSTAT

• The password to access this menu is the 4-digit "date code" on the label on the back side of the Honeywell TH8110R1008 thermostat.

• Set "Ventilation Type" to "None" to get the "G" and "RC" terminals of the Honeywell "Equipment Interface Module" to close whenever the thermostat turns on "cooling" or "heating".
EXPENDABLE REPLACEMENT BATTERIES

• The Honeywell TH8110R1008 thermostat requires 4 "AA" cells that can be non-rechargeable or rechargeable

• The Honeywell TH8110R1008 thermostat requires a single CR2032 button battery

• The Lux WIN100 thermostat requires 2 "A76" Energizer button batteries
INTERNET OF THINGS (IoT) ADD-ON

• You can add a Honeywell model THM6000R1002 "Red Link Enabled Internet Gateway" so that you can access the Honeywell model TH8110R1008 "Vision Pro 8000" thermostat from anywhere where you have Internet access:
Honeywell THM6000R1002 Red Link Enabled Internet Gateway
by Honeywell

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- Control any RedLINK enabled thermostat
- Simple installation to home or business router
- Easily change system modes and indoor temperature through the web portal or mobile app
- High / Low temperature and humidity messaging alerts the user when the indoor conditions are too high or too low
Honeywell THM6000R1002 Red Link Enabled Internet Gateway

by Honeywell

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- Simple installation to home or business router
- Easily change system modes and indoor temperature through the web portal or mobile app
- High / Low temperature and humidity messaging alerts the user when the indoor conditions are too high or too low
INTERNET OF THINGS (IoT) ADD-ON (continued)

• The THM6000R1002 "Red Link Enabled Internet Gateway" connects by means of a Cat 5/5e/6 cable to your existing router or broadband cable.

• The THM6000R1002 "Red Link Enabled Internet Gateway" connects wirelessly to the Honeywell model TH8110R1008 thermostat by means of Honeywell's "Redlink" technology.
The following pictorial diagram shows the Honeywell model THM6000R1002 "Red Link Enabled Internet Gateway" on the left, your existing router or broadband Internet modem in the center, and the model M32854 AC power adapter that provides DC power to the Gateway on the right:
INTERNET OF THINGS (IoT) ADD-ON (continued)

- If you buy and install this Honeywell model THM6000R1002 "Red Link Enabled Internet Gateway", Honeywell will give you a no-cost account at their Web server farm system so that you can log into your Honeywell thermostat with a Web browser from anywhere.
INTERNET OF THINGS (IoT) ADD-ON (continued)

• MULTIPLE ROUTER DMZ FOR MAKING YOUR NETWORK SAFER FOR IoT

• Whenever you connect devices such as a Honeywell thermostat in your home or business to the Internet (= "Internet of Things = IoT), we recommend that you attach the IoT devices to the "De-militarized Zone" (DMZ) segment of a multiple router configuration.
Internet

Broadband Modem

**Important mission-critical**

PC's, cell phones, tablets, and readers connected by means of Cat 5/5e/6 Cable or WiFi wireless

Network Address Translator & Hardware Firewall

Network Switch & WAP

DMZ

Possibly malware-infected "guest" cell phones, tablets, and readers connected by means of Cat 5/5e/6 Cable or WiFi wireless

Network Address Translator & Hardware Firewall

Secure Local Network

Router 1

WAN side

LAN side

Router 2

WAN side

LAN side

Network Switch & WAP

Network Address Translator & Hardware Firewall

Important mission-critical PC's, cell phones, tablets, and readers connected by means of Cat 5/5e/6 Cable or WiFi wireless
Important mission-critical PC's, cell phones, tablets, and readers connected by means of Cat 5/5e/6 Cable or WiFi wireless.
• MUTIPLE ROUTER DMZ FOR MAKING YOUR NETWORK SAFER FOR IoT (continued)

• For information on multiple router "De-Militarized Zone" configurations, please see slides 33 through 44, and 177 at http://aztcs.org/meeting_notes/winhardsigs/secureWeb/secureWeb.pdf